Honeywell

ControlEdge PLC

ControlEdge UOC

ControlEdge 900 Platform Hardware Planning and Installation Guide

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CHAPTER

1 ABOUT THIS GUIDE

Scope

This guide describes how to set up the ControlEdge 900 platform and install UOC or PLC.

Revision history

Revision	Date	Description
A	September 2016	Initial release of the document
B	November 2016	Updated for PLC R130.2 Release including: • Delete the Self-powered 3–wire transmitter for UIO AI, and updated Self-powered 4-wire transmitter for UIO AI. • Add 900RTP-H1xx RTP Cable • Add MOXA Unmanaged Ethernet Switch EDS-308 and EDS-316-MM-SC.
C	April 2017	Updated for the PLC R140 Release including: • Five new I/O modules • Add new RTP and RTP Cables • New Terminal Blocks • New accessory parts
D	June 2017	Updated for PLC. Adding the following items: • Add UIO wiring limitation and hardware version comparison • Add RTP dimension for installing

Revision	Date	Description
E	September 2017	Added UOC information (for Experion R505 release)
F	November 2017	Updated for UOC network topologies
G	December 2017	Updated for ControlEdge PLC R150 Release including: • Five new I/O modules • Add new relay RTP
I	July 2018	Updated DLR topologies for UOC
J	November 2018	Updated for UOC One Slot Rack added Updated for ControlEdge PLC R151 Release including: • 8 channel Analog Output • 16 Channel DC/AC Digital Input • Pulse Output • Serial Communication Module • EtherNet/IP
K	April 2019	Updated release date and version for PLC R152
L	September 2019	Added reference links of RTP user guides
M	January 2020	Updated for ControlEdge PLC R160 release
N	March 2020	Added setting rotary switch to 5 using the 100x switch for DLR topology
O	March 2021	• Removed Quadrature related content because it is not supported. • Added wire gauge for mm², and also updated related diagrams.
P	September 2021	Removed self-powered 4-wire isolated

Revision	Date	Description
		sourcing type transmitter with UIO
Q	February 2022	Redundant UIO, MasterLogic I/O, and Honeywell VFD information is added
R	November 2022	Extended PLC temperature hardware update and information is added **NOTE:** The R173 release is only a hardware upgrade. R172.1 remains the software/firmware version for ControlEdge builder.

Intended audience

This guide is primarily intended for Honeywell field personnel who do hardware planning, installation, operation, and maintenance for the Honeywell ControlEdge™ 900 Controller.

Related documents

The following list identifies publications that may contain information relevant to the information in this document.

PLC Specific

Doc Name	PLC document Set
ControlEdge Builder Software Installation User's Guide	RTDOC-X285
ControlEdge Builder Software Change Notice	RTDOC-X166
ControlEdge PLC and ControlEdge RTU Getting started	RTDOC-X287
ControlEdge Builder User's Guide	RTDOC-X283
ControlEdge Builder Function and Function Block Configuration Reference Guide	RTDOC-X286
ControlEdge Builder Protocol Configuration Reference Guide	RTDOC-X288

Doc Name	PLC document Set
ControlEdge PLC and ControlEdge RTU Network and Security Planning Guide	RTDOC-XX75
ControlEdge PLC EtherNet/IP User's Guide	RTDOC-X548
ControlEdge RTU and PLC DNP3 Device Profile	RTDOC-X346
Firmware Manager User Guide	EPDOC-X470
ControlEdge PLC PROFINET User's Guide	RTDOC-X722

UOC Specific

Doc Name	Experion document set for deployments of UOC
Control Building User's Guide	EPDOC-XX19
Firmware Manager User's Guide	EPDOC-X404
ControlEdge UOC Software Change Notice	EPDOC-X166
Control Builder Parameter References Guides	EPDOC-XX18
UOC User's Guide	EPDOC-X512
Control Builder Components Theory	EPDOC-XX16

Introduction to ControlEdge Technology

Item	Description
ControlEdge PLC	ControlEdge 900 controllers running the eCLR (IEC 61131-3) execution environment with PLC software options configured with ControlEdge Builder.
ControlEdge RTU	ControlEdge 2020 controllers running the eCLR (IEC 61131-3) execution environment with RTU software options configured with ControlEdge Builder.

Item	Description
ControlEdge UOC	ControlEdge 900 controllers running the Honeywell control execution environment (CEE) configured with Experion Control Builder.

Special Terms

The following table describes the commonly used industry-wide and Honeywell-specific terminology:

Terminology	Description
AI	Analog Input
AO	Analog Output
CEE	Control Execution Environment (Experion)
ControlEdge 900	A family of controller and I/O hardware which can be assembled to create PLC or UOC systems.
ControlEdge Builder	Software configuration tool for PLC.
Control Builder	Experion Control Builder, configuration tool for UOC.
COTS	Commercial Off the Shelf
CPM	Control Processor Module (commonly referred to as the controller). The ControlEdge 900 CPM, can be loaded with PLC firmware to become the PLC or with UOC-CPM firmware to become the UOC-CPM.
DCS	Distributed Control System
DI	Digital Input
DLR	Device Level Ring
DO	Digital Output
EPM	Expansion Processor Module (used to connect multiple I/O racks to the Control Processor Module)
Expansion I/O rack	I/O rack with EPM installed
Ethernet/IP	EtherNet/IP™ is a trademark protocol owned by ODVA.
HMI	Human Machine Interface
HSR	High Speed Ring
I/O Rack	ControlEdge 900 form factor rack with 4, 8, or, 12 I/O slots and one slot for non-redundant CPM or EPM.

Terminology	Description
PLC	Programmable Logic Controller
PSM	Power Status Module
PSU	Power Supply Unit
PWA	Printed Wiring Assembly
Redundant Controller Rack	ControlEdge 900 rack capable of hosting a redundant pair of CPMs.
RM	Redundancy Module
RTP	Remote Termination Panel
RIUP	Removal and Insertion Under Power
SCADA	Supervisory Control and Data Acquisition
UIO/UIOM	Universal Input/ Output (Module)
UOC	Unit Operations Controller (Experion). This is a term used to refer to the CPM when used as a controller in the Experion PKS Distributed Control System.

CHAPTER

2 OVERVIEW

Make sure all the hardware modules used in the system are installed with the correct firmware version, and the engineering station has the latest ControlEdge Builder. You can find the firmware and software updates on https://process.honeywell.com with valid credentials.

If the equipment is not used in a manner specified by the manufacturer, the protection provided by the equipment may be impaired.

ControlEdge 900 hardware components can be deployed in two distinct types of control systems.

- The ControlEdge Programmable Logic Controller (PLC)
- The ControlEdge Unit Operations Controller (UOC)

For Control Processor Module (CPM), both the UOC and PLC use it but with different firmware loaded.

ControlEdge PLC can be deployed standalone or with a SCADA system, including Experion PKS. Within Experion, ControlEdge PLC can also communicate in a peer relationship to the DCS controllers such as C300 and ContorlEdge UOC.

ControlEdge UOC is a DCS controller always deployed within Experion PKS.

This document has been divided into three major sections.

- ControlEdge PLC - contains details specific to PLC.
- ControlEdge UOC - contains details specific to UOC.
- ControlEdge 900 common reference information and other chapters- contains details applicable to ControlEdge platform, both PLC and UOC.

How to Use this Guide

The following table outlines the tasks involved in planning and installing a Honeywell ControlEdge 900 Controller. The links provided will navigate the user through those tasks.

Revision	PLC Specific	UOC Specific
Check the model number of the hardware components	See the section Spare parts and model numbers	
Plan the architecture of the system	See the section System architectures planning	See the section System architectures
Understand and plan the hardware components of the system	See the section Hardware components	
Plan the wiring of the system	See the section Wiring and cabling planning	
Install the racks to house the system	See the section Rack installation	
Install and wire the I/O modules	See the section I/O Module installation and wiring	
Troubleshoot the system	See the section Diagnostics and Troubleshooting	
Remove or replace system components	See the section Maintenance	
Software configuration	See *ControlEdge Builder User's Guide for PLC systems*.	See *Control Building User's Guide for UOC systems*.

CHAPTER

3

CONTROLEDGE PLC

Honeywell ControlEdge 900 family comprises a set of hardware and software enabling users and OEMs to assemble a system that fits a broad range of requirements. Any configuration can be readily modified or expanded as requirements dictate.

This section provides the following information:

- I/O Network Topology
- Hardware Configuration of PLC-CPM
- Hardware configuration of EPM
- Hardware configuration of I/O module type
- Device Replacement

I/O Network Topology

The ControlEdge PLC is configured with a non-redundant Control Processor Module (CPM) or a redundant CPM. This section provides details of each configuration.

ControlEdge PLC includes provisions for communication via Ethernet with host systems such as the Honeywell Experion Human Machine Interface (HMI) and other HMI software that support Modbus/TCP or OPC UA protocols. The communication structure of the ControlEdge PLC enables remote placement of input/output components, allowing economies in cabling and wiring.

The Ethernet ports provide a layer of protection against cyber-attacks. Multiple layers of protection are always considered good cyber-security practices, so using a firewall device configured to prevent uncontrolled messages into the CPM is advised. The figures in this manual assume the firewall is installed properly above the CPM's Ethernet port(s) ETH1 and ETH2.

While the CPM has an embedded firewall, it is still recommended to apply network firewall(s) to the control system as the application requires.

Close all Ethernet ports into PLC-CPM except:

- Modbus TCP Slave
- OPC UA Server

- HART IP
- ControlEdge Builder Controller Configuration protocol
- Privacy protocol
- SNTP (if NTP server is enabled)
- Destination DHCP for uplink
- Modbus Master and OPC UA Client that configured in the relative function blocks
- CDA Responder

The port number can be configured in ControlEdge Builder, and see the following table for the default port numbers.

Table 3-1: Default port numbers

Port number	Port number type	Description	Protocol
41103	Fixed destination port	Builder protocol	TCP
24558	Fixed destination port	Discovery protocol	UDP
9050	Fixed source port	Discovery protocol	UDP
123	Fixed source port	SNTP protocol	UDP
123	Fixed destination port	SNTP protocol	UDP
68	Fixed destination port	DHCP Client for uplink	UDP
500	Fixed destination/source port	IPSec for uplink (IKE ports)	TCP
4500	Fixed source port	IPSec for uplink(IKE ports)	TCP
55601	Fixed destination port	IPSec for uplink(CertMngr cleartext)	TCP
55602	Fixed destination port	IPSec for uplink(CertMngr encryption)	TCP
80	Fixed source port	IPSec for uplink (SCEP)	TCP
ANY	Dynamic source port	Modbus TCP master	TCP

Port number	Port number type	Description	Protocol
Based on configuration The default setting is 502.	Dynamic destination port	Modbus slave	TCP
ANY	Dynamic source port	OPC UA client	TCP
Based on configuration The default setting is 4840.	Dynamic destination port	OPC UA server	TCP
Based on configuration The default setting is 5094.	Dynamic destination port	HART-IP server	TCP

ControlEdge 900 I/O Network

In the I/O network used to connect the CPM to expansion I/O racks via the EPM, three network topologies are supported in the network: High Speed Ring(HSR), Device Level Ring(DLR) and Star.

- Up to 144 I/O modules can be configured. Rationale: 12 racks x 12 modules per rack.
- Up to 4608 channels can be configured. Rationale: 12 racks x 12 modules per rack x 32 channels per module (applicable for certain I/O module types only)

Figure 3-1: System architecture with non redundant CPM

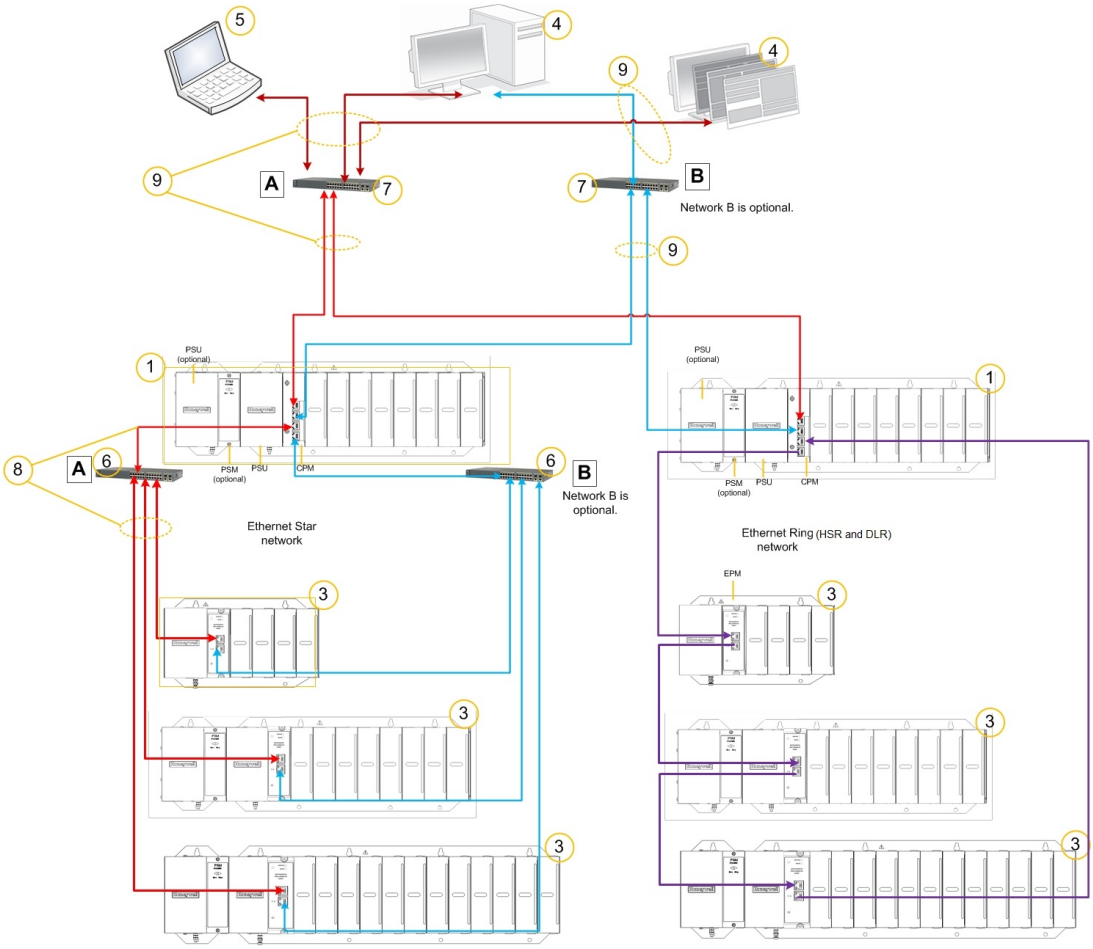
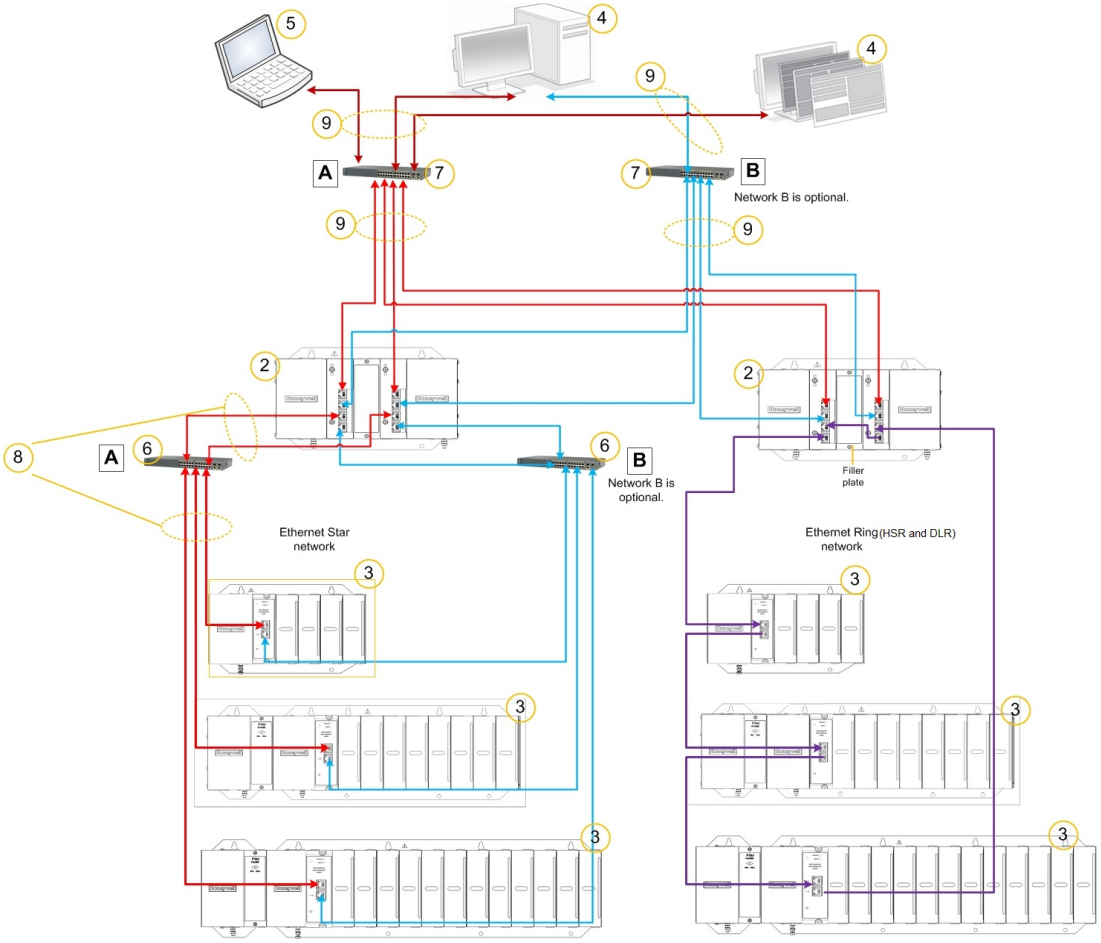


Figure 3-2: System architecture with redundant CPM



The nodes forming the purple Ring (HSR and DLR) in Figure 3-1 and Figure 3-2 must be connected as follows:

- CPM port 3 (ETH3) must be connected to CPM port 4 (ETH4) or EPM port 2 (ETH2).
- CPM port 4 (ETH4) must be connected to CPM port 3 (ETH3) or EPM port 1 (ETH1).
- EPM port 1 (ETH1) must be connected to EPM port 2 (ETH2) or CPM port 4 (EHT4).
- EPM port 2 (ETH2) must be connected to EPM port 1 (ETH1) or CPM port 3 (EHT3).

Table 3-2: System component list for ControlEdge 900 PLC Hardware

Item	Component Name	Description	Source
1	I/O Rack	The system may consist of 5 different types of I/O racks: • 4-slot w/1 power supply • 8-slot w/1 power supply • 12-slot w/1 power supply • 8-slot w/redundant power supplies • 12-slot w/ redundant power supplies	Honeywell
	Local I/O Rack	• 1 I/O Rack • 1 CPM (for controller racks) or 1 EPM (for I/O racks) • Up to 4, 8 or 12 I/O modules • 1 or 2 Power Supplies Optional second Power Supply and Power Status Module (PSM) on 8- and 12-slot I/O rack. A Power Status Module (PSM) is required with redundant power supplies.	
2	Redundant CPM Rack	• 1 Redundant Controller Rack • 2 Power Supplies • 2 CPMs: Redundancy is provided by two CPMs operating in a Redundant Controller Rack; this rack has no I/O modules. • 1 Filler block cover	Honeywell
3	Expansion I/O Rack (Optional)	Includes: • 1 rack	Honeywell

Item	Component Name	Description	Source
		• 1 Power Supply • Optional second Power Supply and Power Status Module (PSM) on 8- and 12- slot I/O rack. • 1 Expansion Processor Module (EPM) • Up to 4, 8 or 12 I/O modules • A Power Status Module (PSM) is required with redundant power supplies. The system may consist of 5 different types of I/O rack: • 4-slot w/1 power supply • 8-slot w/1 power supply • 12-slot w/1 power supply • 8-slot w/redundant power supplies • 12-slot w/ redundant power supplies	
4	Human-Machine Interface (HMI) (Optional)	PC links to the Ethernet network, which includes other HMIs, other ControlEdge 900 Controllers, and other networks (including the Internet). Typically includes HMI operating software which includes configuration tool from Honeywell.	HMI software is available from Honeywell or a third-party supplier.
5	Configuration Station	Connects from ETH1/ETH2 of the specific CPM or network switch linking CPMs.	Configuration software is from Honeywell.
6	Un-managed Ethernet 100Base-T Switch	(Only for Star topology) Enables the private Ethernet 100Base-T port on a	Third-party suppliers or

Item	Component Name	Description	Source
		CPM to the EPMs on the Expansion I/O rack. (The switch is not required if there is no expansion I/O or only one expansion I/O rack in the system.)	Qualified third party devices available from Honeywell
7	Ethernet 100Base-T Switch or Router/Firewall	Enables inter-connection of several 100Base-T Ethernet devices in an Ethernet network. Devices include other ControlEdge 900 Controller, HMIs and routers, servers, and other devices in wider networks. Use of a properly configured firewall provides a more robust network limiting exposure to uncontrolled network traffic.	Third-party suppliers.
8	Ethernet CAT5 shielded cable	Connects I/O expansion racks to CPMs and/or to 100Base-T Ethernet switches. The maximum length of the Ethernet cable is 100m.	Third-party suppliers
	Fiber Optics Cable	The maximum length of multi-mode fiber optic cable depends on the specification of the network device, typically 5 Km with a MOXA EDS-308-MM-SC. A qualified Fiber Optic Converter is required.	
9	Communications cable	Ethernet cable or Fiber Optic Cable connects devices in Ethernet Open Connectivity network to SCADA applications.	Third-party suppliers

The following sections provide information about installing racks, EPM, power supply and so on.

Table 3-3: Reference about installing racks, EPM, power supply and so on

Components	Reference section
Racks	For information about options and types of racks, see the sections Rack Options and Rack Types. For information about installing Racks, see the section Rack Installation.
EPM	For information about installing EPM, see the section Expansion Processor Module.
Power Supply	For information about connecting to AC or DC power supply, see the section Power Supply.
Configuration	For information about configuration, refer to the ControlEdge Builder User's Guide.
Environmental	For information about environmental consideration to be taken care, see the section Environmental Considerations.

MasterLogic I/O Network

The MasterLogic I/O network is used to connect the CPM to MasterLogic I/O racks via the MasterLoigic EtherNet/IP adapters. Two network topologies are supported: Device Level Ring (DLR) and Star.

> **NOTE:** MasterLogic I/O EtherNet/IP adapters connect to CPM's Ethernet Port(s) ETH3 and ETH4.

- Up to 372 I/O modules can be configured. Rationale: 31 MasterLogic racks x 12 modules per rack.
- Up to 23808 channels can be configured. Rationale: 31 MasterLogic racks x 12 modules per rack x 62 channels per module (applicable for certain I/O module types only)

Figure 3-3: MasterLogic system architecture with non redundant CPM

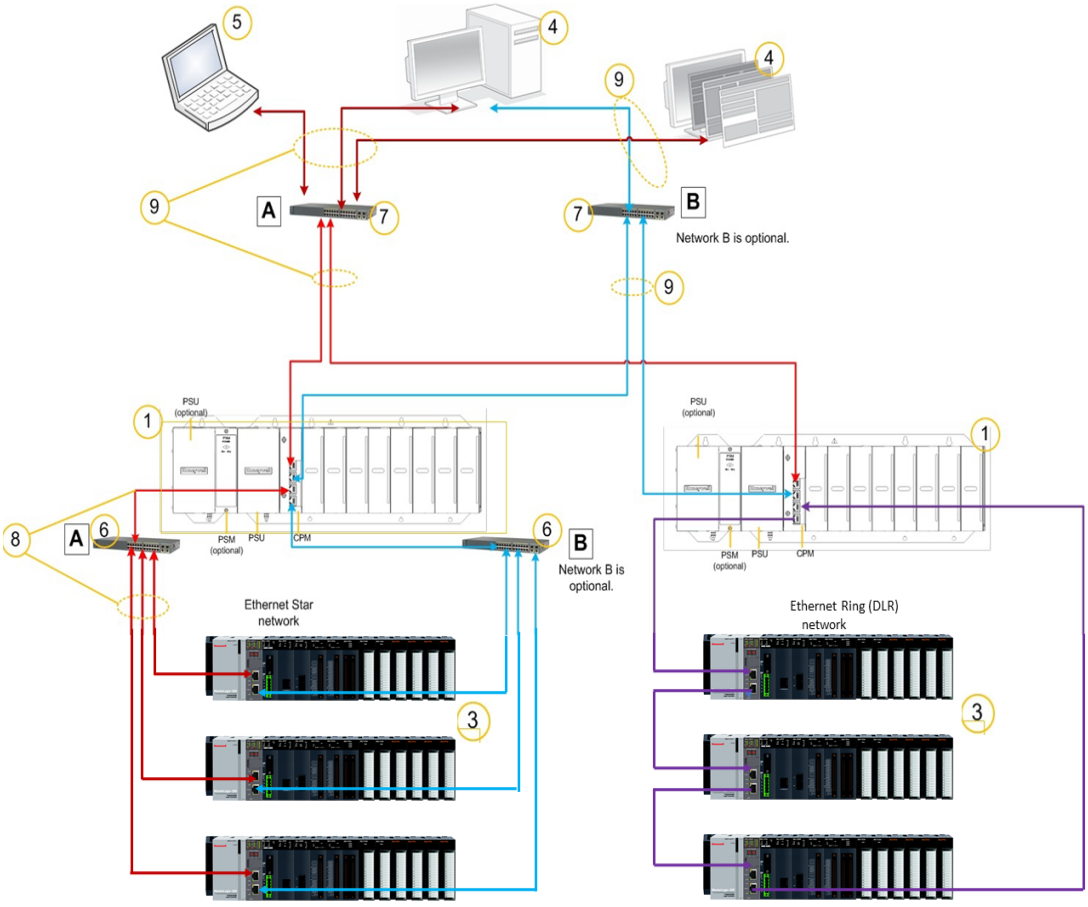
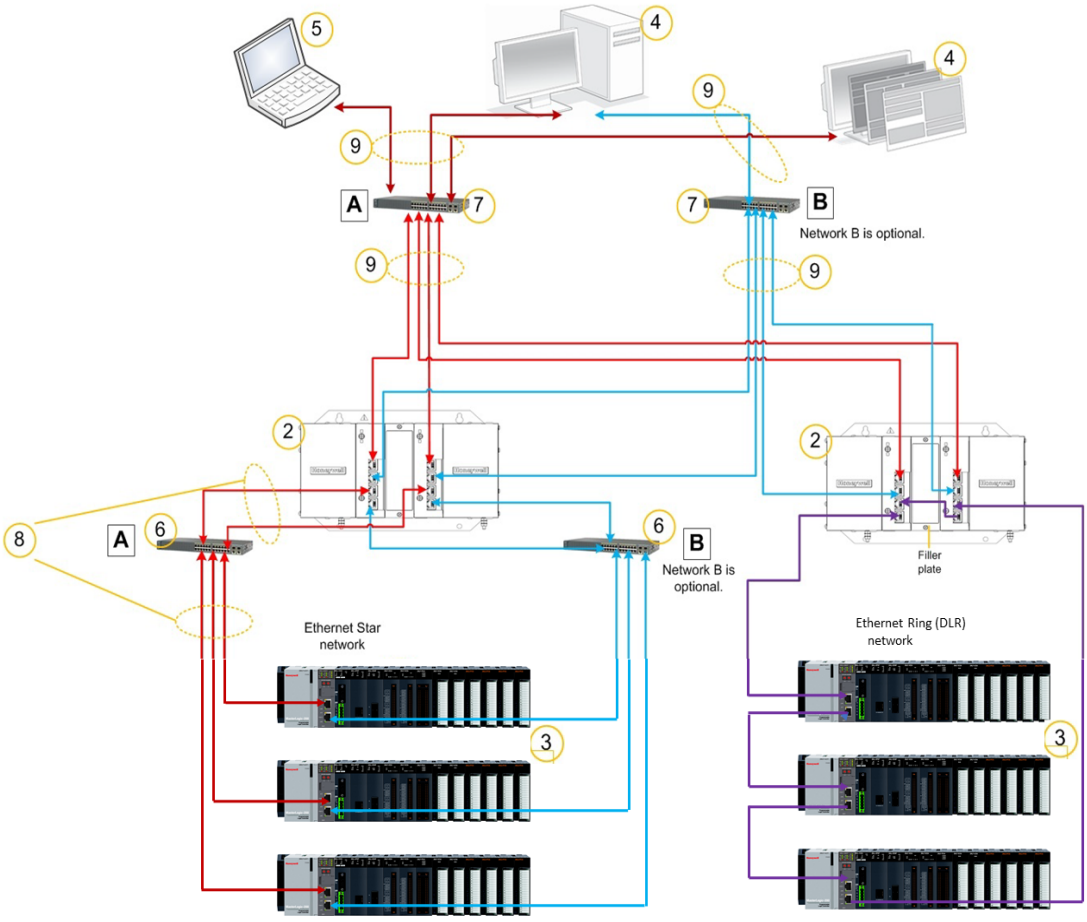


Figure 3-4: MasterLogic System architecture with redundant CPM



The nodes forming the purple ring (DLR) in Figure 3-3 and 3-4 must be connected as follows.

- CPM port 3 (ETH3) must be connected to CPM port 4 (ETH4) or MasterLogic EtherNet/IP Adapter port 2 (ETH2).
- CPM port 4 (ETH4) must be connected to CPM port 3 (ETH3) or MasterLogic EtherNet/IP Adapter port 1 (ETH1).
- MasterLogic EtherNet/IP Adapter port 1 (ETH1) must be connected to MasterLogic Adapter port 2 (ETH2) or CPM port 4 (EHT4).
- MasterLogic EtherNet/IP Adapter port 2 (ETH2) must be connected to MasterLogic Adapter port 1 (ETH1) or CPM port 3 (EHT3).

Table 3-4: System component list for MasterLogic Hardware

Item	Component Name	Description	Source
1	I/O Rack	The system may consist of 4 different types of ML200 I/O racks: • 4-slot w/1 power supply • 6-slot w/1 power supply • 8-slot w/1 power supply • 12-slot w/1 power supply Up to 4, 6, 8, and 12 I/O modules. **NOTE:** ML50 adapter is DIN rail mounted. Maximum 8 I/O modules connect to each adapter.	Honeywell

MasterLogic EtherNet/IP adapters

See "MasterLogic EtherNet/IP adapters" on page 159 for more information.

See *ML50 Installation and Commissioning Guide and ML200 Installation and Commissioning Guide* for more information.

Honeywell VFD Network

The Honeywell VFD network is used to connect the CPM to MVS100 via EtherNet/IP adapters. Only Star network topology is supported.

> **NOTE:** Honeywell VFD supports MVS100 device only.

Figure 3-5: Honeywell VFD system architecture with non redundant CPM

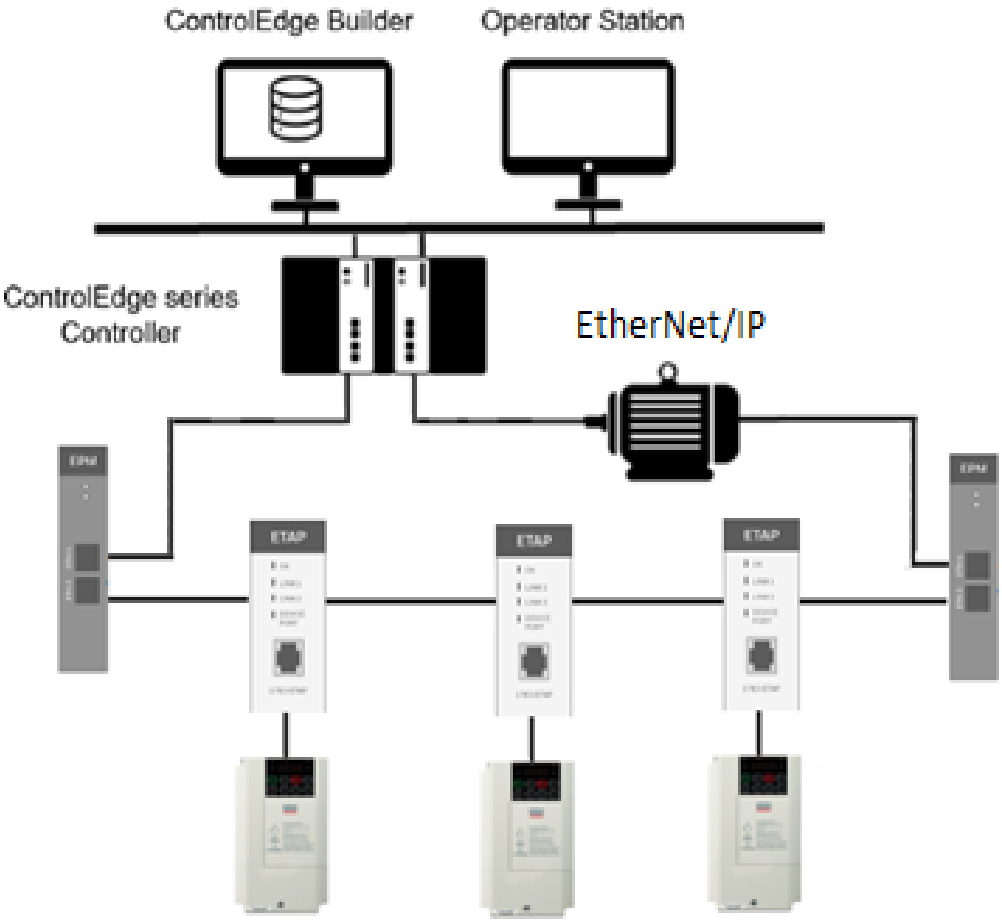
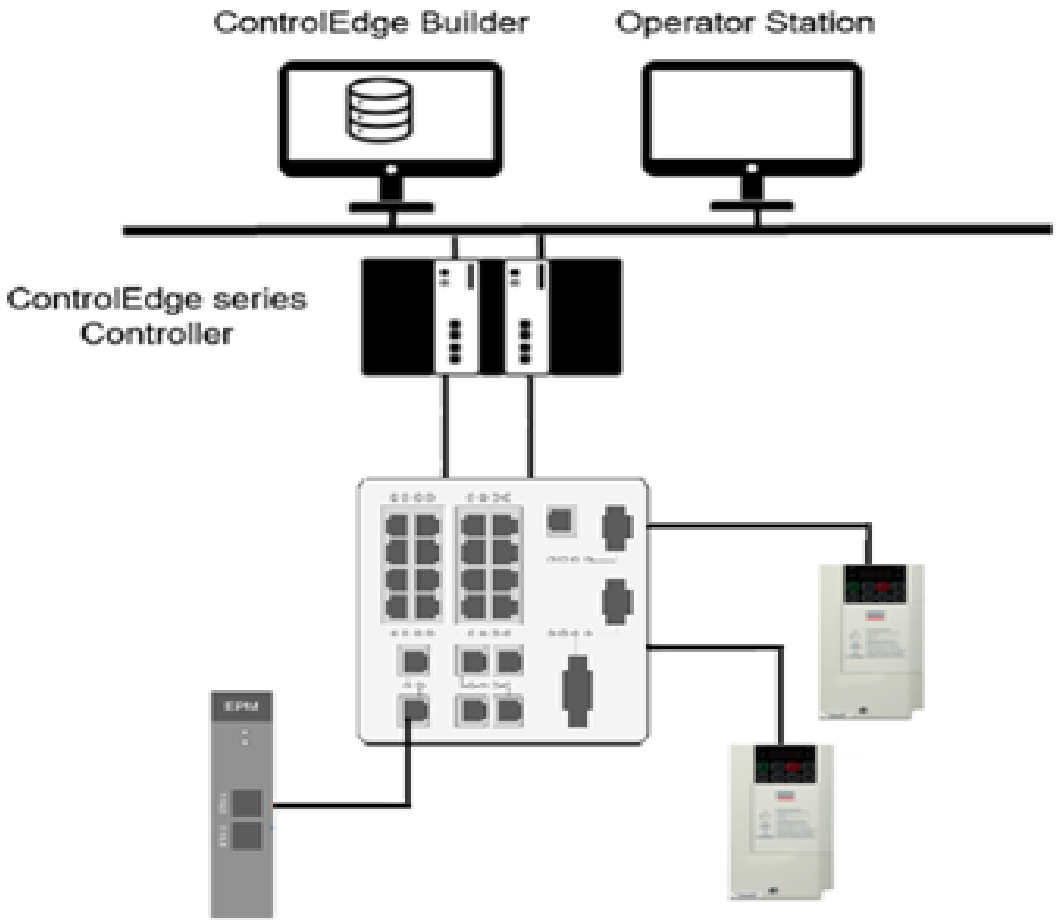


Figure 3-6: Honeywell VFD System architecture with redundant CPM



The nodes forming the ring (Star) network topology using ETAP or Stratix switch, must be connected as shown in Figure 3-5 and 3-6.

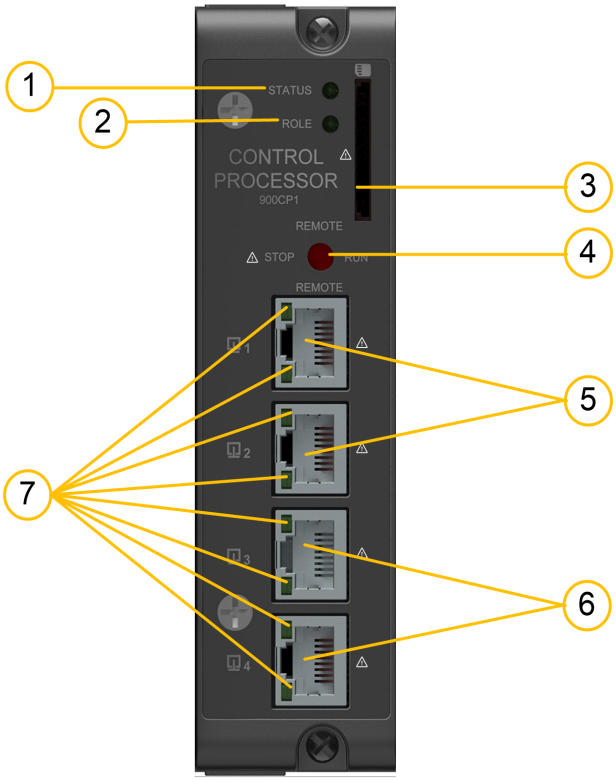
Hardware Configuration of CPM

Control Processor Module

A Redundant Controller Rack contains two CPMs. Either CPM can be primary.

The CPM is shown in the following figure:

Figure 3-7: Control Processor Module



As indicated in this figure, CPM includes:

Table 3-5: CPM Components

Item	Description
1	Status LED indicator for the CPM. For more information, see CPM Indicators section.
2	Role LED indicator for the CPM. For more information, see CPM Indicators section

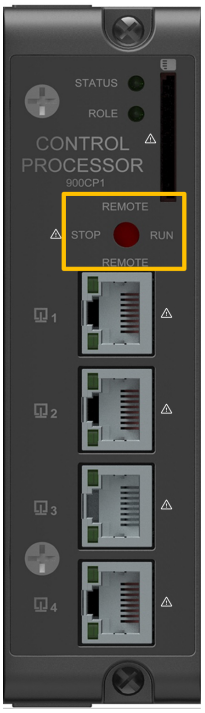
Item	Description
3	SD card slot: supports 32GB Class 6 / Class 10 industry standard, not hot-swappable, maximum weight 3g (0.0066 lb, 0.1058 oz).
4	Mode switch. For more information, see CPM mode switch section.
5	ETH1 and ETH2 host ports to PC applications and/or other CPMs, or other devices.
6	ETH3 and ETH4 ports connect to the Ethernet ports of EPM, switch (for star topology), or CPM.
7	Ethernet LED status indicators for communications functions. For more information, see CPM Indicators section.

CAUTION: Do not remove or insert the Ethernet connection when the CPM is powered unless the area is known to be non-hazardous. Additionally, removing one or more Ethernet connection will cause redundant CPMs to drop sync or switchover. For switchover scenario, the original primary CPM will reboot and become the secondary controller. It will take 3-5mins to fully sync again after switchover.

PLC-CPM mode switch

There are four mode switch positions on CPM: STOP, RUN, and two REMOTE positions, which are identical.

Figure 3-8: Mode switch on CPM



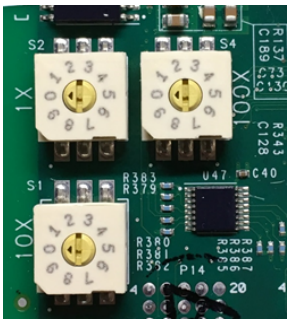
The switch can be rotated clockwise or counter-clockwise fashion to engage the four switch positions. When the mode switch is in the REMOTE position, the operating modes can be configured in the Configuration tool.

For more information on the operating modes, see “Selecting operating modes” in *ControlEdge Builder User’s Guide*.

ATTENTION: For redundant controller system, the position of mode switch in primary PLC-CPM in this box determines the system operating mode. If the mode switches on the primary and secondary CPMs are in different positions, the system will drop sync. Do not rotate the Mode switch when the CPM is powered unless the area is known to be non-hazardous.

PLC-CPM Rotary Switch

Figure 3-9: Control Processor Module



Rotary Switch is used to configure FTE Device Index, which uniquely identifies the controller on the FTE Network.

> **ATTENTION:** It is required to set FTE Device Index no matter the BootP is enabled or disabled in ControlEdge Builder.

Set the FTE Device Index by turning the three rotary decimal switches (range 001 to 509). The leftmost switch on top is used to set the one digit, the right switch on top is used to set the hundreds digit, and the bottom switch sets the tens digit.

Follow the rules below to set the FTE Device Index:

- A non-redundant controller is only configured with an odd numbered Device Index.
- The primary controller (of a redundant controller pair) is always configured with an odd numbered Device Index.
- The secondary controller of a redundant controller pair is configured with the even Device Index that is consecutive with its primary partner's Device Index (i.e. primary controller Device Index plus 1)
- For redundant rack, the left controller is recommended to be configured as the odd device index and the right controller as the event device index (of the consecutive device index pair).
- Redundancy communication between a pair of redundant 900 controller is not possible if their device indexes are not set to a consecutive odd/even pair.

For example: For a redundant pair, the primary and secondary indexes respectively could be 001, 002; 111, 112; 507, 508 and so

on. In a non-redundant setup, the index could be 001 or 111 or 507 and so on.

PLC-CPM Indicators

The following diagram displays the location of the LED indicators on the CPM. The following table explains the meaning of each LED state.

Figure 3-10: LED Indicators on PLC-CPM

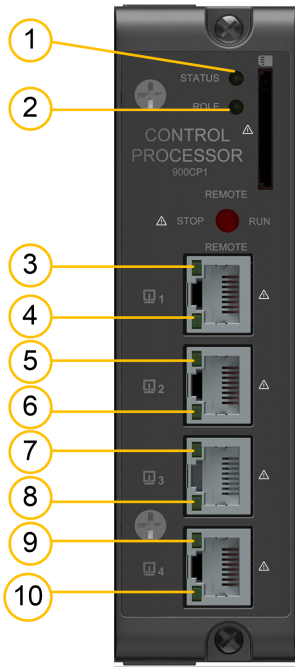


Table 3-6: LED Indications on PLC-CPM

Item	LED	LED State/Color	Description
1	Status	OFF	No Power is applied to CPM.
		On/Green	The controller is working normally.
		On/Red	The controller is stopped.
		On/Orange	The controller is in the power-up process.
		Blinking Red @ 1HZ	The controller is running with an error.
		Blinking Red @ 0.5HZ	The controller is accessible via online communication, but no application is loaded.
		Blinking Red @ 5HZ	IP address is in conflict.
		Blink @ 1HZ / Green & Orange	The controller is upgrading firmware.
2	Role	OFF	It is a non-redundant system or;
		On/Green	The controller is in the primary role, and the system is synchronized, or;
		On/Orange	The controller is in a secondary role, and the system is synchronized.
		Blinking Green @ 1HZ	The controller is in the primary role, and the system is synchronizing.
		Blinking Orange @ 1HZ	The controller is in a secondary role, and the system is synchronizing.
		Blinking Green @ 0.5HZ	The controller is in the primary role, and the system is unsynchronized.
		Blink Red @ 0.5HZ	The controller is in a secondary role, and the system is unsynchronized.

Item	LED	LED State/Color	Description
3, 5, 7, 9	Ethernet Port Speed (Upper LED)	Yellow On/Off	OFF for 10Base-T; ON for 100Base-TX.
4, 6, 8, 10	Ethernet Port Link/ Active (Lower LED)	Green On/Off/ Blinking	On for connection; Off for no connection; and blinking for activity

Hardware Configuration of EPM

See "Expansion Processor Module" on page 92 for more information.

Hardware Configuration of IO

Refer to the I/O module type section.

Device Replacement

ATTENTION: If Secure Communication is enabled in the system, the relative information of the new CPM should be updated in the IPsec configuration of the PC installed the ControlEdge Builder and IPsec should be configured and enabled on the new CPM. For more information, see "Configuring a Secure Connection" in the *ControlEdge PLC and ControlEdge RTU Network and Security Planning Guide*.

Replacing a non-redundant or unsynchronized primary PLC-CPM

ATTENTION: This procedure can only be performed while off-process.
We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode. Component replacements may also require downloading appropriate configuration data to the replaced component

through ControlEdge Builder.
Wear an ESD wrist strap and observe static precautions.

Before replacing a non-redundant or unsynchronized primary PLC-CPM:

- It is recommended to upload and SAVE a copy of the configuration or ensure that a previously saved copy of the current configuration is available.
- It is recommended to bring the process to a safe and orderly shutdown.

You will need a #2 Phillips screwdriver.

To replace a non-redundant or unsynchronized primary PLC-CPM

1. If a process is currently in operation, bring it to the safe mode, and orderly shutdown if it is required.
2. Using an external (user-supplied) switch, disconnect the power supply in the rack (associated with the CPM to be replaced) from the source main power.
3. Observe where communications cables are plugged into the CPM, and if necessary, tag them to identify their functions. Unplug all communications cables.
4. At the top and bottom of the module, loosen the captured screws that secure the module in the rack, and remove the CPM from the rack. (Note that an up/down rocking motion helps with the removal of the module.)
5. Ensure that the new CPM is properly aligned with the slot guides, insert the new CPM in the rack, and secure it in place with the captured screws at the top and bottom of the module.
6. Re-install communications cables.
7. Set the new CPM's mode switch position to STOP (to prevent an old/stale configuration from running and to enable firmware update and configuration load).
8. Using the (user-supplied) switch, re-connect the power supply in the rack (associated with the new CPM) the source main power to the rack.
9. Optional-for IPsec enable system, if Secure Communication is enabled in the system, disable the IPsec in the PC installed the ControlEdge Builder. See "Disable IPsec policy on PCs" in *ControlEdge PLC and ControlEdge RTU Network and Security Guide* for more information.

10. Use the ControlEdge Builder to load firmware to the new CPM to match the version that was running in the removed CPM.
11. Use the ControlEdge Builder to download the configuration to the new CPM.
12. Set the new CPM's mode switch position to the desired operation state.
13. Optional-for IPsec enable system, setup certificates and IPsec policy in the CPM. See "Setup certificates and IPsec policy in PLC/RTU" in *ControlEdge PLC and ControlEdge RTU Network and Security Guide* for more information.
14. Optional-for IPsec enable system, enable the IPsec in the PC installed the ControlEdge Builder. See "Enable IPsec policy on PCs" in *ControlEdge PLC and ControlEdge RTU Network and Security Guide* for more information.

Replacing a secondary PLC-CPM

> **ATTENTION:** Replacing a secondary CPM can be performed while on-process or off-process.
> We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode. Component replacements may also require firmware update. Wear an ESD wrist strap and observe static precautions

You will need a #2 Phillips screwdriver.

To replace a secondary PLC-CPM

1. [Optional] It is recommended to disable and prevent synchronization first by issuing the redundancy disable synchronization command from ControlEdge Builder.
2. Using an external (user-supplied) switch, disconnect the power supply in the rack (associated with the CPM to be replaced) from the source main power.
3. Observe where communications cables are plugged into the CPM to be replaced, and if necessary, tag them to identify their functions. Unplug all communications cables.
4. At the top and bottom of the module to be replaced, loosen the captured screws that secure the module in the rack, and remove the CPM from the rack. (Note that an up/down rocking motion helps with the removal of the module).

5. At the top and bottom of the module, loosen the captured screws that secure the module in the rack, and remove the CPM from the rack.
6. Ensure that the new CPM is properly aligned with the slot guides, insert the new CPM in the rack, and secure it in place with the captured screws at the top and bottom of the module.
7. Re-install communications cables.
8. Set the new CPM's mode switch position to STOP (to enable firmware update).
9. Using an external (user-supplied) switch, re-connect the power supply in the rack (associated with the new CPM) to the source main power.
10. Optional-for IPsec enable system, setup certificates and IPsec policy in the CPM. See "Setup certificates and IPsec policy in PLC/RTU" in *ControlEdge PLC and ControlEdge RTU Network and Security Guide* for more information.
11. Use the ControlEdge Builder to load firmware to the new CPM to match the version that is running in the primary redundant partner CPM.
12. Check the redundancy synchronization state by monitoring the role LED of the primary or secondary CPM.
13. Switch the new secondary CPM's mode switch position to match the primary redundant partner CPM.

Replacing a primary PLC-CPM

> **ATTENTION:** Replacing a synchronized primary CPM can be performed while on-process or off-process.
> Replacing an unsynchronized primary CPM can only be performed off-process.
> We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode.
> Component replacements may also require firmware update and/or downloading appropriate configuration data to the replaced component through ControlEdge Builder.
> Wear an ESD wrist strap and observe static precautions.

You will need a #2 Phillips screwdriver.

Replacing an unsynchronized primary PLC-CPM

- It is recommended to first establish redundancy synchronization between the redundant controllers (when possible) and follow the procedure to replace a synchronized primary PLC-CPM below.
- When primary CPM on-process replacement is either not required or not possible due to inability to synchronize the redundant controllers, follow the off-process procedures in Replacing a non-redundant PLC-CPM section.

Replacing a synchronized primary PLC-CPM

1. [Optional] It is recommended to first transition the synchronized primary CPM into the secondary role by issuing the redundancy switchover command from ControlEdge Builder. This step {1} transitions the synchronized secondary (redundant partner) CPM into the primary role and {2} the CPM to be replaced restarts into the secondary role.
2. Using an external (user-supplied) switch, disconnect the power supply in the rack (associated with the CPM to be replaced) from the source main power. If the optional switchover command was not issued, this step transitions the synchronized secondary (redundant partner) CPM into the primary role. and {2} the CPM to be replaced restarts into the secondary role.
3. Observe where communications cables are plugged into the CPM to be replaced, and if necessary, tag them to identify their functions. Unplug all communications cables.
4. At the top and bottom of the module to be replaced, loosen the captured screws that secure the module in the rack, and remove the CPM from the rack. (Note that an up/down rocking motion helps with removal of the module).
5. Ensure that the new CPM is properly aligned with the slot guides, insert the new CPM in the rack, and secure it in place with the captured screws at top and bottom of the module.
6. Re-install communications cables.
7. Set the new CPM's mode switch position to STOP (to enable firmware update).
8. Using an external (user-supplied) switch, reconnect the power supply in the rack (associated with the new CPM) to the source main power.
9. Optional-for IPsec enable system, setup certificates and IPsec policy in the CPM. See "Setup certificates and IPsec policy in

PLC/RTU" in the *ControlEdge PLC and ControlEdge RTU Network and Security Guide* for more information.

10. Use the ControlEdge Builder to load firmware to the new secondary CPM to match the version that is running in the primary redundant partner CPM.
11. Switch the new secondary CPM's mode switch position to match the primary redundant partner CPM.
12. Check the redundancy synchronization state by monitoring the role LED of the secondary CPM.

Following section provides information about replacing EPM, I/O Module and Spare parts that are common to both PLC and UOC.

Table 3-7: Component Replacement Reference

Component replacement	Reference
EPM	For information about replacing EPM, see the section EPM device replacement.
I/O Module	For information about replacing I/O Module, see the section I/O module replacement.
Spare parts	For information about replacing spare parts, see the section Spare parts.

CHAPTER

4 CONTROLEDGE UOC

ControlEdge UOC is DCS controller available with Experion. UOC provides control for process units through level 0 I/O devices and provides communication data access from level 1 and level 2 FTE networks. Like other Experion DCS controllers, ControlEdge UOC uses the Experion Control Execution Environment (CEE) as the control engine and is configured with Experion Control Builder.

ControlEdge UOC uses many of the ControlEdge 900 platform components. These include the following:

- CPM
- EPM (Firmware version 140 or later)
- ControlEdge 900 UIO Module
- Redundant Controller Rack
- I/O Controller Rack
- Power System
- RTP Kit
- Barrier Terminal Blocks
- Accessories (switches, jumpers, resistors)

Points to note specific to the use of the CPM as a UOC in Experion:

- SD card slot on CPM is currently not utilized and is reserved for use in future.
- The CPM Mode switch is not utilized by UOC firmware. Honeywell recommends that it be covered using (HW part number, if available) after conversion of the PLC CPM into a UOC CPM. However, the switch movement has no effect. For further information on conversion, see UOC User's Guide.

This section provides information about following:

- UOC I/O Expansion Network Topology
- Hardware Configuration of UOC-CPM
- Hardware configuration of EPM
- Hardware configuration of I/O module type
- Device Replacement

UOC I/O Expansion Network Topology

UOC has four Ethernet ports. Port 3 and 4 are used to connect to I/O network, used for I/O. Table below shows UOC supported these network topologies.

Topology Type	Description	Switch Types
Topology 1	HSR ring to 900 I/O.	None
Topology 2	Non-redundant star to 900 I/O	Generic
Topology 3	Redundant star (via PRP) to 900 I/O	Generic
Topology 4	DLR direct connection to 900 I/O and EIP devices	None
Topology 5	DLR ETAP connections 900 I/O and EIP devices.	ETAPs for EPMs or non-DLR devices
Topology 6	Non-redundant star to 900 I/O and EIP devices	Generic and stratix

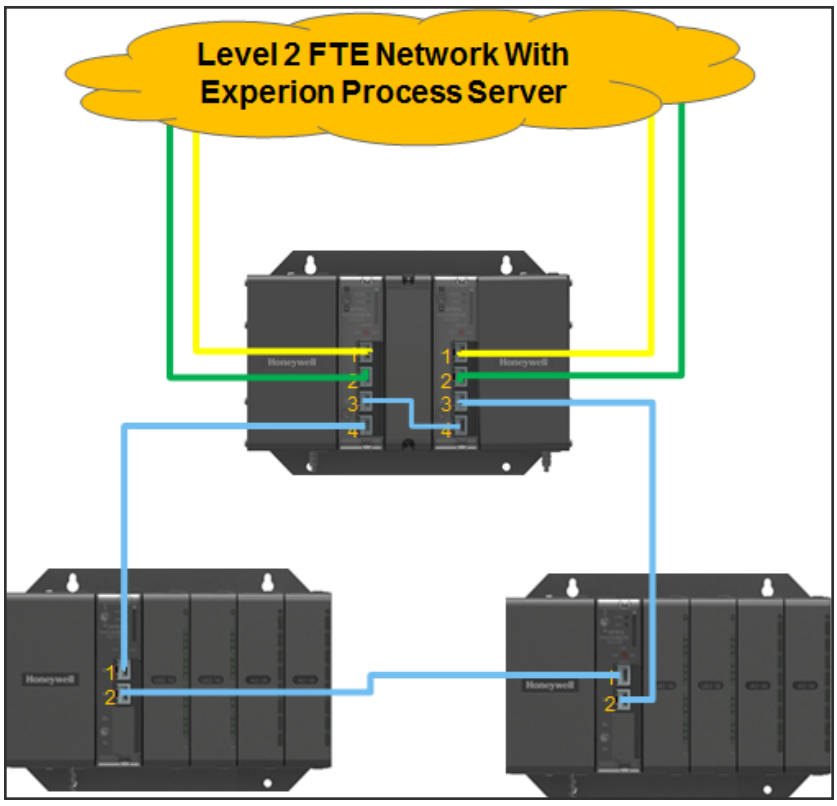
Uplink and downlink subnets must be unique. The Downlink subnet mask must be limited to the number of addresses expected in that subnet.

For example, if a max of 64 addresses is expected, you could use a mask of 255.255.255.192.

HSR Ring to 900 I/O

When connecting to ControlEdge 900 I/O only, a redundant ring topology may be used. The ring type is HSR (High Availability Seamless Redundancy). In this topology no third party redundancy boxes are required. The UOC CPM connects directly, using its two downlink Ethernet ports. Similarly, EPM modules connect directly using their two Ethernet ports. When a UOC downlink is constructed in this fashion, it is not possible to connect third party I/O, Devices or PLCs. Only 900 I/O racks may be connected.

When connecting CPMs and EPMs into an I/O network ring, the numbered ports must be connected so that odd numbered ports always connect to even numbered ports. This is shown in the following diagram for the case of a redundant UOC rack with two UOC CPMs connecting to two, 4-I/O slot, non-redundant racks, each with its own EPM. Also shown are the CPM's connection of ETH1 to the A, Yellow FTE network tree and ETH2 to the B, Green FTE network tree.



Downlink I/O Network

Considerations for components that connect to a UOC's downlink HSR ring network are summarized in the following table.

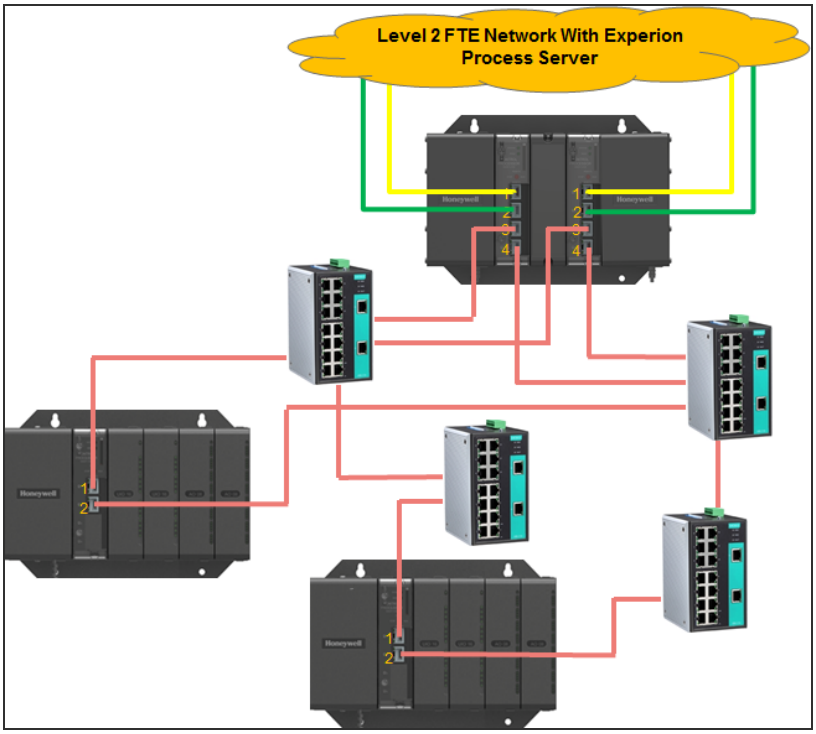
Component Type	Comments
ControlEdge UOC CPM	The UOC CPM must be connected to the downlink I/O ring such that even numbered ports always connect to odd numbered ports. Important properties of UOC CPM communications on the downlink network are configured on the UOC Platform Block in Control Builder. This includes configuration of the UOC DHCP server for assigning EPM IP addresses. It also includes setting the Downlink Network Configuration to Ring-HSR.
ControlEdge 900 I/O Racks with EPMs	An EPM must be connected to the downlink I/O ring such that even numbered ports always connect to odd numbered ports. Before it is inserted into its slot, the 100X rotary switch on the EPM board must be set to indicate I/O network connectivity. This is done by setting it to position 3. The IP address of the EPM is assigned by the UOC CPM based on the module number set on the 10X and 1X

Component Type	Comments
	rotary switches. Ensure that the values within the range of 1-12 are used, as these are the valid values. This too must be set before the EPM is inserted into its slot.

Non-Redundant or Redundant Star to 900 I/O

When connecting to ControlEdge 900 I/O only, either a non-redundant or redundant star topology may be used. The network redundancy type is PRP (Parallel Redundancy Protocol). In this topology no third party redundancy boxes are required. The UOC CPM connects directly, using its two downlink Ethernet ports. Similarly, EPM modules connect directly using their two Ethernet ports. When a UOC downlink is constructed in this fashion, it is not possible to connect third party I/O, Devices or PLCs. Only 900 I/O racks may be connected.

An example of a UOC and two 900 I/O racks on a downlink, redundant, star network is shown in the following diagram. Also shown are the CPM's connection of ETH1 to the A, Yellow FTE network tree and ETH2 to the B, Green FTE network tree.



Redundant Star Network

The UOC does not support star topologies which mix redundant and non-redundant connectivity. Downlink star networks must be set up as exclusively redundant or exclusively non-redundant.

Considerations for components that connect to a UOC's downlink non-redundant or redundant star network are summarized in the following table.

Component Type	Comments
ControlEdge UOC CPM	Important properties of UOC CPM communications on the downlink network are configured on the UOC Platform Block in Control Builder. This includes configuration of the UOC DHCP server for assigning EPM IP addresses. It also includes setting the Downlink Network Configuration to "Non-redundant" in the case of a non-redundant star network or "Star-PRP" in the case of a redundant star network.
ControlEdge 900 I/O Racks with EPMs	Before it is inserted into its slot, the 100X rotary switch on an EPM board must be set to indicate I/O network connectivity. For a non-redundant or redundant star network, this is done by setting it to position 4. The IP address of the EPM is assigned by the UOC CPM based on the module number set on the 10X and 1X rotary switches. Ensure that the values within the range of 1-12 are used, as these are the valid values. This too must be set before the EPM is inserted into its slot.
Unmanaged Switches	900 I/O racks with EPM gateways have been qualified to communicate with UOC through unmanaged switches. Managed switches may not be used. For information on qualified switches see the *ControlEdge 900 Hardware and Installation Guide*.

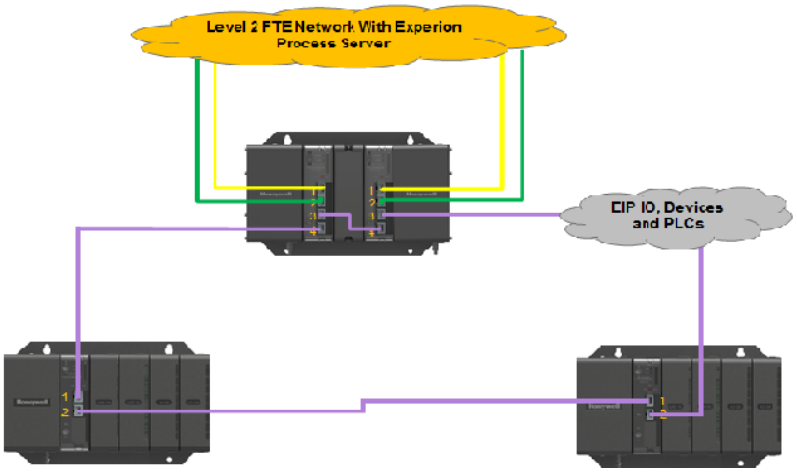
DLR Direct Connection to 900 I/O and EIP devices

DLR is layer 2 data link layer protocol that provides media redundancy, faster network fault detection, and network fault resolution in a ring topology. On network with only DLR devices, one device act as an active ring supervisor and other devices form ring nodes. DLR network contain a maximum 50 IP address nodes (This is Honeywell specification).

DLR network should have at least one node configured as ring supervisor. If there are multiple nodes configured as supervisor, then the node with highest supervisor precedence value becomes active supervisor, others will be backup Supervisors. Ring supervisor connects to CPM through a third party devices.

The active ring supervisor cyclically sends out Beacon Frames and Announce Frames on both ports. They are received on one port of a ring node, processed and passed on to the next ring node via the other port. By default the Beacon Frames are sent every 400 microseconds and the Announce Frames are sent every second.

An example of a DLR Ring network is shown in the following diagram



Downlink DLR Network

DLR ETAP Connection to 900 I/O and EIP Devices

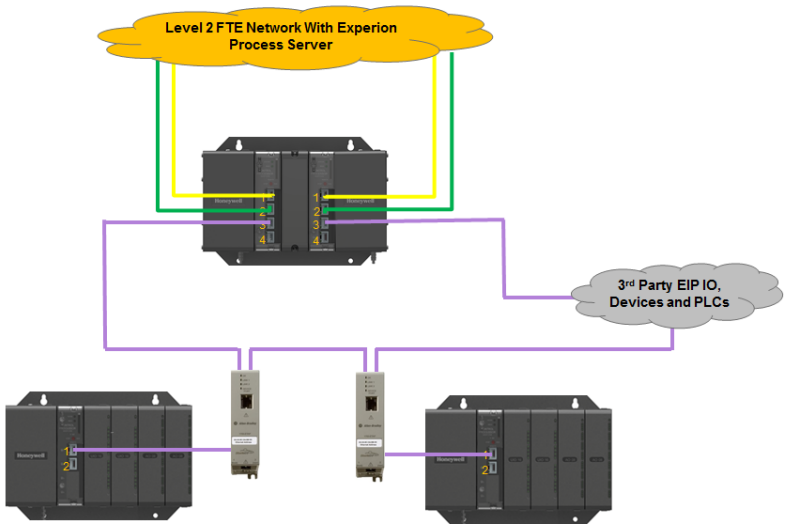
As an alternative to an HSR ring network with only ControlEdge 900 I/O, UOC can optionally be connected to an EtherNet/IP-based I/O, device and PLC ring network through its ETH3 downlink port. Under that configuration a UOC can communicate simultaneously with ControlEdge 900 I/O and third party devices attached to the same EtherNet/IP network.

One supported EtherNet/IP network topology is that of a DLR ring which provides redundancy protection against a single network ring fault. Installation and maintenance of a downlink EtherNet/IP network must be done in accordance with the best practices of Ethernet networking in general and EtherNet/IP in particular. In Experion R510, UOCs will be directly connected to DLR network, and EPMs must be connected to a DLR ring using redundancy boxes

called ETAPs (EtherNet/IP Taps). This requirement will be removed in a future release.

In this topology, UOC connects directly to the ring through downlink ports ETH3 and ETH4. EPMs connect through their ETH1 port with ETH2 port disconnected

An example is shown in the diagram below.



DLR ETAP Connection to 900 I/O and EIP Devices

Installation and maintenance practices for the UOC's downlink EtherNet/IP network generally follow those described in (*EtherNet IP User's Guide*) for topology 2, "C300 Through EIM To EtherNet/IP". Additional considerations for components that connect to the EtherNet/IP network are summarized in the following table.

Component Type	Comments
ControlEdge UOC CPM	The UOC CPM connects to a downlink EtherNet/IP network through its ETH3 and ETH4 ports. Important properties of UOC CPM communications on the downlink network are configured on the UOC Platform Block in Control Builder. This includes configuration of the UOC DHCP server for assigning EPM IP addresses. It also includes Downlink Network Configuration to Non-redundant.

Component Type	Comments
ControlEdge 900 I/O Racks with EPMs	When 900 I/O is used, the EPM in the I/O rack serves the role of communication gateway into the I/O rack. When an EPM is connected to an EtherNet/IP network, its ETH1 port is connected to the ETAP while its ETH2 port is left disconnected. Before it is inserted into its slot, the 100x rotary switch on the EPM board must be set to indicate the type of network connectivity in use. This is done by setting it to position 4. The IP address of the EPM is assigned by the UOC CPM based on the module number set on the 10X and 1x rotary switches. These switches must also be set before the EPM is inserted into its slot.
EtherNet/IP TAPs (ETAPs)	UOC systems use redundancy boxes called ETAPs for connectivity to downlink DLR rings. For further information on the use of ETAPs, see *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf*.
ControlLogix PLC	UOC can communicate with Rockwell Allen Bradley ControlLogix PLCs by passing instances of User Defined Types (UDTs). References to ControLogix data are created in Experion Control Builder with the aid of tag names provided by the Matrikon Allen Bradley OPC server or by export of ControlLogix tag names from the Rockwell Allen Bradley Studio 5000 designer tool. ControlLogix PLCs on a UOC's downlink EtherNet/IP network must always use static IP address assignments. For information on the configuration of ControlLogix communications, see *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf*.
EtherNet/IP I/O and Devices	UOC supports a set of EtherNet/IP devices with pre-populated CEE block types in Experion Control Builder (CB). In addition, CB provides the Parameter Definition Editor (PDE) tool which allows for the integration of new EtherNet/IP I/O and devices independent of Experion release. Although some third party EtherNet/IP devices support IP address assignment from a network resident DHCP server, this feature cannot be used when the EtherNet/IP network connects to UOC. All device IP addresses must be statically assigned. For further information, see *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf*.
Allen Bradley OPC Server from MatrikonOPC	The Rockwell Allen Bradley OPC Server from MatrikonOPC can be installed on the Experion Server in systems which incorporate UOC. The Matrikon OPC Server enables one of two methods whereby ControlLogix tag names can be used to make UDT

Component Type	Comments
	references in a UOC strategy. For further information, see *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf*.
Studio 5000 Logix Designer Software	Studio 5000 Logix Designer Software from Rockwell Allen Bradley is used in conjunction with UOC configurations to configure IP addresses of Rockwell Allen Bradley EtherNet/IP devices. It can also be used to export a file which defines ControlLogix tag names so that they can be used in Control Builder to construct UDT data references from UOC. For further information, see *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf*.

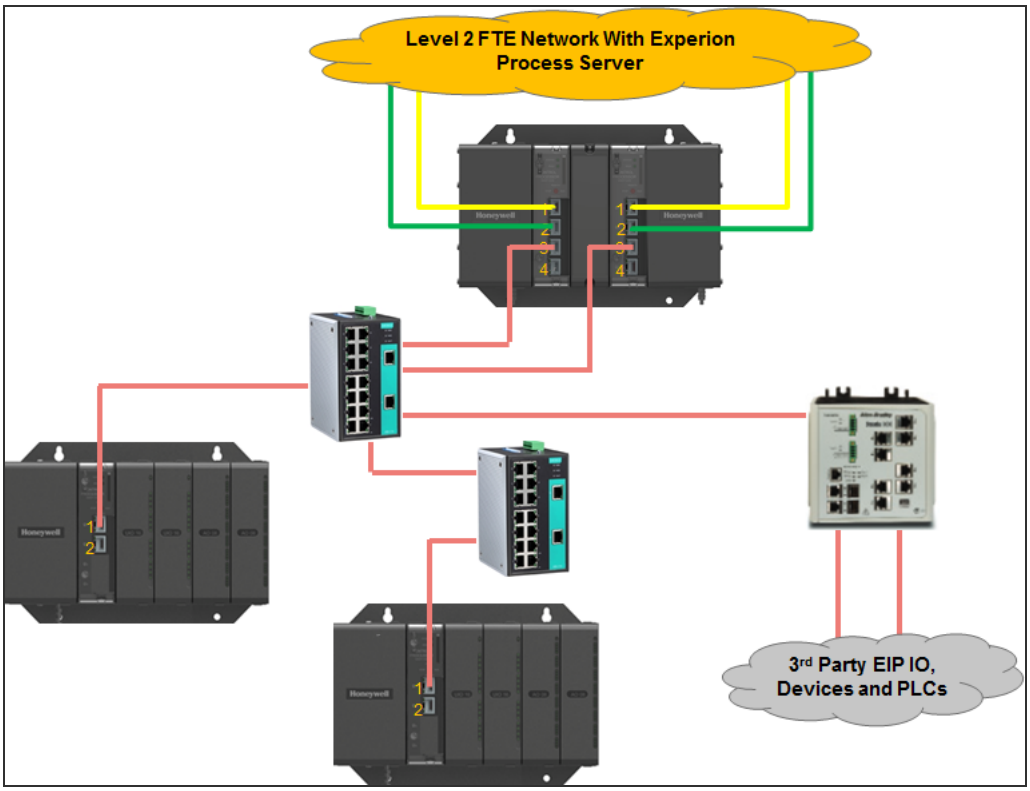
While using DLR (Device Level Ring) on Stratix 5700 Switch, DO NOT CONNECT a DLR network to a Non-DLR port on the Switch. DLR should be connected only to the DLR ports on the switch. Doing this will result in the entire down link network going down. The recovery is to only remove the DLR connection from the switch.

Non-Redundant Star to 900 I/O and EIP Devices

In addition to the DLR ring topology, the UOC can also connect to a non-redundant star EtherNet/IP network through its ETH3 downlink port. This allows it to communicate simultaneously with ControlEdge 900 I/O as well as EtherNet/IP-capable I/O, devices and PLCs.

Installation and maintenance of a downlink EtherNet/IP network must be done in accordance with the best practices of Ethernet networking in general and EtherNet/IP in particular.

In this topology, CPMs connect through their ETH3 downlink port with ETH4 port disconnected. EPMs connect through their ETH1 port with ETH2 port disconnected. An example is shown in the diagram below.



UOC CPM to 900 I/O and EIP Devices

Installation and maintenance practices for the UOC's downlink EtherNet/IP network generally follow those described in *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf for topology 2, "C300 Through EIM To EtherNet/IP"*. Additional considerations for components that connect to the EtherNet/IP network are summarized in the following table. ControlLogix PLCs and EtherNet/IP I/O and Devices are equivalent to those for DLR ring networks.

Component Type	Comments
ControlEdge UOC CPM	The UOC CPM connects to a downlink EtherNet/IP network through its ETH3 and ETH4port. Important properties of UOC CPM communications on the downlink network are configured on the UOC Platform Block in Control Builder. This includes configuration of the UOC DHCP server for assigning EPM IP addresses. It also includes Downlink Network Configuration to Non-redundant.
ControlEdge	When 900 I/O is used, the EPM in the I/O rack serves the role of

Component Type	Comments
900 I/O Racks with EPMs	communication gateway into the I/O rack. When an EPM is connected to an EtherNet/IP network, its ETH1 port is connected to the switch while its ETH2 port is left disconnected. Before it is inserted into its slot, the 100x rotary switch on the EPM board must be set to indicate the type of network connectivity in use. This is done by setting it to position 4. The IP address of the EPM is assigned by the UOC CPM based on the module number set on the 10X and 1x rotary switches. These switches must also be set before the EPM is inserted into its slot.
Unmanaged Switches	900 I/O racks with EPM gateways have been qualified to communicate with UOC through unmanaged switches. EPMs may not be connected through managed switches.
Stratix Switches	EIP I/O, devices and PLCs may be connected to UOC through qualified, Stratix managed switches. For further information on how to deploy and configure Stratix switches, see *EtherNet IP User's Guide_EPDOC-X399-en-510A.pdf*.

Following section provides information about installing racks, EPM, power supply and so on.

Table 4-1: Reference for installing racks, EPM, power supply and so on

Components	Reference section
Racks	For information about options and types of racks, see the sections Rack Options and Rack Types. For information about installing Racks, see the section Rack Installation.
EPM	For information about installing EPM, see the section Expansion Processor Module.
Power Supply	For information about connecting to AC or DC power supply, see the section Power Supply.
Configuration	For information about configuration, refer to the ControlEdge Builder User's Guide.
Environmental	For information about environmental consideration to be taken care, see the section Environmental Considerations.

Hardware configuration of UOC-CPM

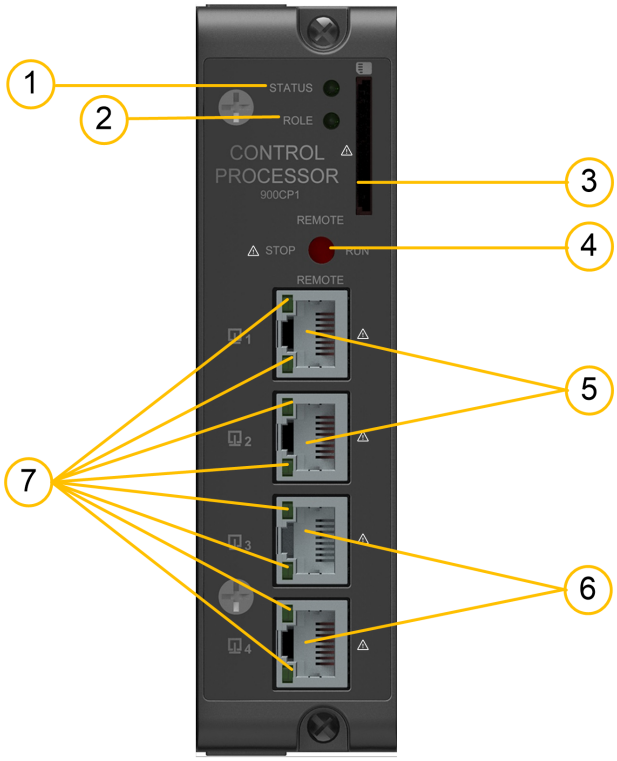
For more information refer to the UOC User's Guide (PLC to UOC conversion).

Control Processor Module

A Redundant Controller Rack contains two CPMs. Either CPM can be primary.

The CPM is shown in the following figure.

Figure 4-1: Control Processor Module



As indicated in this figure, CPM includes:

Table 4-2: Control Processor Module Components

Item	Description
1	Status LED indicator for the CPM.
2	Role LED indicator for the CPM.
3	SD card slot: Reserved for future use.
4	Mode switch
5	Ethernet port 1 (ETH1) and Ethernet port 2 (ETH2) for uplink connectivity to an Experion FTE network. ETH1 should be connected to the FTE A (yellow) and ETH2 should be connected to FTE B (green) networks. For more information, see Experion documentation.
6	Ethernet port 3 (ETH3) and Ethernet port 4 (ETH4) for connectivity to the downlink network for ControlEdge 900 Expansion I/O racks or third party I/O. Only ring network topologies are supported.

Item	Description
7	Ethernet LED status indicators for communications functions. Refer to UOC User's guide for detailed information.

CAUTION: Do not remove or insert the Ethernet connection when the CPM is powered unless the installation is in a non-hazardous area.

UOC-CPM mode switch

ATTENTION: To set the device index, you have to remove the module from the chassis.

Although the Mode switch is used when the CPM is programmed as PLC, it is not used when programmed as UOC.

Figure 4-2: UOC-CPM Rotary Switch

The FTE Device Index uniquely identifies the controller on the FTE Network. The FTE Device Index is configured in two places. First, the CPM rotary switches are used to set the FTE device index of the UOC. Second, Experion PKS Control Builder is used to configure the FTE Device Index in the UOC Platform Function Block.

Control Builder enforces the following:

- The primary controller (of a redundant controller pair) always configured with an odd numbered Device Index.
- A non-redundant controller is only configured with an odd numbered Device Index.
- The secondary controller of a redundant controller pair is configured with the even Device Index that is consecutive with its primary partner's Device Index (i.e. primary controller Device Index plus 1)

Set the Device Index (FTE DEVICE INDEX) by turning the three rotary decimal switches (range 001 to 509). The leftmost switch on top is used for setting the ones digit, the right switch on top is used for setting the hundreds digit, and the bottom switch sets the tens digit.

Example: For a redundant pair, the primary and secondary indexes respectively could be 001, 002; 111, 112; 507, 508 and so on. In a non-redundant setup, the index could be: 001 or 111 or 507 and so on.

Failure to replicate the UOC Device Control Index according to their Control Builder configured Device Indexes will lead to failure in establishing Control Builder - controller communication thereby preventing configuration load.

For in-rack redundancy, the left controller is recommended to be configured as the odd device index and the right controller as the event device index (of the consecutive device index pair).

Redundancy communication between a pair of redundant UOC is not possible if their device indexes are not set to a consecutive odd/even pair.

UOC-CPM Indicators

For detailed information on UOC CPM firmware, on how to convert a PLC CPM into a UOC CPM and on the behaviors of UOC CPM LEDs, refer to the UOC User's Guide.

Hardware Configuration of UOC EPM

See "Expansion Processor Module" on page 92 for more information.

Hardware configuration of I/O

Installation and Wiring

Refer to the I/O Installation & Wiring section.

Modules Types

Refer to the I/O module type section.

Device Replacement

CAUTION: Explosion hazard. Removal and Insertion Under Power is not supported in Division 2/ Zone 2. CPM and/or EPM removal under power is not supported. The up/down rocking motion required to remove the module causes intermittent communications to other modules resident in the same rack. It is recommended that before removing an active CPM or EPM, the user first disconnects the power supply in the rack (associated with the CPM or EPM to be removed) from the source main power.

Replacing a non-redundant or unsynchronized primary UOC-CPM

ATTENTION: This procedure can only be performed while off-process.
We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode. Component replacements may also require downloading appropriate configuration data to the replaced component through Control Builder.
Wear an ESD wrist strap and observe static precautions.

Before replacing a non-redundant or unsynchronized primary UOC-CPM:

- Make sure all UOC configuration data and operator commands are up to date within saved checkpoints or uploaded Control Builder data. If not, save checkpoint, upload to Control Builder or both.
- It is recommended to bring the process to a safe and orderly shutdown.

You will need a #2 Phillips screwdriver.

To replace a non-redundant or unsynchronized primary CPM:

1. If a process is currently in operation, bring it to the safe mode, and orderly shutdown if it is required.
2. Using an external (user-supplied) switch, disconnect the power supply in the rack from the source main power.

3. Observe where communications cables are plugged into the CPM to be replaced, and if necessary, tag them to identify their functions. Unplug all communications cables.
4. At the top and bottom of the module to be replaced, loosen the captured screws that secure the module in the rack (associated with the CPM to be replaced), and remove the CPM from the rack. (Note that an up/down rocking motion helps with removal of the module).
5. Configure the new UOC/CPM rotary device index switches to match the old UOC/CPM rotary device index switches on the removed module.
6. Ensure that the new CPM is properly aligned with the slot guides, insert the new CPM in the rack, and secure it in place with the captured screws at top and bottom of the module.
7. Re-install communications cables.
8. Using an external (user-supplied) switch, re-connect the power supply in the rack (associated with the new CPM) to the source main power.
9. Use the Firmware Manager to load firmware to the new CPM to match the version that was running in the removed module.
10. Use the Control Builder to load the configuration to the new CPM.

Replacing a secondary UOC-CPM

> **ATTENTION:** Replacing a secondary CPM can be performed while on-process or off-process.
> We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode. Component replacements may also require firmware update. Wear an ESD wrist strap and observe static precautions.

You will need a #2 Phillips screwdriver.

To replace a secondary UOC-CPM:

1. [Optional] It is recommended to disable and prevent synchronization first by issuing the redundancy disable synchronization command from Control Builder.
2. Using an external (user-supplied) switch, disconnect the power supply in the rack (associated with the CPM to be replaced) from the source main power.

3. Observe where communications cables are plugged into the CPM to be replaced, and if necessary, tag them to identify their functions. Unplug all communications cables.
4. At the top and bottom of the module to be replaced, loosen the captured screws that secure the module in the rack, and remove the CPM from the rack. (Note that an up/down rocking motion helps with removal of the module).
5. Configure the new CPM rotary device index switches to match the rotary device index switches on the removed module.
6. Ensure that the new CPM is properly aligned with the slot guides, insert the new CPM in the rack, and secure it in place with the captured screws at top and bottom of the module.
7. Re-install communications cables.
8. Using an external (user-supplied) switch, re-connect the power supply in the rack (associated with the new CPM) to the source main power.
9. Use the Firmware Manager to load firmware to the new CPM to match the version that is running in the primary redundant partner CPM.
10. Check the redundancy synchronization state by monitoring the role LED of the primary or secondary CPM.

Replacing a primary UOC-CPM

ATTENTION: Replacing a synchronized primary CPM can be performed while on-process or off-process.
Replacing an unsynchronized primary CPM can only be performed off-process.
We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode. Component replacements may also require firmware update and/or downloading appropriate configuration data to the replaced component through Control Builder. Wear an ESD wrist strap and observe static precautions.

You will need a #2 Phillips screwdriver.

To replace an unsynchronized primary UOC-CPM:

- It is recommended to first establish redundancy synchronization between the redundant controllers (when possible) and follow the

procedure to replace a synchronized primary UOC-CPM below.

- When primary CPM on-process replacement is either not required or not possible due to inability to synchronize the redundant controllers, follow the off-process procedures in Replacing a non-redundant UOC-CPM section.

To replace a synchronized primary UOC-CPM:

1. [Optional] It is recommended to first transition the synchronized primary CPM into the secondary role by issuing the redundancy switchover command from Control Builder. This step {1} transitions the synchronized secondary (redundant partner) CPM into the primary role and {2} the CPM to be replaced restarts into the secondary role.
2. Using an external (user-supplied) switch, disconnect the power supply in the rack (associated with the CPM to be replaced) from the source main power. If the optional switchover command was not issued, this step {1} transitions the synchronized secondary (redundant partner) CPM into the primary role and {2} the CPM to be replaced restarts into the secondary role.
3. Observe where communications cables are plugged into the CPM to be replaced, and if necessary, tag them to identify their functions. Unplug all communications cables.
4. At the top and bottom of the module to be replaced, loosen the captured screws that secure the module in the rack, and remove the CPM from the rack. (Note that an up/down rocking motion helps with removal of the module).
5. Configure the new CPM rotary device index switches to match the old CPM rotary device index switches
6. Ensure that the new CPM is properly aligned with the slot guides, insert the new CPM in the rack, and secure it in place with the captured screws at top and bottom of the module.
7. Re-install communcation cables.
8. Using an external (user-supplied) switch, reconnect the power supply in the rack (associated with the new CPM) to the source main power.
9. Use the Firmware Manager to laod firmware to the new CPM to match the version that is running in the primary redundant partner CPM.
10. Check the redundancy synchronization state by monitoring the role LED of the primary or secondary CPM.

To replace an unsynchronized primary CPM,:

Refer to Replacing a non-redundant UOC-CPM section for this information.

Following section provides information about replacing EPM, I/O Module and Spare parts that are common to both PLC and UOC.

Table 4-3: Reference for replacing EPM, I/O Module and Spare parts that are common to both PLC and UOC

Component replacement	Reference
EPM	For information about replacing EPM, see the section EPM device replacement.
I/O Module	For information about replacing I/O Module, see the section I/O module replacement.
Spare parts	For information about replacing spare parts, see the section Spare parts.

CHAPTER

5 CONTROLEDGE 900 COMMON REFERENCE INFORMATION

This section is applicable to both UOC and PLC systems and provides the following information:

- Installation
- Wiring and cabling planning
- Maintenance
- Diagnostics and Troubleshooting
- Special Condition of Use and Approved Standards

Installation

The topics covered in this chapter are:

- See "Rack options" below for more information.
- See "Rack Types" on page 66 for more information.
- See "Rack installation" on page 74 for more information.
- See "Power Supply" on page 85 for more information.
- See "Environmental considerations" on page 89 for more information.
- See "ControlEdge 900 I/O" on page 96 for more information.
- See "Terminal block styles" on page 112 for more information.
- See "Terminal Block-to-Field (Signal) Wiring" on page 118 for more information.

Rack options

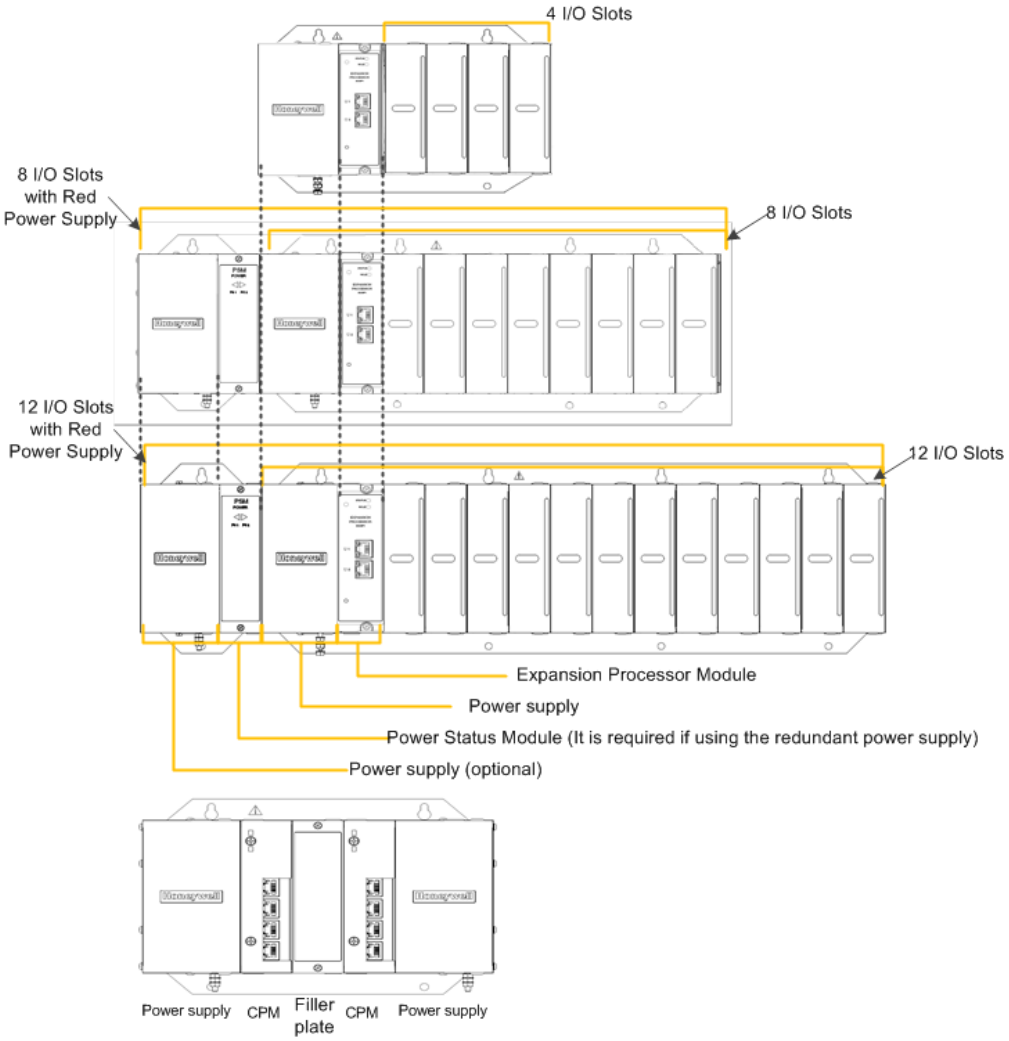
I/O racks are available in 4-slot, 8-slot, and 12-slot versions and can be utilized to house either a controller and I/O or as an I/O expansion rack containing EPM and I/O.

Both 8-slot I/O rack and 12-slot I/O rack have two types of racks:

- 8-slot or 12-slot I/O rack with non-redundant power supply
- 8-slot or 12-slot I/O rack with redundant power supply

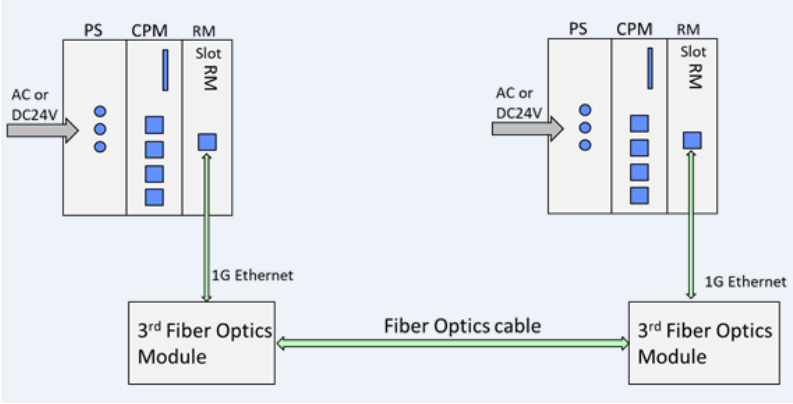
A Power Status Module is required if the I/O rack with redundant power supply is used.

Figure 5-1: Rack Options



Additionally, to eliminate single point of failure, you can also use the dual rack redundancy solution.

As part of this solution you have two single slot racks deployed separately in different areas. The distance between the two racks can be 100 meters if you use a Cat6 shielded cable. Each one slot rack hosts a power supply, a controller module, and a redundancy module (Redundancy +Module (RM) is being introduced as part of the dual rack redundancy solution). Another one slot rack with the same modules is deployed at a different location. The connection between the two racks is established using a specific Ethernet LAN cable. Ethernet ports are present in both the Redundancy Modules (RM).



You can also use two Fiber Optics modules between the Redundancy Modules to extend the distance to 500m (Multi-mode Transmission Distance) or 10Km (Single-mode Transmission Distance).

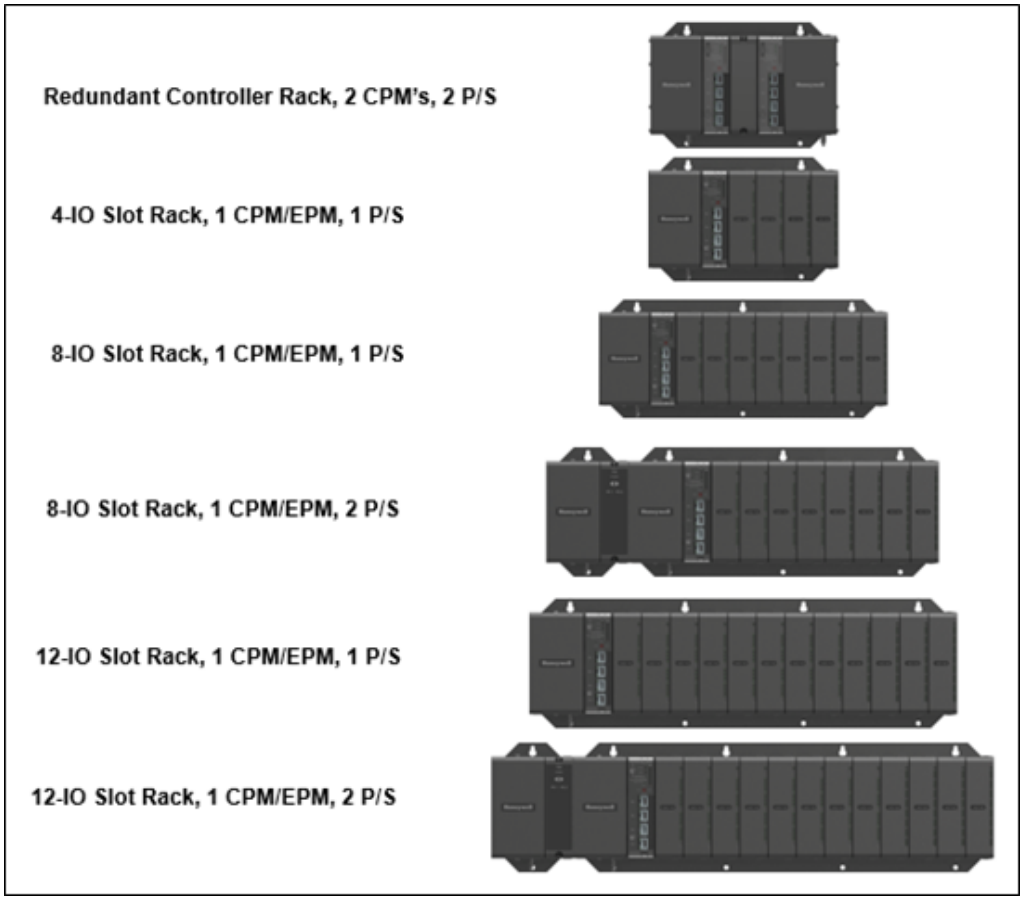
Rack Types

ControlEdge 900 Controller supports the following types of racks:

- Redundant Controller Rack
- Non- redundant Rack, containing 4, 8 or 12 I/O slots (Containing 1 CPM or EPM and 4, 8, or, 12 I/O slots) – There are 3 types of I/O racks.
- Single Controller Rack - Currently this option is supported only for UOC for Experion R510 release.

I/O slot numbers are assigned from left to right from 1 to n, where n represents the maximum number of slots:

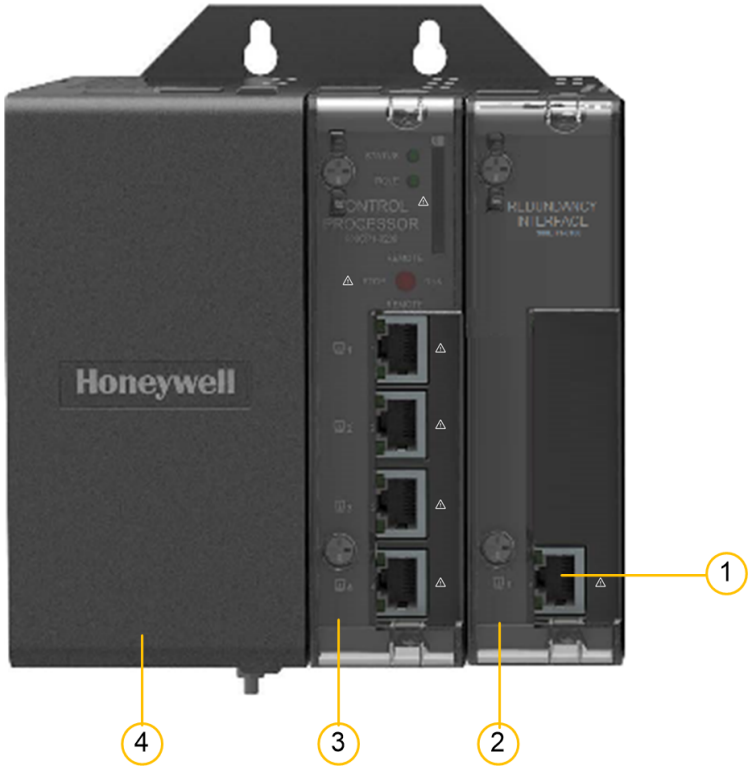
Figure 5-2: Rack Types



Installation Category II, Pollution Degree 2, IEC 60664-1, UL840 Installation coordination.

One Slot Rack

Figure 5-3: One Slot Rack Components

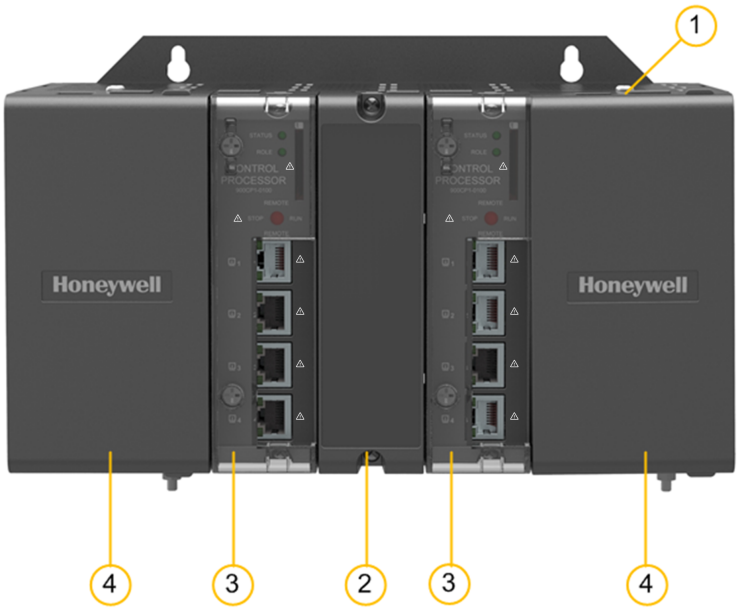


Item	Description
1	Ethernet Port
2	Redundancy Module
3	Single EPM/CPM
4	Single Power Supply

Redundant Controller Rack

Redundant Controller Rack is shown in the following figure.

Figure 5-4: Redundant Controller Rack Components



As indicated in Redundant Controller Rack Components, the Redundant Controller Rack includes:

Item	Description
1	Redundant Controller Rack
2	Redundant Switchover Module Slot Filler
3	Two CPMs (Redundant Primary and Secondary)
4	Two Power Supplies

I/O Rack

I/O rack can include a topology with; either a non-redundant power supply or with redundant power supplies, accommodate a CPM or an EPM, and additional input/output modules. The I/O rack inserted with an EPM enables I/O modules to be located close to the field devices and remote from the CPM.

Figure 5-5: I/O rack with non-redundant power supply

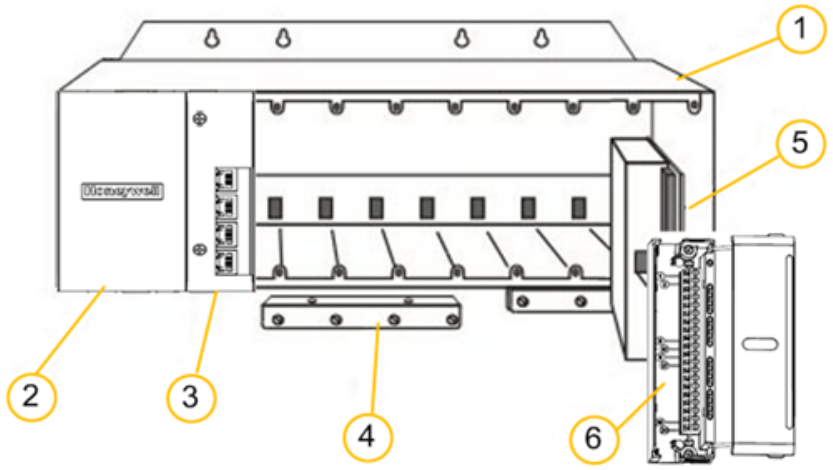
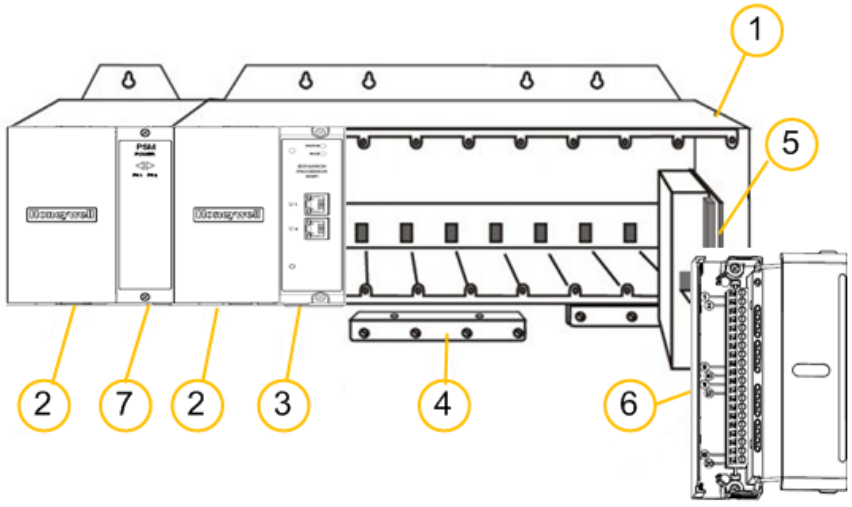


Figure 5-6: I/O rack with redundant power supplies



As indicated in I/O rack with non-redundant power supply and I/O rack with redundant power supplies, the I/O rack includes:

Table 5-1: I/O Rack Componets

Item	Description
1	Rack, available in 4-, 8- or 12-slot versions
2	Power Supply
3	CPM or EPM with Security Cover
4	Grounding bars (for I/O wiring; optional; required for safety applications)
5	Input/Output modules
6	I/O Terminal Blocks
7	Power Status Module (PSM) (required if using redundant power supply)

Rack orientation and mounting

Racks must be mounted horizontally and must never be mounted with the backplane flat on a horizontal panel or tabletop. This allows airflow and ventilation through the racks. The Environmental specifications provided in this guide apply only when using the recommended mounting configuration.

Rack dimensions, including overall dimensions and patterns for drilling holes for mounting, are provided in Rack dimensions section and Rack orientation and mounting section.

Figure 5-7: Rack dimensions

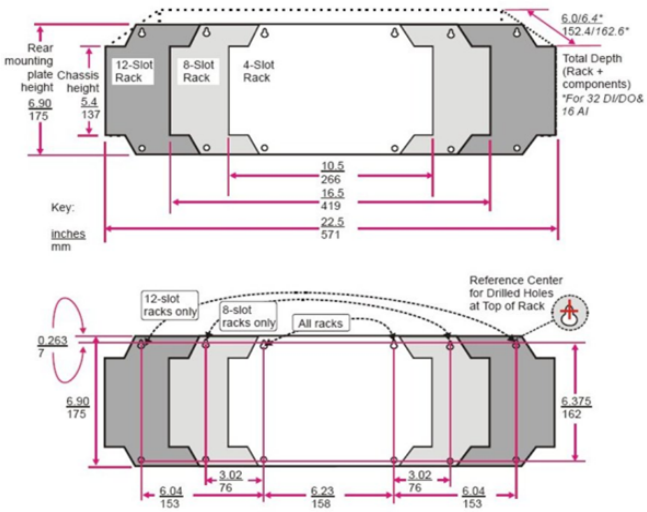


Figure 5-8: Rack dimensions with redundant power supply

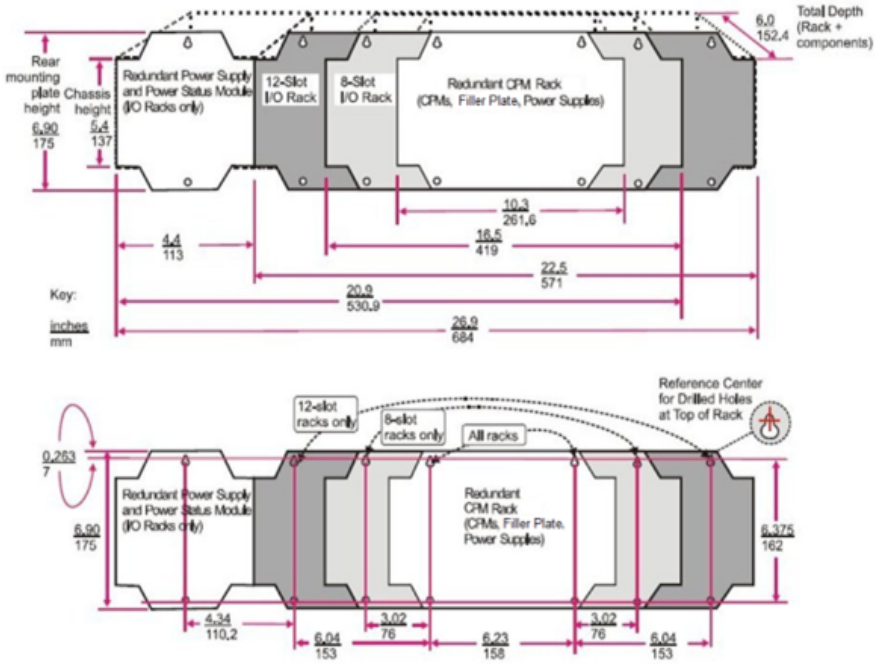
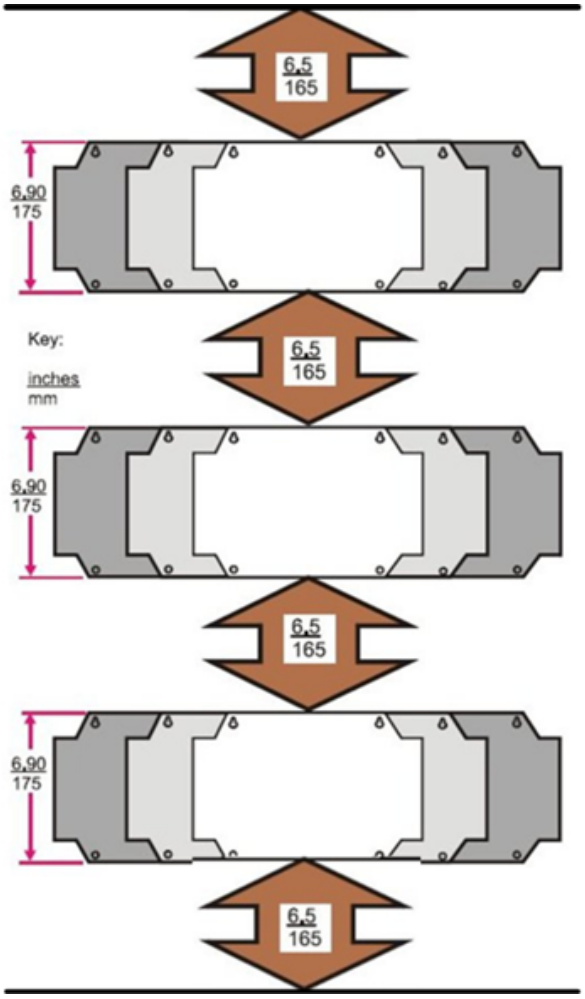


Table 5-2: Rack size

I/O Slot Option	Height	Width	Depth	Comments
4-slot	5.4"	10.5"	6.0"	Rear mounting plate extends height to 6.9" (175mm)
8-slot	5.4"	16.5"	6.0"	
8-slot with redundant power supply	5.4"	20.9"	6.0"	
12-slot	5.4"	22.5"	6.0"	
12-slot with redundant power supply	5.4"	26.9"	6.0"	
Redundant Controller Rack	5.4"	10.3"	6.0"	
1-slot	5.4"	5.9"	6.0"	

Recommended vertical spacing of racks, which is required for rack ventilation and for routing wires, is shown in Vertical spacing of racks (all models).

Figure 5-9: Vertical spacing of racks (all models)



Rack installation

This section contains procedures for installing the racks. It is recommended that the information in this section be reviewed before beginning the installation to help to prevent errors and promote efficiency.

Pre-requisites

Before the installation of the racks and modules, check that the required tools and equipment's are prepared. The dimension and spacing details in the Rack orientation and mounting section should also be checked.

Table 5-3: Installation tools

Types	Item	Description
Common tools	Wire strippers	For Power Supply and for I/O Wiring
	Crimper	For Terminal Lugs on Power Supply wiring and on I/O wiring shields
Screwdrivers	Small flat-tip	For Euro-style Terminal Blocks
	Small/medium flat-tip or #2 Phillips or 3/16 inch slotted screwdriver	For Barrier style Terminal blocks; also for captured screws in Terminal Blocks
	Large (long blade)	For use as I/O Module extractor
Other	Electric drill, with drill bits for #10 or M4 screws, and with drill-bit extender	For rack mounting
	Vacuum cleaner, brush	For use during and after drilling operations
	Pen, ball-point or felt-tip, for entering data on labels for I/O modules)	For entering data on labels for I/O modules
	Multi-Meter (Volt/Ohms/Amps)	For safety checks and for equipment test

Types	Item	Description
	Soldering pencil or gun (for attaching filter capacitors to I/O wiring shields)	For attaching filter capacitors on I/O wiring shields

Preparing the installation site

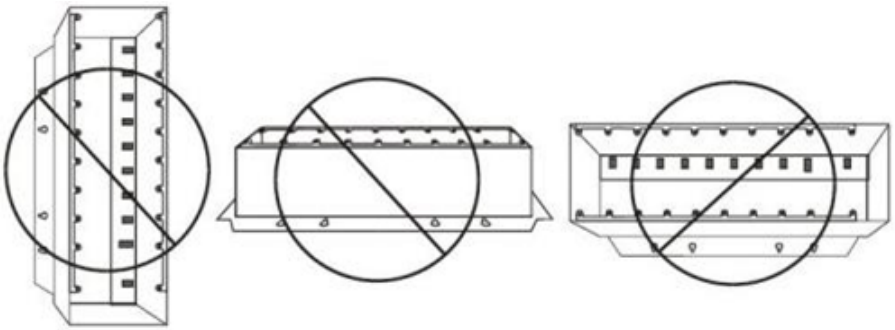
Table 5-4: Site and equipment preparation

Step	Procedure	For more information, see
1	Racks (4-, 8- and 12-slot)	Mount racks section.
2	Install (or verify correct installation of) enclosures for CPM and ancillary equipment:	Mount racks section Installing I/O
3	Install (or verify correct installation of): • External disconnect switches • Fuses at the power source associated with input sensor or output devices for I/O modules	Installing I/O modules section
4	Arrange and organize items to be installed at or near enclosures.	

Mounting racks

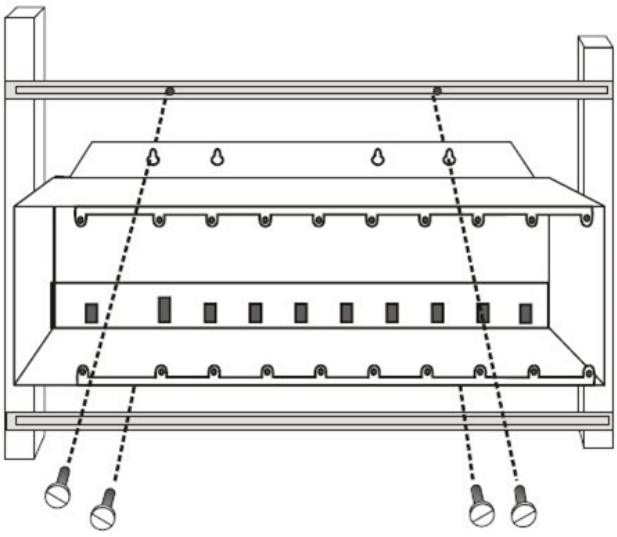
ATTENTION: Never mount racks vertically, or with the backplane horizontal, or upside down.

Figure 5-10: Incorrect rack mounting direction

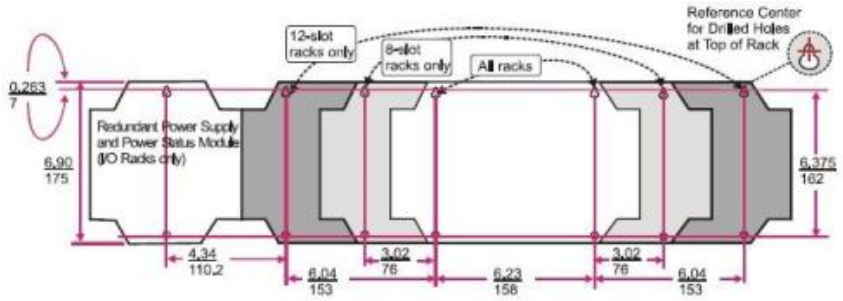


CAUTION: Mark hole locations, and then either remove or cover any equipment below to ensure metal chips generated from drilling / tapping not migrate, causing electrical hazard or damage.

1. Mount the Rack in the enclosure by completing these steps:
   a. Using the diagrams below as a guide, mark the locations for the top holes in the rack.



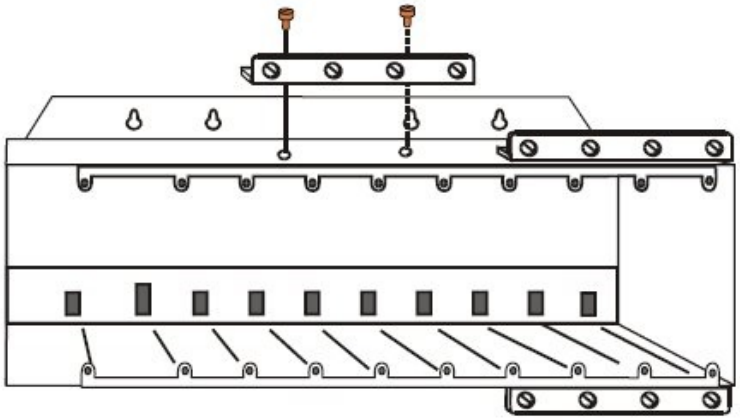
Dimensions and drill patterns are shown here:



b. Drill and tap for # 10 (or M4) screws.
c. Start the mounting screws (supplied by the user) in the drilled holes.
d. Hang the Rack on the screws at the top.
e. Mark the locations for the bottom screws.
f. Drill and tap for # 10 (or M4) screws.
g. Remove the rack from the enclosure.

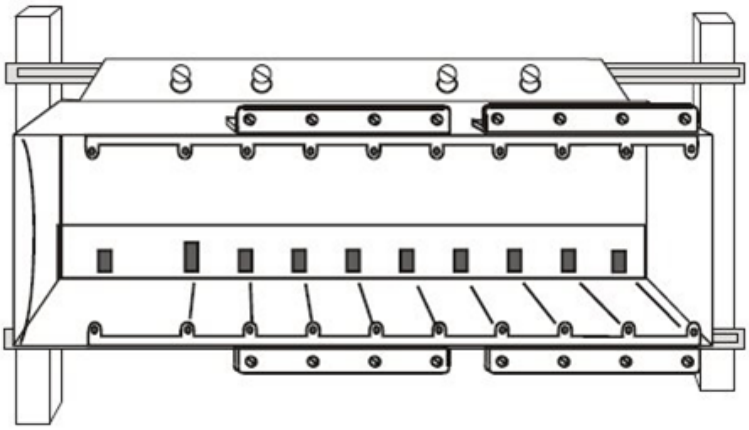
2. Aluminum grounding bars for the I/O module wiring are optional. They can be mounted at the top, at the bottom, or at the top and bottom of the rack, as indicated below. If grounding bars are included, attach them with two M3 screws (supplied with grounding bars in plastic bag), as shown below.

> **ATTENTION:** The plastic bag also includes four M4 screws for attaching the grounding wire lugs, which are attached later. Attach the M4 screws loosely to the grounding bars for safe keeping.



3. Hang the rack in the enclosure on the top screws, as shown below. Install the mounting screws in the bottom of the rack, then tighten all screws.

   CAUTION: Postpone this step until all components have been installed in the rack.



4. Repeat for each rack in the system.

Inserting Modules

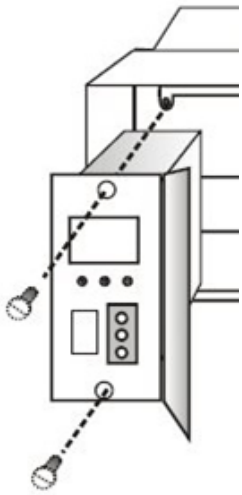
When inserting a module, carefully align the card with the rack. Press the module to ensure that the backplane connector is fully inserted. Secure the module to the rack using the top and bottom screws. Ensure that the screws are properly secured.

Assembling the Redundant Controller Rack

To assemble the Redundant Controller Rack assembly:

1. Carefully place the Power Supplies in the slots in the Rack.

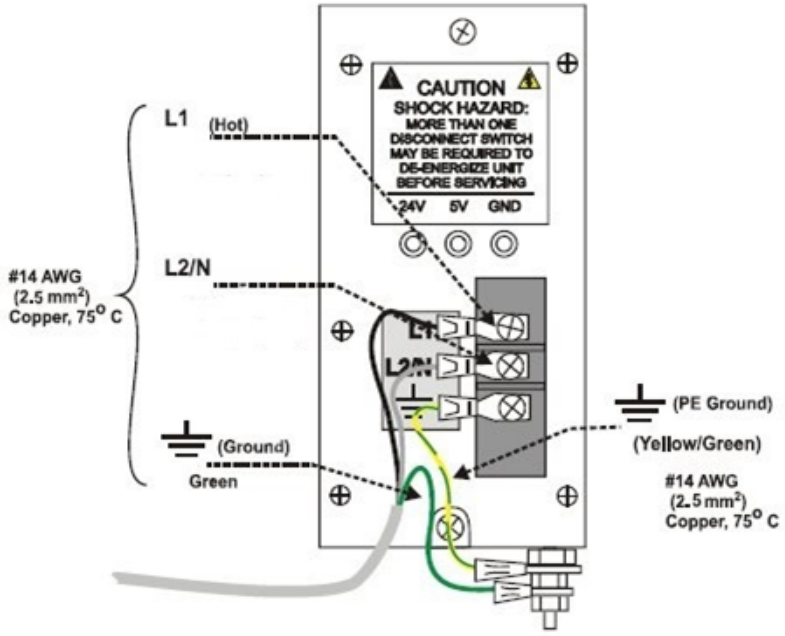
2. Make sure that the connector at the back seats properly. Insert a flat blade in the slots at the top and bottom of the power supply cover while pulling backward to open the cover.
3. Fasten the screws (located in the face of the power supply) into the tabs at the top and bottom of the rack. Set the Torque to 0.4 - 0.5 N.m (3.5 - 4.4 Lb-In). See the following figure for power supply mounting details.



ATTENTION: It is recommended each power supply should be powered from a separate power source and a power

switch should be installed to allow for servicing of each Processor/Supply separately.

4. Ensure that wiring to the Power Supply is disconnected from the site source, and then connect the AC or DC wiring to the power supply as shown below.

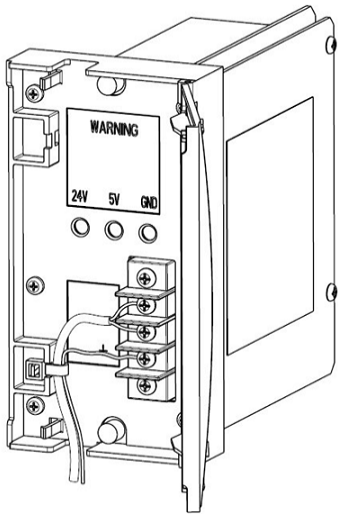


CAUTION:
Hazardous Voltage
Ensure that wiring to the Power Supply is disconnected from the site AC source before installing wiring.
Do not remove Yellow/Green wire from grounding stud on the power supply.
Do not connect PE Ground (Green) Wire directly to terminal on Power Supply.
Failure to comply with these instructions could result in death or serious injury.

ATTENTION: The Yellow/Green wire is supplied with the power supply. The nuts (w/star washers) for the grounding stud are on the stud. For AC power supply use 3.0A, slow-blow for 115V AC operation for each line; 2.5A, slow-blow

for 230V AC operation. For DC power supply use 7.0A slow-blow. Do not apply AC voltages of any kind to DC power supply to avoid the DC power supply being destroyed and vise-versa.

Apply power. For AC power supply only, test voltages at the test points provided on the face of the Power Supply.



ATTENTION: Test-points are electrically connected to the backplane of the rack, and voltage is measured at the backplane. Therefore, if the power supply is not properly seated in the backplane connectors, no voltage will be measured at the test points.

5. Carefully place the CPMs in the rack, adjacent to the Power Supplies. Fasten them in place with captured screws at top and bottom. Torque to 0.4 - 0.5 N.m (3.5 - 4.4 Lb- In).

CAUTION: Ensure that AC power to the rack is disconnected.

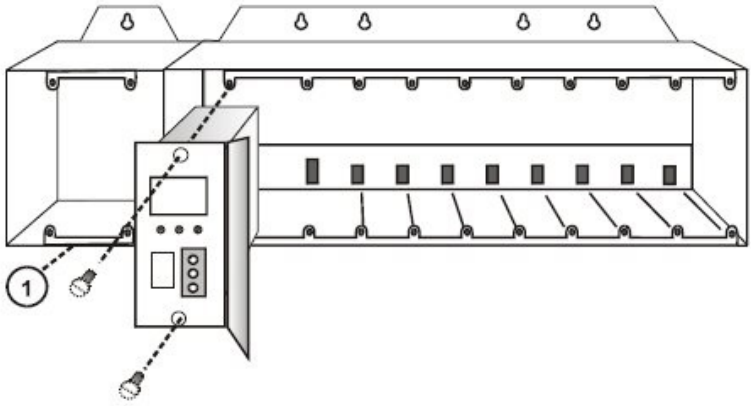
6. Insert the Filler block cover in the middle slot and attach with screws at top and bottom.

Assembling I/O rack

To assemble the I/O rack assembly:

1. Insert the power supply into left-most slot of the main I/O rack as shown in the figure below. See Assembling the Redundant Controller Rack section.

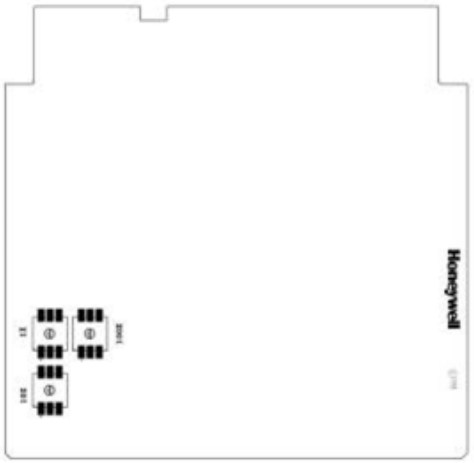
   If the redundant power is used, the I/O rack will contain a second smaller compartment, as shown in item 1 in the following figure. Insert the first power supply in the larger compartment as shown, to the immediate right of the plate dividing the two compartments.



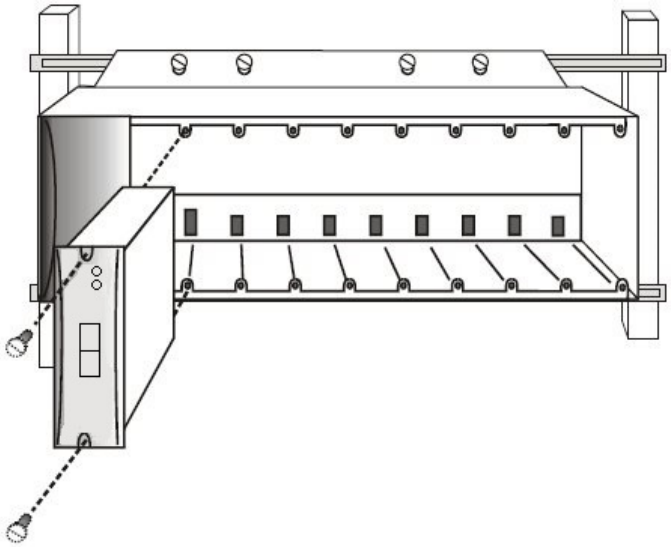
2. If the redundant power is used, the I/O rack will contain a second smaller compartment, this is where the secondary redundant power supply is housed, as shown as item 1.
3. Insert the PSM between the two power supplies. Fasten it in place with screws at top and bottom.
4. Install EPM or CPM as required.
   - Install EPM:
     1. Set the EPM address and network topology for the I/O rack using the rotary switches, as shown below.

        TIP: Set the 10x and 1x switches to the two digit address ranging from 01 to 99. The lower switch (10x) is used to set the tens digit and the upper switch (1x) sets the ones digit. A small slotted screwdriver works well; avoid pencils. Set the network topology using the 100x switch. 3 is for Ring (HSR) network topology, 4 is

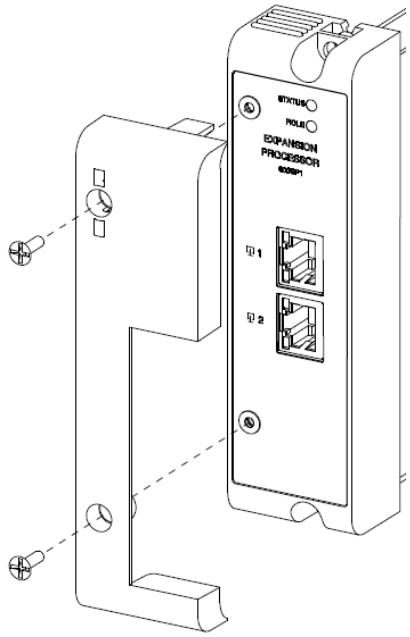
or Star network topology and 5 is for DLR network topology.



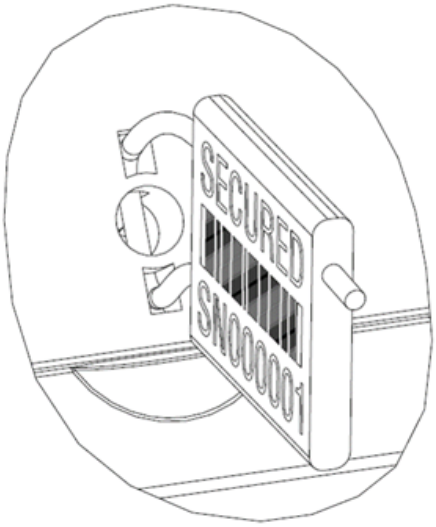
2. Insert EPM to the right of the power supply, and secure it in place with the two captured screws in the faceplate, as shown below.



3. Insert the Ethernet cables, and mount the security cover for the EPM.



4. Optional, mount a wire security seal. The user should get a wire security seal themselves.



- Install CPM: insert CPM to the right of the power supply, and secure it in place with the two captured screws in the faceplate. Set the mode switch, insert the SD card and the Ethernet

cables, and mount the security cover for the EPM. Optional, mount a diameter 0.6 mm wire security seal themselves.

5. Repeat steps 1 through 4 for each I/O rack.

   I/O modules are ready to be installed. See Installing I/O modules section.

> **ATTENTION:** Install a serial communication module in any I/O slot and secure it in place with the two captured screws in the faceplate. Up to six serial communication modules can be added under one CPM.

Power Supply

Both AC power supply and DC power supply can be used in Redundant Controller Rack, I/O rack and Expansion I/O rack.

Figure 5-11: AC Power Supply

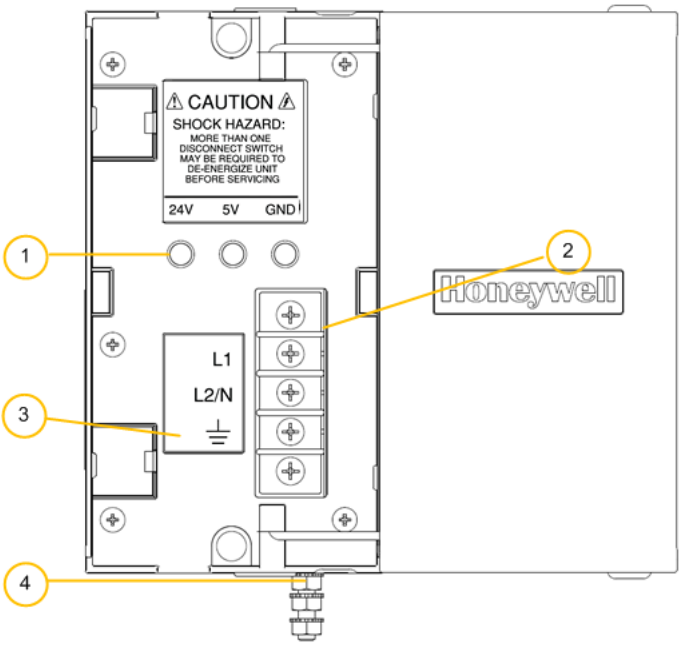
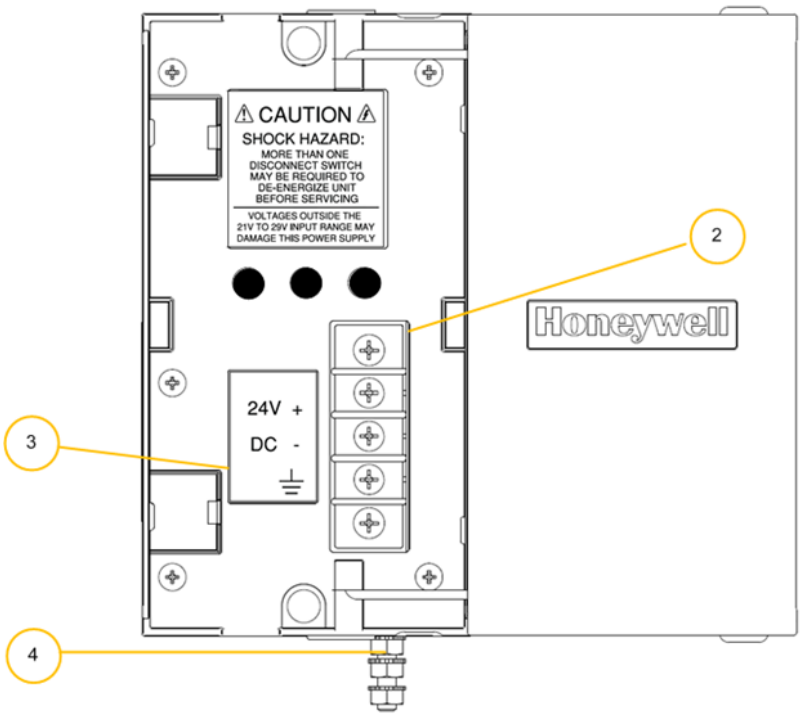


Figure 5-12: DC Power Supply



As indicated in the figures, the power supplies include:

Table 5-5: Power Supply Components

Item	Description
1	Voltage test points
2	AC/DC Input terminal block
3	Wiring label
4	Grounding lug (Reference; lug is not part of power supply; it is mounted to bottom of rack.)

Table 5-6: Specification of power supplies

Item	AC power supply	DC power supply
Input voltage	100-240 V AC	24 V DC
Input voltage range	90 to 264 V AC	21 to 29 V DC

Item	AC power supply	DC power supply
Output voltage	5 V DC and 24 V DC	5 V DC and 24 V DC
Input rating	130 VA	72.5 Watt
Output rating	58 Watt (0 to 60°C)	58 Watt (0 to -51°C)
	41 Watt (-40 to +70°C)	

Each power supply includes a non-field-replaceable internal fuse to protect the supply under certain conditions. (External circuit breaker must be added on both phases of L-N or L-L by the user for Division 2 and Zone 2. The circuit breaker is used for controlling power ON/OFF.)

Power consumption calculation for rack power supply

The following table outlines how to calculate power consumption for a rack power supply. The wattage rating is 60W.

Table 5-7: Power consumption calculation for rack power supply

Module	A: Enter Quantity	B: Max Current @ 5V	C: Max Current @ 24V	D: Calculate 5V current (D = A * B)	E: Calculate 24V current (E = A * C)
CPM	( )	750mA	0mA	( )	(0)
EPM	( )	500mA	0mA	( )	(0)
PSM	( )	22 mA	0 mA	( )	(0)
UIO	( )	380 mA	0 mA*	( )	(0)
UAI	( )	40 mA	25 mA	( )	( )
DIM, 120/240 VAC, 16 Channel	( )	130 mA	0 mA	( )	(0)
DIM, AC/DC, 16 Channel	( )	130 mA	0 mA	( )	(0)
DIM, 24 VDC, 32 Channel	( )	130 mA	0 mA	( )	(0)
DOM, 120/240 VAC, 8	( )	220 mA	0 mA	( )	(0)

Module	A: Enter Quantity	B: Max Current @ 5V	C: Max Current @ 24V	D: Calculate 5V current (D = A * B)	E: Calculate 24V current (E = A * C)
Channel					
DOM, 24 VDC, 32 Channel	( )	235 mA	0 mA	( )	(0)
Relay Output, 8 Channel	( )	110 mA	100 mA	( )	( )
AOM, 4 Channel	( )	40 mA	200 mA	( )	( )
AOM, 8 Channel	( )	225 mA	350 mA	( )	( )
HLAI, 16 Channel	( )	75 mA	50 mA	( )	( )
DIM, Contact type, 16 Channel	( )	130 mA	40 mA	( )	( )
Pulse/Frequency/Quadrature	( )	110 mA	250 mA	( )	( )
Serial Comm Module	( )	400 mA	0 mA	( )	(0)
Redundancy Module	( )	1 mA	0 mA	( )	(0)
				Total mA @ 5V - ( )	Total mA @ 24V - ( )
* The field device is powered by external 24 V power supply. For more information, see Universal Input/Output Module on section.					

Environmental considerations

The product is only used indoors. The CPM must be mounted in suitable equipment enclosures. That is, all components such as the Redundant Controller Rack and I/O rack manufactured by Honeywell must be mounted in approved furniture designed for industrial applications.

Consideration should be given to the installation so that the potential for the build-up of static electricity is minimized or eliminated.

Table 5-8: Environmental specifications

Item	Description
Operating temperature	0 to 60 °C
Extended Operating temperature*	-40 to 70°C
Storage and transportation temperature	-40 to 85 °C
Ambient Relative Humidity	5% to 95% relative humidity (non-condensing)
Vibration (Operative)	IEC 60068-2-6 Sinusoidal (5 to 8.4 Hz) 3.5mm / (8.4 to 150 Hz) 1.0 g; 1 octave/min, 10 cycles per axis, 3 axes.
Shock (Operative)	Half-sine, 15g peak / 11 ms duration, 6 directions
Protection against corrosive atmospheres (for offshore installations)	ANSI/ISA S71.04 Class G3
Altitude	2000 meters
*Refer the Extended temperature (-40 to 70°C) I/O and Rack view part numbers in the below table . See "List of Extended Temperature Module Numbers" on the facing page for more information.	

NOTE: For Extended temperature (-40 to 70°C) system, the user must ensure all the Extended temperature parts are used.

Table 5-9: List of Extended Temperature Module Numbers

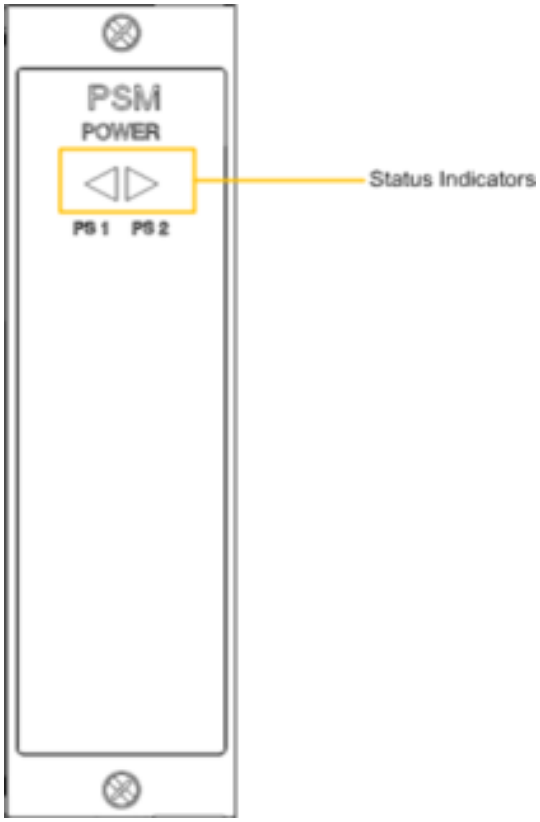
Description	Model Number	Values
Processor Module		
Control Processor Module (CPM), ControlEdge 900	900CP1-0300	Extended Operating Temperature (-40°C to +70°C)
Expansion Processor Module (EPM), ControlEdge 900	900SP1-0300	
I/O Module		
Universal Input/Output Module (UIO Module)	900U01-0100	Extended Operating Temperature (-40°C to +70°C)
Digital Input, 24 VDC, 32 Channel	900G32-0301	
Digital Output, 24 VDC 32 Channel	900H32-0302	
Serial Interface Module, RS485-2 Port and RS232 2 Port	900ES1-0100	
Racks		
1 I/O Slot Rack	900R01-0300	Extended Operating Temperature (-40°C to +70°C)
4 I/O Slot Rack	900R04-0300	
8 I/O Slot Rack	900R08-0300	
12 I/O Slot Rack	900R12-0300	
8 Slot Rack - Red. Power	900R08R-0300	
12 Slot Rack - Red. Power	900R12R-0300	
Redundant CPM Rack (Assembly)	900RR0-0300	
Power Supplies		
Redundant Power Status Module	900PSM-0200	Extended Operating Temperature (-40°C to +70°C)
Power supply AC-DC-NON SIL 41W	900P01-0701	

Power Status Module

The Power Status Module (PSM), shown in the following figure, sits between redundant power supplies on the I/O rack. It is a status module for both power supplies and indicates which are powered, PS-1 (left) or PS-2 (right) or both (typical).

When the status indicator for either or both of the power supplies is lit, it is reporting that the status of the associated power supply is good and that the outputs are within specified limits. When the status is off, either the power supply is off or the voltages are out of tolerance.

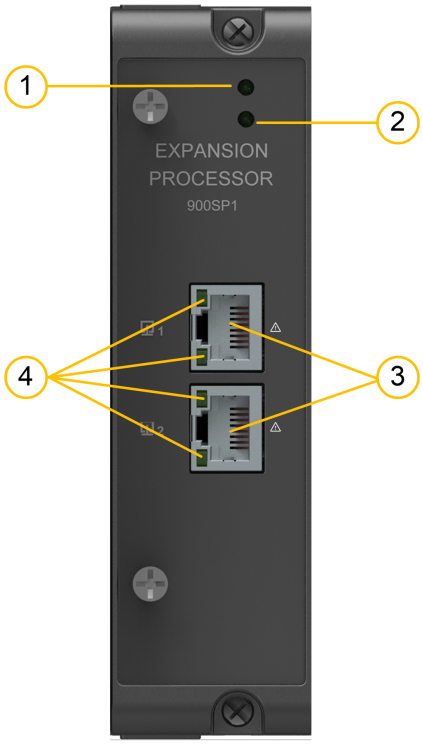
Figure 5-13: Power Status Module



Expansion Processor Module

EPM is shown in the following figure.

Figure 5-14: Expansion Processor Module



It is installed in the expansion I/O rack and provides the link between the CPM and remote I/O modules. Features at the front of the module include:

Table 5-10: Expansion Processor Module Components

Item	Description
1	Status LED indicator for EPM functions. For more information, see EPM Indicators section.
2	Role LED indicator for EPM functions. For more information, see EPM Indicators section.
3	Ethernet 10/100 Base-T Ports; connect to the ports on other EPMs, CPM, or a switch that connects to the CPM (for star topology).
4	Ethernet LED status indicators for communications functions. For more

Item	Description
	information, see EPM Indicators section.

CAUTION: Do not remove or insert the Ethernet connection when the EPM is powered unless the area is known to be non-hazardous.

Serial Communication Module

The rack-slot based serial communication module is used to communicate to serial based controllers. The module can be used to communicate to Modbus RTU Slave, Modbus RTU Master, Modbus ASCII Slave, Modbus ASCII Master and user defined protocol type devices. It contains one Multi-SPI at 4MBps of maximum communication code rate. Also it supports short circuit protection and over voltage protection. The galvanic isolation is 2000 VDC.

There are two DB9 connectors for RS232 and a dual-row terminal connector for RS485 shown in the following figure.

As indicated in this figure, Serial Communication Module includes:

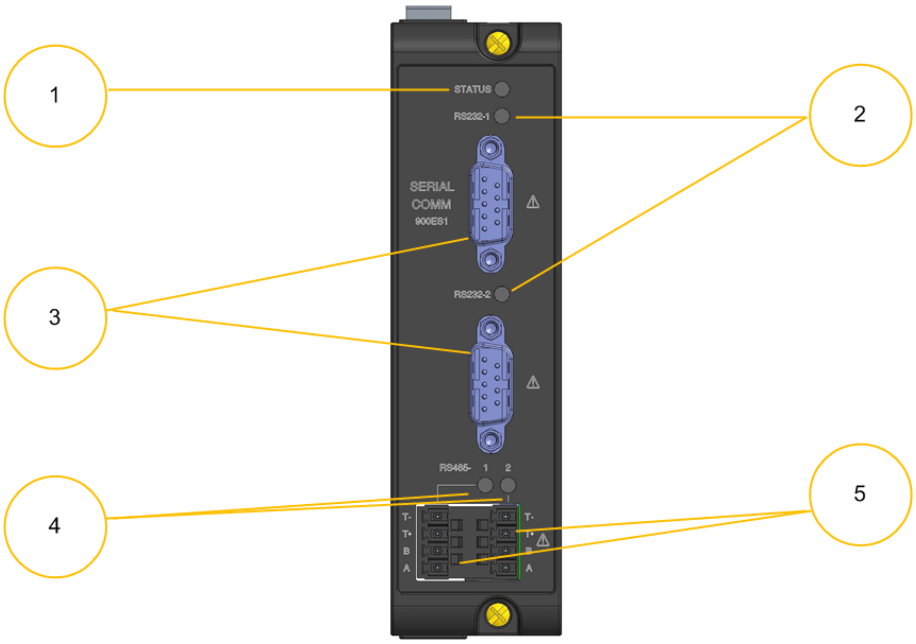


Table 5-11: Serial Communication Module Components

Item	Description
1	Module Status LED indicator for the Serial Communication Module. See "Serial Communication Module Indicators" on page 194 for more information.
2	RS232 LED indicator for the Serial Communication Module. See "Serial Communication Module Indicators" on page 194 for more information.
3	RS232 Ports (two)
4	RS485 LED indicators for the Serial Communication Module. See "Serial Communication Module Indicators" on page 194 for more information.
5	RS485 Ports (two)

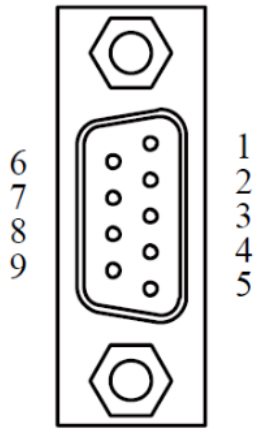
CAUTION: ⚠ Do not remove or insert the serial communication connection when the Serial Communication Module is powered unless the area is known to be non-hazardous.

Table 5-12: RS485 Pin definition

Pin	Type	Description
T-	Output	RS485 terminal resister
T+	Output	RS485 terminal resister
B	Input/output	RS485 B line (-)
A	Input/output	RS485 A line (+)

Typically, short T+ and T-, and a 120-ohm resistor is activated between A and B to revent signal reflections potentially interfering with communications.

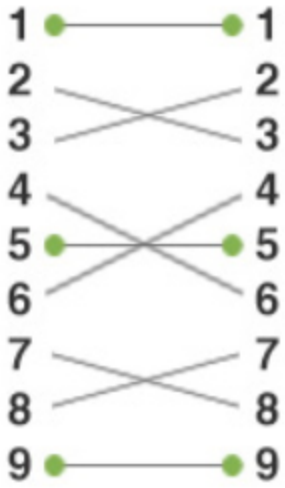
Table 5-13: RS232 Pin definition

Figure	Pin	Definition	Type	Description
 Male DB9	1	DCD	Input	Date carrier detect
	2	RX	Input	Receive data
	3	TX	Output	Transimit data
	4	DTR	Input	Data terminal ready
	5	GND_ISO1	Input	Isolated ground
	6	DSR	Input	Data set ready
	7	RTS	Output	Request to send
	8	CTS	Input	Clear to send
	9	RI	Input	Ring Input

Application cable:

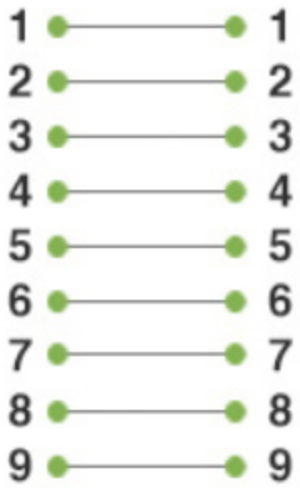
- RS232 port connect to Male DB9 connector:

  As below figure shows, cable require Female-Female cross connection:



- RS232 port connect to Female DB9 connector:

  As below figure shows, cable require Female-Male direct connection:



The application cables are not supplied by Honeywell, and you could prepare them by yourself.

ControlEdge 900 I/O

The configuration and operation of the I/O expansion network is automatic, it is entirely under control of built-in private software that resides in the CPM and in each EPM included in the ControlEdge 900 Controller system. The controller examines the control strategy stored in its memory, verifies that the physical configuration (Rack Numbers and I/O Module type- by Module Number) matches the stored control strategy, and establishes communication with each of the I/O modules in each of the I/O rack.

CAUTION: The ControlEdge 900 Controller I/O expansion network is a private network and the switch used for the interconnection of the CPM and EPMs must not be connected to any other LAN or WAN. Likewise, no devices other than the ControlEdge 900 Controller components should be connected to the switch. Failure to comply will cause communication failures on the I/O expansion network causing I/O modules to go in and out of their failsafe settings.

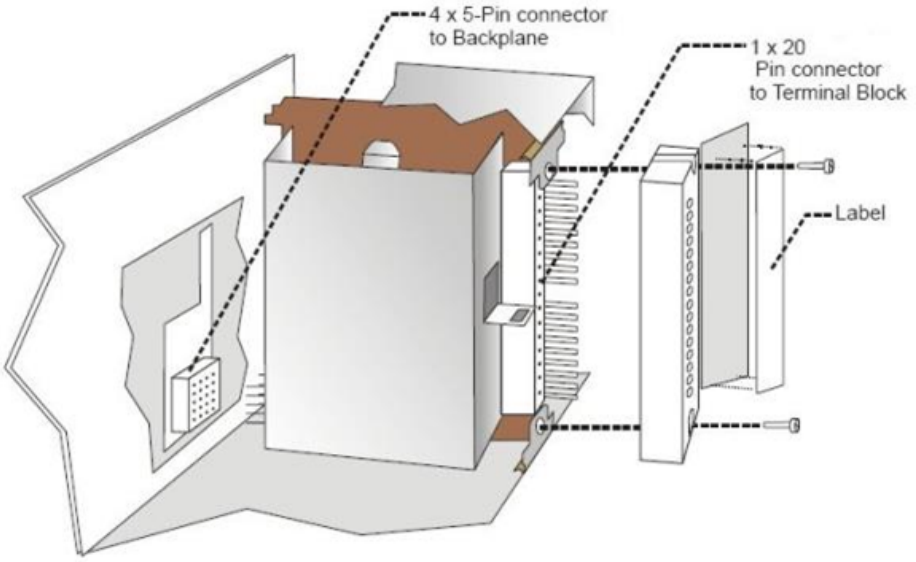
Placing I/O modules in the racks

Each I/O module is placed in an I/O slot in a rack.

Each slot in a rack includes a set of guides that locate the circuit board in the rack, and a pin socket in the backplane that receives the associated pin plug at the back of the I/O module.

At the front of each I/O module, a pin plug receives the associated socket on the back of a terminal block. When the I/O module is inserted into the rack and the terminal block is placed on the circuit board, two captured screws in the terminal block are fastened to metal tabs on the rack.

Figure 5-15: I/O module installation



CAUTION:

- Do not use an input/output terminal block if the terminal block is damaged, if the door is missing, or if one or both mounting screws are missing.
- Always tighten both terminal block screws to proper torque settings before applying field power to the module. Torque to 0.4 - 0.5 Nm (3.5 - 4.4 Lb-In).
- Do not apply energized (“live”) field wiring to an input/output module that is not installed in one of the racks in the system.
- Do not operate the module without a Protective Earth connection on the rack.

Failure to comply with these instructions could result in death or serious injury.

I/O Module Specification

ControlEdge UOC & PLC supports various input/output modules. This section provides technical information to configure ControlEdge UOC & PLC IO Modules. The following IO modules are included:

- Universal Input/output module, 16 channel
- Universal AI – RTD,TC,V 8 Channel
- Analog Input High Level, 16 Channel
- Analog Output, 4 Channel
- Analog Output, 8 Channel
- Digital Input 120/240 VAC, 16 Channel
- Digital Input 24 VDC, 32 Channel
- Digital Input Contact, 16 Channel
- Digital Input 120/240 VAC, 125 VDC (16 Channel Isolated)
- Digital Output 120/240 VAC, 8 Channel
- Digital Output 24 VDC, 32 Channel
- Digital Relay Output, 8 Channel
- Pulse/Frequency/Quadrature, 4 Channel (Only for PLC)

See ControlEdge UOC Specification Document and ControlEdge PLC Specification Document for details.

Universal Input/Output Module

The maximum current of the Universal Input/Output Module (UIO) field side is 4.2 A.

One UIO module provides a 20-terminal block with 16 channels, and it can be connected with two external 24 V DC power supplies. At least one power supply must be connected.

See UIO module wiring and Redundant UIO module wiring section.

ATTENTION: Redundant UIO supports only from firmware version 172.1.1.0 or higher.

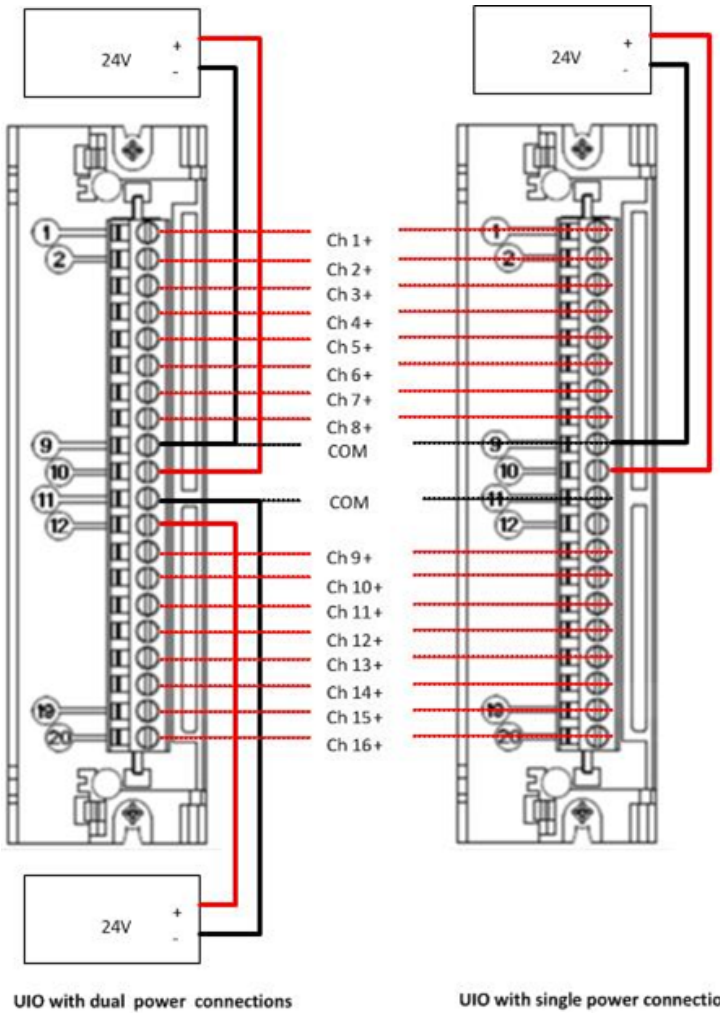
UIO module supports:

- 16 Channel, each channel can be configured for AI, AO, DI & DO

NOTE: Redundant UIO supports 14 Channel, each channel can be configured for AI, AO, DI & DO.

  - Analog Input (AI), 0-20 mA (only for non redundant UIO)
  - Analog Input (AI) with open wire detection, 4-20 mA
  - Analog Output (AO), 4-20 mA, See Field wiring for Analog Output section for channel restrictions on the same UIO module.
  - Digital Input (DI) with line monitoring
  - Digital Output (DO) with short circuit protection
  - Reverse polarity protection is limited to max of Field Supply Voltage.
  - Module I/O configuration and maximum power delivery by I/Os, depends on number of channels, configuration Type and the environment.
- 20 pin EURO style terminal block
- 20 position Barrier style terminal block
- HART Support (AI and AO)
- RTP support. See "Appendix A - Overview of RTPs" for more information.

Figure 5-16: UIO module terminal block



Universal Analog Input Module (UAI)

One UAI module provides a 20-terminal block with 8 channels, it supports inputs mixed on a module. Each channel can be configured as

- mV, V, mA
- T/C
- RTD
- Ohms
- Input impedance: 10 megohm for T/C and mV inputs; >1 megohm for volts and 250 ohms for mA inputs;

- Isolation: 400 V DC for Channel to channel isolation and 1000 V DC for channel to rack isolation;
- Noise Rejection
- Series Mode >60 dB
- Common Mode >130 dB at 120 V AC;
- A/D resolution: 15 Bits
- Update rate: 500 ms (Analog to Digital Converter per module)
- Power Supply Loading: 5 V: 40 mA maximum and 24 V: 25 mA maximum
- 20 pin EURO style terminal block
- RTP support, but TC signal not support RTP solution. For more information, see Using an RTP to field wiring the UAI section.

Digital Input Module (16 channels) - AC Voltage Type

The DI AC Voltage type module is a sinking type module and provides a 20-terminal block with 16 channels. Its input voltage range is from 80V AC to 264 V AC.

DI AC Voltage type module supports:

- Isolation: Galvanically isolated in 2 groups of 8 channel to chassis
- ON Voltage Level: 75 V AC
- OFF Voltage Level: 20 V AC
- Input Impedance: 48 K ohms nominal
- Input Current: 1 mA nominal 120V AC, 60 Hz and 2 mA nominal 230 V AC, 50 Hz
- Minimum ON Current: 0.3 mA
- Maximum OFF Current: 0.2 mA
- OFF to ON Response Time: 4 ms maximum with 1.5 lines cycle maximum
- ON to OFF Response Time: 4 ms maximum with 2 lines cycle maximum
- Power Supply Loading: 5 V: 130 mA max and 24 V: 0 mA
- RTP support. See "Overview of RTPs" on page 211 for more information.

Digital Input Module (32 channels) - DC Voltage Type

The Digital Input Module-DC Voltage Type is sinking type module with below features:

- Channel Density: 32 Channels with two groups of input, each with a pair of terminals of connection to common
- Input voltage range: 10 V DC to 32 V DC.
- Isolation: Galvanic ally isolated in 2 groups of 16 points to rack (30 V DC maximum)
- ON Voltage Level: 9.5 V DC minimum
- OFF Voltage Level: 3.5 V DC maximum
- Minimum ON Current: 1.0 mA
- Maximum OFF Current: 0.7 mA
- OFF to ON Response Time: 5 ms maximum
- ON to OFF Response Time: 5 ms maximum
- Power Supply Loading: 5 V: 215 mA maximum and 24 V: 0 mA
- 20 pin EURO style terminal block
- RTP support, 2 RTP are needed for each module. For more information, see Using Dual RTPs to field wiring the 32 Point DC DI section.

Relay Output Module (8 Channels)

8 channel electromechanical relay output supports:

- Channel 1, Channel 2, Channel 7 and Channel 8 are form C type, provide both NO and NC contact
- Channel 3 ~ Channel 6 are form A type, provide NO contact.
- Input Voltage: 120/240 V AC or 30 VDC
- Output Device: Electromechanical relay; Specified relay life: 1000000 cycles
- Current Rating:
  - 4 A at 240 VAC or 30 VDC resistive load;
  - 0.5 A at 240 VAC or 30 VDC incandescent lamp load
- OFF to ON response time: 11 ms Max
- ON to OFF response time: 8 ms Max
- Maximum Leakage Current: 1 mA @ 350 VDC
- Power Supply Loading: 5V- 110mA maximum; 24V-100mA maximum
- Galvanic Isolation:
  - Relay output contact to relay output contact
  - Relay output contact to logic

Pulse Input/Frequency Input Module (4 Channels)

The 4 Channel Pulse/Frequency/Quadrature Module provides four different functionalities in the form of Pulse Input, Frequency measurement, Quadrature encoder input (not support till now) and Pulse Output. Each of the 4 channels can be configured for any one of these four functionalities.

The Pulse Output functionality uses the digital output available on the module for outputting pulses. 4 Digital Outputs, Open collector, 5 to 24 V DC, 30 mA max used for fast signaling.

Pulse Input Type supports:

- Input Voltage: 0 V DC to 24 V DC
- ON Voltage Level: 3.0 V DC minimum
- OFF Voltage Level: 1.0 V DC maximum
- Input Impedance: 25K ohm
- Frequency: 10 KHz maximum
- Minimum Pulse Width: 3 ˚sec
- Pulse Counter: 32 bits
- Digital Output:
  - If preset action ON, output turns ON for 1 second.
  - If preset action OFF, output latches ON, and remains ON until counter reset command.

Pulse Output supports:

- Channel Used: Any one of the channels can be used for Pulse Output. However, the use of a particular channel for outputting pulses will render the particular input channel unusable for either of pulse or frequency input.
- Digital Output Type: Open Collector, 5 to 24V, 30 mA max
- Frequency Range: 25 Hz – 10 KHz
- Duty cycle: Always 50%
- Pulse Output Duration: Selectable CONTINUOUS or NUMBERED PULSES.

Frequency Input supports:

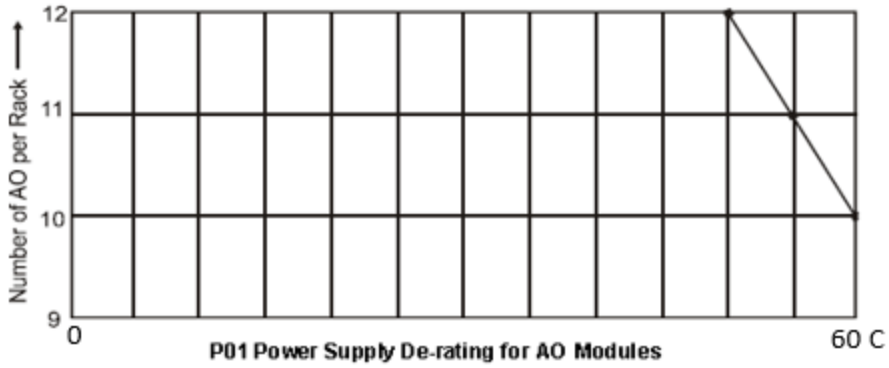
- Input Voltage: 0 V DC to 24V DC
- ON Voltage Level: 3.0 V DC minimum
- OFF Voltage Level: 1.0 V DC maximum
- Input Impedance: 25K ohm
- Frequency: 10 Hz to 100 KHz

- Minimum Pulse Width: 500 ˚sec (10 Hz to 500 Hz) ; 50 ˚sec (10 Hz to 5 KHz) ; 2.5 ˚sec (10 Hz to 100 KHz)
  - The input signal will be rejected if it is below a selected pulse width.
  - The input signal whose pulse width is above the selected pulse width must be within the frequency range specified, otherwise a invalid value (NAN) will be shown and a fail-to-convert error occurs.
- Digital Output ON if input frequency out of range, else OFF

Analog Output Module (4 Channels)

- 4 channel 0-21.8 mA, range selectable analog output
- Load resistance: 750 ohms maximum
- Accuracy: 0.1% full scale
- D/A resolution: 12 Bitsat reference conditions
- Modules per rack: 10 max, up to 12 with product ambient temperature de-rating. See the figure below:

Figure 5-17: De-rating of AO modules



- Update rate: 500 ms
- Minimum current sensing: >3.5 mA per output
- Isolation:
  - 500V DC channel to channel
  - 600V DC isolation from logic
- Output Verification: Readback to controller that indicates output current flowing.
- D/A resolution: 12 bits

- Configurable failsafe behavior between failsafe value and hold last value.
- Failsafe Value: A user-configurable failsafe value to allow predictable in the event of communication between the module and the controller is interrupted or controller exception stop.
- Hold Last value: AO channel hold last value when module is in failsafe state.
- Minimum settable failsafe value is EU Ex Low.
- AO channel of a module be in failsafe will output 0mA when the failsafe value is set as EU Ex Low, and open wire or EU Ex Low error will not be triggered in this case.

Analog Output Module (8 Channels)

The Analog Output module provides eight 0 to 21.0 mA outputs . Outputs are isolated in groups of four with no isolation between outputs in a group. All points are isolated from controller logic.

A green blinking status LED on the module indicates when the module is being scanned. A red status LED when module or channel diagnostics exist. A user specified failsafe value is supported to allow predictable operation in the event communication between the module and the controller is interrupted. Outputs are updated synchronous with control execution.

- Outputs per module: 8, isolated in 2 groups of 4 outputs (1-4, 5-8)
- Current: 0 to 21.0 mA, selectable options: 0-20 mA and 4-20 mA
- Load resistance: 750 ohms max
- Galvanic Isolation: 500VDC group to group. Groups 1-4, 5-8
- Galvanic Isolation from logic: 500 VDC
- Accuracy: 0.1% full scale at reference conditions
- Modules per rack: 4 max when powered from internal 24V backplane power
- Minimum current sensing: >0.5mA per output
- Output Verification: Feedback to controller to indicate output current is flowing.
- D/A Resolution: 13+ bits (1 part in 13332)
- Power Supply Loading: 5V; 225 mA max 24V; 350 mA max
- Terminal Block: 36 Position – Euro style, (Model 900TCK-0001)

A DIP switch on the module selects the use of 24V from Rack PS (internal) power or external loop power via a separate 24V DC power source. The as-shipped (default) switch setting is external power.

> **ATTENTION:** When the DIP switch is set to be off , while the external power is down, the open wire detection is not available.

- External Power Source requirement: Vin:18 to 36 VDC
- Current: 350 mA per module

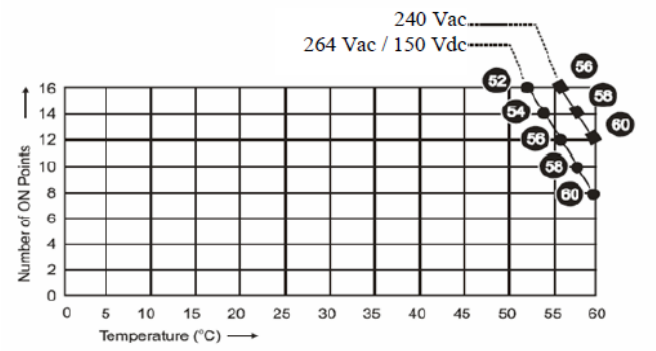
Digital Input Module-AC DC Voltage type

The AC/DC Input Module provides 16 individually isolated, inputs that are powered externally. Two terminals are provided for each circuit. AC or DC power applied between the input terminals cause the inputs to turn On.

There is a green LED state indicator for each channel on the module to indicate when a digital input is ON. A green blinking status LED on the module indicates when the module is being scanned. A red status LED when module diagnostics exist. Logic in the controller allows the state to be inverted when necessary. Requires Euro style 36-terminal terminal block.

*Nominal times excluding controllers scan time and excluding transmission time from module to rack. DC application must include controller line filter setting of 50/60 Hz.

Figure 5-18: Active input De-rating table for AC/DC DI



High Level Analog Input Module (16 Channels)

16 user-configurable channel, each channel can be configured as below type: 0-20 mA;4-20 mA;0-1 V;0-2 V;0-5 V;0-10 V;-1-1 V;-2-2 V;-5-5 V; -10-10 V

- Input Impedance : >1 megohm for volts and 250 ohms for mA inputs
- Galvanic Input Isolation:
  - 400 VDC point to point, solid state switching;
  - 1K VDC to logic.
- Noise Rejection:
  - Series Mode >31dB
  - Common Mode >90dB at 120VAC
- Over-range limit: +/- 10% for linear ranges
- Accuracy:

  Factory configured accuracy = ± 0.1 % of range with below Reference condition:

  Temperature = 25 °C ± 3 °C (77 °F ± 5 °F)

  Humidity = 45 % to 55 % RH non-condensing

  Line voltage = Nominal ± 1 %

  Source resistance = 0 ohm

  Series mode and common mode = 0 V

  Frequency = Nominal ± 1 %

- Temp. Effect on Accuracy: ±0.01% of full scale per degree Celsius maximum
- A/D Converter: One per module
- A/D resolution: ±15Bits
- Update rate: 100ms (Analog to Digital Converter per module)
- Long term Stability: 0.1% per year
- Channel Configuration Data : Stored in non-volatile memory.
- Power supply loading: 5V ; 75mA max 24V ; 50mA max

Digital Input Module-Contact Type (16 Channel)

16 channel Contact Type:

- Inputs per module: 16 (single-ended)
- Voltage supplied: 15 V DC nominal
- Maximum Contact Resistance: 1000 ohms
- Update Rate: 6 ms Maximum
- Switching current: 2.6mA norminal
- Galvanic Isolation: Between Field wiring (input or output) and Module
- Power supply Loading:
  - 5 V; 130 mA maximum
  - 24v; 40 mA maximum

Digital Output Module (8 Channels) - AC Voltage Type

DO AC Voltage type module supports:

- Channel Density: 8 Channels
- Output Type: Triac (Zero switching voltage)
- Input voltage range: 85 V AC to 240 V AC.
- Isolation: Galvanic ally isolated per Channel to channel and channel to rack.
- Transient Overload Voltage Protection
- Maximum Load Current: 2 A per channel and 8 A max. per module (Resistive load)
- OFF to ON Response Time*: 3 ms + 0.5 line cycle max
- ON to OFF Response Time*: 3 ms + 0.5 line cycle max
- Power Supply Loading: 5 V: 220 mA max and 24V: 0 mA
- Per channel Field-replaceable fuse support
- 20 pin EURO style terminal block
- RTP support. For more information, see Using an RTP to field wiring the 8 Point AC DO section.

> **TIP:**
> *Excluding controllers scan time and excluding transmission time from module to rack.

Digital Output Module (32 Channels) - DC Voltage Type

The Digital Output Module – DC Voltage Type is current sourcing type module.

DO DC Voltage type module supports:

- Channel Density: 32 Channels
- Input voltage range: 10.5 V DC to 32V DC.
- Isolation: Galvanic ally isolated in 2 groups of 16 channel to rack
- Overload Current Protection: Active Current Limiting is integrated into the output driver as 4 groups of 8 channels each. Power cycling is not required to reset the module after a fault condition.
- Short Circuit: Whole group of 8 output channels will be switched off if short circuit happens in any channel of the group. Power cycling is not required to reset the module.
- Maximum Load Current:
  - 0.5 A per channel;
  - 6 A maximum per channel group ;
  - 12 A maximum per module;
  - Resistive load 0.25 A per point incandescent lamp load (5 mH maximum)
  - OFF to ON Response Time*: 6 ms
  - ON to OFF Response Time*: 6 ms
  - Power Supply Loading: 5 V: 235 mA max and 24V: 0 mA
  - 20 pin EURO style terminal block
  - RTP support, 2 RTP are needed for each module. For more information, see Using Dual RTPs to field wiring the 32 Point DC DO section.

> **TIP:**
> *Excluding controllers scan time and excluding transmission time from module to rack.

MasterLogic I/O

The configuration and operation of the I/O expansion network are automatic, it is entirely under the control of built-in private software that resides in the CPM and each MasterLogic adapters included in the ControlEdge 900 platform. The controller examines the control strategy stored in its memory, verifies that the physical configuration

(Rack Numbers and I/O Module type- by Module Number) matches the stored control strategy, and establishes communication with each of the I/O modules in each of the I/O rack.

CAUTION: The ControlEdge 900 I/O expansion network is a private network and the switch used for the interconnection of the CPM and MasterLogic I/O must not be connected to any other LAN or WAN. Likewise, no devices other than the ControlEdge 900 Controller components should be connected to the switch. Failure to comply will cause communication failures on the I/O expansion network causing I/O modules to go in and out of their failsafe settings.

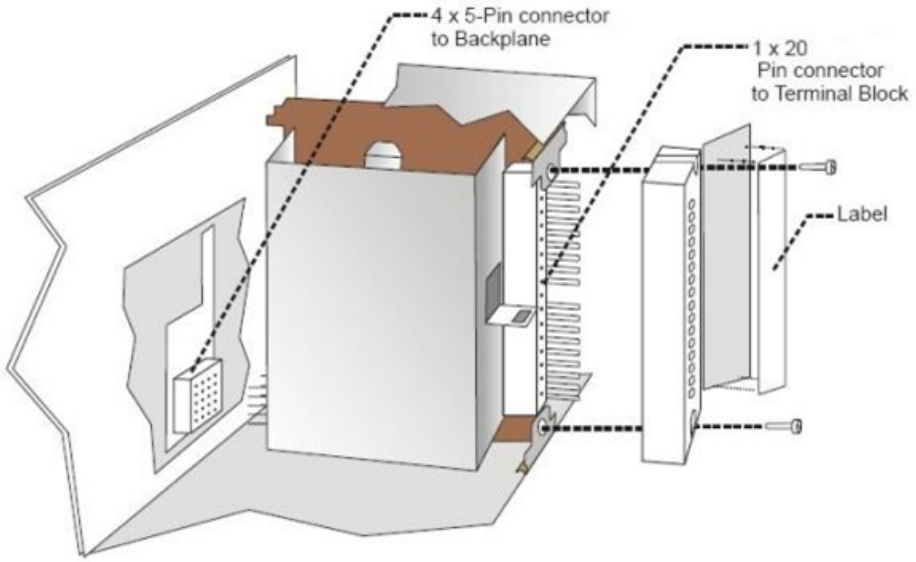
Placing I/O modules in the racks

Each I/O module is placed in an I/O slot in a rack.

Each slot in a rack includes a set of guides that locate the circuit board in the rack, and a pin socket in the backplane that receives the associated pin plug at the back of the I/O module.

At the front of each I/O module, a pin plug receives the associated socket on the back of a terminal block. When the I/O module is inserted into the rack and the terminal block is placed on the circuit board, two captured screws in the terminal block are fastened to metal tabs on the racks.

Figure 5-19: MasterLogic I/O module installation



CAUTION:

- Do not use an input/output terminal block if the terminal block is damaged, if the door is missing, or if one or both mounting screws are missing.
- Always tighten both terminal block screws to proper torque settings before applying field power to the module. Torque to 0.4 - 0.5 Nm (3.5 - 4.4 Lb-In).
- Do not apply energized (“live”) field wiring to an input/output module that is not installed in one of the racks in the system.
- Do not operate the module without a Protective Earth connection on the rack.

Failure to comply with these instructions could result in death or serious injury.

NOTE: Only MasterLogic 200 I/O modules support the hotswap feature.

MasterLogic I/O Module Specification

MasterLogic supports various input/output modules. This document provides technical information to configure MasterLogic I/O Modules. MasterLogic I/O modules are available in two platforms, ML50 and ML200. The following IO modules are included:

ML50 Input/output Modules

- MLE-DC32A: Digital Input, 24 VDC, 32 Channel
- MLE-TN32A: Digital Open Collector Output, 32 Channel
- MLE-DR16A: Digital Input, 24 VDC, 8 Channel Digital Output, Relay 24 VDC, 8 Channel
- MLF-AD08A: Analog Input, Current/Voltage, 8 Channel
- MLF-AD04C: Analog Input, Current/Voltage, Hi-Resolution, 4 Channel
- MLF-DC04C: Analog Output, Current, Hi-Resolution, 4 Channel

- MLF-AH04A: Analog Input, Current/Voltage, 2 Channel Analog Output, Current/Voltage, 2 Channel
- MLE-TP32A: Digital Output, Open Collector, 32 Channel
- MLE-RY16A: Digital Output, Relay, 16 Channel
- MLF-DC04A: Analog Output, Current, 4 Channel

ML200 Input/output Modules

- 2MLI-D22A: Digital Input, 24 VDC (Sink/Source Type), 16 Channel
- 2MLI-D28A: Digital Input, 24 VDC (Sink/Source Type), 64 Channel
- 2MLQ-TR2A: Digital Output, TR, 0.5A (Sink/Source Type), 16 Channel
- 2MLQ-TR8A: Digital Output, TR, 0.1A (Sink/Source Type), 64 Channel
- 2MLF-AD16A: Analog Input, Current/Voltage,16 Channel

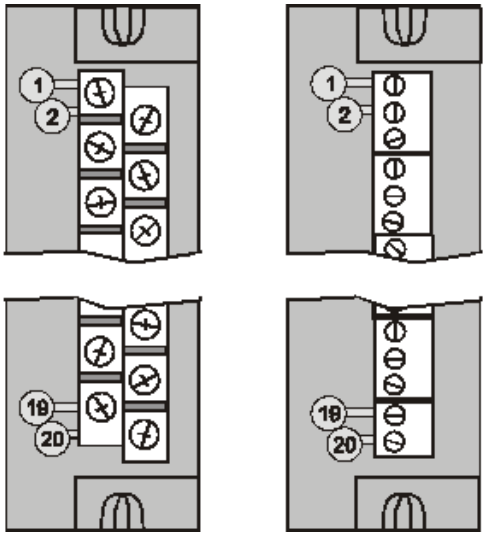
> **NOTE:** The MasterLogic 200 I/O adapters support single and dual power types.

See ControlEdge PLC Specification Document for more details.

Terminal block styles

The terminal block is available in the barrier style, shown below at left, and the Euro style, shown at right. Not shown: a Euro style with 36 connections is also available for certain high capacity modules.

Figure 5-20: Terminal block styles



Terminal blocks have an embossed numbering “key” that shows the numbering pattern of the 20/36 connections.

The frame associated with the terminal block has a transparent hinged door. The hinged door is a tool secured cover. To open the door, insert a flat screwdriver into the slot at the top and bottom of the door while pulling out. The door has molded-in tabs that hold labels, which are uniquely color-coded to identify each module type.

Each label is printed on both sides. On the front (visible when the door is closed) are I/O channel numbers, with spaces in which tag names can be written. On the back (visible when the door is open) are wiring patterns for the type of module located in the slot.

The 20-pin, inline connectors at the back of the terminal blocks are universal; that is, any type of I/O module can be used with either the Barrier style or the Euro style terminal block. The 36-pin Euro terminal blocks must be used with High Level AI, 32 DI, and 32 DO modules.

ATTENTION:
Before mounting terminal blocks in the rack, be sure they are properly keyed to the module type they will be used with. For more information, see Installing I/O modules section.

Terminal Block Colors

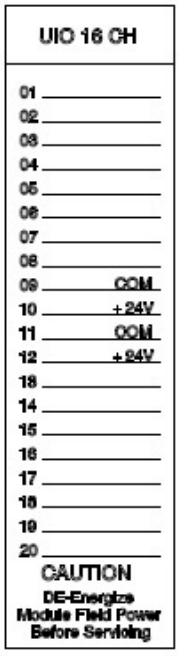
Both the barrier style and the Euro style are available in two colors (red and black). Black terminal blocks, which have gold contacts, are used for low-voltage, low-energy signals such as analog inputs, contact inputs and low DC voltages. Red terminal blocks, which have tin contacts, are used for higher voltages such as 120/240 VAC.

Colors of each Terminal Blocks must correlate to that of the mating header on I/O modules with which they are used; that is:

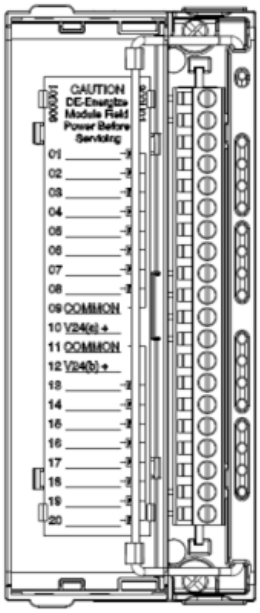
- Black terminal blocks, which have gold contacts, are for use with I/O modules that have black headers and gold pins in the 20-pin connector; these include: Analog Input, 4-channel Analog Output, DC Input, DC Output, Contact Input, pulse Output, Frequency Input.
- Red terminal blocks, which have white (tin) contacts, are for use with I/O modules that have red headers and white- (tin-) contacts in the 20-pin connector; these include: AC Input, AC Output and and Relay Output.
- 36-pin black Euro terminal blocks, which have gold contacts, are for use with 8-point AO, 16-Point AO, 16-point AI, 32-point DI, and 32-point DO modules.
- Terminal blocks must be keyed by the installer to prevent high voltage terminal blocks from being installed on low voltage modules.
- Any of the color-coded labels will fit into the door of any terminal block. Use care to ensure that all hardware components match each other, and also match the control strategy in the configuration file.

Installing I/O modules

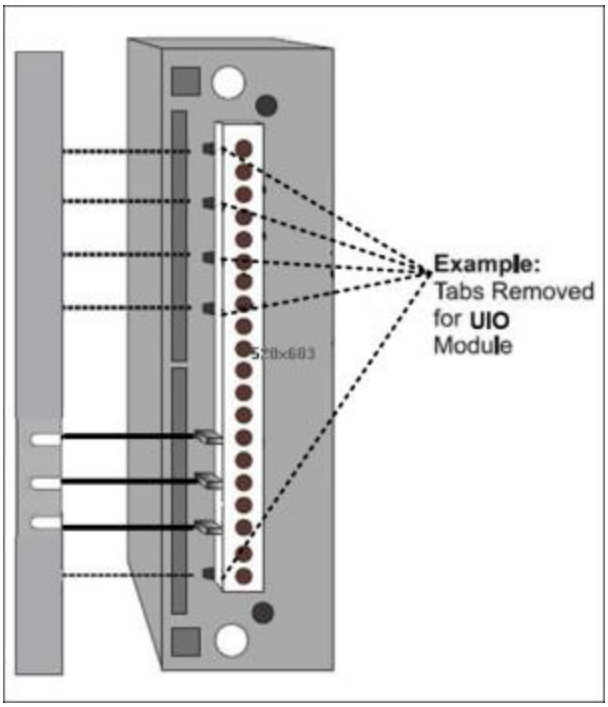
1. Write the tag names of each configured I/O Module on the label.



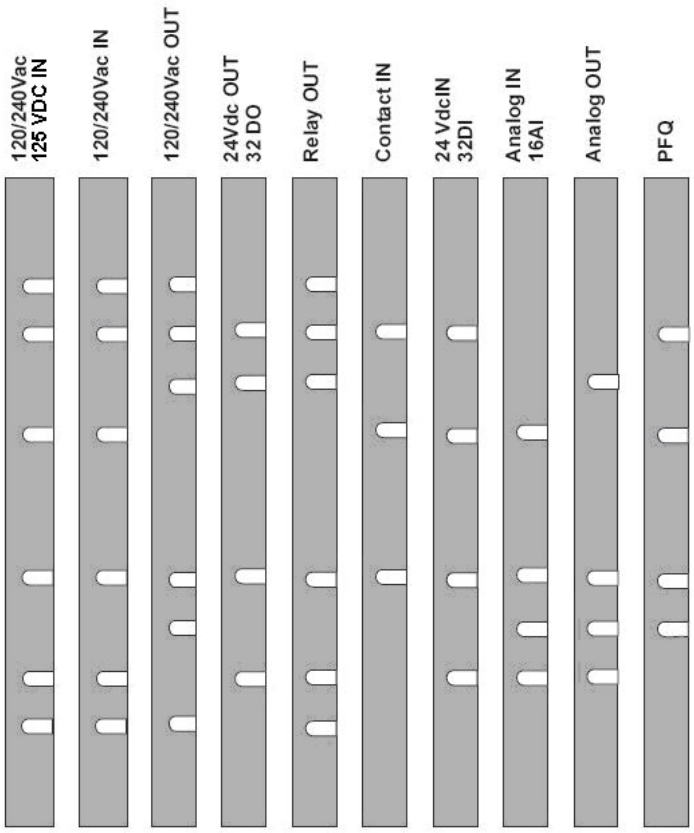
2. Place the label supplied with each module (tag name side out) into the hinged door for that I/O Module. Use the slotted tabs, molded into the door, to hold the label in place.



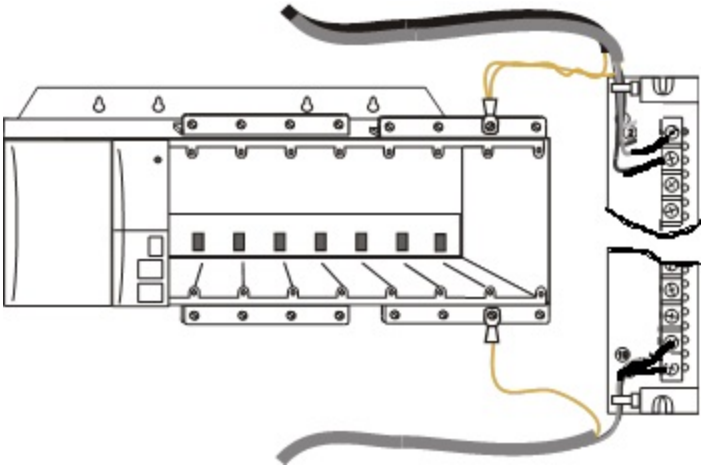
3. For each configured and labeled I/O Module, ONLY break off the "key-tabs" in the pattern that matches that module type. (For a diagram of each key-tab pattern, use the I/O Modules or UIO keying example diagram shown below).



CAUTION:
In the diagram below, the white cut-outs represent the cut-outs on the modules that accommodate tabs on the Terminal Block. That is, all key-tabs that line up with the white cut-outs on the diagram should be retained, and all other tabs should be removed. The orientation of the diagrams below corresponds to the picture of the terminal block, shown in the previous picture.



4. Secure the field cable in place with a cable tie at top or bottom of the terminal block. Form a bend in each wire to provide strain relief, and secure the wire bundle with the tie.
5. Install all I/O modules in the racks.
6. Within each I/O module, install the appropriate terminal block. The following figure is example, for different modules, the wiring details are differernt. See "Terminal Block-to-Field (Signal) Wiring" on the facing page for more information.



ATTENTION: For CE conformity, the optional grounding bar should be installed.

7. In each slot location not occupied by an I/O module, install a Filler Block cover. (Part number 900TNF-0200).

CAUTION:
The Filler Block Cover looks much like an I/O Terminal Block assembly, except that it does not include the wire terminating block (screw terminals). The Filler Block Cover mounts in the same manner as a Terminal Block (with captured screws at top and bottom). Blank labels are provided for mounting in the hinged door.

Terminal Block-to-Field (Signal) Wiring

Terminal Block Wiring can be routed through the terminal block at the top, at the bottom, or both. Wiring should be fixed in place using wire ties at the slotted tabs that are molded in at top and bottom of each terminal block. The terminal block is removable.

The optional Remote Termination Panel (RTP) provides an easy way to connect the ControlEdge 900 Controller to the field wiring. The RTP integrates some of the typical externally connected components, reducing wiring and setup time. It also minimizes the need for multiple wires under a single screw connection by expanding the connectivity of the shared terminals of the I/O modules. See "Appendix A - Overview of RTPs" for more information.

Wiring rules and recommendations

For analog input and analog output channels, twisted-pair wiring with shielded cable is recommended and it will improve noise immunity if wire routing is suspect.

> **ATTENTION:**
> For CE conformity, all signal wire must use shielded cable.

Wire Gauge

Observe all local codes when making power connections. Unless local electrical codes dictate otherwise, the recommended minimum wire size for connections is given in the following table.

Table 5-14: Minimum Recommended Wire Sizes

Wire Gauge (AWG)	Wire Gauge (mm^2)	Wire Application
16	1.5	24V+ and COM to terminal block screw/connection
20	0.75	DC current and voltage field wiring
22	0.5	DC current and voltage wiring in control room

Using crimped pins with the following specification to terminate field wiring:

- Pin with Max Outer Diameter of 2 mm^2 & Min 0.5 mm^2
- Length of pin should be 10 mm to 12 mm.

Figure 5-21: Crimped pins

Routing and securing wires

Typically, field wiring is routed to connections at a terminal panel near the racks, and then from the terminal panel to the terminal blocks on the I/O modules.

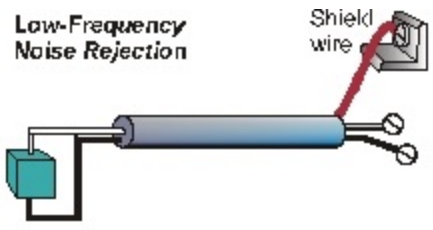
Whatever method of routing is used, wiring must be mechanically supported along its length, and must be protected from physical damage and electromagnetic (noise) interference. For more information, see Electrical considerations section.

> **ATTENTION:**
> All wires must be securely terminated, using appropriate wiring practices.

Signal grounding

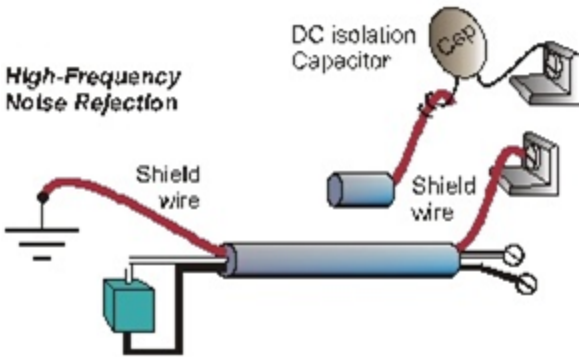
The shield for each analog input and analog output should be grounded at the grounding bar at the top or bottom of each rack as indicated in the following figure. For low-frequency noise rejection, I/O wiring shields should be grounded only at the ControlEdge 900 Controller end.

Figure 5-22: Wire-signal Grounding for low-frequency noise rejection



For high-frequency noise rejection, shields should be grounded at the ControlEdge 900 Controller and at the field device. If the ground voltage potential at the field device is different from that at the ControlEdge 900 Controller, a DC isolation capacitor (1nf/2000V) should be used between the shield and the grounding bar on the rack.

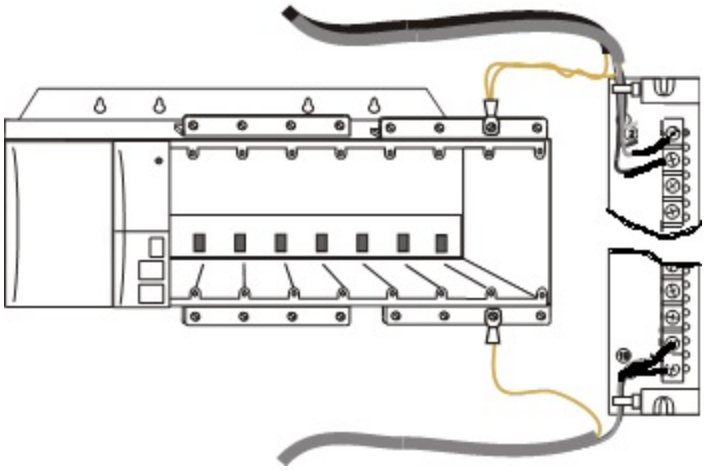
Figure 5-23: Wire-signal Grounding for high-frequency noise rejection



Wire shield grounding

Aluminum grounding bars for I/O wiring are available as options. When selected for use, they are fastened to the top and/or bottom of each rack, as indicated in the following figure. To enable connection of multiple ground wires with a single screw, the wires can be twisted together and secured with a wire lug.

Figure 5-24: Wire-Shield Grounding



To facilitate module replacement, it is advisable in most cases to route all wiring through either the top or the bottom of the terminal block. This allows the terminal block to pivot up or down, allowing ready access to the module, and is the preferred method for a limited number of wires.

For a larger number of wires, or for wires of a heavier gauge, it is advisable to route some wires through the top of the terminal block, and some through the bottom, as indicated in Wire-Shield Grounding

section. In this case, it is necessary to adjust wire length so as to ensure adequate flexibility of the twisted wires and to provide clearance sufficient to remove the I/O module.

Redundant UIO module wiring

> **ATTENTION:** Use prefabricated cable assembly to connect the RUIO module terminal to the Redundant RTP.

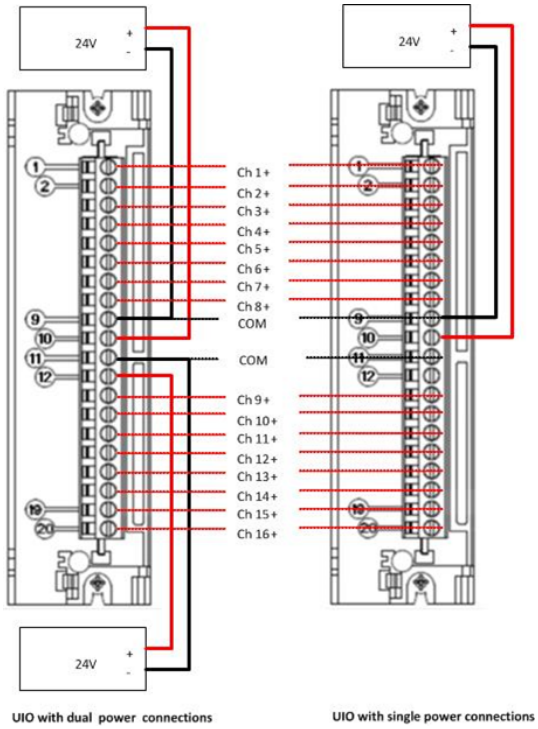
For redundant UIO, RTP installation and wiring see *ControlEdge Remote Termination Panel (RTP) for Redundant Universal Input/Output* (51-52-33-170) document.

See UIO module wiring section to connect the field devices from the RTP terminal.

UIO module wiring

It is 16 Channel universal I/O module, and each channel can be configured for AI, AO, DI and DO. The UIO is sourcing type.

Figure 5-25: UIO with power connection



In above diagram, each power supply source supplies power to the whole module. If redundant power supply are provided, the UIO module still can work in case of failure on one power source.

At least one power supply is required, otherwise UIO module cannot work and "External power" error is reported.

> **ATTENTION:**
> Calibrate the power output at 24 V DC to limit the PWB thermal rise.

See the following table for the UIO specification of different hardware versions:

Table 5-15: UIO specification of different hardware versions

Item	Hardware Version B	Hardware Version D/E
ControlEdge Builder Display*	Version 01.00	Version 02.00
AO Channel Specs without DO channels used	Maximum of 5 into 100 ohms with no other channels configured	No load restrictions:
AO and DO Channel Specs	Maximum DO module current 1.5 A. (3 channels at 500 ma or 6 at 250 ma)	Maximum module current 4.2 A
DI and AI Channel Specs	Maximum 16 per channel	
DO Channel Specs	In 60 Degree C and use High voltage RTP Cable or Terminal Block	Use High voltage RTP Cable - Default :
HART Support	Yes	
Certification	CE, UL	CE, UL, CSA, ATEX, RCM

*The hardware version from View Diagnostics-->I/O diagnostic of ControlEdge Builder can be found.

Field wiring for Analog Input

The UIO is optimized for use with 2-wire, 3-wire or 4-wire transmitters. All 16 channels can accept inputs from most 2-wire, 3-wire or 4-wire transmitters without any special wiring.

The following are the items that UIO AI supports.

- 4-20 mA / 0-20 mA current inputs;
- Devices that accept external power to power a 0/4-20 mA current source and (optionally) the device;
- Devices that return the current to the ground terminal of the external 24 V power supply;
- External devices that can moderate non-compliant devices. For example: 'moderators' = current mirrors, isolators, GI/IS barriers, mv-to-I.

See the following table for the specification of AI Channel:

Table 5-16: UIO specification of AI Channel

Item	Description
Open wire detection	Configurable and only applicable for 4–20 mA type
Field Voltage	>15 V DC (at 0–24 mA)
Short Circuit Current	24.5 mA +/- 0.5 mA
Open Wire Current	<1mA
Input Impedance	Typically 250 ohm
A-D conversion	16 bit
Accuracy	0.1% of full scale (at 23.5 ± 2°C)
	0.17% of full scale (-40 to 70°C)
Input filter	First-order low-pass 100Hz

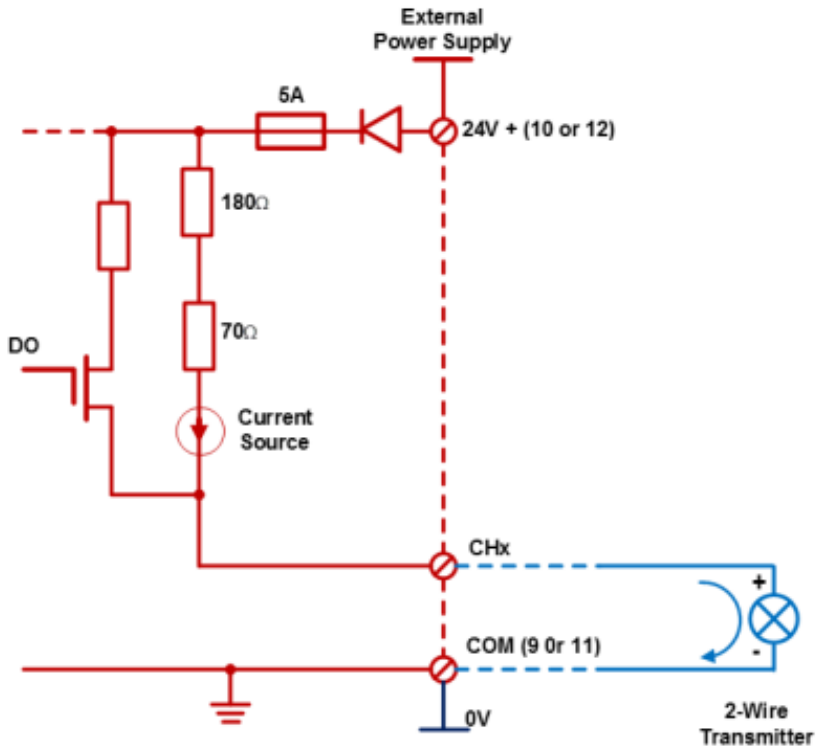
The following items are not directly supported by UIO AIs:

- Voltage inputs (1-5 or mv)
- Thermocouples
- RTDs
- NAMUR devices

- Devices that supply current, which is not first supplied by the external 24V to the device. For example, a device that creates current (even if referenced to Honeywell ground).

Standard 2-wire transmitter with UIO

Figure 5-26: Standard 2-wire transmitter with UIO (Loop Powered)

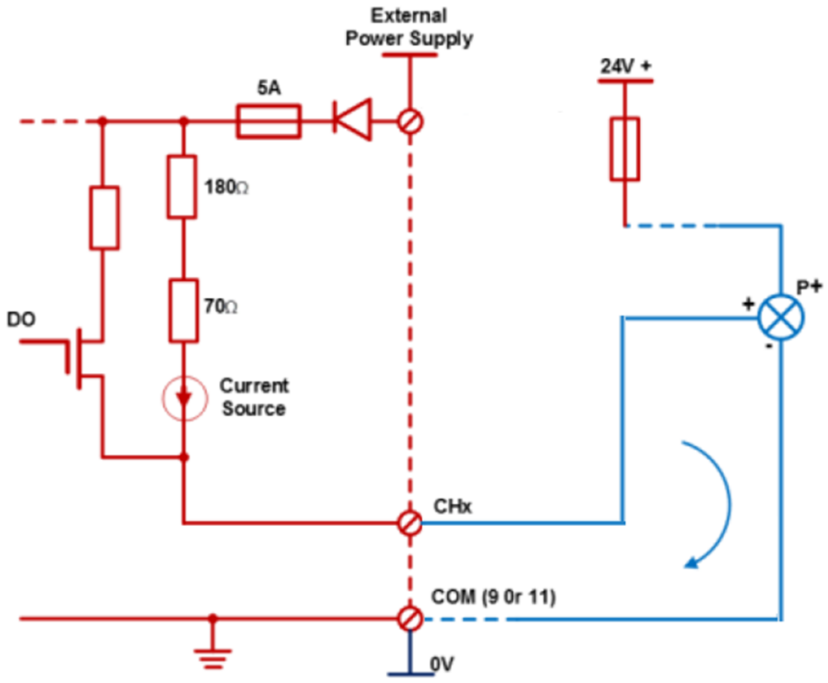


Self-powered 3-wire transmitter with system ground

This can be applied to any channels from 1 through 16.

The simplest wiring is to have the 'common' wire and the 'current source' wire under the same terminal blocks screw. If the site wiring does not permit this method, then a separate external terminal block must be used. The device must reference its 'DCS-side' common to ControlEdge 900 common.

Figure 5-27: Self-powered 3-wire transmitter with system ground (Current Sink)

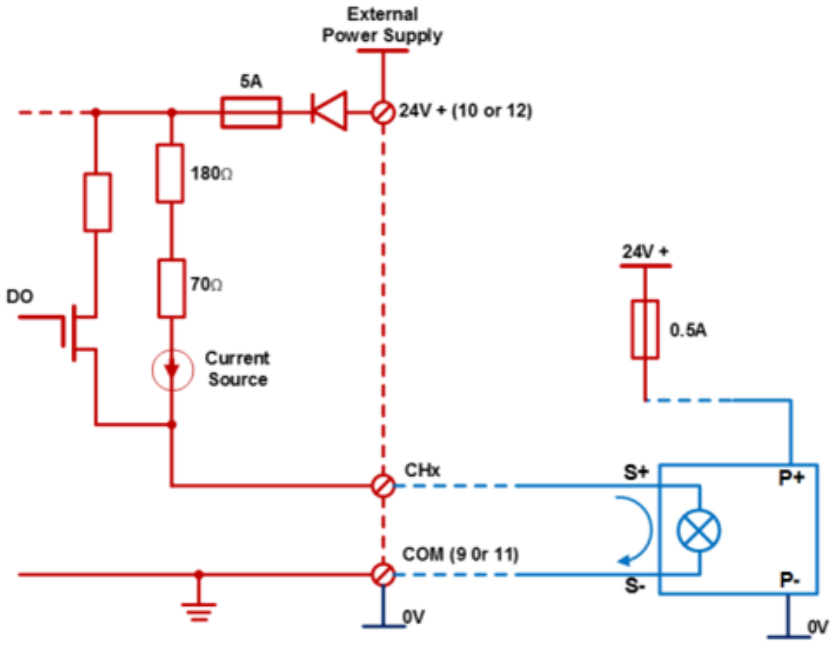


Self-powered 4-wire transmitter

This wiring method can be applied to any of the channels 1 through 16.

> **NOTE:** UIO module does not support sourcing type transmitters.

Figure 5-28: Self-powered 4-wire sinking type transmitter with UIO



UIO does not support the following input types:

- Self-powered 4-wire transmitter with ground-referenced current source: This is because the current return path is on the negative side of the wire-pair.
- Voltage input: This is because UIO supports only current measurements.
- Slide wire: This is because UIO supports only current measurements.

Allowable field wiring resistance - UIO - Analog Input channel

The maximum allowable field wiring resistance between the transmitter and the connection terminal is dependent upon the voltage requirement of the transmitter. The formula for calculating

the maximum wiring resistance for the UIO channel used as an analog input is given by the following equation:

Rmax= [(19.0-Vtx) / (0.022)]

Where, Vtx=Voltage required at the transmitter terminal.

Field wiring for Analog Output

The UIO can drive 4-20mA. See the following list for AO specification:

- No load restrictions: 6 channels with no other channels configured.
- With load restrictions:

  For 60°C Ambient Operation:

  - The max count for AO channel load of 100 to 249 ohm is 6, and no other channels is assigned to the module.
  - The max count for AO channel load of 250 to 499 ohm is 8, and no other channels is assigned to the module.
  - The max count for AO channel load of 500 to 750 ohm is 12. You can configure up to 12 AO channels, and configure other 4 channels for other I/O types.
  - 1 AO channel corresponds to 2.5 AI channels. If 2 AO channels are reduced, then 5 AI channels can be configured.

  For 40°C Ambient Operation:

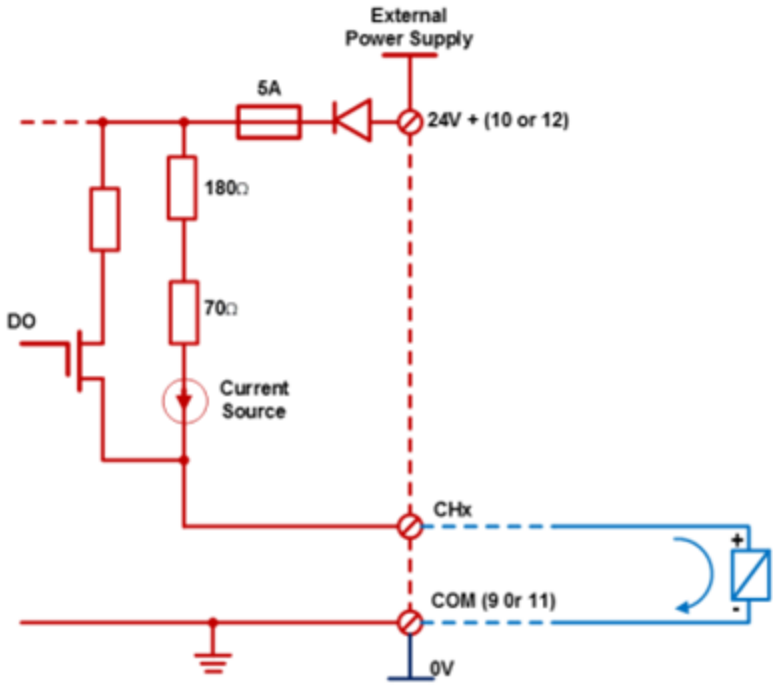
  The max count for AO channel load of 250 to 499 ohm is 16, and no other channels is assigned to the module.

  A tool is provided to calculate UIO channel loading based on Ambient Temperature. For more information, please contact with your Honeywell representative.

Table 5-17: UIO for Analog Output Specification

Item	Description
Field (loop) resistance	Minimal 100 ohm
D-A conversion	12 bit
Accuracy	< 0.5% of full scale including linearity

Figure 5-29: Field wiring for analog output



Field wiring for Digital Input (Dry Contact)

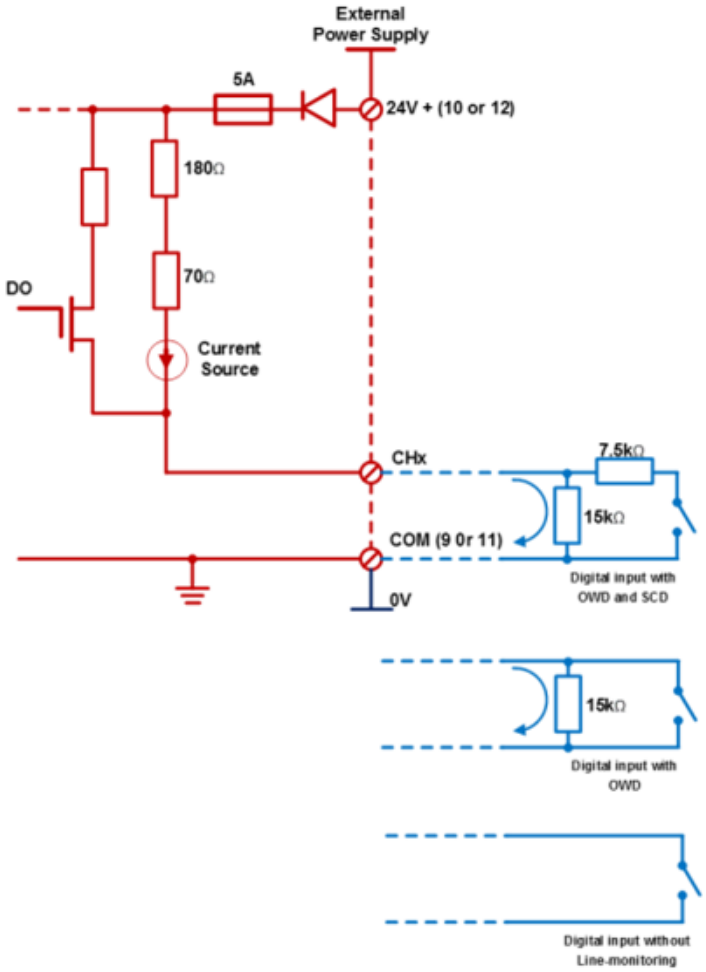
A UIO channel configured as a Digital Input. See the following table for DI specification:

Table 5-18: UIO for DI(Dry Contact) Specification

Item	Description
Signal type	Dry contact
With Open Wire Detection	
Short circuit detection	I > 6mA +/-5%
Closed contact detection	2.8mA < I < 6mA +/-5%
Open contact detection	0.9mA < I < 2.4mA +/-5%
Lead Breakage Detection	I < 0.9mA +/-5%
Input filter	First-order low-pass 100Hz
Without Open Wire Detection	
Closed contact detection	I > 2.8mA +/-5%
Open contact detection	I < 2.4mA +/-5mA
Input filter	First-order low-pass 100Hz

See the following wiring diagram of the UIO channel configuration.

Figure 5-30: Digital input



When the DI channel is configured with open wire detection (OWD), a 15k shunt resistor is required in the field near the switch contact as displayed in the above figure.

A 15k shunt resistor and a 7.5k series resistor are required closed to the contact in field side. Refer to the above block diagram of this channel configuration, and a field wiring example.

ATTENTION:
For channels that are configured with a debounce, UIO will declare that the channel has changed state if all the consecutive samples are in the new state for the configured debounce time period.

Field wiring for Digital Output

When UIO is configured as a Digital Output, the channel can supply up to 0.5A to the field. See the following table for the specification of DO.

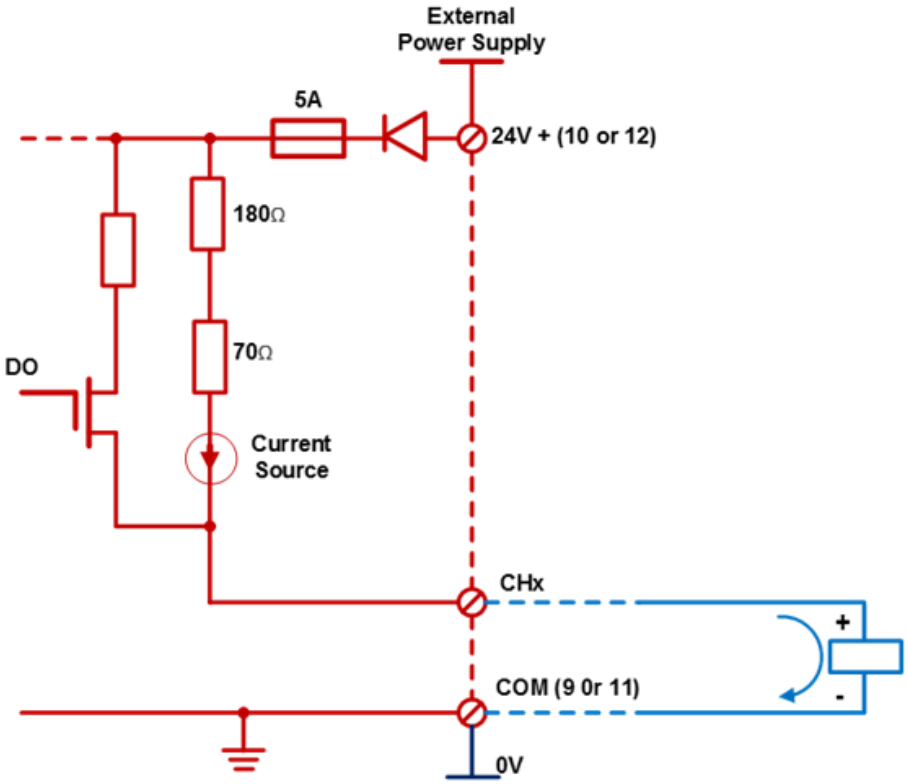
Table 5-19: UIO Specification for DO

Item	Description
Open wire detection	Configurable
Short circuit detection	Enabled by default and un-configurable
Maximum (resistive Load)	500mA
Minimum Load	20mA with OWD and 0mA without OWD
Maximum load capacitance	1 uF
Voltage Drop	< 1 V (at 500mA)
Off Current	< 0.1mA
Lead breakage test current	Approx. 10 mA
Output Current	0 - 23 mA

TIP:
If a Universal I/O Channel configured as Digital Output reports an “OP Fail in circuit/field wire” alarm, the most likely cause of the alarm is a broken wire. The user should check the continuity of field wiring. It is suggested to enable Line Monitoring for DOs so that the Event Log can clearly identify the problem as a possible wire break.

See the following figure for the channel configuration.

Figure 5-31: UIO_DO channel configuration



The UIO-DO channel supports ganging.

A set of two, three, or four DO channels can be configured to deliver up to 1 Ampere, 1.5 Amperes, or 2 Amperes current respectively to the field.

A two-pin branch with a pitch of 0.2 inches (5.08 mm) can be used for interconnecting two DO channels. The following table lists the pins branch for interconnecting the DO channels.

Table 5-20: UIO pins branch for interconnecting the DO

Pins	No. of DO channels Two pins
Two pins branch	2
Three pins branch	3
Four pins branch	4

The field wire must be connected with one of the following OUT pins (together with the branch). One of the OUT pins can be used for connecting the return field wire.

- Two DO channels with a two pin branch
- Three DO channels with a three pin branch

Universal Analog Input Module (UAI) Wiring

The Universal Analog Input Module has eight inputs, which can include any combination of the following input types: RTD, TC, Ohms, Millivolt, Volt, or Milliamp. Figure shows wiring examples of each of the analog input types. An example of wiring for eight TC inputs is given in Analog Input Wiring - Eight TCs section.

Specifications for this module, see Universal Analog Input Module (UAI) section.

> **ATTENTION:**
> To indicate sensor failure the Analog Input software will output a warning if thermocouple resistance > 80 ohms. Use appropriate gauge wiring to prevent inaccurate failure warnings.

Table 5-21: Typical Thermocouple resistance in Ohms per Double Foot @ 68 degrees F

AWG No.	Diameter inches	Type K	Type J	Type T	Type E	Type S Pt/ PT110	Type R Pt/ PT113	Type W5/ W26	Type W/ W26
10	0.102	0.058	0.034	0.029	0.069	0.018	0.018	0.023	0.020
12	0.081	0.091	0.054	0.046	0.109	0.028	0.029	0.037	0.031
14	0.064	0.146	0.087	0.074	0.175	0.045	0.047	0.058	0.049

AWG No.	Diameter inches	Type K	Type J	Type T	Type E	Type S Pt/ PT110	Type R Pt/ PT113	Type W5/ W26	Type W/ W26
16	0.051	0.230	0.137	0.117	0.276	0.071	0.073	0.092	0.078
18	0.040	0.374	0.222	0.190	0.448	0.116	0.119	0.148	0.126
20	0.032	0.586	0.357	0.298	0.707	0.185	0.190	0.235	0.200
24	0.0201	1.490	0.878	0.7526	1.78	0.464	0.478	0.594	0.560
26	0.0159	2.381	1.405	1.204	2.836	0.740	0.760	0.945	0.803
30	0.0100	5.984	3.551	3.043	7.169	1.85	1.91	2.38	2.03
Table values are shown as a reference only; actual values may vary. Consult manufacturer specifications.									

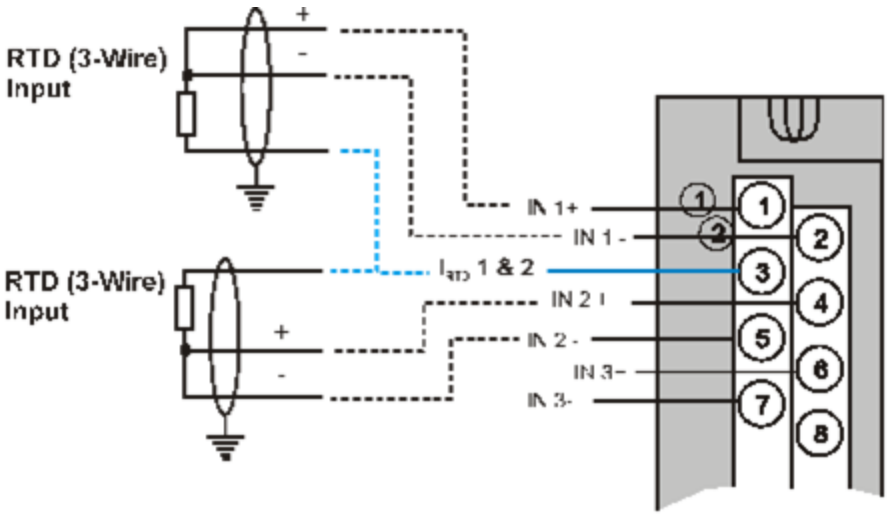
Isolation

This module has eight inputs, which are isolated except for RTD current sources.

RTD Inputs

RTD inputs share current sources (two RTD inputs per source), as shown below:

Figure 5-32: RTD Inputs



For example, the current source for the RTD input at channel one (terminals 1 and 2) is terminal 3 (IRTD 1 & 2). This same current source (IRTD 1 & 2) is also used for an RTD input at channel two (terminals 4 and 5).

Figure on RTD Inputs and Figure on Universal Analog Input Module (UAI) Wiring shows the examples of RTD input wiring (2-wire and 3-wire RTDs). Four-wire RTD inputs are not available.

OHMs Inputs

Ohms inputs are wired similar to 2-wire RTD inputs. That is, they require a current source, and thus must use one of the IRTD current sources. Also, two terminals are jumpered together as they are for two-wire RTD inputs.

Analog channels wired for Ohms inputs differ from RTD inputs in these aspects:

- Ohms inputs connect to variable resistance devices other than RTDs, and
- Ohms inputs are configured in ControlEdge Builder as Ohms inputs, rather than as RTD inputs.

Examples of wiring for resistance inputs are given in RTD Inputs section.

Shield Grounding

Shields must be grounded as described under Shield Grounding at the beginning of this guide.

CAUTION:
- Hazardous voltages exist at terminal blocks.
- Using switches at field devices disconnect the field wiring from power sources before servicing.
- Failure to comply with these instructions could result in death or serious injury.

Figure 5-33: Universal Analog Input Wiring

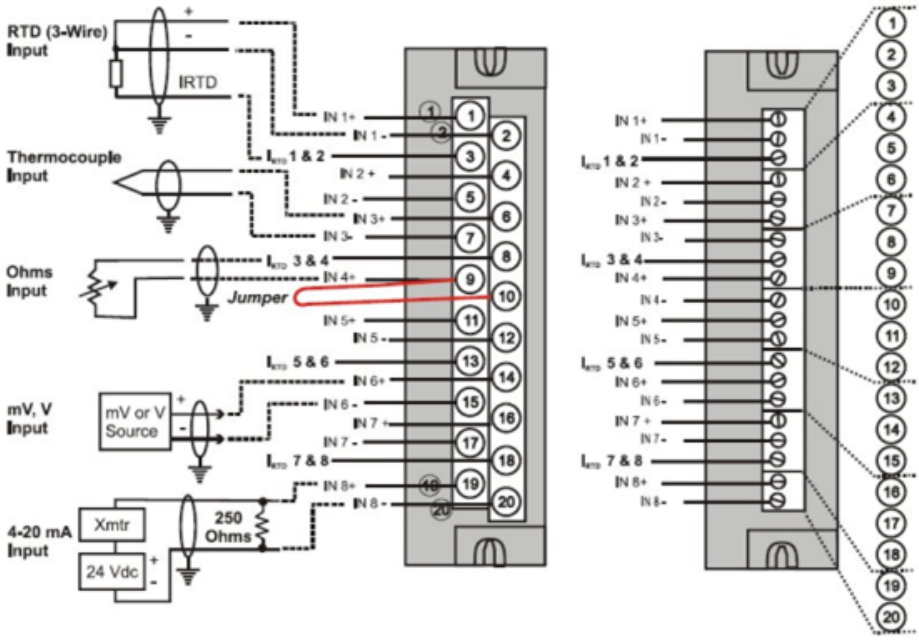


Figure 5-34: Examples of RTD Input Wiring

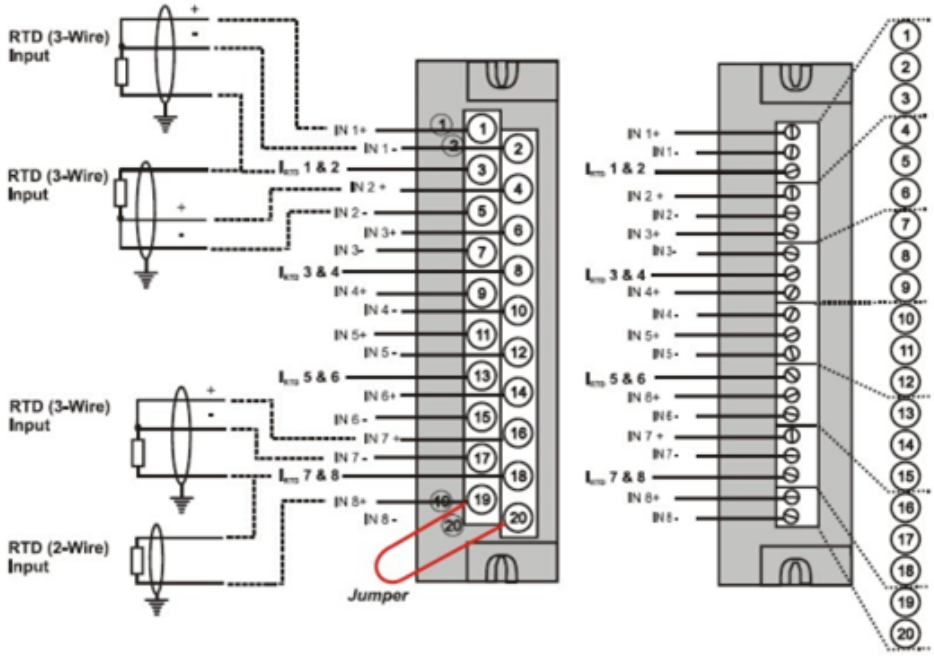


Figure 5-35: Analog Input Wiring - Eight TCs

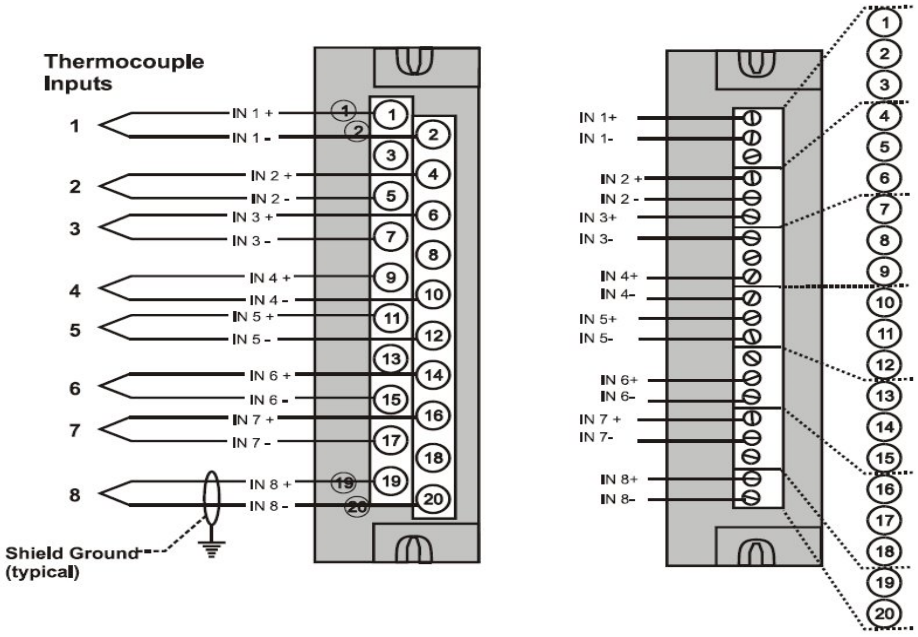


Figure 5-36: Analog Input Wiring - Eight Resistance Inputs

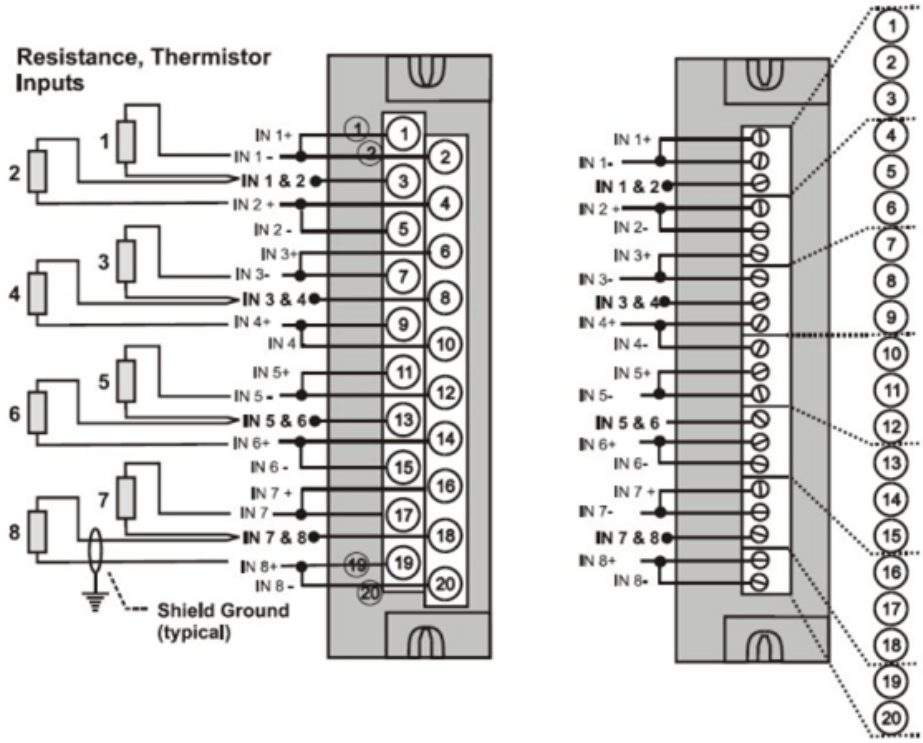
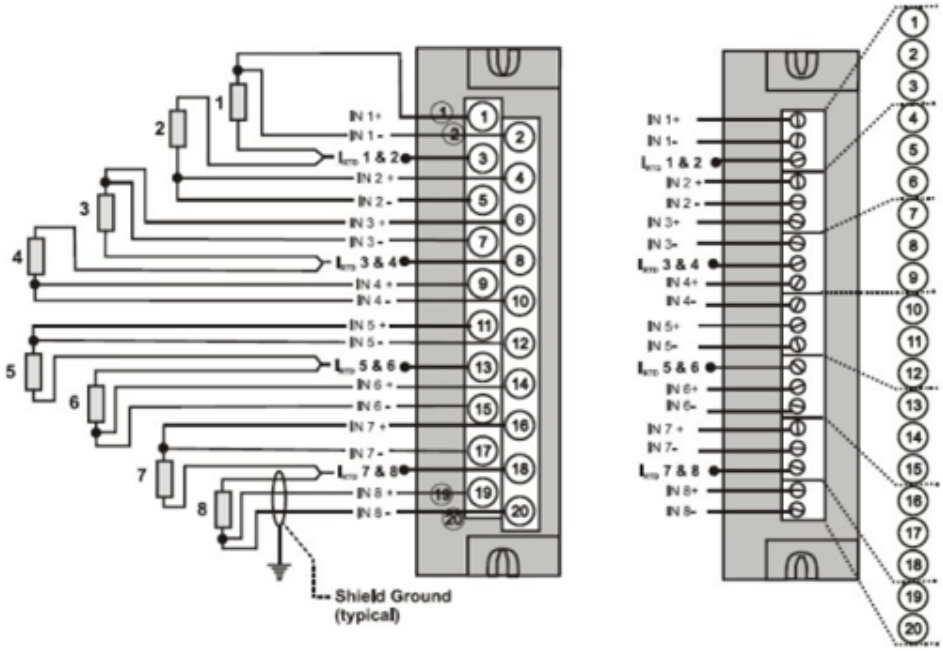


Figure 5-37: Analog Input Wiring - Eight RTDs



Digital Input Module (16 channels)-AC Voltage Type Wiring

The AC Input Module has sixteen inputs. An example of AC Input Module wiring is shown in the AC Input Module Wiring Diagram . Specifications for this module, see Digital Input Module (16 channels)-AC Voltage Type section.

Common Terminals

Two common terminals are provided for each group of eight inputs. Terminals 9 and 10 are for input 1 to 8 and terminal 11 and 12 are for input 9 to 16 as shown in AC Input Module Wiring Diagram section.

Jumper Comb

An optional two-position jumper comb is available as an option (for barrier style terminal blocks only) for connecting digital common wiring at terminals 9 and 11 or terminals 10 and 12. See Figure Digital Input Module (16 channels)-AC Voltage Type Wiring section.

CAUTION:
- Hazardous voltages exist at terminal blocks.
- Using switches at field devices, disconnect the field wiring from power sources before servicing.
- Failure to comply with these instructions could result in death or serious injury.

Figure 5-38: AC Input Module Wiring Diagram

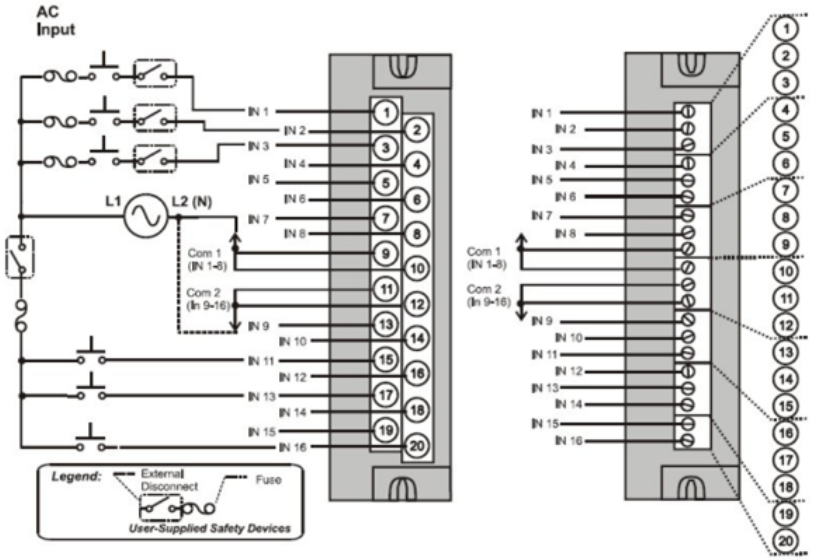
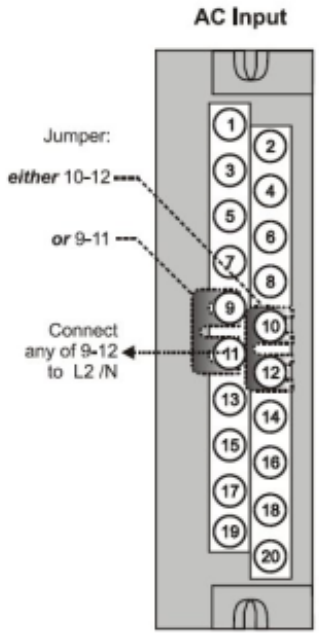


Figure 5-39: AC Input Module Jumper

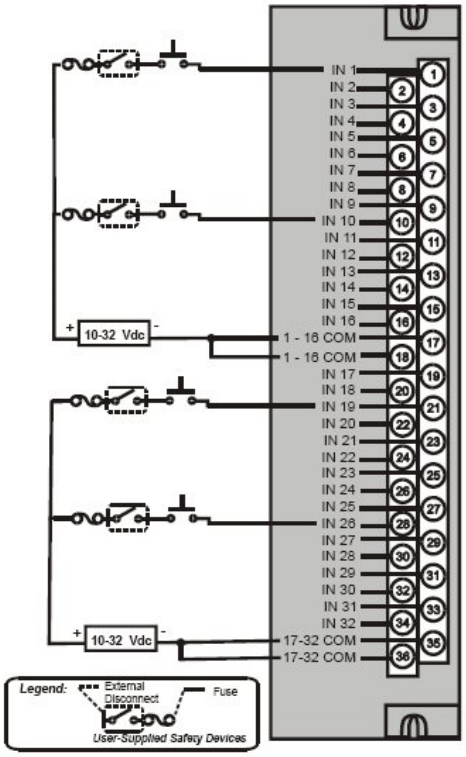


Digital Input Module (32 Channels)-DC Voltage Type Wiring

The 32-point DC Digital Input module below provides two groups of 16 inputs, each with a pair of terminals for connection to common. DC power applied between the common terminal and an input cause the input to turn ON. A green LED on the module provides indication of an ON state. Logic in the controller allows the state to be inverted when necessary.

Requires Low Voltage Euro style 36-terminal terminal block.

Figure 5-40: 32 point DC Input Module Wiring



Digital Output Module (8 Channels) - AC Voltage Type Wiring

The AC Output Module provides eight output circuits. Each output is isolated from the other outputs. An example of AC output wiring is shown below. Specifications for this module, see Digital Output Module (8 Channels)-AC Voltage Type section.

Output Loading

Voltage: 85 to 240 V AC

Maximum per output: 2.0 A resistive load

Maximum per module: 8.0 A

> **TIP:**
> When exceeding 1.0 A per output, it is recommended (but not required) to connect the high-current loads to every other output - for example, outputs 1, 3, 5, 7 or 2, 4, 6, 8. This distributes heat more evenly across the heat sink.

Jumper Comb

A ten-position jumper comb is available for inter-connecting all L1 (Hot) terminals (1, 3, 5, 7, 9, 11, 13, 15, 17, 19). See AC Output Module Jumper section.

Replaceable Fuses

Each output circuit on the AC Output Module includes a (plug-in) replaceable fuse.

Replacement fuse is from Wickmann, part #3741315041. This is a 3.15 Amp time lag fuse with UL/CSA approval for 250 V AC.

Figure 5-41: AC Output Module Wiring Diagram

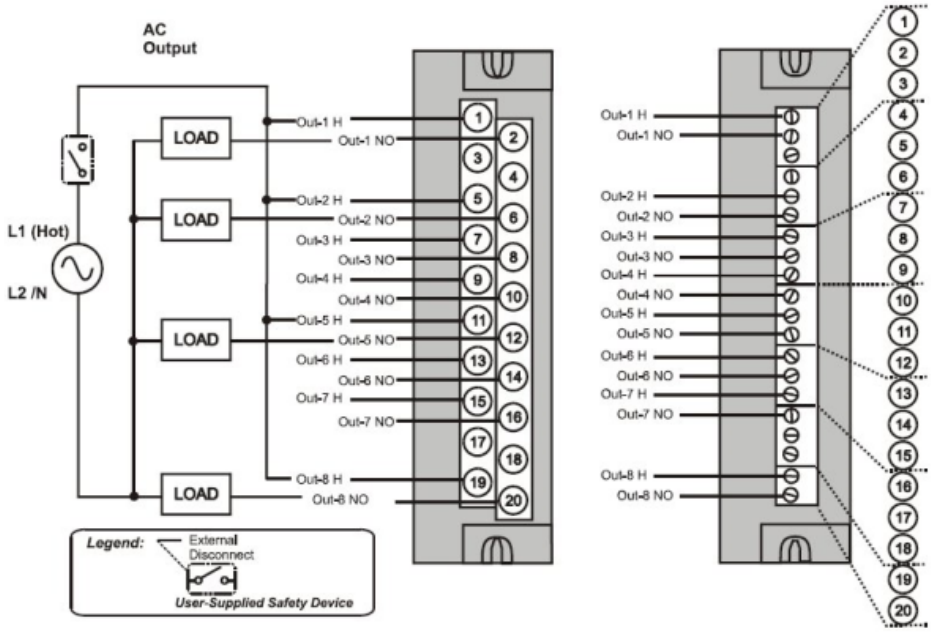
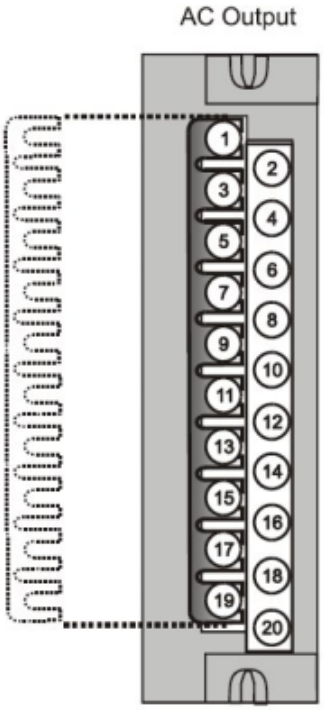


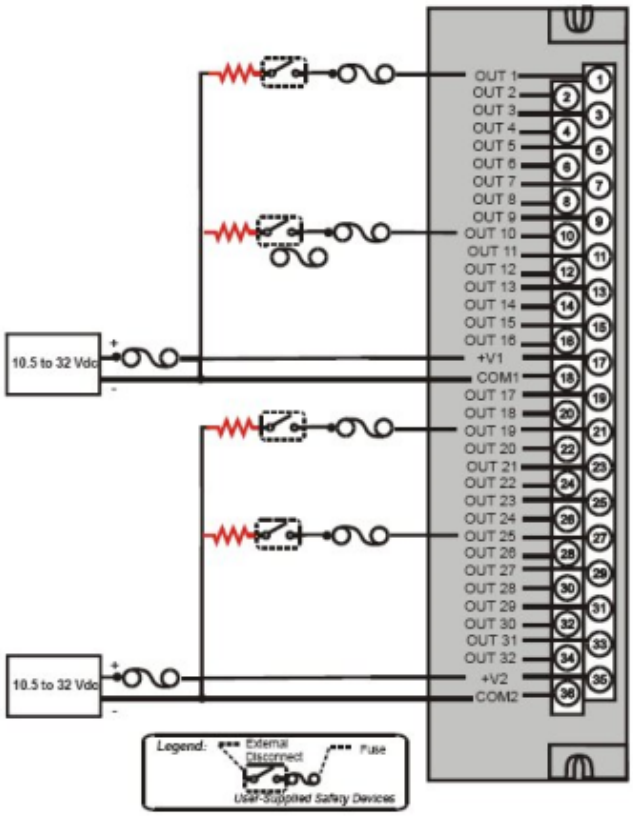
Figure 5-42: AC Output Module Jumper



Digital Output Module (32 Channels)-DC Voltage Type Wiring

The DC digital Output module provides 32 externally powered outputs in 2 groups of 16 (Figure below). The outputs are high side switching (current sourcing) type. Over-current protection is provided for each channel, in 4 groups of 8 channels. In case of short circuit for any output channel, that whole group of 8 is switched off. Power cycling is not required to reset the module. A green LED on the module provides indication of an ON state for each output. It can be used with Low Voltage Euro style 36-terminal terminal block.

Figure 5-43: 32 point DC Output Module Wiring



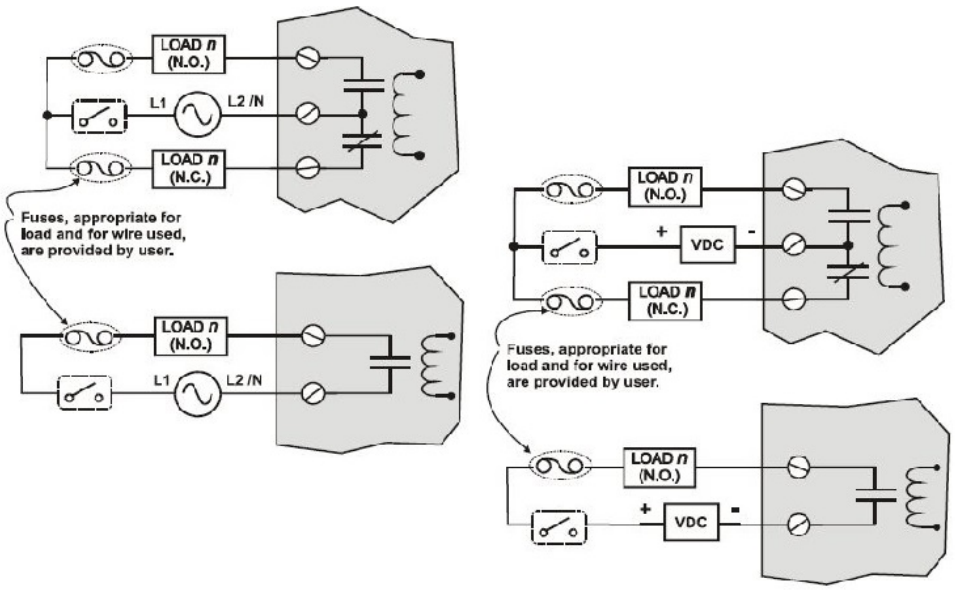
Relay Output Module Wiring

The Relay Output Module provides eight individually isolated, electromechanical relay outputs. Four of the outputs are Form-C, and the other four are Form-A. A schematic showing the relationship of

individual Form-A relays and Form-C relays to external (user) connections is given below.

Examples of Relay Output wiring as they relate to connections on the Terminal Block are shown below.

Figure 5-44: Schematic Example: Relay Output and External Wiring



Contact Rating

Maximum current/output: 4A at 250Vac/30Vdc with resistive load

Maximum current per module: No de-rating per module, but ensure compliance with maximum ratings for each output.

> **TIP:** specified relay life is 1,000,000 cycles. For applications requiring constant cycling of output, Honeywell recommends using a solid state AC or DC output module.

Required Output Fusing

Outputs are not fused in the Relay module. Install a fuse for each output at the field device that is appropriate for the load and the wire used.

Jumper Comb

A ten-position jumper comb, available for the AC Output Module, can be cut in half and used as shown below to reduce the number of

wires required to connect the Relay Output Module to AC Neutral or to DC Common.

> **CAUTION: Hazardous voltages** exist at terminal blocks.
>
> Using switches at field devices disconnect the field wiring from power sources before servicing.
>
> Failure to comply with these instructions could result in death or serious injury.

Figure 5-45: Relay Output Module Wiring Diagram

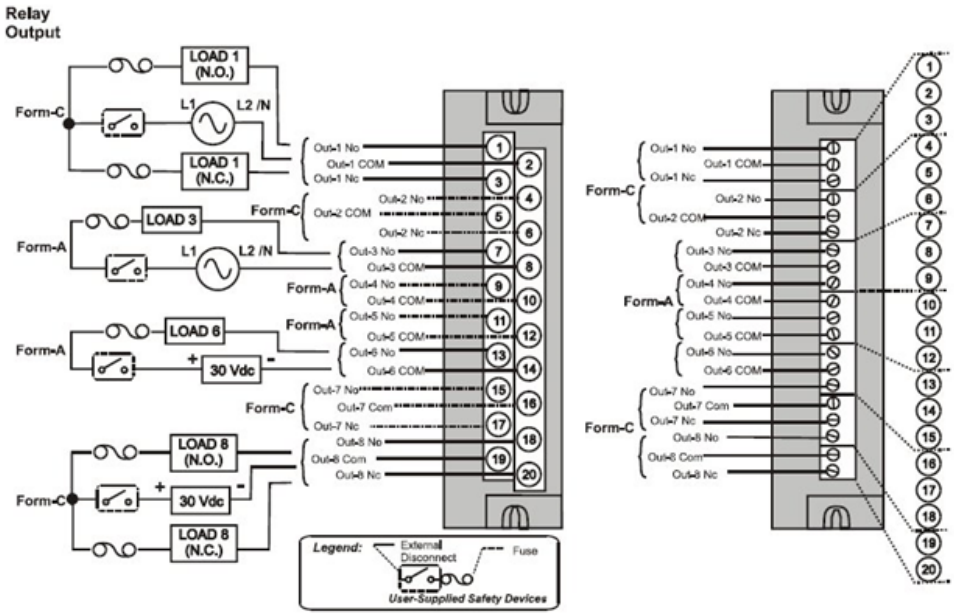
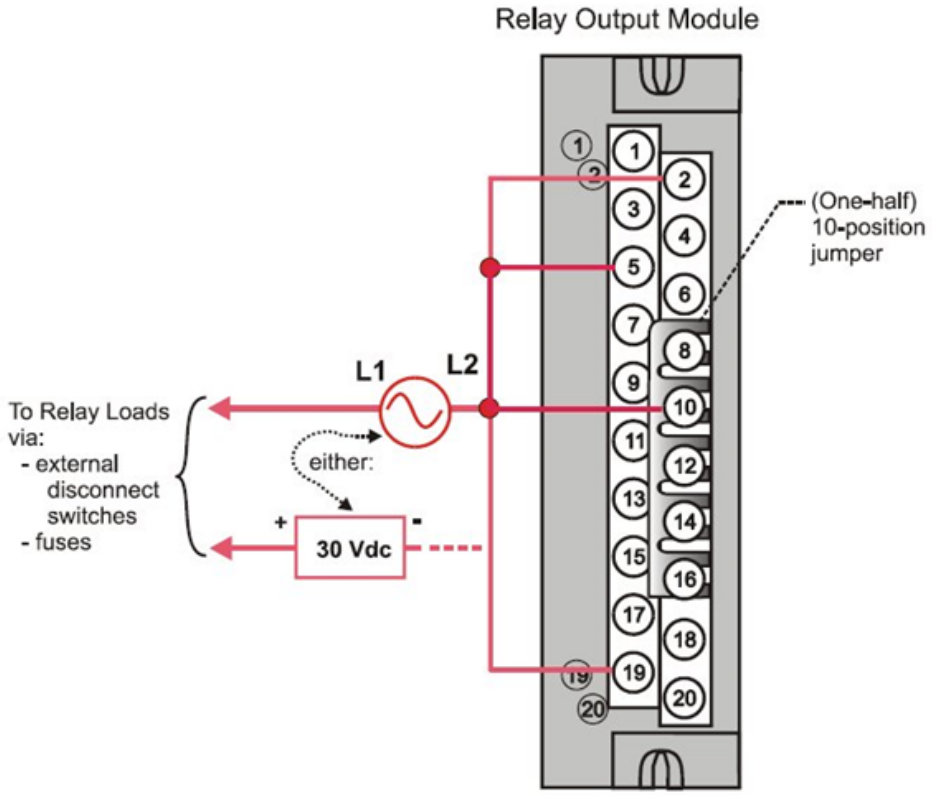


Figure 5-46: Relay Output Module Jumpers



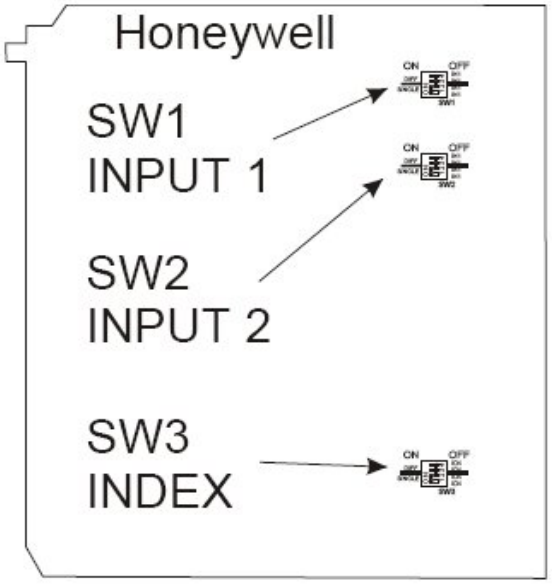
Pulse/Frequency/Quadrature Module (4 Channels) Wiring

The 4 Channel Pulse/Frequency/Quadrature Module provides four different functionalities in the form of Pulse Input, Frequency measurement, Quadrature encoder input (not support till now) and Pulse Output. Each of the 4 channels can be configured for any one of these four functionalities.

The Pulse Output functionality uses the digital output available on the module for outputting pulses.

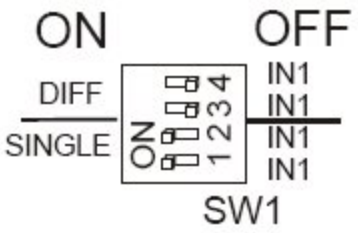
Before installing be sure to set the module DIP switches for differential or single ended. See the following diagram:

Figure 5-47: Switch location on PFQ module



Settings(using input 1 as example)

Single ended (factory setting):



Differential:

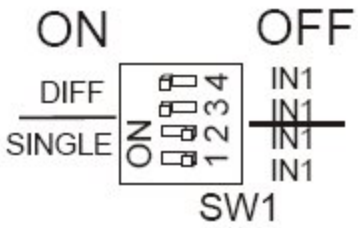


Figure 5-48: Pulse Counting Wiring

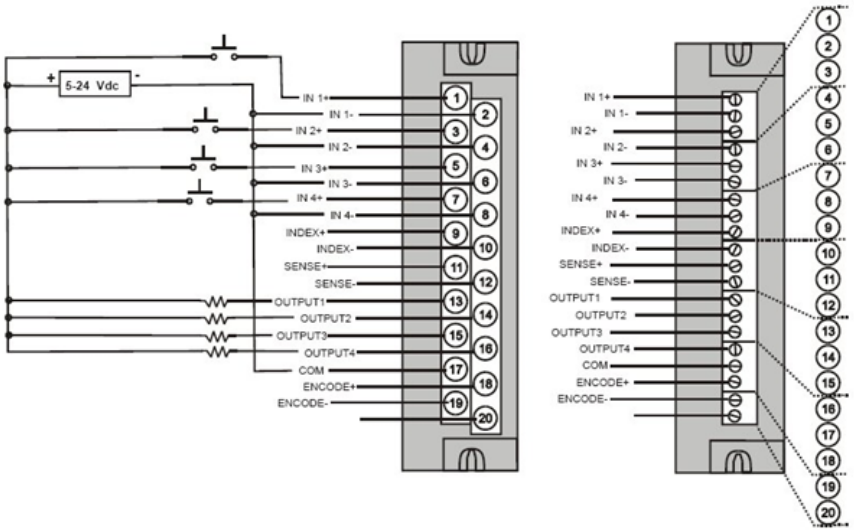


Figure 5-49: Pulse Outing Wiring

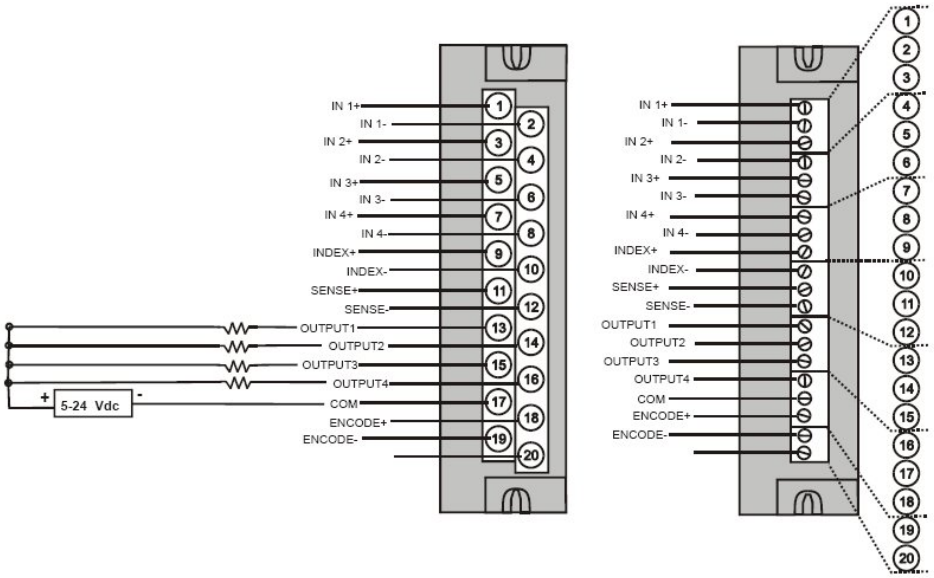
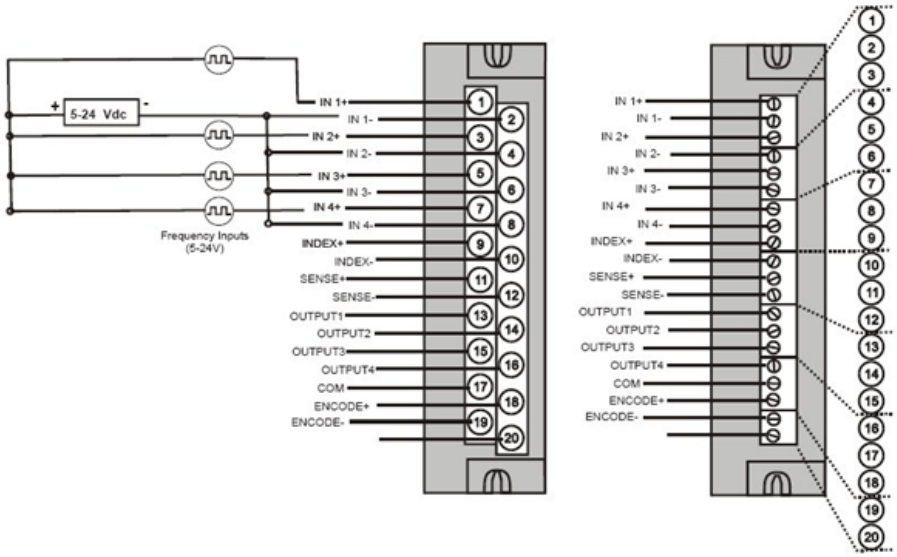


Figure 5-50: Frequency Wiring



Analog Output Module (4 Channels) Wiring

An example of Analog Output Module wiring is shown below.

Isolation

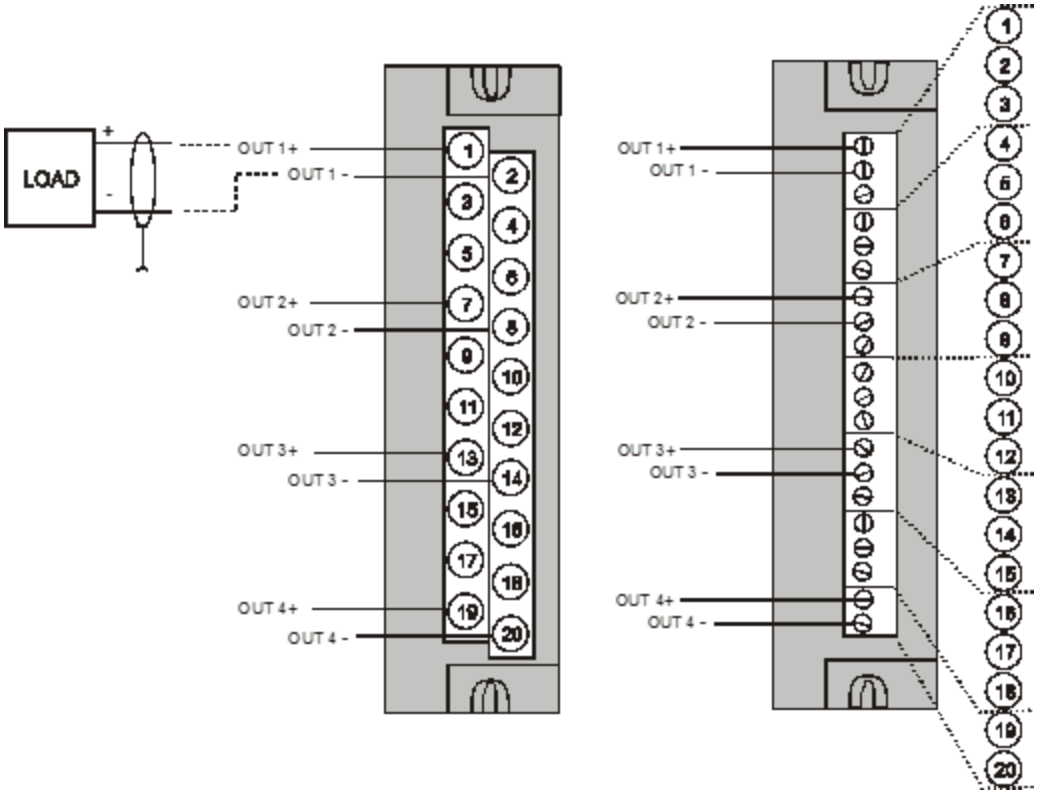
The four outputs are isolated from each other.

Shield Grounding

Shields must be grounded as described under Shield Grounding at the beginning of this section.

> **CAUTION: Hazardous voltages** exist at terminal blocks.
>
> Using switches at field devices disconnect the field wiring form power sources before servicing.
>
> Failure to comply with these instructions could result in death or serious injury.

Figure 5-51: 4 channel Analog Output Wiring Diagram



Analog Output Module (8 Channels) Wiring

CAUTION: Hazardous voltages exist at terminal blocks. AO8 modules require at least one channel to be configured prior to a cold start for the module to work properly. Subsequent channels then may be added with a hot start. Failure to comply with these instructions could result in death or serious injury.

Examples of high level Analog Output Module wiring are shown below. Before installing, be sure to determine power requirements.

Isolation

The outputs are grouped with 4 outputs per group (outputs 1-4, 5-8, 9-12, 13-16). Groups are isolated from each other; outputs are non-isolated within each group.

Shield Grounding

Shields must be grounded as described under Shield Grounding at the beginning of this section.

> **CAUTION: Hazardous voltages** exist at terminal blocks.
> Using switches at field devices disconnect the field wiring form power sources before servicing.
> Failure to comply with these instructions could result in death or serious injury.

If installing 8 channel Analog Output module, set its DIP switch as follows. (Switch is located at edge of module, marked “SW1”.)

- For internal rack power, set DIP switch to ON.
- For external power (18-36V), set DIP switch to OFF (default).

> **NOTE:** 24VDC external power is required if using 6 or more 8-pt. AO modules or 3 or more 16-pt. AO modules.

A small slotted screwdriver or paperclip works well; avoid using pencils.

Figure 5-52: Dip Switch Position of 8 Channel AO

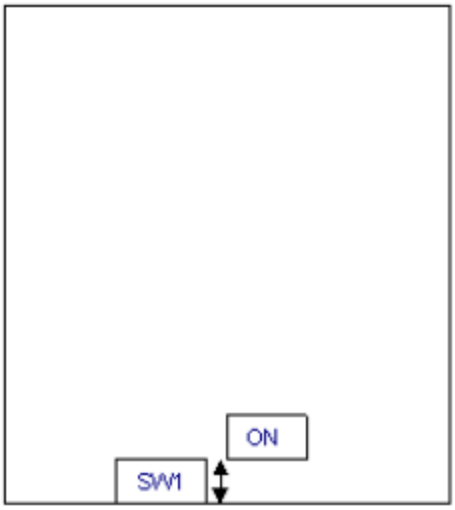
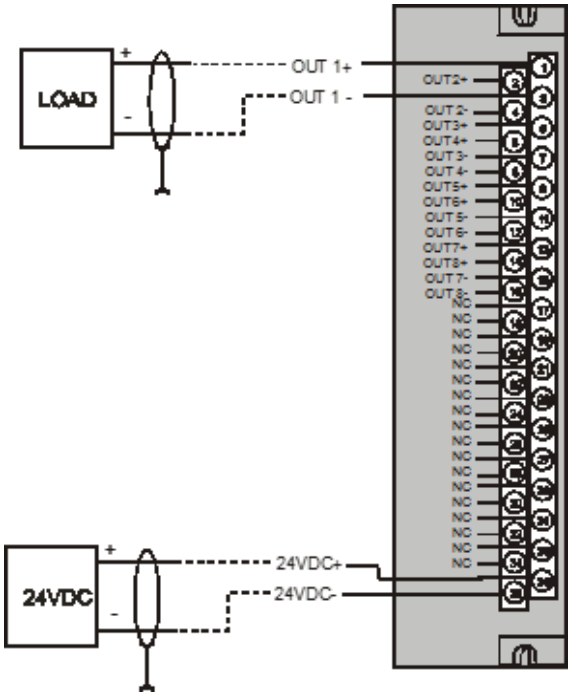


Figure 5-53: 8 Channel Analog Output Wiring Diagram



High Level Analog Input Module (16 Channels) Wiring

Be sure to set the module DIP switches for voltage or current mode. See the following diagram. This requires Low Voltage Euro style 36-terminal terminal block. Requires Low Voltage Euro style 36-terminal terminal block.

Set its SW1 and SW2 DIP switches to ON. This connects an internal 250 ohm resistor.

A small slotted screwdriver or paperclip works well; avoid using pencils.

> **NOTE:** Unused input channel shall not be left open for 900A16-XXXX IO module.

Figure 5-54: HLAI Switch

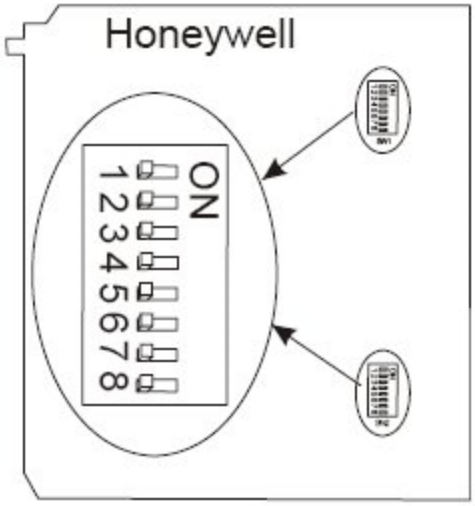
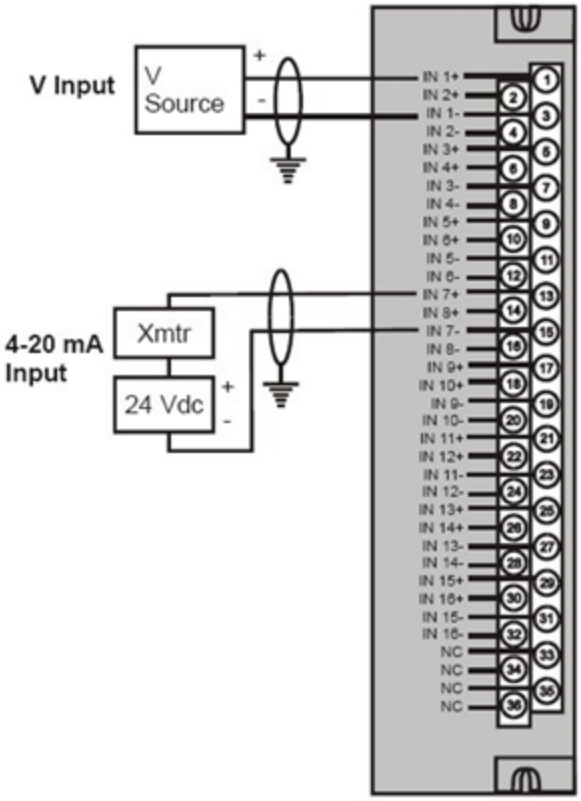


Figure 5-55: 16 point High Level Analog Input Wiring



Digital Input Module-Contact Type (16 Channel) Wiring

The Contact Input Module has sixteen inputs in one group. An example of Contact Input wiring is shown below.

Internally Powered Input Channels

The Contact Input Module provides voltage to the field contacts.

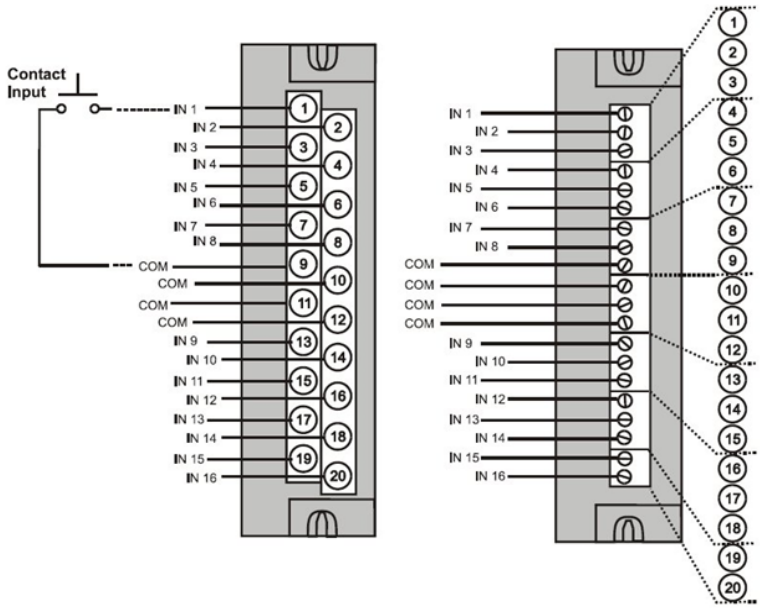
> **CAUTION:** Do not apply any external power to the field device or to the input terminals. Doing so could damage the module.

Common terminals

Four common terminals are provided for the 16 inputs. Terminals 9, 10, 11, and 12 are connected in the Contact Input module.

> **CAUTION: Hazardous voltages** exist at terminal blocks.
>
> Using switches at field devices disconnect the field wiring from power sources before servicing.
>
> Failure to comply with these instructions could result in death or serious injury.

Figure 5-56: Contact Input Wiring Diagram



AC/DC Isolated Input Module Wiring

The AC/DC Input Module has sixteen isolated inputs. An example of AC Input and DC input Module wiring is shown below. And it requires Low Voltage Euro style 36-terminal terminal block.

Isolation

Inputs must be powered from external voltage sources. Inputs are isolated from each other and from controller power.

Figure 5-57: Isolation of Ac/DC Isolated Input Module

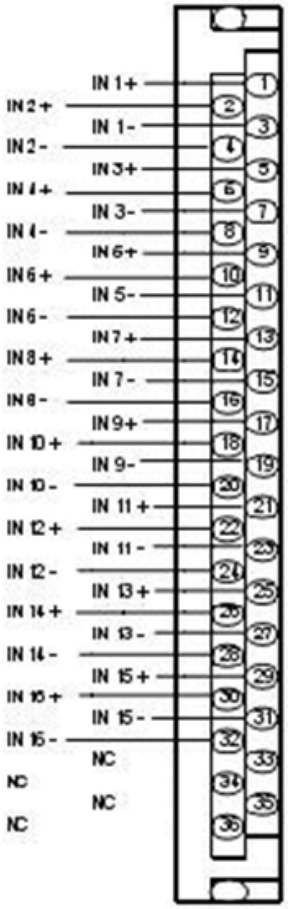
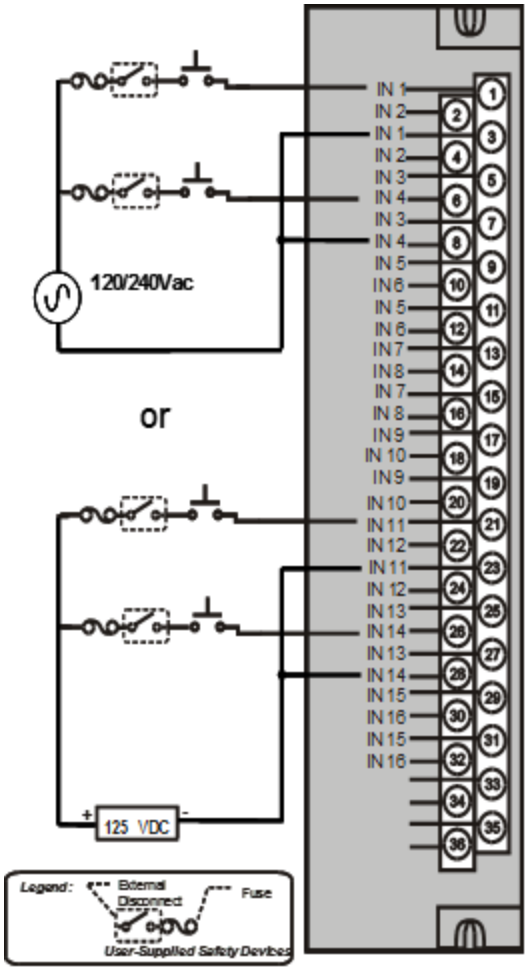


Figure 5-58: AC/DC Isolated Input Module Wiring



MasterLogic EtherNet/IP adapters

EtherNet/IP adapters are used for communication between the ControlEdge 900 controller and MasterLogic I/O modules.

ML50 EtherNet/IP adpater: MEL-BSSRT (Electrical/Copper) Firmware version V1.7

ML200 EtherNet/IP adpater: 2MLL-DBDT (Electrical/Copper) Firmware version V1.3

This section explains general specifications and communication information for the Masterlogic EtherNet/IP adapters.

MEL-BSSRT EtherNet/IP adapter for ML50 I/O

Table 5-22: General specifications

Item	Specification				Standard
Ambient temperature	0 to 55° C				-
Storage temperature	-25 to 70° C				-
Ambient humidity	5 to 95% RH, non-condensing				-
Storage humidity	5 to 95%RH, non-condensing				-
Vibration resistance	Occasional vibration				-
	Frequency	Acceleration	Amplitude	times	IEC61131-2
	5 ≤ f< 8.4 Hz	-	3.5 mm	10 times in each direction for X, Y, Z	
	8.4≤ f≤ 150 Hz	9.8 m/s2 (1G)	-		
	Continuous vibration				
	Frequency	Acceleration	Amplitude		
	5 ≤ f< 8.4 Hz	-	1.75 mm		
	8.4≤ f≤ 150 Hz	4.9 m/s2 (0.5G)	-		
Shock resistance	• Peek acceleration: 147 m/s2(15G) • Duration: 11ms • Half-sine, three times each direction per each axis				IEC61131-2
Noise	Square Wave	AC: ±1500 V			Internal

Item	Specification				Standard
resistance	Impulse noise	DC: ±900V			Standard
	Electrostatic discharge	Voltage: 4kV (Contact discharge)			IC61131-2 IEC61000-4-2
	Radiated electromagnetic field noise	80 to 1000 MHz, 10 V/m			IC61131-2 IEC61000-4-3
	Fast transient burst noise	Segment	Power supply module	Digital/analog input/output communication interface	IC61131-2 IEC61000-4-4
		Voltage	2 kV	1 kV	
Environment	Free from corrosive gasses and excessive dust				-
Altitude	Up to 2,000 ms				-
Pollution degree	Less than equal to 2				-
Cooling	Air-Cooling				-

Table 5-23: communication specifications

Item	MEL-BSSRT	
Transmission Specification	Transmission speed	100/1000Mbps
	Transmission method	Base band
	Maximum distance between nodes	Electric: 100m@CAT5E or higher Optical: 2km@100Mbps.MM , 550m@1Gbps.MM ,5km~80km@ SM
	Send media	Electric: Category 5E or higher STP (Shielded Twisted pair) cable Optical: Multi mode (MMF)/Single mode (SMF) cable.
	Maximum protocol size	1500 bytes
	Communication network access method	CSMA/CD
	Frame error check method	CRC32
Max. Load	Ethernet: 10,000pps	
Topology	Star, Ring, and Linear (between adapters)	
Diagnosis function	IP collision detection function, self diagnosis service, diagnosis using SoftMaster.	
IP setting method	Rotary switch, SoftMaster, BOOTP;	
IP setting range	ML adapter only supports StaticIP, 1. The default IP address is 172.168.0.XX, the XX is configured on 1x and 10x rotary switches on the adapter. 2. The range of the IP address is from 1 to 99. 3. The IP address cannot be in the same network subnet as ETH1 and ETH2. 4. If you want to change to the other subnet (for example:10.10.10.XX), should set 1x and 10x rotary switches to 0(zero) and use additional software: SoftMaster.	

Item	MEL-BSSRT	
External connecting terminal	USB mini B: PADT connection RJ45, SFP: PADT connection, data communication	
Status indication LED	RUN, RMS, RNS, RELAY, LINK/ACT1, LINK/ACT2	
Parameter setting	SoftMaster (USB, Ethernetport)	
Device file	EDS file(Only EtherNet/IP)	
I/O Refresh size	Max input refresh size	512 Byte
	Max output refresh size	512 Byte
Protocol Specifications (EtherNet/IP)	Data processing unit	Byte(8bit)
	Max read data size	Non periodic tag: 1,400 Byte Non periodic object : 1,024 Byte Cycle 1,024 Byte
	Max write data size	Non periodic tag: 1,400 Byte Non periodic object : 1,024 Byte Cycle 1,024 Byte
	Available communication type	Connection type (Cycle) messages: Class1 Non connection type(Non periodic) message: Tag, Object
	Maximum number of connections	Connection type (Cycle) :10 Non connection type(Non periodic) message(Tag, Object):10
Protocol Specifications (Modbus TCP/IP)	Data processing unit	Word(16bit),bit
	Max read data size	125 Word(2,000 Bits)
	Max write data size	123 Word(1,968 Bits)
	Maximum number of connections	64

2MLL-DBDT EtherNet/IP adapter for ML200 I/O

Table 5-24: General specifications

<table>
<tr><th>Item</th><th colspan="4">Specification</th><th>Standard</th></tr>
<tr><td>Ambient temperature</td><td colspan="4">0 to 55° C</td><td>-</td></tr>
<tr><td>Storage temperature</td><td colspan="4">-25 to 70° C</td><td>-</td></tr>
<tr><td>Ambient humidity</td><td colspan="4">5 to 95% RH, non-condensing</td><td>-</td></tr>
<tr><td>Storage humidity</td><td colspan="4">5 to 95%RH, non-condensing</td><td>-</td></tr>
<tr><td rowspan="10">Vibration resistance</td><td colspan="4">Occasional vibration</td><td>-</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>times</td><td rowspan="9">IEC61131-2</td></tr>
<tr><td>5 ≤ f< 8.4 Hz</td><td>-</td><td>3.5 mm</td><td rowspan="4">10 times in each direction for X, Y, Z</td></tr>
<tr><td>8.4≤ f≤ 150 Hz</td><td>9.8 m/s2 (1G)</td><td>-</td></tr>
<tr><td colspan="3">Continuous vibration</td></tr>
<tr><td>Frequency</td><td>Acceleration</td><td>Amplitude</td></tr>
<tr><td>5 ≤ f< 8.4 Hz</td><td>-</td><td>1.75 mm</td></tr>
<tr><td>8.4≤ f≤ 150 Hz</td><td>4.9 m/s2 (0.5G)</td><td>-</td></tr>
<tr><td>Shock resistance</td><td colspan="4">• Peek acceleration: 147 m/s2(15G)
• Duration: 11ms
• Half-sine, three times each direction per each axis</td><td>IEC61131-2</td></tr>
<tr><td>Noise</td><td>Square Wave</td><td colspan="3">AC: ±1500 V</td><td>Internal</td></tr>
</table>

Item	Specification				Standard
resistance	Impulse noise	DC: ±900V			Standard
	Electrostatic discharge	Voltage: 4kV (Contact discharge)			IC61131-2 IEC61000-4-2
	Radiated electromagnetic field noise	80 to 1000 MHz, 10 V/m			IC61131-2 IEC61000-4-3
	Fast transient burst noise	Segment	Power supply module	Digital/analog input/output communication interface	IC61131-2 IEC61000-4-4
		Voltage	2 kV	1 kV	
Environment	Free from corrosive gasses and excessive dust				-
Altitude	Up to 2,000 ms				-
Pollution degree	Less than equal to 2				-
Cooling	Air-Cooling				-

Table 5-25: communication specifications

Item	2MLL-DBDT	
Transmission Specification	Transmission speed	100/1000Mbps
	Transmission method	Base band
	Maximum distance between nodes	Electric: 100m@CAT5E or higher Optical: 2km@100Mbps.MM , 550m@1Gbps.MM ,5km~80km@ SM
	Send media	Electric: Category 5E or higher STP (Shielded Twisted pair) cable Optical: Multi mode(MMF)/Single mode(SMF) cable.
	Maximum protocol size	1500 bytes
	Communication network access method	CSMA/CD
	Frame error check method	CRC32
Max. Load	Ethernet: 10,000pps	
Topology	Star, Ring, and Linear (between adapters)	
Diagnosis function	IP collision detection function, self diagnosis service, diagnosis using SoftMaster.	
IP setting method	Rotary switch, SoftMaster, BOOTP	
IP setting range	ML adapter only supports StaticIP, 1. The default IP address is 172.168.0.XX, the XX is configured on 1x and 10x rotary switches on the adapter. 2. The range of the IP address is from 1 to 99. 3. The IP address cannot be in the same network subnet as ETH1 and ETH2. 4. If you want to change to the other subnet (for example: 10.10.10.XX), should set 1x and 10x rotary switches to 0(zero) and use additional software: SoftMaster.	

Item	2MLL-DBDT	
External connecting terminal	USB mini B: PADT connection RJ45, SFP: PADT connection, data communication	
Status indication LED	PWR, RUN, SVR, I/F, RELAY. PADT, CHK, ERR, FAULT, LINK, ACT	
Parameter setting	SoftMaster (USB, Ethernetport)	
Device file	EDS file (Only EtherNet/IP)	
Maximum number of modules to be installed	12ea	
I/O Refresh size	Max input refresh size	768 Byte
	Max output refresh size	768Byte
Protocol Specifications (EtherNet/IP)	Data processing unit	Byte(8bit)
	Max read data size	Non periodic tag: 1,400 Byte Non periodic object : 1,024 Byte Cycle 1,024 Byte
	Max write data size	Non periodic tag: 1,400 Byte Non periodic object : 1,024 Byte Cycle 1,024 Byte
	Available communication type	Connection type (Cycle) messages: Class1 Non connection type(Non periodic) message: Tag, Object
	Maximum number of connections	Connection type (Cycle) :10 Non connection type(Non periodic) message(Tag, Object):10
Protocol Specifications (Modbus TCP/IP)	Data processing unit	Word(16bit),bit
	Max read data size	125 Word(2,000 Bits)
	Max write data size	123 Word(1,968 Bits)
	Maximum number of connections	64

CHAPTER

6 WIRING AND CABLING PLANNING

Before wiring and cabling, the electrical environment including grounding and distance should be considered. This section provides wiring and cabling diagrams and specifications to assist with the planning.

Electrical considerations

Racks must be mounted and wired using following good industrial practices, such as proper grounding, shielding, local and national electrical codes to ensure proper operation, safety, electrical and EMC compliance.

This section includes diagrams showing the recommended wiring practice for each protective electrical enclosure.

When redundant power supplies are used in Redundant Controller Racks or I/O rack, separate line power sources are recommended to provide the highest level of redundancy and system operation.

Deviations from the installation conditions specified in this manual may invalidate this product's conformity with Low Voltage and EMC.

CAUTION:

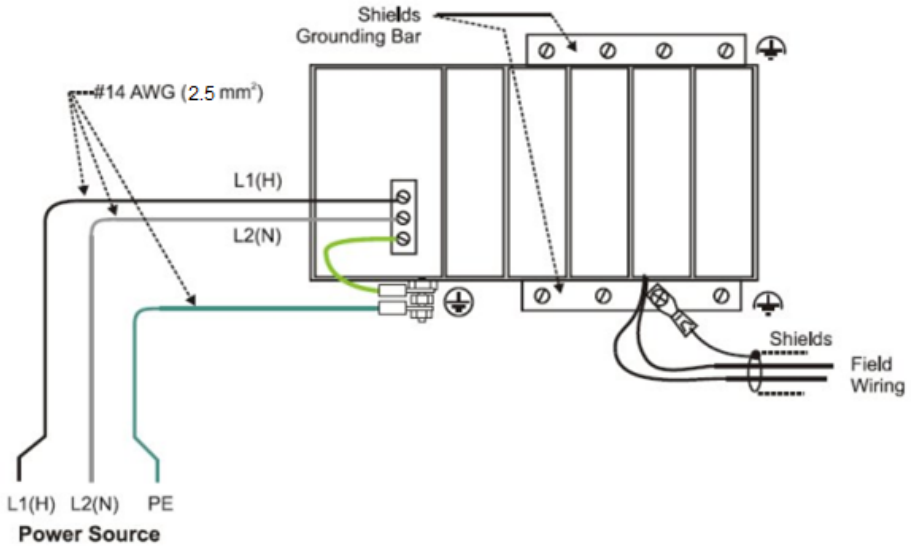
- Hazardous voltages exist in the equipment enclosure. Identify and avoid contact with voltage sources.
- Failure to comply with these instructions could result in death or serious injury.

Controller grounding

Protective bonding (grounding) of the controller and the enclosure in which it is installed must be in accordance with National Electrical Code (ANSI/NFPA 70), Canadian Electrical Code (CEC), IEC 60364 and with local electrical codes.

See the following figure for the protective electrical enclosure wiring with single rack:

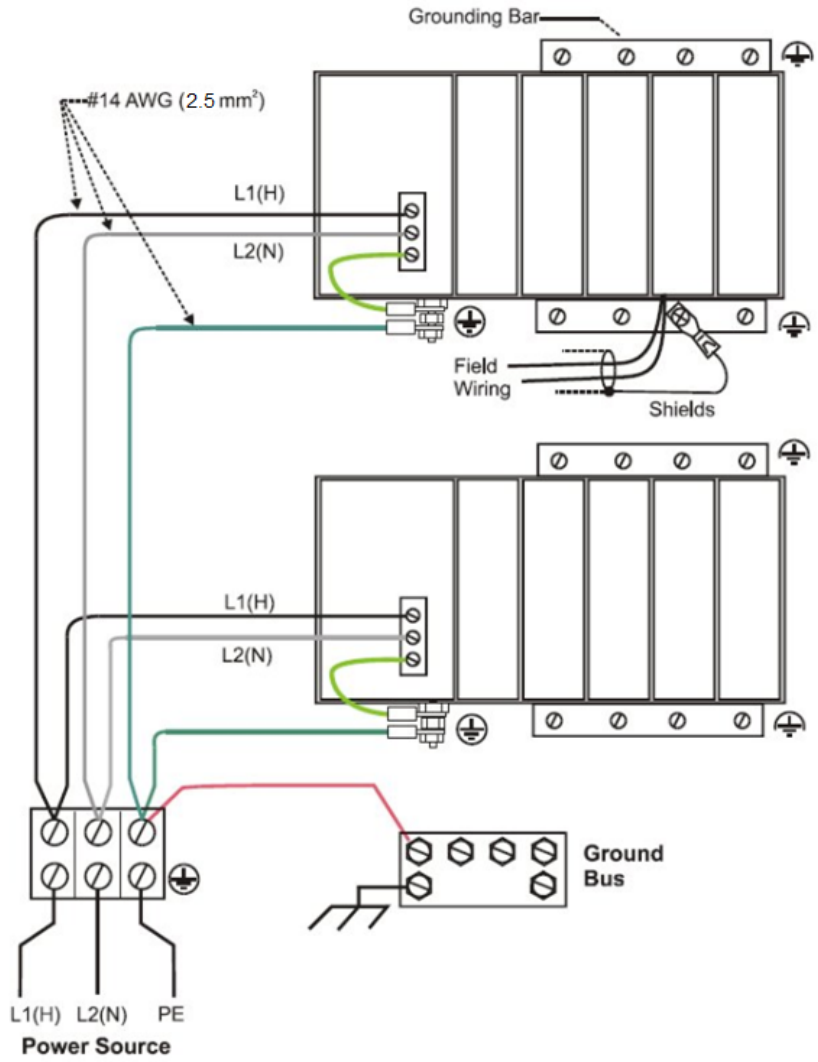
Figure 6-1: Protective electrical enclosure wiring, Single Rack



For 2 phase power source, external circuit breaker must be included in both L1 and L2.

See the following figure for the protective electrical enclosure wiring with multiple racks:

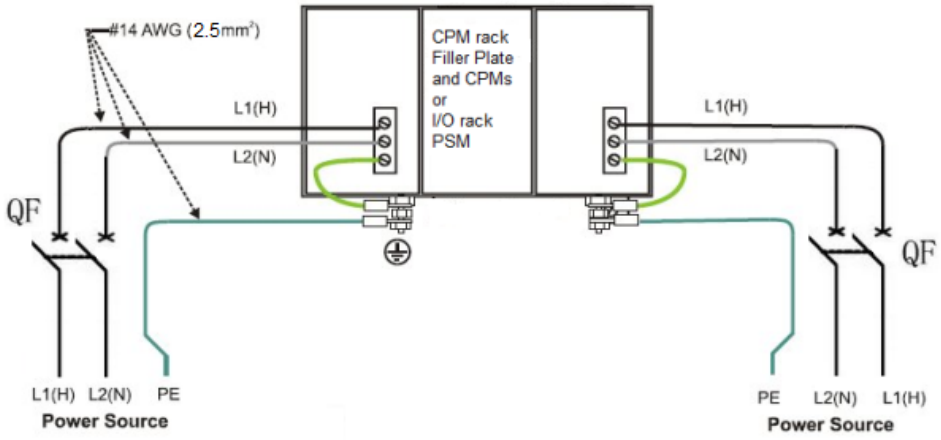
Figure 6-2: Protective electrical enclosure wiring, Multiple Racks



For 2 phase power source, external circuit breaker must be included in both L1 and L2 for each rack.

See the following figure for redundant power supplies each with external circuit breaker:

Figure 6-3: Redundant power supplies each with external circuit breaker



For 2 phase power source, external circuit breaker must be included in both L1 and L2.

See the following table for the slow-blow fuse of the two power supplies.

Table 6-1: Slow-blow of power supplies

Power supply	Input rating	Slow-blow
AC power supply	115 V AC	3.0 A
	230 V AC	2.5 A
DC power supply	24 V DC	7.0 A

CE Conformity

Electrical noise produces undesirable effects in measurements and control circuits.

Digital equipment is especially sensitive to the effects of electrical noise. The following methods can help to reduce these effects:

- Use separate external wiring – group connecting wires into bundles (see Guidelines for grouping wires section) and route the individual bundles through separate conduits or metal trays.
- Use shielded cables for all I/O channels. Ground shields as described in I/O Module installation and wiring section.

- Use suppression devices for additional noise protection. The suppression devices can be added at the external source. Appropriate suppression devices are commercially available.

Grounding wires for routing

Wires that carry relatively high electrical energy can produce unwanted noise in wires that transmit signals of relatively low energy, particularly when they are placed parallel in long wiring runs.

Collect and bundle wires of similar type, and route the bundle separate from bundles of other types. The following table provides suggested guidelines for grouping wires.

Table 6-2: Guidelines for grouping wires

Wire Group	Wire Functions
High voltage (>50 Vdc/VAC)	AC Line power wiring
Signal (<15 Vdc)	Analog signal wire, such as:
Low voltage (<50 Vdc/VAC)	Low voltage alarm relay output wiring

Wiring and cabling distance guidelines

Three network topologies are supported in I/O network: Ring (HSR), DLR and Star.

- For Ethernet connections, cable length must be less than 100 m. The use of Ethernet cables in excess of 100 meters and/or devices other than recommended switches will cause transmission delays on the I/O link which could have adverse effects on CPM performance.

  ATTENTION: Shielded Ethernet cables are required for I/O link.

- For greater than 100 m, a fiber optic cable is recommended with a fiber switch or fiber optic converter.
- If a multi-mode fiber optic cable connects to a MOXA unmanaged Ethernet Switch or similar devices, the distance of the cable is up to 5km. See Fiber Optics Recommendations section for more information.

- Cable lengths specified in this guide are absolute. When planning for routing of cables and wires, be certain to include vertical and horizontal routing within cabinets, raceways, and conduits.
- Minimize the length of I/O wiring. Racks and wiring should also be located away from adverse environmental conditions such as sources of RFI, EMI, and away from areas with high levels of moisture, dust, and corrosive materials.
- For a Star network topology, a switch is required between the CPM and multiple I/O rack.
- One fiber optical converter can be added to connect the switch and a remote rack.
- For a Star network topology, a redundant switch is optional. The I/O network is a private network and other devices including health monitor application, must not connect to it, or it may result in critical performance and security issues.

Fiber Optics Recommendations

Honeywell recommends to use the fiber optic cable for distances longer than 100m. Equipment tested with the fiber optic cable is listed in the following table:

Table 6-3: Fiber optics equipment recommendations

Items	Description
Ethernet Switch	MOXA Unmanaged Ethernet Switch EDS-308-MM-SC with (6) 10/100 Ethernet ports, (2) multi-mode fiber ports with SC Connectors (require 24VDC power)
Fiber optic converter	MOXA Media Converter model IMC-101-M-SC with (1) 10/100BaseT (X) to 100BaseFX multi-mode fiber port with SC connectors (require 24 VDC power)
Fiber Cable	Multi-mode, Duplex, 62.5/125 with SC connectors on both ends
Copper Ethernet Cable	Shielded CAT5 Ethernet
FO Connector	SC Type

CHAPTER

7 MAINTENANCE

This section contains procedures for removing and replacing the active components of a ControlEdge 900 Controller. It also includes recommendations, suggestions, and hints as they apply to the circumstances under which the procedures are used.

Safety considerations - PLAN AHEAD!

When using the procedures in this section, plan the sequence of procedural actions so as to ensure:

- The safety of personnel
- The protection of property
- The integrity of operating processes

> **CAUTION:** The first consideration is safety of personnel. While there is always an inclination to preserve the materials and time invested in a running process, no action should ever be taken that would risk injury to personnel.

Protection of personnel property is an important consideration that always requires comprehensive knowledge of the entire control process: the control equipment, the process control strategy, and the conditions and circumstances that exist when the removal and replacement procedures are taken.

The procedures in this section include notices of potential hazard as they apply to various components in the controller. Because each control process and the set of conditions and circumstances at each user site are unique, it is the user's responsibility to know the potential consequences of each action as it relates to a running process.

It is recommended that the user becomes familiar with the significant aspects of each set of circumstances and has a plan for execution of the proper action sequence.

> **CAUTION:** Most of the modules available for use in the ControlEdge PLC have an REMOVAL AND INSERTION UNDER

POWER designation. That is, they can be Removed and Inserted Under Power, where "power" refers to DC power at the backplane of the rack. (It does not refer to power for field wiring at the terminal board associated with the I/O module, which must be disconnected (using a user-supplied switch) at the field device before removing or inserting the module.

For all other components of the system, AC power to the system must be removed before removal or replacement of the component.

CAUTION: Hazardous voltages exist at the Power Supply and at the terminal boards on I/O Modules:

- Only trained and authorized personnel should perform the procedures in this section.
- Disconnect all sources of power associated with these components before removal or insertion.
- Failure to comply with these instructions could result in death or serious injury.
- EXPLOSION HAZARD Class I, Division 2/Zone 2 Installations
- SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2/ZONE 2.
- EXPLOSION HAZARD Class I, Division 2/Zone 2 Installations
- DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN NOT TO BE HAZARDOUS.

CAUTION: Hazardous voltages exist at the Power Supply and at the terminal boards on I/O Modules:

- Only trained and authorized personnel should perform the procedures in this section.
- Disconnect all sources of power associated with these components before removal or insertion.
- Failure to comply with these instructions could result in death or serious injury.
- EXPLOSION HAZARD Class I, Division 2/Zone 2 Installations
- SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2/ZONE 2.
- EXPLOSION HAZARD Class I, Division 2/Zone 2 Installations

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

Periodic checks

Check . . .	Possible Corrective Action . . .
That the light emitting diodes (LED) are working.	Replace module
That all connections are secure, including ground lug.	Secure connections, as needed.
That cable insulation is not worn or cracked.	Replace cables, as required.
That modules and power supplies are secure.	Tighten mounting screws.
That airflow is unobstructed.	Clean vent holes, remove obstructions.

Removal and Insertion Under Power (RIUP)

CAUTION: All of the I/O module types in the ControlEdge 900 Controller System include the Removal and Insertion Under Power (RIUP) feature. That is, while the rack is powered, any of the controllers or I/O modules can be removed or inserted:

Read and understand all of the following information regarding Removal and Insertion Under Power before attempting to remove and/or replace CPM, EPM, I/O module or Power supply, particularly in a system that is actively controlling a process.

- With no physical damage to the module, to the rack, or to other modules in the rack
- Without disturbing the functions of other I/O modules in the rack.
- Under carefully controlled circumstances, this feature enables the user to remove and insert an I/O module without completely shutting down a running system. However, it must

be recognized that removing or inserting an I/O module under power is potentially hazardous to property and to personnel.

CAUTION: Explosion hazard. Removal and Insertion Under Power is not supported in Division 2/ Zone 2.

Removal and Insertion Under Power : Potential Hazards and Recommended Actions

Hazard	Source	Preventive Action(s)
WARNING	Potentially lethal voltages on Terminal Boards associated with I/O Modules.	Disconnect all signals at terminal blocks from sources of power before removing the terminal block from the I/O module.
CAUTION	Each signal at each of the terminals for I/O Modules has a specific function. Any or all of the signals may be vital for safely controlling a process.	Either:

Replacing the power supply

The power supply for the ControlEdge 900 Controller is used in all Racks. This reduces required inventories of spare parts, and also simplifies removal and replacement procedures.

Removing the power supply from a rack will remove all DC voltages from the rack that powers the CPM or EPM, and from all I/O modules within the rack.

Removing power from the rack has the following consequences:

- All control action stops
- All power to all I/O modules in the rack is lost; hence, all control outputs to the process are lost. Because external power connected to terminal boards (from or to field devices) is still present, it is essential that field devices are maintained in a safe condition during replacement procedures.
- Control to all I/O rack is lost.

TIP: The power supply includes an internal fuse, rated at 5 amperes. This fuse is not replaceable in the field. The user must provide an external fuse that has a current rating lower than that of the internal fuse. See step Replacing the power supply on page of the section Assemble Redundant Controller Rack, Assembly.

CAUTION: For redundant power supply, Removal and Insertion Under Power is supported. Remove the defective power supply from the rack and insert a new one.

TO replace the power supply:

CAUTION: Explosion hazard. Removal and Insertion Under Power is not supported in Division 2/ Zone 2

1. If the power supply to be replaced is powering a rack that is currently controlling a running process, use one of the following methods.
   - Ensure that powering down the rack will not have adverse consequences on any running process.
   - Bring the process to a safe and orderly shutdown.
2. Using an external, user-supplied switch, disconnect the power supply from source main power. Use a meter to ensure that power is off.
3. Depending on the type of wire lugs used, loosen or remove the three screws on the terminal board, and remove the three wires from the terminal board.

   ATTENTION: DO NOT remove the nut that secures the lug for the PE Ground wire (green) to the grounding stake at the bottom of the rack.

4. At the top and bottom of the module, loosen the captured screws that secure the module in the rack, and remove the power supply from the rack.
5. Place the new power supply in the rack.
6. Secure the lugs for AC or DC wiring to the terminals on the new power supply:

- For AC: L1, L2 /N and Ground
- For DC: 24V DC +, 24V DC – and Ground

7. Ensure power can be applied safely, and use the external (user-supplied) switch to re-connect power to the power supply.
8. If the AC power supply is used, using a meter and the test points on the face of the power supply, ensure that voltages (measured on the backplane) are within specifications.

Replacing an EPM

> **CAUTION:** Explosion hazard. Removal and Insertion Under Power is not supported in Division 2/ Zone 2.

You will need a #2 Phillips screwdriver.

To replace an EPM:

1. If a process is currently in operation, then do one of the following two methods:
   - Ensure that removing the EPM will not have adverse consequences on any running process.
   - Bring the process to a safe and orderly shutdown.
2. Observe where communications cables are plugged into the EPM to be replaced, and if necessary, tag them to identify their functions. Unplug the communication cable(s) from the Ethernet port(s).
3. At the top and bottom of the EPM, loosen the captured screws that secure the module in the rack, and remove the module from the rack. (Note that an up/down rocking motion helps with removal of the module.)
4. Configure the EPM address rotary switches on the replacement module to match those of the removed module.
5. Ensure that the new EPM is properly aligned with the slot guides, insert the new EPM in the rack, and secure it in place with the captured screws at top and bottom of the module.
6. Re-install the communication cable(s).
7. Check status indicators at the EPM, CPM, and I/O modules.
8. Load firmware to the new EPM which is the same version as was running in the removed module.

Replacing an I/O module

> **CAUTION:** Read and understand all of the following information regarding Removal and Insertion Under Power (RIUP) before attempting to remove and/or replace any I/O module, particularly in a system that is actively controlling a process.

All of the I/O module types in the ControlEdge 900 controller include the Removal and Insertion Under Power feature. That is, while the rack is powered, any of the I/O Modules can be removed or inserted:

- With no physical damage to the module, to the rack, or to other modules in the rack
- Without disturbing the functions of other I/O modules in the rack or in the system.

Under carefully controlled circumstances, this feature enables the user to remove and insert an I/O module without completely shutting down a running system. However, it must be recognized that removing or inserting an I/O module under power is potentially hazardous to property and to personnel.

Circumstances that dictate prudent actions depend on conditions and specific process applications at each user facility. It is the responsibility of site personnel to know all potential consequences of Removal and Insertion Under Power, and to take actions to prevent all adverse consequences before removing or inserting an I/O module under power. The following table provides some general guidelines for establishing appropriate procedures at a given installation.

Hazard	Source	Preventive Action(s)
DANGER	Potentially lethal voltages on Terminal Blocks.	Disconnect power and all signals at terminal blocks from sources of power before removing the terminal block from the I/O module.
CAUTION	Each signal at each of the terminals for an I/O module has a specific function. Any or all of the signals may be vital for safely controlling a process.	Using trained personnel and appropriate control mechanisms, transfer to manual control of each signal that is necessary to maintain safe process control.

> **CAUTION:**
> Removal or Insertion Under Power of an I/O module is an option, but if operating circumstances permit, disconnecting power from the rack is the preferred option. Plan and develop an action sequence before beginning the replacement procedure. Primary considerations include:
> When replacing I/O module, the voltages to the modules must be disconnected at the field device before removing the terminal block from the module.
> Loss of control/monitoring in a running process - Each signal at each of the terminals for an I/O module has a specific function. Any or all of the signals may be vital for safely controlling a process. Determine the functions of all signals to the modules and know the potential consequences of losing each. If possible, transfer control to alternate mechanisms; otherwise, bring the process to a safe and controlled shutdown.

You will need a #2 Philips screwdriver.

To replace an I/O module:

> **CAUTION:** Explosion hazard. Removal and Insertion Under Power is not supported in Division 2/ Zone 2.

1. Disconnect all signals from power sources. Use a meter to ensure that all voltages are disconnected.
2. If a power-down replacement procedure is opted, also disconnect power from the rack, using the (user-supplied) switch in the source main power.
3. Loosen the captive screws at top and bottom of the module; loosening the screws will cause the terminal block to be partly extracted from the module connector. Remove the terminal block from the module.

   > **CAUTION:** The UIO module will continue to drive the configured failsafe output if the UIO module is removed along with the terminal block with the field power not de-energized. So it is recommended to de-energize field power before UIO module removal.

4. Using the extractor loop on the cover of the module, pull the module from the slot with a long flat-tip screwdriver an extraction lever. as shown in the following illustration.

5. Insert the screwdriver tip into the extraction tab on the front of the module cover, and rotate the screwdriver handle toward the back, using the top edge of the rack as a fulcrum.
6. Verify that the replacement module is of the proper type. Then, carefully insert it into the slot in the rack so as to make proper contact with the connector in the backplane.
7. Replace the terminal block on the module.
8. If the rack was powered-down for the procedure, restore power to the rack.
9. Re-connect signals to field devices.

To replace a redundant I/O module:

> **CAUTION:** Explosion hazard. Removal and Insertion Under Power is not supported in Division 2/ Zone 2.

1. Disconnect all signals from power sources. Use a meter to ensure that all voltages are disconnected.
2. If a power-down replacement procedure is opted, also disconnect power from the rack, using the (user-supplied) switch in the source main power.
3. Disconnect the module cable from the redundant RTP.
4. Loosen the captive screws at top and bottom of the module; loosening the screws will cause the terminal block to be partly extracted from the module connector. Remove the terminal block from the module.

   > **CAUTION:** The UIO module will continue to drive the configured failsafe output if the UIO module is removed along with the terminal block with the field power not de-energized. So it is recommended to de-energize field power before UIO module removal.

5. Using the extractor loop on the cover of the module, pull the module from the slot with a long flat-tip screwdriver an extraction lever. as shown in the following illustration.

6. Insert the screwdriver tip into the extraction tab on the front of the module cover, and rotate the screwdriver handle toward the back, using the top edge of the rack as a fulcrum.
7. Verify that the replacement module is of the proper type. Then, carefully insert it into the slot in the rack so as to make proper contact with the connector in the backplane.
8. Replace the terminal block on the module.
9. Tighten terminal block screws before connecting RTP.
10. Connect the module cable to the redundant RTP.

11. If the rack was powered-down for the procedure, restore power to the rack.
12. Re-connect signals to field devices.

Spare parts and model numbers

ControlEdge 900 Controller

Use the model numbers in the following table if there is a need to purchase spare parts for the ControlEdge 900 Controller system.

Table 7-1: Spare parts and model numbers

Description	Model Number
Processor Module	
Control Processor Module (CPM), ControlEdge 900	900CP1-0200
Expansion Processor Module (EPM), ControlEdge 900	900SP1-0200
Control Processor Module (CPM), ControlEdge 900, Ext. Temp (-40 to 70°C)	900CP1-0300
Expansion Processor Module (EPM), ControlEdge 900, Ext. Temp (-40 to 70°C)	900SP1-0300
Security cover, CPM/EPM	51307946-001
I/O Module	
Universal Input/Output Module (UIO Module), Ext. Temp (-40 to 70°C)	900U01-0100
Universal Analog Input -RTD, TC, V, 8 channel	900A01-0202
Digital Input, 120/240 VAC, 16 Channel	900G03-0202
Digital Input, 120/240 VAC-125VDC, 16 Channel Isolated	900G04-0101
Digital Input, 24 VDC, 32 Channel, Ext. Temp (-40 to 70°C)	900G32-0301
Digital Output, 120/240 VAC 8 Channel	900H03-0202
Digital Output, 24 VDC 32 Channel, Ext. Temp (-40 to 70°C)	900H32-0302
Digital Output - Relay, 8 Channel	900H01-0202
Pulse/Frequency/Quadrature, 4 Channel	900K01-0201
Analog Output, 0 to 20 mA, 4 Channel	900B01-0301
Analog Output, 0 to 20 mA, 8 Channel	900B08-0202

Description	Model Number
Analog Input High Level, 16 Channel	900A16-0103
Digital Input, Contact type, 16 Channel	900G01-0202
Serial Interface Module RS485-2 Port and RS232 2 Port, Ext. Temp (-40 to 70°C)	900ES1-0100
Jump 2 Postion HC900	900J02-0001
Jump 10 Postion HC900 PKG of 10	900J10-0001
Redundancy Module	900E01-0100
Racks	
1 I/O Slot Rack, Ext. Temp (-40 to 70°C)	900R01-0300
4 I/O Slot Rack, Ext. Temp (-40 to 70°C)	900R04-0300
8 I/O Slot Rack, Ext. Temp (-40 to 70°C)	900R08-0300
12 I/O Slot Rack, Ext. Temp (-40 to 70°C)	900R12-0300
8 Slot Rack - Red. Power, Ext. Temp (-40 to 70°C)	900R08R-0300
12 Slot Rack - Red. Power, Ext. Temp (-40 to 70°C)	900R12R-0300
Redundant CPM Rack (Assembly), Ext. Temp (-40 to 70°C)	900RR0-0300
Redundant Switchover Module Slot Filler	900RNF-0200
Ground Bar HC900 (HC900)	900TSS-0001
I/O Components	
DI, DO, AO, AI, Remote Termination Panel (RTP)	900RTS-0001
Redundant UIO Remote Termination Panel (RTP)	900RTI-0100
Analog Input Remote Terminal Panel	900RTA-L001
Relay Output Remote Terminal Panel	900RTR-H001
Filler Block Cover, Spare I/O Slot	900TNF-0200
Terminal Block Housing, Black, 20 Positions (Euro Style)	900TEK-0200
Terminal Block Housing, Red, 20 Positions (Euro Style)	900TER-0200
Terminal Block Housing, Black 36 Positions (Euro Style)	900TCK-0200

Description	Model Number
High Voltage Terminal Block (Barrier Style)	900TBR-0200
Low Voltage Terminal Block (Barrier Style)	900TBK-0200
Low Voltage RTP Cable (1.0m, 3.28ft.)	900RTC-L210
Low Voltage RTP Cable (2.5m, 8.2ft.)	900RTC-L225
Low Voltage RTP Cable (5.0m, 16.4ft.)	900RTC-L250
High Voltage RTP Cable (1.0m, 3.28ft.)	900RTC-H210
High Voltage RTP Cable (2.5m, 8.2ft.)	900RTC-H225
High Voltage RTP Cable (5.0m, 16.4ft.)	900RTC-H250
Low Power RTP Cable,16/32 Channel (1.0M, 3.28ft)	900RTC-3410
Low Power RTP Cable,16/32 Channel (2.5M, 8.2ft)	900RTC-3425
Low Power RTP Cable,16/32 Channel (5.0M,16.4ft)	900RTC-3450
RTP Cable, Relay Board 1.0M 3.28ft	900RTC-R010
RTP Cable, Relay Board 5.0M 16.4ft	900RTC-R050
High Voltage RTP Cable , AO-8 Ch (1.0m, 3.28ft.)	900RTC-BA10
High Voltage RTP Cable, AO-8 Ch (2.5m, 8.2ft.)	900RTC-BA25
High Voltage RTP Cable, AO-8 Ch (5.0m, 16.4ft.)	900RTC-BA50
Shield Terminal Strip (package of 2)	900TSS-0001
MI/MP 250 OHM RESISTOR KIT 8	51205995-501
Power Supplies	
120/240 VAC. 58W	900P01-0501
24 VDC, 51 W	900P24-0501
Redundant Power Status Module, Ext. Temp (-40 to 70°C)	900PSM-0200
Power supply AC-DC-NON SIL 41W, Ext. Temp (-40 to 70°C)	900P01-0701
Kits & Accessories	
(Moxa EDS-308) Ethernet Switching Hub (8 Ports, including 2 fiber optic ports and 6 copper ports), Multi Mode	50008930-001

Description	Model Number
(Moxa EDS-308-SS-SC) Ethernet Switching Hub (8 Ports, including 2 fiber optic ports and 6 copper ports), Single Mode	50008930-004
(Moxa EDS-316-MM-SC) Ethernet Switching Hub (16 Ports, including 2 fiber optic ports and 14 copper ports), Multi Mode	50008930-002
(Moxa EDS-316-SS-SC) Ethernet Switching Hub (16 Ports, including 2 fiber optic ports and 14 copper ports), Single Mode	50008930-003
(Moxa IMC-101-M-SC) Ethernet to Multi-Mode Fiber Optic Convertor	50135395-001
(Moxa IMC-101-S-SC) Ethernet to Single-Mode Fiber Optic Convertor	50135395-002
MOXA MGate MB3180 Modbus Gateway	NA

MasterLogic I/O and accessories

Use the below MasterLogic I/O and accessories for integration to ControlEdge PLC controller.

Table 7-2: MasterLogic I/O and accessories model numbers

Description	Model Number
Racks/Bases (Only for ML200)	
Main Base 4 slot	2MLB-M04A
Main Base 6 slot	2MLB-M06A
Main Base 8 slot	2MLB-M08A
Main Base 12 slot	2MLB-M12A
Adaptors	
EtherNet/IP adaptor (ML200)	2MLL-DBDT
EtherNet/IP adaptor (ML50)	MEL-BSSRT
I/O Modules	
DC24V Input (32 ch)	MLE-DC32A

Description	Model Number
Open Collector Output (32 ch)	MLE-TN32A
DC24V Input (8 ch) and Relay Output (8 ch)	MLE-DR16A
Open Collector Output (32ch)-Source	MLE-TP32A
Relay Output (16 ch)	MLE-RY16A
Current/Voltage Input (8 ch)	MLF-AD08A
Current/Voltage Input (4 ch), Hi-resolution	MLF-AD04C
Current Output (4 ch), Hi-resolution	MLF-DC04C
Current/Voltage Input (2 ch), Current/Voltage Output (2 ch)	MLF-AH04A
Current Output (4 ch)	MLF-DC04A
Digital Input - DC 24V Input (Sink/Source Type), 16 ch	2MLI-D22A
Digital Input - DC 24V Input (Sink/Source Type), 64 ch	2MLI-D28A
Digital Output - TR Output, 0.5A (SinkType), 16 ch	2MLQ-TR2A
Digital Output - TR Output, 0.1A (SinkType), 64 ch	2MLQ-TR8A
Analog Input - Voltage/Current Input Module, 16ch	2MLF-AD16A
DUMMY Module for empty I/O slots	2MLT-DMMA
Power Supply	
Free Voltage(110V,220V) / DC5V, 3A, DC24V,0.6A	2MLP-ACF1
Free Voltage(110V,220V) / DC5V, 6A	2MLP-ACF2
AC220V / DC5V, 8.5A	2MLP-AC23
DC24V / DC5V	2MLP-DC42
Smart Link Assemblies	
Free Voltage(110V,220V) / DC5V, 3A, DC24V,0.6A	2MLP-ACF1
Free Voltage(110V,220V) / DC5V, 6A	2MLP-ACF2
AC220V / DC5V, 8.5A	2MLP-AC23
DC24V / DC5V	2MLP-DC42
Smart Link Assemblies	

Description	Model Number
Smart Link Terminal Board 40P	TG7-1H40S
Relay Board, 40point (For DO Sink Type only)	R32C-NS5A-40P
TB Cable	
Cable Assembly for Terminal Board, 40p-40p, 1.5m	C40HF-15PB-1
Cable Assembly for Terminal Board, 40p-40p, 3.0m	C40HF-30PB-1
Smart Link Cable Ass'y 40-40P, 1.5 Meter	C40HH-15S-XBI
Smart Link Cable Ass'y 40-40P, 3.0 Meter	C40HH-30S-XBI

TIP: Kits & Accessories are not in the scope of the certification we mentioned in the Special Condition of Use and Approved Standards section.

CHAPTER

8 DIAGNOSTICS AND TROUBLESHOOTING

Diagnostics have two functions:

- Automatically alter system operation to react appropriately to operating conditions (particularly in the event of a system fault).
- Provide external indications that enable operating and maintenance personnel to react appropriately when external actions are required.

The following diagnostic indicators are provided for the ControlEdge 900 Controller:

Hardware Light Emitting Diodes (LEDs) that assist with troubleshooting activities solely at the controller. LEDs are also useful for verifying indications viewed as screen items. LED indicators are provided for the following hardware components:

- EPM
- IOM

EPM Indicators

The following diagram displays the location of the LED indicators on the EPM. The following table explains the meaning of each LED state.

Figure 8-1: EPM Indicators

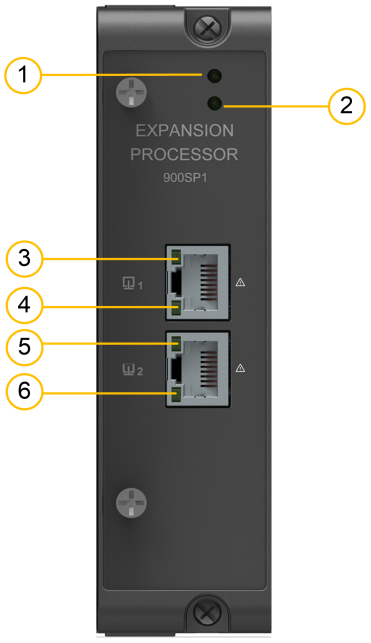


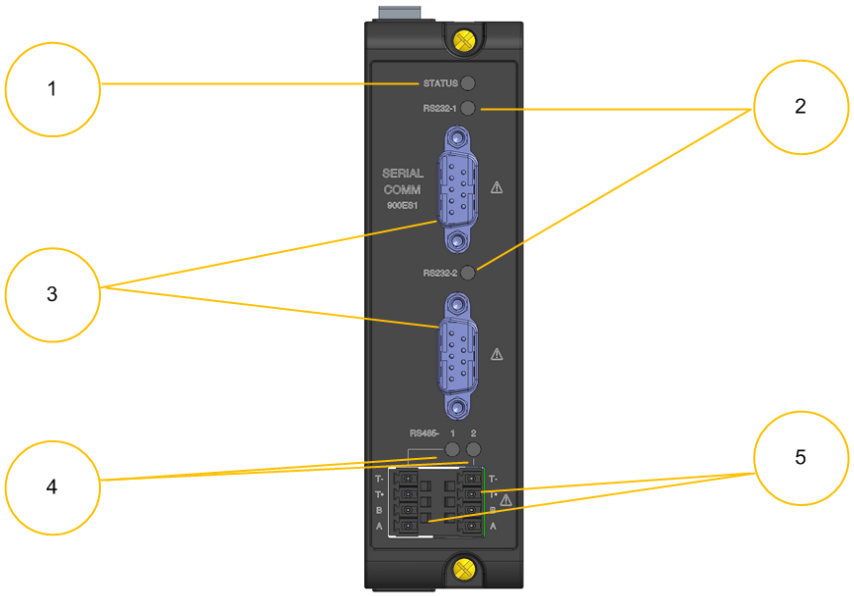
Table 8-1: LED Indications on EPM

Item	LED	LED State/Color	Description
1	Status	OFF	No power is applied to EPM.
		On/Green	EPM is working normally.
		On/Orange	EPM is in power-up process.
		Blink Red @ 1 HZ	EPM is running with error
		Blink Red @ 0.5 HZ	EPM is not configured.
		Blink Red @ 5 HZ	Communication error
		Blink @ 1 HZ / Green & Orange	EPM is upgrading firmware.

Item	LED	LED State/Color	Description
2	Role	Green	Other situation except booting
		OFF	EPM is booting
3, 5	Ethernet Port Speed (Upper LED)	Yellow On/Off	OFF for 10Base-T; ON for 100Base-TX.
4, 6	Ethernet Port Link/ Active (Lower LED)	Green On/Off/ Blinking	OFF for no connection; ON for connection; Blinking for toggle

Serial Communication Module Indicators

The following diagram displays the location of the LED indicators on the serial communication module:



The table below explains the meaning of each LED state:

Table 8-2: Serial Communication Module Indicator Definition

Figure Item	LED	LED State/Color	Description
1	Module Status LED	Solid Orange	Boot
		Blinking Red at 1 Hz	System in running state with error
		Blinking Red at 0.5 Hz	Module offline or unconfigured
		Solid Green	System good in running state without error.
		Blinking Green and Orange at 0.5 Hz	Firmware Upgrade
2	RS232 LEDs	Blinking Orange	TX
		Blingking Green	RX
		Blinking Yellow	TX and RX
		OFF	No communication
4	RS485 LEDs	Blinking Orange	TX
		Blingking Green	RX
		OFF	No communication

I/O Indicators

The following diagram displays the location of the LED indicators on the I/O modules. The table below explains the meaning of each LED state.

Figure 8-2: I/O Indicators

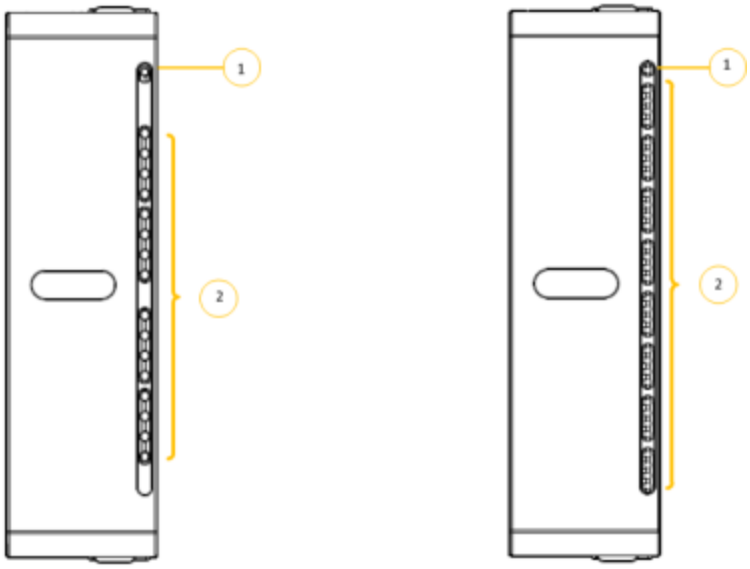


Table 8-3: IOM Indicator Definition

Figure Item	LED	LED State/Color	Description
1	Module Status LED	OFF	No Power
		Solid Red	Hardware Failure
		Blinking Red	See [LED Failure Definition]section
		Solid Green	Cold start with passing diagnostics
		Blinking Green	Normal scanning
2	Channel LEDs	Green ON	For Inputs, indicates On status of the field input even if Forced to the opposite state.
		Green OFF	For Inputs, indicates Off status of the field

Figure Item	LED	LED State/Color	Description
			input even if Forced to the opposite state.

To indicate the type of diagnostic failure, the module's status LED is flashed red with a number of quick strobes followed by a long off time. The table below outlines the potential module diagnostics. The following table outlines the potential module diagnostics.

LED Failure Definition

Number of strobes	Failure	Description	User Action	Applies to
1	Failsafe	The module is in the failsafe state because it is not receiving message requests from the CPU or the whole system is in exception stop.	1. If expansion I/O rack, go to step 2. If non expansion I/O rack, go to step 3. 2. Check the EPM status LED (See "EPM Indicators" on page 192 for more information.). If it's flashing 6 times, proceed with step 3. If it's flashing green, the module probably is not required in the configuration. If it's not on or steady, Cycle power to the EPM. 3. Make sure the module is the correct one for the configuration. 4. Remove the module and check for a bent pin, then reinsert the module 5. Replace the module 6. Remove other modules and replace one at a time until the problem reoccurs. Most likely the last module inserted needs to be replaced.	All modules

Number of strobes	Failure	Description	User Action	Applies to
			7. Replace the rack.	
2	HW/SW Key	The software residing on the module does not match the module type. This diagnostic should only result in the factory.	Replace module	DI and Relay DO and DC DO

Bad I/O Channel Diagnostics

Table below is a list of conditions that can cause a bad channel diagnostic.

Table 8-4: Bad I/O Channel Diagnostics

Module Type	Failure message indicate don configuration tool	Description	User Action
AI	Burnout Failure	The sensor – T/C, RTD, or mV source -- is failing burnout checks.	Check terminal block connections
	Under range	The signal at the terminals is less than 10% below the range of the sensor.	Check the signal level being applied to the terminals.
	Over range	The signal at the terminals is more than 10% over the range of the sensor.	Check the signal level being applied to the

Module Type	Failure message indicate don configuration tool	Description	User Action
			terminals.
	Failing to convert	When attempting to take a reading, the ADC fails. This could result if the incoming signal is either too large or small. It also could result if the ADC circuit is failing. If the problem is the ADC circuit, most likely other channels will have the same failure.	Check the signal level being applied to the terminals.
AO	Bad Channel	The board indicates that the channel is failing to output the correct value.	Check terminal connections.
DO	Bad Channel	The number of configured channels in the DO function block exceeds the number of hardware channels on the DO card.	Reconfigure the DO function block.

Refer to section "I/O module diagnostics" of ControlEdge Builder User Guide for conditions that can cause a bad channel diagnostic and corresponding action.

UIO Indicators

The following diagram displays the location of the LED indicators on the UIO. The table below explains the meaning of each LED state.

Figure 8-3: LED Indicators on UIO

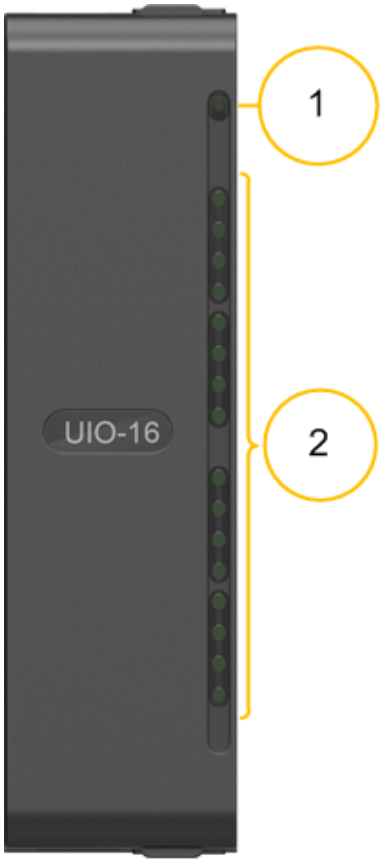


Table 8-5: LED Indication on UIO

Item	LED	LED State/Color	Description
1	Module Status	Solid Green	Power on with self-test passed
		Solid Red	In power-up process or hardware failure or firmware corrupt
		Blink Green (@ 4 Hz)	Normal scanning
		Blink Red (@ 0.5 Hz)	Firmware upgrade
		Blink Red (@ 1 strobe)	Communication error
		Blink Red (@ 3 strobe)	Running with error for module diagnostic and channel diagnostics (detected by the module itself)
2	Channel LEDs	Digital Input:	
		OFF	Channel disabled or State 0
		On/Green	State 1
		Digital Output	
		OFF	Channel disabled or State 0
		On/Green	State 1
		Analog Input	
		OFF	NA
		Analog Output	
		OFF	NA

Table 8-6: LED Indication on redundant UIO

Item	LED	LED State/Color	Description
1	Channel 1	ON	I/O Module healthy.
		OFF	Some or all IO channels are shutdown on this module.
2	Channel 2	ON	Partner IO module is healthy.
		OFF	Partner IO module is not present or failed.

CHAPTER

9 SPECIAL CONDITION OF USE AND APPROVED STANDARDS

Approval Rating

Table 9-1: Approval Rating for Standard Temperature (0 to 60° C)

Certification	Approval Rating
CSA	Class I, Division 2, Groups A, B, C & D T*
ATEx/UKCA	II 3 G Ex ec nC IIC T* Gc (for 900H01) II 3 G Ex ec IIC T* Gc (for other modules)
IECEx	Ex ec nC IIC T* Gc (for 900H01) Ex ec IIC T* Gc (for other modules)
Temperature class (T*):	Module
T3	900G03, 900G04
T5	900G01, 900H01, 900A16, 900K01
T4	900H03, 900P01, 900P24, 900SP1-0200, 900CP1-0200, 900B01, 900B08.
T6	900A01

Table 9-2: Approval Rating for Extended Temperature (-40 to 70° C)

Certification	Approval Rating
CSA	Class I, Division 2, Groups A, B, C & D T*
ATEx/UKCA	II 3 G Ex ec nC IIC T* Gc (for 900H01) II 3 G Ex ec IIC T* Gc (for other modules)
IECEx	Ex ec nC IIC T* Gc (for 900H01) Ex ec IIC T* Gc (for other modules)
Temperature class (T*):	Module

Certification	Approval Rating
T4	900U01-0100, 900G32-0301, 900H32-0302, 900ES1-0100, 900SP1-0300, 900CP1-0300, 900PSM-0200, 900P01-0701

NOTE: Racks do not have any Temperature code, System/Racks will consider T code based on the modules used.

Approved Standards for Division 2/Zone 2 Hazardous Location

For the United States

- The installer shall provide transient over-voltage protection external to the apparatus such that the voltage at the supply terminal of the apparatus does not exceed 140% of the voltage rating of the equipment.
- The equipment shall be mounted in an enclosure providing a minimum degree of protection of IP54 in accordance with ANSI/IEC 60529., and in a tool-secured enclosure which meets the requirements of ANSI/ISA 60079-0 and ANSI/ISA 60079-15.
- Equipment shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application.
- For installation with a second active phase (L-L) instead of neutral (L-N) connection both phases must be protected externally with circuit breaker adequately rated for 3 A maximum and 250 V AC minimum.

For Canada

- The installer shall provide transient over-voltage protection external to the apparatus such that the voltage at the supply terminal of the apparatus does not exceed 140% of the voltage rating of the equipment.
- The equipment shall be mounted in an enclosure providing a minimum degree of protection of IP54 in accordance with CAN/CSA 60529., and in a tool-secured enclosure which meets the requirements of CAN/CSA 60079-0 and CAN/CSA 60079-15.

- Equipment shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application.

Honeywell Part No.	SFO Part No.	Description, Electrical Rating	T-Code
900P01-0701	99-396-0023	PPower Supply, Input: 100-240 Vac, 47-63 Hz, 1.5A (max) Output rated: 5V/6A (max), 24V/1.5A (max), Maximum continuous output power: 41W	T-Code = T4 Ambient: -40˚C to +70˚C.

- The power supplies listed above are intended to be installed within the Honeywell ControlEdge 900 controller Rack with a clearance of minimum 6.5in(165mm) above and below of the rack chassis as per ControlEdge HC900 Controller Installation Guide.
- The above listed power supplies shall be installed in an enclosure that provides a minimum ingress protection of IP 54 in accordance with UL/CSA C22.2 No. 60079-0 as per manual specifications.
- The above listed power supplies shall only be used in an area of not more than pollution degree 2, as defined in IEC 60664-1.
- The three field connections (+24V), (+5V) and (GND) on the Front panel (Terminal pcb) shall only be used in Non-Hazardous area.
- The above power supplies are Equipment Class I (earthed equipment), Pollution Degree 2, Installation Category II, Continuous Operation. Reliable Earth connection shall be provided in the end-use installation.
- The equipment is to be Factory or Field installed by trained service personnel only, in accordance with the manufacturer's installation instructions provided with each unit. These power supplies shall be installed in compliance with the enclosure, mounting, creepage, clearance, markings and segregation requirements of the end-use application.
- The AC-DC power supply models that are rated 90-264 Vac, 47-63 Hz are minimum and maximum of the permitted range, with no tolerance expected from the source supply voltage beyond this range.
- The secondary outputs of these power supply models are considered SELV.

For IECEx/ATEx/UKCA

- The installer shall provide transient over-voltage protection external to the apparatus such that the voltage at the supply terminal of the apparatus does not exceed 140% of the voltage rating of the equipment.
- The equipment shall be mounted in an enclosure providing a minimum degree of protection of IP54 in accordance with EN/IEC 60079-7.
- The equipment shall be mounted in a tool-secured enclosure which meets the requirements of EN/IEC 60079-0 and EN/IEC 60079-7.
- The above HC900 devices are for rack mounting in a suitable protective enclosure, in accordance with the manufacturer's instructions, subject to acceptance by the local authority having jurisdiction.
- Racks do not have Temperature Code, System/Racks derives the T Codes based on Modules used.
- The above models are Equipment Class I, Pollution Degree 2, Installation Category II, Continuous Operation.
- The fixed power applied to the pins 9, 10, 11 and 12 of P1 Terminal Block Interface shall be limited to a maximum of 5A total for the above model 900U02-01XX.
- The equipment shall be used in an area not more than Pollution Degree 2 as defined in EN/IEC 60664-1.
- The SD card shall be not hot swappable, and the maximum weight shall not exceed 3g.
- In addition to the above listed modules, following power supplies are approved for use within ControlEdge 900 Platform. External transient over-voltage protection is required at the power supply terminals and shall not exceed 140% of the rated power supply voltage.

Honeywell Part No.	SFO Part No.	Description, Electrical Rating	T-Code
900P01-0501	99-396-0007	Power Supply, input 100-240Vac, 47- 63 Hz, 1.4A (max); Output rated: 5V/6A (max), 24V/2.0A (max), Power 58 W	T4, Ambient 0°C -60°C
900P24-0501	99-396-0009	DC-DC Convert, Input 21-29	T4, Ambient 0°C -51°C

Honeywell Part No.	SFO Part No.	Description, Electrical Rating	T-Code
		VDC, 5Amps; Output 5VDC/6A max, 24VDC/2A max; Power 58W	

- When DC-DC convert 99-396-0009 or 99-396-0018 is used with the ControlEdge 900 Platform, the permitted maximum ambient is 51°C.
- The power supplies listed above are intended to be installed within the ControlEdge 900 Platform Rack with a clearance of minimum 6.5in(165mm) above and below of the rack chassis as per ControlEdge 900 Platform Installation Guide – Figure 5-9.
- The three Connections (+24V), (+5V) and (GND) on the Front panel (Terminal pcb) of the power supplies shall be used only in Non-Hazardous area.

Approved Standards for Division 2/Zone 2 Hazardous Location

Canadian and US Standards

Table 9-3: Canadian and UL Standards for Standard Temperature (0 to 60°C) and Extended Temperature (-40 to 70° C)

Title	Number
Non-incendive electrical equipment for use in Class I and II, Division 2 and Class III, Divisions 1 and 2 hazardous (classified) locations. And Explosive atmospheres part 0:Equipment general requirements, Part 15: Equipment protection by type of protection "n", Part 7: Equipment protection by increased safety "e"	CSA Standard C22.2 No. 213, CAN/CSA C22.2 No.60079-0, CAN/CSA C22.2 No.60079-15, ANSI/UL 60079-0, ANSI/UL 60079-15, and UL 121201.
Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	CAN/CSA-C22.2 No. 0-10, CAN/CSA-C22.2 No.61010-1, and UL Std. No.61010-1.

European Standards (Zone 2)

ATEx and UKCA Standards

Table 9-4: ATEX standards for Standard Temperature (0 to 60° C) and Extended Temperature (-40 to 70° C)

Title	Number
Explosive atmospheres - Part 0: Equipment - General requirements	EN IEC 60079-0
Explosive atmospheres - Part 15: Equipment protection by type of protection "n"	EN IEC 60079-15
Explosive atmospheres - Part 7: Equipment protection by increased safety "e"	EN IEC 60079-7

International Standards

Table 9-5: International standards for Standard Temperature (0 to 60° C) and Extended Temperature (-40 to 70° C)

Title	Number
Explosive atmospheres - Part 0: Equipment - General requirements	IEC 60079-0
Explosive atmospheres - Part 15: Equipment protection by type of protection "n"	IEC 60079-15
Explosive atmospheres - Part 7: Equipment protection by increased safety "e"	IEC 60079-7

CE LVD and EMC Compliance Standards

LVD directive

Table 9-6: LVD directive for Standard Temperature (0 to 60°C) & Extended Temperature (-40 to 70°C)

Title	Number
Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General	EN 61010-1

Title	Number
requirements	

EMC directive

Table 9-7: EMC directive for Standard Temperature (0 to 60°C) & Extended Temperature (-40 to 70°C)

Title	Number
Programmable controllers- Part 2: Equipment requirements and tests	IEC 61131-2
Electrical equipment for measurement, control and laboratory use - EMC requirements -- Part 1: General requirements	EN 61326-1
Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement.	CISPR 11
Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16A per phase)	IEC 61000-3-2
Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection	IEC 61000-3-3
Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	IEC 61000-4-2
Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	IEC 61000-4-3
Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	IEC 61000-4-4
Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	IEC 61000-4-5

Title	Number
Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	IEC 61000-4-6
Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test	IEC 61000-4-8
Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests	IEC 61000-4-11

NOTE: For All standard's issue date and revision refer corresponding Certificates.

APPENDIX

A

OVERVIEW OF RTPS

The Remote Termination Panel (RTP) provides an easy way to connect the ControlEdge 900 controller to the field wiring. The RTP integrates some of the typical externally connected components, reducing wiring and setup time. It also minimizes the need for multiple wires under a single screw connection by expanding the connectivity of the shared terminals of the I/O modules.

There are three RTP types:

- 900RTA-L001 for UAI
- 900RTS-0001 for UIO, AI, AO, DI and DO
- 900RTR-H001 for Relay Output
- 900RTI-0100 for Redundant UIO

The relationship of modules, terminal blocks and their RTP components are listed below:

> **ATTENTION:** *RTPs are not supported for Extended temperature range (-40 to 70°C) except **900RTI** RTP.*

Table A-1: Module and RTP Matching Table

I/O Module	Terminal Block (Euro)	Terminal Block (Barrier)	RTP	RTP Cable	RTP required per module (only for RTP not for Cable)
UIO (900U01-0100)	900TEK-0200	900TBK-0200	900RTS-0001	900RTC-H2xx 900RTC-L2xx	1
UAI (900A01-0202)	900TEK-0200	900TBK-0200	900RTA-L001	900RTC-L2xx	1
DI24 (900G32-XXXX)	900TCK-0200	N/A	900RTS-0001	900RTC-34xx	2
DI110/220 (900G03-0202)	900TER-0200	900TBR-0200	900RTS-0001	900RTC-H2xx	1
DO24(900H32-	900TCK-	N/A	900RTS-	900RTC-	2

I/O Module	Terminal Block (Euro)	Terminal Block (Barrier)	RTP	RTP Cable	RTP required per module (only for RTP not for Cable)
XXXX)	0200		0001	34xx	
DO110/220 (900H03-0202)	900TER-0200	900TBR-0200	900RTS-0001	900RTC-H2xx	1
DO 8 CH (900H01-0202)	900TER-0200	900TBR-0200	900RTR-H001	900RTC-H2xx	1
HLAI 16 CH (900A16-0103)	900TCK-0200	N/A	900RTS-0001	900RTC-34xx	2
AO 4 CH (900B01-0301)	900TEK-0200	900TBK-0200	900RTS-0001	900RTC-L2xx	1
DI Contact 16 CH (900G01-0202)	900TEK-0200	900TBK-0200	900RTS-0001	900RTC-L2xx	1

For more information on the installation and wiring of ControlEdge 900 Platform Remote Termination Panels, download the user guides from the links below:

- For Analog Input I/O modules: https://www.honeywellprocess.com/library/support/Public/Documents/51-52-33-134.pdf
- For Relay Output I/O modules: https://www.honeywellprocess.com/library/support/Public/Documents/51-52-33-135.pdf
- For Universal Input/Output, Digital Input, Digital Output, Analog Output, High Density I/O modules: https://www.honeywellprocess.com/library/support/Public/Documents/51-52-33-136.pdf

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