NI ELVIS III Using Application Boards

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Contents

Using the Application Boards

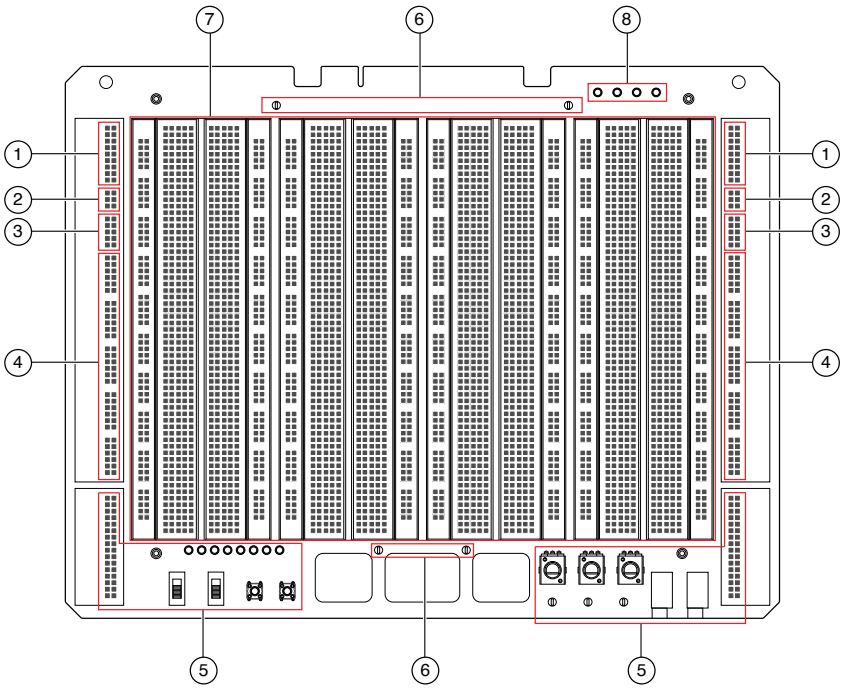
This section introduces the optional application boards and describes the default application board (NI ELVIS III Prototyping Board) and how to use it to connect circuits to the NI ELVIS III workstation.

NI ELVIS III Prototyping Board

The NI ELVIS III Prototyping Board is the default application board for the NI ELVIS III. This general-purpose board can be used to prototype circuits and systems across a wide variety of disciplines. It features a large central build area, convenient access to the NI ELVIS III control I/O, and integrates a set of commonly used circuit components such as buttons and LEDs to simplify prototyping.

> **Notice** Ensure that the application board power button on the workstation is turned off before inserting or removing the prototyping board from the workstation. The integrated LED in the power button should not be lit.

Figure 1. NI ELVIS III Prototyping Board



1. Analog Input
2. Analog Output
3. Fixed User Power Supplies
4. Digital I/O
5. User peripherals
6. Digital ground
7. Central build area (breadboard)
8. Fixed User Power Supplies LEDs

Visit ni.com/info and enter the Info Code breadboardtutorial to learn more about circuit building, circuit examples, and best practices and tips.

Central Build Area

The large central build area features four replaceable solderless breadboards ideal for assembling analog and digital circuitry. When removed, these solderless breadboards expose mounting holes allowing for other prototyping components to be securely mounted to the prototyping board. Smaller prototyping components may fit in the space of a single replaceable breadboard, while others may use the

entire build area. The hole patterns support standard accessories such as the Mechanical Prototyping Add-on for constructing mechatronics systems. You can directly mount products such as the myRIO-1950 to enable the rapid development and validation of embedded systems. Dimensions for the hole locations and sizes are provided to enable the creation of custom accessories.

Figure 2. Solderless Breadboard Mounting Holes

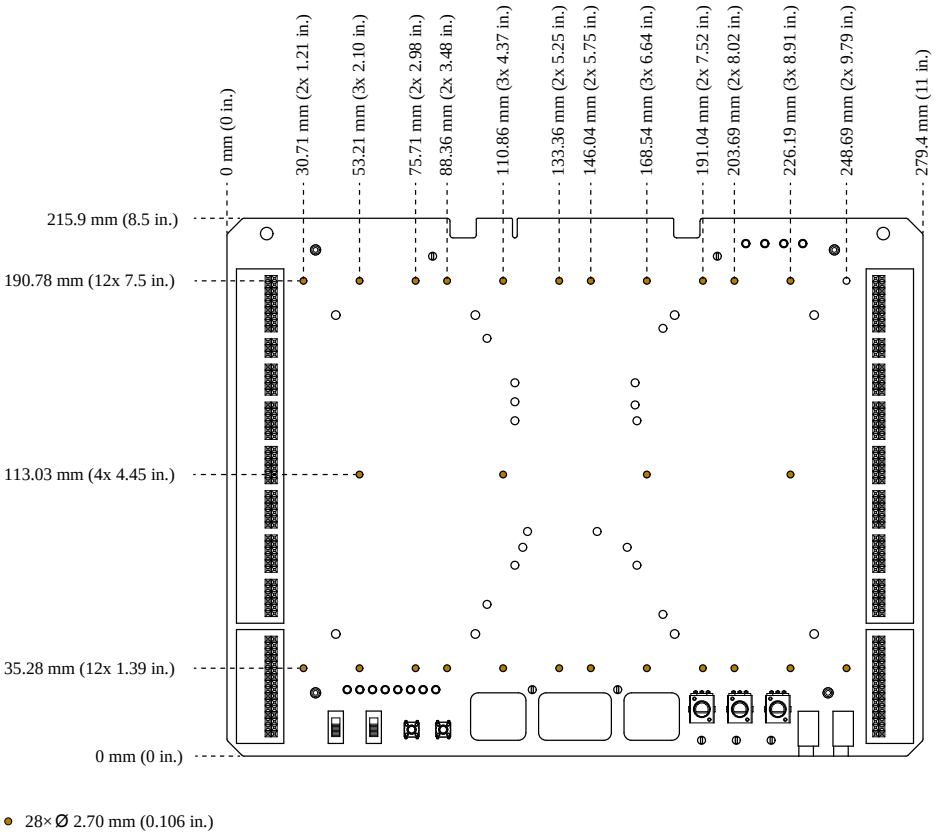
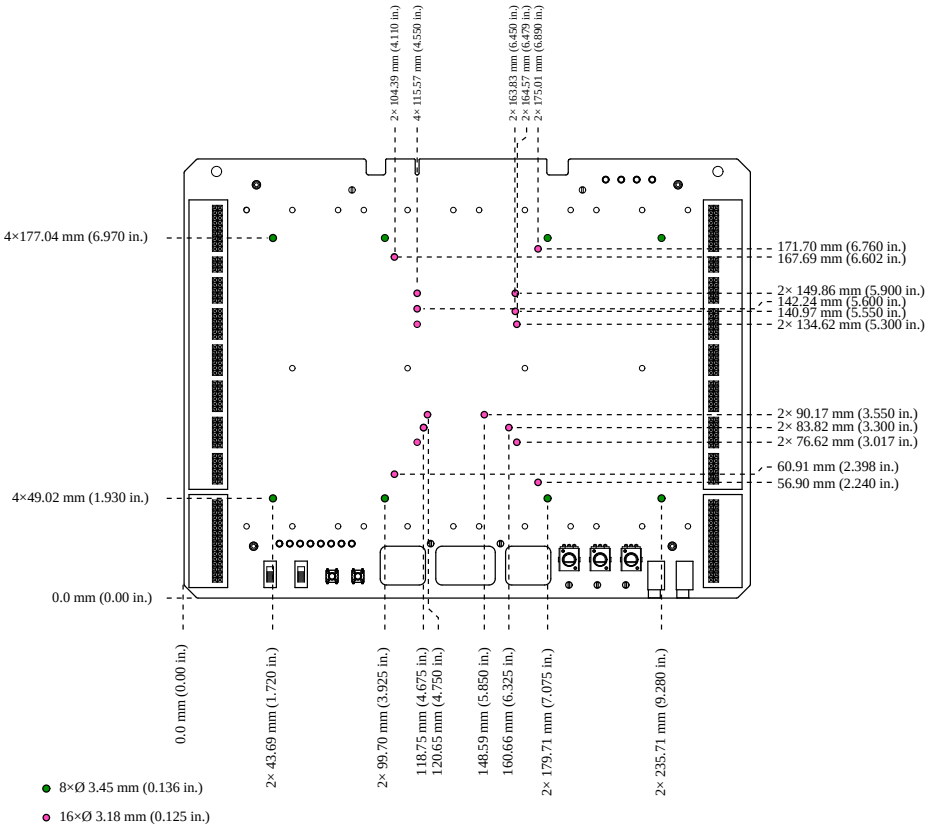


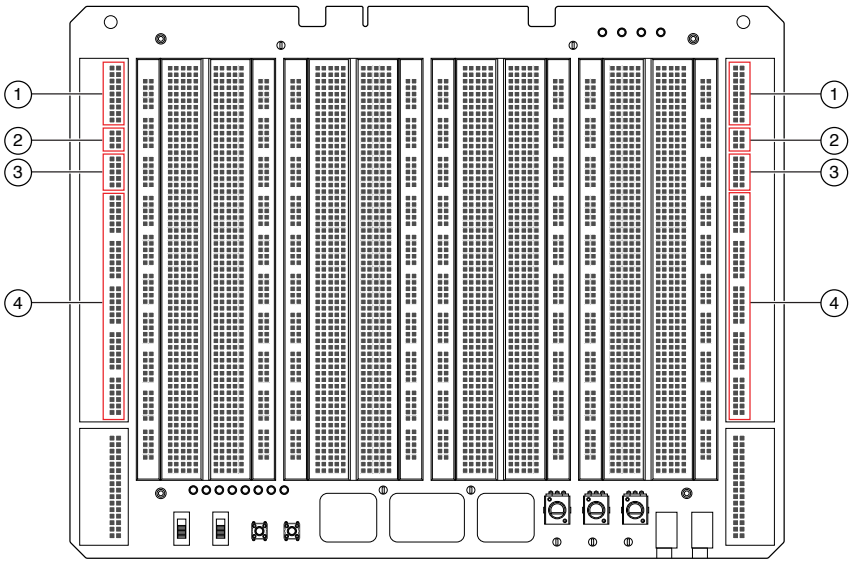
Figure 3. Prototyping Components Mounting Holes



Control I/O

The prototyping board provides convenient access to the NI ELVIS III control I/O through dedicated solderless breadboard strips on either side of the board. These solderless breadboard strips expose the analog input, analog output, digital input/output, and fixed user power supplies. The solderless breadboard strips provide two connection points per signal, and each signal is labeled directly on the solderless breadboard. For more information on the control I/O, refer to the Using the Control I/O section.

Figure 4. NI ELVIS III Prototyping Board Control I/O



1. Analog Input
2. Analog Output
3. Fixed User Power Supplies
4. Digital I/O

Notice Exceeding the current or voltage ratings of a solderless breadboard connection can result in damage to the breadboard. For higher currents, especially for power and ground connections, use multiple connection points to share the current load.

Notice Use DGND for digital signals and power supplies, and AGND for analog signals only.

Fixed User Power Supplies LEDs

The prototyping board has four Fixed User Power Supplies LEDs that correspond to the four fixed user power supply rails. These LEDs will be lit when the fixed user power supplies are enabled. If the LEDs are not lit, the fixed user power supplies are either not enabled or a short circuit condition has occurred.

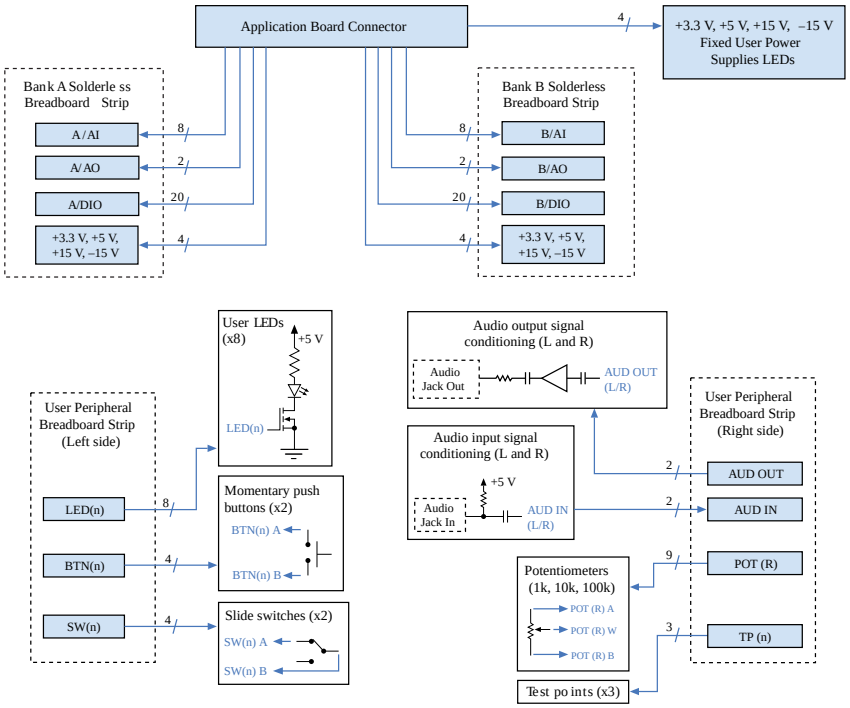
User Peripherals

The prototyping board includes the following circuit components:

- LEDs
- Momentary push buttons
- Slide switches
- Potentiometers
- Audio input conditioning
- Audio output conditioning
- Test points

These resources are accessed through dedicated solderless breadboard strips located to either side of the board. The solderless breadboard strips provide two connection points per signal, and each signal is labeled directly on the solderless breadboard. These resources are not pre-connected to any of the control I/O signals.

Figure 5. Hardware Architecture of User Peripherals



User Peripherals Specifications

Solderless Breadboard	
Voltage	36 V maximum, per connection point

Current	1 A maximum, per connection point

Notice Exceeding the current or voltage ratings of a solderless breadboard connection can result in damage to the breadboard. For higher currents, especially for power and ground connections, use multiple connection points to share the current load.

Notice NI recommends the use of both connection points of the Fixed User Power Supplies to distribute power. For example, when supplying +5 V at 2 A to your circuit, use both connection points provided on the solderless breadboard strip so that each connection point only supplies up to 1 A, maximum. Use at least an equal number of ground connections for each connection.

User Configurable LEDs[1]	
Input range	±15 V
Input high voltage (V_{IH})	2.5 V, minimum
Input low voltage (V_{IL})	0.8 V, maximum
Momentary Push Buttons	
Voltage (resistive load)	15 V, maximum
Current (resistive load)	20 mA, maximum
Contact resistance	50 mΩ
Bounce time	10 ms
Slide Switches	
Voltage	15 V, maximum
Current	20 mA, maximum
Contact resistance	60 mΩ
Potentiometers	
Power	0.05 W, maximum

Standard resistance tolerance	±20%
Residual resistance	±1%

Table 1. Potentiometer Operating Current and Voltage

Potentiometer	Maximum Current ($I^2R = P$)	Maximum Voltage
1 kΩ	7.071 mA	7.071 V
10 kΩ	2.236 mA	20 V
100 kΩ	0.7071 mA	20 V

Test Points	
Current	2 A, maximum
Audio Input Conditioning	
Configuration	One stereo input (AUD IN) consisting of two AC-coupled, single-ended channels (AUD IN L and AUD IN R)
AC coupling capacitor (AUD IN R and AUD IN L)	10 µF
Bandwidth	>20 kHz when source impedance <100 Ω
Connector type (AUD IN)	3.5 mm stereo jack
Audio input type (AUD IN)	Line-in or microphone
Microphone excitation	5 V through 10 kΩ
Audio Output Conditioning	
Configuration	One stereo output (AUD OUT) consisting of two AC-coupled, single-ended channels (AUD OUT L and AUD OUT R)
Output impedance (AUD OUT)	100 Ω in series with 22 µF
Load impedance	8 Ω, minimum
AUD OUT R and AUD OUT L range	±2.5 V
AC coupling capacitor (AUD OUT R and AUD OUT L)	1 µF
Bandwidth	55 Hz to >20 kHz into 32 Ω load

Connector type (AUD OUT)	3.5 mm stereo jack

Compatible Application Boards

The NI ELVIS III Prototyping Board can be removed and replaced with a wide variety of NI ELVIS III specific application boards, covering a broad range of teaching topics. A representative set is listed below. For more information on these boards and additional options, go to Engineering Lab Stations.

Table 2. Compatible Application Boards

Application Board	Part Number	Company
Quanser Controls Board	786516-01	Quanser
Quanser Mechatronic Sensors Board	786517-01	Quanser
Quanser Mechatronic Actuators Board	786519-01	Quanser
Quanser Mechatronic Systems Board	786518-01	Quanser
Quanser Energy Systems Board	786523-01	Quanser
Emona Communications Board	786515-01	Emona
TI Power Electronics Board	786514-01	Texas Instruments

The NI ELVIS III has a high degree of hardware compatibility with application boards designed for NI ELVIS II. However, most NI ELVIS II application boards will require updated software support in order to work with NI ELVIS III. Contact the manufacturer of your existing NI ELVIS II application board for more information on hardware compatibility and if a software update is necessary and available.

Notice Ensure that the application board power button on the workstation is turned off before inserting or removing the prototyping board from the workstation. The integrated LED in the power button should not be lit.

The application board power button enables/disables the fixed user power supply rails and the RIO digital output pull-ups. When disabled, the application board power button prevents the board ID EEPROM from being read. The application

board power button is also used to reenable the application board's functions after a multi-supply short circuit condition.