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DATA SHEET



# CMX09

9-SLOT 3U PXI EXPRESS CHASSIS

UP TO 8 GB/S

## FEATURES

9-slot PXI Express chassis with 1 system controller slot, 6 peripheral slots, 1 hybrid slot and 1 timing slot

High bandwidth PCIe Gen 2 backplane with 2 GB/s slot bandwidth and 8 GB/s system bandwidth

True 4U chassis

Rugged construction with extended temperature range

IEEE 1588 distributed instrument synchronization

Smart switch display for health monitoring and control

Flexible slot-to-slot direct communication for highly-deterministic operations

Partitionable switch architecture with non-transparent bridging for true multi-root support

First and only chassis PXI Multicomputing (PXImc) ready

Rack mount, custom front panels, and bolt-down option available

VTI Instruments

www.vtiinstruments.com

Specifications contained within this document are subject to change without notice

# OVERVIEW

## Slot Configurationtions

The CMX09 is a 9-slot PXI Express mainframe with 1 system controller slot, 6 PXIe Peripheral slots, 1 PXIe hybrid slot and 1 PXIe timing slot. The PXI Express hybrid slot delivers connectivity to either a x4 PCI Express link or to the 32-bit, 33 MHz PCI bus on the backplane. This allows PXI Express, hybrid-compatible, or 32-bit cPCI/PXI-1 modules (without J2 connector) to be used in this slot. The PXIe timing slot accepts either a PXI Express module or a PXI Express system timing controller for advanced timing and synchronization. The system controller slot has configurable 4x4, 2x8 and 1x8 links, which makes it very flexible allowing all PXIe controllers to be supported per spec.

## Unmatched Speed, Flexibility and Performance

### Best in class Bandwidth

The CMX09 uses a 4-lane Gen 2 PCIe backplane to achieve unmatched data rates of up to 2 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

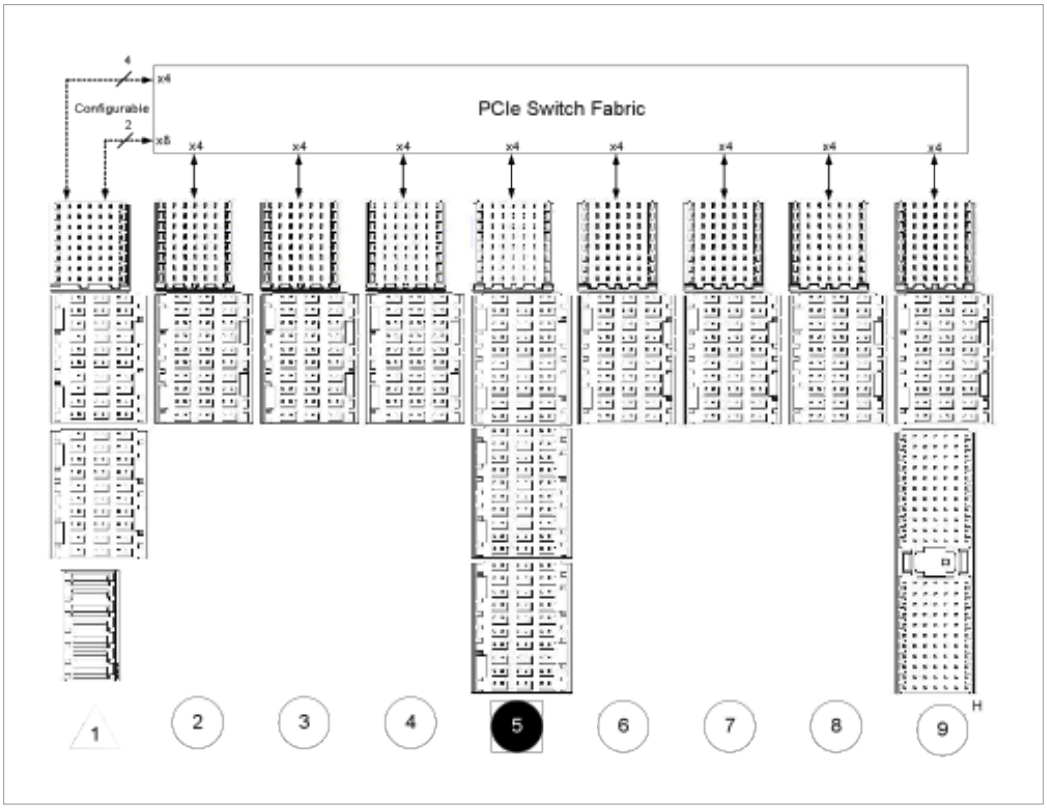
The CMX09's advanced switch fabric uses innovative methods including non-transparent bridging (NTB) and a partitionable switch architecture to allow slot-to-slot direct communication and true multi-root support.

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 is very useful in applications that require closed loop control.
True multi-root support allows any slot to be used as a root-complex which means a data processing or memory unit can be plugged into any slot on the chassis. This combined with slot-to-slot communication capability allows data to be streamed directly from a plugin module to a root complex for storage or processing, without burdening the host processor.

### PXImc Ready

The slot-to-slot direct communication capability combined with true multi-root support allows the CMX09 to be the first and only PXImc (PXI MultiComputing) ready mainframe in the industry. This provides the ability to use multiple processor modules in any slot of the mainframe in order to share the processing requirements for the application.

This allows the CMX09 to be used in high-speed, high-channel count applications where multi-gigabytes/sec of data require in-line processing and analysis.




CMX09 Backplane Layout

## IEEE-1588 Distribution

The CMX09 backplane contains a built-in mechanism for distributing an IEEE-1588 time source to the plugin modules. This mechanism is only supported when using the EMX-2500 Gigabit Ethernet LXI controller, and allows timestamping of data from all plugin 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 CMX09 has a smart-switch display on the front panel which reports the chassis status/health and can also be used to control chassis fan speed.

### Temperature monitoring

The CMX09 chassis monitors its own internal temperature using temperature sensors placed within the chassis. The smart switch can display the measured temperature readings and alert the user if an over-temperature condition occurs.

### Power monitoring

The smart switch monitors the power rail voltages and reports fault conditions if they occur.

### IP Address

When used with the EMX-2500 Gigabit Ethernet LXI controller, the smart switch displays the mainframe IP address, allowing quick and easy connectivity to the instrument.

### Fan Speed

The smart switch allows the user to adjust the mainframe fan speed. When set in auto-mode, the temperature reading from the temperature sensors are used to automatically optimize the fan speed.

In addition, a DB-9 connector is provided in the rear of the chassis that provides pins for voltage monitoring and remote inhibit. Remote inhibit active high and active low are available and can be used to turn off the chassis by applying a connection to +5 V or GND respectively.

# Rugged Design







### Table-top Option

A rugged, compact and light-weight design makes the CMX09 ideal for portable applications. The CMX09 is available with optional handles which makes it convenient to lift and move. There are no air-holes on the front of the chassis, which protects the instruments from spills when used in industrial environments.

### Bolt-down Option

For in-vehicle or on-floor applications, the CMX09 comes with a bolt-down option that allows the mainframe to be mounted on a surface. The bolt-down option includes vibration isolators that can withstand up to 11 Gs of acceleration on the vertical axis and 4 Gs of acceleration on the horizontal axis. In addition, the clearance between the surface and mainframe is adjustable depending on user constraints.

### Rack-mount Option

Traditional rack-mount options with custom front panels are also available.

# Rugged Design

### Innovative Cooling Techniques

The innovative cooling techniques implemented on the CMX09 allow it to be a "True 4U chassis". Traditional PXIe chassis, even if advertised as 4U, often require an additional 1U rackspace for airflow. The CMX09 uses innovative cooling methods to pull cool air from the front and sides of the chassis rather than the top, and expel from the rear. The temperature control mechanism monitors temperature at the exhaust and automatically adjusts the fan speed to optimize air flow. The cooling implementation allows an extended temperature range of up to 60 °C .

### Serviceability

The CMX09 is designed with serviceability in mind. The assembly is very modular with a removable power supply, fan assembly and filter tray, which simplifies on-site diagnostics and replacement of any failed components..

### External Clock

The CMX09 includes a pair of IN/OUT BNC connectors in the rear to bring in 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 5. System timing controllers provide a high-stability clock source and the ability to drive the PXI star and PXIe 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.

Removable filter tray protects instruments in industrial applications





Easily removable power supply and fans trays allow for faster MTTRs

# General Specifications

| | |
|---|---|
| TOTAL SLOTS | 9 slots |
| PXI EXPRESS SYSTEM CONTROLLER | 1 slot (slot 1) |
| PXI EXPRESS PERIPHERAL | 6 slots (slots 2, 3, 4, 6, 7, 8) |
| PXI EXPRESS TIMING | 1 slot (slot 5) |
| PXI EXPRESS HYBRID | 1 slot (slot 9) |
| MODULE SIZE | 3U |
| BANDWIDTH | |
| SLOT | 2 GB/s |
| MAINFRAME | 8 GB/s |
| STANDARDS COMPLIANCE | PXI-5 PXI Express Hardware Specifications |
| | PXI-1 hardware specifications Rev 2.2 |
| | PICMG EXP.0 R1.0 specification |
| SYSTEM SYNCHRONIZATION CLOCKS | |
| 10 MHZ SYSTEM REFERENCE CLOCK: | |
| PXI_CLK10 | |
| MAX SLOT-TO-SLOT SKEW | 1 ns |
| ACCURACY | ±100 ppm Max |
| MAX JITTER | 5 ps RMS Phase Jitter |
| DUTY FACTOR | 45 to 55% |
| 100MHZ SYSTEM REFERENCE CLOCK: | |
| PXI_CLK100 | |
| MAX SLOT-TO-SLOT SKEW | 200 ps |
| ACCURACY | ±100 ppm Max |
| MAX JITTER | < 1 ps RMS Phase Jitter (10 Hz to 12 kHz) |
| | < 1 PS RMS PHASE JITTER (12 KHZ TO 20 MHZ) |
| DUTY FACTOR | 45 to 55% |
| EXTERNAL | |
| 10 MHZ REFERENCE OUT (FROM BNC OUT) | |
| ACCURACY | ±100 ppm max |
| MAXIMUM JITTER | 5 ps RMS Phase Jitter (10 Hz – 1 MHz range) |
| OUTPUT AMPLITUDE | 1 Vpp, ±20% square wave into 50Ω |
| | 2 Vpp unloaded |
| OUTPUT IMPEDANCE | 50Ω ± 5Ω |
| EXTERNAL CLOCK SOURCE | |
| FREQUENCY | 10 MHz ± 100 ppm |
| INPUT AMPLITUDE | 200 mVpp to 5 Vpp squre-wave or sine-wave (Rear panel BNC) |
| | 5V or 3.3V TTL Signal (System timing slot) |
| REAR PANEL BNC INPUT IMPEDANCE | 50Ω ± 5Ω |
| MAXIMUM JITTER INTRODUCED | 1 ps RMS Phase Jitter (10 Hz – 1MHz range) |
| BY BACKPLANE | |
| MECHANICAL | |
| SIZE | 10.8” L X 10.52” D X 7.43” H |
| WEIGHT | 10.8 LBS |

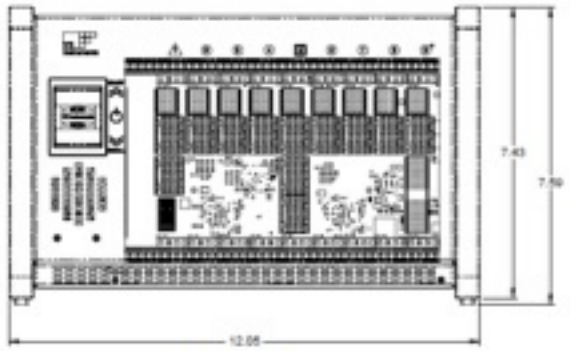
[1] There will be power derating at > 60 °C. Refer to the detailed specifications.

# General Specifications

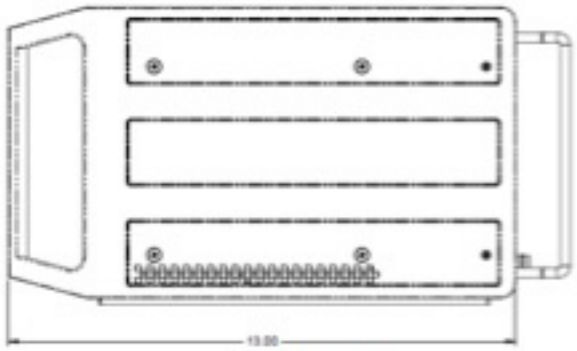
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|---|---|
| **ELECTRICAL** | |
| AC INPUT | |
| INPUT VOLTAGE RANGE | 90 to 264 VAC |
| INPUT FREQUENCY RANGE | 47 to 63 Hz |
| INPUT CURRENT | Max 8A @ 115 VAC, 4 A @ 230 VAC |
| DC OUTPUT | |
| MAX DC POWER OUTPUT | 460 W |
| EFFICIENCY | 85% (typical) |
| +3.3V MAX LOAD | 20 A |
| +5V MAX LOAD | 20 A |
| +12V MAX LOAD | 32 A |
| -12V MAX LOAD | 0.5 A |
| +5V STANDBY MAX LOAD | 2.5 A |
| **COOLING** | |
| FANS | Two 130 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 |

# Environmental Specifications

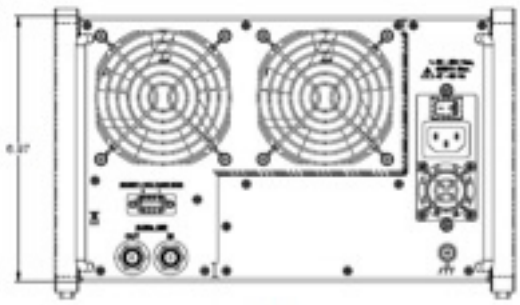
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|---|---|
| Operating Temperature | -20 °C to 60 °C<br>Chassis can operate up to 70 °C with 25 W derating per 0 °C beyond 60 °C |
| Storage Temperature | -30 °C to 85 °C |
| Humidity | 20 to 90% non-condensing |
| Altitude | 10,000 ft. |
| **SAFETY AND EMC** | |
| SAFETY COMPLIANCE | EN 61010-1, IEC 61010-1<br>UL 61010-1, CSA 61010-1<br>2006/95/EC; Low-Voltage Directive (safety) |
| EMC Compliance | EN 61326 (IEC 61326): Class A emissions, basic immunity<br>EN 55011 (CISPR 11): Group 1, Class A emissions<br>AS/NZS CISPR 11: Group 1, Class A emissions<br>FCC 47 CFR Part 15B: Class A emissions<br>ICES-001: Class A emissions |



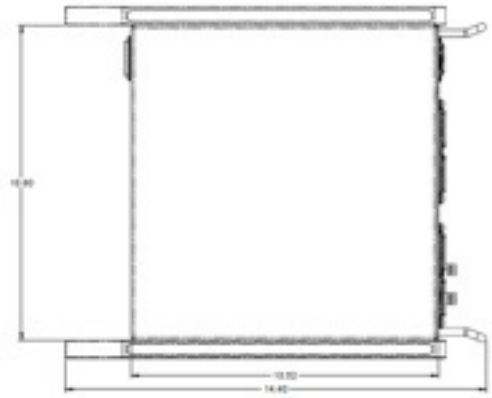

FRONT VIEW




RIGHT SIDE VIEW



REAR VIEW




TOP VIEW

## Ordering Information

| | |
|---|---|
| 70-0463-000 | CMX09, 9-slot 3U PXI Express Chassis, Rack Handle Option |
| 70-0463-100 | CMX09, 9-slot 3U PXI Express Chassis, Rackmount Option |
| 70-0463-200 | CMX09, 9-slot 3U PXI Express Chassis, Rackmount Option with door |
| 70-0463-300 | CMX09, 9-slot 3U PXI Express Chassis, Bolt-down Option |
| | |
| RELATED PRODUCTS | |
| EMX-2500 | Gigabit Ethernet LXI Remote Controller for PXI Express |
| CMX18 | 18-Slot PXI Express Chassis |

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