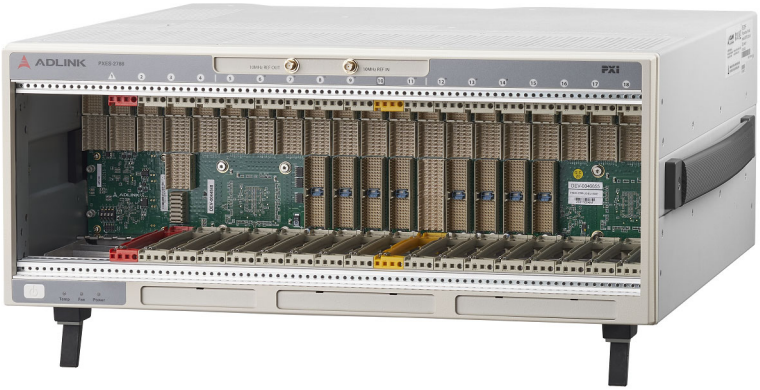
PXES-2788 Series

PXI Express Chassis

User's Manual



Manual Rev.:	1.1
Revision Date:	Dec. 18, 2023
Part No:	50M-00143-1000

LEADING EDGE COMPUTING

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Revision History

Revision	Release Date	Description of Change(s)
1.0	2023-10-22	Initial release
1.1	2023-12-18	Made the following changes: ▶ Removed Maximum Current Per Chassis from DC Power Output table. ▶ Deleted DC Power Output Specifications table. ▶ Added Max Slot Power to Backplane Slot DC Power Current table.

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Preface

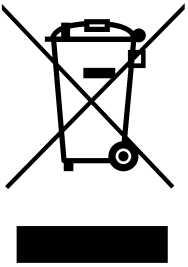
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WARNING: This product can expose you to chemicals including acrylamide, arsenic, benzene, cadmium, Tris(1,3-dichloro-2-propyl)phosphate (TDCPP), 1,4-Dioxane, formaldehyde, lead, DEHP, styrene, DINP, BBP, PVC, and vinyl materials, which are known to the State of California to cause cancer, and acrylamide, benzene, cadmium, lead, mercury, phthalates, toluene, DEHP, DIDP, DnHP, DBP, BBP, PVC, and vinyl materials, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov**.**

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Product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.

NOTE: Additional information, aids, and tips that help users perform tasks.

CAUTION: Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.

WARNING: Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

Get ready to take your testing and measurement applications to the next level with the ADLINK PXES-2788 Series chassis. With its high-performance 18-slot PXI Express backplane, high-output power supply, and cooling capacity, it's designed for heavy-duty and high port density applications. The modular design ensures a high level of maintainability, with replaceable power supplies for high-availability applications, resulting in a very low meantime to repair (MTTR).

Fully compliant with the PXI-5 PXI Express hardware specification, the PXES-2788 Series offers advanced timing and synchronization features for high clock accuracy and external clock and trigger routing. Using PCI Express 3.0 technology, the chassis boasts a system bandwidth of up to 24GB/s for high-throughput, peer-to-peer data transfer applications, and up to 8 GB/s bandwidth for all peripheral slots.

The PXES-2788 Series provides up to 102W power and cooling capacity per slot, allowing for higher power budgets for high-performance and power PXI modules. And with a smart system monitoring controller that reports chassis status, including fan speed, system voltages, and internal temperature, you can be sure that your system is running at optimal performance. The smart fan function dynamically adjusts fan speed based on the embedded temperature sensor to achieve a balance between sufficient airflow and operating noise.

Experience the power and versatility of the ADLINK PXES-2788 Series chassis and take your testing and measurement applications to the next level.

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1.1 Features

- Up to 102W power and cooling capacity per peripheral slot (for more information, please see “Cooling Capacity” on page 10.)
- Up to 1700W/1000W/800W DC power supply total output (for more information, please see “DC Power Output” on page 4.)
- PXES-2788 supports 18 slots (1 system slot with left-3-blank-slot space and 18 peripheral slots)
- PXES-2788E supports 21 slots (1 system slot and 20 peripheral slots)
- PXI Express System Slot routed as 2 Link Configuration x8 x16
- Up to 24 GB/s (PCI Express 3.0 x8 x16 link) system bandwidth
- Up to 8 GB/s (PCI Express 3.0 x8 link) bandwidth for all peripheral slots
- 0°C to 55°C/50°C/45°C operating temperature range (for more information, please see “DC Power Output” on page 4.)
- Two front panel SMA connectors for PXI 10MHz reference clock input and output
- Replaceable power supply unit
- Low-jitter internal 10 MHz reference clock for PXI/PXI Express slots with ±1 ppm stability
- Low-jitter internal 100 MHz reference clock for PXI Express slots with ±1 ppm stability
- Variable speed fan controller optimizes cooling and acoustic emissions
- Through inhibit connector, including remote power button and voltage monitor
- PXI-5 PXI Express hardware specification Rev. 1.1 compliant

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1.2 Specifications

The PXES-2788 Series complies with the PXI-5 Specification Rev.1.1 and accepts all modules compliant with the PXI-5, CompactPCI, and PICMG 2.0 specifications.

Power Supply

Model	PXES-2788/2788E
AC Power Input	
Rated Input	2400 PSU: 200-240V AC, 50/60Hz, 13.3A (X2) 1300 PSU: 100-240V AC, 50-60Hz, 12-7A (X2)
Over-current protection	Internal AC in-line fuse (non user serviceable)
Dual PSU Slots	Current sharing mode, not hot swappable.

Model	*PXES-2788/2788E*
Entrée d'alimentation CA	
Entrée nominale	*2400 PSU: 200-240V AC, 50/60Hz, 13.3A (X2)* *1300 PSU: 100-240V AC, 50-60Hz, 12-7A (X2)*
Protection contre les surintensités	*Fusible AC en ligne interne (non réparable par l'utilisateur).*
Double PSU	*Mode de partage actuel, non remplaçable à chaud.*

Table 1-1: Power Supply Specifications

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DC Power Output

Model	Maximum total DC output power (for all PXIe modules)
PXES-2788/HP PXES-2788E/HP	1700W[1] / 1000W[2]
PXES-2788 PXES-2788E	1000W[3] / 800W[4]

Notes:

1. 0 to 45°C, input power 200Vac to 240Vac for in-box PSU CSU2400AP-3-XX.
2. 0 to 50°C, input power 200Vac to 240Vac for in-box PSU CSU2400AP-3-XX.
3. 0 to 55°C, input power 200Vac to 240Vac for in-box PSU FSP1300-29FM.
4. 0 to 55°C, input power 100Vac to 120Vac for in-box PSU FSP1300-29FM

DC Power Voltage	Load Regulation	Maximum Ripple Noise
+12V	±5%	120mV
+3.3V	±5%	50mV
+5V	±5%	50mV
-12V	±5%	120mV
+5Vsb	±5%	50mV

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Backplane Slot DC Power Current

Note: For more information, please see “DC Power Output” on page 4.

Slot Type	Slot Number	+5V	+3.3V	+12V	-12V	+5Vaux	Max Slot Power
PXIe System Slot	1	15A	15A	30A	-	3A	255w
PXIe Peripheral/ System Timing Slots	PXES-2788: 2,3,4,5,10,15, 16,17,18 PXES-2788E: 2,3,4,5,10,15, 16,17,18,19, 20,21	-	9A	6A	-	1A	102w
PXIe Hybrid Peripheral Slot	6,7,8,9,11,12, 13,14	6A	9A	6A	1A	1A	102w

Table 1-2: Backplane Slot DC Power Current

PXI 10 MHz System Reference Clock (PXI_CLK10)

Item	Detail
Maximum slot-to-slot skew	280 ps
Accuracy	±1 ppm max, 0°C to 55°C, 32˚F to 131˚F
Maximum jitter	0.44 ps RMS phase-jitter (12k Hz–20 MHz)
Duty-factor for PXI_CLK10	45% to 55%
Unloaded signal swing	3.3V ± 5% (±0.165V)

Table 1-3: PXI 10 MHz Reference Clock

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10MHz Clock Output: Front Panel SMA Connector

Item	Detail
Accuracy	±1 ppm max, 0°C to 55°C, 32˚F to 131˚F
Maximum jitter	2.14 ps RMS phase-jitter (12k Hz–20 MHz)
Output amplitude	1 Vpp ±20% square-wave into 50Ω, 2 Vpp unloaded
Output impedance	50Ω ±5Ω

Table 1-4: 10MHz Clock Output: Front Panel SMA Output

10MHz Clock Input Requirements: Front Panel SMA Connector

Item	Detail
Frequency input	10 MHz ±25 PPM
Input signal (10MHz REF In SMA)	100 mVPP to 5 VPP (square or sine)
Input impedance (10MHz REF In SMA)	High impedance
Input signal (PXI_CLK10_IN on 10th slot)	5 V or 3.3 V TTL signal

Table 1-5: 10MHz Clock Input: Front Panel SMA Connector

PXI Star Trigger

Item	Detail
Maximum slot-to-slot skew	250ps
Backplane characteristic impedance	50Ω ±5Ω

Table 1-6: PXI Star Trigger

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PXIe 100 MHz System Reference Clock (PXIe_CLK100)

Item	Description
Maximum slot-to-slot skew	100 ps
Accuracy	±1 ppm max, 0°C to 55°C , 32˚F to 131˚F
Maximum jitter	2.41 ps RMS phase-jitter (12k Hz–20 MHz)
Duty-factor for PXIe_CLK100	45% to 55%
Absolute differential voltage (when terminated with a 50 Ω load to 1.30 V or Thévenin equivalent)	400 to 900 mV
PXIe_SYNC100	Implemented as default behavior. PXIe_SYNC_CTRL is disabled by connecting a 10kΩ pull-down resistor to ground.

Table 1-7: PXI Express 100 MHz System Reference Clock

PXI Differential Star Triggers

(PXIe-DSTARA, PXIe-DSTARB, PXIe-DSTARC)

Item	Detail
Maximum slot-to-slot skew	150ps
Maximum differential skew	25ps
Backplane differential impedance	100Ω ±10Ω
Maximum Channel Bandwidth	1.75GHz

Table 1-8: PXI Differential Star Triggers

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Backplane Slots & Functionality

Type of Slot	Qty	Slot Number	Bus
PXI Express System Slot	1	1	2 Link x8 x16 (Note 1)
PXI Express System Timing Slot	1	10	(Note 2)
PXI Express Hybrid Peripheral Slot	8	6,7,8,9,11,12,13,14	(Notes 2, 3)
PXI Express Peripheral Slot	PXES-2788: 8 PXES-2788E: 11	PXES-2788: 2,3,4,5,10,15,16,17,18 PXES-2788E: 2,3,4,5,10,15,16,17,18, 19,20,21	(Note 2)

Table 1-9: Backplane Slots & Functionality

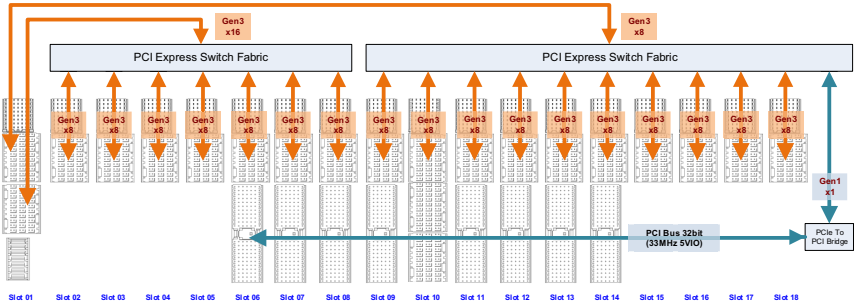
Notes:

1. PCIe x8 x16 Gen3 supports up to 24 GB/s system bandwidth.
2. PCIe x8 Gen3 supports up to 8 GB/s peripheral bandwidth, and up to 4GB/s peripheral bandwidth for PXES-2788E slots 19,20, and 21.
3. PCI Bus 32-bit at 33 MHz and 5 VIO.

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Backplane PCI Express Bus Topology

PXES-2788 Backplane PCI Express Bus Fabric - 2 Link x16 x8



PXES-2788E Backplane PCI Express Bus Fabric - 2 Link x16 x8

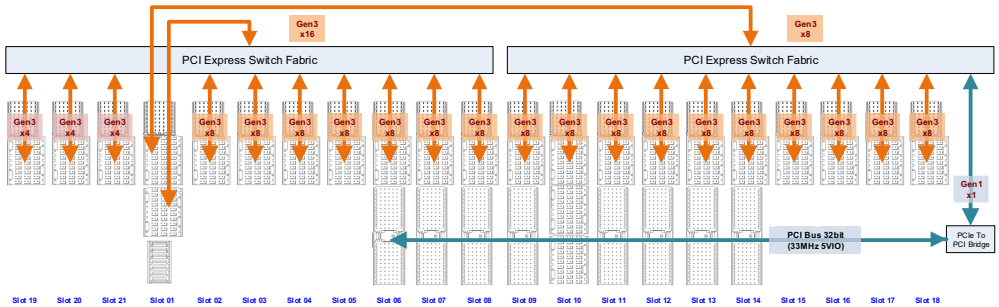


Figure 1-1: Backplane PCI Express Bus Topology

Cooling Capacity

Model	PXES-2788/HP PXES-2788E/HP	PXES-2788 PXES-2788E
Per Peripheral Slot (Max)	102W/slot[1, 5] 85W/slot[2, 5] 60W/slot[3]	85W/slot[2, 5] 60W/slot[4]
System Slot (Max)	200W/sys slot[2] 150W/sys slot[3]	200W/sys slot[2] 150/sys slot[4]
Chassis (Max)	1700W/chassis[2] 1350W/chassis[3]	1700W/chassis[1], 1350W/chassis[4]

Table 1-10: Cooling Capacity

Notes:

1. Ambient temperature: 0°C to 40°C, boost fan mode.
2. Ambient temperature: 0°C to 45°C, boost fan mode.
3. Ambient temperature: 0°C to 50°C.
4. Ambient temperature: 0°C to 55°C.
5. When all slots have installed high power peripheral modules (>60W), the cooling requirements of modules installed in slots 2, 3, 7, 8, 9, 17, 18, 19, 20 shall be limited to less than 72W.
6. For DC power supply for modules, please see “DC Power Output” on page 4

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Cooling

Item	Detail
Chassis Fans (for peripheral modules)	Standard: Forced air circulation through 3x 210 CFM fans High power model: Additional air circulation through 4x 128 CFM fans
Chassis Fan (for backplane and power supply units)	Fans integrated in chassis and power supply unit
Module slot airflow direction	From bottom to top of module
Module airflow intake	Rear of chassis
Module airflow exhaust	Top of chassis
Power supply cooling	Forced air circulation through integrated fan
Power supply intake	Rear of chassis
Power supply exhaust	Top of chassis
Minimum chassis cooling clearances	PXES-2788/HP, PXES-2788E/HP: Rear: 10.2 cm / 4 in. Top (with top fan): 10.2 cm / 4 in PXES-2788, PXES-2788E: Rear: 10.2 cm / 4 in. Top (without top fan): 4.45 cm / 1.75 in

Table 1-11: Cooling



Do not block ventilation holes. Ensure sufficient cooling clearances for the front, bottom, sides, and rear of chassis.

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Mechanical Dimensions and Weight

Item	Detail
Height	194.8mm (7.67”)
Width	With handles: 464.9mm (18.30") Without handles: 444.4mm (17.50")
Depth	482mm (18.98")
Net Weight	11.9 kg (26.2 lbs)
Gross Weight (with package, power cable, and filler panels)	14.6 kg (32.2 lbs)

Table 1-12: Mechanical Dimensions and Weight

(All dimensions in millimeters)

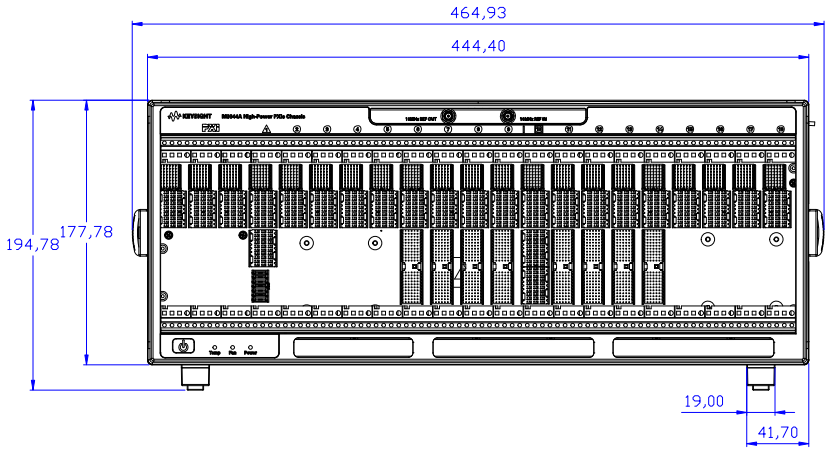


Figure 1-2: Front View

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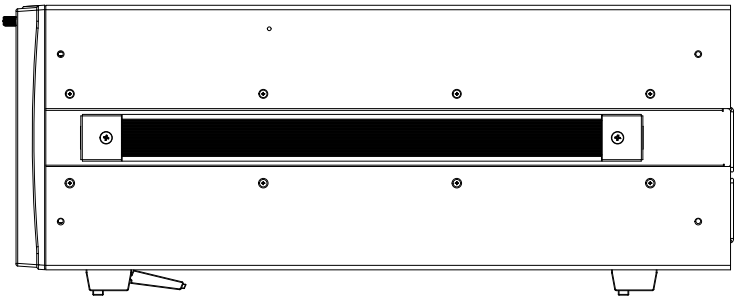


Figure 1-3: Right View

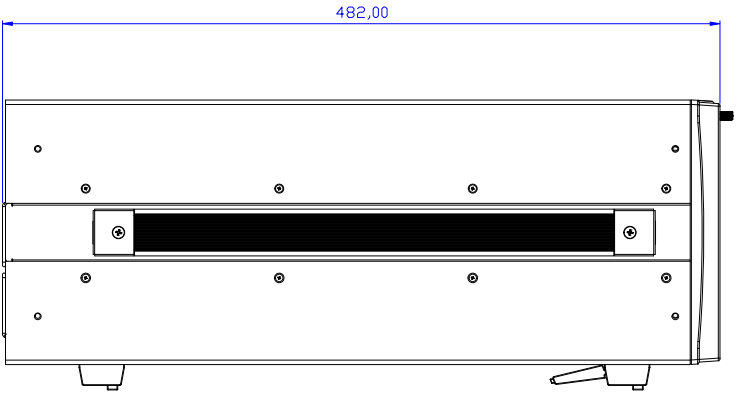


Figure 1-4: Left View

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Pin Definitions

Slot Type	Pin Definition
PXI Express System Slot	Comply with PXISA PXI-5 Hardware Specification: PXI Express System Slot Pin Assignments for 2 Link Operation
PXI Express System Timing Slot	Comply with PXISA PXI-5 Hardware Specification: PXI Express System Timing Slot Pinout
PXI Express Peripheral Slot	Comply with PXISA PXI-5 Hardware Specification: PXI Express Peripheral Slot Pin Assignments
PXI Express Hybrid Peripheral Slot	Comply with PXISA PXI-5 Hardware Specification: PXI Express Hybrid Peripheral Slot Pin Assignments

Table 1-13: PXI Express Slot Pin Definitions

Software and Utilities

The PXES-2788 complies with PXI-6 PXI Express Software Specification Revision 1.2. Related software resources are available in following software packages.

ADLINK PXI Software Service

A software package that provides PXI-2/PXI-6/PXI-9 software services, drivers, sample programs, and utilities for ADLINK PXI Express/PXI system modules and chassis. Please refer to the ADLINK PXI Platform Service user manual for more information.

Measurement Automation and Platform Service (MAPS)

A software package including ADLINK DAQ drivers and ADLINK PXI Software Service. Please refer to the MAPS user manual for more information.

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Environmental Specifications

Item	Detail	
Storage	Ambient temperature: -40°C to 71°C (-40˚F to 159.8˚F) Relative humidity: 10 to 90%, noncondensing	
Operating	Ambient temperature: PXES-2788 0°C to 55°C (32˚F to 131˚F) PXES-2788/HP 0°C to 50°C (32˚F to 122˚F) Relative humidity10 to 90%, noncondensing	
Functional shock	30 G, half-sine, 11 ms pulse duration	
Random Vibration	Operating: 5 to 500 Hz, 0.3 Grms, 3 axes Nonoperating: 5 to 500 Hz, 2.46 Grms, 3 axes	
Fan Mode*	**Fan Speed***	**Acoustic Emissions**
Normal (for up to 60W / slot)	Auto	38.1 dBA
	High	59.1 dBA
Boost (for up to 85W or 102W / slot)	Auto	53.0 dBA
	High	71.6 dBA

*When ambient temp is 25°C, Fan Mode and Fan Speed are set by switches at the rear of the chassis.

Table 1-14: Environmental Specifications

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Electromagnetic Compliance

- EN 61326-1
- BS EN IEC 61326-1

- EN 55011
- BS EN 55011
- AS/NZS CISPR 11

- EN 55032:2015 + A11:2020
- BS EN 55032:2015 + A11:2020
- AS/NZS CISPR 32:2015 + A1:2020
- EN 55035
- BS EN 55035

- CFR47 FCC Part 15 Subpart B
- ICES-003

Safety Compliance

- EN 61010-1:2010/A1:2019 (IEC 61010-1 Ed. 3.1)
- EN IEC 61010-2-201:2018 (IEC 61010-2-201 Ed. 2.0)

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1.3 Connectors, I/O and Controls

1.3.1 Front Panel

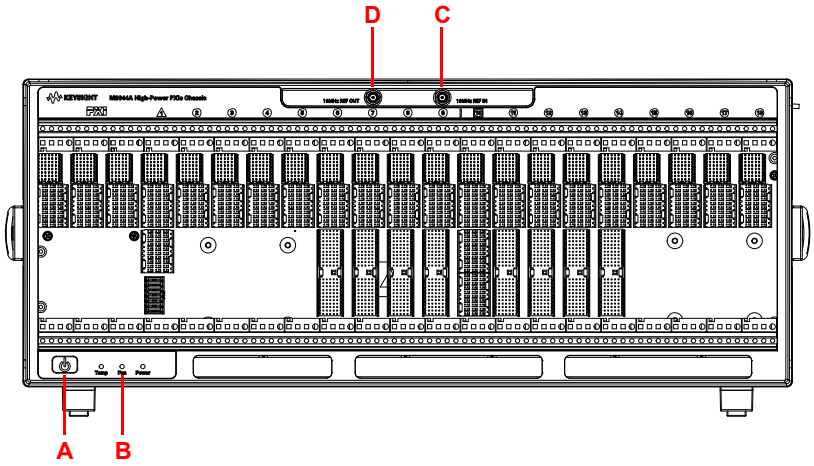


Figure 1-5: PXES-2788 Front Panel

Front Panel Power & Status

Item	Feature	Description
A	Power	Powers the chassis on/off when INHIBIT on rear panel (not shown) is set to “DEF”
B	Chassis Status	Fault, Temperature Fan, Power (L to R)
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 a 10MHz reference clock output.

Table 1-15: Front Panel Power & Status

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Front Panel Indicators

Power (Blue)	Fan (Green)	Temperature (Amber)	Status
Off	Off	Off	Chassis is powered down.
On	On	Off	Chassis is powered on and operating normally.
N/A	N/A	Blinking (1 sec)	One or more temperature sensors exceeds threshold temperature. (Configurable, 70°C default)
N/A	Blinking (1 sec)	N/A	One or more fans falls below threshold speed. (Configurable, 800RPM default)
Blinking (1 sec)	N/A	N/A	One or more power rails exceeds threshold settings. (Defaults are ±5% for 3.3V, 5V, +12V, and -12V; get voltage reading via chassis monitor utility)
Power forced shutdown due to voltage over SS. Blinking (0.5 sec)	Power forced shutdown due to fan over SS. Blinking (0.5 sec)	Power forced shutdown due to temp over SS. Blinking (0.5 sec)	A safety shutdown condition had been detected and forced a chassis shutdown for safety. Safety shutdown conditions: ▶ Over/Under 8% voltage or bad 3.3V, 5V, +12V, or -12V signal on power rails is detected. ▶ Under 600RPM for any fan is detected for more than 60 seconds. ▶ Over 100°C is detected for more than 3 seconds.

Table 1-16: Front Panel Indicators

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1.3.2 Rear Panel

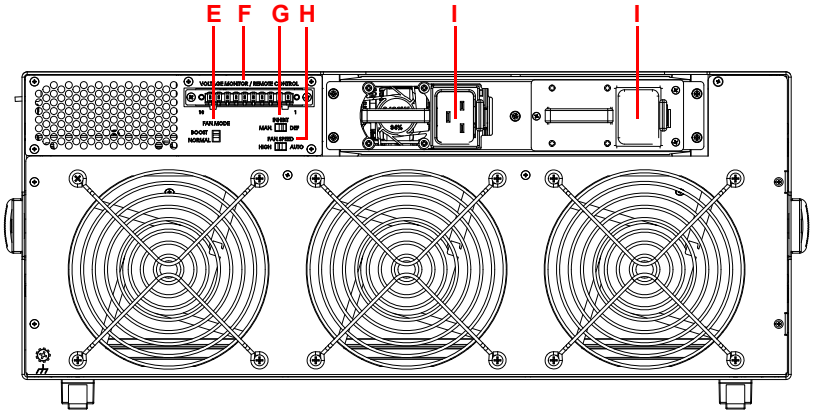


Figure 1-6: PXES-2788 Rear Panel

Rear Panel Features

Item	Feature	Description
E	Fan Mode Switch	**BOOST**: Sets Smart Fan to boost mode: Auto fan speed based on temperature with enhanced ventilation performance. **NORMAL**: Sets Smart Fan to normal mode: Auto fan speed based on temperature with balanced performance between ventilation and acoustic emission.
F	Voltage Monitor / Remote Control	See **Voltage Monitor / Remote Control Connector** on page 20 below.
G	Inhibit Switch	**DEF**: Power ON/OFF (ATX mode) is controlled by the power button on the front panel and Pin10 PWRBTN# on the rear connector. **MAN**: Power ON/OFF (AT mode) is controlled by Pin9 INHIBIT#.
H	Fan Speed Switch	**HIGH**: Disables Smart Fan function. Sets fan speeds of rear 3 fans to max. RPM. **AUTO**: Enables Smart Fan function. Auto fan speed based on Fan Mode Switch setting.
I	Universal Power Inlet	PXES-2788/HP: IEC 60320-1 C19 power inlet PXES-2788: IEC 60320-1 C13 power inlet

Table 1-17: Rear Panel Legend

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Voltage Monitor / Remote Control Connector

Pin	Signal	Type	Description
1	GND	GND	System Ground Pin for Pin 2 to10.
2	5VSB	Output	DC 5V stand-by monitor pin. Inline output current limit resistor 10KΩ.
3	12V	Output	DC 12V monitor pin. Inline output current limit resistor 10KΩ.
4	5V	Output	DC 5V monitor pin. Inline output current limit resistor 10KΩ.
5	3.3V	Output	DC 3.3V monitor pin. Inline output current limit resistor 10KΩ.
6	-12V	Output	Monitor pin of DC -12V. Inline output current limit resistor 10KΩ.
7	PWRGD	Output	High: Chassis power status is on. Low: Chassis power status is off or abnormal. • V_{OH}: 2.3V min (max current 24 mA) • V_{OL}: 0.55V max (max current 24 mA)
8	FAULT	Output	1Hz Pulse: One or more readings are over threshold settings of temperature, fan, and voltage. Low: All readings are under threshold settings. • V_{OH}: 2.3V min (max current 24 mA) • V_{OL}: 0.55V max (max current 24 mA)
9	INHIBIT#	Input, low active	Pin for remote power on/off chassis (AT mode). Valid when rear INHIBIT switch is set as MAN. Internal 1 kΩ pull-up to 5VSB and 10ms internal de-bounce. High or floating: Turn on all DC power output. Low: Turn off all DC power output. • V_{IH}: 2.4V • V_{IL}: 0.5V **Note:** Before setting the signal level for this pin to low (V_{IL}), first perform a shutdown on the system module (slot 1) and wait for the system module OS to shut down completely.

Table 1-18: Voltage Monitor / Remote Control Connector

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Pin	Signal	Type	Description
10	PWRBTN#	Input, low active	Pin for external power button (ATX mode). Valid when rear INHIBIT switch is set as DEF. Low pulse (low duration >100ms) active. Internal 1 KΩ pull-up to 5VSB and 10ms internal de-bounce. • VIH: 2.4V • VIL: 0.5V

Table 1-18: Voltage Monitor / Remote Control Connector

1.3.3 Positions of Backplane Thermal Sensors

Positions of thermal sensors.

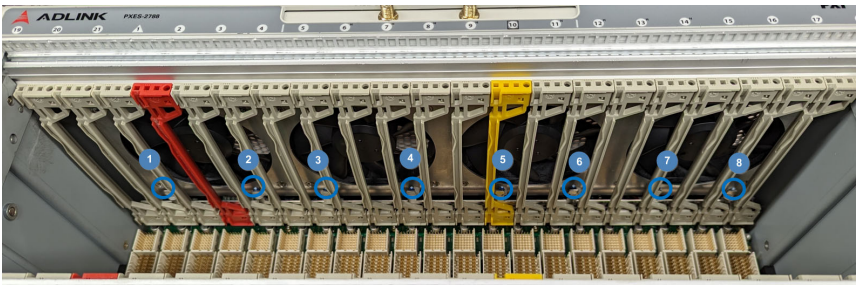


Figure 1-7: PXES-2788 Backplane Thermal Sensor Positions

NOTE:

For details about chassis temperature detection, please see “Chassis Status Monitor” on page 46.

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1.3.4 PCI Express

PCI Express Link Capability

The PXES-2788 backplane provides a PCIe Gen3 switch fabric, allowing PCI express bus data streams between the system slot and all peripheral slots. The system slot supports up to PCIe 2-link x8 and x16 Gen3 lanes, with all peripheral slots supporting up to PCIe x8 Gen3 links individually.


NOTE:

Connector pin assignments of the PXI Express System Controller Slot, PXI Express System Timing Slot, PXI Express Hybrid Peripheral Slots, and PXI Express Peripheral Slots comply with the default pin assignments as defined in PXI-5 PXI Express hardware specification Rev.1.1.

PXI Express System Controller Slot

The chassis System Controller slot is Slot 1 as defined by the PXI specification. The chassis can accommodate a PXI Express system controller that occupies a width up to 4 slots. As defined in the PXI specification, three controller expansion slots allow the controller to expand to the left to prevent the controller from using up peripheral slots.

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PXI Express System Timing Slot

The System Timing slot is Slot 10, providing one dedicated single-ended star trigger and 3 pairs of differential star trigger lines to each peripheral slot. Routing for single ended star trigger signals (PXI_STAR) and differential star trigger signals (PXIe_DSTAR) are as follows.

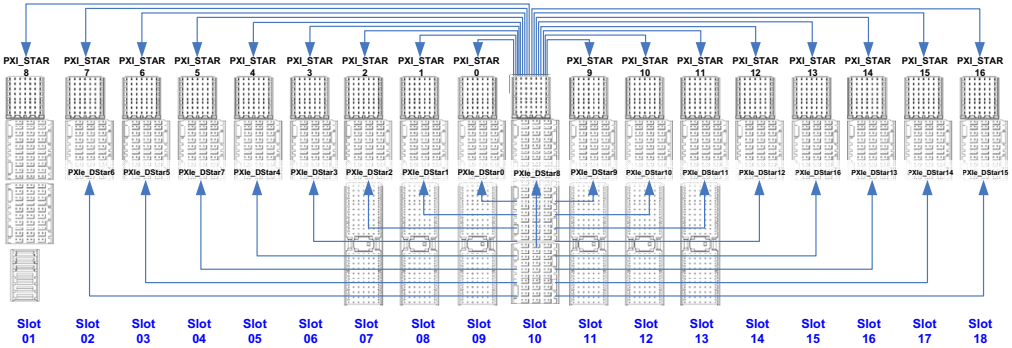


Figure 1-8: Star Trigger & Differential Star Bus Routing

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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 1-19: Star Trigger & Differential Star Bus Assignments

Star trigger functionality provides a precise trigger signal to the peripheral modules by installation of a specific star trigger controller module in the ST slot. The system timing slot can also be used as a general PXI Express (x8 lanes) peripheral slot if star trigger functionality is not required.

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PXI Express Hybrid Peripheral Slots

8 PXI Express hybrid peripheral slots are provided in the PXES-2788/PXES-2788E, all connected with PCIe x8 Gen3 lanes. Each can accommodate a 3U PXI Express (Figure 1-12) CompactPCI Express / hybrid slot compatible PXI-1 (Figure 1-10) CompactPCI peripheral module.

PXI Express Peripheral Slots

8/11 PXI Express peripheral slots are provided in the PXES-2788/PXES-2788E, slots 2-18 are connected with PCIe x8 Gen3 lanes, and slots 19-21 (available in PXES-2788E) are connected with PCIe x4 Gen3 lanes. Each can only accommodate a 3U PXI Express (Figure 1-10) CompactPCI Express peripheral module.

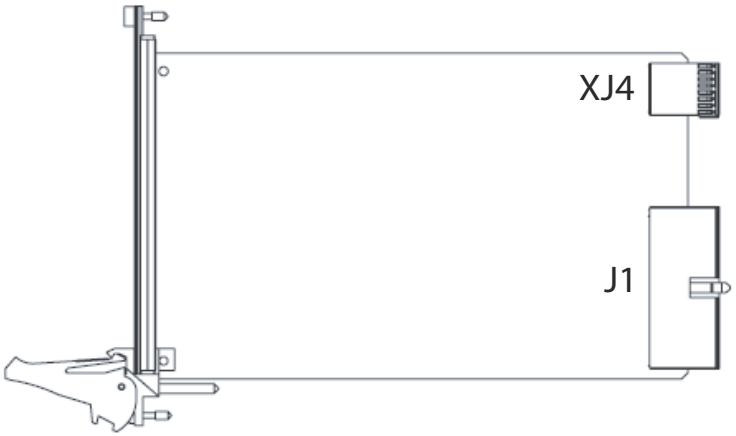


Figure 1-9: 3U Hybrid Slot Compatible PXI-1 Peripheral Module

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Figure 1-10: 3U PXI Express Peripheral Module

Local Bus

The local bus on a PXI backplane is a daisy-chained bus that connects each peripheral slot with adjacent peripheral slots to the left and right. The quantity of local bus lines is decreased from thirteen to one (PXI_LBL6 and PXI_LBR6) on a PXI Express backplane. The remaining local bus lines can transmit analog or digital signals between modules.

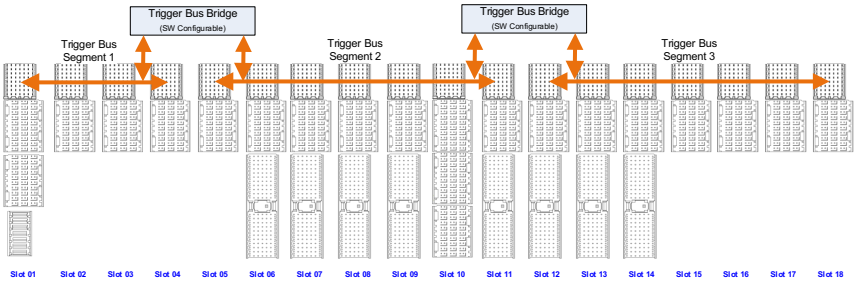
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Trigger Bus

Three trigger bus segments (segment 1: slots 1-4 and slots 19-21 on PXES-2788E, segment 2: slots 5-11, segment 3: slots 12-18), with each trigger bus segment containing 8 trigger lines connecting all slots on the same segment, providing inter-module synchronization. PXI and PXI Express modules can exchange trigger or clock signals through the trigger bus, allowing precisely timed response to asynchronous external events.

Trigger bus bridges can be configured as connected or disconnected (default) for the trigger lines of adjacent segments. As shown, eight combinations of trigger bus segment connections are possible between the three bus segments, with any applicable to each of the eight trigger lines.

PXES-2788 PXI Trigger Bus and Segments



PXES-2788E PXI Trigger Bus and Segments

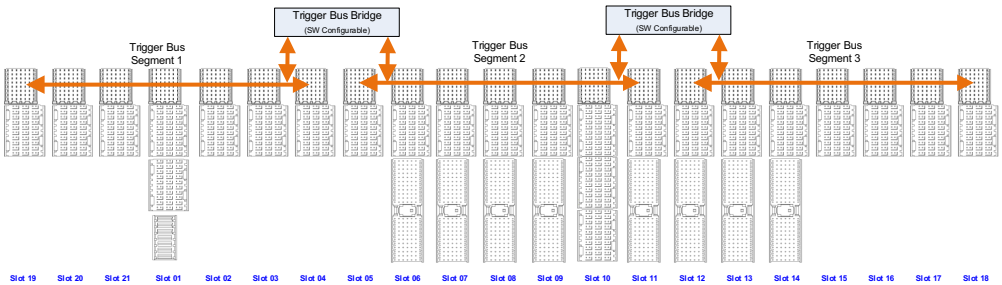
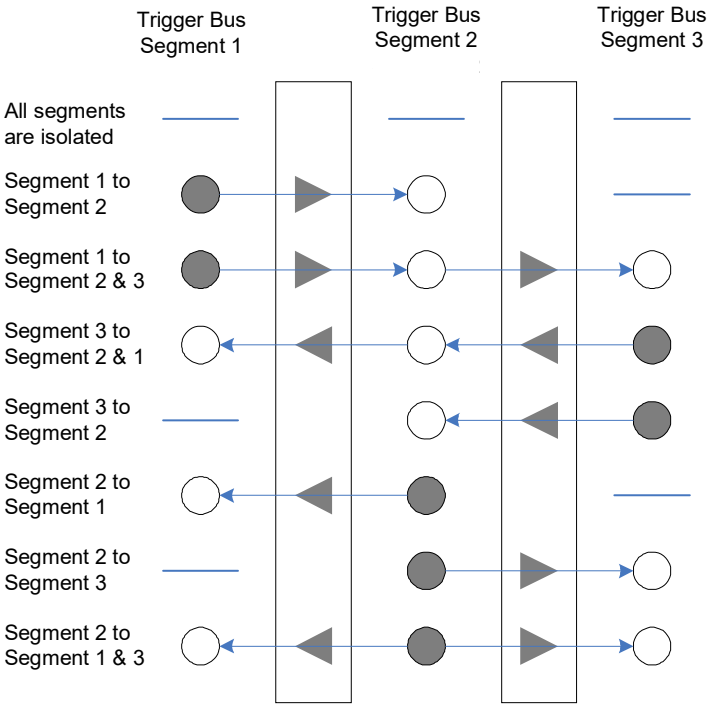


Figure 1-11: Trigger Bus and Bus Bridges

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NOTE:

A solid circle shown represents the source of the trigger.
A transparent circle indicates the trigger destination.

Figure 1-12: Trigger Bus Bridge Routing

The PXES-2788 trigger bus bridge routing can be configured via the ChassisWatch utility, or PXI-9 C++ API function in the ADLINK PXI Platform Service. For details please see the ADLINK PXI Platform Service user manual.

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Reference Clock

The PXES-2788 backplane supplies a single-ended 10MHz reference clock (PXI_CLK10) and differential 100MHz clock (PXIe_CLK100) to each peripheral slot for inter-module synchronization. The independent buffers drive the clock signal to each peripheral slot.

These common reference clock signals can synchronize multiple modules in a PXI Express chassis. PXI modules with phase-lock loop circuits can lock reference clocks to generate an in-phase timebase.

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

The PXES-2788 PXI chassis automatically selects the 10 MHz reference clock source from among:

- ▷ Built-in accurate 10 MHz clock source
- ▷ External 10 MHz clock through a SMA female connector
- ▷ PXI_CLK10_IN pin on the system timing slot (slot 10)

Priorities for 10MHz reference clock are as follows.

System Timing Slot (10th slot)	Front Panel SMA Female Connector	10mhz Clock Driven to Peripheral Slots
No clock present	No clock present	10MHz clock is generated by backplane
No clock present	10MHz clock present	Clock from SMA connector is driven to all peripheral slots
10MHz clock present	No clock present	Clock from system timing slot is driven to all peripheral slots
10MHz clock present	10MHz clock present	Clock from system timing slot is driven to all peripheral slots

Table 1-20: PXES-2788 Reference Clock Priority

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2 Getting Started

This chapter describes procedures for installing the PXES-2788 and making preparations for its operation. Please contact ADLINK or authorized dealer if there are any problems during the installation.



Diagrams and illustrated equipment are for reference only. Actual system configuration and specifications may vary.

2.1 Package Contents

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK.

Please ensure that the following items are included in the package.

- PXES-2788 Chassis
- Power cords (US/ES packages)
- Filler panel kit for unused/reserved slots including one 3-slot panel and eighteen 1-slot panels
- Optionally mount the chassis onto a server or similar rack using the Rack-Mount kit(G) (part number 3.91-95126-0010 PXES-2780).

If any of these items are missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.



Do not install or apply power to equipment that is damaged or missing components. Retain the shipping carton and packing materials for inspection. Please contact your ADLINK dealer/ vendor immediately for assistance and obtain authorization before returning any product.

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2.2 Power Supply Budget Considerations

Please review the power consumption of all modules used in the same PXES-2788. The total maximum power consumed by the system module and peripheral modules shall not exceed the DC power supply of the PXES-2788 as defined in **DC Power Output on page 4** and **Backplane Slot DC Power Current on page 5**.

2.3 Cooling Considerations

The PXES-2788 features an innovative design for heat dissipation, with cooling fans in the rear section of the chassis, drawing cool air through apertures on the bottom for exhaust through the back. This design provides uniform airflow for each PXI slot and exceptional cooling capability. When the chassis is installed in a rack, the cooling design minimizes drawing of hot air from the rear area, where other devices exhaust, while maintaining a steady temperature inside the chassis. For optimal cooling efficiency, retain support feet.

When rack mounting the PXES-2788, keep a 10.2 cm / 4 in. clearance at both the rear and top sides of chassis.



To maintain expected air flow, please always install filler panels in unused slots. The filler panels can be found in the chassis package.

2.4 Configure Settings for Cooling

Heat ventilation is related to the installation location, environmental temperature, and total heat generated by the system module and peripherals. The PXES-2788 features a smart fan function to provide sufficient ventilation and minimize noise emission. There are two switches located at rear of the chassis to configure the smart fan operation.

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2.4.1 Fan Mode Switch

Normal - Aims to provide sufficient ventilation to peripheral modules' power to consume less than 60W per slot with controlled noise emission.

Boost - For peripheral modules up to 85W / 102W power consumption needing more ventilation.


NOTE:

Set fan mode switch to Boost Mode if ambient temperature will be greater than 45°C/114°F (up to 85W) or 40°C/104°F (up to 102W). Up to 102W supported by PXES-2788/HP and PXES-2788E/HP that are equipped with additional top fan.

2.4.2 Fan Speed Switch

Auto - Enables smart fan function.

High - Full fan rotation utilization, two profiles based on Fan Mode Switch (Normal or Boost).

The following table explains specific conditions and recommended settings.

Heat Dissipation Requirements	Recommended Settings
When all peripheral modules require less than 60W cooling capacity per slot	Sets Fan Mode as Normal, and set Fan Speed Switch to Auto.
When one of all peripheral modules require more than 60W cooling capacity per slot	Sets Fan Mode to Boost, and set Fan Speed Switch to Auto.
Maximize ventilation for peripheral modules	Sets Fan Speed to High, and sets Fan Mode Switch based on requirements.

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2.5 Hardware Installation

2.5.1 Installing the System Controller

The PXES-2788 incorporates a system controller slot supporting a PXI Express system controller of up to 4 slot width.

1. Ensure the CPU, memory module(s), and storage device(s) are properly installed on the system controller
2. Locate the system controller slot (Slot 1, colored red).

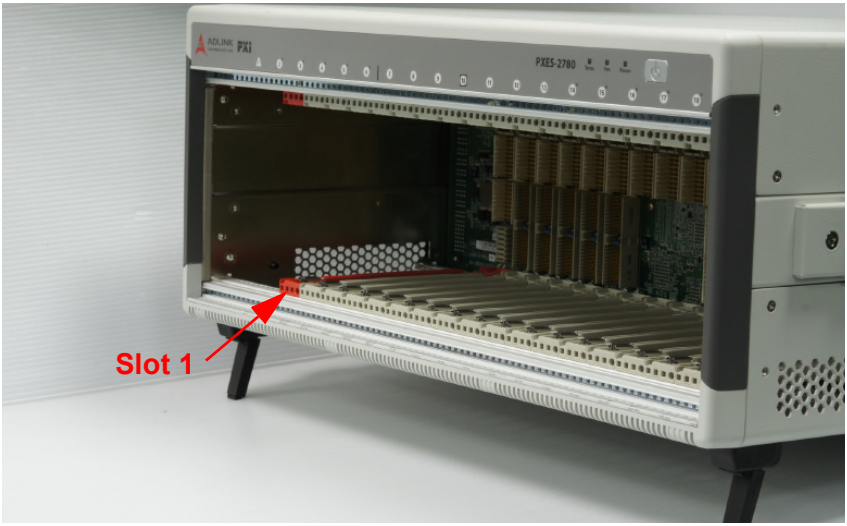


Figure 2-1: System Controller Slot Location (Slot 1)

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3. On the system controller module depress the module release latch.

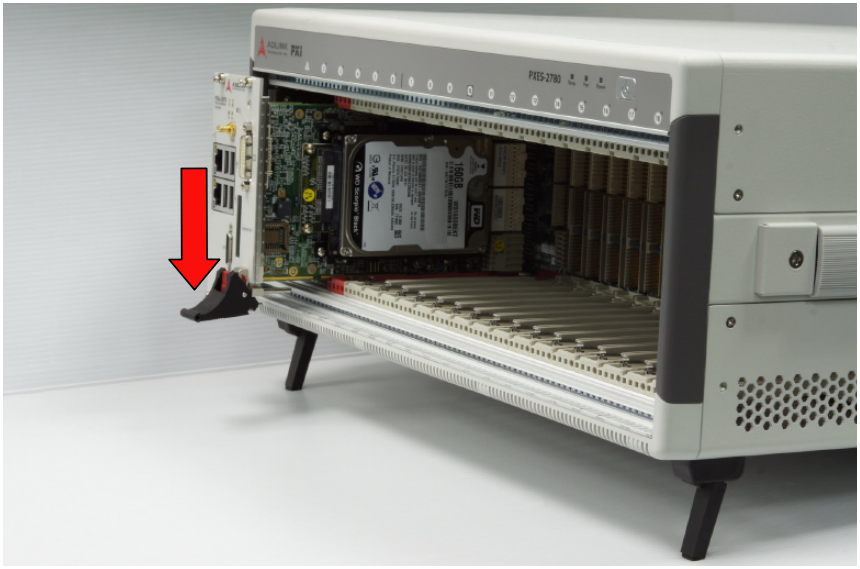


Figure 2-2: Depress Module Release Latch

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4. Align the system controller module's top and bottom edges with the card guides, and carefully slide the module into the chassis.

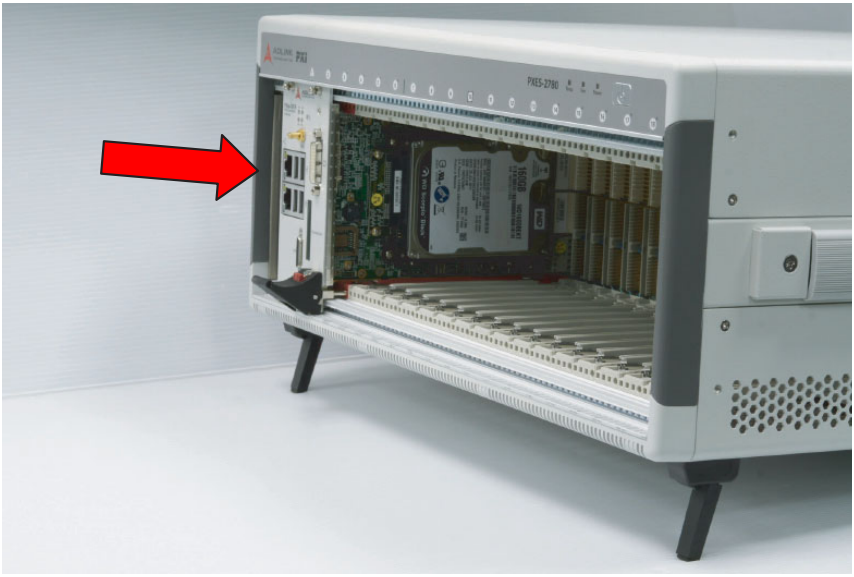


Figure 2-3: Align System Controller Module

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5. Lift the system controller module latch until the module is securely seated in the chassis backplane

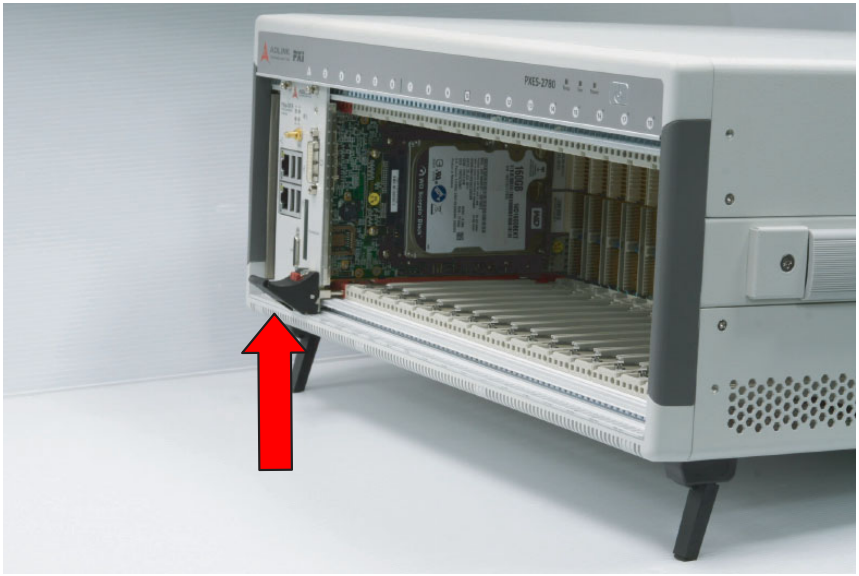


Figure 2-4: Secure System Controller Module Latch

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6. Fasten the screws on the module front panel, and connect all devices to the system controller.



Figure 2-5: Fasten System Controller Module Screws

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2.5.2 Installing Peripheral Modules

The PXE-2785 supports up to seventeen peripheral modules, including a system timing module. To install peripheral modules:

1. Select an available peripheral slot (2 to 18)
2. Depress the peripheral module's latch and align the module's top and bottom edges with the card guides.
3. Carefully slide the module into the chassis.

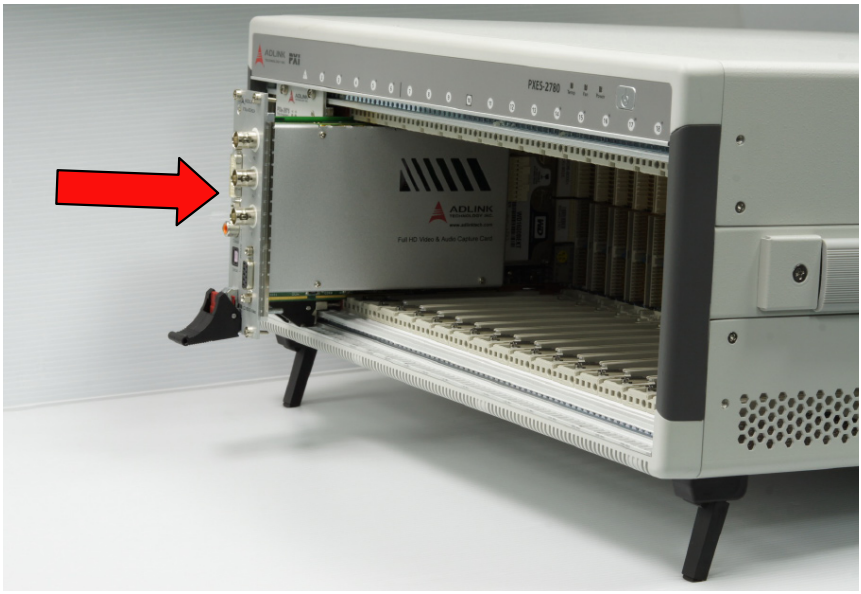


Figure 2-6: Insert Peripheral Module into Chassis

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4. Lift the latch until the peripheral module is securely seated in the chassis backplane.

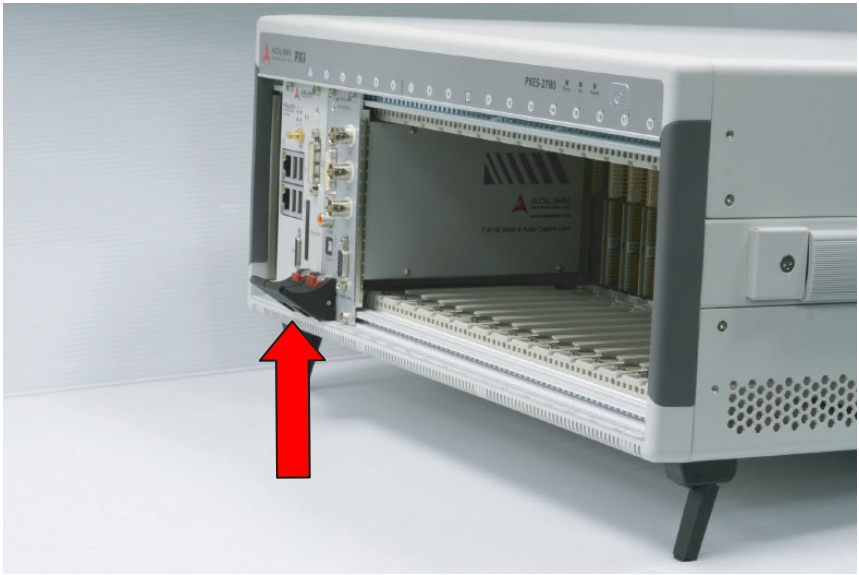


Figure 2-7: Secure Peripheral Module Latch

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5. Fasten the screws on the module's front panel.



Figure 2-8: Fasten Peripheral Controller Module Screws

6. Repeat steps 1 to 5 to install additional PXI or PXIe peripheral modules.

.

NOTE: To improve efficiency of heat dissipation, after installing all PXI modules, please install filler plates for any unused slots.

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2.6 Rack Mounting

ADLINK provides hardware for optional installation of the PXES-2788 to a rack. When mounted in a rack, the Rack-Mount kit(G) (part number 91-95126-0010 PXES-2780) allows for adjustable placement of the PXES-2788 further back in the rack, thus allowing ample room at the front of the unit for external mechanical parts (such as cables and mass interconnect modules).

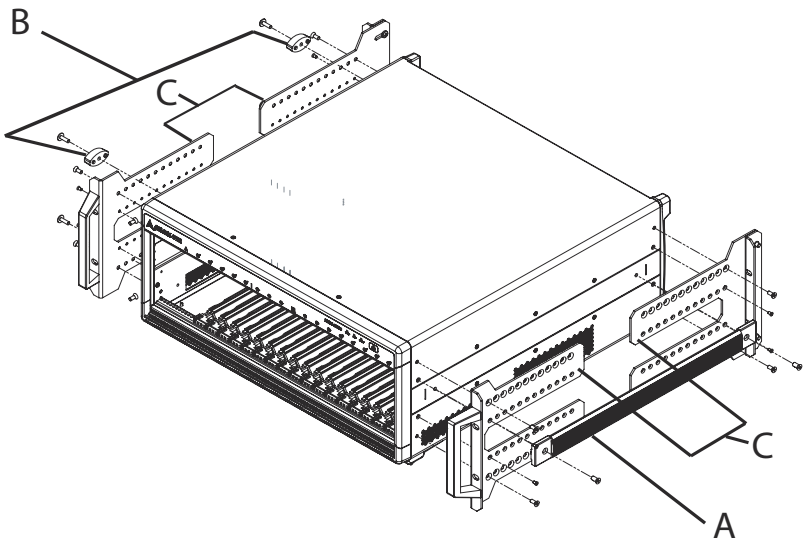


Figure 2-9: Rack Mount Assembly

Feature	Description
A	Carrying Handle
B	4 Rubber Feet (only 2 shown)
C	Mounting Brackets

Table 2-1: Rack Mount Assembly Legend

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To rack mount the PXES chassis, follow the steps below:

1. Remove carrying handle from the chassis right side.
2. Remove the four rubber feet from the chassis left side. Store the feet for later use, as they will not be needed for rack mount use.
3. Install the mounting brackets on both sides of the chassis using the provided M4 screws. Position of the mounting brackets can be adjusted along the screw holes to position the chassis forward or backward as needed.
4. Install the chassis and kit into the rack using eight screws (not included).

2.6.1 Powering Up the System

The PXES-2788/HP and PXES-2788E/HP are equipped with a 200 VAC to 240 VAC power supply.

The PXES-2788 and PXES-2788E are equipped with a 100 VAC to 240 VAC power supply.

All PXES-2788 models are equipped an additional PSU slot for an optional 2nd PSU (the same model as the first PSU) working in current sharing mode for improved PSU de-rating effect in high ambient temperatures.



Do not to perform "hot swapping", replacement, disconnecting or connecting of any components (including cards and cabling) on chassis while the system is powered up. By not observing this Warning, system damage and/or data loss, and physical injury (due to possible shock hazard) may result.

To power up the system:

1. Connect one end of the supplied power cord to the power inlet located at the rear side of the chassis.
2. Plug the other end of the AC power cord to a properly grounded wall socket or power strip.
3. Press the power button. The Power LED (blue) lights up immediately.

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2.7 PXES-2788 Software Resources

The following software resources are available for various application requirements.

2.7.1 ADLINK PXI Platform Services (APPS)

ADLINK PXI Platform Services is a software kit consisting of a utility and a group of software services and drivers.

- **ADLINK ChassisWatch**

  A GUI application program providing chassis status monitoring and configuration functions that are exclusive for ADLINK PXI Express chassis (PXES-2788, PXES-2780, PXES-2590, PXES-2301).

- **PXI Express Chassis Software Services**

  API services and drivers for the PXES-2788 defined in the PXISA PXI-6 Software Specification.

- **PXI Resource Manager**

  A Windows background service following the PXI-2 and PXI-6 Software Specification to scan PXI/PXIe controllers, chassis, and peripheral modules and generate PXI system description files accordingly.

- **PXI Trigger Management Software Services**

  API services and Trigger Manager defined in PXISA PXI-9 PXI and PXI Express Trigger Management Specification.

Please refer to the ADLINK PXI Platform Services user manual for more information.

2.7.2 MAPS Core DAQ Software & Utility

ADLINK's MAPS Core DAQ Software & Utility (Measurement Automation and Platform Services) software package includes ADLINK DAQ drivers, device management utility (ACE), and PXI configuration settings utility. Please refer to the MAPS Core user manual for more information.

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3 System Management & Configuration

The PXES-2788 chassis provides advanced system monitoring and control. Chassis conditions, including internal temperature, fan speed, and DC voltage can all be monitored via ADLINK ChassisWatch — a Windows based utility for ADLINK PXIe chassis monitoring and configuration.

Communication with the chassis monitoring control unit is available using an embedded controller, such as the ADLINK PXIe-3987, via ADLINK ChassisWatch to access the SMBus located on the system slot (1st slot).

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3.1 ChassisWatch

The PXES-2788 chassis provides advanced system monitoring and control via the ADLINK ChassisWatch GUI application. Related functions such as status monitoring, configurable PXI trigger bus bridges, and Smart Fan are introduced in the following sections. For more information about ChassisWatch, please refer to the ADLINK PXI Platform Services user manual.

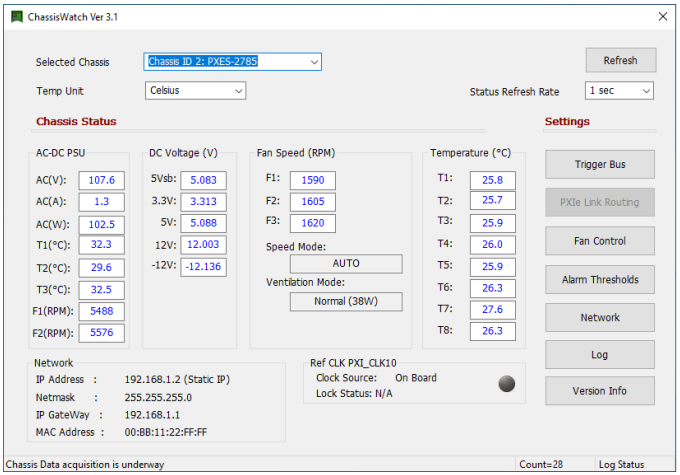


Figure 3-1: Chassis ChassisWatch GUI Application Utility

3.1.1 Chassis Status Monitor

Chassis conditions, including internal temperature, fan speed, and DC voltage can all be monitored by ChassisWatch running on an embedded PXI system controller or remote PC.

3.1.2 Software Configurable PXI Trigger Bus Bridges

The PXES-2788 provides software configurable trigger bus bridges, whereby the user can set the status of each trigger bus line as shown in Figure 3-2. Between trigger bus segments, TRIG BUS A (slot 1 to 6), B (slot 7 to 12), and C (slot 13 to 18), each PXI trigger bus line can be individually configured as different routing topologies. Trigger bus routing settings can be easily saved as templates and loaded quickly.

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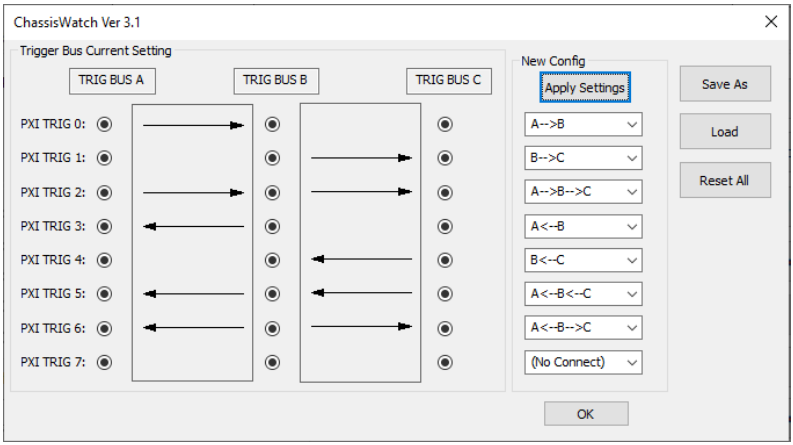


Figure 3-2: Trigger Bus Routing Settings

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3.1.3 Smart Fan

When the Fan switch on the rear panel is set to AUTO, fans run at different speeds based on the measured temperature.

Target Temp indicates the temperature at which fans run at 100%. Using the default 50°C as an example, fans run at 40% when all temperature readings are less than 25°C, and begin ramp-up when any reading exceeds 25°C.

Fans run at 100% speed if any temperature reading exceeds 50°C (e.g., Target Temperature).

Setting parameters are as shown.

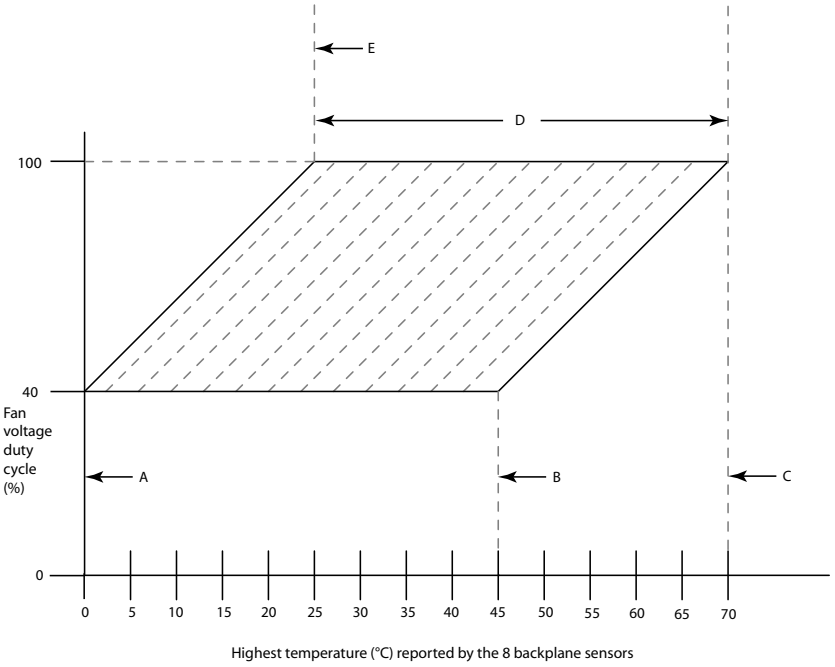


Figure 3-3: Target Temperature Parameters

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Mark	Temperature	Event
A	0°C / 32°F	Lowest chassis temperature at which fan speeds commence ramping up for final 25° temperature mark (see E)
B	45°C / 113°F	Highest chassis temperature at which fan speeds commence ramping up for final 70° temperature mark (see C)
C	70°C / 158°F	Highest chassis temperature at which fan speeds reach maximum speed
D	25°C to 70°C / 77°F to 158°F (temperature range)	Range over which maximum chassis temperature (at which fan speeds reach maximum speed) can be set
E	25°C / 77°F	Lowest chassis temperature at which fan speeds reach maximum speed

Table 3-1: Target Temperature Parameters Legend

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Appendix A - Maintenance

This Appendix describes basic maintenance and troubleshooting instructions for the PXES-2788 chassis.

A.1 Installation Problems

Inability to start the system frequently results from incorrect installation of the system controller, peripheral modules, and other components. Before starting the system, please ensure that:

- The system controller is properly installed and secured.
- All peripheral modules are properly seated on the slots.
- All cables are properly connected to the system controller and peripheral modules.
- All installed peripheral modules are compatible for use in the chassis.
- The power cord is securely plugged into the chassis power connector and power outlet/wall socket/power strip.

If the system fails to start when all installation conditions are met, remove all installed peripheral modules and try again. If the system starts normally, install one peripheral module at a time followed by powering up. You may also try installing the modules into different slots until the desired result is obtained.

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A.2 Basic Troubleshooting

Problem	Ensure that:
System fails to power up	▶ The power cord is securely plugged into the chassis power connector and wall socket/power strip ▶ The wall socket/power strip is live ▶ The power button on the chassis front panel is activated
No video output in the external display	▶ The external display is functioning properly ▶ Display settings support external video.
Power LED (blue) is blinking	▶ There is no short circuit by removing all PXI modules (PXI controller and peripheral modules) If the signal persists, contact your dealer for further assistance
Fan LED (green) is blinking	▶ The fan is unobstructed If the signal persists, contact your dealer for further assistance.
Temperature LED (amber) is blinking	▶ Airflow from the outlet apertures is unobstructed and steady; if not, ensure that adequate clearance for the intake apertures is provided If the temperature of exhausted air is normal (70°C in Default setting) but the temperature LED is still blinking, contact your dealer for further assistance.

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A.3 Maintenance

A.3.1 Handling the Chassis

The PXES-2788 is designed for both rack-mount and bench top use. When transporting or carrying the chassis, it is recommended that the handle be used, being designed to support the weight of the chassis for superior portability and balance.

The PXES-2788 weights 11.9 kg (26.2 lb). Please be careful when moving the chassis to avoid any possible injury.

A.3.2 Cleaning the Exterior

Make sure that the system is turned off before cleaning the chassis exterior. Wipe the exterior with a clean cloth starting from areas that easily accumulate dust or dirt such as the area in and around the chassis and power supply air intake apertures.

A.3.3 Power Requirements

Make sure that the power cord is in good condition before plugging it into the system. It is important to check the reliability of the power source. The PXES-2788 power supply is capable of handling 100 to 240 V AC within the 50 Hz to 60 Hz range. Do not connect the PXES-2788 to an already overloaded circuit.

A.3.4 Replacing the Power Supply Module

The power supply module of PXES-2788 is with removable design that can be replaced in the field based on maintenance requirements. The power supply module can be ordered individually as backup part. Please contact your ADLINK sales window for more information.

The power supply module can be removed by removing all AC power and pulling out the PSU by pushing the latch, and then installing a replacement PSU by pushing it into position until the latch is locked.

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Important Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

- Read these safety instructions carefully.
- Keep the User's Manual for future reference.
- Read the Specifications section of this manual for detailed information on the recommended operating environment.
- The device can be operated at an ambient temperature of 45ºC to 55ºC.
- For indoor use only.
- Altitude during operation: up to 2000m.
- Pollution degree: PD2.
- Equipment maintenance and service:
  - Maintenance and inspection can only be performed by qualified and authorized technicians or personnel.
  - Before performing maintenance tasks, it is imperative to turn off the power switch and remove the power cord from the unit to prevent possible electric shock leading to injury or death.
- When installing/mounting or uninstalling/removing device, or when removal of a chassis cover is required for user servicing (See "Getting Started" on page 31.):
  - Turn off power and unplug any power cords/cables.
  - Reinstall all chassis covers before restoring power.
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources.
  - Keep device away from high heat or humidity.
  - Keep device properly ventilated (do not block or cover ventilation openings).
  - Always use recommended voltage and power source settings.
  - Always install and operate device near an easily accessible electrical outlet.

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- ▷ Secure the power cord (do not place any object on/over the power cord).
- ▷ Only install/attach and operate device on stable surfaces and/or recommended mountings.

- ▶ If the device will not be used for long periods of time, turn off and unplug it from its power source
- ▶ Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools
- ▶ A Lithium-type battery may be provided for uninterrupted backup or emergency power.



Risk of explosion if battery is replaced with one of an incorrect type; please dispose of used batteries appropriately.
Risque d'explosion si la pile est remplacée par une autre de type incorrect. Veuillez jeter les piles usagées de façon appropriée.

- ▶ The device must be serviced by authorized technicians when:
  - ▷ The power cord or plug is damaged.
  - ▷ Liquid has entered the device interior.
  - ▷ The device has been exposed to high humidity and/or moisture.
  - ▷ The device is not functioning or does not function according to the User's Manual.
  - ▷ The device has been dropped and/or damaged and/or shows obvious signs of breakage.
- ▶ Disconnect the power supply cord before loosening the thumbscrews and always fasten the thumbscrews with a screwdriver before starting the system up.
- ▶ It is recommended that the device be installed only in a server room or computer room where access is:
  - ▷ Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefor, and any precautions required.
  - ▷ Only afforded by the use of a tool or lock and key, or other means of security, and controlled by the authority responsible for the location.

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	**BURN HAZARD** Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching.

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Consignes de Sécurité Importante

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil , pour éviter des blessures ou des dommages.

- *Lisez attentivement ces consignes de sécurité.*
- *Conservez le manuel de l'utilisateur pour référence future.*
- *Lisez la section Spécifications de ce manuel pour des informations détaillées sur l'environnement d'exploitation recommandé.*
- *L'appareil peut être utilisé à une température ambiante de 45ºC to 55ºC.*
- *Pour une utilisation en intérieur uniquement.*
- *Altitude en fonctionnement: jusqu'à 2000m.*
- *Degré de pollution: PD2.*
- *Maintenance et entretien des équipements:*
  - *L'entretien et l'inspection ne peuvent être effectués que par des techniciens ou du personnel qualifiés et autorisés.*
  - *Avant d'effectuer des tâches de maintenance, il est impératif de couper l'interrupteur d'alimentation et de retirer le cordon d'alimentation de l'appareil pour éviter tout choc électrique pouvant entraîner des blessures ou la mort.*
- *Lors de l'installation / du montage ou de la désinstallation / retrait du périphérique, ou lorsque le retrait d'un capot du châssis est requis pour la maintenance par l'utilisateur (See “Getting Started” on page 31.):*
  - *Coupez l'alimentation et débranchez tous les cordons / câbles d'alimentation.*
  - *Réinstallez tous les couvercles de châssis avant de rétablir l'alimentation.*
- Pour éviter les chocs électriques et / ou les dommages à l'appareil:
  - *Gardez l'appareil éloigné de l'eau ou des sources de liquide.*

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- ▷ *Gardez l'appareil éloigné de la chaleur ou de l'humidité élevée.*
- ▷ *Gardez l'appareil correctement ventilé (ne bloquez pas et ne couvrez pas les ouvertures de ventilation).*
- ▷ *Utilisez toujours les paramètres de tension et de source d'alimentation recommandés.*
- ▷ *Installez et utilisez toujours l'appareil à proximité d'une prise électrique facilement accessible.*
- ▷ *Fixez le cordon d'alimentation (ne placez aucun objet sur / sur le cordon d'alimentation).*
- ▷ *Installez / fixez et utilisez l'appareil uniquement sur des surfaces stables et / ou des supports recommandés.*

- ▶ *Si l'appareil n'est pas utilisé pendant de longues périodes, éteignez-le et débranchez-le de sa source d'alimentation*
- ▶ *N'essayez jamais de réparer l'appareil, qui ne doit être entretenu que par du personnel technique qualifié à l'aide d'outils appropriés.*
- ▶ *Une batterie de type lithium peut être fournie pour une alimentation de secours ou une alimentation de secours ininterrompue.*



Risque d'explosion si la pile est remplacée par une autre de type incorrect. Veuillez jeter les piles usagées de façon appropriée.

- ▶ *L'appareil doit être réparé par des techniciens autorisés lorsque:*
  - ▷ *Le cordon d'alimentation ou la fiche est endommagé.*
  - ▷ *Du liquide a pénétré à l'intérieur de l'appareil.*
  - ▷ *L'appareil a été exposé à une humidité et / ou une humidité élevées.*
  - ▷ *L'appareil ne fonctionne pas ou ne fonctionne pas selon le manuel de l'utilisateur.*
  - ▷ *L'appareil est tombé et / ou endommagé et / ou montre des signes évidents de casse.*
- ▶ *Débranchez le cordon d'alimentation avant de desserrer les vis moletées et serrez toujours les vis moletées avec un tournevis avant de démarrer le système.*

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- *Il est recommandé d'installer l'appareil uniquement dans une salle de serveurs ou une salle informatique où l'accès est:*
  - *Réservé au personnel de maintenance qualifié ou aux utilisateurs familiers avec les restrictions appliquées à l'emplacement, les raisons de celles-ci et les précautions nécessaires.*
  - *Seulement permis par l'utilisation d'un outil ou d'une serrure et d'une clé, ou d'autres moyens de sécurité, et contrôlé par l'autorité responsable de l'emplacement.*

	***RISQUE DE BRÛLURES*** *Ne touchez pas cette surface, cela pourrait entraîner des blessures.* *Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*

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Getting Service

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