



CMX18A

18-SLOT PXIe CHASSIS USER'S MANUAL

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ABOUT AMETEK

AMETEK Programmable Power, Inc., a Division of AMETEK, Inc., is a global leader in the design and manufacture of precision, programmable power supplies for R&D, test and measurement, process control, power bus simulation and power conditioning applications across diverse industrial segments. From bench top supplies to rack mounted industrial power subsystems, AMETEK Programmable Power is the proud manufacturer of Elgar, Sorensen, California Instruments, Amrel brand power supplies. Also, VTI Instruments brand which delivers precision modular instrumentation and systems for electronic signal distribution, acquisition, and monitoring, used in the world's most demanding test applications. AMETEK, Inc. is a leading global manufacturer of electronic instruments and electromechanical devices with annualized sales of \$4 billion. The Company has over 15,000 colleagues working at nearly 150 manufacturing facilities and nearly 150 sales and service centers in the United States and 30 other countries around the world.

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EXCLUSION FOR DOCUMENTATION

UNLESS SPECIFICALLY AGREED TO IN WRITING, AMETEK PROGRAMMABLE POWER, INC. ("AMETEK"):

(a) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN ITS MANUALS OR OTHER DOCUMENTATION.

(b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSSES, DAMAGES, COSTS OR EXPENSES, WHETHER SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION. THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK, AND

(c) GIVES NOTIFICATION THAT, IF THIS MANUAL IS IN ANY LANGUAGE OTHER THAN ENGLISH, ALTHOUGH STEPS HAVE BEEN TAKEN TO MAINTAIN THE ACCURACY OF THE TRANSLATION, THE ACCURACY CANNOT BE GUARANTEED. APPROVED AMETEK CONTENT IS WITHIN THE ENGLISH LANGUAGE VERSION, WHICH IS POSTED AT WWW.PROGRAMMABLEPOWER.COM.

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CERTIFICATION

AMETEK/VTI Instruments (VTI) certifies that this product met its published specifications at the time of shipment from the factory. VTI further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (formerly National Bureau of Standards), to the extent allowed by that organization's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY TERMS

The product referred to herein is warranted against defects in material and workmanship for a period of three years from the receipt date of the product at customer's facility. AMETEK Programmable Power, Inc. ("AMETEK"), provides this written warranty covering the Product stated above, and if the Buyer discovers and notifies AMETEK in writing of any defect in material or workmanship within the applicable warranty period stated above, then AMETEK may, at its option: repair or replace the Product; or issue a credit note for the defective Product; or provide the Buyer with replacement parts for the Product. The Buyer will, at its expense, return the defective Product or parts thereof to AMETEK in accordance with the return procedure specified below. AMETEK will, at its expense, deliver the repaired or replaced Product or parts to the Buyer. Any warranty of AMETEK will not apply if the Buyer is in default under the Purchase Order Agreement or where the Product, or any part thereof, is as follows:

- ✓ damaged by misuse, accident, negligence or failure to maintain the same as specified or required by AMETEK.
- ✓ damaged by modifications, alterations or attachments thereto which are not authorized by AMETEK.
- ✓ installed or operated contrary to the instructions of AMETEK.
- ✓ opened, modified, or disassembled in any way without AMETEK's consent.
- ✓ used in combination with items, articles or materials not authorized by AMETEK.

The Buyer may not assert any claim that the Products are not in conformity with any warranty until the Buyer has made all payments to AMETEK provided for in the Purchase Order Agreement.

PRODUCT RETURN PROCEDURE

Request a Return Material Authorization (RMA) number from the repair facility (must be done in the country in which it was purchased):

In the USA, contact the AMETEK Customer Service Department prior to the return of the product to AMETEK for repair:

Telephone: 800-733-5427, ext. 2295 or ext. 2463 (toll free North America)

858-450-0085, ext. 2295 or ext. 2463 (direct)

Outside the United States, contact the nearest Authorized Service Center (ASC). A full listing can be found either through your local distributor, or on our website, www.programmablepower.com, by tapping Support button or going to the Service Centers tab.

When requesting an RMA, have the following information ready:

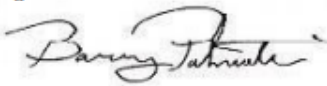
- ✓ Model number
- ✓ Serial number
- ✓ Description of the problem

- ✓ **NOTE:** Unauthorized returns will not be accepted and will be returned at the shipper's expense.
- ✓ **NOTE:** A returned product found upon inspection by AMETEK to be in specification is subject to an evaluation fee and applicable freight charges.



Declaration of Conformity

This is to declare that the product listed below conforms to the relevant requirements of the Electromagnetic Compatibility directive (European Council directive 2014/30/EU; generally referred to as the EMC directive), to the requirements of the Low Voltage directive 2014/35/EU, dated 26 February 2014, and to the RoHS3 Directive (EU Directive 2015/863 dated 4 June 2015). In substantiation, the products were tested and or evaluated to the standards shown below

Product Type	Product Model Number(s)	Conforming to Standards:
PXI Express 9 Slot Chassis PXI Express 18 Slot Chassis	CMX09A, CMX18A.	EN 61326-1:2013 EN 61010-1:2010 EN 50581-1:2012
Signature: 		Date: 5/18/2020
Name: Barry Palmatier Title: Compliance Engineer		First Issued: Doc. Part No:

Ametek Programmable Power, 9250 Brown Deer Rd., San Diego, CA 92121-2294 USA
Telephone: USA 858-450-0085, 800-733-5427 FAX: USA 858-458-0257

GENERAL SAFETY INSTRUCTIONS

Review the following safety precautions to avoid bodily injury and/or damage to the product. These precautions must be observed during all phases of operation or service of this product. Failure to comply with these precautions, or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture, and intended use of the product. Note that this product contains no user serviceable parts or spare parts.

Service should only be performed by qualified personnel. Disconnect all power before servicing.

TERMS AND SYMBOLS

These terms may appear in this manual:

WARNING	Indicates that a procedure or condition may cause bodily injury or death.
CAUTION	Indicates that a procedure or condition could possibly cause damage to equipment or loss of data.

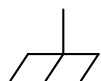
These symbols may appear on the product or in the manual:



ATTENTION - Important instructions



Indicates hazardous voltage.



Frame or chassis ground



Indicates that the product was manufactured after August 13, 2005. This mark is placed in accordance with *EN 50419, Marking of electrical and electronic equipment in accordance with Article 11(2) of Directive 2002/96/EC (WEEE)*. End-of-life product can be returned to AMETEK by obtaining an RMA number. Fees for take-back and recycling will apply if not prohibited by national law.

WARNINGS

Follow these precautions to avoid injury or damage to the product:

Apply local earth ground

The safety earth ground cable provided with this instrument meets the required regulatory and statutory safety standards as indicated by this product's declaration of conformity. The green/yellow safety cable must be applied between the safety ground on the rear of the unit and the local safety earth ground. This is required for safe operation of the equipment. Refer to the manual on how to apply the safety earth ground cable

Use proper Power Cord

The power cable provided with this instrument meets the required regulatory and statutory safety standards as indicated by this product's declaration of conformity. VTI recommends that the power cord provided be used with the instrument that it is provided with. If a different power cord is must to be used, however, it is the responsibility of the user to select a power cord that meets any and all regulatory and statutory requirements for their industry and country.

Use proper Power Source

To avoid electrical overload, electric shock, or fire hazard, do not use a power source that applies other than the specified voltage. The mains outlet that is used to power the equipment must be within 3 meters of the device and shall be easily accessible.

Use proper Fuse

To avoid fire hazard, only use the type and rating fuse specified for this product.

Power Consumption

Prior to using plug-in modules, it is imperative that the power consumption of all modules that will be installed in the mainframe be calculated for all power supply rails. The required information can be found in *Detailed Specifications* in this manual. *Failure to do so may result in damaging the plug-in modules and the mainframe.*

Avoid Electric Shock

To avoid electric shock or fire hazard, do not operate this product with the covers removed. Do not connect or disconnect any cable, probes, test leads, etc. while they are connected to a voltage source. Remove all power and unplug unit before performing any service. ***Service should only be performed by qualified personnel.***

Ground the Product

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground.

Operating Conditions

To avoid injury, electric shock or fire hazard:

- Do not operate in wet or damp conditions.
- Do not operate in an explosive atmosphere.
- Operate or store only in specified temperature range.
- Provide proper clearance for product ventilation to prevent overheating.
- When selecting the installation location, be certain that there is enough space around the power plug and the outlet so that they are readily accessible. Do not insert the power cord into an outlet where accessibility to the plug cord is poor.
- All unused slots should be closed with the dummy filler panels to ensure a proper air circulation. This is critical to avoid overheating of the cards.

- DO NOT operate if any damage to this product is suspected.
Product should be inspected or serviced only by qualified personnel.

IMPROPER USE



The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

Conformity is checked by inspection.

SUPPORT RESOURCES

Support resources for this product are available on the Internet and at AMETEK customer support centers.

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International: <https://www.powerandtest.com/sales-reps/programmable-power-sales>

Visit www.powerandtest.com for worldwide support sites and service plan information.

SECTION 1

INTRODUCTION

OVERVIEW

The CMX18A is an 18-slot PXI Express chassis which is compliant with both PXI Express and cPCI Express specifications. The spacious chassis has one system slot, one system timing slot, six PXIe peripheral slots, and ten hybrid peripheral slots for versatile testing and measurement applications requiring enhanced bandwidth. The hybrid slots accept CompactPCI, PXI, CompactPCI Express, and PXI Express modules which maximize the flexibility of the chassis. The chassis has a configurable PCIe switch fabric which is configurable in two-link and four-link PXI Express deployments with 8 GB/s system bandwidth and 4 GB/s slot bandwidth for dedicated peripheral slots. The chassis is equipped with a smart system monitoring controller which reports the full chassis status including fan speeds, system voltages, and internal temperature.

The CMX18A delivers 800 W of power and is designed to operate in environments of 0 °C to 55 °C. Three 185.9 CFM fans in the back of the chassis draw cool air from the front of the chassis and exhaust the hot air through the rear. Combined with innovative cooling design, the fans are able to uniformly dissipate heat from each PXI slot and ensure that instruments do not overheat during operation. The BNC connectors provide 10 MHz clock input/output on the rear panel enable synchronization with additional devices.

UNPACKING

Upon arrival, the shipping carton should be inspected for damage. If the carton or any of its contents are damaged, please contact AMETEK Programmable Power Inc immediately for a replacement. Do not dispose of the carton or any of its contents; AMETEK Programmable Power Inc will not replace the damaged product if these materials are not returned.

Please check that the following materials are in the carton. If any of these materials are missing please contact VTI Instruments immediately.

- CMX18A 3U 18-Slot Chassis
- Distribution Disc
- Power Cord

SECTION 2

FEATURES

FEATURES

The CMX18A chassis provides the following features:

- 18-slot PXI Express chassis with one system controller slot, one timing slot, ten hybrid slots, and six peripheral slots
- High bandwidth PCIe Gen 2.0 backplane with 4 GB/s slot bandwidth on dedicated slots (8,9,11 and 12) and 8 GB/s system bandwidth
- IEEE 1588 distributed instrument synchronization
- Chassis status monitoring and reporting
- Remote chassis power on/off control
- Flexible slot-to-slot direct communication for highly deterministic operations
- 0 °C to 55 °C extended operating temperature range
- Power, temperature, and fan monitoring LEDs

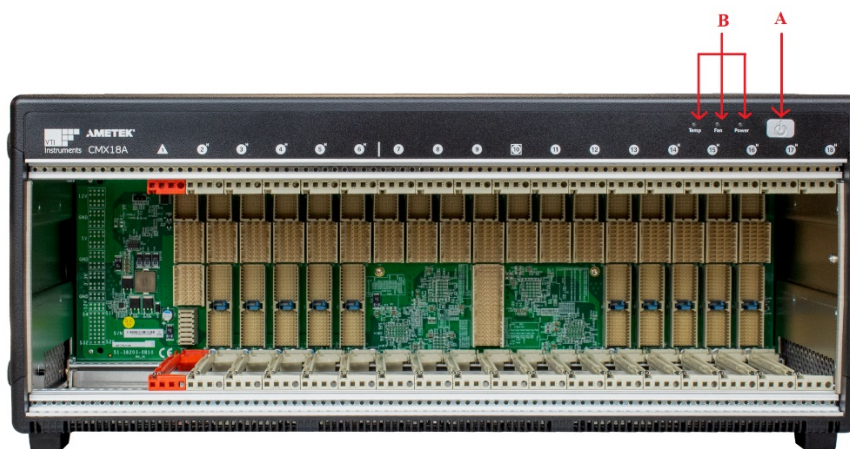


FIGURE 2-1: CMX18A FRONT PANEL OVERVIEW

	Feature	Details
A	Power	Powers the chassis on/off (when INHIBIT on rear panel (not shown) is set to “DEF”)
B	Chassis Status	Temperature, Fan, and Power (L to R), functions as follows

TABLE 2-1: FRONT PANEL LEGEND

Status	Temperature (Amber)	Fan (Green)	Power (Blue)
On (Lit)	N/A	Fans operating normally	DC voltage supply is normal
Off	Temperature is normal	Chassis is powered down	Chassis is powered down
Blinking	One or more temperature sensors exceeds threshold temperature (default 70°C)	One or more fans falls below threshold speed (default is 800RPM)	One or more power rails exceeds threshold settings (defaults are $\pm 5\%$ for 5V, 3.3V, +12V, and -12V)

TABLE 2-2: FRONT PANEL LED INDICATORS



FIGURE 2-2: CMX18A REAR PANEL OVERVIEW

	Feature	Details
C	10MHz Reference Clock Input	The BNC connector acts as a 10MHz reference clock input, whereby the backplane 10MHz clock is overridden in the presence of an external 10MHz clock
D	10MHz Reference Clock Output	The BNC connector acts as 10MHz reference clock output
E	Remote Monitoring Connector	The D-sub9 connector acts as a remote monitoring connector, when connected to a remote computer using a standard D-sub9 cable, with pin assignments shown in Figure 1-7 Note: The remote monitor port is Rx-Tx/Tx-Rx crossed, such that a RS-232 cable with Rx-Rx/Tx-Tx connection must be used
F	Inhibit/Voltage Monitoring DB-9 Connector	The DB-9 connector monitors the four main voltage rails via digital multimeter <ul style="list-style-type: none"> voltage rail pin assignments shown in Figure 1-7 10 kΩ current limiting resistors on each volt-age rail prevent accidental overload one Inhibit (active low) pin is provided to power the chassis on/off when the Inhibit Switch is in the MAN (manual) position, such that chassis is powered on when Inhibit pin is logic high or open, and off when Inhibit pin is grounded
G	Inhibit Switch	In the DEF (default) position, the front panel power button turns the power supply on/off, and in the MAN (manual) position, the INHIBIT pin on the DB-9 connector turns the power supply on/off

H	Fan Switch	In the HIGH position, fans operate at maximum speed, and in AUTO, the fans run based on the monitored chassis temperature
I	Universal Power Inlet	Accepts IEC 60320-1 C19 power outlet-equipped connection
J	Chassis Ground Lug	The ground wire can be crimped to the ground lug, using a crimp tool of the appropriate size, with the other end connected to ground

TABLE 2-3: REAR PANEL CONNECTORS

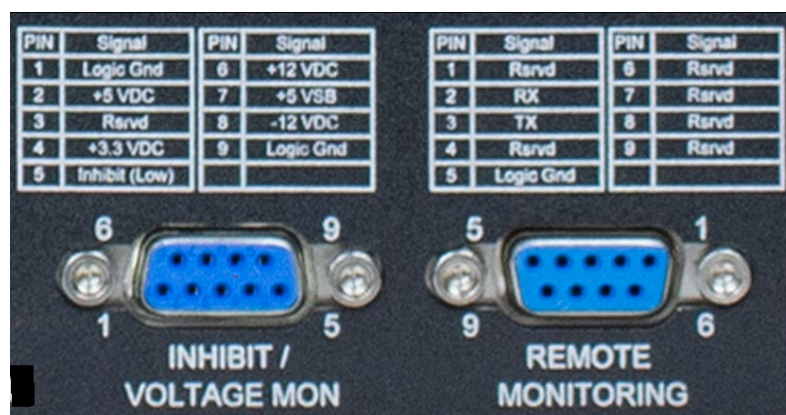


FIGURE 2-3: INHIBIT / VOLTAGE & REMOTE MONITORING CONNECTORS

BACKPLANE

Slot Configuration

The CMX18A is an 18-slot PXI Express mainframe with one system controller slot, one PXIe timing slot, ten PXIe hybrid slots, and six PXIe peripheral slots. The ten PXI Express hybrid peripheral slots are all connected with PCIe x4 lanes. Each slot can accommodate a 3U PXI Express/CompactPCI Express/hybrid slot compatible PXI-1/CompactPCI peripheral module.

The six PXI Express peripheral slots can accommodate a 3U PXI Express/Compact PCI Express peripheral module. Slots 8, 9, 11, and 12 are connected with PCIe Gen2.0 x8 lanes where the other four peripheral slots are connected with PCIe Gen2.0 x4 lanes.

The system controller slot is slot 1 of the chassis. The CMX18A can accommodate a PXI express system controller that is up to four slots wide. The expansion slots allow for the use of larger system controllers without occupying peripheral slots.

The system controller slot features configurable 4x4, 2x8, and 1x8 link options which allow all PXIe controllers to be supported per spec.

The system timing slot (ST) is slot 10 of the chassis which provides one dedicated, single-ended star trigger and two pairs of differential star trigger lines to, and one pair of differential star trigger lines from, each peripheral slot. Star trigger functionality provides a precise trigger signal to

peripheral modules by the installation of a specific star trigger controller module in the ST slot. The system timing slot can be used as a general PXI Express (x4 lanes) peripheral slot if star trigger functionality is not required. Routing of single ended star trigger signals (PXI_STAR) and differential star trigger signals (PXI_DSTAR) are shown in Figure 2-4.

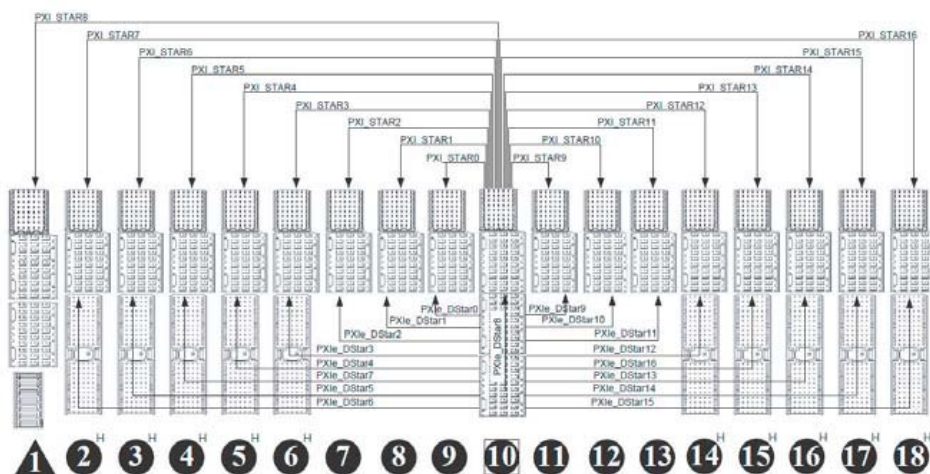


FIGURE 2-4: STAR TRIGGER ROUTING

Slot	PXI_Star	PXIe_DStar
1	8	N/A
2	7	6
3	6	5
4	5	7
5	4	4
6	3	3
7	2	2
8	1	1
9	0	0
10	N/A	8
11	9	9
12	10	10
13	11	11
14	12	12
15	13	16
16	14	13
17	15	14
18	16	15

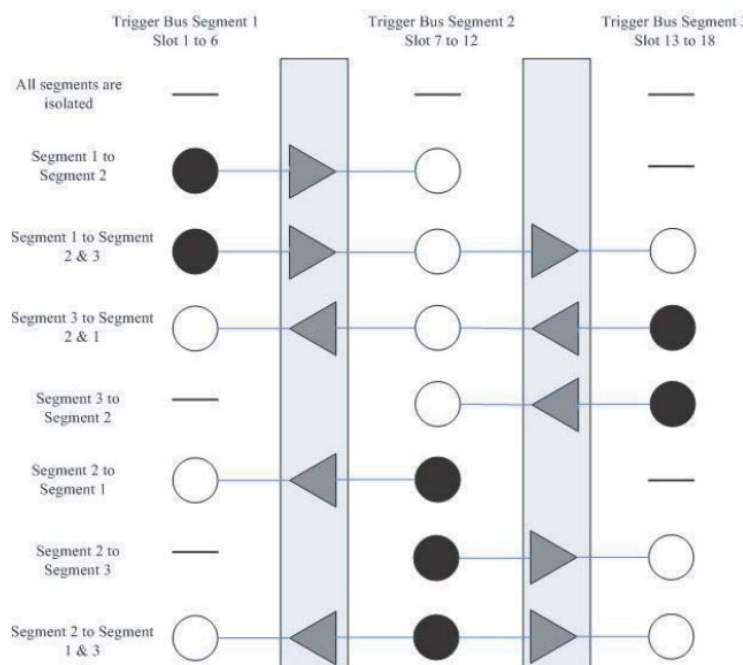
Table 2-4: Star Trigger Routing

Local Bus

The local bus on the PXI backplane is a daisy-chained bus that connects each peripheral slot with adjacent peripheral slots to the left and right. There is only one (1) local bus line in a PXI Express backplane.

Trigger Bus

The CMX18A backplane is separated into three trigger bus segments. The first segment is from the 1st to 6th slot, the second segment is from the 7th to 12th slot, and the third segment is from the 13th to 18th slot. Each trigger bus segment contains eight (8) trigger lines which connects all slots in the same segment which allows inter-module synchronization.



NOTE: Solid circles represent the source of the trigger and the transparent circle represents the trigger destination. For details regarding configuration of trigger bus bridge routing please see Trigger Bus on page 36.

FIGURE 2-5: TRIGGER BUS BRIDGE CAPABILITY

Reference Clock

The CMX18A backplane supplies a single-ended 10 MHz reference clock (PXI_CLK10) and differential 100 MHz clock (PXIe_CLK100) to each peripheral slot for inter-module synchronization. The independent buffers drive the clock signal to each peripheral slot.

The shared reference clock signals can synchronize multiple modules in the chassis. PXI modules with phase-lock loop circuits can lock reference clocks to generate an in-phase time base.

The PXI_CLK10 and PXIe_CLK100 clocks are phase locked based on the PXI-5 specification. Since the external 10 MHz clock input can override the onboard 10 MHz clock source, a phase-lock loop (PLL) circuit on the backplane synchronizes the PXIe_CLK100 and external 10 MHz clock.

The CMX18A will automatically select a reference clock from one of the three sources: internal 10 MHz clock, external 10 MHz clock through a BNC connector, or PXI_CLK10_IN pin on the system timing slot. The priority of which source the chassis selects is as follows:

System Timing Slot (10th Slot)	BNC Connector on Rear Panel	10 MHz Clock Drive to Peripheral Slots
No clock present	No clock present	10 MHz clock is generated by backplane
No clock present	10 MHz clock present	Clock from BNC connector is driven to all peripheral slots
10 MHz clock present	No clock present	Clock from system timing slot is driven to all peripheral slots
10 MHz clock present	10 MHz clock present	Clock from system timing slot is driven to all peripheral slots

TABLE 2-5: REFERENCE CLOCK PRIORITY

SPEED, FLEXIBILITY, AND PERFORMANCE

Best in Class Bandwidth

The CMX18A uses a 4-lane PCIe Gen2.0 backplane to achieve unmatched data rates of up to 4 GB/s per slot and 8 GB/s system. This is especially useful when using high-speed instruments like digitizers, oscilloscopes, and signal generators.

Advanced PCIe Switch Fabric

The CMX18A's advanced switch fabric uses innovative methods, like non-transparent bridging (NTB) and partitionable switch architecture, to allow slot-to-slot direct communication and true multi-root support.

Slot-to-slot direct communication allows data from any slot to be read directly by another slot without having to go through the controller and host. This allows extremely high-speed, deterministic data transfers between slots which are very useful for applications that require closed loop control.

True multi-root support allows any slot to be used as a root-complex meaning data processing, or memory units, can be plugged into any slot on the chassis. This, combined with the slot-to-slot communication capability, allows data to be streamed directly from a plug-in module to a root complex for storage or processing without burdening the host processor.

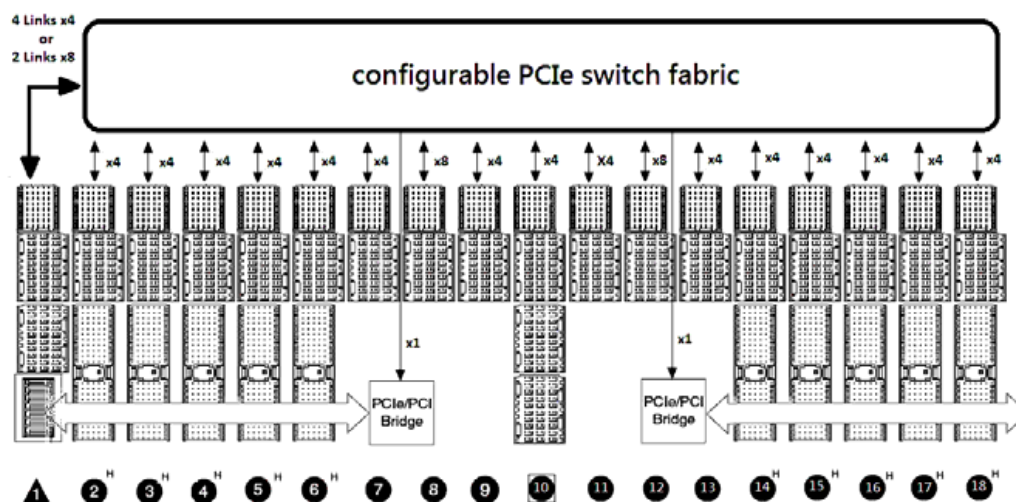


FIGURE 2-6: CMX18A BACKPLANE ARCHITECTURE

TEMPERATURE REGULATION

The CMX18A is equipped with eight temperature sensors distributed across the backplane in order to accurately measure the temperature throughout the entire chassis. The chassis will regulate the ambient temperature by adjusting the cooling fan speeds based on the temperature readings of the sensors. The temperature reading of each sensor can be viewed through the monitor utility (provided with the chassis).

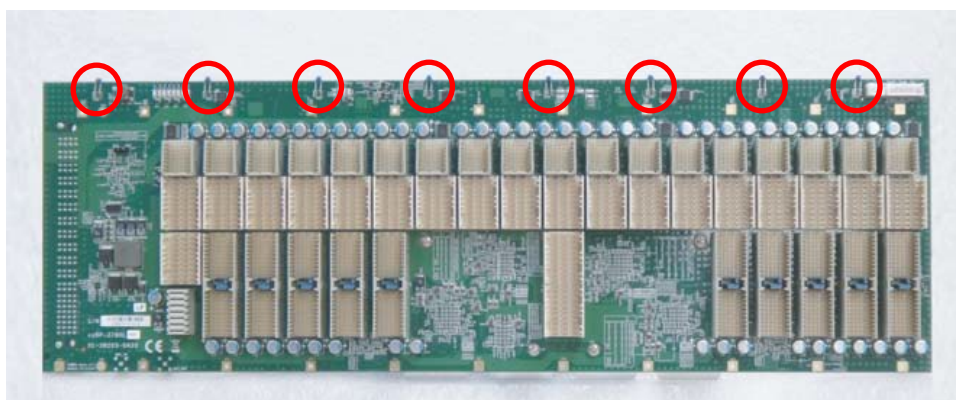


FIGURE 2-7: TEMPERATURE SENSORS ON THE BACKPLANE

IEEE 1588 DISTRIBUTION

The CMX18A backplane contains a built-in mechanism for distributing an IEEE-1588 time source to the plug-in modules. This mechanism is only supported when using the EMX-2500 Gigabit Ethernet LXI controller which allows the time stamping of data from all plug-in modules on a common time-base for advanced timing and synchronization. In addition, it also provides the capability to synchronize PXI systems with LXI instruments.

SYSTEM MONITORING FOR SIMPLIFIED MAINTENANCE

The CMX18A reports the chassis status/health of the unit which can be accessed through the DB9 connectors.

- **Temperature monitoring:** The CMX18A chassis monitors its own internal temperature using temperature sensors placed within the chassis. The CMX18A can report the measured temperature readings and alert the user if an over-temperature condition occurs.
- **Power monitoring:** The CMX18A can report the power rail voltages of the unit and reports fault conditions if they occur.
- **Fan Speed:** By default, the fan speed is optimized based on the measured internal ambient temperature. The fan speed can also be controlled through the use of an external switch located on the rear of the chassis.

In addition, a DB9 connector has been implemented in the rear of the chassis that allows for voltage monitoring and remote inhibit.

RUGGED DESIGN

The CMX18A is a highly attractive option for applications which require a high capacity chassis due to its rugged and light weight design. Ventilation ducts were omitted from the top panel of the chassis to ensure that instruments within the chassis are protected from possible spills when used in industrial environments.

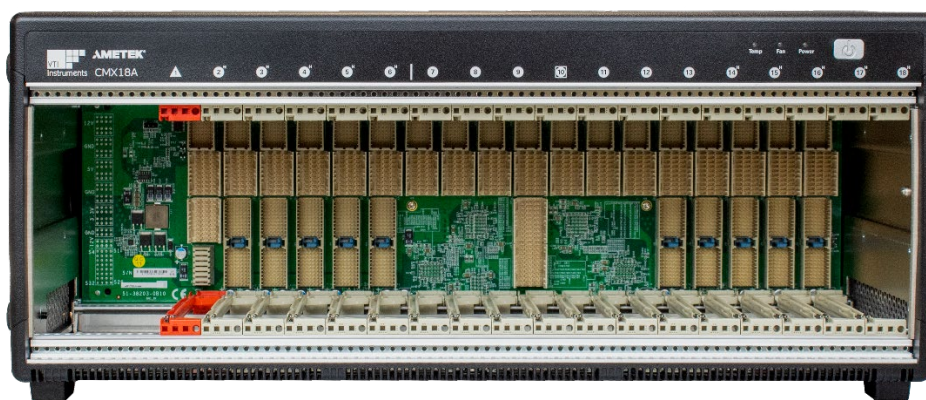


FIGURE 2-8: CMX18A CHASSIS (FRONT VIEW)

EXTERNAL CLOCK

The CMX18A includes a pair of IN/OUT BNC connectors in the rear to allow for an external 10 MHz reference clock. When a 10 MHz clock signal is detected on the IN connector, the internal clock is phase locked to the external clock. This reference clock may also be driven by a system timing module in slot 10. System timing controllers are high-stability clock sources which provide the ability to drive the PXI star and PXI Express differential star triggers. In addition, timing controllers typically have the ability to import and export the PXI trigger lines on the backplane. The OUT BNC connector provides a buffered, non-TTL version of the 10 MHz reference clock.

REMOTE VOLTAGE MONITORING AND INHIBIT CONTROL

The CMX18A features remote voltage monitoring and inhibit control through a DB9 connector located on the rear of the chassis. The DB9 connector is intended for voltage monitoring as well as

using the inhibit functionality of the chassis. The DB9 connector should not be used to provide power to external devices.

When the inhibit switch is set to the 'DEF' (default) position, the front power button turns the power on/off. In order to use the inhibit functionality, the inhibit switch on the rear of the chassis must be set to 'MAN'. While the inhibit switch is set to 'MAN' the chassis will not shut down through the front panel switch and can only be shut down by connecting the inhibit pin (pin 5) to a ground pin (pin 1 or 9). Figure 2-9 outlines the pin assignments of the DB9 connectors.

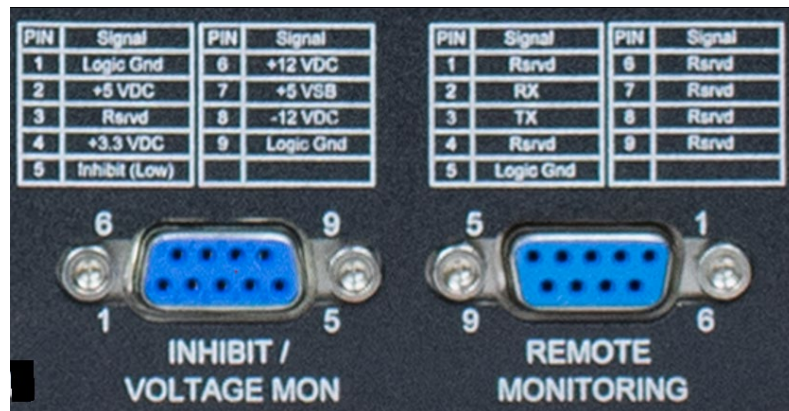


FIGURE 2-9: DB9 CONNECTOR PIN LAYOUTS

CAUTION Do not short the DB9 connector probe leads together. Doing so can cause permanent damage to the chassis.

INNOVATIVE COOLING TECHNIQUES

The CMX18A uses innovative cooling methods to pull cool air into the chassis through the bottom and sides of the chassis rather than drawing air from the rear which may draw hot exhaust from other devices. The fans then guide the air through the chassis and push it out through the rear exhaust. The temperature control mechanism monitors the temperature at the exhaust and automatically adjusts fan speed to optimize the internal temperature of the chassis.



Allow at least 1U clearance below the unit when it is mounted in a cabinet in order to ensure that airflow into the chassis is not obstructed. Obstructing the intake may cause the chassis and other devices to overheat. The cooling implementation allows an extended temperature range of up to 55 °C.

DETAILED SPECIFICATIONS

SYSTEM SPECIFICATION

General Specifications

Total Slots	18 slots
PXI Express System Controller	1 slot (slot 1)
PXI Express Peripheral	6 slots (slots 7-9 and 11-13)
PXI Express Timing	1 slot (slot 10)
PXI Express Hybrid	10 slot (slots 2-6 and 14-18)
Module Size	3U
Bandwidth	
Slot	4 GB/s
Mainframe	8 GB/s
Standards Compliance	PXI™-5 Specification Rev 1.0 Compact-PCI PICMG 2.0

System Synchronization Clocks Specifications

10 MHz System Reference Clock: PXI_CLK10	
Max Slot-to-Slot Skew	300 ps
Accuracy	±25 ppm max
BNC Output Amplitude	1 Vpk-pk ±20% square-wave into 50 Ω, 2 Vpk-pk unloaded
BNC Output Impedance	50 Ω ±5 Ω
100 MHz System Reference Clock: PXIe_CLK100	
Max slot-to-slot skew	100 ps
Accuracy	±25 ppm max.
10 MHz Reference Clock Input	
Frequency	10 MHz ± 100 ppm
Input Amplitude	100 mVpp to 5 Vpp square-wave or sine-wave (Rear panel BNC)
Input Impedance	50 Ω ± 5 Ω

ELECTRICAL SPECIFICATIONS

Electrical	
AC Input	
Input Voltage Range	100 VAC to 240 VAC
Input Frequency Range	50 Hz to 60 Hz
Input Power	1200W max
Power Rating	
Max DC Power Output	800 W
Efficiency	85% (typical)
+3.3V Max Load	60 A
+5V Max Load	29 A
+12V Max Load	45 A
-12V Max Load	2.5 A
+5V standby Max Load	2 A
Environmental Specifications	
Operating Temperature	0 ° C to 55 °C
Storage Temperature	-20 °C to 70 °C
Humidity	10% to 90% non-condensing
Functional Shock	30 G, half-sine, 11 ms pulse duration
Random Shock	Operating: 5 Hz to 500 Hz, 0.3 Grms, 3 axis Non-operating: 5 Hz to 500 Hz, 2.46 Grms, 3 axis
Sound Pressure Level (at Operator Position)	Auto Fan (up to 25°C ambient): 46.3 dBA High Fan: 64.5 dBA (Tested in Accordance with ISO 7779)
Sound Power	Auto Fan (up to 25°C ambient): 56.0 dBA High Fan: 76.0 dBA
Safety and EMC	
Safety Compliance	EN 61010-1
CE Compliance	Low-Voltage Directive (safety): 73/23/EEC Electromagnetic Compatibility Directive (EMC): 9/336/EEC
Electromagnetic Compatibility	EN 61326(IEC 61326): Class A emissions, basic immunity EN 55011 (CISPR 11): Group 1, Class A emissions
MTBF	40,438 hours, Telcordia (Bellcore) SR-332 methodology

MECHANICAL SPECIFICATIONS

Mechanical

Size 18.1" W x 7.46" H x 18.14" D

Weight 26.2 lbs

Cooling

Fans

Three 185.9 CFM fans with High / Auto speed modes

Chassis Cooling Intake

Bottom of front bezel, bottom panel of chassis

Chassis Cooling Exhaust

Rear of chassis

Slot Airflow Direction

Bottom of module to top of module

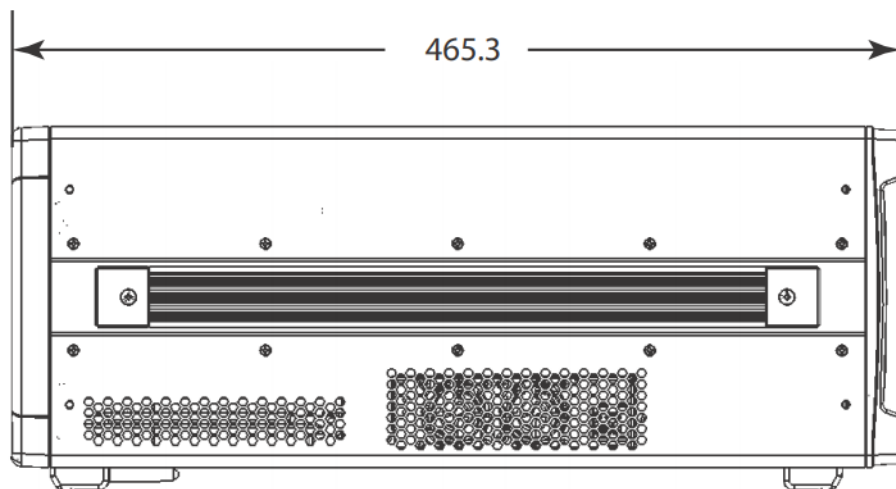


FIGURE 2-10: RIGHT VIEW

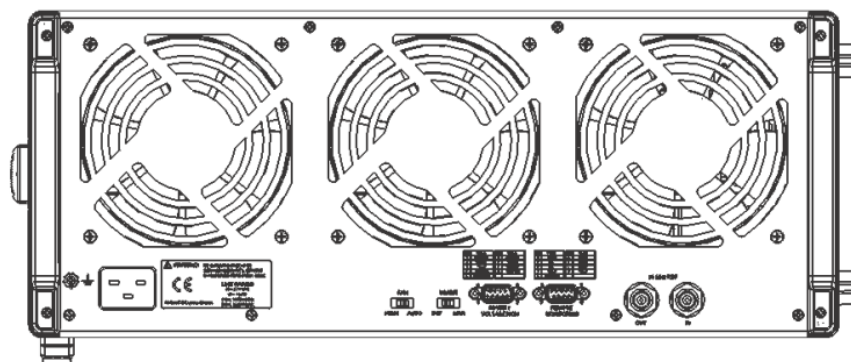


FIGURE 2-11: REAR VIEW

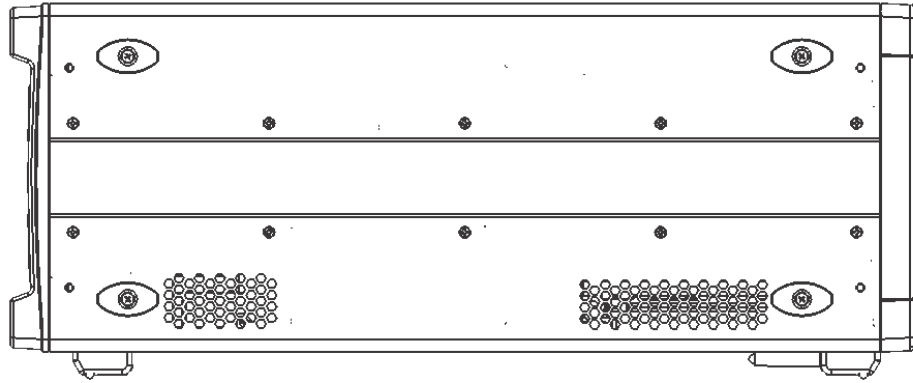


FIGURE 2-12: LEFT VIEW

SECTION 3

PREPARATION FOR USE

SYSTEM POWER REQUIREMENTS

Please ensure that the power cord is in good working condition before plugging it into the system and attempt to start up the chassis.

The CMX18A operates from 100 to 240 V AC at 50 Hz to 60 Hz.

CAUTION Do not connect the chassis to an already overloaded circuit. Doing so may cause permanent damage to the chassis.

CONNECTING THE MAINFRAME TO EARTH GROUND

The supplied power cord grounding conductor provides adequate grounding for this voltage and frequency level. However, if an ungrounded power cord is to be used or if the power source is not grounded, please use the following steps to connect the chassis to a safety ground:

- 1) Connect a 16 AWG (or larger) wire to the ground terminal located on the rear panel (this connection is marked by a symbol). Use a grounding lug with a star washer or a toothed lug to make this connection.
- 2) Attach the other end of the wire to a permanent earth ground also using a star washer or a toothed lug.



FIGURE 3-1: CHASSIS GROUND TERMINAL

AIR FLOW REQUIREMENTS

The CMX18A is designed to intake air from the bottom and sides of the unit. The fans pull air into the unit from the bottom and side ventilation ports of the unit and push it out of the rear exhaust.

Placing objects against the ventilation ports of the chassis will obstruct airflow and cause the chassis to overheat. Prolonged obstruction of ventilation can cause permanent damage to the chassis. Therefore, consideration should be given when placing objects underneath the chassis so that airflow is not obstructed.

When rack mounting the CMX18A, at least 1U (44.5 mm/1.75 in.) clearance is required below the chassis so that there is adequate airflow into the chassis. Additionally, keep objects and equipment at least 76.2 mm/3 in. away from the rear of the chassis.

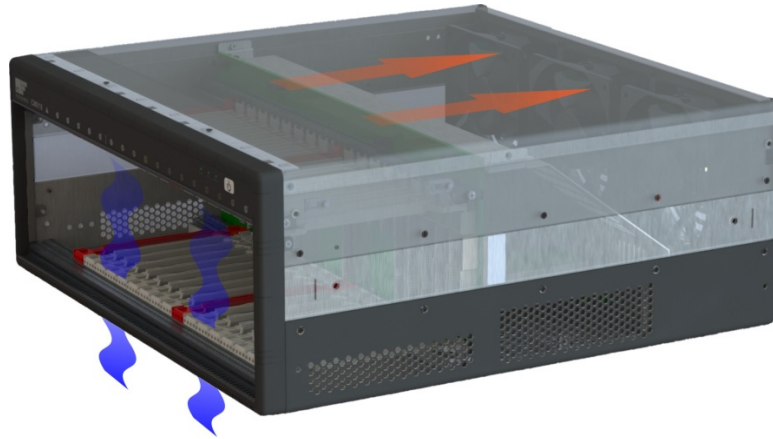


FIGURE 3-2: AIR FLOW MODEL

TURNING ON THE CHASSIS

The chassis will not power on until a controller has been installed. A VTI controller (such as the EMX-2500) or similar controller must first be installed.

Turning on the Chassis

- 1) Ensure the power switch at the rear of the chassis is in the OFF position.
- 2) Connect the AC power cord.

CAUTION Do not turn on the chassis before inserting the controller into the chassis.

- 3) Insert the controller into slot 1 (left-most slot; a triangle with a 1 inside of it is located above the slot). Take care that the card is properly mounted on the red brackets and that the ejector handle is fully engaged. When installed properly, the controller should not be able to be removed except by pressing down on the ejector handle. Please reference the *Plug-in Module Installation* section on page 30 if you have difficulty installing the controller; the installation process is the same as installing a plug-in module.
- 4) Attach the controller to the chassis with the Phillips-head screw located at the very top of the controller.
- 5) Press the standby power switch. The power LED (blue) will light up immediately.

PLUG-IN MODULE INSTALLATION

Overview

The CMX18A chassis supports up to 18 peripheral modules, including a system timing module.

Required Tools

#2 Phillips Screwdriver

Installing a Plug-In Module

- 1) Turn off chassis before installing or removing any module
- 2) Insert the module after aligning it with the top and bottom mounting brackets. The module should slide in with ease if properly aligned on the brackets. Make sure that the ejector handle is disengaged from the module and lowered completely.
- 3) Once the module is inserted as far back as possible, pull up on the ejector handle to lock the module into the chassis. The module should sit flush with the chassis and should not be able to be removed without disengaging the ejector handle. The button should 'click' into place to once the ejector handle is fully engaged.
- 4) Attach the module to the chassis with the Phillips-head screw located at the top and bottom of the module.

INSTALLING THE BLANKING PANELS

Unused slots on the CMX18A should be covered with blanking panels. Blanking panels ensure that optimal air flow is achieved while the unit is in use. They also ensure that all air flowing through the chassis is first passed through the air filter to reduce the amount of maintenance that the chassis needs.

Assembly Preparation

The following part is needed for blanking panel installation:

Sequence	Stock Code	Description	Quantity
1	70-0698-200R	KIT, BLANK PANEL, CMX09A/CMX18A,,QTY 9	2*

* Qty 1 comes with the Unit, if the customer requires additional blank panels refer Ordering Section.

Required Tools

#2 Philips Screwdriver

Installing a Blanking Panel

- 1) Acquire a blanking panel and the two Phillips-head screws provided with the blanking panel.
- 2) Line the blanking panel vertically with the chassis so that the two holes of the blanking panel align properly with the holes on the chassis.
- 3) Install the two Phillips-head screws using the #2 Phillips screwdriver to attach the blanking panel to the chassis.

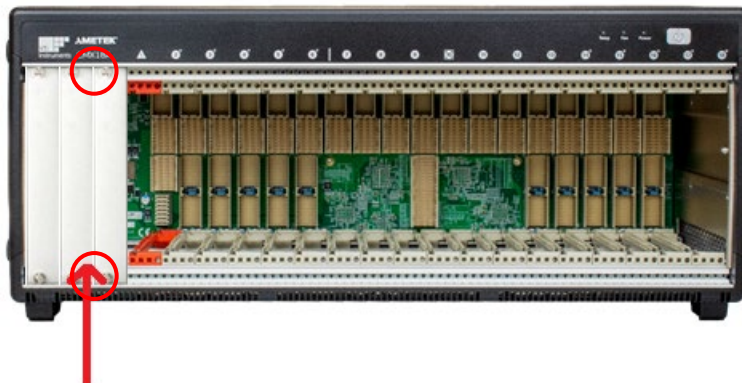


FIGURE 3-3: BLANKING PANEL INSTALLATION

SYSTEM MANAGEMENT AND CONFIGURATION

OVERVIEW

The CMX18A offers advanced system monitoring and control. Chassis conditions such as internal temperature, fan speed, and DC voltage can all be monitored on the system controller or through a remote PC.

The CMX18A offers software configurable trigger bus bridges. The status of each trigger bus line can be individually set by the user (refer to for more information). The CMX18A backplane supports both 4 x4, 2 x8, through the configurable PCIe switch fabric.

Communication with the chassis monitoring control unit can be established through an embedded controller (such as the VTI EMX-2500) connected to the SMBus located on the system slot (1st slot) or through the use of a remote PC communicating with the chassis through the RS-232 serial port (DB9 connector on the rear panel).

Please note that the RS-232 serial port can only monitor the chassis status and does not provide the capability to change the trigger bus bridges or PCIe switch fabric settings. Function comparison between the SMBus interface and RS-232 serial power are shown in Table 3-1.

Function	SMBus	RS-232 Serial Port
Chassis Status Monitoring	Yes	Yes
Alarm Threshold Setting	Yes	Yes
Trigger Bus Setting	Yes	No
PCIe Link Setting	Yes	No

TABLE 3-1: SUPPORTED FUNCTION COMPARISON BETWEEN SMBUS AND RS-232

INSTALLING THE MONITOR UTILITY

The remote monitoring utility and function library are provided on the CD included with the chassis.

Monitor Utility Installation

- 1) Connect a USB CD-/DVD-ROM drive to the system controller.
- 2) Place the monitor utility CD in the drive.
- 3) Locate the monitoring utility in the installation CD/DVD
- 4) Double-click the **Setup.exe** file and follow the instructions to complete the installation.

MONITORING THE CMX18A

OVERVIEW

AMETEK provides a GUI program (CMX18A Chassis Remote Monitor Utility) to monitor the status of the CMX18A chassis.

The utility is separated into three categories: *Connect Control*, *Remote Status and Control*, and *Chassis Status*.

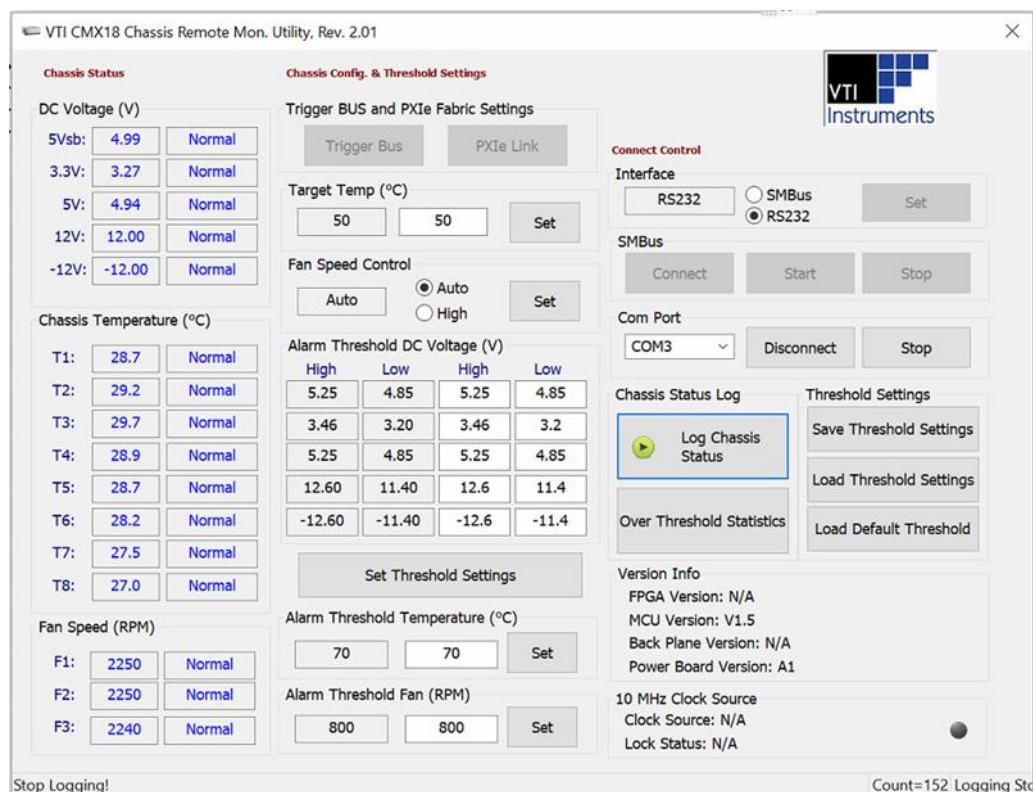


FIGURE 3-4: FTP MONITOR INTERFACE

CONNECT CONTROL

Interface

This field selects the communication interface type (SMBus or RS232) between the chassis and utility. Select 'Set' to apply the selection.

SMBus

Selecting 'Connect' reserves system SMBus.
Selecting 'Start' initializes SMBus communication.
Selecting 'Stop' ends communication.
Selecting 'Disconnect' releases system SMBus.

Com Port

The available serial ports registered in the operating system can be seen in the pull-down list. Select the serial port which is connected to the chassis.

Note: this section is only available when the interface is set to 'RS232'. The baud rate for RS232 is automatically set to 9600.

Selecting 'Connect' reserves the selected serial port.
Selecting 'Run' initializes serial port communication.
Selecting 'Stop' ends communication.
Selecting 'Disconnect' releases the serial port.

Chassis Status Log

The 'Chassis Status Log' function serves to record monitored data. Pressing the 'Log Chassis Status' button opens the 'Log File Settings' window as shown below.

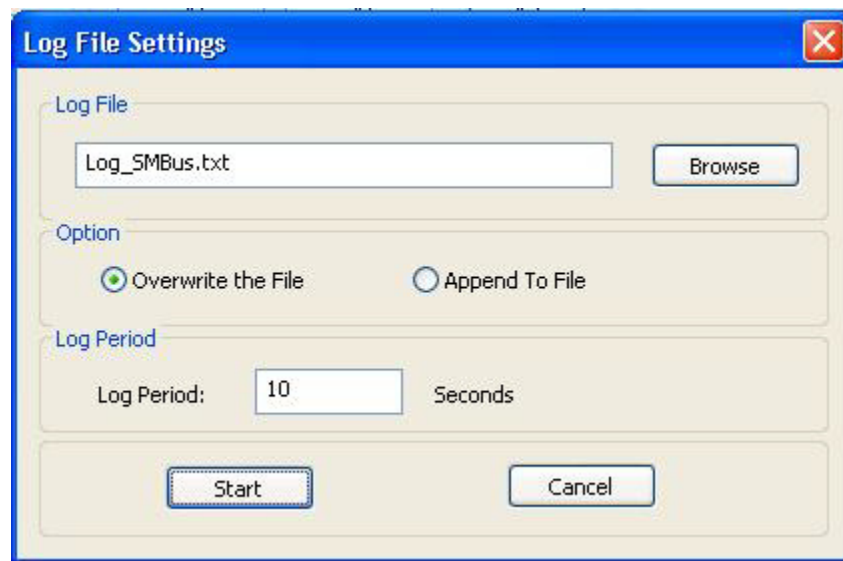


FIGURE 3-5: LOG OPTIONS DIALOG

The name of the log file can be entered, overwritten, or appended to selected operations. The log period can be entered in seconds. Selecting 'Start' begins the log.

'Over Threshold Statistics', when selected, displays statistics exceeding the threshold.

Save/Load Threshold

All threshold and control settings can be saved or loaded here.

Selecting the 'Save Threshold Settings' button saves all current settings.
Selecting the 'Load Threshold Settings' button loads all settings from the saved file.
Selecting the 'Load Default Threshold' button resets all threshold settings to the default values.

Version Info

This field displays the current firmware version.

REMOTE STATUS AND CONTROL

Overview

Provides operational and threshold settings for the chassis including target temperature, fan mode, and threshold settings for DC voltage, temperature, and fan speeds.

Target Temperature

When the fan switch on the rear panel of the chassis is set to 'AUTO' the fans will run at varying speeds depending on the monitored internal temperature of the chassis.

'Target Temp' indicates the internal temperature that the chassis will attempt to achieve when the fans are running at 100%. For example, at the default 50 °C setting the fans will run at 40% when all temperature readings are less than 25 °C and will ramp up to 100% if the temperature approaches 50 °C.

'Target Temp' can be set by entering the desired target temperature in degrees Celsius in the field and clicking 'Set'.

Fan Speed (Remote Status and Control)

The current selection of the fan setting switch located on the rear panel of the chassis will be shown here. The two possible statuses are 'Auto' and 'High'. Selecting 'Auto' or 'High' and clicking 'Set' will directly change the fan mode.

Alarm Threshold

Active alarm threshold settings are shown here including: DC voltage, temperature, and fan speeds. The updated threshold setting can also be set here by entering the desired value and clicking 'Set Threshold Settings'.

Trigger Bus

The default PXI trigger bus routing settings are shown below. 'TRIG BUS A' refers to slots 1 through 6, 'TRIG BUS B' refers to slots 7 through 12, and 'TRIG BUS C' refers to slots 13 through 18. Each PXI trigger bus can be individually configured to custom routing topologies. Routing settings can be easily saved as templates.

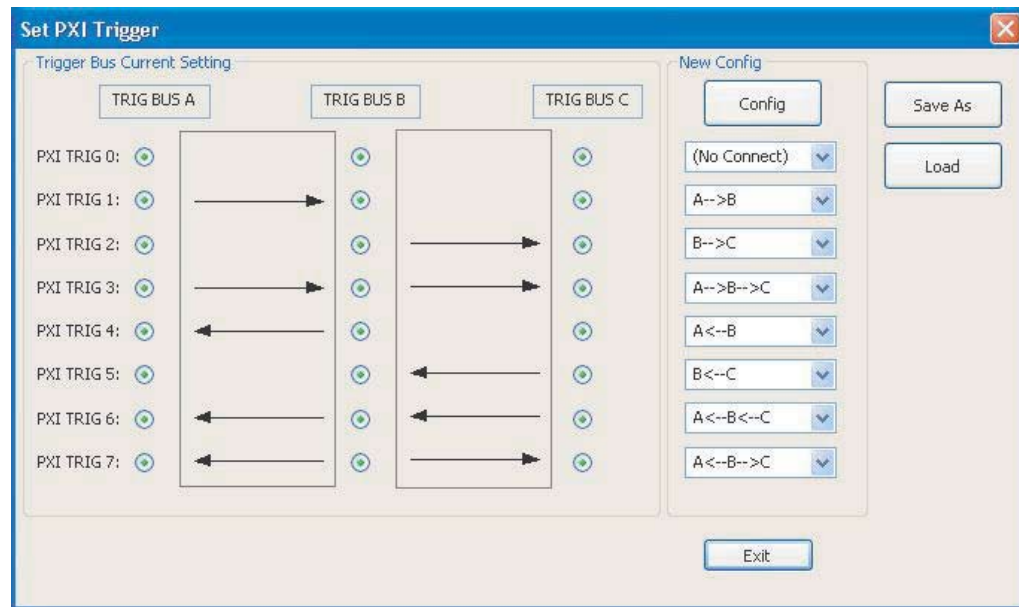


FIGURE 3-6: PXI TRIGGER ROUTING INTERFACE

PXIe Link

This screen displays the PCI express switch fabric settings for the CMX18A backplane.

The 'New Config' section allows the user to choose between 4 x4, 2 x8 through the pull-down menu. Selecting 'Config' will apply any new settings.

Note: The chassis will not reflect the new settings until it is restarted.

Chassis Temperature

When the fan switch located on the rear panel of the chassis is set to 'AUTO' the fans will run at varying speeds depending on the measured internal temperature of the chassis.

The setting parameters are shown below.

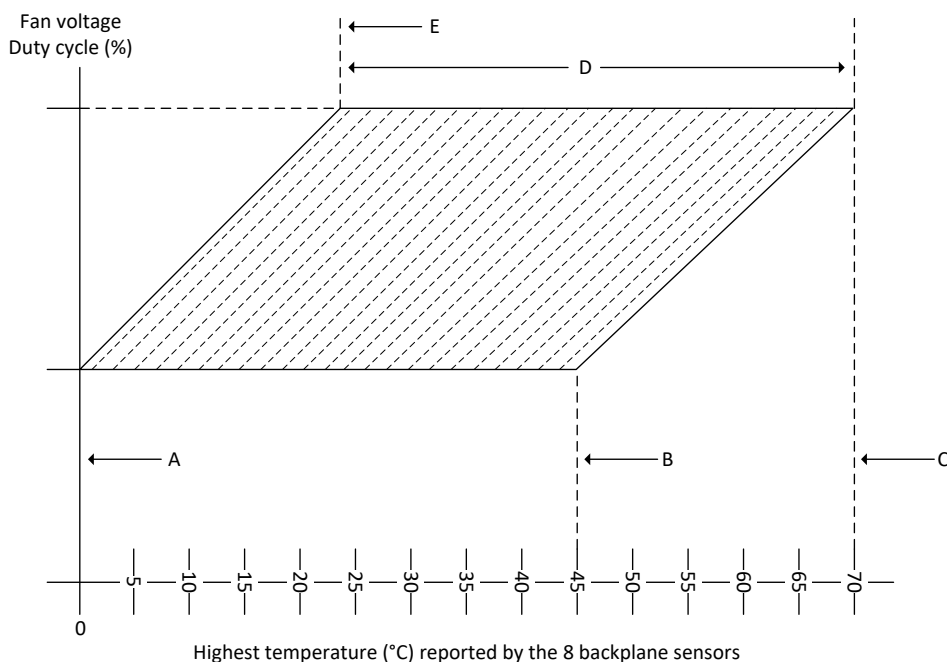


FIGURE 3-7: TARGET TEMPERATURE PARAMETERS

Mark	Temperature	Event
A	0 °C	Lowest temperature that the chassis can be at before the fan speed begins to ramp up.
B	45 °C	Highest temperature that the chassis can be at before the fan speed begins to ramp up.
C	70 °C	Highest temperature that the chassis can be at before fan speeds are at maximum speed.
D	25 °C to 70 °C (45° range)	Temperature range over which the maximum chassis temperature can be set.
E	25 °C	Lowest temperature that the chassis can be set at before fan speeds are at maximum speed.

TABLE 3-2 - TARGET TEMPERATURE PARAMETERS LEGEND

CHASSIS STATUS

Overview

This screen displays real time operating values for DC voltage, chassis temperature, and fan speed.

DC Voltage

Displays monitored power rail readings for 5 V AUX, 3.3 V, 5 V, 12 V, and -12 V. The status of these values will read 'Normal' when the readings are within the threshold range and 'Abnormal' when the threshold range is exceeded.

Fan Speed (Chassis Status)

Displays monitored fan speeds of the three cooling fans. The status of these values will read 'Normal' when the readings exceed the minimum operating speed of 800 RPM and 'Abnormal' when the readings fall below 800 RPM.

SECTION 4

BENCH-TOP USE

OVERVIEW

The CMX18A chassis, in its most basic form, is designed for bench-top use with its four rubberized pegs. In the event of a spill, the pegs prevent the chassis from being submerged in any spilled liquid. The rubberized pegs additionally prevent the chassis from accidentally being pushed off of table tops or shelves.



FIGURE 4-1: TABLE TOP OPTION

RACK MOUNT OPTION

OVERVIEW

AMETEK also provides an optional kit which can be installed on the CMX18A so that it can be rack-mounted. The CMX18A rack mount kit recesses the chassis into the rack which accommodates for external mechanical parts on the front side of the chassis such as cables and mass interconnect modules.

ASSEMBLY

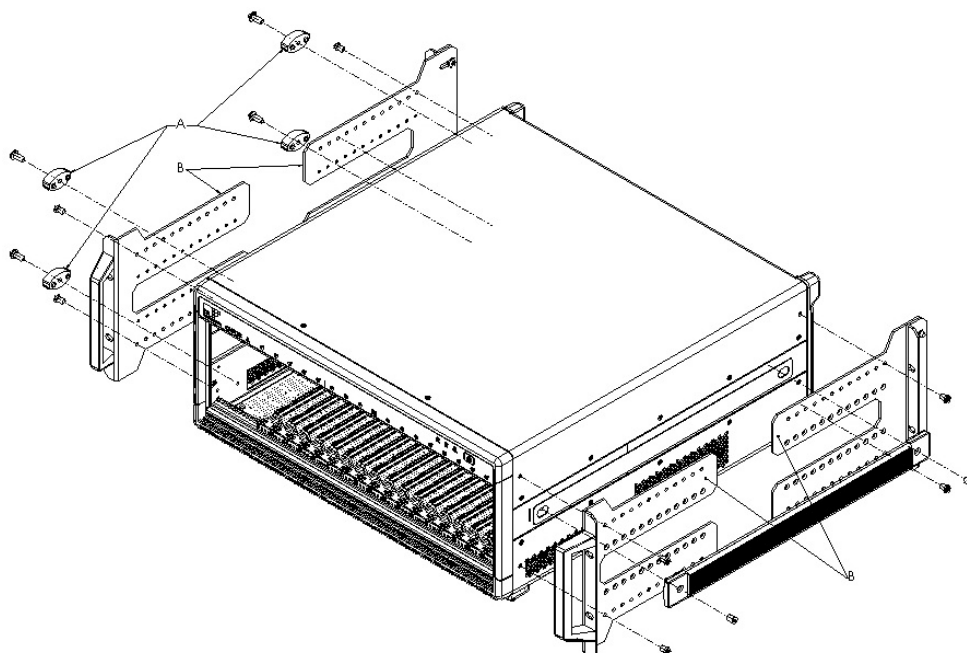


FIGURE 4-2: RACK MOUNT ASSEMBLY

A	Rubber Feet
B	Mounting Brackets

TABLE 4-1 - RACK MOUNT ASSEMBLY LEGEND

- 1) Remove the four rubber feet from the left side
- 2) Install the mounting brackets on both sides of the chassis using the provided M4 screws. A range of screw holes are provided on the mounting bracket so that the chassis can be recessed into the rack by the desired amount.

Install the chassis in the rack using eight screws (not included).

ORDERING INFORMATION –

Model No.	Description	P/N
CMX18A	Chassis, 18-slot, PXIe	70-0699-000R
	CMX18A, RACK MOUNT KIT	70-0699-100R
	KIT, BLANK PANEL, CMX09A/CMX18A, QTY 9	70-0698-200R
	KIT, BLANK PANEL CMX09A/CMX18A, QTY 5	70-0463-901R
EMX2500	F/A, EMX-2500, GbE LXI SYS CNTR	70-0409-007R
EMX-4250	Digitizer, 24-bit, 16Ch, 204.8 kSa/s IEPE/Volts	70-0409-004R
EMX-4251	Digitizer, 24-bit, 8Ch, 204.8 kSa/s IEPE/Volts	70-0409-012R
EMX-4350	Digitizer, 24-bit, 4Ch, 625.0 kSa/s IEPE/Volts	70-0409-002R
EMX-4380	Digitizer, 24-bit, 4Ch, 625.0 kSa/s IEPE/Volts/Charge	70-0409-011R
EMX-4016	Break-Out-Box (BOB), 16Ch, for EMX-4250/4251, 1U 19" Rack Mount	70-0409-015R
EMX-4116	Break-Out-Box (BOB), 16Ch, for EMX-4250/4251, ½ width Rack Mount	70-0409-016R
EMX-4032	Break-Out-Box (BOB), 32Ch, for EMX-4250/4251, 1U 19" Rack Mount	70-0409-016R
EMX-4008	Break-Out-Box (BOB), 8Ch, for EMX-4250/4251, Table Top	70-0409-010R
	Break-Out-Cable (BOC) Micro-D to 8Ch BNC, for EMX-4250/4251	53-0515-020R
	Cable Assy. Micro-D to Micro-D for EMX-4250/4251 to BOB	53-0515-020R
	Adapter 10-32 Female Microdot to BNC Male	27-0577-000
	Plug, 25-pin Female Micro-D, ITT Cannon MDSM-25SC-Z11-VS1	27-0295-025

SECTION 5

MAINTENANCE AND TROUBLESHOOTING

INTRODUCTION

The CMX18A should operate without the need for service, except for occasional cleaning of the air filter. The need for cleaning will vary depending on how many hours a day the unit operates for as well as the cleanliness of the air. The following sections will cover various details of cleaning the chassis as well as the steps to replace or clean various components.

The short section below describes installation problems as well as the meaning of various LED indicators located on the front panel of the chassis.

Troubleshooting

Installation Problems

Inability to start the system frequently results from incorrect installation of modules such as the system controller or peripherals. Please ensure that:

- The system controller is properly installed and secured.
- All peripheral modules are properly seated on the slot guide rails.
- All cables are properly connected to the modules.
- The power cord is securely connected to a power source as well as the chassis power connector.

If the system fails to start when the above conditions have been checked, remove all installed peripheral modules and repeat the same process. If the system starts normally, shut off the system, insert one peripheral module, and attempt to power up the chassis. Repeat the process until the desired result is achieved. If the chassis does not power up with a certain module, install the module in a different slot and attempt to power up the chassis.

General

System Fails to Power Up	Please check the following: -The power cord is securely connected to the chassis power connector and the power outlet. -The power outlet is live. -The main power switch on the back of the chassis is on. -The standby power button on the front panel is on.
No Video Output in the External Display	-The external display is functioning properly. -Display setting support external video.
Green LED ON	Fans are operating normally.
Green LED OFF	Chassis is powered off.
Green LED Blinking (Fan LED)	One or more fans are running below the default threshold speed of 800 RPM. Please ensure that the fan is not obstructed by any objects. Contact your dealer if the fan appears to be operating normally and the fan LED is still blinking.

Amber LED ON	N/A
Amber LED OFF	The chassis is operating within normal temperatures.
Amber LED Blinking (Temperature LED)	One or more temperature sensors are exceeding the default threshold of 70 °C. Please ensure that both outlet and intake apertures are not obstructed and are given adequate clearance. Contact your dealer if the temperature of the exhausted air is below 50 °C and the temperature LED is still blinking.
Blue LED ON	DC Voltage supply is normal.
Blue LED OFF	Chassis is powered off.
Blue LED Blinking (Power LED)	One or more power rails are exceeding the default threshold of 5 V, 3.3 V, +12 V, or -12V (±5%). Please remove all PXI modules (both the controller and peripheral modules) to ensure that there is no short circuit. Contact your dealer if the chassis and all plugged in modules appear to be functioning correctly and the power LED is still blinking.

EXTERIOR



Before attempting to clean the chassis, ensure that the chassis is powered off and the power cord is removed. Wipe the exterior of the chassis with a clean cloth in order to remove dust and dirt that has accumulated on the chassis. Areas such as air inlets should be thoroughly cleaned of dust in order to maximize airflow to the unit.

INTERIOR



Before attempting to clean or disassemble the chassis, ensure that the chassis is powered off and the power cord has been removed. Failing to do so may result in bodily injury or death in extreme cases.

TEMPERATURE DETECT

The amber LED located on the front panel of the chassis will begin to blink if the internal temperature exceeds the default threshold temperature of 70 °C. The chassis is allowed to exceed the maximum temperature of 90 °C for 15 minutes after which it will immediately shut down. If the chassis reaches 100 °C at any point, the chassis will immediately shut down.

HANDLING THE CHASSIS AND CABLES

The CMX18A features two robust handles in order to be as portable as possible. The handles are designed to support the full weight of the chassis and it is strongly recommended that both handles are used during transportation. Take care when moving the chassis to avoid any possible injury.