

CPU300 Datasheet

MAN1477_01_EN_959CPU300_DS



compatible with
OCS-I/O

Part Number: HE959CPU300

User Manual and Add-Ons

Find the documents via the [Documentation Search](#).

Part #	Description
MAN1517	CPU300 User Manual
HE-BAT009	3V Lithium Coin Battery
HE-XCK	Programming Cable Kit
HE-FBD001	Ferrite core for filtering out electrical noise
HE200MJ2TRM	Adapter, RJ45 (8P8C) male to 8-position terminal strip

OCS-I/O

Horner OCS-I/O is a remote I/O option that connects using the CsCAN Network to all Horner OCS host controllers. See the Horner [OCS-I/O website](#) for additional information.

Battery Maintenance

The CPU300 has an advanced battery system that uses a lithium coin battery. The battery powers the real time clock when power is removed. See manual **MAN1517** via the [Documentation Search](#) for more details on battery replacement.

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TECHNICAL SPECIFICATIONS

General Specifications

Required Power (steady state)	630 mA at 24VDC
Required Power (inrush)	35A for 200µs 24VDC switched
Primary Power Range	10-30VDC
Real Time Clock (RTC)	Battery backed; lithium coin cell CR2450
Battery Life	10 years (RTC Support)
Clock Accuracy	± 90 seconds per month
Relative Humidity	5 to 95% non-condensing
Operating Temperature	-10°C to +60°C
Storage Temperature	-20°C to +70°C
Temperature Code	T5
Weight	9.5 oz (270 g)
Mounting	35 mm DIN Rail
Housing Material	Plastic

Control and Logic

Control Language Support	Register -Based Advanced Ladder Logic, Variable-Based Advanced Ladder Logic, IEC 61131-3 Languages.
Logic Program Size	2 MB
Non-Retentive Memory	128kB
Internal Storage Memory	16MB
Total Program Memory	2.5MB
Logic Scan Rate	0.02ms/kB
PID Support	32
%I (Digital Inputs)	2048
%Q (Digital Outputs)	2048
%AI (Analog Inputs)	512
%AQ (Analog Outputs)	512
General Purpose 16-bit Registers (%R) Retentive Registers	50,000
General Purpose 1-bit Registers (%T) Temporary Bits	16,384
General Purpose 1-bit Registers (%M) Retentive Bits	16,384

Connectivity

Serial Ports	1 x RS-232, 1 x RS-485
CAN Port Speeds Support	125kb, 250kb, 500kb, 1Mb/sec.
CAN Protocols	CsCAN, CANopen, DeviceNet, J1939
Ethernet	2 x 10/100Mbps
Ethernet Protocols	TCP/IP, Modbus TCP, FTP, SMTP, EGD, ICMP, ASCII, Cscape, Ethernet IP
microSD	SDHC, SDXC in FAT32 format
Communication Support	WebMI, E-mail, TCP/IP, Modbus, FTP, Datalogging
Remote I/O	OCS-I/O
Removable Memory	microSD, SDHC, SDXC (in FAT32 format), support for 32GB maximum. Application Updates, Datalogging
USB Type A (500 mA max)	USB 2.0 (480Kbps) for USB flash drives (2TB), Wi-Fi, cameras, mice and keyboards
USB Type C	Programming

Testing

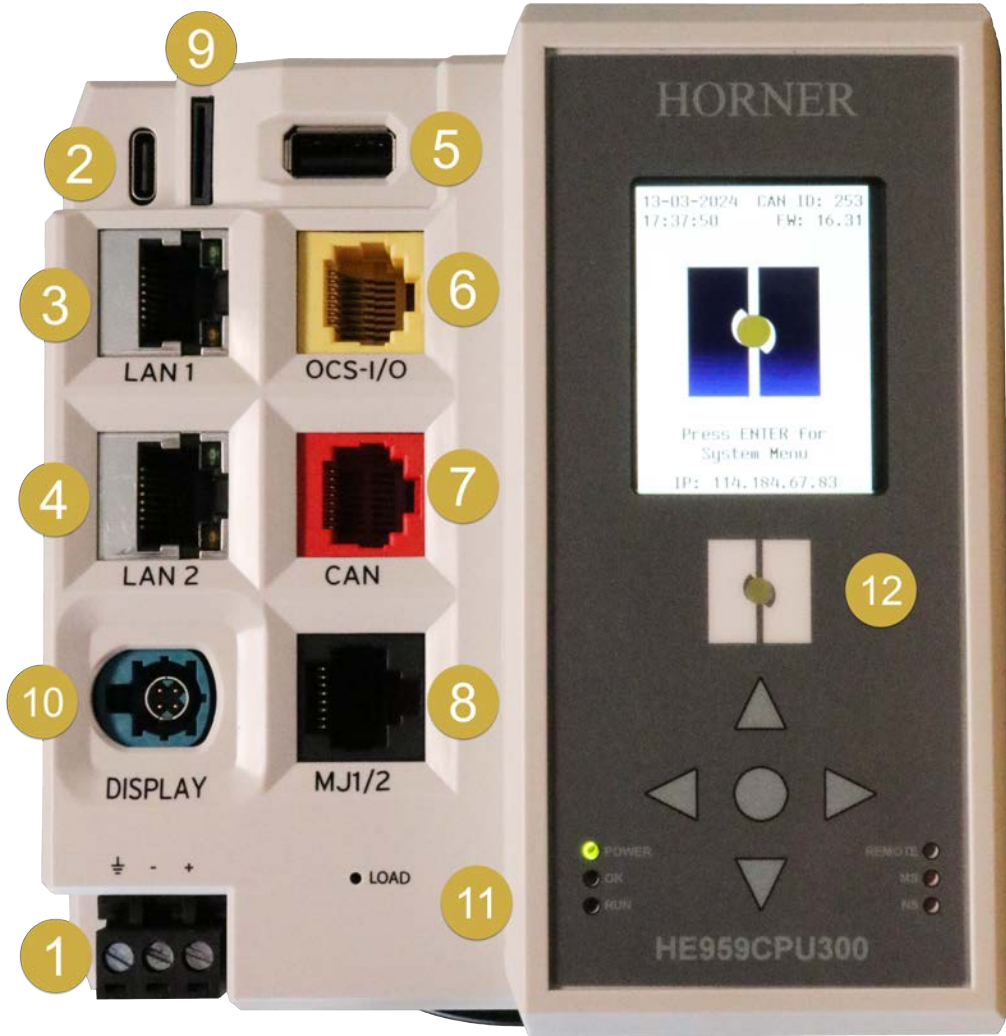
Shock	IEC 60068-2-27
Vibration	IEC 60068-2-6
UL Environmental Ratings	IP20
Certifications (UL/CE)	North America Europe

USB Webcams

USB Webcams supported should support the UVC (USB Video class) protocol for the OCS to be able to display video. Most USB based video devices support this today. Special feature such as zoom and high definition are not supported by the OCS.

CONTROLLER OVERVIEW

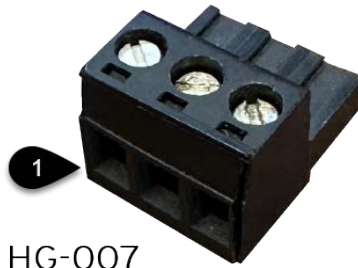
Overview of CPU300



- 1. Power
- 2. USB Type C Port
- 3. Ethernet Port 1
- 4. Ethernet Port 2
- 5. USB Type A Port
- 6. OCS-I/O Port (not active with initial firmware)
- 7. CAN Port
- 8. Serial Port
- 9. microSD Slot
- 10. HMI Connect Port
- 11. LED Status Lights
- 12. System Menu Panel

Power Wiring

NOTE: The Primary Power Range is 10-30VDC.



HG-007

Primary Power Port Pins		
PIN	Signal	Description
1	Ground	Frame/Earth Ground
2	DC-	Input Power Supply Ground
3	DC+	Input Power Supply Voltage

Wiring Characteristics

- Solid/Stranded Wire: 12-24 AWG (2.5-0.2mm²)
- Strip length: 0.28" (7mm)
- Torque, Terminal Hold-Down Screws: 4.5 – 7 in•lbs (0.50 – 0.78 N•m)

DC- is internally connected to I/O V-. A Class 2 power supply must be used.

Power Up

1. **Optional:** Attach ferrite core with a minimum of two turns of the DC+ and DC- signals from the DC supply that is powering the controllers.



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2. Connect to earth ground.
3. Apply recommended power.

COMMUNICATIONS

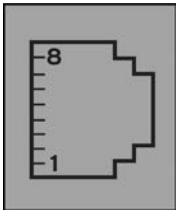
Serial Communication

MJ1/2 Serial Ports

Two serial ports are provided using the single 8-position modular jack labeled MJ1/2.

- **MJ1** defaults to one of several methods available to program the controller. It may instead be specified for RS-232 communications, such as for Modbus Master/Slave, or to communicate to devices such as bar code scanners.
- **MJ2** may only be used as half-duplex (2-wire) RS-485. The most common use is for Modbus communications, either as a Modbus Master or Modbus Slave, though other options are also available.

NOTE: To break pins out to terminals, use the [HE200MJ2TRM](#) accessory.



MJ1/2 SERIAL PORTS

MJ1: RS-232 w/full handshaking

MJ2: RS-485 half-duplex

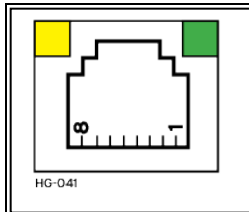
PIN	MJ1 PIN Assignments		MJ2 PIN Assignments	
	SIGNAL	DIRECTION	SIGNAL	DIRECTION
8	TXD	OUT	-	-
7	RXD	IN	-	-
6	0V	GROUND	0V	GROUND
5	+5V @ 60mA	OUT	+5V @ 60mA	OUT
4	RTS	OUT	-	-
3	CTS	IN	-	-
2	-	-	RX - / TX -	IN / OUT
1	-	-	RX + / TX +	IN / OUT

NOTE: Attach optional Ferrite Core (HE-FBD001) with a minimum of two turns of serial cable.

Ethernet

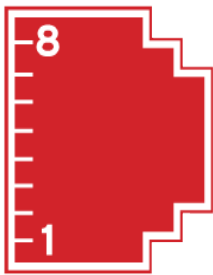
A 10/100 Ethernet port with automatic MDI-X (crossover detection) is provided via the single 8-position modular jack labeled LAN. Additional features are available for use over Ethernet, including WebMI, Modbus TCP/IP, Ethernet/IP, SMTP (E-mail), expansion I/O to SmartRail, and more.

Ethernet configuration is done via the Cscape Hardware Configuration. For more information on Ethernet, available features and protocols, refer to the Ethernet Supplement document (SUP0740).



Green LED indicates link - when illuminated, data communication is available.
Yellow LED indicates activity - when flashing, data is in transmission.

CAN Communications

 HG-042	Modular jack (8p8c)	CAN Pin Assignments	
		PIN	SIGNAL
		8	No Connection
		7	Ground
		6	Shield
		5	No Connection
		4	No connection
		3	Ground
		2	CAN Data Low
		1	CAN Data High

The CAN port is provided via the single 8-position modular jack labeled “CAN”. It may be used to communicate with other OCS products using the Horner CsCAN protocol. Remote expansion I/O such as SmartRail, SmartBlock, and SmartStix may be implemented using the CsCAN protocol.

Termination for the CAN port may be enabled from the System Menu or System Register. This should only occur if this device is at either end of the CAN network. Only the two devices on either end of the CAN network should be terminated.

Discrete Wiring

For CAN or serial connections the [HE200MJ2TRM](#) accessory will provide a modular connector to wiring block adapter for installations that require discrete wiring.



HG-043

microSD Slot

A microSD card may be used for data and alarm logging, historic trending, program loading, firmware updates, and other features. Supported types of microSD cards are SD, SDHC, and SDXC if the format of the card file system is FAT32.

RUN LED

LED Indicators	
Status	Description
OFF	OCS is in IDLE/STOP mode
Green Flashing (1Hz)	DO / IO mode or RUN with no ladder program
ON	Ladder code running

Remote (HMI) LEDs

LED Indicators	
Status	Description
ON	Solid red if HMI connect display is connected
OFF	HMI Connect display not connected

Status LEDs

When the OK and RUN are flashing alternately, a firmware download is in progress. When the flashing stops, the firmware download is complete and the unit reboots (approximately 30 seconds).

LED Indicators				
Status	POWER	OK	MS	NS
V+ Power Applied	ON	ANY	ANY	ANY
Self-Test FAIL	ON	ANY	OFF	ANY
Self-Test PASS	ON	ON	ANY	ANY
Network Normal	ON	ON	ON	ON
Duplicate Net ID	ON	ON	ON	OFF
Configuration Mismatch	ON	Flash (1Hz)	ON	Flash (1Hz)
OCS Stop Mode/Communication Timeout	ON	ON	ON	Flash (1Hz)
OCS Run Mode	ON	ANY	ANY	ANY
Onboard I/O Fault	ON	OFF	ON	ON
Invalid Dynamic Configuration	ON	Flash (1Hz)	ON	ON
Power Up/Waiting to be Configured	ON	ON	Flash (1Hz)	Flash (1Hz)

NOTE: When flashing together, the firmware download has failed, and the number of flashes indicates the error. There will be a two second gap and the pattern will be repeated. The number of flashes and the associated error are as follows:

- 2 Flashes - The MAC ID is empty.
- 3 Flashes - The internal MAC file is corrupt.
- 4 Flashes - The MAC ID TXT file is invalid.
- 5 Flashes - The MAC ID file is not found or the microSD card is empty or missing system files.

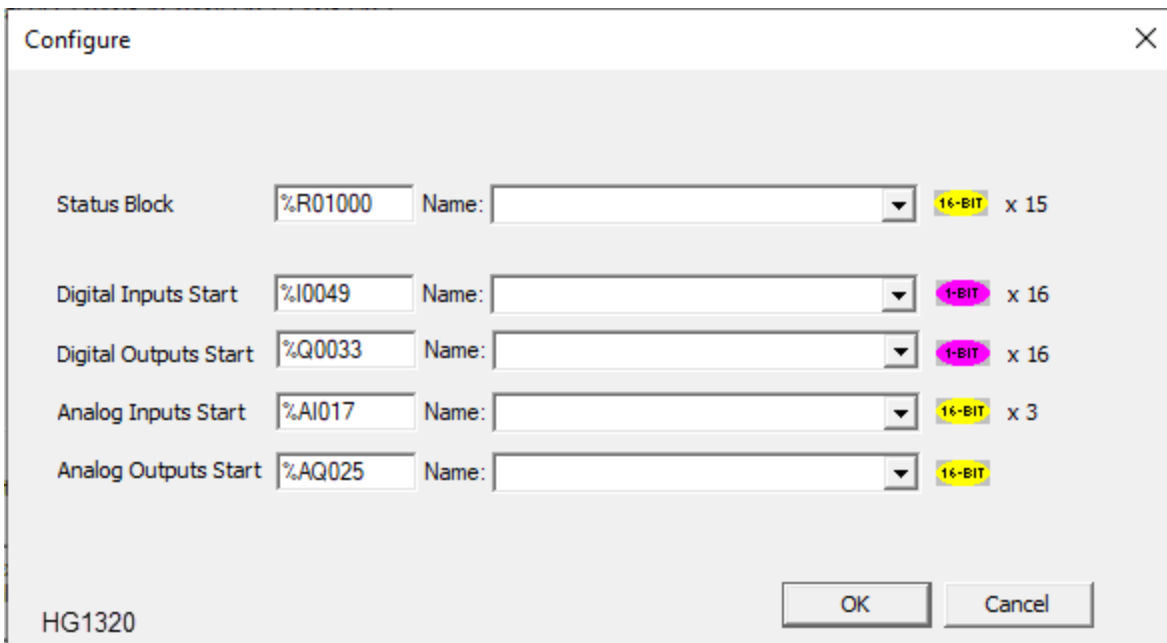
CSCAPE CONFIGURATION

The OCS-I/O is configured from Cscape, under "Hardware Configuration." Check the release notes on the OCS model to ensure OCS-I/O support is included.

NOTE: Cscape 10.1 SP1 and beyond is required.

General configuration steps:

1. In Cscape, select Controller > Hardware Configuration.
2. Confirm that the OCS controller has been selected.
3. Select the "Local I/O" tab.
4. Click the "Edit I/O" button. This opens the following dialog:

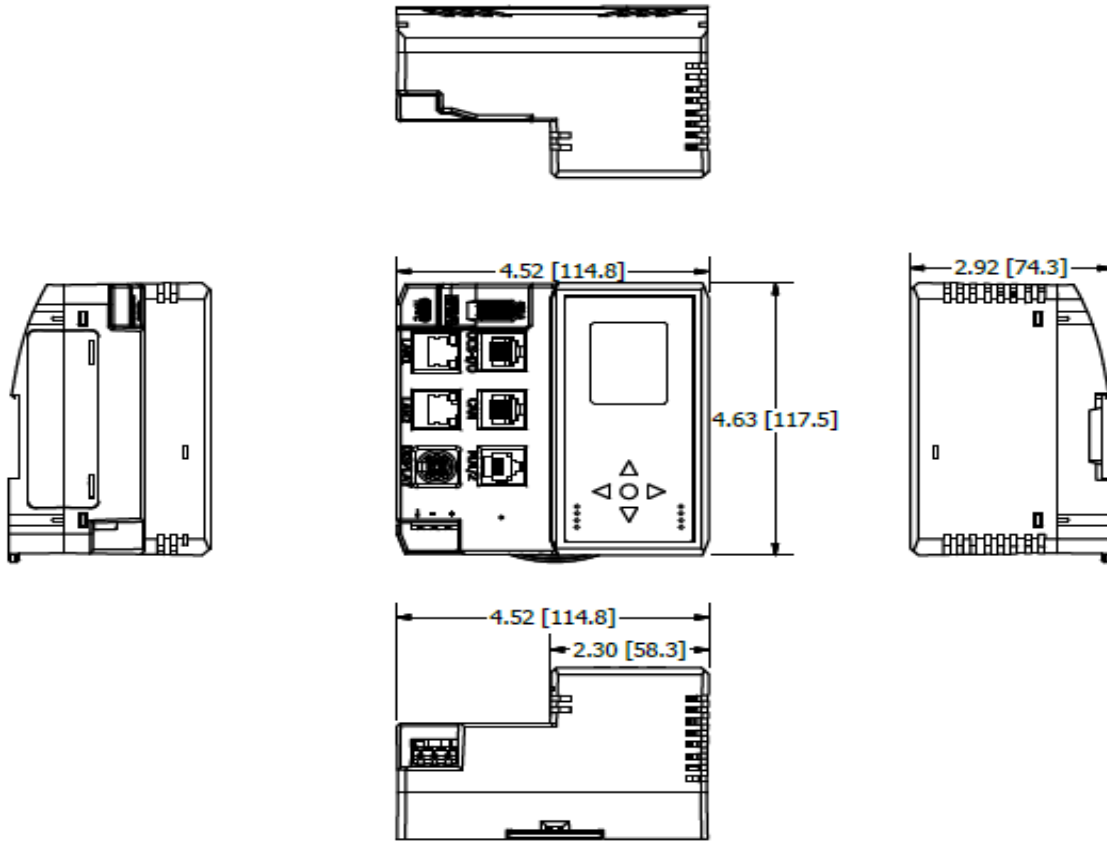


Field Name	Description
Status Register	Location where fifteen consecutive words are reported
Digital Inputs / Digital Outputs / Analog Inputs / Analog Outputs Start	Starting locations for each type of I/O for this base. Choose a starting addresses that does not conflict with the OCS built-in I/O mapping.

5. After entering all the required information (above), click "OK". The following Hardware Configuration dialog will appear.
 - Modules can be added using the "Add Module" button. As I/O modules are added the Input Map, Output Map, and Current Draw are updated, showing the accumulated I/O Module Information. More details regarding each module can be viewed using the "More Info" button.
 - If the OCS and I/O modules are correctly connected and powered up, and if Cscape currently has communications to the OCS, the "Auto Populate IO" button may be used to recognize all modules installed on this OCS.
 - Right-clicking on an OCS module permits additional detailed configuration to be performed, as follows:
 - Digital Input modules can be configured to update on a change of state (typical) or periodically (rare). Input filtering can also be adjusted from the default of 1ms.
 - Digital Output modules can optionally be configured to hold last state in Stop/Idle mode.
 - Analog Input modules can be configured with an update rate of 10ms to 255 seconds. Analog Inputs also have configurable data type and range which varies by module type.
 - Analog Output modules have configurable type and range, and also can have Stop/Idle behavior adjusted to Hold Last State, or go to Minimum (default), Medium or Maximum value.
6. Press "OK" to complete the process.

DIMENSIONS & INSTALLATION

CPU300 Dimensions



WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

ATTENTION - RISQUE D'EXPLOSION - NE DÉBRANCHEZ PAS L'ÉQUIPEMENT SAUF SI L'ALIMENTATION A ÉTÉ COUPÉE OU SI LA ZONE N'EST PAS DANGEREUSE.

This OCS may only be used in the Class I, Division 2, Groups A, B, C and D Hazardous Locations only.

Temperature Ranges

- The operating temperature range is -10°C to +60°C.
- The storage temperature range is -20°C to +70°C.

Summary

- The HE959CPU300 is compact and mounts on DIN-rail. Each I/O module installed adds width in increments of 19mm.

NOTE: The distance between wiring duct and surrounding modules, above and below each module, should be a minimum of 50mm apart.

- Modules can be added after the HE959CPU300 base has been installed on the DIN-rail. **However, they cannot be hot swapped when the power is applied.** (I/O scanning will stop until the correct modules for the system are detected in all slots.)

NOTE: I/O scanning will stop until the correct modules for the system are detected in all slots.

Installation Instructions

Devices are to be installed into an enclosure suitable for the environment and that is only accessible with the use of a tool.

DIN Rail Overview

- Modules mount on a DIN rail. Be certain that the DIN rail is in a horizontal position before installing the unit. A horizontal orientation is required to prevent the unit from slipping off the DIN rail.
- The module is compact and mounts on the DIN rail. Each I/O module installed adds width in increments of 19mm. The distance between wiring duct and surrounding modules must be at least 50mm apart.
- Modules can be added after the base has been installed on the DIN rail.
- The spade connector for grounding and the DIN rail clip add to the overall measurements. The CAN/PWR and LAN connectors also add to the measurements.

How to Install the Modules

1. Connect the bus connectors to each other to form a backplane that can accept up to 8 modules, including the CPU300 or another base.
2. Snap the bus connectors into the DIN rail. The DIN rail should be 35 mm × 7.5 mm and made to EN 60715 standards.
3. Place the HE959CPU300 or other bus head to the leftmost connector.
4. Insert modules by latching at the top of the DIN rail first and then rocking downward until the latch at the bottom of the DIN rail engages.



How to Remove the Modules

Modules may be removed while powered, however I/O scanning on the remaining modules will stop and I/O will go into the default state until a new module is inserted and all modules in the configuration are present.

1. Insert a flat-blade screwdriver into the metal DIN rail latch at the bottom of the module.
2. Pry downwards to the release latch.
3. Rock the module up and off the DIN Rail.

SAFETY & MAINTENANCE

Warnings

1. To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.
2. To reduce the risk of fire, electrical shock, or physical injury, it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.
3. Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.
4. In the event of repeated failure, do **NOT** replace the fuse again as repeated failure indicates a defective condition that will **NOT** clear by replacing the fuse.
5. Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment.
6. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.
7. **WARNING: Battery may explode if mistreated. Do not recharge, disassemble, or dispose of in fire.**
8. **WARNING: EXPLOSION HAZARD - Batteries must only be changed in an area known to be non-hazardous.**
9. **WARNING: Do not disconnect while circuit is live unless area is known to be non-hazardous.**

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Precautions

All applicable codes and standards need to be followed in the installation of this product. Adhere to the following safety precautions whenever any type of connection is made to the module:

1. Connect the safety (earth) ground on the power connector first before making any other connections.
2. When connecting to the electric circuits or pulse-initiating equipment, open their related breakers.
3. Do NOT make connection to live power lines.
4. Make connections to the module first; then connect to the circuit to be monitored.
5. Route power wires in a safe manner in accordance with good practice and local codes.
6. Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
7. Ensure hands, shoes, and floor are dry before making any connection to a power line.
8. Make sure the unit is turned OFF before making connections to terminals.
9. Make sure all circuits are de-energized before making connections.
10. Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
11. Use copper conductors in field wiring only, 60/75°C.
12. Use caution when connecting controllers to PCs via serial or USB. PCs, especially laptops, may use “floating power supplies” that are ungrounded. This could cause a damaging voltage potential between the laptop and controller. Ensure the controller and laptop are grounded for maximum protection. Consider using a USB isolator due to voltage potential differences as a preventative measure.



Technical Support

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