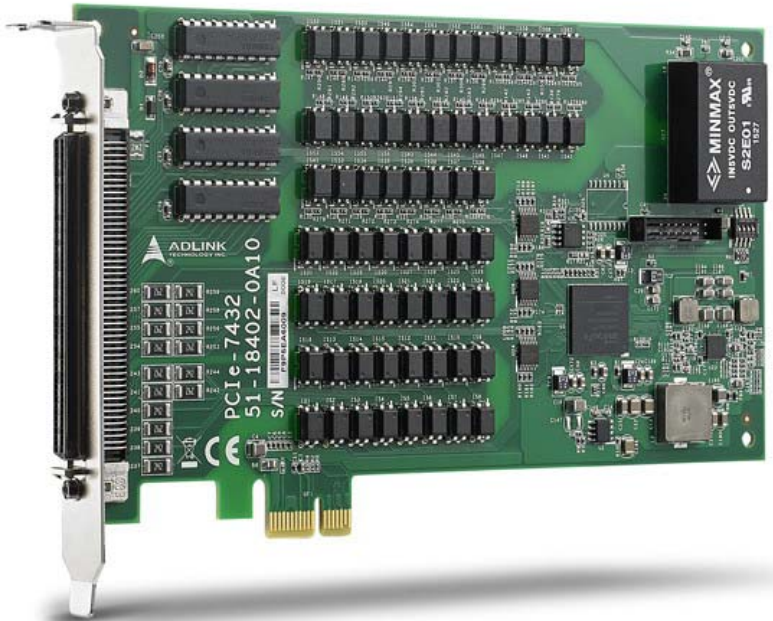




**ADLINK**  
TECHNOLOGY INC.

## PCIe-7432

32CH Isolated DI/32CH Isolated DO  
PCIe Card



**Manual Rev.:** 2.00  
**Revision Date:** Jan. 29, 2016  
**Part No:** 50-11259-1000

**Advance Technologies; Automate the World.**

# Revision History

Revision	Release Date	Description of Change(s)
2.00	Jan.29, 2016	Initial release

# Preface

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ADLINK is committed to fulfill its social responsibility to global environmental preservation through compliance with the European Union's Restriction of Hazardous Substances (RoHS) directive and Waste Electrical and Electronic Equipment (WEEE) directive. Environmental protection is a top priority for ADLINK. We have enforced measures to ensure that our products, manufacturing processes, components, and raw materials have as little impact on the environment as possible. When products are at their end of life, our customers are encouraged to dispose of them in accordance with the product disposal and/or recovery programs prescribed by their nation or company.

## **Trademarks**

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

ADLINK'S PCIe-7432 for PCIe bus provides 32CH isolated DI and 32CH isolated DO and robust 2,500V isolation protection, suitable for most industrial applications.

All digital input channels are identical non-polar and opto-isolated. All channels are isolated and suitable for collecting digital inputs in noisy environments. Digital input channel 0 & 1 interrupt are supported.

Common input junction can be common ground or common power, depending on the environment, such that digital input can be either current source or current sink. When isolated digital output is ON, sink current is through transistors, and when OFF, none is.

The extra connection is utilized for the flywheel diode, forming a current-release closed loop, whereby transistors are protected from high reverse voltage generated by the inductance load when output is switched from ON to OFF.

## 1.1 Features

- ▶ PCI Express x1, Plug and Play
- ▶ 32CH isolated digital input & 32CH isolated digital output
- ▶ Isolation Voltage 2500V RMS
- ▶ Sink current up to 500mA@24V on single isolated output, 120mA@24V for all ON channels
- ▶ Isolated input voltage up to 24V
- ▶ Digital input channels 0 & 1 interrupt

## 1.2 Applications

- ▶ Laboratory and industrial automation
- ▶ Watchdog timer (WDT)
- ▶ Event counter
- ▶ Frequency counter and generator
- ▶ Low level pulse generator
- ▶ Time delay

## 1.3 Specifications

### 1.3.1 Digital Input

<b>Input Channels</b>	32
<b>Photocoupler</b>	HCPL-814
<b>Input current</b>	10 mA rated 20 mA max. for isolated input
<b>Input voltage</b>	Up to 24V DC or 24V AC Logic Low: 0 to 1.5V Logic High 5 to 24V
<b>Input impedance</b>	2.4kΩ @ 0.5W
<b>Interrupt Sources</b>	Digital input channels 0 and channel 1
<b>Isolated voltage</b>	2,500V RMS channel-to-system

### 1.3.2 Digital Output

<b>Output Channels</b>	32
<b>Output Type</b>	Darlington transistor with common ground
<b>Output Voltage</b>	5V DC min, 35V DC maximum
<b>Throughput</b>	10kHz (0.1 ms)
<b>Isolated voltage</b>	2,500V RMS channel-to-system

### 1.3.3 Isolated +5V Power Supply

<b>Output Voltage</b>	+5V
<b>Output Current</b>	200mA max. (@ 40°C)

### 1.3.4 Physical & Bus

<b>Dimensions</b>	175 mm x 107 mm, standard PCIe half size
<b>Bus</b>	1x PCI Express
<b>Operating temperature</b>	0 to 60 °C
<b>Storage temperature</b>	-20 °C to 80 °C
<b>Humidity</b>	5 to 95% non-condensing
<b>Power consumption</b>	+12V@180mA(typical) 500mA (Max.)

## 1.4 Software Support

ADLINK provides comprehensive software solutions for all system building requirements. In addition to programming libraries such as DLLs for most Windows-based systems, ADLINK also provides drivers for other application environments such as LabVIEW®.

Be sure to install the driver & utility before using the PCIe-7432.

### PCIS-DASK

PCIS-DASK consists of advanced 32/64-bit kernel drivers and SDK for customized DAQ application development, enabling detailed operations and superior performance and reliability from data acquisition systems.

PCIS-DASK kernel drivers now support Windows 7/8.1 OS.

## 1.5 PCB Layout



NOTE:

All dimensions shown are in mm

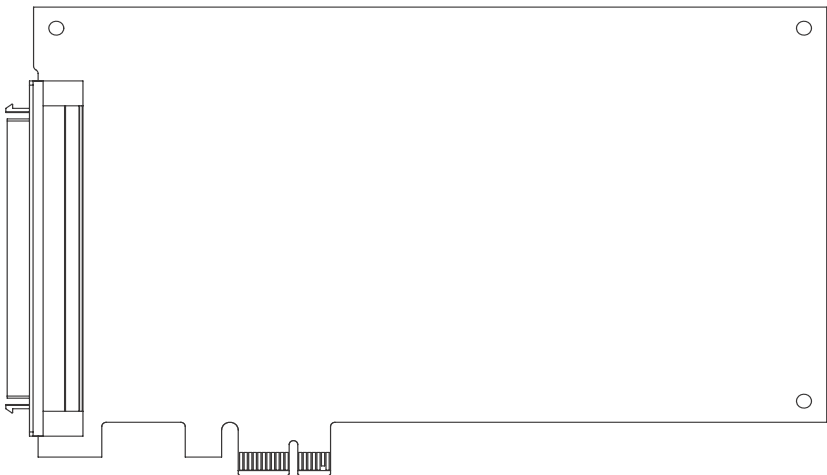
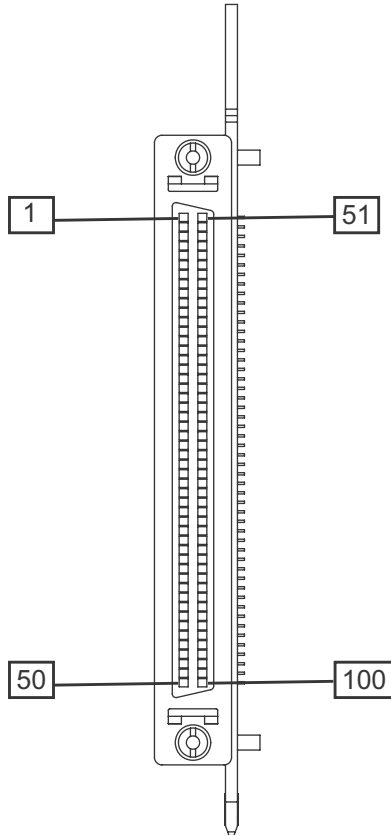


Figure 1-1: PCIe-7432 Board Layout

## 1.6 Connectors

The PCIe-7432 is equipped with a 100-pin SCSI connector (CN1).



**Figure 1-2: PCIe-7432 CN1 Connector**

ID	Pin	Pin	ID
IDI_0	1	51	IDI_8
IDI_1	2	52	IDI_9
IDI_2	3	53	IDI_10
IDI_3	4	54	IDI_11

ID	Pin	Pin	ID
IDI_4	5	55	IDI_12
IDI_5	6	56	IDI_13
IDI_6	7	57	IDI_14
IDI_7	8	58	IDI_15
COM1	9	59	COM2
COM1	10	60	COM2
COM1	11	61	COM2
COM1	12	62	COM2
IDI_16	13	63	IDI_24
IDI_17	14	64	IDI_25
IDI_18	15	65	IDI_26
IDI_19	16	66	IDI_27
IDI_20	17	67	IDI_28
IDI_21	18	68	IDI_29
IDI_22	19	69	IDI_30
IDI_23	20	70	IDI_31
COM3	21	71	COM4
COM3	22	72	COM4
COM3	23	73	COM4
COM3	24	74	COM4
NC	25	75	NC
IDO_0	26	76	IDO_8
IDO_1	27	77	IDO_9
IDO_2	28	78	IDO_10
IDO_3	29	79	IDO_11
IDO_4	30	80	IDO_12
IDO_5	31	81	IDO_13
IDO_6	32	82	IDO_14
IDO_7	33	83	IDO_15
VDD1	34	84	VDD2
IGND	35	85	IGND
IGND	36	86	IGND
IGND	37	87	IGND

ID	Pin	Pin	ID
IDO_16	38	88	IDO_24
IDO_17	39	89	IDO_25
IDO_18	40	90	IDO_26
IDO_19	41	91	IDO_27
IDO_20	42	92	IDO_28
IDO_21	43	93	IDO_29
IDO_22	44	94	IDO_30
IDO_23	45	95	IDO_31
VDD3	46	96	VDD4
IGND	47	97	IGND
IGND	48	98	IGND
IGND	49	99	IGND
V5V	50	100	V5V

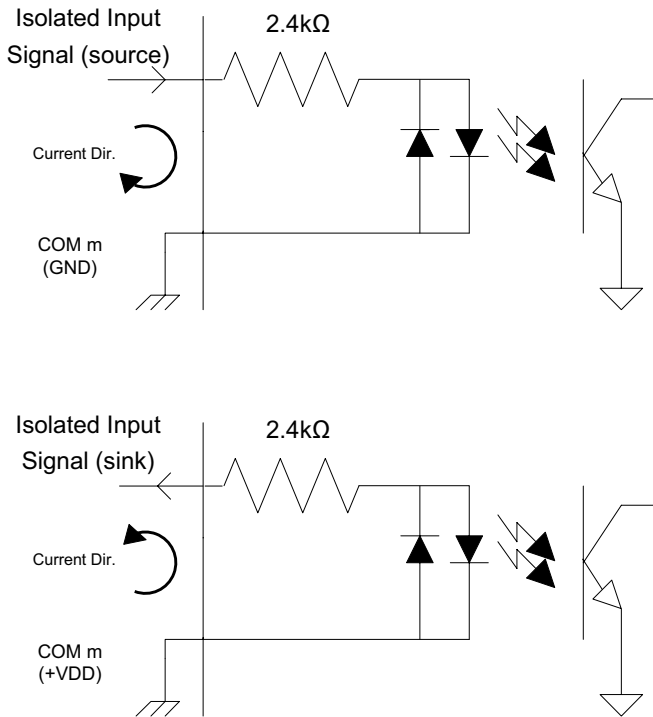
**Table 1-1: PCIe-7432 CN1 Pin Assignment**

## 1.7 DI/O Channels

### Isolated Digital Input Channels

Isolated digital input has an open collector transistor structure with voltage range 0V to 24V and input resistance of 2.4kΩ. Connection between external signals and the PCIe-7432 is as shown in Fig A01. Since input common junction can be common ground in the environment, digital input can be either a current source or a current sink.

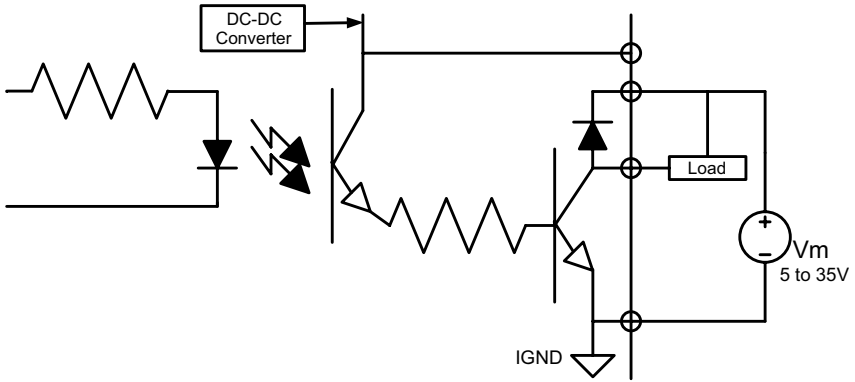




**Figure 1-3: Isolated Input Connection**

## Isolated Digital Output Channels

Common ground connection of the isolated digital output is as shown. When isolated digital output is ON, sink current is through transistors, and when OFF, none is. When the load is of an inductance nature, such as a relay, coil or motor, the VDD pin must be connected to an external power source. The extra connection is utilized for the flywheel diode to form a current-release closed loop, whereby transistors are protected from any high reverse voltage generated by the inductance load when output is switched from ON to OFF.



**Figure 1-4: Common Ground Connection**

## 2 Getting Started

### 2.1 Unpacking Checklist

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. Ensure that the following items are included in the package.

- ▶ PCIe-7432 high-speed DI/O card
- ▶ Quick Start Guide

If any of the items is damaged or missing, contact your dealer immediately.



CAUTION:

The card must be protected from static discharge and physical shock. Never remove any of the socketed parts except at a static-free workstation. Use the anti-static bag shipped with the product to handle the card. Wear a grounded wrist strap when servicing.

---

### 2.2 Installing the Card

Install the card driver before you install the card into your computer system. See “Software Support” on page 3. for driver support information.

To install the card:

1. Turn off the system/chassis and disconnect the power plug from the power source.
2. Remove the system/chassis cover.
3. Select the PCIE Express slot that you intend to use, then remove the bracket opposite the slot, if any.
4. Align the card connectors (golden fingers) with the slot, then press the card firmly until the card is completely seated on the slot.
5. Secure the card to the chassis with a screw.

6. Replace the system/chassis cover.
7. Connect the power plug to a power source, then turn on the system.

### **Configuration**

All PCI/PCIE Express cards on your system are configured individually. Because configuration is controlled by the system and the software, no jumper setting is required for base address, DMA, and interrupt IRQ. Configuration is subject to change with every boot of the system as new PCI/PCIE Express® cards are added or removed.

### **Troubleshooting**

If your system fails to boot or if you experience erratic operation with your PCI/PCIE Express card in place, an interrupt conflict may have been generated (such as when the BIOS Setup is incorrectly configured). Refer to the system's BIOS documentation for details.

## 3 Register Format

The following detailed register format descriptions are helpful for low-level programming, although it is recommended that users first fully understand the PCIe interface.

### 3.1 I/O Address Map

As PCIe-7432 registers are 32 bits long, they are accessible via 32-bit I/O instruction. The register address map, including descriptions and offset addresses relative to the base address, is as follows.

Address	Write	Read
Base + 0x00	Isolated DO	Isolated DI
Base + 0x40	Clear IRQ	--

**Table 3-1: I/O Register Map**



NOTE:

- ▶ I/O port is 32 bits wide
- ▶ There is no 8-bit or 16-bit I/O access

### 3.2 Digital Input Register

Each bit of based address corresponds to a signal on one of the 32 digital input channels.

**Address: BASE + 0 to BASE + 3 for 7432**

**Attribute: Read Only**

**Data format: 7432**

	7	6	5	4	3	2	1	0
Base + 0	IDI_7	IDI_6	IDI_5	IDI_4	IDI_3	IDI_2	IDI_1	IDI_0
Base + 1	IDI_15	IDI_14	IDI_13	IDI_12	IDI_11	IDI_10	IDI_9	IDI_8
Base + 2	IDI_23	IDI_22	IDI_21	IDI_20	IDI_19	IDI_18	IDI_17	IDI_16
Base + 3	IDI_31	IDI_30	IDI_29	IDI_28	IDI_27	IDI_26	IDI_25	IDI_24

**Table 3-2: IDI\_N: Isolated Digital Input CH N**

### 3.3 Digital Output Register

Each bit of based address corresponds to a signal on one of the 32 digital output channels.

**Address: BASE + 0 to BASE + 3 for 7432**

**Attribute: Write Only**

**Data format: 7432**

	7	6	5	4	3	2	1	0
Base + 0	IDO_7	IDO_6	IDO_5	IDO_4	IDO_3	IDO_2	IDO_1	IDO_0
Base + 1	IDO_15	IDO_14	IDO_13	IDO_12	IDO_11	IDO_10	IDO_9	IDO_8
Base + 2	IDO_23	IDO_22	IDO_21	IDO_20	IDO_19	IDO_18	IDO_17	IDO_16
Base + 3	IDO_31	IDO_30	IDO_29	IDO_28	IDO_27	IDO_26	IDO_25	IDO_24

**Table 3-3: IDI\_N: Isolated Digital Input CH N**

# Appendix A C/C++ DOS Function Library

## A.1 Data Types

The following data types in the PCIe function library can be used in application programs.

Type	Description	Range
U8	8-bit ASCII character	0 to 255
I16	16-bit signed integer	-32768 to 32767
U16	16-bit unsigned integer	0 to 65535
I32	32-bit signed integer	-2147483648 to 2147483647
U32	32-bit single-precision floating-point	0 to 4294967295
F32	32-bit single-precision floating-point	-3.402823E38 to 3.402823E38
F64	64-bit double-precision floating-point	-.797683134862315E308 to 1.797683134862315E309
Boolean	Boolean logic value	TRUE, FALSE

## A.2 List of Functions

Function
Initial
Digital Input Relative Functions
Digital Output Relative Functions
Interrupt Source Control
Get Interrupt Status
Interrupt Enable
Interrupt Disable

### Initial

Initializes all installed PCIe-7432 cards. Plug and play capability allows IRQ and I/O address to be assigned by the system BIOS directly.

## Syntax

### **C/C++ (DOS)**

```
U16 _7432_Initial (U16 *existCards, PCI_INFO  
*pciInfo)
```

### **C/C++ (Windows)**

```
U16 W_7432_Initial (U16 *existCards, PCI_INFO  
*pciInfo)
```

### **Visual Basic (Windows)**

```
W_7432_Initial (existCards As Integer, info As  
PCI_INFO) As Integer
```

## Argument

*existCards*: The number of installed PCIe-7432 cards.

*Pciinfo*: Records PCIe bus plug and play initialization information as set by p&p BIOS. PCIe\_INFO structure is defined in ACL\_PCI.H, with base I/O address and interrupt channel number are stored in pciinfo for reference.

## Return Code

```
ERR_NoError  
ERR_PCIBiosNotExist
```

## Digital Input Relative Functions

Read 32-bit digital input data from the digital input port (to obtain 32-bit data, call function **\_7432\_DI**).

## Syntax

### **C/C++ (DOS)**

```
U16 _7432_DI (U16 cardNo, U32 *di_data)
```

### **C/C++ (Windows)**

```
U16 W_7432_DI (U16 cardNo, U32 *di_data)
```

### **Visual Basic (Windows)**

```
W_7432_DI (ByVal cardNo As Integer, di_data As  
Long) As Integer
```



**Argument**

*cardNo*: Card number of selected board

*di\_data*: Returns 32-bit value from digital port

**Return Code**

ERR\_NoError  
ERR\_BoardNoInit

**Digital Output Relative Functions**

Write data to the digital output ports (to write 32-bit data, call function **\_7432\_DO**).

**Syntax****C/C++ (DOS)**

```
U16 _7432_DO (U16 cardNo, U32 do_data)
```

**C/C++ (Windows)**

```
U16 W_7432_DO (U16 cardNo, U32 do_data)
```

**Visual Basic (Windows)**

```
W_7432_DO (ByVal cardNo As Integer, ByVal do_data  
As Long) As Integer
```

**Argument**

*cardNo*: Card number of selected board

*do\_data*: value is written to digital output port

**Return Code**

ERR\_NoError  
ERR\_BoardNoInit

**Interrupt Source Control**

The dual interrupt system allows two interrupt sources to be generated and checked by the software, with the function enabling selection and control of the interrupt sources by writing data to the interrupt control register. The interrupt source can be set as Channel 0 (INT1) and/or Channel 1 (INT2) of the digital input channels.

## Syntax

### **C/C++ (DOS)**

```
void _7432_Set_INT_Control (U16 cardNo, U16  
    int1Flag, U16 int2Flag)
```

### **C/C++ (Windows)**

```
void W_7432_Set_INT_Control (U16 cardNo, U16  
    int1Flag, U16 int2Flag)
```

### **Visual Basic (Windows)**

```
W_7432_Set_INT_Control (ByVal cardNo As Integer,  
    ByVal int1Flag As Integer, ByVal int2Flag As  
    Integer)
```

## Argument

*cardNo*: Card number of selected board

*int1Flag*: INT1 setting; 0: disable, 1: enable

*int2Flag*: INT2 setting; 0: disable, 1: enable

## Return Code

```
ERR_NoError  
ERR_BoardNoInit
```

## Get Interrupt Status

The dual interrupt system allows two interrupt sources to be generated and checked by the software, with the function identifying the inserted interrupt when both INT1 and INT2 are in use.

## Syntax

### **C/C++ (DOS)**

```
void _7432_Get_IRQ_Status (U16 cardNo, U16  
    *int1Status, U16 *int2Status)
```

### **C/C++ (Windows)**

```
void W_7432_Get_IRQ_Status (U16 cardNo, U16  
    *int1Status, U16 *int2Status)
```

**Visual Basic (Windows)**

```
W_7432_Get_IRQ_Status (ByVal cardNo As Integer,
    int1Status As Integer, int2Status As
    Integer)
```

**Argument**

*cardNo*: Card number of selected board

*int1Status*: 0: interrupt not INT1, 1: interrupt is INT1

*int2Status*: 0: interrupt not INT2, 1: interrupt is INT2

**Return Code**

```
ERR_NoError
ERR_BoardNoInit
```

**Interrupt Enable**

Activates the interrupt controller. After calling, software signals every interrupt request signal generated. Refer to sample program 7432int.c.

**Syntax****C/C++ (Windows)**

```
U16 W_7432_INT_Enable (U16 cardNo, HANDLE
    *hEvent)
```

**Visual Basic (Windows)**

```
W_7432_INT_Enable (ByVal cardNo As Integer,
    hEvent As Long) As Integer
```

**Argument**

*cardNo*: Card number of selected board

*hEvent*: address of array of two handles, with HEvent[0] and hEvent[1] events for interrupt signals INT1 and INT2 respectively.

**Return Code**

```
ERR_NoError
ERR_BoardNoInit
```

## Interrupt Disable

Disables generation of interrupt signals. Only available for Windows 95 drivers.

### Syntax

#### **C/C++ (Windows)**

```
U16 W_7432_INT_Disable (U16 cardNo)
```

#### **Visual Basic (Windows)**

```
W_7432_INT_Disable (ByVal cardNo As Integer) As  
Integer
```

### Argument

*cardNo*: Card number of selected board

### Return Code

```
ERR_NoError  
ERR_BoardNoInit
```

## Important Safety Instructions

For user safety, please read and follow all **instructions**, **WARNINGS**, **CAUTIONS**, and **NOTES** marked in this manual and on the associated equipment before handling/operating the equipment.

- ▶ Read these safety instructions carefully.
- ▶ Keep this user's manual for future reference.
- ▶ Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- ▶ When installing/mounting or uninstalling/removing equipment:
  - ▷ Turn off power and unplug any power cords/cables.
- ▶ To avoid electrical shock and/or damage to equipment:
  - ▷ Keep equipment away from water or liquid sources;
  - ▷ Keep equipment away from high heat or high humidity;
  - ▷ Keep equipment properly ventilated (do not block or cover ventilation openings);
  - ▷ Make sure to use recommended voltage and power source settings;
  - ▷ Always install and operate equipment near an easily accessible electrical socket-outlet;
  - ▷ Secure the power cord (do not place any object on/over the power cord);
  - ▷ Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
  - ▷ If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.

- ▶ Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

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. Dispose of used batteries appropriately.

---

- ▶ Equipment must be serviced by authorized technicians when:
  - ▷ The power cord or plug is damaged;
  - ▷ Liquid has penetrated the equipment;
  - ▷ It has been exposed to high humidity/moisture;
  - ▷ It is not functioning or does not function according to the user's manual;
  - ▷ It has been dropped and/or damaged; and/or,
  - ▷ It has an obvious sign of breakage.

# Getting Service

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