
NI-SWITCH

User Manual

2025-08-09



Contents

NI-SWITCH Overview	21
NI-SWITCH Operating Requirements	22
Glossary	23
New Features and Changes	37
NI-SWITCH 2023 Q1 Changes.....	37
Features.....	38
Scanning	38
Writing a Software Trigger Scanning Program.....	39
Scanning NI Switches with NI Digital Multimeters	40
Single Module Scanning	46
Scan Lists	47
Single Module Scanning - Synchronous	50
Single Module Scanning - Handshaking	51
Multiple Module Scanning	52
Multiple Module Scan Lists.....	54
Multiple Module Scanning - Synchronous	56
Multiple Module Scanning - Handshaking	58
Adding Additional Settling Time.....	60
Connection and Disconnection List Syntax	62
Disabling Digital Filtering.....	64
Immediate Operations	64
Setting Source and Configuration Channels	67
Simulating a Switch.....	70
Getting Started	72
Creating an application with NI-SWITCH	72
Using NI-SWITCH in LabVIEW.....	73
Considerations for using the LabVIEW Real-Time Module	74
Using NI-SWITCH in LabWindows/CVI	74
Using NI-SWITCH in Visual C/C++	75
Using NI-SWITCH in Visual Basic.....	77
NI-SWITCH Examples.....	78
Using NI Switches in IVI.....	79

Configuring Hardware in MAX	81
Configuring a PXI/PXI Express Switch	82
NI SwitchBlock Configuration Panel Help	82
Simulating the NI SwitchBlock in MAX	82
Configuring the NI SwitchBlock in MAX.....	84
Removing an NI SwitchBlock Carrier or Device in MAX	87
NI SwitchBlock Device Basics	88
Integration and System Considerations.....	90
Environment	90
PXI/PXI Express Chassis Recommendations.....	90
PXI Express Compatibility.....	91
Protecting NI Switch Products when Switching Inductive Loads	92
NI Switch Health Center Help.....	93
About the NI Switch Health Center	93
Accessing the NI Switch Health Center	96
Testing Relays with the NI Switch Health Center	96
Generating Reports with the NI Switch Health Center.....	98
Switch Relay Replacement	98
Switch Relay Maintenance with the NI Switch Health Center	99
Relay Lifetime	100
Error Cases in the NI Switch Health Center	101
Programming with NI-SWITCH.....	102
Programming Flow	102
Initialization	103
Operation Modes	106
Close	107
Setting and Checking Properties and Attributes.....	107
Setting Properties and Attributes Before Reading Them	108
NI-SWITCH Programming Examples	108
Error and Status Codes.....	110
Fundamentals	121
Relay Forms.....	121
Relay Types	122
Electromechanical Relays	123
Armature Relays	123
Transfer Switches.....	126

Reed Relays	128
Solid-State Relays (SSR)	129
FET Switches	130
Topologies	131
General-Purpose Topologies	131
Multiplexer	132
Matrix	133
Transfer Switches (Topology)	133
Fault Insertion Units	134
N-Wire Switching Modes	137
General Switching Considerations	139
Contact Resistance	139
Relay Life	139
Path Resistance	140
Thermal EMF and Offset Voltage	140
Relay Operation	143
Cycle Process	143
Settling Time	144
Relay Count	145
Switching Inductive Loads	145
Switching Capacitive Loads	146
Switching Capacity	148
Switching Voltage	149
Switching Current	149
Switching Power	149
Reed Relay Protection	150
Bounce	151
Arcing	152
Inrush Current	153
Board Layout and Topology	155
Example System	158
NI SwitchBlock Switching Considerations	159
NI SwitchBlock Basics	160
NI PXI-2800 Carrier for the NI SwitchBlock	160
NI SwitchBlock Cards and Devices	161
NI SwitchBlock Safety Interlock	163

Setting Up and Configuring the NI SwitchBlock	164
Installing the NI SwitchBlock.....	164
NI SwitchBlock Device Reference	164
Expanding Multiple NI SwitchBlock Carriers	170
NI SwitchBlock Programming Considerations	171
Initializing with Topology for NI SwitchBlock Devices.....	171
Using the Analog Bus on an NI SwitchBlock Carrier.....	175
NI SwitchBlock Power Limits.....	178
NI SwitchBlock Maintenance.....	179
Replacing a Fuse on the NI SwitchBlock Carrier	179
NI SwitchBlock Integrated Relay Test	182
NI SwitchBlock Troubleshooting	183
Programming the NI SwitchBlock in NI-SWITCH and NI-DAQmx.....	183
NI SwitchBlock Overview	183
The NI SwitchBlock Carrier and the Analog Bus	184
System Configuration Options for the NI SwitchBlock	186
Routing Signals Within One NI SwitchBlock Device	189
Routing Signals Between Multiple NI SwitchBlock Devices	191
RF Switching Considerations.....	195
Characteristic Impedance	195
Rise Time	197
Bandwidth and Insertion Loss	198
Voltage Standing Wave Ratio (VSWR).....	202
Crosstalk.....	202
Isolation	203
Scanning Fundamentals.....	204
Software Trigger Scanning.....	205
Synchronous Scanning.....	206
Handshaking.....	207
NI-SWITCH Switches.....	210
NI PXI-2501/2503	210
NI PXI-2501 Amplifier.....	212
NI PXI-2501 Hardware Diagram.....	212
NI PXI-2501 1-Wire 48×1 Amplified Multiplexer Topology	213
NI PXI-2503 Hardware Diagram.....	214
NI PXI-2501/2503 Triggering.....	215

NI PXI-2501/2503 1-Wire 48×1 Multiplexer Topology	217
NI PXI-2501 2-Wire 24×1 Amplified Multiplexer Topology	221
NI PXI-2501/2503 2-Wire 24×1 Multiplexer Topology	222
NI PXI-2501/2503 2-Wire 4×6 Matrix Topology	227
NI PXI-2501/2503 2-Wire Dual 12×1 Multiplexer Topology	231
NI PXI-2501/2503 2-Wire Quad 6×1 Multiplexer Topology	236
NI PXI-2501/2503 4-Wire 12×1 Multiplexer Topology	242
NI PXI-2501/2503 Current-Loop Receivers	248
Cold-Junction Temperature Sensor Channel	248
Relay Replacement	249
Matrix Expansion	254
Multiplexer Expansion	254
NI PXI-2510	255
NI PXI-2510 Hardware Diagram	256
NI PXI-2510 Independent Topology	258
NI PXI-2510 Relay Replacement	260
NI PXI-2510 Triggering	267
NI PXI/PXIe-2512	269
NI PXI/PXIe-2512 Front Panel	270
NI PXI/PXIe-2512 Hardware Diagram	272
NI PXI/PXIe-2512 Independent Topology	273
NI PXI/PXIe-2512 Triggering	274
NI PXI/PXIe-2514	275
NI PXI/PXIe-2514 Front Panel	276
NI PXI/PXIe-2514 Hardware Diagram	278
NI PXI/PXIe-2514 Independent Topology	279
NI PXI/PXIe-2514 Triggering	281
NI PXI/PXIe-2515	282
NI PXI/PXIe-2515 Analog Channel Expansion	284
NI PXI/PXIe-2515 Front Panel	285
NI PXI/PXIe-2515 Hardware Diagram	286
NI PXI/PXIe-2515 Independent Topology	287
NI PXI/PXIe-2515 Intended Use	293
NI PXI/PXIe-2515 Triggering	296
NI PXI-2520	298
NI PXI-2520 80-SPST Topology	299

NI PXI-2520 Hardware Diagram	301
NI PXI-2520 Relay Replacement	301
NI PXI-2520 Triggering	304
NI PXI-2521	305
NI PXI-2521 40-DPST Topology	306
NI PXI-2521 Hardware Diagram	308
NI PXI-2521 Relay Replacement	309
NI PXI-2521 Triggering	311
NI PXI-2522	313
NI PXI-2522 53-SPDT Topology	314
NI PXI-2522 Hardware Diagram	316
NI PXI-2522 Relay Replacement	317
NI PXI-2522 Triggering	319
NI PXI-2523	321
NI PXI-2523 26-DPDT Topology	322
NI PXI-2523 Hardware Diagram	325
NI PXI-2523 Relay Replacement	325
NI PXI-2523 Triggering	328
NI PXIe-2524	329
NI PXIe-2524 1-Wire 128×1 Multiplexer Topology	331
NI PXIe-2524 1-Wire Dual 64×1 Multiplexer Topology	337
NI PXIe-2524 Front Panel	343
NI PXIe-2524 Hardware Diagram	343
NI PXIe-2524 1-Wire Octal 16×1 Multiplexer Topology	344
NI PXIe-2524 1-Wire Quad 32×1 Multiplexer Topology	351
NI PXIe-2524 Relay Replacement	357
NI PXIe-2524 1-Wire Sixteen 8×1 Multiplexer Topology	360
NI PXIe-2525	366
NI PXIe-2525 2-Wire 64×1 Multiplexer Topology	368
NI PXIe-2525 2-Wire Dual 32×1 Multiplexer Topology	373
NI PXIe-2525 Front Panel	377
NI PXIe-2525 Hardware Diagram	378
NI PXIe-2525 2-Wire Octal 8×1 Multiplexer Topology	379
NI PXIe-2525 2-Wire Quad 16×1 Multiplexer Topology	384
NI PXIe-2525 Relay Replacement	389
NI PXIe-2525 2-Wire Sixteen 4×1 Multiplexer Topology	393

NI PXIe-2526	399
NI PXIe-2526 1-Wire 158×1 Multiplexer Topology	400
NI PXIe-2526 2-Wire 79×1 Multiplexer Topology	405
NI PXIe-2526 Front Panel	410
NI PXIe-2526 Hardware Diagram.....	410
NI PXIe-2526 Relay Replacement	411
NI PXI/PXIe-2527.....	414
NI PXI/PXIe-2527 1-Wire 64×1 Multiplexer Topology	415
NI PXI/PXIe-2527 2-Wire 32×1 Multiplexer Topology	419
NI PXI/PXIe-2527 4-Wire 16×1 Multiplexer Topology	423
NI PXI/PXIe-2527 1-Wire Dual 32×1 Multiplexer Topology.....	425
NI PXI/PXIe-2527 2-Wire Dual 16×1 Multiplexer Topology.....	429
NI PXI/PXIe-2527 Hardware Diagram	432
NI PXI/PXIe-2527 Independent Topology	433
NI PXI/PXIe-2527 Relay Replacement	436
NI PXI/PXIe-2527 Triggering.....	442
Thermocouple Measurement	443
NI PXI/PXIe-2529.....	446
NI PXI/PXIe-2529 2-Wire 4×32 Matrix Topology	447
NI PXI/PXIe-2529 2-Wire 8×16 Matrix Topology	451
Expanding the NI PXI/PXIe-2529 Matrix Using the NI TB-2636	455
NI PXI/PXIe-2529 2-Wire Dual 4×16 Matrix Topology	456
NI PXI/PXIe-2529 Hardware Diagram	460
NI PXI/PXIe-2529 Matrix Expansion	461
NI PXI/PXIe-2529 Relay Replacement	461
NI PXI/PXIe-2529 Triggering.....	466
NI PXI-2530/2530B	468
NI PXI-2530/2530B 1-Wire 128×1 Multiplexer Topology.....	470
NI PXI-2530/2530B 1-Wire 4×32 Matrix Topology	471
NI PXI-2530/2530B 1-Wire 8×16 Matrix Topology	472
NI PXI-2530/2530B 2-Wire 4×16 Matrix Topology	474
NI PXI-2530/2530B 2-Wire 64×1 Multiplexer Topology.....	475
NI PXI-2530 1-Wire 4x32 Matrix Topology	476
NI PXI-2530 1-Wire 8x16 Matrix Topology	479
NI PXI-2530 2-Wire 4x16 Matrix Topology	482
NI PXI-2530 1-Wire Multiplexer and Independent Topologies	486

NI PXI-2530 2-Wire Multiplexer Topologies.....	493
NI PXI-2530 4-Wire Multiplexer Topologies.....	504
NI PXI-2530 Relay Replacement	512
NI PXI-2530 Signal Connections	517
NI PXI-2530B 1-Wire 4x32 Matrix Topology.....	517
NI PXI-2530B 1-Wire 8x16 Matrix Topology.....	520
NI PXI-2530B 2-Wire 4x16 Matrix Topology.....	523
NI PXI-2530B 1-Wire Multiplexer and Independent Topologies.....	526
NI PXI-2530B 2-Wire Multiplexer Topologies	534
NI PXI-2530B 4-Wire Multiplexer Topologies	546
NI PXI-2530B Relay Replacement	553
NI PXI-2530B Signal Connections	557
NI PXI-2530/2530B Triggering	557
Expanding the NI PXI-2530/2530B Matrix Using the NI TB-2632/2632B.....	559
NI PXI-2530/2530B 4-Wire 32x1 Multiplexer Topology.....	561
NI PXI-2530/2530B 1-Wire Dual 64x1 Multiplexer Topology	562
NI PXI-2530/2530B 2-Wire Dual 32x1 Multiplexer Topology	563
NI PXI-2530/2530B 4-Wire Dual 16x1 Multiplexer Topology	565
NI PXI-2530/2530B Hardware Diagram	567
NI PXI-2530/2530B Independent Topology	567
NI PXI-2530 2-Wire 4x16 Matrix Topology	569
NI PXI-2530/2530B Matrix Expansion.....	573
NI PXI-2530/2530B 1-Wire Octal 16x1 Multiplexer Topology	573
NI PXI-2530/2530B 1-Wire Quad 32x1 Multiplexer Topology	575
NI PXI-2530/2530B 2-Wire Quad 16x1 Multiplexer Topology	577
NI PXI/PXIe-2531.....	579
NI PXI/PXIe-2531 Hardware Diagram	580
NI PXI/PXIe-2531 Relay Replacement	581
NI PXI/PXIe-2531 Triggering.....	596
NI PXI/PXIe-2531 1-Wire 4x128 Matrix Topology	597
NI PXI/PXIe-2531 1-Wire 8x64 Matrix Topology	601
NI PXI/PXIe-2531 1-Wire Sixteen 2x16 Matrix Topology.....	604
NI PXI/PXIe-2531 1-Wire Dual 4x64 Matrix Topology	606
NI PXI/PXIe-2531 1-Wire Dual 8x32 Matrix Topology	610
NI PXI/PXIe-2532/2532B	614
NI PXI/PXIe-2532 Relay Replacement	616

NI PXI/PXIe-2532B Relay Replacement	632
NI PXI/PXIe-2532/2532B Hardware Diagram	647
NI PXI/PXIe-2532/2532B Matrix Expansion	648
NI PXI/PXIe-2532/2532B Triggering	652
NI PXI/PXIe-2532/2532B 1-Wire 16×32 Matrix Topology	654
NI PXI/PXIe-2532/2532B 1-Wire 4×128 Matrix Topology	661
NI PXI/PXIe-2532/2532B 1-Wire 8×64 Matrix Topology.....	667
NI PXI/PXIe-2532/2532B 1-Wire Quad 4×32 Matrix Topology	673
NI PXI/PXIe-2532/2532B 1-Wire Sixteen 2×16 Matrix Topology	681
NI PXI/PXIe-2532/2532B 1-Wire Dual 16×16 Matrix Topology.....	684
NI PXI/PXIe-2532/2532B 1-Wire Dual 4×64 Matrix Topology	693
NI PXI/PXIe-2532/2532B 1-Wire Dual 8×32 Matrix Topology	700
NI PXI/PXIe-2532/2532B 2-Wire 16×16 Matrix Topology	707
NI PXI/PXIe-2532/2532B 2-Wire 4×64 Matrix Topology.....	715
NI PXI/PXIe-2532/2532B 2-Wire 8×32 Matrix Topology.....	722
NI PXI/PXIe-2532/2532B 2-Wire Dual 4×32 Matrix Topology.....	729
NI PXI-2533	736
NI PXI-2533 1-Wire 4×64 Matrix Topology	737
NI PXI-2533 Hardware Diagram.....	738
NI PXI-2533 Triggering.....	739
NI PXI-2534	740
NI PXI-2534 1-Wire 8×32 Matrix Topology	741
NI PXI-2534 Hardware Diagram.....	743
NI PXI-2534 Triggering.....	744
NI PXI-2535	745
NI PXI-2535 1-Wire 4×136 Matrix Topology	746
NI PXI-2535 Hardware Diagram.....	748
NI PXI-2535 Matrix Expansion	749
NI PXI-2535 Triggering.....	750
NI PXI-2536	752
NI PXI-2536 1-Wire 8×68 Matrix Topology	753
NI PXI-2536 Hardware Diagram.....	754
NI PXI-2536 Matrix Expansion	755
NI PXI-2536 Triggering.....	756
NI PXI/PXIe-2540.....	758
NI PXI/PXIe-2540 1-Wire 8×9 Matrix Topology	758

NI PXI/PXIe-2540 Front Panel.....	759
NI PXI/PXIe-2540 Hardware Diagram.....	760
NI PXI/PXIe-2540 Triggering.....	762
NI PXI/PXIe-2541.....	764
NI PXI/PXIe-2541 1-Wire 8×12 Matrix Topology.....	764
NI PXI/PXIe-2541 Front Panel.....	765
NI PXI/PXIe-2541 Hardware Diagram.....	766
NI PXI-2541 Matrix Expansion.....	768
NI PXI/PXIe-2541 Triggering.....	769
NI PXI/PXIe-2542.....	771
NI PXI/PXIe-2542 Front Panel.....	772
NI PXI/PXIe-2542 Hardware Diagram.....	772
NI PXI/PXIe-2542 Quad 2×1 Terminated Multiplexer (Quad SP2T) Topology ...	773
NI PXI/PXIe-2542 Triggering.....	774
NI PXI/PXIe-2543.....	776
NI PXI/PXIe-2543 Dual 4×1 Terminated Multiplexer (Dual SP4T) Topology.....	777
NI PXI/PXIe-2543 Front Panel.....	778
NI PXI/PXIe-2543 Hardware Diagram.....	779
NI PXI/PXIe-2543 Triggering.....	779
NI PXI/PXIe-2544.....	781
NI PXI/PXIe-2544 8×1 Terminated Multiplexer (Dual SP8T) Topology.....	781
NI PXI/PXIe-2544 Front Panel.....	783
NI PXI/PXIe-2544 Hardware Diagram.....	783
NI PXI/PXIe-2544 Triggering.....	784
NI PXI-2545.....	785
NI PXI-2545 Terminated 4×1 Multiplexer (SP4T) Topology.....	786
NI PXI-2545 Front Panel.....	788
NI PXI-2545 Hardware Diagram.....	788
NI PXI-2545 Triggering.....	789
NI PXI-2546.....	790
NI PXI-2546 Dual 4×1 Multiplexer (Dual SP4T) Topology.....	791
NI PXI-2546 Front Panel.....	792
NI PXI-2546 Hardware Diagram.....	793
NI PXI-2546 Triggering.....	794
NI PXI-2547.....	795
NI PXI-2547 8×1 Multiplexer (SP8T) Topology.....	796

NI PXI-2547 Front Panel	797
NI PXI-2547 Hardware Diagram.....	798
NI PXI-2547 Triggering.....	799
NI PXI-2548	800
NI PXI-2548 Quad SPDT Topology.....	801
NI PXI-2548 Front Panel	802
NI PXI-2548 Hardware Diagram.....	803
NI PXI-2548 Triggering.....	803
NI PXI-2549	805
NI PXI-2549 Dual Terminated SPDT Topology	806
NI PXI-2549 Front Panel	807
NI PXI-2549 Hardware Diagram.....	808
NI PXI-2549 Triggering.....	809
NI PXI-2554	810
NI PXI-2554 4×1 Multiplexer (SP4T) Topology	811
NI PXI-2554 Front Panel	812
NI PXI-2554 Hardware Diagram.....	813
NI PXI-2554 Triggering.....	813
NI PXI-2555	815
NI PXI-2555 Terminated 4×1 Multiplexer (SP4T) Topology	816
NI PXI-2555 Front Panel	817
NI PXI-2555 Hardware Diagram.....	818
NI PXI-2555 Triggering.....	819
NI PXI-2556	820
NI PXI-2556 Dual 4×1 Multiplexer (Dual SP4T) Topology.....	821
NI PXI-2556 Front Panel	822
NI PXI-2556 Hardware Diagram.....	823
NI PXI-2556 Triggering.....	824
NI PXI-2557	825
NI PXI-2557 8×1 Multiplexer (SP8T) Topology	826
NI PXI-2557 Front Panel	827
NI PXI-2557 Hardware Diagram.....	828
NI PXI-2557 Triggering.....	829
NI PXI-2558	830
NI PXI-2558 Quad SPDT Topology.....	831
NI PXI-2558 Front Panel	832

NI PXI-2558 Hardware Diagram	833
NI PXI-2558 Triggering	833
NI PXI-2559	835
NI PXI-2559 Dual Terminated SPDT Topology	836
NI PXI-2559 Front Panel	837
NI PXI-2559 Hardware Diagram	838
NI PXI-2559 Triggering	839
NI PXI-2564	840
NI PXI-2564 16-SPST Topology	841
NI PXI-2564 8-DPST Topology	843
NI PXI-2564 Hardware Diagram	845
NI PXI-2564 Relay Replacement	845
NI PXI-2564 Triggering	849
NI PXI-2565	850
NI PXI-2565 16-SPST Topology	851
NI PXI-2565 Flyback Voltage Protection	853
NI PXI-2565 Hardware Diagram	855
NI PXI-2565 Relay Replacement	855
NI PXI-2565 Triggering	858
NI PXI-2566	859
NI PXI-2566 16-SPDT Topology	860
NI PXI-2566 8-DPDT Topology	862
NI PXI-2566 Hardware Diagram	865
NI PXI-2566 Relay Replacement	866
NI PXI-2566 Triggering	869
NI PXI-2567	870
Available 5 V and 12 V Sources	871
NI PXI-2567 Hardware Diagram	871
NI PXI-2567 Independent Topology	872
NI PXI-2567 Triggering	875
NI PXI-2568	877
NI PXI-2568 15-DPST Topology	878
NI PXI-2568 31-SPST Topology	880
NI PXI-2568 Hardware Diagram	881
NI PXI-2568 Relay Replacement	882
NI PXI-2568 Triggering	885

NI PXI/PXIe-2569.....	887
NI PXI/PXIe-2569 100-SPST Topology	888
NI PXI/PXIe-2569 50-DPST Topology	891
NI PXI/PXIe-2569 Hardware Diagram	892
NI PXI/PXIe-2569 Relay Replacement	893
NI PXI/PXIe-2569 Triggering	898
NI PXI-2570	900
NI PXI-2570 40-SPDT Topology	901
NI PXI-2570 Hardware Diagram	904
NI PXI-2570 Relay Replacement	904
NI PXI-2570 Triggering	910
NI PXI-2571	912
NI PXI-2571 66-SPDT Topology	913
NI PXI-2571 Hardware Diagram	916
NI PXI-2571 Relay Replacement	916
NI PXI-2571 Triggering	918
NI PXI/PXIe-2575.....	920
NI PXI/PXIe-2575 1-Wire 196×1 Multiplexer Topology	922
NI PXI/PXIe-2575 2-Wire 95×1 Multiplexer Topology	924
NI PXI/PXIe-2575 2-Wire 98×1 Multiplexer Topology	926
NI PXI/PXIe-2575 Hardware Diagram	928
NI PXI/PXIe-2575 Relay Replacement	932
NI PXI/PXIe-2575 Triggering	946
NI PXI-2576	948
NI PXI-2576 Hardware Diagram	950
NI PXI-2576 Independent Topology	951
NI PXI-2576 Relay Replacement	954
NI PXI-2576 Triggering	958
NI PXI-2576 2-Wire 64×1 Multiplexer Topology	960
NI PXI-2576 2-Wire Dual 32×1 Multiplexer Topology	962
NI PXI-2576 2-Wire Octal 8×1 Multiplexer Topology	965
NI PXI-2576 2-Wire Quad 16×1 Multiplexer Topology	968
NI PXI-2576 2-Wire Sixteen 4×1 Multiplexer Topology	971
NI PXI-2584	974
NI PXI-2584 Hardware Diagram	975
NI PXI-2584 Relay Replacement	976

NI PXI-2584 Signal Connections	980
NI PXI-2584 Triggering.....	981
NI PXI-2584 Independent Topology	983
NI PXI-2584 1-Wire 12×1 Multiplexer Topology	984
NI PXI-2584 1-Wire Dual 6×1 Multiplexer Topology.....	986
NI PXI-2584 Interleaved Multiplexer (User-Implemented)	987
NI PXI-2584 2-Wire 6×1 Multiplexer Topology	992
NI PXI-2585	994
NI PXI-2585 1-Wire 10×1 Multiplexer Topology	995
NI PXI-2585 Hardware Diagram.....	996
NI PXI-2585 Relay Replacement	996
NI PXI-2585 Triggering.....	1000
NI PXI-2586	1002
NI PXI-2586 10-SPST Topology	1003
NI PXI-2586 5-DPST Topology	1004
NI PXI-2586 Hardware Diagram.....	1005
NI PXI-2586 Relay Replacement	1006
NI PXI-2586 Triggering.....	1010
NI PXI-2590	1012
NI PXI-2590 4×1 Multiplexer Topology.....	1012
NI PXI-2590 Hardware Diagram.....	1013
NI PXI-2590/2591 Triggering.....	1014
NI PXI-2591	1015
NI PXI-2591 4×1 Multiplexer Topology.....	1016
NI PXI-2591 Hardware Diagram.....	1017
NI PXI/PXIe-2593.....	1017
NI PXI/PXIe-2593 Front Panel.....	1018
NI PXI/PXIe-2593 Hardware Diagram	1019
Dimensionally Flexible Sparse Matrix	1020
NI PXI/PXIe-2593 Triggering.....	1021
NI PXI/PXIe-2593 Independent Topology	1023
NI PXI/PXIe-2593 16×1 Multiplexer Topology.....	1025
NI PXI/PXIe-2593 3×1 Multiplexers	1027
NI PXI/PXIe-2593 8×1 Terminated Multiplexer Topology.....	1029
NI PXI/PXIe-2593 Dual 4×1 Terminated Multiplexer Topology	1030
NI PXI/PXIe-2593 Dual 8×1 Multiplexer Topology	1032

NI PXI-2594/2595	1034
NI PXI-2594/2595 4×1 Multiplexer Topology.....	1035
NI PXI-2594/2595 Front Panels	1036
NI PXI-2594/2595 Hardware Diagram	1037
NI PXI-2594/2595 Triggering.....	1037
NI PXI-2596	1039
NI PXI-2596 Dual 6×1 Multiplexer Topology	1040
NI PXI-2596 Front Panel	1041
NI PXI-2596 Hardware Diagram.....	1041
NI PXI-2596 Triggering.....	1042
NI PXI-2597	1043
NI PXI-2597 6×1 Terminated Multiplexer Topology.....	1044
NI PXI-2597 Front Panel	1045
NI PXI-2597 Hardware Diagram.....	1046
NI PXI-2597 Triggering.....	1046
NI PXI-2598	1048
NI PXI-2598 Dual Transfer Switch Topology	1049
NI PXI-2598 Front Panel	1050
NI PXI-2598 Hardware Diagram.....	1051
NI PXI-2598 Triggering.....	1051
NI PXI-2599	1053
NI PXI-2599 2-SPDT Topology	1054
NI PXI-2599 Front Panel	1055
NI PXI-2599 Hardware Diagram.....	1055
NI PXI-2599 Triggering.....	1056
NI PXI-2720	1057
NI PXI-2720 Hardware Diagram.....	1058
NI PXI-2720 Independent Topology	1060
NI PXI-2720 Relay Replacement	1063
NI PXI-2720 Triggering.....	1068
NI PXI-2722	1070
NI PXI-2722 Hardware Diagram.....	1071
NI PXI-2722 Independent Topology	1073
NI PXI-2722 Relay Replacement	1076
NI PXI-2722 Triggering.....	1081
NI PXIe-2725	1083

NI PXIe-2725 Hardware Diagram.....	1084
NI PXIe-2725 Independent Topology.....	1086
NI PXIe-2725 Relay Replacement.....	1090
NI PXIe-2725 Triggering.....	1097
NI PXIe-2727.....	1098
NI PXIe-2727 Hardware Diagram.....	1099
NI PXIe-2727 Independent Topology.....	1101
NI PXIe-2727 Relay Replacement.....	1105
NI PXIe-2727 Triggering.....	1112
NI PXIe-2737 2-Wire 4×64 Matrix Topology.....	1113
NI PXIe-2737.....	1115
NI PXIe-2737 Front Panel.....	1116
NI PXIe-2737 Hardware Diagram.....	1116
NI PXIe-2737 Relay Replacement.....	1117
NI PXIe-2738.....	1124
NI PXIe-2738 2-Wire 8×32 Matrix Topology.....	1125
NI PXIe-2738 Front Panel.....	1126
NI PXIe-2738 Hardware Diagram.....	1127
NI PXIe-2738 Relay Replacement.....	1128
NI PXIe-2739.....	1134
NI PXIe-2739 2-Wire 16×16 Matrix Topology.....	1135
NI PXIe-2739 Front Panel.....	1136
NI PXIe-2739 Hardware Diagram.....	1137
NI PXIe-2739 Relay Replacement.....	1138
NI PXI-2746.....	1145
NI Quad PXIe-2746 4×1 Multiplexer (Quad SP4T) Topology.....	1145
NI PXIe-2746 Front Panel.....	1147
NI PXIe-2746 Hardware Diagram.....	1148
NI PXIe-2747.....	1149
NI PXIe-2747 Dual 8×1 Multiplexer (SP8T) Topology.....	1150
NI PXIe-2747 Front Panel.....	1151
NI PXIe-2747 Hardware Diagram.....	1152
NI PXIe-2748.....	1153
NI PXIe-2748 16×1 Multiplexer (SP8T) Topology.....	1154
NI PXIe-2748 Front Panel.....	1155
NI PXIe-2748 Hardware Diagram.....	1156

NI PXIe-2790	1157
NI PXIe-2790 Front Panel	1158
NI PXIe-2790 Hardware Diagram.....	1158
NI PXIe-2790 Independent Topology.....	1159
NI PXIe-2790 Triggering.....	1160
NI PXI-2796	1161
NI PXI-2796 Dual 6×1 Multiplexer Topology	1162
NI PXI-2796 Front Panel	1163
NI PXI-2796 Hardware Diagram.....	1164
NI PXI-2796 Triggering.....	1164
NI PXI-2797	1166
NI PXI-2797 6×1 Terminated Multiplexer Topology.....	1166
NI PXI-2797 Front Panel	1167
NI PXI-2797 Hardware Diagram.....	1168
NI PXI-2797 Triggering.....	1168
NI PXI-2798	1170
NI PXI-2798 Dual Transfer Switch Topology	1171
NI PXI-2798 Front Panel	1172
NI PXI-2798 Hardware Diagram.....	1173
NI PXI-2798 Triggering.....	1173
NI PXI-2799	1175
NI PXI-2799 2-SPDT Topology	1176
NI PXI-2799 Front Panel	1177
NI PXI-2799 Hardware Diagram.....	1177
NI PXI-2799 Triggering.....	1178
NI 2810	1179
NI 2810 1-Wire 4×43 Matrix Topology.....	1180
NI 2810 Hardware Diagram	1183
NI 2810 Multicard Topologies	1184
NI 2810 Relay Replacement.....	1185
NI 2811	1189
NI 2811 1-Wire 8×21 Matrix Topology.....	1190
NI 2811 Hardware Diagram	1193
NI 2811 Multicard Topologies	1194
NI 2811 Relay Replacement.....	1195
NI 2812	1199

NI 2812 1-Wire 16×9 Matrix Topology.....	1200
NI 2812 Hardware Diagram	1203
NI 2812 Multicard Topologies	1204
NI 2812 Relay Replacement	1205
NI 2813	1209
NI 2813 2-Wire 4×21 Matrix Topology.....	1210
NI 2813 Hardware Diagram	1213
NI 2813 Multicard Topologies	1214
NI 2813 Relay Replacement	1215
NI 2814	1219
NI 2814 2-Wire 8×9 Matrix Topology.....	1220
NI 2814 Hardware Diagram	1223
NI 2814 Multicard Topologies	1224
NI 2814 Relay Replacement	1225
NI 2815	1230
NI 2815 1-Wire 4×86 Matrix Topology.....	1231
NI 2815 Hardware Diagram	1233
NI 2815 Multicard Topologies	1234
NI 2815 Relay Replacement	1235
NI 2816	1244
NI 2816 1-Wire 8×46 Matrix Topology.....	1245
NI 2816 Hardware Diagram	1248
NI 2816 Multicard Topologies	1249
NI 2816 Relay Replacement	1250
NI 2817	1259
NI 2817 1-Wire 16×22 Matrix Topology	1260
NI 2817 Hardware Diagram	1263
NI 2817 Multicard Topologies	1264
NI 2817 Relay Replacement	1265
NI 2833	1271
NI 2833 2-Wire 4×71 Matrix Topology.....	1272
NI 2833 Hardware Diagram	1274
NI 2833 Multicard Topologies	1275
NI 2833 Relay Replacement	1276
NI 2834	1283
NI 2834 2-Wire 8×34 Matrix Topology.....	1284

NI 2834 Hardware Diagram	1286
NI 2834 Multicard Topologies	1287
NI 2834 Relay Replacement	1288
NI 2865A	1294
NI 2865A 1-Wire 4×84 Matrix Topology	1296
NI 2865A Hardware Diagram	1297
NI 2865A Multicard Topologies	1298

NI-SWITCH Overview

This publication contains information about the terminology and concepts related to switch products and the NI-SWITCH instrument driver. In addition to device-specific information, this help file contains getting started steps for creating an application.

For information about programming your NI switch product with the NI-DAQmx API, refer to the NI-DAQmx Help.

Related information:

- [Download NI-SWITCH](#)
- [License Setup and Activation](#)
- [NI-SWITCH Soft Front Panels](#)
- [NI-SWITCH Properties Reference](#)
- [NI-SWITCH LabVIEW API Reference](#)
- [NI-SWITCH C API Reference](#)
- [NI-SWITCH .NET API Reference](#)
- [NI Learning Center](#)

NI-SWITCH Operating Requirements

Your system must meet the following minimum requirements to run and use NI-Switch.

- Supported Operating Systems
 - Windows 11 or Windows 10 (64-bit)
 - Windows Server 2022 (64-bit)
 - Windows Server 2019 (64-bit)
 - Windows Server 2016 (64-bit)
 - RedHat Enterprise Linux 8 or 9.0
 - openSUSE Leap 15.3 or 15.4
 - Ubuntu 22.04 or 20.04

Glossary

Prefixes

Symbol	Prefix	Value
p	pico	10^{-12}
n	nano	10^{-9}
μ	micro	10^{-6}
m	milli	10^{-3}
k	kilo	10^3
M	mega	10^6
G	giga	10^9
T	tera	10^{12}

Numbers/Symbols

nV	nanovolts	10^{-9} volts
μ V	microvolts	10^{-6} volts
$\mu\Omega$	microohms	10^{-6} ohms
m Ω	milliohms	10^{-3} ohms
M Ω	megaohms	10^6 ohms
pA	picoamps	10^{-12} amperes
nA	nanoamps	10^{-9} amperes
μ A	microamps	10^{-6} amperes
mA	milliamps	10^{-3} amperes

A	
A	amps
AC	alternating current
AC current	The measurement of the electrical current (in amperes) of AC signals. The measurement is typically made using rms averaging.
AC Voltage	A voltage that changes as a function of time.
ADE	application development environment—A software environment incorporating the development, debug, and analysis tools for software development. LabVIEW, Measurement Studio, and Visual Studio are examples.
American Wire Gauge	AWG—A U.S. standard set of non-ferrous wire conductor sizes. Gauge means the diameter. Non-ferrous includes copper and also aluminum and other materials, but is most frequently applied to copper household electrical wiring and telephone wiring. Typical household wiring is AWG number 12 or 14. Telephone wire is usually 22, 24, or 26. The higher the gauge number, the smaller the diameter and the thinner the wire. Since thicker wire carries more current because it has less electrical resistance over a given length, thicker wire is better for longer distances. For this reason, where extended distance is critical, a company installing a network might prefer telephone wire with the lower-gauge, thicker wire of AWG 24 to AWG 26. AWG is sometimes known as Brown and Sharpe (B&S) Wire Gauge.
analog	A signal whose amplitude can have a continuous range of values.
analog bus	See NI SwitchBlock analog bus.
analog bus sharing	The simultaneous connection of multiple NI SwitchBlock devices to the same analog bus line, enabled using the Analog Bus Sharing Enable property or <code>NISWITCH_ANALOG_BUS_SHARING_ENABLE</code> attribute.
API, application programming interface	1. A standardized set of subroutines or functions along with the parameters that a program can call. 2. A set of functions exported by a library.
B	
backplane	Circuit board that installed modules or cards connect to at the back of a chassis or carrier.
bandwidth	The range of frequencies present in a signal, or the range of frequencies to which a measuring device can respond.

Break-Before-Make	A type of switching contact that is completely disengaged from one terminal before it connects with another terminal.
bus, buses	The group of electrical conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC buses are the PCI, AT(ISA), and EISA bus.
C	
capacitance	The ability to hold an electrical charge.
card	See NI SwitchBlock card.
carrier	See NI SwitchBlock carrier.
channel	1. Pathway from a CPU or, on a network, between computers. 2. A channel can also be an input connection to a data acquisition system or to an instrument, such as an oscilloscope or logic analyzer. 3. Pin or wire lead to which you apply or from which you read an analog or digital signal. Analog signals can be single-ended or differential. For digital signals, channels group to form ports. Ports usually consist of either four or eight digital channels.
characteristic impedance	A transmission line parameter that determines how propagating signals are transmitted or reflected in the line.
CMOS	Complementary-Metal-Oxide Semiconductor
cold junction, cold-junction, cold-junction compensation	1. A method of compensating for inaccuracies in thermocouple circuits. 2. An artificial reference level that compensates for ambient temperature variations in thermocouple measurement circuits. IC temperature sensors are linear and their output is expressed as mV/°C. A 10 mV/°C sensor, for example, outputs 250 mV at 25 °C. Thermistor outputs, however, are nonlinear. Therefore, thermistor output is specified as the voltage range over a defined temperature range (x volts at 50 °C to y volts at 0 °C).
cold switching	The process of closing the relay contacts before applying voltage and current, as well as removing voltage and current before opening the contacts.
COM	The common terminal of a multiplexer.
contact bounce	The intermittent and usually undesired opening of mechanical relay contacts during closure, or closing of contacts during opening. The contact bounce period depends upon the type of relay and varies from .5 ms for small reed

	relays to 10-20 ms for larger relays.
contact life	The maximum number of expected switch or relay closures with a given voltage/current load before failure.
contact material	The material of which the contacts of a relay are made.
contact potential	A voltage produced between contact terminals due to the temperature gradient across the relay contacts.
contact rating	The maximum voltage, current, and power capacities of relay contacts under specified environmental conditions.
contact resistance	The electrical resistance across closed contacts.
contactor	An electric switch for controlling a motor or other electric device.
Controller	An intelligent device (usually involving a CPU) that is capable of controlling other devices.
crosspoint switch	An integrated circuit term; a switch that connects the signal on an input bus to one or more output buses. Also referred to as a switch matrix.
current	The rate of flow of electric charge measured in amperes.
current drive	The ability to supply a given output current. Refer to current sinking.
current drive capability	The amount of current a digital or analog output channel is capable of sourcing or sinking while still operating within voltage range specifications.
current excitation	The current a DMM can generate to perform a variety of measurements including resistance measurements.
current loop	A communications method that transmits data as current flow over relatively long distances and through environments with relatively high noise.
current sinking	The ability of a signal generator or output of a DAQ device to dissipate current for analog or digital output signals. Refer to current drive.
current sourcing	The ability of a DAQ device or instrument device to supply current for external devices, such as sensors or conditioning units. ICP is one technique for supplying DC current to transducers with built-in amplifiers.
D	
DAQ	1. Data acquisition—The process of collecting and measuring electrical signals from sensors, transducers, and test probes or fixtures and inputting them to a computer for processing. 2. Data acquisition—The process of collecting and measuring the same kinds

	of electrical signals with A/D and/or DIO devices plugged into a computer, and possibly generating control signals with D/A and/or DIO devices in the same computer.
dB	decibel
DC	direct current—Although the term speaks of current, many different types of DC measurements are made, including DC voltage, DC current, and DC power.
DC coupled	Allowing the transmission of both AC and DC signals.
DC current	The electric current of a DC signal.
DC gain error	The gain error on the DC component of a signal. This specification is not applicable when the device has AC input coupling.
DC offset	The DC voltage or current present on a signal. A typical technique in many instruments is to put the instrument in DC offset calibration mode, where the external signal is removed. Then, the internally generated DC offset signal is measured, and in some cases, stored, and compensated for.
DC parametric measurement	The use of Ohm's Law, which states that the current through a conductor is directly proportional to the voltage and inversely proportional to the resistance, to measure one DC characteristic by forcing another. For instance, you can force a current in order to measure terminal voltage, or vice versa.
DC voltage	The direct current (non-changing) component of a voltage. In practice, the DC voltage should not change over the period of observation, that is, the measurement time.
dielectric constant	The ratio of a capacitance using a given dielectric to the capacitance using a vacuum as a dielectric.
differential thermal EMF	the voltage difference between two junctions
DIO	digital input/output
DMM	digital multimeter—A digital instrument capable of measuring several different fundamental electrical characteristics, most often voltage, resistance, and current.
DPDT	double-pole double-throw
drive current	the current that flows through the coil of an electromechanical relay to move the armature
dry circuit	Switching below specified levels of voltage and current to minimize any

switching	physical and electrical changes in the contact junction.
dry reed relay	A glass enclosed, hermetically sealed, magnetically actuated contact. Typical atmosphere inside the glass enclosure is nitrogen.
DUT	device under test
E	
E Series	A standard architecture for instrumentation-class, multichannel data acquisition devices.
electrical life	The number of switch cycles, under load, before the contact resistance of a relay rises above 1 Ω .
electromechanical relay	A type of relay composed of a coil, an armature mechanism, and contacts.
EMF	electromotive force—The electrical force present without a load on the circuit.
endpoint programming	Programming technique that uses two inputs which are the physical channels that connect together. NI Switch Executive will automatically use of any channels that have been reserved for routing to create this connection. For example, specifying to connect column 0 (c0) to column 1(c1) would be used in endpoint programming. In order for the connection to be made, at least one row (r0), must be configured as reserved for routing. This programming technique is simple regardless of how many modules are added to the system, assuming channels are reserved for routing appropriately.
expansion bridge	Accessory for the NI SwitchBlock that connects the analog buses of adjacent carriers so that the carriers share a single analog bus.
explicit path programming	Programming technique that requires every individual path to be explicitly closed. NI Switch Executive will not automatically route through devices or channels that have been reserved for routing. For example, to connect column 0 (c0) to column 1 (c1), two separate connection paths must be defined: one to connect column 0 to a row, and the second to connect the row to column 1. Explicit path programming becomes more complicated as additional modules are required in the route.
F	
fault	In a component or circuit, a defect such as a short-circuit to ground or an unintended open circuit. Also, a failure condition caused by such a defect.
fault insertion unit	A device designed to insert fault conditions.
FET switch	Field-Effect Transistor—A type of relay composed of several CMOS transistors. A voltage applied to the control circuitry connects the source and drain of a

	transistor network.
form	A classification of relays categorized by the number of poles, throws, and default position of the relay.
FIU	fault insertion unit
frequency	The basic unit of rate, measured in events or oscillations per second using a frequency counter or spectrum analyzer. Frequency is the reciprocal of the period of a signal.
front panel	1. The interactive user interface of a VI. Modeled after the front panel of physical instruments, it is composed of switches, slides, meters, graphs, charts, gauges, LEDs, and other controls and indicators. 2. The physical front panel of an instrument or other hardware
Functions palette	The LabVIEW palette containing block diagram structures, constants, communication features, and VIs.
fundamental	The component of a periodic wave whose frequency, f_0 , is the greatest common divisor of the harmonic frequencies, and the inverse of the wave period T .
G	
general-purpose topology	A topology composed of multiple isolated relays used to connect one input to one output.
GND	ground
ground	1. A pin. 2. An electrically neutral wire that has the same potential as the surrounding earth. Normally, a noncurrent-carrying circuit intended for safety. 3. A common reference point for an electrical system.
H	
handshaking	A type of scanning similar to synchronous scanning except that the switch sends a digital pulse back to the other device after each scan list entry has been executed.
harmonic	Pertaining to whole-number multiples of the fundamental frequency of a sound or signal.
HIL	hardware-in-the-loop

hot switching	The process of closing the relay contacts after applying voltage and current, as well as applying voltage and current before opening the contacts.
HVAB	high-voltage analog bus
I	
I/O	input/output—Transfer of data to/from a computer system involving communications channels, operator interface devices, and/or data acquisition and control interfaces.
impedance	1. The electrical characteristic of a circuit expressed in ohms and/or capacitance/inductance. 2. resistance
inductance	The characteristic of a coil that generates a voltage due to changes in the current. An inductor creates a voltage that is the derivate of the current, while a capacitor creates a voltage that is the integral of the current.
inrush current	The peak instantaneous current drawn by a circuit or device when first turned on.
insertion loss	The attenuation of signals due to the impedance when passing the signals through a switching module or system. Specified as a decibel value (dB) over a frequency range.
integrated relay test	Integrated feature for NI SwitchBlock that verifies the proper operation of each individual relay.
isolation voltage	The voltage that an isolated circuit can normally withstand, usually specified from input to input and/or from any input to the amplifier output, or to the computer bus.
L	
LabVIEW	Laboratory Virtual Instrument Engineering Workbench—A program development application based on the programming language G and used commonly for test and measurement purposes.
latching	The ability to keep a relay contact in its current state if power is removed.
latching relay	A type of electromechanical relay without a default position that remains in its last position when the drive current stops flowing.
LED	light-emitting diode
load impedance	Resistance, capacitance, and (often) inductance presented by a load to an output amplifier. The recommended load impedance is the minimum

	resistance and maximum capacitance that the circuitry connected to the analog output should have.
load regulation	The ability of a power supply to keep its output voltage or current at a constant value with a changing output load.
LVDS	low voltage differential signaling. A low-noise, low-power, low-amplitude method for high-speed digital data transfer.
M	
make-before-break	Breaking and completing two paths simultaneously.
matrix	A topology in which you can connect multiple inputs to multiple outputs organized as columns and rows.
MAX	Measurement & Automation Explorer—A controlled, centralized configuration environment that allows you to configure all of your NI devices.
Measurement Category	The following is a description of measurement categories: 1. Measurement Category I is for measurements performed on circuits not directly connected to MAINS 1 . This category includes signals such as voltages on a printed wire board (PWB) on the secondary of an isolation transformer. 2. Measurement Category II is for measurements performed on circuits directly connected to the low-voltage installation. This category refers to local-level distribution such as that provided by a standard wall outlet. 3. Measurement Category III is for measurements performed in the building installation. This category is a distribution level referring to hardwired equipment that does not rely on standard building insulation. 4. Measurement Category IV is for measurements performed at the source of the low-voltage (<1,000 V) installation.
mechanical life	The number of switch cycles before the contact resistance of a relay rises above 1 Ω .
minimum switch load	In hot switching, the minimum power required to sufficiently close and maintain connection between electromechanical relay contacts.
MOSFET	Metal-Oxide-Semiconductor Field-Effect Transistor
multicard device	NI SwitchBlock device composed of two or more cards.
multiplex	To assign more than one signal to a channel.
multiplexer	A topology in which you can connect one input to multiple outputs or one

	output to multiple inputs.
mux	synonym for multiplexer
N	
NC	normally closed
NI SwitchBlock	High-density expandable switch carrier and interconnectable cards that enable greater switching capacity per slot than standalone PXI switch modules. The NI SwitchBlock operates within a PXI chassis or, when connected to a PXI peripheral slot or a PXI Express hybrid peripheral slot, within a PXI Express chassis.
NI SwitchBlock analog bus	A shared set of traces on the carrier backplane used to internally route connections between cards in the carrier. This bus is shared across multiple carriers when the carriers are connected using the NI 2806 expansion bridge.
NI SwitchBlock analog bus line	A single trace of the analog bus on an NI SwitchBlock carrier. See NI SwitchBlock analog bus.
NI SwitchBlock card	High-density relay card that can be combined with other NI SwitchBlock cards in software to operate as a single device.
NI SwitchBlock carrier	Subchassis that operates within a PXI/PXI Express chassis and holds interconnectable NI SwitchBlock cards.
NI SwitchBlock device	One or more cards configured in software to function as a single device.
NO	normally open
nonlatching relay	A type of electromechanical relay with an initial position of normally closed maintained by the force of a spring or permanent magnet while no drive current flows.
O	
overcurrent	A current above the optimum, operational, or rated current.
overtemperature	A temperature above that at which a component, circuit, device, or system is rated.
P	
path	The route a signal follows through the switch from input terminal to output terminal.
path resistance	The resistance of a complete signal path from source to destination. This includes resistance of wiring, switching, and input and output connectors.

PCB	printed circuit board
power consumption limit	Maximum amount of power that a module or carrier can draw from a chassis, or that a card can draw from a carrier, without damaging the NI switch products.
power dissipation limit	Maximum amount of power that can be lost as heat from signals or from power consumed from the backplane without damaging the NI switch products.
power limits	Maximum amount of power, including power consumption and power dissipation, that can route through a module, carrier or carrier slot without damaging the NI switch products.
PXI	PCI eXtensions for Instrumentation—A modular, computer-based instrumentation platform.
PXI Express	PCI Express eXtensions for Instrumentation—The PXI implementation of PCI Express, a scalable full-simplex serial bus standard that operates at 2.5 Gbps and offers both asynchronous and isochronous data transfers.
PXI Express-compatible module	A modified PXI module that is compatible with existing PXI chassis slots and PXI hybrid chassis slots. PXI Express-compatible modules preserve hardware and software compatibility, with the exception of local bus features.
R	
R-C time constant	Time required to charge a capacitor to 63.2 percent of its maximum voltage.
reed relay	A type of relay composed of two overlapping ferromagnetic blades hermetically sealed within a gas capsule that is filled with an inert gas.
relay	An electrically activated mechanical device that opens and closes electrical contacts.
resource	Term that can refer to any of the following: NI SwitchBlock carrier, NI SwitchBlock card, PXI/PXI Express card.
resistance	The resistance to the flow of electric current. One ohm (Ω) is the resistance through which one volt of electric force causes one ampere to flow.
RF	radio frequency—Refers to frequencies below the infrared range.
RF multiplexer	A switch capable of selecting one of many RF channels.
rise time	The time for a signal to transition from 10% to 90% of the maximum signal amplitude.
S	
safety interlock	Safety feature that prevents the front connector of an installed NI SwitchBlock card from exposing high-voltage signals when disconnected from accessories.

scan	The process of cycling through a predefined scan list to when and how to make or break connections.
scan list	A string composed of channel names and characters that define connections, disconnections, triggering, and timing of the scan.
scan rate	The number of relay cycles that can be performed in a given time frame. Applicable when using a scan list. The scan rate specifies the frequency of the following actions (initial state - ch0 is connected to com0): • Obtain trigger input, disconnect ch0 from com0, and wait for debounce. • Connect ch0 to com0, wait for debounce, send scan advanced signal, and wait for trigger input.
Seebeck coefficients	Temperature coefficients of specific metal-to-metal junctions.
Seebeck voltage	A property of dissimilar materials to develop a voltage offset across their junction, proportional to the temperature gradient across said junction, resulting in a current if there is a complete electrical path between the materials. For switching, the Seebeck effect can become an issue when performing low level signal measurements.
sense	The channel of a DMM used to measure the voltage drop across a resistance in a 4-wire measurement.
settling time	The time required for a signal to reach a steady state after sending an actuation command to the relay.
shared analog bus line	An analog bus line that multiple NI SwitchBlock devices connect to simultaneously. See analog bus sharing.
short	Short-circuit. A low-resistance connection which is established between two points in a circuit, bypassing any paths with higher resistance. For example, such a connection between the conductors of a transmission line. An intentional short (such as a short-circuit fault condition) rarely causes damage, but an accidental or otherwise unintentional short between transmission lines or power rails at different voltage potentials can often cause damage due to excessive current flow.
single-card device	NI SwitchBlock device composed of one card.
software trigger scanning	A type of scanning where the scan list advances at every call of niSwitch Send Software Trigger.
solid-state relay	A type of relay incorporating an LED to control the gate of a photo-sensitive MOSFET.

SPDT	single-pole double-throw
SPST	single-pole single-throw
SSR	solid-state relay
stub	Portion of trace attached to a signal path that degrades the signal.
switch	A device for routing signals between two points.
switching capacity	The maximum current and voltage that a relay is specified to handle.
switching current	The maximum rated current that can flow through the switch as it makes or breaks a contact.
switching time (speed)	The time necessary for a switch to actuate and settle to a known state.
switching voltage	The maximum signal voltage that the switch module can safely maintain.
synchronous scanning	A type of scanning where the scan list advances after the switch receives a digital pulse from another device.
T	
terminal	Named location where a signal is either produced (generated) or consumed (acquired).
terminal block	A group of several terminals, intended for interconnection of circuits, mounted on a solid insulating block.
thermal EMF	The voltage created by the junction of dissimilar metals that increases and decreases with the rise and fall of the ambient temperature.
topology	Organizational representation of the channels and relays in a switch module.
transistor	A device used to amplify a signal or open and close a circuit.
V	
VA	volt-ampere—A measurement of power. The volt-ampere rating is sometimes used if the rated equipment has significant phase shift between the current and voltage. Hence, the volt-ampere rating gives a power rating that ignores this phase shift.
V _{batt}	battery voltage
VI	virtual instrument
voltage	the electromotive force
voltage standing wave ratio	The measure of signal reflection in a propagating signal.

VSWR	voltage standing wave ratio

New Features and Changes

Learn about updates—including new features and behavior changes—introduced in each version of the NI-SWITCH.

NI-SWITCH 2023 Q1 Changes

- Added support for LabVIEW 2023 and later.

Features

This book explains how to program switches for the following features:

Related concepts:

- [Scanning](#)
- [Adding Additional Settling Time](#)
- [Connection and Disconnection List Syntax](#)
- [Disabling Digital Filtering](#)
- [Immediate Operations](#)
- [Setting Source and Configuration Channels](#)
- [Simulating a Switch](#)

Scanning

The NI-SWITCH API offers the following three triggering schemes for scanning.

- Software trigger scanning
- Synchronous scanning
- Handshaking

Refer to the switch module documentation in Devices to determine if the switch module supports scanning.

Refer to ***Software Trigger Scanning*** for information on programming software triggers using NI-SWITCH. If you are scanning NI switches with an NI DMM, and you are using NI-SWITCH and NI-DMM APIs, refer to Scanning NI Switches with NI Digital Multimeters.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

Related concepts:

- [Software Trigger Scanning](#)

- [Synchronous Scanning](#)
- [Handshaking](#)
- [Writing a Software Trigger Scanning Program](#)
- [Scanning NI Switches with NI Digital Multimeters](#)

Writing a Software Trigger Scanning Program

To write a software trigger scanning program, complete the following steps:

1. Set the topology of the switch module using the niSwitch Initialize With Topology VI or the `niSwitch_InitWithTopology` function.
2. Set the **trigger input** (`triggerInput`) parameter to `Software Trigger` using the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function.
3. Set the number of times the switch cycles through the scan list, once or infinitely, using the niSwitch Set Continuous Scan VI or the `niSwitch_SetContinuousScan` function.
4. Set up the list of connections using the niSwitch Configure Scan List VI or the `niSwitch_ConfigureScanList` function. Refer to Scan Lists for syntax information.
5. Initiate the scan using the niSwitch Initiate Scan VI or the `niSwitch_InitiateScan` function. The first entry in the scan list is executed and the switch waits for software triggers to execute the subsequent entries in the list.
6. Execute each set of connections in the scan list by calling the niSwitch Send Software Trigger VI and the `niSwitch_SendSoftwareTrigger` function.
7. Terminate the scanning operation using the niSwitch Abort Scan VI or the `niSwitch_AbortScan` function.
8. Release resources using the niSwitch Close VI or the `niSwitch_close` function.

Refer to the niSwitch Software Scanning example for an illustration of a basic software scanning application.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

Related concepts:

- [Scan Lists](#)
- [NI-SWITCH Programming Examples](#)

Scanning NI Switches with NI Digital Multimeters

In applications where you are connecting multiple test points to a Digital Multimeter (DMM), it may be appropriate to incorporate a switch to route signals between the test points and the DMM. Scanning can be used when the timing of connections needs to be synchronized with the DMM. To determine whether your DMM can exchange signals with NI switches during multipoint scanning operations, refer to the Scanning Switch Modules topic in the NI Digital Multimeters Help. When scanning NI switches with NI DMMs, the following factors will influence your scanning setup:

- Trigger Options
- System Options
- Scanning Capabilities

Refer to Single Module Scanning and Multiple Module Scanning for details on how to select the scanning setup that fits your needs.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

Trigger Options

The trigger inputs and outputs that are available for your NI switch, in conjunction with your system and scanning selections, will determine how trigger signals are sent between your NI Switch and your NI DMM. The following table lists the trigger input and output options for all NI switches.

Trigger Options for National Instruments Switches

Switch	INPUT Trigger Input	OUTPUT Trigger Output
• PXI-2501 • PXI-2503 • PXI/PXIe-2529	all PXI trig, Front	

Switch	INPUT Trigger Input	OUTPUT Trigger Output
• PXI-2530 • PXI-2530B • PXI/PXIe-2543 • PXI-2566 • PXI-2567 • PXI/PXIe-2593		
• PXI-2510 • PXI/PXIe-2512 • PXI/PXIe-2514 • PXI/PXIe-2515 • PXI/PXIe-2527 • PXI/PXIe-2531 • PXI/PXIe-2532 • PXI/PXIe-2532B • PXI-2533 • PXI-2534 • PXI-2535 • PXI-2536 • PXI-2545 • PXI-2546 • PXI-2547 • PXI-2548 • PXI-2549 • PXI-2554 • PXI-2555 • PXI-2556 • PXI-2557 • PXI-2558 • PXI-2559 • PXI-2564 • PXI-2565 • PXI-2568 • PXI/PXIe-2569 • PXI-2570 • PXI-2571 • PXI/PXIe-2575 • PXI-2576	all PXI trig	

Switch	INPUT Trigger Input	OUTPUT Trigger Output
• PXI-2584 • PXI-2585 • PXI-2586 • PXI-2590 • PXI-2591 • PXI-2594 • PXI-2595 • PXI-2596 • PXI-2597 • PXI-2598 • PXI-2599 • PXI-2720 • PXI-2722 • PXIe-2725 • PXIe-2727		
• PXIe-2524 • PXIe-2525 • PXIe-2526 • PXIe-2737 • PXIe-2738 • PXIe-2739 • PXIe-2746 • PXIe-2747 • PXIe-2748 • NI 2810 • NI 2811 • NI 2812 • NI 2813 • NI 2814 • NI 2815 • NI 2816 • NI 2817 • NI 2833 • NI 2834	Triggering is not supported	

where

PXI trig refers to PXI trigger lines 0-7

Front refers to the front panel or terminal block

System Options

You can categorize different DMM/switch systems according to the DMM, the switch and the cable used. The following figure represents each possible system with a letter.

DMM/Switch System Options

DMM \ Switch	SCXI Switches		PXI/PXIe Switches
	In PXI/SCXI Combo Chassis	In Separate SCXI Chassis	
Right Most Slot	Internal PXI/SCXI Lines		PXI Trigger Lines 0 to 7 A
Any PXI/PXIe Slot or Any PCI Slot	AUX Trigger Cable SH9MD–AUX Cable		Aux Trigger Cable B
USB-4065			—

The systems are classified as follows:

- System A—The DMM triggers the PXI switch using PXI trigger lines. PXI-4060 uses only PXI trigger lines 0 to 6. PXI-4070 uses PXI trigger lines 0 to 7.
- System B—A PXI or PCI DMM triggers the PXI switch using the AUX trigger cable.

Scanning Capabilities

The following table shows the scanning capabilities for every NI switch. The number after S or H indicates the setup number. FThe links in the table direct you to Multiple Module Scanning setups. For single module setups, refer to Single Module Scanning.

Scanning Capabilities for NI Switches

Switches	System A: PXI Trigger Lines	System B: AUX Trigger Cable
- PXI-2501 - PXI-2503 - PXI/PXIe-2529 - PXI-2530 - PXI-2530B - PXI/PXIe-2543 - PXI-2566 - PXI-2567 - PXI/PXIe-2593	- Synchronous scanning setup 1: Refer to section Setup 1—Using Internal PXI Trigger Lines in Multiple Module Scanning - Synchronous - Handshaking setup 3: Refer to Setup 3—Using Internal PXI Trigger Lines in Multiple Module Scanning - Handshaking	- Synchronous scanning setup 2: Refer to section Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch in Multiple Module Scanning - Synchronous - Handshaking setup 4: Refer to section Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch in Multiple Module Scanning - Handshaking
- PXI-2510 - PXI/PXIe-2512 - PXI/PXIe-2514 - PXI/PXIe-2515 - PXI/PXIe-2527 - PXI/PXIe-2531 - PXI/PXIe-2532 - PXI/PXIe-2532B - PXI-2533 - PXI-2534 - PXI-2535 - PXI-2536 - PXI-2545 - PXI-2546 - PXI-2547 - PXI-2548 - PXI-2549 - PXI-2554 - PXI-2555 - PXI-2556	- Synchronous scanning setup 1: Refer to section Setup 1—Using Internal PXI Trigger Lines in Multiple Module Scanning - Synchronous - Handshaking setup 3: Refer to Setup 3—Using Internal PXI Trigger Lines in Multiple Module Scanning - Handshaking	

Switches	System A: PXI Trigger Lines	System B: AUX Trigger Cable
• PXI-2557 • PXI-2558 • PXI-2559 • PXI-2565 • PXI-2568 • PXI/PXIe-2569 • PXI-2570 • PXI-2571 • PXI/PXIe-2575 • PXI-2576 • PXI-2584 • PXI-2590 • PXI-2591 • PXI-2594 • PXI-2595 • PXI-2596 • PXI-2597 • PXI-2598 • PXI-2599 • PXI-2720 • PXI-2722 • PXIe-2725 • PXIe-2727		
• NI 2810 • NI 2811 • NI 2812 • NI 2813 • NI 2814 • NI 2815 • NI 2816 • NI 2817 • NI 2833 • NI 2834	Scanning is not supported	

Related concepts:

- [Single Module Scanning](#)

- [Multiple Module Scanning](#)
- [Multiple Module Scanning - Synchronous](#)
- [Multiple Module Scanning - Handshaking](#)

Single Module Scanning

NI-SWITCH supports single module scanning for PXI/PXI Express switches in NI-SWITCH and NI-DAQmx.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

NI-SWITCH

To scan individual switches using NI-SWITCH, you can write a scan list or use the programming examples.

NI-DAQmx

For information about developing a single switch scanning application using NI-DAQmx, refer to the NI-DAQmx Help.

Determining the Scanning Setup

The scanning setup is dependent on your hardware and triggering scheme. Based on your hardware and triggering scheme requirements, choose one of the following scanning setups:

PXI/PXI Express Scanning—Synchronous

- Setup 1—Using Internal PXI Trigger Lines
- Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

PXI/PXI Express Scanning—Handshaking

- Setup 3—Using Internal PXI Trigger Lines
- Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Related concepts:

- [Scan Lists](#)
- [NI-SWITCH Programming Examples](#)
- [Single Module Scanning - Synchronous](#)
- [Single Module Scanning - Handshaking](#)

Scan Lists

A scan list is a string composed of channel names and characters that define connections, disconnections, triggering, and timing of the scan.

Scan List Characters

The following table shows characters that can be used in a scan list when programming with NI-SWITCH.

Character(s)	Definition
->	Used in a connect action (<code>channel1->channel2</code>). For example, the string <code>ch0->com0</code> connects CH0 to COM0.
~	Used with '-' in a disconnect action (<code>~channel1->channel2</code>). Valid only in No Action mode. For example, <code>~ch0->com0</code> means disconnect CH0 and COM0.
;	Wait for debounce, send scan advanced output signal [*] , then wait for trigger input
&	Separates connect and/or disconnect actions. For example, the string <code>ch0->com0 & ch9->com1</code> means connect CH0 to COM0 and CH9 to COM1 (in no particular order and with minimal delay).
&&	Wait for debounce. For example, <code>ch0->com0 && ch9->com1</code> means connect CH0 to COM0, wait for the relays to settle, then connect CH9 to COM1.
:	Used in a channel range (<code>channelX:Y</code> , where X and Y are integers). Text containing a channel range represents multiple scan list entries. For example, the string <code>ch0:7->com0;</code> represents eight scan list entries. A semicolon must appear after the connect action using a channel range.



Note^{*} The switch only sends a scan advanced output signal if a relay is connected in each scan list entry. For example, in No Action mode, if you only

disconnect a relay in a scan list entry, the switch does not send a scan advanced output signal. The scan list entry `ch1->com1 & ~ch0->com0;` would result in the switch sending a scan advanced output signal, but the scan list entry `~ch0->com0;` would not. When a multiple module scan list contains multiple semicolons in a row (for example, `ch0->com0 ; ; ;`), the switch sends a scan advanced output signal only for the first semicolon in the series.



Tip NI-SWITCH ignores white space and line returns. Use these to format the appearance of lengthy scan lists.

Scan List Entries

A scan list entry is the text delimited by semicolons (;). Scan lists are composed of one or more scan list entries. For example, the following scan list contains two scan list entries:

```
ch0->com0; ch1->com0;
```

Scan Modes

The scan mode affects how the driver interprets the scan list. Typical scanning applications use the Break Before Make scan mode.

Mode	Description
Break Before Make (default)	Connections from the previous scan list entry are automatically disconnected before executing the current scan list entry. Disconnect actions, such as <code>~channel1->channel2</code> , are not valid in this mode.
No Action	Connections remain connected until they are explicitly disconnected by a disconnect action.
Break After Make	Currently not supported.

Scan List Examples

Example 1

Scan Mode: No Action

Scan List: `ch0->com0; ~ch0->com0 && ch1->com0; ~ch1->com0 &&`

Meaning:

1. Connect ch0 to com0.
2. Wait for debounce, send scan advanced signal, then wait for trigger input.
3. Disconnect ch0 from com0 and wait for debounce.
4. Connect ch1 to com0.
5. Wait for debounce, send scan advanced signal, then wait for trigger input.
6. Disconnect ch1 from com0 and wait for debounce.
7. If the scan is set to continuous, return to step 1; otherwise, end the scan.

Example 2

Scan Mode: Break Before Make

Scan List: `ch0->com0; ch1->com0;`

Meaning:

The scan list in this example is equivalent to the scan list in Example 1. Notice that the disconnect actions in Example 1 are no longer required.

Example 3

Scan Mode: Break Before Make Scan List: `ch0:1->com0;`

Meaning:

This scan list is equivalent to Example 1 and Example 2. This scan list uses a channel range to reduce keystrokes.

Related concepts:

- [Scanning](#)
- [Settling Time](#)
- [Multiple Module Scan Lists](#)

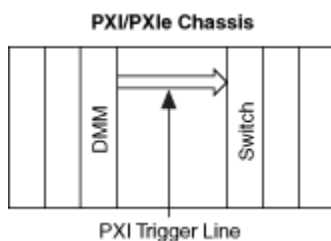
Single Module Scanning - Synchronous

Refer to the trigger topic of the switch module in Devices for possible **Trigger Input** locations.

- Setup 1—Using Internal PXI Trigger Lines
- Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Setup 1—Using Internal PXI Trigger Lines

All PXI/PXI Express switches can receive an input trigger from PXI trigger lines of a PXI/PXI Express chassis. In this setup, no cable is used between the DMM and the PXI/PXI Express switch for triggering. The DMM sends its MC signal to the PXI/PXI Express switch through a PXI trigger line.



1. Set **Trigger Input** to `TTLn` in `niSwitch Configure Trigger`.
2. Set **Measurement Complete Destination** in `niDMM Configure Measurement` to the same `TTLn` used in `niSwitch Configure Trigger`.

Refer to the switch module in Devices for possible **Trigger Input** locations.

Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Some PXI/PXI Express switches can receive an input trigger from the front panel or terminal block. This setup uses the AUX trigger cable to trigger the switch.



1. Connect the MC signal from the DMM to the external trigger input terminal on the front panel or in the terminal block of a PXI/PXI Express switch.
2. Set **Trigger Input** to `External` in `niSwitch Configure Trigger`.
3. Set **Measurement Complete Destination** to `External` in `niDMM Configure Measurement`.

Refer to the switch module in Devices for possible **Trigger Input** locations.

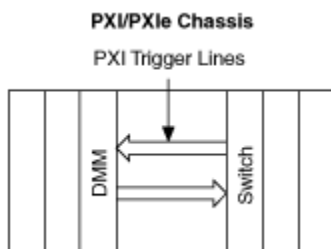
Single Module Scanning - Handshaking

Refer to the trigger topic of the switch module in Devices for possible **Trigger Input** locations.

- Setup 3—Using Internal PXI Trigger Lines
- Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Setup 3—Using Internal PXI Trigger Lines

To handshake with a PXI/PXI Express switch, you can use the internal PXI trigger lines of a PXI/PXI Express chassis. In this setup, no cable is used between the DMM and the PXI/PXI Express switch for triggering.



1. Set **Trigger Input** to `TTLn` in `niSwitch Configure Trigger`.
2. Set **Scan Advanced Output** to `TTLm` in `niSwitch Configure Trigger`.
3. Set **Measurement Complete Destination** to `TTLn` in `niDMM Configure Measurement Complete Destination`.
4. Set **Trigger Source** to `TTLm` in `niDMM Configure Trigger`.

5. Set **Sample Trigger Source** to `TTL in niDMM Configure Multi Point`.

Refer to the switch module in Devices for possible **Trigger Input** and **Scan Advanced Output** locations.

Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Some PXI/PXI Express switches can receive their input trigger and send their scan advanced at the front panel or terminal block. This setup uses the AUX trigger cable to trigger the switch.



1. Connect the MC signal from the DMM to the external trigger input terminal on the front panel or in the terminal block of a PXI/PXI Express switch.
2. Connect the Ext Trig In signal of the DMM to the Scanner Advanced terminal on the front panel or in the terminal block of the same PXI/PXI Express switch.
3. Set **Trigger Input** to `External in niSwitch Configure Trigger`.
4. Set **Scan Advanced Output** to `External in niSwitch Configure Trigger`.
5. Set **Measurement Complete Destination** to `External in niDMM Configure Measurement Complete Destination`.
6. Set **Trigger Source** to `External in niDMM Configure Trigger`.
7. Set **Sample Trigger Source** to `External in niDMM Configure Multi Point`.

Refer to the switch module in Devices for possible **Trigger Input** and **Scan Advanced Output** locations.

Multiple Module Scanning

NI-SWITCH supports multiple module scanning for PXI/PXI Express switches in NI-DAQmx and NI-SWITCH.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

NI-DAQmx

NI recommends NI-DAQmx for multiple module switch scanning. You can access the NI-DAQmx multiple module switch scanning programming examples at `<LabVIEW>\examples\DAQmx\Switches`. For more information about developing a multiple module switch scanning application using NI-DAQmx, refer to the document, Multi-module Scanning with National Instruments Switches at ni.com/info using the info code `ex797g`.

NI-SWITCH

To scan multiple switches using NI-SWITCH, you can write a scan list or use the programming examples. When scanning multiple switch modules, you must duplicate the NI-SWITCH programming example for each switch you want to scan.

Determining the Scanning Setup

The scanning setup is dependent on your hardware and triggering scheme. Based on your hardware and triggering scheme, choose one of the following scanning setups:



Tip The `niSwitch Multi Switch Synch Int`, `niSwitch Multi Switch Sync Ext`, `niSwitch Multi 27_28 Sync`, `niSwitch Multi Switch Hand Int`, and `niSwitch Multi Switch Hand Ext` examples mentioned in the following sections are available at ni.com/support. Click **Example Code** and search for "Switch Multi-Module Scanning."

PXI/PXI Express Scanning—Synchronous

- Setup 1—Using Internal PXI Trigger Lines
- Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

PXI/PXI Express Scanning—Handshaking

- Setup 3—Using Internal PXI Trigger Lines
- Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Related concepts:

- [Multiple Module Scan Lists](#)
- [NI-SWITCH Programming Examples](#)
- [Multiple Module Scanning - Synchronous](#)
- [Multiple Module Scanning - Handshaking](#)

Multiple Module Scan Lists

Use the following process for populating the scan lists of the switches in the scanning operation using NI-SWITCH. The following example scans four consecutive channels of three switches. Refer to Scan Lists for basic scan list syntax.

Scan List for Switch #1

In the scan list of switch #1, enter the channels that you want to scan followed by the number of semicolons ";" equal to the sum of the channels in the other scan lists plus one. For the purpose of this example, the total number of semicolons after the channel entry is nine. The scan list looks like this: `ch0:3->com0 ; ; ; ; ; ; ; ; ;`

The following figure illustrates the scan list for switch #1.

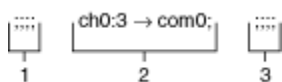


1. Channels of switch #1 to be scanned followed by one semicolon. This entry is the same as for scanning a single module.
2. Number of semicolons equal to the number of channels of switch #2 instructs switch #1 not to react to the triggers dedicated to switch #2. These semicolons are dummy entries corresponding to the channels of switch #2.
3. Number of semicolons equal to the number of channels of switch #3 instructs switch #1 not to react to the triggers dedicated to switch #3. These semicolons are dummy entries corresponding to the channels of switch #3.

Scan List for Switch #2

In the scan list for switch #2, enter the number of semicolons equal to the channels in the first scan list, then the channels that you want to scan in switch #2 and the number of semicolons equal to the sum of channels in the remaining scan lists plus one. For the purpose of this example, the number of semicolons before the channel entry is four, the number of semicolons after the channel entry is five. The scan list looks like this: `;;;;ch0:3->com0; ; ; ;`

The following figure illustrates the scan list for switch #2.



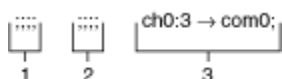
1. Number of semicolons equal to the number of channels of switch #1 instructs switch #2 not to react to the triggers dedicated to switch #1. These semicolons are dummy entries corresponding to the channels of switch #1.
2. Channels of switch #2 to be scanned followed by one semicolon. This entry is the same as for scanning a single module.
3. Number of semicolons equal to the number of channels switch #3 instructs switch #2 not to react to the triggers dedicated to switch #3. These semicolons are dummy entries corresponding to the channels of switch #3.

Scan List for Switch #3

In the scan list for switch #3, enter the number of semicolons equal to sum of the channels in all the previous scan lists, then the channels that you want to scan followed by one semicolon. For the purpose of this example, the number of semicolons before the channel entry is 8. The scan list looks like this:

`;;;; ; ; ; ; ; ; ; ;ch0:3->com0;`

The following figure illustrates the scan list for switch #3.



1. Number of semicolons equal to the number of channels of switch #1 instructs switch #3 not to react to the triggers dedicated to switch #1. These semicolons are dummy entries corresponding to the channels of switch #1.

2. Number of semicolons equal to the number of channels of switch #2 instructs switch #3 not to react to the triggers dedicated to switch #2. These semicolons are dummy entries corresponding to the channels of switch #2.
3. Channels of switch #3 to be scanned followed by one semicolon. This entry is the same as for scanning a single module.

Related concepts:

- [Scan Lists](#)

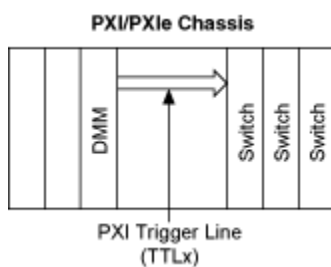
Multiple Module Scanning - Synchronous

Refer to the trigger topic of the switch module in Devices for possible **Trigger Input** locations.

- Setup 1—Using Internal PXI Trigger Lines
- Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Setup 1—Using Internal PXI Trigger Lines

All PXI/PXI Express switches can receive an input trigger from PXI trigger lines of a PXI/PXI Express chassis. In this setup, no cable is used between the DMM and the PXI/PXI Express switches for triggering. The DMM sends its MC signal to the PXI/PXI Express switches through a PXI trigger line.

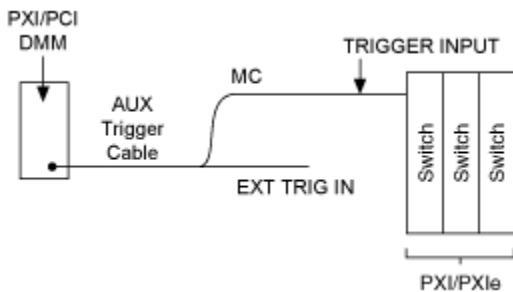


1. Open `niSwitch Multi Switch Synch Int`.
2. Create scan lists according to the process described in Multiple Module Scan Lists.
3. Set **Trigger Input** to the same PXI trigger line for all switches. This input line should coincide with the destination of the DMM MC signal.

resource name 1 PXI1Slot4 topology name 1 2530/1-Wire 128x1 Mux scan list 1 ch0:3->com0; ; ; ; ; ; ; ; trigger input 1 TTL0	resource name 2 PXI2::15 topology name 2 2503/2-Wire 24x1 Mux scan list 2 ; ; ; ; ch0:3->com0; ; ; ; ; trigger input 2 TTL0	resource name 3 PXI1Slot3 topology name 3 2529/2-Wire 4x32 Matrix scan list 3 ; ; ; ; ; ; ; ; r0->c0:3; trigger input 3 TTL0

Setup 2—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Some PXI/PXI Express switches can receive an input trigger from the front panel or terminal block. This setup uses the AUX trigger cable to trigger the switches.



1. Connect the MC signal from the DMM to the external trigger input terminal on the front panel or in the terminal block of one PXI/PXI Express switch.
2. Open niSwitch Multi Switch Sync Ext.
3. Create scan lists according to the process described in Multiple Module Scan Lists.
4. Add niSwitch Route Trigger Input to the configuration of the switch where the AUX trigger cable from the DMM is connected.
5. Set **Trigger Input Connector** to Front Connector.
6. Set **Trigger Input Bus Line** to TTLn.
7. Set **Trigger Input** to the same TTLn for all switches.
8. Set **Measurement Complete Destination** to External in the DMM configuration.

resource name 1 PXI2::14 topology name 1 2503/2-Wire 24x1 Mux scan list 1 ch0:3->com0; ; ; ; ; ; ; ; trigger input 1 TTL2 trigger input connector Front Connector trigger input bus line TTL2	resource name 2 PXI2::11 topology name 2 2501/2-Wire 24x1 Mux scan list 2 ; ; ; ; ch0:3->com0; ; ; ; ; trigger input 2 TTL2	resource name 3 PXI2::12 topology name 3 2590/4x1 Mux scan list 3 ; ; ; ; ; ; ; ; ch0:3->com; trigger input 3 TTL2

Related concepts:

- [Multiple Module Scanning](#)
- [Multiple Module Scan Lists](#)

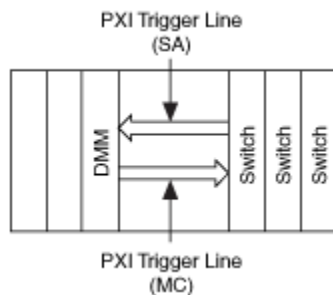
Multiple Module Scanning - Handshaking

Refer to the trigger topic of the switch module in Devices for possible **Trigger Input** locations.

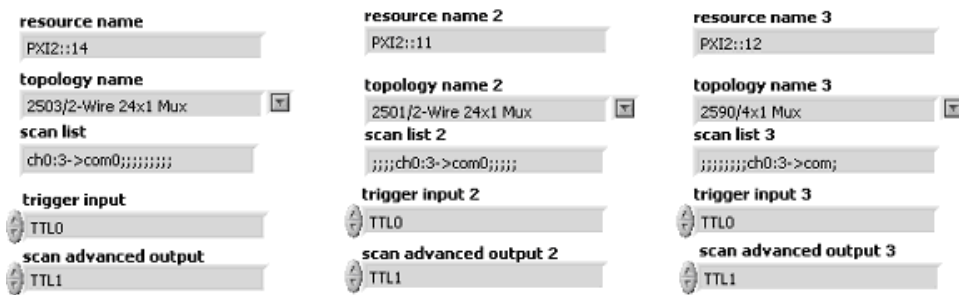
- Setup 3—Using Internal PXI Trigger Lines
- Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

Setup 3—Using Internal PXI Trigger Lines

To handshake with multiple PXI/PXI Express switches, you can use internal PXI trigger lines. In this setup, a trigger cable is not needed between the DMM and the PXI/PXI Express switches.

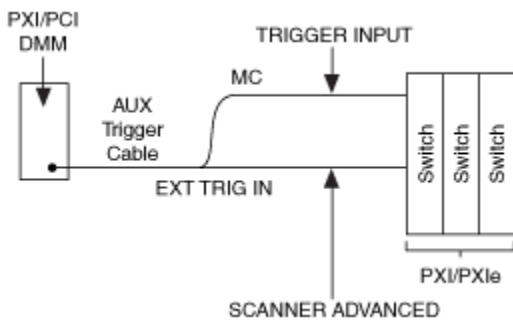


1. Open `niSwitch Multi Switch Hand Int.`
2. Create scan lists according to the process described in [Multiple Module Scan Lists](#).
3. Set **Trigger Input** to the same PXI trigger line for all switches. This input line should coincide with the destination of the DMM MC signal.
4. Set **Scan Advanced Output** to the same PXI trigger line for all switches. This output must coincide with the trigger source of the DMM.



Setup 4—Using AUX Trigger Cable Connected to Front of PXI/PXI Express Switch

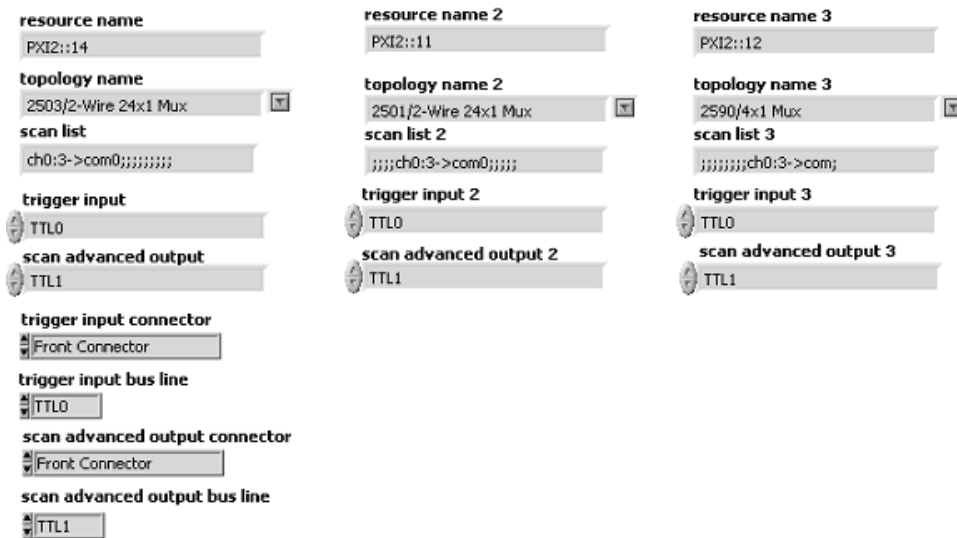
Some PXI/PXI Express switches can receive/send triggers from/to the front panel or terminal block. This setup uses the AUX trigger cable to trigger the switches.



1. Connect the MC signal from the DMM to the external trigger input terminal on the front panel or in the terminal block of one PXI/PXI Express switch.
2. Connect the Ext Trig In signal of the DMM to the Scanner Advanced terminal on the front panel or in the terminal block of the same PXI/PXI Express switch.
3. Open `niSwitch Multi Switch Hand Ext`.
4. Create scan lists according to the process described in Multiple Module Scan Lists.
5. Add `niSwitch Route Trigger Input` and `niSwitch Route Scan Advanced Output` before `niSwitch Commit` of the switch where the AUX trigger cable from the DMM is connected.
6. Set **Trigger Input Connector** to `Front Connector`.
7. Set **Scan Advanced Output Connector** to `Front Connector`.
8. Set **Trigger Input Bus Line** to a PXI trigger line.
9. Set **Trigger Input** of all the switches to the same PXI trigger line of **Trigger Input Bus Line**.
10. Set **Scan Advanced Output Bus Line** to a different PXI trigger line.
11. Set **Scan Advanced Output** of all the switches to the same PXI trigger line of **Scan**

Advanced Output Bus Line.

12. Set **Measurement Complete Destination** to `External` in the DMM configuration.
13. Set **Trigger Source** to `External` in the DMM configuration.



Related concepts:

- [Multiple Module Scanning](#)
- [Multiple Module Scan Lists](#)

Adding Additional Settling Time

Some applications, such as high temperature or vibration measurements, may require additional settling time to acquire accurate measurements.

Setting the Settling Time

You can change the default settling time of a switch by using the `niSwitch Property Node` or the `niSwitch_SetAttributeViReal64` function and `NISWITCH_ATTR_SETTLING_TIME` attribute.

In LabVIEW:

1. Add the `niSwitch Property Node` to the block diagram.
2. Click the property node and select **Module Characteristics»Settling Time**.
3. Right-click the **Settling Time** property and select **Change to Write**.

4. Right-click the **Settling Time** property and create a constant.
5. Set the constant to the amount of time (in seconds) to wait for settling.

In C:

1. Create a new ViSession named **switchSession** using the `niSwitchInit` function.
2. Create a ViReal64 variable named **settlingTime** and set the value to the desired new settling time in seconds.
3. Call the function

```
niSwitchCheckErr(niSwitch_SetAttributeViReal64(switchSession,
VI_NULL, NISWITCH_ATTR_SETTLING_TIME, settlingTime));
```



Note If you set the settling time of a switch module below the default settling time, NI-SWITCH coerces the value to the default settling time.

Checking the Settling Time

You can check the default settling time of a switch by using the niSwitch Property Node or the `niSwitch_CheckAttributeViReal64` function and `NISWITCH_ATTR_SETTLING_TIME` attribute.

In LabVIEW:

1. Add the niSwitch Property Node to the block diagram.
2. Click the property node and select **Module Characteristics»Settling Time**.
3. Right-click the **Settling Time** property and create an indicator.

In C:

1. Create a new ViSession named **switchSession** using the `niSwitchInit` function.
2. Create a ViReal64 variable named **settlingTime**. Its value in seconds will be returned in the next step.
3. Call the function

```
niSwitchCheckErr(niSwitch_GetAttributeViReal64(switchSession,
VI_NULL, NISWITCH_ATTR_SETTLING_TIME, &settlingTime));
```

Related concepts:

- [Settling Time](#)

Connection and Disconnection List Syntax

You can use connection lists and disconnection lists with niSwitch Connect Channels (Multiple) and niSwitch Disconnect Channels (Multiple) to create strings of one or more switching operation. For lists with multiple operations, commas separate each operation. NI-SWITCH validates the connection and disconnection lists, and aborts execution of the list if errors are returned.

Set a channel as a configuration channel to allow NI-SWITCH to use the channel for internal path creation. If a path between two channels includes one or more channels, the intermediate channels should be set as a configuration channel. If multiple intermediate channels exist, and the channel type is set as a configuration channel, NI-SWITCH selects the intermediate channel to use.



Note Configuration channels may also be referred to as "reserved for routing" in other switch APIs.

Switching operations can connect and disconnect channels in one of two ways. Refer to the following table to determine the switching operation.

Switching Operations	Syntax	Description
Specify Endpoints	<code>channel1 -> channel2</code>	NI-SWITCH searches for an available path between endpoints to connect or disconnect. The two specified channels must be on the same device, and an available path must exist between them.
Specify Explicit Path	<code>[channel1 -> channel2 -> channel3]</code>	You define the endpoints and any intermediate channels of the path.*



Note* The order of operations does not guarantee order of execution. To ensure a specific order, use multiple connection and disconnection lists.



Tip NI-SWITCH ignores white space and line returns. Use these to format the appearance of lengthy lists.

Connection and Disconnection List Examples

Example 1

If you want to create a connection or disconnection list with switching operations that specify endpoints and explicit paths, separate the switching operations with commas.

Syntax: `Operation1, Operation2, Operation3`

Example: `c0 -> r0, [c1 -> r2 -> c5], r0 -> c4`

Example 2

If a path exists between channel0, com0, and AB0, you can connect channel0 to AB0 by setting the channel type of com0 as a configuration channel.

Syntax: `channel1 -> channel2`

Example: `channel0 -> AB0`

Example 3

If you want to connect column 1 and column 5 of a matrix, and use row 2 to complete the connection, you must set the channel type of row 2 to a configuration channel before the connection is made.

Syntax: `[channel1 -> channel2 -> channel3]`

Example: `[c1 -> r2 -> c5]`

Related Information:

- Scan Lists
- Setting Source and Configuration Channels

Related concepts:

- [Scan Lists](#)
- [Setting Source and Configuration Channels](#)

Disabling Digital Filtering

Digital filtering, enabled by default, prevents the switch module from being triggered by pulses that are less than 150 ns on PXI trigger lines 0–7. Some devices used with a switch may only be able to send triggers that are less than 150 ns. For the switch module to recognize these pulse widths, digital filtering must be disabled.

You can disable digital filtering by using the niSwitch Property Node or the `niSwitch_SetAttributeViBoolean` function. Complete the following steps to disable digital filtering.



Caution When digital filtering is disabled, it is possible for the switch module to be triggered by noise on the PXI trigger lines. If the device triggering the switch is capable of sending pulses greater than 150 ns, you should not disable digital filtering.

1. Add the niSwitch Property Node to the block diagram.
2. Click the property node and select **Module Characteristics»Digital Filter Enable**.
3. Right-click the **Digital Filter Enable** property and select **Change to Write**.
4. Right-click the **Digital Filter Enable** property and create a constant.
5. Set the constant to **False**.

Immediate Operations

The following VIs perform immediate operations:

- niSwitch Connect Channels (Single)
- niSwitch Connect Channels (Multiple)
- niSwitch Disconnect Channels (Single)
- niSwitch Disconnect Channels (Multiple)
- niSwitch Disconnect All Channels

- niSwitch Relay Control

The following functions perform immediate operations:

- niSwitch_Connect
- niSwitch_ConnectMultiple
- niSwitch_Disconnect
- niSwitch_DisconnectMultiple
- niSwitch_DisconnectAll
- niSwitch_RelayControl

When you use the immediate functions, NI-SWITCH determines if the path is valid and actuates the appropriate relays to make connecting and disconnecting channels easy for you.

To determine if the path you select is valid, NI-SWITCH refers to the topology you select in the niSwitch Initialize With Topology VI or the `niSwitch_InitWithTopology` function. If the path is invalid for that topology, NI-SWITCH returns an error. Refer to the topology of the switch in Devices to determine valid channel names. Alternatively, you can run the niSwitch Can Connect Channels VI or the `niSwitch_CanConnect` function to determine if the path is valid without physically connecting the channels. Refer to the hardware diagram of the switch module in Devices to determine valid relay names.



Note You can configure channels as source or configuration channels.

Connecting Channels

To connect channels, complete the following steps:

1. Run the niSwitch Connect Channels (Single) VI or the `niSwitch_Connect` function.
2. Set **Channel 1** to one endpoint of the path you want to create.
3. Set **Channel 2** to the other endpoint of the path you want to create.

Connecting Multiple Channels

To connect multiple channels, complete the following steps:

1. Run the niSwitch Connect Channels (Multiple) VI or the `niSwitch_ConnectMultiple` function.
2. Set the **connection list** to the paths you want to create. Use Connection and Disconnection List Syntax for valid connection list syntax and examples.
3. Separate multiple operations with commas.

Disconnecting Channels

To disconnect channels, complete the following steps:

1. Run the niSwitch Disconnect Channels (Single) VI or the `niSwitch_Disconnect` function.
2. Set **Channel 1** to one endpoint of the path you want to break.
3. Set **Channel 2** to the other endpoint of the path you want to break.

Disconnecting Multiple Channels

To disconnect multiple channels, complete the following steps:

1. Run the niSwitch Disconnect Channels (Multiple) VI or the `niSwitch_DisconnectMultiple` function.
2. Set the **disconnection list** to the paths you want to break. Use Connection and Disconnection List Syntax for valid disconnection list syntax and examples.
3. Separate multiple operations with commas.

Disconnecting All Channels

To disconnect all channels, run the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function.

Individual Relay Control



Caution Controlling individual relays voids the source-channel protection provided in the predefined topologies.

To control individual relays, complete the following steps:

1. Run the niSwitch Relay Control VI or the `niSwitch_RelayControl` function.
2. Set **Relay Name** to the name of the relay you want to control. Refer to the hardware diagram of the switch for valid relay names.
3. Set **Relay Action** to `Open` or `Close`.
4. Run the niSwitch Close VI or the `niSwitch_close` function to end the session.

Related concepts:

- [Setting Source and Configuration Channels](#)
- [Connection and Disconnection List Syntax](#)
- [Topologies](#)

Setting Source and Configuration Channels

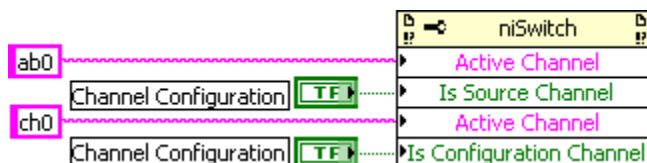
You can use NI-SWITCH to set the channel type. Set a channel as a source channel to provide additional software protection against unintentional damage to your system. Set a channel as a configuration channel to complete connections supported by the architecture of the switch, but unsupported in software.



Note The source channel type provides additional software protection when you use immediate VIs/functions or scanning VIs/functions, but it does not provide additional protection when you manipulate relays directly using the niSwitch Relay Control VI or the `niSwitch_RelayControl` function. NI does not recommend combining these types of VI/function calls.

To edit a channel type, use the niSwitch Property Node or one of the `niSwitch_SetAttribute` functions.

The following figure represents a source channel (`ab0`) and a configuration channel (`ch0`) in the niSwitch Property Node.



Source Channels

Set a source channel to indicate to the driver that a signal source is connected to the channel. NI-SWITCH does not allow two user-defined source channels to be directly or indirectly connected.



Note Switch modules with form C relays have a physical connection that always exists between the common (COM) and normally open (NO) or normally closed (NC) channel. NI-SWITCH may not reflect that connection in all cases, and hazardous or undesired connections can be created. For example, if you make a call to connect a COM channel to either an NO or NC channel, NI-SWITCH verifies that there are no source conflicts. However, operations such as the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function or the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function may create connections that are not reflected in the software.

Configuration Channels

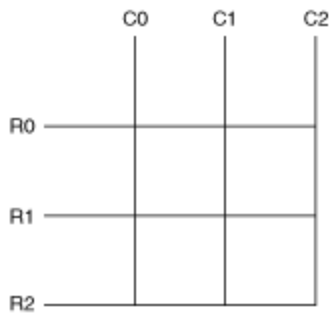
Set a configuration channel to allow NI-SWITCH to use the channel for internal path creation. Creating a column-to-column connection will fail in a matrix if a row channel is not set as a configuration channel.



Note Configuration channels may also be referred to as "reserved for routing" in other switch APIs.

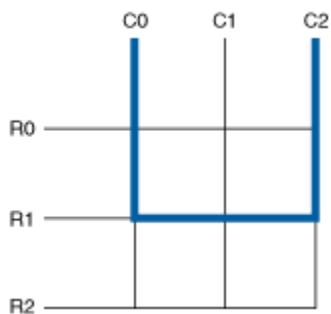
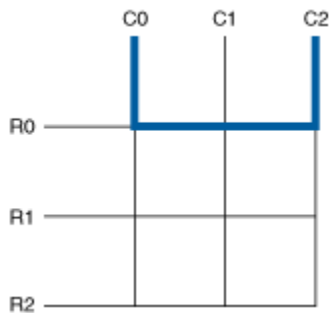
Creating a Route Example

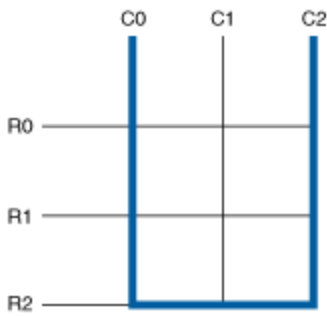
Refer the matrix in the following figure, and complete the following steps to create a route connecting C0 and C2.



1. Create a path between C0 and C2—Use the niSwitch Property Node or the appropriate `niSwitch_SetAttribute` function to set `r0` as the configuration channel.
2. Create a route—Run the niSwitch Connect Channels VI or the `niSwitch_Connect` function with **channel 1** and **channel 2** set to `c0` and `c2`, respectively.
3. Repeat steps 1 and 2 for rows `r1` and `r2` as configuration channels.

The following figures represent the routes you can create using R0, R1, and R2 as configuration channels, respectively.





Related concepts:

- [Immediate Operations](#)
- [Scanning](#)
- [Relay Forms](#)

Simulating a Switch

Simulate a switch using NI-SWITCH or Measurement & Automation Explorer (MAX) to develop, modify, and/or test an application without hardware. Using a simulated switch to test an application eliminates the risk of hardware damage. Additionally, you can use a simulated switch to evaluate an NI product for which you do not have hardware.



Tip As with an installed and configured switch, you can use the Switch Soft Front Panel to test the basic functionality of a simulated switch and troubleshoot an application.

To simulate the NI SwitchBlock, refer to [Simulating the NI SwitchBlock in MAX](#).

NI-SWITCH

Complete the following steps to create and configure a simulated switch using NI-SWITCH:

1. Run the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function.
2. Set the **simulate** parameter to `Yes` to ignore the resource name.
3. Specify the topology of the switch in the **topology name** parameter. Refer to the switch module in `Devices` for a list of valid topology names.

Alternatively, you can run the `niSwitch Initialize With Options VI` or the `niSwitch_InitWithOptions` function.

MAX

Refer to the `NI-DAQmx Simulated Devices` topic in the `Measurement & Automation Explorer Help for NI-DAQmx` for detailed instructions about creating simulated switches.



Note Some devices may not support device simulation from MAX.

Related information:

- [Simulate a SwitchBlock Device in NI MAX](#)

Getting Started

To get started using your NI switch device and driver software, refer to the getting started guide for your device. The getting started guide explains how to complete the following tasks:

- Install the software and hardware
- Configure the hardware in MAX
- Connect signals to Switch Terminal Blocks
- Program the hardware
- Troubleshoot

The getting started guide for your device is printed in your hardware kit, installed with the driver software, and available at ni.com/manuals.



Tip Complete the getting started guide for your device before using the information in this help file.

Related concepts:

- [Creating an application with NI-SWITCH](#)
- [Integration and System Considerations](#)

Creating an application with NI-SWITCH

This book explains how to begin using NI-SWITCH with your application development environment (ADE), lists files to include in your application, and includes special considerations for each ADE.



Note Install NI-SWITCH before you build an application.

To build an application, use one of the following ADEs:

- LabVIEW
- LabWindows/CVI
- Visual C++

- Visual Basic

Related concepts:

- [Using NI-SWITCH in LabVIEW](#)
- [Using NI-SWITCH in LabWindows/CVI](#)
- [Using NI-SWITCH in Visual C/C++](#)
- [Using NI-SWITCH in Visual Basic](#)

Using NI-SWITCH in LabVIEW

This topic assumes that you are using the NI LabVIEW ADE to manage your code development and that you are familiar with the ADE.

To develop an NI-SWITCH application in LabVIEW, follow these general steps:

1. Open a new or existing LabVIEW virtual instrument (VI).
2. From the **Functions** palette, select **Measurement I/O»NI-SWITCH** to access the NI-SWITCH API.
3. Select the VIs that you want to use and add them to the block diagram to build your application.

Example Programs

Use the NI Example Finder to search or browse NI-SWITCH examples. Search examples by keyword to find a particular device or measurement VI. To browse the NI-SWITCH examples available in LabVIEW, launch LabVIEW, and select **Help»Find Examples**. To browse examples by task, select **Hardware Input and Output»Modular Instruments»NI-SWITCH (Switches)**; to browse examples by directory structure, select **instr»niSwitch**.

For more information about NI-SWITCH examples, refer to NI-SWITCH Programming Examples.

Related concepts:

- [NI-SWITCH Programming Examples](#)

Considerations for using the LabVIEW Real-Time Module

To develop an NI-SWITCH application in the LabVIEW Real-Time Module, follow the same steps used for developing any application in the LabVIEW Real-Time Module, with the addition of using the NI-SWITCH LabVIEW VIs.



Note Applications running NI-SWITCH in the LabVIEW Real-Time Module on an RT target may be compromised and/or slow at 64 MB.

Hardware Support

NI-SWITCH supports all National Instruments switch modules on RT targets.

Unsupported Features

When using NI switch modules with the LabVIEW Real-Time Module, the Switch Soft Front Panel is not supported.

Related Documentation

- For configuration instructions for remote systems, refer to the MAX Remote Systems Help in Measurement & Automation Explorer (MAX) by selecting **Help»Help Topics»Remote Systems**.
- For more information about the LabVIEW Real-Time Module, refer to the LabVIEW Real-Time Module Help at ni.com/manuals.
- For additional troubleshooting and support information, refer to the LabVIEW Real-Time Support main page at ni.com/support/labview/real-time.

Using NI-SWITCH in LabWindows/CVI

This topic assumes that you are using the LabWindows/CVI ADE to manage your code development and that you are familiar with the ADE.

To develop an NI-SWITCH application in LabWindows/CVI, follow these general steps:

1. Open an existing or new project file.
2. Load the NI-SWITCH function panel at `IVI\Drivers\NISWITCH`.
3. Use the function panel to navigate the function hierarchy and to generate function

calls with the proper syntax and variable values.



Note CVI 6.0 and earlier uses the header and `.lib` files in the `\VXIpn` directories instead of `IVI\` directories.

Example Programs

For more information about NI-SWITCH examples, refer to NI-SWITCH Programming Examples.



Note CVI 6.0 and earlier users must use the example project files titled with a "6" suffix.

Related concepts:

- [NI-SWITCH Programming Examples](#)

Using NI-SWITCH in Visual C/C++

This topic assumes that you are using the Microsoft Visual C or C++ ADE to manage your code development and that you are familiar with the following ADEs:

- Microsoft Visual C++ 6.0
- Microsoft Visual Studio 2010

Using NI-SWITCH in Microsoft Visual C++ 6.0

To develop an NI-SWITCH application with Microsoft Visual C++ 6.0, follow these general steps:

1. Open an existing or new Visual C/C++ project to manage your application code.
2. Create source code files of type `.c` (C) or `.cpp` (C++).
3. Add the source code files to the project.
4. Add the following code in the source code files:

```
#include "niswitch.h"
```

5. Add the NI-SWITCH include and library files to the project. <IVIROOTDIR32> is an alias to a specific National Instruments file folder location. Refer to the NI-SWITCH Readme File for more information about installed file locations.
 - a. Select **Project»Settings»C/C++»Preprocessor»Additional include directories**, and add the paths, separated by a semicolon, to the `niswitch.h` and `visa.h` files. The `niswitch.h` and `visa.h` files are located in the <IVIROOTDIR32>\Include and <VXIPNPPATH>\WinNT\include directories, respectively.
 - b. Select **Project»Settings»Link»General»Object/Library Modules**, and add `niswitch.lib`.
 - c. Select **Project»Settings»Link»Input»Additional library path**, and add the path to the `niswitch.lib` file. The `niswitch.lib` file is located in the <IVIROOTDIR32>\Lib\msc or the <IVIROOTDIR32>\Lib x64\msc directory.
6. Build your application using the appropriate programming flow steps.

Using NI-SWITCH in Microsoft Visual Studio 2010

To develop an NI-SWITCH application with Microsoft Visual Studio 2010, follow these general steps:

1. Open an existing or new Visual C/C++ project to manage your application code.
2. Create source code files of type `.c` (C) or `.cpp` (C++).
3. Add the source code files to the project.
4. Add the following code in the source code files:

```
#include "niswitch.h"
```

5. Add the NI-SWITCH include and library files to the project. <IVIROOTDIR32> is an alias to a specific National Instruments file folder location. Refer to the NI-SWITCH Readme File for more information about installed file locations.
 - a. Select **Project»Properties»Configuration Properties»C/C++»General»Additional Include Directories**, add the paths, separated by a semicolon, to the `niswitch.h` and `visa.h` files. The `niswitch.h` and `visa.h` files are located in the <IVIROOTDIR32>\Include and <VXIPNPPATH>\WinNT\Visa\include directories, respectively.
 - b. Select **Project»Properties»Configuration Properties»Linker»Input»Additional Dependencies**, and add `niswitch.lib`.

- c. Select **Project»Properties»Configuration Properties»Linker»General»Additional Library Directories**, and add the path to the `niswitch.lib` file. The `niswitch.lib` file is located in the `<IVIROOTDIR32>\Lib\msc` or the `<IVIROOTDIR32>\Lib x64\msc` directory.
6. Build your application using the appropriate programming flow steps.

Microsoft Visual C Examples

Installed examples for Visual C/C++ are in the NI-SWITCH Readme File.

The C examples were built and tested using Microsoft Visual C++ 6.0 with Service Pack 5.0. These examples are console-based with no graphical interface.

To build the examples in Microsoft Visual C++ 6.0 using the Microsoft NMAKE utility, complete the following steps:

1. Go to the directory for the particular example you want to use.
2. Run the VCVARS32.BAT batch file (located in the \bin directory of the MSVC compiler) to set up the environment variables for command line usage if they are not already set. You might need to increase the initial environment size of the DOS box to accommodate the added environment variables.
3. To build an example run `nmake CFG="Win32 Debug"`. The executable is built to the debug subdirectory by default.

Related concepts:

- [Programming Flow](#)

Using NI-SWITCH in Visual Basic

This topic assumes that you are using the Microsoft Visual Basic ADE to manage your code development and that you are familiar with the ADE.

To develop an NI-SWITCH application in Visual Basic, follow these general steps:

1. Open an existing or new Visual Basic project.
2. Create files necessary for your application and add them to the project.

3. Add a reference to the National Instruments Switch Library (NISWITCH), which is part of the NI-SWITCH DLL. In Visual Basic 6.0, select the **Project»References** menu option and National Instruments Switch Library (NISWITCH). If you do not see NISWITCH listed there, click **Browse** and locate `NISWITCH_32.dll` in your `IVI\Bin` directory.
4. Use the Object Browser <F2> to find function prototypes and constants.
5. Add NI-SWITCH function calls to your application.
6. Run your application by clicking **Run**.

Example Programs

To load an example project with Visual Basic 6.0 or later, select **File»Open Project**, then select the `.vbp` file of your choice.

For more information about NI-SWITCH examples, including example locations, refer to NI-SWITCH Programming Examples.

Special Considerations

String Passing

In Visual Basic, variables of data type String do not need special modifications to be passed to NI-SWITCH functions. Visual Basic automatically appends a null character to the end of a string before passing it (by reference, since strings cannot be passed by value in Visual Basic) to a procedure or function.

Parameter Passing

By default, Visual Basic passes parameters by reference. Prepend the `ByVal` keyword if you need to pass by value.

Related concepts:

- [NI-SWITCH Programming Examples](#)

NI-SWITCH Examples

NI-SWITCH includes several example applications that demonstrate the functionality

of your device and can serve as interactive tools, programming models, and building blocks for your own applications.

NI Example Finder

The NI Example Finder is a utility that organizes examples into categories and allows you to browse and search installed examples. For example, search for "SWITCH" to locate all NI-SWITCH examples. You can see descriptions and compatible hardware models for each example or see all the examples compatible with one particular hardware model.

To locate examples using the NI Example Finder within LabVIEW, select **Help»Find Examples** and navigate to **Hardware Input and Output»Modular Instruments»NI-SWITCH**.

Example Locations

ADE		Example Locations
LabVIEW		Within LabVIEW, select Help»Find Examples and navigate to Hardware Input and Output»Modular Instruments .
LabWindows/CVI		C:\Users\Public\Documents\National Instruments\CVI\samples\niSwitch
C/C++		• Windows — Users\Public\Documents\National Instruments\NIDocDir\NI-SWITCH\examples • Linux — usr/share/niswitch-devel/examples
.NET	4.0	C:\Users\Public\Documents\National Instruments\NI-SWITCH\Examples\DotNET 4.0
	4.5	C:\Users\Public\Documents\National Instruments\NI-SWITCH\Examples\DotNET 4.5
Python		Refer to <i>Python NI-SWITCH Examples</i> .

Using NI Switches in IVI

Create an IVI logical name and a corresponding driver session to use National

Instruments switch modules in IVI. Complete the following steps to create an IVI logical and a corresponding driver session.

1. Open Measurement & Automation Explorer (MAX).
2. Expand **IVI Drivers** in the MAX configuration tree.
3. Create a new driver session.
 - a. Right-click **Driver Sessions** in the configuration tree, and select **Create New (case-sensitive)**. The configuration panel opens in the configuration window.
 - b. Complete the following steps to configure the new driver session.
 - i. Select the **Software** tab, and select **niSwitch** from the Software Module listbox.
 - ii. Select the **Hardware** tab, and select the switch module you want to use from the Hardware Asset listbox.
4. Create a new logical name.
 - a. Right-click **Logical Names** in the configuration tree, and select **Create New (case-sensitive)**. The configuration panel opens in the configuration window.
 - b. To configure the new logical name, select the driver session that you created in step 3 from the **Driver Session** listbox.



Note To create a new hardware asset, click **Create New** to the right of the Hardware Asset listbox.

- iii. Select the **General** tab, and select **Don't Simulate** from the Simulate With listbox.
- iv. In the Driver Setup textbox, enter the driver setup string for the switch module you want to use. Refer to Determining the Driver Setup String for more information about driver setup strings.



Note To view the properties of the driver session you have selected, click **Go To** to the right of the **Driver Session** listbox.

5. To save the IVI configuration, click **Save IVI Configuration** at the top of the configuration view. If you decide not to save your changes, click **Revert** to revert to the previous configuration.

Determining the Driver Setup String

Complete the following steps to determine the driver setup string for the switch

module.

1. Determine the topology name.
 - a. Open the NI Switches Help file.
 - b. Select the **Contents** tab.
 - c. Expand the **Devices** book, and select the switch module you want to use. The device overview for the switch module is displayed in the help window.
 - d. In the device overview, the Operation Modes table(s) lists the topology and software names for each supported topology. The topology name is the first software name listed in the table not the constant name in parenthesis. For example, if you want to use the NI PXI-2501 in the 48x1 Mux mode, the topology name is "2501/1-Wire 48x1 Mux" not `"NISWITCH_TOPOLOGY_2501_1_WIRE_48X1_MUX."`
2. Using the topology name, determine the driver setup string.
 - **NI-DAQmx devices**—The driver setup string is `topology:<topology name>`. If you are using the NI PXI-2501 in the 48x1 Mux mode, for example, the driver setup string is `topology:2501/1-Wire 48x1 Mux`.

Configuring Hardware in MAX

Use Measurement & Automation Explorer (MAX) to configure your National Instruments hardware. MAX informs other programs about which devices reside in the system and how they are configured. MAX is installed by default with NI-SWITCH.

1. Launch MAX by navigating to **Start»All Programs»National Instruments»Measurement & Automation** or by clicking the Measurement & Automation desktop icon.
2. In the Configuration pane, double-click **Devices and Interfaces** to see the list of installed devices. Installed devices appear under the name of their associated chassis.
3. Expand your **Chassis** tree item. MAX lists all devices installed in the chassis. Your default device names may vary.
4. Record the device identifier MAX assigns to the hardware. Use this identifier when programming your NI switch.

Configuring a PXI/PXI Express Switch

To configure an NI PXI/PXI Express switch module, complete the following steps in MAX:

1. Expand **Devices and Interfaces**. If you are using a remote RT target, expand Remote Systems, find and expand your target, and expand **Devices and Interfaces**.
2. Right-click the switch device you want to configure. Select **Configure**.
3. The **Terminal Block/Topology** tab is selected by default. Select the terminal block connected to the switch module from the **Terminal Block/Accessory** listbox.
4. Select the **Channels** tab.
5. If necessary, designate source channels for the topology selected in the **Terminal Block/Topology** tab. You can set different source channels for each topology.
6. If necessary, designate reserved channels for routing. You can reserve different channels for routing in each topology.
7. Click **OK** to accept the changes.



Note Some devices may only be configurable using NI-SWITCH attributes and may not be configurable through MAX.

Related concepts:

- [Setting Source and Configuration Channels](#)

NI SwitchBlock Configuration Panel Help

This help file contains information about using the NI SwitchBlock Configuration Panel in Measurement & Automation Explorer (MAX) to configure the NI SwitchBlock. This help file also contains information about simulating the NI SwitchBlock in MAX and guidelines for combining NI SwitchBlock cards into devices.

For information about programming the NI SwitchBlock, refer to the NI Switches Help.

Simulating the NI SwitchBlock in MAX

You can simulate the NI SwitchBlock using Measurement & Automation Explorer (MAX) to develop, modify, and/or test an application without hardware. Using a simulated

switch device to test an application eliminates the risk of hardware damage. Additionally, you can use a simulated switch device to evaluate an NI product for which you do not have hardware.



Tip You can use the Switch Soft Front Panel to test the basic functionality of a simulated switch device and troubleshoot an application as you would with an installed and configured switch device.

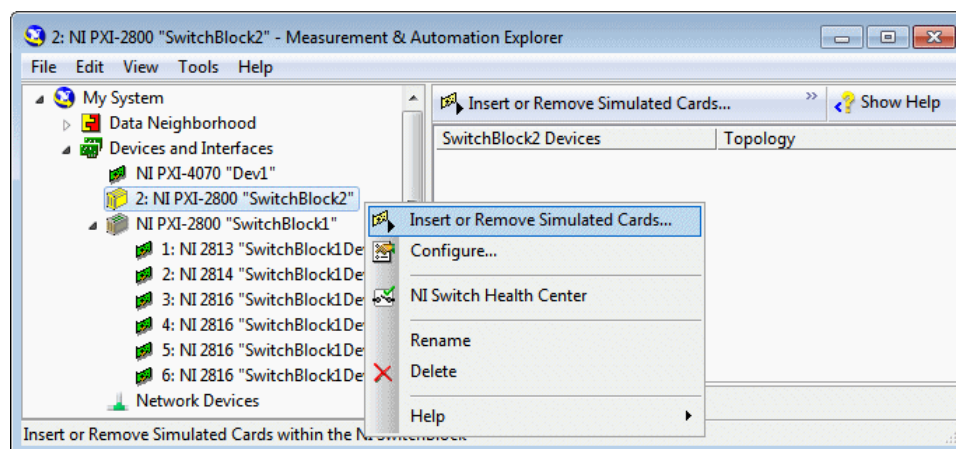
Simulating a Carrier

Refer to the NI-DAQmx Simulated Devices topic in the Measurement & Automation Explorer Help for NI-DAQmx for detailed instructions about creating a simulated NI SwitchBlock carrier. When creating an NI-DAQmx simulated device, NI SwitchBlock carriers are categorized under **Switches**.

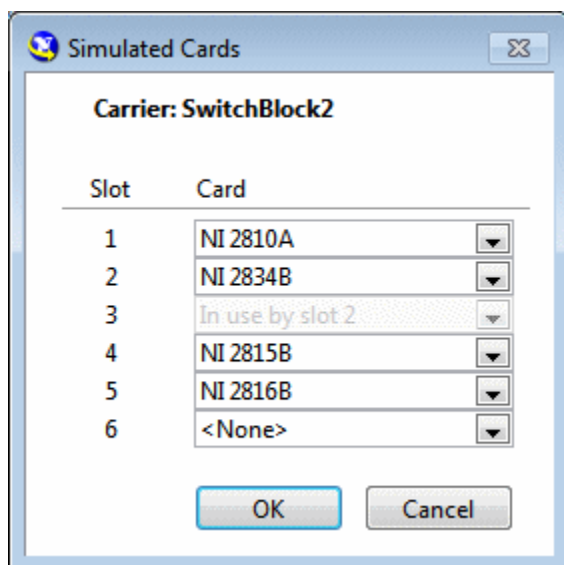
Inserting, Removing, or Modifying Simulated Cards in a Simulated Carrier

Complete the following steps to insert or remove simulated NI SwitchBlock cards in a simulated carrier in MAX.

1. To launch the Simulated Cards panel, right-click the simulated carrier in the MAX device tree and select **Insert or Remove Simulated Cards** as shown in the following figure.



2. For each slot in which you would like to insert a simulated card, select the card model you would like to simulate from the **Card** drop-down list as shown in the following figure.



To leave a slot empty or remove a simulated card, select **<None>** from the **Card** list for that slot. If a multislot card is selected, the fields for the corresponding occupied slots are disabled. You can insert a multislot card only in slots that have an adequate number of empty slots after it. For example, you cannot insert a multislot card in the last slot of a carrier.

- When you have selected the cards you would like to simulate, select **OK** to update the configuration tree in MAX, or select **Cancel** to revert to the existing configuration. Once the configuration is applied, the right pane in MAX displays the updated card configuration.

Simulated cards can only be inserted into a simulated carrier. Each simulated card is initially configured as a single-card device. Refer to ***Configuring the NI SwitchBlock in MAX*** to combine multiple simulated cards into a device.

Related concepts:

- [Configuring the NI SwitchBlock in MAX](#)

Configuring the NI SwitchBlock in MAX

Configure the NI SwitchBlock under **Devices and Interfaces** in MAX.

- If you are using an embedded PXI controller, power on the chassis. If you are using

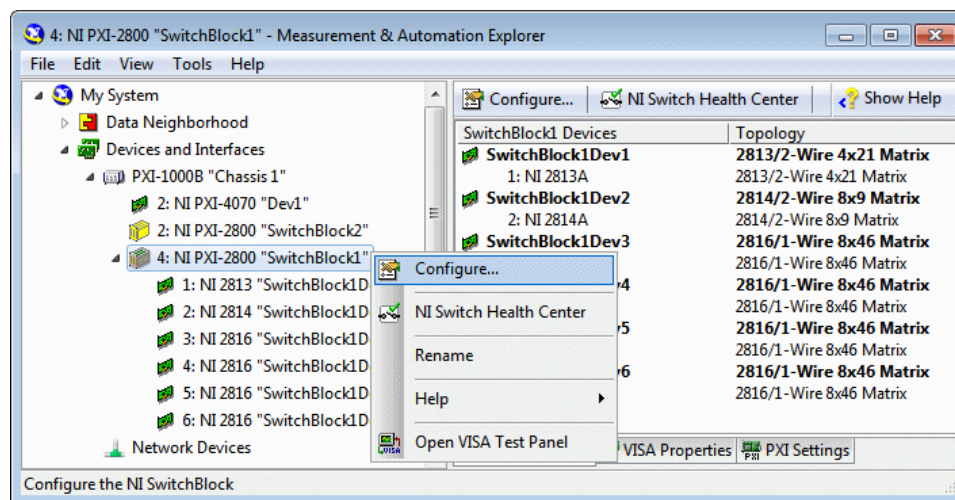
a MXI controller, you should power on the chassis before you power on the computer.

2. Launch MAX (**Start»All Programs»National Instruments»Measurement & Automation**).
3. Expand **Devices and Interfaces**. If you are using a remote real-time (RT) target, expand **Remote Systems**, find and expand the target, and then expand **Devices and Interfaces**.
4. Verify that the NI SwitchBlock carrier appears under the appropriate chassis. The slot number MAX assigns to the NI SwitchBlock carrier is the second PXI slot from the left of the carrier. If your chassis does not show up under **Devices and Interfaces**, refer to the chassis documentation to identify the chassis.

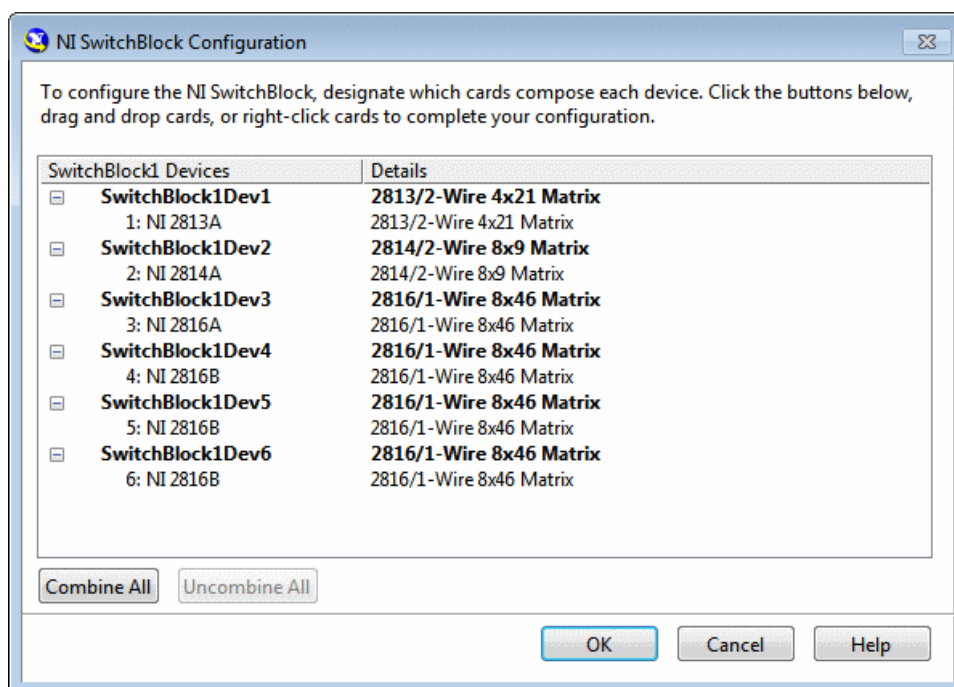


Note If the carrier does not appear, press <F5> to refresh the view in MAX. If the carrier still does not appear, reinstall the hardware. Refer to NI Technical Support at ni.com/support for troubleshooting information if the carrier is still not recognized. For more information about using MAX, refer to the available help files within MAX.

5. Right-click the carrier and select **Configure** to launch the NI SwitchBlock Configuration Panel as shown in the following figure.



6. By default, all NI SwitchBlock cards in the carrier appear as single-card devices, as shown in the following figure.



To combine or uncombine the cards in your carriers, use one or more of the following methods to designate which cards compose each device:

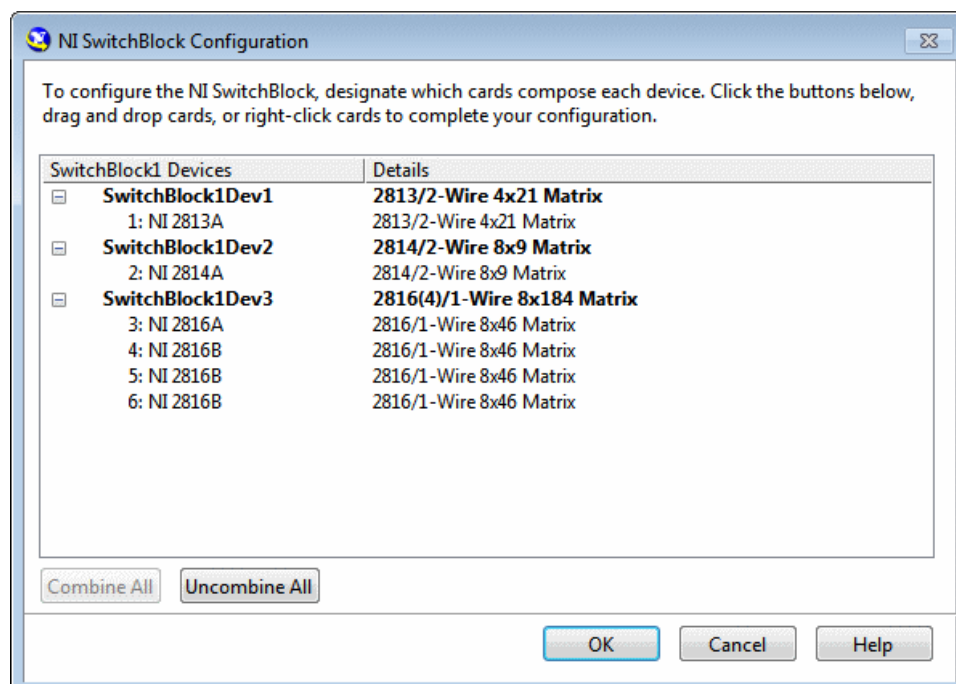
- Select **Combine All** to combine all NI SwitchBlock cards of the same model in the carrier into multiscard devices.
- Select **Uncombine All** to split all NI SwitchBlock cards in the carrier into single-card devices.
- After cards have been combined, right-click a card and select **Move To»New Device** to create a new device.
- Drag and drop a card into the desired device to create a multiscard device.
- Select **Move To»Device Name** to create a multiscard device, where **Device Name** indicates the name of the device into which you would like to move the card.



Note If a device name has not been previously specified in the MAX configuration tree, MAX will auto-generate a device name such as SwitchBlock1Dev1, where SwitchBlock1 indicates the name of the carrier in which the cards that compose the device are installed.

Refer to the NI Switches Help for guidelines for creating multiscard devices.

The following figure illustrates the resulting configuration if you select **Combine All** when configuring an NI SwitchBlock composed of four different models of cards.



7. When you have completed assigning cards to devices, select **OK** to update the configuration tree in MAX, or select **Cancel** to revert to the existing configuration. The updated configuration also appears in the right pane in MAX.
8. To test the configuration, right-click each of the devices in the carrier under **Devices and Interfaces** in the MAX configuration tree, and select **Self-Test**. After the test, a message indicates either successful verification of the configuration or that an error occurred. If an error occurs, refer to ni.com/support for troubleshooting information.

Removing an NI SwitchBlock Carrier or Device in MAX

Complete one of the following procedures to remove an NI SwitchBlock carrier or device from your configuration in MAX.

Removing an Installed Carrier

To remove an installed carrier from the MAX configuration tree, power off and unplug the PXI/PXI Express chassis in which the carrier is installed, then physically remove the carrier from the PXI/PXI Express chassis. Power on the system, then right-click the carrier name in the configuration tree in MAX and select **Delete**.

Removing an Installed Device

To remove an installed device from the MAX configuration tree, power off and unplug the PXI/PXI Express chassis in which the carrier that contains the device is installed, then physically remove the cards that compose the device from the carrier. Power on the system, then right-click the device name in the configuration tree in MAX and select **Delete**.

Removing a Simulated Carrier or Device

To remove a simulated carrier or device from your configuration, right-click the simulated carrier or device in the configuration tree and select **Delete**.

NI SwitchBlock Device Basics

What do you want to do?

Run the NI-DAQmx Test Panels

Use Test Panels to interactively test the functionality of your NI SwitchBlock device. To run the test panels, right-click the device name in the configuration tree, and select **Test Panels**. Because the NI SwitchBlock carrier is not a switch device, there is no test panel for the carrier.

Insert Simulated Cards

To insert simulated cards into a simulated NI SwitchBlock carrier, right-click the simulated carrier in the configuration tree and select **Insert or Remove Simulated Cards**. Refer to the NI SwitchBlock Configuration Panel Help for more information about inserting simulated cards into a simulated NI SwitchBlock carrier.

Configure the NI SwitchBlock

To designate which cards compose devices in an NI SwitchBlock system, right-click the NI SwitchBlock carrier in the configuration tree and select **Configure**. Refer to the NI SwitchBlock Configuration Panel Help for more information about configuring an NI SwitchBlock system.

Test Relays

To access an integrated relay test and relay counts for cards in an NI SwitchBlock carrier, right-click the NI SwitchBlock carrier in the configuration tree and select **NI Switch Health Center**. Refer to the NI Switch Health Center Help for more information about the NI Switch Health Center.

Remove the Device or Carrier

Refer to the NI SwitchBlock Configuration Panel Help for information about removing a device or carrier from the configuration tree.

Integration and System Considerations

This book contains information related to integrating NI switch modules with other devices and environments.

Environment

NI switch modules use components whose performance can be adversely affected by operation outside the specified limits. For more information, refer to the Environment section in the specifications document of the device at Related Documentation.

For best performance, observe the following recommendations:

- Operate NI PXI/PXI Express switch modules in a PXI-compliant PXI/PXI Express chassis at an ambient temperature between 0 °C and 55 °C and at a relative humidity up to 90%.
- Use a chassis that has a well-designed cooling system. All NI PXI/PXI Express chassis meet this requirement.



Note To ensure that an NI PXI/PXI Express switch device operates at peak performance within the PXI/PXI Express chassis, refer to PXI/PXI Express Chassis Recommendations.

- Keep the NI switch device clean and free from contaminants.

Operating in high humidity or dusty conditions may cause increased leakage between circuit components and can result in additional errors.

Related concepts:

- [PXI/PXI Express Chassis Recommendations](#)

PXI/PXI Express Chassis Recommendations

NI PXI/PXI Express switch modules are designed to operate in any PXI-compliant PXI/PXI Express chassis. Temperature rise of the switch module can vary with slot position

in the chassis. Observe the following recommendations to minimize this temperature variation and to ensure normal operating conditions for the NI switch module:

- Some chassis include fan filters. Depending on the amount of chassis use and the ambient dust levels, filters might require more frequent cleaning. NI recommends cleaning the chassis fan filters at least every six months and keeping the chassis environment clean to minimize the amount of dust that enters the chassis. Perform routine maintenance of the chassis cooling fan filters to assure continuous cooling effectiveness and to keep dust off of the NI switch module components. If regular maintenance of dirty or clogged filters is not possible, you can remove foam filters to maintain adequate cooling. NI does not recommend removing metal fan filters. For more information about cleaning the chassis fan filters, refer to the documentation for your chassis.
- Install PXI/PXI Express filler panels in all empty slots.
- Verify that the PXI/PXI Express chassis fans that provide forced air remain unobstructed to allow for proper cooling of the PXI/PXI Express chassis, devices, and controller.

PXI Express Compatibility

In an effort to incorporate PCI Express signaling into PXI, the PXI Systems Alliance (pxisa.org) has defined a modification for PXI modules. On modified PXI modules, known as hybrid slot compatible PXI modules, the top rear connector is replaced with a smaller connector.

Hybrid slot compatible PXI modules preserve the following features:

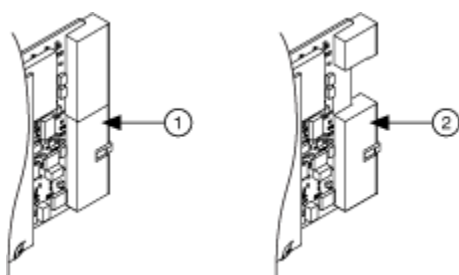
- Software compatibility—Hybrid slot compatibility does not require any changes to existing applications and/or driver software.
- Specifications—Hybrid slot compatibility does not alter module specifications.
- PXI communication—Hybrid slot compatibility preserves the speed and capability of all PXI communication.
- PXI timing and triggering—Hybrid slot compatibility supports existing PXI timing and PXI triggering capabilities.
- Hybrid slot compatible PXI modules can operate in standard PXI slots in an NI PXI/PXI Express chassis, as well as in PXI Express hybrid slots in an NI PXI Express chassis, while PXI cards that are not hybrid slot compatible can only operate in

standard PXI slots. To determine if your NI switch product is hybrid slot compatible, refer to the following figure.



Note Refer to your NI PXI/PXI Express chassis documentation to determine which slots are PXI slots, PXI Express slots, or PXI Express Hybrid slots.

A comparison of a PXI module and a hybrid slot compatible PXI module is shown in the following figure.



1. PXI Module
2. Hybrid Slot Compatible PXI Module

Protecting NI Switch Products when Switching Inductive Loads

Switching inductive loads, such as motors and solenoids, may produce high voltage transients in excess of the NI switch products' rated voltage. Without additional protection, these transients can interfere with NI switch product operation and impact relay life. For more information, visit ni.com/info and enter the Info Code `relayflyback`.

NI Switch Health Center Help

This help file contains information about using the NI Switch Health Center to test relays on NI-SWITCH relay cards.

The NI Switch Health Center executes a hardware-integrated relay test and provides access to the relay count tracking data stored on NI-SWITCH relay cards. Results from the relay test are graphically displayed on a relay card diagram, making it easy to locate relays that need to be replaced or relays are near end-of-life.

About the NI Switch Health Center

The NI Switch Health Center simplifies relay maintenance and reliability in high-channel-count NI switching systems. The NI Switch Health Center executes a hardware-integrated relay continuity test that verifies that every relay on the card is functional, executes an integrated relay resistance test that measures the resistance changes across relays, and provides access to the relay count tracking data stored on the cards. When you launch the NI Switch Health Center, the test starts automatically. Click the **Start** button to run the test again. Click the **Abort** button to stop a test in progress. Click the **Report** button to generate an HTML report that documents the results of the relay test and relay counts for each relay in your switching system.

NI Switch Health Center Tests

The NI Switch Health Center can report the following:

- Relay functionality using the integrated relay continuity test
- Relay contact resistance changes ($\Delta\Omega$) using the integrated relay resistance test
- Relay cycle counts using relay count tracking

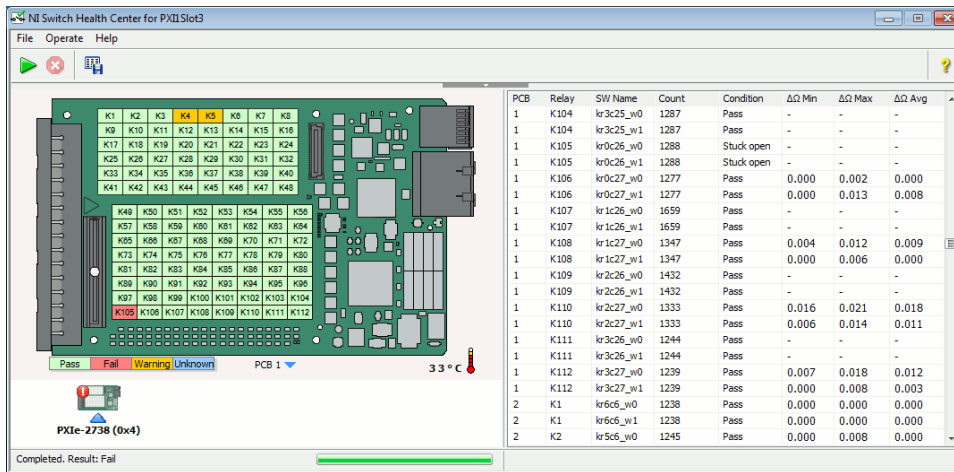


Note Some devices may not support the integrated relay resistance test.

PCB Thumbnails

The NI Switch Health Center displays a thumbnail for the relay card in the main

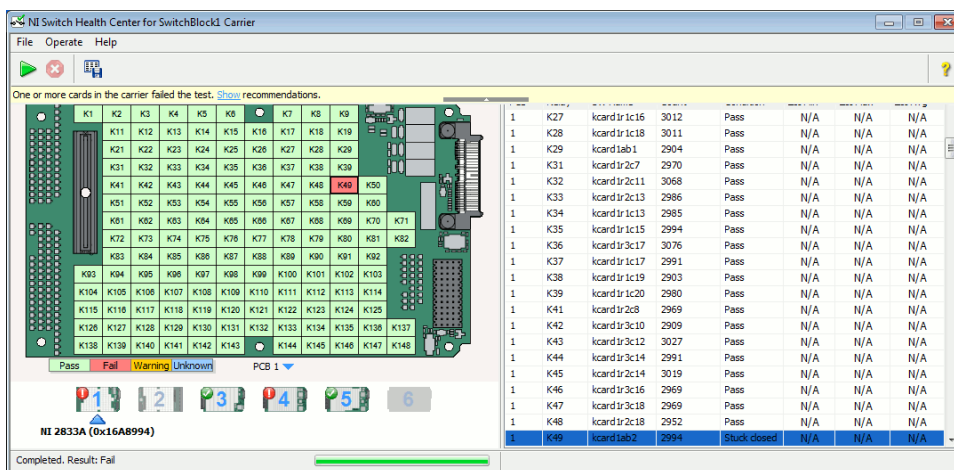
window beneath the card's PCB diagram, as shown in the figure below. You can use the drop-down arrow beneath the PCB diagram to select the PCB diagram you want to display.



NI SwitchBlock

For NI SwitchBlock, the NI Switch Health Center displays thumbnails representing the card occupying the numbered slot. You can click on a thumbnail to view a specific card diagram. Thumbnails for slots without cards are grayed out completely, as shown in slot 6 in the figure below.

For cards occupying more than one slot, such as the NI 2833 and NI 2834, only the thumbnail of the left-most slot is enabled and the others are disabled. Slots 1 and 2 in the figure below represent a multislot card. When you click on the thumbnail of an enabled multislot card, the diagram for the left-most PCB is displayed by default.



Test Results

Results from the relay test are graphically displayed on a PCB diagram and in a sortable table, making it easy to locate relays for replacement. If you click on any relay in the PCB diagram, its corresponding relay will be highlighted in the table. Conversely, if you click on any relay in the table, its corresponding relay in the PCB diagram will be highlighted.



Note The device temperature is displayed on the PCB diagram before the integrated relay resistance test begins. The temperature may affect the results of the resistance test.

Double-pole relays are referred to by relay contact name. For example, a 2-Wire DPST relay is referred to as "kr0c0_w0" and "kr0c0_w1," with "_w0" referring to one relay contact and "_w1" referring to the other relay contact. When you select a relay on the PCB diagram, the first relay contact is highlighted in the results table. If you select either relay contact in the results table, the corresponding relay will be highlighted in the PCB diagram.



Note Dashes in place of minimum, maximum, and average resistance change values ($\Delta\Omega$) indicate that the resistance test was unable to return a resistance change for the relay, due to other failed relays. A result of "N/A" in the resistance column indicates that the device does not support the integrated relay resistance test.

If any relays fail the relay test, a banner will appear indicating that one or more relays have failed the test. The banner will also provide recommendations for the relay(s) that failed the test.

Report Generation

At the end of each relay test, you can generate an HTML report documenting the condition and resistance change of all the relays on each card along with their relay counts. Once the test has completed, click the **Report** icon to generate a report. The report can not be generated until the test for at least one card has completed. The report includes links to the online model pages for each device tested.



Note The SHC report lists a relay as "Untested" if the resistance test was unable to return a resistance change for that relay.

Related concepts:

- [Accessing the NI Switch Health Center](#)
- [Switch Relay Maintenance with the NI Switch Health Center](#)
- [Testing Relays with the NI Switch Health Center](#)
- [Generating Reports with the NI Switch Health Center](#)

Accessing the NI Switch Health Center

You can access the NI Switch Health Center from within Measurement & Automation Explorer (MAX) or from the **Start** menu.

From MAX

- Right-click on a resource and select **NI Switch Health Center**, or
- Select a resource and click **NI Switch Health Center** in the task bar.

From the Start Menu

Select **Start » Programs » National Instruments » NI-SWITCH » NI Switch Health Center**.

Related concepts:

- [Testing Relays with the NI Switch Health Center](#)
- [About the NI Switch Health Center](#)

Testing Relays with the NI Switch Health Center

To test relays with the NI Switch Health Center, complete the following steps:

1. Disconnect any cables or interchangeable test interfaces (ITAs) from the device(s).



Note Safety interlock circuitry on the NI SwitchBlock relay cards prevents the relay test from running until all external connections have been disconnected.

2. Launch the NI Switch Health Center from either MAX or the Start menu.

From MAX, complete one of the following:

- Right-click on a resource and select **NI Switch Health Center**
- Select a resource and click **NI Switch Health Center** in the task bar.

The NI Switch Health Center launches, initializes, and begins testing relays in the selected resource.

From the Start Menu, complete the following.

- a. If you have only one resource present, the relay test starts automatically. If you have more than one resource installed, select the resource you want to test in the listbox from the NI Switch Health Center - Setup dialog box that displays.
- b. Click the **Start** button.

The NI Switch Health Center initializes and begins testing relays in the selected resource.

3. The relay test displays the following information:

- Relay functionality using the integrated relay continuity test
- Relay contact resistance changes using the integrated relay resistance test
- Relay cycle counts using relay count tracking



Note Some devices may not support the integrated relay resistance test.

Click **Abort** at any time to stop the test and release the resource for use.

4. Click the **Start** button to repeat tests as necessary.

After completion of each relay test, you can generate a report documenting the results of the test.

Related concepts:

- [Accessing the NI Switch Health Center](#)
- [Generating Reports with the NI Switch Health Center](#)
- [Switch Relay Maintenance with the NI Switch Health Center](#)

Generating Reports with the NI Switch Health Center

After completing a relay test for at least one resource, you can generate an HTML report documenting the condition of all the relays. The report includes links to the online model pages for reference. The report also includes PCB diagrams for each card, to identify the physical location of relays that need replacement.

Complete the following steps to generate a report after each relay test:

1. Click the **Report** button.
2. In the Save Report dialog box, specify a file name and location for the report directory.
3. Click **Save**.

The NI Switch Health Center creates an HTML report and supporting files in the directory location you specified.

Switch Relay Replacement

Refer to the NI Switches Help at **Start » Programs » National Instruments » NI-SWITCH » Documentation » NI Switches Help** for detailed relay manufacturer information and relay replacement instructions. After completing the replacement procedure, refer to the NI Switches Help for information about resetting a relay count to track the lifetime of the new relay.



Note If a heavily used relay needs to be replaced while the relay card is still under warranty, following the instructions in the NI Switches Help and correctly replacing the relay yourself does not affect the warranty.

If most of the relays on one of the cards need to be replaced at the same time or if one of the boards is damaged, you can contact NI support and arrange to send the entire card back to NI for relay replacement.

Switch Relay Maintenance with the NI Switch Health Center

You can use the NI Switch Health Center for switch relay maintenance using the following relay tests to determine whether a relay is functional or will need to be replaced.

Integrated Relay Continuity Test

The NI Switch Health Center tests relays by sending a signal through a combination of routes on each card to verify the condition of each relay. When the test has finished, each relay is determined to be functional, stuck open, stuck closed, or unknown. A relay status can be reported as unknown if relay conditions may not be determinable because of specific combinations of failures. If the integrated relay test is aborted before completion, some relays may be untested.

Integrated Relay Resistance Test

Changes in contact resistance over time can indicate that a relay is approaching, or has reached, end-of-life. The NI Switch Health Center tests for changes in resistance using the integrated relay resistance test. When you run a relay test with the NI Switch Health Center, you can view the resistance change across individual relays to determine whether a relay is close to end-of-life.

The integrated relay resistance test reports the change in resistance relative to a baseline resistance measured at the time the device was manufactured. A large change in resistance from the baseline indicates that the relay will soon need to be replaced. If the change in resistance reaches $1\ \Omega$, NI recommends that you replace the relay.



Note Some devices may not support the integrated relay resistance test.

Relay Count Tracking

Relay count tracking can also be used to determine relay lifetime and mechanical lifetime by maintaining an accurate count of relay cycles. All devices offer onboard relay count tracking that you can view in the NI Switch Health Center or the NI Switch

Soft Front Panel. Relay counts are stored on the switch hardware, allowing you to monitor relay cycle count if hardware is moved between systems. Using this information, you can perform preventive relay maintenance, detect inefficient switching code, and in some applications, extend the life of your card by balancing the relay utilization across the card. If monitored over time, you can use relay count tracking to anticipate when a relay will fail.

Users can also programmatically access the relay count tracking feature to identify specific relays that have a greater cycle count, and thus shift their testing procedure to utilize relays with a lower cycle count.

You can read current relay counts from the hardware at any time using the NI Switch Health Center, NI Switch Soft Front Panel, or NI-SWITCH driver, and integrate it into your test code to supply operator warnings if relays exceed their electrical life expectancy.

Related concepts:

- [Testing Relays with the NI Switch Health Center](#)
- [Accessing the NI Switch Health Center](#)
- [About the NI Switch Health Center](#)

Relay Lifetime

When selecting a relay for an application, an important characteristic to consider is the relay life expectancy. Relay life expectancy can be measured by relay cycles but can be more accurately measured by relay contact resistance. One relay cycle is defined as the action of opening and closing the relay. Most switching products provide both mechanical and electrical expected lifetimes.

Mechanical Lifetime

The mechanical lifetime is the typical number of cycles that a relay can sustain under dry switching conditions (switched with no electrical load). The mechanical lifetime is based on metal fatigue within the bending armature or reed switch. The typical number of cycles tends to be higher than the electrical lifetime and is rarely reached in switching systems.

Electrical Lifetime

Switching active electrical signals, especially high-power signals, causes arcing across the relay contacts. This arcing produces pits on the contact surface and accelerates the contact wear. The electrical lifetime is the number of switch cycles under load before the contact resistance rises above a certain value, or the contacts become stuck open or stuck closed. This electrical life specification is often used as the cycle limit for a given relay; however, it can only be used as a reliable indicator for relay failure if the load being switched in your test system matches the load that was used to determine the relay specification. Measuring relay contact resistance provides a more accurate indicator of electrical lifetime for relays.

Error Cases in the NI Switch Health Center

The NI Switch Health Center will stop running and return errors in the following cases.

Error message: The test cannot run because the Integrated Relay Test terminals are shorted. This is usually caused by specific combinations of failed relays on a resource. Refer to the NI Switch Health Center Help for more information about locating the resource that is causing this error.

The NI Switch Health Center will not be able to perform the Integrated Relay Test when there are specific combinations of relay failures on resource. Complete the following steps to identify which resource is causing this error:

1. Shut down the NI PXI system.
2. Remove any resource.
3. Power on the NI PXI system and run the NI Switch Health Center.
4. Repeat steps 1 through 3 until the NI Switch Health Center runs without errors.

If the removal of a specific resource allows the NI Switch Health Center to run successfully, contact National Instruments to have the resource repaired. If errors continue after trying this procedure, contact National Instruments for assistance.

Programming with NI-SWITCH

To program your switch module, select an API—NI-SWITCH or NI-DAQmx. Refer to the NI Switches Getting Started Guide for more information about these APIs.

With the NI-SWITCH API

This book covers programming your switch module with the NI-SWITCH API. The following topics are covered:

- Getting Started—How to begin creating your applications in LabVIEW, LabWindows/CVI, Visual C++, and Visual Basic
- Programming Flow—The programming flow for immediate operations, and scanning
- Features—Task-based information for using your switch module and its features
- Examples—Examples in NI LabVIEW, LabWindows/CVI, Visual C++, and Visual Basic
- Error and Status Codes—Error codes for NI-SWITCH and IviSwitch

With the NI-DAQmx API

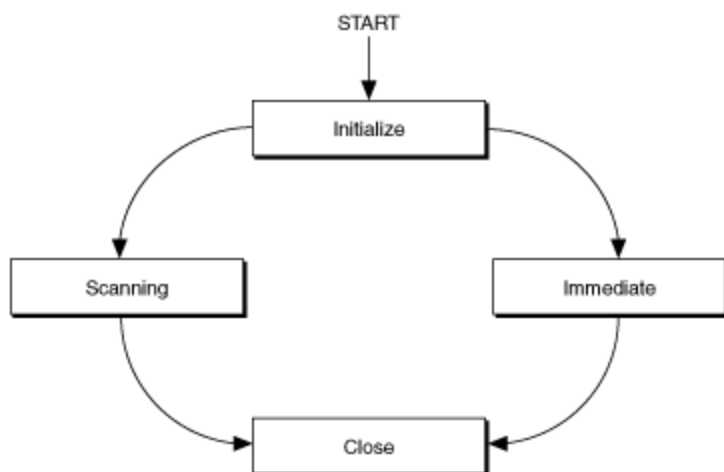
To program your switch module with the NI-DAQmx API, refer to the NI-DAQmx Help.

Related concepts:

- [Creating an application with NI-SWITCH](#)
- [Programming Flow](#)
- [Features](#)
- [NI-SWITCH Programming Examples](#)
- [Error and Status Codes](#)

Programming Flow

The following diagram shows the programming flow of applications using NI-SWITCH.



Tip For more information about configuring attributes or setting properties, refer to [Setting and Checking Properties and Attributes](#).

Related concepts:

- [Setting and Checking Properties and Attributes](#)

Initialization

A call to initialize sets the switch to a known state and allows you to simulate the switch and reset the device. Initializing with the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function also allows you to define the topology.

For any application you write, call the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function to establish communication with the switch.

Use the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function to establish a session with the switch and send initialization commands that set the instrument to the state necessary for NI-SWITCH operation. The `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function also verifies that NI-SWITCH supports the switch, resets the switch to a known state, returns a `ViSession` handle used to identify the instrument in all subsequent NI-SWITCH calls, and allows you to set the topology of the switch, including simulation.

The `niSwitch Initialize With Topology VI` and the `niSwitch_InitWithTopology`

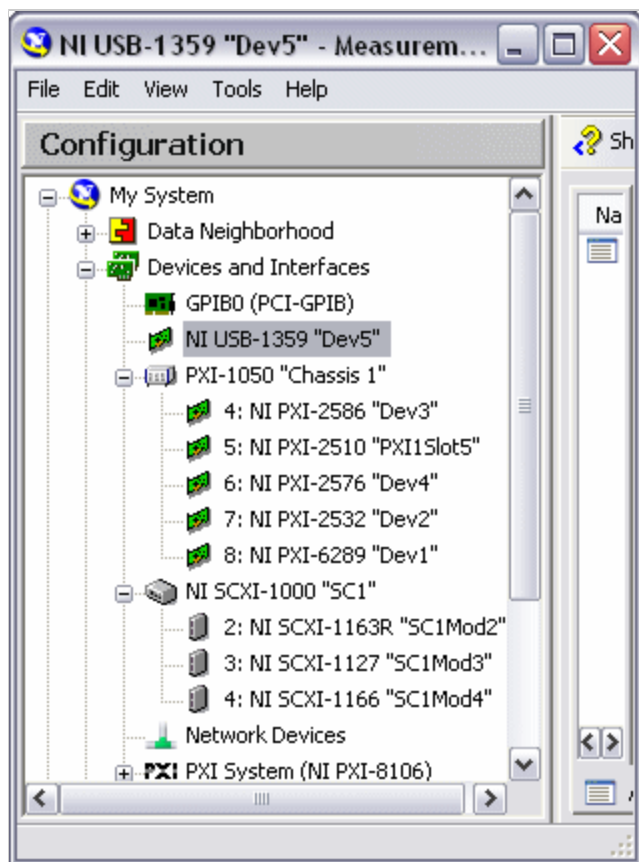
function override the topology for the switch module you set in Measurement & Automation Explorer (MAX). Refer to the NI Switches Getting Started Guide for information on configuring your switch module in MAX.

Resource Names

To establish a session with the correct switch module, you must pass a resource name to the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function. The syntax of the resource name depends on where in MAX you configured your switch module—under **Devices and Interfaces** or **PXI System**.

MAX Configuration Under Devices and Interfaces

If you configured the switch module under **Devices and Interfaces** in MAX, the resource name is the string in quotes. For example, the resource name of the NI PXI-2576 in the following figure would be `Dev4`. Pass this string to the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function. You can rename the resource name for switch modules configured under **Devices and Interfaces** simply by clicking on the device in MAX and entering a new name.



Alternative Initialization Methods

You can also open a session to the switch module by calling the `niSwitch Initialize VI` or the `niSwitch_init` function, or by calling the `niSwitch Initialize With Options VI` or the `niSwitch_InitWithOptions` function. The `niSwitch Initialize VI` or the `niSwitch_init` function performs all the functionality of the `niSwitch Initialize With Topology VI` or the `niSwitch_InitWithTopology` function except that it does not set the topology of the switch. Instead, the driver uses the topology you set in MAX for the switch module. The `niSwitch Initialize VI` or the `niSwitch_init` function is available for those interested in maintaining IVI-compliance. For more information about IVI, refer to ivifoundation.org.

In addition to performing all the functionality of the `niSwitch Initialize VI` or the `niSwitch_init` function, the `niSwitch Initialize With Options VI` or the `niSwitch_InitWithOptions` function optionally sets the initial state of the switch. With the `niSwitch Initialize With Options VI` or the `niSwitch_InitWithOptions` function, you can configure the topology, range checking, caching, coercion recording, simulation, and status reporting. Refer to the

option string (`optionString`) parameter of `niSwitch Initialize With Options VI` or the `niSwitch_InitWithOptions` function.

Once you have initialized the switch, you must configure it.

Related concepts:

- [Simulating a Switch](#)
- [Operation Modes](#)

Operation Modes

NI-SWITCH offers two operation modes for programming National Instruments switches: immediate operations and scanning. During scanning, each operation in the scan list occurs after an event. Immediate operations occur instantly or as fast as the relay or relays can actuate.

Immediate Operations

During immediate operations, relays are actuated after each VI or function call rather than waiting for a trigger.

Scanning

Scanning is typically used when timing of connections must be synchronized with an event from another device, such as a measurement device (hardware-timed scanning), or must be timed by software (software-timed scanning).

Connection operations are entered in a scan list that is downloaded to the memory of the switch module. The first entry in the scan list is executed when the scan is initiated. The trigger settings determine how the switch advances through subsequent entries in the list. The scan list can be executed once or repeatedly.

There are three trigger schemes for scanning: software trigger scanning for software-timed scanning, synchronous scanning for hardware-timed scanning, and handshaking for hardware-timed scanning.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

Related concepts:

- [Immediate Operations](#)
- [Scan Lists](#)
- [Writing a Software Trigger Scanning Program](#)
- [Synchronous Scanning](#)
- [Handshaking](#)

Close

When your program finishes, terminate the session with the niSwitch Close VI or the `niSwitch_close` function.

The niSwitch Close VI or the `niSwitch_close` function is essential for freeing resources, including deallocating memory, destroying threads, and freeing operating system resources. Every session that you initialize must be closed, even if an error occurs during your program. Although NI does not recommend it, when debugging an application, you can abort execution before reaching the niSwitch Close VI or the `niSwitch_close` function.

Setting and Checking Properties and Attributes

Properties and attributes allow access to advanced configuration options and information for LabVIEW and C/C++/VB respectively.

NI-SWITCH contains high-level VIs/functions that set most of the switch module properties/attributes. Use the high-level driver VIs/functions as much as possible because they handle order dependencies and multithread locking.

Properties

In LabVIEW, you can get (read) or set (write) properties with the NI-SWITCH Property Node. Refer to the niSwitch Property Node for more information.

Refer to `niSwitch` Properties for a complete listing of NI-SWITCH properties.

Attributes

In C and Visual Basic, attributes are accessed with the `niSwitch_SetAttribute` and `niSwitch_GetAttribute` functions. These functions correspond to a particular data type. For example, to set `NISWITCH_ATTR_CONTINUOUS_SCAN` (data type `ViBoolean`), use the `niSwitch_SetAttributeViBoolean` function.

Refer to NI-SWITCH Attributes for a complete listing of NI-SWITCH attributes.

Setting Properties and Attributes Before Reading Them

Properties and attributes are modified when you set them or when you call a configuration VI or function that sets them, respectively. It is important to set the properties or attributes or call any configuration VIs or functions before reading back any property or attribute values for the following reasons:

- Values read are coerced depending on the current configuration of the session. If you read a property or attribute value and then set other properties or attributes, the value read may no longer be valid.
- The driver verifies that the configuration of the device is valid at the time the property or attribute is read. It is possible to get an error when reading a property or attribute if the configuration is not valid at that point, even when a setting later could make it valid.
- Reading properties or attributes causes the driver to verify the current configuration. If you change some of the settings later, those settings need to be validated again.



Note Perform all module configuration before writing data on output devices.

NI-SWITCH Programming Examples

NI-SWITCH includes a collection of programming examples that demonstrate switch functionality. NI-SWITCH programming examples are instructional tools that you can

use as stand-alone programs or integrate into your application. Whether you are developing a new application or modifying an existing application, the NI-SWITCH programming examples can facilitate your application development.

Use the following partial list to identify NI-SWITCH programming example(s) to aid in your application development:

- niSwitch Making Connections on a Switch—Demonstrates how to connect channels.
- niSwitch Software Scanning—Demonstrates how to scan a series of channels on a switch using software scanning.
- niSwitch DMM Switch Synchronous Scanning—Demonstrates how to scan a series of channels on a switch module and take measurements with an NI digital multimeter using synchronous scanning. NI-DMM 2.0 or later is required.
- niSwitch DMM Switch Handshaking—Demonstrates how to scan a series of channels on a switch module and take measurements with an NI digital multimeter using handshaking. NI-DMM 2.0 or later is required.
- niSwitch Controlling an Individual Relay—Demonstrates how to control an individual relay on a switch module.

Accessing the Programming Examples

Examples are available for the following ADEs:

- LabVIEW
- LabWindows™/CVI™
- Visual C/C++
- Visual Basic

For example locations and supported ADE versions, refer to the NI-SWITCH Readme File.

NI-DAQmx includes programming examples for switch functionality, such as multiple module scanning, that is supported in NI-DAQmx. Access the NI-DAQmx programming examples for switches at <LabVIEW>\examples\DAQmx\Switches.

Error and Status Codes

NI-SWITCH Codes

Error Code	Hexadecimal Code	Error and Status Code	Description
1073356801	0x3FFA2001	NISWITCH_WARN_PATH_REMAINS	Some connections remain disconnected.
1073356802	0x3FFA2002	NISWITCH_WARN_IMPLICIT_CONNECTION_EXISTS	The connections are connected.
-1074130943	0xBFFA1001	NISWITCH_ERROR_TRIGGER_NOT_SOFTWARE	The software trigger is not supported.
-1074126847	0xBFFA2001	NISWITCH_ERROR_INVALID_SWITCH_PATH	Invalid switch path.
-1074126846	0xBFFA2002	NISWITCH_ERROR_INVALID_SCAN_LIST	Invalid scan list.
-1074126845	0xBFFA2003	NISWITCH_ERROR_RSRC_IN_USE	One or more channels are in use.
-1074126844	0xBFFA2004	NISWITCH_ERROR_EMPTY_SCAN_LIST	The scan list is empty.
-1074126843	0xBFFA2005	NISWITCH_ERROR_EMPTY_SWITCH_PATH	The switch path is empty.
-1074126842	0xBFFA2006	NISWITCH_ERROR_SCAN_IN_PROGRESS	The scan is in progress.

Error Code	Hexadecimal Code	Error and Status Code	Description
			scan mode operation can perform this
-1074126841	0xBFFA2007	NISWITCH_ERROR_NO_SCAN_IN_PROGRESS	The scan mode operation can perform this
-1074126840	0xBFFA2008	NISWITCH_ERROR_NO_SUCH_PATH	No existing channel
-1074126839	0xBFFA2009	NISWITCH_ERROR_IS_CONFIGURATION_CHANNEL	You may expect configuration channel
-1074126838	0xBFFA200A	NISWITCH_ERROR_NOT_A_CONFIGURATION_CHANNEL	One terminal channel pattern configuration channel
-1074126837	0xBFFA200B	NISWITCH_ERROR_ATTEMPT_TO_CONNECT_SOURCES	You may connect between different sources

Error Code	Hexadecimal Code	Error and Status Code	Description
-1074126836	0xBFFA200C	NISWITCH_ERROR_EXPLICIT_CONNECTION_EXISTS	An explicit connection between channels already exists.
-1074126835	0xBFFA200D	NISWITCH_ERROR_LEG_MISSING_FIRST_CHANNEL	A leg in the path begins with a channel that is not a source channel.
-1074126834	0xBFFA200E	NISWITCH_ERROR_LEG_MISSING_SECOND_CHANNEL	A leg in the path ends with a channel that is not a destination channel.
-1074126833	0xBFFA200F	NISWITCH_ERROR_CHANNEL_DUPLICATED_IN_LEG	The same channel is specified more than once in a leg.
-1074126832	0xBFFA2010	NISWITCH_ERROR_CHANNEL_DUPLICATED_IN_PATH	A channel is specified more than once in a path.
-1074126831	0xBFFA2011	NISWITCH_ERROR_PATH_NOT_FOUND	No path was found between the source and destination channels.
-1074126830	0xBFFA2012	NISWITCH_ERROR_DISCONTINUOUS_PATH	The path is discontinuous, meaning that there is a break in the path between two channels that are not connected by a direct channel.
-1074126829	0xBFFA2013	NISWITCH_ERROR_CANNOT_CONNECT_DIRECTLY	The source and destination channels cannot be connected directly.

Error Code	Hexadecimal Code	Error and Status Code	Description
			can dire con
-1074126828	0xBFFA2014	NISWITCH_ERROR_CHANNELS_ALREADY_CONNECTED	A le pat two tha alre con
-1074126827	0xBFFA2015	NISWITCH_ERROR_CANNOT_CONNECT_TO_ITSELF	A cl can con itse
-1074126826	0xBFFA2016	NISWITCH_ERROR_MAX_TIME_EXCEEDED	Max exc bef ope con
-1074118655	0xBFFA4001	NISWITCH_ERROR_SESSION_ALREADY_OPEN	And pro alre a se this mo
-1074118654	0xBFFA4002	NISWITCH_ERROR_INVALID_RESOURCE_DESCRIPTOR	Inva res
-1074118653	0xBFFA4003	NISWITCH_ERROR_SCANNING_NOT_SUPPORTED	You attr call fun onl sca this mo not sca this

Error Code	Hexadecimal Code	Error and Status Code	Description
			does not support scaling current topology
-1074118652	0xBFFA4004	NISWITCH_ERROR_MUST_SPECIFY_MODULE	You must indicate the module number to get the configuration from the controller. The software does not automatically detect the cable to route the trigger module (ie, Controller Module).
-1074118651	0xBFFA4005	NISWITCH_ERROR_MODULE_FIFO_LENGTH_EXCEEDED	The controller cannot execute the size of the module on the module.
-1074118650	0xBFFA4006	NISWITCH_ERROR_HW_COMMUNICATE_TMO	Error communicating with the Interchange timing occurred while hardware resources.

Error Code	Hexadecimal Code	Error and Status Code	Description
-1074118649	0xBFFA4007	NISWITCH_ERROR_TTL_BUS_REQUIRED	Expected trigger advance to be TTL 0-T
-1074118648	0xBFFA4008	NISWITCH_ERROR_MODULE_IS_BBM_ONLY	This request is module specific. Breach of Module
-1074118647	0xBFFA4009	NISWITCH_ERROR_1127_TTL1_CONFLICT	TTL detected 1127 conflict. Use line driver down channel rem 1127 from
-1074118645	0xBFFA400B	NISWITCH_ERROR_INVALID_DRIVER_SETUP_STRING	The setup string is invalid.
-1074118644	0xBFFA400C	NISWITCH_ERROR_TOPOLOGY_NOT_SUPPORTED	No device supported for topology. Different topology configuration device. DAC the res

Error Code	Hexadecimal Code	Error and Status Code	Description
			des
-1074118643	0xBFFA400D	NISWITCH_ERROR_INVALID_TOPOLOGY	The top is in
-1074118642	0xBFFA400E	NISWITCH_ERROR_HARDWARE_UNEXPECTEDLY_RESET	The une pow Clo ope ses
-1074118641	0xBFFA400F	NISWITCH_ERROR_HANDSHAKING_INITIATION_CONFLICT	The Har Init Trig are inc An Trig not wit Me Dev (or Init Har Init
-1074118639	0xBFFA4011	NISWITCH_ERROR_DAQMX_DESCRIPTOR_LEGACY_RSC_TYPE	A D res des spe the set spe Leg res
-1074118638	0xBFFA4012	NISWITCH_ERROR_AMBIGUOUS_MODEL_CODE	Mo spe driv

Error Code	Hexadecimal Code	Error and Status Code	Description
			stri am Mu swi the mo
-1074118637	0xBFFA4013	NISWITCH_ERROR_TRIGGER_INPUT_NOT_SUPPORTED	The inp is n sup the
-1074118636	0xBFFA4014	NISWITCH_ERROR_INVALID_TERMINALBLOCK_FOR_TOPOLOGY	The term is in cur top
-1074118635	0xBFFA4015	NISWITCH_ERROR_CANT_INVERT_WHEN_SOURCE_EQUALS_DEST	Sig be wh sign equ des
-1074118634	0xBFFA4016	NISWITCH_ERROR_CONFLICTING_TRIGGER_ROUTE_EXISTS	Rec trig can ma a co trig alre
-1074118633	0xBFFA4017	NISWITCH_ERROR_INVALID_VALUE_FOR_DEVICE	Thi doe sup spe for attr ope
-1074118632	0xBFFA4018	NISWITCH_ERROR_TRIGGER_POLARITY_CONFLICT	Trig

Error Code	Hexadecimal Code	Error and Status Code	Description
			pol sca out mu san par swi
-1074118629	0xBFFA401B	NISWITCH_ERROR_RESERVATION_ERROR	Res erro
-1074118628	0xBFFA401C	NISWITCH_ERROR_ANALOG_BUS_INVALID	Ana inv
-1074118627	0xBFFA401D	NISWITCH_ERROR_POWER_LIMIT_EXCEEDED	Pow exc the car
-1074118626	0xBFFA401E	NISWITCH_ERROR_DEVICE_SELF_TEST_FAILED	Dev fail
-1074118625	0xBFFA401F	NISWITCH_ERROR_CARD_DETECTED_DOES_NOT_MATCH_EXPECTED_CARD	On car NI S dev bee and rem you was on. lea une beh Res sys
-1074118624	0xBFFA4020	NISWITCH_ERROR_ANALOG_BUS_STATE_INCONSISTENT	An bri bee or n wh

Error Code	Hexadecimal Code	Error and Status Code	Description
			system power. This une beh Res sys
-1074118623	0xBFFA4021	NISWITCH_ERROR_FIVE_VOLT_DETECT_FAILED	The you Swi can blo you doo for rep fus
-1074118622	0xBFFA4022	NISWITCH_ERROR_SLOT_POWER_LIMIT_EXCEEDED	Power exc spe the car
-1074118621	0xBFFA4023	NISWITCH_ERROR_CANNOT_EXCEED_RELAY_DRIVE_LIMIT	The rela atte be this exc rela for
-1074118620	0xBFFA4024	NISWITCH_ERROR_INVALID_CONNECTION_LIST	Inv SW con
-1074118619	0xBFFA4025	NISWITCH_ERROR_DISCONNECTION_PATH_NOT_SAME_AS_EXISTING_PATH	Dis pat san exis

Error Code	Hexadecimal Code	Error and Status Code	Description
-1074118618	0xBFFA4026	NISWITCH_ERROR_INVALID_RELAY_NAME	Specified relay name is not valid for the device.
-1074118617	0xBFFA4027	NISWITCH_ERROR_ANALOG_BUS_SHARING_DIFFERENT_WIRE_MODES	Unable to connect the channels to the device because the channels are configured with different wire modes. Disconnect the channels from the device and reconfigure the channels before using this function.

Fundamentals

This book contains information about the terminology and concepts related to switches and switching applications.

- Relay Forms
- Relay Types
- Topologies
- N-Wire Switching Modes
- General Switching Considerations
- NI SwitchBlock Switching Considerations
- RF Switching Considerations
- Scanning

Related concepts:

- [Relay Forms](#)
- [Relay Types](#)
- [Topologies](#)
- [N-Wire Switching Modes](#)
- [General Switching Considerations](#)
- [RF Switching Considerations](#)
- [Scanning Fundamentals](#)

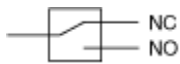
Relay Forms

Relays are classified by their number of poles and number of throws. The pole of a relay is the terminal common to every path. Each position where the pole can connect is called a throw. A relay can be made of n poles and m throws. For example, a single-pole single-throw (SPST) relay has one pole and one throw, as illustrated in the following figure.

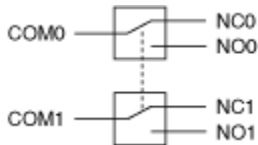


A single-pole double-throw (SPDT) relay has one pole and two throws. Based on the default position of the pole, one throw is considered normally open (NO) while the

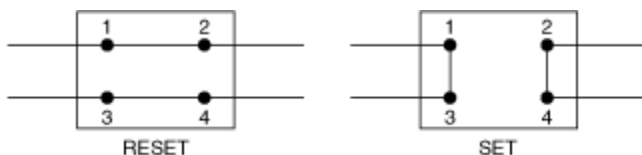
other is normally closed (NC). The following figure illustrates a SPDT relay.



A double-pole double-throw (DPDT) relay has two poles, each with two simultaneously controlled throws, as illustrated in the following figure.



An RF transfer switch (DPDT) has four ports (1–4) and two states (reset and set). In the reset state, port 1 is connected to port 2 and port 3 is connected to port 4. In the set state, port 1 is connected to port 3 and port 2 is connected port 4. The following figure illustrates the reset and set states of an RF transfer switch.



Relays are then classified into forms. Relay forms are categorized by the number of poles and throws as well as the default position of the relay. The following table lists three common relay forms.

Form	Symbol	Description
Form A		SPST relays with a default state of normally open.
Form B		SPST relays with a default state of normally closed.
Form C		SPDT relays that break the connection with one throw before making contact with the other (break-before-make).

Relay Types

NI switch modules use the following relay types:

- Electromechanical Relays

- Solid-State Relays
- FET Switches

To determine the relay type(s) of a specific switch module, refer to the specifications for that switch module.

Related concepts:

- [Electromechanical Relays](#)
- [Solid-State Relays \(SSR\)](#)
- [FET Switches](#)

Electromechanical Relays

NI uses the following types of electromechanical relays:

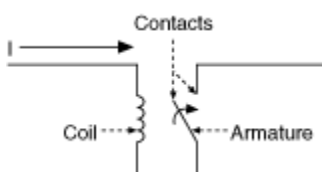
- Armature Relays
 - Transfer Switches
- Reed Relays

Related concepts:

- [Armature Relays](#)
- [Transfer Switches](#)
- [Reed Relays](#)

Armature Relays

Armature relays are a type of electromechanical relay made of coils, an armature mechanism, and contacts. When the coil is energized, the induced magnetic field moves the armature. This movement opens or closes the contacts. If your switch module uses armature relays, consider the factors that affect relay life. The following figure represents an armature relay.

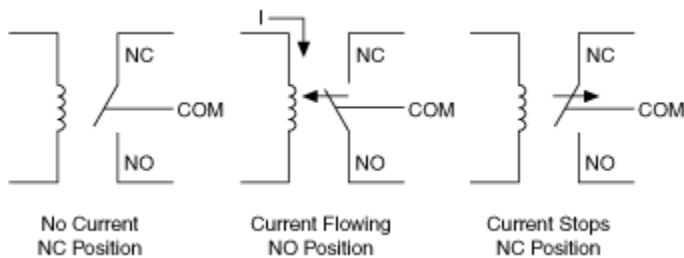


There are two types of armature relays, latching and nonlatching.

Nonlatching

A nonlatching relay has an initial position of normally closed (NC). This position is maintained by the force of a spring or permanent magnet while no current flows. The normally open (NO) contact is maintained by the force of a magnetic field while current flows through the coil. When the current stops, the relay reverts to its initial NC position.

Nonlatching armature relays are useful in control applications when the switch must return to a known state if power is lost. The following figure shows examples of nonlatching relays.

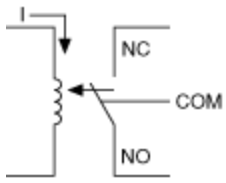


Latching

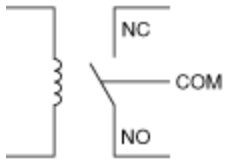
A latching relay can have one or two coils. Latching relays have no default position and remain in their last position when the drive current stops flowing. While the relays themselves may be latching, their reset position in a module is based on the control circuitry and software (NI-SWITCH resets all relays on all modules during initialize and reset). Latching relays are useful in applications where power consumption and dissipation must be limited because, once actuated, the relays require no current flow to maintain their position.

In one-coil latching, the direction of current flow determines the position of the relay. In two-coil latching, the coil in which the current flows determines the position of the armature. The following figure shows a one-coil latching relay.

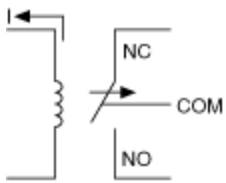
1. Current Flows (NO Position)



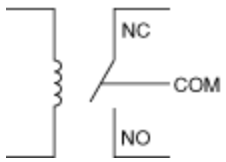
2. Current Stops and Relay Stays In Position



3. Current Flows In Opposite Direction (NC Position)

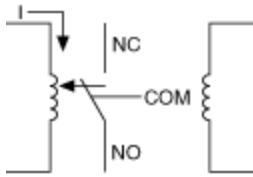


4. Current Stops and Relay Stays In Position



The following figure shows a two-coil latching relay.

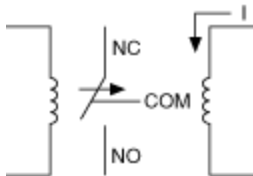
1. Current Flows In One Coil (NO Position)



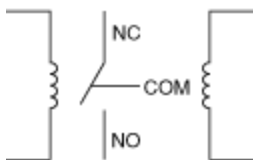
2. Current Stops and Relay Stays In Position



3. Current Flows In the Other Coil (NC Position)



4. Current Stops and Relay Stays In Position



Related Topics

Electromechanical Relays

Relay Life

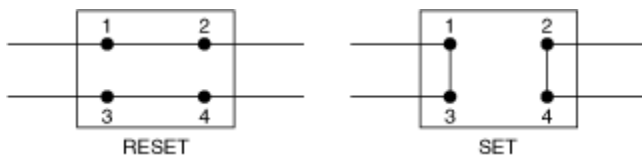
Related concepts:

- [Electromechanical Relays](#)
- [Relay Life](#)

Transfer Switches

An RF transfer switch (DPDT) is a type of armature relay that is composed of four ports (1–4) in one of two states (reset and set). In the reset state, port 1 is connected to port 2 and port 3 is connected to port 4. In the set state, port 1 is connected to port 3 and port 2 is connected port 4. The reset and set states of an RF transfer switch are illustrated in

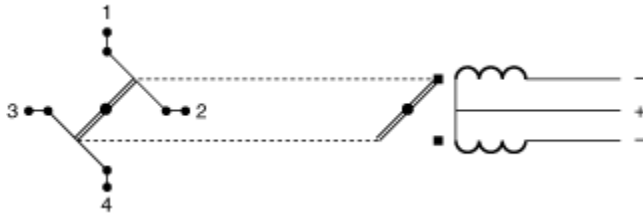
the following figures:



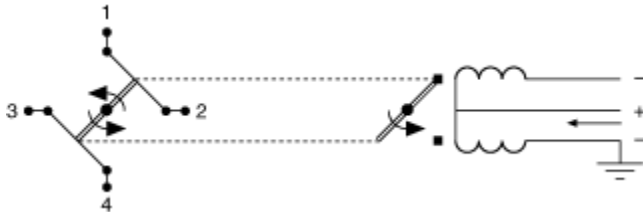
Transfer Switch Operation Cycle

The following figures illustrate the operation cycle of a transfer switch with 2-coil latching:

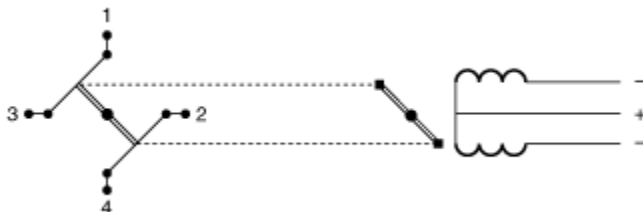
1. The transfer switch begins in the reset state.



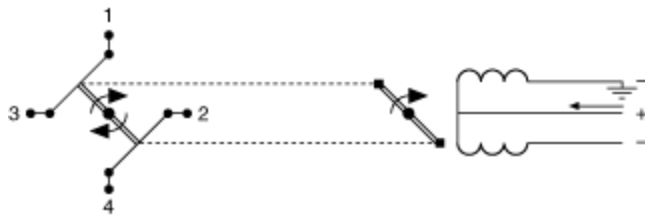
2. Current flows through the lower coil to change the transfer switch to the set state.



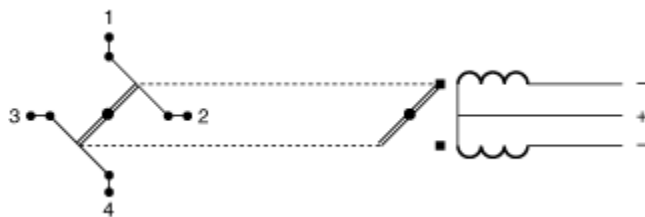
3. The transfer switch is now in the set state.



4. Current flows through the upper coil to change the transfer switch to the reset state.



5. The transfer switch ends in the reset state.



Related Topics

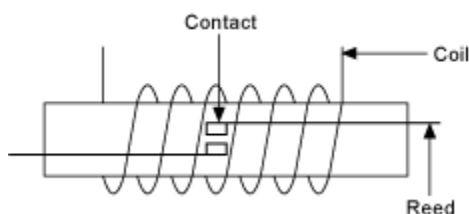
Armature Relays

Related concepts:

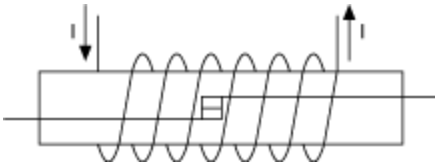
- [Armature Relays](#)

Reed Relays

Reed relays are a type of electromechanical relay composed of coils wrapped around reed switches. The reed switch has two overlapping ferromagnetic blades hermetically sealed within a glass capsule that is filled with an inert gas. When the coil is energized, the two reeds physically contact one another to complete a path through the relay. When the coil is deenergized, the spring force in the reeds pulls the reeds apart. The following figure represents an open reed relay.



The following figure represents a closed reed relay.



The reeds are generally smaller and therefore can actuate much faster than the armatures in armature relays. However, reeds are also more susceptible to damage from arcing than are armatures in armature relays. When a spark jumps across the contacts, it can melt a small section of the reed. If the contacts are still closed when the molten section resolidifies, the contacts may weld together. The spring force in the reeds is often insufficient to mechanically break the weld.

When using switch modules with reed relays, consider the effects of switching capacitive loads to protect the reed relays.

Related Topics

Armature Relays

Reed Relay Protection

Electromechanical Relays

Switching Capacitive Loads

Related concepts:

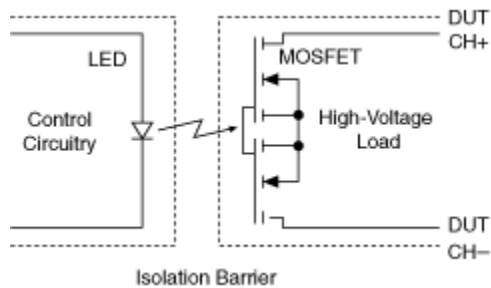
- [Armature Relays](#)
- [Reed Relay Protection](#)
- [Electromechanical Relays](#)
- [Switching Capacitive Loads](#)

Solid-State Relays (SSR)

Solid-state relays incorporate an LED to control the gate of a photo-sensitive metal-oxide-semiconductor field-effect transistor (MOSFET). This relay structure provides an isolation barrier between the control circuitry and the load allowing the relay to switch high voltage. It takes about 1 ms (depending on the relay) for the LED to power on, and 0.5 ms for the LED to power off. These times restrict the switching speed of this relay,

yet SSRs are faster than electromechanical relays.

The following figure shows a diagram of a typical solid-state relay. The digital control signal powers an LED that turns the MOSFET circuitry on and off. The LED is required to isolate the drive circuitry from the DUT signal.



Related Information

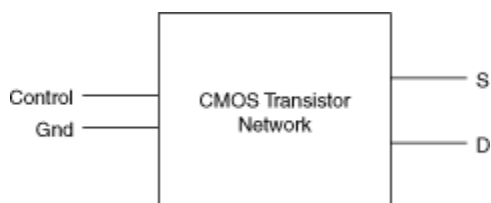
Electromechanical Relays

Related concepts:

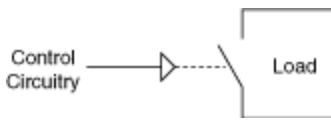
- [Electromechanical Relays](#)

FET Switches

Field-effect transistor (FET) switches are made of several CMOS transistors. A voltage is applied to the control circuitry, which connects the source (S) and drain (D) of a transistor network (load circuit) as shown in the following figure.



There is no additional isolation between the control circuitry and the signal path, as shown in the following figure. This lack of isolation restricts operation to low voltage, but it allows very fast switching speeds.



Topologies

A switch topology is an organizational representation of the channels and relays on a switch module. Topologies often show the default connections for the relays on a module and label the channel names. Some switch modules can use multiple topologies or a variation of a topology. Some terminal blocks or accessories may force the switch module to use a given topology or set of topologies.

NI-SWITCH supports the following topologies:

- General-Purpose
- Multiplexer
- Matrix
- Transfer Switches (Topology)
- Fault Insertion Units

Refer to Initialization for more information about setting the topology of the switch module.

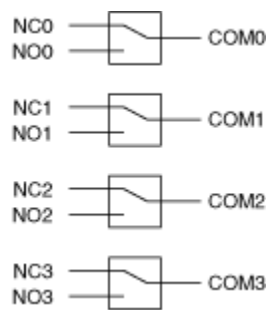
Related concepts:

- [General-Purpose Topologies](#)
- [Multiplexer](#)
- [Matrix](#)
- [Transfer Switches \(Topology\)](#)
- [Fault Insertion Units](#)
- [Initialization](#)

General-Purpose Topologies

General-purpose topologies consist of multiple isolated relays. Each channel of a general-purpose switch module can connect one input to one output. They are typically used to power on or power off devices such as motors, fans, and lights or to switch high-voltage or high-current signals.

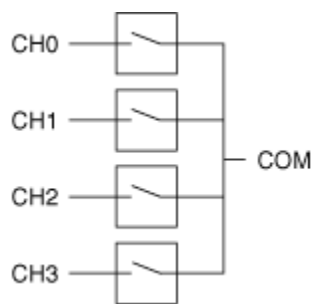
The following figure shows an example general-purpose topology.



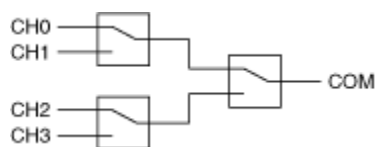
Multiplexer

A multiplexer, or a mux, is a topology in which you can connect one input to multiple outputs or one output to multiple inputs. This topology is often used for scanning when you need to automatically connect a sequence of channels to a common line.

The following figure shows a multiplexer composed of form A relays.



The following figure shows a multiplexer composed of form C relays.



Related Topics

Operation Modes

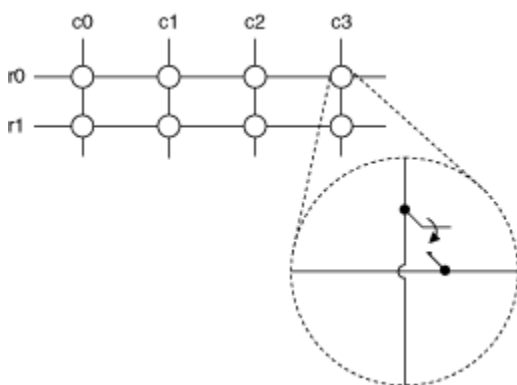
Related concepts:

- [Operation Modes](#)

Matrix

A matrix is one of the most flexible switching configurations. Unlike a multiplexer, a matrix can connect multiple inputs to multiple outputs organized as columns and rows. You can connect any column to any number of rows and any row to any number of columns. At each intersection of a row and column, there is a switch. When the switch is closed, the row is connected to the column.

Matrix size is often described as M rows by N columns ($M \times N$). The following figure illustrates a 1-wire, 2×4 matrix.



Related Topics

Multiplexer

Related concepts:

- [Multiplexer](#)

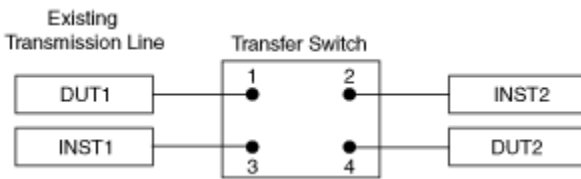
Transfer Switches (Topology)

An RF transfer switch (DPDT) has four ports (1–4) and two states (reset and set). In the reset state, port 1 is connected to port 2 and port 3 is connected to port 4. In the set state, port 1 is connected to port 3 and port 2 is connected to port 4.

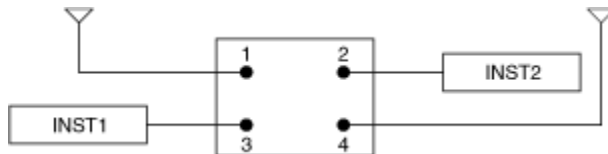
Using a Transfer Switch

The following figures illustrate example uses of a transfer switch.

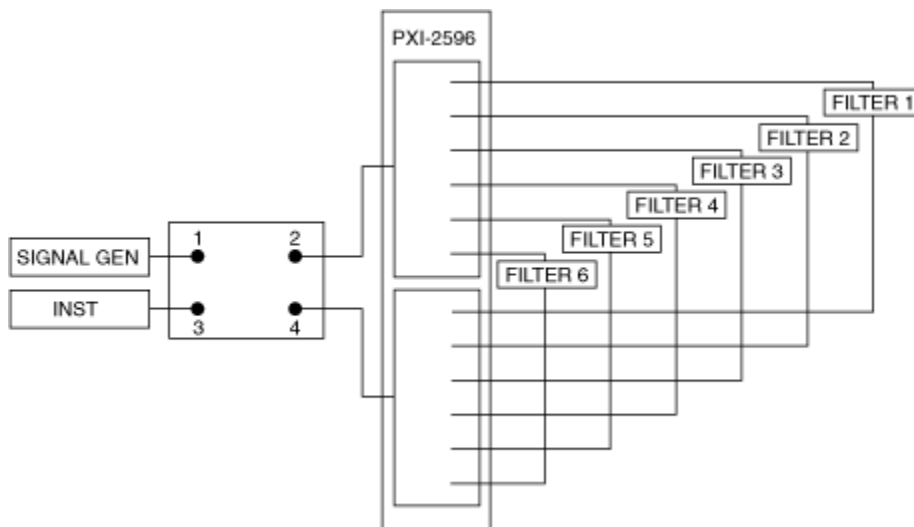
- Testing two DUTs with different instruments



- Testing antennas



- Testing multiple filters with the NI PXI-2596

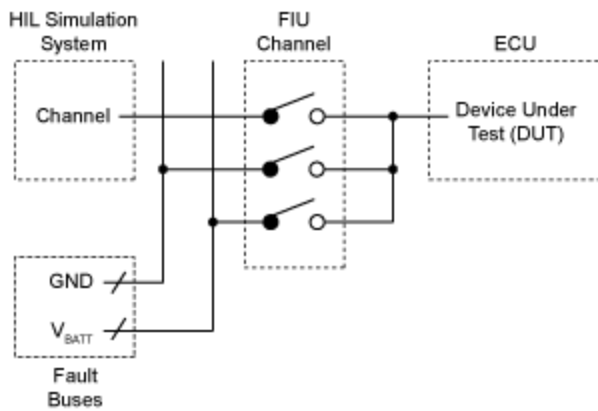


Related concepts:

- [NI PXI-2596](#)

Fault Insertion Units

Fault insertion units (FIUs) are designed to insert fault conditions between automated test equipment, such as hardware-in-the-loop (HIL) simulation systems, and devices under test (DUTs). The following figure represents how a FIU would be used in a complete test system.



To insert fault conditions, internal relays are configured to create short-circuit connections and open circuits.

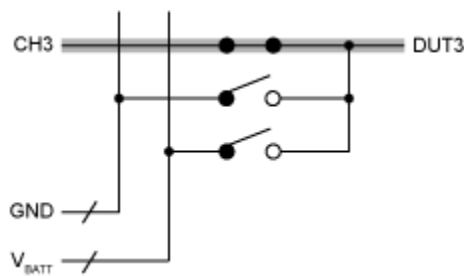
Automated test applications commonly use the following fault conditions:

- open circuits
- short to ground or short to power
- pin-to-pin short

FIUs with switchable fault bus inputs can be used to create additional fault conditions, such as a pin-to-pin short through a load.

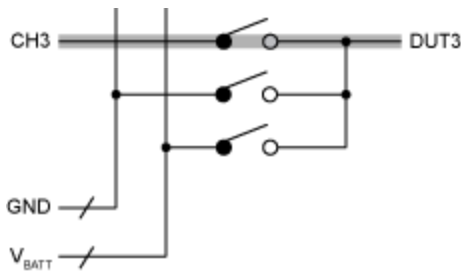
No-Fault Operation

In an FIU's no-fault setting, test equipment is directly connected to DUT signal lines through the FIU module. The following figure shows a no-fault operation.



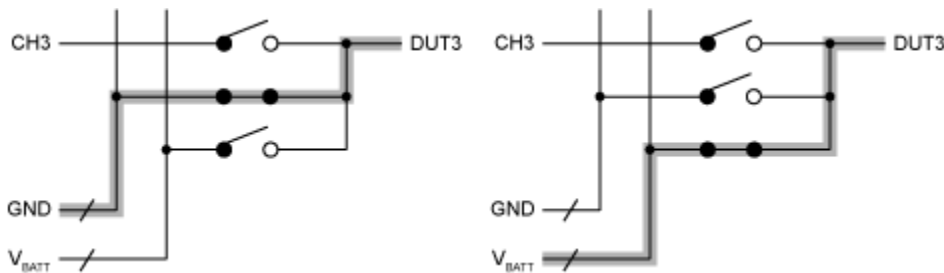
Open Circuit Faults

In an open circuit or interrupt fault, the signal line between the test application and DUT is left open to determine how the DUT behaves after a signal interruption. The following figure shows an open circuit or interrupt fault.



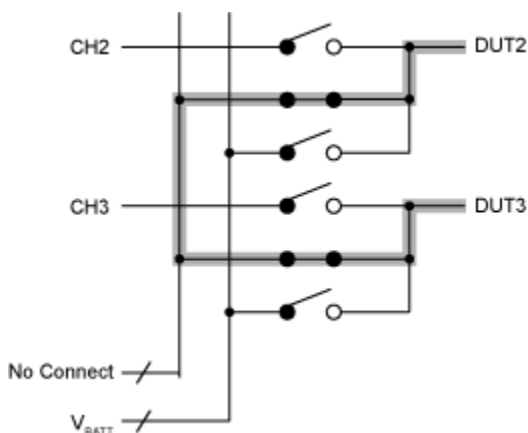
Short to Ground or Short to Power

To simulate shorts to ground or power, the signal line is connected from an external fault line or fault bus to the DUT. The fault buses can be configured to simulate power supply lines or system ground. The following figures represent a short to ground and short to power.



Pin-to-Pin Short

In a pin-to-pin short, the DUT signal line is connected to one or more additional DUT signal lines. The following figure shows a pin-to-pin short.

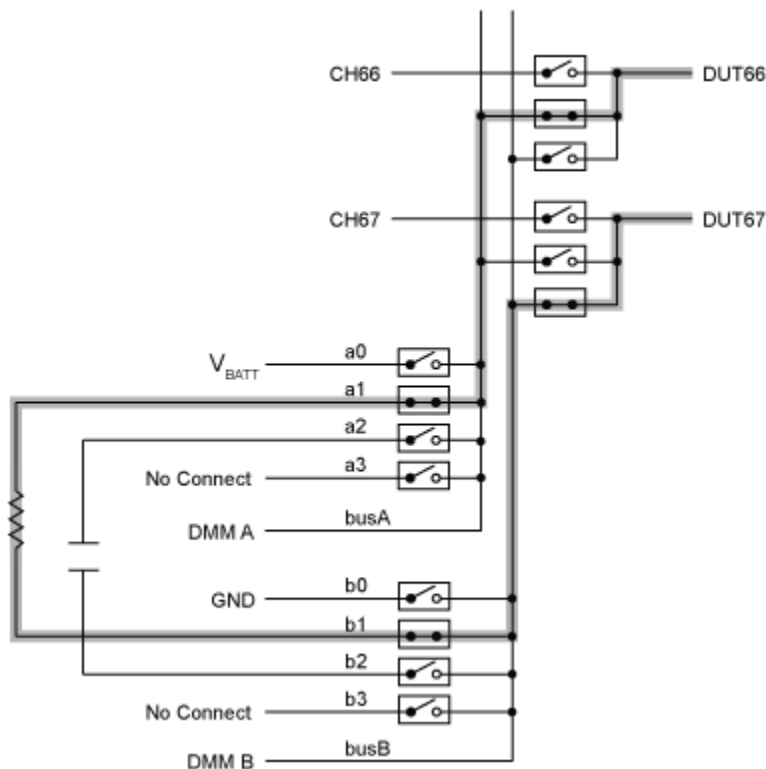


Example Pin-to-Pin Short Through a Load Using the NI PXI-2510

The NI PXI-2510 has two fault buses. Each fault bus has four switchable inputs to select

among multiple fault conditions such as battery voltage (V_{batt}), ground (GND), and other fault voltage potentials. The non-switchable input to each fault bus is intended for monitoring the fault bus with a DMM. The switchable fault bus inputs allow for another fault condition: a pin-to-pin short through a load.

The following example shows a pin-to-pin short through a load using the NI PXI-2510:

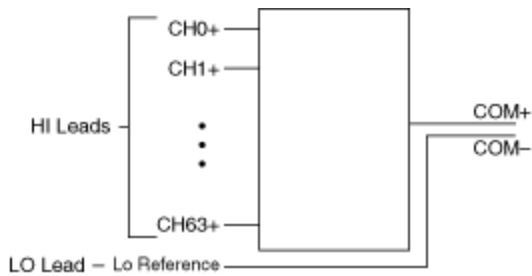


N-Wire Switching Modes

NI switch modules are capable of switching one, two and/or four wires.

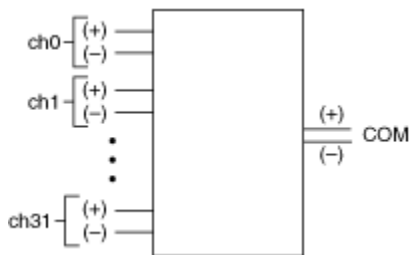
1-Wire

In 1-wire mode, you connect the HI leads to the relays and the LO leads to a common connection. All signals are referenced to this common connection. All NI multiplexers can operate in 1-wire mode. The following figure shows an example of 1-wire mode.



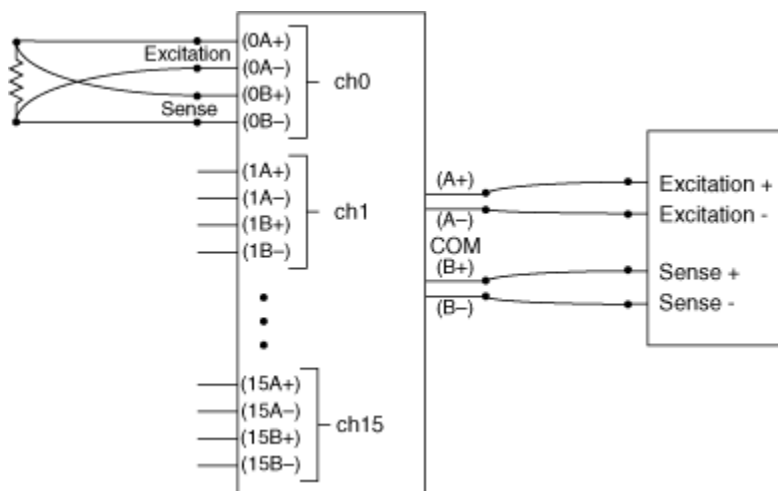
2-Wire

In 2-wire mode, you connect both positive and negative leads to the terminals of a channel. The following figure shows an example of 2-wire mode.



4-Wire

4-wire mode is usually used for 4-wire resistance measurements. One channel (two leads) is used for the current excitation and another channel (two leads) is used for measuring the voltage drop (sense) across the resistor. The following figure shows an example of 4-wire mode.



Related concepts:

- [Multiplexer](#)

General Switching Considerations

Consider the following concepts when developing a switching application.

Contact Resistance

Contact resistance refers to the DC resistance through one set of closed contacts in a relay.

Relay Life

NI switches typically specify a conservative estimation of the expected life of the electromechanical relay components. Relay life is specified as a minimum number of cycles before the end of the relay life. One cycle is defined as the action of opening and closing the relay. The expected life is divided into two main categories: mechanical and electrical life.



Tip Some switch modules are capable of tracking relay usage using the `niSwitch Get Relay Count VI` or the `niSwitch_GetRelayCount` function. Refer to [Relay Count](#) for more information.

Mechanical Life

The contacts of mechanical relays wear with usage, and worn contacts have a higher contact resistance. The mechanical life specification is typically the number of switch cycles before the contact resistance rises above 1 Ω . This rating assumes no electrical load across contacts during actuation.

Electrical Life

Switching active electrical signals, especially high power signals, causes arcing across the relay contacts. This arcing produces pits on the contact surface and accelerates the contact wear described in Mechanical Life. The electrical life specification is the number of switch cycles, under load, before the contact resistance rises above 1 Ω .

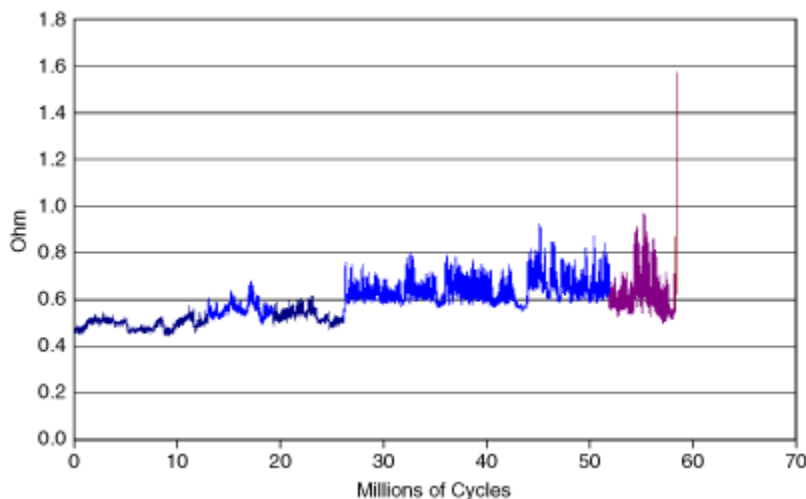
Related concepts:

- [Electromechanical Relays](#)
- [Relay Count](#)
- [Contact Resistance](#)
- [Arcing](#)

Path Resistance

Path resistance is the resistance of a complete signal path from source to destination terminals on a switch module. The total resistance includes the resistance of PCB traces, relays, and connectors. Trace and connector resistance is generally stable, but relay contact resistance increases with use.

The following figure illustrates the typical path resistance of a switch module with a mechanical life of 50 million cycles.



Related concepts:

- [Contact Resistance](#)
- [Relay Life](#)

Thermal EMF and Offset Voltage

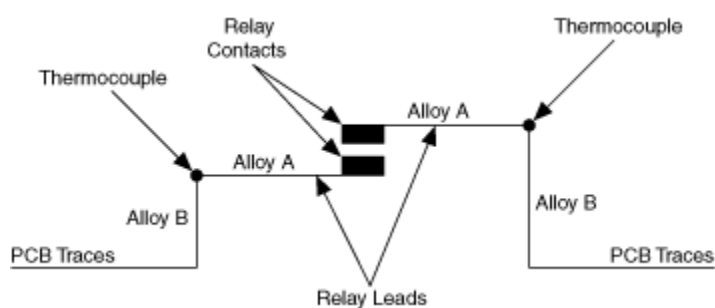
When two, dissimilar metals are joined a voltage is created. This voltage is known as the thermal electromotive force (EMF) or the Seebeck voltage. The Seebeck voltage is

dependent on the temperature of the junction and the composition of the metals joined. The specific metal-to-metal junctions result in specific temperature coefficients ($\mu\text{V}/^\circ\text{C}$), also known as Seebeck coefficients. The following table lists the most common metals and their respective Seebeck coefficients.

Junction	$\mu\text{V}/^\circ\text{C}$
Copper-Copper	<0.3
Copper-Gold	0.5
Copper-Silver	0.5
Copper-Brass	3
Copper-Nickel	10
Copper-Lead-Tin Solder	1-3
Copper-Aluminum	5
Copper-Kovar	40
Copper-Copper Oxide	>500

Thermal EMF in Switches

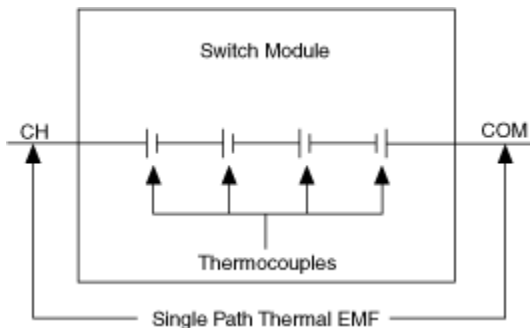
The leads of electromechanical relays are usually composed of metal alloys, most often nickel-iron alloy, while the PCB of a switch module is usually composed of copper or copper alloy. The junction between these two, dissimilar metals creates a thermocouple, as illustrated in the following figure.



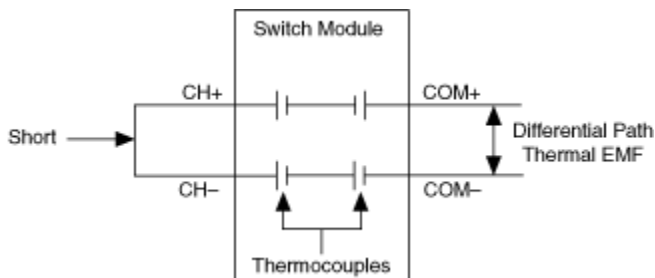
Note A thermocouple developed in a relay is dependent on the temperature of the junction. The temperature of a junction varies according to the ambient temperature, the number of relays activated, the air flow

inside the switch module, and the types of switch modules located in the adjacent slots.

A signal path can transverse a single relay or multiple relays. The sum of all the thermocouples in a signal path is expressed as the thermal EMF. Thermal EMF can be specified as single path (single wire) or differential path thermal EMF. The following figure illustrates thermal EMF measured in a single path.



The following figure illustrates thermal EMF measured in a differential path.



Accuracy

When measuring voltage with a switch and a DMM, be sure to account for thermal EMF in the overall system accuracy calculation.

For example, if the DMM has an accuracy of 4 μV and the switch has a differential path thermal EMF of 3 μV , the overall system accuracy can be calculated as follows:

$$\sqrt{(4^2 + 3^2)} = 5 \mu\text{V}$$

Thus, when measuring a 50 mV signal, the overall system accuracy is 0.01%.



Note For information about thermal EMF and thermocouple measurement, refer to Thermocouple Measurement.

Related concepts:

- [Thermocouple Measurement](#)

Relay Operation

This book contains information about concepts related to relay operation.

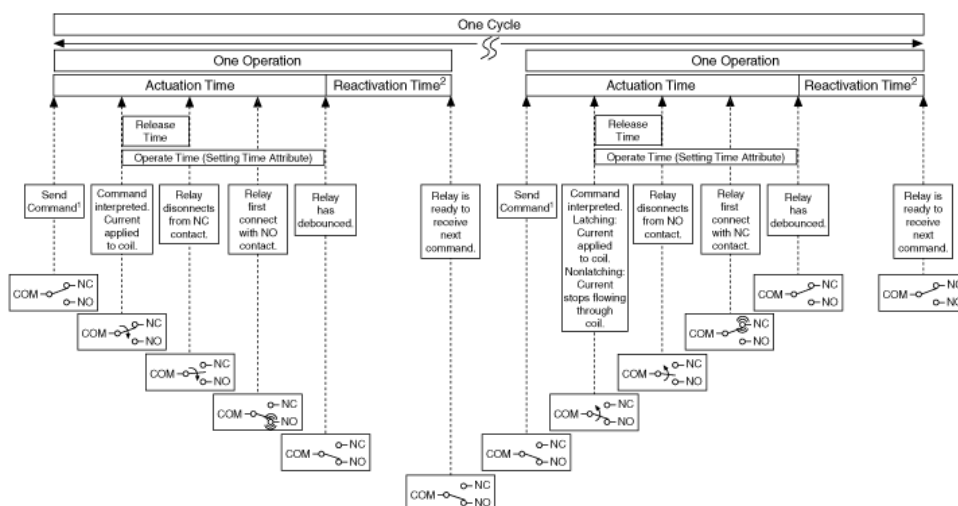
- Cycle Process
- Settling Time
- Relay Count

Related concepts:

- [Cycle Process](#)
- [Settling Time](#)
- [Relay Count](#)

Cycle Process

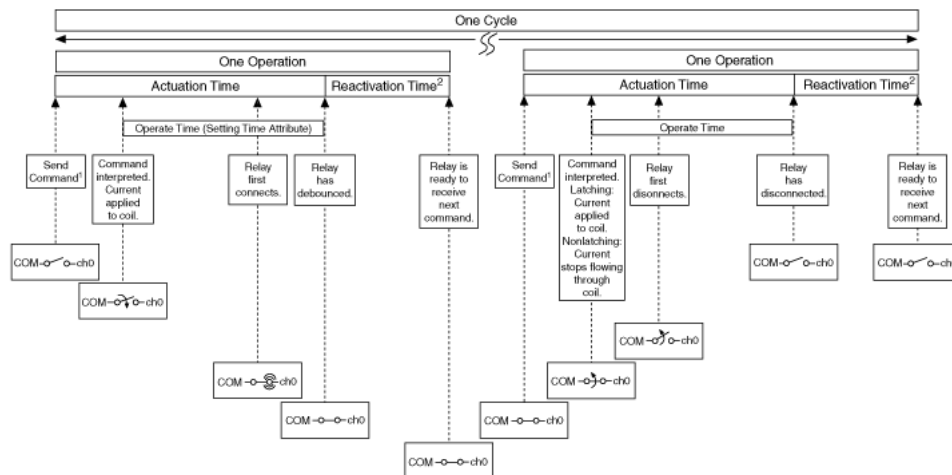
The following diagram represents the process an electromechanical SPDT general-purpose relay performs during a cycle.



¹The command can be from a software or hardware trigger.

²The SCXI-1192 is the only National Instruments switch with a significant reactivation time: 475 ms.

The following diagram represents the process an electromechanical SPST general-purpose relay performs during a cycle.



¹The command can be from a software or hardware trigger.

²The SCXI-1192 is the only National Instruments switch with a significant reactivation time: 475 ms.

For certain situations you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information on increasing the default settling time.

Related concepts:

- [Adding Additional Settling Time](#)

Settling Time

Settling time refers to the time required for a signal to reach a steady state after sending an actuation command to the relay. Steady state is determined by the required accuracy of the measurement. Highly accurate measurements require longer settling times than less accurate measurements.

Settling time is an important consideration for solid-state relays with high path resistance and R-C time constants.

Some switch modules apply settling time only when relays are closed, not when relays are open.

For certain situations you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about increasing the default

settling time. Refer to the Checking the Settling Time section of the Adding Additional Settling Time topic for more information about checking the default settling time of a switch.

Related concepts:

- [Solid-State Relays \(SSR\)](#)
- [Adding Additional Settling Time](#)

Relay Count

Most switch modules and cards are capable of tracking relay usage using the niSwitch Get Relay Count VI or the `niSwitch_GetRelayCount` function.

Relay counts are stored on your NI switch hardware in nonvolatile storage such as EEPROM or flash, and are backed up periodically as well as on system shutdown. Unexpected power removal could prevent proper backup of the relay counts, resulting in the possible loss of a few minutes of relay count data.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

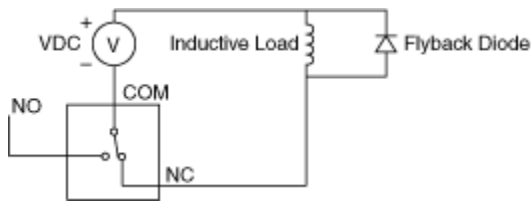
The following switch modules do not support relay counting:

- NI PXI-2501
- NI PXI-2503
- NI PXI-2565
- NI PXI-2590
- NI PXI-2591

Switching Inductive Loads

When inductive loads are connected to the relays, a large counter electromotive force may occur when the relay actuates because of the energy stored in the load. These flyback voltages can severely damage the relay contacts and greatly shorten the relay life.

Limit these flyback voltages at your inductive load by installing a flyback diode for DC loads or a metal oxide varistor for AC loads, as shown in the following figure.



Refer to the switch module documentation for information on preparing the switch module to properly handle inductive loads.

Related concepts:

- [Relay Life](#)

Switching Capacitive Loads

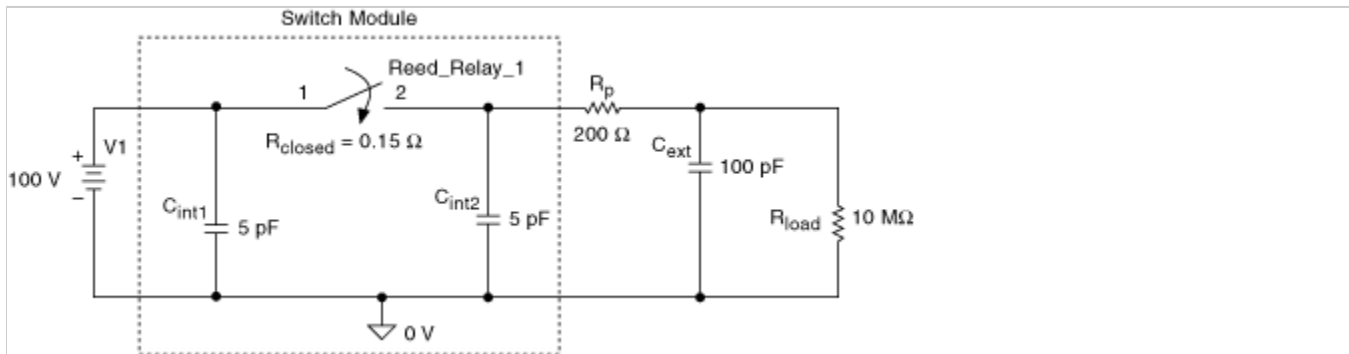
When a switch closes, a transient current flows to charge the capacitance. This current may be substantially higher than the steady-state current through the system and cause contact welding. Even though the voltage and steady-state currents are within the switch specifications, damage may occur because of this high inrush current.

To limit inrush current, an impedance, such as a resistor, should be placed in series between C_{int2} and $C_{external}$. This resistor isolates the unwanted effects of the load capacitance and limits damage to the relay contacts. A protection resistance, R_p , should be selected such that

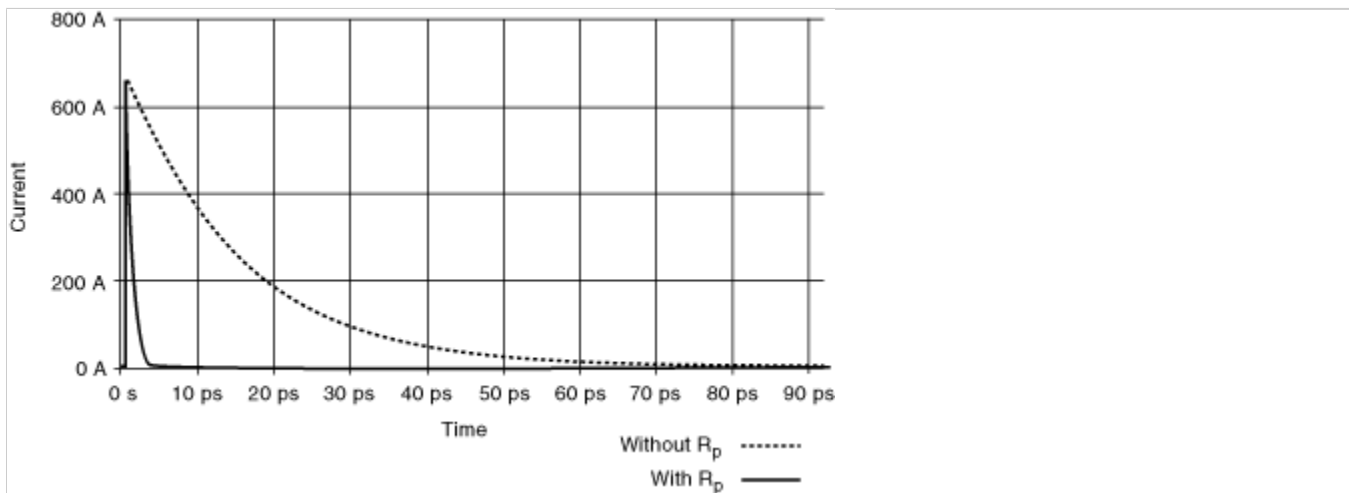
$$V/R_p < \text{switching current rating of the relay}$$

The following figures illustrate the use of the protection resistor R_p .

Resistor R_p Added to Limit Current into C_{external}



Current Graph Comparison



The energy associated with the inrush currents in these two circuits can be expressed as

$$E_{\text{without protection}} = \frac{1}{2}(C_{\text{int2}} + C_{\text{ext}})V^2 = 525 \text{ nJ}$$

and

$$E_{\text{with protection}} = \frac{1}{2}(C_{\text{int2}})V^2 = 25 \text{ nJ}$$



Note Although the peak currents are the same, the associated energy for the protected circuit is 21 times less.

Related Topics

Inrush Current

Related concepts:

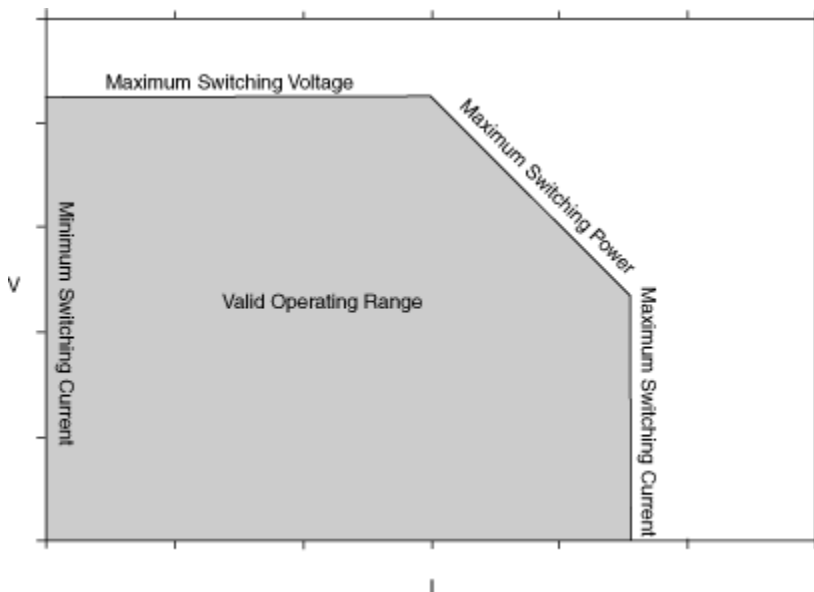
- [Inrush Current](#)

Switching Capacity

Signal levels through a switch must account for the following specifications:

- Switching Voltage
- Switching Current
- Switching Power

The following figure shows the valid operating range defined by these limits.



Related concepts:

- [Switching Voltage](#)
- [Switching Current](#)
- [Switching Power](#)

Switching Voltage

Switching voltage refers to the maximum signal voltage that the switch module can safely maintain. Switching voltage is defined from channel-to-ground and from channel-to-channel. Channel-to-ground is the voltage potential between the signal line and the grounded chassis. Channel-to-channel is the voltage potential between any pair of signal lines within the switch module. This voltage includes voltages across open relay contacts, as well as voltages between adjacent connection terminals.



Note CE compliance marking for measurement and control devices requires compliance to the IEC 61010-1 standard. Switch modules intended for high voltage signals ($> 60 \text{ VDC} / 30 \text{ V}_{\text{rms}}$) are rated for Installation Categories as defined in this standard. Installation Categories describe the acceptable transient overvoltages and fault protection necessary for safe operation. Refer to the Read Me First: Safety and Electromagnetic Compatibility document for more information on Installation Categories.

Switching Current

Switching current is the maximum rated current that can flow through the switch as it makes or breaks a contact. Switching active currents results in arcing that can damage the contacts of electromechanical relays. A minimum current specification indicates the smallest current that can reliably flow through the switch.

Related concepts:

- [Arcing](#)
- [Relay Life](#)
- [Electromechanical Relays](#)

Switching Power

Switching power is the limit on the combined open-contact voltage and closed-contact current of a signal in the switch.

Switching Power = Switching Voltage x Switching Current

Switching high-power signals causes high-energy arcing at the electromechanical

contacts during actuation, reducing the useful life of the switch.

Related concepts:

- [Arcing](#)
- [Relay Life](#)

Reed Relay Protection

The life expectancy of a reed relay can be greatly affected by the nature of the load. To prolong the life of reed relays, consider the following list when using switches with reed relays:

- Bounce
- Arcing
- Inrush Current
- Switching Capacitive Loads
- Board Layout and Topology
- Example System

In general, reed relays are vulnerable to contact welding from high currents. Parasitic capacitance within a system can unavoidably create high inrush currents that can damage the reed relay. To minimize inrush current, decrease or isolate external capacitance by:

1. Using lower switching voltages.
2. Avoiding large capacitive loads to the switch.
3. Isolating external capacitance with series impedance R_p such that:

$V/R_p < \text{switching current rating of the relay}$

Related concepts:

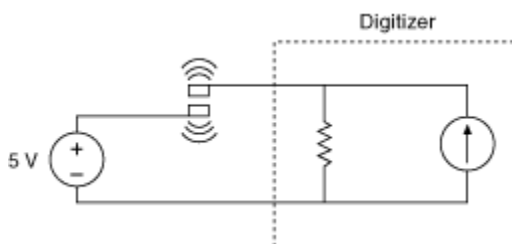
- [Relay Life](#)
- [Reed Relays](#)
- [Bounce](#)
- [Arcing](#)
- [Inrush Current](#)

- [Switching Capacitive Loads](#)
- [Board Layout and Topology](#)
- [Example System](#)

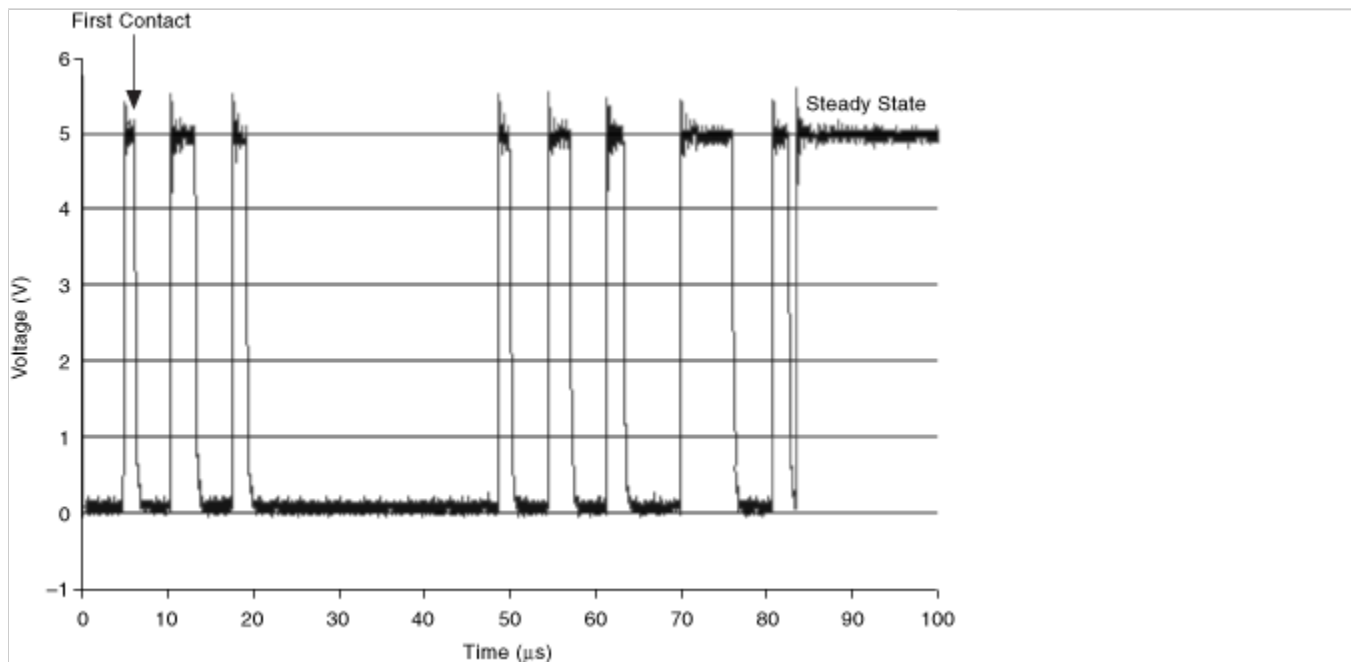
Bounce

Armature and reed relay contacts bounce. When closing, the contacts touch momentarily, making and breaking continuity until finally remaining in the closed position. The following figures demonstrate relay bounce.

Test System to Measure Relay Bounce



Voltage During Relay Bounce



Related concepts:

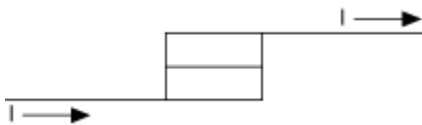
- [Armature Relays](#)
- [Reed Relays](#)

Arcing

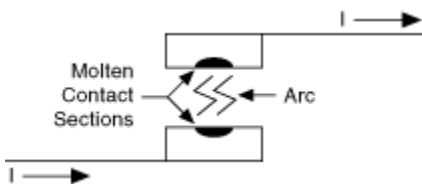
Every switching system has some amount of inductance. When a relay opens a circuit with inductance, an arc occurs across the relay contacts, sometimes causing significant damage. The small mass of the reed relay switch makes the reed more susceptible to damage during arcing.

When bouncing, the first momentary closure initiates current flow through the relay. As the contacts open, an arc forms that can melt part of the contact surface. If the contacts are still molten when they finally stabilize in the closed position and solidify before reopening, a micro-weld can form, permanently closing the relay. The spring force of the reeds may not be sufficient to break this weld when the current stops flowing through the coil. Such contact welding constitutes end-of-life for the relay. The following sequence of figures illustrates a relay bouncing, arcing, and welding closed.

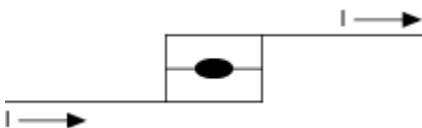
Relay Closed. Current Flows.



Relay Bounces. Arc Melts Contacts.



Relay Closes. Contacts Still Molten.



Contacts Welded Closed; Spring Force Unable to Break Weld.

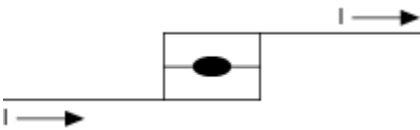


Welding contacts is also possible if you send a large current through relays that are already closed. The non-zero contact resistance can heat up and cause the same welding phenomenon described above. The following sequence of figures show large current welding a relay closed.

Relay Closed



Large Current Melts Contacts



Contacts Welded Closed; Spring Force Unable to Break Weld.



Related concepts:

- [Reed Relays](#)
- [Relay Life](#)

Inrush Current

As current flows through the relay, power is dissipated in the contacts as represented in the following equation:

$$P = I^2 R_{\text{contact}} + I^2 R_{\text{arc}}$$

where

P = power absorbed by relay contacts

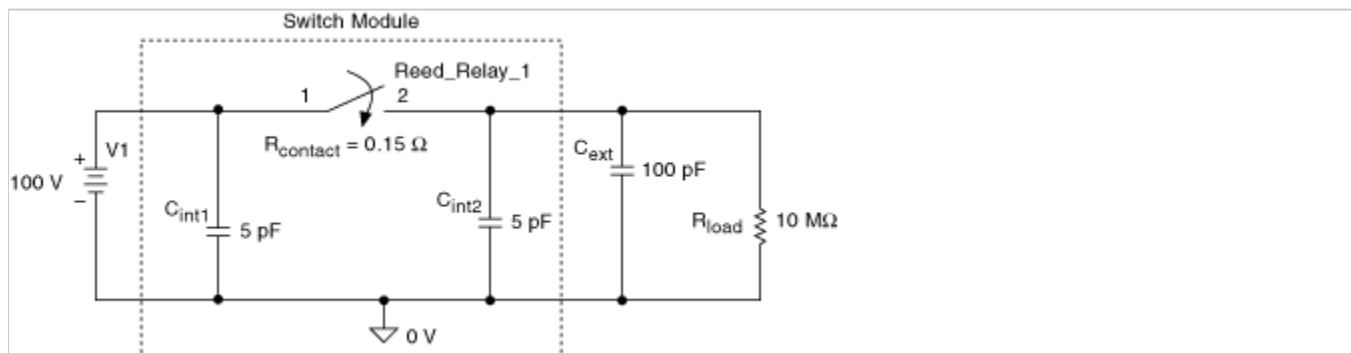
I = inrush current through the module

R_{arc} = resistance of the arc that exists between the relay contacts during bounce

$R_{contact}$ = resistance across the relay contacts

R_{arc} dissipates as heat, raising the temperature of the contacts. Inrush currents momentarily expose the contacts to very high power levels. The energy associated with the inrush current may be sufficient to melt the contact surfaces after bouncing and weld the relay contacts closed. Inrush currents usually decrease rapidly to the steady state levels. Contact bounce, however, can subject the relay to multiple inrushes per activation, causing further damage.

The following figure shows a relay within a switch module connected to a voltage source and a load. C_{int1} , C_{int2} and $R_{contact}$ always produce an inrush current proportional to the input voltage. The duration of the inrush current increases (as does contact heating) with the addition of external capacitance at the load. Inrush current flows while load capacitance C_{int2} and C_{ext} are being charged.

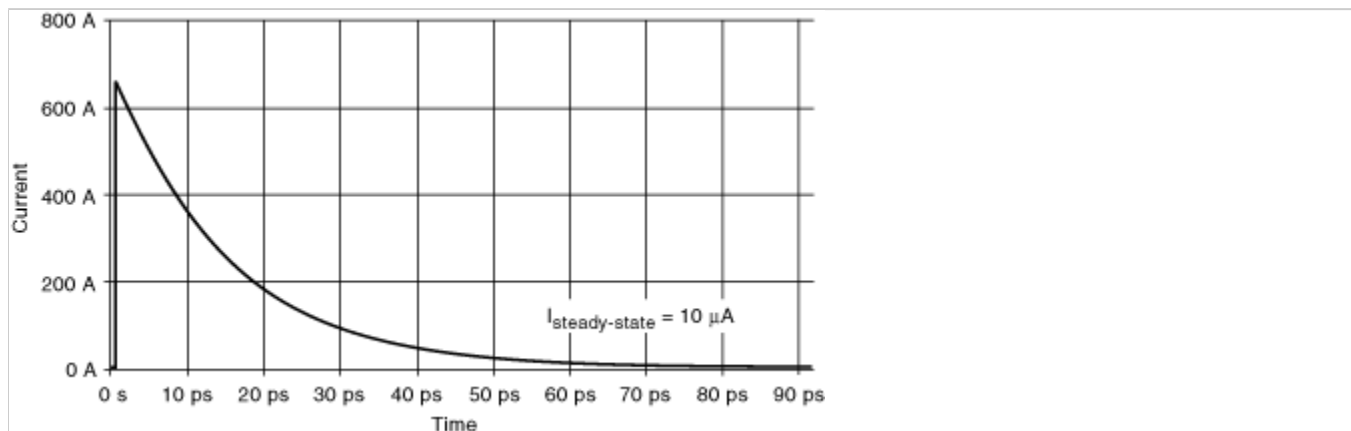


where τ = time constant

In this figure, $C_{int2} + C_{external} = C$ and $\tau = R_{contact}C > R_{contact}C_{int2}$

When the voltage across C_{int2} is not the same as $(C_{int2} + C_{external})$, closing the relay causes momentary inrush current equal to the voltage difference across the relay, divided by the resistance of the relay and associated wiring.

Capacitive Load Switching ($\tau = R_{\text{contact}}C$)



To prevent damage to these modules, place a resistor in series with your load as detailed in Switching Capacitive Loads .

Related Topics

Switching Capacitive Loads

Related concepts:

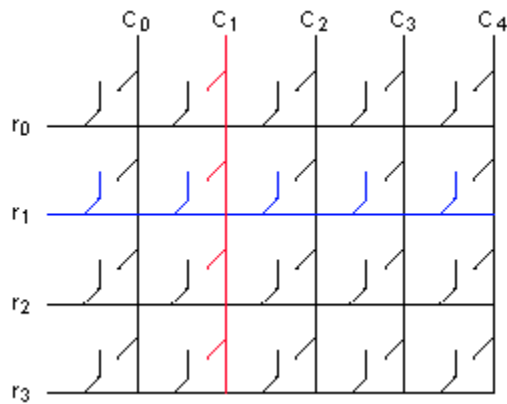
- [Bounce](#)
- [Switching Capacitive Loads](#)

Board Layout and Topology

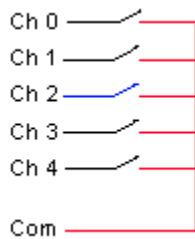
The open contact capacitance of a single reed relay is often very low ($< 1 \text{ pF}$), and cannot store enough energy to damage the relay when switching at the rated voltage. The amount of capacitance across an open relay is directly related to the topology of the switch, the layout of the PCBs, and the loads connected to the switch module.

Topologies with long traces and many connected relays, such as matrices, have higher capacitances than simpler topologies.

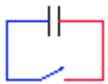
Matrix Topology



Multiplexer Topology

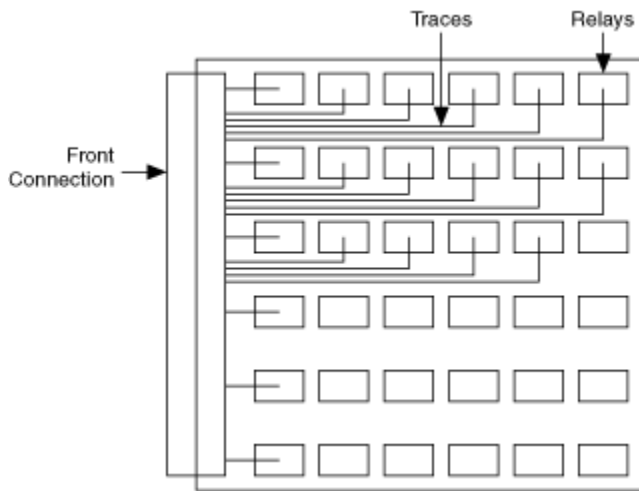


Equivalent Circuit



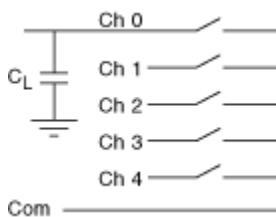
Most instrumentation switches have arrays of relays on a circuit board and a connector on one side. All of the traces must route to the connector. Dense, parallel routes on a PCB increase capacitance between the traces.

Dense Signal Routing Increases Parasitic Capacitance

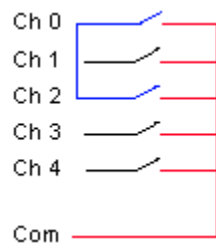


Connecting large capacitive loads directly to the switch terminals or connecting multiple terminals together can substantially increase the load capacitance.

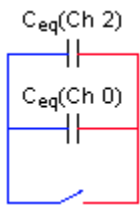
Capacitive Load Connected to a Multiplexer Channel



Multiplexer with 2 Inputs Tied Together



Equivalent Circuit of 2 Multiplexer Channels Tied Together



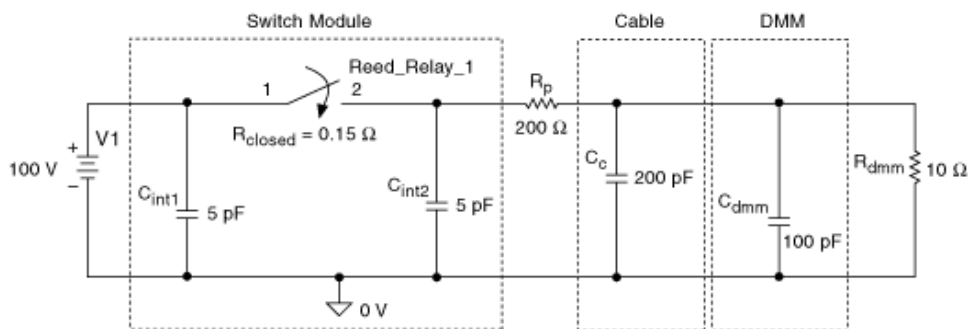
Related concepts:

- [Reed Relays](#)

Example System

The following figure illustrates a test system with a capacitance of 200 pF added to simulate cable capacitance. Also, the external load has been identified as the input to a high-impedance DMM. Even the input to the DMM presents a substantial capacitive load. The addition of the cable to connect the switch to the load increases this load further. The total load capacitance is 300 pF.

Test System with Protection



The following table shows lifetime test results for a circuit with no protection and for a circuit with 200 Ω of protection resistance.

R_p (Ω)	Lifetime (cycles)
0	160,000
200	1,500,000

This example shows nearly a 10-to-1 increase in lifetime when a protective series impedance is used to isolate the switch from the capacitive load.

NI SwitchBlock Switching Considerations

The NI SwitchBlock is a high-density, customizable, and expandable system that can operate within a PXI/PXI Express chassis and is composed of an NI SwitchBlock carrier that holds interconnectable NI SwitchBlock cards. Multiple cards can be combined in software to operate as one device, enabling customization of device topologies to fit testing needs.

Because six NI SwitchBlock cards can fit in the space occupied by four PXI modules, the NI SwitchBlock enables greater switching density per PXI slot than PXI switch modules. The integrated analog bus backplane enables clean routing of signals between the cards in a carrier. Installation of the NI 2806 expansion bridge enables connection of the analog bus between multiple carriers.

NI SwitchBlock Basics

- NI PXI-2800 Carrier for the NI SwitchBlock
- NI SwitchBlock Cards and Devices
- Safety Interlock

Setting Up and Configuring the NI SwitchBlock

- Installing the NI SwitchBlock
- Expanding Multiple NI SwitchBlock Carriers
- Simulating the NI SwitchBlock in MAX
- Configuring the NI SwitchBlock in MAX
- Removing an NI SwitchBlock Carrier or Device in MAX
- NI SwitchBlock Device Reference

NI SwitchBlock Programming Considerations

- Initializing with Topology for NI SwitchBlock Devices
- Using the Analog Bus on an NI SwitchBlock Carrier
- Power Limits

NI SwitchBlock Maintenance

- Replacing a Fuse on the NI SwitchBlock Carrier
- Integrated Relay Test

Programming the NI SwitchBlock in NI-SWITCH and NI-DAQmx

- NI SwitchBlock Overview
- The NI SwitchBlock Carrier and the Analog Bus
- System Configuration Options for the NI SwitchBlock
- Routing Signals Within One NI SwitchBlock Device
- Routing Signals Between Multiple NI SwitchBlock Devices

Related concepts:

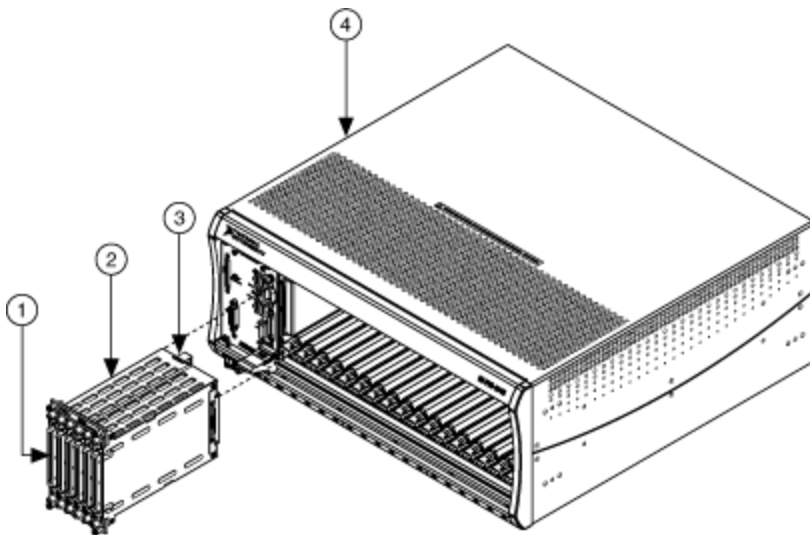
- [NI SwitchBlock Device Reference](#)

NI SwitchBlock Basics

Expand this book for basic information about the NI SwitchBlock.

NI PXI-2800 Carrier for the NI SwitchBlock

The NI PXI-2800 carrier for the NI SwitchBlock operates within a PXI chassis or, when connected to a PXI peripheral slot or a PXI Express hybrid peripheral slot, within a PXI Express chassis. The carrier occupies four PXI/PXI Express chassis slots while allowing up to six NI SwitchBlock cards to be inserted, enabling greater switching density than PXI switch modules. The installed cards can be combined in software to operate as multichannel devices that fit testing needs. The following figure represents a SwitchBlock card and carrier with a PXI/PXI Express chassis.



1	NI SwitchBlock Card
2	NI PXI-2800 Carrier
3	NI PXI-2800 Backplane Connector
4	NI PXI/PXI Express Chassis



Note The second-to-left slot occupied by the carrier must be a PXI slot, as this is where the carrier connects to the PXI backplane. This is the slot number that MAX assigns to the carrier.

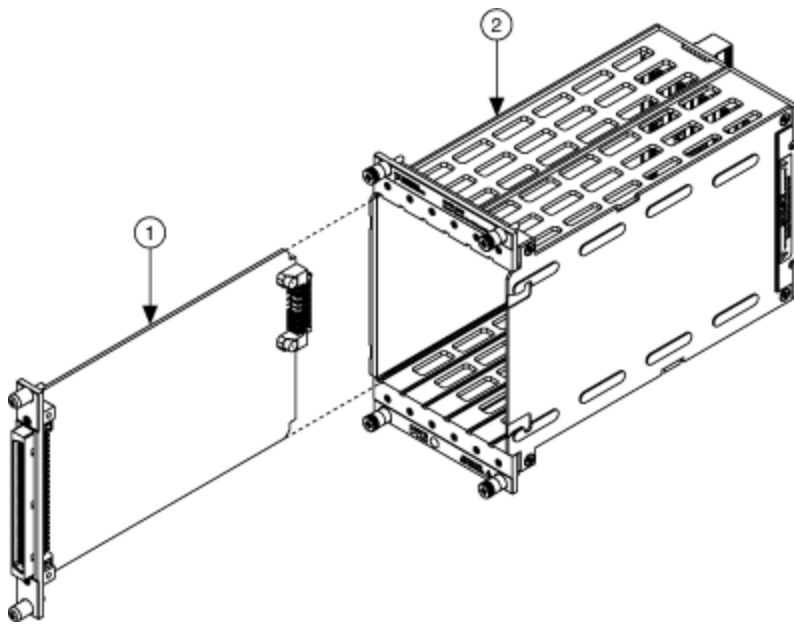
You can expand multiple NI SwitchBlock carriers using the NI 2806 expansion bridge.

NI SwitchBlock Cards and Devices

NI SwitchBlock carriers can be configured in the NI SwitchBlock Configuration Panel in MAX to create single-card or multicard NI SwitchBlock devices.

NI SwitchBlock Cards

NI SwitchBlock cards operate within an NI SwitchBlock carrier, occupying less space and offering greater switching density than PXI switch modules. The following figure represents an NI SwitchBlock card and carrier.



1	NI SwitchBlock Card
2	NI PXI-2800 Carrier

Each card is available in two types, type A and type B, which vary only in which signals they route to the front panel connector. Refer to the NI SwitchBlock Device Reference for information about the differences between type A and type B cards.

Refer to the device book for your card for card-specific information.

NI SwitchBlock Devices

An NI SwitchBlock device is a software construct that represents one or more cards configured in software to function as a device. Refer to Configuring the NI SwitchBlock in MAX to designate which cards compose the devices in your NI SwitchBlock. The NI SwitchBlock Device Reference includes guidelines for combining cards into devices.



Note All NI SwitchBlock devices are programmed in the same manner regardless of the number of NI SwitchBlock cards that compose them.

Maximizing AC Performance of the Cards that Compose Your NI SwitchBlock Devices

To maximize the AC performance of the cards that compose your NI SwitchBlock devices, NI recommends the following practices, when possible:

- Keep point-to-point signals on the same card. Routing signals across the analog bus backplane increases the number of stubs attached to the signal path, which can degrade high-frequency signals.
- Reduce the number of stubs attached to the signal path by using only type B cards. While type A cards are required to directly access the analog bus channels, the cabling may create additional stubs and capacitively load the analog bus, which degrades high frequency performance.
- Do not fan out AC signals. Fanning out AC signals reduces bandwidth and increases crosstalk.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI SwitchBlock Safety Interlock

NI SwitchBlock cards require the use of a safety interlock resistor, without which you cannot route signals to or from the analog bus.

Front Panel Cable Detection

To prevent the front connectors of NI SwitchBlock cards from exposing high-voltage signals when disconnected from NI SwitchBlock accessories, the cards detect whether a cable or other accessory is attached to the front connector. NI accessories for the NI SwitchBlock connect pin 96 to pin 48 through a 500 Ω resistor (500 $\Omega \pm 20\%$, 1/10 W minimum) built into the accessory. If the resistor does not connect these two pins, no matrix lines can connect to the analog bus.

Creating Custom Test Fixtures

If you create your own cable or custom test fixture for your NI SwitchBlock, incorporate the interlock resistor into your design to ensure that your signal lines are touch-safe

when the test fixture or cable is removed. Additionally, incorporating the safety interlock resistor allows the operation of an integrated relay test when your fixture is disconnected.

Setting Up and Configuring the NI SwitchBlock

Expand this book for information about installing and configuring the NI SwitchBlock.

Installing the NI SwitchBlock

Refer to the NI Switches Getting Started Guide for information about installing an NI SwitchBlock carrier or card. Refer to the expansion bridge documentation for information about installing the NI 2806 expansion bridge for the NI SwitchBlock.

NI SwitchBlock Device Reference

An NI SwitchBlock device represents one or more NI SwitchBlock cards that are configured in software to function as a device.



Note All NI SwitchBlock devices are programmed in the same manner regardless of the number of NI SwitchBlock cards that compose them.

Refer to the following sections for guidelines and requirements when configuring your cards to function as devices.

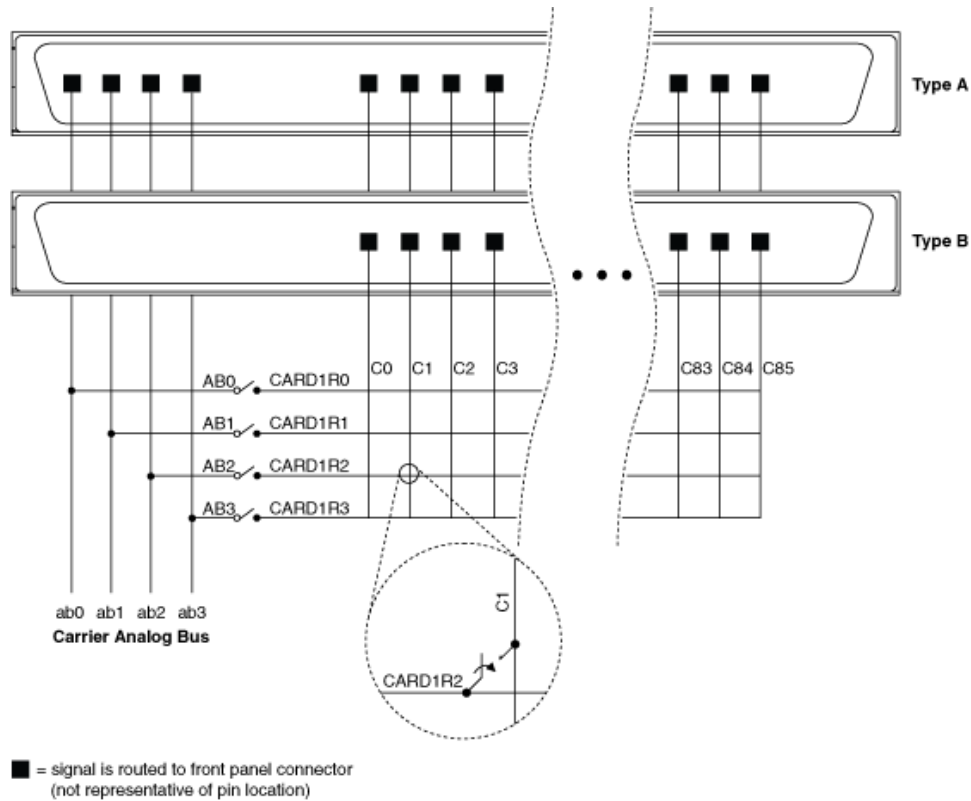
- NI SwitchBlock Card Types
- Card Combination Use Cases
- Requirements for Multicard Devices
- Topologies of Multicard Devices
- Channel Naming for NI SwitchBlock Devices
- Relay Naming for NI SwitchBlock Devices

NI SwitchBlock Card Types

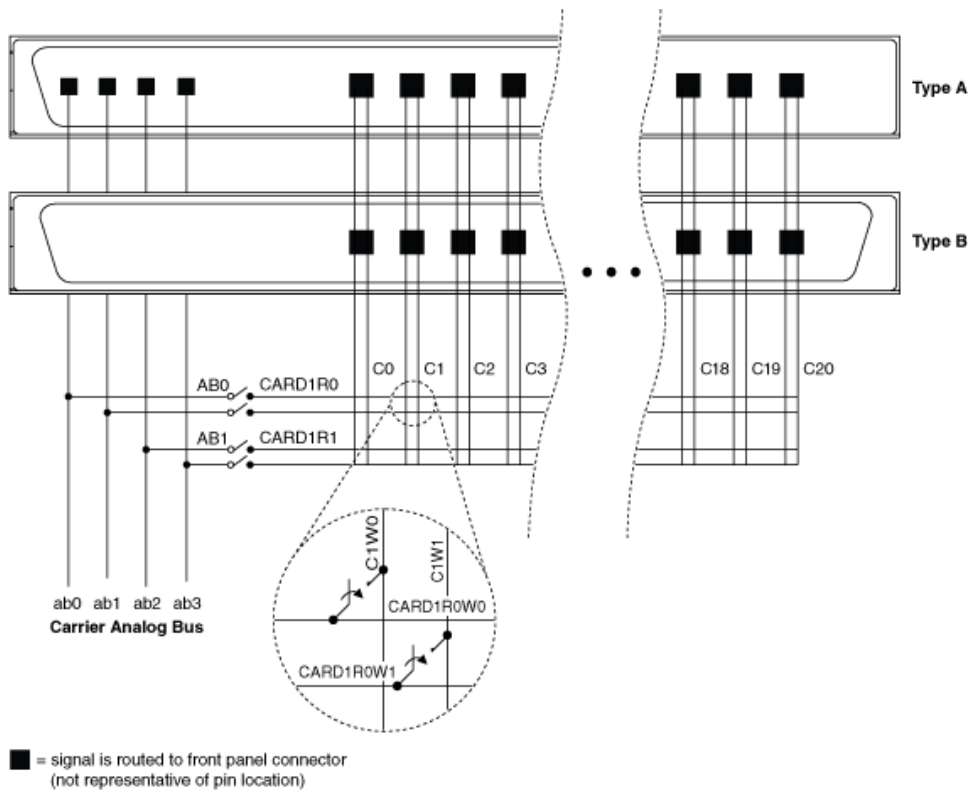
Each card is available in two types, type A and type B, which vary only in the signals they route to the front panel connector. The letter at the end of the card model indicates the type of card. For example, NI 2810A indicates a type A card, and NI 2810B

indicates a type B card. Refer to the following figure and table for differences between card types.

The following image represents a 1-wire device.



The following image represents a 2-wire device.



Card Type	Characteristics
A	Front connector pins connect to all analog bus channels and columns of the matrix. Type A cards directly route analog bus lines on the NI SwitchBlock carrier to the front connector.
B	Front connector pins connect only to the columns of the matrix.

Card Combination Use Cases

Create a multcard device according to the requirements for multcard devices when a single-card device cannot support the size of your application. Refer to the following use cases to decide how to compose your multcard device.

Card Combination	Use Cases
One Type A Card + One or More Type B Cards	Recommended when an application requires direct access to the analog bus channels. Typical usage of this card combination involves connecting analog bus channels to columns.
All Type B Cards	Recommended when connecting only to columns. Analog bus channels may still be used for signal routing as needed, but they will not be routed to the

Card Combination	Use Cases
	front panel I/O connector.



Note Using all type A cards is not recommended. Using multiple type A cards in an NI SwitchBlock system duplicates connections to the same analog bus lines and reduces signal integrity.

Requirements for Multicard Devices

- While different card models may be installed and operated in the same NI SwitchBlock carrier, a device may only be composed of cards of the same model. For example, you can combine two NI 2811A/B cards into one device, but if you install an NI 2811A/B and an NI 2816A/B, you will have to operate them as separate devices.
- All cards in a multicard device must be installed in the same NI SwitchBlock carrier. If your switching system spans multiple carriers, NI recommends using NI Switch Executive to manage all cards as a single virtual device. Refer to the NI Switch Executive Help for information about creating virtual devices.
- While multicard devices may be composed of any combination of type A and type B cards, NI recommends reducing the total number of paths you expose a signal to by using no more than one type A card in an NI SwitchBlock system. Refer to the Card Combination Use Cases section of this help topic for more information about recommended card combination options.

Refer to the device book for your card in the NI Switches Help for information about card combinations for specific topologies.

Topologies of Multicard Devices

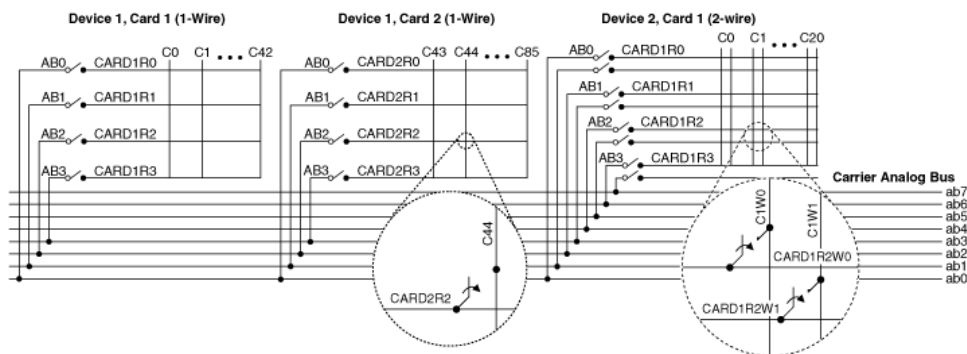
The topology of a multicard device is the merger of the topologies of each individual card. The number of columns in a multicard device can be determined by multiplying the number of cards combined by the number of columns on one card.

For example, the topology of a single NI 2810A/B card is a 1-Wire 4×43 matrix. If you create a multicard device using three NI 2810A/B cards, 43 columns multiplied by three cards would total 129 columns in the multicard device. The resulting topology for the

multicard device would be a 1-Wire 4×129 matrix. Each card maintains its own row channels, and the analog bus channels are used to connect channels in different cards.

Channel Naming for NI SwitchBlock Devices

Refer to the following images and instructions to determine the row, column, and analog bus channel names for your NI SwitchBlock device.



Row Channel Names

Row channel names are composed of the card number followed by the row number, written in the format, `cardXrY`, where X indicates the card number and Y indicates the row number. Card numbers correspond to the position of the card in relation to the other cards composing the device, starting with 1 for the leftmost card in the device.



Note The card number does not always correspond with the carrier slot number for the installed card. For instance, when the leftmost card in your device is installed in the third slot of the carrier, this card will still be numbered `card1`.

Column Channel Names

Column channel names are written in the format `cZ`, where Z indicates the column number. In multicard devices, column numbers for each card resume where the columns for the previous card in the device ended, with column numbers for the leftmost card starting at zero. In separate SwitchBlock devices, column numbers start at `c0` for the first relay card.

Analog Bus Channel Names

Analog bus channels connect the rows to the carrier analog bus. Analog bus channel names are written in the format `abX`, where `X` indicates the analog bus channel number and corresponds to the adjacent row channel. All relay cards within the same carrier, or within multiple carriers connected using an expansion bridge, connect to the same analog bus through their analog bus channels regardless of which NI SwitchBlock device they are in.

Relay Naming for NI SwitchBlock Devices

Refer to the following instructions to determine the relay names for your NI SwitchBlock device.

Matrix Relays

Matrix relay names for NI SwitchBlock 1-wire cards follow the format of `kcardXrYcZ`, where `cardXrY` indicates the name of the row channel that connects at that relay and `cZ` indicates the name of the column channel that connects at that relay. For example, a relay that connects `card1r5` and `c18` would be named `kcard1r5c18`. A relay that connects `card2r2` and `c44` would be named `kcard2r2c44`.

Matrix relay names for NI SwitchBlock 2-wire cards with SPST relays follow the formats of `kcardXrYcZw0` and `kcardXrYcZw1` for each wire on the channel.

Analog Bus Relays

Analog bus relay names for NI SwitchBlock 1-wire cards follow the format of `kcardXabY`, where `cardX` indicates the card number and `abY` indicates name of the analog bus channel that the relay connects to a corresponding row. For example, the relay that connects `ab2` to `card1r2` would be named `kcard1ab2`.

Analog bus relay names for NI SwitchBlock 2-wire cards with SPST relays follow the formats of `kcardXabYw0` and `kcardXabYw1` for each wire.



Note All NI SwitchBlock cards attach to the same physical analog bus regardless of whether they are 1-wire or 2-wire devices. However, the specific

analog bus line(s) that an analog bus channel connects to differs between 1-wire and 2-wire cards. For example, `ab0` for a 1-wire device connects to analog bus line 0 by closing `kcard1ab0` while `ab0` for a 2-wire device connects to analog bus lines 0 and 1 by closing `kcard1ab0w0` and `kcard1ab0w1`.

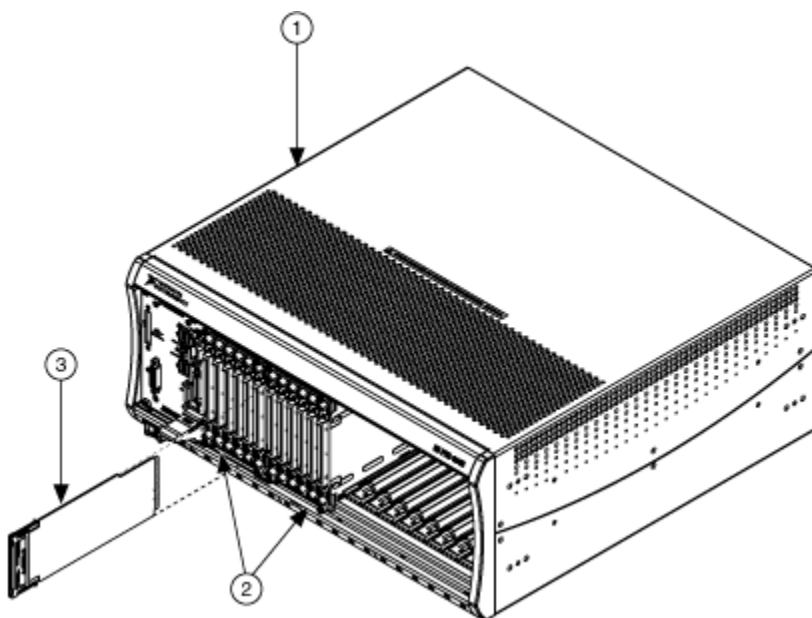
Expanding Multiple NI SwitchBlock Carriers

You can connect the analog buses of multiple adjacent NI SwitchBlock carriers with the NI 2806 expansion bridge for the NI SwitchBlock.



Note If you connect multiple carriers with the expansion bridge, you cannot connect to the analog bus on any of the connected carriers until the drivers for all connected carriers have been loaded by the system. This prevents unintentional shorts between channels across the analog bus. You may still manipulate relays directly using the niSwitch Relay Control VI or the `niSwitch_RelayControl` function, but with the risk of shorts across the analog bus.

The following figure shows where to insert the NI 2806 expansion bridge.



1	NI PXI/PXI Express Chassis

2	NI PXI-2800 Carriers
3	NI 2806 Expansion Bridge

If the analog buses of multiple adjacent carriers have been connected, you can enable devices in both carriers to connect to the same analog bus line simultaneously using the Analog Bus Sharing Enable property or the `NISWITCH_ATTR_ANALOG_BUS_SHARING_ENABLE` attribute.



Note NI recommends using NI Switch Executive to operate systems that contain multiple carriers. The NI Switch Executive Help includes information about using NI Switch Executive to create virtual devices that span multiple carriers.

NI SwitchBlock Programming Considerations

Expand this book for information about programming the NI SwitchBlock.

Initializing with Topology for NI SwitchBlock Devices

Use the topology of the NI SwitchBlock device you created in MAX and one of the VIs or functions described in the following sections to initialize your NI SwitchBlock device with topology.

- Initializing with Topology in LabVIEW
- Initializing with Topology in C

Initializing with Topology in LabVIEW

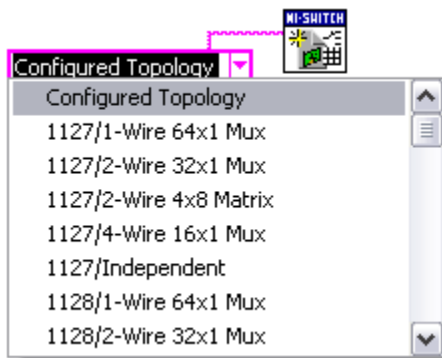
Refer to the following sections for information about initializing an NI SwitchBlock device with topology using the niSwitch Initialize With Topology VI or the niSwitch Initialize With Options VI.



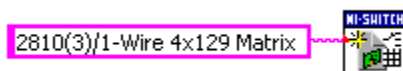
Note You must use the topology created when you configured the device in MAX.

Initializing with the niSwitch Initialize With Topology VI

You can specify the topology of your device using the niSwitch Initialize With Topology VI by wiring either a constant or a string to the **topology name** parameter. If you wire a constant to the **topology name** parameter, select **Configured Topology** from the drop-down menu for the constant. **Configured Topology** specifies the last topology that was configured for the device in MAX.



If you would like to explicitly state the device topology in your programming, you can wire a string to the **topology name** parameter instead of creating a constant. The following figure shows the topology string wired to the niSwitch Initialize With Topology VI for a combination of three NI 2810 cards.



Use the following format to type the topology string for the device you configured in MAX.

```
MODEL(N)/1-Wire RxC Matrix
```

where MODEL represents the model number, not including the letter for the card type, of the NI SwitchBlock cards combined in the device.

N represents the quantity of NI SwitchBlock cards combined in the device. The topology string for a single-card device does not contain (N).

R represents the number of rows in the topology.

C represents the number of columns in the topology.

You can also find the topology string for your device in MAX. When you select your device in the MAX configuration tree, you can find the topology string for your device in the Topology column of the item view in MAX.

Initializing with the niSwitch Initialize With Options VI

You can specify the topology of your device using the niSwitch Initialize With Options VI by setting the topology config token, located in the Driver Setup string for the **option string** parameter. You can set the value of the topology config token to `Configured Topology` to specify the last topology that was configured for the device in MAX.

DriverSetup=topology:Configured Topology



If you would like to explicitly state the device topology in your programming, you can set the value of the topology config token using the topology string for the device in the format described in the Initializing with the niSwitch Initialize With Topology VI section of this topic. The following figure shows the topology string used with the niSwitch Initialize With Options VI for a combination of three NI 2810 cards.

DriverSetup=topology:2810(3)/1-Wire 4x129 Matrix



Initializing with Topology in C

Refer to the following sections for information about initializing an NI SwitchBlock device with topology using the `niSwitch_InitWithTopology` function and the `niSwitch_InitWithOptions` function.



Note You must use the topology created when you configured the device in MAX.

Initializing with the `niSwitch_InitWithTopology` Function

You can specify the topology of your device using the `niSwitch_InitWithTopology` function by setting the topology parameter. If you set the **topology** parameter using the `#define` topology name, the only valid value is `NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY`.

If you would like to explicitly state the device topology in your programming, you can set the **topology** parameter using the topology string for the device in the format described in the Initializing with the `niSwitch Initialize With Topology VI` section of this topic.



Note If you enter a topology string, you must enter the string exactly as you see it in MAX. Refer to the Initializing with the `niSwitch Initialize With Topology VI` section of this topic for information about finding the topology string in MAX.

Initializing with the `niSwitch_InitWithOptions` Function

You can specify the topology of your device using the `niSwitch_InitWithOptions` function by setting the topology config token, located in the Driver Setup string for the **optionString** parameter. You can set the value of the topology config token to `Configured Topology` to specify the last topology that was configured for the device in MAX.

If you would like to explicitly state the device topology in your programming, you can set the value of the topology config token using the topology string for the device in the format described in the Initializing with the `niSwitch Initialize With Topology VI` section of this topic.



Note If you enter a topology string, you must enter the string exactly as you see it in MAX. Refer to the Initializing with the `niSwitch Initialize With Topology VI` section of this topic for information about finding the topology string in MAX.

Using the Analog Bus on an NI SwitchBlock Carrier

Refer to the following sections for information about the analog bus on your NI SwitchBlock carrier and how to use it.

Basics

Each carrier has an analog bus that you can use to make connections between cards that compose a multcard device, between devices in the same carrier, or between devices in different carriers when the NI 2806 expansion bridge is installed.

NI SwitchBlock devices contain analog bus channels used to connect to the analog bus on the carrier. To connect a row on a card to the analog bus on the carrier, connect the row to the analog bus channel of the same number on the device.



Note The carrier analog bus lines are not channels in software. To connect your device to the analog bus, connect a row to an analog bus channel.



Note Analog bus channels on 1-wire cards connect to a single line on the analog bus, while analog bus channels on 2-wire cards connect to two lines on the analog bus.

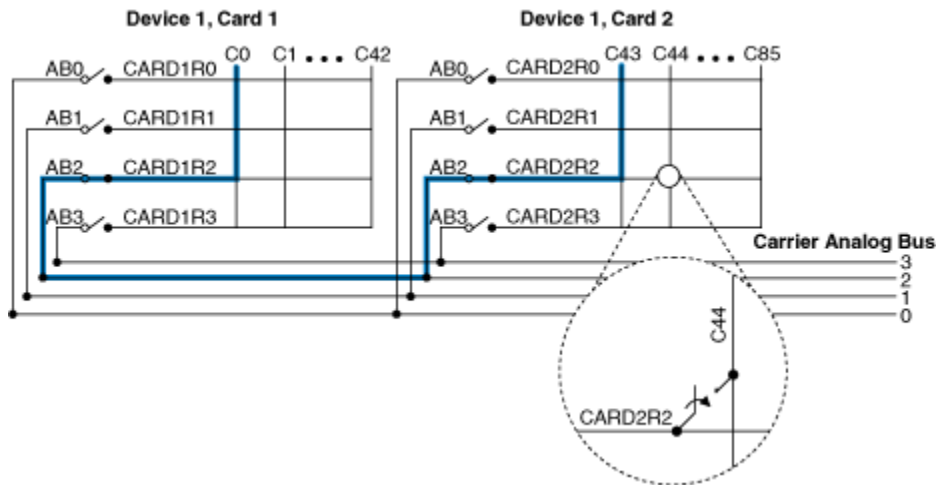
Because all cards in a carrier share the analog bus, multiple devices cannot connect to the same analog bus line simultaneously unless they are both of the same wire mode and you allow multiple devices to connect to the same analog bus lines using the Analog Bus Sharing Enable property or the `NISWITCH_ATTR_ANALOG_BUS_SHARING_ENABLE` attribute.



Note Enabling and disabling analog bus sharing protects the user from inadvertently connecting to the same analog bus lines when you use the immediate VIs/functions, but it does not provide additional protection when you manipulate relays directly using the niSwitch Relay Control VI or the `niSwitch_RelayControl` function. NI does not recommend manipulating relays directly when multiple NI SwitchBlock devices connect to the analog bus.

Connecting Signals Between Cards in a Multicard Device

You can use analog bus channels to route signals between the cards that compose a multicard device. The following image illustrates signal connections to connect channels `c0` and `c43` in a multicard device composed of two cards.



Complete the following steps to connect signals between cards in the same device:

1. Determine which channels you want to connect.
2. Set all channels between the channels selected in Step 1, including the analog bus channels, as reserved for routing.



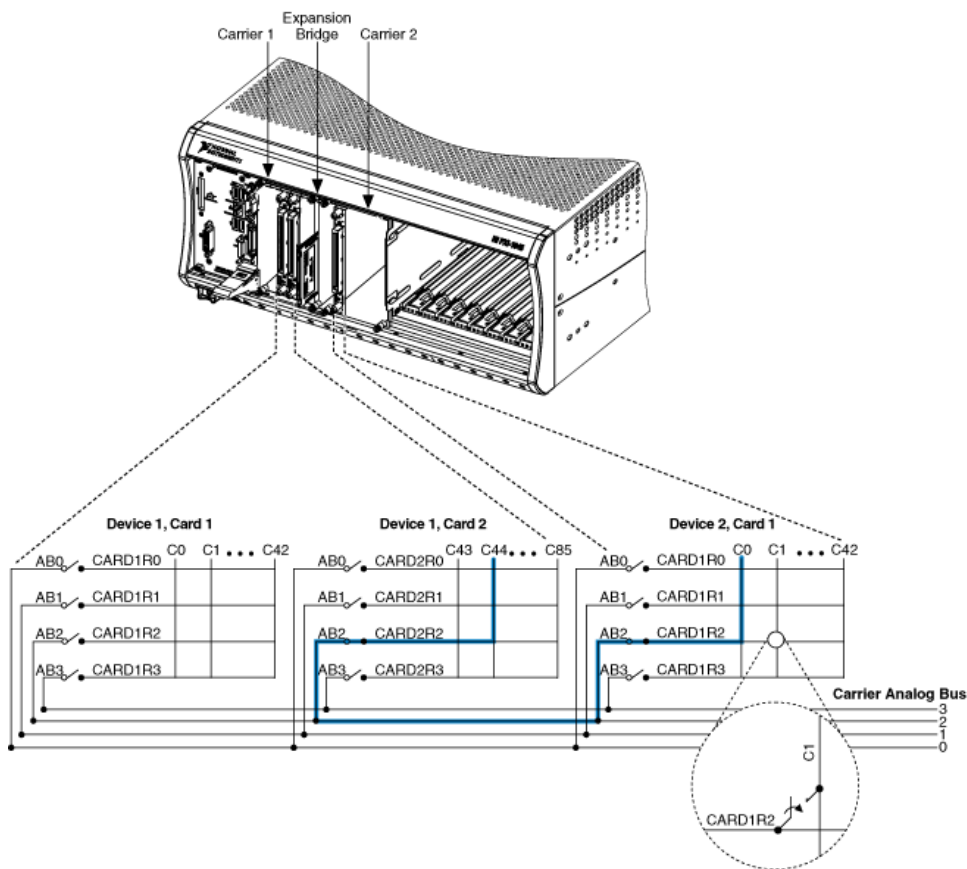
Note You can set a channel as reserved for routing only if it is not already in use and its Analog Bus Sharing Enable property is set to FALSE.

3. Connect the channels selected in Step 1 through any channels necessary to route the signals. Refer to the previous figure for an example of routing to connect `c0` to `c43` in a device composed of two NI 2810 cards.

Connecting Signals Between Devices

You can use the analog bus to route signals between multiple NI SwitchBlock devices with the same wire mode, whether the devices are installed in the same carrier or installed in separate carriers connected by the NI 2806 expansion bridge. The following image illustrates signal connections to connect channel `c44` in a multicard device installed in one carrier to channel `c0` in a single-card device installed in an adjacent

carrier connected by the NI 2806 expansion bridge.



Complete the following steps to connect signals between multiple devices:

1. Verify that the devices are of the same wire mode.
2. If the devices you would like to connect are in separate carriers, verify that the NI 2806 expansion bridge has been installed.
3. Determine which analog bus channels, such as `ab0`, you want to connect signals to on each of the devices.
4. Enable an analog bus channel on each of the devices to be shared across devices using the Analog Bus Sharing Enable property or the `NISWITCH_ATTR_ANALOG_BUS_SHARING_ENABLE` attribute. Refer to the Basics section of this topic to determine which analog bus channel on each device corresponds to the analog bus line you would like to share.



Note Analog bus channels can be shared only when the corresponding analog bus lines are not already in use. The analog bus channels on a 1-wire device connect to a single analog bus line each, while the analog

bus channels on a 2-wire device connect to two lines each.

5. Reserve for routing any channels needed to connect the channels selected in Step 3 to the analog bus channel that will share the analog bus line.



Note A channel that shares an analog bus line cannot be reserved for routing, and a channel that has been reserved for routing cannot share an analog bus line.

6. For each device, connect the channels selected in Step 3 to the analog bus channel that will share the analog bus line through any channels selected in Step 4. For example, to connect `c44` on Device 1 to `c0` on Device 2 in the system shown in the previous image, you would need to route signals between `c44` and `ab2` on Device 1 and between `c0` and `ab2` on Device 2.

Related Information:

- Analog Bus Sharing Enable Property
- Analog Bus Sharing Enable Attribute
- niSwitch Properties

Related concepts:

- [Immediate Operations](#)

NI SwitchBlock Power Limits

NI SwitchBlock carriers have a power consumption limit and a power dissipation limit (power limits) based on the available cooling capabilities of and power available from the PXI/PXI Express chassis in which the carrier is installed. Each slot in a carrier has power limits based on the characteristics of the card installed in that slot. The carrier's power limit is based on the combination of cards installed in the carrier. These power limits determine the maximum number of relays that can be driven simultaneously while dissipating power from user-supplied signals. For information about how to determine carrier power limits, visit ni.com/info and enter the info code, `sbpwrlim`.

To prevent a blown fuse, the switch driver automatically checks before each operation whether the power required for that operation exceeds the carrier or slot power limits. If your desired operation exceeds the carrier or slot power limits, the switch driver will return an error. You can clear the error using the niSwitch Reset VI or `niSwitch_reset` function to reset each device, or using the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function to disconnect all channels on each device.

After clearing the error, examine your application to find ways to use less power by operating fewer relays simultaneously. The switch driver tracks power consumption, but you should also track your power dissipation because it varies depending on your application and system. For more information about tracking power consumption in your system, visit ni.com/info and enter the info code, `sbpwrlim`.

NI SwitchBlock Maintenance

Expand this book for information about maintaining the NI SwitchBlock.

Replacing a Fuse on the NI SwitchBlock Carrier

An LED on the backplane inside the NI SwitchBlock carrier indicates the condition of the carrier fuse. The carrier fuse is field replaceable. If one of the following scenarios occurs, you need to replace the fuse:

- The LED inside the carrier is off when the chassis in which the carrier is installed is powered on.
- When you right-click a device in the carrier in the MAX configuration tree and select **Self-Test**, MAX returns an error that indicates the fuse in the carrier has blown.

Refer to the following table for information about ordering replacement fuses.

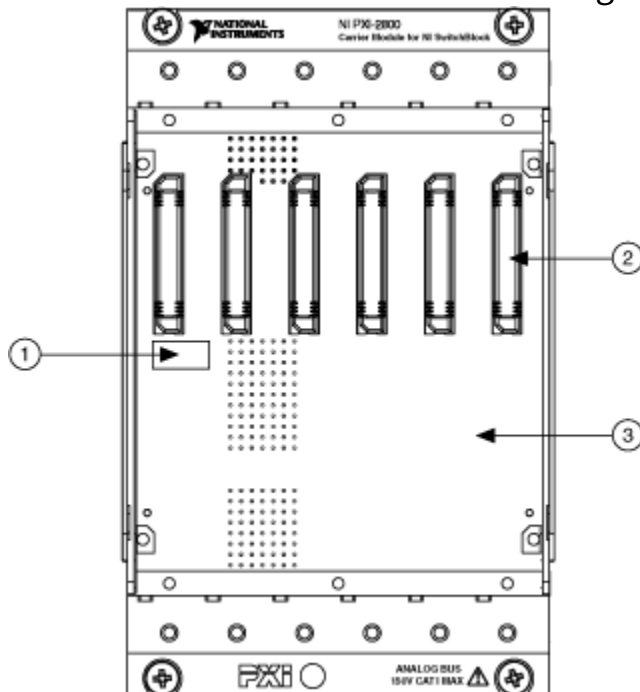
Fuse Type	Rating	Blow Speed	Manufacturer	Part Number
5 V internal supply fuse	7 A, 125 V	Very fast (FF)	Littelfuse	0453007

Use the following instructions to locate and replace the fuse.

Locate the Fuse

Complete the following steps to locate the fuse:

1. Power off and unplug the NI PXI/PXI Express chassis.
2. Remove all NI SwitchBlock cards from the carrier.
3. Remove any installed NI 2806 expansion bridges.
4. Remove the carrier from the NI PXI/PXI Express chassis.
5. Locate the fuse on the backplane of the carrier directly below the connector for the leftmost card as shown in the following figure.



1	Fuse
2	NI PXI-2800 Backplane Connector
3	NI PXI-2800 Backplane

Replace the Fuse

Complete one of the following procedures to replace the fuse.

Replacement Method 1

Complete the following procedure if you would like to minimize the number of steps

and tools required to replace the fuse.

1. Insert a small pair of needle nose pliers into the front of the carrier and gently pull on the fuse to remove it from the fuse holder.
2. Replace the fuse.
3. Reinstall any cards and NI 2806 expansion bridges that you removed when you located the fuse.

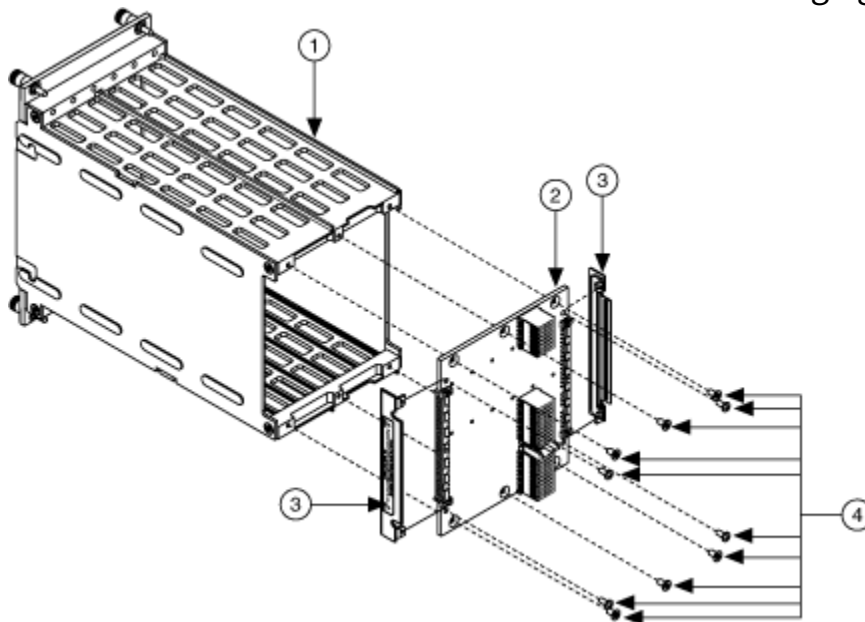


Caution If you removed one or more NI 2806 expansion bridges but do not plan to reinstall them, you must reinstall the expansion bridge connector covers on any unused expansion bridge connectors on the carrier.

Replacement Method 2

Complete the following procedure if you would like more work space when replacing the fuse.

1. Use a T8 Torx[®] screwdriver to remove the six T8 screws that connect the backplane to the back of the carrier. If the expansion bridge connector covers are attached to the carrier, also remove the four T8 screws that connect expansion bridge connector covers to the carrier. Refer to the following figure.



1	NI PXI-2800 Carrier

2	NI PXI-2800 Backplane
3	Expansion Bridge Connector Covers
4	Screws

2. Remove the expansion bridge connector covers.
3. Remove the backplane from the back of the carrier.
4. Use a pair of needle nose pliers to gently pull on the fuse to remove it from the fuse holder.
5. Replace the fuse.
6. Reattach the backplane to the back of the carrier using the six T8 screws removed previously.
7. Reinstall the carrier as well as any cards and NI 2806 expansion bridges that you removed when you located the fuse.



Caution If you removed one or more NI 2806 expansion bridges but do not plan to reinstall them, you must reinstall the expansion bridge connector covers on any unused expansion bridge connectors on the carrier.

NI SwitchBlock Integrated Relay Test

The NI SwitchBlock has an integrated relay test feature that verifies the proper operation of each individual relay. When you disable the safety interlock on your NI SwitchBlock, certain rows on each card are connected together through resistors to enable integrated relay test. During an integrated relay test, different combinations of relay connections are tested to determine the condition of each relay. Integrated relay test functionality enables you to increase the long-term reliability of your test system and reduce debug time.

To perform an integrated relay test on your NI SwitchBlock, place the NI SwitchBlock in integrated relay test mode by disabling the safety interlock, then launch the NI Switch Health Center (**Start»All Programs»National Instruments»NI-SWITCH»NI Switch Health Center**).



Note You must disable the safety interlock before performing an integrated

relay test. This ensures the integrated relay test signals will not cause adverse effects on your test equipment and signals, and that your signals will not interfere with the integrated relay test results. You can disable the safety interlock by either disconnecting the cable from the front of the NI SwitchBlock or by disconnecting your terminal block or custom test fixture from the other end of the cable.

NI SwitchBlock Troubleshooting

This topic describes common problems you may encounter with the NI SwitchBlock and suggests solutions or workarounds.

Relays do not seem to be switching signals.

- Ensure that your signals are properly connected to the front panel of the module and that your connectivity solution includes the safety interlock resistor.
- You may have a bad relay. Consider performing an integrated relay test, routing through a different relay path, or troubleshooting your relay connection with a DMM or other measurement instrument.
- You may have blown the fuse that provides power to the cards. Refer to Replacing a Fuse on the NI SwitchBlock Carrier to determine whether the fuse in your carrier has blown. If necessary, replace the fuse.

I am issuing commands to operate relays, but I do not see my signals being routed as I expect.

Refer to the considerations in the Relays do not seem to be switching signals section.

Programming the NI SwitchBlock in NI-SWITCH and NI-DAQmx

Expand this book for information about programming the NI SwitchBlock in NI-SWITCH and NI-DAQmx.

NI SwitchBlock Overview

The NI SwitchBlock is a switch platform designed for large matrix test systems. It includes internal column expansion features that can create matrices with more than

8,800 crosspoints in a single PXI chassis. To improve long-term system reliability, the NI SwitchBlock ships with the new NI Switch Health Center, which contains an integrated relay test, relay count tracking, and report generation tool.

Although National Instruments recommends using NI Switch Executive to program the NI SwitchBlock, you can program the NI SwitchBlock using the NI-SWITCH and NI-DAQmx driver APIs. NI Switch Executive intelligent route management software enables large matrix application programming and includes a configuration wizard that accelerates development with the NI SwitchBlock. This help topic explains how to program the NI SwitchBlock with the NI-SWITCH and NI-DAQmx driver APIs.

Important Information about Getting Started with NI SwitchBlock

For more information about getting started with the NI SwitchBlock, visit ni.com/info and enter the Info Code `exbpzd`.

For more information about the NI SwitchBlock hardware architecture, visit ni.com/info and enter the Info Code `exmsq9`.

For more information about programming the NI SwitchBlock, visit ni.com/info and enter the Info Code `exy2pt`.

For more information about connecting to the NI SwitchBlock, visit ni.com/info and enter the Info Code `ex88cp`.

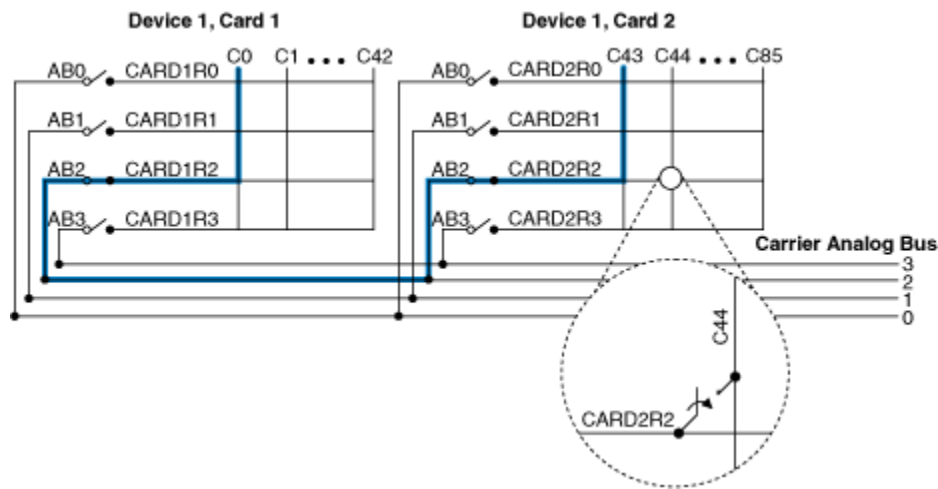
To watch the "Programming the NI SwitchBlock" webcast, visit ni.com/info and enter the Info Code `exee6e`.

The NI SwitchBlock Carrier and the Analog Bus

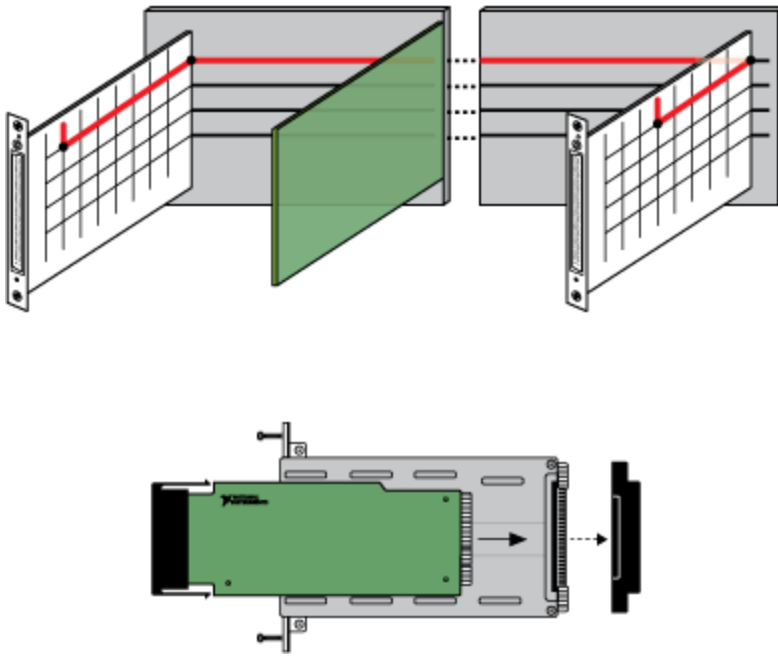
All NI SwitchBlock systems contain at least two components: one NI SwitchBlock carrier and one or more NI SwitchBlock relay cards. Each relay card contains a single switch matrix of rows and columns. If there are multiple relay cards in one NI SwitchBlock carrier, individual matrices can be column expanded using the analog bus lines to create large matrices.

The backplane of the NI SwitchBlock carrier includes 16 analog bus lines that can be used to route signals between relay cards. Analog bus relays are located between the

rows of the relay cards and their respective analog bus line on the backplane of the NI SwitchBlock carrier. The Following figure represents an NI SwitchBlock carrier with two relay cards that have been combined into a single NI SwitchBlock device.



The NI SwitchBlock carrier has analog bus expansion connectors on the left and right sides that can join with the NI 2806 Expansion Bridge to enable analog bus sharing between multiple NI SwitchBlock carriers in a PXI chassis. Multiple NI 2806 Expansion Bridges can be used to expand the analog bus to up to four NI SwitchBlock carriers in a single 18-slot NI PXI chassis for a total of 24 NI SwitchBlock relay cards. The following figures represent two NI SwitchBlock carriers with an NI 2806 Expansion Bridge. You can route a signal between NI SwitchBlock carriers using the NI 2806 Expansion Bridge as shown in the first figure. You must remove the analog bus cover from the NI PXI-2800 carrier before inserting the expansion bridge, as shown in the second figure.



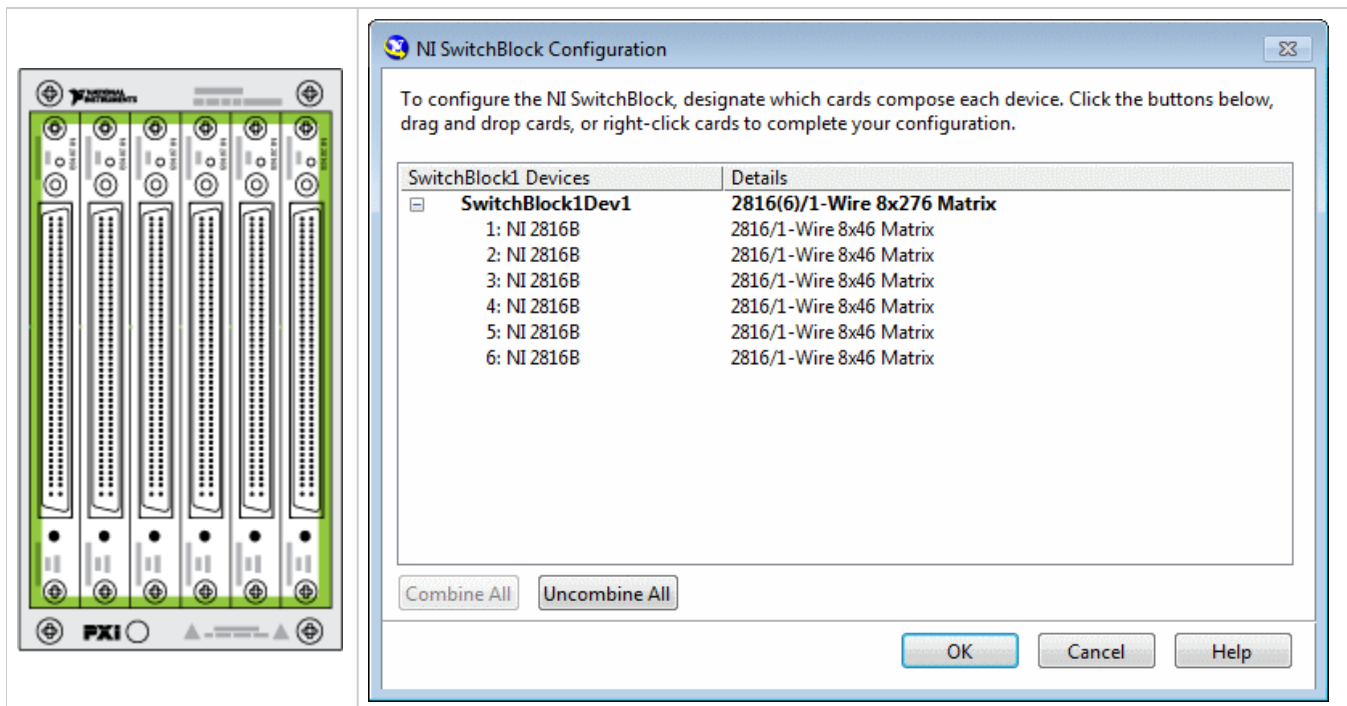
System Configuration Options for the NI SwitchBlock

You can configure your NI SwitchBlock system as one NI SwitchBlock device or as multiple NI SwitchBlock devices.

One NI SwitchBlock Device

The one NI SwitchBlock device method routes signals within a single NI SwitchBlock relay card in an NI SwitchBlock carrier or between multiple NI SwitchBlock relay cards within the same NI SwitchBlock carrier that have been combined into a single NI SwitchBlock device.

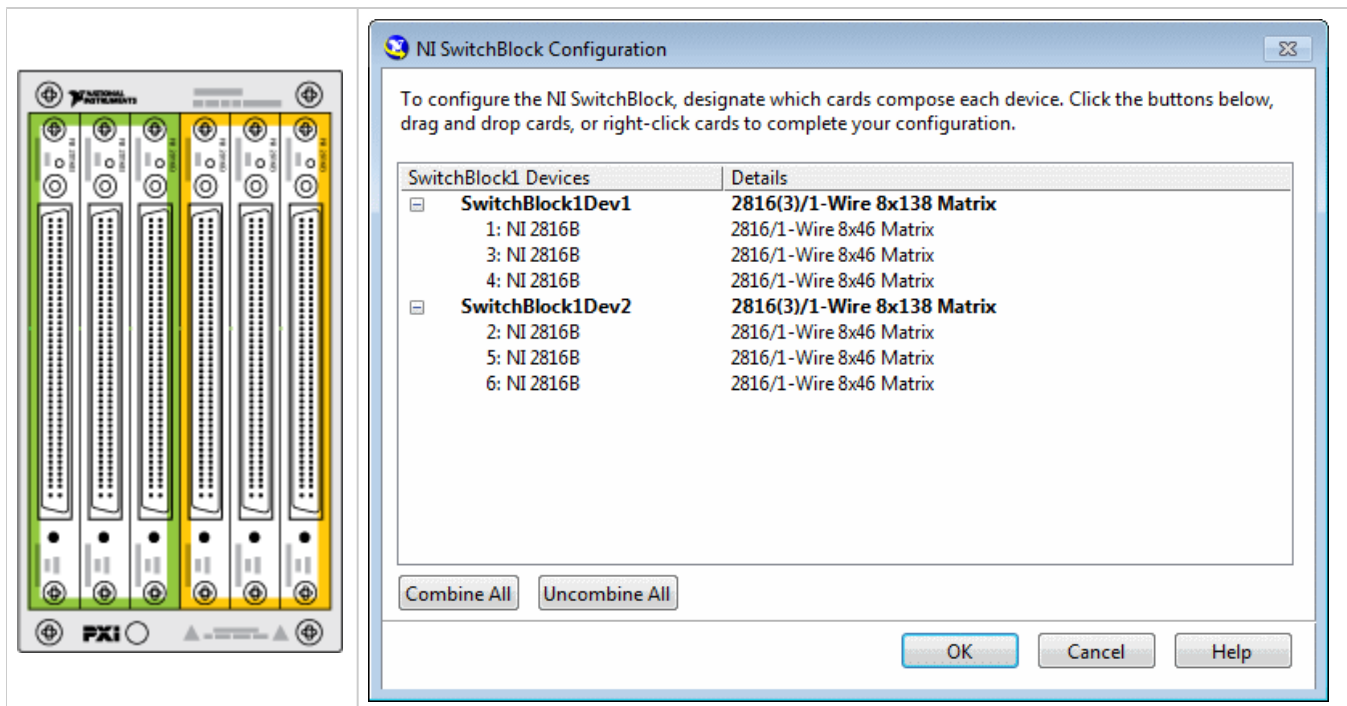
The following figure shows multiple relay cards in one NI SwitchBlock carrier that have been combined into a single NI SwitchBlock device.



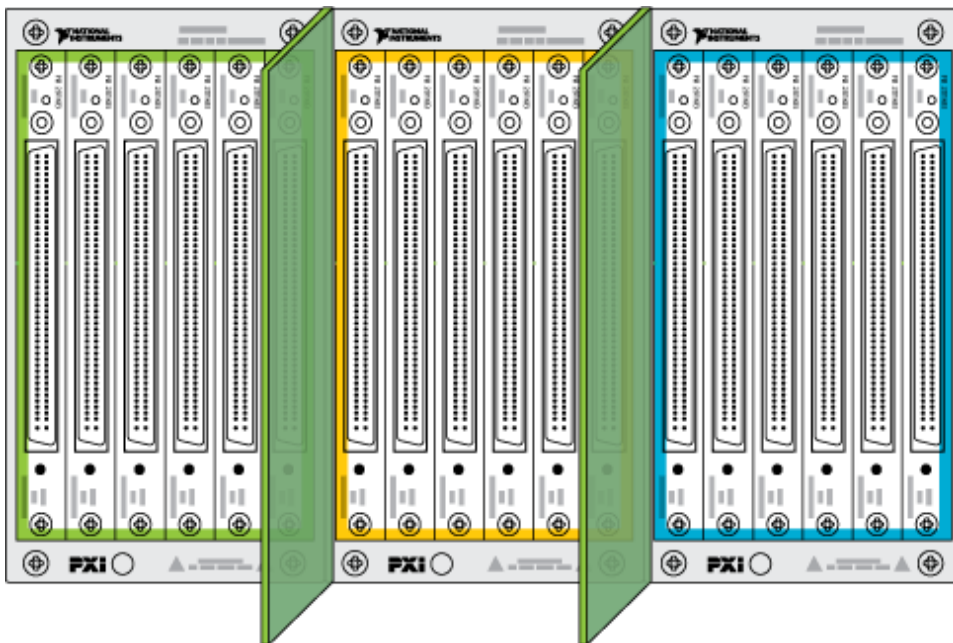
Multiple NI SwitchBlock Devices

The multiple NI SwitchBlock device method routes signals between multiple NI SwitchBlock devices within the same NI SwitchBlock carrier or between multiple NI SwitchBlock devices within multiple NI SwitchBlock carriers connected with the NI 2806 Expansion Bridge.

The following figure shows multiple relay cards in one NI SwitchBlock carrier that are combined into multiple NI SwitchBlock devices.



The following figure shows multiple relay cards in multiple NI SwitchBlock carriers combined using the NI 2806 Expansion Bridge.



Both of the preceding multiple NI SwitchBlock device configurations are equivalent within software.



Note Refer to Configuring the NI SwitchBlock in MAX for information on combining multiple NI SwitchBlock relay cards into a single NI SwitchBlock device and creating multiple NI SwitchBlock devices within a single NI SwitchBlock carrier.

Routing Signals Within One NI SwitchBlock Device

You can route signals in a single NI SwitchBlock device with NI-DAQmx and NI-SWITCH using either endpoint programming or explicit path programming.

Endpoint Programming

Endpoint programming uses NI-DAQmx or NI-SWITCH to automatically determine the best route between two columns. This programming technique remains straightforward regardless of how many NI SwitchBlock relay cards are in an NI SwitchBlock device.

Follow these steps to use endpoint programming:

1. Set all of the rows and analog bus lines within the NI SwitchBlock device as Reserved for Routing. To set Reserved for Routing in NI-DAQmx, set the **Channel Usage** property to Reserved For Routing. In NI-SWITCH, set the Channel Configuration property Is Configuration Channel to True.
2. Specify the two columns to connect using the NI-DAQmx **Switch Connect** function or the niSwitch Connect Channels VI. NI-DAQmx and NI-SWITCH automatically determine the best route between the columns using any combination of the rows and analog bus lines that have been reserved for routing. NI-DAQmx and NI-SWITCH return an error if no path is available or if no lines have been reserved for routing.



Note The numbers and names of the rows and analog bus lines that must be reserved for routing change based on the topology of the relay cards used. Refer to the device information in the NI Switches Help for the correct row and analog bus names.

The following examples show how to use endpoint programming to route signals

within a single NI SwitchBlock device composed of six NI 2810s. These examples contain a subVI that automatically determines the correct naming for all of the rows and analog bus lines that must be reserved. This VI can be used with any NI SwitchBlock device.

For an example using NI-DAQmx for single device endpoint connections, visit ni.com/info and enter the Info Code `exv36g`. For an example using NI-SWITCH for single device endpoint connections, visit ni.com/info and enter the Info Code `exi3qv`.

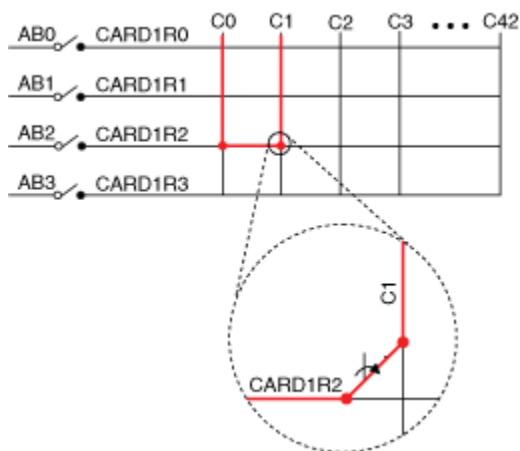
Explicit Path Programming

Explicit path programming is a technique that requires every individual path to be explicitly closed. This method provides additional customization by allowing selection of which rows and analog bus lines are used to connect signals. Explicit path programming becomes more complicated as additional modules are required in the route. Explicit path programming does not require any path to be reserved for routing.

Follow these steps to use explicit path programming to connect two columns (cX and cY) on the same relay card:

1. Connect column cX to row CardMrN.
2. Connect column cY to row CardMrN.

The following figure shows how connections are made on a single relay card with NI SwitchBlock devices.

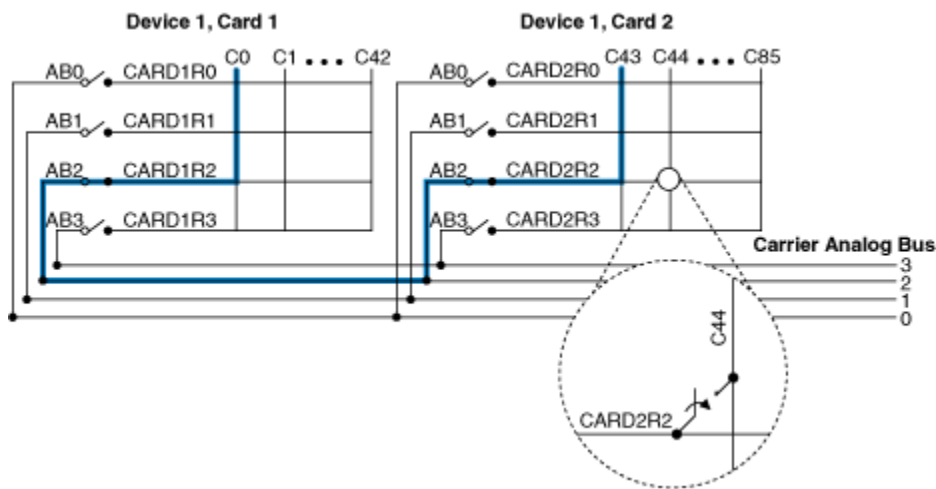


Follow these steps to use explicit path programming to connect two columns on

different relay cards (CardM and CardK):

1. Connect column cX to row CardMrN on the first relay card.
2. Connect row CardMrN to analog bus line abZ on the first relay card.
3. Connect analog bus line abZ to row CardKrN on the second relay card.
4. Connect row CardKrN to column cY on the second relay card.

The following figure shows how connections are made between multiple relay cards on a single NI SwitchBlock device.



The following examples show connections between multiple relay cards using six NI 2810 relay cards combined into a single NI SwitchBlock device.

For an example using NI-DAQmx for single device explicit path connections, visit ni.com/info and enter the Info Code `exut3a`. For an example using NI-SWITCH for single device explicit path connections, visit ni.com/info and enter the Info Code `exzh6m`.

Routing Signals Between Multiple NI SwitchBlock Devices

You can route signals between multiple NI SwitchBlock devices in the same carrier or between multiple NI SwitchBlock devices in two or more NI SwitchBlock carriers.

Sharing Signals Between Multiple SwitchBlock Devices

Follow these steps to share signals between multiple NI SwitchBlock devices:

1. If more than one carrier is present, install the NI 2806 Expansion Bridge between the two NI SwitchBlock carriers. Once the NI 2806 Expansion Bridge is installed, there is no difference between multiple NI SwitchBlock devices in a single carrier and multiple NI SwitchBlock devices in multiple carriers. Refer to Expanding Multiple NI SwitchBlock Carriers for more information.
2. Enable analog bus sharing on each analog bus line used to share signals between multiple NI SwitchBlock devices. Enabling analog bus sharing removes the default software setting that restricts two NI SwitchBlock devices from connecting to the same analog bus line simultaneously. Refer to Using the analog bus on an NI SwitchBlock Carrier for more information.



Note If two NI SwitchBlock devices would be connected to the same analog bus line at the same time without analog bus sharing enabled, NI-DAQmx and NI-SWITCH will return an error and not connect the second NI SwitchBlock device to the analog bus.

Sharing Analog Bus Lines Between NI SwitchBlock Devices of Different Types

Analog bus lines between NI SwitchBlock relay cards of different types can be shared if they have the same wire mode.

For example, the NI 2815 is a four-row, 1-wire module that connects to analog bus lines ab0-3. The NI 2816 is an eight-row, 1-wire module that connects to analog bus lines ab0-7. The first four analog bus lines (ab0-3) can be shared between the NI 2815 and NI 2816 and used to route signals between them. However, analog bus lines ab4-7 can only be shared with the NI 2816 or other 1-wire NI SwitchBlock relay cards with at least 8 rows.

NI SwitchBlock devices of different wire modes cannot share analog bus lines. For example, the NI 2816 is an eight-row, 1-wire relay card and cannot share analog bus lines with the NI 2813, a four-row, 2-wire relay card. Though both devices use eight analog bus lines, NI-DAQmx and NI-SWITCH do not allow analog bus sharing to be enabled between these devices.



Note Sharing the Analog Bus between NI SwitchBlock relay cards with

different wire modes can be accomplished by using lower-level relay control functions. These functions bypass all automatic software settings. Refer to the NI-SWITCH relay VIs book in the NI-SWITCH LabVIEW Reference and the DAQmx Relay Operations VIs book in the LabVIEW Help for more information.

There are two ways to program multiple NI SwitchBlock devices after analog bus sharing has been enabled: endpoint programming and explicit path programming.

Endpoint Programming

Endpoint programming uses NI-DAQmx or NI-SWITCH to automatically determine the best route between two columns. This programming technique remains straightforward regardless of how many NI SwitchBlock relay cards are in an NI SwitchBlock device.

Follow these steps to use endpoint programming:

1. Enable analog bus sharing for all of the analog bus lines on each device. To enable analog bus sharing, set the NI-DAQmx Switch Channel property **Analog Bus Sharing Enable** to True, or set the NI-SWITCH Channel Configuration Analog Bus Sharing Enable property to True.
2. Set all rows within the NI SwitchBlock device as Reserved for Routing. To reserve a line for routing in NI-DAQmx, set the **Channel Usage** property to Reserved For Routing. In NI-SWITCH, set the Channel Configuration property Is Configuration Channel to True. NI-DAQmx and NI-SWITCH automatically determine the best route between the columns using any combination of the rows that have been reserved for routing. NI-DAQmx and NI-SWITCH return an error if no path is available or if no lines have been reserved for routing.
3. Specify the column and analog bus line to connect on each NI SwitchBlock device. This will require a separate NI-DAQmx Connect command or NI-SWITCH Connect Channels command for each NI SwitchBlock Device. NI-DAQmx and NI-SWITCH will automatically determine the route between the columns and the analog bus line using one of the rows that have been reserved for routing. NI-DAQmx and NI-SWITCH will return an error if no path is available or if no lines have been reserved for routing.



Note The numbers and names of the rows that must be reserved for routing and analog bus lines that must be shared will change based on the topology of the relay cards used. Refer to the device information in the NI Switches Help for the correct row and analog bus names.

The following examples show how to use endpoint programming to route signals between two NI SwitchBlock devices, each containing three NI 2810 relay cards. These examples contain a subVI that automatically determines the correct naming for all of the rows that must be reserved for routing and the analog bus lines that must be shared. This VI can be used with any NI SwitchBlock device.

For an example using NI-DAQmx for multiple device endpoint connections, visit ni.com/info and enter the Info Code `excj kx`. For an example using NI-SWITCH for multiple device endpoint connections, visit ni.com/info and enter the Info Code `ex6dte`.

Explicit Path Programming

Explicit path programming requires every individual path to be explicitly closed. This method provides additional customization by allowing the selection of which rows and analog bus lines are used to connect signals. Explicit path programming becomes more complicated as additional modules are required in the route. Explicit path programming does not require any path to be reserved for routing.

Follow these steps to use explicit path programming to connect two columns (cX and cY) on the same relay card (CardM):

1. Connect column cX to row CardMrN.
2. Connect cY to row CardMrN.

Follow these steps to use explicit path programming to connect two columns (cX and cY) on different relay cards (CardM and CardK) in different NI SwitchBlock devices:

1. Enable analog bus sharing for all of the analog bus lines on each device. To enable analog bus sharing, set the NI-DAQmx Switch Channel property **Analog Bus Sharing Enable** to True, or set the NI-SWITCH Channel Configuration Analog Bus Sharing Enable property to True.

2. Connect column cX to row CardMrN on the first relay card.
3. Connect row CardMrN to analog bus line abZ on the first relay card.
4. Connect analog bus line abZ to row CardKrN on the second relay card.
5. Connect row CardKrN to column cY on the second relay card.



Note If two NI SwitchBlock devices are connected to the same analog bus line at the same time without analog bus sharing enabled, NI-DAQmx and NI-SWITCH return an error and not connect the second NI SwitchBlock device to the analog bus.

The following examples show how to route a signal between two NI SwitchBlock devices, each containing three NI 2810 relay cards. These examples can be used with any two NI SwitchBlock devices. These examples contain a subVI that automatically determines the correct naming for all of the analog bus lines that must be shared. This VI can be used with any NI SwitchBlock device.

For an example using NI-DAQmx for multiple device explicit path connections, visit ni.com/info and enter the Info Code `ex5z4m`. For an example using NI-SWITCH for multiple device explicit path connections, visit ni.com/info and enter the Info Code `exmpji`.

RF Switching Considerations

Learn about the terminology and concepts related to RF switching applications.

Characteristic Impedance

Characteristic impedance is a transmission line parameter that determines how propagating signals are transmitted or reflected in the line. The following equation and figures represent the components of characteristic impedance.

$$Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$$

where

Z_0 is the characteristic impedance

L is the inductance per length

C is the capacitance per length

R is the resistance per length

G is the dielectric conductance per length

ω is the frequency (radians/s)

If a transmission line is in the system, its characteristic impedance must also match the source and the load for maximum power transfer.

In an ideal, lossless transmission line, there is no series resistance or dielectric loss, as shown by the following formula:

$$R = 0, \quad G = 0 \quad \Rightarrow \quad Z_0 = \sqrt{\frac{L}{C}} \quad (\text{frequency independent})$$

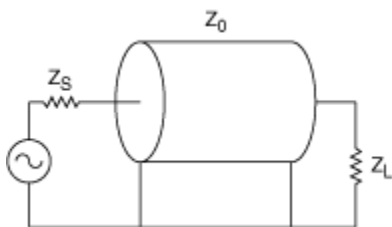
The following figure shows an electrical system diagram

where

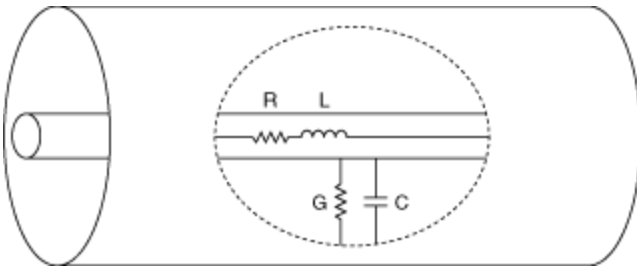
Z_S is the source impedance

Z_0 is the characteristic impedance of the transmission line

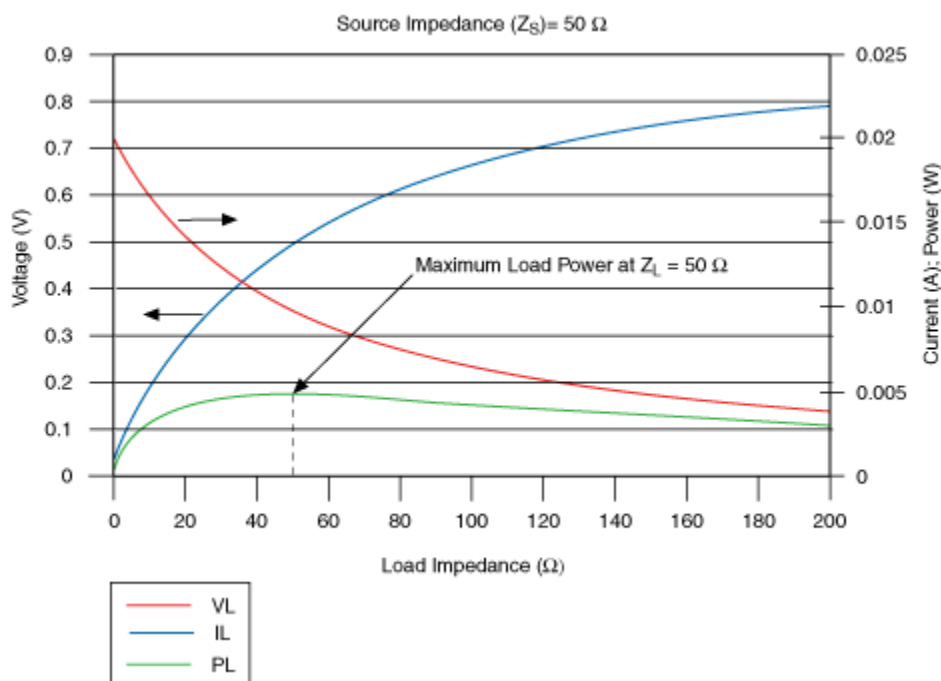
Z_L is the load impedance



The following figure is an electrical representation of a transmission line showing the components that affect characteristic impedance.



Maximum power is transferred from the source to the load when both have the same impedance. This is displayed in the following graph which shows the voltage, current, and power transferred at various load impedances. The graph assumes no transmission line losses and a source impedance of 50 Ohms.

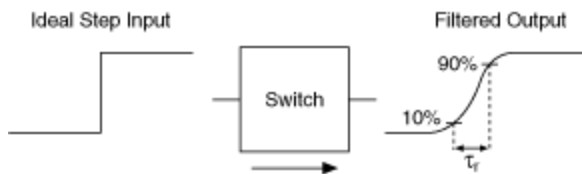


Rise Time

Given an ideal step input, rise time is the time required for the output signal voltage to rise from 10% to 90% of the step amplitude. Rise time is related to bandwidth using the following approximation:

$$\tau_r = 0.35/\text{bandwidth (Hz)}$$

The following figure illustrates rise time.



Related concepts:

- [Bandwidth and Insertion Loss](#)

Bandwidth and Insertion Loss

Signal bandwidth is the useful range of signal frequencies for a switch. NI switch modules are specified for frequencies as low as DC, so bandwidth is specified as the maximum recommended signal frequency. In many cases, bandwidth is the highest signal frequency that the switch can maintain <3 dB of insertion loss. Some RF modules specify bandwidths based on reflections (VSWR) instead of insertion loss.

Insertion Loss

As a high-frequency signal traverses through a switch module, it is attenuated by series resistance, dielectric absorption, and by reflections from impedance mismatches. This attenuation is called insertion loss. The amount of signal remaining at the output of the switch module is represented as a ratio to the input signal in decibels (dB):

$$\text{Transmitted signal (dB)} = 10 \log(P_{\text{out}}/P_{\text{in}})$$

where P_{out} is the output power level, and P_{in} is the input power level.

This ratio can also be expressed in terms of signal voltage:

$$\text{Transmitted signal (dB)} = 20 \log(V_{\text{out}}/V_{\text{in}})$$

Because the switch attenuates the signal, output magnitude is less than input magnitude, and the transmitted signal ratio is always <0 dB.

By convention, insertion loss is the ratio of input signal to the output signal, in decibels (dB):

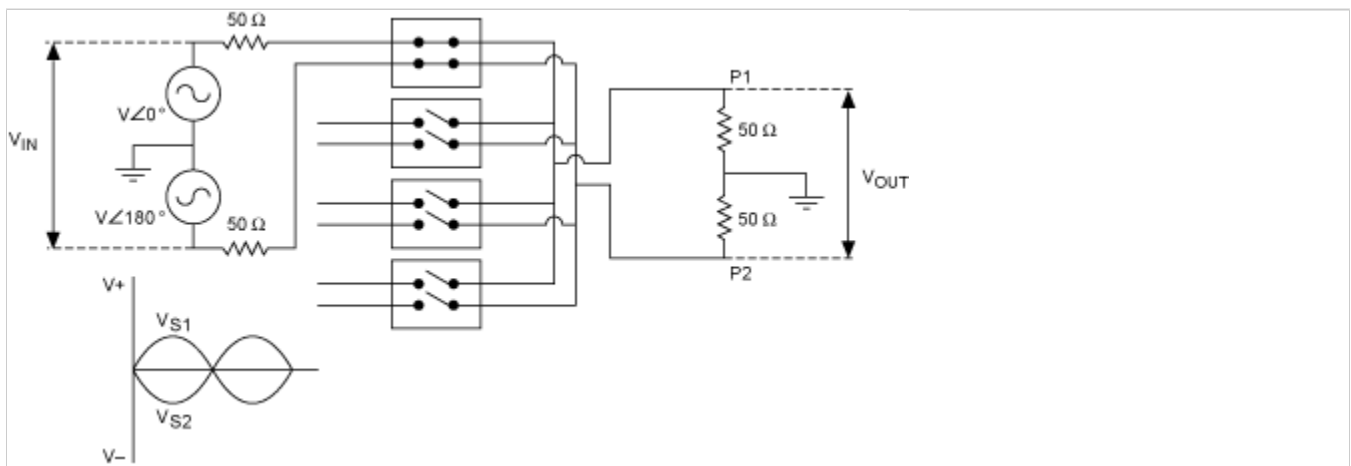
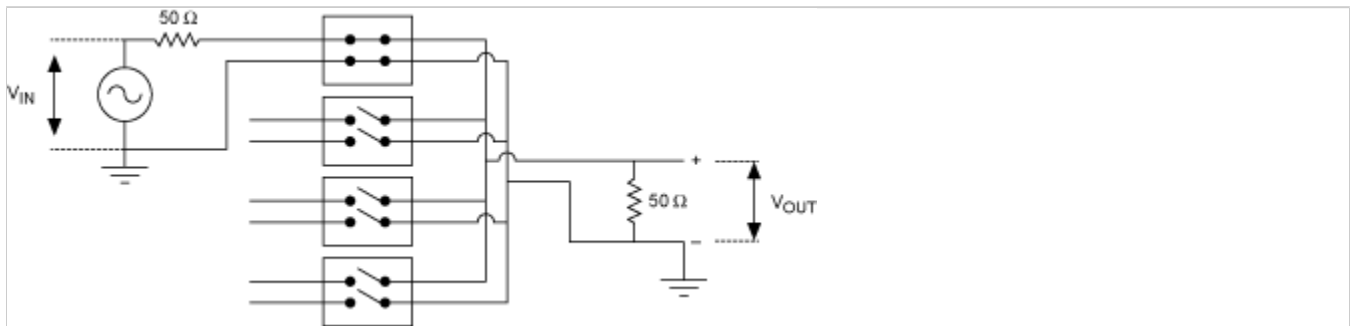
$$\text{Insertion loss (dB)} = 10 \log(P_{\text{in}}/P_{\text{out}}) = -10 \log(P_{\text{out}}/P_{\text{in}})$$

$$\text{Insertion loss (dB)} = 20 \log(V_{\text{in}}/V_{\text{out}}) = -20 \log(V_{\text{out}}/V_{\text{in}})$$

Output magnitude is less than input magnitude, so insertion loss is >0 dB.

The contributing factors of series resistance, dielectric loss, and mismatch reflections are frequency dependent and generally result in insertion loss rising with signal frequency.

The following figures illustrate single-ended and differential measurements, respectively.



Bandwidth and Square Waves

If a signal is purely sinusoidal, the bandwidth/insertion loss rating of a switch module can be directly applied. For signals that have multiple frequency components, like a square wave, the rating may be difficult to apply.

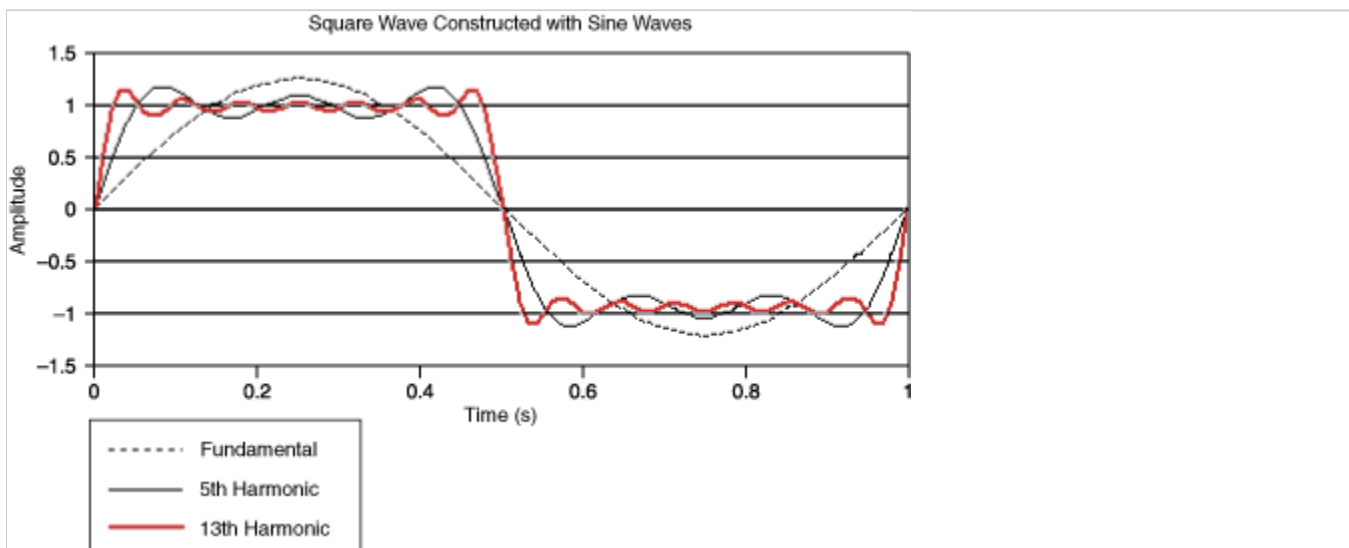
A square wave can be represented using a natural harmonic series, where only the odd harmonics are used. The frequency components that make up an ideal square wave are infinite.

$$\text{Square wave (t)} = (4/\pi)[\sin \omega t + (1/3)\sin 3\omega t + (1/5)\sin 5\omega t + \dots]$$

where ω is frequency in radians per second

A square wave may have a fundamental frequency below the rated bandwidth. However, harmonics above the rating may be attenuated by increasing insertion loss.

For example, consider a 2 V peak-to-peak square wave. The square wave can be approximated by the summation of multiple harmonic sine waves. Three harmonics are shown in the following figure: the fundamental frequency (or first harmonic), the fifth, and the 13th harmonic.



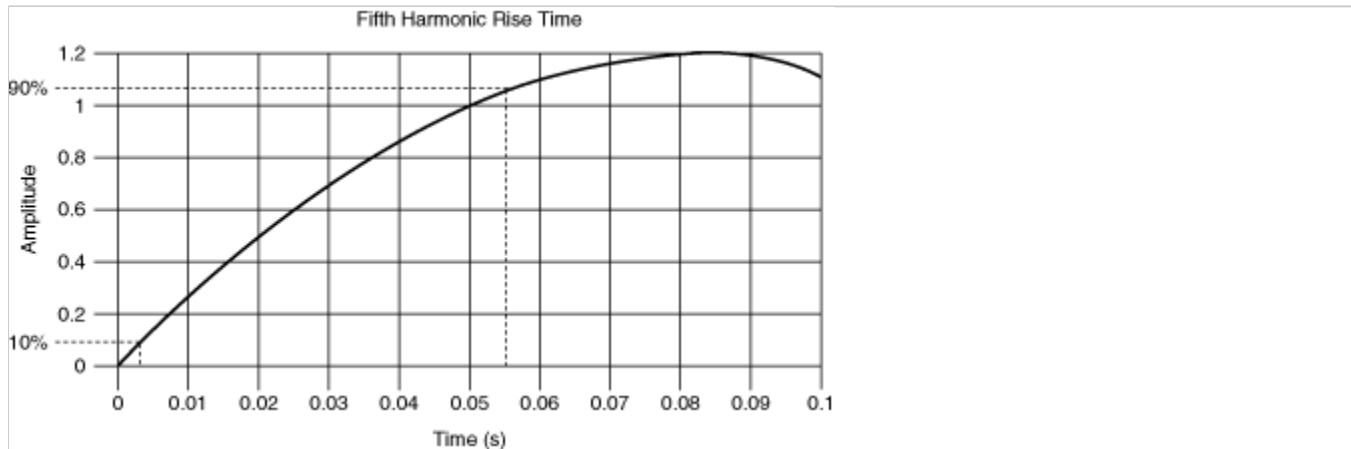
If the frequency content of a square wave is known, the required switch bandwidth can be determined based on the highest harmonic to be passed with minimal distortion.

If the frequency content is unknown, the -3 dB point can be approximated using the rise time of the harmonic to be preserved. The rise time is related to the -3 dB point bandwidth by the following approximation:

$$3 \text{ dB bandwidth (Hz)} \approx 0.35/\tau_r$$

where τ is the rise time from 10% to 90% of the signal amplitude.

The following figure shows this approximation applied to the fifth harmonic of the square wave from the previous example:



where $\tau = 0.0515$ s

3 dB bandwidth = 6.79 Hz

To preserve the rise time of the signal, a switch with an insertion loss of 3 dB at 6.79 Hz minimum should be chosen.

For a square wave, once the fifth or seventh harmonic is reached, the change in the rise time is minimal. In the previous example, a switch with an insertion loss of 3 dB at 7 Hz will be sufficient to pass as a 1 Hz square wave.



Tip For square wave signals, select a switch with a –3 dB point at a frequency seven times the fundamental frequency of the square wave. If less attenuation is desired, the –3 dB point should be a higher frequency.

Related concepts:

- [Voltage Standing Wave Ratio \(VSWR\)](#)
- [Rise Time](#)

Voltage Standing Wave Ratio (VSWR)

Any impedance mismatches along a transmission line causes partial reflection of the propagating signals. The impedance difference determines the magnitude of the reflection. The length of a mismatched section determines the lowest signal frequencies that reflect from the section. VSWR is a measure of that signal reflection.

With an incident sine wave into the switch module, some of the signal reflects down the line. This reflected wave interferes with the incident wave. VSWR is the ratio of maximum to minimum amplitude in the resulting interference wave, as shown in the following formula:

$$\text{VSWR} = \frac{1 + [p]}{1 - [p]}$$

where p is the reflection coefficient

Reflections can also be represented as a logarithmic ratio of the reflected signal to the input signal. This ratio is called return loss:

RL (dB)	= 10 log (P _{In} / P _{Reflected})
	= 20 log (V _{In} / V _{Reflected})
	= -20 log (V _{Reflected} / V _{In})
	= -20 log p

Crosstalk

Crosstalk is the amount of signal from one active channel that appears on another active channel. Crosstalk is specified in dB of transmission, according to one of the following equations:

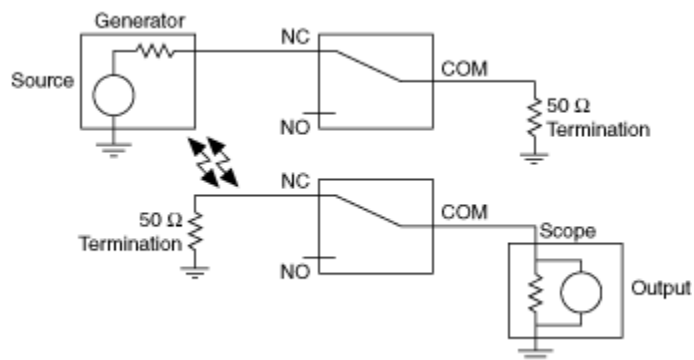
$$\text{Crosstalk (dB)} = 10 \log (P_{\text{out}} / P_{\text{source}})$$

$$\text{Crosstalk (dB)} = 20 \log (V_{\text{out}} / V_{\text{source}})$$

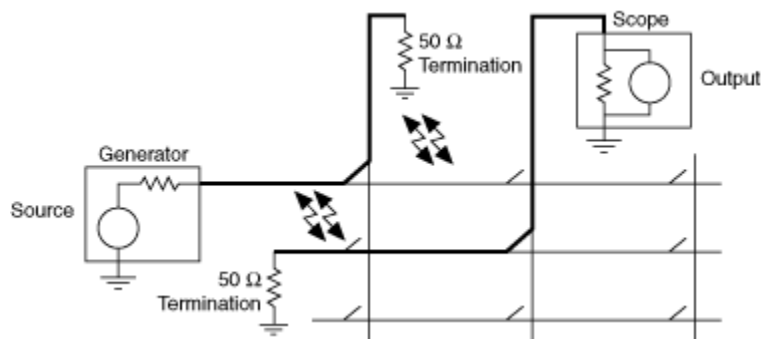
The following figures illustrate crosstalk. All channels are assumed to be appropriately

terminated.

Crosstalk on a General Purpose Module



Crosstalk on a Matrix Module



Isolation

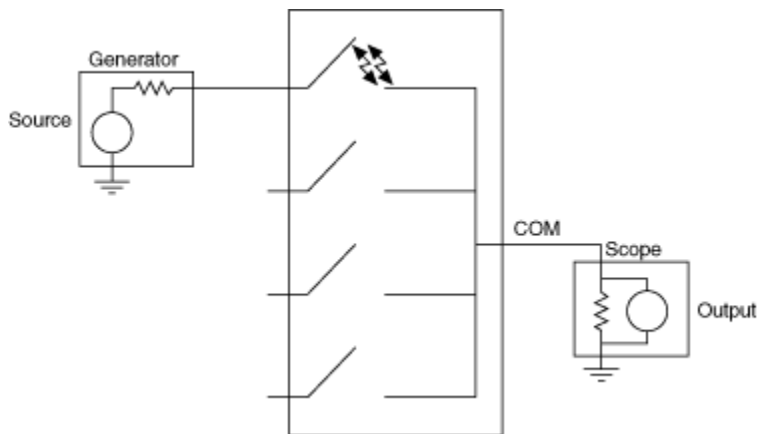
Isolation is the ability to keep a signal on an unused channel from appearing on an active, terminated channel. Isolation is specified in dB of rejection, according to one of the following equations:

$$\text{Isolation (dB)} = 10 \log (P_{\text{source}} / P_{\text{out}})$$

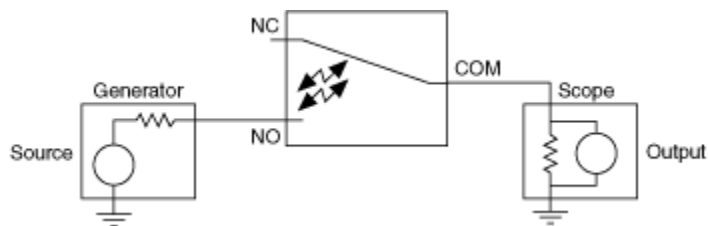
$$\text{Isolation (dB)} = 20 \log (V_{\text{source}} / V_{\text{out}})$$

The following figures illustrate isolation.

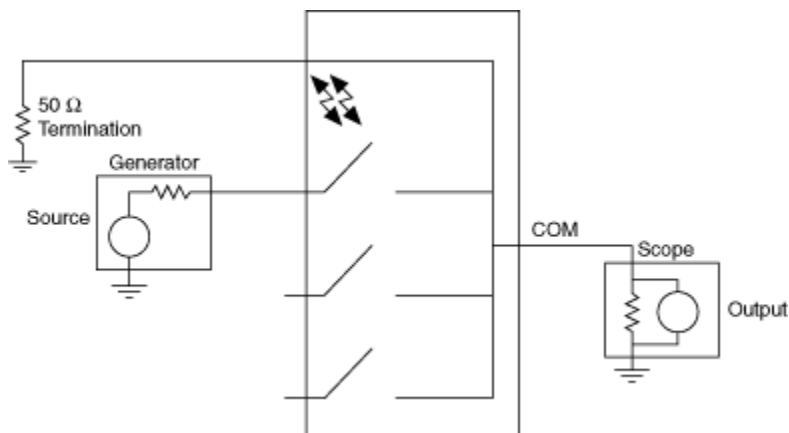
Open Relay Isolation on a Multiplexer Module



Open Relay Isolation on a General Purpose Module



Channel to Channel Isolation



Scanning Fundamentals

Scanning is typically used when the timing of connections must be synchronized with an event from another device, such as a measurement device (hardware-timed scanning), or must be timed by software (software-timed scanning).

Connection operations are entered in a scan list that is downloaded to the memory of the switch module. The first entry in the scan list is executed when the scan is initiated. The trigger settings determine how the switch advances through subsequent entries in the list. The scan list can be executed once or repeatedly.

There are three trigger schemes for scanning:

- Software trigger scanning—Used for software-timed scanning
- Synchronous scanning—Used for hardware-timed scanning
- Handshaking—Used for hardware-timed scanning



Note Some devices may not support scanning. Refer to your device book for more information about supported features.

Related concepts:

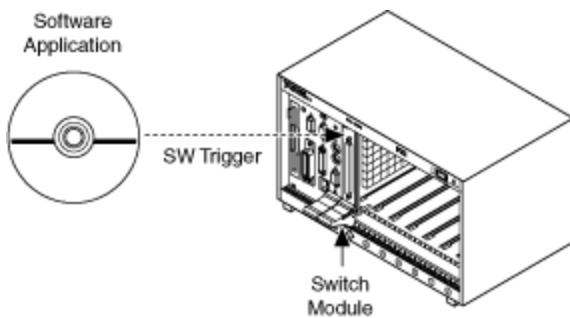
- [Scan Lists](#)
- [Software Trigger Scanning](#)
- [Synchronous Scanning](#)
- [Handshaking](#)

Software Trigger Scanning

The niSwitch Send Software Trigger VI and the `niSwitch_SendSoftwareTrigger` function allow you to advance to the next entry in a scan list through a software command. You can use this software command instead of sending triggers on the trigger input terminal. The switch can still optionally send a trigger on measurement complete once it has settled. Call the niSwitch Send Software Trigger VI or the `niSwitch_SendSoftwareTrigger` function again to execute the next scan list entry. The switch can still optionally send a trigger on the digital pulse, or measurement complete signal, once it has settled. The following figure represents a software trigger scanning application.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.



Related concepts:

- [Scan Lists](#)

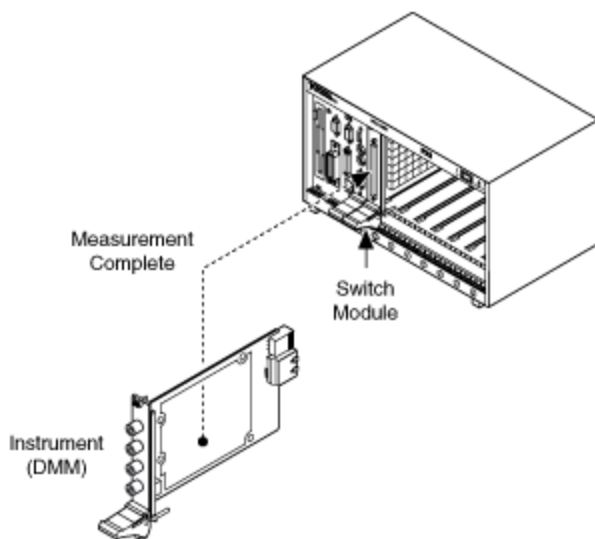
Synchronous Scanning

NI recommends using handshaking when using NI switch and DMM products. If using other brands of hardware that do not have a trigger input, NI recommends using synchronous mode.

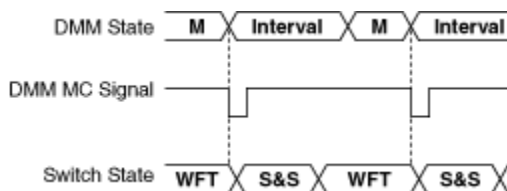
With synchronous scanning, the DMM takes a measurement and generates a digital pulse—the measurement complete (MC) signal. When the switch receives this digital pulse, it advances to the next entry in its scan list. The DMM takes the next measurement after a time interval. You must program the DMM interval time by configuring an Interval Sample trigger. Set the **interval** parameter to the time needed for the switch to activate and settle. Initiate the switch before initiating the DMM for its first measurement. The following figure represents a synchronous scanning operation.



Note Some devices may not support scanning. Refer to your device book for more information about supported features.



The following figure represents a synchronous scanning timing diagram.



where

M = measurement

WFT = wait for trigger

S&S = switch and settle

Related concepts:

- [Handshaking](#)

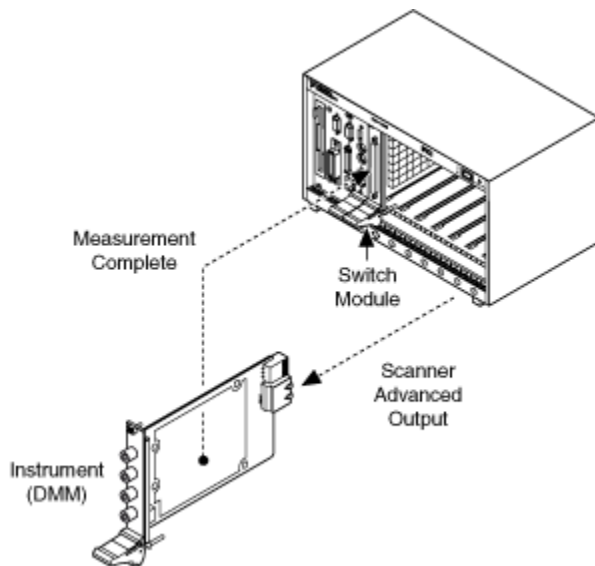
Handshaking

Handshaking allows the DMM and switch to take measurements without controller interaction. The controller periodically acquires data from the DMM at a user-specified interval. Handshaking frees the controller for other tasks and takes measurements faster than immediate operations mode. The handshaking trigger is sent from both DMM to switch and switch to DMM. This differs from synchronous mode, in which only

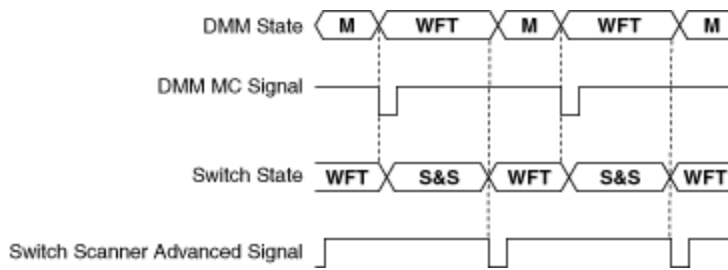
one trigger is sent from the DMM to switch. Scanning is faster in handshaking mode; therefore, handshaking is recommended over synchronous mode when using NI products.

With handshaking, the DMM is initiated and waiting for a trigger. The switch module is initiated, executes the first connection in the scan list, and generates a digital pulse—Scan Advanced (SA) signal. The DMM receives this signal from the switch, takes a measurement, and then generates a digital pulse—measurement complete (MC). When the switch receives the digital pulse, it advances to the next entry in its scan list. After the relays of the switch module have settled, the switch sends a digital pulse and triggers the DMM for a new measurement. Refer to the Multiple Point Acquisitions topic in the NI Digital Multimeters Help at ni.com/manuals to determine the triggering options. The following figure represents a handshaking process between a switch module and DMM (instrument).

 **Note** Some devices may not support scanning. Refer to your device book for more information about supported features.



The following figure shows a handshaking timing diagram.



where

M = measurement

WFT = wait for trigger

S&S = switch and settle

Related concepts:

- [Immediate Operations](#)
- [Synchronous Scanning](#)

NI-SWITCH Switches

NI PXI-2501/2503

The NI PXI-2501/2503 are multiplexer/matrix switch modules for the PXI platform. The NI PXI-2501 is composed of FET switches, and the NI PXI-2503 uses armature relays.

NI PXI-2501 Operation Modes

The following table lists the supported topology of the NI PXI-2501 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 48×1 Multiplexer	2501/1-Wire 48x1 Mux(NISWITCH_TOPOLOGY_2501_1_WIRE_48X1_MUX)	✓	✓
1-Wire 48×1 Amplified Multiplexer	2501/1-Wire 48x1 Amplified Mux(NISWITCH_TOPOLOGY_2501_1_WIRE_48X1_AMPLIFIED_MUX)	✓	✓
2-Wire 24×1 Multiplexer	2501/2-Wire 24x1 Mux(NISWITCH_TOPOLOGY_2501_2_WIRE_24X1_MUX)	✓	✓
2-Wire 24×1 Amplified Multiplexer	2501/2-Wire 24x1 Amplified Mux(NISWITCH_TOPOLOGY_2501_2_WIRE_24X1_AMPLIFIED_MUX)	✓	✓
2-Wire Dual 12×1 Multiplexer	2501/2-Wire Dual 12x1 Mux(NISWITCH_TOPOLOGY_2501_2_WIRE_DUAL_12X1_MUX)	✓	✓
2-Wire Quad 6×1 Multiplexer	2501/2-Wire Quad 6x1 Mux(NISWITCH_TOPOLOGY_2501_2_WIRE_QUAD_6X1_MUX)	✓	✓
2-Wire 4×6 Matrix	2501/2-Wire 4x6 Matrix(NISWITCH_TOPOLOGY_2501_2_WIRE_4X6_MATRIX)	✓	✓

Topology	Software Name	Immediate	Scanning
4-Wire 12×1 Multiplexer	2501/4-Wire 12x1 Mux(NISWITCH_TOPOLOGY_2501_4_WIRE_12X1_MUX)	✓	✓

NI PXI-2503 Operation Modes

The following table lists the supported topologies of the NI PXI-2503 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 48×1 Multiplexer	2503/1-Wire 48x1 Mux(NISWITCH_TOPOLOGY_2503_1_WIRE_48X1_MUX)	✓	✓
2-Wire 24×1 Multiplexer	2503/2-Wire 24x1 Mux(NISWITCH_TOPOLOGY_2503_2_WIRE_24X1_MUX)	✓	✓
2-Wire Dual 12×1 Multiplexer	2503/2-Wire Dual 12x1 Mux(NISWITCH_TOPOLOGY_2503_2_WIRE_DUAL_12X1_MUX)	✓	✓
2-Wire Quad 6×1 Multiplexer	2503/2-Wire Quad 6x1 Mux(NISWITCH_TOPOLOGY_2503_2_WIRE_QUAD_6X1_MUX)	✓	✓
2-Wire 4×6 Matrix	2503/2-Wire 4x6 Matrix(NISWITCH_TOPOLOGY_2503_2_WIRE_4X6_MATRIX)	✓	✓
4-Wire 12×1 Multiplexer	2503/4-Wire 12x1 Mux(NISWITCH_TOPOLOGY_2503_4_WIRE_12X1_MUX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [NI PXI-2501/2503 1-Wire 48×1 Multiplexer Topology](#)
- [NI PXI-2501 1-Wire 48×1 Amplified Multiplexer Topology](#)
- [NI PXI-2501/2503 2-Wire 24×1 Multiplexer Topology](#)
- [NI PXI-2501 2-Wire 24×1 Amplified Multiplexer Topology](#)

- [NI PXI-2501/2503 2-Wire Dual 12×1 Multiplexer Topology](#)
- [NI PXI-2501/2503 2-Wire Quad 6×1 Multiplexer Topology](#)
- [NI PXI-2501/2503 2-Wire 4×6 Matrix Topology](#)
- [NI PXI-2501/2503 4-Wire 12×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2501 Amplifier

The NI PXI-2501 has an amplifier with a gain of 1. This amplifier can be switched in-line before the COM0 signal and the AB0 signal. The amplifier helps decrease the settling time of the FET switch. The high-impedance amplifier isolates the FET from the resistance, capacitance, and inductance in the external wiring. This isolation decreases the resistance/capacitance time constant seen by the FET, which improves settling time. When the amplifier is used, the switch module becomes directional, where CHx is for signal inputs and COM0 or AB0 are for signal outputs.

The amplifier has an offset that can be calibrated for more accurate measurements. The calibration data can be stored into and retrieved from the EEPROM on the module.

The NI PXI-2501 also has an amplifier in the CJS0+ to COM0+ signal path. This amplifier in the cold-junction sensor signal path is used to improve settling time performance. It prevents the impedance of the cold-junction sensor from increasing the settling time when switching the CJS channel. As a result, when scanning thermocouples, the settling time for the cold-junction sensor channel should be about the same as for the channels with the thermocouples.

Related concepts:

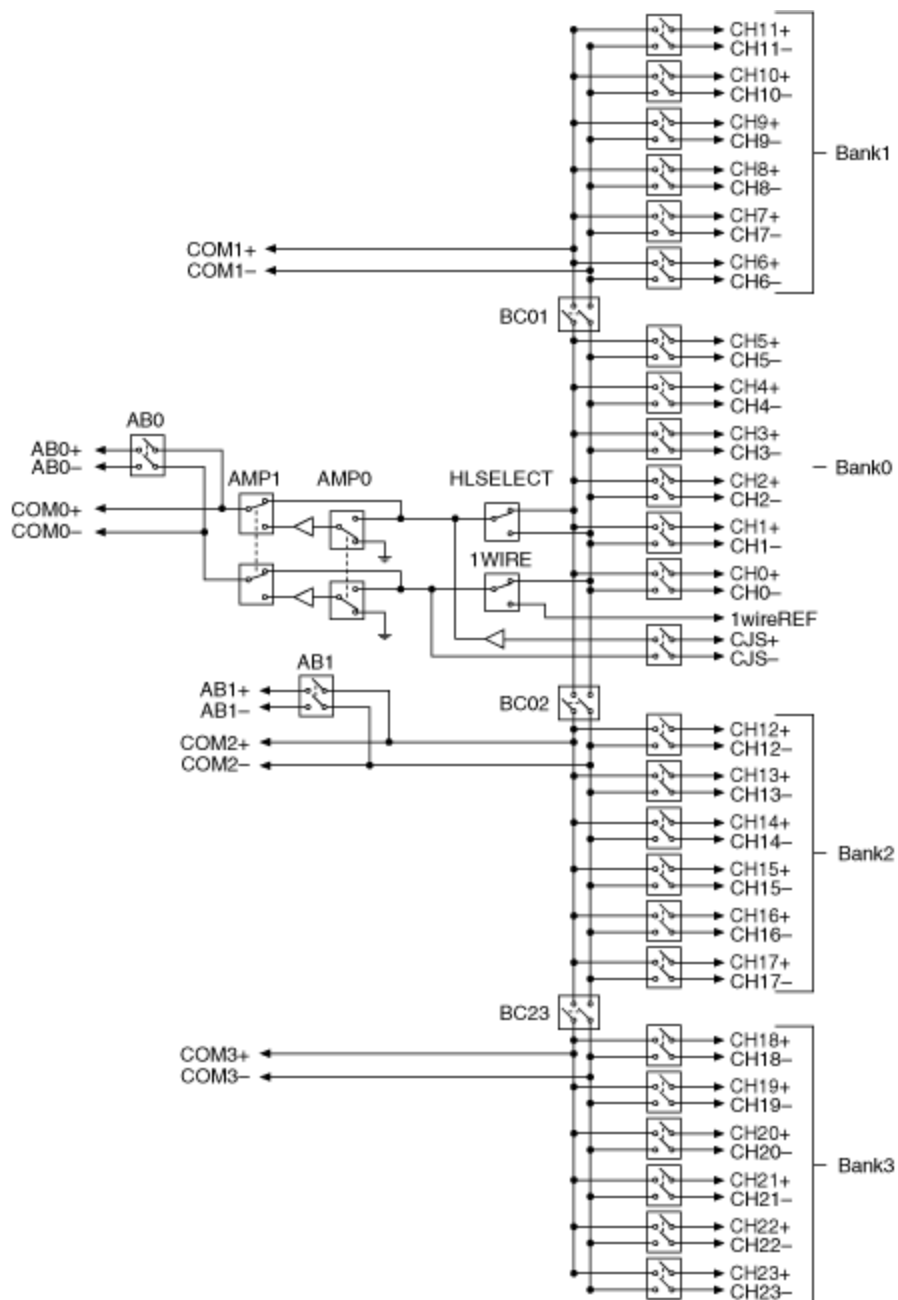
- [FET Switches](#)

NI PXI-2501 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2501.



Note Relay names are the same for every topology.



NI PXI-2501 1-Wire 48×1 Amplified Multiplexer Topology

When using the NI PXI-2501 as a 1-wire 48×1 amplified multiplexer, connect your signals using the NI TB-2605 terminal block. The following figure is a representation of the NI PXI-2501 in this mode.



The NI PXI-2501 in this topology operates the same way as the 1-wire 48×1 multiplexer topology except that an amplifier, indicated in the figure above, can be used.

Related concepts:

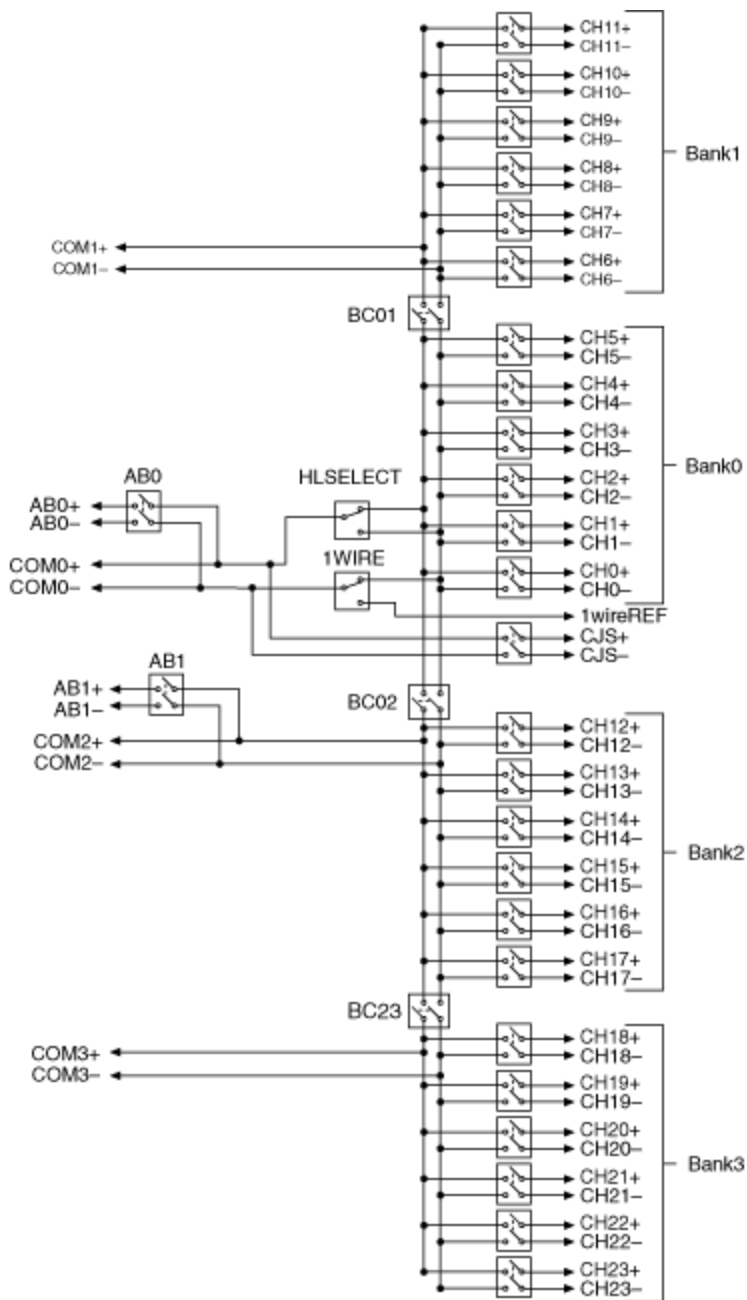
- [N-Wire Switching Modes](#)
- [NI PXI-2501 Amplifier](#)
- [Multiplexer](#)
- [NI PXI-2501/2503 1-Wire 48×1 Multiplexer Topology](#)

NI PXI-2503 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2503.



Note Relay names are the same for every topology.



NI PXI-2501/2503 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2501/2503.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on TB-2605 terminal block

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2501/2503.

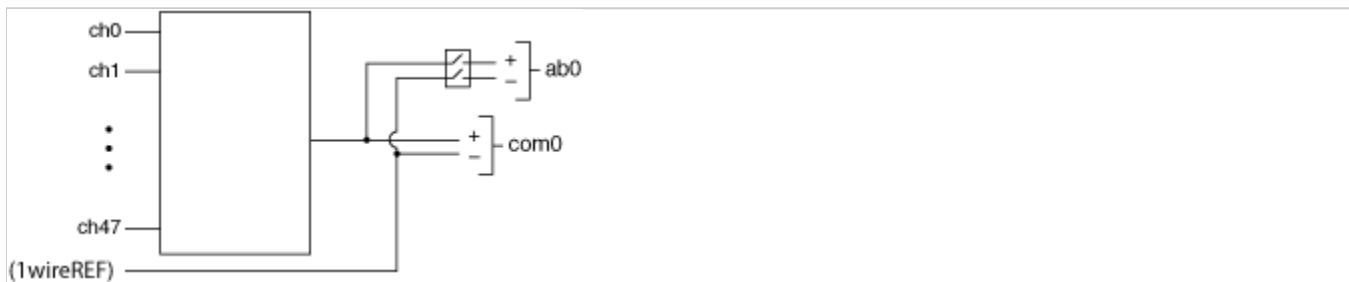
Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Scan Advanced Output	Software	Hardware
Front Connector	External(NISWITCH_VAL_EXTERNAL)	SCANADV on TB-2605 terminal block

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2501/2503 1-Wire 48×1 Multiplexer Topology

When using the NI PXI-2501/2503 as a 1-wire 48×1 multiplexer, connect your signals using the NI TB-2605 terminal block. The following figure is a representation of the NI PXI-2501/2503 in this mode.



Making a Connection

In 1-wire mode, all channels can connect to COM0+. COM0– is always connected to 1_WIRE_LO_REF and can optionally be used to route the second wire of a different signal (for example, the LO terminal of a DMM) through the switch.

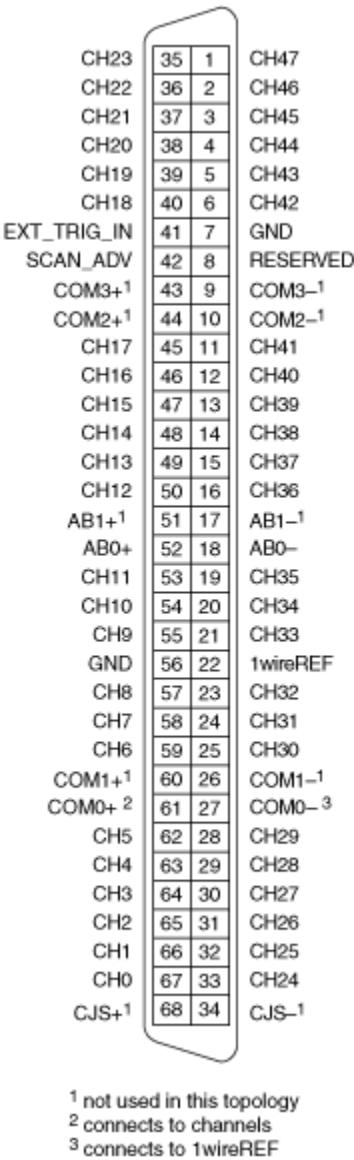
During scanning, an example scan list entry is `ch2->com0 ;`. This entry routes the signal connected to ch2 to COM0+.

During immediate operations when calling the niSwitch Connect Channels VI or the `niSwitch_Connect` function with `ch2` and `com0`, the signal connected to ch2 is routed to COM0+. To route the signals to AB0, use the niSwitch Connect Channels VI or the `niSwitch_Connect` function with `com0` and `ab0`.

Pinout

The following figure and tables identify the pins for the NI PXI-2501/2503 in the 1-wire

48×1 multiplexer topology.



Caution Do not connect to RESERVED pins.

Pinout

Software Name	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name	
ch0	67	CH0
ch1	66	CH1

Software Name	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name	
ch2	65	CH2
ch3	64	CH3
ch4	63	CH4
ch5	62	CH5
ch6	59	CH6
ch7	58	CH7
ch8	57	CH8
ch9	55	CH9
ch10	54	CH10
ch11	53	CH11
ch12	50	CH12
ch13	49	CH13
ch14	48	CH14
ch15	47	CH15
ch16	46	CH16
ch17	45	CH17
ch18	40	CH18
ch19	39	CH19
ch20	38	CH20
ch21	37	CH21
ch22	36	CH22
ch23	35	CH23
ch24	33	CH24
ch25	32	CH25
ch26	31	CH26
ch27	30	CH27

Software Name	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name	
ch28	29	CH28
ch29	28	CH29
ch30	25	CH30
ch31	24	CH31
ch32	23	CH32
ch33	21	CH33
ch34	20	CH34
ch35	19	CH35
ch36	16	CH36
ch37	15	CH37
ch38	14	CH38
ch39	13	CH39
ch40	12	CH40
ch41	11	CH41
ch42	6	CH42
ch43	5	CH43
ch44	4	CH44
ch45	3	CH45
ch46	2	CH46
ch47	1	CH47
1wire	22	1wireREF
com0	61	COM0+
27	COM0–	
ab0	52	AB0+
18	AB0–	
No Connect ¹	60	COM1+

Software Name	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name	
26	COM1–	
No Connect ¹	44	COM2+
10	COM2–	
No Connect ¹	43	COM3+
9	COM3–	
No Connect ¹	51	AB1+
17	AB1–	
¹ Not used in this topology		

Additional Pin References

NI PXI-2501/2503 Connector Pin Number	Signal name
7, 56	GND
41	TRIG IN
42	SCANADV
8	RESERVED
68	CJS+
34	CJS-

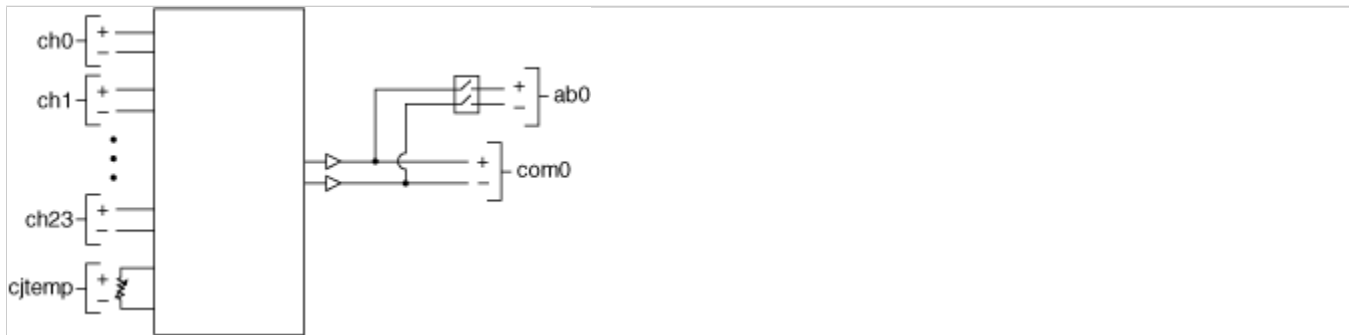
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [Operation Modes](#)

NI PXI-2501 2-Wire 24×1 Amplified Multiplexer Topology

When using the NI PXI-2501 as a 2-wire 24×1 amplified multiplexer, connect your signals using the NI TB-2605 terminal block. In this topology, you can connect to a

cold-junction sensor channel for cold-junction compensation. The following figure is a representation of the NI PXI-2501 in this mode.



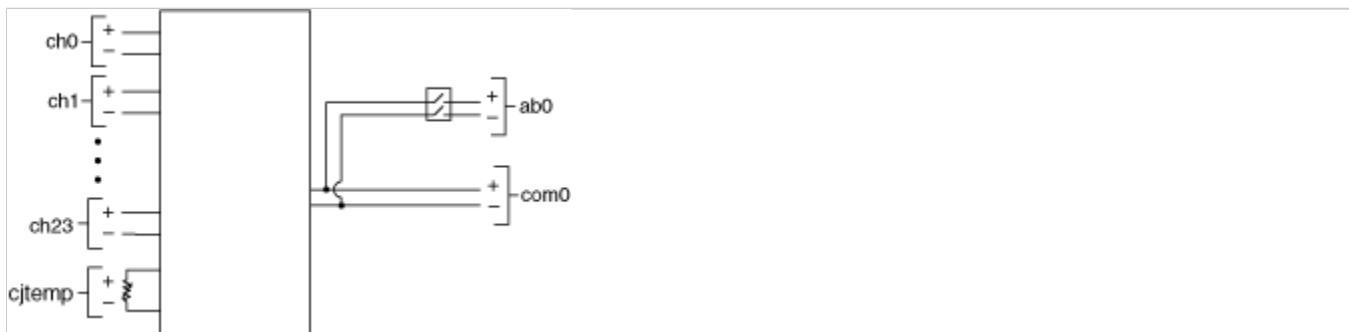
The NI PXI-2501 in this topology operates the same way as the 2-wire 24×1 multiplexer topology except that an amplifier, indicated in the figure above, can be used.

Related concepts:

- [N-Wire Switching Modes](#)
- [NI PXI-2501 Amplifier](#)
- [Multiplexer](#)
- [Cold-Junction Temperature Sensor Channel](#)
- [NI PXI-2501/2503 2-Wire 24×1 Multiplexer Topology](#)

NI PXI-2501/2503 2-Wire 24×1 Multiplexer Topology

When using the NI PXI-2501/2503 as a 2-wire 24×1 multiplexer, connect your signals using the NI TB-2605 terminal block. In this topology, you can connect to a Cold-Junction Sensor Channel for cold-junction compensation. The following figure is a representation of the NI PXI-2501/2503 in this mode.



Making a Connection

The NI PXI-2501/2503 in this topology contains 24 2-wire input channels connected to a common 2-wire channel. In software, these input channels are referred to as `ch<0..23>` and the common channel is referred to as `com0`. All positive leads (`CH0+` through `CH23+`) can connect to `COM0+`, and all negative leads (`CH0-` through `CH23-`) can connect to `COM0-`.

For example, to connect a 2-wire signal to `ch5`, wire the HI side to `CH5+` and the LO side to `CH5-`. For `com0`, connect to `COM0+` and `COM0-` for the HI and LO of the signal, respectively.

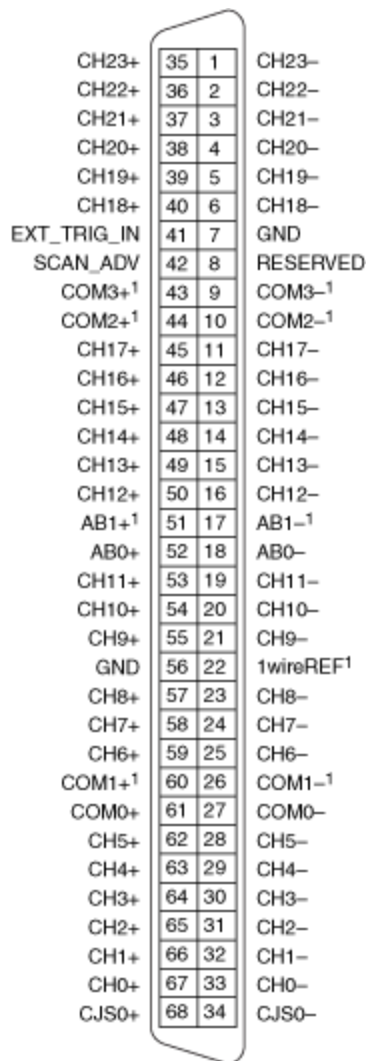
You can also route `cjtemp` to `com0`, which routes `com0` to a temperature sensor on the NI TB-2605 terminal block. Refer to Cold-Junction Sensor Channel for more information.

During scanning, an example scan list entry is `CH2->com0 ;`. This entry routes the signal connected to `CH2+` to `COM0+` and the signal connected to `CH2-` to `COM0-`.

During immediate operations when calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `ch2` and `com0`, the signal connected to `CH2+` is routed to `COM0+` and the signal connected to `CH2-` is routed to `COM0-`. To route the signals to `AB0`, use the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `com0` and `ab0`.

Pinout

The following figure and tables identify the pins for the NI PXI-2501/2503 in the 2-wire 24×1 multiplexer topology.



¹not used in this topology



Caution Do not connect to RESERVED pins.

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
ch0	+	67	CH0+
–	33	CH0–	
ch1	+	66	CH1+
–	32	CH1–	
ch2	+	65	CH2+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	31	CH2–	
ch3	+	64	CH3+
–	30	CH3–	
ch4	+	63	CH4+
–	29	CH4–	
ch5	+	62	CH5+
–	28	CH5–	
ch6	+	59	CH6+
–	25	CH6–	
ch7	+	58	CH7+
–	24	CH7–	
ch8	+	57	CH8+
–	23	CH8–	
ch9	+	55	CH9+
–	21	CH9–	
ch10	+	54	CH10+
–	20	CH10–	
ch11	+	53	CH11+
–	19	CH11–	
ch12	+	50	CH12+
–	16	CH12–	
ch13	+	49	CH13+
–	15	CH13–	
ch14	+	48	CH14+
–	14	CH14–	
ch15	+	47	CH15+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	13	CH15–	
ch16	+	46	CH16+
–	12	CH16–	
ch17	+	45	CH17+
–	11	CH17–	
ch18	+	40	CH18+
–	6	CH18–	
ch19	+	39	CH19+
–	5	CH19–	
ch20	+	38	CH20+
–	4	CH20–	
ch21	+	37	CH21+
–	3	CH21–	
ch22	+	36	CH22+
–	2	CH22–	
ch23	+	35	CH23+
–	1	CH23–	
com0	+	61	COM0+
–	27	COM0–	
ab0	+	52	AB0+
–	18	AB0–	
No Connect ¹	+	60	COM1+
–	26	COM1–	
No Connect ¹	+	44	COM2+
–	10	COM2–	
No Connect ¹	+	43	COM3+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	9	COM3–	
No Connect ¹	+	51	AB1+
–	17	AB1–	
¹ Not used in this topology			

Additional Pin References

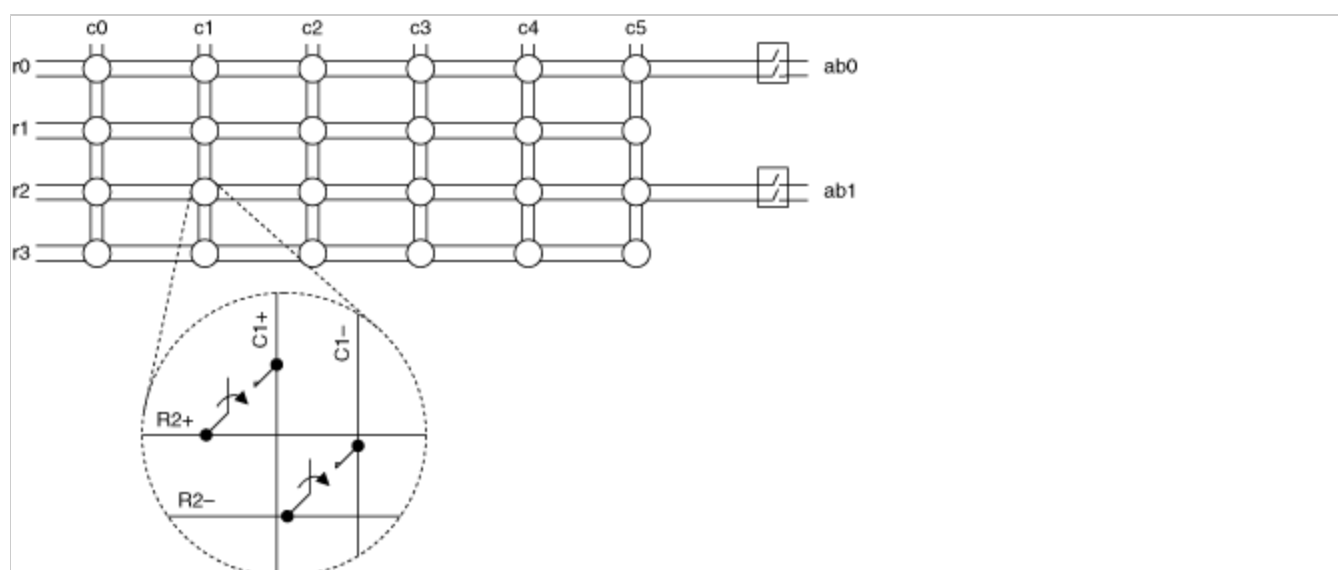
NI PXI-2501/2503 Connector Pin Number	Signal name
7, 56	GND
41	TRIG IN
42	SCANADV
8	RESERVED
68	CJS+
34	CJS-
22	1wireREF

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [Cold-Junction Temperature Sensor Channel](#)

NI PXI-2501/2503 2-Wire 4×6 Matrix Topology

When using the NI PXI-2501/2503 as a 2-wire 4×6 matrix, connect your signals using the NI TB-2606 terminal block. The following figure is a representation of the NI PXI-2501/2503 in this mode.



Making a Connection

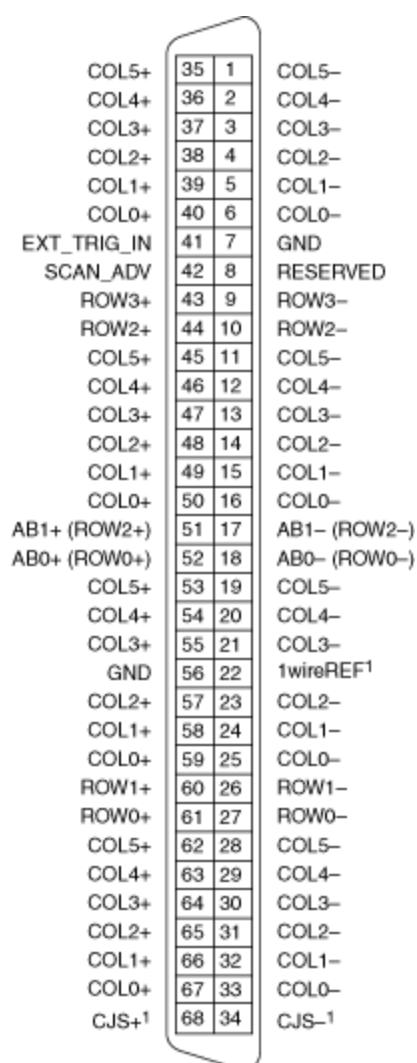
In this topology, connect your positive and negative leads to $Cx\pm$ or $Rx\pm$ inside the NI TB-2606 terminal block.

During scanning, an example scan list entry is `r2->c1;`. This entry routes the signal connected to $R2+$ to $C1+$ and connects $R2-$ to $C1-$.

During immediate operations when calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `r2` and `c1`, the signal connected to $R2+$ is routed to $C1+$ and the signal connected to $R2-$ is routed to $C1-$. To route the signals to $AB0$, use the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `com0` and `ab0`.

Pinout

The following figure and tables identify the pins for the NI PXI-2501/2503 in the 2-wire 4x6 matrix topology.



¹not used in this topology

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2606 Terminal Name		
c0	+	67, 59, 50, 40	C0+
-	33, 25, 16, 6	C0-	
c1	+	66, 58, 49, 39	C1+
-	32, 24, 15, 5	C1-	
c2	+	65, 57, 48, 38	C2+
-	31, 23, 14, 4	C2-	
c3	+	64, 55, 47, 37	C3+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2606 Terminal Name		
-	30, 21, 13, 3	C3-	
c4	+	63, 54, 46, 36	C4+
-	29, 20, 12, 2	C4-	
c5	+	62, 53, 45, 35	C5+
-	28, 19, 11, 1	C5-	
r0	+	61	R0+
-	27	R0-	
r1	+	60	R1+
-	26	R1-	
r2	+	44	R2+
-	10	R2-	
r3	+	43	R3+
-	9	R3-	
ab0	+	52	AB0+
-	18	AB0-	
ab1	+	51	AB1+
-	17	AB1-	

Additional Pin References

NI PXI-2501/2503 Connector Pin Number	Signal name
7, 56	GND
41	TRIG IN
42	SCANADV
8	RESERVED
68	CJS+
34	CJS-

NI PXI-2501/2503 Connector Pin Number	Signal name
22	1wireREF



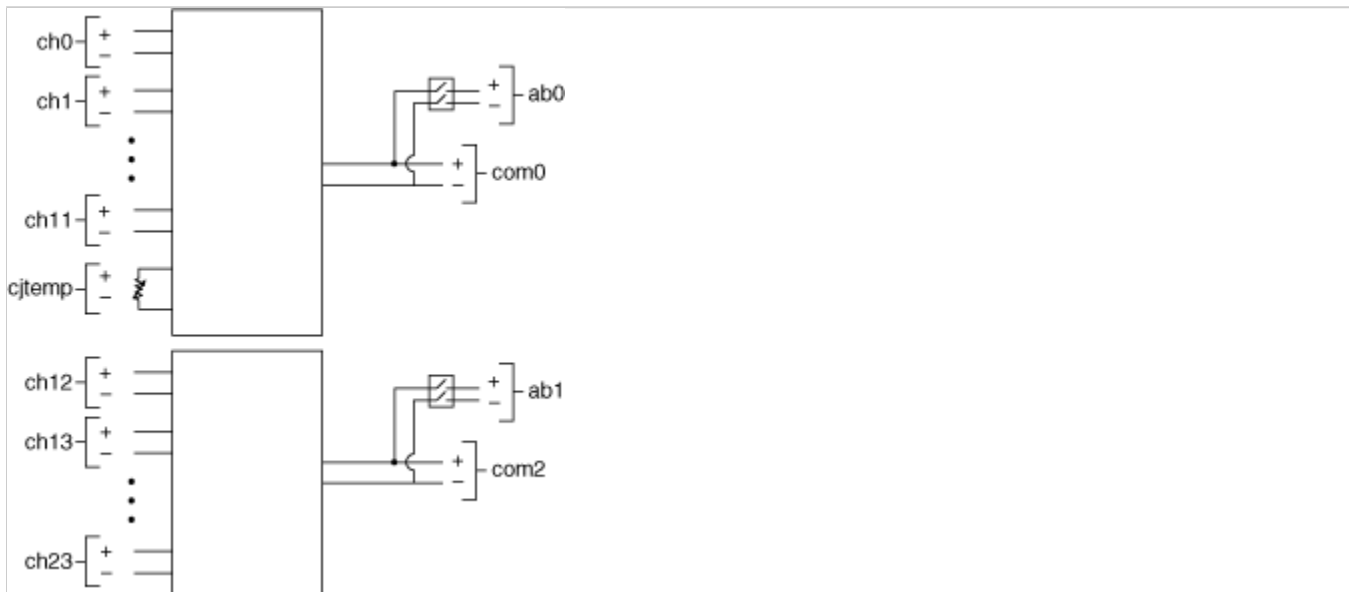
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [Operation Modes](#)

NI PXI-2501/2503 2-Wire Dual 12×1 Multiplexer Topology

When using the NI PXI-2501/2503 as a 2-wire dual 12×1 multiplexer, connect your signals using the NI TB-2605 terminal block. In this topology, you can connect to a Cold-Junction Sensor Channel for cold-junction compensation. The following figure is a representation of the NI PXI-2501/2503 in this mode.



Making a Connection

The NI PXI-2501/2503 in this topology contains two banks of 12 2-wire input channels connected to a common 2-wire channel. These input channels are referred to as

ch<0..23> and the two common channels are referred to as com0 and com2. You can only connect to the common channel that is in the same bank. The banks are organized as follows:

Input Channels	Common Channel
ch0, ch1, ch2, ch3, ch4, ch5, ch6, ch7, ch8, ch9, ch10, ch11, cjtemp	com0
ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20, ch21, ch22, ch23	com2

For example, you can connect ch5 to com0; however, you cannot connect ch5 to com2 in this topology. When connecting signals for ch5, you would connect them to CH5+ and CH5– for HI and LO of the signal, respectively. For com0, connect to COM0+ and COM0– for HI and LO of the signal, respectively.

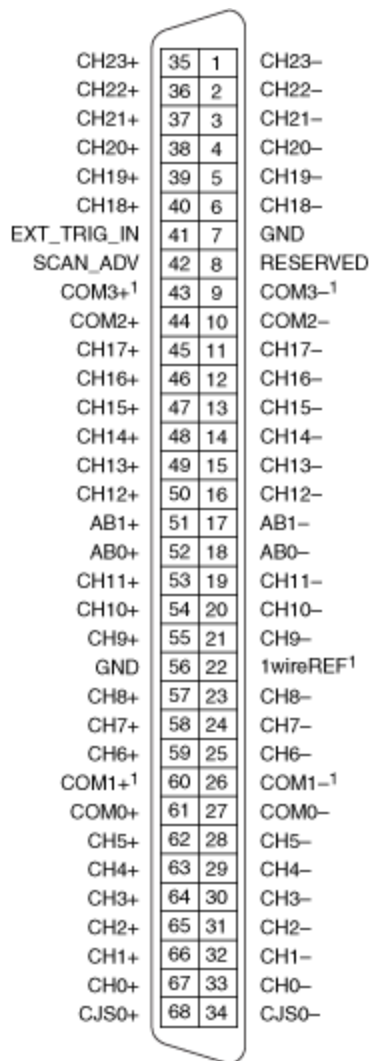
Notice that in the first bank you can connect cjtemp to com0. This connects com0 to a temperature sensor on the NI TB-2605 terminal block. Refer to Cold-Junction Sensor Channel for more information.

During scanning, an example scan list entry is `ch2->com0 ;`. This entry routes the signal connected to CH2+ to COM0+ and the signal from CH2– to COM0–.

During immediate operations when calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `ch2+` and `com0`, the signal connected to CH2+ is routed to COM0+ and the signal connected to CH2– is routed to COM0–. To route the signals to AB0, use the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `com0` and `ab0`.

Pinout

The following figure and tables identify the pins for the NI PXI-2501/2503 in the 2-wire dual 12×1 multiplexer topology.



¹not used in this topology



Caution Do not connect to RESERVED pins.

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
ch0	+	67	CH0+
–	33	CH0–	
ch1	+	66	CH1+
–	32	CH1–	
ch2	+	65	CH2+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	31	CH2–	
ch3	+	64	CH3+
–	30	CH3–	
ch4	+	63	CH4+
–	29	CH4–	
ch5	+	62	CH5+
–	28	CH5–	
ch6	+	59	CH6+
–	25	CH6–	
ch7	+	58	CH7+
–	24	CH7–	
ch8	+	57	CH8+
–	23	CH8–	
ch9	+	55	CH9+
–	21	CH9–	
ch10	+	54	CH10+
–	20	CH10–	
ch11	+	53	CH11+
–	19	CH11–	
ch12	+	50	CH12+
–	16	CH12–	
ch13	+	49	CH13+
–	15	CH13–	
ch14	+	48	CH14+
–	14	CH14–	
ch15	+	47	CH15+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	13	CH15–	
ch16	+	46	CH16+
–	12	CH16–	
ch17	+	45	CH17+
–	11	CH17–	
ch18	+	40	CH18+
–	6	CH18–	
ch19	+	39	CH19+
–	5	CH19–	
ch20	+	38	CH20+
–	4	CH20–	
ch21	+	37	CH21+
–	3	CH21–	
ch22	+	36	CH22+
–	2	CH22–	
ch23	+	35	CH23+
–	1	CH23–	
com0	+	61	COM0+
–	27	COM0–	
com2	+	44	COM2+
–	10	COM2–	
ab0	+	52	AB0+
–	18	AB0–	
ab1	+	51	AB1+
–	17	AB1–	
No Connect ¹	+	60	COM1+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	26	COM1–	
No Connect ¹	+	43	COM3+
–	9	COM3–	
¹ Not used in this topology			

Additional Pin References

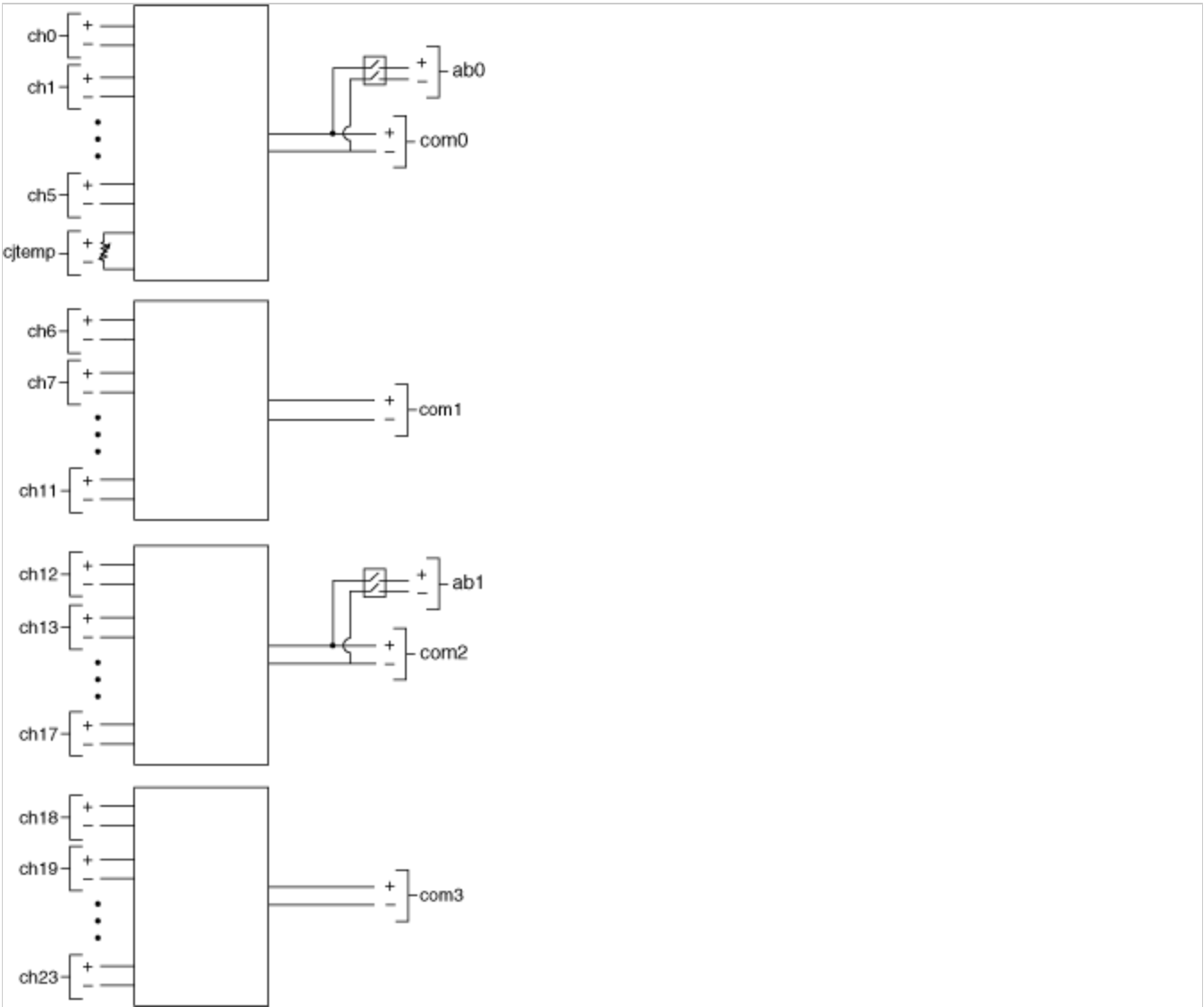
NI PXI-2501/2503 Connector Pin Number	Signal name
7, 56	GND
41	TRIG IN
42	SCANADV
8	RESERVED
68	CJS+
34	CJS-
22	1wireREF

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [Cold-Junction Temperature Sensor Channel](#)

NI PXI-2501/2503 2-Wire Quad 6×1 Multiplexer Topology

When using the NI PXI-2501/2503 as a 2-wire quad 6×1 multiplexer, connect your signals using the NI TB-2605 terminal block. In this topology, you can connect to a Cold-Junction Temperature Sensor Channel for cold-junction compensation. The following figure is a representation of the NI PXI-2501/2503 in this mode.



Making a Connection

The NI PXI-2501/2503 in this topology contains four banks of six 2-wire input channels connected to a common 2-wire channel. These input channels are referred to as ch<0..23>, and the four common channels are referred to as com<0..3>. You can only connect to the common channel that is in the same bank. The banks are organized as shown in the following table.

Input Channels	Common Channel
ch0, ch1, ch2, ch3, ch4, ch5, cjtemp	com0
ch6, ch7, ch8, ch9, ch10, ch11	com1

Input Channels	Common Channel
ch12, ch13, ch14, ch15, ch16, ch17	com2
ch18, ch19, ch20, ch21, ch22, ch23	com3

For example, you can connect ch5 to com0; however, you cannot connect ch5 to com1 in this topology. When connecting signals for ch5, you would connect them to CH5+ and CH5– for HI and LO of the signal, respectively. For com0, connect to COM0+ and COM0– for HI and LO of the signal, respectively.

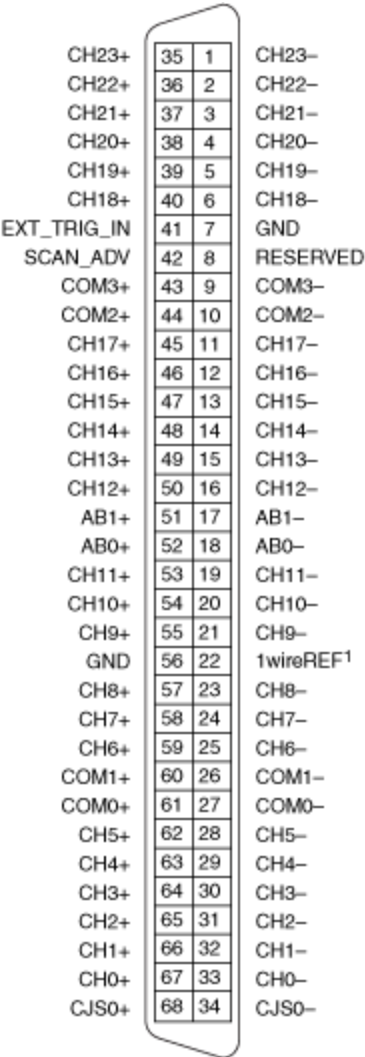
Notice that in the first bank you can connect `cjtemp` to com0. This connects com0 to a temperature sensor on the NI TB-2605 terminal block. Refer to Cold-Junction Temperature Sensor Channel for more information.

During scanning, an example scan list entry is `ch2->com0 ;`. This entry routes the signal connected to CH2+ to COM0+ and the signal connected to CH2– is routed to COM0–.

During immediate operations when calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `ch2` and `com0`, the signal connected to CH2+ is routed to COM0+. To route the signals to ABO, use the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with `com0` and `ab0` and the signal connected to CH2– is routed to COM0–.

Pinout

The following figure and tables identify the pins for the NI PXI-2501/2503 in the 2-wire quad 6×1 multiplexer topology.



¹not used in this topology

Caution Do not connect to RESERVED pins.

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
ch0	+	67	CH0+
-	33	CH0-	
ch1	+	66	CH1+
-	32	CH1-	
ch2	+	65	CH2+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	31	CH2–	
ch3	+	64	CH3+
–	30	CH3–	
ch4	+	63	CH4+
–	29	CH4–	
ch5	+	62	CH5+
–	28	CH5–	
ch6	+	59	CH6+
–	25	CH6–	
ch7	+	58	CH7+
–	24	CH7–	
ch8	+	57	CH8+
–	23	CH8–	
ch9	+	55	CH9+
–	21	CH9–	
ch10	+	54	CH10+
–	20	CH10–	
ch11	+	53	CH11+
–	19	CH11–	
ch12	+	50	CH12+
–	16	CH12–	
ch13	+	49	CH13+
–	15	CH13–	
ch14	+	48	CH14+
–	14	CH14–	
ch15	+	47	CH15+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	13	CH15–	
ch16	+	46	CH16+
–	12	CH16–	
ch17	+	45	CH17+
–	11	CH17–	
ch18	+	40	CH18+
–	6	CH18–	
ch19	+	39	CH19+
–	5	CH19–	
ch20	+	38	CH20+
–	4	CH20–	
ch21	+	37	CH21+
–	3	CH21–	
ch22	+	36	CH22+
–	2	CH22–	
ch23	+	35	CH23+
–	1	CH23–	
com0	+	61	COM0+
–	27	COM0–	
com1	+	60	COM1+
–	26	COM1–	
com2	+	44	COM2+
–	10	COM2–	
com3	+	43	COM2+
–	9	COM2–	
ab0	+	52	AB0+

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
–	18	AB0–	
ab1	+	51	AB1+
–	17	AB1–	
¹ Not used in this topology			

Additional Pin References

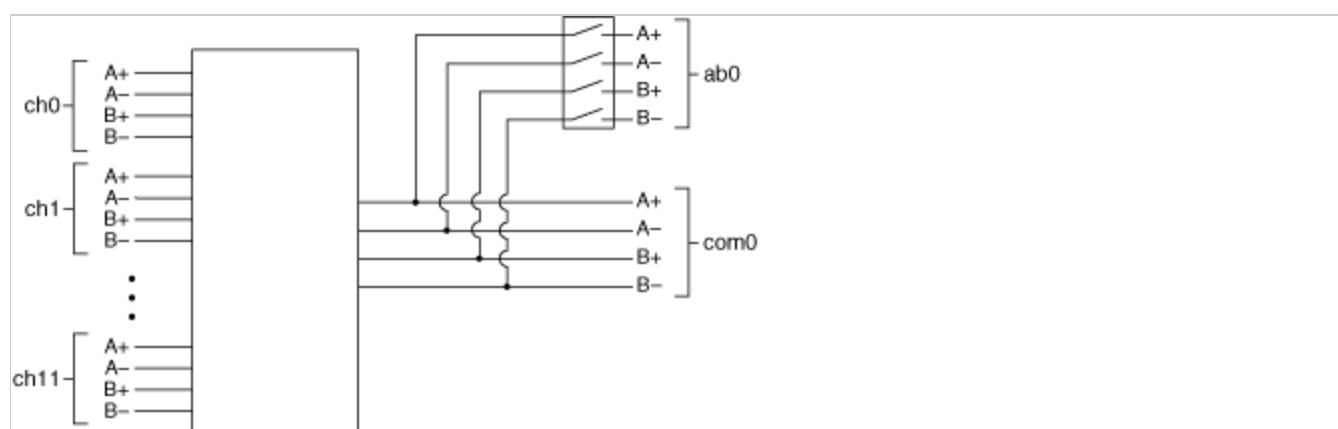
NI PXI-2501/2503 Connector Pin Number	Signal name
7, 56	GND
41	TRIG IN
42	SCANADV
8	RESERVED
68	CJS+
34	CJS-
22	1wireREF

Related concepts:

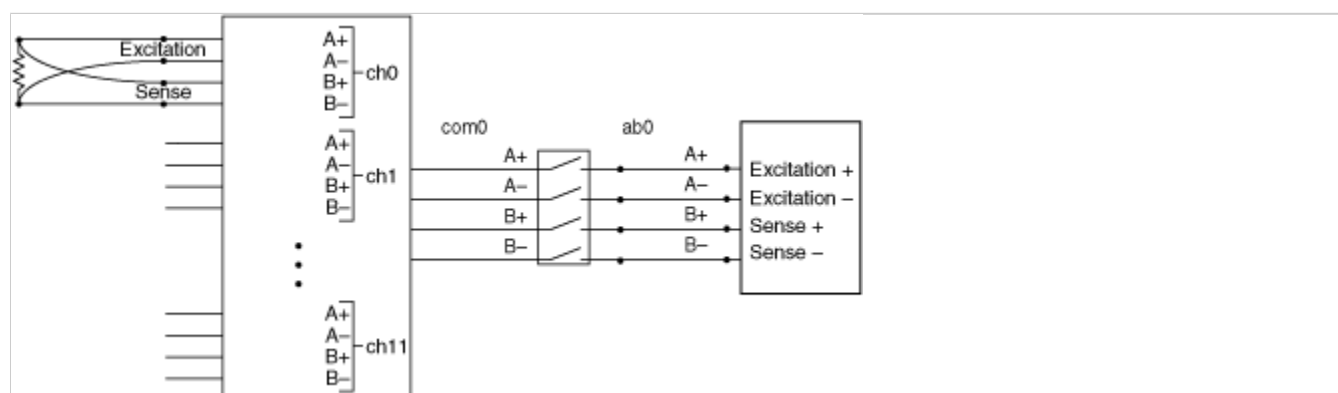
- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [Cold-Junction Temperature Sensor Channel](#)

NI PXI-2501/2503 4-Wire 12×1 Multiplexer Topology

When using the NI PXI-2501/2503 as a 4-wire 12×1 multiplexer, connect your signals using the NI TB-2605 terminal block. The following figure is a representation of the NI PXI-2501/2503 in this mode.



4-wire mode is usually used in 4-wire resistance measurements. One pair of wires supplies the excitation current while the other pair makes the voltage measurement. In 4-wire mode, connect your excitation or source leads to CHxA+ and CHxA-, and connect your measurement or sensing leads to CHxB+ and CHxB-, as shown in the following figure:



Note The previous figure shows the DMM connected to the analog bus (AB) of the switch module. Instead of routing signals to the AB, you can connect COM0A+ and COM0A- to the excitation terminals and COM0B+ and COM0B- to the sense terminals of the DMM.

Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2A+ is routed to COM0A+

signal connected to CH2A- is routed to COM0A-

signal connected to CH2B+ is routed to COM0B+

signal connected to CH2B- is routed to COM0B-

Pinout

The following figure identifies the pins for the NI PXI-2501/2503 in the 4-wire 12×1 multiplexer topology.

CH11B+	35	1	CH11B-
CH10B+	36	2	CH10B-
CH9B+	37	3	CH9B-
CH8B+	38	4	CH8B-
CH7B+	39	5	CH7B-
CH6B+	40	6	CH6B-
EXT_TRIG_IN	41	7	GND
SCAN_ADV	42	8	RESERVED
COM1B+ ¹	43	9	COM1B- ¹
COM0B+	44	10	COM0B-
CH5B+	45	11	CH5B-
CH4B+	46	12	CH4B-
CH3B+	47	13	CH3B-
CH2B+	48	14	CH2B-
CH1B+	49	15	CH1B-
CH0B+	50	16	CH0B-
AB0B+	51	17	AB0B-
AB0A+	52	18	AB0A-
CH11A+	53	19	CH11A-
CH10A+	54	20	CH10A-
CH9A+	55	21	CH9A-
GND	56	22	1wireREF ¹
CH8A+	57	23	CH8A-
CH7A+	58	24	CH7A-
CH6A+	59	25	CH6A-
COM1A+ ¹	60	26	COM1A- ¹
COM0A+	61	27	COM0A-
CH5A+	62	28	CH5A-
CH4A+	63	29	CH4A-
CH3A+	64	30	CH3A-
CH2A+	65	31	CH2A-
CH1A+	66	32	CH1A-
CH0A+	67	33	CH0A-
CJS+ ¹	68	34	CJS- ¹

¹not used in this topology



Caution Do not connect to RESERVED pins.

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
ch0	+	67	CH0A+
-	33	CH0A-	
+	50	CH0B+	
-	16	CH0B-	
ch1	+	66	CH1A+
-	32	CH1A-	
+	49	CH1B+	
-	15	CH1B-	
ch2	+	65	CH2A+
-	31	CH2A-	
+	48	CH2B+	
-	14	CH2B-	
ch3	+	64	CH3A+
-	30	CH3A-	
+	47	CH3B+	
-	13	CH3B-	
ch4	+	63	CH4A+
-	29	CH4A-	
+	46	CH4B+	
-	12	CH4B-	
ch5	+	62	CH5A+
-	28	CH5A-	
+	45	CH5B+	
-	11	CH5B-	

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
ch6	+	59	CH6A+
-	25	CH6A-	
+	40	CH6B+	
-	6	CH6B-	
ch7	+	58	CH7A+
-	24	CH7A-	
+	39	CH7B+	
-	5	CH7B-	
ch8	+	57	CH8A+
-	23	CH8A-	
+	38	CH8B+	
-	4	CH8B-	
ch9	+	55	CH9A+
-	21	CH9A-	
+	37	CH9B+	
-	3	CH9B-	
ch10	+	54	CH10A+
-	20	CH10A-	
+	36	CH10B+	
-	2	CH10B-	
ch11	+	53	CH11A+
-	19	CH11A-	
+	35	CH11B+	
-	1	CH11B-	
com0	+	61	COM0A+
-	27	COM0A-	

Software Name	Polarity	Hardware Name	
NI PXI-2501/2503 Connector Pin Number	NI TB-2605 Terminal Name		
+	44	COM0B+	
-	10	COM0B-	
No Connect ¹	+	60	COM1A+
-	26	COM1A-	
+	43	COM1B+	
-	9	COM1B-	
ab0	+	52	AB0A+
-	18	AB0A-	
+	51	AB0B+	
-	17	AB0B-	
¹ Not used in this topology			

NI PXI-2501/2503 Connector Pin Number	Signal name
7, 56	GND
41	TRIG IN
42	SCANADV
8	RESERVED
68	CJS+
34	CJS-
22	1wireREF

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [Operation Modes](#)

NI PXI-2501/2503 Current-Loop Receivers

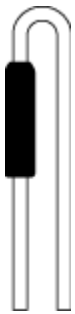
The NI PXI-2501/2503 modules have sockets for transforming individual channels to current-to-voltage converters. NI offers a process-current pack of four 249 Ω , 0.1%, 5 ppm, 0.25 W resistors. The reference designator format for the current-loop resistors is such that for input channel x, the resistor is RCLx. For example, the resistor for channel 14 is RCL14.



Caution Before installing the resistors in your module, make sure that no signals are connected to your module front connector.

Before installing your module in the NI PXI chassis, you must install the resistors by performing the following steps:

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis. Properly grounding yourself prevents damage to your PXI module from electrostatic discharge.
2. Bend and trim the resistor lead as shown in the following figure. Be sure that the resistor does not extend more than 0.5 in. (1.3 cm) above the surface of the circuit board.



3. Insert the resistor into the appropriate socket, labeled RCLx.

Cold-Junction Temperature Sensor Channel

The NI PXI-2501/2503 has a dedicated temperature sensor channel useful for cold-junction compensation when switching thermocouples. The NI TB-2605 and TBX-68S terminal blocks both have onboard temperature sensors that connect to the dedicated cold-junction sensor channel. You can access the cold-junction sensor channel by connecting to channel `cj temp` in the 2-wire 24×1 multiplexer, 2-wire dual 12×1

multiplexer, and 2-wire quad 6×1 multiplexer topologies.

Related concepts:

- [NI PXI-2501/2503 2-Wire 24×1 Multiplexer Topology](#)
- [NI PXI-2501/2503 2-Wire Dual 12×1 Multiplexer Topology](#)
- [NI PXI-2501/2503 2-Wire Quad 6×1 Multiplexer Topology](#)

Relay Replacement

The NI PXI-2503 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
NEC-TOKIN	EF2-4.5NUX-L6

Relay Kit	Part Number
M3 Distribution (10 relays)	197488A-01

Complete the following steps to replace a failed relay.

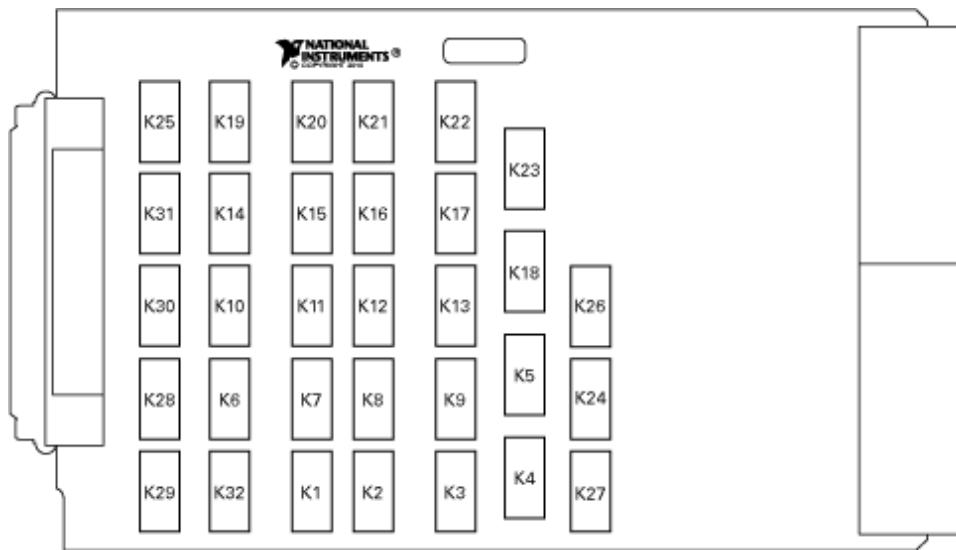
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



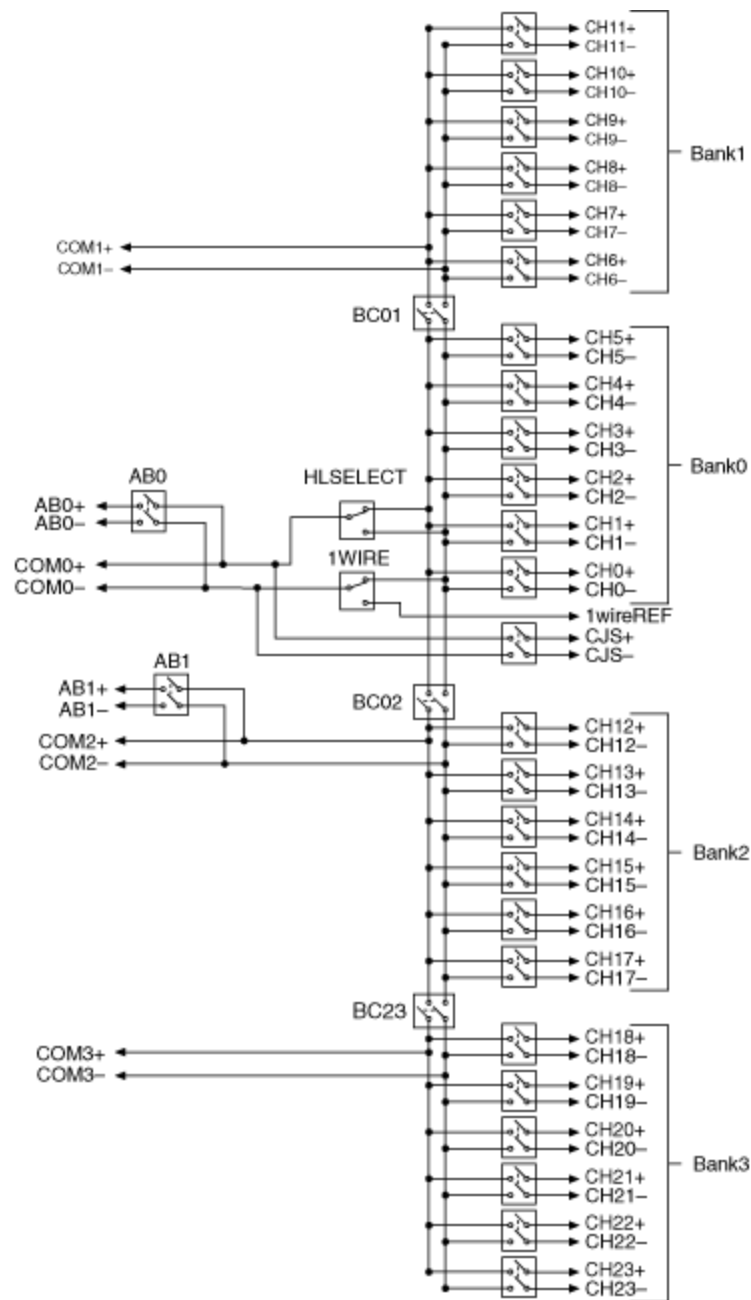
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Refer to the following figures and table to locate the relay you want to replace.

NI PXI-2503



NI PXI-2503 Hardware Diagram



Relay Name	Reference Designator
CH0	K32
CH1	K1
CH2	K2
CH3	K3
CH4	K4

Relay Name	Reference Designator
CH5	K5
CH6	K6
CH7	K7
CH8	K8
CH9	K9
CH10	K10
CH11	K11
CH12	K12
k13	K12
CH13	K13
CH14	K14
CH15	K15
CH16	K16
CH17	K17
CH18	K18
CH19	K19
CH20	K20
CH21	K21
CH22	K22
CH23	K23
BC01	K24
BC23	K25
BC02	K26
CJTEMP	K27
1WIRE	K28
HLSEL	K29
AB0	K30

Relay Name	Reference Designator
AB2	K31

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Matrix Expansion

To expand the matrix of a PXI-2501/2503, directly connect wire from one terminal block to the other using the NI TB-2606 terminal block. Each PXI-2501/2503 can operate as a 4×6 matrix. To form a 4×12 matrix, use two PXI-2501/2503 modules and connect all the rows from both TB-2606 terminal blocks.

To form a 12×6 matrix, you need three PXI-2501/2503 modules with three TB-2606 terminal blocks. Connect all the columns from all three terminal blocks.



Note The analog bus connectors cannot be used to expand a matrix.

Multiplexer Expansion

If you need to multiplex through more channels than the number present on your NI PXI-2501/2503, you can expand the size of the multiplexer. The NI TB-2605 terminal block has two analog bus connectors that allow analog bus sharing between two other NI PXI-2501/2503s. Each NI TB-2605 comes with a plug to share this analog bus between modules.

Refer to the NI PXI-2501/2503 hardware diagrams to see the analog bus relay that connects the multiplexer COM lines to an analog bus. This analog bus relay must be closed for multiplexer expansion. When this analog bus is shared between NI PXI-2501/2503 modules, a single larger multiplexer is formed. For example, connecting two NI PXI-2501/2503 modules using their analog bus in 2-wire 24×1 multiplexer topology, creates a 2-wire 48×1 multiplexer.

You can also use the LV6-BAN4 cable to connect a DMM directly to the analog bus that acts as the COM of the expanded multiplexer.

Related Topics

NI PXI-2501 Hardware Diagram

NI PXI-2503 Hardware Diagram

Related concepts:

- [NI PXI-2501 Hardware Diagram](#)
- [NI PXI-2503 Hardware Diagram](#)

NI PXI-2510

The NI PXI-2510 is an FIU switch module for the PXI platform. The NI PXI-2510 is composed of armature relays.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2510 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Independent	2510/ Independent(NISWITCH_TOPOLOGY_2510_INDEPENDENT)	✓	✓

Related Information

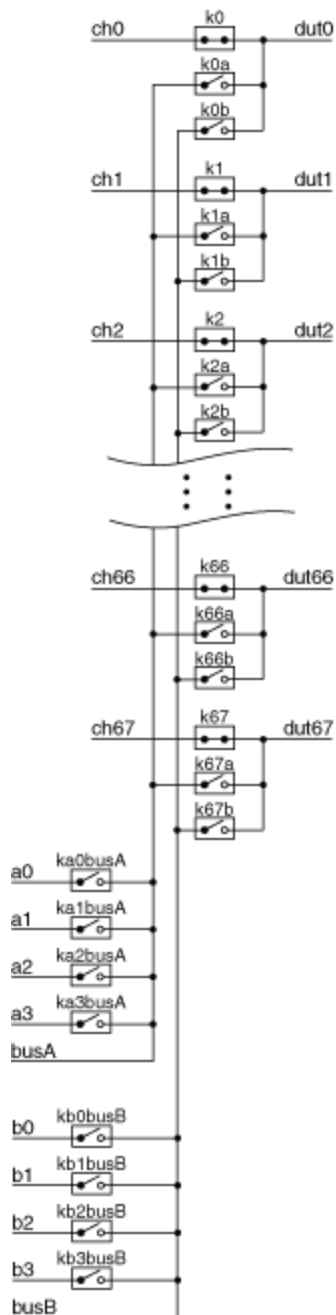
- Integration and System Considerations

Related concepts:

- [Fault Insertion Units](#)
- [Armature Relays](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2510 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI-2510 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2510.

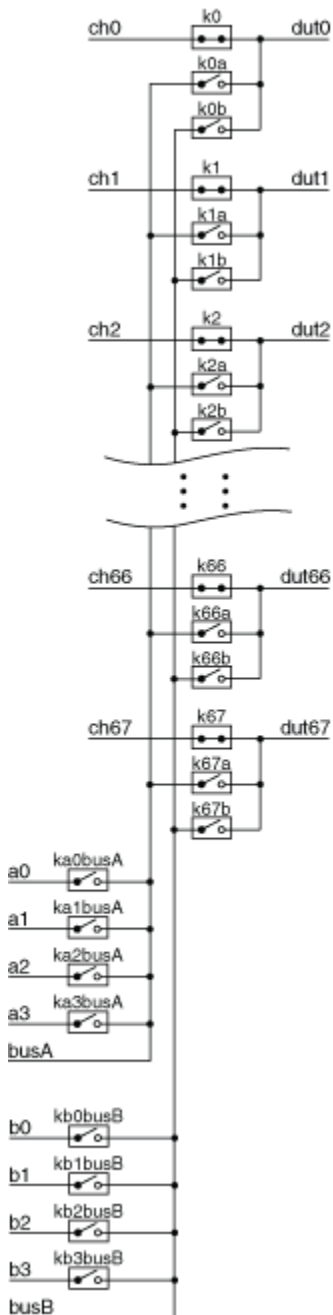


The following table lists relay names for the NI PXI-2510.

Relays
k0...k67
k0a...k67a
k0b...k67b
ka0busA...ka3busA
kb0busB...kb3busB

NI PXI-2510 Independent Topology

The following figure represents the NI PXI-2510 in the independent topology.



Making a Connection

Both the scanning command, `dut1->busA;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `dut1`

and `busA`, result in the following connection:

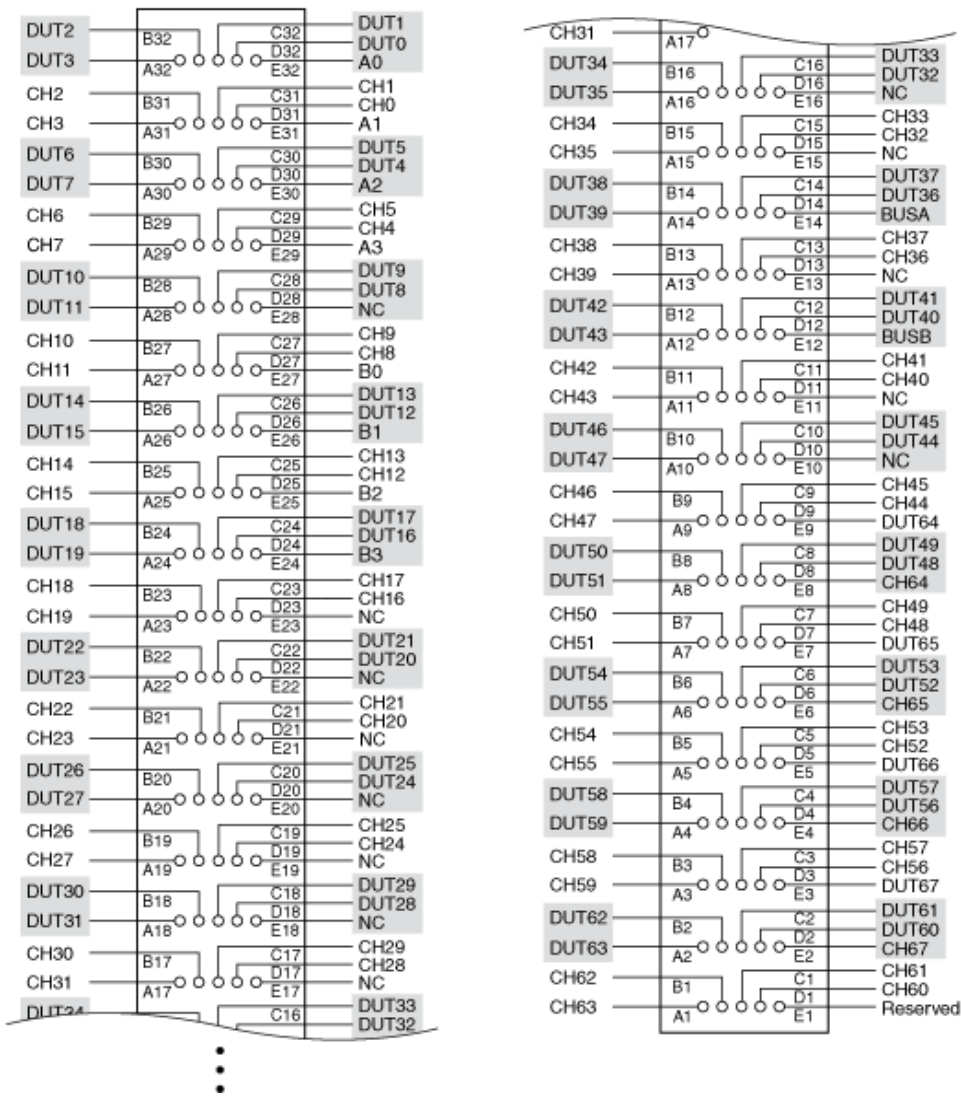
signal connected to DUT1 is routed to `busA`



Note The pass-through channels (`chN` to `dutN`) on the PXI-2510 are connected in its power on or reset state. The `niSwitch Reset` and `niSwitch Disconnect All Channels VIs` or `niSwitch_reset` and `niSwitch_DisconnectAll` functions will connect the pass-through channels (`chN` to `dutN`). Special attention needs to be given to the behavior of the relays associated with the pass-through channels (`k0...k67`). These relays (`k0...k67`) are in their open state when the pass-through channels (`chN` to `dutN`) are connected and vice versa. If you intend to use the `niSwitch Relay Control VI` or `niSwitch_RelayControl` function to operate these relays, please note that closing relays (`k0...k67`) will disconnect the pass through channels (`chN` to `dutN`). Because the pass-through channels (`chN` to `dutN`) are connected in its power-on or reset state, these channels may need to be disconnected during a scanning operation. In order to disconnect the channels during a scan, set the Scan Mode property to **None**, or the `NISWITCH_ATTR_SCAN_MODE` attribute to `NISWITCH_VAL_NONE`.

Pinout

The following figure identifies the pins for the NI PXI-2510.



NI PXI-2510 Relay Replacement

The NI PXI-2510 uses electromechanical armature relays.



Note The NI PXI-2510 uses a custom lead length to meet safety standards. Trim leads to no more than 1 mm (0.04 inch) from the PCB. You also can use the spare relay included with the module at location K49.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 relays)	781089-10

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

Disassemble the Module

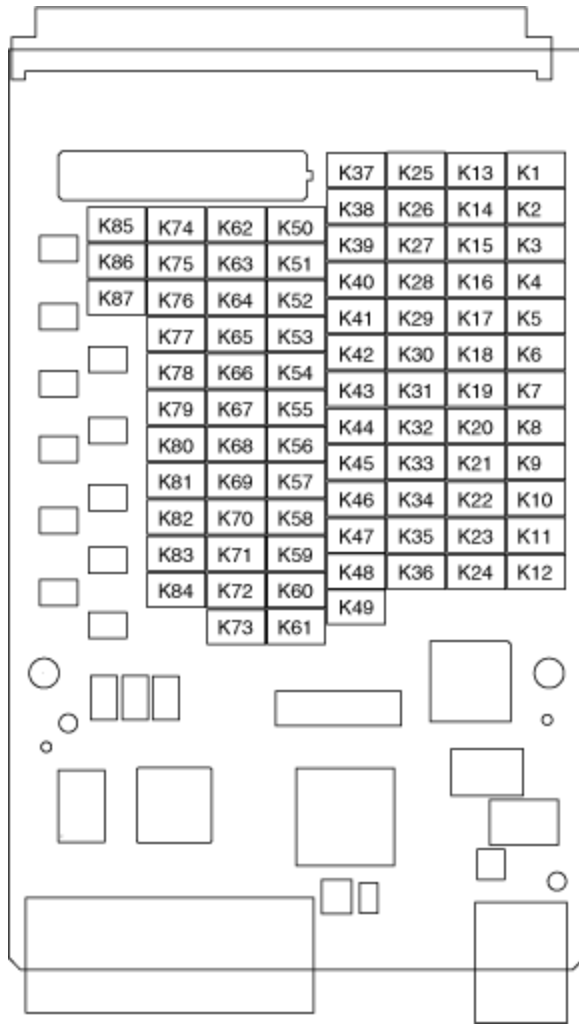
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

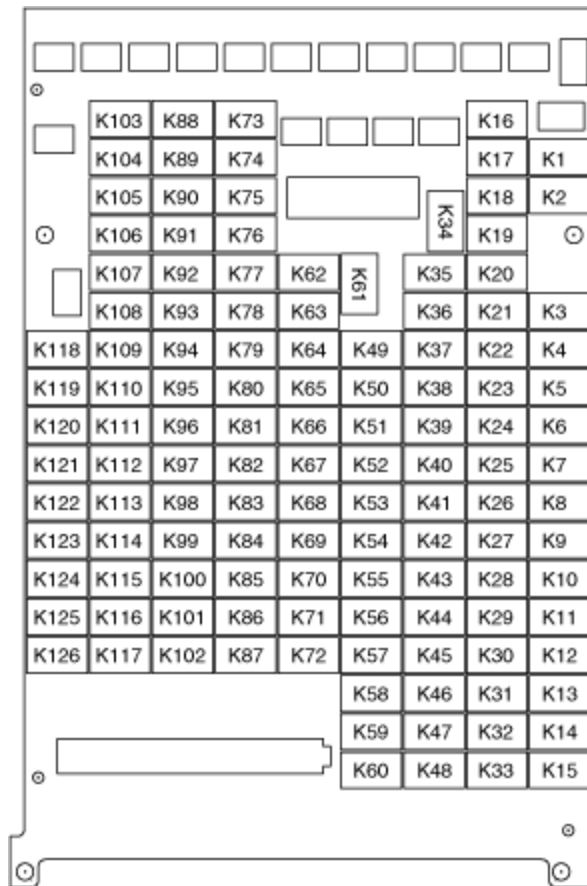
Base Board



ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
k0	K12	k7a	K14	k14b	K40	k22	K37
k0a	K11	k7b	K15	k15	K39	k22a	K38
k0b	K10	k8	K35	k15a	K38	k22b	K59
k1	K7	k8a	K34	k15b	K60	k23	K61
k1a	K8	k8b	K36	k16	K61	k23a	K56
k1b	K9	k9	K33	k16a	K58	k23b	K57
k2	K6	k9a	K32	k16b	K57	k24	K56
k2a	K5	k9b	K31	k17	K58	k24a	K57
k2b	K4	k10	K28	k17a	K57	k24b	K56
k3	K2	k10a	K29	k17b	K56	k25	K57

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
k3a	K3	k10b	K30	k18	K53	k25a	K54
k3b	K1	k11	K25	k18a	K55	k25b	K55
k4	K23	k11a	K26	k18b	K54	ka0busA	K54
k4a	K22	k11b	K27	k19	K50	ka1busA	K50
k4b	K24	k12	K48	k19a	K52	ka2busA	K52
k5	K21	k12a	K47	k19b	K51	ka3busA	K51
k5a	K19	k12b	K46	k20	K73	kb0busB	K73
k5b	K20	k13	K45	k20a	K72	kb1busB	K72
k6	K16	k13a	K44	k20b	K71	kb2busB	K71
k6a	K17	k13b	K43	k21	K70	kb3busB	K70
k6b	K18	k14	K42	k21a	K68	Spare	K68
k7	K13	k14a	K41	k21b	K69		K69

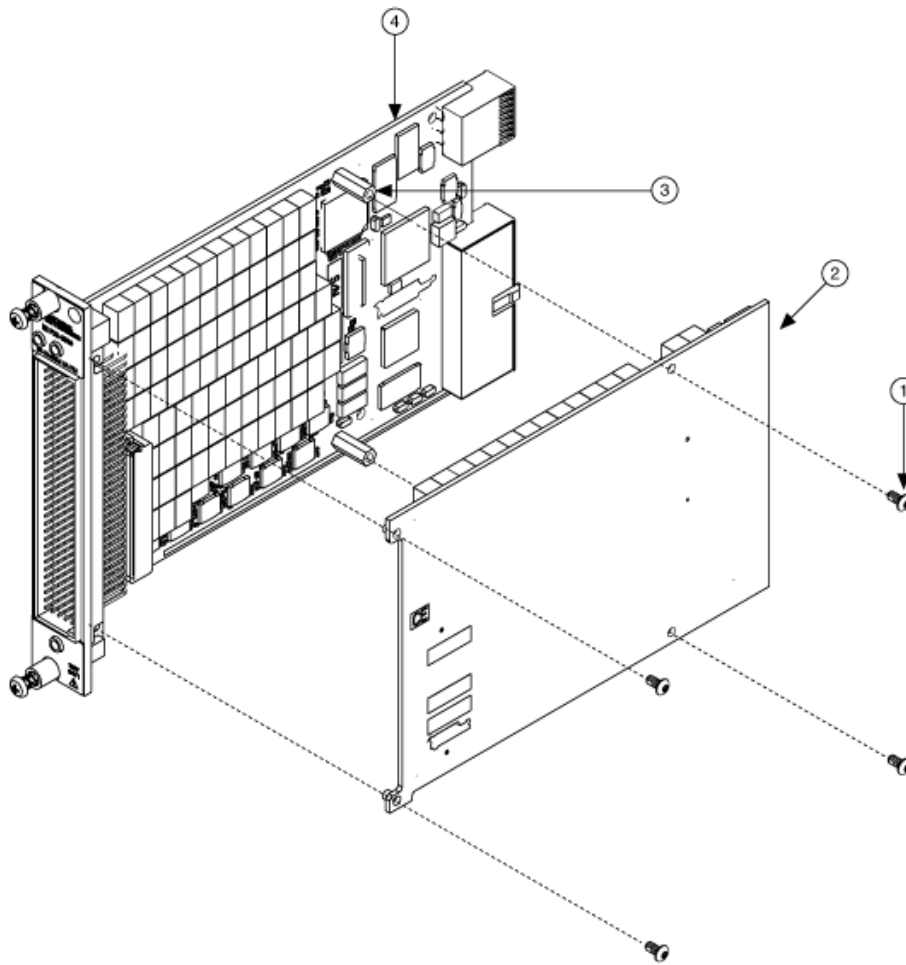
Mezzanine Board



ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
k26	K57	k36b	K85	k47a	K11	k58	K56
k26a	K56	k37	K21	k47b	K10	k58a	K55
k26b	K55	k37a	K20	k48	K66	k58b	K72
k27	K72	k37b	K19	k48a	K65	k59	K71
k27a	K71	k38	K30	k48b	K64	k59a	K70
k27b	K70	k38a	K29	k49	K63	k59b	K3
k28	K3	k38b	K28	k49a	K62	k60	K2
k28a	K2	k39	K33	k49b	K61	k60a	K1
k28b	K1	k39a	K32	k50	K69	k60b	K6
k29	K6	k39b	K31	k50a	K68	k61	K5
k29a	K5	k40	K42	k50b	K67	k61a	K4
k29b	K4	k40a	K41	k51	K84	k61b	

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
k30	K45	k40b	K40	k51a	K83	k62	K84
k30a	K44	k41	K39	k51b	K82	k62a	K83a
k30b	K43	k41a	K38	k52	K102	k62b	K83b
k31	K60	k41b	K37	k52a	K101	k63	K84a
k31a	K59	k42	K9	k52b	K100	k63a	K84b
k31b	K58	k42a	K8	k53	K81	k63b	K85
k32	K18	k42b	K7	k53a	K80	k64	K86
k32a	K17	k43	K15	k53b	K79	k64a	K87
k32b	K16	k43a	K14	k54	K105	k64b	K88
k33	K24	k43b	K13	k54a	K104	k65	K89
k33a	K23	k44	K36	k54b	K103	k65a	K90
k33b	K22	k44a	K35	k55	K123	k65b	K91
k34	K27	k44b	K34	k55a	K122	k66	K92
k34a	K26	k45	K54	k55b	K121	k66a	K93
k34b	K25	k45a	K53	k56	K99	k66b	K94
k35	K48	k45b	K52	k56a	K98	k67	K95
k35a	K47	k46	K51	k56b	K97	k67a	K96
k35b	K46	k46a	K50	k57	K96	k67b	K97
k36	K87	k46b	K49	k57a	K95		
k36a	K86	k47	K12	k57b	K94		

- Remove the four screws that secure the mezzanine board to the base board. Do not remove the hex standoffs or the base board.



1	Screws
2	Mezzanine board
3	Hex standoff
4	Base board

4. Separate the mezzanine board from the base board.

Replace the Relay

The NI PXI-2510 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2510 Triggering

The NI PXI-2520 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2520.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2520.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Scan Advanced Output	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2512

The NI PXI/PXIe-2512 (NI 2512) is an FIU switch module for the PXI or PXI Express platforms. The NI 2512 is composed of FET switches.

Operation Modes

The following table lists the supported topology of the NI 2512 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Independent	2512/ Independent(NISWITCH_TOPOLOGY_2512_INDEPENDENT)	✓	✓

Related Information

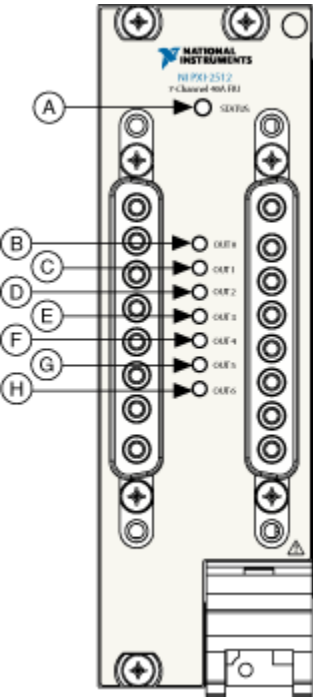
- Integration and System Considerations

Related concepts:

- [Fault Insertion Units](#)
- [FET Switches](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2512 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2512 Front Panel

The following figure illustrates the NI PXI/PXIe-2512 front panel.



Item		Description
A	Module Status Indicator	LED
B	DUT0 Status Indicator	LED
C	DUT1 Status Indicator	LED
D	DUT2 Status Indicator	LED
E	DUT3 Status Indicator	LED
F	DUT4 Status Indicator	LED

Item		Description
G	DUT5 Status Indicator	LED
H	DUT6 Status Indicator	LED

Status Indicators

Status indicators on the front panel of the NI PXI/PXIe-2512 provide feedback about device operation.

Use the following table to determine the state of the module using the status indicator.

Status Indicator	Auxiliary Power Input State
Green	OK, no channel errors present.
Red	Error detected on one or more channels.

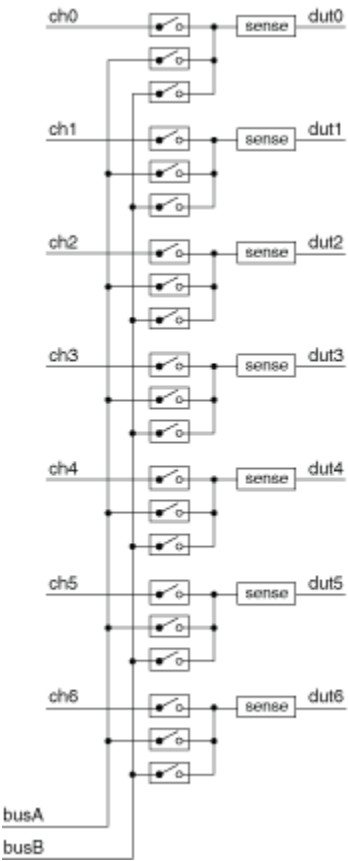
Use the following table to determine the state of DUTn channel using a status indicator.

Status Indicator	Channel Output State
(Off)	Open
Green	Pass-through channel closed (CHn to DUTn)
Blink Amber Once	DUTn connected to fault bus A
Blink Amber Twice	DUTn connected to fault bus B
Solid Amber	Any combination of multiple DUTn paths closed (CHn, BusA, BusB)
Blink Red Once [*]	Overtemperature error detected on DUTn
Solid Red ^{**}	Overcurrent error detected on DUTn

Status Indicator	Channel Output State
*Overcurrent condition does not exist at the time the overtemperature condition was detected. **Overtemperature condition might or might not exist.	

NI PXI/PXIe-2512 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2512 (NI 2512).

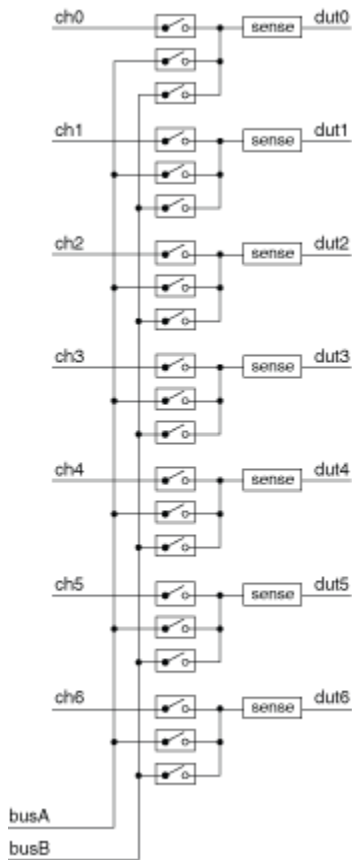


The following table lists relay names for the NI 2512.

Relays
k0...k6
k0a...k6a
k0b...k6b

NI PXI/PXIe-2512 Independent Topology

The following figure represents the NI PXI/PXIe-2512 (NI 2512) in the independent topology.



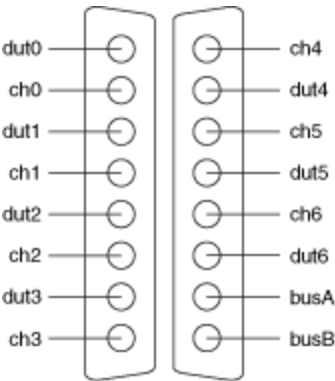
Making a Connection

Both the scanning command, `dut1->busA;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `dut1` and `busA`, result in the following connection:

signal connected to DUT1 is routed to busA

Pinout

The following figure identifies the pins for the NI 2512.



NI PXI/PXIe-2512 Triggering

The NI PXI/PXIe-2512 (NI 2512) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2512.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6

Trigger Input	Software	Hardware
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2512.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2514

The NI PXI/PXIe-2514 (NI 2514) is an FIU switch module for the PXI or PXI Express

platforms. The NI 2514 is composed of FET switches.

Operation Modes

The following table lists the supported topology of the NI 2514 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Independent	2514/ Independent(NISWITCH_TOPOLOGY_2514_INDEPENDENT)	✓	✓

Related Information

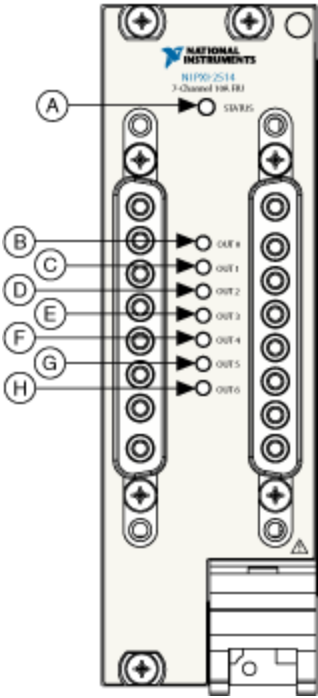
- Integration and System Considerations

Related concepts:

- [Fault Insertion Units](#)
- [FET Switches](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2514 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2514 Front Panel

The following figure illustrates the NI PXI/PXIe-2514 front panel.



Item		Description
A	Module Status Indicator	LED
B	DUT0 Status Indicator	LED
C	DUT1 Status Indicator	LED
D	DUT2 Status Indicator	LED
E	DUT3 Status Indicator	LED
F	DUT4 Status Indicator	LED
G	DUT5 Status Indicator	LED
H	DUT6 Status Indicator	LED

Status Indicators

Status indicators on the front panel of the NI PXI/PXIe-2514 provide feedback about device operation.

Use the following table to determine the state of the module using the status indicator.

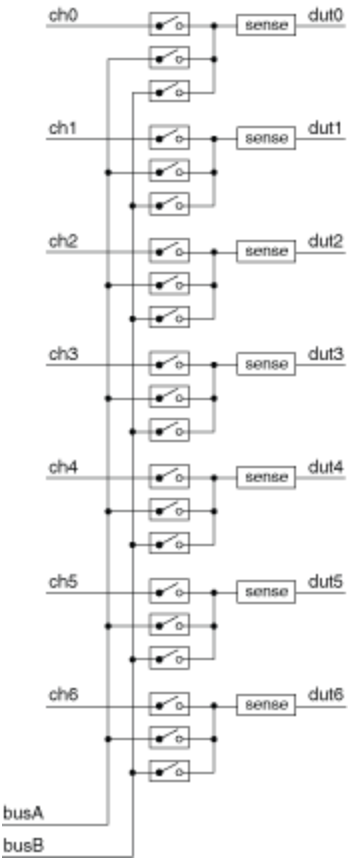
Status Indicator	Auxiliary Power Input State
Green	OK, no channel errors present.
Red	Error detected on one or more channels.

Use the following table to determine the state of DUTn channel using a status indicator.

Status Indicator	Channel Output State
(Off)	Open
Green	Pass-through channel closed (CHn to DUTn)
Blink Amber Once	DUTn connected to fault bus A
Blink Amber Twice	DUTn connected to fault bus B
Solid Amber	Any combination of multiple DUTn paths closed (CHn, BusA, BusB)
Blink Red Once [*]	Overtemperature error detected on DUTn
Solid Red ^{**}	Overcurrent error detected on DUTn
*Overcurrent condition does not exist at the time the overtemperature condition was detected. **Overtemperature condition might or might not exist.	

NI PXI/PXIe-2514 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2514 (NI 2514).

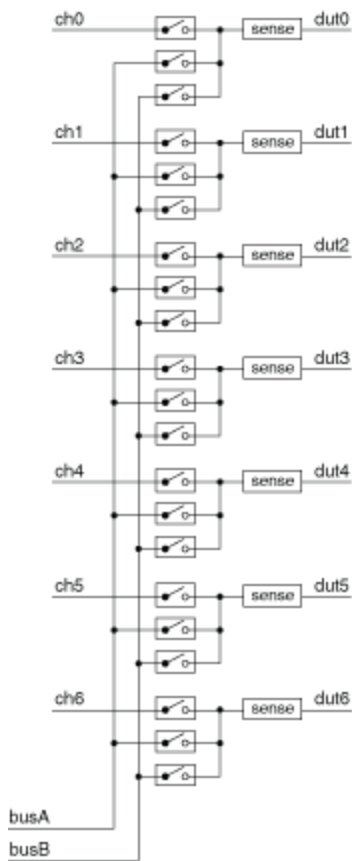


The following table lists relay names for the NI 2514.

Relays
k0...k6
k0a...k6a
k0b...k6b

NI PXI/PXIe-2514 Independent Topology

The following figure represents the NI PXI/PXIe-2514 (NI 2514) in the independent topology.



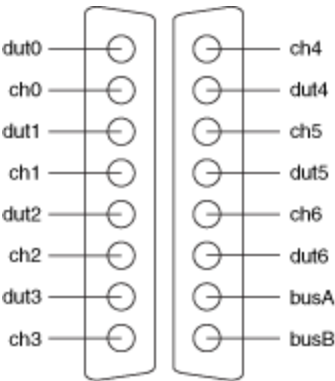
Making a Connection

Both the scanning command, `dut1->busA;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `dut1` and `busA`, result in the following connection:

signal connected to DUT1 is routed to busA

Pinout

The following figure identifies the pins for the NI 2514.



NI PXI/PXIe-2514 Triggering

The NI PXI/PXIe-2514 (NI 2514) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2514.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6

Trigger Input	Software	Hardware
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2514.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2515

The NI PXI/PXIe-2515 (NI 2515) is a multiplexer switch module for the PXI or PXI Express

platform that enables connectivity by routing high-speed digital I/O (DIO) signals between a device under test (DUT) and a supported NI high-speed DIO device or parametric measurement devices. Refer to the NI 2515 Pin Associations table for a list of supported NI high-speed DIO devices.

The NI 2515 uses reed relays. A number of factors can affect the life expectancy of reed relays. Refer to Reed Relay Protection for information about protecting the reed relays on the NI 2515.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Switching inductive loads (for example, motors and solenoids) can produce high-voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2515 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Independent	2515/ Independent(NISWITCH_TOPOLOGY_2515_INDEPENDENT)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [NI PXI/PXIe-2515 Independent Topology](#)

- [Reed Relays](#)
- [Reed Relay Protection](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Topologies](#)
- [Operation Modes](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2515 Analog Channel Expansion

You can expand the number of analog channels beyond two with additional NI PXI/PXIe-2515 (NI 2515) modules. Each additional NI 2515 module provides two additional analog channels. The number of digital lines does not change when you add analog channels.

Analog Channel Expansion on the NI 2515

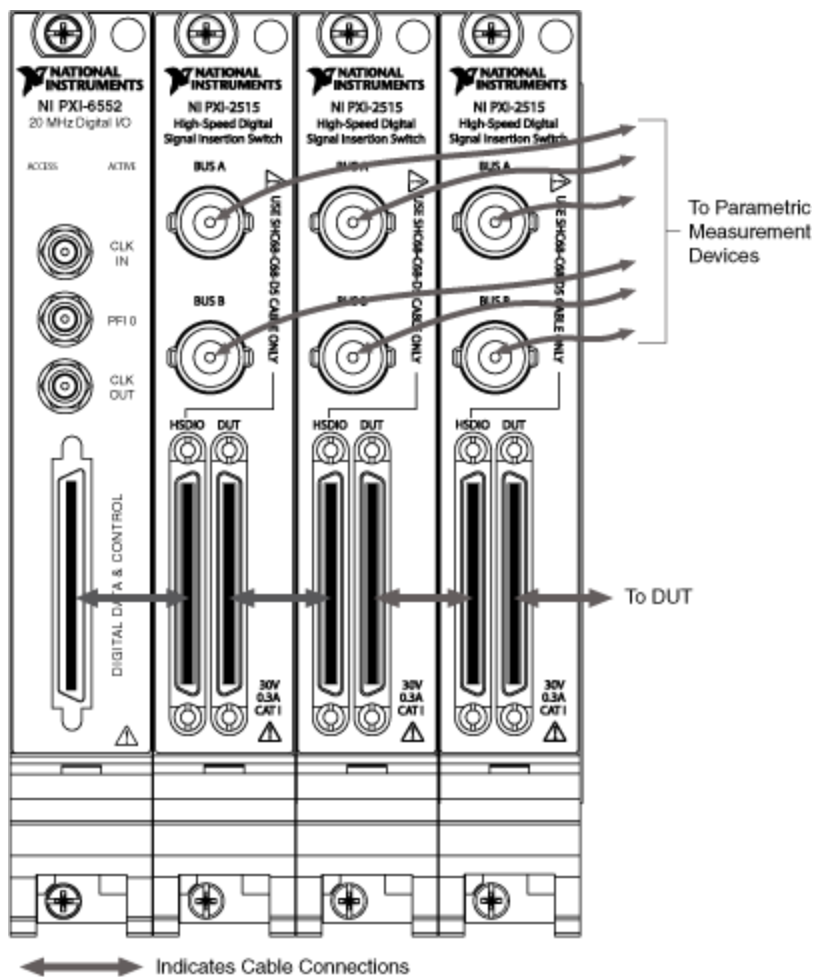
Complete the following steps to expand the number of analog channels.

1. Connect the first NI 2515 to the NI PXI-654x or 655x HSDIO module as described in NI PXI/PXIe-2515 Intended Use.
2. For each additional NI 2515 module, connect the "IO NI 2515" side of an additional SCH68-C68-D5 cable to the "HSDIO" connector of an additional module.



Note You must use the SCH68-C68-D5 cable. The pinouts are different from other SCH68 cables.

3. Connect the other end of the SCH68-C68-D5 cable to the "DUT" connector of the previous module.



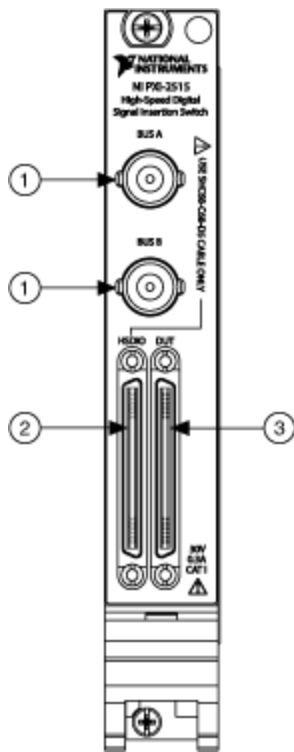
Note HSDIO signal quality is incrementally reduced by each additional NI 2515 module.

Related concepts:

- [NI PXI/PXIe-2515 Intended Use](#)

NI PXI/PXIe-2515 Front Panel

The following figure illustrates the NI PXI/PXIe-2515 front panel. Refer to the NI PXI/PXIe-2515 Intended Use topic for an example of the NI 2515 connected to a system.



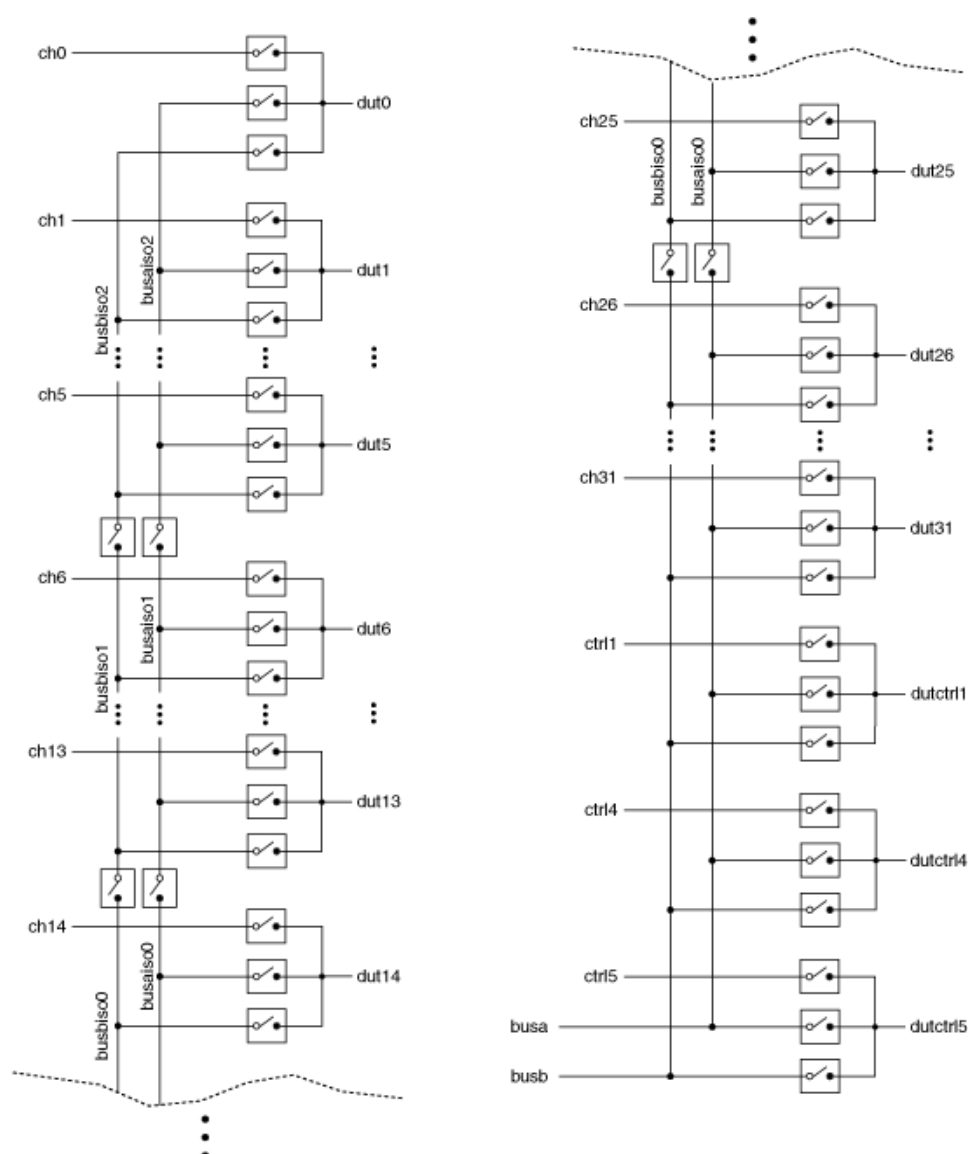
Item	Description
1	BNC connectors
2	VHDCI connector for connection to high-speed DIO device
3	VHDCI connector for connection to DUT

Related concepts:

- [NI PXI/PXIe-2515 Intended Use](#)

NI PXI/PXIe-2515 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2515.



Note ctrl0, ctrl2, and ctrl3 do not route through relays, but rather pass through from the left connector to the right connector. These channels cannot be connected to the analog bus channels, busa and busb.

NI PXI/PXIe-2515 Independent Topology

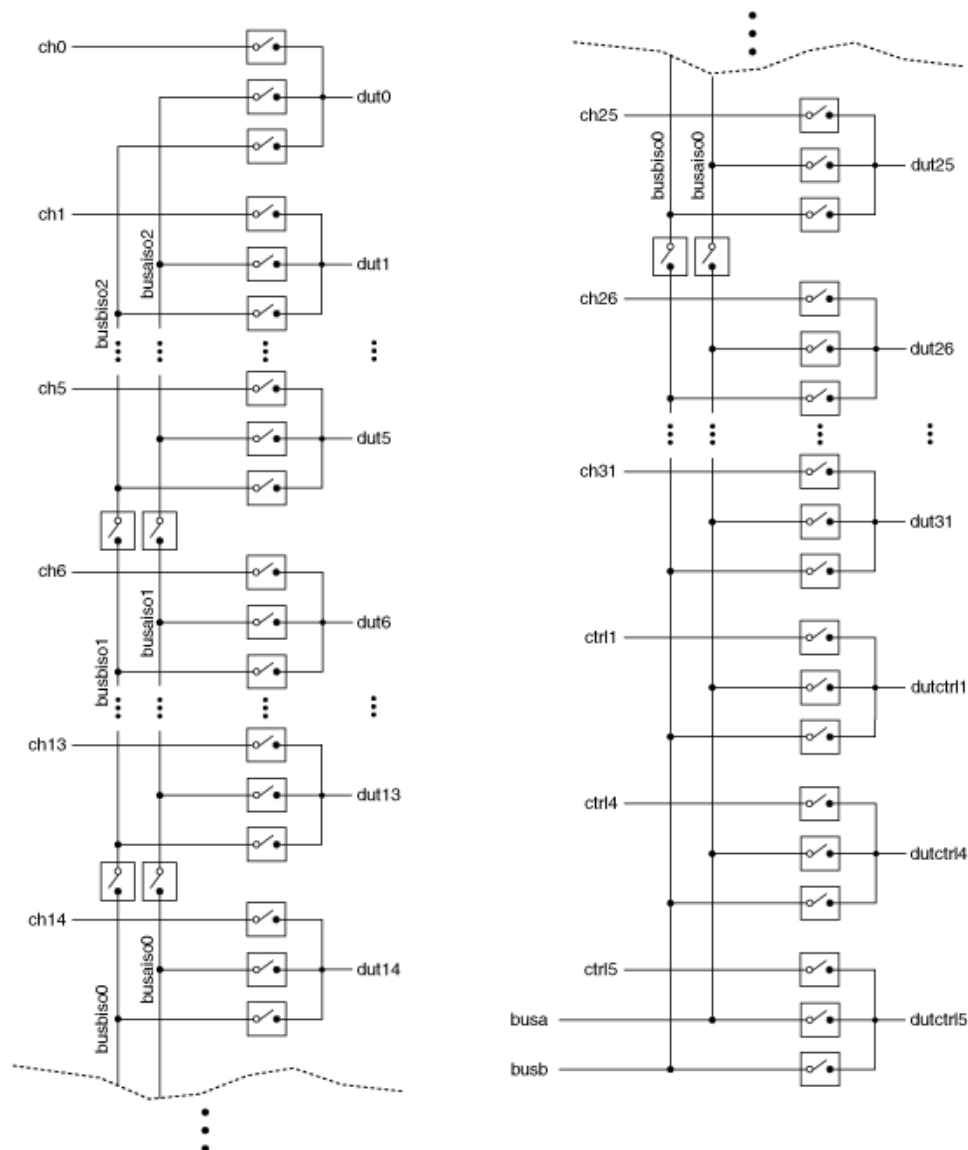
Use the NI PXI/PXIe-2515 (NI 2515) independent topology to connect a single pin of a DUT to a supported NI high-speed DIO device and parametric measurement devices. Refer to the following sections for more information about the intended use of the NI 2515.

- Hardware Diagram

- Making a Connection
- Pinout
- Pin Associations

Hardware Diagram

The following figure represents the NI 2515 in the independent topology.



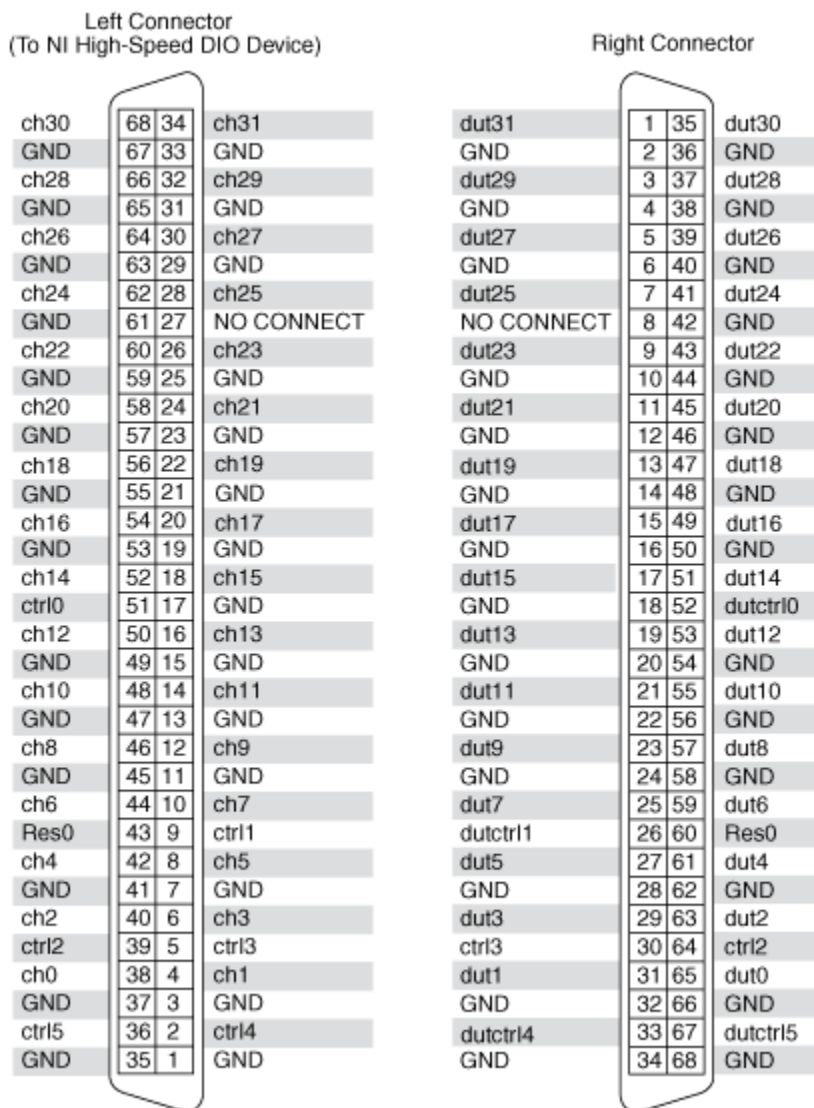
Note ctrl0, ctrl2, and ctrl3 do not route through relays, but rather pass through from the left connector to the right connector. These channels cannot be connected to the analog bus channels, busa and busb.

Making a Connection

With the independent topology, you can let NI-SWITCH determine the path between two specified channels by setting the intermediate channels as reserved for routing and using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function, or you can control individual relays using the `niSwitch Relay Control VI` or the `niSwitch_RelayControl` function.

Pinout

The following figure identifies the pins for the NI 2515 in the independent topology.





Caution Do not connect to Res0. Res0 is reserved for future use.



Caution Use only the NI SHC68-C68-D5 cable to connect the supported NI high-speed DIO device to the NI 2515. The cable translates the pinout of the supported NI high-speed DIO device to the HSDIO connector on the NI 2515 so that the pinout of the DUT connector on the NI 2515 matches that of the supported NI high-speed DIO device.



Note ctrl0, ctrl2, and ctrl3 do not route through relays, but rather pass through from the left connector to the right connector. These channels cannot be connected to the analog bus channels, busa and busb.

Pin Associations

The NI 2515 is recommended for use with the NI 6535/6536/6537, the NI 654x, the NI 655x, and the NI 6581 high-speed DIO devices, using the designated cable for connection between the NI 2515 and the supported NI high-speed DIO device. Refer to the following table for corresponding signals on the NI 2515 and supported NI high-speed DIO devices.

Using the NI 2515 Pin Associations Table

To use the following table, first find the high-speed DIO signal you want to route to your DUT. Look across the table row that contains the high-speed DIO signal to find the NI 2515 right connector and left connector channels necessary to route that signal. For cables recommended to connect the NI 2515 to your system, refer to NI 2515 Signal Connections.

Pin	High-speed DIO Channel						NI 2515 Left Connector		NI 2515 Right Connector
NI 6535/6536/6537	NI 654x	NI 6551/6552	NI 6555/6556	NI 6581	Pin	Channel	Pin	Channel	
1	P3.7	DIO 31	RESERVED	PFI 31	RESERVED	34	ch31	1	dut31
2	GND	GND	GND	GND	GND	33	GND	2	GND
3	P3.5	DIO 29	RESERVED	PFI 29	RESERVED	32	ch29	3	dut29

Pin	High-speed DIO Channel						NI 2515 Left Connector		NI 2515 Right Connector
NI 6535/ 6536/ 6537	NI 654x	NI 6551/ 6552	NI 6555/ 6556	NI 6581	Pin	Channel	Pin	Channel	
4	GND	GND	GND	GND	GND	31	GND	4	GND
5	P3.3	DIO 27	RESERVED	PFI 27	RESERVED	30	ch27	5	dut27
6	GND	GND	GND	GND	GND	29	GND	6	GND
7	P3.1	DIO 25	RESERVED	PFI 25	RESERVED	28	ch25	7	dut25
8	RESERVED	RESERVED	RESERVED	GND	GND	27	NO CONNECT	8	NO CONNECT
9	P2.7	DIO 23	RESERVED	DIO 23	P2.7	26	ch23	9	dut23
10	GND	GND	GND	GND	GND	25	GND	10	GND
11	P2.5	DIO 21	RESERVED	DIO 21	P2.5	24	ch21	11	dut21
12	GND	GND	GND	GND	GND	23	GND	12	GND
13	P2.3	DIO 19	DIO 19	DIO 19	P2.3	22	ch19	13	dut19
14	GND	GND	GND	GND	GND	21	GND	14	GND
15	P2.1	DIO 17	DIO 17	DIO 17	P2.1	20	ch17	15	dut17
16	GND	GND	GND	GND	GND	19	GND	16	GND
17	P1.7	DIO 15	DIO 15	DIO 15	P1.7	18	ch15	17	dut15
18	GND	GND	GND	GND	GND	17	GND	18	GND
19	P1.5	DIO 13	DIO 13	DIO 13	P1.5	16	ch13	19	dut13
20	GND	GND	GND	GND	GND	15	GND	20	GND
21	P1.3	DIO 11	DIO 11	DIO 11	P1.3	14	ch11	21	dut11
22	GND	GND	GND	GND	GND	13	GND	22	GND
23	P1.1	DIO 9	DIO 9	DIO 9	P1.1	12	ch9	23	dut9
24	GND	GND	GND	GND	GND	11	GND	24	GND
25	P0.7	DIO 7	DIO 7	DIO 7	P0.7	10	ch7	25	dut7
26	PFI 1	PFI 1	PFI 1	PFI 1	PFI 1	9	ctrl1	26	dutctrl1
27	P0.5	DIO 5	DIO 5	DIO 5	P0.5	8	ch5	27	dut5
28	GND	GND	GND	X	GND	GND	GND	28	GND
29	P0.3	DIO 3	DIO 3	DIO 3	P0.3	6	ch3	29	dut3
30	PFI 3	PFI 3	PFI 3	PFI 3	GND	5	ctrl3	30	ctrl3
31	P0.1	DIO 1	DIO 1	DIO 1	P0.1	4	ch1	31	dut1
32	GND	GND	GND	GND	GND	3	GND	32	GND
33	PFI 4	DDC CLK OUT	DDC CLK OUT	PFI 4/DDC CLK OUT	CLOCK OUT	2	ctrl4	33	dutctrl4
34	GND	GND	GND	GND	GND	1	GND	34	GND
35	P3.6	DIO 30	RESERVED	PFI 30	RESERVED	68	ch30	35	dut30
36	GND	GND	GND	GND	GND	67	GND	36	GND
37	P3.4	DIO 28	RESERVED	PFI 28	RESERVED	66	ch28	37	dut28

Pin	High-speed DIO Channel						NI 2515 Left Connector		NI 2515 Right Connector
NI 6535/ 6536/ 6537	NI 654x	NI 6551/ 6552	NI 6555/ 6556	NI 6581	Pin	Channel	Pin	Channel	
38	GND	GND	GND	GND	GND	65	GND	38	GND
39	P3.2	DIO 26	RESERVED	PFI 26	RESERVED	64	ch26	39	dut26
40	GND	GND	GND	GND	GND	63	GND	40	GND
41	P3.0	DIO 24	RESERVED	PFI 24	RESERVED	62	ch24	41	dut24
42	GND	GND	GND	GND	GND	61	GND	42	GND
43	P2.6	DIO 22	RESERVED	DIO 22	P2.6	60	ch22	43	dut22
44	GND	GND	GND	GND	GND	59	GND	44	GND
45	P2.4	DIO 20	RESERVED	DIO 20	P2.4	58	ch20	45	dut20
46	GND	GND	GND	GND	GND	57	GND	46	GND
47	P2.2	DIO 18	DIO 18	DIO 18	P2.2	56	ch18	47	dut18
48	GND	GND	GND	GND	GND	55	GND	48	GND
49	P2.0	DIO 16	DIO 16	DIO 16	P2.0	54	ch16	49	dut16
50	GND	GND	GND	GND	GND	53	GND	50	GND
51	P1.6	DIO 14	DIO 14	DIO 14	P1.6	52	ch14	51	dut14
52	PFI 0	RESERVED	RESERVED	GND	GND	51	ctrl0	52	dutctrl0
53	P1.4	DIO 12	DIO 12	DIO 12	P1.4	50	ch12	53	dut12
54	GND	GND	GND	GND	GND	49	GND	54	GND
55	P1.2	DIO 10	DIO 10	DIO 10	P1.2	48	ch10	55	dut10
56	GND	GND	GND	GND	GND	47	GND	56	GND
57	P1.0	DIO 8	DIO 8	DIO 8	P1.0	46	ch8	57	dut8
58	GND	GND	GND	GND	GND	45	GND	58	GND
59	P0.6	DIO 6	DIO 6	DIO 6	P0.6	44	ch6	59	dut6
60	RESERVED	RESERVED	RESERVED	RESERVED	NO CONNECT	43	Res0	60	Res0
61	P0.4	DIO 4	DIO 4	DIO 4	P0.4	42	ch4	61	dut4
62	GND	GND	GND	GND	GND	41	GND	62	GND
63	P0.2	DIO 2	DIO 2	DIO 2	P0.2	40	ch2	63	dut2
64	PFI 2	PFI 2	PFI 2	PFI 2	PFI 2	39	ctrl2	64	ctrl2
65	P0.0	DIO 0	DIO 0	DIO 0	P0.0	38	ch0	65	dut0
66	GND	GND	GND	GND	GND	37	GND	66	GND
67	PFI 5	STROBE	STROBE	PFI 5/ STROBE	GLOBAL CLOCK 0	36	ctrl5	67	dutctrl5
68	GND	GND	GND	GND	GND	35	GND	68	GND

Related concepts:

- [NI PXI/PXIe-2515 Intended Use](#)

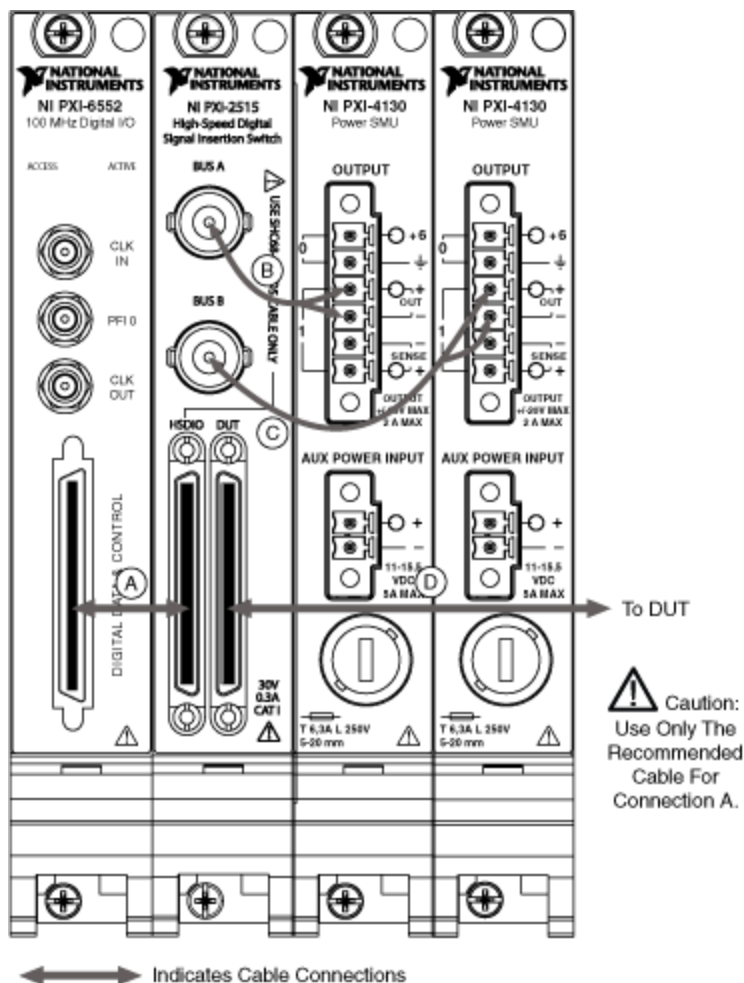
NI PXI/PXIe-2515 Intended Use

The two analog buses of the NI PXI/PXIe-2515 (NI 2515) are intended to facilitate connectivity in performing DC parametric measurements. The analog buses of the NI 2515 are not intended for high-bandwidth analog measurements (for example, rise time and skew). Refer to the following sections for more information about the intended use of the NI 2515.

- NI 2515 Intended Use
- NI 2515 Signal Connections

NI 2515 Intended Use

You can connect the NI 2515 to one supported NI high-speed DIO device and up to two other instruments. Refer to NI PXI/PXIe-2515 Analog Channel Expansion if your system requires the connection of more than two other instruments. The NI 2515 is intended for use with any supported single-ended NI high-speed DIO device (for example, the NI 654x or the NI 655x), and it is not intended for use with a low-voltage differential signaling (LVDS) NI high-speed DIO device (for example, the NI 656x). Refer to the following figure and the NI 2515 Signal Connections table for an example of the intended use of the NI 2515 in a system.



Note Slot placement of the modules within the chassis varies depending on the slot compatibility of your system.



Note NI recommends placing your supported NI high-speed DIO device in the chassis slot immediately to the left of the NI 2515. Use caution when inserting or removing a device immediately to the left of the NI 2515 when the NI SHC68-C68-D5 cable is connected to the NI 2515, as the cable connector may overlap slightly into the space of that slot.

NI 2515 Signal Connections

Refer to the following table to select accessories that connect the NI 2515 to your system.

Connection Indicated in Intended Use Diagram	Cable Connection	Recommended Accessories	Notes
A	VHDCI connector on supported NI high-speed DIO device to left VHDCI connector on NI 2515	NI SHC68-C68-D5 0.5m Shielded Single-Ended Cable for High-Speed Digital Signal Insertion Switch	 Caution Use only the NI SHC68-C68-D5 cable to connect the supported NI high-speed DIO device to the NI 2515. The cable translates the pinout of the supported NI high-speed DIO device to the HSDIO connector on the NI 2515 so that the pinout of the DUT connector on the NI 2515 matches that of the supported NI high-speed DIO device.
B and C	BNC connectors on NI 2515 to parametric measurement devices	—	There is not a designated cable to connect the BNC connectors on the NI 2515 to parametric measurement devices. Select a cable that fits the connectivity needs of your system.  Note The outer shields of both analog bus channels (B and C in the diagram) are connected to chassis ground. Therefore, the negative lead of any analog bus channel must be at chassis ground.
D	Right VHDCI connector on NI 2515 to DUT	You have the following options: NI CB-2162 connector block and NI SHC68-C68-D4 Shielded Single-Ended Cable for	Refer to ni.com/manuals for information on the use of these signal connection options.

Connection Indicated in Intended Use Diagram	Cable Connection	Recommended Accessories	Notes
		High-Speed Digital Devices • NI SMB-2163 breakout box and NI SHC68-C68-D4 Shielded Single-Ended Cable for High-Speed Digital Devices • NI SHC68-H1X38 Shielded Single-Ended Flying-Lead Cable	

Related concepts:

- [NI PXI/PXIe-2515 Analog Channel Expansion](#)

NI PXI/PXIe-2515 Triggering

The NI PXI/PXIe-2515 (NI 2515) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2515.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A

Trigger Input	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2515.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5

Scan Advanced Output	Software	Hardware
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2520

The NI PXI-2520 is an 80-channel general-purpose relay module for the PXI platform. The NI PXI-2520 is composed of 80 armature non-latching SPST relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI PXI-2520 and possible operation modes.

Topology	Software Name	Immediate	Scanning
80-SPST	2520/80-SPST(NISWITCH_TOPOLOGY_2520_80_SPST)	✓	✓

Related Information

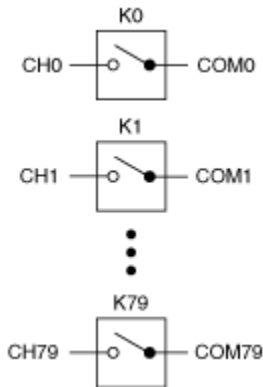
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2520 80-SPST Topology](#)
- [Integration and System Considerations](#)

NI PXI-2520 80-SPST Topology

The following figure represents the NI PXI-2520 in the 80-SPST topology.



Making a Connection

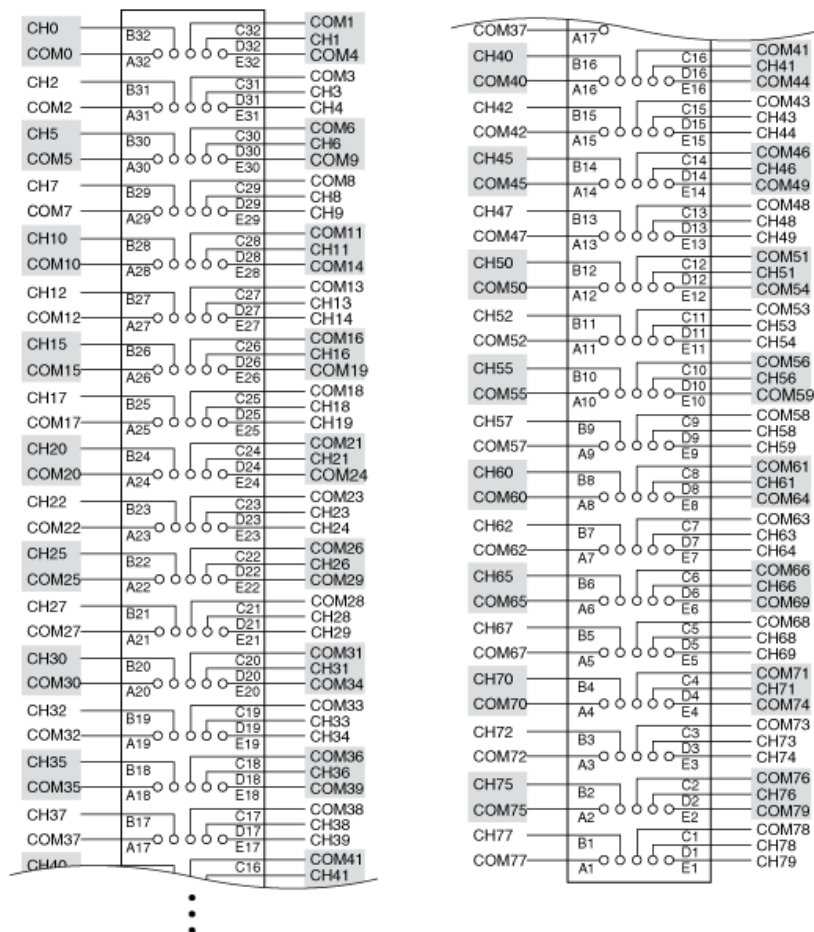
You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI PXI-2520, a typical scan list entry could be `ch2->com2;`. This entry closes the relay between CH2 and COM2.

Pinout

The following figure identifies the pins for the NI PXI-2520 in the 80-SPST topology.



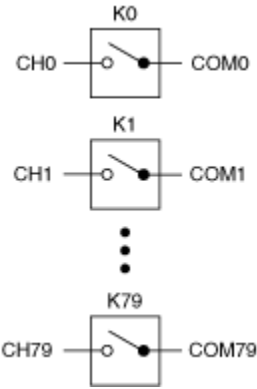
Related concepts:

- Operation Modes

- [Scan Lists](#)

NI PXI-2520 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2520.



The following table lists relay names for the NI PXI-2520.

Relays
k0...k79

NI PXI-2520 Relay Replacement

The NI PXI-2520 uses electromechanical armature relays.

**Note** The NI PXI-2520 uses a custom lead length to meet safety standards. Trim leads to no more than 1 mm (0.04 inch) from the PCB. You also can use the spare relay included with the module at location K80.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Tyco Electronics	1462041-5

Relay Kit	Part Number
National Instruments (10 relays)	782460-10

Complete the following steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the front of the module. The following table maps the relay names to the channel names.

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
ch0	K0	ch20	K20	ch40	K40	ch60	K60
ch1	K1	ch21	K21	ch41	K41	ch61	K61
ch2	K2	ch22	K22	ch42	K42	ch62	K62
ch3	K3	ch23	K23	ch43	K43	ch63	K63
ch4	K4	ch24	K24	ch44	K44	ch64	K64
ch5	K5	ch25	K25	ch45	K45	ch65	K65
ch6	K6	ch26	K26	ch46	K46	ch66	K66
ch7	K7	ch27	K27	ch47	K47	ch67	K67
ch8	K8	ch28	K28	ch48	K48	ch68	K68
ch9	K9	ch29	K29	ch49	K49	ch69	K69
ch10	K10	ch30	K30	ch50	K50	ch70	K70
ch11	K11	ch31	K31	ch51	K51	ch71	K71
ch12	K12	ch32	K32	ch52	K52	ch72	K72
ch13	K13	ch33	K33	ch53	K53	ch73	K73
ch14	K14	ch34	K34	ch54	K54	ch74	K74
ch15	K15	ch35	K35	ch55	K55	ch75	K75
ch16	K16	ch36	K36	ch56	K56	ch76	K76
ch17	K17	ch37	K37	ch57	K57	ch77	K77
ch18	K18	ch38	K38	ch58	K58	ch78	K78

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
ch19	K19	ch39	K39	ch59	K59	ch79	K79

3. Replace the relay.

The NI PXI-2520 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2520 Triggering

The NI PXI-2520 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2520.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2520.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2521

The NI PXI-2521 is a 40-channel general-purpose relay module for the PXI platform. The NI PXI-2521 is composed of 40 armature non-latching DPST relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI PXI-2521 and possible operation modes.

Topology	Software Name	Immediate	Scanning
40-DPST	2521/40-DPST(NISWITCH_TOPOLOGY_2521_40_DPST)	✓	✓

Related Information

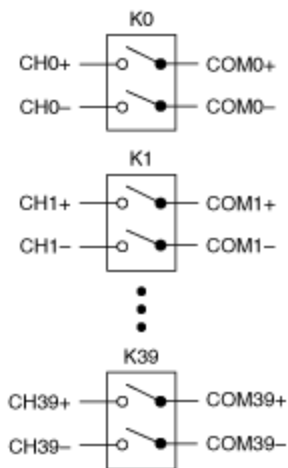
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2521 40-DPST Topology](#)
- [Integration and System Considerations](#)

NI PXI-2521 40-DPST Topology

The following figure represents the NI PXI-2521 in the 40-DPST topology.



Making a Connection

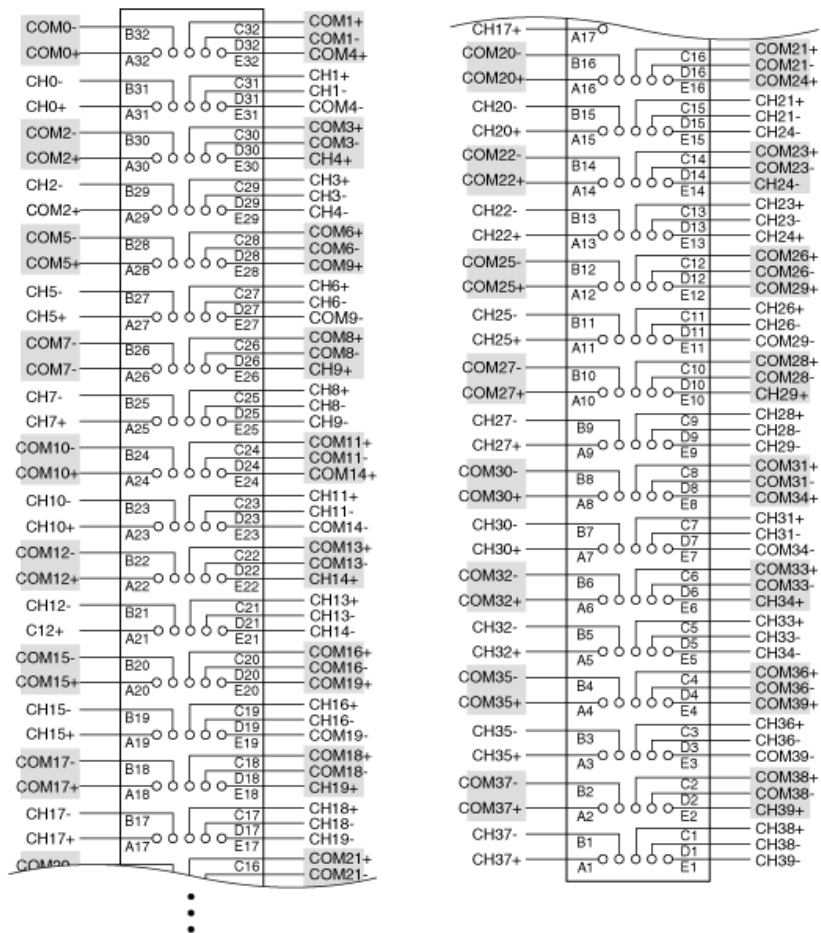
You can control the channels using the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI PXI-2521, a typical scan list entry could be `ch2->com2;`. This entry closes the relay between CH2 and COM2.

Pinout

The following figure identifies the pins for the NI PXI-2521 in the 40-DPST topology.

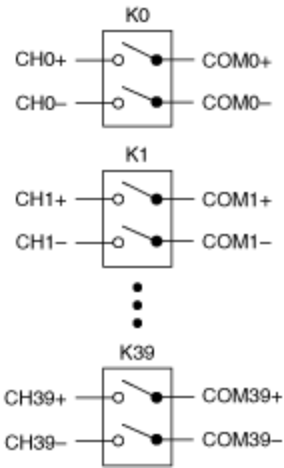


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2521 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2521.



The following table lists relay names for the NI PXI-2521.

Relays
k0...k39

NI PXI-2521 Relay Replacement

The NI PXI-2521 uses electromechanical armature relays.

**Note** The NI PXI-2521 uses a custom lead length to meet safety standards. Trim leads to no more than 1 mm (0.04 inch) from the PCB. You also can use the spare relay included with the module at location K40.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Tyco Electronics	1462043-6

Relay Kit	Part Number
National Instruments (10 relays)	782461-10

Complete the following steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI

chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the front of the module. The following table maps the relay names to the channel names.

ChannelName	RelayName	ChannelName	RelayName
ch0	K0	ch20	K20
ch1	K1	ch21	K21
ch2	K2	ch22	K22
ch3	K3	ch23	K23
ch4	K4	ch24	K24
ch5	K5	ch25	K25
ch6	K6	ch26	K26
ch7	K7	ch27	K27
ch8	K8	ch28	K28
ch9	K9	ch29	K29
ch10	K10	ch30	K30
ch11	K11	ch31	K31
ch12	K12	ch32	K32
ch13	K13	ch33	K33
ch14	K14	ch34	K34
ch15	K15	ch35	K35
ch16	K16	ch36	K36
ch17	K17	ch37	K37
ch18	K18	ch38	K38
ch19	K19	ch39	K39

3. Replace the relay.

The NI PXI-2521 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2521 Triggering

The NI PXI-2521 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2521.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2521.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Scan Advanced Output	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2522

The NI PXI-2522 is a 53-channel general-purpose relay module for the PXI platform. The NI PXI-2522 is composed of 53 armature non-latching SPDT relays.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2522 and possible operation modes.

Topology	Software Name	Immediate	Scanning
53-SPDT	2522/53-SPDT(NISWITCH_TOPOLOGY_2522_53_SPDT)	✓	✓

Related Information:

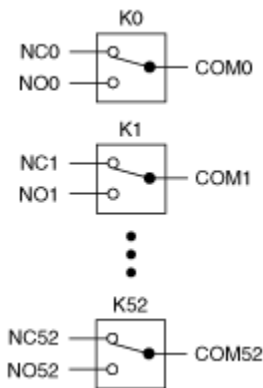
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2522 53-SPDT Topology](#)
- [Integration and System Considerations](#)

NI PXI-2522 53-SPDT Topology

The following figure represents the NI PXI-2522 in the 53-SPDT topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

To connect the NO terminal to the COM terminal of that channel, disconnect the NC terminal from the COM of that channel.

For example, to connect NO2 to COM2, use the following code:

```
niSwitch_Disconnect(vi, "nc2", "com2")
```

```
niSwitch_Connect(vi, "no2", "com2")
```



Note To connect NO to COM you do not need to disconnect NC from COM after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the niSwitch_DisconnectAll function has been made.



Note niSwitch_Disconnect(vi, "nc2", "com2") does not activate the relay until niSwitch_Connect(vi, "no2", "com2") is executed.

To connect the NC terminal to the COM terminal of that channel, disconnect the NO terminal from the COM of that channel.

For example, to connect NC2 to COM2, use the following code:

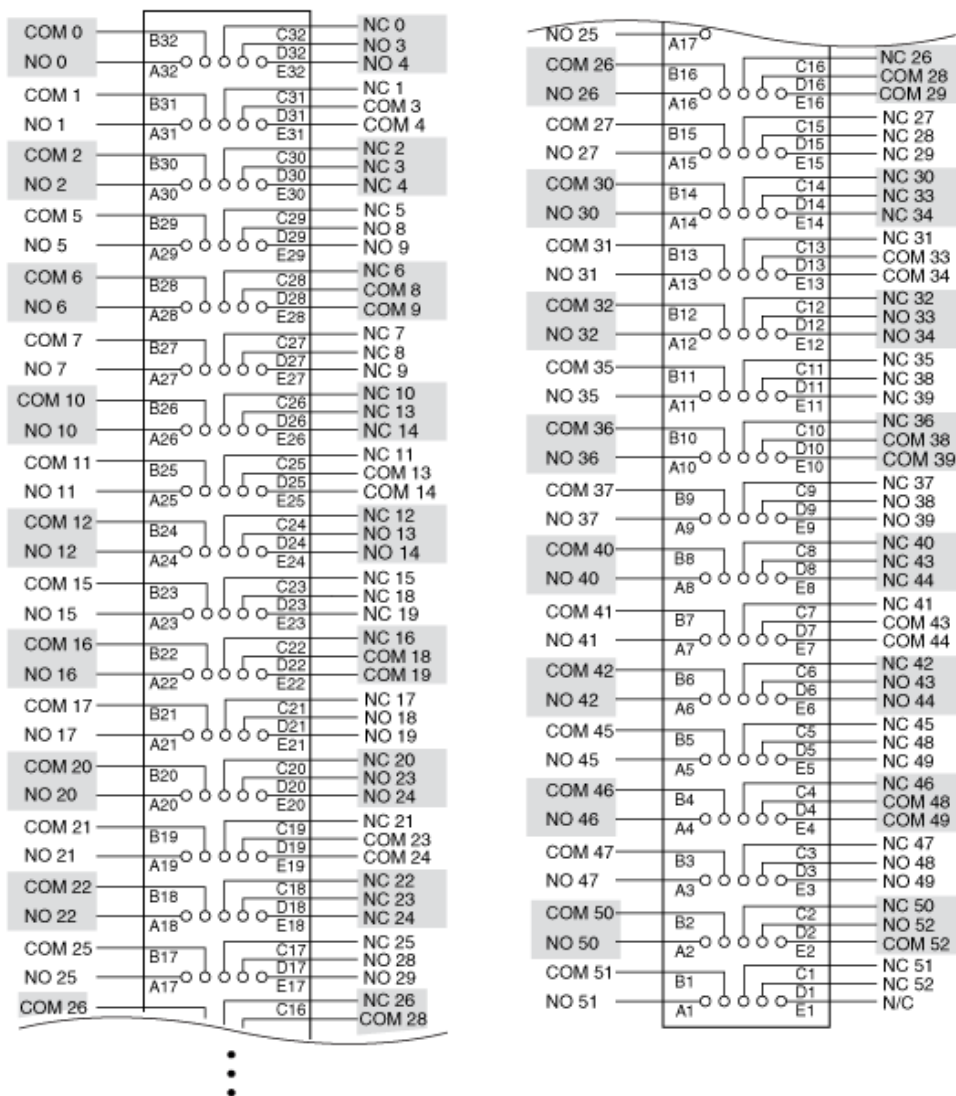
```
niSwitch_Disconnect(vi, "no2", "com2")
```

```
niSwitch_Connect(vi, "nc2", "com2")
```

When scanning the NI PXI-2522, a typical scan list entry could be `nc2->com2;`. This entry routes the signal connected to NC2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2522 in the 53-SPDT topology.

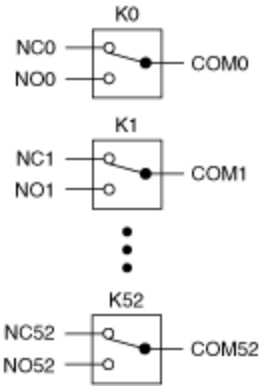


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2522 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2522.



The following table lists relay names for the NI PXI-2522.

Relays
k0...k52

NI PXI-2522 Relay Replacement

The NI PXI-2522 uses electromechanical armature relays.



Note The NI PXI-2522 uses a custom lead length to meet safety standards. Trim leads to no more than 1 mm (0.04 inch) from the PCB. You also can use the spare relay included with the module at location K53.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 relays)	781089-10

Complete the following steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the front of the module. The following table maps the relay names to the channel names.

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
ch0	K0	ch20	K20	ch40	K40
ch1	K1	ch21	K21	ch41	K41
ch2	K2	ch22	K22	ch42	K42
ch3	K3	ch23	K23	ch43	K43
ch4	K4	ch24	K24	ch44	K44
ch5	K5	ch25	K25	ch45	K45
ch6	K6	ch26	K26	ch46	K46
ch7	K7	ch27	K27	ch47	K47
ch8	K8	ch28	K28	ch48	K48
ch9	K9	ch29	K29	ch49	K49
ch10	K10	ch30	K30	ch50	K50
ch11	K11	ch31	K31	ch51	K51
ch12	K12	ch32	K32	ch52	K52
ch13	K13	ch33	K33	-	-
ch14	K14	ch34	K34	-	-
ch15	K15	ch35	K35	-	-
ch16	K16	ch36	K36	-	-
ch17	K17	ch37	K37	-	-
ch18	K18	ch38	K38	-	-
ch19	K19	ch39	K39	-	-

3. Replace the relay.

The NI PXI-2522 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2522 Triggering

The NI PXI-2522 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2522.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2522.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Scan Advanced Output	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2523

The NI PXI-2523 is an 26-channel general-purpose relay module for the PXI platform. The NI PXI-2523 is composed of 26 armature non-latching DPDT relays.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2523 and possible operation modes.

Topology	Software Name	Immediate	Scanning
26-DPDT	2523/26-DPDT(NISWITCH_TOPOLOGY_2523_26_DPDT)	✓	✓

Related Information

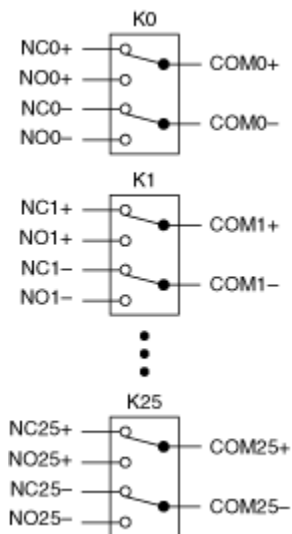
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2523 26-DPDT Topology](#)
- [Integration and System Considerations](#)

NI PXI-2523 26-DPDT Topology

The following figure represents the NI PXI-2523 in the 26-DPDT topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

To connect the NO terminal to the COM terminal of that channel, disconnect the NC terminal from the COM of that channel.

For example, to connect NO2 to COM2, use the following code:

```
niSwitch_Disconnect(vi, "nc2", "com2")

niSwitch_Connect(vi, "no2", "com2")
```



Note To connect NO to COM you do not need to disconnect NC from COM after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function has been made.



Note `niSwitch_Disconnect(vi, "nc2", "com2")` does not activate the relay until `niSwitch_Connect(vi, "no2", "com2")` is executed.

To connect the NC terminal to the COM terminal of that channel, disconnect the NO terminal from the COM of that channel.

For example, to connect NC2 to COM2, use the following code:

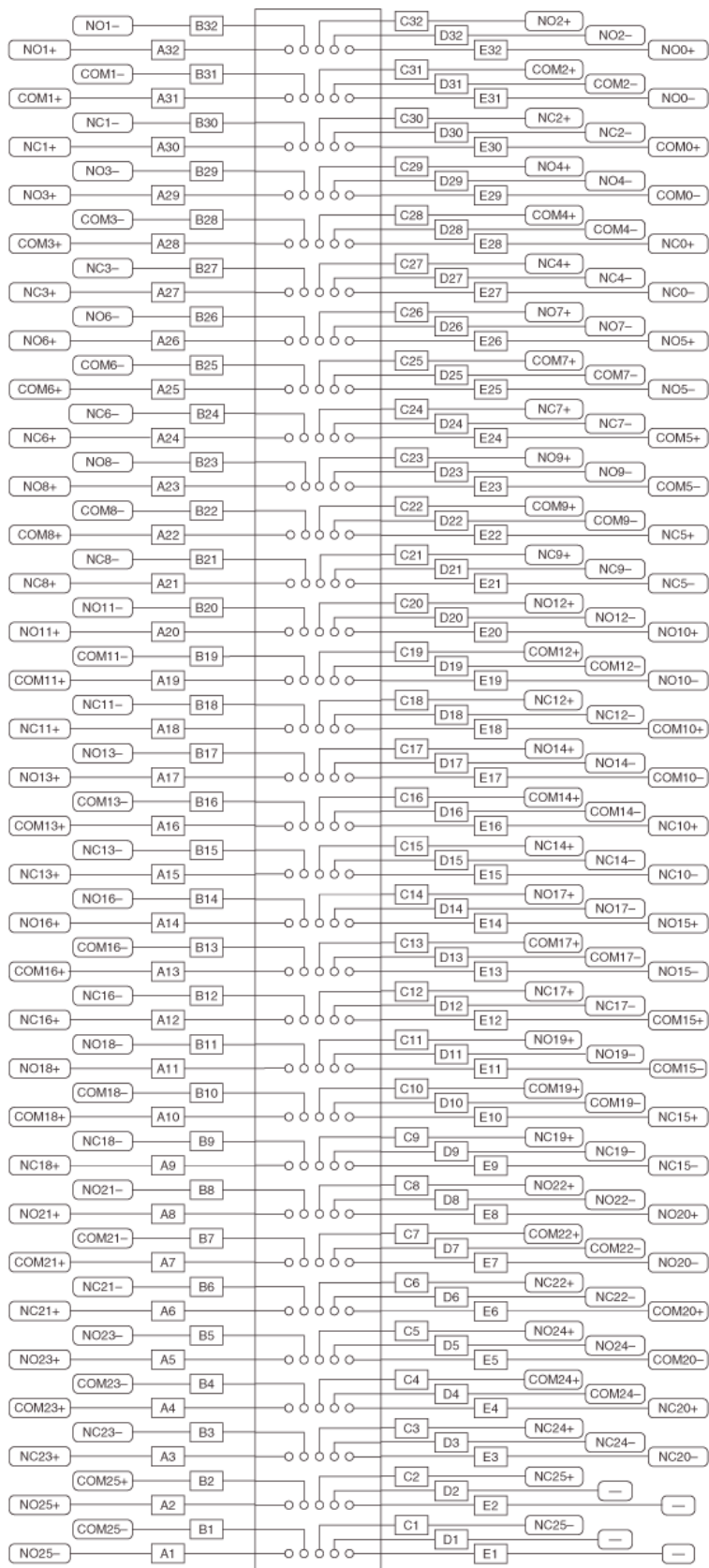
```
niSwitch_Disconnect(vi, "no2", "com2")

niSwitch_Connect(vi, "nc2", "com2")
```

When scanning the NI PXI-2523, a typical scan list entry could be `nc2->com2;`. This entry routes the signal connected to NC2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2523 in the 26-DPDT topology.

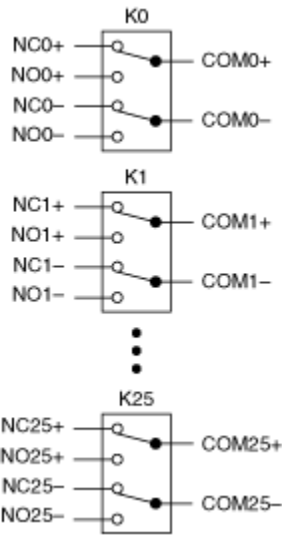


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2523 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2523.



The following table lists relay names for the NI PXI-2523.

Relays
k0...k25

NI PXI-2523 Relay Replacement

The NI PXI-2523 uses electromechanical armature relays.



Note The NI PXI-2523 uses a custom lead length to meet safety standards. Trim leads to no more than 1 mm (0.04 inch) from the PCB. You also can use the spare relay included with the module at location K26.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 relays)	781089-10

Complete the following steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the front of the module. The following table maps the relay names to the channel names.

ChannelName	RelayName	ChannelName	RelayName
ch0	K0	ch20	K20
ch1	K1	ch21	K21
ch2	K2	ch22	K22
ch3	K3	ch23	K23
ch4	K4	ch24	K24
ch5	K5	ch25	K25
ch6	K6	-	-
ch7	K7	-	-
ch8	K8	-	-
ch9	K9	-	-
ch10	K10	-	-
ch11	K11	-	-
ch12	K12	-	-
ch13	K13	-	-
ch14	K14	-	-
ch15	K15	-	-

ChannelName	RelayName	ChannelName	RelayName
ch16	K16	-	-
ch17	K17	-	-
ch18	K18	-	-
ch19	K19	-	-

3. Replace the relay.

The NI PXI-2523 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2523 Triggering

The NI PXI-2523 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2523.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2523.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXIe-2524

The NI PXIe-2524 (NI 2524) is a high-voltage multiplexer relay module for the PXI Express platform. The NI 2524 is composed of 111 armature relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the rated voltage of the module.

Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2524 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 128x1 Multiplexer	2524/1-Wire 128x1 Mux(NISWITCH_TOPOLOGY_2524_1_WIRE_128X1_MUX)	✓	
1-Wire Dual 64x1 Multiplexer	2524/1-Wire Dual 64x1 Mux(NISWITCH_TOPOLOGY_2524_1_WIRE_DUAL_64X1_MUX)	✓	
1-Wire Quad 32x1 Multiplexer	2524/1-Wire Quad 32x1 Mux(NISWITCH_TOPOLOGY_2524_1_WIRE_QUAD_32X1_MUX)	✓	
1-Wire Octal 16x1 Multiplexer	2524/1-Wire Octal 16x1 Mux(NISWITCH_TOPOLOGY_2524_1_WIRE_OCTAL_16X1_MUX)	✓	
1-Wire Sixteen 8x1 Multiplexer	2524/1-Wire Sixteen 8x1 Mux(NISWITCH_TOPOLOGY_2524_1_WIRE_SIXTEEN_8X1_MUX)	✓	

Related Information

- Integration and System Considerations

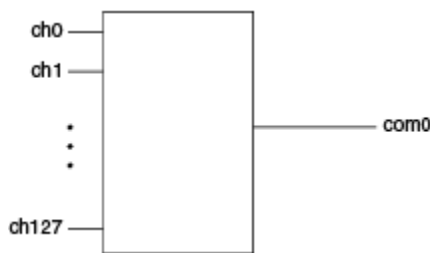
Related concepts:

- [Multiplexer](#)
- [Armature Relays](#)

- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2524 1-Wire 128×1 Multiplexer Topology](#)
- [NI PXIe-2524 1-Wire Dual 64×1 Multiplexer Topology](#)
- [NI PXIe-2524 1-Wire Quad 32×1 Multiplexer Topology](#)
- [NI PXIe-2524 1-Wire Sixteen 8×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2524 1-Wire 128×1 Multiplexer Topology

The following figure represents the NI PXIe-2524 (NI 2524) in the 1-wire 128×1 multiplexer topology.



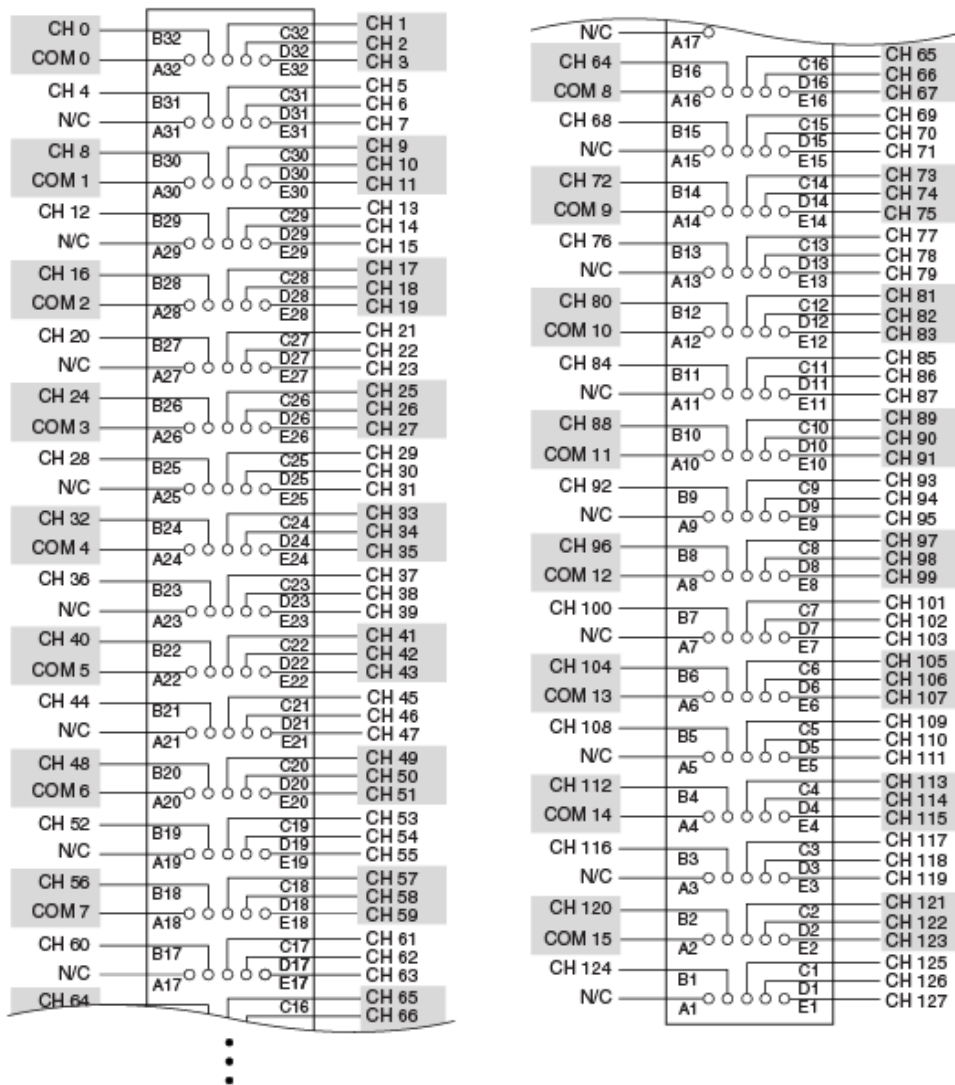
Making a Connection

When using the NI 2524 as a 1-wire 128×1 multiplexer, all channels route to com0. You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to connect channel 1 to com0, call `niSwitch_Connect(vi, "ch1", "com0")`. To disconnect channel 1 from com0, call `niSwitch_Disconnect(vi, "ch1", "com0")`.

Pinout

The following figure identifies the pins for the NI 2524 in the 1-wire 128×1 multiplexer topology.



The following table lists channel pairings and relay assignments for the NI 2524 in the 1-wire 128×1 multiplexer topology.

1-Wire 128×1 Channel Name		Relay Name
CH0	CH4	kb0s1
CH1	CH5	kb0s2
CH2	CH6	kb0s3
CH3	CH7	kb0s4
CH8	CH12	kb1s1
CH9	CH13	kb1s2
CH10	CH14	kb1s3

1-Wire 128×1 Channel Name		Relay Name
CH11	CH15	kb1s4
CH16	CH20	kb2s1
CH17	CH21	kb2s2
CH18	CH22	kb2s3
CH19	CH23	kb2s4
CH24	CH28	kb3s1
CH25	CH29	kb3s2
CH26	CH30	kb3s3
CH27	CH31	kb3s4
CH32	CH36	kb4s1
CH33	CH37	kb4s2
CH34	CH38	kb4s3
CH35	CH39	kb4s4
CH40	CH44	kb5s1
CH41	CH45	kb5s2
CH42	CH46	kb5s3
CH43	CH47	kb5s4
CH48	CH52	kb6s1
CH49	CH53	kb6s2
CH50	CH54	kb6s3
CH51	CH55	kb6s4
CH56	CH60	kb7s1
CH57	CH61	kb7s2
CH58	CH62	kb7s3
CH59	CH63	kb7s4
CH64	CH68	kb8s1
CH65	CH69	kb8s2

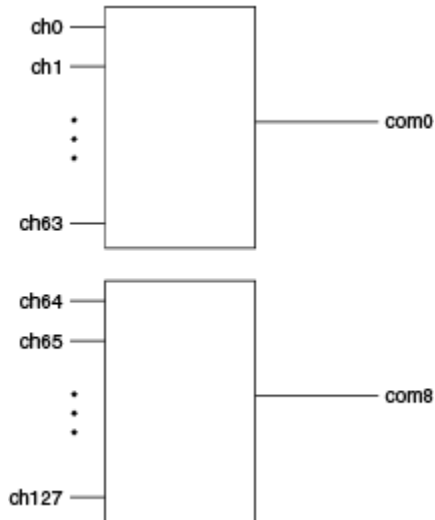
1-Wire 128×1 Channel Name		Relay Name
CH66	CH70	kb8s3
CH67	CH71	kb8s4
CH72	CH76	kb9s1
CH73	CH77	kb9s2
CH74	CH78	kb9s3
CH75	CH79	kb9s4
CH80	CH84	kb10s1
CH81	CH85	kb10s2
CH82	CH86	kb10s3
CH83	CH87	kb10s4
CH88	CH92	kb11s1
CH89	CH93	kb11s2
CH90	CH94	kb11s3
CH91	CH95	kb11s4
CH96	CH100	kb12s1
CH97	CH101	kb12s2
CH98	CH102	kb12s3
CH99	CH103	kb12s4
CH104	CH108	kb13s1
CH105	CH109	kb13s2
CH106	CH110	kb13s3
CH107	CH111	kb13s4
CH112	CH116	kb14s1
CH113	CH117	kb14s2
CH114	CH118	kb14s3
CH115	CH119	kb14s4
CH120	CH124	kb15s1

1-Wire 128×1 Channel Name		Relay Name
CH121	CH125	kb15s2
CH122	CH126	kb15s3
CH123	CH127	kb15s4
CH123	CH127	kb15s4
COM 0		kb0com1
kb0com2		
kbc01		
kb1com1		
kb1com2		
kb1com2		
kbc02		
kb2com1		
kb2com2		
kbc23		
kb3com1		
kb3com2		
kbc04		
kb4com1		
kb4com2		
kbc45		
kb5com1		
kb5com2		
kbc46		
kb6com1		
kb6com2		
kbc67		
kb7com1		

1-Wire 128×1 Channel Name		Relay Name
kb7com2		
kbc08		
kb8com1		
kb8com2		
kbc89		
kb9com1		
kb9com2		
kbc810		
kb10com1		
kb10com2		
kbc1011		
kb11com1		
kb11com2		
kbc812		
kb12com1		
kb12com2		
kbc1213		
kb13com1		
kb13com2		
kbc1214		
kb14com1		
kb14com2		
kbc1415		
kb15com1		
kb15com2		

NI PXIe-2524 1-Wire Dual 64×1 Multiplexer Topology

The following figure represents the NI PXIe-2524 (NI 2524) in the 1-wire dual 64×1 multiplexer topology.



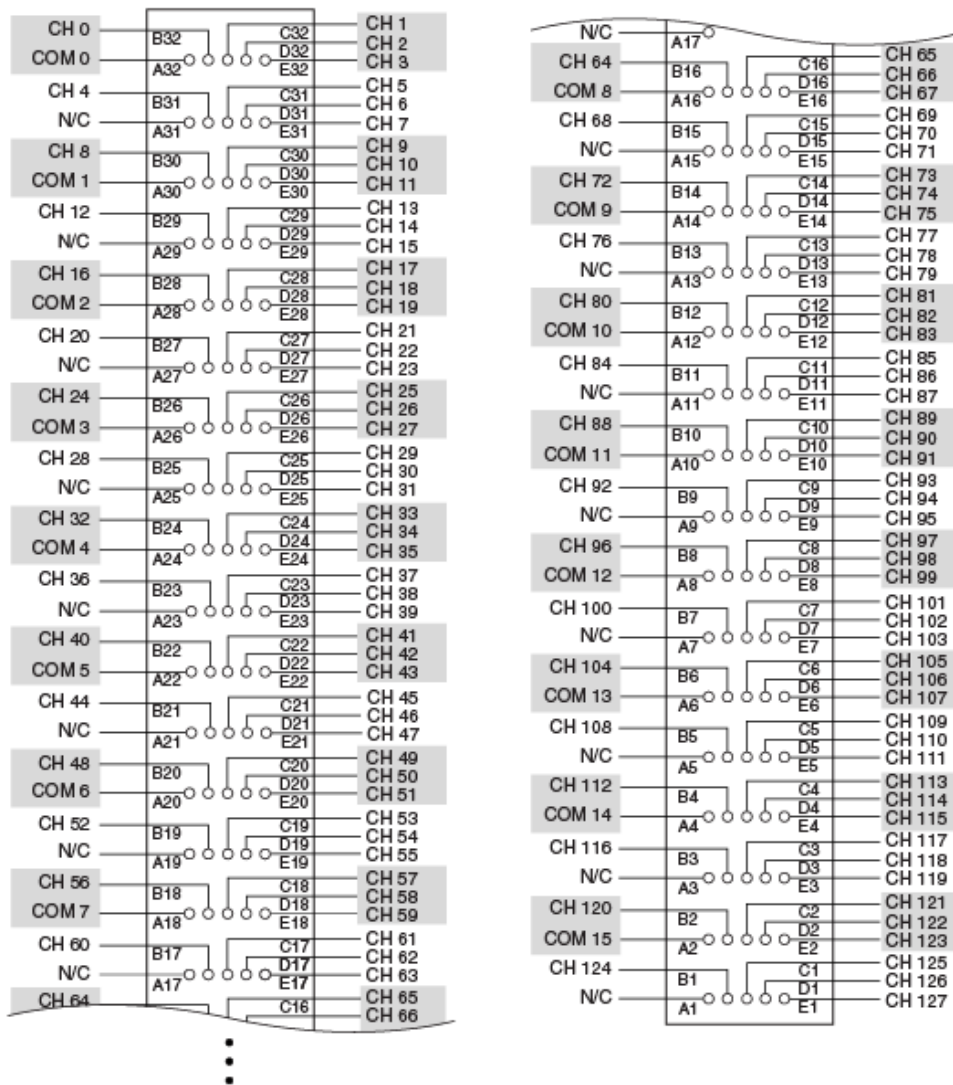
Making a Connection

When using the NI 2524 as a 1-wire dual 64×1 multiplexer, all channels in a given bank route to the corresponding com. You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to connect channel 1 to com0, call `niSwitch_Connect(vi, "ch1", "com0")`. To disconnect channel 1 from com0, call `niSwitch_Disconnect(vi, "ch1", "com0")`.

Pinout

The following figure identifies the pins for the NI 2524 in the 1-wire dual 64×1 multiplexer topology.



The following table lists channel pairings and relay assignments for the NI 2524 in the 1-wire dual 64×1 multiplexer topology.

1-Wire Dual 64×1 Channel Name		Relay Name
CH0	CH4	kb0s1
CH0	CH4	kb0s1
CH1	CH5	kb0s2
CH2	CH6	kb0s3
CH3	CH7	kb0s4
CH8	CH12	kb1s1
CH9	CH13	kb1s2

1-Wire Dual 64×1 Channel Name		Relay Name
CH10	CH14	kb1s3
CH11	CH15	kb1s4
CH16	CH20	kb2s1
CH17	CH21	kb2s2
CH18	CH22	kb2s3
CH19	CH23	kb2s4
CH24	CH28	kb3s1
CH25	CH29	kb3s2
CH26	CH30	kb3s3
CH27	CH31	kb3s4
CH32	CH36	kb4s1
CH33	CH37	kb4s2
CH34	CH38	kb4s3
CH35	CH39	kb4s4
CH40	CH44	kb5s1
CH41	CH45	kb5s2
CH42	CH46	kb5s3
CH43	CH47	kb5s4
CH48	CH52	kb6s1
CH49	CH53	kb6s2
CH50	CH54	kb6s3
CH51	CH55	kb6s4
CH56	CH60	kb7s1
CH57	CH61	kb7s2
CH58	CH62	kb7s3
CH59	CH63	kb7s4
CH64	CH68	kb8s1

1-Wire Dual 64×1 Channel Name		Relay Name
CH65	CH69	kb8s2
CH66	CH70	kb8s3
CH67	CH71	kb8s4
CH72	CH76	kb9s1
CH73	CH77	kb9s2
CH74	CH78	kb9s3
CH75	CH79	kb9s4
CH80	CH84	kb10s1
CH81	CH85	kb10s2
CH82	CH86	kb10s3
CH83	CH87	kb10s4
CH88	CH92	kb11s1
CH89	CH93	kb11s2
CH90	CH94	kb11s3
CH91	CH95	kb11s4
CH96	CH100	kb12s1
CH97	CH101	kb12s2
CH98	CH102	kb12s3
CH99	CH103	kb12s4
CH104	CH108	kb13s1
CH105	CH109	kb13s2
CH106	CH110	kb13s3
CH107	CH111	kb13s4
CH112	CH116	kb14s1
CH113	CH117	kb14s2
CH114	CH118	kb14s3
CH115	CH119	kb14s4

1-Wire Dual 64×1 Channel Name		Relay Name
CH120	CH124	kb15s1
CH121	CH125	kb15s2
CH122	CH126	kb15s3
CH123	CH127	kb15s4
CH123	CH127	kb15s4
COM 0		kb0com1
kb0com2		
kbc01		
kb1com1		
kb1com2		
kbc02		
kb2com1		
kb2com2		
kbc23		
kb3com1		
kb3com2		
kbc04		
kb4com1		
kb4com2		
kbc45		
kb5com1		
kb5com2		
kbc46		
kb6com1		
kb6com2		
kbc67		
kb7com1		

1-Wire Dual 64×1 Channel Name		Relay Name
kb7com2		
COM 8		kb8com1
kb8com2		
kbc89		
kb9com1		
kb9com2		
kbc810		
kb10com1		
kb10com2		
kbc1011		
kb11com1		
kb11com2		
kbc812		
kb12com1		
kb12com2		
kbc1213		
kb13com1		
kb13com2		
kbc1214		
kb14com1		
kb14com2		
kbc1415		
kb15com1		
kb15com2		

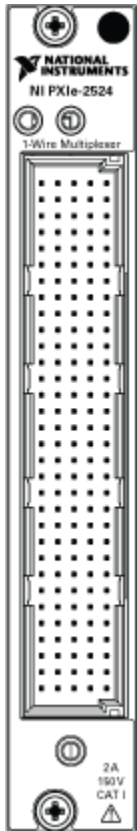
Related concepts:

- [N-Wire Switching Modes](#)

- [Multiplexer](#)

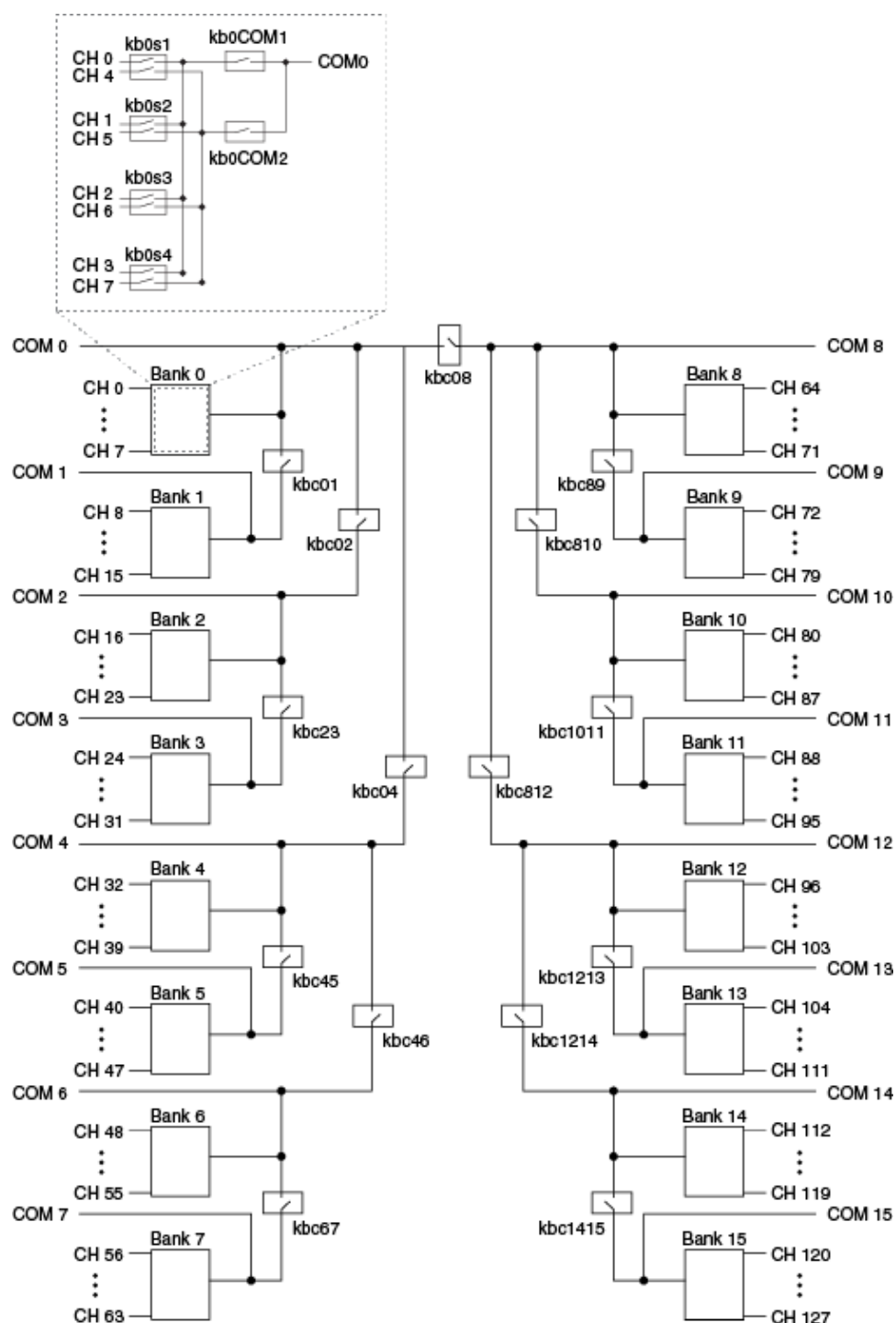
NI PXIe-2524 Front Panel

The following figure illustrates the NI PXIe-2524 front panel.



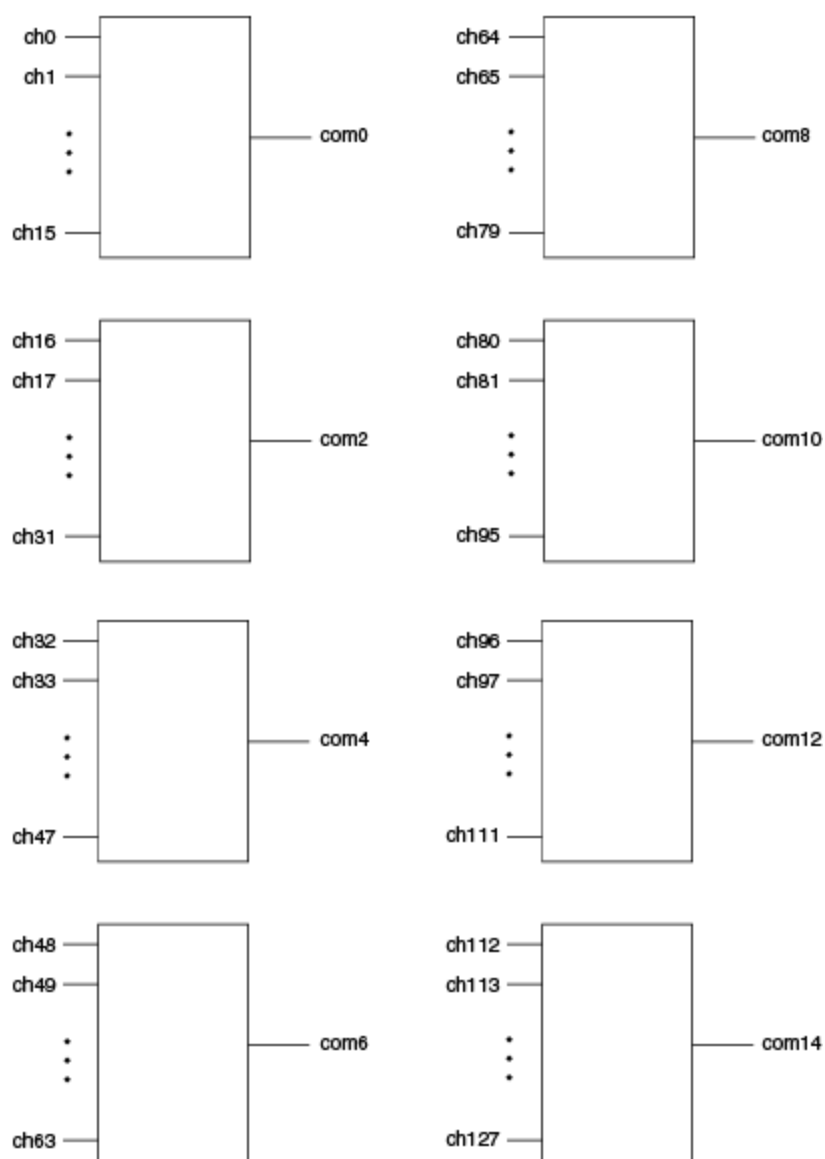
NI PXIe-2524 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2524.



NI PXIe-2524 1-Wire Octal 16×1 Multiplexer Topology

The following figure represents the NI PXIe-2524 (NI 2524) in the 1-wire octal 16×1 multiplexer topology.



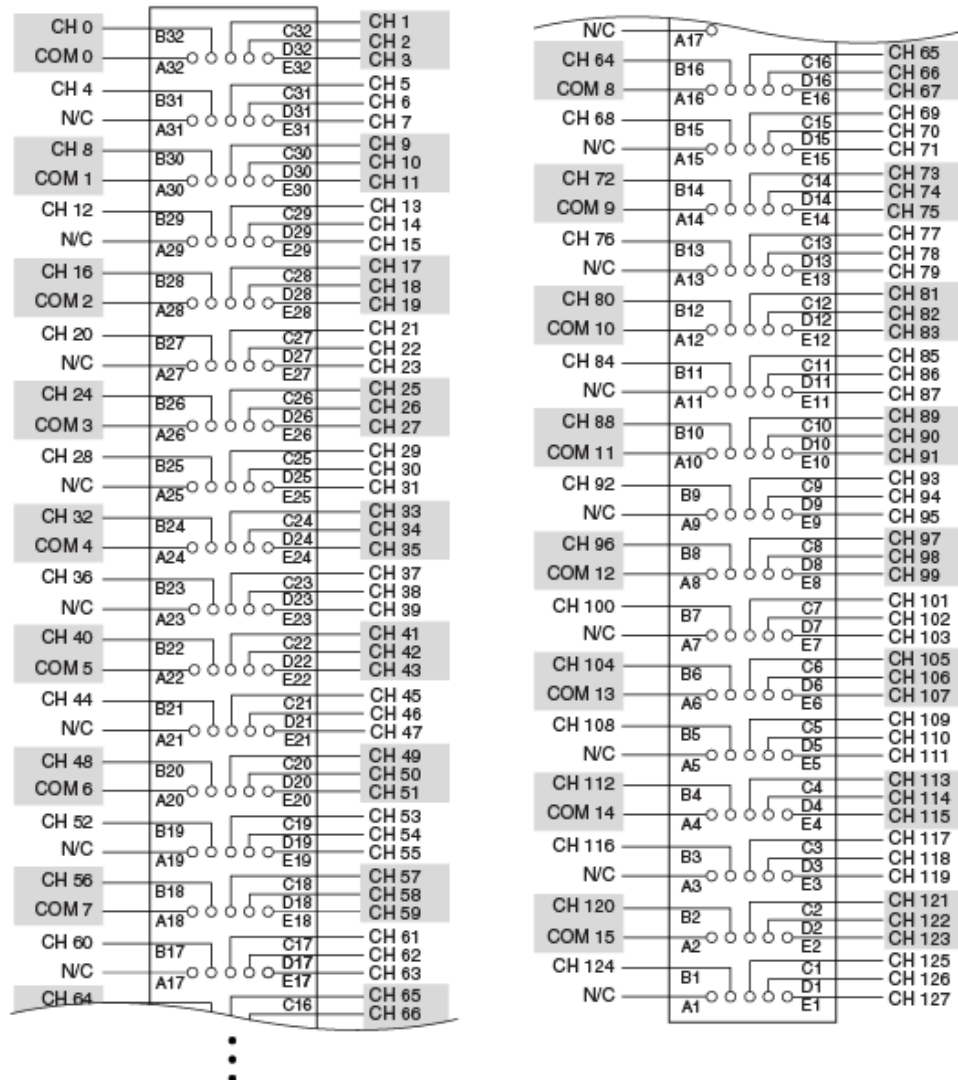
Making a Connection

When using the NI 2524 as a 1-wire octal 16×1 multiplexer, all channels in a given bank route to the corresponding com. You can control the channels using the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function.

For example, to connect channel 1 to com0, call `niSwitch_Connect(vi, "ch1", "com0")`. To disconnect channel 1 from com0, call `niSwitch_Disconnect(vi, "ch1", "com0")`.

Pinout

The following figure identifies the pins for the NI 2524 in the 1-wire octal 16×1 multiplexer topology.



The following table lists channel pairings and relay assignments for the NI 2524 in the 1-wire octal 16×1 multiplexer topology.

1-Wire Octal 16×1 Channel Name		Relay Name
CH0	CH4	kb0s1
CH0	CH4	kb0s1
CH1	CH5	kb0s2

1-Wire Octal 16×1 Channel Name		Relay Name
CH2	CH6	kb0s3
CH3	CH7	kb0s4
CH8	CH12	kb1s1
CH9	CH13	kb1s2
CH10	CH14	kb1s3
CH11	CH15	kb1s4
CH16	CH20	kb2s1
CH17	CH21	kb2s2
CH18	CH22	kb2s3
CH19	CH23	kb2s4
CH24	CH28	kb3s1
CH25	CH29	kb3s2
CH26	CH30	kb3s3
CH27	CH31	kb3s4
CH32	CH36	kb4s1
CH33	CH37	kb4s2
CH34	CH38	kb4s3
CH35	CH39	kb4s4
CH40	CH44	kb5s1
CH41	CH45	kb5s2
CH42	CH46	kb5s3
CH43	CH47	kb5s4
CH48	CH52	kb6s1
CH49	CH53	kb6s2
CH50	CH54	kb6s3
CH51	CH55	kb6s4
CH56	CH60	kb7s1

1-Wire Octal 16×1 Channel Name		Relay Name
CH57	CH61	kb7s2
CH58	CH62	kb7s3
CH59	CH63	kb7s4
CH64	CH68	kb8s1
CH65	CH69	kb8s2
CH66	CH70	kb8s3
CH67	CH71	kb8s4
CH72	CH76	kb9s1
CH73	CH77	kb9s2
CH74	CH78	kb9s3
CH75	CH79	kb9s4
CH80	CH84	kb10s1
CH81	CH85	kb10s2
CH82	CH86	kb10s3
CH83	CH87	kb10s4
CH88	CH92	kb11s1
CH89	CH93	kb11s2
CH90	CH94	kb11s3
CH91	CH95	kb11s4
CH96	CH100	kb12s1
CH97	CH101	kb12s2
CH98	CH102	kb12s3
CH99	CH103	kb12s4
CH104	CH108	kb13s1
CH105	CH109	kb13s2
CH106	CH110	kb13s3
CH107	CH111	kb13s4

1-Wire Octal 16×1 Channel Name		Relay Name
CH112	CH116	kb14s1
CH113	CH117	kb14s2
CH114	CH118	kb14s3
CH115	CH119	kb14s4
CH120	CH124	kb15s1
CH121	CH125	kb15s2
CH122	CH126	kb15s3
CH123	CH127	kb15s4
CH123	CH127	kb15s4
COM 0		kb0com1
kb0com2		
kbc01		
kb1com1		
kb1com2		
COM 2		kb2com1
kb2com2		
kbc23		
kb3com1		
kb3com2		
COM 4		kb4com1
kb4com2		
kbc45		
kb5com1		
kb5com2		
COM 6		kb6com1
kb6com2		
kbc67		

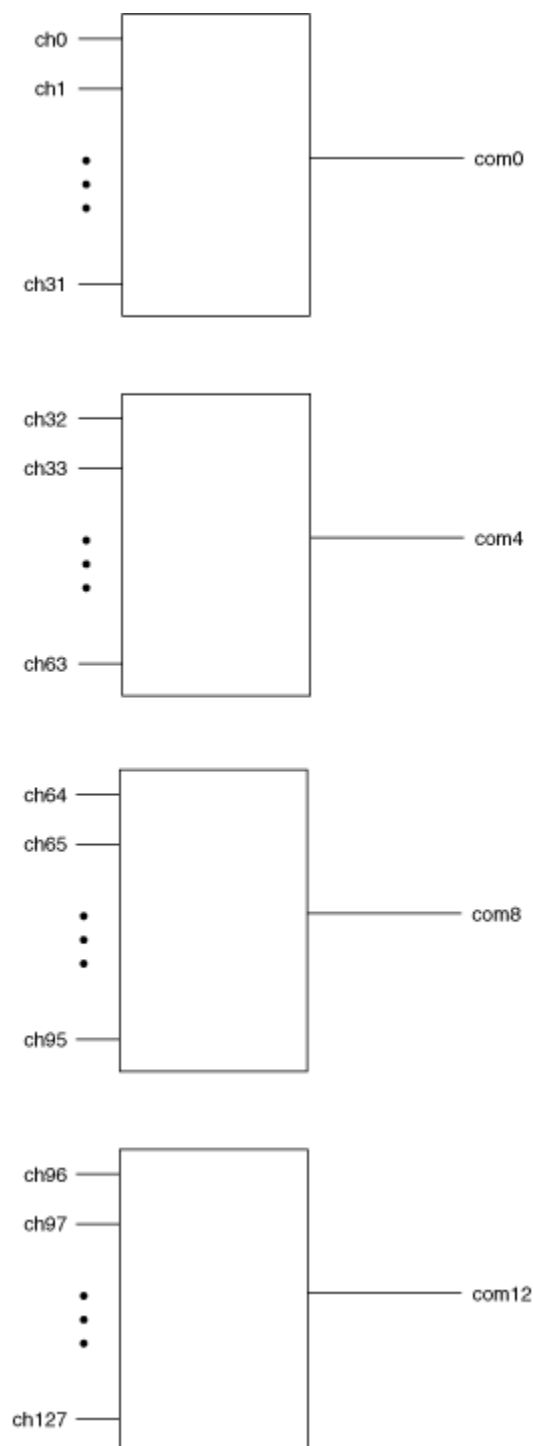
1-Wire Octal 16×1 Channel Name		Relay Name
kb7com1		
kb7com2		
COM 8		kb8com1
kb8com2		
kbc89		
kb9com1		
kb9com2		
COM 10		kb10com1
kb10com2		
kbc1011		
kb11com1		
kb11com2		
COM 12		kb12com1
kb12com2		
kbc1213		
kb13com1		
kb13com2		
COM 14		kb14com1
kb14com2		
kbc1415		
kb15com1		
kb15com2		

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2524 1-Wire Quad 32×1 Multiplexer Topology

The following figure represents the NI PXIe-2524 (NI 2524) in the 1-wire quad 32×1 multiplexer topology.



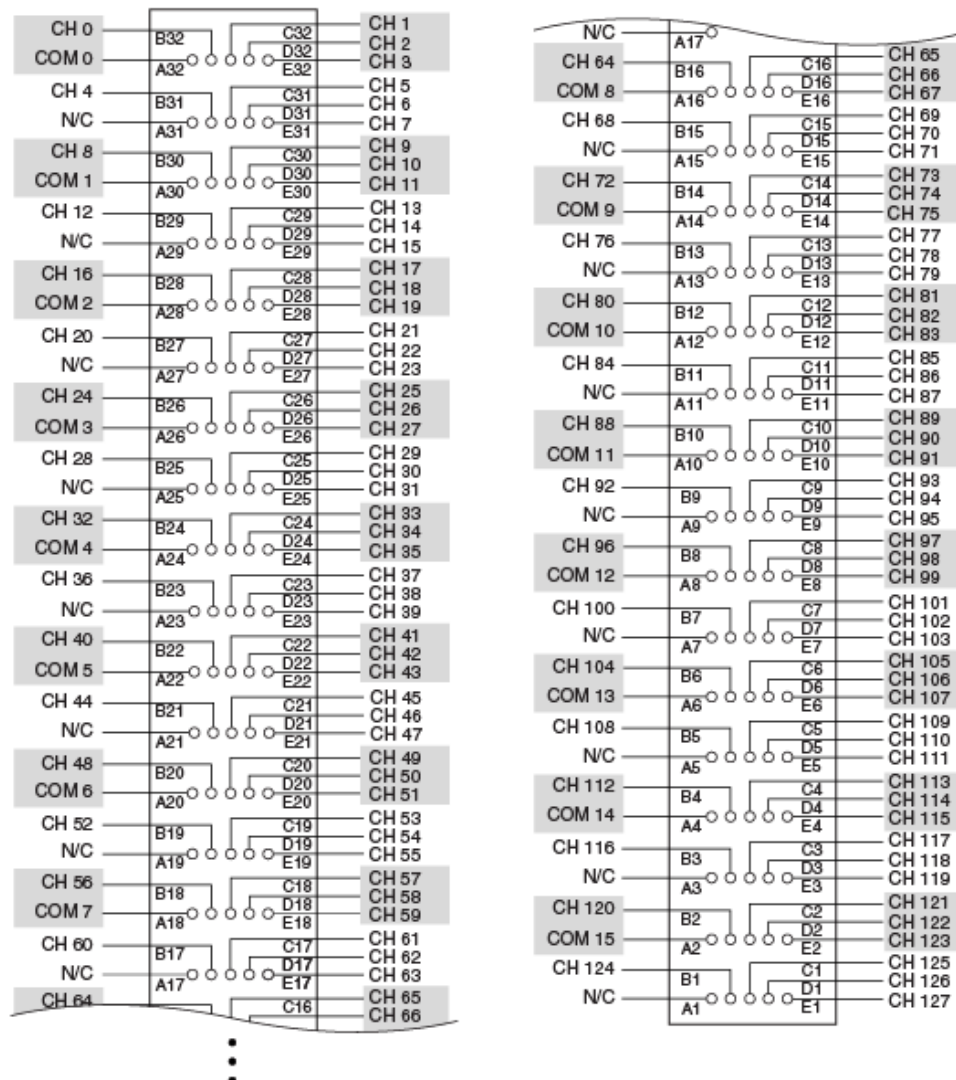
Making a Connection

When using the NI 2524 quad 32×1, all channels in a given bank route to the corresponding com. You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to connect channel 1 to com0, call `niSwitch_Connect(vi, "ch1", "com0")`. To disconnect channel 1 from com0, call `niSwitch_Disconnect(vi, "ch1", "com0")`.

Pinout

The following figure identifies the pins for the NI 2524 in the 1-wire quad 32×1 multiplexer topology.



The following table lists channel pairings and relay assignments for the NI 2524 in the 1-wire quad 32×1 multiplexer topology.

1-Wire Quad 32×1 Channel Name		Relay Name
CH0	CH4	kb0s1
CH0	CH4	kb0s1
CH1	CH5	kb0s2
CH2	CH6	kb0s3
CH3	CH7	kb0s4
CH8	CH12	kb1s1
CH9	CH13	kb1s2
CH10	CH14	kb1s3
CH11	CH15	kb1s4
CH16	CH20	kb2s1
CH17	CH21	kb2s2
CH18	CH22	kb2s3
CH19	CH23	kb2s4
CH24	CH28	kb3s1
CH25	CH29	kb3s2
CH26	CH30	kb3s3
CH27	CH31	kb3s4
CH32	CH36	kb4s1
CH33	CH37	kb4s2
CH34	CH38	kb4s3
CH35	CH39	kb4s4
CH40	CH44	kb5s1
CH41	CH45	kb5s2
CH42	CH46	kb5s3
CH43	CH47	kb5s4

1-Wire Quad 32×1 Channel Name		Relay Name
CH48	CH52	kb6s1
CH49	CH53	kb6s2
CH50	CH54	kb6s3
CH51	CH55	kb6s4
CH56	CH60	kb7s1
CH57	CH61	kb7s2
CH58	CH62	kb7s3
CH59	CH63	kb7s4
CH64	CH68	kb8s1
CH65	CH69	kb8s2
CH66	CH70	kb8s3
CH67	CH71	kb8s4
CH72	CH76	kb9s1
CH73	CH77	kb9s2
CH74	CH78	kb9s3
CH75	CH79	kb9s4
CH80	CH84	kb10s1
CH81	CH85	kb10s2
CH82	CH86	kb10s3
CH83	CH87	kb10s4
CH88	CH92	kb11s1
CH89	CH93	kb11s2
CH90	CH94	kb11s3
CH91	CH95	kb11s4
CH96	CH100	kb12s1
CH97	CH101	kb12s2
CH98	CH102	kb12s3

1-Wire Quad 32×1 Channel Name		Relay Name
CH99	CH103	kb12s4
CH104	CH108	kb13s1
CH105	CH109	kb13s2
CH106	CH110	kb13s3
CH107	CH111	kb13s4
CH112	CH116	kb14s1
CH113	CH117	kb14s2
CH114	CH118	kb14s3
CH115	CH119	kb14s4
CH120	CH124	kb15s1
CH121	CH125	kb15s2
CH122	CH126	kb15s3
CH123	CH127	kb15s4
CH123	CH127	kb15s4
COM 0		kb0com1
kb0com2		
kbc01		
kb1com1		
kb1com2		
kbc02		
kb2com1		
kb2com2		
kbc23		
kb3com1		
kb3com2		
COM 4		kb4com1
kb4com2		

1-Wire Quad 32×1 Channel Name		Relay Name
kbc45		
kb5com1		
kb5com2		
kbc46		
kb6com1		
kb6com2		
kbc67		
kb7com1		
kb7com2		
COM 8		kb8com1
kb8com2		
kbc89		
kb9com1		
kb9com2		
kbc810		
kb10com1		
kb10com2		
kbc1011		
kb11com1		
kb11com2		
COM 12		kb12com1
kb12com2		
kbc1213		
kb13com1		
kb13com2		
kbc1214		
kb14com1		

1-Wire Quad 32×1 Channel Name	Relay Name
kb14com2	
kbc1415	
kb15com1	
kb15com2	

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2524 Relay Replacement

The NI PXIe-2524 uses electromechanical armature relays.

Refer to the following tables for information about ordering replacement relays. Use relays of the same brand that you are replacing.

Relay Manufacturer	Part Number
Tyco	1462043-6

Relay Kit	Part Number
National Instruments (10 relays, Tyco)	782461-10

Complete the following steps to locate, remove, and replace a failed relay.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI Express chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI PXIe-2524 PCB 1

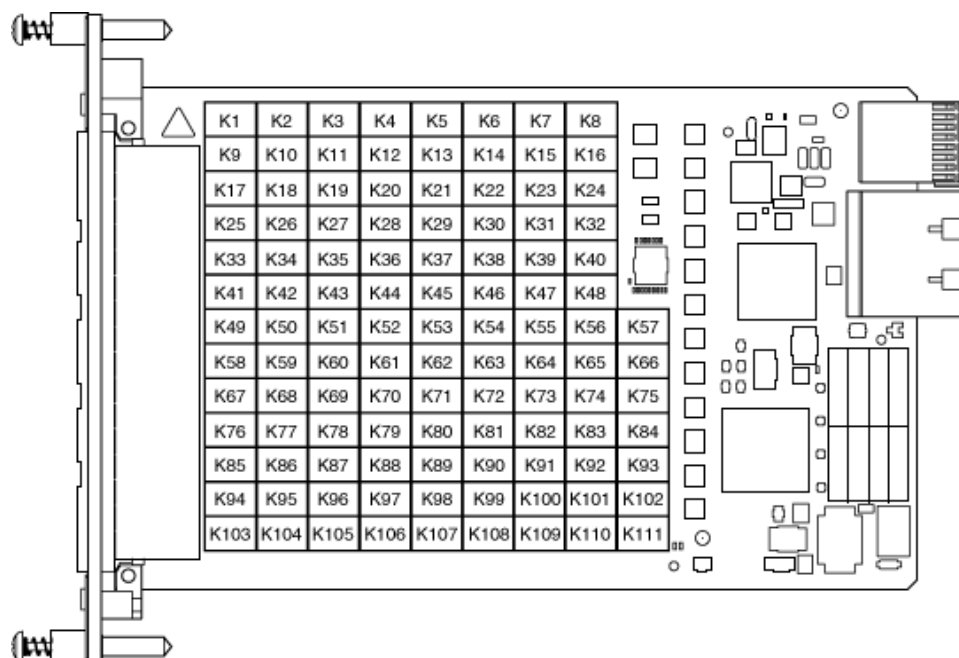


Table 1. NI PXIe-2524 PCB 1 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kb0s1	K1	kb4s1	K33	kb8s1	K58	kb12s1	K85	kb01	K12
kb0s2	K3	kb4s2	K33	kb8s2	K60	kb12s2	K87	kb023	K19
kb0s3	K5	kb4s3	K37	kb8s3	K62	kb12s3	K89	kb045	K23
kb0s4	K7	kb4s4	K39	kb8s4	K64	kb12s4	K91	kb067	K66
kb0com1	K9	kb4com1	K41	kb8com1	K67	kb12com1	K95	kb089	K93
kb0com2	K10	kb4com2	K42	kb8com2	K68	kb12com2	K94	kb01011	K84
kb1s1	K2	kb5s1	K34	kb9s1	K59	kb13s1	K86	kb01213	K111
kb1s2	K4	kb5s2	K36	kb9s2	K61	kb13s2	K88	kb01415	K102
kb1s3	K6	kb5s3	K38	kb9s3	K63	kb13s3	K90	kb002	K11
kb1s4	K8	kb5s4	K40	kb9s4	K65	kb13s4	K92	kb046	K75
kb1com1	K13	kb5com1	K43	kb9com1	K69	kb13com1	K96	kb0810	K16
kb1com2	K14	kb5com2	K44	kb9com2	K70	kb13com2	K97	kb01214	K15
kb2s1	K25	kb6s1	K49	kb10s1	K76	kb14s1	K103	kb004	K20
kb2s2	K27	kb6s2	K51	kb10s2	K78	kb14s2	K105	kb0812	K57
kb2s3	K29	kb6s3	K53	kb10s3	K80	kb14s3	K107	kb008	K24
kb2s4	K31	kb6s4	K55	kb10s4	K82	kb14s4	K109		
kb2com1	K18	kb6com1	K46	kb10com1	K72	kb14com1	K99		

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kb2com2	K17	kb6com2	K45	kb10com2	K71	kb14com2	K98		
kb3s1	K26	kb7s1	K50	kb11s1	K77	kb15s1	K104		
kb3s2	K28	kb7s2	K52	kb11s2	K79	kb15s2	K106		
kb3s3	K30	kb7s3	K54	kb11s3	K81	kb15s3	K108		
kb3s4	K32	kb7s4	K56	kb11s4	K83	kb15s4	K110		
kb3com1	K22	kb7com1	K48	kb11com1	K74	kb15com1	K100		
kb3com2	K21	kb7com2	K47	kb11com2	K73	kb15com2	K101		

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework

- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Complete the following steps to replace a relay:

1. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



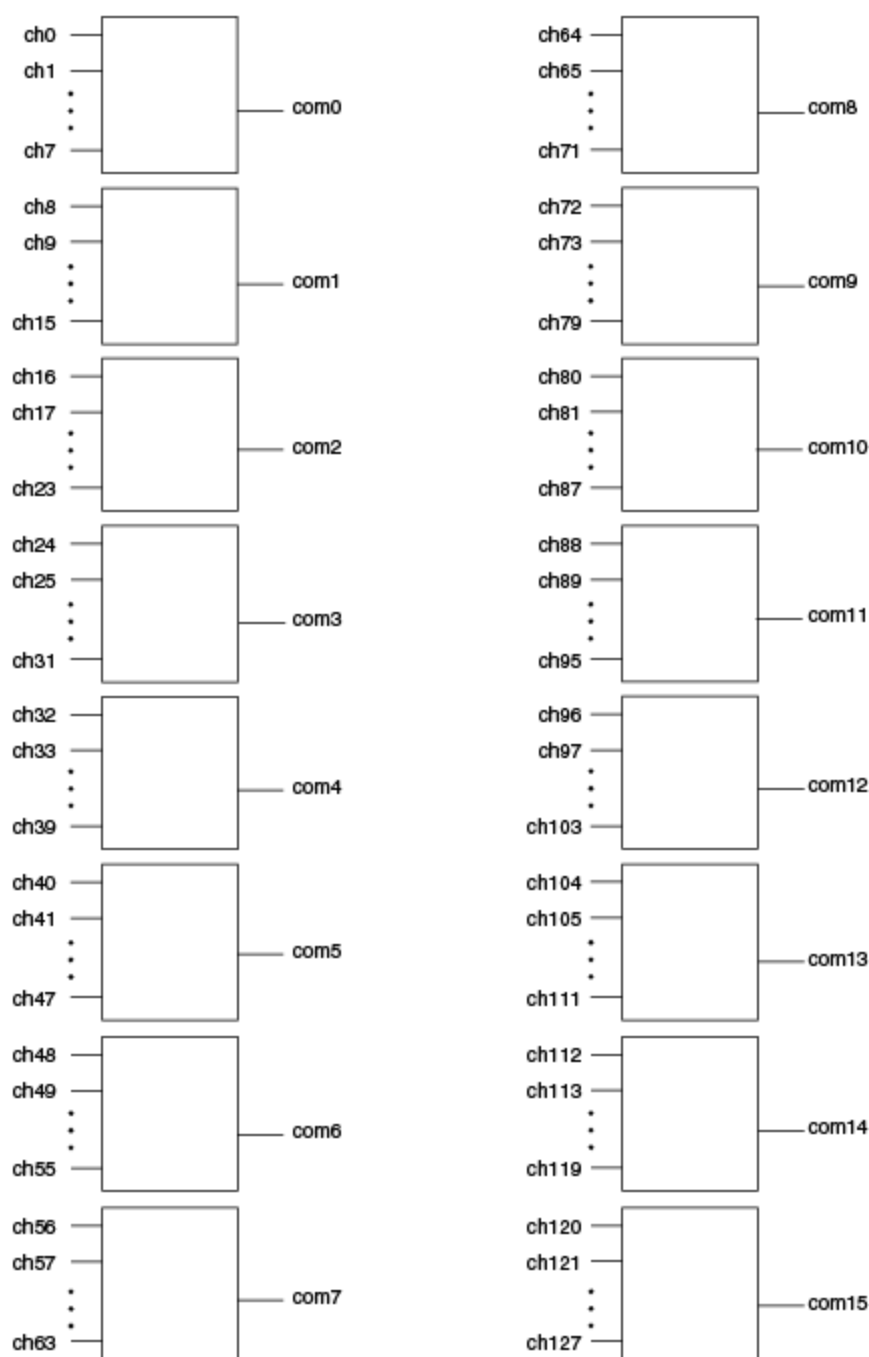
2. Replace the relay as you would any other through-hole part. Trim the replaced relay to no more than 0.41 mm (0.016 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXIe-2524 1-Wire Sixteen 8×1 Multiplexer Topology

The following figure represents the NI PXIe-2524 (NI 2524) in the 1-wire sixteen 8×1 multiplexer topology.



Making a Connection

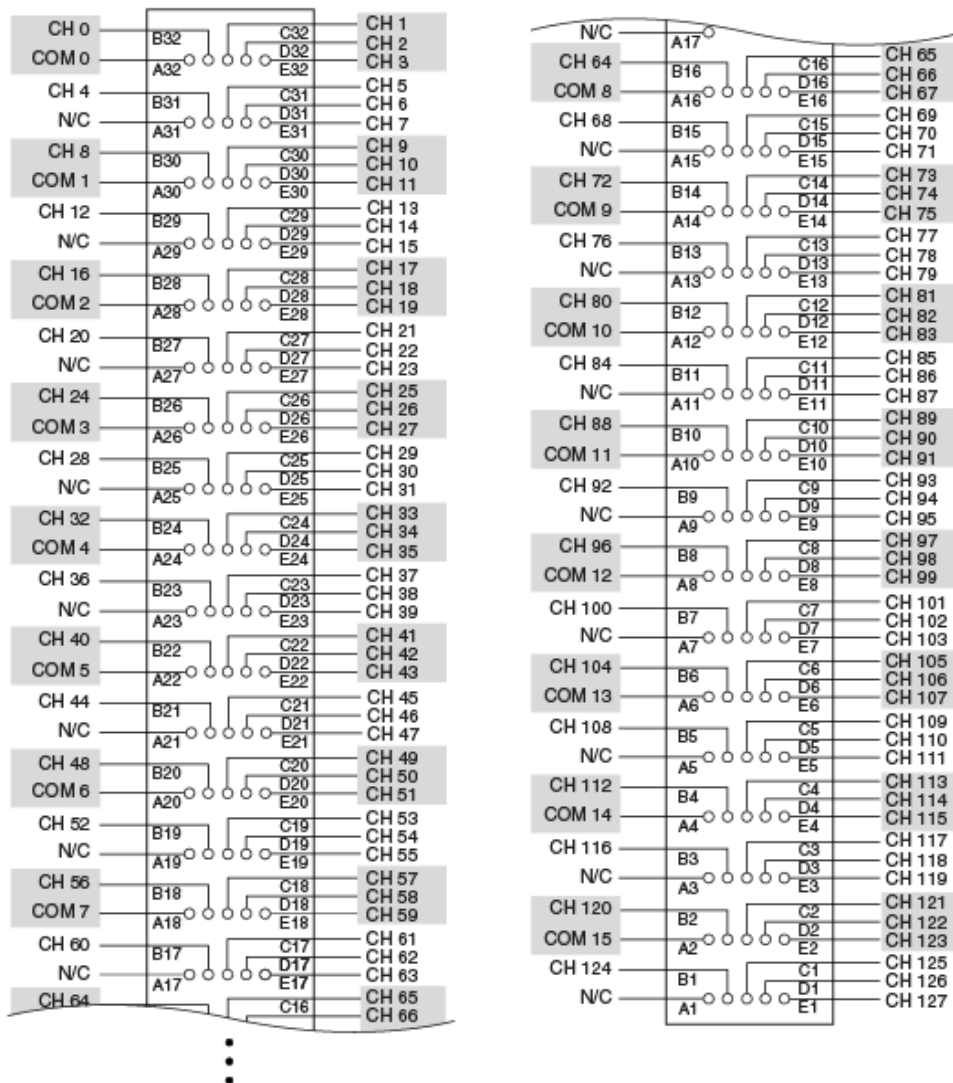
When using the NI 2524 as a 1-wire sixteen 8×1 multiplexer, all channels in a given bank route to the corresponding com. You can control the channels using the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function.

For example, to connect channel 1 to com0, call `niSwitch_Connect(vi, "ch1", "com0")`. To disconnect channel 1 from com0, call

```
niSwitch_Disconnect(vi, "ch1", "com0").
```

Pinout

The following figure identifies the pins for the NI 2524 in the 1-wire sixteen 8×1 multiplexer topology.



The following table lists channel pairings and relay assignments for the NI 2524 in the 1-wire sixteen 8×1 multiplexer topology.

1-Wire Sixteen 8×1 Channel Name		Relay Name
CH0	CH4	kb0s1

1-Wire Sixteen 8×1 Channel Name		Relay Name
CH0	CH4	kb0s1
CH1	CH5	kb0s2
CH2	CH6	kb0s3
CH3	CH7	kb0s4
CH8	CH12	kb1s1
CH9	CH13	kb1s2
CH10	CH14	kb1s3
CH11	CH15	kb1s4
CH16	CH20	kb2s1
CH17	CH21	kb2s2
CH18	CH22	kb2s3
CH19	CH23	kb2s4
CH24	CH28	kb3s1
CH25	CH29	kb3s2
CH26	CH30	kb3s3
CH27	CH31	kb3s4
CH32	CH36	kb4s1
CH33	CH37	kb4s2
CH34	CH38	kb4s3
CH35	CH39	kb4s4
CH40	CH44	kb5s1
CH41	CH45	kb5s2
CH42	CH46	kb5s3
CH43	CH47	kb5s4
CH48	CH52	kb6s1
CH49	CH53	kb6s2
CH50	CH54	kb6s3

1-Wire Sixteen 8×1 Channel Name		Relay Name
CH51	CH55	kb6s4
CH56	CH60	kb7s1
CH57	CH61	kb7s2
CH58	CH62	kb7s3
CH59	CH63	kb7s4
CH64	CH68	kb8s1
CH65	CH69	kb8s2
CH66	CH70	kb8s3
CH67	CH71	kb8s4
CH72	CH76	kb9s1
CH73	CH77	kb9s2
CH74	CH78	kb9s3
CH75	CH79	kb9s4
CH80	CH84	kb10s1
CH81	CH85	kb10s2
CH82	CH86	kb10s3
CH83	CH87	kb10s4
CH88	CH92	kb11s1
CH89	CH93	kb11s2
CH90	CH94	kb11s3
CH91	CH95	kb11s4
CH96	CH100	kb12s1
CH97	CH101	kb12s2
CH98	CH102	kb12s3
CH99	CH103	kb12s4
CH104	CH108	kb13s1
CH105	CH109	kb13s2

1-Wire Sixteen 8×1 Channel Name		Relay Name
CH106	CH110	kb13s3
CH107	CH111	kb13s4
CH112	CH116	kb14s1
CH113	CH117	kb14s2
CH114	CH118	kb14s3
CH115	CH119	kb14s4
CH120	CH124	kb15s1
CH121	CH125	kb15s2
CH122	CH126	kb15s3
CH123	CH127	kb15s4
CH123	CH127	kb15s4
COM 0		kb0com1
kb0com2		
COM 1		kb0com1
kb1com2		
COM 2		kb2com1
kb2com2		
COM 3		kb3com1
kb3com2		
COM 4		kb4com1
kb4com2		
COM 5		kb5com1
kb5com2		
COM 6		kb6com1
kb6com2		
COM 7		kb7com1
kb7com2		

1-Wire Sixteen 8×1 Channel Name		Relay Name
COM 8		kb8com1
kb8com2		
COM 9		kb9com1
kb9com2		
COM 10		kb10com1
kb10com2		
COM 11		kb11com1
kb10com2		
COM 12		kb12com1
kb12com2		
COM 13		kb13com1
kb13com1		
COM 14		kb14com1
kb14com2		
COM 15		kb15com1
kb15com2		

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2525

The NI PXIe-2525 (NI 2525) is a high-voltage multiplexer relay module for the PXI Express platform. The NI 2525 is composed of 79 armature relays.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the rated voltage of the module. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI 2525 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-Wire 64×1 Multiplexer	2525/2-Wire 64x1 Mux(NISWITCH_TOPOLOGY_2525_2_WIRE_64X1_MUX)	✓	
2-Wire Dual 32×1 Multiplexer	2525/2-Wire Dual 32x1 Mux(NISWITCH_TOPOLOGY_2525_2_WIRE_DUAL_32X1_MUX)	✓	
2-Wire Quad 16×1 Multiplexer	2525/2-Wire Quad 16x1 Mux(NISWITCH_TOPOLOGY_2525_2_WIRE_QUAD_16X1_MUX)	✓	
2-Wire Octal 8×1 Multiplexer	2525/2-Wire Octal 8x1 Mux(NISWITCH_TOPOLOGY_2525_2_WIRE_OCTAL_8X1_MUX)	✓	
2-Wire Sixteen 4×1 Multiplexer	2525/2-Wire Sixteen 4x1 Mux(NISWITCH_TOPOLOGY_2525_2_WIRE_SIXTEEN_4X1_MUX)	✓	

Related Information

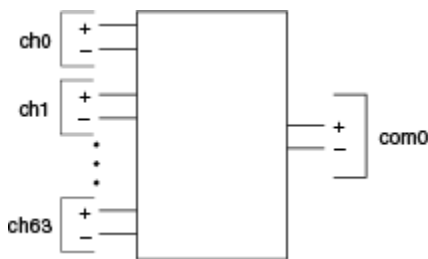
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Armature Relays](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2525 2-Wire 64×1 Multiplexer Topology](#)
- [NI PXIe-2525 2-Wire Dual 32×1 Multiplexer Topology](#)
- [NI PXIe-2525 2-Wire Quad 16×1 Multiplexer Topology](#)
- [NI PXIe-2525 2-Wire Octal 8×1 Multiplexer Topology](#)
- [NI PXIe-2525 2-Wire Sixteen 4×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2525 2-Wire 64×1 Multiplexer Topology

The following figure represents the NI PXIe-2525 (NI 2525) in the 2-wire 64×1 multiplexer topology.



Making a Connection

When using the NI 2525 as a 2-wire 64×1 multiplexer, all positive leads (ch0+ through ch63+) route to com0+, and all negative leads (ch0– through ch63–) route to com0–. The pair com0+ and com0– is addressed collectively as com0 in software.

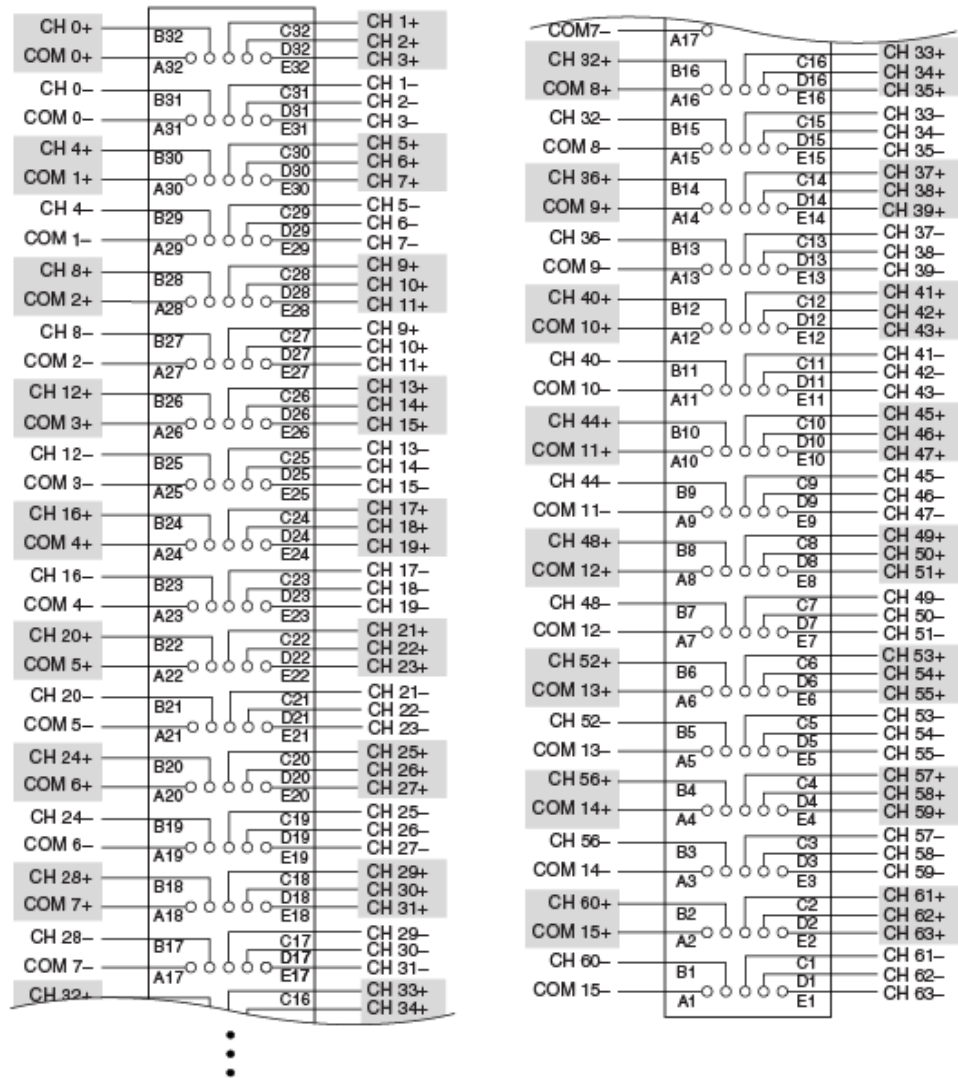
The immediate operation command (the niSwitch Connect Channels VI or the `niSwitch_Connect` function), with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2– is routed to com0–

Pinout

The following figure identifies the pins for the NI 2525 in the 2-wire 64×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2525 in the 2-wire 64×1 multiplexer topology.

2-Wire 64×1 Channel Name	Relay Name
CH0	k0
CH1	k1
CH2	k2

2-Wire 64×1 Channel Name	Relay Name
CH3	k3
CH4	k4
CH5	k5
CH6	k6
CH7	k7
CH8	k8
CH9	k9
CH10	k10
CH11	k11
CH12	k12
CH13	k13
CH14	k14
CH15	k15
CH16	k16
CH17	k17
CH18	k18
CH19	k19
CH20	k20
CH21	k21
CH22	k22
CH23	k23
CH24	k24
CH25	k25
CH26	k26
CH27	k27
CH28	k28
CH29	k29

2-Wire 64×1 Channel Name	Relay Name
CH30	k30
CH31	k31
CH32	k32
CH33	k33
CH34	k34
CH35	k35
CH36	k36
CH37	k37
CH38	k38
CH39	k39
CH40	k40
CH41	k41
CH42	k42
CH43	k43
CH44	k44
CH45	k45
CH46	k46
CH47	k47
CH48	k48
CH49	k49
CH50	k50
CH51	k51
CH52	k52
CH53	k53
CH54	k54
CH55	k55
CH56	k56

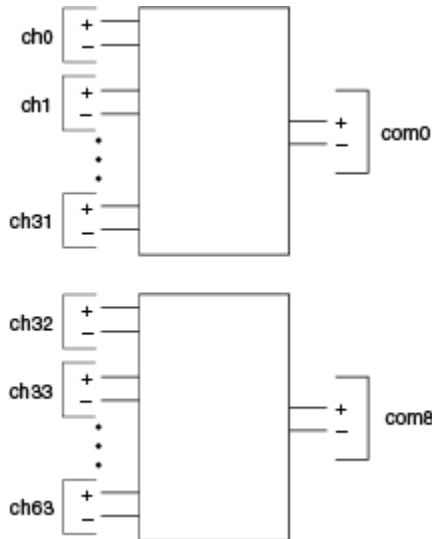
2-Wire 64×1 Channel Name	Relay Name
CH57	k57
CH58	k58
CH59	k59
CH60	k60
CH61	k61
CH62	k62
CH63	k63
COM 0	kbc01
kbc02	
kbc23	
kbc04	
kbc45	
kbc46	
kbc67	
kbc89	
kbc810	
kbc1011	
kbc812	
kbc1213	
kbc1214	
kbc1415	

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2525 2-Wire Dual 32×1 Multiplexer Topology

The following figure represents the NI PXIe-2525 (NI 2525) in the 2-wire dual 32×1 multiplexer topology.



Making a Connection

When using the NI 2525 as a 2-wire dual 32×1 multiplexer, the positive leads of the first bank (ch0+ through ch31+) route to com0+, and the negative leads of the first bank (ch0– through ch31–) route to com0–. The pair com0+ and com0– is addressed collectively as com0 in software. The second bank follows a similar routing scheme.

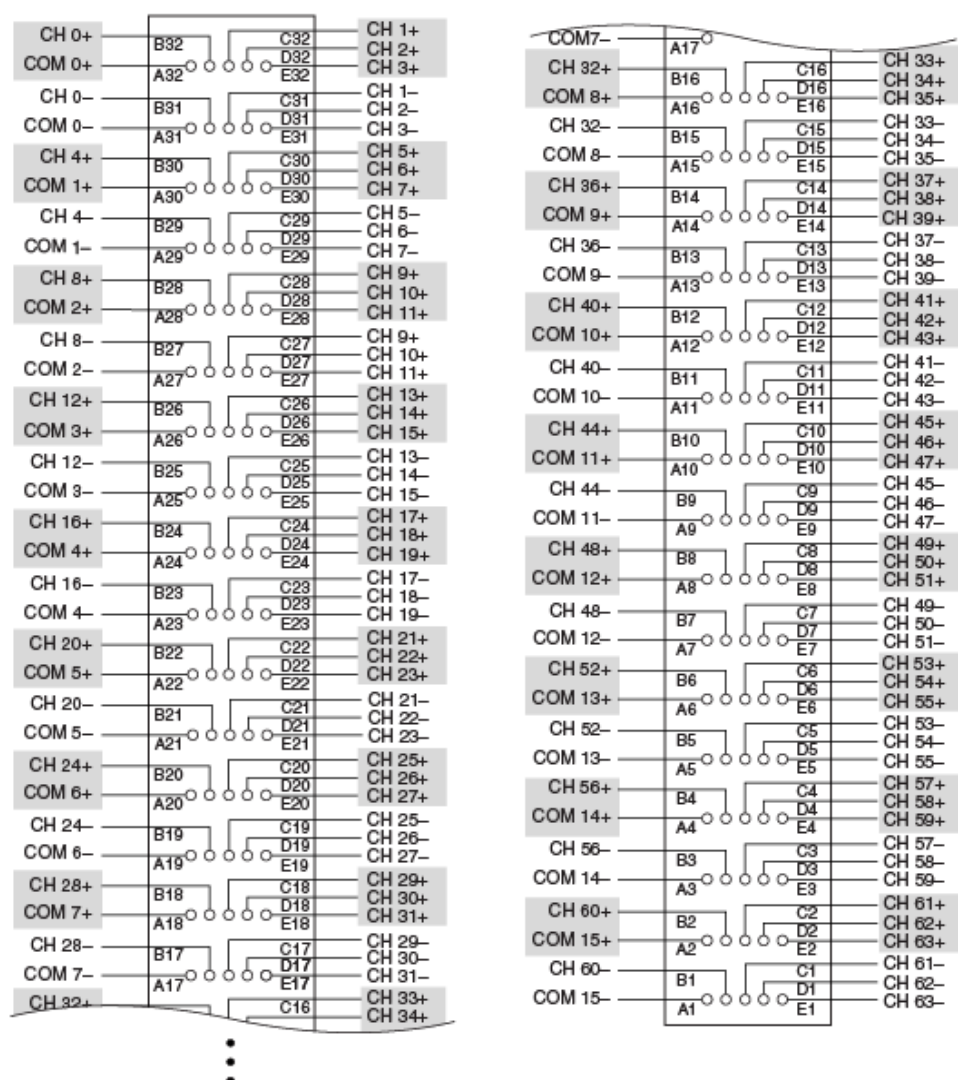
The immediate operation command (the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function), with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2– is routed to com0–

Pinout

The following figure identifies the pins for the NI 2525 in the 2-wire dual 32×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2525 in the 2-wire dual 32x1 multiplexer topology.

2-Wire Dual 32x1 Channel Name	Relay Name
CH0	k0
CH1	k1
CH2	k2
CH3	k3
CH4	k4
CH5	k5
CH6	k6

2-Wire Dual 32×1 Channel Name	Relay Name
CH7	k7
CH8	k8
CH9	k9
CH10	k10
CH11	k11
CH12	k12
CH13	k13
CH14	k14
CH15	k15
CH16	k16
CH17	k17
CH18	k18
CH19	k19
CH20	k20
CH21	k21
CH22	k22
CH23	k23
CH24	k24
CH25	k25
CH26	k26
CH27	k27
CH28	k28
CH29	k29
CH30	k30
CH31	k31
CH32	k32
CH33	k33

2-Wire Dual 32×1 Channel Name	Relay Name
CH34	k34
CH35	k35
CH36	k36
CH37	k37
CH38	k38
CH39	k39
CH40	k40
CH41	k41
CH42	k42
CH43	k43
CH44	k44
CH45	k45
CH46	k46
CH47	k47
CH48	k48
CH49	k49
CH50	k50
CH51	k51
CH52	k52
CH53	k53
CH54	k54
CH55	k55
CH56	k56
CH57	k57
CH58	k58
CH59	k59
CH60	k60

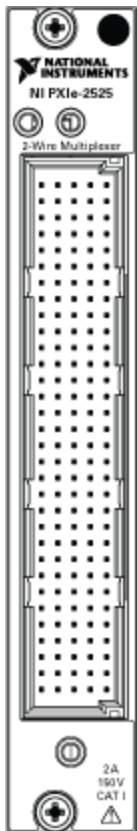
2-Wire Dual 32×1 Channel Name	Relay Name
CH61	k61
CH62	k62
CH63	k63
COM 0	kbc01
kbc02	
kbc23	
kbc04	
kbc45	
kbc46	
kbc67	
COM 8	kbc89
kbc810	
kbc1011	
kbc812	
kbc1213	
kbc1214	
kbc1415	

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

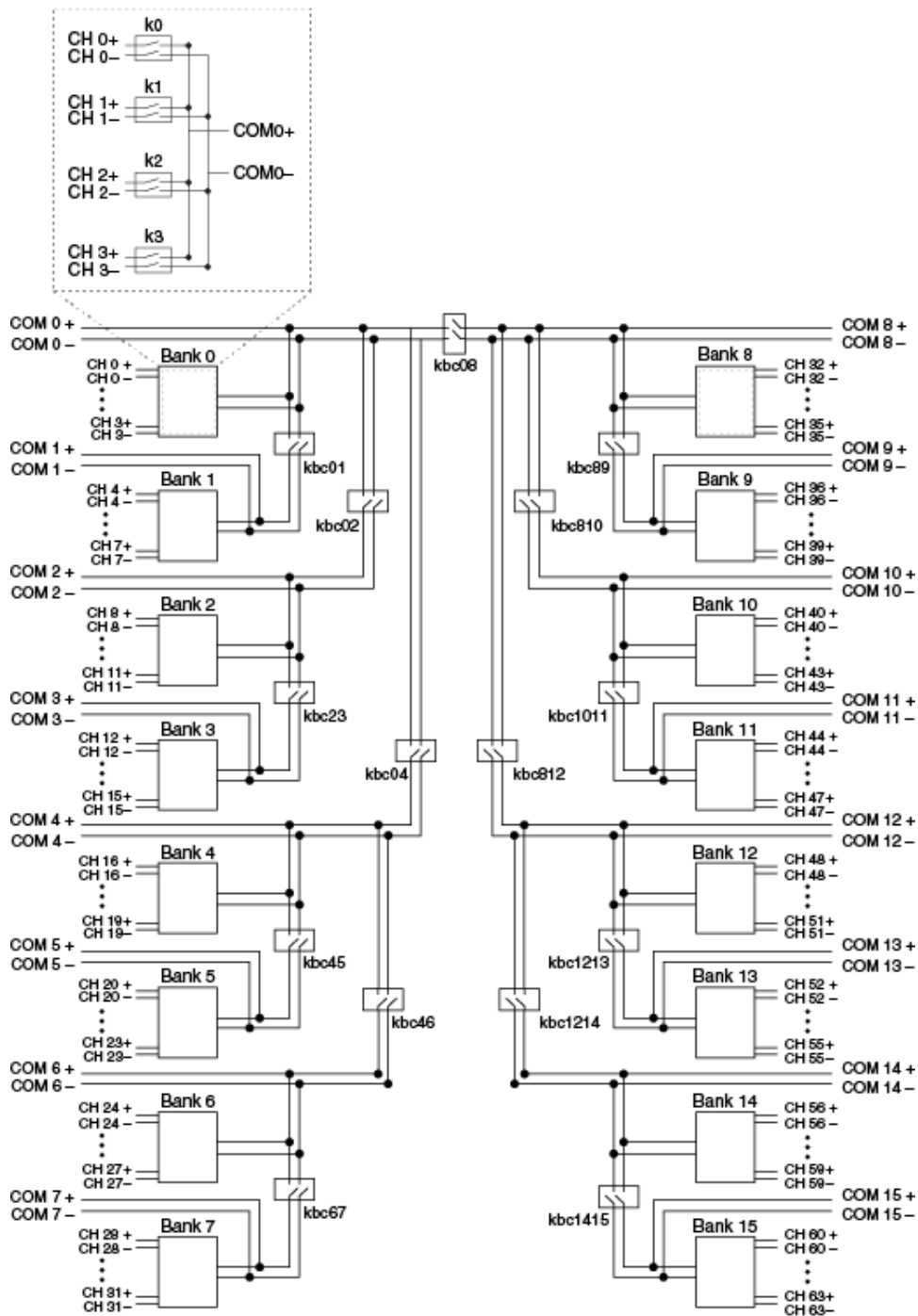
NI PXIe-2525 Front Panel

The following figure illustrates the NI PXIe-2525 front panel.



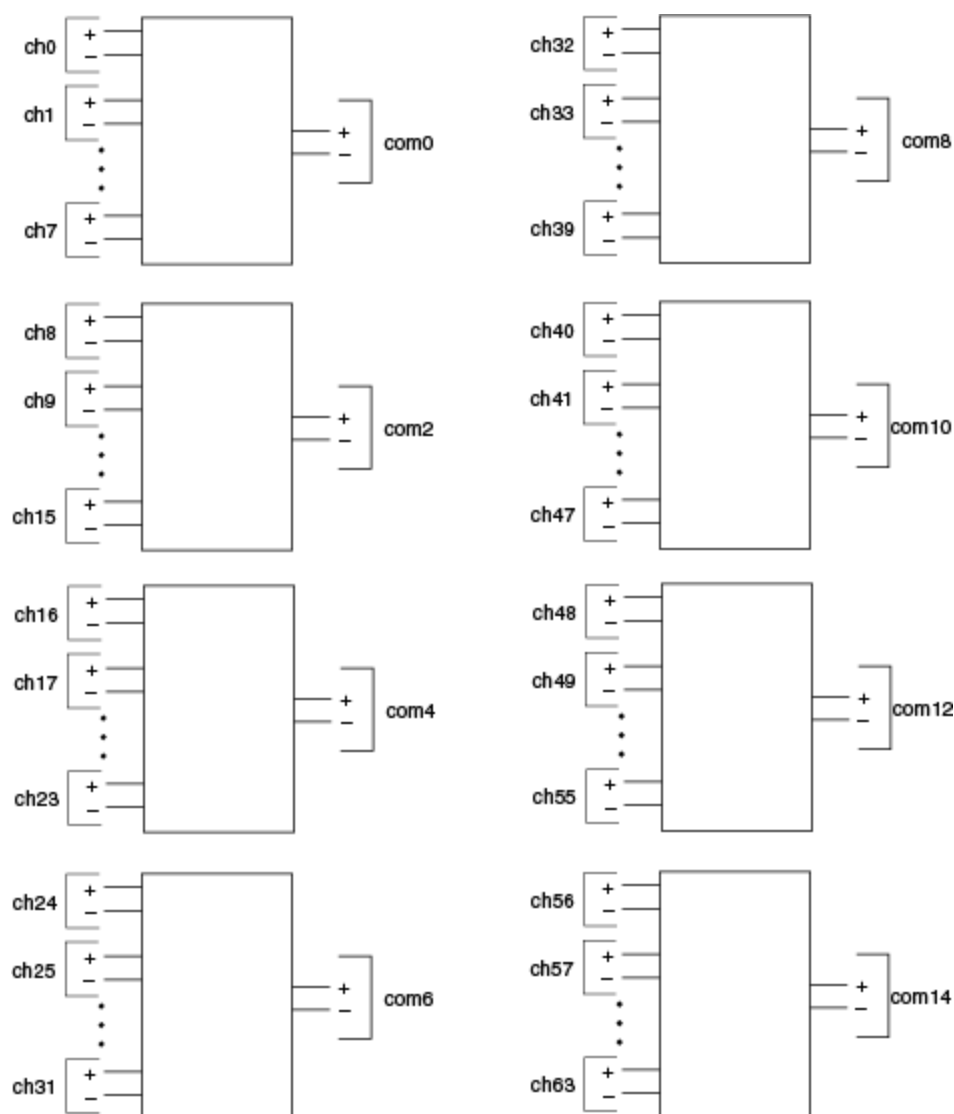
NI PXIe-2525 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2525.



NI PXIe-2525 2-Wire Octal 8×1 Multiplexer Topology

The following figure represents the NI PXIe-2525 (NI 2525) in the 2-wire octal 8×1 multiplexer topology.



Making a Connection

When using the NI 2525 as a 2-wire octal 8×1 multiplexer, the positive leads of the first bank (ch0+ through ch7+) route to com0+, and the negative leads of the first bank (ch0– through ch7–) route to com0–. The pair com0+ and com0– is addressed collectively as com0 in software. All other banks follow a similar routing scheme.

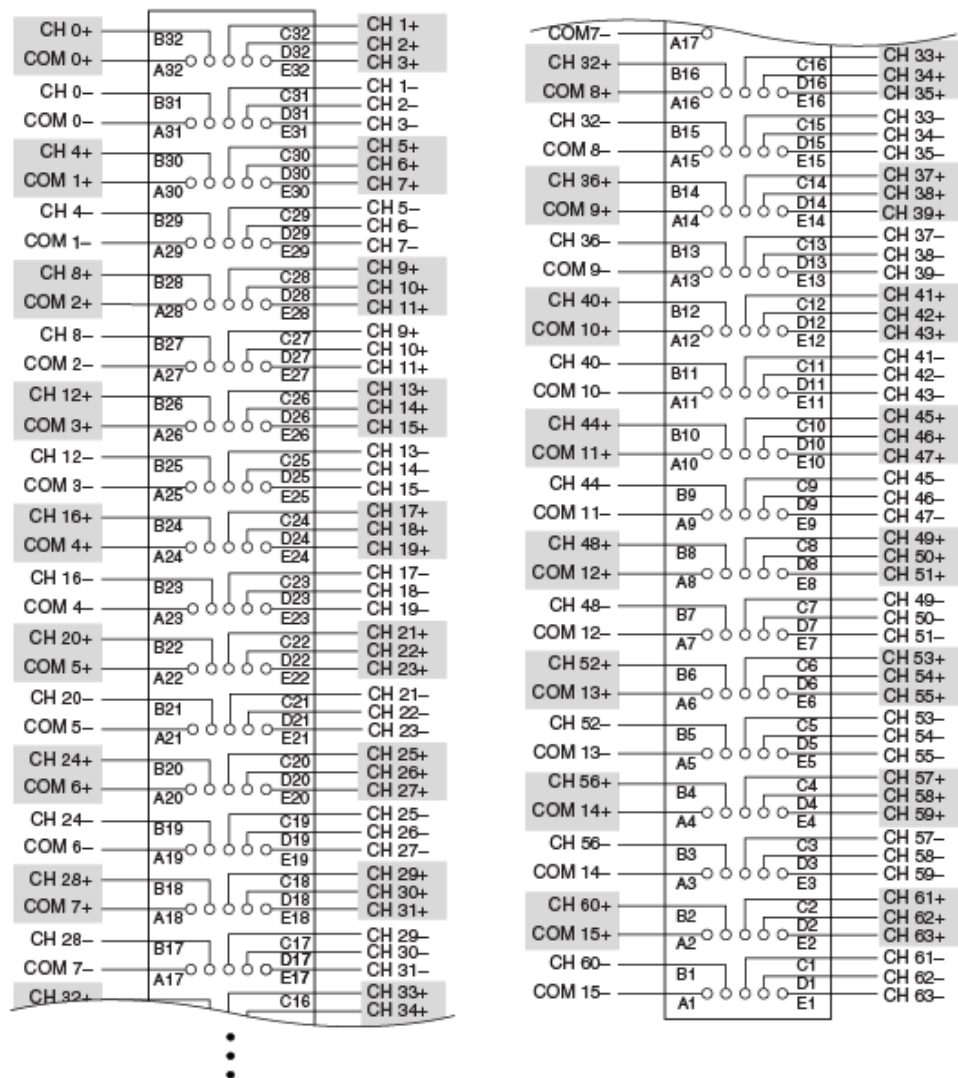
The immediate operation command (the niSwitch Connect Channels VI or the niSwitch_Connect function), with parameters ch2 and com0, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2- is routed to com0-

Pinout

The following figure identifies the pins for the NI 2525 in the 2-wire octal 8×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2525 in the 2-wire octal 8×1 multiplexer topology.

2-Wire Octal 8×1 Channel Name	Relay Name
CH0	k0
CH1	k1

2-Wire Octal 8×1 Channel Name	Relay Name
CH2	k2
CH3	k3
CH4	k4
CH5	k5
CH6	k6
CH7	k7
CH8	k8
CH9	k9
CH10	k10
CH11	k11
CH12	k12
CH13	k13
CH14	k14
CH15	k15
CH16	k16
CH17	k17
CH18	k18
CH19	k19
CH20	k20
CH21	k21
CH22	k22
CH23	k23
CH24	k24
CH25	k25
CH26	k26
CH27	k27
CH28	k28

2-Wire Octal 8×1 Channel Name	Relay Name
CH29	k29
CH30	k30
CH31	k31
CH32	k32
CH33	k33
CH34	k34
CH35	k35
CH36	k36
CH37	k37
CH38	k38
CH39	k39
CH40	k40
CH41	k41
CH42	k42
CH43	k43
CH44	k44
CH45	k45
CH46	k46
CH47	k47
CH48	k48
CH49	k49
CH50	k50
CH51	k51
CH52	k52
CH53	k53
CH54	k54
CH55	k55

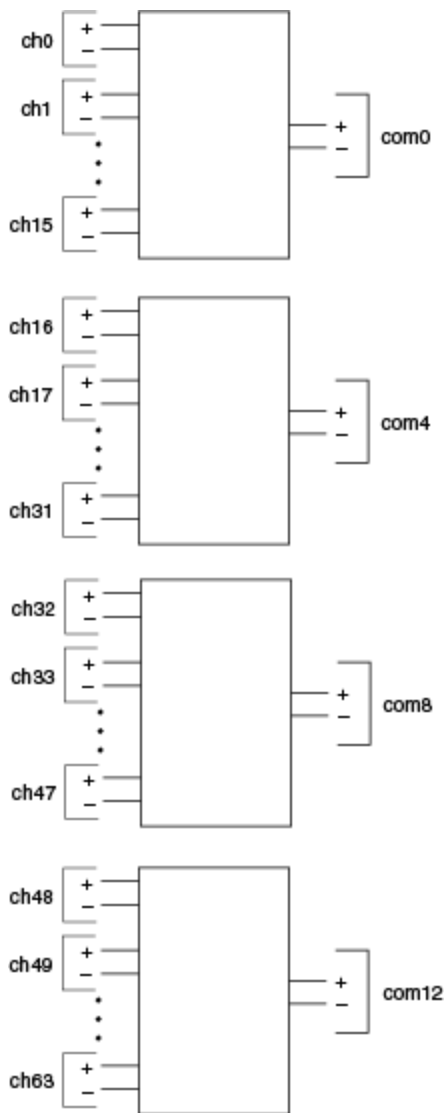
2-Wire Octal 8×1 Channel Name	Relay Name
CH56	k56
CH57	k57
CH58	k58
CH59	k59
CH60	k60
CH61	k61
CH62	k62
CH63	k63
COM 0	kbc01
COM 2	kbc23
COM 4	kbc45
COM 6	kbc67
COM 8	kbc89
COM 10	kbc1011
COM 12	kbc1213
COM 14	kbc1415

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2525 2-Wire Quad 16×1 Multiplexer Topology

The following figure represents the NI PXIe-2525 (NI 2525) in the 2-wire quad 16×1 multiplexer topology.



Making a Connection

When using the NI 2525 as a 2-wire quad 16×1 multiplexer, the positive leads of the first bank (ch0+ through ch15+) route to com0+, and the negative leads of the first bank (ch0– through ch15–) route to com0–. The pair com0+ and com0– is addressed collectively as com0 in software. All other banks follow a similar routing scheme.

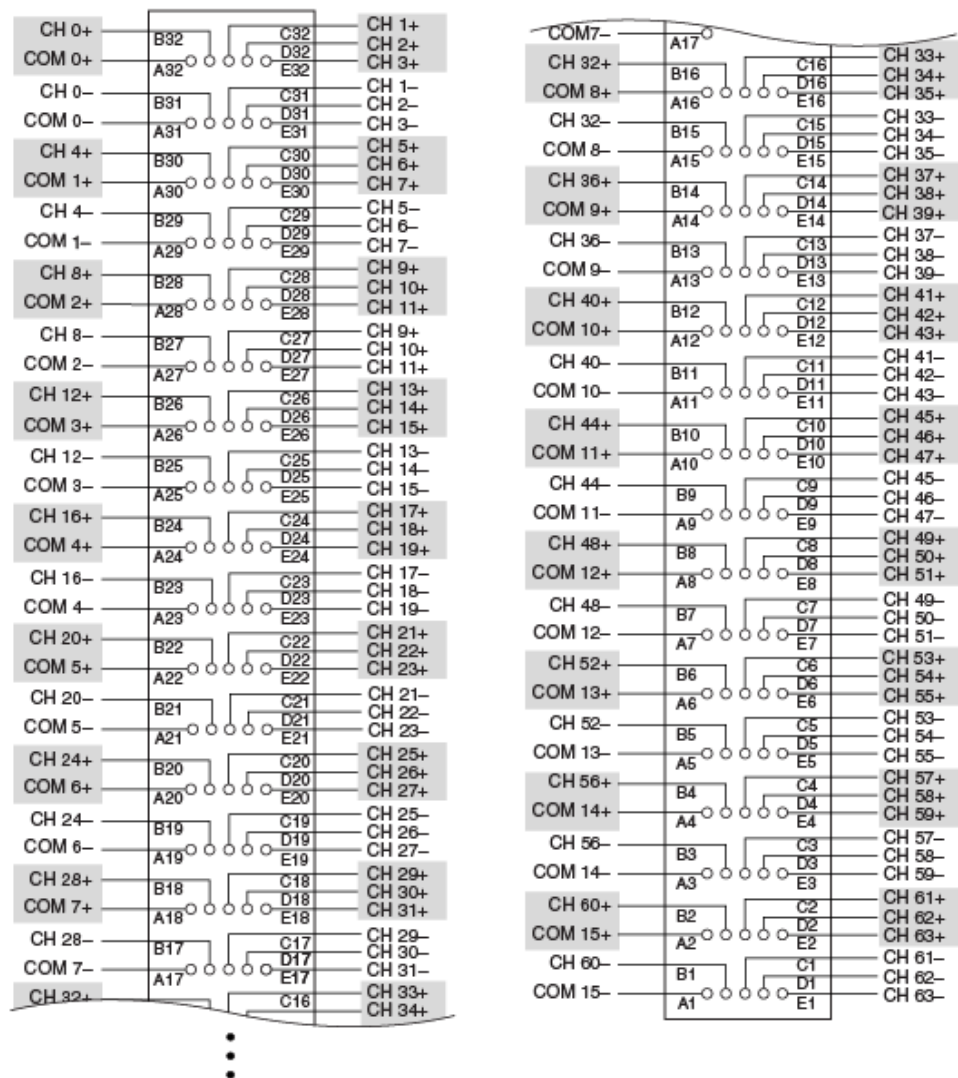
The immediate operation (the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function), with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2- is routed to com0-

Pinout

The following figure identifies the pins for the NI 2525 in the 2-wire quad 16×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2525 in the 2-wire quad 16×1 multiplexer topology.

2-Wire Quad 16×1 Channel Name	Relay Name
CH0	k0
CH1	k1

2-Wire Quad 16×1 Channel Name	Relay Name
CH2	k2
CH3	k3
CH4	k4
CH5	k5
CH6	k6
CH7	k7
CH8	k8
CH9	k9
CH10	k10
CH11	k11
CH12	k12
CH13	k13
CH14	k14
CH15	k15
CH16	k16
CH17	k17
CH18	k18
CH19	k19
CH20	k20
CH21	k21
CH22	k22
CH23	k23
CH24	k24
CH25	k25
CH26	k26
CH27	k27
CH28	k28

2-Wire Quad 16×1 Channel Name	Relay Name
CH29	k29
CH30	k30
CH31	k31
CH32	k32
CH33	k33
CH34	k34
CH35	k35
CH36	k36
CH37	k37
CH38	k38
CH39	k39
CH40	k40
CH41	k41
CH42	k42
CH43	k43
CH44	k44
CH45	k45
CH46	k46
CH47	k47
CH48	k48
CH49	k49
CH50	k50
CH51	k51
CH52	k52
CH53	k53
CH54	k54
CH55	k55

2-Wire Quad 16×1 Channel Name	Relay Name
CH56	k56
CH57	k57
CH58	k58
CH59	k59
CH60	k60
CH61	k61
CH62	k62
CH63	k63
COM 0	kbc01
kbc02	
kbc23	
COM 4	kbc45
kbc46	
kbc67	
COM 8	kbc89
kbc810	
kbc1011	
COM 10	kbc1213
kbc1214	
kbc1415	

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2525 Relay Replacement

The NI PXIe-2525 uses electromechanical armature relays.

Refer to the following tables for information about ordering replacement relays. Use relays of the same brand that you are replacing.

Relay Manufacturer	Part Number
Tyco	1462043-6

Relay Kit	Part Number
National Instruments (10 relays, Tyco)	782461-10

Complete the following steps to locate, remove, and replace a failed relay.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI Express chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

NI PXIe-2525 PCB 1

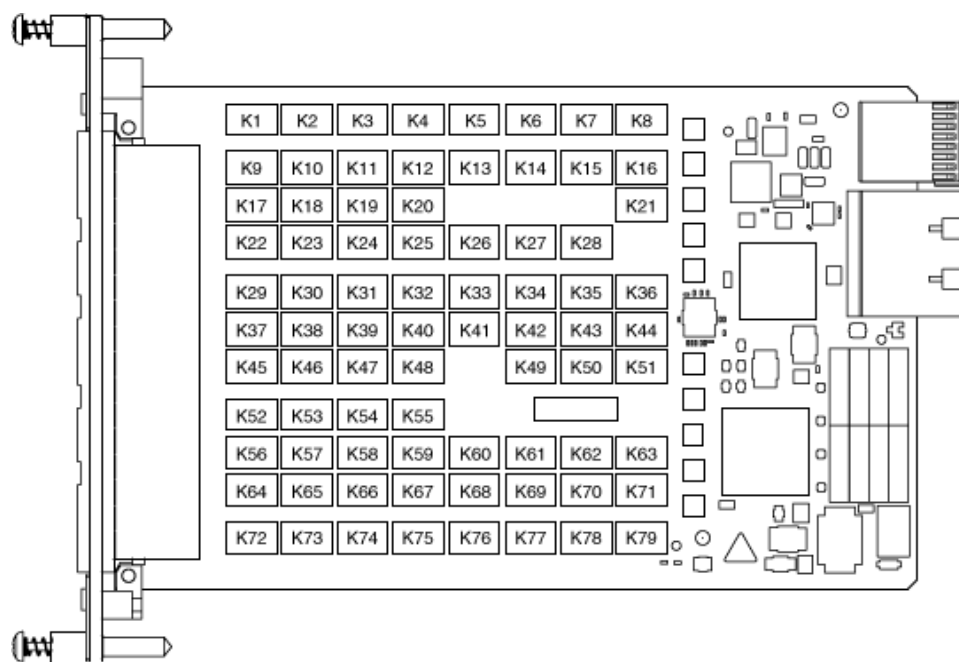


Table 2. NI PXIe-2525 PCB 1 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
k0	K4	k16	25	k32	K48	k48	K67	kbc01	K6
k1	K3	k17	K24	k33	K47	k49	K66	kbc23	K21
k2	K2	k18	K23	k34	K46	k50	K65	kbc45	K35
k3	K1	k19	K22	k35	K45	k51	K64	kbc67	K33
k4	K16	k20	K36	k36	K44	k52	K63	kbc89	K49
k5	K15	k21	K28	k37	K43	k53	K62	kbc1011	K51
k6	K14	k22	K27	k38	K42	k54	K61	kbc1213	K71
k7	K13	k23	K26	k39	K41	k55	K60	kbc1415	K68
k8	K12	k24	K32	k40	K55	k56	K75	kbc02	K7
k9	K11	k25	K31	k41	K54	k57	K74	kbc46	K34
k10	K10	k26	K30	k42	K53	k58	K73	kbc810	K50
k11	K9	k27	K29	k43	K52	k59	K72	kbc1214	K69
k12	K20	k28	K40	k44	K59	k60	K79	kbc04	K5
k13	K19	k29	K39	k45	K58	k61	K78	kbc812	K70
k14	K18	k30	K38	k46	K57	k62	K77	kbc08	K8
k15	K17	k31	K37	k47	K56	k63	K76		

3. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers

ending in L.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Complete the following steps to replace a relay:

1. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers

ending in L. The different label types are shown in the following figure.



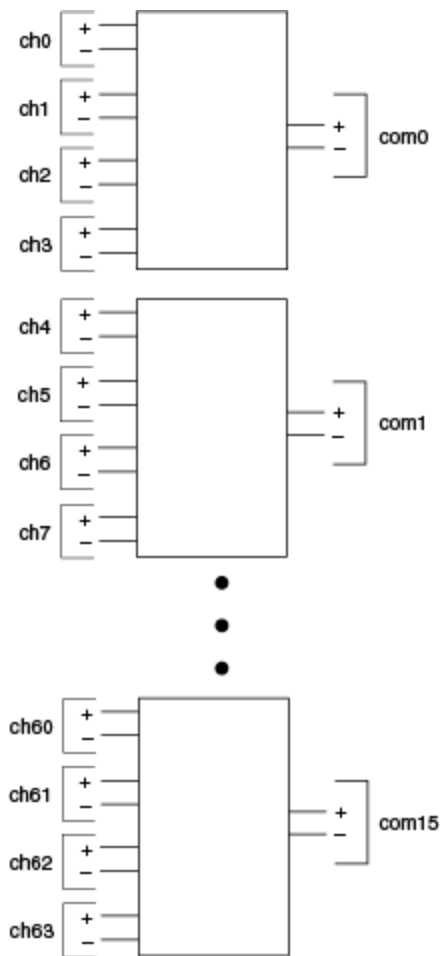
2. Replace the relay as you would any other through-hole part. Trim the replaced relay to no more than 0.41 mm (0.016 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXIe-2525 2-Wire Sixteen 4×1 Multiplexer Topology

The following figure represents the NI PXIe-2525 (NI 2525) in the 2-wire sixteen 4×1 multiplexer topology.



Making a Connection

When using the NI 2525 as a 2-wire sixteen 4x1 multiplexer, the positive leads of the first bank (ch0+ through ch3+) route to com0+, and the negative leads of the first bank (ch0- through ch3-) route to com0-. The pair com0+ and com0- is addressed collectively as com0 in software. All other banks follow a similar routing scheme.

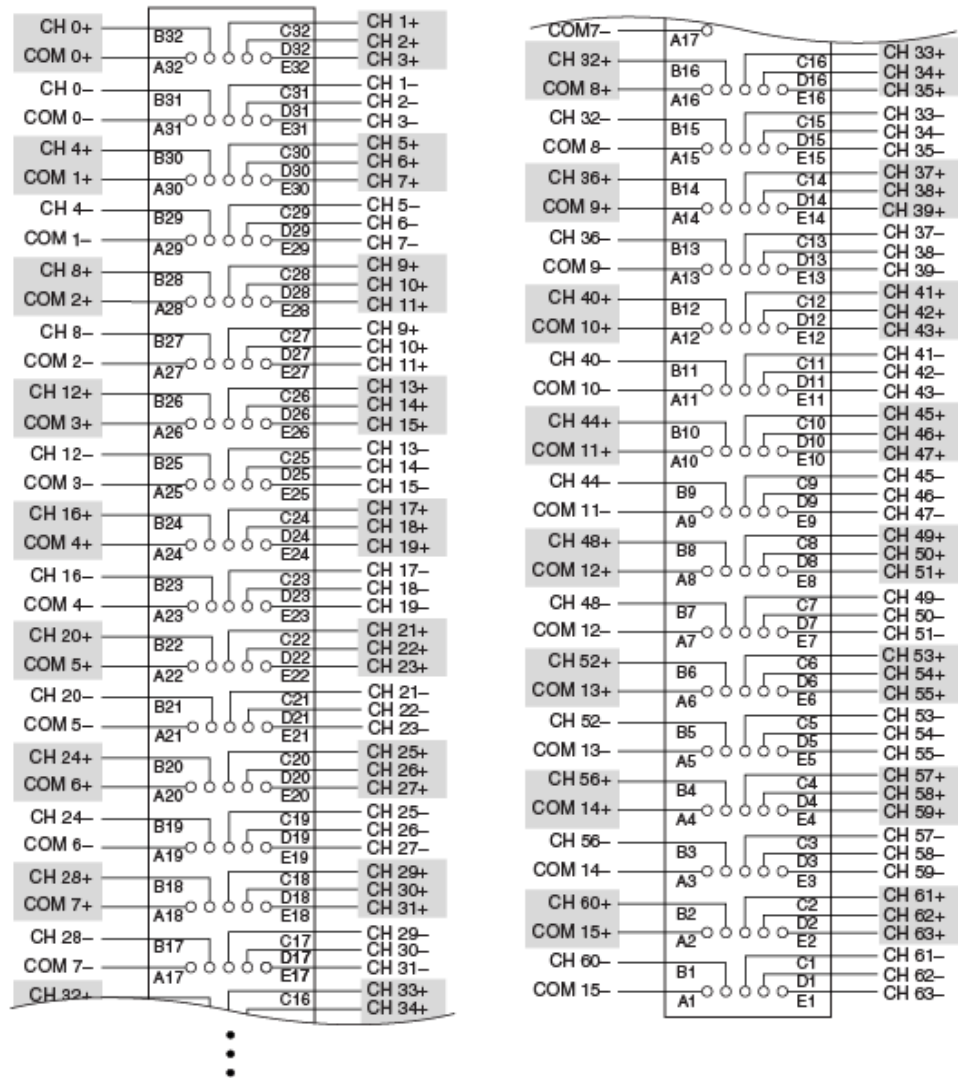
The immediate operation command (the niSwitch Connect Channels VI or the `niSwitch_Connect` function), with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2- is routed to com0-

Pinout

The following figure identifies the pins for the NI 2525 in the 2-wire sixteen 4×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2525 in the 2-wire sixteen 4×1 multiplexer topology.

2-Wire Sixteen 4×1 Channel Name	Relay Name
CH0	k0
CH1	k1
CH2	k2

2-Wire Sixteen 4×1 Channel Name	Relay Name
CH3	k3
CH4	k4
CH5	k5
CH6	k6
CH7	k7
CH8	k8
CH9	k9
CH10	k10
CH11	k11
CH12	k12
CH13	k13
CH14	k14
CH15	k15
CH16	k16
CH17	k17
CH18	k18
CH19	k19
CH20	k20
CH21	k21
CH22	k22
CH23	k23
CH24	k24
CH25	k25
CH26	k26
CH27	k27
CH28	k28
CH29	k29

2-Wire Sixteen 4×1 Channel Name	Relay Name
CH30	k30
CH31	k31
CH32	k32
CH33	k33
CH34	k34
CH35	k35
CH36	k36
CH37	k37
CH38	k38
CH39	k39
CH40	k40
CH41	k41
CH42	k42
CH43	k43
CH44	k44
CH45	k45
CH46	k46
CH47	k47
CH48	k48
CH49	k49
CH50	k50
CH51	k51
CH52	k52
CH53	k53
CH54	k54
CH55	k55
CH56	k56

2-Wire Sixteen 4×1 Channel Name	Relay Name
CH57	k57
CH58	k58
CH59	k59
CH60	k60
CH61	k61
CH62	k62
CH63	k63
COM 0	—
COM 1	—
COM 2	—
COM 3	—
COM 4	—
COM 5	—
COM 6	—
COM 7	—
COM 8	—
COM 9	—
COM 10	—
COM 11	—
COM 12	—
COM 13	—
COM 14	—
COM 15	—

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXIe-2526

The NI PXIe-2526 (NI 2526) is a 158×1 multiplexer relay module for the PXI Express platform. The NI 2526 is composed of 82 armature relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the rated voltage of the module. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI 2526 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 158×1 Multiplexer	2526/1-Wire 158x1 Mux(NISWITCH_TOPOLOGY_2526_1_WIRE_158X1_MUX)	✓	
2-Wire 79×1 Multiplexer	2526/2-Wire 79x1 Mux(NISWITCH_TOPOLOGY_2526_2_WIRE_79X1_MUX)	✓	

Related Information

- [Integration and System Considerations](#)

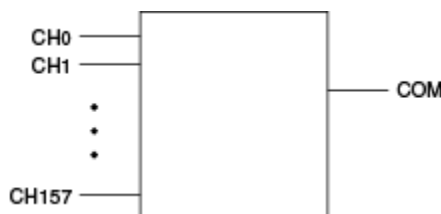
Related concepts:

- [Multiplexer](#)
- [Armature Relays](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)

- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2526 1-Wire 158×1 Multiplexer Topology](#)
- [NI PXIe-2526 2-Wire 79×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2526 1-Wire 158×1 Multiplexer Topology

The following figure represents the NI PXIe-2526 (NI 2526) in the 1-wire 158×1 multiplexer topology.



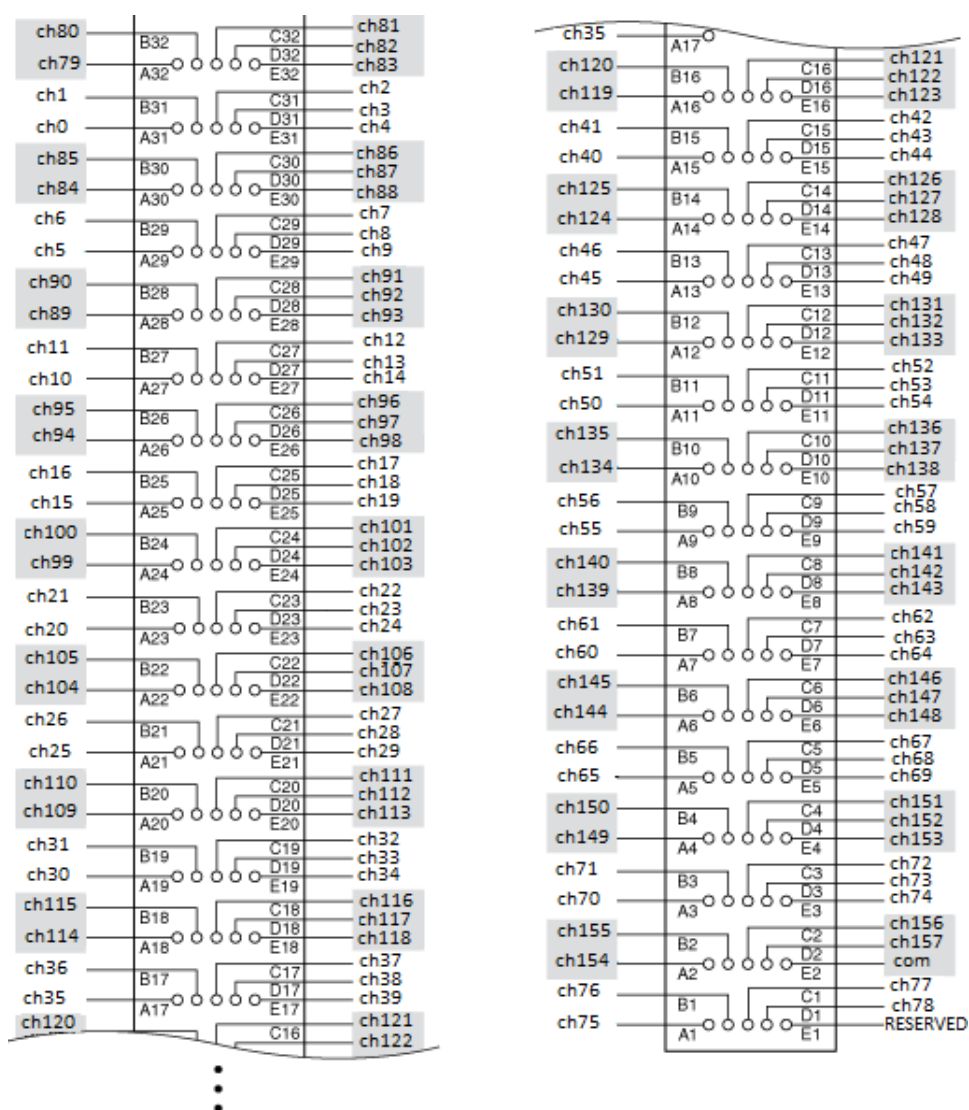
Making a Connection

When using the NI 2526 as a 1-wire 158×1 multiplexer, all channels route to com0. You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to connect channel 1 to com0, call `niSwitch_Connect(vi, "ch1", "com")`. To disconnect channel 1 from com0, call `niSwitch_Disconnect(vi, "ch1", "com")`.

Pinout

The following figure identifies the pins for the NI 2526 in the 1-wire 158×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2526 in the 1-wire 158×1 multiplexer topology.

1-Wire 158×1 Channel Name		Relay Name
CH0	CH79	k0
CH1	CH80	k1
CH2	CH81	k2
CH3	CH82	k3
CH4	CH83	k4
CH4	CH83	k4

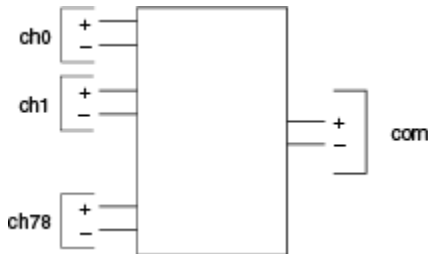
1-Wire 158×1 Channel Name		Relay Name
CH5	CH84	k5
CH6	CH85	k6
CH7	CH86	k7
CH8	CH87	k8
CH9	CH88	k9
CH10	CH89	k10
CH11	CH90	k11
CH12	CH91	k12
CH13	CH92	k13
CH14	CH93	k14
CH14	CH93	k14
CH15	CH94	k15
CH16	CH95	k16
CH17	CH96	k17
CH18	CH97	k18
CH19	CH98	k19
CH20	CH99	k20
CH20	CH99	k20
CH21	CH100	k21
CH22	CH101	k22
CH23	CH102	k23
CH24	CH103	k24
CH25	CH104	k25
CH26	CH105	k26
CH27	CH106	k27
CH28	CH107	k28
CH29	CH108	k29

1-Wire 158×1 Channel Name		Relay Name
CH30	CH109	k30
CH31	CH110	k31
CH32	CH111	k32
CH33	CH112	k33
CH34	CH113	k34
CH35	CH114	k35
CH36	CH115	k36
CH37	CH116	k37
CH38	CH117	k38
CH39	CH118	k39
CH40	CH119	k40
CH41	CH120	k41
CH42	CH121	k42
CH43	CH122	k43
CH44	CH123	k44
CH45	CH124	k45
CH46	CH125	k46
CH47	CH126	k47
CH48	CH127	k48
CH49	CH128	k49
CH50	CH129	k50
CH51	CH130	k51
CH52	CH131	k52
CH53	CH132	k53
CH54	CH133	k54
CH55	CH134	k55
CH56	CH135	k56

1-Wire 158×1 Channel Name		Relay Name
CH57	CH136	k57
CH58	CH137	k58
CH59	CH138	k59
CH60	CH139	k60
CH61	CH140	k61
CH62	CH141	k62
CH63	CH142	k63
CH64	CH143	k64
CH65	CH144	k65
CH66	CH145	k66
CH67	CH146	k67
CH68	CH147	k68
CH69	CH148	k69
CH70	CH149	k70
CH71	CH150	k71
CH72	CH151	k72
CH73	CH152	k73
CH74	CH153	k74
CH75	CH154	k75
CH76	CH155	k76
CH77	CH156	k77
CH78	CH157	k78
COM		kcomhi
kcomlo		
kcomlo1w		

NI PXIe-2526 2-Wire 79×1 Multiplexer Topology

The following figure represents the NI PXIe-2526 (NI 2526) in the 2-wire 79×1 multiplexer topology.



Making a Connection

When using the NI 2526 as a 2-wire 79×1 multiplexer, all positive leads (ch0+ through ch78+) route to com+, and all negative leads (ch0– through ch78–) route to com–. The pair com+ and com– is addressed collectively as com in software.

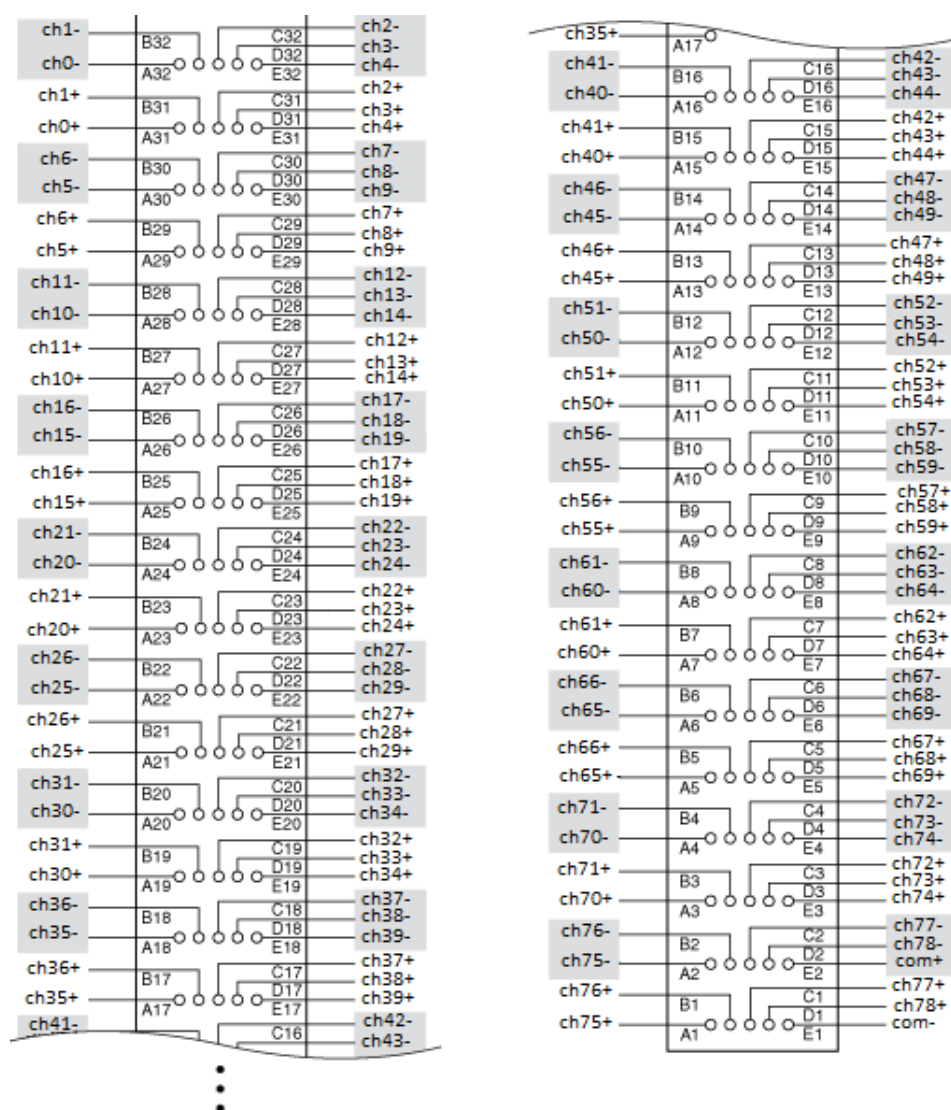
The immediate operation (the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function), with parameters `ch2` and `com`, result in the following connections:

signal connected to ch2+ is routed to com+

signal connected to ch2– is routed to com–

Pinout

The following figure identifies the pins for the NI 2526 in the 2-wire 79×1 multiplexer topology.



The following table lists the channel pairings and relay assignments for the NI 2526 in the 2-wire 79x1 multiplexer topology.

2-Wire 79x1 Channel Name	Relay Name
CH0	k0
CH1	k1
CH2	k2
CH3	k3
CH4	k4
CH4	k4

2-Wire 79×1 Channel Name	Relay Name
CH5	k5
CH6	k6
CH7	k7
CH8	k8
CH9	k9
CH10	k10
CH11	k11
CH12	k12
CH13	k13
CH14	k14
CH14	k14
CH15	k15
CH16	k16
CH17	k17
CH18	k18
CH19	k19
CH20	k20
CH20	k20
CH21	k21
CH22	k22
CH23	k23
CH24	k24
CH25	k25
CH26	k26
CH27	k27
CH28	k28
CH29	k29

2-Wire 79×1 Channel Name	Relay Name
CH30	k30
CH31	k31
CH32	k32
CH33	k33
CH34	k34
CH35	k35
CH36	k36
CH37	k37
CH38	k38
CH39	k39
CH40	k40
CH41	k41
CH42	k42
CH43	k43
CH44	k44
CH45	k45
CH46	k46
CH47	k47
CH48	k48
CH49	k49
CH50	k50
CH51	k51
CH52	k52
CH53	k53
CH54	k54
CH55	k55
CH56	k56

2-Wire 79×1 Channel Name	Relay Name
CH57	k57
CH58	k58
CH59	k59
CH60	k60
CH61	k61
CH62	k62
CH63	k63
CH64	k64
CH65	k65
CH66	k66
CH67	k67
CH68	k68
CH69	k69
CH70	k70
CH71	k71
CH72	k72
CH73	k73
CH74	k74
CH75	k75
CH76	k76
CH77	k77
CH78	k78
COM	kcomhi
kcomlo	

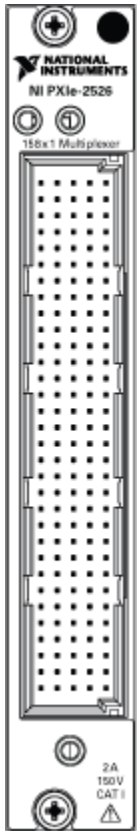
Related concepts:

- [N-Wire Switching Modes](#)

- [Multiplexer](#)

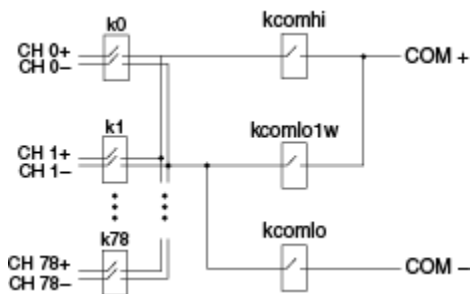
NI PXIe-2526 Front Panel

The following figure illustrates the NI PXIe-2526 front panel.



NI PXIe-2526 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2526.



NI PXIe-2526 Relay Replacement

The NI PXIe-2526 uses electromechanical armature relays.

Refer to the following tables for information about ordering replacement relays. Use relays of the same brand that you are replacing.

Relay Manufacturer	Part Number
Tyco	1462043-6

Relay Kit	Part Number
National Instruments (10 relays, Tyco)	782461-10

Complete the following steps to locate, remove, and replace a failed relay.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI Express chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

NI PXIe-2526 PCB 1

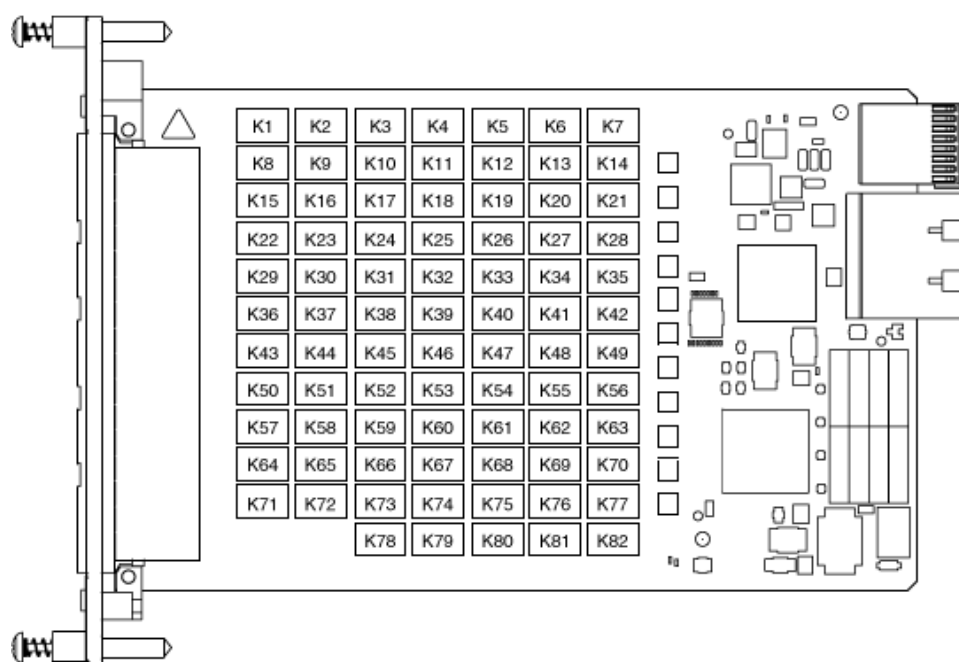


Table 3. NI PXIe-2526 PCB 1 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
k0	K1	k16	K17	k32	K33	k48	K49	k64	K65	kcomhi	K78
k1	K2	k17	K18	k33	K34	k49	K50	k65	K66	kcomlo1w	K79
k2	K3	k18	K19	k34	K35	k50	K51	k66	K67	kcomlo	K80
k3	K4	k19	K20	k35	K36	k51	K52	k67	K68		
k4	K5	k20	K21	k36	K37	k52	K53	k68	K69		
k5	K6	k21	K22	k37	K38	k53	K54	k69	K70		
k6	K7	k22	K23	k38	K39	k54	K55	k70	K71		
k7	K8	k23	K24	k39	K40	k55	K56	k71	K72		
k8	K9	k24	K25	k40	K41	k56	K57	k72	K73		
k9	K10	k25	K26	k41	K42	k57	K58	k73	K74		
k10	K11	k26	K27	k42	K43	k58	K59	k74	K75		
k11	K12	k27	K28	k43	K44	k59	K60	k75	K76		
k12	K13	k28	K29	k44	K45	k60	K61	k76	K77		
k13	K14	k29	K30	k45	K46	k61	K62	k77	K81		
k14	K15	k30	K31	k46	K47	k62	K63	k78	K82		
k15	K16	k31	K32	k47	K48	k63	K64				

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers

ending in L.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Complete the following steps to replace a relay:

1. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers

ending in L. The different label types are shown in the following figure.



- 2. Replace the relay as you would any other through-hole part. Trim the replaced relay to no more than 0.41 mm (0.016 inch) from the PCB.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI/PXIe-2527

The NI PXI/PXIe-2527 (NI 2527) is a high-density multiplexer switch module for the PXI or PXI Express platform. The NI 2527 uses armature relays.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI 2527 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 64×1 Multiplexer	2527/1-Wire 64x1 Mux(NISWITCH_TOPOLOGY_2527_1_WIRE_64X1_MUX)	✓	✓
1-Wire Dual 32×1 Multiplexer	2527/1-Wire Dual 32x1 Mux(NISWITCH_TOPOLOGY_2527_1_WIRE_DUAL_32X1_MUX)	✓	✓

Topology	Software Name	Immediate	Scanning
2-Wire 32×1 Multiplexer	2527/2-Wire 32x1 Mux(NISWITCH_TOPOLOGY_2527_2_WIRE_32X1_MUX)	✓	✓
2-Wire Dual 16×1 Multiplexer	2527/2-Wire Dual 16x1 Mux(NISWITCH_TOPOLOGY_2527_2_WIRE_DUAL_16X1_MUX)	✓	✓
4-Wire 16×1 Multiplexer	2527/4-Wire 16x1 Mux(NISWITCH_TOPOLOGY_2527_4_WIRE_16X1_MUX)	✓	✓
Independent	2527/ Independent(NISWITCH_TOPOLOGY_2527_INDEPENDENT)	✓	✓

Related Information

- Integration and System Considerations

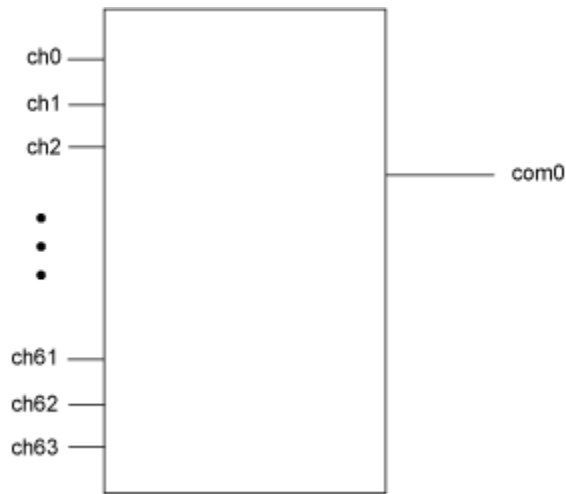
Related concepts:

- [Multiplexer](#)
- [Armature Relays](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2527 1-Wire 64×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2527 1-Wire Dual 32×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2527 2-Wire 32×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2527 2-Wire Dual 16×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2527 4-Wire 16×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2527 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2527 1-Wire 64×1 Multiplexer Topology

Connect to the pins of the NI TB-2627 terminal block to use the NI PXI/PXIe-2527 (NI 2527) as a 1-wire 64×1 multiplexer. In this topology, all channel terminals (CH0 through CH63) route to COM0+. The 1WREF0 lead is always connected to COM0-. COM0+ is addressed as com0 in software.

The following figure represents the NI 2527 in the 1-wire 64×1 multiplexer topology.



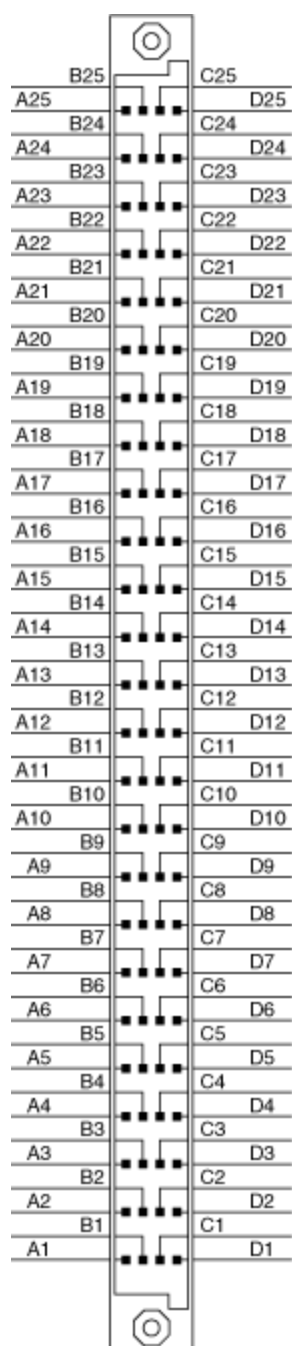
Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2 is routed to COM0

Pinout

The following figure and table identify the pins for the NI 2527 in the 1-wire 64×1 multiplexer topology.



Software Name	Pin Number	Software Name	Pin Number
ch0	A1	ch36	B3
ch1	D1	ch37	C3
ch2	A2	ch38	B4
ch3	D2	ch39	C4
ch4	A3	ch40	B5

Software Name	Pin Number	Software Name	Pin Number
ch5	D3	ch41	C5
ch6	A4	ch42	B6
ch7	D4	ch43	C6
ch8	A5	ch44	B7
ch9	D5	ch45	C7
ch10	A6	ch46	B8
ch11	D6	ch47	C8
ch12	A7	ch48	B10
ch13	D7	ch49	C10
ch14	A8	ch50	B11
ch15	D8	ch51	C11
ch16	A10	ch52	B12
ch17	D10	ch53	C12
ch18	A11	ch54	B13
ch19	D11	ch55	C13
ch20	A12	ch56	B14
ch21	D12	ch57	C14
ch22	A13	ch58	B15
ch23	D13	ch59	C15
ch24	A14	ch60	B16
ch25	D14	ch61	C16
ch26	A15	ch62	B17
ch27	D15	ch63	C17
ch28	A16	com0	A9
ch29	D16	—	—
ch30	A17	—	—
ch31	D17	—	—

Software Name	Pin Number	Software Name	Pin Number
ch32	B1	—	—
ch33	C1	—	—
ch34	B2	—	—
ch35	C2	—	—

Additional Pin References

NI 2527 Connector Pin Number	Signal Name
B9	com0–
A18	com1+
B18	com1–
C9	1wref0
C18	1wref1
A25	cjtemp+
D25	cjtemp–



Note In the 1-wire 64×1 multiplexer topology, do not connect to A18 or B18, as they are internally connected to certain routes.

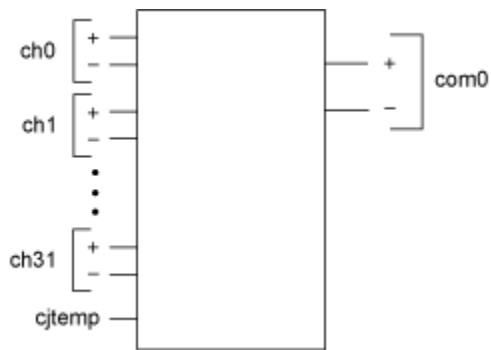
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI/PXIe-2527 2-Wire 32×1 Multiplexer Topology

Connect to the pins of the NI TB-2627 terminal block to use the NI PXI/PXIe-2527 (NI 2527) as a 2-wire 32×1 multiplexer. In this topology, all positive leads (CH0+ through CH31+) route to COM0+ and all negative leads (CH0– through CH31–) route to COM0–. The pair COM0+ and COM0– is addressed as com0 in software.

The following figure represents the NI 2527 in the 2-wire 32×1 multiplexer topology.



Making a Connection

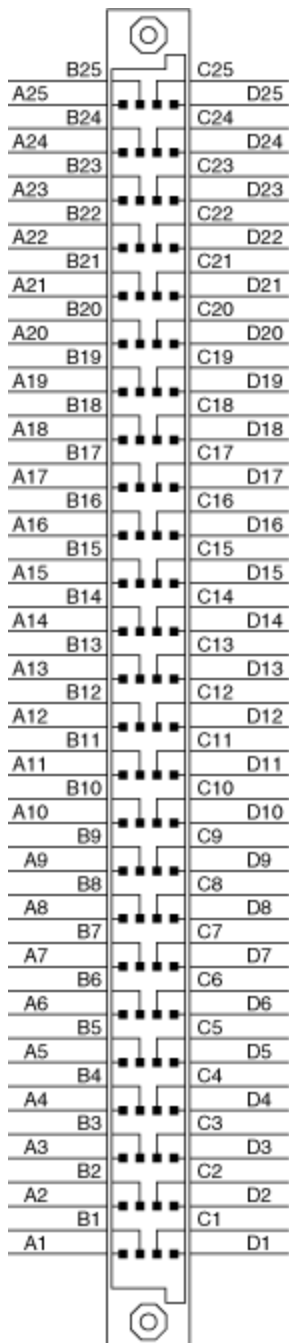
Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2+ is routed to COM0+

signal connected to CH2- is routed COM0-

Pinout

The following figure and table identify the pins for the NI 2527 in the 2-wire 32×1 multiplexer topology.



Software Name	Pin Number		Software Name	Pin Number	
+	-	+	-		
ch0	A1	B1	ch18	A11	B11
ch1	D1	C1	ch19	D11	C11
ch2	A2	B2	ch20	A12	B12
ch3	D2	C2	ch21	D12	C12

Software Name	Pin Number		Software Name	Pin Number	
+	–	+	–		
ch4	A3	B3	ch22	A13	B13
ch5	D3	C3	ch23	D13	C13
ch6	A4	B4	ch24	A14	B14
ch7	D4	C4	ch25	D14	C14
ch8	A5	B5	ch26	A15	B15
ch9	D5	C5	ch27	D15	C15
ch10	A6	B6	ch28	A16	B16
ch11	D6	C6	ch29	D16	C16
ch12	A7	B7	ch30	A17	B17
ch13	D7	C7	ch31	D17	C17
ch14	A8	B8	com0	A9	B9
ch15	D8	C8	cjtemp	A25	D25
ch16	A10	B10	—	—	—
ch17	D10	C10	—	—	—

Additional Pin References

NI 2527 Connector Pin Number	Signal Name
A18	com1+
B18	com1–
C9	1wref0
C18	1wref1



Note In the 2-wire 32×1 multiplexer topology, do not connect to A18 or B18, as they are internally connected to certain routes.

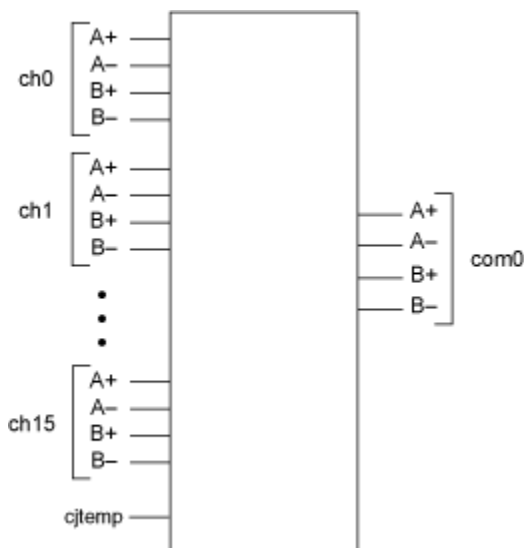
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI/PXIe-2527 4-Wire 16×1 Multiplexer Topology

Connect to the pins of the NI TB-2627 terminal block to use the NI PXI/PXIe-2527 (NI 2527) as a 4-wire 16×1 multiplexer. In this topology, all positive "A" leads (CH0A+ through CH15A+) route to COM0+. All negative "A" leads (CH0A– through CH15A–) route to COM0–. All positive "B" leads (CH0B+ through CH15B+) route to COM1+. All negative "B" leads (CH0B– through CH15B–) route to COM1–. COM0+, COM0–, COM1+, and COM1– are addressed as com0 in software.

The following figure represents the NI 2527 in the 4-wire 16×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2A+ is routed to COM0A+

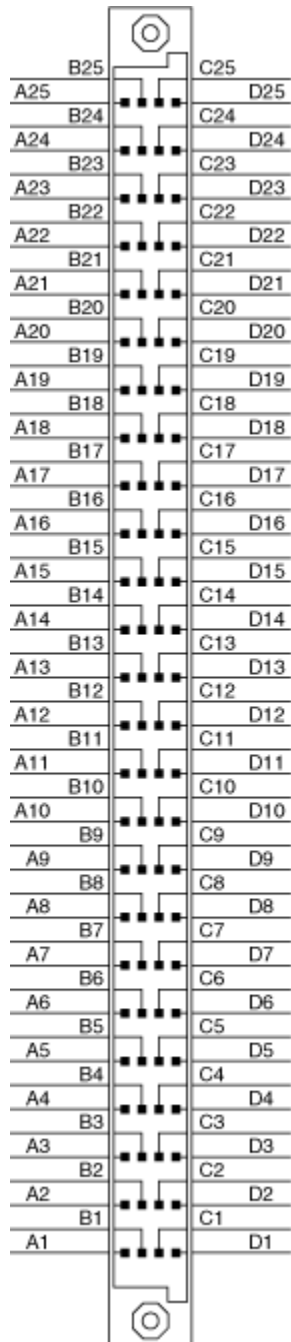
signal connected to CH2A– is routed to COM0A–

signal connected to CH2B+ is routed to COM0B+

signal connected to CH2B– is routed to COM0B–

Pinout

The following figure and table identify the pins for the NI 2527 in the 4-wire 16×1 multiplexer topology.



Software Name	Pin Number			
A+	A–	B+	B–	
ch0	A1	B1	A10	B10
ch1	D1	C1	D10	C10
ch2	A2	B2	A11	B11
ch3	D2	C2	D11	C11
ch4	A3	B3	A12	B12
ch5	D3	C3	D12	C12
ch6	A4	B4	A13	B13
ch7	D4	C4	D13	C13
ch8	A5	B5	A14	B14
ch9	D5	C5	D14	C14
ch10	A6	B6	A15	B15
ch11	D6	C6	D15	C15
ch12	A7	B7	A16	B16
ch13	D7	C7	D16	C16
ch14	A8	B8	A17	B17
ch15	D8	C8	D17	C17
com0	A9	B9	A18	B18
cjtemp	A25	D25	—	—

Related concepts:

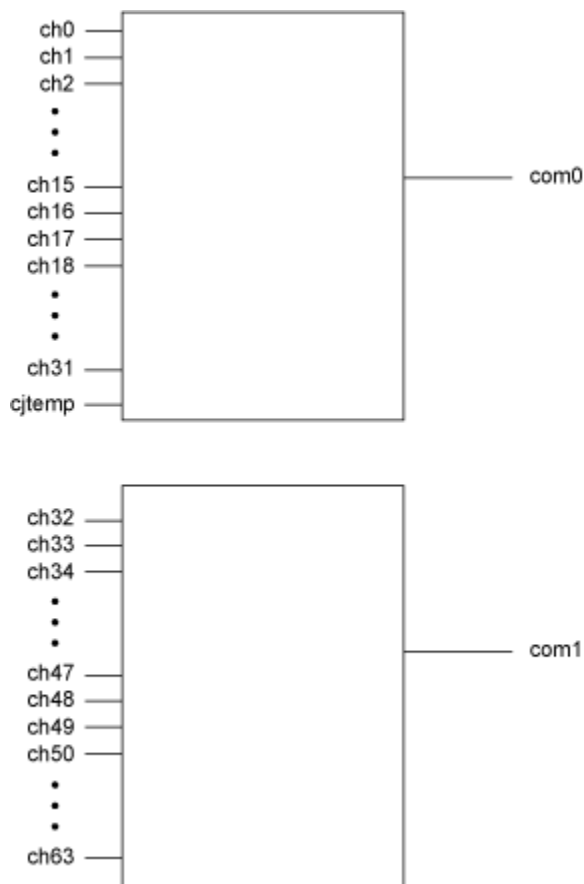
- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI/PXIe-2527 1-Wire Dual 32 × 1 Multiplexer Topology

Connect to the pins of the NI TB-2627 terminal block to use the NI PXI/PXIe-2527 (NI 2527) as a 1-wire dual 32×1 multiplexer. In this topology, CH0 through CH31 route

to COM0+, and CH32 through CH63 route to COM1+. The 1WREF0 lead is connected to COM0– and the 1WREF1 lead is connected to COM1–. The pair COM0+ and COM0– is addressed as com0 in software, and the pair COM1+ and COM1– is addressed as com1 in software.

The following figure represents the NI 2527 in the 1-wire dual 32×1 multiplexer topology.



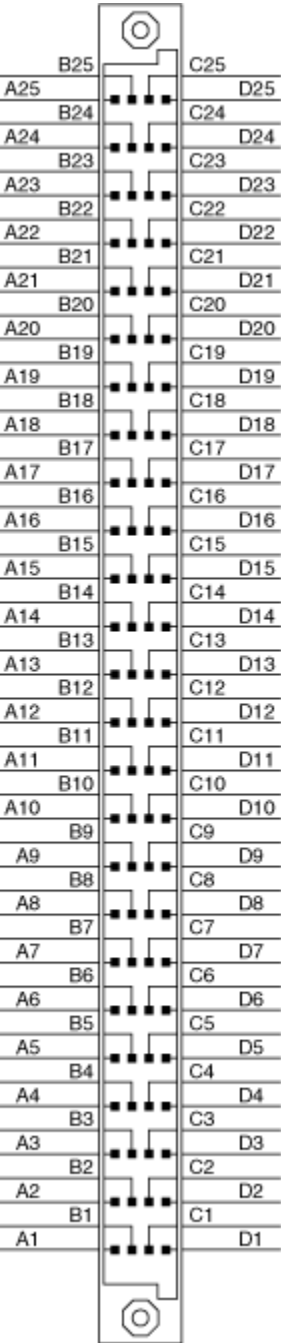
Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

signal connected to CH2 is routed to COM0

Pinout

The following figure and table identify the pins for the NI 2527 in the 1-wire dual 32×1 multiplexer topology.



Software Name	Pin Number	Software Name	Pin Number
ch0	A1	ch36	A12

Software Name	Pin Number	Software Name	Pin Number
ch1	D1	ch37	D12
ch2	A2	ch38	A13
ch3	D2	ch39	D13
ch4	A3	ch40	A14
ch5	D3	ch41	D14
ch6	A4	ch42	A15
ch7	D4	ch43	D15
ch8	A5	ch44	A16
ch9	D5	ch45	D16
ch10	A6	ch46	A17
ch11	D6	ch47	D17
ch12	A7	ch48	B10
ch13	D7	ch49	C10
ch14	A8	ch50	B11
ch15	D8	ch51	C11
ch16	B1	ch52	B12
ch17	C1	ch53	C12
ch18	B2	ch54	B13
ch19	C2	ch55	C13
ch20	B3	ch56	B14
ch21	C3	ch57	C14
ch22	B4	ch58	B15
ch23	C4	ch59	C15
ch24	B5	ch60	B16
ch25	C5	ch61	C16
ch26	B6	ch62	B17
ch27	C6	ch63	C17

Software Name	Pin Number	Software Name	Pin Number
ch28	B7	com0	A9
ch29	C7	com1	A18
ch30	B8	—	—
ch31	C8	—	—
ch32	A10	—	—
ch33	D10	—	—
ch34	A11	—	—
ch35	D11	—	—

Additional Pin References

NI 2527 Connector Pin Number	Signal Name
B9	com0–
B18	com1–
C9	1wref0
C18	1wref1
A25	cjtemp+
D25	cjtemp–

Related concepts:

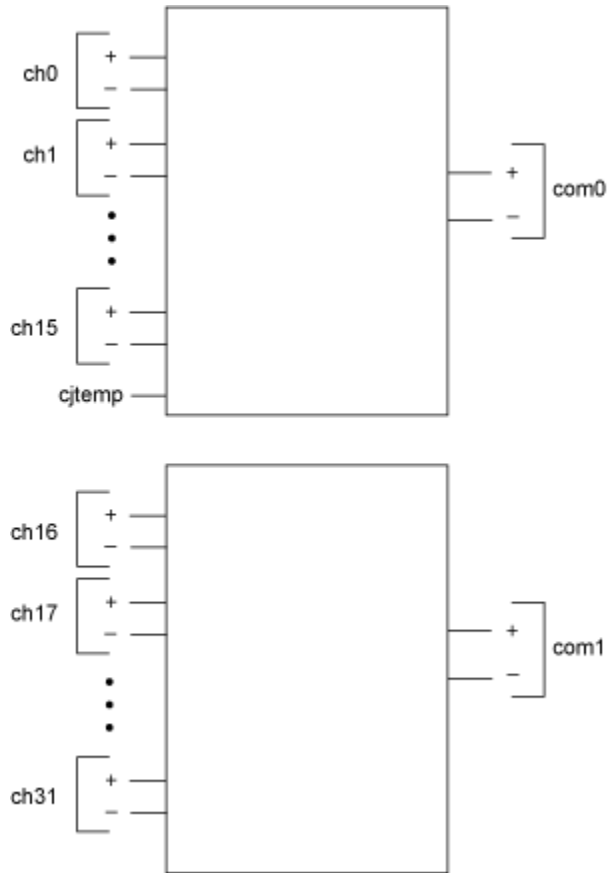
- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI/PXIe-2527 2-Wire Dual 16×1 Multiplexer Topology

Connect to the pins of the NI TB-2627 terminal block to use the NI PXI/PXIe-2527 (NI 2527) as a 2-wire dual 16×1 multiplexer. In this topology, CH0+ through CH15+ route to COM0+, and CH0– through CH15– route to COM0–. Additionally, CH16+ through CH31+ route to COM1+, and CH16– through CH31– route to COM1–. The pair COM0+ and COM0– is addressed as com0 in software, and the pair COM1+ and COM1–

is addressed as com1 in software.

The following figure represents the NI 2527 in the 2-wire dual 16×1 multiplexer topology.



Making a Connection

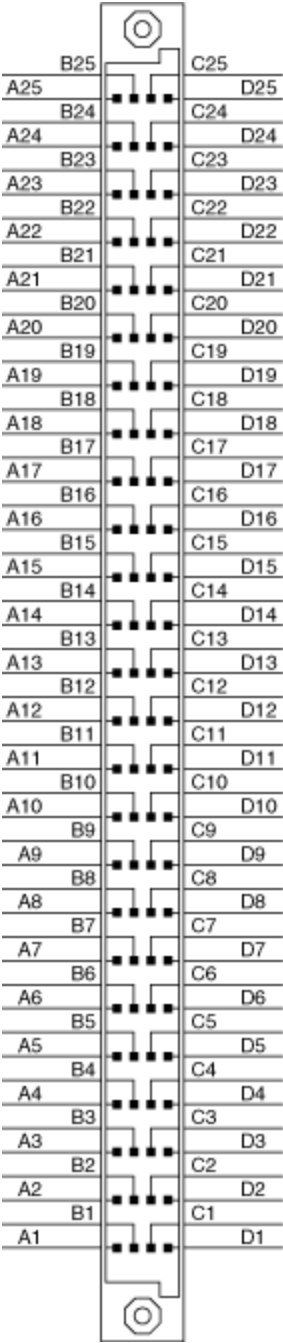
Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2+ is routed to COM0+

signal connected to CH2- is routed COM0-

Pinout

The following figure and table identify the pins for the NI 2527 in the 2-wire dual 16×1 multiplexer topology.



Software Name	Pin Number		Software Name	Pin Number	
+	-	+	-		
ch0	A1	B1	ch18	A11	B11
ch1	D1	C1	ch19	D11	C11
ch2	A2	B2	ch20	A12	B12
ch3	D2	C2	ch21	D12	C12

Software Name	Pin Number		Software Name	Pin Number	
+	–	+	–		
ch4	A3	B3	ch22	A13	B13
ch5	D3	C3	ch23	D13	C13
ch6	A4	B4	ch24	A14	B14
ch7	D4	C4	ch25	D14	C14
ch8	A5	B5	ch26	A15	B15
ch9	D5	C5	ch27	D15	C15
ch10	A6	B6	ch28	A16	B16
ch11	D6	C6	ch29	D16	C16
ch12	A7	B7	ch30	A17	B17
ch13	D7	C7	ch31	D17	C17
ch14	A8	B8	com0	A9	B9
ch15	D8	C8	com1	A18	B18
ch16	A10	B10	cjtemp	A25	D25
ch17	D10	C10	-	-	-

Related concepts:

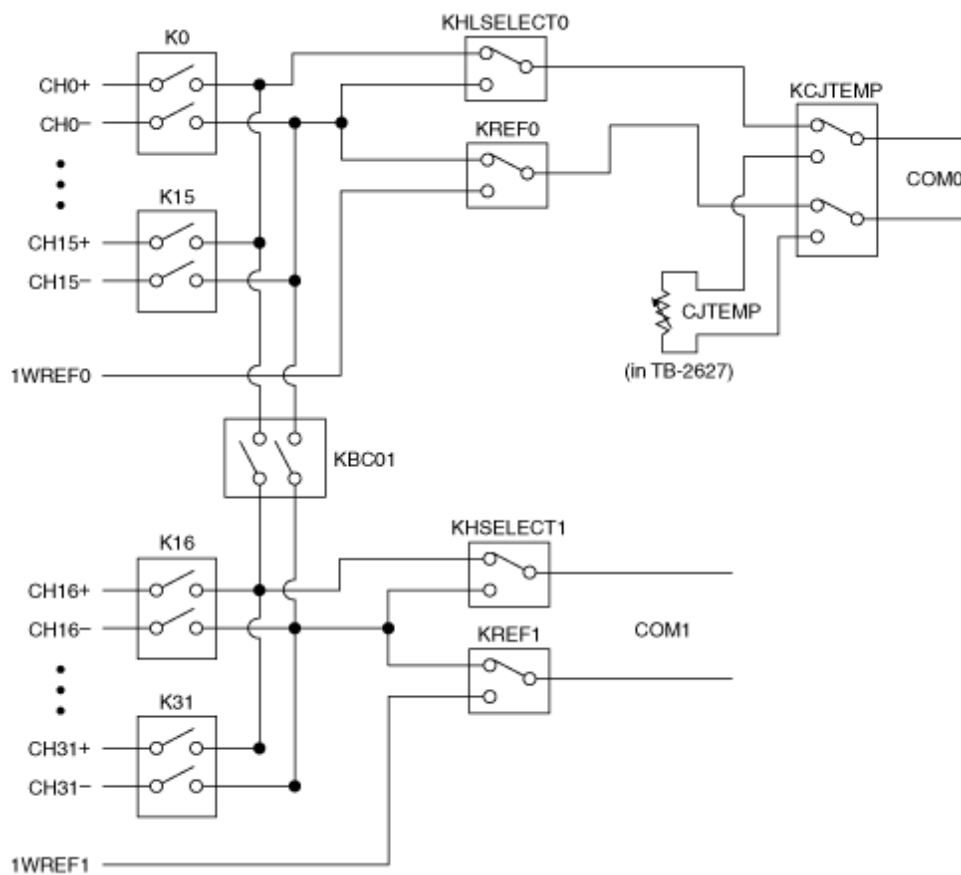
- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI/PXIe-2527 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2527.

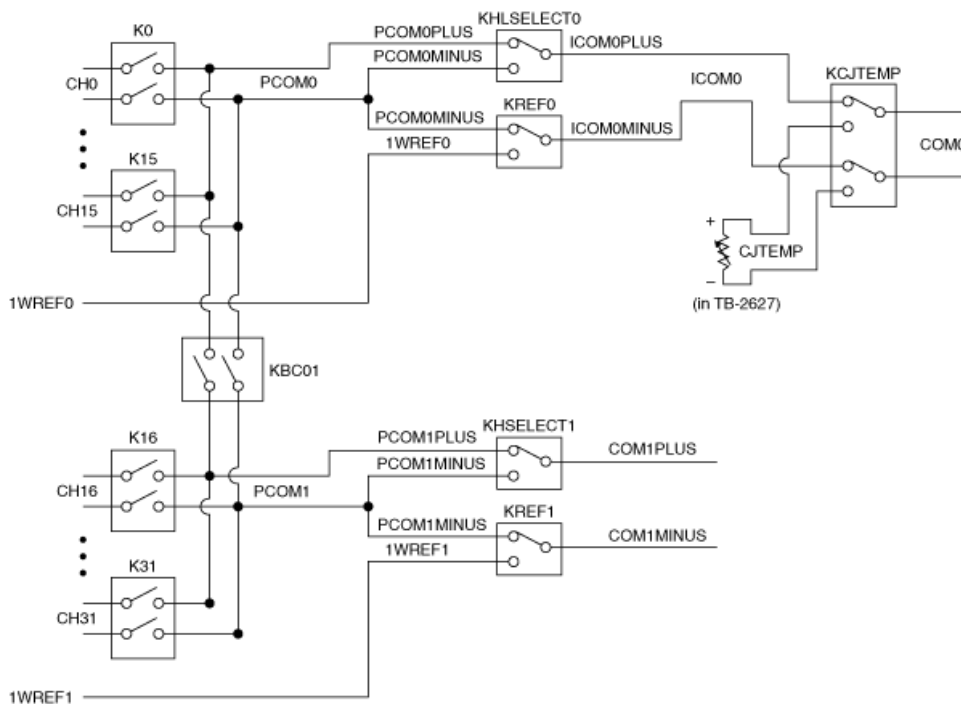


Note Relay names are the same for every topology.



NI PXI/PXIe-2527 Independent Topology

When using the NI PXI/PXIe-2527 (NI 2527) in the independent topology, connect the signals using the NI TB-2627 terminal block. Select this topology to utilize the full routing capabilities of the NI 2527.

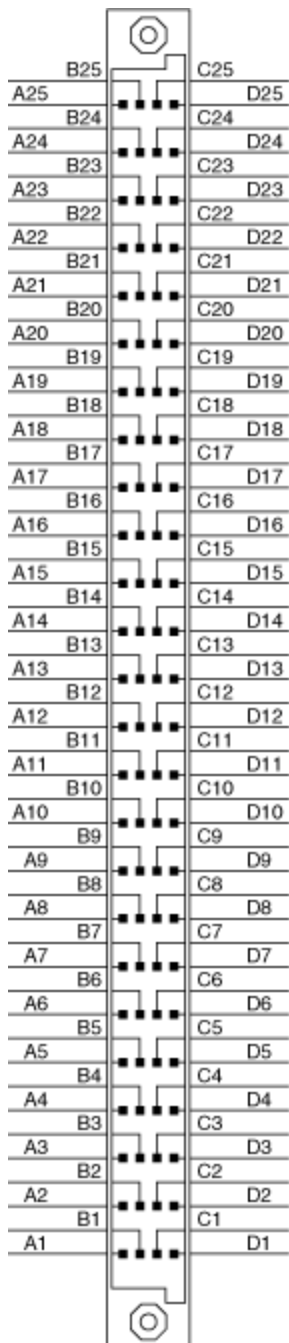


Making a Connection

With the independent topology, you can let NI-SWITCH determine the path between two specified channels by setting the intermediate channels as reserved for routing and using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function, or you can control individual relays using the `niSwitch Relay Control VI` or the `niSwitch_RelayControl` function.

Pinout

The following figure and table identify the pins for the NI 2527 in the independent topology.



Software Name	Pin Number		Software Name	Pin Number	
+	–	+	–		
ch0	A1	B1	ch17	D10	C10
ch1	D1	C1	ch18	A11	B11
ch2	A2	B2	ch19	D11	C11
ch3	D2	C2	ch20	A12	B12

Software Name	Pin Number		Software Name	Pin Number	
ch4	A3	B3	ch21	D12	C12
ch5	D3	C3	ch22	A13	B13
ch6	A4	B4	ch23	D13	C13
ch7	D4	C4	ch24	A14	B14
ch8	A5	B5	ch25	D14	C14
ch9	D5	C5	ch26	A15	B15
ch10	A6	B6	ch27	D15	C15
ch11	D6	C6	ch28	A16	B16
ch12	A7	B7	ch29	D16	C16
ch13	D7	C7	ch30	A17	B17
ch14	A8	B8	ch31	D17	C17
ch15	D8	C8	com0	A9	B9
ch16	A10	B10	com1	A18	B18
cjtemp	A25	D25	—	—	—

The following is a list of the valid internal channel names:

pcom0	pcom1
1wref0	1wref1
cjtemp	icom0
pcom1plus	pcom1minus
icom0plus	icom0minus
pcom0plus	pcom0minus
com1plus	com1minus

NI PXI/PXIe-2527 Relay Replacement

The NI PXI/PXIe-2527 (NI 2527) uses electromechanical armature relays.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
AXICOM (Tyco Electronics)	IM42PGR (5-1462039-7)

Relay Kit	Part Number
National Instruments (10 relays)	782051-01

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

Disassemble the Module

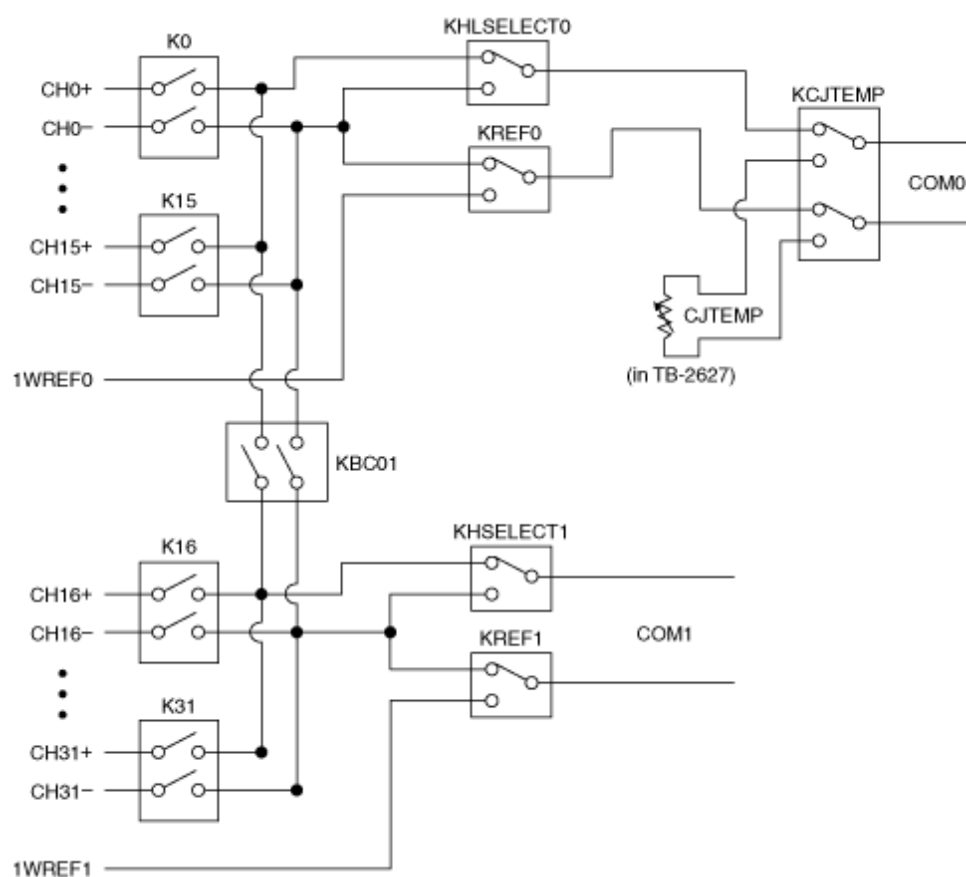
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Refer to the following figure and table to locate the relay you want to replace.

NI 2527 Hardware Diagram



Note Use the numbers printed on the board to verify the revision letter of the NI 2527. (Revision B = ASSY192245B-01; Revision A = ASSY192245A-01.) Use the revision letter to determine the correct reference designator for the relay you want to replace.

Relay Name	Reference Designator(Revision B)	Reference Designator (Revision A)
k0	k0	k33
k1	k1	k35
k2	k2	k30
k3	k3	k38
k4	k4	k34
k5	k5	k29
k6	k6	k25
k7	k7	k24

Relay Name	Reference Designator(Revision B)	Reference Designator (Revision A)
k8	k8	k21
k9	k9	k20
k10	k10	k17
k11	k11	k31
k12	k12	k16
k13	k13	k37
k14	k14	k36
k15	k15	k26
k16	k16	k13
k17	k17	k22
k18	k18	k6
k19	k19	k18
k20	k20	k14
k21	k21	k11
k22	k22	k8
k23	k23	k12
k24	k24	k9
k25	k25	k7
k26	k26	k5
k27	k27	k10
k28	k28	k1
k29	k29	k3
k30	k30	k4
k31	k31	k2
kbc01	k32	k32
khlselect0	k33	k28
kref0	k34	k27

Relay Name	Reference Designator(Revision B)	Reference Designator (Revision A)
khlselect1	k35	k23
kref1	k36	k19
kcjtemp	k37	k15

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick

- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI/PXIe-2527 Triggering

The NI PXI/PXIe-2527 (NI 2527) recognizes trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2527.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2527.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

Thermocouple Measurement

The NI PXI/PXIe-2527 (NI 2527) and the NI TB-2627 can measure thermocouples.



Tip NI software can convert a thermocouple voltage to the thermocouple temperature. For example code, visit ni.com/examples and enter 2527 in the Search field.

When measuring thermocouples, be sure to account for error in the measurements. The total error in thermocouple measurement is the sum of the system error (determined by the thermal EMF of the NI 2527 and the CJC temperature of the NI TB-2627) and the thermocouple error (determined by the type of thermocouple used).

Determining the System Error

To determine the system error for the NI 2527/TB-2627, first calculate the thermal EMF error of the NI 2527 using the following equation.

	$E_{EMF} = [(T_{+1} - T) / (V_{+1} - V)] \times V_{EMF}$	(1)
where	E_{EMF} represents the thermal EMF error of the NI 2527	
	T is the temperature being measured, in degrees Celsius	
	T_{+1} is $(T + 1\text{ }^{\circ}\text{C})$	
	V is the voltage that corresponds to T	
	V_{+1} is the voltage that corresponds to T_{+1}	
	V_{EMF} represents the thermal EMF of the NI 2527	



Note In thermocouple reference tables, T and T_{+1} are known values used to calculate the slope of the thermocouple Temperature vs. Voltage graph. Refer to a thermocouple reference table to determine the values of V and V_{+1} that correspond to T and T_{+1} , respectively. Refer to the NI PXI/PXIe-2527 Specifications to determine the thermal EMF value of the NI 2527. For optimal thermocouple measurement performance ($V_{EMF} = 2.5\text{ }\mu\text{V}$), power down the latching relays of the NI 2527. For more information about powering down latching relays, refer to the Power Down Latching Relays After Debounce property in NI-SWITCH or the Power Down Latching Relays After Settling property in NI-DAQmx.

After you have determined the thermal EMF error using Equation 1, calculate the system error using the following equation.

	$E_S = E_{EMF} + E_{CJC}$	(2)
where	E_S represents the system error of the NI 2527/TB-2627	
	E_{EMF} represents the error due to thermal EMF of the NI 2527	
	E_{CJC} represents the error due to CJC temperature sensor of the NI TB-2627	

Example

Measuring a K-type thermocouple at 200 °C with a CJC temperature of 25 °C, the system error of the NI 2527/TB-2627 is calculated in the following example.

Assuming typical thermal EMF (2.5 µV), first calculate the error due to thermal EMF using Equation 1.

E_{EMF}	=	$[(201\text{ °C} - 200\text{ °C}) / (8.178\text{ µV} - 8.138\text{ µV})] \times 0.0025\text{ µV}$
	=	0.063 °C



Note In this example, the values of V and V_{+1} are found in the thermocouple reference tables of Omega Engineering's The Temperature Handbook. Vol. 29. Stamford, CT: Omega Engineering Inc, 1995.

To determine the system error, add the error due to thermal EMF to the error due to the CJC temperature sensor using Equation 2.

E_S	=	0.063 °C + 0.5 °C
	=	0.563 °C

Determining the Thermocouple Error

Independent of the NI 2527/TB-2627 system, thermocouple error is the greater of the following values: $\pm$ a temperature range or $\pm$ a percent of the measurement.

In the example, a standard grade K-type thermocouple is used to measure 200 °C. The Temperature Handbook lists the error for a standard grade K-type thermocouple as $\pm 2.2\text{ °C}$ or $\pm 0.75\%$ of the measurement temperature. Because $\pm 0.75\%$ of 200 °C ($\pm 1.5\text{ °C}$) is less than $\pm 2.2\text{ °C}$, the error of a standard grade K-type thermocouple is $\pm 2.2\text{ °C}$.

Determining the Total Error

The total error in thermocouple measurement is the sum of the system error and the thermocouple error. Use the following equation to determine the total error in

thermocouple measurement.

	$E_T = E_S + E_{Th}$	(3)
where	E_T represents the total error in thermocouple measurement	
	E_S represents the system error	
	E_{Th} represents the thermocouple error	

To determine the total error in thermocouple measurement in the example, add the thermocouple error to the system error using Equation 3, as illustrated in the following calculation.

E_T	=	$0.56\text{ }^{\circ}\text{C} + 2.2\text{ }^{\circ}\text{C}$
	=	$2.76\text{ }^{\circ}\text{C}$

Assuming typical thermal EMF, the total error in thermocouple measurement at 200 °C for the NI 2527/TB-2627 with a K-type thermocouple is ±2.76 °C.

NI PXI/PXIe-2529

The NI PXI/PXIe-2529 (NI 2529) is a 128 crosspoint, high-density matrix switch module for the PXI or PXI Express platform. The NI 2529 is designed for switching low and high voltages. For low-voltage measurements, the NI 2529 uses relays with <9 µV thermal offset to ensure accurate measurements.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI 2529 and possible

operation modes.

Topology	Software Name	Immediate	Scanning
2-Wire Dual 4×16 Matrix	2529/2-Wire Dual 4x16 Matrix(NISWITCH_TOPOLOGY_2529_2_WIRE_DUAL_4X16_MATRIX)	✓	✓
2-Wire 8×16 Matrix	2529/2-Wire 8x16 Matrix(NISWITCH_TOPOLOGY_2529_2_WIRE_8X16_MATRIX)	✓	✓
2-Wire 4×32 Matrix	2529/2-Wire 4x32 Matrix(NISWITCH_TOPOLOGY_2529_2_WIRE_4X32_MATRIX)	✓	✓

Related Information

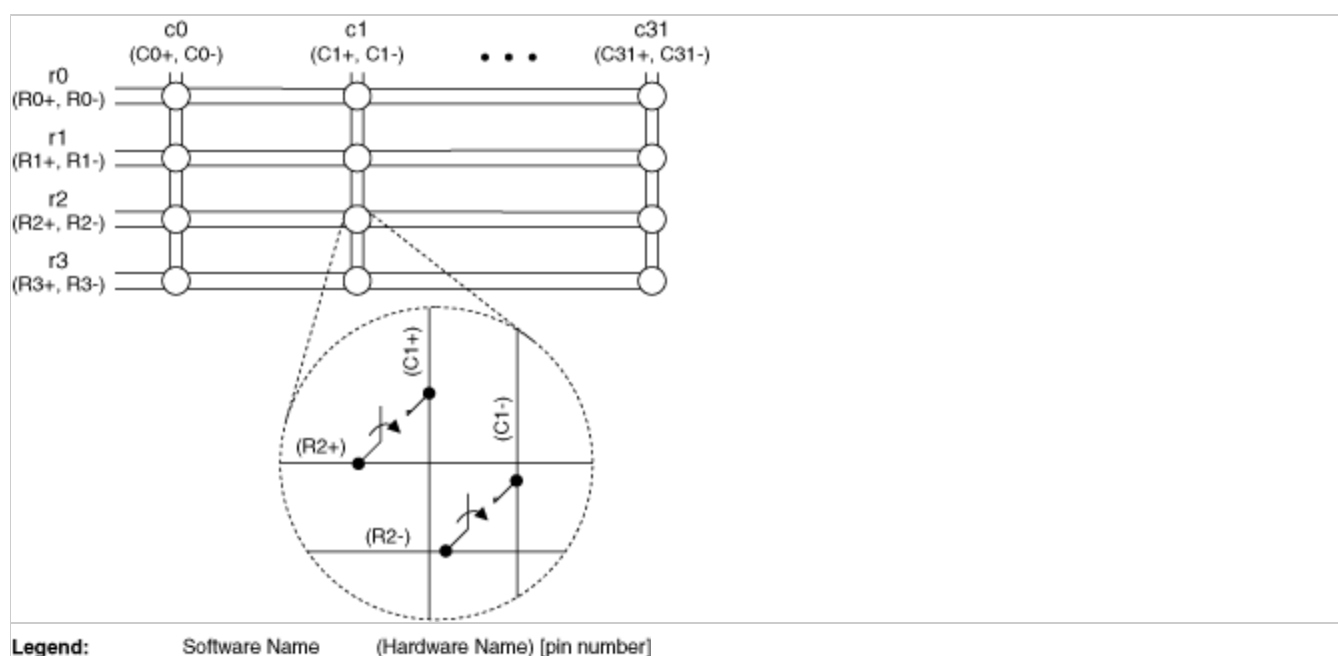
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2529 2-Wire Dual 4×16 Matrix Topology](#)
- [NI PXI/PXIe-2529 2-Wire 8×16 Matrix Topology](#)
- [NI PXI/PXIe-2529 2-Wire 4×32 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2529 2-Wire 4×32 Matrix Topology

The NI TB-2634 or the NI TB-2636 terminal block creates a 2-wire 4×32 matrix topology with the NI PXI/PXIe-2529 (NI 2529). The following figure represents the NI 2529 in the 2-wire 4×32 matrix topology.



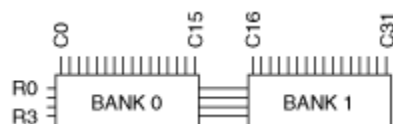
Making a Connection

The NI 2529 combined with the NI TB-2634 or the NI TB-2636 creates a 4x32 matrix. In this topology, you can connect any row to any column. When connecting signals to r1, you would connect them to R1+ and R1- in the terminal block. When connecting signals to c0, you would connect them to C0+ and C0- in the terminal block.

You can connect the channels of the NI 2529 using the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect row 1 to column 1, call the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to r1 and the **channel 2** parameter set to c1.

When scanning the NI 2529 in 4x32 matrix topology, a typical scan list entry could be r1->c20;. This entry routes the signal connected to row 1 to column 20.

Bank Connection Diagram



Terminal Block Connections

The NI TB-2634 and NI TB-2636 terminal blocks configure the NI 2529 as a 2-wire 4×32 matrix.

The following table lists the NI 2529 pins and their associated column connections. Refer to the NI 2529 pinout for pin locations.

Connection	Pins	Connection	Pins	Connection	Pins	Connection	Pins
C0+	B24	C8+	B19	C16+	B14	C24+	B9
C0-	A24	C8-	A19	C16-	A14	C24-	A9
C1+	B23	C9+	B18	C17+	B13	C25+	B8
C1-	A23	C9-	A18	C17-	A13	C25-	A8
C2+	B22	C10+	B17	C18+	B12	C26+	B7
C2-	A22	C10-	A17	C18-	A12	C26-	A7
C3+	B21	C11+	B16	C19+	B11	C27+	B6
C3-	A21	C11-	A16	C19-	A11	C27-	A6
C4+	C24	C12+	C19	C20+	C14	C28+	C9
C4-	D24	C12-	D19	C20-	D14	C28-	D9
C5+	C23	C13+	C18	C21+	C13	C29+	C8
C5-	D23	C13-	D18	C21-	D13	C29-	D8
C6+	C22	C14+	C17	C22+	C12	C30+	C7
C6-	D22	C14-	D17	C22-	D12	C30-	D7
C7+	C21	C15+	C16	C23+	C11	C31+	C6
C7-	D21	C15-	D16	C23-	D11	C32-	D6

The following table lists the NI 2529 pins that the NI TB-2634 and NI TB-2636 short and the row connections created.

Connection	Pins	Connection	Pins	Connection	Pins	Connection	Pins
R0+	B25,B15	R1+	C25,C15	R2+	B20,B10	R3+	C20,C10



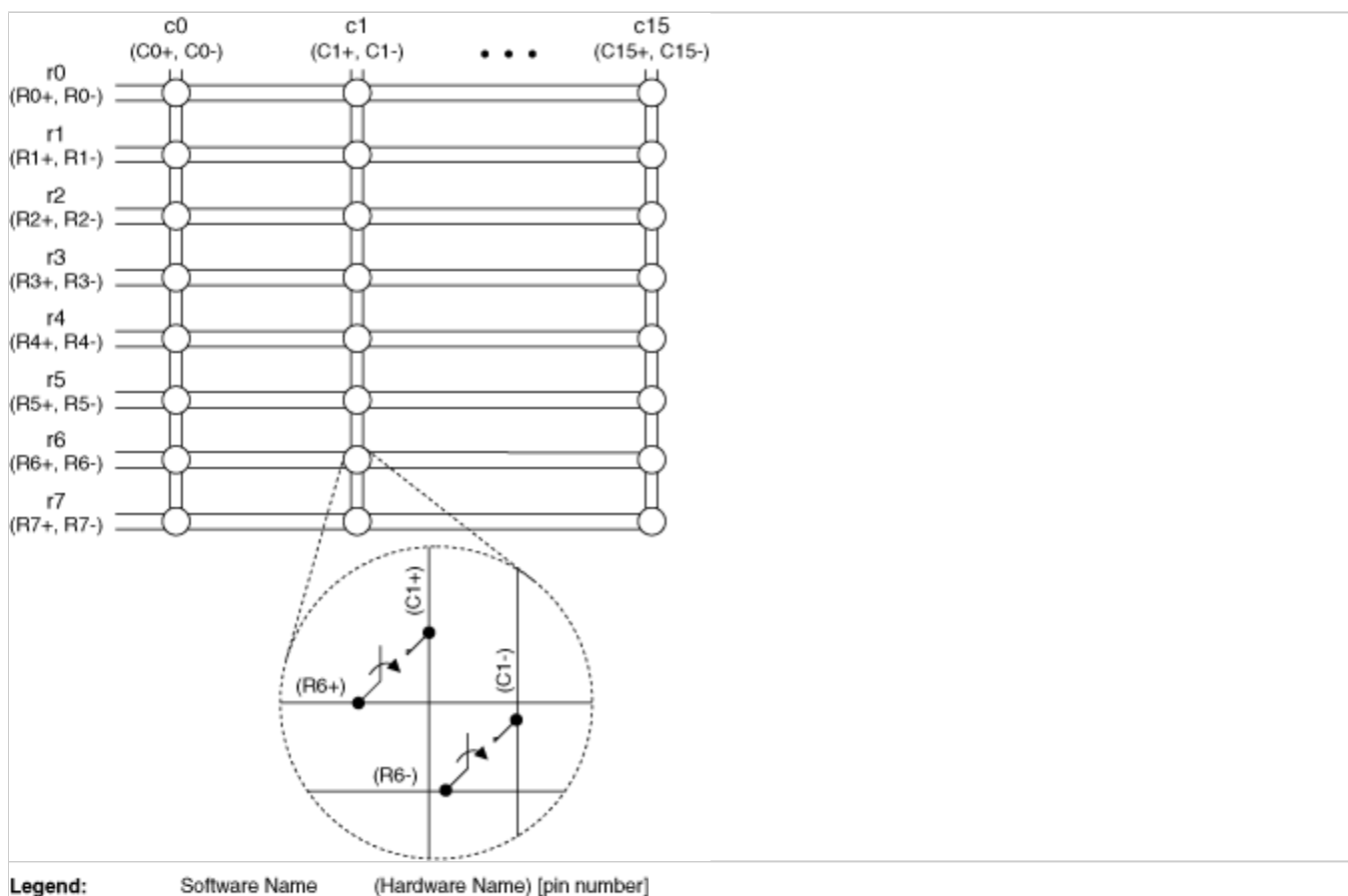
Caution Do not connect to RESERVED pins or to NO CONNECT pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [Operation Modes](#)

NI PXI/PXIe-2529 2-Wire 8×16 Matrix Topology

The TB-2635 terminal block creates a 2-wire 8×16 matrix topology with the NI PXI/PXIe-2529 (NI 2529). The following figure represents the NI 2529 in the 2-wire 8×16 matrix topology.



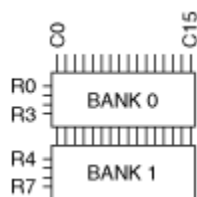
Making a Connection

The NI 2529 combined with the NI TB-2635 creates an 8×16 matrix. In this topology you can connect any row to any column. When connecting signals to r1, you would connect them to R1+ and R1– in the terminal block. When connecting signals to c0, you would connect them to C0+ and C0– in the terminal block.

You can connect the channels of the NI 2529 using the niSwitch Connect Channels VI or the `niSwitch_Connect` function. For example, to connect row 1 to column 1, call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with the **channel 1** parameter set to `r1` and the **channel 2** parameter set to `c1`.

When scanning the NI 2529 in 8×16 matrix topology, a typical scan list entry could be `r5->c1;`. This entry routes the signal connected to row 5 to column 1.

Bank Connection Diagram



Terminal Block Connections

The NI TB-2635 terminal block configures the NI 2529 as a 2-wire 8×16 matrix.

The following table lists the NI 2529 pins that the NI TB-2635 terminal block shorts and the column connections created. If you do not use the NI TB-2635 terminal block, short the pins externally to achieve a 2-wire 8×16 matrix topology. Refer to the NI 2529 pinout for pin locations.

Connection	Pins	Connection	Pins	Connection	Pins	Connection	Pins
C0+	B24, B14	C4+	C24, C14	C8+	B19, B9	C12+	C19, C9
C0-	A24, A14	C4-	D24, D14	C8-	A19, A9	C12-	D19, D9
C1+	B23, B13	C5+	C23, C13	C9+	B18, B8	C13+	C18, C8
C1-	A23, A13	C5-	D23, D13	C9-	A18, A8	C13-	D18, D8

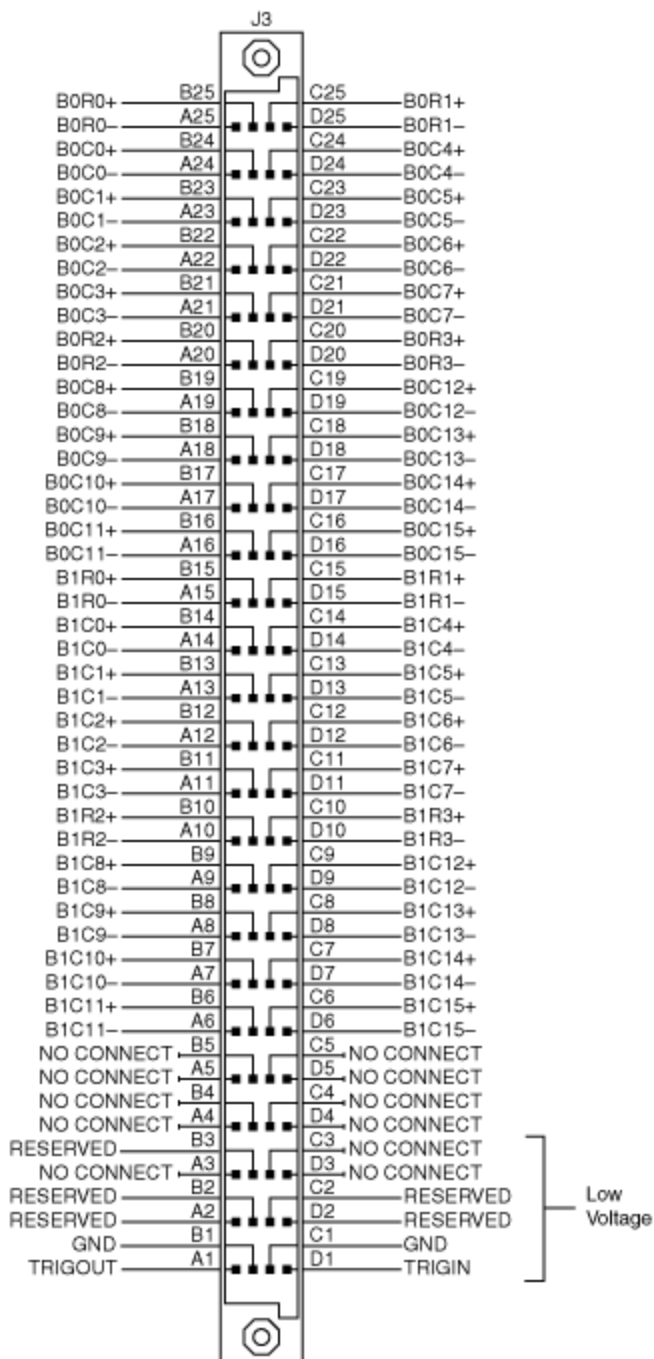
Connection	Pins	Connection	Pins	Connection	Pins	Connection	Pins
C2+	B22,B12	C6+	C22,C12	C10+	B17,B7	C14+	C17,C7
C2-	A22,A12	C6-	D22,D12	C10-	A17,A7	C14-	D17,D7
C3+	B21,B11	C7+	C21,C11	C11+	B16,B6	C15+	C16,C6
C3-	A21,A11	C7-	D21,D11	C11-	A16,A6	C15-	D16,D6

The following table lists the NI 2529 pins and their associated row connection.

Connection	Pins	Connection	Pins	Connection	Pins	Connection	Pins
R0+	B25	R2+	B20	R4+	B15	R6+	B10
R0-	A25	R2-	A20	R4-	A15	R6-	A10
R1+	C25	R3+	C20	R5+	C15	R7+	C10
R1-	D25	R3-	D20	R5-	D15	R7-	D10

Pinout

The following figure identifies the pins for the NI 2529.



Caution Do not connect to RESERVED pins or to NO CONNECT pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

Related concepts:

- [N-Wire Switching Modes](#)

- [Matrix](#)
- [Operation Modes](#)
- [Scan Lists](#)

Expanding the NI PXI/PXIe-2529 Matrix Using the NI TB-2636

Use the NI TB-2636 and bare wire to expand the NI PXI/PXIe-2529 (NI 2529).

Getting Started

To expand the NI 2529, you need the following items:

- Bare wire
- Two or more NI TB-2636 terminal blocks
- Two or more NI 2529 switch modules

NI TB-2636 Terminal Reference

Refer to the following figure and complete the procedures in either the Expanding the NI 2529 Columns or Expanding the NI 2529 Rows section to expand the NI 2529.



Expanding the NI 2529 Columns

Complete the following steps to expand the columns of an NI 2529 using an NI TB-2636 terminal block.

1. Connect one end of the bare wire to a row screw terminal on one NI TB-2636.
2. Connect the other end of the bare wire to the corresponding row screw terminal on another NI TB-2636.
3. (Optional) To expand the columns on the NI 2529 further, attach another bare wire to the row screw terminal you accessed in the previous step. Connect the other end of the bare wire to the corresponding row screw terminal on another NI TB-2636.
4. Repeat the previous steps for all rows.

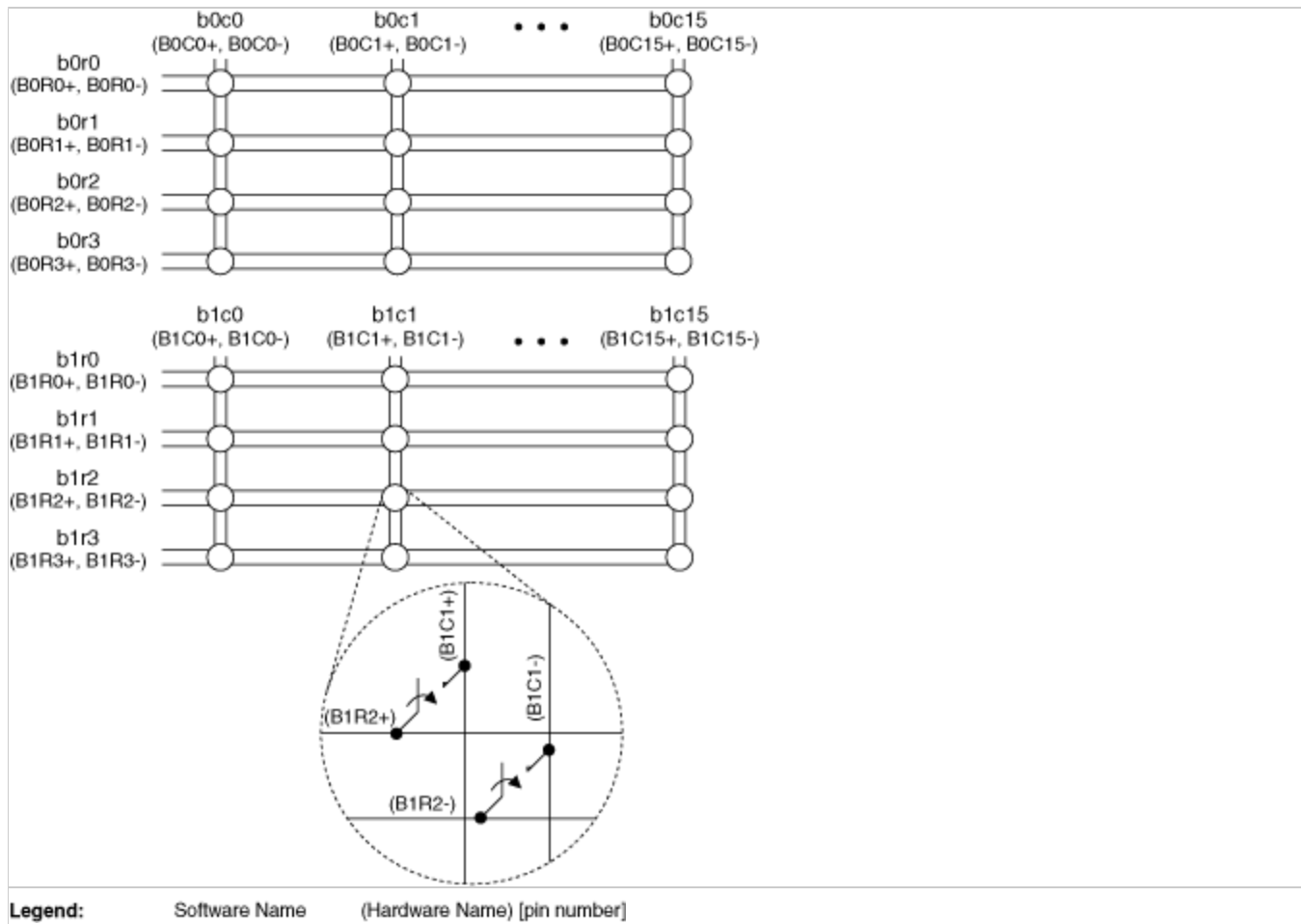
Expanding the NI 2529 Rows

Complete the following steps to expand the rows of an NI 2529 using an NI TB-2636 terminal block.

1. Connect one end of the bare wire to a column screw terminal on one NI TB-2636.
2. Connect the other end of the bare wire to the corresponding column screw terminal on another NI TB-2636.
3. (Optional) To expand the rows on the NI 2529 further, attach another bare wire to the column screw terminal you accessed in the previous step. Connect the other end of the bare wire to the corresponding column screw terminal on another NI TB-2636.
4. Repeat the previous steps for all columns.

NI PXI/PXIe-2529 2-Wire Dual 4×16 Matrix Topology

The following figure represents the NI PXI/PXIe-2529 (NI 2529) in the 2-wire dual 4×16 matrix topology.



Making a Connection

The NI 2529 in this topology creates two banks of 4x16 matrices. You can only connect rows and columns to rows and columns in the same bank. For more information about how to use the NI 2529 in a dual 4x16 matrix configuration, visit ni.com/info and enter the info code, `exudrg`.

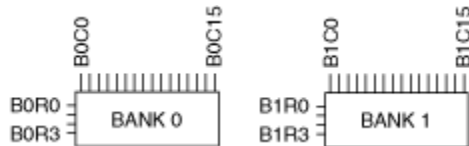
You can connect the channels of the NI 2529 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect bank 0 row 1 to bank 0 column 1, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `b0r1` and the **channel 2** parameter set to `b0c1`.

When scanning the NI 2529 in dual 4x16 matrix topology, a typical scan list entry could be `b0r1->b0c1;`. This entry routes the signal connected to bank 0 row 1 to bank 0 column 1.



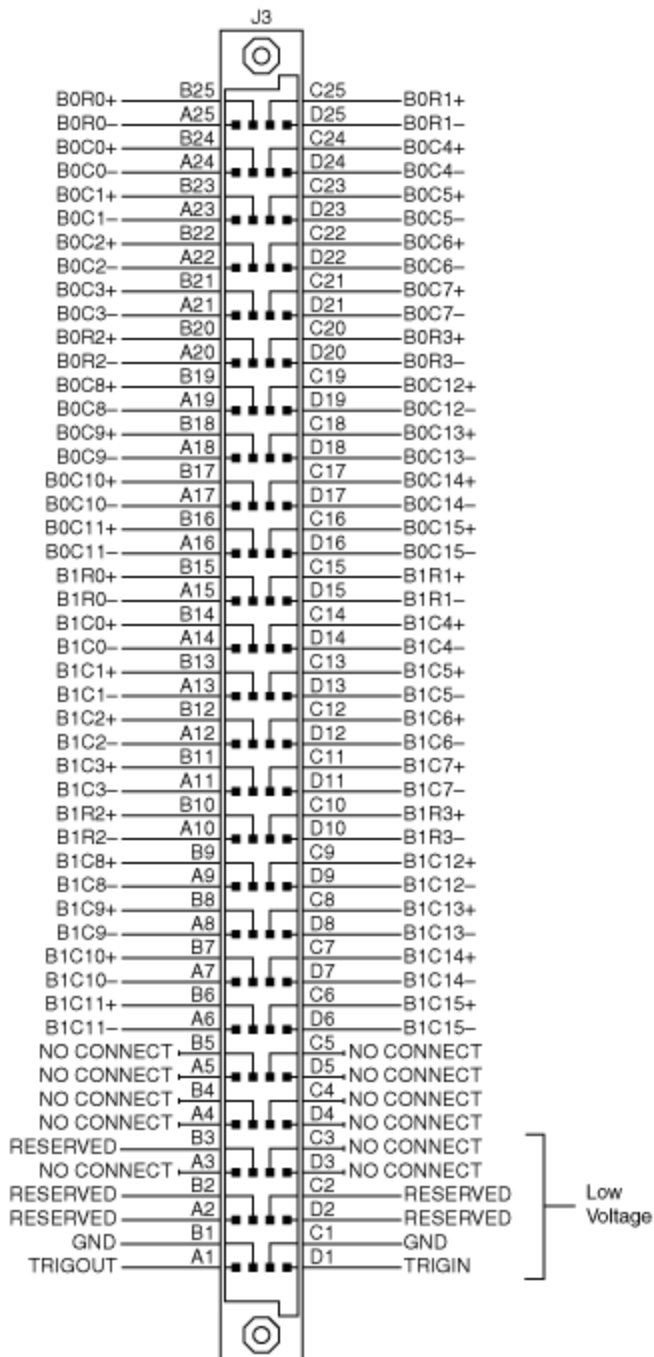
Note You can, for example, connect b0r1 to b0c0; however, you cannot connect b0r1 directly to b1c1 in this topology. When connecting signals to b0r1, you would connect them to B0R1+ and B0R1– in the terminal block. When connecting signals to b0c0, you would connect them to B0C0+ and B0C0– in the terminal block.

Bank Connection Diagram



Pinout

The following figure identifies the pins for the NI 2529.



Caution Do not connect to RESERVED pins or to NO CONNECT pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

Related concepts:

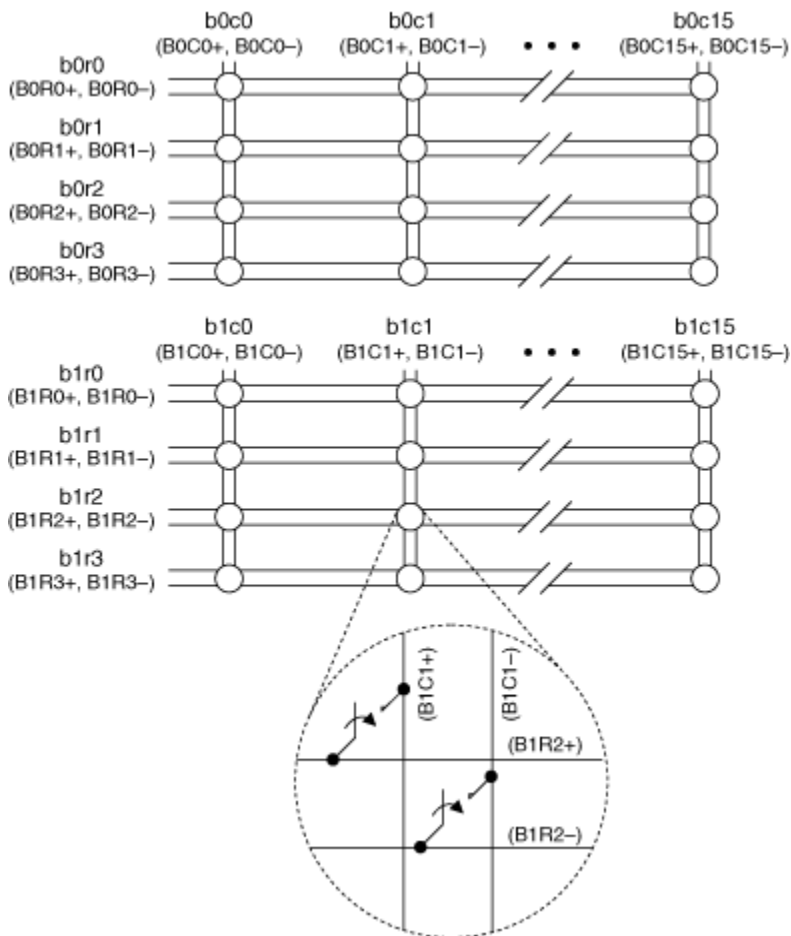
- [N-Wire Switching Modes](#)

- [Matrix](#)
- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2529 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2529 (NI 2529).

 **Note** Relay names are the same for every topology.



The following table lists relay names for the NI 2529.

Bank 1Relays	Bank 2Relays
B0R0C0...B0R0C15	B1R0C0...B1R0C15
B0R1C0...B0R1C15	B1R1C0...B1R1C15

Bank 1 Relays	Bank 2 Relays
B0R2C0...B0R2C15	B1R2C0...B1R2C15
B0R3C0...B0R3C15	B1R3C0...B1R3C15

NI PXI/PXIe-2529 Matrix Expansion

You can expand the NI PXI/PXIe-2529 (NI 2529) matrix using either the NI TB-2634, NI TB-2635, or the NI TB-2636 terminal block. The terminal block you are using determines the matrix expansion procedure you will follow. The following table lists the terminal blocks and matrix topologies available for the NI 2529.

Terminal Block	Topology(Row x Column)
NI TB-2634	2-wire 4×32, 2-wire dual 4×16
NI TB-2635	2-wire 8×16
NI TB-2636	2-wire 4×32

NI PXI/PXIe-2529 Relay Replacement

The NI PXI/PXIe-2529 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Aromat (NAiS)	AGQ210A4H

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

Disassemble the Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace.
 - a. Determine the channel name for the relay using the Bank Connection Diagram for your topology.
 - b. Match the channel name to its corresponding relay name using the following tables.

Table 4. Daughterboard Relay Locations (Top View)

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName
B0ROC0	K72	B0R1C0	K80	B0R2C0	K88	B0R3C0
B0ROC1	K71	B0R1C1	K79	B0R2C1	K87	B0R3C1
B0ROC2	K70	B0R1C2	K78	B0R2C2	K86	B0R3C2
B0ROC3	K69	B0R1C3	K77	B0R2C3	K85	B0R3C3
B0ROC4	K1	B0R1C4	K9	B0R2C4	K17	B0R3C4
B0ROC5	K2	B0R1C5	K10	B0R2C5	K18	B0R3C5
B0ROC6	K3	B0R1C6	K11	B0R2C6	K19	B0R3C6
B0ROC7	K4	B0R1C7	K12	B0R2C7	K20	B0R3C7
B0ROC8	K68	B0R1C8	K76	B0R2C8	K84	B0R3C8
B0ROC9	K67	B0R1C9	K75	B0R2C9	K83	B0R3C9
B0ROC10	K66	B0R1C10	K74	B0R2C10	K82	B0R3C10
B0ROC11	K65	B0R1C11	K73	B0R2C11	K81	B0R3C11
B0ROC12	K5	B0R1C12	K13	B0R2C12	K21	B0R3C12
B0ROC13	K6	B0R1C13	K14	B0R2C13	K22	B0R3C13
B0ROC14	K7	B0R1C14	K15	B0R2C14	K23	B0R3C14
B0ROC15	K8	B0R1C15	K16	B0R2C15	K24	B0R3C15

Table 5. Daughterboard Relay Locations (Bottom View)

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName
B1ROC0	K104	B1R1C0	K112	B1R2C0	K120	B1R3C0

ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName
B1ROC1	K103	B1R1C1	K111	B1R2C1	K119	B1R3C1
B1ROC2	K102	B1R1C2	K110	B1R2C2	K118	B1R3C2
B1ROC3	K101	B1R1C3	K109	B1R2C3	K117	B1R3C3
B1ROC4	K33	B1R1C4	K41	B1R2C4	K49	B1R3C4
B1ROC5	K34	B1R1C5	K42	B1R2C5	K50	B1R3C5
B1ROC6	K35	B1R1C6	K43	B1R2C6	K51	B1R3C6
B1ROC7	K36	B1R1C7	K44	B1R2C7	K52	B1R3C7
B1ROC8	K100	B1R1C8	K108	B1R2C8	K116	B1R3C8
B1ROC9	K99	B1R1C9	K107	B1R2C9	K115	B1R3C9
B1ROC10	K98	B1R1C10	K106	B1R2C10	K114	B1R3C10
B1ROC11	K97	B1R1C11	K105	B1R2C11	K113	B1R3C11
B1ROC12	K37	B1R1C12	K45	B1R2C12	K53	B1R3C12
B1ROC13	K38	B1R1C13	K46	B1R2C13	K54	B1R3C13
B1ROC14	K39	B1R1C14	K47	B1R2C14	K55	B1R3C14
B1ROC15	K40	B1R1C15	K48	B1R2C15	K56	B1R3C15

- c. Use the relay name to locate the relay on the daughterboard.



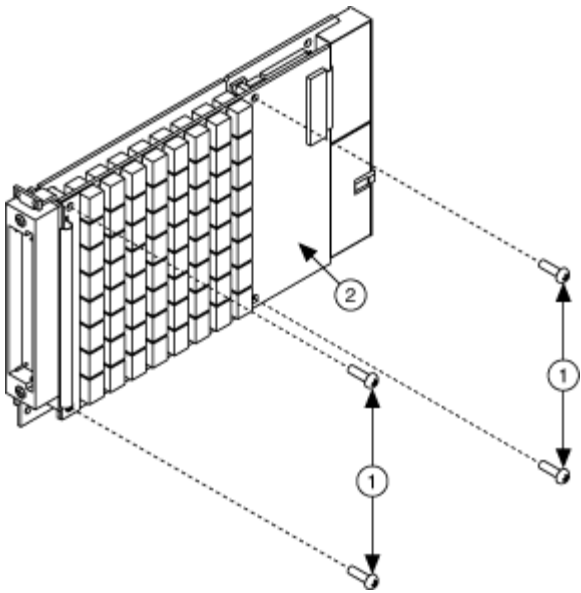
Note Relay names are printed on the PCB.



Note Older versions of this module might have plastic lead covers that you must remove. The module retains full specifications even if these covers are not reinstalled.

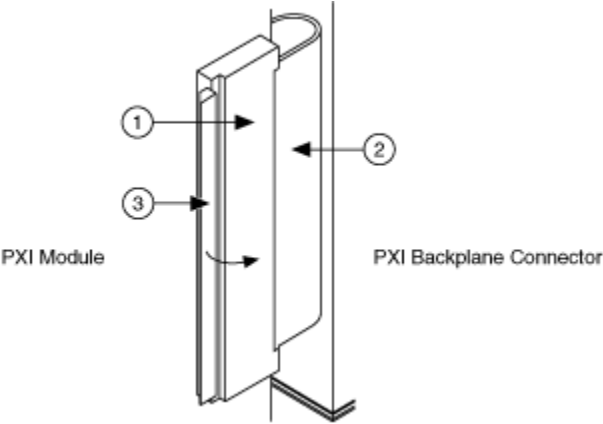
3. Remove the four screws and two lead covers (if present) that secure the

daughterboard to the switch assembly.



1	Screws
2	Lead Covers (if present)

4. To gain access the bottom of the daughterboard, disconnect the PCB interconnect cable by lifting the PCB cable latch on the J1 connector.



1	PCB Interconnect Cable
2	PCB Cable Latch
3	J1 Connector

5. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free

solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5

seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI/PXIe-2529 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI/PXIe-2529 (NI 2529).

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIGIN on TB-2634/2635 terminal blocks

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2529.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6

Scan Advanced Output	Software	Hardware
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIGOUT on TB-2634/2635 terminal blocks

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2530/2530B

The NI PXI-2530 and NI PXI-2530B are high-density multiplexer/matrix switch modules for the PXI platform. The NI PXI-2530/2530B uses reed relays.

A number of factors can affect the life expectancy of reed relays. Refer to Reed Relay Protection for information about protecting reed relays.

Refer to the NI PXI-2530 Signal Connections and NI PXI-2530B Signal Connections sections for pinouts for each topology.



Note In MAX, both the NI PXI-2530 and NI PXI-2530B appear as "NI PXI-2530".

Operation Modes

The following table lists the supported topologies of the NI PXI-2530/2530B and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 128×1 Multiplexer	2530/1-Wire 128x1 Mux(NISWITCH_TOPOLOGY_2530_1_WIRE_128X1_MUX)	✓	✓

Topology	Software Name	Immediate	Scanning
1-Wire Dual 64×1 Multiplexer	2530/1-Wire Dual 64x1 Mux(NISWITCH_TOPOLOGY_2530_1_WIRE_DUAL_64X1_MUX)	✓	✓
1-Wire Quad 32×1 Multiplexer	2530/1-Wire Quad 32x1 Mux(NISWITCH_TOPOLOGY_2530_1_WIRE_QUAD_32X1_MUX)	✓	✓
1-Wire Octal 16×1 Multiplexer	2530/1-Wire Octal 16x1 Mux(NISWITCH_TOPOLOGY_2530_1_WIRE_OCTAL_16X1_MUX)	✓	✓
2-Wire 64×1 Multiplexer	2530/2-Wire 64x1 Mux(NISWITCH_TOPOLOGY_2530_2_WIRE_64X1_MUX)	✓	✓
2-Wire Dual 32×1 Multiplexer	2530/2-Wire Dual 32x1 Mux(NISWITCH_TOPOLOGY_2530_2_WIRE_DUAL_32X1_MUX)	✓	✓
2-Wire Quad 16×1 Multiplexer	2530/2-Wire Quad 16x1 Mux(NISWITCH_TOPOLOGY_2530_2_WIRE_QUAD_16X1_MUX)	✓	✓
4-Wire 32×1 Multiplexer	2530/4-Wire 32x1 Mux(NISWITCH_TOPOLOGY_2530_4_WIRE_32X1_MUX)	✓	✓
4-Wire Dual 16×1 Multiplexer	2530/4-Wire Dual 16x1 Mux(NISWITCH_TOPOLOGY_2530_4_WIRE_DUAL_16X1_MUX)	✓	✓
1-Wire 4×32 Matrix	2530/1-Wire 4x32 Matrix(NISWITCH_TOPOLOGY_2530_1_WIRE_4X32_MATRIX)	✓	✓
1-Wire 8×16 Matrix	2530/1-Wire 8x16 Matrix(NISWITCH_TOPOLOGY_2530_1_WIRE_8X16_MATRIX)	✓	✓
2-Wire 4×16 Matrix	2530/2-Wire 4x16 Matrix(NISWITCH_TOPOLOGY_2530_2_WIRE_4X16_MATRIX)	✓	✓
Independent	2530/ Independent(NISWITCH_TOPOLOGY_2530_INDEPENDENT)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

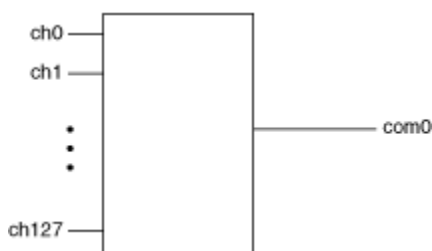
- [NI PXI-2530/2530B 1-Wire 128×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 1-Wire Dual 64×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 1-Wire Quad 32×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 1-Wire Octal 16×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 2-Wire 64×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 2-Wire Dual 32×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 2-Wire Quad 16×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 4-Wire 32×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 4-Wire Dual 16×1 Multiplexer Topology](#)
- [NI PXI-2530/2530B 1-Wire 4×32 Matrix Topology](#)
- [NI PXI-2530/2530B 1-Wire 8×16 Matrix Topology](#)
- [NI PXI-2530/2530B 2-Wire 4×16 Matrix Topology](#)
- [NI PXI-2530/2530B Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI-2530/2530B 1-Wire 128×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 1-wire 128×1 multiplexer. In this topology, all channel terminals (CH0 through CH127) route to COM0. A reference, 1WREF0, always remains connected to COM1. The pair, COM0 and COM1, is provided for convenient connectivity to a 2-wire device, such as a DMM.

When using the 1-wire 128x1 topology, COM1 connects only to 1WREF0 and can optionally be used to route the second wire of a differential signal through the switch. This is useful to keep the path lengths and routing conditions similar on the differential pair, but is not necessary.

The following figure represents the NI PXI-2530/2530B in the 1-wire 128×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

signal connected to CH2 is routed to COM0

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

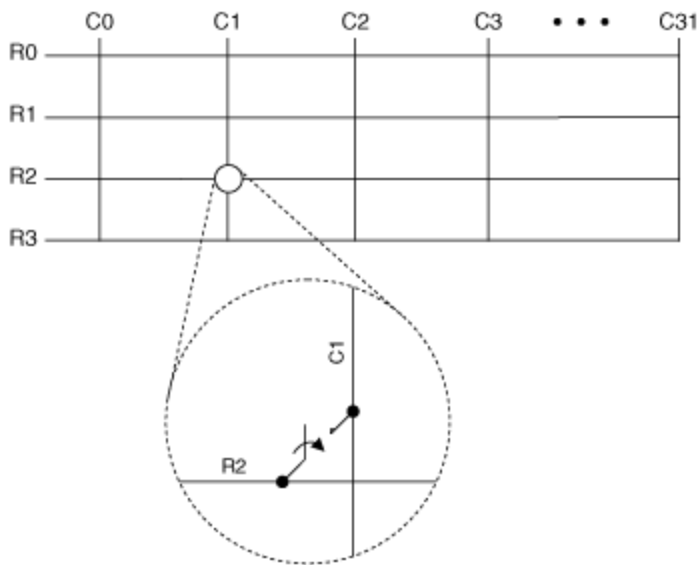
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 1-Wire 4×32 Matrix Topology

Use the NI TB-2631/2631B terminal block with the NI PXI-2530/2530B as a 1-wire 4×32 matrix.

The following figure represents the NI PXI-2530/2530B in the 1-wire 4×32 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2631 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2631B terminal mapping.

Related concepts:

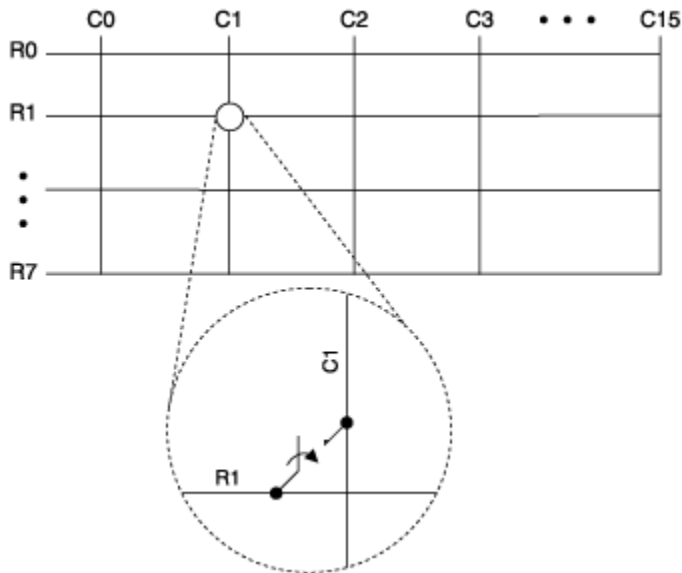
- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 1-Wire 8×16 Matrix Topology

Use the NI TB-2632/2632B terminal block with the NI PXI-2530/2530B as a 1-wire 8×16

matrix.

The following figure represents the NI PXI-2530/2530B in the 1-wire 8×16 matrix topology.



Making a Connection

Both the scanning command, `r1->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r1` and `c1`, result in the following connection:

signal connected to R1 is routed to C1

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2632 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2632B terminal mapping.

Related concepts:

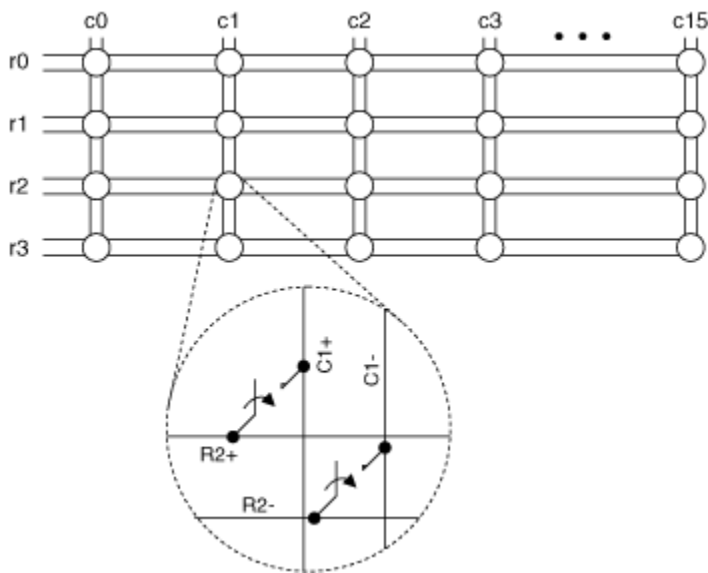
- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI-2530 Signal Connections](#)

- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 2-Wire 4×16 Matrix Topology

Use the NI TB-2631/2631B terminal block with the NI PXI-2530/2530B as a 2-wire 4×16 matrix.

The following figure represents the NI PXI-2530/2530B in the 2-wire 4×16 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connections:

signal connected to R2+ is routed to C1+

signal connected to R2- is routed to C1-

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2631 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2631B

terminal mapping.

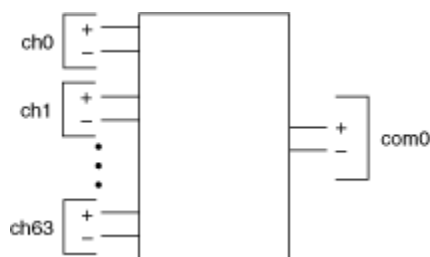
Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 2-Wire 64×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 2-wire 64×1 multiplexer. In this topology, all positive leads (CH0+ through CH63+) route to COM0+, and all negative leads (CH0– through CH63–) route to COM0–. The pair COM0+ and COM0– is addressed collectively as com0 in software.

The following figure represents the NI PXI-2530/2530B in the 2-wire 64×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2+ is routed to COM0+

signal connected to CH2– is routed to COM0–

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector

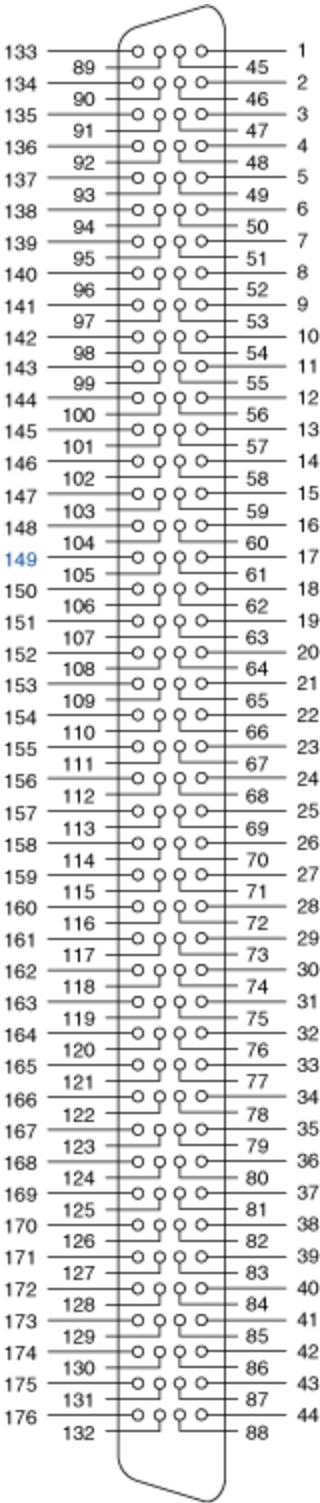
pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530 1-Wire 4x32 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530 in the 1-wire 4x32 matrix topology.



Software Name	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2631Terminal Name	
r0	141	ROW 0

Software Name	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2631Terminal Name	
r1	114	ROW 2
r2	9	ROW 4
r3	70	ROW 6
c0	1, 62, 106, 133	COLUMN 0
c1	45, 19, 151, 89	COLUMN 1
c2	2, 63, 107, 134	COLUMN 2
c3	46, 20, 152, 90	COLUMN 3
c4	3, 64, 108, 135	COLUMN 4
c5	47, 21, 153, 91	COLUMN 5
c6	4, 65, 109, 136	COLUMN 6
c7	48, 22, 154, 92	COLUMN 7
c8	5, 66, 110, 137	COLUMN 8
c9	49, 23, 155, 93	COLUMN 9
c10	6, 67, 111, 138	COLUMN 10
c11	50, 24, 156, 94	COLUMN 11
c12	7, 68, 112, 139	COLUMN 12
c13	51, 25, 157, 95	COLUMN 13
c14	8, 69, 113, 140	COLUMN 14
c15	52, 26, 158, 96	COLUMN 15
c16	10, 71, 115, 142	COLUMN 16
c17	54, 28, 160, 98	COLUMN 17
c18	11, 72, 116, 143	COLUMN 18
c19	55, 29, 161, 99	COLUMN 19
c20	12, 73, 117, 144	COLUMN 20
c21	56, 30, 162, 100	COLUMN 21
c22	13, 74, 118, 145	COLUMN 22

Software Name	Hardware Name	
NI PXI-2530 Connector Pin Number	NI TB-2631 Terminal Name	
c23	57, 31, 163, 101	COLUMN 23
c24	14, 75, 119, 146	COLUMN 24
c25	58, 32, 164, 102	COLUMN 25
c26	15, 76, 120, 147	COLUMN 26
c27	59, 33, 165, 103	COLUMN 27
c28	16, 77, 121, 148	COLUMN 28
c29	60, 34, 166, 104	COLUMN 29
c30	17, 78, 122, 149	COLUMN 30
c31	61, 35, 167, 105	COLUMN 31

Additional Pin References

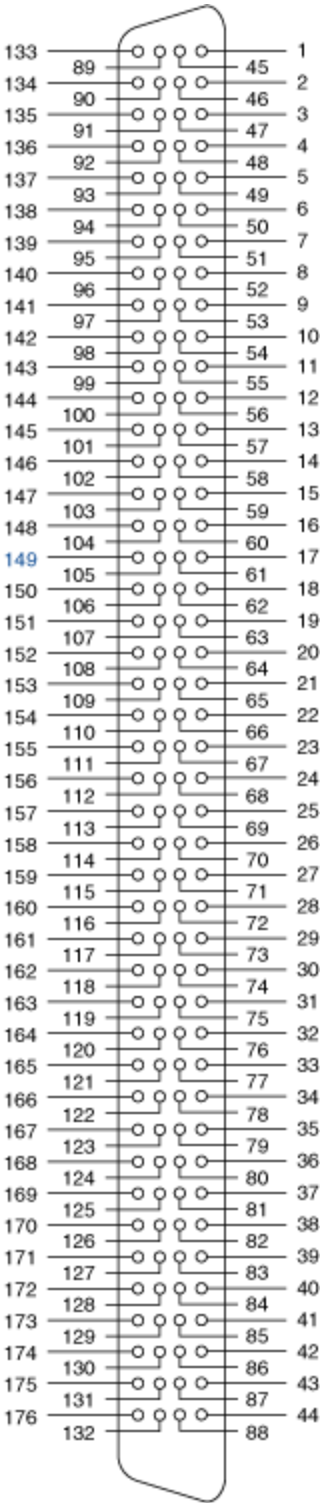
NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530 1-Wire 8x16 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530 in the 1-wire 8x16 matrix topology.



Software Name	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2632Terminal Name	
r0	141	ROW 0

Software Name	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2632Terminal Name	
r1	97	ROW 1
r2	114	ROW 2
r3	159	ROW 3
r4	9	ROW 4
r5	53	ROW 5
r6	70	ROW 6
r7	27	ROW 7
c0	1, 62, 106, 133, 10, 71, 115, 142	COLUMN 0
c1	45, 19, 151, 89, 54, 28, 160, 98	COLUMN 1
c2	2, 63, 107, 134, 11, 72, 116, 143	COLUMN 2
c3	46, 20, 152, 90, 55, 29, 161, 99	COLUMN 3
c4	3, 64, 108, 135, 12, 73, 117, 144	COLUMN 4
c5	47, 21, 153, 91, 56, 30, 162, 100	COLUMN 5
c6	4, 65, 109, 136, 13, 74, 118, 145	COLUMN 6
c7	48, 22, 154, 92, 57, 31, 163, 101	COLUMN 7
c8	5, 66, 110, 137, 14, 75, 119, 146	COLUMN 8
c9	49, 23, 155, 93, 58, 32, 164, 102	COLUMN 9
c10	6, 67, 111, 138, 15, 76, 120, 147	COLUMN 10
c11	50, 24, 156, 94, 59, 33, 165, 103	COLUMN 11
c12	7, 68, 112, 139, 16, 77, 121, 148	COLUMN 12
c13	51, 25, 157, 95, 60, 34, 166, 104	COLUMN 13
c14	8, 69, 113, 140, 17, 78, 122, 149	COLUMN 14
c15	52, 26, 158, 96, 61, 35, 167, 105	COLUMN 15

Additional Pin References

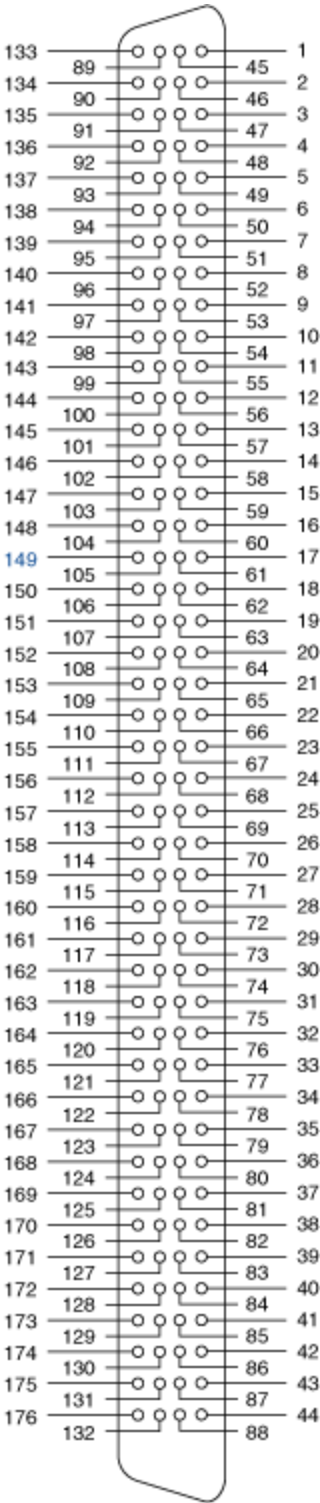
NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530 2-Wire 4x16 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530 in the 2-wire 4x16 matrix topology.



Software Name	Polarity	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2631Terminal Name		
r0	+	141	ROW 0

Software Name	Polarity	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2631Terminal Name		
–	97	ROW 1	
r1	+	114	ROW 2
–	159	ROW 3	
r2	+	9	ROW 4
–	53	ROW 5	
r3	+	70	ROW 6
–	27	ROW 7	
c0	+	1, 62, 106, 133	COLUMN 0
–	45, 19, 151, 89	COLUMN 16	
c1	+	2, 63, 107, 134	COLUMN 1
–	46, 20, 152, 90	COLUMN 17	
c2	+	3, 64, 108, 135	COLUMN 2
–	47, 21, 153, 91	COLUMN 18	
c3	+	4, 65, 109, 136	COLUMN 3
–	48, 22, 154, 92	COLUMN 19	
c4	+	5, 66, 110, 137	COLUMN 4
–	49, 23, 155, 93	COLUMN 20	
c5	+	6, 67, 111, 138	COLUMN 5
–	50, 24, 156, 94	COLUMN 21	
c6	+	7, 68, 112, 139	COLUMN 6
–	51, 25, 157, 95	COLUMN 22	
c7	+	8, 69, 113, 140	COLUMN 7
–	52, 26, 158, 96	COLUMN 23	
c8	+	10, 71, 115, 142	COLUMN 8
–	54, 28, 160, 98	COLUMN 24	
c9	+	11, 72, 116, 143	COLUMN 9

Software Name	Polarity	Hardware Name	
NI PXI-2530 Connector Pin Number	NI TB-2631 Terminal Name		
–	55, 29, 161, 99	COLUMN 25	
c10	+	12, 73, 117, 144	COLUMN 10
–	56, 30, 162, 100	COLUMN 26	
c11	+	13, 74, 118, 145	COLUMN 11
–	57, 31, 163, 101	COLUMN 27	
c12	+	14, 75, 119, 146	COLUMN 12
–	58, 32, 164, 102	COLUMN 28	
c13	+	15, 76, 120, 147	COLUMN 13
–	59, 33, 165, 103	COLUMN 29	
c14	+	16, 77, 121, 148	COLUMN 14
–	60, 34, 166, 104	COLUMN 30	
c15	+	17, 78, 122, 149	COLUMN 15
–	61, 35, 167, 105	COLUMN 31	

Additional Pin References

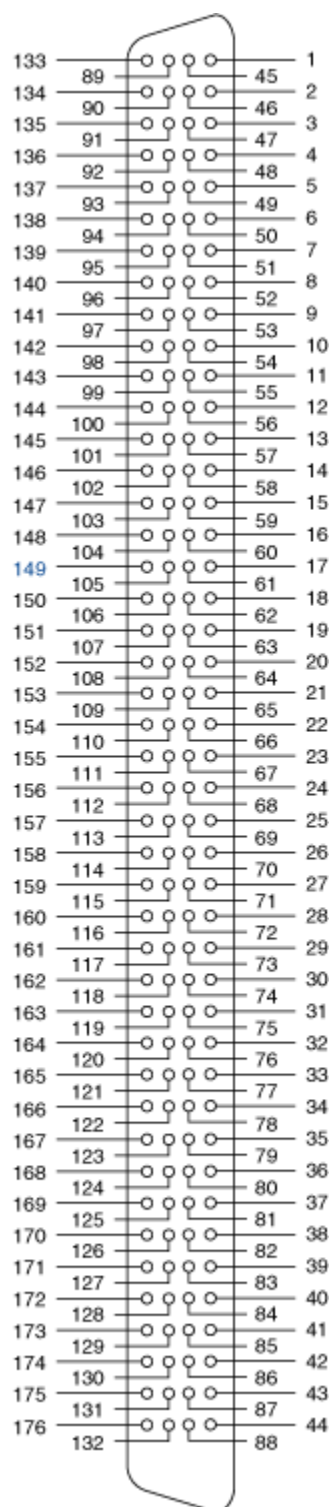
NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530 1-Wire Multiplexer and Independent Topologies

The following figure and table identify the pins for the NI PXI-2530 in the 1-wire multiplexer and independent topologies.



Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name
com0	com0	com0	com0	com0	141	Bank 0, Pin 18
——	——	——	com1	com1	97	Bank 1, Pin 18
——	——	com2	com2	com2	114	Bank 2, Pin 18
——	——	——	com3	com3	159	Bank 3, Pin 18
——	com4	com4	com4	com4	9	Bank 4, Pin 18
——	——	——	com5	com5	53	Bank 5, Pin 18
——	——	com6	com6	com6	70	Bank 6, Pin 18
——	——	——	com7	com7	27	Bank 7, Pin 18
——	——	——	——	1wref0	150	Bank 0-1, Pin 17
——	——	——	——	1wref1	123	Bank 2-3, Pin 17
——	——	——	——	1wref2	18	Bank 4-5, Pin 17
——	——	——	——	1wref3	79	Bank 6-7 Pin 17
ch0					133	Bank 0, Pin 1
ch1					89	Bank 0, Pin 2
ch2					134	Bank 0, Pin 3
ch3					90	Bank 0, Pin 4
ch4					135	Bank 0, Pin 5
ch5					91	Bank 0, Pin 6
ch6					136	Bank 0, Pin 7
ch7					92	Bank 0, Pin 8
ch8					137	Bank 0, Pin 9
ch9					93	Bank 0, Pin 10
ch10					138	Bank 0, Pin 11

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name
ch11					94	Bank 0, Pin 12
ch12					139	Bank 0, Pin 13
ch13					95	Bank 0, Pin 14
ch14					140	Bank 0, Pin 15
ch15					96	Bank 0, Pin 16
ch16					142	Bank 1, Pin 1
ch17					98	Bank 1, Pin 2
ch18					143	Bank 1, Pin 3
ch19					99	Bank 1, Pin 4
ch20					144	Bank 1, Pin 5
ch21					100	Bank 1, Pin 6
ch22					145	Bank 1, Pin 7
ch23					101	Bank 1, Pin 8
ch24					146	Bank 1, Pin 9
ch25					102	Bank 1, Pin 10
ch26					147	Bank 1, Pin 11
ch27					103	Bank 1, Pin 12
ch28					148	Bank 1, Pin 13
ch29					104	Bank 1, Pin 14
ch30					149	Bank 1, Pin 15
ch31					105	Bank 1, Pin 16
ch32					106	Bank 2, Pin 1
ch33					151	Bank 2, Pin 2
ch34					107	Bank 2, Pin 3

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name
ch35					152	Bank 2, Pin 4
ch36					108	Bank 2, Pin 5
ch37					153	Bank 2, Pin 6
ch38					109	Bank 2, Pin 7
ch39					154	Bank 2, Pin 8
ch40					110	Bank 2, Pin 9
ch41					155	Bank 2, Pin 10
ch42					111	Bank 2, Pin 11
ch43					156	Bank 2, Pin 12
ch44					112	Bank 2, Pin 13
ch45					157	Bank 2, Pin 14
ch46					113	Bank 2, Pin 15
ch47					158	Bank 2, Pin 16
ch48					115	Bank 3, Pin 1
ch49					160	Bank 3, Pin 2
ch50					116	Bank 3, Pin 3
ch51					161	Bank 3, Pin 4
ch52					117	Bank 3, Pin 5
ch53					162	Bank 3, Pin 6
ch54					118	Bank 3, Pin 7
ch55					163	Bank 3, Pin 8
ch56					119	Bank 3, Pin 9
ch57					164	Bank 3, Pin 10
ch58					120	Bank 3, Pin 11

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name
ch59					165	Bank 3, Pin 12
ch60					121	Bank 3, Pin 13
ch61					166	Bank 3, Pin 14
ch62					122	Bank 3, Pin 15
ch63					167	Bank 3, Pin 16
ch64					1	Bank 4, Pin 1
ch65					45	Bank 4, Pin 2
ch66					2	Bank 4, Pin 3
ch67					46	Bank 4, Pin 4
ch68					3	Bank 4, Pin 5
ch69					47	Bank 4, Pin 6
ch70					4	Bank 4, Pin 7
ch71					48	Bank 4, Pin 8
ch72					5	Bank 4, Pin 9
ch73					49	Bank 4, Pin 10
ch74					6	Bank 4, Pin 11
ch75					50	Bank 4, Pin 12
ch76					7	Bank 4, Pin 13
ch77					51	Bank 4, Pin 14
ch78					8	Bank 4, Pin 15
ch79					52	Bank 4, Pin 16
ch80					10	Bank 5, Pin 1
ch81					54	Bank 5, Pin 2
ch82					11	Bank 5, Pin 3

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name
ch83					55	Bank 5, Pin 4
ch84					12	Bank 5, Pin 5
ch85					56	Bank 5, Pin 6
ch86					13	Bank 5, Pin 7
ch87					57	Bank 5, Pin 8
ch88					14	Bank 5, Pin 9
ch89					58	Bank 5, Pin 10
ch90					15	Bank 5, Pin 11
ch91					59	Bank 5, Pin 12
ch92					16	Bank 5, Pin 13
ch93					60	Bank 5, Pin 14
ch94					17	Bank 5, Pin 15
ch95					61	Bank 5, Pin 16
ch96					62	Bank 6, Pin 1
ch97					19	Bank 6, Pin 2
ch98					63	Bank 6, Pin 3
ch99					20	Bank 6, Pin 4
ch100					64	Bank 6, Pin 5
ch101					21	Bank 6, Pin 6
ch102					65	Bank 6, Pin 7
ch103					22	Bank 6, Pin 8
ch104					66	Bank 6, Pin 9
ch105					23	Bank 6, Pin 10
ch106					67	Bank 6, Pin 11

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name
ch107					24	Bank 6, Pin 12
ch108					68	Bank 6, Pin 13
ch109					25	Bank 6, Pin 14
ch110					69	Bank 6, Pin 15
ch111					26	Bank 6, Pin 16
ch112					71	Bank 7, Pin 1
ch113					28	Bank 7, Pin 2
ch114					72	Bank 7, Pin 3
ch115					29	Bank 7, Pin 4
ch116					73	Bank 7, Pin 5
ch117					30	Bank 7, Pin 6
ch118					74	Bank 7, Pin 7
ch119					31	Bank 7, Pin 8
ch120					75	Bank 7, Pin 9
ch121					32	Bank 7, Pin 10
ch122					76	Bank 7, Pin 11
ch123					33	Bank 7, Pin 12
ch124					77	Bank 7, Pin 13
ch125					34	Bank 7, Pin 14
ch126					78	Bank 7, Pin 15
ch127					35	Bank 7, Pin 16

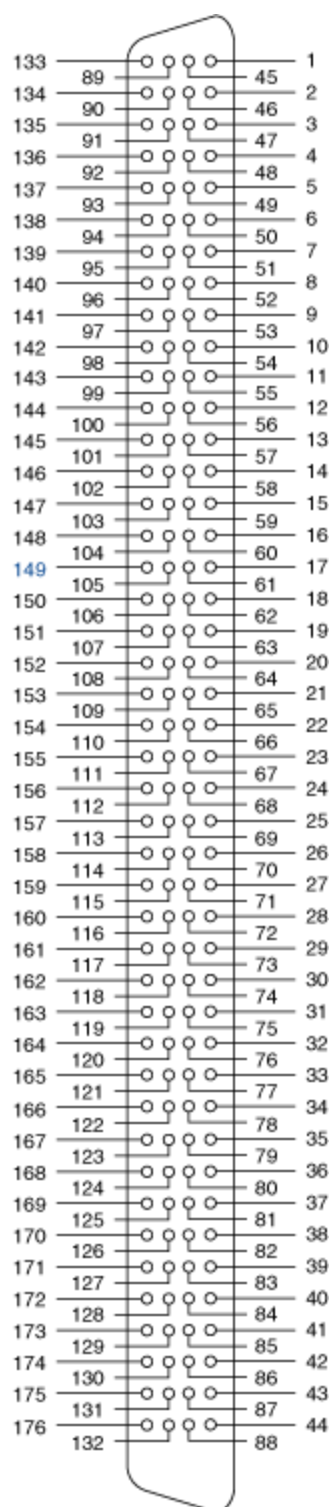
Additional Pin References

NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED

 **Caution** Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530 2-Wire Multiplexer Topologies

The following figure and table identify the pins for the NI PXI-2530 in the 2-wire multiplexer topologies.



Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
com0	com0	com0	+	141	Bank 0, Pin 18
–	97	Bank 1, Pin 18			
—	—	com1	+	114	Bank 2, Pin 18
—	—	–	159	Bank 3, Pin 18	
—	com1	com2	+	9	Bank 4, Pin 18
—	–	53	Bank 5, Pin 18		
—	—	com3	+	70	Bank 6, Pin 18
—	—	–	27	Bank 7, Pin 18	
—	—	—	+	150	Bank 0-1, Pin 17
—	—	—	–	123	Bank 2-3, Pin 17
—	—	—	+	18	Bank 4-5, Pin 17
—	—	—	–	79	Bank 6-7, Pin 17
ch0			+	133	Bank 0, Pin 1
–	142	Bank 1, Pin 1			
ch1			+	89	Bank 0, Pin 2
–	98	Bank 1, Pin 2			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
ch2			+	134	Bank 0, Pin 3
–	143	Bank 1, Pin 3			
ch3			+	90	Bank 0, Pin 4
–	99	Bank 1, Pin 4			
ch4			+	135	Bank 0, Pin 5
–	144	Bank 1, Pin 5			
ch5			+	91	Bank 0, Pin 6
–	100	Bank 1, Pin 6			
ch6			+	136	Bank 0, Pin 7
–	145	Bank 1, Pin 7			
ch7			+	92	Bank 0, Pin 8
–	101	Bank 1, Pin 8			
ch8			+	137	Bank 0, Pin 9
–	146	Bank 1, Pin 9			
ch9			+	93	Bank 0, Pin 10

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
–	102	Bank 1, Pin 10			
ch10			+	138	Bank 0, Pin 11
–	147	Bank 1, Pin 11			
ch11			+	94	Bank 0, Pin 12
–	103	Bank 1, Pin 12			
ch12			+	139	Bank 0, Pin 13
–	148	Bank 1, Pin 13			
ch13			+	95	Bank 0, Pin 14
–	104	Bank 1, Pin 14			
ch14			+	140	Bank 0, Pin 15
–	149	Bank 1, Pin 15			
ch15			+	96	Bank 0, Pin 16
–	105	Bank 1, Pin 16			
ch16			+	106	Bank 2, Pin 1
–	115	Bank 3, Pin 1			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
ch17			+	151	Bank 2, Pin 2
–	160	Bank 3, Pin 2			
ch18			+	107	Bank 2, Pin 3
–	116	Bank 3, Pin 3			
ch19			+	152	Bank 2, Pin 4
–	161	Bank 3, Pin 4			
ch20			+	108	Bank 2, Pin 5
–	117	Bank 3, Pin 5			
ch21			+	153	Bank 2, Pin 6
–	162	Bank 3, Pin 6			
ch22			+	109	Bank 2, Pin 7
–	118	Bank 3, Pin 7			
ch23			+	154	Bank 2, Pin 8
–	163	Bank 3, Pin 8			
ch24			+	110	Bank 2, Pin 9

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
–	119	Bank 3, Pin 9			
ch25			+	155	Bank 2, Pin 10
–	164	Bank 3, Pin 10			
ch26			+	111	Bank 2, Pin 11
–	120	Bank 3, Pin 11			
ch27			+	156	Bank 2, Pin 12
–	165	Bank 3, Pin 12			
ch28			+	112	Bank 2, Pin 13
–	121	Bank 3, Pin 13			
ch29			+	157	Bank 2, Pin 14
–	166	Bank 3, Pin 14			
ch30			+	113	Bank 2, Pin 15
–	122	Bank 3, Pin 15			
ch31			+	158	Bank 2, Pin 16
–	167	Bank 3, Pin 16			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
ch32			+	1	Bank 4, Pin 1
–	10	Bank 5, Pin 1			
ch33			+	45	Bank 4, Pin 2
–	54	Bank 5, Pin 2			
ch34			+	2	Bank 4, Pin 3
–	11	Bank 5, Pin 3			
ch35			+	46	Bank 4, Pin 4
–	55	Bank 5, Pin 4			
ch36			+	3	Bank 4, Pin 5
–	12	Bank 5, Pin 5			
ch37			+	47	Bank 4, Pin 6
–	56	Bank 5, Pin 6			
ch38			+	4	Bank 4, Pin 7
–	13	Bank 5, Pin 7			
ch39			+	48	Bank 4, Pin 8

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
–	57	Bank 5, Pin 8			
ch40			+	5	Bank 4, Pin 9
–	14	Bank 5, Pin 9			
ch41			+	49	Bank 4, Pin 10
–	58	Bank 5, Pin 10			
ch42			+	6	Bank 4, Pin 11
–	15	Bank 5, Pin 11			
ch43			+	50	Bank 4, Pin 12
–	59	Bank 5, Pin 12			
ch44			+	7	Bank 4, Pin 13
–	16	Bank 5, Pin 13			
ch45			+	51	Bank 4, Pin 14
–	60	Bank 5, Pin 14			
ch46			+	8	Bank 4, Pin 15
–	17	Bank 5, Pin 15			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
ch47			+	52	Bank 4, Pin 16
–	61	Bank 5, Pin 16			
ch48			+	62	Bank 6, Pin 1
–	71	Bank 7, Pin 1			
ch49			+	19	Bank 6, Pin 2
–	28	Bank 7, Pin 2			
ch50			+	63	Bank 6, Pin 3
–	72	Bank 7, Pin 3			
ch51			+	20	Bank 6, Pin 4
–	29	Bank 7, Pin 4			
ch52			+	64	Bank 6, Pin 5
–	73	Bank 7, Pin 5			
ch53			+	21	Bank 6, Pin 6
–	30	Bank 7, Pin 6			
ch54			+	65	Bank 6, Pin 7

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
–	74	Bank 7, Pin 7			
ch55			+	22	Bank 6, Pin 8
–	31	Bank 7, Pin 8			
ch56			+	66	Bank 6, Pin 9
–	75	Bank 7, Pin 9			
ch57			+	23	Bank 6, Pin 10
–	32	Bank 7, Pin 10			
ch58			+	67	Bank 6, Pin 11
–	76	Bank 7, Pin 11			
ch59			+	24	Bank 6, Pin 12
–	33	Bank 7, Pin 12			
ch60			+	68	Bank 6, Pin 13
–	77	Bank 7, Pin 13			
ch61			+	25	Bank 6, Pin 14
–	34	Bank 7, Pin 14			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
ch62			+	69	Bank 6, Pin 15
–	78	Bank 7, Pin 15			
ch63			+	26	Bank 6, Pin 16
–	35	Bank 7, Pin 16			

Additional Pin References

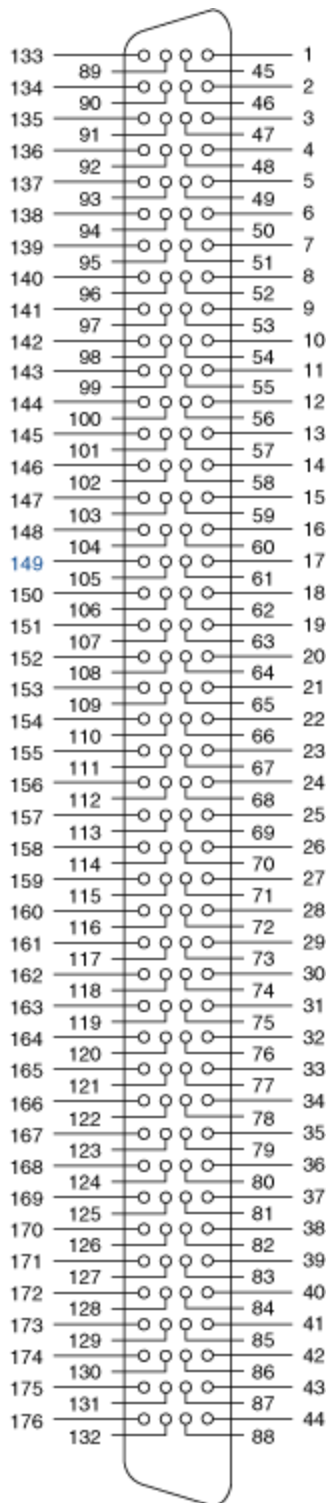
NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530 4-Wire Multiplexer Topologies

The following figure and table identify the pins for the NI PXI-2530 in the 4-wire multiplexer topologies.



Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name	
com0	com0	A+	141	Bank 0, Pin 18
A-	97	Bank 1, Pin 18		
B+	9	Bank 4, Pin 18		
B-	53	Bank 5, Pin 18		
——	com1	A+	114	Bank 2, Pin 18
——	A-	159	Bank 3, Pin 18	
——	B+	70	Bank 6, Pin 18	
——	B-	27	Bank 7, Pin 18	
——	——	——	150	Bank 0-1, Pin 17
——	——	——	123	Bank 2-3, Pin 17
——	——	——	18	Bank 4-5, Pin 17
——	——	——	79	Bank 6-7 Pin 17
ch0		A+	133	Bank 0, Pin 1
A-	142	Bank 1, Pin 1		
B+	1	Bank 4, Pin 1		
B-	10	Bank 5, Pin 1		
ch1		A+	89	Bank 0, Pin 2
A-	98	Bank 1, Pin 2		
B+	45	Bank 4, Pin 2		
B-	54	Bank 5, Pin 2		
ch2		A+	134	Bank 0, Pin 3
A-	143	Bank 1, Pin 3		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name	
B+	2	Bank 4, Pin 3		
B-	11	Bank 5, Pin 3		
ch3		A+	90	Bank 0, Pin 4
A-	99	Bank 1, Pin 4		
B+	46	Bank 4, Pin 4		
B-	55	Bank 5, Pin 4		
ch4		A+	135	Bank 0, Pin 5
A-	144	Bank 1, Pin 5		
B+	3	Bank 4, Pin 5		
B-	12	Bank 5, Pin 5		
ch5		A+	91	Bank 0, Pin 6
A-	100	Bank 1, Pin 6		
B+	47	Bank 4, Pin 6		
B-	56	Bank 5, Pin 6		
ch6		A+	136	Bank 0, Pin 7
A-	145	Bank 1, Pin 7		
B+	4	Bank 4, Pin 7		
B-	13	Bank 5, Pin 7		
ch7		A+	92	Bank 0, Pin 8
A-	101	Bank 1, Pin 8		
B+	48	Bank 4, Pin 8		
B-	57	Bank 5, Pin 8		
ch8		A+	137	Bank 0, Pin 9
A-	146	Bank 1, Pin 9		
B+	5	Bank 4, Pin 9		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name	
B-	14	Bank 5, Pin 9		
ch9		A+	93	Bank 0, Pin 10
A-	102	Bank 1, Pin 10		
B+	49	Bank 4, Pin 10		
B-	58	Bank 5, Pin 10		
ch10		A+	138	Bank 0, Pin 11
A-	147	Bank 1, Pin 11		
B+	6	Bank 4, Pin 11		
B-	15	Bank 5, Pin 11		
ch11		A+	94	Bank 0, Pin 12
A-	103	Bank 1, Pin 12		
B+	50	Bank 4, Pin 12		
B-	59	Bank 5, Pin 12		
ch12		A+	139	Bank 0, Pin 13
A-	148	Bank 1, Pin 13		
B+	7	Bank 4, Pin 13		
B-	16	Bank 5, Pin 13		
ch13		A+	95	Bank 0, Pin 14
A-	104	Bank 1, Pin 14		
B+	51	Bank 4, Pin 14		
B-	60	Bank 5, Pin 14		
ch14		A+	140	Bank 0, Pin 15
A-	149	Bank 1, Pin 15		
B+	8	Bank 4, Pin 15		
B-	17	Bank 5, Pin 15		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name	
ch15		A+	96	Bank 0, Pin 16
A-	105	Bank 1, Pin 16		
B+	52	Bank 4, Pin 16		
B-	61	Bank 5, Pin 16		
ch16		A+	106	Bank 2, Pin 1
A-	115	Bank 3, Pin 1		
B+	62	Bank 6, Pin 1		
B-	71	Bank 7, Pin 1		
ch17		A+	151	Bank 2, Pin 2
A-	160	Bank 3, Pin 2		
B+	19	Bank 6, Pin 2		
B-	28	Bank 7, Pin 2		
ch18		A+	107	Bank 2, Pin 3
A-	116	Bank 3, Pin 3		
B+	63	Bank 6, Pin 3		
B-	72	Bank 7, Pin 3		
ch19		A+	152	Bank 2, Pin 4
A-	161	Bank 3, Pin 4		
B+	20	Bank 6, Pin 4		
B-	29	Bank 7, Pin 4		
ch20		A+	108	Bank 2, Pin 5
A-	117	Bank 3, Pin 5		
B+	64	Bank 6, Pin 5		
B-	73	Bank 7, Pin 5		
ch21		A+	153	Bank 2, Pin 6

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530Connector Pin Number	NI TB-2630Terminal Name	
A-	162	Bank 3, Pin 6		
B+	21	Bank 6, Pin 6		
B-	30	Bank 7, Pin 6		
ch22		A+	109	Bank 2, Pin 7
A-	118	Bank 3, Pin 7		
B+	65	Bank 6, Pin 7		
B-	74	Bank 7, Pin 7		
ch23		A+	154	Bank 2, Pin 8
A-	163	Bank 3, Pin 8		
B+	22	Bank 6, Pin 8		
B-	31	Bank 7, Pin 8		
ch24		A+	110	Bank 2, Pin 9
A-	119	Bank 3, Pin 9		
B+	66	Bank 6, Pin 9		
B-	75	Bank 7, Pin 9		
ch25		A+	155	Bank 2, Pin 10
A-	164	Bank 3, Pin 10		
B+	23	Bank 6, Pin 10		
B-	32	Bank 7, Pin 10		
ch26		A+	111	Bank 2, Pin 11
A-	120	Bank 3, Pin 11		
B+	67	Bank 6, Pin 11		
B-	76	Bank 7, Pin 11		
ch27		A+	156	Bank 2, Pin 12
A-	165	Bank 3, Pin 12		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530 Connector Pin Number	NI TB-2630 Terminal Name	
B+	24	Bank 6, Pin 12		
B-	33	Bank 7, Pin 12		
ch28		A+	112	Bank 2, Pin 13
A-	121	Bank 3, Pin 13		
B+	68	Bank 6, Pin 13		
B-	77	Bank 7, Pin 13		
ch29		A+	157	Bank 2, Pin 14
A-	166	Bank 3, Pin 14		
B+	25	Bank 6, Pin 14		
B-	34	Bank 7, Pin 14		
ch30		A+	113	Bank 2, Pin 15
A-	122	Bank 3, Pin 15		
B+	69	Bank 6, Pin 15		
B-	78	Bank 7, Pin 15		
ch31		A+	158	Bank 2, Pin 16
A-	167	Bank 3, Pin 16		
B+	26	Bank 6, Pin 16		
B-	35	Bank 7, Pin 16		

Additional Pin References

NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND

NI PXI-2530 Connector Pin Number	Signal Name
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530 Relay Replacement

The NI PXI-2530 uses reed relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Meder	MS05-1A87-75DHR
Coto	9097-0006

Relay Kit	Part Number
National Instruments (10 matrix relays)	781450-10

Complete the following steps to disassemble your switch module, replace a failed relay, and reassemble your switch module.



Note The NI PXI-2530 has eight spare relays that can be used to replace broken relays. Removing these relays does not change the functionality of the module.

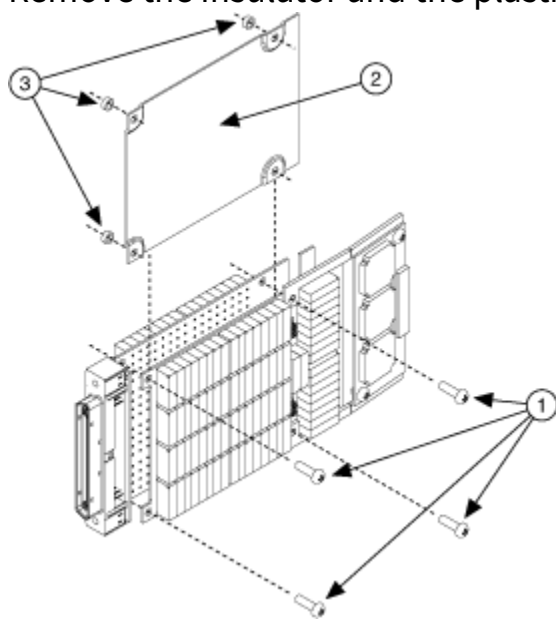
Disassemble the Switch Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



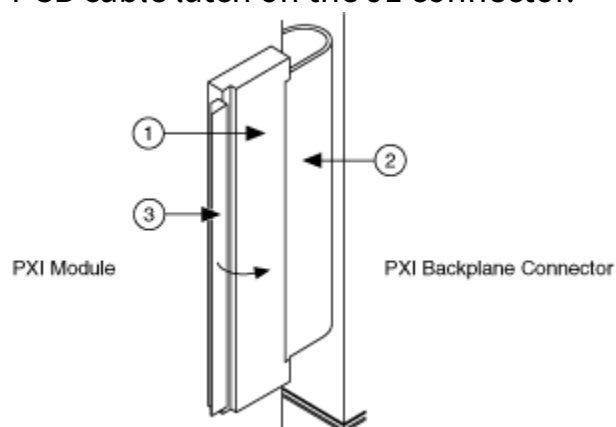
Note Properly grounding yourself prevents damage to your switch module from electrostatic discharge.

2. Remove the four screws that secure the top and bottom daughterboards to the switch assembly.
3. Remove the insulator and the plastic spacers that separate the daughterboards.



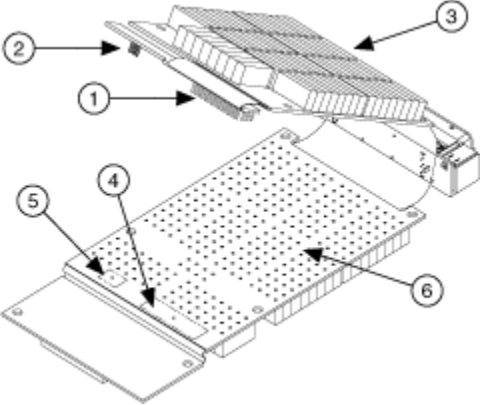
1	Screws
2	Insulator
3	Plastic Spacers

4. To access the daughterboards, disconnect the PCB interconnect cable by lifting the PCB cable latch on the J1 connector.



1	PCB Interconnect Cable
2	PCB Cable Latch
3	J1 Connector

5. Carefully disconnect connectors J7 and J1 on the bottom daughterboard from connectors J8 and J1, respectively, on the top daughterboard.



1	J7 Connector
2	J1 Connector
3	Bottom Daughterboard
4	J8 Connector
5	J1 Connector
6	Top Daughterboard

6. Refer to the following figures to locate the relay you want to replace.

Table 6. Top Daughterboard

FRONT CONNECTOR	CH127	CH111	CH80	CH64
	CH126	CH110	CH81	CH65
	CH125	CH109	CH82	CH66
	CH124	CH108	CH83	CH67
	CH123	CH107	CH84	CH68
	CH122	CH106	CH85	CH69
	CH121	CH105	CH86	CH70
	CH120	CH104	CH87	CH71
	CH119	CH103	CH88	CH72
	CH118	CH102	CH89	CH73
	CH117	CH101	CH90	CH74
	CH116	CH100	CH91	CH75
SPARE SPARE	CH115	CH99	CH92	CH76
	CH114	CH98	CH93	CH77
	CH113	CH97	CH94	CH78
	CH112	CH96	CH95	CH79
KBC01 KCOM1 KREF01 KBC13 KBC02 KBC23 KCOM3 KREF23	CH48	CH32	CH31	CH15
	CH49	CH33	CH30	CH14
	CH50	CH34	CH29	CH13
	CH51	CH35	CH28	CH12
	CH52	CH36	CH27	CH11
	CH53	CH37	CH26	CH10
	CH54	CH38	CH25	CH9
	CH55	CH39	CH24	CH8
	CH56	CH40	CH23	CH7
	CH57	CH41	CH22	CH6
	CH58	CH42	CH21	CH5
	CH59	CH43	CH20	CH4
	CH60	CH44	CH19	CH3
FRONT CONNECTOR	CH61	CH45	CH18	CH2
	CH62	CH46	CH17	CH1
	CH63	CH47	CH16	CH0
KBC04 SPARE SPARE KBC45 KCOM5 KBC46 SPARE KREF45				
KBC15 KBC57 SPARE SPARE KBC67 SPARE KREF67 KCOM7				

Table 7. Bottom Daughterboard

KBC01 KCOM1 KREF01 KBC13 KBC02 KBC23 KCOM3 KREF23	CH48	CH32	CH31	CH15
	CH49	CH33	CH30	CH14
	CH50	CH34	CH29	CH13
	CH51	CH35	CH28	CH12
	CH52	CH36	CH27	CH11
	CH53	CH37	CH26	CH10
	CH54	CH38	CH25	CH9
	CH55	CH39	CH24	CH8
	CH56	CH40	CH23	CH7
	CH57	CH41	CH22	CH6
	CH58	CH42	CH21	CH5
	CH59	CH43	CH20	CH4
FRONT CONNECTOR	CH60	CH44	CH19	CH3
	CH61	CH45	CH18	CH2
	CH62	CH46	CH17	CH1
	CH63	CH47	CH16	CH0

7. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free

solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part.

Reassemble the Switch Module

Complete the Disassemble the Switch Module steps in reverse order to reassemble your switch module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2530 Signal Connections

This book contains the pinout and signal connection information for the following types of topologies of the NI PXI-2530:

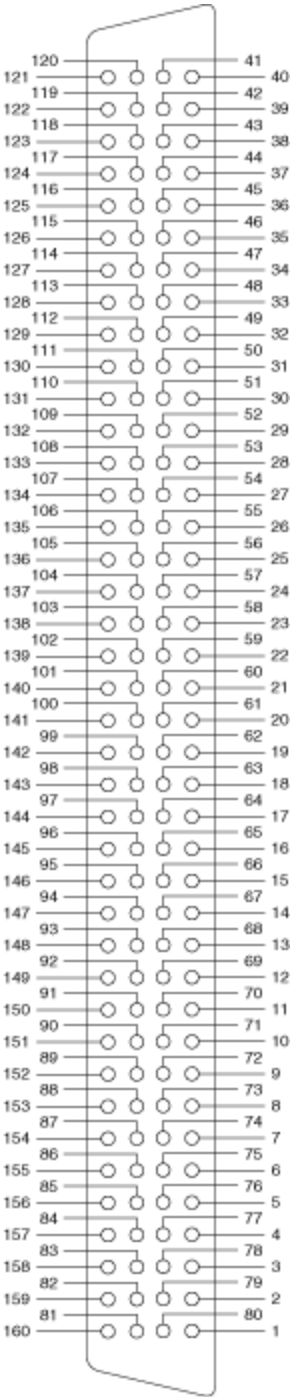
- 1-Wire Multiplexer Topologies
- 2-Wire Multiplexer Topologies
- 4-Wire Multiplexer Topologies
- 1-Wire 4x32 Matrix Topology
- 1-Wire 8x16 Matrix Topology
- 2-Wire 4x16 Matrix Topology
- Independent Topology

Related concepts:

- [NI PXI-2530 1-Wire Multiplexer and Independent Topologies](#)
- [NI PXI-2530 2-Wire Multiplexer Topologies](#)
- [NI PXI-2530 4-Wire Multiplexer Topologies](#)
- [NI PXI-2530 1-Wire 4x32 Matrix Topology](#)
- [NI PXI-2530 1-Wire 8x16 Matrix Topology](#)
- [NI PXI-2530 2-Wire 4x16 Matrix Topology](#)

NI PXI-2530B 1-Wire 4x32 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530B in the 1-wire 4x32 matrix topology.



Software Name	Hardware Name	
NI PXI-2530BConnector Pin Number	NI TB-2631BTerminal Name	
r0	51	ROW 0
r1	5	ROW 2
r2	110	ROW 4

Software Name	Hardware Name	
NI PXI-2530BConnector Pin Number	NI TB-2631BTerminal Name	
r3	156	ROW 6
c0	120, 94, 67, 41	COLUMN 0
c1	121, 149, 15, 40	COLUMN 1
c2	119, 91, 12, 42	COLUMN 2
c3	122, 150, 11, 39	COLUMN 3
c4	118, 146, 70, 43	COLUMN 4
c5	123, 100, 61, 38	COLUMN 5
c6	117, 141, 20, 44	COLUMN 6
c7	124, 99, 62, 37	COLUMN 7
c8	116, 142, 19, 45	COLUMN 8
c9	125, 98, 63, 36	COLUMN 9
c10	115, 143, 18, 46	COLUMN 10
c11	126, 97, 64, 35	COLUMN 11
c12	114, 144, 17, 47	COLUMN 12
c13	127, 96, 65, 34	COLUMN 13
c14	113, 145, 16, 48	COLUMN 14
c15	128, 95, 66, 33	COLUMN 15
c16	111, 147, 14, 50	COLUMN 16
c17	130, 93, 68, 31	COLUMN 17
c18	112, 148, 13, 49	COLUMN 18
c19	129, 92, 69, 32	COLUMN 19
c20	109, 85, 1, 52	COLUMN 20
c21	132, 81, 4, 29	COLUMN 21
c22	108, 157, 3, 53	COLUMN 22
c23	133, 90, 71, 28	COLUMN 23
c24	107, 151, 10, 54	COLUMN 24

Software Name	Hardware Name	
NI PXI-2530B Connector Pin Number	NI TB-2631B Terminal Name	
c25	134, 89, 72, 27	COLUMN 25
c26	106, 152, 9, 55	COLUMN 26
c27	135, 88, 73, 26	COLUMN 27
c28	105, 153, 8, 56	COLUMN 28
c29	136, 87, 74, 25	COLUMN 29
c30	104, 154, 7, 57	COLUMN 30
c31	137, 86, 75, 24	COLUMN 31

Additional Pin References

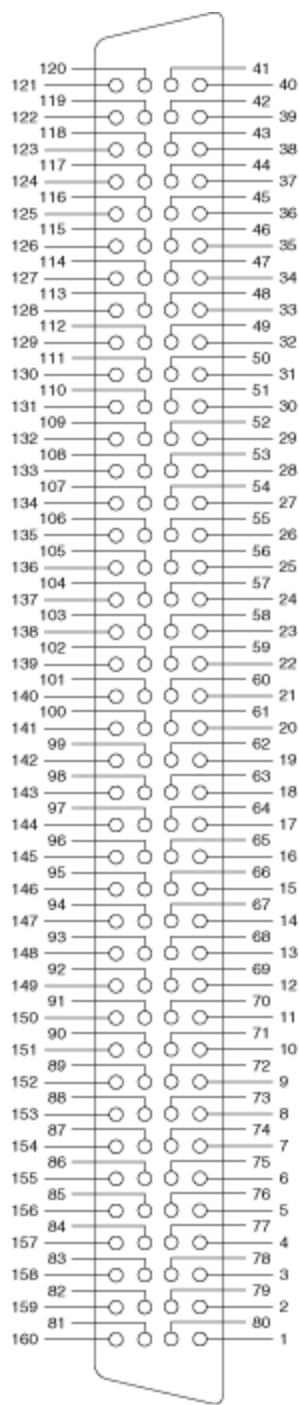
NI PXI-2530B Connector Pin Number	Signal Name
2, 21, 22, 23, 59, 60, 77, 78, 79, 80, 101, 102, 138, 140, 160	NO CONNECT
83, 158	GND
159	TRIGIN
82	TRIGOUT
139	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530B 1-Wire 8x16 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530B in the 1-wire 8x16 matrix topology.



Software Name	Hardware Name	
NI PXI-2530BConnector Pin Number	NI TB-2632BTerminal Name	
r0	51	ROW 0
r1	30	ROW 1
r2	5	ROW 2

Software Name	Hardware Name	
NI PXI-2530B Connector Pin Number	NI TB-2632B Terminal Name	
r3	76	ROW 3
r4	110	ROW 4
r5	131	ROW 5
r6	156	ROW 6
r7	84	ROW 7
c0	120, 94, 67, 41, 111, 147, 14, 50	COLUMN 0
c1	121, 149, 15, 40, 130, 93, 68, 31	COLUMN 1
c2	119, 91, 12, 42, 112, 148, 13, 49	COLUMN 2
c3	122, 150, 11, 39, 129, 92, 69, 32	COLUMN 3
c4	118, 146, 70, 43, 109, 85, 1, 52	COLUMN 4
c5	123, 100, 61, 38, 132, 81, 4, 29	COLUMN 5
c6	117, 141, 20, 44, 108, 157, 3, 53	COLUMN 6
c7	124, 99, 62, 37, 133, 90, 71, 28	COLUMN 7
c8	116, 142, 19, 45, 107, 151, 10, 54	COLUMN 8
c9	125, 98, 63, 36, 134, 89, 72, 27	COLUMN 9
c10	115, 143, 18, 46, 106, 152, 9, 55	COLUMN 10
c11	126, 97, 64, 35, 135, 88, 73, 26	COLUMN 11
c12	114, 144, 17, 47, 105, 153, 8, 56	COLUMN 12
c13	127, 96, 65, 34, 136, 87, 74, 25	COLUMN 13
c14	113, 145, 16, 48, 104, 154, 7, 57	COLUMN 14
c15	128, 95, 66, 33, 137, 86, 75, 24	COLUMN 15

Additional Pin References

NI PXI-2530B Connector Pin Number	Signal Name
2, 21, 22, 23, 59, 60, 77, 78, 79, 80, 101, 102, 138, 140, 160	NO CONNECT
83, 158	GND

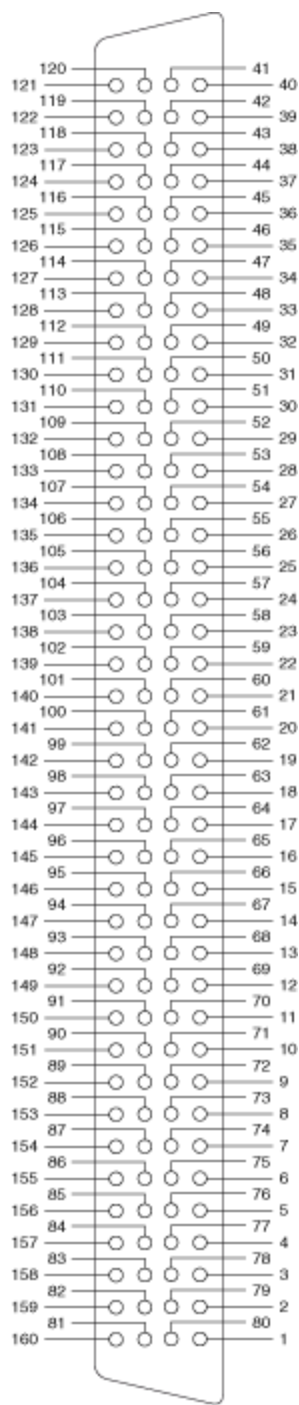
NI PXI-2530B Connector Pin Number	Signal Name
159	TRIGIN
82	TRIGOUT
139	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530B 2-Wire 4x16 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530B in the 2-wire 4x16 matrix topology.



Software Name	Polarity	Hardware Name	
NI PXI-2530BConnector Pin Number	NI TB-2631BTerminal Name		
r0	+	51	ROW 0
-	30	ROW 1	
r1	+	5	ROW 2

Software Name	Polarity	Hardware Name	
NI PXI-2530BConnector Pin Number	NI TB-2631BTerminal Name		
-	76	ROW 3	
r2	+	110	ROW 4
-	131	ROW 5	
r3	+	156	ROW 6
-	84	ROW 7	
c0	+	120, 94, 67, 41	COLUMN 0
-	121, 149, 15, 40	COLUMN 16	
c1	+	119, 91, 12, 42	COLUMN 1
-	122, 150, 11, 39	COLUMN 17	
c2	+	118, 146, 70, 43	COLUMN 2
-	123, 100, 61, 38	COLUMN 18	
c3	+	117, 141, 20, 44	COLUMN 3
-	124, 99, 62, 37	COLUMN 19	
c4	+	116, 142, 19, 45	COLUMN 4
-	125, 98, 63, 36	COLUMN 20	
c5	+	115, 143, 18, 46	COLUMN 5
-	126, 97, 64, 35	COLUMN 21	
c6	+	114, 144, 17, 47	COLUMN 6
-	127, 96, 65, 34	COLUMN 22	
c7	+	113, 145, 16, 48	COLUMN 7
-	128, 95, 66, 33	COLUMN 23	
c8	+	111, 147, 14, 50	COLUMN 8
-	130, 93, 68, 31	COLUMN 24	
c9	+	112, 148, 13, 49	COLUMN 9
-	129, 92, 69, 32	COLUMN 25	
c10	+	109, 85, 1, 52	COLUMN 10

Software Name	Polarity	Hardware Name	
NI PXI-2530B Connector Pin Number	NI TB-2631B Terminal Name		
-	132, 81, 4, 29	COLUMN 26	
c11	+	108, 157, 3, 53	COLUMN 11
-	133, 90, 71, 28	COLUMN 27	
c12	+	107, 151, 10, 54	COLUMN 12
-	134, 89, 72, 27	COLUMN 28	
c13	+	106, 152, 9, 55	COLUMN 13
-	135, 88, 73, 26	COLUMN 29	
c14	+	105, 153, 8, 56	COLUMN 14
-	136, 87, 74, 25	COLUMN 30	
c15	+	104, 154, 7, 57	COLUMN 15
-	137, 86, 75, 24	COLUMN 31	

Additional Pin References

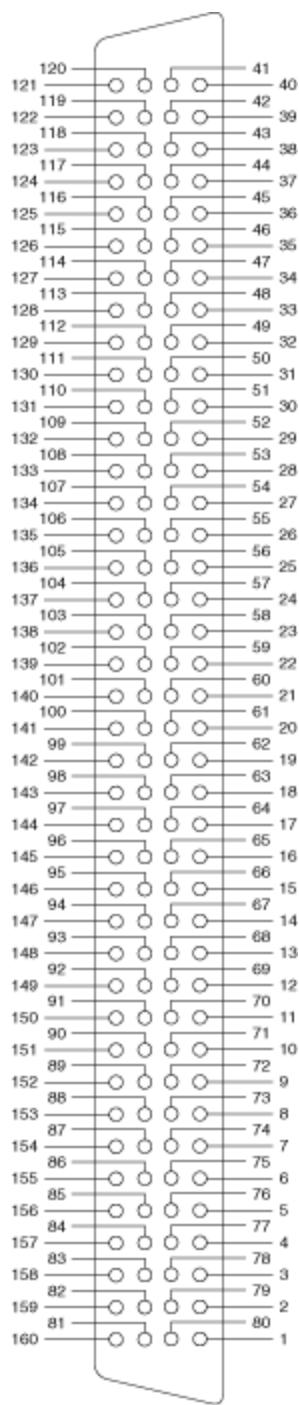
NI PXI-2530B Connector Pin Number	Signal Name
2, 21, 22, 23, 59, 60, 77, 78, 79, 80, 101, 102, 138, 140, 160	NO CONNECT
83, 158	GND
159	TRIGIN
82	TRIGOUT
139	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530B 1-Wire Multiplexer and Independent Topologies

The following figure and table identify the pins for the NI PXI-2530B in the 1-wire multiplexer and independent topologies.



Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name
com0	com0	com0	com0	com0	51	Bank 0, Pin 18

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name
—	—	—	com1	com1	30	Bank 1, Pin 18
—	—	com2	com2	com2	5	Bank 2, Pin 18
—	—	—	com3	com3	76	Bank 3, Pin 18
—	com4	com4	com4	com4	110	Bank 4, Pin 18
—	—	—	com5	com5	131	Bank 5, Pin 18
—	—	com6	com6	com6	156	Bank 6, Pin 18
—	—	—	com7	com7	84	Bank 7, Pin 18
—	—	—	—	1wref0	58	Bank 0-1, Pin 17
—	—	—	—	1wref1	6	Bank 2-3, Pin 17
—	—	—	—	1wref2	103	Bank 4-5, Pin 17
—	—	—	—	1wref3	155	Bank 6-7, Pin 17
ch0					41	Bank 0, Pin 1
ch1					40	Bank 0, Pin 2
ch2					42	Bank 0, Pin 3
ch3					39	Bank 0, Pin 4
ch4					43	Bank 0, Pin 5
ch5					38	Bank 0, Pin 6
ch6					44	Bank 0, Pin 7
ch7					37	Bank 0, Pin 8
ch8					45	Bank 0, Pin 9
ch9					36	Bank 0, Pin 10
ch10					46	Bank 0, Pin 11
ch11					35	Bank 0, Pin 12

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name
ch12					47	Bank 0, Pin 13
ch13					34	Bank 0, Pin 14
ch14					48	Bank 0, Pin 15
ch15					33	Bank 0, Pin 16
ch16					50	Bank 1, Pin 1
ch17					31	Bank 1, Pin 2
ch18					49	Bank 1, Pin 3
ch19					32	Bank 1, Pin 4
ch20					52	Bank 1, Pin 5
ch21					29	Bank 1, Pin 6
ch22					53	Bank 1, Pin 7
ch23					28	Bank 1, Pin 8
ch24					54	Bank 1, Pin 9
ch25					27	Bank 1, Pin 10
ch26					55	Bank 1, Pin 11
ch27					26	Bank 1, Pin 12
ch28					56	Bank 1, Pin 13
ch29					25	Bank 1, Pin 14
ch30					57	Bank 1, Pin 15
ch31					24	Bank 1, Pin 16
ch32					67	Bank 2, Pin 1
ch33					15	Bank 2, Pin 2
ch34					12	Bank 2, Pin 3
ch35					11	Bank 2, Pin 4

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name
ch36					70	Bank 2, Pin 5
ch37					61	Bank 2, Pin 6
ch38					20	Bank 2, Pin 7
ch39					62	Bank 2, Pin 8
ch40					19	Bank 2, Pin 9
ch41					63	Bank 2, Pin 10
ch42					18	Bank 2, Pin 11
ch43					64	Bank 2, Pin 12
ch44					17	Bank 2, Pin 13
ch45					65	Bank 2, Pin 14
ch46					16	Bank 2, Pin 15
ch47					66	Bank 2, Pin 16
ch48					14	Bank 3, Pin 1
ch49					68	Bank 3, Pin 2
ch50					13	Bank 3, Pin 3
ch51					69	Bank 3, Pin 4
ch52					1	Bank 3, Pin 5
ch53					4	Bank 3, Pin 6
ch54					3	Bank 3, Pin 7
ch55					71	Bank 3, Pin 8
ch56					10	Bank 3, Pin 9
ch57					72	Bank 3, Pin 10
ch58					9	Bank 3, Pin 11
ch59					73	Bank 3, Pin 12

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name
ch60					8	Bank 3, Pin 13
ch61					74	Bank 3, Pin 14
ch62					7	Bank 3, Pin 15
ch63					75	Bank 3, Pin 16
ch64					120	Bank 4, Pin 1
ch65					121	Bank 4, Pin 2
ch66					119	Bank 4, Pin 3
ch67					122	Bank 4, Pin 4
ch68					118	Bank 4, Pin 5
ch69					123	Bank 4, Pin 6
ch70					117	Bank 4, Pin 7
ch71					124	Bank 4, Pin 8
ch72					116	Bank 4, Pin 9
ch73					125	Bank 4, Pin 10
ch74					115	Bank 4, Pin 11
ch75					126	Bank 4, Pin 12
ch76					114	Bank 4, Pin 13
ch77					127	Bank 4, Pin 14
ch78					113	Bank 4, Pin 15
ch79					128	Bank 4, Pin 16
ch80					111	Bank 5, Pin 1
ch81					130	Bank 5, Pin 2
ch82					112	Bank 5, Pin 3
ch83					129	Bank 5, Pin 4

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name
ch84					109	Bank 5, Pin 5
ch85					132	Bank 5, Pin 6
ch86					108	Bank 5, Pin 7
ch87					133	Bank 5, Pin 8
ch88					107	Bank 5, Pin 9
ch89					134	Bank 5, Pin 10
ch90					106	Bank 5, Pin 11
ch91					135	Bank 5, Pin 12
ch92					105	Bank 5, Pin 13
ch93					136	Bank 5, Pin 14
ch94					104	Bank 5, Pin 15
ch95					137	Bank 5, Pin 16
ch96					94	Bank 6, Pin 1
ch97					149	Bank 6, Pin 2
ch98					91	Bank 6, Pin 3
ch99					150	Bank 6, Pin 4
ch100					146	Bank 6, Pin 5
ch101					100	Bank 6, Pin 6
ch102					141	Bank 6, Pin 7
ch103					99	Bank 6, Pin 8
ch104					142	Bank 6, Pin 9
ch105					98	Bank 6, Pin 10
ch106					143	Bank 6, Pin 11
ch107					97	Bank 6, Pin 12

Software Name					Hardware Name	
Single128x1	Dual64x1	Quad32x1	Octal16x1	Independent	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name
ch108					144	Bank 6, Pin 13
ch109					96	Bank 6, Pin 14
ch110					145	Bank 6, Pin 15
ch111					95	Bank 6, Pin 16
ch112					147	Bank 7, Pin 1
ch113					93	Bank 7, Pin 2
ch114					148	Bank 7, Pin 3
ch115					92	Bank 7, Pin 4
ch116					85	Bank 7, Pin 5
ch117					81	Bank 7, Pin 6
ch118					157	Bank 7, Pin 7
ch119					90	Bank 7, Pin 8
ch120					151	Bank 7, Pin 9
ch121					89	Bank 7, Pin 10
ch122					152	Bank 7, Pin 11
ch123					88	Bank 7, Pin 12
ch124					153	Bank 7, Pin 13
ch125					87	Bank 7, Pin 14
ch126					154	Bank 7, Pin 15
ch127					86	Bank 7, Pin 16

Additional Pin References

NI PXI-2530B Connector Pin Number	Signal Name
2, 21, 22, 23, 59, 60, 77, 78, 79, 80, 101, 102, 138, 140, 160	NO CONNECT

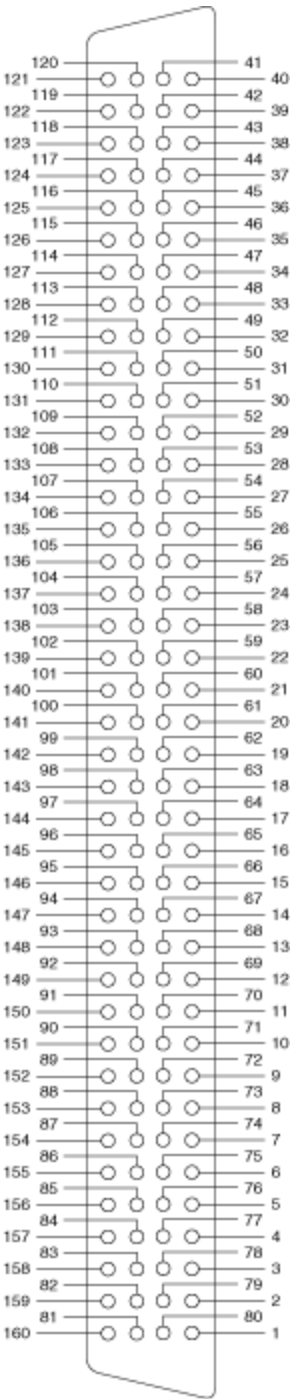
NI PXI-2530B Connector Pin Number	Signal Name
83, 158	GND
159	TRIGIN
82	TRIGOUT
139	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530B 2-Wire Multiplexer Topologies

The following figure and table identify the pins for the NI PXI-2530B in the 2-wire multiplexer topologies.



Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
com0	com0	com0	+	51	Bank 0, Pin

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
					18
-	30	Bank 1, Pin 18			
—	—	com1	+	5	Bank 2, Pin 18
—	—	-	76	Bank 3, Pin 18	
—	com1	com2	+	110	Bank 4, Pin 18
—	-	131	Bank 5, Pin 18		
—	—	com3	+	156	Bank 6, Pin 18
—	—	-	84	Bank 7, Pin 18	
—	—	—	+	58	Bank 0-1, Pin 17
—	—	—	-	6	Bank 2-3, Pin 17
—	—	—	+	103	Bank 4-5, Pin 17
—	—	—	-	155	Bank 6-7, Pin 17
ch0			+	41	Bank 0, Pin 1
-	50	Bank 1, Pin 1			
ch1			+	40	Bank 0, Pin 2
-	31	Bank 1, Pin 2			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
ch2			+	42	Bank 0, Pin 3
-	49	Bank 1, Pin 3			
ch3			+	39	Bank 0, Pin 4
-	32	Bank 1, Pin 4			
ch4			+	43	Bank 0, Pin 5
-	52	Bank 1, Pin 5			
ch5			+	38	Bank 0, Pin 6
-	29	Bank 1, Pin 6			
ch6			+	44	Bank 0, Pin 7
-	53	Bank 1, Pin 7			
ch7			+	37	Bank 0, Pin 8
-	28	Bank 1, Pin 8			
ch8			+	45	Bank 0, Pin 9
-	54	Bank 1, Pin 9			
ch9			+	36	Bank 0, Pin

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
					10
-	27	Bank 1, Pin 10			
ch10			+	46	Bank 0, Pin 11
-	55	Bank 1, Pin 11			
ch11			+	35	Bank 0, Pin 12
-	26	Bank 1, Pin 12			
ch12			+	47	Bank 0, Pin 13
-	56	Bank 1, Pin 13			
ch13			+	34	Bank 0, Pin 14
-	25	Bank 1, Pin 14			
ch14			+	48	Bank 0, Pin 15
-	57	Bank 1, Pin 15			
ch15			+	33	Bank 0, Pin 16
-	24	Bank 1, Pin 16			
ch16			+	67	Bank 2, Pin 1

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
-	14	Bank 3, Pin 1			
ch17			+	15	Bank 2, Pin 2
-	68	Bank 3, Pin 2			
ch18			+	12	Bank 2, Pin 3
-	13	Bank 3, Pin 3			
ch19			+	11	Bank 2, Pin 4
-	69	Bank 3, Pin 4			
ch20			+	70	Bank 2, Pin 5
-	1	Bank 3, Pin 5			
ch21			+	61	Bank 2, Pin 6
-	4	Bank 3, Pin 6			
ch22			+	20	Bank 2, Pin 7
-	3	Bank 3, Pin 7			
ch23			+	62	Bank 2, Pin 8
-	71	Bank 3,			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
		Pin 8			
ch24			+	19	Bank 2, Pin 9
-	10	Bank 3, Pin 9			
ch25			+	63	Bank 2, Pin 10
-	72	Bank 3, Pin 10			
ch26			+	18	Bank 2, Pin 11
-	9	Bank 3, Pin 11			
ch27			+	64	Bank 2, Pin 12
-	73	Bank 3, Pin 12			
ch28			+	17	Bank 2, Pin 13
-	8	Bank 3, Pin 13			
ch29			+	65	Bank 2, Pin 14
-	74	Bank 3, Pin 14			
ch30			+	16	Bank 2, Pin 15
-	7	Bank 3, Pin 15			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
ch31			+	66	Bank 2, Pin 16
-	75	Bank 3, Pin 16			
ch32			+	120	Bank 4, Pin 1
-	111	Bank 5, Pin 1			
ch33			+	121	Bank 4, Pin 2
-	130	Bank 5, Pin 2			
ch34			+	119	Bank 4, Pin 3
-	112	Bank 5, Pin 3			
ch35			+	122	Bank 4, Pin 4
-	129	Bank 5, Pin 4			
ch36			+	118	Bank 4, Pin 5
-	109	Bank 5, Pin 5			
ch37			+	123	Bank 4, Pin 6
-	132	Bank 5, Pin 6			
ch38			+	117	Bank 4, Pin

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
					7
-	108	Bank 5, Pin 7			
ch39			+	124	Bank 4, Pin 8
-	133	Bank 5, Pin 8			
ch40			+	116	Bank 4, Pin 9
-	107	Bank 5, Pin 9			
ch41			+	125	Bank 4, Pin 10
-	134	Bank 5, Pin 10			
ch42			+	115	Bank 4, Pin 11
-	106	Bank 5, Pin 11			
ch43			+	126	Bank 4, Pin 12
-	135	Bank 5, Pin 12			
ch44			+	114	Bank 4, Pin 13
-	105	Bank 5, Pin 13			
ch45			+	127	Bank 4, Pin 14

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
-	136	Bank 5, Pin 14			
ch46			+	113	Bank 4, Pin 15
-	104	Bank 5, Pin 15			
ch47			+	128	Bank 4, Pin 16
-	137	Bank 5, Pin 16			
ch48			+	94	Bank 6, Pin 1
-	147	Bank 7, Pin 1			
ch49			+	149	Bank 6, Pin 2
-	93	Bank 7, Pin 2			
ch50			+	91	Bank 6, Pin 3
-	148	Bank 7, Pin 3			
ch51			+	150	Bank 6, Pin 4
-	92	Bank 7, Pin 4			
ch52			+	146	Bank 6, Pin 5
-	85	Bank 7,			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
		Pin 5			
ch53			+	100	Bank 6, Pin 6
-	81	Bank 7, Pin 6			
ch54			+	141	Bank 6, Pin 7
-	157	Bank 7, Pin 7			
ch55			+	99	Bank 6, Pin 8
-	90	Bank 7, Pin 8			
ch56			+	142	Bank 6, Pin 9
-	151	Bank 7, Pin 9			
ch57			+	98	Bank 6, Pin 10
-	89	Bank 7, Pin 10			
ch58			+	143	Bank 6, Pin 11
-	152	Bank 7, Pin 11			
ch59			+	97	Bank 6, Pin 12
-	88	Bank 7, Pin 12			

Software Name			Polarity	Hardware Name	
Single 64x1	Dual 32x1	Quad 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
ch60			+	144	Bank 6, Pin 13
-	153	Bank 7, Pin 13			
ch61			+	96	Bank 6, Pin 14
-	87	Bank 7, Pin 14			
ch62			+	145	Bank 6, Pin 15
-	154	Bank 7, Pin 15			
ch63			+	95	Bank 6, Pin 16
-	86	Bank 7, Pin 16			

Additional Pin References

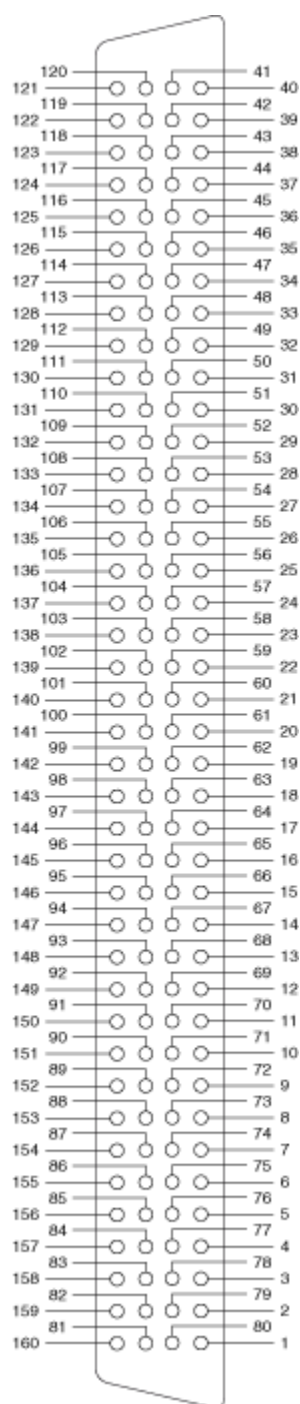
NI PXI-2530B Connector Pin Number	Signal Name
2, 21, 22, 23, 59, 60, 77, 78, 79, 80, 101, 102, 138, 140, 160	NO CONNECT
83, 158	GND
159	TRIGIN
82	TRIGOUT
139	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530B 4-Wire Multiplexer Topologies

The following figure and table identify the pins for the NI PXI-2530B in the 4-wire multiplexer topologies.



Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
com0	com0	A+	51	Bank 0, Pin 18
A-	30	Bank 1, Pin 18		
B+	110	Bank 4, Pin 18		
B-	131	Bank 5, Pin 18		
——	com1	A+	5	Bank 2, Pin 18
——	A-	76	Bank 3, Pin 18	
——	B+	156	Bank 6, Pin 18	
——	B-	84	Bank 7, Pin 18	
——	——	——	58	Bank 0-1, Pin 17
——	——	——	6	Bank 2-3, Pin 17
——	——	——	103	Bank 4-5, Pin 17
——	——	——	155	Bank 6-7, Pin 17
ch0		A+	41	Bank 0, Pin 1
A-	50	Bank 1, Pin 1		
B+	120	Bank 4, Pin 1		
B-	111	Bank 5, Pin 1		
ch1		A+	40	Bank 0, Pin 2
A-	31	Bank 1, Pin 2		
B+	121	Bank 4, Pin 2		
B-	130	Bank 5, Pin 2		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
ch2		A+	42	Bank 0, Pin 3
A-	49	Bank 1, Pin 3		
B+	119	Bank 4, Pin 3		
B-	112	Bank 5, Pin 3		
ch3		A+	39	Bank 0, Pin 4
A-	32	Bank 1, Pin 4		
B+	122	Bank 4, Pin 4		
B-	129	Bank 5, Pin 4		
ch4		A+	43	Bank 0, Pin 5
A-	52	Bank 1, Pin 5		
B+	118	Bank 4, Pin 5		
B-	109	Bank 5, Pin 5		
ch5		A+	38	Bank 0, Pin 6
A-	29	Bank 1, Pin 6		
B+	123	Bank 4, Pin 6		
B-	132	Bank 5, Pin 6		
ch6		A+	44	Bank 0, Pin 7
A-	53	Bank 1, Pin 7		
B+	117	Bank 4, Pin 7		
B-	108	Bank 5, Pin 7		
ch7		A+	37	Bank 0, Pin 8
A-	28	Bank 1, Pin 8		
B+	124	Bank 4, Pin 8		
B-	133	Bank 5, Pin 8		
ch8		A+	45	Bank 0, Pin 9

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
A-	54	Bank 1, Pin 9		
B+	116	Bank 4, Pin 9		
B-	107	Bank 5, Pin 9		
ch9		A+	36	Bank 0, Pin 10
A-	27	Bank 1, Pin 10		
B+	125	Bank 4, Pin 10		
B-	134	Bank 5, Pin 10		
ch10		A+	46	Bank 0, Pin 11
A-	55	Bank 1, Pin 11		
B+	115	Bank 4, Pin 11		
B-	106	Bank 5, Pin 11		
ch11		A+	35	Bank 0, Pin 12
A-	26	Bank 1, Pin 12		
B+	126	Bank 4, Pin 12		
B-	135	Bank 5, Pin 12		
ch12		A+	47	Bank 0, Pin 13
A-	56	Bank 1, Pin 13		
B+	114	Bank 4, Pin 13		
B-	105	Bank 5, Pin 13		
ch13		A+	34	Bank 0, Pin 14
A-	25	Bank 1, Pin 14		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
B+	127	Bank 4, Pin 14		
B-	136	Bank 5, Pin 14		
ch14		A+	48	Bank 0, Pin 15
A-	57	Bank 1, Pin 15		
B+	113	Bank 4, Pin 15		
B-	104	Bank 5, Pin 15		
ch15		A+	33	Bank 0, Pin 16
A-	24	Bank 1, Pin 16		
B+	128	Bank 4, Pin 16		
B-	137	Bank 5, Pin 16		
ch16		A+	67	Bank 2, Pin 1
A-	14	Bank 3, Pin 1		
B+	94	Bank 6, Pin 1		
B-	147	Bank 7, Pin 1		
ch17		A+	15	Bank 2, Pin 2
A-	68	Bank 3, Pin 2		
B+	149	Bank 6, Pin 2		
B-	93	Bank 7, Pin 2		
ch18		A+	12	Bank 2, Pin 3
A-	13	Bank 3, Pin 3		
B+	91	Bank 6, Pin 3		
B-	148	Bank 7, Pin 3		
ch19		A+	11	Bank 2, Pin 4

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
A-	69	Bank 3, Pin 4		
B+	150	Bank 6, Pin 4		
B-	92	Bank 7, Pin 4		
ch20		A+	70	Bank 2, Pin 5
A-	1	Bank 3, Pin 5		
B+	146	Bank 6, Pin 5		
B-	85	Bank 7, Pin 5		
ch21		A+	61	Bank 2, Pin 6
A-	4	Bank 3, Pin 6		
B+	100	Bank 6, Pin 6		
B-	81	Bank 7, Pin 6		
ch22		A+	20	Bank 2, Pin 7
A-	3	Bank 3, Pin 7		
B+	141	Bank 6, Pin 7		
B-	157	Bank 7, Pin 7		
ch23		A+	62	Bank 2, Pin 8
A-	71	Bank 3, Pin 8		
B+	99	Bank 6, Pin 8		
B-	90	Bank 7, Pin 8		
ch24		A+	19	Bank 2, Pin 9
A-	10	Bank 3, Pin 9		
B+	142	Bank 6, Pin 9		
B-	151	Bank 7, Pin 9		
ch25		A+	63	Bank 2, Pin 10

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530B Connector Pin Number	NI TB-2630B Terminal Name	
A-	72	Bank 3, Pin 10		
B+	98	Bank 6, Pin 10		
B-	89	Bank 7, Pin 10		
ch26		A+	18	Bank 2, Pin 11
A-	9	Bank 3, Pin 11		
B+	143	Bank 6, Pin 11		
B-	152	Bank 7, Pin 11		
ch27		A+	64	Bank 2, Pin 12
A-	73	Bank 3, Pin 12		
B+	97	Bank 6, Pin 12		
B-	88	Bank 7, Pin 12		
ch28		A+	17	Bank 2, Pin 13
A-	8	Bank 3, Pin 13		
B+	144	Bank 6, Pin 13		
B-	153	Bank 7, Pin 13		
ch29		A+	65	Bank 2, Pin 14
A-	74	Bank 3, Pin 14		
B+	96	Bank 6, Pin 14		
B-	87	Bank 7, Pin 14		
ch30		A+	16	Bank 2, Pin 15
A-	7	Bank 3, Pin 15		

Software Name		Polarity	Hardware Name	
Single 32x1	Dual 16x1	NI PXI-2530BConnector Pin Number	NI TB-2630BTerminal Name	
B+	145	Bank 6, Pin 15		
B-	154	Bank 7, Pin 15		
ch31		A+	66	Bank 2, Pin 16
A-	75	Bank 3, Pin 16		
B+	95	Bank 6, Pin 16		
B-	86	Bank 7, Pin 16		

Additional Pin References

NI PXI-2530B Connector Pin Number	Signal Name
2, 21, 22, 23, 59, 60, 77, 78, 79, 80, 101, 102, 138, 140, 160	NO CONNECT
83, 158	GND
159	TRIGIN
82	TRIGOUT
139	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530B Relay Replacement

The NI PXI-2530B uses reed relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Coto	9012-05-11

Complete the following steps to replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your switch module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the back of module. The following table maps the relay names to the reference designator.

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
k0	K16	k50	K126	k100	K101
k1	K15	k51	K116	k101	K108
k2	K14	k52	K115	k102	K104
k3	K13	k53	K113	k103	K107
k4	K12	k54	K114	k104	K103
k5	K11	k55	K125	k105	K106
k6	K10	k56	K124	k106	K94
k7	K9	k57	K123	k107	K105
k8	K8	k58	K122	k108	K93
k9	K7	k59	K121	k109	K95
k10	K6	k60	K120	k110	K102
k11	K5	k61	K119	k111	K96
k12	K4	k62	K118	k112	K146
k13	K3	k63	K112	k113	K144
k14	K2	k64	K25	k114	K145
k15	K1	k65	K32	k115	K143
k16	K69	k66	K24	k116	K133
k17	K68	k67	K33	k117	K131

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
k18	K71	k68	K23	k118	K132
k19	K70	k69	K31	k119	K142
k20	K67	k70	K22	k120	K141
k21	K66	k71	K30	k121	K140
k22	K65	k72	K21	k122	K139
k23	K64	k73	K29	k123	K138
k24	K63	k74	K20	k124	K137
k25	K62	k75	K28	k125	K136
k26	K56	k76	K19	k126	K135
k27	K57	k77	K27	k127	K134
k28	K60	k78	K18	kbc01	K55
k29	K61	k79	K26	kbc02	K73
k30	K58	k80	K51	kbc04	K17
k31	K59	k81	K49	kbc13	K128
k32	K82	k82	K52	kbc15	K34
k33	K81	k83	K50	kbc23	K111
k34	K83	k84	K38	kbc45	K36
k35	K85	k85	K48	kbc46	K92
k36	K84	k86	K37	kbc57	K90
k37	K89	k87	K47	kbc67	K130
k38	K88	k88	K39	kcom1	K54
k39	K87	k89	K42	kcom3	K110
k40	K86	k90	K40	kcom5	K35
k41	K74	k91	K41	kcom7	K129
k42	K75	k92	K43	kref01	K53
k43	K79	k93	K45	kref23	K109

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
k44	K78	k94	K44	kref45	K72
k45	K77	k95	K46	kref67	K91
k46	K76	k96	K100	—	—
k47	K80	k97	K99	—	—
k48	K127	k98	K98	—	—
k49	K117	k99	K97	—	—

3. Replace the relay.

The NI PXI-2530B uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies and using lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

- a. Make sure you have the following items:
 - Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
 - 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
 - Solder wick
 - Isopropyl alcohol
 - Cotton swabs
- b. Replace the relay as you would any other through-hole part.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2530B Signal Connections

This book contains the pinout and signal connection information for the following types of topologies of the NI PXI-2530B:

- 1-Wire Multiplexer Topologies
- 2-Wire Multiplexer Topologies
- 4-Wire Multiplexer Topologies
- 1-Wire 4x32 Matrix Topology
- 1-Wire 8x16 Matrix Topology
- 2-Wire 4x16 Matrix Topology
- Independent Topology

Related concepts:

- [NI PXI-2530B 1-Wire Multiplexer and Independent Topologies](#)
- [NI PXI-2530B 2-Wire Multiplexer Topologies](#)
- [NI PXI-2530B 4-Wire Multiplexer Topologies](#)
- [NI PXI-2530B 1-Wire 4x32 Matrix Topology](#)
- [NI PXI-2530B 1-Wire 8x16 Matrix Topology](#)
- [NI PXI-2530B 2-Wire 4x16 Matrix Topology](#)

NI PXI-2530/2530B Triggering

The NI PXI-2530/2530B can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2530/2530B.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on NI terminal block

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2530/2530B.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Scan Advanced Output	Software	Hardware
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG OUT on NI terminal block

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

Expanding the NI PXI-2530/2530B Matrix Using the NI TB-2632/2632B

Use the NI TB-2632/2632B and bare wire to expand the NI PXI-2530/2530B.

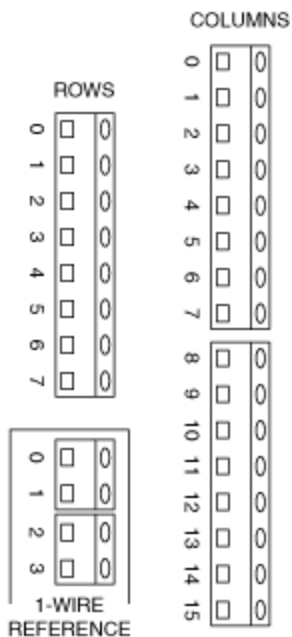
Getting Started

To expand the NI PXI-2530/2530B, you need the following items:

- Bare wire
- Two or more NI TB-2632/2632B terminal blocks
- Two or more NI PXI-2530/2530B switch modules

NI TB-2632/2632B Terminal Reference

Refer to the following figure and complete the procedures in either the Expanding the NI PXI-2530/2530B Columns or Expanding the NI PXI-2530/2530B Rows section to expand the NI PXI-2530/2530B.



Expanding the NI PXI-2530/2530B Columns

Complete the following steps to expand the columns of an NI PXI-2530/2530B using an NI TB-2632/2632B terminal block.

1. Connect one end of the bare wire to a row screw terminal on one NI TB-2632/2632B.
2. Connect the other end of the bare wire to the corresponding row screw terminal on another NI TB-2632/2632B.
3. (Optional) To expand the columns on the NI PXI-2530/2530B further, attach another bare wire to the row screw terminal you accessed in the previous step. Connect the other end of the bare wire to the corresponding row screw terminal on another NI TB-2632/2632B.
4. Repeat the previous steps for all rows.

Expanding the NI PXI-2530/2530B Rows

Complete the following steps to expand the rows of an NI PXI-2530/2530B using an NI TB-2632/2632B terminal block.

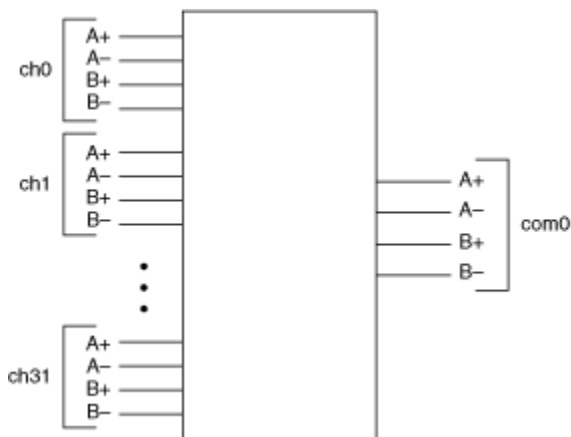
1. Connect one end of the bare wire to a column screw terminal on one NI TB-2632/2632B.
2. Connect the other end of the bare wire to the corresponding column screw terminal on another NI TB-2632/2632B.

3. (Optional) To expand the rows on the NI PXI-2530/2530B further, attach another bare wire to the column screw terminal you accessed in the previous step. Connect the other end of the bare wire to the corresponding column screw terminal on another NI TB-2632/2632B.
4. Repeat the previous steps for all columns.

NI PXI-2530/2530B 4-Wire 32×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 4-wire 32×1 multiplexer. In this topology, all positive "A" leads (CH0A+ through CH31A+) route to COM0A+. All negative "A" leads (CH0A– through CH31A–) route to COM0A–. All positive "B" leads (CH0B+ through CH31B+) route to COM0B+. All negative "B" leads (CH0B– through CH31B–) route to COM0B–. COM0A+, COM0A–, COM0B+, and COM0B– are addressed collectively as com0 in software.

The following figure represents the NI PXI-2530/2530B in the 4-wire 32×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2A+ is routed to COM0A+

signal connected to CH2A– is routed to COM0A–

signal connected to CH2B+ is routed to COM0B+

signal connected to CH2B– is routed to COM0B–

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

Related concepts:

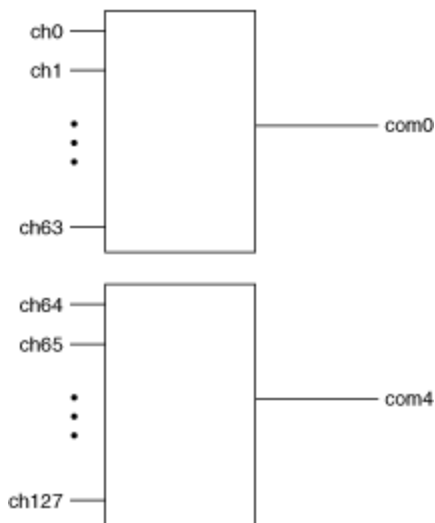
- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 1-Wire Dual 64×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 1-wire dual 64×1 multiplexer. In this topology, channel terminals CH0 through CH63 route to COM0. A reference, 1WREF0, always remains connected to COM1.

Channel terminals CH64 through CH127 route to COM4. A reference, 1WREF2, always remains connected to COM5.

The following figure represents the NI PXI-2530/2530B in the 1-wire dual 64×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

signal connected to CH2 is routed to COM0

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

Related concepts:

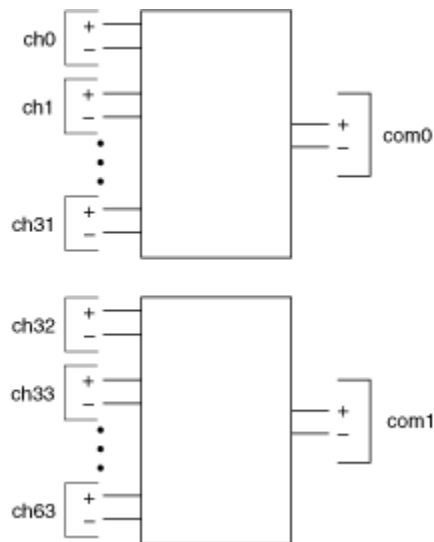
- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 2-Wire Dual 32×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 2-wire dual 32×1 multiplexer. In this topology, the positive leads of the first bank (CH0+ through

CH31+) route to COM0+, and the negative leads of the first bank (CH0– through CH31–) route to COM0–. The pair COM0+ and COM0– is addressed collectively as com0 in software. The other bank follows a similar routing scheme.

The following figure represents the NI PXI-2530/2530B in the 2-wire dual 32×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2+ is routed to COM0+

signal connected to CH2– is routed to COM0–

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

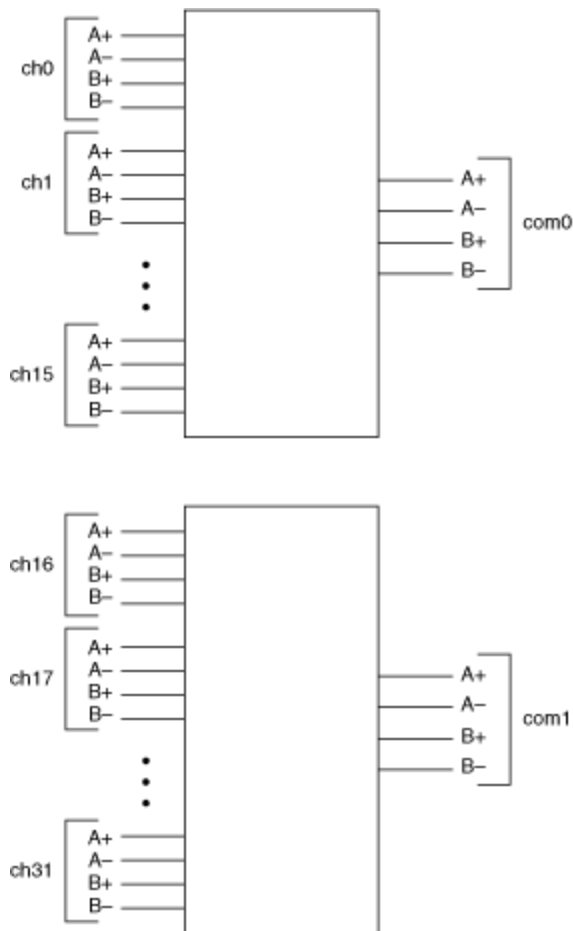
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 4-Wire Dual 16×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 4-wire dual 16×1 multiplexer. In this topology, the positive "A" leads of the first bank (CH0A+ through CH15A+) route to COM0A+. The negative "A" leads of the first bank (CH0A– through CH15B–) route to COM0A–. The positive "B" leads of the first bank (CH0B+ through CH15B+) route to COM0B+. The negative "B" leads of the first bank (CH0B– through CH15B–) route to COM0B–. COM0A+, COM0A–, COM0B+, and COM0B– are addressed collectively as com0 in software. The other bank follows a similar routing scheme.

The following figure represents the NI PXI-2530/2530B in the 4-wire dual 16×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2A+ is routed to COM0A+

signal connected to CH2A- is routed to COM0A-

signal connected to CH2B+ is routed to COM0B+

signal connected to CH2B- is routed to COM0B-

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector

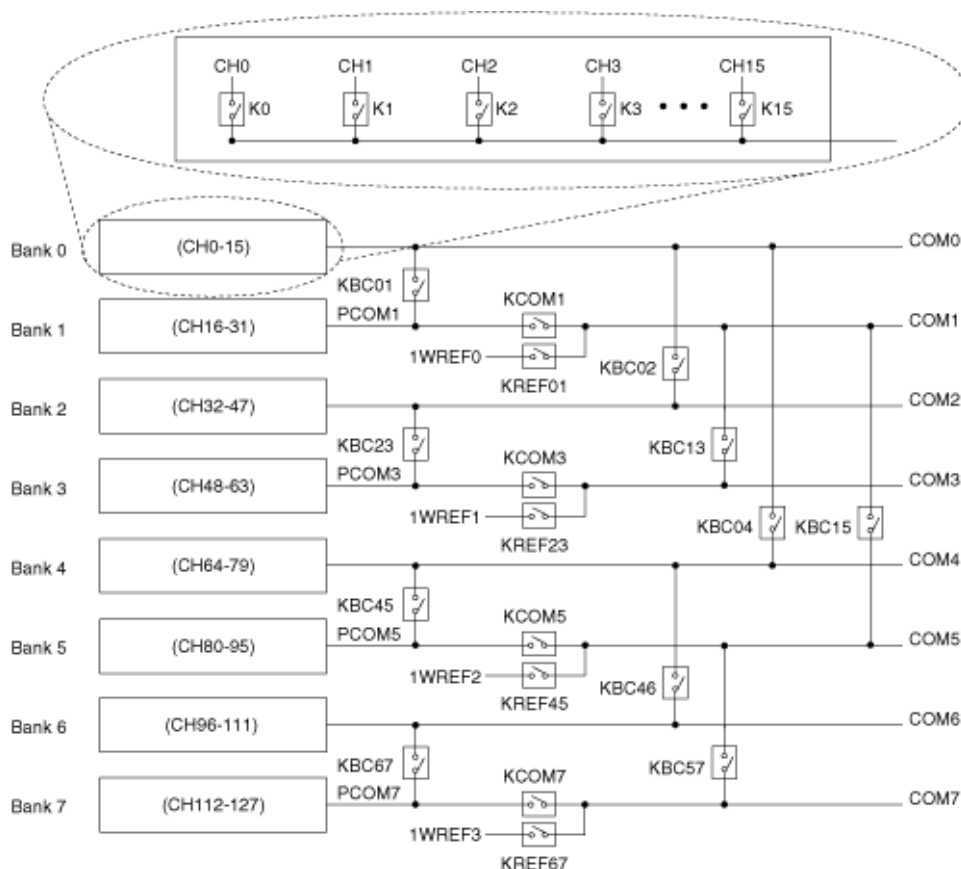
pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2530/2530B.



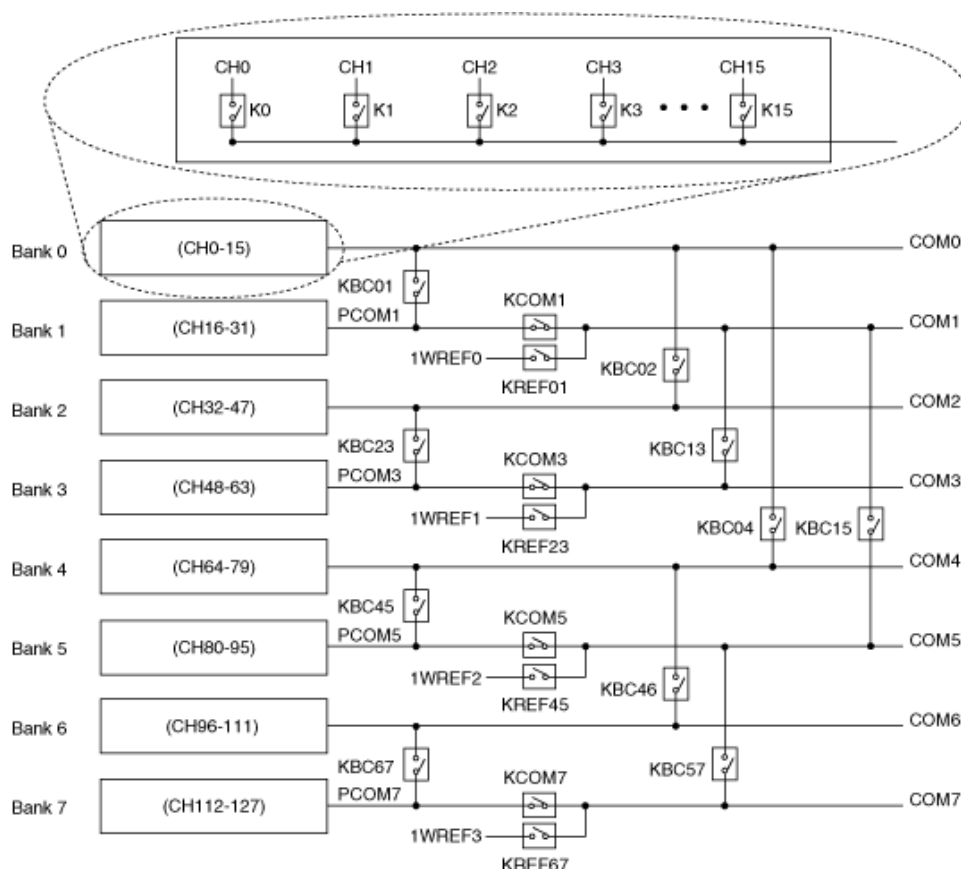
NI PXI-2530/2530B Independent Topology

When using the NI PXI-2530/2530B in the independent topology, connect your signals

using the NI TB-2630/2630B terminal block. Select this topology to utilize the full routing capabilities of the NI PXI-2530/2530B.



Note When using the independent topology, always select **NONE** in MAX for the terminal block.



Making a Connection

With the independent topology, you can let NI-SWITCH determine the path between two specified channels by setting the intermediate channels as reserved for routing and using the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function, or you can control individual relays using the `niSwitch_Relay Control VI` or the `niSwitch_RelayControl` function.

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal

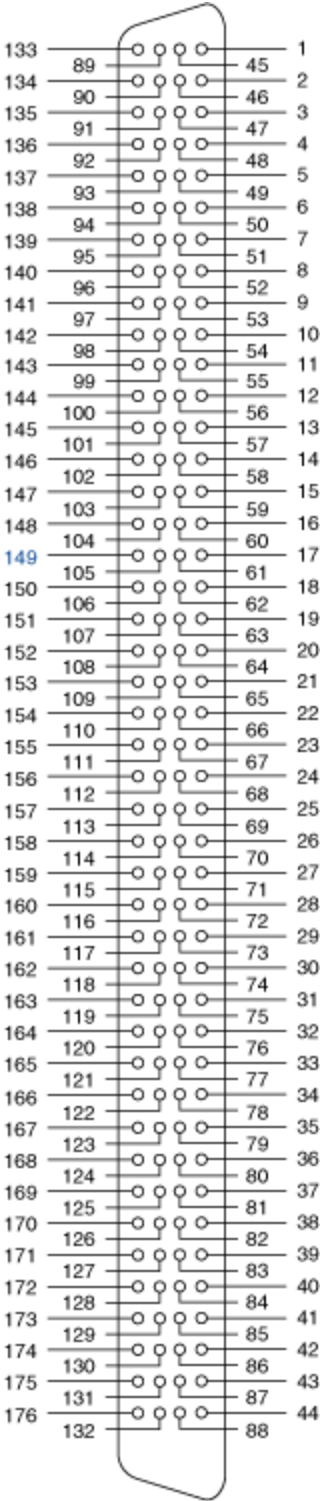
Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

Related concepts:

- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530 2-Wire 4x16 Matrix Topology

The following figure and table identify the pins for the NI PXI-2530 in the 2-wire 4x16 matrix topology.



Software Name	Polarity	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2631Terminal Name		
r0	+	141	ROW 0

Software Name	Polarity	Hardware Name	
NI PXI-2530Connector Pin Number	NI TB-2631Terminal Name		
–	97	ROW 1	
r1	+	114	ROW 2
–	159	ROW 3	
r2	+	9	ROW 4
–	53	ROW 5	
r3	+	70	ROW 6
–	27	ROW 7	
c0	+	1, 62, 106, 133	COLUMN 0
–	45, 19, 151, 89	COLUMN 16	
c1	+	2, 63, 107, 134	COLUMN 1
–	46, 20, 152, 90	COLUMN 17	
c2	+	3, 64, 108, 135	COLUMN 2
–	47, 21, 153, 91	COLUMN 18	
c3	+	4, 65, 109, 136	COLUMN 3
–	48, 22, 154, 92	COLUMN 19	
c4	+	5, 66, 110, 137	COLUMN 4
–	49, 23, 155, 93	COLUMN 20	
c5	+	6, 67, 111, 138	COLUMN 5
–	50, 24, 156, 94	COLUMN 21	
c6	+	7, 68, 112, 139	COLUMN 6
–	51, 25, 157, 95	COLUMN 22	
c7	+	8, 69, 113, 140	COLUMN 7
–	52, 26, 158, 96	COLUMN 23	
c8	+	10, 71, 115, 142	COLUMN 8
–	54, 28, 160, 98	COLUMN 24	
c9	+	11, 72, 116, 143	COLUMN 9

Software Name	Polarity	Hardware Name	
NI PXI-2530 Connector Pin Number	NI TB-2631 Terminal Name		
–	55, 29, 161, 99	COLUMN 25	
c10	+	12, 73, 117, 144	COLUMN 10
–	56, 30, 162, 100	COLUMN 26	
c11	+	13, 74, 118, 145	COLUMN 11
–	57, 31, 163, 101	COLUMN 27	
c12	+	14, 75, 119, 146	COLUMN 12
–	58, 32, 164, 102	COLUMN 28	
c13	+	15, 76, 120, 147	COLUMN 13
–	59, 33, 165, 103	COLUMN 29	
c14	+	16, 77, 121, 148	COLUMN 14
–	60, 34, 166, 104	COLUMN 30	
c15	+	17, 78, 122, 149	COLUMN 15
–	61, 35, 167, 105	COLUMN 31	

Additional Pin References

NI PXI-2530 Connector Pin Number	Signal Name
36, 80, 37, 81, 38, 82, 39, 83, 40, 84, 41, 85, 168, 124, 169, 125, 170, 126, 171, 127, 172, 128, 173, 129	NO CONNECT
42, 86, 174, 130	GND
43	TRIGIN
87	TRIGOUT
44, 88, 175, 131, 176, 132	RESERVED



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2530/2530B Matrix Expansion

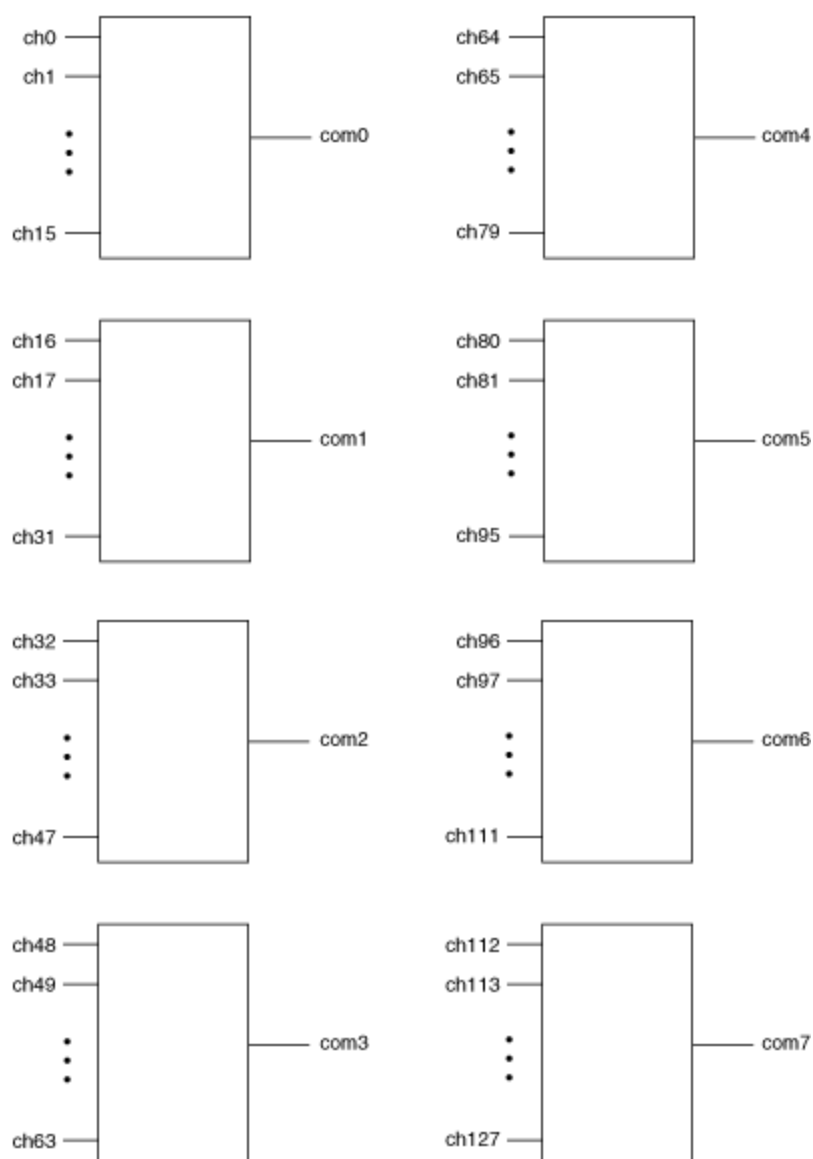
You can expand the NI PXI-2530/2530B matrix using either the NI TB-2631/2631B or NI TB-2632/2632B terminal block. The terminal block you are using determines the matrix expansion procedure you will follow. The following table lists the terminal blocks and matrix topologies available for the NI PXI-2530/2530B.

Terminal Block	Topology(Row x Column)
NI TB-2631/2631B	1-wire 4×32, 2-wire 4×16
NI TB-2632/2632B	1-wire 8×16

NI PXI-2530/2530B 1-Wire Octal 16×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 1-wire octal 16×1 multiplexer. In this topology, channel terminals CH0 through CH15 route to COM0. All other banks follow a similar routing scheme.

The following figure represents the NI PXI-2530/2530B in the 1-wire octal 16×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

signal connected to CH2 is routed to COM0

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal

Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

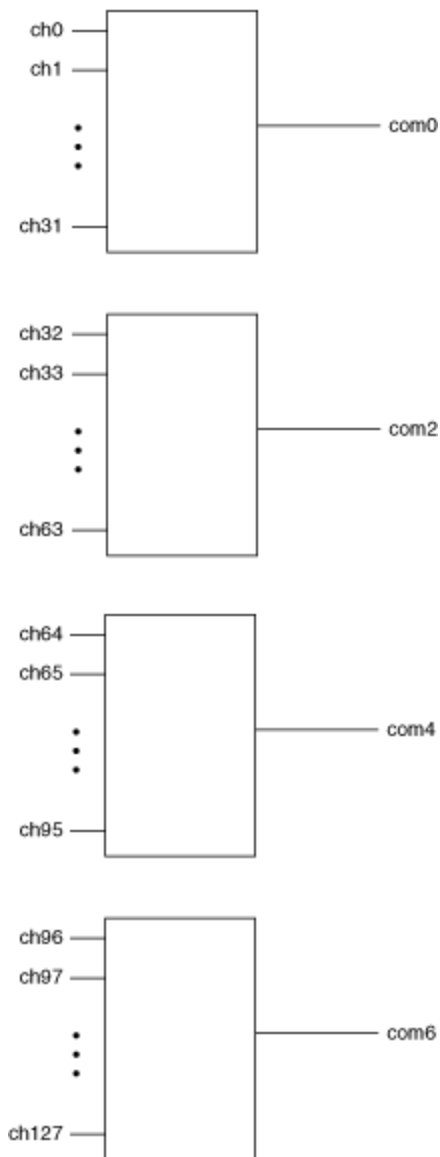
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 1-Wire Quad 32×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 1-wire quad 32×1 multiplexer. In this topology, channel terminals CH0 through CH31 route to COM0, CH32 through CH63 route to COM2, CH64 through CH95 route to COM4, and CH96 through CH127 route to COM6. A reference, 1WREF0, always remains connected to COM1.

The following figure represents the NI PXI-2530/2530B in the 1-wire quad 32×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

signal connected to CH2 is routed to COM0

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal

Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

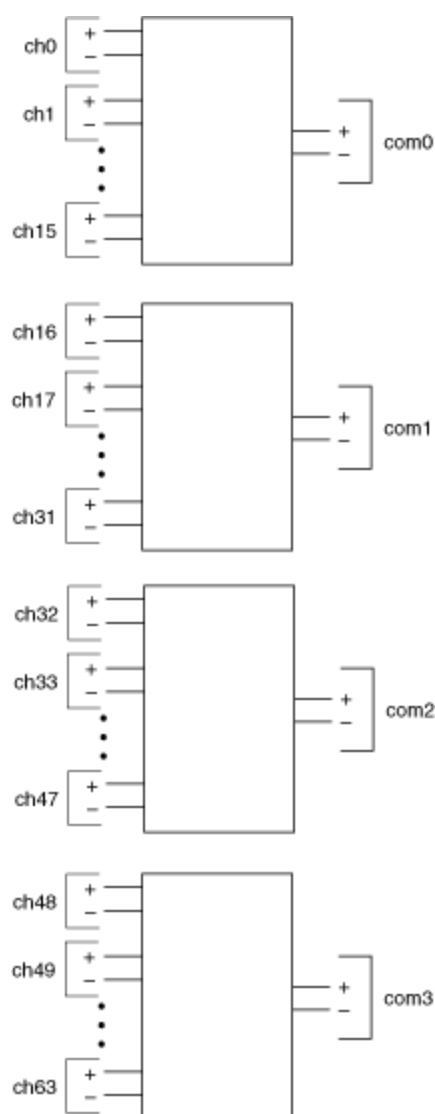
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI-2530/2530B 2-Wire Quad 16×1 Multiplexer Topology

Use the NI TB-2630/2630B terminal block with the NI PXI-2530/2530B as a 2-wire quad 16×1 multiplexer. In this topology, the positive leads of the first bank (CH0+ through CH15+) route to COM0+, and the negative leads of the first bank (CH0– through CH15–) route to COM0–. The pair COM0+ and COM0– is addressed collectively as com0 in software. All other banks follow a similar routing scheme.

The following figure represents the NI PXI-2530/2530B in the 2-wire quad 16×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0 ;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2+ is routed to COM0+

signal connected to CH2- is routed to COM0-

Signal Connections

Refer to the NI PXI-2530 Signal Connections section for the NI PXI-2530 front connector

pinout and NI TB-2630 terminal mapping. Refer to the NI PXI-2530B Signal Connections section for the NI PXI-2530B front connector pinout and NI TB-2630B terminal mapping.

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)
- [NI PXI-2530 Signal Connections](#)
- [NI PXI-2530B Signal Connections](#)

NI PXI/PXIe-2531

The NI PXI/PXIe-2531 (NI 2531) is a 512-crosspoint, high-density matrix switch module for the PXI or PXI Express platform. The NI 2531 is designed for switching high and low voltages.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI 2531 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 4×128 Matrix	2531/1-Wire 4x128 Matrix(NISWITCH_TOPOLOGY_2531_1_WIRE_4X128_MATRIX)	✓	✓
1-Wire 8×64 Matrix	2531/1-Wire 8x64 Matrix(NISWITCH_TOPOLOGY_2531_1_WIRE_8X64_MATRIX)	✓	✓
1-Wire	2531/1-Wire Dual 4x64	✓	✓

Topology	Software Name	Immediate	Scanning
Dual 4×64 Matrix	Matrix(NISWITCH_TOPOLOGY_2531_1_WIRE_DUAL_4X64_MATRIX)		
1-Wire Dual 8×32 Matrix	2531/1-Wire Dual 8x32 Matrix(NISWITCH_TOPOLOGY_2531_1_WIRE_DUAL_8X32_MATRIX)	✓	✓
1-Wire Sixteen 2×16 Matrix	2531/1-Wire Dual 8x32 Matrix(NISWITCH_TOPOLOGY_2531_1_WIRE_SIXTEEN_2X16_MATRIX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

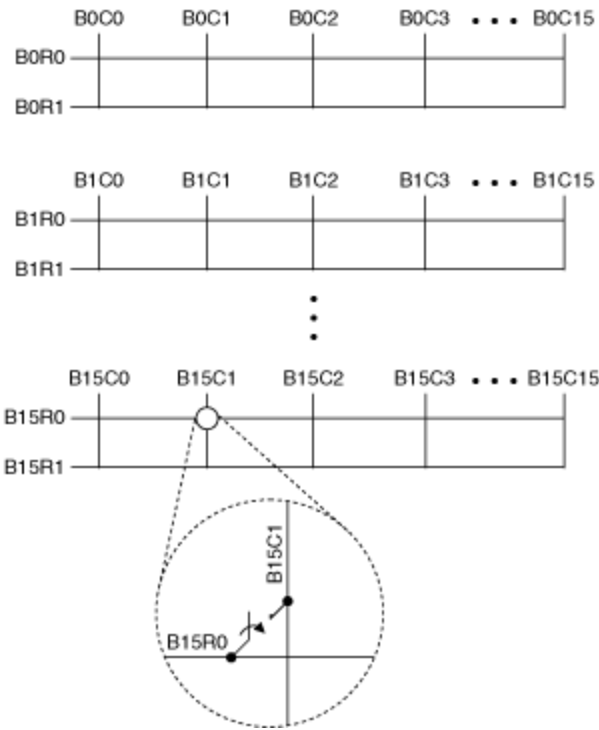
- [Matrix](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2531 1-Wire 4×128 Matrix Topology](#)
- [NI PXI/PXIe-2531 1-Wire 8×64 Matrix Topology](#)
- [NI PXI/PXIe-2531 1-Wire Dual 4×64 Matrix Topology](#)
- [NI PXI/PXIe-2531 1-Wire Dual 8×32 Matrix Topology](#)
- [NI PXI/PXIe-2531 1-Wire Sixteen 2×16 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2531 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2531 (NI 2531).



Note Hardware relay names are for the native 1-wire sixteen 2×16 matrix topology.



The following table lists relay names for the NI 2531.

Bank 0Relays	Bank 1Relays	...	Bank 15Relays
kB0R0C0...kB0R0C15	kB1R0C0...kB1R0C15	...	kB15R0C0...kB15R0C15
kB0R1C0...kB0R1C15	kB1R1C0...kB1R1C15	...	kB15R1C0...kB15R1C15

NI PXI/PXIe-2531 Relay Replacement

The NI PXI/PXIe-2531 uses reed relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
Meder	CRR05-1A

Complete the following sets of steps to disassemble your switch module, replace a failed relay, and reassemble your switch module.

Disassemble the Switch Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your switch module from electrostatic discharge.

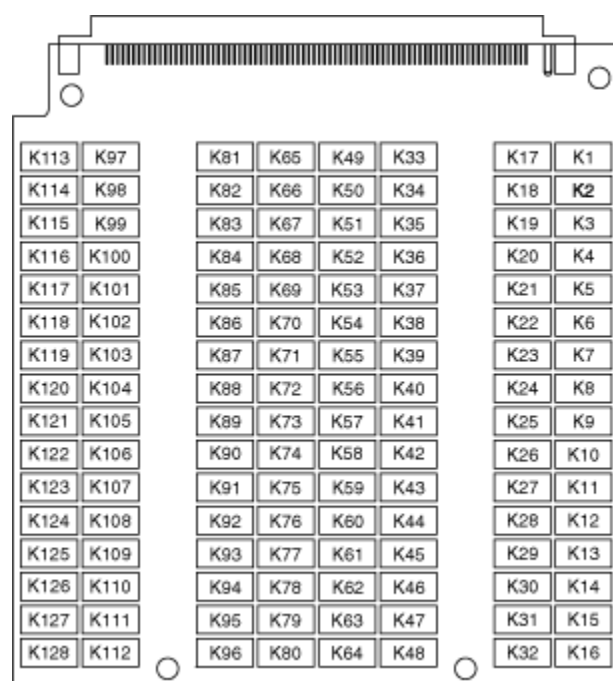
2. Locate the relay you want to replace.
 - a. Determine the relay name using the Bank Connection Diagram for your topology.
 - b. Match the relay name to its corresponding reference designator and locate the relay using the following figures and tables.



Note The reference designator locations for the top and bottom mezzanine boards are identical. Relays are located on both sides of each mezzanine board.

Top-Left Notched Side of Mezzanine Boards

The following figure illustrates relay locations on the side of each mezzanine board that has a notch in the top left corner.



Top-Right Notched Side of Mezzanine Boards

The following figure illustrates relay locations on the side of each mezzanine board that has a notch in the top right corner.

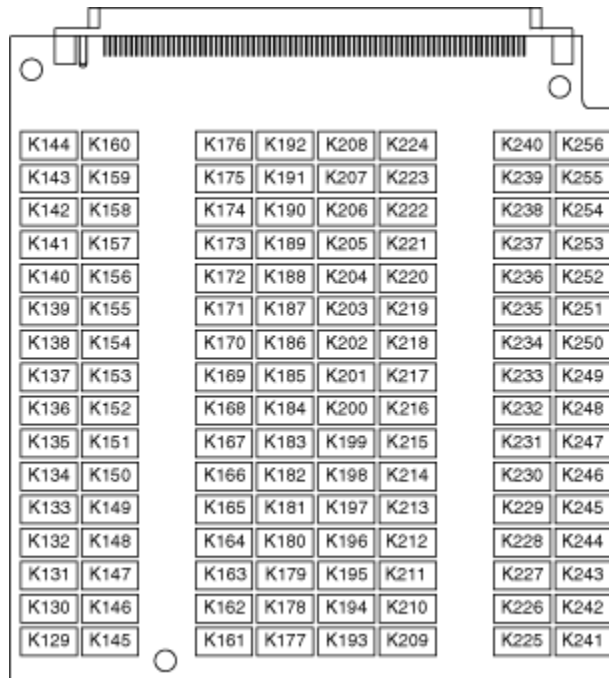


Table 8. Top Mezzanine Board Relay Locations

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B8R0C0	K144	B10R0C0	K176	B12R0C0	K193
B8R0C1	K143	B10R0C1	K175	B12R0C1	K194
B8R0C2	K142	B10R0C2	K174	B12R0C2	K195
B8R0C3	K141	B10R0C3	K173	B12R0C3	K196
B8R0C4	K140	B10R0C4	K172	B12R0C4	K197
B8R0C5	K139	B10R0C5	K171	B12R0C5	K198
B8R0C6	K138	B10R0C6	K170	B12R0C6	K199
B8R0C7	K137	B10R0C7	K169	B12R0C7	K200
B8R0C8	K136	B10R0C8	K168	B12R0C8	K201
B8R0C9	K135	B10R0C9	K167	B12R0C9	K202
B8R0C10	K134	B10R0C10	K166	B12R0C10	K203

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B8R0C11	K133	B10R0C11	K165	B12R0C11	K204
B8R0C12	K132	B10R0C12	K164	B12R0C12	K205
B8R0C13	K131	B10R0C13	K163	B12R0C13	K206
B8R0C14	K130	B10R0C14	K162	B12R0C14	K207
B8R0C15	K129	B10R0C15	K161	B12R0C15	K208
B8R1C0	K1	B10R1C0	K33	B12R1C0	K80
B8R1C1	K2	B10R1C1	K34	B12R1C1	K79
B8R1C2	K3	B10R1C2	K35	B12R1C2	K78
B8R1C3	K4	B10R1C3	K36	B12R1C3	K77
B8R1C4	K5	B10R1C4	K37	B12R1C4	K76
B8R1C5	K6	B10R1C5	K38	B12R1C5	K75
B8R1C6	K7	B10R1C6	K39	B12R1C6	K74
B8R1C7	K8	B10R1C7	K40	B12R1C7	K73
B8R1C8	K9	B10R1C8	K41	B12R1C8	K72
B8R1C9	K10	B10R1C9	K42	B12R1C9	K71
B8R1C10	K11	B10R1C10	K43	B12R1C10	K70
B8R1C11	K12	B10R1C11	K44	B12R1C11	K69
B8R1C12	K13	B10R1C12	K45	B12R1C12	K68
B8R1C13	K14	B10R1C13	K46	B12R1C13	K67
B8R1C14	K15	B10R1C14	K47	B12R1C14	K66
B8R1C15	K16	B10R1C15	K48	B12R1C15	K65
B9R0C0	K160	B11R0C0	K192	B13R0C0	K209
B9R0C1	K159	B11R0C1	K191	B13R0C1	K210
B9R0C2	K158	B11R0C2	K190	B13R0C2	K211
B9R0C3	K157	B11R0C3	K189	B13R0C3	K212
B9R0C4	K156	B11R0C4	K188	B13R0C4	K213
B9R0C5	K155	B11R0C5	K187	B13R0C5	K214

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B9R0C6	K154	B11R0C6	K186	B13R0C6	K215
B9R0C7	K153	B11R0C7	K185	B13R0C7	K216
B9R0C8	K152	B11R0C8	K184	B13R0C8	K217
B9R0C9	K151	B11R0C9	K183	B13R0C9	K218
B9R0C10	K150	B11R0C10	K182	B13R0C10	K219
B9R0C11	K149	B11R0C11	K181	B13R0C11	K220
B9R0C12	K148	B11R0C12	K180	B13R0C12	K221
B9R0C13	K147	B11R0C13	K179	B13R0C13	K222
B9R0C14	K146	B11R0C14	K178	B13R0C14	K223
B9R0C15	K145	B11R0C15	K177	B13R0C15	K224
B9R1C0	K17	B11R1C0	K49	B13R1C0	K96
B9R1C1	K18	B11R1C1	K50	B13R1C1	K95
B9R1C2	K19	B11R1C2	K51	B13R1C2	K94
B9R1C3	K20	B11R1C3	K52	B13R1C3	K93
B9R1C4	K21	B11R1C4	K53	B13R1C4	K92
B9R1C5	K22	B11R1C5	K54	B13R1C5	K91
B9R1C6	K23	B11R1C6	K55	B13R1C6	K90
B9R1C7	K24	B11R1C7	K56	B13R1C7	K89
B9R1C8	K25	B11R1C8	K57	B13R1C8	K88
B9R1C9	K26	B11R1C9	K58	B13R1C9	K87
B9R1C10	K27	B11R1C10	K59	B13R1C10	K86
B9R1C11	K28	B11R1C11	K60	B13R1C11	K85
B9R1C12	K29	B11R1C12	K61	B13R1C12	K84
B9R1C13	K30	B11R1C13	K62	B13R1C13	K83
B9R1C14	K31	B11R1C14	K63	B13R1C14	K82
B9R1C15	K32	B11R1C15	K64	B13R1C15	K81

Table 9. Bottom Mezzanine Board Relay Locations

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R0C0	K144	B2R0C0	K176	B4R0C0	K193
B0R0C1	K143	B2R0C1	K175	B4R0C1	K194
B0R0C2	K142	B2R0C2	K174	B4R0C2	K195
B0R0C3	K141	B2R0C3	K173	B4R0C3	K196
B0R0C4	K140	B2R0C4	K172	B4R0C4	K197
B0R0C5	K139	B2R0C5	K171	B4R0C5	K198
B0R0C6	K138	B2R0C6	K170	B4R0C6	K199
B0R0C7	K137	B2R0C7	K169	B4R0C7	K200
B0R0C8	K136	B2R0C8	K168	B4R0C8	K201
B0R0C9	K135	B2R0C9	K167	B4R0C9	K202
B0R0C10	K134	B2R0C10	K166	B4R0C10	K203
B0R0C11	K133	B2R0C11	K165	B4R0C11	K204
B0R0C12	K132	B2R0C12	K164	B4R0C12	K205
B0R0C13	K131	B2R0C13	K163	B4R0C13	K206
B0R0C14	K130	B2R0C14	K162	B4R0C14	K207
B0R0C15	K129	B2R0C15	K161	B4R0C15	K208
B0R1C0	K1	B2R1C0	K33	B4R1C0	K80
B0R1C1	K2	B2R1C1	K34	B4R1C1	K79
B0R1C2	K3	B2R1C2	K35	B4R1C2	K78
B0R1C3	K4	B2R1C3	K36	B4R1C3	K77
B0R1C4	K5	B2R1C4	K37	B4R1C4	K76
B0R1C5	K6	B2R1C5	K38	B4R1C5	K75
B0R1C6	K7	B2R1C6	K39	B4R1C6	K74
B0R1C7	K8	B2R1C7	K40	B4R1C7	K73
B0R1C8	K9	B2R1C8	K41	B4R1C8	K72
B0R1C9	K10	B2R1C9	K42	B4R1C9	K71

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R1C10	K11	B2R1C10	K43	B4R1C10	K70
B0R1C11	K12	B2R1C11	K44	B4R1C11	K69
B0R1C12	K13	B2R1C12	K45	B4R1C12	K68
B0R1C13	K14	B2R1C13	K46	B4R1C13	K67
B0R1C14	K15	B2R1C14	K47	B4R1C14	K66
B0R1C15	K16	B2R1C15	K48	B4R1C15	K65
B1R0C0	K160	B3R0C0	K192	B5R0C0	K209
B1R0C1	K159	B3R0C1	K191	B5R0C1	K210
B1R0C2	K158	B3R0C2	K190	B5R0C2	K211
B1R0C3	K157	B3R0C3	K189	B5R0C3	K212
B1R0C4	K156	B3R0C4	K188	B5R0C4	K213
B1R0C5	K155	B3R0C5	K187	B5R0C5	K214
B1R0C6	K154	B3R0C6	K186	B5R0C6	K215
B1R0C7	K153	B3R0C7	K185	B5R0C7	K216
B1R0C8	K152	B3R0C8	K184	B5R0C8	K217
B1R0C9	K151	B3R0C9	K183	B5R0C9	K218
B1R0C10	K150	B3R0C10	K182	B5R0C10	K219
B1R0C11	K149	B3R0C11	K181	B5R0C11	K220
B1R0C12	K148	B3R0C12	K180	B5R0C12	K221
B1R0C13	K147	B3R0C13	K179	B5R0C13	K222
B1R0C14	K146	B3R0C14	K178	B5R0C14	K223
B1R0C15	K145	B3R0C15	K177	B5R0C15	K224
B1R1C0	K17	B3R1C0	K49	B5R1C0	K96
B1R1C1	K18	B3R1C1	K50	B5R1C1	K95
B1R1C2	K19	B3R1C2	K51	B5R1C2	K94
B1R1C3	K20	B3R1C3	K52	B5R1C3	K93
B1R1C4	K21	B3R1C4	K53	B5R1C4	K92

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B1R1C5	K22	B3R1C5	K54	B5R1C5	K91
B1R1C6	K23	B3R1C6	K55	B5R1C6	K90
B1R1C7	K24	B3R1C7	K56	B5R1C7	K89
B1R1C8	K25	B3R1C8	K57	B5R1C8	K88
B1R1C9	K26	B3R1C9	K58	B5R1C9	K87
B1R1C10	K27	B3R1C10	K59	B5R1C10	K86
B1R1C11	K28	B3R1C11	K60	B5R1C11	K85
B1R1C12	K29	B3R1C12	K61	B5R1C12	K84
B1R1C13	K30	B3R1C13	K62	B5R1C13	K83
B1R1C14	K31	B3R1C14	K63	B5R1C14	K82
B1R1C15	K32	B3R1C15	K64	B5R1C15	K81

- c. Use the reference designator to locate the relay on the mezzanine board.



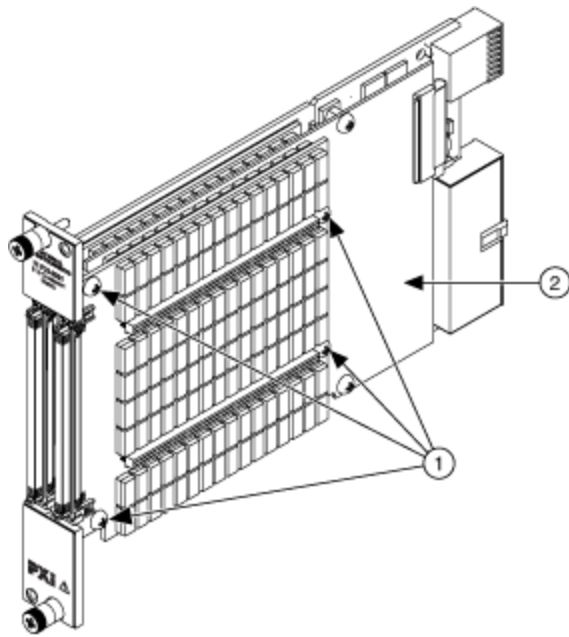
Note Reference designators are printed on the mezzanine boards.

3. Disassemble the module. Refer to Disconnecting the Top Mezzanine Board if the relay you want to replace is located on the top mezzanine board. Refer to Disconnecting the Bottom Mezzanine Board if the relay you want to replace is located on the bottom mezzanine board. Refer to both procedures if you want to replace relays on both boards.

Disconnecting the Top Mezzanine Board

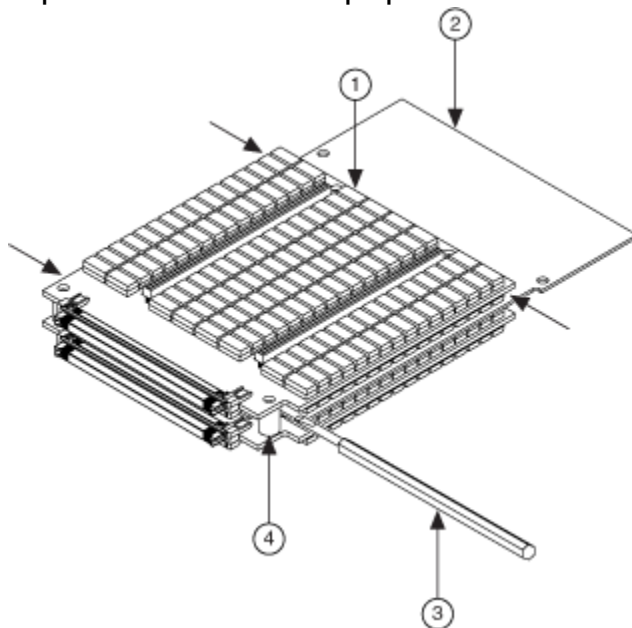
Complete the following steps to disconnect the top mezzanine board from the driver board.

1. Remove the top mezzanine board screws.



1	Mezzanine Board Screws
2	Driver Board

2. Use a plastic screwdriver to gently pry the top mezzanine board from the driver board, prying a little at each corner for an even distribution of pressure until the top mezzanine board pops loose. Retain the spacers from between the boards.



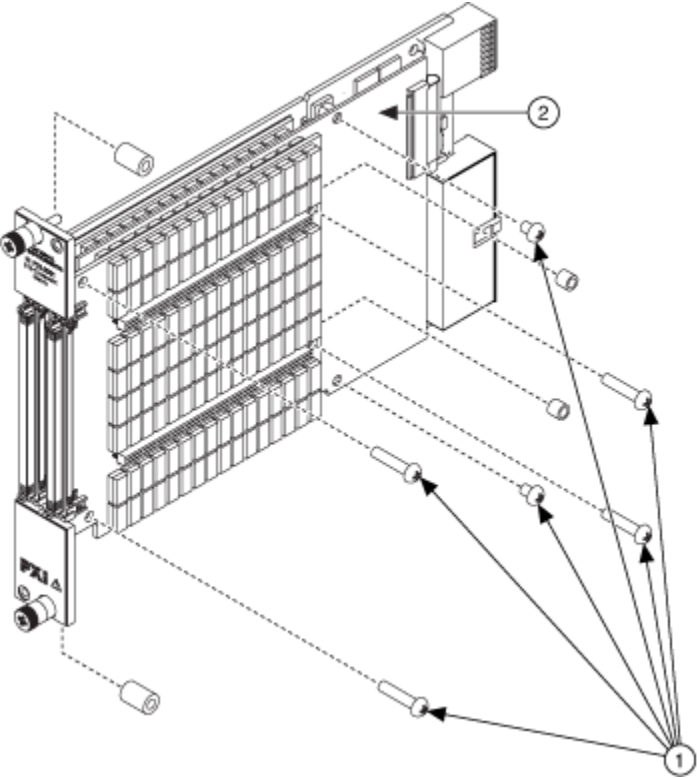
1	Top Mezzanine Board

2	Driver Board
3	Plastic Screwdriver
4	Spacer

Disconnecting the Bottom Mezzanine Board

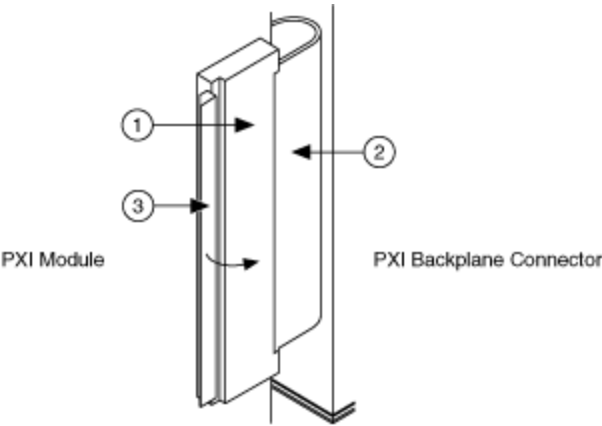
Complete the following steps to disconnect the bottom mezzanine board from the driver board.

- 1. Remove the mezzanine board screws.



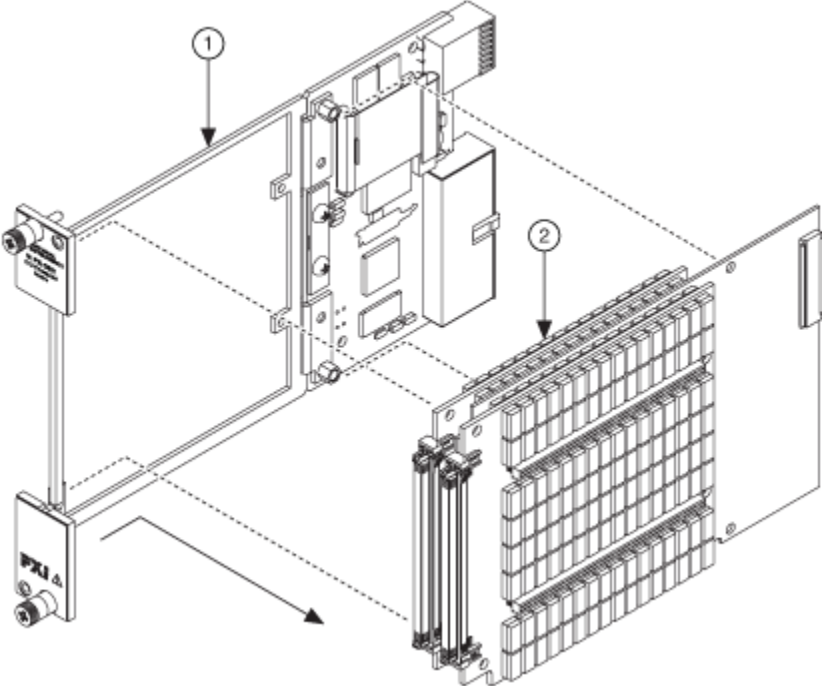
1	Mezzanine Board Screws
2	Driver Board

- 2. Disconnect the PCB interconnect cable by lifting the PCB cable latch on the J2 connector.



1	J2 Connector
2	PCB Interconnect Cable
3	PCB Cable Latch

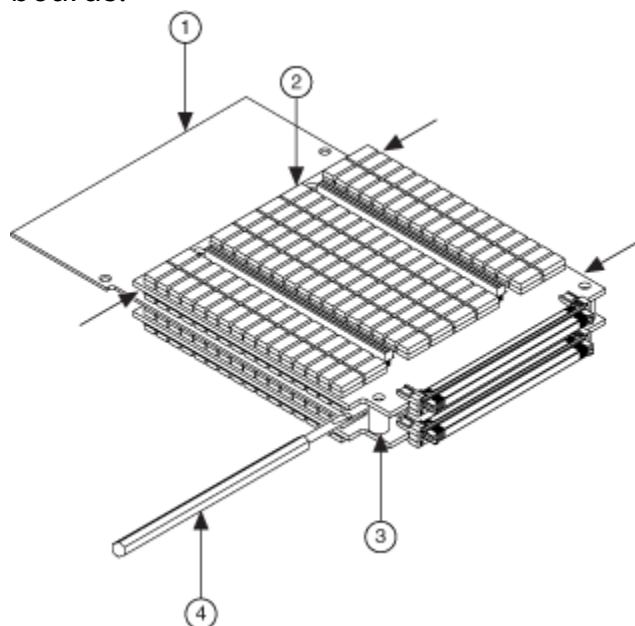
3. Separate the daughterboard assembly from the CMI bracket.



1	CMI Bracket
2	Daughterboard Assembly

4. Use a plastic screwdriver to gently pry the bottom mezzanine board from the driver board, prying a little at each corner for an even distribution of pressure until

the bottom mezzanine board pops loose. Retain the spacers from between the boards.



1	Driver Board
2	Bottom Mezzanine Board
3	Spacer
4	Plastic Screwdriver

Replace the Relay

The NI PXI/PXIe-2531 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Hot air rework station with hot air gun set to 371 °C (700 °F) for lead-free solder rework
- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Fine tweezers

Complete the following steps to replace the relay:

1. Apply heat with the hot air gun for 30 to 45 seconds in a circular motion around the relay, keeping the hot air gun 0.75 to 1 inch (1.91 to 2.54 cm) above the daughterboard.
2. Gently lift the relay with tweezers to remove it from the PCB. If the relay does not lift easily, apply hot air in a circular motion around the relay two to three times and gently try to lift the relay again. Repeat until the solder reflows and the relay lifts easily.
3. Use the soldering iron to tin the leads of the new relay.
4. Use the soldering iron to create a uniform distribution of solder on the pads of the daughterboard PCB.
5. Use the hot air gun to heat the PCB and the relay leads.
6. Hold the new relay in place on the board with the tweezers while using the hot air gun to apply heat in a circular motion until the solder reflows.

Reassemble the Module

Refer to the following procedures to reconnect the boards that you disconnected in Disassemble the Switch Module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

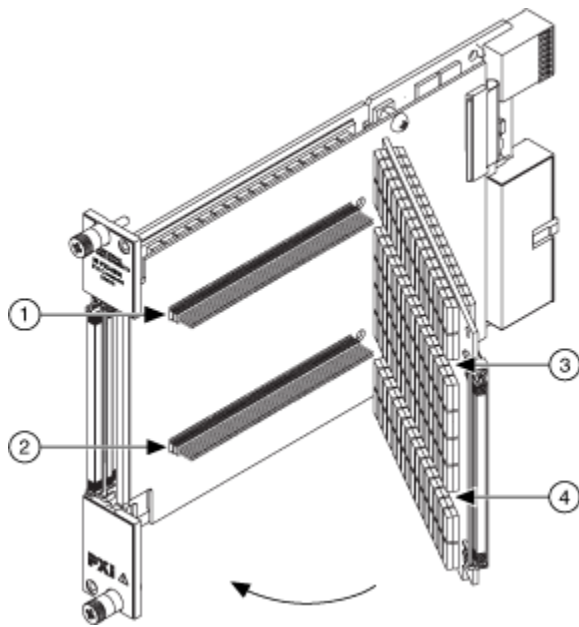
Reconnecting the Top Mezzanine Board

Complete the following steps to reconnect the top mezzanine board to the driver board.

1. Align pin holes 179 and 180 on the J4 and J5 connectors of the top mezzanine board with pins 179 and 180 of the J3 and J4 connectors on the driver board. Gently fold the mezzanine board over onto the driver board as shown in the following figure. Leave approximately 6 mm of clearance between the mezzanine board and the driver board. Do not press the boards together.



Note Ensure the black surface mount J2 and J3 connectors on the mezzanine board face away from the driver board, and the notch in the corner of the mezzanine board faces the bottom front of the module.



1	Driver Board J4 Connector
2	Driver Board J3 Connector
3	Mezzanine Board J4 Connector
4	Mezzanine Board J5 Connector

2. Replace the spacers between the driver board and top mezzanine board.
3. Secure the top mezzanine board to the driver board using the screws from step 1.

Reconnecting the Bottom Mezzanine Board

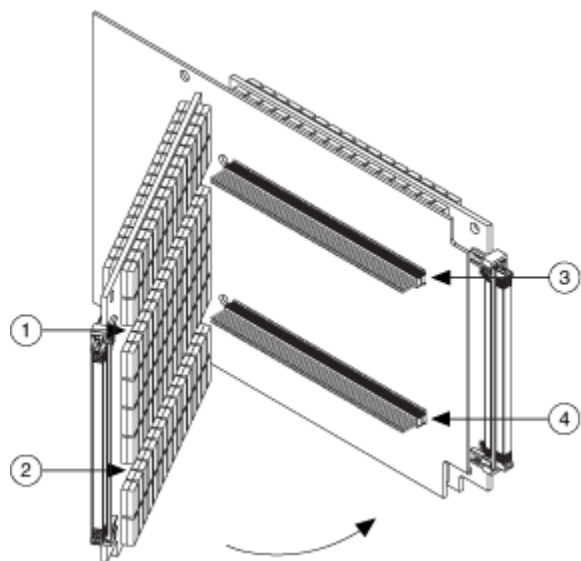
Complete the following steps to reconnect the bottom mezzanine board to the driver

board.

1. Align pin holes 179 and 180 on the J2 and J3 connectors of the bottom mezzanine board with pins 179 and 180 of the J5 and J6 connectors on the driver board. Gently fold the mezzanine board over onto the driver board as shown in the following figure. Leave approximately 6 mm of clearance between the mezzanine board and the driver board. Do not press the boards together.



Note Ensure the black surface mount J4 and J5 connectors on the mezzanine board face away from the driver board, and the notch in the corner of the mezzanine board faces the bottom front of the module.



1	Mezzanine Board J2 Connector
2	Mezzanine Board J3 Connector
3	Driver Board J5 Connector
4	Driver Board J6 Connector

2. Connect the PCB interconnect cable to the J2 connector on the bottom mezzanine board.
3. Reconnect the daughterboard to the CMI bracket.
4. Replace the spacers between the driver board and bottom mezzanine board.
5. Secure the daughterboard assembly to the CMI bracket using the screws from step

2.

6. Replace the ejector handle assembly screw from step 1.

NI PXI/PXIe-2531 Triggering

The NI PXI/PXIe-2531 (NI 2531) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2531.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2531.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

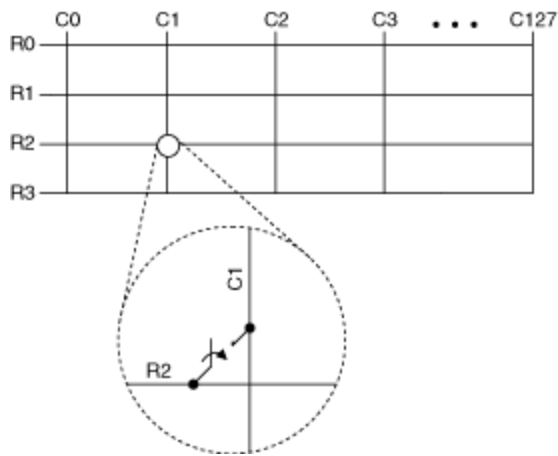
Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2531 1-Wire 4×128 Matrix Topology

The NI TB-2648 terminal block creates a 1-wire 4×128 matrix topology with the NI PXI/PXIe-2531 (NI 2531). The following figure represents the NI 2531 in the 1-wire 4×128 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

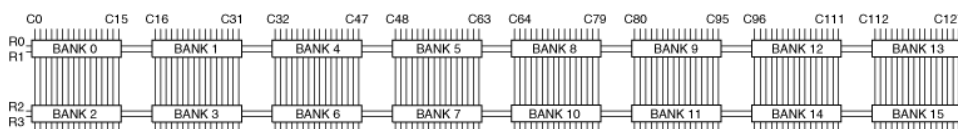
signal connected to R2 is routed to C1

Terminal Block Connections

The NI TB-2648 terminal block connects banks of the NI 2531 to create the 1-wire 4×128 matrix topology.

Bank Connection Diagram

The following figure illustrates how the native banks of the NI 2531 connect using the NI TB-2648 to create the 1-wire 4×128 matrix topology.



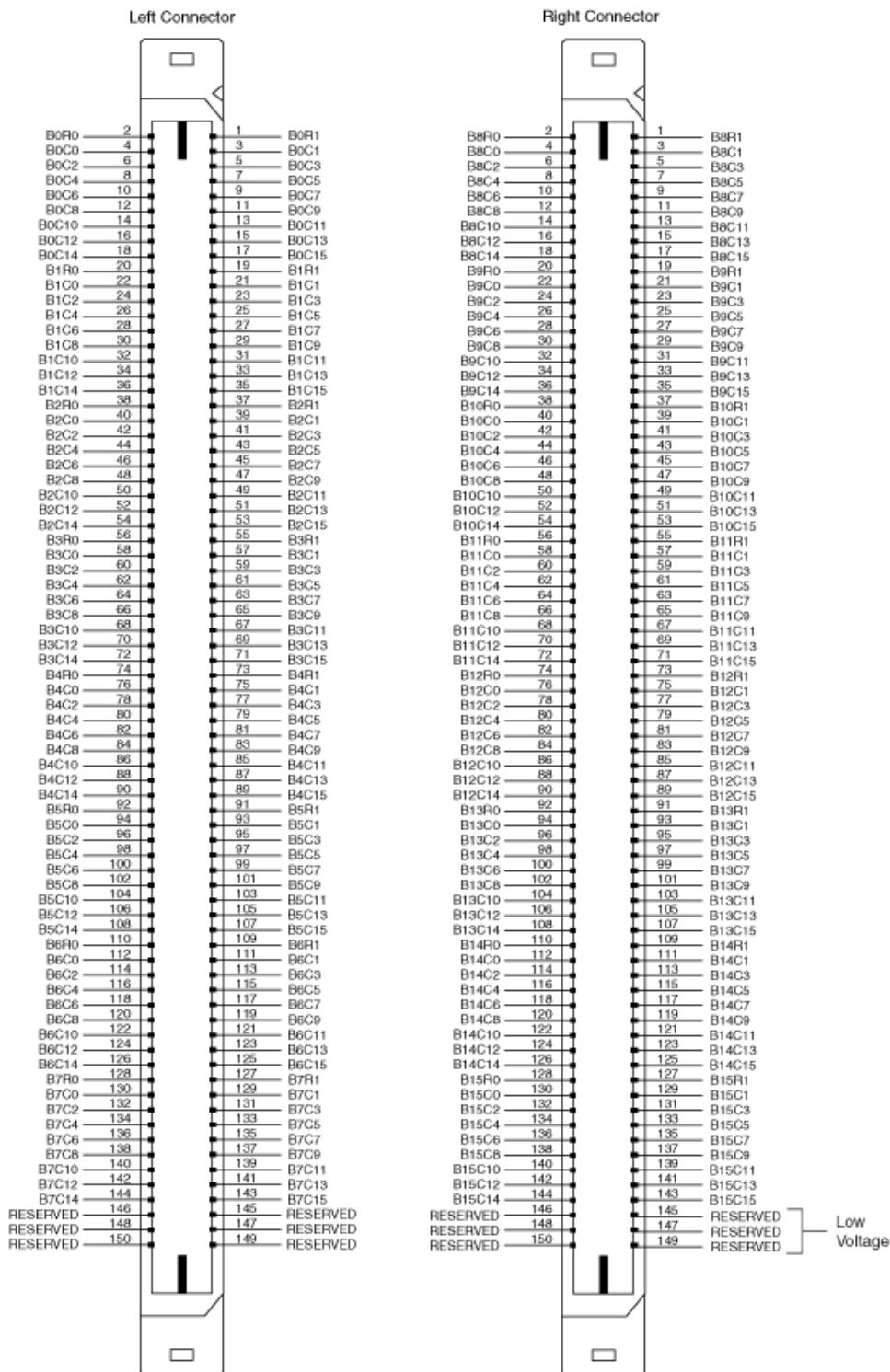
Terminal Block Connector Pinouts

The following figure identifies the pins for the NI TB-2648 connectors.

Top Connector			Bottom Connector		
R3	68 34	R1	R3	68 34	R1
R2	67 33	R0	R2	67 33	R0
C32	66 32	C0	C96	66 32	C64
C33	65 31	C1	C97	65 31	C65
C34	64 30	C2	C98	64 30	C66
C35	63 29	C3	C99	63 29	C67
C36	62 28	C4	C100	62 28	C68
C37	61 27	C5	C101	61 27	C69
C38	60 26	C6	C102	60 26	C70
C39	59 25	C7	C103	59 25	C71
C40	58 24	C8	C104	58 24	C72
C41	57 23	C9	C105	57 23	C73
C42	56 22	C10	C106	56 22	C74
C43	55 21	C11	C107	55 21	C75
C44	54 20	C12	C108	54 20	C76
C45	53 19	C13	C109	53 19	C77
C46	52 18	C14	C110	52 18	C78
C47	51 17	C15	C111	51 17	C79
C48	50 16	C16	C112	50 16	C80
C49	49 15	C17	C113	49 15	C81
C50	48 14	C18	C114	48 14	C82
C51	47 13	C19	C115	47 13	C83
C52	46 12	C20	C116	46 12	C84
C53	45 11	C21	C117	45 11	C85
C54	44 10	C22	C118	44 10	C86
C55	43 9	C23	C119	43 9	C87
C56	42 8	C24	C120	42 8	C88
C57	41 7	C25	C121	41 7	C89
C58	40 6	C26	C122	40 6	C90
C59	39 5	C27	C123	39 5	C91
C60	38 4	C28	C124	38 4	C92
C61	37 3	C29	C125	37 5	C93
C62	36 2	C30	C126	36 2	C94
C63	35 1	C31	C127	35 1	C95

Pinout

The following figure identifies the pins for the NI 2531.

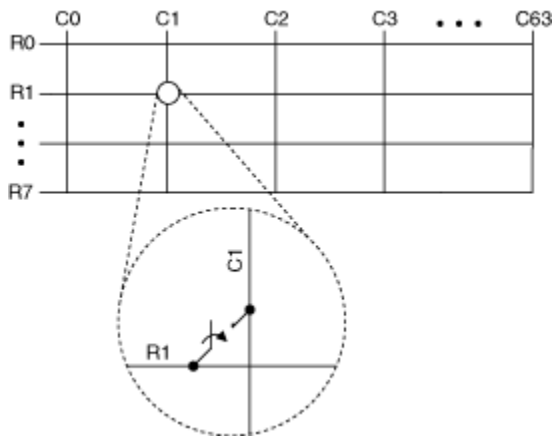


Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)

NI PXI/PXIe-2531 1-Wire 8×64 Matrix Topology

The NI TB-2650 terminal block creates a 1-wire 8×64 matrix topology with the NI PXI/PXIe-2531 (NI 2531). The following figure represents the NI 2531 in the 1-wire 8×64 matrix topology.



Making a Connection

Both the scanning command, `r1->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r1` and `c1`, result in the following connection:

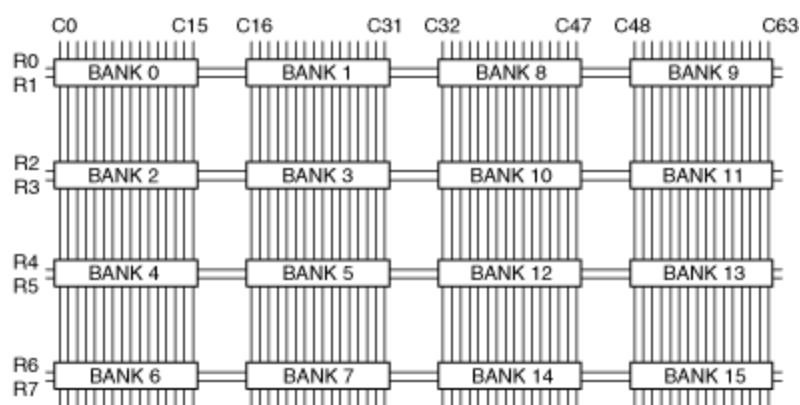
signal connected to R1 is routed to C1

Terminal Block Connections

The NI TB-2650 terminal block connects banks of the NI 2531 to create the 1-wire 8×64 matrix topology.

Bank Connection Diagram

The following figure illustrates how the native banks of the NI 2531 connect using the NI TB-2650 to create the 1-wire 8×64 matrix topology.



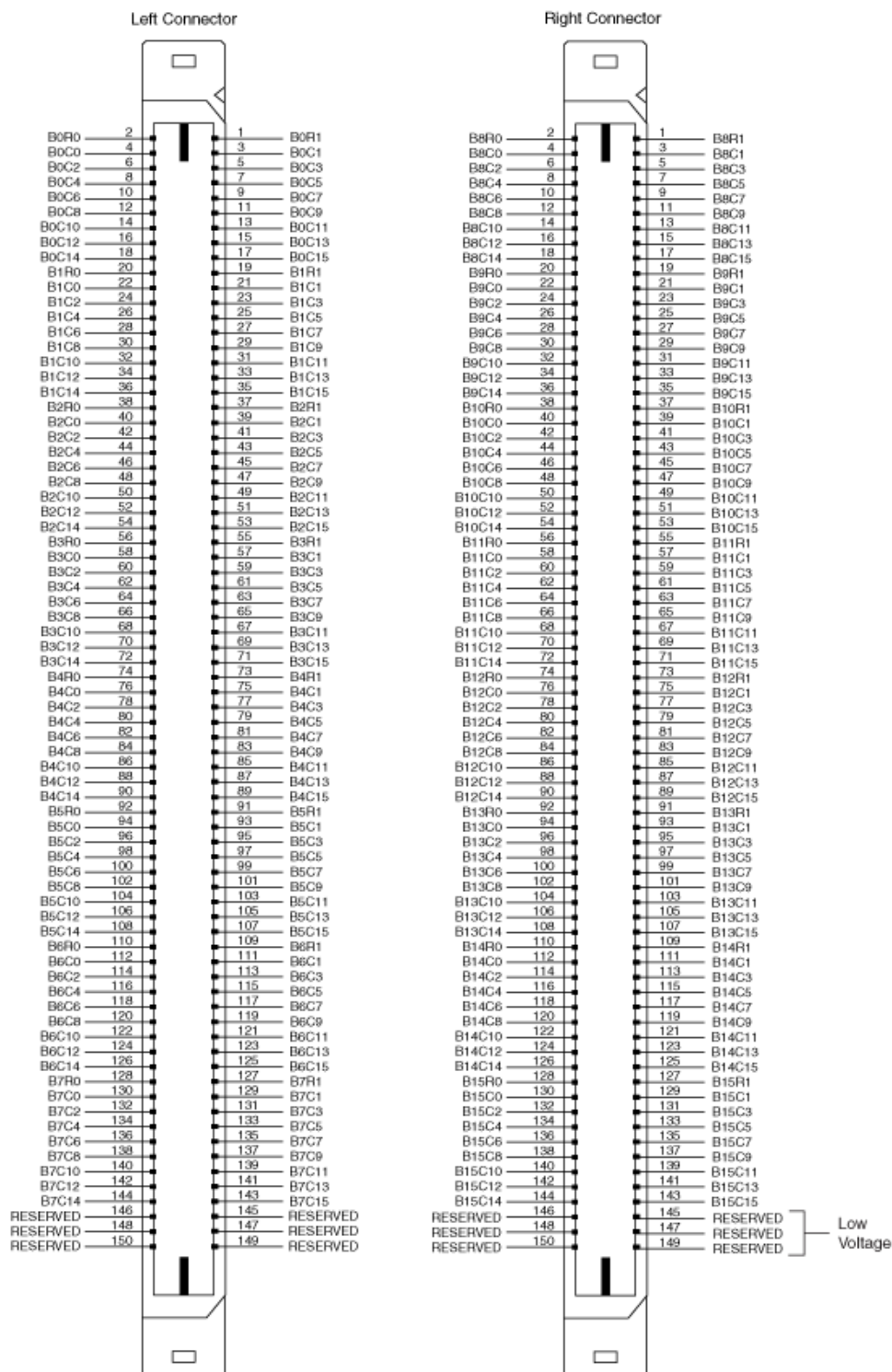
Terminal Block Connector Pinouts

The following figure identifies the pins for the NI TB-2650 connectors.

Top Connector			Bottom Connector		
R3	68 34	R1	R3	68 34	R1
R2	67 33	R0	R2	67 33	R0
RESERVED	66 32	C0	RESERVED	66 32	C32
RESERVED	65 31	C1	RESERVED	65 31	C33
RESERVED	64 30	C2	RESERVED	64 30	C34
RESERVED	63 29	C3	RESERVED	63 29	C35
RESERVED	62 28	C4	RESERVED	62 28	C36
RESERVED	61 27	C5	RESERVED	61 27	C37
RESERVED	60 26	C6	RESERVED	60 26	C38
RESERVED	59 25	C7	RESERVED	59 25	C39
RESERVED	58 24	C8	RESERVED	58 24	C40
RESERVED	57 23	C9	RESERVED	57 23	C41
RESERVED	56 22	C10	RESERVED	56 22	C42
RESERVED	55 21	C11	RESERVED	55 21	C43
RESERVED	54 20	C12	RESERVED	54 20	C44
RESERVED	53 19	C13	RESERVED	53 19	C45
RESERVED	52 18	C14	RESERVED	52 18	C46
RESERVED	51 17	C15	RESERVED	51 17	C47
RESERVED	50 16	C16	RESERVED	50 16	C48
RESERVED	49 15	C17	RESERVED	49 15	C49
RESERVED	48 14	C18	RESERVED	48 14	C50
RESERVED	47 13	C19	RESERVED	47 13	C51
RESERVED	46 12	C20	RESERVED	46 12	C52
RESERVED	45 11	C21	RESERVED	45 11	C53
RESERVED	44 10	C22	RESERVED	44 10	C54
RESERVED	43 9	C23	RESERVED	43 9	C55
RESERVED	42 8	C24	RESERVED	42 8	C56
RESERVED	41 7	C25	RESERVED	41 7	C57
RESERVED	40 6	C26	RESERVED	40 6	C58
RESERVED	39 5	C27	RESERVED	39 5	C59
R7	38 4	C28	R7	38 4	C60
R6	37 3	C29	R6	37 5	C61
R5	36 2	C30	R5	36 2	C62
R4	35 1	C31	R4	35 1	C63

Pinout

The following figure identifies the pins for the NI 2531.

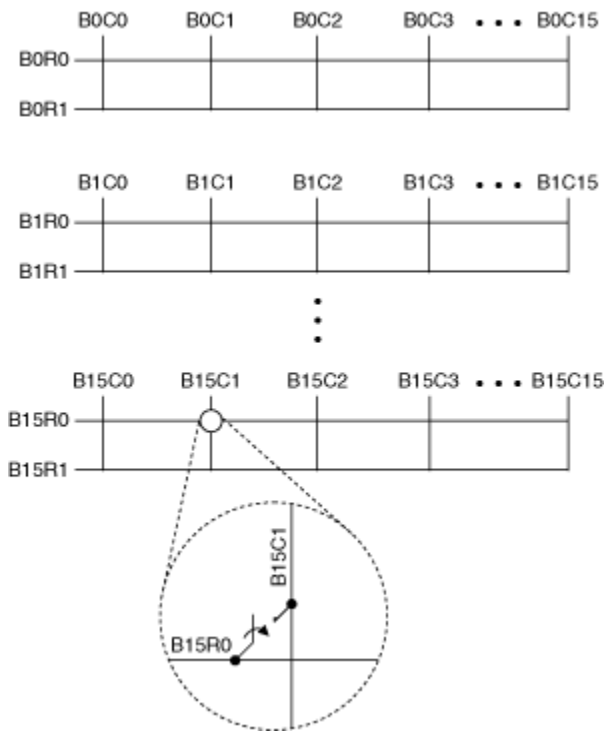


Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)

NI PXI/PXIe-2531 1-Wire Sixteen 2×16 Matrix Topology

The following figure represents the NI PXI/PXIe-2531 in the 1-wire sixteen 2×16 matrix topology.



Making a Connection

Both the scanning command, `b15r0->b15c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b15r0` and `b15c1`, result in the following connection:

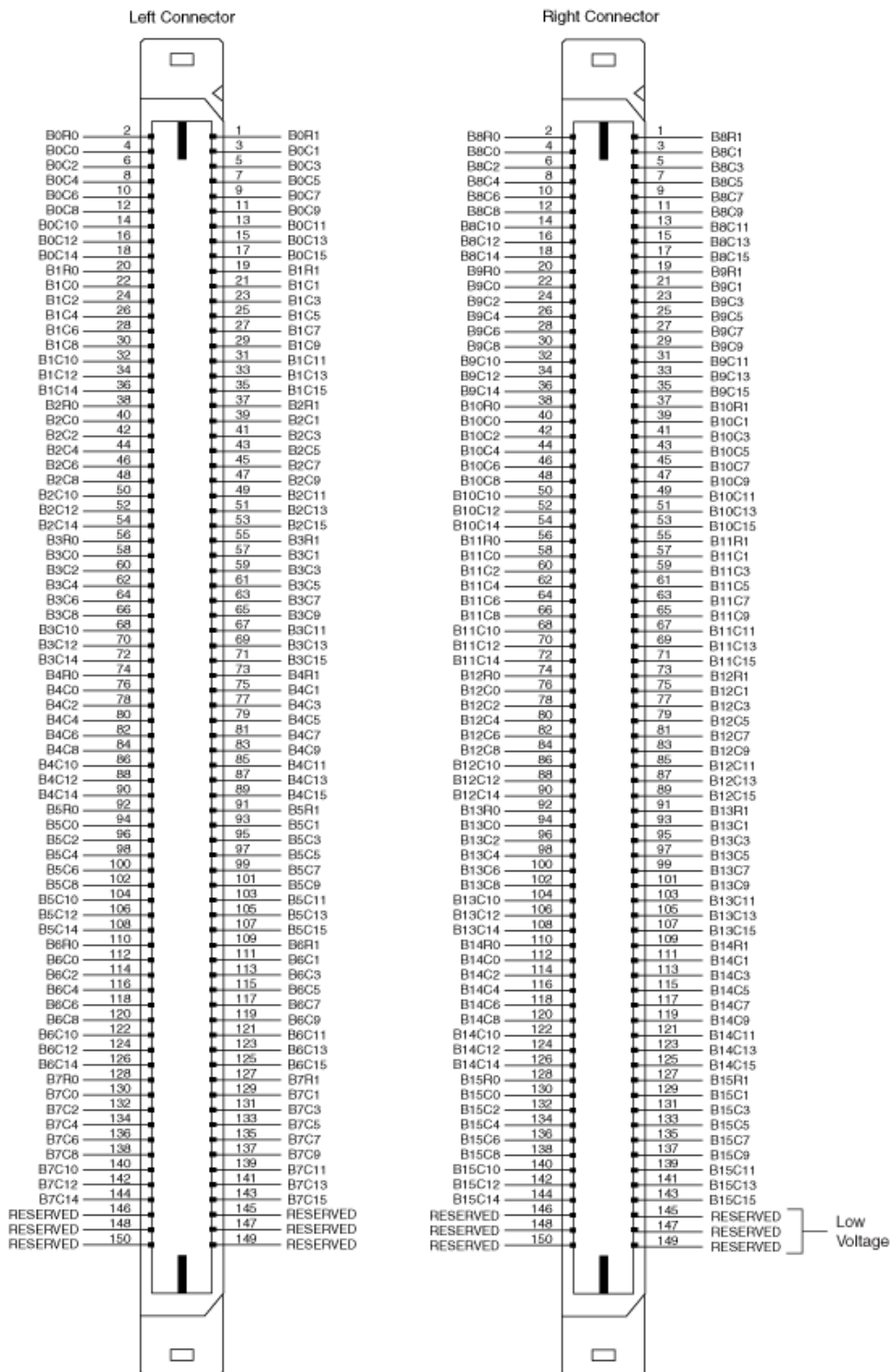
signal connected to B15R0 is routed to B15C1



Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Pinout

The following figure identifies the pins for the NI 2531.





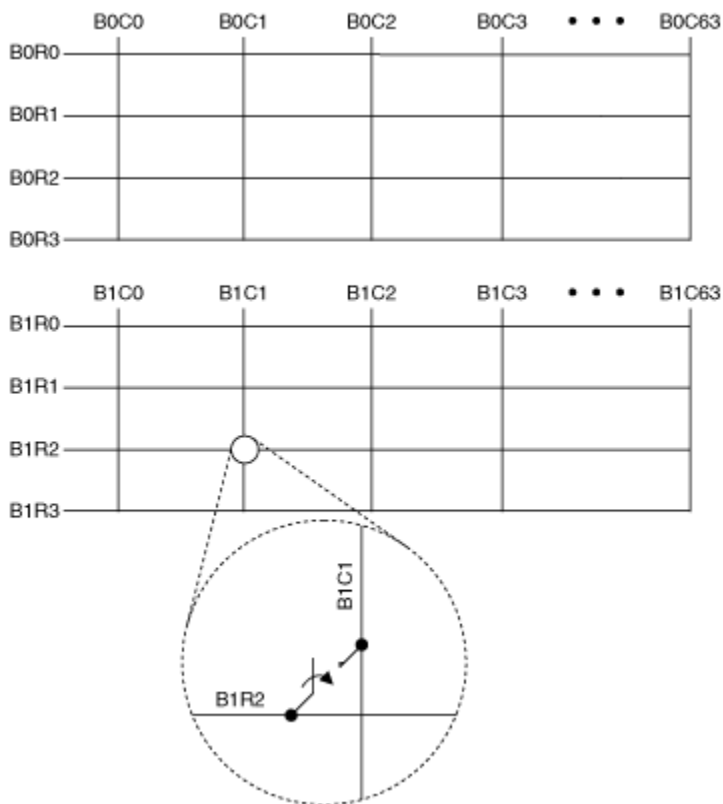
Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)

NI PXI/PXIe-2531 1-Wire Dual 4×64 Matrix Topology

The NI TB-2649 terminal block creates a 1-wire dual 4×64 matrix topology with the NI PXI/PXIe-2531 (NI 2531). The following figure represents the NI 2531 in the 1-wire dual 4×64 matrix topology.



Making a Connection

For bank 0, both the scanning command, `b0r2->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r2` and `b0c1`, result in the following connection:

signal connected to B0R2 is routed to B0C1

For bank 1, both the scanning command, `b1r2->b1c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b1r2` and `b1c1`, result in the following connection:

signal connected to B1R2 is routed to B1C1



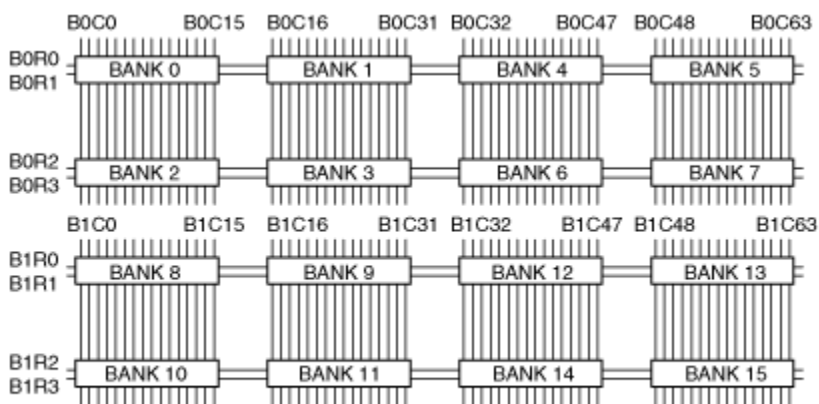
Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2649 terminal block connects banks of the NI 2531 to create the 1-wire dual 4×64 matrix topology.

Bank Connection Diagram

The following figure illustrates how the native banks of the NI 2531 connect using the NI TB-2649 to create the 1-wire dual 4×64 matrix topology.



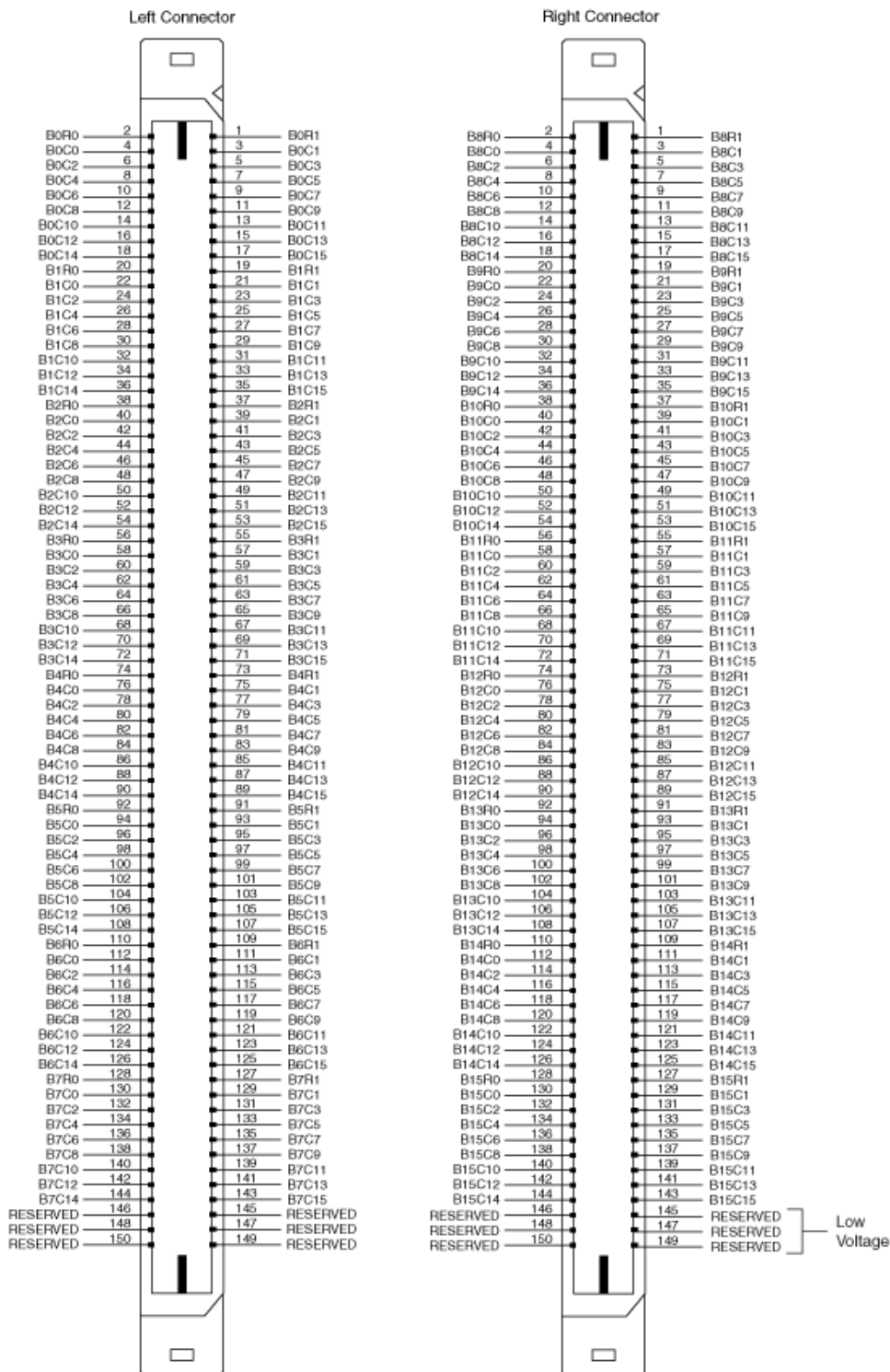
Terminal Block Connector Pinouts

The following figure identifies the pins for the NI TB-2649 connectors.

Top Connector			Bottom Connector		
B0R3	68	34	B0R1	68	34
B0R2	67	33	B0R0	67	33
B0C32	66	32	B1C32	66	32
B0C33	65	31	B1C33	65	31
B0C34	64	30	B1C34	64	30
B0C35	63	29	B1C35	63	29
B0C36	62	28	B1C36	62	28
B0C37	61	27	B1C37	61	27
B0C38	60	26	B1C38	60	26
B0C39	59	25	B1C39	59	25
B0C40	58	24	B1C40	58	24
B0C41	57	23	B1C41	57	23
B0C42	56	22	B1C42	56	22
B0C43	55	21	B1C43	55	21
B0C44	54	20	B1C44	54	20
B0C45	53	19	B1C45	53	19
B0C46	52	18	B1C46	52	18
B0C47	51	17	B1C47	51	17
B0C48	50	16	B1C48	50	16
B0C49	49	15	B1C49	49	15
B0C50	48	14	B1C50	48	14
B0C51	47	13	B1C51	47	13
B0C52	46	12	B1C52	46	12
B0C53	45	11	B1C53	45	11
B0C54	44	10	B1C54	44	10
B0C55	43	9	B1C55	43	9
B0C56	42	8	B1C56	42	8
B0C57	41	7	B1C57	41	7
B0C58	40	6	B1C58	40	6
B0C59	39	5	B1C59	39	5
B0C60	38	4	B1C60	38	4
B0C61	37	3	B1C61	37	5
B0C62	36	2	B1C62	36	2
B0C63	35	1	B1C63	35	1
		B0C31			B1C31

Pinout

The following figure identifies the pins for the NI 2531.

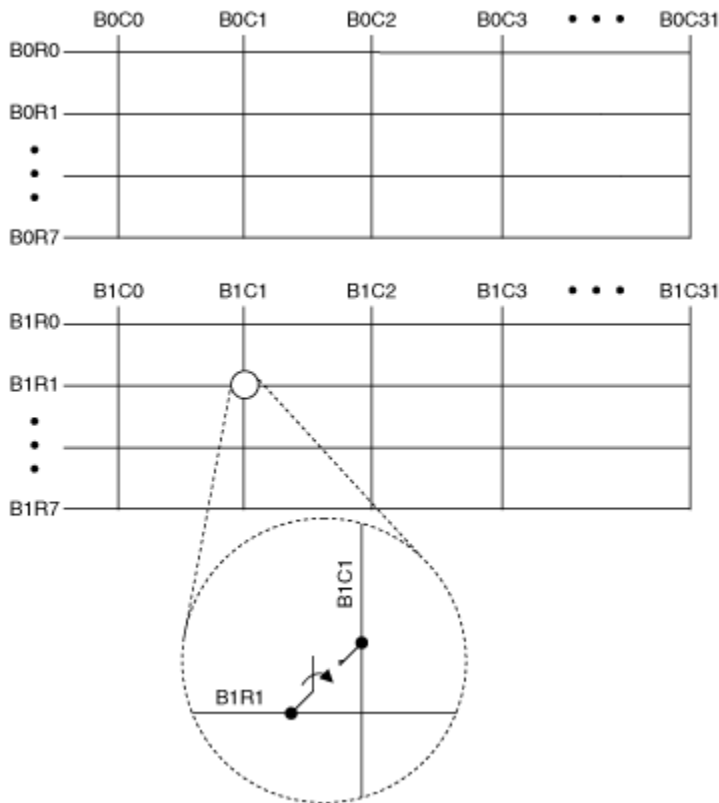


Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)

NI PXI/PXIe-2531 1-Wire Dual 8×32 Matrix Topology

The NI TB-2651 terminal block creates a 1-wire dual 8×32 matrix topology with the NI PXI/PXIe-2531 (NI 2531). The following figure represents the NI 2531 in the 1-wire dual 8×32 matrix topology.



Making a Connection

For bank 0, both the scanning command, `b0r1->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r1` and `b0c1`, result in the following connection:

signal connected to B0R1 is routed to B0C1

For bank 1, both the scanning command, `b1r1->b1c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b1r1` and `b1c1`, result in the following connection:

signal connected to B1R1 is routed to B1C1



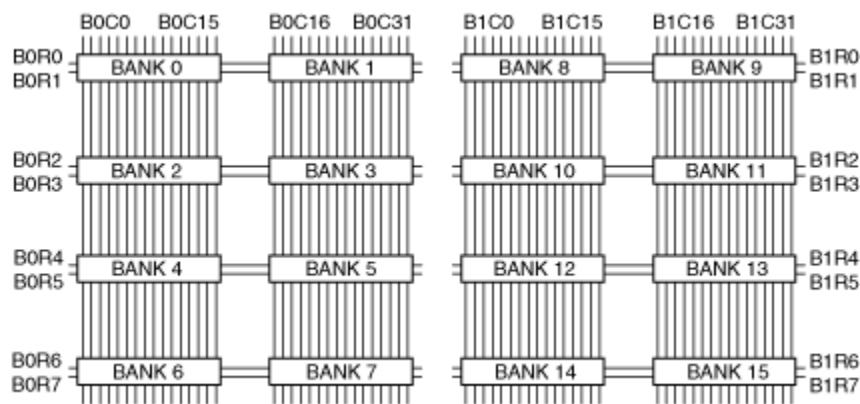
Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2651 terminal block connects the banks of the NI 2531 to create the 1-wire dual 8×32 matrix topology.

Bank Connection Diagram

The following figure illustrates how the native banks on the NI 2531 connect using the NI TB-2651 to create the 1-wire dual 8×32 matrix topology.



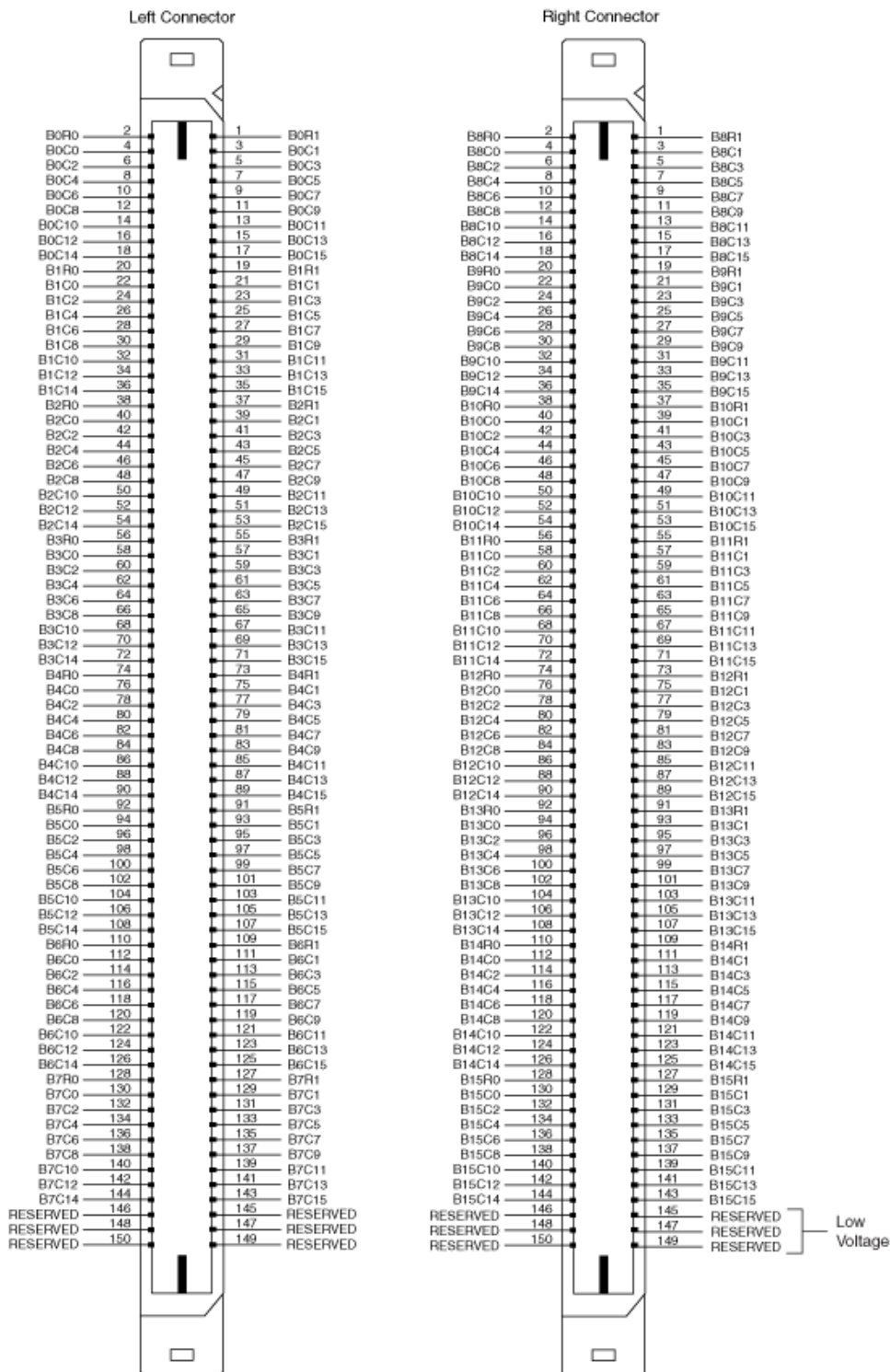
Terminal Block Connector Pinouts

The following figure identifies the pins for the NI TB-2651 connectors.

Top Connector			Bottom Connector		
B0R3	68	34	B0R1	68	34
B0R2	67	33	B0R0	67	33
RESERVED	66	32	B0C0	66	32
RESERVED	65	31	B0C1	65	31
RESERVED	64	30	B0C2	64	30
RESERVED	63	29	B0C3	63	29
RESERVED	62	28	B0C4	62	28
RESERVED	61	27	B0C5	61	27
RESERVED	60	26	B0C6	60	26
RESERVED	59	25	B0C7	59	25
RESERVED	58	24	B0C8	58	24
RESERVED	57	23	B0C9	57	23
RESERVED	56	22	B0C10	56	22
RESERVED	55	21	B0C11	55	21
RESERVED	54	20	B0C12	54	20
RESERVED	53	19	B0C13	53	19
RESERVED	52	18	B0C14	52	18
RESERVED	51	17	B0C15	51	17
RESERVED	50	16	B0C16	50	16
RESERVED	49	15	B0C17	49	15
RESERVED	48	14	B0C18	48	14
RESERVED	47	13	B0C19	47	13
RESERVED	46	12	B0C20	46	12
RESERVED	45	11	B0C21	45	11
RESERVED	44	10	B0C22	44	10
RESERVED	43	9	B0C23	43	9
RESERVED	42	8	B0C24	42	8
RESERVED	41	7	B0C25	41	7
RESERVED	40	6	B0C26	40	6
RESERVED	39	5	B0C27	39	5
B0R7	38	4	B0C28	38	4
B0R6	37	3	B0C29	37	3
B0R5	36	2	B0C30	36	2
B0R4	35	1	B0C31	35	1

Pinout

The following figure identifies the pins for the NI 2531.



Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)

NI PXI/PXIe-2532/2532B

The NI PXI/PXIe-2532 and NI PXI/PXIe-2532B (NI 2532/2532B) are 512-crosspoint, high-density matrix switch modules for the PXI or PXI Express platform. The NI 2532/2532B are designed for switching high and low voltages.



Note In MAX, both the NI PXI-2532 and NI PXI-2532B appear as "NI PXI-2532" and both the NI PXIe-2532 and NI PXIe-2532B appear as "NI PXIe-2532".



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI 2532/2532B and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 4×128 Matrix	2532/1-Wire 4x128 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_4X128_MATRIX)	✓	✓
1-Wire 8×64 Matrix	2532/1-Wire 8x64 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_8X64_MATRIX)	✓	✓
1-Wire 16×32 Matrix	2532/1-Wire 16x32 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_16X32_MATRIX)	✓	✓
1-Wire Dual 4×64 Matrix	2532/1-Wire Dual 4x64 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_DUAL_4X64_MATRIX)	✓	✓

Topology	Software Name	Immediate	Scanning
1-Wire Dual 8×32 Matrix	2532/1-Wire Dual 8x32 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_DUAL_8X32_MATRIX)	✓	✓
1-Wire Dual 16×16 Matrix	2532/1-Wire Dual 16x16 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_DUAL_16X16_MATRIX)	✓	✓
1-Wire Quad 4×32 Matrix	2532/1-Wire Quad 4x32 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_QUAD_4X32_MATRIX)	✓	✓
1-Wire Sixteen 2×16 Matrix	2532/1-Wire Sixteen 2x16 Matrix(NISWITCH_TOPOLOGY_2532_1_WIRE_SIXTEEN_2X16_MATRIX)	✓	✓
2-Wire 4×64 Matrix	2532/2-Wire 4x64 Matrix(NISWITCH_TOPOLOGY_2532_2_WIRE_4X64_MATRIX)	✓	✓
2-Wire 8×32 Matrix	2532/2-Wire 8x32 Matrix(NISWITCH_TOPOLOGY_2532_2_WIRE_8X32_MATRIX)	✓	✓
2-Wire 16×16 Matrix	2532/2-Wire 16x16 Matrix(NISWITCH_TOPOLOGY_2532_2_WIRE_16X16_MATRIX)	✓	✓
2-Wire Dual 4×32 Matrix	2532/2-Wire Dual 4x32 Matrix(NISWITCH_TOPOLOGY_2532_2_WIRE_DUAL_4X32_MATRIX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2532/2532B 1-Wire 4×128 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire 8×64 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire 16×32 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire Dual 4×64 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire Dual 8×32 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire Dual 16×16 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire Quad 4×32 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 1-Wire Sixteen 2×16 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 2-Wire 4×64 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 2-Wire 8×32 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 2-Wire 16×16 Matrix Topology](#)
- [NI PXI/PXIe-2532/2532B 2-Wire Dual 4×32 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2532 Relay Replacement

The NI PXI/PXIe-2532 uses reed relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
Meder	CRR05-1A

Complete the following sets of steps to disassemble your switch module, replace a failed relay, and reassemble your switch module.

Disassemble the Switch Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your switch module from electrostatic discharge.

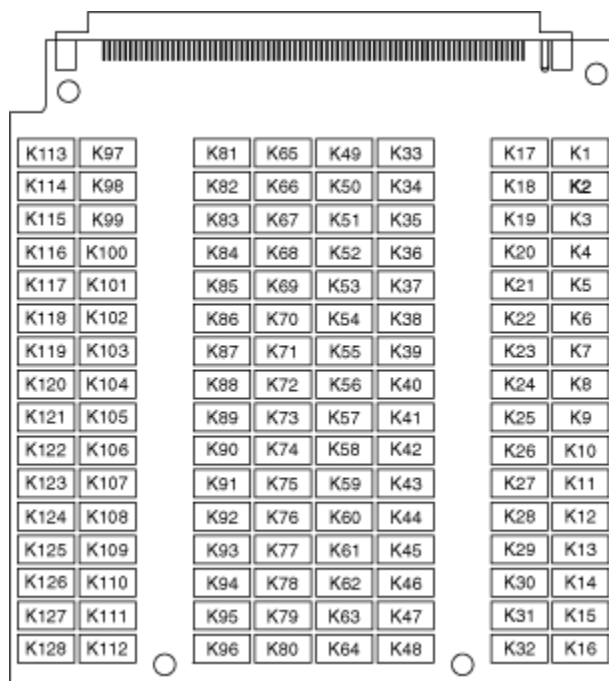
2. Locate the relay you want to replace.
 - a. Determine the relay name using the Bank Connection Diagram for your topology.
 - b. Match the relay name to its corresponding reference designator and locate the relay using the following figures and tables.



Note The reference designator locations for the top and bottom mezzanine boards are identical. Relays are located on both sides of each mezzanine board.

Top-Left Notched Side of Mezzanine Boards

The following figure illustrates relay locations on the side of each mezzanine board that has a notch in the top left corner.



Top-Right Notched Side of Mezzanine Boards

The following figure illustrates relay locations on the side of each mezzanine board that has a notch in the top right corner.

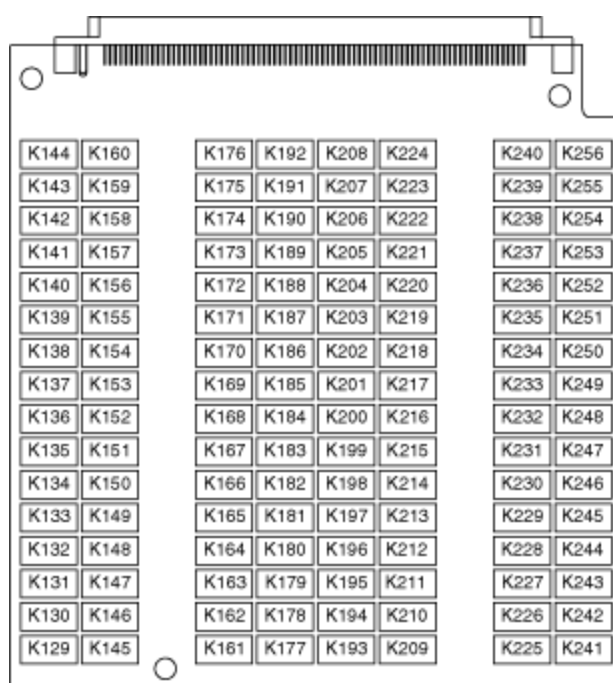


Table 10. Top Mezzanine Board Relay Locations

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B8R0C0	K144	B10R0C0	K176	B12R0C0	K193
B8R0C1	K143	B10R0C1	K175	B12R0C1	K194
B8R0C2	K142	B10R0C2	K174	B12R0C2	K195
B8R0C3	K141	B10R0C3	K173	B12R0C3	K196
B8R0C4	K140	B10R0C4	K172	B12R0C4	K197
B8R0C5	K139	B10R0C5	K171	B12R0C5	K198
B8R0C6	K138	B10R0C6	K170	B12R0C6	K199
B8R0C7	K137	B10R0C7	K169	B12R0C7	K200
B8R0C8	K136	B10R0C8	K168	B12R0C8	K201
B8R0C9	K135	B10R0C9	K167	B12R0C9	K202
B8R0C10	K134	B10R0C10	K166	B12R0C10	K203
B8R0C11	K133	B10R0C11	K165	B12R0C11	K204
B8R0C12	K132	B10R0C12	K164	B12R0C12	K205
B8R0C13	K131	B10R0C13	K163	B12R0C13	K206
B8R0C14	K130	B10R0C14	K162	B12R0C14	K207

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B8R0C15	K129	B10R0C15	K161	B12R0C15	K208
B8R1C0	K1	B10R1C0	K33	B12R1C0	K80
B8R1C1	K2	B10R1C1	K34	B12R1C1	K79
B8R1C2	K3	B10R1C2	K35	B12R1C2	K78
B8R1C3	K4	B10R1C3	K36	B12R1C3	K77
B8R1C4	K5	B10R1C4	K37	B12R1C4	K76
B8R1C5	K6	B10R1C5	K38	B12R1C5	K75
B8R1C6	K7	B10R1C6	K39	B12R1C6	K74
B8R1C7	K8	B10R1C7	K40	B12R1C7	K73
B8R1C8	K9	B10R1C8	K41	B12R1C8	K72
B8R1C9	K10	B10R1C9	K42	B12R1C9	K71
B8R1C10	K11	B10R1C10	K43	B12R1C10	K70
B8R1C11	K12	B10R1C11	K44	B12R1C11	K69
B8R1C12	K13	B10R1C12	K45	B12R1C12	K68
B8R1C13	K14	B10R1C13	K46	B12R1C13	K67
B8R1C14	K15	B10R1C14	K47	B12R1C14	K66
B8R1C15	K16	B10R1C15	K48	B12R1C15	K65
B9R0C0	K160	B11R0C0	K192	B13R0C0	K209
B9R0C1	K159	B11R0C1	K191	B13R0C1	K210
B9R0C2	K158	B11R0C2	K190	B13R0C2	K211
B9R0C3	K157	B11R0C3	K189	B13R0C3	K212
B9R0C4	K156	B11R0C4	K188	B13R0C4	K213
B9R0C5	K155	B11R0C5	K187	B13R0C5	K214
B9R0C6	K154	B11R0C6	K186	B13R0C6	K215
B9R0C7	K153	B11R0C7	K185	B13R0C7	K216
B9R0C8	K152	B11R0C8	K184	B13R0C8	K217
B9R0C9	K151	B11R0C9	K183	B13R0C9	K218

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B9R0C10	K150	B11R0C10	K182	B13R0C10	K219
B9R0C11	K149	B11R0C11	K181	B13R0C11	K220
B9R0C12	K148	B11R0C12	K180	B13R0C12	K221
B9R0C13	K147	B11R0C13	K179	B13R0C13	K222
B9R0C14	K146	B11R0C14	K178	B13R0C14	K223
B9R0C15	K145	B11R0C15	K177	B13R0C15	K224
B9R1C0	K17	B11R1C0	K49	B13R1C0	K96
B9R1C1	K18	B11R1C1	K50	B13R1C1	K95
B9R1C2	K19	B11R1C2	K51	B13R1C2	K94
B9R1C3	K20	B11R1C3	K52	B13R1C3	K93
B9R1C4	K21	B11R1C4	K53	B13R1C4	K92
B9R1C5	K22	B11R1C5	K54	B13R1C5	K91
B9R1C6	K23	B11R1C6	K55	B13R1C6	K90
B9R1C7	K24	B11R1C7	K56	B13R1C7	K89
B9R1C8	K25	B11R1C8	K57	B13R1C8	K88
B9R1C9	K26	B11R1C9	K58	B13R1C9	K87
B9R1C10	K27	B11R1C10	K59	B13R1C10	K86
B9R1C11	K28	B11R1C11	K60	B13R1C11	K85
B9R1C12	K29	B11R1C12	K61	B13R1C12	K84
B9R1C13	K30	B11R1C13	K62	B13R1C13	K83
B9R1C14	K31	B11R1C14	K63	B13R1C14	K82
B9R1C15	K32	B11R1C15	K64	B13R1C15	K81

Table 11. Bottom Mezzanine Board Relay Locations

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R0C0	K144	B2R0C0	K176	B4R0C0	K193
B0R0C1	K143	B2R0C1	K175	B4R0C1	K194

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R0C2	K142	B2R0C2	K174	B4R0C2	K195
B0R0C3	K141	B2R0C3	K173	B4R0C3	K196
B0R0C4	K140	B2R0C4	K172	B4R0C4	K197
B0R0C5	K139	B2R0C5	K171	B4R0C5	K198
B0R0C6	K138	B2R0C6	K170	B4R0C6	K199
B0R0C7	K137	B2R0C7	K169	B4R0C7	K200
B0R0C8	K136	B2R0C8	K168	B4R0C8	K201
B0R0C9	K135	B2R0C9	K167	B4R0C9	K202
B0R0C10	K134	B2R0C10	K166	B4R0C10	K203
B0R0C11	K133	B2R0C11	K165	B4R0C11	K204
B0R0C12	K132	B2R0C12	K164	B4R0C12	K205
B0R0C13	K131	B2R0C13	K163	B4R0C13	K206
B0R0C14	K130	B2R0C14	K162	B4R0C14	K207
B0R0C15	K129	B2R0C15	K161	B4R0C15	K208
B0R1C0	K1	B2R1C0	K33	B4R1C0	K80
B0R1C1	K2	B2R1C1	K34	B4R1C1	K79
B0R1C2	K3	B2R1C2	K35	B4R1C2	K78
B0R1C3	K4	B2R1C3	K36	B4R1C3	K77
B0R1C4	K5	B2R1C4	K37	B4R1C4	K76
B0R1C5	K6	B2R1C5	K38	B4R1C5	K75
B0R1C6	K7	B2R1C6	K39	B4R1C6	K74
B0R1C7	K8	B2R1C7	K40	B4R1C7	K73
B0R1C8	K9	B2R1C8	K41	B4R1C8	K72
B0R1C9	K10	B2R1C9	K42	B4R1C9	K71
B0R1C10	K11	B2R1C10	K43	B4R1C10	K70
B0R1C11	K12	B2R1C11	K44	B4R1C11	K69
B0R1C12	K13	B2R1C12	K45	B4R1C12	K68

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R1C13	K14	B2R1C13	K46	B4R1C13	K67
B0R1C14	K15	B2R1C14	K47	B4R1C14	K66
B0R1C15	K16	B2R1C15	K48	B4R1C15	K65
B1R0C0	K160	B3R0C0	K192	B5R0C0	K209
B1R0C1	K159	B3R0C1	K191	B5R0C1	K210
B1R0C2	K158	B3R0C2	K190	B5R0C2	K211
B1R0C3	K157	B3R0C3	K189	B5R0C3	K212
B1R0C4	K156	B3R0C4	K188	B5R0C4	K213
B1R0C5	K155	B3R0C5	K187	B5R0C5	K214
B1R0C6	K154	B3R0C6	K186	B5R0C6	K215
B1R0C7	K153	B3R0C7	K185	B5R0C7	K216
B1R0C8	K152	B3R0C8	K184	B5R0C8	K217
B1R0C9	K151	B3R0C9	K183	B5R0C9	K218
B1R0C10	K150	B3R0C10	K182	B5R0C10	K219
B1R0C11	K149	B3R0C11	K181	B5R0C11	K220
B1R0C12	K148	B3R0C12	K180	B5R0C12	K221
B1R0C13	K147	B3R0C13	K179	B5R0C13	K222
B1R0C14	K146	B3R0C14	K178	B5R0C14	K223
B1R0C15	K145	B3R0C15	K177	B5R0C15	K224
B1R1C0	K17	B3R1C0	K49	B5R1C0	K96
B1R1C1	K18	B3R1C1	K50	B5R1C1	K95
B1R1C2	K19	B3R1C2	K51	B5R1C2	K94
B1R1C3	K20	B3R1C3	K52	B5R1C3	K93
B1R1C4	K21	B3R1C4	K53	B5R1C4	K92
B1R1C5	K22	B3R1C5	K54	B5R1C5	K91
B1R1C6	K23	B3R1C6	K55	B5R1C6	K90
B1R1C7	K24	B3R1C7	K56	B5R1C7	K89

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B1R1C8	K25	B3R1C8	K57	B5R1C8	K88
B1R1C9	K26	B3R1C9	K58	B5R1C9	K87
B1R1C10	K27	B3R1C10	K59	B5R1C10	K86
B1R1C11	K28	B3R1C11	K60	B5R1C11	K85
B1R1C12	K29	B3R1C12	K61	B5R1C12	K84
B1R1C13	K30	B3R1C13	K62	B5R1C13	K83
B1R1C14	K31	B3R1C14	K63	B5R1C14	K82
B1R1C15	K32	B3R1C15	K64	B5R1C15	K81

- c. Use the reference designator to locate the relay on the mezzanine board.



Note Reference designators are printed on the mezzanine boards.

3. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L.

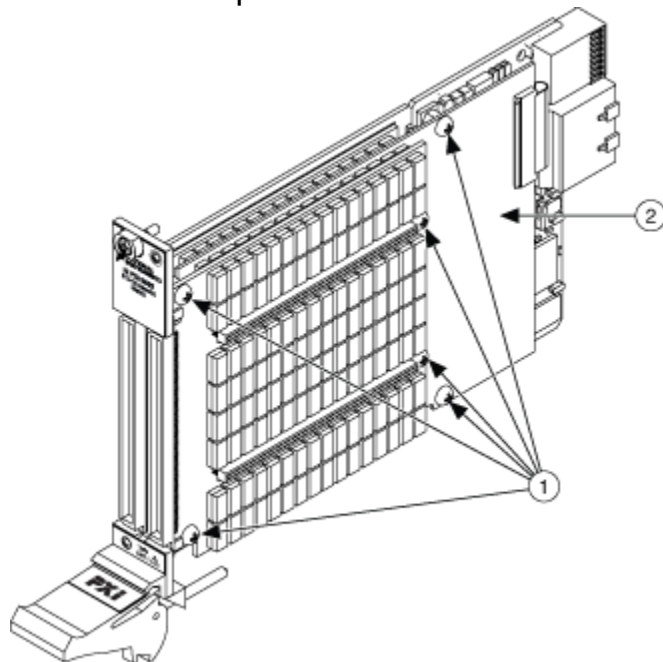


4. Disassemble the module. Refer to Disconnecting the Top Mezzanine Board if the relay you want to replace is located on the top mezzanine board. Refer to Disconnecting the Bottom Mezzanine Board if the relay you want to replace is located on the bottom mezzanine board. Refer to both procedures if you would like to replace relays on both boards.

Disconnecting the Top Mezzanine Board

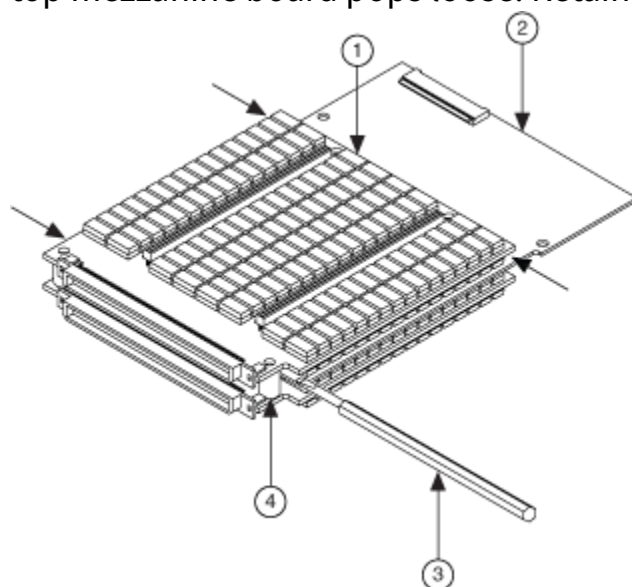
Complete the following steps to disconnect the top mezzanine board from the driver board.

1. Remove the top mezzanine board screws.



1	Mezzanine Board Screws
2	Driver Board

2. Use a plastic screwdriver to gently pry the top mezzanine board from the driver board, prying a little at each corner for an even distribution of pressure until the top mezzanine board pops loose. Retain the spacers from between the boards.



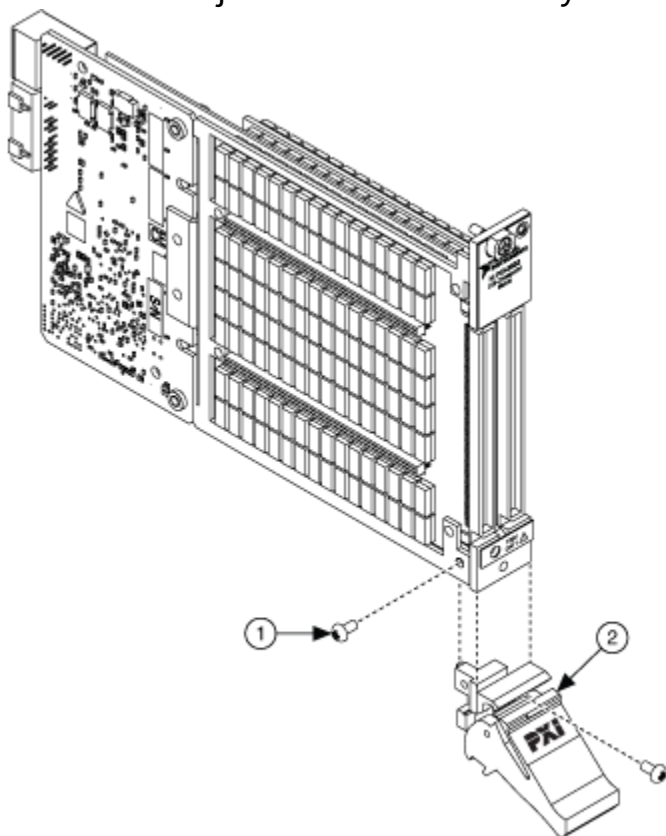
1	Top Mezzanine Board

2	Driver Board
3	Plastic Screwdriver
4	Spacer

Disconnecting the Bottom Mezzanine Board

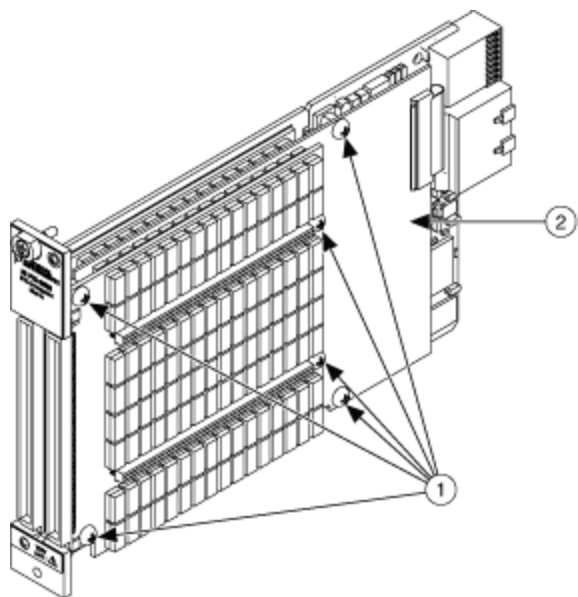
Complete the following steps to disconnect the bottom mezzanine board from the driver board.

1. Remove the ejector handle assembly screw.



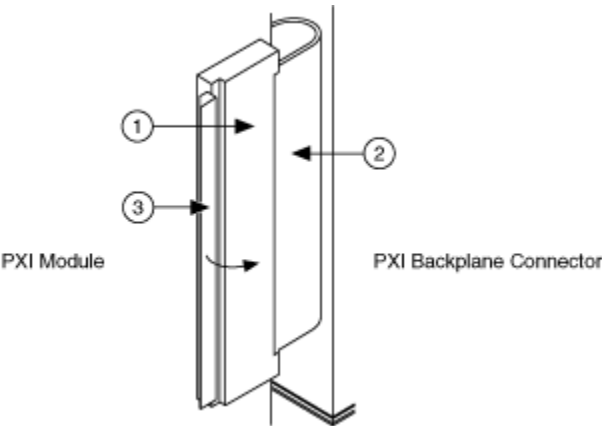
1	Ejector Handle Screw
2	Ejector Handle Assembly

2. Remove the mezzanine board screws.



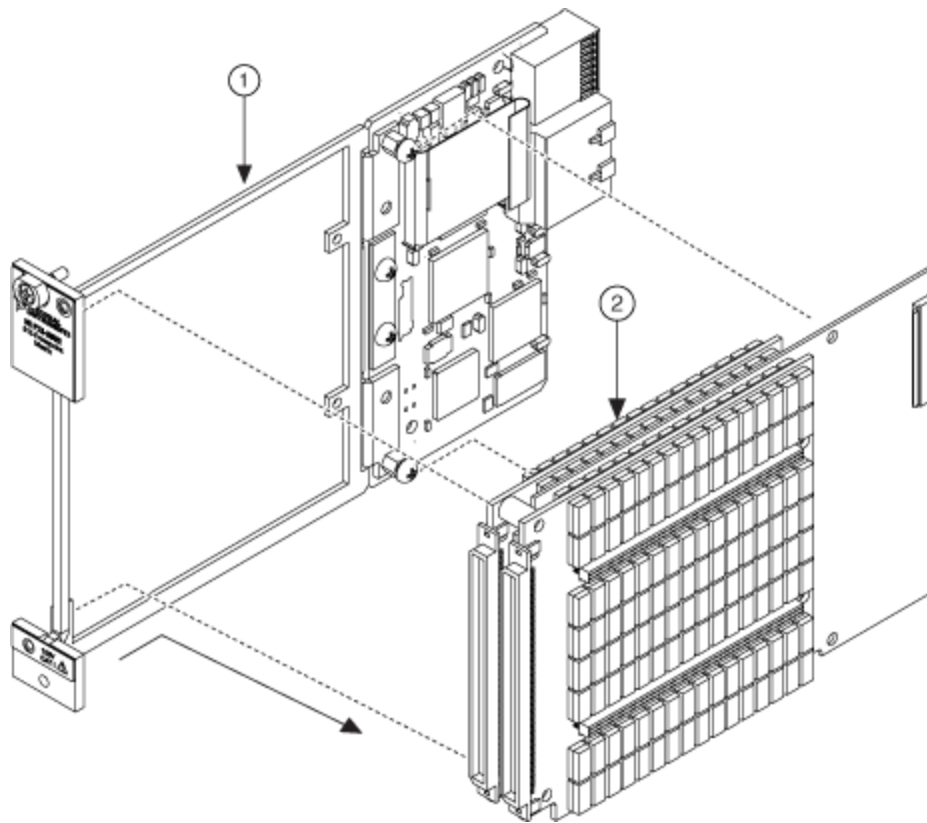
1	Mezzanine Board Screws
2	Driver Board

3. Disconnect the PCB interconnect cable by lifting the PCB cable latch on the J2 connector.



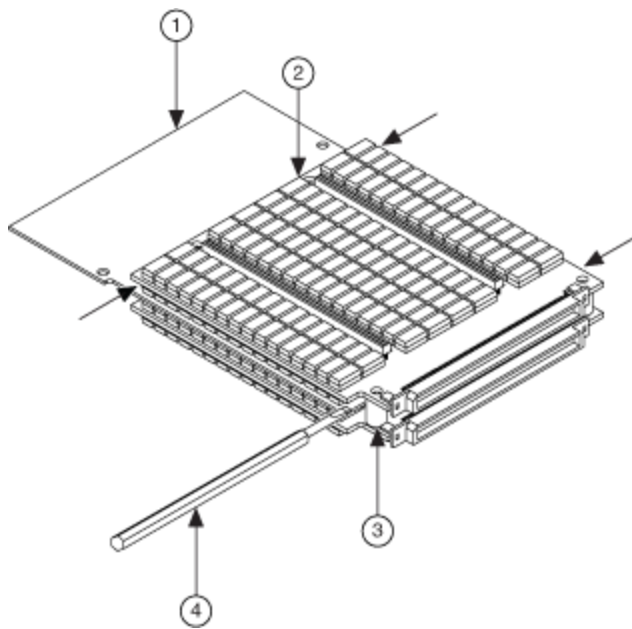
1	J2 Connector
2	PCB Interconnect Cable
3	PCB Cable Latch

4. Separate the daughterboard assembly from the CMI bracket.



1	CMI Bracket
2	Daughterboard Assembly

5. Use a plastic screwdriver to gently pry the bottom mezzanine board from the driver board, prying a little at each corner for an even distribution of pressure until the bottom mezzanine board pops loose. Retain the spacers from between the boards.



1	Driver Board
2	Bottom Mezzanine Board
3	Spacer
4	Plastic Screwdriver

Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Hot air rework station with hot air gun set to 316 °C (600 °F) for lead solder rework

- or 371 °C (700 °F) for lead-free solder rework
- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Fine tweezers

Complete the following steps to replace the relay:

1. Apply heat with the hot air gun for 30 to 45 seconds in a circular motion around the relay, keeping the hot air gun 0.75 to 1 inch (1.91 to 2.54 cm) above the daughterboard.
2. Gently lift the relay with tweezers to remove it from the PCB. If the relay does not lift easily, apply hot air in a circular motion around the relay two to three times and gently try to lift the relay again. Repeat until the solder reflows and the relay lifts easily.
3. Use the soldering iron to tin the leads of the new relay.
4. Use the soldering iron to create a uniform distribution of solder on the pads of the daughterboard PCB.
5. Use the hot air gun to heat the PCB and the relay leads.
6. Hold the new relay in place on the board with the tweezers while using the hot air gun to apply heat in a circular motion until the solder reflows.

Reassemble the Module

Refer to the following procedures to reconnect the boards that you disconnected in Disassemble the Switch Module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

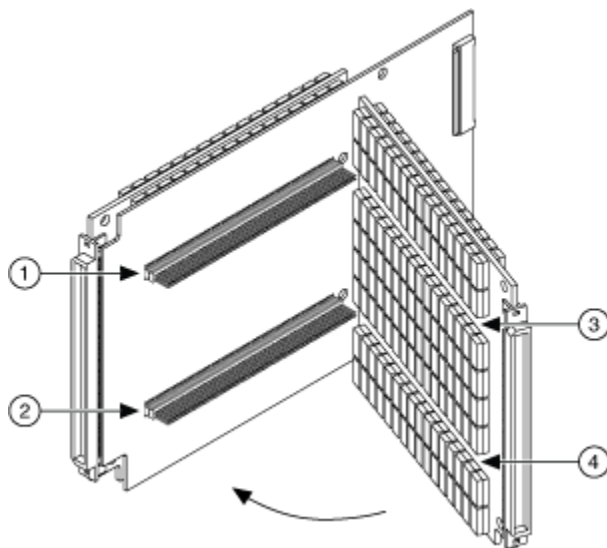
Reconnecting the Top Mezzanine Board

Complete the following steps to reconnect the top mezzanine board to the driver board.

1. Align pin holes 179 and 180 on the J4 and J5 connectors of the top mezzanine board with pins 179 and 180 of the J3 and J4 connectors on the driver board. Gently fold the mezzanine board over onto the driver board as shown in the following figure. Leave approximately 6 mm of clearance between the mezzanine board and the driver board. Do not press the boards together.



Note Ensure the black surface mount J2 and J3 connectors on the mezzanine board face away from the driver board, and the notch in the corner of the mezzanine board faces the bottom front of the module.



1	Driver Board J4 Connector
2	Driver Board J3 Connector
3	Mezzanine Board J4 Connector
4	Mezzanine Board J5 Connector

2. Replace the spacers between the driver board and top mezzanine board.
3. Secure the top mezzanine board to the driver board using the screws from step 1.

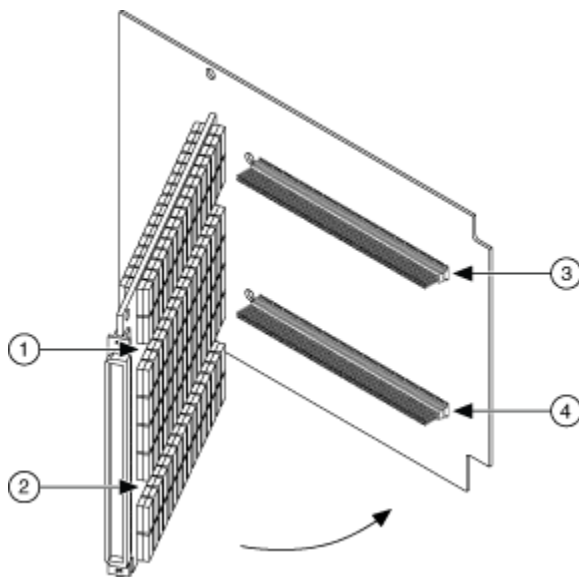
Reconnecting the Bottom Mezzanine Board

Complete the following steps to reconnect the bottom mezzanine board to the driver board.

1. Align pin holes 179 and 180 on the J2 and J3 connectors of the bottom mezzanine board with pins 179 and 180 of the J5 and J6 connectors on the driver board. Gently fold the mezzanine board over onto the driver board as shown in the following figure. Leave approximately 6 mm of clearance between the mezzanine board and the driver board. Do not press the boards together.



Note Ensure the black surface mount J4 and J5 connectors on the mezzanine board face away from the driver board, and the notch in the corner of the mezzanine board faces the bottom front of the module.



1	Mezzanine Board J2 Connector
2	Mezzanine Board J3 Connector
3	Driver Board J5 Connector
4	Driver Board J6 Connector

2. Connect the PCB interconnect cable to the J2 connector on the bottom mezzanine board.
3. Reconnect the daughterboard to the CMI bracket.
4. Replace the spacers between the driver board and bottom mezzanine board.
5. Secure the daughterboard assembly to the CMI bracket using the screws from step 2.
6. Replace the ejector handle assembly screw from step 1.

NI PXI/PXIe-2532B Relay Replacement

The NI PXI/PXIe-2532B uses reed relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
Meder	CRR05-1A

Complete the following sets of steps to disassemble your switch module, replace a failed relay, and reassemble your switch module.

Disassemble the Switch Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your switch module from electrostatic discharge.

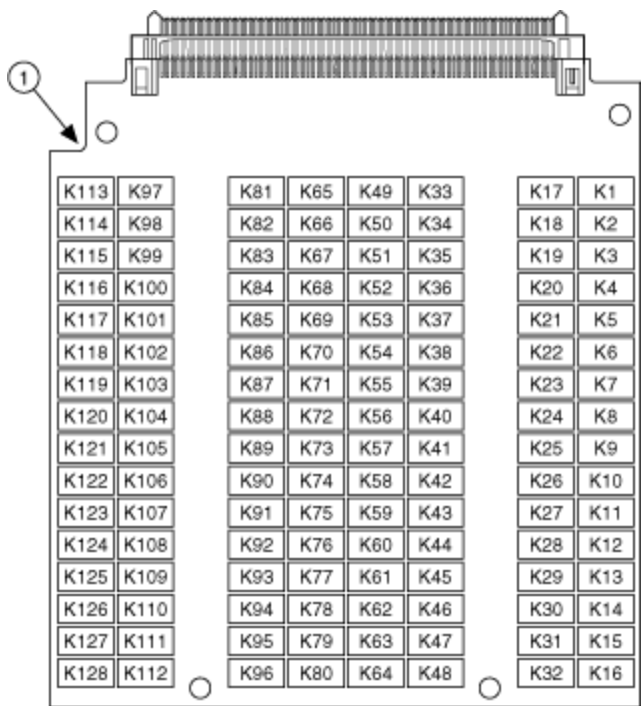
2. Locate the relay you want to replace.
 - a. Determine the relay name using the Bank Connection Diagram for your topology.
 - b. Match the relay name to its corresponding reference designator and locate the relay using the following figures and tables.



Note The reference designator locations for the top and bottom mezzanine boards are identical. Relays are located on both sides of each mezzanine board.

Top-Left Notched Side of Mezzanine Boards

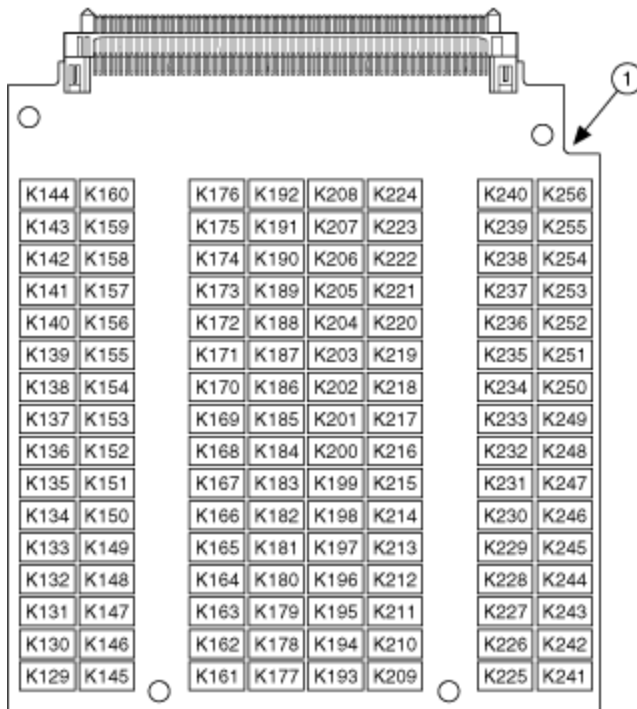
The following figure illustrates relay locations on the side of each mezzanine board that has notch in the top left corner.



1	Left Notch

Top-Right Notched Side of Mezzanine Boards

The following figure illustrates relay locations on the side of each mezzanine board that has a notch in the top right corner.



1	Right Notch

Table 12. Top Mezzanine Board Relay Locations

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B8R0C0	K144	B10R0C0	K176	B12R0C0	K193
B8R0C1	K143	B10R0C1	K175	B12R0C1	K194
B8R0C2	K142	B10R0C2	K174	B12R0C2	K195
B8R0C3	K141	B10R0C3	K173	B12R0C3	K196
B8R0C4	K140	B10R0C4	K172	B12R0C4	K197
B8R0C5	K139	B10R0C5	K171	B12R0C5	K198
B8R0C6	K138	B10R0C6	K170	B12R0C6	K199
B8R0C7	K137	B10R0C7	K169	B12R0C7	K200
B8R0C8	K136	B10R0C8	K168	B12R0C8	K201
B8R0C9	K135	B10R0C9	K167	B12R0C9	K202
B8R0C10	K134	B10R0C10	K166	B12R0C10	K203
B8R0C11	K133	B10R0C11	K165	B12R0C11	K204

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B8R0C12	K132	B10R0C12	K164	B12R0C12	K205
B8R0C13	K131	B10R0C13	K163	B12R0C13	K206
B8R0C14	K130	B10R0C14	K162	B12R0C14	K207
B8R0C15	K129	B10R0C15	K161	B12R0C15	K208
B8R1C0	K1	B10R1C0	K33	B12R1C0	K80
B8R1C1	K2	B10R1C1	K34	B12R1C1	K79
B8R1C2	K3	B10R1C2	K35	B12R1C2	K78
B8R1C3	K4	B10R1C3	K36	B12R1C3	K77
B8R1C4	K5	B10R1C4	K37	B12R1C4	K76
B8R1C5	K6	B10R1C5	K38	B12R1C5	K75
B8R1C6	K7	B10R1C6	K39	B12R1C6	K74
B8R1C7	K8	B10R1C7	K40	B12R1C7	K73
B8R1C8	K9	B10R1C8	K41	B12R1C8	K72
B8R1C9	K10	B10R1C9	K42	B12R1C9	K71
B8R1C10	K11	B10R1C10	K43	B12R1C10	K70
B8R1C11	K12	B10R1C11	K44	B12R1C11	K69
B8R1C12	K13	B10R1C12	K45	B12R1C12	K68
B8R1C13	K14	B10R1C13	K46	B12R1C13	K67
B8R1C14	K15	B10R1C14	K47	B12R1C14	K66
B8R1C15	K16	B10R1C15	K48	B12R1C15	K65
B9R0C0	K160	B11R0C0	K192	B13R0C0	K209
B9R0C1	K159	B11R0C1	K191	B13R0C1	K210
B9R0C2	K158	B11R0C2	K190	B13R0C2	K211
B9R0C3	K157	B11R0C3	K189	B13R0C3	K212
B9R0C4	K156	B11R0C4	K188	B13R0C4	K213
B9R0C5	K155	B11R0C5	K187	B13R0C5	K214
B9R0C6	K154	B11R0C6	K186	B13R0C6	K215

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B9R0C7	K153	B11R0C7	K185	B13R0C7	K216
B9R0C8	K152	B11R0C8	K184	B13R0C8	K217
B9R0C9	K151	B11R0C9	K183	B13R0C9	K218
B9R0C10	K150	B11R0C10	K182	B13R0C10	K219
B9R0C11	K149	B11R0C11	K181	B13R0C11	K220
B9R0C12	K148	B11R0C12	K180	B13R0C12	K221
B9R0C13	K147	B11R0C13	K179	B13R0C13	K222
B9R0C14	K146	B11R0C14	K178	B13R0C14	K223
B9R0C15	K145	B11R0C15	K177	B13R0C15	K224
B9R1C0	K17	B11R1C0	K49	B13R1C0	K96
B9R1C1	K18	B11R1C1	K50	B13R1C1	K95
B9R1C2	K19	B11R1C2	K51	B13R1C2	K94
B9R1C3	K20	B11R1C3	K52	B13R1C3	K93
B9R1C4	K21	B11R1C4	K53	B13R1C4	K92
B9R1C5	K22	B11R1C5	K54	B13R1C5	K91
B9R1C6	K23	B11R1C6	K55	B13R1C6	K90
B9R1C7	K24	B11R1C7	K56	B13R1C7	K89
B9R1C8	K25	B11R1C8	K57	B13R1C8	K88
B9R1C9	K26	B11R1C9	K58	B13R1C9	K87
B9R1C10	K27	B11R1C10	K59	B13R1C10	K86
B9R1C11	K28	B11R1C11	K60	B13R1C11	K85
B9R1C12	K29	B11R1C12	K61	B13R1C12	K84
B9R1C13	K30	B11R1C13	K62	B13R1C13	K83
B9R1C14	K31	B11R1C14	K63	B13R1C14	K82
B9R1C15	K32	B11R1C15	K64	B13R1C15	K81

Table 13. Bottom Mezzanine Board Relay Locations

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R0C0	K144	B2R0C0	K176	B4R0C0	K193
B0R0C1	K143	B2R0C1	K175	B4R0C1	K194
B0R0C2	K142	B2R0C2	K174	B4R0C2	K195
B0R0C3	K141	B2R0C3	K173	B4R0C3	K196
B0R0C4	K140	B2R0C4	K172	B4R0C4	K197
B0R0C5	K139	B2R0C5	K171	B4R0C5	K198
B0R0C6	K138	B2R0C6	K170	B4R0C6	K199
B0R0C7	K137	B2R0C7	K169	B4R0C7	K200
B0R0C8	K136	B2R0C8	K168	B4R0C8	K201
B0R0C9	K135	B2R0C9	K167	B4R0C9	K202
B0R0C10	K134	B2R0C10	K166	B4R0C10	K203
B0R0C11	K133	B2R0C11	K165	B4R0C11	K204
B0R0C12	K132	B2R0C12	K164	B4R0C12	K205
B0R0C13	K131	B2R0C13	K163	B4R0C13	K206
B0R0C14	K130	B2R0C14	K162	B4R0C14	K207
B0R0C15	K129	B2R0C15	K161	B4R0C15	K208
B0R1C0	K1	B2R1C0	K33	B4R1C0	K80
B0R1C1	K2	B2R1C1	K34	B4R1C1	K79
B0R1C2	K3	B2R1C2	K35	B4R1C2	K78
B0R1C3	K4	B2R1C3	K36	B4R1C3	K77
B0R1C4	K5	B2R1C4	K37	B4R1C4	K76
B0R1C5	K6	B2R1C5	K38	B4R1C5	K75
B0R1C6	K7	B2R1C6	K39	B4R1C6	K74
B0R1C7	K8	B2R1C7	K40	B4R1C7	K73
B0R1C8	K9	B2R1C8	K41	B4R1C8	K72
B0R1C9	K10	B2R1C9	K42	B4R1C9	K71

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B0R1C10	K11	B2R1C10	K43	B4R1C10	K70
B0R1C11	K12	B2R1C11	K44	B4R1C11	K69
B0R1C12	K13	B2R1C12	K45	B4R1C12	K68
B0R1C13	K14	B2R1C13	K46	B4R1C13	K67
B0R1C14	K15	B2R1C14	K47	B4R1C14	K66
B0R1C15	K16	B2R1C15	K48	B4R1C15	K65
B1R0C0	K160	B3R0C0	K192	B5R0C0	K209
B1R0C1	K159	B3R0C1	K191	B5R0C1	K210
B1R0C2	K158	B3R0C2	K190	B5R0C2	K211
B1R0C3	K157	B3R0C3	K189	B5R0C3	K212
B1R0C4	K156	B3R0C4	K188	B5R0C4	K213
B1R0C5	K155	B3R0C5	K187	B5R0C5	K214
B1R0C6	K154	B3R0C6	K186	B5R0C6	K215
B1R0C7	K153	B3R0C7	K185	B5R0C7	K216
B1R0C8	K152	B3R0C8	K184	B5R0C8	K217
B1R0C9	K151	B3R0C9	K183	B5R0C9	K218
B1R0C10	K150	B3R0C10	K182	B5R0C10	K219
B1R0C11	K149	B3R0C11	K181	B5R0C11	K220
B1R0C12	K148	B3R0C12	K180	B5R0C12	K221
B1R0C13	K147	B3R0C13	K179	B5R0C13	K222
B1R0C14	K146	B3R0C14	K178	B5R0C14	K223
B1R0C15	K145	B3R0C15	K177	B5R0C15	K224
B1R1C0	K17	B3R1C0	K49	B5R1C0	K96
B1R1C1	K18	B3R1C1	K50	B5R1C1	K95
B1R1C2	K19	B3R1C2	K51	B5R1C2	K94
B1R1C3	K20	B3R1C3	K52	B5R1C3	K93
B1R1C4	K21	B3R1C4	K53	B5R1C4	K92

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
B1R1C5	K22	B3R1C5	K54	B5R1C5	K91
B1R1C6	K23	B3R1C6	K55	B5R1C6	K90
B1R1C7	K24	B3R1C7	K56	B5R1C7	K89
B1R1C8	K25	B3R1C8	K57	B5R1C8	K88
B1R1C9	K26	B3R1C9	K58	B5R1C9	K87
B1R1C10	K27	B3R1C10	K59	B5R1C10	K86
B1R1C11	K28	B3R1C11	K60	B5R1C11	K85
B1R1C12	K29	B3R1C12	K61	B5R1C12	K84
B1R1C13	K30	B3R1C13	K62	B5R1C13	K83
B1R1C14	K31	B3R1C14	K63	B5R1C14	K82
B1R1C15	K32	B3R1C15	K64	B5R1C15	K81

- c. Use the reference designator to locate the relay on the mezzanine board.



Note Reference designators are printed on the mezzanine boards.

3. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L.

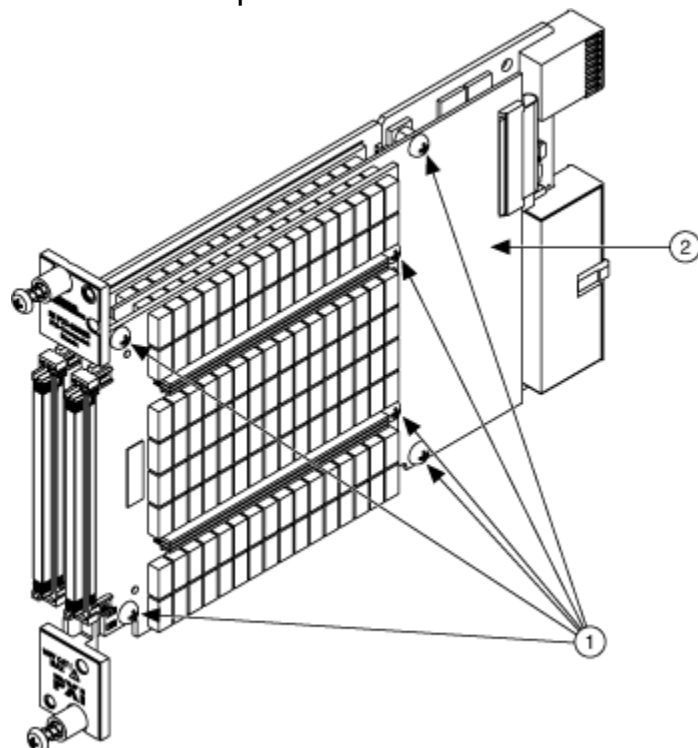


4. Disassemble the module. Refer to Disconnecting the Top Mezzanine Board if the relay you want to replace is located on the top mezzanine board. Refer to Disconnecting the Bottom Mezzanine Board if the relay you want to replace is located on the bottom mezzanine board. Refer to both procedures if you would like to replace relays on both boards.

Disconnecting the Top Mezzanine Board

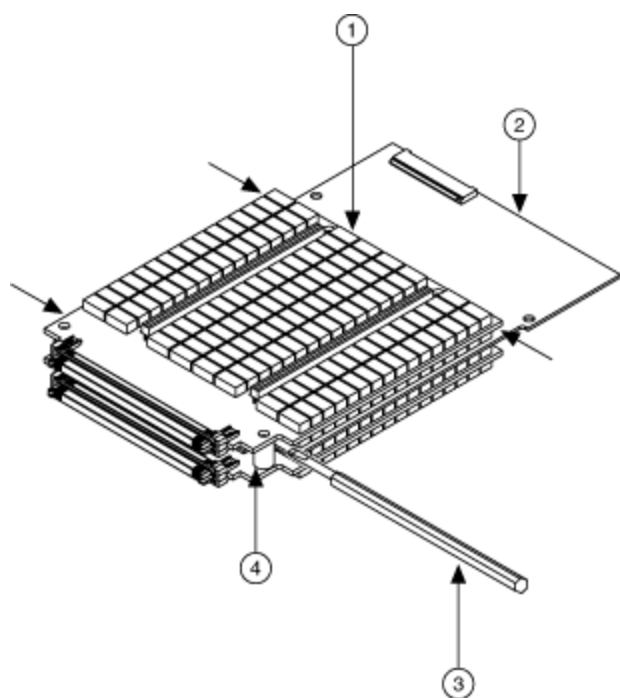
Complete the following steps to disconnect the top mezzanine board from the driver board.

1. Remove the top mezzanine board screws.



1	Mezzanine Board Screws
2	Driver Board

2. Use a plastic screwdriver to gently pry the top mezzanine board from the driver board, prying a little at each corner for an even distribution of pressure until the top mezzanine board pops loose. Retain the spacers from between the boards.

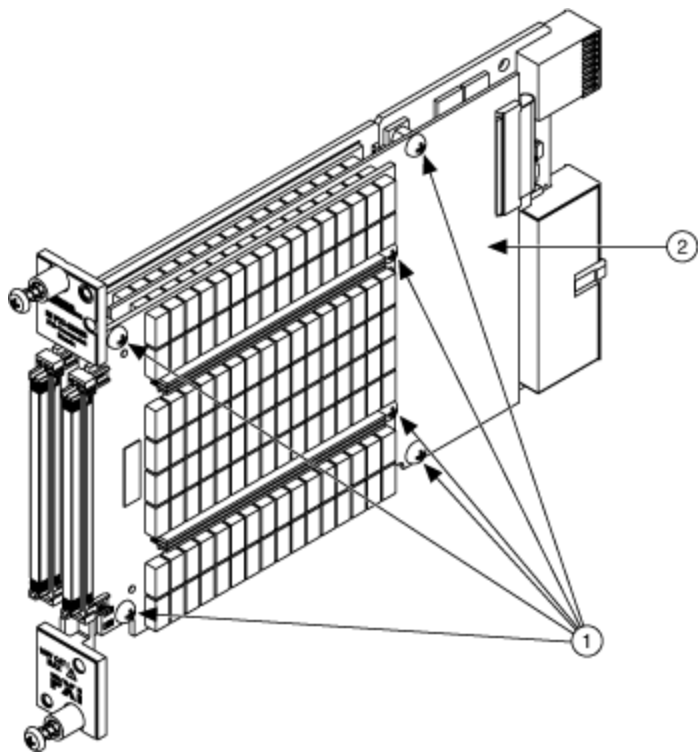


1	Top Mezzanine Board
2	Driver Board
3	Plastic Screwdriver
4	Spacer

Disconnecting the Bottom Mezzanine Board

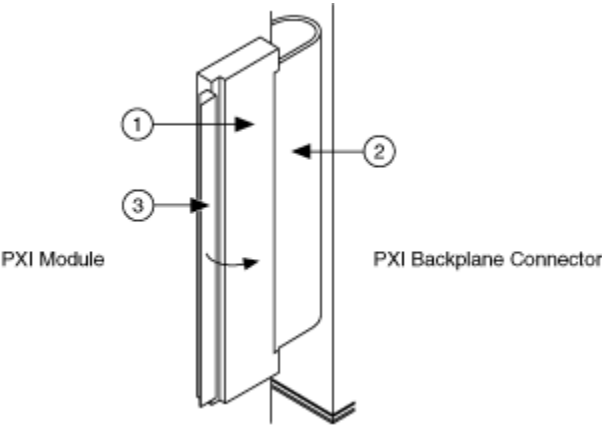
Complete the following steps to disconnect the bottom mezzanine board from the driver board.

1. Remove the mezzanine board screws.



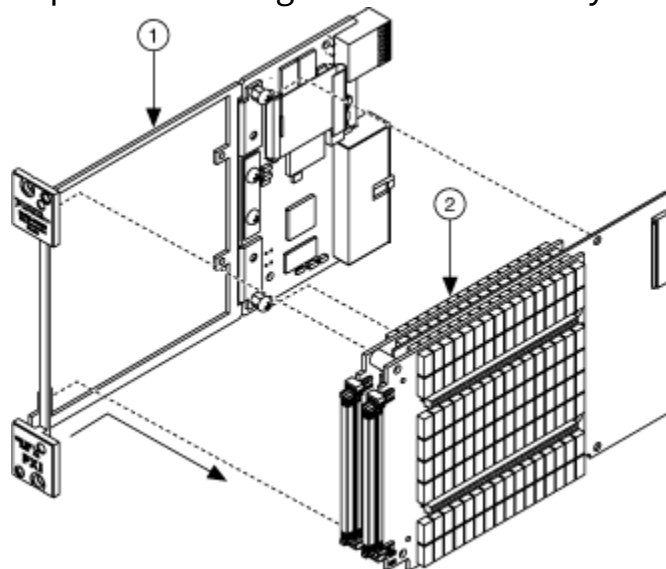
1	Mezzanine Board Screws
2	Driver Board

2. Disconnect the PCB interconnect cable by lifting the PCB cable latch on the J2 connector.



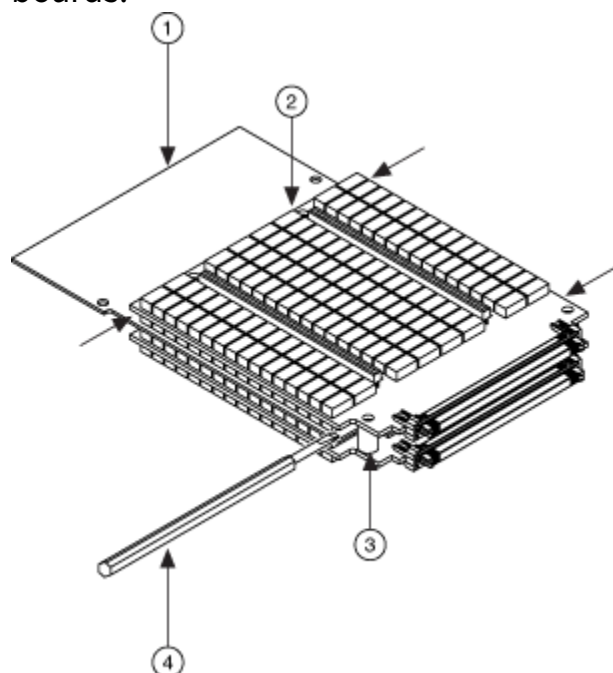
1	J2 Connector
2	PCB Interconnect Cable
3	PCB Cable Latch

3. Separate the daughterboard assembly from the CMI bracket.



1	CMI Bracket
2	Daughterboard Assembly

4. Use a plastic screwdriver to gently pry the bottom mezzanine board from the driver board, prying a little at each corner for an even distribution of pressure until the bottom mezzanine board pops loose. Retain the spacers from between the boards.



1	Driver Board
2	Bottom Mezzanine Board
3	Spacer
4	Plastic Screwdriver

Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Hot air rework station with hot air gun set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Fine tweezers

Complete the following steps to replace the relay:

1. Apply heat with the hot air gun for 30 to 45 seconds in a circular motion around the relay, keeping the hot air gun 0.75 to 1 inch (1.91 to 2.54 cm) above the daughterboard.
2. Gently lift the relay with tweezers to remove it from the PCB. If the relay does not lift easily, apply hot air in a circular motion around the relay two to three times and

gently try to lift the relay again. Repeat until the solder reflows and the relay lifts easily.

3. Use the soldering iron to tin the leads of the new relay.
4. Use the soldering iron to create a uniform distribution of solder on the pads of the daughterboard PCB.
5. Use the hot air gun to heat the PCB and the relay leads.
6. Hold the new relay in place on the board with the tweezers while using the hot air gun to apply heat in a circular motion until the solder reflows.

Reassemble the Module

Refer to the following procedures to reconnect the boards that you disconnected in Disassemble the Switch Module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

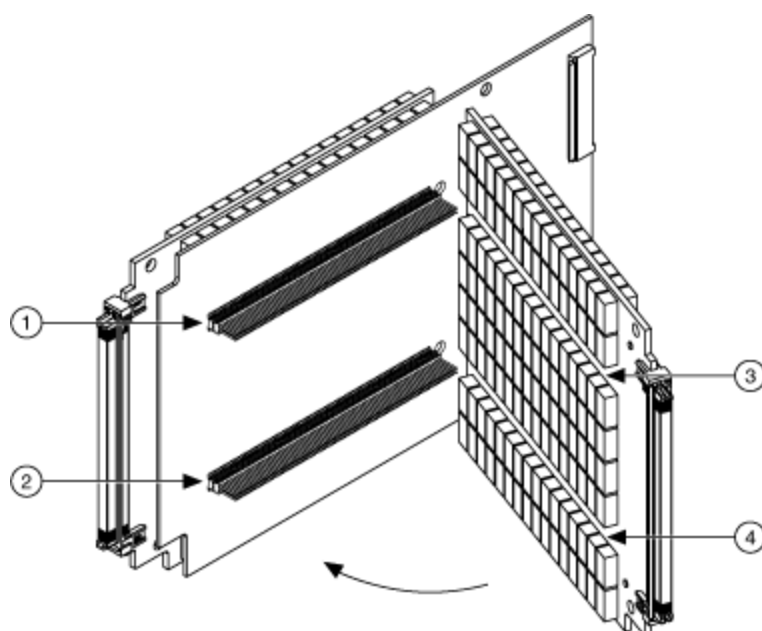
Reconnecting the Top Mezzanine Board

Complete the following steps to reconnect the top mezzanine board to the driver board.

1. Align pin holes 179 and 180 on the J4 and J5 connectors of the top mezzanine board with pins 179 and 180 of the J3 and J4 connectors on the driver board. Gently fold the mezzanine board over onto the driver board as shown in the following figure. Leave approximately 6 mm of clearance between the mezzanine board and the driver board. Do not press the boards together.



Note Ensure the black surface mount J2 and J3 connectors on the mezzanine board face away from the driver board, and the notch in the corner of the mezzanine board faces the bottom front of the module.



1	Driver Board J4 Connector
2	Driver Board J3 Connector
3	Mezzanine Board J4 Connector
4	Mezzanine Board J5 Connector

2. Replace the spacers between the driver board and top mezzanine board.
3. Secure the top mezzanine board to the driver board using the screws from step 1.

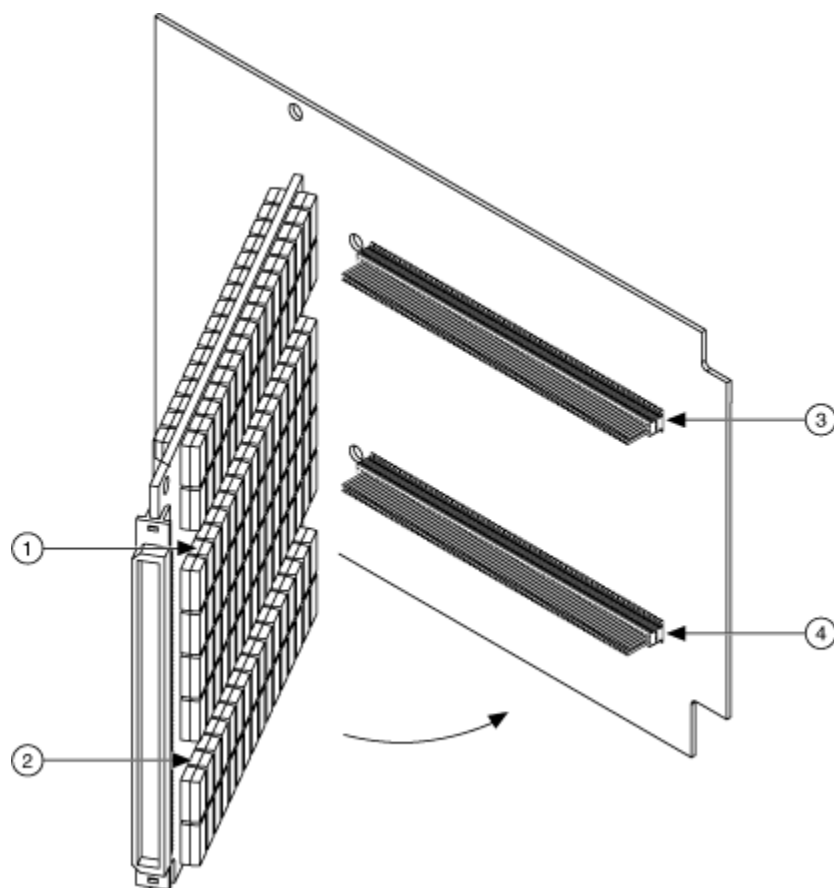
Reconnecting the Bottom Mezzanine Board

Complete the following steps to reconnect the bottom mezzanine board to the driver board.

1. Align pin holes 179 and 180 on the J2 and J3 connectors of the bottom mezzanine board with pins 179 and 180 of the J5 and J6 connectors on the driver board. Gently fold the mezzanine board over onto the driver board as shown in the following figure. Leave approximately 6 mm of clearance between the mezzanine board and the driver board. Do not press the boards together.



Note Ensure the black surface mount J4 and J5 connectors on the mezzanine board face away from the driver board, and the notch in the corner of the mezzanine board faces the bottom front of the module.



1	Mezzanine Board J2 Connector
2	Mezzanine Board J3 Connector
3	Driver Board J5 Connector
4	Driver Board J6 Connector

2. Connect the PCB interconnect cable to the J2 connector on the bottom mezzanine board.
3. Reconnect the daughterboard to the CMI bracket.
4. Replace the spacers between the driver board and bottom mezzanine board.
5. Secure the daughterboard assembly to the CMI bracket using the screws from step 2.

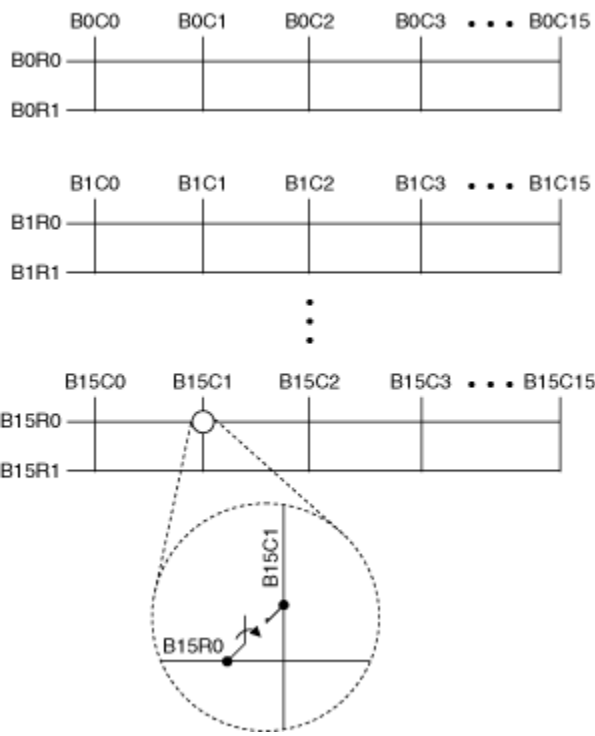
NI PXI/PXIe-2532/2532B Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2532/2532B

(NI 2532/2532B).



Note Hardware relay names are for the native 1-wire sixteen 2×16 matrix topology.



The following table lists relay names for the NI 2532/2532B.

Bank 0Relays	Bank 1Relays	...	Bank 15Relays
kB0R0C0...kB0R0C15	kB1R0C0...kB1R0C15	...	kB15R0C0...kB15R0C15
kB0R1C0...kB0R1C15	kB1R1C0...kB1R1C15	...	kB15R1C0...kB15R1C15

NI PXI/PXIe-2532/2532B Matrix Expansion

You can expand the matrices of the NI PXI/PXIe-2532/2532B (NI 2532/2532B) by increasing the number of columns in the matrix.

To expand the number of columns, use the terminal block row connection headers to connect the rows on adjacent terminal blocks. The following table lists the available terminal blocks and matrix configurations that support column expansion.

Terminal Block	Configuration(Row x Column)
NI TB-2640/2640B	1-wire 4×128
NI TB-2641/2641B	1-wire 8×64
NI TB-2642/2642B	1-wire 16×32
NI TB-2643/2643B	1-wire Dual 4×64
NI TB-2643/2643B	2-wire 4×64
NI TB-2644/2644B	1-wire Dual 8×32
NI TB-2644/2644B	2-wire 8×32
NI TB-2645B	1-wire Dual 16×16
NI TB-2645B	2-wire 16×16
NI TB-2646B	1- wire Quad 4×32
NI TB-2646B	2-wire Dual 4×32



Note The NI TB-2645 does not support column expansion.

Column Expansion on the NI 2532/2532B

Most terminal blocks feature row connection headers that enable you to join rows on two adjacent terminal blocks to expand the number of columns in a matrix. These terminal blocks include two row connection header sets with identical pinouts. The NI TB-2646B includes two row connection header sets with differing pinouts. Refer to the NI Switches Help and the NI TB-2646B Installation Instructions for row connection header pinouts.

Terminal Blocks with Two Identical Row Connection Headers

The column expansion procedure is the same for all of the terminal block modules with two identical row connection headers. This includes the NI TB-2640/2641/2642/2643/2644 and NI TB-2640B/2641B/2642B/2643B/2644B/2645B.

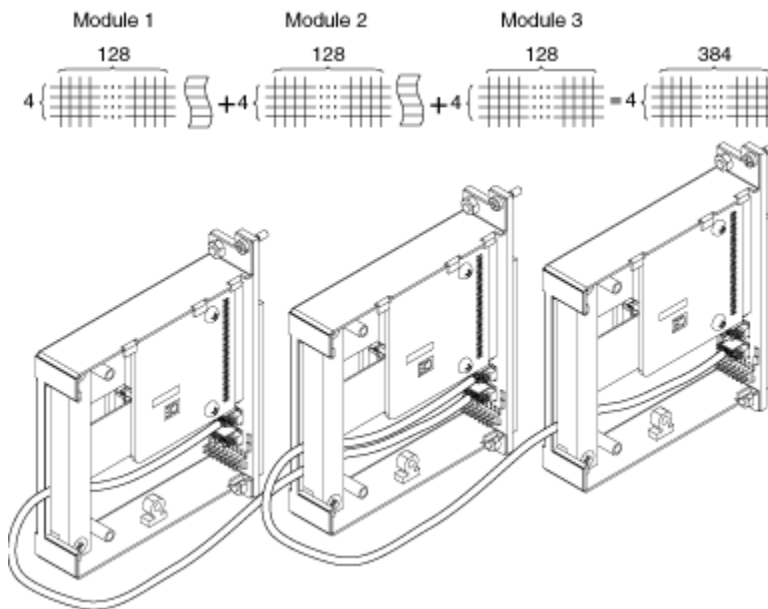


Note The NI TB-2645B requires two row ribbon cables for matrix expansion.

Complete the following steps to expand the number of columns of a matrix using a NI TB-2640/2641/2642/2643/2644.

1. Connect one end of the ribbon cable to either row connection header on one of the terminal blocks.
2. Connect the other end of the ribbon cable to either row connection header on the other terminal block.

The following figure illustrates how to use ribbon cables to connect rows on multiple NI TB-2640 modules and expand the number of columns.



The same procedure is used on NI TB-2640/2641/2642/2643/2644 terminal blocks by using the appropriate row ribbon cable header as specified in the following table.

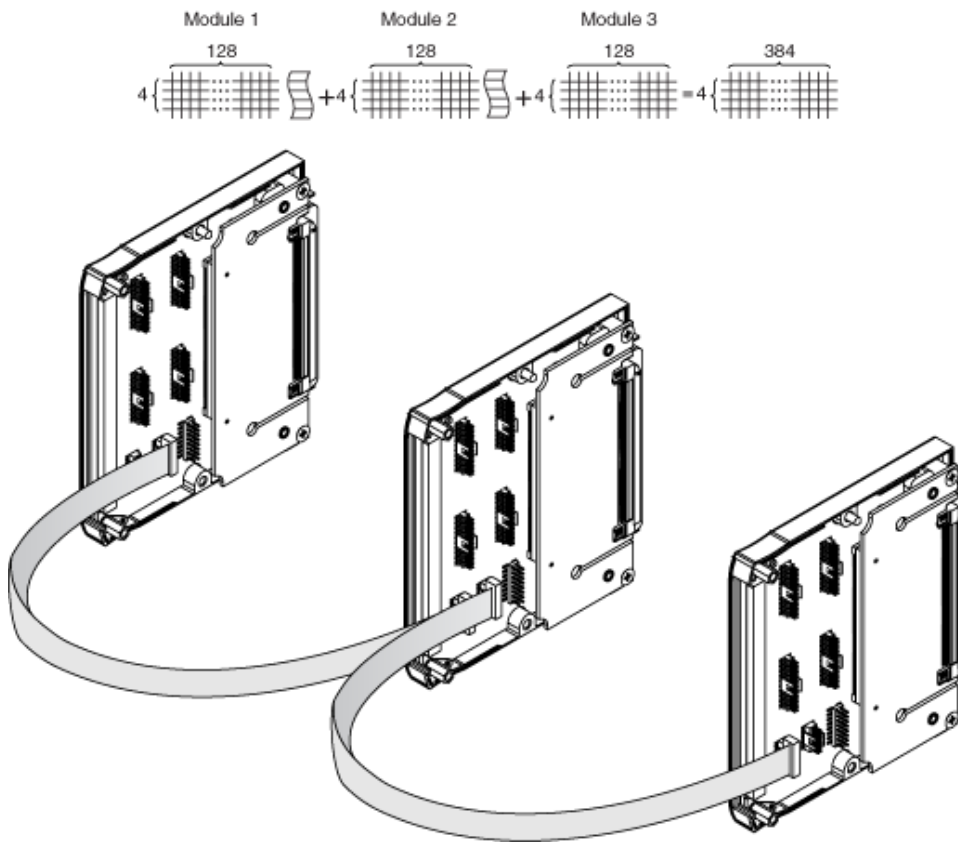
Terminal Block Module	Row Connection Header 1	Row Connection Header 2
NI TB-2640	J3	J4
NI TB-2641	J2	J3
NI TB-2642	J2	J3
NI TB-2643	J3	J4
NI TB-2644	J2	J3

Complete the following steps to expand the number of columns of a matrix using a NI

TB-2640B/2641B/2642B/2643B/2644B/2645B.

1. Connect one end of the ribbon cable to either row connection header on one of the terminal blocks.
2. Connect the other end of the ribbon cable to either row connection header on the other terminal block.

The following figure illustrates how to use ribbon cables to connect rows on multiple NI TB-2640B modules and expand the number of columns.



The same procedure is used on NI TB-2640B/2641B/2642B/2643B/2644B/2645B terminal blocks by using the appropriate row ribbon cable header as specified in the following table.

Terminal Block Module	Row Connection Header 1	Row Connection Header 2
NI TB-2640B	J4	J5
NI TB-2641B	J4	J5
NI TB-2642B	J8	J9

Terminal Block Module	Row Connection Header 1	Row Connection Header 2
NI TB-2643B	J4	J5
NI TB-2644B	J4	J5
NI TB-2645B	Cable 1 - J4 Cable 2 - J6	Cable 1 - J5 Cable 2 - J7



Note For the NI TB-2645B, do not connect a row ribbon cable from a Cable 1 header to a Cable 2 header.

Terminal Blocks with a Row Connection Headers with Modified Pinout

The NI TB-2646B has a second row connection header with a modified pinout that is not identical to the first row connection header. Column expansion can only be achieved by connecting a row ribbon cable from the row connection header of one terminal block to the same row connection header of an adjacent terminal block. Refer to the NI TB-2646B Installation Instructions for row connection header pinouts.

Complete the following steps to expand the number of columns of a matrix using a NI TB-2646B.

1. Connect one end of the ribbon cable to either row connection header 1 or row connection header 2 on one of the NI TB-2646B terminal blocks.
2. Connect the other end of the ribbon cable to the same row connection header on another NI TB-2646B terminal block.

The same procedure is used on NI TB-2646B terminal blocks by using the appropriate row ribbon cable header as specified in the following table.

Terminal Block Module	Row Connection Header 1	Row Connection Header 2
NI TB-2646B	J4	J9

NI PXI/PXIe-2532/2532B Triggering

The NI PXI/PXIe-2532/2532B (NI 2532/2532B) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2532/2532B.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2532/2532B.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Scan Advanced Output	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

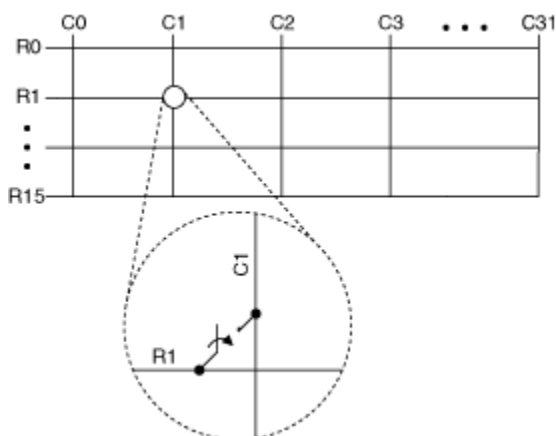
Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2532/2532B 1-Wire 16×32 Matrix Topology

The NI TB-2642 terminal block creates a 1-wire 16×32 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2642B terminal block creates a 1-wire 16×32 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 1-wire 16×32 matrix topology.



Making a Connection

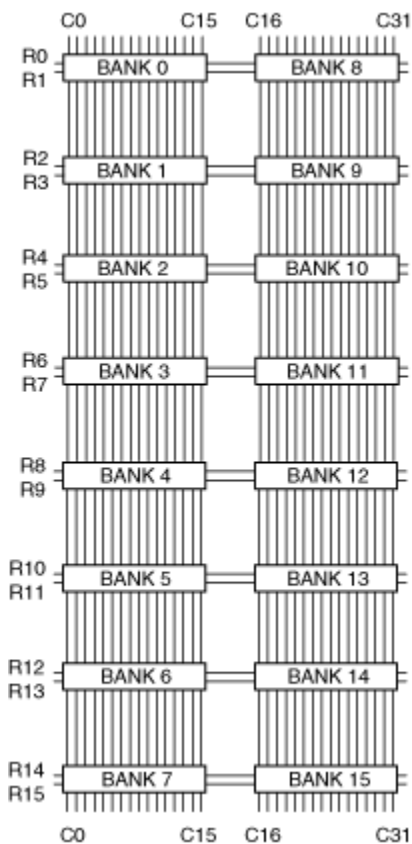
Both the scanning command, `r1->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r1` and `c1`, result in the following connection:

signal connected to R1 is routed to C1

Terminal Block Connections

The NI TB-2642 terminal block connects banks of the NI 2532 to create the 1-wire 16×32 matrix topology. The NI TB-2642B terminal block connects banks of the NI 2532B to create the 1-wire 16×32 matrix topology. The following figure illustrates how the native banks of the NI 2532/2532B connect using the NI TB-2642/2642B to create the 1-wire 16×32 matrix topology.

Bank Connection Diagram



The following table lists the pin assignments for the NI TB-2642/2642B column ribbon

cable headers.

Column Pin Connections

The following table refers to the J3 connector on the NI TB-2642 column connection board and the J13 connector on the NI TB-2642B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C0	Pin 9	C8	Pin 17	C16	Pin 25	C24
Pin 2	C1	Pin 10	C9	Pin 18	C17	Pin 26	C25
Pin 3	C2	Pin 11	C10	Pin 19	C18	Pin 27	C26
Pin 4	C3	Pin 12	C11	Pin 20	C19	Pin 28	C27
Pin 5	C4	Pin 13	C12	Pin 21	C20	Pin 29	C28
Pin 6	C5	Pin 14	C13	Pin 22	C21	Pin 30	C29
Pin 7	C6	Pin 15	C14	Pin 23	C22	Pin 31	C30
Pin 8	C7	Pin 16	C15	Pin 24	C23	Pin 32	C31



Note The column connection board J2 connector on the NI TB-2642 is not used in this configuration.

Row Pin Connections

The NI TB-2642 and NI TB-2642B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	RO
2	R1
3	R2

Pin Number	Row
4	R3
5	R4
6	R5
7	R6
8	R7
9	R8
10	R9
11	R10
12	R11
13	R12
14	R13
15	R14
16	R15

Row Protection Bypass Header

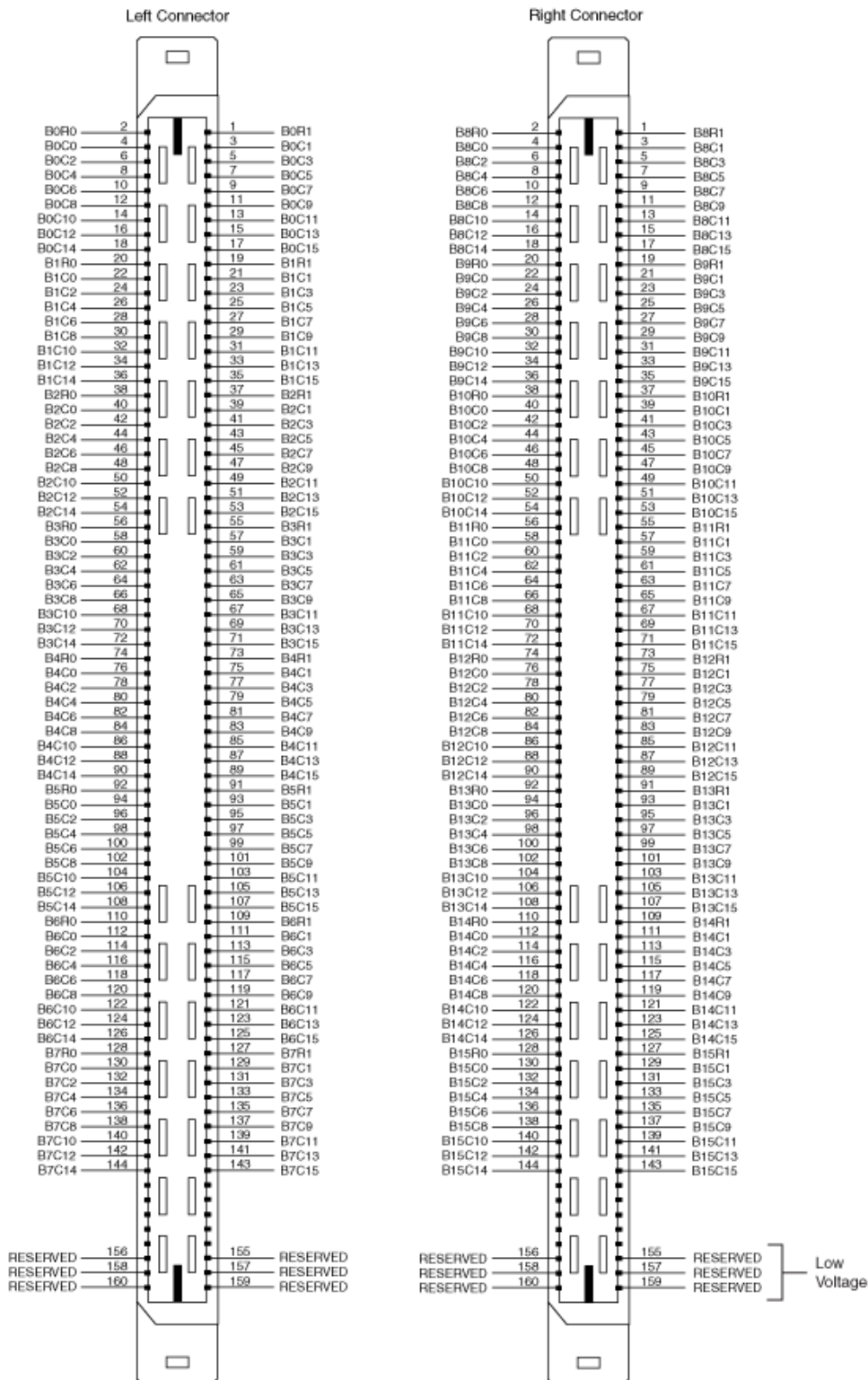
Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2642 Module Interface Board		NI TB-2642B	
Header	Pins Connected	Header	Pins Connected	
R0	N/A	N/A	J14	1-2
R1	N/A	N/A	J14	5-6
R2	N/A	N/A	J14	9-10
R3	N/A	N/A	J14	13-14
R4	N/A	N/A	J15	1-2
R5	N/A	N/A	J15	5-6

Bypassed Row	NI TB-2642 Module Interface Board		NI TB-2642B	
Header	Pins Connected	Header	Pins Connected	
R6	N/A	N/A	J15	9-10
R7	N/A	N/A	J15	13-14
R8	N/A	N/A	J16	1-2
R9	N/A	N/A	J16	5-6
R10	N/A	N/A	J16	9-10
R11	N/A	N/A	J16	13-14
R12	N/A	N/A	J17	1-2
R13	N/A	N/A	J17	5-6
R14	N/A	N/A	J17	9-10
R15	N/A	N/A	J17	13-14

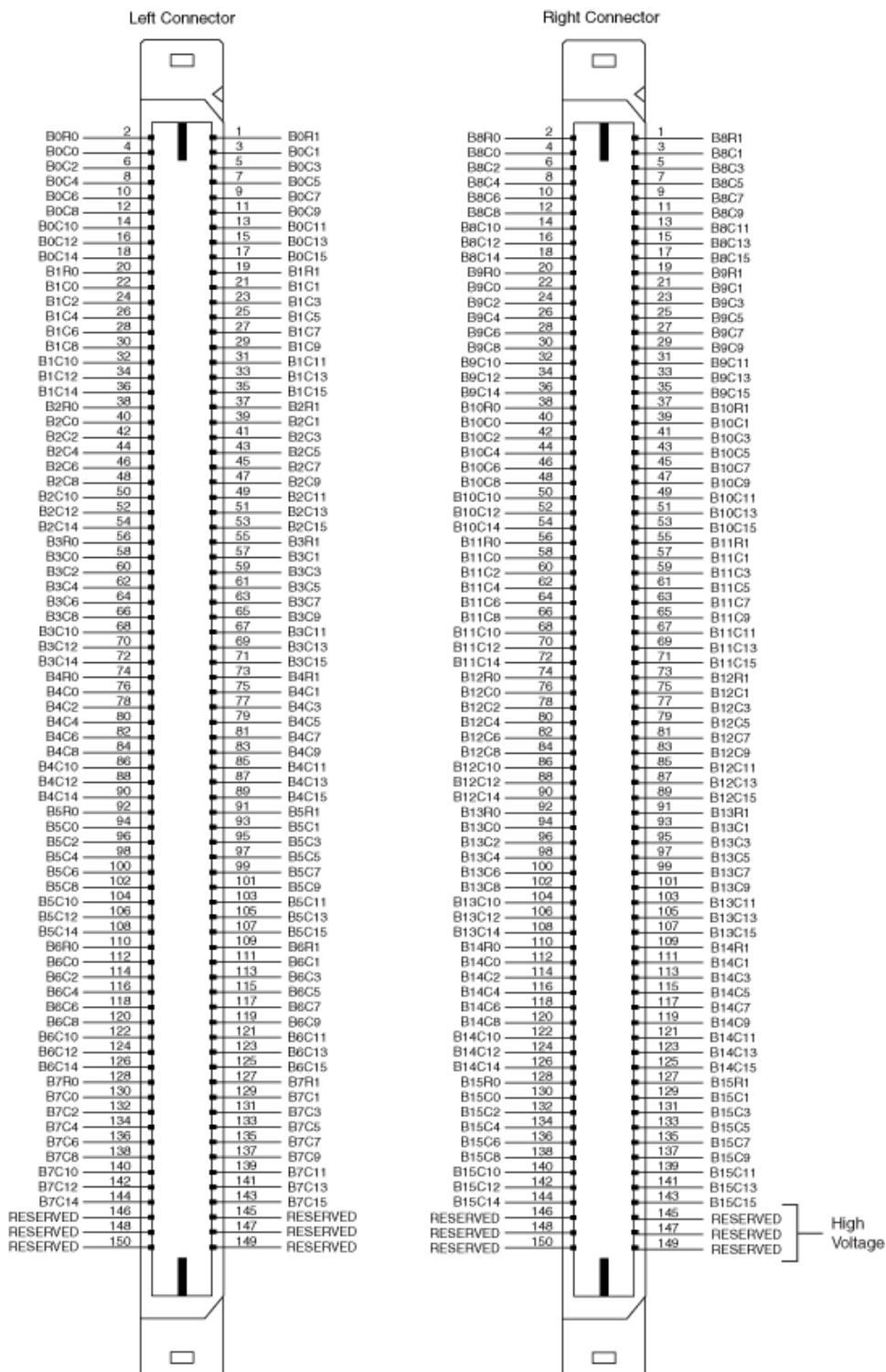
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



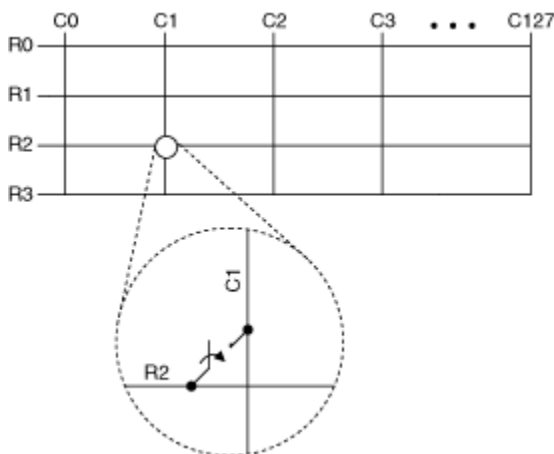
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 1-Wire 4×128 Matrix Topology

The NI TB-2640 terminal block creates a 1-wire 4×128 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2640B terminal block creates a 1-wire 4×128 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 1-wire 4×128 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

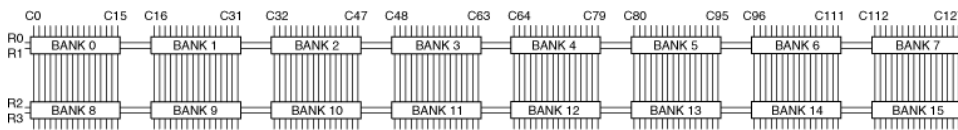
signal connected to R2 is routed to C1

Terminal Block Connections

The NI TB-2640 terminal block connects banks of the NI 2532 to create the 1-wire 4×128 matrix topology. The NI TB-2640B terminal block connects banks of the NI 2532B to create the 1-wire 4×128 matrix topology. The following figure illustrates how the native banks of the NI 2532/2532B connect using the NI TB-2640/2640B to

create the 1-wire 4×128 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2640/2640B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the upper column connection board of the NI TB-2640 and the J13 connector on the NI TB-2640B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C127	Pin 9	C119	Pin 17	C111	Pin 25	C103
Pin 2	C126	Pin 10	C118	Pin 18	C110	Pin 26	C102
Pin 3	C125	Pin 11	C117	Pin 19	C109	Pin 27	C101
Pin 4	C124	Pin 12	C116	Pin 20	C108	Pin 28	C100
Pin 5	C123	Pin 13	C115	Pin 21	C107	Pin 29	C99
Pin 6	C122	Pin 14	C114	Pin 22	C106	Pin 30	C98
Pin 7	C121	Pin 15	C113	Pin 23	C105	Pin 31	C97
Pin 8	C120	Pin 16	C112	Pin 24	C104	Pin 32	C96

The following table refers to the J2 connector on the upper column connection board of the NI TB-2640 and the J12 connector on the NI TB-2640B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C95	Pin 9	C87	Pin 17	C79	Pin 25	C71
Pin 2	C94	Pin 10	C86	Pin 18	C78	Pin 26	C70
Pin 3	C93	Pin 11	C85	Pin 19	C77	Pin 27	C69

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 4	C92	Pin 12	C84	Pin 20	C76	Pin 28	C68
Pin 5	C91	Pin 13	C83	Pin 21	C75	Pin 29	C67
Pin 6	C90	Pin 14	C82	Pin 22	C74	Pin 30	C66
Pin 7	C89	Pin 15	C81	Pin 23	C73	Pin 31	C65
Pin 8	C88	Pin 16	C80	Pin 24	C72	Pin 32	C64

The following table refers to the J3 connector on the lower column connection board of the NI TB-2640 and the J3 connector on the NI TB-2640B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C0	Pin 9	C8	Pin 17	C16	Pin 25	C24
Pin 2	C1	Pin 10	C9	Pin 18	C17	Pin 26	C25
Pin 3	C2	Pin 11	C10	Pin 19	C18	Pin 27	C26
Pin 4	C3	Pin 12	C11	Pin 20	C19	Pin 28	C27
Pin 5	C4	Pin 13	C12	Pin 21	C20	Pin 29	C28
Pin 6	C5	Pin 14	C13	Pin 22	C21	Pin 30	C29
Pin 7	C6	Pin 15	C14	Pin 23	C22	Pin 31	C30
Pin 8	C7	Pin 16	C15	Pin 24	C23	Pin 32	C31

The following table refers to the J2 connector on the lower column connection board of the NI TB-2640 and the J2 connector on the NI TB-2640B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C32	Pin 9	C40	Pin 17	C48	Pin 25	C56
Pin 2	C33	Pin 10	C41	Pin 18	C49	Pin 26	C57
Pin 3	C34	Pin 11	C42	Pin 19	C50	Pin 27	C58
Pin 4	C35	Pin 12	C43	Pin 20	C51	Pin 28	C59
Pin 5	C36	Pin 13	C44	Pin 21	C52	Pin 29	C60
Pin 6	C37	Pin 14	C45	Pin 22	C53	Pin 30	C61

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 7	C38	Pin 15	C46	Pin 23	C54	Pin 31	C62
Pin 8	C39	Pin 16	C47	Pin 24	C55	Pin 32	C63

Row Pin Connections

The NI TB-2640 and NI TB-2640B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	R0
2	R1
3	R2
4	R3
5–16	—

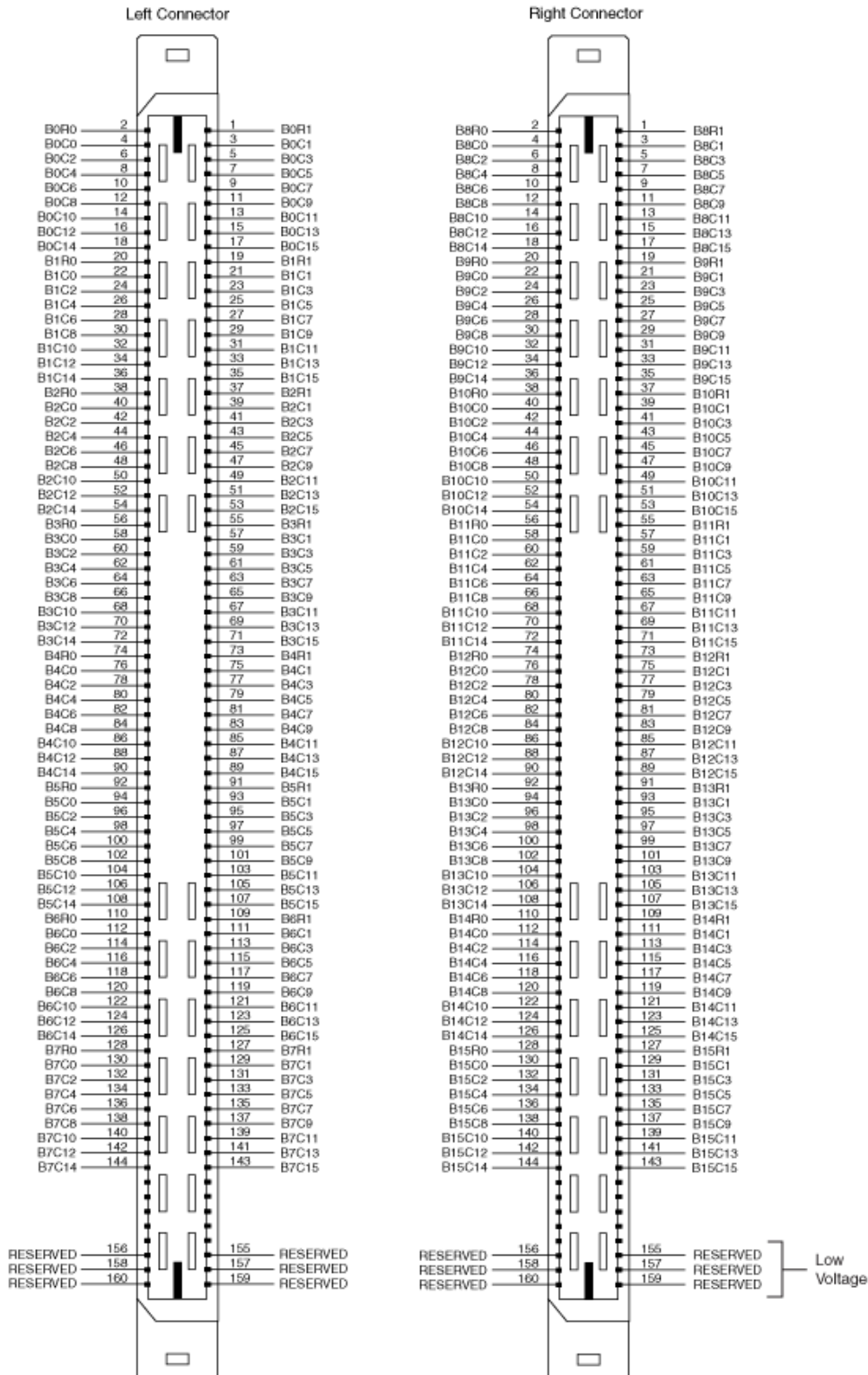
Row Protection Bypass Header

Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2640 Module Interface Board		NI TB-2640B	
Header	Pins Connected	Header	Pins Connected	
R0	J5	1-2	J14	1-2
R1	J5	5-6	J14	3-4
R2	J5	9-10	J14	5-6
R3	J5	13-14	J14	7-8

Pinout

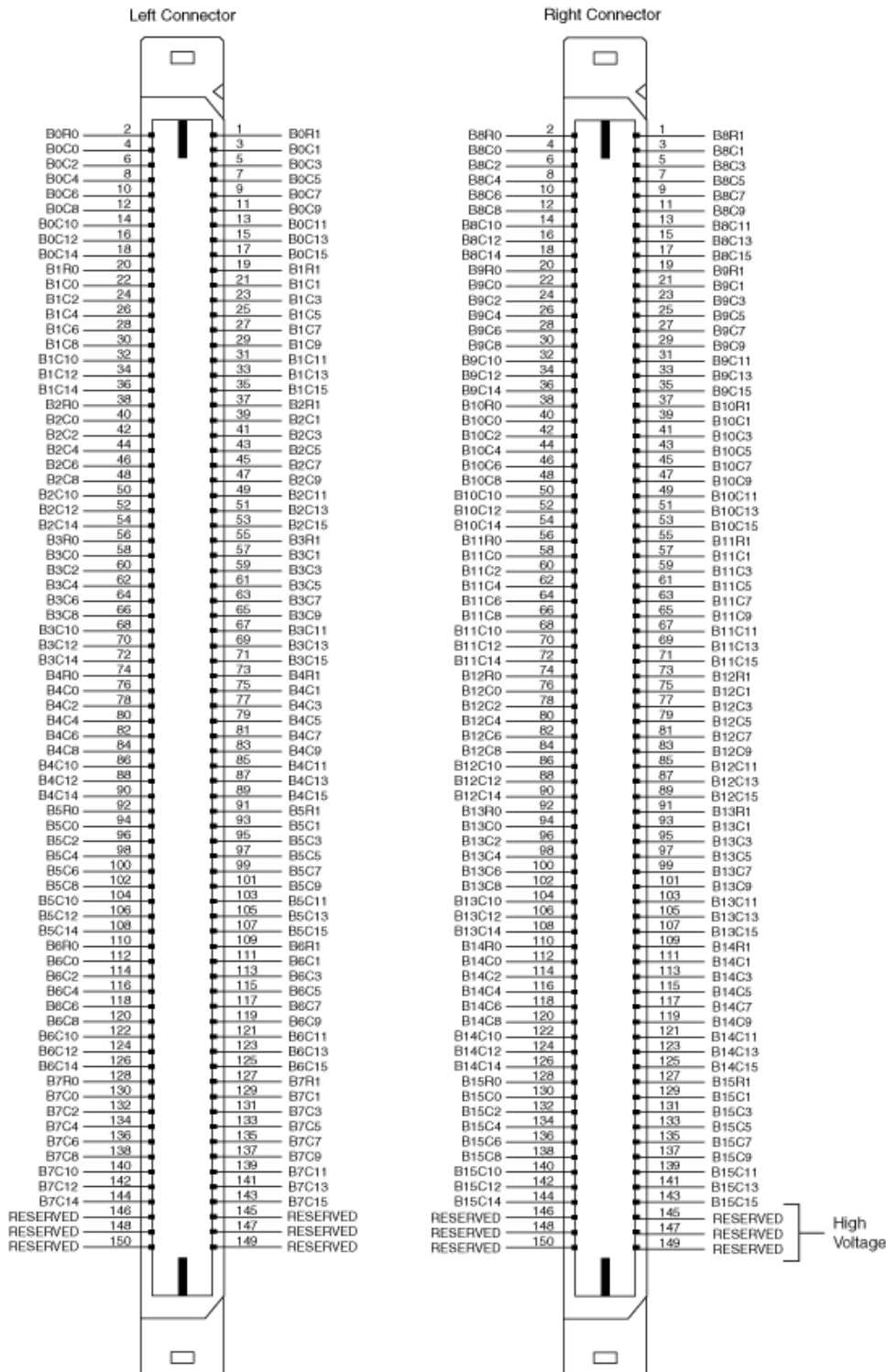
The following figure identifies the pins for the NI 2532.





Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.





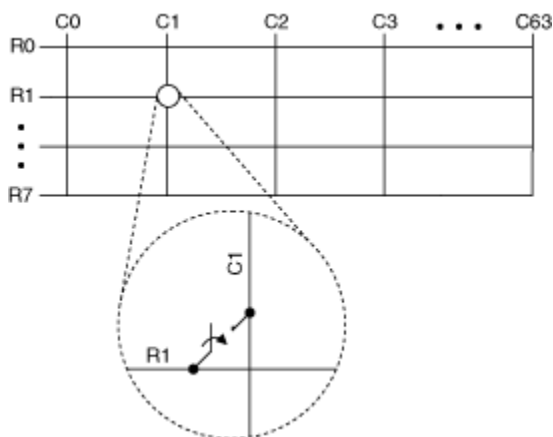
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 1-Wire 8×64 Matrix Topology

The NI TB-2641 terminal block creates a 1-wire 8×64 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2641B terminal block creates a 1-wire 8×64 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 1-wire 8×64 matrix topology.



Making a Connection

Both the scanning command, `r1->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r1` and `c1`, result in the following connection:

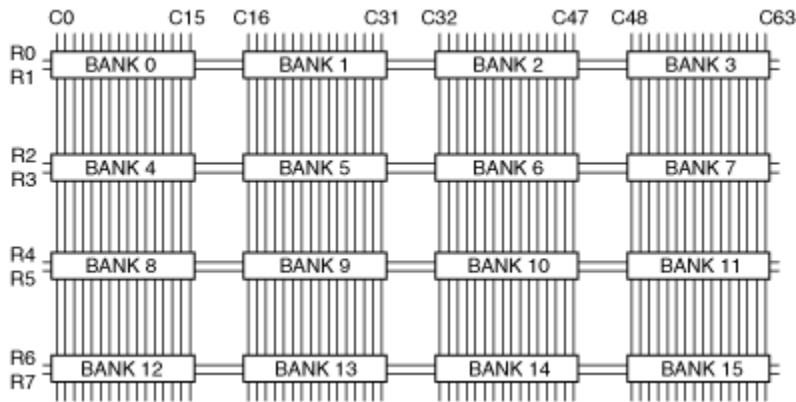
signal connected to R1 is routed to C1

Terminal Block Connections

The NI TB-2641 terminal block connects banks of the NI 2532 to create the 1-wire 8×64 matrix topology. The NI TB-2641B terminal block connects banks of the NI 2532B to

create the 1-wire 8×64 matrix topology. The following figure illustrates how the native banks of the NI 2532/2532B connect using the NI TB-2641/2641B to create the 1-wire 8×64 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2641/2641B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the NI TB-2641 column connection board and the J3 connector on the NI TB-2641B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C0	Pin 9	C8	Pin 17	C16	Pin 25	C24
Pin 2	C1	Pin 10	C9	Pin 18	C17	Pin 26	C25
Pin 3	C2	Pin 11	C10	Pin 19	C18	Pin 27	C26
Pin 4	C3	Pin 12	C11	Pin 20	C19	Pin 28	C27
Pin 5	C4	Pin 13	C12	Pin 21	C20	Pin 29	C28
Pin 6	C5	Pin 14	C13	Pin 22	C21	Pin 30	C29
Pin 7	C6	Pin 15	C14	Pin 23	C22	Pin 31	C30
Pin 8	C7	Pin 16	C15	Pin 24	C23	Pin 32	C31

The following table refers to the J2 connector on the NI TB-2641 column connection

board and the J2 connector on the NI TB-2641B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C32	Pin 9	C40	Pin 17	C48	Pin 25	C56
Pin 2	C33	Pin 10	C41	Pin 18	C49	Pin 26	C57
Pin 3	C34	Pin 11	C42	Pin 19	C50	Pin 27	C58
Pin 4	C35	Pin 12	C43	Pin 20	C51	Pin 28	C59
Pin 5	C36	Pin 13	C44	Pin 21	C52	Pin 29	C60
Pin 6	C37	Pin 14	C45	Pin 22	C53	Pin 30	C61
Pin 7	C38	Pin 15	C46	Pin 23	C54	Pin 31	C62
Pin 8	C39	Pin 16	C47	Pin 24	C55	Pin 32	C63

Row Pin Connections

The NI TB-2641 and NI TB-2641B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	R0
2	R1
3	R2
4	R3
5	R4
6	R5
7	R6
8	R7
9–16	—

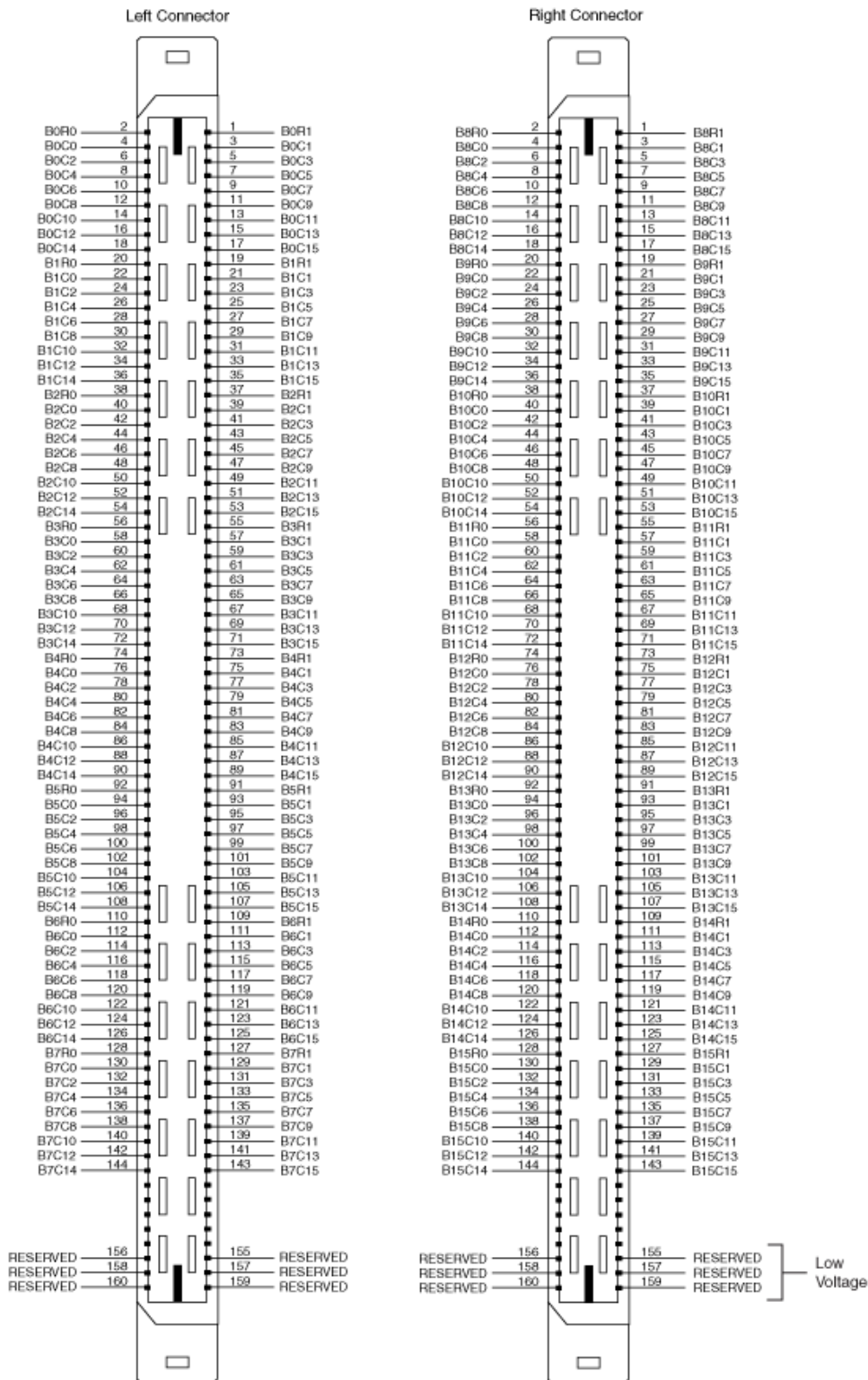
Row Protection Bypass Header

Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2641 Module Interface Board		NI TB-2641B	
Header	Pins Connected	Header	Pins Connected	
R0	J4	1-2	J14	1-2
R1	J4	3-4	J14	3-4
R2	J4	5-6	J14	5-6
R3	J4	7-8	J14	7-8
R4	J4	9-10	J14	9-10
R5	J4	11-12	J14	11-12
R6	J4	13-14	J14	13-14
R7	J4	15-16	J14	15-16

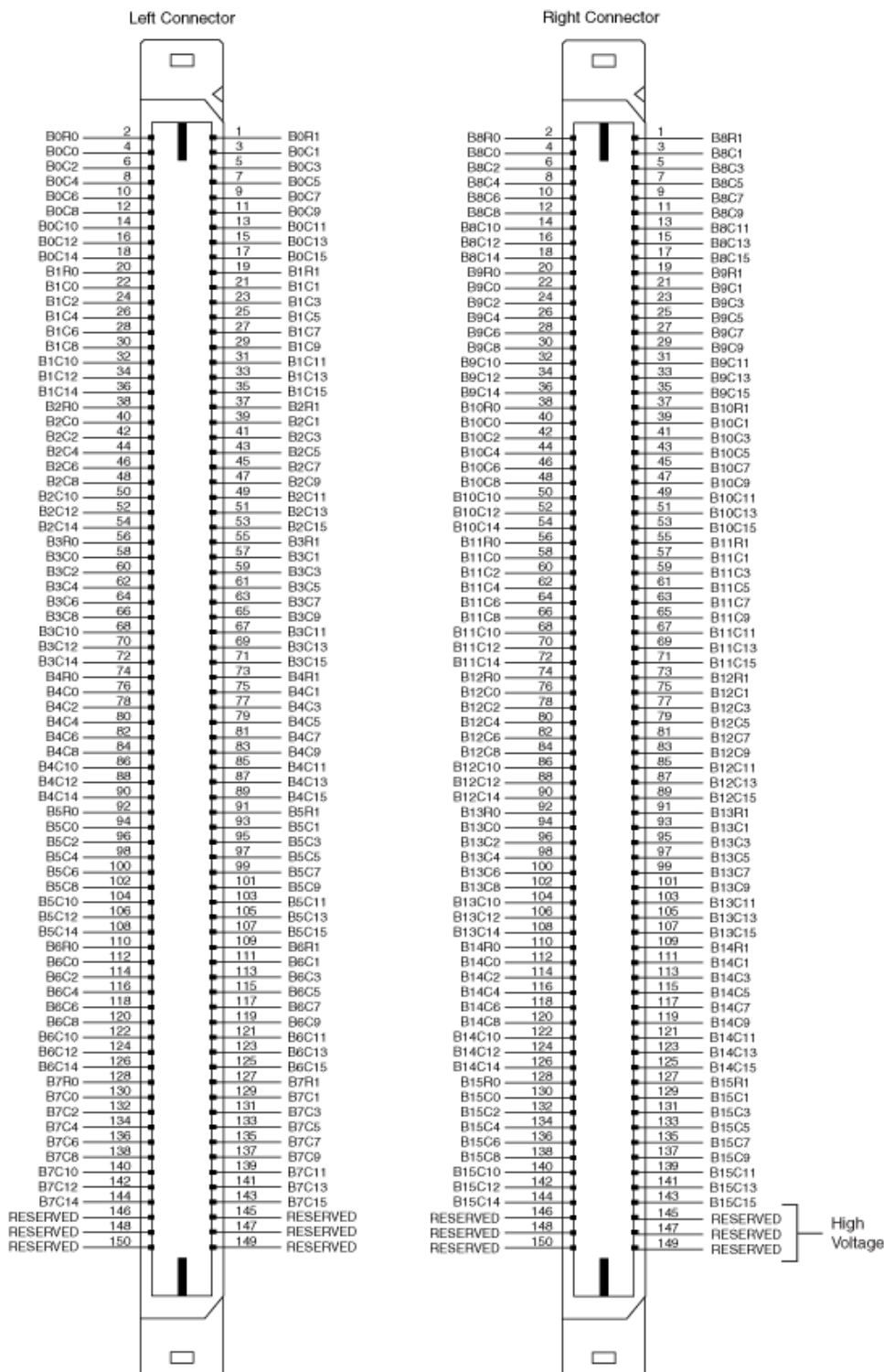
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



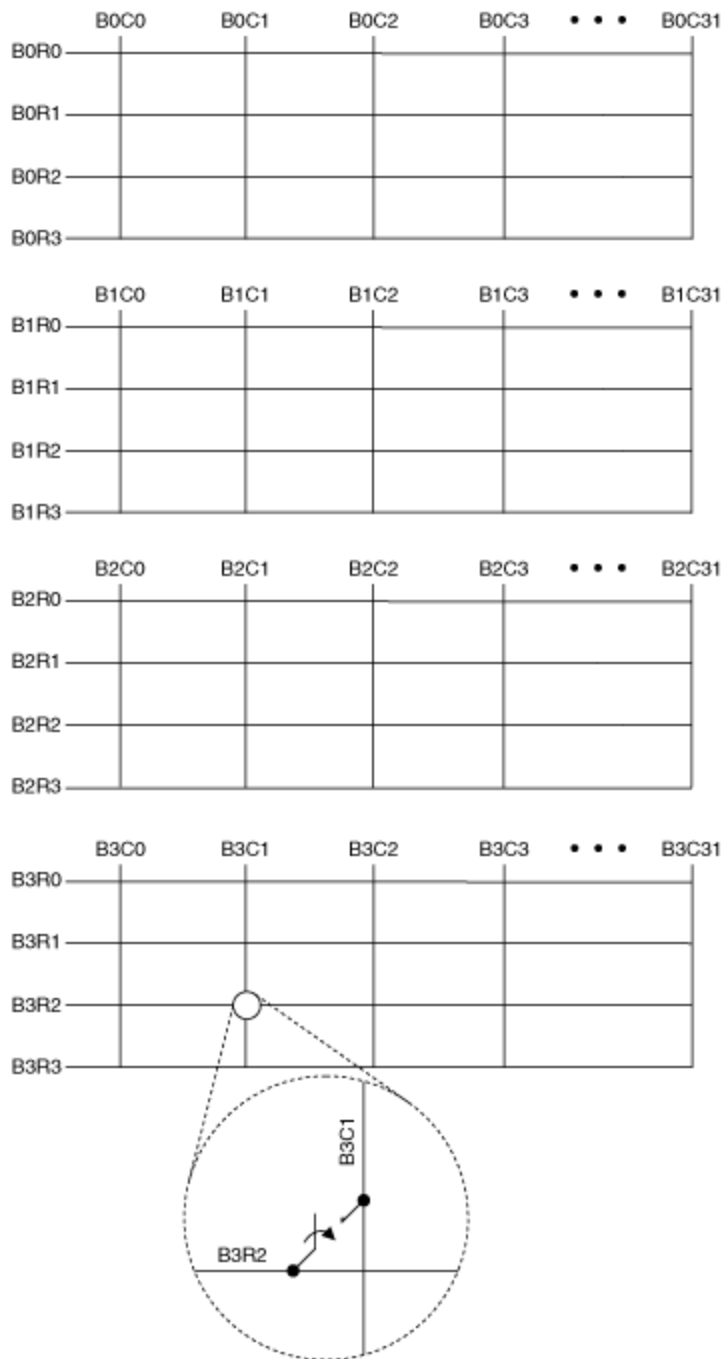
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 1-Wire Quad 4×32 Matrix Topology

The NI TB-2646B terminal block creates a 1-wire quad 4×32 matrix topology with the NI PXI/PXIe-2532B (NI 2532B).The following figure represents the NI 2532/2532B in the 1-wire quad 4×32 matrix topology.



Making a Connection

Both the scanning command, `b0r2->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r2` and `b0c1`, results in the following connection:

signal connected to B0R2 is routed to B0C1.

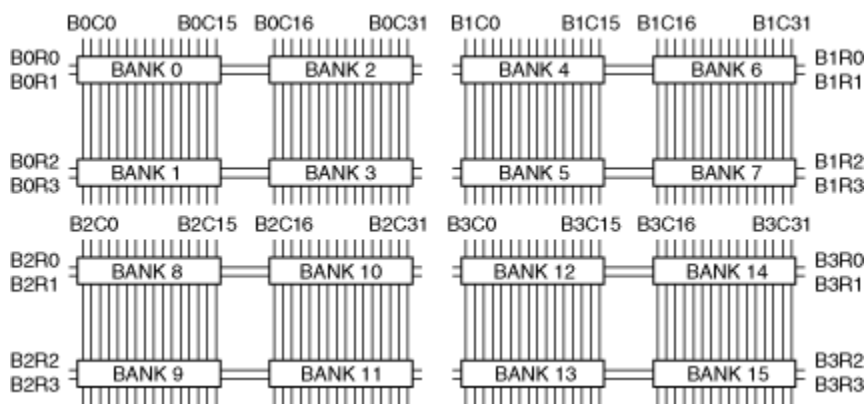


Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2646B terminal block connects banks of the NI 2532B to create the 1-wire quad 4×32 matrix topology. The following figure illustrates how the sixteen native banks of the NI 2532B connect using the NI TB-2646B to create the 1-wire quad 4×32 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2646B column ribbon cable headers.

Column Pin Connections

The following table refers to the J13 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B3C31	Pin 9	B3C27	Pin 17	B3C23	Pin 25	B3C19
Pin 2	B1C31	Pin 10	B1C27	Pin 18	B1C23	Pin 26	B1C19
Pin 3	B3C30	Pin 11	B3C26	Pin 19	B3C22	Pin 27	B3C18
Pin 4	B1C30	Pin 12	B1C26	Pin 20	B1C22	Pin 28	B1C18
Pin 5	B3C29	Pin 13	B3C25	Pin 21	B3C21	Pin 29	B3C17
Pin 6	B1C29	Pin 14	B1C25	Pin 22	B1C21	Pin 30	B1C17

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 7	B3C28	Pin 15	B3C24	Pin 23	B3C20	Pin 31	B3C16
Pin 8	B1C28	Pin 16	B1C24	Pin 24	B1C20	Pin 32	B1C16

The following table refers to the J12 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B3C15	Pin 9	B3C11	Pin 17	B3C7	Pin 25	B3C3
Pin 2	B1C15	Pin 10	B1C11	Pin 18	B1C7	Pin 26	B1C3
Pin 3	B3C14	Pin 11	B3C10	Pin 19	B3C6	Pin 27	B3C2
Pin 4	B1C14	Pin 12	B1C10	Pin 20	B1C6	Pin 28	B1C2
Pin 5	B3C13	Pin 13	B3C9	Pin 21	B3C5	Pin 29	B3C1
Pin 6	B1C13	Pin 14	B1C9	Pin 22	B1C5	Pin 30	B1C1
Pin 7	B3C12	Pin 15	B3C8	Pin 23	B3C4	Pin 31	B3C0
Pin 8	B1C12	Pin 16	B1C8	Pin 24	B1C4	Pin 32	B1C0

The following table refers to the J3 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C0	Pin 9	B0C4	Pin 17	B0C8	Pin 25	B0C12
Pin 2	B2C0	Pin 10	B2C4	Pin 18	B2C8	Pin 26	B2C12
Pin 3	B0C1	Pin 11	B0C5	Pin 19	B0C9	Pin 27	B0C13
Pin 4	B2C1	Pin 12	B2C5	Pin 20	B2C9	Pin 28	B2C13
Pin 5	B0C2	Pin 13	B0C6	Pin 21	B0C10	Pin 29	B0C14
Pin 6	B2C2	Pin 14	B2C6	Pin 22	B2C10	Pin 30	B2C14
Pin 7	B0C3	Pin 15	B0C7	Pin 23	B0C11	Pin 31	B0C15
Pin 8	B2C3	Pin 16	B2C7	Pin 24	B2C11	Pin 32	B2C15

The following table refers to the J2 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C16	Pin 9	B0C20	Pin 17	B0C24	Pin 25	B0C28
Pin 2	B2C16	Pin 10	B2C20	Pin 18	B2C24	Pin 26	B2C28
Pin 3	B0C17	Pin 11	B0C21	Pin 19	B0C25	Pin 27	B0C29
Pin 4	B2C17	Pin 12	B2C21	Pin 20	B2C25	Pin 28	B2C29
Pin 5	B0C18	Pin 13	B0C22	Pin 21	B0C26	Pin 29	B0C30
Pin 6	B2C18	Pin 14	B2C22	Pin 22	B2C26	Pin 30	B2C30
Pin 7	B0C19	Pin 15	B0C23	Pin 23	B0C27	Pin 31	B0C31
Pin 8	B2C19	Pin 16	B2C23	Pin 24	B2C27	Pin 32	B2C31

Row Pin Connections

The NI TB-2646B provides two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following tables list the pin assignments for the row connections.

The following table refers to the J9 connector on the NI TB-2646B.

Pin Number	Row
1	B1R0
2	B3R0
3	B1R1
4	B3R1
5	B1R2
6	B3R2
7	B1R3
8	B3R3
9	B0R0
10	B2R0

Pin Number	Row
11	B0R1
12	B2R1
13	B0R2
14	B2R2
15	B0R3
16	B2R3

The following table refers to the J4 connector on the NI TB-2646B.

Pin Number	Row
1	B0R0
2	B2R0
3	B0R1
4	B2R1
5	B0R2
6	B2R2
7	B0R3
8	B2R3
9	B1R0
10	B3R0
11	B1R1
12	B3R1
13	B1R2
14	B3R2
15	B1R3
16	B3R3

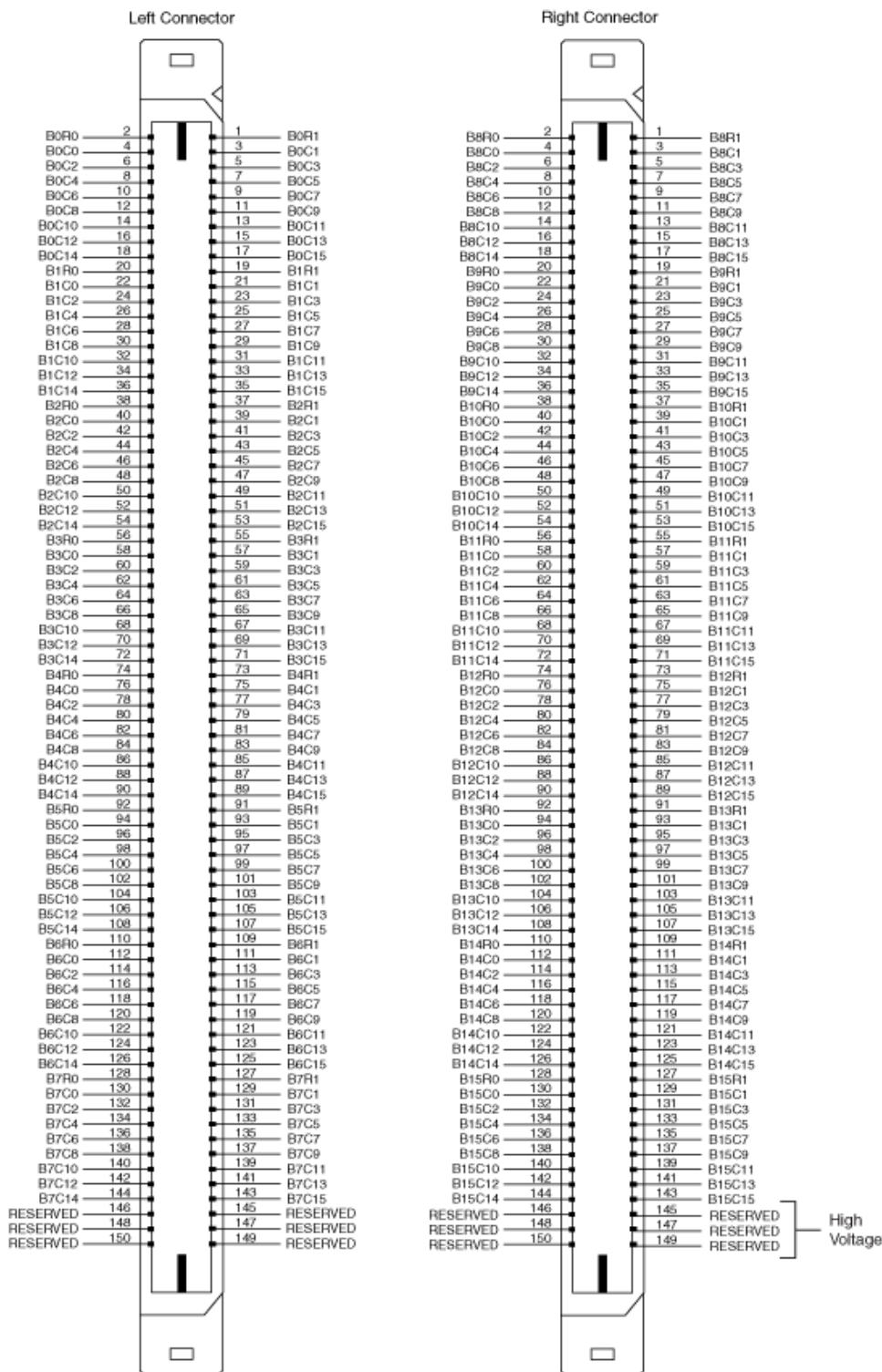
Row Protection Bypass Header

Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2646B	
Header	Pins Connected	
B0R0	J14	1-2
B2R0	J14	3-4
B0R1	J14	5-6
B2R1	J14	7-8
B0R2	J14	9-10
B2R2	J14	11-12
B0R3	J14	13-14
B2R3	J14	15-16
B1R0	J15	1-2
B3R0	J15	3-4
B1R1	J15	5-6
B3R1	J15	7-8
B1R2	J15	9-10
B3R2	J15	11-12
B1R3	J15	13-14
B3R3	J15	15-16

Pinout

The following figure identifies the pins for the NI 2532B.



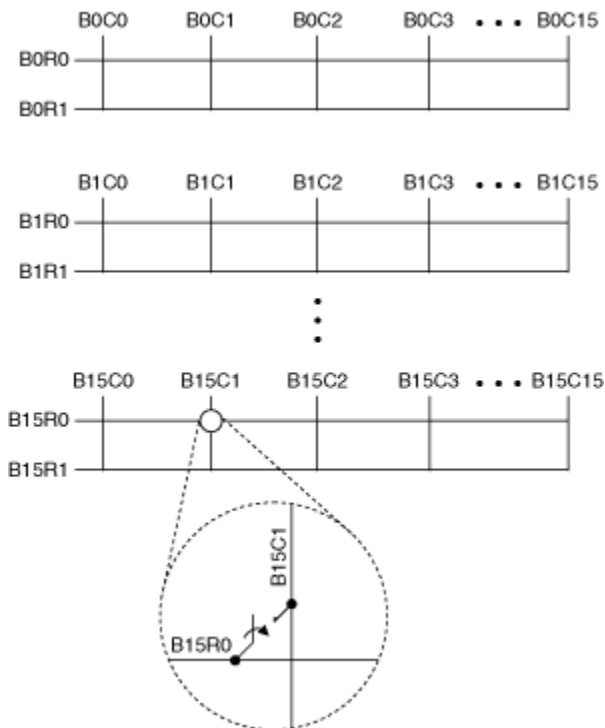
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 1-Wire Sixteen 2×16 Matrix Topology

The following figure represents the NI PXI/PXIe-2532/2532B (NI 2532/2532B) in the 1-wire sixteen 2×16 matrix topology.



Making a Connection

Both the scanning command, `b15r0->b15c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b15r0` and `b15c1`, result in the following connection:

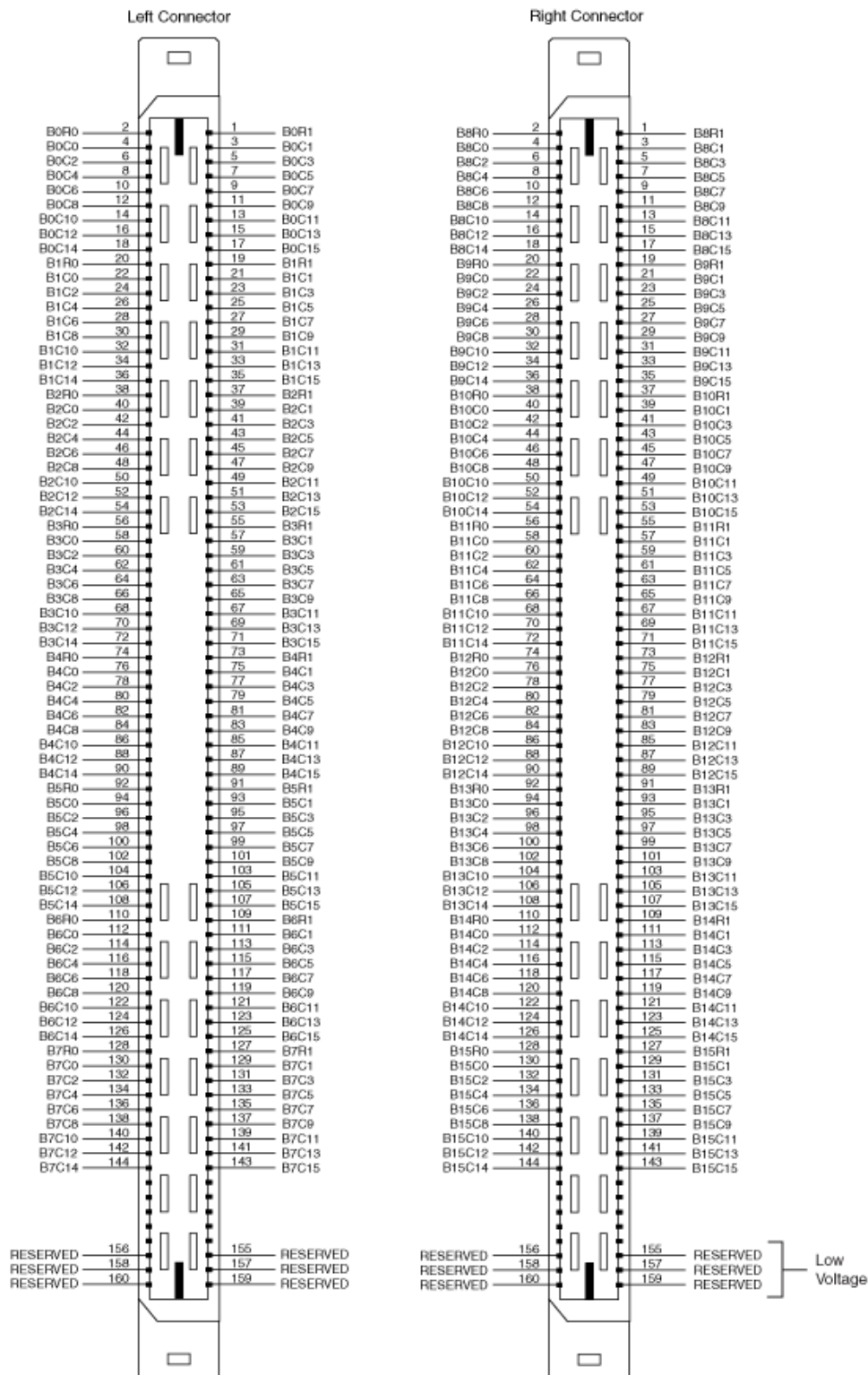
signal connected to B15R0 is routed to B15C1



Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Pinout

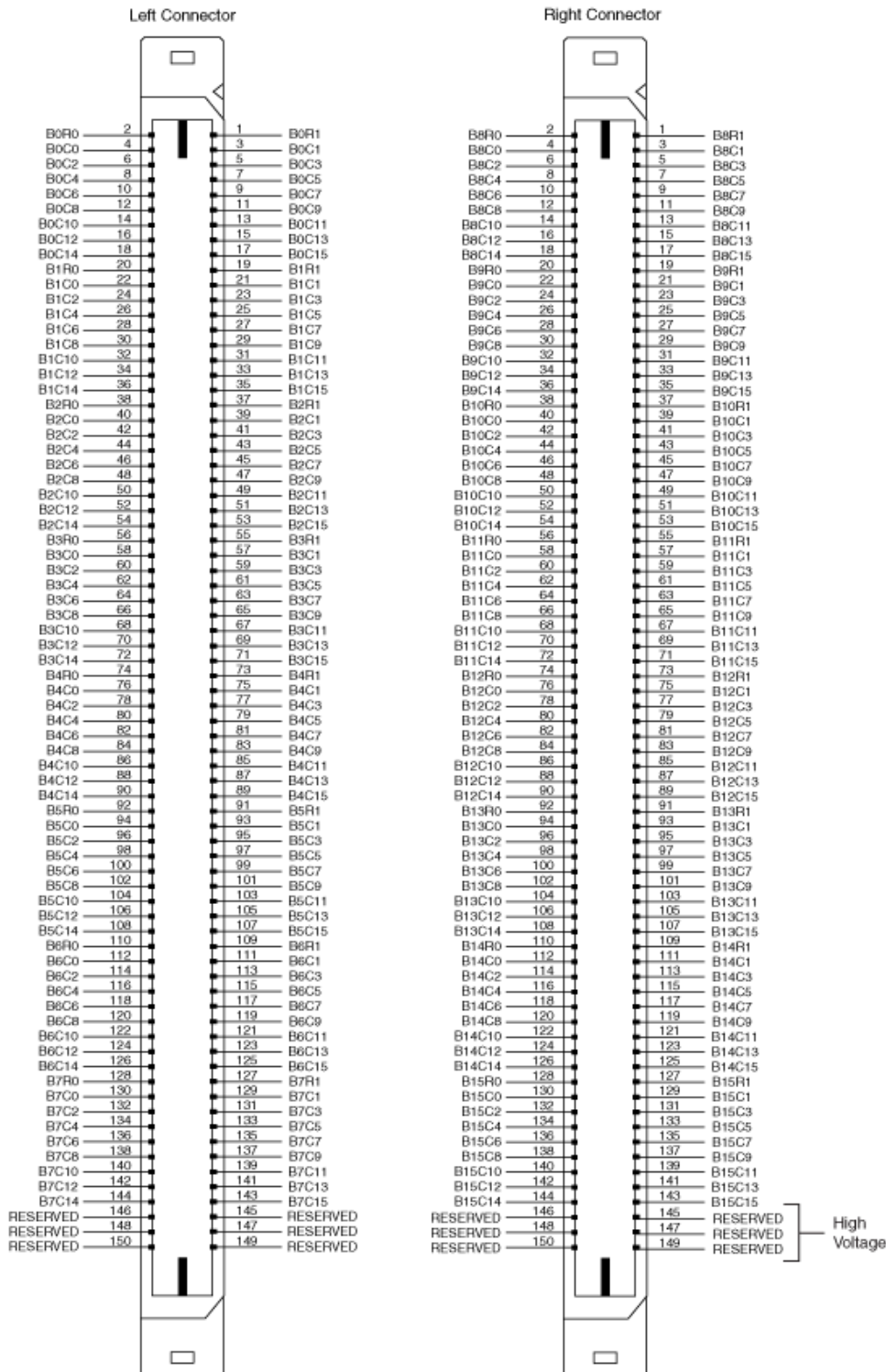
The following figure identifies the pins for the NI 2532.





Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.





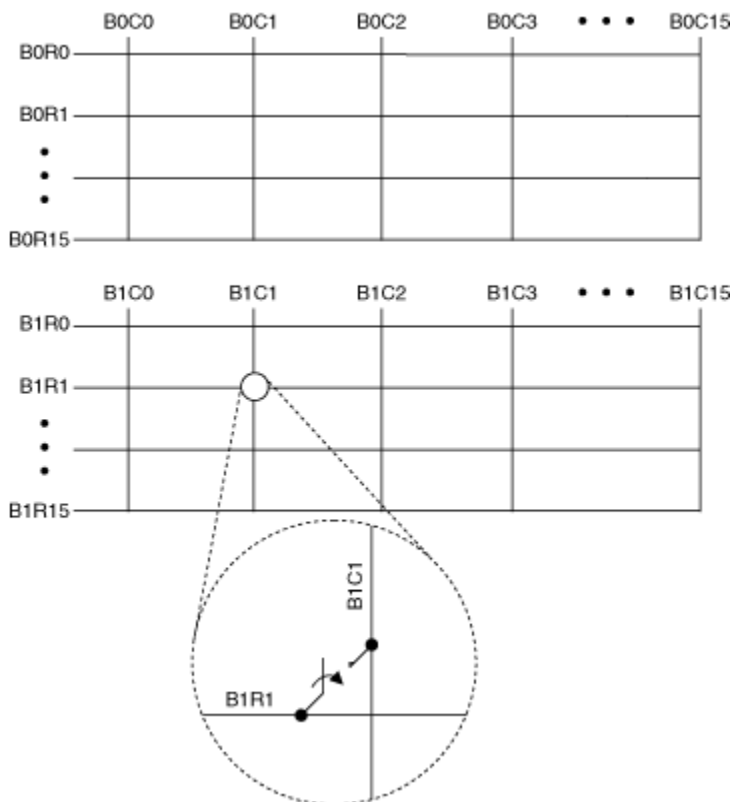
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)

NI PXI/PXIe-2532/2532B 1-Wire Dual 16×16 Matrix Topology

The NI TB-2645 terminal block creates a 1-wire dual 16×16 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2645B terminal block creates a 1-wire dual 16×16 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 1-wire dual 16×16 matrix topology.



Making a Connection

For bank 0, both the scanning command, `b0r1->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r1` and `b0c1`, result in the following connection:

signal connected to B0R1 is routed to B0C1

For bank 1, both the scanning command, `b1r1->b1c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b1r1` and `b1c1`, result in the following connection:

signal connected to B1R1 is routed to B1C1

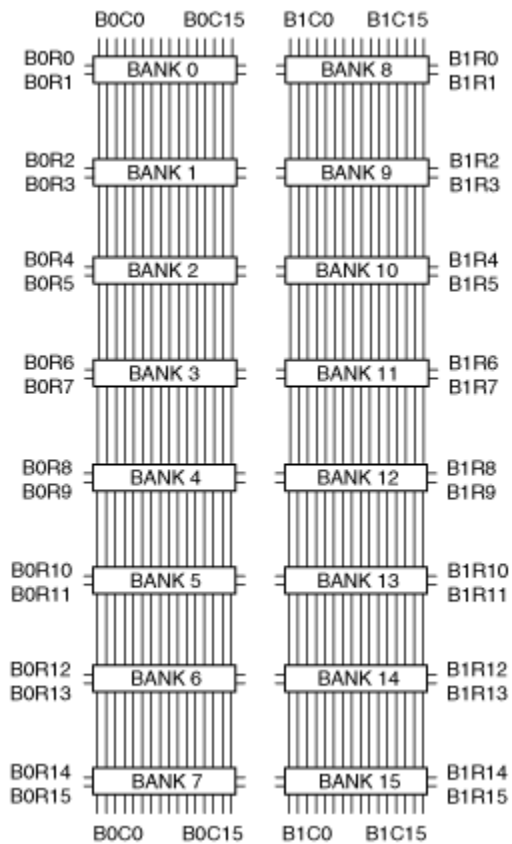


Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2645 terminal block connects the banks of the NI 2532 to create the 1-wire dual 16×16 matrix topology. The NI TB-2645B terminal block connects the banks of the NI 2532B to create the 1-wire dual 16×16 matrix topology. The following figure illustrates how the native banks on the NI 2532/2532B connect using the NI TB-2645/2645B to create the 1-wire dual 16×16 matrix topology.

Bank Connection Diagram



The following table lists the pin assignments for the NI TB-2645/2645B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the NI TB-2645 column connection board and the J3 connector on the NI TB-2645B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C0	Pin 9	B0C4	Pin 17	B0C8	Pin 25	B0C12
Pin 2	B1C0	Pin 10	B1C4	Pin 18	B1C8	Pin 26	B1C12
Pin 3	B0C1	Pin 11	B0C5	Pin 19	B0C9	Pin 27	B0C13
Pin 4	B1C1	Pin 12	B1C5	Pin 20	B1C9	Pin 28	B1C13
Pin 5	B0C2	Pin 13	B0C6	Pin 21	B0C10	Pin 29	B0C14

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 6	B1C2	Pin 14	B1C6	Pin 22	B1C10	Pin 30	B1C14
Pin 7	B0C3	Pin 15	B0C7	Pin 23	B0C11	Pin 31	B0C15
Pin 8	B1C3	Pin 16	B1C7	Pin 24	B1C11	Pin 32	B1C15



Note The column connection board J2 connector on the NI TB-2645 is not used in this configuration.

Row Pin Connections

The NI TB-2645/2645B requires two row ribbon cables for row connections. The NI TB-2645 provides one pair of ribbon cable headers to connect your application. The NI TB-2645B provides two pairs of ribbon cable headers. Use one cable header pair to connect to your application and the other for column expansion.

The following tables list the pin assignments for row connection.

The following table refers to the J2 connector on the NI TB-2645 Module Interface Board and the J4 and J5 connectors on the NI TB-2645B.

Pin Number	Row
Pin 1	B0R0
Pin 2	B1R0
Pin 3	B0R1
Pin 4	B1R1
Pin 5	B0R2
Pin 6	B1R2
Pin 7	B0R3
Pin 8	B1R3
Pin 9	B0R4
Pin 10	B1R4

Pin Number	Row
Pin 11	B0R5
Pin 12	B1R5
Pin 13	B0R6
Pin 14	B1R6
Pin 15	B0R7
Pin 16	B1R7

The following table refers to the J3 connector on the NI TB-2645 Module Interface Board and the J6 and J7 connectors on the NI TB-2645B.

Pin Number	Row
Pin 1	B0R8
Pin 2	B1R8
Pin 3	B0R9
Pin 4	B1R9
Pin 5	B0R10
Pin 6	B1R10
Pin 7	B0R11
Pin 8	B1R11
Pin 9	B0R12
Pin 10	B1R12
Pin 11	B0R13
Pin 12	B1R13
Pin 13	B0R14
Pin 14	B1R14
Pin 15	B0R15
Pin 16	B1R15

Row Protection Bypass Header

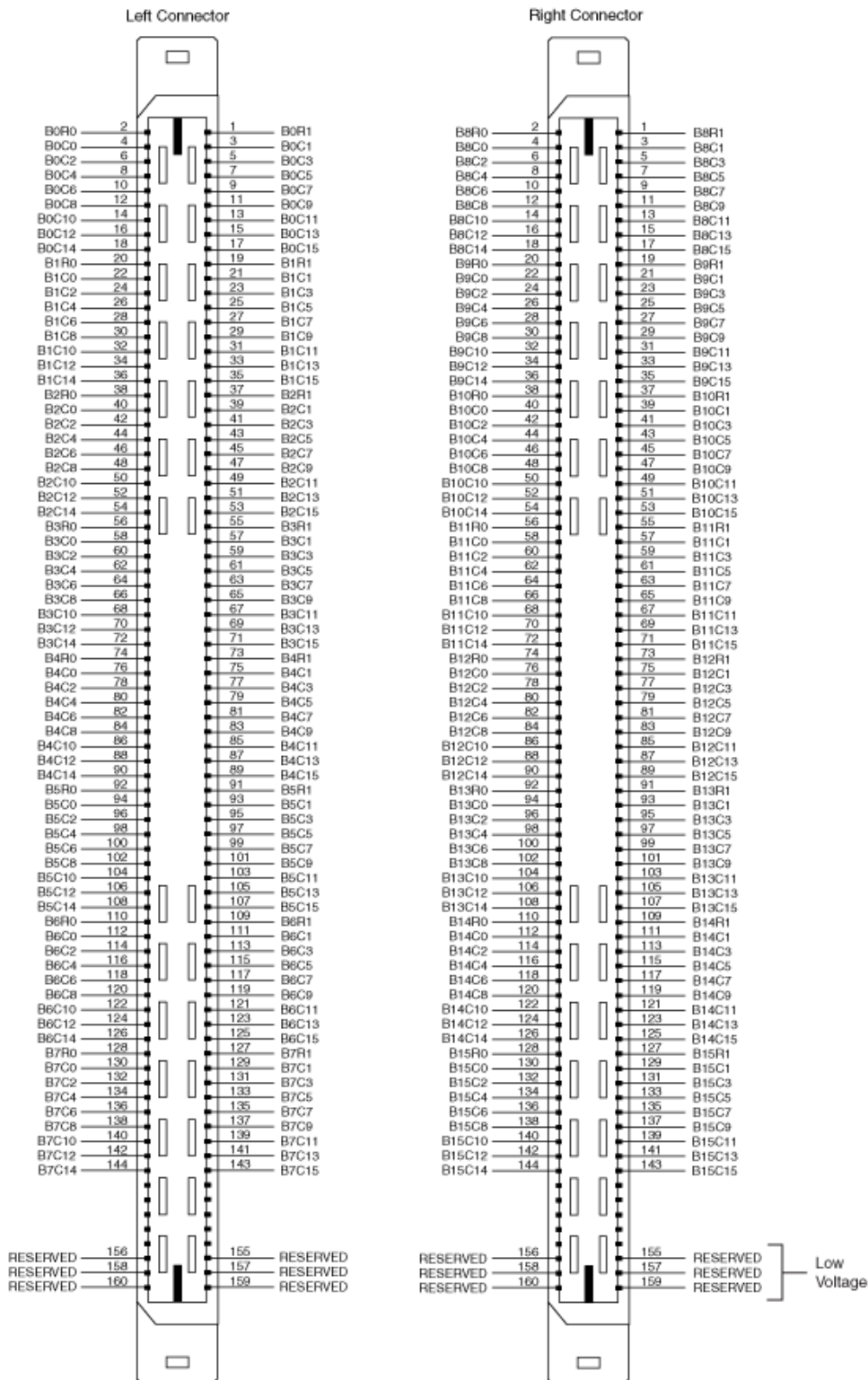
Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2645 Module Interface Board		NI TB-2645B	
Header	Pins Connected	Header	Pins Connected	
B0R0	N/A	N/A	J14	1-2
B1R0	N/A	N/A	J14	3-4
B0R1	N/A	N/A	J14	5-6
B1R1	N/A	N/A	J14	7-8
B0R2	N/A	N/A	J14	9-10
B1R2	N/A	N/A	J14	11-12
B0R3	N/A	N/A	J14	13-14
B1R3	N/A	N/A	J14	15-16
B0R4	N/A	N/A	J15	1-2
B1R4	N/A	N/A	J15	3-4
B0R5	N/A	N/A	J15	5-6
B1R5	N/A	N/A	J15	7-8
B0R6	N/A	N/A	J15	9-10
B1R6	N/A	N/A	J15	11-12
B0R7	N/A	N/A	J15	13-14
B1R7	N/A	N/A	J15	15-16
B0R8	N/A	N/A	J16	1-2
B1R8	N/A	N/A	J16	3-4
B0R9	N/A	N/A	J16	5-6
B1R9	N/A	N/A	J16	7-8
B0R10	N/A	N/A	J16	9-10

Bypassed Row	NI TB-2645 Module Interface Board		NI TB-2645B	
Header	Pins Connected	Header	Pins Connected	
B1R10	N/A	N/A	J16	11-12
B0R11	N/A	N/A	J16	13-14
B1R11	N/A	N/A	J16	15-16
B0R12	N/A	N/A	J17	1-2
B1R12	N/A	N/A	J17	3-4
B0R13	N/A	N/A	J17	5-6
B1R13	N/A	N/A	J17	7-8
B0R14	N/A	N/A	J17	9-10
B1R14	N/A	N/A	J17	11-12
B0R15	N/A	N/A	J17	13-14
B1R15	N/A	N/A	J17	15-16

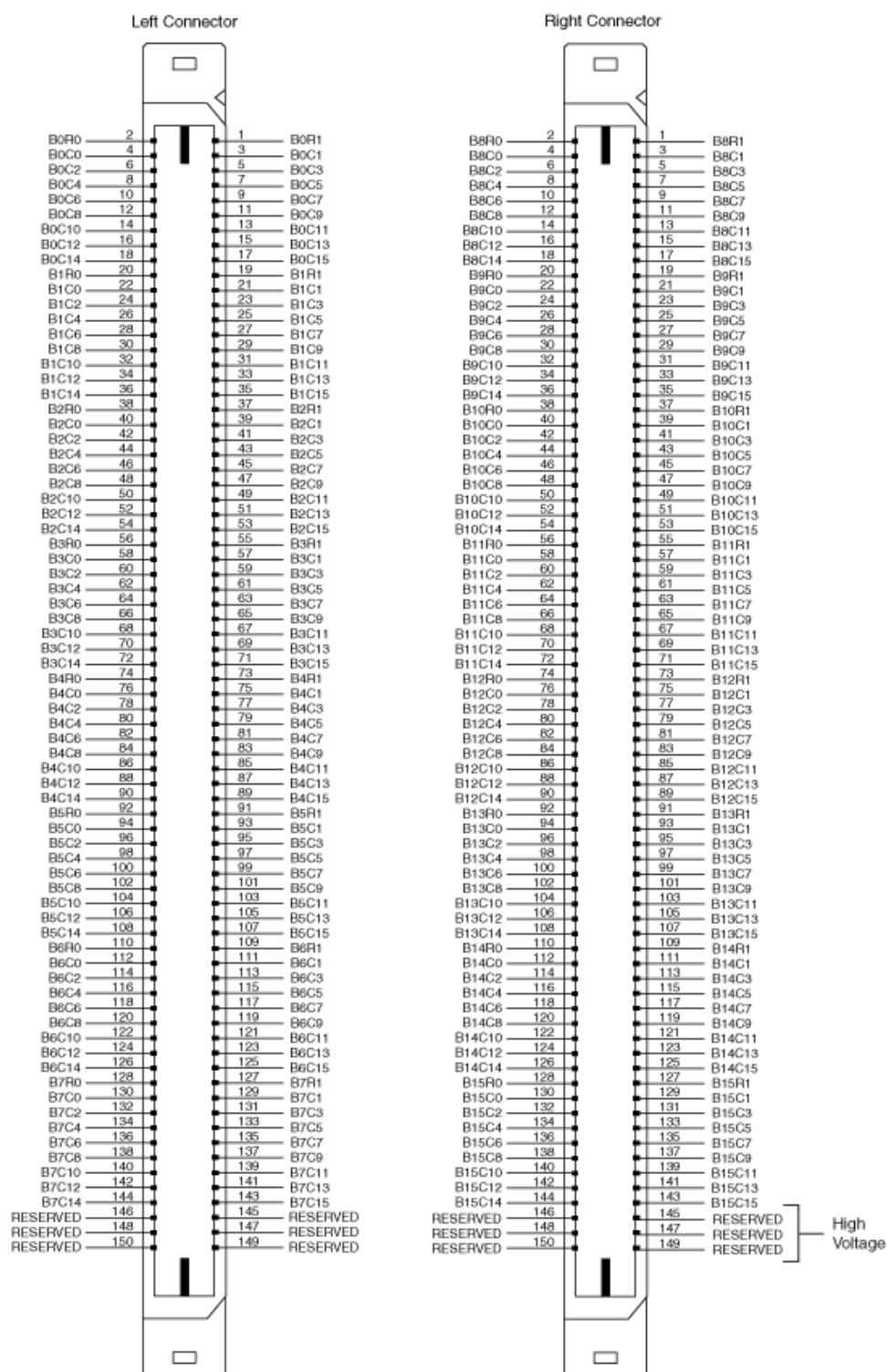
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



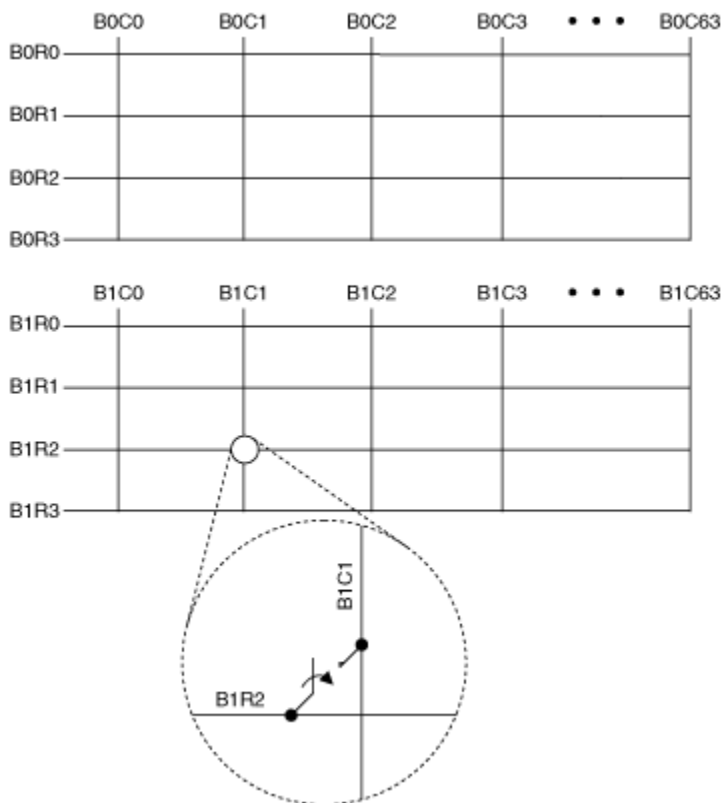
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 1-Wire Dual 4×64 Matrix Topology

The NI TB-2643 terminal block creates a 1-wire dual 4×64 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2643B terminal block creates a 1-wire dual 4×64 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 1-wire dual 4×64 matrix topology.



Making a Connection

For bank 0, both the scanning command, `b0r2->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r2` and `b0c1`, result in the following connection:

signal connected to B0R2 is routed to B0C1

For bank 1, both the scanning command, `b1r2->b1c1;`, and the immediate operation, `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function with parameters `b1r2` and `b1c1`, result in the following connection:

signal connected to B1R2 is routed to B1C1

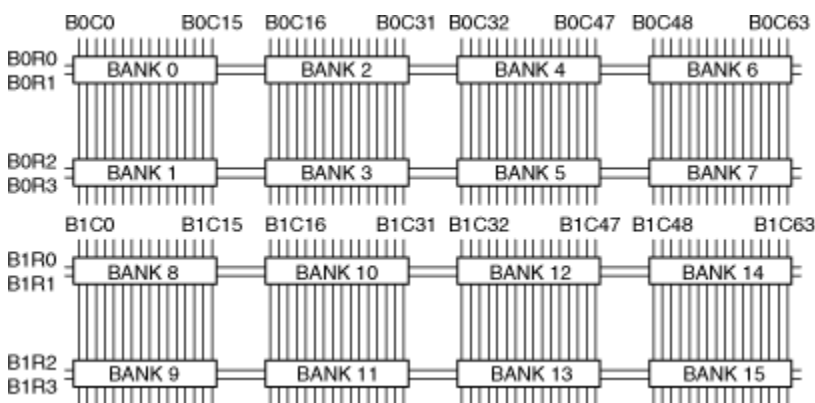


Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2643 terminal block connects banks of the NI 2532 to create the 1-wire dual 4×64 matrix topology. The NI TB-2643B terminal block connects banks of the NI 2532B to create the 1-wire dual 4×64 matrix topology. The following figure illustrates how the native banks of the NI 2532/2532B connect using the NI TB-2643/2643B to create the 1-wire dual 4×64 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2643/2643B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the upper column connection board of the NI TB-2643 and the J13 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B1C63	Pin 9	B1C59	Pin 17	B1C55	Pin 25	B1C51
Pin 2	B0C63	Pin 10	B0C59	Pin 18	B0C55	Pin 26	B0C51
Pin 3	B1C62	Pin 11	B1C58	Pin 19	B1C54	Pin 27	B1C50
Pin 4	B0C62	Pin 12	B0C58	Pin 20	B0C54	Pin 28	B0C50
Pin 5	B1C61	Pin 13	B1C57	Pin 21	B1C53	Pin 29	B1C49
Pin 6	B0C61	Pin 14	B0C57	Pin 22	B0C53	Pin 30	B0C49
Pin 7	B1C60	Pin 15	B1C56	Pin 23	B1C52	Pin 31	B1C48
Pin 8	B0C60	Pin 16	B0C56	Pin 24	B0C52	Pin 32	B0C48

The following table refers to the J2 connector on the upper column connection board of the NI TB-2643 and the J12 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B1C47	Pin 9	B1C43	Pin 17	B1C39	Pin 25	B1C35
Pin 2	B0C47	Pin 10	B0C43	Pin 18	B0C39	Pin 26	B0C35
Pin 3	B1C46	Pin 11	B1C42	Pin 19	B1C38	Pin 27	B1C34
Pin 4	B0C46	Pin 12	B0C42	Pin 20	B0C38	Pin 28	B0C34
Pin 5	B1C45	Pin 13	B1C41	Pin 21	B1C37	Pin 29	B1C33
Pin 6	B0C45	Pin 14	B0C41	Pin 22	B0C37	Pin 30	B0C33
Pin 7	B1C44	Pin 15	B1C40	Pin 23	B1C36	Pin 31	B1C32
Pin 8	B0C44	Pin 16	B0C40	Pin 24	B0C36	Pin 32	B0C32

The following table refers to the J3 connector on the lower column connection board of the NI TB-2643 and the J3 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C0	Pin 9	B0C4	Pin 17	B0C8	Pin 25	B0C12
Pin 2	B1C0	Pin 10	B1C4	Pin 18	B1C8	Pin 26	B1C12

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 3	B0C1	Pin 11	B0C5	Pin 19	B0C9	Pin 27	B0C13
Pin 4	B1C1	Pin 12	B1C5	Pin 20	B1C9	Pin 28	B1C13
Pin 5	B0C2	Pin 13	B0C6	Pin 21	B0C10	Pin 29	B0C14
Pin 6	B1C2	Pin 14	B1C6	Pin 22	B1C10	Pin 30	B1C14
Pin 7	B0C3	Pin 15	B0C7	Pin 23	B0C11	Pin 31	B0C15
Pin 8	B1C3	Pin 16	B1C7	Pin 24	B1C11	Pin 32	B1C15

The following table refers to the J2 connector on the lower column connection board of the NI TB-2643 and the J2 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C16	Pin 9	B0C20	Pin 17	B0C24	Pin 25	B0C28
Pin 2	B1C16	Pin 10	B1C20	Pin 18	B1C24	Pin 26	B1C28
Pin 3	B0C17	Pin 11	B0C21	Pin 19	B0C25	Pin 27	B0C29
Pin 4	B1C17	Pin 12	B1C21	Pin 20	B1C25	Pin 28	B1C29
Pin 5	B0C18	Pin 13	B0C22	Pin 21	B0C26	Pin 29	B0C30
Pin 6	B1C18	Pin 14	B1C22	Pin 22	B1C26	Pin 30	B1C30
Pin 7	B0C19	Pin 15	B0C23	Pin 23	B0C27	Pin 31	B0C31
Pin 8	B1C19	Pin 16	B1C23	Pin 24	B1C27	Pin 32	B1C31

Row Pin Connections

The NI TB-2643 and NI TB-2643B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	B0R0

Pin Number	Row
2	B1R0
3	B0R1
4	B1R1
5	B0R2
6	B1R2
7	B0R3
8	B1R3
9–16	—

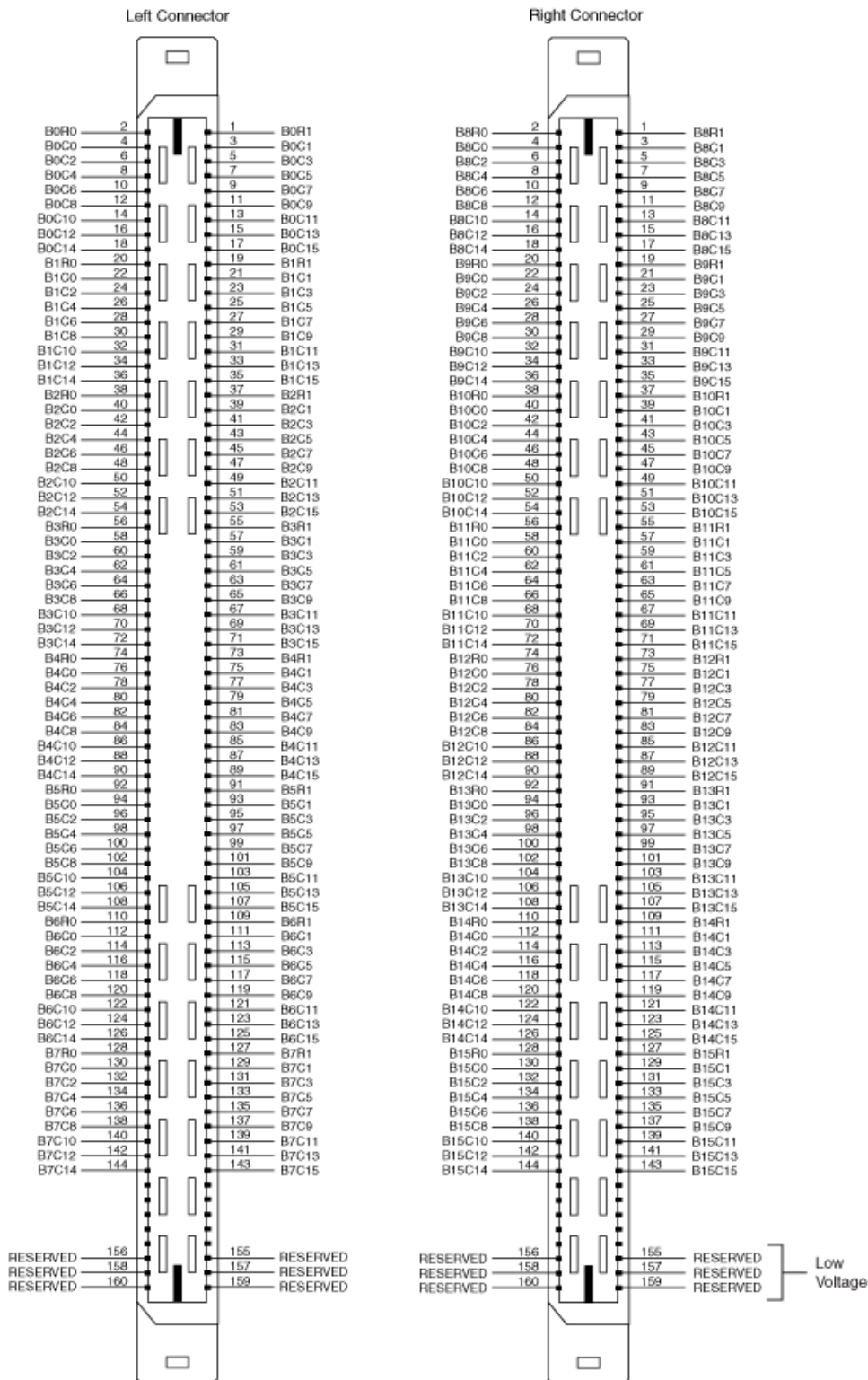
Row Protection Bypass Header

Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2643 Module Interface Board		NI TB-2643B	
Header	Pins Connected	Header	Pins Connected	
B0R0	J5	1-2	J14	1-2
B1R0	J5	3-4	J14	3-4
B0R1	J5	5-6	J14	5-6
B1R1	J5	7-8	J14	7-8
B0R2	J5	9-10	J14	9-10
B1R2	J5	11-12	J14	11-12
B0R3	J5	13-14	J14	13-14
B1R3	J5	15-16	J14	15-16

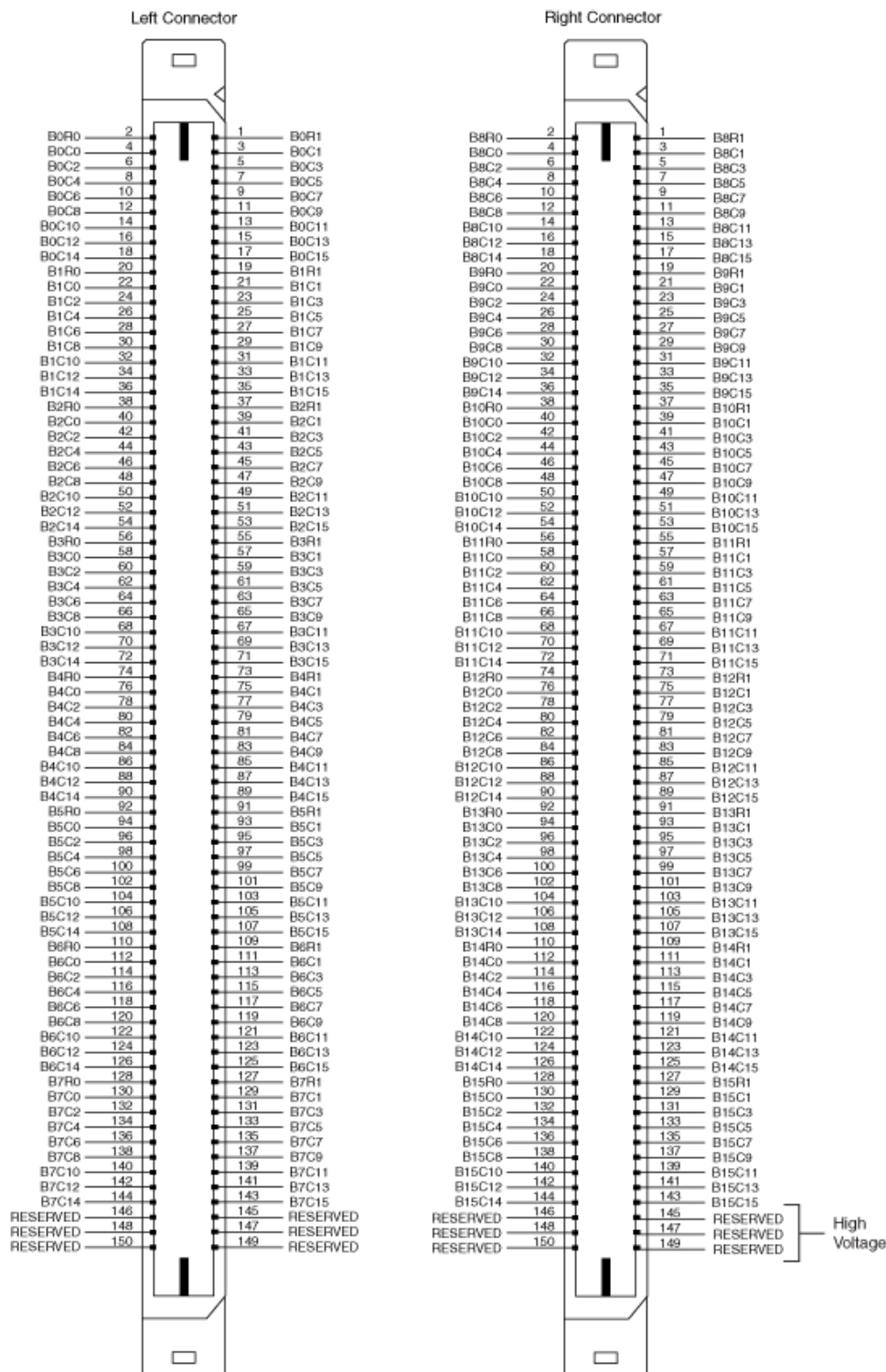
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



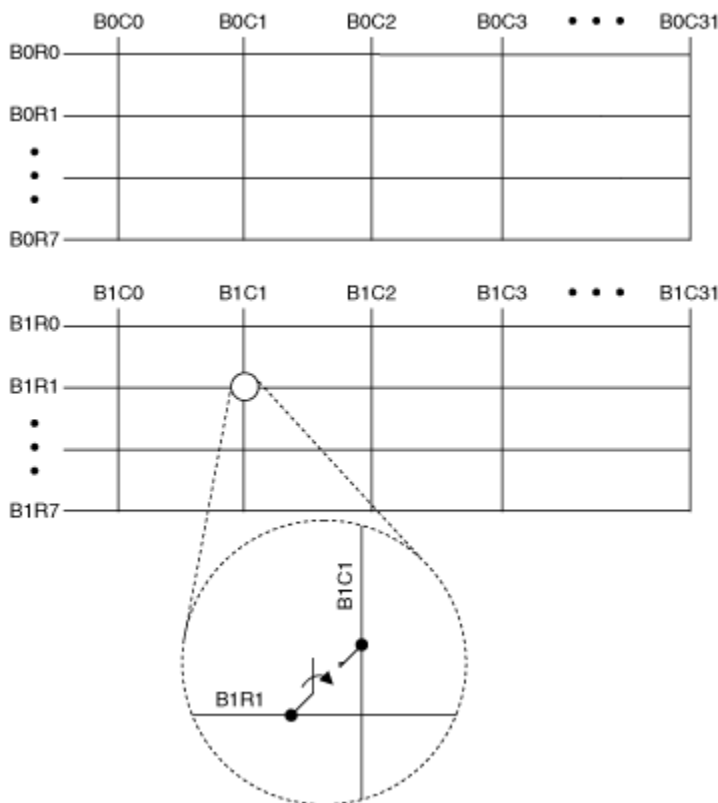
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 1-Wire Dual 8×32 Matrix Topology

The NI TB-2644 terminal block creates a 1-wire dual 8×32 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2644B terminal block creates a 1-wire dual 8×32 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 1-wire dual 8×32 matrix topology.



Making a Connection

For bank 0, both the scanning command, `b0r1->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r1` and `b0c1`, result in the following connection:

signal connected to B0R1 is routed to B0C1

For bank 1, both the scanning command, `b1r1->b1c1;`, and the immediate operation, `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function with parameters `b1r1` and `b1c1`, result in the following connection:

signal connected to B1R1 is routed to B1C1

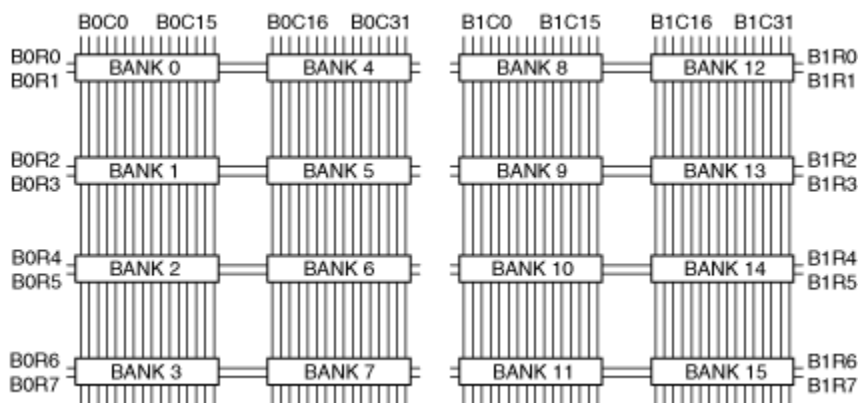


Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2644 terminal block connects the banks of the NI 2532 to create the 1-wire dual 8×32 matrix topology. The NI TB-2644B terminal block connects the banks of the NI 2532B to create the 1-wire dual 8×32 matrix topology. The following figure illustrates how the native banks on the NI 2532/2532B connect using the NI TB-2644/2644B to create the 1-wire dual 8×32 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2644/2644B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the NI TB-2644 column connection board and the J3 connector on the NI TB-2644B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C0	Pin 9	B0C4	Pin 17	B0C8	Pin 25	B0C12
Pin 2	B1C0	Pin 10	B1C4	Pin 18	B1C8	Pin 26	B1C12
Pin 3	B0C1	Pin 11	B0C5	Pin 19	B0C9	Pin 27	B0C13
Pin 4	B1C1	Pin 12	B1C5	Pin 20	B1C9	Pin 28	B1C13
Pin 5	B0C2	Pin 13	B0C6	Pin 21	B0C10	Pin 29	B0C14
Pin 6	B1C2	Pin 14	B1C6	Pin 22	B1C10	Pin 30	B1C14
Pin 7	B0C3	Pin 15	B0C7	Pin 23	B0C11	Pin 31	B0C15
Pin 8	B1C3	Pin 16	B1C7	Pin 24	B1C11	Pin 32	B1C15

The following table refers to the J2 connector on the NI TB-2644 column connection board and the J2 connector on the NI TB-2644B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C16	Pin 9	B0C20	Pin 17	B0C24	Pin 25	B0C28
Pin 2	B1C16	Pin 10	B1C20	Pin 18	B1C24	Pin 26	B1C28
Pin 3	B0C17	Pin 11	B0C21	Pin 19	B0C25	Pin 27	B0C29
Pin 4	B1C17	Pin 12	B1C21	Pin 20	B1C25	Pin 28	B1C29
Pin 5	B0C18	Pin 13	B0C22	Pin 21	B0C26	Pin 29	B0C30
Pin 6	B1C18	Pin 14	B1C22	Pin 22	B1C26	Pin 30	B1C30
Pin 7	B0C19	Pin 15	B0C23	Pin 23	B0C27	Pin 31	B0C31
Pin 8	B1C19	Pin 16	B1C23	Pin 24	B1C27	Pin 32	B1C31

Row Pin Connections

The NI TB-2644 and NI TB-2644B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	B0R0
2	B1R0
3	B0R1
4	B1R1
5	B0R2
6	B1R2
7	B0R3
8	B1R3
9	B0R4
10	B1R4
11	B0R5
12	B1R5
13	B0R6
14	B1R6
15	B0R7
16	B1R7

Row Protection Bypass Header

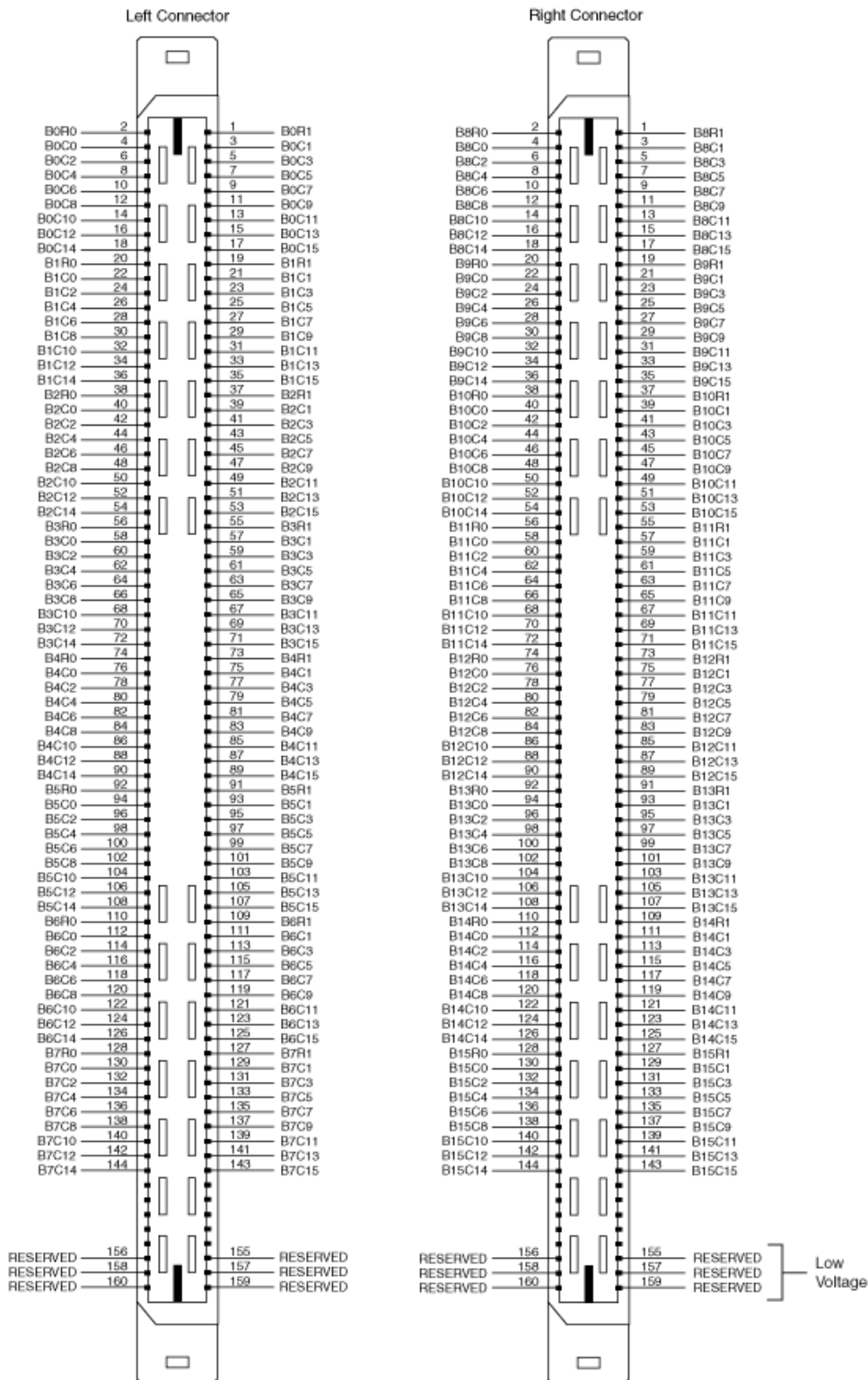
Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2644 Module Interface Board		NI TB-2644B	
Header	Pins Connected	Header	Pins Connected	
B0R0	N/A	N/A	J14	1-2
B1R0	N/A	N/A	J14	3-4
B0R1	N/A	N/A	J14	5-6

Bypassed Row	NI TB-2644 Module Interface Board		NI TB-2644B	
Header	Pins Connected	Header	Pins Connected	
B1R1	N/A	N/A	J14	7-8
B0R2	N/A	N/A	J14	9-10
B1R2	N/A	N/A	J14	11-12
B0R3	N/A	N/A	J14	13-14
B1R3	N/A	N/A	J14	15-16
B0R4	N/A	N/A	J15	1-2
B1R4	N/A	N/A	J15	3-4
B0R5	N/A	N/A	J15	5-6
B1R5	N/A	N/A	J15	7-8
B0R6	N/A	N/A	J15	9-10
B1R6	N/A	N/A	J15	11-12
B0R7	N/A	N/A	J15	13-14
B1R7	N/A	N/A	J15	15-16

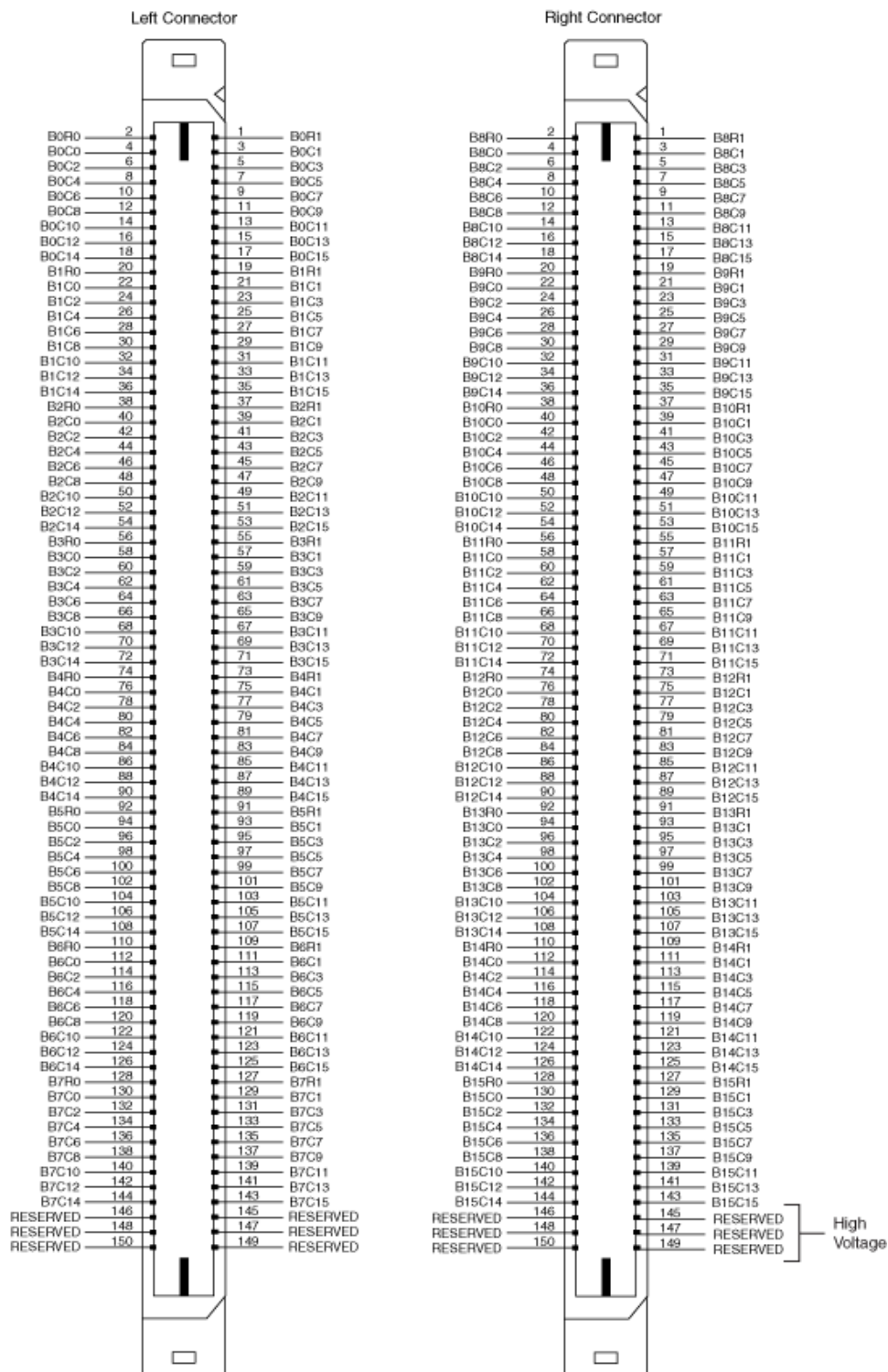
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



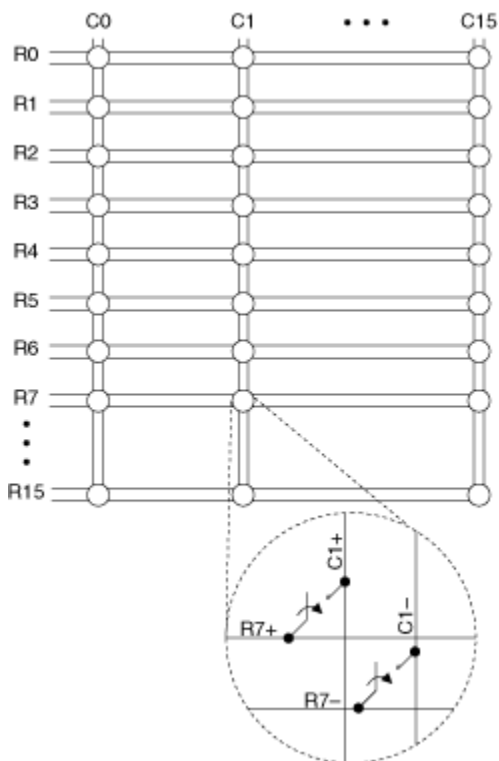
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 2-Wire 16×16 Matrix Topology

The NI TB-2645 terminal block creates a 2-wire 16×16 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2645B terminal block creates a 2-wire 16×16 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 2-wire 16×16 matrix topology.



Making a Connection

Both the scanning command, `r6->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r6` and `c1`, result in the following connections:

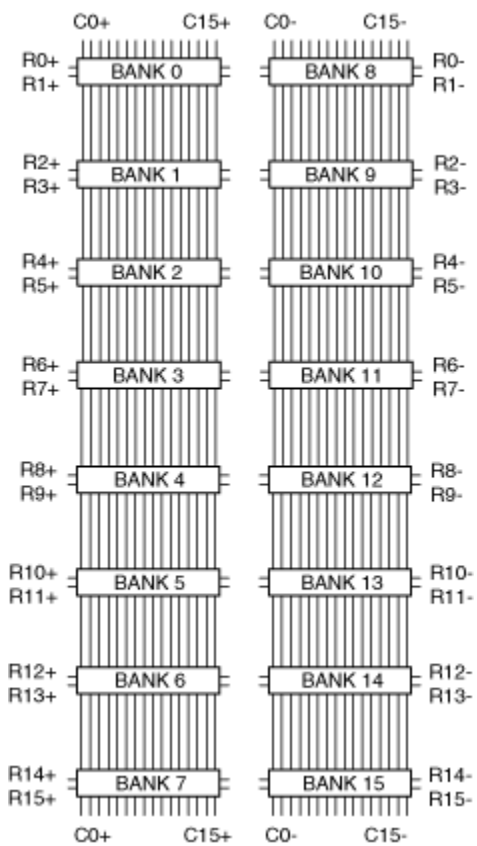
signal connected to R6+ is routed to C1+

signal connected to R6– is routed to C1–

Terminal Block Connections

The NI TB-2645 terminal block connects the banks of the NI 2532 to create the 2-wire 16×16 matrix topology. The NI TB-2645B terminal block connects the banks of the NI 2532B to create the 2-wire 16×16 matrix topology. The following figure illustrates how the native banks on the NI 2532/2532B connect using the NI TB-2645/2645B to create the 2-wire 16×16 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2645/2645B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the NI TB-2645 column connection board and the J3 connector on the NI TB-2645B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C0+	Pin 9	C4+	Pin 17	C8+	Pin 25	C12+
Pin 2	C0–	Pin 10	C4–	Pin 18	C8–	Pin 26	C12–
Pin 3	C1+	Pin 11	C5+	Pin 19	C9+	Pin 27	C13+
Pin 4	C1–	Pin 12	C5–	Pin 20	C9–	Pin 28	C13–
Pin 5	C2+	Pin 13	C6+	Pin 21	C10+	Pin 29	C14+
Pin 6	C2–	Pin 14	C6–	Pin 22	C10–	Pin 30	C14–
Pin 7	C3+	Pin 15	C7+	Pin 23	C11+	Pin 31	C15+
Pin 8	C3–	Pin 16	C7–	Pin 24	C11–	Pin 32	C15–



Note The column connection board J2 connector on the NI TB-2645 is not used in this configuration.

Row Pin Connections

The NI TB-2645/2645B requires two row ribbon cables for row connections. The TB-2645 provides one pair of ribbon cable headers to connect your application. The TB-2645B provides two pairs of ribbon cable headers. Use one cable header pair to connect to your application and the other for column expansion.

The following tables list the pin assignments for row connection.

The following table refers to the J2 connector on the NI TB-2645 Module Interface Board and the J4 and J5 connectors on the NI TB-2645B.

Pin Number	Row
Pin 1	R0+
Pin 2	R0–
Pin 3	R1+
Pin 4	R1–
Pin 5	R2+

Pin Number	Row
Pin 6	R2–
Pin 7	R3+
Pin 8	R3–
Pin 9	R4+
Pin 10	R4–
Pin 11	R5+
Pin 12	R5–
Pin 13	R6+
Pin 14	R6–
Pin 15	R7+
Pin 16	R7–

The following table refers to the J3 connector on the NI TB-2645 Module Interface Board and the J6 and J7 connectors on the NI TB-2645B.

Pin Number	Row
Pin 1	R8+
Pin 2	R8–
Pin 3	R9+
Pin 4	R9–
Pin 5	R10+
Pin 6	R10–
Pin 7	R11+
Pin 8	R11–
Pin 9	R12+
Pin 10	R12–
Pin 11	R13+
Pin 12	R13–

Pin Number	Row
Pin 13	R14+
Pin 14	R14–
Pin 15	R15+
Pin 16	R15–

Row Protection Bypass Header

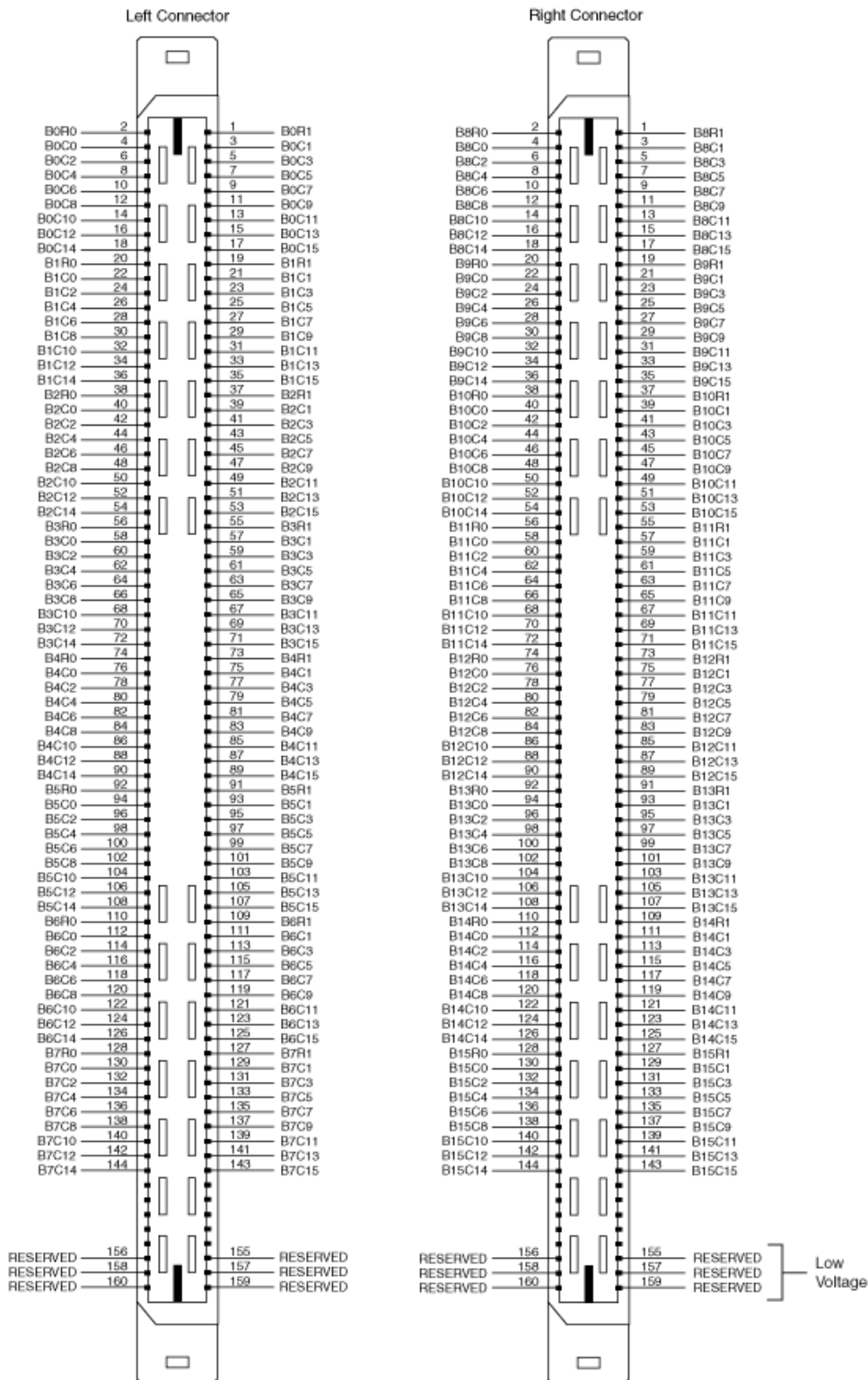
Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2645 Module Interface Board		NI TB-2645B	
Header	Pins Connected	Header	Pins Connected	
R0+	N/A	N/A	J14	1-2
R0–	N/A	N/A	J14	3-4
R1+	N/A	N/A	J14	5-6
R1–	N/A	N/A	J14	7-8
R2+	N/A	N/A	J14	9-10
R2–	N/A	N/A	J14	11-12
R3+	N/A	N/A	J14	13-14
R3–	N/A	N/A	J14	15-16
R4+	N/A	N/A	J15	1-2
R4–	N/A	N/A	J15	3-4
R5+	N/A	N/A	J15	5-6
R5–	N/A	N/A	J15	7-8
R6+	N/A	N/A	J15	9-10
R6–	N/A	N/A	J15	11-12
R7+	N/A	N/A	J15	13-14

Bypassed Row	NI TB-2645 Module Interface Board		NI TB-2645B	
Header	Pins Connected	Header	Pins Connected	
R7-	N/A	N/A	J15	15-16
R8+	N/A	N/A	J16	1-2
R8-	N/A	N/A	J16	3-4
R9+	N/A	N/A	J16	5-6
R9-	N/A	N/A	J16	7-8
R10+	N/A	N/A	J16	9-10
R10-	N/A	N/A	J16	11-12
R11+	N/A	N/A	J16	13-14
R11-	N/A	N/A	J16	15-16
R12+	N/A	N/A	J17	1-2
R12-	N/A	N/A	J17	3-4
R13+	N/A	N/A	J17	5-6
R13-	N/A	N/A	J17	7-8
R14+	N/A	N/A	J17	9-10
R14-	N/A	N/A	J17	11-12
R15+	N/A	N/A	J17	13-14
R15-	N/A	N/A	J17	15-16

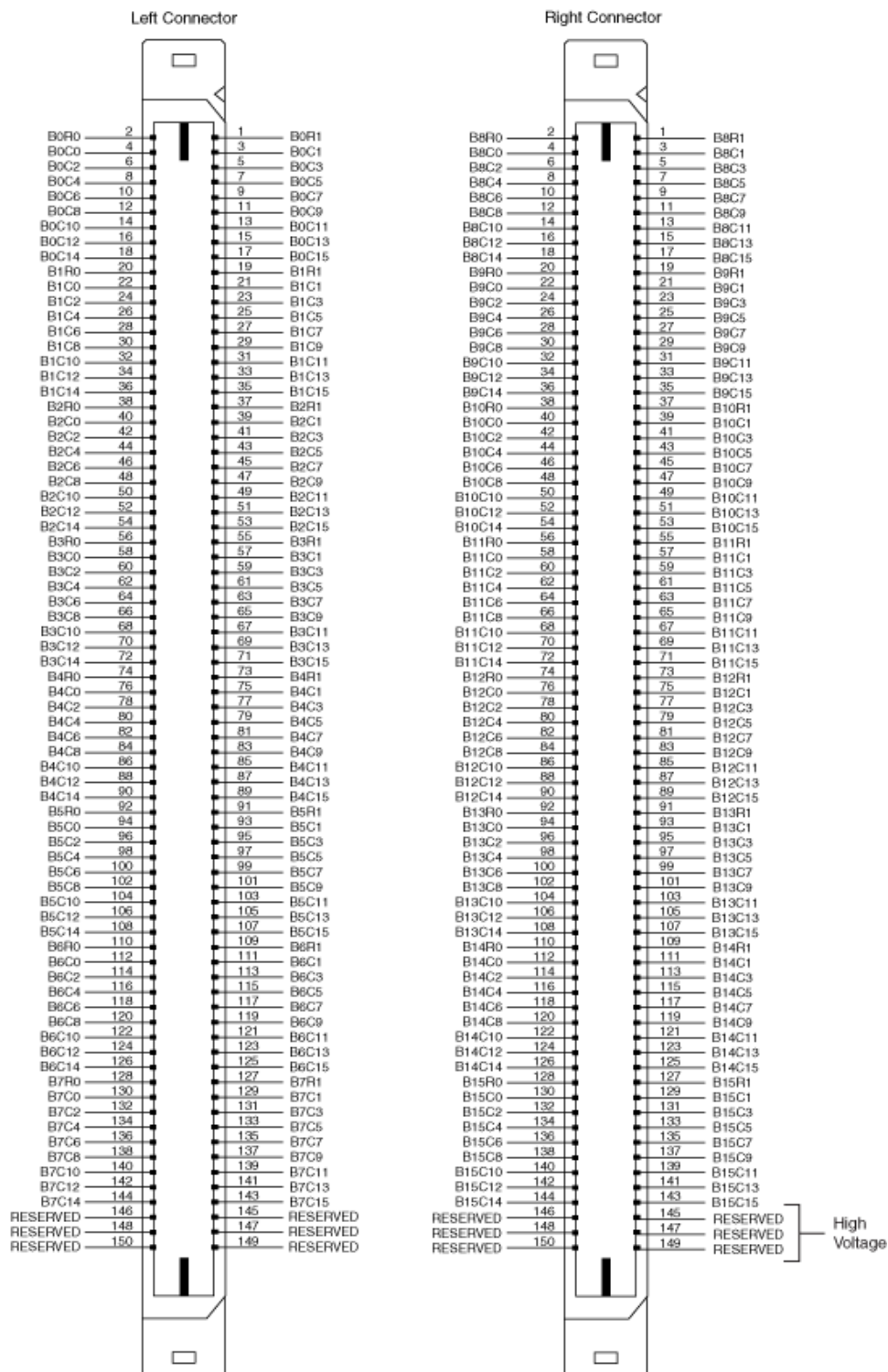
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



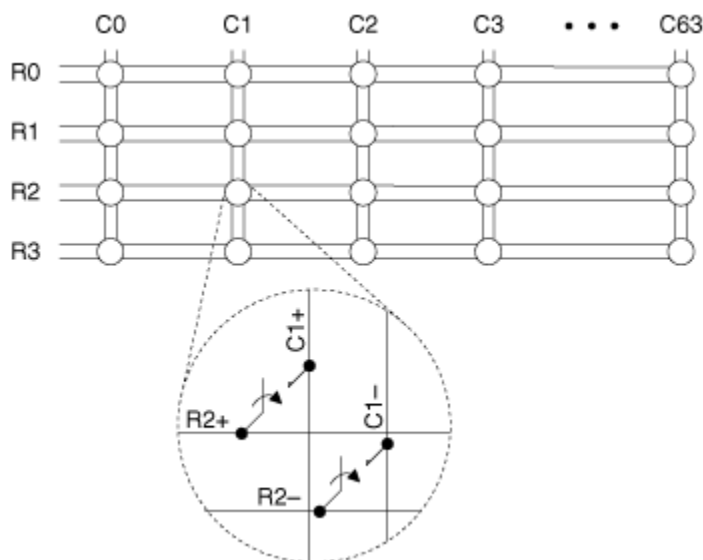
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 2-Wire 4×64 Matrix Topology

The NI TB-2643 terminal block creates a 2-wire 4×64 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2643B terminal block creates a 2-wire 4×64 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 2-wire 4×64 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connections:

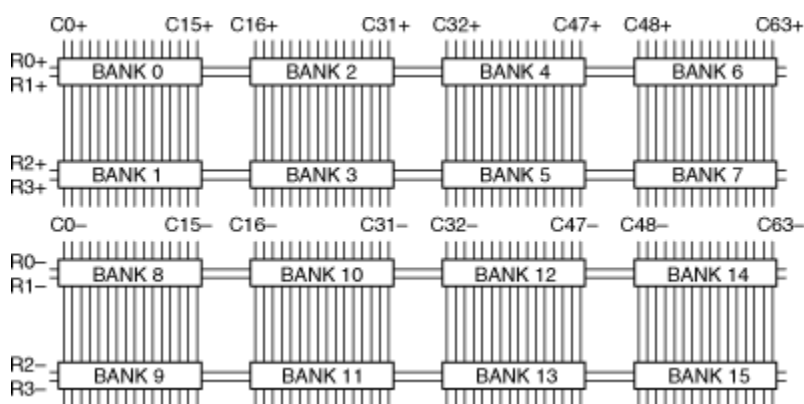
signal connected to `R2+` is routed to `C1+`

signal connected to `R2-` is routed to `C1-`

Terminal Block Connections

The NI TB-2643 terminal block connects banks of the NI 2532 to create the 2-wire 4×64 matrix topology. The NI TB-2643B terminal block connects banks of the NI 2532B to create the 2-wire 4×64 matrix topology. The following figure illustrates how the native banks of the NI 2532/2532B connect using the NI TB-2643/2643B to create the 2-wire 4×64 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2643/2643B upper and lower column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the upper column connection board of the NI TB-2643 and the J13 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C63–	Pin 9	C59–	Pin 17	C55–	Pin 25	C51–
Pin 2	C63+	Pin 10	C59+	Pin 18	C55+	Pin 26	C51+
Pin 3	C62–	Pin 11	C58–	Pin 19	C54–	Pin 27	C50–
Pin 4	C62+	Pin 12	C58+	Pin 20	C54+	Pin 28	C50+
Pin 5	C61–	Pin 13	C57–	Pin 21	C53–	Pin 29	C49–
Pin 6	C61+	Pin 14	C57+	Pin 22	C53+	Pin 30	C49+
Pin 7	C60–	Pin 15	C56–	Pin 23	C52–	Pin 31	C48–

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 8	C60+	Pin 16	C56+	Pin 24	C52+	Pin 32	C48+

The following table refers to the J2 connector on the upper column connection board of the NI TB-2643 and the J12 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C47–	Pin 9	C43–	Pin 17	C39–	Pin 25	C35–
Pin 2	C47+	Pin 10	C43+	Pin 18	C39+	Pin 26	C35+
Pin 3	C46–	Pin 11	C42–	Pin 19	C38–	Pin 27	C34–
Pin 4	C46+	Pin 12	C42+	Pin 20	C38+	Pin 28	C34+
Pin 5	C45–	Pin 13	C41–	Pin 21	C37–	Pin 29	C33–
Pin 6	C45+	Pin 14	C41+	Pin 22	C37+	Pin 30	C33+
Pin 7	C44–	Pin 15	C40–	Pin 23	C36–	Pin 31	C32–
Pin 8	C44+	Pin 16	C40+	Pin 24	C36+	Pin 32	C32+

The following table refers to the J3 connector on the lower column connection board of the NI TB-2643 and the J3 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C0+	Pin 9	C4+	Pin 17	C8+	Pin 25	C12+
Pin 2	C0–	Pin 10	C4–	Pin 18	C8–	Pin 26	C12–
Pin 3	C1+	Pin 11	C5+	Pin 19	C9+	Pin 27	C13+
Pin 4	C1–	Pin 12	C5–	Pin 20	C9–	Pin 28	C13–
Pin 5	C2+	Pin 13	C6+	Pin 21	C10+	Pin 29	C14+
Pin 6	C2–	Pin 14	C6–	Pin 22	C10–	Pin 30	C14–
Pin 7	C3+	Pin 15	C7+	Pin 23	C11+	Pin 31	C15+
Pin 8	C3–	Pin 16	C7–	Pin 24	C11–	Pin 32	C15–

The following table refers to the J2 connector on the lower column connection board

of the NI TB-2643 and the J2 connector on the NI TB-2643B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C16+	Pin 9	C20+	Pin 17	C24+	Pin 25	C28+
Pin 2	C16–	Pin 10	C20–	Pin 18	C24–	Pin 26	C28–
Pin 3	C17+	Pin 11	C21+	Pin 19	C25+	Pin 27	C29+
Pin 4	C17–	Pin 12	C21–	Pin 20	C25–	Pin 28	C29–
Pin 5	C18+	Pin 13	C22+	Pin 21	C26+	Pin 29	C30+
Pin 6	C18–	Pin 14	C22–	Pin 22	C26–	Pin 30	C30–
Pin 7	C19+	Pin 15	C23+	Pin 23	C27+	Pin 31	C31+
Pin 8	C19–	Pin 16	C23–	Pin 24	C27–	Pin 32	C31–

Row Pin Connections

The NI TB-2643 and NI TB-2643B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	R0+
2	R0–
3	R1+
4	R1–
5	R2+
6	R2–
7	R3+
8	R3–
9–16	—

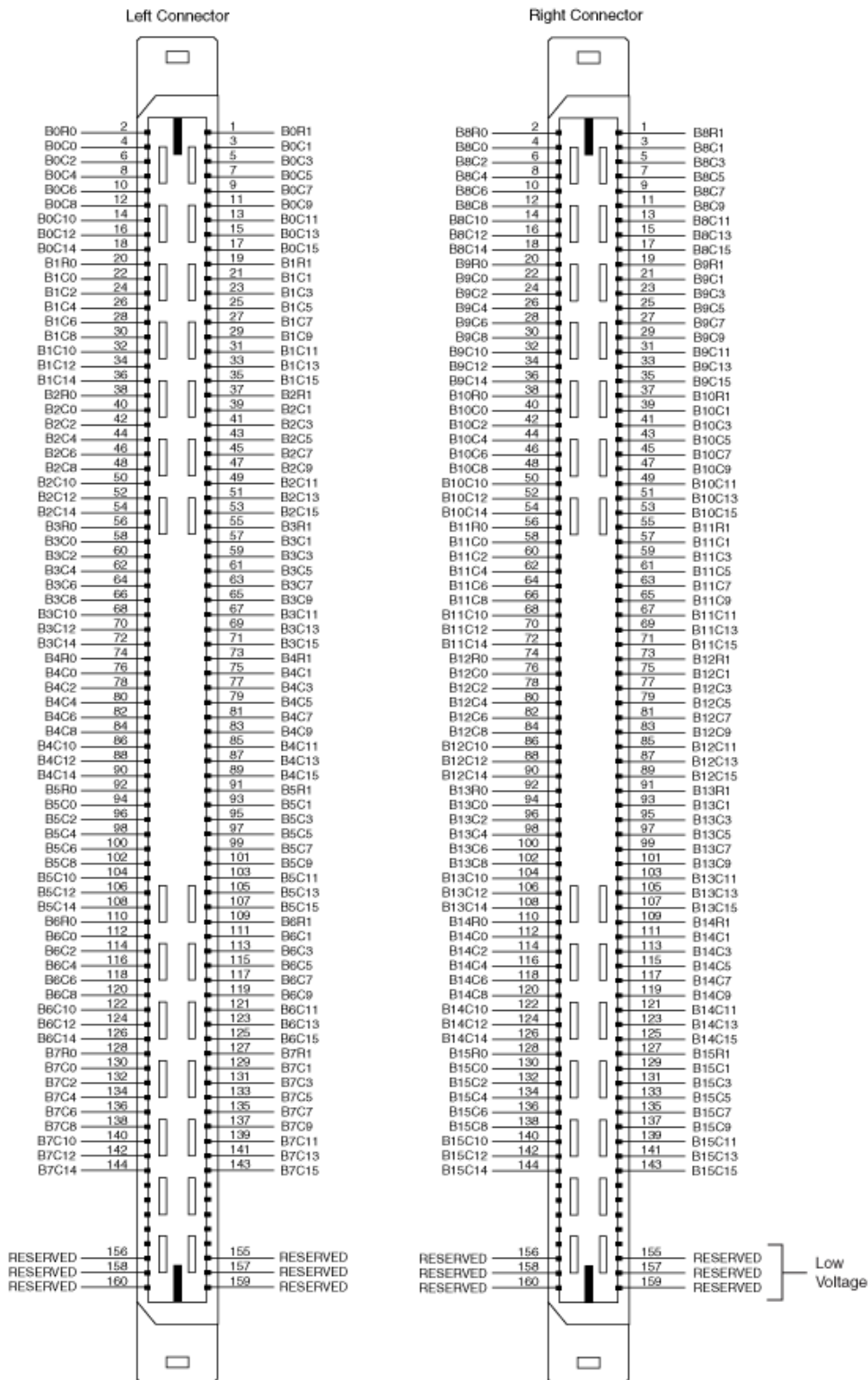
Row Protection Bypass Header

Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2643 Module Interface Board		NI TB-2643B	
Header	Pins Connected	Header	Pins Connected	
R0+	J5	1-2	J14	1-2
R0-	J5	3-4	J14	3-4
R1+	J5	5-6	J14	5-6
R1-	J5	7-8	J14	7-8
R2+	J5	9-10	J14	9-10
R2-	J5	11-12	J14	11-12
R3+	J5	13-14	J14	13-14
R3-	J5	15-16	J14	15-16

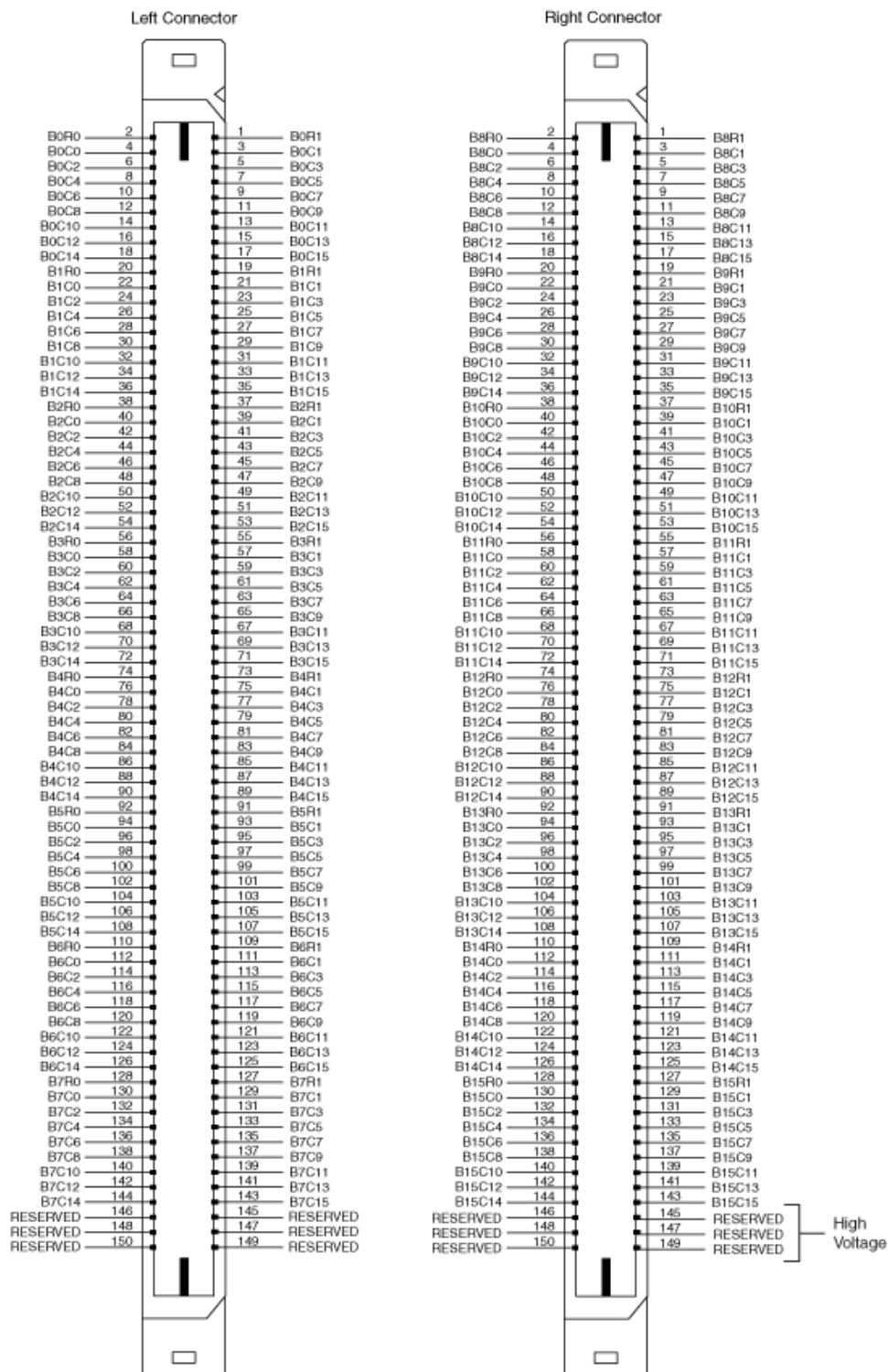
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



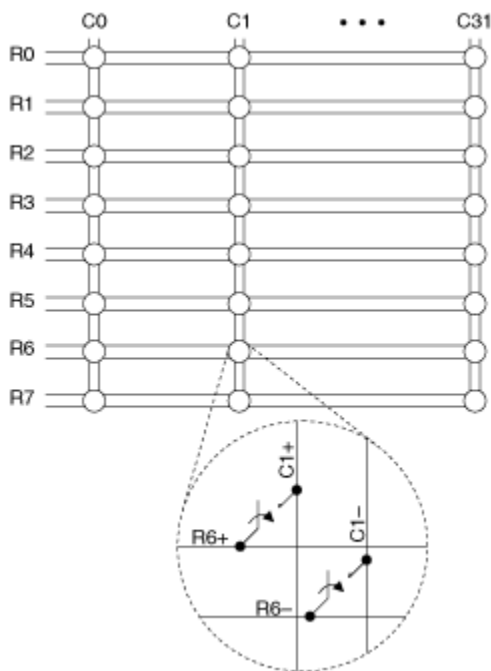
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 2-Wire 8×32 Matrix Topology

The NI TB-2644 terminal block creates a 2-wire 8×32 matrix topology with the NI PXI/PXIe-2532 (NI 2532). The NI TB-2644B terminal block creates a 2-wire 8×32 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 2-wire 8×32 matrix topology.



Making a Connection

Both the scanning command, `r6->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r6` and `c1`, result in the following connections:

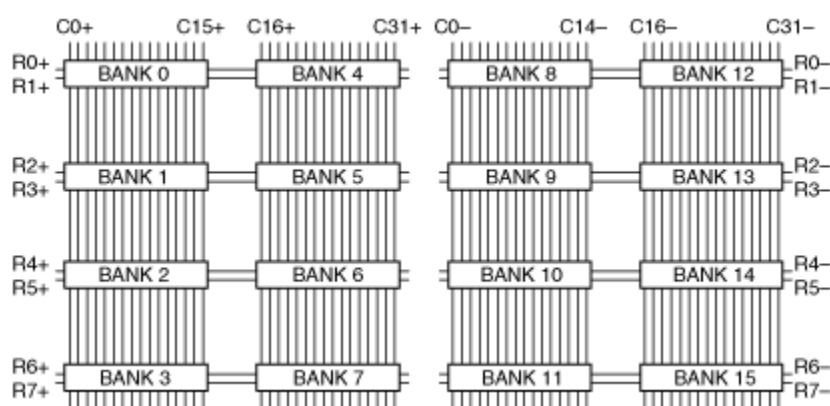
signal connected to R6+ is routed to C1+

signal connected to R6- is routed to C1-

Terminal Block Connections

The NI TB-2644 terminal block connects the banks of the NI 2532 to create the 2-wire 8×32 matrix topology. The NI TB-2644B terminal block connects the banks of the NI 2532B to create the 2-wire 8×32 matrix topology. The following figure illustrates how the native banks on the NI 2532/2532B connect using the NI TB-2644/2644B to create the 2-wire 8×32 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2644/2644B column ribbon cable headers.

Column Pin Connections

The following table refers to the J3 connector on the NI TB-2644 column connection board and the J3 connector on the NI TB-2644B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C0+	Pin 9	C4+	Pin 17	C8+	Pin 25	C12+
Pin 2	C0-	Pin 10	C4-	Pin 18	C8-	Pin 26	C12-
Pin 3	C1+	Pin 11	C5+	Pin 19	C9+	Pin 27	C13+
Pin 4	C1-	Pin 12	C5-	Pin 20	C9-	Pin 28	C13-
Pin 5	C2+	Pin 13	C6+	Pin 21	C10+	Pin 29	C14+
Pin 6	C2-	Pin 14	C6-	Pin 22	C10-	Pin 30	C14-
Pin 7	C3+	Pin 15	C7+	Pin 23	C11+	Pin 31	C15+

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 8	C3–	Pin 16	C7–	Pin 24	C11–	Pin 32	C15–

The following table refers to the J2 connector on the NI TB-2644 column connection board and the J2 connector on the NI TB-2644B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	C16+	Pin 9	C20+	Pin 17	C24+	Pin 25	C28+
Pin 2	C16–	Pin 10	C20–	Pin 18	C24–	Pin 26	C28–
Pin 3	C17+	Pin 11	C21+	Pin 19	C25+	Pin 27	C29+
Pin 4	C17–	Pin 12	C21–	Pin 20	C25–	Pin 28	C29–
Pin 5	C18+	Pin 13	C22+	Pin 21	C26+	Pin 29	C30+
Pin 6	C18–	Pin 14	C22–	Pin 22	C26–	Pin 30	C30–
Pin 7	C19+	Pin 15	C23+	Pin 23	C27+	Pin 31	C31+
Pin 8	C19–	Pin 16	C23–	Pin 24	C27–	Pin 32	C31–

Row Pin Connections

The NI TB-2644 and NI TB-2644B provide two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following table lists the pin assignments for row connection.

Pin Number	Row
1	R0+
2	R0–
3	R1+
4	R1–
5	R2+
6	R2–

Pin Number	Row
7	R3+
8	R3–
9	R4+
10	R4–
11	R5+
12	R5–
13	R6+
14	R6–
15	R7+
16	R7–

Row Protection Bypass Header

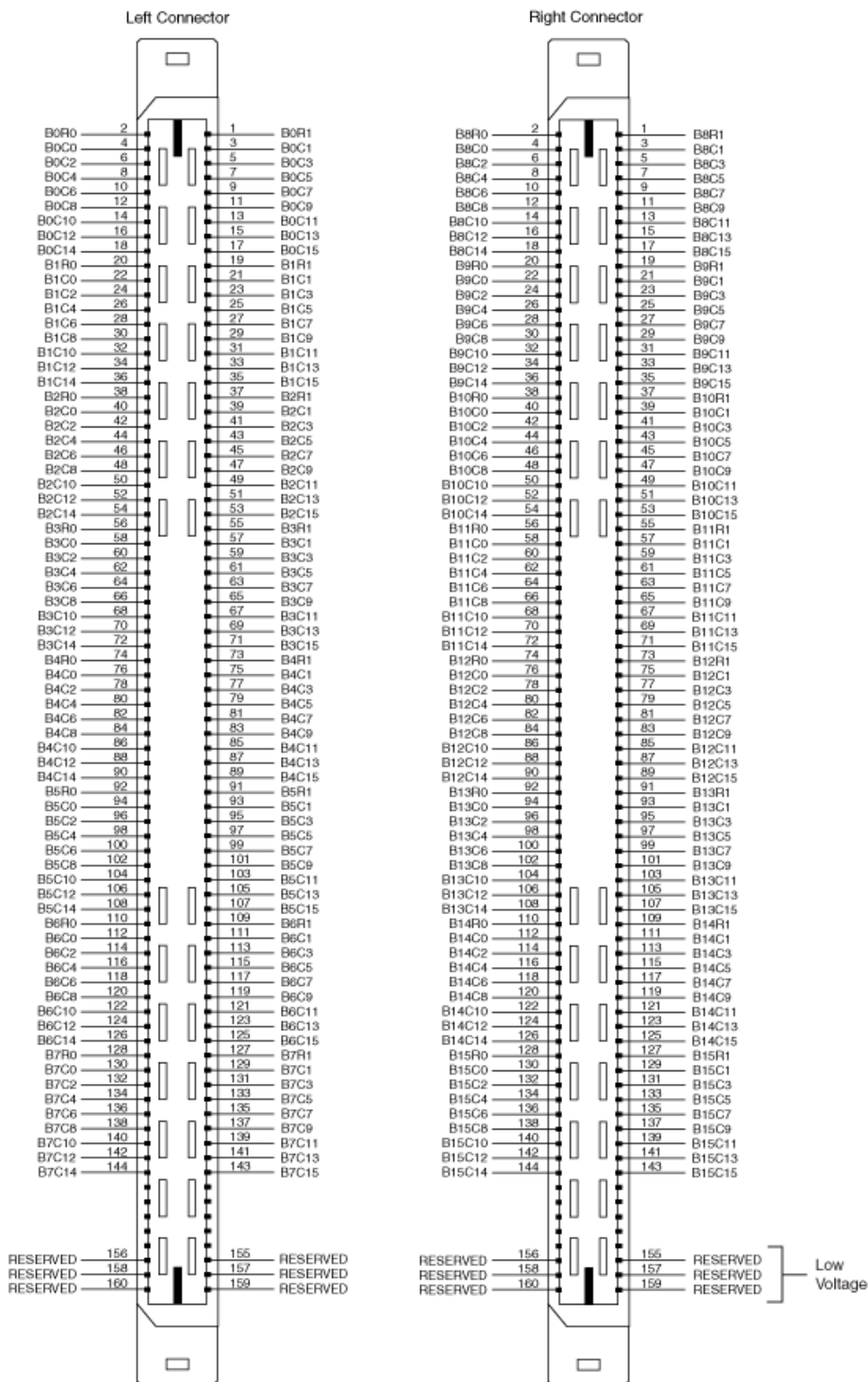
Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2644 Module Interface Board		NI TB-2644B	
Header	Pins Connected	Header	Pins Connected	
R0+	N/A	N/A	J14	1-2
R0–	N/A	N/A	J14	3-4
R1+	N/A	N/A	J14	5-6
R1–	N/A	N/A	J14	7-8
R2+	N/A	N/A	J14	9-10
R2–	N/A	N/A	J14	11-12
R3+	N/A	N/A	J14	13-14
R3–	N/A	N/A	J14	15-16
R4+	N/A	N/A	J15	1-2

Bypassed Row	NI TB-2644 Module Interface Board		NI TB-2644B	
Header	Pins Connected	Header	Pins Connected	
R4-	N/A	N/A	J15	3-4
R5+	N/A	N/A	J15	5-6
R5-	N/A	N/A	J15	7-8
R6+	N/A	N/A	J15	9-10
R6-	N/A	N/A	J15	11-12
R7+	N/A	N/A	J15	13-14
R7-	N/A	N/A	J15	15-16

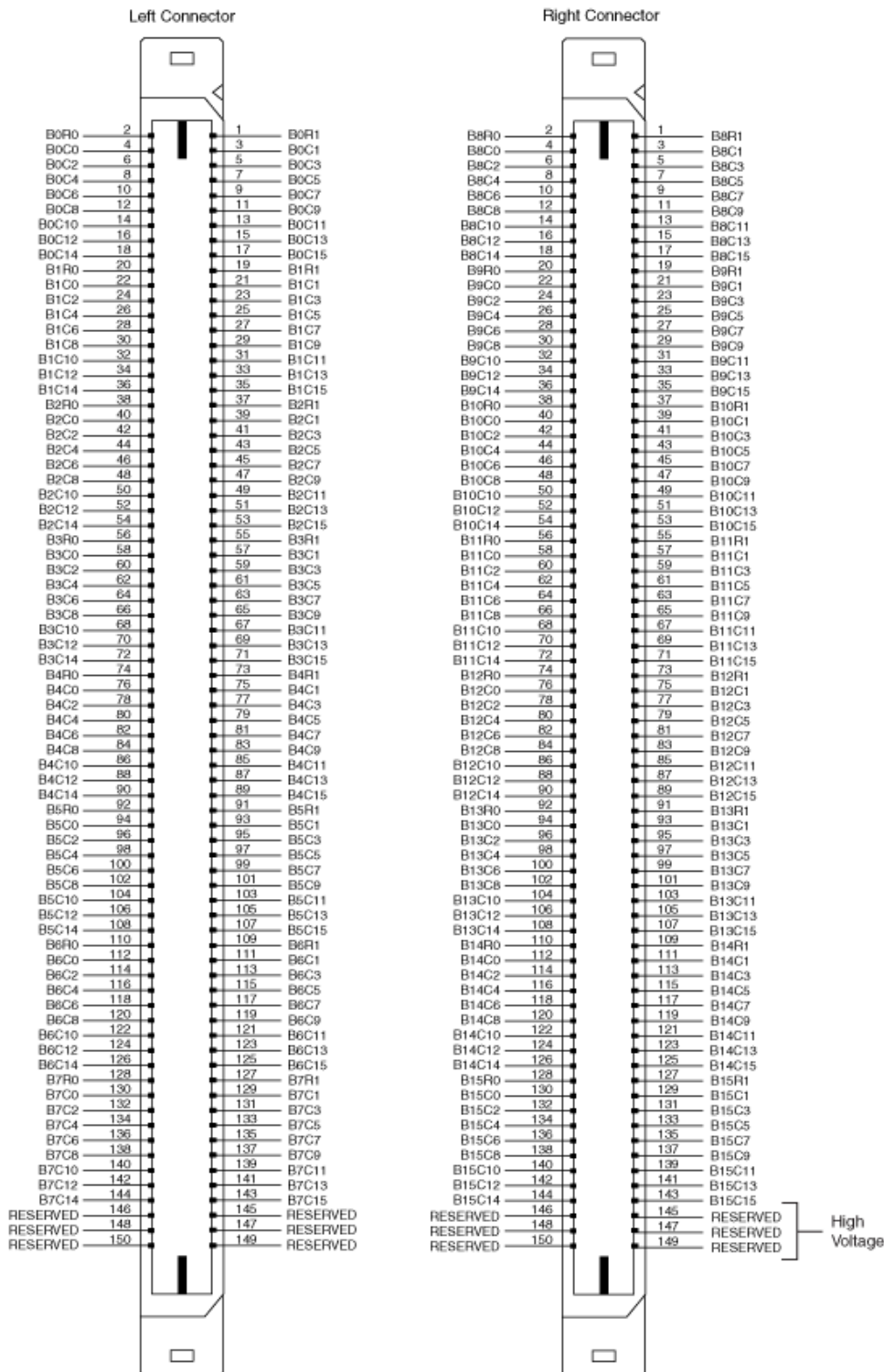
Pinout

The following figure identifies the pins for the NI 2532.



Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

The following figure identifies the pins for the NI 2532B.



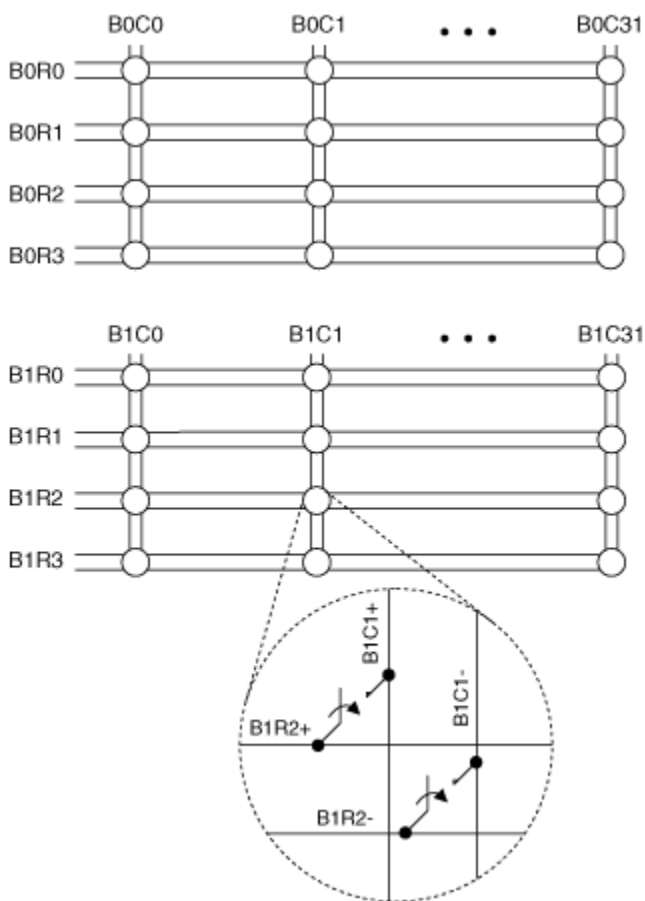
Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI/PXIe-2532/2532B 2-Wire Dual 4×32 Matrix Topology

The NI TB-2646B terminal block creates a 2-wire dual 4×32 matrix topology with the NI PXI/PXIe-2532B (NI 2532B). The following figure represents the NI 2532/2532B in the 2-wire dual 4×32 matrix topology.



Making a Connection

Both the scanning command, `b0r2->b0c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `b0r2` and `b0c1`, result in the following connections:

signal connected to B0R2+ is routed to B0C1+

signal connected to B0R2– is routed to B0C1–

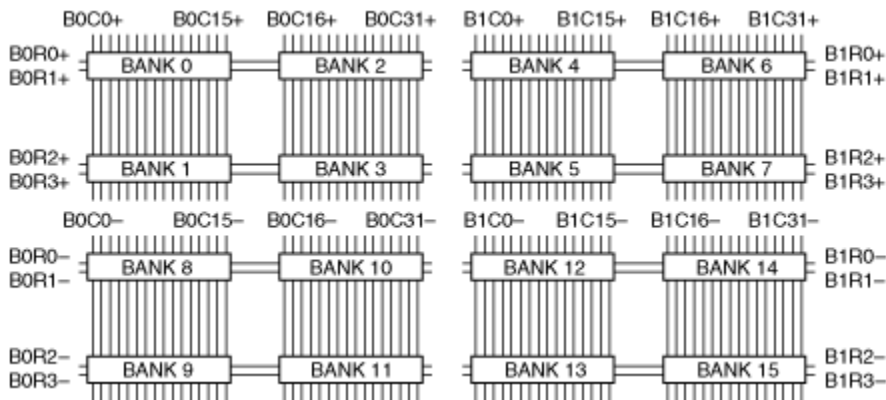


Note While you can, for example, connect B0R1 to B0C0, you cannot connect B0R1 directly to B1C1 in this topology.

Terminal Block Connections

The NI TB-2646B terminal block connects banks of the NI 2532B to create the 2-wire dual 4×32 matrix topology. The following figure illustrates how the native banks of the NI 2532B connect using the NI TB-2646B to create the 2-wire dual 4×32 matrix topology.

Bank Connection Diagram



The following tables list the pin assignments for the NI TB-2646B column ribbon cable headers.

Column Pin Connections

The following table refers to the J13 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B1C31–	Pin 9	B1C27–	Pin 17	B1C23–	Pin 25	B1C19–
Pin 2	B1C31+	Pin 10	B1C27+	Pin 18	B1C23+	Pin 26	B1C19+
Pin 3	B1C30–	Pin 11	B1C26–	Pin 19	B1C22–	Pin 27	B1C18–

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 4	B1C30+	Pin 12	B1C26+	Pin 20	B1C22+	Pin 28	B1C18+
Pin 5	B1C29–	Pin 13	B1C25–	Pin 21	B1C21–	Pin 29	B1C17–
Pin 6	B1C29+	Pin 14	B1C25+	Pin 22	B1C21+	Pin 30	B1C17+
Pin 7	B1C28–	Pin 15	B1C24–	Pin 23	B1C20–	Pin 31	B1C16–
Pin 8	B1C28+	Pin 16	B1C24+	Pin 24	B1C20+	Pin 32	B1C16+

The following table refers to the J12 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B1C15–	Pin 9	B1C11–	Pin 17	B1C7–	Pin 25	B1C3–
Pin 2	B1C15+	Pin 10	B1C11+	Pin 18	B1C7+	Pin 26	B1C3+
Pin 3	B1C14–	Pin 11	B1C10–	Pin 19	B1C6–	Pin 27	B1C2–
Pin 4	B1C14+	Pin 12	B1C10+	Pin 20	B1C6+	Pin 28	B1C2+
Pin 5	B1C13–	Pin 13	B1C9–	Pin 21	B1C5–	Pin 29	B1C1–
Pin 6	B1C13+	Pin 14	B1C9+	Pin 22	B1C5+	Pin 30	B1C1+
Pin 7	B1C12–	Pin 15	B1C8–	Pin 23	B1C4–	Pin 31	B1C0–
Pin 8	B1C12+	Pin 16	B1C8+	Pin 24	B1C4+	Pin 32	B1C0+

The following table refers to the J3 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C0+	J3 Pin 9	B0C4+	J3 Pin 17	B0C8+	J3 Pin 25	B0C12+
J3 Pin 2	B0C0–	J3 Pin 10	B0C4–	J3 Pin 18	B0C8–	J3 Pin 26	B0C12–
J3 Pin 3	B0C1+	J3 Pin 11	B0C5+	J3 Pin 19	B0C9+	J3 Pin 27	B0C13+
J3 Pin 4	B0C1–	J3 Pin 12	B0C5–	J3 Pin 20	B0C9–	J3 Pin 28	B0C13–
J3 Pin 5	B0C2+	J3 Pin 13	B0C6+	J3 Pin 21	B0C10+	J3 Pin 29	B0C14+
J3 Pin 6	B0C2–	J3 Pin 14	B0C6–	J3 Pin 22	B0C10–	J3 Pin 30	B0C14–
J3 Pin 7	B0C3+	J3 Pin 15	B0C7+	J3 Pin 23	B0C11+	J3 Pin 31	B0C15+

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
J3 Pin 8	B0C3–	J3 Pin 16	B0C7–	J3 Pin 24	B0C11–	J3 Pin 32	B0C15–

The following table refers to the J2 connector on the NI TB-2646B.

Pin Number	Column	Pin Number	Column	Pin Number	Column	Pin Number	Column
Pin 1	B0C16+	Pin 9	B0C20+	Pin 17	B0C24+	Pin 25	B0C28+
Pin 2	B0C16–	Pin 10	B0C20–	Pin 18	B0C24–	Pin 26	B0C28–
Pin 3	B0C17+	Pin 11	B0C21+	Pin 19	B0C25+	Pin 27	B0C29+
Pin 4	B0C17–	Pin 12	B0C21–	Pin 20	B0C25–	Pin 28	B0C29–
Pin 5	B0C18+	Pin 13	B0C22+	Pin 21	B0C26+	Pin 29	B0C30+
Pin 6	B0C18–	Pin 14	B0C22–	Pin 22	B0C26–	Pin 30	B0C30–
Pin 7	B0C19+	Pin 15	B0C23+	Pin 23	B0C27+	Pin 31	B0C31+
Pin 8	B0C19–	Pin 16	B0C23–	Pin 24	B0C27–	Pin 32	B0C31–

Row Pin Connections

The NI TB-2646B provides two ribbon cable headers for row connection. Use one cable header to connect to your application. Use the other cable header for column expansion.

The following tables list the pin assignments for row connection.

The following table refers to the J9 connector on the NI TB-2646B.

Pin Number	Row
1	B1R0+
2	B1R0–
3	B1R1+
4	B1R1–
5	B1R2+

Pin Number	Row
6	B1R2–
7	B1R3+
8	B1R3–
9	B0R0+
10	B0R0–
11	B0R1+
12	B0R1–
13	B0R2+
14	B0R2–
15	B0R3+
16	B0R3–

The following table refers to the J4 connector on the NI TB-2646B.

Pin Number	Row
1	B0R0+
2	B0R0–
3	B0R1+
4	B0R1–
5	B0R2+
6	B0R2–
7	B0R3+
8	B0R3–
9	B1R0+
10	B1R0–
11	B1R1+
12	B1R1–
13	B1R2+

Pin Number	Row
14	B1R2–
15	B1R3+
16	B1R3–

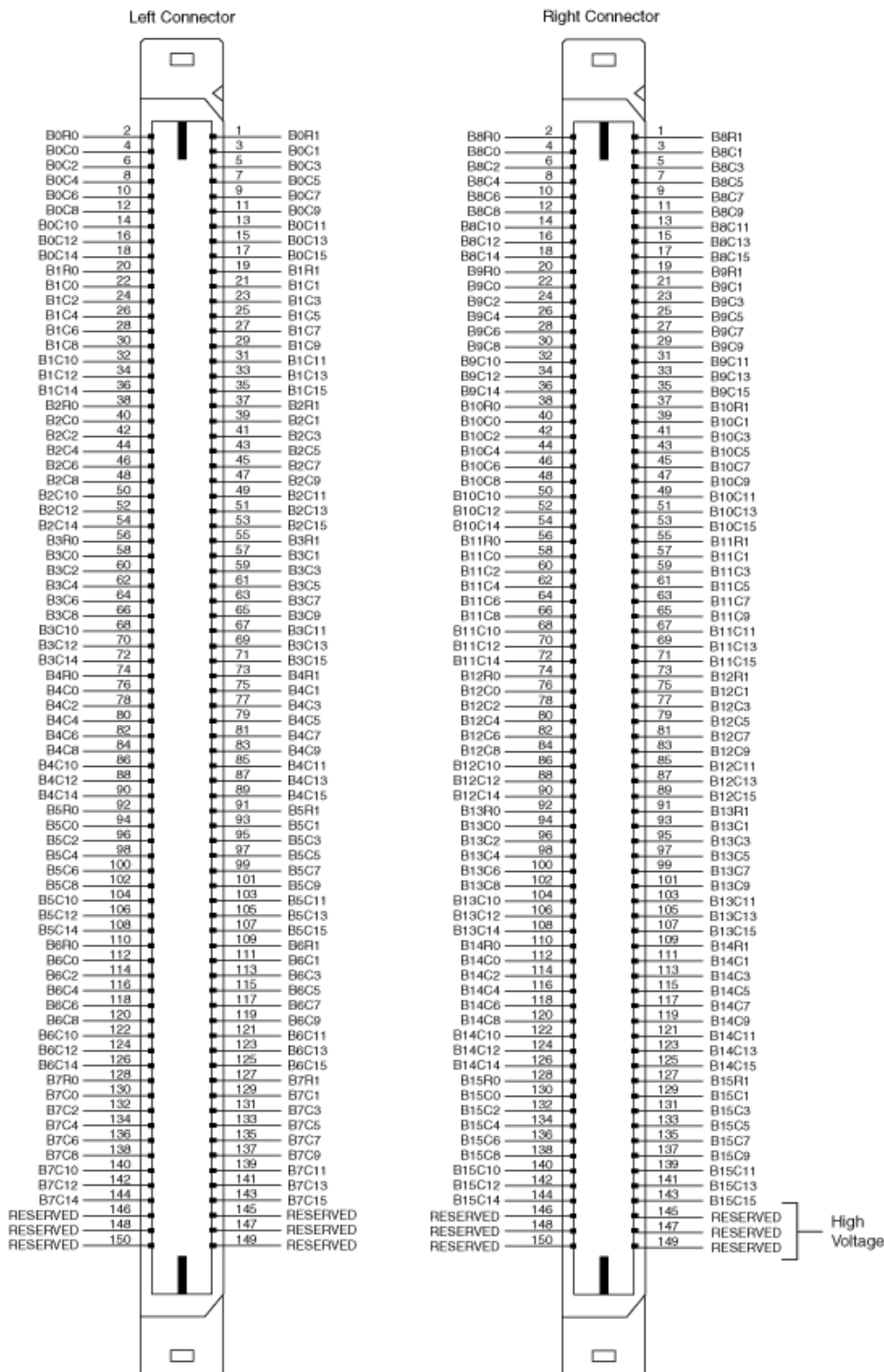
Row Protection Bypass Header

Each row signal is isolated from the reed relays through a 100 Ω resistor. To bypass this resistor, install a jumper on the appropriate pins of the header indicated in the table below. The following table lists the appropriate jumper position for bypassing the resistor on each row signal.

Bypassed Row	NI TB-2646B	
Header	Pins Connected	
B0R0+	J14	1-2
B0R0-	J14	3-4
B0R1+	J14	5-6
B0R1-	J14	7-8
B0R2+	J14	9-10
B0R2-	J14	11-12
B0R3+	J14	13-14
B0R3-	J14	15-16
B1R0+	J15	1-2
B1R0-	J15	3-4
B1R1+	J15	5-6
B1R1-	J15	7-8
B1R2+	J15	9-10
B1R2-	J15	11-12
B1R3+	J15	13-14
B1R3-	J15	15-16

Pinout

The following figure identifies the pins for the NI 2532B.





Caution Do not connect to RESERVED pins.

Related concepts:

- [N-Wire Switching Modes](#)
- [Matrix](#)
- [NI PXI/PXIe-2532/2532B Matrix Expansion](#)

NI PXI-2533

The NI PXI-2533 is a 256-crosspoint, high-density matrix switch module for the PXI platform. The NI PXI-2533 is composed of solid-state relays (SSRs).



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2533 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 4x64 Matrix	2533/1-Wire 4x64 Matrix(NISWITCH_TOPOLOGY_2533_1_WIRE_4X64_MATRIX)	✓	✓

Related Information

- [Integration and System Considerations](#)

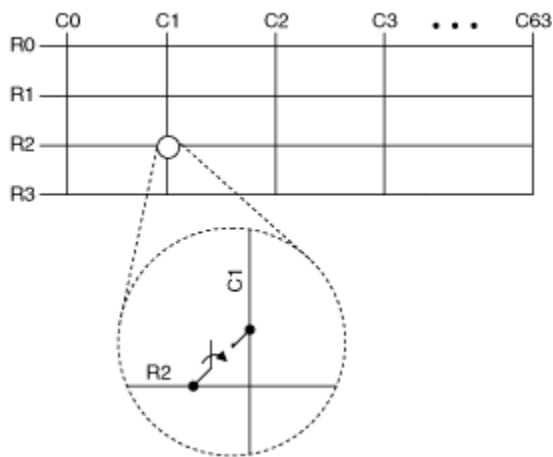
Related concepts:

- [Matrix](#)

- [Solid-State Relays \(SSR\)](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2533 1-Wire 4×64 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI-2533 1-Wire 4×64 Matrix Topology

When using the NI PXI-2533 in this topology, connect your signals using the NI TB-2633 terminal block. The following figure represents the NI PXI-2533 in the 1-wire 4×64 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

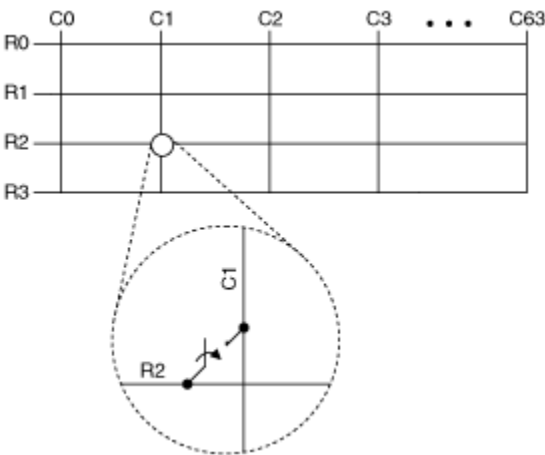
Pinout

The following figure identifies the pins for the NI PXI-2533.

C1	35	1	C0
C3	36	2	C2
C5	37	3	C4
C7	38	4	C6
C9	39	5	C8
C11	40	6	C10
C13	41	7	C12
C15	42	8	C14
C17	43	9	C16
C19	44	10	C18
C21	45	11	C20
C23	46	12	C22
C25	47	13	C24
C27	48	14	C26
C29	49	15	C28
C31	50	16	C30
C63	51	17	C62
C61	52	18	C60
C59	53	19	C58
C57	54	20	C56
C55	55	21	C54
C53	56	22	C52
C51	57	23	C50
C49	58	24	C48
C47	59	25	C46
C45	60	26	C44
C43	61	27	C42
C41	62	28	C40
C39	63	29	C38
C37	64	30	C36
C35	65	31	C34
C33	66	32	C32
R2	67	33	R3
R0	68	34	R1

NI PXI-2533 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2533.



The following table lists relay names for the NI PXI-2533.

Relays
kR0C0...kR0C63
kR1C0...kR1C63
kR2C0...kR2C63
kR3C0...kR3C63

NI PXI-2533 Triggering

The NI PXI-2533 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2533.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software	niSwitch Send Software Trigger VI or	N/A

Trigger Input	Software	Hardware
Trigger	<code>niSwitch_SendSoftwareTrigger</code> function	

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2533.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2534

The NI PXI-2534 is a 256-crosspoint, high-density matrix switch module for the PXI platform. The NI PXI-2534 is composed of solid-state relays (SSRs).



Note Switching inductive loads (for example, motors and solenoids) can

produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2534 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 8×32 Matrix	2534/1-Wire 8x32 Matrix(NISWITCH_TOPOLOGY_2534_1_WIRE_8X32_MATRIX)	✓	✓

Related Information

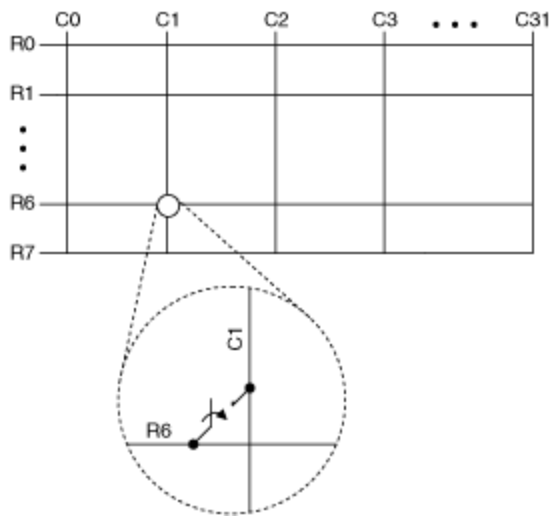
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Solid-State Relays \(SSR\)](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2534 1-Wire 8×32 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI-2534 1-Wire 8×32 Matrix Topology

When using the NI PXI-2534 in this topology, connect your signals using the NI TB-2637 terminal block. The following figure represents the NI PXI-2534 in the 1-wire 8×32 matrix topology.



Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

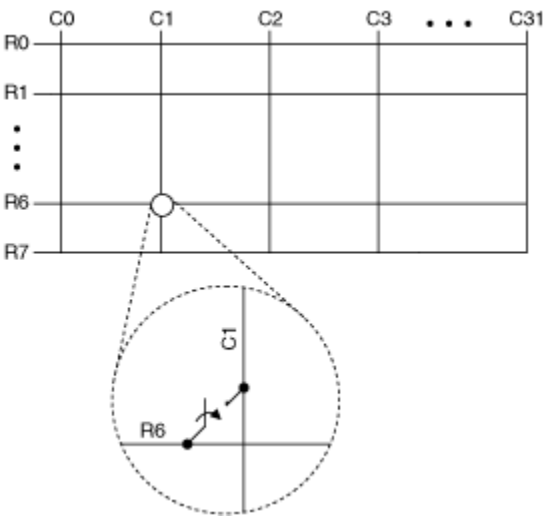
Pinout

The following figure identifies the pins for the NI PXI-2534.

C1	35	1	C0
C3	36	2	C2
C5	37	3	C4
C7	38	4	C6
C9	39	5	C8
C11	40	6	C10
C13	41	7	C12
C15	42	8	C14
C17	43	9	C16
C19	44	10	C18
C21	45	11	C20
C23	46	12	C22
C25	47	13	C24
C27	48	14	C26
C29	49	15	C28
C31	50	16	C30
R4	51	17	R5
R6	52	18	R7
NO CONNECT	53	19	NO CONNECT
NO CONNECT	54	20	NO CONNECT
NO CONNECT	55	21	NO CONNECT
NO CONNECT	56	22	NO CONNECT
NO CONNECT	57	23	NO CONNECT
NO CONNECT	58	24	NO CONNECT
NO CONNECT	59	25	NO CONNECT
NO CONNECT	60	26	NO CONNECT
NO CONNECT	61	27	NO CONNECT
NO CONNECT	62	28	NO CONNECT
NO CONNECT	63	29	NO CONNECT
NO CONNECT	64	30	NO CONNECT
NO CONNECT	65	31	NO CONNECT
NO CONNECT	66	32	NO CONNECT
R2	67	33	R3
R0	68	34	R1

NI PXI-2534 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2534.



The following table lists relay names for the NI PXI-2534.

Relays
kR0C0...kR0C31
kR1C0...kR1C31
kR2C0...kR2C31
kR3C0...kR3C31
kR4C0...kR4C31
kR5C0...kR5C31
kR6C0...kR6C31
kR7C0...kR7C31

NI PXI-2534 Triggering

The NI PXI-2534 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2534.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6

Trigger Input	Software	Hardware
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2534.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2535

The NI PXI-2535 is a 544-crosspoint, high-density matrix switch module for the PXI

platform. The NI PXI-2535 is composed of FET switches. The PXI-2535 has additional fault protection circuitry to prevent overvoltage conditions. If proper grounding is not used on certain applications, relays will appear stuck open. For more information about FET fault protection circuitry, visit ni.com/info and enter the Info Code `exfcjv`.

Operation Modes

The following table lists the supported topology of the NI PXI-2535 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 4×136 Matrix	2535/1-Wire 4x136 Matrix(NISWITCH_TOPOLOGY_2535_1_WIRE_4X136_MATRIX)	✓	✓

Related Information

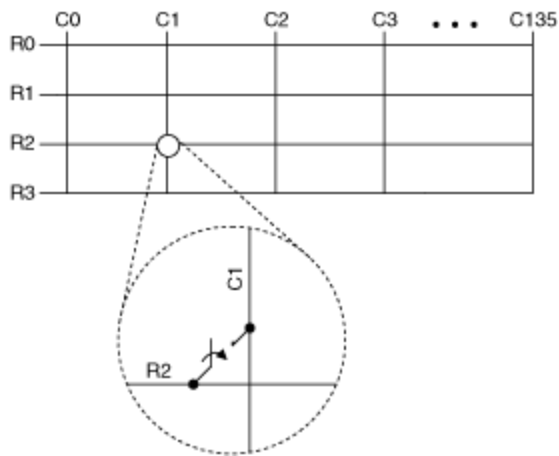
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [FET Switches](#)
- [Operation Modes](#)
- [NI PXI-2535 1-Wire 4×136 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI-2535 1-Wire 4 × 136 Matrix Topology

The following figure represents the NI PXI-2535 in the 1-wire 4×136 matrix topology.



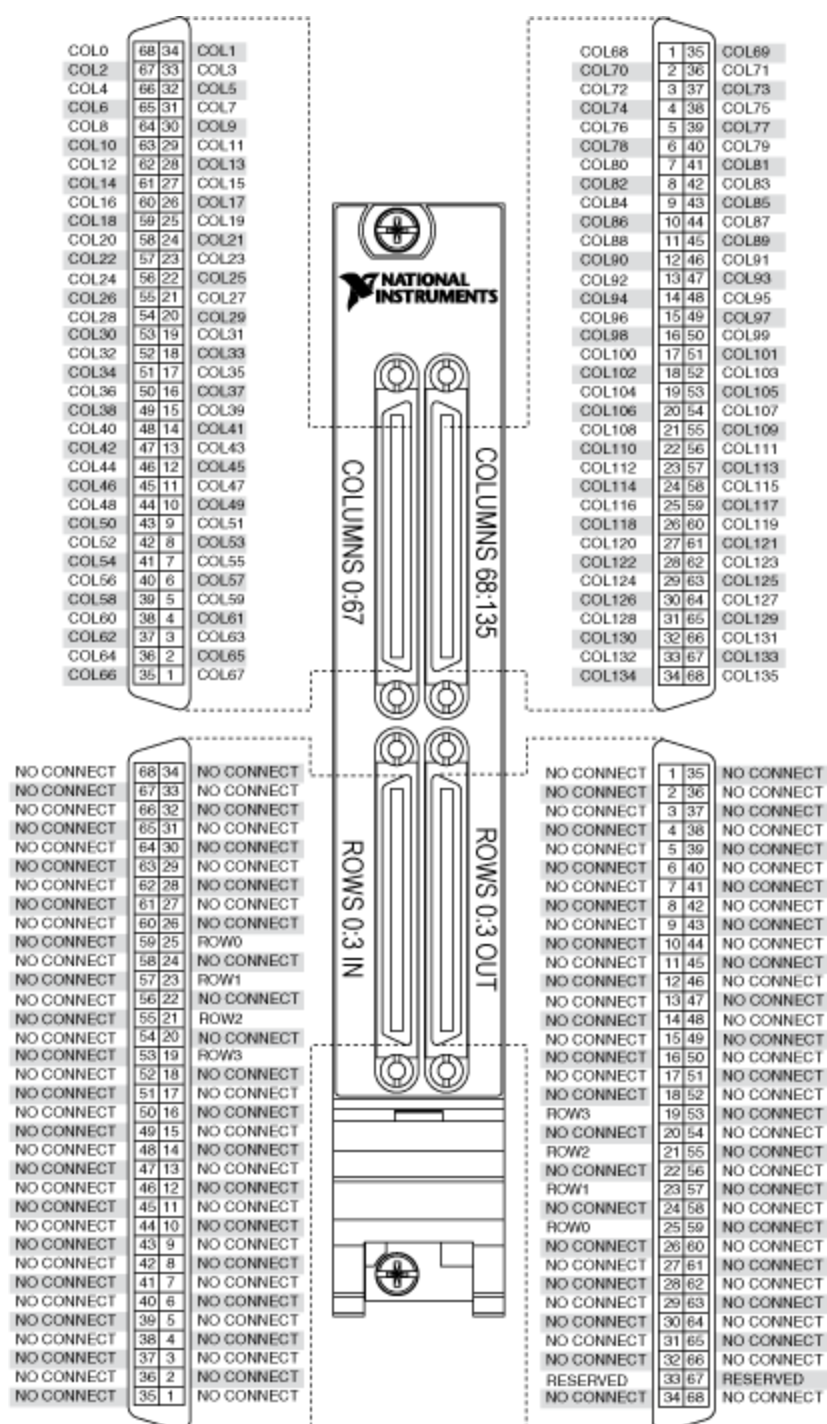
Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

Pinout

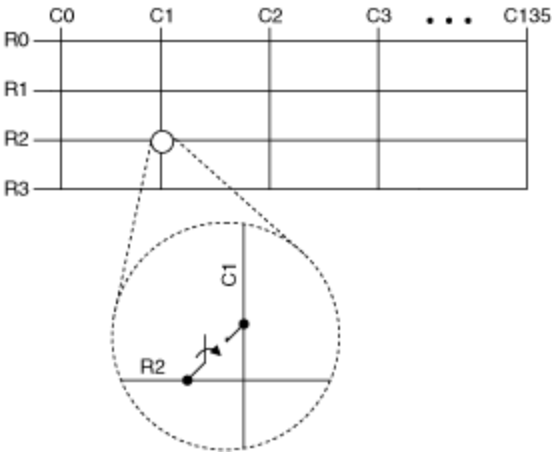
The following figure identifies the pins for the NI PXI-2535.



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2535 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2535.



The following table lists relay names for the NI PXI-2535.

Relays
kR0C0...kR0C135
kR1C0...kR1C135
kR2C0...kR2C135
kR3C0...kR3C135

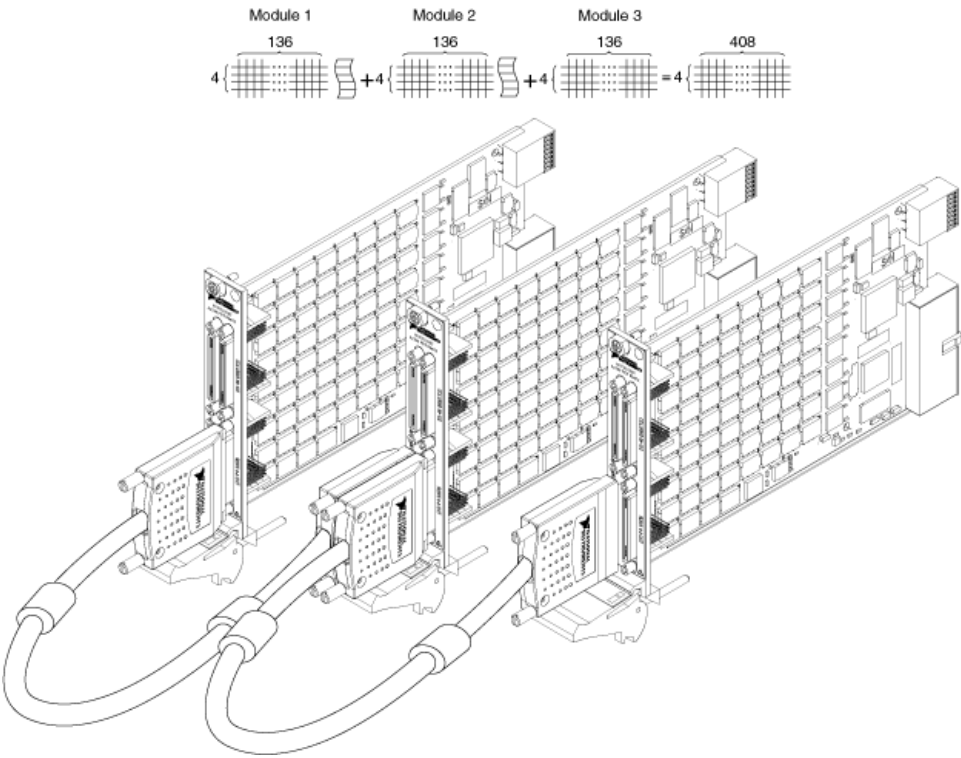
NI PXI-2535 Matrix Expansion

You can expand the matrices of the NI PXI-2535 by increasing the number of columns in the matrix using the SHC68-C68-S cable.

Column Expansion on the NI PXI-2535

Complete the following steps to expand the number of columns of a matrix.

1. Connect one end of the SHC68-C68-S cable to a row connector on the NI PXI-2535.
2. Connect the other end of the SHC68-C68-S cable to a row connector on another NI PXI-2535.



NI PXI-2535 Triggering

The NI PXI-2535 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2535.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger

Trigger Input	Software	Hardware
		line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or <code>niSwitch_SendSoftwareTrigger</code> function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2535.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2536

The NI PXI-2536 is a 544-crosspoint, high-density matrix switch module for the PXI platform. The NI PXI-2536 is composed of FET switches. The PXI-2536 has additional fault protection circuitry to prevent overvoltage conditions. If proper grounding is not used on certain applications, relays will appear stuck open. For more information about FET fault protection circuitry, visit ni.com/info and enter the Info Code `exfcjv`.

Operation Modes

The following table lists the supported topology of the NI PXI-2536 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 8×68 Matrix	2536/1-Wire 8x68 Matrix(NISWITCH_TOPOLOGY_2536_1_WIRE_8X68_MATRIX)	✓	✓

Related Information:

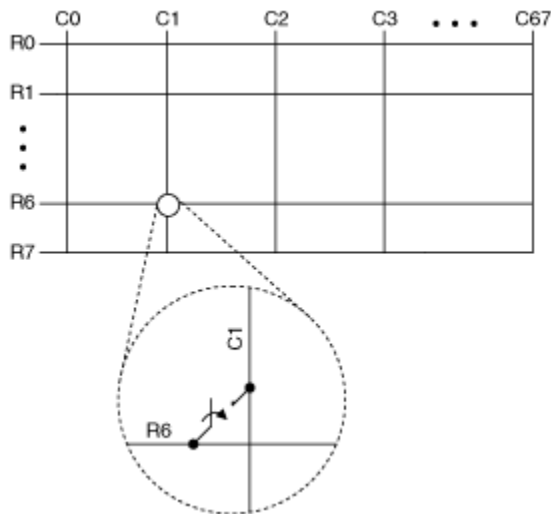
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [FET Switches](#)
- [Operation Modes](#)
- [NI PXI-2536 1-Wire 8×68 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI-2536 1-Wire 8×68 Matrix Topology

The following figure represents the NI PXI-2536 in the 1-wire 8×68 matrix topology.



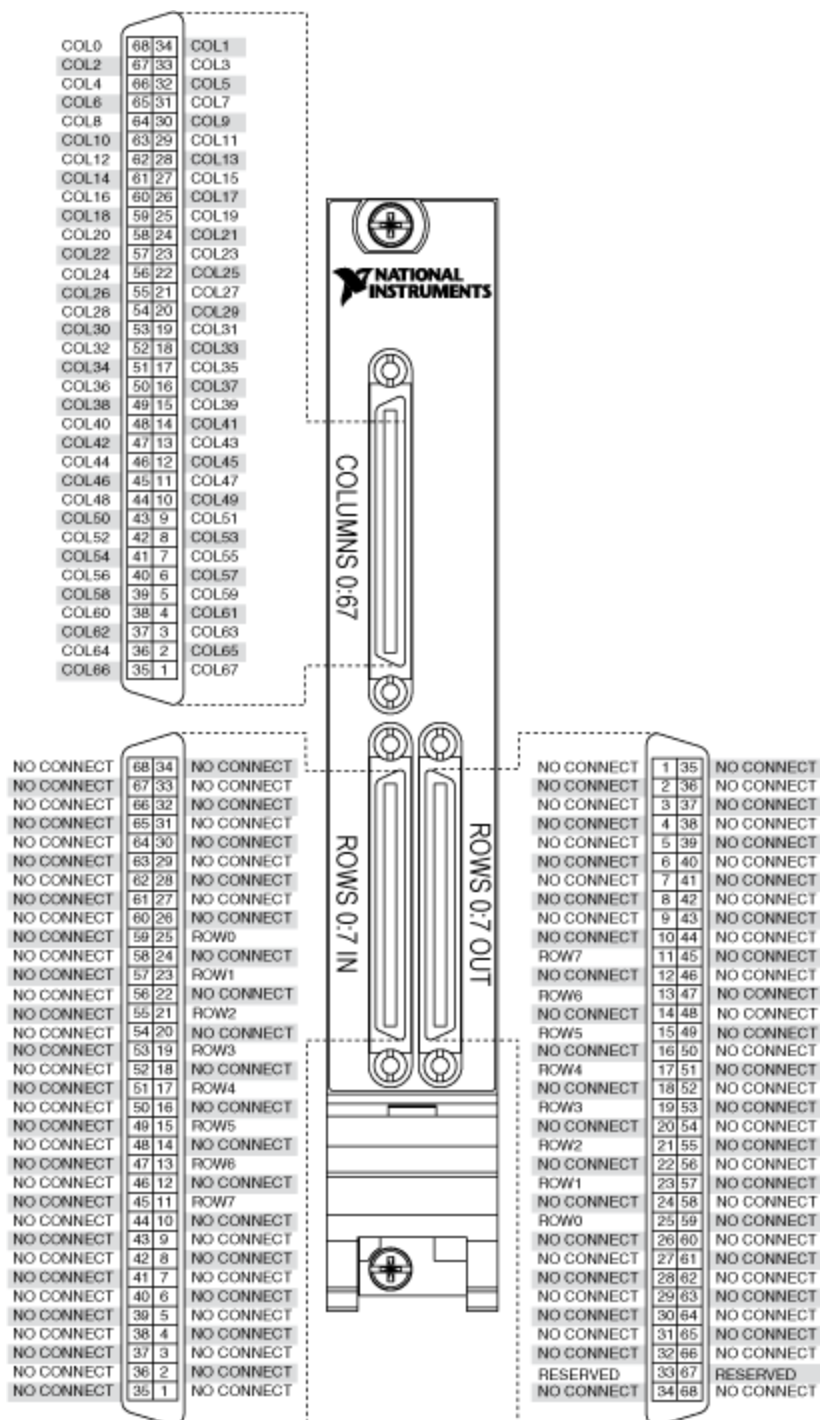
Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

Pinout

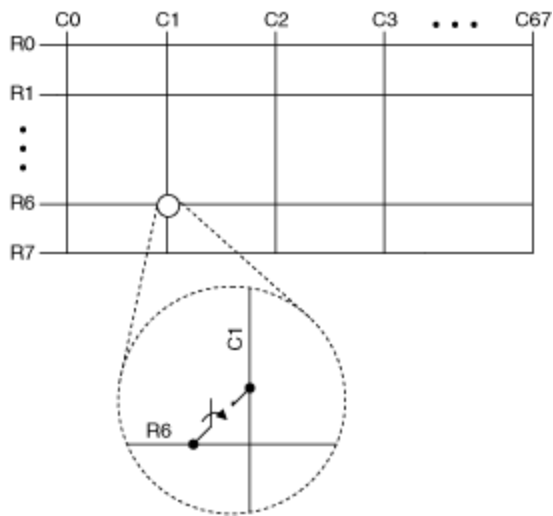
The following figure identifies the pins for the NI PXI-2536.



Caution Do not connect to RESERVED pins or to NO CONNECT pins.

NI PXI-2536 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2536.



The following table lists relay names for the NI PXI-2536.

Relays
kR0C0...kR0C67
kR1C0...kR1C67
kR2C0...kR2C67
kR3C0...kR3C67
kR4C0...kR4C67
kR5C0...kR5C67
kR6C0...kR6C67
kR7C0...kR7C67

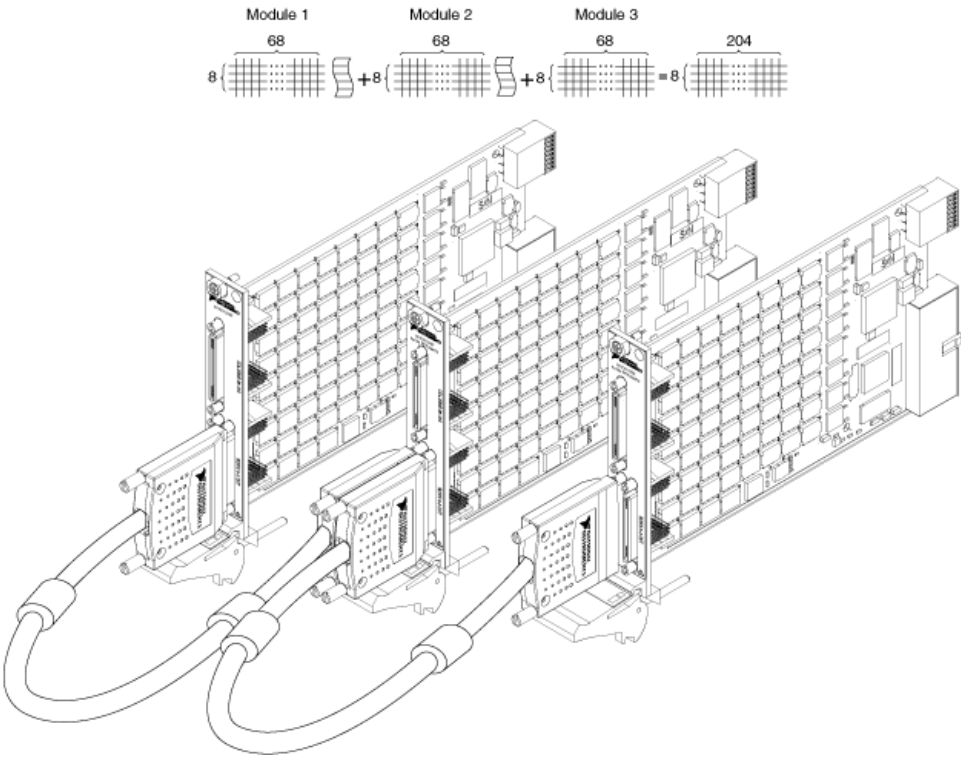
NI PXI-2536 Matrix Expansion

You can expand the matrices of the NI PXI-2536 by increasing the number of columns in the matrix using the SHC68-C68-S cable.

Column Expansion on the NI PXI-2536

Complete the following steps to expand the number of columns of a matrix.

1. Connect one end of the SHC68-C68-S cable to a row connector on the NI PXI-2536.
2. Connect the other end of the SHC68-C68-S cable to a row connector on another NI PXI-2536.



NI PXI-2536 Triggering

The NI PXI-2536 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2536.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger

Trigger Input	Software	Hardware
		line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or <code>niSwitch_SendSoftwareTrigger</code> function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2536.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2540

The NI PXI/PXIe-2540 (NI 2540) is an RF matrix switch module for the PXI or PXI Express platform. The NI 2540 is designed to handle RF signals up to 350 MHz.

Operation Modes

The following table lists the supported topology of the NI 2540 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 8x9 Matrix	2540/1-Wire 8x9 Matrix(NISWITCH_TOPOLOGY_2540_1_WIRE_8X9_MATRIX)	✓	✓

Related Information

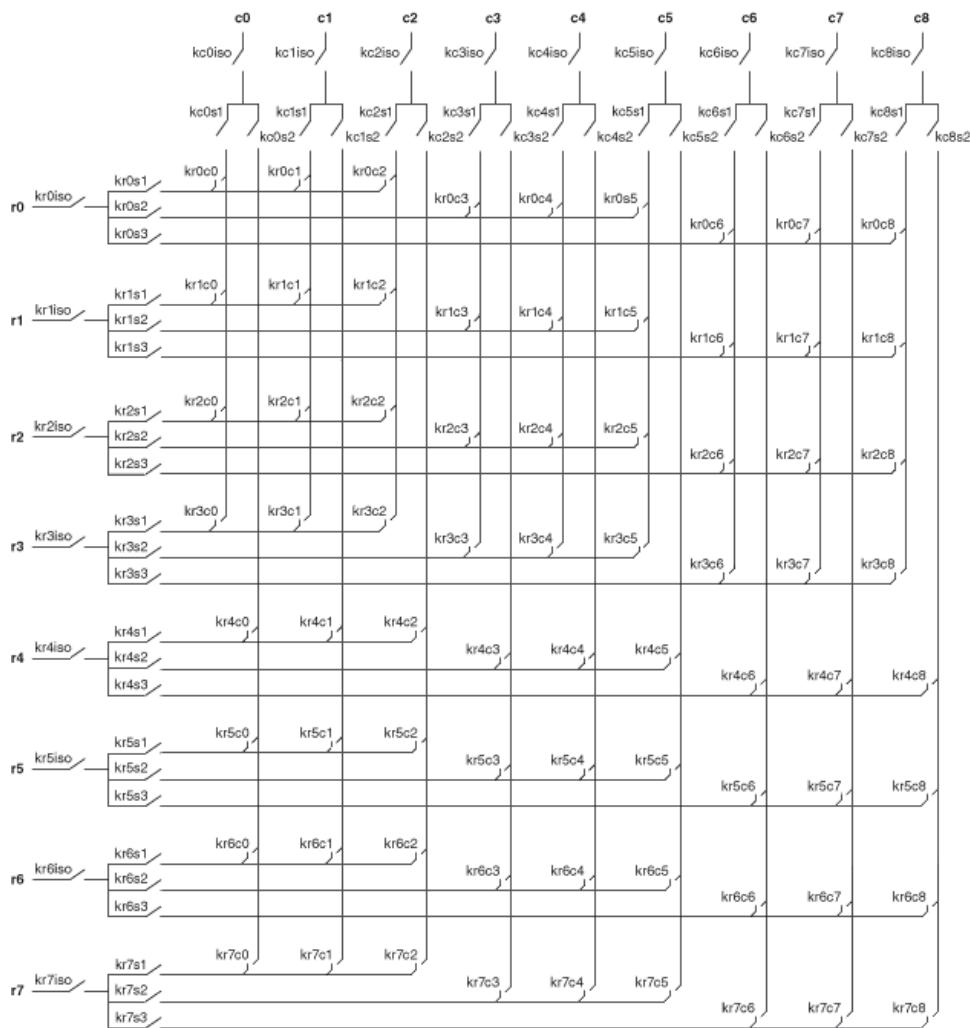
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2540 1-Wire 8×9 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2540 1-Wire 8×9 Matrix Topology

The following figure represents the NI PXI/PXIe-2540 in the 1-wire 8×9 matrix topology.



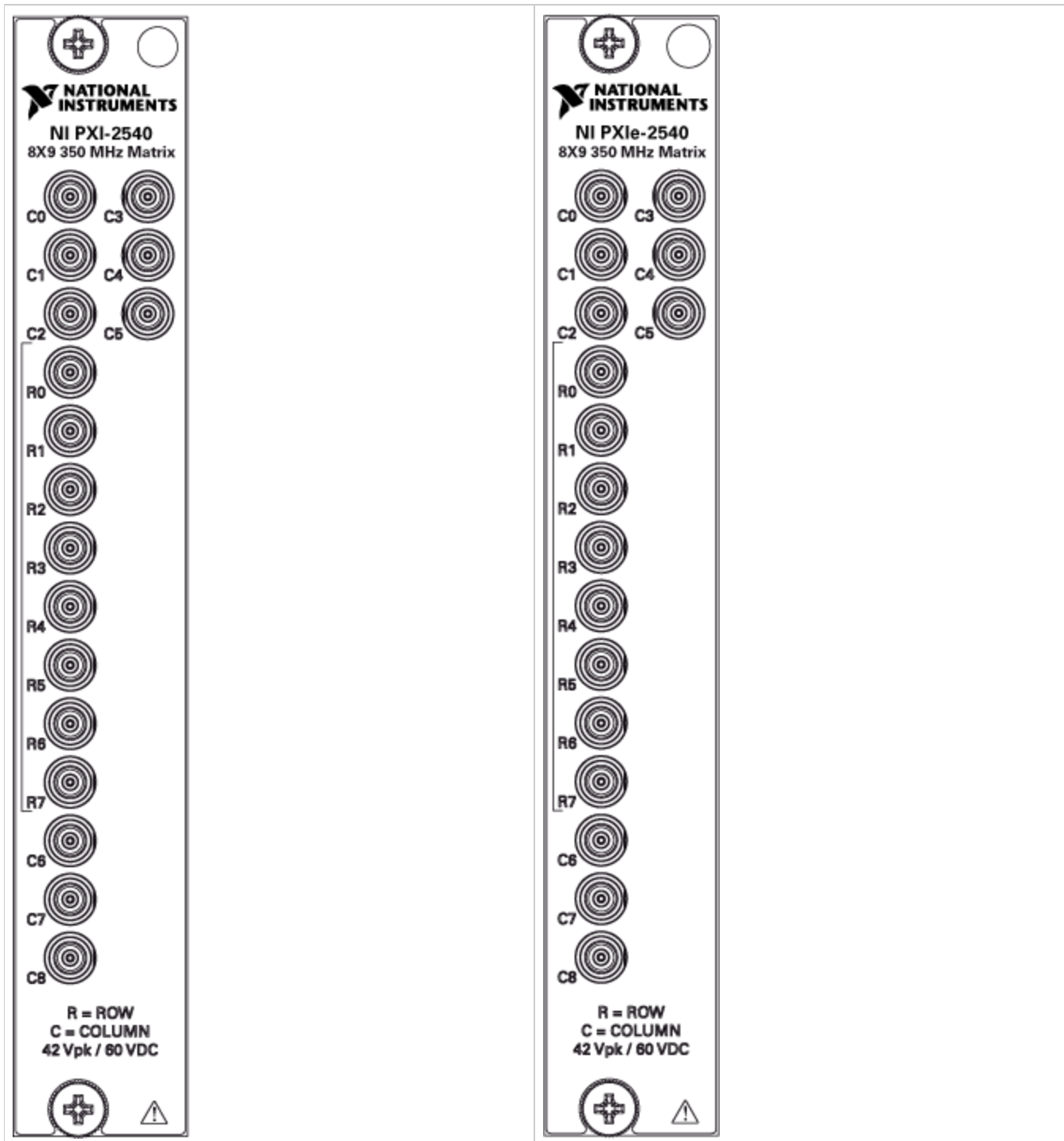
Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

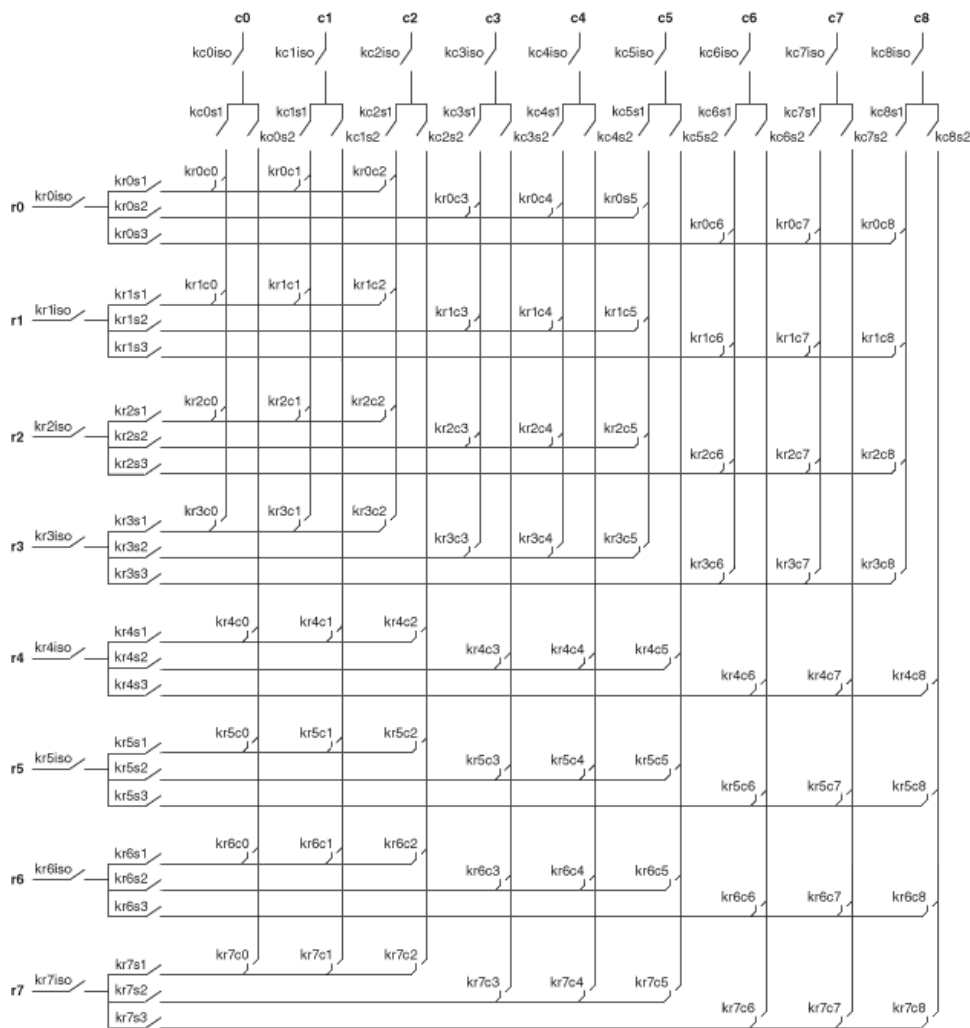
NI PXI/PXIe-2540 Front Panel

The following figures illustrate the NI PXI-2540 and NI PXIe-2540 front panels.



NI PXI/PXIe-2540 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2540 (NI 2540).



The following table lists relay names and their functions for the NI 2540.

Relay Name	Function
kr0iso...kr7iso	Row Isolation Relays
kr0s1...kr7s1	Crosspoint Relays
kr0s2...kr7s2	
kr0s3...kr7s3	
kr0c0...kr0c8	
kr1c0...kr1c8	Crosspoint Relays
kr2c0...kr2c8	
kr3c0...kr3c8	

Relay Name	Function
kr4c0...kr4c8	
kr5c0...kr5c8	
kr6c0...kr6c8	
kr7c0...kr7c8	
kc0iso...kc8iso	Column Isolation Relays
kc0s1...kc8s1	
kc0s2...kc8s2	

NI PXI/PXIe-2540 Triggering

The NI PXI/PXIe-2540 (NI 2540) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2540.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5

Trigger Input	Software	Hardware
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2540.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2541

The NI PXI/PXIe-2541 (NI 2541) is an RF matrix switch module for the PXI or PXI Express platform. The NI 2541 is designed to handle RF signals up to 300 MHz.

Operation Modes

The following table lists the supported topology of the NI 2541 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 8x12 Matrix	2541/1-Wire 8x12 Matrix(NISWITCH_TOPOLOGY_2541_1_WIRE_8X12_MATRIX)	✓	✓

Related Information

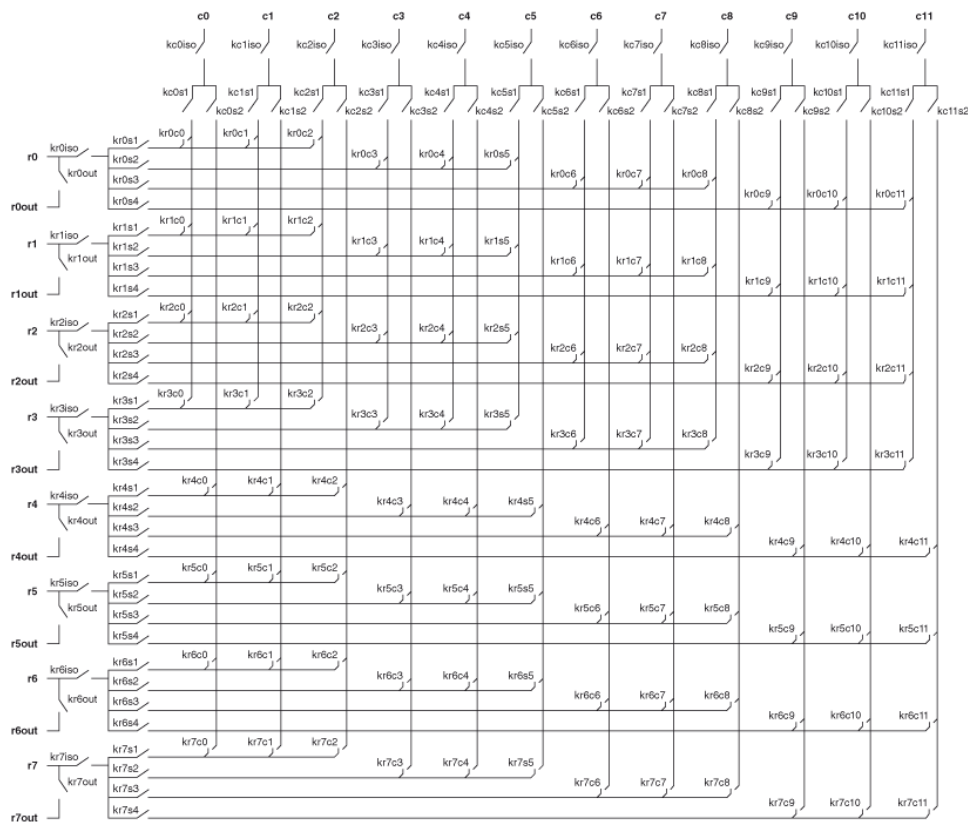
- [Integration and System Considerations](#)

Related concepts:

- [Matrix](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2541 1-Wire 8×12 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2541 1-Wire 8×12 Matrix Topology

The following figure represents the NI PXI/PXIe-2541 in the 1-wire 8×12 matrix topology.



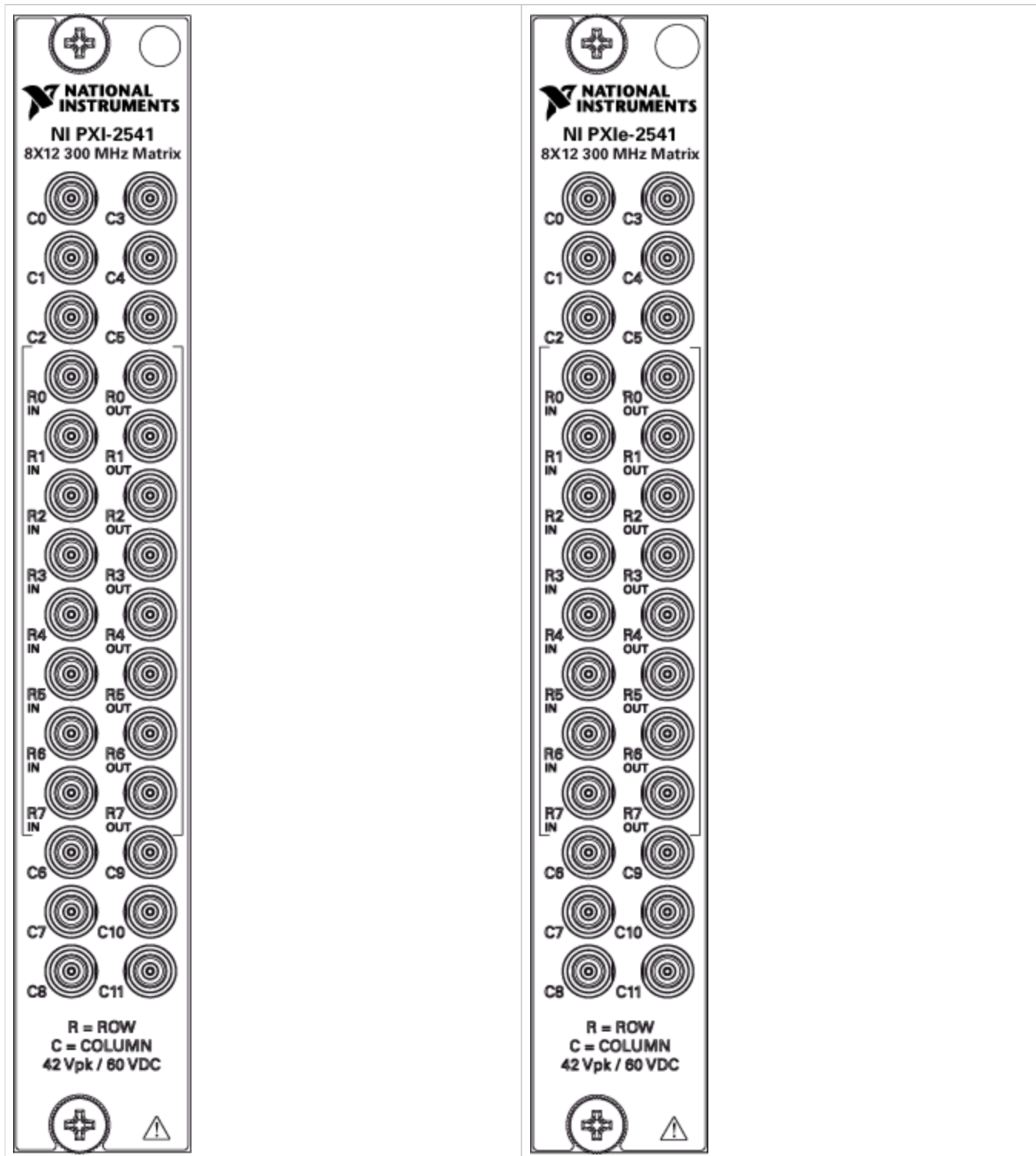
Making a Connection

Both the scanning command, `r2->c1;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `r2` and `c1`, result in the following connection:

signal connected to R2 is routed to C1

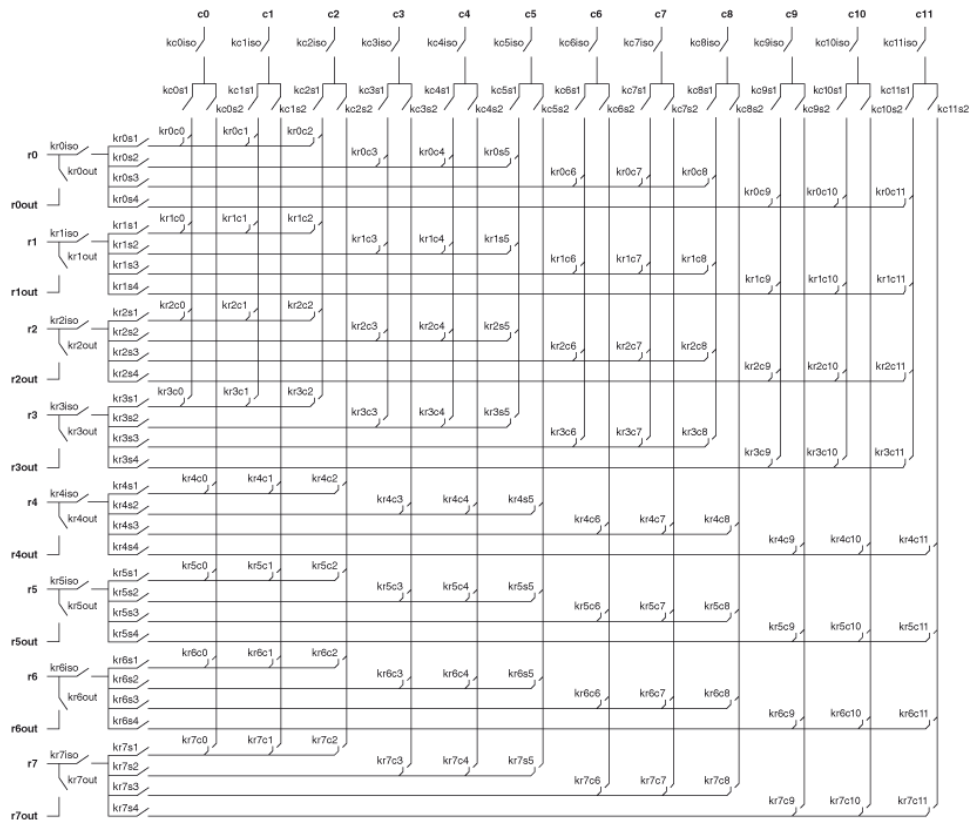
NI PXI/PXIe-2541 Front Panel

The following figures illustrate the NI PXI-2541 and NI PXIe-2541 front panels.



NI PXI/PXIe-2541 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2541 (NI 2541).



The following table lists relay names and their functions for the NI 2541.

Relay Name	Function
kr0iso...kr7iso	Row Isolation Relays
kr0out...kr7out	
kr0s1...kr7s1	
kr0s2...kr7s2	
kr0s3...kr7s3	
kr0s4...kr7s4	
kr0c0...kr0c11	Crosspoint Relays
kr1c0...kr1c11	
kr2c0...kr2c11	
kr3c0...kr3c11	
kr4c0...kr4c11	
kr5c0...kr5c11	

Relay Name	Function
kr6c0...kr6c11	Column Isolation Relays
kr7c0...kr7c11	
kc0iso...kc11iso	
kc0s1...kc11s1	
kc0s2...kc11s2	

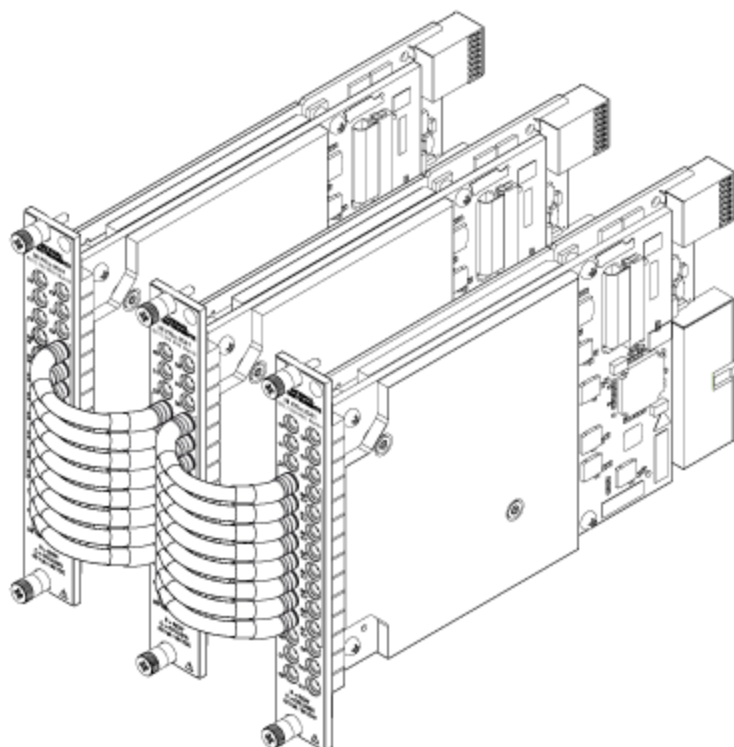
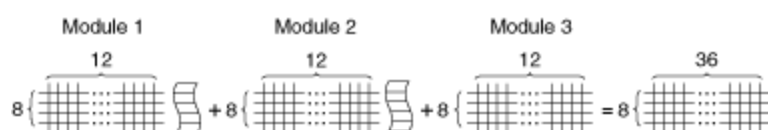
NI PXI-2541 Matrix Expansion

You can expand the matrices of the NI PXI/PXIe-2541 (NI 2541) by increasing the number of columns in the matrix using the MCX Plug to MCX Plug RG316 cable.

Column Expansion on the NI PXI/PXIe-2541

Complete the following steps to expand the number of columns of a matrix.

1. Connect one end of the MCX Plug to MCX Plug RG316 cable to a row out (rXout) connector on the NI 2541.
2. Connect the other end of the MCX Plug to MCX Plug RG316 cable to a row in (rX) connector on another NI 2541, or NI 2540.
3. Repeat for all rows on which column expansion is desired.



NI PXI/PXIe-2541 Triggering

The NI PXI/PXIe-2541 (NI 2541) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2541.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Trigger Input	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2541.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2542

The NI PXI/PXIe-2542 (NI 2542) is a terminated multiplexer switch module for the PXI bus that can carry 50 Ω RF signals up to 6.6 GHz.

Operation Modes

The following table lists the supported topology of the NI 2542 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Quad 2×1 Terminated Multiplexer	2542/Quad 2x1 Terminated Mux(NISWITCH_TOPOLOGY_2542_Quad_2X1_TERMINATED_MUX)	✓	✓

Related Information

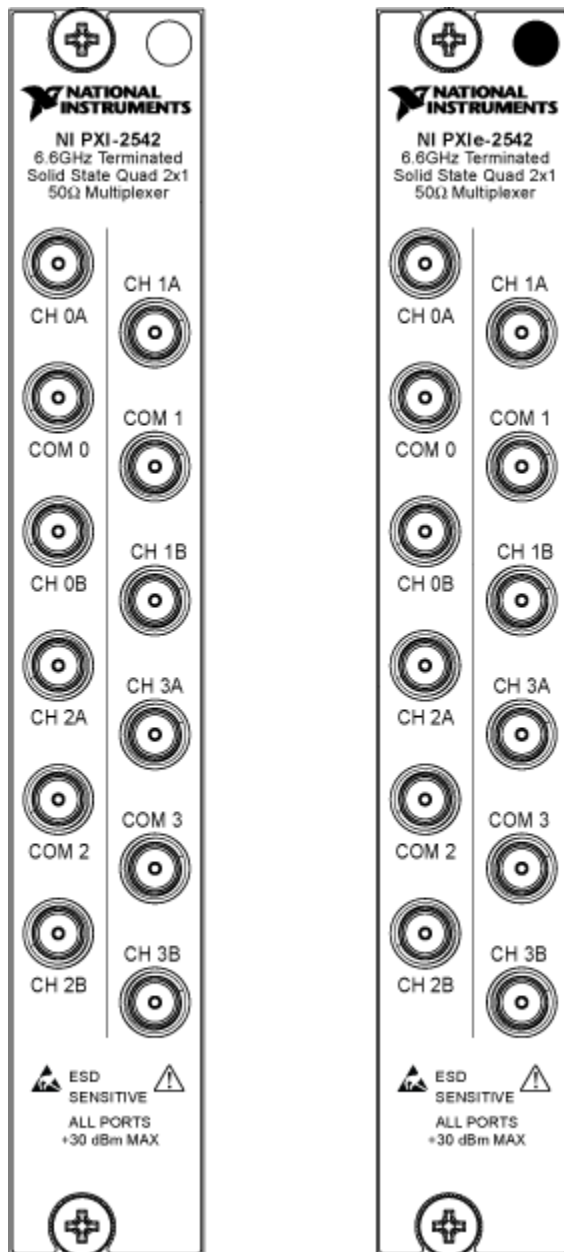
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2542 Quad 2×1 Terminated Multiplexer \(Quad SP2T\) Topology](#)
- [Integration and System Considerations](#)

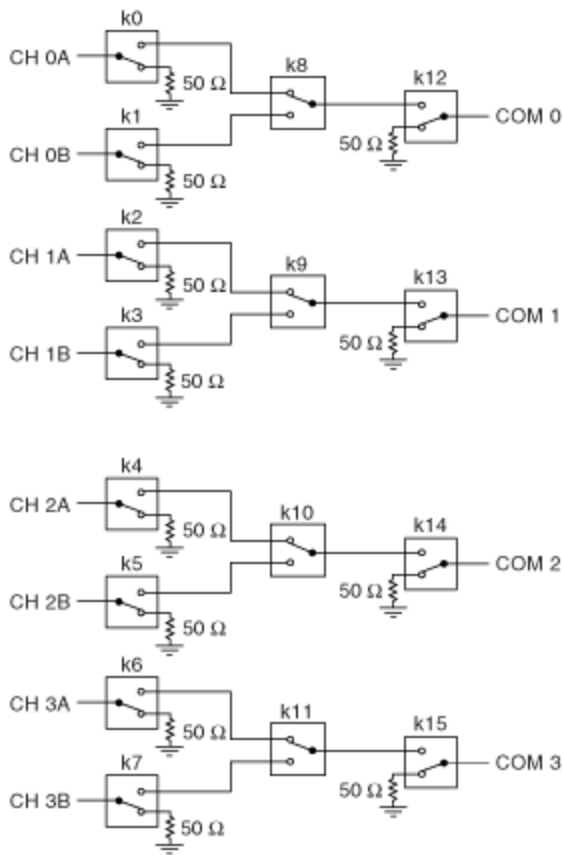
NI PXI/PXIe-2542 Front Panel

The following figure illustrates the NI PXI/PXIe-2542 front panel.



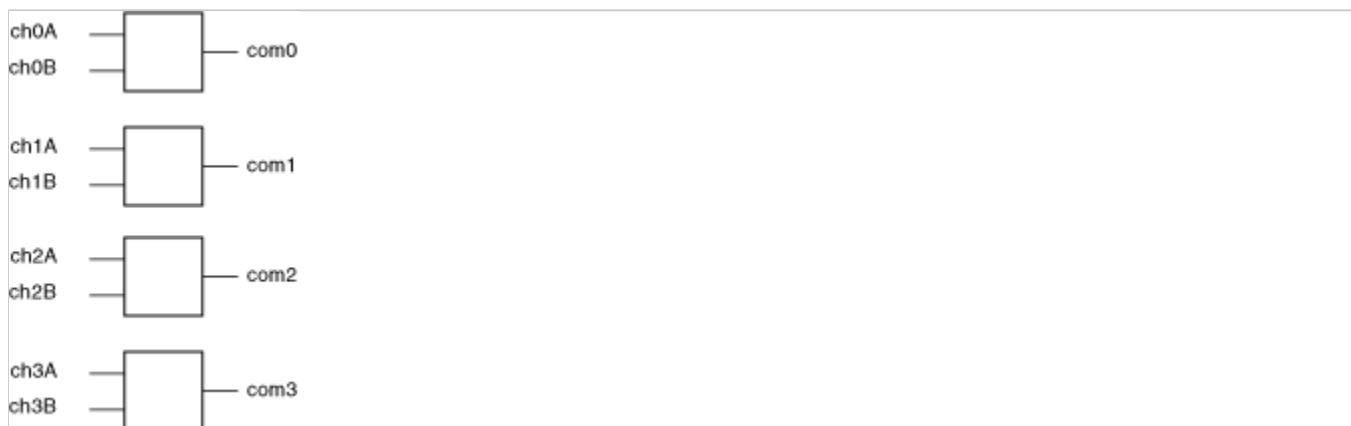
NI PXI/PXIe-2542 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2542.



NI PXI/PXIe-2542 Quad 2×1 Terminated Multiplexer (Quad SP2T) Topology

The following figure represents the NI PXI/PXIe-2542 (NI 2542) in the quad 2×1 terminated multiplexer topology.



Making a Connection

Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1A and COM 1 and the other between CH 2B and COM 2:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1A` and `com1`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1A` and `com1`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2B` and `com2`.

When scanning the NI 2542, a typical scan list entry might be `ch1A->com1 ;`. This entry routes the signal connected to CH 1A to COM 1.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2542 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI/PXIe-2542 (NI 2542).

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger

Trigger Input	Software	Hardware
		line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2542.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5

Scan Advanced Output	Software	Hardware
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI/PXIe-2543

The NI PXI/PXIe-2543 (NI 2543) is a terminated multiplexer switch module for the PXI bus that can carry 50 Ω RF signals up to 6.6 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2543 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 4×1 Terminated Multiplexer	2543/Dual 4x1 Terminated Mux(NISWITCH_TOPOLOGY_2543_DUAL_4X1_TERMINATED_MUX)	✓	✓

Related Information

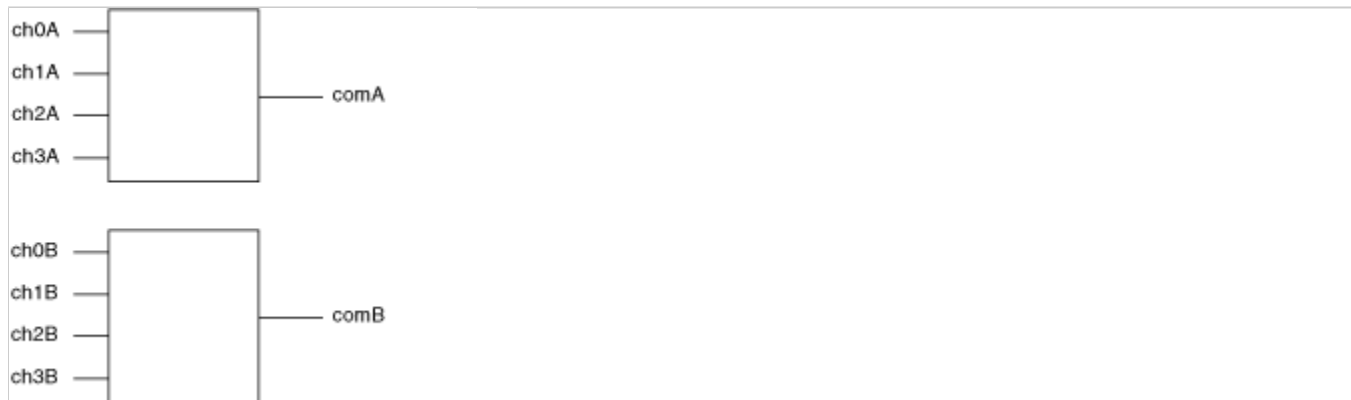
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2543 Dual 4×1 Terminated Multiplexer \(Dual SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2543 Dual 4×1 Terminated Multiplexer (Dual SP4T) Topology

The following figure represents the NI PXI/PXIe-2543 in the dual 4×1 terminated multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1A and COM A and the other between CH 2B and COM B:

1. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch1A` and `comA`.
2. Call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function with parameters `ch1A` and `comA`.
3. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2B` and `comB`.

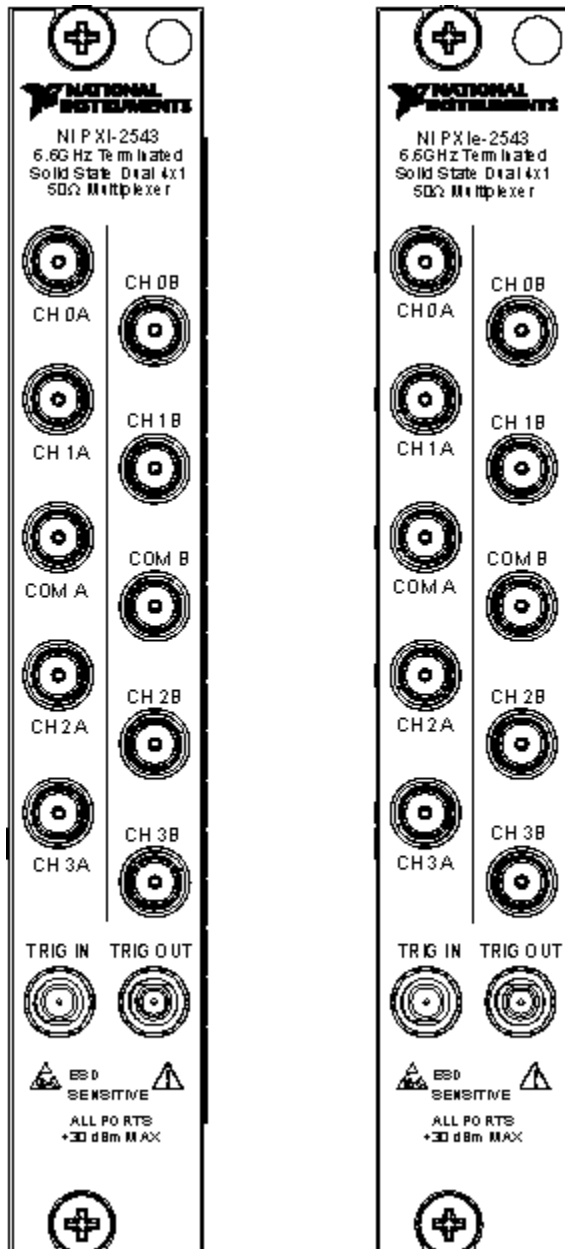
When scanning the NI PXI/PXIe-2543, a typical scan list entry might be `ch1A->comA;`. This entry routes the signal connected to CH 1A to COM A.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

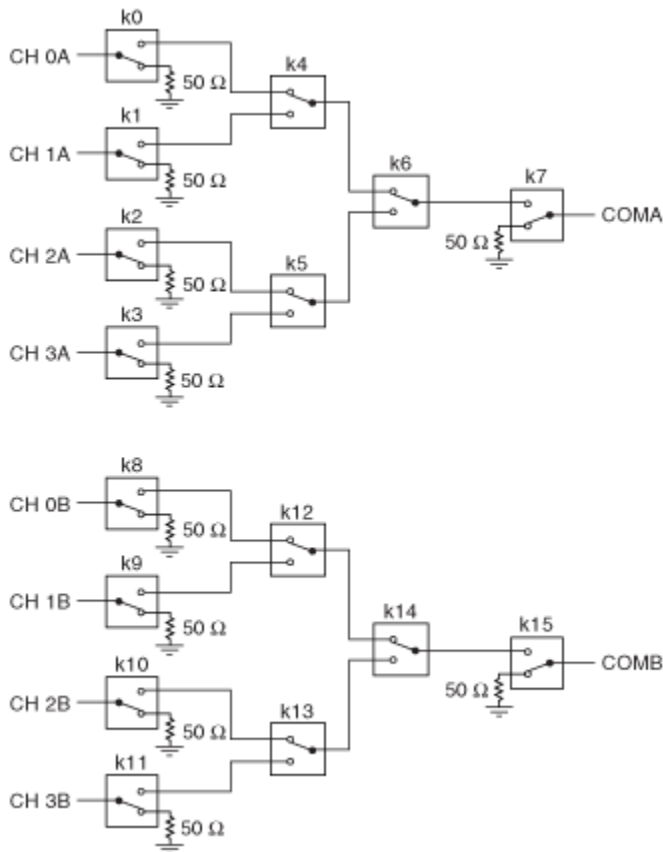
NI PXI/PXIe-2543 Front Panel

The following figure illustrates the NI PXI/PXIe-2543 front panel.



NI PXI/PXIe-2543 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2543.



NI PXI/PXIe-2543 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI/PXIe-2543.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2

Trigger Input	Software	Hardware
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on the front panel

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI/PXIe-2543.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG OUT on the front panel

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI/PXIe-2544

The NI PXI/PXIe-2544 (NI 2544) is a terminated multiplexer switch module for the PXI bus that can carry 50 Ω RF signals up to 6.6 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2544 and possible operation modes.

Topology	Software Name	Immediate	Scanning
8×1 Terminated Multiplexer	2544/8x1 Terminated Mux(NISWITCH_TOPOLOGY_2544_8X1_TERMINATED_MUX)	✓	✓

Related Information

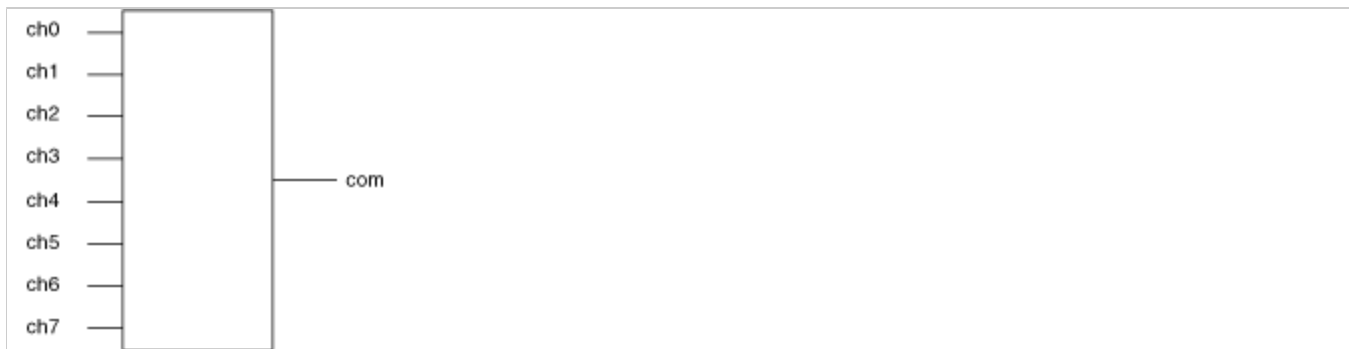
- [Integration and System Considerations](#)

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2544 8×1 Terminated Multiplexer \(Dual SP8T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2544 8×1 Terminated Multiplexer (Dual SP8T) Topology

The following figure represents the NI PXI/PXIe-2544 (NI 2544) in the 8×1 terminated multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1 and COM and the other between CH 2 and COM:

1. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com`.

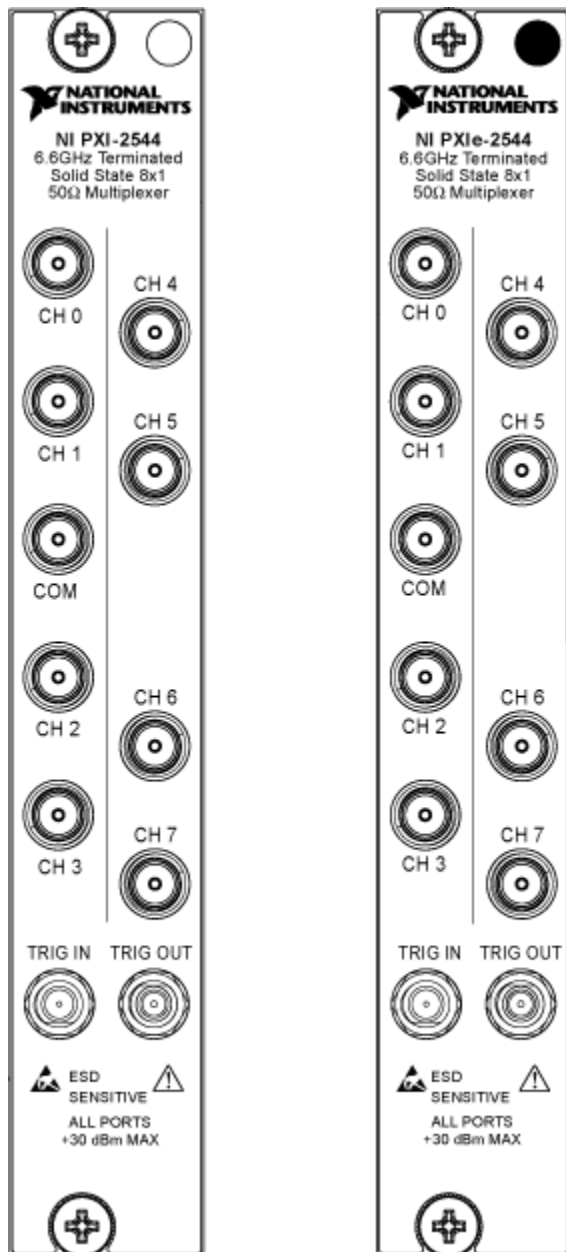
When scanning the NI 2544, a typical scan list entry might be `ch1->com;`. This entry routes the signal connected to CH 1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

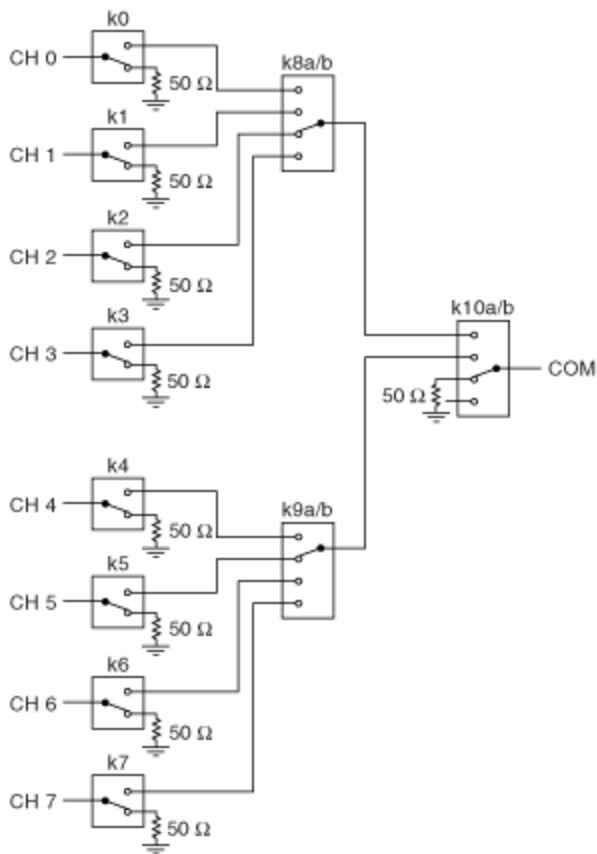
NI PXI/PXIe-2544 Front Panel

The following figure illustrates the NI PXI/PXIe-2544 front panel.



NI PXI/PXIe-2544 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2544.



NI PXI/PXIe-2544 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI/PXIe-2544 (NI 2544).

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5

Trigger Input	Software	Hardware
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or <code>niSwitch_SendSoftwareTrigger</code> function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on the front panel

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2544.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG OUT on the front panel

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2545

The NI PXI-2545 is a terminated multiplexer switch module for the PXI bus that can

carry 50 Ω RF signals up to 2.7 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2545 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4x1 Terminated Multiplexer	2545/4x1 Terminated Mux(NISWITCH_TOPOLOGY_2545_4X1_TERMINATED_MUX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2545 Terminated 4×1 Multiplexer \(SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2545 Terminated 4×1 Multiplexer (SP4T) Topology

The following figure represents the NI PXI-2545 in the terminated 4×1 multiplexer topology.





Caution The terminators on the NI PXI-2545 are rated for 1.5 W at 25 °C. When operating at ambient temperatures greater than 25 °C, a termination power derating applies. Refer the NI PXI-2545 Specifications for more information about termination power derating. Terminators cannot withstand the full rated power of the NI PXI-2545.

Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note All channels are disconnected from COM when the NI PXI-2545 is in its power on state. Any input channel not connected to COM is connected to its associated 50 Ω terminator.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1 and COM and the other between CH 2 and COM:

1. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com`.

When scanning the NI PXI-2545, a typical scan list entry might be `ch1->com;`. This entry routes the signal connected to CH 1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

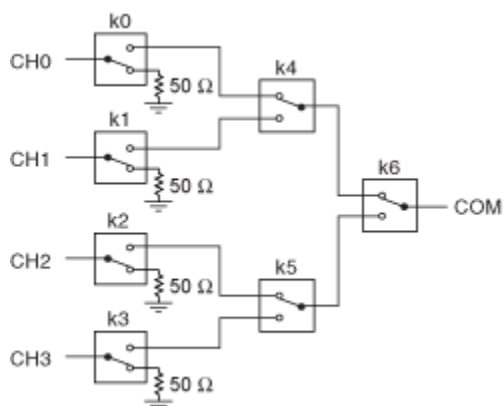
NI PXI-2545 Front Panel

The following figure illustrates the NI PXI-2545 front panel.



NI PXI-2545 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2545.



NI PXI-2545 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2545.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2545.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2546

The NI PXI-2546 is a multiplexer switch module for the PXI bus that can carry 50 Ω RF signals up to 2.7 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2546 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 4×1 Multiplexer	2546/Dual 4x1 Mux(NISWITCH_TOPOLOGY_2546_DUAL_4X1_MUX)	✓	✓

Related Information

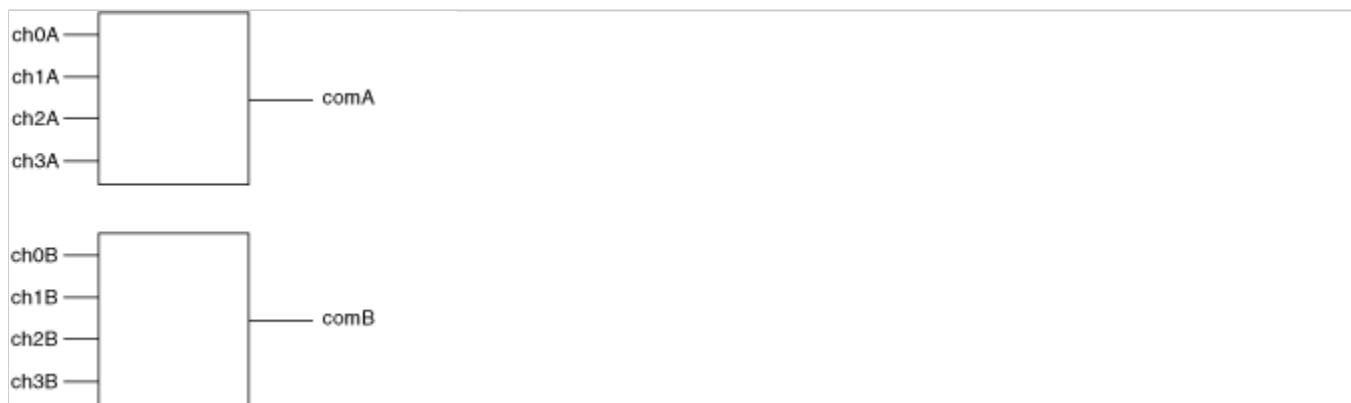
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2546 Dual 4×1 Multiplexer \(Dual SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2546 Dual 4×1 Multiplexer (Dual SP4T) Topology

The following figure represents the NI PXI-2546 in the dual 4×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of each of the 4x1 multiplexers is always connected to the common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the

default channel (ch0) from COM upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1A and COM A and the other between CH 2B and COM B:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1A` and `comA`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1A` and `comA`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2B` and `comB`.

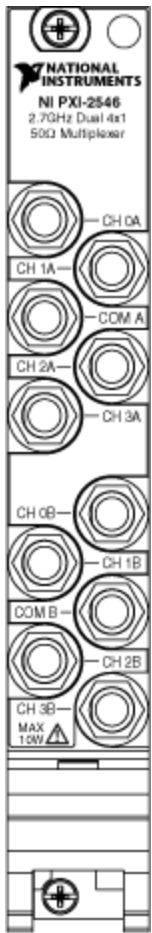
When scanning the NI PXI-2546, a typical scan list entry might be `ch1A->comA;`. This entry routes the signal connected to CH 1A to COM A.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

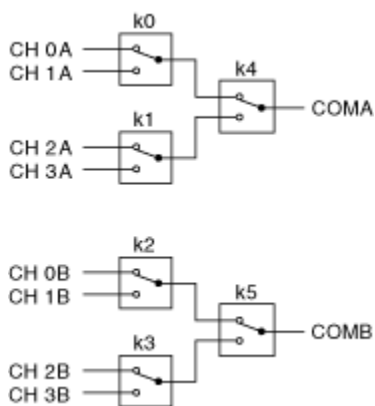
NI PXI-2546 Front Panel

The following figure illustrates the NI PXI-2546 front panel.



NI PXI-2546 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2546.



NI PXI-2546 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2546.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2546.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2547

The NI PXI-2547 is a multiplexer switch module for the PXI bus that can carry 50 Ω RF signals up to 2.7 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2547 and possible operation modes.

Topology	Software Name	Immediate	Scanning
8×1 Multiplexer	2547/8x1 Mux(NISWITCH_TOPOLOGY_2547_8X1_MUX)	✓	✓

Related Information

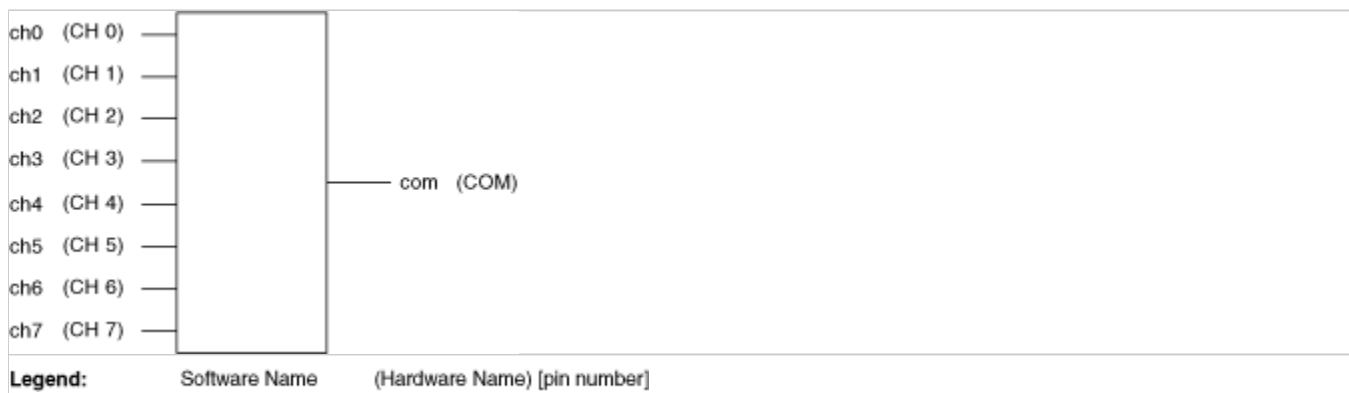
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2547 8×1 Multiplexer \(SP8T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2547 8×1 Multiplexer (SP8T) Topology

The following figure represents the NI PXI-2547 in the 8×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of the 8×1 multiplexer is always connected to the common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (ch0) from COM upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1 and COM and the other between CH 2 and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

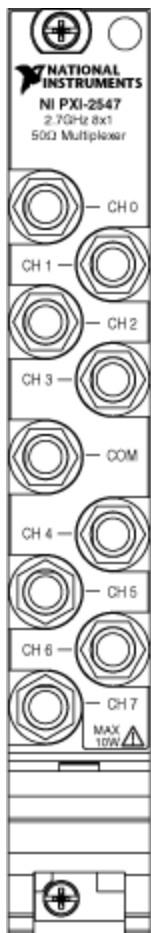
When scanning the NI PXI-2547, a typical scan list entry might be `ch1->com;`. This entry routes the signal connected to CH 1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

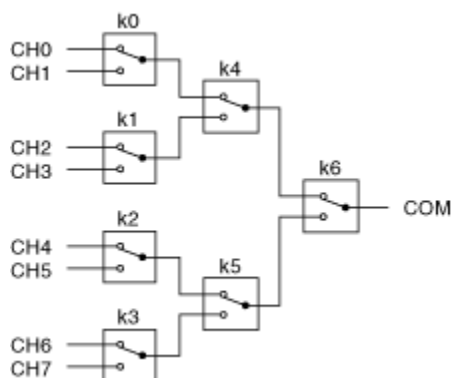
NI PXI-2547 Front Panel

The following figure illustrates the NI PXI-2547 front panel.



NI PXI-2547 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2547.



NI PXI-2547 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2547.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2547.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2548

The NI PXI-2548 is a 4-channel, general-purpose switch module for the PXI bus that can carry 50 Ω RF signals up to 2.7 GHz. The NI PXI-2548 is composed of 4-SPDT relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2548 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4-SPDT	2548/4-SPDT(NISWITCH_TOPOLOGY_2548_4_SPDT)	✓	✓

Related Information

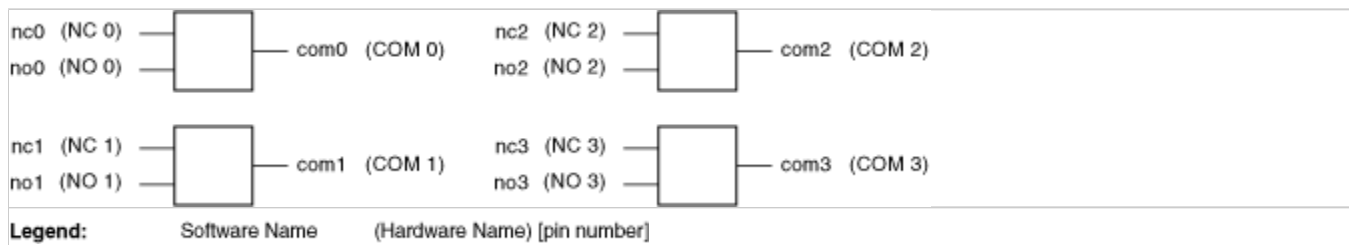
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [RF Switching Considerations](#)
- [NI PXI-2548 Quad SPDT Topology](#)
- [Topologies](#)
- [Operation Modes](#)
- [Integration and System Considerations](#)

NI PXI-2548 Quad SPDT Topology

The following figure represents the NI PXI-2548 in the quad SPDT general-purpose topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel is always connected to each common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (NCx) from COMx upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between NO 1 and COM1 and the other between NC 1

and COM1:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `no1` and `com1`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `no1` and `com1`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `nc1` and `com1`.

When scanning the NI PXI-2548, a typical scan list entry might be `no1->com1 ;`. This entry routes the signal connected to NO 1 to COM 1.

Related concepts:

- [General-Purpose Topologies](#)
- [Operation Modes](#)
- [Scan Lists](#)

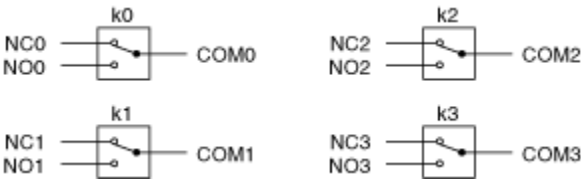
NI PXI-2548 Front Panel

The following figure illustrates the NI PXI-2548 front panel.



NI PXI-2548 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2548.



NI PXI-2548 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2548.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2548.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2549

The NI PXI-2549 is a 2-channel, general-purpose switch module for the PXI bus that can carry 50 Ω RF signals up to 2.7 GHz. The NI PXI-2549 is composed of two terminated SPDT relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2549 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Terminated 2-SPDT	2549/Terminated 2-SPDT(NISWITCH_TOPOLOGY_2549_TERMINATED_2_SPDT)	✓	✓

Related Information

- Integration and System Considerations

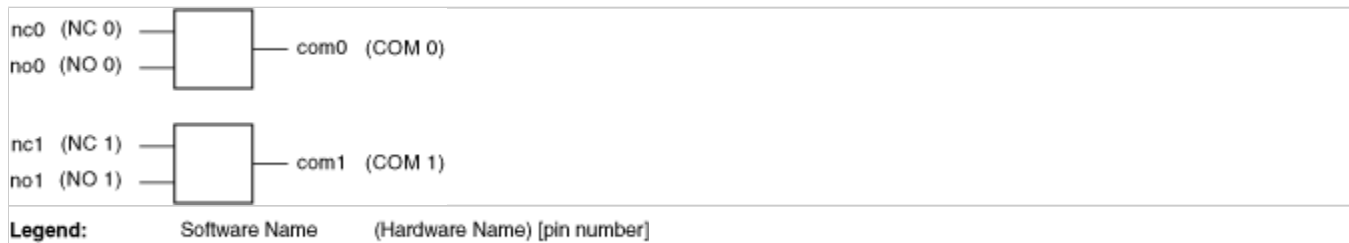
Related concepts:

- [General-Purpose Topologies](#)
- [RF Switching Considerations](#)
- [NI PXI-2549 Dual Terminated SPDT Topology](#)
- [Topologies](#)

- [Operation Modes](#)
- [Integration and System Considerations](#)

NI PXI-2549 Dual Terminated SPDT Topology

The following figure represents the NI PXI-2549 in the dual terminated SPDT general-purpose topology.



Caution The terminators on the NI PXI-2549 are rated for 1.5 W at 25 °C. When operating at ambient temperatures greater than 25 °C, a termination power derating applies. Refer the NI PXI-2549 Specifications for more information about termination power derating. Terminators cannot withstand the full rated power of the NI PXI-2549.

Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel is always connected to each common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (NCx) from COMx upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between NO 1 and COM1 and the other between NC 1 and COM1:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `no1` and `com1`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `no1` and `com1`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `nc1` and `com1`.

When scanning the NI PXI-2549, a typical scan list entry might be `no1->com1 ;`. This entry routes the signal connected to NO 1 to COM 1.

Related concepts:

- [General-Purpose Topologies](#)
- [Operation Modes](#)
- [Scan Lists](#)

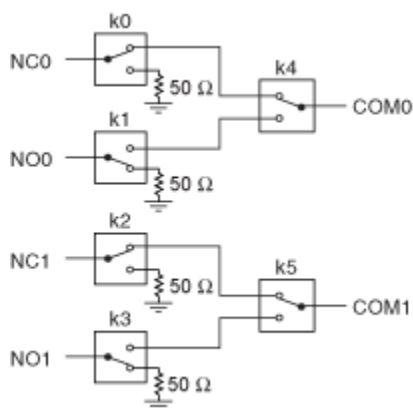
NI PXI-2549 Front Panel

The following figure illustrates the NI PXI-2549 front panel.



NI PXI-2549 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2549.



NI PXI-2549 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2549.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2549.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2554

The NI PXI-2554 is a multiplexer switch module for the PXI bus that can carry 75 Ω RF signals up to 2.5 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2554 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4×1 Multiplexer	2554/4x1 Mux(NISWITCH_TOPOLOGY_2554_4X1_MUX)	✓	✓

Related Information

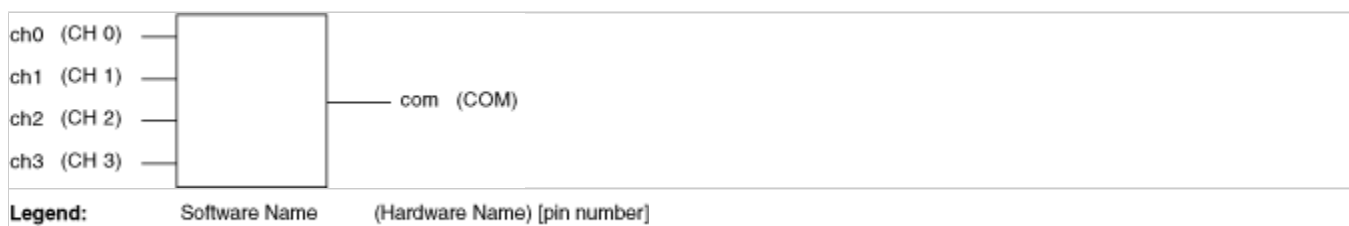
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2554 4×1 Multiplexer \(SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2554 4 × 1 Multiplexer (SP4T) Topology

The following figure represents the NI PXI-2554 in the 4×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of the 4x1 multiplexer is always connected to the common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (ch0) from COM upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1 and COM and the other between CH 2

and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

When scanning the NI PXI-2554, a typical scan list entry might be `ch1->com;`. This entry routes the signal connected to CH 1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

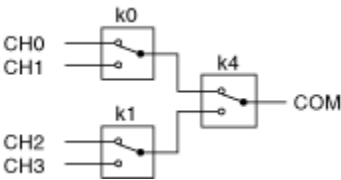
NI PXI-2554 Front Panel

The following figure illustrates the NI PXI-2554 front panel.



NI PXI-2554 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2554.



NI PXI-2554 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2554.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2554.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2555

The NI PXI-2555 is a terminated multiplexer switch module for the PXI bus that can carry 75 Ω RF signals up to 2.5 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2555 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4x1 Terminated Multiplexer	2555/4x1 Terminated Mux(NISWITCH_TOPOLOGY_2555_4X1_TERMINATED_MUX)	✓	✓

Related Information

- Integration and System Considerations

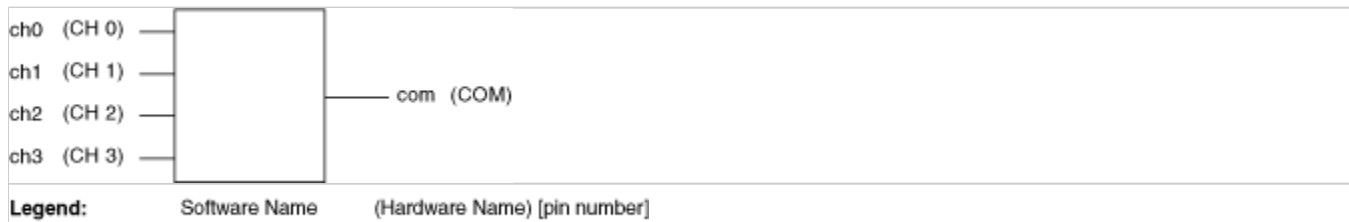
Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)

- [NI PXI-2555 Terminated 4×1 Multiplexer \(SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2555 Terminated 4×1 Multiplexer (SP4T) Topology

The following figure represents the NI PXI-2555 in the terminated 4×1 multiplexer topology.



Caution The terminators on the NI PXI-2555 are rated for 1.5 W at 25 °C. When operating at ambient temperatures greater than 25 °C, a termination power derating applies. Refer to the NI PXI-2555 Specifications for more information about termination power derating. Terminators cannot withstand the full rated power of the NI PXI-2555.

Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note All channels are disconnected from COM when the NI PXI-2555 is in its power on state. Any input channel not connected to COM is connected to its associated 75 Ω terminator.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1 and COM and the other between CH 2 and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

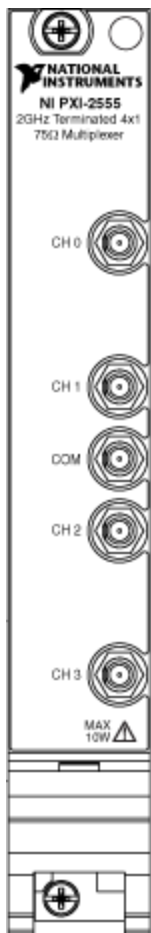
When scanning the NI PXI-2555, a typical scan list entry might be `ch1->com;`. This entry routes the signal connected to CH 1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

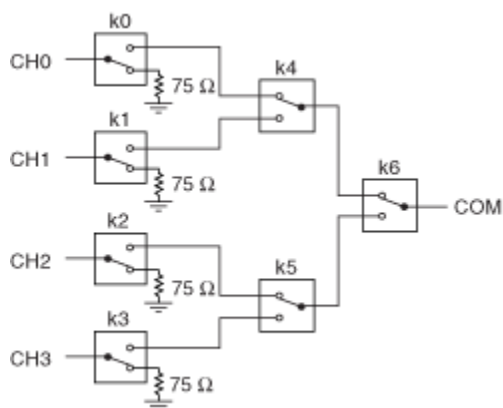
NI PXI-2555 Front Panel

The following figure illustrates the NI PXI-2555 front panel.



NI PXI-2555 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2555.



NI PXI-2555 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2555.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2555.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2556

The NI PXI-2556 is a multiplexer switch module for the PXI bus that can carry 75 Ω RF signals up to 2.5 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2556 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 4×1 Multiplexer	2556/Dual 4x1 Mux(NISWITCH_TOPOLOGY_2556_DUAL_4X1_MUX)	✓	✓

Related Information

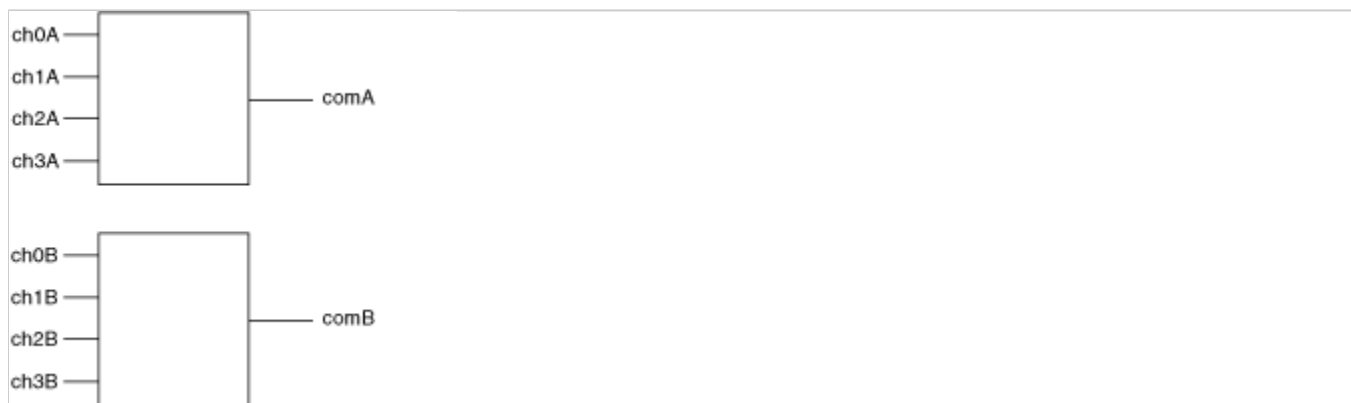
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2556 Dual 4×1 Multiplexer \(Dual SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2556 Dual 4×1 Multiplexer (Dual SP4T) Topology

The following figure represents the NI PXI-2556 in the dual 4×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of each of the 4x1 multiplexers is always connected to the common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the

default channel (ch0) from COM upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1A and COM A and the other between CH 2A and COM A:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1A` and `comA`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1A` and `comA`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2A` and `comA`.

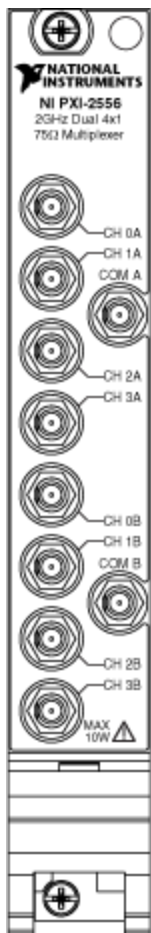
When scanning the NI PXI-2556, a typical scan list entry might be `ch1A->comA;`. This entry routes the signal connected to CH 1A to COM A.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

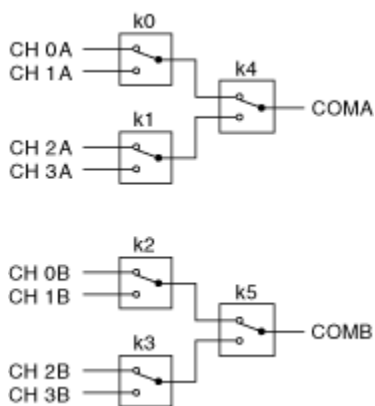
NI PXI-2556 Front Panel

The following figure illustrates the NI PXI-2556 front panel.



NI PXI-2556 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2556.



NI PXI-2556 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2556.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2556.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2557

The NI PXI-2557 is a multiplexer switch module for the PXI bus that can carry 75 Ω RF signals up to 2.5 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2557 and possible operation modes.

Topology	Software Name	Immediate	Scanning
8×1 Multiplexer	2557/8x1 Mux(NISWITCH_TOPOLOGY_2557_8X1_MUX)	✓	✓

Related Information

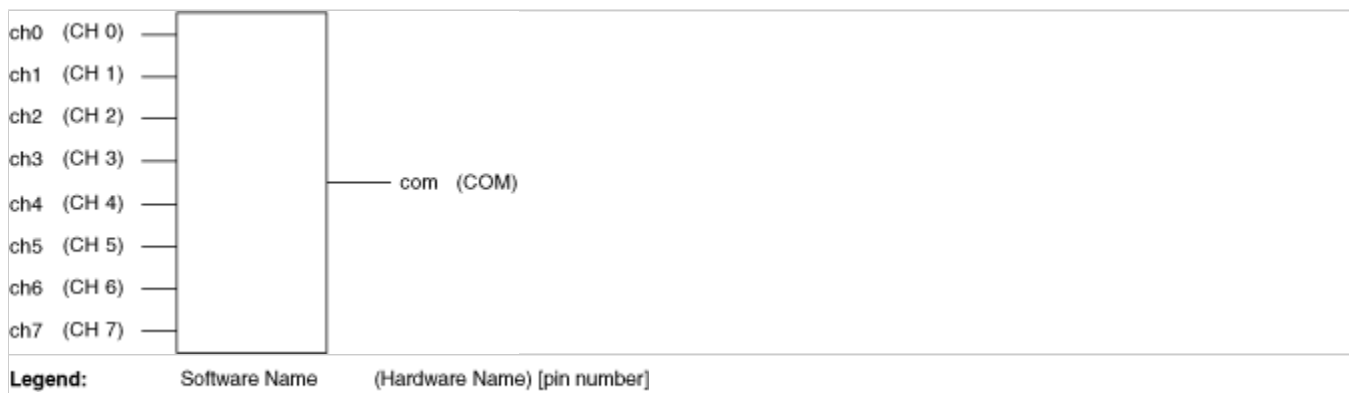
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2557 8×1 Multiplexer \(SP8T\) Topology](#)
- [Integration and System Considerations](#)

NI PXI-2557 8×1 Multiplexer (SP8T) Topology

The following figure represents the NI PXI-2557 in the 8×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of the 8×1 multiplexer is always connected to the common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (ch0) from COM upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH 1 and COM and the other between CH 2 and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

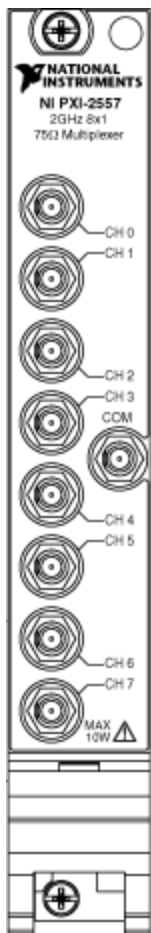
When scanning the NI PXI-2557, a typical scan list entry might be `ch1->com;`. This entry routes the signal connected to CH 1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

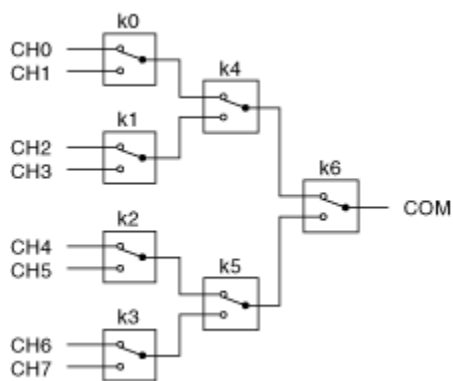
NI PXI-2557 Front Panel

The following figure illustrates the NI PXI-2557 front panel.



NI PXI-2557 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2557.



NI PXI-2557 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2557.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2557.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2558

The NI PXI-2558 is a 4-channel, general-purpose switch module for the PXI bus that can carry 75 Ω RF signals up to 2.5 GHz. The NI PXI-2558 is composed of 4-SPDT relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2558 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4-SPDT	2558/4-SPDT(NISWITCH_TOPOLOGY_2558_4_SPDT)	✓	✓

Related Information

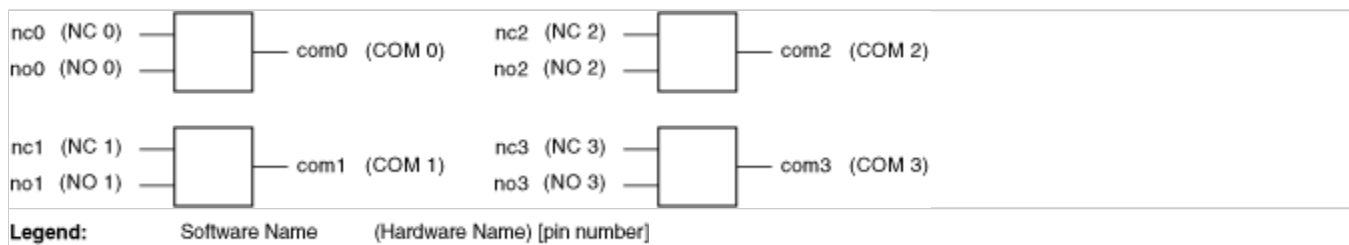
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [RF Switching Considerations](#)
- [NI PXI-2558 Quad SPDT Topology](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2548 Quad SPDT Topology](#)
- [Integration and System Considerations](#)

NI PXI-2558 Quad SPDT Topology

The following figure represents the NI PXI-2558 in the quad SPDT general-purpose topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel is always connected to each common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (NCx) from COMx upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make

consecutive connections—one between NO 1 and COM1 and the other between NC 1 and COM1:

1. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `no1` and `com1`.
2. Call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function with parameters `no1` and `com1`.
3. Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `nc1` and `com1`.

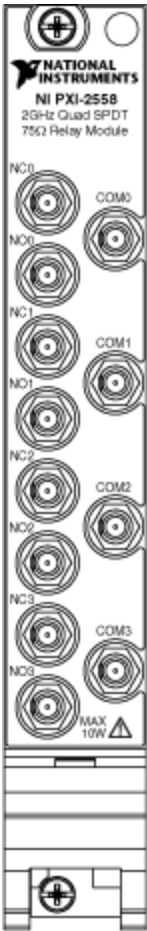
When scanning the NI PXI-2558, a typical scan list entry might be `no1->com1 ;`. This entry routes the signal connected to NO 1 to COM 1.

Related concepts:

- [General-Purpose Topologies](#)
- [Operation Modes](#)
- [Scan Lists](#)

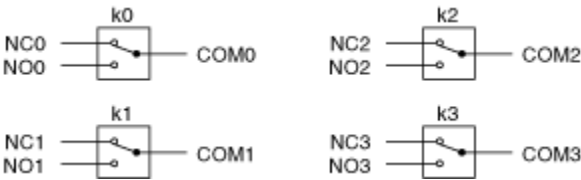
NI PXI-2558 Front Panel

The following figure illustrates the NI PXI-2558 front panel.



NI PXI-2558 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2558.



NI PXI-2558 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2558.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2558.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2559

The NI PXI-2559 is a 2-channel, general-purpose switch module for the PXI bus that can carry 75 Ω RF signals up to 2.5 GHz. The NI PXI-2559 is composed of two terminated SPDT relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2559 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Terminated 2-SPDT	2559/Terminated 2-SPDT(NISWITCH_TOPOLOGY_2559_TERMINATED_2_SPDT)	✓	✓

Related Information

- Integration and System Considerations

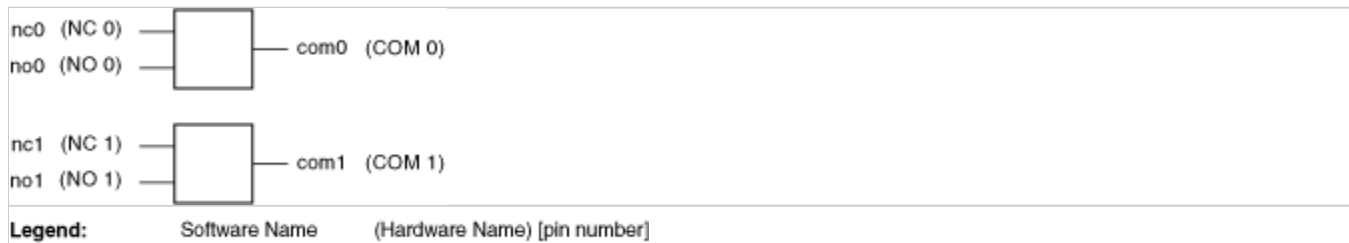
Related concepts:

- [General-Purpose Topologies](#)
- [RF Switching Considerations](#)
- [NI PXI-2559 Dual Terminated SPDT Topology](#)
- [Topologies](#)

- [Operation Modes](#)
- [Integration and System Considerations](#)

NI PXI-2559 Dual Terminated SPDT Topology

The following figure represents the NI PXI-2559 in the dual terminated SPDT general-purpose topology.



Caution The terminators on the NI PXI-2559 are rated for 1.5 W at 25 °C. When operating at ambient temperatures greater than 25 °C, a termination power derating applies. Refer the NI PXI-2559 Specifications for more information about termination power derating. Terminators cannot withstand the full rated power of the NI PXI-2559.

Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel is always connected to each common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (NCx) from COMx upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between NO 1 and COM1 and the other between NC 1 and COM1:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `no1` and `com1`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `no1` and `com1`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `nc1` and `com1`.

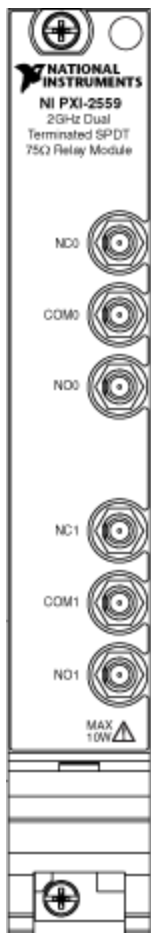
When scanning the NI PXI-2559, a typical scan list entry might be `no1->com1 ;`. This entry routes the signal connected to NO 1 to COM 1.

Related concepts:

- [General-Purpose Topologies](#)
- [Operation Modes](#)
- [Scan Lists](#)

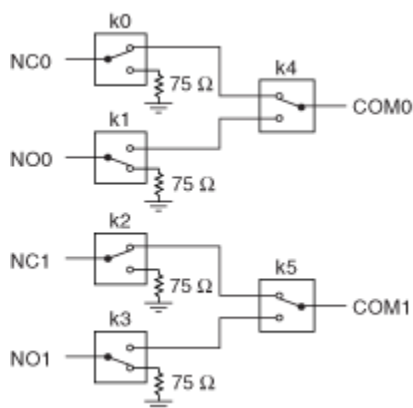
NI PXI-2559 Front Panel

The following figure illustrates the NI PXI-2559 front panel.



NI PXI-2559 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2559.



NI PXI-2559 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2559.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2559.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2564

The NI PXI-2564 is a 16-channel general-purpose power relay module for the PXI platform. The NI PXI-2564 is composed of 16 electromechanical armature latching SPST relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI PXI-2564 and possible operation modes.

Topology	Software Name	Immediate	Scanning
16-SPST	2564/16-SPST(NISWITCH_TOPOLOGY_2564_16_SPST)	✓	✓
8-DPST	2564/8-DPST(NISWITCH_TOPOLOGY_2564_8_DPST)	✓	✓

Related Information

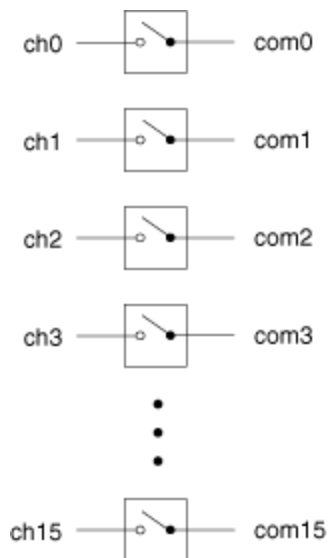
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Electromechanical Relays](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2564 16-SPST Topology](#)
- [NI PXI-2564 8-DPST Topology](#)
- [Integration and System Considerations](#)

NI PXI-2564 16-SPST Topology

The following figure represents the NI PXI-2564 in the 16-SPST topology.



Making a Connection

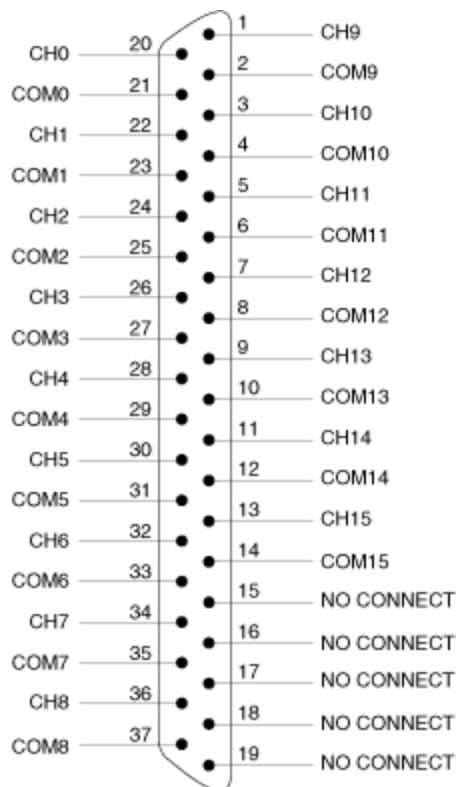
You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI PXI-2564, a typical scan list entry could be `ch2->com2`; . This entry closes the relay between CH2 and COM2.

Pinout

The following figure identifies the pins for the NI PXI-2564 in the 16-SPST topology.

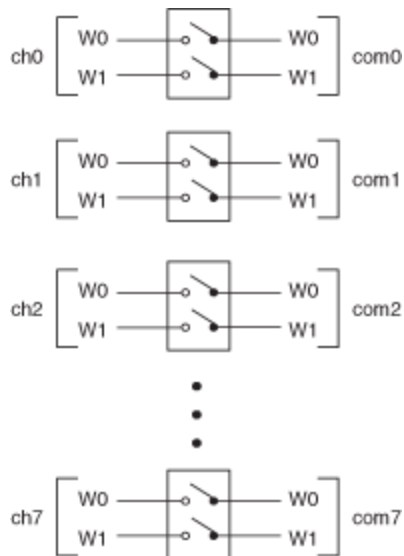


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2564 8-DPST Topology

The following figure represents the NI PXI-2564 in the 8-DPST topology.



Making a Connection

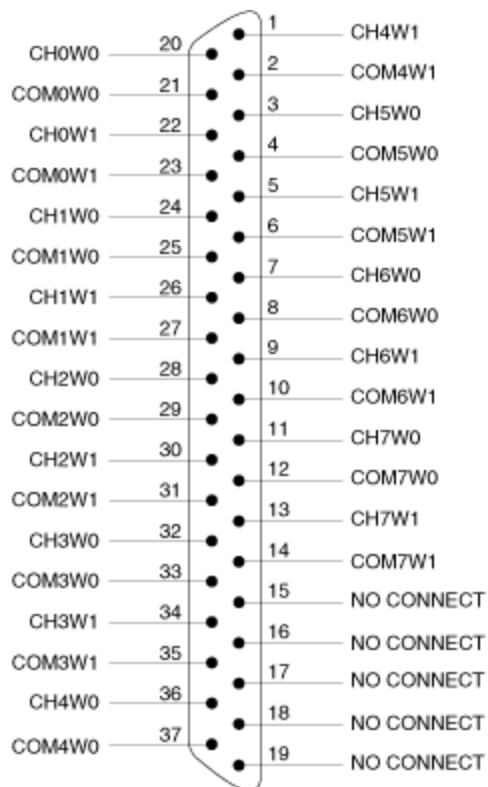
Both the scanning command, `ch2->com2;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to CH2W0 is routed to COM2W0

signal connected to CH2W1 is routed to COM2W1

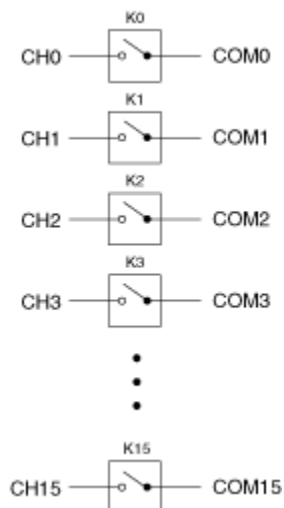
Pinout

The following figure identifies the pins for the NI PXI-2564 in the 8-DPST topology.



NI PXI-2564 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2564.



NI PXI-2564 Relay Replacement

The NI PXI-2564 uses electromechanical armature relays.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Fujitsu	JY-5H-K

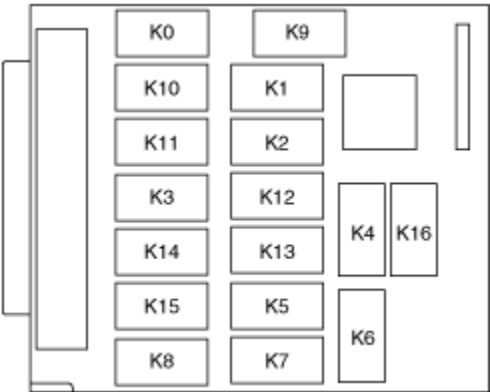
Relay Kit	Part Number
National Instruments (16 relays)	780262-01

Complete the following sets of steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.

**Note** Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.



Channel Name	Relay Name
CH0	K0
CH1	K1
CH2	K2
CH3	K3

Channel Name	Relay Name
CH4	K4
CH5	K5
CH6	K6
CH7	K7
CH8	K8
CH9	K9
CH10	K10
CH11	K11
CH12	K12
CH13	K13
CH14	K14
CH15	K15

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2564 Triggering

The NI PXI-2564 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2564.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6

Trigger Input	Software	Hardware
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2564.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2565

The NI PXI-2565 is a 16-channel general-purpose switch module for the PXI platform.

The NI PXI-2565 is composed of 16 SPST relays.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2565 and possible operation modes.

Topology	Software Name	Immediate	Scanning
16-SPST	2565/16-SPST(NISWITCH_TOPOLOGY_2565_16_SPST)	✓	✓

Related Information

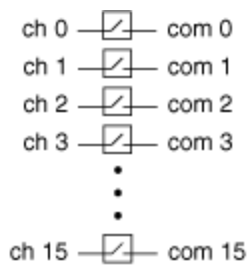
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Relay Forms](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2565 16-SPST Topology](#)
- [Integration and System Considerations](#)

NI PXI-2565 16-SPST Topology

The following figure represents the NI PXI-2565 in the 16-SPST topology.



Making a Connection

You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI PXI-2565, a typical scan list entry could be `ch2->com2;`. This entry routes the signal connected to CH2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2565 in the 16-SPST topology.

	A	B	
CH0	1	1	CH8
COM0	2	2	COM8
CH1	3	3	CH9
COM1	4	4	COM9
CH2	5	5	CH10
COM2	6	6	COM10
CH3	7	7	CH11
COM3	8	8	COM11
CH4	9	9	CH12
COM4	10	10	COM12
CH5	11	11	CH13
COM5	12	12	COM13
CH6	13	13	CH14
COM6	14	14	COM14
CH7	15	15	CH15
COM7	16	16	COM15

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2565 Flyback Voltage Protection

When inductive loads are connected to the relays, a large counter electromotive force may occur at relay switching time because of the energy stored in the inductive load. These flyback voltages can severely damage the relay contacts and significantly shorten the life of the relay.

You can limit flyback voltages at your inductive load by installing a flyback diode for DC loads or a varistor for AC loads. The NI PXI-2565 switch module has solder connections for a diode or varistor. With this diode/varistor installed, you can limit flyback voltages when switching inductive loads.



Caution Before installing the diode or varistor in your module, ensure that no signals are connected to your module front connector.

Before installing your switch module in the PXI chassis, install the diode/varistor by performing the steps described in the following sections.

Disassemble the Module

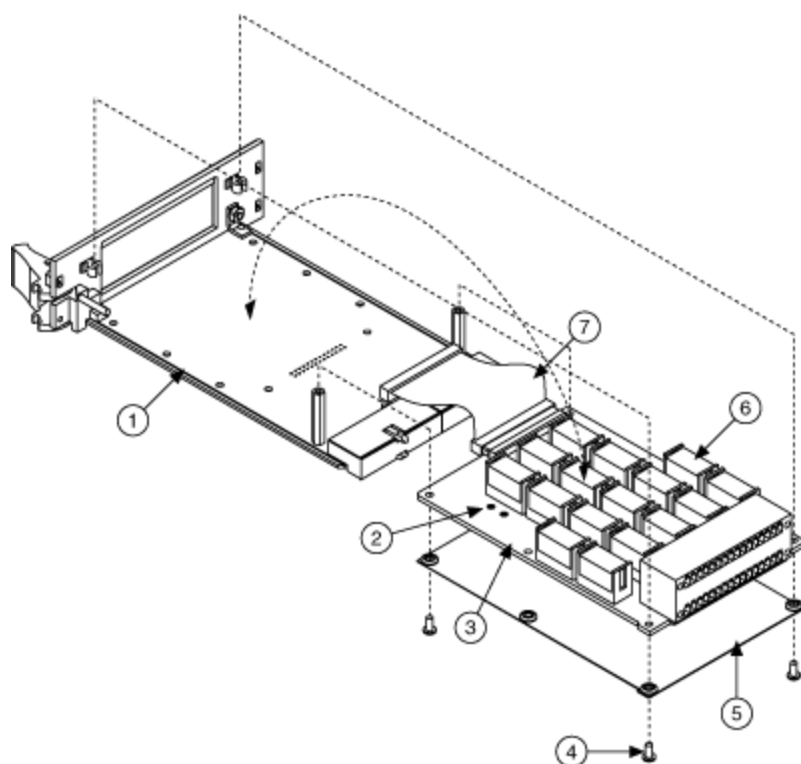
To disassemble the module, complete the following steps, referring to the parts locator diagram as needed.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Loosen the four screws that fasten the relay module to the carrier module and front panel.



1	Carrier Module
2	Solder Location for Flyback Voltage Protection Device
3	Relay Module
4	Screws
5	Plastic Insulator Cover
6	Relay and Socket
7	Ribbon Cable

3. Remove the plastic insulator cover.
4. Lift up the card and disconnect the ribbon cable from the relay module.

Install the Diode/Varistor

Complete the following steps to install the diode/varistor.

1. Remove solder, as necessary, from the diode/varistor locations.
2. Insert the diode/varistor into the appropriate location, labeled RVx, where x corresponds to the channel number.

3. Solder and trim the leads.

Reassemble the Module

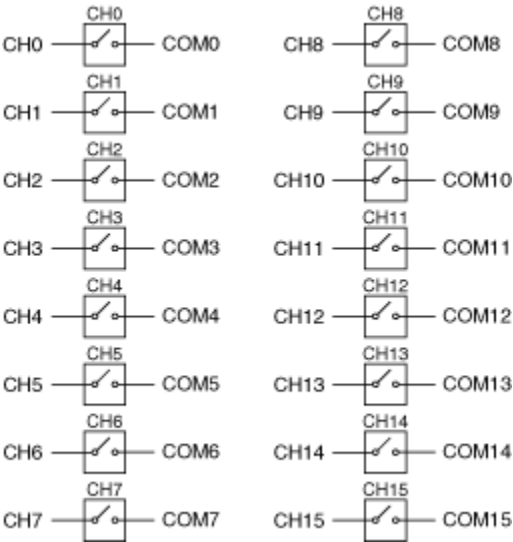
Complete the Disassemble the Module steps in reverse order to reassemble your module.

Related concepts:

- [Switching Inductive Loads](#)

NI PXI-2565 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2565.



NI PXI-2565 Relay Replacement

The NI PXI-2565 uses socketed electromechanical relays.

Refer to the following tables for information about ordering replacement relays.

Relay Manufacturer	Part Number
Aromat (NAiS)	DSP1a-DC5V

Relay Kit	Part Number
National Instruments (16 relays)	777880-01

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

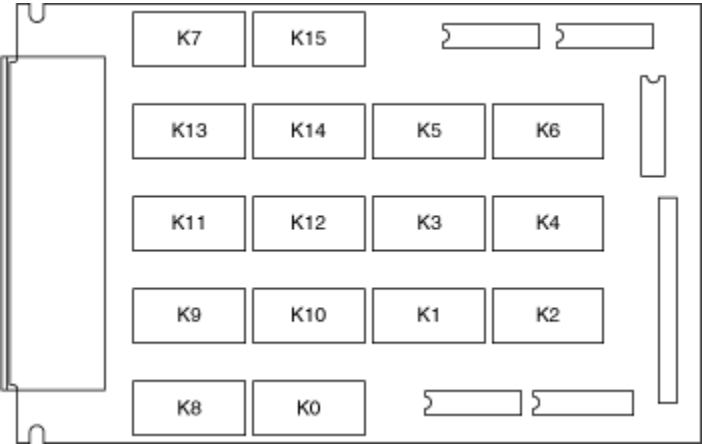
Disassemble the Module

- 1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.

**Note** Properly grounding yourself prevents damage to your module from electrostatic discharge.

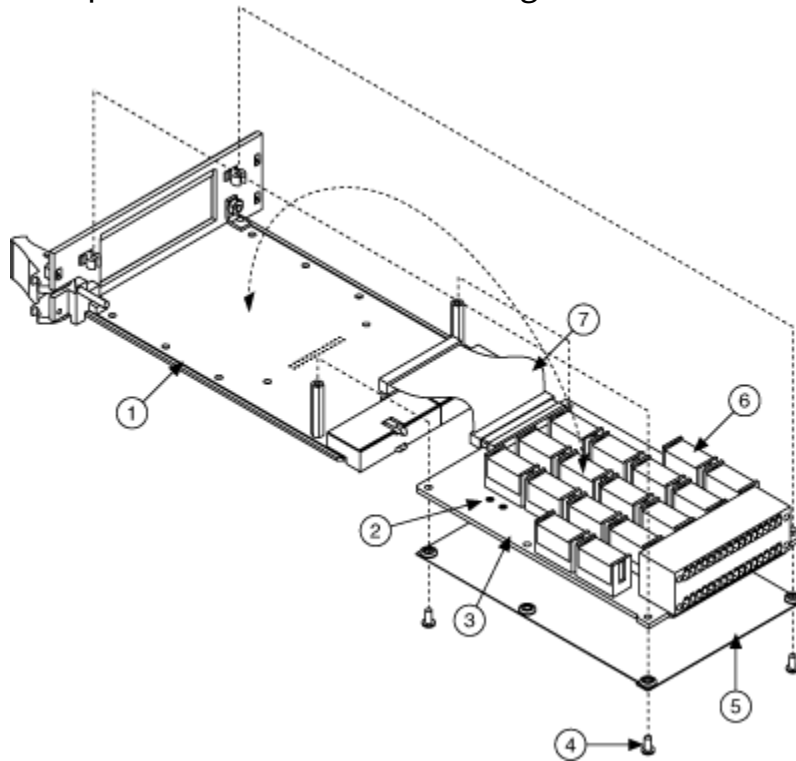
- 2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI PXI-2565 Relay Map



ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName	ChannelName	RelayName
CH0	K0	Cp	K4	CH8	K8	CH12	K12
CH1	K1	CH5	K5	CH9	K9	CH13	K13
CH2	K2	CH6	K6	CH10	K10	CH14	K14
CH3	K3	CH7	K7	CH11	K11	CH15	K15

3. Remove the four screws that fasten the NI PXI-2565 relay daughtercard to the main board.
4. Lift up the card as shown in the figure below.



1	Carrier Module
2	Solder Location for Flyback Voltage Protection Device
3	Relay Module
4	Screws
5	Insulator
6	Relay and Socket
7	Ribbon Cable

Replace the Relay

1. Remove the relay by gently applying force.
2. Before inserting the new relay, match the direction of the relay and the socket.
3. Insert the relay, making sure the relay is properly seated and the socket hooks the top of the relay.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.

NI PXI-2565 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2565.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2565.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2566

The NI PXI-2566 is a 16-channel general-purpose relay switch module for the PXI platform designed for switching and controlling low-level and power signals.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to *Protecting NI Switch Products when Switching Inductive Loads*.

Operation Modes

The following table lists the supported topology of the NI PXI-2566 and possible

operation modes.

Topology	Software Name	Immediate	Scanning
16-SPDT	2566/16-SPDT(NISWITCH_TOPOLOGY_2566_16_SPDT)	✓	✓
8-DPDT	2566/8-DPDT(NISWITCH_TOPOLOGY_2566_8_DPDT)	✓	✓

Related Information

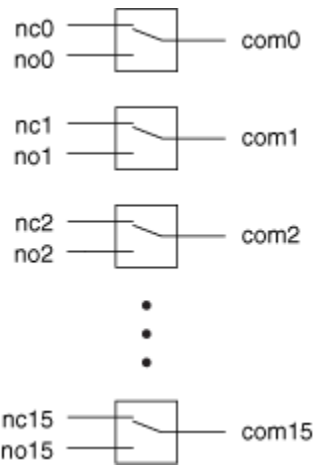
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2566 16-SPDT Topology](#)
- [NI PXI-2566 8-DPDT Topology](#)
- [Integration and System Considerations](#)

NI PXI-2566 16-SPDT Topology

The following figure represents the NI PXI-2566 in the 16-SPDT topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the

`niSwitch_Connect` function.

To connect the NO terminal to the COM terminal of that channel, disconnect the NC terminal from the COM of that channel.

For example, to connect NO2 to COM2, use the following code:

```
niSwitch_Disconnect(vi, "nc2", "com2")
```

```
niSwitch_Connect(vi, "no2", "com2")
```



Note To connect NO to COM you do not need to disconnect NC from COM after the module has been reset or a call to the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function has been made.



Note `niSwitch_Disconnect(vi, "nc2", "com2")` does not activate the relay until `niSwitch_Connect(vi, "no2", "com2")` is executed.

To connect the NC terminal to the COM terminal of that channel, disconnect the NO terminal from the COM of that channel.

For example, to connect NC2 to COM2, use the following code:

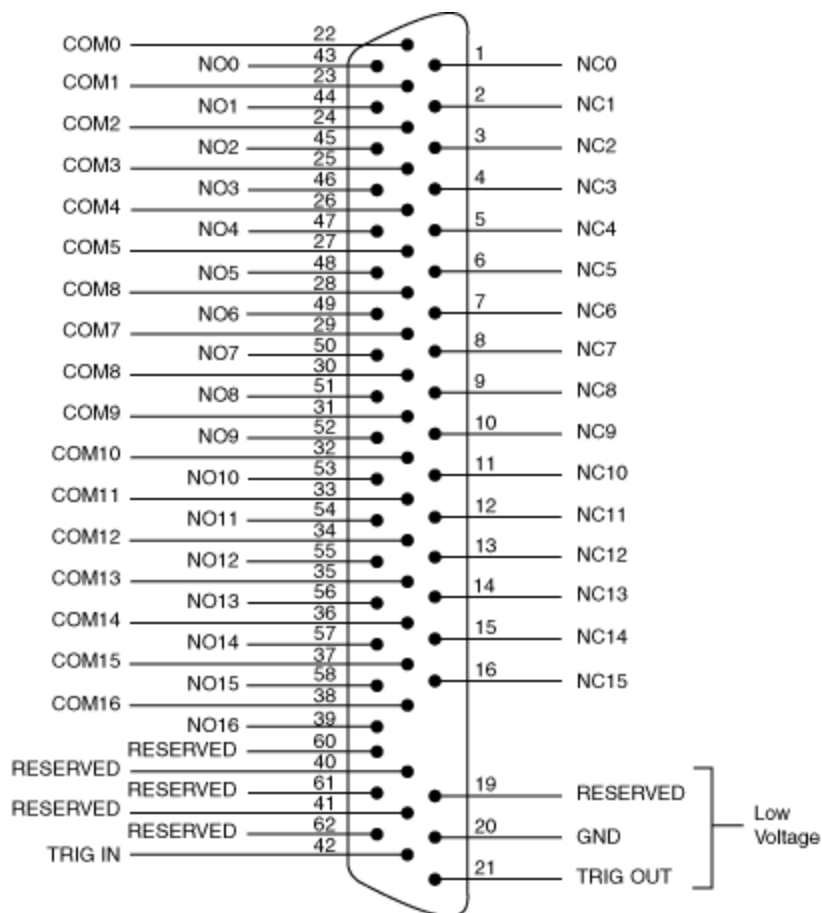
```
niSwitch_Disconnect(vi, "no2", "com2")
```

```
niSwitch_Connect(vi, "nc2", "com2")
```

When scanning the NI PXI-2566, a typical scan list entry could be `nc2->com2 ;`. This entry routes the signal connected to NC2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2566 in the 16-SPDT topology.



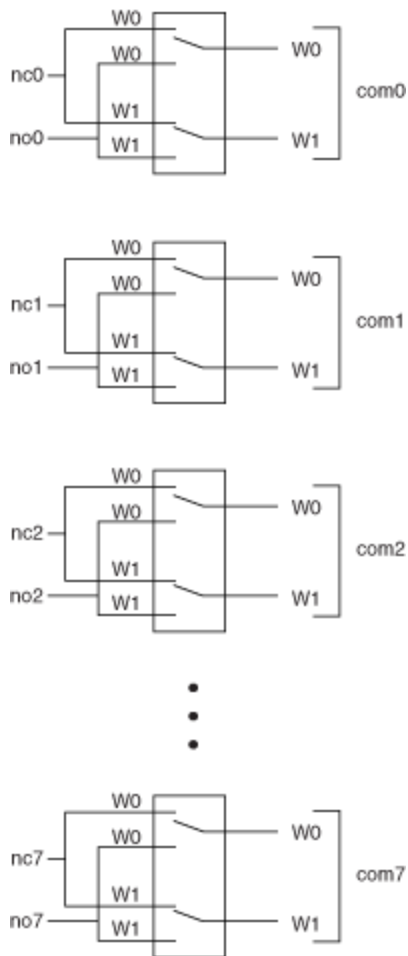
Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2566 8-DPDT Topology

The following figure represents the NI PXI-2566 in the 8-DPDT topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

To connect the NO terminal to the COM terminal of that channel, disconnect the NC terminal from the COM of that channel.

For example, to connect NO2 to COM2, use the following code:

```
niSwitch_Disconnect(vi, "nc2", "com2")
```

```
niSwitch_Connect(vi, "no2", "com2")
```



Note To connect NO to COM you do not need to disconnect NC from COM after the module has been reset or a call to the niSwitch Disconnect All

Channels VI or the `niSwitch_DisconnectAll` function has been made.



Note `niSwitch_Disconnect(vi, "nc2", "com2")` does not activate the relay until `niSwitch_Connect(vi, "no2w0", "com2w0")` is executed.

To connect the NC terminal to the COM terminal of that channel, disconnect the NO terminal from the COM of that channel.

For example, to connect NC2 to COM2, use the following code:

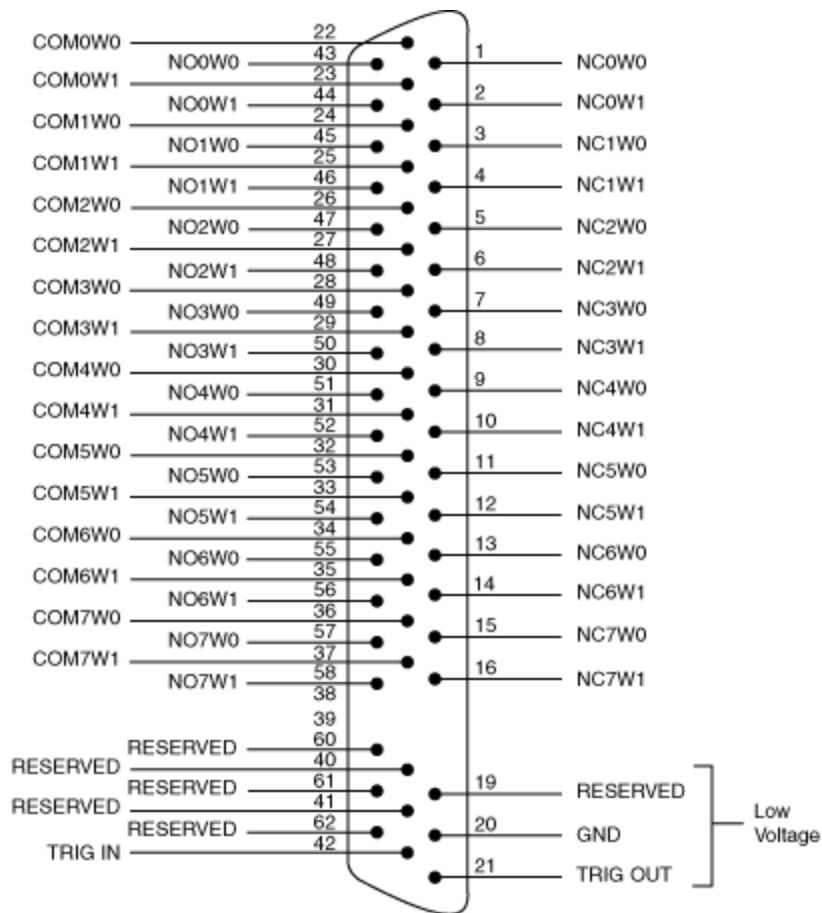
```
niSwitch_Disconnect(vi, "no2", "com2")
```

```
niSwitch_Connect(vi, "nc2", "com2")
```

When scanning the NI PXI-2566, a typical scan list entry could be `nc2->com2`; . This entry routes the signal connected to NC2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2566 in the 8-DPDT topology.



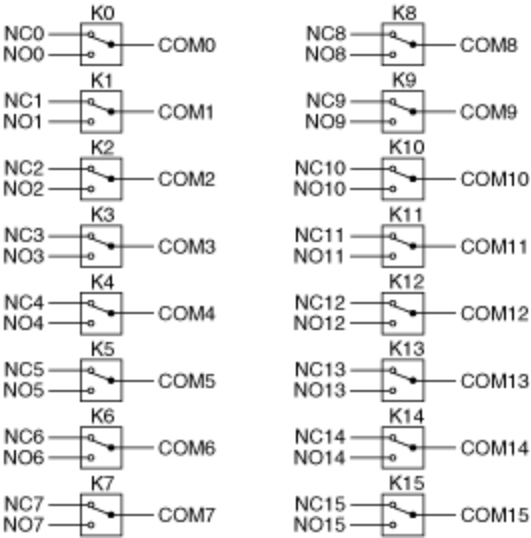
Caution Do not connect to RESERVED pins. Keep low-voltage pins isolated from row and column channels when high voltage is present.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2566 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2566.



NI PXI-2566 Relay Replacement

The NI PXI-2566 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
Aromat (NAiS)	TQ2SA-5V

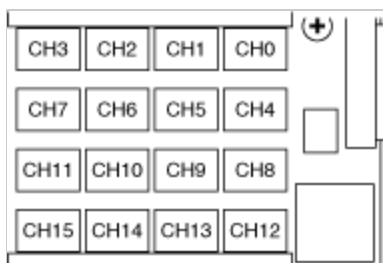
Complete the following sets of steps to replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure for relay locations.



Note Older versions of this module might have adhesive plastic lead covers that you must remove. The module retains full specifications even if the covers are not reinstalled.

3. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



4. Replace the relay.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Before you begin, make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2566 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2566.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on TB-2666 terminal block

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2566.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG OUT on TB-2666 terminal block

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2567

The NI PXI-2567 is a 64-channel general-purpose relay driver module for the PXI platform. The NI PXI-2567 is designed to handle up to 0.6 A drive current and up to 50 V drive voltage. The NI PXI-2567 also has two sources available for driving relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2567 and possible operation modes.



Note Using two channels per relay, the NI PXI-2567 can also control 32 two-

coil latching relays.

Topology	Software Name	Immediate	Scanning
Independent	2567/ Independent(NISWITCH_TOPOLOGY_2567_INDEPENDENT)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

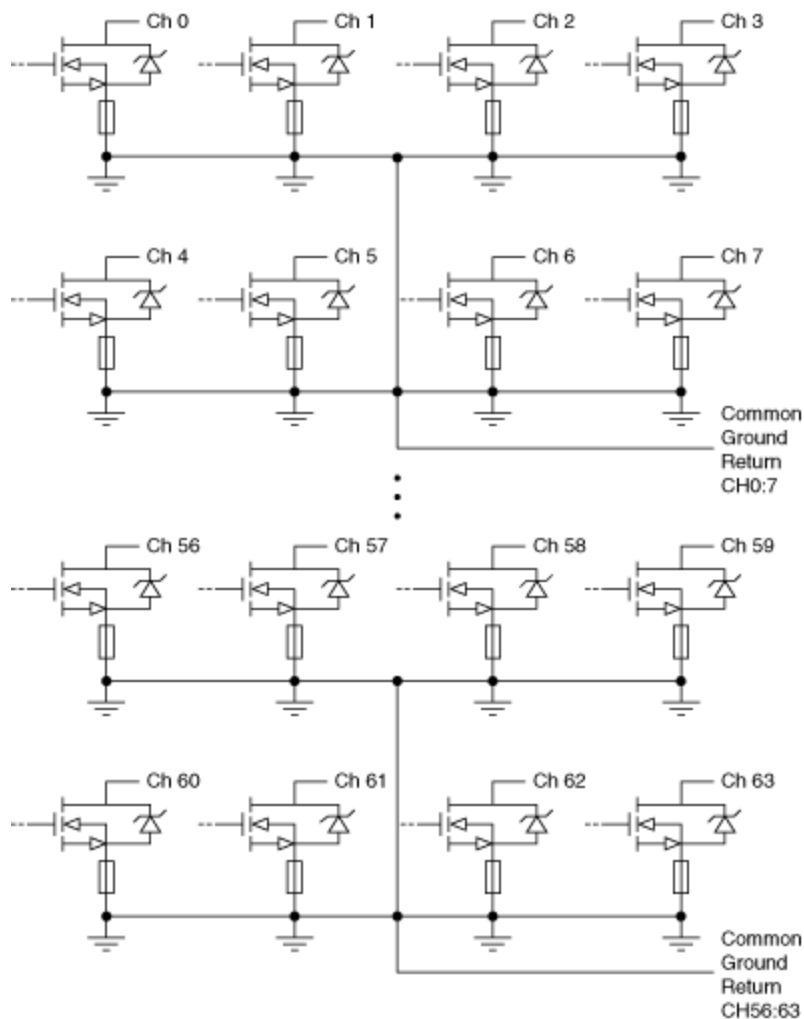
- [General-Purpose Topologies](#)
- [Available 5 V and 12 V Sources](#)
- [Operation Modes](#)
- [NI PXI-2567 Independent Topology](#)
- [Integration and System Considerations](#)

Available 5 V and 12 V Sources

The NI PXI-2567 has a 5 V and a 12 V source available to drive relays. The 5 V source, available on pin 58, can provide up to 1.25 A of current. The 12 V source, available on pin 19, can provide 0.50 A of current.

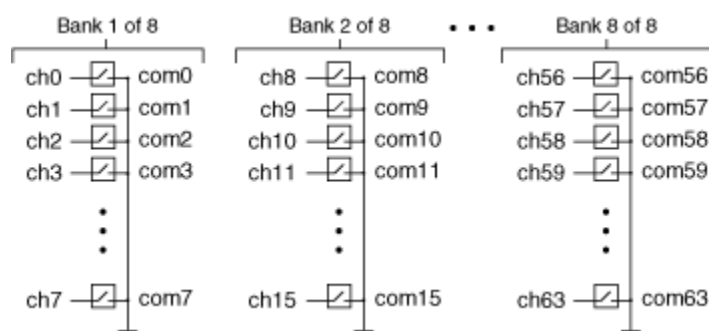
NI PXI-2567 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2567.



NI PXI-2567 Independent Topology

The following figure is a representation of the NI PXI-2567 topology.

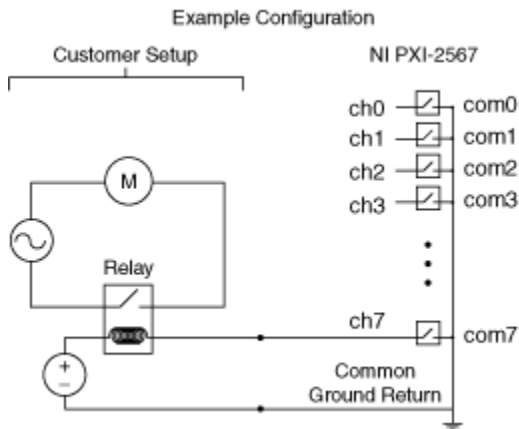


Making a Connection

To drive your relay, use the niSwitch Connect Channels VI or the

`niSwitch_Connect` function.

For example, to actuate a relay connected to channel 7, you can connect the positive terminal of your voltage source to one side of the relay coil, and connect the other relay coil terminal to pin 44 of the front connector. Then connect the negative terminal of your voltage source to the common ground return of channel 7 (pin 42). Closing the channel 7 driver completes the circuit, driving your relay. The following figure illustrates how to actuate a relay connected to channel 7.



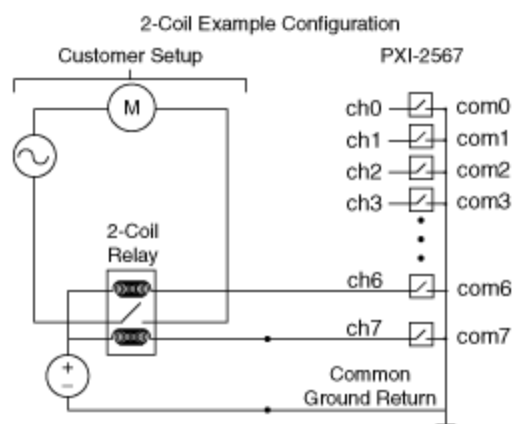
To close the channel 7 relay, call `niSwitch_Connect(vi, "ch7", "com7")`.

Alternatively, you can open and close relays by calling the `niSwitch Relay Control VI` or the `niSwitch_RelayControl` function. For the relay name, enter K0 for channel 0, K1 for channel 1, and so on.

When scanning the NI PXI-2567, a typical scan list entry could be `ch2->com2;`. This entry drives the relay connected to channel 2.

Driving 2-Coil Relays

The following figure shows an example of a configuration using the NI PXI-2567 to drive a 2-coil relay.



To close the relay in this example, you would call `niSwitch_Connect(vi, "ch7", "com7")`. To open the relay, then you would call `niSwitch_Disconnect(vi, "ch7", "com7")` and then `niSwitch_Connect(vi, "ch6", "com6")`.

Alternatively, you can actuate the relay by calling the `niSwitch Relay Control VI` or the `niSwitch_RelayControl` function. To close the relay in this example, you would call `niSwitch_RelayControl(vi, K7, NISWITCH_VAL_CLOSE_RELAY)` to power on the lower coil in the diagram. Then call `niSwitch_RelayControl(vi, K7, NISWITCH_VAL_OPEN_RELAY)` to power off the lower coil, and call `niSwitch_RelayControl(vi, K6, NISWITCH_VAL_CLOSE_RELAY)` power on the other coil and open the relay.

Pinout

The following figure identifies the pins for the NI PXI-2567.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on pin 59

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2567.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2

Scan Advanced Output	Software	Hardware
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG OUT on pin 20

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2568

The NI PXI-2568 is a 31-channel general-purpose relay module for the PXI platform. The NI PXI-2568 is composed of 31 armature latching SPST relays.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2568 and possible operation modes.

Topology	Software Name	Immediate	Scanning
31-SPST	2568/31-SPST(NISWITCH_TOPOLOGY_2568_31_SPST)	✓	✓
15-DPST	2568/15-DPST(NISWITCH_TOPOLOGY_2568_15_DPST)	✓	✓

Related Information

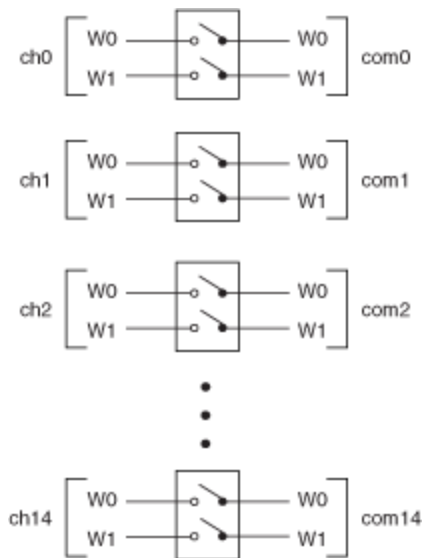
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2568 31-SPST Topology](#)
- [NI PXI-2568 15-DPST Topology](#)
- [Integration and System Considerations](#)

NI PXI-2568 15-DPST Topology

The following figure represents the NI PXI-2568 in the 15-DPST topology.



Making a Connection

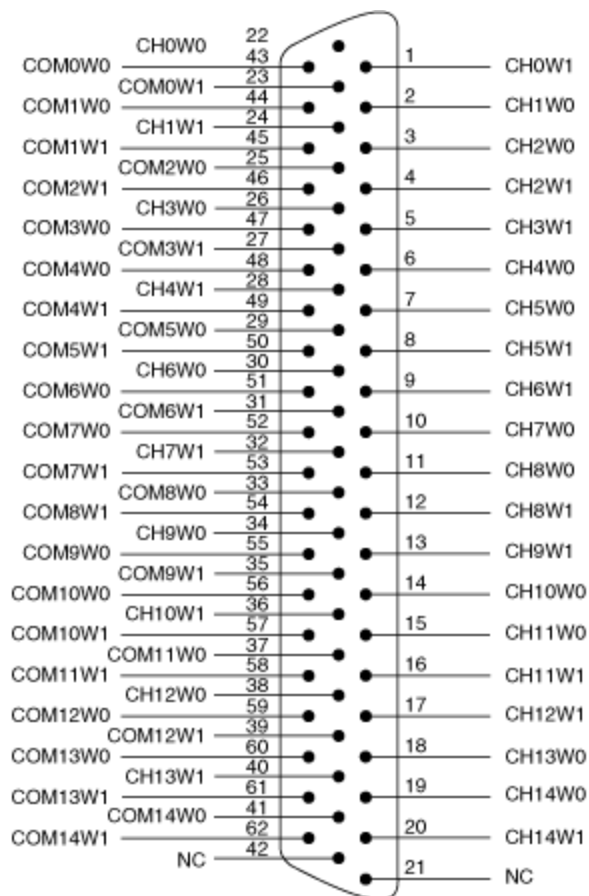
Both the scanning command, `ch2->com2;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com2`, result in the following connections:

signal connected to CH2W0 is routed to COM2W0

signal connected to CH2W1 is routed to COM2W1

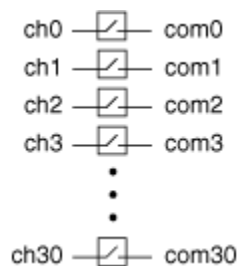
Pinout

The following figure identifies the pins for the NI PXI-2568 in the 15-DPST topology.



NI PXI-2568 31-SPST Topology

The following figure represents the NI PXI-2568 in the 31-SPST topology.



Making a Connection

You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

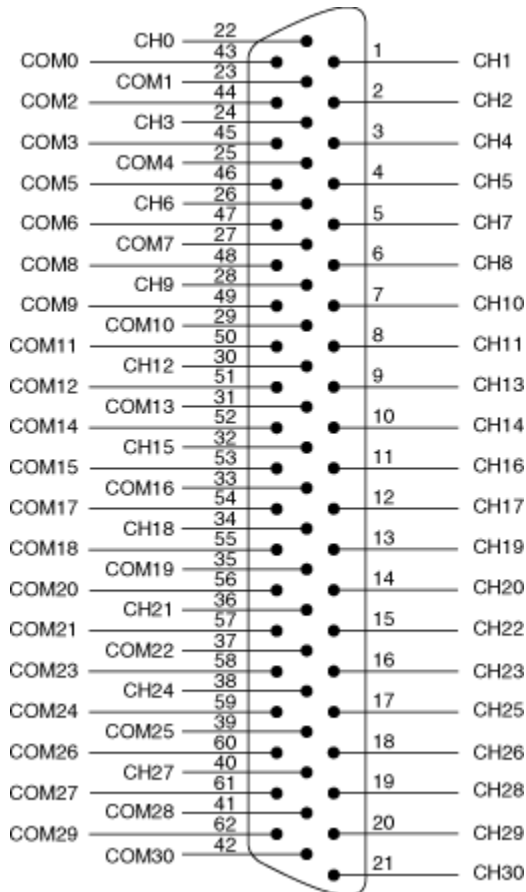
For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call

```
niSwitch_Disconnect(vi, "ch2", "com2").
```

When scanning the NI PXI-2568, a typical scan list entry could be `ch2->com2`; . This entry closes the relay between CH2 and COM2.

Pinout

The following figure identifies the pins for the NI PXI-2568 in the 31-SPST topology.

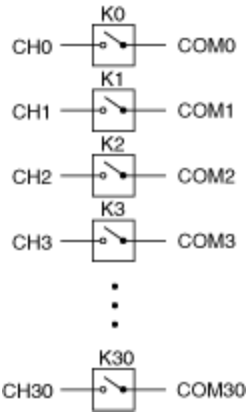


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2568 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2568.



NI PXI-2568 Relay Replacement

The NI PXI-2568 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
AXICOM (Tyco Electronics)	IM42GR (3-1462037-1)

Relay Kit	Part Number
National Instruments (10 relays)	779356-01

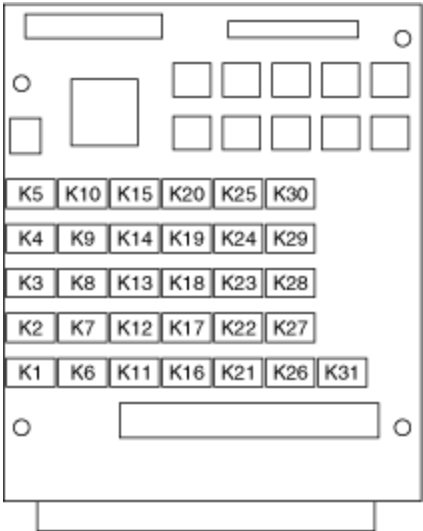
Complete the following sets of steps to replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.



Channel Name	Relay Name	Channel Name	Relay Name
CH0	K1	CH16	K17
CH1	K2	CH17	K18
CH2	K3	CH18	K19
CH3	K4	CH19	K20
CH4	K5	CH20	K21
CH5	K6	CH21	K22
CH6	K7	CH22	K23
CH7	K8	CH23	K24
CH8	K9	CH24	K25
CH9	K10	CH25	K26
CH10	K11	CH26	K27
CH11	K12	CH27	K28
CH12	K13	CH28	K29
CH13	K14	CH29	K30
CH14	K15	CH30	K31
CH15	K16		



Note Older versions of this module might have plastic lead covers that you must remove. The module retains full specifications even if these covers are not reinstalled.

3. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L.



4. Replace the relay.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick

- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

- a. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

- b. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

- c. Remove the relay.
- d. Clean the pads with isopropyl alcohol and cotton swabs.
- e. Place the new relay on the PCB pads and solder.
- f. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2568 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital

filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2568.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2568.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2569

The NI PXI/PXIe-2569 (NI 2569) is a 100-channel general-purpose relay module for the PXI or PXI Express platform. The NI 2569 is composed of 100 armature latching SPST relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI 2569 and possible operation modes.

Topology	Software Name	Immediate	Scanning
100-SPST	2569/100-SPST(NISWITCH_TOPOLOGY_2569_100_SPST)	✓	✓
50-DPST	2569/50-DPST(NISWITCH_TOPOLOGY_2569_50_DPST)	✓	✓

Related Information

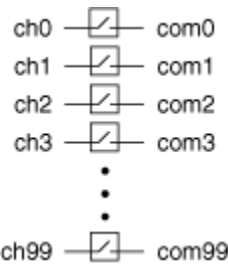
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2569 100-SPST Topology](#)
- [NI PXI/PXIe-2569 50-DPST Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2569 100-SPST Topology

The following figure represents the NI PXI/PXIe-2569 (NI 2569) in the 100-SPST topology.



Making a Connection

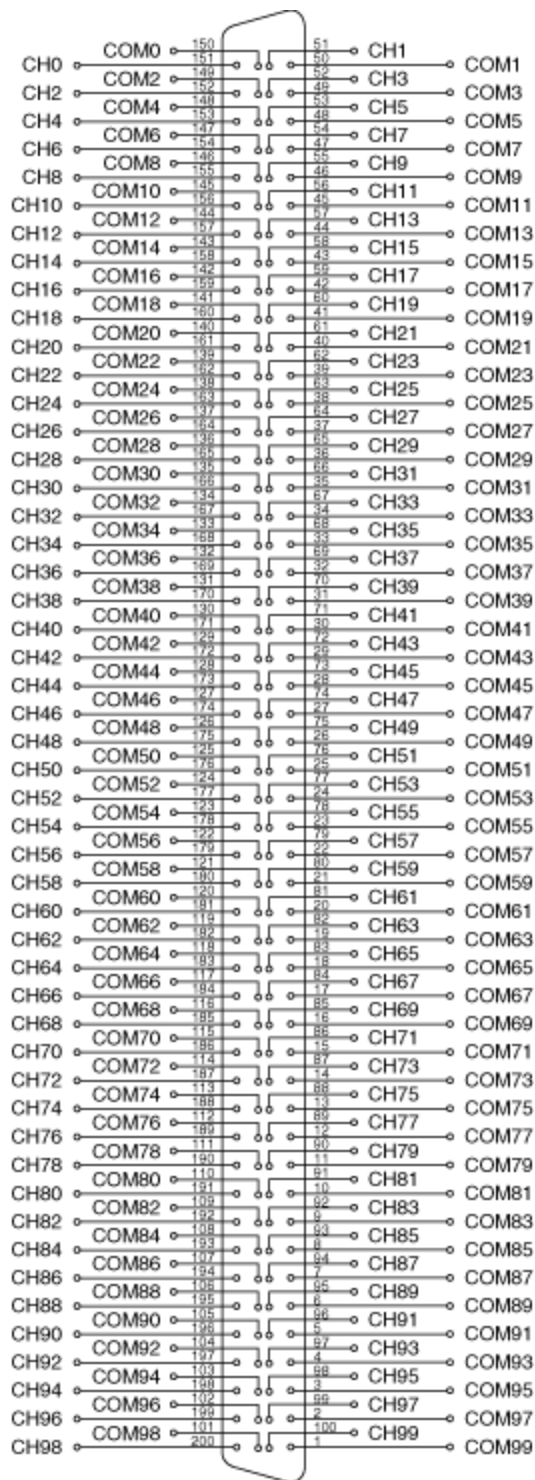
You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI 2569, a typical scan list entry could be `ch2->com2 ;`. This entry closes the relay between CH2 and COM2.

Pinout

The following figure identifies the pins for the NI 2569 in the 100-SPST topology.

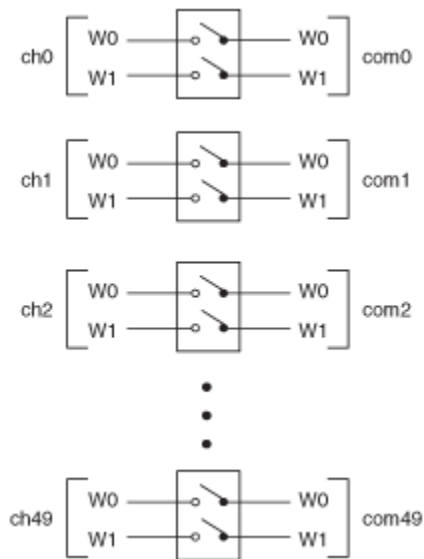


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2569 50-DPST Topology

The following figure represents the NI PXI/PXIe-2569 (NI 2569) in the 50-DPST topology.



Making a Connection

Both the scanning command, `ch2->com2 ;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com2`, result in the following connections:

signal connected to CH2W0 is routed to COM2W0

signal connected to CH2W1 is routed to COM2W1

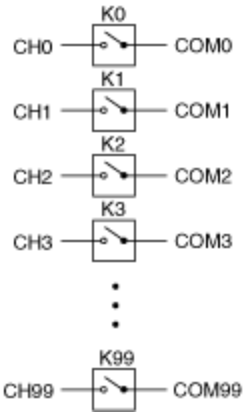
Pinout

The following figure identifies the pins for the NI 2569 in the 50-DPST topology.



NI PXI/PXIe-2569 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2569.



NI PXI/PXIe-2569 Relay Replacement

The NI PXI/PXIe-2569 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
AXICOM (Tyco Electronics)	IM42GR (3-1462037-1)

Relay Kit	Part Number
National Instruments (10 relays)	779356-01

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

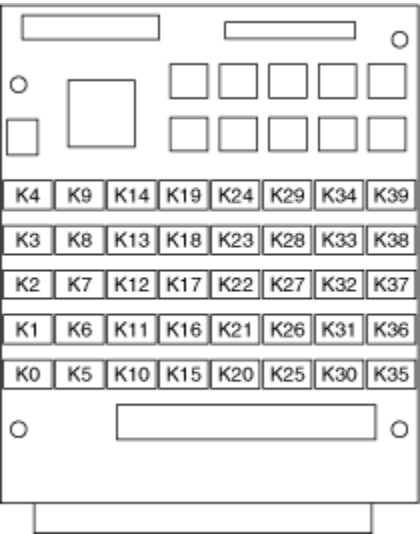
Disassemble the Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.

**Note** Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

Base Board



Mezzanine Board



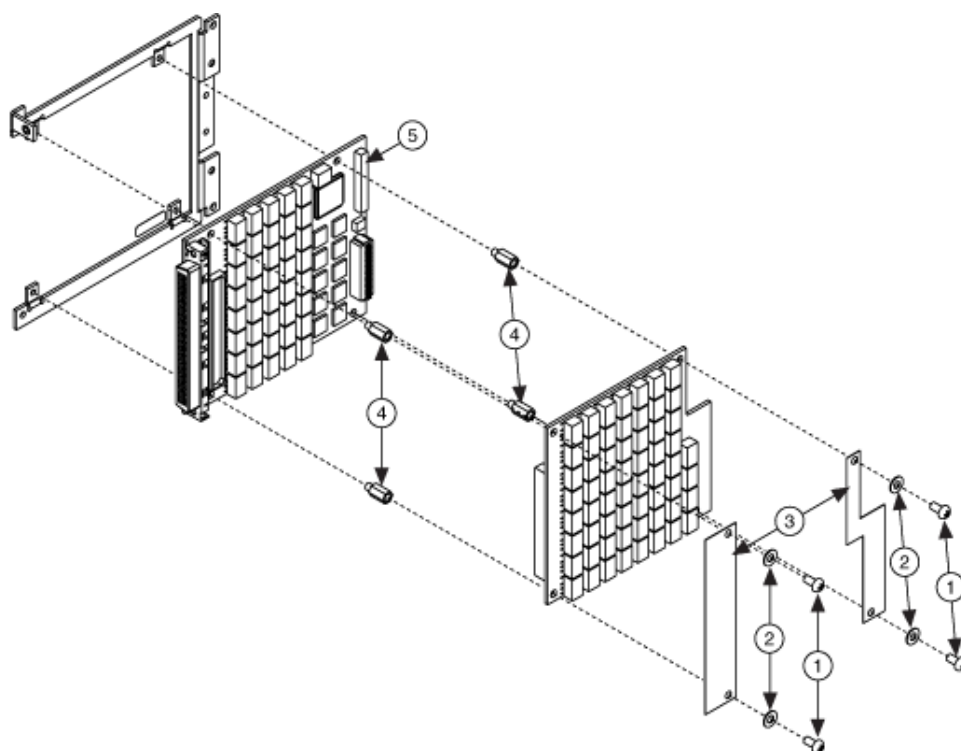
ChannelName	RelayName	ChannelName	RelayName	Channelname	RelayName	ChannelName	R
CH0	K0	CH25	K25	CH50	K50	CH75	K
CH1	K1	CH26	K26	CH51	K51	CH76	K
CH2	K2	CH27	K27	CH52	K52	CH77	K
CH3	K3	CH28	K28	CH53	K53	CH78	K
Cp	K4	CH29	K29	CH54	K54	CH79	K
CH5	K5	CH30	K30	CH55	K55	CH80	K
CH6	K6	CH31	K31	CH56	K56	CH81	K

ChannelName	RelayName	ChannelName	RelayName	Channelname	RelayName	ChannelName	R
CH7	K7	CH32	K32	CH57	K57	CH82	K
CH8	K8	CH33	K33	CH58	K58	CH83	K
CH9	K9	CH34	K34	CH59	K59	CH84	K
CH10	K10	CH35	K35	CH60	K60	CH85	K
CH11	K11	CH36	K36	CH61	K61	CH86	K
CH12	K12	CH37	K37	CH62	K62	CH87	K
CH13	K13	CH38	K38	CH63	K63	CH88	K
CH14	K14	CH38	K38	CH64	K64	CH89	K
CH15	K15	Cp0	K40	CH65	K65	CH90	K
CH16	K16	Cp1	K41	CH66	K66	CH91	K
CH17	K17	Cp2	K42	CH67	K67	CH92	K
CH18	K18	Cp3	K43	CH68	K68	CH93	K
CH19	K19	Cp4	K44	CH69	K69	CH94	K
CH20	K20	Cp5	K45	CH70	K70	CH95	K
CH21	K21	Cp6	K46	CH71	K71	CH96	K
CH22	K22	Cp7	K47	CH72	K72	CH97	K
CH23	K23	Cp8	K48	CH73	K73	CH98	K
CH24	K24	Cp9	K49	CH74	K74	CH99	K

- Remove the four screws and washers, and two lead covers (if present), that secure the mezzanine board to the base board. Do not remove the hex standoffs or the base board.



Note Older versions of this module might have adhesive plastic lead covers that you must remove. The module retains full specifications even if these covers are not reinstalled.



1	Screws
2	Washers
3	Lead covers (if present)
4	Hex standoff
5	Base board

4. Separate the mezzanine board from the base board.
5. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

- 3. Remove the relay.
- 4. Clean the pads with isopropyl alcohol and cotton swabs.
- 5. Place the new relay on the PCB pads and solder.
- 6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI/PXIe-2569 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI/PXIe-2569 (NI 2569).

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger

Trigger Input	Software	Hardware
		line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2569.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2570

The NI PXI-2570 is a 40-channel general-purpose relay module for the PXI platform designed for switching and controlling low-level and power signals. The NI PXI-2570 is composed of 40 armature latching SPDT relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI PXI-2570 and possible operation modes.

Topology	Software Name	Immediate	Scanning
40-SPDT	2570/40-SPDT(NISWITCH_TOPOLOGY_2570_40_SPDT)	✓	✓

Related Information

- [Integration and System Considerations](#)

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2570 40-SPDT Topology](#)
- [Integration and System Considerations](#)

NI PXI-2570 40-SPDT Topology

The following figure represents the NI PXI-2570 in the 40-SPDT topology.



Making a Connection

You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To connect the NO terminal to the COM terminal of that channel, disconnect the NC terminal from the COM of that channel.

For example, to connect NO2 to COM2, use the following code:

```
niSwitch_Disconnect(vi, "NC2", "COM2")
```

```
niSwitch_Connect(vi, "NO2", "COM2")
```



Note To connect NO to COM you do not need to disconnect NC from COM after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function has been made.

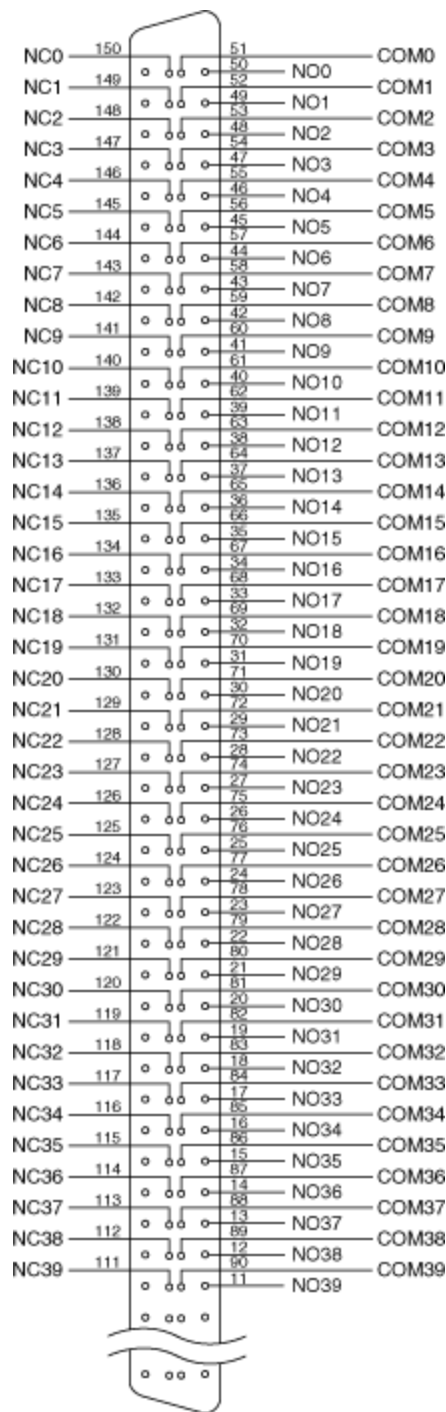


Note `niSwitch_Disconnect(vi, "NC2", "COM2")` does not activate the relay until `niSwitch_Connect(vi, "NO2", "COM2")` is executed.

When scanning the NI PXI-2570, a typical scan list entry could be `nc2->com2;`. This entry routes the signal connected to NC2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2570 in the 40-SPDT topology.

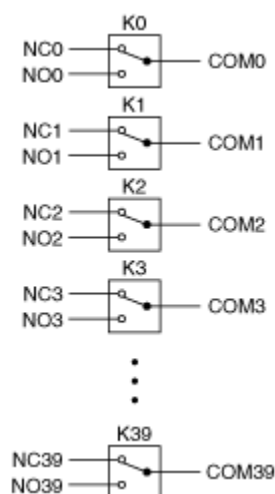


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2570 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2570.



NI PXI-2570 Relay Replacement

The NI PXI-2570 uses electromechanical armature relays. This topic provides relay replacement instructions for through-hole and surface-mount relays depending on the revision of your module assembly:

- NI PXI-2570 Through-Hole Relay Replacement
- NI PXI-2570 Surface-Mount Relay Replacement



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2570 Through-Hole Relay Replacement

The NI PXI-2570 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
AXICOM (Tyco Electronics)	IM42PNS (7-1462039-8)

Relay Kit	Part Number
National Instruments (10 relays)	781678-01

Complete the following steps to replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the back of module. The following table maps the relay names to the channel names.

Channel Name	Relay Name	Channel Name	Relay Name
CH0	K0	CH20	K20
CH1	K1	CH21	K21
CH2	K2	CH22	K22
CH3	K3	CH23	K23
CH4	K4	CH24	K24
CH5	K5	CH25	K25
CH6	K6	CH26	K26
CH7	K7	CH27	K27
CH8	K8	CH28	K28
CH9	K9	CH29	K29
CH10	K10	CH30	K30
CH11	K11	CH31	K31
CH12	K12	CH32	K32

Channel Name	Relay Name	Channel Name	Relay Name
CH13	K13	CH33	K33
CH14	K14	CH34	K34
CH15	K15	CH35	K35
CH16	K16	CH36	K36
CH17	K17	CH37	K37
CH18	K18	CH38	K38
CH19	K19	CH39	K39

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L.



- Replace the relay.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

a. Make sure you have the following:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

b. Replace the relay as you would any other through-hole part.

NI PXI-2570 Surface-Mount Relay Replacement

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
AXICOM (Tyco Electronics)	IM42GR (3-1462037-1)

Relay Kit	Part Number
National Instruments (10 relays)	779356-01

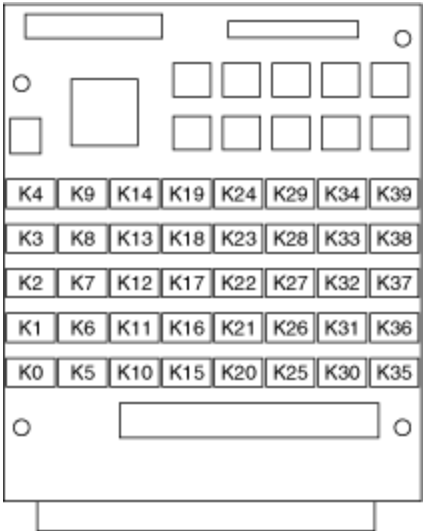
Complete the following sets of steps to replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.



Channel Name	Relay Name	Channel Name	Relay Name
CH0	K0	CH20	K20
CH1	K1	CH21	K21
CH2	K2	CH22	K22
CH3	K3	CH23	K23
CH4	K4	CH24	K24
CH5	K5	CH25	K25
CH6	K6	CH26	K26
CH7	K7	CH27	K27
CH8	K8	CH28	K28
CH9	K9	CH29	K29
CH10	K10	CH30	K30
CH11	K11	CH31	K31
CH12	K12	CH32	K32
CH13	K13	CH33	K33
CH14	K14	CH34	K34
CH15	K15	CH35	K35
CH16	K16	CH36	K36
CH17	K17	CH37	K37

Channel Name	Relay Name	Channel Name	Relay Name
CH18	K18	CH38	K38
CH19	K19	CH39	K39



Note Older versions of this module might have adhesive plastic lead covers that you must remove. The module retains full specifications even if these covers are not reinstalled.

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



- Replace the relay.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework

or 371 °C (700 °F) for lead-free solder rework

- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.

NI PXI-2570 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2570.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2570.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Scan Advanced Output	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2571

The NI PXI-2571 is a 66-channel general-purpose relay module for the PXI platform designed for switching and controlling low-level and power signals. The NI PXI-2571 is composed of 66 armature-latching SPDT relays.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about how to set and check the settling time using NI-SWITCH.



Note Switching inductive loads, such as motors and solenoids, can produce high-voltage transients in excess of the rated voltage of the module. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2571 and possible

operation modes.

Topology	Software Name	Immediate	Scanning
66-SPDT	2571/66-SPDT(NISWITCH_TOPOLOGY_2571_66_SPDT)	✓	✓

Related Information

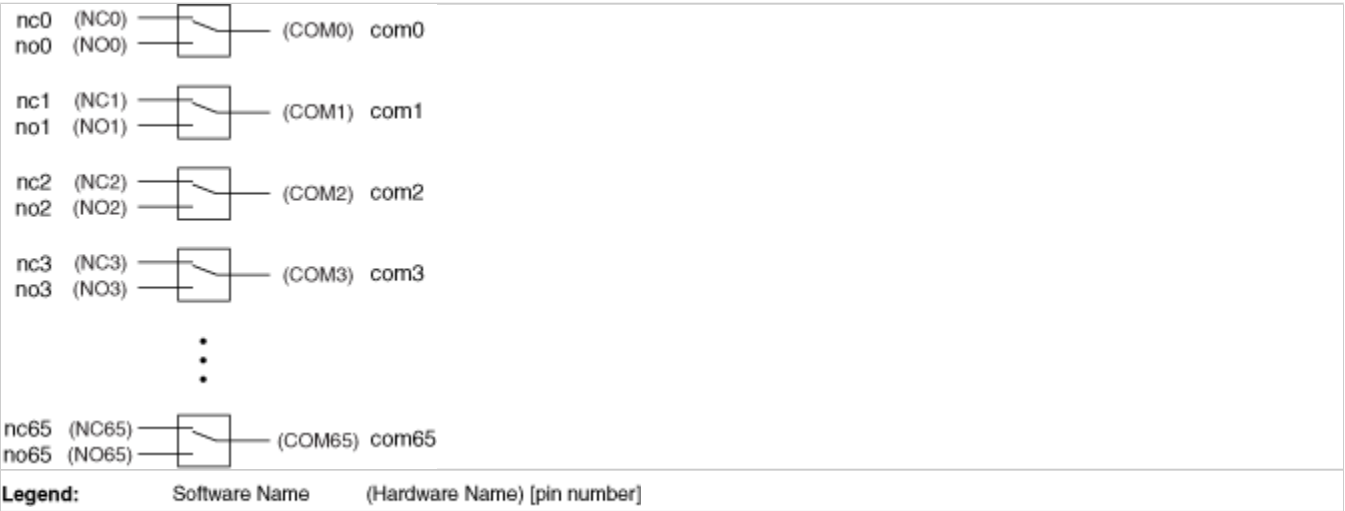
- Integration and System Considerations

Related concepts:

- [General-Purpose Topologies](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2571 66-SPDT Topology](#)
- [Integration and System Considerations](#)

NI PXI-2571 66-SPDT Topology

The following figure represents the NI PXI-2571 in the 66-SPDT topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

To connect the NO terminal to the COM terminal of that channel, disconnect the NC terminal from the COM terminal of that channel.

For example, to connect NO2 to COM2, use the following code:

```
niSwitch_Disconnect(vi, "NC2", "COM2")
```

```
niSwitch_Connect(vi, "NO2", "COM2")
```



Note To connect NO to COM, you do not need to disconnect NC from COM after the module has been reset or after you make a call to the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function.

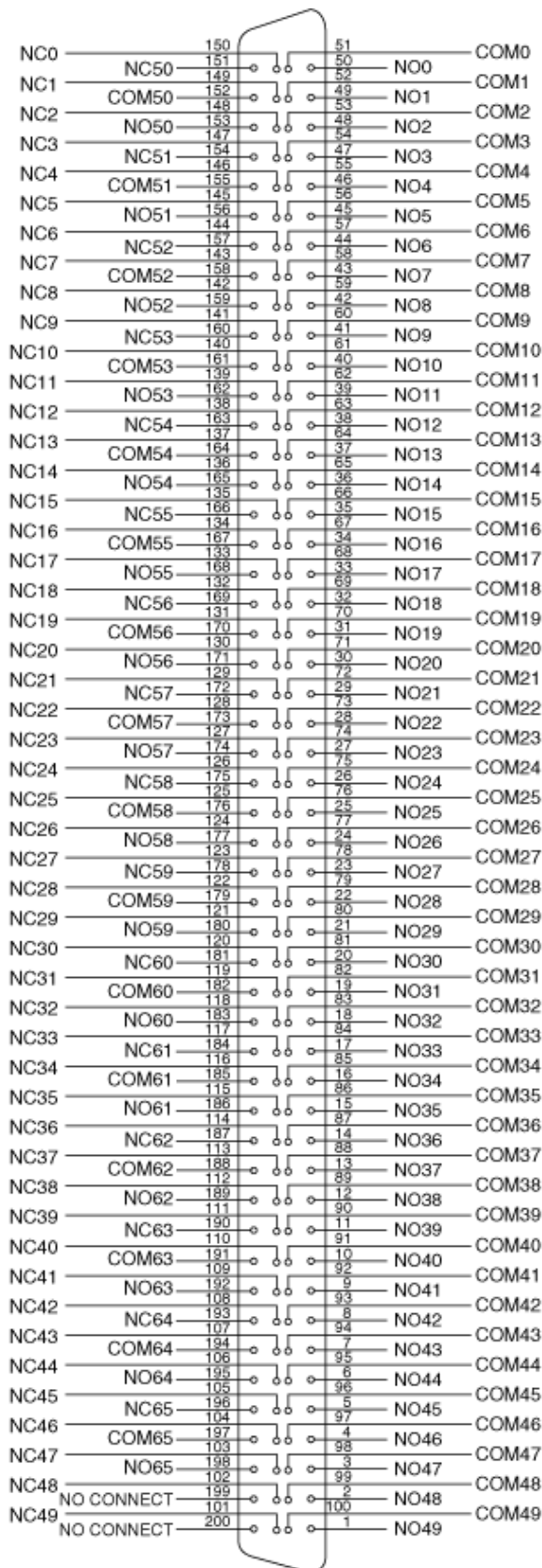


Note `niSwitch_Disconnect(vi, "NC2", "COM2")` does not activate the relay until `niSwitch_Connect(vi, "NO2", "COM2")` is executed.

When scanning the NI PXI-2571, a typical scan list entry could be `nc2->com2;`. This entry routes the signal connected to NC2 to COM2.

Pinout

The following figure identifies the pins for the NI PXI-2571 in the 66-SPDT topology.

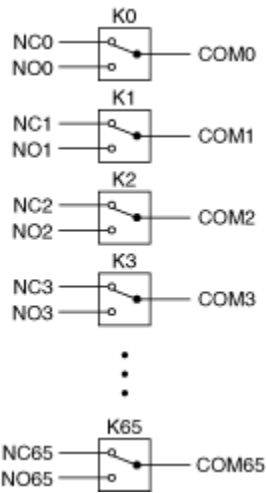


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2571 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2571.



NI PXI-2571 Relay Replacement

The NI PXI-2571 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
AXICOM (Tyco Electronics)	IM42PNS (7-1462039-8)

Relay Kit	Part Number
National Instruments (10 relays)	781678-01

Complete the following steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Relay names are labeled on the back of module. The following table maps the relay names to the channel names.

Channel Name	Relay Name	Channel Name	Relay Name	Channel Name	Relay Name	Channel Name	Relay Name
CH0	K0	CH20	K20	CH40	K40	CH60	K60
CH1	K1	CH21	K21	CH41	K41	CH61	K61
CH2	K2	CH22	K22	CH42	K42	CH62	K62
CH3	K3	CH23	K23	CH43	K43	CH63	K63
CH4	K4	CH24	K24	CH44	K44	CH64	K64
CH5	K5	CH25	K25	CH45	K45	CH65	K65
CH6	K6	CH26	K26	CH46	K46	—	—
CH7	K7	CH27	K27	CH47	K47	—	—
CH8	K8	CH28	K28	CH48	K48	—	—
CH9	K9	CH29	K29	CH49	K49	—	—
CH10	K10	CH30	K30	CH50	K50	—	—
CH11	K11	CH31	K31	CH51	K51	—	—
CH12	K12	CH32	K32	CH52	K52	—	—
CH13	K13	CH33	K33	CH53	K53	—	—
CH14	K14	CH34	K34	CH54	K54	—	—
CH15	K15	CH35	K35	CH55	K55	—	—
CH16	K16	CH36	K36	CH56	K56	—	—
CH17	K17	CH37	K37	CH57	K57	—	—
CH18	K18	CH38	K38	CH58	K58	—	—
CH19	K19	CH39	K39	CH59	K59	—	—

3. Replace the Relay

The NI PXI-2571 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies and using lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

a. Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

b. Replace the relay as you would any other through-hole part.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information about resettling relay count.

NI PXI-2571 Triggering

The 2571 can send and receive triggers using synchronous and handshaking modes. This module can recognize trigger pulse widths less than 150 ns by disabling digital

filtering.

Trigger Input

The following table lists valid trigger inputs for the measurement complete path on the NI PXI-2571.

Trigger Input	Terminal Name	Hardware Terminal Used
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output Terminals

The following table lists valid scan advanced output terminals for the NI PXI-2571.

Scan Advanced Output	Terminal Name	Hardware Terminal Used
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Terminal Name	Hardware Terminal Used
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for description of the trigger input signals and scan advanced output signals.

Related concepts:

- [Synchronous Scanning](#)
- [Handshaking](#)
- [Disabling Digital Filtering](#)

NI PXI/PXIe-2575

The NI PXI/PXIe-2575 (NI 2575) is a 196×1 multiplexer relay module for the PXI or PXI Express platform. The NI 2575 is composed of 99 DPDT relays. These relays are configured in hardware as 98 DPST relays and one DPDT relay.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI 2575 and possible operation

modes.

Topology	Software Name	Immediate	Scanning
1-Wire 196×1 Multiplexer	2575/1-Wire 196x1 Mux(NISWITCH_TOPOLOGY_2575_1_WIRE_196X1_MUX)	✓	✓
2-Wire 98×1 Multiplexer	2575/2-Wire 98x1 Mux(NISWITCH_TOPOLOGY_2575_2_WIRE_98X1_MUX)	✓	✓
2-Wire 95×1 Multiplexer	2575/2-Wire 95x1 Mux(NISWITCH_TOPOLOGY_2575_2_WIRE_95X1_MUX)	✓	✓



Note When using either the SH200LFH-4xDB50F-S or SH200LFH-BARE WIRE cable with the NI 2575 in the 2-wire 98×1 topology, CH95, CH96, and CH97 will have lower RF performance than the other 95 channels because they are not in twisted pairs in the cable. To avoid using these channels, NI-SWITCH has support for a 2-wire 95×1 topology that does not include CH95, CH96, and CH97.

Related Information

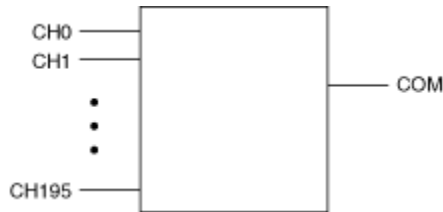
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2575 1-Wire 196×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2575 2-Wire 98×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2575 2-Wire 95×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2575 1-Wire 196×1 Multiplexer Topology

The following figure represents the NI PXI/PXIe-2575 (NI 2575) in the 1-wire 196×1 multiplexer topology.



Making a Connection

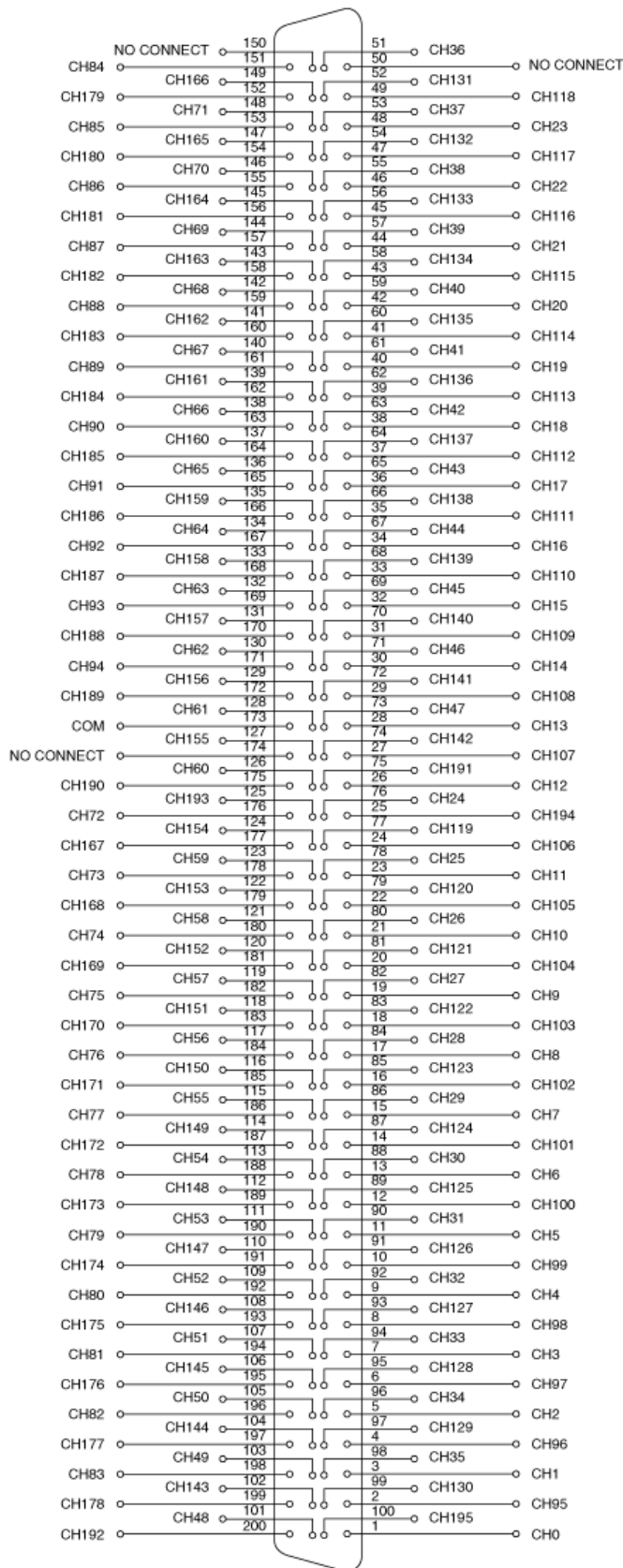
You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to close the relay of channel 1, call `niSwitch_Connect(vi, "ch1", "com")`. To open the relay of channel 1, call `niSwitch_Disconnect(vi, "ch1", "com")`.

When scanning the NI 2575, a typical scan list entry could be `ch1->com;`. This entry closes the relay between CH1 and COM.

Pinout

The following figure identifies the pins for the NI 2575 in the 1-wire 196×1 multiplexer topology.

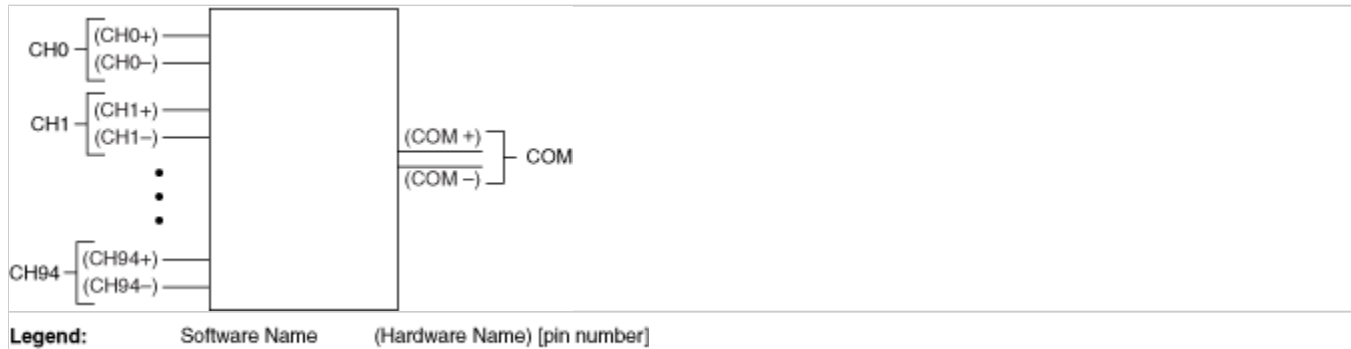


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2575 2-Wire 95×1 Multiplexer Topology

The following figure represents the NI PXI/PXIe-2575 (NI 2575) in the 2-wire 95×1 multiplexer topology.



Making a Connection

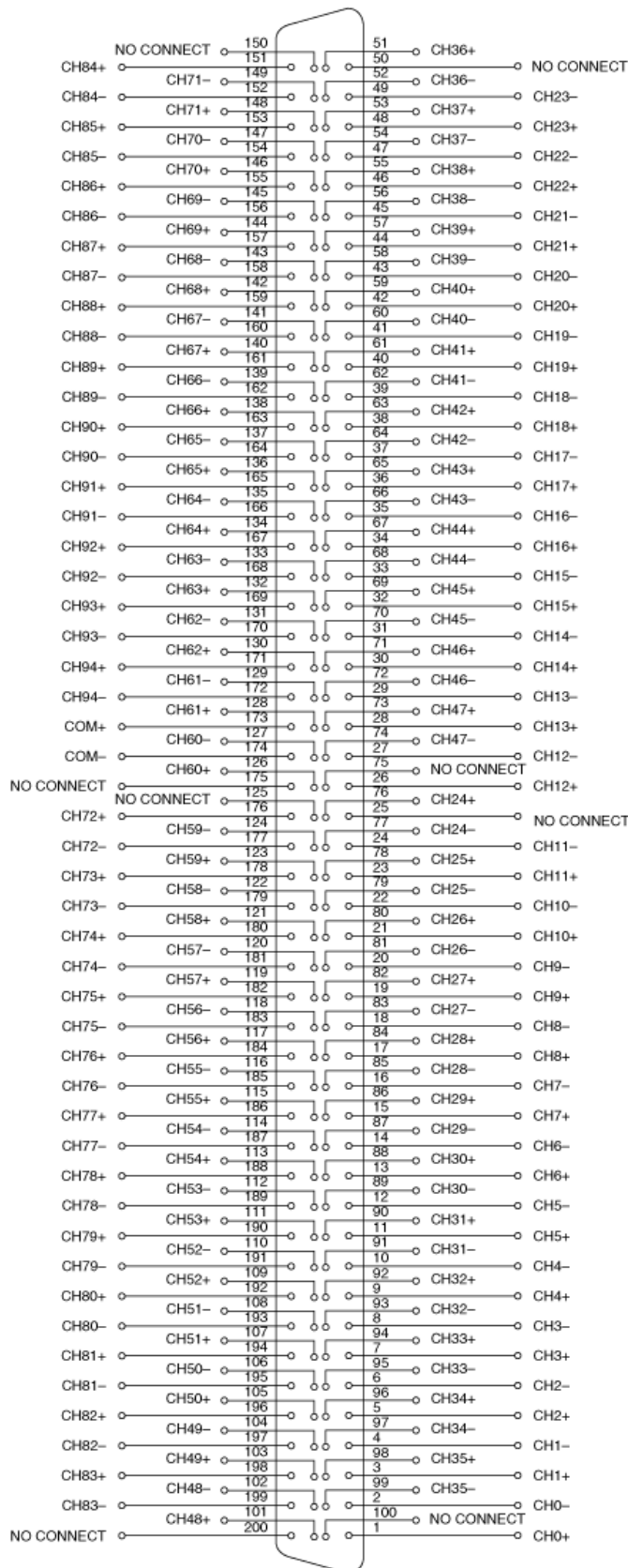
You can control the channels using the `niSwitch_Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 1, call `niSwitch_Connect(vi, "ch1", "com")`. To open the relay of channel 1, call `niSwitch_Disconnect(vi, "ch1", "com")`.

When scanning the NI 2575, a typical scan list entry could be `ch1->com;`. This entry closes the relay between CH1 and COM.

Pinout

The following figure identifies the pins for the NI 2575 in the 2-wire 95×1 multiplexer topology.

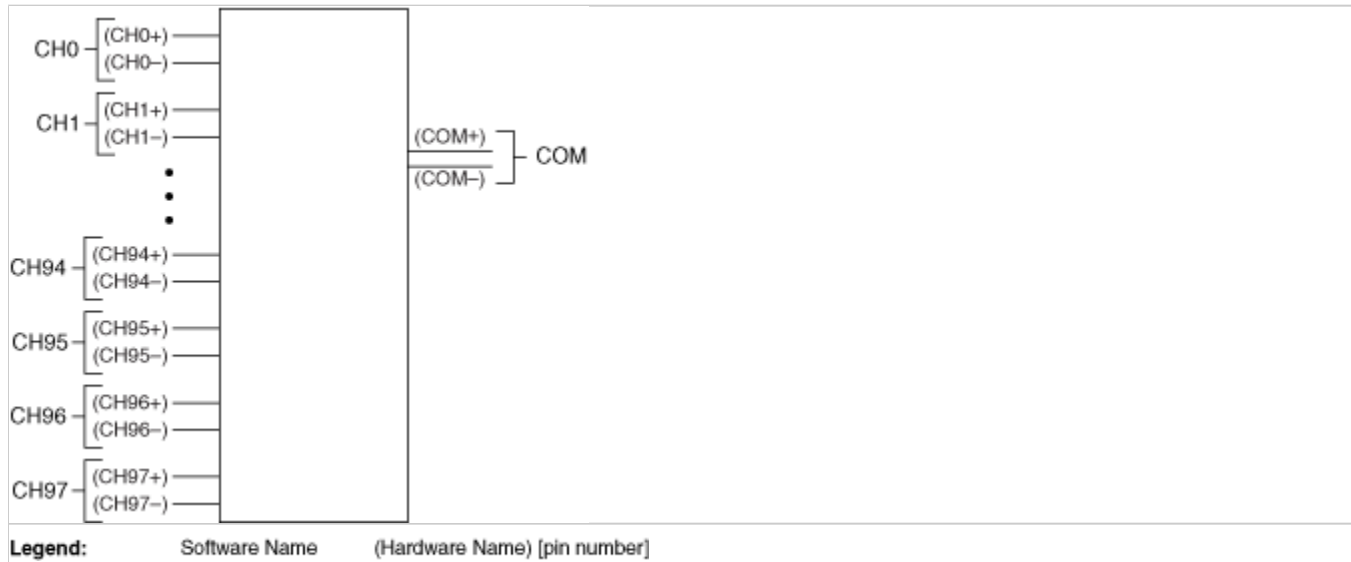


Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2575 2-Wire 98×1 Multiplexer Topology

The following figure represents the NI PXI/PXIe-2575 (NI 2575) in the 2-wire 98×1 multiplexer topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to close the relay of channel 1, call `niSwitch_Connect(vi, "ch1", "com")`. To open the relay of channel 1, call `niSwitch_Disconnect(vi, "ch1", "com")`.

When scanning the NI 2575, a typical scan list entry could be `ch1->com;`. This entry closes the relay between CH1 and COM.

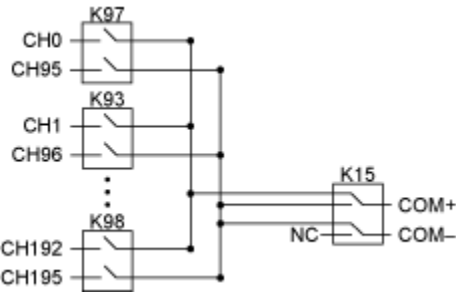
Pinout

The following figure identifies the pins for the NI 2575 in the 2-wire 98×1 multiplexer topology.

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2575 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2575 (NI 2575).



The following table lists channel pairings and relay assignments for the NI 2575.

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Relay Number
CH0	CH95	CH0	CH0	K97
CH1	CH96	CH1	CH1	K93
CH2	CH97	CH2	CH2	K89
CH3	CH98	CH3	CH3	K85
CH4	CH99	CH4	CH4	K81
CH5	CH100	CH5	CH5	K77
CH6	CH101	CH6	CH6	K73
CH7	CH102	CH7	CH7	K69
CH8	CH103	CH8	CH8	K65
CH9	CH104	CH9	CH9	K61
CH10	CH105	CH10	CH10	K57
CH11	CH106	CH11	CH11	K53
CH12	CH107	CH12	CH12	K47
CH13	CH108	CH13	CH13	K44

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Relay Number
CH14	CH109	CH14	CH14	K40
CH15	CH110	CH15	CH15	K39
CH16	CH111	CH16	CH16	K32
CH17	CH112	CH17	CH17	K28
CH18	CH113	CH18	CH18	K24
CH19	CH114	CH19	CH19	K20
CH20	CH115	CH20	CH20	K16
CH21	CH116	CH21	CH21	K11
CH22	CH117	CH22	CH22	K7
CH23	CH118	CH23	CH23	K3
CH24	CH119	CH24	CH24	K52
CH25	CH120	CH25	CH25	K56
CH26	CH121	CH26	CH26	K60
CH27	CH122	CH27	CH27	K64
CH28	CH123	CH28	CH28	K68
CH29	CH124	CH29	CH29	K72
CH30	CH125	CH30	CH30	K76
CH31	CH126	CH31	CH31	K80
CH32	CH127	CH32	CH32	K84
CH33	CH128	CH33	CH33	K87
CH34	CH129	CH34	CH34	K91
CH35	CH130	CH35	CH35	K95
CH36	CH131	CH36	CH36	K2
CH37	CH132	CH37	CH37	K6
CH38	CH133	CH38	CH38	K10
CH39	CH134	CH39	CH39	K14

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Relay Number
CH40	CH135	CH40	CH40	K19
CH41	CH136	CH41	CH41	K23
CH42	CH137	CH42	CH42	K27
CH43	CH138	CH43	CH43	K31
CH44	CH139	CH44	CH44	K35
CH45	CH140	CH45	CH45	K38
CH46	CH141	CH46	CH46	K43
CH47	CH142	CH47	CH47	K46
CH48	CH143	CH48	CH48	K96
CH49	CH144	CH49	CH49	K92
CH50	CH145	CH50	CH50	K88
CH51	CH146	CH51	CH51	K83
CH52	CH147	CH52	CH52	K79
CH53	CH148	CH53	CH53	K75
CH54	CH149	CH54	CH54	K71
CH55	CH150	CH55	CH55	K67
CH56	CH151	CH56	CH56	K63
CH57	CH152	CH57	CH57	K59
CH58	CH153	CH58	CH58	K55
CH59	CH154	CH59	CH59	K51
CH60	CH155	CH60	CH60	K45
CH61	CH156	CH61	CH61	K42
CH62	CH157	CH62	CH62	K37
CH63	CH158	CH63	CH63	K34
CH64	CH159	CH64	CH64	K30
CH65	CH160	CH65	CH65	K26

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Relay Number
CH66	CH161	CH66	CH66	K22
CH67	CH162	CH67	CH67	K18
CH68	CH163	CH68	CH68	K13
CH69	CH164	CH69	CH69	K9
CH70	CH165	CH70	CH70	K5
CH71	CH166	CH71	CH71	K1
CH72	CH167	CH72	CH72	K50
CH73	CH168	CH73	CH73	K54
CH74	CH169	CH74	CH74	K58
CH75	CH170	CH75	CH75	K62
CH76	CH171	CH76	CH76	K66
CH77	CH172	CH77	CH77	K70
CH78	CH173	CH78	CH78	K74
CH79	CH174	CH79	CH79	K78
CH80	CH175	CH80	CH80	K82
CH81	CH176	CH81	CH81	K86
CH82	CH177	CH82	CH82	K90
CH83	CH178	CH83	CH83	K94
CH84	CH179	CH84	CH84	K0
CH85	CH180	CH85	CH85	K4
CH86	CH181	CH86	CH86	K8
CH87	CH182	CH87	CH87	K12
CH88	CH183	CH88	CH88	K17
CH89	CH184	CH89	CH89	K21
CH90	CH185	CH90	CH90	K25
CH91	CH186	CH91	CH91	K29

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Relay Number
CH92	CH187	CH92	CH92	K33
CH93	CH188	CH93	CH93	K36
CH94	CH189	CH94	CH94	K41
CH190	CH193	—	CH95	K48
CH191	CH194	—	CH96	K49
CH192	CH195	—	CH97	K98
COM Relay				K15

NI PXI/PXIe-2575 Relay Replacement

The NI PXI/PXIe-2575 uses electromechanical armature relays.

Refer to the following tables for information about ordering replacement relays. Use relays of the same brand that you are replacing.

Relay Manufacturer	Part Number
OMRON	G6KU-2F-Y
Tyco	5-1462039-7

Relay Kit	Part Number
National Instruments (10 relays, OMRON)	780386-01
National Instruments (10 relays, Tyco)	782051-01

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

Disassemble the Module

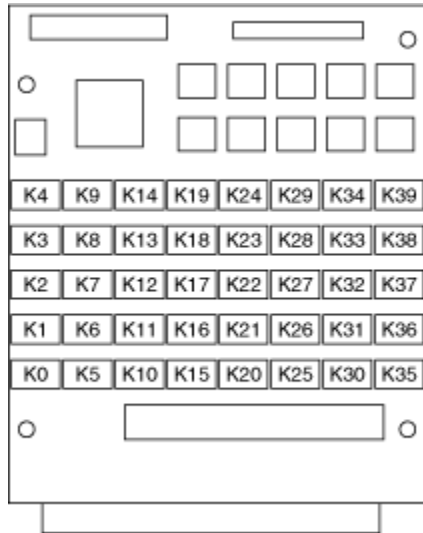
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



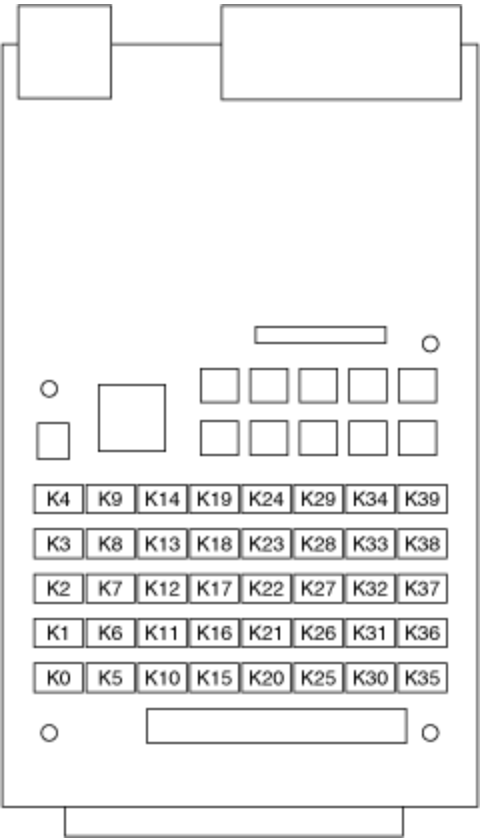
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

Base Board 191700D and Earlier



Base Board 151664A and Later (PXI-2575 only)



Mezzanine Board



1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
CH0	CH95	CH0	CH0	k97	K97 (mezzanine)	K97 (mezzanine)
CH1	CH96	CH1	CH1	k93	K93 (mezzanine)	K93 (mezzanine)
CH2	CH97	CH2	CH2	k89	K89 (mezzanine)	K89 (mezzanine)
CH3	CH98	CH3	CH3	k85	K85 (mezzanine)	K85 (mezzanine)
CH4	CH99	CH4	CH4	k81	K81 (mezzanine)	K81 (mezzanine)
CH5	CH100	CH5	CH5	k77	K77 (mezzanine)	K77 (mezzanine)
CH6	CH101	CH6	CH6	k73	K73 (mezzanine)	K73 (mezzanine)
CH7	CH102	CH7	CH7	k69	K69 (mezzanine)	K69 (mezzanine)
CH8	CH103	CH8	CH8	k65	K65 (mezzanine)	K65 (mezzanine)
CH9	CH104	CH9	CH9	k61	K61 (mezzanine)	K61 (mezzanine)
CH10	CH105	CH10	CH10	k57	K57 (mezzanine)	K57 (mezzanine)
CH11	CH106	CH11	CH11	k53	K53 (mezzanine)	K53 (mezzanine)
CH12	CH107	CH12	CH12	k47	K47 (mezzanine)	K47 (mezzanine)
CH13	CH108	CH13	CH13	k44	K44	K44

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
					(mezzanine)	(mezzanine)
CH14	CH109	CH14	CH14	k40	K40 (mezzanine)	K40 (mezzanine)
CH15	CH110	CH15	CH15	k39	K39 (base board)	K40 (base board)
CH16	CH111	CH16	CH16	k32	K32 (base board)	K33 (base board)
CH17	CH112	CH17	CH17	k28	K28 (base board)	K29 (base board)
CH18	CH113	CH18	CH18	k24	K24 (base board)	K25 (base board)
CH19	CH114	CH19	CH19	k20	K20 (base board)	K21 (base board)
CH20	CH115	CH20	CH20	k16	K16 (base board)	K17 (base board)
CH21	CH116	CH21	CH21	k11	K11 (base board)	K12 (base board)
CH22	CH117	CH22	CH22	k7	K7 (base board)	K8 (base board)
CH23	CH118	CH23	CH23	k3	K3 (base board)	K4 (base board)
CH24	CH119	CH24	CH24	k52	K52 (mezzanine)	K52 (mezzanine)
CH25	CH120	CH25	CH25	k56	K56 (mezzanine)	K56 (mezzanine)
CH26	CH121	CH26	CH26	k60	K60 (mezzanine)	K60 (mezzanine)

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
CH27	CH122	CH27	CH27	k64	K64 (mezzanine)	K64 (mezzanine)
CH28	CH123	CH28	CH28	k68	K68 (mezzanine)	K68 (mezzanine)
CH29	CH124	CH29	CH29	k72	K72 (mezzanine)	K72 (mezzanine)
CH30	CH125	CH30	CH30	k76	K76 (mezzanine)	K76 (mezzanine)
CH31	CH126	CH31	CH31	k80	K80 (mezzanine)	K80 (mezzanine)
CH32	CH127	CH32	CH32	k84	K84 (mezzanine)	K84 (mezzanine)
CH33	CH128	CH33	CH33	k87	K87 (mezzanine)	K87 (mezzanine)
CH34	CH129	CH34	CH34	k91	K91 (mezzanine)	K91 (mezzanine)
CH35	CH130	CH35	CH35	k95	K95 (mezzanine)	K95 (mezzanine)
CH36	CH131	CH36	CH36	k2	K2 (base board)	K3 (base board)
CH37	CH132	CH37	CH37	k6	K6 (base board)	K7 (base board)
CH38	CH133	CH38	CH38	k10	K10 (base board)	K11 (base board)
CH39	CH134	CH39	CH39	k14	K14 (base board)	K15 (base board)
CH40	CH135	CH40	CH40	k19	K19 (base	K20 (base

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
					board)	board)
CH41	CH136	CH41	CH41	k23	K23 (base board)	K24 (base board)
CH42	CH137	CH42	CH42	k27	K27 (base board)	K28 (base board)
CH43	CH138	CH43	CH43	k31	K31 (base board)	K32 (base board)
CH44	CH139	CH44	CH44	k35	K35 (base board)	K36 (base board)
CH45	CH140	CH45	CH45	k38	K38 (base board)	K39 (base board)
CH46	CH141	CH46	CH46	k43	K43 (mezzanine)	K43 (mezzanine)
CH47	CH142	CH47	CH47	k46	K46 (mezzanine)	K46 (mezzanine)
CH48	CH143	CH48	CH48	k96	K96 (mezzanine)	K96 (mezzanine)
CH49	CH144	CH49	CH49	k92	K92 (mezzanine)	K92 (mezzanine)
CH50	CH145	CH50	CH50	k88	K88 (mezzanine)	K88 (mezzanine)
CH51	CH146	CH51	CH51	k83	K83 (mezzanine)	K83 (mezzanine)
CH52	CH147	CH52	CH52	k79	K79 (mezzanine)	K79 (mezzanine)
CH53	CH148	CH53	CH53	k75	K75 (mezzanine)	K75 (mezzanine)

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
CH54	CH149	CH54	CH54	k71	K71 (mezzanine)	K71 (mezzanine)
CH55	CH150	CH55	CH55	k67	K67 (mezzanine)	K67 (mezzanine)
CH56	CH151	CH56	CH56	k63	K63 (mezzanine)	K63 (mezzanine)
CH57	CH152	CH57	CH57	k59	K59 (mezzanine)	K59 (mezzanine)
CH58	CH153	CH58	CH58	k55	K55 (mezzanine)	K55 (mezzanine)
CH59	CH154	CH59	CH59	k51	K51 (mezzanine)	K51 (mezzanine)
CH60	CH155	CH60	CH60	k45	K45 (mezzanine)	K45 (mezzanine)
CH61	CH156	CH61	CH61	k42	K42 (mezzanine)	K42 (mezzanine)
CH62	CH157	CH62	CH62	k37	K37 (base board)	K38 (base board)
CH63	CH158	CH63	CH63	k34	K34 (base board)	K35 (base board)
CH64	CH159	CH64	CH64	k30	K30 (base board)	K31 (base board)
CH65	CH160	CH65	CH65	k26	K26 (base board)	K27 (base board)
CH66	CH161	CH66	CH66	k22	K22 (base board)	K23 (base board)
CH67	CH162	CH67	CH67	k18	K18 (base	K19 (base

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
					board)	board)
CH68	CH163	CH68	CH68	k13	K13 (base board)	K14 (base board)
CH69	CH164	CH69	CH69	k9	K9 (base board)	K10 (base board)
CH70	CH165	CH70	CH70	k5	K5 (base board)	K6 (base board)
CH71	CH166	CH71	CH71	k1	K1 (base board)	K2 (base board)
CH72	CH167	CH72	CH72	k50	K50 (mezzanine)	K50 (mezzanine)
CH73	CH168	CH73	CH73	k54	K54 (mezzanine)	K54 (mezzanine)
CH74	CH169	CH74	CH74	k58	K58 (mezzanine)	K58 (mezzanine)
CH75	CH170	CH75	CH75	k62	K62 (mezzanine)	K62 (mezzanine)
CH76	CH170	CH76	CH76	k66	K66 (mezzanine)	K66 (mezzanine)
CH77	CH172	CH77	CH77	k70	K70 (mezzanine)	K70 (mezzanine)
CH78	CH173	CH78	CH78	k74	K74 (mezzanine)	K74 (mezzanine)
CH79	CH174	CH79	CH79	k78	K78 (mezzanine)	K78 (mezzanine)
CH80	CH175	CH80	CH80	k82	K82 (mezzanine)	K82 (mezzanine)

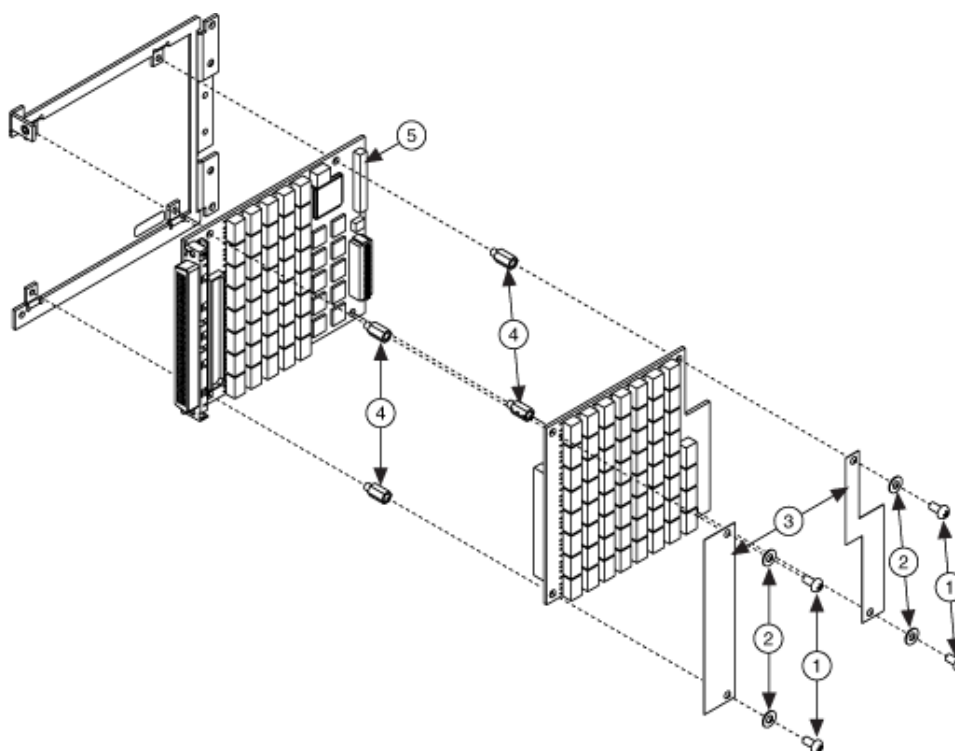
1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
CH81	CH176	CH81	CH81	k86	K86 (mezzanine)	K86 (mezzanine)
CH82	CH177	CH82	CH82	k90	K90 (mezzanine)	K90 (mezzanine)
CH83	CH178	CH83	CH83	k94	K94 (mezzanine)	K94 (mezzanine)
CH84	CH179	CH84	CH84	k0	K0 (base board)	K1 (base board)
CH85	CH180	CH85	CH85	k4	K4 (base board)	K5 (base board)
CH86	CH181	CH86	CH86	k8	K8 (base board)	K9 (base board)
CH87	CH182	CH87	CH87	k12	K12 (base board)	K13 (base board)
CH88	CH183	CH88	CH88	k17	K17 (base board)	K18 (base board)
CH89	CH184	CH89	CH89	k21	K21 (base board)	K22 (base board)
CH90	CH185	CH90	CH90	k25	K25 (base board)	K26 (base board)
CH91	CH186	CH91	CH91	k29	K29 (base board)	K30 (base board)
CH92	CH187	CH92	CH92	k33	K33 (base board)	K34 (base board)
CH93	CH188	CH93	CH93	k36	K36 (base board)	K37 (base board)
CH94	CH189	CH94	CH94	k41	K41	K41

1-Wire 196×1 Channel Name		2-Wire 95×1 Channel Name	2-Wire 98×1 Channel Name	Software Relay Name	Reference Designator (Base Board 191700D and earlier)	Reference Designator (Base Board 151664A and later) (PXI-2575 only)
					(mezzanine)	(mezzanine)
CH190	CH193	—	CH95	k48	K48 (mezzanine)	K48 (mezzanine)
CH191	CH194	—	CH96	k49	K49 (mezzanine)	K49 (mezzanine)
CH192	CH195	—	CH97	k98	K98 (mezzanine)	K98 (mezzanine)
COM Relay				k15	K15 (base board)	K16 (base board)

3. Remove the parts that secure the mezzanine board to the base board.
 - **Disassembly of Base Board 191700D and Earlier**—Remove the four screws and washers that secure the mezzanine board to the base board. Do not remove the hex standoffs or the base board.

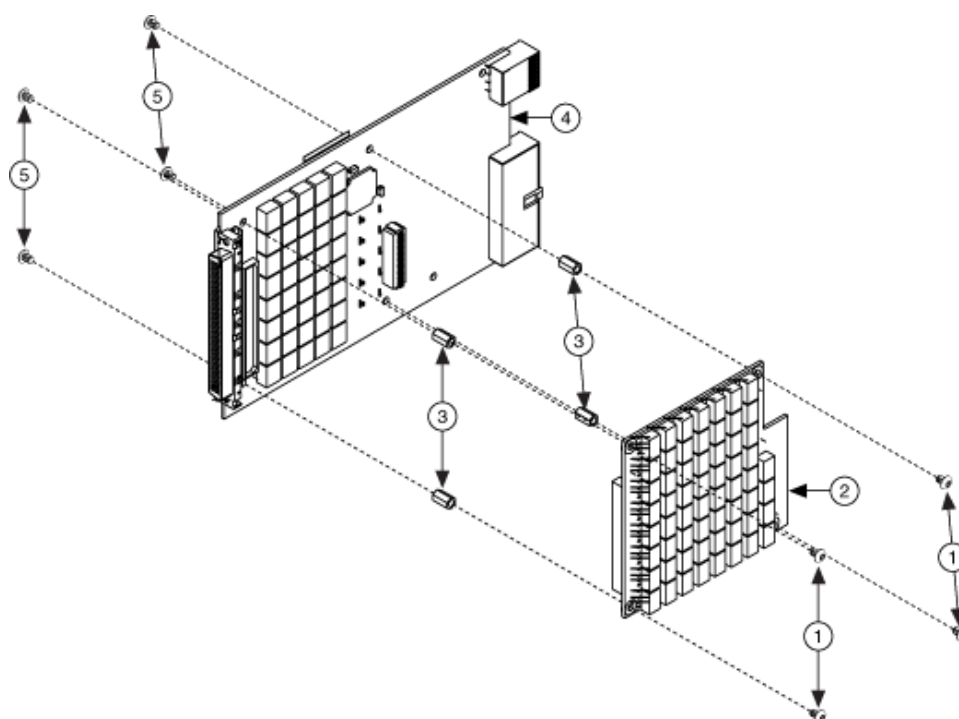


Note Older versions of this module might have adhesive plastic lead covers that you must remove. The module retains full specifications even if these covers are not reinstalled.



1	Screws
2	Washers
3	Lead covers (if present)
4	Hex standoff
5	Base board

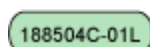
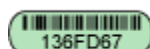
- **Disassembly of Base Board 151664A and Later (PXI-2575 only)**—Remove the four screws that secure the mezzanine board to the base board. Do not remove the hex standoffs.



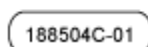
1	Screws
2	Mezzanine board
3	Hex standoff
4	Base board
5	Screws

4. Separate the mezzanine board from the base board.
5. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L.

Lead-free



Lead



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Notice Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Notice If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Notice Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Notice Do not use flux remover to clean the board after relay replacement.

Reassemble the Module

Complete the ***Disassemble the Module*** steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after replacing a failed relay. Refer to ***Resetting a Relay Count*** in the ***NI-SWITCH Switch Soft Front Panel User Manual*** for more information.

NI PXI/PXIe-2575 Triggering

The NI PXI/PXIe-2575 (NI 2575) can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI 2575.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger

Trigger Input	Software	Hardware
		line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2575.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5

Scan Advanced Output	Software	Hardware
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2576

The NI PXI-2576 is a high-density multiplexer switch module for the PXI platform. The NI PXI-2576 is composed of electromechanical armature latching DPST relays.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI PXI-2576 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-Wire Sixteen 4x1	2576/2-Wire Sixteen 4x1 Mux(NISWITCH_TOPOLOGY_2576_2_WIRE_SIXTEEN_4X1_MUX)	✓	✓

Topology	Software Name	Immediate	Scanning
Multiplexer			
2-Wire Octal 8×1 Multiplexer	2576/2-Wire Octal 8x1 Mux(NISWITCH_TOPOLOGY_2576_2_WIRE_OCTAL_8X1_MUX)	✓	✓
2-Wire Quad 16×1 Multiplexer	2576/2-Wire Quad 16x1 Mux(NISWITCH_TOPOLOGY_2576_2_WIRE_QUAD_16X1_MUX)	✓	✓
2-Wire Dual 32×1 Multiplexer	2576/2-Wire Dual 32x1 Mux(NISWITCH_TOPOLOGY_2576_2_WIRE_DUAL_32X1_MUX)	✓	✓
2-Wire 64×1 Multiplexer	2576/2-Wire 64x1 Mux(NISWITCH_TOPOLOGY_2576_2_WIRE_64X1_MUX)	✓	✓
Independent	2576/ Independent(NISWITCH_TOPOLOGY_2576_INDEPENDENT)	✓	✓

Related Information

- Integration and System Considerations

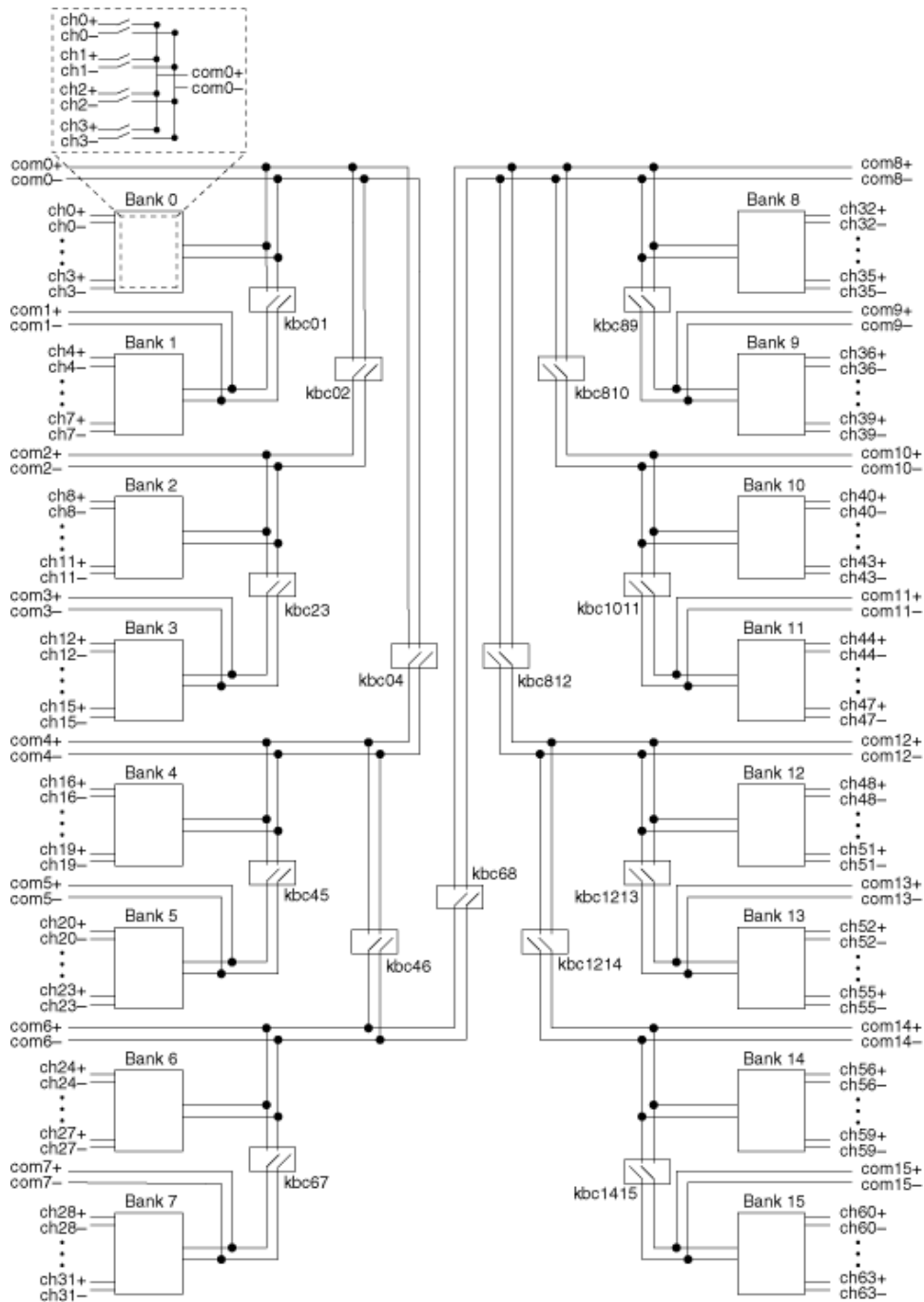
Related concepts:

- [Multiplexer](#)
- [Electromechanical Relays](#)
- [Armature Relays](#)
- [Relay Forms](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2576 2-Wire Sixteen 4×1 Multiplexer Topology](#)
- [NI PXI-2576 2-Wire Octal 8×1 Multiplexer Topology](#)
- [NI PXI-2576 2-Wire Quad 16×1 Multiplexer Topology](#)
- [NI PXI-2576 2-Wire Dual 32×1 Multiplexer Topology](#)
- [NI PXI-2576 2-Wire 64×1 Multiplexer Topology](#)
- [NI PXI-2576 Independent Topology](#)

- Integration and System Considerations

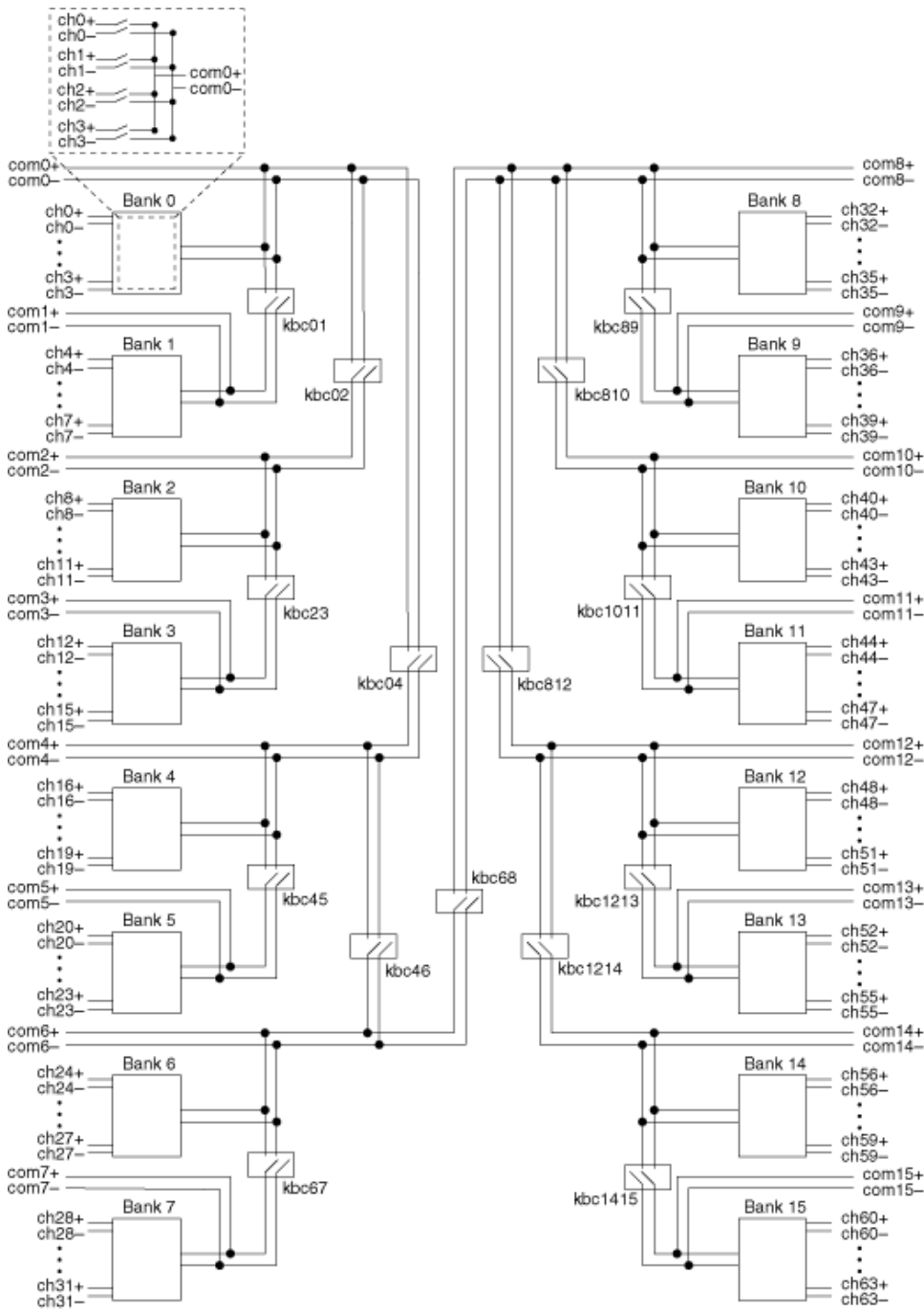
NI PXI-2576 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2576.



NI PXI-2576 Independent Topology

When using the NI PXI-2576 in the independent topology, connect the signals using the NI TB-2676 terminal block. Select this topology to utilize the full routing capabilities of the NI PXI-2576. The following figure represents the NI PXI-2576 in the independent topology.

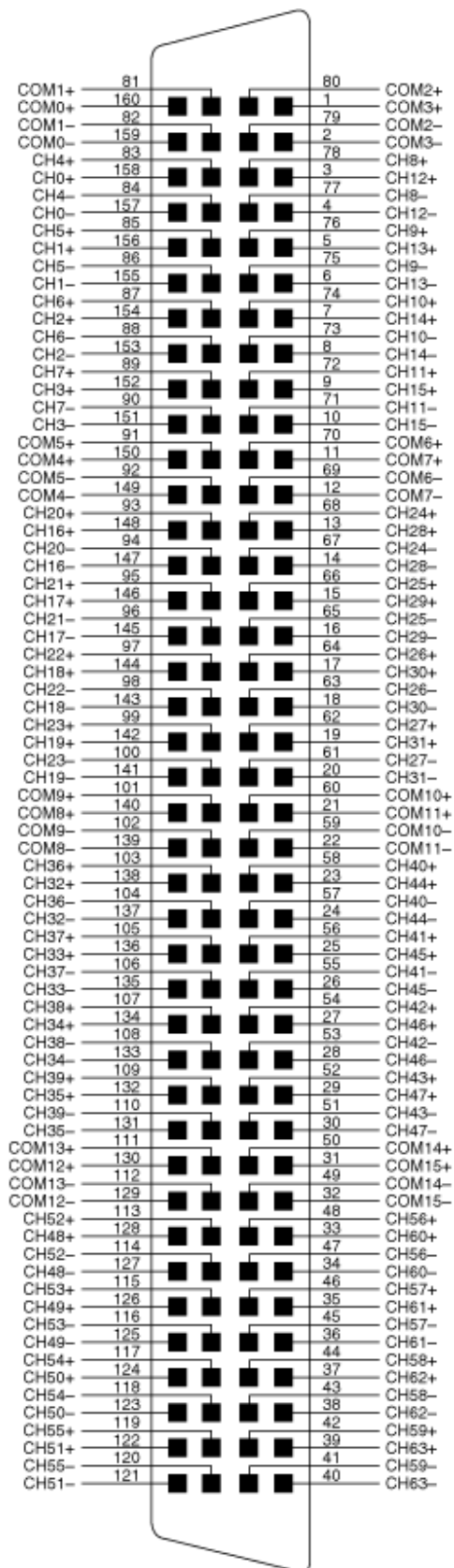


Making a Connection

With the independent topology, you can let NI-SWITCH determine the path between two specified channels by setting the intermediate channels as reserved for routing and using the niSwitch Connect Channels VI or the `niSwitch_Connect` function, or you can control individual relays using the niSwitch Relay Control VI or the `niSwitch_RelayControl` function.

Pinout

The following figure and table identify the pins for the NI PXI-2576 in the independent topology.



NI PXI-2576 Relay Replacement

The NI PXI-2576 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
OMRON	G6JU-2P-Y DC4.5

Relay Kit	Part Number
National Instruments (10 relays)	780383-01

Complete the following steps to replace a failed relay.

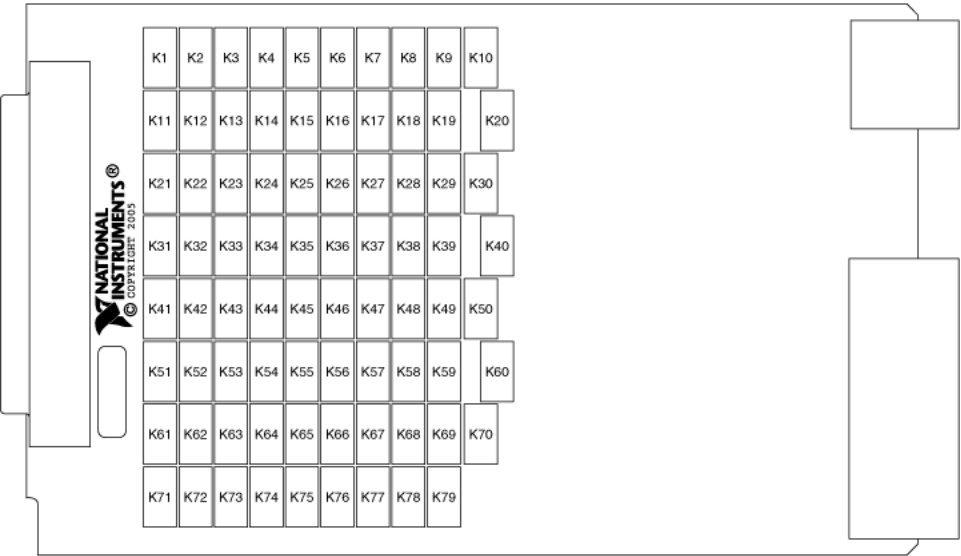
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



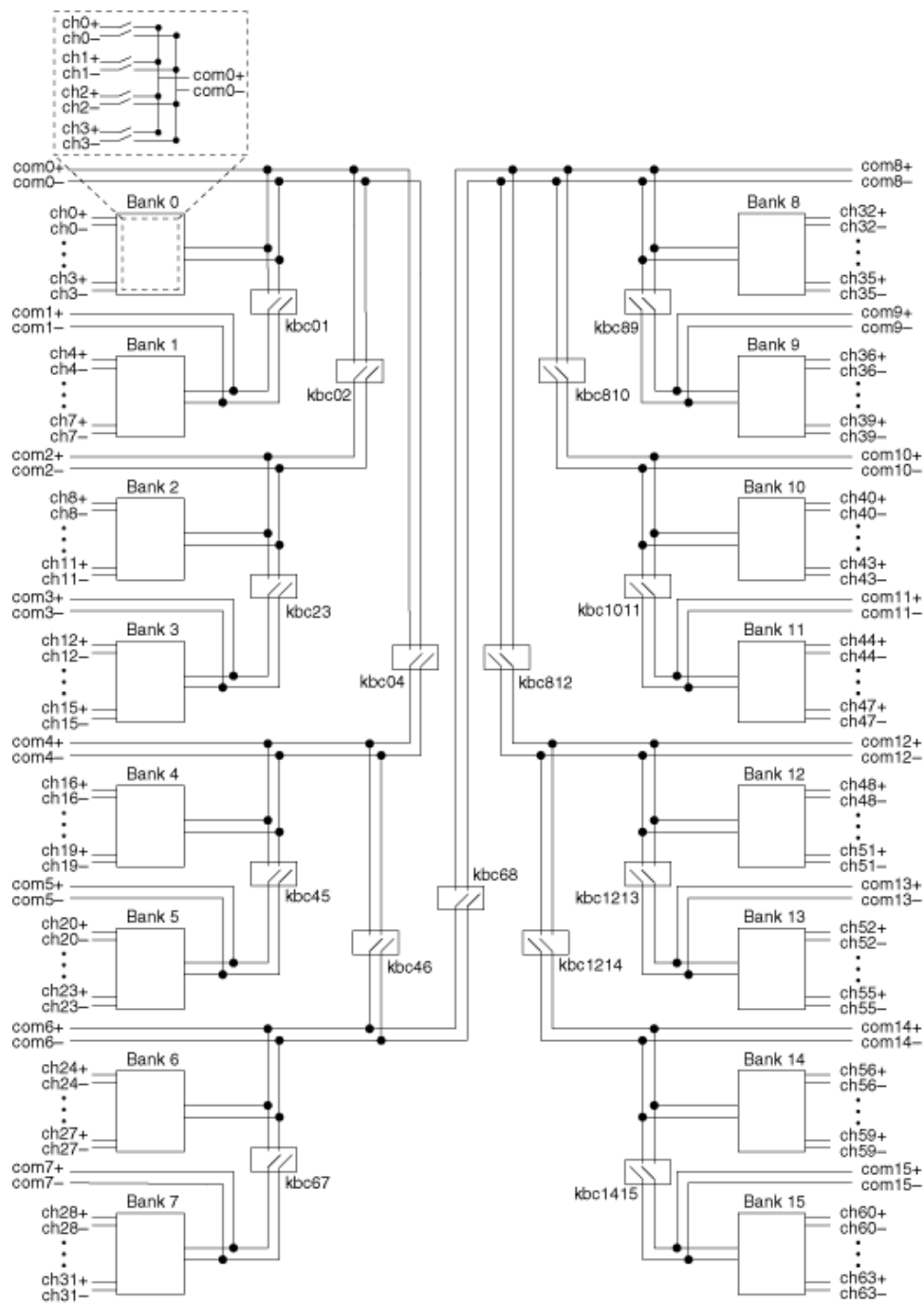
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Refer to the following figures and table to locate the relay you want to replace.

NI PXI-2576



NI PXI-2576 Hardware Diagram



Relay Name	Reference Designator	Relay Name	Reference Designator
k0	K6	k40	K56
k1	K7	k41	K57
k2	K8	k42	K58

Relay Name	Reference Designator	Relay Name	Reference Designator
k3	K9	k43	K59
k4	K1	k44	K51
k5	K2	k45	K52
k6	K3	k46	K53
k7	K4	k47	K54
k8	K16	k48	K66
k9	K17	k49	K67
k10	K18	k50	K68
k11	K19	k51	K69
k12	K11	k52	K61
k13	K12	k53	K62
k14	K13	k54	K63
k15	K14	k55	K64
k16	K26	k56	K76
k17	K27	k57	K77
k18	K28	k58	K78
k19	K29	k59	K79
k20	K21	k60	K71
k21	K22	k61	K72
k22	K23	k62	K73
k23	K24	k63	K74
k24	K36	kbc01	K5
k25	K37	kbc23	K15
k26	K38	kbc45	K25
k27	K39	kbc67	K35
k28	K31	kbc89	K45
k29	K32	kbc1011	K55

Relay Name	Reference Designator	Relay Name	Reference Designator
k30	K33	kbc1213	K65
k31	K34	kbc1415	K75
k32	K46	kbc02	K10
k33	K47	kbc46	K30
k34	K48	kbc810	K50
k35	K49	kbc1214	K70
k36	K41	kbc04	K20
k37	K42	kbc812	K60
k38	K43	kbc68	K40
k39	K44	—	

- Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit

from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part.

**Tip** In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2576 Triggering

The NI PXI-2576 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2576.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Trigger Input	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2576.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

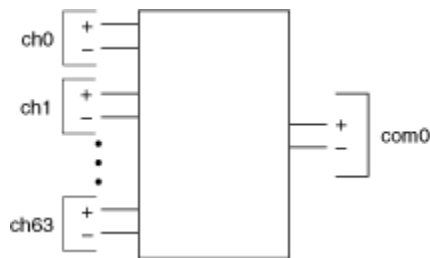
Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2576 2-Wire 64×1 Multiplexer Topology

The following figure represents the NI PXI-2576 in the 2-wire 64×1 multiplexer topology.



Making a Connection

When using the NI PXI-2576 as a 2-wire 64×1 multiplexer, all positive leads (ch0+ through ch63+) route to com0+, and all negative leads (ch0- through ch63-) route to com0-. The pair com0+ and com0- is addressed collectively as com0 in software.

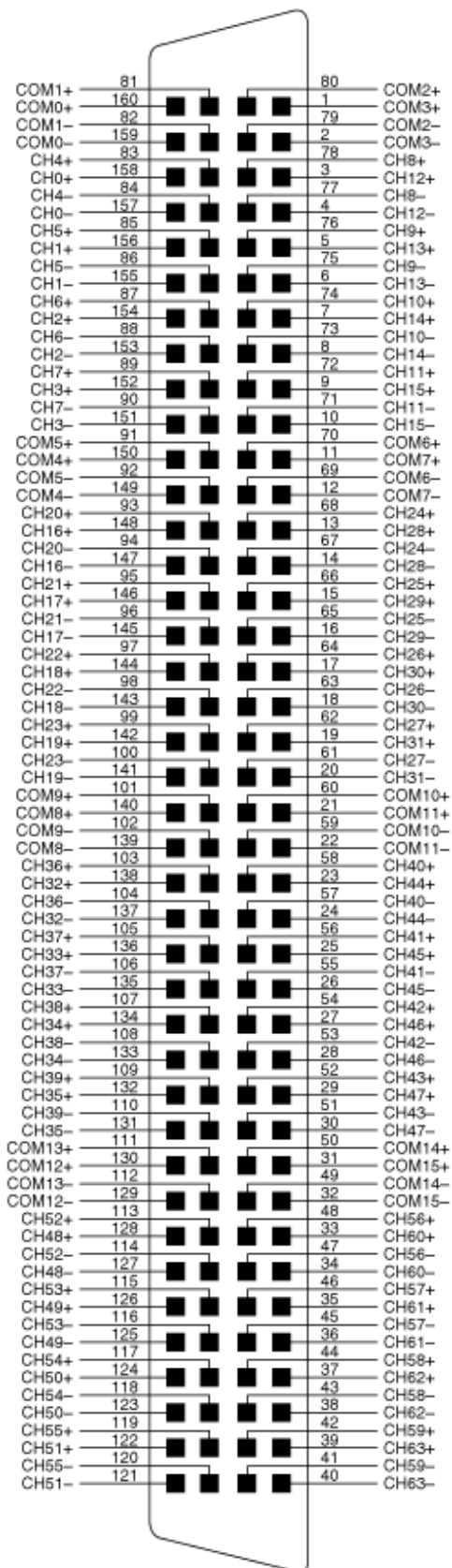
Both the scanning command, `ch2->com0;`, and the immediate operation, niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2- is routed to com0-

Pinout

The following figure identifies the pins for the NI PXI-2576 in the 2-wire 64×1 multiplexer topology.

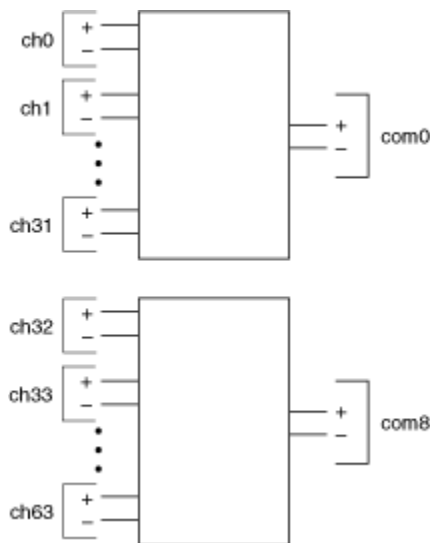


Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2576 2-Wire Dual 32×1 Multiplexer Topology

The following figure represents the NI PXI-2576 in the 2-wire dual 32×1 multiplexer topology.



Making a Connection

When using the NI PXI-2576 as a 2-wire dual 32×1 multiplexer, the positive leads of the first bank (ch0+ through ch31+) route to com0+, and the negative leads of the first bank (ch0– through ch31–) route to com0–. The pair com0+ and com0– is addressed collectively as com0 in software. The second bank follows a similar routing scheme.

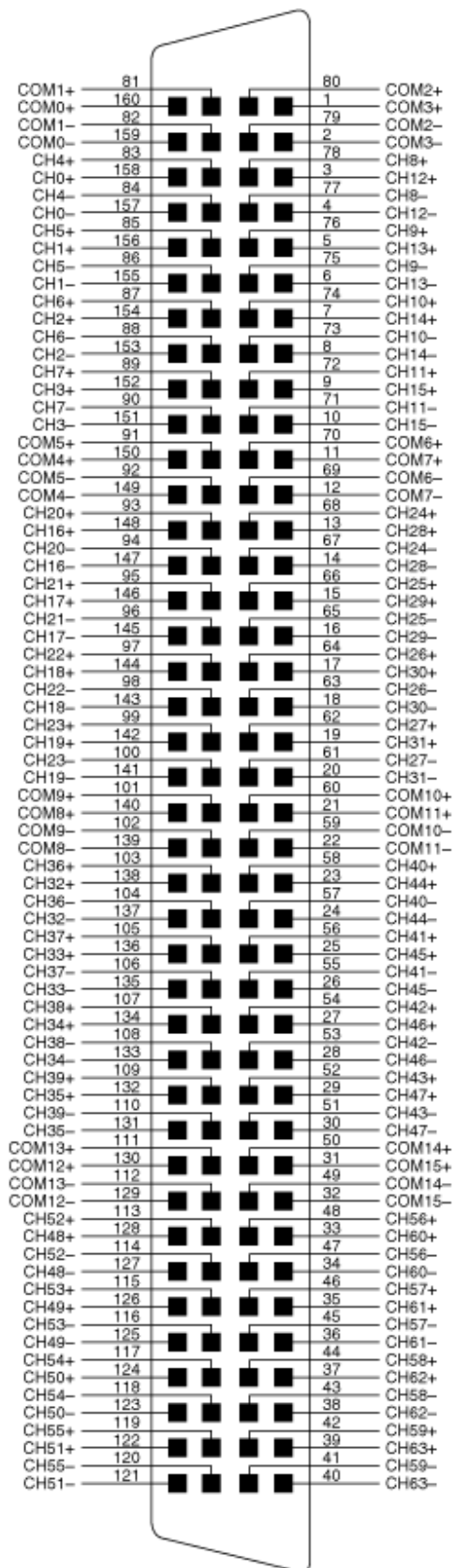
Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2– is routed to com0–

Pinout

The following figure identifies the pins for the NI PXI-2576 in the 2-wire dual 32×1 multiplexer topology.

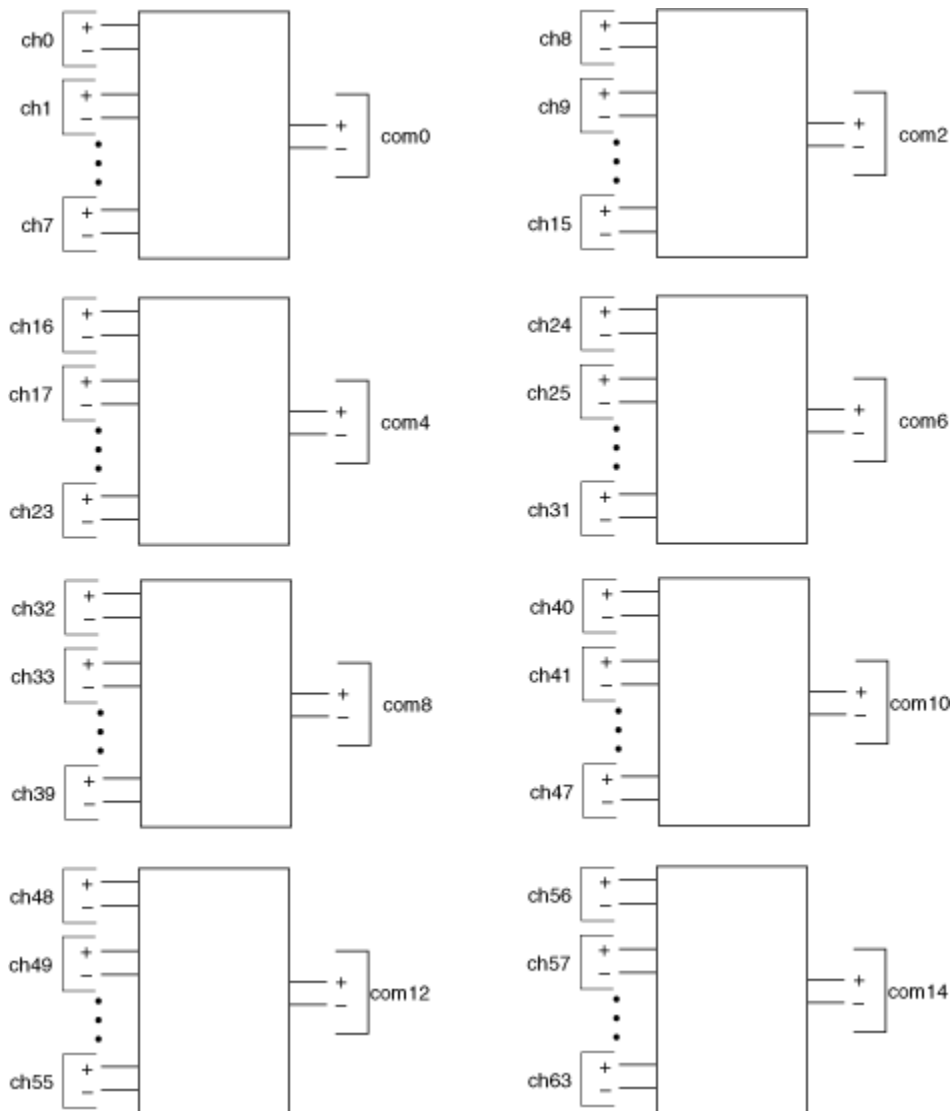


Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2576 2-Wire Octal 8×1 Multiplexer Topology

The following figure represents the NI PXI-2576 in the 2-wire octal 8×1 multiplexer topology.



Making a Connection

When using the NI PXI-2576 as a 2-wire octal 8×1 multiplexer, the positive leads of the first bank (ch0+ through ch7+) route to com0+, and the negative leads of the first bank (ch0- through ch7-) route to com0-. The pair com0+ and com0- is addressed

collectively as com0 in software. All other banks follow a similar routing scheme.

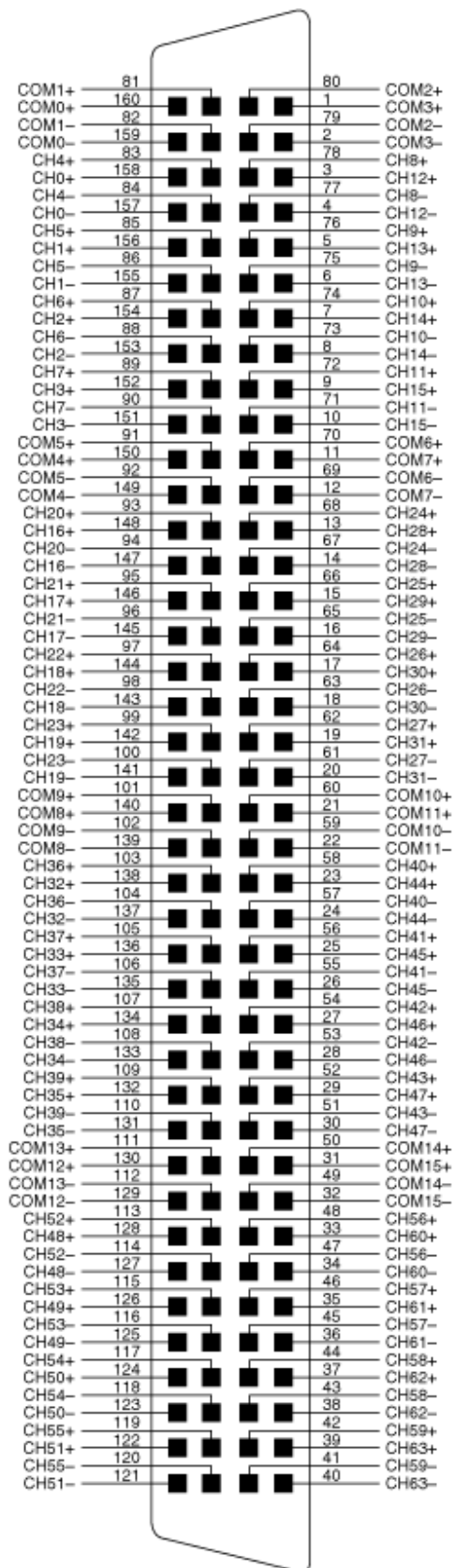
Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to ch2+ is routed to com0+

signal connected to ch2- is routed to com0-

Pinout

The following figure identifies the pins for the NI PXI-2576 in the 2-wire octal 8×1 multiplexer topology.

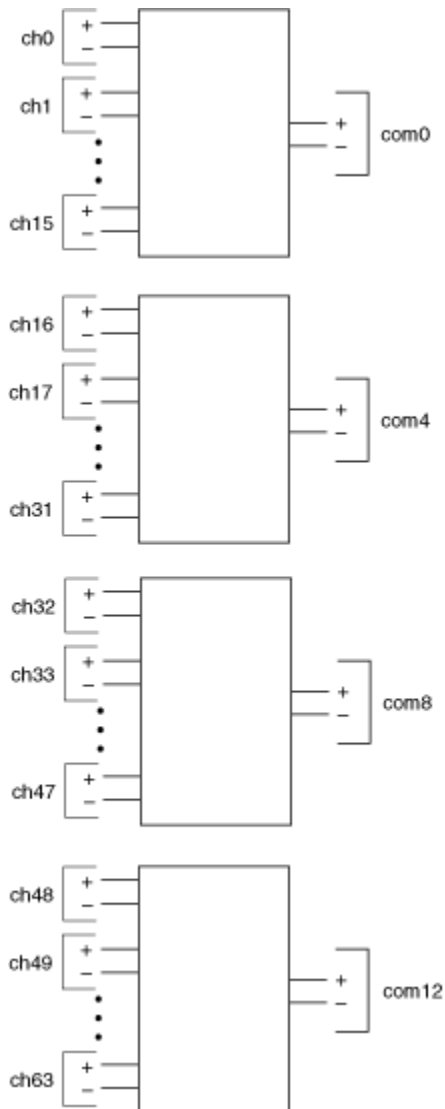


Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2576 2-Wire Quad 16×1 Multiplexer Topology

The following figure represents the NI PXI-2576 in the 2-wire quad 16×1 multiplexer topology.



Making a Connection

When using the NI PXI-2576 as a 2-wire quad 16×1 multiplexer, the positive leads of the first bank (ch0+ through ch15+) route to com0+, and the negative leads of the first bank (ch0– through ch15–) route to com0–. The pair com0+ and com0– is addressed

collectively as com0 in software. All other banks follow a similar routing scheme.

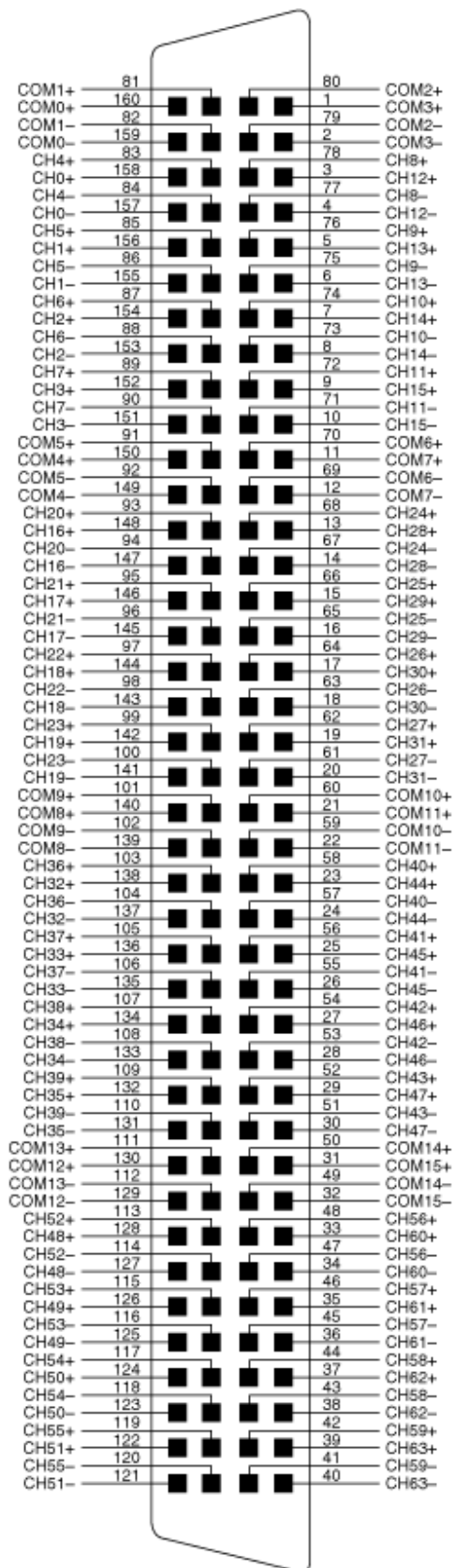
Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to `ch2+` is routed to `com0+`

signal connected to `ch2-` is routed to `com0-`

Pinout

The following figure identifies the pins for the NI PXI-2576 in the 2-wire quad 16×1 multiplexer topology.

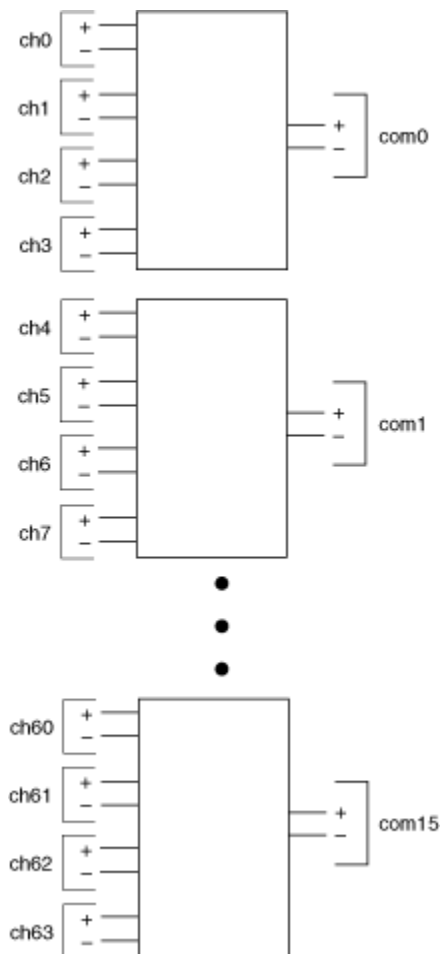


Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2576 2-Wire Sixteen 4×1 Multiplexer Topology

The following figure represents the NI PXI-2576 in the 2-wire sixteen 4×1 multiplexer topology.



Making a Connection

When using the NI PXI-2576 as a 2-wire sixteen 4×1 multiplexer, the positive leads of the first bank (ch0+ through ch3+) route to com0+, and the negative leads of the first bank (ch0- through ch3-) route to com0-. The pair com0+ and com0- is addressed collectively as com0 in software. All other banks follow a similar routing scheme.

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch`

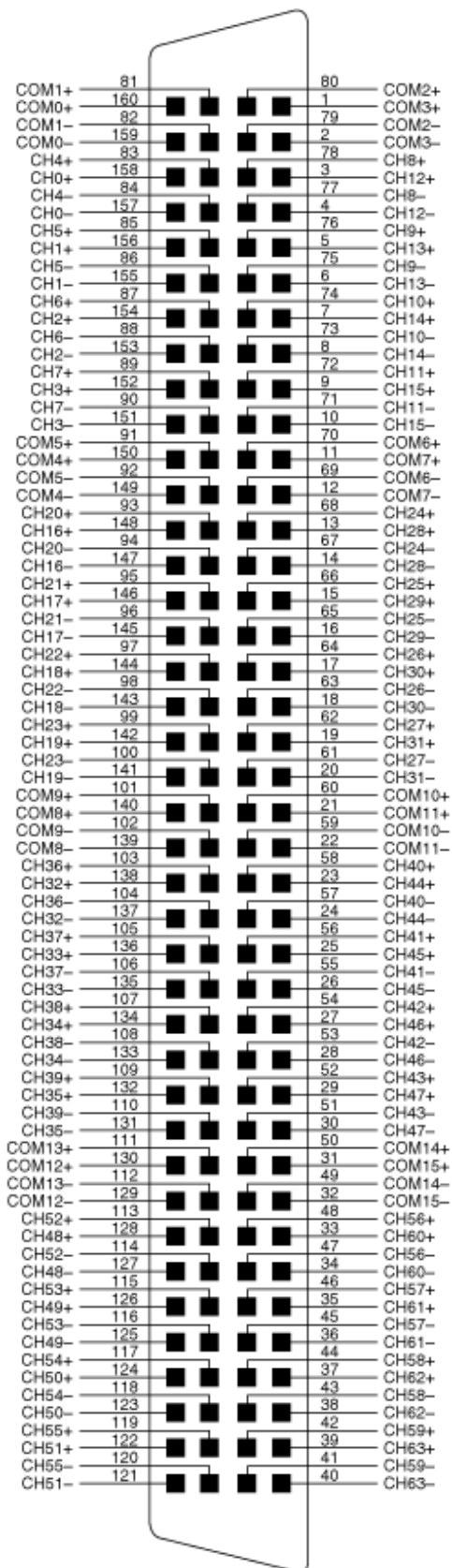
Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connections:

signal connected to `ch2+` is routed to `com0+`

signal connected to `ch2-` is routed to `com0-`

Pinout

The following figure identifies the pins for the NI PXI-2576 in the 2-wire sixteen 4×1 multiplexer topology.



Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2584

The NI PXI-2584 is a high-voltage multiplexer switch module for the PXI platform. The NI PXI-2584 uses reed relays.

A number of factors can affect the life expectancy of reed relays. Refer to Reed Relay Protection for information about protecting the reed relays of the NI PXI-2584.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information.

You can use the reference (REF) connections on the NI PXI-2584 to reduce noise and preserve signal integrity in 1-wire topologies. Refer to NI PXI-2584 Signal Connections for more information about REF connections.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI PXI-2584 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire Dual 6×1 Multiplexer	2584/1-Wire Dual 6x1 Mux(NISWITCH_TOPOLOGY_2584_1_WIRE_DUAL_6X1_MUX)	✓	✓
1-Wire 12×1 Multiplexer	2584/1-Wire 12x1 Mux(NISWITCH_TOPOLOGY_2584_1_WIRE_12X1_MUX)	✓	✓

Topology	Software Name	Immediate	Scanning
2-Wire 6×1 Multiplexer	2584/2-Wire 6x1 Mux(NISWITCH_TOPOLOGY_2584_2_WIRE_6X1_MUX)	✓	✓
Independent	2584/Independent(NISWITCH_TOPOLOGY_2584_INDEPENDENT)	✓	✓



Tip Use the Independent topology to configure the NI PXI-2584 for interleaved functionality. The user-implemented interleaved functionality is useful when measuring stacked signals—for example, battery stacks.

Related Information

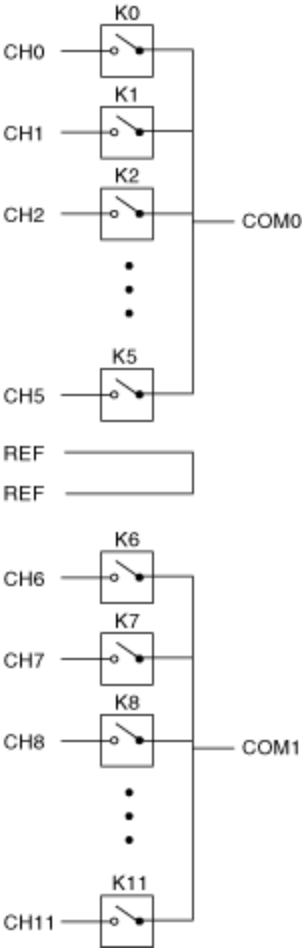
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Reed Relays](#)
- [Reed Relay Protection](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [NI PXI-2584 Signal Connections](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2584 1-Wire Dual 6×1 Multiplexer Topology](#)
- [NI PXI-2584 1-Wire 12×1 Multiplexer Topology](#)
- [NI PXI-2584 2-Wire 6×1 Multiplexer Topology](#)
- [NI PXI-2584 Independent Topology](#)
- [NI PXI-2584 Interleaved Multiplexer \(User-Implemented\)](#)
- [Integration and System Considerations](#)

NI PXI-2584 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2584.



NI PXI-2584 Relay Replacement

The NI PXI-2584 uses reed relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Coto Technology	9104-05-11

Complete the following sets of steps to disassemble your switch module, replace a failed relay, and reassemble your switch module.

Disassemble the Switch Module

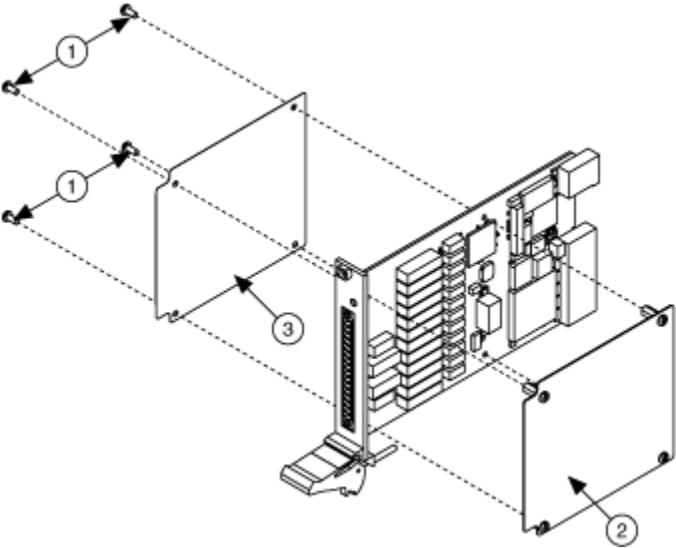
1. Ground yourself using a grounding strap or a ground connected to your PXI

chassis.



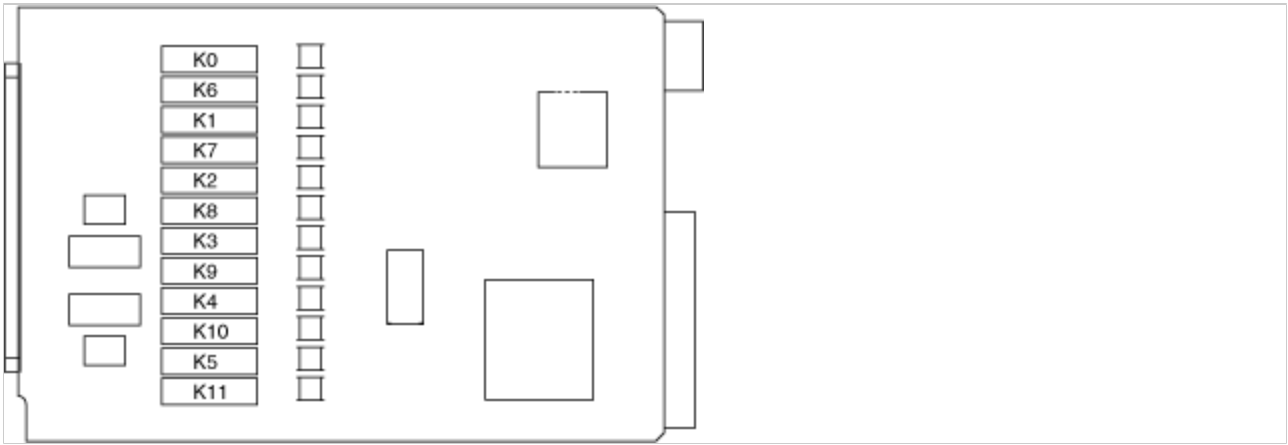
Note Properly grounding yourself prevents damage to your switch module from electrostatic discharge.

2. Remove the four screws that secure the plastic cover on the top and plastic lead cover on the bottom of the switch assembly.



1	Screws
2	Plastic Cover
3	Plastic Lead Cover

3. Carefully separate the adhered top cover absorber from the relays by slowly prying up on the cover. (Note: some metal relay caps might come loose during this process and can be put back onto the relays after you have completed relay replacement.)
4. Locate the relay you want to replace. Refer to the following figure and table for relay locations.



Channel Name	Relay Name
CH0	K0
CH1	K1
CH2	K2
CH3	K3
CH4	K4
CH5	K5
CH6	K6
CH7	K7
CH8	K8
CH9	K9
CH10	K10
CH11	K11

5. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to under 1.2 mm (0.05 inch) protrusion.

Reassemble the Switch Module

Replace the top cover while carefully aligning the standoffs with the mounting holes in the module. Secure the bottom cover using the four screws removed in Disassemble the Module, step 2.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

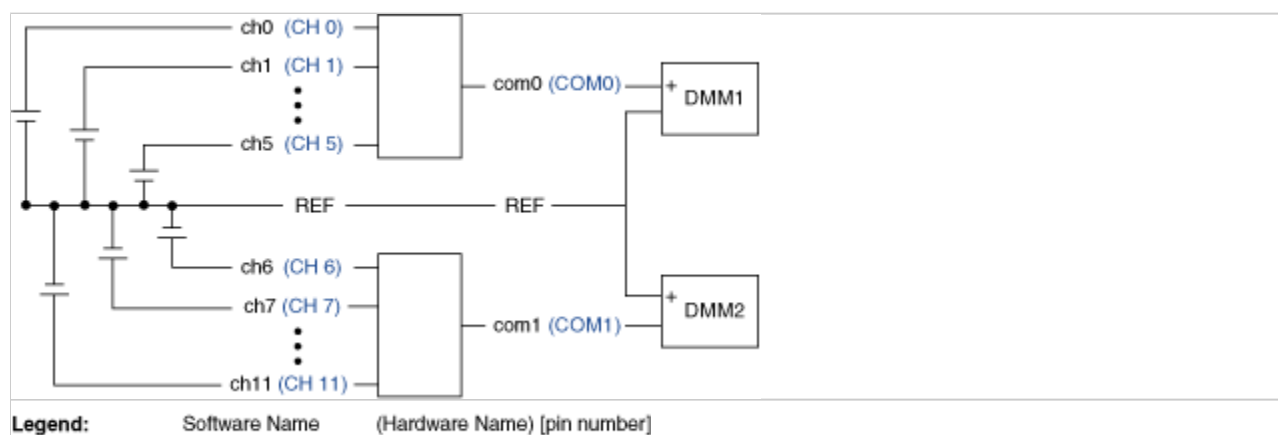
NI PXI-2584 Signal Connections

Use the two reference (REF) connections of the NI PXI-2584 to lower emissions (noise) and preserve signal integrity. The reference connections of NI PXI-2584 should be electrically connected to each other at all times and used only in 1-wire topologies.

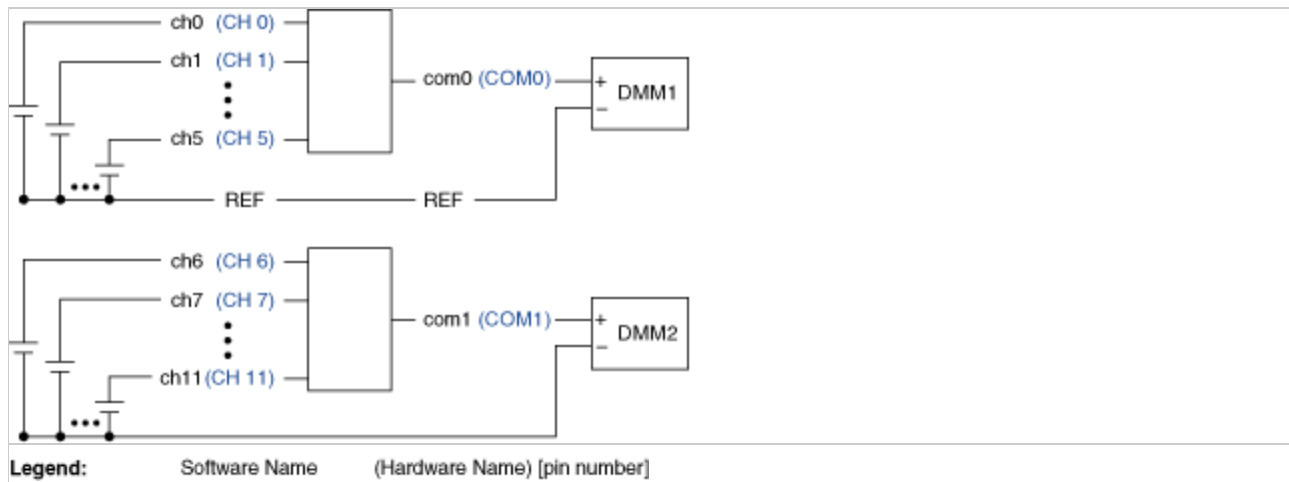
1-Wire Dual 6×1 Multiplexer Topology

The following figures represent the NI PXI-2584 in the 1-wire dual 6×1 multiplexer topology using reference connections. Depending on the reference signals you want to connect, choose one of following configuration options:

- When the reference signals connected to both multiplexers are the same, connect the reference signals to REF, as shown in the following figure.

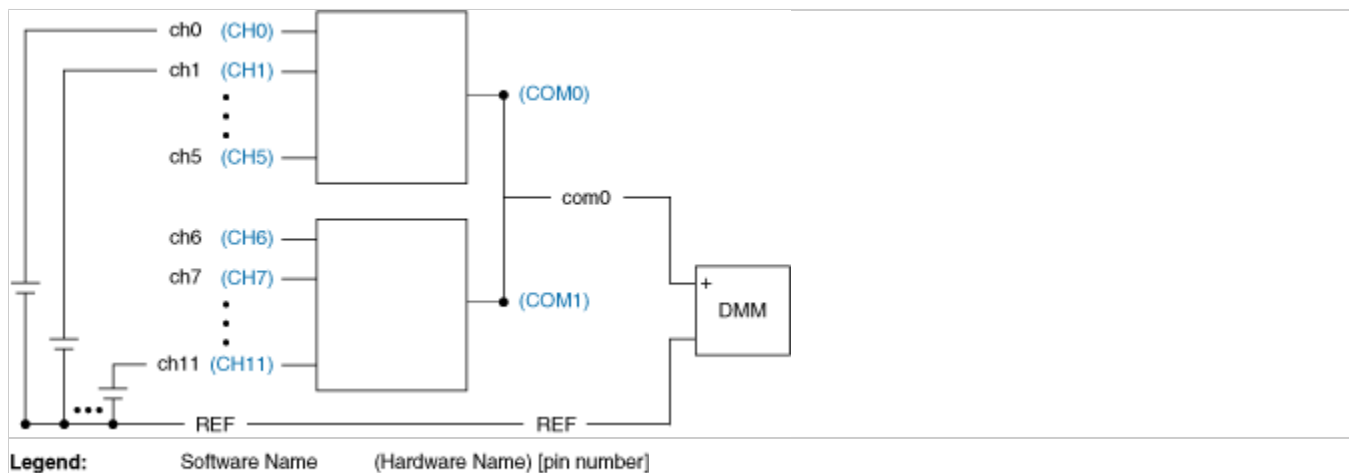


- When the reference signals connected to both multiplexers are not the same, connect the reference signals of one multiplexer to REF and the reference signals of the other multiplexer directly to the measurement device, as shown in the following figure.



1-Wire 12×1 Multiplexer Topology

The following figure represents the NI PXI-2584 in the 1-wire 12×1 multiplexer topology using reference connections.



Related concepts:

- [NI PXI-2584 1-Wire Dual 6×1 Multiplexer Topology](#)
- [NI PXI-2584 1-Wire 12×1 Multiplexer Topology](#)

NI PXI-2584 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2584.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2584.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1

Scan Advanced Output	Software	Hardware
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

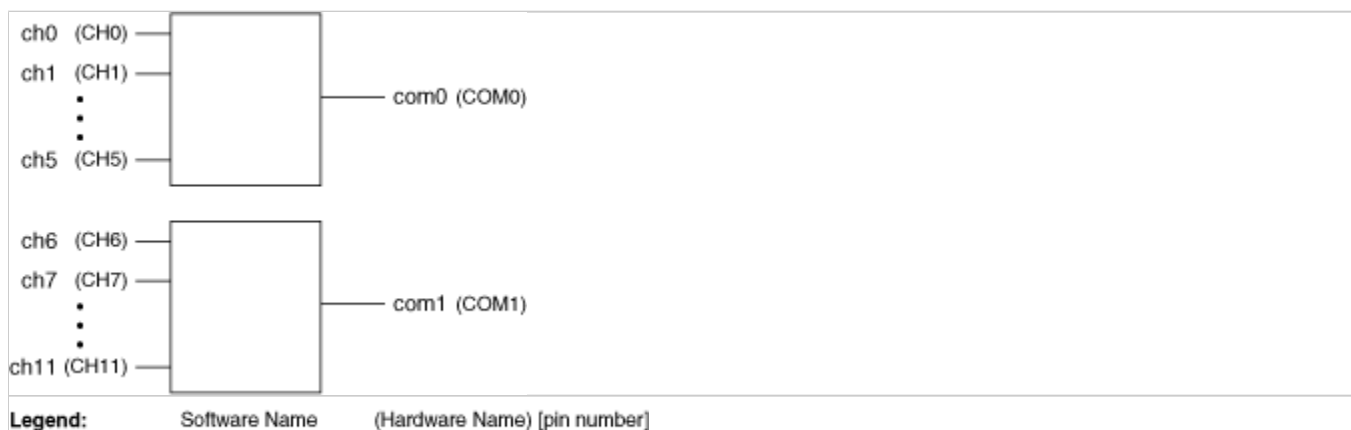
Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2584 Independent Topology

Use the independent topology to utilize the full routing capabilities of the NI PXI-2584. For example, when measuring stacked signals, use the independent topology to configure the NI PXI-2584 as an interleaved multiplexer.

The following figure represents the NI PXI-2584 in the independent topology.



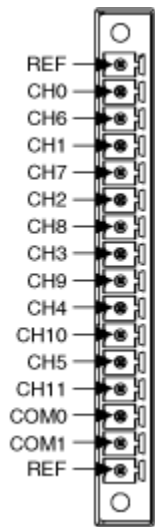
Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

signal connected to CH2 is routed to COM0

Pinout

The following figure identifies the pins for the NI PXI-2584 in the independent topology.

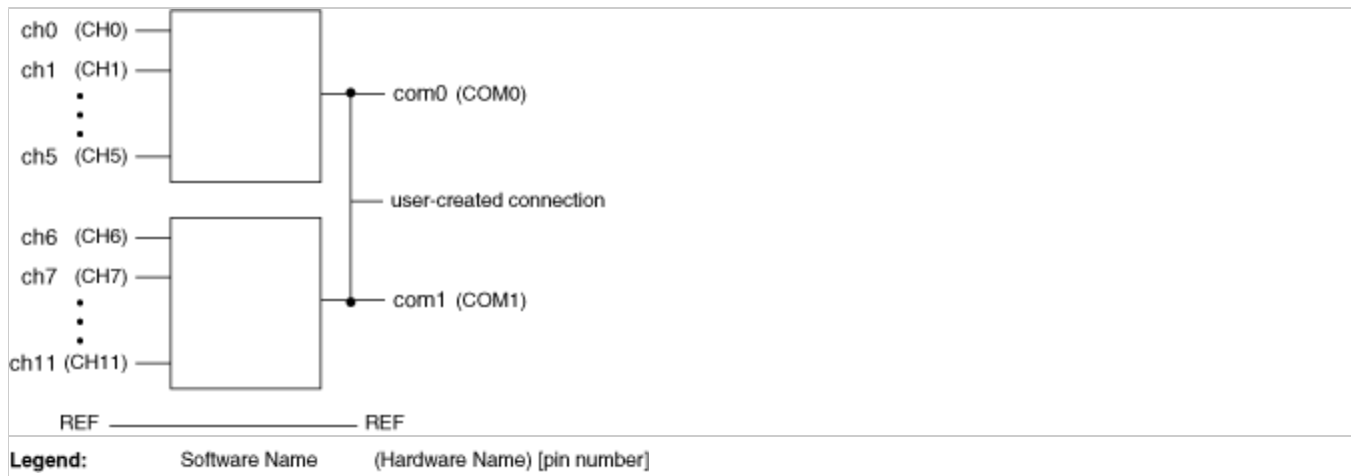


Related concepts:

- [NI PXI-2584 Interleaved Multiplexer \(User-Implemented\)](#)

NI PXI-2584 1-Wire 12×1 Multiplexer Topology

Install an external jumper wire between the COM0 and COM1 pins to use the NI PXI-2584 as a 1-wire 12×1 multiplexer. The following figure represents the NI PXI-2584 1-wire 12×1 multiplexer topology.



Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

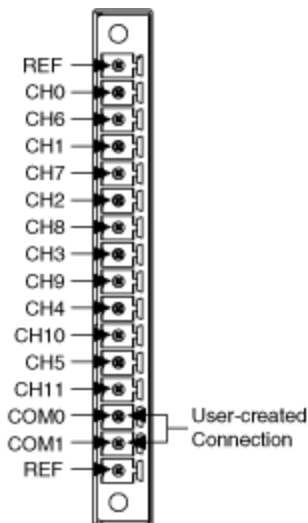
Signal connected to CH2 is routed to COM0.

Both the scanning command, `ch7->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch7` and `com0`, result in the following connection:

Signal connected to CH7 is routed to COM1.

Pinout

The following figure identifies the pins for the NI PXI-2584 in the 1-wire 12×1 multiplexer topology.

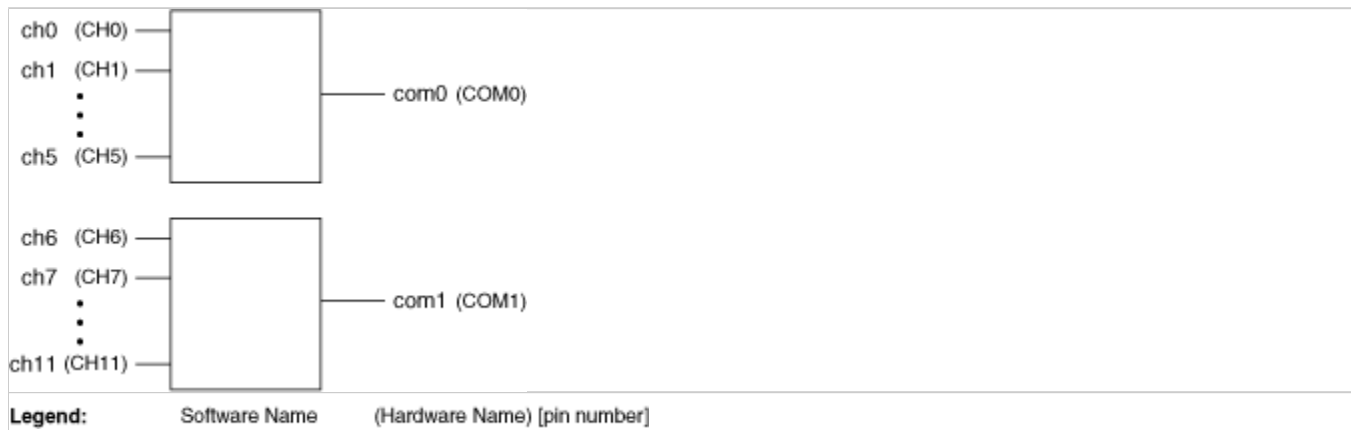


Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2584 1-Wire Dual 6×1 Multiplexer Topology

The following figure represents the NI PXI-2584 in the 1-wire dual 6×1 multiplexer topology.



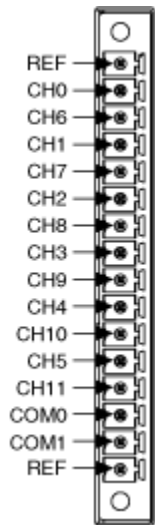
Making a Connection

Both the scanning command, `ch2->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch2` and `com0`, result in the following connection:

Signal connected to CH2 is routed to COM0.

Pinout

The following figure identifies the pins for the NI PXI-2584 in the 1-wire dual 6×1 multiplexer topology.



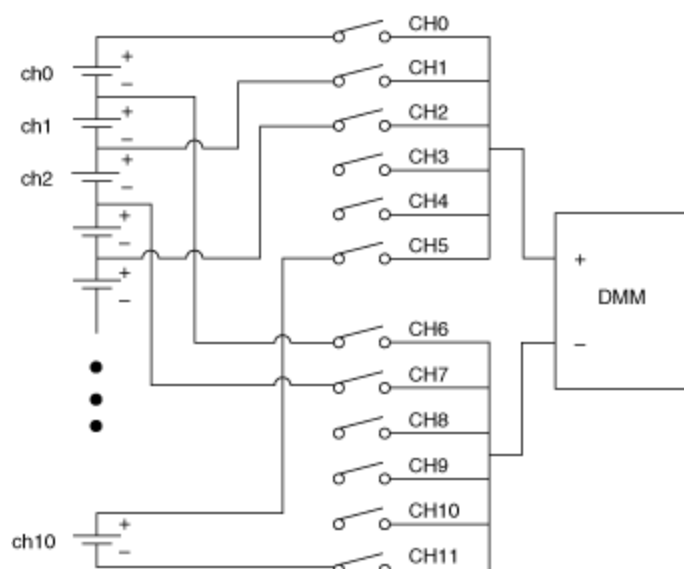
Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2584 Interleaved Multiplexer (User-Implemented)

You can use the NI PXI-2584 independent topology to create a 2-wire 11×1 multiplexer. The independent topology interleaves the two multiplexer banks of the NI PXI-2584 to create one interleaved multiplexer. Interleaved multiplexing is useful for measuring stacked signals such as battery stacks where each channel shares a connection with the channels before and after it. By sharing connections you can nearly double the channel count while still maintaining 2-wire (differential) measurements.

A representation of an interleaved multiplexer is shown in the following figure. The channels of the interleaved multiplexer are shown on the left of the figure.



Note Signals connected to odd channels are measured in reverse polarity.



Note In multiple module operations, a straddled channel—an additional channel composed of the last channel of the first device (ch11) and the first channel of the second device (ch0)—is created between the two devices.

Use the Independent topology for both scanning and immediate operation of the NI PXI-2584 when using it as a 2-wire 11×1 interleaved multiplexer.

Single Module Scanning

In single module scanning, to measure signals as shown in the preceding figure, complete the following steps:

1. Close CH0, and CH6. The DMM measures the signal between CH0 and CH6.
2. Open CH0, and close CH1 (CH6 remains closed). The DMM measures the signal between CH1 and CH6, in reverse polarity.
3. Open CH6, and close CH7 (CH1 remains closed). The DMM measures the signal between CH1 and CH7.
4. Open CH1, and close CH2 (CH7 remains closed). The DMM measures the signal between CH2 and CH7, in reverse polarity.
5. Continue this pattern for the rest of the channels.
6. Open CH10, and close CH11 (CH5 remains closed). The DMM measures the signal between CH5 and CH11.

Refer to the following example for scan list syntax.

```
/Dev1/ch0->com0 & ch6->com1; ~ch0->com0 && ch1->com0;  
~ch6->com1 && ch7->com1;...~ch10->com1 && ch11->com1; ~ch5->com0 & ~ch11->com1 &&
```

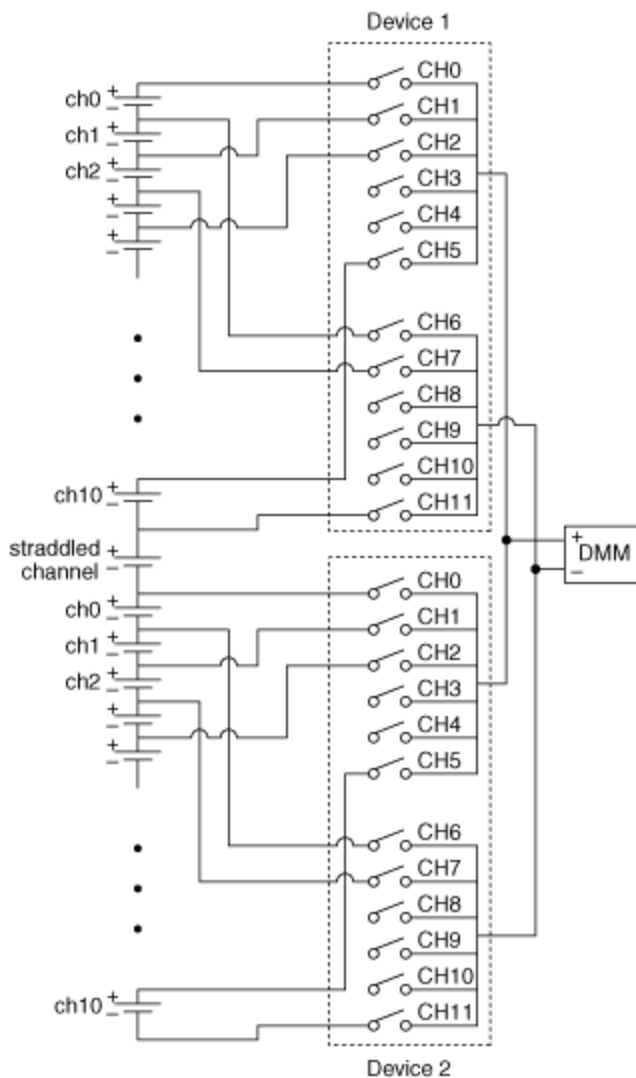


Note When calling the niSwitch Configure Scan List VI or the `niSwitch_ConfigureScanList` function, select **No Action** for the **scan mode** parameter.

Refer to the NI-SWITCH or the NI-DAQmx programming example for more information about single module scanning with the NI PXI-2584.

Multiple Module Scanning

In multiple module scanning, to measure signals on multiple devices, including the straddled channel signal, as shown in the following figure, complete the following steps:



1. Follow the steps in single module scanning to measure the signals on the first device.
2. Open CH5 on Dev1, and close CH0 on Dev2 (CH11 on Dev1 remains closed). The DMM measures the signal between CH11 on Dev1 and CH0 on Dev2 in reverse polarity.
3. Open CH11 on Dev1, and close CH6 on Dev2 (CH0 on Dev2 remains closed) The DMM measures the signal between CH0 on Dev2 and CH6 on Dev2.
4. Open CH0 on Dev2, and close CH1 on Dev2 (CH6 on Dev2 remains closed) The DMM measures the signal between CH1 on Dev2 and CH6 on Dev2 in reverse polarity.
5. Open CH6 on Dev2, and close CH7 on Dev2 (CH1 on Dev2 remains closed) The DMM measures the signal between CH2 on Dev2 and CH7 on Dev2.
6. Continue this pattern for the rest of the channels.
7. Open CH10 on Dev2, and close CH11 on Dev2 (CH5 on Dev2 remains closed). The DMM measures the signal between CH5 on Dev2 and CH11 on Dev2.

Refer to the following example for scan list syntax.

```
/Dev1/ch0->com0 & ch6->com1; ~ch0->com0 && ch1->com0;...~ch5->com0 && /Dev2/  
ch0->com0; /Dev1/~ch11->com1 && /Dev2/ch6->com1;  
~ch0->com0 && ch1->com0;...~ch10->com1 && ch11->com1; ~ch5->com0 & ~ch11->com1 &&
```

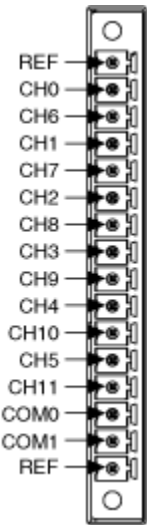


Note When calling the niSwitch Configure Scan List VI or the niSwitch_ConfigureScanList function, select **No Action** for the **scan mode** parameter.

Multiple module scanning with the NI PXI-2584 is supported only in NI-DAQmx. Refer to the NI-DAQmx programming example for more information about multiple module scanning with the NI PXI-2584.

Pinout

The following figure and table identify the pins for the NI PXI-2584 when used as a 2-wire 11×1 interleaved multiplexer.



Interleaved Channel	Pin Name	
+	-	
ch0	CH0	CH6
ch1	CH6	CH1

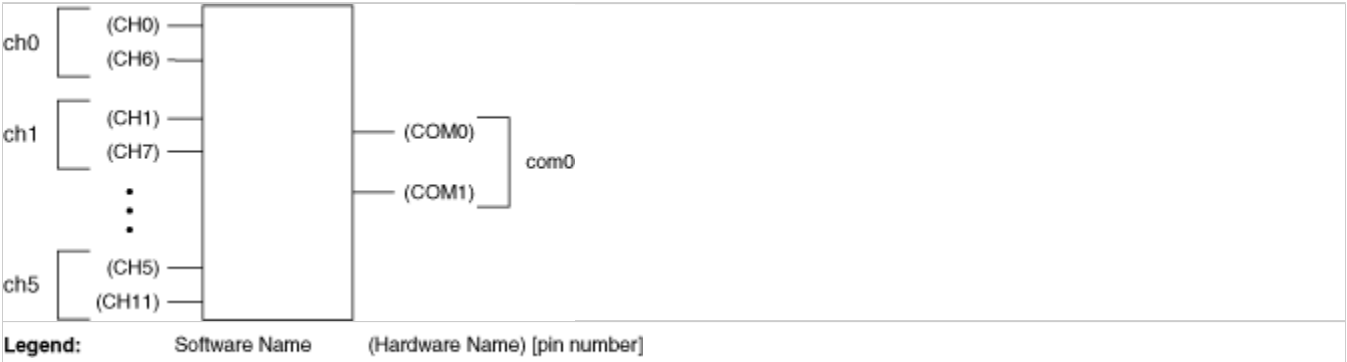
Interleaved Channel	Pin Name	
+	-	
ch2	CH1	CH7
ch3	CH7	CH2
ch4	CH2	CH8
ch5	CH8	CH3
ch6	CH3	CH9
ch7	CH9	CH4
ch8	CH4	CH10
ch9	CH10	CH5
ch10	CH5	CH11

Related concepts:

- [NI PXI-2584 Independent Topology](#)
- [Single Module Scanning](#)
- [NI-SWITCH Programming Examples](#)
- [Multiple Module Scanning](#)

NI PXI-2584 2-Wire 6×1 Multiplexer Topology

The following figure represents the NI PXI-2584 in the 2-wire 6×1 multiplexer topology.



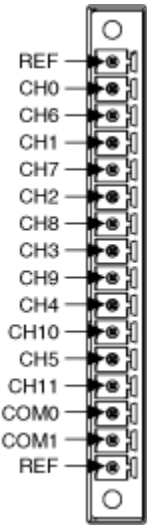
Making a Connection

Both the scanning command, `ch1->com0;`, and the immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `ch1` and `com0`, result in the following connections:

- Signal connected to CH1 is routed to COM0.
- Signal connected to CH7 is routed to COM1.

Pinout

The following figure and table identify the pins for the NI PXI-2584 in the in the 2-wire 6×1 multiplexer topology.



Software Name	Pin Name	
+	-	
ch0	CH0	CH6
ch1	CH1	CH7
ch2	CH2	CH8
ch3	CH3	CH9
ch4	CH4	CH10
ch5	CH5	CH11

Related concepts:

- [N-Wire Switching Modes](#)
- [Multiplexer](#)

NI PXI-2585

The NI PXI-2585 is a 10×1 multiplexer module for the PXI platform. The NI PXI-2585 is composed of 10 SPST armature nonlatching relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI PXI-2585 and possible operation modes.

Topology	Software Name	Immediate	Scanning
1-Wire 10×1 Multiplexer	2585/1-Wire 10x1 Mux(NISWITCH_TOPOLOGY_2585_1_WIRE_10X1_MUX)	✓	✓

Related Information

- [Integration and System Considerations](#)

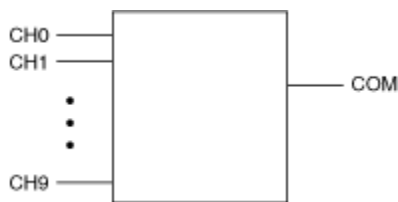
Related concepts:

- [Relay Forms](#)

- [Armature Relays](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2585 1-Wire 10×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2585 1-Wire 10×1 Multiplexer Topology

The following figure represents the NI PXI-2585 in the 1-wire 10×1 multiplexer topology.



Making a Connection

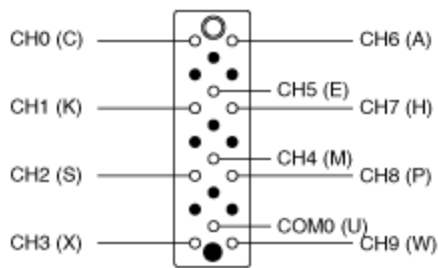
You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com")`.

When scanning the NI PXI-2585, a typical scan list entry could be `ch2->com;`. This entry closes the relay between CH2 and COM.

Pinout

The following figure identifies the pins for the NI PXI-2585 in the 1-wire 10×1 multiplexer topology.



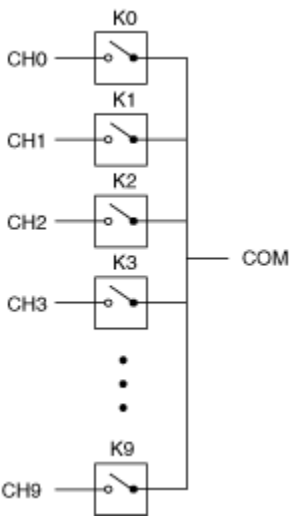
Letters in parentheses reference the pin designators of the connector.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2585 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2586.



NI PXI-2585 Relay Replacement

The NI PXI-2585 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
Potter & Brumfield (Tyco Electronics)	RTB14005F (2-1419108-4)

Complete the following sets of steps to disassemble your module and replace a failed relay.

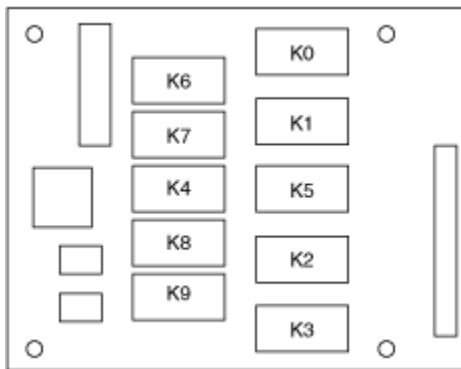
Disassemble the Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



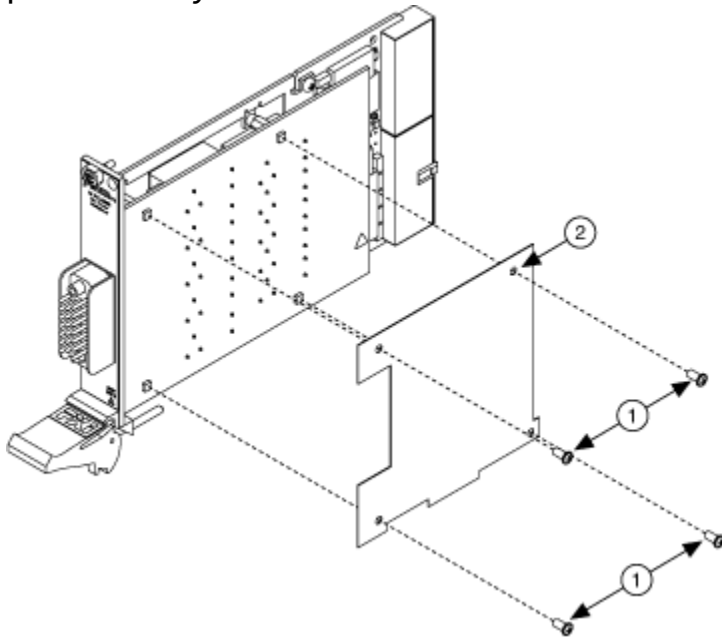
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.



Channel Name	Relay Name
CH0	K0
CH1	K1
CH2	K2
CH3	K3
CH4	K4
CH5	K5
CH6	K6
CH7	K7
CH8	K8
CH9	K9

3. Remove the four screws from the back of the relay board, and carefully peel off the plastic safety shield.



1	Screws
2	Plastic safety shield

4. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station.

Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.

- Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.

Reassemble the Module

Secure the plastic safety shield using the four screws removed in Disassemble the Module, step 3.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2585 Triggering

The NI PXI-2585 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2585.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger

Trigger Input	Software	Hardware
		line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2585.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2586

The NI PXI-2586 is a 10-channel general-purpose relay module for the PXI platform designed for switching and controlling power signals. The NI PXI-2586 is composed of 10 SPST armature nonlatching relays.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI PXI-2586 and possible operation modes.

Topology	Software Name	Immediate	Scanning
10-SPST	2586/10-SPST(NISWITCH_TOPOLOGY_2586_10_SPST)	✓	✓
5-DPST	2586/5-DPST(NISWITCH_TOPOLOGY_2586_5_DPST)	✓	✓

Related Information

- [Integration and System Considerations](#)

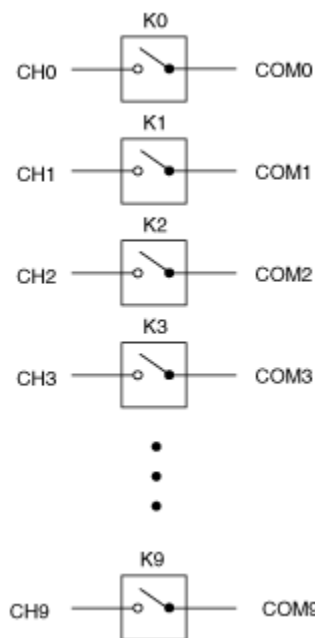
Related concepts:

- [General-Purpose Topologies](#)
- [Relay Forms](#)
- [Armature Relays](#)

- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2586 10-SPST Topology](#)
- [NI PXI-2586 5-DPST Topology](#)
- [Integration and System Considerations](#)

NI PXI-2586 10-SPST Topology

The following figure represents the NI PXI-2586 in the 10-SPST topology.



Making a Connection

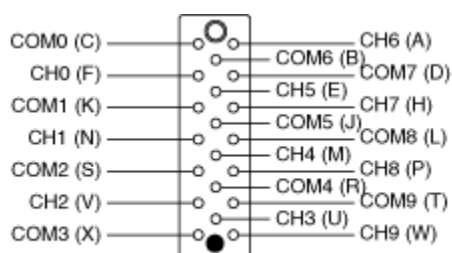
You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI PXI-2586, a typical scan list entry could be `ch2->com2`; . This entry closes the relay between CH2 and COM2.

Pinout

The following figure identifies the pins for the NI PXI-2586 in the 10-SPST topology.



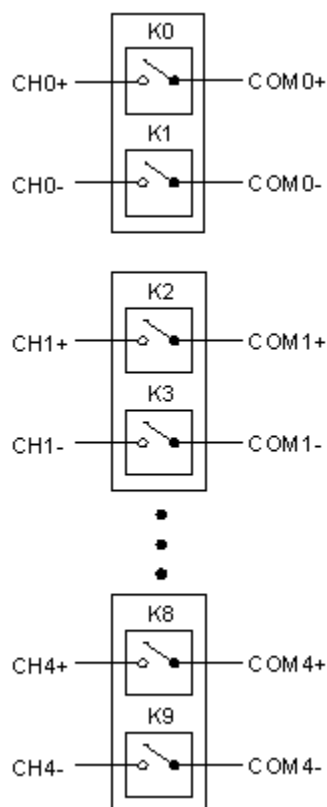
Letters in parentheses reference the pin designators of the connector.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2586 5-DPST Topology

The following figure represents the NI PXI-2586 in the 5-DPST topology.



Making a Connection

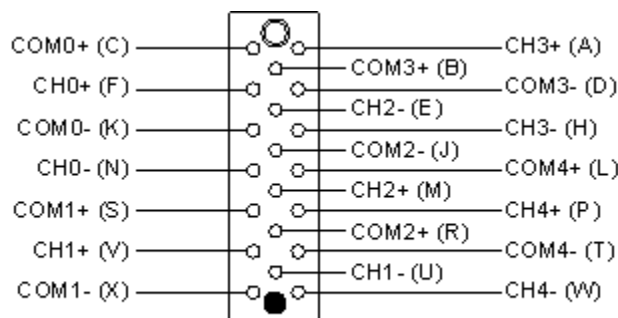
You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to close the relay of channel 2, call `niSwitch_Connect(vi, "ch2", "com2")`. To open the relay of channel 2, call `niSwitch_Disconnect(vi, "ch2", "com2")`.

When scanning the NI PXI-2586, a typical scan list entry could be `ch2->com2`; . This entry closes the relays between CH2+ and COM2+ and between CH2- and COM2-.

Pinout

The following figure identifies the pins for the NI PXI-2586 in the 5-DPST topology.



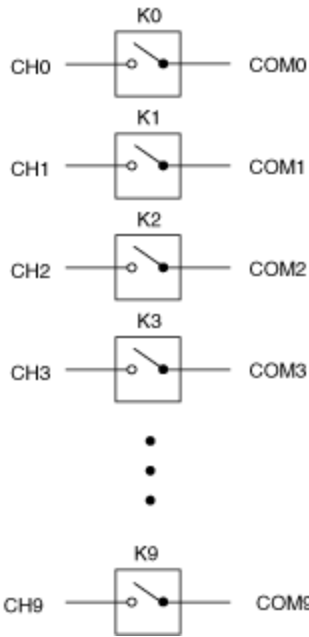
Letters in parentheses reference the pin designators of the connector.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2586 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2586.



NI PXI-2586 Relay Replacement

The NI PXI-2586 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part Number
Potter & Brumfield (Tyco Electronics)	RTB14005F (2-1419108-4)

Complete the following sets of steps to disassemble your module and replace a failed relay.

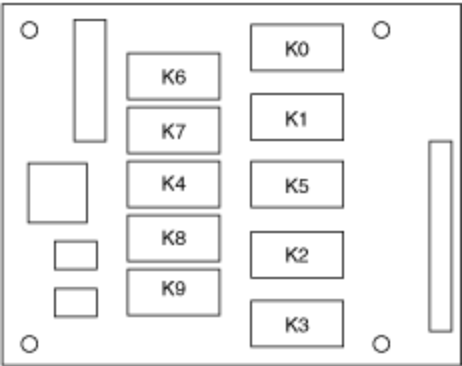
Disassemble the Module

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



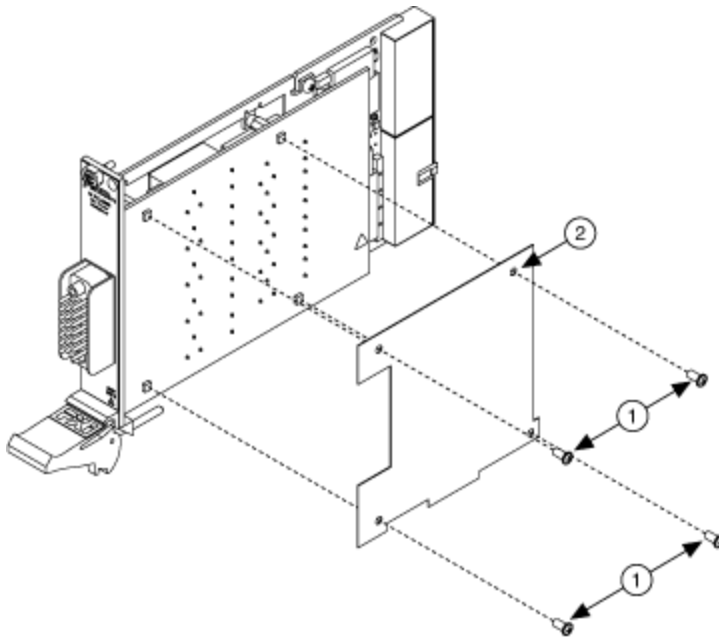
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.



Channel Name	Relay Name
CH0	K0
CH1	K1
CH2	K2
CH3	K3
CH4	K4
CH5	K5
CH6	K6
CH7	K7
CH8	K8
CH9	K9

3. Remove the four screws from the back of the relay board, and carefully peel off the plastic safety shield.



1	Screws
2	Plastic safety shield

4. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

If you have a surface mount rework station, replace the relay as you would any other surface mount part. Otherwise, complete the following steps to replace the relay:

1. Use the soldering iron and solder wick to remove as much solder from the relay pads as possible. Do not leave the soldering iron on any lead for more than 5 seconds.



Note If it is necessary to reapply the soldering iron to the pad, allow the connection to cool completely before reapplying the soldering iron.

2. Apply heat to the pads one at a time, and use the pick to gently pry the relay pins from the pads. Make sure that the solder is molten before prying.



Caution Using excessive force on a soldered pad can result in lifting the PCB trace and ruining the board.

3. Remove the relay.
4. Clean the pads with isopropyl alcohol and cotton swabs.
5. Place the new relay on the PCB pads and solder.
6. Remove the excess flux with isopropyl alcohol and cotton swabs.



Caution Do not use flux remover to clean the board after relay replacement.

Reassemble the Module

Secure the plastic safety shield using the four screws removed in Disassemble the Module, step 3.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2586 Triggering

The NI PXI-2586 can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2586.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4

Trigger Input	Software	Hardware
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2586.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI-2590

The NI PXI-2590 is a multiplexer switch module for the PXI bus designed to handle RF signals up to 1.3 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2590 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4×1 Multiplexer	2590/4x1 Mux(NISWITCH_TOPOLOGY_2590_4X1_MUX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI-2590 4×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2590 4 × 1 Multiplexer Topology

The following figure represents the NI PXI-2590 in the 4×1 multiplexer topology.



Making a Connection

In this topology, you can connect channels by calling the niSwitch Connect Channels VI or the niSwitch_Connect function.

To connect the CHx terminal to the COM terminal, disconnect the previously connected terminal from the COM.

For example, to connect CH2 to COM after connecting CH1 to COM, use the following code:

```
niSwitch_Disconnect(vi, "ch1", "com")
```

```
niSwitch_Connect(vi, "ch2", "com")
```



Note For an initial connection, you do not need to disconnect the default channel (ch0) from COM after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the niSwitch_DisconnectAll function has been made.



Note niSwitch_Disconnect(vi, "ch1", "com") does not activate the relay until the niSwitch_Connect(vi, "ch2", "com") is executed. One channel of the 4x1 multiplexer is always connected to the common channel.

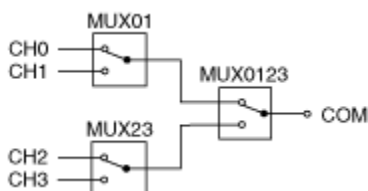
When scanning the NI PXI-2590, a typical scan list entry could be `ch1->com;`. This entry routes the signal connected to CH1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2590 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2590.



NI PXI-2590/2591 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2590/2591.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2590/2591.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2591

The NI PXI-2591 is a multiplexer switch module for the PXI bus designed to handle RF signals up to 4 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2591 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4×1 Multiplexer	2591/4x1 Mux(NISWITCH_TOPOLOGY_2591_4X1_MUX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI-2591 4×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2591 4×1 Multiplexer Topology

The following figure represents the NI PXI-2591 in the 4×1 multiplexer topology.



Making a Connection

In this topology, you can connect channels by calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To connect the CHx terminal to the COM terminal, disconnect the previously connected terminal from the COM.

For example, to connect CH2 to COM after connecting CH1 to COM, use the following code:

```
niSwitch_Disconnect(vi, "ch1", "com")
```

```
niSwitch_Connect(vi, "ch2", "com")
```



Note For an initial connection, you do not need to disconnect the default channel (ch3) from COM after the module has been reset or a call to the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function has been made.



Note `niSwitch_Disconnect(vi, "ch1", "com")` does not activate the relay until the `niSwitch_Connect(vi, "ch2", "com")` is executed. One channel of the 4x1 multiplexer is always connected to the

common channel.

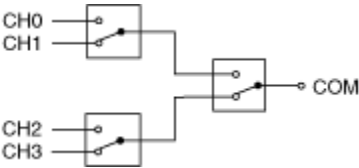
When scanning the NI PXI-2591, a typical scan list entry could be `ch1->com;`. This entry routes the signal connected to CH1 to COM.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2591 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2591.



NI PXI/PXIe-2593

The NI PXI/PXIe-2593 (NI 2593) is a high-density multiplexer switch module for the PXI or PXI Express platform. The NI 2593 is designed to handle RF signals up to 500 MHz.

Operation Modes

The following table lists the supported topology of the NI 2593 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 8×1 Multiplexer	2593/Dual 8x1 Mux(NISWITCH_TOPOLOGY_2593_DUAL_8X1_MUX)	✓	✓
Dual 4×1 Terminated Multiplexer	2593/Dual 4x1 Terminated Mux(NISWITCH_TOPOLOGY_2593_DUAL_4X1_TERMINATED_MUX)	✓	✓
16×1	2593/16x1 Mux(NISWITCH_TOPOLOGY_2593_16X1_MUX)	✓	✓

Topology	Software Name	Immediate	Scanning
Multiplexer			
8×1 Terminated Multiplexer	2593/8x1 Terminated Mux(NISWITCH_TOPOLOGY_2593_8X1_TERMINATED_MUX)	✓	✓
Independent	2593/Independent(NISWITCH_TOPOLOGY_2593_INDEPENDENT)	✓	✓

Related Information

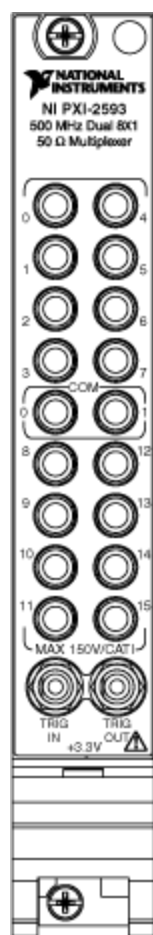
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI/PXIe-2593 Dual 8×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2593 Dual 4×1 Terminated Multiplexer Topology](#)
- [NI PXI/PXIe-2593 16×1 Multiplexer Topology](#)
- [NI PXI/PXIe-2593 8×1 Terminated Multiplexer Topology](#)
- [NI PXI/PXIe-2593 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI/PXIe-2593 Front Panel

The following figure illustrates the NI PXI/PXIe-2593 front panel.

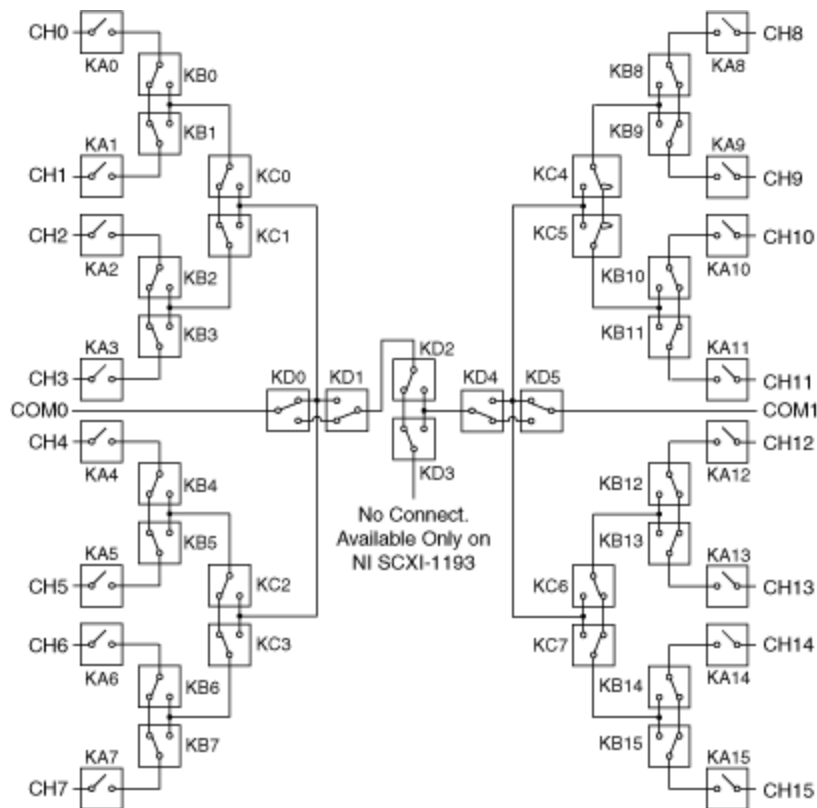


NI PXI/PXIe-2593 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI/PXIe-2593.



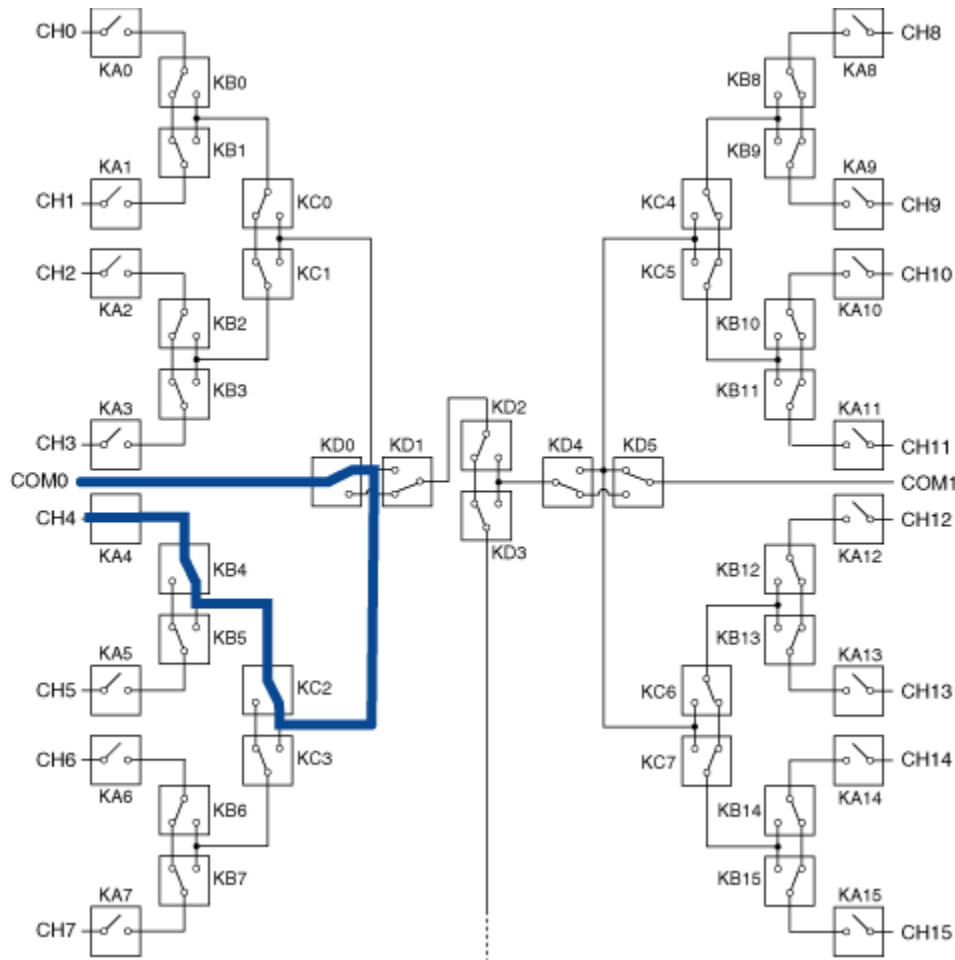
Note Relay names are the same for every topology.



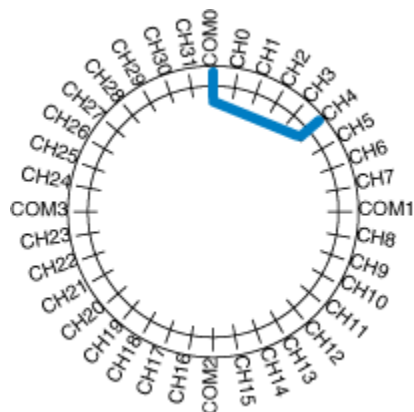
Dimensionally Flexible Sparse Matrix

The NI PXI/PXIe-2593 architecture allows signals to be routed between any channel pair or common pair while maintaining >500 MHz bandwidth and minimizing RF stubs and reflections. The architecture provides more flexibility than traditional sparse matrices because the shape of the matrix is user-defined, and there is no restriction on row-to-row or column-to-column connections. For additional information about dimensionally flexible sparse matrices, refer to the document, *Advanced Signal Routing with the NI PXI/PXIe-2593 and NI SCXI-1193 RF Switches* at ni.com/info using the info code `ex2qd9`.

Routing Configuration



Equivalent Representation



NI PXI/PXIe-2593 Triggering

This module can recognize trigger pulse widths less than 150 ns by disabling digital filtering.

Trigger Input

The following table lists valid trigger inputs for the NI PXI/PXIe-2593 (NI 2593).

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG IN on the front panel

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI 2593.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4

Scan Advanced Output	Software	Hardware
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Front Connector	External(NISWITCH_VAL_EXTERNAL)	TRIG OUT on the front panel

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

Related concepts:

- [Disabling Digital Filtering](#)

NI PXI/PXIe-2593 Independent Topology

The NI PXI/PXIe-2593 (NI 2593) supports the independent topology, allowing you to utilize its full routing capabilities. Possible configurations include 3×1 multiplexers and dimensionally flexible sparse matrices.

Making a Connection

Control the individual relays with the niSwitch Relay Control VI or the `niSwitch_RelayControl` function (refer to the NI 2593 hardware diagram for relay names). For example, to connect CH2 to COM0 on the NI 2593, call the niSwitch Relay Control VI or the `niSwitch_RelayControl` function with **relay action** set to **Relay Closed** and **relay name** set to KA0. Repeat the call to the niSwitch Relay Control VI or the `niSwitch_RelayControl` function to close KB1 then KC0.

When scanning the NI 2593, use the channel names in the scan list. A typical scan list entry could be `ch2->com0 ;`. This entry routes the signal connected to CH2 to COM0.

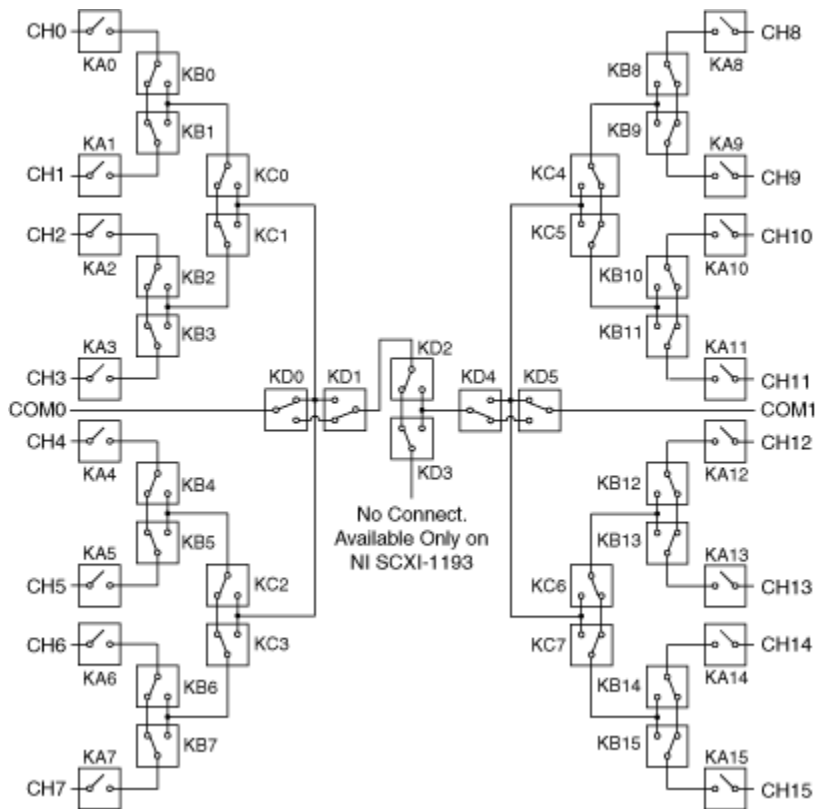
Valid Internal Channels

To determine the internal channel names, combine the names of all relays adjacent to a channel, in alphabetical order, and remove the K's. For example, the channel

connecting KA0 and KB0 is called A0B0.

For example, to connect CH0 to COM0 using internal channel names, you need to call the following:

```
niSwitch_Connect (exampleSession, ch0, a0b0);
niSwitch_Connect (exampleSession, a0b0, b0b1c0);
niSwitch_Connect (exampleSession, b0b1c0, c0c1c2c3d0d1);
niSwitch_Connect (exampleSession, c0c1c2c3d0d1, com0);
```



The following is a list of the valid internal channel names:

a0b0	b0b1	c0c1	ch4
a10b10	b0b1c0	c0c1c2c3d0d1	ch5
a11b11	b10b11	c2c3	ch6
a12b12	b10b11c5	c4c5	ch7
a13b13	b12b13	c4c5c6c7d4d5	ch8

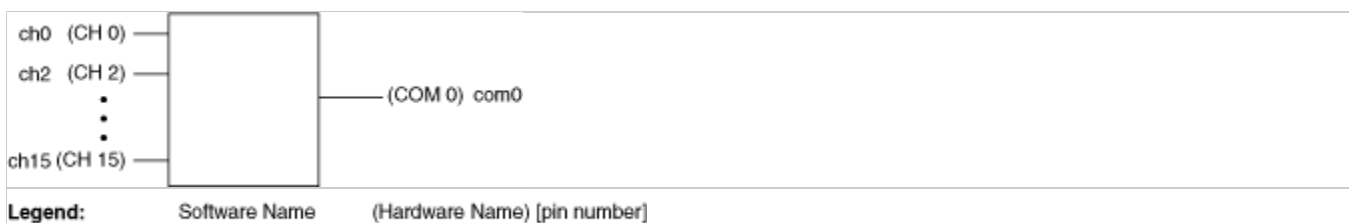
a14b14	b12b13c6	c6c7	ch9
a15b15	b14b15	ch0	com0
a1b1	b14b15c7	ch10	com1
a2b2	b2b3	ch11	d0d1
a3b3	b2b3c1	ch12	d1d2
a4b4	b4b5	ch13	d2d3
a5b5	b4b5c2	ch14	d2d3d4
a6b6	b6b7	ch15	d4d5
a7b7	b6b7c3	ch1	
a8b8	b8b9	ch2	
a9b9	b8b9c4	ch3	

Related concepts:

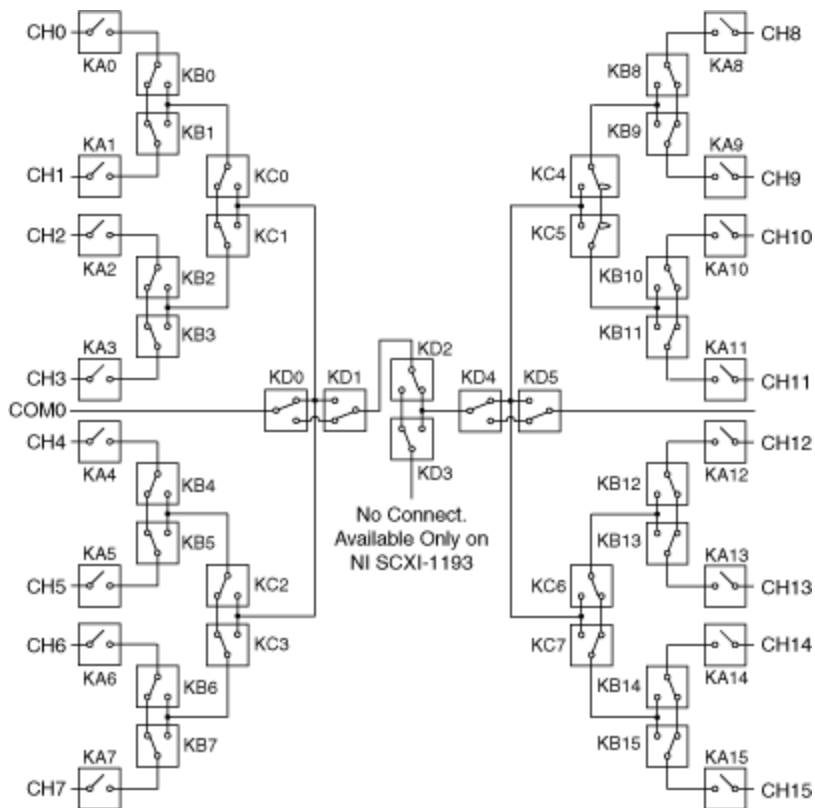
- [NI PXI/PXIe-2593 3×1 Multiplexers](#)
- [Dimensionally Flexible Sparse Matrix](#)
- [NI PXI/PXIe-2593 Hardware Diagram](#)
- [Operation Modes](#)
- [Scan Lists](#)

NI PXI/PXIe-2593 16×1 Multiplexer Topology

The following figure represents the NI PXI/PXIe-2593 (NI 2593) 16×1 multiplexer topology.



The following figure shows the reset position of the NI 2593 in the 16×1 multiplexer topology.



The NI 2593 in this topology contains 16 channels connected to a common channel. These channels are referred to as `ch<0..15>`, and the common channel is referred to as `com0`. You can connect any channel to `com0` in this topology.

Making a Connection

You can connect the channels of the NI 2593 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect channel 15 to common 0, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `ch15` and the **channel 2** parameter set to `com0`.

When scanning the NI 2593, a typical scan list entry could be `ch2->com0 ;`. This entry routes the signal from `ch2` to `com0`.

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)

NI PXI/PXIe-2593 3×1 Multiplexers

The NI PXI/PXIe-2593 can be configured as a 3×1 Multiplexer. Refer to the following text, table, and figures for configuration instructions, and use the following links for module-specific implementations of this configuration.

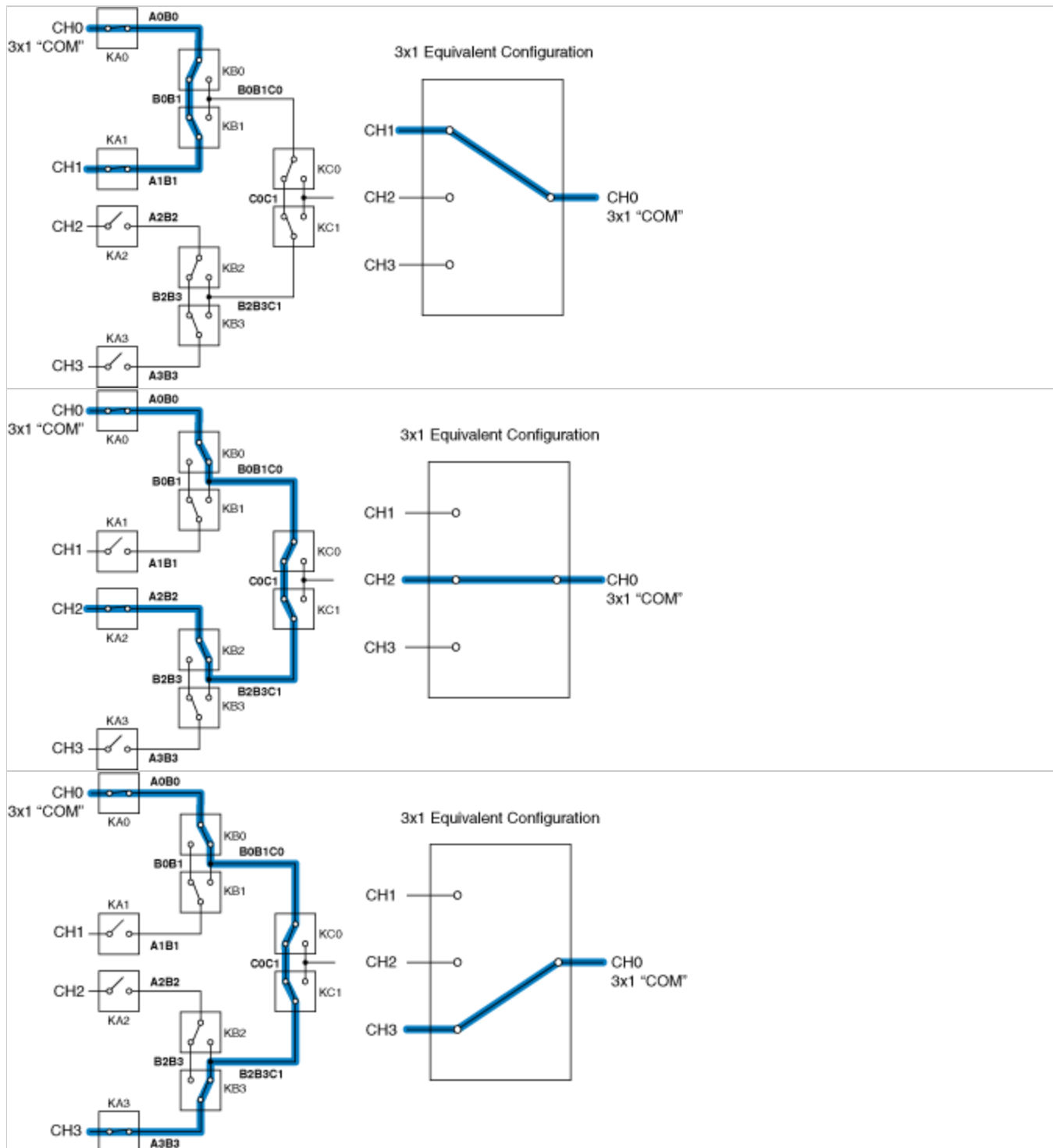
Each group of four channels (0:3, 4:7, 8:11, etc.) can be configured as independent, unterminated 3×1 multiplexers. Choose one channel as the "common," and route it to the other three channels.

For example, choosing CH0 as a 3×1 common, route CH1, CH2, and CH3 to it with the command options described in the following table and figure.

Route	Connect / Disconnect Calls Connection List	Individual Relay Control
CH0->CH1	CH0->A0B0, A0B0->B0B1, B0B1->A1B1, A1B1->CH1	Close KA0, KA1 Open KB0, KB1
CH0->CH2	CH0->A0B0, A0B0->B0B1C0, B0B1C0->C0C1, C0C1->B2B3C1, B2B3C1->A2B2, A2B2->CH2	Close KA0, KB0, KA2, KB2 Open KB1*, KB3*, KC0, KC1
CH0->CH3	CH0->A0B0, A0B0->B0B1C0, B0B1C0->C0C1, C0C1->B2B3C1, B2B3C1->A3B3, A3B3->CH3	Close KA0, KB0, KA3, KB3 Open KB1*, KB2* KC0, KC1

*Switch unused relays away from the signal path to improve high-frequency performance.

Refer to the following figure for an example of a 3×1 configuration using CH0-CH3 on the NI PXI/PXIe-2593.



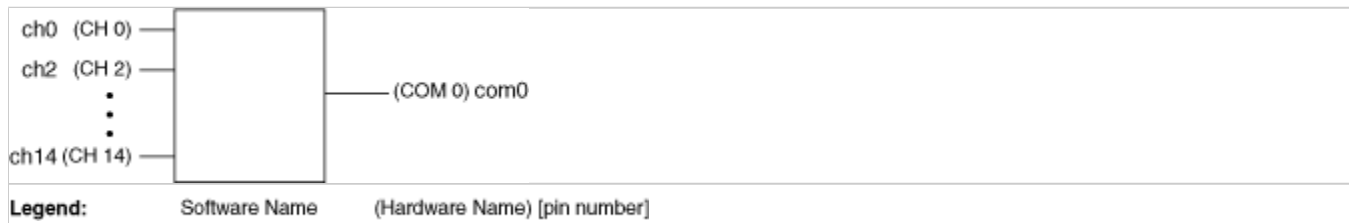
The NI PXI/PXIe-2593 can be configured as quad 3×1 multiplexers using its 16 channels. The COM terminals are unused.

Related concepts:

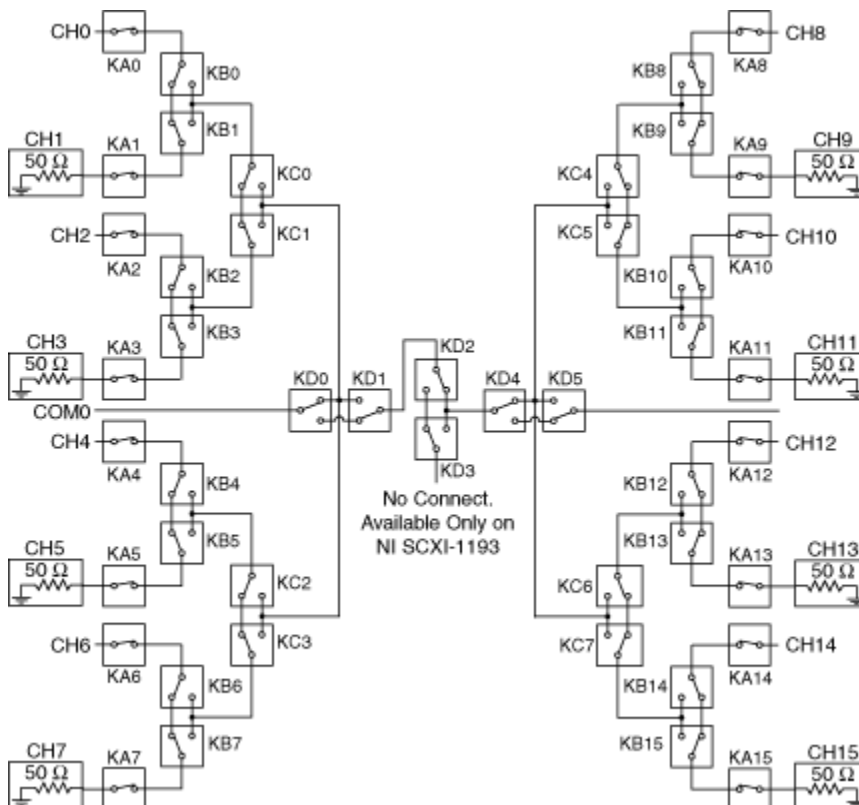
- [Multiplexer](#)

NI PXI/PXIe-2593 8×1 Terminated Multiplexer Topology

The following figure represents the NI PXI/PXIe-2593 (NI 2593) 8×1 terminated multiplexer topology.



The following figure shows the reset position of the NI 2593 in the 8×1 terminated multiplexer topology.



For proper termination, connect an external terminator, such as the NI 50 Ω MCX terminator (778831-01), to every odd channel. Any input channel not connected to the COM is routed back to its associated termination channel.

The NI 2593 in this topology contains 8 channels connected to a common channel. These channels are referred to as `ch<0..14>`, and the common channel is referred to as `com0`. You can connect any even input channel to `com0` in this topology.

Making a Connection

You can connect the channels of the NI 2593 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect channel 14 to common 0, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `ch14` and the **channel 2** parameter set to `com0`.

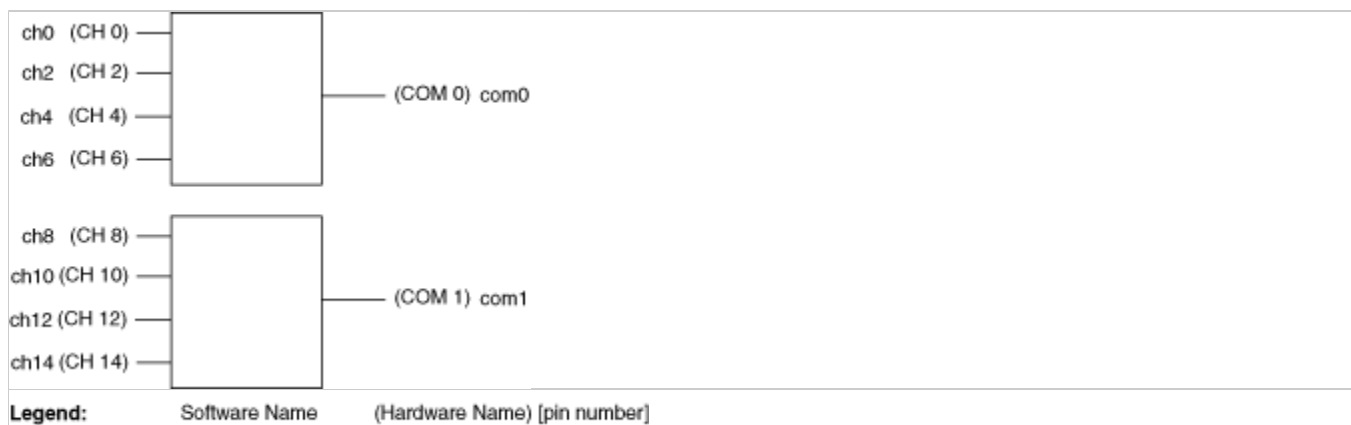
When scanning the NI 2593, a typical scan list entry could be `ch2->com0 ;`. This entry routes signal connected to `ch2` to `com0`.

Related concepts:

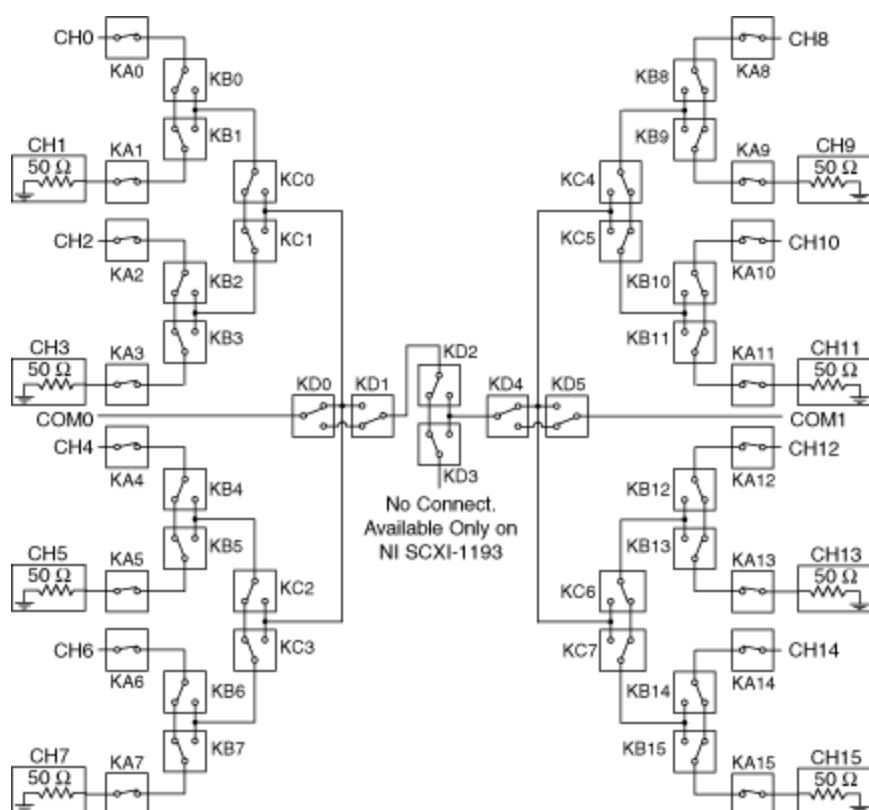
- [Multiplexer](#)
- [Operation Modes](#)

NI PXI/PXIe-2593 Dual 4×1 Terminated Multiplexer Topology

The following figure represents the NI PXI/PXIe-2593 (NI 2593) dual 4×1 terminated multiplexer topology.



The following figure shows the reset position of the NI 2593 in the dual 4×1 terminated multiplexer topology.



Making a Connection

For proper termination, connect an external terminator, such as the NI 50 Ω MCX terminator (778831-01), to every odd channel. Any input channel not connected to the COM is routed back to its associated termination channel.

The NI 2593 in this topology contains two banks of four input channels connected to a common channel. These input channels are the even channels from channel 0 to channel 14. The two common channels are referred to as com0 and com1. You can only connect to the common channel that is in the same bank. The banks are organized as follows:

Input Channels	Common Channel
ch0, ch2, ch4, ch6,	com0
ch8, ch10, ch12, ch14	com1

For example, you can connect ch6 to com0; however, you cannot connect ch6 to com1 in this topology.

You can connect the channels of the NI 2593 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect channel 14 to common 1, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `ch14` and the **channel 2** parameter set to `com1`.

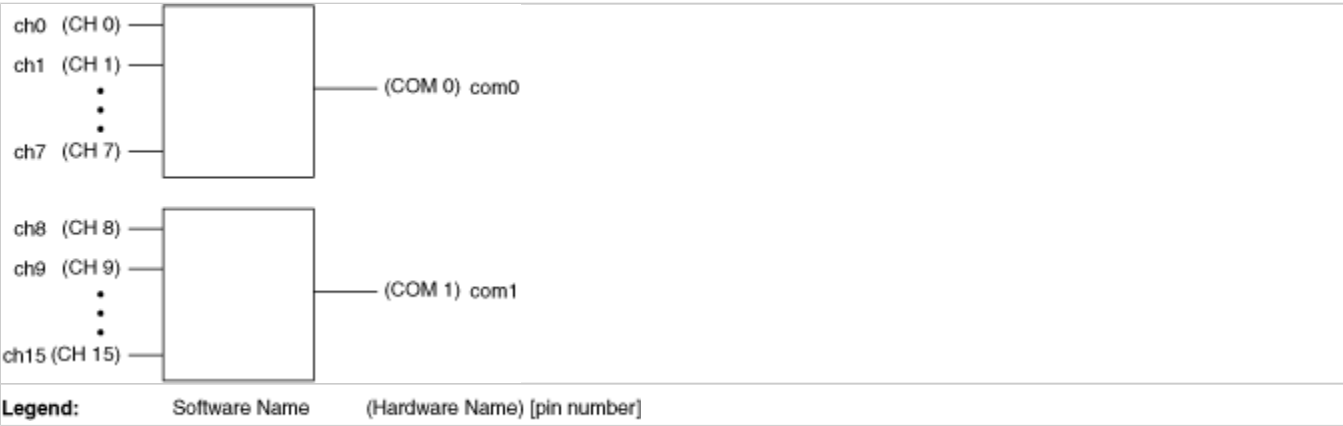
When scanning the NI 2593, a typical scan list entry could be `ch2->com0 ;`. This disconnects `ch2` from its termination and route it to `com0`.

Related concepts:

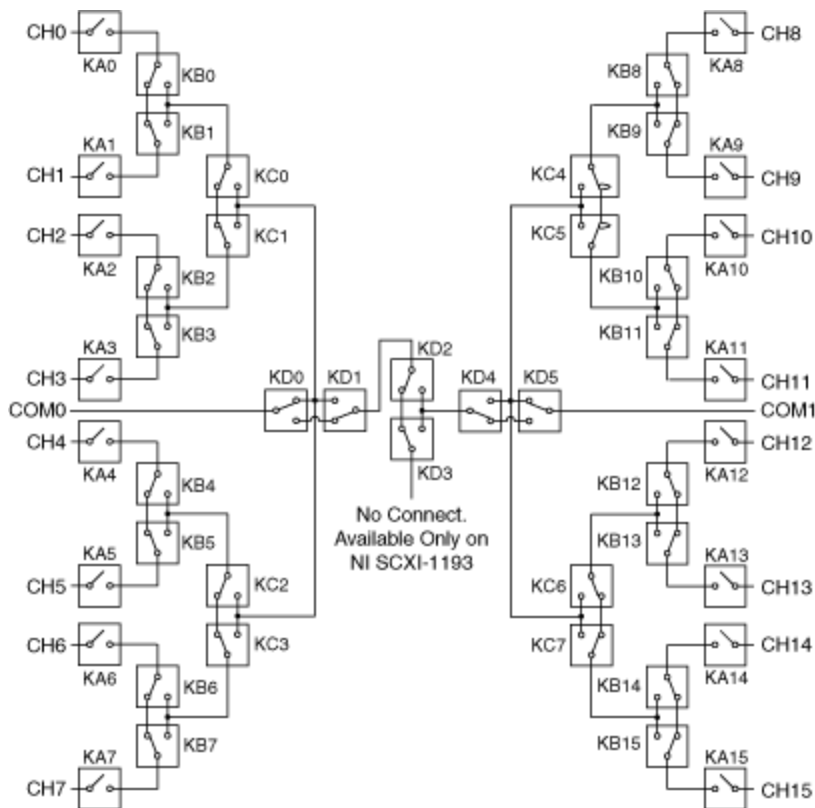
- [Multiplexer](#)
- [Operation Modes](#)

NI PXI/PXIe-2593 Dual 8×1 Multiplexer Topology

The following figure represents the NI PXI/PXIe-2593 (NI 2593) dual 8×1 multiplexer topology.



The following figure shows the reset position of the NI 2593 in the dual 8×1 multiplexer topology. The reset position is the power-on configuration of the module.



Making a Connection

The NI 2593 in this topology contains two banks of eight input channels connected to a common channel. These input channels are referred to as `ch<0..15>`, and the two common channels are referred to as `com0` and `com1`. You can only connect to the common channel that is in the same bank. The banks are organized as follows:

Input Channels	Common Channel
<code>ch0, ch1, ch2, ch3, ch4, ch5, ch6, ch7</code>	<code>com0</code>
<code>ch8, ch9, ch10, ch11, ch12, ch13, ch14, ch15</code>	<code>com1</code>

For example, you can connect `ch7` to `com0`; however, you cannot connect `ch7` to `com1` in this topology.

You can connect the channels of the NI 2593 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect channel 15 to common 1, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `ch15` and the **Channel 2** parameter set to `com1`.

When scanning the NI 2593, a typical scan list entry could be `ch2->com0 ;`. This entry routes the signal from ch2 to com0.

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)

NI PXI-2594/2595

The NI PXI-2594 and the NI PXI-2595 are multiplexer switch modules for the PXI bus designed to handle RF signals up to 2.5 GHz (NI PXI-2594) and 5 GHz (NI PXI-2595).

NI PXI-2594 Operation Modes

The following table lists the supported topology of the NI PXI-2594 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4×1 Multiplexer	2594/4x1 Mux(NISWITCH_TOPOLOGY_2594_4X1_MUX)	✓	✓

NI PXI-2595 Operation Modes

The following table lists the supported topology of the NI PXI-2595 and possible operation modes.

Topology	Software Name	Immediate	Scanning
4×1 Multiplexer	2595/4x1 Mux(NISWITCH_TOPOLOGY_2595_4X1_MUX)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2594/2595 4×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2594/2595 4 × 1 Multiplexer Topology

The following figure represents the NI PXI-2594/2595 in the 4×1 multiplexer topology.



Making a Connection

In this topology, you can connect channels by calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to connect `ch1` to `com`, call `niSwitch_Connect (vi, "ch1", "com")`. If you now want to connect `ch2` to `com`, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect(vi, "ch1", "com")
```

```
niSwitch_Connect(vi, "ch2", "com")
```



Note `niSwitch_Disconnect(vi, "ch1", "com")` does not operate the relay until the `niSwitch_Connect(vi, "ch2", "com")` is executed. One channel of the 4x1 multiplexer is always connected to the common channel.



Note For an initial connection, you do not need to disconnect the default channel (`ch0`) from `COM` after the module has been reset or a call to the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function has been made.

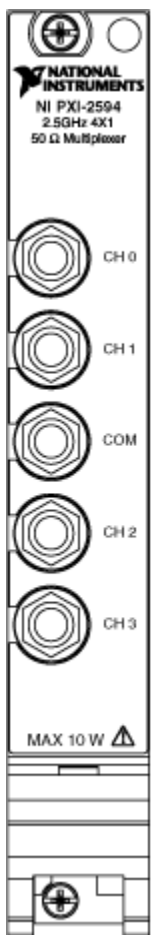
When scanning the NI PXI-2594/2595, a typical scan list entry could be `ch1->com;`. This entry routes the signal connected to CH1 to COM.

Related concepts:

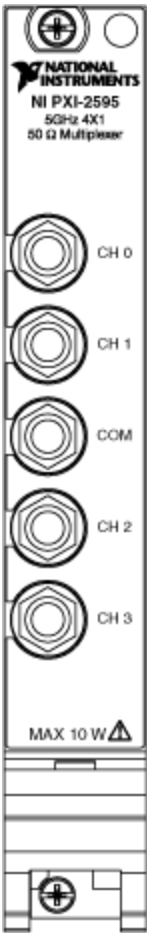
- [Operation Modes](#)
- [Scan Lists](#)

NI PXI-2594/2595 Front Panels

The following figure illustrates the NI PXI-2594 front panel.

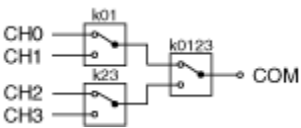


The following figure illustrates the NI PXI-2595 front panel.



NI PXI-2594/2595 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2594/2595.



NI PXI-2594/2595 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2594/2595.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A

Trigger Input	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2594/2595.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5

Scan Advanced Output	Software	Hardware
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2596

The NI PXI-2596 is a multiplexer switch module for the PXI bus designed to handle RF signals up to 26.5 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2596 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 6x1 Multiplexer	2596/Dual 6x1 Mux(NISWITCH_TOPOLOGY_2596_DUAL_6X1_MUX)	✓	✓

Related Information

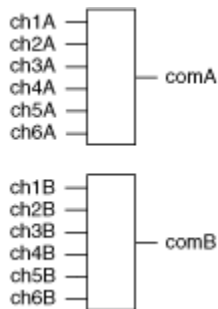
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI-2596 Dual 6×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2596 Dual 6×1 Multiplexer Topology

The following figure represents the NI PXI-2596 in the dual 6×1 multiplexer topology.



Making a Connection

In this topology, you can connect channels by calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To connect the CH_{*n*}x terminal to the COM_{*x*} terminal, disconnect the previously connected terminal from the COM_{*x*}.

For example, to connect ch1A to comA, call `niSwitch_Connect (vi, "ch1A", "comA")`. If you now want to connect ch2A to comA, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect (vi, "ch1A", "comA")
```

```
niSwitch_Connect (vi, "ch2A", "comA")
```



Note All channels are disconnected from COM when the NI PXI-2596 is in its power on state.

When scanning the NI PXI-2596, a typical scan list entry could be `ch1A->comA`; . This entry routes the signal connected to CH1A to COMA.

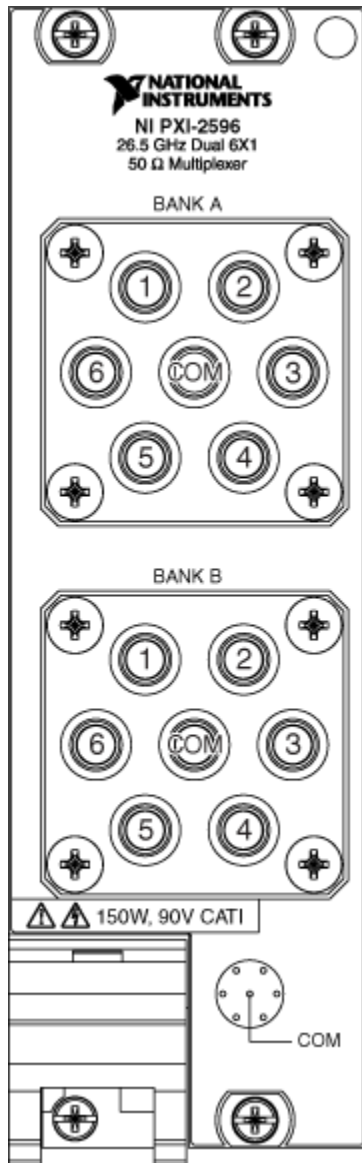
Related concepts:

- [Operation Modes](#)

- [Scan Lists](#)

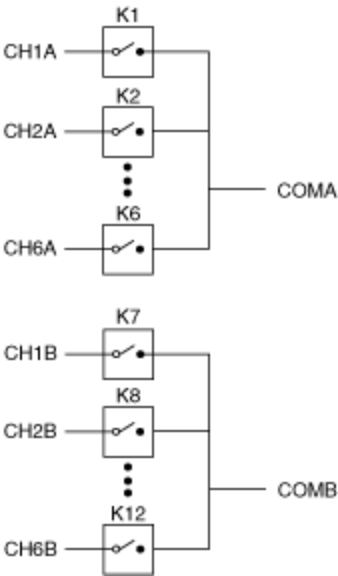
NI PXI-2596 Front Panel

The following figure illustrates the NI PXI-2596 front panel.



NI PXI-2596 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2596.



NI PXI-2596 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2596.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger

Trigger Input	Software	Hardware
		line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2596.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2597

The NI PXI-2597 is a terminated multiplexer switch module for the PXI bus designed to handle RF signals up to 26.5 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2597 and possible operation modes.

Topology	Software Name	Immediate	Scanning
6x1 Terminated Multiplexer	2597/6x1 Terminated Mux(NISWITCH_TOPOLOGY_2597_6X1_TERMINATED_MUX)	✓	✓

Related Information

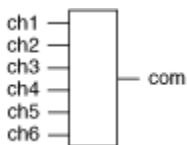
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI-2597 6×1 Terminated Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2597 6×1 Terminated Multiplexer Topology

The following figure represents the NI PXI-2597 in the 6×1 terminated multiplexer topology.



Caution The terminators on the NI PXI-2597 are rated for 1 W average power at 25 °C, with power on all terminators not to exceed 3 W. Terminators cannot withstand the full rated power of the NI PXI-2597.

Making a Connection

In this topology, you can connect channels by calling the niSwitch Connect Channels VI

or the `niSwitch_Connect` function.

To connect the CHx terminal to the COM terminal, disconnect the previously connected terminal from the COM.

For example, to connect ch1 to com, call `niSwitch_Connect (vi, "ch1", "com")`. If you now want to connect ch2 to com, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect (vi, "ch1", "com")
```

```
niSwitch_Connect (vi, "ch2", "com")
```



Note Any input channel not connected to COM is connected to its associated 50 Ω terminator.



Note All channels are disconnected from COM when the NI PXI-2597 is in its power on state.

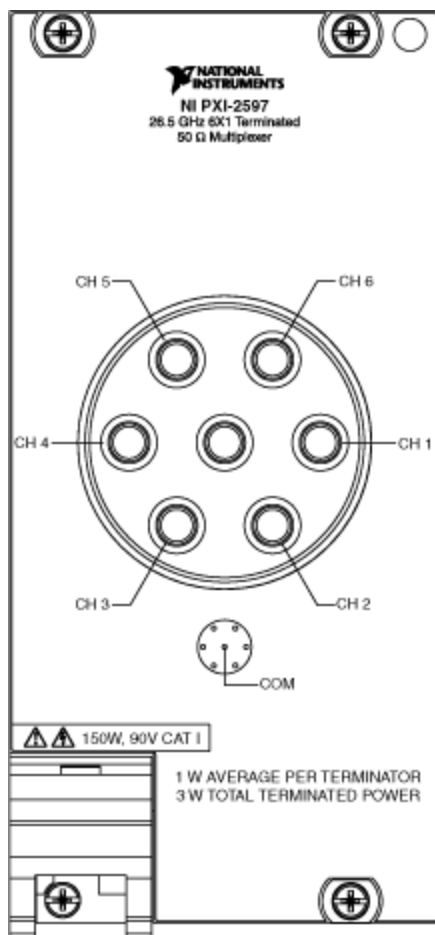
When scanning the NI PXI-2597, a typical scan list entry could be `ch2->com;`. This entry routes signal connected to ch2 to com.

Related concepts:

- [Operation Modes](#)

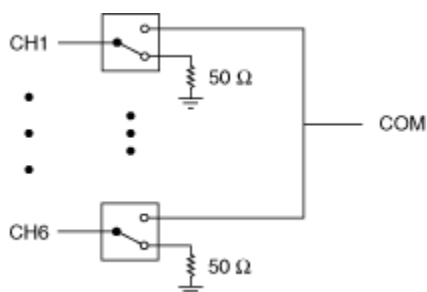
NI PXI-2597 Front Panel

The following figure illustrates the NI PXI-2597 front panel.



NI PXI-2597 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2597.



NI PXI-2597 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2597.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2597.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2598

The NI PXI-2598 is an 2-channel, transfer switch module for the PXI platform designed to handle RF signals up to 26.5 GHz. The NI PXI-2598 is composed of transfer switch relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2598 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual Transfer	2598/Dual Transfer(NISWITCH_TOPOLOGY_2598_DUAL_TRANSFER)	✓	✓

Related Information

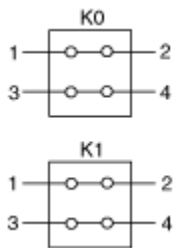
- Integration and System Considerations

Related concepts:

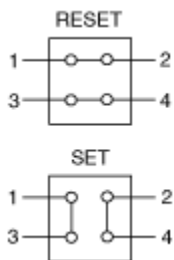
- [Transfer Switches](#)
- [RF Switching Considerations](#)
- [Operation Modes](#)
- [Integration and System Considerations](#)

NI PXI-2598 Dual Transfer Switch Topology

The following figures represents the NI PXI-2598 in the dual transfer switch topology.



The following figures show the two states of each transfer switch, reset and set.



Application

The dual transfer switch topology of the NI PXI-2598 enables customers to insert and remove components in a high-frequency signal path. To insert the DUT, configure the transfer switch in its reset state. To remove the DUT, configure the transfer switch in its set state.

Making a Connection

You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To set the transfer switch, disconnect the `nc` terminal from `com`, and connect `no` to `com`.

For example, to set the transfer switch K0, use the following code:

```
niSwitch_Disconnect(vi, "nc0", "com0")
```

```
niSwitch_Connect(vi, "no0", "com0")
```



Note To connect no to com you do not need to disconnect nc from com after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the niSwitch_DisconnectAll function has been made.



Note niSwitch_Disconnect(vi, "nc0", "com0") does not operate the relay until niSwitch_Connect(vi, "no0", "com0") is executed. Similarly, niSwitch_Disconnect(vi, "no0", "com0") does not operate the relay until niSwitch_Connect(vi, "nc0", "com0") is executed.

To reset the transfer switch, disconnect the no terminal from com, and connect nc to com.

For example, to reset the transfer switch K0, use the following code:

```
niSwitch_Disconnect(vi, "no0", "com0")
```

```
niSwitch_Connect(vi, "nc0", "com0")
```

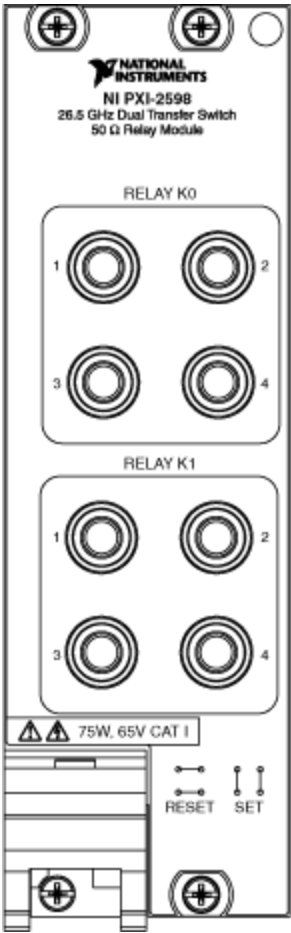
When scanning the NI PXI-2598, a typical scan list entry could be nc0->com0;. This entry resets transfer switch K0.

Related concepts:

- [Transfer Switches](#)
- [Operation Modes](#)
- [Scan Lists](#)

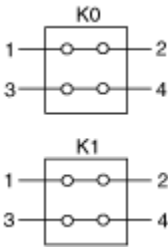
NI PXI-2598 Front Panel

The following figure illustrates the NI PXI-2598 front panel.



NI PXI-2598 Hardware Diagram

The following figures show the hardware diagram for the NI PXI-2598.



NI PXI-2598 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2598.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2598.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2599

The NI PXI-2599 is an 2-channel, general-purpose switch module for the PXI platform designed to handle RF signals up to 26.5 GHz. The NI PXI-2599 is composed of 2-SPDT relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2599 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-SPDT	2599/2-SPDT(NISWITCH_TOPOLOGY_2599_2_SPDT)	✓	✓

Related Information

- Integration and System Considerations

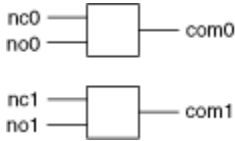
Related concepts:

- [General-Purpose Topologies](#)
- [RF Switching Considerations](#)
- [NI PXI-2599 2-SPDT Topology](#)
- [Operation Modes](#)

- [Integration and System Considerations](#)

NI PXI-2599 2-SPDT Topology

The following figure represents the NI PXI-2599 in the 2-SPDT general-purpose topology.



Making a Connection

You can control the channels using the niSwitch Connect Channels VI or the `niSwitch_Connect` function.

For example, to connect the NO terminal of channel 1 to the COM terminal of channel 1, call `niSwitch_Connect (vi, "no1", "com1")`. If you now want to connect NC1 to COM1, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect(vi, "no1", "com1")
```

```
niSwitch_Connect(vi, "nc1", "com1")
```



Note `niSwitch_Disconnect(vi, "no1", "com1")` does not operate the relay until the `niSwitch_Connect(vi, "nc1", "com1")` is executed.



Note For an initial connection, you do not need to disconnect the default channel (ncx) from COM after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function has been made.

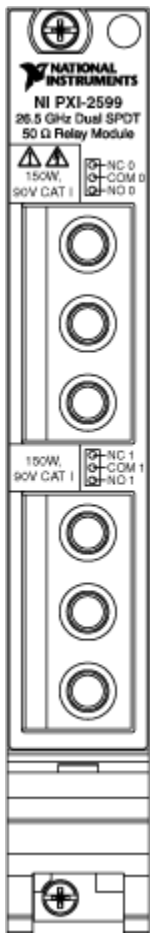
When scanning the NI PXI-2599, a typical scan list entry could be `nc1->com1;`. This entry routes the signal connected to NC1 to COM1.

Related concepts:

- [General-Purpose Topologies](#)
- [Operation Modes](#)
- [Scan Lists](#)

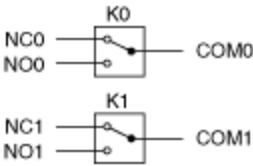
NI PXI-2599 Front Panel

The following figure illustrates the NI PXI-2599 front panel.



NI PXI-2599 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2599.



NI PXI-2599 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2599.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2599.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2720

The NI PXI-2720 is a programmable resistor module for the PXI platform. The NI PXI-2720 is composed of reed relays in parallel with discrete resistors. The NI PXI-2720 has 10 channels that can nominally switch from 0 to 255 Ω in 1 Ω steps.



Note NI has created a set of reference VIs that you can use to specify a desired resistance value to output or RTD temperature to simulate. Using the reference VIs is the simplest way to interact with the NI PXI-2720 programmable resistor module. It is also possible to program using direct calls in NI-SWITCH, NI-DAQmx, NI Switch Executive, or an IVI switch driver. For more information, including a detailed overview of the NI PXI-2720 architecture, please visit ni.com/info and enter the Info Code 272xOverview.



Note Switching inductive loads, such as motors and solenoids, can produce high-voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation

and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2720 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Ten 8-bit channels	2720/ Independent(NISWITCH_TOPOLOGY_2720_INDEPENDENT)	✓	✓

Related Information

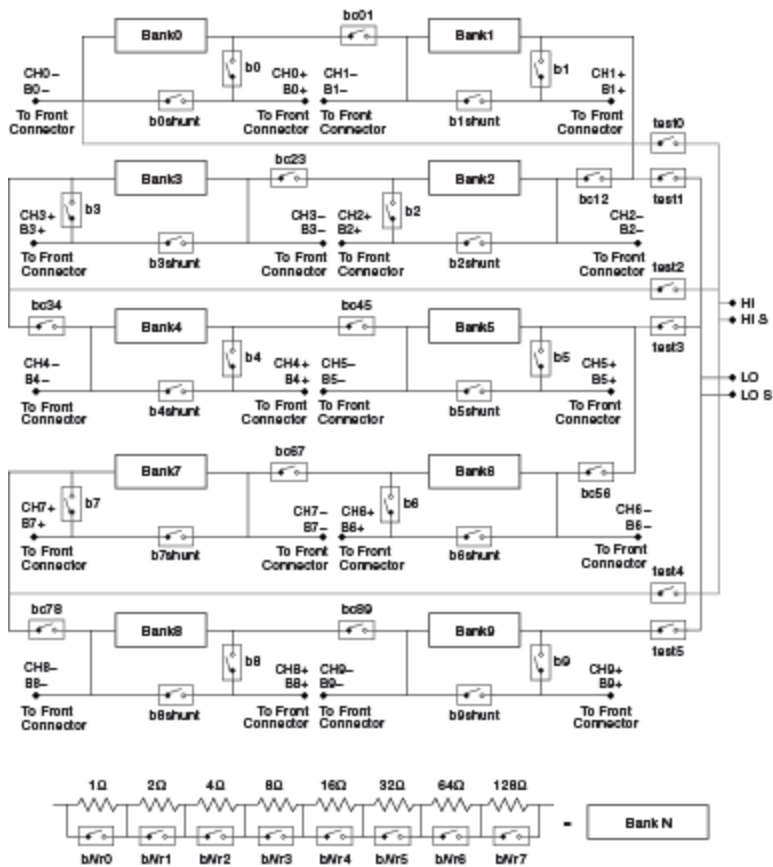
- Integration and System Considerations

Related concepts:

- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2720 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI-2720 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2720.



Note Resistance values are nominal. Please see the NI PXI-2720 Specifications for resistor values and accuracy information

The following table lists relay names for the NI PXI-2720.

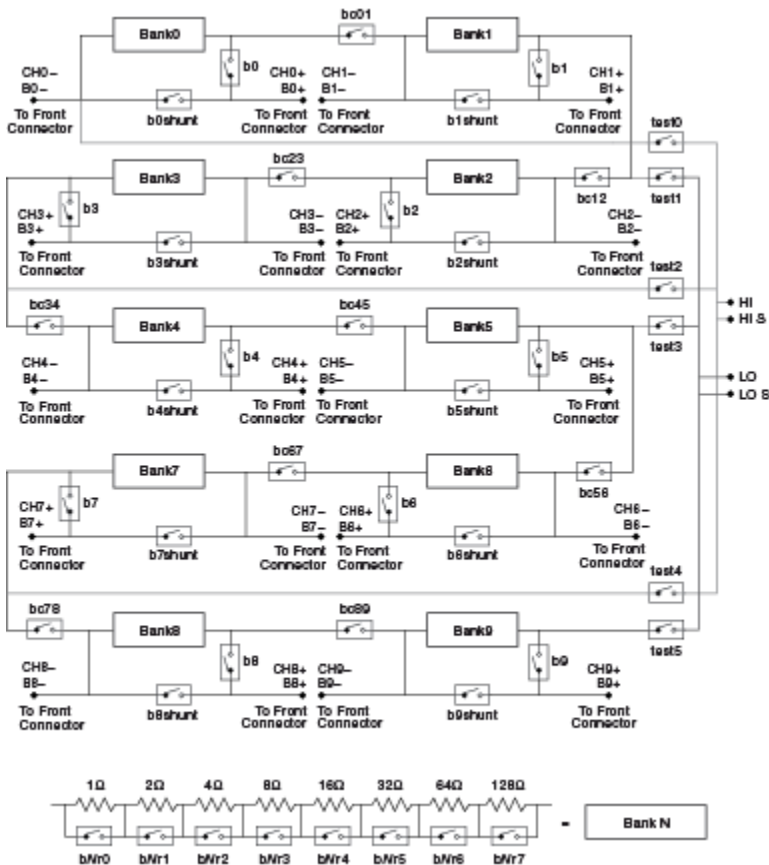
Relays
kb0r0, kb0r1...kb0r7
kb1r0, kb1r1...kb1r7
kb2r0, kb2r1...kb2r7
kb3r0, kb3r1...kb3r7
kb4r0, kb4r1...kb4r7
kb5r0, kb5r1...kb5r7
kb6r0, kb6r1...kb6r7
kb7r0, kb7r1...kb7r7
kb8r0, kb8r1...kb8r7
kb9r0, kb9r1...kb9r7
kb0...kb9
kb0shunt...kb9shunt
kbc01, kbc12...kbc89

Relays

ktest0, ktest1...ktest5

NI PXI-2720 Independent Topology

The following figure represents the NI PXI-2720 in the independent topology.



Note Bank connect relays allow adjacent banks or channels to connect together internally. For example, you can connect two or more adjacent channels together to create a potentiometer, a voltage divider, or a multi-segment resistor chain.

Making a Connection

Each 8-bit channel is composed of one bank on the NI PXI-2720. For example, ch0 is composed of bank 0 and ch1 is composed of bank 1. NI has created a set of reference VIs that will programmatically open and close relays based on a user-specified resistance value or RTD temperature to simulate. To access these reference VIs, visit

ni.com/info and enter the Info Code 272xOverview. NI recommends using this set of reference VIs for the easiest programming experience. If not using these reference VIs, NI recommends using the low-level relay control VIs or functions instead of the connect channel VIs or functions. The DAQmx Relay API supports closing multiple relays in a single driver call, which is faster than the channel API.

When a bank relay is closed, the corresponding resistor is placed in parallel with the low resistance of the relay, which nominally equates to a zero Ω shunt. Closing any of the 8 bank relays in a given bank decreases the resistance of that bank.

For example, the following procedure uses the NI-SWITCH Relay API to short across the largest resistor in bank 0 and join bank 0 and bank 1 in series.

1. Close `b0r7` by calling the niSwitch Relay Control VI with the inputs of `b0r7` and `close`.
2. Close `bc01` by calling the niSwitch Relay Control VI with the inputs of `bc01` and `close`.

You can perform the same operation using the NI-SWITCH Channel API, as shown below.

1. Connect `b0->b0r7` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b0r7`.
2. Connect `b0->b1` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b1`.

Each bank is initially in a high impedance (open) state across the bank terminals. To enable the desired output channel you must first connect the bank relay, `bN`.

Each bank includes a shunt relay that completely bypasses the bank's string of 8 series relays. Closing the shunt relay `bN->bNshunt`, for example, `b0->b0shunt` or low-level `kb0shunt`, results in a low resistance across the bank, 0 Ω nominally. This allows the NI PXI-2720 module to pass signals with minimal attenuation.



Note It is not necessary to close all 8 bank relays and the shunt relay. Configuring multiple banks this way can exceed the power budget of the NI PXI-2720.

The 4-pin front panel test connector can connect to any adjacent pair of even-odd banks, allowing resistance measurements, or voltage measurements, across those two banks, for example b0 to b1, b2 to b3, b4 to b5. On 16-bit NI 272x modules, this allows channel resistance measurements using a DMM with Offset Compensated Ohms (such as the NI PXI-4070, NI PXI-4071, or NI PXI-4072). To connect a pair of banks to the test leads, close the appropriate test relays using the command `testN->testout`. For example, to measure the resistance across banks 0 and 1, call `test0->testout` and `test1->testout`. For banks 2 and 3, call `test1->testout` and `test2->testout`. Refer to the device's hardware diagram for valid test relay connections.



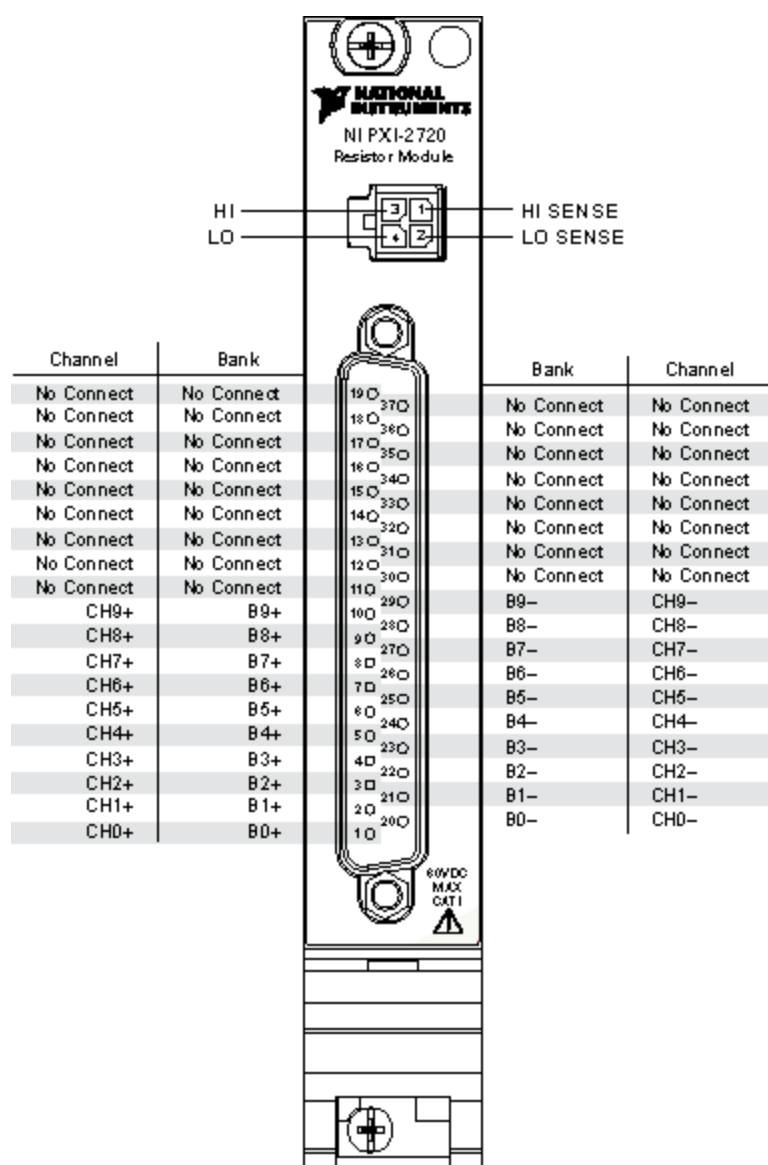
Note Closing multiple pairs of test relays introduces low impedance paths between banks. NI recommends disconnecting the 37-pin DSUB connector if these low impedance paths would damage your device under test or cause the current specifications of the NI PXIe-2727 to be exceeded.



Note Each channel on the NI PXI-2720 exhibits an "open" when initialized, reset, and first powered on. The `niSwitch Reset` and `niSwitch Disconnect All Channels VIs` or `niSwitch_reset` and `niSwitch_DisconnectAll` functions will disconnect all relays, resulting in an open circuit on each channel.

Pinout

The following figure identifies the pins for the NI PXI-2720.



Note Do not connect to "No Connect" pins.

NI PXI-2720 Relay Replacement

The NI PXI-2720 uses reed relays.



Note The NI PXI-2720 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
All Relays	Coto	9117-0001

Relay Kit	Part Number
National Instruments (10 relays)	781451-10

Complete the following sets of steps to disassemble your module, replace a failed relay, and reassemble your module.

Disassemble the Module

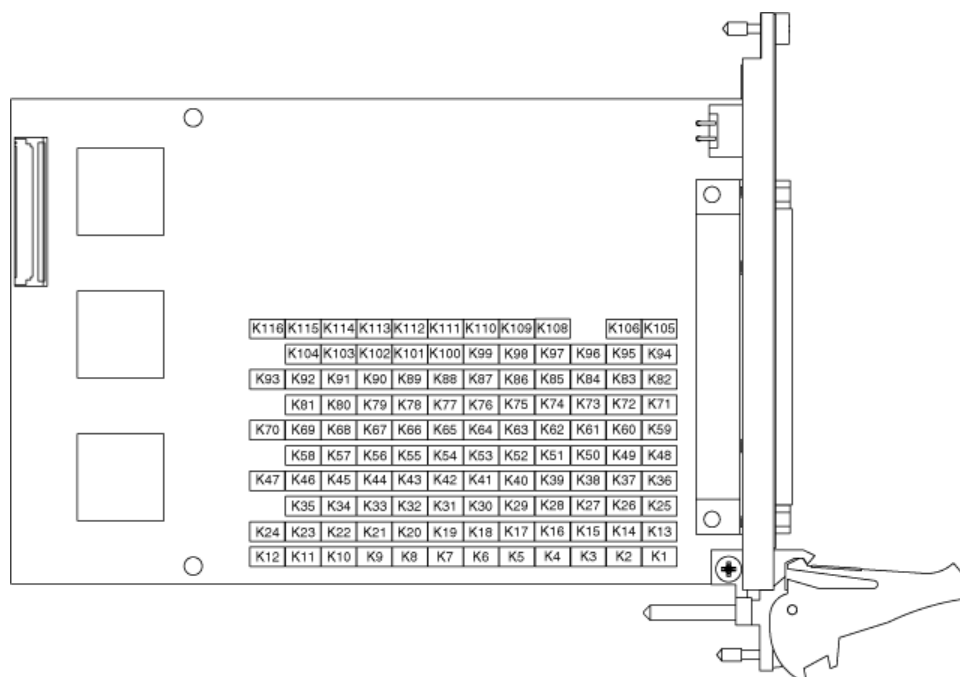
1. Ground yourself using a grounding strap or a ground connected to the PXI chassis.



Note Properly grounding yourself prevents damage to the module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

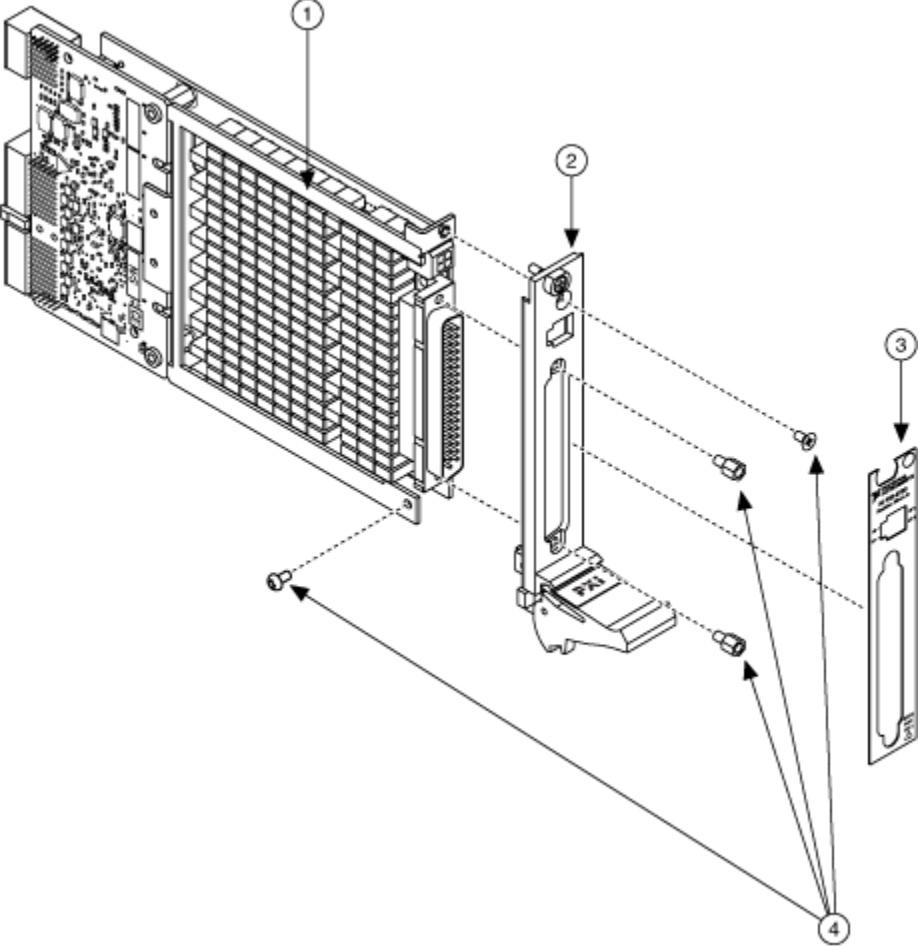
NI PXI 2720 Relay Map



RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb0shunt	K1	kb2r2	K30	kb5shunt	K59
kb0	K2	kb2r3	K31	kb5	K60
kb0c01	K3	kb2r4	K32	kb5c56	K61
ktest0	K4	kb2r5	K33	ktest3	K62
kb0r0	K5	kb2r6	K34	kb5r0	K63
kb0r1	K6	kb2r7	K35	kb5r1	K64
kb0r2	K7	kb3shunt	K36	kb5r2	K65
kb0r3	K8	kb3	K37	kb5r3	K66
kb0r4	K9	kb3c34	K38	kb5r4	K67
kb0r5	K10	ktest2	K39	kb5r5	K68
kb0r6	K11	kb3r0	K40	kb5r6	K69
kb0r7	K12	kb3r1	K41	kb5r7	K70
kb1shunt	K13	kb3r2	K42	kb6shunt	K71
kb1	K14	kb3r3	K43	kb6	K72
kb1c12	K15	kb3r4	K44	kb6c67	K73
test1	K16	kb3r5	K45	kb6r0	K74
kb1r0	K17	kb3r6	K46	kb6r1	K75
kb1r1	K18	kb3r7	K47	kb6r2	K76
kb1r2	K19	kb4shunt	K48	kb6r3	K77
kb1r3	K20	kb4	K49	kb6r4	K78
kb1r4	K21	kb4c45	K50	kb6r5	K79
kb1r5	K22	kb4r0	K51	kb6r7	K80
kb1r6	K23	kb4r1	K52	kb6r6	K80
kb1r7	K24	kb4r2	K53	kb7shunt	K82
kb2shunt	K25	kb4r3	K54	kb7	K83
kb2	K26	kb4r4	K55	kb7c78	K84
kb2c23	K27	kb4r5	K56	test4	K85

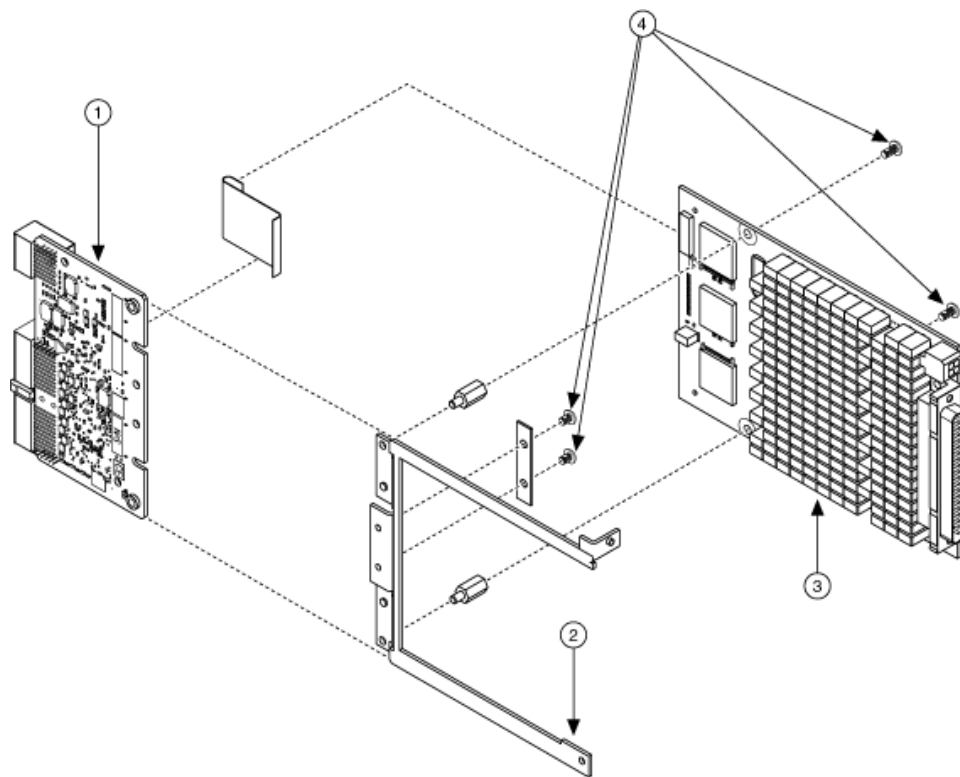
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb2r0	K28	kb4r6	K57	kb7r0	K86
kb2r1	K29	kb4r7	K58	kb7r1	K87

3. Remove the front panel, as shown in the following image.



1	Bracket
2	Front Panel
3	Front Panel Overlay
4	Screws

4. Remove the bracket, as shown in the following image.



1	CA3 Digital Back End
2	Bracket
3	Daughter Card
4	Screws

Replace the Relay

The NI PXI-2720 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being

reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2720 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2720. NI recommends using the low-level relay control API instead of hardware triggers. Hardware triggers are supported but because of the nature of the independent topology, if hardware triggers are used, "no action" mode should be used. Otherwise, each scan list entry must incorporate the state for all channels.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2720.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2722

The NI PXI-2722 is a programmable resistor module for the PXI platform. The NI PXI-2722 is composed of reed relays in parallel with discrete resistors. The NI PXI-2722 has five channels that can nominally switch from 0 to 16,383 Ω in 0.25 Ω steps.



Note NI has created a set of reference VIs that you can use to specify a desired resistance value to output or RTD temperature to simulate. Using the reference VIs is the simplest way to interact with the NI PXI-2722 programmable resistor module. It is also possible to program using direct calls in NI-SWITCH, NI-DAQmx, NI Switch Executive, or an IVI switch driver. For more information, including a detailed overview of the NI PXI-2722 architecture, please visit ni.com/info and enter the Info Code 272xOverview.



Note Switching inductive loads, such as motors and solenoids, can produce high-voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXI-2722 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Five 16-bit channels	2722/ Independent(NISWITCH_TOPOLOGY_2722_INDEPENDENT)	✓	✓

Related Information

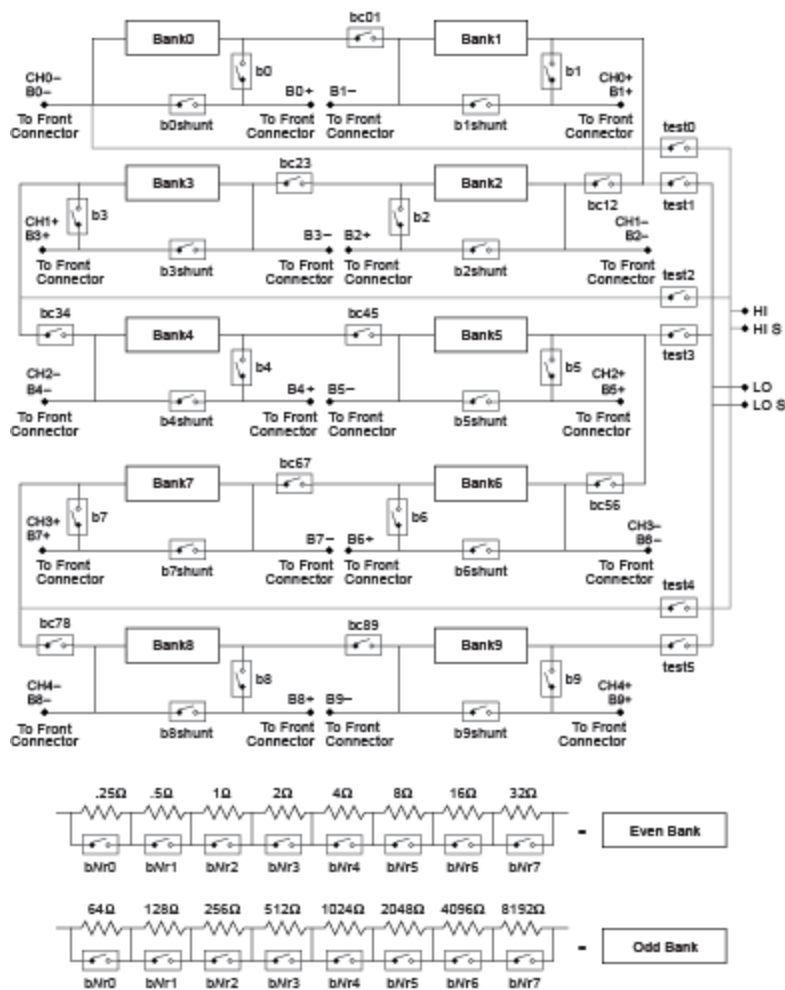
- Integration and System Considerations

Related concepts:

- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXI-2722 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXI-2722 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2722.



Note Resistance values are nominal. Please see the NI PXI-2722 Specifications for resistor values and accuracy information

The following table lists relay names for the NI PXI-2722.

Relays
kb0r0, kb0r1...kb0r7
kb1r0, kb1r1...kb1r7
kb2r0, kb2r1...kb2r7
kb3r0, kb3r1...kb3r7
kb4r0, kb4r1...kb4r7
kb5r0, kb5r1...kb5r7
kb6r0, kb6r1...kb6r7
kb7r0, kb7r1...kb7r7
kb8r0, kb8r1...kb8r7
kb9r0, kb9r1...kb9r7

Relays

kb0...kb9

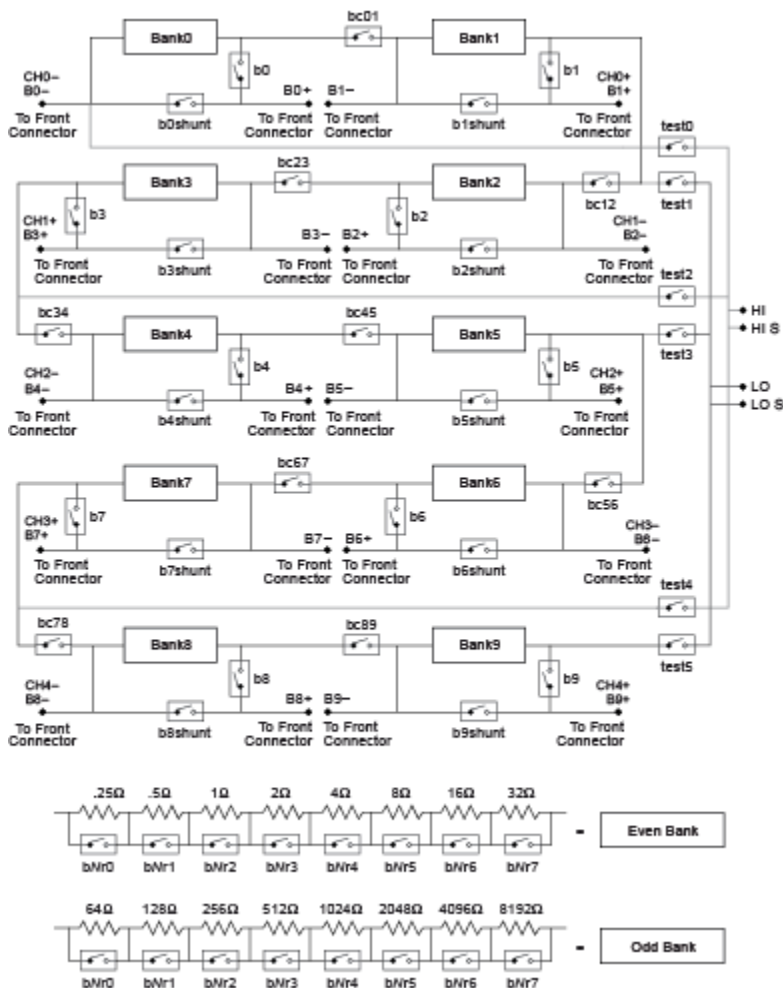
kb0shunt...kb9shunt

kbc01, kbc12...kbc89

ktest0, ktest1...ktest5

NI PXI-2722 Independent Topology

The following figure represents the NI PXI-2722 in the independent topology.



Note Bank connect relays allow adjacent banks or channels to connect together internally. For example, you can connect two or more adjacent channels together to create a potentiometer, a voltage divider, or a multi-segment resistor chain.

Making a Connection

Each 16-bit channel is composed of two adjacent 8-bit banks on the NI PXI-2722. For example, ch0 is composed of banks 0 and 1 and ch1 is composed of banks 2 and 3. NI has created a set of reference VIs that will programmatically open and close relays based on a user-specified resistance value or RTD temperature to simulate. To access these reference VIs, visit ni.com/info and enter the Info Code 272xOverview. NI recommends using this set of reference VIs for the easiest programming experience. If not using these reference VIs, NI recommends using the low-level relay control VIs or functions instead of the connect channel VIs or functions. The DAQmx Relay API supports closing multiple relays in a single driver call, which is faster than the channel API.

When a bank relay is closed, the corresponding resistor is placed in parallel with the low resistance of the relay, which nominally equates to a zero Ω shunt. Closing any of the 8 bank relays in a given bank decreases the resistance of that bank.

For example, the following procedure uses the NI-SWITCH Relay API to short across the largest resistor in bank 0 and join bank 0 and bank 1 in series.

1. Close `b0r7` by calling the niSwitch Relay Control VI with the inputs of `b0r7` and `close`.
2. Close `bc01` by calling the niSwitch Relay Control VI with the inputs of `bc01` and `close`.

You can perform the same operation using the NI-SWITCH Channel API, as shown below.

1. Connect `b0->b0r7` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b0r7`.
2. Connect `b0->b1` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b1`.

Each bank is initially in a high impedance (open) state across the bank terminals. To enable the desired output channel you must first connect the bank relay, `bN`.

Each bank includes a shunt relay that completely bypasses the bank's string of 8 series relays. Closing the shunt relay `bN->bNshunt`, for example, `b0->b0shunt` or low-level

`kb0shunt`, results in a low resistance across the bank, 0 Ω nominally. This allows the NI PXI-2722 module to pass signals with minimal attenuation. On 16-bit modules (NI PXI-2722 and NI PXIe-2727), closing the upper bank's shunt relay reduces the resistance when outputting values less than 64 Ω .



Note It is not necessary to close all 8 bank relays and the shunt relay. Configuring multiple banks this way can exceed the power budget of the NI PXI-2722.

The 4-pin front panel test connector can connect to any adjacent pair of even-odd banks, allowing resistance measurements, or voltage measurements, across those two banks, for example `b0` to `b1`, `b2` to `b3`, `b4` to `b5`. On 16-bit NI 272x modules, this allows channel resistance measurements using a DMM with Offset Compensated Ohms (such as the NI PXI-4070, NI PXI-4071, or NI PXI-4072). To connect a pair of banks to the test leads, close the appropriate test relays using the command `testN->testout`. For example, to measure the resistance across banks 0 and 1, call `test0->testout` and `test1->testout`. For banks 2 and 3, call `test1->testout` and `test2->testout`. Refer to the device's hardware diagram for valid test relay connections.



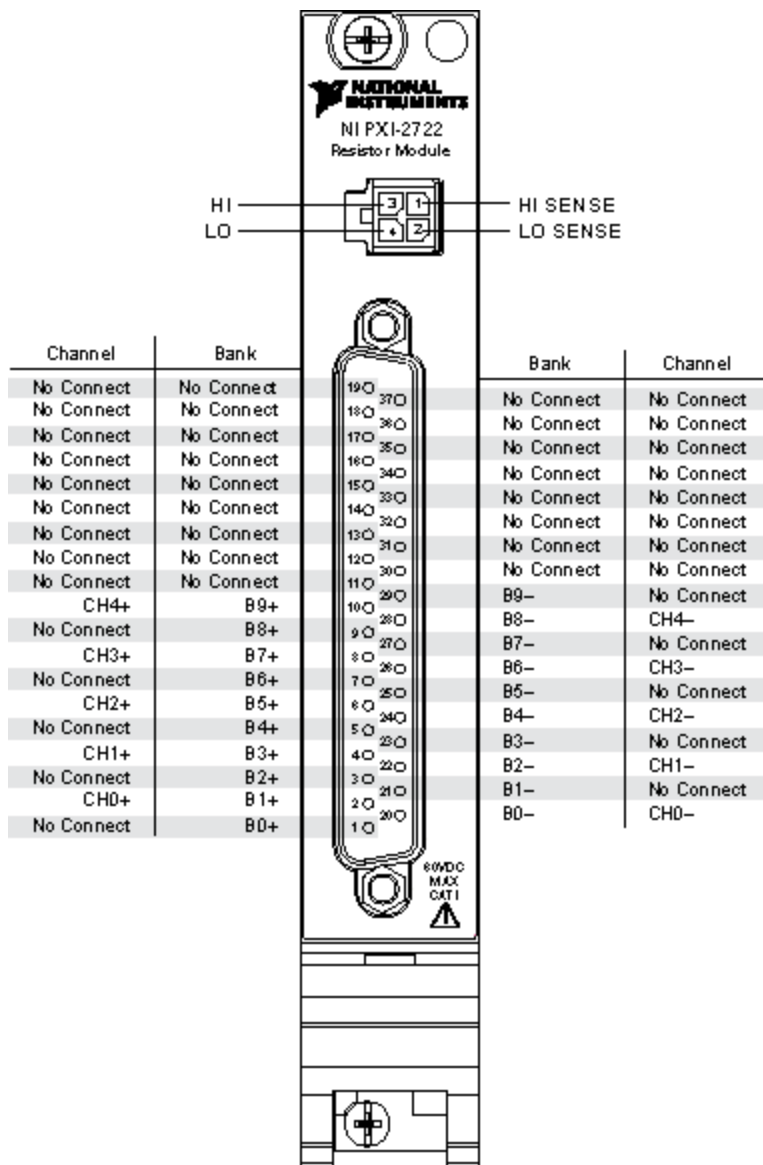
Note Closing multiple pairs of test relays introduces low impedance paths between banks. NI recommends disconnecting the 37-pin DSUB connector if these low impedance paths would damage your device under test or cause the current specifications of the NI PXIe-2727 to be exceeded.



Note Each channel on the NI PXI-2722 exhibits an "open" when initialized, reset, and first powered on. The `niSwitch Reset` and `niSwitch Disconnect All Channels VIs` or `niSwitch_reset` and `niSwitch_DisconnectAll` functions will disconnect all relays, resulting in an open circuit on each channel.

Pinout

The following figure identifies the pins for the NI PXI-2722.



Note Do not connect to "No Connect" pins.

NI PXI-2722 Relay Replacement

The NI PXI-2722 uses reed relays.



Note The NI PXI-2722 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
All Relays	Coto	9117-0001

Relay Kit	Part Number
National Instruments (10 relays)	781451-10

Complete the following sets of steps to disassemble the module, replace a failed relay, and reassemble your module.

Disassemble the Module

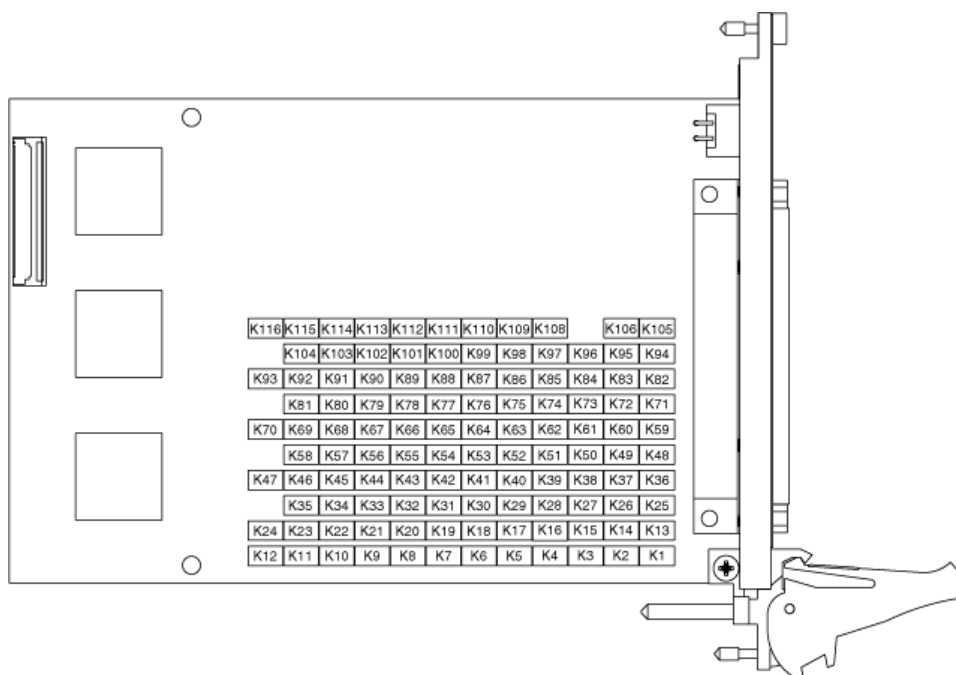
1. Ground yourself using a grounding strap or a ground connected to the PXI chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

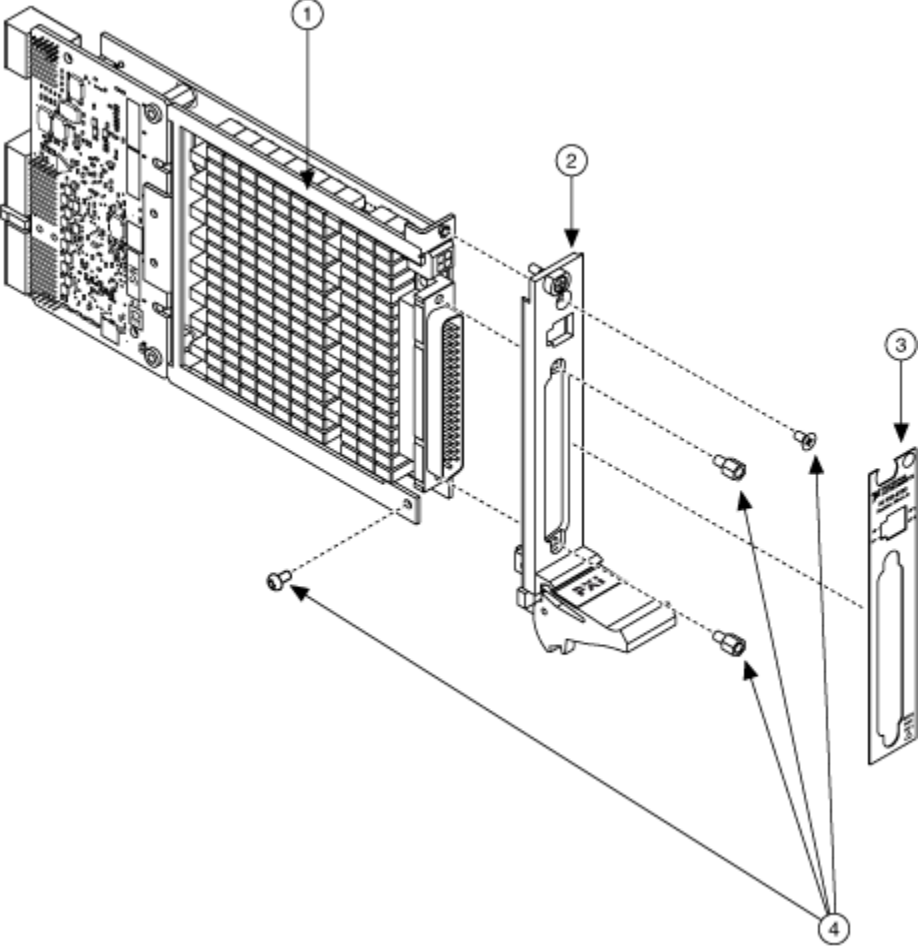
NI PXI 2722 Relay Map



RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb0shunt	K1	kb2r2	K30	kb5shunt	K59
kb0	K2	kb2r3	K31	kb5	K60
kb0c01	K3	kb2r4	K32	kb5c56	K61
test0	K4	kb2r5	K33	test3	K62
kb0r0	K5	kb2r6	K34	kb5r0	K63
kb0r1	K6	kb2r7	K35	kb5r1	K64
kb0r2	K7	kb3shunt	K36	kb5r2	K65
kb0r3	K8	kb3	K37	kb5r3	K66
kb0r4	K9	kb3c34	K38	kb5r4	K67
kb0r5	K10	test2	K39	kb5r5	K68
kb0r6	K11	kb3r0	K40	kb5r6	K69
kb0r7	K12	kb3r1	K41	kb5r7	K70
kb1shunt	K13	kb3r2	K42	kb6shunt	K71
kb1	K14	kb3r3	K43	kb6	K72
kb1c12	K15	kb3r4	K44	kb6c67	K73
test1	K16	kb3r5	K45	kb6r0	K74
kb1r0	K17	kb3r6	K46	kb6r1	K75
kb1r1	K18	kb3r7	K47	kb6r2	K76
kb1r2	K19	kb4shunt	K48	kb6r3	K77
kb1r3	K20	kb4	K49	kb6r4	K78
kb1r4	K21	kb4c45	K50	kb6r5	K79
kb1r5	K22	kb4r0	K51	kb6r7	K80
kb1r6	K23	kb4r1	K52	kb6r6	K80
kb1r7	K24	kb4r2	K53	kb7shunt	K82
kb2shunt	K25	kb4r3	K54	kb7	K83
kb2	K26	kb4r4	K55	kb7c78	K84
kb2c23	K27	kb4r5	K56	test4	K85

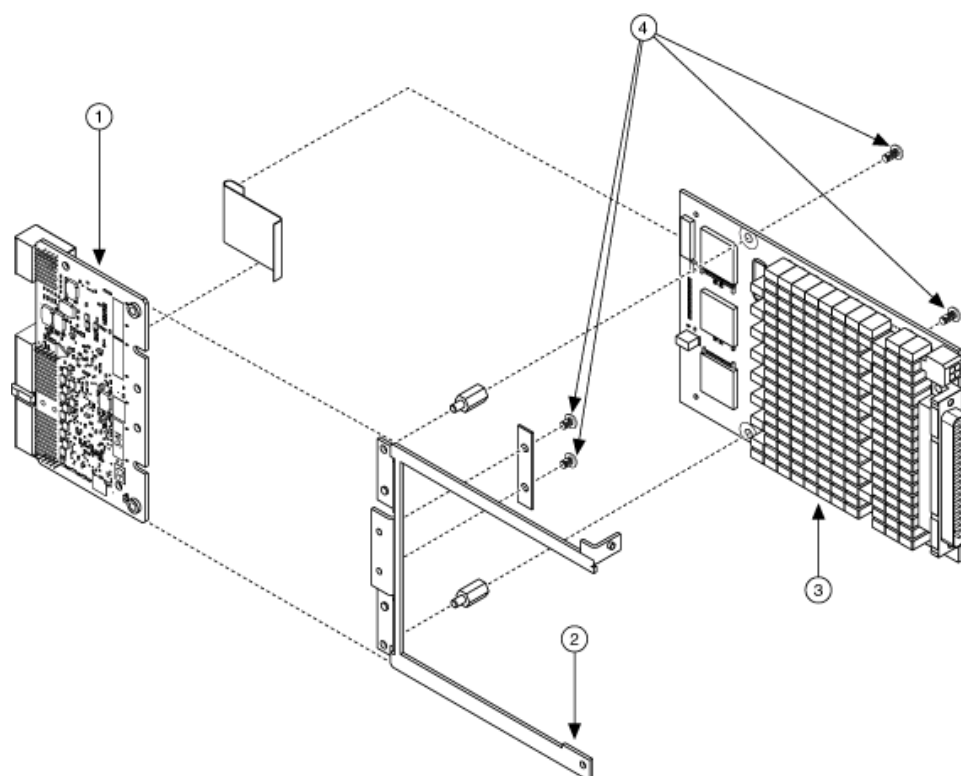
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb2r0	K28	kb4r6	K57	kb7r0	K86
kb2r1	K29	kb4r7	K58	kb7r1	K87

3. Remove the front panel, as shown in the following image.



1	Bracket
2	Front Panel
3	Front Panel Overlay
4	Screws

4. Remove the bracket, as shown in the following image.



1	CA3 Digital Back End
2	Bracket
3	Daughter Card
4	Screws

Replace the Relay

The NI PXI-2722 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being

reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2722 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2722. NI recommends using the low-level relay control API instead of hardware triggers. Hardware triggers are supported but because of the nature of the independent topology, if hardware triggers are used, "no action" mode should be used. Otherwise, each scan list entry must incorporate the state for all channels.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2722.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXIe-2725

The NI PXIe-2725 is a programmable resistor module for the PXI Express platform. The NI PXIe-2725 is composed of reed relays in parallel with discrete resistors. The NI PXIe-2725 has 18 channels that can nominally switch from 0 to 255 Ω in 1 Ω steps.



Note NI has created a set of reference VIs that you can use to specify a desired resistance value to output or RTD temperature to simulate. Using the reference VIs is the simplest way to interact with the NI PXIe-2725 programmable resistor module. It is also possible to program using direct calls in NI-SWITCH, NI-DAQmx, NI Switch Executive, or an IVI switch driver. For more information, including a detailed overview of the NI PXIe-2725 architecture, please visit ni.com/info and enter the Info Code 272xOverview.



Note Switching inductive loads, such as motors and solenoids, can produce high-voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXIe-2725 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Eighteen 8-bit channels	2725/ Independent(NISWITCH_TOPOLOGY_2725_INDEPENDENT)	✓	✓

Related Information

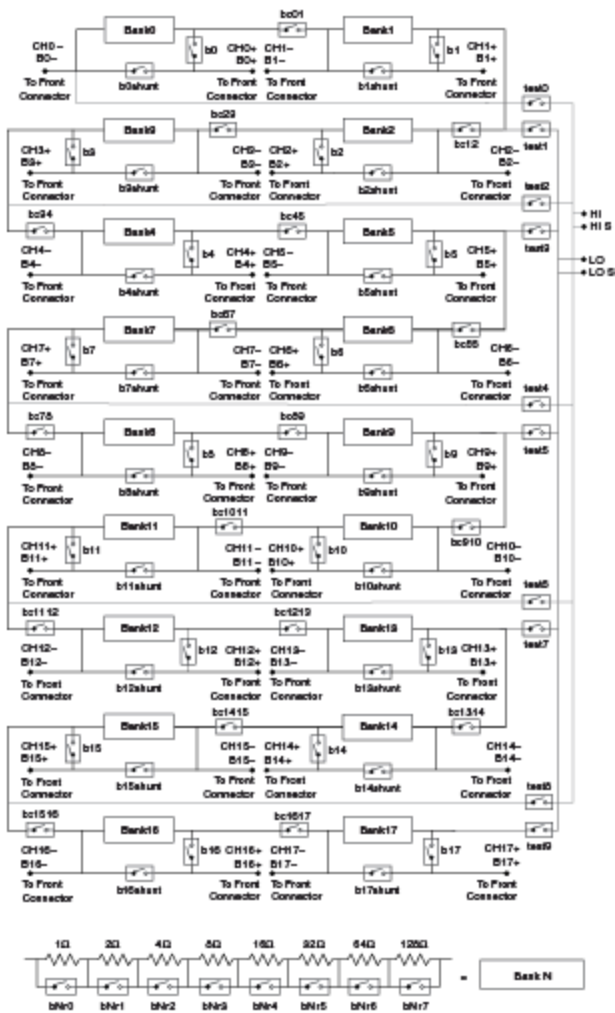
- Integration and System Considerations

Related concepts:

- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2725 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2725 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2725.



Note Resistance values are nominal. Please see the NI PXIe-2725 Specifications for resistor values and accuracy information

The following table lists relay names for the NI PXIe-2725.

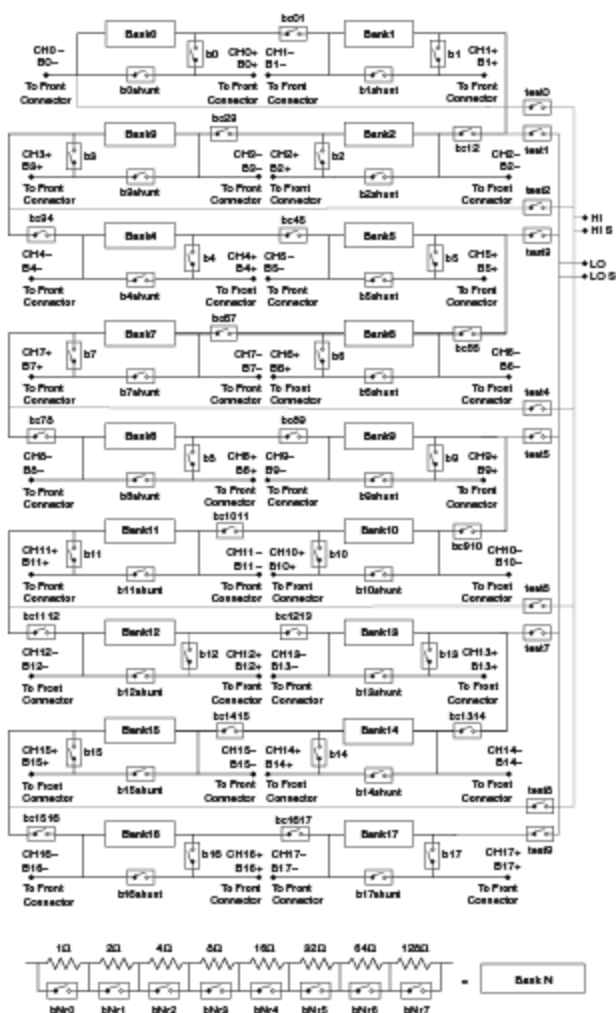
Relays

kb0r0, kb0r1...kb0r7
 kb1r0, kb1r1...kb1r7
 kb2r0, kb2r1...kb2r7
 kb3r0, kb3r1...kb3r7
 kb4r0, kb4r1...kb4r7
 kb5r0, kb5r1...kb5r7
 kb6r0, kb6r1...kb6r7
 kb7r0, kb7r1...kb7r7
 kb8r0, kb8r1...kb8r7

Relays
kb9r0, kb9r1...kb9r7
kb10r0, kb10r1...kb10r7
kb11r0, kb11r1...kb11r7
kb12r0, kb12r1...kb12r7
kb13r0, kb13r1...kb13r7
kb14r0, kb14r1...kb14r7
kb15r0, kb15r1...kb15r7
kb16r0, kb16r1...kb16r7
kb17r0, kb17r1...kb17r7
kb0...kb17
kb0shunt...kb17shunt
kbc01, kbc12...kbc1617
ktest0, ktest1...ktest9

NI PXIe-2725 Independent Topology

The following figure represents the NI PXIe-2725 in the independent topology.



Making a Connection



Note Bank connect relays allow adjacent banks or channels to connect together internally. For example, you can connect two or more adjacent channels together to create a potentiometer, a voltage divider, or a multi-segment resistor chain.

Making a Connection

Each 8-bit channel is composed of one bank on the NI PXIe-2725. For example, ch0 is composed of bank 0 and ch1 is composed of bank 1. NI has created a set of reference VIs that will programmatically open and close relays based on a user-specified resistance value or RTD temperature to simulate. To access these reference VIs, visit ni.com/info and enter the Info Code 272xOverview. NI recommends using this set of reference VIs for the easiest programming experience. If not using these

reference VIs, NI recommends using the low-level relay control VIs or functions instead of the connect channel VIs or functions. The DAQmx Relay API supports closing multiple relays in a single driver call, which is faster than the channel API.

When a bank relay is closed, the corresponding resistor is placed in parallel with the low resistance of the relay, which nominally equates to a zero Ω shunt. Closing any of the 8 bank relays in a given bank decreases the resistance of that bank.

For example, the following procedure uses the NI-SWITCH Relay API to short across the largest resistor in bank 0 and join bank 0 and bank 1 in series.

1. Close `b0r7` by calling the niSwitch Relay Control VI with the inputs of `b0r7` and `close`.
2. Close `bc01` by calling the niSwitch Relay Control VI with the inputs of `bc01` and `close`.

You can perform the same operation using the NI-SWITCH Channel API, as shown below.

1. Connect `b0->b0r7` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b0r7`.
2. Connect `b0->b1` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b1`.

Each bank is initially in a high impedance (open) state across the bank terminals. To enable the desired output channel you must first connect the bank relay, `bN`.

Each bank includes a shunt relay that completely bypasses the bank's string of 8 series relays. Closing the shunt relay `bN->bNshunt`, for example, `b0->b0shunt` or low-level `kb0shunt`, results in a low resistance across the bank, 0 Ω nominally. This allows the NI PXIe-2725 module to pass signals with minimal attenuation.



Note It is not necessary to close all 8 bank relays and the shunt relay. Configuring multiple banks this way can exceed the power budget of the NI PXI-2725.

The 4-pin front panel test connector can connect to any adjacent pair of even-odd

banks, allowing resistance measurements, or voltage measurements, across those two banks, for example b0 to b1, b2 to b3, b4 to b5. On 16-bit NI 272x modules, this allows channel resistance measurements using a DMM with Offset Compensated Ohms (such as the NI PXI-4070, NI PXI-4071, or NI PXI-4072). To connect a pair of banks to the test leads, close the appropriate test relays using the command `testN->testout`. For example, to measure the resistance across banks 0 and 1, call `test0->testout` and `test1->testout`. For banks 2 and 3, call `test1->testout` and `test2->testout`. Refer to the device's hardware diagram for valid test relay connections.



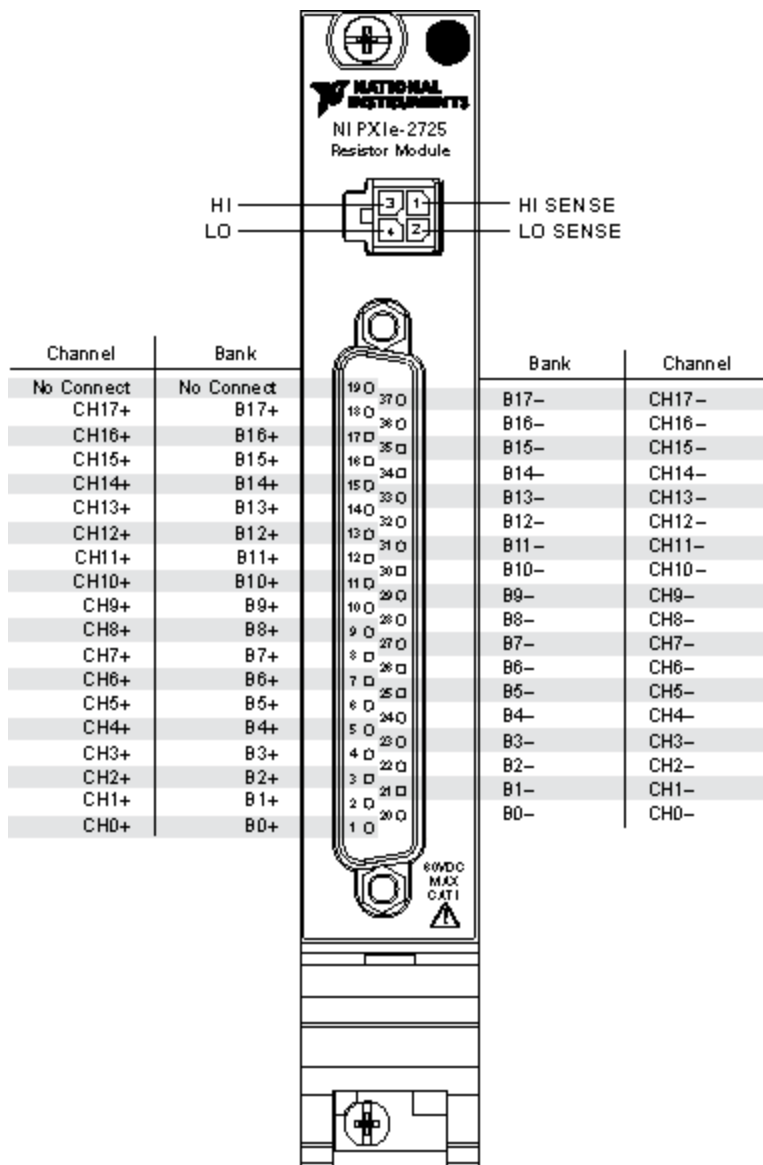
Note Closing multiple pairs of test relays introduces low impedance paths between banks. NI recommends disconnecting the 37-pin DSUB connector if these low impedance paths would damage your device under test or cause the current specifications of the NI PXIe-2727 to be exceeded.



Note Each channel on the NI PXI-2725 exhibits an "open" when initialized, reset, and first powered on. The `niSwitch Reset` and `niSwitch Disconnect All Channels VIs` or `niSwitch_reset` and `niSwitch_DisconnectAll` functions will disconnect all relays, resulting in an open circuit on each channel.

Pinout

The following figure identifies the pins for the NI PXIe-2725.



Note Do not connect to "No Connect" pins.

NI PXIe-2725 Relay Replacement

The NI PXIe-2725 uses reed relays.



Note The NI PXIe-2725 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
All Relays	Coto	9117-0001

Relay Kit	Part Number
National Instruments (10 relays)	781451-10

Complete the following sets of steps to disassemble the module, replace a failed relay, and reassemble your module.

Disassemble the Module

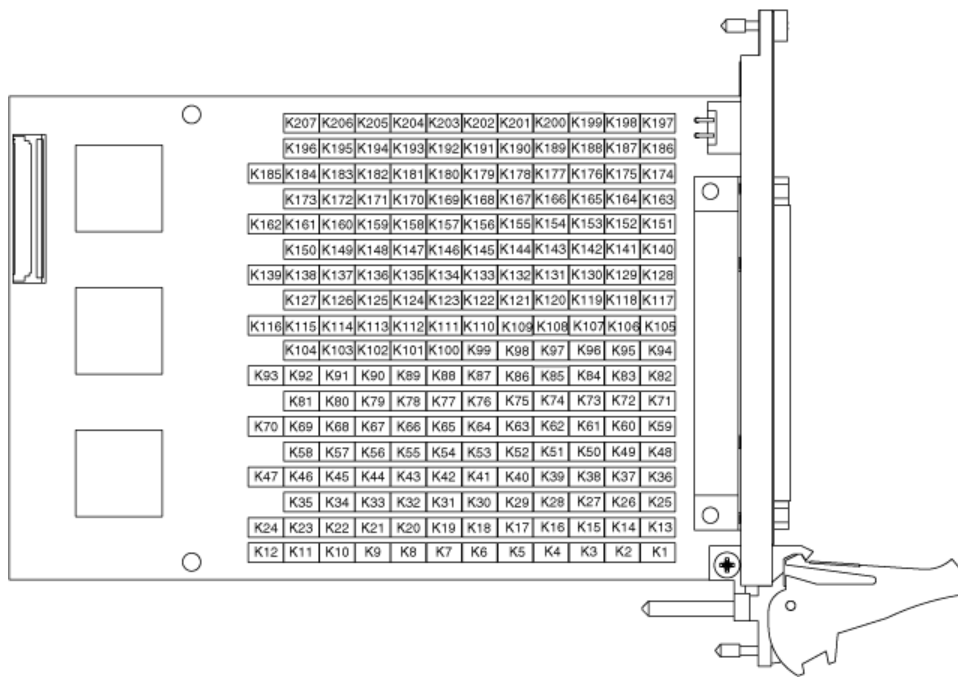
1. Ground yourself using a grounding strap or a ground connected to the PXI Express chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

NI PXIe 2725 Relay Map

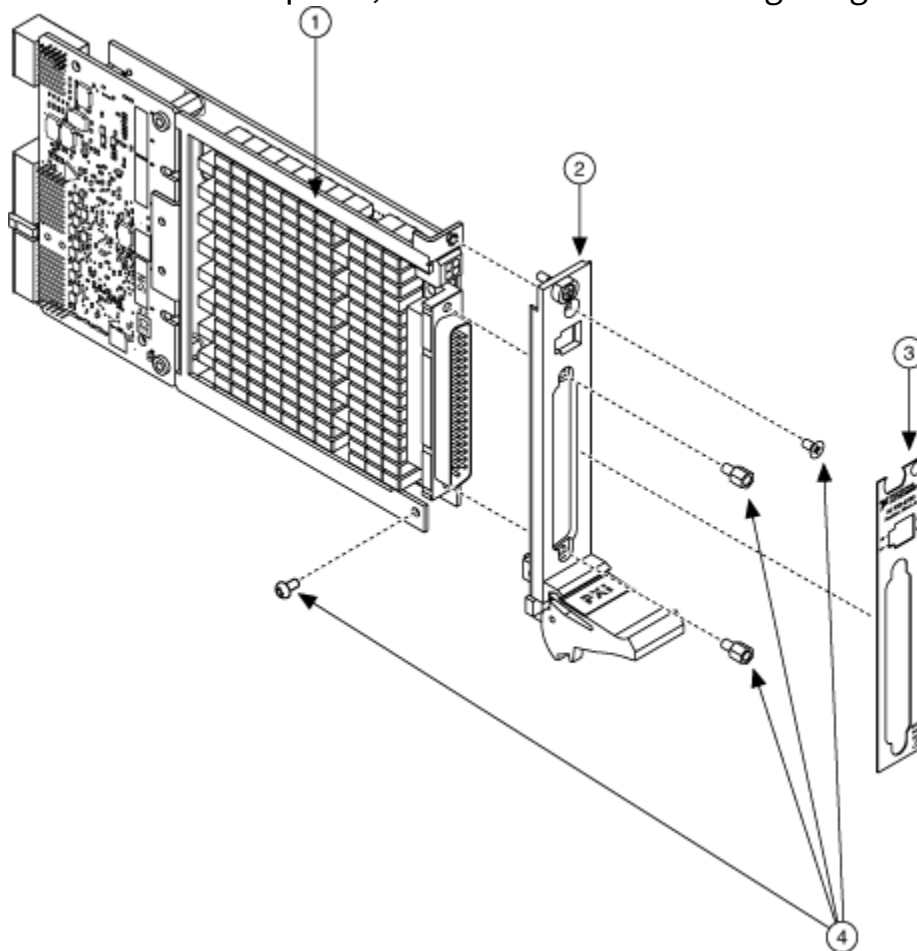


RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb0shunt	K1	kb4r2	K53	kb9shunt	K105
kb0	K2	kb4r3	K54	kb9	K106
kb01	K3	kb4r4	K55	kb910	K107
test0	K4	kb4r5	K56	test5	K108
kb0r0	K5	kb4r6	K57	kb9r0	K109
kb0r1	K6	kb4r7	K58	kb9r1	K110
kb0r2	K7	kb5shunt	K59	kb9r2	K111
kb0r3	K8	kb5	K60	kb9r3	K112
kb0r4	K9	kb56	K61	kb9r4	K113
kb0r5	K10	test3	K62	kb9r5	K114
kb0r6	K11	kb5r0	K63	kb9r6	K115
kb0r7	K12	kb5r1	K64	kb9r7	K116
kb1shunt	K13	kb5r2	K65	kb10shunt	K117
kb1	K14	kb5r3	K66	kb10	K118
kb12	K15	kb5r4	K67	kb1011	K119

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
test1	K16	kb5r5	K68	kb10r0	K120
kb1r0	K17	kb5r6	K69	kb10r1	K121
kb1r1	K18	kb5r7	K70	kb10r2	K122
kb1r2	K19	kb6shunt	K71	kb10r3	K123
kb1r3	K20	kb6	K72	kb10r4	K124
kb1r4	K21	kb67	K73	kb10r5	K125
kb1r5	K22	kb6r0	K74	kb10r6	K126
kb1r6	K23	kb6r1	K75	kb10r7	K127
kb1r7	K24	kb6r2	K76	kb11shunt	K128
kb2shunt	K25	kb6r3	K77	kb11	K129
kb2	K26	kb6r4	K78	kb1112	K130
kb23	K27	kb6r5	K79	test6	K131
kb2r0	K28	kb6r7	K80	kb11r0	K132
kb2r1	K29	kb6r6	K80	kb11r1	K133
kb2r2	K30	kb7shunt	K82	kb11r2	K134
kb2r3	K31	kb7	K83	kb11r3	K135
kb2r4	K32	kb78	K84	kb11r4	K136
kb2r5	K33	test4	K85	kb11r5	K137
kb2r6	K34	kb7r0	K86	kb11r6	K138
kb2r7	K35	kb7r1	K87	kb11r7	K139
kb3shunt	K36	kb7r2	K88	kb12shunt	K140
kb3	K37	kb7r3	K89	kb12	K141
kb34	K38	kb7r4	K90	kb1213	K142
test2	K39	kb7r5	K91	kb12r0	K143
kb3r0	K40	kb7r6	K92	kb12r1	K144
kb3r1	K41	kb7r7	K93	kb12r2	K145
kb3r2	K42	kb8shunt	K94	kb12r3	K146

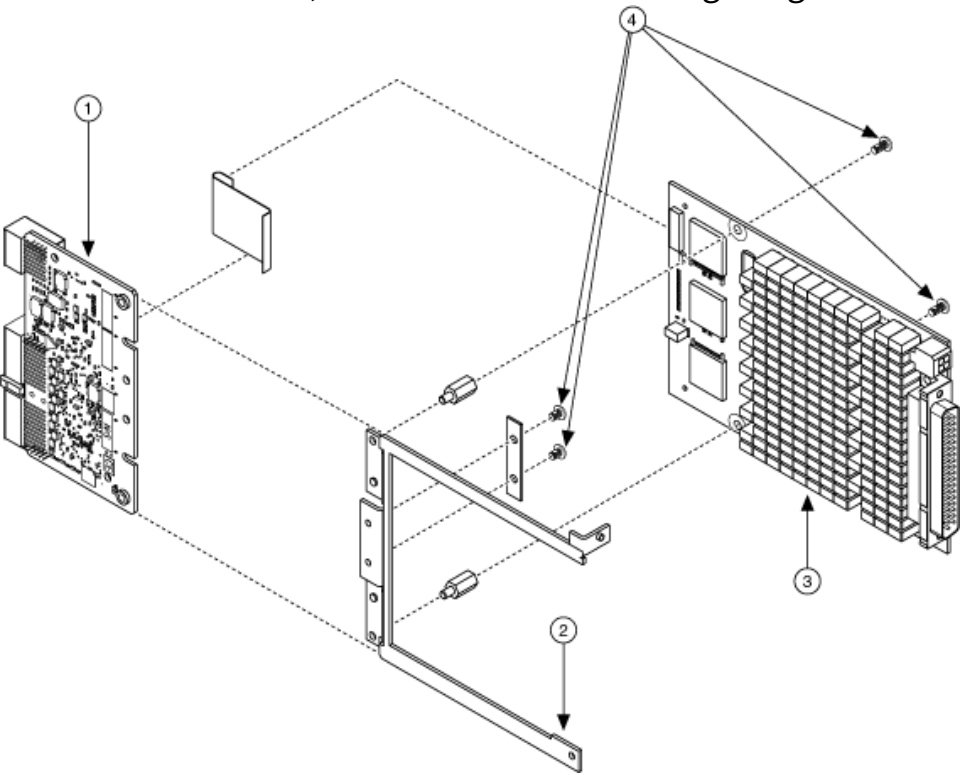
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb3r3	K43	kb8	K95	kb12r4	K147
kb3r4	K44	kbc89	K96	kb12r5	K148
kb3r5	K45	kb8r0	K97	kb12r6	K149
kb3r6	K46	kb8r1	K98	kb12r7	K150
kb3r7	K47	kb8r2	K99	kb13shunt	K151
kb4shunt	K48	kb8r3	K100	kb13	K152
kb4	K49	kb8r4	K101	kbc1314	K153
kbc45	K50	kb8r5	K102	test7	K154
kb4r0	K51	kb8r6	K103	kb13r0	K155
kb4r1	K52	kb8r7	K104	kb13r1	K156

3. Remove the front panel, as shown in the following image.



1	Bracket
2	Front Panel
3	Front Panel Overlay
4	Screws

4. Remove the bracket, as shown in the following image.



1	CA3 Digital Back End
2	Bracket
3	Daughter Card
4	Screws

Replace the Relay

The NI PXIe-2725 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-

free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXIe-2725 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXIe-2725.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXIe-2725.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXIe-2727

The NI PXIe-2727 is a programmable resistor module for the PXI Express platform. The NI PXIe-2727 is composed of reed relays in parallel with discrete resistors. The NI PXIe-2727 has nine channels that can nominally switch from 0 to 16,383 Ω in 0.25 Ω steps.



Note NI has created a set of reference VIs that you can use to specify a desired resistance value to output or RTD temperature to simulate. Using the reference VIs is the simplest way to interact with the NI PXIe-2727 programmable resistor module. It is also possible to program using direct calls in NI-SWITCH, NI-DAQmx, NI Switch Executive, or an IVI switch driver. For more information, including a detailed overview of the NI PXIe-2727 architecture, please visit ni.com/info and enter the Info Code 272xOverview.



Note Switching inductive loads, such as motors and solenoids, can produce high-voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation

and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI PXIe-2727 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Nine 16-bit channels	2727/ Independent(NISWITCH_TOPOLOGY_2727_INDEPENDENT)	✓	✓

Related Information

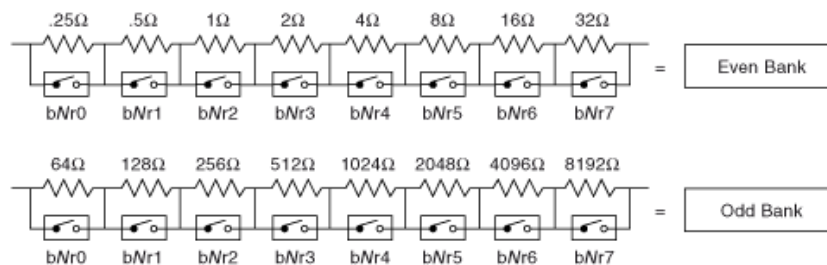
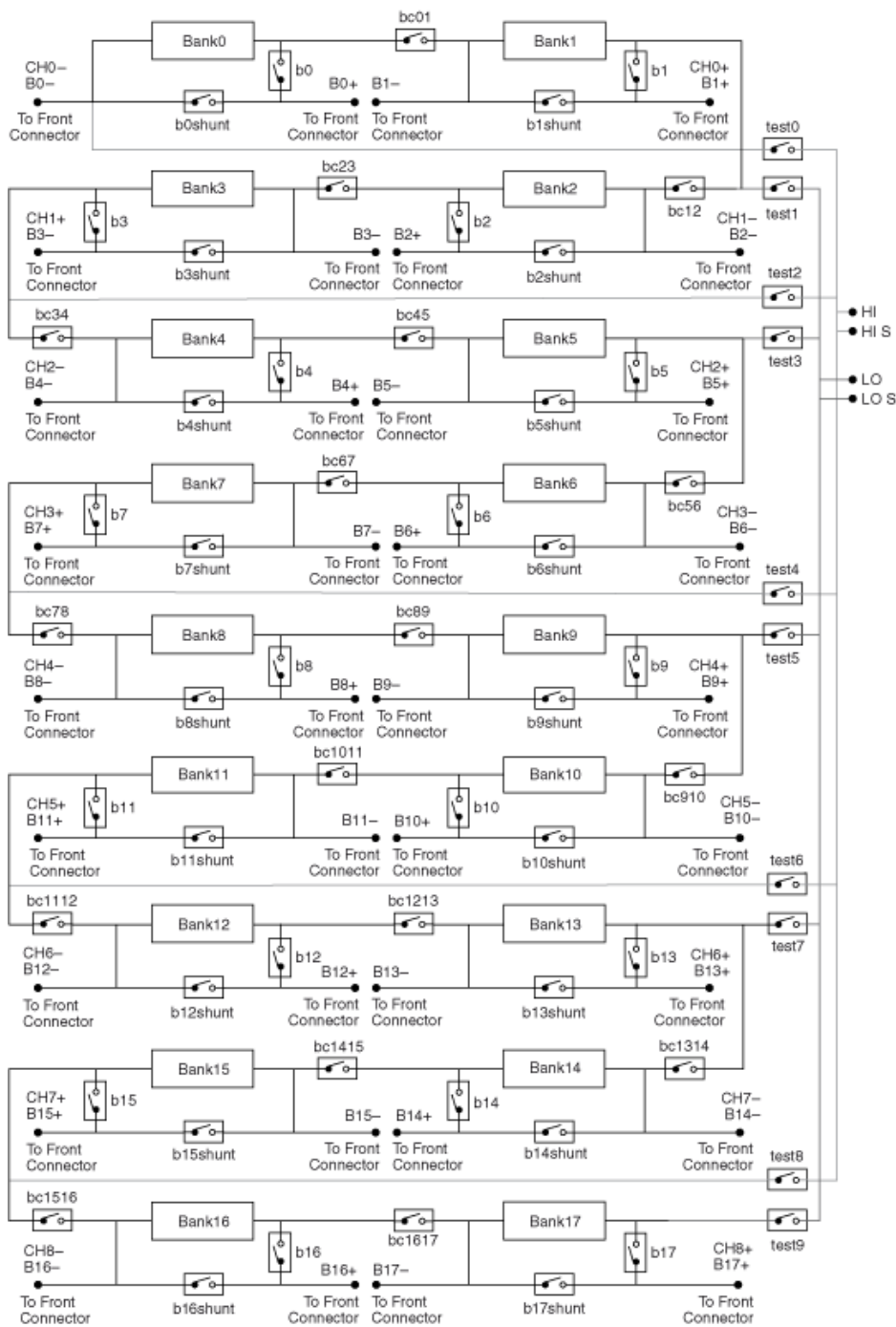
- Integration and System Considerations

Related concepts:

- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2727 Independent Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2727 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2727.





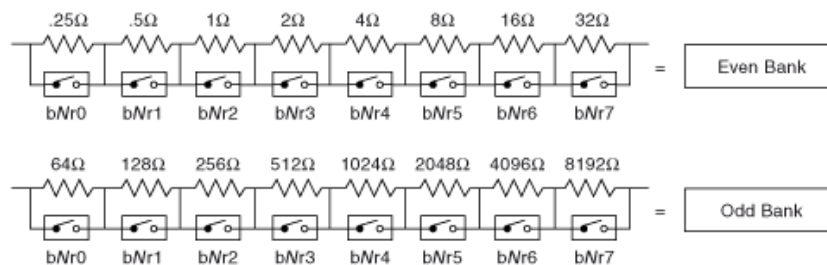
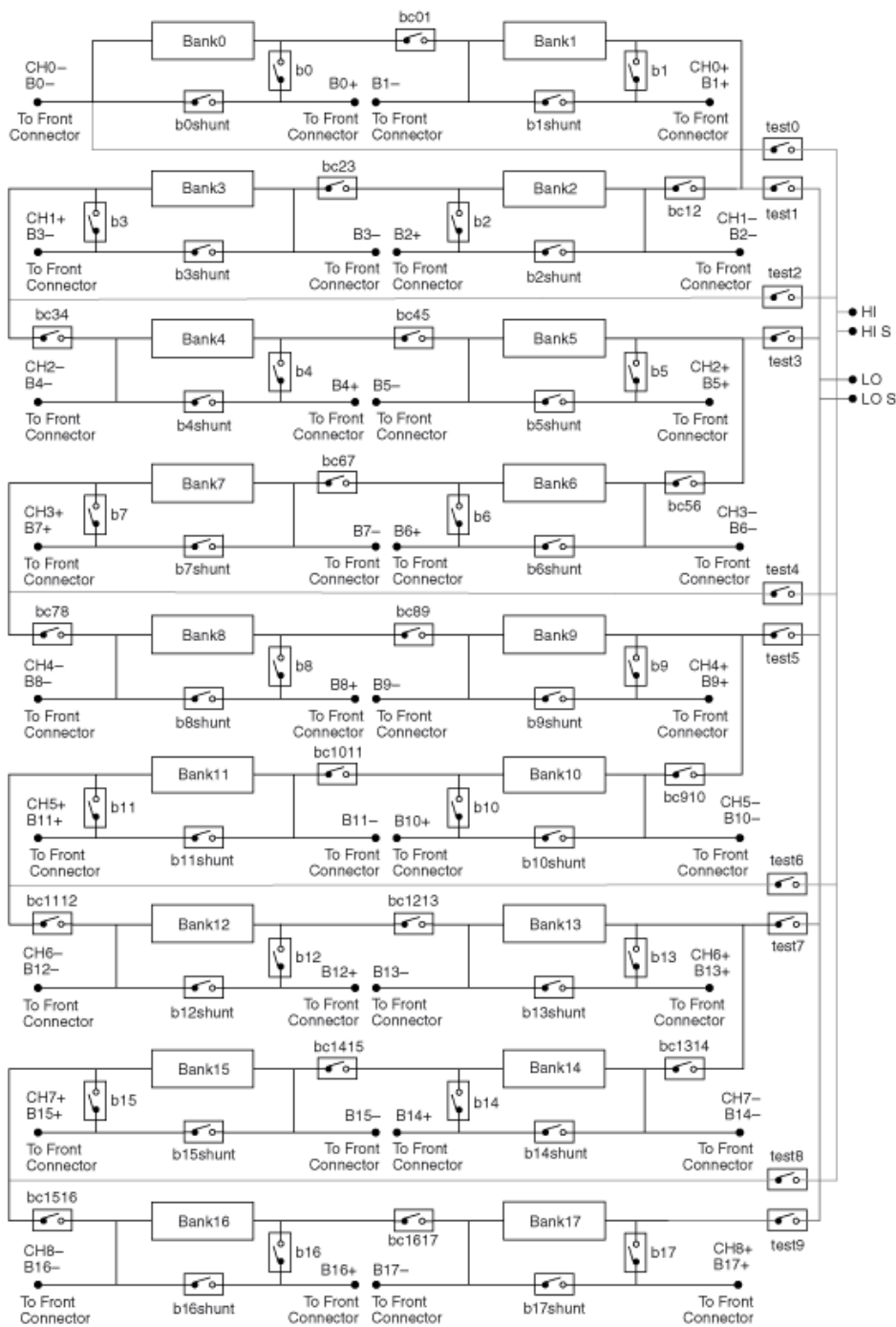
Note Resistance values are nominal. Please see the NI PXIe-2727 Specifications for resistor values and accuracy information

The following table lists relay names for the NI PXIe-2727.

Relays
kb0r0, kb0r1...kb0r7
kb1r0, kb1r1...kb1r7
kb2r0, kb2r1...kb2r7
kb3r0, kb3r1...kb3r7
kb4r0, kb4r1...kb4r7
kb5r0, kb5r1...kb5r7
kb6r0, kb6r1...kb6r7
kb7r0, kb7r1...kb7r7
kb8r0, kb8r1...kb8r7
kb9r0, kb9r1...kb9r7
kb10r0, kb10r1...kb10r7
kb11r0, kb11r1...kb11r7
kb12r0, kb12r1...kb12r7
kb13r0, kb13r1...kb13r7
kb14r0, kb14r1...kb14r7
kb15r0, kb15r1...kb15r7
kb16r0, kb16r1...kb16r7
kb17r0, kb17r1...kb17r7
kb0...kb17
kb0shunt...kb17shunt
kbc01, kbc12...kbc1617
ktest0, ktest1...ktest9

NI PXIe-2727 Independent Topology

The following figure represents the NI PXIe-2727 in the independent topology.





Note Bank connect relays allow adjacent banks or channels to connect together internally. For example, you can connect two or more adjacent channels together to create a potentiometer, a voltage divider, or a multi-segment resistor chain.

Making a Connection

Each 16-bit channel is composed of two adjacent 8-bit banks on the NI PXIe-2727. For example, ch0 is composed of banks 0 and 1 and ch1 is composed of banks 2 and 3. NI has created a set of reference VIs that will programmatically open and close relays based on a user-specified resistance value or RTD temperature to simulate. To access these reference VIs, visit ni.com/info and enter the Info Code 272xOverview. NI recommends using this set of reference VIs for the easiest programming experience. If not using these reference VIs, NI recommends using the low-level relay control VIs or functions instead of the connect channel VIs or functions. The DAQmx Relay API supports closing multiple relays in a single driver call, which is faster than the channel API.

When a bank relay is closed, the corresponding resistor is placed in parallel with the low resistance of the relay, which nominally equates to a zero Ω shunt. Closing any of the 8 bank relays in a given bank decreases the resistance of that bank.

For example, the following procedure uses the NI-SWITCH Relay API to short across the largest resistor in bank 0 and join bank 0 and bank 1 in series.

1. Close `b0r7` by calling the niSwitch Relay Control VI with the inputs of `b0r7` and `close`.
2. Close `bc01` by calling the niSwitch Relay Control VI with the inputs of `bc01` and `close`.

You can perform the same operation using the NI-SWITCH Channel API, as shown below.

1. Connect `b0->b0r7` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b0r7`.
2. Connect `b0->b1` by calling niSwitch Connect Channels VI with the inputs of `b0` and `b1`.

Each bank is initially in a high impedance (open) state across the bank terminals. To enable the desired output channel you must first connect the bank relay, `bN`.

Each bank includes a shunt relay that completely bypasses the bank's string of 8 series relays. Closing the shunt relay `bN->bNshunt`, for example, `b0->b0shunt` or low-level `kb0shunt`, results in a low resistance across the bank, 0 Ω nominally. This allows the NI PXIe-2727 module to pass signals with minimal attenuation. On 16-bit modules (NI PXI-2722 and NI PXIe-2727), closing the upper bank's shunt relay reduces the resistance when outputting values less than 64 Ω .



Note It is not necessary to close all 8 bank relays and the shunt relay. Configuring multiple banks this way can exceed the power budget of the NI PXI-2727.

The 4-pin front panel test connector can connect to any adjacent pair of even-odd banks, allowing resistance measurements, or voltage measurements, across those two banks, for example `b0` to `b1`, `b2` to `b3`, `b4` to `b5`. On 16-bit NI 272x modules, this allows channel resistance measurements using a DMM with Offset Compensated Ohms (such as the NI PXI-4070, NI PXI-4071, or NI PXI-4072). To connect a pair of banks to the test leads, close the appropriate test relays using the command `testN->testout`. For example, to measure the resistance across banks 0 and 1, call `test0->testout` and `test1->testout`. For banks 2 and 3, call `test1->testout` and `test2->testout`. Refer to the device's hardware diagram for valid test relay connections.



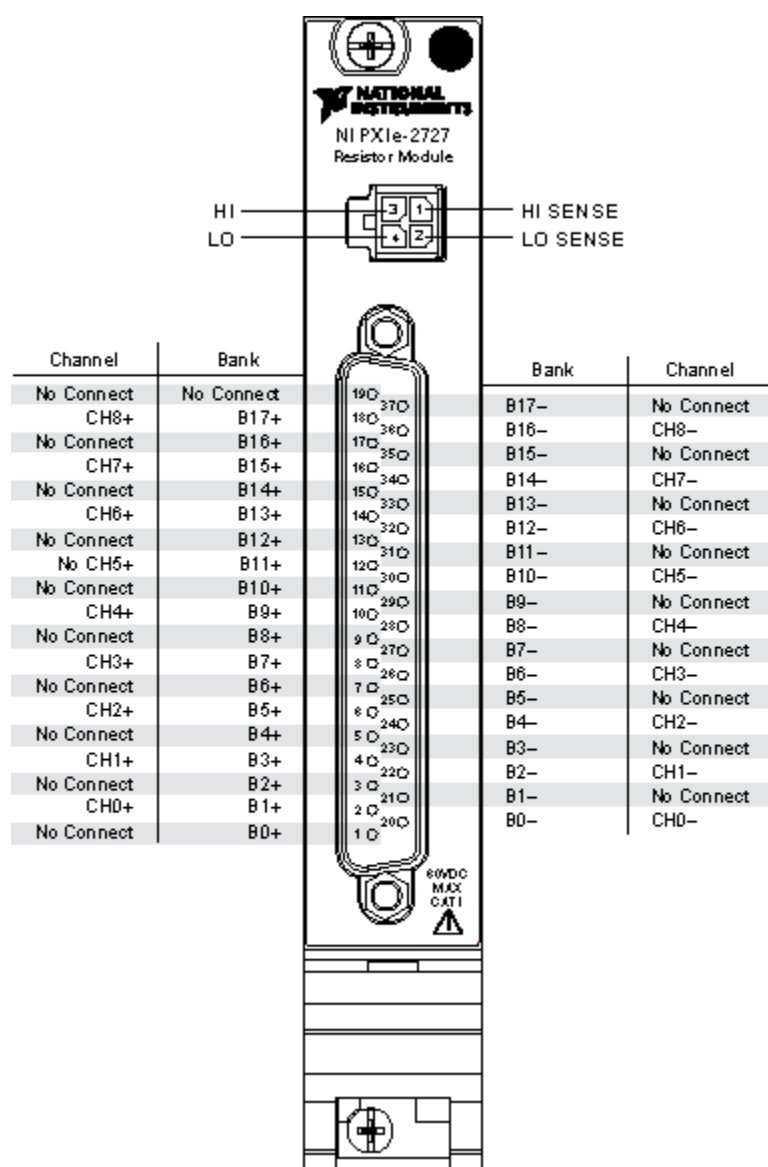
Note Closing multiple pairs of test relays introduces low impedance paths between banks. NI recommends disconnecting the 37-pin DSUB connector if these low impedance paths would damage your device under test or cause the current specifications of the NI PXIe-2727 to be exceeded.



Note Each channel on the NI PXI-2727 exhibits an "open" when initialized, reset, and first powered on. The `niSwitch Reset` and `niSwitch Disconnect All Channels VIs` or `niSwitch_reset` and `niSwitch_DisconnectAll` functions will disconnect all relays, resulting in an open circuit on each channel.

Pinout

The following figure identifies the pins for the NI PXIe-2727.



Note Do not connect to "No Connect" pins.

NI PXIe-2727 Relay Replacement

The NI PXIe-2727 uses reed relays.



Note The NI PXIe-2727 uses a custom lead length to meet safety standards.

Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
All Relays	Coto	9117-0001

Relay Kit	Part Number
National Instruments (10 relays)	781451-10

Complete the following sets of steps to disassemble the module, replace a failed relay, and reassemble your module.

Disassemble the Module

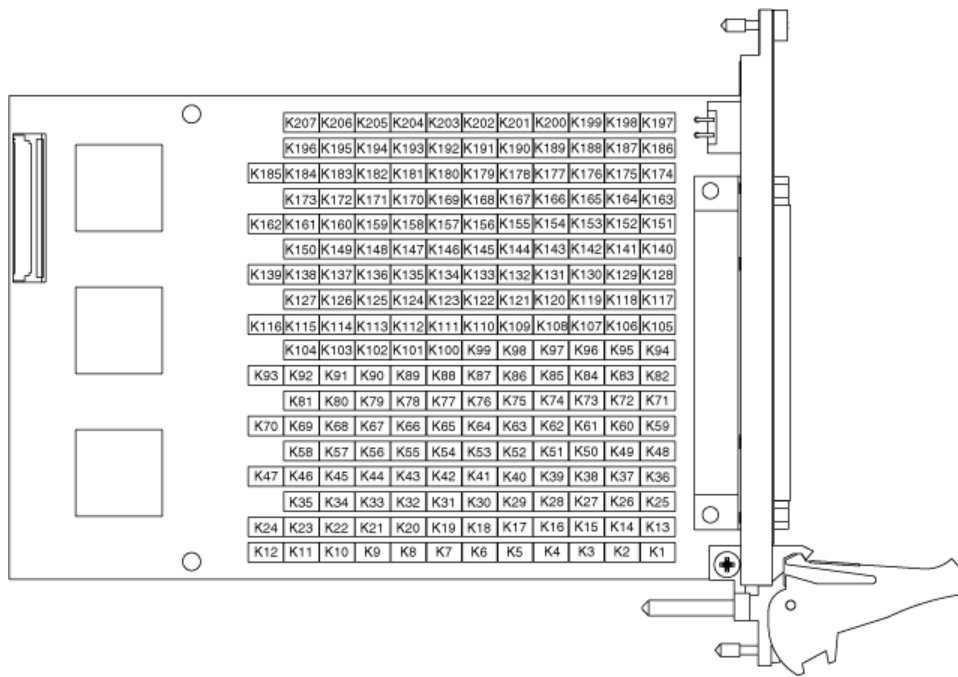
1. Ground yourself using a grounding strap or a ground connected to the PXI Express chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

NI PXIe 2727 Relay Map

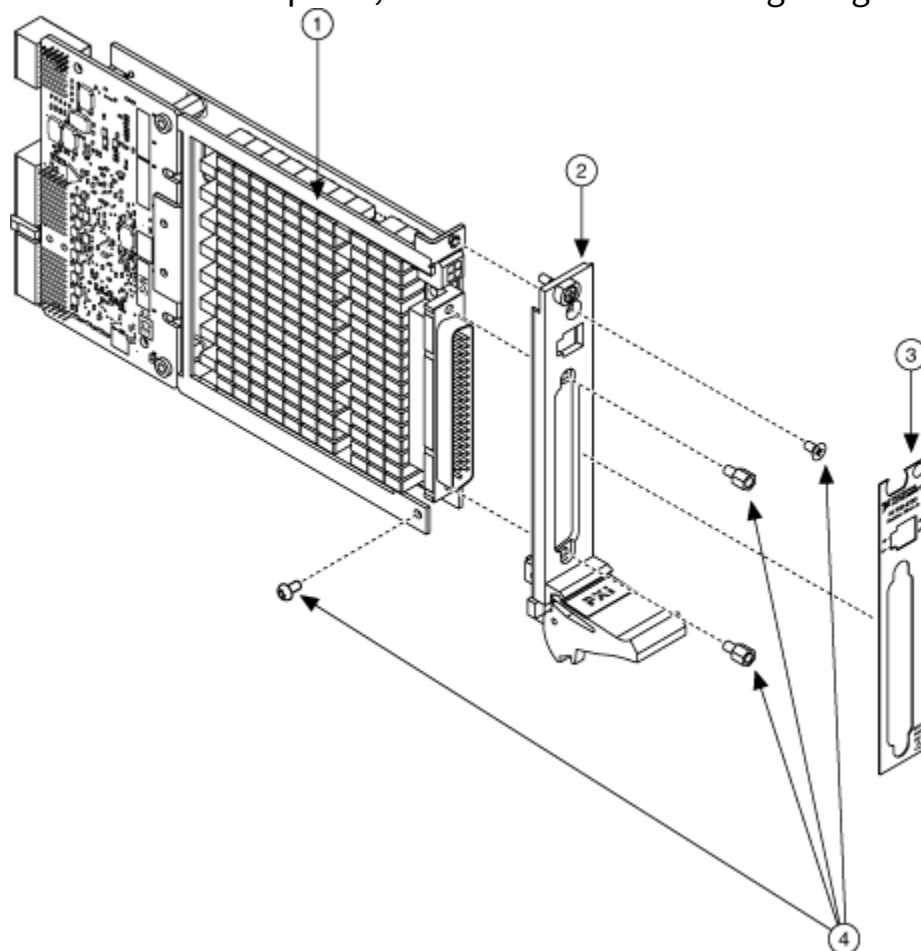


RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb0shunt	K1	kb4r2	K53	kb9shunt	K105
kb0	K2	kb4r3	K54	kb9	K106
kb01	K3	kb4r4	K55	kb0910	K107
test0	K4	kb4r5	K56	test5	K108
kb0r0	K5	kb4r6	K57	kb9r0	K109
kb0r1	K6	kb4r7	K58	kb9r1	K110
kb0r2	K7	kb5shunt	K59	kb9r2	K111
kb0r3	K8	kb5	K60	kb9r3	K112
kb0r4	K9	kb056	K61	kb9r4	K113
kb0r5	K10	test3	K62	kb9r5	K114
kb0r6	K11	kb5r0	K63	kb9r6	K115
kb0r7	K12	kb5r1	K64	kb9r7	K116
kb1shunt	K13	kb5r2	K65	kb10shunt	K117
kb1	K14	kb5r3	K66	kb10	K118
kb012	K15	kb5r4	K67	kb01011	K119

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
test1	K16	kb5r5	K68	kb10r0	K120
kb1r0	K17	kb5r6	K69	kb10r1	K121
kb1r1	K18	kb5r7	K70	kb10r2	K122
kb1r2	K19	kb6shunt	K71	kb10r3	K123
kb1r3	K20	kb6	K72	kb10r4	K124
kb1r4	K21	kb67	K73	kb10r5	K125
kb1r5	K22	kb6r0	K74	kb10r6	K126
kb1r6	K23	kb6r1	K75	kb10r7	K127
kb1r7	K24	kb6r2	K76	kb11shunt	K128
kb2shunt	K25	kb6r3	K77	kb11	K129
kb2	K26	kb6r4	K78	kb1112	K130
kb23	K27	kb6r5	K79	test6	K131
kb2r0	K28	kb6r7	K80	kb11r0	K132
kb2r1	K29	kb6r6	K80	kb11r1	K133
kb2r2	K30	kb7shunt	K82	kb11r2	K134
kb2r3	K31	kb7	K83	kb11r3	K135
kb2r4	K32	kb78	K84	kb11r4	K136
kb2r5	K33	test4	K85	kb11r5	K137
kb2r6	K34	kb7r0	K86	kb11r6	K138
kb2r7	K35	kb7r1	K87	kb11r7	K139
kb3shunt	K36	kb7r2	K88	kb12shunt	K140
kb3	K37	kb7r3	K89	kb12	K141
kb34	K38	kb7r4	K90	kb1213	K142
test2	K39	kb7r5	K91	kb12r0	K143
kb3r0	K40	kb7r6	K92	kb12r1	K144
kb3r1	K41	kb7r7	K93	kb12r2	K145
kb3r2	K42	kb8shunt	K94	kb12r3	K146

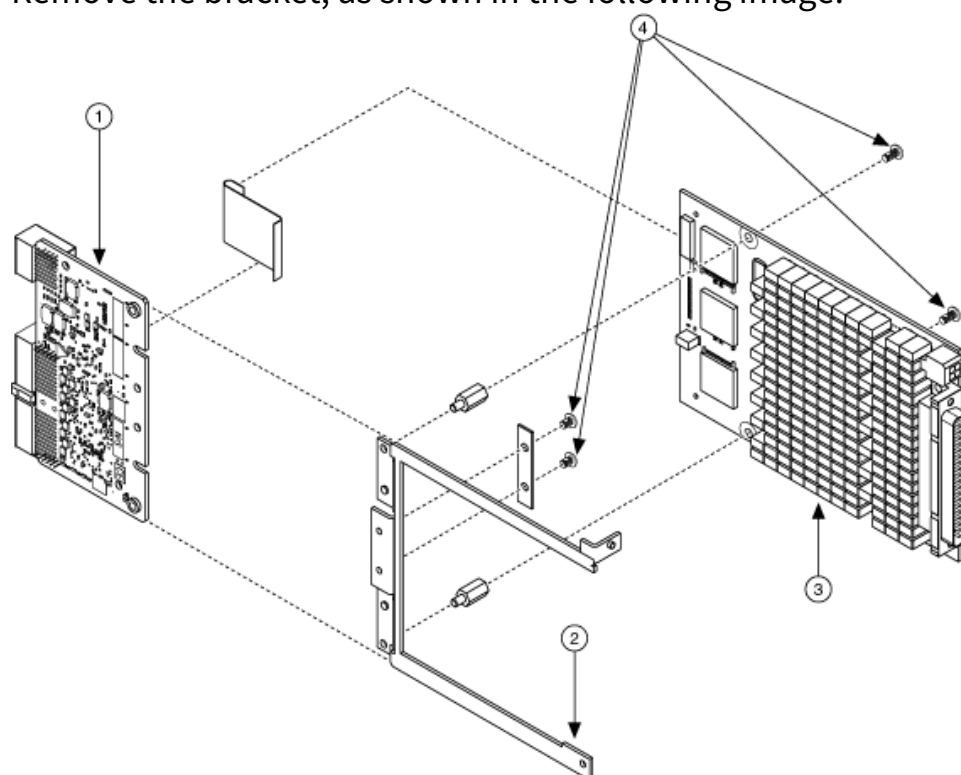
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kb3r3	K43	kb8	K95	kb12r4	K147
kb3r4	K44	kbc89	K96	kb12r5	K148
kb3r5	K45	kb8r0	K97	kb12r6	K149
kb3r6	K46	kb8r1	K98	kb12r7	K150
kb3r7	K47	kb8r2	K99	kb13shunt	K151
kb4shunt	K48	kb8r3	K100	kb13	K152
kb4	K49	kb8r4	K101	kbc1314	K153
kbc45	K50	kb8r5	K102	test7	K154
kb4r0	K51	kb8r6	K103	kb13r0	K155
kb4r1	K52	kb8r7	K104	kb13r1	K156

3. Remove the front panel, as shown in the following image.



1	Bracket
2	Front Panel
3	Front Panel Overlay
4	Screws

4. Remove the bracket, as shown in the following image.



1	CA3 Digital Back End
2	Bracket
3	Daughter Card
4	Screws

Replace the Relay

The NI PXIe-2727 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-

free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXIe-2727 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXIe-2727.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXIe-2727.

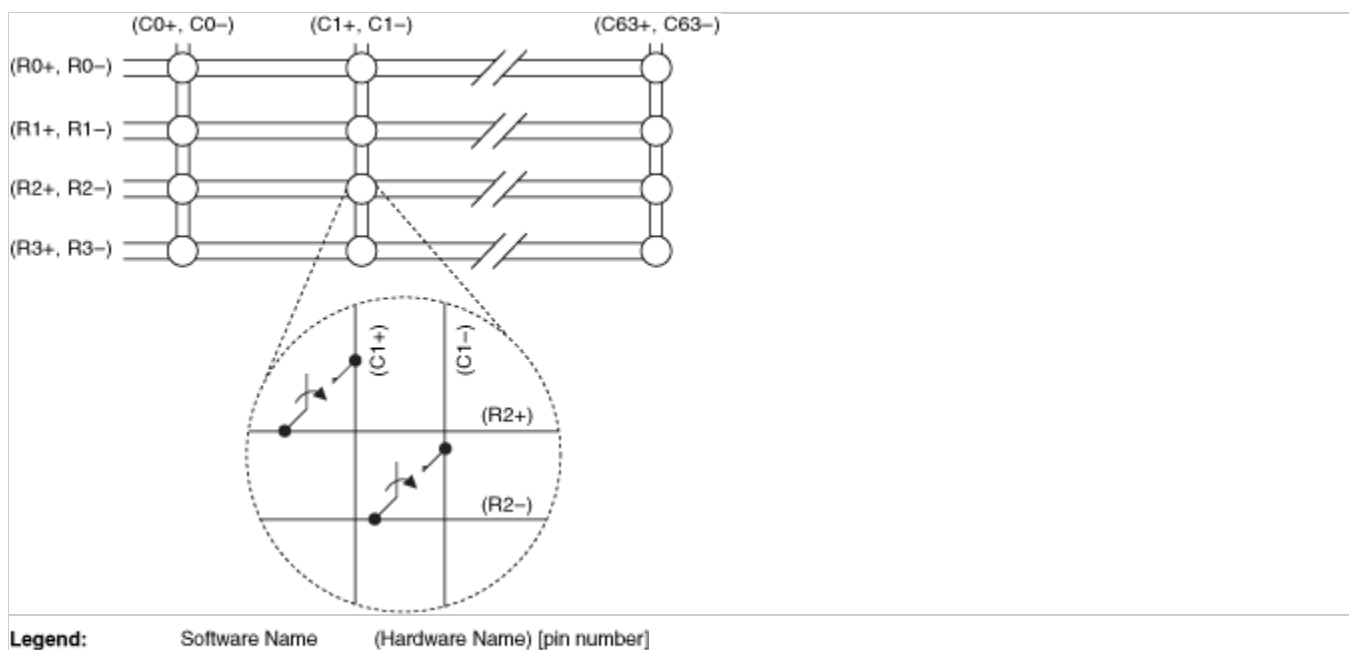
Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXIe-2737 2-Wire 4×64 Matrix Topology

The following figure represents the NI PXIe-2737 (NI 2737) in the 2-wire 4×64 matrix topology.



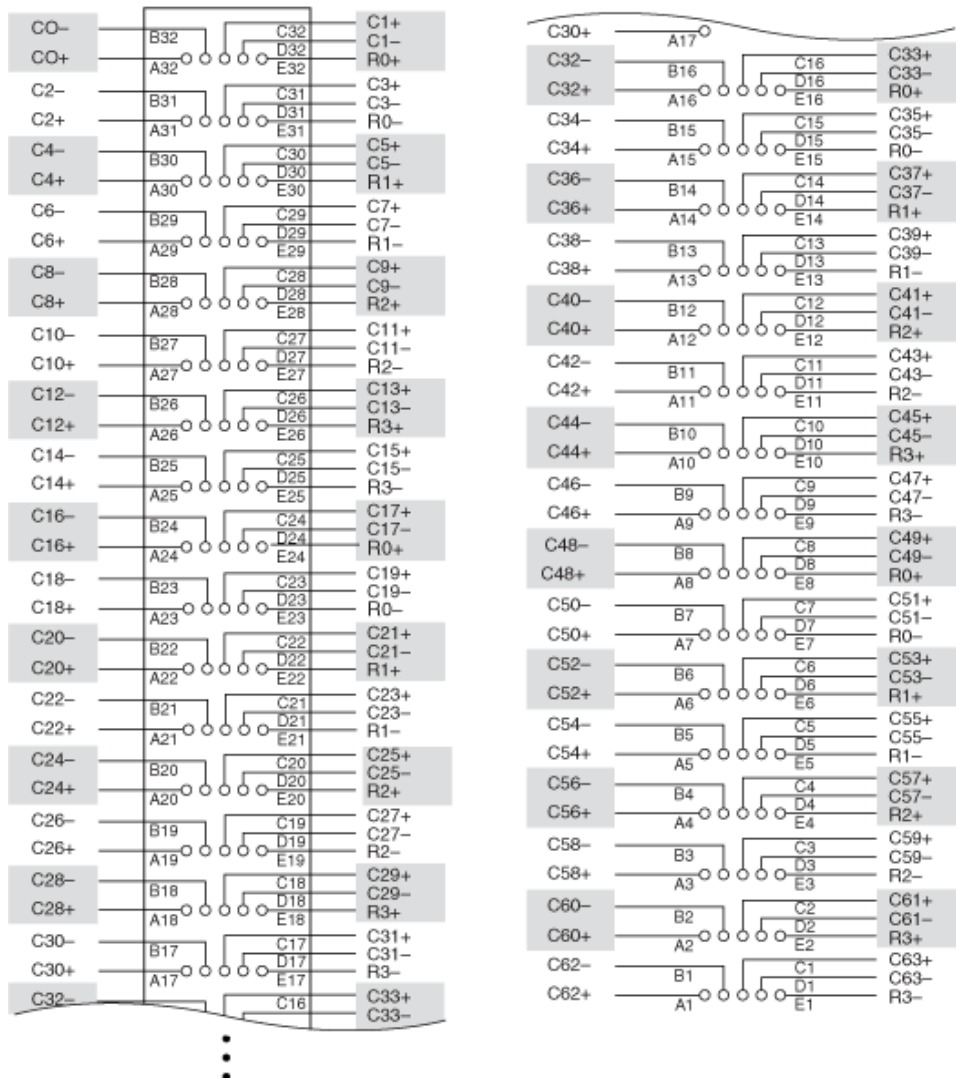
Making a Connection

The NI 2737 is a 4×64 matrix. In this topology you can connect any row to any column. In software, R0 refers to the R0+ and R0– pair. All other channels follow a similar naming scheme.

You can connect the channels of the NI 2737 using the niSwitch Connect Channels VI or the niSwitch_Connect function. For example, to connect row 1 to column 1, call the niSwitch Connect Channels VI or the niSwitch_Connect function with the **channel 1** parameter set to r1 and the **channel 2** parameter set to c1, or vice versa.

Pinout

The following figure identifies the pins for the NI 2737.



NI PXIe-2737

The NI PXIe-2737 (NI 2737) is a 256 crosspoint, high-density matrix switch module for the PXI Express platform. The NI 2737 is designed for switching low and high voltages. For low-voltage measurements, the NI 2737 uses relays with <10 μ V thermal offset to ensure accurate measurements.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2737 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-Wire 4×64 Matrix	2737/2-Wire 4x64 Matrix(NISWITCH_TOPOLOGY_2737_2_WIRE_4X64_MATRIX)	✓	

Related Information

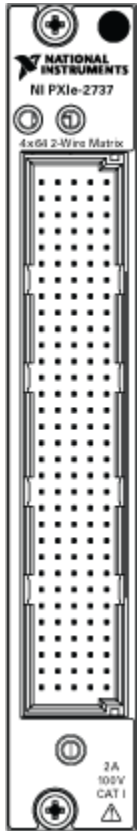
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2737 2-Wire 4×64 Matrix Topology](#)
- [Integration and System Considerations](#)

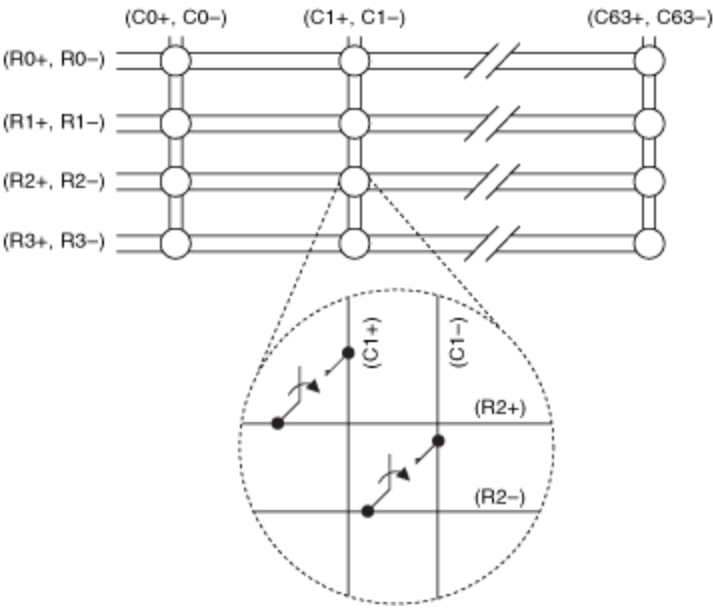
NI PXIe-2737 Front Panel

The following figure illustrates the NI PXIe-2737 front panel.



NI PXIe-2737 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2737 (NI 2737).



The following table lists relay names for the NI 2737.

Relays
kr0c0...kr0c63
kr1c0...kr1c63
kr2c0...kr2c63
kr3c0...kr3c63

NI PXIe-2737 Relay Replacement

The NI PXIe-2737 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 relays)	781089-10

Complete the following steps to disassemble your module, replace a failed relay, and reassemble your module.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI Express chassis.



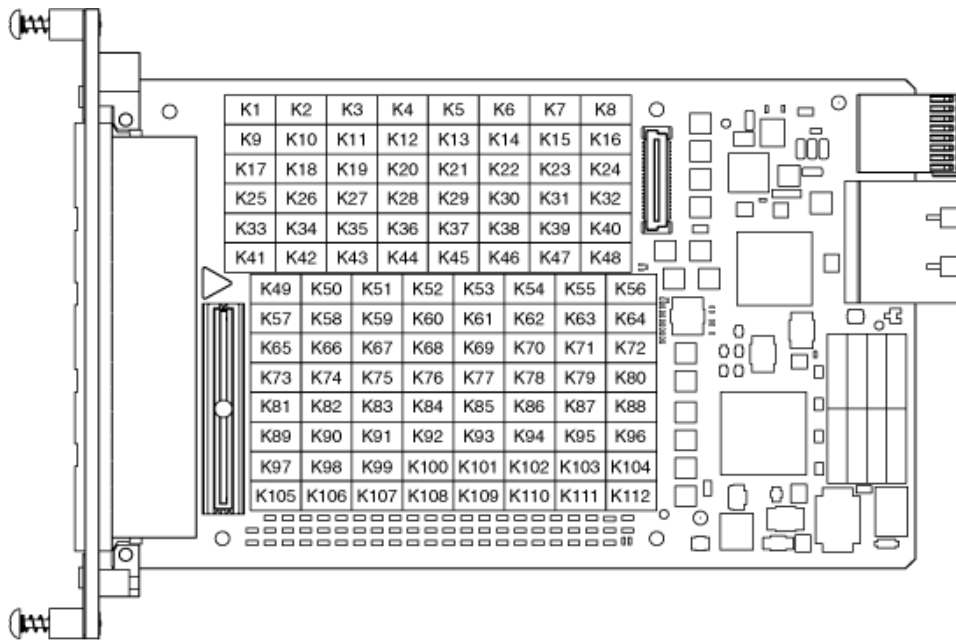
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Refer to the following figures and table to locate the relay you want to replace.
 - a. Match the channel name to its corresponding relay name.
 - b. Match the relay name with its reference designator using the tables below.

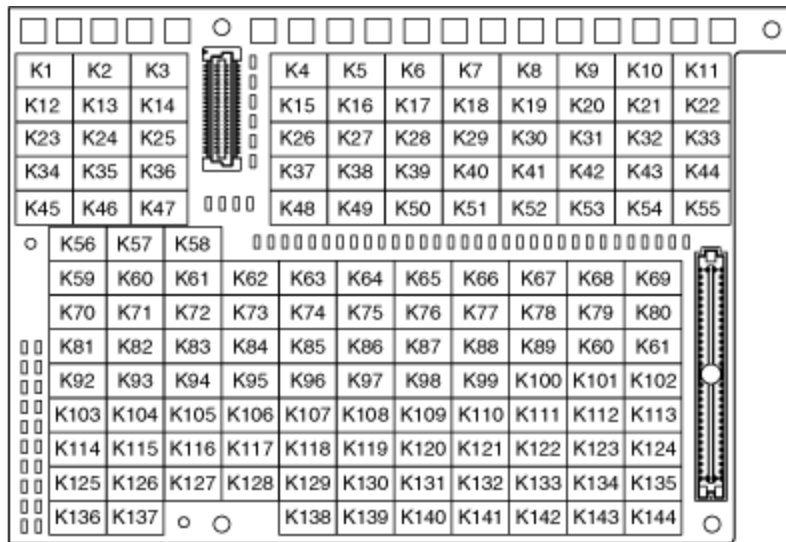


Note Reference designators are printed on the PCB.

NI PXIe-2737 PCB 1



NI PXIe-2737 PCB 2



NI PXle-2737 Hardware Diagram

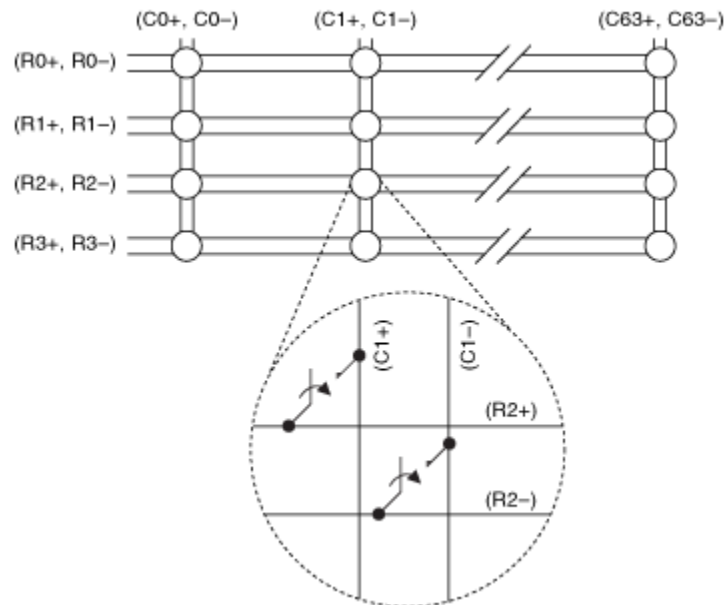


Table 14. NI PXle-2737 PCB 1 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c0	K1	kr2c0	K5	kr0c16	K65	kr2c16	K69
kr0c1	K2	kr2c1	K6	kr0c17	K66	kr2c17	K70
kr0c2	K9	kr2c2	K13	kr0c18	K73	kr2c18	K77
kr0c3	K10	kr2c3	K14	kr0c19	K74	kr2c19	K78

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c4	K17	kr2c4	K21	kr0c20	K81	kr2c20	K85
kr0c5	K18	kr2c5	K22	kr0c21	K82	kr2c21	K86
kr0c6	K25	kr2c6	K29	kr0c22	K89	kr2c22	K93
kr0c7	K26	kr2c7	K30	kr0c23	K90	kr2c23	K94
kr0c8	K33	kr2c8	K37	kr0c24	K97	kr2c24	K101
kr0c9	K34	kr2c9	K38	kr0c25	K98	kr2c25	K102
kr0c10	K41	kr2c10	K45	kr0c26	K105	kr2c26	K109
kr0c11	K42	kr2c11	K46	kr0c27	K106	kr2c27	K110
kr0c12	K49	kr2c12	K53	kr1c16	K67	kr3c16	K71
kr0c13	K50	kr2c13	K54	kr1c17	K68	kr3c17	K72
kr0c14	K57	kr2c14	K61	kr1c18	K75	kr3c18	K79
kr0c15	K58	kr2c15	K62	kr1c19	K76	kr2c19	K80
kr1c0	K3	kr3c0	K7	kr1c20	K83	kr3c20	K87
kr1c1	K4	kr3c1	K8	kr1c21	K84	kr3c21	K88
kr1c2	K11	kr3c2	K15	kr1c22	K91	kr3c22	K95
kr1c3	K12	kr3c3	K16	kr1c23	K92	kr3c23	K96
kr1c4	K19	kr3c4	K23	kr1c24	K99	kr3c24	K103
kr1c5	K20	kr3c5	K24	kr1c25	K100	kr3c25	K104
kr1c6	K27	kr3c6	K31	kr1c26	K107	kr3c26	K111
kr1c7	K28	kr3c7	K32	kr1c27	K108	kr3c27	K112
kr1c8	K35	kr3c8	K39				
kr1c9	K36	kr3c9	K40				
kr1c10	K43	kr3c10	K47				
kr1c11	K44	kr3c11	K48				
kr1c12	K51	kr3c12	K55				
kr1c13	K52	kr3c13	K56				

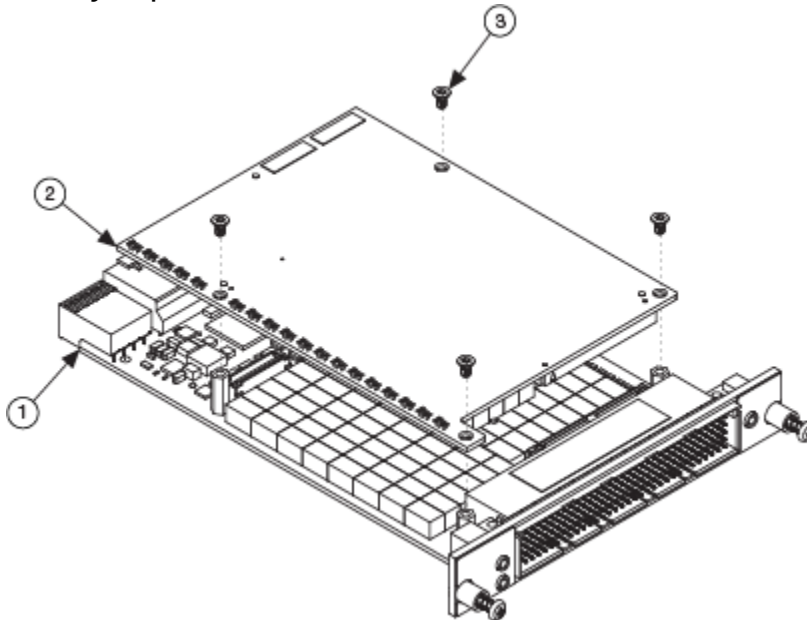
Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr1c14	K59	kr3c14	K63				
kr1c15	K60	kr3c15	K64				

Table 15. NI PXIe-2737 PCB 2 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c28	K11	kr0c32	K33	kr2c32	K29	kr0c48	K69	kr2c48	K65
kr0c29	K10	kr0c33	K32	kr2c33	K28	kr0c49	K68	kr2c49	K64
kr0c30	K22	kr0c34	K44	kr2c34	K40	kr0c50	K80	kr2c50	K76
kr0c31	K21	kr0c35	K43	kr2c35	K39	kr0c51	K79	kr2c51	K75
kr1c28	K9	kr0c36	K55	kr2c36	K51	kr0c52	K91	kr2c52	K87
kr1c29	K8	kr0c37	K54	kr2c37	K50	kr0c53	K90	kr2c53	K86
kr1c30	K20	kr0c38	K3	kr2c38	K1	kr0c54	K102	kr2c54	K98
kr1c31	K19	kr0c39	K14	kr2c39	K12	kr0c55	K101	kr2c55	K97
kr2c28	K7	kr0c40	K25	kr2c40	K23	kr0c56	K113	kr2c56	K109
kr2c29	K6	kr0c41	K36	kr2c41	K34	kr0c57	K112	kr2c57	K108
kr2c30	K18	kr0c42	K47	kr2c42	K45	kr0c58	K124	kr2c58	K120
kr2c31	K17	kr0c43	K58	kr2c43	K56	kr0c59	K123	kr2c59	K119
kr3c28	K5	kr0c44	K61	kr2c44	K59	kr0c60	K135	kr2c60	K131
kr3c29	K4	kr0c45	K72	kr2c45	K70	kr0c61	K134	kr2c61	K130
kr3c30	K16	kr0c46	K83	kr2c46	K81	kr0c62	K144	kr2c62	K140
kr3c31	K15	kr0c47	K94	kr2c47	K92	kr0c63	K143	kr2c63	K139
		kr1c32	K31	kr3c32	K27	kr1c48	K67	kr3c48	K63
		kr1c33	K30	kr3c33	K26	kr1c49	K66	kr3c49	K62
		kr1c34	K42	kr3c34	K38	kr1c50	K78	kr3c50	K74
		kr1c35	K41	kr3c35	K37	kr1c51	K77	kr3c51	K73
		kr1c36	K53	kr3c36	K49	kr1c52	K89	kr3c52	K85
		kr1c37	K52	kr3c37	K48	kr1c53	K88	kr3c53	K84
		kr1c38	K2	kr3c38	K127	kr1c54	K100	kr3c54	K96
		kr1c39	K13	kr3c39	K126	kr1c55	K99	kr3c55	K95
		kr1c40	K24	kr3c40	K116	kr1c56	K111	kr3c56	K107
		kr1c41	K35	kr3c41	K115	kr1c57	K110	kr3c57	K106
		kr1c42	K46	kr3c42	K105	kr1c58	K122	kr3c58	K118
		kr1c43	K57	kr3c43	K136	kr1c59	K121	kr3c59	K117
		kr1c44	K60	kr3c44	K125	kr1c60	K133	kr3c60	K129
		kr1c45	K71	kr3c45	K114	kr1c61	K132	kr3c61	K128
		kr1c46	K82	kr3c46	K103	kr1c62	K142	kr3c62	K138
		kr1c47	K93	kr3c47	K104	kr1c63	K141	kr3c63	K137

Disassemble the Module

1. Remove the four screws that secure PCB 2 to the switch assembly.
2. Gently separate PCB 1 and PCB 2.



1	PCB 1
2	PCB 2
3	Screw

Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Verify that you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Complete the following steps to replace a relay:

1. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



2. Replace the relay as you would any other through-hole part. Trim the replaced relay to no more than 0.41 mm (0.016 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXIe-2738

The NI PXIe-2738 (NI 2738) is a 256 crosspoint, high-density matrix switch module for the PXI Express platform. The NI 2738 is designed for switching low and high voltages. For low-voltage measurements, the NI 2738 uses relays with $<10\ \mu\text{V}$ thermal offset to ensure accurate measurements.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topologies of the NI 2738 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-Wire 8×32 Matrix	2738/2-Wire 8x32 Matrix (NISWITCH_TOPOLOGY_2738_2_WIRE_8X32_MATRIX)	✓	

Related Information

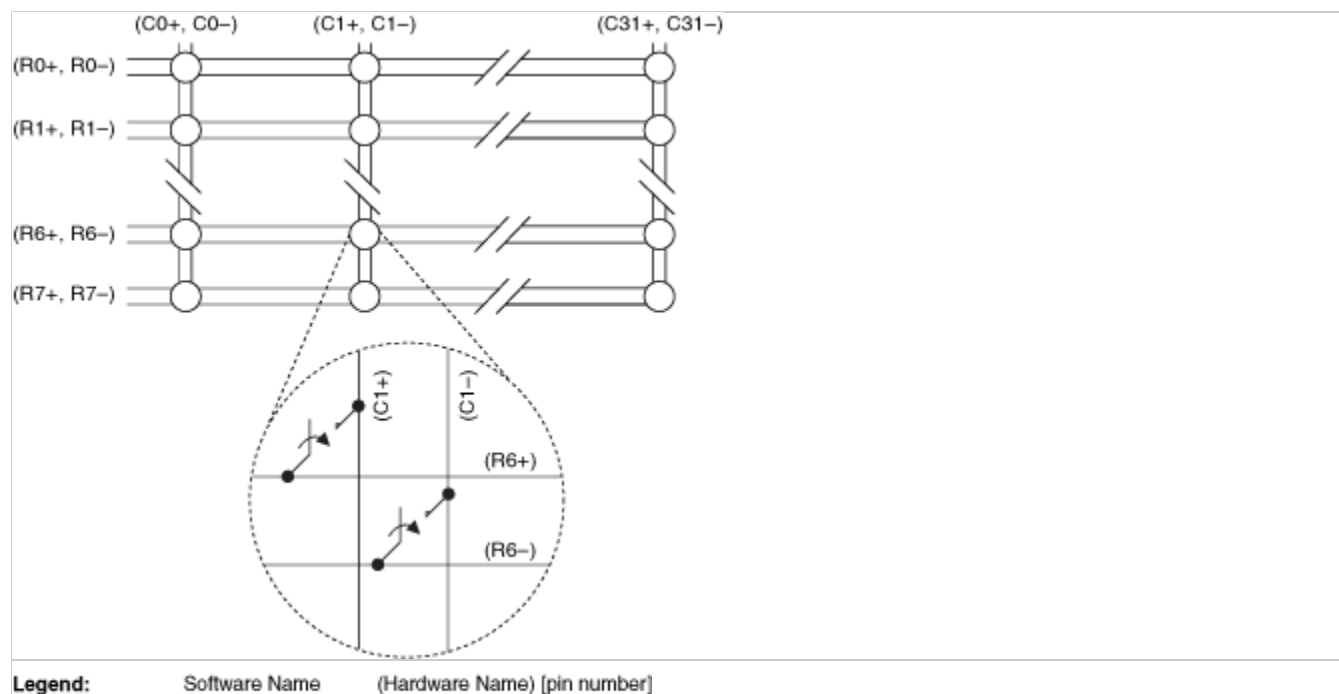
- [Integration and System Considerations](#)

Related concepts:

- [Matrix](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2738 2-Wire 8×32 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2738 2-Wire 8×32 Matrix Topology

The following figure represents the NI PXIe-2738 (NI 2738) in the 2-wire 8×32 matrix topology.



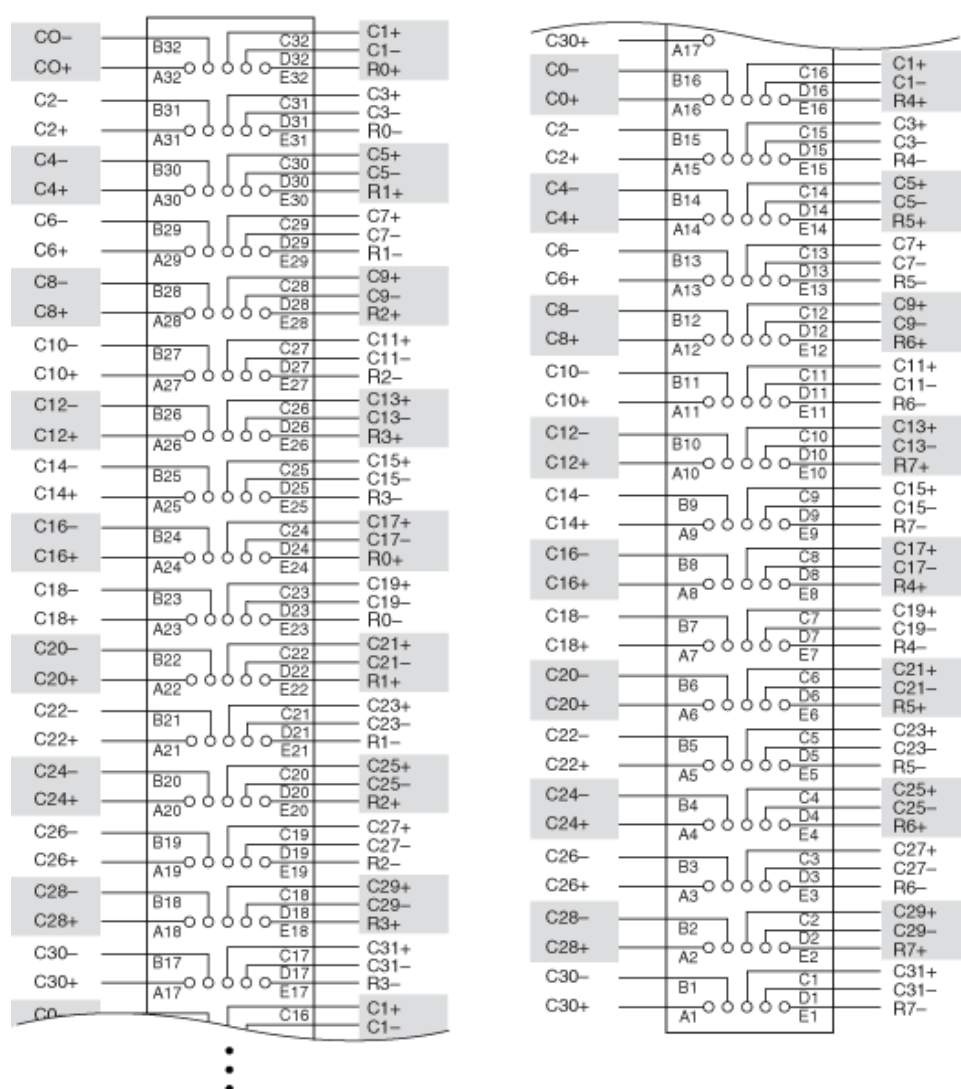
Making a Connection

The NI 2738 is an 8×32 matrix. In this topology you can connect any row to any column. In software, R0 refers to the R0+ and R0- pair. All other channels follow a similar naming scheme.

You can connect the channels of the NI 2738 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect row 1 to column 1, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `r1` and the **channel 2** parameter set to `c1`, or vice versa.

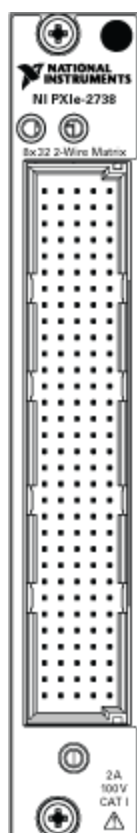
Pinout

The following figure identifies the pins for the NI 2738.



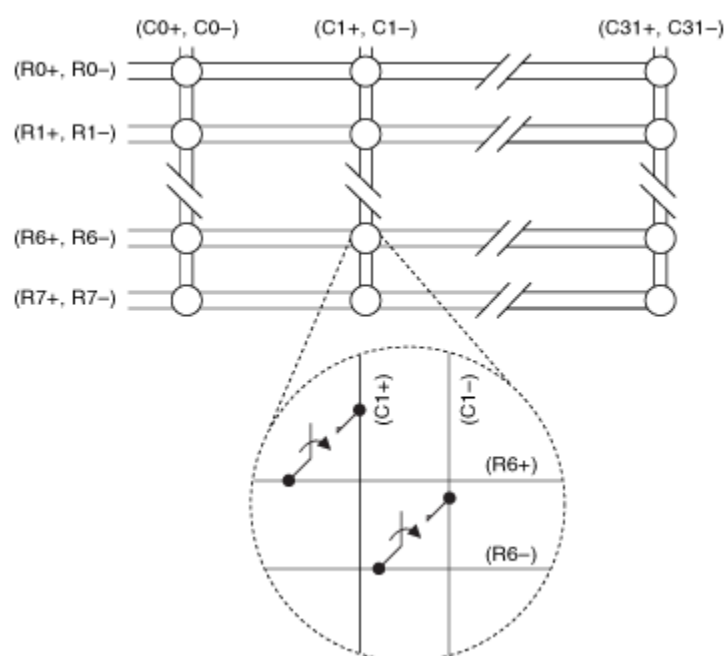
NI PXIe-2738 Front Panel

The following figure illustrates the NI PXIe-2738 front panel.



NI PXIe-2738 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2738.



The following table lists relay names for the NI 2738.

Relays
kr0c0...kr0c31
kr1c0...kr1c31
kr2c0...kr2c31
kr3c0...kr3c31
kr4c0...kr4c31
kr5c0...kr5c31
kr6c0...kr6c31
kr7c0...kr7c31

NI PXIe-2738 Relay Replacement

The NI PXIe-2738 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 relays)	781089-10

Complete the following steps to disassemble your module, replace a failed relay, and reassemble your module.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI Express chassis.



Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

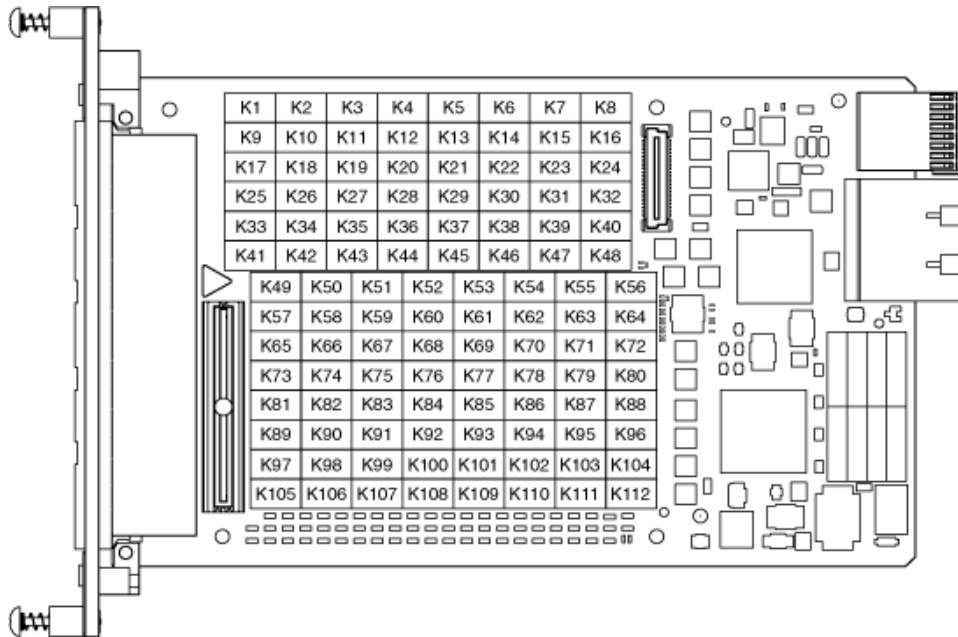
2. Refer to the following figures and table for the relay you want to replace.

- Match the channel name to its corresponding relay name.
- Match the relay name with its reference designator using the tables below.

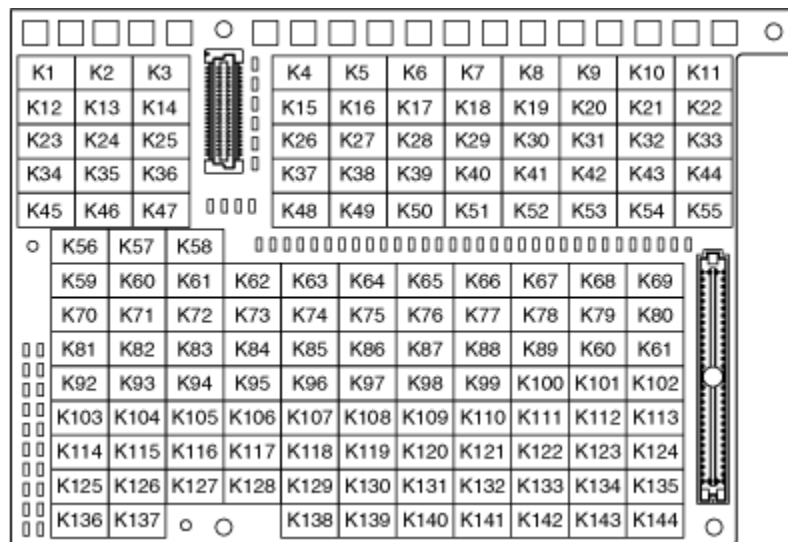


Note Reference designators are printed on the PCB.

NI PXIe-2738 PCB 1



NI PXIe-2738 PCB 2



NI PXIe-2738 Hardware Diagram

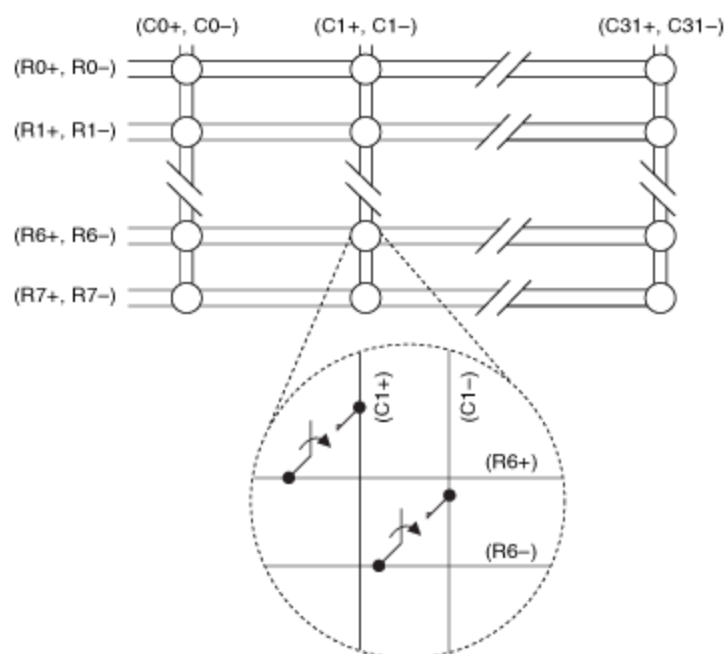


Table 16. NI PXIe-2738 PCB 1 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c0	K1	kr2c0	K5	kr0c16	K65	kr2c16	K69
kr0c1	K2	kr2c1	K6	kr0c17	K66	kr2c17	K70
kr0c2	K9	kr2c2	K13	kr0c18	K73	kr2c18	K77
kr0c3	K10	kr2c3	K14	kr0c19	K74	kr2c19	K78
kr0c4	K17	kr2c4	K21	kr0c20	K81	kr2c20	K85
kr0c5	K18	kr2c5	K22	kr0c21	K82	kr2c21	K86
kr0c6	K25	kr2c6	K29	kr0c22	K89	kr2c22	K93
kr0c7	K26	kr2c7	K30	kr0c23	K90	kr2c23	K94
kr0c8	K33	kr2c8	K37	kr0c24	K97	kr2c24	K101
kr0c9	K34	kr2c9	K38	kr0c25	K98	kr2c25	K102
kr0c10	K41	kr2c10	K45	kr0c26	K105	kr2c26	K109
kr0c11	K42	kr2c11	K46	kr0c27	K106	kr2c27	K110
kr0c12	K49	kr2c12	K53	kr1c16	K67	kr3c16	K71
kr0c13	K50	kr2c13	K54	kr1c17	K68	kr3c17	K72

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c14	K57	kr2c14	K61	kr1c18	K75	kr3c18	K79
kr0c15	K58	kr2c15	K62	kr1c19	K76	kr3c19	K80
kr1c0	K3	kr3c0	K7	kr1c20	K83	kr3c20	K87
kr1c1	K4	kr3c1	K8	kr1c21	K84	kr3c21	K88
kr1c2	K11	kr3c2	K15	kr1c22	K91	kr3c22	K95
kr1c3	K12	kr3c3	K16	kr1c23	K92	kr3c23	K96
kr1c4	K19	kr3c4	K23	kr1c24	K99	kr3c24	K103
kr1c5	K20	kr3c5	K24	kr1c25	K100	kr3c25	K104
kr1c6	K27	kr3c6	K31	kr1c26	K107	kr3c26	K111
kr1c7	K28	kr3c7	K32	kr1c27	K108	kr3c27	K112
kr1c8	K35	kr3c8	K39				
kr1c9	K36	kr3c9	K40				
kr1c10	K43	kr3c10	K47				
kr1c11	K44	kr3c11	K48				
kr1c12	K51	kr3c12	K55				
kr1c13	K52	kr3c13	K56				
kr1c14	K59	kr3c14	K63				
kr1c15	K60	kr3c15	K64				

Table 17. NI PXIe-2738 PCB 2 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c28	K11	kr4c0	K33	kr6c0	K29	kr4c16	K69	kr6c16	K65
kr0c29	K10	kr4c1	K32	kr6c1	K28	kr4c17	K68	kr6c17	K64
kr0c30	K22	kr4c2	K44	kr6c2	K40	kr4c18	K80	kr6c18	K76
kr0c31	K21	kr4c3	K43	kr6c3	K39	kr4c19	K79	kr6c19	K75
kr1c28	K9	kr4c4	K55	kr6c4	K51	kr4c20	K91	kr6c20	K87
kr1c29	K8	kr4c5	K54	kr6c5	K50	kr4c21	K90	kr6c21	K86
kr1c30	K20	kr4c6	K3	kr6c6	K1	kr4c22	K102	kr6c22	K98
kr1c31	K19	kr4c7	K14	kr6c7	K12	kr4c23	K101	kr6c23	K97

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr2c28	K7	kr4c8	K25	kr6c8	K23	kr4c24	K113	kr6c24	K109
kr2c29	K6	kr4c9	K36	kr6c9	K34	kr4c25	K112	kr6c25	K108
kr2c30	K18	kr4c10	K47	kr6c10	K45	kr4c26	K124	kr6c26	K120
kr2c31	K17	kr4c11	K58	kr6c11	K56	kr4c27	K123	kr6c27	K119
kr3c28	K5	kr4c12	K61	kr6c12	K59	kr4c28	K135	kr6c28	K131
kr3c29	K4	kr4c13	K72	kr6c13	K70	kr4c29	K134	kr6c29	K130
kr3c30	K16	kr4c14	K83	kr6c14	K81	kr4c30	K144	kr6c30	K140
kr3c31	K15	kr4c15	K94	kr6c15	K92	kr4c31	K143	kr6c31	K139
		kr5c0	K31	kr7c0	K27	kr5c16	K67	kr7c16	K63
		kr5c1	K30	kr7c1	K26	kr5c17	K66	kr7c17	K62
		kr5c2	K42	kr7c2	K38	kr5c18	K78	kr7c18	K74
		kr5c3	K41	kr7c3	K37	kr5c19	K77	kr7c19	K73
		kr5c4	K53	kr7c4	K49	kr5c20	K89	kr7c20	K85
		kr5c5	K52	kr7c5	K48	kr5c21	K88	kr7c21	K84
		kr5c6	K2	kr7c6	K127	kr5c22	K100	kr7c22	K96
		kr5c7	K13	kr7c7	K126	kr5c23	K99	kr7c23	K95
		kr5c8	K24	kr7c8	K116	kr5c24	K111	kr7c24	K107
		kr5c9	K35	kr7c9	K115	kr5c25	K110	kr7c25	K106
		kr5c10	K46	kr7c10	K105	kr5c26	K122	kr7c26	K118
		kr5c11	K57	kr7c11	K136	kr5c27	K121	kr7c27	K117
		kr5c12	K60	kr7c12	K125	kr5c28	K133	kr7c28	K129
		kr5c13	K71	kr7c13	K114	kr5c29	K132	kr7c29	K128
		kr5c14	K82	kr7c14	K103	kr5c30	K142	kr7c30	K138
		kr5c15	K93	kr7c15	K104	kr5c31	K141	kr7c31	K137

Disassemble the Module

1. Remove the four screws that secure PCB 2 to the switch assembly.
2. Gently separate PCB 1 and PCB 2.

1	PCB 1
2	PCB 2
3	Screw

Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Verify that you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Complete the following steps to replace a relay:

1. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



2. Replace the relay as you would any other through-hole part. Trim the replaced relay to no more than 0.41 mm (0.016 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXIe-2739

The NI PXIe-2739 (NI 2739) is a 256 crosspoint, high-density matrix switch module for the PXI Express platform. The NI 2739 is designed for switching low and high voltages. For low-voltage measurements, the NI 2739 uses relays with <10 μ V thermal offset to ensure accurate measurements.



Note Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topologies of the NI 2739 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-Wire 16×16 Matrix	2739/2-Wire 16x16 Matrix (NISWITCH_TOPOLOGY_2739_2_WIRE_16X16_MATRIX)	✓	

Related Information

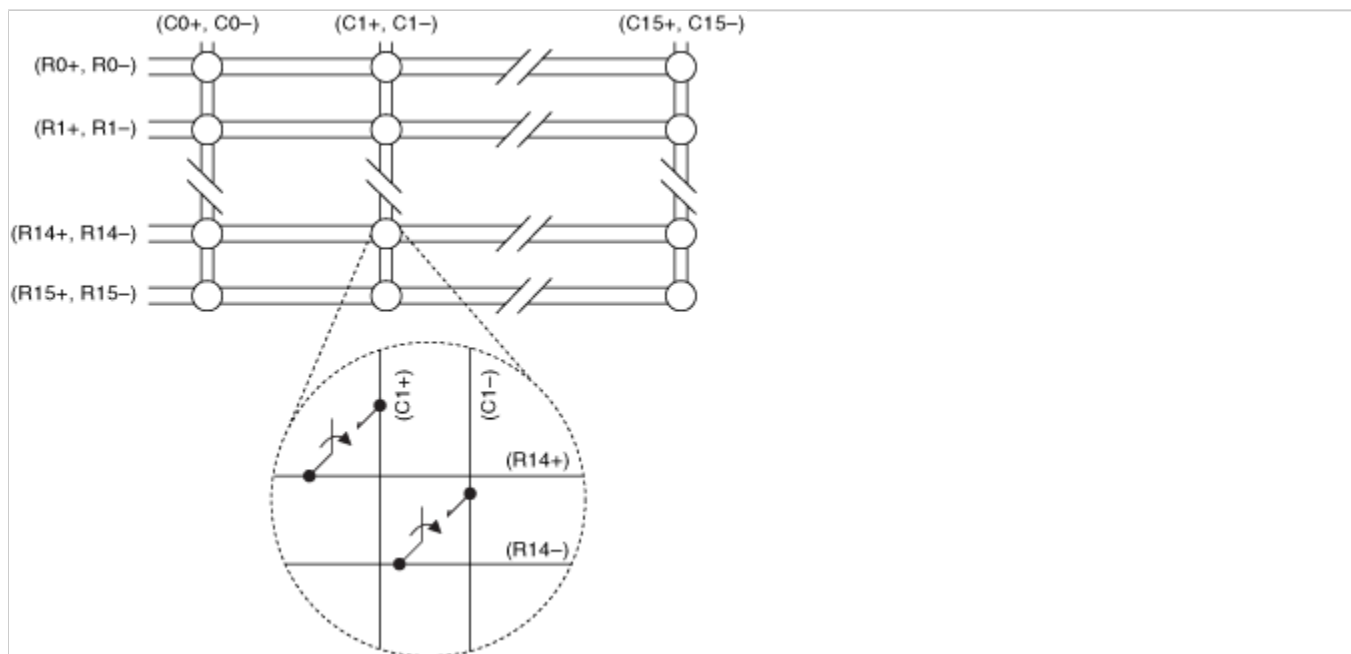
- [Integration and System Considerations](#)

Related concepts:

- [Matrix](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI PXIe-2739 2-Wire 16×16 Matrix Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2739 2-Wire 16×16 Matrix Topology

The following figure represents the NI PXIe-2739 (NI 2739) in the 2-wire 16×16 matrix topology.



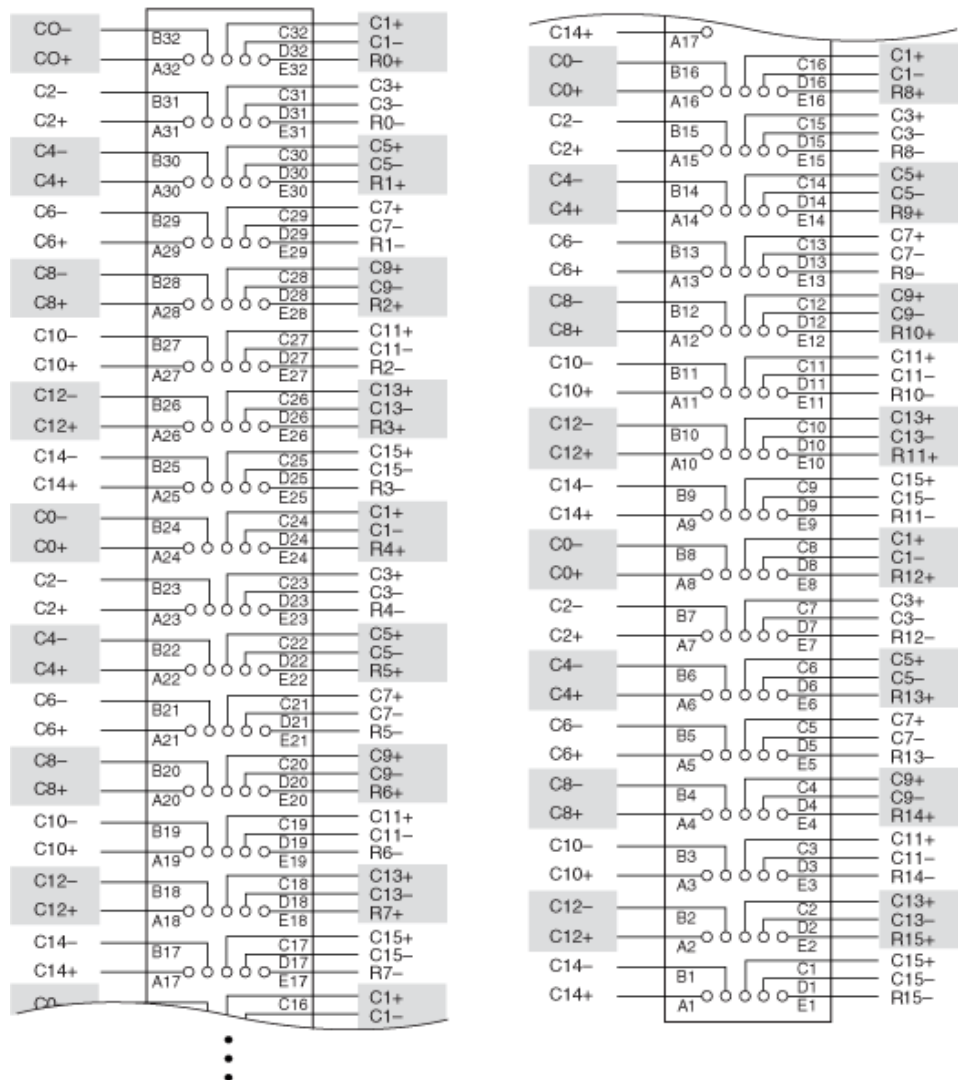
Making a Connection

The NI 2739 is a 16×16 matrix. In this topology, you can connect any row to any column. In software, R0 refers to the R0+ and R0- pair. All other channels follow a similar naming scheme.

You can connect the channels of the NI 2739 using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function. For example, to connect row 1 to column 1, call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with the **channel 1** parameter set to `r1` and the **channel 2** parameter set to `c1`.

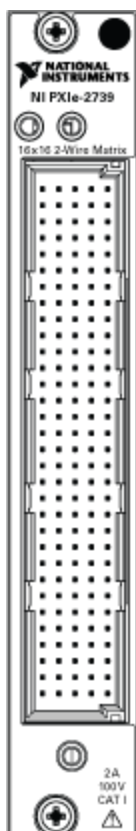
Pinout

The following figure identifies the pins for the NI 2739.



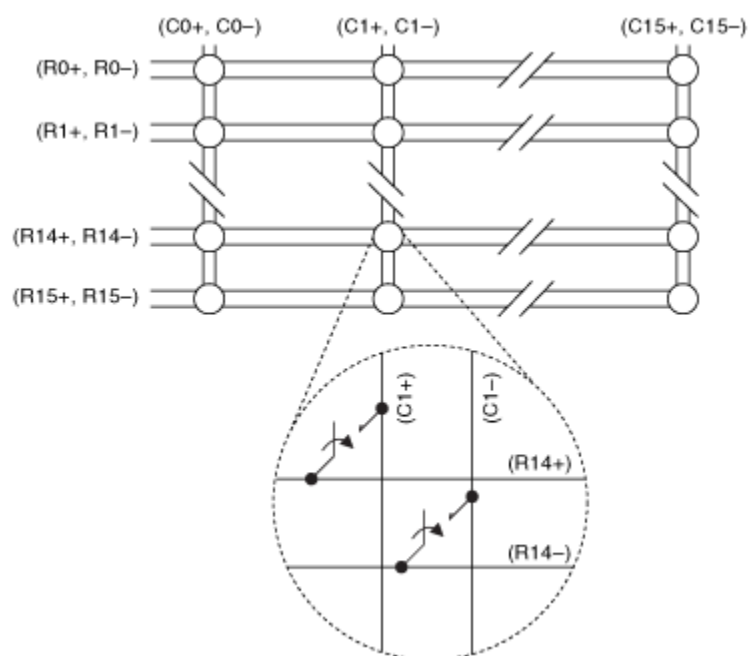
NI PXIe-2739 Front Panel

The following figure illustrates the NI PXIe-2739 front panel.



NI PXIe-2739 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2739.



The following table lists relay names for the NI 2739.

Relays
kr0c0...kr0c15
kr1c0...kr1c15
kr2c0...kr2c15
kr3c0...kr3c15
kr4c0...kr4c15
kr5c0...kr5c15
kr6c0...kr6c15
kr7c0...kr7c15
kr8c0...kr8c15
kr9c0...kr9c15
kr10c0...kr10c15
kr11c0...kr11c15
kr12c0...kr12c15
kr13c0...kr13c15
kr14c0...kr14c15
kr15c0...kr15c15

NI PXIe-2739 Relay Replacement

The NI PXIe-2739 uses electromechanical armature relays.

Refer to the following table for information about ordering replacement relays.

Relay Manufacturer	Part
Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 relays)	781089-10

Complete the following steps to disassemble your module, replace a failed relay, and reassemble your module.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI Express chassis.



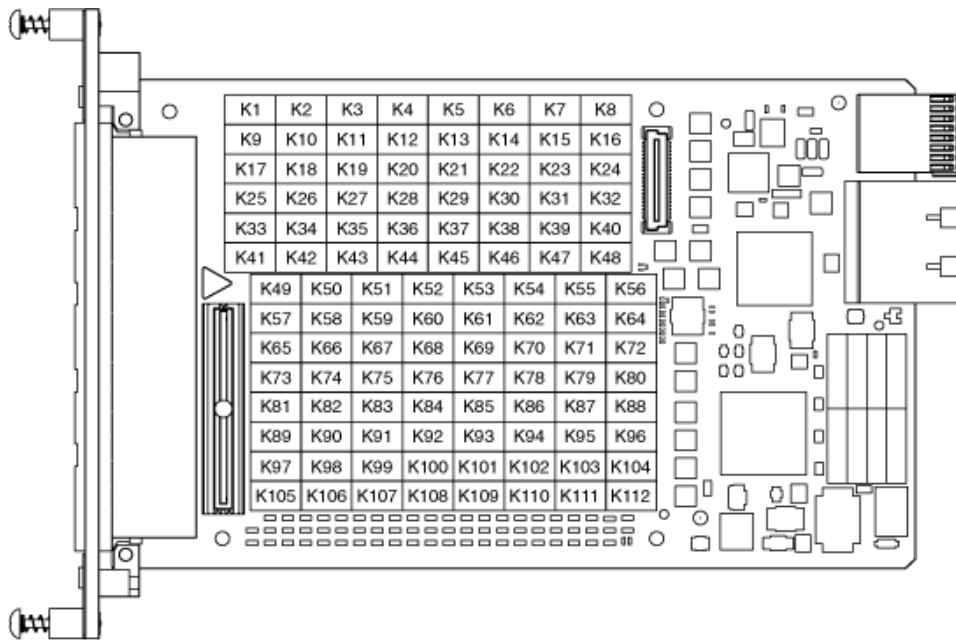
Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Refer to the following figures and table to locate the relay you want to replace.
 - a. Match the channel name to its corresponding relay name.
 - b. Match the relay name with its reference designator using the tables below.

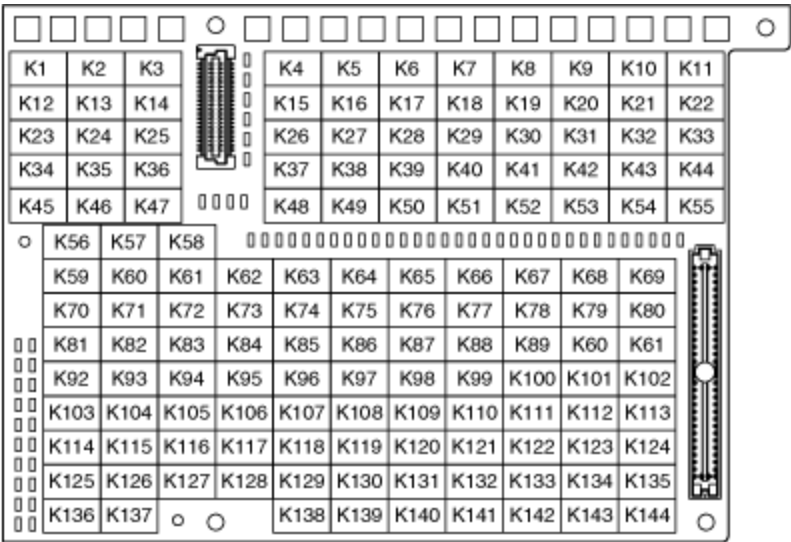


Note Reference designators are printed on the PCB.

NI PXIe-2739 PCB 1



NI PXIe-2739 PCB 2



NI PXIe-2739 Hardware Diagram

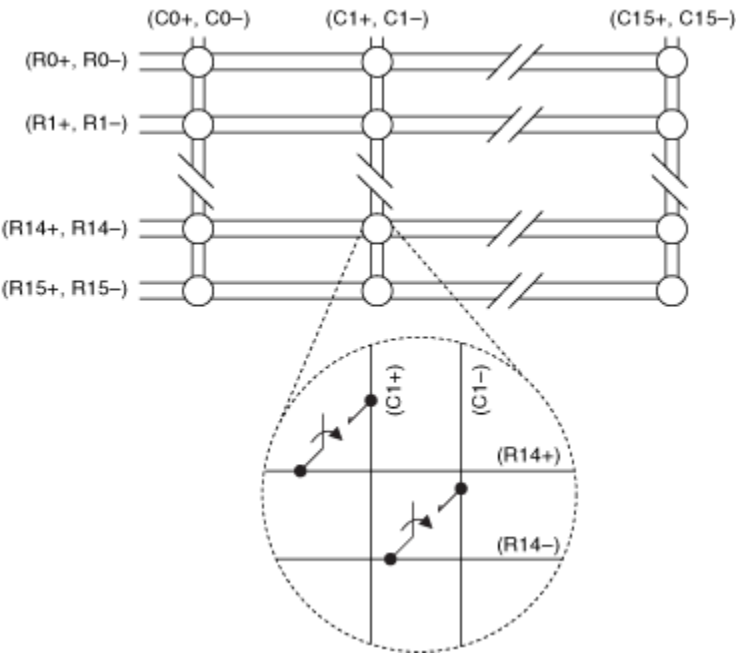


Table 18. NI PXIe-2739 PCB 1 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c0	K1	kr2c0	K5	kr4c0	K65	kr6c0	K69
kr0c1	K2	kr2c1	K6	kr4c1	K66	kr6c1	K70
kr0c2	K9	kr2c2	K13	kr4c2	K73	kr6c2	K77
kr0c3	K10	kr2c3	K14	kr4c3	K74	kr6c3	K78

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr0c4	K17	kr2c4	K21	kr4c4	K81	kr6c4	K85
kr0c5	K18	kr2c5	K22	kr4c5	K82	kr6c5	K86
kr0c6	K25	kr2c6	K29	kr4c6	K89	kr6c6	K93
kr0c7	K26	kr2c7	K30	kr4c7	K90	kr6c7	K94
kr0c8	K33	kr2c8	K37	kr4c8	K97	kr6c8	K101
kr0c9	K34	kr2c9	K38	kr4c9	K98	kr6c9	K102
kr0c10	K41	kr2c10	K45	kr4c10	K105	kr6c10	K109
kr0c11	K42	kr2c11	K46	kr4c11	K106	kr6c11	K110
kr0c12	K49	kr2c12	K53	kr5c0	K67	kr7c0	K71
kr0c13	K50	kr2c13	K54	kr5c1	K68	kr7c1	K72
kr0c14	K57	kr2c14	K61	kr5c2	K75	kr7c2	K79
kr0c15	K58	kr2c15	K62	kr5c3	K76	kr7c3	K80
kr1c0	K3	kr3c0	K7	kr5c4	K83	kr7c4	K87
kr1c1	K4	kr3c1	K8	kr5c5	K84	kr7c5	K88
kr1c2	K11	kr3c2	K15	kr5c6	K91	kr7c6	K95
kr1c3	K12	kr3c3	K16	kr5c7	K92	kr7c7	K96
kr1c4	K19	kr3c4	K23	kr5c8	K99	kr7c8	K103
kr1c5	K20	kr3c5	K24	kr5c9	K100	kr7c9	K104
kr1c6	K27	kr3c6	K31	kr5c10	K107	kr7c10	K111
kr1c7	K28	kr3c7	K32	kr5c11	K108	kr7c11	K112
kr1c8	K35	kr3c8	K39				
kr1c9	K36	kr3c9	K40				
kr1c10	K43	kr3c10	K47				
kr1c11	K44	kr3c11	K48				
kr1c12	K51	kr3c12	K55				
kr1c13	K52	kr3c13	K56				

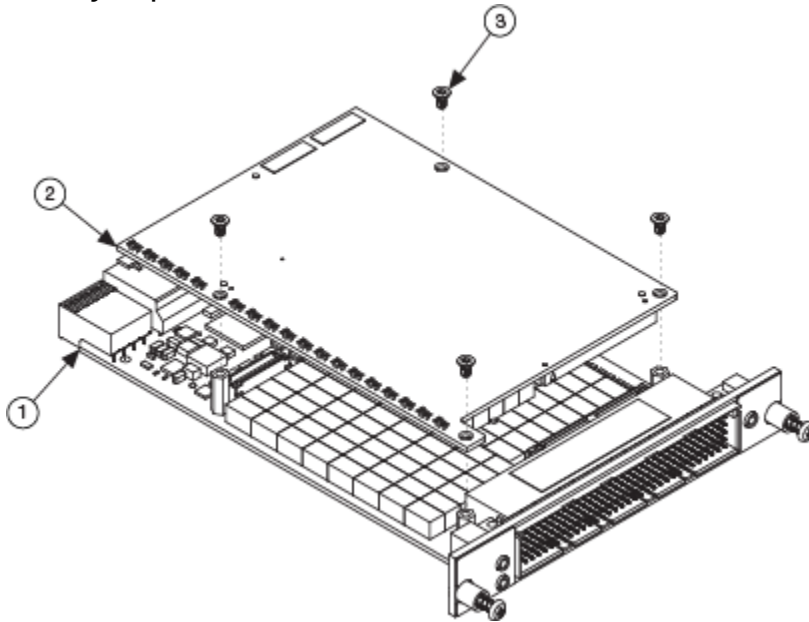
Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr1c14	K59	kr3c14	K63				
kr1c15	K60	kr3c15	K64				

Table 19. NI PXIe-2739 PCB 2 Relay Locations

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kr4c12	K11	kr8c0	K33	kr10c0	K29	kr12c0	K69	kr14c0	K65
kr4c13	K10	kr8c1	K32	kr10c1	K28	kr12c1	K68	kr14c1	K64
kr4c14	K22	kr8c2	K44	kr10c2	K40	kr12c2	K80	kr14c2	K76
kr4c15	K21	kr8c3	K43	kr10c3	K39	kr12c3	K79	kr14c3	K75
kr5c12	K9	kr8c4	K55	kr10c4	K51	kr12c4	K91	kr14c4	K87
kr5c13	K8	kr8c5	K54	kr10c5	K50	kr12c5	K90	kr14c5	K86
kr5c14	K20	kr8c6	K3	kr10c6	K1	kr12c6	K102	kr14c6	K98
kr5c15	K19	kr8c7	K14	kr10c7	K12	kr12c7	K101	kr14c7	K97
kr6c12	K7	kr8c8	K25	kr10c8	K23	kr12c8	K113	kr14c8	K109
kr6c13	K6	kr8c9	K36	kr10c9	K34	kr12c9	K112	kr14c9	K108
kr6c14	K18	kr8c10	K47	kr10c10	K45	kr12c10	K124	kr14c10	K120
kr6c15	K17	kr8c11	K58	kr10c11	K56	kr12c11	K123	kr14c11	K119
kr7c12	K5	kr8c12	K61	kr10c12	K59	kr12c12	K135	kr14c12	K131
kr7c13	K4	kr8c13	K72	kr10c13	K70	kr12c13	K134	kr14c13	K130
kr7c14	K16	kr8c14	K83	kr10c14	K81	kr12c14	K144	kr14c14	K140
kr7c15	K15	kr8c15	K94	kr10c15	K92	kr12c15	K143	kr14c15	K139
		kr9c0	K31	kr11c0	K27	kr13c0	K67	kr15c0	K63
		kr9c1	K30	kr11c1	K26	kr13c1	K66	kr15c1	K62
		kr9c2	K42	kr11c2	K38	kr13c2	K78	kr15c2	K74
		kr9c3	K41	kr11c3	K37	kr13c3	K77	kr15c3	K73
		kr9c4	K53	kr11c4	K49	kr13c4	K89	kr15c4	K85
		kr9c5	K52	kr11c5	K48	kr13c5	K88	kr15c5	K84
		kr9c6	K2	kr11c6	K127	kr13c6	K100	kr15c6	K96
		kr9c7	K13	kr11c7	K126	kr13c7	K99	kr15c7	K95
		kr9c8	K24	kr11c8	K116	kr13c8	K111	kr15c8	K107
		kr9c9	K35	kr11c9	K115	kr13c9	K110	kr15c9	K106
		kr9c10	K46	kr11c10	K105	kr13c10	K122	kr15c10	K118
		kr9c11	K57	kr11c11	K136	kr13c11	K121	kr15c11	K117
		kr9c12	K60	kr11c12	K125	kr13c12	K133	kr15c12	K129
		kr9c13	K71	kr11c13	K114	kr13c13	K132	kr15c13	K128
		kr9c14	K82	kr11c14	K103	kr13c14	K142	kr15c14	K138
		kr9c15	K93	kr11c15	K104	kr13c15	K141	kr15c15	K137

Disassemble the Module

1. Remove the four screws that secure PCB 2 to the switch assembly.
2. Gently separate PCB 1 and PCB 2.



1	PCB 1
2	PCB 2
3	Screw

Replace the Relay



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies, and lead solder for relay replacement on lead assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 316 °C (600 °F) for lead solder rework or 371 °C (700 °F) for lead-free solder rework
- 63/37 Tin/Lead solder (flux core) for lead solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Complete the following steps to replace a relay:

1. Locate the assembly and serial number labels on the board with the relay you want to replace. White labels indicate the board was assembled using lead solder (Sn 63 Pb 37). Green labels indicate the board was assembled using lead-free solder (Sn 96.5 Ag 3.0 Cu 0.5). Lead-free assemblies have assembly numbers ending in L. The different label types are shown in the following figure.



2. Replace the relay as you would any other through-hole part. Trim the replaced relay to no more than 0.41 mm (0.016 inch) from the PCB.

Reassemble the Module

Complete the Disassemble the Module steps in reverse order to reassemble your module.



Tip In NI-SWITCH 3.1 or later, you can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

NI PXI-2746

The NI PXIe-2746 (NI 2746) is a quad 4×1 multiplexer switch module for the PXI Express bus that can carry 50 Ω RF signals up to 3 GHz.

Operation Modes

The following table lists the supported topology of the NI 2746 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Quad 4×1 Multiplexer	2746/Quad 4x1 Mux(NISWITCH_TOPOLOGY_2746_QUAD_4X1_MUX)	✓	

Related Information

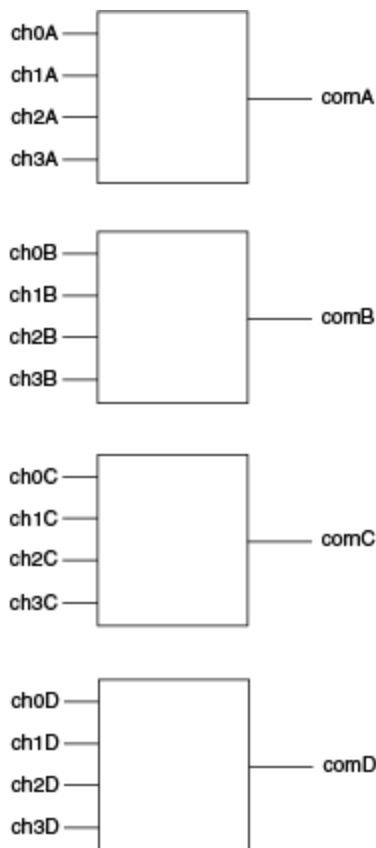
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI Quad PXIe-2746 4×1 Multiplexer \(Quad SP4T\) Topology](#)
- [Integration and System Considerations](#)

NI Quad PXIe-2746 4×1 Multiplexer (Quad SP4T) Topology

The following figure represents the NI PXIe-2746 (NI 2746) in the 4×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of the 4×1 multiplexer is always connected to a common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel from COM upon initial connection.

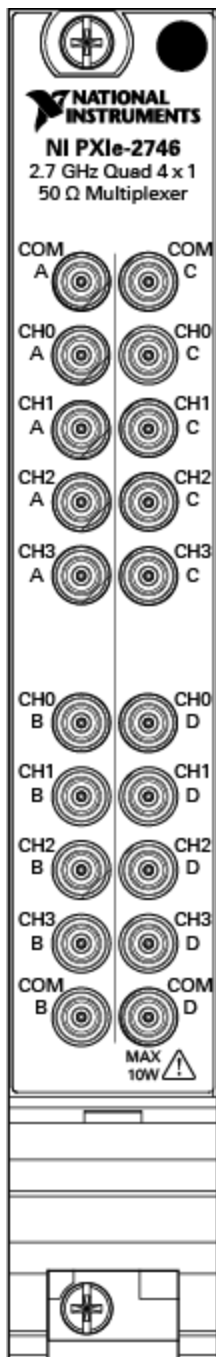
The following sequence of tasks illustrates the VI/function calls necessary to make

consecutive connections—one between CH1 and COM and the other between CH2 and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

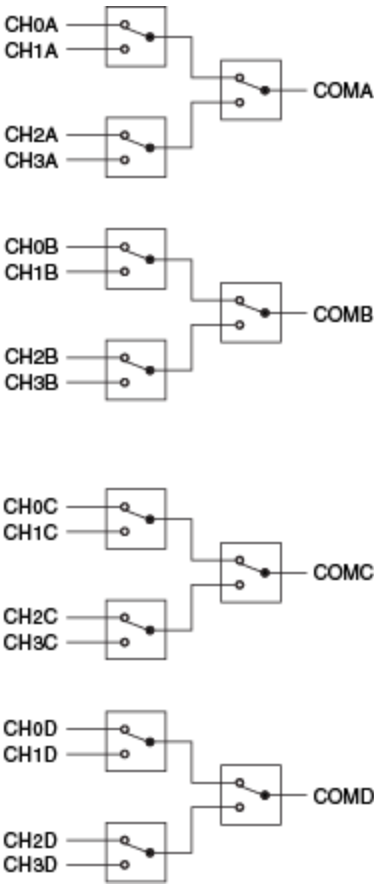
NI PXIe-2746 Front Panel

The following figure illustrates the NI PXIe-2746 front panel.



NI PXIe-2746 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2746.



NI PXIe-2747

The NI PXIe-2747 (NI 2747) is a dual 8×1 multiplexer switch module for the PXI Express bus that can carry 50 Ω RF signals up to 3 GHz.

Operation Modes

The following table lists the supported topology of the NI 2747 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 8×1 Multiplexer	2747/Dual 8x1 Mux (NISWITCH_TOPOLOGY_2747_DUAL_8X1_MUX)	✓	

Related Information

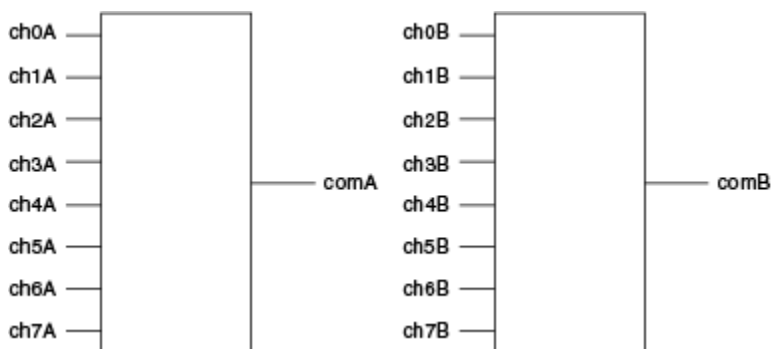
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXIe-2747 Dual 8×1 Multiplexer \(SP8T\) Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2747 Dual 8×1 Multiplexer (SP8T) Topology

The following figure represents the NI PXIe-2747 in the 8×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of the 8×1 multiplexer is always connected to a

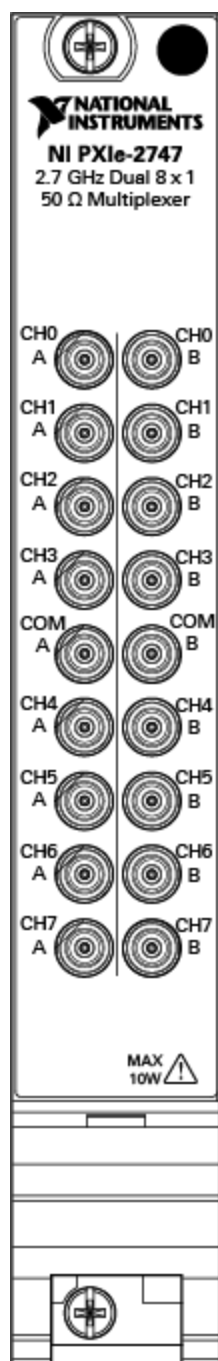
common channel. If you have reset the module or called the niSwitch Disconnect All Channels VI or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel from COM upon initial connection.

The following sequence of tasks illustrates the VI/function calls necessary to make consecutive connections—one between CH1 and COM and the other between CH2 and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

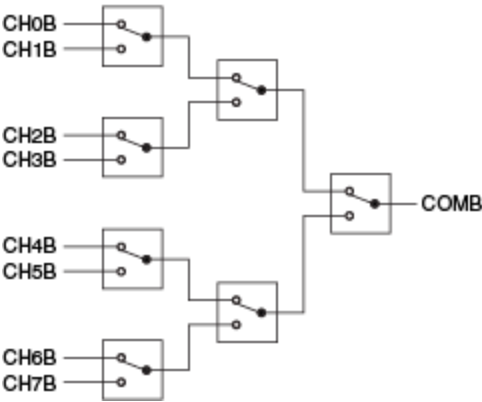
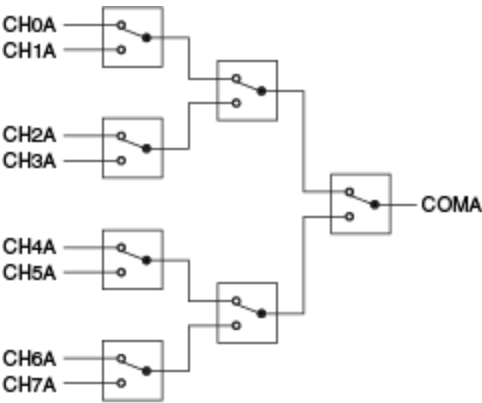
NI PXIe-2747 Front Panel

The following figure illustrates the NI PXIe-2747 front panel.



NI PXIe-2747 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2747.



NI PXIe-2748

The NI PXIe-2748 (NI 2748) is a 16×1 multiplexer switch module for the PXI Express bus that can carry 50 Ω RF signals up to 3 GHz.

Operation Modes

The following table lists the supported topology of the NI 2748 and possible operation modes.

Topology	Software Name	Immediate	Scanning
16×1 Multiplexer	2748/16x1 Mux (NISWITCH_TOPOLOGY_2748_16X1_MUX)	✓	

Related Information

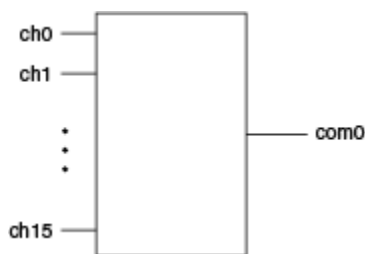
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXI-2547 8×1 Multiplexer \(SP8T\) Topology](#)
- [Integration and System Considerations](#)

NI PXIe-2748 16×1 Multiplexer (SP8T) Topology

The following figure represents the NI PXIe-2748 in the 16×1 multiplexer topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.



Note The `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function does not operate the relay until the next `niSwitch Connect Channels VI` or the next `niSwitch_Connect` function is executed. Thus, one channel of the 16×1 multiplexer is always connected to the common channel. If you have reset the module or called the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function, you do not need to disconnect the default channel (ch0) from COM upon initial connection.

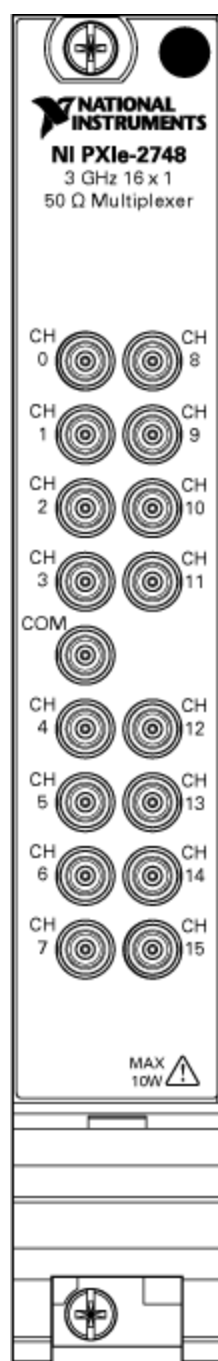
The following sequence of tasks illustrates the VI/function calls necessary to make

consecutive connections—one between CH1 and COM and the other between CH2 and COM:

1. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch1` and `com`.
2. Call the niSwitch Disconnect Channels VI or the `niSwitch_Disconnect` function with parameters `ch1` and `com`.
3. Call the niSwitch Connect Channels VI or the `niSwitch_Connect` function with parameters `ch2` and `com`.

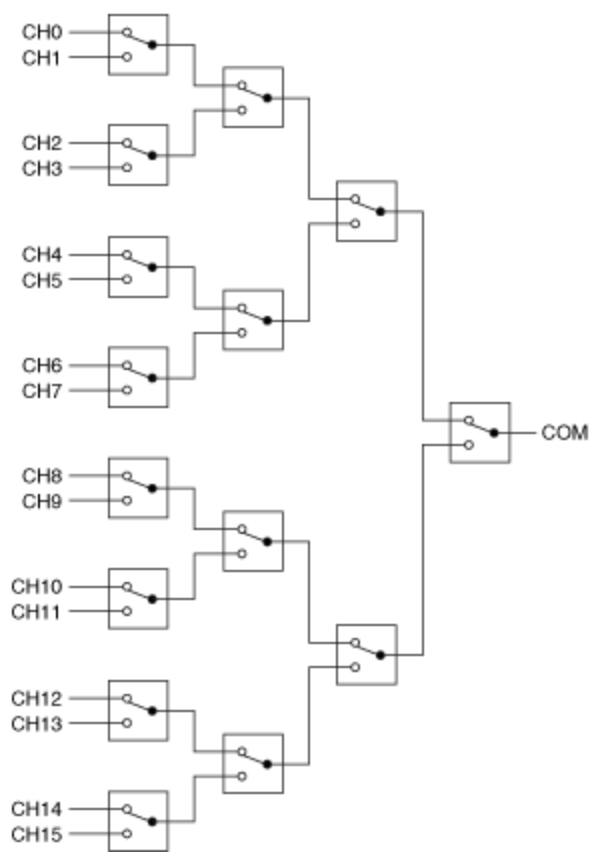
NI PXIe-2748 Front Panel

The following figure illustrates the NI PXIe-2748 front panel.



NI PXIe-2748 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2748.



NI PXIe-2790

The NI PXIe-2790 is an RF power combiner switch module for the PXI Express platform that uses CMOS switches and handles RF signals up to 6 GHz.

Operation Modes

The following table lists the supported topology of the NI PXIe-2790 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Independent	2790/ Independent(NISWITCH_TOPOLOGY_2790_INDEPENDENT)	✓	✓

Related Information

- Integration and System Considerations

Related concepts:

- [RF Switching Considerations](#)
- [Topologies](#)
- [Operation Modes](#)
- [NI PXIe-2790 Independent Topology](#)
- [Integration and System Considerations](#)

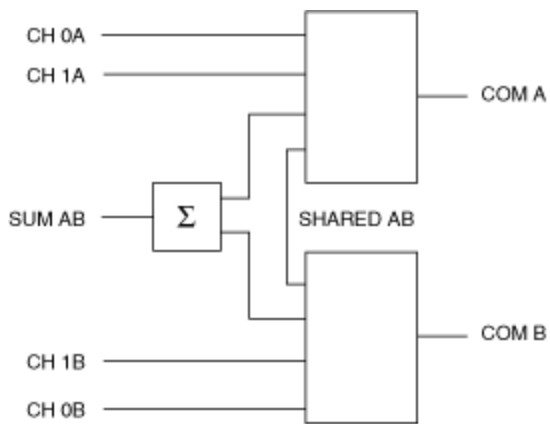
NI PXIe-2790 Front Panel

The following figure illustrates the NI PXIe-2790 front panel.



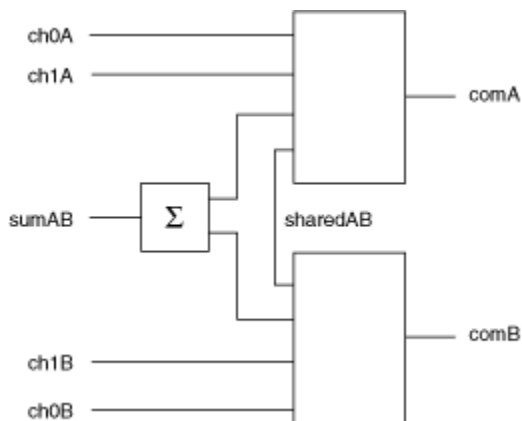
NI PXIe-2790 Hardware Diagram

The following figure shows the hardware diagram for the NI PXIe-2790.



NI PXIe-2790 Independent Topology

The following figure represents the NI PXIe-2790 in the independent topology.



Making a Connection

Call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function to connect channels in this topology. If applicable, you must call the `niSwitch Disconnect Channels VI` or the `niSwitch_Disconnect` function to disconnect an existing connection before you call the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

The initially connected channels on the NI 2790 are `sumAB` to `comA` and `sumAB` to `comB`. To connect `ch1A` to `comA`, disconnect `sumAB` from `comA` and connect `ch1A` to `comA`. To connect `ch1B` to `comB`, disconnect `sumAB` from `comB` and connect `ch1B` to `comB`. Banks A and B operate independently.

NI PXIe-2790 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXIe-2790.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXIe-2790.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A

Scan Advanced Output	Software	Hardware
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2796

The NI PXI-2796 is a multiplexer switch module for the PXI bus designed to handle RF signals up to 40 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2796 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual 6x1 Multiplexer	2796/Dual 6x1 Mux(NISWITCH_TOPOLOGY_2796_DUAL_6X1_MUX)	✓	✓

Related Information

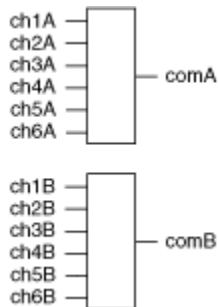
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI-2796 Dual 6×1 Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2796 Dual 6×1 Multiplexer Topology

The following figure represents the NI PXI-2796 in the dual 6×1 multiplexer topology.



Making a Connection

In this topology, you can connect channels by calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To connect the CH_nx terminal to the COM_x terminal, disconnect the previously connected terminal from the COM_x.

For example, to connect ch1A to comA, call `niSwitch_Connect (vi, "ch1A", "comA")`. If you now want to connect ch2A to comA, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect (vi, "ch1A", "comA")
```

```
niSwitch_Connect (vi, "ch2A", "comA")
```



Note All channels are disconnected from COM when the NI PXI-2796 is in its power on state.

When scanning the NI PXI-2796, a typical scan list entry could be `ch1A->comA;`. This

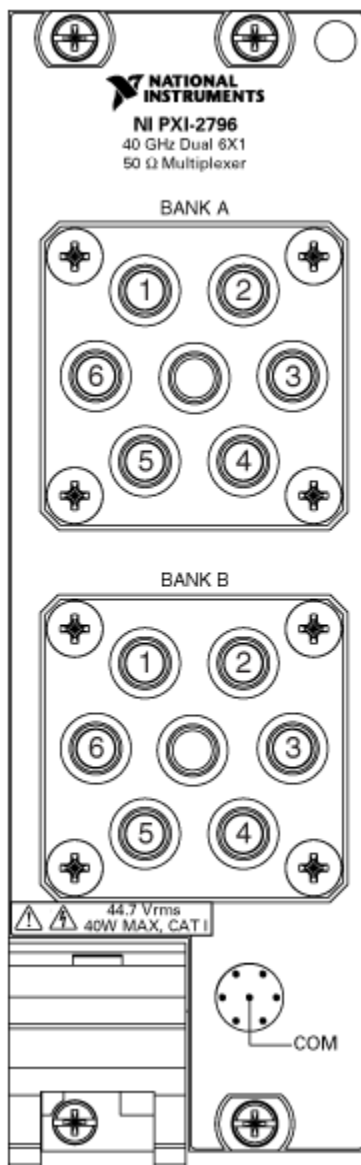
entry routes the signal connected to CH1A to COMA.

Related concepts:

- [Operation Modes](#)
- [Scan Lists](#)

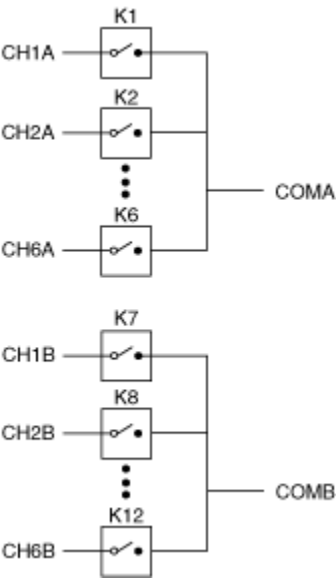
NI PXI-2796 Front Panel

The following figure illustrates the NI PXI-2796 front panel.



NI PXI-2796 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2796.



NI PXI-2796 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2796.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger

Trigger Input	Software	Hardware
		line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2796.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the niSwitch_ConfigureScanTrigger function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2797

The NI PXI-2797 is a terminated multiplexer switch module for the PXI bus designed to handle RF signals up to 40 GHz.

Operation Modes

The following table lists the supported topology of the NI PXI-2797 and possible operation modes.

Topology	Software Name	Immediate	Scanning
6x1 Terminated Multiplexer	2797/6x1 Terminated Mux(NISWITCH_TOPOLOGY_2797_6X1_TERMINATED_MUX)	✓	✓

Related Information

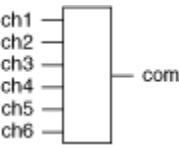
- Integration and System Considerations

Related concepts:

- [Multiplexer](#)
- [Operation Modes](#)
- [NI PXI-2797 6×1 Terminated Multiplexer Topology](#)
- [Integration and System Considerations](#)

NI PXI-2797 6×1 Terminated Multiplexer Topology

The following figure represents the NI PXI-2797 in the 6×1 terminated multiplexer topology.



Caution The terminators on the NI PXI-2797 are rated for 1 W average

power at 25 °C, with power on all terminators not to exceed 3 W. Terminators cannot withstand the full rated power of the NI PXI-2797.

Making a Connection

In this topology, you can connect channels by calling the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To connect the CHx terminal to the COM terminal, disconnect the previously connected terminal from the COM.

For example, to connect ch1 to com, call `niSwitch_Connect (vi, "ch1", "com")`. If you now want to connect ch2 to com, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect (vi, "ch1", "com")
```

```
niSwitch_Connect (vi, "ch2", "com")
```



Note Any input channel not connected to COM is connected to its associated 50 Ω terminator.



Note All channels are disconnected from COM when the NI PXI-2797 is in its power on state.

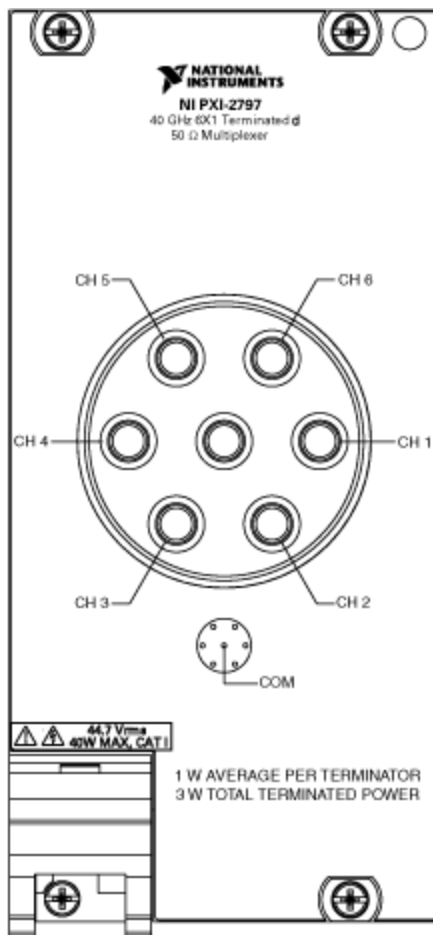
When scanning the NI PXI-2797, a typical scan list entry could be `ch2->com;`. This entry routes signal connected to ch2 to com.

Related concepts:

- [Operation Modes](#)

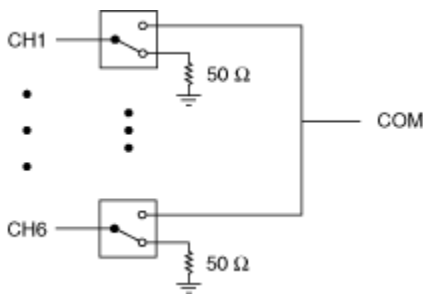
NI PXI-2797 Front Panel

The following figure illustrates the NI PXI-2797 front panel.



NI PXI-2797 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2797.



NI PXI-2797 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2797.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2797.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2798

The NI PXI-2798 is an 2-channel, transfer switch module for the PXI platform designed to handle RF signals up to 40 GHz. The NI PXI-2798 is composed of transfer switch relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2798 and possible operation modes.

Topology	Software Name	Immediate	Scanning
Dual Transfer	2798/Dual Transfer(NISWITCH_TOPOLOGY_2798_DUAL_TRANSFER)	✓	✓

Related Information

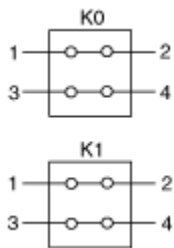
- Integration and System Considerations

Related concepts:

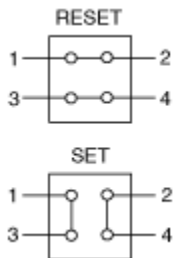
- [Transfer Switches](#)
- [RF Switching Considerations](#)
- [Operation Modes](#)
- [Integration and System Considerations](#)

NI PXI-2798 Dual Transfer Switch Topology

The following figures represents the NI PXI-2798 in the dual transfer switch topology.



The following figures show the two states of each transfer switch, reset and set.



Application

The dual transfer switch topology of the NI PXI-2798 enables customers to insert and remove components in a high-frequency signal path. To insert the DUT, configure the transfer switch in its reset state. To remove the DUT, configure the transfer switch in its set state.

Making a Connection

You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

To set the transfer switch, disconnect the `nc` terminal from `com`, and connect `no` to `com`.

For example, to set the transfer switch K0, use the following code:

```
niSwitch_Disconnect(vi, "nc0", "com0")
```

```
niSwitch_Connect(vi, "no0", "com0")
```



Note To connect no to com you do not need to disconnect nc from com after the module has been reset or a call to the niSwitch Disconnect All Channels VI or the niSwitch_DisconnectAll function has been made.



Note niSwitch_Disconnect(vi, "nc0", "com0") does not operate the relay until niSwitch_Connect(vi, "no0", "com0") is executed. Similarly, niSwitch_Disconnect(vi, "no0", "com0") does not operate the relay until niSwitch_Connect(vi, "nc0", "com0") is executed.

To reset the transfer switch, disconnect the no terminal from com, and connect nc to com.

For example, to reset the transfer switch K0, use the following code:

```
niSwitch_Disconnect(vi, "no0", "com0")
```

```
niSwitch_Connect(vi, "nc0", "com0")
```

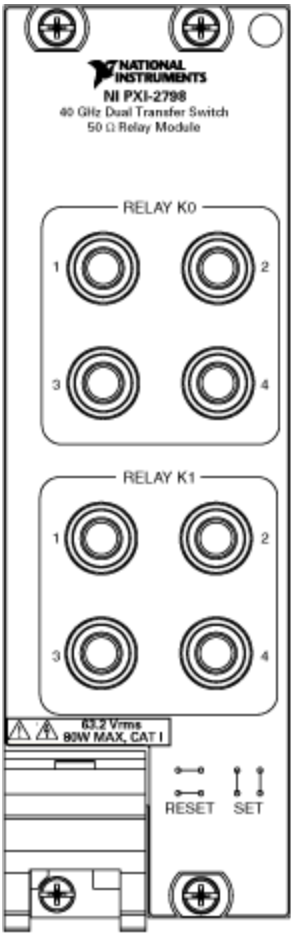
When scanning the NI PXI-2798, a typical scan list entry could be nc0->com0;. This entry resets transfer switch K0.

Related concepts:

- [Transfer Switches](#)
- [Operation Modes](#)
- [Scan Lists](#)

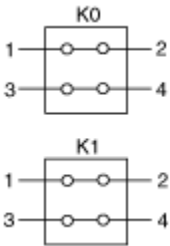
NI PXI-2798 Front Panel

The following figure illustrates the NI PXI-2798 front panel.



NI PXI-2798 Hardware Diagram

The following figures show the hardware diagram for the NI PXI-2798.



NI PXI-2798 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2798.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2798.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3

Scan Advanced Output	Software	Hardware
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the niSwitch Configure Scan Trigger VI or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI PXI-2799

The NI PXI-2799 is an 2-channel, general-purpose switch module for the PXI platform designed to handle RF signals up to 40 GHz. The NI PXI-2799 is composed of 2-SPDT relays.

Operation Modes

The following table lists the supported topology of the NI PXI-2799 and possible operation modes.

Topology	Software Name	Immediate	Scanning
2-SPDT	2799/2-SPDT(NISWITCH_TOPOLOGY_2799_2_SPDT)	✓	✓

Related Information

- Integration and System Considerations

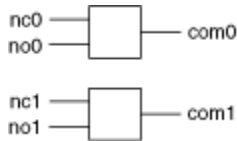
Related concepts:

- [General-Purpose Topologies](#)
- [RF Switching Considerations](#)
- [NI PXI-2799 2-SPDT Topology](#)
- [Operation Modes](#)

- [Integration and System Considerations](#)

NI PXI-2799 2-SPDT Topology

The following figure represents the NI PXI-2799 in the 2-SPDT general-purpose topology.



Making a Connection

You can control the channels using the `niSwitch Connect Channels VI` or the `niSwitch_Connect` function.

For example, to connect the NO terminal of channel 1 to the COM terminal of channel 1, call `niSwitch_Connect (vi, "no1", "com1")`. If you now want to connect NC1 to COM1, first disconnect the existing connection. The sequence of calls for this task is as follows:

```
niSwitch_Disconnect(vi, "no1", "com1")
```

```
niSwitch_Connect(vi, "nc1", "com1")
```



Note `niSwitch_Disconnect(vi, "no1", "com1")` does not operate the relay until the `niSwitch_Connect(vi, "nc1", "com1")` is executed.



Note For an initial connection, you do not need to disconnect the default channel (ncx) from COM after the module has been reset or a call to the `niSwitch Disconnect All Channels VI` or the `niSwitch_DisconnectAll` function has been made.

When scanning the NI PXI-2799, a typical scan list entry could be `nc1->com1;`. This entry routes the signal connected to NC1 to COM1.

Related concepts:

- [General-Purpose Topologies](#)
- [Operation Modes](#)
- [Scan Lists](#)

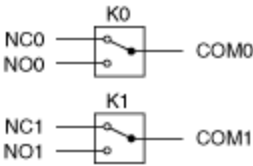
NI PXI-2799 Front Panel

The following figure illustrates the NI PXI-2799 front panel.



NI PXI-2799 Hardware Diagram

The following figure shows the hardware diagram for the NI PXI-2799.



NI PXI-2799 Triggering

Trigger Input

The following table lists valid trigger inputs for the NI PXI-2799.

Trigger Input	Software	Hardware
Immediate	Immediate(NISWITCH_VAL_IMMEDIATE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7
Software Trigger	niSwitch Send Software Trigger VI or niSwitch_SendSoftwareTrigger function	N/A

Scan Advanced Output

The following table lists valid scan advanced outputs for the NI PXI-2799.

Scan Advanced Output	Software	Hardware
None	None(NISWITCH_VAL_NONE)	N/A
TTL0	TTL0(NISWITCH_VAL_TTL0)	PXI trigger line 0
TTL1	TTL1(NISWITCH_VAL_TTL1)	PXI trigger line 1
TTL2	TTL2(NISWITCH_VAL_TTL2)	PXI trigger line 2
TTL3	TTL3(NISWITCH_VAL_TTL3)	PXI trigger line 3
TTL4	TTL4(NISWITCH_VAL_TTL4)	PXI trigger line 4
TTL5	TTL5(NISWITCH_VAL_TTL5)	PXI trigger line 5
TTL6	TTL6(NISWITCH_VAL_TTL6)	PXI trigger line 6
TTL7	TTL7(NISWITCH_VAL_TTL7)	PXI trigger line 7

Refer to the `niSwitch Configure Scan Trigger VI` or the `niSwitch_ConfigureScanTrigger` function for descriptions and values of the trigger inputs and scan advanced outputs.

NI 2810

The NI 2810A/B (NI 2810) is a high-density matrix switch card for the NI SwitchBlock. The NI 2810 is designed for combination with other NI 2810 cards to create a customized NI SwitchBlock multcard device.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to [Reed Relay Protection](#). For information about inductive loads refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI 2810 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 4×43 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

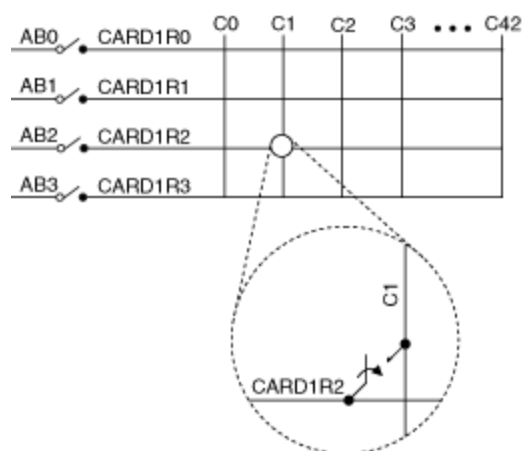
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2810 1-Wire 4×43 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2810 1-Wire 4×43 Matrix Topology

The following figure represents the NI 2810A/B (NI 2810) in the 1-wire 4×43 matrix topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to CARD1R2 is routed to C1

Pinout

The following figure identifies the pins for the NI 2810.

AB0 ^(A) / NO CONNECT ^(B)	49	1	AB1 ^(A) / NO CONNECT ^(B)
AB2 ^(A) / NO CONNECT ^(B)	50	2	AB3 ^(A) / NO CONNECT ^(B)
NO CONNECT	51	3	NO CONNECT
NO CONNECT	52	4	NO CONNECT
C0	53	5	C1
C2	54	6	C3
C4	55	7	C5
C6	56	8	C7
C8	57	9	C9
C10	58	10	C11
C12	59	11	C13
C14	60	12	C15
C16	61	13	C17
C18	62	14	C19
C20	63	15	C21
C22	64	16	C23
C24	65	17	C25
C26	66	18	C27
C28	67	19	C29
C30	68	20	C31
C32	69	21	C33
C34	70	22	C35
C36	71	23	C37
C38	72	24	C39
C40	73	25	C41
C42	74	26	NO CONNECT
NO CONNECT	75	27	NO CONNECT
NO CONNECT	76	28	NO CONNECT
NO CONNECT	77	29	NO CONNECT
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



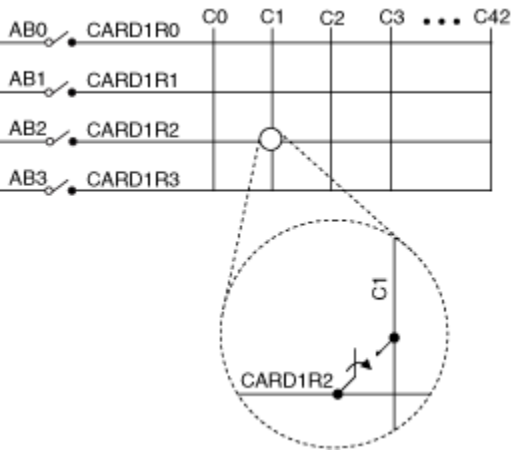
Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2810 Hardware Diagram

The following figure shows the hardware diagram for the NI 2810A/B (NI 2810).

 **Note** Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2810 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0
kCARD1AB1
kCARD1AB2
kCARD1AB3
kCARD1R0C0...kCARD1R0C42
kCARD1R1C0...kCARD1R1C42
kCARD1R2C0...kCARD1R2C42
kCARD1R3C0...kCARD1R3C42

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2810 Multicard Topologies

The following table lists possible topologies for an NI 2810 NI SwitchBlock device. Refer to *Initializing with Topology for NI SwitchBlock Devices* for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2810 Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 4×43 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 4×86 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 4×129 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 4×172 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 4×215 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	1-Wire 4×258 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2810 1-Wire 4×43 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2810 Relay Replacement

The NI 2810A/B (NI 2810) uses reed relays.



Note The NI 2810 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Meder	MS05-BV50980
Safety (Reference Designators K17 and K58)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781450-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.

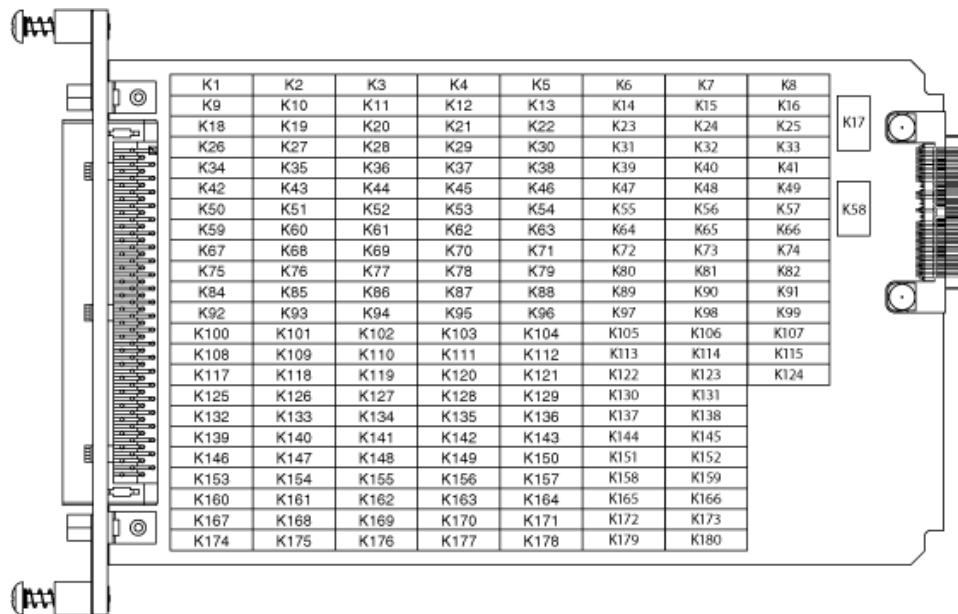


Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for

relay locations.

NI 2810 Relay Map



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K16	kcard1r0c40	K170	kcard1r1c41	K179
kcard1ab1	K25	kcard1r0c41	K180	kcard1r1c42	K176
kcard1ab2	K57	kcard1r0c42	K177	kcard1r2c0	K2
kcard1ab3	K66	kcard1r1c0	K3	kcard1r2c1	K6
kcard1r0c0	K4	kcard1r1c1	K7	kcard1r2c2	K10
kcard1r0c1	K8	kcard1r1c2	K11	kcard1r2c3	K14
kcard1r0c2	K12	kcard1r1c3	K15	kcard1r2c4	K19
kcard1r0c3	K24	kcard1r1c4	K20	kcard1r2c5	K23
kcard1r0c4	K21	kcard1r1c5	K32	kcard1r2c6	K27
kcard1r0c5	K33	kcard1r1c6	K28	kcard1r2c7	K31

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c6	K29	kcard1r1c7	K40	kcard1r2c8	K35
kcard1r0c7	K41	kcard1r1c8	K36	kcard1r2c9	K39
kcard1r0c8	K37	kcard1r1c9	K48	kcard1r2c10	K43
kcard1r0c9	K49	kcard1r1c10	K44	kcard1r2c11	K47
kcard1r0c10	K45	kcard1r1c11	K55	kcard1r2c12	K51
kcard1r0c11	K56	kcard1r1c12	K52	kcard1r2c13	K63
kcard1r0c12	K53	kcard1r1c13	K64	kcard1r2c14	K60
kcard1r0c13	K65	kcard1r1c14	K61	kcard1r2c15	K68
kcard1r0c14	K62	kcard1r1c15	K69	kcard1r2c16	K72
kcard1r0c15	K70	kcard1r1c16	K73	kcard1r2c17	K76
kcard1r0c16	K82	kcard1r1c17	K77	kcard1r2c18	K80
kcard1r0c17	K78	kcard1r1c18	K81	kcard1r2c19	K85
kcard1r0c18	K74	kcard1r1c19	K86	kcard1r2c20	K89
kcard1r0c19	K87	kcard1r1c20	K90	kcard1r2c21	K93
kcard1r0c20	K91	kcard1r1c21	K94	kcard1r2c22	K97
kcard1r0c21	K95	kcard1r1c22	K98	kcard1r2c23	K101
kcard1r0c22	K99	kcard1r1c23	K102	kcard1r2c24	K105
kcard1r0c23	K103	kcard1r1c24	K106	kcard1r2c25	K109
kcard1r0c24	K107	kcard1r1c25	K110	kcard1r2c26	K113
kcard1r0c25	K111	kcard1r1c26	K114	kcard1r2c27	K118
kcard1r0c26	K115	kcard1r1c27	K119	kcard1r2c28	K122
kcard1r0c27	K120	kcard1r1c28	K123	kcard1r2c29	K126
kcard1r0c28	K124	kcard1r1c29	K127	kcard1r2c30	K130
kcard1r0c29	K128	kcard1r1c30	K131	kcard1r2c31	K133
kcard1r0c30	K138	kcard1r1c31	K134	kcard1r2c32	K137
kcard1r0c31	K135	kcard1r1c32	K144	kcard1r2c33	K140
kcard1r0c32	K145	kcard1r1c33	K141	kcard1r2c34	K150

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c33	K142	kcard1r1c34	K151	kcard1r2c35	K147
kcard1r0c34	K152	kcard1r1c35	K148	kcard1r2c36	K154
kcard1r0c35	K149	kcard1r1c36	K155	kcard1r2c37	K158
kcard1r0c36	K156	kcard1r1c37	K159	kcard1r2c38	K161
kcard1r0c37	K166	kcard1r1c38	K162	kcard1r2c39	K165
kcard1r0c38	K163	kcard1r1c39	K172	kcard1r2c40	K168
kcard1r0c39	K173	kcard1r1c40	K169	kcard1r2c41	K178

Replace the Relay

The NI 2810 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2811

The NI 2811A/B (NI 2811) is a high-density matrix switch card for the NI SwitchBlock. The NI 2811 is designed for combination with other NI 2811 cards to create a customized NI SwitchBlock multicard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2811 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 8×21 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

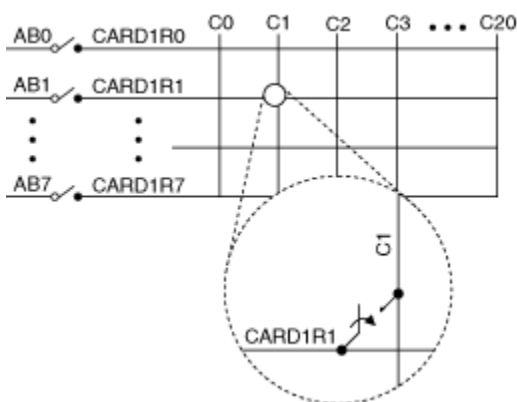
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2811 1-Wire 8×21 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2811 1-Wire 8×21 Matrix Topology

The following figure represents the NI 2811A/B (NI 2811) in the 1-wire 8×21 matrix topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect`

function with parameters `card1r1` and `c1`, results in the signal connected to CARD1R1 being routed to C1.

Pinout

The following figure identifies the pins for the NI 2811.

AB0 ^(A) / NO CONNECT ^(B)	49	1	AB1 ^(A) / NO CONNECT ^(B)
AB2 ^(A) / NO CONNECT ^(B)	50	2	AB3 ^(A) / NO CONNECT ^(B)
AB4 ^(A) / NO CONNECT ^(B)	51	3	AB5 ^(A) / NO CONNECT ^(B)
AB6 ^(A) / NO CONNECT ^(B)	52	4	AB7 ^(A) / NO CONNECT ^(B)
C0	53	5	C1
C2	54	6	C3
C4	55	7	C5
C6	56	8	C7
C8	57	9	C9
C10	58	10	C11
C12	59	11	C13
C14	60	12	C15
C16	61	13	C17
C18	62	14	C19
C20	63	15	NO CONNECT
NO CONNECT	64	16	NO CONNECT
NO CONNECT	65	17	NO CONNECT
NO CONNECT	66	18	NO CONNECT
NO CONNECT	67	19	NO CONNECT
NO CONNECT	68	20	NO CONNECT
NO CONNECT	69	21	NO CONNECT
NO CONNECT	70	22	NO CONNECT
NO CONNECT	71	23	NO CONNECT
NO CONNECT	72	24	NO CONNECT
NO CONNECT	73	25	NO CONNECT
NO CONNECT	74	26	NO CONNECT
NO CONNECT	75	27	NO CONNECT
NO CONNECT	76	28	NO CONNECT
NO CONNECT	77	29	NO CONNECT
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

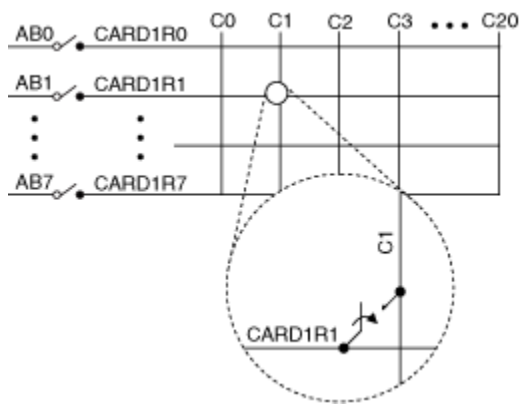
AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card and would make no connection on a type B card.

NI 2811 Hardware Diagram

The following figure shows the hardware diagram for the NI 2811A/B (NI 2811).



Note Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2811 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0
kCARD1AB1
kCARD1AB2
kCARD1AB3
kCARD1AB4
kCARD1AB5
kCARD1AB6
kCARD1AB7
kCARD1R0C0...kCARD1R0C20
kCARD1R1C0...kCARD1R1C20
kCARD1R2C0...kCARD1R2C20
kCARD1R3C0...kCARD1R3C20
kCARD1R4C0...kCARD1R4C20
kCARD1R5C0...kCARD1R5C20
kCARD1R6C0...kCARD1R6C20
kCARD1R7C0...kCARD1R7C20

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2811 Multicard Topologies

The following table lists possible topologies for an NI 2811 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2811 Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 8×21 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 8×42 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 8×63 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 8×84 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 8×105 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	1-Wire 8×126 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2811 1-Wire 8×21 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2811 Relay Replacement

The NI 2811A/B (NI 2811) uses reed relays.



Note The NI 2811 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Meder	MS05-BV50980
Safety (Reference Designators K17, K58, K83, and K116)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781450-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Locate the Relay

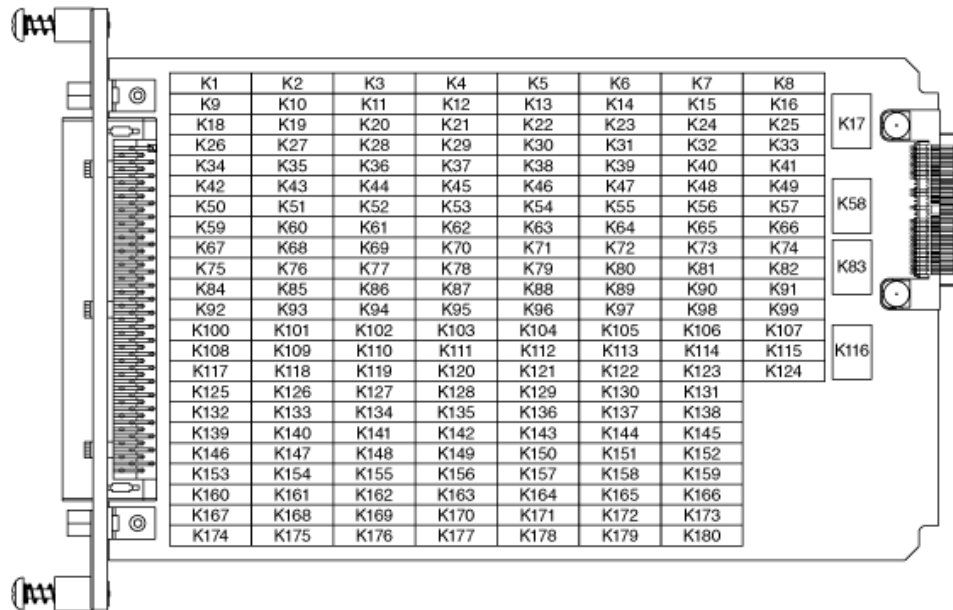
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI 2811 Relay Map



RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab7	K124	kcard1r2c1	K59	kcard1r4c3	K101
kcard1r0c0	K1	kcard1r2c2	K67	kcard1r4c4	K109
kcard1r0c1	K9	kcard1r2c3	K51	kcard1r4c5	K118
kcard1r0c2	K18	kcard1r2c4	K60	kcard1r4c6	K102
kcard1r0c3	K2	kcard1r2c5	K68	kcard1r4c7	K110
kcard1r0c4	K10	kcard1r2c6	K52	kcard1r4c8	K119
kcard1r0c5	K19	kcard1r2c7	K61	kcard1r4c9	K103
kcard1r0c6	K3	kcard1r2c8	K69	kcard1r4c10	K111
kcard1r0c7	K11	kcard1r2c9	K53	kcard1r4c11	K120
kcard1r0c8	K20	kcard1r2c10	K62	kcard1r4c12	K104
kcard1r0c9	K4	kcard1r2c11	K70	kcard1r4c13	K112
kcard1r0c10	K12	kcard1r2c12	K54	kcard1r4c14	K121
kcard1r0c11	K21	kcard1r2c13	K63	kcard1r4c15	K105
kcard1r0c12	K5	kcard1r2c14	K71	kcard1r4c16	K113
kcard1r0c13	K13	kcard1r2c15	K55	kcard1r4c17	K122
kcard1r0c14	K22	kcard1r2c16	K64	kcard1r4c18	K73
kcard1r0c15	K6	kcard1r2c17	K72	kcard1r4c19	K81
kcard1r0c16	K14	kcard1r2c18	K40	kcard1r4c20	K74
kcard1r0c17	K23	kcard1r2c19	K48	kcard1r5c0	K125
kcard1r0c18	K7	kcard1r2c20	K41	kcard1r5c1	K132
kcard1r0c19	K15	kcard1r3c0	K75	kcard1r5c2	K139
kcard1r0c20	K8	kcard1r3c1	K84	kcard1r5c3	K126
kcard1r1c0	K26	kcard1r3c2	K92	kcard1r5c4	K133
kcard1r1c1	K34	kcard1r3c3	K76	kcard1r5c5	K140
kcard1r1c2	K42	kcard1r3c4	K85	kcard1r5c6	K127
kcard1r1c3	K27	kcard1r3c5	K93	kcard1r5c7	K134
kcard1r1c4	K35	kcard1r3c6	K77	kcard1r5c8	K141

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r1c5	K43	kcard1r3c7	K86	kcard1r5c9	K128
kcard1r1c6	K28	kcard1r3c8	K94	kcard1r5c10	K135
kcard1r1c7	K36	kcard1r3c9	K78	kcard1r5c11	K142
kcard1r1c8	K44	kcard1r3c10	K87	kcard1r5c12	K129
kcard1r1c9	K29	kcard1r3c11	K95	kcard1r5c13	K136
kcard1r1c10	K37	kcard1r3c12	K79	kcard1r5c14	K143
kcard1r1c11	K45	kcard1r3c13	K88	kcard1r5c15	K130
kcard1r1c12	K30	kcard1r3c14	K96	kcard1r5c16	K137
kcard1r1c13	K38	kcard1r3c15	K80	kcard1r5c17	K144
kcard1r1c14	K46	kcard1r3c16	K89	kcard1r5c18	K90

Replace the Relay

The NI 2811 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework

- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2812

The NI 2812A/B (NI 2812) is a high-density matrix switch card for the NI SwitchBlock. The NI 2812 is designed for combination with other NI 2812 cards to create a customized NI SwitchBlock multicard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2812 and possible operation

modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 16×9 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

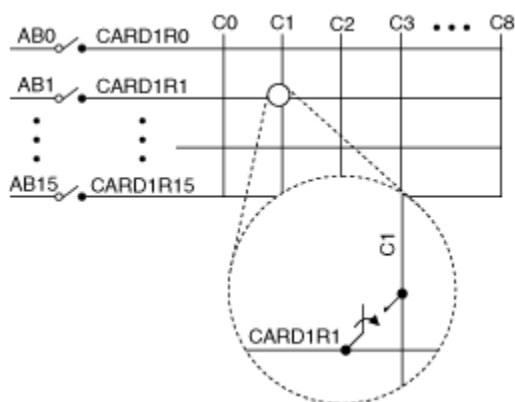
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2812 1-Wire 16×9 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2812 1-Wire 16×9 Matrix Topology

The following figure represents the NI 2812A/B (NI 2812) in the 1-wire 16×9 matrix topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to CARD1R2 is routed to C1

Pinout

The following figure identifies the pins for the NI 2812.

AB0 ^(A) / NO CONNECT ^(B)	49	1	AB1 ^(A) / NO CONNECT ^(B)
AB2 ^(A) / NO CONNECT ^(B)	50	2	AB3 ^(A) / NO CONNECT ^(B)
AB4 ^(A) / NO CONNECT ^(B)	51	3	AB5 ^(A) / NO CONNECT ^(B)
AB6 ^(A) / NO CONNECT ^(B)	52	4	AB7 ^(A) / NO CONNECT ^(B)
AB8 ^(A) / NO CONNECT ^(B)	53	5	AB9 ^(A) / NO CONNECT ^(B)
AB10 ^(A) / NO CONNECT ^(B)	54	6	AB11 ^(A) / NO CONNECT ^(B)
AB12 ^(A) / NO CONNECT ^(B)	55	7	AB13 ^(A) / NO CONNECT ^(B)
AB14 ^(A) / NO CONNECT ^(B)	56	8	AB15 ^(A) / NO CONNECT ^(B)
C0	57	9	C1
C2	58	10	C3
C4	59	11	C5
C6	60	12	C7
C8	61	13	NO CONNECT
NO CONNECT	62	14	NO CONNECT
NO CONNECT	63	15	NO CONNECT
NO CONNECT	64	16	NO CONNECT
NO CONNECT	65	17	NO CONNECT
NO CONNECT	66	18	NO CONNECT
NO CONNECT	67	19	NO CONNECT
NO CONNECT	68	20	NO CONNECT
NO CONNECT	69	21	NO CONNECT
NO CONNECT	70	22	NO CONNECT
NO CONNECT	71	23	NO CONNECT
NO CONNECT	72	24	NO CONNECT
NO CONNECT	73	25	NO CONNECT
NO CONNECT	74	26	NO CONNECT
NO CONNECT	75	27	NO CONNECT
NO CONNECT	76	28	NO CONNECT
NO CONNECT	77	29	NO CONNECT
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

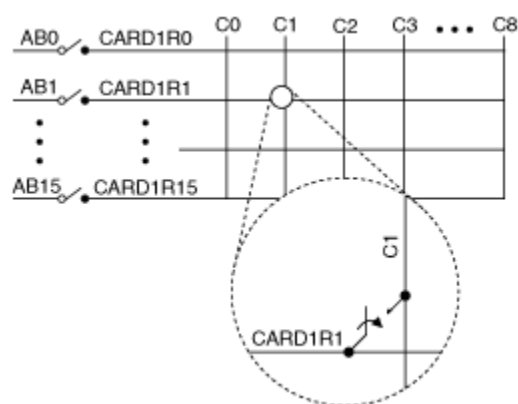
AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2812 Hardware Diagram

The following figure shows the hardware diagram for the NI 2812A/B (NI 2812).



Note Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2812 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0...kCARD1AB15
kCARD1R0C0...kCARD1R0C8
kCARD1R1C0...kCARD1R1C8
kCARD1R2C0...kCARD1R2C8
kCARD1R3C0...kCARD1R3C8
kCARD1R4C0...kCARD1R4C8
kCARD1R5C0...kCARD1R5C8
kCARD1R6C0...kCARD1R6C8
kCARD1R7C0...kCARD1R7C8
kCARD1R8C0...kCARD1R8C8
kCARD1R9C0...kCARD1R9C8
kCARD1R10C0...kCARD1R10C8
kCARD1R11C0...kCARD1R11C8
kCARD1R12C0...kCARD1R12C8
kCARD1R13C0...kCARD1R13C8
kCARD1R14C0...kCARD1R14C8

Relays

kCARD1R15C0...kCARD1R15C8

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2812 Multicard Topologies

The following table lists possible topologies for an NI 2812 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 $\Omega \pm 20\%$, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2812 Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 16×9 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 16×18 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 16×27 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 16×36 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 16×45 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Number of NI 2812 Cards	Topology	Software Name	Immediate	Scanning
6	1-Wire 16×54 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2812 1-Wire 16×9 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2812 Relay Replacement

The NI 2812A/B (NI 2812) uses reed relays.



Note The NI 2812 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Meder	MS05-BV50980
Safety (Reference Designators K181–K188)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781450-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your

NI SwitchBlock card.

Locate the Relay

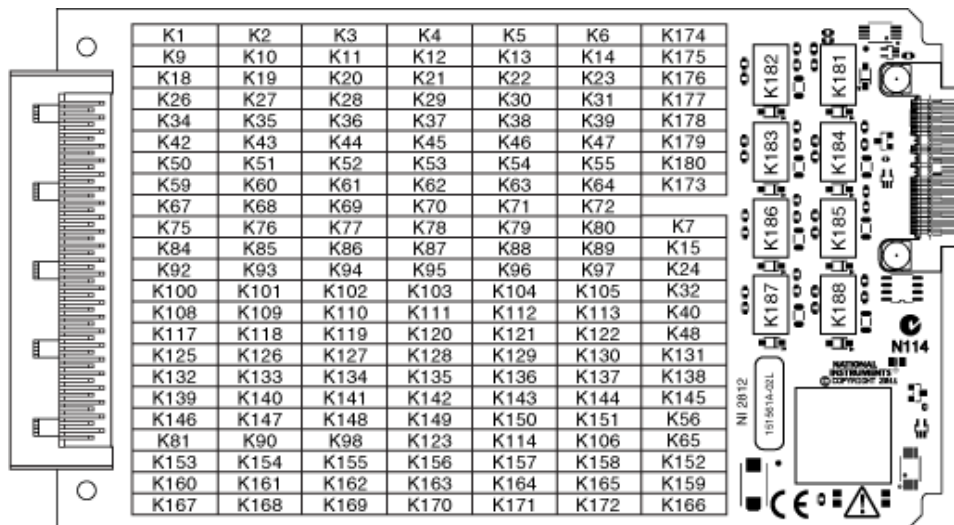
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI 2812 Relay Map



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multocard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K174	kcard1r2c6	K34	kcard1r7c1	K93
kcard1ab1	K175	kcard1r2c7	K35	kcard1r7c2	K94
kcard1ab2	K176	kcard1r2c8	K36	kcard1r7c3	K95

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab3	K177	kcard1r3c0	K42	kcard1r7c4	K96
kcard1ab4	K178	kcard1r3c1	K43	kcard1r7c5	K97
kcard1ab5	K179	kcard1r3c2	K44	kcard1r7c6	K89
kcard1ab6	K180	kcard1r3c3	K45	kcard1r7c7	K88
kcard1ab7	K173	kcard1r3c4	K46	kcard1r7c8	K87
kcard1ab8	K7	kcard1r3c5	K47	kcard1r8c0	K100
kcard1ab9	K15	kcard1r3c6	K39	kcard1r8c1	K101
kcard1ab10	K24	kcard1r3c7	K38	kcard1r8c2	K102
kcard1ab11	K32	kcard1r3c8	K37	kcard1r8c3	K103
kcard1ab12	K40	kcard1r4c0	K50	kcard1r8c4	K104
kcard1ab13	K48	kcard1r4c1	K51	kcard1r8c5	K105
kcard1ab14	K56	kcard1r4c2	K52	kcard1r8c6	K108
kcard1ab15	K65	kcard1r4c3	K53	kcard1r8c7	K109
kcard1r0c0	K1	kcard1r4c4	K54	kcard1r8c8	K110
kcard1r0c1	K2	kcard1r4c5	K55	kcard1r9c0	K117
kcard1r0c2	K3	kcard1r4c6	K59	kcard1r9c1	K118
kcard1r0c3	K4	kcard1r4c7	K60	kcard1r9c2	K119
kcard1r0c4	K5	kcard1r4c8	K61	kcard1r9c3	K120
kcard1r0c5	K6	kcard1r5c0	K67	kcard1r9c4	K121
kcard1r0c6	K9	kcard1r5c1	K68	kcard1r9c5	K122
kcard1r0c7	K10	kcard1r5c2	K69	kcard1r9c6	K113
kcard1r0c8	K11	kcard1r5c3	K70	kcard1r9c7	K112
kcard1r1c0	K18	kcard1r5c4	K71	kcard1r9c8	K111
kcard1r1c1	K19	kcard1r5c5	K72	kcard1r10c0	K125
kcard1r1c2	K20	kcard1r5c6	K64	kcard1r10c1	K126
kcard1r1c3	K21	kcard1r5c7	K63	kcard1r10c2	K127
kcard1r1c4	K22	kcard1r5c8	K62	kcard1r10c3	K128

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r1c5	K23	kcard1r6c0	K75	kcard1r10c4	K129
kcard1r1c6	K14	kcard1r6c1	K76	kcard1r10c5	K130
kcard1r1c7	K13	kcard1r6c2	K77	kcard1r10c6	K132
kcard1r1c8	K12	kcard1r6c3	K78	kcard1r10c7	K133
kcard1r2c0	K26	kcard1r6c4	K79	kcard1r10c8	K134
kcard1r2c1	K27	kcard1r6c5	K80	kcard1r11c0	K139
kcard1r2c2	K28	kcard1r6c6	K84	kcard1r11c1	K140
kcard1r2c3	K29	kcard1r6c7	K85	kcard1r11c2	K141
kcard1r2c4	K30	kcard1r6c8	K86	kcard1r11c3	K142
kcard1r2c5	K31	kcard1r7c0	K92	kcard1r11c4	K143

Replace the Relay

The NI 2812 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework

- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2813

The NI 2813A/B (NI 2813) is a high-density matrix switch card for the NI SwitchBlock. The NI 2813 is designed for combination with other NI 2813 cards to create a customized NI SwitchBlock multicard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2813 and possible operation

modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
2-Wire 4×21 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

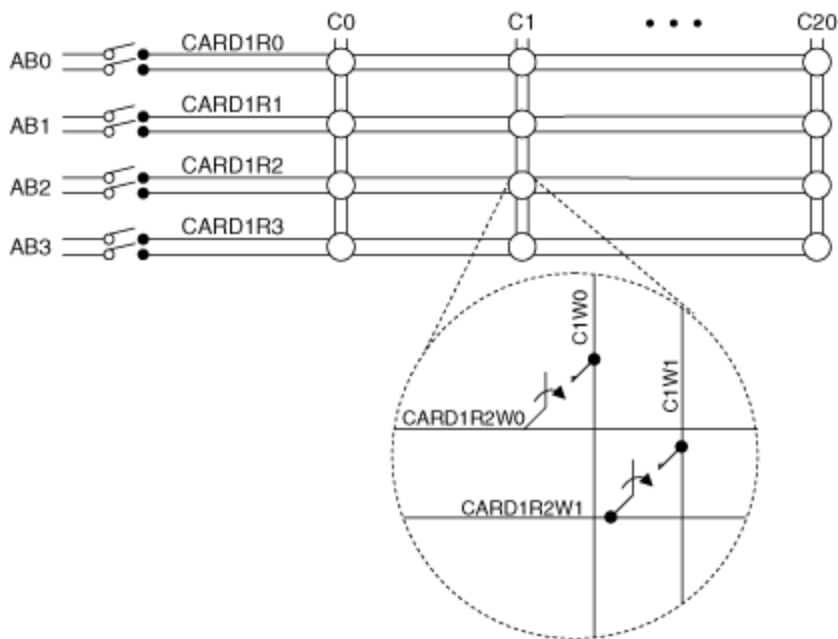
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2813 2-Wire 4×21 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2813 2-Wire 4×21 Matrix Topology

The following figure represents the NI 2813A/B (NI 2813) in the 2-Wire 4×21 Matrix Topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to `CARD1R2W0` is routed to `C1W0`

signal connected to `CARD1R2W1` is routed to `C1W1`

Pinout

The following figure identifies the pins for the NI 2813.

AB0W0 ^(A) / NO CONNECT ^(B)	49	1	AB0W1 ^(A) / NO CONNECT ^(B)
AB1W0 ^(A) / NO CONNECT ^(B)	50	2	AB1W1 ^(A) / NO CONNECT ^(B)
AB2W0 ^(A) / NO CONNECT ^(B)	51	3	AB2W1 ^(A) / NO CONNECT ^(B)
AB3W0 ^(A) / NO CONNECT ^(B)	52	4	AB3W1 ^(A) / NO CONNECT ^(B)
NO CONNECT	53	5	NO CONNECT
NO CONNECT	54	6	NO CONNECT
NO CONNECT	55	7	NO CONNECT
NO CONNECT	56	8	NO CONNECT
C0W0	57	9	C0W1
C1W0	58	10	C1W1
C2W0	59	11	C2W1
C3W0	60	12	C3W1
C4W0	61	13	C4W1
C5W0	62	14	C5W1
C6W0	63	15	C6W1
C7W0	64	16	C7W1
C8W0	65	17	C8W1
C9W0	66	18	C9W1
C10W0	67	19	C10W1
C11W0	68	20	C11W1
C12W0	69	21	C12W1
C13W0	70	22	C13W1
C14W0	71	23	C14W1
C15W0	72	24	C15W1
C16W0	73	25	C16W1
C17W0	74	26	C17W1
C18W0	75	27	C18W1
C19W0	76	28	C19W1
C20W0	77	29	C20W1
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



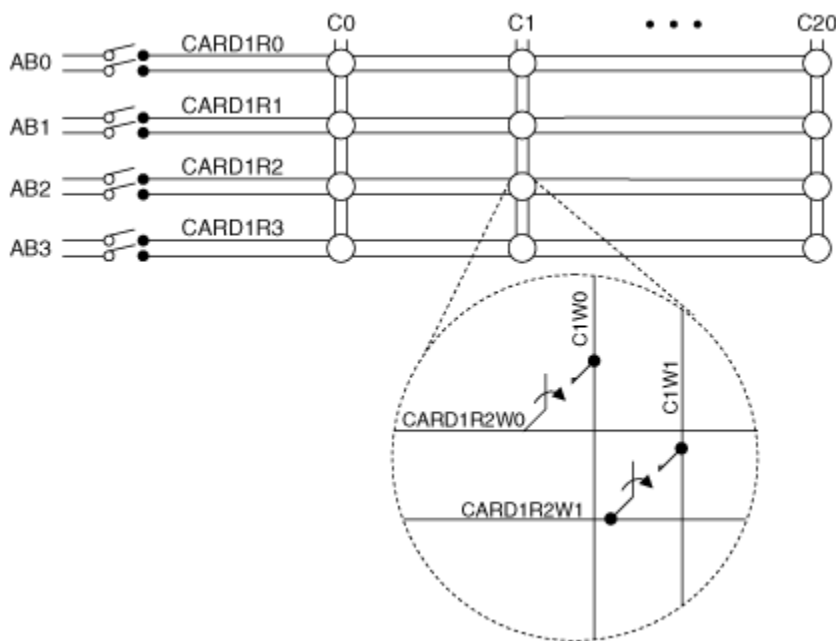
Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2813 Hardware Diagram

The following figure shows the hardware diagram for the NI 2813A/B (NI 2813).

 **Note** Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2813 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

 **Note** The relay names below do not designate the two wires as + and –. Instead they use W0 and W1 to designate wire 0 and wire 1.

Relays
kCARD1AB0W0...kCARD1AB3W0
kCARD1AB0W1...kCARD1AB3W1
kCARD1R0C0W0...kCARD1R0C20W0
kCARD1R0C0W1...kCARD1R0C20W1
kCARD1R1C0W0...kCARD1R1C20W0
kCARD1R1C0W1...kCARD1R1C20W1

Relays
kCARD1R2C0W0...kCARD1R2C20W0
kCARD1R2C0W1...kCARD1R2C20W1
kCARD1R3C0W0...kCARD1R3C20W0
kCARD1R3C0W1...kCARD1R3C20W1

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2813 Multicard Topologies

The following table lists possible topologies for an NI 2813 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2813 Cards	Topology	Software Name	Immediate	Scanning
1	2-Wire 4×21 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	2-Wire 4×42 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	2-Wire 4×63 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	2-Wire 4×84 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Number of NI 2813 Cards	Topology	Software Name	Immediate	Scanning
5	2-Wire 4×105 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	2-Wire 4×126 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2813 2-Wire 4×21 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2813 Relay Replacement

The NI 2813A/B (NI 2813) uses reed relays.



Note The NI 2813 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Meder	MS05-BV50980
Safety (Reference Designators K17, K58, K83, and K116)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781450-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Locate the Relay

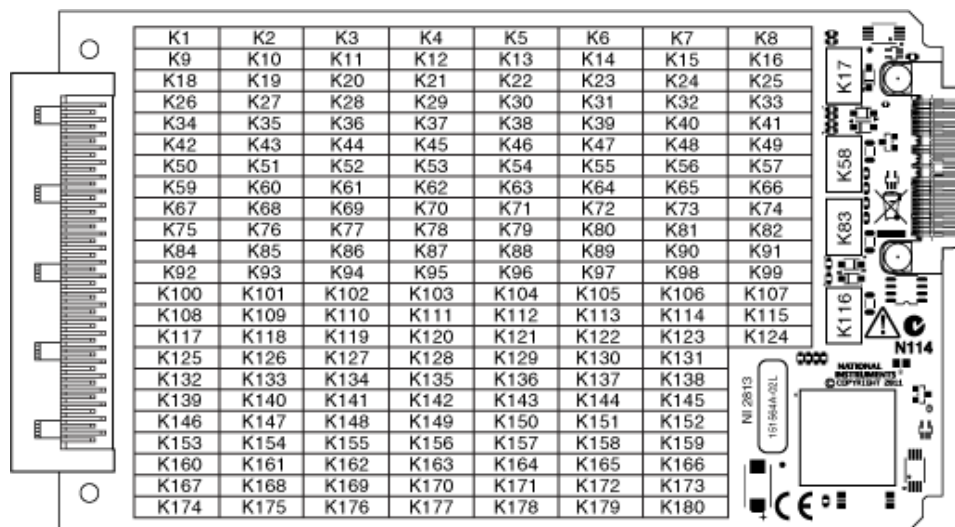
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI 2813 Relay Map



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0w0	K8	kcard1r0c18w0	K38	kcard1r1c19w0	K89
kcard1ab0w1	K16	kcard1r0c18w1	K46	kcard1r1c19w1	K97
kcard1ab1w0	K25	kcard1r0c19w0	K39	kcard1r1c20w0	K90

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab1w1	K33	kcard1r0c19w1	K47	kcard1r1c20w1	K98
kcard1ab2w0	K41	kcard1r0c20w0	K40	kcard1r2c0w0	K100
kcard1ab2w1	K49	kcard1r0c20w1	K48	kcard1r2c0w1	K108
kcard1ab3w0	K57	kcard1r1c0w0	K50	kcard1r2c1w0	K101
kcard1ab3w1	K66	kcard1r1c0w1	K59	kcard1r2c1w1	K109
kcard1r0c0w0	K1	kcard1r1c1w0	K51	kcard1r2c2w0	K102
kcard1r0c0w1	K9	kcard1r1c1w1	K60	kcard1r2c2w1	K110
kcard1r0c1w0	K2	kcard1r1c2w0	K51	kcard1r2c3w0	K103
kcard1r0c1w1	K10	kcard1r1c2w1	K60	kcard1r2c3w1	K111
kcard1r0c2w0	K3	kcard1r1c3w0	K53	kcard1r2c4w0	K104
kcard1r0c2w1	K11	kcard1r1c3w1	K62	kcard1r2c4w1	K112
kcard1r0c3w0	K4	kcard1r1c4w0	K54	kcard1r2c5w0	K105
kcard1r0c3w1	K12	kcard1r1c4w1	K63	kcard1r2c5w1	K113
kcard1r0c4w0	K5	kcard1r1c5w0	K55	kcard1r2c6w0	K106
kcard1r0c4w1	K13	kcard1r1c5w1	K64	kcard1r2c6w1	K114
kcard1r0c5w0	K6	kcard1r1c6w0	K56	kcard1r2c7w0	K117
kcard1r0c5w1	K14	kcard1r1c6w1	K65	kcard1r2c7w1	K125
kcard1r0c6w0	K7	kcard1r1c7w0	K67	kcard1r2c8w0	K118
kcard1r0c6w1	K15	kcard1r1c7w1	K75	kcard1r2c8w1	K126
kcard1r0c7w0	K18	kcard1r1c8w0	K68	kcard1r2c9w0	K119
kcard1r0c7w1	K26	kcard1r1c8w1	K76	kcard1r2c9w1	K127
kcard1r0c8w0	K19	kcard1r1c9w0	K69	kcard1r2c10w0	K120
kcard1r0c8w1	K27	kcard1r1c9w1	K77	kcard1r2c10w1	K128
kcard1r0c9w0	K20	kcard1r1c10w0	K70	kcard1r2c11w0	K121
kcard1r0c9w1	K28	kcard1r1c10w1	K78	kcard1r2c11w1	K129
kcard1r0c10w0	K21	kcard1r1c11w0	K71	kcard1r2c12w0	K122
kcard1r0c10w1	K29	kcard1r1c11w1	K79	kcard1r2c12w1	K130

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c11w0	K22	kcard1r1c12w0	K72	kcard1r2c13w0	K123
kcard1r0c11w1	K30	kcard1r1c12w1	K80	kcard1r2c13w1	K131
kcard1r0c12w0	K23	kcard1r1c13w0	K73	kcard1r2c14w0	K132
kcard1r0c12w1	K31	kcard1r1c13w1	K81	kcard1r2c14w1	K139
kcard1r0c13w0	K24	kcard1r1c14w0	K84	kcard1r2c15w0	K133
kcard1r0c13w1	K32	kcard1r1c14w1	K92	kcard1r2c15w1	K140
kcard1r0c14w0	K34	kcard1r1c15w0	K85	kcard1r2c16w0	K134
kcard1r0c14w1	K42	kcard1r1c15w1	K93	kcard1r2c16w1	K141
kcard1r0c15w0	K35	kcard1r1c16w0	K86	kcard1r2c17w0	K135
kcard1r0c15w1	K43	kcard1r1c16w1	K94	kcard1r2c17w1	K142
kcard1r0c16w0	K36	kcard1r1c17w0	K87	kcard1r2c18w0	K136
kcard1r0c16w1	K44	kcard1r1c17w1	K95	kcard1r2c18w1	K143
kcard1r0c17w0	K37	kcard1r1c18w0	K88	kcard1r2c19w0	K137
kcard1r0c17w1	K45	kcard1r1c18w1	K96	kcard1r2c19w1	K144

Replace the Relay

The NI 2813 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2814

The NI 2814A/B (NI 2814) is a high-density matrix switch card for the NI SwitchBlock. The NI 2814 is designed for combination with other NI 2814 cards to create a customized NI SwitchBlock multcard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to

Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2814 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
2-Wire 8×9 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

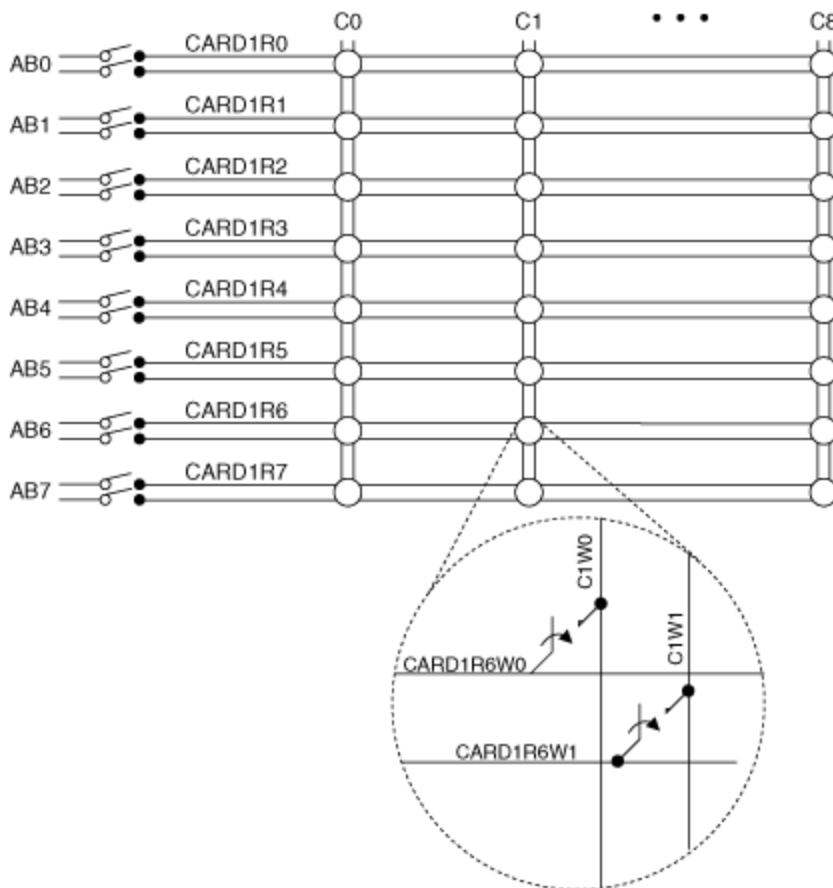
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2814 2-Wire 8×9 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2814 2-Wire 8×9 Matrix Topology

The following figure represents the NI 2814A/B (NI 2814) in the 2-Wire 8×9 Matrix Topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to `CARD1R2W0` is routed to `C1W0`

signal connected to `CARD1R2W1` is routed to `C1W1`

Pinout

The following figure identifies the pins for the NI 2814.

AB0W0 ^(A) / NO CONNECT ^(B)	49	1	AB0W1 ^(A) / NO CONNECT ^(B)
AB1W0 ^(A) / NO CONNECT ^(B)	50	2	AB1W1 ^(A) / NO CONNECT ^(B)
AB2W0 ^(A) / NO CONNECT ^(B)	51	3	AB2W1 ^(A) / NO CONNECT ^(B)
AB3W0 ^(A) / NO CONNECT ^(B)	52	4	AB3W1 ^(A) / NO CONNECT ^(B)
AB4W0 ^(A) / NO CONNECT ^(B)	53	5	AB4W1 ^(A) / NO CONNECT ^(B)
AB5W0 ^(A) / NO CONNECT ^(B)	54	6	AB5W1 ^(A) / NO CONNECT ^(B)
AB6W0 ^(A) / NO CONNECT ^(B)	55	7	AB6W1 ^(A) / NO CONNECT ^(B)
AB7W0 ^(A) / NO CONNECT ^(B)	56	8	AB7W1 ^(A) / NO CONNECT ^(B)
C0W0	57	9	C0W1
C1W0	58	10	C1W1
C2W0	59	11	C2W1
C3W0	60	12	C3W1
C4W0	61	13	C4W1
C5W0	62	14	C5W1
C6W0	63	15	C6W1
C7W0	64	16	C7W1
C8W0	65	17	C8W1
NO CONNECT	66	18	NO CONNECT
NO CONNECT	67	19	NO CONNECT
NO CONNECT	68	20	NO CONNECT
NO CONNECT	69	21	NO CONNECT
NO CONNECT	70	22	NO CONNECT
NO CONNECT	71	23	NO CONNECT
NO CONNECT	72	24	NO CONNECT
NO CONNECT	73	25	NO CONNECT
NO CONNECT	74	26	NO CONNECT
NO CONNECT	75	27	NO CONNECT
NO CONNECT	76	28	NO CONNECT
NO CONNECT	77	29	NO CONNECT
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

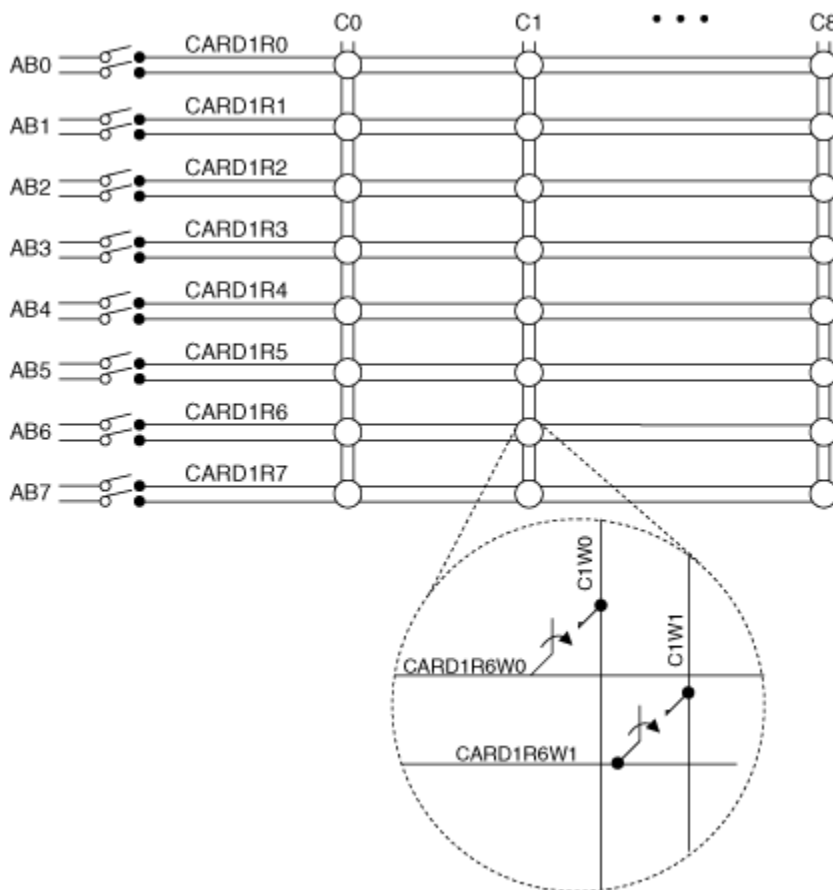
AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2814 Hardware Diagram

The following figure shows the hardware diagram for the NI 2814A/B (NI 2814).



Note Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2814 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.



Note The relay names below do not designate the two wires as + and -. Instead they use W0 and W1 to designate wire 0 and wire 1.

Relays
kCARD1AB0W0...kCARD1AB7W0
kCARD1AB0W1...kCARD1AB7W1
kCARD1R0C0W0...kCARD1R0C8W0
kCARD1R0C0W1...kCARD1R0C8W1
kCARD1R1C0W0...kCARD1R1C8W0
kCARD1R1C0W1...kCARD1R1C8W1
kCARD1R2C0W0...kCARD1R2C8W0
kCARD1R2C0W1...kCARD1R2C8W1
kCARD1R3C0W0...kCARD1R3C8W0
kCARD1R3C0W1...kCARD1R3C8W1
kCARD1R4C0W0...kCARD1R4C8W0
kCARD1R4C0W1...kCARD1R4C8W1
kCARD1R5C0W0...kCARD1R5C8W0
kCARD1R5C0W1...kCARD1R5C8W1
kCARD1R6C0W0...kCARD1R6C8W0
kCARD1R6C0W1...kCARD1R6C8W1
kCARD1R7C0W0...kCARD1R7C8W0
kCARD1R7C0W1...kCARD1R7C8W1

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2814 Multicard Topologies

The following table lists possible topologies for an NI 2814 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2814 Cards	Topology	Software Name	Immediate	Scanning
1	2-Wire 8×9 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	2-Wire 8×18 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	2-Wire 8×27 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	2-Wire 8×36 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	2-Wire 8×45 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	2-Wire 8×54 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2814 2-Wire 8×9 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2814 Relay Replacement

The NI 2814A/B (NI 2814) uses reed relays.



Note The NI 2814 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Meder	MS05-BV50980
Safety (Reference Designators K15, K16, K45, K46, K74, K75, K104, and K105)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781450-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Locate the Relay

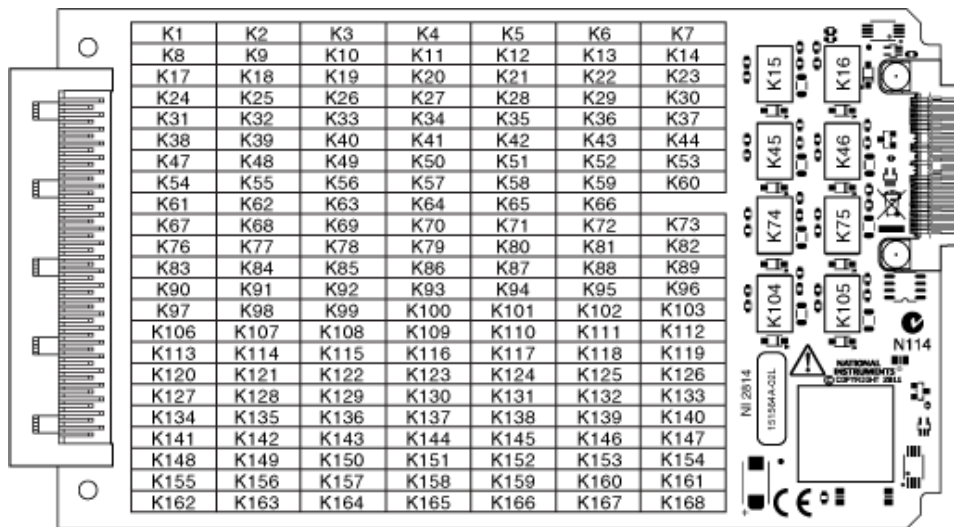
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI 2814 Relay Map



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDe
kcard1ab0w0	K7	kcard1r1c3w0	K34	kcard1r3c5w0	K81
kcard1ab0w1	K14	kcard1r1c3w1	K41	kcard1r3c5w1	K88
kcard1ab1w0	K23	kcard1r1c4w0	K35	kcard1r3c6w0	K66
kcard1ab1w1	K30	kcard1r1c4w1	K42	kcard1r3c6w1	K72
kcard1ab2w0	K37	kcard1r1c5w0	K36	kcard1r3c7w0	K65
kcard1ab2w1	K44	kcard1r1c5w1	K43	kcard1r3c7w1	K71
kcard1ab3w0	K53	kcard1r1c6w0	K22	kcard1r3c8w0	K64
kcard1ab3w1	K60	kcard1r1c6w1	K29	kcard1r3c8w1	K70
kcard1ab4w0	K73	kcard1r1c7w0	K21	kcard1r4c0w0	K90
kcard1ab4w1	K82	kcard1r1c7w1	K28	kcard1r4c0w1	K97
kcard1ab5w0	K89	kcard1r1c8w0	K20	kcard1r4c1w0	K91
kcard1ab5w1	K96	kcard1r1c8w1	K27	kcard1r4c1w1	K98
kcard1ab6w0	K103	kcard1r2c0w0	K47	kcard1r4c2w0	K92
kcard1ab6w1	K112	kcard1r2c0w1	K54	kcard1r4c2w1	K99

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDe
kcard1ab7w0	K119	kcard1r2c1w0	K48	kcard1r4c3w0	K93
kcard1ab7w1	K126	kcard1r2c1w1	K55	kcard1r4c3w1	K100
kcard1r0c0w0	K1	kcard1r2c2w0	K49	kcard1r4c4w0	K94
kcard1r0c0w1	K8	kcard1r2c2w1	K56	kcard1r4c4w1	K101
kcard1r0c1w0	K2	kcard1r2c3w0	K50	kcard1r4c5w0	K95
kcard1r0c1w1	K9	kcard1r2c3w1	K57	kcard1r4c5w1	K102
kcard1r0c2w0	K3	kcard1r2c4w0	K51	kcard1r4c6w0	K106
kcard1r0c2w1	K10	kcard1r2c4w1	K58	kcard1r4c6w1	K113
kcard1r0c3w0	K4	kcard1r2c5w0	K52	kcard1r4c7w0	K107
kcard1r0c3w1	K11	kcard1r2c5w1	K59	kcard1r4c7w1	K114
kcard1r0c4w0	K5	kcard1r2c6w0	K61	kcard1r4c8w0	K108
kcard1r0c4w1	K12	kcard1r2c6w1	K67	kcard1r4c8w1	K115
kcard1r0c5w0	K6	kcard1r2c7w0	K62	kcard1r5c0w0	K120
kcard1r0c5w1	K13	kcard1r2c7w1	K68	kcard1r5c0w1	K127
kcard1r0c6w0	K17	kcard1r2c8w0	K63	kcard1r5c1w0	K121
kcard1r0c6w1	K24	kcard1r2c8w1	K69	kcard1r5c1w1	K128
kcard1r0c7w0	K18	kcard1r3c0w0	K76	kcard1r5c2w0	K122
kcard1r0c7w1	K25	kcard1r3c0w1	K83	kcard1r5c2w1	K129
kcard1r0c8w0	K19	kcard1r3c1w0	K77	kcard1r5c3w0	K123
kcard1r0c8w1	K26	kcard1r3c1w1	K84	kcard1r5c3w1	K130
kcard1r1c0w0	K31	kcard1r3c2w0	K78	kcard1r5c4w0	K124
kcard1r1c0w1	K38	kcard1r3c2w1	K85	kcard1r5c4w1	K131
kcard1r1c1w0	K32	kcard1r3c3w0	K79	kcard1r5c5w0	K125
kcard1r1c1w1	K39	kcard1r3c3w1	K86	kcard1r5c5w1	K132
kcard1r1c2w0	K33	kcard1r3c4w0	K80	kcard1r5c6w0	K111
kcard1r1c2w1	K40	kcard1r3c4w1	K87	kcard1r5c6w1	K118

Replace the Relay

The NI 2814 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2815

The NI 2815A/B (NI 2815) is a high-density matrix switch card for the NI SwitchBlock. The NI 2815 is designed for combination with other NI 2815 cards to create a customized NI SwitchBlock multiscard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2815 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 4×86 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

- Integration and System Considerations

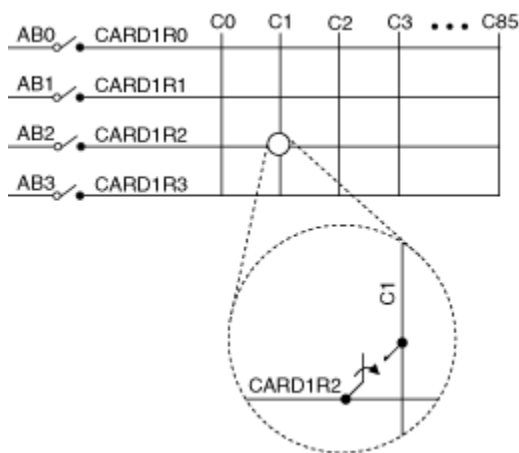
Related concepts:

- [Matrix](#)

- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2815 1-Wire 4×86 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2815 1-Wire 4×86 Matrix Topology

The following figure represents the NI 2815A/B (NI 2815) in the 1-wire 4×86 matrix topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to CARD1R2 is routed to C1

Pinout

The following figure identifies the pins for the NI 2815.

AB0 ^(A) / NO CONNECT ^(B)	49	1	AB1 ^(A) / NO CONNECT ^(B)
AB2 ^(A) / NO CONNECT ^(B)	50	2	AB3 ^(A) / NO CONNECT ^(B)
C0	51	3	C1
C2	52	4	C3
C4	53	5	C5
C6	54	6	C7
C8	55	7	C9
C10	56	8	C11
C12	57	9	C13
C14	58	10	C15
C16	59	11	C17
C18	60	12	C19
C20	61	13	C21
C22	62	14	C23
C24	63	15	C25
C26	64	16	C27
C28	65	17	C29
C30	66	18	C31
C32	67	19	C33
C34	68	20	C35
C36	69	21	C37
C38	70	22	C39
C40	71	23	C41
C42	72	24	C43
C44	73	25	C45
C46	74	26	C47
C48	75	27	C49
C50	76	28	C51
C52	77	29	C53
C54	78	30	C55
C56	79	31	C57
C58	80	32	C59
C60	81	33	C61
C62	82	34	C63
C64	83	35	C65
C66	84	36	C67
C68	85	37	C69
C70	86	38	C71
C72	87	39	C73
C74	88	40	C75
C76	89	41	C77
C78	90	42	C79
C80	91	43	C81
C82	92	44	C83
C84	93	45	C85
INTERLOCK ENABLE	96	48	GND



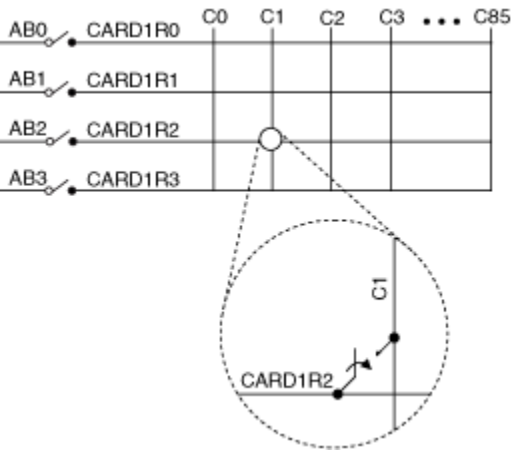
Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2815 Hardware Diagram

The following figure shows the hardware diagram for the NI 2815A/B (NI 2815).

 **Note** Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2815 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0
kCARD1AB1
kCARD1AB2
kCARD1AB3
kCARD1R0C0...kCARD1R0C85
kCARD1R1C0...kCARD1R1C85
kCARD1R2C0...kCARD1R2C85
kCARD1R3C0...kCARD1R3C85

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2815 Multicard Topologies

The following table lists possible topologies for an NI 2815 NI SwitchBlock device. Refer to *Initializing with Topology for NI SwitchBlock Devices* for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2815 Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 4×86 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 4×172 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 4×258 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 4×344 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 4×430 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	1-Wire 4×516 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2815 1-Wire 4×86 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2815 Relay Replacement

The NI 2815A/B (NI 2815) uses reed relays.



Note The NI 2815 uses a custom lead length to meet safety standards. Trim the leads per rework instructions or use one of the custom relays from the relay kit. If spare relays are included with the module at locations K351 to K358, you can also use those.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Coto	9117-0001
Safety (Reference Designators K18 and K53)	Tyco Electronics	5-1462039-8
Matrix	Standex-Meder	UMS05-BV51338

Relay Kit	Part Number
National Instruments (10 matrix relays, Coto 9117)	781451-10
National Instruments (10 safety relays, Tyco Electronics)	781089-10
National Instruments (10 matrix relays, Standex-Meder UMS)	786915-01



Note Some revisions of NI 2815 have spare relays included on the board at locations K351 to K358 that can be used to replace broken relays. Removing the spare relays does not change the functionality of the NI 2815.



Note Some switch model revisions were built using different relays. Contact NI to find out which relay was used on a specific device.

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Disassemble the Card

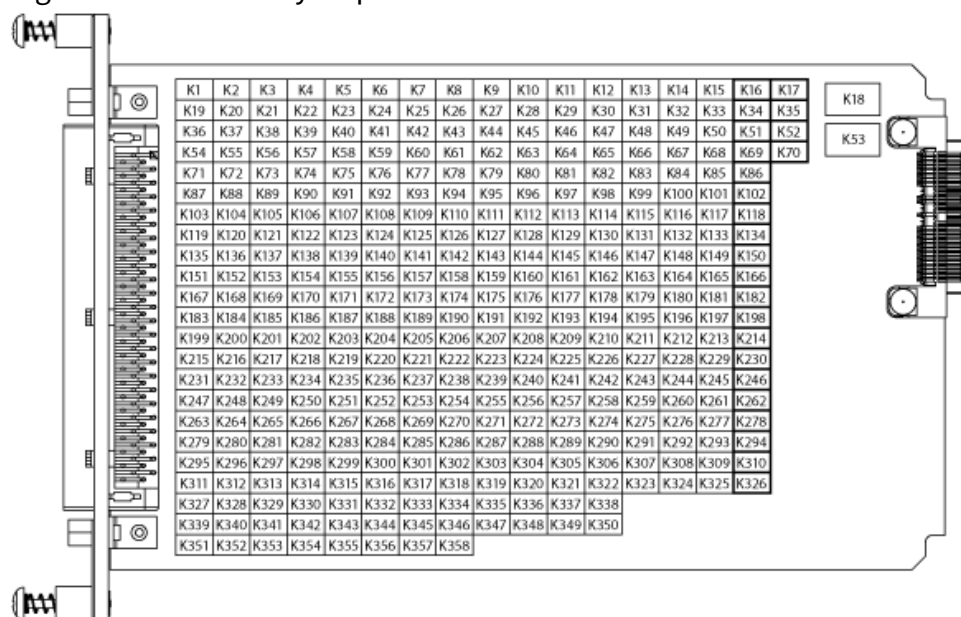
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

Figure 1. NI 2815 Relay Map



Note The insulator cover attaches to the two rightmost columns of matrix relays, outlined in bold on the relay map, and must be removed to replace these relays. You can replace these relays and the insulator cover by sending the card to National Instruments for a rework return material authorization (RMA) or by following the instructions in the relay

replacement procedure.



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

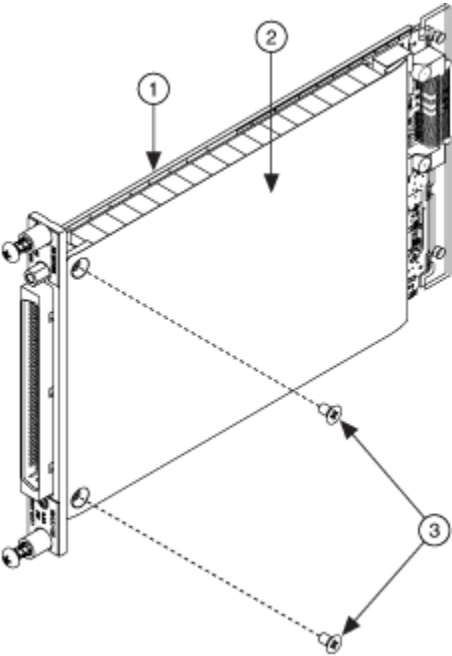
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K35	kcard1r0c83	K343	kcard1r1c84	K336
kcard1ab1	K17	kcard1r0c84	K335	kcard1r1c85	K348
kcard1ab2	K70	kcard1r0c85	K347	kcard1r2c0	K3
kcard1ab3	K52	kcard1r1c0	K2	kcard1r2c1	K21
kcard1r0c0	K1	kcard1r1c1	K20	kcard1r2c2	K7
kcard1r0c1	K19	kcard1r1c2	K6	kcard1r2c3	K25
kcard1r0c2	K5	kcard1r1c3	K24	kcard1r2c4	K11
kcard1r0c3	K23	kcard1r1c4	K10	kcard1r2c5	K29
kcard1r0c4	K9	kcard1r1c5	K28	kcard1r2c6	K15
kcard1r0c5	K27	kcard1r1c6	K14	kcard1r2c7	K33
kcard1r0c6	K13	kcard1r1c7	K32	kcard1r2c8	K38
kcard1r0c7	K31	kcard1r1c8	K37	kcard1r2c9	K56
kcard1r0c8	K36	kcard1r1c9	K55	kcard1r2c10	K42
kcard1r0c9	K54	kcard1r1c10	K41	kcard1r2c11	K60
kcard1r0c10	K40	kcard1r1c11	K59	kcard1r2c12	K46
kcard1r0c11	K58	kcard1r1c12	K45	kcard1r2c13	K64
kcard1r0c12	K44	kcard1r1c13	K63	kcard1r2c14	K50
kcard1r0c13	K62	kcard1r1c14	K49	kcard1r2c15	K68
kcard1r0c14	K48	kcard1r1c15	K67	kcard1r2c16	K73
kcard1r0c15	K66	kcard1r1c16	K72	kcard1r2c17	K89
kcard1r0c16	K71	kcard1r1c17	K88	kcard1r2c18	K77
kcard1r0c17	K87	kcard1r1c18	K76	kcard1r2c19	K93

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c18	K75	kcard1r1c19	K92	kcard1r2c20	K81
kcard1r0c19	K91	kcard1r1c20	K80	kcard1r2c21	K97
kcard1r0c20	K79	kcard1r1c21	K96	kcard1r2c22	K85
kcard1r0c21	K95	kcard1r1c22	K84	kcard1r2c23	K101
kcard1r0c22	K83	kcard1r1c23	K100	kcard1r2c24	K105
kcard1r0c23	K99	kcard1r1c24	K104	kcard1r2c25	K121
kcard1r0c24	K103	kcard1r1c25	K120	kcard1r2c26	K109
kcard1r0c25	K119	kcard1r1c26	K108	kcard1r2c27	K125
kcard1r0c26	K107	kcard1r1c27	K124	kcard1r2c28	K113
kcard1r0c27	K123	kcard1r1c28	K112	kcard1r2c29	K129
kcard1r0c28	K111	kcard1r1c29	K128	kcard1r2c30	K117
kcard1r0c29	K127	kcard1r1c30	K116	kcard1r2c31	K133
kcard1r0c30	K115	kcard1r1c31	K132	kcard1r2c32	K137
kcard1r0c31	K131	kcard1r1c32	K136	kcard1r2c33	K153
kcard1r0c32	K135	kcard1r1c33	K152	kcard1r2c34	K141
kcard1r0c33	K151	kcard1r1c34	K140	kcard1r2c35	K157
kcard1r0c34	K139	kcard1r1c35	K156	kcard1r2c36	K145
kcard1r0c35	K155	kcard1r1c36	K144	kcard1r2c37	K161
kcard1r0c36	K143	kcard1r1c37	K160	kcard1r2c38	K149
kcard1r0c37	K159	kcard1r1c38	K148	kcard1r2c39	K165
kcard1r0c38	K147	kcard1r1c39	K164	kcard1r2c40	K169
kcard1r0c39	K163	kcard1r1c40	K168	kcard1r2c41	K185
kcard1r0c40	K167	kcard1r1c41	K184	kcard1r2c42	K173
kcard1r0c41	K183	kcard1r1c42	K172	kcard1r2c43	K189
kcard1r0c42	K171	kcard1r1c43	K188	kcard1r2c44	K177
kcard1r0c43	K187	kcard1r1c44	K176	kcard1r2c45	K193
kcard1r0c44	K175	kcard1r1c45	K192	kcard1r2c46	K181

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c45	K191	kcard1r1c46	K180	kcard1r2c47	K197
kcard1r0c46	K179	kcard1r1c47	K196	kcard1r2c48	K201
kcard1r0c47	K195	kcard1r1c48	K200	kcard1r2c49	K217
kcard1r0c48	K199	kcard1r1c49	K216	kcard1r2c50	K205
kcard1r0c49	K215	kcard1r1c50	K204	kcard1r2c51	K221
kcard1r0c50	K203	kcard1r1c51	K220	kcard1r2c52	K209
kcard1r0c51	K219	kcard1r1c52	K208	kcard1r2c53	K225
kcard1r0c52	K207	kcard1r1c53	K224	kcard1r2c54	K213
kcard1r0c53	K223	kcard1r1c54	K212	kcard1r2c55	K229
kcard1r0c54	K211	kcard1r1c55	K228	kcard1r2c56	K233
kcard1r0c55	K227	kcard1r1c56	K232	kcard1r2c57	K249
kcard1r0c56	K231	kcard1r1c57	K248	kcard1r2c58	K237
kcard1r0c57	K247	kcard1r1c58	K236	kcard1r2c59	K253
kcard1r0c58	K235	kcard1r1c59	K252	kcard1r2c60	K241
kcard1r0c59	K251	kcard1r1c60	K240	kcard1r2c61	K257
kcard1r0c60	K239	kcard1r1c61	K256	kcard1r2c62	K245
kcard1r0c61	K255	kcard1r1c62	K244	kcard1r2c63	K261
kcard1r0c62	K243	kcard1r1c63	K260	kcard1r2c64	K265
kcard1r0c63	K259	kcard1r1c64	K264	kcard1r2c65	K281
kcard1r0c64	K263	kcard1r1c65	K280	kcard1r2c66	K269
kcard1r0c65	K279	kcard1r1c66	K268	kcard1r2c67	K285
kcard1r0c66	K267	kcard1r1c67	K284	kcard1r2c68	K273
kcard1r0c67	K283	kcard1r1c68	K272	kcard1r2c69	K289
kcard1r0c68	K271	kcard1r1c69	K288	kcard1r2c70	K277
kcard1r0c69	K287	kcard1r1c70	K276	kcard1r2c71	K293
kcard1r0c70	K275	kcard1r1c71	K292	kcard1r2c72	K297
kcard1r0c71	K291	kcard1r1c72	K296	kcard1r2c73	K313

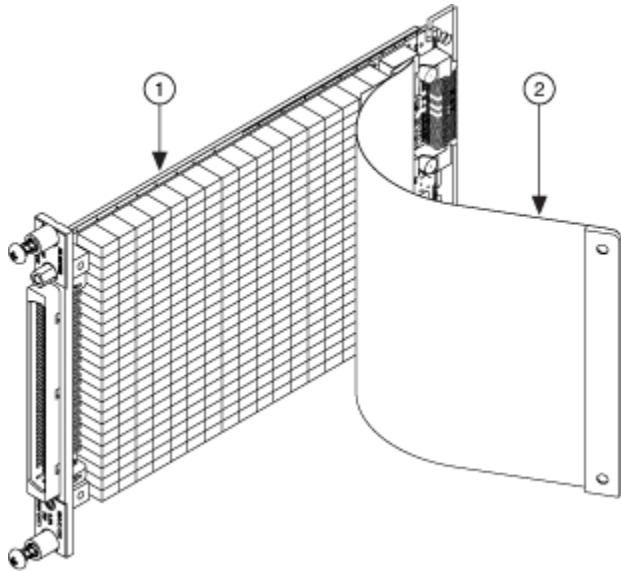
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c72	K295	kcard1r1c73	K312	kcard1r2c74	K301
kcard1r0c73	K311	kcard1r1c74	K300	kcard1r2c75	K317
kcard1r0c74	K299	kcard1r1c75	K316	kcard1r2c76	K305
kcard1r0c75	K315	kcard1r1c76	K304	kcard1r2c77	K321
kcard1r0c76	K303	kcard1r1c77	K320	kcard1r2c78	K309
kcard1r0c77	K319	kcard1r1c78	K308	kcard1r2c79	K325
kcard1r0c78	K307	kcard1r1c79	K324	kcard1r2c80	K329
kcard1r0c79	K323	kcard1r1c80	K328	kcard1r2c81	K341
kcard1r0c80	K327	kcard1r1c81	K340	kcard1r2c82	K333
kcard1r0c81	K339	kcard1r1c82	K332	kcard1r2c83	K345
kcard1r0c82	K331	kcard1r1c83	K344	kcard1r2c84	K337

3. Remove the screws that hold one side of the insulator cover to the card.



1	NI 2815
2	Insulator Cover
3	Screws

4. Lift the insulator cover to access the relays. To replace a relay in one of the two rightmost columns of matrix relays, carefully peel the adhesive strip of the insulator cover off of these two columns of relays.



1	NI 2815
2	Insulator Cover

Replace the Relay

The NI 2815 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.

Reassemble the Card

Refer to one of the following procedures to reassemble your card after replacing any relays.

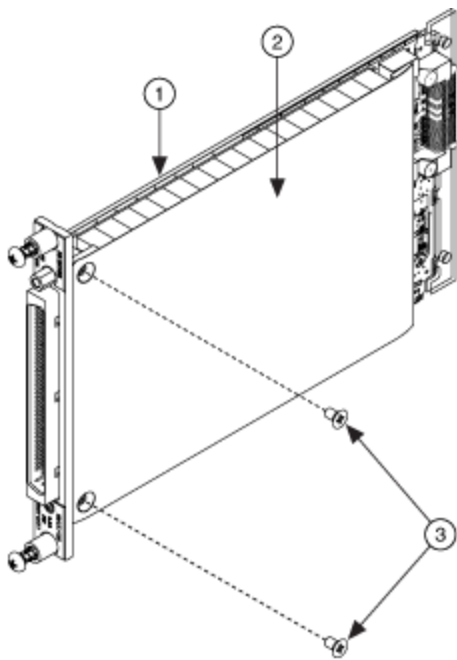
Reassembly If Insulator Cover Was Not Removed

If you only replaced relays outside of the two rightmost columns of matrix relays, and therefore did not remove the adhesive strip of the insulator cover, complete the Disassemble the Card steps in reverse order to reassemble your card.

Reassembly If Insulator Cover Was Removed

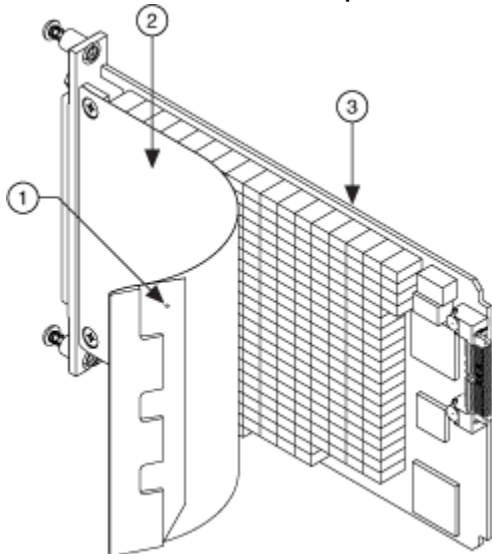
If you removed the insulator cover, including the adhesive strip, to replace a relay in one of the two rightmost columns of matrix relays, complete the following steps to reassemble your card.

1. Use screws to attach one side of the replacement insulator cover to the card.



1	NI 2815
2	Insulator Cover
3	Screws

2. Lift the unattached side of the replacement insulator cover and remove the liner from the adhesive strip.



1	Adhesive Strip
2	Insulator Cover

3

NI 2815

3. Firmly press the adhesive strip on top of the two rightmost columns of matrix relays.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2816

The NI 2816A/B (NI 2816) is a high-density matrix switch card for the NI SwitchBlock. The NI 2816 is designed for combination with other NI 2816 cards to create a customized NI SwitchBlock multiscard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2816 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and

NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 8×46 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

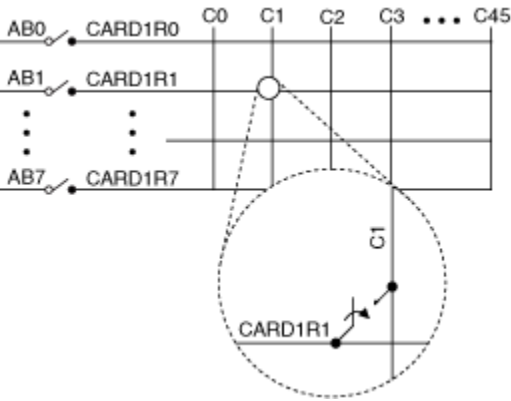
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2816 1-Wire 8×46 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2816 1-Wire 8×46 Matrix Topology

The following figure represents the NI 2816A/B (NI 2816) in the 1-wire 8×46 matrix topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r1` and `c1`, results in the following connection:

signal connected to CARD1R1 is routed to C1

Pinout

The following figure identifies the pins for the NI 2816.

AB0 ^(A) / NO CONNECT ^(B)	49	1	AB1 ^(A) / NO CONNECT ^(B)
AB2 ^(A) / NO CONNECT ^(B)	50	2	AB3 ^(A) / NO CONNECT ^(B)
AB4 ^(A) / NO CONNECT ^(B)	51	3	AB5 ^(A) / NO CONNECT ^(B)
AB6 ^(A) / NO CONNECT ^(B)	52	4	AB7 ^(A) / NO CONNECT ^(B)
C0	53	5	C1
C2	54	6	C3
C4	55	7	C5
C6	56	8	C7
C8	57	9	C9
C10	58	10	C11
C12	59	11	C13
C14	60	12	C15
C16	61	13	C17
C18	62	14	C19
C20	63	15	C21
C22	64	16	C23
C24	65	17	C25
C26	66	18	C27
C28	67	19	C29
C30	68	20	C31
C32	69	21	C33
C34	70	22	C35
C36	71	23	C37
C38	72	24	C39
C40	73	25	C41
C42	74	26	C43
C44	75	27	C45
NO CONNECT	76	28	NO CONNECT
NO CONNECT	77	29	NO CONNECT
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



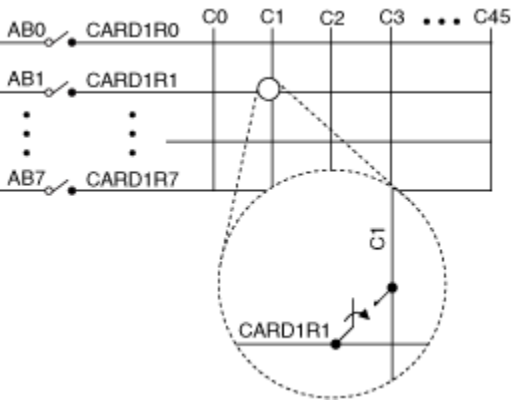
Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2816 Hardware Diagram

The following figure shows the hardware diagram for the NI 2816A/B (NI 2816).

 **Note** Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2816 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0
kCARD1AB1
kCARD1AB2
kCARD1AB3
kCARD1AB4
kCARD1AB5
kCARD1AB6
kCARD1AB7
kCARD1R0C0...kCARD1R0C45
kCARD1R1C0...kCARD1R1C45
kCARD1R2C0...kCARD1R2C45
kCARD1R3C0...kCARD1R3C45
kCARD1R4C0...kCARD1R4C45
kCARD1R5C0...kCARD1R5C45
kCARD1R6C0...kCARD1R6C45
kCARD1R7C0...kCARD1R7C45

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2816 Multicard Topologies

The following table lists possible topologies for an NI 2816 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2816 Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 8×46 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 8×92 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 8×138 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 8×184 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 8×230 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	1-Wire 8×276 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2816 1-Wire 8×46 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2816 Relay Replacement

The NI 2816A/B (NI 2816) uses reed relays.



Note The NI 2816 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Coto	9117-0001
Safety (Reference Designators K18, K53, K168, and K283)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781451-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Disassemble the Card

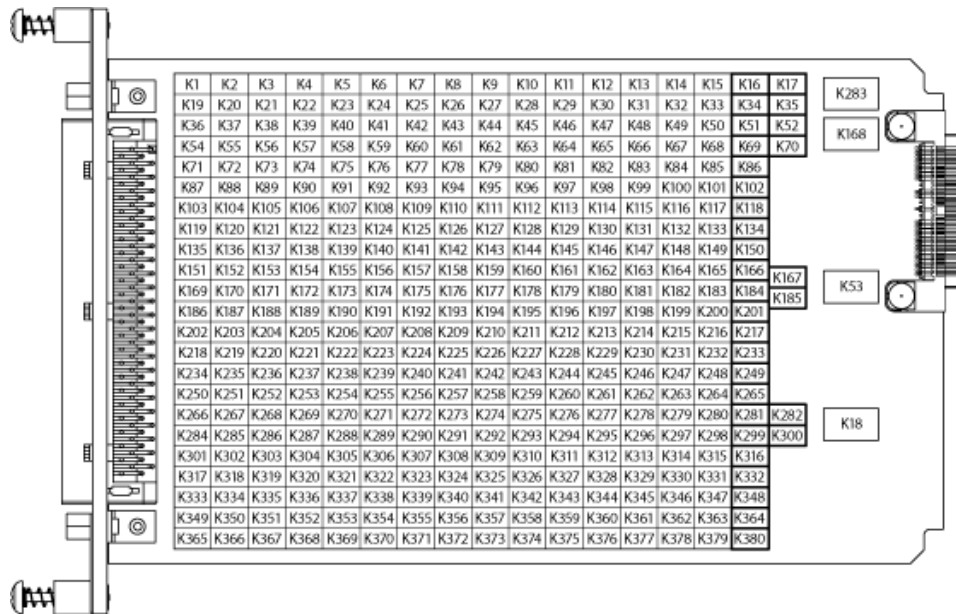
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI 2816 Relay Map



Note The insulator cover attaches to the two rightmost columns of matrix relays, outlined in bold on the relay map, and must be removed to replace these relays. You can replace these relays and the insulator cover by sending the card to National Instruments for a rework return material authorization (RMA) or by following the instructions in the relay replacement procedure.



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K35	kcard1r1c40	K333	kcard1r3c42	K351

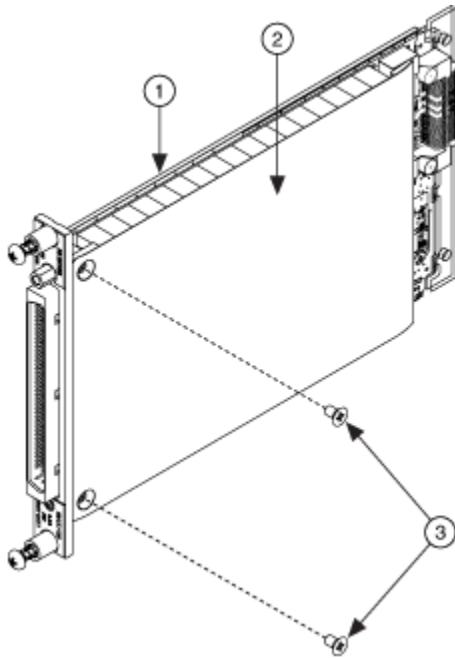
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab1	K17	kcard1r1c41	K334	kcard1r3c43	K352
kcard1ab2	K70	kcard1r1c42	K349	kcard1r3c44	K367
kcard1ab3	K52	kcard1r1c43	K350	kcard1r3c45	K368
kcard1ab4	K185	kcard1r1c44	K365	kcard1r4c0	K9
kcard1ab5	K167	kcard1r1c45	K366	kcard1r4c1	K10
kcard1ab6	K300	kcard1r2c0	K7	kcard1r4c2	K27
kcard1ab7	K282	kcard1r2c1	K8	kcard1r4c3	K28
kcard1r0c0	K5	kcard1r2c2	K25	kcard1r4c4	K44
kcard1r0c1	K6	kcard1r2c3	K26	kcard1r4c5	K45
kcard1r0c2	K23	kcard1r2c4	K42	kcard1r4c6	K62
kcard1r0c3	K24	kcard1r2c5	K43	kcard1r4c7	K63
kcard1r0c4	K40	kcard1r2c6	K60	kcard1r4c8	K79
kcard1r0c5	K41	kcard1r2c7	K61	kcard1r4c9	K80
kcard1r0c6	K58	kcard1r2c8	K77	kcard1r4c10	K95
kcard1r0c7	K59	kcard1r2c9	K78	kcard1r4c11	K96
kcard1r0c8	K75	kcard1r2c10	K93	kcard1r4c12	K111
kcard1r0c9	K76	kcard1r2c11	K94	kcard1r4c13	K112
kcard1r0c10	K91	kcard1r2c12	K109	kcard1r4c14	K127
kcard1r0c11	K92	kcard1r2c13	K110	kcard1r4c15	K128
kcard1r0c12	K107	kcard1r2c14	K125	kcard1r4c16	K143
kcard1r0c13	K108	kcard1r2c15	K126	kcard1r4c17	K144
kcard1r0c14	K123	kcard1r2c16	K141	kcard1r4c18	K159
kcard1r0c15	K124	kcard1r2c17	K142	kcard1r4c19	K160
kcard1r0c16	K139	kcard1r2c18	K157	kcard1r4c20	K177
kcard1r0c17	K140	kcard1r2c19	K158	kcard1r4c21	K178
kcard1r0c18	K155	kcard1r2c20	K175	kcard1r4c22	K194
kcard1r0c19	K156	kcard1r2c21	K176	kcard1r4c23	K195

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c20	K173	kcard1r2c22	K192	kcard1r4c24	K210
kcard1r0c21	K174	kcard1r2c23	K193	kcard1r4c25	K211
kcard1r0c22	K190	kcard1r2c24	K208	kcard1r4c26	K226
kcard1r0c23	K191	kcard1r2c25	K209	kcard1r4c27	K227
kcard1r0c24	K206	kcard1r2c26	K224	kcard1r4c28	K242
kcard1r0c25	K207	kcard1r2c27	K225	kcard1r4c29	K243
kcard1r0c26	K222	kcard1r2c28	K240	kcard1r4c30	K258
kcard1r0c27	K223	kcard1r2c29	K241	kcard1r4c31	K259
kcard1r0c28	K238	kcard1r2c30	K256	kcard1r4c32	K274
kcard1r0c29	K239	kcard1r2c31	K257	kcard1r4c33	K275
kcard1r0c30	K254	kcard1r2c32	K272	kcard1r4c34	K292
kcard1r0c31	K255	kcard1r2c33	K273	kcard1r4c35	K293
kcard1r0c32	K270	kcard1r2c34	K290	kcard1r4c36	K309
kcard1r0c33	K271	kcard1r2c35	K291	kcard1r4c37	K310
kcard1r0c34	K288	kcard1r2c36	K307	kcard1r4c38	K325
kcard1r0c35	K289	kcard1r2c37	K308	kcard1r4c39	K326
kcard1r0c36	K305	kcard1r2c38	K323	kcard1r4c40	K341
kcard1r0c37	K306	kcard1r2c39	K324	kcard1r4c41	K342
kcard1r0c38	K321	kcard1r2c40	K339	kcard1r4c42	K357
kcard1r0c39	K322	kcard1r2c41	K340	kcard1r4c43	K358
kcard1r0c40	K337	kcard1r2c42	K355	kcard1r4c44	K373
kcard1r0c41	K338	kcard1r2c43	K356	kcard1r4c45	K374
kcard1r0c42	K353	kcard1r2c44	K371	kcard1r5c0	K11
kcard1r0c43	K354	kcard1r2c45	K372	kcard1r5c1	K12
kcard1r0c44	K369	kcard1r3c0	K3	kcard1r5c2	K29
kcard1r0c45	K370	kcard1r3c1	K4	kcard1r5c3	K30
kcard1r1c0	K1	kcard1r3c2	K21	kcard1r5c4	K46

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r1c1	K2	kcard1r3c3	K22	kcard1r5c5	K47
kcard1r1c2	K19	kcard1r3c4	K38	kcard1r5c6	K64
kcard1r1c3	K20	kcard1r3c5	K39	kcard1r5c7	K65
kcard1r1c4	K36	kcard1r3c6	K56	kcard1r5c8	K81
kcard1r1c5	K37	kcard1r3c7	K57	kcard1r5c9	K82
kcard1r1c6	K54	kcard1r3c8	K73	kcard1r5c10	K97
kcard1r1c7	K55	kcard1r3c9	K74	kcard1r5c11	K98
kcard1r1c8	K71	kcard1r3c10	K89	kcard1r5c12	K113
kcard1r1c9	K72	kcard1r3c11	K90	kcard1r5c13	K114
kcard1r1c10	K87	kcard1r3c12	K105	kcard1r5c14	K129
kcard1r1c11	K88	kcard1r3c13	K106	kcard1r5c15	K130
kcard1r1c12	K103	kcard1r3c14	K121	kcard1r5c16	K145
kcard1r1c13	K104	kcard1r3c15	K122	kcard1r5c17	K146
kcard1r1c14	K119	kcard1r3c16	K137	kcard1r5c18	K161
kcard1r1c15	K120	kcard1r3c17	K138	kcard1r5c19	K162
kcard1r1c16	K135	kcard1r3c18	K153	kcard1r5c20	K179
kcard1r1c17	K136	kcard1r3c19	K154	kcard1r5c21	K180
kcard1r1c18	K151	kcard1r3c20	K171	kcard1r5c22	K196
kcard1r1c19	K152	kcard1r3c21	K172	kcard1r5c23	K197
kcard1r1c20	K169	kcard1r3c22	K188	kcard1r5c24	K212
kcard1r1c21	K170	kcard1r3c23	K189	kcard1r5c25	K213
kcard1r1c22	K186	kcard1r3c24	K204	kcard1r5c26	K228
kcard1r1c23	K187	kcard1r3c25	K205	kcard1r5c27	K229
kcard1r1c24	K202	kcard1r3c26	K220	kcard1r5c28	K244
kcard1r1c25	K203	kcard1r3c27	K221	kcard1r5c29	K245
kcard1r1c26	K218	kcard1r3c28	K236	kcard1r5c30	K260
kcard1r1c27	K219	kcard1r3c29	K237	kcard1r5c31	K261

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r1c28	K234	kcard1r3c30	K252	kcard1r5c32	K276
kcard1r1c29	K235	kcard1r3c31	K253	kcard1r5c33	K277
kcard1r1c30	K250	kcard1r3c32	K268	kcard1r5c34	K294
kcard1r1c31	K251	kcard1r3c33	K269	kcard1r5c35	K295
kcard1r1c32	K266	kcard1r3c34	K286	kcard1r5c36	K311
kcard1r1c33	K267	kcard1r3c35	K287	kcard1r5c37	K312
kcard1r1c34	K284	kcard1r3c36	K303	kcard1r5c38	K327
kcard1r1c35	K285	kcard1r3c37	K304	kcard1r5c39	K328
kcard1r1c36	K301	kcard1r3c38	K319	kcard1r5c40	K343
kcard1r1c37	K302	kcard1r3c39	K320	kcard1r5c41	K344
kcard1r1c38	K317	kcard1r3c40	K335	kcard1r5c42	K359
kcard1r1c39	K318	kcard1r3c41	K336	kcard1r5c43	K360

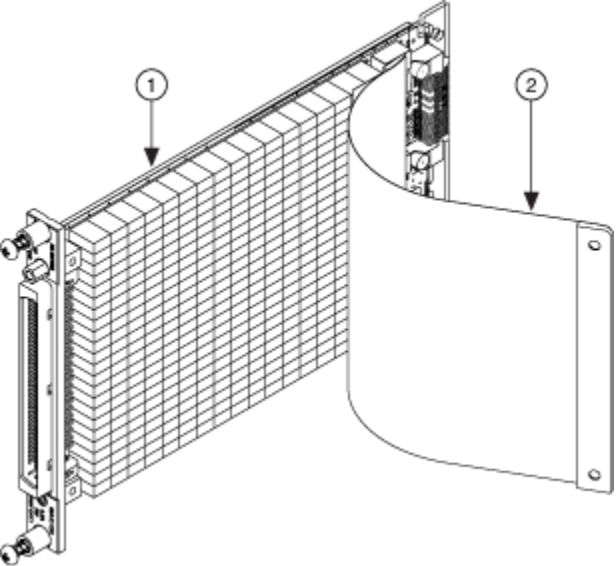
3. Remove the screws that hold one side of the insulator cover to the card.



1	NI 2816
2	Insulator Cover

3	Screws

4. Lift the insulator cover to access the relays. To replace a relay in one of the two rightmost columns of matrix relays, carefully peel the adhesive strip of the insulator cover off of these two columns of relays.



1	NI 2816
2	Insulator Cover

Replace the Relay

The NI 2816 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could

contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.

Reassemble the Card

Refer to one of the following procedures to reassemble your card after replacing any relays.

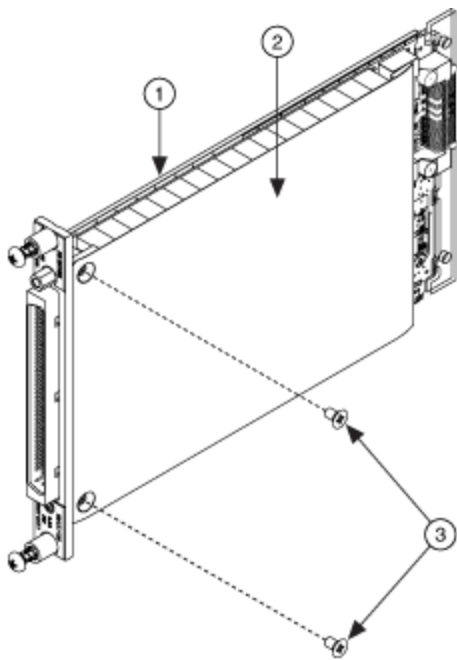
Reassembly If Insulator Cover Was Not Removed

If you only replaced relays outside of the two rightmost columns of matrix relays, and therefore did not remove the adhesive strip of the insulator cover, complete the Disassemble the Card steps in reverse order to reassemble your card.

Reassembly If Insulator Cover Was Removed

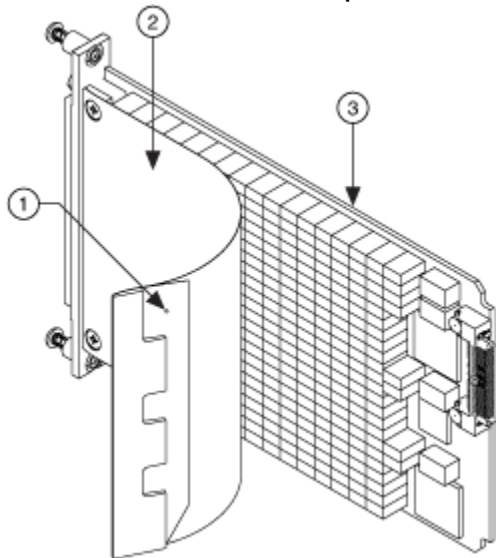
If you removed the insulator cover, including the adhesive strip, to replace a relay in one of the two rightmost columns of matrix relays, complete the following steps to reassemble your card.

1. Use screws to attach one side of the replacement insulator cover to the card.



1	NI 2816
2	Insulator Cover
3	Screws

2. Lift the unattached side of the replacement insulator cover and remove the liner from the adhesive strip.



1	Adhesive Strip
2	Insulator Cover

3

NI 2816

3. Firmly press the adhesive strip on top of the two rightmost columns of matrix relays.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2817

The NI 2817A/B (NI 2817) is a high-density matrix switch card for the NI SwitchBlock. The NI 2817 is designed for combination with other NI 2817 cards to create a customized NI SwitchBlock multiscard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2817 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and

NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 16×22 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

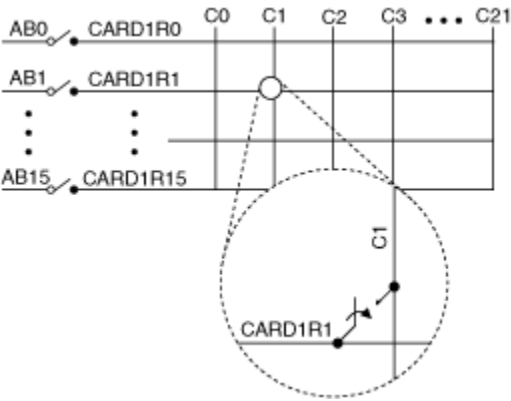
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2817 1-Wire 16×22 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2817 1-Wire 16×22 Matrix Topology

The following figure represents the NI 2817A/B (NI 2817) in the 1-wire 16×22 matrix topology.



Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to CARD1R2 is routed to C1

Pinout

The following figure identifies the pins for the NI 2817.

AB0 ^(A) / NO CONNECT ^(B)	49	1	AB1 ^(A) / NO CONNECT ^(B)
AB2 ^(A) / NO CONNECT ^(B)	50	2	AB3 ^(A) / NO CONNECT ^(B)
AB4 ^(A) / NO CONNECT ^(B)	51	3	AB5 ^(A) / NO CONNECT ^(B)
AB6 ^(A) / NO CONNECT ^(B)	52	4	AB7 ^(A) / NO CONNECT ^(B)
AB8 ^(A) / NO CONNECT ^(B)	53	5	AB9 ^(A) / NO CONNECT ^(B)
AB10 ^(A) / NO CONNECT ^(B)	54	6	AB11 ^(A) / NO CONNECT ^(B)
AB12 ^(A) / NO CONNECT ^(B)	55	7	AB13 ^(A) / NO CONNECT ^(B)
AB14 ^(A) / NO CONNECT ^(B)	56	8	AB15 ^(A) / NO CONNECT ^(B)
C0	57	9	C1
C2	58	10	C3
C4	59	11	C5
C6	60	12	C7
C8	61	13	C9
C10	62	14	C11
C12	63	15	C13
C14	64	16	C15
C16	65	17	C17
C18	66	18	C19
C20	67	19	C21
NO CONNECT	68	20	NO CONNECT
NO CONNECT	69	21	NO CONNECT
NO CONNECT	70	22	NO CONNECT
NO CONNECT	71	23	NO CONNECT
NO CONNECT	72	24	NO CONNECT
NO CONNECT	73	25	NO CONNECT
NO CONNECT	74	26	NO CONNECT
NO CONNECT	75	27	NO CONNECT
NO CONNECT	76	28	NO CONNECT
NO CONNECT	77	29	NO CONNECT
NO CONNECT	78	30	NO CONNECT
NO CONNECT	79	31	NO CONNECT
NO CONNECT	80	32	NO CONNECT
NO CONNECT	81	33	NO CONNECT
NO CONNECT	82	34	NO CONNECT
NO CONNECT	83	35	NO CONNECT
NO CONNECT	84	36	NO CONNECT
NO CONNECT	85	37	NO CONNECT
NO CONNECT	86	38	NO CONNECT
NO CONNECT	87	39	NO CONNECT
NO CONNECT	88	40	NO CONNECT
NO CONNECT	89	41	NO CONNECT
NO CONNECT	90	42	NO CONNECT
NO CONNECT	91	43	NO CONNECT
NO CONNECT	92	44	NO CONNECT
NO CONNECT	93	45	NO CONNECT
INTERLOCK ENABLE	96	48	GND



Note Dual connections separated by a slash in the format of TYPE A SIGNAL^(A)/TYPE B SIGNAL^(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled

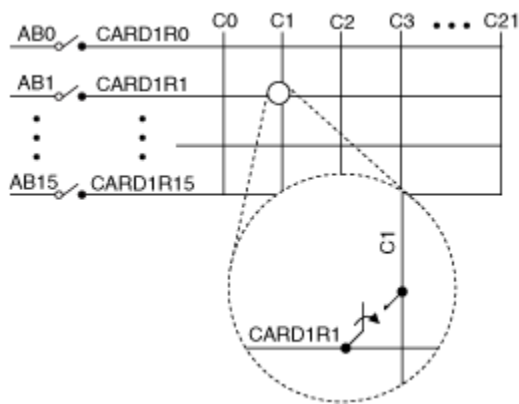
AB0^(A)/NO CONNECT^(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2817 Hardware Diagram

The following figure shows the hardware diagram for the NI 2817A/B (NI 2817).



Note Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2817 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0...kCARD1AB15
kCARD1R0C0...kCARD1R0C21
kCARD1R1C0...kCARD1R1C21
kCARD1R2C0...kCARD1R2C21
kCARD1R3C0...kCARD1R3C21
kCARD1R4C0...kCARD1R4C21
kCARD1R5C0...kCARD1R5C21
kCARD1R6C0...kCARD1R6C21
kCARD1R7C0...kCARD1R7C21
kCARD1R8C0...kCARD1R8C21
kCARD1R9C0...kCARD1R9C21
kCARD1R10C0...kCARD1R10C21
kCARD1R11C0...kCARD1R11C21
kCARD1R12C0...kCARD1R12C21
kCARD1R13C0...kCARD1R13C21
kCARD1R14C0...kCARD1R14C21

Relays

kCARD1R15C0...kCARD1R15C21

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2817 Multicard Topologies

The following table lists possible topologies for an NI 2817 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2817 Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 16×22 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 16×44 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 16×66 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 16×88 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 16×110 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Number of NI 2817 Cards	Topology	Software Name	Immediate	Scanning
6	1-Wire 16×132 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2817 1-Wire 16×22 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2817 Relay Replacement

The NI 2817A/B (NI 2817) uses reed relays.



Note The NI 2817 uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Coto	9117-0001
Safety (Reference Designators K18, K53, K168, K283, K381, K382, K383 and K384)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781451-10
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on your NI SwitchBlock card.

Locate the Relay

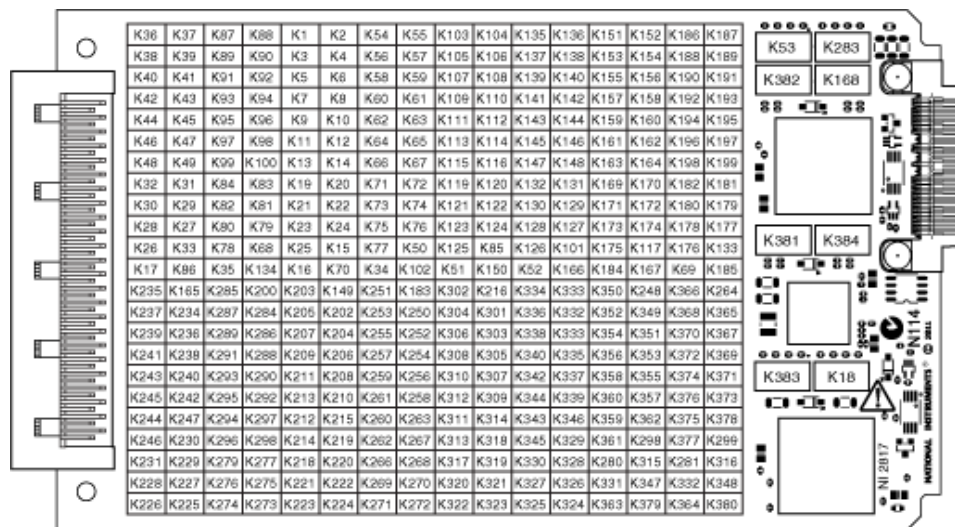
1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.



Note Properly grounding yourself prevents damage to your card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

NI 2817 Relay Map



Note The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K15	kcard1r3c10	K97	kcard1r7c14	K182
kcard1ab1	K33	kcard1r3c11	K98	kcard1r7c15	K181
kcard1ab2	K50	kcard1r3c12	K99	kcard1r7c16	K180

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesign
kcard1ab3	K68	kcard1r3c13	K100	kcard1r7c17	K179
kcard1ab4	K85	kcard1r3c14	K84	kcard1r7c18	K178
kcard1ab5	K101	kcard1r3c15	K83	kcard1r7c19	K177
kcard1ab6	K117	kcard1r3c16	K82	kcard1r7c20	K176
kcard1ab7	K133	kcard1r3c17	K81	kcard1r7c21	K69
kcard1ab8	K149	kcard1r3c18	K80	kcard1r8c0	K202
kcard1ab9	K165	kcard1r3c19	K79	kcard1r8c1	K203
kcard1ab10	K183	kcard1r3c20	K78	kcard1r8c2	K204
kcard1ab11	K200	kcard1r3c21	K35	kcard1r8c3	K205
kcard1ab12	K216	kcard1r4c0	K103	kcard1r8c4	K206
kcard1ab13	K232	kcard1r4c1	K104	kcard1r8c5	K207
kcard1ab14	K248	kcard1r4c2	K105	kcard1r8c6	K208
kcard1ab15	K264	kcard1r4c3	K90	kcard1r8c7	K209
kcard1r0c0	K1	kcard1r4c4	K91	kcard1r8c8	K210
kcard1r0c1	K2	kcard1r4c5	K108	kcard1r8c9	K211
kcard1r0c2	K3	kcard1r4c6	K109	kcard1r8c10	K212
kcard1r0c3	K4	kcard1r4c7	K110	kcard1r8c11	K213
kcard1r0c4	K5	kcard1r4c8	K111	kcard1r8c12	K214
kcard1r0c5	K6	kcard1r4c9	K112	kcard1r8c13	K215
kcard1r0c6	K7	kcard1r4c10	K113	kcard1r8c14	K218
kcard1r0c7	K8	kcard1r4c11	K114	kcard1r8c15	K219
kcard1r0c8	K9	kcard1r4c12	K115	kcard1r8c16	K220
kcard1r0c9	K10	kcard1r4c13	K116	kcard1r8c17	K221
kcard1r0c10	K11	kcard1r4c14	K119	kcard1r8c18	K222
kcard1r0c11	K12	kcard1r4c15	K120	kcard1r8c19	K223
kcard1r0c12	K13	kcard1r4c16	K121	kcard1r8c20	K224
kcard1r0c13	K14	kcard1r4c17	K122	kcard1r8c21	K70

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesign
kcard1r0c14	K19	kcard1r4c18	K123	kcard1r9c0	K234
kcard1r0c15	K20	kcard1r4c19	K124	kcard1r9c1	K235
kcard1r0c16	K21	kcard1r4c20	K125	kcard1r9c2	K236
kcard1r0c17	K22	kcard1r4c21	K51	kcard1r9c3	K237
kcard1r0c18	K23	kcard1r5c0	K135	kcard1r9c4	K238
kcard1r0c19	K24	kcard1r5c1	K136	kcard1r9c5	K239
kcard1r0c20	K25	kcard1r5c2	K137	kcard1r9c6	K240
kcard1r0c21	K16	kcard1r5c3	K138	kcard1r9c7	K241
kcard1r1c0	K36	kcard1r5c4	K139	kcard1r9c8	K242
kcard1r1c1	K37	kcard1r5c5	K140	kcard1r9c9	K243
kcard1r1c2	K38	kcard1r5c6	K141	kcard1r9c10	K244
kcard1r1c3	K39	kcard1r5c7	K142	kcard1r9c11	K245
kcard1r1c4	K40	kcard1r5c8	K143	kcard1r9c12	K246
kcard1r1c5	K41	kcard1r5c9	K144	kcard1r9c13	K247
kcard1r1c6	K42	kcard1r5c10	K145	kcard1r9c14	K231
kcard1r1c7	K43	kcard1r5c11	K146	kcard1r9c15	K230
kcard1r1c8	K44	kcard1r5c12	K147	kcard1r9c16	K229
kcard1r1c9	K45	kcard1r5c13	K148	kcard1r9c17	K228
kcard1r1c10	K46	kcard1r5c14	K132	kcard1r9c18	K227
kcard1r1c11	K47	kcard1r5c15	K131	kcard1r9c19	K226
kcard1r1c12	K48	kcard1r5c16	K130	kcard1r9c20	K225
kcard1r1c13	K49	kcard1r5c17	K129	kcard1r9c21	K86
kcard1r1c14	K32	kcard1r5c18	K128	kcard1r10c0	K250
kcard1r1c15	K31	kcard1r5c19	K127	kcard1r10c1	K251
kcard1r1c16	K30	kcard1r5c20	K126	kcard1r10c2	K252
kcard1r1c17	K29	kcard1r5c21	K52	kcard1r10c3	K253
kcard1r1c18	K28	kcard1r6c0	K151	kcard1r10c4	K254

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r1c19	K27	kcard1r6c1	K152	kcard1r10c5	K255
kcard1r1c20	K26	kcard1r6c2	K153	kcard1r10c6	K256
kcard1r1c21	K17	kcard1r6c3	K154	kcard1r10c7	K257
kcard1r2c0	K54	kcard1r6c4	K155	kcard1r10c8	K258
kcard1r2c1	K55	kcard1r6c5	K156	kcard1r10c9	K259
kcard1r2c2	K56	kcard1r6c6	K157	kcard1r10c10	K260
kcard1r2c3	K39	kcard1r6c7	K158	kcard1r10c11	K261
kcard1r2c4	K58	kcard1r6c8	K159	kcard1r10c12	K262
kcard1r2c5	K59	kcard1r6c9	K160	kcard1r10c13	K263
kcard1r2c6	K60	kcard1r6c10	K161	kcard1r10c14	K266
kcard1r2c7	K61	kcard1r6c11	K162	kcard1r10c15	K267
kcard1r2c8	K62	kcard1r6c12	K163	kcard1r10c16	K268
kcard1r2c9	K63	kcard1r6c13	K164	kcard1r10c17	K269
kcard1r2c10	K64	kcard1r6c14	K169	kcard1r10c18	K270
kcard1r2c11	K65	kcard1r6c15	K170	kcard1r10c19	K271
kcard1r2c12	K66	kcard1r6c16	K171	kcard1r10c20	K272
kcard1r2c13	K67	kcard1r6c17	K172	kcard1r10c21	K102
kcard1r2c14	K71	kcard1r6c18	K173	kcard1r11c0	K284
kcard1r2c15	K31	kcard1r6c19	K174	kcard1r11c1	K285
kcard1r2c16	K73	kcard1r6c20	K175	kcard1r11c2	K286
kcard1r2c17	K74	kcard1r6c21	K184	kcard1r11c3	K287
kcard1r2c18	K76	kcard1r7c0	K186	kcard1r11c4	K288
kcard1r2c19	K76	kcard1r7c1	K187	kcard1r11c5	K289
kcard1r2c20	K77	kcard1r7c2	K188	kcard1r11c6	K290
kcard1r2c21	K34	kcard1r7c3	K189	kcard1r11c7	K291
kcard1r3c0	K87	kcard1r7c4	K190	kcard1r11c8	K292
kcard1r3c1	K88	kcard1r7c5	K191	kcard1r11c9	K293

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r3c2	K89	kcard1r7c6	K192	kcard1r11c10	K294
kcard1r3c3	K90	kcard1r7c7	K193	kcard1r11c11	K295
kcard1r3c4	K91	kcard1r7c8	K194	kcard1r11c12	K296
kcard1r3c5	K92	kcard1r7c9	K195	kcard1r11c13	K297
kcard1r3c6	K93	kcard1r7c10	K196	kcard1r11c14	K279
kcard1r3c7	K94	kcard1r7c11	K197	kcard1r11c15	K278
kcard1r3c8	K95	kcard1r7c12	K198	kcard1r11c16	K277
kcard1r3c9	K96	kcard1r7c13	K199	kcard1r11c17	K276

Replace the Relay

The NI 2817 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this condition. This rework can prevent the same unit from being reworked later on a lead-free solder station, because it could contaminate the station.

Make sure you have the following items:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol

- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2833

The NI 2833A/B (NI 2833) is a high-density matrix switch card for the NI SwitchBlock. The NI 2833 is designed for combination with other NI 2833 cards to create a customized NI SwitchBlock multiscard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Switching inductive loads (for example, motors and solenoids) can produce high-voltage transients in excess of the card's rated voltage. Without additional protection, these transients can interfere with card operation and impact relay life. For more information about transient suppression, refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2833 and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
2-Wire 4×71 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

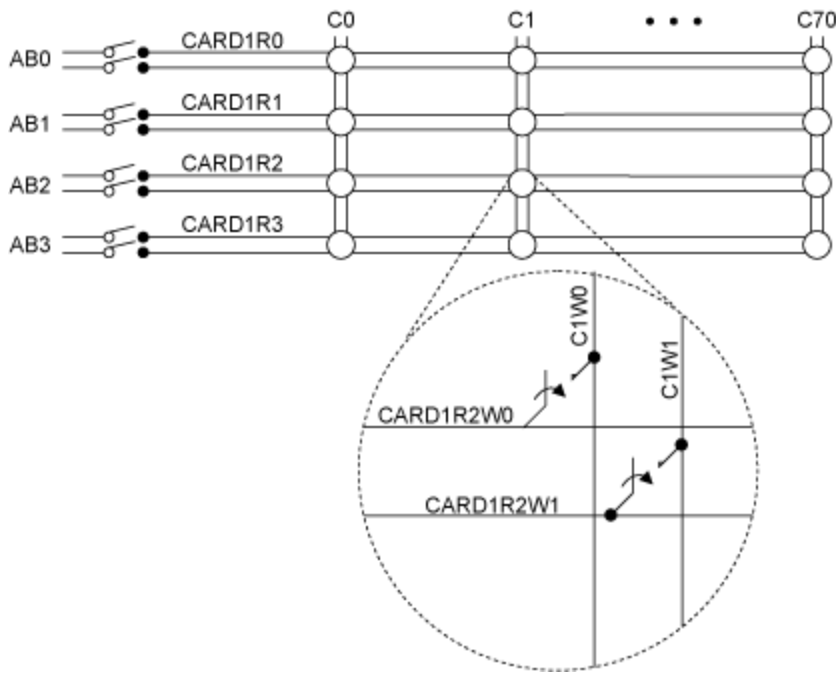
- Integration and System Considerations

Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2833 2-Wire 4×71 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2833 2-Wire 4×71 Matrix Topology

The following figure represents the NI 2833A/B (NI 2833) in the 2-wire 4×71 matrix topology.



Making a Connection

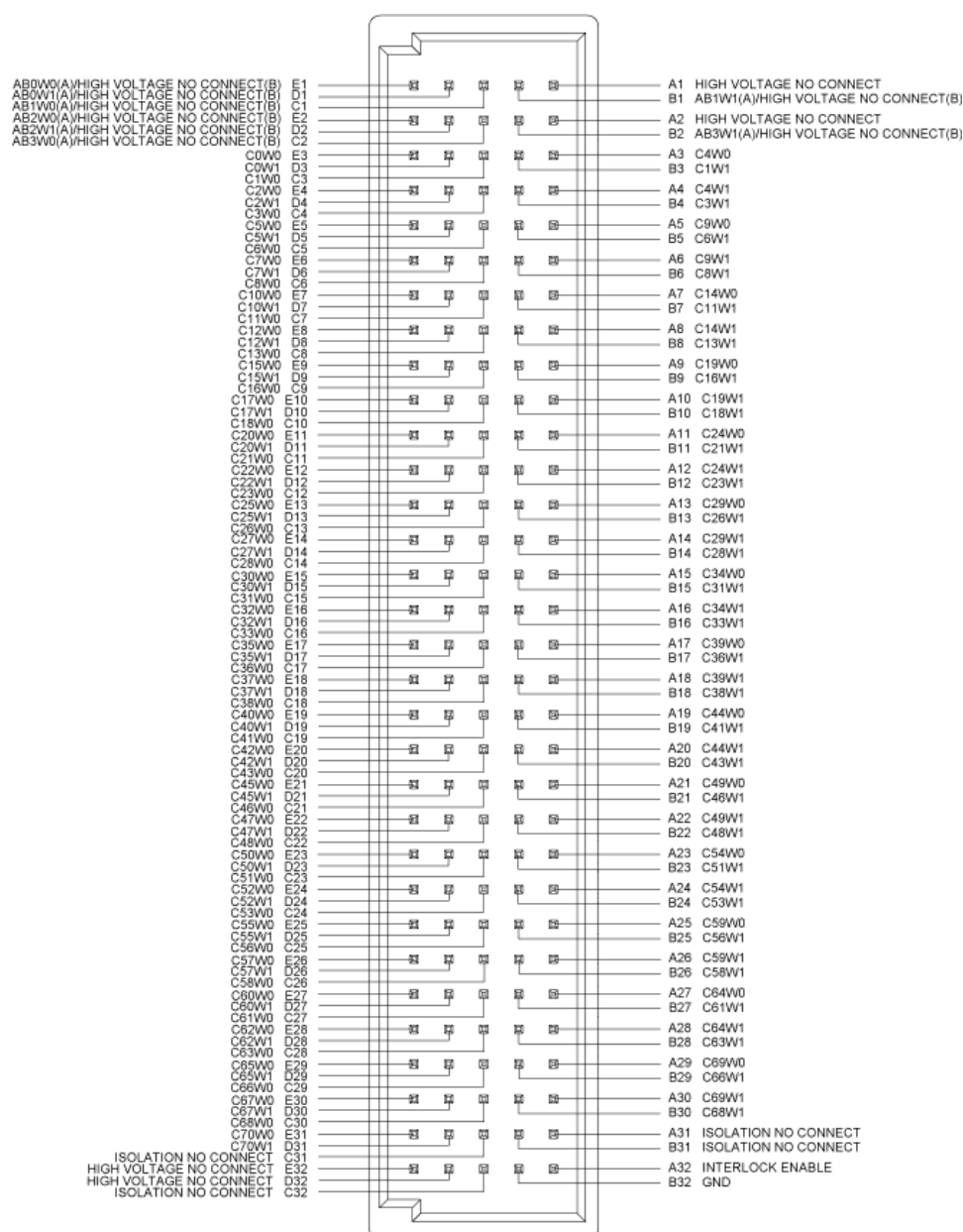
The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to `CARD1R2W0` is routed to `C1W0`

signal connected to `CARD1R2W1` is routed to `C1W1`

Pinout

The following figure identifies the pins for the NI 2833.



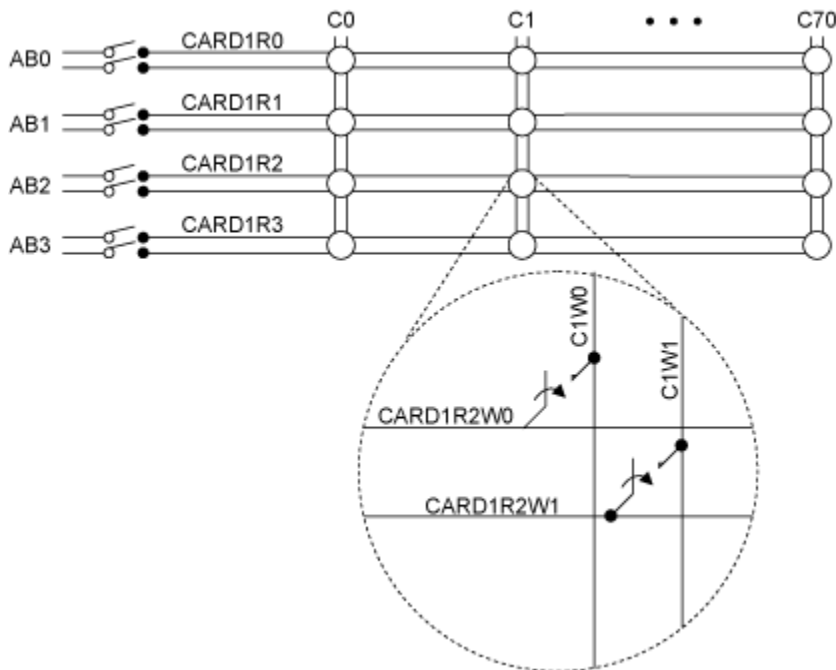
Note Dual connections separated by a slash in the format of TYPE A SIGNAL(A)/TYPE B SIGNAL(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled AB0W0(A)/High Voltage No Connect(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2833 Hardware Diagram

The following figure shows the hardware diagram for the NI 2833A/B (NI 2833).



Note Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2833 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0...kCARD1AB3
kCARD1R0C0...kCARD1R0C70
kCARD1R1C0...kCARD1R1C70
kCARD1R2C0...kCARD1R2C70
kCARD1R3C0...kCARD1R3C70

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2833 Multicard Topologies

The following table lists possible topologies for an NI 2833 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 $\Omega \pm 20\%$, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2833 Cards	Topology	Software Name	Immediate	Scanning
1	2-Wire 4×71 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	2-Wire 4×142 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	2-Wire 4×213 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2833 2-Wire 4×71 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2833 Relay Replacement

The NI 2833A/B (NI 2833) uses electromechanical relays.



Note The NI 2833 uses a custom lead length to meet safety standards. Trim leads according to rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Tyco Electronics	7-1462039-8
Safety (Reference Designators K10, K20, K30, and K40)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781678-01
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on an NI SwitchBlock card.

Locate the Relay

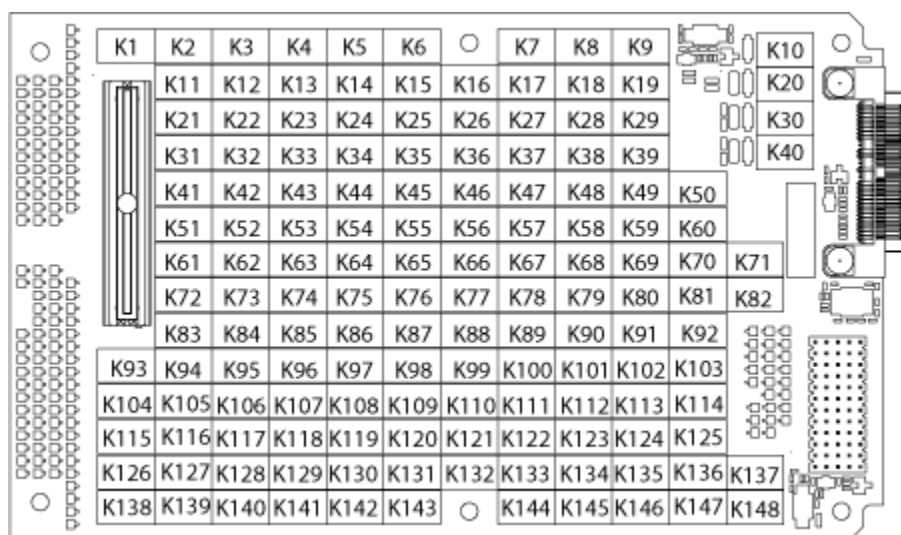
1. Ground yourself using a grounding strap or a ground connected to the PXI chassis.



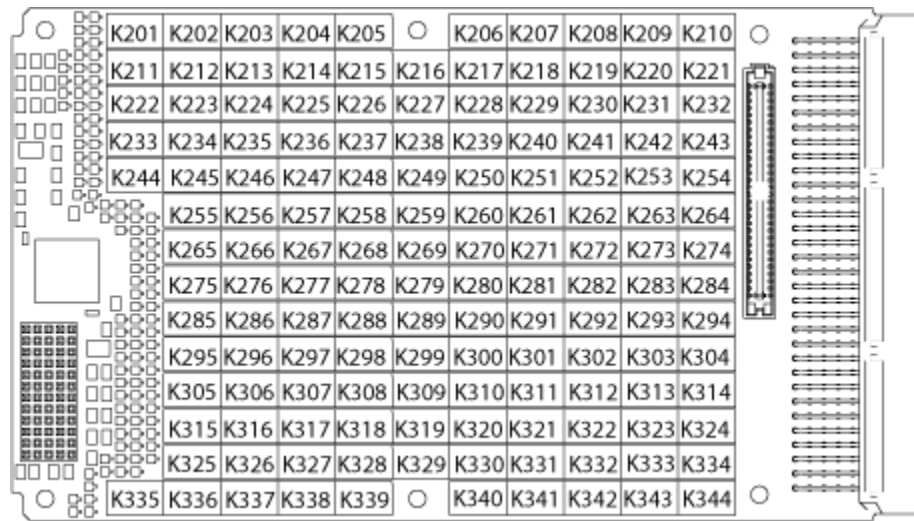
Note Properly grounding yourself prevents damage to the card from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

NI 2833 PCB1 Relay Map



NI 2833 PCB2 Relay Map



The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K9	kcard1r0c68	K343	kcard1r1c69	K314
kcard1ab1	K29	kcard1r0c69	K334	kcard1r1c70	K324
kcard1ab2	K49	kcard1r0c70	K344	kcard1r2c0	K243
kcard1ab3	K50	kcard1r1c0	K232	kcard1r2c1	K254
kcard1r0c0	K210	kcard1r1c1	K220	kcard1r2c2	K242
kcard1r0c1	K221	kcard1r1c2	K231	kcard1r2c3	K241
kcard1r0c2	K209	kcard1r1c3	K230	kcard1r2c4	K252
kcard1r0c3	K208	kcard1r1c4	K218	kcard1r2c5	K240
kcard1r0c4	K219	kcard1r1c5	K229	kcard1r2c6	K239
kcard1r0c5	K207	kcard1r1c6	K228	kcard1r2c7	K31
kcard1r0c6	K206	kcard1r1c7	K11	kcard1r2c8	K41
kcard1r0c7	K1	kcard1r1c8	K21	kcard1r2c9	K250
kcard1r0c8	K2	kcard1r1c9	K227	kcard1r2c10	K22
kcard1r0c9	K217	kcard1r1c10	K3	kcard1r2c11	K32

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c10	K4	kcard1r1c11	K12	kcard1r2c12	K23
kcard1r0c11	K13	kcard1r1c12	K24	kcard1r2c13	K33
kcard1r0c12	K5	kcard1r1c13	K34	kcard1r2c14	K45
kcard1r0c13	K14	kcard1r1c14	K25	kcard1r2c15	K55
kcard1r0c14	K6	kcard1r1c15	K35	kcard1r2c16	K26
kcard1r0c15	K15	kcard1r1c16	K27	kcard1r2c17	K16
kcard1r0c16	K7	kcard1r1c17	K37	kcard1r2c18	K48
kcard1r0c17	K17	kcard1r1c18	K28	kcard1r2c19	K58
kcard1r0c18	K8	kcard1r1c19	K38	kcard1r2c20	K59
kcard1r0c19	K18	kcard1r1c20	K39	kcard1r2c21	K82
kcard1r0c20	K19	kcard1r1c21	K136	kcard1r2c22	K92
kcard1r0c21	K137	kcard1r1c22	K114	kcard1r2c23	K103
kcard1r0c22	K148	kcard1r1c23	K125	kcard1r2c24	K91
kcard1r0c23	K147	kcard1r1c24	K113	kcard1r2c25	K102
kcard1r0c24	K135	kcard1r1c25	K124	kcard1r2c26	K90
kcard1r0c25	K146	kcard1r1c26	K112	kcard1r2c27	K101
kcard1r0c26	K134	kcard1r1c27	K123	kcard1r2c28	K89
kcard1r0c27	K145	kcard1r1c28	K111	kcard1r2c29	K100
kcard1r0c28	K133	kcard1r1c29	K122	kcard1r2c30	K77
kcard1r0c29	K144	kcard1r1c30	K99	kcard1r2c31	K88
kcard1r0c30	K121	kcard1r1c31	K110	kcard1r2c32	K87
kcard1r0c31	K132	kcard1r1c32	K109	kcard1r2c33	K98
kcard1r0c32	K131	kcard1r1c33	K120	kcard1r2c34	K86
kcard1r0c33	K143	kcard1r1c34	K108	kcard1r2c35	K97
kcard1r0c34	K130	kcard1r1c35	K119	kcard1r2c36	K85
kcard1r0c35	K142	kcard1r1c36	K107	kcard1r2c37	K96
kcard1r0c36	K129	kcard1r1c37	K118	kcard1r2c38	K84

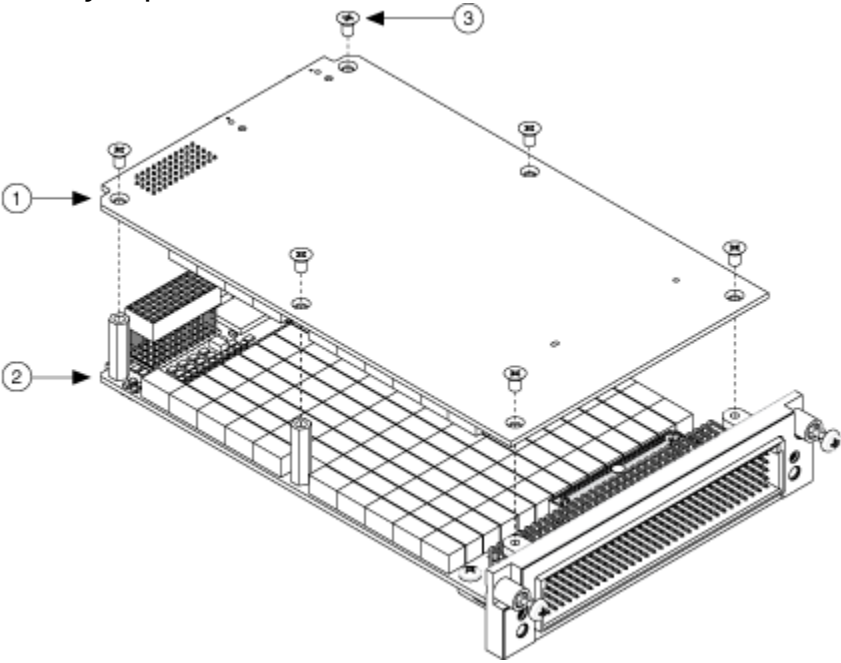
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c37	K141	kcard1r1c38	K106	kcard1r2c39	K95
kcard1r0c38	K128	kcard1r1c39	K117	kcard1r2c40	K105
kcard1r0c39	K140	kcard1r1c40	K116	kcard1r2c41	K104
kcard1r0c40	K139	kcard1r1c41	K127	kcard1r2c42	K93
kcard1r0c41	K126	kcard1r1c42	K115	kcard1r2c43	K238
kcard1r0c42	K138	kcard1r1c43	K215	kcard1r2c44	K237
kcard1r0c43	K216	kcard1r1c44	K226	kcard1r2c45	K236
kcard1r0c44	K205	kcard1r1c45	K225	kcard1r2c46	K247
kcard1r0c45	K204	kcard1r1c46	K213	kcard1r2c47	K235
kcard1r0c46	K214	kcard1r1c47	K224	kcard1r2c48	K234
kcard1r0c47	K203	kcard1r1c48	K223	kcard1r2c49	K245
kcard1r0c48	K202	kcard1r1c49	K211	kcard1r2c50	K233
kcard1r0c49	K212	kcard1r1c50	K222	kcard1r2c51	K295
kcard1r0c50	K201	kcard1r1c51	K315	kcard1r2c52	K305
kcard1r0c51	K335	kcard1r1c52	K325	kcard1r2c53	K286
kcard1r0c52	K336	kcard1r1c53	K306	kcard1r2c54	K296
kcard1r0c53	K326	kcard1r1c54	K316	kcard1r2c55	K287
kcard1r0c54	K337	kcard1r1c55	K307	kcard1r2c56	K297
kcard1r0c55	K327	kcard1r1c56	K317	kcard1r2c57	K288
kcard1r0c56	K338	kcard1r1c57	K308	kcard1r2c58	K298
kcard1r0c57	K328	kcard1r1c58	K318	kcard1r2c59	K279
kcard1r0c58	K339	kcard1r1c59	K299	kcard1r2c60	K289
kcard1r0c59	K319	kcard1r1c60	K309	kcard1r2c61	K290
kcard1r0c60	K329	kcard1r1c61	K310	kcard1r2c62	K300
kcard1r0c61	K330	kcard1r1c62	K320	kcard1r2c63	K291
kcard1r0c62	K340	kcard1r1c63	K311	kcard1r2c64	K301
kcard1r0c63	K331	kcard1r1c64	K321	kcard1r2c65	K292

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c64	K341	kcard1r1c65	K312	kcard1r2c66	K302
kcard1r0c65	K332	kcard1r1c66	K322	kcard1r2c67	K293
kcard1r0c66	K342	kcard1r1c67	K313	kcard1r2c68	K303
kcard1r0c67	K333	kcard1r1c68	K323	kcard1r2c69	K294

Disassemble the Card

Complete the following steps to disassemble the NI 2833.

- 1. Remove the six screws from the top of PCB1.
- 2. Gently separate PCB1 and PCB2.



1	PCB1
2	PCB2
3	Screws

Replace the Relay

The NI 2833 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.

Reassemble the Card

Complete the Disassemble the Card steps in reverse order to reassemble your switch module.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2834

The NI 2834A/B (NI 2834) is a high-density matrix switch card for the NI SwitchBlock. The NI 2834 is designed for combination with other NI 2834 cards to create a customized NI SwitchBlock multiscard device.

For certain applications, you may need to increase the default settling time. Refer to [Adding Additional Settling Time](#) for more information about when the additional time is needed.



Note Switching inductive loads (for example, motors and solenoids) can produce high-voltage transients in excess of the card's rated voltage. Without additional protection, these transients can interfere with card operation and impact relay life. For more information about transient suppression, refer to [Protecting NI Switch Products when Switching Inductive Loads](#).

Operation Modes

The following table lists the supported topology of the NI 2834 and possible operation modes. Refer to [Initializing with Topology for NI SwitchBlock Devices](#) for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
2-Wire 8×34 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Information

- [Integration and System Considerations](#)

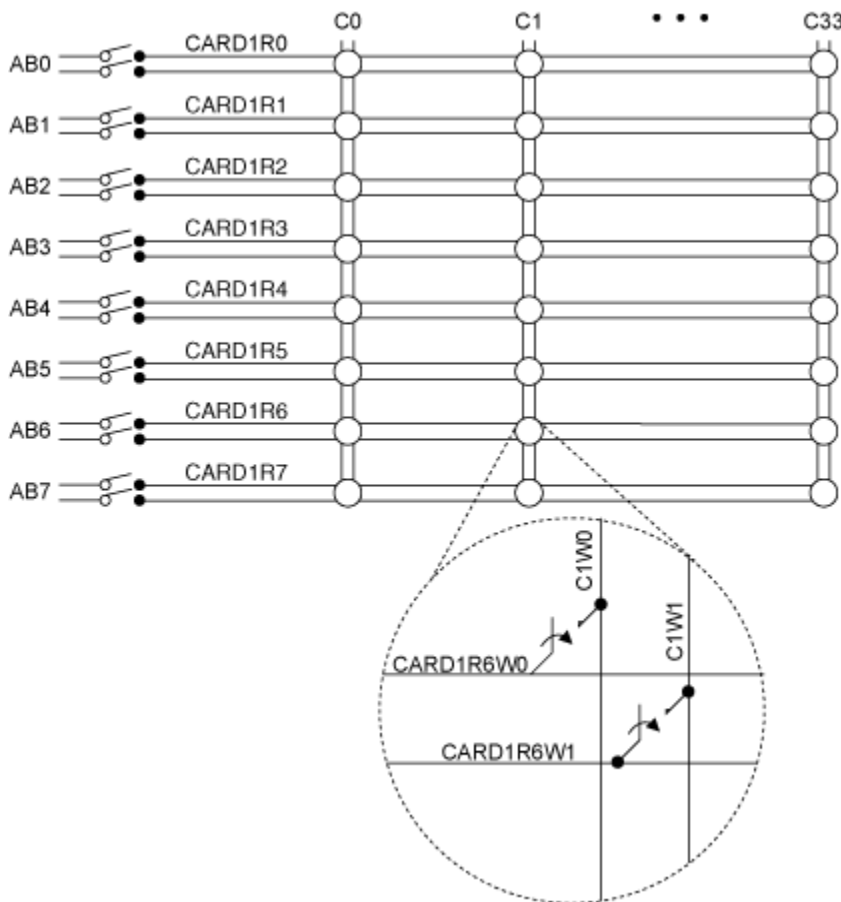
Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)

- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [Operation Modes](#)
- [NI 2834 2-Wire 8×34 Matrix Topology](#)
- [Integration and System Considerations](#)

NI 2834 2-Wire 8×34 Matrix Topology

The following figure represents the NI 2834A/B (NI 2834) in the 2-Wire 8×34 Matrix Topology.



Making a Connection

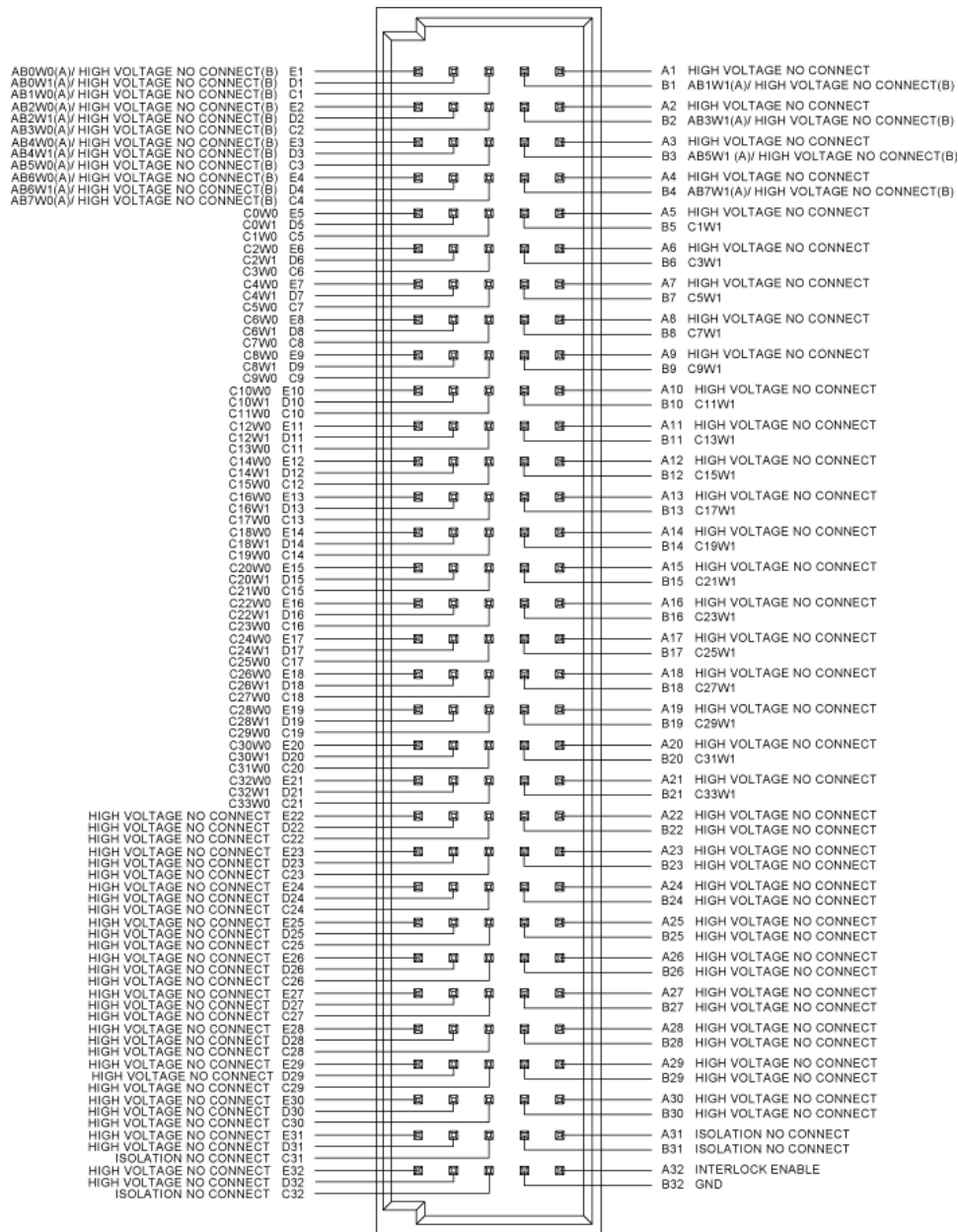
The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to `CARD1R2W0` is routed to `C1W0`

signal connected to CARD1R2W1 is routed to C1W1

Pinout

The following figure identifies the pins for the NI 2834.



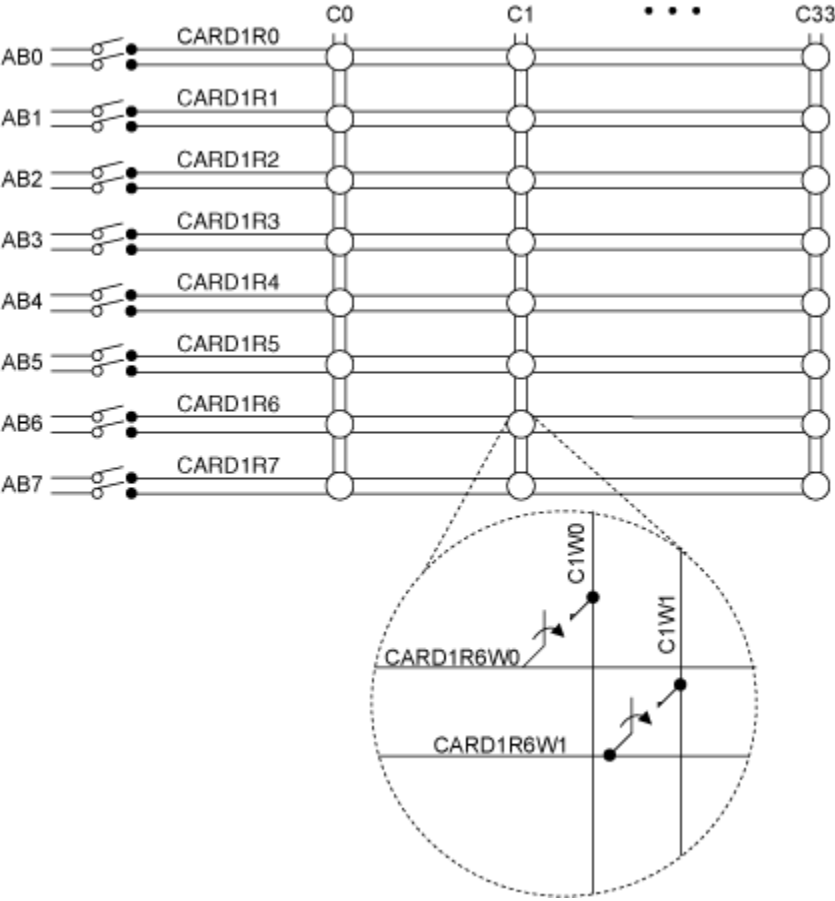
Note Dual connections separated by a slash in the format of TYPE A SIGNAL(A)/TYPE B SIGNAL(B) indicate pins that connect to a different signal depending on the card type. For example, a pin labeled AB0W0(A)/High

Voltage No Connect(B) would connect to AB0 on a type A card, and would make no connection on a type B card.

NI 2834 Hardware Diagram

The following figure shows the hardware diagram for the NI 2834A/B (NI 2834).

 **Note** Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2834 card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0...kCARD1AB7
kCARD1R0C0...kCARD1R0C33
kCARD1R1C0...kCARD1R1C33
kCARD1R2C0...kCARD1R2C33

Relays

kCARD1R3C0...kCARD1R3C33
kCARD1R4C0...kCARD1R0C33
kCARD1R5C0...kCARD1R1C33
kCARD1R6C0...kCARD1R2C33
kCARD1R7C0...kCARD1R3C33

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2834 Multicard Topologies

The following table lists possible topologies for an NI 2834 NI SwitchBlock device. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 Ω $\pm$ 20%, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2834 Cards	Topology	Software Name	Immediate	Scanning
1	2-Wire 8×34 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	2-Wire 8×68 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	2-Wire 8×102 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard

devices.

Related concepts:

- [NI 2834 2-Wire 8×34 Matrix Topology](#)
- [NI SwitchBlock Device Reference](#)

NI 2834 Relay Replacement

The NI 2834A/B (NI 2834) uses electromechanical relays.



Note The NI 2834 uses a custom lead length to meet safety standards. Trim leads according to rework instructions or use one of the custom relays from the relay kit.

Refer to the following tables for information about ordering replacement relays.

Relay	Relay Manufacturer	Part Number
Matrix	Tyco Electronics	7-1462039-8
Safety (Reference Designators K10, K20, K30, K40, K50, K60, K70, and K80)	Tyco Electronics	5-1462039-8

Relay Kit	Part Number
National Instruments (10 matrix relays)	781678-01
National Instruments (10 safety relays)	781089-10

Complete the following sets of steps to locate and replace a failed relay on an NI SwitchBlock card.

Locate the Relay

1. Ground yourself using a grounding strap or a ground connected to the PXI chassis.

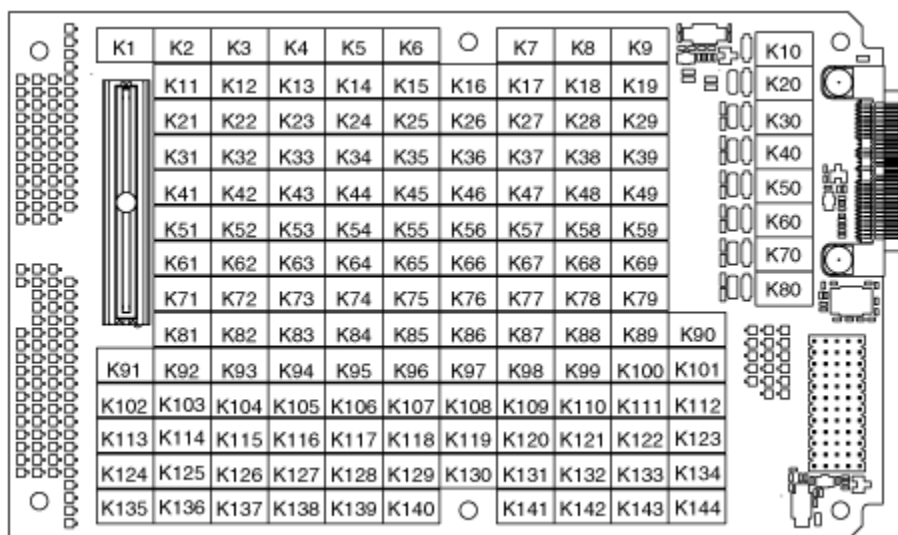


Note Properly grounding yourself prevents damage to the card from

electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figures and table for relay locations.

NI 2834 PCB1 Relay Map



NI 2834 PCB2 Relay Map



The relay names in the following table correspond to a single-card device. Refer to the NI SwitchBlock Device Reference for information about relay naming for multicard devices.

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1ab0	K19	kcard1r1c28	K225	kcard1r3c30	K256
kcard1ab1	K29	kcard1r1c29	K214	kcard1r3c31	K266
kcard1ab2	K49	kcard1r1c30	K224	kcard1r3c32	K245
kcard1ab3	K69	kcard1r1c31	K223	kcard1r3c33	K255
kcard1ab4	K90	kcard1r1c32	K212	kcard1r4c0	K283
kcard1ab5	K112	kcard1r1c33	K222	kcard1r4c1	K294
kcard1ab6	K123	kcard1r2c0	K264	kcard1r4c2	K293
kcard1ab7	K134	kcard1r2c1	K254	kcard1r4c3	K282
kcard1r0c0	K221	kcard1r2c2	K253	kcard1r4c4	K272
kcard1r0c1	K210	kcard1r2c3	K263	kcard1r4c5	K102
kcard1r0c2	K209	kcard1r2c4	K241	kcard1r4c6	K81
kcard1r0c3	K220	kcard1r2c5	K51	kcard1r4c7	K92
kcard1r0c4	K208	kcard1r2c6	K41	kcard1r4c8	K82
kcard1r0c5	K1	kcard1r2c7	K31	kcard1r4c9	K281
kcard1r0c6	K2	kcard1r2c8	K52	kcard1r4c10	K291
kcard1r0c7	K3	kcard1r2c9	K240	kcard1r4c11	K63
kcard1r0c8	K12	kcard1r2c10	K251	kcard1r4c12	K73
kcard1r0c9	K219	kcard1r2c11	K43	kcard1r4c13	K74
kcard1r0c10	K207	kcard1r2c12	K33	kcard1r4c14	K84
kcard1r0c11	K4	kcard1r2c13	K44	kcard1r4c15	K75
kcard1r0c12	K13	kcard1r2c14	K55	kcard1r4c16	K290
kcard1r0c13	K5	kcard1r2c15	K45	kcard1r4c17	K76
kcard1r0c14	K14	kcard1r2c16	K250	kcard1r4c18	K86
kcard1r0c15	K6	kcard1r2c17	K36	kcard1r4c19	K87
kcard1r0c16	K206	kcard1r2c18	K46	kcard1r4c20	K279
kcard1r0c17	K15	kcard1r2c19	K47	kcard1r4c21	K98
kcard1r0c18	K16	kcard1r2c20	K260	kcard1r4c22	K99

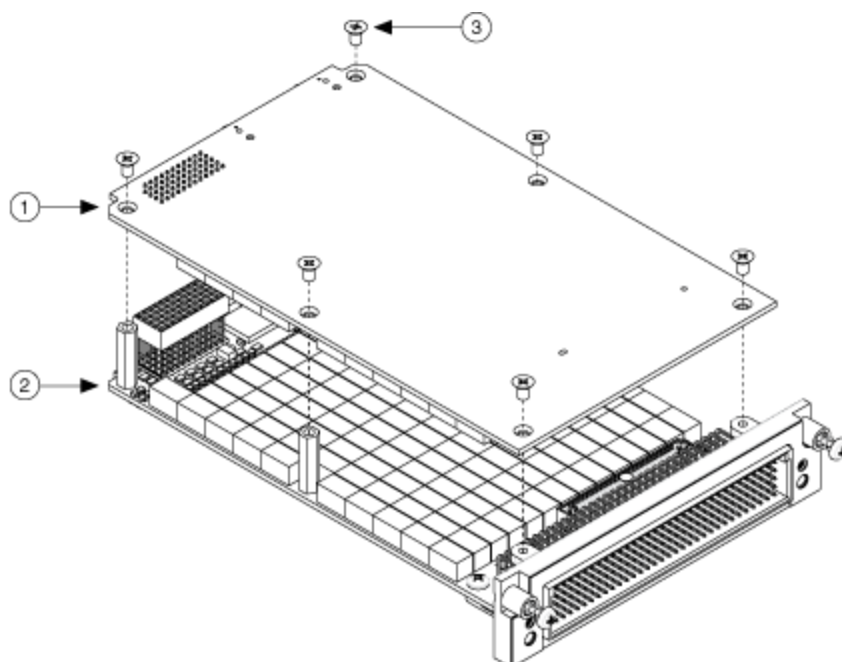
RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r0c19	K7	kcard1r2c21	K57	kcard1r4c23	K88
kcard1r0c20	K217	kcard1r2c22	K48	kcard1r4c24	K269
kcard1r0c21	K17	kcard1r2c23	K58	kcard1r4c25	K89
kcard1r0c22	K8	kcard1r2c24	K249	kcard1r4c26	K288
kcard1r0c23	K18	kcard1r2c25	K59	kcard1r4c27	K278
kcard1r0c24	K216	kcard1r2c26	K237	kcard1r4c28	K267
kcard1r0c25	K9	kcard1r2c27	K248	kcard1r4c29	K277
kcard1r0c26	K205	kcard1r2c28	K236	kcard1r4c30	K276
kcard1r0c27	K215	kcard1r2c29	K246	kcard1r4c31	K286
kcard1r0c28	K204	kcard1r2c30	K235	kcard1r4c32	K265
kcard1r0c29	K213	kcard1r2c31	K234	kcard1r4c33	K275
kcard1r0c30	K203	kcard1r2c32	K244	kcard1r5c0	K314
kcard1r0c31	K202	kcard1r2c33	K233	kcard1r5c1	K304
kcard1r0c32	K211	kcard1r3c0	K284	kcard1r5c2	K303
kcard1r0c33	K201	kcard1r3c1	K274	kcard1r5c3	K302
kcard1r1c0	K243	kcard1r3c2	K273	kcard1r5c4	K292
kcard1r1c1	K232	kcard1r3c3	K262	kcard1r5c5	K113
kcard1r1c2	K231	kcard1r3c4	K252	kcard1r5c6	K103
kcard1r1c3	K242	kcard1r3c5	K91	kcard1r5c7	K93
kcard1r1c4	K230	kcard1r3c6	K61	kcard1r5c8	K104
kcard1r1c5	K11	kcard1r3c7	K71	kcard1r5c9	K301
kcard1r1c6	K21	kcard1r3c8	K72	kcard1r5c10	K311
kcard1r1c7	K32	kcard1r3c9	K261	kcard1r5c11	K83
kcard1r1c8	K22	kcard1r3c10	K271	kcard1r5c12	K94
kcard1r1c9	K218	kcard1r3c11	K62	kcard1r5c13	K95
kcard1r1c10	K229	kcard1r3c12	K53	kcard1r5c14	K85
kcard1r1c11	K42	kcard1r3c13	K64	kcard1r5c15	K96

RelayName	ReferenceDesignator	RelayName	ReferenceDesignator	RelayName	ReferenceDesignator
kcard1r1c12	K23	kcard1r3c14	K54	kcard1r5c16	K300
kcard1r1c13	K24	kcard1r3c15	K65	kcard1r5c17	K108
kcard1r1c14	K34	kcard1r3c16	K270	kcard1r5c18	K97
kcard1r1c15	K25	kcard1r3c17	K56	kcard1r5c19	K109
kcard1r1c16	K228	kcard1r3c18	K66	kcard1r5c20	K310
kcard1r1c17	K35	kcard1r3c19	K67	kcard1r5c21	K120
kcard1r1c18	K26	kcard1r3c20	K280	kcard1r5c22	K110
kcard1r1c19	K27	kcard1r3c21	K77	kcard1r5c23	K121
kcard1r1c20	K239	kcard1r3c22	K68	kcard1r5c24	K299
kcard1r1c21	K37	kcard1r3c23	K78	kcard1r5c25	K111
kcard1r1c22	K28	kcard1r3c24	K259	kcard1r5c26	K289
kcard1r1c23	K38	kcard1r3c25	K79	kcard1r5c27	K298
kcard1r1c24	K227	kcard1r3c26	K258	kcard1r5c28	K287
kcard1r1c25	K39	kcard1r3c27	K268	kcard1r5c29	K297
kcard1r1c26	K238	kcard1r3c28	K257	kcard1r5c30	K296
kcard1r1c27	K226	kcard1r3c29	K247	kcard1r5c31	K306

Disassemble the Card

Complete the following steps to disassemble the NI 2834.

1. Remove the six screws from the top of PCB1.
2. Gently separate PCB1 and PCB2.



1	PCB1
2	PCB2
3	Screws

Replace the Relay

The NI 2834 uses lead-free assemblies.



Note NI recommends using lead-free solder for relay replacement on lead-free assemblies.



Caution Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.



Caution If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being reworked later on a lead-free solder station, which could contaminate the station.

Make sure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 0.5 mm (0.02 inch) from the PCB.

Reassemble the Card

Complete the Disassemble the Card steps in reverse order to reassemble your switch module.



Tip You can use the Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the Switch Soft Front Panel Help for more information.

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2865A

The NI 2865A is a high-density matrix switch card for the NI SwitchBlock. The NI 2865A is designed for combination with other NI 2865A cards to create a customized NI SwitchBlock multcard device.

For certain applications, you may need to increase the default settling time. Refer to Adding Additional Settling Time for more information about when the additional time is needed.



Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition

of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load refer to Reed Relay Protection. For information about inductive loads refer to Protecting NI Switch Products when Switching Inductive Loads.

Operation Modes

The following table lists the supported topology of the NI 2865A and possible operation modes. Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.

Topology	Software Name	Immediate	Scanning
1-Wire 4×84 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Related Topics

Matrix

NI SwitchBlock Switching Considerations

Settling Time

Operation Modes

Integration and System Considerations<

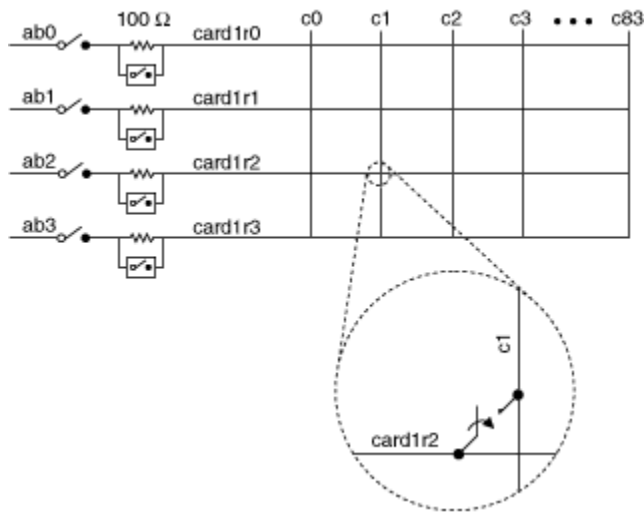
Related concepts:

- [Matrix](#)
- [Settling Time](#)
- [Adding Additional Settling Time](#)
- [Reed Relay Protection](#)
- [Protecting NI Switch Products when Switching Inductive Loads](#)
- [NI 2865A 1-Wire 4×84 Matrix Topology](#)
- [Operation Modes](#)

- Integration and System Considerations

NI 2865A 1-Wire 4×84 Matrix Topology

The following figure represents the NI 2865A in the 1-wire 4×84 matrix topology.



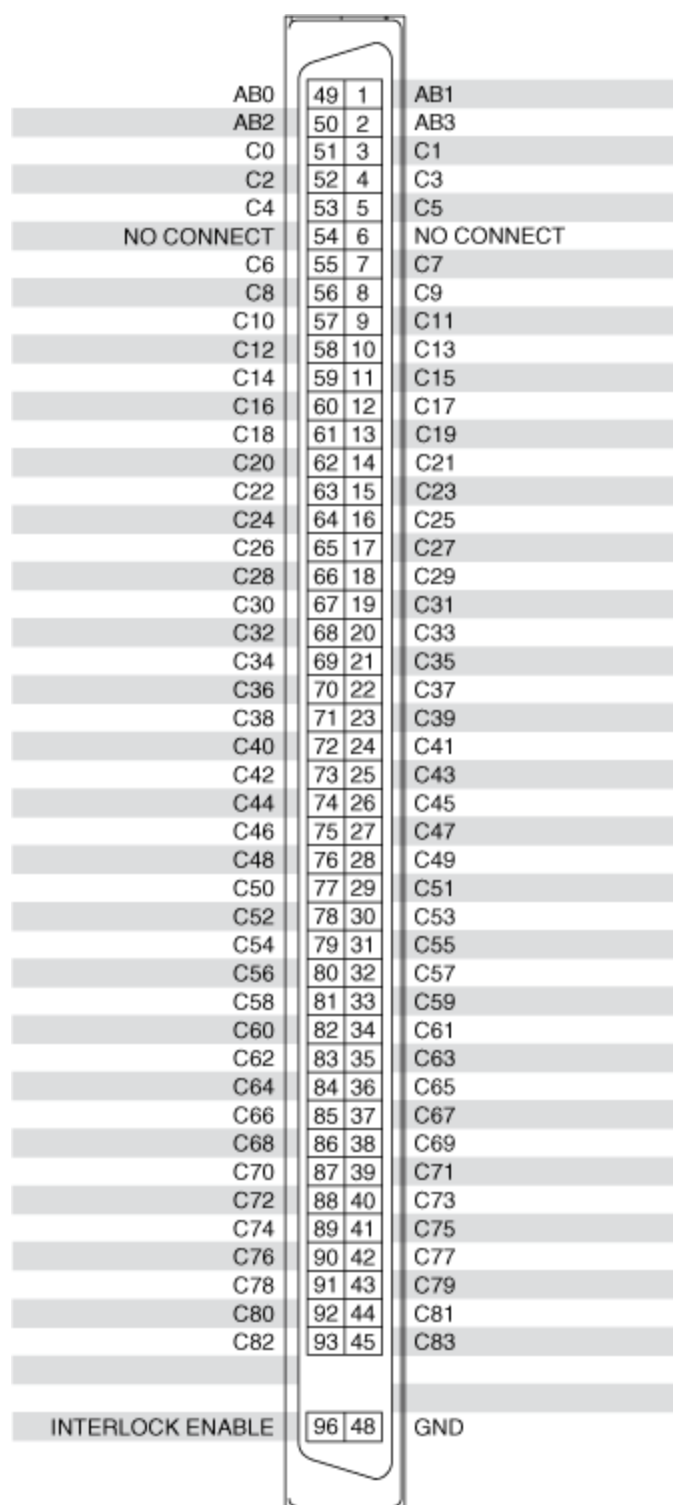
Making a Connection

The immediate operation, `niSwitch Connect Channels VI` or the `niSwitch_Connect` function with parameters `card1r2` and `c1`, results in the following connection:

signal connected to `card1r2` is routed to `c1`

Pinout

The following figure identifies the pins for the NI 2865A.

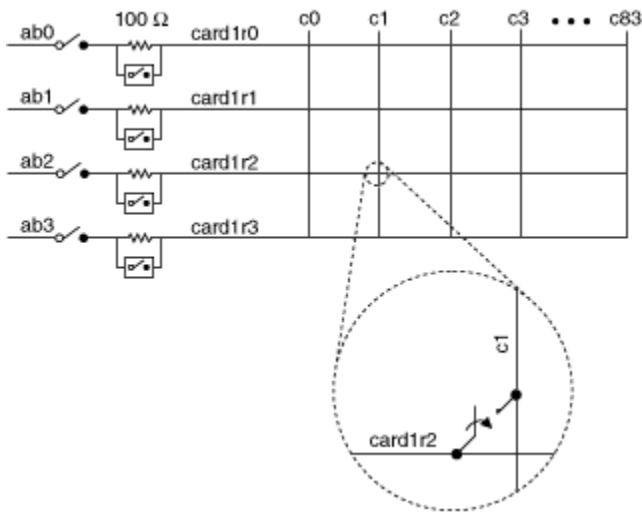


NI 2865A Hardware Diagram

The following figure shows the hardware diagram for the NI 2865A.



Note Hardware relay names are for the topology of a single-card device.



The following table lists relay names for one NI 2865A card. Refer to the NI SwitchBlock Device Reference for channel and relay naming when multiple cards are combined.

Relays
kCARD1AB0
kCARD1AB1
kCARD1AB2
kCARD1AB3
kCARD1BP0
kCARD1BP1
kCARD1BP2
kCARD1BP3
kCARD1R0C0...kCARD1R0C83
kCARD1R1C0...kCARD1R1C83
kCARD1R2C0...kCARD1R2C83
kCARD1R3C0...kCARD1R3C83

Related concepts:

- [NI SwitchBlock Device Reference](#)

NI 2865A Multicard Topologies

The following table lists possible topologies for an NI 2865A NI SwitchBlock device.

Refer to Initializing with Topology for NI SwitchBlock Devices for information about using the Configured Topology and NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY software names.



Note You must connect pin 96 (INTERLOCK ENABLE) to pin 48 (GND) with a 500 Ω resistor (500 $\Omega \pm 20\%$, 1/10 W minimum) to allow connection to the analog bus. Refer to the NI SwitchBlock Safety Interlock topic for additional information about this safety feature.

Number of NI 2865A Cards	Topology	Software Name	Immediate	Scanning
1	1-Wire 4×84 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
2	1-Wire 4×168 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
3	1-Wire 4×252 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
4	1-Wire 4×336 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
5	1-Wire 4×420 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—
6	1-Wire 4×504 Matrix	Configured Topology(NISWITCH_TOPOLOGY_CONFIGURED_TOPOLOGY)	✓	—

Refer to the NI SwitchBlock Device Reference for information about creating multicard devices.

Related concepts:

- [NI 2865A 1-Wire 4×84 Matrix Topology](#)

- [NI SwitchBlock Device Reference](#)