ETX-16201/16202/16203/16209 User Manual

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Contents

ETX-16201/16202/16203/16209 User Manual

The ETX-16201/16202/16203/16209 User Manual provides detailed descriptions of the product functionality and the step by step processes for use.

Looking for Something Else?

For information not found in the User Manual for your product, such as specifications and API reference, browse ***Related Information***.

Related information:

- Software and Driver Downloads
- NI-Pulser .NET API Reference Manual
- NI-PowerSignalsDAQ.NET API Reference Manual
- Release Notes
- License Setup and Activation
- Dimensional Drawings
- Product Certifications
- Letter of Volatility
- Discussion Forums
- NI Learning Center

ETX-1620x Overview

The ETX-16201/16202/16203/16209 (ETX-1620x) is a production test system that tests traction inverters. The rack includes instrumentation for power electronics, and the system uses a standardized mass interconnect to interface with the rack instrumentation. Use the ETX-1620x to perform low-voltage and communication tests, high-power and load tests, and high-current pulse tests.

The regulatory ID for the system is ATE-38-3D50P-*, where * may be any letter.

ETX-1620x Key Features

The ETX-1620x has the following features and capabilities.

- Targets production and end of line testing applications for inverter DUTs.
- Sources up to 9 kW through a high-power power supply.
- Allows for more standardization, re-use, and increased serviceability across multiple test lines because all I/O is present within the standardized mass interconnect.
- Allows a current pulse up to 1200 A through a pulser, which allows you to test overcurrents and perform calibration at the DUT output stage.
- Validates hardware presence within the rack through maintenance software. The maintenance software also allows you to test I/O connectivity at the mass interconnect using the FDT-16050.

ETX Inverter Production Test System Models

The following ETX Inverter Production Test System models are available.

Table 1. ETX-1620x Models

Model Name	Description
ETX-16201	ETX for Inverter Production Test System, Pulser Configuration
ETX-16202	ETX for Inverter Production Test System, Pulser Configuration with Automotive Ethernet

Model Name	Description
ETX-16203	ETX for Inverter Production Test System, Pulser Configuration with FlexRay
ETX-16209	ETX for Inverter Production Test System, Pulser Configuration, Custom with D25

Related reference:

- ETX-1620x Hardware Components

ETX-1620x Software Support

The ETX Inverter Production Test System Software Suite includes all required software packages for use with the ETX-1620x. If you need features from newer releases of specific drivers, NI does not restrict upgrades; however, the ETX-1620x was tested only with the 2024 Q1 Software Suite packages.

Table 2. Earliest Driver or Software Version Support

Driver or Software Name	Earliest Version Support
ETX Inverter Production Test System Software Suite	2024 Q1

ETX-1620x Regulatory Information

General Guidelines

Note Refer to the component-level documentation for information about the instruments installed in this product, including proper use, I/O connections, and pinouts. All I/O must be connected per the ratings of the individual components included in the product unless otherwise called out in this manual or the ***ETX-16201/16202/16203/16209 Specifications***.

Note Only remove panels when qualified personnel perform maintenance and repair procedures.

Note Any modifications made to the system not specified by the manufacturer may reduce the personal safety measures employed, reduce rack stability, and void safety compliance.

Related information:

- ETX-16201/16202/16203/16209 Specifications

Icons

Refer to the following descriptions if one of these icons is marked on your product or used in this guide.

- **Notice**—Take precautions to avoid data loss, loss of signal integrity, degradation of performance, or damage to the product.
- **Caution**— Take precautions to avoid injury. Consult the product documentation for cautionary statements when you see this icon printed on the product. Cautionary statements are localized into French for compliance with Canadian requirements.
- **Caution: Possibility of Electric Shock**—Take precautions to avoid electrical shock.
- **Protective Conductor Terminal (PE)**— Indicates a terminal that connects to

accessible dead metal parts of the product. Connect the PE terminal(s) to an earth ground system (protective conductor) for safety.
- **Chassis Ground**—Indicates a terminal that connects to the chassis ground.

Safety Guidelines

Caution Observe all instructions and cautions in the user documentation. Using the product in a manner not specified can damage the product and compromise the built-in safety protection.

Attention Suivez toutes les instructions et respectez toutes les mises en garde de la documentation d'utilisation. L'utilisation du produit de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée.

Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the product, take the following precautions. A hazardous voltage is a voltage greater than:

- 30 V RMS, 42.4 V peak, or 60 V DC in DRY LOCATIONS

Hazardous voltages may be applied to, or be present on, certain pins of the mass interconnect as follows:

- The programmable DC supply outputs on J9 can source up to 1.5 kVDC, 30 A.
- Hazardous voltage may be applied from Pulser outputs on J11 and to Pulser connections on J11 and J12. When hazardous voltage is present on Pulser outputs, it may also be applied to pins on J13. When hazardous voltage is applied to J13, all pins on J13 must be treated as hazardous.
- Hazardous voltage may be applied to pins on J15. PWRDAQ channels are isolated from one another up to 1500 VDC, and PULSER channels are isolated up to 200 VDC. PWRDAQ and PULSER channels are isolated from one another.

Hazardous Voltage Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.

Tension dangereuse S'assurer que le câblage à tension dangereuse est effectué par du personnel qualifié respectant les normes électriques locales.

Hazardous Voltage When product terminals are hazardous voltage LIVE, you must ensure that devices and circuits connected to the product are properly insulated from human contact.

Tension dangereuse Lorsqu'une haute tension dangereuse est appliquée aux bornes du produit, vous devez vous assurer que les appareils et les circuits auxquels il est connecté sont correctement isolés de tout contact humain.

Hazardous Voltage All wiring must be insulated for the highest voltage used.

Tension dangereuse Tout le câblage doit être isolé pour la plus haute tension utilisée.

Safety Compliance Standards

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1

Note For safety certifications, refer to the product label or the Product Certifications and Declarations section.

EMC Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) as stated in the product specifications. These requirements and limits are designed to provide reasonable protection against

harmful interference when the product is operated in its intended operational electromagnetic environment.

This product is intended for use in commercial and light-industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by NI could void your authority to operate it under your local regulatory rules.

EMC Notices

Refer to the following notices for cables, accessories, and prevention measures necessary to ensure the specified EMC performance.

Notice For EMC declarations and certifications, and additional information, refer to the Product Certifications and Declarations section.

Notice Changes or modifications to the product not expressly approved by NI could void your authority to operate the product under your local regulatory rules.

Caution This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

Attention Cet équipement n'est pas destiné à être utilisé dans des environnements résidentiels et peut ne pas fournir une protection adéquate à la réception radio dans de tels environnements.

Notice The performance of this product can be disrupted if subjected to Electrostatic Discharge (ESD) during operation. To prevent damage, industry-

standard ESD prevention measures must be employed during installation, maintenance, and operation.

Notice This product may become more sensitive to electromagnetic disturbances in the operational environment when test leads are attached or when the product is connected to a test object.

Notice Operate this product only with shielded cables and accessories.

Notice Install the snap-on ferrite bead for each cable as denoted in the product installation instructions.

Notice The length of all I/O cables, except those connected to Ethernet, USB 2.0, RS-232, and external EMO, must be no longer than 3 m (10 ft).

EMC Standards

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- ICES-001: Class A emissions

Note Group 1 equipment is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note In Europe, Australia, New Zealand, and Canada (per CISPR 11) Class A equipment is intended for use in non-residential locations.

Environmental Guidelines

Notice Failure to follow all keep out instructions in the product documentation can cause temperature derating.

Notice This product is intended for use in indoor applications only.

Notice All cabling should be strain-relieved near input connectors. Take care not to directionally bias cable connectors within input connectors when applying strain relief.

Notice Intake temperatures must be within the operating specifications.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the ***Engineering a Healthy Planet*** web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

Battery Directive, Recycling, and Replacement

Battery Directive For more information about compliance with the EU Battery Directive 2006/66/EC about Batteries and Accumulators and Waste

> Batteries and Accumulators, visit ni.com/environment/batterydirective.

The product may contain one or multiple replaceable batteries in the incorporated products or components. Products containing lithium must be disposed of or recycled in accordance with all local laws and site regulations.

This product may contain one or multiple batteries in the incorporated products or components. If you need to replace the battery in an NI-branded product or component, refer to the user manual for the incorporated product or component to find battery replacement instructions. You can find documentation for NI-branded products and components online at ni.com/manuals. For third-party products or components, refer to the manufacturer's website for battery replacement instructions.

电子信息产品污染控制管理办法（中国RoHS）

- **中国RoHS**— NI符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于NI中国RoHS合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

台灣經濟部標準檢驗局RoHS (台灣 RoHS)

R39957
RoHS

想了解本產品更多信息，請參考 `ni.com/environment/rohs_taiwan`。此鏈接包含

- 本產品台灣RoHS限用物質含有情況標示。
- 如何查詢本產品製造年份。
- 產品手冊下載。

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate

link.

Export Compliance

This product is subject to control under the U.S. Export Administration Regulations (15 CFR Part 730 et. seq.) administered by the U.S. Department of Commerce's Bureau of Industry and Security (BIS) (www.bis.doc.gov) and other applicable U.S. export control laws and sanctions regulations. This product may also be subject to additional license requirements of other countries' regulations.

Additionally, this product may also require export licensing before being returned to NI. The issuance of a Return Material Authorization (RMA) by NI does not constitute export authorization. The user must comply with all applicable export laws prior to exporting or re-exporting this product. See ni.com/legal/export-compliance for more information and to request relevant import classification codes (e.g. HTS), export classification codes (e.g. ECCN), and other import/export data.

ETX-1620x System Components

The ETX-1620x is a system that is comprised of hardware components. You must use the ETX-1620x with the software components in the ETX Inverter Production Test System Software Suite.

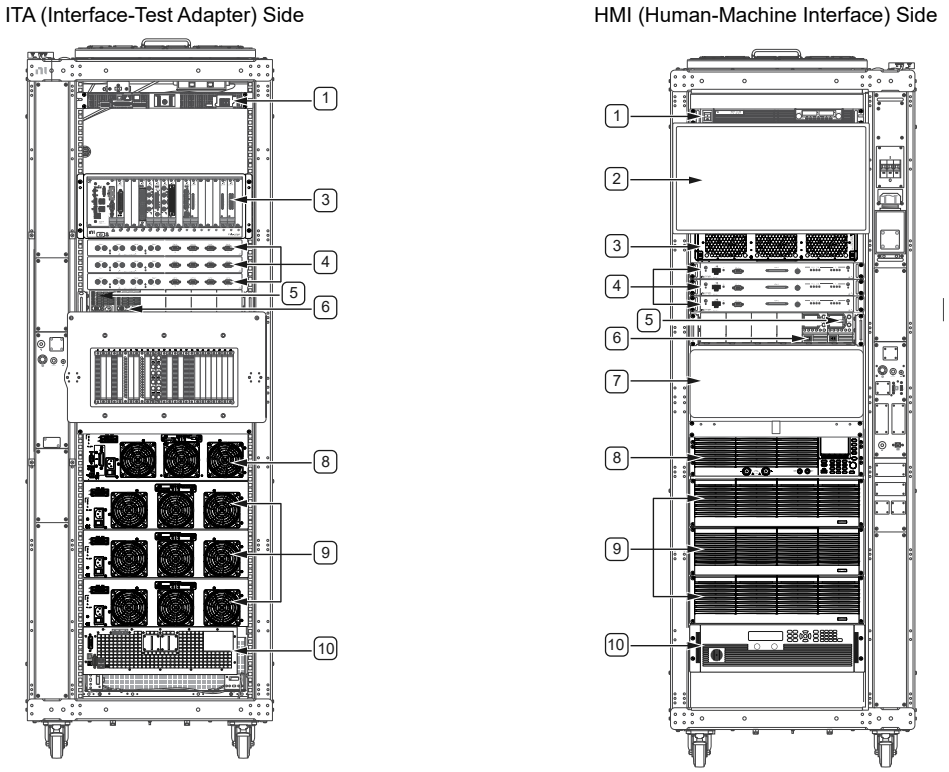
ETX-1620x Hardware Components

The ETX-1620x is comprised of the following hardware components.

> **Notice** A system and the surrounding environment must meet the requirements defined in ***ETX-16201/16202/16203/16209 Specifications***.

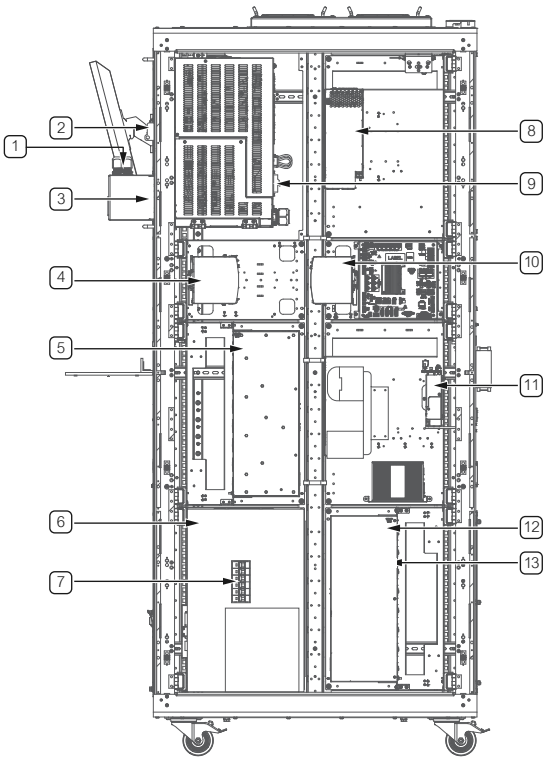
Component Locator Images

Figure 1. Internal Component Locator



1. RMX-4122
2. Monitor
3. PXI chassis
4. RM-26999 (x3)
5. RMX-41041
6. RMX-41011
7. RM-16061
8. PEL-3111
9. PEL-3211 (x3)
10. EA-PS 11500-30

Figure 2. Power Entry and Power Distribution Components Locator



1. Facility power source entry point
2. 63 A branch breaker
3. Input power terminal block (located in the protective enclosure)
4. Fan panel DC power
5. AC power distribution unit (PDU) 3
6. 3-Phase AC PDU
7. 63 A branch breaker for 3-phase AC PDU

8. DC PDU 2 (AUX DC 1200)
9. Single-phase, 20 A branch breaker
10. Rack control unit (RCU) DC power supply
11. DC PDU 1 (AUX DC 600)
12. AC PDU 1
13. AC PDU 2 (AC PDU 2 is behind AC PDU 1 in the image)

Related reference:

- ETX Inverter Production Test System Models

Related information:

- ETX-1620x Specifications

Pulser Components

The pulser can create brief, high current pulses that you can use to take measurements. The pulser includes a bias supply that can power a DUT in preparation to receive a pulse.

Table 3. Pulser Components

Component Type	Model, NI Part Number	Resource Name	Ratings Override	PXI Chassis Slot	Mass Interconnect Slot
Pulse current multiplexer	RM-16061, 138834-01	PULSER_MUX1	—	—	J11 and J12
Electronic load	PEL-3111, 756658-01	PULSER_ELOAD1	—	—	—
	PEL-3211 (Quantity: 3), 756659-01	PULSER_ELOAD_BOOSTER1 PULSER_ELOAD_BOOSTER2	—	—	—

Component Type	Model, NI Part Number	Resource Name	Ratings Override	PXI Chassis Slot	Mass Interconnect Slot
		PULSER_ELOAD_BOOSTER3			
Power supply	RMX-41011, 786006-01	PULSER_CHARGE_PPS1	—	—	—
	RMX-4122, 782857-01	PULSER_BIAS_PPS1	—	—	—
Power measurements conditioner	RM-26999, 786328-01	PULSER_PMC1	1500 VDC, Category I Supported transducers: • DS50UB-10V • DS200UB-10V • DS600UB-10V • DM1200UB-10V • DL2000UB-10V	—	J15 and J18
Multifunction I/O	PXIe-6366, 781057-01	PULSER_SMIO	—	16	—
Current transducer	DM1200UB-10V, 788929-01	PULSER_TRANSDUCER1	—	—	—

Refer to ***Pulser Specifications*** for more information about the pulser.

Related reference:

- Pulser Specifications

Power Signals DAQ Components

Use the Power Signals DAQ to perform voltage and current measurements in the ETX-1620x.

Table 4. Power Signals DAQ Components

Component Type	Model, NI Part Number	Resource name	Ratings Override	PXI Chassis Slot	Mass Interconnect Slot
Multifunction I/O	PXIe-6368, 785926-01	PWRSIGDAQ1_SMIO1	—	17	—
Power measurements conditioner	RM-26999 (Quantity: 2), 786328-01	PWRSIGDAQ1_PMC1 PWRSIGDAQ1_PMC2	1500 VDC, Category I Supported transducers: • DS50UB-10V • DS200UB-10V • DS600UB-10V • DM1200UB-10V • DL2000UB-10V	—	J15 and J18
Current transducer	DS50UB-10V, 786956-01	PWRSIGDAQ1_TRANSDUCER1	—	—	—

Additional Components

The following components are independent of the composite instruments, and you can configure and use these components individually in the ETX-1620x. Additional components have an NI part number unless otherwise noted.

Table 5. Additional Components

Component type	Model, NI Part Number	Resource Name	Ratings Override	PXI Chassis Slot	Mass Interconnect Slot
PXI chassis	PXIe-1084, 784058-01	PXIChassis1	—	—	—
PXI controller	PXIe-8862, Contact NI	User-specified	—	1	—
Digital multimeter	PXIe-4082, 783131-01	DMM1	±60 V	6	J4
	PXIe-4082, 783131-01	DMM2	±300 V	8	J13
Multifunction I/O	PXIe-6366, 781057-01	SMIO1	—	12	J17
Power supply	PXIe-4112, 782857-01	PXI_PPS1	—	11	J17
	RMX-41041, 786014-01	RMX_PPS1	—	—	J6
	EA-PS	HP_PPS1	1500 V, 30 A,	—	J9

Component type	Model, NI Part Number	Resource Name	Ratings Override	PXI Chassis Slot	Mass Interconnect Slot
	11500-30[1], 789716-01		10 kW		
Source measure unit	PXIe-4139, 782856-02	SMU1	—	7	J4
Relay driver	PXI-2567, 778572-67	RELAY_DRIVER1	16 channels (CH0 through CH15)	2	J1
Multiplexer	PXIe-2527, 780587-27	MUX1	—	9	J13
Matrix	PXIe-2737, 782835-37	MATRIX1	—	5	J4
Bank-isolated digital I/O module	PXI-6528, 778543-01	DIO1	32 channels (16 source/sink inputs in 2 banks, 16 source/sink outputs in 2 banks)	3	J1
Analog output	PXIe-4322, 782878-01	AO1	—	13	J17
RS232 serial instrument control module	PXIe-8430/8, 781472-01	COM2	2-port	4	J1

1. The ETX-16209 has a different power supply than the other ETX models. Refer to ETX-16209 specific supplemental documentation for more information.

Component type	Model, NI Part Number	Resource Name	Ratings Override	PXI Chassis Slot	Mass Interconnect Slot
		COM3			
CAN/LIN	PXIe-8510, 784122-01	CAN1 CAN2 CAN3 CAN4 LIN5 LIN6	4 CAN channels 2 LIN channels[2]	18	J17
FlexRay	PXI-8517, 780689-02	FlexRay1 FlexRay2	2 ports	14	J17
Automotive Ethernet	PXIe-8523, 87311-01	ENET1 ENET2 ENET3 ENET4	4 channels[3]	15	J17

Note Refer to the ETX model number (ETX-1620x) in ***ETX Inverter Production Test System Models*** to determine which vehicle

2. The CAN connection is through the TRC-8543, and the LIN connection is through the TRC-8546.
3. The PXIe-8523 has four channels of 100/1000BASE-T1 automotive Ethernet. ETX-16202 only supports 1000BASE-T1 on one channel at a time; it supports 100BASE-T1 simultaneously on up to all four channels.

communication option your system includes.

Related reference:

- ETX Inverter Production Test System Models

Field Diagnostic Tester

Use the field diagnostic tester (FDT) and maintenance software to perform continuity checks for components within the system. The FDT generates reports and alerts you of discontinuity and reasonable shorts within the system.

Table 6. FDT Component Information

Component Type	Model	Resource Name	NI Part Number
FDT	FDT-16050	N/A	789858-01

Notice To avoid damage to the FDT, do not touch bare pins on the FDT without proper electrostatic discharge (ESD) protection.

Note FDT-16050 is only compatible with ETX-16201, ETX-16202, and ETX-16203.

Note The FDT can only verify continuity on instruments that are included in the original ETX configuration shipped by NI.

ETX-1620x Software Components

Use the ETX Inverter Production Test System Software Suite and its components with the ETX-1620x.

ETX Inverter Production Test System Software Suite

The ETX Inverter Production Test System Software Suite is a collection of software for the ETX Inverter Production Test System.

The ETX Inverter Production Test System Software Suite combines the following pieces of software:

- ETX Inverter Production Test System Maintenance Software
- All the software drivers necessary to program components within the ETX Inverter Production Test System
- Application software for development of test programs for inverters including LabVIEW, TestStand, and Switch Executive

ETX Inverter Production Test System Maintenance Software

Use the ETX Inverter Production Test System Maintenance Software to do the following:

- Check whether the system contains correct components
- Interactively reset, self-test, and self-calibrate components that support those operations
- Check continuity between the internal system components and the mass interconnect

To check continuity, you also need the field diagnostic tester (FDT), a hardware accessory for the ETX Inverter Production Test System.

NI-Pulser Driver

Use the NI-Pulser instrument driver to control the pulser composite instrument within the ETX Inverter Production Test System.

NI-Pulser is an NI instrument driver that lets you control the pulser, which is composed of several individual instruments, interconnecting cables, and interposers within ETX Inverter Production Test System. NI-Pulser also supports contactless current sensors inside the test system and/or within fixtures attached to the test system. NI-Pulser includes .NET API and example programs in C#.

Related reference:

- Pulser Components
- Pulser Specifications

Related information:

- NI-Pulser .NET API Reference Manual

NI-PowerSignalsDAQ Driver

Use the NI-PowerSignalsDAQ driver to take high-voltage and high-current signal measurements.

NI-PowerSignalsDAQ is an NI instrument driver that lets you control the Power Signals DAQ, which is composed of several individual instruments, interconnecting cables, and interposers within ETX Inverter Production Test System. This instrument driver also supports contactless current sensors inside the test system and/or within fixtures attached to the Test System. NI-PowerSignalsDAQ includes .NET API and example programs in C#.

The NI-PowerSignalsDAQ API relies on the RM-26999 and supporting hardware to take measurements from signals located on J15 and J18 of the mass interconnect.

- Current measurements are taken using a current transducer. The signal level is routed back to the RM-26999 through the mass interconnect on J18.
- Voltage measurements are taken on J15 of the mass interconnect.

Related information:

- NI-PowerSignalsDAQ.NET API Reference Manual

Part Numbers for Recommended Cables and Accessories

Use part numbers to purchase the cables and accessories NI recommends to optimize the performance of ETX-1620x.

Table 7. ETX-1620x Accessories

Component	Part Number
FDT-16050	789858-01

Component	Part Number
Emergency shutdown (EMO) passthrough accessory	116088-1R5
Lockout for miniature circuit breaker accessory	756303-01

Refer to ***Field Replacement Components*** for a list of additional cables and accessories, the associated part numbers, and NI repair coverage.

Note Use power cables that are in accordance with your local regulations. CEE7 power cables are for use in the EU and countries with similar regulations. NEMA power cables are for use in the US/Canada and countries with similar regulations.

Related reference:

- Field Replacement Components

ETX-1620x Examples

NI installs example code with your software or driver that demonstrates the functionality of ETX-1620x. Use these examples to learn about the product or accelerate your own application development.

Most NI products install examples that you can access directly or from within NI software. The example experience can differ slightly across products and versions.

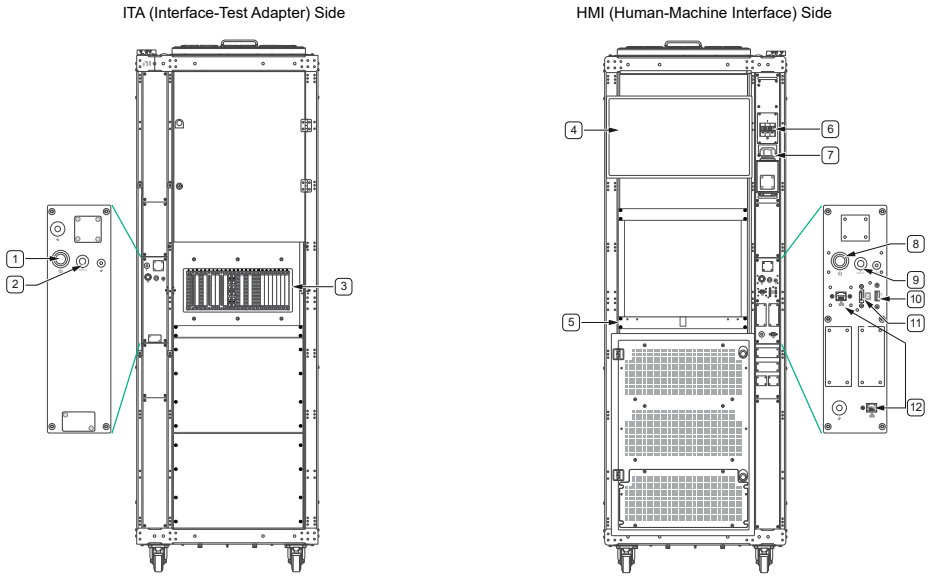
ETX-1620x examples are located in the `C:\Users\Public\Documents\National Instruments\ETX Inverter Production Test System` directory.

Physical Interface Descriptions

The following sections depict physical interface descriptions of ETX-1620x components.

ETX-1620x Rack Layout

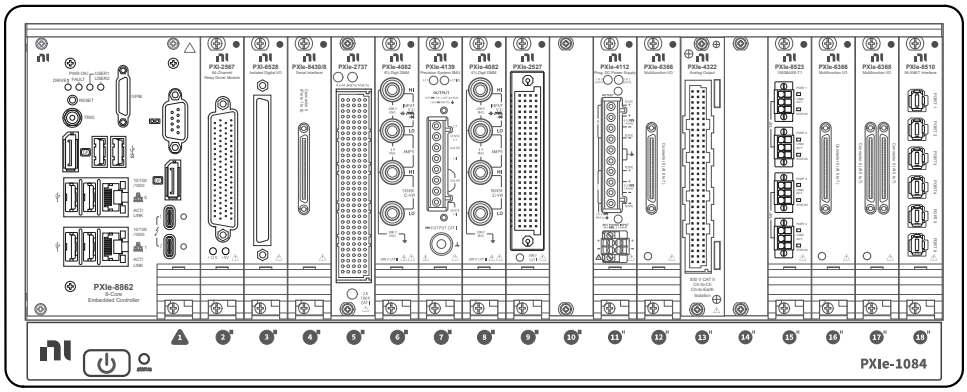
Figure 3. ETX-1620x Test Rack Exterior



1. Power button (ITA side)
2. Status LED (ITA side)
3. Mass interconnect
4. Monitor
5. Keyboard tray
6. Main circuit breaker
7. Power cable grip
8. Power button (HMI side)
9. Status LED (HMI side)
10. USB port
11. Display port
12. Ethernet port (x2)

PXI Configuration

Figure 4. PXIe-1084 Chassis Configuration



Note You must leave reserved slots empty when configuring additional equipment into the ETX-1620x.

Table 8. PXIe-1084 Slot Number Assignment

Slot Number	Instrument	Mass Interconnect	Applicable Models
1	PXIe-8862	—	All
2	PXI-2567	J1	All
3	PXI-6528	J1	All
4	PXIe-8430/8	J1	All
5	PXIe-2737	J4	All
6	PXIe-4082	J4	All
7	PXIe-4139	J4	All
8	PXIe-4082	J13	All
9	PXIe-2527	J13	All
10	Open	—	All
11	PXIe-4112	J17	All
12	PXIe-6366	J17	All
13	PXIe-4322	J17	All
14	PXI-8517	J17	ETX-16203
15	PXIe-8523	J17	ETX-16202

Slot Number	Instrument	Mass Interconnect	Applicable Models
16	PXI3-6366	Internal	All
17	PXIe-6368	Internal	All
18	PXIe-8510	J17	All

Mass Interconnect Configuration

Figure 5. Mass Interconnect Configuration

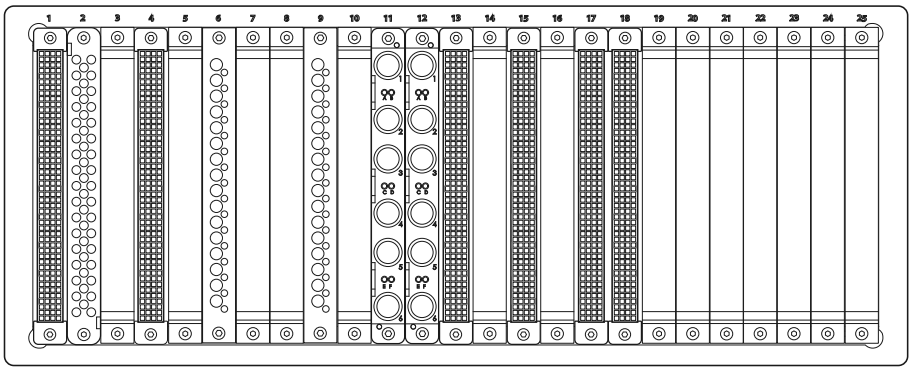


Table 9. Mass Interconnect Slot Number Assignment

Slot Number	Equipment	Description
J1	PXI-6528, PXI-2567	Adapter communication
J2	DC PDU	DC power distribution
J3	—	Reserved
J4	PXIe-4082, PXIe-2737, PXIe-4139	Measurement I/O
J5	—	Reserved
J6	RMX-41041	Programmable power supply (PPS)
J7	—	Reserved
J8	—	High-voltage keepout
J9	EA-PS 11500-30[4]	High-power PPS
J10	—	High-voltage keepout

4. The ETX-16209 has a different power supply than the other ETX models. Refer to ETX-16209 specific supplemental documentation for more information.

Slot Number	Equipment	Description
J11	RM-16061	Pulse current output
J12	RM-16061	Pulse current output
J13	PXIe-2527, PXIe-4082	Measurement I/O (300 V)
J14	—	High-voltage keepout
J15	RM-26999	Voltage channels
J16	—	High-voltage keepout
J17	PXIe-4112, PXIe-6366, PXI-8510, PXIe-4322	Automotive Ethernet or FlexRay PXI-8510: CAN/LIN
J18	RM-26999	Current transducer connections for the pulser and power signals DAQ
J19	—	Reserved
J20	—	Not used
J21	—	Not used
J22	—	Not used
J23	—	Not used
J24	—	Not used
J25	—	Not used

Note The ETX-1620x nomenclature adds J to the slot numbers on the mass interconnect.

Note You must ensure that the high-voltage keepout and slots are free of non-insulated conductors on the receiver side and the interface-test adapter side of the mass interconnect.

Mass Interconnect Pinouts

The ETX-1620x has a mass interconnect component with the following measurement category, isolation voltages, and pinouts. Mass interconnect information is located in the ***ETX-16201/16202/16203/16209 User Manual*** and ***ETX-16201/16202/16203/16209 Specifications***.

Related information:

- ETX-16201/16202/16203/16209 Specifications

Measurement Category

Caution Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV.

Attention Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour effectuer des mesures dans ces catégories.

Warning Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV, or for measurements on MAINs circuits or on circuits derived from Overvoltage Category II, III, or IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation. The product can only withstand transients up to the transient overvoltage rating without breakdown or damage to the insulation. An analysis of the working voltages, loop impedances, temporary overvoltages, and transient overvoltages in the system must be conducted prior to making measurements.

Mise en garde Ne pas connecter le produit à des signaux dans les

> catégories de mesure II, III ou IV et ne pas l'utiliser pour des mesures dans ces catégories, ou des mesures sur secteur ou sur des circuits dérivés de surtensions de catégorie II, III ou IV pouvant présenter des surtensions transitoires supérieures à ce que le produit peut supporter. Le produit ne doit pas être raccordé à des circuits ayant une tension maximale supérieure à la tension de fonctionnement continu, par rapport à la terre ou à d'autres voies, sous peine d'endommager et de compromettre l'isolation. Le produit peut tomber en panne et son isolation risque d'être endommagée si les tensions transitoires dépassent la surtension transitoire nominale. Une analyse des tensions de fonctionnement, des impédances de boucle, des surtensions temporaires et des surtensions transitoires dans le système doit être effectuée avant de procéder à des mesures.

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as ***MAINS*** voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

> **Note** Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Isolation Voltages

Isolation voltages only apply to hazardous voltage pins on the mass interconnect connectors referenced in the following table. Connectors not referenced in the following table have no isolation voltage ratings and are not intended to handle voltages above 30 Vrms, 60 VDC, or 42.4 Vpk.

- **Working Voltage**—The highest RMS value of the AC or DC voltage across the insulation that can continuously occur when the equipment is supplied at rated voltage.
- **Transient Overvoltage (Vpk)**—An overvoltage condition of a relatively short

duration, a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped.

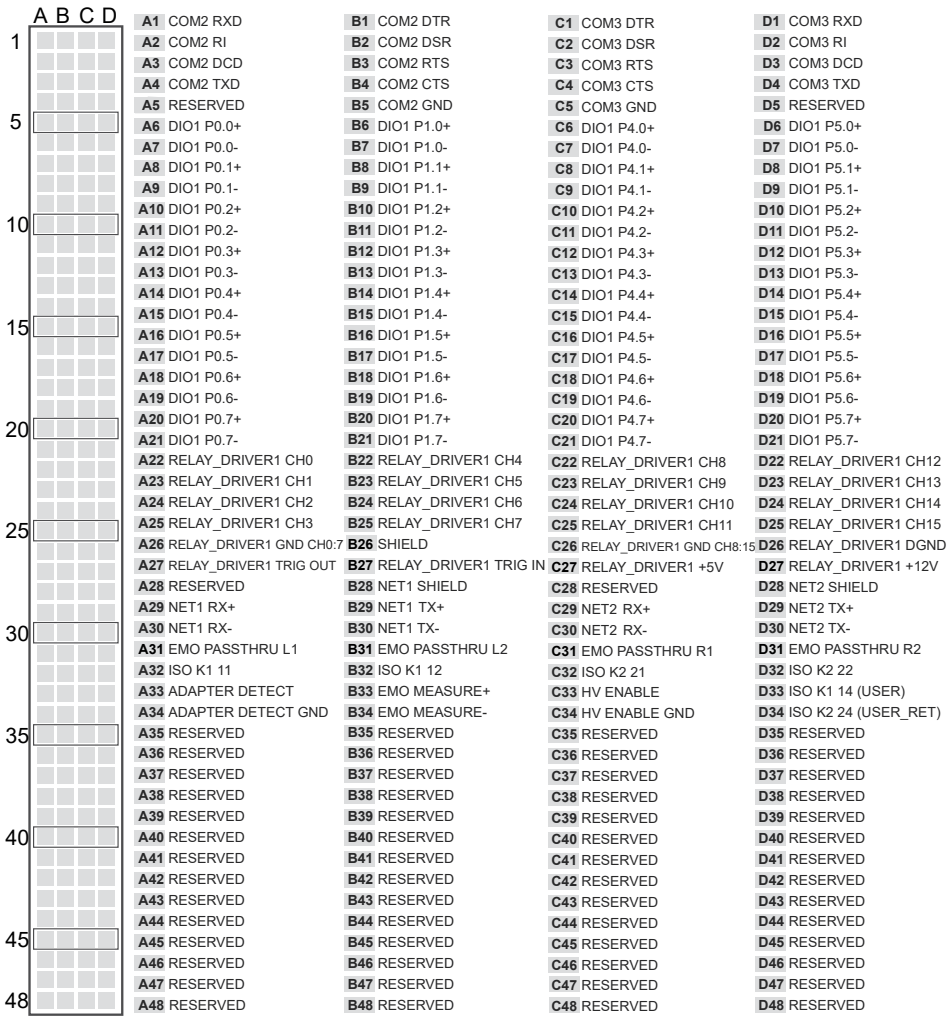
Table 10. Isolation Voltages on Mass Interconnect Connectors

Connector	Isolation Barrier	Maximum Working Voltage	Transient Overvoltage
J9	Channel-to-ground/ earth (Common Mode)	1500 VDC	0 Vpk
J11	Channel-to-ground/ earth (Common Mode)	230 VDC	0 Vpk
J12	Channel-to-ground/ earth (Common Mode)	230 VDC	0 Vpk
J13	Channel-to-ground/ earth (Common Mode)	300 VDC	0 Vpk
J15	Channel-to-ground/ earth (Common Mode)	1500 VDC	0 Vpk

J1 Pinout: Adapter Control and Communication

Figure 6. J1 Pinout

Note EMO PASSTHRU pins are only available when you use the EMO passthrough accessory (part number 756303-01).



A	B	C	D
A1 COM2 RXD	B1 COM2 DTR	C1 COM3 DTR	D1 COM3 RXD
A2 COM2 RI	B2 COM2 DSR	C2 COM3 DSR	D2 COM3 RI
A3 COM2 DCD	B3 COM2 RTS	C3 COM3 RTS	D3 COM3 DCD
A4 COM2 TXD	B4 COM2 CTS	C4 COM3 CTS	D4 COM3 TXD
A5 RESERVED	B5 COM2 GND	C5 COM3 GND	D5 RESERVED
A6 DIO1 P0.0+	B6 DIO1 P1.0+	C6 DIO1 P4.0+	D6 DIO1 P5.0+
A7 DIO1 P0.0-	B7 DIO1 P1.0-	C7 DIO1 P4.0-	D7 DIO1 P5.0-
A8 DIO1 P0.1+	B8 DIO1 P1.1+	C8 DIO1 P4.1+	D8 DIO1 P5.1+
A9 DIO1 P0.1-	B9 DIO1 P1.1-	C9 DIO1 P4.1-	D9 DIO1 P5.1-
A10 DIO1 P0.2+	B10 DIO1 P1.2+	C10 DIO1 P4.2+	D10 DIO1 P5.2+
A11 DIO1 P0.2-	B11 DIO1 P1.2-	C11 DIO1 P4.2-	D11 DIO1 P5.2-
A12 DIO1 P0.3+	B12 DIO1 P1.3+	C12 DIO1 P4.3+	D12 DIO1 P5.3+
A13 DIO1 P0.3-	B13 DIO1 P1.3-	C13 DIO1 P4.3-	D13 DIO1 P5.3-
A14 DIO1 P0.4+	B14 DIO1 P1.4+	C14 DIO1 P4.4+	D14 DIO1 P5.4+
A15 DIO1 P0.4-	B15 DIO1 P1.4-	C15 DIO1 P4.4-	D15 DIO1 P5.4-
A16 DIO1 P0.5+	B16 DIO1 P1.5+	C16 DIO1 P4.5+	D16 DIO1 P5.5+
A17 DIO1 P0.5-	B17 DIO1 P1.5-	C17 DIO1 P4.5-	D17 DIO1 P5.5-
A18 DIO1 P0.6+	B18 DIO1 P1.6+	C18 DIO1 P4.6+	D18 DIO1 P5.6+
A19 DIO1 P0.6-	B19 DIO1 P1.6-	C19 DIO1 P4.6-	D19 DIO1 P5.6-
A20 DIO1 P0.7+	B20 DIO1 P1.7+	C20 DIO1 P4.7+	D20 DIO1 P5.7+
A21 DIO1 P0.7-	B21 DIO1 P1.7-	C21 DIO1 P4.7-	D21 DIO1 P5.7-
A22 RELAY_DRIVER1 CH0	B22 RELAY_DRIVER1 CH4	C22 RELAY_DRIVER1 CH8	D22 RELAY_DRIVER1 CH12
A23 RELAY_DRIVER1 CH1	B23 RELAY_DRIVER1 CH5	C23 RELAY_DRIVER1 CH9	D23 RELAY_DRIVER1 CH13
A24 RELAY_DRIVER1 CH2	B24 RELAY_DRIVER1 CH6	C24 RELAY_DRIVER1 CH10	D24 RELAY_DRIVER1 CH14
A25 RELAY_DRIVER1 CH3	B25 RELAY_DRIVER1 CH7	C25 RELAY_DRIVER1 CH11	D25 RELAY_DRIVER1 CH15
A26 RELAY_DRIVER1 GND CH0:7	B26 SHIELD	C26 RELAY_DRIVER1 GND CH8:15	D26 RELAY_DRIVER1 DGND
A27 RELAY_DRIVER1 TRIG OUT	B27 RELAY_DRIVER1 TRIG IN	C27 RELAY_DRIVER1 +5V	D27 RELAY_DRIVER1 +12V
A28 RESERVED	B28 NET1 SHIELD	C28 RESERVED	D28 NET2 SHIELD
A29 NET1 RX+	B29 NET1 TX+	C29 NET2 RX+	D29 NET2 TX+
A30 NET1 RX-	B30 NET1 TX-	C30 NET2 RX-	D30 NET2 TX-
A31 EMO PASSTHRU L1	B31 EMO PASSTHRU L2	C31 EMO PASSTHRU R1	D31 EMO PASSTHRU R2
A32 ISO K1 11	B32 ISO K1 12	C32 ISO K2 21	D32 ISO K2 22
A33 ADAPTER DETECT	B33 EMO MEASURE+	C33 HV ENABLE	D33 ISO K1 14 (USER)
A34 ADAPTER DETECT GND	B34 EMO MEASURE-	C34 HV ENABLE GND	D34 ISO K2 24 (USER_RET)
A35 RESERVED	B35 RESERVED	C35 RESERVED	D35 RESERVED
A36 RESERVED	B36 RESERVED	C36 RESERVED	D36 RESERVED
A37 RESERVED	B37 RESERVED	C37 RESERVED	D37 RESERVED
A38 RESERVED	B38 RESERVED	C38 RESERVED	D38 RESERVED
A39 RESERVED	B39 RESERVED	C39 RESERVED	D39 RESERVED
A40 RESERVED	B40 RESERVED	C40 RESERVED	D40 RESERVED
A41 RESERVED	B41 RESERVED	C41 RESERVED	D41 RESERVED
A42 RESERVED	B42 RESERVED	C42 RESERVED	D42 RESERVED
A43 RESERVED	B43 RESERVED	C43 RESERVED	D43 RESERVED
A44 RESERVED	B44 RESERVED	C44 RESERVED	D44 RESERVED
A45 RESERVED	B45 RESERVED	C45 RESERVED	D45 RESERVED
A46 RESERVED	B46 RESERVED	C46 RESERVED	D46 RESERVED
A47 RESERVED	B47 RESERVED	C47 RESERVED	D47 RESERVED
A48 RESERVED	B48 RESERVED	C48 RESERVED	D48 RESERVED

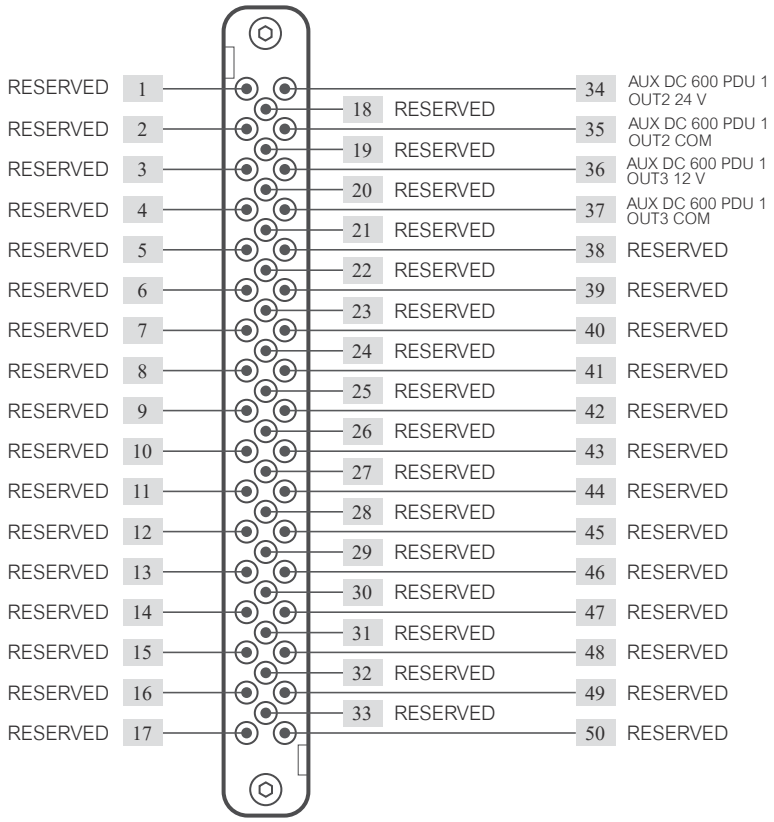
Refer to ***Additional Components*** for more information about the component type associated with J1.

Related reference:

- Additional Components

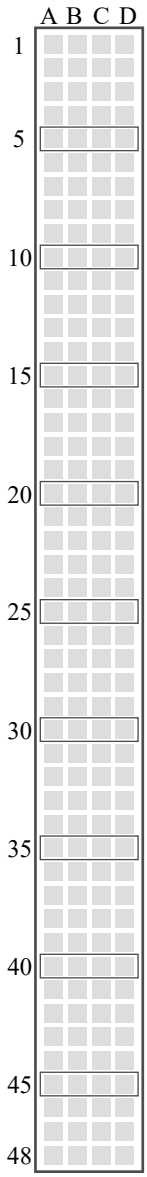
J2 Pinout: DC PDU 1

Figure 7. J2 Pinout



J4 Pinout: DMM1, MATRIX1, and SMU1

Figure 8. J4 Pinout



	A	B	C	D
1	A1 DMM1 HI	B1 RESERVED	C1 DMM1 HI SENSE	D1 RESERVED
	A2 RESERVED	B2 RESERVED	C2 RESERVED	D2 RESERVED
	A3 RESERVED	B3 DMM1 LO	C3 RESERVED	D3 DMM1 LO SENSE
	A4 RESERVED	B4 RESERVED	C4 RESERVED	D4 RESERVED
5	A5 MATRIX1 C0+	B5 MATRIX1 C2+	C5 MATRIX1 C4+	D5 MATRIX1 C6+
	A6 MATRIX1 C0-	B6 MATRIX1 C2-	C6 MATRIX1 C4-	D6 MATRIX1 C6-
	A7 MATRIX1 C1+	B7 MATRIX1 C3+	C7 MATRIX1 C5+	D7 MATRIX1 C7+
	A8 MATRIX1 C1-	B8 MATRIX1 C3-	C8 MATRIX1 C5-	D8 MATRIX1 C7-
	A9 MATRIX1 R0+	B9 MATRIX1 R0-	C9 MATRIX1 R1+	D9 MATRIX1 R1-
10	A10 MATRIX1 C8+	B10 MATRIX1 C10+	C10 MATRIX1 C12+	D10 MATRIX1 C14+
	A11 MATRIX1 C8-	B11 MATRIX1 C10-	C11 MATRIX1 C12-	D11 MATRIX1 C14-
	A12 MATRIX1 C9+	B12 MATRIX1 C11+	C12 MATRIX1 C13+	D12 MATRIX1 C15+
	A13 MATRIX1 C9-	B13 MATRIX1 C11-	C13 MATRIX1 C13-	D13 MATRIX1 C15-
	A14 MATRIX1 R2+	B14 MATRIX1 R2-	C14 MATRIX1 R3+	D14 MATRIX1 R3-
15	A15 MATRIX1 C16+	B15 MATRIX1 C18+	C15 MATRIX1 C20+	D15 MATRIX1 C22+
	A16 MATRIX1 C16-	B16 MATRIX1 C18-	C16 MATRIX1 C20-	D16 MATRIX1 C22-
	A17 MATRIX1 C17+	B17 MATRIX1 C19+	C17 MATRIX1 C21+	D17 MATRIX1 C23+
	A18 MATRIX1 C17-	B18 MATRIX1 C19-	C18 MATRIX1 C21-	D18 MATRIX1 C23-
	A19 MATRIX1 R4+	B19 MATRIX1 R4-	C19 MATRIX1 R5+	D19 MATRIX1 R5-
20	A20 MATRIX1 C24+	B20 MATRIX1 C26+	C20 MATRIX1 C28+	D20 MATRIX1 C30+
	A21 MATRIX1 C24-	B21 MATRIX1 C26-	C21 MATRIX1 C28-	D21 MATRIX1 C30-
	A22 MATRIX1 C25+	B22 MATRIX1 C27+	C22 MATRIX1 C29+	D22 MATRIX1 C31+
	A23 MATRIX1 C25-	B23 MATRIX1 C27-	C23 MATRIX1 C29-	D23 MATRIX1 C31-
	A24 MATRIX1 R6+	B24 MATRIX1 R6-	C24 MATRIX1 R7+	D24 MATRIX1 R7-
25	A25 MATRIX1 C32+	B25 MATRIX1 C34+	C25 MATRIX1 C36+	D25 MATRIX1 C38+
	A26 MATRIX1 C32-	B26 MATRIX1 C34-	C26 MATRIX1 C36-	D26 MATRIX1 C38-
	A27 MATRIX1 C33+	B27 MATRIX1 C35+	C27 MATRIX1 C37+	D27 MATRIX1 C39+
	A28 MATRIX1 C33-	B28 MATRIX1 C35-	C28 MATRIX1 C37-	D28 MATRIX1 C39-
	A29 MATRIX1 R8+	B29 MATRIX1 R8-	C29 MATRIX1 R9+	D29 MATRIX1 R9-
30	A30 MATRIX1 C40+	B30 MATRIX1 C42+	C30 MATRIX1 C44+	D30 MATRIX1 C46+
	A31 MATRIX1 C40-	B31 MATRIX1 C42-	C31 MATRIX1 C44-	D31 MATRIX1 C46-
	A32 MATRIX1 C41+	B32 MATRIX1 C43+	C32 MATRIX1 C45+	D32 MATRIX1 C47+
	A33 MATRIX1 C41-	B33 MATRIX1 C43-	C33 MATRIX1 C45-	D33 MATRIX1 C47-
	A34 MATRIX1 R10+	B34 MATRIX1 R10-	C34 MATRIX1 R11+	D34 MATRIX1 R11-
35	A35 MATRIX1 C48+	B35 MATRIX1 C50+	C35 MATRIX1 C52+	D35 MATRIX1 C54+
	A36 MATRIX1 C48-	B36 MATRIX1 C50-	C36 MATRIX1 C52-	D36 MATRIX1 C54-
	A37 MATRIX1 C49+	B37 MATRIX1 C51+	C37 MATRIX1 C53+	D37 MATRIX1 C55+
	A38 MATRIX1 C49-	B38 MATRIX1 C51-	C38 MATRIX1 C53-	D38 MATRIX1 C55-
	A39 MATRIX1 R12+	B39 MATRIX1 R12-	C39 MATRIX1 R13+	D39 MATRIX1 R13-
40	A40 MATRIX1 C56+	B40 MATRIX1 C58+	C40 MATRIX1 C60+	D40 MATRIX1 C62+
	A41 MATRIX1 C56-	B41 MATRIX1 C58-	C41 MATRIX1 C60-	D41 MATRIX1 C62-
	A42 MATRIX1 C57+	B42 MATRIX1 C59+	C42 MATRIX1 C61+	D42 MATRIX1 C63+
	A43 MATRIX1 C57-	B43 MATRIX1 C59-	C43 MATRIX1 C61-	D43 MATRIX1 C63-
	A44 MATRIX1 R14+	B44 MATRIX1 R14-	C44 MATRIX1 R15+	D44 MATRIX1 R15-
45	A45 GUARD	B45 RESERVED	C45 RESERVED	D45 RESERVED
	A46 SMU1 HI	B46 SMU1 GUARD	C46 SMU1 LO	D46 SMU1 CHS GND
	A47 SMU1 GUARD	B47 SMU1 GUARD	C47 SMU1 LO SENSE	D47 RESERVED
48	A48 SMU1 HI SENSE	B48 RESERVED	C48 RESERVED	D48 RESERVED

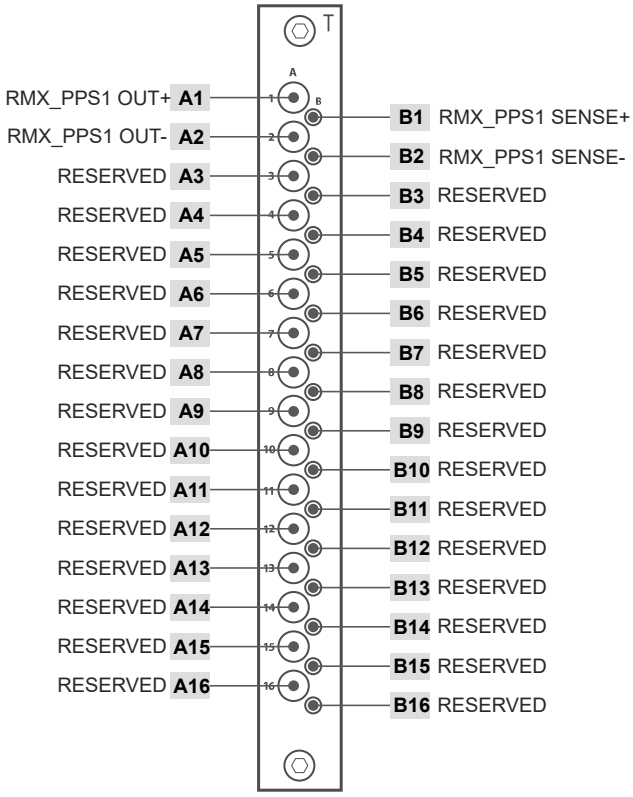
Refer to ***Additional Components*** for more information about the component type associated with J4.

Related reference:

- Additional Components

J6: RMX_PPS1

Figure 9. J6 Pinout



Refer to ***Additional Components*** for more information about the component type associated with J6.

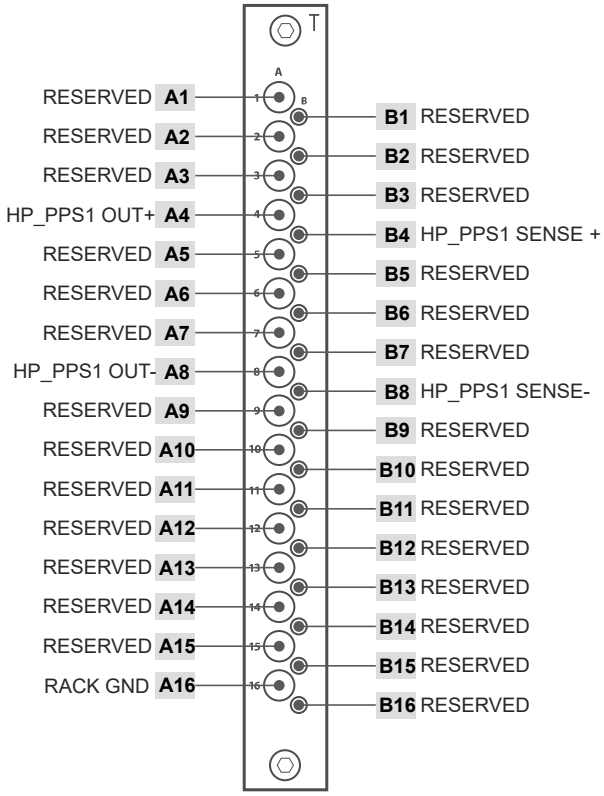
Related reference:

- Additional Components

J9: HP_PPS1

Note High voltage up to 1500 VDC may be present on J9. The EA-PS 11500-30 is capable of sourcing up to 1500 VDC.

Figure 10. J9 Pinout



Refer to ***Additional Components*** for more information about the component type associated with J9.

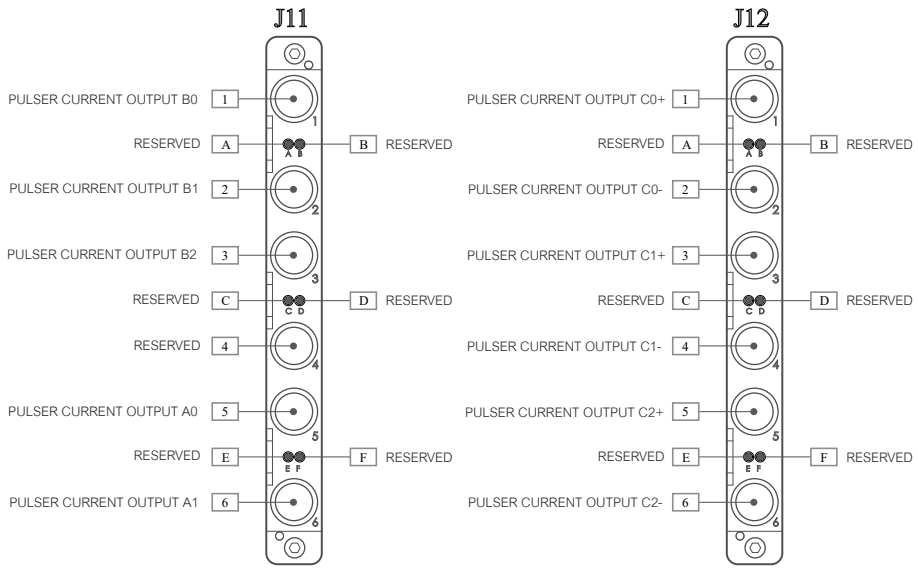
Related reference:

- Additional Components

J11 and J12: Pulser Current Output

Note High voltage up to 230 VDC may be present on J11 and J12. The RM-16061 can source up to 230 VDC as bias voltage.

Figure 11. J11 and J12 Pinouts



Refer to ***Pulser Components*** for more information about the component type associated with J11 and J12.

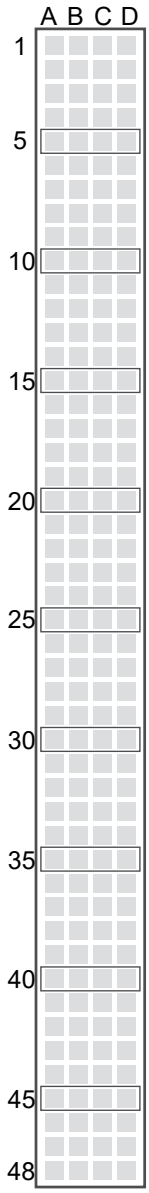
Related reference:

- Pulser Components

J13: DMM2 and MUX1

Note High voltage up to 300 VDC may be present on J13. The PXIe-2527 and PXIe-4082 on J13 can be connected to up to 300 VDC.

Figure 12. J13 Pinout



A	B	C	D
A1 DMM2 HI	B1 RESERVED	C1 DMM2 HI SENSE	D1 RESERVED
A2 RESERVED	B2 RESERVED	C2 RESERVED	D2 RESERVED
A3 RESERVED	B3 DMM2 LO	C3 RESERVED	D3 DMM2 LO SENSE
A4 RESERVED	B4 RESERVED	C4 RESERVED	D4 RESERVED
A5 MUX1 CH0+	B5 MUX1 CH2+	C5 MUX1 CH4+	D5 MUX1 CH6+
A6 MUX1 CH0-	B6 MUX1 CH2-	C6 MUX1 CH4-	D6 MUX1 CH6-
A7 MUX1 CH1+	B7 MUX1 CH3+	C7 MUX1 CH5+	D7 MUX1 CH7+
A8 MUX1 CH1-	B8 MUX1 CH3-	C8 MUX1 CH5-	D8 MUX1 CH7-
A9 MUX1 CH8+	B9 MUX1 CH10+	C9 MUX1 CH12+	D9 MUX1 CH14+
A10 MUX1 CH8-	B10 MUX1 CH10-	C10 MUX1 CH12-	D10 MUX1 CH14-
A11 MUX1 CH9+	B11 MUX1 CH11+	C11 MUX1 CH13+	D11 MUX1 CH15+
A12 MUX1 CH9-	B12 MUX1 CH11-	C12 MUX1 CH13-	D12 MUX1 CH15-
A13 MUX1 COM0+	B13 MUX1 1WREF0	C13 MUX1 COM 1+	D13 RESERVED
A14 MUX1 COM0-	B14 MUX1 1WREF1	C14 MUX1 COM 1+	D14 RESERVED
A15 MUX1 CH16+	B15 MUX1 CH18+	C15 MUX1 CH20+	D15 MUX1 CH22+
A16 MUX1 CH16-	B16 MUX1 CH18-	C16 MUX1 CH20-	D16 MUX1 CH22-
A17 MUX1 CH17+	B17 MUX1 CH19+	C17 MUX1 CH21+	D17 MUX1 CH23+
A18 MUX1 CH17-	B18 MUX1 CH19-	C18 MUX1 CH21-	D18 MUX1 CH23-
A19 MUX1 CH24+	B19 MUX1 CH26+	C19 MUX1 CH28+	D19 MUX1 CH30+
A20 MUX1 CH24-	B20 MUX1 CH26-	C20 MUX1 CH28-	D20 MUX1 CH30-
A21 MUX1 CH25+	B21 MUX1 CH27+	C21 MUX1 CH29+	D21 MUX1 CH31+
A22 MUX1 CH25-	B22 MUX1 CH27-	C22 MUX1 CH29-	D22 MUX1 CH31-
A23 RESERVED	B23 RESERVED	C23 RESERVED	D23 RESERVED
A24 RESERVED	B24 RESERVED	C24 RESERVED	D24 MUX1 SHIELD
A25 RESERVED	B25 RESERVED	C25 RESERVED	D25 RESERVED
A26 RESERVED	B26 RESERVED	C26 RESERVED	D26 RESERVED
A27 RESERVED	B27 RESERVED	C27 RESERVED	D27 RESERVED
A28 RESERVED	B28 RESERVED	C28 RESERVED	D28 RESERVED
A29 RESERVED	B29 RESERVED	C29 RESERVED	D29 RESERVED
A30 RESERVED	B30 RESERVED	C30 RESERVED	D30 RESERVED
A31 RESERVED	B31 RESERVED	C31 RESERVED	D31 RESERVED
A32 RESERVED	B32 RESERVED	C32 RESERVED	D32 RESERVED
A33 RESERVED	B33 RESERVED	C33 RESERVED	D33 RESERVED
A34 RESERVED	B34 RESERVED	C34 RESERVED	D34 RESERVED
A35 RESERVED	B35 RESERVED	C35 RESERVED	D35 RESERVED
A36 RESERVED	B36 RESERVED	C36 RESERVED	D36 RESERVED
A37 RESERVED	B37 RESERVED	C37 RESERVED	D37 RESERVED
A38 RESERVED	B38 RESERVED	C38 RESERVED	D38 RESERVED
A39 RESERVED	B39 RESERVED	C39 RESERVED	D39 RESERVED
A40 RESERVED	B40 RESERVED	C40 RESERVED	D40 RESERVED
A41 RESERVED	B41 RESERVED	C41 RESERVED	D41 RESERVED
A42 RESERVED	B42 RESERVED	C42 RESERVED	D42 RESERVED
A43 RESERVED	B43 RESERVED	C43 RESERVED	D43 RESERVED
A44 RESERVED	B44 RESERVED	C44 RESERVED	D44 RESERVED
A45 RESERVED	B45 RESERVED	C45 RESERVED	D45 RESERVED
A46 RESERVED	B46 RESERVED	C46 RESERVED	D46 RESERVED
A47 RESERVED	B47 RESERVED	C47 RESERVED	D47 RESERVED
A48 RESERVED	B48 RESERVED	C48 RESERVED	D48 RESERVED

Refer to ***Additional Components*** for more information about the component type associated with J13.

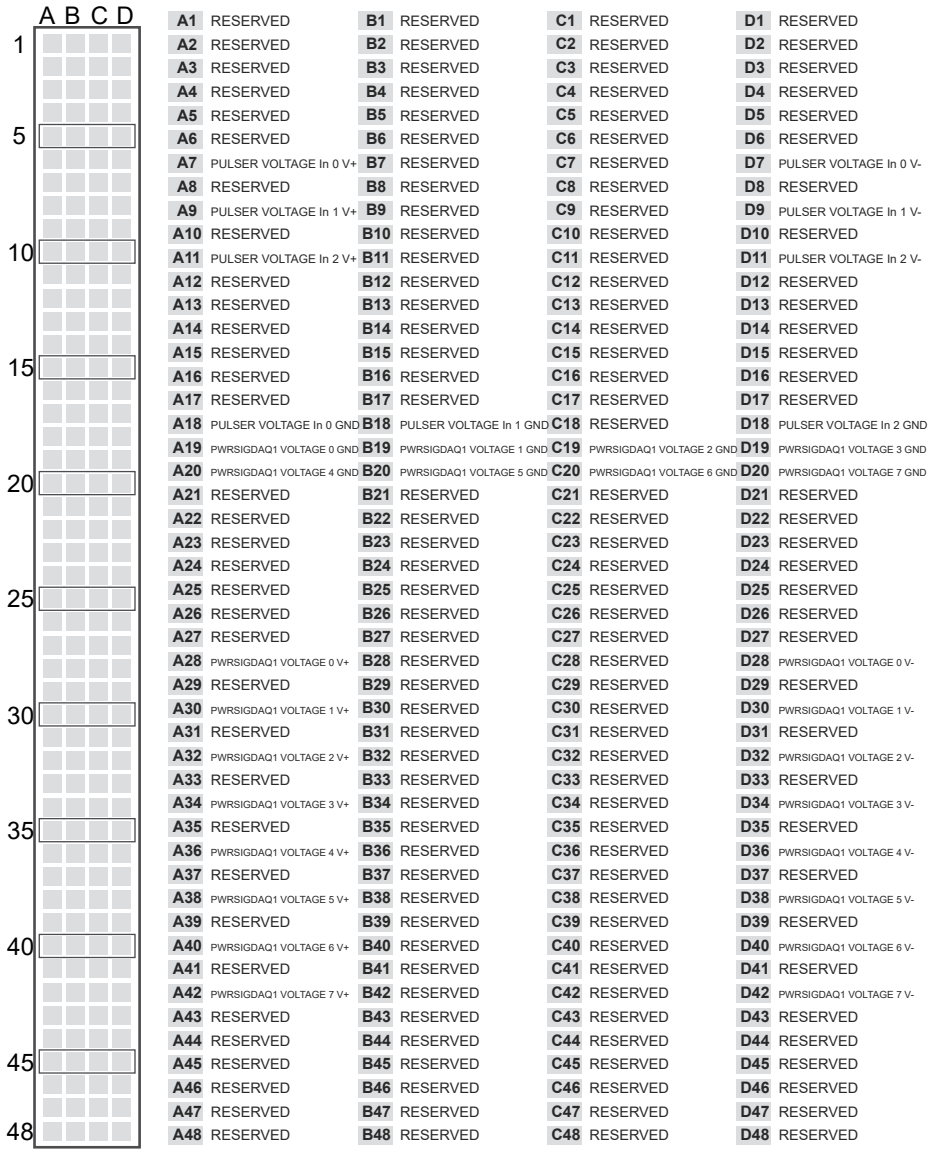
Related reference:

- Additional Components

J15: Pulser and Power Signals DAQ Voltage

Note High voltage up to 1500 VDC may be present on J15. PULSER and PWRSIGDAQ voltage channels can accept input voltages up to 1500 VDC.

Figure 13. J15 Pinout



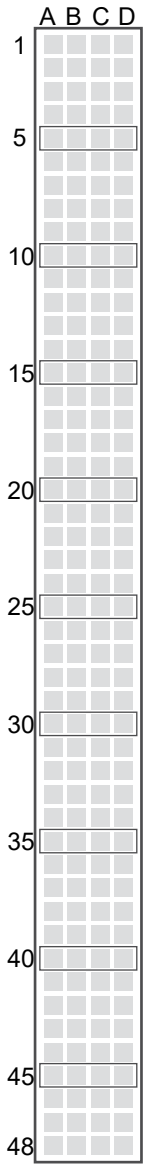
Refer to ***Pulser Components*** and ***Power Signals DAQ*** for more information about the component type associated with J15.

Related reference:

- Power Signals DAQ Components
- Pulser Components

J17: SMIO1 and PXI_PPS1

Figure 14. J17 Pinout



A1 CAN1 LO	B1 CAN1 Shield	C1 CAN2 Shield	D1 CAN2 LO
A2 CAN1 HI	B2 CAN1 Vsup	C2 CAN2 Vsup	D2 CAN2 HI
A3 CAN1 COM	B3 CAN1 COM	C3 CAN2 COM	D3 CAN2 COM
A4 CAN3 LO	B4 CAN3 SHIELD	C4 CAN4 SHIELD	D4 CAN4 LO
A5 CAN3 HI	B5 CAN3 Vsup	C5 CAN4 Vsup	D5 CAN4 HI
A6 CAN3 COM	B6 CAN3 COM	C6 CAN4 COM	D6 CAN4 COM
A7 No Connect	B7 LIN5 SHIELD	C7 LIN6 SHIELD	D7 No Connect
A8 LIN5	B8 LIN5 Vsup	C8 LIN6 Vsup	D8 LIN6
A9 LIN5 COM	B9 LIN5 COM	C9 LIN6 COM	D9 LIN6 COM
A10 AUTO-ENET 1 TRX_P	B10 AUTO-ENET 2 TRX_P	C10 AUTO-ENET 3 TRX_P	D10 AUTO-ENET 4 TRX_P
A11 AUTO-ENET 1 TRX_M	B11 AUTO-ENET 2 TRX_M	C11 AUTO-ENET 3 TRX_M	D11 AUTO-ENET 4 TRX_M
A12 AUTO-ENET 5 TRX_P	B12 AUTO-ENET 6 TRX_P	C12 AUTO-ENET 7 TRX_P	D12 AUTO-ENET 8 TRX_P
A13 AUTO-ENET 5 TRX_M	B13 AUTO-ENET 6 TRX_M	C13 AUTO-ENET 7 TRX_M	D13 AUTO-ENET 8 TRX_M
A14 FLEXRAY 1 VBAT	B14 FLEXRAY 1 BP A	C14 FLEXRAY 2 BM A	D14 FLEXRAY T1
A15 RESERVED	B15 FLEXRAY 1 BM A	C15 FLEXRAY 2 BP A	D15 FLEXRAY 2 COM
A16 FLEXRAY 1 COM	B16 FLEXRAY 1 BP B	C16 FLEXRAY 2 BM B	D16 RESERVED
A17 FLEXRAY T0	B17 FLEXRAY 1 BM B	C17 FLEXRAY 2 BP B	D17 FLEXRAY 2 VBAT
A18 T0 SHIELD	B18 SHIELD	C18 SHIELD	D18 T1 SHIELD
A19 SMIO1 AI0+	B19 SMIO1 AI1+	C19 SMIO1 AI2+	D19 SMIO1 AI3+
A20 SMIO1 AI0-	B20 SMIO1 AI1-	C20 SMIO1 AI2-	D20 SMIO1 AI3-
A21 SMIO1 AIGND0	B21 SMIO1 AIGND1	C21 SMIO1 AIGND2	D21 SMIO1 AIGND3
A22 SMIO1 AI4+	B22 SMIO1 AI5+	C22 SMIO1 AI6+	D22 SMIO1 AI7+
A23 SMIO1 AI4-	B23 SMIO1 AI5-	C23 SMIO1 AI6-	D23 SMIO1 AI7-
A24 SMIO1 AIGND4	B24 SMIO1 AIGND5	C24 SMIO1 AIGND6	D24 SMIO1 AIGND7
A25 SMIO1 RSVD/AISENSE	B25 SMIO1 APFI0	C25 SMIO1 AO0	D25 SMIO1 AO1
A26 SMIO1 +5V	B26 SMIO1 SHIELD	C26 SMIO1 AOGND0	D26 SMIO1 AOGND1
A27 SMIO1 P0.0	B27 SMIO1 P0.1	C27 SMIO1 P0.2	D27 SMIO1 P0.3
A28 SMIO1 DGND0	B28 SMIO1 DGND1	C28 SMIO1 DGND2	D28 SMIO1 DGND3
A29 SMIO1 P0.4	B29 SMIO1 P0.5	C29 SMIO1 P0.6	D29 SMIO1 P0.7
A30 SMIO1 P1.0	B30 SMIO1 P1.1	C30 SMIO1 P1.2	D30 SMIO1 P1.3
A31 SMIO1 DGND4	B31 SMIO1 DGND5	C31 SMIO1 DGND6	D31 SMIO1 DGND7
A32 SMIO1 P1.4	B32 SMIO1 P1.5	C32 SMIO1 P1.6	D32 SMIO1 P1.7
A33 SMIO1 P2.0	B33 SMIO1 P2.1	C33 SMIO1 P2.2	D33 SMIO1 P2.3
A34 SMIO1 DGND8	B34 SMIO1 DGND9	C34 SMIO1 DGND10	D34 SMIO1 DGND11
A35 SMIO1 P2.4	B35 SMIO1 P2.5	C35 SMIO1 P2.6	D35 SMIO1 P2.7
A36 PXI_PPS1 CHSGND	B36 PXI_PPS1 CHSGND	C36 RESERVED	D36 RESERVED
A37 RESERVED	B37 RESERVED	C37 RESERVED	D37 RESERVED
A38 RESERVED	B38 PXI_PPS1 OUT0+	C38 PXI_PPS1 SENSE1+	D38 RESERVED
A39 PXI_PPS1 SENSE0+	B39 PXI_PPS1 OUT0-	C39 PXI_PPS1 SENSE1-	D39 PXI_PPS1 OUT1+
A40 PXI_PPS1 SENSE0-	B40 RESERVED	C40 RESERVED	D40 PXI_PPS1 OUT1-
A41 RESERVED	B41 RESERVED	C41 RESERVED	D41 RESERVED
A42 RESERVED	B42 RESERVED	C42 RESERVED	D42 RESERVED
A43 RESERVED	B43 RESERVED	C43 RESERVED	D43 RESERVED
A44 AO1 AO0+	B44 AO1 AO1+	C44 AO1 AO2+	D44 AO1 AO3+
A45 AO1 AO0-	B45 AO1 AO1-	C45 AO1 AO2-	D45 AO1 AO3-
A46 AO1 AO4+	B46 AO1 AO5+	C46 AO1 AO6+	D46 AO1 AO7+
A47 AO1 AO4-	B47 AO1 AO5-	C47 AO1 AO6-	D47 AO1 AO7-
A48 RESERVED	B48 RESERVED	C48 RESERVED	D48 RESERVED

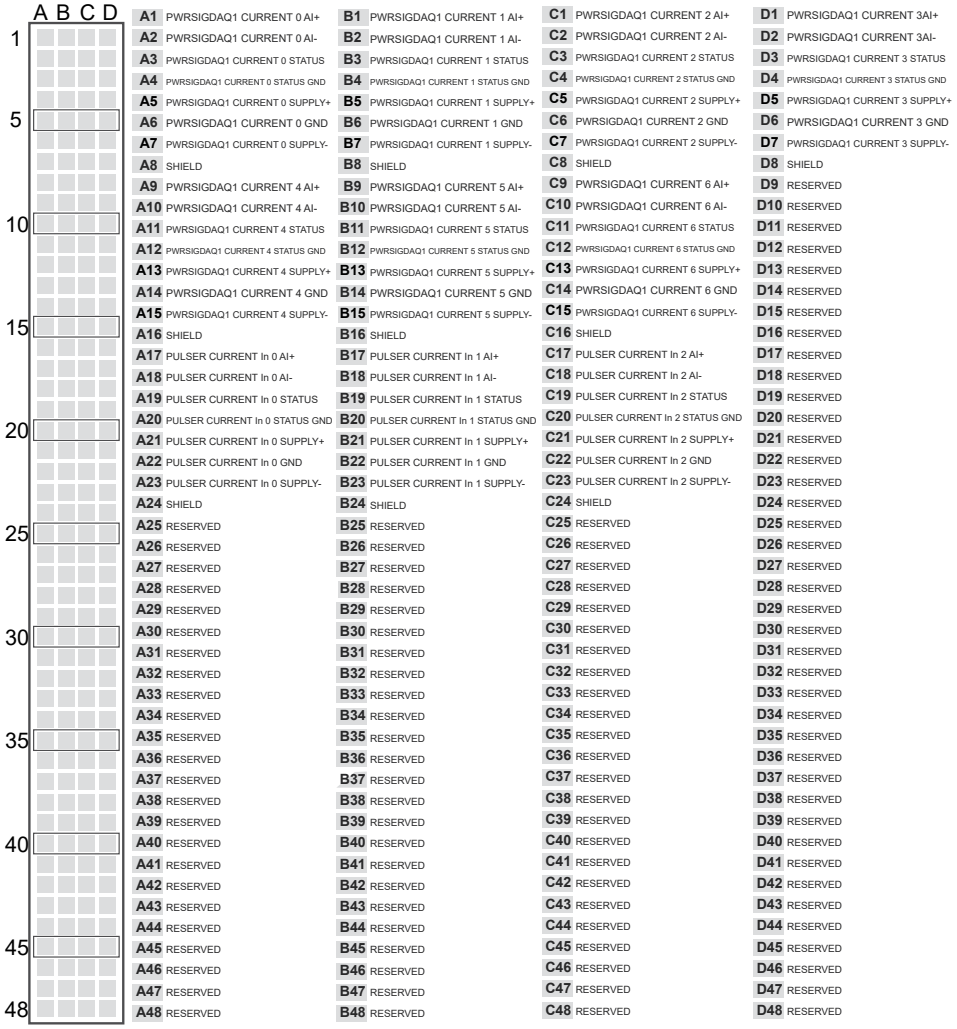
Refer to ***Additional Components*** for more information about the component type associated with J17.

Related reference:

- Additional Components

J18: Pulser and Power Signals DAQ Current

Figure 15. J18 Pinout



Refer to ***Pulser Components*** and ***Power Signals DAQ*** for more information about the component type associated with J18.

Related reference:

- Power Signals DAQ Components
- Pulser Components

Site Preparation

You must follow all safety requirements and instructions to properly set up, configure, and use the system. Ensure the facility meets the following requirements before the ETX-1620x arrives.

Site Requirements

Ensure that your site can accommodate requirements for the operating environment, physical characteristics, and ventilation clearances.

Operating Environment

The ETX-1620x is intended for indoor use only. Ensure the location has stable environmental conditions to reduce variability in performance. Ensure the facility has cooling capacity equivalent to the maximum power consumption of the system.

Table 11. Operating Environment Requirements

Operating temperature	5 °C to 32 °C
Operating humidity	10% RH to 80% RH, noncondensing
Pollution degree	2
Maximum altitude	2000 m

Note ETX-1620x can be in standby mode at up to 40 °C but must be within the operating temperature range in normal use.

ETX-1620x Physical Characteristics

Ensure the location, including passageways and elevators, can accommodate the size and weight of the ETX-1620x. Physical characteristic information is located in the ***ETX-16201/16202/16203/16209 User Manual*** and ***ETX-16201/16202/16203/16209 Specifications***.

Table 12. Physical Characteristics and Rack Air Circulation

Dimensions	1053 mm × 679 mm × 1971 mm (41.5 in. × 26.7 in. × 77.6 in.)
Maximum weight	440 kg (970 lbs)
Acoustic emissions	64 dB, 1 m away

Related information:

- ETX-16201/16202/16203/16209 Specifications

Ventilation Clearances

Ventilation clearances are required to ensure proper airflow. Ensure obstructions are outside the following clearance requirements. Ventilation clearance information is located in the ***ETX-16201/16202/16203/16209 User Manual*** and ***ETX-16201/16202/16203/16209 Specifications***.

Table 13. Minimum Cooling Clearances

Left and right sides	0 mm (0 in.)
ITA side	0 mm (0 in.)
HMI side	305 mm (12 in.)
Top	508 mm (20 in.)

Notice The intake temperature must be within the operating specifications.

Related information:

- ETX-16201/16202/16203/16209 Specifications

Power Requirements

Provide AC power connection to facility power source and connection to protective earth ground.

Power Entry Panel

Caution To completely interrupt power to a three phase system, you must switch off the main breaker on the power entry panel. Position equipment so that it is easy to access the main breaker.

Attention Pour interrompre complètement l'alimentation d'un système triphasé, vous devez éteindre le disjoncteur principal sur le panneau d'entrée d'alimentation. Positionner l'équipement de sorte qu'il soit facile d'accéder au disjoncteur principal.

Note Ensure the system is positioned to allow you to easily disconnect power.

The power entry panel (PEP) is the RMX-10140-50D2P.

Table 14. Input Voltage Range

Overvoltage category	II
Branch circuit rating	63 A
Voltage rating	208 V 3P+PE
Frequency	50 Hz or 60 Hz
Current rating	50 A

The overall power consumption is 15 kW.

Note The overall power consumption is the maximum power dissipation with all equipment in the rack at the maximum allowable power. The actual value varies depending on the system use. The high-power supply installed in the ETX-1620x accounts for 9 kW of this rating.

Note The product has been tested for power supply voltage fluctuations of ±10%.

Table 15. Input Power Supply Wiring

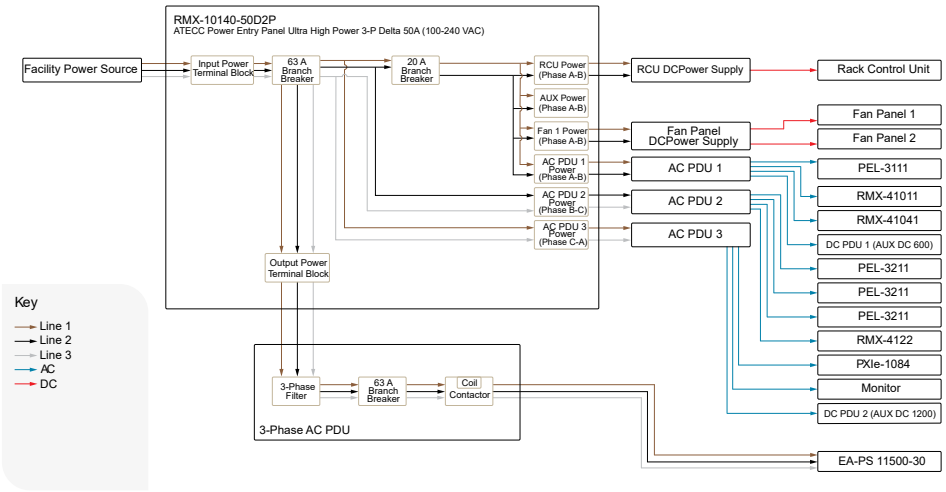
Connector	3-position screw terminal
Cable diameter	22.2 mm to 32 mm (0.9 in. to 1.3 in.)
Ring lug size	M6
Tool	3/16 hex driver
Torque	5.1 N · m (45 lb · in.)
Wire strip length	15.7 mm (0.62 in.)

For the input power cable, NI recommends copper wire at least 10 mm^2 (8 AWG) minimum; installation of the ETX-1620x to the facilities must be made per the local electrical code requirement, and a qualified electrical contractor should make the installation.

Caution EMO_MEASURE removes power from the main instruments and interface. The AUX C13 and RCU outlets on the PEP remain powered, but the ETX-1620x does not use those outlets to power any internal equipment. Activating EMO_MEASURE does not put the rack into a service safe state. To completely interrupt power to the rack, disconnect the AC power cable.

Attention EMO_MEASURE coupe l'alimentation des instruments principaux et de l'interface. Les prises AUX C13 et RCU du PEP restent sous tension, mais l'ETX-1620x ne les utilise pas pour alimenter un équipement interne. L'activation d'EMO_MEASURE ne met pas le rack dans un état sécurisé pour l'entretien. Pour interrompre complètement l'alimentation du rack, déconnecter le câble d'alimentation CA.

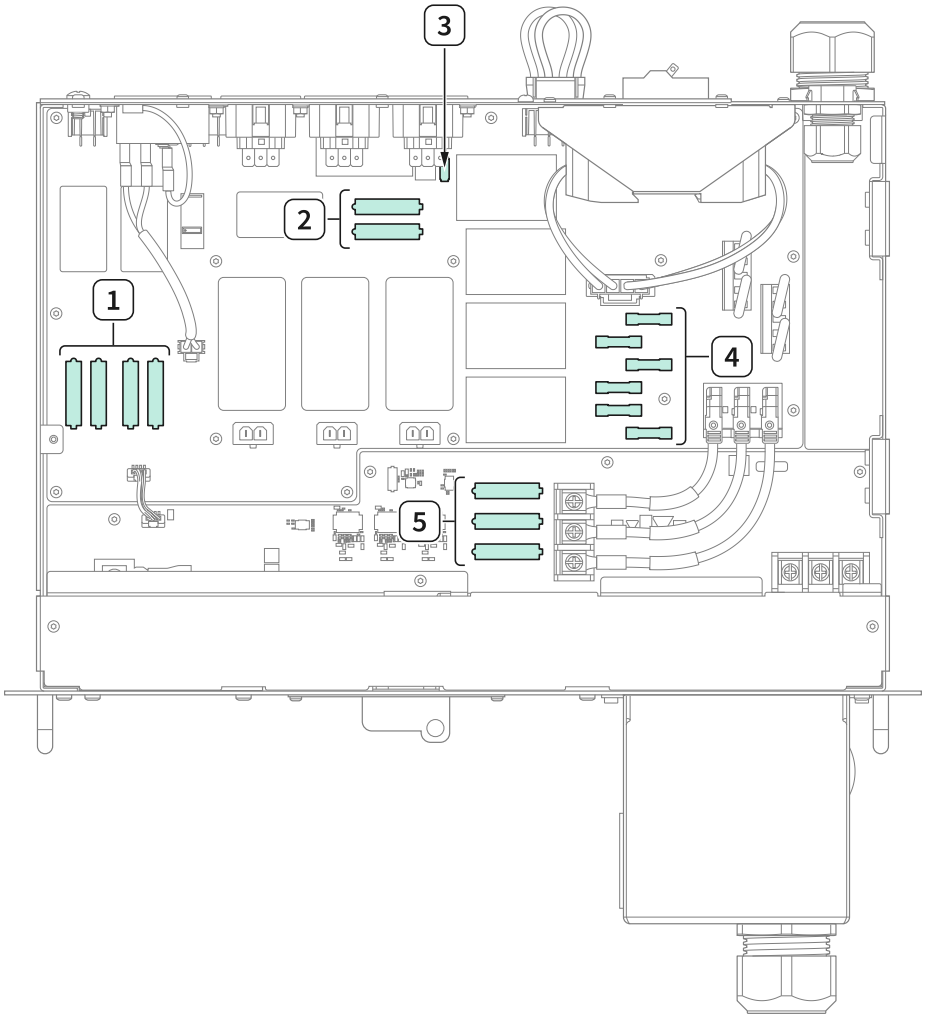
Figure 16. Power Circuits



RMX-10140 3-Phase 50 A PEP Fuses

The following diagram shows fuses on 50 A power entry panels.

Figure 17. RMX-10140-50D2P 50A 3-Phase Delta PEP Fuses, Full View



1. Double pole fuses feeding fan power
2. Double pole fuses feeding RCU power and C13 AUX power
3. AC/DC fuse
4. Input double pole fuses
5. 3-phase fuses

50A 3-Phase Delta PEP Fuses

Table 16. Double Pole Fuses, Fan Power

Current rating	6.3 A
Minimum voltage range	240 V
Voltage rating	440 V
Size	3AB, 6.3 mm x 32 mm

Fuse type	Time-lag
Recommended replacement	Littelfuse 35616300029

Note Fuses F11 and F12 fuse the Fan 1 outlet, and fuses F9 and F10 fuse the Fan 2 outlet.

Table 17. Double Pole Fuses, RCU Power and C13 AUX Power

Current rating	6.3 A
Minimum voltage range	240 V
Voltage rating	440 V
Size	3AB, 6.3 mm x 32 mm
Fuse type	Time-lag
Recommended replacement	Littelfuse 35616300029

Table 18. AC/DC Fuse

Current rating	2 A
Minimum voltage range	240 V
Voltage rating	250 V
Size	NANO, 3.1 mm x 10.1 mm
Fuse type	Time-lag
Recommended replacement	Littelfuse 0160002.MR

Table 19. Double Pole Fuses, Inputs

Current rating	20 A
Minimum voltage range	240 V
Voltage rating	600 V
Size	5 mm x 20 mm
Fuse type	Time-lag
Recommended replacement	Bel Fuse 0ADKC9200-BE

Table 20. 3-Phase Fuses

Current rating	30 A
Minimum voltage range	480 V
Voltage rating	500 V
Size	3AB, 6.3 mm x 32 mm
Fuse type	Time-lag
Recommended replacement	Bel Fuse 0ADGC9300-BE

Field Wiring Cable Specifications

The field wiring cable supplies power and protective earth for the ETX-1620x through internal terminal connections. Before performing initial power setup, you must provide a field wiring cable that meets the requirements in the following table.

Field wiring cable specification information is located in the ***ETX-16201/16202/16203/16209 User Manual*** and ***ETX-16201/16202/16203/16209 Specifications***.

Caution Ensure that the field wiring cable preparation and power configuration is performed only by qualified personnel.

Attention Assurez-vous que la préparation du câblage sur site et la configuration de l'alimentation sont effectuées uniquement par du personnel qualifié.

Note High levels of leakage current might be present on the product. Connect the product to the protective earth terminal before connecting to AC power.

Note The facility installation must provide a means for connection to protective earth, and qualified personnel must install a protective earthing conductor from the protective earthing terminal on the product to the

protective earth wire in the facility.

Note Only use copper wire to connect the protective earthing terminal of your product to the protective earth wire in the facility.

Table 21. Field Wiring Cable Requirements

Outer diameter of the input power cable	22.2 mm to 32 mm
Ground wiring	2.5 mm^2 to 70 mm^2 (14 AWG to 2/0 AWG)
Wire strip length	15.7 mm (0.6 in.)
L1, L2, and L3 wiring	10 mm^2 to 35 mm^2 (8 AWG to 2 AWG) with M6 ring lugs installed
Minimum insulator temperature rating	90 °C (194 °F)

Related tasks:

- Connecting the Rack to Facility Power

Related information:

- ETX-16201/16202/16203/16209 Specifications

Pulser Specifications

Learn about specifications for the pulser and RM-16061. For complete NI specifications, visit `ni.com/docs` and search by model number.

Pulser specification information is located in the ***ETX-16201/16202/16203/16209 User Manual*** and ***ETX-16201/16202/16203/16209 Specifications***.

The pulser generates a trapezoidal pulse.

- The pulser bias supply is an isolated supply that connects to outputs A0 (V+) and A1 (V-) on J11. Bias supply current and voltage are available only between these two pins.
- The pulse is a low voltage, ground referenced signal with a maximum potential of 20 V. If one of the bias outputs is in the pulse path, the bias supply becomes ground referenced during the pulse. It is critical that the pulser is the only connection to ground reference the DUT.
- The bias supply can power the DUT while taking measurements with the pulser. Do not pulse across the bias supply. Pulses are intended to be across other signal paths in the DUT. To protect the bias supply, the pulser does not allow pulses across A0 and A1. You can configure a pulse between A0 or A1 and another PULSER CURRENT OUTPUT on J11 or J12 while the bias supply is active.

Figure 18. Pulse Waveform

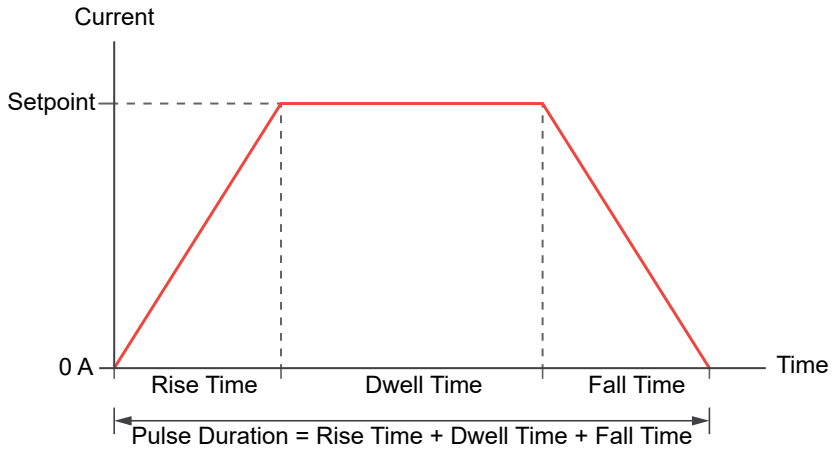


Table 22. Pulser Output

Maximum pulse current	1200 A Maximum pulse current is the maximum supported value for the setpoint.
Maximum bias voltage	230 V
Maximum bias current	3 A
Maximum slew rate	1 A/µs
Minimum rise time	1 µs/A × Setpoint
Minimum fall time	1 µs/A × Setpoint
Maximum pulse duration	10 ms

Table 23. Pulse Path Wiring

Rating	300 V, minimum
Minimum insulator temperature rating	90 °C
Material	Copper
Size	35 mm^2 (2 AWG)

Related reference:

- Pulser Components

Related information:

- ETX-16201/16202/16203/16209 Specifications

Pulser Waveform Examples

- **Minimum Rise Time**—A setpoint of 1000 A and maximum slew rate of 1 A/µs yields minimum rise time of 1000 A ÷ 1 A/µs = 1 ms.
- **Required Slew Rate**—A setpoint of 500 A with a desired 1 ms fall time requires a slew rate of 0.5 A/µs. This is possible because 0.5 A/µs is lower than the maximum supported slew rate of 1 A/µs.

- **Pulse Duration**—For a pulse with rise time of 1 ms, dwell time of 5 ms, and fall time of 2 ms, the pulse duration is 1 ms + 5 ms + 2 ms = 8 ms. This is possible because 8 ms is shorter than the maximum supported pulse duration of 10 ms.

Pulse Current Multiplexer Specifications

The RM-16061 functions as a pulse current multiplexer in the ETX-1620x. Pulse current multiplexer specification information is located in the ***ETX-16201/16202/16203/16209 User Manual*** and ***ETX-16201/16202/16203/16209 Specifications***.

Table 24. RM-16061 Input

Power	24 VDC, 3 A
Charge	20 VDC, 10 A
Bias	230 VDC, 3 A
Pulse/load bus bar ratings	20 VDC, 1200 A

Table 25. Replacement I/O Connectors

Connector Name	Vendor	Part Number
Bias	Phoenix Contact	1777808
Charge	Weidmuller	2459570000
Power	Phoenix Contact	1703350

Table 26. RM-16061 Ground Terminal

Ground screw	M4 × 0.7
Maximum torque	1.92 N · m (17.0 lb · in.)

Related concepts:

- Grounding the ETX-1620x

RM-16061 Fuse

The RM-16061 has a user serviceable time-delay fuse.

Table 27. RM-16061 Fuse

Current rating	12 A
Voltage rating	20 VDC minimum
Size and dimensions	5.2 mm × 20 mm
Type	Time-delay
Interrupt rating	300 A
Recommended replacement	Eaton BK1-S505H(-V)-12-R

Calculating the Pulse Multiplexer Lifetime

RM-16061 is a wear part because it relies on contactors with set lifetimes to multiplex the pulse to various positions. The contractors within the ETX-1620x are conservatively rated to 1 million cycles per contractor.

Optimize your test plan by reducing the total number of switch cycles within the RM-16061. The RM-16061 records the total number of switch cycles of each contractor. You can also calculate the switch count based on the assumption that with the test sequence optimization, each contractor does not switch more than twice per DUT.

The following is a sample calculation of the RM-16061 lifetime.

Pulse Multiplexer Lifetime Calculation Example

- Contactor lifetime = 1 million cycles
- DUT throughput = 1 unit every 90 seconds
- Line uptime = 90%

525,600 minutes per year × 90% line uptime = 473,040 working minutes per year

473, 040 working minutes ÷ 1.5 minutes per DUT = 315,360 DUTs per year

315,360 DUTs per year × 2 switches per DUT = 630,720 switches per year

1 million switches ÷ 630,720 switches per year = 1.58 years lifetime for RM-16061

Related tasks:

- Replacing the RM-16061

Override Ratings

When used within the ETX-1620x, tighter specifications are imposed on certain components. You must use these components only within their ETX-1620x specifications as described in the following table.

Table 28. Override Ratings for System Components

Component	Affected Slot	Override Specification Description	In-system Specification Value
PXIe-4082	PXI chassis slot 6, mass interconnect slot J4	Maximum input voltage	60 V
RM-26999	All	Maximum input voltage	1500 V
		Current transducer compatibility	Refer to ***External Current Transducers*** for current transducer compatibility.
EA-PS 11500-30	All	Maximum output power	9 kW
RMX-4122	All	Maximum output current	3 A
PXIe-2567	All	Number of channels	16[5]
PXIe-6528	All	Number of channels	16 input and 16 output[6]
PXIe-8430/8	All	Number of ports	2[7]

5. Only a subset of available channels is connected to the mass interconnect. Refer to ***Mass Interconnect Pinouts*** for information about which channels are available.
6. Only a subset of available channels is connected to the mass interconnect. Refer to ***Mass Interconnect Pinouts*** for information about which channels are available.
7. Only port 1 and port 2 are available at the mass interconnect in slot J1. Ports 1 and 2 are enumerated COM2 and COM3, respectfully.

Related concepts:

- External Current Transducers

Related reference:

- Mass Interconnect Pinouts

Related information:

- ETX-16201/16202/16203/16209 Specifications

Receiving the ETX-1620x

Complete the following steps when receiving the ETX-1620x.

1. Verifying Storage Conditions
   Verify the facility meets storage condition requirements and can accommodate the ETX-1620x shipping crate.
2. Inspecting the Shipment
   Inspect the ETX-1620x shipment prior to opening the crate.
3. Unpacking the Rack
   Before unpacking the rack, ensure that there is enough clearance in front of the crate to lay out the crate ramp and roll the rack out of the crate.
4. Moving the Rack
   Move the ETX-1620x by lifting the rack from the top or by using a forklift.

Verifying Storage Conditions

Verify the facility meets storage condition requirements and can accommodate the ETX-1620x shipping crate.

Storage Conditions

When the shipping crate arrives at the facility, store the crate indoors in an area that meets the following conditions.

Table 29. Storage Requirements

Ambient temperature	0 °C to 60 °C
Relative humidity	5% RH to 80% RH, noncondensing
Pollution degree	2

Shipping Crate Dimensions

Ensure the facility, including passageways and elevators, can accommodate the shipping crate.

Table 30. Shipping Crate Dimensions

Width	875 mm
Depth	1210 mm
Height	2184 mm
Maximum weight, including the test rack	605 kg
Weight of crate without the test rack	105 kg

NI recommends a suitable lifting apparatus, such as a pallet jack, for transporting the shipping crate around the facility.

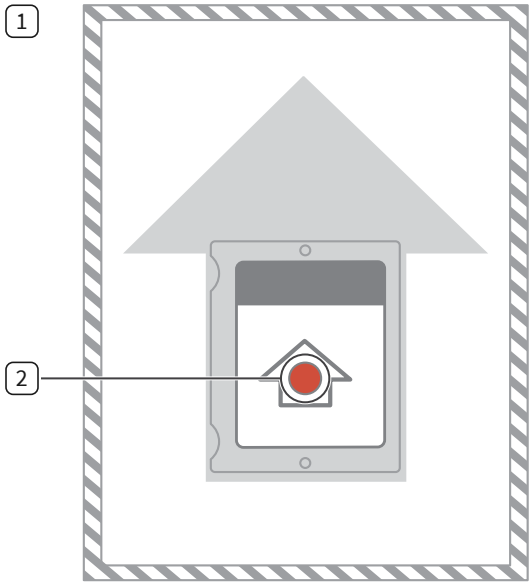
If the facility cannot accommodate the shipping crate, unpack the shipping crate and move the test rack using its mounted casters.

Inspecting the Shipment

Inspect the ETX-1620x shipment prior to opening the crate.

Notice Do not discard any parts or packaging until you have verified continuity of the ETX-1620x. Do not reject the ETX-1620x shipment.

Figure 19. ETX-1620x Shipping Crate Sensors



1. Tilt Sensor Sticker
2. Tilt Sensor

1. Before you open the crate, inspect the tilt sensors on the sides of the crate.

Note A red sensor indicates that the sensor was activated during delivery.

2. Inspect the crate for any damage.
3. Review the packing list attached to the crate.
4. Accept the shipment.

Contact NI if the tilt sensor on the crate is activated or the crate is damaged.

Unpacking the Rack

Before unpacking the rack, ensure that there is enough clearance in front of the crate to lay out the crate ramp and roll the rack out of the crate.

1. Release the butterfly latches connecting the side panel to the crate.
2. Lift the side panel upwards and remove it from the crate.
3. Insert the notched top of the side panel into the groove on the bottom of the crate opening so that the side panel can act as a ramp when you remove the rack from the crate.
4. Ensure that the crate ramp is secure.
5. Remove any accessories and documentation from the crate.
6. Unlatch and remove the front batten holding the rack in place.
7. Remove any foam padding between the rack and the crate.
8. Unlock the brakes on the two visible casters on the rack.
9. Slowly roll the rack out of the crate and down the ramp.
10. Inspect the rack for any physical damage.

Contact NI if the rack or any additional materials are physically damaged.

Dispose of the shipping crate per your company policies, or store the shipping crate if you intend to reuse the crate to transport the rack.

Moving the Rack

Move the ETX-1620x by lifting the rack from the top or by using a forklift.

Moving the Rack by Lifting from the Top

Complete the following tasks before lifting the rack from the top:

- Power off the system.
- Disconnect any cabling that might be disconnected or damaged from moving the rack.
- Disconnect the AC power cable and switch the main breaker to the off position.

Equipment

- Eyebolt (x4)

Figure 20. Eyebolt

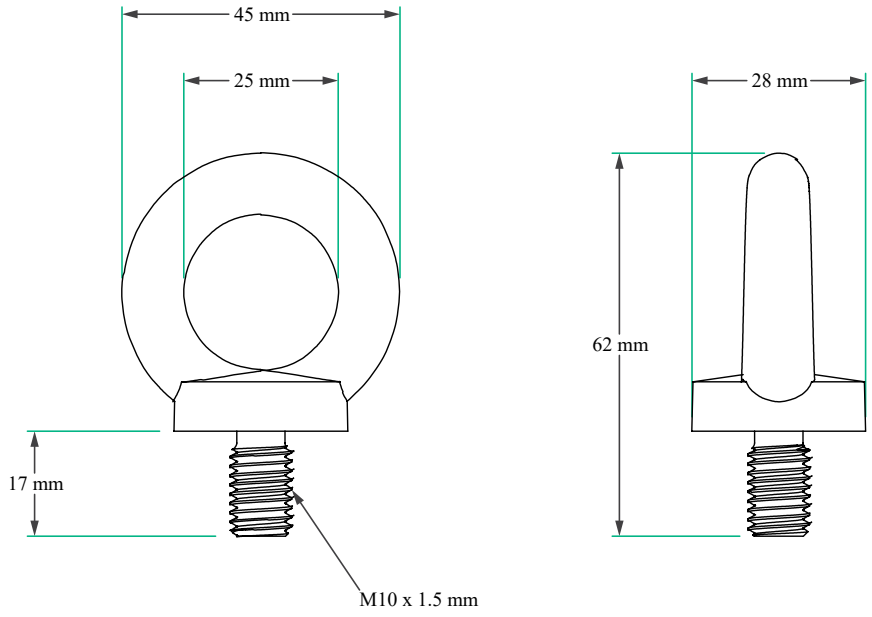
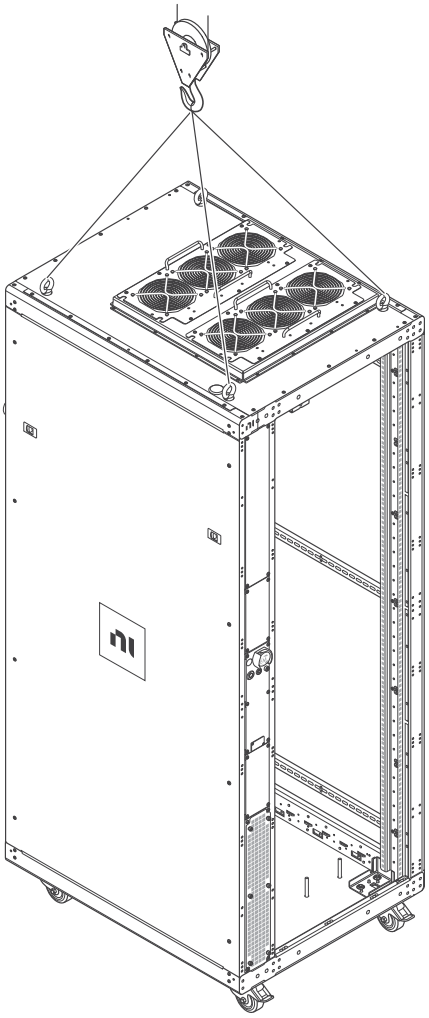


Figure 21. Lifting the Rack from the Top (Generic, Empty Rack Shown for Reference)



1. Connect the four eyebolts to the mounting holes on the top of the rack.
2. Connect the four eyebolts to a crane or lifting apparatus.

> **Note** Ensure that the weight of the rack is balanced evenly across all four eye bolts.

3. Using a crane or lifting apparatus, lift the rack and move it to the new location.

Moving the Rack with a Forklift

Complete the following tasks before moving the rack with a forklift:

- Power off the system.
- Disconnect any cabling that may be disconnected or damaged when moving the rack.
- Disconnect the AC power cable and switch the main breaker to the off position.

Equipment

- Forklift

Figure 22. Forklift Dimensions

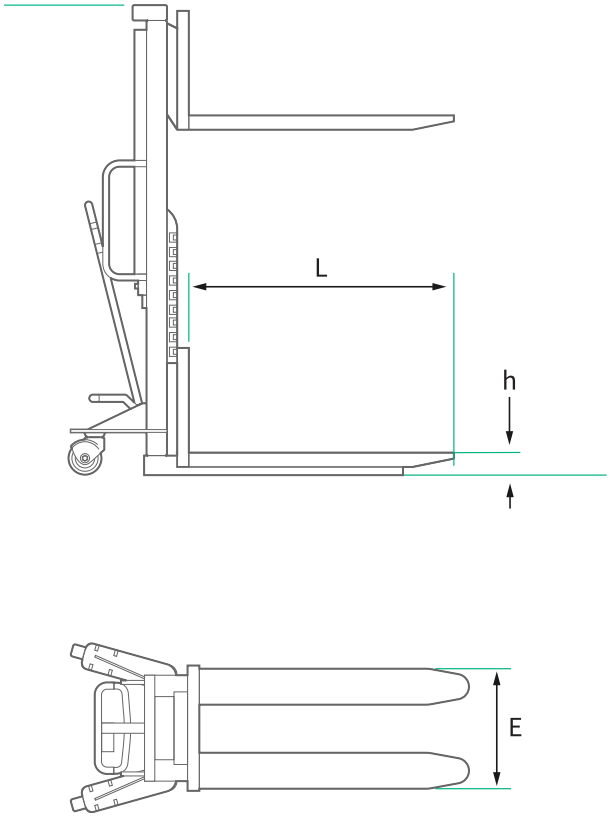


Table 31. Forklift Dimensions

	E	h	L
When lifting from the left or right side	<590 mm (23.2 in.)	<90 mm (3.5 in.)	670 mm (26.3 in.)
When lifting from the HMI or ITA side	<450 mm (17.7 in)	<90 mm (3.5 in)	>670 mm (26.3 in)

1. Place the forks under the correct side of the rack for the forklift you are using.
2. Lift the rack and move it to the new location.

Note Ensure that the rack is secure and stable during the move.

Installing the ETX-1620x

Complete the following steps to install the ETX-1620x.

1. Installing the Monitor and Monitor Tilter
   The ETX-1620x includes a monitor as well as a monitor tilter. Complete the following steps to install the monitor and monitor tilter.
2. Connecting the Rack to Facility Power
3. Verifying Continuity
   Verify the continuity of your system using a field diagnostic tester (FDT).
4. Completing Installation

Installing the Monitor and Monitor Tilter

The ETX-1620x includes a monitor as well as a monitor tilter. Complete the following steps to install the monitor and monitor tilter.

1. Refer to steps 2-5 in the Ergomart ***WM9110S Monitor Wall Mount Installation Instructions*** to attach the monitor to the ETX-1620x test rack.
2. Connect the computer monitor to the ETX-1620x DisplayPort, USB, and AC power cables located on the front of the test rack.
3. Connect a USB keyboard and mouse to the monitor USB ports.

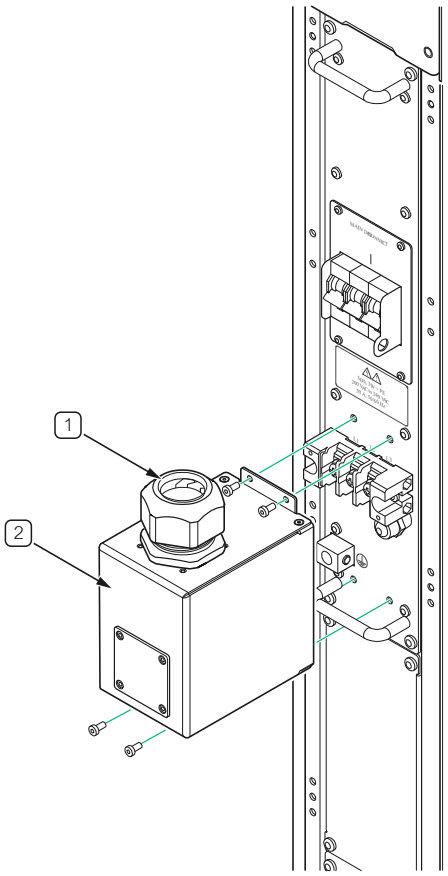
Connecting the Rack to Facility Power

Caution Ensure that the power configuration is performed only by qualified personnel.

Attention Assurez-vous que la configuration de l'alimentation est effectuée uniquement par du personnel qualifié.

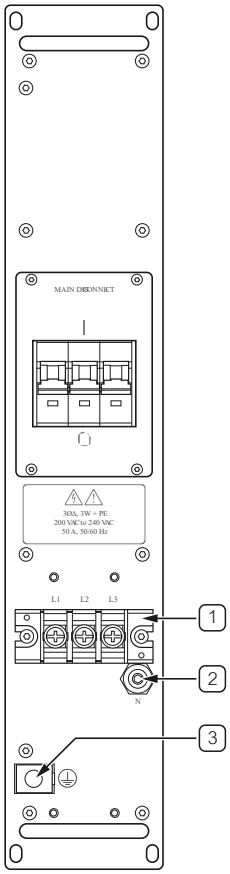
Before you begin, prepare the field wiring cable to connect to the rack and the facility power branch.

Figure 23. Removing the Protective Enclosure



1. Cable grommet
2. Hardwired input protective enclosure

Figure 24. Power Connection Components



1. M6 screw thread input terminal block
2. Insulator termination for neutral
3. Earth termination mechanical lug

Equipment

- 3 mm hex driver
- 3/16 in. hex driver
- #2 Phillips screwdriver
- 4 mm hex driver

1. Disconnect power from the facility power branch that services the rack.
2. Turn off the main disconnect branch breaker.
3. Remove the protective enclosure from the rack using the 3 mm hex driver.
4. Route the prepared end of the field wiring cable through the cable grommet.
5. Insert the grounding wire through the inlet of the protective earth mechanical lug.

6. Torque the protective earth mechanical lug clamping screw to 5.1 N · m (45.0 lb · in.) using the 3/16 in. hex driver.

> **Note** The protective earth wire must have more slack than the power wires to ensure that the grounding terminal is always the last to disconnect in the event of excessive strain.

7. Install each remaining wire into the input screw terminal.
   a. Insert the ring lug into the appropriate terminal.
   b. Torque the clamping screws on the L1, L2, and L3 terminals to 2.5 N · m to 3.0 N · m (22.1 lb · in. to 26.6 lb · in.) using the #2 Phillips screwdriver.
   c. If input power includes a neutral wire, connect it to the neutral isolation terminal.
   d. If applicable, torque the terminal for neutral to 2.8 N · m (25.0 lb · in.) using the 4 mm hex driver.
8. Install the protective enclosure on the rack.
9. Torque the mounting screws on the protective enclosure to 1.3 N · m (11.5 lb · in.) using the 3 mm hex driver.
10. Tighten the cable grommet to secure the field wiring cable in place.
11. Connect the field wiring cable to the facility power source.
12. Turn on the main disconnect branch breaker.

> **Note** The rack control unit powers on when facility power is applied and the main input breaker is in the ON position.

13. Ensure that the status LED flashes red once and then illuminates solid green.

Related reference:

- Field Wiring Cable Specifications

Verifying Continuity

Verify the continuity of your system using a field diagnostic tester (FDT).

1. Launch the Test System Maintenance Software.
2. Select **Check Continuity** under the **Operations** section.

3. Click **Run Selected Operations**.
4. Verify there is not a fixture or FDT connected to the ETX.
5. Click **Continue**.
6. Remove the protective covers from the mass interconnect on the ETX and the FDT.
7. Verify that no pins on the mass interconnect or FDT are bent, broken, or otherwise damaged.
8. When prompted, complete the following steps to connect the FDT to the mass interconnect:
   a. Pull the handle on the mass interconnect down to the open position.
   b. Connect the FDT to the mass interconnect.
   c. Push the handle on the mass interconnect up to the locked position.
9. Click **Continue** to start the continuity test.
10. Wait for the continuity testing to complete.
11. Confirm that all ETX components passed.
    If any component failed, check the footnote in the report for additional details.
12. Remove the FDT from the mass interconnect.
13. Replace the protective covers on the mass interconnect and FDT.

Related information:

- Test System Maintenance Software Manual

Components Assumed Present

Test System Maintenance Software is not able to verify the details of every component in the ETX-1620x. In the Maintenance Software Report, components that the Test System Maintenance Software cannot positively identify are reported as components assumed present.

Can Continuity Checks Verify Details of the Current Transducer?

Test System Maintenance Software continuity checks cannot verify the presence or correct the connectivity of the current transducer (DS50UB-10V), which measures the output of the power supply (EA-PS 11500-30).

If you experience issues measuring the output current of the power supply, complete the following steps.

1. Verify that only the positive wire of the power supply output passes through the center of the current transducer.
2. Verify that the current transducer is the expected model and that the model matches the appropriate settings in the fixture information file.
3. Verify the integrity of the control cable between the RM-26999 and the current transducer.

Completing Installation

After verifying continuity for the ETX-1620x, dispose of the shipping crate per your company policies. Alternatively, store the shipping crate if you intend to reuse the crate to transport the ETX-1620x.

Powering the ETX-1620x On and Off

Powering the ETX-1620x On

Before powering on the system, ensure the following:

- All rack panels are installed and doors are closed
- The field wiring cable is connected to facility power
- The main disconnect branch breaker is on

1. Verify that the status LED is solid green.
2. Press the power button.
3. Verify that the power LED is white, the status LED is green, and that Windows starts.

What Should I Do if the Rack Does Not Power On?

Complete the following troubleshooting options if the rack does not power on:

- Ensure the system facility power is correct for the rack.
- Verify that the power connection is installed correctly.
- Ensure that the main disconnect branch breaker is turned on.
- Ensure the Interlocks and EMO Measure are configured to allow the system to turn on. Refer to the respective section for configuration information.

Related concepts:

- Closing Interlocks
- Configuring EMO Measure

Powering the ETX-1620x Off

1. Close any open applications.
2. Shut down Windows.
3. Press and hold the power button.

Note Disconnect the rack from facility power before performing any maintenance or repair procedures.

Applying Lockout/Tagout Devices to the ETX-1620x

Apply lockout/tagout (LOTO) devices to isolate equipment from all potentially hazardous energy. Applying LOTO devices ensures that equipment is locked out when performing any service or maintenance activities.

All authorized personnel who perform maintenance or service work are responsible for following the LOTO procedure. Supervisors are responsible for ensuring that their teams understand and comply with the LOTO procedure.

Note All personnel must receive training in the proper application and removal of LOTO devices.

Note LOTO procedures apply to all forms of energy, including electrical and pneumatic energy (if applicable).

Record all lockout/tagout activities in the LOTO logbook. Include the date, time, equipment involved, and personnel responsible.

1. To prepare the ETX-1620x for shutdown, complete the following steps:
   a. Identify all energy sources associated with the machine or piece of equipment, including electrical and pneumatic energy sources.
   b. Review all available documentation, including electrical diagrams, piping schematics, and any equipment-specific lockout procedures.
   c. Notify all affected personnel that a lockout is required and why.
2. Power off the ETX-1620x.
   Refer to ***Powering the ETX-1620x Off*** for more information.
3. To isolate the equipment from energy sources, locate and operate the isolating devices.
4. Power off or disconnect the feeder breaker.
5. Apply a lockout device to each energy-isolating device.
   Applying the lockout device ensures nobody can operate the energy-isolating

device.

6. Apply the Eaton lockout device (part number 756303-01) to the breaker of the ETX-1620x circuit breaker.
   a. Turn the breaker to the off position.
   b. Screw the lockout device to the breaker handle.
   c. Apply the lock through the center of the device, covering the screw.
7. Place a clearly visible tag on each lockout device with the following information:
   - Who is responsible for the lockout
   - Date
   - Reason for the lockout

Note Ensure that the tags follow all local regulations. Most facilities require a two-person team to apply and verify tags.

8. Release or block any stored energy.
   For example, bleed the pneumatic lines.
9. Test for zero energy by verifying that all energy sources are isolated.
   The status light on the ETX-1620x is off when all energy sources are isolated.
10. Re-verify that all energy sources are isolated and that all stored energy has been dissipated.

Perform the necessary maintenance or service while ensuring that the lockout remains in place. Continue to monitor the work environment for any unsafe conditions.

Related tasks:

- Powering the ETX-1620x Off

Removing Lockout/Tagout Devices from the ETX-1620x

After performing the necessary maintenance or service on the ETX-1620x, remove the LOTO devices to restore the equipment.

1. Confirm that the maintenance work is complete and that the equipment is safe to operate.
2. Remove all maintenance tools and parts from the surrounding environment.
3. Replace all doors and panels on the ETX-1620x.
4. Remove the LOTO devices.
   Each authorized person who applied a LOTO device must remove the device they

applied.
5. Inform the affected personnel that the LOTO devices have been removed and that the ETX-1620x is ready to use.
6. Power on the ETX-1620x.
   Refer to ***Powering the ETX-1620x On*** for more information.

Related tasks:

- Powering the ETX-1620x On

Password for the ATE Core Configurations Generation 2 API

You can reset the default password for the ATE Core Configurations Generation 2 API if the password is lost.

Identifying the Default Password

The default password for the ATE Core Configurations Generation 2 API is based on the serial number of the rack control unit (RCU) and has eight hexadecimal characters.

If the serial number of the RCU carrier assembly has less than eight characters, leading zeros prepend the serial number to form the default password. For example, if the serial number is `217D902`, the default password is `0217d902`.

Resetting the RCU Password

Use the **Reset** button to reset the RCU password if the password is lost. The **Reset** button, accessible through physical access to the ATE rack, is the only way to reset the RCU password to default.

Caution Ensure that the password reset is performed only by qualified personnel.

Attention Assurez-vous que la réinitialisation du mot de passe est effectuée

> uniquement par du personnel qualifié.

1. Power down the rack.
2. Open the side space.
3. Locate the RCU.
   Refer to ***ATE Core Configurations Generation 2 System Components*** to locate the RCU.
4. Hold **Reset** for > 15 seconds.
   Refer to ***Rack Control Unit*** in the ***ATE Core Configurations Generation 2 User Manual*** to locate the **Reset** button.
5. Flip the main breaker to the system off and back on.

Related information:

- ATE Core Configurations Generation 2 System Components
- Rack Control Unit

Integrating the ETX-1620x

To integrate the ETX-1620x, you must ensure that the test adapter that the system is a part of is configured appropriately with the following considerations.

Signal Path Lengths

Ensure all signal paths connected to the mass interconnect are less than 3 meters in length.

Note For signals connected to the pulser, it is critical to use cables that are as short as possible. Shorter cables improve the ability of the pulser to shape the pulse and take precise measurements.

Grounding the ETX-1620x

You must ground the ETX-1620x rack frame as described in ***Pulse Current Multiplexer Attributes***.

In addition, you must ground pin A16 on J9 within the adapter.

Caution Grounding pin A16 on J9 is a safety critical ground and must be capable of carrying 30 A.

Attention La broche de mise à la masse A16 sur J9 est une masse critique pour la sécurité et doit pouvoir supporter 30 A.

Related reference:

- Pulse Current Multiplexer Specifications

Closing Interlocks

The ETX-1620x includes an interlock system to prevent devices from outputting hazardous voltage except under controlled conditions.

The interlock circuit checks four conditions before allowing the output of hazardous voltages. All interlocks are dry contact and the default state is Open. The following table describes requirements for closing each interlock.

Table 32. Requirements for Closing Interlocks

Condition Name	CLOSED Condition	Interlock Control Pins on the Mass Interconnect
Adapter Detect	The Adapeter_Detect+ pin is pulled low (for example, through Adapter_Detect-).	J1 A33 (Adapter_Detect+) J1 A34 (Adapter_Detect-)
HV Enable	The HV_Enable+ pin is pulled low (for example, through HV_Enable-).	J1 C33 (HV_Enable+) J1 C34 (HV_Enable-)
Isolation Interlock	Output of high-power supply is isolated from ground.	N/A
Door Interlock	The front door, rear door, and both side panels are closed.	N/A

If all four conditions are met, the interlock circuit is closed.

If any of the four conditions are not met, the interlock circuit is open. When the circuit is open, the pulser does not allow you to build a path, and no voltage passes from the bias supply to the mass interconnect. In addition, the high-power supply does not allow any output.

Related concepts:

- RM-16061 Interlock Connection

Checking Interlock Status

Check the state of the interlock circuit using the NI-ATECore.NET API.

A software example of checking the interlock status is included with the examples installed on the system.

Related concepts:

- ETX-1620x Examples

Related information:

- API Documentation NI-ATECore.NET API Reference Manual

Adapter Detect Interlock

The Adapter Detect interlock is intended to be used to indicate whether an adapter is plugged into the mass interconnect.

On J1, hardwire pins A33 and A34 together in the adapter to optimize how the interlock circuit checks the Adapter Detect condition. For example, if you hardwire J1, A33 and A34 together in the adapter, Adapter Detect is pulled low whenever the adapter is plugged into the system.

The Adapter Detect interlock also interacts with the EMO_MEASURE circuit. Refer to ***Configuring EMO Measure*** for more information.

Related concepts:

- Configuring EMO Measure

HV Enable Interlock

The HV Enable interlock is intended to be actively controlled by the adapter. The HV Enable interlock opens or closes as conditions in the adapter or assembly line demand.

Note Do not actuate the HV Enable interlock individually for each DUT. The interlock circuit has an expected life of about 500,000 actuations.

For example, if you connect the HV Enable interlock pins to a programmable logic controller (PLC) inside the adapter, the PLC controls whether the pins are shorted together based on whether it is acceptable to allow hazardous voltage outputs from the test system.

DIP Switches

Verify that the four interlock DIP switches on the rack control unit (RCU) are enabled to ensure proper function of the ETX-1620x safety interlocks.

Refer to the ***Rack Control Unit*** section of the ***ATE Core Configurations Generation 2 User Manual*** for information about the location and settings of the RCU interlock DIP switches.

Do not change the state of the RCU interlock DIP switches. Changing the state of the DIP switches compromises the ability of the test rack to deactivate hazardous signals.

To check the state of inputs to the interlock circuit, use the example program that NI provides. The example program can help determine whether the rack believes it is safe to source hazardous voltage. The program can also check whether the interlock circuit is behaving as expected.

Related information:

- Rack Control Unit

Configuring EMO Measure

The EMO Measure feature can be used to remotely hard shutdown the rack when the mass interconnect is connected to a test adapter, as indicated in the following caution.

Caution EMO_MEASURE removes power from the main instruments and

interface. The AUX C13 and RCU outlets on the PEP remain powered, but the ETX-1620x does not use those outlets to power any internal equipment. Activating EMO_MEASURE does not put the rack into a service safe state. To completely interrupt power to the rack, disconnect the AC power cable.

Attention EMO_MEASURE coupe l'alimentation des instruments principaux et de l'interface. Les prises AUX C13 et RCU du PEP restent sous tension, mais l'ETX-1620x ne les utilise pas pour alimenter un équipement interne. L'activation d'EMO_MEASURE ne met pas le rack dans un état sécurisé pour l'entretien. Pour interrompre complètement l'alimentation du rack, déconnecter le câble d'alimentation CA.

The EMO Measure behavior depends on the state of the Adapter Detect interlock (J1, pins A33 and A34). Refer to ***Interlocks*** for more information about the Adapter Detect interlock.

Use 12 VDC to 24 VDC with EMO Measure pins. The test system monitors the state of the EMO Measure pins only when the Adapter Detect interlock is closed. While the Adapter Detect interlock is closed, the following statements are true:

- The system does not power on unless DC voltage is present between pins J1, B33 and J1, B34 (EMO Measure + and EMO Measure -). However, providing DC voltage does not turn on the system. You must still push the power button to power on the system.
- Removing voltage from the EMO Measure pins causes the test system to shut down unless the Adapter Detect interlock simultaneously opens.
- Putting DC voltage on the EMO Measure pins has no direct effect.

Note You must use an external voltage source to provide voltage to the EMO Measure pins while the Adapter Detect interlock is closed for the power button to power on the tester. The test system does not have an always-on source voltage that you can use for this purpose. You can power on the test system without voltage on the EMO Measure pins if the Adapter Detect interlock is open.

Related concepts:

- Adapter Detect Interlock

External Current Transducers

The system only supports transducers with voltage outputs. The mass interconnect pins on J18 cannot adequately carry outputs from a current driven transducer.

You must use the following Danisense transducers in the test adapter.

- DS50UB-10V
- DS200UB-10V
- DS600UB-10V
- DM1200UB-10V
- DL2000UB-10V

Output Power Isolation

It is critical to maintain isolation between the outputs of the high-power supply, the pulser bias supply, and ground.

> **Notice** The ETX-1620x may be damaged if the high-power and pulser bias supply outputs are not allowed to float relative to the ground.

You must isolate the following pins on the mass interconnect:

Table 33. Isolation of Mass Interconnect Pins

Mass Interconnect Slot	Pin
J9	A4
	A8
	B4
	B8
J11	A0
	A1[8]

8. After you build a path in the pulser, you can ground reference the pins in that path as long as the path

The isolation monitor indicates the isolation of the high-power supply. Refer to ***Isolation Monitor*** for more information.

Isolation Monitor

The ETX-1620x uses a Bender iso685 isolation monitor to monitor the isolation of the high-power supply output. The isolation monitoring system only monitors the isolation from ground of the high-power supply output; it does not ensure isolation of any other subsystem.

The isolation monitor also controls two mechanical relays that are exposed on J1 as show in ***J1 Pinout: Adapter Control and Communication***. The names of the ISO pins in rows 32 – 34 refer to pins on the isometer output relays as described in the ***ISOMETER iso685*** manual.

In addition to exposing the output relays on the mass interconnect, the isolation monitor controls the Isolation Interlock.

You can configure alarm levels and relay output conditions as needed for your application, but you must not change the value of the settings marked not user configurable in the following table. Changes to these values may disrupt normal operation of the test system, including how the Maintenance Software tests connections and Isolation Interlock function.

Table 34. iso685 Default Configuration within ETX-1620x

Setting	Default Value	User Configurable	Notes
Insulation Alarm 1	450 kΩ	Yes	300 Ω per volt based on maximum output voltage of the high-power supply.
Insulation Alarm 2	150 kΩ	Yes	100 Ω per volt based on maximum output voltage of the high power supply.
Output Digital 2 Mode	Active	No	Required for proper isolation interlock

remains intact. The adapter design must leave these pins floating to prevent damage to the pulser.

Setting	Default Value	User Configurable	Notes
			functionality.
Output Digital 2 Function 1	Ins. Alarm 1	No	Required for proper isolation interlock functionality.
Output Digital 2 Function 2	Device Fault	No	Required for proper isolation interlock functionality.
Output Digital 2 Function 3	—	Yes	Use this option to configure additional triggers for opening the isolation interlock.
Output Digital 2 Test	On	No	Required for continuity test of interlocks.
Output Relay 1 Relay Mode	N/C	Yes	—
Output Relay 1 Test	On	No	Required for continuity test of Relay 1.
Output Relay 1 Function 1	Ins. Alarm 1	Yes	—
Output Relay 2 Relay Mode	N/C	Yes	—
Output Relay 2 Test	On	No	Required for continuity test of Relay 2.
Output Relay 2 Function 1	Ins. Alarm 2	Yes	—
Profile	Power Circuits	No	—
Coupling Device	AGH150-4	No	—
System Type	3AC	No	The isolation monitor automatically sets this value when used with a coupling device; it must not be changed.

Refer to the ***ISOMETER iso685*** manual for information about isolation monitor

functionality and configuration.

Related reference:

- J1 Pinout: Adapter Control and Communication

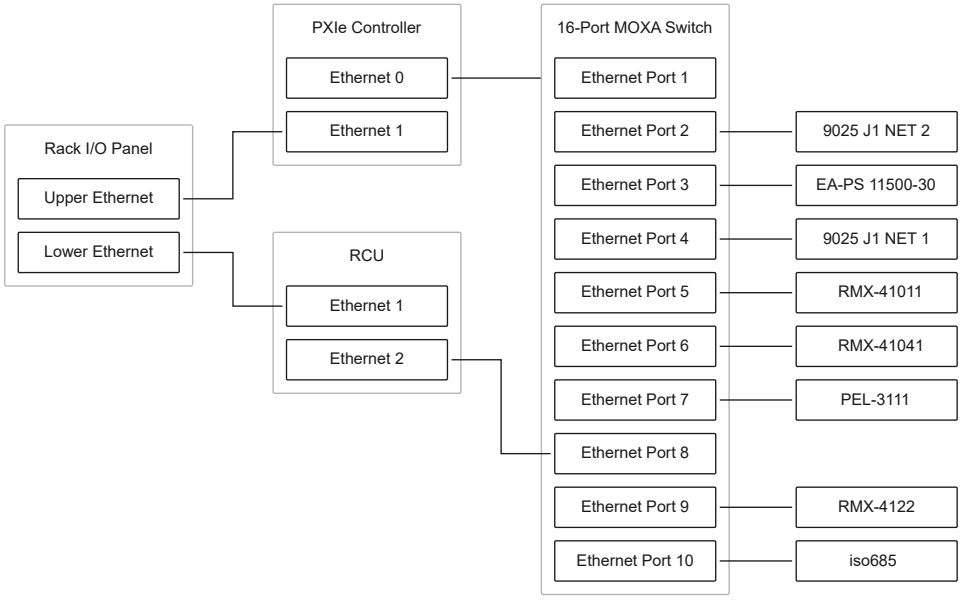
Related information:

- ISOMETER iso685

Ethernet Topology

Learn about the Ethernet connections between the ETX-1620x rack I/O panel, PXIe controller, rack control unit (RCU), MOXA switch, and other components.

Figure 25. Ethernet Block Diagram



Note Ethernet ports in the MOXA switch that are not depicted in the block diagram are unused.

Note When Ethernet connections go through the MOXA switch, the connection speed is limited to 10/100BaseTX.

The following table describes the IP addresses the system expects for its internal

devices. Using different IP addresses may cause issues with Maintenance Software and composite instrument drivers. Unless otherwise specified, the expected subnet mask is 255.255.0.0.

Table 35. IP Addresses for Internal Devices

Device	Assigned IP Address	Resource Name
PXI controller secondary port	169.254.160.2	User-specified
RCU port 1	169.254.160.9	RCU
RMX-41041 DC power supply	169.254.160.21	RMX_PPS1
Pulser charge supply RMX-41011	169.254.160.70	PULSER_CHARGE_PPS1
Pulser ELoad PEL-3111	169.254.160.72	PULSER_ELOAD1
Pulser bias supply RMX-4122	169.254.160.74	PULSER_BIAS_PPS1
Isolation monitor iso685-D	169.254.160.100	INSULATION_MONITOR1
EA-PS 11500-30	169.254.160.65	HP_PPS1

Using the Pulser

The pulser can create brief, high current pulses that you can use to take measurements. The following sections describe how to use the pulser.

Pulser Topology

The following figures show bus bar and input connectors on the pulser, as well as a block diagram of the pulser.

Pulser Connectivity

Figure 26. Pulser Connectivity: Mass Interconnect Side

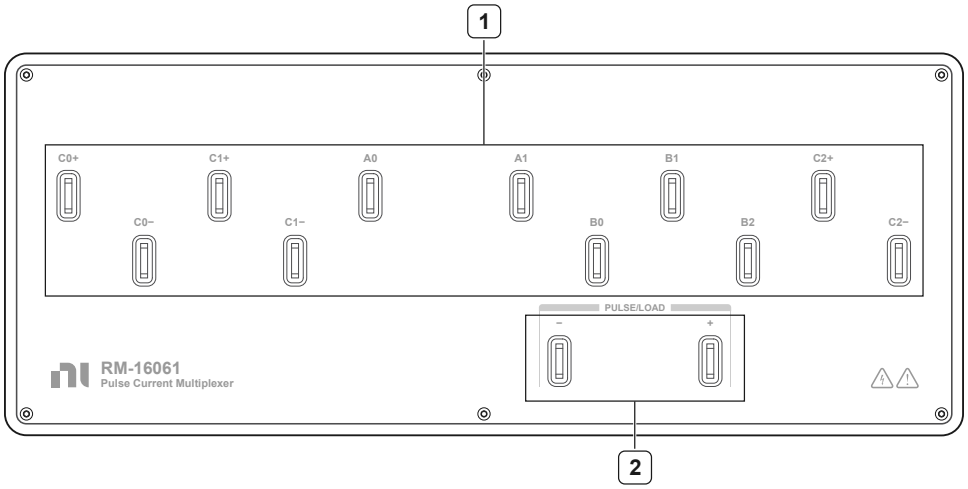
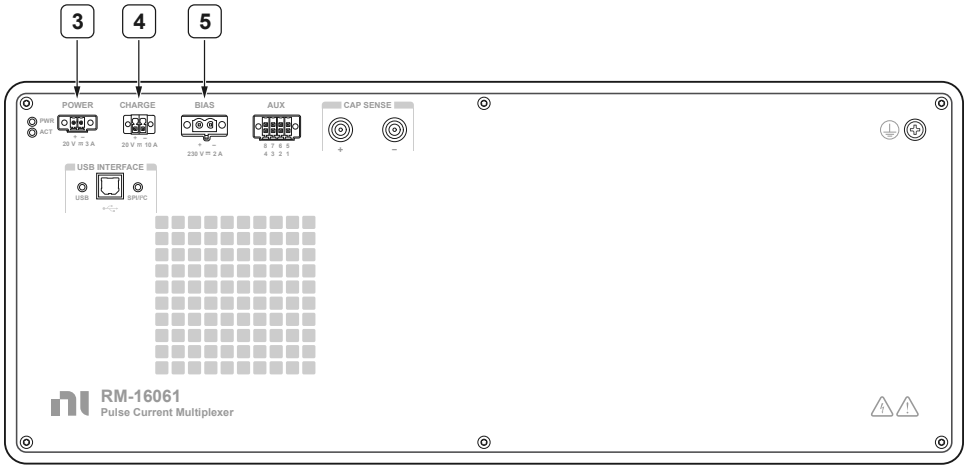


Figure 27. Pulser Connectivity: Human-Machine Interface Side



1. Output bus bars

2. Pulse/load bus bars
3. Input power connector
4. Input charge connector
5. Input bias connector

Pulser Block Diagram

Figure 28. RM-16061 Block Diagram

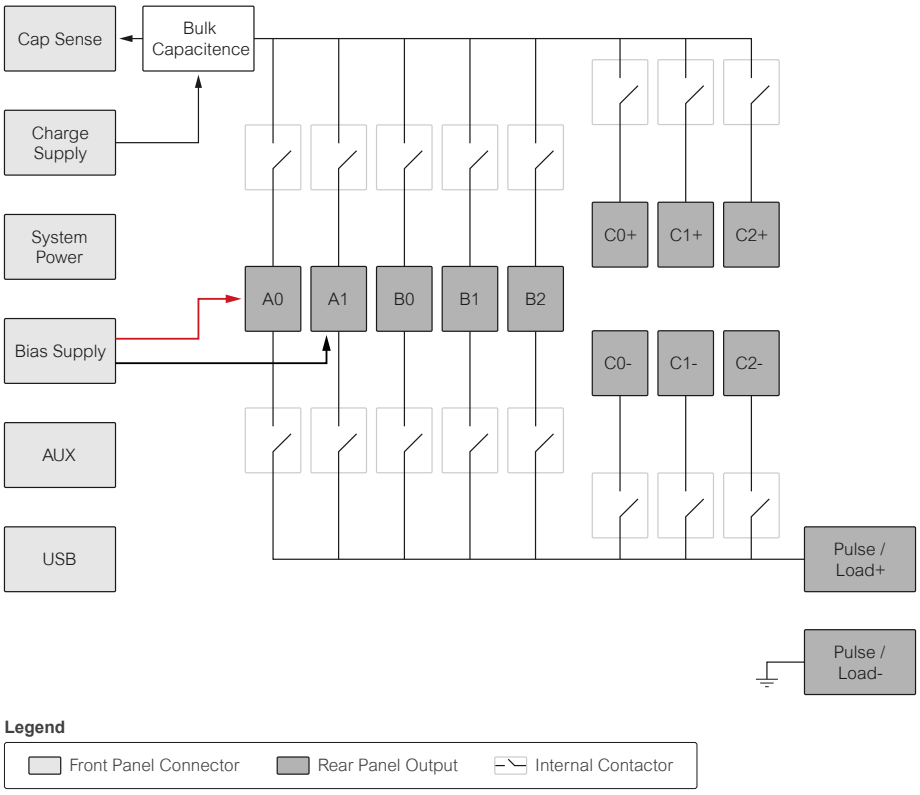


Table 36. RM-16061 Input Connectors

Input Connector	Description
System Power	Input power
Charge Supply	Charge
Bias Supply	Bias
AUX	Interlock
USB	Controller
Cap Sense	Measurement point for the source voltage for the pulse

Note Cap sense connects to the source voltage of a pulse within the RM-16061. Cap sense is not the voltage across the DUT.

RM-16061 Interlock Connection

The RM-16061 responds to an interlock signal that you can use to enable or disable outputs from the RM-16061. Pin 5 and Pin 1 of the AUX connector control this interlock input. When you short these pins, outputs from the pulser are enabled. System-level interlocks control this circuit and automatically disable pulser outputs unless the right conditions are met. Refer to ***Closing Interlocks*** for more information about system-level interlocks.

Related concepts:

- Closing Interlocks

Choosing Pulse Parameters

A well-regulated pulse is trapezoidal in its shape, and it should match the parameters that were specified for that pulse. Refer to ***Pulser Specifications*** for an example of a pulse waveform.

You can specify the following pulse parameters:

- Rise time
- Fall time
- Dwell time
- Setpoint
- Charge voltage

Charge Voltage

The charge voltage is a control parameter for the beginning of a pulse only, so you cannot specify the charge voltage throughout the pulse. The charge voltage is not part of the pulse waveform shape.

The default charge voltage is 15 V. You do not need to set the charge voltage value to perform a pulse. However, you might need to change the default charge voltage for a given test based on the following factors:

- Electrical characteristics of the pulse path
- Pulse waveform in a given test

A pulse might only have a single charge voltage, but you can specify a different charge voltage for each pulse.

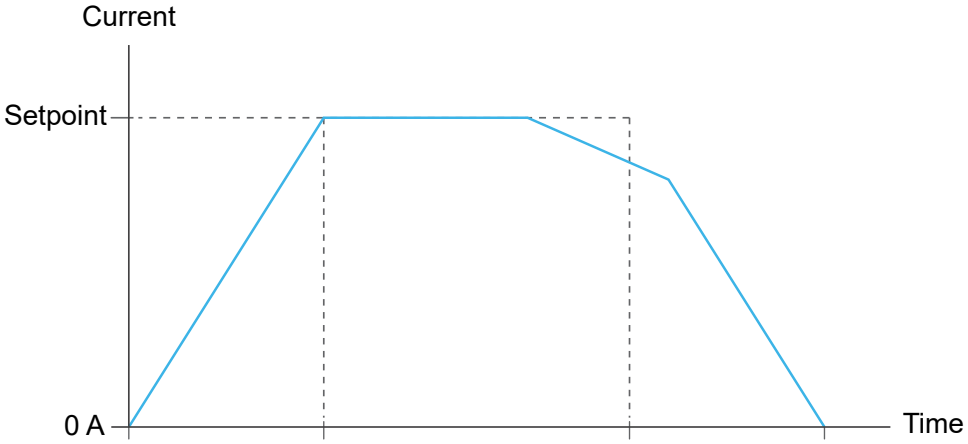
Note NI recommends changing the charge voltage only if you do not get a well-regulated pulse.

Note When using different charge voltages for different pulses, ensure you adjust the charge voltage at the appropriate time. Refer to ***Adjusting the Charge Voltage*** for more information.

If the charge voltage is too high or too low for a given path and waveform combination, the pulser cannot regulate the waveform cleanly.

If the charge voltage is too low, the pulse current waveform might not reach the specified setpoint or sustain the pulse duration. The following figure is an example of a pulse beginning to deteriorate early due to a low charge voltage.

Figure 29. Incomplete Pulse

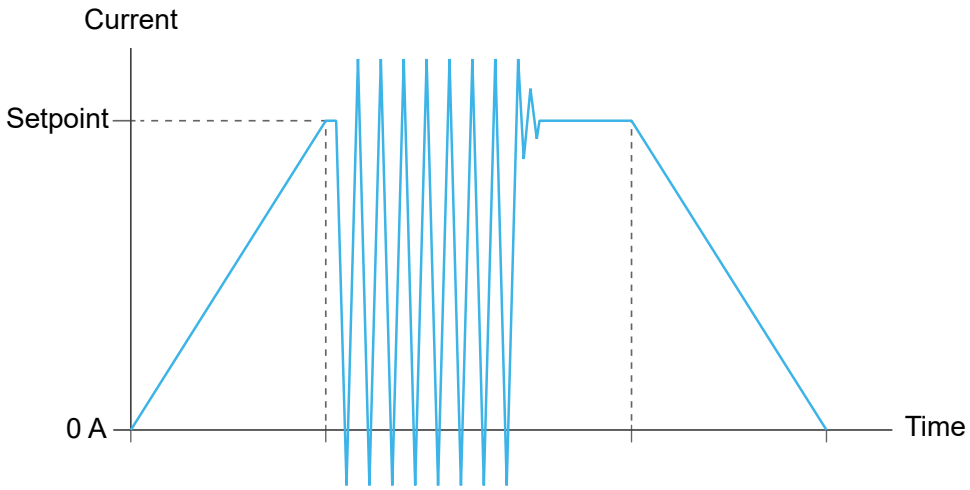


To correct incomplete pulse waveforms, increase the charge voltage.

If the charge voltage is too high, the pulse current waveform rapidly stops and restarts

to bleed off excess power without damaging itself. The following figure is an example of this behavior.

Figure 30. Ringing Pulse



To correct ringing pulse waveforms, decrease the charge voltage.

In general, it is easier to regulate pulses at lower setpoints and with shorter durations. If you are unable to find a suitable charge voltage, modify the waveform.

Adjusting the Charge Voltage

The pulser composite instrument can increase charge voltage between pulses by raising the specified charge voltage between performing pulses.

However, the pulser composite instrument cannot reduce the charge voltage of a pulse while a session is open unless you execute a pulse. If the pulser is charged and ready to pulse when you specify a lower pulse voltage, the pulser remains in a ready state. However, the voltage does not adjust downward until you perform the next pulse. The next pulse charges to the new specified charge voltage. Thus, you can use pulses to lower the charge voltage without closing a session to the pulser.

What Should I Do If the RM-16061 Fails to Charge or Generate a Pulse?

If the RM-16061 fails to charge or generate a pulse, check the S505H fuse on the RM-16061.

Related reference:

- RM-16061 Fuse

- Pulser Specifications

Instrument Calibration

Note

For the NI instruments used in the ETX-1620x, refer to the ***Calibration Service Levels and Product Information*** page on `ni.com` for additional information about the calibration service levels.

For third-party instruments, refer to the respective documentation for the calibration intervals and service levels. NI does not support third party instrument calibration.

Table 37. Recommended Calibration Intervals

Instrument	Recommended Calibration Interval
PXIe-4082	2 years
PXIe-4112	2 years
PXIe-4139	1 year
PXIe-6366	2 years
PXIe-6368	2 years
RM-26999	2 years
RMX-4122	1 year

Related information:

- Calibration Service Levels and Product Information
- Service Terms
- RM-26999 Calibration Procedure
- Danisense Calibration
- GW Instek Calibration
- Keysight Calibration
- EA Calibration Services

Maintenance and Repair

Learn how to prepare the system for maintenance and repair, which tools are required to access the inside of the rack, and what to do after maintenance is complete.

Caution You are required to familiarize yourself with all system requirements and guidelines in addition to requirements of all applicable codes, laws, and standards.

Attention Vous devez vous familiariser avec toutes les exigences et directives du système, ainsi que celles de tous les codes, lois et normes applicables.

Caution Ensure that maintenance is performed only by qualified personnel. Verify that all equipment is in a safe state after maintenance, prior to returning the system to operation.

Attention Assurez-vous que l’entretien est effectué uniquement par du personnel qualifié. Vérifiez que tout l’équipement est dans un état sécurisé après l’entretien, avant de remettre le système en service.

Caution Disconnect and remove all power from the product before performing any servicing or repairs.

Attention Débranchez et coupez toute alimentation du produit avant d'effectuer toute maintenance ou réparation.

Caution To completely interrupt power to a three phase system, you must switch off the main breaker on the Power Entry Panel. Position equipment so that it is easy to access the main breaker.

Attention Pour interrompre complètement l'alimentation d'un système triphasé, vous devez éteindre le disjoncteur principal sur le panneau d'entrée d'alimentation. Positionner l'équipement de sorte qu'il soit facile d'accéder au disjoncteur principal.

Before Maintenance or Repair

Complete the following tasks before removing any panels from the rack to perform maintenance or make repairs.

1. Power off the system.

   Refer to ***Powering the ETX-1620x Off*** for more information about removing power from the system.

2. Turn off the branch breaker.
3. Lock and tag the branch breaker as part of a lockout/tagout procedure.

Required Tools

The following tools are required to access the inside of the rack:

- Access key for front and rear doors
- #2 Phillips screwdriver and 3 mm hex driver for filler/side panels

After Maintenance or Repair

After performing maintenance or making repairs, complete the following tasks before restoring power to the system.

1. Properly ground all hardware that requires a standalone safety ground bond, including the following:
   - RM-16061
   - RM-26999 (x3)
   - Isolation Monitor
   - Rack GND, J9 pin A16
2. Install protective covers over hazardous outputs, including the following:

    - EA-PS 11500-30 output and sense
    - RMX-4122 output and sense
    - 3-phase PDU
3. Install and secure doors and all filler/side panels.
4. Verify that the equipment within the ETX-1620x is configured correctly.
    - In NI MAX, ensure that the component resource names match the resource names that are defined in ***ETX-1620x Hardware Components***.
    - Ensure that the component IP addresses match the assigned IP addresses that are defined in ***Ethernet Topology***.

Related concepts:

- Ethernet Topology

Related tasks:

- Powering the ETX-1620x Off

Related reference:

- ETX-1620x Hardware Components

Field Replacement Components

Refer to the following tables for field replacement components. Part numbers and repair coverage are pending for some components.

Note ***Customer Responsible*** means that these components are not Covered Products as per NI Terms of Service, and customers need to purchase such system parts individually and replace them by themselves.

Note Field replacement components have an NI part number unless otherwise noted.

Table 38. Instruments

NI Part Number	Model	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
Chassis				
784058-01	PXIe-1084	✓	—	—
Controller				
Contact NI	PXIe-8862 (32 GB)	✓	—	—
Data Acquisition				
781057-01	PXIe-6366	✓	—	—
785926-01	PXIe-6386	✓	—	—
DMM				
783130-01	PXIe-4081	✓	—	—
783131-01	PXIe-4082	✓	—	—
Electronic Load				
756658-01	PEL-3111 (GW Instek)	—	—	✓
756659-01	PEL-3211 (GW Instek)	—	—	✓
Power Supply				
789716-01	EA-PS 11500-30	—	—	✓
782857-01	PXIe-4112	✓	—	—
786006-01	RMX-41011, 0 VDC - 20 VDC, 0 A - 10 A	✓	—	—
786014-01	RMX-41041, 0 VDC - 20 VDC, 0 A - 40 A	✓	—	—
SMU				
782856-02	PXIe-4139	✓	—	—
Switch				
778572-67	PXI-2567	✓	—	—

NI Part Number	Model	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
780587-27	PXIe-2527	✓	—	—
782835-37	PXIe-2737	✓	—	—
Transducer				
786956-01	Danisense DS50UB-10V	—	✓	—
788929-01	Danisense DM1200UB-10V	—	✓	—
Pulse Multiplexer				
138834-01	RM-16061	✓	—	—
Rack Mount				
113354A-02	RM-16061 Pulse MUX to Mass Interconnect, 5 VPC High Power to Ring Lug	—	✓	—

Table 39. Rack Components

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
789484-01	Power Entry Panel, UHP, 3-P Delta 50 A , ATE Core	—	✓	—
788924-01	Power Supply, 24 V, 120 W, PS-25	✓	—	—
788926-01	Power Supply, 24 V, 480 W, PS-27	✓	—	—
789094-01	3-P Contactor, 3P(3 NO), 24 VDC Coil, ATE Core	—	✓	—

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
789496-01	3-P Filter, 3P, 110 A, ATE Core	—	✓	—
789491-01	Branch Circuit Breaker, 3P, 40 A, ATE Core	—	✓	—
789466-01	Fan Panel, Environmental Gray, ATE Core	—	✓	—
789471-01	1-Phase Power Distribution Unit, ATE Core	—	✓	—
789473-01	Rack Control Unit, ATE Core	—	✓	—
789478-01	DC PDU 1 (AUX DC 600)	—	✓	—
789467-01	DC PDU 2 (AUX DC 1200)	—	✓	—

Table 40. Accessories

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
System Cable				
138916-01	ECUTS for Inverter, Mini Power and Sense	✓	—	—
113621-01	ECUTS for Inverter, Keysight power/ sense and safety GND	✓	—	—
769638-01	DSUB, HD78 Gray, Receptacle to Plug,	✓	—	—

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
	Shielded			
132503-02	ECUTS, B3-2, Microfit 3.0 RCPT to 8-position combicon	✓	—	—
132504-02	ECUTS, B4-2,QuadraPaddle 192 to 160-din, DMM and PXIe-4322	✓	—	—
139711-01	ECUTS for Inverter, B103, VPC QuadraPaddle Signal to DMM and PXIe-2527	✓	—	—
139380-02	Pulse MUX Bias	✓	—	—
132507-01	ECUTS, B7-1, VPC Micro Power to Power Supplies	✓	—	—
138767-01	Bus, Conductor, Positive Side, Threaded Terminals, 3x PEL-3211, Copper	✓	—	—
138767-02	Bus, Conductor, Negative Side, Threaded Terminals, 3x PEL-3211, Copper	✓	—	—
138767-03	Bus, Conductor, Positive Side, Threaded Terminals, PEL-3111 to Booster, Copper	✓	—	—

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
138767-04	Bus, Conductor, Negative Side, Threaded Terminals, PEL-3111 to Booster, Copper	✓	—	—
139355-1R5	6 AWG Ferrule to 6 AWG Ferrule and M6 Ring, 1.5 M	✓	—	—
139635-02	DB15M to 20 AWG, Ferrule	✓	—	—
N/A	CAT-5E Ethernet, Thin Profile, 2 M	—	—	✓
N/A	CAT-5E Ethernet, Thin Profile, 1 M	—	—	✓
139517-01	ECUTS for Inverter, RM-26999 V-Ins to Quad	✓	—	—
191945-02	68-POS .050 Series D-Type to 68-pos VHDCI Offset, Type SHC68-68, 2 M	✓	—	—
192061-01	68-pos VHDCI Offset to 68-pos VHDCI Offset, Type SHC68-C68-EPM, 1 M	✓	—	—
758463-01	GTL-255 Frame Link Cable (300 mm)	—	—	✓
113533-01	Current DAQ Input, RM-26999 to QP	✓	—	—

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
113354-01	RM-16061 Pulse MUX to Mass Interconnect, 6 VPC High Power to Ring Lug	✓	—	—
Hardware Assembly Component				
755429-01	Monitor Mount and Tilter Head, VESA, Wall Mount, WMS9110S	—	—	✓
749458-01	Keyboard Shelf with Mousepad	—	—	✓
134234-01	Bracket, Rack Mount, Front, PXI Express Chassis, ECUTS-16001	—	—	✓
115766-01	Bracket, Rack Mount, 19 in. Rack, Current Sensor, MUX to Pulser	—	✓	—
138926-01	Bracket, Rack Mount, 19 in. Rack, Current Sensor, HV Supply	—	✓	—
751454-01	Blank Panel for RMX-410x Rack Mount Kit	—	—	✓
Miscellaneous				
139072-01	ECUTS Receiver B101 Adapter Board	✓	—	—
139023-01	ECUTS Receiver	✓	—	—

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
	B102 Adapter Board			
787462-01	Dell Ultrasharp 24 Monitor – U2422H	—	✓	—
788126-01	USB English Keyboard and Optical USB Mouse	—	—	✓
788127-01	Strain Relief Plate for VPC Receiver Modules	—	—	✓
788134-01	Cable Tie, Nylon, 21.5 in. L x .16 in. W	—	—	✓
Panduit ABM1M-A-M	Cable Tie Mount, Adhesive Backed, 4 Way, ½ in. Square	—	—	✓
Panduit PLT1M	Tie, Nylon, 3.9 X 0.1, 0.87 Bundle Diameter	—	—	✓
Richco WS-A-2-01	Clip, Snap-In, Wire Management, 1/16 in. Panel	—	—	✓
Thomas & Betts TY242MX	Nylon Ties, TY-RAP, Length 8.19 in.	—	—	✓
WAGO 221-613	Connector, Compact Splice, 3 Conductor, 6 mm, 10 AWG, Lever Actuation Type, Transparent	—	—	✓
Weidmuller 2583980000	Sealing Element, Cable Gland, 14 mm - 15 mm Clamping Range	—	—	✓

NI Part Number	Description	NI Repair Coverage		
		Advanced Replacement	Standard Repair	Customer Responsible
Weidmuller 2584160000	Cable Gland, Separable, 32 mm, Black	—	—	✓
763844-01	Cable, Display Port to Display Port, 1.8 M	—	—	✓
769604-02	Cable, USB, High Speed, Type-A to Type-B, 2 M	—	—	✓

Table 41. Power Cords and Alternatives per Region

NI Part Number	Description	Alternate Shipping Kit	Alternate Description	NI Repair Coverage		
				Advanced Replacement	Standard Repair	Customer Responsible
133084-1R5	14 AWG, 250 V, ZLock C14 to ZLock C15, 1.5 M	No alternate	No alternate	✓	—	—
Note The following power cords have alternate part numbers for specific regions around the globe with the purpose of meeting the regional power requirements.						
133083-1R5	Power Cord for NI Test Systems, C14 to C13, 1.5 M, Locking	785713-0112	Power Cord, AC, IEC C14 to C13, 1.5 m, PSE	✓	—	—
		785713-0401	Power Cord, AC, IEC C14 to C13, 1.5 m, EU, KC, CCC			
133084-1R5	Power Cord for NI Test	786208-1R5	Power Cord, AC, IEC C15	✓	—	—

NI Part Number	Description	Alternate Shipping Kit	Alternate Description	NI Repair Coverage		
				Advanced Replacement	Standard Repair	Customer Responsible
	Systems, C14 to C15, 1.5 M, Locking		to C14, 1.5 m, Japan			
		786207-1R5	Power Cord, AC, IEC C15 to C14, 1.5 m, China			
		786206-1R5	Power Cord, AC, IEC C15 to C14, 1.5 m, Europe			
		786205-1R5	Power Cord, AC, IEC C15 to C14, 1.5 m, Korea			
133086-02	Power Cord, 12 AWG, 250V, Zlock C20 to Zlock C19, 2.0 M	785710-02	Power Cord, AC, IEC C20 to C19, 2.5 m, EU, KC, CCC	✓	—	—
		785710-0212	Power Cord, AC, IEC C20 to C19, 2.5 m, PSE			
133087-0R6	Power Cord for NI Test Systems, C14 to C13, 0.6 M, Locking	785713-0112	Power Cord, AC, IEC C14 to C13, 1.5 m, PSE	✓	—	—
		785713-0401	Power Cord, AC, IEC C14 to C13, 1.5 m, EU, KC, CCC			

Table 42. VPC Part Numbers for ETX Inverter Production Test System Tools

Mass Interconnect Slots	Connector Type	Receiver Tools			ITA Tools		
		Crimper	Locator	Extractor	Crimper	Locator	Extractor
J1, J4, J13, J15, J17, J18	QuadraPaddle	910101125	—	910110112	910101103	910104140	910110111
J2	Micro Power	910101102	910104145	910112123	910101102	910104144	910112123
	Micro Coax	—	—	910112123	—	—	910112123
J11, J12	High Power	910102116	—	910112129	910102116	—	910112129
J7, J9	TriPaddle	910101103	910104127	910110102	910101103	910104107	910110102
	Mini Power	—	—	910112104	—	—	910112104

Table 43. VPC Part Numbers for ETX Inverter Production Test System Receiver Components

Mass Interconnect Slots	Connector Type	Receiver Components			
		Module	Module Description	Contact	Contact Description
J1, J4, J13, J15, J17, J18	QuadraPaddle	510150130	192 Position, Loaded with Twin Female Contacts	610138200	QuadraPaddle, Twin Female
J7, J9	TriPaddle	510104206	16 Position, Dual TriPaddle / Mini Power	610110177	TriPaddle, 10 Amp, 14-18 AWG Crimp
	Mini Power			610116112	Mini Power, 8 AWG Solder
J11, J12	High Power	510104307	6 Position, High Power	610149101	High Power, 2 AWG
J2	Micro Power	510104267	50 Position, Micro Power / Micro Coax	610142101	Micro Power, 12-14 AWG Crimp
	Micro Coax			7-362116525-036	Micro Coax to SMA Plug, RG316, 36 in. Patchcord

Mass Interconnect Slots	Connector Type	Receiver Components			
		Module	Module Description	Contact	Contact Description
				7-362116526-036	Micro Coax to BNC Plug, RG316, 36 in. Patchcord
				7-362116527-036	Micro Coax to SMB Plug, RG316, 36 in. Patchcord

ETX-1620x Terminal Block Connections

Certain connections within the ETX Inverter Production Test System are routed through a bank of DIN rail-mounted terminal blocks that are located in the side space of the rack.

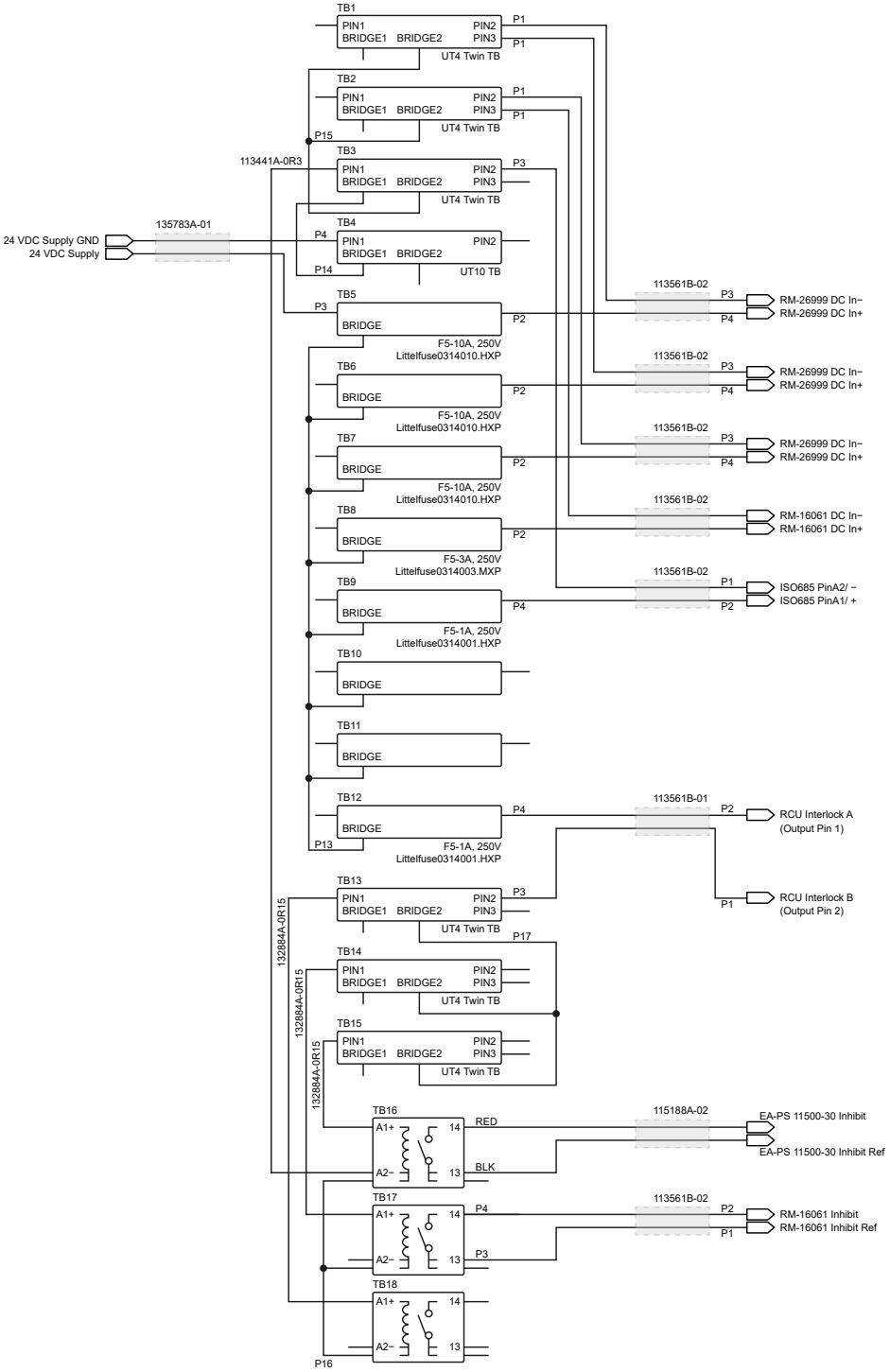
The following components get power from the DIN rail-mounted terminal blocks:

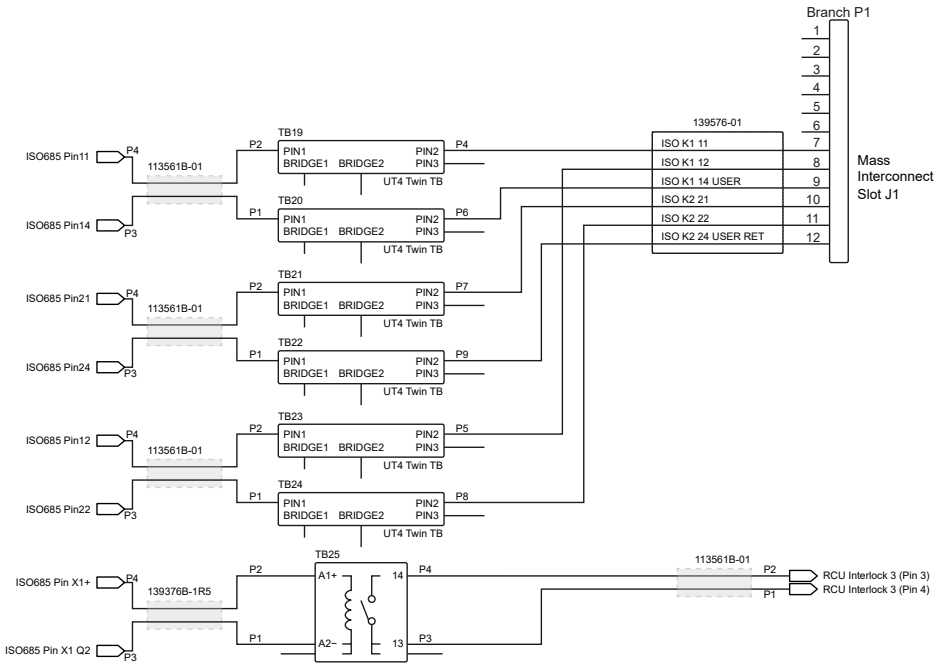
- RM-16061 (pulse multiplexer)
- RM-26999 (power measurements conditioner)
- iso685-D (isolation monitor)

Several connections relevant to the system interlock circuits also run through the DIN terminal blocks. The Test System Maintenance Software may indicate if connection or component discovery issues are related to this bank of terminal blocks.

The following figure is a full schematic of the DIN rail-mounted terminal blocks. Refer to the schematic when performing maintenance or repairs.

Figure 31. ETX-1620x DIN Rail-Mounted Terminal Block Schematic





Repairing the FDT

Consult ***ITA PCB Contact Installation and Removal*** in the ***Quadrapaddle User Manual*** on ***www.vpc.com*** for information on how to replace a bent or broken pin on the FDT.

For all other FDT repairs, submit a request for RMA to your assigned NI Hardware Services Program Manager.

Related tasks:

- Submitting a Request for RMA, Repair Services, or Replacement Parts

Related information:

- VPC Home Page

Replacing Broken Pins on Cables

Consult ***www.vpc.com*** for information on repairing bent and broken pins on mass interconnect cables, and determining if a cable must be replaced entirely. Consult ***Replacing Cables to the Mass Interconnect*** for information on replacing

irreparably damaged cables.

Related information:

- VPC Home Page

Replacing the RM-16061

NI recommends that you replace the RM-16061 within the ETX-1620x when the switch count on any one of the contactors reaches 1 million cycles.

Prior to replacing the RM-16061, place a sturdy table adjacent to the human-machine interface side of the rack to minimize vertical movement of the RM-16061.

Note Lifting the RM-16061 requires two people. Ensure there is enough space near the crate to place the new RM-16061 after lifting it out of the crate.

Equipment

- Small Phillips head screwdriver
- 3 mm hex socket
- Rack key
- Size 8 wrench
- Small NI screwdriver
- #2 Phillips screwdriver

1. Follow all ***Before Maintenance or Repair*** procedures.
2. Remove the side panel using a 3 mm hex socket.
3. Unlock and remove the top door of the rack using your rack key.
4. Remove the access panel below the monitor using a Phillips head screwdriver. For additional access, you can open the VPC 9025 fold down panel using a #2 Phillips screwdriver.
5. Locate the RM-16061 directly behind the mass interconnect.
   Refer to ***ETX-1620x Hardware Components*** for more information.

   Note Do not remove the mass interconnect.

6. Remove all connections to the RM-16061.
   - Mass interconnect side: Use a size 8 wrench to loosen and remove the M5 hex nut and M5 hex bolt at each bus bar connection
   - Human-machine interface side:
     - Remove all connections, including the top right ground lug
     - Remove all captive connections with a small NI screwdriver
     - Unplug all other connections
7. Using two people, slide the RM-16061 out of the human-machine interface side of the rack and place the RM-16061 on the adjacent table.
8. Install a new RM-16061 into the rack.

Validate the RM-16061 before connecting to the adapter. NI recommends using the FDT-16050 and the ETX Inverter Production Test System Maintenance Software to validate the RM-16061 replacement.

Related concepts:

- Calculating the Pulse Multiplexer Lifetime
- Maintenance and Repair

Related reference:

- ETX-1620x Hardware Components

Replacing the RMX-4122

Learn how to replace the RMX-4122 power supply (part number 784763-01) in the ETX-1620x.

Equipment

- Torque driver, N · m or lb · in.
  - #2 Phillips head bit
- Torque wrench, N · m or lb · in.
  - 8 mm socket wrench bit
- 8 mm wrench
- Flathead screwdriver
- #1 Phillips head screwdriver

- Tray for loose fastening hardware

Torque the fasteners to the following specifications:

- M5 hex head: 2.49 N · m (22.0 lb · in.)
- 10-32 pan head: 3.16 N · m (27.9 lb · in.)

1. Follow all ***Before Maintenance or Repair*** procedures.
2. While facing the mass interconnect, unlock the door above the mass interconnect and pull the door open.
3. Remove the safety cover from the output terminals of the RMX-4122 using the #1 Phillips head screwdriver.
4. Loosen and remove the output terminal M5 nuts and bolts using the 8 mm wrench.
5. Note where each cable is connected to the back of the RMX-4122, then remove all cables from back of the RMX-4122.
6. While facing the monitor and keyboard, complete the following steps:
   a. Tilt the monitor down.
   b. Unfasten the 10-32 screws securing the top filler panel to the rack and set aside the filler panel.
7. Locate the S-brackets holding the front of the RMX-4122 to the vertical rack rails.
8. Unfasten the 10-32 screws from the rack rail mounts using the #2 Phillips head bit.
9. Using the rails that support the RMX-4122, pull the RMX-4122 forward through the front of the rack to remove it.
   If necessary, remove the monitor from the monitor mount to facilitate removal of the RMX-4122.

Follow the removal instructions in reverse order with a new RMX-4122.

Note Align the RMX-4122 with Rack U 37.

Note Use the L-brackets to rest the power supply during installation.

Related concepts:

- Maintenance and Repair

Replacing the Danisense DS50UB

Learn how to replace the Danisense DS50UB current transducer (part number 786956-01). The DS50UB is by the exhaust of the EA-PS 11500-30 power supply.

Equipment

- Torque driver, N · m or lb · in.
  - T10 torx bit
  - #2 Phillips bit
- Torque wrench, N · m or lb · in.
  - 8 mm socket wrench bit
  - 10 mm socket wrench bit
- 8 mm wrench
- 10 mm wrench
- Small flathead screwdriver
- Tray for loose fastening hardware

Torque the fasteners to the following specifications:

- M5 pan head: 4.01 N · m (35.4 lb · in.)
- M6 hex head: 6.83 N · m (60.4 lb · in.)
- 10-32 pan head: 3.16 N · m (27.9 lb · in.)

1. Follow all ***Before Maintenance or Repair*** procedures.
2. While facing the mass interconnect, remove the screws containing the lowest 8U filler panel using the #2 Phillips bit.
   Set aside the filler panel.
3. Remove the following cables from the DS50UB current transducer.
   a. Disconnect the DB9 cable using a small flathead screwdriver.
   b. Disconnect the BNC plug by pushing the plug in, turning it 90° counterclockwise, and pulling it out.
4. Unfasten the screws holding the safety cover over the output terminal of the EA-PS 11500-30 (HV supply) using the T10 torx driver.
   Place the loose screws in the tray for loose fastening hardware.
5. Loosen the bolts securing the ring terminals on the HV supply output terminals using the 10 mm wrench.

   a. Place the loose bolts, washers, and nuts in the tray for loose fastening hardware.
   b. Pull the 8 AWG red wire from the + output terminal of the HV supply through the DS50UB current transducer so that the red wire no longer passes through its center.
6. Unfasten the two M5 screws holding the DS50UB current transducer to its mounting bracket using the #2 Phillips bit.
7. Pull the current transducer out of the system rack.

Follow the removal instructions in reverse order with a new DS50UB current transducer.

Note Ensure that the red 8 AWG wire goes through the hole in the current transducer before going through the safety cover to reconnect to the HV supply.

Note You must reinstall the safety cover onto the HV supply before powering on the system rack.

Related concepts:

- Maintenance and Repair

Replacing the Danisense DM1200UB

Learn how to remove and replace the Danisense DM1200UB current transducer (part number 788929-01). The DM1200UB is attached to the mass interconnect folding panel.

Equipment

- Torque driver, N · m or lb · in.
  - 3/32 hex bit
  - 3 mm hex bit
  - #2 Phillips bit
- Torque wrench, N · m or lb · in.
  - 7 mm socket wrench bit

    - 10 mm socket wrench bit
- 7 mm wrench
- 10 mm wrench
- Small flathead screwdriver
- Large flathead screwdriver
- Tray for loose fastening hardware

Torque the fasteners to the following specifications:

- VPC module mounting screws: 0.45 N · m (4.0 lb · in.)
- M4 nut: 1.96 N · m (17.3 lb · in.)
- M5 pan head and nut: 4.01 N · m (35.4 lb · in.)
- M6 hex head: 6.83 N · m (60.4 lb · in.)
- 10-32 pan head: 3.16 N · m (27.9 lb · in.)

1. Follow all ***Before Maintenance or Repair*** procedures.
2. While facing the mass interconnect, remove the right-side panel from the system.
    a. Quarter turn all of the hex head fasteners using the 3 mm hex bit.
    b. Push the sliding latches toward each other, lift the side panel, and pull the side panel off.
3. While facing the mass interconnect, complete the following steps:
    a. Remove the screws containing the lowest 8U filler panel using the #2 Phillips bit.
    b. Unlock and open the door above the mass interconnect using the large flathead screwdriver.
4. Open the mass interconnect folding panel.
    a. Use the 3/32 hex bit to unfasten the VPC modules in mass interconnect slots 1, 2, 4, 6, 9, 11, 12, 13, 15, 17, and 18.
    b. Turn and push the VPC modules through the mass interconnect so that they are inside the system rack.
    If necessary, remove as many filler panels as needed.
    c. Unfasten the four 10-32 screws securing the top of the folding panel to the system rack using the #2 Phillips bit.
    d. Pull the folding panel handle gently until the folding panel is opened to a maximum of 60°.
5. Remove the bolt and nut securing the 2 AWG red wire passing through the center of the current transducer at 16U using the 10 mm wrench set.

6. Pull the 2 AWG red wire through the top of the current transducer.
7. Remove the following cables from the DM1200UB current transducer:
   a. Disconnect the DB9 cable with a small flathead screwdriver.
   b. Disconnect the BNC plug by pushing it in, turning it 90° counterclockwise, and pulling it out.
8. Remove the current transducer bracket.
   a. Identify the bracket mounted below the gas springs of the folding panel that secures the DM1200UB current transducer.
   b. Remove the two M5 screws and use the 8 mm socket bit to remove the two M5 nuts on either side of the bracket using the #2 Phillips bit.
   c. Pull the transducer bracket up to lift the bracket from the cradling screws that previously held the M5 nuts.
   d. Pull the transducer bracket away from the folding panel assembly and out of the system rack through the side panel.
9. Set the current transducer bracket on a table so that you have access to the bottom of the current transducer.
10. Unfasten the four M4 nuts holding the current transducer to the bracket using the 7 mm socket bit.
11. Pull the current transducer out of the system rack.

Follow the removal instructions in reverse order with a new DM1200UB current transducer.

Note Ensure that the red 2 AWG wire goes through the hole in the current transducer.

Note Populate the VPC modules and filler panels into the mass interconnect in the same way they were populated before removal.

Related concepts:

- Maintenance and Repair

Removing the Charger Cable Connected to the RMX-41011

Learn how to remove and replace the charger cable (part number 139376-1R5) on the RMX-41011.

Equipment

- #2 Phillips screwdriver
- NI screwdriver
- Tray for loose fastening hardware

Note The charger cable replacement instructions only refer to the replacement of the 139376-1R5 cable. Other cables or spare parts might have different requirements.

1. Follow all ***Before Maintenance or Repair*** procedures.
2. While facing the mass interconnect, remove the right-side panel of the rack.
   a. Unlatch the eight captured quarter-turn screws.
   b. Retract the pull latches.
   c. Set aside the side panel.

   Note To avoid damage to the panel, keep the panel upright. Do not load the panel mid-span.
3. While facing the human-machine interface (HMI) side of the rack, remove the 8U filler panel above the keyboard.
4. Remove the wire from the connector.

   Note Leave the charge connector connected to the RM-16061.
5. When facing the mass interconnect side of the rack, unlock and open the top door of the rack.
6. Remove the cover on the RMX-41011.
7. Unscrew the ring lugs on the RMX-41011.

8. Locate and remove the charger cable.
   The cable is routed under the RM-16061, between the RMX-41011 and RM-16061.

Related concepts:

- Maintenance and Repair

Replacing the Charger Cable on the RMX-41011

1. Install the system-level cable labels on the charger cable.
2. Route the new charger cable under the RM-16061, between the RMX-41011 and RM-16061.
3. Screw the ring lugs into the RMX-41011 and replace the covers.
4. Push the ferrules into the charger cable connector.
5. Close the rack.

Contacting NI for Support

You can request support from NI if the available online resources do not meet your needs. Provide as much information as possible in your support request so NI service representatives fully understand the issue you are experiencing. NI can work with you to gather all the necessary information but preparing it ahead of time can reduce the amount of time it takes to process the support request.

Note NI cannot ensure support for any items added to the system's original shipping configuration, such as from a second-tier integrator, because they were not provided by NI. Contact the responsible party first if you suspect the issue involves any of these items.

System Information

Before submitting any type of support or service request, collect the following information about your system from the system sticker.

- Serial number
- Part number
- Model name
- Configuration name

Submitting a Request for Calibration Services

To submit a request for calibration, complete the following steps.

1. Collect your system information.
2. Collect the applicable component model name and serial number.
3. Contact your assigned NI Hardware Services Program Manager or the support channel defined in your service agreement to discuss service options.

Submitting a Request for RMA, Repair Services, or Replacement Parts

To submit a request for return materials authorization (RMA), repair, or to order replacement parts, complete the following steps.

1. Collect your system information.
2. Collect the applicable component part number and serial number.
3. Contact your assigned NI Hardware Services Program Manager or the support channel defined in your service agreement to discuss service options.

Submitting a Request for Technical Support

To submit a request for general technical support, complete the following steps.

1. Collect your system information.
2. Visit ni.com/support, and select **Submit or Manage a Service Request**.
3. Use the Service Request Manager to request technical support.