ATE Core Configurations

RMX-10011 User Manual

October 2017
377138A-01

NATIONAL INSTRUMENTS

Worldwide Technical Support and Product Information

ni.com

Worldwide Offices

Visit ni.com/niglobal to access the branch office web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

National Instruments Corporate Headquarters

11500 North Mopac Expressway Austin, Texas 78759-3504 USA Tel: 512 683 0100

For further support information, refer to the *NI Services* appendix. To comment on National Instruments documentation, refer to the National Instruments web site at ni.com/info and enter the Info Code feedback.

Legal Information

Limited Warranty

This document is provided ‘as is’ and is subject to being changed, without notice, in future editions. For the latest version, refer to `ni.com/manuals`. NI reviews this document carefully for technical accuracy; however, NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS.

NI warrants that its hardware products will be free of defects in materials and workmanship that cause the product to fail to substantially conform to the applicable NI published specifications for one (1) year from the date of invoice.

For a period of ninety (90) days from the date of invoice, NI warrants that (i) its software products will perform substantially in accordance with the applicable documentation provided with the software and (ii) the software media will be free from defects in materials and workmanship.

If NI receives notice of a defect or non-conformance during the applicable warranty period, NI will, in its discretion: (i) repair or replace the affected product, or (ii) refund the fees paid for the affected product. Repaired or replaced Hardware will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer. If NI elects to repair or replace the product, NI may use new or refurbished parts or products that are equivalent to new in performance and reliability and are at least functionally equivalent to the original part or product.

You must obtain an RMA number from NI before returning any product to NI. NI reserves the right to charge a fee for examining and testing Hardware not covered by the Limited Warranty.

This Limited Warranty does not apply if the defect of the product resulted from improper or inadequate maintenance, installation, repair, or calibration (performed by a party other than NI); unauthorized modification; improper environment; use of an improper hardware or software key; improper use or operation outside of the specification for the product; improper voltages; accident, abuse, or neglect; or a hazard such as lightning, flood, or other act of nature.

THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND THE CUSTOMER’S SOLE REMEDIES, AND SHALL APPLY EVEN IF SUCH REMEDIES FAIL OF THEIR ESSENTIAL PURPOSE.

EXCEPT AS EXPRESSLY SET FORTH HEREIN, PRODUCTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND AND NI DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT, AND ANY WARRANTIES THAT MAY ARISE FROM USAGE OF TRADE OR COURSE OF DEALING. NI DOES NOT WARRANT, GUARANTEE, OR MAKE ANY REPRESENTATIONS REGARDING THE USE OF OR THE RESULTS OF THE USE OF THE PRODUCTS IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE. NI DOES NOT WARRANT THAT THE OPERATION OF THE PRODUCTS WILL BE UNINTERRUPTED OR ERROR FREE.

In the event that you and NI have a separate signed written agreement with warranty terms covering the products, then the warranty terms in the separate agreement shall control.

Copyright

End-User License Agreements and Third-Party Legal Notices

You can find end-user license agreements (EULAs) and third-party legal notices in the following locations:

- Notices are located in the `<National Instruments>\_Legal Information` and `<National Instruments>` directories.
- EULAs are located in the `<National Instruments>\Shared\MDF\Legal\license` directory.
- Review `<National Instruments>\_Legal Information.txt` for information on including legal information in installers built with NI products.

U.S. Government Restricted Rights

If you are an agency, department, or other entity of the United States Government (“Government”), the use, duplication, reproduction, release, modification, disclosure or transfer of the technical data included in this manual is governed by the Restricted Rights provisions under Federal Acquisition Regulation 52.227-14 for civilian agencies and Defense Federal Acquisition Regulation Supplement Section 252.227-7014 and 252.227-7015 for military agencies.

Trademarks

Refer to the *NI Trademarks and Logo Guidelines* at `ni.com/trademarks` for more information on National Instruments trademarks.

ARM, Keil, and µVision are trademarks or registered of ARM Ltd or its subsidiaries.

LEGO, the LEGO logo, WEDO, and MINDSTORMS are trademarks of the LEGO Group.

TETRIX by Pitsco is a trademark of Pitsco, Inc.

FIELDBUS FOUNDATION™ and FOUNDATION™ are trademarks of the Fieldbus Foundation.

Patents

For patents covering National Instruments products/technology, refer to the appropriate location: **Help»Patents** in your software, the patents.txt file on your media, or the *National Instruments Patent Notice* at ni.com/patents.

Export Compliance Information

Refer to the *Export Compliance Information* at ni.com/legal/export-compliance for the National Instruments global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data.

WARNING REGARDING USE OF NATIONAL INSTRUMENTS PRODUCTS

YOU ARE ULTIMATELY RESPONSIBLE FOR VERIFYING AND VALIDATING THE SUITABILITY AND RELIABILITY OF THE PRODUCTS WHENEVER THE PRODUCTS ARE INCORPORATED IN YOUR SYSTEM OR APPLICATION, INCLUDING THE APPROPRIATE DESIGN, PROCESS, AND SAFETY LEVEL OF SUCH SYSTEM OR APPLICATION.

PRODUCTS ARE NOT DESIGNED, MANUFACTURED, OR TESTED FOR USE IN LIFE OR SAFETY CRITICAL SYSTEMS, HAZARDOUS ENVIRONMENTS OR ANY OTHER ENVIRONMENTS REQUIRING FAIL-SAFE PERFORMANCE, INCLUDING IN THE OPERATION OF NUCLEAR FACILITIES; AIRCRAFT NAVIGATION; AIR TRAFFIC CONTROL SYSTEMS; LIFE SAVING OR LIFE SUSTAINING SYSTEMS OR SUCH OTHER MEDICAL DEVICES; OR ANY OTHER APPLICATION IN WHICH THE FAILURE OF THE PRODUCT OR SERVICE COULD LEAD TO DEATH, PERSONAL INJURY, SEVERE PROPERTY DAMAGE OR ENVIRONMENTAL HARM (COLLECTIVELY, “HIGH-RISK USES”). FURTHER, PRUDENT STEPS MUST BE TAKEN TO PROTECT AGAINST FAILURES, INCLUDING PROVIDING BACK-UP AND SHUT-DOWN MECHANISMS. NI EXPRESSLY DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY OF FITNESS OF THE PRODUCTS OR SERVICES FOR HIGH-RISK USES.

Compliance

Electromagnetic Compatibility Information

This hardware has been tested and found to comply with the applicable regulatory requirements and limits for electromagnetic compatibility (EMC) as indicated in the hardware's Declaration of Conformity (DoC)[1]. These requirements and limits are designed to provide reasonable protection against harmful interference when the hardware is operated in the intended electromagnetic environment. In special cases, for example when either highly sensitive or noisy hardware is being used in close proximity, additional mitigation measures may have to be employed to minimize the potential for electromagnetic interference.

While this hardware is compliant with the applicable regulatory EMC requirements, there is no guarantee that interference will not occur in a particular installation. To minimize the potential for the hardware to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this hardware in strict accordance with the instructions in the hardware documentation and the DoC[1].

If this hardware does cause interference with licensed radio communications services or other nearby electronics, which can be determined by turning the hardware off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver (the device suffering interference).
- Relocate the transmitter (the device generating interference) with respect to the receiver.
- Plug the transmitter into a different outlet so that the transmitter and the receiver are on different branch circuits.

Some hardware may require the use of a metal, shielded enclosure (windowless version) to meet the EMC requirements for special EMC environments such as, for marine use or in heavy industrial areas. Refer to the hardware's user documentation and the DoC[1] for product installation requirements.

When the hardware is connected to a test object or to test leads, the system may become more sensitive to disturbances or may cause interference in the local electromagnetic environment.

Operation of this hardware in a residential area is likely to cause harmful interference. Users are required to correct the interference at their own expense or cease operation of the hardware.

Changes or modifications not expressly approved by National Instruments could void the user's right to operate the hardware under the local regulatory rules.

[1] The Declaration of Conformity (DoC) contains important EMC compliance information and instructions for the user or installer. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Contents

1 Introduction

This manual contains information on the core system elements including maintenance and servicing information.

Documentation Icons

This icon denotes a suggestion, or recommendation to add clarity to the documentation.

This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

Overview

The ATE Core Configurations contain the core mechanical, power, and safety infrastructure for an automated test station. These systems provide the ultimate balance in standardized core components to simplify design and documentation, along with the flexibility for NI and third party instrumentation layout and are meant to be customized for a specific application.

Nomenclature

The ATE Core Configurations are uniquely identified by the voltage and power input type of the system. Refer to Appendix A, *Specifications* for more details about ATE Core Configurations power input ratings.

The following table identifies ATE Core Configurations system configurations. The model name can be found on the system label located above the Power Entry Panel.

Table 1. ATE Core Configurations

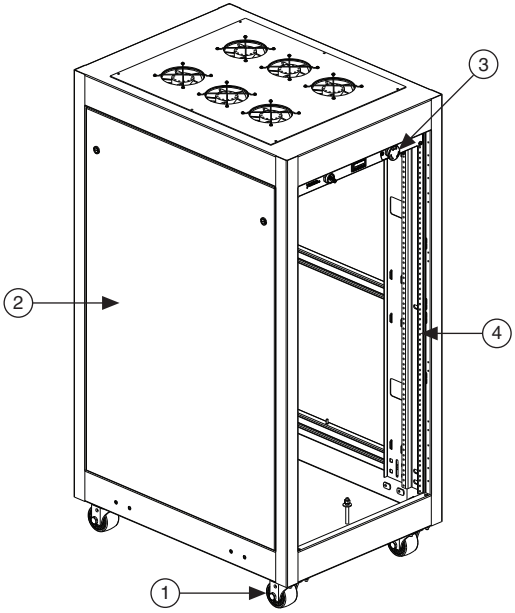
System	Model Name	
	24 U Rack	**40 U Rack**
Low Power	ATE-116H-A	ATE-116F-A
Mid Power	ATE-130H-A	ATE-130F-A
High Power (Delta)	ATE-3D16H-A	ATE-3D16F-A
High Power (Wye)	ATE-3W16H-A	ATE-3W16F-A

Core System Layout

The following figures show the locations of the ATE Core Configurations hardware.

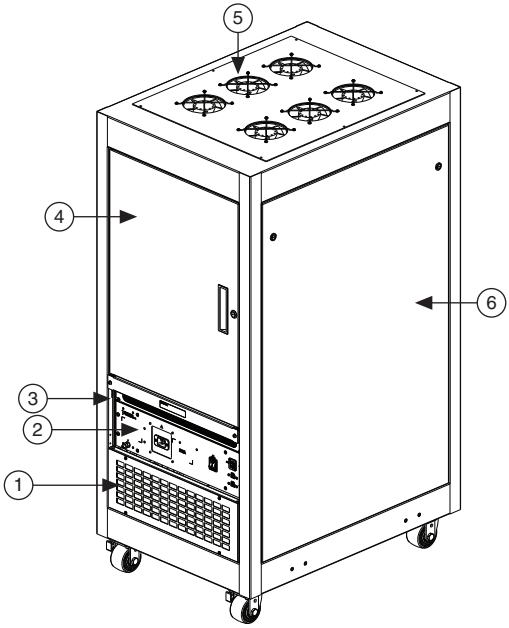
Note The following figures show a 24 U Low Power configuration.

Figure 1-2. Front and Side View of ATE Core Configurations



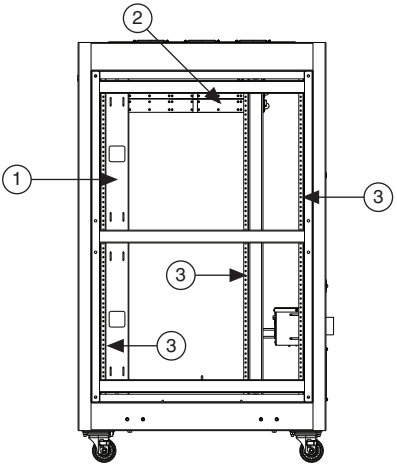
1	Industrial Casters	3	Emergency Power Off (EPO) Panel
2	Side Panel	4	Mounting Rails

Figure 1-3. Rear and Side View of ATE Core Configurations



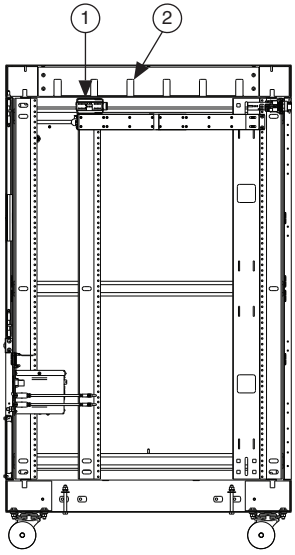
1	4U Air Inlet Panel	4	Removable Rear Door
2	3U Power Entry Panel	5	Fan Panel
3	1U Brush Cable Entry	6	Side Panel

Figure 1-4. Side View of ATE Core Configurations



1 Cable Management
2 Power Distribution Unit
3 Mounting Rails

Figure 1-5. Cutaway View of Ethernet Switch Location



1 Ethernet Switch
2 Cable Management

2

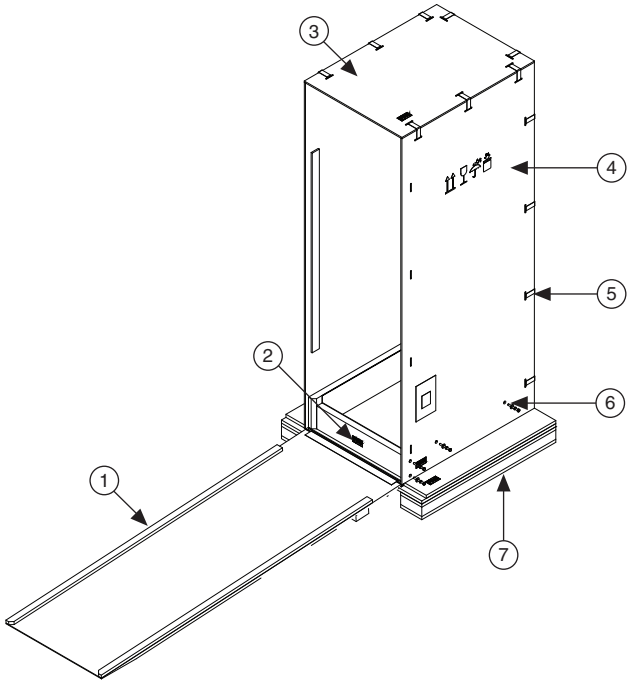
Installation and Configuration

Packaging Information

ATE Core Configurations ship from the factory in a shipping crate. The shipping crate can negotiate ramps and small bumps such as door thresholds.

Carefully inspect the shipping crate and the rack for damage. Check for visible damage to the metal work. If damage appears to have been caused during shipment, file a claim with the carrier. Retain the packing material for possible inspection and/or reshipment.

Figure 2-1. Rack Packaging Assembly



1	Ramp Assembly	5	Clamp
2	Removable Block	6	Bolt Assembly (x8)
3	Top Panel	7	Base Assembly
4	Side Panel (x2)		

Crate Dimensions

Figure 2-2. 24U Crate Dimensions

Dimensions are in millimeters (inches)

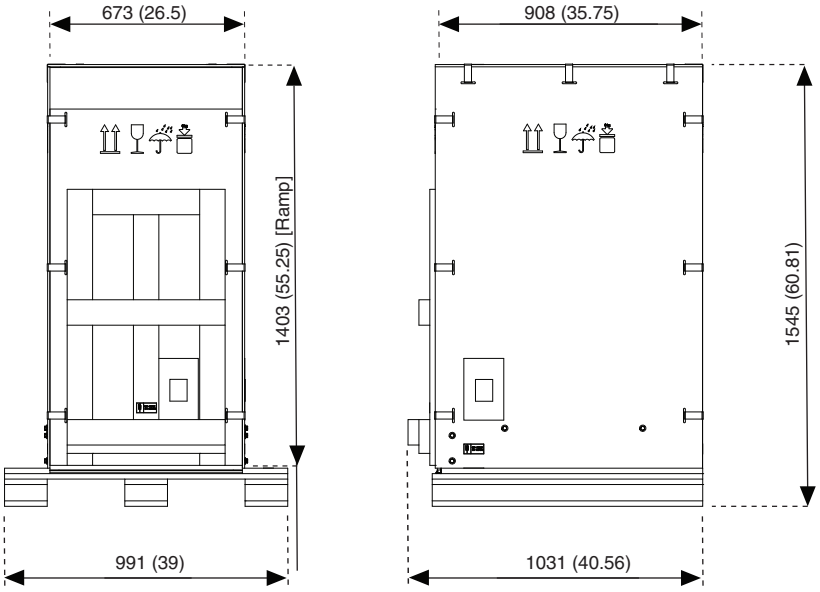
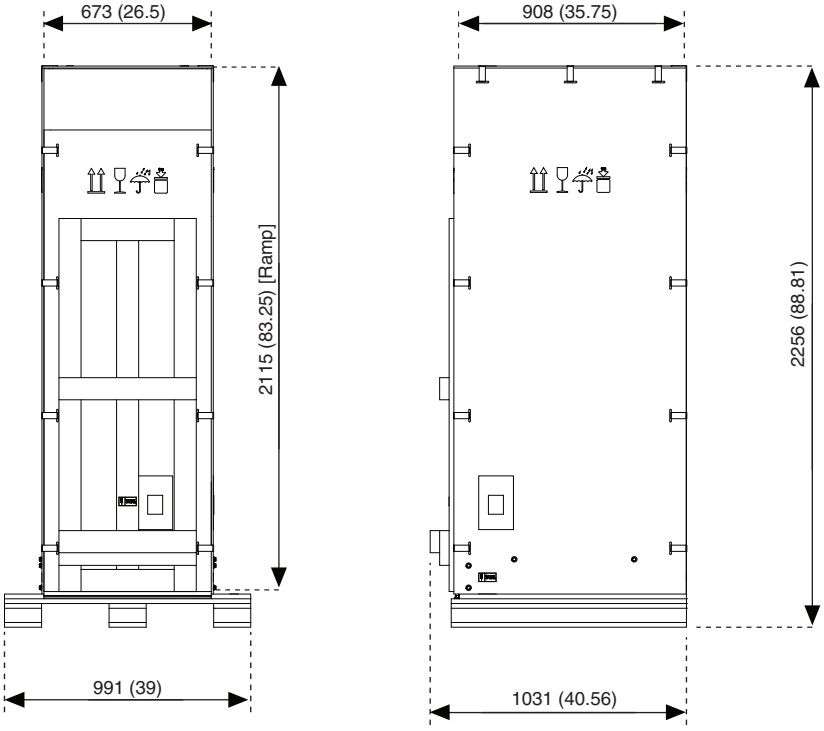


Figure 2-3. 40U Crate Dimensions

Dimensions are in millimeters (inches)



Required Tools

The ATE Core Configurations do not require special tools. Ensure that you have the following standard tools to bring up, maintain, and troubleshoot.

- Screwdrivers
  - Standard Head
    - Large size for side panels and uncrating
    - Small size for PDU DC connectors
  - Phillips Head (#1 and #2)
  - 1/2 in. wrench or socket (for uncrating)

Hallway and Door Width Requirements

Verify that all doors, elevators, and passageways en route to the final location are large enough to allow passage of the crated system. The crated system requires the use of a floor jack or forklift to engage the pallet and lift the crated system. Consider this when evaluating hallways, doors, and elevators along the route the system must travel.

If obstacles or lack of space restrict adequate crate movement, remove the system from the pallet in the receiving area and push it on the cabinet casters to the final destination.

The system is equipped with four rack mounted casters for easy movement throughout the facility. Due to weight distribution of the instrumentation, the system is most stable during movement when you push from the front or back of the rack. Avoid side-to-side movement except for final positioning.

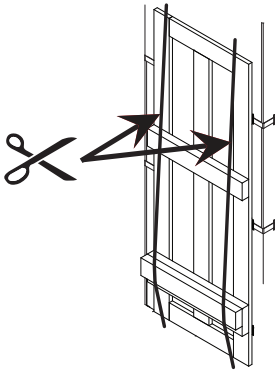
Caution Deploying the rack from the shipping crate requires moving it in a back-to-front direction. *Never* stand directly in front of the rack when loading or unloading from a shipping carton.

Uncrating the System

Note Do *not* discard any parts or packaging until you complete the system bring up and verification process.

1. Carefully cut the two vertical straps affixed to the container.

Figure 2-4. Cutting Vertical Straps



2. Remove clamps securing the ramp.
3. Lower the ramp and ensure ramp is attached to the crate using metal track on the base assembly.
4. Unscrew the four bolts on either side of the container (1/2 in. wrench or socket).

5. Remove the removable block at the top of the ramp.
6. Roll the rack out of the crate using the ramp.
7. Remove VpCI bag.
8. Move the system to its designated area.

Mechanical Stability and Loading

Precautions were taken in designing your rack configuration to ensure physical stability of the system. It is designed to not easily overbalance or tip. When adding equipment to the rack, it is important to preserve stability.

- For IEC 61010-1 compliance, the rack and all its equipment must weigh less than 1,000 lb. (453.5 kg), evenly distributed between each caster. Contact NI for more information about the weight of your rack as received.
- There may be steel ballast plates at the bottom of the rack. Do *not* remove the steel ballast plates. They are intended to improve the stability and safety of the rack based on its specific configuration.

Caution Stability is based on the specific configuration of the system ordered, when fully assembled. Your system may be shipped in separate crates or boxes. Use caution to ensure stability while moving your system, and prior to assembly of the configured system.

Caution If you remove equipment from the rack, it may no longer be compliant with IEC 61010-1 stability standards. Ensure that any modifications you make to the rack configuration maintain sufficient stability in accordance with IEC 61010-1. Any modifications made to the system not specified by the manufacturer may reduce the personal safety measures employed and compliance with IEC 61010-1. Such modification, removal, or installation of equipment must be done by a qualified and trained service person.

- To further improve the stability of the rack, it may be tethered to the floor or a wall. Make sure to keep all cooling clearances open if the rack is to be tethered. Ensure your tether is sufficient for the weight of the rack. Tethering should be done in accordance with local practices, and any securement should be made between the system frame and the surrounding structure by mechanical means able to support four times the load of the system.
- To ensure rack stability, any equipment over 10 lb. (4.5 kg) that hangs permanently outside of the rack must have external support such as legs.

Site Requirements

This section describes the requirements for the location where the ATE Core Configurations is operated. Verify that you have met all requirements before powering on.

Power Connection

The ATE Core Configurations contains a Power Entry Panel for AC Mains and a corresponding power plug.

The system must meet the following power connection requirements:

- AC Mains power must be supplied to the system power plug.
- Power cord(s) must meet the following criteria:
  - Cable/wires must be insulated for the highest voltage based on the input rating of the system, and properly sized for current rating.
  - Wire gauge specifications must meet or exceed requirements and in compliance with all applicable local codes and requirements.
  - Wired by a qualified electrician.

Power Recommendations

National Instruments recommends the following requirements.

- Provide separate AC branch for the system due to the current requirements of the system.
- Copper wire for the system drop between the AC source and system.
- Before servicing the ATE Core Configurations, physically remove the Mains plug from the power outlet.
- A minimum 20 A switch or circuit breaker must be provided in the installation for fully disconnecting/removing power for the high power, 3-phase systems. This device must be suitably located, easily reached, and identified as the disconnecting device for this system.

Caution You must press the Emergency Power Off (EPO) button, or turn the Main Power Switch on the EPO to the off position, to fully disable the UPS output power if the system includes the optional UPS.

Caution Verify the AC source and service conductor are sized correctly before connecting the system.

Cooling Requirements

The ATE Core Configurations ship with several features to help facilitate proper cooling, but due to instrumentation layout, third party devices, cabling, and mass interconnect, it is important to do a thorough thermal assessment of the final system assembly.

Each system ships with either a high or low speed fan panel including six 120 mm fans capable of driving a total of 540 CFM in the low speed fan panel configuration, or 1350 CFM in the high speed fan panel configuration. Additional airflow can be added with a 1U rack mount fan panel that utilizes three 4 in. fans (270 CFM) for targeted areas within the rack.

Each system configuration also includes a 4U vent below the rear door to facilitate airflow into the rack. Air filters are provided and it is recommended they be properly maintained based on environmental conditions. These filters are user serviceable and replacement kits are available on `ni.com`.

Note Do not block the top (exhaust vent) or air intake.

NI recommends maintaining 2U of open space directly above and below the Power Entry Panel to allow for proper airflow through the panel.

NI also recommends against adding equipment to the top 1U of the rack, or modifying the position of the PDU and Ethernet switch located at the top of the rack. NI has validated sufficient cooling with the PDU and Ethernet switch in their pre-installed locations.

Exhaust

The exhaust air from all instruments should have an unobstructed pathway to exit the rack. Arrange instruments to provide a continuous airflow path from all instrument outlets.

3

Safety Information

Safety Requirements

The following general safety requirements and specifications must be observed during all phases of operation of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in the system documentation violates safety standards of design, manufacture, intended use, and could invalidate the warranty of the system. This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury. NI assumes no liability for the customer's failure to comply with these requirements.

Note Using the ATE Core Configurations, or any component within, in a manner not specified by the manufacturer may reduce or eliminate equipment and/or personnel safety measures.

Caution Where this symbol is used, documentation must be consulted.

Before connecting the system to a power source, read this section and verify that you have complied with all safety requirements and specifications.

Caution Before undertaking any bring up, troubleshooting, maintenance, or exploratory procedure, carefully read the following caution notices.

Note Refer to the *APC UPS Operation Manual* for detailed information and specifications for this accessory if applicable.

AC Mains Cables

The following cables are available from National Instruments under the following orderable part numbers:

Table 3-1. Low Power Configuration Power Cables

Part Number	Description
785708-01	AC, IEC C19 to NEMA 5-20P, 2.5 m
785714-04	AC, IEC C19 to CEE7, 3P, 16 A, 2.5 m
785714-09	AC, IEC C19 to CEE7, 3P, 16 A, 2.5 m (KCC)
785714-10	AC, IEC C19 to GB3, 3P, 16 A, 2.5 m

-

Table 3-2. Mid Power Configuration Power Cables

Part Number	Description
785718-01	AC, Single Phase IEC 60309, 2P+E, Receptacle, to IEC 60309, 2P+E, Plug, 2.5 m
785719-01	AC, Single Phase IEC 60309, 2P+E, Receptacle, to NEMA L6-30, 2.5 m
785735-01	IEC 60309, 2P+E, pin and sleeve (connector only)

Table 3-3. High Power Configuration Power Cable

Part Number	Description
785717-01	AC, Three Phase IEC 60309, 3P+N+E, Receptacle, to IEC 60309, 3P+N+E, Plug, 2.5 m
785734-01	IEC 60309, 3P+N+E, pin and sleeve (connector only)

Refer to *Appendix B, Internal Power Cables* for information about internal cables.

Removing Power

Caution To completely interrupt power to a single phase system, you *must* disconnect the AC power cable. Do *not* position equipment so that it is difficult to disconnect the cable.

To completely interrupt power to a three phase system, you *must* switch off the Main Breaker on the Power Entry Panel. Do *not* position equipment so that it is difficult to access the main breaker.

Caution You *must* press the Emergency Power Off (EPO) button, or turn the Main Power Switch on the EPO to the off position, to fully disable the UPS output power if the system includes the optional UPS.

Operator Safety Information

Cables and connectors are considered inaccessible if a tool (screwdriver, wrench, socket, etc.) or a key (equipment in a locked cabinet) is required to gain access to a conductive surface connected to any cable conductor.

Caution Access is prohibited to operators and is to be done by a trained service person only.

Caution Filler panels shall be installed in all empty slots on the front of the rack so that operator access to interior equipment surfaces is restricted.

Caution Verify equipment under test has adequate insulation between the cable connections and any operator-accessible parts (doors, covers, panel shields, cases, cabinets, etc.).

Safety Features

Safety Shutoff Thermostats

ATE Core Configurations has two safety shutoff thermostats (or four if the system is configured with a UPS) on the interior surface of the fan cooling panel located at the top of the rack. The thermostats are configured to shut the system off in the event the rack is unable to provide adequate cooling, preventing a safety hazard to the user. When triggered by a severe over temperature event, the thermostats will shut down the system by cutting power at the Power Entry Panel AC outlet(s), immediately shutting off power to any downstream equipment (including the PDUs).

Caution Once the thermostats have tripped, any touchable or accessible surface should be allowed to cool to 65° C before servicing the system. All service must be done by a trained service person.

To reset the thermostats once they have tripped, locate the thermostats on the interior surface of the fan panel at the top of the rack, and depress the red button located on the bottom facing surface of each thermostat. The system should now power on as normal once the powering on procedure has been utilized. Refer to the *Powering On* section of Chapter 4, *System Bring Up*, for more information about this procedure.

If the thermostats have tripped it is likely a result of a fault in the system (such as a fan failure) and should be addressed before the system is allowed to resume normal operation.

Caution Do not attempt to reset the thermostats until their temperature is below 45° C.

Note The thermostats are configured so they will not activate under normal operating conditions, recommended power levels, cooling configuration, and ambient environment. If the thermostats are triggered and no equipment fault can be found in the system, the system may be configured in such a way that there is an extreme thermal load in a small area of the system. Care should be taken to configure the system so thermal loads are spread evenly throughout the interior of the system.

Caution Switch off the Main Breaker before attempting to reset the thermostats.

Emergency Power Off (EPO) Panel

The EPO Panel can be used to disable the PEP, PDU(s), optional UPS, and any equipment connected to them.

EPO Temperature Controller

The secondary temperature controller on the EPO panel is user configurable and can be used to control the operation of the system for thermal performance, but is not a safety temperature protective device.

Circuit Protection

Several layers of circuit protection are designed into the systems. The Power Entry Panel has circuit protection to ensure the overall system does not draw current beyond the Mains power limit.

Walls and Rear Door

All configurations come with pre-installed removable side walls and locking rear door. Side panels utilize quarter-turn inset screws for easy serviceability. The rear door may be easily removed using the spring-loaded hinges attaching it to the rack frame.

Grounding

The Power Entry Panel must be connected to a power source that has a proper ground. You should be able to choose any piece of equipment in the test system that is an end power consumer and follow its path to ground back to the Power Entry Panel.

4

System Bring Up

Before powering on your system, ensure all equipment is present. Make sure all system components are properly connected before proceeding. Your ATE Core Configurations system will arrive from NI without interconnects between the modules and devices.

Note Your exact configuration may consist of all the required elements and any optional components.

System Hardware

Power Entry Panel (PEP)

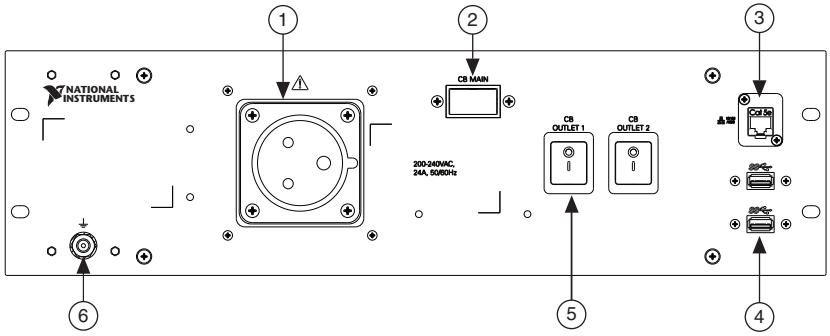
There are four distinct power configurations available with the ATE Core Configurations:

- Low Power
- Mid Power
- High Power (Delta)
- High Power (Wye)

Each Power Entry Panel contains:

- Applicable IEC power entry connector
  - Low Power: IEC 60320 C20
  - Mid Power: IEC 60309 2P+E
  - High Power (Delta and Wye): IEC 60309 3P+N+E
- Applicable circuit protection
- Applicable line filter for EMI protection within the system
- Applicable kill-switch relay for emergency shutoff of Mains power via EPO Panel
- Two USB 3.0 ports with attached 2 m cable
- One Gigabit Ethernet port
- One external grounding lug with internal grounding plate connections for all rack mount equipment

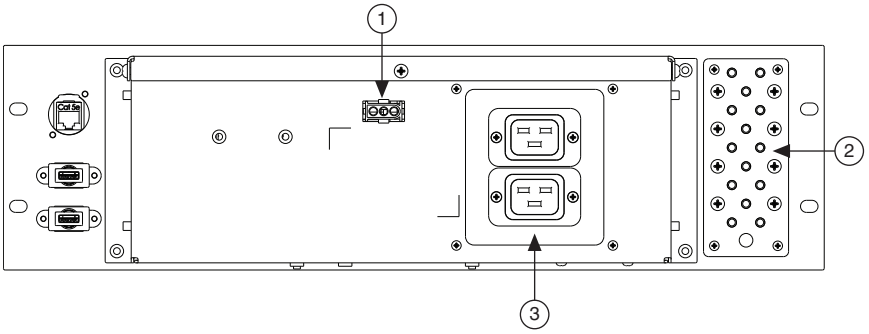
Figure 4-1. Front View of Power Entry Panel



1	Power Inlet Connector	3	Ethernet Port	5	Individual Outlet Breakers (Mid Power Only)
2	Main Breaker	4	USB Ports	6	Ground Stud

Note Mid Power PEP shown, components are representative.

Figure 4-2. Rear View of Power Entry Panel Rear



1	DC Output to EPO Panel	2	Grounding Plate	3	Output Connector(s)

Note Mid Power PEP shown, components are representative.

Main Disconnect and Circuit Breakers

The Main Breaker on the Power Entry Panel controls whether AC power will be allowed into the rack. If the Main Breaker is off, the rack cannot be powered on.

The Mid Power, Power Entry Panel has two additional circuit breakers controlling power output from the Power Entry Panel individually to each Power Distribution Unit in the system.

USB Ports

The Power Entry Panel has two USB ports which provide access to extension cables within the rack. These cables can be connected to provide external access to USB ports on internal equipment.

Ethernet Port

The Power Entry Panel has an Ethernet port connected to a switch inside the rack to facilitate network connectivity to internal equipment. Refer to Figure 1-5, *Cutaway View of Ethernet Switch Location* for more details about the Ethernet Switch location.

Connecting to a Network

Complete the following steps to connect the ATE to a network.

1. Connect an active network cable to the Ethernet port on the Power Entry Panel
2. Configure the network and user settings according to the standard practices of your facility and within the IP address setting restrictions.

Removing Power

Caution To completely interrupt power to a single phase system, you *must* disconnect the AC power cable. Do not position equipment so that it is difficult to disconnect the cable.

To completely interrupt power to a three phase system, you *must* switch off the main breaker on the Power Entry Panel. Do *not* position equipment so that it is difficult to access the main breaker. Do *not* proceed unless qualified personnel has reviewed all installation instructions, written warnings and cautions.

Caution You *must* press the Emergency Power Off (EPO) button, or turn the Main Power Switch on the EPO to the off position, to fully disable the UPS output power if the system includes the optional UPS.

Power Distribution Unit (PDU)

A PDU takes an input power signal and distributes it to a number of outlets that can power components of the system. These internal power outlets from the PDU have a rated voltage and current and are available for both alternating and direct current.

- Low Power ATE Core Configuration systems utilize a single-phase PDU that supports global voltages (100-240 V, 50-60 Hz) and has a 20 A (IEC C19) input connector which cables directly to the Power Entry Panel.
- Mid Power ATE Core Configuration systems support double the total system power of the low-power systems. Mid Power systems utilize two of the single-phase PDUs with the exception that the second PDU does not provide DC outputs. Both PDUs wire directly to the Power Entry Panel.

- High Power ATE Core Configuration systems utilize a three-phase PDU that supports global voltages (200-208 V Delta and 380-415 V Wye, 50-60 Hz) and has a fixed 16 A (IEC 60309 3P + N + E) power cable which connects directly to the Power Entry Panel.

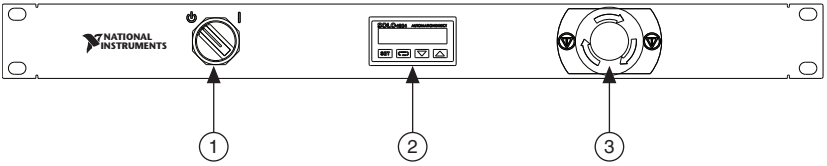
Refer to your Power Distribution Unit user documentation for more information about the PDU.

Emergency Power Off (EPO) Panel

When a test system encounters a serious issue or an emergency is taking place in the facility, operators need the ability to quickly and cleanly power off the test system. EPO mechanisms are included on the ATE Core Configurations to simplify connectivity and inhibit power switching.

Operators may use the EPO to reset a system in an error state, prevent damage to a DUT, or even prevent harm to themselves.

Figure 4-3. EPO Panel



1 Main Power Switch 2 Temperature Controller 3 EPO Button

Emergency Power Off (EPO) Button

The EPO button is one way to control whether the system is powered. If the EPO button is pressed, power will not flow past the PEP or optional UPS. To release the EPO button once it has been pressed, rotate it clockwise.

Main Power Switch

The Main Power Switch is the primary way of controlling whether the system is active. It toggles between two positions: Standby and On.

Temperature Controller

The Temperature Controller (AutomationDirect SL4824-RR-D) will shut off the rack if the internal temperature reaches a certain user programmable level. The controller measures temperature based on the location of the attached thermocouple.

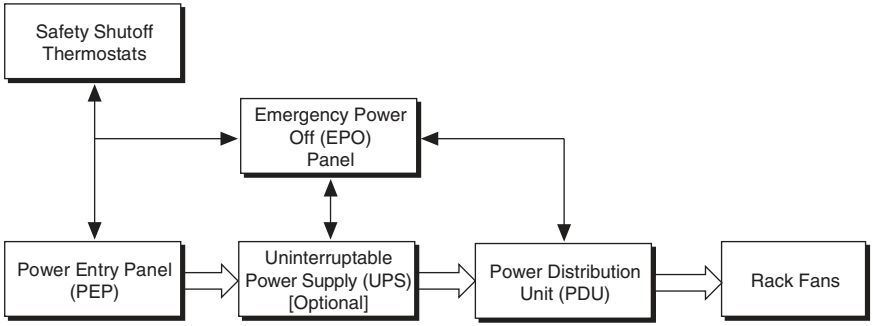
Uninterruptable Power Supply (UPS)

You can use the UPS to power critical components in your system during power loss, brownouts, and during normal operation as well. The UPS delivers power with a dependable voltage and current supply. It acts as a battery power supply after a power outage or significant brownout.

Refer to your Uninterruptable Power Supply user documentation for more information about the UPS.

System Block Diagrams

Figure 4-4. Low Power System Block Diagram



Note PDU connects directly to the PEP if there is not a UPS installed.

Figure 4-5. Mid Power System Block Diagram

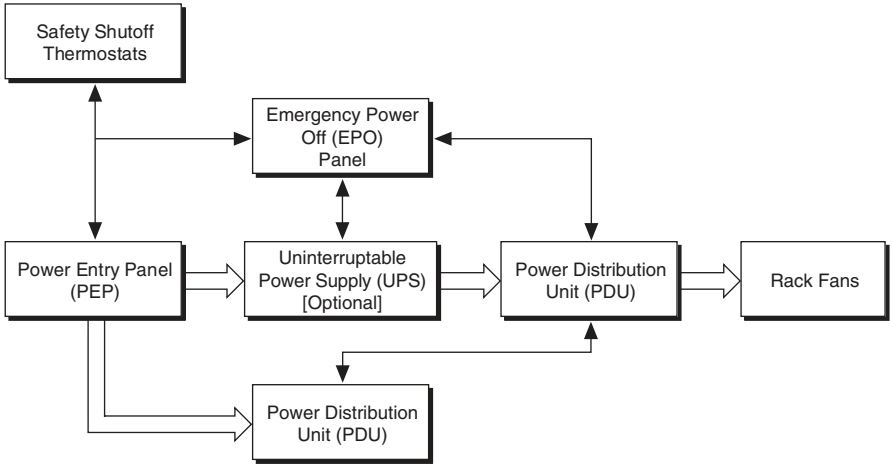
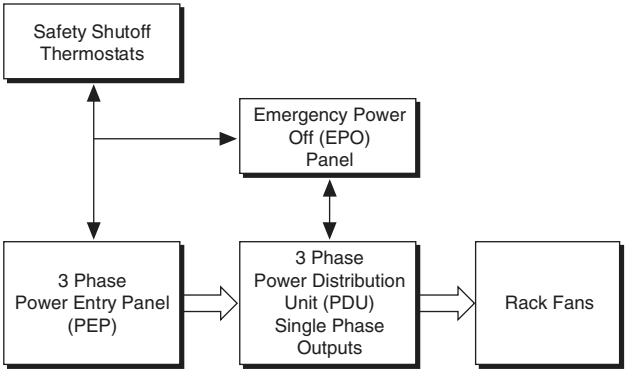


Figure 4-6. High Power System Block Diagram



Power States

The ATE Core Configuration system has multiple states of operation:

- **Off**—The system is entirely disabled with no power passing through the line filter or any internal test system components.

  To turn power off, switch the Main Beaker on the Power Entry Panel to the off position, or disconnect Mains power from the Power Entry Panel.
- **Standby**—DC power is passing out of the PEP and into the thermostat EPO panel in the **Standby** state.

  The system is in Standby MAINs power is connected to the PEP and Main Breaker on the PEP is in the on position, but one (or more) of the following is true:
  - EPO button is depressed
  - Main Power Switch on EPO Panel is off
  - Temperature controller on the EPO Panel is reading a higher temperature than the programmed shutoff value
  - Safety shutoff thermostats have detected an unsafe air exit temperature
- **On**—A change to this state begins the main power on sequence of the test system. All PDUs receive AC power and enable outlets to other system equipment.
- **Emergency Power Off (EPO)**—The EPO immediately cuts AC power from the PEP, PDU(s), and optional UPS when a user or system monitor recognizes an unacceptable operating condition. This returns the system to the **Standby** state until the EPO button is released. The system will power back up once the EPO button is released, unless the Main Power switch or Main Breaker are turned off.

Powering On

Complete the following steps to power on the ATE Core Configurations.

Caution Do not proceed unless qualified personnel has reviewed all installation instructions, written warnings, and cautions.

1. Verify that the Power Inlet Connector on the Power Entry Panel is connected to AC Mains.
2. Verify that the Main Breaker (and individual outlet breakers on Mid Power Panel) on the back of the Power Entry Panel is in the **ON** position.
3. Confirm that the **Emergency Power Off (EPO)** button is not depressed.
4. Verify that the programmed temperature shutoff value of the temperature controller located on the EPO Panel is above the current temperature reading in the system.
5. Rotate the **Main Power** switch, located on the EPO panel, to the **On** position.

5

Maintenance

This section describes preventative maintenance procedures, how often the procedures need to be performed, and where further maintenance details can be found.

Caution *Always* disconnect the AC power cable, and switch the Main Breaker to the off position, before cleaning or servicing the system.

Table 5-1. Required Maintenance Schedule

Procedure	Frequency	Required
Cleaning exterior	As needed	Yes
Cleaning air intake filter(s)	Monthly, as needed	Yes

Cleaning

Cleaning the Exterior

Clean exterior surfaces with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, wipe with a cloth moistened in a mild soap solution. Remove any soap residue by wiping with a cloth moistened with clear water. Do *not* use abrasive compounds on any part of the ATE Core Configurations.

Caution Avoid getting moisture inside the system during exterior cleaning. Use only enough moisture to dampen the cloth.

Caution Do *not* wash the front- or rear-panel connectors or switches. Cover these components while cleaning the ATE Core Configurations.

Caution Do *not* use harsh chemical cleaning agents; they may damage the system. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Cleaning Air Intake Filters

Clean the air intake filters using warm water with a mild soap solution, then air dry the filters to remove moisture.

Caution Avoid installing wet filters into the ATE Core Configurations. Verify that the filters are thoroughly dry before re-installing.

Replacement Parts

Optional replacement power entry panels are available from National Instruments. The following table lists available power entry panels and their orderable part numbers.

Table 5-2. Replacement Power Entry Panels

Part Number	Model	Description
785797-01	PEP-116	RMX-10040 Power Entry Panel (1-Phase, 16 A)
785798-01	PEP-130	RMX-10040 Power Entry Panel (1-Phase, 24 A)
785799-01	PEP-3W16	RMX-10040 Power Entry Panel (3-Phase Wye, 16 A)
785800-01	PEP-3D16	RMX-10040 Power Entry Panel (3-Phase Delta, 16 A)

Table 5-3. Spare and Replacement Parts

Part Number	Description
784839-01	Spare caster set
785520-01	Spare air filter panel
785791-01	Replacement air filters, Qty 5
784840-01	Spare fan panel (low speed)
784840-02	Spare fan panel (high speed)
785515-01	Spare side panel 24U
785516-01	Spare side panel 40U
785517-01	Spare rear door panel 24U
785518-01	Spare rear door panel 40U
785521-01	Spare mounting rails 24U, Qty 2
785522-01	Spare mounting rails 40U, Qty 2

Table 5-3. Spare and Replacement Parts (Continued)

Part Number	Description
785523-01	Spare cable manager 24U
785524-01	Spare cable manager 40U
785512-01	1U filler panels for 19 in. rack. Qty 5.
785513-01	3U filler panels for 19 in. rack. Qty 3.

Note Other replacement parts available. Contact NI for more information.

Note Not all default components inside the ATE Core Configurations are eligible for service program coverage. The items eligible for service program coverage include the PDU, EPO Panel, and the Moxa Ethernet Switch.

Calibration

Calibration for each ATE Core Configurations component is available and can be coordinated through your local sales representative, or by contacting the designated support resources.

Table 5-4. Component Repair and Calibration for ATE Core Configurations

Component	Required/Optional	Serviceable	Calibration Required
Rack	Required	No	No
Rack Panels	Optional	No	No
Rack Fan Panel	Required	No	No
Air Filter	Required	No	No
UPS	Optional	No	No
Rack Mount for UPS	Required (when UPS is mounted)	No	No
Power Input Connectors	Required	No	No
PDU	Required	Yes	No
Ethernet Switch	Required	Yes	No

A

Specifications

This section contains specifications for the ATE Core Configurations.

Mechanical

Contact National Instruments for the weight of your rack as configured. To estimate your rack's weight without a scale, add the weight of each piece of equipment in the rack to the following base values:

Base configuration weight
(rack, fan panel, power entry panel, PDU) ..... 320 lb. (145 kg)

Ballast plate weight (each) ..... 45 lb. (20.4 kg)

Maximum weight (Base configuration, and all equipment installed, stored, or attached to rack)

24U, 40U rack..... 1,000 lb. (453.5 kg), evenly distributed across each caster

Keyboard shelf (optional)..... 30 lb. (13.6 kg)

Storage drawer (optional) ..... 30 lb. (13.6 kg)

The outlet circuit breaker(s) on the power entry panels PEP-116 and PEP-130 for Low and Mid power ATE Core Configurations are rated for an impact energy level of IK06 (1J), when tested with a direct vertical impact per IEC 61010-1, 3rd Ed., Table 15 and Clause 8.2. The circuit breakers should be guarded against impacts exceeding 1J.

Core System Hardware

24U Rack Dimensions

System height ..... 53.5 in. (1,358.9 mm)

System width ..... 23 in. (584.2 mm)

System depth..... 31.5 in. (800 mm)

Mountable depth ..... 29.5 in. (749.3 mm)

Max static load..... 1,000 lb. (453.5 kg), evenly distributed across each caster

40U Rack Dimensions

System height.....81.5 in (2,070.1 mm)

System width.....23 in. (584.2 mm)

System depth.....31.5 in. (800 mm)

Mountable depth .....29.5 in. (749.3 mm)

Max static load.....1,000 lb. (453.5 kg), evenly distributed across each caster

Environment

Maximum altitude.....2,000 m (800 mbar)
Allowable power dissipation is decreased by 25% at 2000 m. Refer to Tables A-1 through A-5 in the *Maximum Thermal Load* section for more information.

Pollution degree 2

Indoor use only.

Overvoltage category II

Operating Environment

Ambient temperature is defined as the temperature that exists just outside of the air intake on the bottom rear of the rack. This temperature may be higher than ambient room temperature depending on the surrounding equipment and/or blockages present. You *must* ensure that this ambient temperature does not exceed the rated ambient temperature range.

Ambient temperature range .....5° C to 40° C

Relative humidity range .....10% to 80%, non condensing;

For proper ventilation, keep the following areas clear of obstructions:

Above top of fan panel.....30 in. (762 mm)

Adjacent to the intake panel.....12 in. (304.8 mm)

Storage Environment

Ambient temperature range .....0 °C to 65 °C

Relative humidity range.....10% to 80%, non condensing

Acoustic Emissions

Sound Pressure Level (at Operator Position)

High speed fan panel ..... 92 dBA max. at operator position
85 dBA max. at bystander position (1 m away)

Caution All personnel must use hearing protection while the RMX-10011 system with a high speed fan panel is in operation.

Electrical

AC Ratings

Low Power (ATE-116H-A, ATE-116F-A)

Rating

- Input ..... 100 to 240 VAC, 16 A, 50/60 Hz (No UPS)
  100 to 120 VAC, 16 A, 50/60 Hz (with 120 V UPS)
  200 to 240 VAC, 16 A, 50/60 Hz (with 240 V UPS)
- PDU Output ..... 100 to 120 VAC, 10 A (per receptacle), 50/60 Hz
  - Total AC Output ..... 15.2 A with low speed fan panel
    12.9 A with high speed fan panel
    8.7 A with DC supply fully loaded
- PDU Output ..... 200 to 240 VAC, 10 A (per receptacle), 50/60 Hz
  - Total AC Output ..... 15.5 A with low speed fan panel
    14.5 A with high speed fan panel
    12.4 A with DC supply fully loaded

Mid Power (ATE-130H-A, ATE-130F-A)

Rating

- Input ..... 200 to 240 VAC, 24 A, 50/60 Hz
- PDU Output (each) ..... 200 to 240 VAC, 16 A total,
  10 A maximum per receptacle, 50/60 Hz
  - Total AC Output of PDU with DC ..... 15.5 A with low speed fan panel
    14.5 A with high speed fan panel
    12.4 A with DC supply fully loaded
- PDU Output (combined) ..... 200 to 240 VAC, 24 A maximum, 50/60 Hz

Note 24 A maximum must account for power consumed by fan panel and other required DC loads.

High Power 3-Phase Wye (ATE-3W16H-A, ATE-3W16F-A)

Rating

Input.....220/380 to 240/415 VAC, 16 A, 50/60 Hz, 3P+N+PE, 3Φ

PDU Output (each phase) .....220 to 240 VAC, 10 A maximum per C13 receptacle, 16 A maximum per C19 receptacle, 50/60 Hz (single phase)

Bank J1 .....15.5 A with low speed fan panel
14.4 A with high speed fan panel
12.7 A with DC supply fully loaded

High Power 3-Phase Delta (ATE-3D16H-A, ATE-3D16F-A)

Rating

Input.....200 to 208 VAC, 16 A, 50/60 Hz, 3P+PE, 3Φ

PDU Output (each phase) .....200 to 208 VAC, 9.2 A, 50/60 Hz (single phase)

Bank J1 .....8.7 A with low speed fan panel
7.7 A with high speed fan panel
5.6 A with DC supply fully loaded

Note Loads connected to the PDU Output receptacles/banks must be within the maximum ratings of the PDU and should be balanced between the outputs to ensure optimal performance.

DC Ratings

		Maximum Output Current	
Output	**Voltage**	**100 to 120 VAC Input**	**200 to 240 VAC Input**
DC1	12 VDC	10.4 A	12.5 A
DC2	24 VDC	5.2 A	6.25 A
DC3	24 VDC	5.2 A	6.25 A
DC4	48 VDC	2.6 A	3.13 A

- The low speed fan panel consumes 1.38 A at 24 VDC (DC2).
- The high speed fan panel consumes 5.1 A each from both 24 VDC outputs (DC2 and DC3). For a total of 10.2 A.
- Ethernet hub consumes 0.1 A at 48 VDC (DC4)
- Available output current must be reduced by current drawn by fan panel and Ethernet hub.

Maximum Thermal Load

The following tables represent the maximum power that can be dissipated inside the rack for a given ambient environment, fan panel selection, and lowest thermally rated equipment installed in the rack. Additional power beyond the rated levels can be passed through to equipment located externally to the rack (for example, using NI 1U RMX DC Power Supplies to power a device under test where the load is physically outside of the rack).

Caution The ATE Core Configurations have been validated and rated to work with certified equipment with ambient temperature ratings that fall within the maximum internal temperature ratings of 45 °C or 50 °C in the following tables.

Equipment with ambient temperature ratings below 45 °C have not been validated to work with the ATE Core Configurations systems. If equipment rated below 45 °C is used, care must be taken to ensure the operating conditions of the equipment are not violated. Consideration should be given to the thermal load around the equipment, the location of the equipment's air intake, exhaust air location of nearby equipment, and the end use ambient environment the system will be installed in.

Please refer to following examples for guidelines on using the tables.

Example 1 — A mid power rack will be used in a typical manufacturing environment (28 °C ambient) with a low speed fan panel, and the rack configuration will include equipment that has operational ambient temperature ratings up to 45 °C. The maximum power that can be dissipated in this rack is 2,550 W.

Example 2 — A high power Wye three phase rack will be used in a typical room temp environment (23 °C ambient) with a high speed fan panel, and the rack configuration will contain equipment that has operational ambient temperature ratings of 50 °C (and no equipment with a maximum rating below 50 °C). The maximum power that can be dissipated in this rack is 8,500 W.

Note The ambient temperature ratings and power dissipation limitations in the chart above do not guarantee the thermal performance of equipment in the rack, only that the rack contains adequate cooling capacity to provide the rated internal rack ambient needed to support properly rated and installed equipment. Ensure that individual pieces of equipment installed in the rack are within their specified operational ranges.

Note All equipment inside the rack must be powered, directly or indirectly, through the rack Power Entry Panel. Other sources of external power must *not* be used.

Table A-1. Low Power (100 to 120 VAC, 16 A, 50/60 Hz Input) (Watts)

	Low Speed Fan Panel		High Speed Fan Panel	
	Max. Internal Temp		Max. Internal Temp	
24U or 40 U Configurations	**45 °C**	**50 °C**	**45 °C**	**50 °C**
40 °C Ambient (Maximum Mfg Environment)	500 W	1,350 W	1,500 W	1,500 W
28 °C Ambient (Typical Mfg Environment)	1,870 W	1,870 W	1,620 W	1,620 W
23 °C Ambient (Typical Room Temperature)	1,870 W	1,870 W	1,620 W	1,620 W

Table A-2. Low Power (200 to 240 VAC, 16 A, 50/60 Hz Input) (Watts)

	Low Speed Fan Panel		High Speed Fan Panel	
	Max. Internal Temp		Max. Internal Temp	
24U or 40 U Configurations	**45 °C**	**50 °C**	**45 °C**	**50 °C**
40 °C Ambient (Maximum Mfg Environment)	500 W	1,350 W	1,500 W	1,500 W
28 °C Ambient (Typical Mfg Environment)	2,550 W	3,400 W	3,540 W	3,540 W
23 °C Ambient (Typical Room Temperature)	3,400 W	3,790 W	3,540 W	3,540 W

Table A-3. Mid Power (200 to 240 VAC, 24 A, 50/60 Hz Input) (Watts)

	Low Speed Fan Panel		High Speed Fan Panel	
	Max. Internal Temp		Max. Internal Temp	
24U or 40 U Configurations	**45 °C**	**50 °C**	**45 °C**	**50 °C**
40 °C Ambient (Maximum Mfg Environment)	500 W	1,350 W	1,500 W	1,500 W
28 °C Ambient (Typical Mfg Environment)	2,550 W	3,400 W	5,460 W	5,460 W
23 °C Ambient (Typical Room Temperature)	3,400 W	4,300 W	5,460 W	5,460 W

Table A-4. High Power (3 Phase Delta, 200 to 208 VAC, 16 A, 50/60 Hz Input) (Watts)

	Low Speed Fan Panel		High Speed Fan Panel	
	Max. Internal Temp		Max. Internal Temp	
24U or 40 U Configurations	**45 °C**	**50 °C**	**45 °C**	**50 °C**
40 °C Ambient (Maximum Mfg Environment)	500 W	1,350 W	1,500 W	1,500 W
28 °C Ambient (Typical Mfg Environment)	2,550 W	3,400 W	5,440 W	5,440 W
23 °C Ambient (Typical Room Temperature)	3,400 W	4,300 W	5,440 W	5,440 W

Table A-5. High Power (3 Phase Wye, 220/380 to 240/415 VAC, 16 A, 50/60 Hz Input) (Watts)

24U or 40 U Configurations	Low Speed Fan Panel		High Speed Fan Panel	
	Max. Internal Temp		Max. Internal Temp	
	45 °C	50 °C	45 °C	50 °C
40 °C Ambient (Maximum Mfg Environment)	500 W	1,350 W	1,500 W	1,500 W
28 °C Ambient (Typical Mfg Environment)	2,550 W	3,400 W	6,500 W	8,500 W
23 °C Ambient (Typical Room Temperature)	3,400 W	4,300 W	8,500 W	8,500 W

Note Refer to *Electrical* section for the maximum electrical ratings.

Safety

This product is designed to meet the requirements of the following standards of safety for test and measurement equipment:

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

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

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
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) 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 For EMC declarations and certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2014/35/EC; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

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 *Minimize Our Environmental Impact* 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.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 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 National Instruments 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`.)

B

Internal Power Cables

This appendix lists the internal power cables for the ATE Core Configurations.

Table B-1. RMX-10011 Internal Power Cables

Part Number	Description
785707-01	AC, IEC C20 to NEMA 5-20R, 125 V, 16 A, 0.25 m (US)
785708-01	AC, IEC C19 to NEMA 5-20P, 125 V, 16 A, 2.5 m (US)
785709-01	AC, IEC C20 to IEC C13, 240 V, 10 A (EU), 16 A (UL), 1.5 m (US, EU)
785709-02	AC, IEC C20 to IEC C13, 240 V, 10 A (EU), 16 A (UL), 2.5 m (US, EU)
785710-01	AC, IEC C20 to IEC C19, 240 V, 16 A, 1.5 m (US, EU, China, Korea)
785710-0112	AC, IEC C20 to IEC C19, 240 V, 16 A, 1.5 m (Japan)
785710-02	AC, IEC C20 to IEC C19, 240 V, 16 A, 2.5 m (US, EU, China, Korea)
785710-0212	AC, IEC C20 to IEC C19, 240 V, 16 A, 2.5 m (Japan)
785711-01	AC, IEC C20 to Bare Wire, 240 V, 16 A, 1.5 m (US, EU, China, Korea)
785711-0112	AC, IEC C20 to Bare Wire, 240 V, 16 A, 1.5 m (Japan)
785711-02	AC, IEC C20 to Bare Wire, 240 V, 16 A, 2.5 m (US, EU, China, Korea)
785711-0212	AC, IEC C20 to Bare Wire, 240 V, 16 A, 2.5 m (Japan)
785712-01	AC, IEC C14 to Bare Wire, 240 V, 10 A, 1.5 m (EU, China, Korea)
785712-02	AC, IEC C14 to Bare Wire, 240 V, 10 A, 2.5 m (EU, China, Korea)
785713-01	AC, IEC C14 to IEC C13, 240 V, 10 A, 1.5 m (US)
785713-0112	AC, IEC C14 to IEC C13, 240 V, 10 A, 1.5 m (Japan)
785713-02	AC, IEC C14 to IEC C13, 240 V, 10 A, 2.5 m (US)
785713-0401	AC, IEC C14 to IEC C13, 240V, 10 A, 1.5 m (EU, China, Korea)
785713-0402	AC, IEC C14 to IEC C13, 240V, 10 A, 2.5 m (EU, China, Korea)
785727-01	AC, NEMA 5-20P to Bare Wire, 125 V, 20 A, 1.5m (US)

Table B-1. RMX-10011 Internal Power Cables (Continued)

Part Number	Description
785727-02	AC, NEMA 5-20P to Bare Wire, 125 V, 20 A, 2.5m (US)
785892-01	AC, IEC C14 to Bare Wire, 240 V, 10 A, 1.5 m (US)
785892-02	AC, IEC C14 to Bare Wire, 240 V, 10 A, 2.5 m (US)

C

NI Services

National Instruments provides global services and support as part of our commitment to your success. Take advantage of product services in addition to training and certification programs that meet your needs during each phase of the application life cycle; from planning and development through deployment and ongoing maintenance.

To get started, register your product at ni.com/myproducts.

As a registered NI product user, you are entitled to the following benefits:

- Access to applicable product services.
- Easier product management with an online account.
- Receive critical part notifications, software updates, and service expirations.

Log in to your National Instruments ni.com User Profile to get personalized access to your services.

Services and Resources

- **Maintenance and Hardware Services—**NI helps you identify your systems' accuracy and reliability requirements and provides warranty, sparing, and calibration services to help you maintain accuracy and minimize downtime over the life of your system. Visit ni.com/services for more information**.**
  - **Warranty and Repair—**All NI hardware features a one-year standard warranty that is extendable up to five years. NI offers repair services performed in a timely manner by highly trained factory technicians using only original parts at a National Instruments service center.
  - **Calibration—**Through regular calibration, you can quantify and improve the measurement performance of an instrument. NI provides state-of-the-art calibration services. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit ni.com/alliance.

- **Training and Certification**—The NI training and certification program is the most effective way to increase application development proficiency and productivity. Visit ni.com/training for more information.
  - The Skills Guide assists you in identifying the proficiency requirements of your current application and gives you options for obtaining those skills consistent with your time and budget constraints and personal learning preferences. Visit ni.com/skills-guide to see these custom paths.
  - NI offers courses in several languages and formats including instructor-led classes at facilities worldwide, courses on-site at your facility, and online courses to serve your individual needs.
- **Technical Support**—Support at ni.com/support includes the following resources:
  - **Self-Help Technical Resources**—Visit ni.com/support for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on. Registered users also receive access to the NI Discussion Forums at ni.com/forums. NI Applications Engineers make sure every question submitted online receives an answer.
  - **Software Support Service Membership**—The Standard Service Program (SSP) is a renewable one-year subscription included with almost every NI software product, including NI Developer Suite. This program entitles members to direct access to NI Applications Engineers through phone and email for one-to-one technical support, as well as exclusive access to online training modules at ni.com/self-paced-training. NI also offers flexible extended contract options that guarantee your SSP benefits are available without interruption for as long as you need them. Visit ni.com/ssp for more information.
- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification.

For information about other technical support options in your area, visit ni.com/services, or contact your local office at ni.com/contact.

You also can visit the Worldwide Offices section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Glossary

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

Symbols

°	Degrees.
≥	Equal or greater than.
≤	Equal or less than.
%	Percent.

A

A	Amperes.
AC	Alternating current.
ANSI	American National Standards Institute.
Auto	Automatic fan speed control.
AWG	American Wire Gauge.

B

backplane	An assembly, typically a printed circuit board, with connectors and signal paths that bus the connector pins.
BNC	Bayonet Neill Concelman connector; a commonly used coaxial connector.

C

C	Celsius.
cfm	Cubic feet per minute.
CFR	Code of Federal Regulations.
cm	Centimeters.
CompactPCI	An adaptation of the Peripheral Component Interconnect (PCI) Specification 2.1 or later for industrial and/or embedded applications requiring a more robust mechanical form factor than desktop PCI. It uses industry standard mechanical components and high-performance connector technologies to provide an optimized system intended for rugged applications. It is electrically compatible with the PCI Specification, which enables low-cost PCI components to be utilized in a mechanical form factor suited for rugged environments.
CSA	Canadian Standards Association.

D

daisy-chain	A method of propagating signals along a bus, in which the devices are prioritized on the basis of their position on the bus.
DB-9	A 9-pin D-SUB connector.
DC	Direct current.
DoC	Declaration of Conformity.
D-SUB	Subminiature D connector.

E

efficiency	Ratio of output power to input power, expressed as a percentage.
EIA	Electronic Industries Association.
EMC	Electromagnetic Compatibility.
EMI	Electromagnetic Interference.

F

FCC	Federal Communications Commission.
filler panel	A blank module front panel used to fill empty slots in the chassis.

G

g	(1) grams; (2) a measure of acceleration equal to 9.8 m/s^2.
GPIB	General Purpose Interface Bus (IEEE 488).
g_{RMS}	A measure of random vibration. The root mean square of acceleration levels in a random vibration test profile.

H

hr	Hours.
Hz	Hertz; cycles per second.

I

IEC	International Electrotechnical Commission; an organization that sets international electrical and electronics standards.
IEEE	Institute of Electrical and Electronics Engineers.
I_{MP}	Mainframe peak current.

in.	Inches.
inhibit	To turn off.

J

jitter	A measure of the small, rapid variations in clock transition times from their nominal regular intervals. Units: seconds RMS.

K

kg	Kilograms.
km	Kilometers.

L

lb	Pounds.
LED	Light emitting diode.
line regulation	The maximum steady-state percentage that a DC voltage output will change as a result of a specified change in input AC voltage (step change from 90 to 132 VAC or 180 to 264 VAC).
load regulation	The maximum steady-state percentage that a DC voltage output will change as a result of a step change from no-load to full-load output current.

M

m	Meters.
MHz	Megahertz. One million Hertz; one Hertz equals one cycle per second.
mi	Miles.
ms	Milliseconds.

MTBF	Mean time between failure.
MTTR	Mean time to repair.

N

NEMA	National Electrical Manufacturers Association.
NI	National Instruments.

P

power supply shuttle	A removable module that contains the chassis power supply.
PXI	PCI eXtensions for Instrumentation.
PXI_CLK10	10 MHz PXI system reference clock.

R

RH	Relative humidity.
RMS	Root mean square.

S

s	Seconds.
skew	Deviation in signal transmission times.
slot blocker	An assembly installed into an empty slot to improve the airflow in adjacent slots.
standby	The backplane is unpowered (off), but the chassis is still connected to AC power mains.
System controller	A module configured for installation in Slot 1of a PXI chassis. This device is unique in the PXI system in that it performs the system controller functions, including clock sourcing and arbitration for data transfers across the backplane. Installing such a device into any other slot can damage the device, the PXI backplane, or both.

system reference clock	A 10 MHz clock, also called PXI_CLK10, that is distributed to all peripheral slots in the chassis, as well as a BNC connector on the rear of chassis labeled *10 MHz REF OUT*. The system reference clock can be used for synchronization of multiple modules in a measurement or control system. The 10 MHz REF IN and OUT BNC connectors on the rear of the chassis can be used to synchronize multiple chassis to one reference clock. The PXI backplane specification defines implementation guidelines for PXI_CLK10.
System Timing slot	This slot is located at slot 4 and has dedicated trigger lines to other slots.

T

TTL	Transistor-transistor logic.

U

UL	Underwriter’s Laboratories.

V

V	Volts.
VAC	Volts alternating current.
V_{pp}	Peak-to-peak voltage.

W

W	Watts.

Index

T

U