USER GUIDE
NI 653x Cable Adapter

このドキュメントには、日本語ページも含まれています。

The NI 653*x* cable adapter interfaces with National Instruments high-speed digital I/O (DIO) devices. The cable adapter provides an easy way to connect the Very High Density Connector Interface (VHDCI) connectors, labeled as *Digital Data & Control,* on the NI 6535/6536/6537 devices and NI 6535B/6536B/6537B devices to the 68-pin DAQ connectors found on older NI 6533/6534 accessories and fixturing. The cable adapter is also compatible with the NI 654x and NI 655x digital pattern generator/analyzer devices.

For best signal integrity, NI recommends using the NI 6535/6536/6537 and 6535B6536B/6537B devices with newer accessories such as the NI CB-2162 and NI SMB-2163.

This guide explains how to set up and use the NI 653x cable adapter.

Contents

NATIONAL INSTRUMENTS

What You Need to Get Started

To set up and use the NI 653x cable adapter, you need the following items:

❑ NI SHC68-C68-D2 or NI C68-C68-D4 cable assembly
(for NI 6535/6536/6537/654x/655x and NI 6535B/6536B/6537B
devices)

❑ Compatible NI high-speed digital I/O device
(NI 6535/6536/6537/654x/655x or NI 6535B/6536B/6537B)

❑ (Optional) 22- to 26-gauge wire

❑ (Optional) The documentation included with the NI high-speed DIO
device and the driver software included with your device

❑ (Optional) NI 6533 or NI 6534 supported terminal block

Related Documentation

National Instruments high-speed DIO devices ship with several documents
designed to familiarize you with different aspects of the device. The titles
and location of the documents vary based on the driver that supports the
NI device, but you should have the following types of documentation:

• Getting Started Guide—This printed document should be the first
thing you read. Its purpose is to guide you through setting up the
high-speed DIO device and configuring it to generate or acquire your
first samples.

• Help—This online document provides more in-depth information
about the hardware capabilities of the high-speed DIO device, theory
of operation discussion, and information on programming flow and
software reference.

• Specifications—This printed document provides specifications for the
NI hardware.

Visit ni.com/manuals for the most current documentation.

You may also have documentation for any application development
environment (ADE) you are using.

Parts Locator Diagram

Refer to Figure 1 to locate connectors and components on the NI 653x cable adapter.
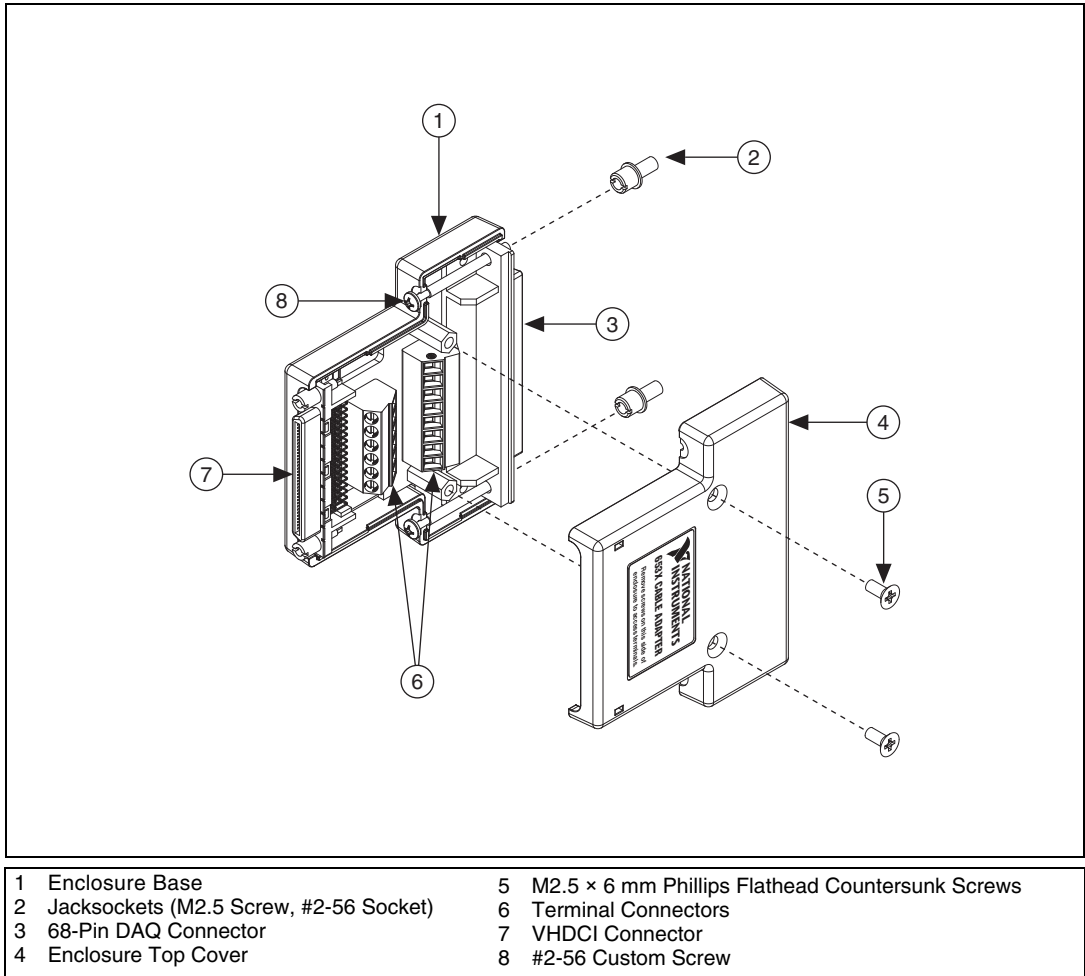
Figure 1. NI 653x Cable Adapter Parts Locator Diagram

1	Enclosure Base	5	M2.5 × 6 mm Phillips Flathead Countersunk Screws
2	Jacksockets (M2.5 Screw, #2-56 Socket)	6	Terminal Connectors
3	68-Pin DAQ Connector	7	VHDCI Connector
4	Enclosure Top Cover	8	#2-56 Custom Screw

Installing Cables

An SHC68-C68-D2 or C68-C68-D4 cable connects the NI 653x cable adapter to the NI high-speed DIO device. Figure 2 shows how to install the cable.
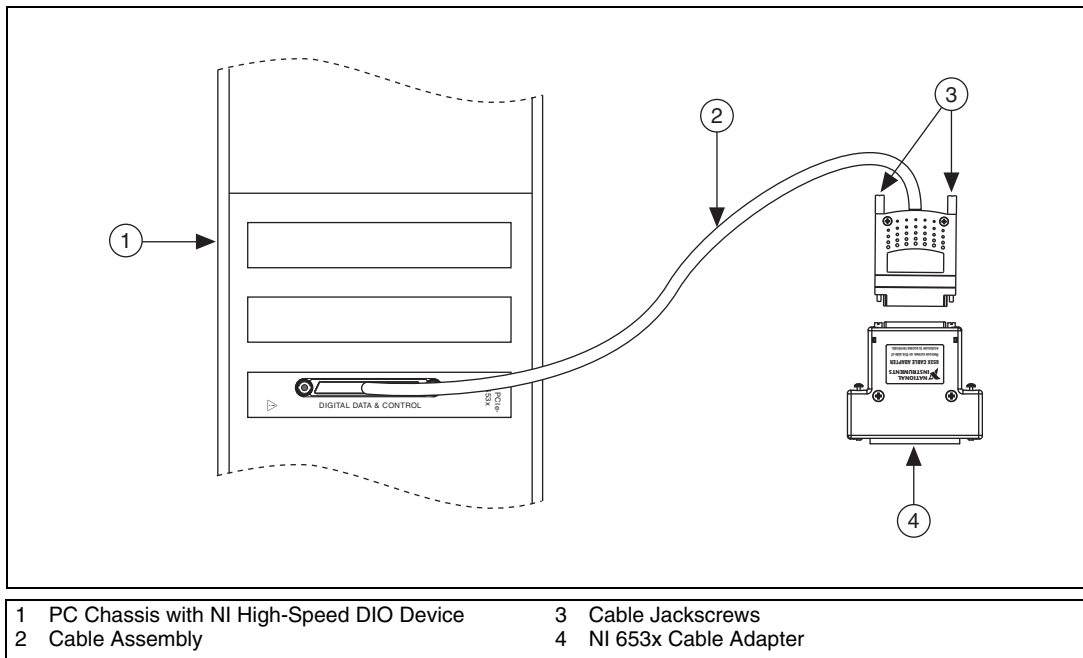

1	PC Chassis with NI High-Speed DIO Device	3	Cable Jackscrews
2	Cable Assembly	4	NI 653x Cable Adapter

Figure 2. Connecting a SHC68-C68-D2 or C68-C68-D4 Cable
to the NI 653x Cable Adapter

⚠ **Caution** *Before* connecting the cable, disconnect power from the NI device and any other connected hardware to prevent damage to the hardware and personal injury. NI is *not* liable for damage resulting from improper connections.

Refer to Figure 2 as you complete the following steps to install the cable adapter:

1. Insert the cable into the cable adapter.
2. Tighten the cable jackscrews.

⚠ **Caution** Before attaching any cables or accessories, install the NI high-speed DIO device. Refer to the Getting Started Guide that shipped with your device for instructions on installing the device.

Removing the NI 653x Cable Adapter from its Enclosure

You will need to remove the NI 653x cable adapter from its enclosure to connect signals. To remove the cable adapter from its enclosure, complete the following steps:

1. Remove the screws from the cable adapter enclosure top cover, as shown in Figure 3.
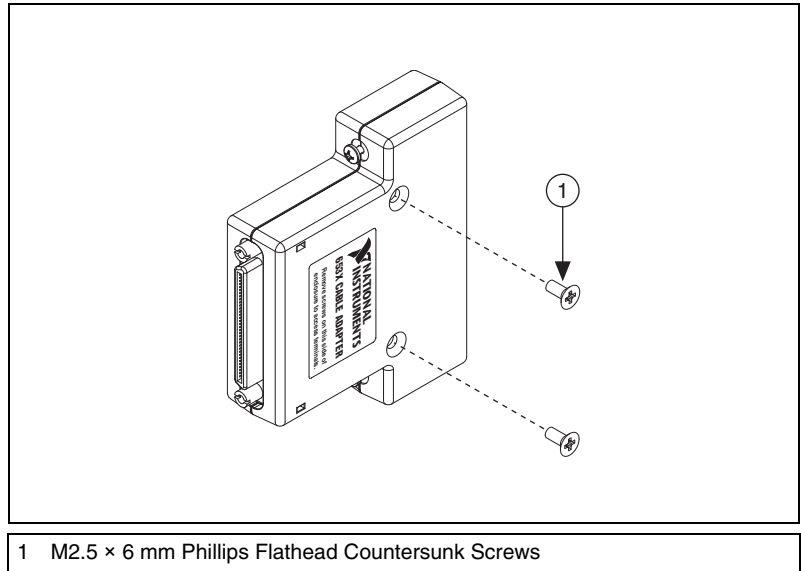

| 1 | M2.5 × 6 mm Phillips Flathead Countersunk Screws |

Figure 3. Remove Screws from the Enclosure

2. Remove the enclosure top cover.

Note Be sure to remove the screws from side with the NI logo label, as shown in Figure 3.

Connecting Signals

The NI 653x cable adapter provides connectivity to up to 32 of the single-ended DIO channels of an NI high-speed DIO device. Each DIO, PFI, and clock channel of the NI high-speed DIO device connects to a corresponding pin on the NI 653x cable adapter. The 32 DIO channels are directly connected between the two bulk connectors. PFI <0..5> from the NI 6535/6535B, NI 6536/6536B, and NI 6537/6537B VHDCI connector are connected to a 6-position screw terminal. PFI <0..7> from the NI 6533/6534 68-pin DAQ connector are connected to an 8-position screw terminal.

PFI channels must be manually connected through screw terminals for flexibility and to ensure correct signal routing. You can make connections between the PFI channels using 22- to 26-gauge wire.

The NI 6533/6534 devices have specific applications for PFI channels and thus require custom wiring to be compatible. An example of how to make these connections is provided in the *NI 6535/6536/6537 or NI 6535B/6536B/6537B Custom Wiring Example* section.

Figure 4 shows the screw terminal locations on the NI 653x cable adapter.

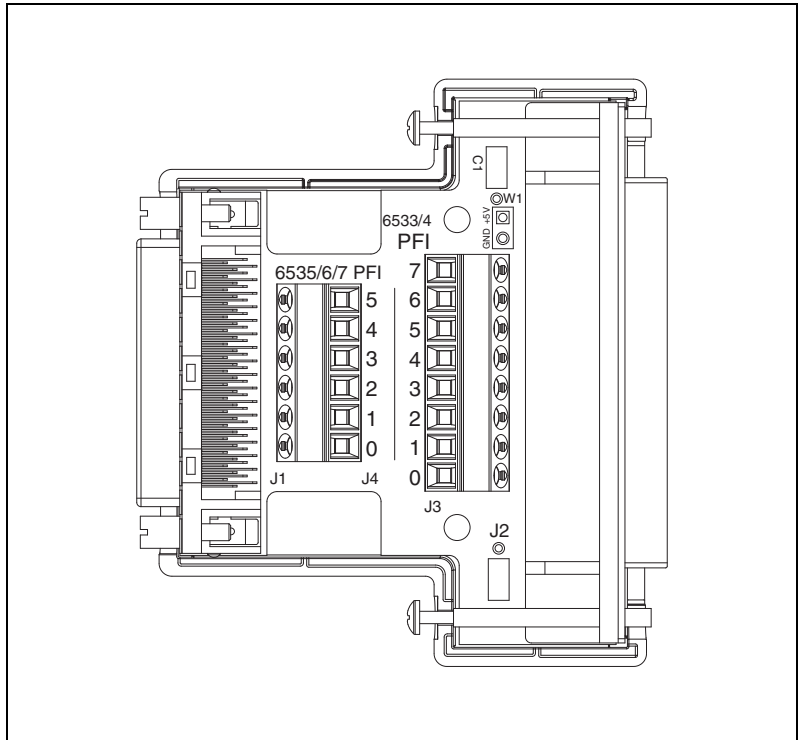
Figure 4. NI 653x Signal Connections

✎ **Note** Refer to the help file for your device for information about the number of available DIO channels on your device. DIO <20..31> or PFI_0 may not be applicable to your device.

Figures 5 and 6 show pinouts for the VHDCI connector and 68-pin DAQ connector, respectively.
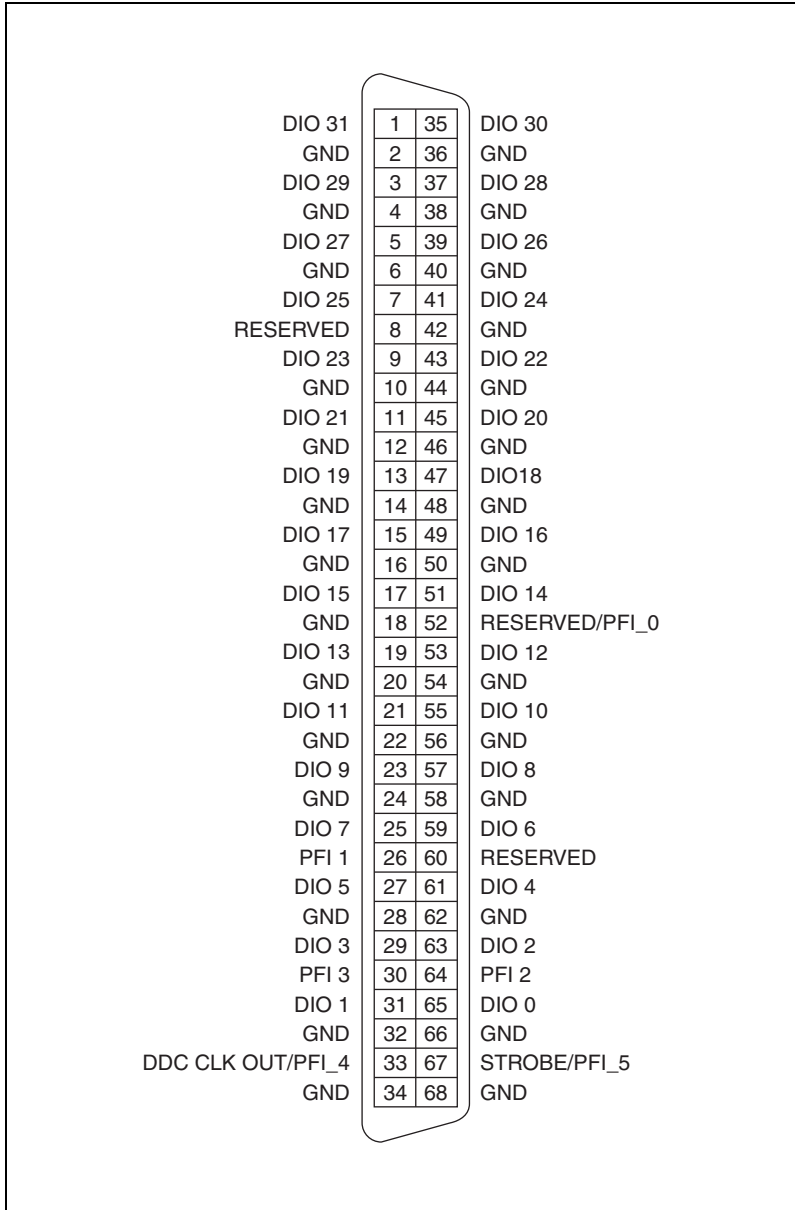
DIO 31	1	35	DIO 30
GND	2	36	GND
DIO 29	3	37	DIO 28
GND	4	38	GND
DIO 27	5	39	DIO 26
GND	6	40	GND
DIO 25	7	41	DIO 24
RESERVED	8	42	GND
DIO 23	9	43	DIO 22
GND	10	44	GND
DIO 21	11	45	DIO 20
GND	12	46	GND
DIO 19	13	47	DIO18
GND	14	48	GND
DIO 17	15	49	DIO 16
GND	16	50	GND
DIO 15	17	51	DIO 14
GND	18	52	RESERVED/PFI_0
DIO 13	19	53	DIO 12
GND	20	54	GND
DIO 11	21	55	DIO 10
GND	22	56	GND
DIO 9	23	57	DIO 8
GND	24	58	GND
DIO 7	25	59	DIO 6
PFI 1	26	60	RESERVED
DIO 5	27	61	DIO 4
GND	28	62	GND
DIO 3	29	63	DIO 2
PFI 3	30	64	PFI 2
DIO 1	31	65	DIO 0
GND	32	66	GND
DDC CLK OUT/PFI_4	33	67	STROBE/PFI_5
GND	34	68	GND

Figure 5. VHDCI Connector Pinout (NI SHC68-C68-D2 or NI C68-C68-D4 Cable)

```
            +5 V   | 1  | 35 |   R GND
           PFI 2   | 2  | 36 |   GND
           PFI 6   | 3  | 37 |   GND
           PFI 0   | 4  | 38 |   D PULL
           PFI 4   | 5  | 39 |   GND
           PFI 5   | 6  | 40 |   C PULL
           PFI 1   | 7  | 41 |   GND
           PFI 7   | 8  | 42 |   GND
           PFI 3   | 9  | 43 |   R GND
            P0.0   | 10 | 44 |   P0.1
             GND   | 11 | 45 |   P0.2
            P0.3   | 12 | 46 |   GND
            P0.4   | 13 | 47 |   P0.5
             GND   | 14 | 48 |   P0.6
            P0.7   | 15 | 49 |   GND
            P1.0   | 16 | 50 |   GND
            P1.1   | 17 | 51 |   P1.2
             GND   | 18 | 52 |   P1.3
           R GND   | 19 | 53 |   P1.4
             GND   | 20 | 54 |   P1.5
            P1.6   | 21 | 55 |   GND
            P1.7   | 22 | 56 |   R GND
            P2.0   | 23 | 57 |   P2.1
             GND   | 24 | 58 |   P2.2
            P2.3   | 25 | 59 |   GND
            P2.4   | 26 | 60 |   P2.5
             GND   | 27 | 61 |   P2.6
            P2.7   | 28 | 62 |   GND
            P3.0   | 29 | 63 |   P3.1
             GND   | 30 | 64 |   P3.2
            P3.3   | 31 | 65 |   GND
            P3.4   | 32 | 66 |   P3.5
             GND   | 33 | 67 |   P3.6
            P3.7   | 34 | 68 |   GND
```

Figure 6. 68-pin DAQ Connector (NI 6533/6534 Fixture or Accessory)

Table 1 describes the VHDCI signals shown in Figure 5. Table 2 describes the DAQ connector signals shown in Figure 6.

Table 1. VHDCI Connector Pinout Descriptions (NI 6535/6536/6537/654x/655x and NI 6535B/6536B/6537B)

Pin	Signal Description	Connection
DIO <0..31>	Bidirectional digital data channels 0 through 31.	P0 <0..7>, P1 <0..7>, P2 <0..7>, or P3 <0..7> on a 68-pin DAQ connector
PFI <0..5>	Programmable functional interface (PFI) channels 0 through 5.	6-position screw terminal (J4)
GND	Ground reference for signals.	—
RESERVED	These channels are reserved for system use. Do not connect signals to these channels.	—

Note Refer to your device documentation for supported channels.

Table 2. DAQmx Connector Pinout Descriptions (NI 6533/6534)

Pin	Signal Description	Connection
P0 <0..7>	Bidirectional digital data port 0 channels 0 through 7.	VHDCI DIO <0..7>
P1 <0..7>	Bidirectional digital data port 1 channels 0 through 7.	VHDCI DIO <8..15>
P2 <0..7>	Bidirectional digital data port 2 channels 0 through 7.	VHDCI DIO <16..23>
P3 <0..7>	Bidirectional digital data port 3 channels 0 through 7.	VHDCI DIO <24..31>
PFI <0..7>	Programmable functional interface (PFI) channels 0 through 7.	8-position screw terminal (J3)
+ 5 V	DC power	Unpopulated W1
C PULL, D PULL	Power on state control	NC

Note The NI 6535/6536/6537/654x/655x and the NI 6535B/3536B/6537B do not provide +5 V. If your fixtures require this, access to the +5 V signal on the DAQ connector is provided through the unpopulated W1 through-hole solder pad.

⚠ **Caution** Connections that exceed any of the maximum ratings for the NI 653x cable adapter or the NI high-speed DIO device can damage the device and the computer. Maximum input ratings are provided in the *Specifications* section and in the specifications document that shipped with the NI high-speed DIO device. NI is *not* liable for any damage resulting from such signal connections.

Table 3 shows the relationship between PFI channels and the termination sockets.

Table 3. PFI Screw Terminals

Connector	Channel	Socket
VHDCI (NI 6535/6536/6537/654x/655x and NI 6535B/6536B/6537B)	PFI <0..5>	J4
68-Pin DAQ Connector (NI 6533/6534)	PFI <0..7>	J3

📝 **Note** Refer to the help file for your device for information about the number of available DIO channels on your device. DIO <20..31> or PFI_0 may not be applicable to your device.

NI 6535/6536/6537 or NI 6535B/6536B/6537B Custom Wiring Example

You can use different wiring schemes to connect the PFI channels in multiple configurations. This section describes a burst handshaking example using an NI 653x cable adapter to provide compatibility between an NI 6533/6534 and an NI 6535/6536/6537 or NI 6535B/6536B/6537B where the fixture is configured to work with the NI 6533/6534. Without changing the fixture setup, the adapter and software can be changed to maintain functionality.

The NI 653x cable adapter can be configured using 22- to 26-gauge wire as shown in Figure 7.
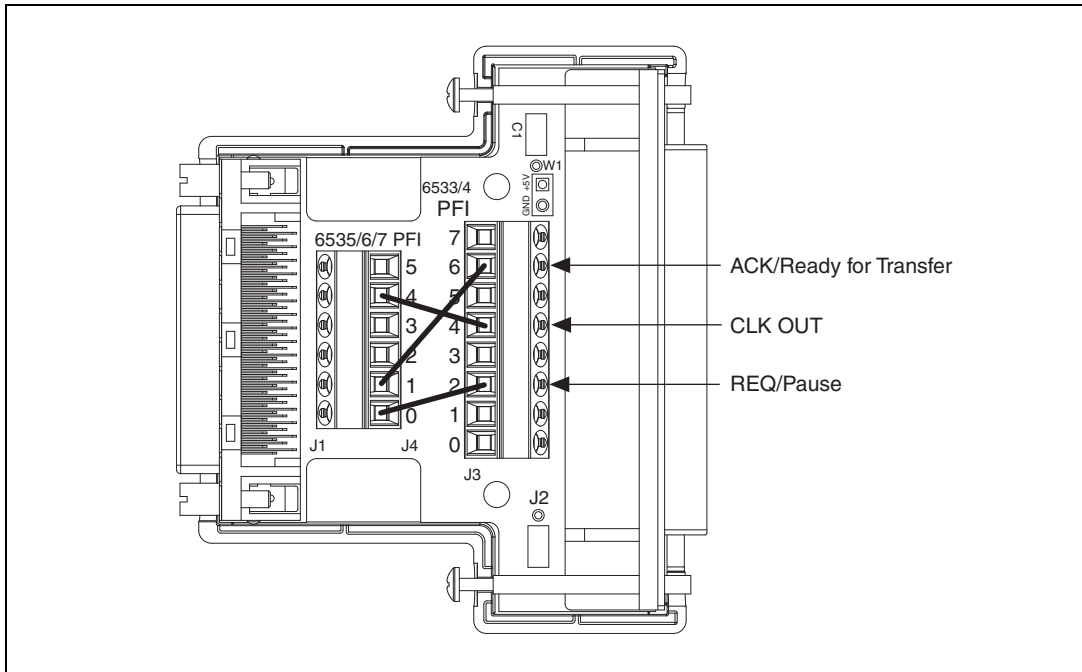
Figure 7. Example Connectivity

This custom wiring results in the signal assignments shown in the following table.

Table 4. Example Connections

VHDCI NI 6535/6536/6537 or NI 6535B/6536B/6537B	68-Pin DAQ NI 6533/6534
PFI_0	PFI_2 (REQ/Pause)
PFI_1	PFI_6 (ACK/Ready for Transfer)
PFI_4	PFI_4 (CLK OUT)

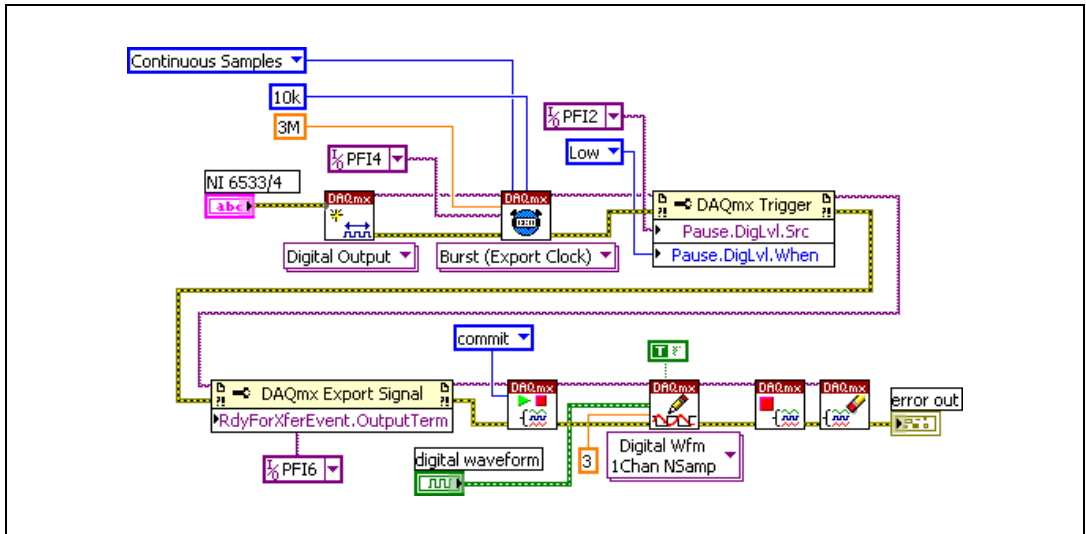A burst handshaking example using the NI 6533/6534 can be coded in LabVIEW as shown in Figure 8.

Figure 8. NI 6533/6534 Burst Handshaking Application

Figure 9 shows the changes made to this LabVIEW VI to accommodate the NI 653x cable adapter connections and provide compatibility with the previous application using an NI 6535/6536/6537 or an NI 6535B/6536B/6537B instead of an NI 6533/6534.
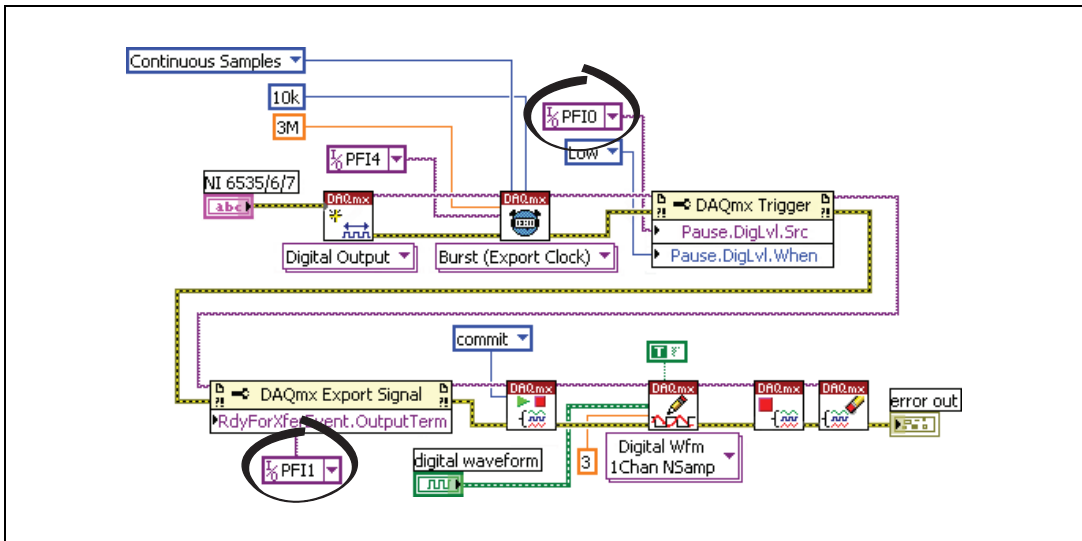
Figure 9. NI 653x Burst Handshaking Application with NI 653x Cable Adapter and NI 6535/6536/6537 or NI 6535B/6536B/6537B (Changes Circled)

Specifications

Digital I/O

VHDCI DIO channels .... 32, single-ended

VHDCI control channels .... 6, single-ended

DAQ DIO channels .... 32, single-ended

DAQ control channels .... 8, single-ended

Traces

Type .... Matched length to 100 mils

AC impedance .... 50 Ω

Power

Maximum voltage rating .... 5.5 V

Physical

Dimensions .... 62.7 × 69.3 × 16.7 mm
(2.47 × 2.73 × 0.66 in.)

I/O connectors .... 68-pin VHDCI connector,
6 position screw terminal,
8 position screw terminal,
68-pin DAQ connector

Recommended wire gage .... 22-26 AWG

Recommended torque
for screw terminals .... 0.3 N · m (2.7 lb · in)

Recommended torque
for cover screws .... 0.23 N · m (2.0 lb · in)

Weight .... 60 g (2.1 oz)

⚠️ **Caution** When connected to other test objects, this product may cause radio interference. In a residential environment, the user may be required to take adequate measures to reduce the radio interference.

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

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