

Honeywell

**Experion PKS
Control Hardware and ControlNet
Installation
Guide**

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Process Knowledge System®

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About This Document

Revision Notes

The following list provides notes concerning all revisions of this document.

Doc ID	Rel ID	Date	Notes

References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title	Doc ID

Contacts

World Wide Web

The following lists Honeywell's World Wide Web sites that will be of interest to our industrial automation and control customers.

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Corporate	http://www.honeywell.com
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The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user, often in terms of performing a task.
	REFERENCE -EXTERNAL: Identifies an additional source of information outside of the bookset.
	REFERENCE - INTERNAL: Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.

Symbol	Definition
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. CAUTION symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death. WARNING symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING, Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	ESD HAZARD: Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal: Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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Part I

Control Hardware Installation

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Preinstallation Considerations

General Control Hardware Installation Requirements and Reference

A word about Experion PKS Control hardware

Experion PKS Control hardware is an umbrella term used to refer to all the chassis-mounted components, including the chassis, which can be supplied with a Experion PKS system. This includes the Control Processor module (CPM), the Redundancy Module (RM) and all the Chassis Input/Output Modules just to mention a few.

Installation declaration



ATTENTION

This equipment shall be installed in accordance with the requirements of the National Electrical Code (NEC), ANSI/NFPA 70, or the Canadian Electrical Code (CEC), C22.1. It is supplied as "open equipment" that is intended to be mounted on a sub-panel within an enclosure. The suitability of the enclosure and installed system shall be acceptable to the local "authority having jurisdiction," as defined in the NEC, or "authorized person" as defined in the CEC.

Removal and Insertion Under Power (RIUP) function guidelines

The Control hardware modules have been designed to permit removal and insertion under power (RIUP) without damaging the module or interrupting chassis backpanel communications. However, the possibility of arcing or sparking is present anytime electrical connections are made or broken. For this reason, the use of the RIUP function is prohibited in Division 2 hazardous locations. In this case, power must be removed before removing and inserting a module.



WARNING

Do **not** use the removal and insertion under power (RIUP) function for modules installed in a chassis located in a Division 2 hazardous location.

Unless the location is known to be non-hazardous, as determined by a combustible gas detector, do **not**:

- connect or disconnect cables,

Preinstallation Considerations

General Control Hardware Installation Requirements and Reference

-
- connect or disconnect Removable Terminal Blocks (RTBs), and
 - remove or insert modules under power.
-

Other RIUP guidelines include:

- Put the CPM in its Idle state before RIUP, since removing a CPM from an on process Controller may cause indeterminable and unexpected results in your process.
- Be sure you consider the possible impact on the process before you RIUP any module.
- Before you RIUP a module in a Primary Controller in a Redundant Chassis Pair (RCP), initiate a Controller switchover, so it is not initiated by the RIUP function.
- Minimize the number of RIUP cycles for a module or chassis slot to prevent long-term damage to hardware.

Wire selection criteria

- Supply wiring shall be copper conductors per NEC Table 310-16 or CEC Table 3, as applicable.
- Remote control and signal I/O wiring shall be Class 1, 75°C (167°F) copper conductors.

Since cable routes can vary from using plenum air returns to being buried underground, we suggest that you work with a cable manufacturer to select the wiring that meets your particular installation requirements. If you have access to the Internet, you can visit the Belden Wire and Cable Company web site at www.belden.com for helpful technical data on a wide variety of wire and cable types.

Preinstallation Considerations

General Control Hardware Installation Requirements and Reference

Protective Earth (PE) ground guidelines

A PE ground provides protection against fire and electric shock hazards.

A wire shall be connected from the ground terminal on the chassis power supply to the PE ground bolt attached to the chassis. A wire shall be connected from the PE ground bolt attached to the chassis to the PE ground on the power source to provide the PE (safety) ground for the Experion PKS system. See Figures 1 and 2 for typical PE ground connections for single and multiple chassis installations, respectively.

Observe the following rules when making PE ground connections.

- Use an eight- inch length of 14 AWG (2.1 mm²) wire, color coded green with one or more yellow stripes, with a #8 lug for the connection between the chassis power supply ground and the PE ground bolt.
- Use a suitable length of 14 AWG (2.1 mm²) wire, color coded green with one or more yellow stripes, with a #8 lug for the connection between the chassis PE ground bolt and power source PE ground conductor.
- Use a nut with captive star washer to secure the PE ground lug.
- Tighten the nut on the terminal to a torque of 12 inch-pounds (1.36 Newton-meters).
- Strip 1/4-inch of insulation from end for ground wire for power supply terminal connection.
- For a multiple chassis installation, the PE ground conductors shall be suitably terminated at the terminal block for the power source service.

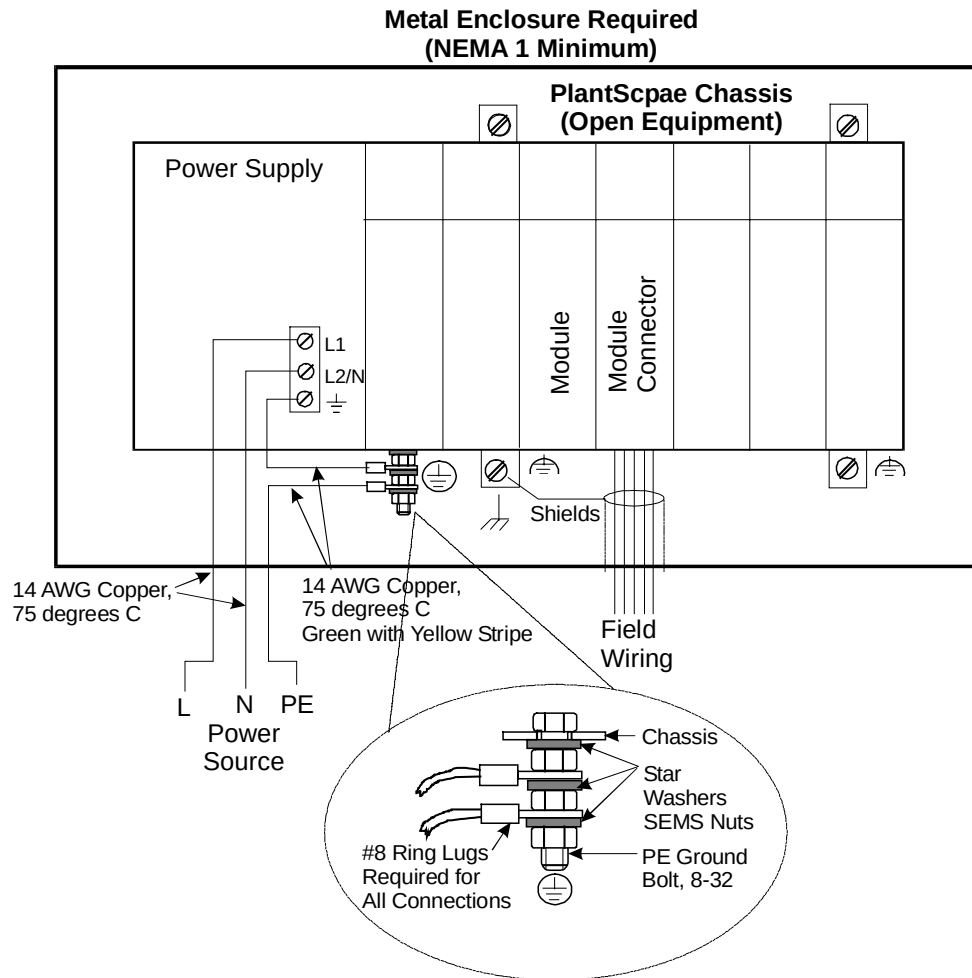


Figure 1 Typical ground connections for single-chassis installation.

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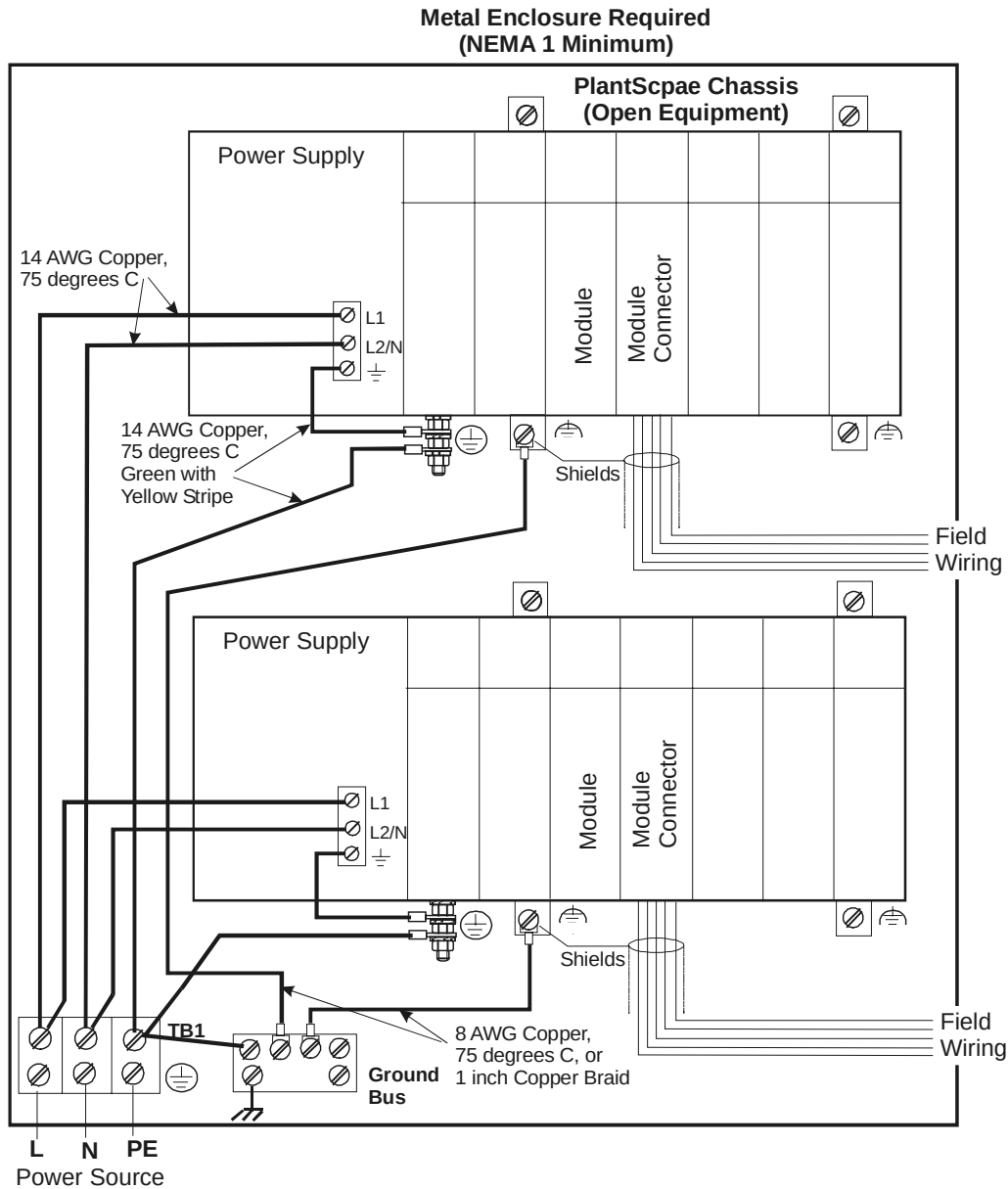


Figure 2 Typical ground connections for multiple-chassis installation.

Ground bus connection guidelines

If a ground bus has not been supplied with the enclosure, you will have to supply your own. Connect each functional chassis-ground conductor directly from each chassis to an individual bolt on the ground bus, as shown in Figure 2. Use 8 AWG (8.3 mm²) wire or 1-inch (25.4 mm) copper braid for the conductor. The ground bus is also connected to the PE ground terminal on the power source terminal block by a suitable length of 14 AWG (2.1 mm²) wire, color coded green with one or more yellow stripes.



CAUTION

Connect each ground wire to the ground bus individually. Do not stack one ground lug directly on top of the other since:

- this connection can become loose due to compression of the metal lugs; and
- later removal of a chassis and its ground wire may require other ground wires to be temporarily removed; interrupting those chassis ground connections.



REFERENCE

Please refer to the *Planning for Bonding and Grounding* section in the *Planning Guide* for more information about chassis ground connections.

Control hardware hazardous location classification

The Experion PKS Control hardware is CSA Certified and FM Approved Nonincendive Equipment for installation in Class I, Division 2, Group A, B, C & D Hazardous (Classified) Locations. It is the user's responsibility to insure that all parts of the system, and any other equipment in the Division 2 area, are listed for installation in a Class I, Division 2 Hazardous (Classified) Location.

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About hazardous (classified) locations

Electrical Codes

Installation of electrical apparatus within hazardous (classified) locations of the United States is conducted under the provisions of the National Electrical Code (NEC), ANSI/NFPA 70, Article 500; and within Canada, under the provisions of the Canadian Electrical Code (CEC) C22.1, Part 1, Section 18.

Classifications

In both the United States and Canada, hazardous locations are classified into one of these three classes.

Class	Description of Hazardous Location
I	Presence of flammable gases or vapors may be present in quantities sufficient to produce explosive or ignitable mixtures.
II	Presence of combustible dusts, powders or grains.
III	Presence of easily ignitable fibers or flyings.

Divisions

The classes listed above are further classified into one of the following divisions based upon the level of risk present.

Division	Description of Risk
1	Locations in which hazardous concentrations of flammable gases or vapors, or combustible dust in suspension are continuously, intermittently or periodically present under normal operating conditions.
2	Locations in which flammable gases or vapors are present, but normally confined within closed containers or systems from which they can escape only under abnormal or fault conditions. Combustible dusts are not normally in suspension nor likely to be thrown into suspension.

For example, A **Class III, Division 1** location is a location in which easily ignitable fibers or material processing combustible flyings are handled, manufactured or used. A **Class III, Division 2** location is a location in which easily ignitable fibers are stored or handled.

Groups

Flammable gases, vapors and ignitable dusts, fibers and flyings are classified into one of the following groups according to the energy required to ignite the most easily-ignitable mixture within air.

Class I Group	Description of Atmosphere
A	Atmospheres containing acetylene.
B	Atmospheres containing hydrogen, fuel and combustible process gases containing more than 30 percent hydrogen by volume, or gases or vapors of equivalent hazard
C	Atmospheres such as ethyl ether, ethylene, or gasses or vapors of equivalent hazard.
D	Atmospheres such as acetone, ammonia, benzene, butane, cyclopropane, ethanol, gasoline, hexane, methanol, methane, natural gas, naphtha, propane or gases or vapors of equivalent hazard
Class II Group	Description
E	Atmospheres containing combustible metal dusts including aluminum, magnesium, and their commercial alloys, and other metals of similarly hazardous characteristics.
F	Atmospheres containing combustible carbonaceous dusts including carbon black, charcoal, coal or other dusts that have been sensitized by other materials so that they present an explosion hazard.
G	Atmospheres containing combustible dusts not included in Group E or F, including flour wood, grain, and other dusts of similarly hazardous characteristics.

Preinstallation Considerations

General Control Hardware Installation Requirements and Reference

Methods of Protection

The following table summarizes available methods of protection for use in given locations.

Protection Concept	Designation	Permitted Use	Principle
Explosionproof	XP	Division 1 & 2	Contains explosion and quenches flame.
Intrinsic Safety	IS	Division 1 & 2	Limit energy of sparks under normal and fault conditions.
Pressurized	Type X and Y	Division 1	Keeps flammable gas out.
Pressurized	Type Z	Division 2	Keeps flammable gas out.
Nonincendive	NI	Division 2	No arcs, sparks or hot surfaces under normal conditions

Control hardware temperature classification guidelines

The temperature classification and marking of the Control hardware modules, and other equipment installed in the Class I, Division 2 Hazardous (Classified) Location, shall not exceed the ignition temperature of the specific gas or vapor to be encountered.



REFERENCE

For information regarding ignition temperatures of gases and vapors, see the Manual for Classification of Gases, Vapors, and Dusts for Electrical Equipment in Hazardous (Classified) Locations, NFPA 497M, and the Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, NFPA 325.

The Control hardware is rated for use in a 60°C (140°F) ambient unless otherwise marked on a module.



ATTENTION

The temperature classification for the Control hardware is determined by the “worst case” temperature classification for any module installed in the system. Each module is marked with a temperature identification number or “T” code. The lowest “T” code or highest maximum temperature determines the temperature classification for the system. It is the user’s responsibility to determine the suitability of the Control hardware, and any other apparatus in the same area, for installation in a Class I, Division 2 Hazardous (Classified) Location based on the worst case temperature classification.

Temperature Identification Numbers/Codes

Electric equipment suitable for ambient temperatures exceeding 40°C (104°F) shall be marked with both the maximum ambient temperature and the operating temperature or temperature range at that ambient temperature.

The temperature range shall be marked in identification numbers or “T” codes, as shown in NEC Article 500, Table 500-3(d), CEC Section 18, Rule 18-052. The following table lists the identification numbers per the NEC Table 500-3(d) for reference.

Temperature Identification Number	Maximum Temperature	
	Degrees C	Degrees F
T1	450	842
T2	300	572
T2A	280	536
T2B	260	500
T2C	230	446
T2D	215	419
T3	200	392
T3A	180	356
T3B	165	329
T3C	160	320
T4	135	275
T4A	120	248

Preinstallation Considerations

General Control Hardware Installation Requirements and Reference

Temperature Identification Number	Maximum Temperature	
	Degrees C	Degrees F
T5	100	212
T6	85	185

Control hardware component handling guidelines



ESD

Electrostatic discharge can damage integrated circuits or semiconductors if you touch backpanel connector pins. Follow these guidelines when you handle a module:

- Touch a grounded object to discharge static potential,
 - Wear an approved wrist-strap grounding device,
 - Do not touch the backpanel connector or connector pins,
 - Do not touch circuit components inside the module,
 - If available, use a static safe workstation,
 - When not in use, keep the module in its static shield box or bag.
-

Getting Started

Starting conditions and assumptions

The procedures in this Guide assume that:

- You have completed all pertinent planning activities as outlined in the *Planning Guide*.
- You have reviewed the *Preinstallation Considerations* in this *Guide*.
- You have received, unpacked, and checked your Control hardware.
- You have common everyday tools and hardware on hand.
- Only technically qualified personnel will install the equipment.
- You are responsible for adhering to all National Codes and local ordinances that govern the installation of equipment at your facility.
- All equipment will be installed in its unpowered state.

To begin installing your Control hardware

If your Control hardware...	Then...
has been pre-installed in enclosures by Honeywell,	follow the procedures for moving and installation as outlined in <u>Enclosure Installation</u> in this guide.
has been pre-installed in enclosures by someone other than Honeywell,	follow the procedures for moving and installing as outlined by their documentation. (Note: <u>Enclosure Installation</u> in this guide can also serve as a guide for this operation.)
has been ordered as individual components,	first install your enclosure as defined in your site/project and equipment-supplier engineering documentation. Use the procedures defined in this document for specific installation tasks, but first review <u>To begin installing individual Control hardware components</u>

To begin installing individual Control hardware components

If you are installing...	Then...
Chassis,	Follow the <u>Chassis Installation</u> procedures in this guide.
Controller Modules,	Follow the appropriate <u>Controller Module Installation and Removal</u> procedures in this guide.
Redundancy Modules,	Follow the <u>Redundancy Module Installation and Removal</u> procedures in this guide.
I/O Modules,	Follow the appropriate <u>I/O Module Installation, Wiring, and Removal</u> or <u>Process Manager I/O Installation and Wiring</u> procedures in this guide.
Serial Interface Modules,	Follow the <u>Serial Interface Module Installation and Removal</u> procedures in this guide.
ControlNet Communication Modules,	Follow the appropriate <u>ControlNet Communication Module Installation and Removal</u> procedures in this guide.
Ethernet Communication Modules,	Follow the appropriate <u>Ethernet Communication Module Installation and Removal</u> procedures in this guide.
Fault Tolerant Ethernet Bridge Modules	Refer to the <i>Fault Tolerant Ethernet Bridge Implementation Guide</i> for information.
Battery Extension Modules	Follow the <u>Battery Extension Module Installation and Removal</u> procedures in this guide.
Power Supplies,	Follow the appropriate <u>Power Supply Installation and Removal</u> procedures in this guide.
I/O Link Interface Module	Follow the appropriate <u>I/O Link Interface Module Installation and Removal</u> procedures in this guide.

Enclosure Installation

Moving the Enclosure

Before You Begin

Your enclosure(s) may be moved one of four ways:

- Moving by Fork Lift,
- Moving by Mobile Lifter,
- Moving by Rollers, or
- Crane, see Moving by Crane - Using a Transport Skid or Moving by Crane - Using Eyebolts.



CAUTION

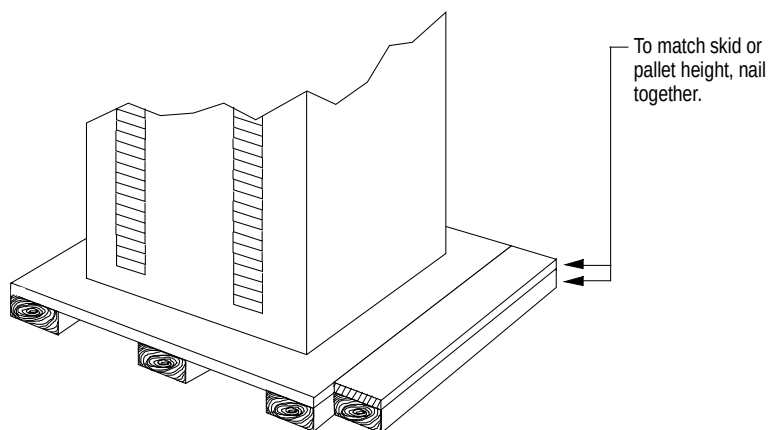
Please note the following precautions:

- Follow any specific procedures or requirements provided by your enclosure supplier.
 - When moving an enclosure, use lifters with a capacity of 1100 kg (2500 pounds) or more.
 - If your enclosure doors are not recessed, tilting the unit more than 45 degrees, front or back, may damage the doors.
-

Moving by Fork Lift

The equipment, on the original shipping skid, is moved by forklift to the final location as outlined in the following procedure.

Step	Action
1	Move the equipment to the electronics room by forklift; remove the forklift.
2	Open the cabinet doors. Locate the skid bolts, and remove them.
3	Stack lumber against the pallet to a matching height.

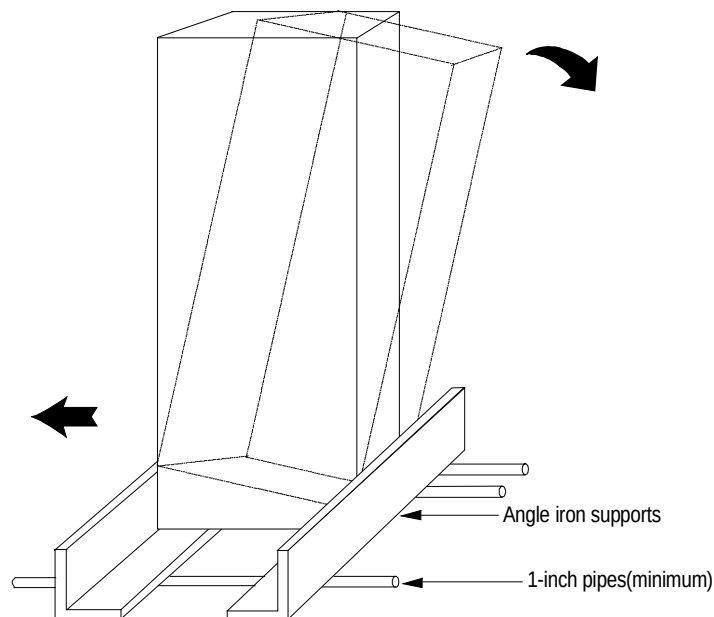


4	Manually move the equipment onto the lumber.
5	Tip the cabinet weight onto the lumber, then pull out the skid.
6	Tip the cabinet off the lumber and onto the floor; remove the lumber.
7	Manually move the cabinet to the exact and final position.
-

Moving by Mobile Lifter

The equipment is removed from the shipping skid, then placed on a transport skid made from angle iron. It is then moved with a mobile lifter using the procedure in the table below.

Step	Action
1	Remove any steel bands, turnbuckles, and cables securing the equipment to the shipping skid.
2	Open the cabinet doors, and locate the bolts holding the cabinets to the shipping skid; remove them, and close the doors.
3	One side at a time, tilt the equipment slightly; slide-out one of the angle irons used to make up a transport skid underneath the cabinet.

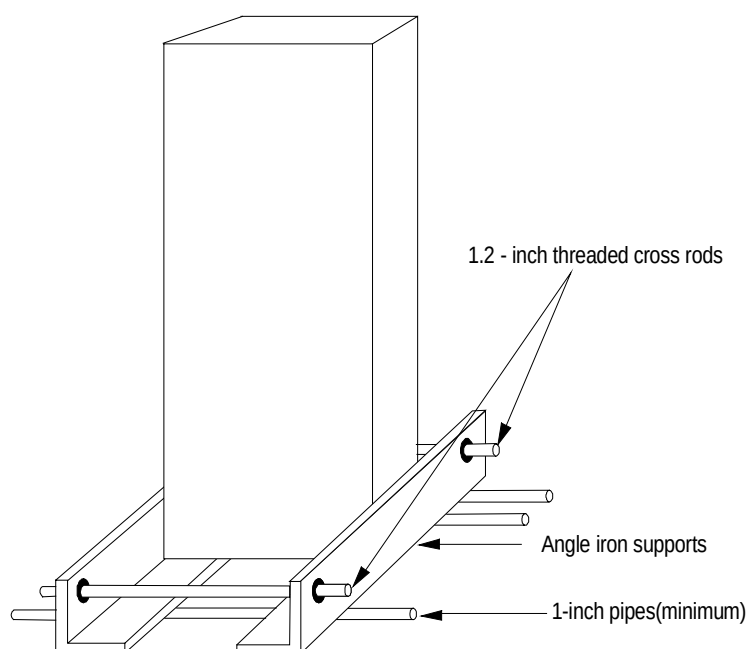


- 4 Repeat Steps 1—3 for the other angle.
- 5 Insert a strip of heavy cardboard between each angle-iron and the equipment finish.

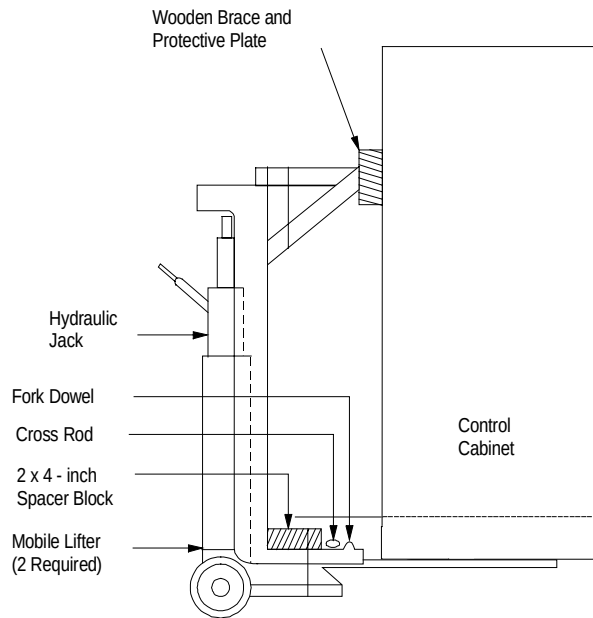
Enclosure Installation

Moving the Enclosure

Step	Action
6	Tighten the angle irons against the cabinet by tapping slightly.
7	Insert and tighten two 12 mm (1/2 in.) minimum, threaded cross-rods as illustrated.



Step	Action
8	Spread the lifter forks to 0.8 m (32 in.) centers and put them under each cross rod. Place the fork dowel between the cross-rods and the cabinet, just touching the cross-rods as illustrated.

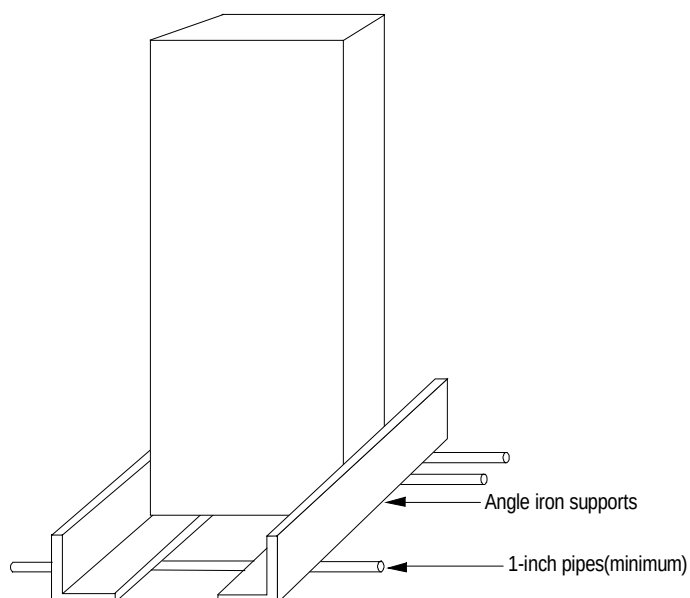


- 9** Place wooden spacer blocks along the forks. They should be long enough to press the cross-rods against the fork dowels.
- 10** Position a protective plate, using braces as illustrated. Be sure that the plate does not press against handles or other cabinet hardware.
- 11** Raise both lifter forks evenly until the equipment clears the shipping skid; pull the skid out of the way.
- 12** Wheel the equipment to the final position in the electronics room; lower it to the floor.
- 13** Pull out the mobile lifters. Dismantle and remove the angle-iron transport skid.
- 14** Manually place the cabinet in the exact and final position.

Moving by Rollers

The cabinet is moved to its final destination with pipe rollers under a transport skid made from angle iron. Use the procedure outlined in the table below.

Step	Action
1	Use one of the previous methods to move the cabinet to a location where rollers are to be used.
2	Build the angle-iron transport skid as illustrated.
3	Roll the cabinet to the final location. A minimum of three pipes must be under the transport skid at all times.



4	When the cabinet is near its final location, tilt it back, then remove the pipes. Remove the middle pipe last.
5	Dismantle the transport skid, and position the cabinet manually to the exact and final location.

Moving by Crane - Using a Transport Skid

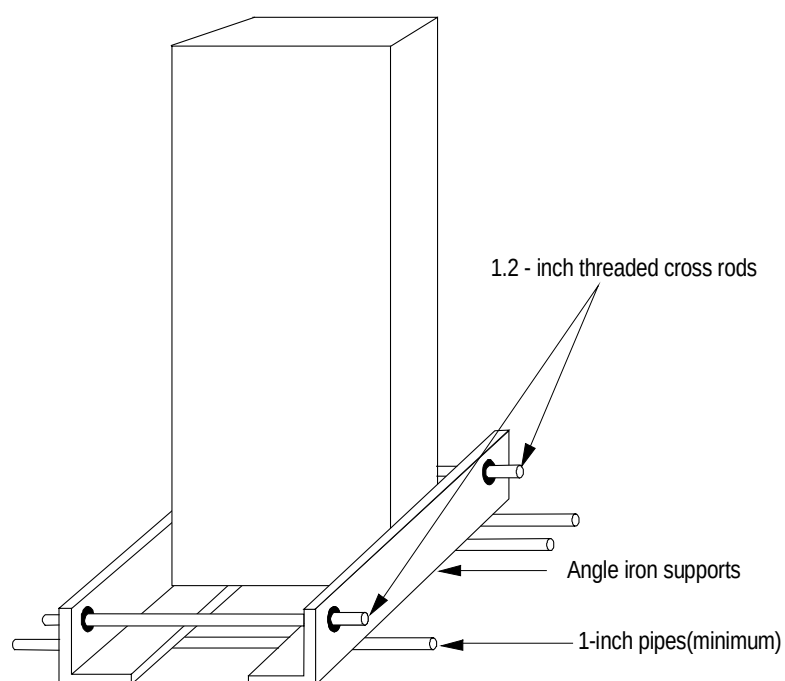
In this method, the cabinet is lifted into place with a crane; an angle-iron transport skid is used under each cabinet. This procedure is described in the table below. See [Moving by Crane - Using Eyebolts](#) in this section for that procedure.

Step	Action
1	Remove any steel bands, turnbuckles, and cables securing the equipment to the shipping skid.
2	Open the cabinet's door and locate the bolts holding the cabinets to the shipping skid; remove them and close the doors.
3	Tilt the equipment slightly, and slide one of the angle irons used to make up a transport skid underneath the cabinet.
4	Repeat Steps 1—3 for the other angle.
5	Insert a strip of heavy cardboard between each angle iron and the equipment finish.
6	Tighten the angle irons against the cabinet by tapping slightly.

Enclosure Installation

Moving the Enclosure

Step	Action
7	Insert and tighten two 12 mm (1/2 in.) minimum diameter, threaded cross-rods as illustrated.



Step	Action
8	Attach the appropriately sized spreader and cables as illustrated.

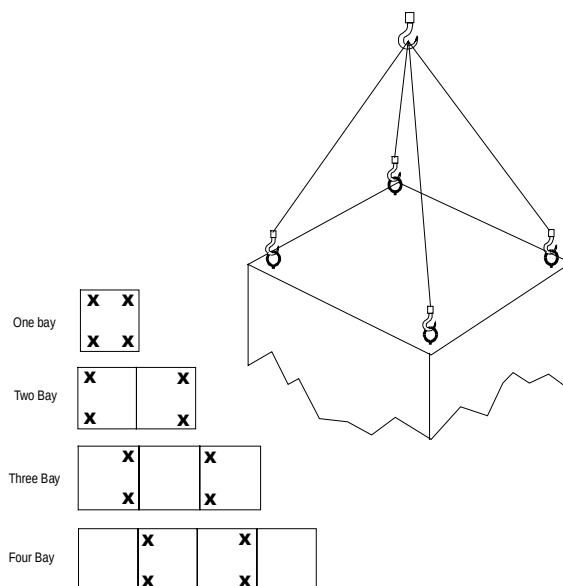
The diagram shows a 3D perspective of a rectangular cabinet being prepared for lifting. A spreader, represented by a hook at the top, is connected to four cables that extend down to the corners of the cabinet's top surface. The cabinet is positioned on a transport skid. This skid is supported by four vertical angle iron supports, which are in turn supported by four horizontal pipes. Labels with arrows point to these components: 'Spreader' points to the hook, 'Angle iron supports' points to one of the vertical supports, and '1-inch pipes(minimum)' points to one of the horizontal pipes.

9	Lift and move the cabinet to near its final location.
10	Disconnect the crane's cables and spreader. Dismantle and remove the angle-iron transport skid.
11	Manually move the cabinet to its exact and final position.

Moving by Crane - Using Eyebolts

In this method, the cabinet is lifted into place with a crane, using lifting eyebolts you have installed on each cabinet. This procedure is described in the table below. See Moving by Crane - Using a Transport Skid in this section for that procedure.

Step	Action
1	Remove any steel bands, turnbuckles, and cables securing the equipment to the shipping skid.
2	Open the cabinet doors, and locate the bolts holding the cabinets to the shipping skid; remove them, and close the doors.
3	Attach the appropriately sized cables as illustrated



4	Lift and move the cabinet to near its final location.
5	Disconnect the crane's cables, and if necessary, manually move the cabinet to its exact and final position.
-

Leveling and Bolting Down Enclosures

Leveling

Many enclosures do not include levelers. It may be necessary to hand-fit shims underneath the cabinet in order to make it sit solidly. Refer to any documentation that accompanied your enclosure.

Bolt Down

A cabinet typically has holes in the bottom for bolting it to a floor. Both filled and partially filled cabinets should be bolted down. Cabinets that are bolted together are not easily moved, and may not require bolting down.

Installing the Internal Infrastructure

Introduction

Before proceeding, check to determine if any system infrastructure components, such as power and ground buses (field-wire terminal panels or strips) and ControlNet taps and drop cables, need to be installed.

If Honeywell did not preconfigure your enclosure(s), you may need to install the following internal infrastructure components yourself

- ground buses
- DIN-rails
- field-wiring terminal panels or strips
- ControlNet taps and drop cables
- power buses
- cabinet circuit breakers (not permitted in Class 1, Division 2 locations)
- cooling equipment (as required by application)



REFERENCE

All of the previously mentioned system infrastructure components, except DIN-rails, should have been installed during system cabling and wiring. For DIN-rail installation, refer to [Installing DIN-rails](#) in this guide.

Installing DIN-rails

One or more DIN-rails may be required in your enclosure to provide a mounting location for certain components. Among other possible components, ControlNet taps are designed to optionally mount to a DIN-rail. If your enclosure:

- **Specified** DIN-rails, then they should have been installed by your supplier or control system integrator (CSI).
- **Did not specify** DIN-rails, then you may need to install them yourself. Refer to your enclosure and DIN-rail supplier's documentation for installation details.

Chassis Installation

Preparing to Install the Controller Chassis

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you are installing the chassis in the correct enclosure.

Check that the enclosure meets the minimum size requirements listed in Table 1 for the given chassis model to ensure compliance with all approval body standards.



ATTENTION

Be sure you provide proper thermal management inside all enclosure configurations to meet the ambient temperature requirement for your application. The Control hardware is rated for use in a 60 °C (140 °F) ambient unless otherwise marked on a module. Please see the Control hardware temperature classification guidelines in this document for more information. Thermal management considerations include:

- Adhering to minimum enclosure size recommendations.
- Observing minimum spacing requirements for all hardware.
- Routing cables and wire trays so they are outside the unobstructed space around the hardware and not laying cables on top of any hardware.

Using cooling equipment, such as fans and heat exchangers, as required to keep the temperature of the air exiting from within one inch (25mm) above the chassis from exceeding 70 °C (158 °F).

Prepare for Installation

In addition to the chassis, make sure you have:

- M4 or M5 (#10 or #12) hardware — phillips screw and star washer or SEM screw (phillips screw with attached star washer) — for chassis-mounting tabs (see Table 1)
- Phillips screwdriver
- Drill

Chassis Installation

Preparing to Install the Controller Chassis

- All Honeywell and site-specific documentation for your chassis

Table 1 Chassis-mounting tabs and fasteners and minimum enclosure sizes

This Model Chassis	Has	Requiring	And, Minimum Enclosure Size (W x H x D) is . . .
TC-FXX041or TC-FXX042	4 mounting tabs	4 screws/washers or SEMs	50.7 x 50.7 x 20.3 cm 20 x 20 x 8 in
TC-FXX071 or TC-FXX072	4 mounting tabs	4 screws/washers or SEMs	50.7 x 70 x 20.3 cm 20 x 24 x 8 in
TC-FXX101 or TC-FXX102 or TK-FXX102	6 mounting tabs	6 screws/washers or SEMs	76.2 x 50.7 x 20.3 cm 30 x 20 x 8 in
TC-FXX131 or TC-FXX132 or TK-FXX132	8 mounting tabs	8 screws/washers or SEMs	76.2 x 70 x 20.3 30 x 24 x 8 in
TC-FXX171 or TC-FXX172	8 mounting tabs	8 screws/washers or SEMs	82.2 x 76.2 x 20.3 cm 36 x 30 x 8 in

Mounting Space Requirements



ATTENTION

Make sure you meet the minimum spacing requirements illustrated in Figure 3, when mounting your chassis.

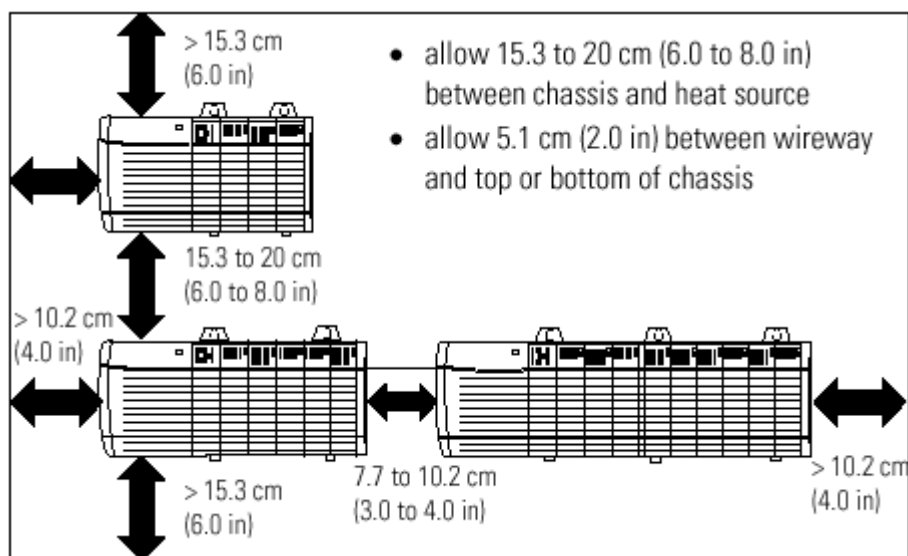
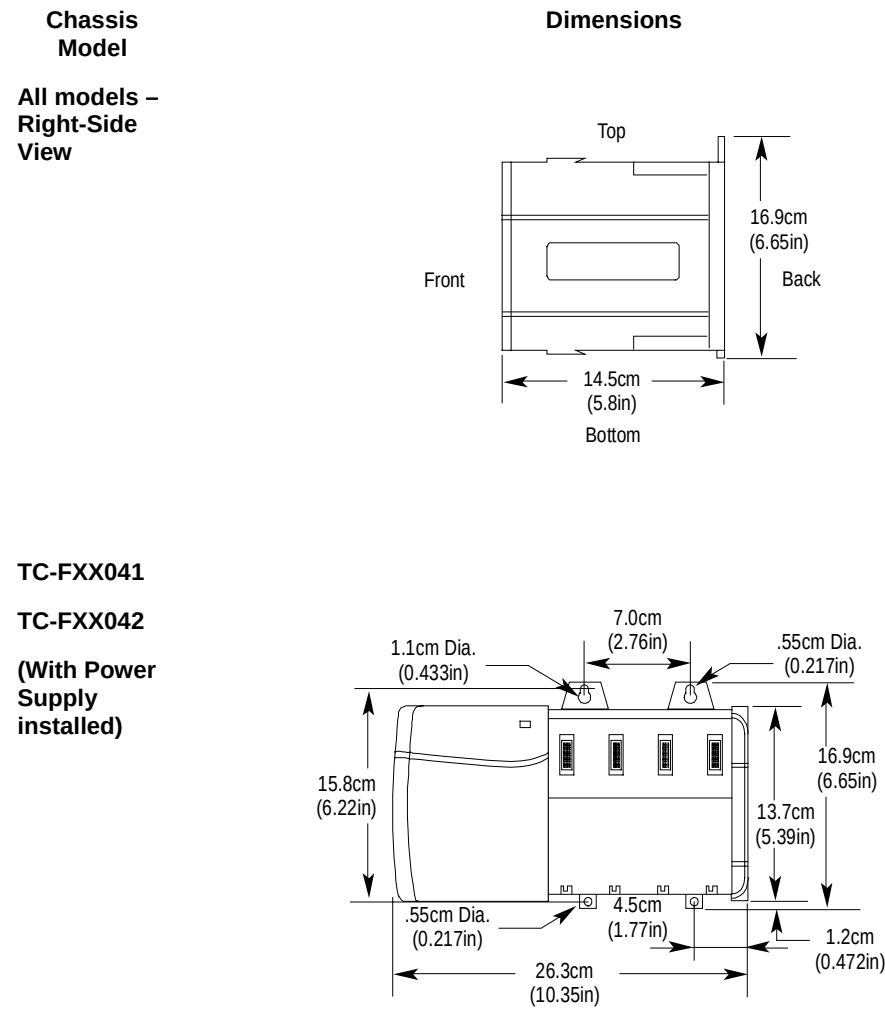


Figure 3 Minimum chassis-mounting space requirements

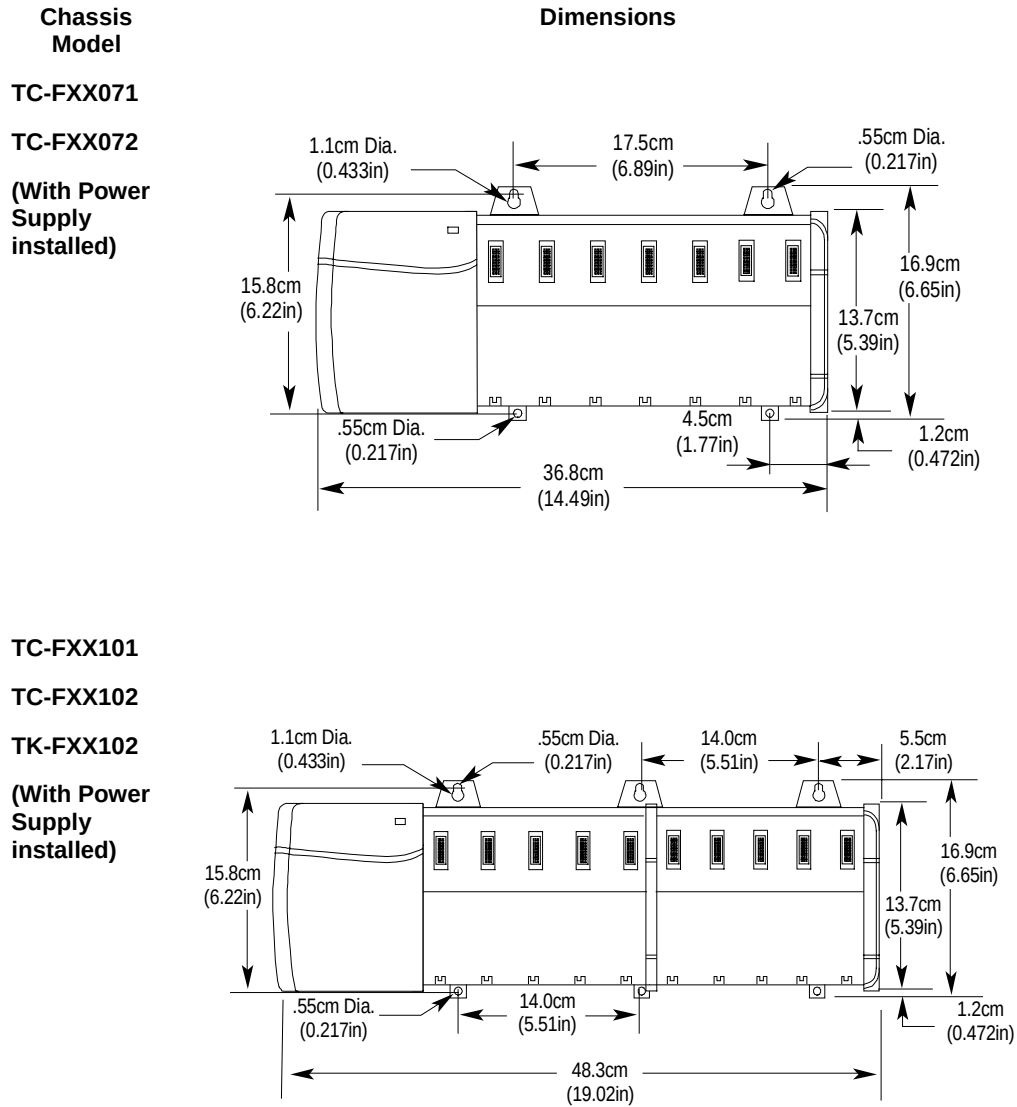
Chassis Installation
Preparing to Install the Controller Chassis

Chassis-mounting Dimensions



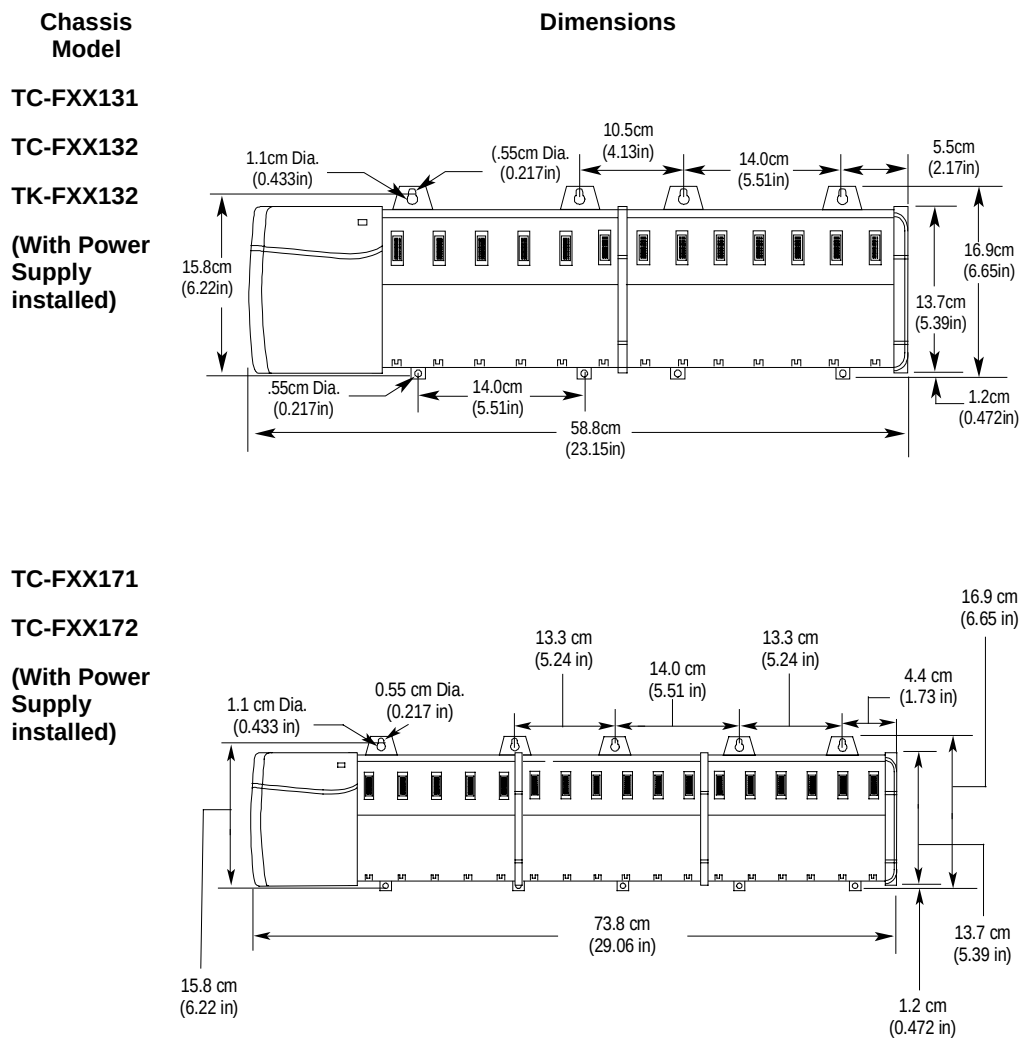
Chassis Installation

Preparing to Install the Controller Chassis



Chassis Installation

Preparing to Install the Controller Chassis



Installing the Controller Chassis

Install Your Chassis

Use the following procedure to install the chassis on the back panel of the enclosure.



ATTENTION

Your chassis may be mounted with either bolts or welded studs.



CAUTION

During the following procedure:

- If the chassis-mounting tabs do **not** lay flat before the screws are tightened, use additional washers as shims. This will ensure that tightening the screws does **not** warp the chassis. Warping a chassis could damage the backpanel, and cause poor connections.
 - Do **not** drill holes for a chassis above an already installed chassis. Metal chips from drilling can damage or short the backpanel, and short the backpanel card-edge connectors.
-

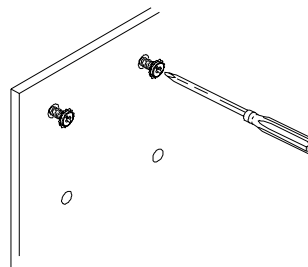
Step	Action
1	Reference the appropriate chassis mounting dimensions and measure and mark the location of the mounting tab holes on the back panel. Or, if you have help, position the chassis in the desired location on the back panel and use a center punch to mark the location of the mounting tab holes.
2	Using the marks made in Step 1, drill tap holes in the back panel of the enclosure for #10 (M4) or #12 (M5) mounting screws.
3	Scrape paint off of the back panel so that continuity will exist between the back panel and the installed chassis.

Chassis Installation

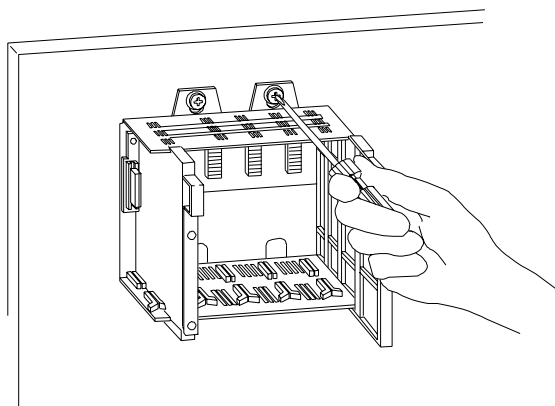
Installing the Controller Chassis

Step	Action

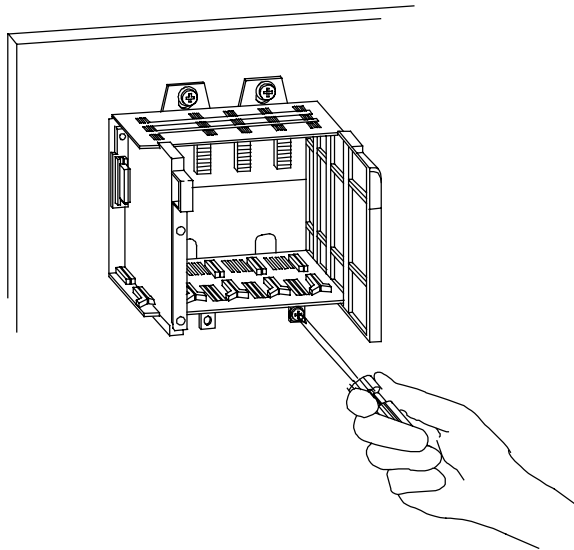
- 4** Put a split lock-washer and flat washer on a phillips screw and screw it into a top mounting hole so it is secure, but not tight against the panel. Repeat as required for the remaining top mounting holes.



- 5** Align the chassis top mounting tab holes with the installed screws, slip the tabs over the screws, and slide the chassis behind the washers, so it rests on the screws. Tighten the screws.



Step	Action
6	Leaving the far-left bottom tab open for functional ground connection, install the remaining bottom mounting tab screw(s).



7	If your plan calls for Redundant Controllers, repeat this procedure to install the second chassis of the redundant pair as well as the remote I/O chassis.
-

Post Chassis Installation Tasks

Attach power supply and install modules

Unless you ordered your chassis pre-configured from the factory, please attach the power supply and install the modules as outlined in applicable sections of this Guide. Refer to *Planning Your Chassis Configurations* in the *Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.



ATTENTION

Users are responsible for checking that all components have the appropriate firmware and setting initial network parameters for any chassis that they configure. This includes verifying that all Control hardware components pass their powerup diagnostics.

Make ground connections

In conjunction with power and field wiring, you are responsible for making functional and Protective Earth (PE) ground connections from the chassis and power supply to the ground source. Please refer to the *Protective Earth (PE) ground guidelines* and *Ground bus connection guidelines* in this *Guide* for general grounding recommendations. Also, refer to Planning for Bonding and Grounding in the Planning Guide for additional grounding information.

Controller Module Installation and Removal

Preparing to Install Controller Modules

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that no power is applied to the chassis.

Prepare for installation

Verify that you have a C200 Control Processor module (CPM) model TC-PRS021. It supersedes the C100 CPM model TC-PNX021 and can be used with both non-redundant and redundant Controller configurations. The C100 CPM can only be used with non-redundant Controller configurations as noted in Table 2. The installation procedures are identical for both models.

Table 2 CPM model number reference

Module Type	Model Number	Description
C100 CPM	TC-PNX021	Was discontinued at PlantScape system version R110 and was replaced by the C200 CPM. The C100 CPM can still be used with later PlantScape system versions in non-redundant Controller configurations only until system version R320.
	TC-PRS021	Supersedes the C100 CPM and can be used with non-redundant or redundant Controller configurations.

Confirm the selected chassis slot location for mounting the CPM. The default location is slots 1 and 2. Be sure your planned chassis configuration complies with the configuration rules outlined in *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide*.

Controller Module Installation and Removal

Preparing to Install Controller Modules



REFERENCE

For specific information concerning the:

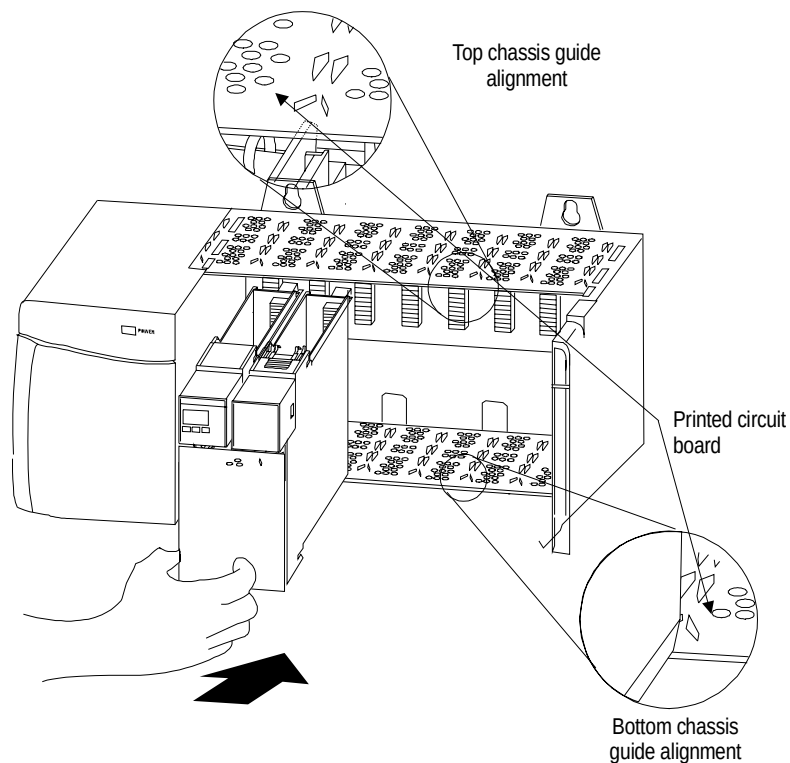
- Planning of your system configuration, please refer to *System Configuration Examples Using ControlNet* in the Control Hardware Planning Guide.
 - Operation of redundant controllers, please refer to *Basic Redundancy Design Concepts and Implications for Control Builder Functions* in the *Experion PKS Control Builder Components Theory*.
-

Installing the Control Processor Module

Insert in the Chassis

Use the following procedure to insert the CPM into the chassis. This procedure assumes that this is the initial installation of a CPM in an unpowered chassis.

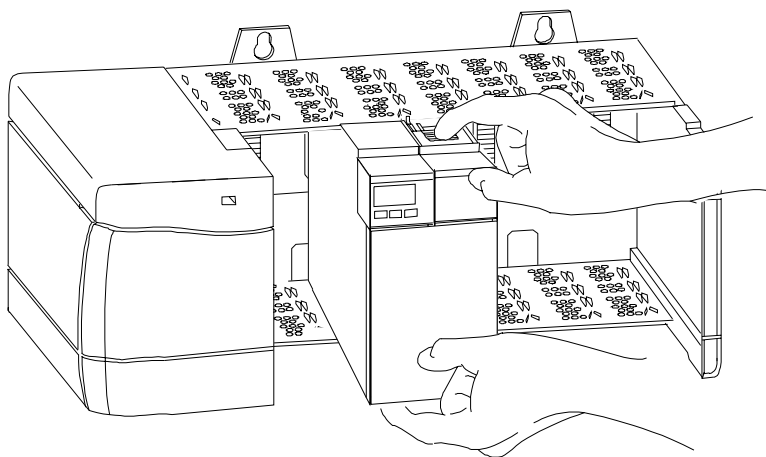
Step	Action
1	Position the module at the desired chassis slots location. The default location is slots 1 and 2. (Remember that slot numbering is zero-based and the left most slot is number "0".)
2	Align the module's circuit board with the top and bottom chassis guides.



Controller Module Installation and Removal

Installing the Control Processor Module

Step	Action
3	Slide the module into the chassis until the module tabs “click” into position.



- 4 If you are configuring a Redundant Chassis Pair, repeat this procedure to install the second CPM in the other chassis of the redundant pair.

Install, Connect, or Remove the CPM Battery

About the battery

The CPM contains a non-rechargeable lithium battery that is accessible when its front cover is open. The battery provides backup power for Random Access Memory (RAM) retention during a power interruption.



CAUTION

The battery used in the CPM may present a risk of fire or chemical burn, if mistreated. Do **not** recharge, disassemble, heat above 100 degrees C (212 degrees F), or incinerate. Replace the battery with a Honeywell model TC-BATT01 battery only. Using another battery may present the risk of fire or explosion.

Battery reference

The battery is disconnected to protect it during shipment and storage. Refer to the following section *Installing the Control Processor Battery* to connect the battery plug to the battery terminal pins on the CPM or install a replacement battery.



ATTENTION

If your chassis configuration also includes a Battery Extension Module (BEM), you can leave the CPM battery installed and connected. But, the BAT LED on the front of the CPM will turn Red instead of Green after powerup to show that the startup diagnostics has detected both batteries.

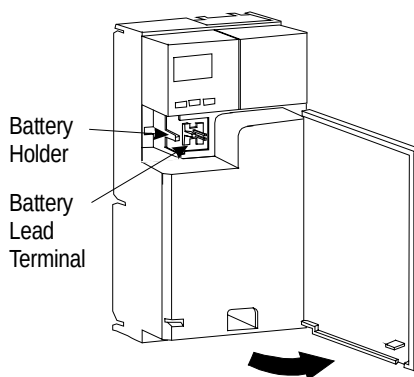
Installing the Control Processor Battery

Insert in the module

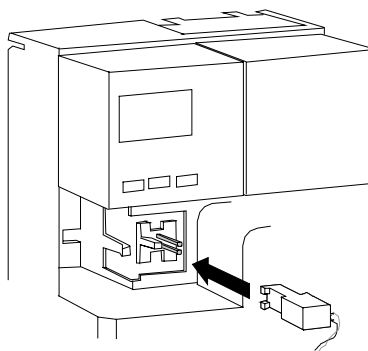
Use the following procedure to install the CPM battery or just connect the battery plug to the battery terminal pins on the CPM, if the battery is already installed.

Step	Action

- 1** Open the front door on the Control Processor.



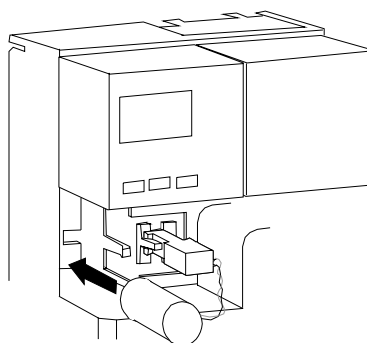
- 2** Align and press the plug on the battery's two-wire lead onto the module battery terminal pins.



Controller Module Installation and Removal

Installing the Control Processor Battery

Step	Action
3	Insert the end of the battery away from the lead wires into the recessed area in the module. Make sure the black retaining tab, located next to the battery lead terminal, clicks and secures the battery in its holder.



TIP

Put a label on the back of the module's front door that lists the date the battery was installed to provide a convenient reference for determining how long the battery has been in service.

4	Close the Control Processor module's front door.
5	If you are configuring a Redundant Chassis Pair, repeat this procedure to install/connect the battery in the second CPM in the other chassis of the redundant pair.
-

Post CPM Installation Checks

Install other modules

Install the other modules planned for the chassis configuration as outlined in applicable sections of this *Guide*. Refer to *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.

Load personality image



ATTENTION

If the CPM is not installed and pre-configured by the factory, users must load the CPM's personality image (firmware) to make it fully operational. This is also true for any replacement CPM ordered separately from the factory.

Once the Control hardware is installed and system communications are established, refer to Loading *CPM personality image – Optional* in the *Startup and Shutdown Guide* to update the CPM's firmware.

Removing the Control Processor Module



WARNING

Be sure your process is “Off Control” before you remove a CPM. This means the CPM should be in its idle state.

Remove from the chassis

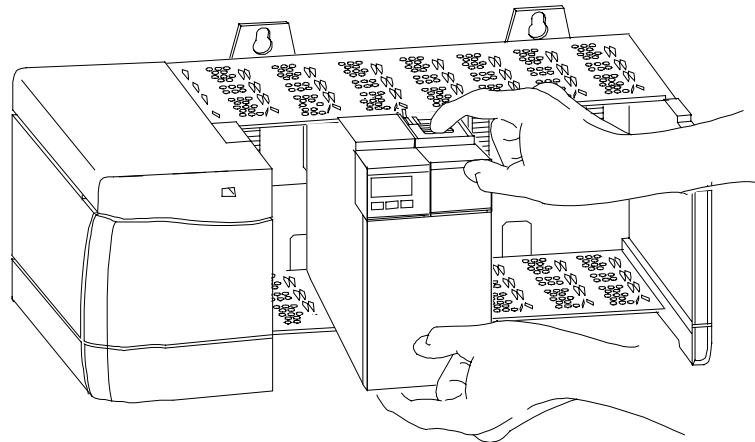
Use the following procedure to remove the CPM from the chassis.



ATTENTION

If the CPM battery is not installed or it is discharged, the CPM will not retain its database after power is removed.

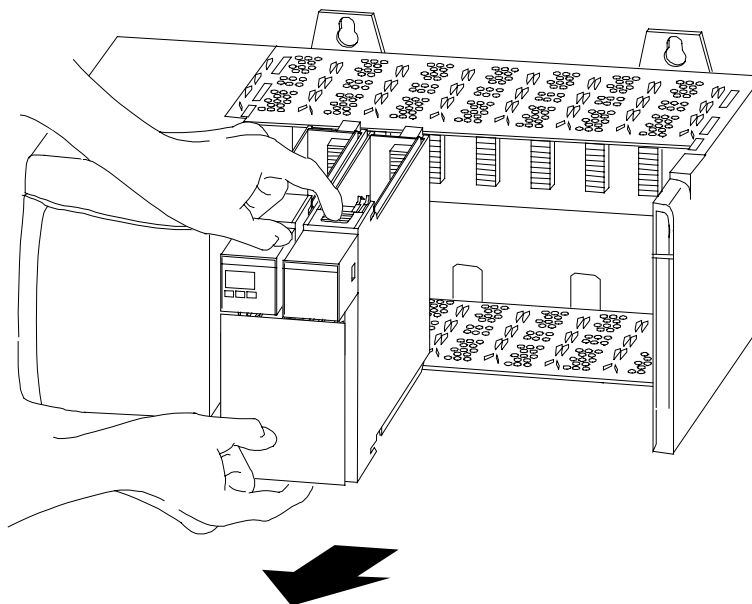
Step	Action
1	Open the door on the power supply and flip the power switch to its OFF position.
2	Push in the top and bottom locking tabs.



Controller Module Installation and Removal

Step	Action

3	Pull the module out of the chassis.



Install Replacement CPM

Procedure

Refer to the previous *Installing the Control Processor Module* procedure in this *Guide* to insert the replacement CPM into the chassis.

Once the replacement CPM is installed, refer to the *Loading CPM personality image – Optional* in the *Startup and Shutdown Guide* to update the CPM's firmware.



ATTENTION

Users are responsible for checking that replacement modules have the appropriate firmware. This includes verifying that replacement modules pass their powerup diagnostics.

Removing the Control Processor Battery

Remove from the module

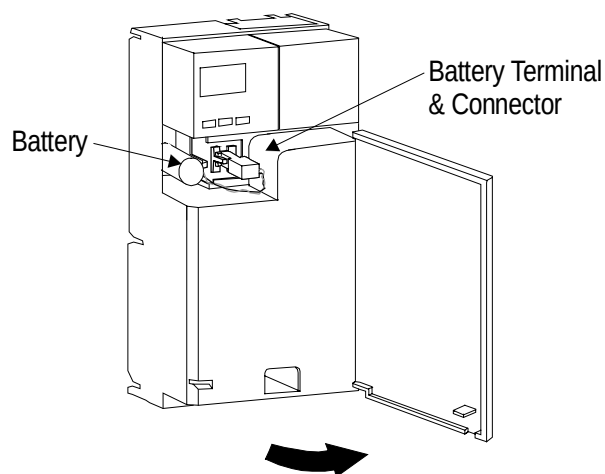
Use the following procedure to remove the CPM battery from the CPM.



ATTENTION

The CPM will not retain its database, if power is lost while the battery is removed.

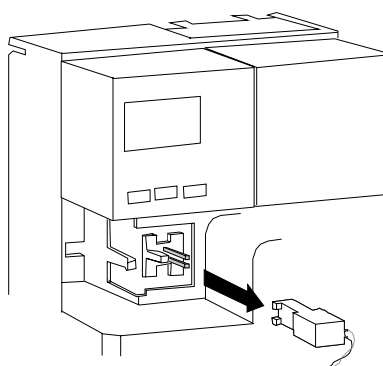
Step	Action
1	Open the front door on the Control Processor.



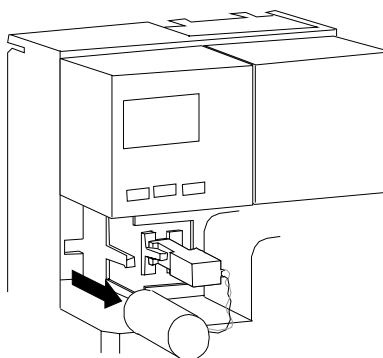
Controller Module Installation and Removal

Removing the Control Processor Battery

Step	Action
2	Disconnect the plug on the battery's two-wire lead from the CPM's battery terminal pins.



- 3 Push the black tab (located next to the battery lead terminal) securing the battery in its holder to the right and pull the battery from the recessed area in the module.



- 4 If you are:
- Replacing the battery, refer to *Installing the Control Processor Battery, Insert in the module* in this *Guide*.
 - Not replacing the battery, continue with Step 5.

Controller Module Installation and Removal

Removing the Control Processor Battery

Step	Action
5	Close the Control Processor module's front door.

Redundancy Module Installation and Removal

Preparing to Install Redundancy Modules

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that both chassis for the Redundant Chassis Pair (RCP) are installed and they include C200 CPMs.

Check that no power is applied to either chassis.

Prepare for installation

Verify that you have two Redundancy Modules (RM) and a redundancy cable of sufficient length to connect between the two installed modules as listed in Table 3.

Table 3 RM and Redundancy Cable Model Number Reference

Module Type	Model Number	Description
Redundancy Module	TC-PRR021	Two-slot module
Redundancy Cables	GN-KRR011	1 meter redundant fiber optic
	GN-KRR031	3 meter redundant fiber optic
	GN-KRR101	10 meter redundant fiber optic

Confirm the selected chassis slot location for mounting the RM in each chassis. The default location is slots 5 and 6 in a 10- or 17-slot chassis or slots 4 and 5 in other chassis models. Be sure your planned chassis configuration complies with the configuration rules outlined in the *Process controller chassis configuration* in the *Control Hardware Planning Guide*.

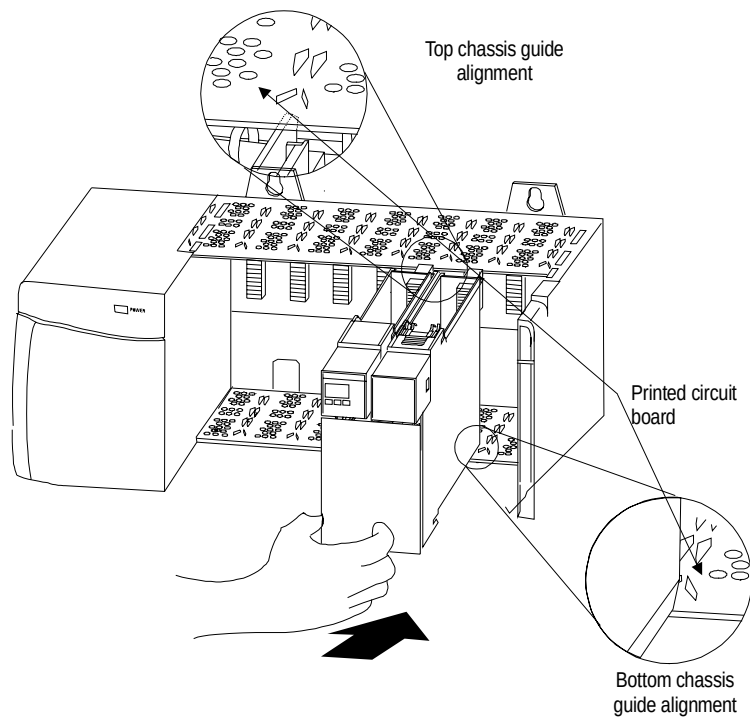
Check that shielded, twisted pair cable size AWG 22 to 14 is available to wire the Status Contact Interface connector on the RM, if this function is to be used in your application.

Installing the Redundancy Module

Insert in the Chassis

Use the following procedure to insert an RM into the chassis.

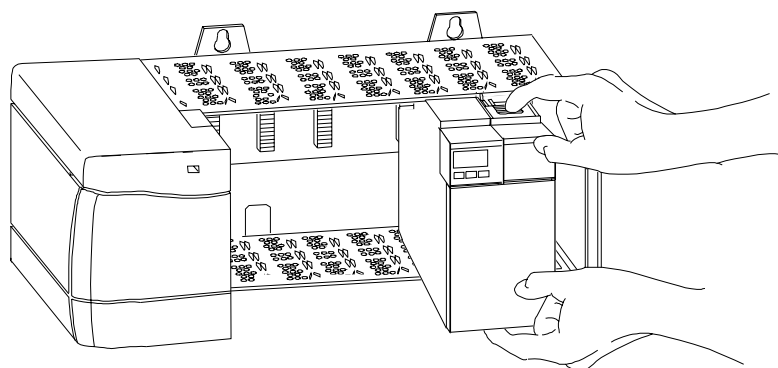
Step	Action
1	Position the module at the desired chassis slots location. The default location is slots 5 and 6 in a 10- or 17-slot chassis or slots 4 and 5 in other chassis models. (Remember that slot numbering is zero-based and the left most slot is number "0".)
2	Align the module's circuit board with the top and bottom chassis guides.



Redundancy Module Installation and Removal

Installing the Redundancy Module

Step	Action
3	Slide the module into the chassis until the module tabs “click” into position.



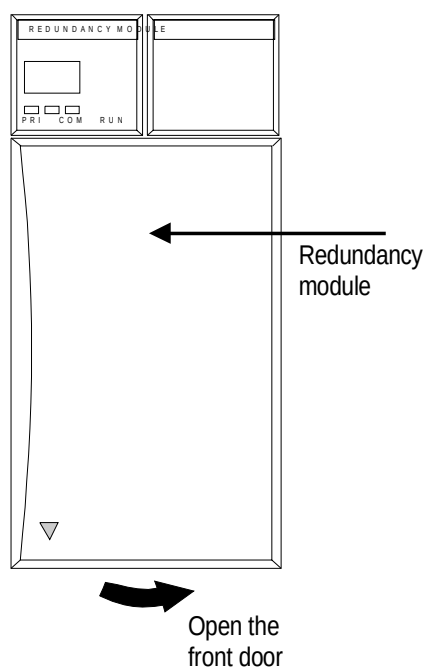
- 4 Repeat this procedure to install the second RM in the other chassis in the redundant pair.
 - 5 Go to the next section *Installing the Redundancy Cable*.
-

Installing the Redundancy Cable

Connect between RMs

Use the following procedure to connect the redundancy cable between the RMs in the RCP.

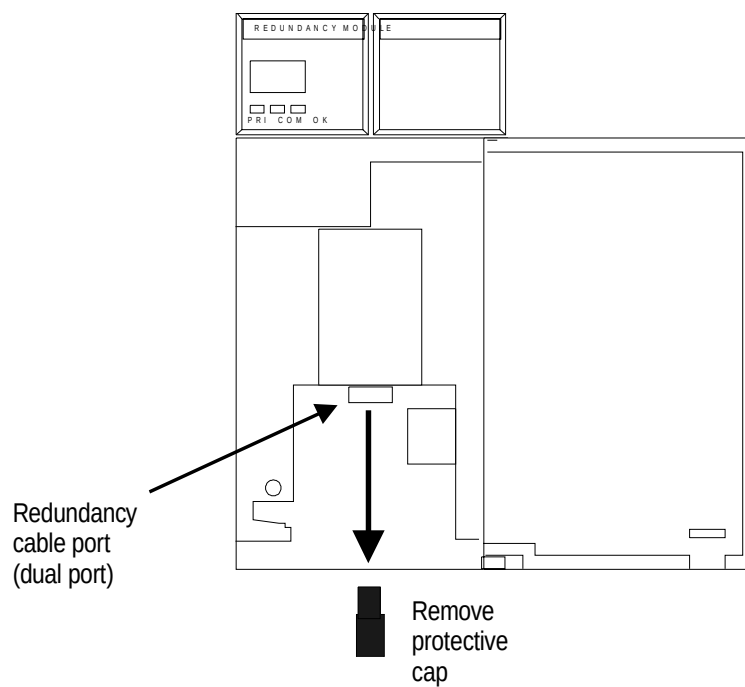
Step	Action
1	Open the front door on one of the Redundancy modules in the RCP.



Redundancy Module Installation and Removal

Installing the Redundancy Cable

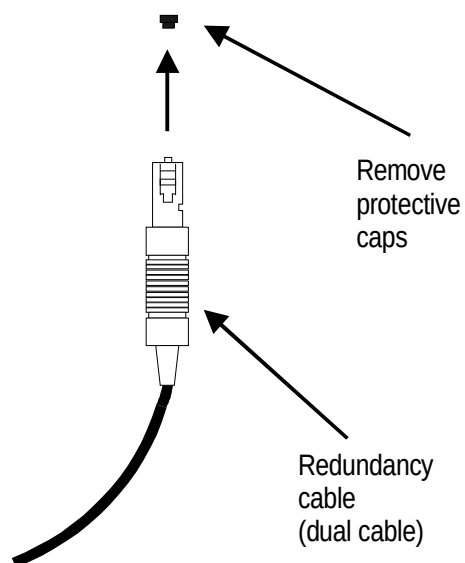
Step	Action
2	Remove the protective cap from module's Redundancy cable port.



Redundancy Module Installation and Removal

Installing the Redundancy Cable

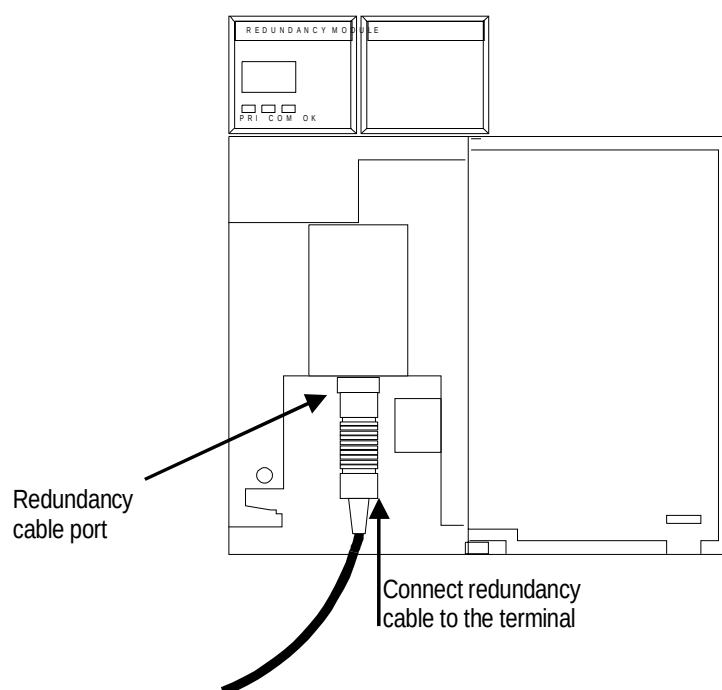
Step	Action
3	Remove the protective caps from one end of the Redundancy cable.



Redundancy Module Installation and Removal

Installing the Redundancy Cable

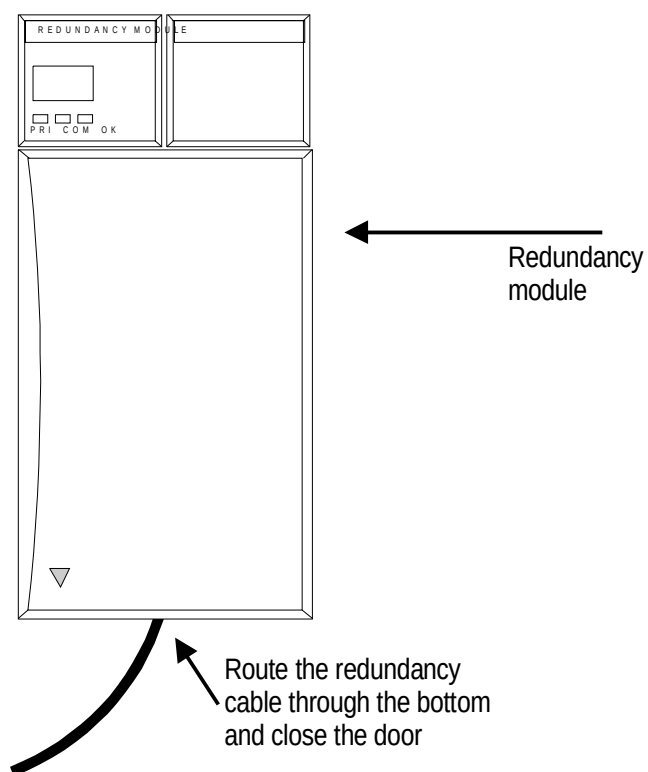
Step	Action
4	Connect the Redundancy cable to the terminal.



Redundancy Module Installation and Removal

Installing the Redundancy Cable

Step	Action
5	Route the Redundancy cable out the bottom of the module and close the door.



- 6 Observing good wiring practices, route the other end of the redundancy cable to the RM in the other chassis of the redundant pair.
 - 7 Repeat Steps 1 to 5 to connect the other end of the redundancy cable to the second RM.
 - 8 If applicable, wire the Status Contact interface connector as outlined in the next section with the same title.
-

Wiring the Status Contact Interface connector



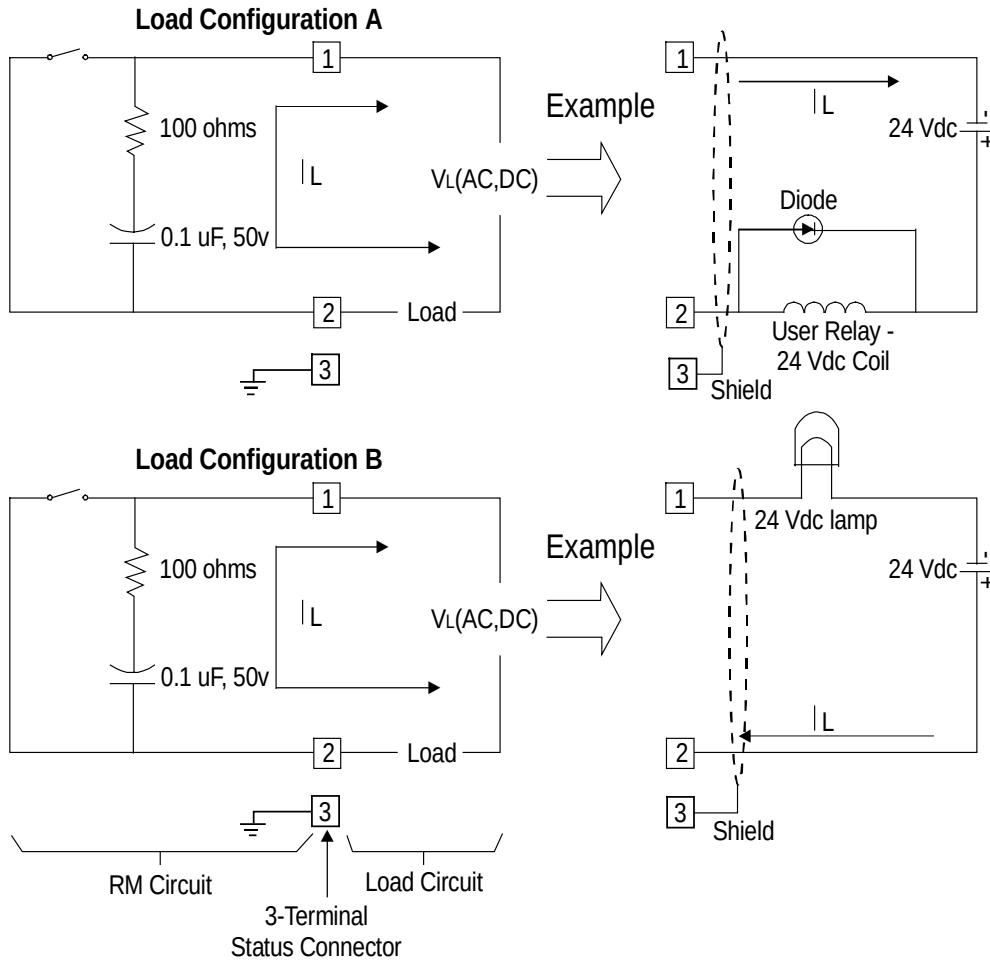
ATTENTION

Some earlier versions of the Redundancy Module do **not** have a Status Contact Interface connector.

About the Status Contact Interface connector

The Redundancy Module includes an optically-isolated, solid state relay that is wired to a Status Contact Interface connector on the front of the module. This normally-open relay contact remains closed when the RM is operating as a primary and opens when the RM switches to secondary/backup status or loses power.

A user can connect an external circuit through the Status Contact Interface connector to monitor the status of the RM. Schematics of typical user supplied monitoring circuits are shown in Figure 4.



Notes:

1. The shield wire must be insulated to comply with CE mark requirements.
2. Do not connect the shield to ground on the load side.

Figure 4 Typical user-supplied Status Contact Interface monitoring circuits

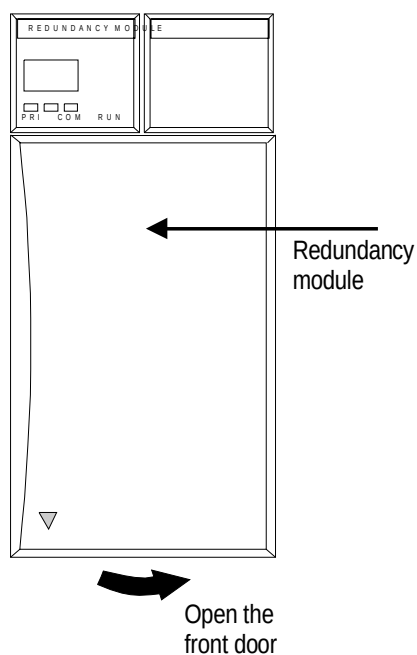
Redundancy Module Installation and Removal

Wiring the Status Contact Interface connector

Wire the connector

Use the following procedure to wire the Status Contact Interface connector to your external monitoring circuit.

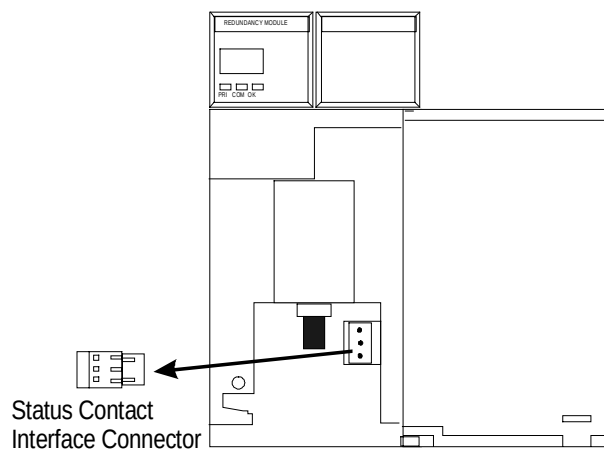
Step	Action
1	Open the front door to the Redundancy module.



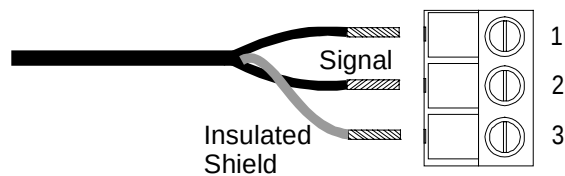
Redundancy Module Installation and Removal

Wiring the Status Contact Interface connector

Step	Action
2	Remove the cable plug from the Status Contact Interface connector



- 3 Connect the signal wires from your external circuit to terminals 1 and 2 on the cable plug. The connector pins are not polarized, so a dc powered load can be connected without regard to polarity. For an inductive load, such as the coil of another relay, use a diode or other voltage limiting device across the coil to protect the RM's solid state relay contact from transient over-voltage (over 40Volts). See Figure 4 for typical monitoring circuit schematics.

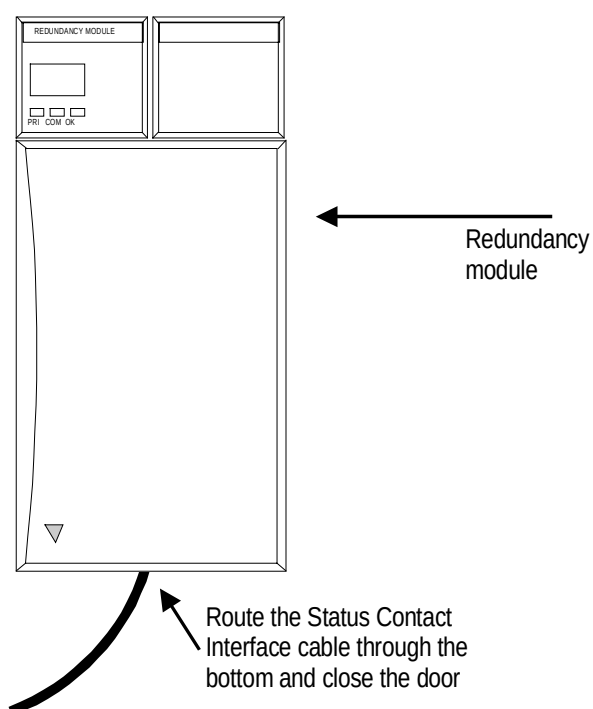


- 4 Connect the insulated shield for the Status Contact Interface cable to terminal 3. Do **not** connect the shield to ground at the load end of the cable.

Redundancy Module Installation and Removal

Wiring the Status Contact Interface connector

Step	Action
5	Insert the wired cable plug into the Status Contact Interface connector, route the Status Contact Interface cable out the bottom of the module, and close the door.



6	Repeat this procedure for the other RM in the RCP, if desired.
-

Post RM Installation Tasks

Install other modules

Install the other modules planned for the RCP configuration as outlined in applicable sections of this Guide. Refer to *Process controller chassis configuration* in the *Control Hardware Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.



WARNING

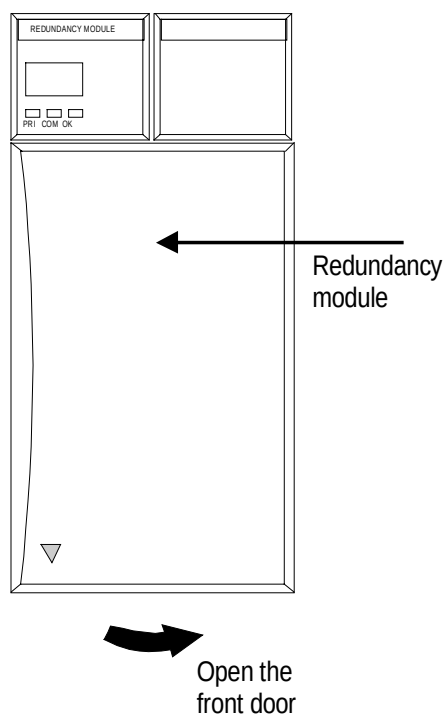
Do **not** install I/O modules in a redundant Controller chassis, since their data could be lost during a switchover to the backup Controller.

Removing the Status Contact Interface Cable

Remove cable from RM

Use the following procedure to remove the Status Contact Interface cable from an RM.

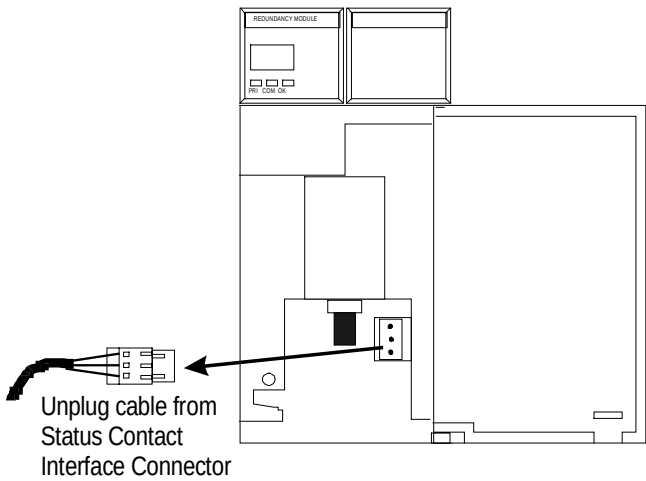
Step	Action
1	Open the front door on the Redundancy module.



Redundancy Module Installation and Removal

Removing the Status Contact Interface Cable

Step	Action
2	Pull the cable plug from the Status Contact Interface connector.



The diagram illustrates a rack-mounted Redundancy Module. A cable with a multi-pin connector is shown being unplugged from a port on the module. An arrow points from the text 'Unplug cable from Status Contact Interface Connector' to the cable's connector. The module has a label 'REDUNDANCY MODULE' and 'FBI COM DA' on its front panel.

3	Remove the cable wires from the plug and return the plug to the Status Contact Interface connector, so it is available for future use.
4	Remove the user-supplied external monitoring circuit.

Removing the Redundancy Cable

Remove redundancy cable from RM

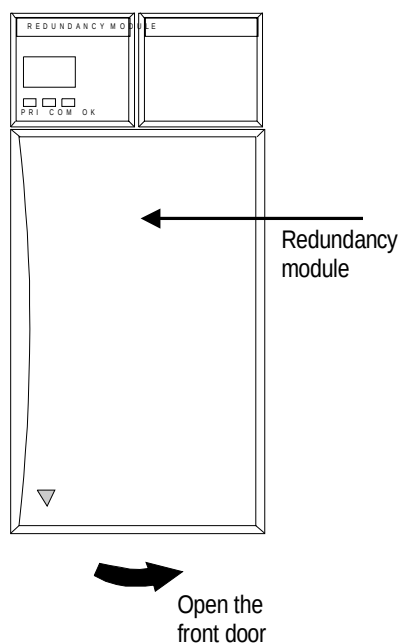


ATTENTION

Removing the redundancy cable from either the Primary or Backup (Secondary) RM immediately puts the Backup (Secondary) Controller into its Disqualified state. This functionally changes the Primary Controller into a non-redundant Controller.

Use the following procedure to remove the redundancy cable from between the RMs in an RCP.

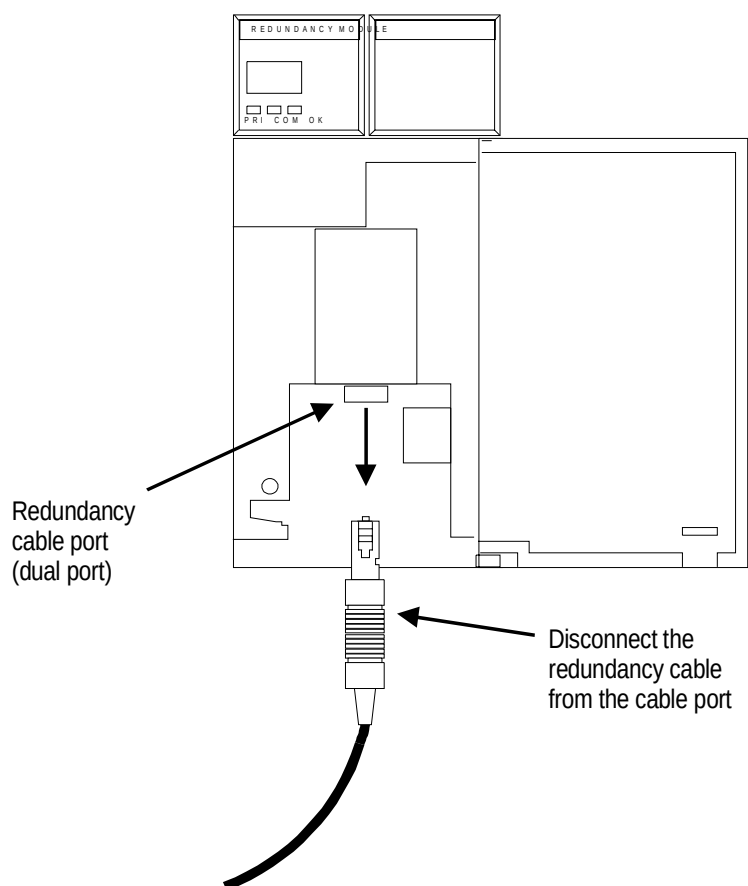
Step	Action
1	Open the front door to the Redundancy module.



Redundancy Module Installation and Removal

Removing the Redundancy Cable

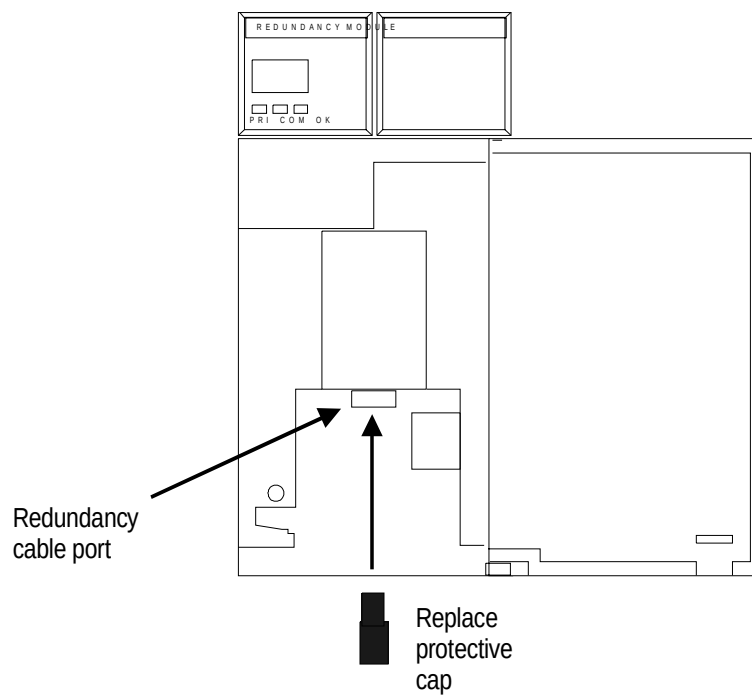
Step	Action
2	Disconnect the Redundancy cable from the terminal.



Redundancy Module Installation and Removal

Removing the Redundancy Cable

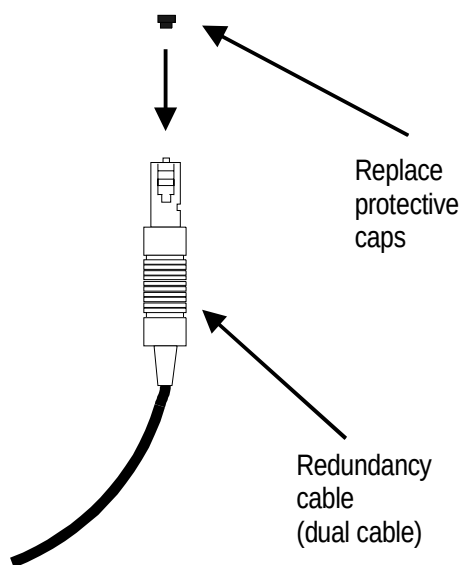
Step	Action
3	Replace the protective cap on the modules Redundancy cable terminal.



Redundancy Module Installation and Removal

Removing the Redundancy Cable

Step	Action
4	Replace the protective cap on the exposed Redundancy cable connector.



5	Repeat Steps 1—4 for the second RM.
6	Remove the Redundancy cable from its routing path between the two Controllers.
-

Post RM Cable Removal Considerations

Check and reconfigure Controllers

Once you remove the redundancy cable, the Controllers no longer function as an RCP. You must make the appropriate Controller and database configuration changes to operate the Controllers as two separate non-redundant Controllers. This function is beyond the scope of this documentation. Please refer to the appropriate sections in Knowledge Builder for more information.

Remove Redundancy Module

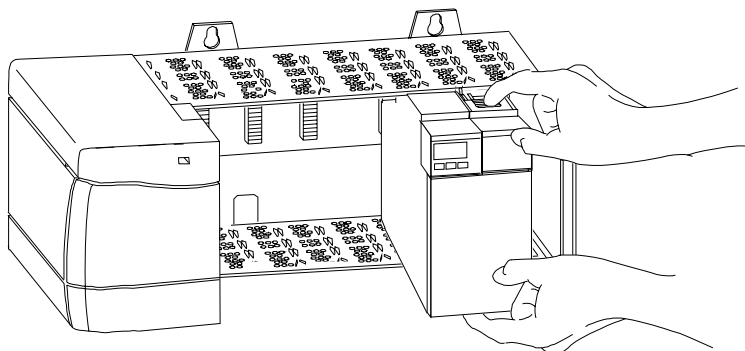
Remove the Redundancy Module as outlined in the next section with the same title.

Removing the Redundancy Module

Remove RM from chassis

Use the following procedure to remove an RM from the chassis.

Step	Action
1	If RM is operating as the Primary, initiate Controller switchover, so it is operating as the Backup before you remove it.
2	Push in the top and bottom locking tabs.

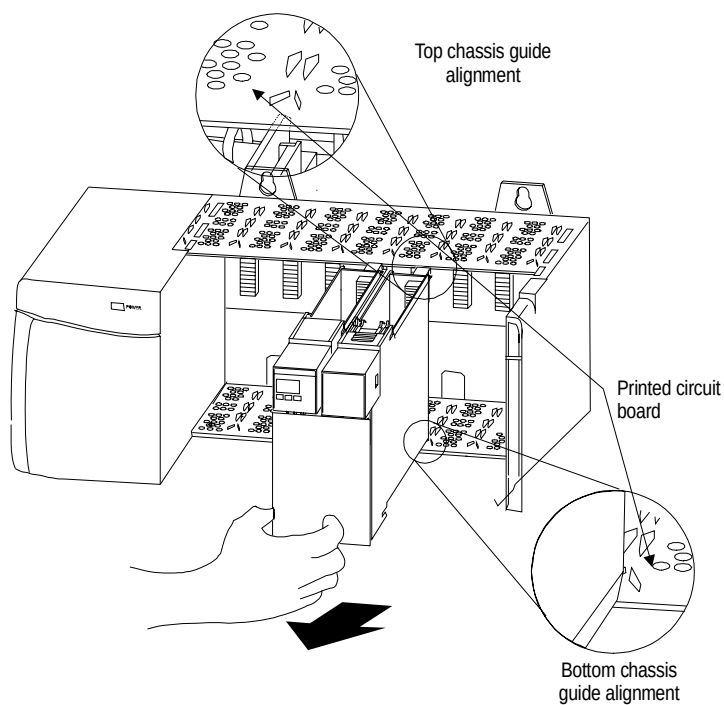


Redundancy Module Installation and Removal

Removing the Redundancy Module

Step	Action

3	Pull the module out of the chassis.



Install Replacement RM

Procedure

Refer to the previous *Installing the Redundancy Module* procedure in this *Guide* to insert the replacement RM into the chassis.

Once the RM is installed, refer to the section *NetworkTools, Firmware Upgrades* in the *Troubleshooting and Maintenance Guide* to update the RM's firmware.



ATTENTION

Users are responsible for checking that replacement modules have the appropriate firmware. This includes verifying that replacement modules pass their powerup diagnostics.

I/O Module Installation, Wiring, and Removal

Preparing to Install I/O Modules

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that no power is applied to the chassis.

Check that the chassis is **not** part of a Redundant Chassis Pair.

Prepare for installation

Verify that you have appropriate Chassis I/O Modules for your application as listed in Table 4.



ATTENTION

- If you are installing HART I/O modules (TC/TK-HAI081, or TC/TK-HAO081) in a process controller chassis, see HART I/O Implementation Guide for procedures.
- Model numbers beginning with the prefix "TK" are for a coated version of the I/O module.

Table 4 Chassis I/O Modules Model Number Reference

Module Type	Model Number	Description
Analog Input	TC-IAH061 or TK-IAH061	6-point, High-Level, 10 Vdc and 20 mA
	TC-IAH161 or TK-IAH161	16-point, High-Level, 10 Vdc and 20 mA, Non-Isolated
	TC-IXL061 or TK-IXL061	6-point, Thermocouple
	TC-IXR061 or TK-IXR061	6-point, RTD

I/O Module Installation, Wiring, and Removal

Preparing to Install I/O Modules

Module Type	Model Number	Description
Analog Output	TC-OAH061 or TK-OAH061	6-point, 4–20 mA
	TC-OAV061 or TK-OAV061	6-point, 10 Vdc
	TC-OAV081 or TK-OAV081	8-point, 10 Vdc and 4–20 mA, Non-Isolated
Discrete AC Input	TC-IDA161 or TK-IDA161	16-point, 120 Vac
	TC-IDK161 or TK-IDK161	16-point, 120 Vac, Isolated
	TC-IDW161 or TK-IDW161	16-point, 220 Vac, Isolated
	TC-IDX081 or TK-IDX081	8-point, 120 Vac, Diagnostic
Discrete AC Output	TC-ODA161 or TK-ODA161	16-point, 120/220 Vac
	TC-ODK161 or TK-ODK161	16-point, 120/220 Vac, Isolated
	TC-ODX081 or TK-ODX081	8-point, 120 Vac, Diagnostic
Discrete Digital Input	TC-IDD321 or TK-IDD321	32-point, 24 Vdc
	TC-IDJ161 or TK-IDJ161	16-point, 24 Vdc, Isolated
	TC-IDX161 or TK-IDX161	16-point, 10–30 Vdc, Diagnostic
Discrete Digital Output	TC-ODD321 or TK-ODD321	32-point, 24 Vdc
	TC-ODJ161 or TK-ODJ161	16-point, 24 Vdc, Isolated
	TC-ODX161 or TK-ODX161	16-point, 10–30 Vdc, Diagnostic

I/O Module Installation, Wiring, and Removal
Preparing to Install I/O Modules

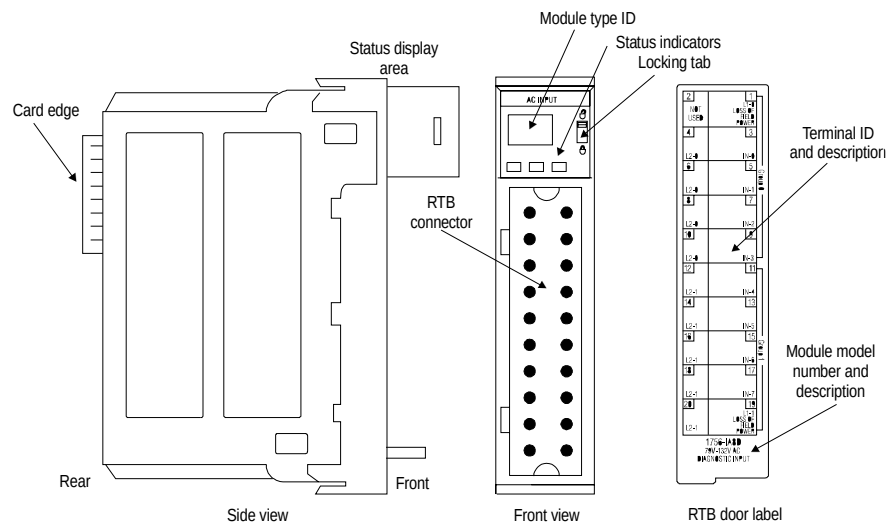
Module Type	Model Number	Description
<i>Isolated Contact Module</i>	TC-ORC161 or TK-ORC161	16-point, 10-265 Vac, 5-150 Vdc, Isolated
<i>Isolated Relay Module</i>	TC-ORC081 or TK-ORC081	8-point, 10-265 Vac, 5-150 Vdc, Isolated
<i>Pulse Input Module</i>	TC-MDP081 or TK-MDP081	8-point, 5-24 Vdc Pulse Input Module
<i>Miscellaneous</i>	TC-XXXXX1	Blank Slot Covers (2 per model number)

Check module components

All I/O modules share a similar set of common components, as illustrated below. The basic module foot print is identical, as shown in the side view. Two variations of the Removable Terminal Block (RTB) connector (20- and 36-pin) provide the only significant difference in the front panel. RTB's are ordered separately and include an RTB door label (in 20 or 36 position format as appropriate) for terminal/field wiring identification. You can also order optional Remote Termination Panels including an RTB with a prewired cable. Please refer to *Using Remote Termination Panels (RTPs)* in this *Guide* for more information.

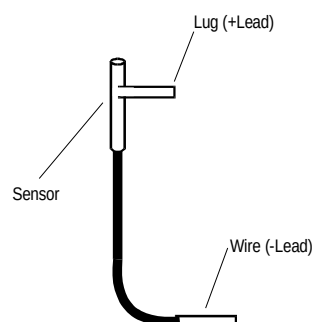
Common Components

All I/O modules contain these basic components.



Unique Components

The TC-IXL061/TK-IXL061 Thermocouple Input Module includes a Cold Junction Sensor for use when connecting the field-wiring directly to the module rather than employing a Remote Termination Panel (RTP) you supply yourself.



CAUTION

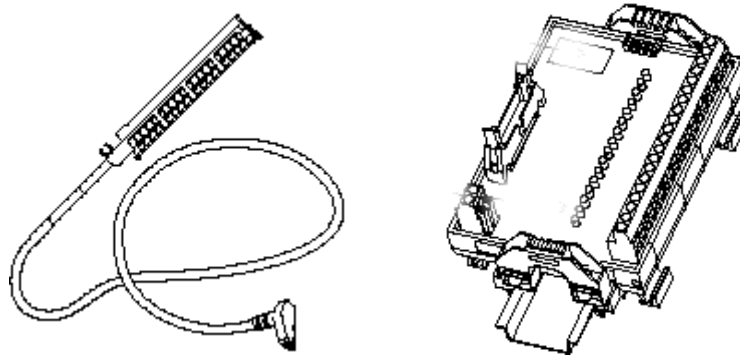
If using or installing a Remote Termination Panel (RTP), it is your responsibility to ensure the selected RTP meets all applicable specifications and requirements.

I/O Module Installation, Wiring, and Removal

Preparing to Install I/O Modules

Optional Components

A Remote Termination Panel with pre-wired cable in standard length of 1 m (3 ft) or 2.5 m (8 ft) is available for most I/O modules listed in Table 4. Please see the section Using Remote Termination Panels (RTPs) for more information.



Check chassis configuration

Confirm the chassis configuration for your I/O module components. Be sure your planned chassis configuration complies with the configuration rules outlined in the *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide*. And, check the I/O Module planning restrictions and recommendations outlined in the *Planning Your I/O Modules and Remote Termination Panels* in the *Control Hardware Planning Guide*.



WARNING

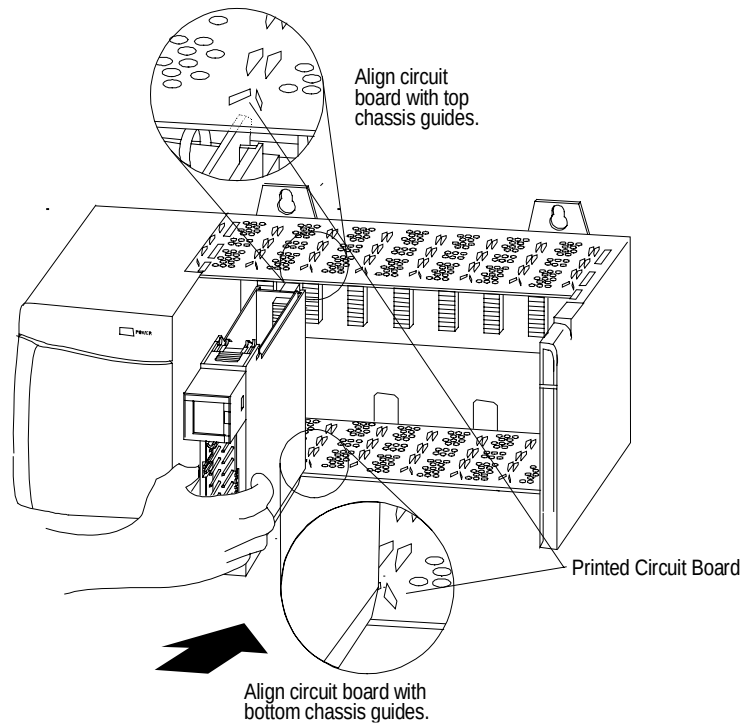
Do **not** install I/O modules in a redundant Controller chassis, since their data could be lost during a switchover to the backup Controller.

Installing I/O Modules

Insert the modules into the chassis

Use the following general procedure to install an I/O module in the chassis.

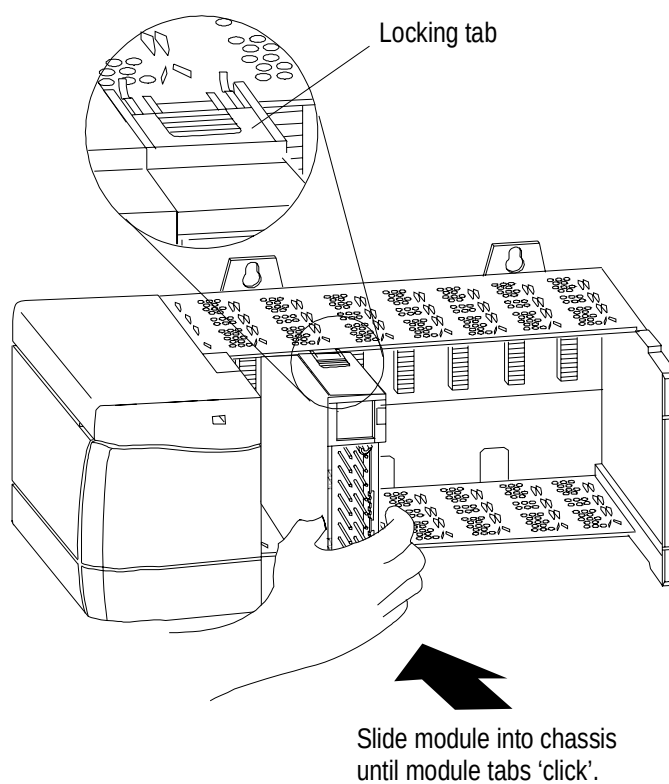
Step	Action
1	Align the module's circuit board with the top and bottom chassis guide for the desired slot location. (Remember that slot numbering is zero-based and the left most slot is number "0", and it is reserved for the ControlNet Interface module.)



I/O Module Installation, Wiring, and Removal

Installing I/O Modules

Step	Action
2	Slide the module into the chassis until the module tabs “click” into position.



3	Go to the next Section <i>Keying the Removable Terminal Blocks (RTBs)</i> .

Keying the Removable Terminal Blocks (RTBs)



CAUTION

Use a unique keying pattern for each module - RTB combination. This inhibits the RTB/field wiring from being connected to the wrong I/O module.

Refer to your site documentation for any predefined keying patterns or conventions.

About RTB Keying

Every RTB/module combination should be keyed so that each RTB can only be installed on the module for which it was intended. This inhibits field wiring coming from one group of devices from being connected to the wrong I/O module.

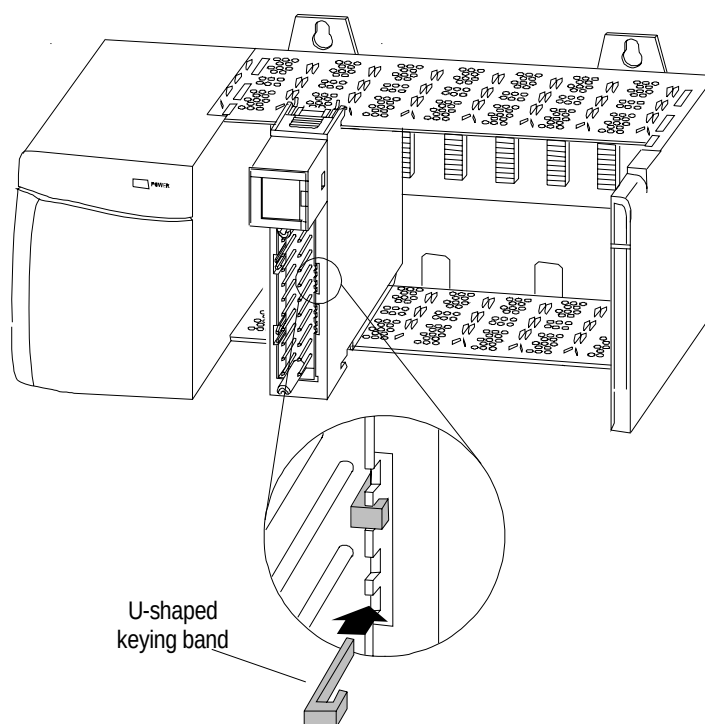
RTB's include a series of slots that accept keying tabs. Similarly, I/O modules accept keying bands. As outlined in the following procedure, you insert a keying band(s) onto the module where no keying tab will be installed on the RTB. You then insert keying tabs onto the RTB in the unkeyed module positions. This then permits only the RTB that is intended for a given I/O module to be connected.

I/O Module Installation, Wiring, and Removal

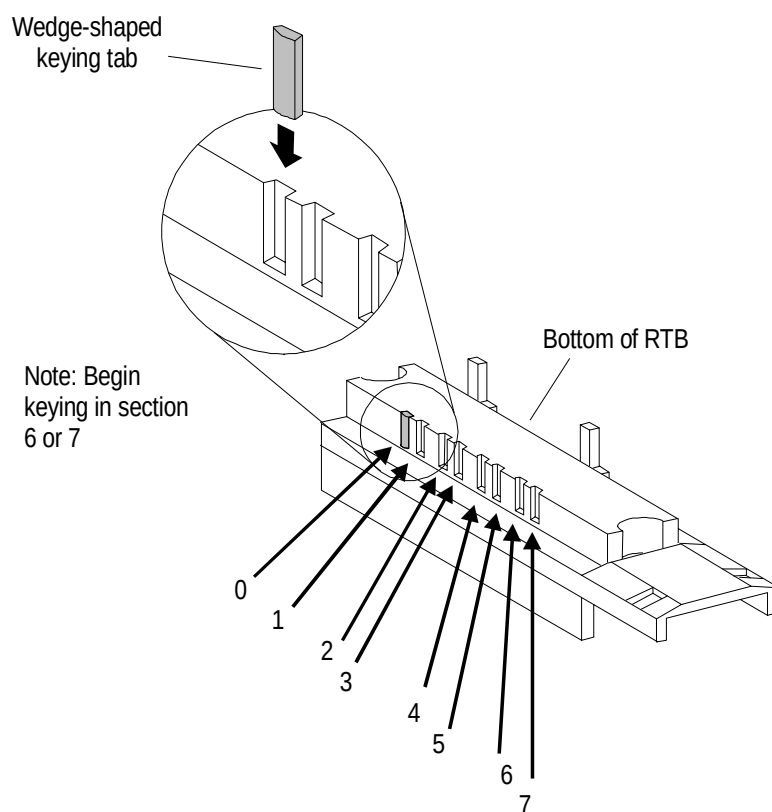
Keying the Removable Terminal Blocks (RTBs)

Key RTB to module

Step	Action
1	Insert the U-shaped keying band with the longer side near the terminals in the positions that correspond to the unkeyed RTB positions. Push the band onto the module until it snaps into place.



Step	Action
2	Insert the wedge-shaped keying tab, rounded edge first, into the RTB positions that correspond to the “unkeyed” module positions. Push the tab into the RTB, until it stops.



Post I/O Module Installation Task

Wire the RTB

It is easier to make field wiring connections to the RTB before it is installed on the front of the module. Proceed to the next section *Preparing to Connect Field Wiring* in this *Guide* to begin the wiring task.

Preparing to Connect Field Wiring

General wiring guidelines

Observe the following guidelines for connecting field wiring to an RTB or optional RTP.

- Use 22 to 14 AWG shielded wire, such as Belden 8761, for field connections. Users are responsible for selecting the wire that is appropriate for their application and that meets National Codes and local ordinances.
- Remove field side power before making connections to the RTB.
- Strip 8.0 to 8.3 mm (0.31 to 0.33 in) of insulation from the wire end to be connected to the RTB terminal.
- Begin wiring the RTB from the bottom terminals and move up.
- Use a tie-wrap to secure the wires in the strain relief area of the RTB.
- Connect shields to ground at the field side, whenever possible. If not possible, connect shield to the chassis functional ground.

Tools needed

- Flat-blade screwdriver with maximum blade width of 3.2 mm (1/8 in.).
- Wire stripper/cutter.

Connecting Field Wiring to RTB

Wiring the RTB

Use the following general procedure to connect field wiring to terminals on a 20-position (TC-TBNH) or 36-position (TC-TBCH) RTB before installing it on the module.

Step	Action
1	Refer to <i>Appendix A – I/O Module Wiring Reference</i> to determine the specific field wiring connections for the given I/O module model. Users are responsible for routing the wiring to the RTB, labeling the wiring for identification, and connecting the wiring to the correct RTB terminals.
2	Strip 8.0 to 8.3 mm (0.31 to 0.33 in) of insulation from the wire end to be inserted into an RTB terminal. .



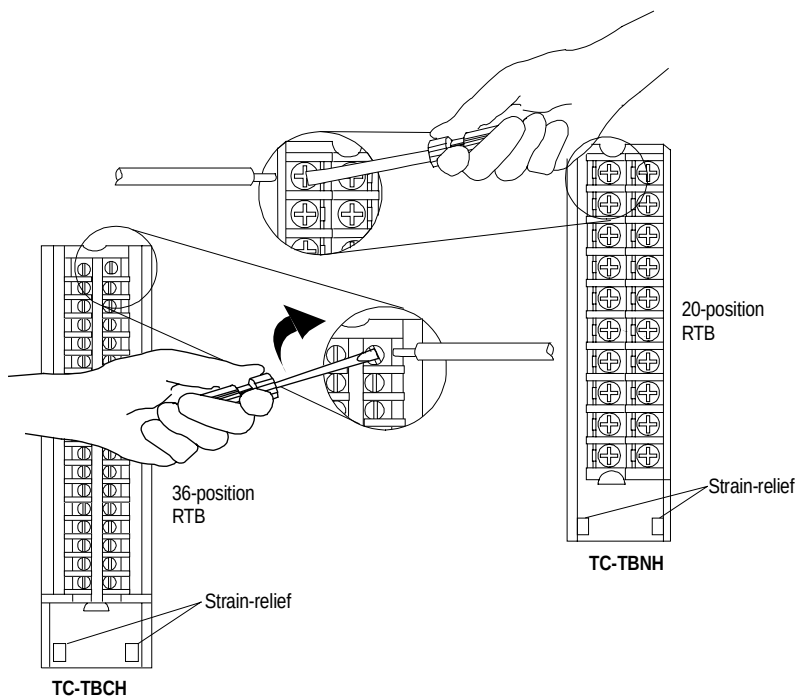
ATTENTION

There have been connector failures due to excessive removal of insulation from wires:

- With excessive insulation removed it is possible to push the wire down into the cavity that the IO connector pin occupies.
- This will cause the wire to press against the spring portion of the contact resulting in intermittent contacts.

3	Using a screwdriver, loosen the designated terminal screw for the given wire connection.

Step	Action
4	Insert the stripped wire end into the open terminal, and tighten the screw to secure the wire.

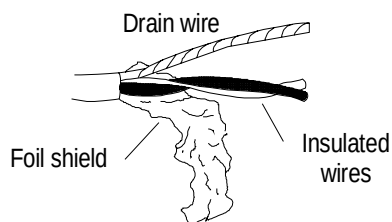


- 5** Repeat Steps 2 to 4 until wiring for all field devices is connected to the correct terminals on the RTB.
- 6** Were you able to connect wire cable shields to ground at the field side?
 - If the answer is **Yes**, go to Step 12.
 - If the answer is **No**, go to Step 7 to connect shield to chassis functional ground.
- 7** If required, remove enough cable jacket to expose a sufficient length of the drain wire to reach the chassis functional ground.

I/O Module Installation, Wiring, and Removal

Connecting Field Wiring to RTB

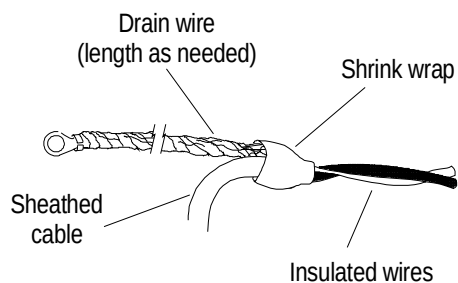
Step	Action
8	Separate the foil shield and bare drain wire from the insulated cable.



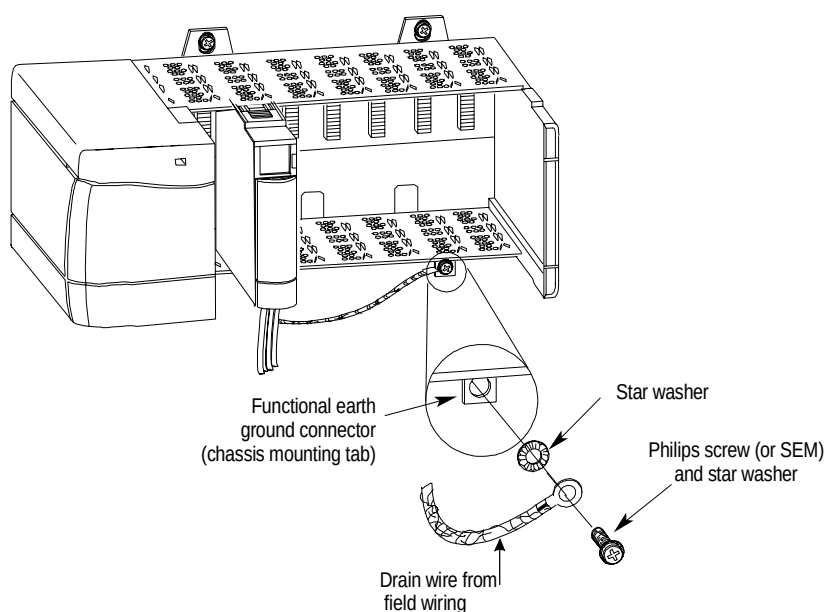
- 9 Twist the foil shield and drain wire together to form a single strand.



- 10 Attach a wire lug, then apply heat shrink tubing to the exit area, when the drain wire is doubled-back along the insulated cable.



Step	Action
11	Remove the screw from a bottom chassis mounting tab and connect the drain wire lug as shown below, after the RTB is installed on the module. (Note that this step assumes that the chassis is grounded as shown in Figure 1 or 2).



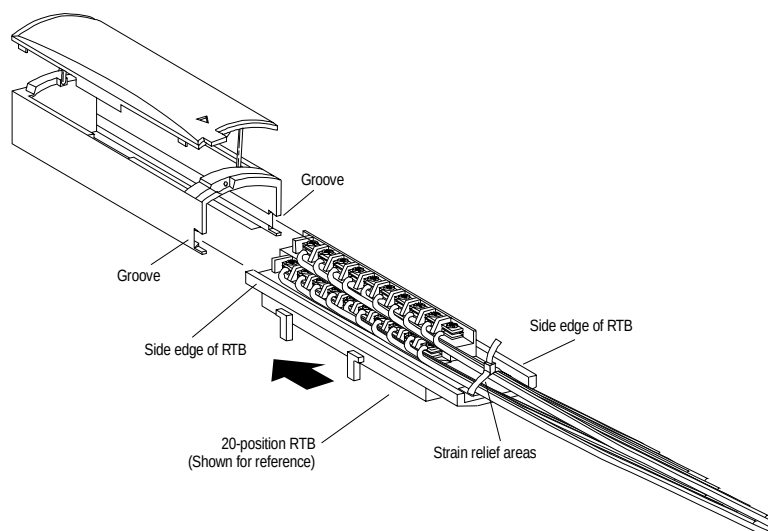
12	After field-side wiring is complete, secure the wires in the strain relief area with a cable tie.
13	Go to the next section <i>Installing the RTB</i> .
-

Installing the RTB

Assemble the RTB and housing

Use the following procedure to assemble the wired RTB in its housing.

Step	Action
1	Align the grooves at the bottom of each side of the housing with the side edges of the RTB.
2	Slide the RTB into the housing, until it snaps into place.

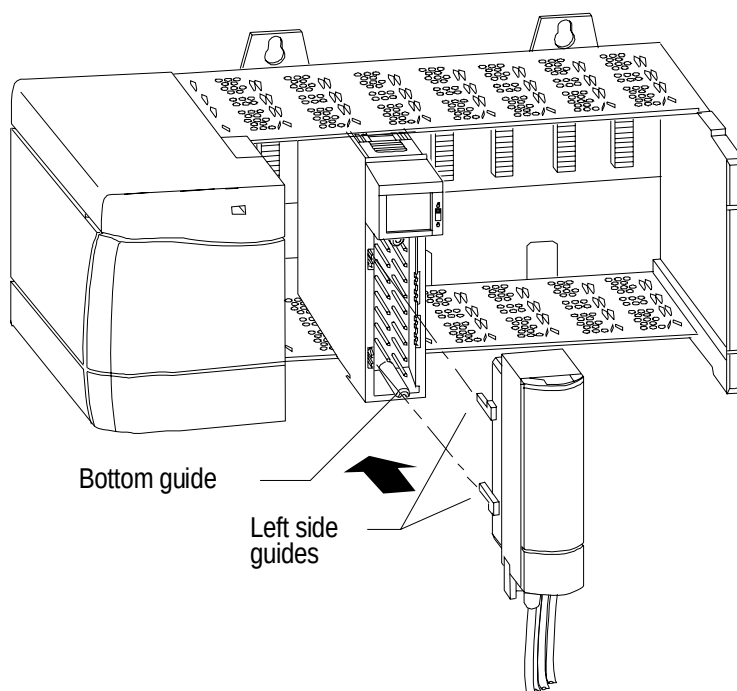


3	Go to the next procedure <i>Install RTB on module</i> .

Install RTB on module

Use the following procedure to install the RTB on the front of the I/O module.

Step	Action
1	Align the top, bottom and left-side guides of the RTB with the guides on the module.

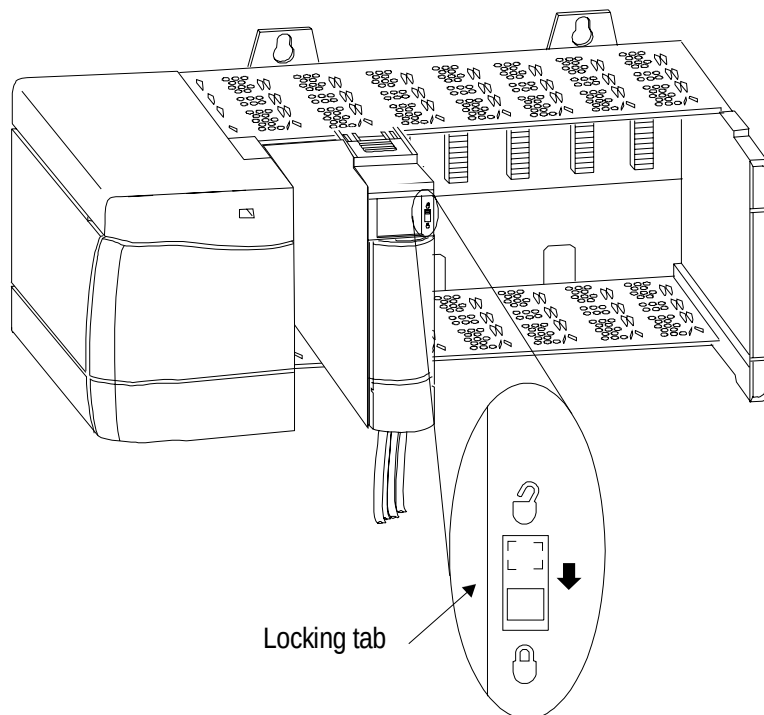


- 2 Press quickly and evenly to seat the RTB on the module, until the latches snap into place.

I/O Module Installation, Wiring, and Removal

Installing the RTB

Step	Action
3	Slide the locking tab down to lock the RTB onto the module.



Other Related Installation Considerations

Review Remote Termination Panel (RTP) use

Since an optional RTP can be used in place of an RTB to connect field wiring to an I/O module, Refer to the *Using Remote Termination Panels (RTPs)* in this *Guide* for more information on using an RTP instead of an RTB.

Install other modules

Install the other modules planned for the chassis configuration as outlined in applicable sections of this Guide. Refer to *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.

Using Remote Termination Panels (RTPs)

About RTPs

Remote Termination Panels (RTPs) allow you to connect I/O modules to termination strips by connecting one end of a cable to the front of the I/O module and the other end to a DIN rail mounted Interface Module (IFM). You can then connect your field wiring to the IFM terminal strip.

RTP models

The following table lists the available RTP and associated RTP cable options for each I/O module. For complete information on installation and setup of an RTP, refer to the documentation that accompanies the RTP.

I/O Model #	RTP Model #	RTP Cable Options	Comment
Analog Input			
TC-IAH061 or TK-IAH061	1492-AIFM6S-3	1492-HWACAB010X 1492-HWACAB025X	Current
	1492-AIFM6S-3	1492-HWACAB010Y 1492-HWACAB025Y	Voltage
TC-IAH161 or TK-IAH161	1492-AIFM6-F-5	1492-HWACAB010UA 1492-HWACAB025UA	Voltage
	1492-AIFM6-F-5	1492-HWACAB010UB 1492-HWACAB025UB	Current
TC-IXL061 or TK-IXL061	1492-AIFM6TC-3	1492-HWACAB010Y 1492-HWACAB025Y	Thermo-couple
TC-IXR061 or TK-IXR061	1492-AIFM6S-3	1492-HWACAB010Z 1492-HWACAB025Z	RTD
Analog Output			
TC-OAH061 or TK-OAH061	1492-AIFM6S-3	1492-HWACAB010Y 1492-HWACAB025Y	Current
TC-OAV061 or TK-OAV061	1492-AIFM6S-3	1492-HWACAB010Y 1492-HWACAB025Y	Voltage
TC-OAV081 or TK-OAV081	1492-AIFM8-3	1492-HWACAB010WA 1492-HWACAB025WA	Voltage

I/O Module Installation, Wiring, and Removal
Using Remote Termination Panels (RTPs)

I/O Model #	RTP Model #	RTP Cable Options	Comment
	1492-AIFM8-3	1492-HWACAB010WB 1492-HWACAB025WB	Current
AC Input			
TC-IDA161 or TK-IDA161	1492-IFM20D120A-2	1492-HWCAB010X 1492-HWCAB025X	120 Vac
TC-IDK161 or TK-IDK161	1492-IFM40DS120A-4	1492-HWCAB010Y 1492-HWCAB025Y	120 Vac
TC-IDW161 or TK-IDW161	1492-IFM40DS240A-4	TBD	240 Vac
TC-IDX081 or TK-IDX081	1492-IFM20F-2	1492-HWCAB010U 1492- HWCAB025U	120 Vac
AC Output			
TC-ODA161 or TK-ODA161	1492-IFM20F-F120-2	1492-HWCAB010X 1492-HWCAB025X	120 Vac
	1492-IFM20F-F240-2	TBD	240 Vac
TC-ODX081 or TK-ODX081	1492-IFM20F-2	1492-HWCAB010U 1492-HWCAB025U	120 Vac
TC-ODK161 or TK-ODK161	1492-IFM40F-FS120-4	1492-HWCAB010Y 1492-HWCAB025Y	120 Vac
	1492-IFM40F-FS240-4	TBD	240 Vac
DC Input			
TC-IDD321 or TK-IDD321	1492-IFM40D24A-2	1492-HWCAB010Z 1492-HWCAB025Z	Voltage
TC-IDJ161 or TK-IDJ161	1492-IFM40DS24A-4	1492-HWCAB010Y 1492-HWCAB025Y	Voltage
TC-IDX161 or TK-IDX161	1492-IFM40DS24A-4	1492-HWCAB010Y 1492-HWCAB025Y	Voltage
DC Output			
TC-ODD321 or TK-ODD321	1492-IFM40F-F24-2	1492-HWCAB010Z 1492-HWCAB025Z	Voltage

I/O Module Installation, Wiring, and Removal

Using Remote Termination Panels (RTPs)

I/O Model #	RTP Model #	RTP Cable Options	Comment
TC-ODJ161 or TK-ODJ161	1492-IFM40F-FS24-2	1492-HWCAB010Y 1492-HWCAB025Y	Voltage
TC-ODX161 or TK-ODX161	1492-IFM40F-2	1492-HWCAB010Y 1492-HWCAB025Y	Voltage
Contact/Relay Output			
TC-ORC161 or TK-ORC161 ¹	1492-IFM40DS24-4 1492-IFM40DS120-4 1492-IFM40FS-2 1492-IFM40F-FS24-2 1492-IFM40F-FS24-4 1492-IFM40F-FS120-2 1492-IFM40F-FS120-4 1492-IFM40F-FS240-4	1492-HWCAB010Y 1492-HWCAB025Y	Voltage
TC-ORC081 or TK-ORC081	Same as Above	Same as Above	Voltage

¹ Do not use a model 1492 IFM with a model TC/TK-ORC161 module in any application that requires agency certification of the Experion PKS system. Use of the IFM violates the UL, CSA and FM certifications of this product.

Removing I/O Modules

Remove RTB from the module



WARNING

We recommend that you remove field-side power before removing the RTB from the module. If you must remove or insert an RTB with field-side power applied, please note:

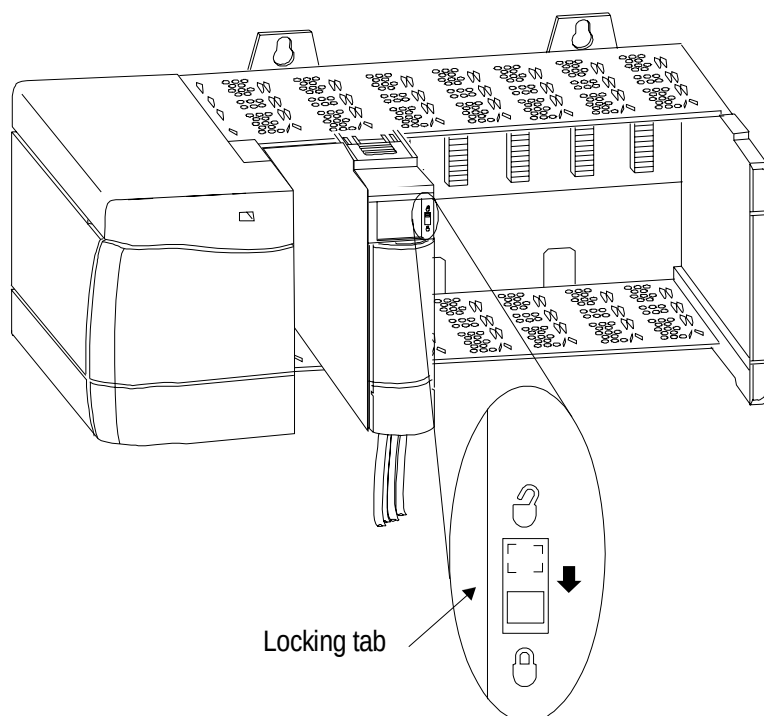
- The RTB will be electrically live. Do not touch the RTB's terminals.
- Unintended machine motion or loss of process control can occur.

Use the following procedure to remove the RTB from an I/O module.

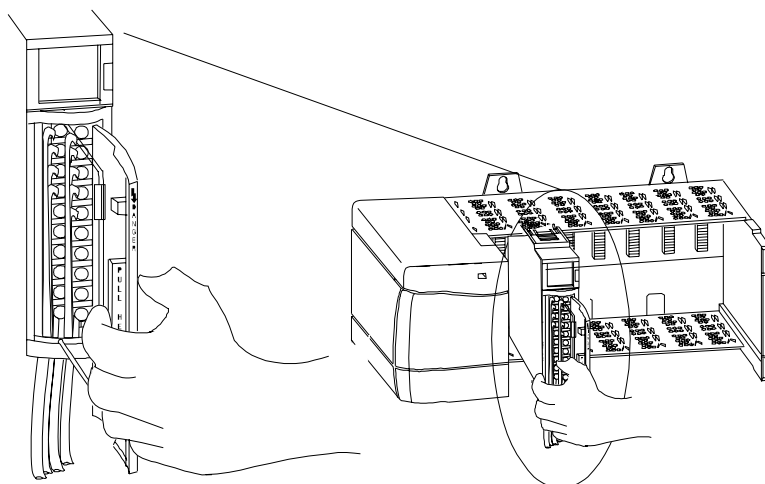
I/O Module Installation, Wiring, and Removal

Removing I/O Modules

Step	Action
1	Unlock the locking tab at the top of the module.



- 2 Open the RTB door, using the bottom tab.
 - 3 If a shield for field wiring is connected to a bottom chassis mounting tab, disconnect it now.
-
- 4 Hold the spot marked **Pull Here**, and pull the RTB off the module.



-
- 5 Go to the next procedure *Remove the module*.
-

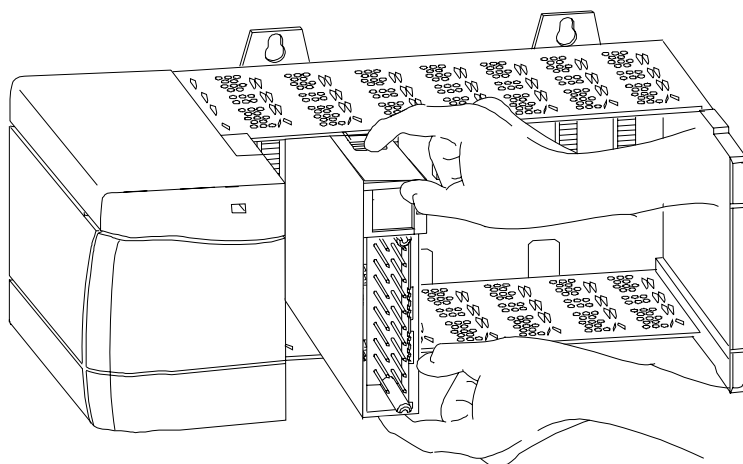
I/O Module Installation, Wiring, and Removal

Removing I/O Modules

Remove the module

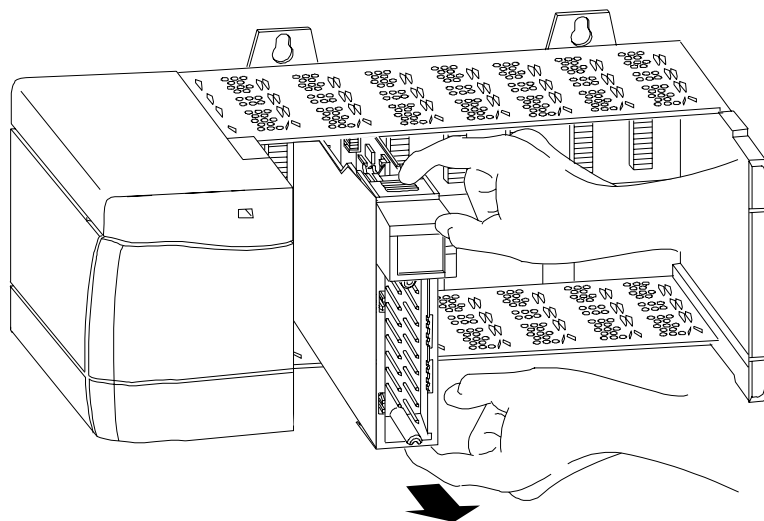
Use the following procedure to remove the I/O module from the chassis, once the RTB is removed as outlined in the previous procedure.

Step	Action
1	Push in the top and bottom locking tabs.



Step	Action

2	Pull the module out of the chassis.



Install Replacement I/O Module

Procedure

Refer to the previous *Installing I/O Modules* procedure in this *Guide* to insert the replacement I/O module into the chassis.

Once the I/O Module is installed, refer to *NetworkTools, Firmware Upgrades* in the *Troubleshooting and Maintenance Guide* to update the I/O module's firmware.



ATTENTION

Users are responsible for checking that replacement modules have the appropriate firmware. This includes verifying that replacement modules pass their powerup diagnostics.

Serial Interface Module Installation and Removal

Preparing to Install the Serial Interface Module

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that no power is applied to the chassis.

Review the *Serial Interface Module Implementation Guide* for general background and details on installing the Serial Interface Field Termination Assembly (FTA).

Prepare for installation

Verify that you have the Serial Interface Module (SIM), power adapter, FTA(s), and cables needed to enable bi-directional, serial-protocol communications between the Experion PKS Control Processor and your qualified third-party devices as listed in Table 5.

Table 5 SIM and Associated Component Model Number Reference

Component	Model Number
Serial Interface Module, 2 Channel	TC-MUX021/TK-MUX021
SIM-to-Power Adapter Cable (3 meters)	TC-KSM003
SIM FTA Power Adapter 24 Vdc, or	TC-SMPD01
SIM FTA Power Adapter 85-265 Vac	TC-SMPC01
Power Adapter-to-FTA Internal Cabinet Cable, or	MU-KLAMxx (where xx identifies length)
Power Adapter-to-FTA External Cabinet Cable	MU-KSXxxx (where xxx identifies length)
Modbus FTA (supports standard Modbus RTU EIA-232 or EIA-422/485 communications)	MC-TSIM12
Allen-Bradley DF1 FTA (supports A-B	MC-TSIA12

Serial Interface Module Installation and Removal

Preparing to Install the Serial Interface Module

Component	Model Number
DF1 serial protocol (EIA-232 only) communications)	

Confirm the chassis configuration for your Serial Interface Module (SIM). Be sure your planned chassis configuration complies with the configuration rules outlined in the *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide*. And, check the Serial Interface Module (SIM) planning restrictions and recommendations outlined in the *Planning Your I/O Modules and Remote Termination Panels* in the *Control Hardware Planning Guide*.

Tools needed

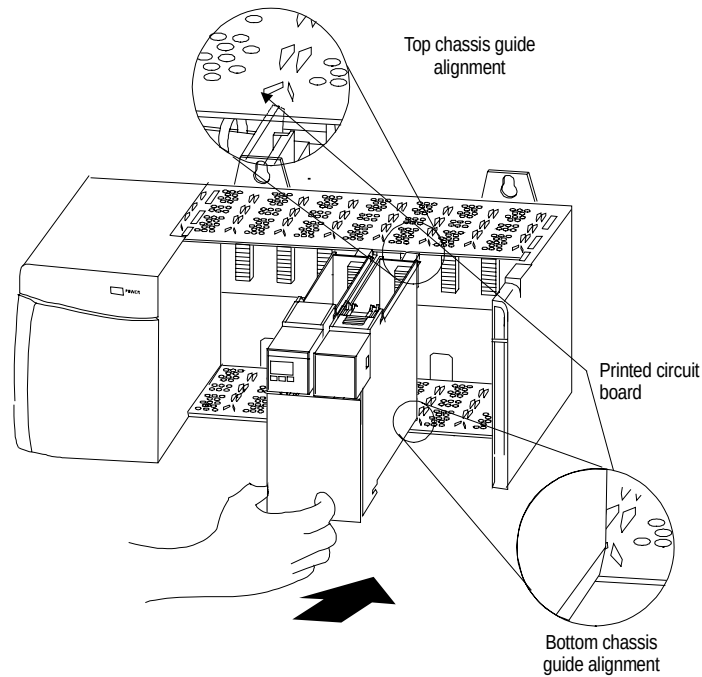
- Philips screwdriver
- Drill (only for panel mounting power adapter and/or FTA)

Installing the Serial Interface Module

Insert in the Chassis

Use the following procedure to install the SIM in the chassis and connect the SIM-to-power adapter cable.

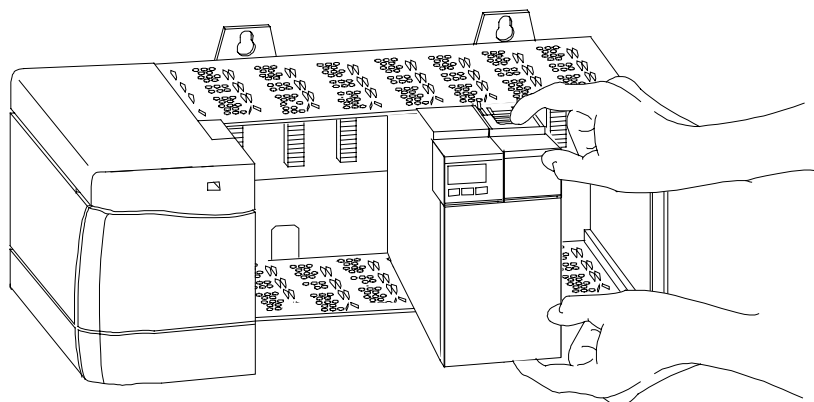
Step	Action
1	Position the module at the planned chassis slot location. For example, slots 3 and 4. (Remember that slot numbering is zero-based and the left most slot is number "0".)
2	Align the module's circuit board with the top and bottom chassis guides.



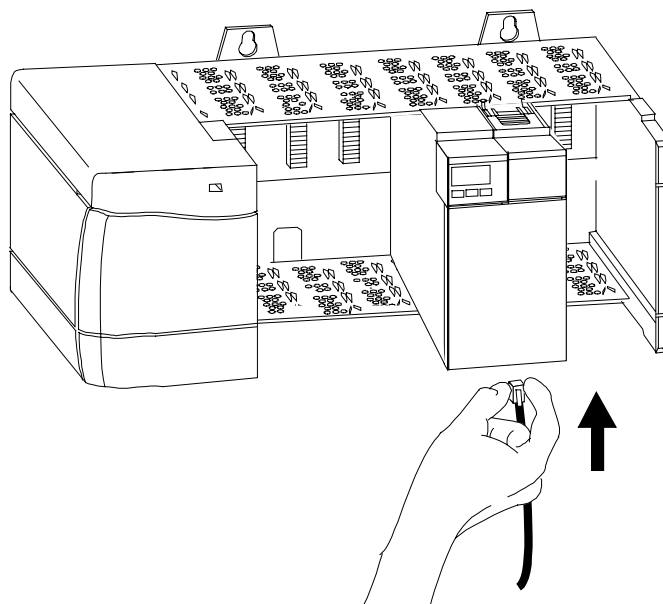
Serial Interface Module Installation and Removal

Installing the Serial Interface Module

Step	Action
3	Slide the module into the chassis until the module tabs “click” into position.



4	Connect the SIM to Power Adapter cable assembly.



5	Go to the next section <i>Installing the Power Adapter</i> .
-

Installing the Power Adapter

Procedures



ATTENTION

Your Power Adapter may be either DIN Rail mounted or mounted directly to a flat surface.

Mounting Power Adapter on a flat surface



CAUTION

During the following procedure:

- Do not drill holes for a Power Adapter above an already installed chassis. Debris from the drilling can damage or short the chassis backpanel, and short the backpanel card-edge connectors.
- If the Power Adapter does not lay flat before the screws are tightened, use additional washers as shims. This will ensure that the circuit board is not warped or crack by tightening the screws. Warping a Power Adapter could cause a malfunction and prevent proper operation.

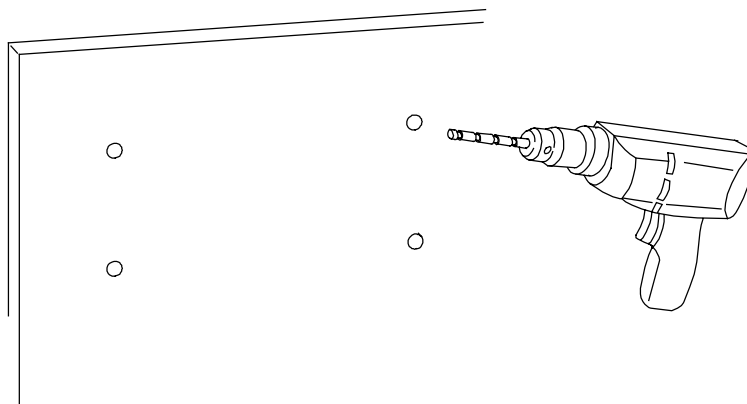
Use the following procedure to mount the Power Adapter on a flat surface, such as the back panel of an enclosure.

Step

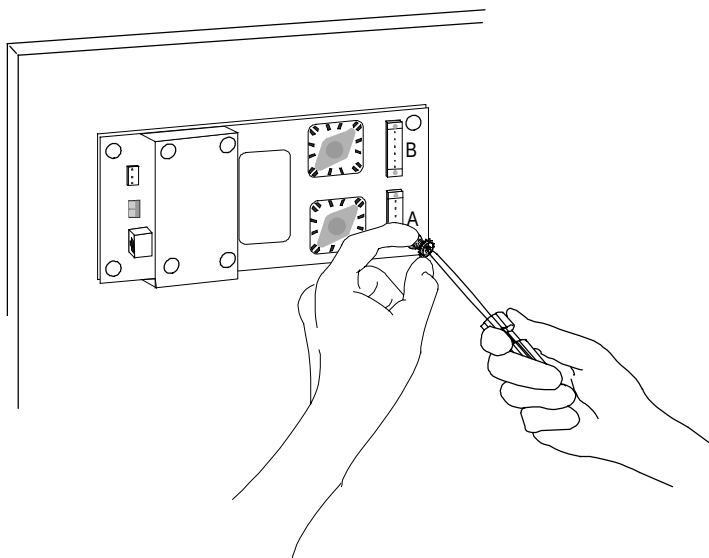
Action

- 1** Position the Power Adapter on the mounting surface. While holding it in place, use a pencil or center punch to mark the four mounting hole locations on the surface.

Step	Action
2	Remove the Power Adapter and drill tap holes at the marked locations.



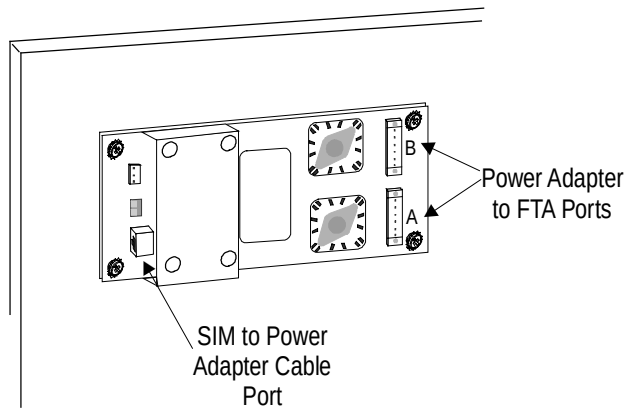
3	Using the screws provided, mount the Power Adapter to the surface.



Serial Interface Module Installation and Removal

Installing the Power Adapter

Step	Action
4	Connect the SIM-to-Power Adapter cable to terminal connector J1 on the Power Adapter.



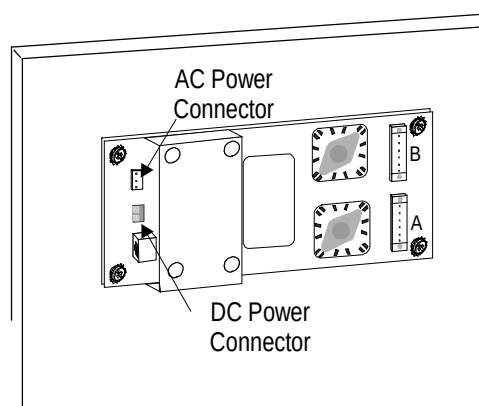
CAUTION

Be sure the 24Vdc power supply that you use to power the TC/TK-SMPD01 SIM FTA Power Adapter is **dedicated** to powering only that Power Adapter and is **not** used to power any other equipment. The power supply must also be a floating power source, such as a DIN rail-mounted Phoenix Contact (MCR-PS-24DC/24DC/200) power supply with floating 24Vdc output. Otherwise, voltage transients on the user-supplied 24Vdc to the Power Adapter may damage the associated TC/TK-MUX021 SIM in the chassis. You can also use the ac-powered TC/TK-SIMPC01 SIM FTA Power Adapter instead of the dc-powered version, as an alternative.

Serial Interface Module Installation and Removal

Installing the Power Adapter

Step	Action
5	- For Vdc model, connect leads from 24 Vdc power supply to J5 terminals on the adapter, observing polarity. - For Vac model, connect leads from 120/240 Vac line to J4 terminals L1, L2, and GND.



- 6 Refer to the *Serial Interface Module Implementation Guide* for details on installing the Modbus or Allen-Bradley FTA and making the Power Adapter to FTA cable connections, as well as field device connections to the FTA.

Mounting Power Adapter on DIN rail



ATTENTION

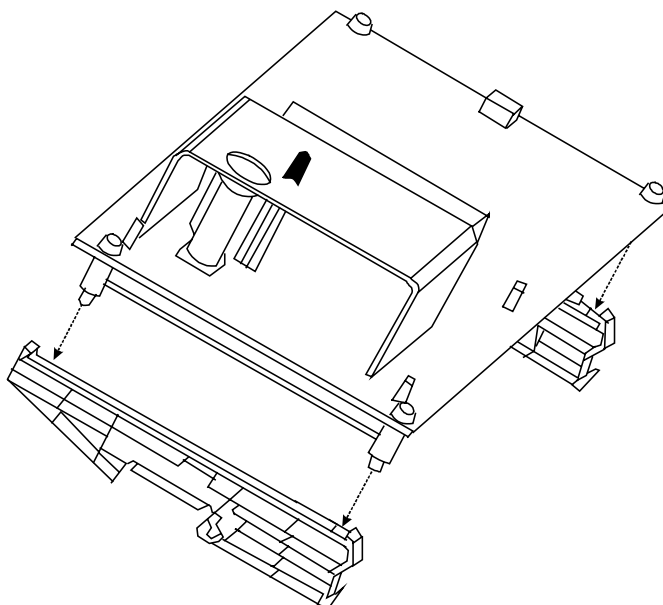
Users are responsible for supplying and installing the DIN rails.

Use the following procedure to mount the Power Adapter on the user supplied DIN rail.

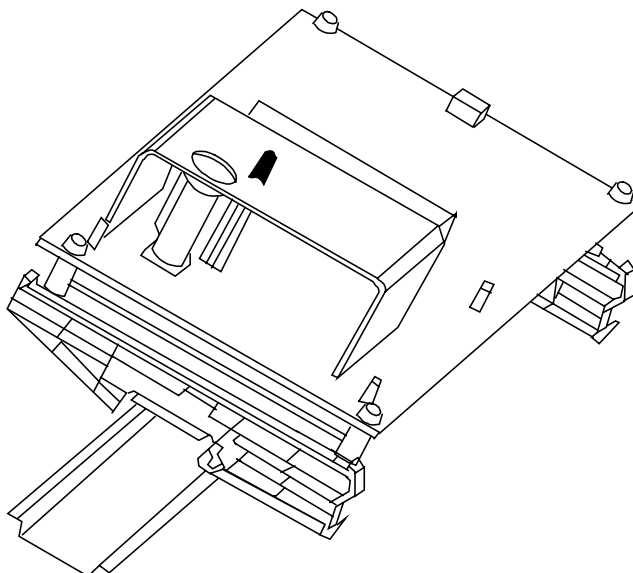
Step

Action

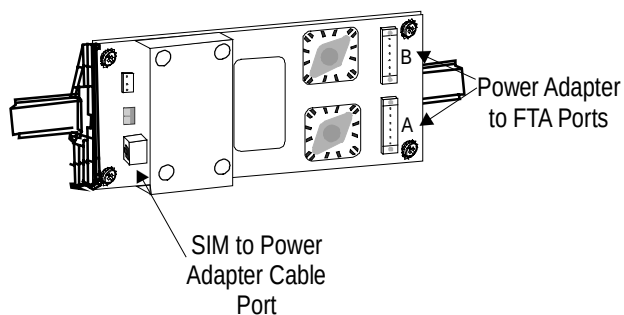
- 1** Install the supplied rail mount adapters on the bottom of the Power Adapter



Step	Action
2	Snap the Power Adapter on to the DIN Rail



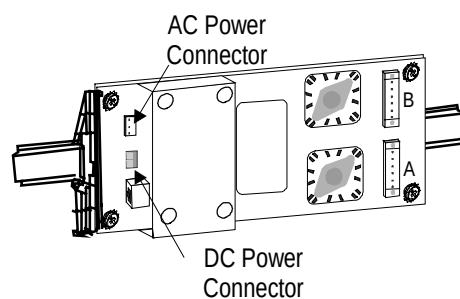
3	Connect the SIM-to-Power Adapter cable to terminal connector J1 on the Power Adapter.



Serial Interface Module Installation and Removal

Installing the Power Adapter

Step	Action
4	- For Vdc model, connect leads from 24 Vdc power supply to J5 terminals on the adapter, observing polarity. - For Vac model, connect leads from 120/240 Vac line to J4 terminals L1, L2, and GND.



5	Refer to the <i>Serial Interface Module Implementation Guide</i> for details on installing the Modbus or Allen-Bradley FTA and making the Power Adapter to FTA cable connections as well as field device connections to the FTA.
-

Post SIM Installation Tasks

Install other modules

Install the other modules planned for the chassis configuration as outlined in applicable sections of this *Guide*. Refer to *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.

Load personality image



ATTENTION

If the SIM is not installed and pre-configured by the factory, users must load the SIM's personality image (firmware) to make it fully operational. This is also true for any replacement SIM ordered separately from the factory.

Once the SIM is installed and system communications are established, refer to *Loading SIM personality image – Optional* in the *Startup and Shutdown Guide* to update the SIM's firmware.

Removing the Serial Interface Module

Remove from the Chassis



WARNING

We recommend that you take your process “Off Control” before removing any control hardware component. This means the CPM should be in its idle state. Any time you remove a module from the chassis of an on-control process system, the potential for unintended machine motion or loss of process control exists.

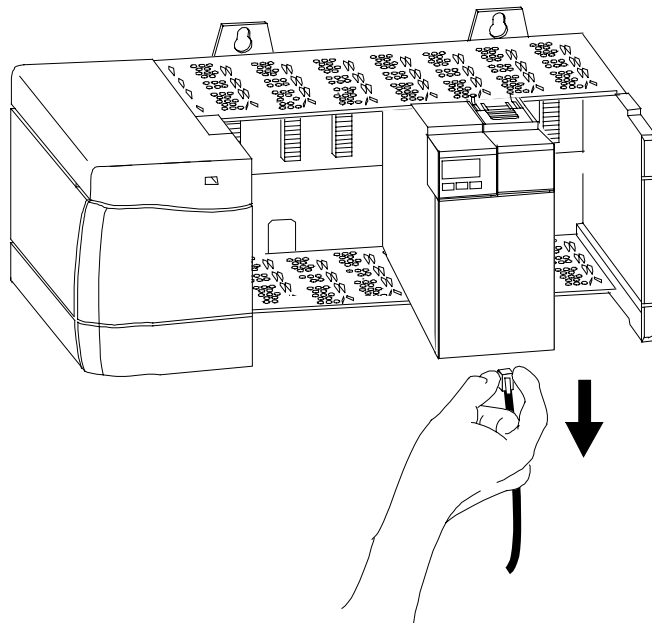
Use the following procedure to remove the SIM from the chassis.

Step

Action

1

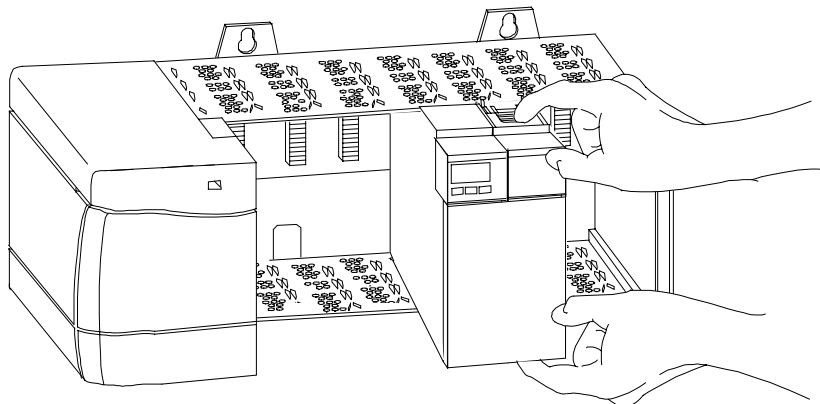
Remove the SIM to Power Adapter cable assembly.



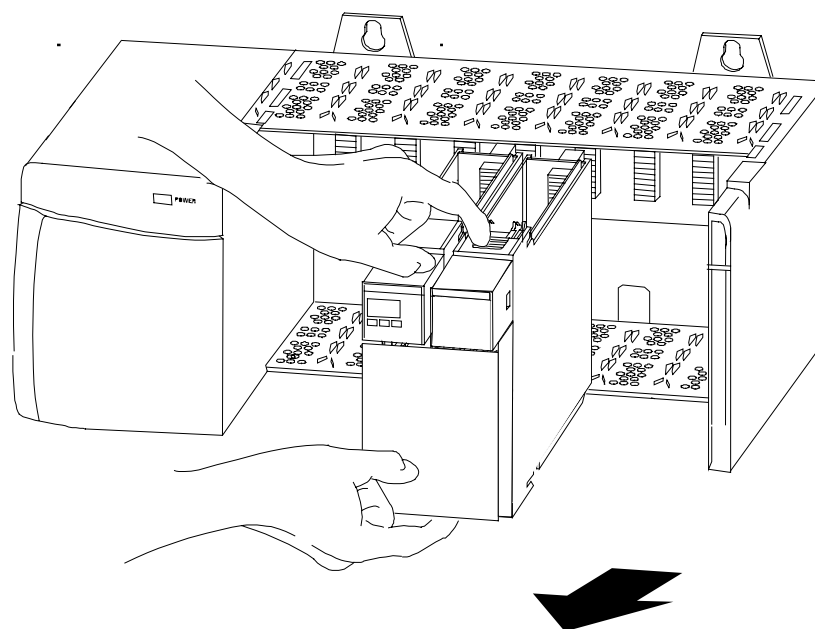
Serial Interface Module Installation and Removal

Removing the Serial Interface Module

Step	Action
2	Push in the top and bottom locking tabs.



3	Pull the SIM out of the chassis.



Install Replacement SIM

Procedure

Refer to the previous *Installing the Serial Interface Module* procedure in this *Guide* to insert the replacement SIM into the chassis.

Once the SIM is installed, refer to *SIM personality image – Optional* in the *Startup and Shutdown Guide* to update the SIM's firmware.



ATTENTION

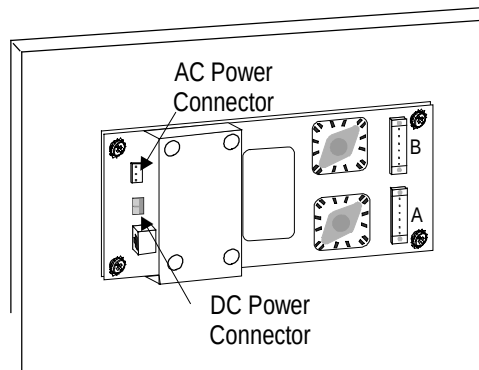
Users are responsible for checking that replacement modules have the appropriate firmware. This includes verifying that replacement modules pass their powerup diagnostics.

Removing the Power Adapter

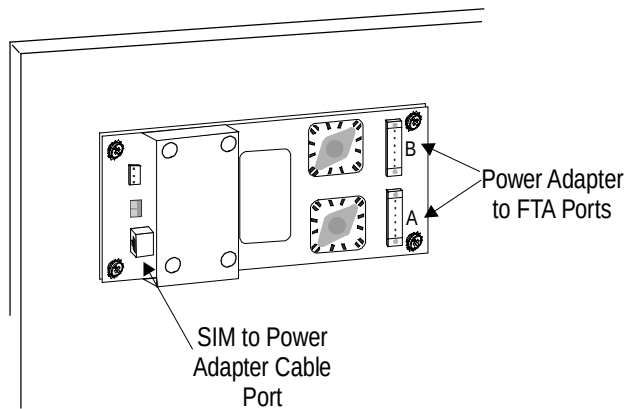
Procedures

Remove Power Adapter from surface

Step	Action
1	Turn Off the power source.
2	Remove power cable leads from ac or dc power connector.



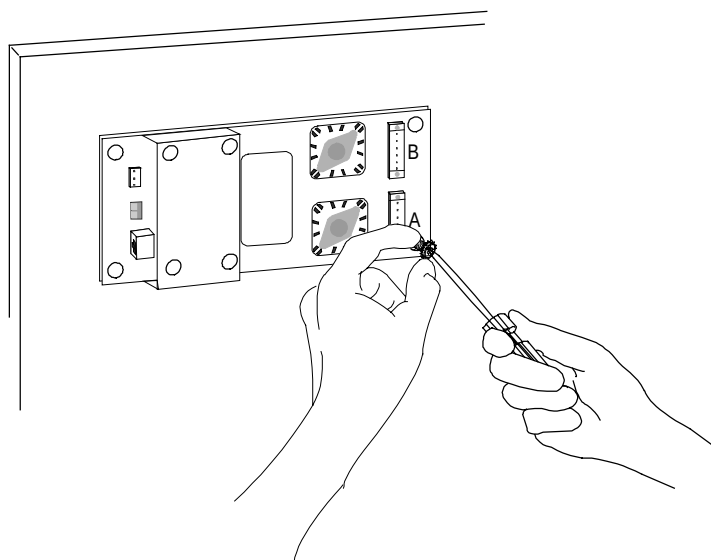
- 3 Disconnect the SIM-to-Power Adapter, and the Power Adapter-to-FTA cables.



Serial Interface Module Installation and Removal

Removing the Power Adapter

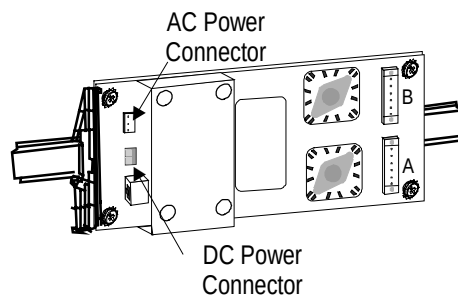
Step	Action
4	Remove the screws that hold the Power Adapter to the surface. Be sure you are holding the Power Adapter when you remove the last screw.



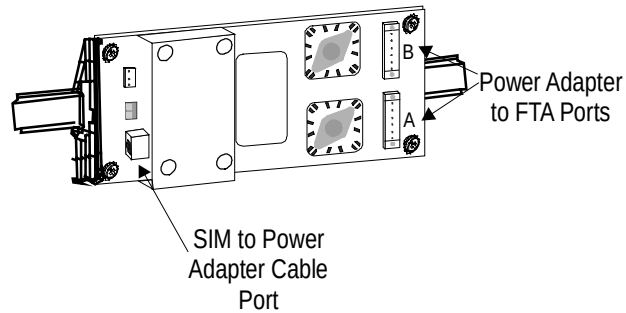
Remove Power Adapter from DIN Rail

Use the following procedure to remove a Power Adapter from a DIN rail.

Step	Action
1	Turn Off the power source.
2	Remove power cable leads from ac or dc power connector.



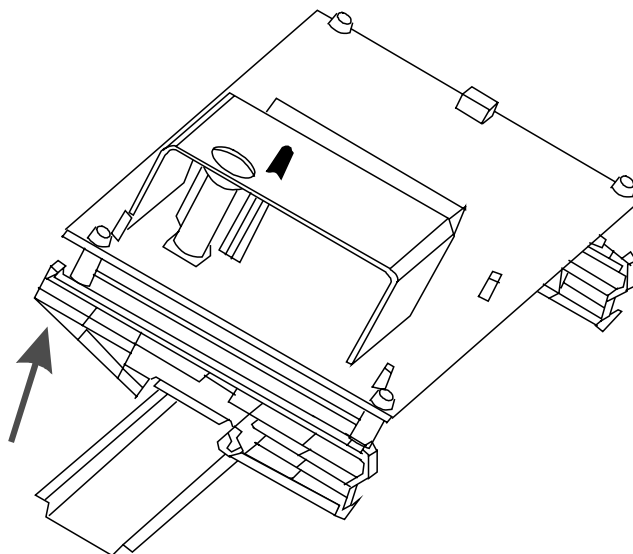
- 3 Disconnect the SIM-to-Power Adapter and the Power Adapter-to-FTA cables.



Serial Interface Module Installation and Removal

Removing the Power Adapter

Step	Action
4	Grasp both rail mount adapters on the tapered side and pull forward slightly to pop the Power Adapter off the rail. Be sure you hold onto the Power Adapter, so it does not fall on the floor.



Install replacement Power Adapter

Procedure

Refer to the previous *Mounting Power Adapter on a flat surface* or *Mounting Power Adapter on a DIN rail* procedure in this *Guide* to mount the replacement Power Adapter on a surface or DIN rail.



ATTENTION

If you are removing the SIM and its associated components from the control strategy, you are responsible for making the required changes in your control database.

Serial Interface Module Installation and Removal

Install replacement Power Adapter

ControlNet Communication Module Installation and Removal

Preparing to Install the ControlNet Module

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that no power is applied to the chassis.

Be aware that this section does **not** apply to the Peripheral Component Interconnect Communication (PCIC) interface card in the Experion PKS Server(s). Please refer to Installing the PCIC Card in the *ControlNet Installation Guide* for installation details.

Prepare for installation

Verify that you have the ControlNet modules needed to support the planned Supervisory and I/O ControlNet networks for your Experion PKS system, as listed in Table 6.



ATTENTION

The model numbers beginning with the prefix "TK" are for the coated version of the ControlNet module.

Table 6 ControlNet module Model Number Reference

Model Number	Description	Notes
TC-CCN013	Single-Media (Non-Redundant) ControlNet Interface (Series D)	This model supersedes models TC-CCN012 and TC-CCN011. It supports redundant Controllers and is required for optional Fieldbus communications support.
TC-CCR013, TK-CCR013	Dual-Media (Redundant) ControlNet Interface (Series D)	This model supersedes models TC-CCR012 and TC-CCR011. It supports redundant Controllers and is required for optional Fieldbus communications support.

ControlNet Communication Module Installation and Removal

Preparing to Install the ControlNet Module

Model Number	Description	Notes
TC-CCN012 (Obsolete)	Single-Media (Non-Redundant) ControlNet Interface (Series C)	TC-CCN013 supersedes this model. This model supersedes model TC-CCN011 and supports redundant Controllers. Firmware version 4.11 or higher does support the Fieldbus communications option.
TC-CCR012, TK-CCR012 (Obsolete)	Dual-Media (Redundant) ControlNet Interface (Series C)	TC-CCR013 supersedes this model. This model supersedes model TC-CCR011 and supports redundant Controllers. Firmware version 4.11 or higher does support the Fieldbus communications option.
TC-CCN011 (Obsolete)	Single-Media (Non-Redundant) ControlNet Interface (Series A)	TC-CCN012 and TC-CCN013 supersede this model. It does not support redundant Controllers or the Fieldbus communications option.
TC-CCR011 (Obsolete)	Dual-Media (Redundant) ControlNet Interface (Series A)	TC-CCR012 and TC-CCR013 supersede this model. It does not support redundant Controllers or the Fieldbus communications option.



ATTENTION

The TC-CCN013 and TC-CCR013 models are required for Fieldbus communications support within a redundant Controller configuration for Experion PKS system. These models are qualified for use with scheduled traffic concurrent with Controller redundancy.

Confirm the chassis configuration for your ControlNet module(s) and the ControlNet network addressing configuration for your system. Be sure your planned chassis configuration complies with the configuration rules outlined in the *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide*. And, check the ControlNet configuration planning details outlined in the *ControlNet Configuration* in the *Control Hardware Planning Guide*.

Tools needed

- Jeweler's screwdriver

Installing the ControlNet Module

Insert in the Chassis



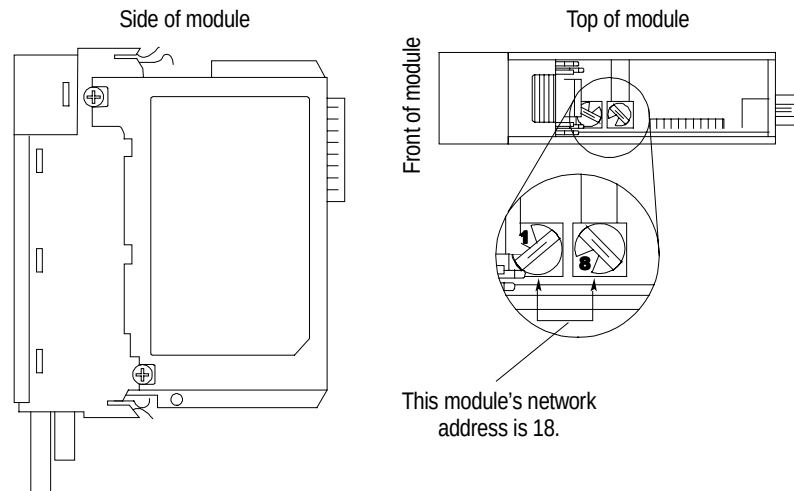
ATTENTION

Users are responsible for making the correct ControlNet address assignments for the ControlNet modules used in their planned Supervisory and I/O ControlNet networks. Valid ControlNet module addresses range from 1 to 18.

For details regarding ControlNet addressing, refer to *Planning Your ControlNet Addressing* in the *Control Hardware Planning Guide*.

Use the following procedure to set the ControlNet module's network address and insert the ControlNet module into the chassis.

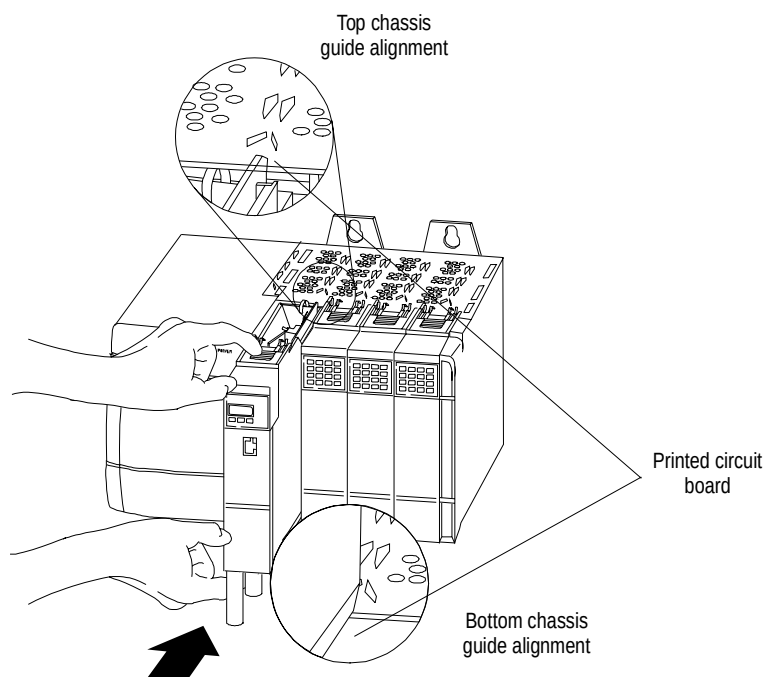
Step	Action
1	Use your fingers or a jeweler's screwdriver to set the module's network address switches to the planned ControlNet network address for this ControlNet module.



ControlNet Communication Module Installation and Removal

Installing the ControlNet Module

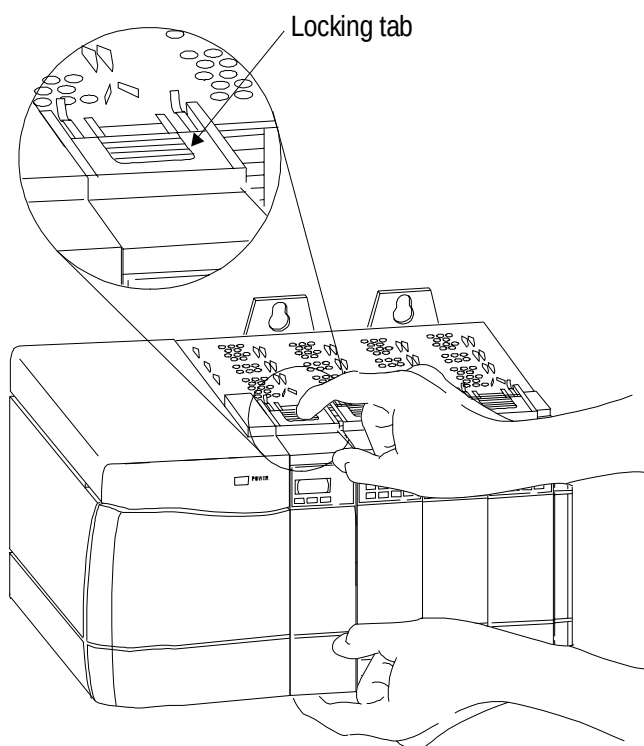
Step	Action
2	Align the module's circuit board with the top and bottom chassis guides for the planned slot location. Typically, slot 0 is reserved for the ControlNet module. (Remember that slot numbering is zero-based and the left most slot is number 0.)



ControlNet Communication Module Installation and Removal

Installing the ControlNet Module

Step	Action
3	Slide the module into the chassis, until the module tabs “click” into position.



- 4 Repeat Steps 1 to 3 to install other ControlNet modules, as required.
- 5 Go to the next Section *Connecting ControlNet Network Cables*.

Connecting ControlNet Network Cables



ATTENTION

Procedures for network cable installation can be found in the *Control Hardware Planning Guide*.

The following procedures assume that network cabling has been run, and is available at the chassis.

Attaching ControlNet Cables



WARNING

Unless the location is known to be non-hazardous, do **not**:

- connect or disconnect cables,
- connect or disconnect Removable Terminal Blocks (RTBs),
- install or remove modules,

while the Control system is powered.



CAUTION

You **must** connect your Supervisory ControlNet drop-cables and I/O ControlNet drop-cables to the correct ControlNet modules. Intermixed connections can have unexpected and undesirable results, including potential loss of control. For more information regarding drop-cable identification, refer to the *Control Hardware Planning Guide, Planning for drop-cable identification*.

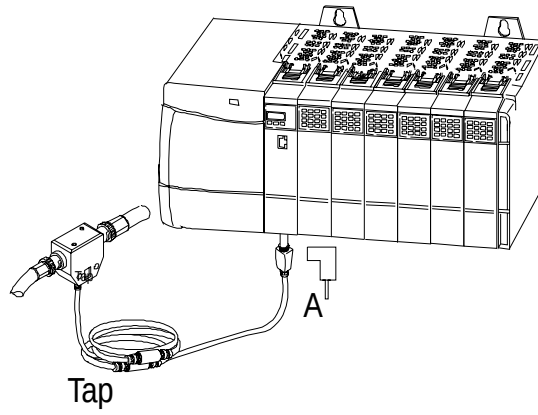


ATTENTION

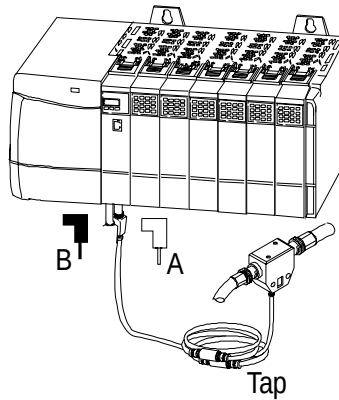
You can install redundant (dual) media ControlNet module models in either a redundant or non-redundant Controller configuration. In both cases, you have the option of using “dual” (redundant) or “single” (non-redundant) - media ControlNet networks. When using a dual-media ControlNet module in a single-media network, always connect the drop cables to tap “A.” This provides consistency across your network, and will facilitate migration to a redundant network in the future.

Use the following procedure to connect the ControlNet trunk cable to the ControlNet module.

Step	Action
<i>Single Media ControlNet module</i>	
1	Attach the drop cable from the trunk cable tap to the single-media module's connector.



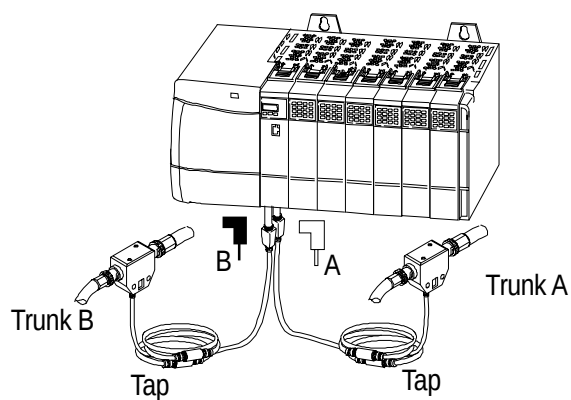
<i>Redundant Media ControlNet module</i>	
1	Attach the drop cable from the “A” trunk cable tap to the dual-media module's “A” connector.



ControlNet Communication Module Installation and Removal

Connecting ControlNet Network Cables

Step	Action
2	Attach the drop cable from the “B” trunk cable tap to the dual-media module’s “B” connector.



3	Repeat the single-media or redundant-media ControlNet module Steps to complete network connections, as required.
-

Post ControlNet Module Installation Tasks

Install other modules

Install the other modules planned for the chassis configuration as outlined in applicable sections of this *Guide*. Refer to *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.

Check ControlNet parameters

Once the ControlNet modules are installed and system communications are established, refer to *NetworkTools, ControlNet Parameters* in the *Troubleshooting and Maintenance Guide* to check the ControlNet module “keeper” values. Be aware that the default keeper values listed in the referenced document are different for applications that include fiber optic media or the Fieldbus Linking Device.

Removing the ControlNet Module

Remove from the Chassis



WARNING

We recommend that you take your process “Off Control” before removing any Control hardware component. This means the CPM should be in its idle state. Any time you remove a module from the chassis of an on-control process system, the potential for unintended machine motion or loss of process control exists.

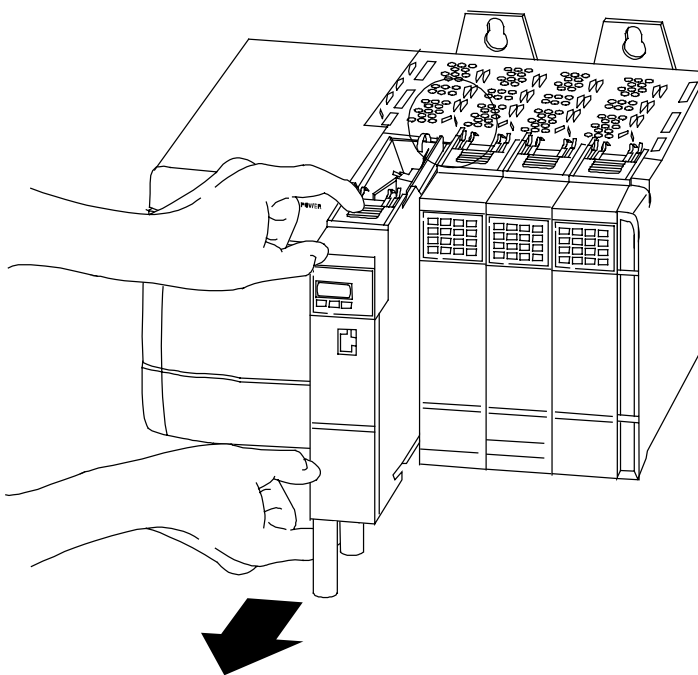
Use the following procedure to remove the ControlNet module from the chassis.

Step	Action
1	Disconnect the ControlNet drop-cable(s) from A and B connectors on the bottom of the module, as applicable for single- or dual-media.

ControlNet Communication Module Installation and Removal

Removing the ControlNet Module

Step	Action
2	Push in the top and bottom locking tabs and pull the ControlNet module from its chassis slot.



Install Replacement ControlNet module

Procedure

Refer to the previous *Installing the ControlNet Interface Module* procedure in this *Guide* to insert the replacement ControlNet module into the chassis.

Once the ControlNet module is installed, refer to *NetworkTools*, *Firmware Upgrades* in the *Troubleshooting and Maintenance Guide* to update the ControlNet module's firmware. Also, refer to *Check ControlNet Parameters* in this *Guide* to confirm the module's "keeper" values.



ATTENTION

Users are responsible for checking that replacement modules have the appropriate firmware. This includes verifying that replacement modules pass their powerup diagnostics.

Ethernet Communication Module Installation and Removal

Preparing to Install the Ethernet Module

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that no power is applied to the chassis.

Be aware that this section does **not** apply to the Network Interface Card (3COM Fast Etherlink XL 100MBps) in the Experion PKS Server(s). Please refer to the manufacturer's documentation for installation details.

Prepare for installation

Verify that you have the Ethernet modules TC-CEN021 needed to support the planned Supervisory Ethernet networks for your Experion PKS system.



ATTENTION

The model TC-CEN021 Ethernet module is a direct replacement for the previous TC-CEN011 model. However, the TC-CEN021 module does not include an Access Unit Interface (**AUI**) type connector nor a front panel door, and its RJ-45 port is located on the bottom of the module. If you are currently using a TC-CEN011 module with an **AUI** type connection, you will have to convert to a **RJ-45** type connection to replace it with a model TC-CEN021 module.

Confirm the chassis configuration for your Ethernet module(s) and the Ethernet network addressing configuration for your system. Be sure your planned chassis configuration complies with the configuration rules outlined in the *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide*.

Installing the Ethernet Module

Insert in the Chassis

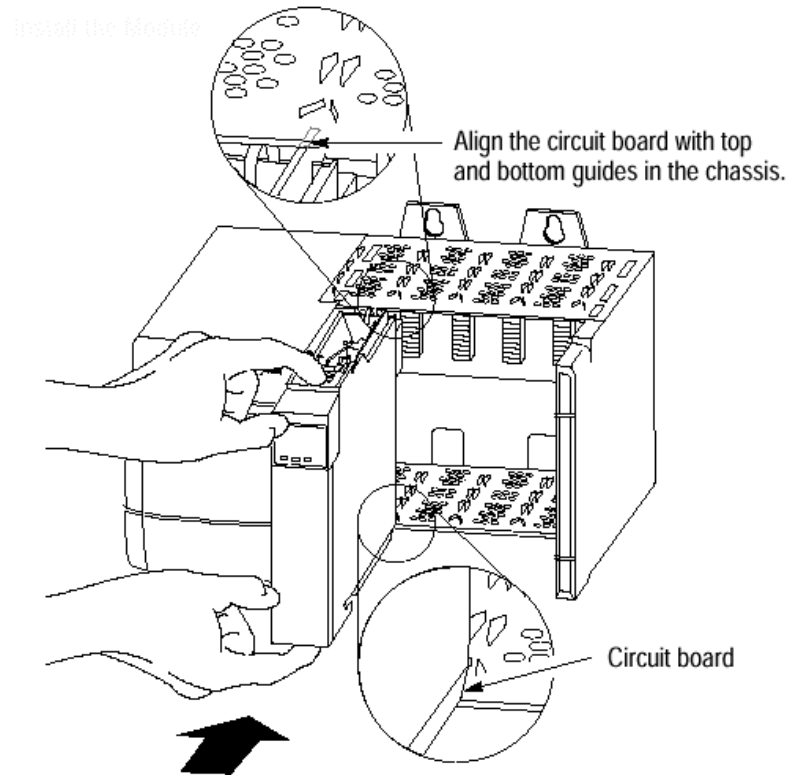


ATTENTION

Users are responsible for making the correct IP address assignments for the Ethernet modules used in their planned Supervisory Ethernet networks.

Use the following procedure to insert the Ethernet module into the chassis.

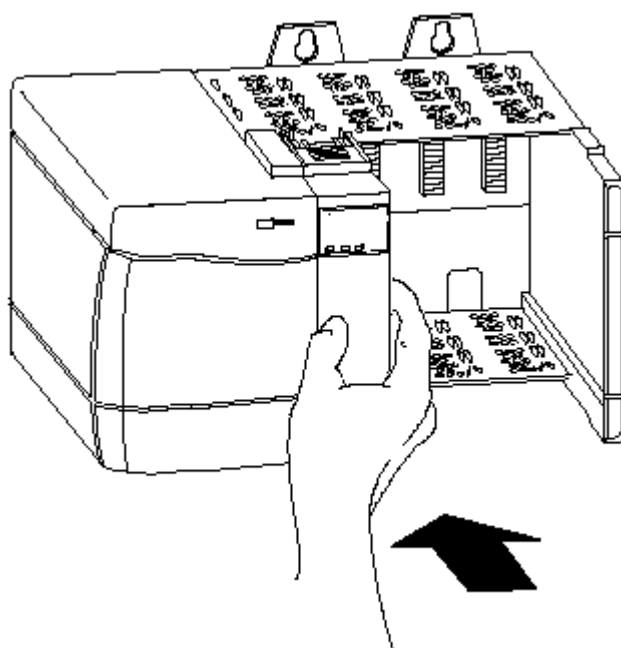
Step	Action
1	Align the module's circuit board with the top and bottom chassis guides for the planned slot location. Typically, slot 0 is reserved for the Ethernet module. (Remember that slot numbering is zero-based and the left most slot is number "0".)



Ethernet Communication Module Installation and Removal

Installing the Ethernet Module

Step	Action
2	Slide the module into the chassis, until the module's locking tabs "click" into position. The module is fully installed when it is flush with the power supply or other installed modules.



- 3 Repeat Steps 1 and 2 to install other Ethernet modules, as required.
- 4 Go to the next Section *Making Ethernet Network Connections*.

Making Ethernet Network Connections

Attaching Ethernet cables



WARNING

Unless the location is known to be non-hazardous, do **not**:

- connect or disconnect cables,
 - install or remove modules,
- while the Control system is powered.
-

The Ethernet module has a RJ-45 socket for network cable connections, as shown in Figure 5.

Ethernet Communication Module Installation and Removal

Making Ethernet Network Connections

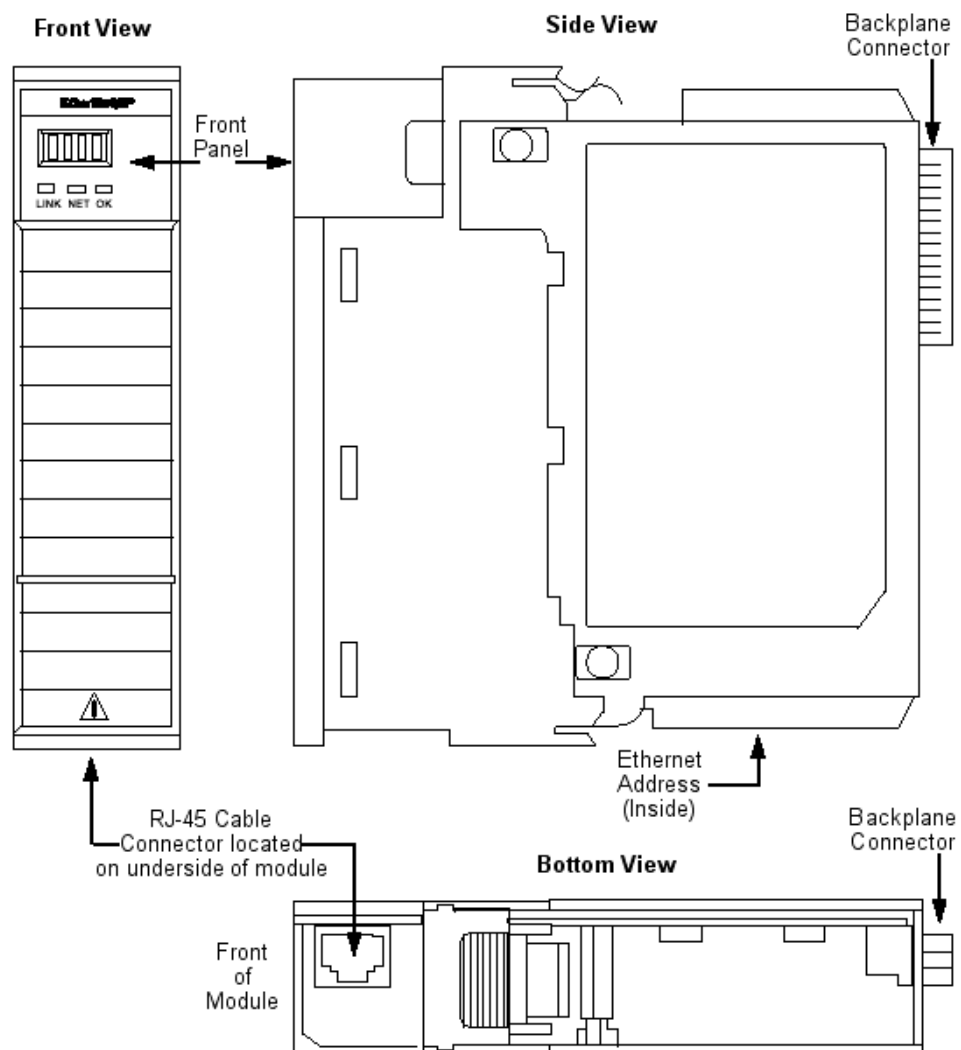


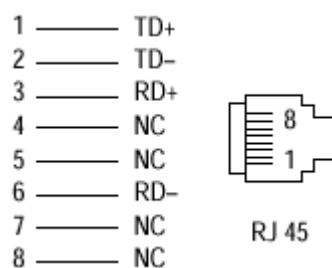
Figure 5 Front view of Ethernet module with view of RJ-45 connector.

Ethernet Communication Module Installation and Removal

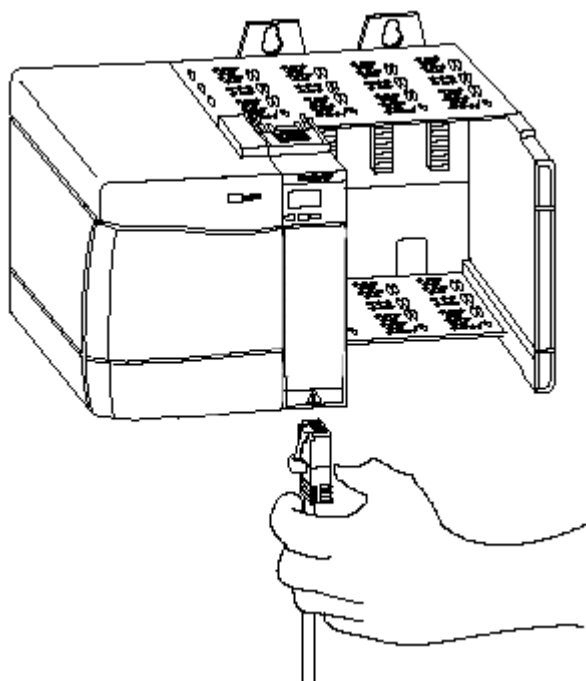
Making Ethernet Network Connections

Use the following procedure to connect the network cable between the switch port and the Ethernet module port.

Step	Action
1	Be sure the cable connector is wired as shown in the following diagram.



- 2 Plug the RJ-45 cable plug into the socket on the bottom of the module, so it locks in place.



Ethernet Communication Module Installation and Removal

Making Ethernet Network Connections

Step	Action
3	Connect the other end of the cable to the Ethernet switch port. Be sure to make all Supervisory Ethernet network connections.

Post Ethernet module Installation Tasks

Check Ethernet Configuration

The Ethernet module uses the Transmission Control Protocol/Internet Protocol (TCP/IP) suite of protocols for Ethernet communications. An Ethernet Supervisory network is a packet switched network. It transmits information between the Experion PKS Server and the Process Controller on the network in small segments called data packets.

The TCP/IP protocol suite defines the specific communication characteristics based on an international Open Systems Interconnection (OSI) reference model. The actual communication between nodes depends upon the physical (hardware) addresses and internet (IP) addresses specific to a given network.

Each Ethernet module comes with a factory assigned hardware address. The address is a 48-bit address that consists of six hexadecimal digits separated by dots. It is printed on a label on the front of the module.

The IP address identifies each node on the IP network (or system of connected networks). Each TCP/IP node on a network (including the Ethernet module) must have a unique IP address.

Check to be sure all network addresses are configured before you put the Ethernet module into operation.



REFERENCE - EXTERNAL

For more information about TCP/IP and internetworking, refer to:

- *Internetworking with TCP/IP* – Vol. 1, 2nd ed., by Douglas E Comer (ISBN 0-13-216987-8)
 - *The Ethernet Management Guide — Keeping The Link* (ISB 0-07-046320-4)
 - *An Introduction to TCP/IP* (ISBN 3-540-96651-X)
 - *Computer Networks* by Andrew S. Tanenbaum (ISBN 0-13-162959-X)
-

Ethernet Communication Module Installation and Removal

Post Ethernet module Installation Tasks

Install other modules

Install the other modules planned for the chassis configuration as outlined in applicable sections of this *Guide*. Refer to *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide* for more information about chassis configuration, including default module placement and redundant Controller considerations.

Removing the Ethernet Module

Remove from the Chassis

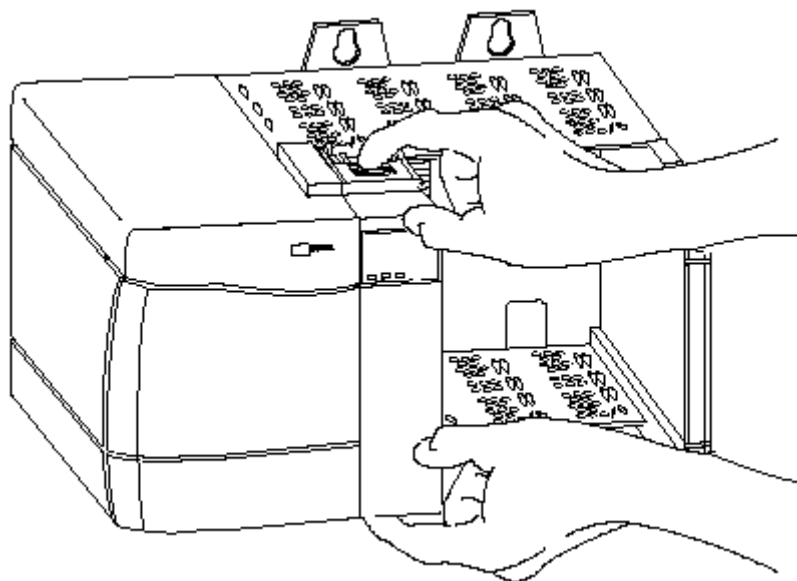


WARNING

We recommend that you take your process “Off Control” before removing any Control hardware component. This means the CPM should be in its idle state. Any time you remove a module from the chassis of an on-control process system, the potential for unintended machine motion or loss of process control exists.

Use the following procedure to remove the Ethernet module from the chassis.

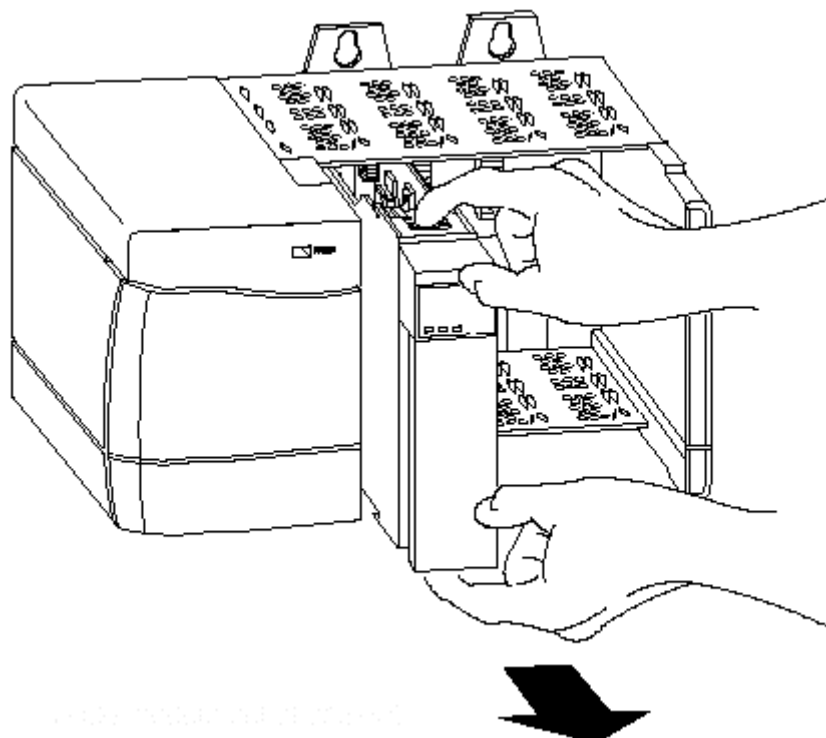
Step	Action
1	Disconnect the RJ45 cable plug from the connector on the front of the module.
2	Push in the top and bottom locking tabs.



Ethernet Communication Module Installation and Removal

Removing the Ethernet Module

Step	Action
3	Pull the Ethernet module from its chassis slot.



Install Replacement Ethernet module

Procedure

Refer to the previous *Installing the Ethernet Module* procedure in this *Guide* to insert the replacement Ethernet module into the chassis.

Once the Ethernet module is installed, refer to *NetworkTools, Firmware Upgrades* in the *Troubleshooting and Maintenance Guide* to check the modules IP addresses. Also, be sure to enter the replacement module's new Ethernet hardware address.



ATTENTION

Users are responsible for checking that replacement modules have the appropriate firmware. This includes verifying that replacement modules pass their powerup diagnostics.

Ethernet Communication Module Installation and Removal

Install Replacement Ethernet module

Battery Extension Module Installation and Removal

Preparing to Install the Battery Extension Module

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).

Check that no power is applied to the chassis.

Prepare for installation

Verify that you have the Battery Extension Modules (BEMs) model TC-PPD011 (uncoated) or TK-PPD011 (coated) needed to support the planned Controller chassis configuration for your Experion PKS system. Be sure you have the battery for the module, since the module is shipped without the battery installed.

Confirm the chassis configuration for your Battery Extension Module(s). Be sure your planned chassis configuration complies with the configuration rules outlined in the *Planning Your Chassis Configurations* in the *Control Hardware Planning Guide*.

Tools needed

- Small flat-blade screwdriver

Installing the Battery Extension Module



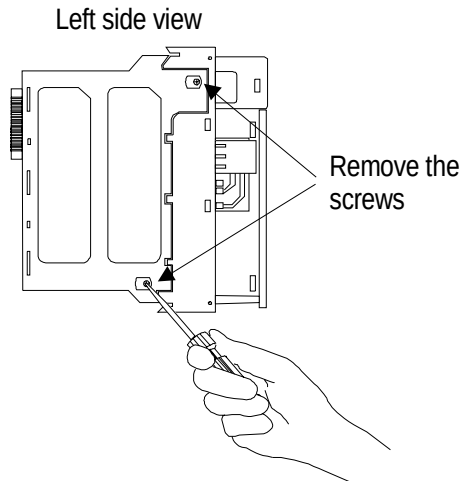
ATTENTION

We suggest that you remove or disconnect the battery in the CPM, when you install a BEM. While both batteries can be present at the same time, the BAT LED on the front of the CPM will turn Red instead of Green after powerup to show that the startup diagnostics has detected both batteries..

Install the battery and Insert BEM in the Chassis

Use the following procedure to install the battery in the BEM and the BEM in the chassis.

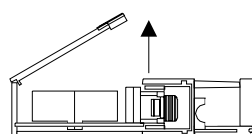
Step	Action
1	Remove the screws securing the cover to the Battery Extension Module.



Battery Extension Module Installation and Removal

Installing the Battery Extension Module

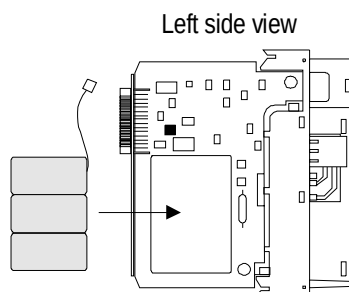
Step	Action
2	Remove the cover for the Battery Extension Module.



Remove the
cover

Bottom view

3	Insert the battery into the battery holder.



Left side view

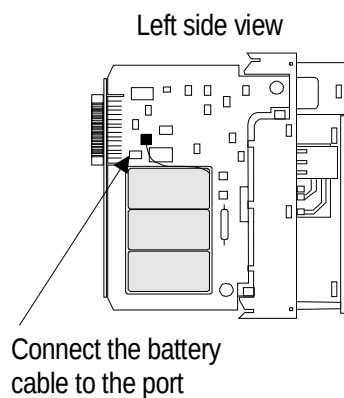
Insert the battery
into it's holder

Battery Extension Module Installation and Removal

Installing the Battery Extension Module

Step	Action

4	Connect the battery cable to the port.

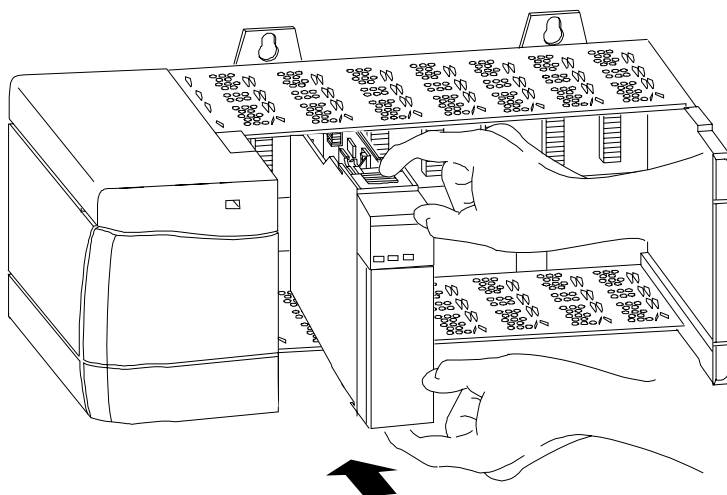


5	Install the cover and secure with the screws removed in Step 1.
6	Position the module at planned chassis slot location. Default location is slot 4 in a 10- or 17-slot chassis, or slot 6 in a 7- or 13-slot chassis. (Remember that slot numbering is zero-based and the left most slot is number "0".)

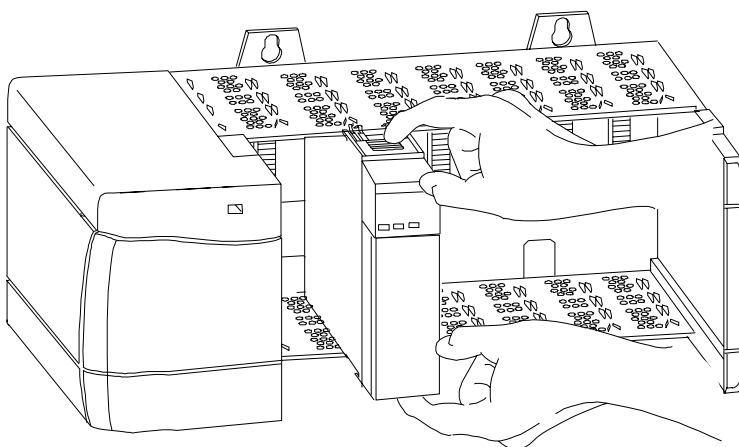
Battery Extension Module Installation and Removal

Installing the Battery Extension Module

Step	Action
7	Align the module's circuit board with the top and bottom chassis guides.



- 8 Slide the module into the chassis until the module tabs “click” into position.



- 9 Go to the next section *Wiring the BEM Status Contact*.

Wiring the BEM Status Contact

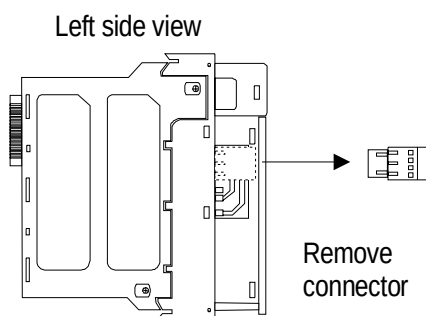
About the status contacts

The BEM normally-open relay contact remains closed (and the normally-closed contact remains open) when the BEM is able to provide 3.0 to 3.6 Vdc battery backup power. The BEM normally-open relay contact opens (and the normally-closed contact closes) when the BEM is **not** able to provide at least 3.0 Vdc battery backup power.

Procedure

Use the following procedure to connect an external user supplied annunciator circuit to an integral BEM normally open or normally closed contact.

Step	Action
1	Unplug the connector from the Battery Extension Module socket.



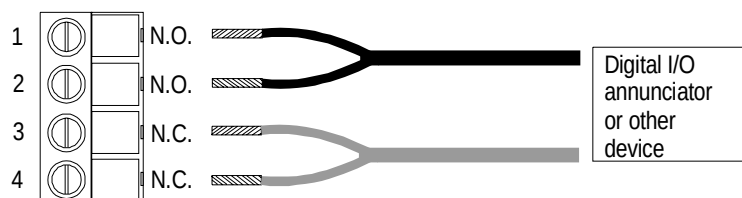
ATTENTION

The maximum voltage and current ratings for the alarm relay contacts are 30 Vac/Vdc and 100 mA, respectively.

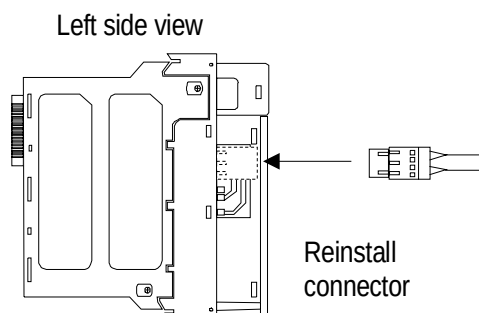
Battery Extension Module Installation and Removal

Wiring the BEM Status Contact

Step	Action
2	Insert the user supplied wiring and tighten the screws. - Terminals 1 and 2 provide a normally-open relay contact that OPENS when the battery output drops below 3.0 Vdc. - Terminals 3 and 4 provide a normally-closed relay contact that CLOSES when the battery output drops below 3.0 Vdc.



- 3** Plug the connector into the Battery Extension Module socket.



Removing the Battery Extension Module

Remove from chassis

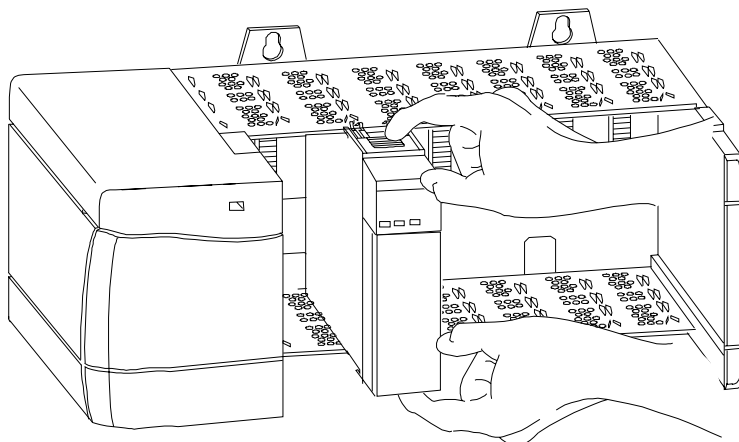


CAUTION

The CPM will not retain its RAM, if power is lost while the BEM is removed from the chassis and the CPM battery is not connected.

Use the following procedure to remove the BEM from the Chassis.

Step	Action
1	If a user-supplied circuit is wired to the BEM status connector, unplug the connector from the Battery Extension Module socket.
2	Push in the top and bottom locking tabs.

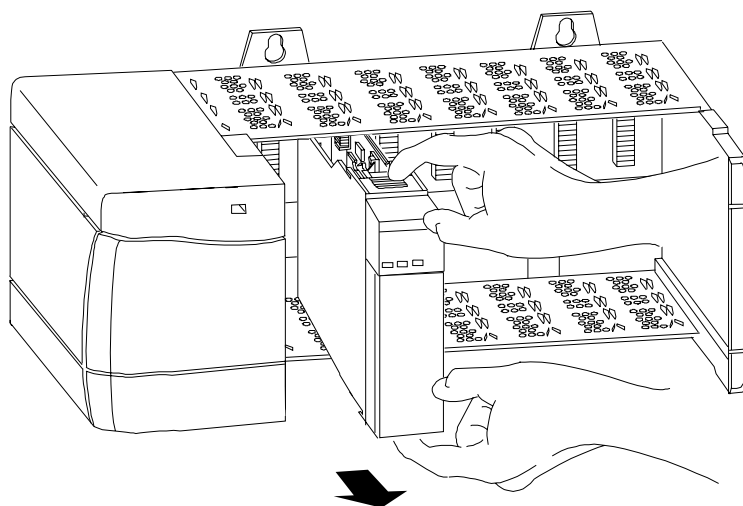


Battery Extension Module Installation and Removal

Removing the Battery Extension Module

Step	Action

3	Pull the module out of the chassis.
-



Install Replacement BEM or Battery

Procedure

Refer to the previous *Installing the Battery Extension Module* in this *Guide* to insert the replacement BEM into the chassis. Or, adapt the procedure to remove and replace the battery and re-install the BEM.

Power Supply Installation and Removal

Preparing to Install the Power Supply

Before you begin

Be sure you have reviewed the *Preinstallation Considerations* in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).



CAUTION

Since power output ratings vary for given approval bodies, be sure the specified load capacity and temperature rating for the power supply will not be exceeded in your application.

For applicable power output rating specifications, refer to the Experion PKS specifications. The Experion PKS specifications can be found on the Honeywell website: <http://www.acs.honeywell.com>. Just follow the Experion PKS product links.

Prepare for installation

Verify that you have the Power Supply model needed to match your power source output, as listed in Table 7.

Table 7 Power supply model number reference

Voltage Type	Model Number	Nominal Power Rating
Vac	TC-FPCXX1 (Obsolete)	120/240Vac
	TC-FPCXX2/TK-FPCXX2	120/240Vac
Vdc	TC-FPDXX1 (Obsolete)	24Vdc
	TC-FPDXX2/TK-FPDXX2	24Vdc

Tools needed

- 1/8-inch flat-blade screwdriver
- 1/4-inch flat-blade (#2) or phillips screwdriver

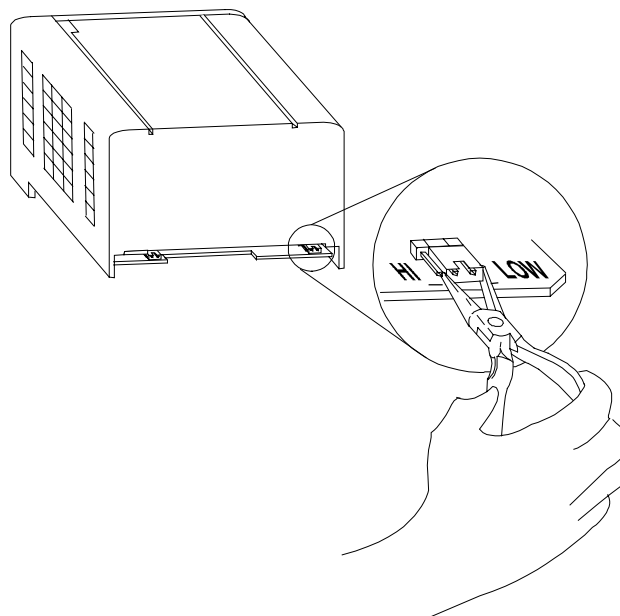
- Needle-nose pliers

Installing the Power Supply

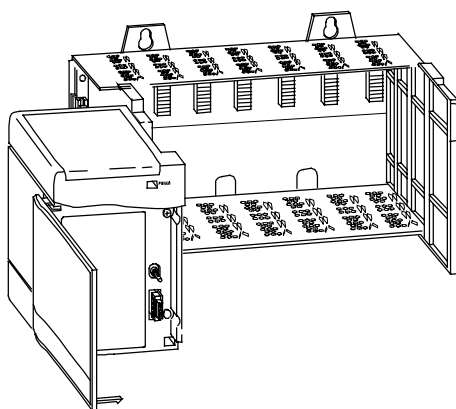
Install on chassis

Use the following procedure to configure the input voltage jumper and install the power supply on the chassis.

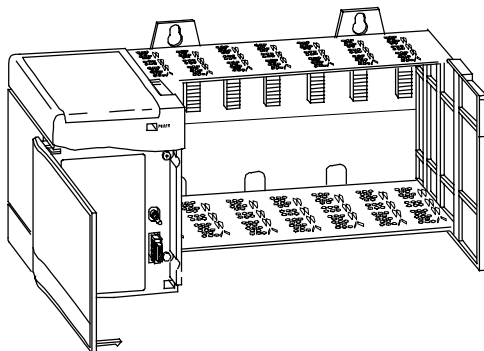
Step	Action
1	Sit the power supply printed circuit board side down on a table. Facing the back of the supply, locate the input voltage jumper on the edge of the printed circuit board. Confirm that the jumper is in the correct position for the given power supply model and supply voltage as listed in Table 8. If required, use needle-nose pliers to change the jumper position, as shown below.



Step	Action
2	Align the circuit board of the power supply with the card guides on the left side of the chassis.



- 3 Slide the power supply in until it is flush with the chassis.

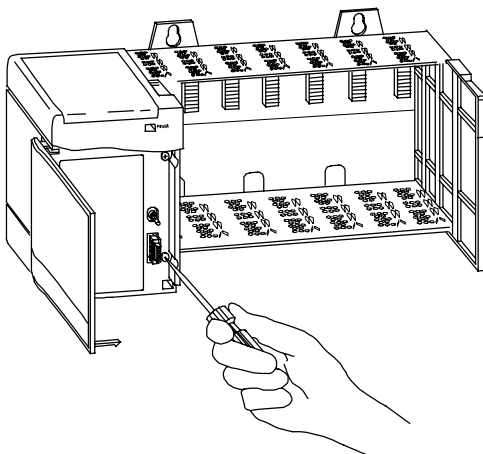


Power Supply Installation and Removal

Installing the Power Supply

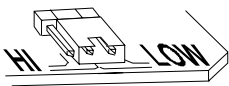
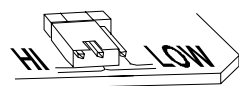
Step	Action

4	Fasten the power supply to the chassis.



5	Go to the next Section <i>Connect power wiring</i> .
-

Table 8 Power supply input voltage jumper positions

For an input voltage of...	On power supply model...	set the input voltage jumper as...
16–32 Vdc	TC-FPDXX2/ TK-FPDXX2	Low (Note 1) 
120 Vac	TC-FPCXX2/ TK-FPCXX2	
19–32 Vdc (Note 2)	TC-FPDXX2/ TK-FPDXX2	High (Note 1) 
240 Vac	TC-FPCXX2/ TK-FPCXX2	

Note 1: The default setting for TC-FPCXX2/TK-FPCXX2 is Low.
The default setting for TC-FPDXX2/TK-FPDXX2 is High.

Note 2: If your input voltage falls below 19V for intervals of two minutes or less (e. g., motor cranking) and your inputs and outputs are not affected by system input power voltages of 15V, set the input jumper to the Low position.

Connect power wiring



WARNING

Turn off power at the source of the supply before connecting to the power supply terminals. Failure to do so could cause injury to personnel and/or equipment.



ATTENTION

Power lines, grounds, and bus bars should have been installed during system cabling and wiring installation.

Torque screw terminals to 7 inch-pound (0.8 Newton-meter).

Power Supply Installation and Removal

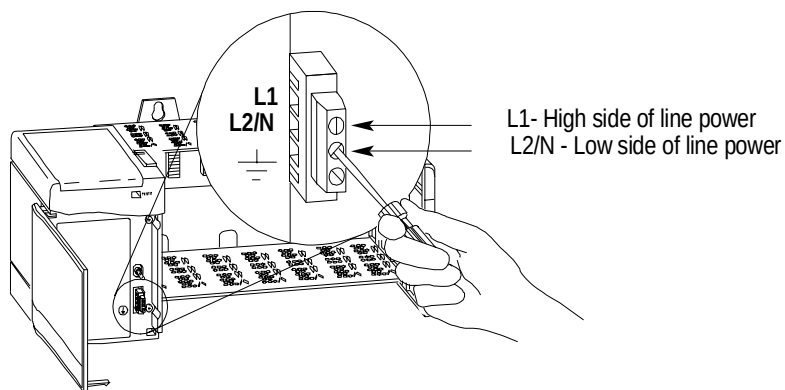
Installing the Power Supply

Use the appropriate portion of the following procedure to connect the power wiring to the given power supply model.

Step	Action

TC-FPCXX2 and TK-FPCXX2 120/240 Vac Power Supplies

- 1 Connect the high side of the ac power line (black) to the L1 terminal.
- 2 Connect the low side of the ac power line (white) to the L2/N terminal.

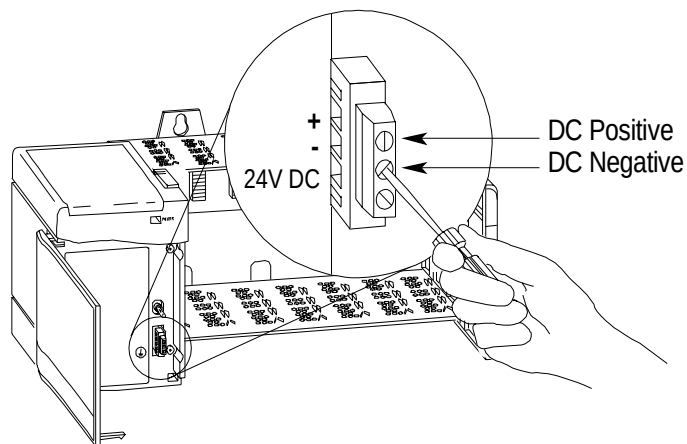


- 3 Connect the PE ground (green with yellow stripe) to the ground terminal. See *Figure 1* and *Figure 2* for proper examples on making PE ground connections.

TC-FPDXX2 and TK-FPDXX2 24 Vdc Power Supplies

- 1 Connect the positive side of the dc power line to the positive (+) terminal.

Step	Action
2	Connect the negative side of the dc power line to the negative (-) terminal.



3	Connect the PE ground (green with yellow stripe) to the ground terminal. See <i>Figure 1</i> and <i>Figure 2</i> for proper examples on making PE ground connections.

Preparing for Operation

Remove the Protective Label

Remove your power supply's protective label, as illustrated in Figure 6.



CAUTION

Make sure the chassis is mounted to your enclosure, rack or panels before you remove the protective label. When installing multiple chassis in the same location, be sure all are installed before removing their power supply's protective labels. This label protects the power supply from metal shavings during chassis installation.

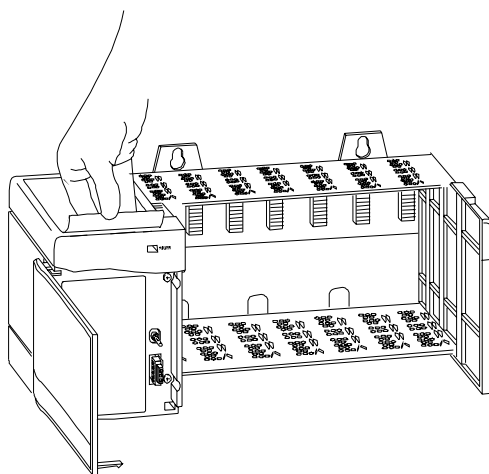


Figure 6 Power supply protective label

Removing the Power Supply

Remove from the Chassis



WARNING

Take your process "Off Control" before removing the power supply. This means the CPM should be in its idle state.



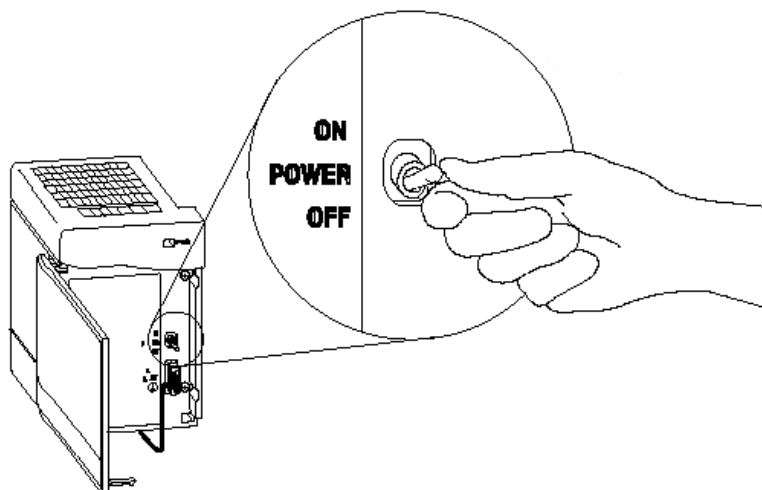
ATTENTION

If the CPM battery is not installed or it is discharged, the CPM will not retain its database after power is removed.

Use the following procedure to remove the power supply from the chassis.

Step	Action

1	Open the power supply door and flip the power switch to its OFF position.

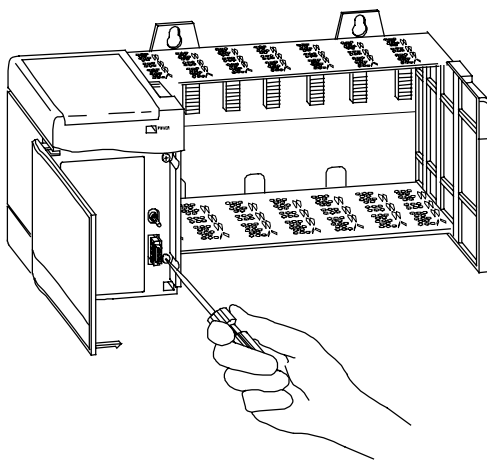


2	Turn OFF the main power source for the power supply. Disconnect the power line and ground leads from the power supply terminals.

Power Supply Installation and Removal

Removing the Power Supply

Step	Action
3	Loosen the two screws securing the power supply to the chassis.



4	Pull the power supply forward to slide it from the chassis.

Install Replacement Power Supply

Procedure

Refer to the previous *Installing the Power Supply* procedure in this *Guide* to install the replacement power supply on the chassis

Power Supply Installation and Removal

Install Replacement Power Supply

I/O Link Interface Module Installation and Removal

Overview

Background

The following table summarizes the features that are key to bringing Process Manager (PM) I/O into Experion PKS.

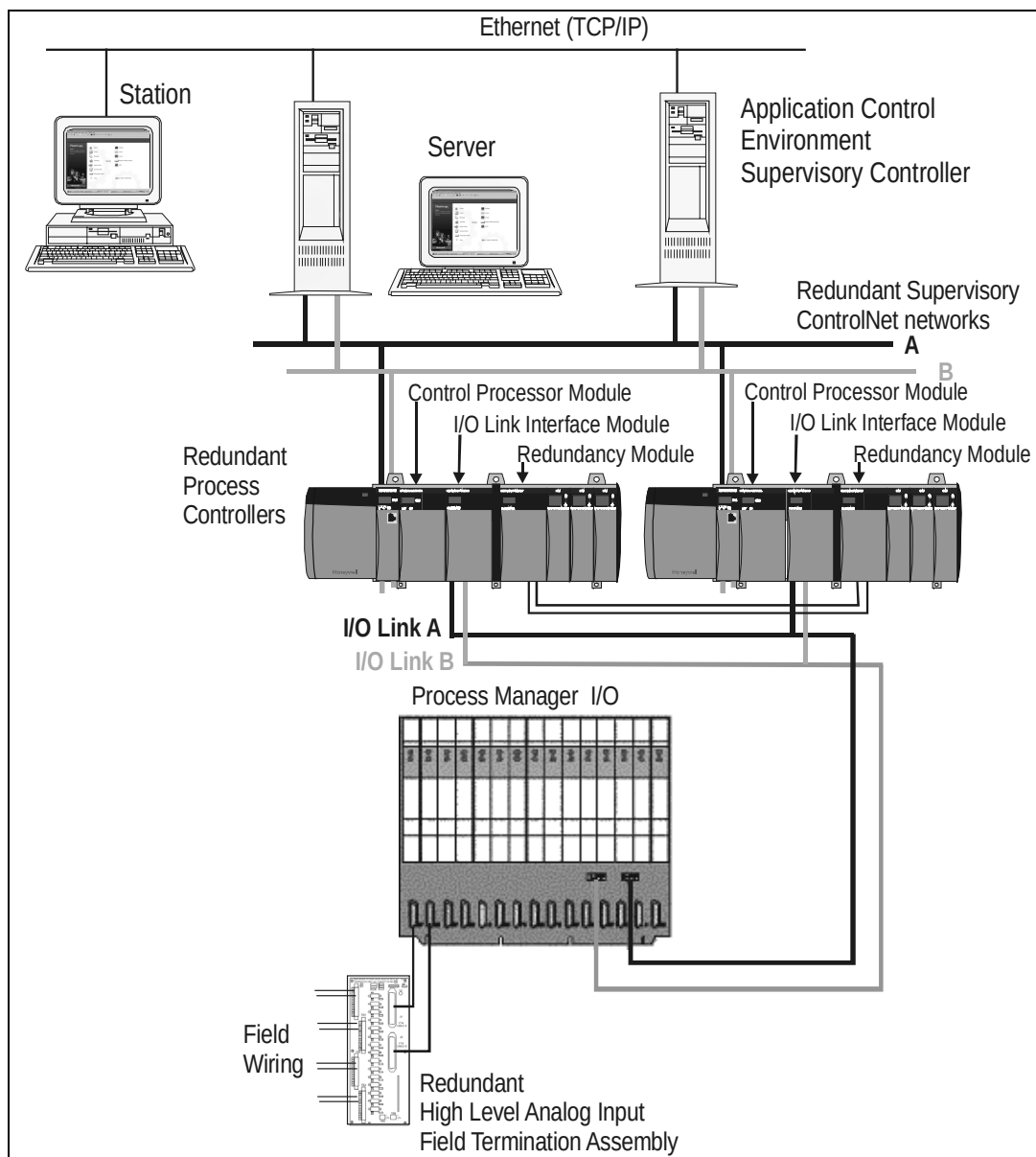
Feature	Description
High Availability I/O	Many of the PM I/O processors allow for redundancy to achieve minimal downtime. Redundant power supplies with battery backup provide uninterrupted power.
High Integrity - Robust I/O	Built-in features, such as redundancy, on-line diagnostics and Div 2, non-incendive field wiring make PM I/O robust for process I/O applications.
Additional features previously not available.	Features such as integration of DE protocol-based field devices and standby manual control.

PM I/O architecture

As part of Experion PKS control hardware, the I/O Link Interface Module (IOLIM) is the link to the PM I/O control hardware and field devices. As shown in the following figure, the IOLIM resides in any process controller card file and is the network gateway between the Supervisory ControlNet and the PM I/O processors and Field Terminal Assemblies (FTAs). It supports communications to access process data and maintenance information from the I/O processors, FTAs and field devices.

I/O Link Interface Module Installation and Removal

Overview



Experion PKS PM I/O Architecture

IOLIM Features

The IOLIM is a double-wide module that plugs into a non-redundant or redundant controller chassis. It supports Flash ROM-based storage of the I/O Link configuration, so in the event of a power interruption, the IOLIM retains information on the I/O processors that have been configured. Configuration data for the I/O points reside in the I/O processors.

Control Builder serves as common configuration tool

The Experion PKS Control Builder application supports integral configuration of the IOLIM and associated PM I/O devices. This includes creating hardware blocks, associating the blocks, assigning modules, assigning devices, and loading components. Please note that since configuration data for the PM I/O points reside in the I/O device and not in the process controller, the I/O processor must be present during a configuration load.

Station provides centralized operator interface

The Station application includes Detail Displays dedicated to configured IOLIMs and IOLINK function blocks, PM I/O processors, I/O function blocks and associated field devices. They provide access to the same parameters that are accessible through the configuration forms of Control Builder.

The reporting of alarm conditions and retrieval of process data for inclusion in group, trend, history, and schematic displays are seamlessly integrated with Experion PKS's existing notification management system.

Planning Considerations

Experion PKS system references

Please refer to the following Knowledge Builder publications for general planning details and installation considerations for the Experion PKS system in general. For the sake of brevity, this Guide does not repeat the applicable general guidelines, consideration, cautions, etc. that are covered in these other Guides.

- *Control Hardware Planning Guide*

If this is a new Experion PKS system installation, we recommend that you familiarize yourself with the contents of these publications before you install any Experion PKS system equipment.

Installation declaration



ATTENTION

This equipment shall be installed in accordance with the requirements of the National Electrical Code (NEC), ANSI/NFPA 70, of the Canadian Electrical Code (CEC), C22.1. It is supplied as “open equipment” that is intended to be mounted on a subpanel within an enclosure. The suitability of the enclosure and installed system shall be acceptable to the local “authority having jurisdiction,” as defined in the NEC, or “authorized person” as defined in the CEC.

I/O module allowance

Be sure your Experion PKS system I/O requirements do not exceed the capacities listed in the following table.

Component	Total Per Controller	Total Per Server
Maximum number of IOLIMs	2	20
Maximum number of Primary I/O processors (IOPs).	64	
The maximum number of Primary I/O Processors (IOPs) per IOLIM is 40. This number may vary depending on the required sampling period of the IOPs.		

- The IOLIM must reside in the same controller chassis as the C200 CPM. Both redundant and non-redundant chassis are supported. Therefore a redundant controller chassis must contain at least a Supervisory ControlNet Interface (CNI), a CPM, a Redundancy Module (RM) and IOLIM. A non-redundant controller chassis must contain at least a Supervisory ControlNet Interface (CNI), a CPM, and IOLIM.
- The controller chassis may contain additional CNI modules connected to other Experion PKS I/O families, such as Rail I/O control hardware.

PM I/O Component References

The following table identifies the hardware components available for integrating PM I/O control hardware and field devices with a Experion PKS system.

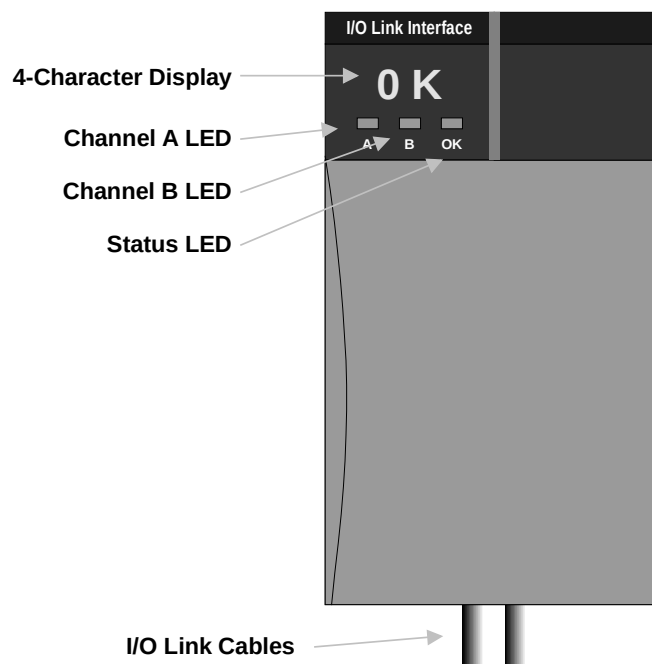
Control Hardware Component	Description	Honeywell Model Number
PM Module (IOLIM)	Double-width module that mount in a supervisory or redundant controller chassis. Serves as the “gateway” between the Experion PKS control environment and the PM I/O processors and Field Termination Assemblies.	TC-IOLI01
IOLIM Cable	Interconnecting cable between the IOLIM and the PM I/O card file.	TC-KIOLxx
PM I/O Card File	Card file that accepts I/O processor plug-in cards. Card files can accommodate 7 or up to 15 I/O processor cards.	MU-HPFxxx
I/O Processor (IOP)	Plug-in Input/Output Processor card. IOPs, along with Field Termination Assemblies (FTAs), perform input and output scanning and processing on various field I/O devices.	Various
Field Termination Assembly (FTA)	Provides connection points for the process control field wiring. Fuses, relays, and resistors protect the FTA circuitry, and also sense, condition, or operate the connected field device. The FTA communicates with an associated IOP.	Various
FTA Cable	Interconnecting cable between an FTA and the associated IO processor.	MU-KFTAxx or MU-KFTSxx

Intrinsically safe applications

You are responsible for adhering to all applicable national codes and local ordinances for applying intrinsically safe equipment in a potentially explosive atmosphere.

Installing IOLIM Model TC-IOLI01

Front Cover View



Double Wide Module TC-IOLI01

I/O Link Interface Module Installation and Removal

Installing IOLIM Model TC-IOLI01



ESD HAZARD

Electrostatic discharge can damage integrated circuits or semiconductors if you touch backpanel connector pins. Follow these guidelines when you handle a module:

- Touch a grounded object to discharge static potential,
 - Wear an approved wrist-strap grounding device,
 - Do not touch the backpanel connector or connector pins,
 - Do not touch circuit components inside the module,
 - If available, use a static safe workstation,
 - When not in use, keep the module in its static shield box or bag.
-

Setting I/O link physical address

A hardware jumper pin is used to establish the IOLIM's Device Physical Address (DPA) on the I/O link. Use the procedure below to set the hardware jumper on the IOLIM.

Step	Action
1	Remove the IOLIM assembly from its static shield bag.
2	Locate the hardware jumper at the bottom edge of the Printed Wiring Assembly (PWA)
3	Set the jumper according to your application: • For redundant IOLIM configurations, the jumper setting on the primary and secondary IOLIMs must be different. (If the jumper is used on the primary IOLIM in a redundant pair, then remove the jumper from the secondary IOLIM.) • For non-redundant configurations, the I/O link physical address does not matter. (The jumper can be used or removed from the IOLIM.)

Setting I/O link interface cable shield ground

The I/O Link Interface is a serial communications network that connects all IOP card files associated with an IOLIM. Redundant I/O link interface cables (labeled Link A and Link B) are used to connect the IOP card files to the IOLIM. Each I/O link interface cable contains a cable shield that must be grounded.

CAUTION

For non-CE compliant installations, the cable shield ground for the I/O link interface cable should be made only at one point. This ground point is at the first IOP card file backpanel of the link. (The first IOP card file is located closest to the IOLIM or power system.)

For CE compliant installations, The cable shield ground is made at each IOLIM and each IOP card file backpanel of the link.

See [I/O Link interface cable shield grounding](#) for additional information.



ATTENTION

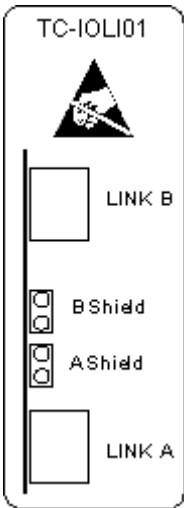
The I/O Link Interface cable shield grounding must be carefully adhered to when installing a PM I/O subsystem. Failure to follow the above guidelines can result in unwanted ground loops that may cause I/O Link communications errors

Two jumpers located behind the front cover of the IOLIM are used to set the cable shield ground for the I/O link interface cable. Follow the steps below to set the cable shield ground appropriately.

Step	Action
1	Open the front door of the IOLIM.
2	Locate the hardware jumpers designated as A Shield and B Shield on front edge of the daughterboard. See figure.

I/O Link Interface Module Installation and Removal

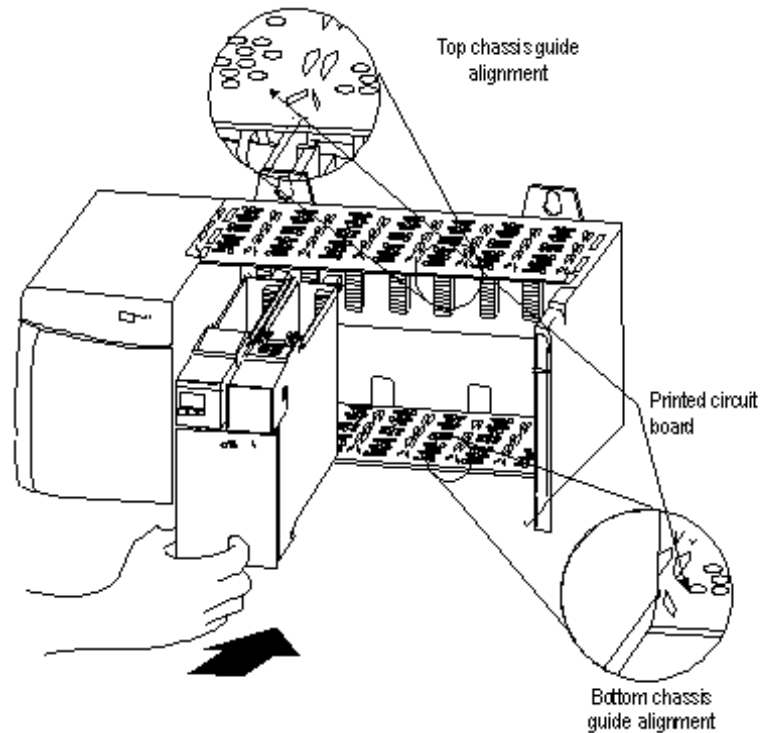
Installing IOLIM Model TC-IOLI01

Step	Action
	 The diagram shows the front panel of the TC-IOLI01 module. At the top is the model number 'TC-IOLI01' and a warning triangle icon. Below these are four ports arranged vertically: 'LINK B' (a large square port), 'B Shield' (a small square port with a pin), 'A Shield' (a small square port with a pin), and 'LINK A' (a large square port). A vertical line separates the ports from the labels.
3	Determine if this process control system is a CE compliant or non-CE compliant installation. See CAUTION above. If the system is a CE compliant installation, make sure that a jumper is present on pins that are labeled A Shield and B Shield. If the system is a non-CE compliant installation, remove the jumpers from both A Shield and B Shield.
4	Close the front door to the IOLIM.

Inserting module into chassis

Use the following procedure to insert the IOLIM into the controller chassis. This procedure assumes that this is the initial installation of a IOLIM in an unpowered chassis.

Step	Action
1	Position the module at the desired chassis slots location. For example, slots 1 and 2. (Remember that slot numbering is zero-based and the left most slot is number "0".)
2	Align the module's circuit board with the top and bottom chassis guides

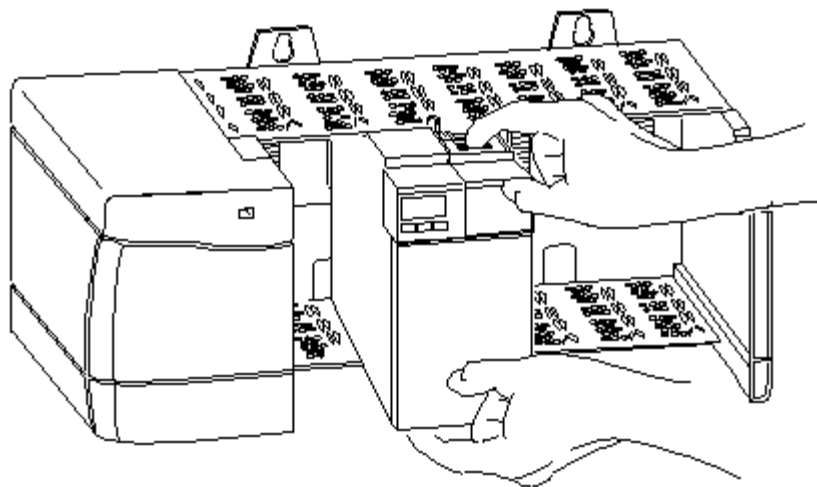


3	Slide the module into the chassis until the module tabs "click" into position.
-

I/O Link Interface Module Installation and Removal

Installing IOLIM Model TC-IOLI01

Step	Action



4	Go to the next procedure <i>Connecting I/O link interface cable to module</i> .
-

Connecting I/O link interface cable to module

Cable Model TC-KIOLxx is used to connect the IOLIM to the PM I/O card file and the PM power system. The cable assembly is available in various lengths:

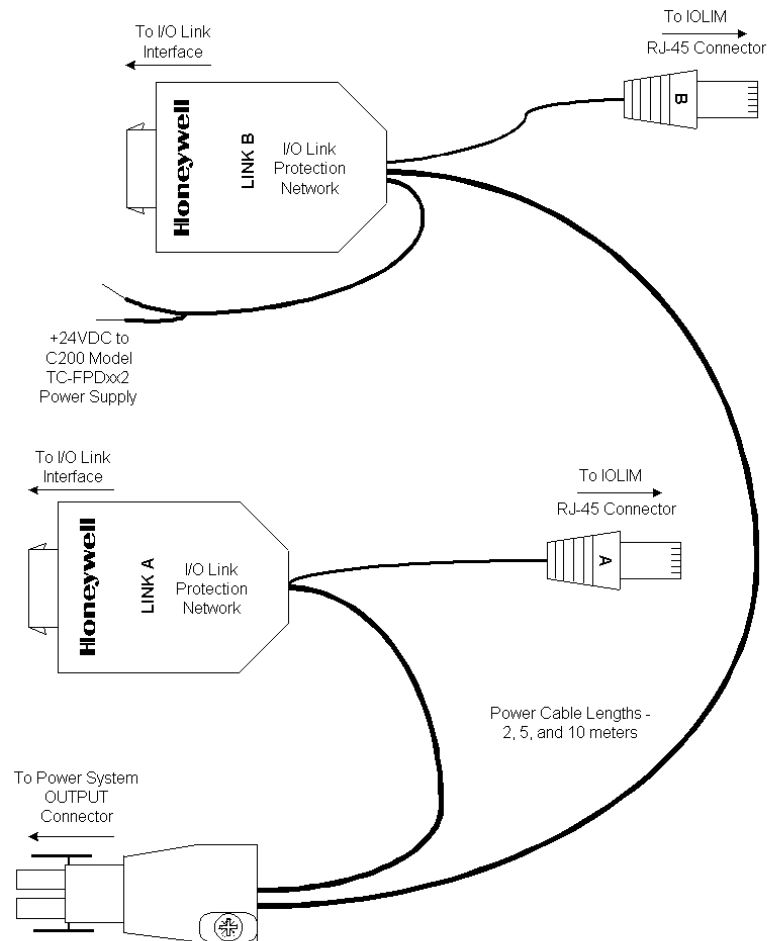
Cable Model	Cable Length
• TC-KIOL02	2 meters
• TC-KIOL05	5 meters
• TC-KIOL10	10 meters

Use the following procedure to connect the I/O link interface cable to the IOLIM. This procedure assumes that the IOLIM is installed in an unpowered control cabinet and controller chassis.

I/O Link Interface Module Installation and Removal

Installing IOLIM Model TC-IOLI01

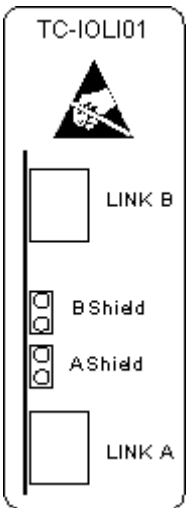
Step	Action
1	Be sure that the TC-KIOLxx cable is long enough to reach from the IOLIM connectors to the PM power system OUTPUT connector. See Figure.



- 2** Open the front cover of the IOLIM to access two LINK connectors.
 Connect the cables with RJ-45 connectors marked "A" and "B" to the appropriate connector marked LINK A and LINK B in the IOLIM.

I/O Link Interface Module Installation and Removal

Installing IOLIM Model TC-IOLI01

Step	Action
	 The diagram shows a vertical rectangular module labeled TC-IOLI01 at the top. Below the label is a triangular warning symbol with a lightning bolt and a crossed-out circle. Further down, there are four rectangular ports arranged vertically. The top port is labeled LINK B. Below it are two smaller ports labeled B Shield and A Shield. The bottom port is labeled LINK A.
3	Open the front cover of the power supply in the process controller chassis. Connect the red (+) and black (-) wire pair to the + and – terminals of the DC INPUT POWER SUPPLY terminal block.
4	Mate the cable ends with white connectors marked "LINK A" and "LINK B" with the appropriate <u>I/O link cables from the IOP Card file</u>.
5	Run the cable connector marked "C1" to the PM power system inside the control cabinet. Connect cable to one of the OUTPUT connectors on the PM power system backpanel.

Loading IOLIM firmware



ATTENTION

If the IOLIM is not installed and pre-configured by the factory, users must load the IOLIM's firmware to make it fully operational. This is also true for any replacement IOLIM ordered separately from the factory.

Once the Control hardware is installed and system communications are established, the IOLIM's firmware must be updated. The procedure for loading the IOLIM's firmware is similar to the one used for loading the CPM's personality image. Refer to *Loading IOLIM personality image – Optional* in the *Startup and Shutdown Guide* to update the IOLIM's firmware.



TIP

The boot and personality image files are **iolimboot.nvs** and **iolimapp.nvs**, respectively, and they are at this directory location:

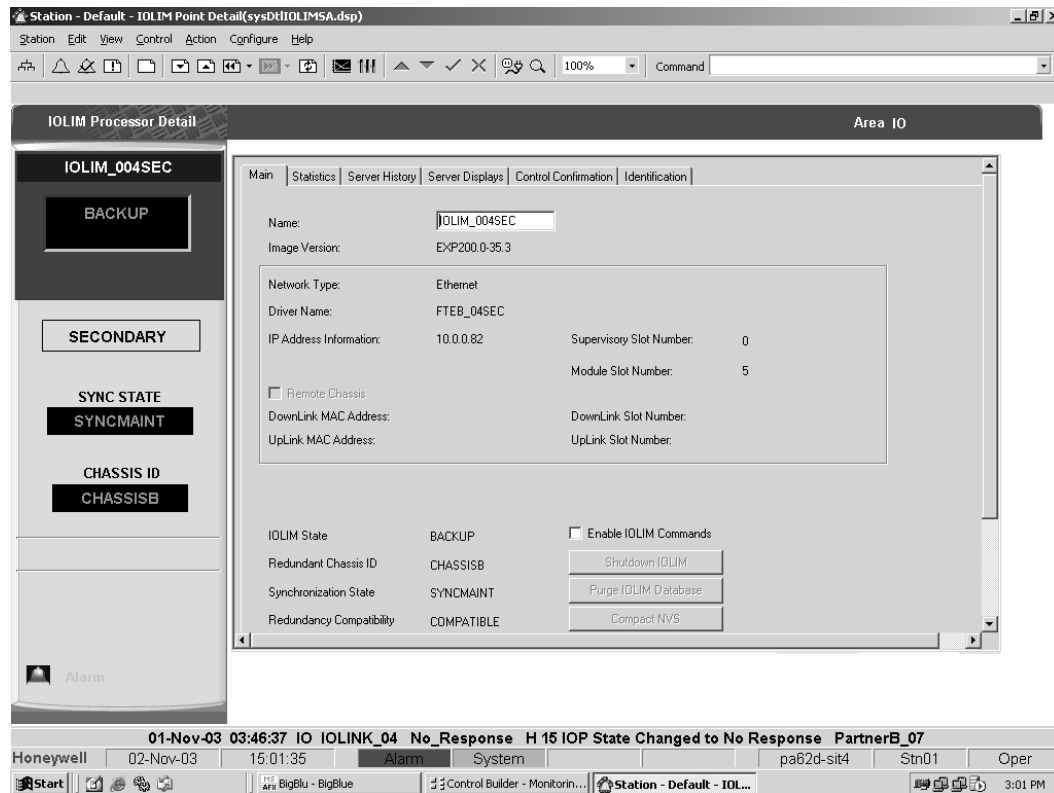
C:\Program Files\Honeywell\Experion PKS\Engineering Tools\system\FIRMWARE\IOLIM

Monitoring PM I/O Functions Using Station Displays

Using Station Detail displays

The Experion PKS Server Station application includes pre-configured Detail displays for the IOLIM, IOLink and PM device function blocks. These displays are the default entries for the Point Detail Page parameter on the Server Parameters tab of the configuration form.

The following figure shows a sample IOLIM Detail display for reference. The left side of the display shows a “live” view of the IOLIM front panel. A view of configuration data with real time updates is provided on the right of the display.



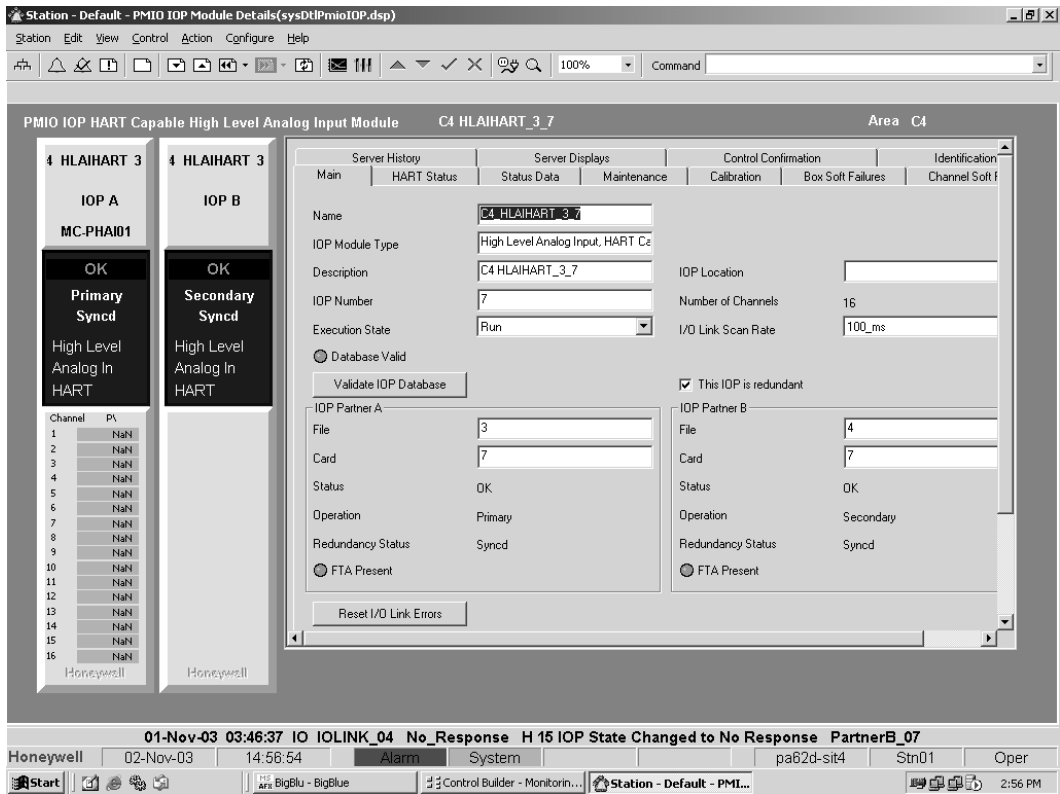
Typical IOLIM Detail display in Station.



REFERENCE - INTERNAL

Please refer to the *Operator's Guide* for detailed information about calling up, navigating, and viewing Station displays.

Once you establish communications with a PM I/O link you can begin monitoring the status of any component that has been loaded as part of a Control Strategy to a IOLIM with points registered in the Experion PKS Server. The Detail displays let you quickly view the component's current state, fault status, and pertinent configuration data.



The PM I/O Detail displays do feature convenient links to related PM I/O component displays for easy access to associated data.

Using Station Event Summary display

Like the Detail displays, the Alarm and Event Summary displays support the integration of PM I/O generated notifications and events. It is integrated with Experion PKS component data and is for the most part self-explanatory. The following figure shows a typical Alarm Summary display that includes IOLIM, Link, and Device indications. Use this display to get a quick review of recent conditions that have raised alarms within the system.

HAOCHANNEL_02.?? SELECTED 0

Alarms				
Area: (all areas),		View: (all alarms),		
	Date & Time ▾	Area	Source	Condition
⚠	10/31/2003 21:00:00	System	Testing license	
⚠	10/31/2003 20:00:00	System	Testing license	
⚠	10/31/2003 18:59:59	System	Testing license	
⚠	10/31/2003 18:37:43	C4	C4_HLAIHART_3_7	ADOUTCAL_043
⚠	10/31/2003 18:00:00	System	Testing license	
⚠	10/31/2003 17:00:00	System	Testing license	
⚠	10/31/2003 15:59:59	System	Testing license	
▾	10/31/2003 15:24:33	C2	C2_CM64_HART	BADCTL
▾	10/31/2003 15:20:08	C2	C2_CM64_HART	BAD PV
⚠	10/31/2003 15:00:00	System	Testing license	
⚠	10/31/2003 14:14:55	System	FTEB_04SEC:RM03	Fault
⚠	10/31/2003 14:12:03	CP	CPM_005	DIAG
▾	10/31/2003 14:12:03	CP	CPM_005	OK
▾	10/31/2003 14:11:52	FT	FTEB_04SEC	OK
⚠	10/31/2003 14:11:42	IO	IOLIM_004SEC	DIAG
▾	10/31/2003 14:11:41	IO	IOLIM_004SEC	OK
⚠	10/31/2003 9:00:30	HA	HAOCHANNEL_04	Device Malfunction
⚠	10/31/2003 9:00:30	HA	HAOCHANNEL_04	Device Revision Mismatch
⚠	10/31/2003 9:00:30	HA	HAOCHANNEL_03	Device Malfunction
⚠	10/31/2003 9:00:30	HA	HAOCHANNEL_03	Device Revision Mismatch
⚠	10/31/2003 9:00:30	HA	HAOCHANNEL_02	Device Malfunction
⚠	10/31/2003 9:00:30	HA	HAOCHANNEL_02	Device Revision Mismatch
▾	10/31/2003 8:42:12	System	FTEB_02PRI:GW0607	Fault

Unacknowledged alarms: **66** Acknowledged alarms: **7**

Alarm Summary display includes Device related details.

Process Manager I/O Installation and Wiring

Process Manager I/O Hardware

Experion PKS system references

Please refer to the following Knowledge Builder publications for general planning details and installation considerations for the Experion PKS system in general. For the sake of brevity, this guide does not repeat the applicable general guidelines, consideration, cautions, etc. that are covered in these other Guides.

- *Planning Guide*

If this is a new Experion PKS system installation, we recommend that you familiarize yourself with the contents of these publications before you install any Experion PKS system equipment.

Installation declaration



ATTENTION

This equipment shall be installed in accordance with the requirements of the National Electrical Code (NEC), ANSI/NFPA 70, of the Canadian Electrical Code (CEC), C22.1. It is supplied as "open equipment" that is intended to be mounted on a subpanel within an enclosure. The suitability of the enclosure and installed system shall be acceptable to the local "authority having jurisdiction," as defined in the NEC, or "authorized person" as defined in the CEC.

Experion PKS PM I/O hardware

Various hardware components comprise the Process Manager I/O (PM I/O). The following table identifies the hardware components available for integrating PM I/O devices with an Experion PKS system.

Hardware Component	Description	Honeywell Part Number
PM I/O Control Cabinets	Single or dual-access NEMA 1-rated equipment cabinets that house Process Controller chassis, IOP card files, Power System, and the FTA mounting channels.	MU-CBSM01 / MU-CBDM01

Process Manager I/O Installation and Wiring

Process Manager I/O Hardware

Hardware Component	Description	Honeywell Part Number
	See Appendices C and D in the <i>Planning Guide</i> for additional information	
PM I/O Link Interface Module (IOLIM)	Double-width module that mounts in a Supervisory or redundant process controller chassis. Serves as the "gateway" between the Experion PKS control environment and the PM I/O processors and Field Termination Assemblies.	TC-IOLI01
IOLIM Cable	Interconnecting cable between the IOLIM and the PM I/O card file.	TC-KIOLxx
PM I/O Card File	Card file that accepts I/O processor plug-in cards (IOPs). Card files can accommodate 7 or up to 15 I/O processor cards.	MU-HPFxxx
I/O Processor (IOP)	Plug-in Input/Output Processor card. IOPs, along with Field Termination Assemblies (FTAs), perform input and output scanning and processing on various I/O field devices.	Various
Field Termination Assembly (FTA)	Provides connection points for the process control wiring (field wiring). Fuses, relays, and resistors protect the FTA circuitry, and also sense, condition, or operate the	Various

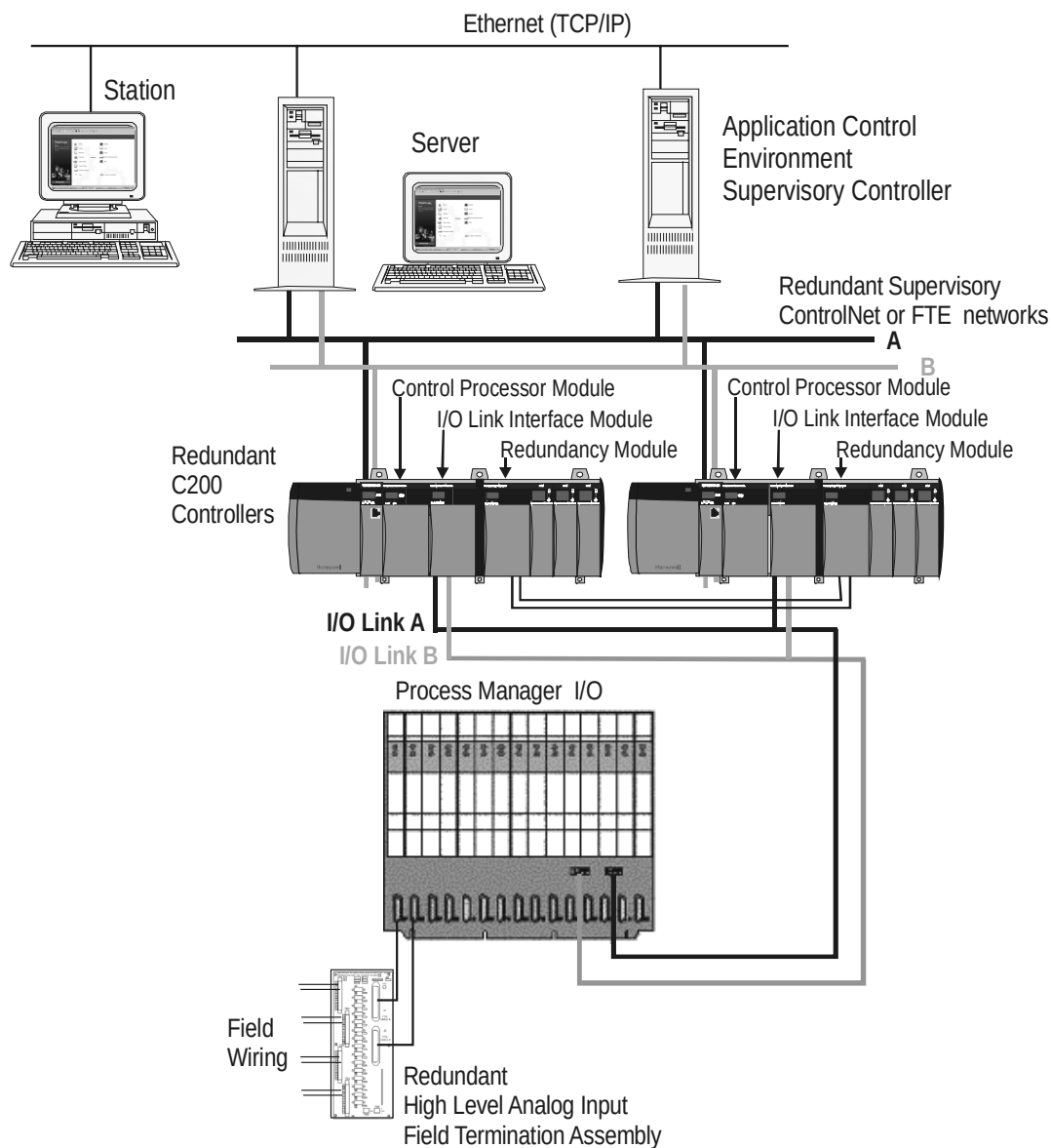
Process Manager I/O Installation and Wiring

Process Manager I/O Hardware

Hardware Component	Description	Honeywell Part Number
	connected device. The FTA communicates with an associated IOP. Most FTAs are available as standard FTA and also Galvanically Isolated FTA.	
FTA Cable	Interconnecting cable between an FTA and the associated IOP.	MU-KFTAx MU-KFTSxx
Remote I/O using I/O Link Extender	Through the use of fiber optic couplers and cables, an IOP card file and associated FTAs can be located remotely up to 8 kilometers.	MC-IOLM02 MC-IOLX02 MC-ILDX03
Power Systems	Power supply modules that provide 24 Vdc power to the PM I/O card files and associated equipment. Redundant power is available using optional battery backup, a secondary power supply module or an uninterruptible power supply.	MU-PSRxxx MC-PSRxxx AC Only

Process Manager I/O Installation and Wiring

Process Manager I/O Hardware



IOLIM and PM I/O Topology

IOLIM module allowance

Be sure your Experion PKS system I/O requirements do not exceed the capacities listed in the following table.

Component	Total Per Controller	Total Per Server
Maximum number of IOLIMs	2	20
Maximum number of Primary IO Processors (IOPs) per Controller.	64	
The maximum number of Primary IOPs per IOLIM is 40. This number may vary depending on the required sampling period of the IOPs.		

Note: A Primary IOP is considered either a single IOP or a redundant IOP pair.

Intrinsically safe applications

You are responsible for adhering to all applicable national codes and local ordinances for applying intrinsically safe equipment in a potentially explosive atmosphere.

Preparing to Install Process Manager I/O Hardware

Before you begin

- Be sure you have reviewed the [Preinstallation Considerations](#) in this *Guide* and confirmed that you have taken steps to minimize Electrostatic Discharge (ESD).
- Check that no power is applied to the equipment cabinet.

Prepare for installation

Verify that you have the appropriate PM I/O hardware for your application. The following table lists IOP card types, model numbers and the minimum firmware revision level that is compatible for operation in Experion PKS.



ATTENTION

Prefix MC in the model number indicates conformally coated components.

IOP Cards and Firmware Revision

IOP Card Type	Model	Firmware Revision
Analog Input – Low Level (LLAI)	MU/MC-PAIL02	6.0 (J)
Analog Input – Low Level Multiplexer (LLMUX)	MU/MC-PLAM02	4.1 (F)
Analog Input – Remote Hardened Multiplexer (RHMUX)	MU/MC-PRHM01	6.0 (E)
Analog Input – High Level (HLAI)	MC-PAIH03	6.1 (G)
Analog Input – High Level HART capable (HLAIHART)	MC-PHAI01	N/R
Smart Transmitter Interface – Multivariable (STI_MV)	MU/MC-PSTX03	6.0 (F)
Analog Output – 8-Channel	MC-PAOX03	N/R
Analog Output – 16-Channel (AO_16)	MC-PAOY22	N/R

IOP Card Type	Model	Firmware Revision
Analog Output – 16-Channel HART Capable (AO16HART)	MC-PHA001	N/R
Digital Input (DI)	MU/MC-PDIX02	N/R
Digital Input – 24 V (DI_24V)	MU/MC-PDIY22	N/R
Digital Input Sequence of Events (DISOE)	MU/MC-PDIS12	N/R
Digital Output – 16-Channel (DO_16)	MU/MC-PDOX02	N/R
Digital Output – 32-Channel (DO_32)	MU/MC-PDOY22	N/R

Note: N/R denotes no firmware restrictions.

The table below lists the model number of the IOP cards and the associated Field Termination Assemblies (FTAs) available for Experion PKS systems. Additional hardware components are listed and described in the second and third tables that follow.



REFERENCE - INTERNAL

If you are Installing Galvanically Isolated FTAs, the model numbers reference and associated hardware are listed there.

PM I/O Processor (IOP) and FTA Model Numbers

PM IOP and FTA Model Numbers Reference

IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
<i>Analog Input</i>			

Process Manager I/O Installation and Wiring
Preparing to Install Process Manager I/O Hardware

IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
MU-PAIL02 / MC-PAIL02	Low Level Analog Input, (LLAI)	MU- TAIL01 / MC-TAIL01 MU- TAIL02 / MC-TAIL02 MU- TAIL03 / MC-TAIL03 *	LLAI FTA with Compression Terminals Single IOP Interface
MU-PLAM02 / MC-PLAM02	Low Level Mux Analog Input, (LLMux)	MU-TAMR02 / MC-TAMR02 MU-TAMR03 / MC-TAMR03 *	LLMux RTD FTA with Compression Terminals, Single IOP Interface
		MU-TAMT02 / MC-TAMT02 MU-TAMT03 / MC-TAMT03 *	LLMux TC FTA with Local CJR, Compression Terminals, Single IOP Interface
		MU-TAMT12 / MC-TAMT12 MU-TAMT13 / MC-TAMT13 *	LLMux TC FTA with Remote CJR, Compression Terminals, Dual IOP Interface
MU-PRHM01 MC-PRHM01 *	Remote Hardened Mux, (RHMUX) IOP	MC-GRMT01 *	RHMUX TC FTA with Local CJR, Screw Terminals
MU-PAIH02 / MC-PAIH02	High Level Analog Input, (HLAI) Non-CE Compliant	MU-TAIH01 MU-TAIH02 / MC-TAIH02	HLAI/STI FTA with Compression Terminals Single IOP Interface
		MU-TAIH12 / MC-TAIH12	HLAI/STI FTA with Compression Terminals Redundant IOP Interface
		MU-TAIH22 / MC-TAIH22	Enhanced Power HLA/STI FTA with Comp. Terminals Redundant IOP Interface

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IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
		MU-TAIH52 / MC-TAIH52	HLAI/STI FTA with Screw Terminals Redundant IOP Interface
		MU-TAIH62 / MC-TAIH62	Enhanced Power HLA/STI FTA with Screw Terminals Redundant IOP Interface
MU-PAIH03 / MC-PAIH03 *	High Level Analog Input, (HLAI) CE Compliant	MU-TAIH03 / MC-TAIH03 *	HLAI FTA with Compression Terminals Single IOP Interface
		MU-TAIH13 / MC-TAIH13 *	HLAI FTA with Compression Terminals Redundant IOP Interface
		MU-TAIH23 / MC-TAIH23 *	Enhanced Power HLA/STI FTA with Comp. Terminals Redundant IOP Interface
		MU-TAIH53 / MC-TAIH53 *	HLAI FTA with Screw Terminals Redundant IOP Interface
MC-PHAI01 *	High Level Analog Input, HART-Capable, CE Compliant (HLAIHART)	MU-TAIH04 / MC-TAIH04 *	AI HART-Compatible FTA with Comp. Terminals Single IOP Interface
		MU-TAIH14 / MC-TAIH14	AI HART-Compatible FTA with Comp. Terminals Redundant IOP Interface
		MU-TAIH15 / MC-TAIH15 *	AI HART-Compatible FTA with Comp. Terminals Redundant IOP Interface
		MU-TAIH54 / MC-TAIH54 *	AI HART-Compatible FTA with Screw Terminals Redundant IOP Interface
MU-PSTX02 / MC-PSTX02	Smart Transmitter Interface, (STI)	MU-TAIH01 MU-TAIH02 / MC-TAIH02	HLAI/STI FTA with Compression Terminals Single IOP Interface

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IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
MU-PSTX03 / MC-PSTX03 *	Smart Transmitter Interface, Multivariable, (STI_MV)	MU-TAIH22 / MC-TAIH22	Enhanced Power HLAI/STI FTA with Comp. Terminals Redundant IOP Interface
		MU-TAIH62 / MC-TAIH62	Enhanced Power HLAI/STI FTA with Screw Terminals Redundant IOP Interface
		MU-TSTX03 / MC-TSTX03 *	STI FTA with Compression Terminals Single IOP Interface
		MU-TSTX13 / MC-TSTX13 *	STI FTA with Compression Terminals Redundant IOP Interface
		MU-TSTX53 / MC-TSTX53 *	STI FTA with Screw Terminals Redundant IOP Interface
Analog Output			
MU-PAOX02 MU-PAOX03 / MC-PAOX03	Analog Output, (AO) 8-Channel	MU-TAOX01 MU-TAOX02 / MC-TAOX02 *	AO FTA with Compression Terminals Single IOP Interface
		MU-TAOX12 / MC-TAOX12 *	AO FTA with Compression Terminals Redundant IOP Interface
		MU-TAOX52 / MC-TAOX52 *	AO FTA with Screw Terminals Redundant IOP Interface
MU-PAOY22 / MC-PAOY22 *	Analog Output, (AO) 16-Channel	MU-TAOY22 / MC-TAOY22 *	AO FTA with Compression Terminals, Standby Manual Device Connector Redundant IOP Interface

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IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
		MU-TAOY23 / MC-TAOY23	AO FTA with Compression Terminals, Without Standby Manual Device Connector Redundant IOP Interface
		MU-TAOY52 / MC-TAOY52 *	AO FTA with Screw Terminals, Standby Manual Device Connector Redundant IOP Interface
		MU-TAOY53 / MC-TAOY53	AO FTA with Screw Terminals, Without Standby Manual Device Connector Redundant IOP Interface
		MU-THAO11 / MC-THAO11 *	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface HART connection capability
MC-PHAO01 *	Analog Output, HART 16-Channel (AO16HART)	MU-TAOY24 / MC-TAOY24 *	AO HART-Compatible FTA with Compression Terminals, Standby Manual Device Connector Redundant IOP Interface
		MU-TAOY25 / MC-TAOY25	AO HART-Compatible FTA with Compression Terminals, Without Standby Manual Device Connector Redundant IOP Interface
		MU-TAOY54 / MC-TAOY54 *	AO HART-Compatible FTA with Screw Terminals, Standby Manual Device Connector Redundant IOP Interface

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IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
		MU-TAOY55 / MC-TAOY55	AO HART-Compatible FTA with Screw Terminals, Without Standby Manual Device Connector Redundant IOP Interface
Digital Input			
MU-PDIX02 / MC-PDIX02 *	Digital Input	MU-TDID11	24 Vdc DI FTA with Compression Terminals
		MU-TDID12 / MC-TDID12 *	
		MU-TDID52 / MC-TDID52 *	24 Vdc DI FTA with Screw Terminals
		MU-TDID72 / MC-TDID72	24 Vdc DI FTA with Screw Terminals
		MU-TDIA11	120 Vac DI FTA with Compression Terminals
		MU-TDIA12 / MC-TDIA12 *	
		MU-TDIA52 / MC-TDIA52 *	120 Vac DI FTA with Screw Terminals
		MU-TDIA72 / MC-TDIA72	120 Vac DI FTA with Screw Terminals
MU-PDIY22 / MC-PDIY22 *	Digital Input	MU-TDIA21	240 Vac DI FTA with Compression Terminals
		MU-TDIA22 / MC-TDIA22 *	
		MU-TDIA62 / MC-TDIA62 *	240 Vac DI FTA with Screw Terminals
MU-PDIY22 / MC-PDIY22 *	Digital Input	MU-TDIY22 / MC-TDIY22 *	24 Vdc DI FTA with Compression Terminals
		MU-TDIY62 / MC-TDIY62 *	24 Vdc DI FTA with Screw Terminals
MU-PDIS12 / MC-PDIS12	Digital Input Sequence of Events (DISOE)	Compatible with all Digital Input FTAs listed above.	

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IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
Digital Output			
MU-PDOX02 / MC-PDOX02 *	Digital Output, (DO_16)	MU-TDON11 MU-TDON12 / MC-TDON12 *	24 Vdc Nonisolated DO FTA Compression Terminals
		MU-TDON52 / MC-TDON52 *	24 Vdc Nonisolated DO FTA—Screw Terminals
		MU-TDOD11 MU-TDOD12 / MC-TDOD12 MU-TDOD13 / MC-TDOD13 MU-TDOD14 / MC-TDOD14 *	3-30 Vdc Solid State DO FTA with Compression Terminals
		MU-TDOD52 / MC-TDOD52 MU-TDOD53 / MC-TDOD53 MU-TDOD52 / MC-TDOD52 *	3-30 Vdc Solid State DO FTA with Screw Terminals
		MU-TDOD21 MU-TDOD22 / MC-TDOD22 MU-TDOD23 / MC-TDOD23 *	31-200 Vdc Solid State DO FTA with Compression Terminals
		MU-TDOD62 / MC-TDOD62 MU-TDOD63 / MC-TDOD63 *	31-200 Vdc Solid State DO FTA with Screw Terminals

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IOP Model No.	IOP Type and Description	Associated Standard FTA Model Nos.	FTA Description
		MU-TDOA11 MU-TDOA12 / MC-TDOA12 MU-TDOA13 / MC-TDOA13 *	120/240 Vac Solid State DO FTA with Compression Terminals
		MU-TDOA52 / MC-TDOA52 MU-TDOA53 / MC-TDOA53 *	120/240 Vac Solid State DO FTA with Screw Terminals
		MU-TDOR11 MU-TDOR12 / MC-TDOR12 *	120 Vac/120 Vdc Relay DO FTA with Compression Terminals
		MU-TDOR52 / MC-TDOR52 *	120 Vac/120 Vdc Relay DO FTA with Screw Terminals
		MU-TDOR21 MU-TDOR22 / MC-TDOR22 *	240 Vac/125 Vdc Relay DO FTA with Compression Terminals
		MU-TDOR62 / MC-TDOR62 *	240 Vac/125 Vdc Relay DO FTA with Screw Terminals
MU-PDOY22 / MC-PDOY22 *	Digital Output, (DO_32)	MU-TDOY22 / MC-TDOY22 *	24 Vdc Isolated DO FTA with Compression Terminals
		MU-TDOY62 / MC-TDOY62 *	24 Vdc Isolated DO FTA with Screw Terminals
		MU-TDOY23 / MC-TDOY23 *	240 Vac/125 Vdc Relay DO FTA with Compression Terminals
		MU-TDOY63 / MC-TDOY63 *	240 Vac/125 Vdc Relay DO FTA with Screw Terminals

* CE Compliant hardware available.

Additional PM I/O hardware components

PM I/O Hardware Model Numbers Reference

Component	Model Number	Description
PM I/O Cabinets	MU-CBSM01 / MU-CBDM01 MU-CBSX01 / MU-CBDX01 *	Single or dual-access NEMA 1-rated equipment cabinets that house Process Controller chassis, IOP card files, Power System, and the FTA mounting channels. See Appendices C and D in the <i>Planning Guide</i> for additional information.
<u>PM I/O Card Files</u>	7-Slot Left MU-HPFH01 MU-HPFI03	Provides 7-Slots and interface connectors for IOP cards. The card slots are numbered 1 to 7 and can be installed adjacent to a 7-slot right IOP card file.
	7-Slot Right MU-HPFH11 MU-HPFI13	Provides 7-Slots and interface connectors for IOP cards. The card slots are numbered 9 to 15 and can be installed adjacent to a 7-slot left IOP card file.
	15-Slot Card File MU-HPFX02 MU-HPFI23	Provides 15-Slots and interface connectors for IOP cards.
<u>IOP to FTA Cables</u>	MU-KFTAx Or MU-KFTSxx	Connects the IOP to its associated FTA.
<u>Vertical FTA Mounting Channel</u>		Provides a mounting surface and wiring channels for all FTAs. The mounting channels are installed in a vertical orientation inside an equipment cabinet and accommodate standard sizes of FTAs, process wiring, power wiring and connecting cables.

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Component	Model Number	Description
<u>Horizontal FTA Mounting Channel</u>		Provides a mounting surface and wiring channels for all FTAs. The mounting channels are mounted in a horizontal orientation inside an equipment cabinet and accommodate standard sizes of FTAs, process wiring, power wiring and connecting cables.
<u>Power Adapter</u> (Used with LL MUX Analog Input FTAs)	MU-TLPA02	Takes the low level analog inputs from two LLMux FTAs (16 channels each) and provides 32 channel inputs to the LLMux IOP.
<u>IOP to Power Adapter Cable</u>	MU-KFTAxx Or MU-KFTSxx	Connects a LLMux IOP to a model MU-TLPA02 power adapter.
<u>Power Adapter to FTA cable</u>	MU-KLAMxx Or MU-KLXxxx	Connects the power adapter to the LLMux FTA.
<u>Power Adapter for RHMux FTA</u> (Used with RHMUX Analog Input FTAs)	MU-GRPA01 (IS) Or MU-TRPA01 (NI)	Takes the low level analog inputs from two RHMux FTAs (16 channels each) and provides 32 channel inputs to the RHMux IOP.
<u>Power Adapter to FTA cable</u>	MU-KLO305	Connects the power adapter (MU-GRPA01 or MU-TRPA01) to the RHMUX FTA when installed outdoors.
<u>Remote CJR Sensor</u>	51304589-xxx	Allows remote sensing of the Cold Junction Reference for model MU-TAMT12 and MU-TAMT13 Thermocouple LLMux FTAs.
<u>Remote CJR Cable</u>	MU-KRCJ00	Connects the remote CJR sensor to model MU-TAMT12 and MU-TAMT13 Thermocouple LLMux FTAs
<u>Digital Input Power Distribution Assembly</u>	MU-TDPR01 MU-TDPR02	Provides an external fused 24 Vdc power source to the 24 Vdc digital input FTAs for the process control contacts

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Component	Model Number	Description
<u>Marshalling Panel</u>	MU-GMAR52	Provides accessibility to the signals from the auxiliary connectors on the Galvanically Isolated FTAs, but it can be used as a general purpose marshalling panel in the subsystem.
<u>Power Systems</u>	MU/MC-PSRXxx MU/MC-PSRBxx	Provides 24 Vdc power for operation of all IOP cards, Power Distribution Assemblies and FTAs, a nominal 3.6 Vdc battery output for backup of the IOP memory circuits, and a nominal 0.25 ampere, 6 Vac output for operation of a LLAI line frequency noise cancellation clock circuit.
	AC Only Power System (optional)	This Power System is intended for use with an uninterruptible ac power source. It does not provide a battery backup option for continuous operation in the event of a primary power loss.

* CE Compliant hardware available.



ATTENTION

Generally, the suffix "xx" in the model number represents the length of the cable in meters.

Remote I/O Hardware

Remote I/O components provide the ability to locate IOP card files and associated FTAs up to 8 kilometers (5 miles) from the local IOLIM and IOP card files. The following table summarizes the hardware components used in remote I/O applications.

Remote I/O Hardware Model Number Reference

Component	Model Number	Description
<u>I/O Link Extender Card</u>	<u>Standard</u> MC-IOLM02 MC-IOLX02	Standard I/O Link Extender card is the interface to remote IOP card files located up to 1.3 kilometers (4000 feet).
	<u>Long Distance</u> MC-ILDX03	Long Distance I/O Link Extender card is the interface to remote IOP card files located up to 8 kilometers (5 miles).
<u>I/O Link Extender Adapter Kit</u>	MU-ILES01	The kit consists of a connector adapter, shroud, and mounting spacers. It is used only in CE Compliant installations of remote I/O links.
<u>I/O Link Interface Cable</u>	51195479-xxx 51204042-xxx	A metallic cable that connects a primary IOP card file and its associated secondary IOP card file in a redundant installation.
I/O Fiber Optic Coupler (Included with I/O Link Extender Card)	<u>Standard</u> 51201557-150	Standard I/O Fiber Optic Coupler module. Part number 51201557-150 supports one pair (Link A and Link B) of fiber optic cable connections for standard I/O Link Extender card.
	51201557-350	Part number 51201557-350 supports three pair (Link A and Link B) of fiber optic cable connections for long distance I/O Link Extender card.
	<u>Long Distance</u> 51309208-150	Long Distance I/O Fiber Optic Coupler module. Part number 51309208-150 supports one pair (Link A and Link B) of fiber optic cable connections for long distance I/O Link Extender card.

Component	Model Number	Description
<u>Fiber Optic Cable</u>		Used to connect the I/O fiber optic couplers of the local IOP card file and the remote IOP card file(s).



ATTENTION

Generally, the suffix “xx” in the model number represents the length of the cable in meters.

Check PM I/O Components

- FTAs are available in various types and sizes depending upon the IOP used and the field devices connected to it. See [Installation Considerations for FTAs](#) for detailed information on FTA types and installation requirements.
- See Appendices C and D in the *Control Hardware Planning Guide* for the dimensions and installation considerations for the PM I/O control cabinet enclosures.
- For all hardware associated with remote I/O applications (such as I/O Link Extender Cards, Adapter kits and Fiber optic coupler modules), see [Installing Remote I/O](#).
- See [Installing Power Systems](#) mounting dimensions and installation instructions for PM I/O power system assemblies.
- All cables are identified by either model number or part number. Numbers should be stamped on the connector, or on a tag attached around the cable. The length of the cable can be identified by the last two (or three) number digits of the model number (or part number). The last two digits of the model number identify the length in meters. The last three digits of the part number identify the cable length in inches.

Check PM Cabinet configuration

Confirm the cabinet configuration of your PM I/O components. Be sure that your planned cabinet configuration complies with the configuration rules outlined in Appendix C or Appendix D in the *Planning Guide*. And, check the installation restrictions and recommendations outlined in the Control Hardware Configuration section of the *Planning Guide*.

FTA Installation Considerations

Field Termination Assemblies (FTAs) are available in two basic varieties, standard FTAs and Galvanically Isolated FTAs. Although there are various sizes and types of FTAs, all FTAs are installed on FTA mounting channels that can be mounted either in PM I/O cabinets or on facility terminal panels.

Description of the FTAs and the installation requirements for FTAs on the FTA mounting channels are covered in the following subsections.

FTA selection and mounting considerations

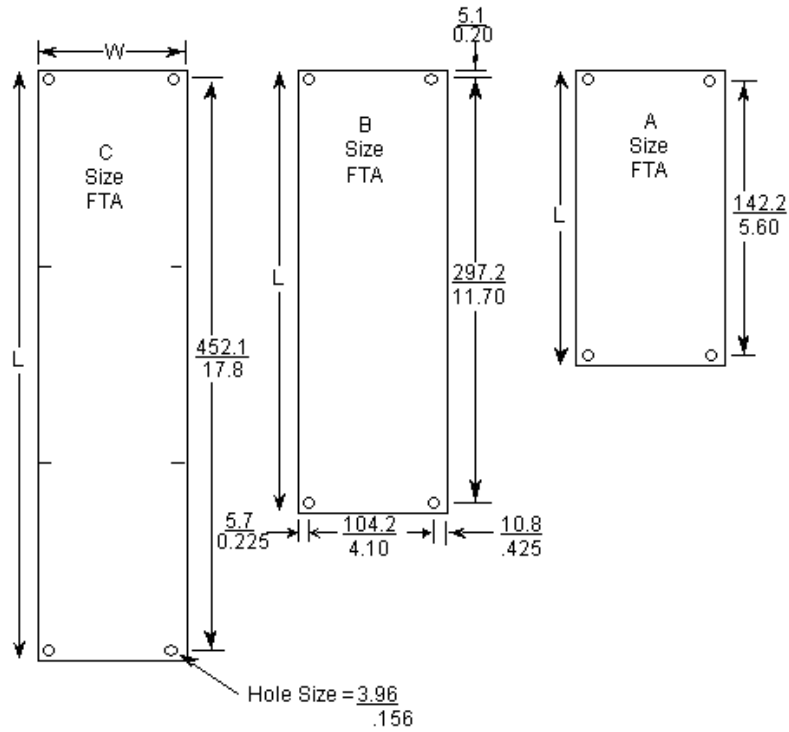
FTA selection is generally based on the number of channels in the FTA, the FTA's mounting size, and the field wiring terminal type on the FTA. The applicable information for all available standard FTAs is summarized in Table 9.

FTA mounting sizes

Mounting size of the various FTAs are classified as size, A, B, and C, where:

- A-size requires one mounting space which is 152 millimeters (6 inches) on the FTA mounting channel,
- B-size FTA is bigger and requires two mounting spaces which is 307 millimeters (12.1 inches) on FTA mounting channel.
- C-size FTA requires three spaces, or 462 millimeters (18.2 inches).

All FTA sizes have a width dimension of 120 millimeters (4.75 inches). The following figure illustrates the actual dimensions for the three FTA sizes.



Size	Length L	Width W
A	152.4/6.00	120.7/4.75
B	307.3/12.10	120.7/4.75
C	462.3/18.20	120.7/4.75

All measurements are in millimeters
inches

Note:

The center of the mounting holes is a constant distance from the edge of the assembly board for all three FTA sizes as shown for size B.

Sizes B and C, depending on the type of FTA, can have additional mounting holes along the length (sides) of the FTA. The additional mounting holes all fall on a grid established for mounting adjacent A-size FTAs.

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FTA Mounting Size Dimensions

Galvanically Isolated FTAs

If you are installing Galvanically Isolated FTAs, there are more requirements and restrictions governing installation. It is suggested that you read the information here on FTA mounting channel requirements and then go to [Installing Galvanically Isolated FTAs](#) for more specific instructions on Galvanically Isolated FTA installation.

Field wiring terminal types

There are three types of field wiring terminals available on standard FTAs. They are:

- Compression (C) type with removable terminal connector(s)
- Screw (S) type with stationary terminals
- Removable screw (RS) type with removable terminal connector(s).

The following table summarizes which wiring terminal types are available for standard FTAs by model number.

Standard FTAs



ATTENTION

The prefix MC in the model number indicates that the FTA is available with a conformal coating, MU indicates a nonconformally coated FTA.

Table 9 Standard FTAs, Number of Channels and Mounting Size

Model Number	Description	Field Wiring Term. Type	No. of Chnls	Mounting Size
Analog Input				
MU/MC-TAIL02	Low Level Analog Input (Single IOP)	C	8	B
MU/MC-TAIL03	Low Level Analog Input (Single IOP)	C	8	B
MU/MC-TAMR02	Low Level Analog Input Multiplexer RTD (Single IOP)	C	16	B
MU/MC-TAMR03 *	Low Level Analog Input Multiplexer RTD (Single IOP)	C	16	B
MU/MC-TAMT02	Low Level Analog Input Multiplexer	C	16	B

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Model Number	Description	Field Wiring Term. Type	No. of Chnls	Mounting Size
	TC—Local CJR (Single IOP)			
MU/MC-TAMT03 *	Low Level Analog Input Multiplexer TC—Local CJR (Single IOP)	C	16	B
MU/MC-TAMT12	Low Level Analog Input Multiplexer TC—Remote CJR (Single IOP)	C	16	B
MU/MC-TAMT13 *	Low Level Analog Input Multiplexer TC—Remote CJR (Single IOP)	C	16	B
MU/MC-TAIH02	High Level Analog Input/STI (Single IOP)	C	16	A
MU/MC-TAIH03 *	High Level Analog Input (Single IOP)	C	16	A
MU/MC-TAIH04 *	High Level Analog Input, HART-Compatible (Single IOP)	C	16	A
MU/MC-TAIH12	High Level Analog Input/STI	C	16	B
MU/MC-TAIH13 *	High Level Analog Input	C	16	B
MU/MC-TAIH14	High Level Analog Input, HART-Compatible	C	16	B
MU/MC-TAIH15 *	High Level Analog Input, HART-Compatible	C	16	B
MU/MC-TAIH22	Enhanced Power High Level Analog Input/STI	C	16	B
MU/MC-TAIH23 *	Enhanced Power High Level Analog Input	C	16	B
MU/MC-TAIH52	High Level Analog Input/STI	S	16	B
MU/MC-TAIH53 *	High Level Analog Input	S	16	B
MU/MC-TAIH54 *	High Level Analog Input, HART-Compatible	S	16	B
MU/MC-TAIH62	Enhanced Power High Level Analog Input/STI	S	16	B

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Model Number	Description	Field Wiring Term. Type	No. of Chnls	Mounting Size
MU/MC-TSTX03 *	Smart Transmitter Interface (Single IOP)	C	16	A
MU/MC-TSTX13 *	Smart Transmitter Interface	C	16	B
MU/MC-TSTX53 *	Smart Transmitter Interface	C	16	B
Analog Output				
MU/MC-TAOX02	Analog Output (Single IOP)	C	8	A
MU/MC-TAOX12	Analog Output	C	8	B
MU/MC-TAOX52	Analog Output	S	8	B
MU/MC-THAO11 *	Analog Output With HART and Standby Manual connectors	C	16	B
MU/MC-TAOY22 *	Analog Output With Standby Manual connectors	C	16	B
MU/MC-TAOY23	Analog Output Without Standby Manual connectors	C	16	B
MU/MC-TAOY24 *	Analog Output With Standby Manual connectors, HART-Compatible	C	16	B
MU/MC-TAOY25	Analog Output Without Standby Manual connectors, HART-Compatible	C	16	B
MU/MC-TAOY52 *	Analog Output With Standby Manual connectors	S	16	B
MU/MC-TAOY53	Analog Output Without Standby Manual connectors	S	16	B
MU/MC-TAOY54 *	Analog Output With Standby Manual connectors, HART-Compatible	S	16	B
MU/MC-TAOY55	Analog Output Without Standby Manual connectors, HART-Compatible	S	16	B
Digital Input				
MU/MC-TDID12 *	24 Vdc Digital Input	C	32	C

Process Manager I/O Installation and Wiring
FTA Installation Considerations

Model Number	Description	Field Wiring Term. Type	No. of Chnls	Mounting Size
MU/MC-TDID52 *	24 Vdc Digital Input	S	32	C
MU/MC-TDID72	24 Vdc Digital Input (Single IOP)	C	32	B
MU/MC-TDIY22 *	24 Vdc Digital Input	C	32	B
MU/MC-TDIY62 *	24 Vdc Digital Input	S	32	B
MU-TDIA11	120 Vac Digital Input	C	32	C
MU/MC-TDIA12	120 Vac Digital Input	C	32	C
MU/MC-TDIA52	120 Vac Digital Input	S	32	C
MU/MC-TDIA72	120 Vac Digital Input (Single IOP)	RS	32	C
MU/MC-TDIA22	240 Vac Digital Input	C	32	C
MU/MC-TDIA62	240 Vac Digital Input	S	32	C
Digital Output				
MU/MC-TDON12	24 Vdc Nonisolated Digital Output	C	16	B
MU/MC-TDON52	24 Vdc Nonisolated Digital Output	S	16	B
MU/MC-TDOY22 *	24 Vdc Isolated Digital Output	C	32	B
MU/MC-TDOY62 *	24 Vdc Isolated Digital Output	S	32	B
MU/MC-TDOD12 *	3-30 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD13	3-30 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD14	3-30 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD52 *	3-30 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD53	3-30 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD54	3-30 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD22	31-200 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD23	31-200 Vdc Solid-State Digital Output	C	16	B

Process Manager I/O Installation and Wiring

FTA Installation Considerations

Model Number	Description	Field Wiring Term. Type	No. of Chnls	Mounting Size
MU/MC-TDOD62	31-200 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD63	31-200 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOA12	120/240 Vac Solid-State Digital Output	C	16	B
MU/MC-TDOA13	120/240 Vac Solid-State Digital Output	C	16	B
MU/MC-TDOA52	120/240 Vac Solid-State Digital Output	S	16	B
MU/MC-TDOA53	120/240 Vac Solid-State Digital Output	S	16	B
MU/MC-TDOR12	120 Vac/125 Vdc Relay Digital Output	C	16	B
MU/MC-TDOR52	120 Vac/125 Vdc Relay Digital Output	S	16	B
MU/MC-TDOR22	240 Vac/125 Vdc Relay Digital Output	C	16	B
MU/MC-TDOR62	240 Vac/125 Vdc Relay Digital Output	S	16	B
MU/MC-TDOY23 *	240 Vac/125 Vdc Relay Digital Output	C	16	B
MU/MC-TDOY63 *	240 Vac/125 Vdc Relay Digital Output	S	16	B
Additional Components				
MU/MC-TDPR02	Digital Input Power Distribution Assembly 12 outputs	S	N/A	A
MU/MC-TLPA02	Power Adapter (supports LLMux FTAs)	C	2	A

* CE Compliant hardware available.

FTA mounting channel requirements

FTAs are mounted onto FTA mounting channels that are installed on back panels in a PM I/O control cabinet. These mounting channels provide a surface to attach the FTA panel, and two troughs to accommodate the IOP cables and field wiring. There are two types of FTA mounting channels, vertical and horizontal which refers to the alignment of the channels inside the PM I/O cabinet.

Vertical FTA mounting channels

Vertical FTA mounting channels are available in two widths, standard and wide, both of which are 930 millimeters (36.6 inches) in length. They differ only in the width of the field wiring trough. The larger width FTA mounting channel is five inches wider to accommodate a greater area for field wiring and also provide mounting holes to attach a vertical bus bar for the cable shields/grounds.

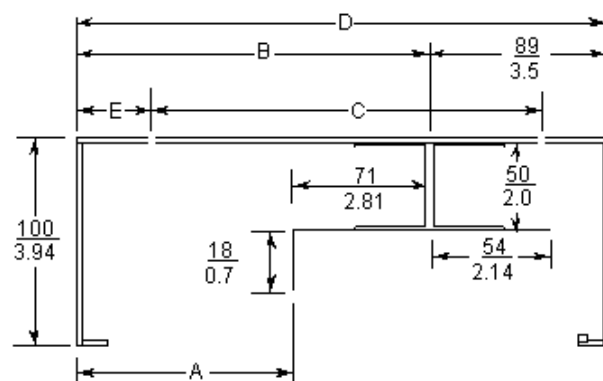
The following figure shows the physical dimensions of both mounting channels which can accommodate six "A" size, three "B" size, or two "C" size FTA mounting spaces. Mixtures of different FTA sizes in any order are permissible.

The number of FTA mounting channels required to mount FTAs depends on the number of FTAs and their size, A, B, or C.

A single vertical FTA mounting channel will fill the lower half of a single door cabinet that already has a Power System and one IOP card file. At the back of a dual-access PM I/O control cabinet, two FTA mounting channels can be placed one above the other to provide placement of FTAs from top to bottom in a cabinet.

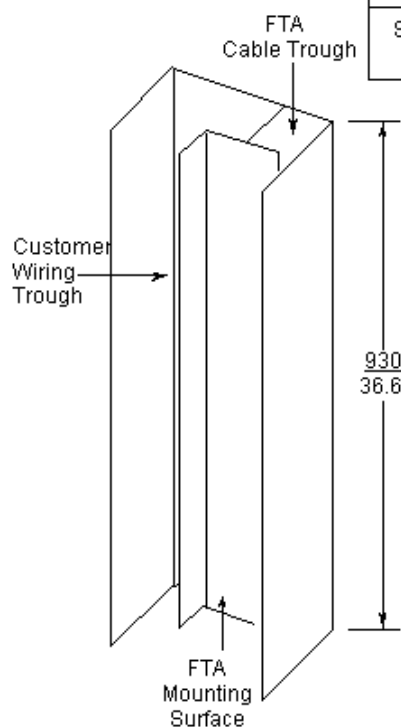
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FTA Installation Considerations



Cross Section View

Channel Size	A _c	B _c	C _c	D _c	E _c
Wide	<u>220</u> 8.7	<u>292</u> 11.5	<u>305</u> 12.0	<u>381</u> 15.0	<u>64</u> 2.5
Standard	<u>94</u> 3.7	<u>165</u> 6.5	<u>178</u> 7.0	<u>254</u> 10.0	<u>64</u> 2.5



Note: Dimensions are in millimeters/inches.

Vertical FTA Mounting Channel Dimensions

Vertical bus bar

The wide FTA mounting channel has holes drilled and tapped that provide for mounting a vertical bus bar to terminate cable shields or safety ground wires. The vertical FTA bus bar fits the 930 millimeter (36.6 inch) long FTA mounting channel.

Wire connectors are used to attach cable shields and ground wires to the bus bar. If you need additional wire connectors, see your Honeywell Sales Engineer.

Horizontal FTA mounting channel

Horizontal FTA mounting channels have two troughs, one upper and one lower, and are 620 millimeters (24.4-inch) in length. The physical dimensions are shown in the following figure. Field wiring enters the lower channel from the right side of the cabinet and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s), Power Distribution Assemblies, and Marshalling Panels, if present, are routed in the upper channel of the FTA mounting channel from the left side of the cabinet.

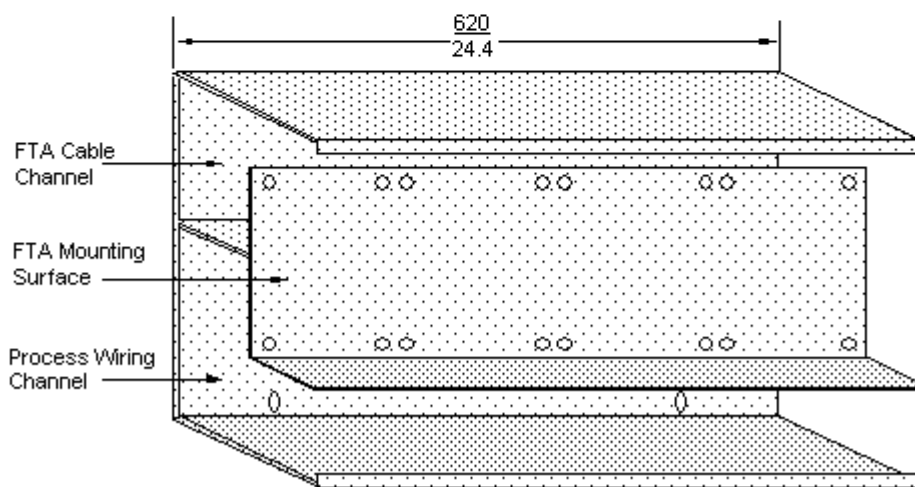
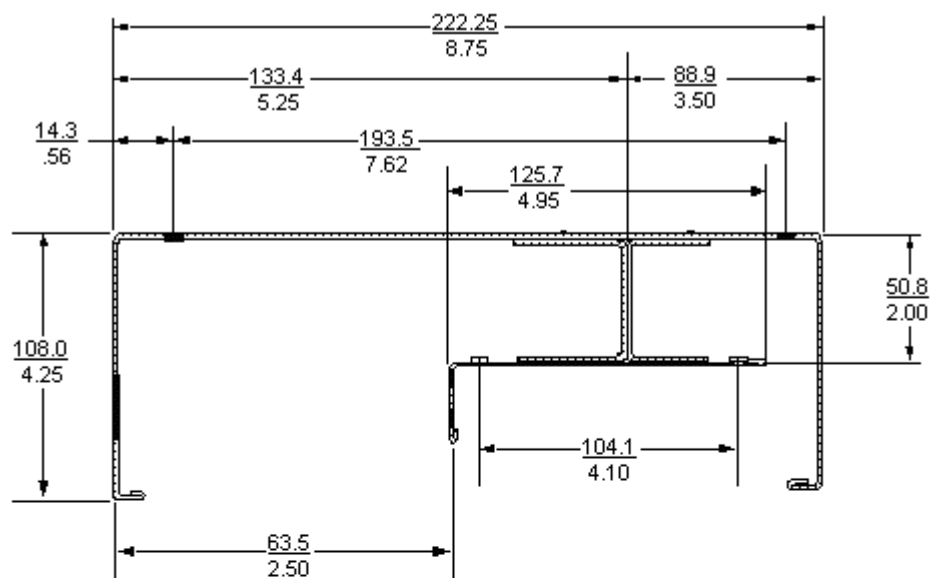
Up to three horizontal FTA mounting channels can be installed below the Power System in a single access cabinet. A gap of approximately 230 millimeters (9 inches), the approximate width of a horizontal FTA mounting channel, must be maintained between the FTA mounting channels and the Power System.

In a dual-access PM I/O control cabinet, up to eight horizontal FTA mounting channels can be installed on one side of a cabinet.

Horizontal bus bar

The horizontal FTA mounting channel also has holes drilled and tapped that provide for mounting a horizontal bus bar to terminate cable shields or safety ground wires.

Wire connectors are used to attach cable shields and ground wires to the bus bar. If you need additional wire connectors, see your Honeywell Sales Engineer.



Note: Dimensions are in millimeters/inches.

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Horizontal FTA Mounting Channel Dimensions

Installing Standard FTAs

FTA mounting channel installation

Vertical or horizontal FTA mounting channels can be installed in a control cabinet, or in facility terminal panels. The following figure illustrates the vertical FTA mounting channel in an equipment cabinet.

Install the FTA mounting channel with plated M5 pan-head screws and outside star washers. This ensures that the FTA mounting channel is grounded to the structure underneath. The structure underneath must connect to local **Safety Ground**, which in turn must connect to the facility's Safety Ground.

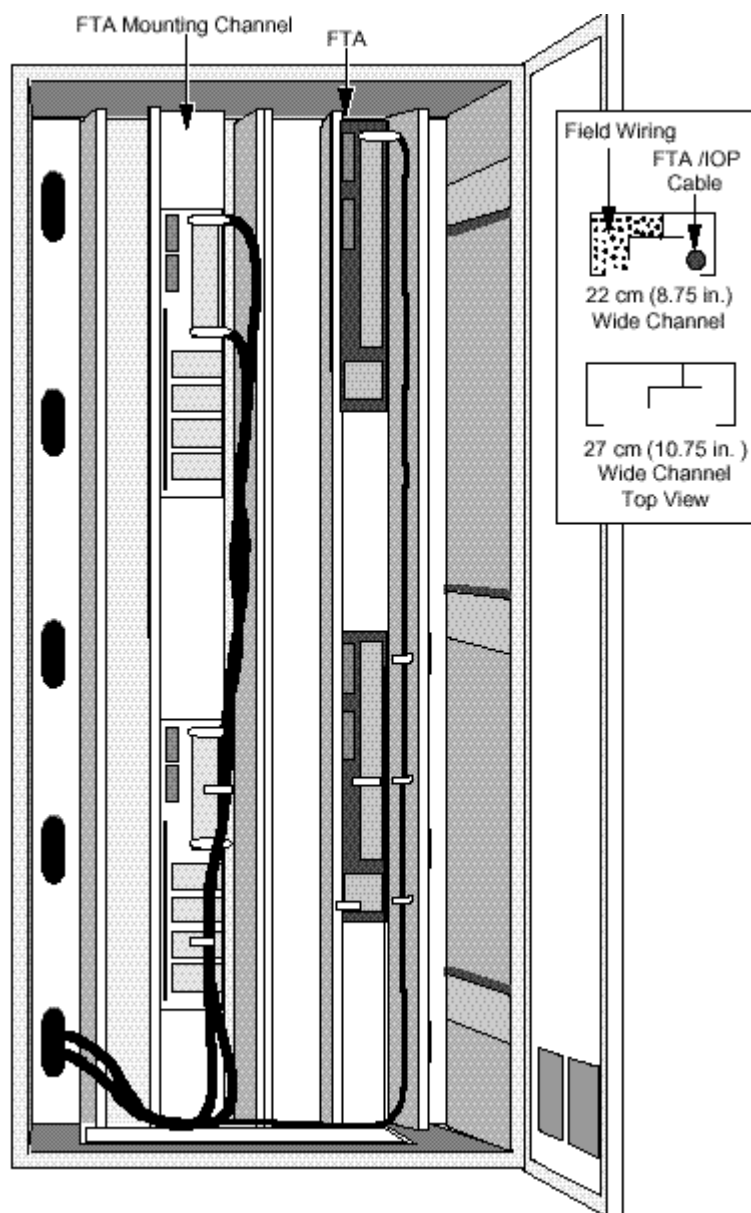
The FTAs mount using threaded holes in the FTA mounting channel. When installing an FTA, use care to avoid cross-threading the hole.



ATTENTION

Please read the sections below before installing the FTAs onto FTA mounting channels. The sections contain rules for FTA installation and field wiring routing, remote installation of FTAs outside of a control cabinet, and grounding of metallic members. These rules will help ensure reliable operation and will minimize signal interference.

When installing Galvanically Isolated FTAs, See [Installing Galvanically Isolated FTAs](#) for more specific instructions.



Vertical FTA Mounting Channel Installation

Rules for FTA installation and process wiring

When installing standard FTAs and routing the process wiring, some installation rules should be followed to minimize problems with wiring crosstalk. FTAs are assigned to a category, (either 1 or 2), according to the list in the following table. The installation of the FTAs also must be compatible with the wire routing.

Process Control Signal Wiring Categories

Category	Wiring Description
1	Low level analog input
	High level analog input and output
	Smart Transmitter Interface
	0 to 30 Vac/dc RMS working digital input and output
2	30 to 130 Vac/dc RMS working digital input and output
	131 to 250 Vac/dc RMS working digital input and output

When installing FTAs, rules for mounting standard FTAs place the Low Level Analog Input FTA at the top of the left-most FTA mounting channel. If the first FTA mounting channel reaches capacity, another FTA mounting channel is added and filled from the top again. This continues until all Category 1 FTAs have been installed, ending with the 3-30 Vdc Solid State Digital Output FTA. A break in the sequence occurs between Category 1 and Category 2 FTAs.

Nonshielded wire pairs in Category 1 can generally be mixed in one FTA mounting channel. There are some exceptions. Check with your Honeywell representative. The same is true for Category 2 in another FTA mounting channel; however, the extreme difference in signal levels is such that nonshielded pairs for both categories should not be in the same mounting channel. Electrical codes may also prohibit mixing of categories. It is recommended that Category 2 cables start in a new FTA mounting channel.

If facility terminal panels are considered, use multiple panels, if possible. Install Category 1 FTAs in one terminal panel and Category 2 in another.

Special considerations and wiring rules

It may not always be practical to use a whole FTA mounting channel for a given category of standard FTAs. Similarly, it may become necessary to add an FTA at a later time, and the available FTA mounting channel is not configured for the desired category.

Assuming that there are no electrical code conflicts for the process signal classes being discussed, a solution may be found using the wiring techniques that follow.

- Shield the process wiring in the FTA mounting channel, whether Category 1 or Category 2. Shielding the wiring the full distance to the FTA is a positive way of preventing wiring crosstalk.
- The two wiring categories could be installed at opposite ends of the same FTA mounting channel. For example, Category 1 signals might be routed up the side of a cabinet and access the FTA mounting channel through the top. As such, the Category 1 signals at the top do not mix with Category 2 signals at the bottom.
- Do not use the FTA mounting channel to run Class 1 and Class 2 wiring side by side. This is a Class 1 Power Limited Circuits wire-way as defined in the *National Electric Code (NEC)* for the USA; therefore, it is not suitable for sharing with Class 2 (process) circuits.

Separate wiring to standard FTAs and galvanically isolated FTAs

The routing of wiring that is connected to Galvanically Isolated FTAs and supporting components is governed by specific requirements discussed in Installing Galvanically Isolated FTAs. The wiring to Galvanically Isolated FTAs and standard FTAs must be separated. The two types of FTAs are restricted to installation on FTA mounting channels that are dedicated to the type of FTAs, the probability of the wiring mixing in the cabinet is not likely. If the wiring for the two types of FTAs is routed in opposite directions, one type upward and the other type downward, separation is guaranteed in the cabinet.

Remote FTA installation

If it is necessary to install FTAs remote from the control cabinet, it is recommended that FTAs be installed in a metal enclosure. Most FTAs are more than cable termination assemblies. In many cases, they are also composed of electrical circuits or modules. These circuits benefit from the protection of an enclosure similar to a PM I/O control cabinet.

FTAs installed outside a cabinet may exhibit some degradation in performance or reliability because of the absence of the protective cabinet. When FTAs are not mounted in a PM I/O control cabinet, certain practices should be adhered to for maximum system performance and reliability.

- **Install FTAs in a metal enclosure.** FTAs must be installed in a metal enclosure for best performance.
- **Install FTAs on an FTA mounting channel.** The FTAs must be installed on FTA mounting channels, which have been previously described, and standard FTAs must be mounted vertically. Installing FTAs in any other position, or without the use of an FTA mounting channel, can alter the anticipated design air flow, causing undesirable hot spots.
- **Mount the FTA upright.** Standard and Galvanically Isolated FTAs, when mounted on a vertical FTA mounting channel, must also be mounted in their upright position, as opposed to their upside-down position. The orientation of the FTA can usually be determined by the silkscreen lettering on the assembly. Also, the FTA to IOP cable connectors are generally located at the top of the assembly.
- **Follow FTA mounting hierarchy.** The following table lists the recommended order in which FTAs should be installed in the mounting area. Mounting areas are separated into two classes, one class accommodating signals of 30 volts or less, and a second that accommodates signals greater than 30 volts. Low level analog signals are included in the first class. Field and IOP to FTA cables should be secured with cable tie-downs.

FTA Mounting Hierarchy

Area	Order	Function
1	1	High Level Analog Input
1	2	Smart Transmitter Interface
1	3	Analog Output
1	4	Low Level Analog Input
1	5	Power Adapter (LLMux)
1	6	Low Level Analog Input Multiplexer
1	7	24 Vdc Digital Input
1	8	24 Vdc Nonisolated Digital Output
1	9	3-30 Vdc Solid-State Digital Output
2	1	120 Vac Digital Input
2	2	240 Vac Digital Input
2	3	31-200 Vdc Solid-State Digital Output
2	4	24-240 Vac Solid-State Digital Output
2	5	120 Vac/125 Vdc Relay Digital Output
2	6	240 Vac/125 Vdc Relay Digital Output

Grounding of all metallic members

FTA mounting channels, the cabinet, and all metallic members must be well bonded and grounded to provide the maximum system protection from induced transients in the field cable connections. The recommended grounding practice is to bond all metallic members with 1 3/4-inch flat copper braid. For metallic members that are secured by bolts, a stainless steel internal tooth lockwasher under both the head of the bolt and the nut are required to ensure reliable bonding. Threaded bolt holes in members must be clear of all paint to ensure good electrical contact. Paint under lockwashers should also be removed if its thickness will prevent the lockwasher from penetrating to the surface of the metal.

Bond cabinet to safety ground

The cabinet must be bonded to the closest Safety Ground rod or grid. See Planning for Bonding and Grounding and Appendix D in the *Planning Guide* for more on control cabinet grounding.

The bonding connections should be made with 1.75-inch wide braid or 70 mm² (2/0 AWG) cable. Both have a nominal 135,000 circular mill area. Because most electrical noise is of a high frequency nature, the surface area of the bonding connections is more important than the cross-sectional area. To provide a ground path of known integrity, a conductor from the FTA to the Safety Ground rod or grid is required. The connection must be made to the nearest Safety Ground. An additional connection to the closest grounded metallic building structure is also recommended. This can be building steel, metallic plumbing pipes, or other metallic components as long as it is an electrically secure Safety Ground.

Grounding of structural members

Structural building members, cable trays, and pipes have large surface areas that present a low impedance to high frequency noise. The structural connections and mountings of these items usually provide a good path for high frequency signals. All bonding connections to the building's structural ground should be similar, but never less than a 25 mm² (4 AWG) Master Reference Ground (MRG) cable connection.

Field wiring to FTA terminals

To aid you in connecting field devices to the FTA terminals, [Appendix C](#) contains wiring diagrams and assembly layouts of all standard FTAs, by signal type. Field wiring diagrams for Galvanically Isolated FTAs are provided in [Appendix D](#). Please refer to them for details in connecting field (process) wiring to FTA terminals.

Installing Galvanically Isolated FTAs

A group of Field Termination Assemblies (FTAs) that accept plug-in Galvanic Isolation Modules is available. The FTAs are compatible with the IOPs that support the companion standard (non-Galvanically Isolated) FTAs.

CE compliance

Some Galvanically Isolated Field Termination Assemblies and their supporting assemblies, such as a Combiner Panel, are CE Compliant, while others are not CE Compliant. Generally, CE Compliant Galvanically Isolated assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA shielded cable.

All HART FTAs are CE Compliant.

FTA selection

All Galvanically Isolated FTA assemblies are approximately 309 by 124 millimeters (12 inches by 4.9 inches), which is the B-size FTA classification for mounting size. The FTAs can be installed on FTA mounting channels that are horizontally or vertically positioned in the cabinet with certain restrictions. Applicable information for Galvanically Isolated FTAs is summarized in following table.

Galvanically Isolated FTAs are available with either of two wire terminal types.

- Compression (C) type with removable terminal connector(s)
- Crimp (CR) type with stationary terminals

Screw (S) type terminals are installed on the combiner panel and marshalling panel also listed in the following table.

Galvanically Isolated FTAs, Terminal Connector Type and Channels

Model Number	Description	Terminal Type	No. of Channels
Analog Input			
MU/MC-GAIH12	High Level Analog Input FTA— voltage outputs to both the IOP and an auxiliary connector	C	16
MU/MC-GAIH82	High Level Analog Input FTA— voltage outputs to both the IOP and an auxiliary connector	CR	16
MU/MC-GAIH13	High Level Analog Input/HART/Smart Transmitter Interface FTA— voltage outputs to both the IOP and an auxiliary connector	C	16
MU/MC-GAIH83	High Level Analog Input/Smart Transmitter Interface FTA— voltage outputs to both the IOP and an auxiliary connector	CR	16
MU/MC-GAIH14	High Level Analog Input/HART/Smart Transmitter Interface FTA— with device high drive and voltage outputs to both the IOP and an auxiliary connector	C	16
MU/MC-GAIH84	High Level Analog Input/Smart Transmitter Interface FTA— with device high drive and voltage outputs to both the IOP and an auxiliary connector	CR	16
MU/MC-GAIH22	High Level Analog Input/HART Transmitter FTA— with voltage outputs to the IOP and current outputs to an auxiliary connector (Auxiliary receiver output)	C	16
MU/MC-GAIH92	High Level Analog Input FTA— with voltage outputs to the IOP and current outputs to an auxiliary connector (Auxiliary receiver output)	CR	16
Analog Output			
MU/MC-GAOX02	Analog Output (Single IOP) FTA— with Line Fault Detection in the IOP	C	8
MU/MC-GAOX72	Analog Output (Single IOP) FTA— with Line Fault Detection in the IOP	CR	8

Process Manager I/O Installation and Wiring
Installing Galvanically Isolated FTAs

Model Number	Description	Terminal Type	No. of Channels
MU/MC-GHAO11	Analog Output FTA— with HART connection capability	C	16
MU/MC-GHAO21	Analog Output FTA—HART Compatible	C	16
MU/MC-GAOX12	Analog Output FTA— with Line Fault Detection in the IOP	C	8
MU/MC-GAOX82	Analog Output FTA— with Line Fault Detection in the IOP	CR	8
Digital Input			
MU/MC-GDID12	24 Vdc Digital Input FTA— with relay outputs to the IOP and an auxiliary connector and Line Fault Detection in the IOP	C	32
MU/MC-GDID82	24 Vdc Digital Input FTA— with relay outputs to the IOP and an auxiliary connector and Line Fault Detection in the IOP	CR	32
MU/MC-GDID13	24 Vdc Digital Input FTA— with solid-state voltage outputs to the IOP and no auxiliary connector	C	32
MU/MC-GDID83	24 Vdc Digital Input FTA— with solid-state voltage outputs to the IOP and no auxiliary connector	CR	32
Digital Output			
MU/MC-GDOD12	24 Vdc Digital Output FTA— with 16 output override inputs from an auxiliary connector	C	16
MU/MC-GDOD82	24 Vdc Digital Output FTA— with 16 output override inputs from an auxiliary connector	CR	16
MU/MC-GDOL12	24 Vdc Digital Output FTA— with Line Fault Detection outputs to an auxiliary connector	C	16
MU/MC-GDOL82	24 Vdc Digital Output FTA— with Line Fault Detection outputs to an auxiliary connector	CR	16

Auxiliary connector

Some FTA types, such as the High Level Analog Input, Digital Input and Digital Output FTAs, have a single 50-pin auxiliary connector that supports a particular auxiliary function. See [Marshalling Panel](#).

Additional hardware used with galvanically isolated FTAs

There are additional hardware components that are associated with Galvanically Isolated FTA installations. These components are listed and described in the following table.

Additional Hardware Components

Hardware Component	Model Number	Description	Term. Type
Power Distribution Assembly	MU/MC-GPRD02	Provides fused 24 Vdc power distribution to Galvanically Isolated FTAs	N/A
Power Cables	MU-KDPRxx	Connects the power distribution assembly to the power output connector of the power system	N/A
	MU-KSPRxx	A shielded CE Compliant version of the MU-KDPRxx power cable.	N/A
	MU-KGPRxx	Connects the power distribution assembly to the GI FTAs.	N/A
Marshalling Panel	MU/MC-GMAR52	Provides the ability to repeat signals into or out of the safe side of the Galvanic Isolation Modules mounted on the FTA	S
Combiner Panel	MU/MC-GLFD02	Combines the Line Fault Detection (LFD) outputs of two Digital Output FTAs and presents the signals to redundant Digital Input IOPs for integration	S

FTA Mounting Considerations



ATTENTION

The ambient temperature limits of the Galvanic Isolation Modules on the FTAs are -20 to +60 degrees C (working) and -40 to +80 degrees C (storage). The humidity limits are 5 to 95% relative humidity.

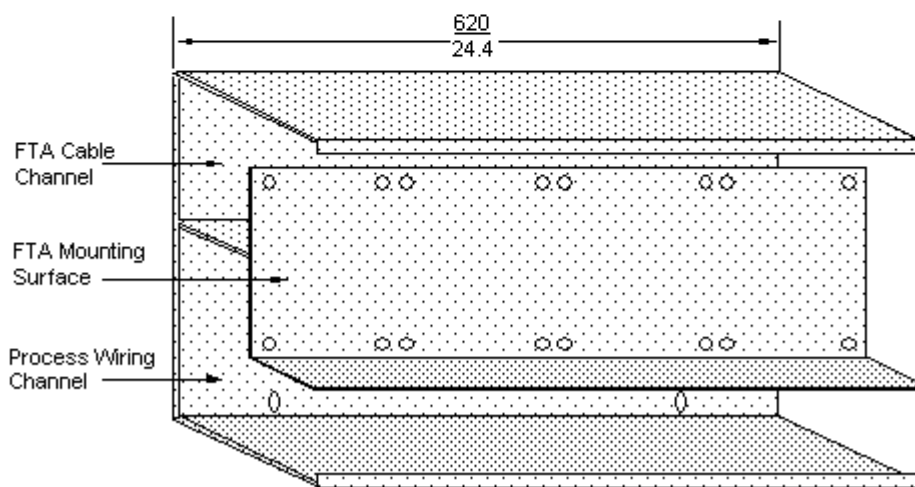
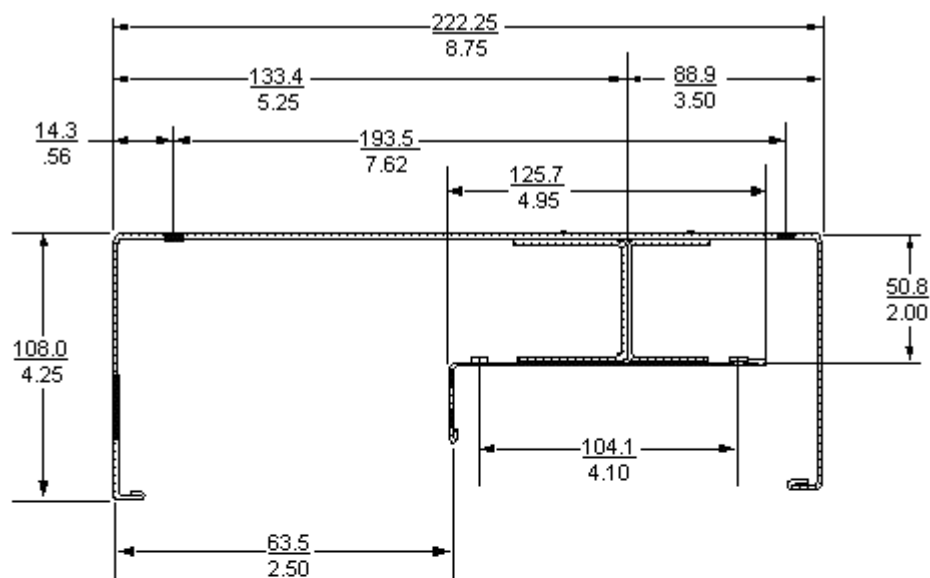
Because of the increased heat dissipation requirements of Galvanically Isolated FTAs, cabinet fan assemblies are mandatory on both sides of a dual-access cabinet. The single-access cabinet also requires a cabinet fan assembly

FTA mounting channel requirements

Standard FTAs are always mounted on 920-millimeter (36-inch) long FTA mounting channels that are installed vertically in the cabinet. Galvanically Isolated FTAs can be mounted on 620-millimeter (24-inch) long FTA mounting channels that are installed horizontally in the cabinet to provide better heat dissipation for the FTAs, or they can be mounted on inverted (upside-down from normal orientation) vertical FTA mounting channels.

The physical dimensions of the horizontal mounting channel are shown in the following figure.

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Installing Galvanically Isolated FTAs



Note: Dimensions are in millimeters/inches.

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Horizontal FTA Mounting Channel Dimensions

Up to eight horizontal FTA mounting channels can be installed in a cabinet with a 6-millimeter (.25-inch) gap between them to accommodate the use of cable ties as necessary and is shown in the following figure.

The horizontal FTA mounting channel is installed with the field wiring trough toward the bottom of the cabinet. The trough that contains the cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, and the Combiner Panel, if applicable, is toward the top of the cabinet. One or two FTAs can be mounted on each horizontal FTA mounting channel.



ATTENTION

Installation of Galvanically Isolated and standard FTAs on the same FTA mounting channel is **not** permitted. Both types of FTAs mounted on the same FTA mounting channel would be an Intrinsic Safety violation.

The vertical FTA mounting channel is installed in an inverted position with the field wiring trough toward the right side of the cabinet. The trough that contains the cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, and the Combiner Panel, if applicable, is toward the left side of the cabinet.

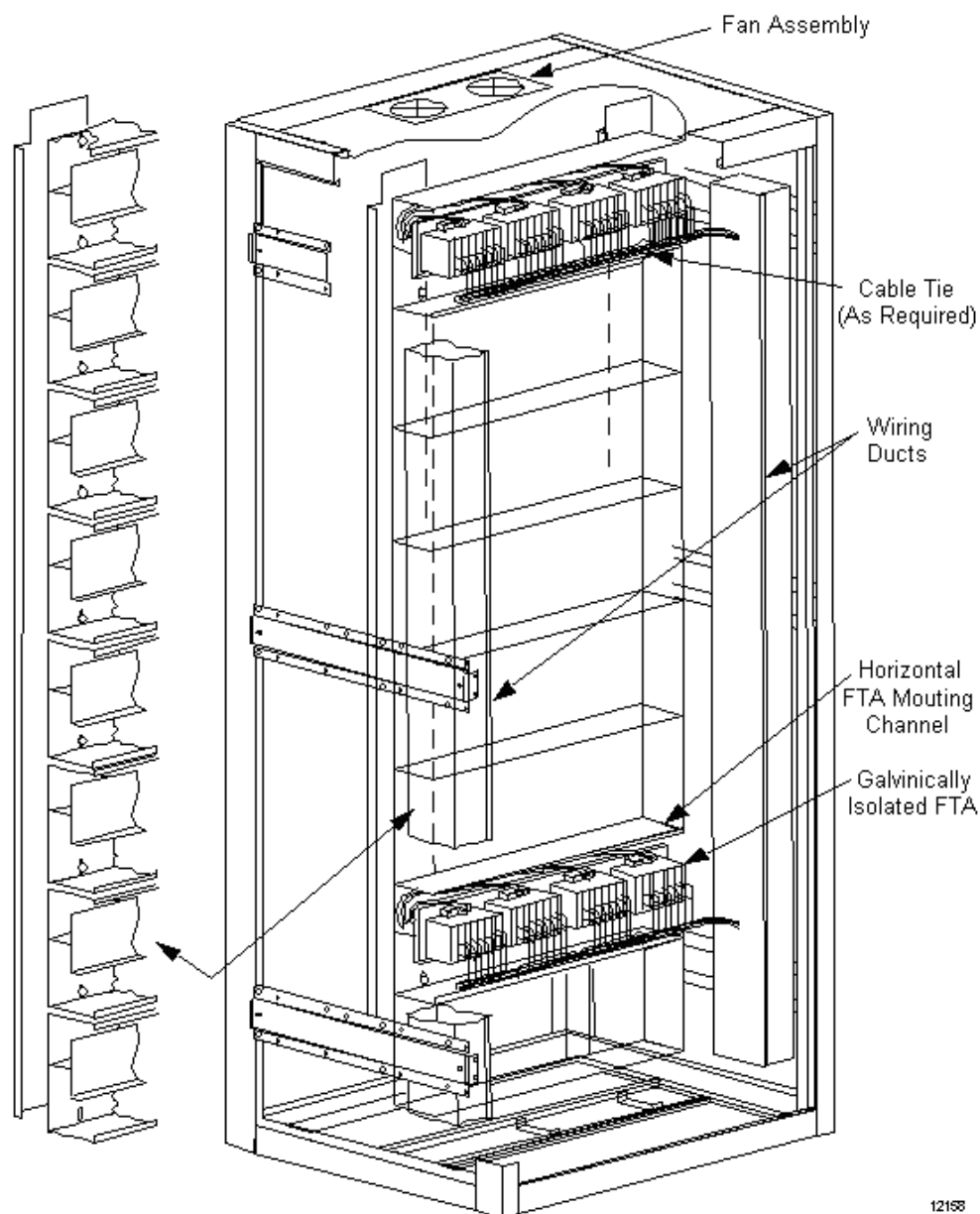
Up to three FTAs can be mounted on each vertical FTA mounting channel.

Both FTA mounting channels types permitted

Although it is not permissible to mount standard FTAs and Galvanically Isolated FTAs on the same FTA mounting channel, it is permissible, but not preferable, to install both the vertical FTA mounting channels and the horizontal FTA mounting channels in the same cabinet.

If it is a requirement, up to three vertical FTA mounting channels can be installed in the lower portion of the cabinet and up to three horizontal FTA mounting channels can be installed in the upper portion of the cabinet. A fourth horizontal FTA mounting channel is omitted, even though the space is available, to provide separation between the vertical and horizontal FTA mounting channels.

Galvanically Isolated FTAs can be mounted either horizontally or vertically.



Horizontal FTA Mounting Channel Installation

Marshalling Panel mounting

The model MU-GMAR52 Marshalling Panel can be mounted on either a horizontally or vertically oriented FTA mounting channel. No Galvanically Isolated FTAs can be mounted on the same FTA mounting channel.

Combiner Panel Mounting

The model MU-GLFD02 Combiner Panel mounting size is similar to an “A” size FTA and can be mounted on the same FTA mounting channel as the FTA it is connected with.

Power Distribution Assembly

Galvanically Isolated FTAs use more 24 Vdc power than standard FTAs. Because of the increased demand, the Galvanic Isolation Power Distribution Assembly, is used to directly supply power to the FTAs. The power for a standard FTA is provided from the IOP through the cable that connects the IOP to the FTA.

The Galvanically Isolated FTAs have dual 2-pin power connectors for power source redundancy. Power for the two connectors can be provided by a single power source or separate power sources. A model MU-KGPRxx power cable can be used to connect the 24 Vdc from the Power Distribution Assembly to the FTA. Diodes on the FTA that “or” the two power sources prevent the two power sources from shorting together.

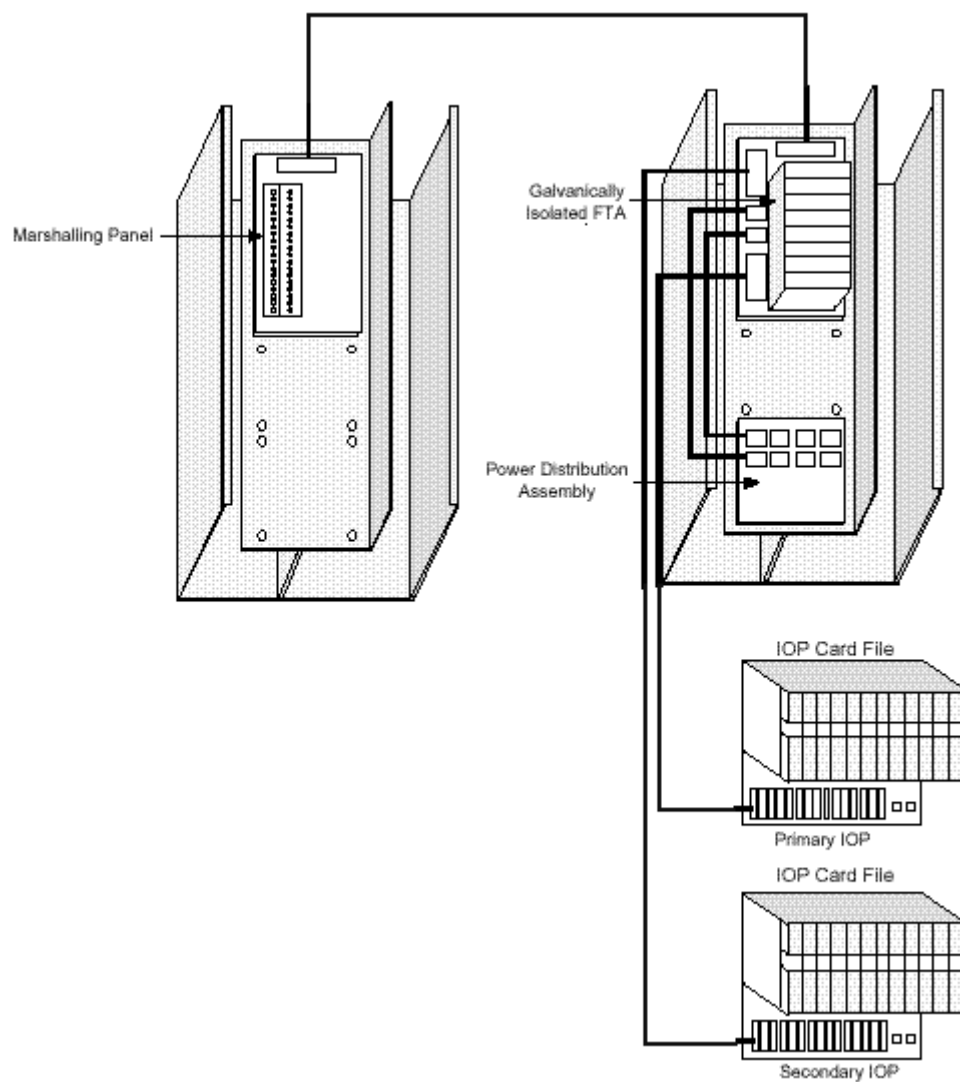
Power Distribution Assembly mounting

The Power Distribution Assembly(s) can be installed on the same FTA mounting channel as the FTA(s) (either a horizontally or vertically oriented FTA mounting channel), but a spacing of at least 6 inches must exist between a Power Distribution Assembly and an FTA installed on an FTA mounting channel.

If the field wires leaving the Galvanically Isolated FTAs are dressed downward toward the floor of the cabinet, the Power Distribution Assembly(s) must be installed above the FTAs. As a result, the field wires will not pass close to a Power Distribution Assembly. If the field wires are routed upward toward the top of the cabinet, install the Power Distribution Assembly(s) below the FTAs.

Process Manager I/O Installation and Wiring

Installing Galvanically Isolated FTAs



Typical GI FTA, Power Distribution Assembly and Marshalling Panel Mounting

Field Wiring Connections

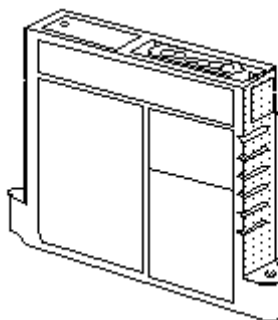


ATTENTION

The following describes the different types of field wiring connections to the galvanic isolation modules and the cable routing to and from the GI FTAs. [Appendix D](#) contains wiring diagrams and assembly layout drawings for each type GI FTA.

The FTAs do not have field terminal connectors mounted directly on the assembly's printed circuit board as the standard FTAs do; instead, field wires are connected to compression-type or crimp-type connectors that mate with the connector on the individual Galvanic Isolation Module.

Field wire connections are made at the plug-in Galvanic Isolation Module on the FTA. In general, the Galvanic Isolation Module provides terminal connections for one field device. The exception is the Galvanic Isolation Module on the Digital Input FTA. It provides terminal connections for two field devices. The following figure is an illustration of a typical Galvanic Isolation Module.



Typical Galvanic Isolation Module

The FTAs and their Galvanic Isolation Modules can be in place during the installation of the field wiring, but it is not a requirement because of the module connector's plug-in capability.

Cable shield connection

Spare wires and cable shields are terminated in the normal manner. Because the FTA does not have a built-in shield bus, the accommodation of a large number of shield wires requires the use of a bus bar that is installed on the FTA mounting channel and connected to the local Master Reference Ground (MRG).

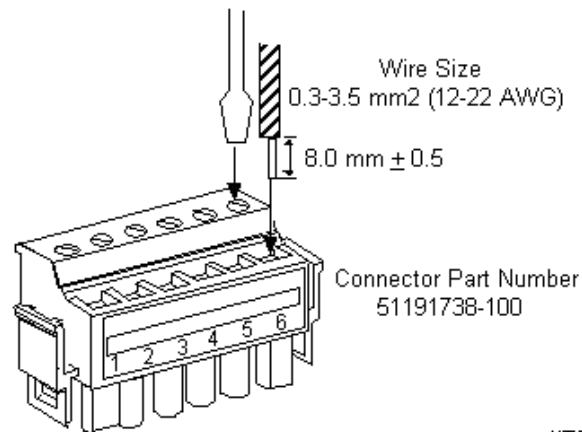
Terminal connectors

Compression-type or crimp-type pluggable 6-terminal connectors can be specified for the Galvanic Isolation Modules. The model number for the FTA specifies the connector type.

- Compression-type terminal connectors are provided on FTAs where the model number ends in 02, 12, 13, 14, or 22, such as MU-GAOX02, MU-GAIH12, etc.
- Crimp-type terminal connectors are provided on the FTA where the model number ends in 72, 82, 83, 84, or 92, such as MU-GAOX72, MU-GAIH82, etc.

Compression-type terminal connector

The compression-type terminal connector accepts size 0.3 to 3.5 mm² (12 to 22 AWG) wire. The wire is stripped to a length of 8.0 millimeters, inserted into the 6-pin terminal connector, and held in place by tightening a dedicated screw as shown in the following figure. Like the crimp-type terminal connector, the compression-type connector's female pins mate with companion male pins in the 6-pin connector on the Galvanic Isolation Module. Unlike the crimp-type terminal connector, six pins are always present and cannot be extracted. The inserted wires are removed by loosening the dedicated screw. The compression-type terminal connector is locked into place by tabs at the sides of the connector.



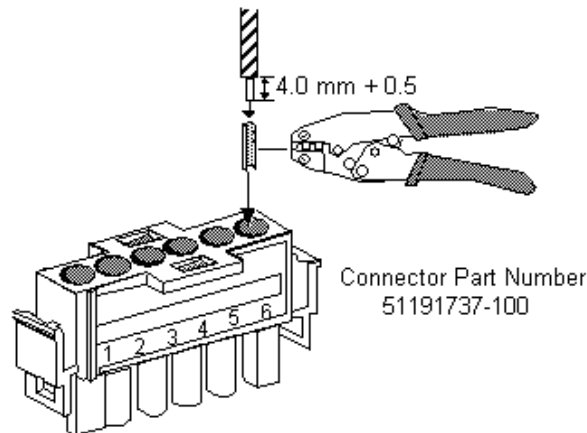
11376

Compression-Type Terminal Connector

Crimp pin-type terminal connectors

The female crimp pins are installed over the stripped end of the wiring, before its insertion into a compression terminal-type connector where it is locked into place by the crimp-type connector. Size 0.5 to 2.5 mm² (14 to 20 AWG) wiring is accommodated with a crimp pin as shown in the following figure. The female crimp pins, that are inserted into the connector, mate with companion male pins in the 6-pin connector on the Galvanic Isolation Module. An extraction tool must be used to remove the female crimp pin. The crimp-type terminal connector is locked into place by tabs at the sides of the connector.

<u>Wire Size</u>	<u>Crimp Pin Part Number</u>	<u>Crimp Tool Part Number</u>
0.5-2.5 mm ² (14-20 AWG)	51191737-201	51191787-100



11373

Crimp-Type Terminal Connector

Field wire and cable routing

Generally, the field wires must be routed so that a minimum 2-inch separation is maintained between other wires or electrical components. The wiring can be separated from other wiring by a grounded metal barrier or a nonconductive divider.

Horizontal FTA mounting channel cabling

All power cables must be routed in the upper channel of a horizontal FTA mounting channel. The field wires to the Galvanically Isolated FTAs must always be routed in the lower channel of a horizontal FTA mounting channel. No other wires, other than field

wires to Galvanically Isolated FTAs, can be routed in the lower channel of the horizontal FTA mounting channel.

When FTAs are mounted on a horizontal FTA mounting channel, the field wires that connect to the FTA are routed to the right in the lower channel and out of the cabinet by going up or down the right side of the cabinet.

The cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, and the Marshalling Panel, if applicable, must be routed in the upper channel of the FTA mounting channel. The routing is to the left in the channel and up or down the left side of the cabinet.

Vertical FTA mounting channel cabling

All power cables must be routed in the left channel of a vertical FTA mounting channel. The field wires to the Galvanically Isolated FTAs must always be routed in the right channel of a vertical FTA mounting channel. No other wires, other than field wires to Galvanically Isolated FTAs, can be routed in the right channel of the vertical FTA mounting channel.

When FTAs are mounted on a vertical FTA mounting channel that is installed in an inverted position, the field wires that connect to the FTA are routed in the right channel and out of the cabinet by going up or down the right side of the cabinet.

The cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, Combiner Panel, and the Marshalling Panel, if applicable, must be routed in the left channel of the FTA mounting channel. The routing is up or down the left side of the cabinet.

Power Distribution Assembly Cabling

Cabling to the Power Distribution Assembly must be routed in the upper or left channel and to the left side of the cabinet, except for the cables carrying power to an FTA mounted on the same FTA mounting channel. See also [Power Distribution Assembly mounting](#).

Process Manager I/O Installation and Wiring

Installing Galvanically Isolated FTAs

Additional Power System

If an additional Power System is required in the cabinet to power the Galvanically Isolated FTAs, it can be installed on the same side of the cabinet as the FTA mounting channels. Install the Power System at the top of the cabinet if the FTA's field wiring entry is at the bottom of the cabinet so the field wires are not routed near the Power System. If the field wiring entry is at the top of the cabinet, install the Power System at the bottom of the cabinet.

Installing PM IOP Card Files

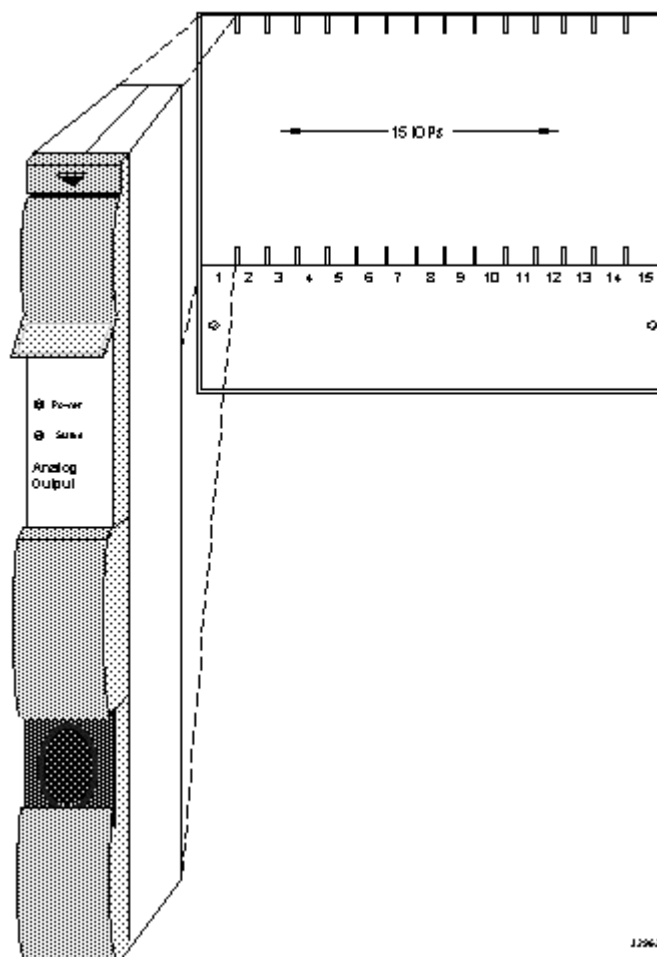
Two Card File Sizes

Two sizes of IOP card file assemblies provide either seven or 15 card slots to accommodate any of the various IOP plug-in card types. See the following figure. The card file also contains a variety of connectors for power cables, process signal cables, and cables for connecting redundant and remote I/O hardware.

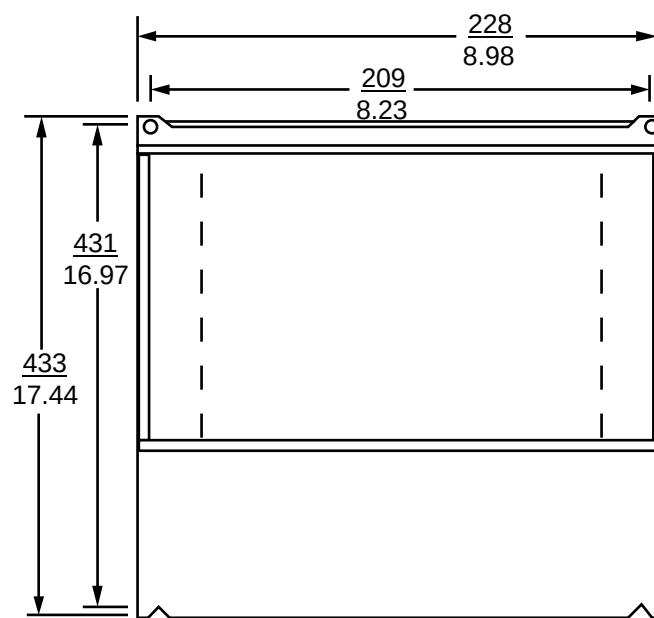
There are two types of 7-slot card file assemblies, Left 7-Slot and Right 7-Slot. The Left and Right 7-Slot card files are the same size and are intended to be mounted adjacent to each other on the cabinet's 19" RETMA mounting infrastructure using appropriate hardware. The 15-Slot card file mounts alone on the 19" RETMA mounting infrastructure. The following figures show the physical dimension of the 7-slot and 15-slot card files respectively.

Process Manager I/O Installation and Wiring

Installing PM IOP Card Files



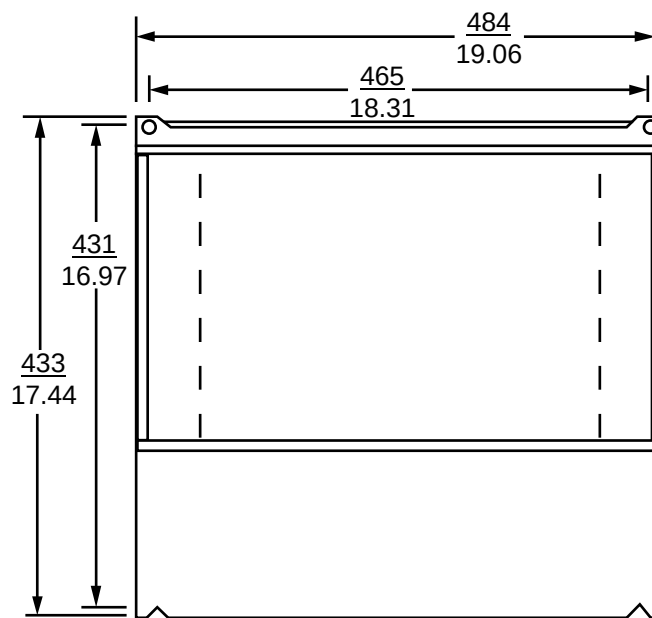
15-Slot IOP Card File



Note: Dimensions are in millimeters/inches.

16012

Seven-Slot Card File Installation Dimensions



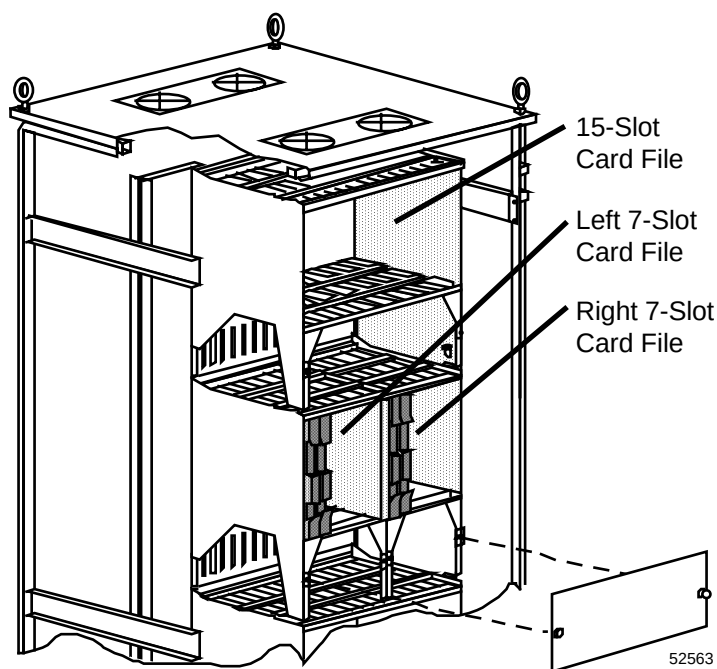
Note: Dimensions are in millimeters/inches.

53135

Fifteen-Slot Card File Installation Dimensions

Installing 7-Slot and 15-Slot card files

The following figure illustrates the installation of Left and Right 7-Slot and 15-Slot card files in a side-by-side configuration.

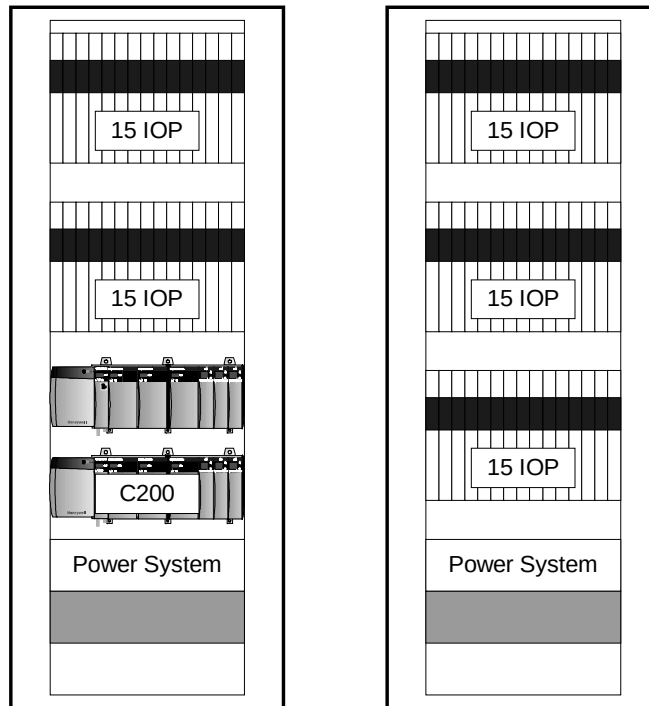


Installation of 7-Slot and 15-Slot Card Files

Typical IOP card file Installations

The following figure shows typical cabinet arrangement of process controller chassis hardware and PM IOP card files. The cabinet on the left contains two controller chassis, two 15-slot IOP card files and a power supply. The cabinet on the right contains three 15-slot IOP card files and a power supply. The associated FTAs may be installed in the rear of the cabinet, if it is a dual access cabinet, or in a separate cabinet.

IOP card files can be installed at remote locations with the use of fiber optic I/O Link Extenders, as well as locally in the cabinet or cabinet complex.



Typical Cabinet Arrangements for IOP Card File Installation

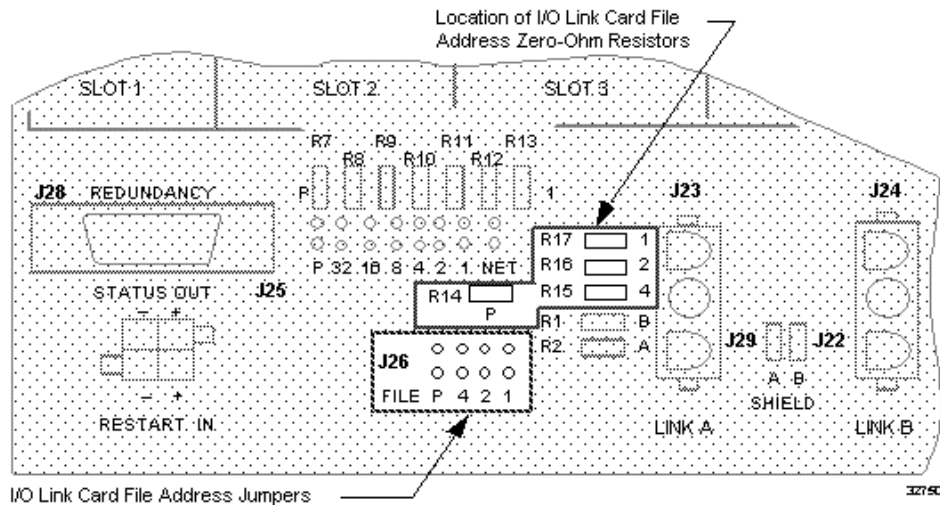
I/O Link Address Pinning

IOP card file addressing

The I/O Link is a dual serial communications link between IOP card files that are connected to a common IOLIM. All IOP card files must be hardware configured (pinned) for an address on the I/O link interface. I/O link address selection is implemented (pinned) in one of two ways:

- Two-pin hardware jumpers, or
- Zero-ohm resistors located on each card file backpanel. Zero-ohm resistors that are used in place of jumpers are soldered in at the factory only by special request

The IOP card file I/O link addresses must be configured (pinned) consecutively, starting at I/O link address 0 (zero). See the following figure for the location of the jumpers on the 7-Slot IOP card file.

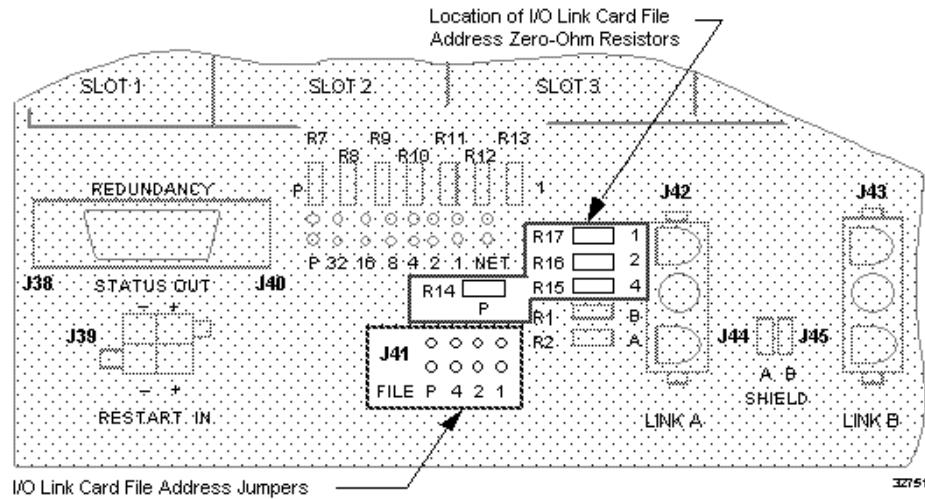


Left 7-Slot Card File I/O Link Address Pinning

Any IOP card files in the PM I/O subsystem must be addressed consecutively, starting at I/O link address 0 (zero). See the following figure for the location of the jumpers on the 15-Slot card file.

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I/O Link Address Pinning



15-Slot Card File I/O Link Address Pinning



ATTENTION

The numerical I/O link address displayed on the workstation displays is numbered one higher (+1) than the actual pinned I/O link address. The I/O link address of 0 is displayed as a numerical address of 1 on the system displays. (i.e. pinned value of 0 = card file 1, pinned value of 1 = card file 2, etc.).

One method only

Use only one of the two methods to set the I/O link address for the IOP card files. Either remove all jumpers and use the zero-ohm resistors, or clip out the zero-ohm resistors and use the jumpers to set the address. The jumper method (without the resistors) is the most common method.



ATTENTION

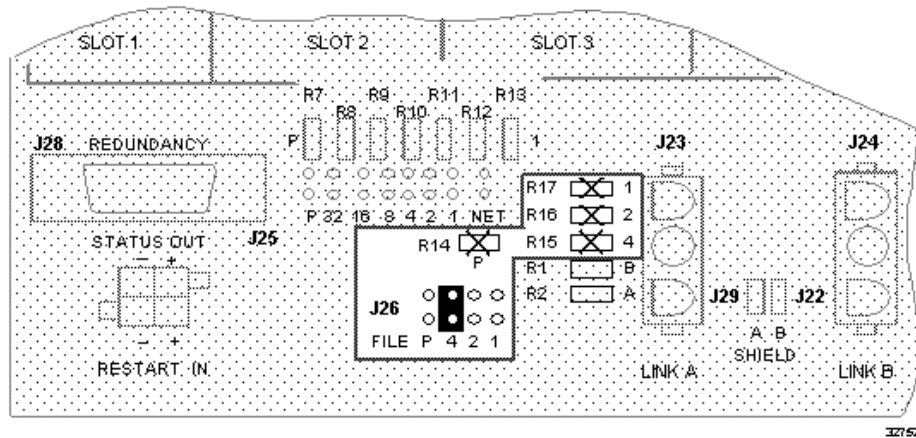
Whichever method you use, please note that there are four address positions labeled 1, 2, 4 and P. The "P" position is for parity. It is used so that all I/O link addresses are set using an odd number of jumpers, (or resistors). See examples below.

Jumper method example

I/O link address configuration using plug jumpers is demonstrated with the following example. Refer to the following figure to locate the 7-slot card file pinning area (J26) for the following procedure.

Step	Action
1	Assume an IOP card file is to be configured for an I/O Link hardware address of 4. (The workstation will display this card file's I/O Link address as 5.)
2	Take diagonal cutters and remove all the zero-ohm resistors.
3	Install a plug jumper to bridge both pins at position 4.
Note: Because this single jumper constitutes an odd number of jumpers, remove the P (parity) plug jumper as well as all others.	

Even though the J-number (J26 in this case) differs between the 7-Slot and 15-Slot card files, the method of pinning the card file address remains the same.



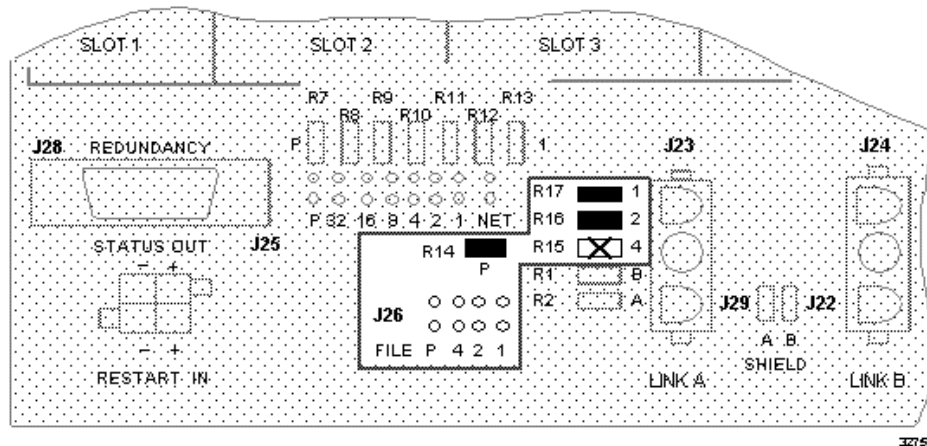
Left 7-Slot Card File I/O Link Address Pinning with Plug Jumpers

Zero-ohm resistor jumper pinning example

I/O link address configuration using zero-ohm resistor jumpers is demonstrated with the following example. Refer to the following figure to locate the 7-slot card file resistor jumper area for the following procedure.

Step	Action
1	Assume an I/O card file is to be configured for an I/O Link hardware address of 3. (The workstation will display this card file's address as 4.)
2	Remove all the plug jumpers and set them aside.
3	Leave the zero-ohm resistors at positions 1 and 2 ($1 + 2 = 3$), and leave the P (parity) zero-ohm resistor because an odd number of jumpers is required. (A logic one is created by leaving the zero-ohm resistor in place and a zero is created by removing the zero-ohm resistor.)
4	Remove all other zero-ohm resistors with diagonal cutters.

Even though the jack number (J26 in this case) differs between the 7 and 15-Slot card files, the method of pinning the card file address remains the same.



Left 7-Slot Card File I/O Link Address Pinning with Zero-Ohm Resistors

CAUTION

If a zero-ohm resistor jumper is incorrectly removed, do not attempt to correct the problem by resoldering the jumper. The backpanel can be easily damaged. Instead, remove all the zero-ohm resistor jumpers and configure the card file's I/O link address with the plug jumpers

Installing PM I/O Processor Cards

IOP Card Types

There are several types of Input/Output Processor (IOP) card assemblies available for Experion PKS systems. Some IOP card types interface with more than one type of Field Termination Assembly (FTA). The functional types of IOPs are:

- High Level Analog Input (HLAI)
- High Level Analog Input, HART (HAI)
- Low Level Analog Input (LLAI)
- Low Level Analog Input Multiplexer (LLMux)
- Remote Hardened Multiplexer (RHMux)
- Analog Output (AO)
- Analog Output (HAO)
- Digital Input (DI)
- Digital Input Sequence of Events (DISOE)
- Digital Output (DO)
- Smart Transmitter Interface (STI)
- Smart Transmitter Interface Multivariable (STI_MV)



TIP

We recommend that you install the IOP card files and the FTAs (mounted on FTA mounting channels) in the control cabinet BEFORE you install the IOP cards.

Installing IOP card assemblies

Any type IOP card assembly can be installed in any IOP card file slot. Follow the steps below to install the IOP card assemblies.

Step	Action
1	Consult site documentation. Locate the correct card slot in the IOP card file.
2	When installing an IOP card, first connect your ESD wrist strap to the cabinet's ground bar, and then remove the card from its pouch.
3	Carefully slide the card onto the card rails, checking to be sure that the card is inserted in both rails.
4	Slide the card into the card file until it has made contact with the backpanel connectors. Then firmly press on the front of the card with the heel of your hand. Do not use excessive force! If the card doesn't slip easily into its connectors, remove the card and locate the source of the obstruction. Check for bent contacts at the backpanel connectors.
5	Repeat steps 1 to 4 for each IOP card to be installed.

Installing Remote I/O

Overview

Remote I/O options are available to enable IOPs and FTAs to be located at up to six remote sites. Redundant fiber-optic cable links (Link A and Link B) are used to connect the remote I/O. I/O Link Extender cards, installed in IOP card files, enable IOPs and their associated FTAs to be located remotely up to 8 kilometers (5 miles) from a local site. Each remote I/O link consists of two I/O Link Extender cards and their associated Fiber Optic Coupler modules that occupy one slot in the IOP card files at both the local and remote sites. Fiber Optic Coupler modules, connected to the IOP card file backpanel, drive and terminate the fiber optic transmission cable that connects the local and remote IOP card files. Also, remote installation of IOPs and FTAs can significantly reduce signal wire runs.

Two types of I/O link extenders – standard and long distance

There are two options for installing the remote I/O hardware:

The “Standard” I/O Link Extender card provides remote extension of IOP card files up to 1.3 kilometers (4000 feet) from the local IOP card file. An associated fiber optic coupler module provides attachment for one, two, or three fiber optic cables at the local card file. A second fiber optic coupler module terminates a single optic cable at the remote IOP card file.

The “Long Distance” I/O Link Extender card provides remote extension of IOP card files up to 8 kilometers (5 miles) from the local card file. An associated fiber optic coupler module, capable of driving and terminating a single fiber optic cable, is installed at both the local card file and the remote IOP card file.

There can be a mix of Standard and Long Distance I/O Link Extenders in a subsystem; however, both ends of a Link A and Link B must contain the same type I/O link extender card.

Standard I/O Link Extender Installation

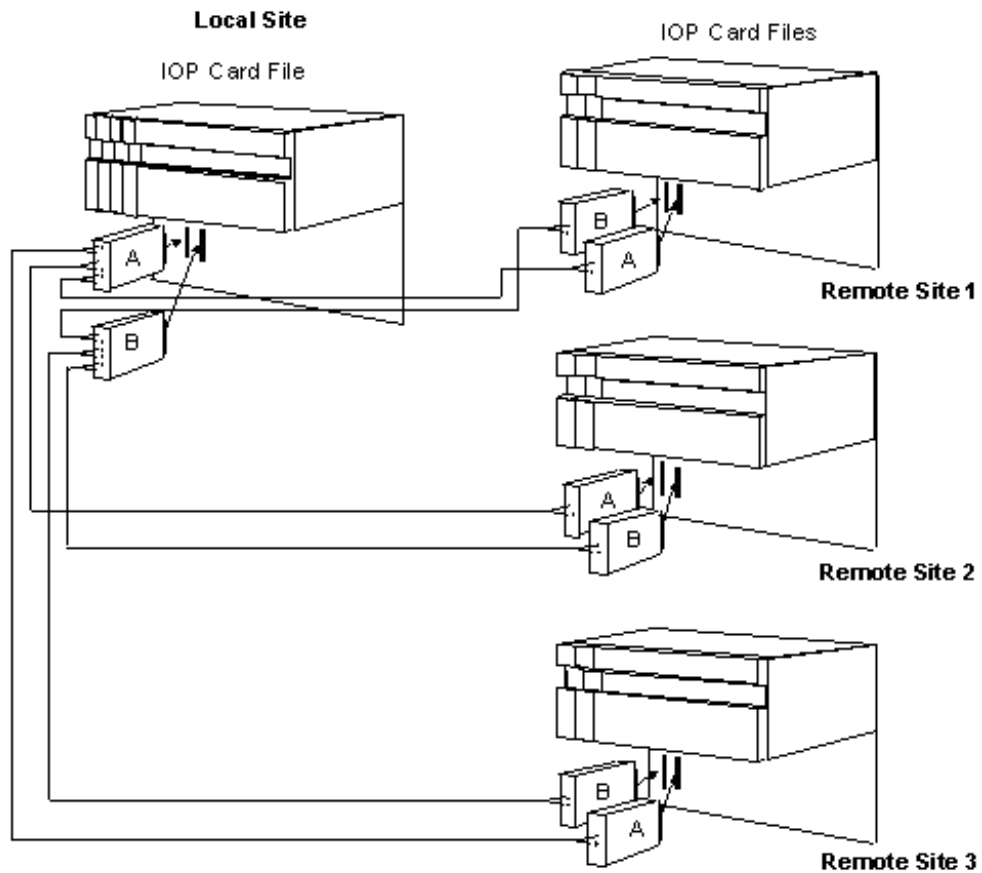
The Standard I/O link extender can be installed in nonredundant and redundant IOP card file configurations.

Nonredundant installation example

Two I/O link extender cards and their associated fiber optic coupler modules are required at each end of the I/O link extension, one for Link A and one for Link B. The cards are

normally installed in adjacent card file slots as illustrated in the following figure for a nonredundant installation.

Figure 7 Standard I/O Link Extender Interconnections with Nonredundant IOPs



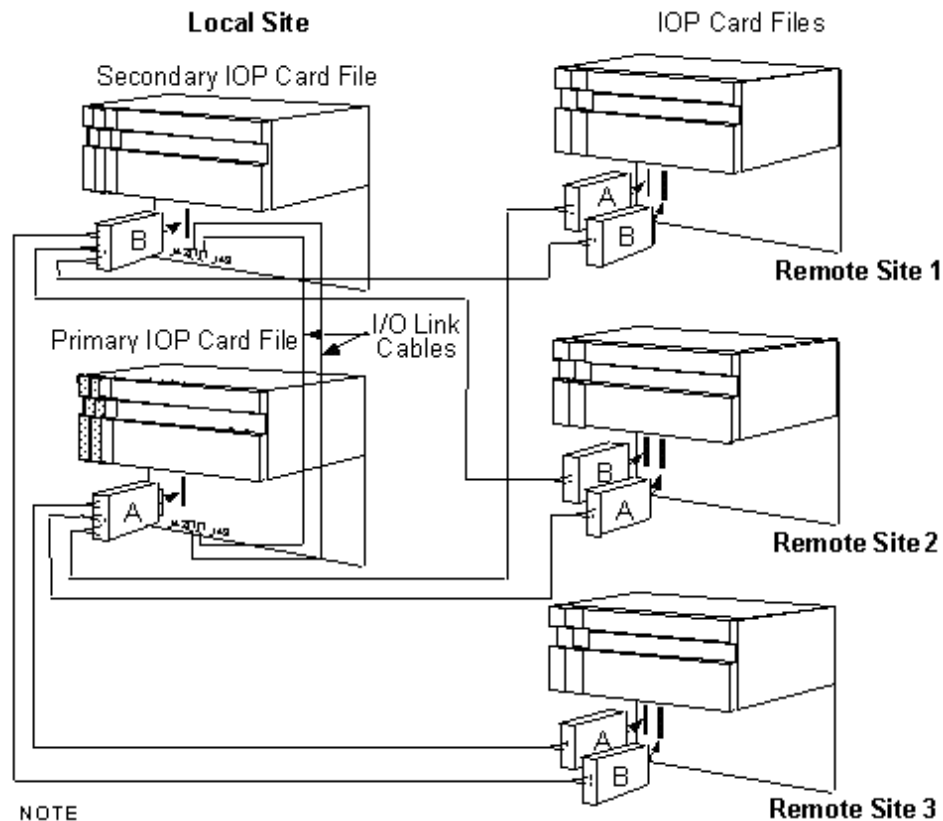
Note: The following PM I/O subsystem configuration is assumed.

1. The local IOP card file is configured as card file #1, (I/O link address of 0).
2. Remote Site #1's IOP card file is configured as card file #2, (I/O link address of 1).
3. Remote Site #2's IOP card file is configured as card file #3, (I/O link address of 2).
4. Remote Site #3's IOP card file is configured as card file #4, (I/O link address of 3).

Redundant installation example

In the case of separate redundant IOP card files, where Link A is installed in the primary IOP card file and Link B is installed in the secondary IOP card file, the I/O links must use the same slot in both card files as illustrated in the following figure.

Figure 8 Standard I/O Link Extender Interconnections with Redundant IOPs



The following PM I/O subsystem configuration is assumed.

1. The primary IOP card file is configured as card file #1, (I/O link address of 0).
2. The secondary IOP card file is configured as card file #2, (I/O link address of 1).
3. Remote Site #1's IOP card file is configured as card file #3, (I/O link address of 2).
4. Remote Site #2's IOP card file is configured as card file #4, (I/O link address of 3).
5. Remote Site #3's IOP card file is configured as card file #5, (I/O link address of 4).

I/O link extender card installation and link termination

Both I/O Link A and Link B are terminated at only one end of the link. For IOP card files that are connected locally, the IOP card file at the end of the local I/O link provides the termination. The 15-slot IOP card file does not have any termination because the metallic I/O link cables normally provide a connection to the terminators at the IOP card file end of a link. When a card file is located remotely by a fiber optic link, the connection to the terminators is not available.

To provide termination at the remote end of a link, the I/O Link Extender card has jumper selectable terminators available. The **LINK TERMINATION** jumper, **J2**, has two positions, “**IN**” and “**OUT**.” See the following figure for the location of the jumper on the standard I/O Link Extender card.

Link A and Link B selection is determined by the IOP card file I/O link address and the card slot number of the installed I/O link extender card.

Follow the procedure to set the Link Termination jumper on the Standard I/O link extender card and install it in the IOP card file.

Step	Action
1	On the I/O link extender card to be installed in the local IOP card file end of the link, set jumper J2 to the “ OUT ” position. See the following figure for location.
2	Install the I/O link extender card into the proper slot of the local IOP card file.
3	Repeat steps 1 and 2 for all I/O link extender cards to be installed in the local IOP card file(s).



ATTENTION

For nonredundant configurations

If I/O link extender cards for both Link A and Link B are to be installed in the same IOP card file, the cards are normally installed in adjacent card file slots. For example, link extender cards for Link A and Link B are installed in Slots 3 and 4 of the IOP card file.

For redundant configurations

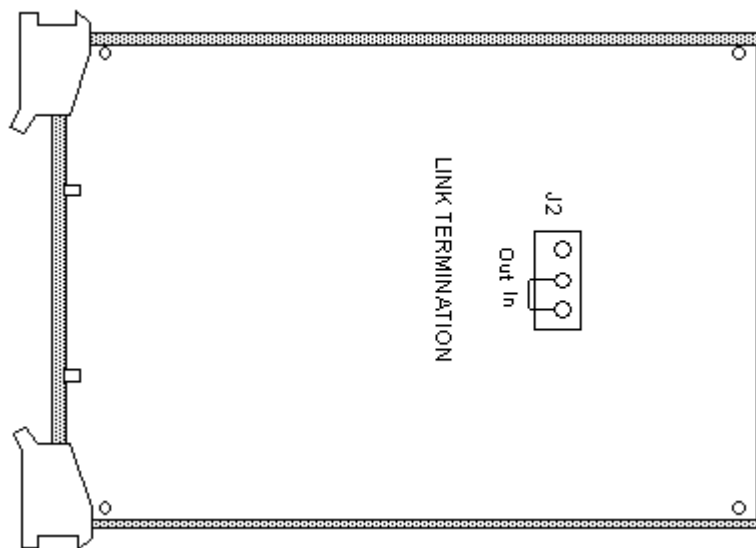
Where Link A is installed in one IOP card file and Link B is installed in the other IOP card file, the same card slot must be used in both card files. For example, link extender card for Link A is installed in Slot 3 of the primary IOP card file therefore Link B must also be installed in Slot 3 of the secondary IOP card file.

4	On the I/O link extender card to be installed at the remote end of the link, set

Process Manager I/O Installation and Wiring

Installing Remote I/O

Step	Action
	jumper J2 to the "IN" position. See the following figure for jumper location.
5	Install the IO link extender card into the proper slot of the remote IOP card file.
6	Repeat steps 4 and 5 for all I/O link extender cards to be installed in the remote IOP card file(s).



- Move jumper J2 to "Out" if this I/O Link Extender card is used in the local IOP card file.
- Move jumper J2 to "In" if this I/O Link Extender card is used in the remote card file.
- LINK A or LINK B selection is determined by the slot/card file position.

Standard I/O Link Extender Card Termination Jumper

Link A and link B selection

The card slot number and the IOP card file link address in which the I/O link extender card/Fiber optic coupler module set is installed determines whether the I/O link extension is driving Link A or Link B. The card file is assigned an I/O link address number by configuration.

- If the I/O link address of the IOP card file and the card slot number are both an odd or even number, the IOP will drive Link A. (For example: A I/O Link extender card is inserted into card slot 6 of the IOP card file that has an I/O link address of 4 will drive Link A.)
- If the IOP card file link address and card slot number of the link extender card are different, (i.e. the numbers are odd and even), the extender card will drive Link B. Both ends of the link must have the same link designation (A or B) when connecting the fiber optic cable.

After installation of the link and upon applying power to the equipment, the link selection is indicated by one of two LEDs on the front of the fiber optic coupler module housing.

I/O Interface cable installation



ATTENTION

A metallic I/O Link Interface cable is required between redundant IOP card files for communications with the IOP card slots in the secondary IOP card file.

The metallic I/O link interface cable connects the primary IOP card file and the associated secondary IOP card file in a redundant installation. The cable is a three-conductor shielded cable. The CE compliant interface cable (part number 51204042-xxx) and the CE non-compliant cable (part number 51195479-xxx) are ordered in pairs. Two cables are provided when ordered by the part number.

See Installing I/O Link Interface Cable for instructions

Fiber optic coupler module installation

Two fiber optic coupler modules are required at each end of the I/O link extension on the IOP card file backpanel, one for Link A and one for Link B. The couplers must be installed in the connector that is located directly under the card slot that contains the I/O Link Extender card. The fiber optic coupler modules are labeled "A" and "B" in the examples in Figure 7 and Figure 8.

CE compliance

When installing fiber optic coupler modules in CE Compliant card files, (models MU-IOFX03, MU-PMFX03, or MU-PMFR03), an I/O link extender adapter kit, (model MU-ILES01) must be used.

Two couplers types

A choice of two fiber optic coupler module types is available for use with standard I/O link extenders, a single interface and a triple interface coupler. Depending on the application, the appropriate fiber optic coupler module is selected that can interface one, two, or three fiber optic cables. Figure 7 shows an example application of a triple interface coupler in a nonredundant configuration. A single interface fiber optic coupler module is used as the remote terminating fiber optic coupler module.

Follow the procedure to install the fiber optic couplers for your application.

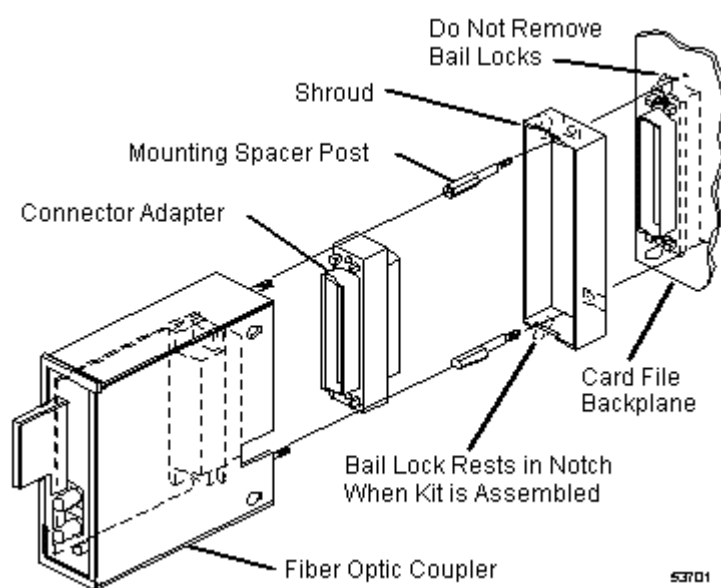
Step	Action
1	Locate the correct fiber optic coupler (single interface or triple interface) for the associated link.
2	Locate the correct card slot connector on the IOP card file backpanel associated with the slot where the I/O link extender card is installed.
3	If required for CE compliance, assemble and install an I/O link extender adapter kit onto the slot connector as shown in Figure 9. Do not remove the connector bail locks and tighten the mounting spacers securely. Do not over tighten
4	Install the fiber optic coupler onto the slot of the IOP card file and secure with mounting screws.

I/O link extender adapter kit

The I/O link extender adapter kit consists of a connector adapter, shroud, and mounting spacers as illustrated in Figure 9. The kit must be used because the card file's ground plate prevents the fiber optic coupler module from seating in the backpanel connector.

If required for your application, assemble the fiber optic coupler module and adapter kit as shown in the following figure.

Figure 9 I/O Link Extender Adapter Kit



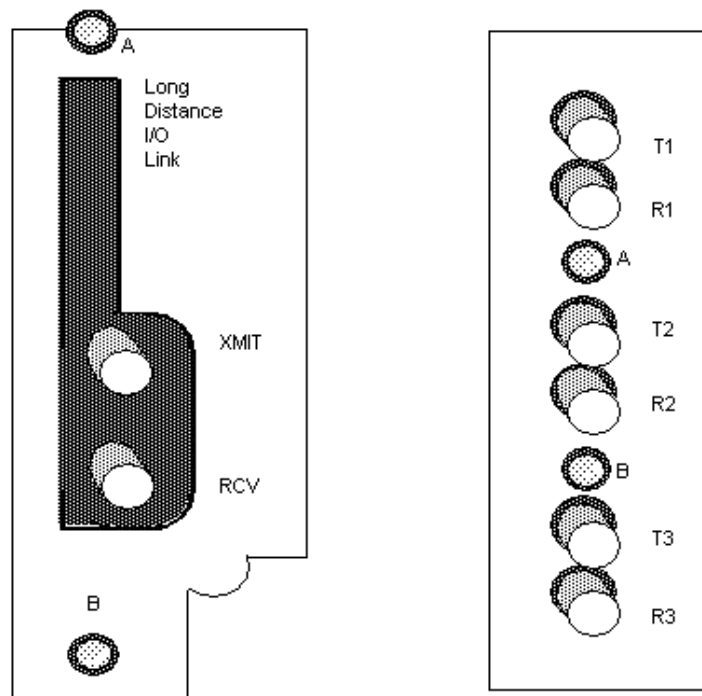
Fiber optic cable installation

The fiber optic cable is installed by a contractor that is specialized in splicing, installing and servicing fiber optic cable systems. Contact a qualified contractor for cable installation.

Installation Requirement

The maximum difference in fiber optic cable length between Link A and Link B must be less than 500 meters (1640 feet) to limit the communications delay difference between Link A and Link B.

The fiber optic cable has multiples of two 62.5 micron fibers for each connection. Connection to the fiber optic cable is accomplished by ST-type connectors. Because the links are duplex and a separate fiber is required for transmit and receive, a pair of ST-type connectors are used at each end of the fiber link which connect to the front of the fiber optic coupler module. See the following figure. Labeling on the front of the fiber optic coupler module housing identifies each pair connection. **T1** (Transmit) and **R1** (Receive) are the first pair and where applicable, **T2** and **R2**, and **T3** and **R3**, are the second and third pairs, respectively. Two LEDs (marked A and B) will indicate the active link once power is applied. See the following figure for a front view of the triple interface fiber optic coupler module.



Fiber Optic Couplers Front View

After fiber optic cable Installation

Following the installation of the cable, the contractor should be required to perform and pass an Optical Time Domain Reflectometer (OTDR) test. This test will pinpoint kinks in the cable or damaged cable areas.

When the OTDR Test has been finished and the cable is ready to be connected to the fiber optic coupler module transmitters, a measurement of all the fiber optic transmitters should be taken. Record these measurements and retain them as a permanent record. After the cable has been connected to the transmitter, record the power measured at the receiver end of the cable.

The Power loss measurement must be at least -24 db for the standard and -29 db for the long distance fiber optic link. See Signal Loss Budget for the Loss Budget calculation in the *Planning Guide*.

The following equipment can be used to measure the power level of the transmitters and the cable loss.

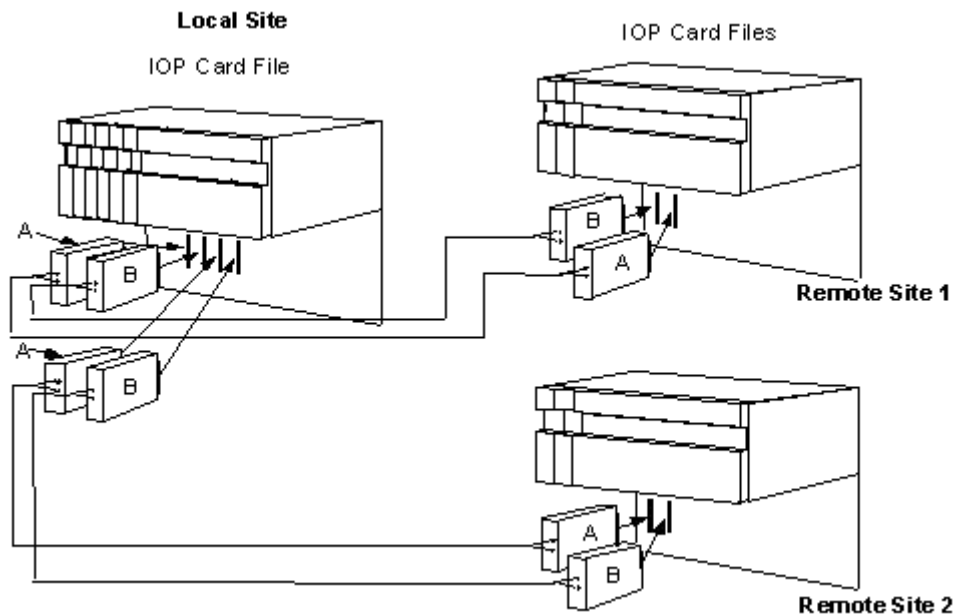
- Hewlett Packard Model 8152A - Optical Average Power Meter
- Hewlett Packard Model 81520A - Optical Head
- Hewlett Packard Model 81000VA - ST Connector Adapter
- Intelco Model 131 Meter
- Intelco Model 2510 ST Adapter
- Laser Precision AM-3500 Meter (specify ST Adapter when ordering)
- Photodyne Model 17XT - Optical Power Meter
- Photodyne Model 2041 - ST Adapter Cap
- Tektronics Model 2815 Optoscope (Specify Option 27 to get ST connectors)

Long distance I/O link extender

Long distance I/O link extender cards are used when locating IOP card files and their associated FTAs greater than 1.3 kilometers (4000 feet) and up to 8 kilometers (5 miles) from a local site. Two I/O link extender cards and their associated fiber optic coupler modules are required at each end of the I/O link extension, one for Link A and one for Link B. The links are normally installed in adjacent card file slots as illustrated in the following figures. The fiber optic coupler modules are labeled A and B in the following figure.

Nonredundant installation example

The following figure illustrates a nonredundant IOP installation.



Note: The following PM I/O subsystem configuration is assumed.

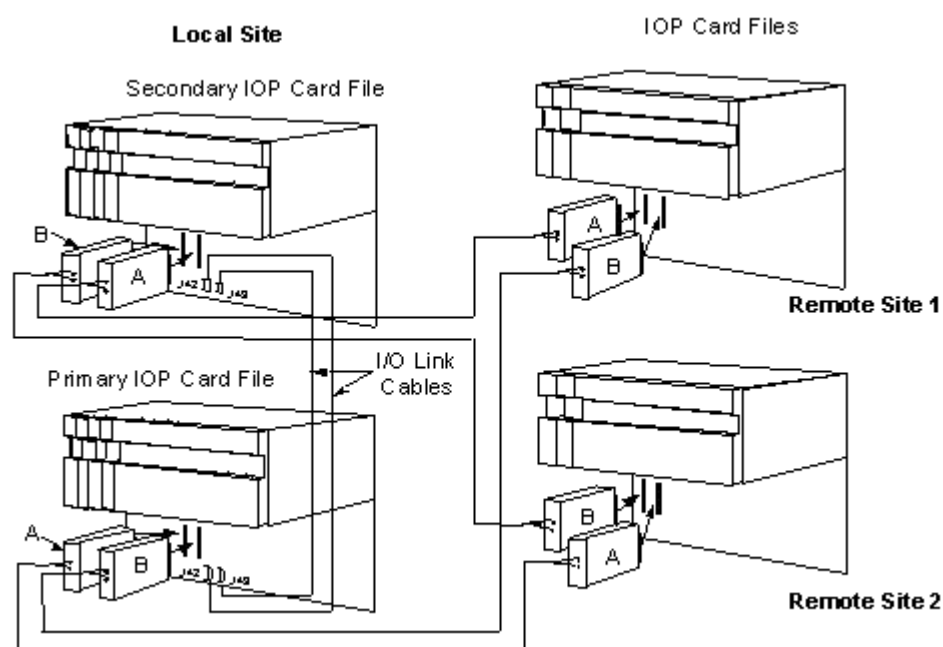
1. The local IOP card file is configured as card file #1, (I/O link address of 0).
2. Remote Site #1's IOP card file is configured as card file #2, (I/O link address of 1).
3. Remote Site #2's IOP card file is configured as card file #3, (I/O link address of 2).

Long Distance I/O Link Extender Interconnections with Nonredundant IOPs

Redundant IOP installation

In the case of separate redundant IOP card files, where Link A is installed in the primary IOP card file and Link B is installed in the secondary card file, the I/O links must use the same slot in both card files as illustrated in the following figure.

The following figure illustrates a redundant IOP installation.



Note: The following PM I/O subsystem configuration is assumed.

1. The primary IOP card file is configured as card file #1, (I/O link address of 0).
2. The secondary IOP card file is configured as card file #2, (I/O link address of 1).
3. Remote Site #1's IOP card file is configured as card file #3, (I/O link address of 2).
4. Remote Site #2's IOP card file is configured as card file #4, (I/O link address of 3).
5. Remote Site #3's IOP card file is configured as card file #5, (I/O link address of 4).

Long Distance I/O Link Extender Interconnections with Redundant IOPs

I/O link extender card installation, link selection and link termination

Both I/O Link A and Link B are terminated at only one end of the link. For IOP card files that are connected locally, the IOP card file at the end of the local I/O link provides the termination. The 15-slot IOP card file does not have any termination because the metallic I/O link cables normally provide a connection to the terminators at the IOP card file end of a link. When a card file is located remotely by a fiber optic link, the connection to the terminators is not available.

To provide termination, the I/O link extender card has jumper selectable terminators available. The **LINK TERMINATION** jumper, **J3**, has two positions, **“IN”** and **“OUT.”** See the following figure for the location of the jumper on the Long Distance I/O Link Extender card.

Link A and B selection is determined by jumper selection on the I/O link extender card. See the following figure.

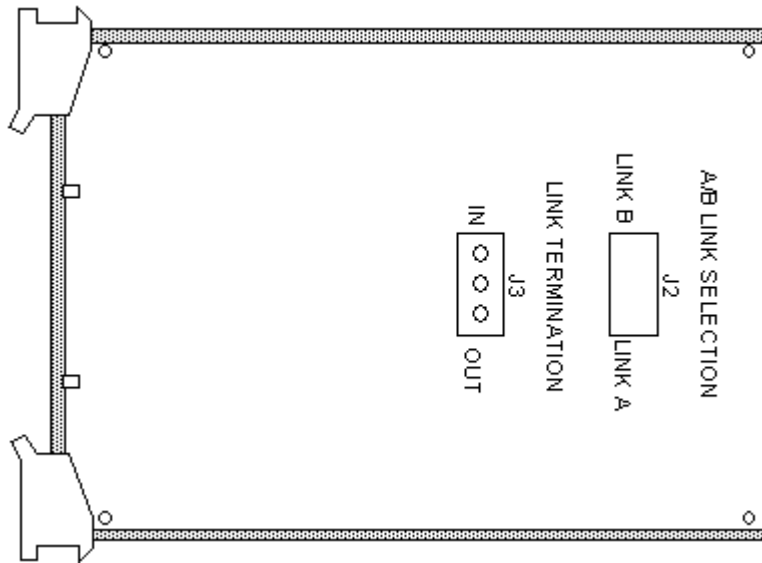
Follow the procedure to set the Link Termination and Link Selection jumpers on the Long Distance IO link extender card and install it in the IOP card file.

Step	Action
1	On the I/O link extender card to be installed at the local end of the fiber optic link, set the jumper J3 to the “OUT” position. See the following figure for location.
2	Set jumper J2 to the correct Link (A or B) to be supported by the I/O link extender card.
3	Install the IO link extender card into the proper slot of the local IOP card file.
4	Repeat steps 1 through 3 for all I/O link extender cards to be installed in the local IOP card file(s).

Step	Action
	ATTENTION For nonredundant configurations If I/O link extender cards for both Link A and Link B are to be installed in the same IOP card file, the cards are normally installed in adjacent card file slots. For example, link extender cards for Link A and Link B are installed in Slots 3 and 4 of the IOP card file. For redundant configurations Where Link A is installed in the primary IOP card file and Link B is installed in the secondary IOP card file, the same card slot must be used in both card files. For example, link extender card for Link A is installed in Slot 3 of the primary IOP card file and Link B must also be installed in Slot 3 of the secondary IOP card file.
5	On the I/O link extender card to be installed at the remote end of the fiber optic link, set jumper J3 to the “ IN ” position. See the following figure.
6	Set jumper J2 to the correct Link (A or B) to be supported by the I/O link extender card.
7	Install the IO link extender card into the proper slot of the remote IOP card file.
8	Repeat steps 5 through 7 fro all I/O link extender cards to be installed in the remote IOP card file(s).

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- Set jumper J3 to "OUT" if the link extender card is to be installed in a local IOP card file
- Set jumper J3 to "IN" if the link extender card is to be installed in a remote IOP card file. (Shelf/stock position is "IN".)
- Set jumper J2 to the proper Link A or Link B.

Long Distance I/O Link Extender Card Termination Jumper

I/O Interface cable installation



ATTENTION

A metallic I/O Link Interface cable is required between redundant IOP card files for communications with the IOP card slots in the secondary IOP card file.

The metallic I/O link interface cable connects the primary IOP card file and the associated secondary IOP card file in a redundant installation. The cable is a three-conductor shielded cable. The CE compliant interface cable (part number 5120402-xxx) and the CE non-compliant cable (part number 51195479-xxx) are ordered in pairs. Two cables are provided when ordered by the part number.

See [Installing I/O Link Interface Cable](#) for instructions

Fiber optic coupler module installation

Two fiber optic coupler modules are required at each end of the I/O link extension, one for Link A and one for Link B. The couplers must be installed in the connector that is located directly under the card slot that contains the I/O Link Extender card. The fiber optic coupler modules are labeled "A" and "B" in the previous figures showing [Long Distance I/O Link Extender](#) Interconnections.

There is one type of fiber optic coupler module associated with the long distance I/O extender card and it accommodates a single fiber optic link. Additional I/O link extender cards and associated fiber optic coupler modules can be installed to increase the number of fiber links.

Follow the procedure to install the fiber optic couplers for your application.

Step	Action
1	Locate the correct fiber optic coupler for the associated link.
2	Locate the correct card slot connector on the IOP card file backpanel associated with the slot where the I/O link extender card is installed.
3	If required for CE compliance, assemble and install an I/O link extender adapter kit onto the slot connector as shown in Figure 9. Do not remove the connector bail locks and tighten the mounting spacers securely. Do not over tighten
4	Install the fiber optic coupler onto the slot of the IOP card file and secure with mounting screws.

Fiber optic cable installation

The fiber optic cable is installed by a contractor which is specialized in splicing, installing and servicing fiber optic cable systems. Contact a qualified contractor for cable installation

Installation requirements

- It is recommended that spares be included in the fiber optic cable installation. The cost of additional fibers is small compared to cable replacement; therefore a sufficient number of spares should be specified.
- The maximum difference in fiber optic cable length between Link A and Link B must be less than 500 meters (1640 feet)

Process Manager I/O Installation and Wiring

Installing Remote I/O

- The cable must have a total signal loss of no more than -5.5 db at 850 nanometers for the standard and -19 db at 1300 nanometers for the long distance fiber optic link to meet the minimum Loss Budget. See the *Planning* manual for the Loss Budget calculation.

The fiber optic cable has multiples of two 62.5 micron fibers for each connection. Connection to the fiber optic cable is accomplished by ST-type connectors. Because the links are duplex and a separate fiber is required for transmit and receive, a pair of ST-type connectors is required at each end of the fiber link which connect to the front of the fiber optic coupler module. The front of the coupler housing identifies the connections as **XMT** (transmit) and **RCV** (receive). Two LEDs (marked A and B) will indicate the active (selected) link once power is applied. See previous front view of the Long Distance fiber optic coupler module.

After fiber optic cable Installation

Following the installation of the cable, the contractor should be required to perform and pass an Optical Time Domain Reflectometer (OTDR) test. This test will pinpoint kinks in the cable or damaged cable areas.

When the OTDR Test has been finished and the cable is ready to be connected to the fiber optic coupler module transmitters, a measurement of all the fiber optic transmitters should be taken. Record these measurements and retain them as a permanent record. After the cable has been connected to the transmitter, record the power measured at the receiver end of the cable.

The Power loss measurement must be at least -24 db for the standard and -29 db for the long distance fiber optic link. See Signal Loss Budget for the Loss Budget calculation in the *Planning Guide*.

The following equipment can be used to measure the power level of the transmitters and the cable loss.

- Hewlett Packard Model 8152A - Optical Average Power Meter
- Hewlett Packard Model 81520A - Optical Head
- Hewlett Packard Model 81000VA - ST Connector Adapter
- Intelco Model 131 Meter
- Intelco Model 2510 ST Adapter
- Laser Precision AM-3500 Meter (specify ST Adapter when ordering)
- Photodyne Model 17XT - Optical Power Meter
- Photodyne Model 2041 - ST Adapter Cap
- Tektronics Model 2815 Optoscope (Specify Option 27 to get ST connectors)

Installing Power Systems

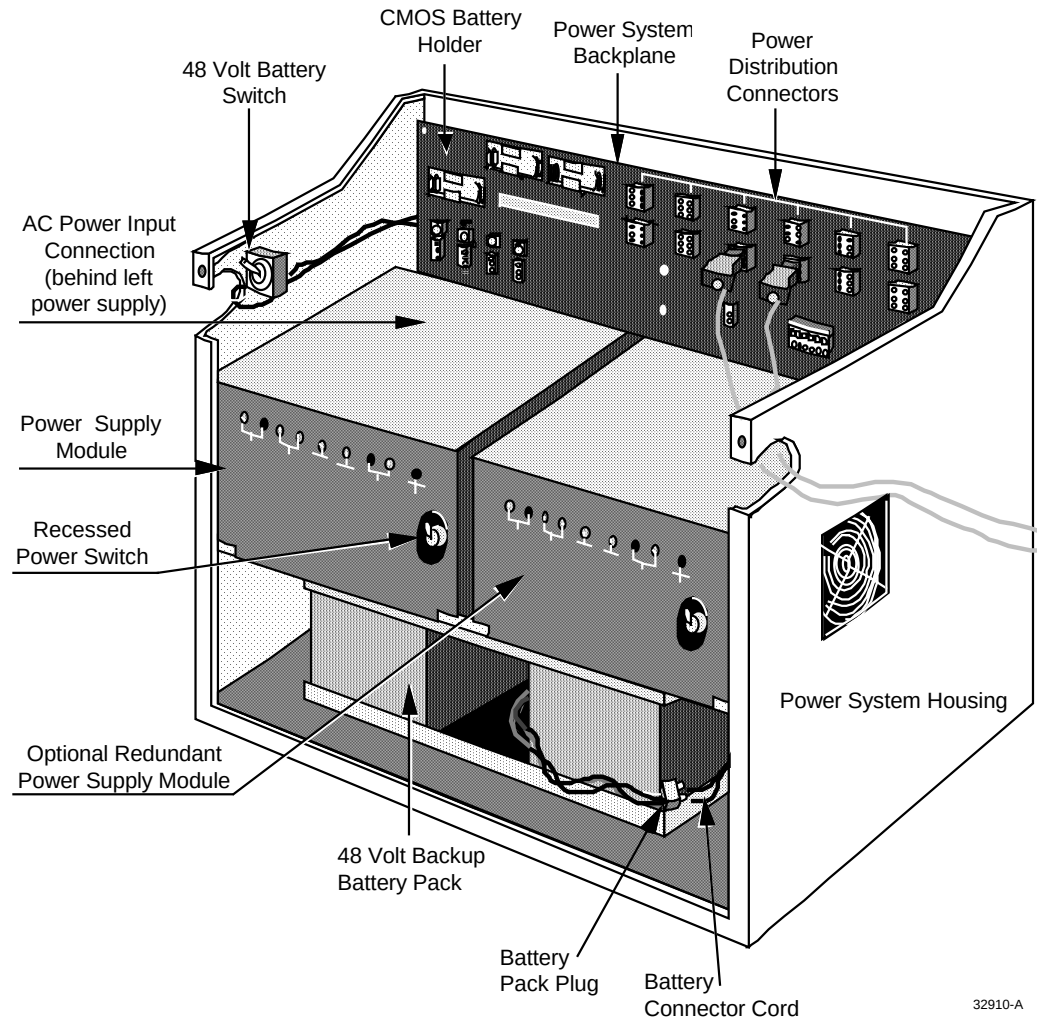
Power system load requirements

Each Power System's load requirements must be examined as a function of the options that are installed in the Process Manager I/O subsystem. These demands are discussed in the *Planning Guide*; see Planning for Process Manager I/O Power Requirements

The following two types of power systems are available to power IOP subsystems.

- Standard Power System - Provides up to 20 amperes of 24 Vdc power. Options include 48 Vdc Battery Backup module feature and rechargeable NiCad CMOS memory backup power.
- AC Only Power System - Offers optional 8- or 16-ampere redundant 24 Vdc power

By calculating the total current requirement, you can determine how many Power Systems are required. If more than one Power System is required, it may be desirable to connect each control cabinet to a separate power system. It may also be desirable to connect the "A" IOP and "B" IOP of a redundant pair to separate power systems. The following figure illustrates the various power system components and features.



PM I/O Power System Components

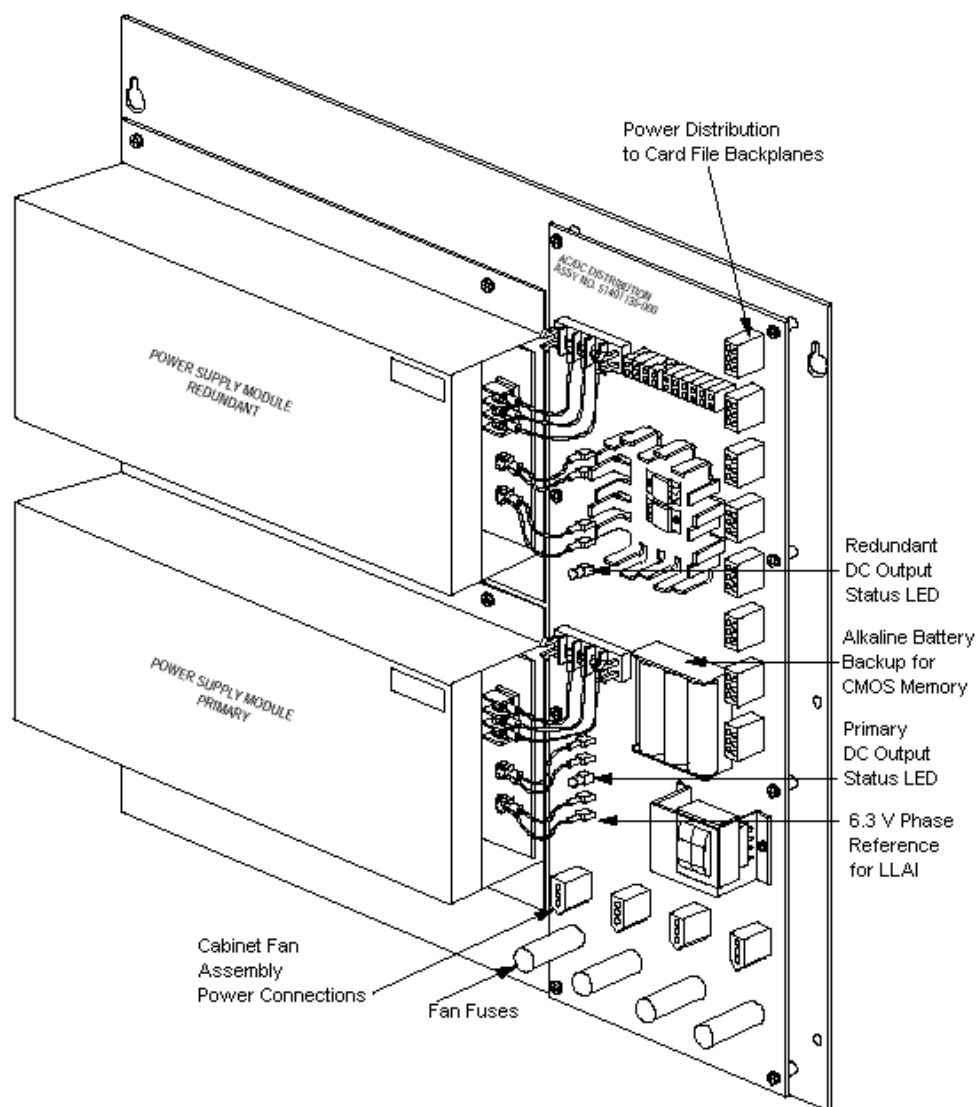
AC only power system

The AC Only Power System shown in the following figure offers optional 8- or 16-ampere redundant Power Supply Modules, but does not offer the optional 48 Vdc Battery Backup module feature and rechargeable NiCad CMOS memory backup power.

Process Manager I/O Installation and Wiring

Installing Power Systems

Alkaline batteries are used instead of rechargeable NiCad batteries for CMOS data retention.



AC Only Optional Power System

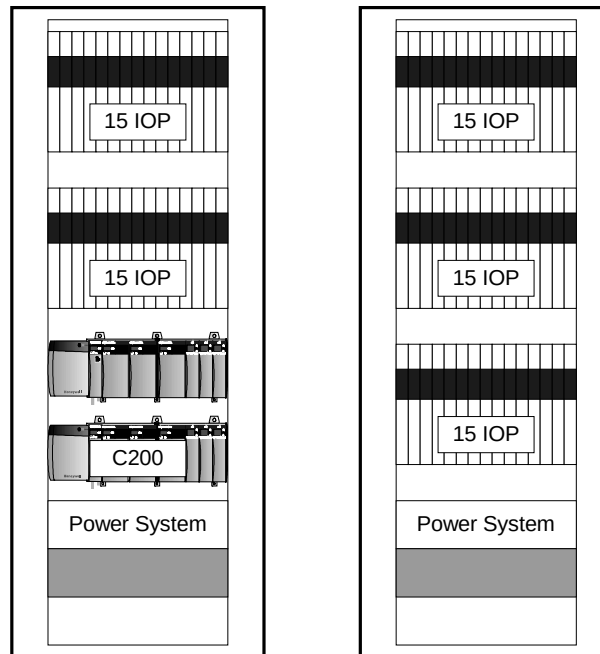
Provide adequate power

Generally, power for a subsystem with up to 35 IOPs can be adequately provided by one power system. A subsystem with redundant I/O may need additional power systems. The power calculation is made using the information provided in Appendix E of the *Planning Guide*.

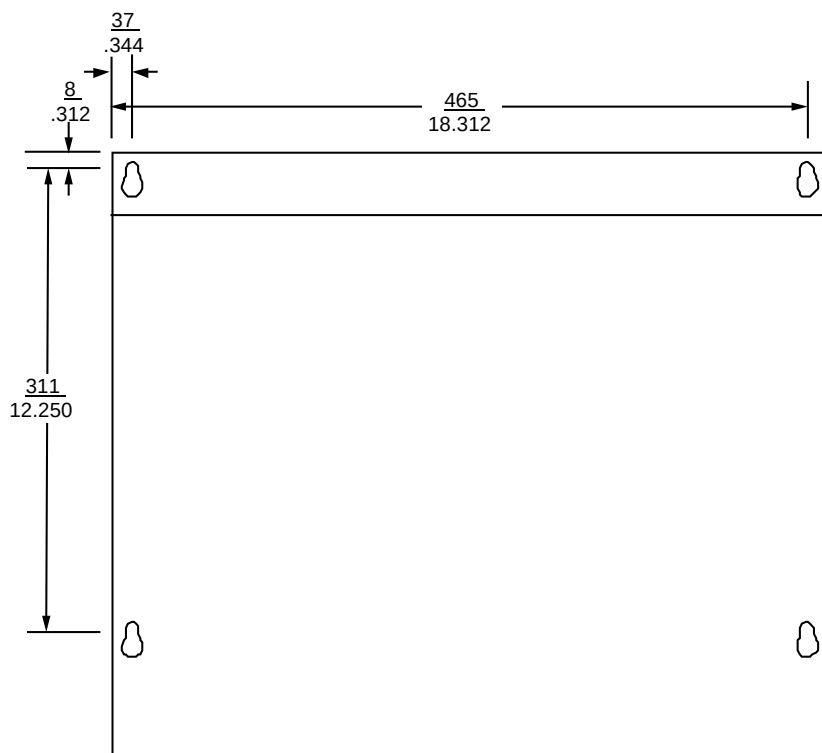
Subsystems with either remote I/O, or remote cabinets containing one or more IOP card files must be self-contained with at least one power system.

Mounting location

Mounting of the power system in the I/O cabinet is typically at the bottom as shown in the following figure. Your application may dictate power system installation at a different location inside the cabinet. Check your site documentation to verify installation. Mounting dimensions for the power system are shown in the second figure below.



Typical PM I/O Cabinet layouts



Note: Dimensions are in millimeters/inches.

2818

Power System Installation Dimensions

Follow the steps to install the power system in the control cabinet.

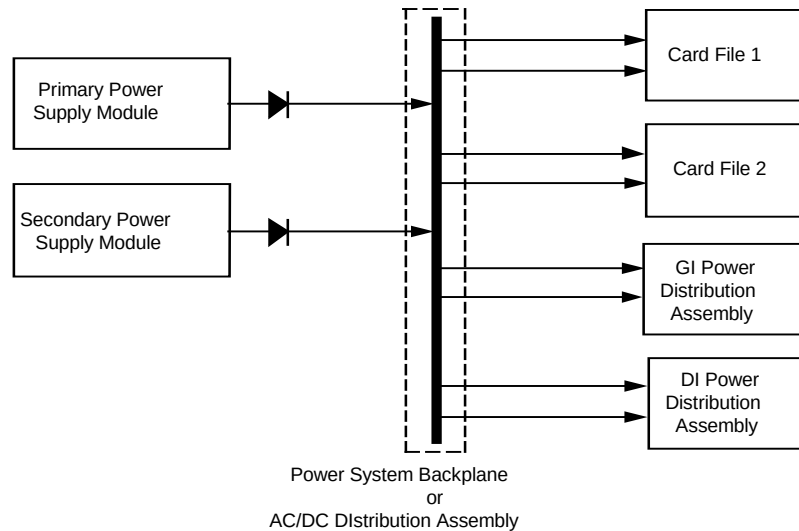
Step	Action
1	Consult site documentation. Locate the power system and the correct cabinet location for the installation.
2	Position the power system assembly inside the cabinet. Line up the mounting holes of the power system shelf with the holes in the cabinet.
	TIP Since the power system is heavy, you may need to support the power system using wood blocks in order to hold it in position.

Step	Action
3	Mount the power system to the equipment rack in the cabinet. Secure with screw hardware.
4	If not installed already, proceed to mount all process controller chassis, IOP card files, FTAs, and power distribution assemblies to be installed in the cabinet. Refer to the site documentation and appropriate installation procedures.

Power distribution

The following figure illustrates typical DC power distribution from the power system backpanel to PM I/O hardware components.

To improve reliability, 24 Vdc, 3.6 Vdc, and 6 Vac power distribution to the IOP card files is always provided by two power distribution cables.



6569

Typical Cabinet 24 Vdc Power Distribution

All PM assemblies that require 24 Vdc power contain two input connectors for redundancy. A pair of power distribution cables is used to provide power from the power system to IOP card files, digital input power distribution assemblies, and galvanically

isolated power distribution assemblies. See *Planning Guide* for part numbers of power distribution cables for CE compliant and CE non-compliant installations.

Power distribution backpanel, Model MU-PSRX04

There are twelve 24 Vdc power distribution output connectors (labeled OUTPUT 1 through OUTPUT 12), four Cabinet Fan Assembly power connectors with associated fuse holders, and a NiCad battery holder on the backpanel. Sets of terminals provide alarm signals (for external alarm mechanisms) from each Power Supply Module and the CMOS Battery Backup. The alarm signals are normally wired in series to a 24 Vdc Digital Input FTA to notify the system when a power supply module fails. The following figure illustrates the power distribution backpanel features.

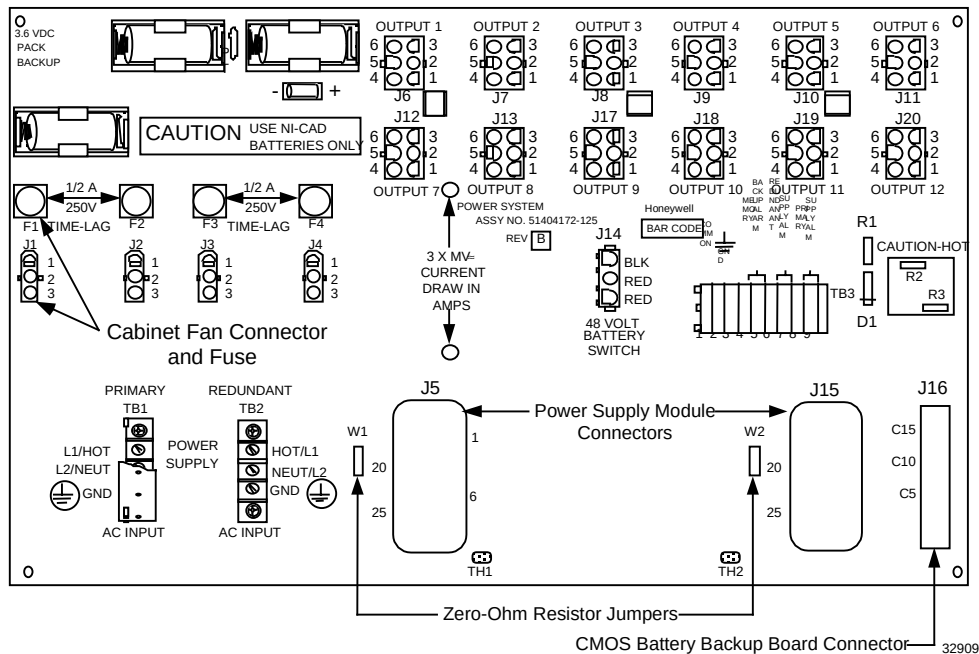


Figure 10 Model MU-PSRX04 Power Distribution Backpanel Features

Cable Installation

Installation guidelines

After mounting the power system, IOP card files, FTAs and other hardware assemblies in the cabinet, you can install interconnecting cables to and from the PM I/O components.

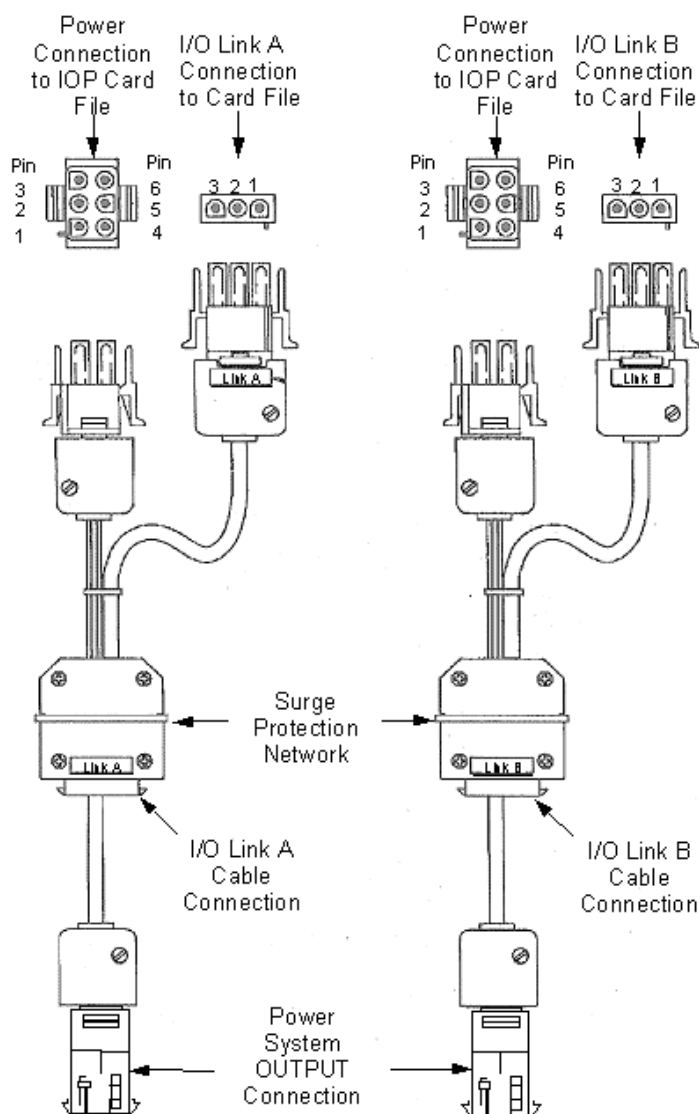
- Cables should be routed within the cabinet, or cabinet complex from one connection point to its destination point.
- Adhere to the wire and cable routing guidelines when wiring FTAs installed in mounting channels.
- If cables are routed from a cabinet to an external destination, use shielded cables. Check your site documentation for cable types and model/part number.
- Allow sufficient cable lead at the connection points for installation and cable dress.

Installing Power Cables

Power cables for IOP

The power cables that are available for use in a PM I/O subsystem have an integrated surge protection network as part of the cable. The network protects the I/O link interface transceivers from power surges when each I/O link interface cable is routed through a protection network at the card file. For this feature to be effective, all card files in the subsystem (for example, a subsystem being all the IOP card files that are connected to the IOLIM through the metallic I/O link interface cable) must have the surge protection network feature installed. The following figure shows the construction of a pair of power cables with the power surge protection network.

Figure 11 Power Cable with I/O Link Protectors



Refer to Power Cables for IOPs in the *Planning Guide* for cable models and part numbers for CE compliant and CE non-compliant installations.

Procedure

Follow the steps below to install the power cables to the PM cabinet components.

It is assumed for this procedure that all components are in an unpowered state.

Step	Action
1	Check site documentation for power cable installation of PM control cabinet components.
2	Install power cable by first connecting the six-pin connector to the OUTPUT connector on the power system backpanel. See Figure 10 for the location of the connectors.
3	Route the cable to the appropriate IOP card file and connect the six-pin connector to the POWER A connector on the card file backpanel. See Figure 12 for the location of the connectors.
4	Repeat steps 1 through 3 to install the redundant power cable from the power system backpanel to the POWER B connector on the IOP card file.
5	Repeat steps 1 through 4 for all remaining IOP card files in the control cabinet.

Fifteen-Slot IOP Card File Backpanel Connections

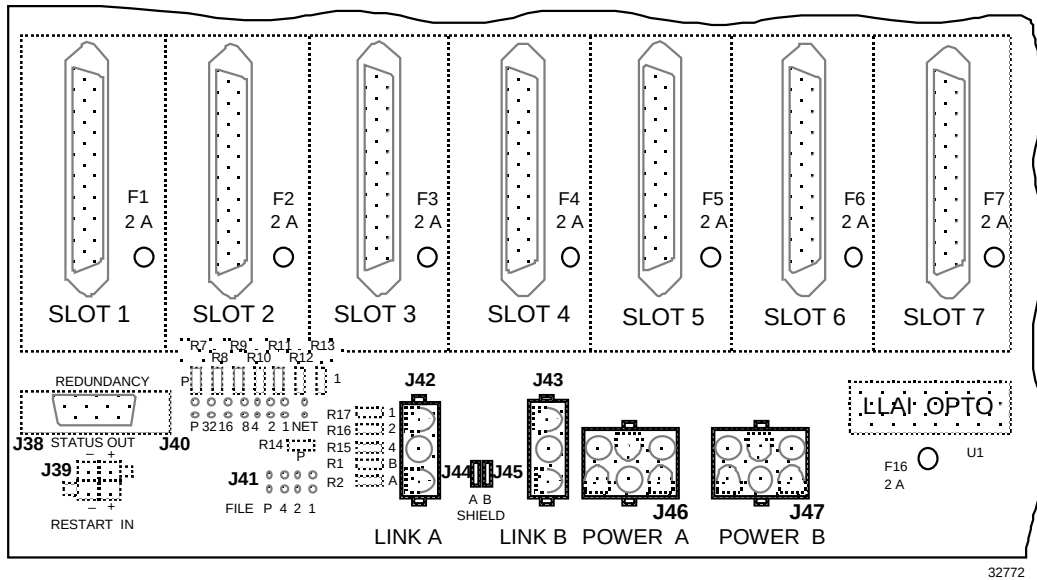


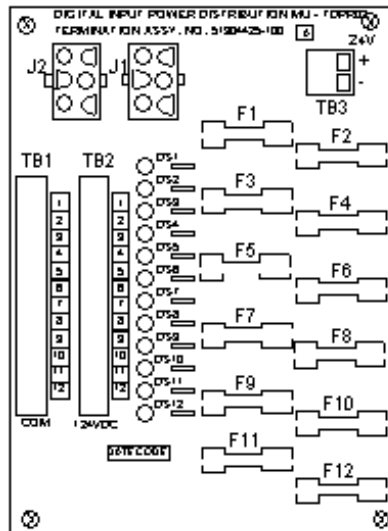
Figure 12 Fifteen-Slot IOP Card File Backpanel Connections

Power cables for power distribution assemblies

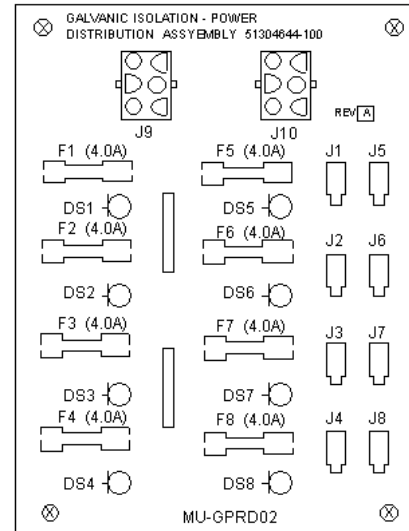
A pair of power cables supply 24 Vdc from the power system to both Digital Input Power Distribution Assemblies and Galvanically Isolated Power Distribution Assemblies. These power cables do not have surge protection. . If cables are routed from a cabinet to an external destination, use the shielded model of the cable. Check your site documentation for cable models, or see Power Cables for IOPs in the *Planning Guide* for power cable part numbers for CE compliant and CE non-compliant installations. Follow the steps below to install the power cables to power distribution assemblies

Step	Action
1	Check site documentation for power cable installation of PM control cabinet components.
2	Install power cable by first connecting the six-pin connector to the OUTPUT connector on the power system backpanel. See Figure 10 for the location of the connectors.
3	Route the cable to the appropriate power distribution assembly and connect the six-pin connector to the connector on the assembly. See the following figures for connector location.
4	Repeat steps 1 through 3 to install the redundant power cable from the power system backpanel to the power distribution assembly connector.
5	Repeat steps 1 through 4 for all remaining power distribution assemblies in the control cabinet.

Power Distribution Assemblies



Digital Input



Galvanically Isolated

Installing I/O Link Interface cable

The I/O Link Interface is a dual serial communications link between IOP card files that are connected to a common IOLIM. If there is more than one card file, I/O link interface cables are daisy-chained to all IOP card files associated with the IOLIM. In a redundant installation, both primary and secondary IOP card files are connected to the IOLIM using I/O link interface cables. When installing remote I/O, all IOP card files at the local site, including both primary and secondary IOP card files in a redundant installation, are connected to the IOLIM using the interface cables.

Cabling Requirements

The metallic I/O link interface cable is a three-conductor shielded cable. Up to six IOP card files and IOLIMs can be connected to one I/O link interface. Since the files are daisy-chained, the cable should contain the appropriate number of drops (connectors) for the number of IOP card files and IOLIMs to be connected. See Spare Parts in the *Troubleshooting and Maintenance Guide* for available I/O link interface cable types and part numbers. Two cables are provided when ordered by the part number.

- Power cables should be installed first, before the I/O link interface cabling.
- I/O link interface cables are to be no longer than 10 m (33 feet) in total length and are not to leave the cabinet or cabinet complex.
- Two cables are required because the I/O link interface is redundant for reliability. One cable is designated **Link A** and the other **Link B**.
- The I/O link interface cabling does not involve external terminators and therefore an empty I/O link interface connector on the backpanel is acceptable.

CAUTION

Use caution when connecting the I/O link interface cables because of the differences between the 7-slot and 15-slot IOP card files. All card files have two I/O link interface connectors marked **LINKA** and **LINKB**.

The following table identifies the I/O link interface connectors on the 7-Slot, 15-Slot, IOP card file backpanels.

IOP Card File Connector Assignments for I/O Link Interface Cables

Card File Type	I/O Link A Connector	I/O Link B Connector
7-Slot	J23	J24
15-Slot	J42	J43

Power surge protection for the I/O link interface

An induced power surge can originate through an FTA's field connections as a result of a lightning strike. This power surge can be 10 amperes or greater and elevate the card file(s) above the common mode range of the I/O link interface transceivers to possibly cause transceiver failure.

To prevent this occurrence, a power cable was developed with an integrated surge protection network which filters the power surge on the I/O link interface to the power cable's ground before the I/O link interface connects to the card file.

Figure 11 illustrates a pair of surge protection network power cables identifying the connections for both Link A and Link B.

The I/O Link Interface connects to the surge protection network which is integrated with the power cable and then passes through the filter, which then connects to the card file. The method of implementing the surge protection is illustrated in Figure 13.

New and upgraded subsystems only

The surge protection network power cable is presently used in new production and newly upgraded hardware only. However, older hardware can and should be upgraded by the use of a set of power cable I/O link protector adapters, Honeywell part number 51204127-100. See Spare Parts in the *Troubleshooting and Maintenance Guide* for available I/O link interface cable types and part numbers.

I/O Link interface cables in adjacent cabinets

The I/O link interface cable daisy chain can be extended to include additional intermediate drops. Longer daisy chain runs from card file to card file in one cabinet can also include card files in an adjacent cabinet. I/O link interface cables with the appropriate number of drops must be ordered to satisfy your PM I/O subsystem configuration (number of card files). Refer to I/O Link Interface cables in the *Planning Guide* for a complete listing of available cables types and part numbers.

I/O Link interface cable installation

Follow the procedure to install the I/O interface cables with IOP card files.
Note that example describes I/O link interface cable installation to 15-slot IOP card files.

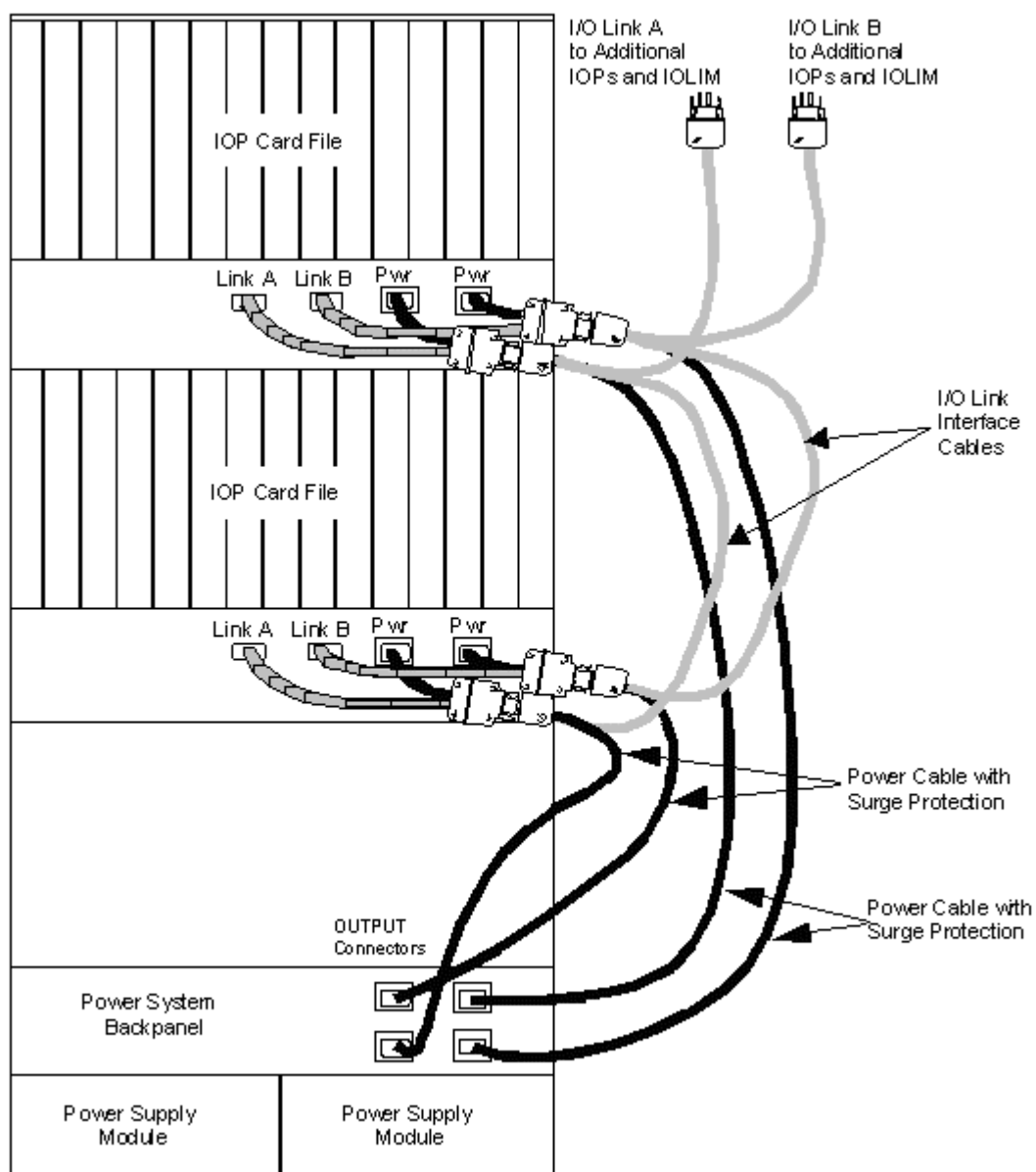
Step	Action
1	Consult site documentation to locate all IOP card files, both primary and secondary in a redundant installation, associated with an IOLIM.
2	Connect one end of an I/O interface cable to the surge protection network connected to <u>LINK A of the IOLIM</u> in the controller chassis.
3	Connect the next I/O interface cable drop (connector) to the surge protection network connected to J42 (LINK A) of the first IOP card file. The first IOP card file is usually located closest to the IOLIM or power system. See Figure 13.
4	Connect the I/O interface cable to all other associated IOP card files by connecting the cable to the surge protection network that is connected to the LINK A connection of the IOP card file backpanel.
5	Repeat steps 2 through 4 to install the I/O link interface cable to LINK B of the

Step	Action
	IOLIM and all associated IOP card files.
6	Repeat steps 1 through 5 for all remaining IOLIMs and associated IOP card files in the system.

Typical I/O Link and power cable connection

The following figure illustrates typical surge protection network power cable and I/O link interface cable connections to the Power System and card files in a cabinet.

Figure 13 Typical Cabinet I/O Link Interface Cable Connections



I/O Link interface cable shield grounding

Each I/O link interface cable (Link A and Link B) contains a cable shield that must be grounded.



ATTENTION

The IOLIM in the controller chassis contains jumpers that set the I/O interface cable shield ground. These jumpers are labeled B Shield and A Shield on the IOLIM and should be set accordingly. See [Setting I/O link interface cable shield ground](#).

For non-CE compliant applications, the cable shield for the I/O link interface cable should be grounded at only one point along the interface cable daisy chain. This is normally done on the backpanel of the first IOP card file (file position 1) in the first control cabinet (using jumpers on the backpanel).

- On a 7-Slot card file, J29 and J22 are located on the IOP card file backpanel between the I/O link interface cable connectors. Both the A and B I/O link interface cables have their own jumper for grounding the cable shield. J29 is for the Link A cable shield and J22 is for the Link B cable shield. The cable shield is grounded if the jumper is bridged across both pins.
- On the 15-Slot card file, J44 and J45 are located on the IOP card file backpanel between the I/O link interface cable connectors and accomplish the same function.

For CE Compliant applications, the I/O link interface cable shield must be grounded to the card file chassis (Safety Ground) at each connector. This is accomplished with shield wire that attaches to a FASTON terminal on the card file's backpanel ground plate. Only cables with a part number of 51204042-xxx can be used. See Spare Parts in the *Troubleshooting and Maintenance Guide* for available I/O link interface cable types and part numbers.



ATTENTION

The I/O link interface cable shield grounding must be carefully adhered to when installing a PM I/O subsystem. Failure to follow the above guidelines can result in unwanted ground loops that may cause I/O Link communications errors.

Follow the steps below to set the I/O link interface cable shield grounding.

Step	Action
1	Refer to site documentation to locate the IOLIM in the controller chassis and the associated IOP card files in the control cabinets.
2	Determine if this process control system is a • Non-CE compliant installation (Go to Step 3.) • CE compliant installation. (Go to Step 4.)
3	If the system is a non-CE compliant installation, • Locate the first IOP card file (file position 1) closest to the power system. Make sure that a jumper is present across both pairs of pins that are labeled J22 and J29 (7-slot card file) or J44 and J45 (<u>15-slot card file</u>). • Remove the jumpers from the shield ground pins of all other associated card files and the <u>IOLIM</u>.
4	If the system is a CE compliant installation, • Make sure that a jumper is present across both pairs of pins that are labeled J22 and J29 (7-slot card file) or J44 and J45 (15-slot card file). • Continue to insert the jumpers on the pins for each associated IOP card file. • Make sure the <u>IOLIM</u> also contains jumpers across the A Shield and B Shield pins.

Installing IOP to FTA Cables

It is up to the installer to make sure that the cabling from the IOP card file is connected to the appropriate FTA. Cable model MU-KFTAxx contains fifty-pin connectors at each end and it is used as the IOP to FTA cable. The cable comes in a variety of lengths up to 50 meters (164 feet). The "xx" in the suffix of the model number identifies the length of the cable in meters. Refer for Planning for Field Termination Assemblies (FTAs) in the *Planning Guide* for listing of IOP to FTA cable models and part numbers.

Follow the steps below to install the IOP to FTA cables.

Step	Action
1	Locate the connector for the IOP card that is directly below the IOP card slot. (Connectors are marked <u>SLOT 1</u> , <u>SLOT 2</u> , <u>SLOT 3</u> , etc., corresponding to the IOP card slot number.)
2	Make sure that cable (Model MU-KFTAxx) you are using is long enough to reach from the IOP card file connector to the FTA connector.
3	Install one end of the IOP – FTA cable onto the proper SLOT connector of the IOP card file. Use the bale locks to secure the cable. See Figure 12 and Figure 14 .
4	Route the cable to the appropriate FTA and install the cable onto J1. Secure the cable using the bale locks. *
5	Repeat steps 1 to 4 for all remaining IOP card and FTAs.

* On most FTAs, the J1 connector is for the IOP to FTA cable for primary IOPs. J2 connector is for the secondary IOP, if it is a redundant installation.

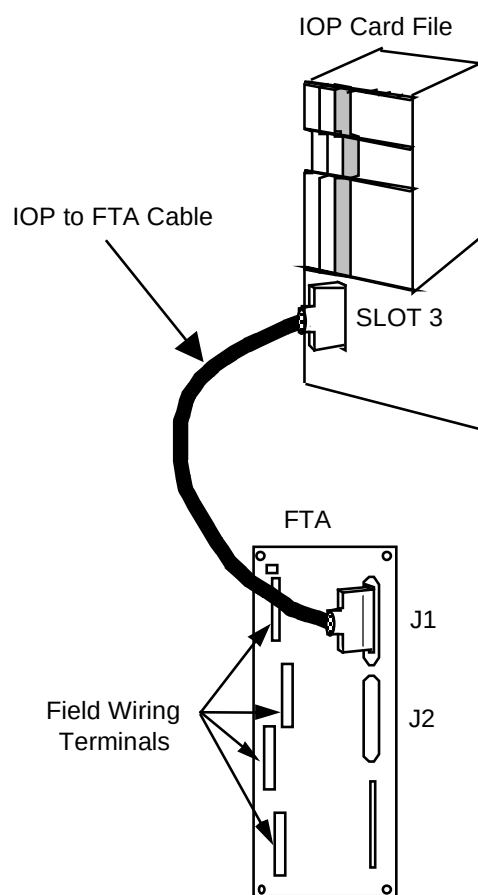


Figure 14 IOP to FTA Cabling

Appendix A – I/O Module Wiring Reference

Analog Input Module Wiring

TC-IAH061/TK-IAH061 – 6-point High-level analog input module



CAUTION

Please note that:

- applying 24 Vdc to the inputs is not recommended. Doing so may damage the module when the input transducer is shorted, or the field wiring is incorrectly connected, or momentarily shorted. It is recommended that you do not connect field wiring to this module until the wiring and the transducer(s) have been thoroughly checked.
- each input channel can be individually configured for voltage or current range. Be sure the channel range configuration is correct for the intended field wiring connection.
- when using this module for current inputs—
 - the voltage (V) and current (I) input terminals must be shorted together on the RTB for current inputs.
 - the internal 249 ohm input current shunt is rated at 0.25W. Do not exceed this rating.

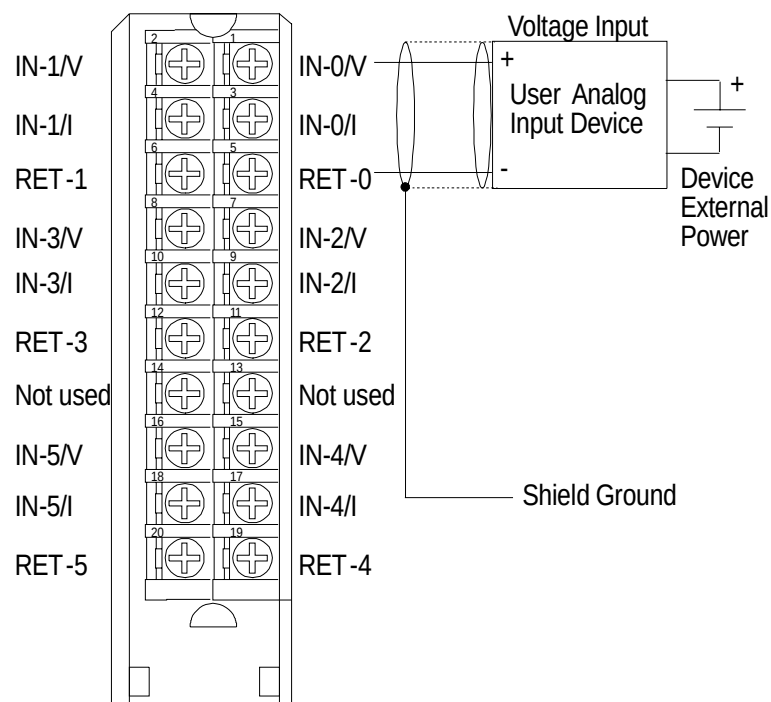
Appendix A – I/O Module Wiring Reference

Analog Input Module Wiring

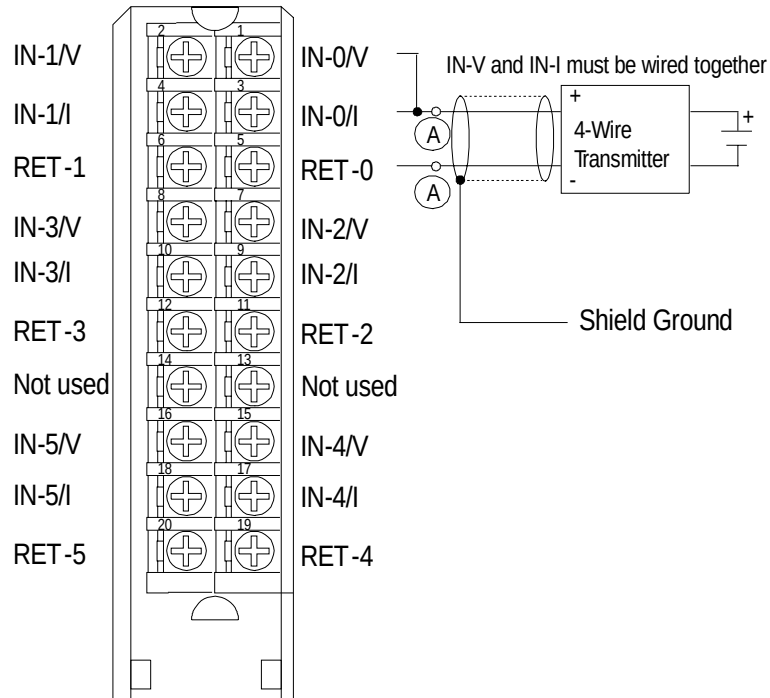
Pin Outs and Wiring Examples

TC-IAH061/TK-IAH061

Voltage wiring example



Current wiring example
with a 4-wire transmitter

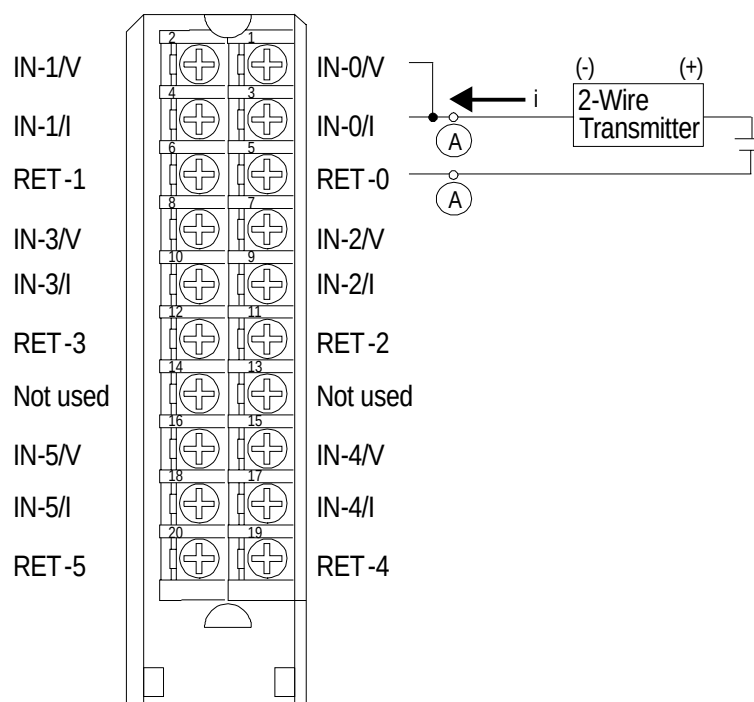


Note: Place additional loop devices (e.g. strip chart recorders, etc.) at either A location

Appendix A – I/O Module Wiring Reference

Analog Input Module Wiring

Current wiring example
with a 2-wire transmitter



Note: Place additional loop devices (e.g. strip chart recorders etc..) at either A location. The voltage (IN-X/V) and current (IN – X/I) terminals for a given input channel must be wired together. For example, wire IN-0/V pin 1 to IN – 0/I pin 3, for a current input channel 0.

TC-IAH161/TK-IAH161 – 16 -point high-level voltage/current analog input module



ATTENTION

All terminals with the same name are connected together on the module.
For example, RTN pins 9, 10, 27 and 28 are connected



CAUTION

Please note that:

- applying 24 Vdc to the inputs is not recommended. Doing so may damage the module when the input transducer is shorted, or the field wiring is incorrectly connected or momentarily shorted. It is recommended that you do not connect field wiring to this module until the wiring and the transducer(s) have been thoroughly checked.
- each input channel can be individually configured for voltage or current range. Be sure the channel range configuration is correct for the intended field wiring connection.
- when using this module for 4 to 20 MA current inputs—
 - all terminals marked i RTN must be wired to terminals marked RTN.
 - the internal 249 ohm input current shunt is rated at 0.25W. Do not exceed this rating.

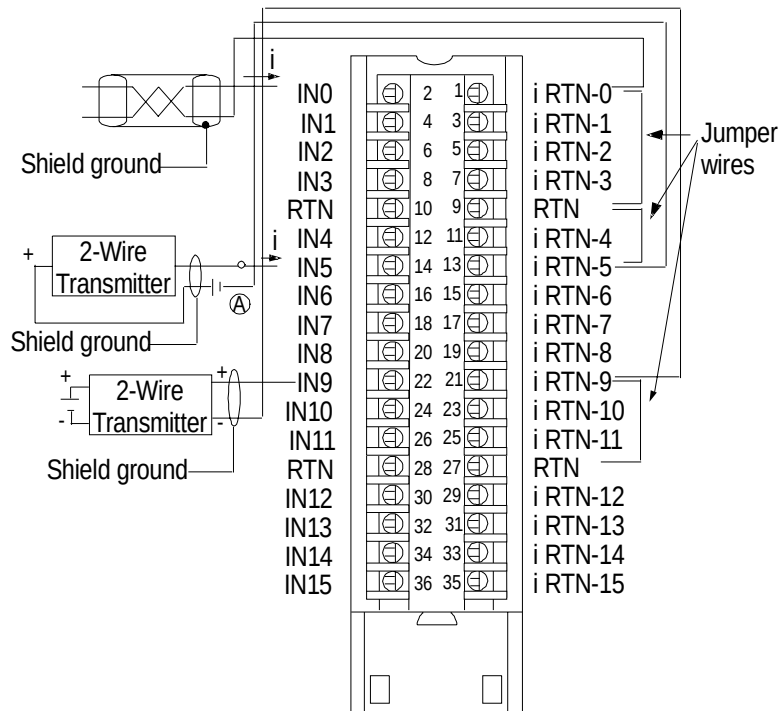
Appendix A – I/O Module Wiring Reference

Analog Input Module Wiring

Pin Outs and Wiring Examples

TC-IAH161/TK-IAH161

Single-ended current wiring example



Notes: All terminals marked RTN are connected internally.

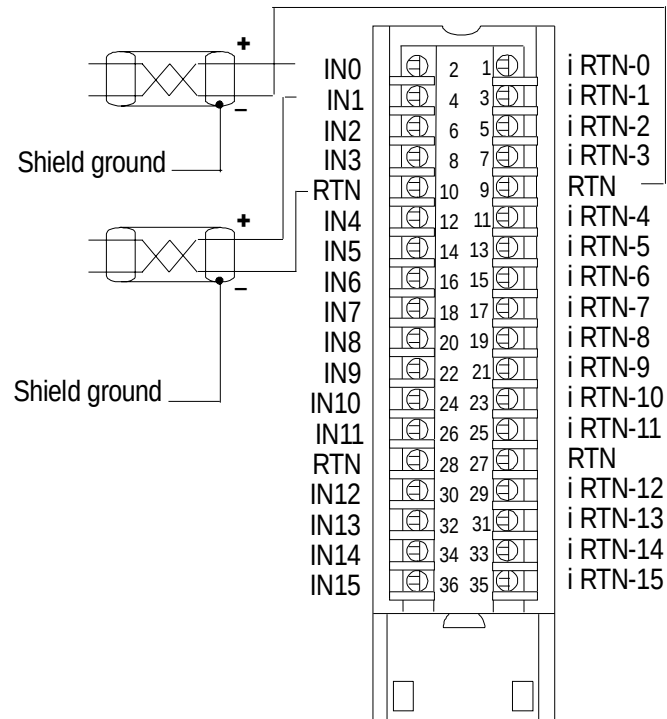
A 249 ohm current loop resistor is located between IN-x and i RTN-x terminals for 4 – 20 MA range only.

For current applications, all terminals marked i RTN must be wired to terminals marked RTN.

If you use a shorting bar instead of jumper wires, be sure you only short terminals with a common source.

Place additional loop devices, such as strip chart recorders, at the “A” location shown.

Single-ended voltage wiring example



Notes: All terminals marked RTN are connected internally.

Terminals marked i RTN are not used for single-ended voltage wiring.

TC-IXL061/TK-IXL061 – 6-point/Thermocouple input module



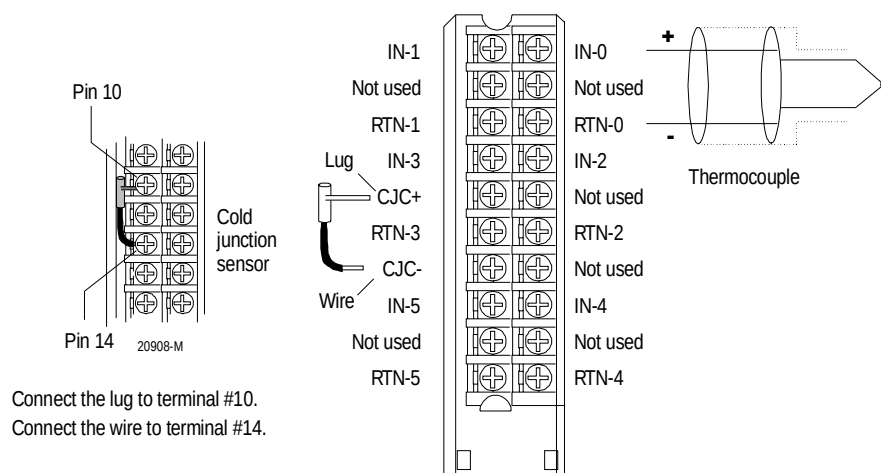
WARNING

To maintain a ± 3 degrees C (± 5 degrees F) Reference Junction Compensation for the thermocouple, the chassis containing the module must be mounted in a NEMA 4 or NEMA 12 enclosure that is approximately 24 in. (610mm) wide, 20 in. (508mm) high, and 8 in. (203mm) deep.

Not following this recommendation could cause the Reference Junction Compensation error to exceed ± 5 degrees C (± 9 degrees F) depending on the actual mounting procedure used.

Pin Outs and Wiring Example

TC-IXL061/TK-IXL061

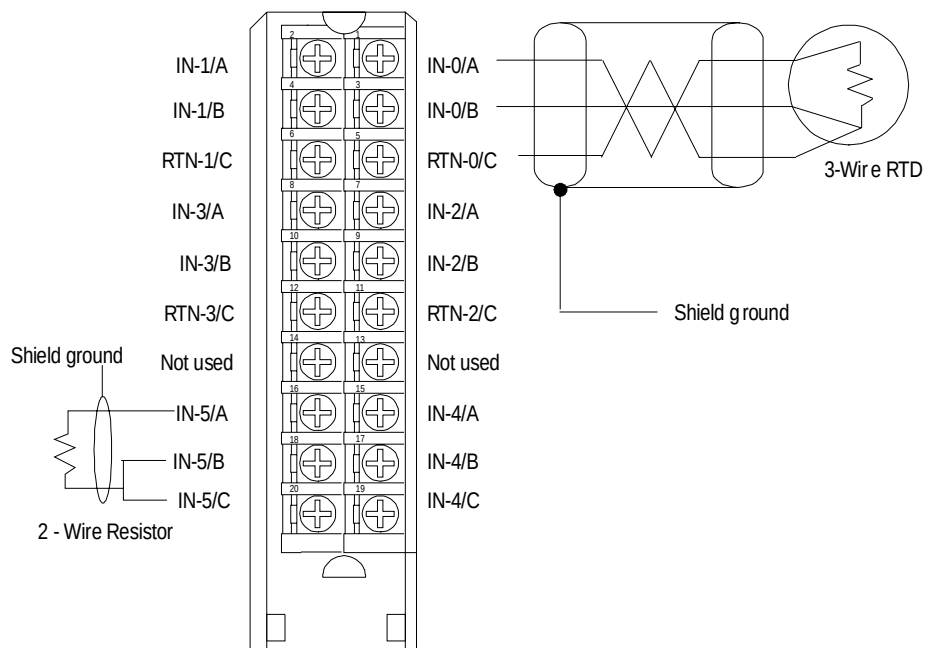


TC-IXR061/TK-IXR061 – 6-point/RTD input module

Pin Outs and Wiring Examples

TC-IXR061/TK-IXR061

2 & 3 - Wire wiring example

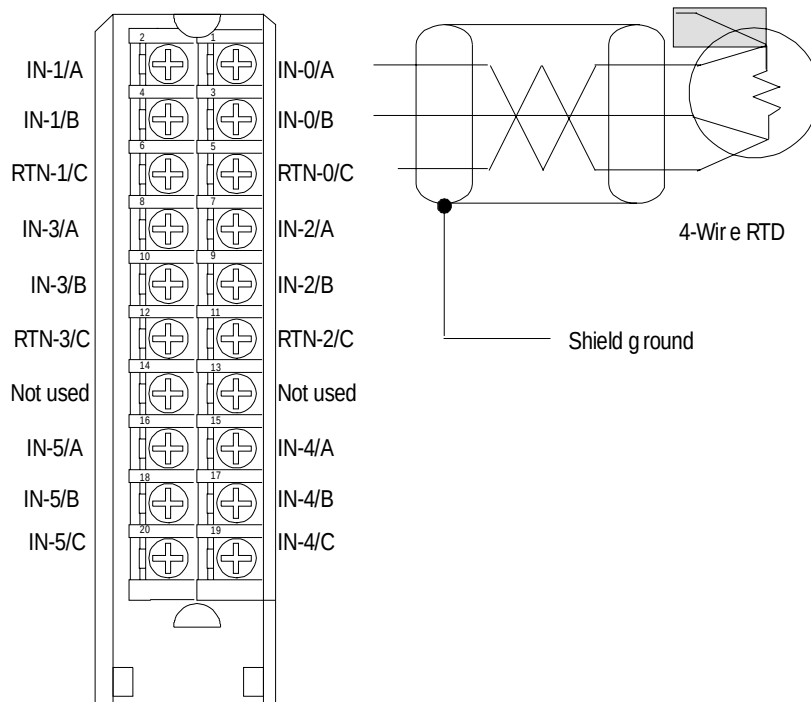


Note: For 2-Wire resistor applications including calibration, make sure in X/B and RTN = X/C are shorted together [input channel 5].

Appendix A – I/O Module Wiring Reference

Analog Input Module Wiring

4- Wire wiring example



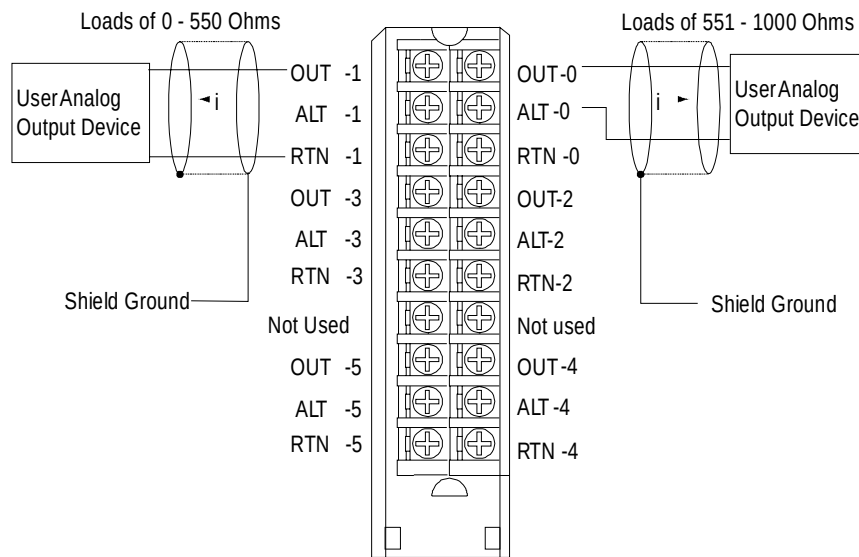
Note: Wiring is exactly the same as the 3-wire RTD with one wire left open.

Analog Output Module Wiring

TC-OAH061/TK-OAH061 – 6-point/4 to 20 mA analog output module

Pin Outs and Wiring Example

TC-OAH061/TK-OAH061



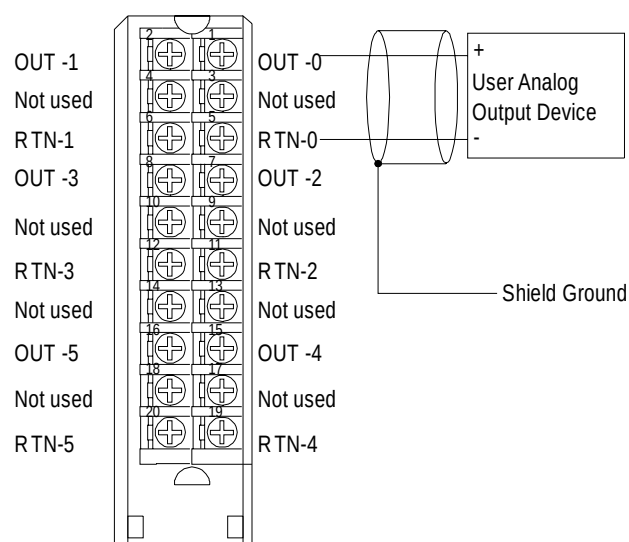
Note: Place additional devices any where in the loop.

Appendix A – I/O Module Wiring Reference
Analog Output Module Wiring

TC-OAV061/TK-OAV061 – 6-point/10 Vdc analog output module

Pin Outs and Wiring Example

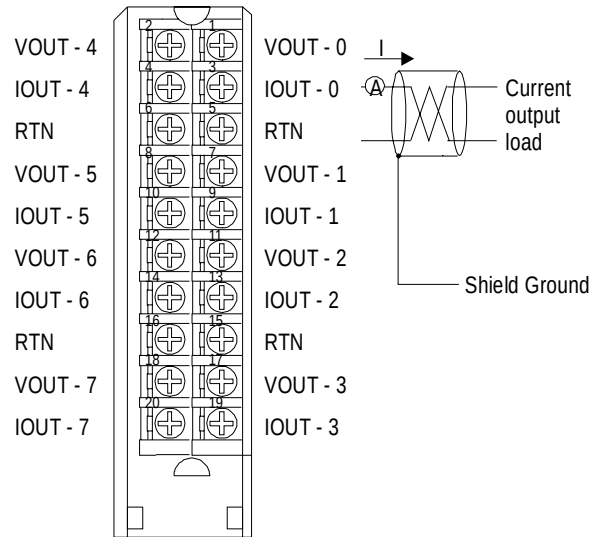
TC-OAV061/TK-OAV061



TC-OAV081/TK-OAV081 – 8-point High level voltage/current analog output module

Pin Outs and Wiring Example

TC-OAV081/TK-OAV081



Note: Place additional loop devices (e.g. strip chart recorders, etc.) At the A location noted above.

Discrete AC Input Module Wiring

TC-IDA161/TK-IDA161 – 16-point/120(79-132) Vac discrete AC input module



ATTENTION

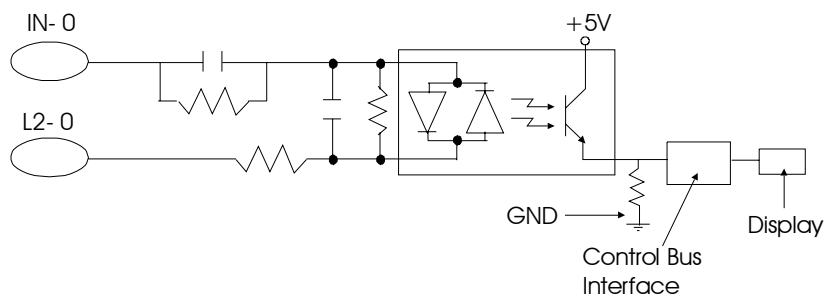
All terminals with the same name are connected together on the module.
For example, L2 – 0 pins 9 and 10 are connected.



CAUTION

This input module permits the field-side input device (switch) to be located on either the hot or neutral side of the source.

Simplified Schematic



TC-IDK161/TK-IDK161 – 16-point / 120(79-132) Vac Isolated discrete AC input module



ATTENTION

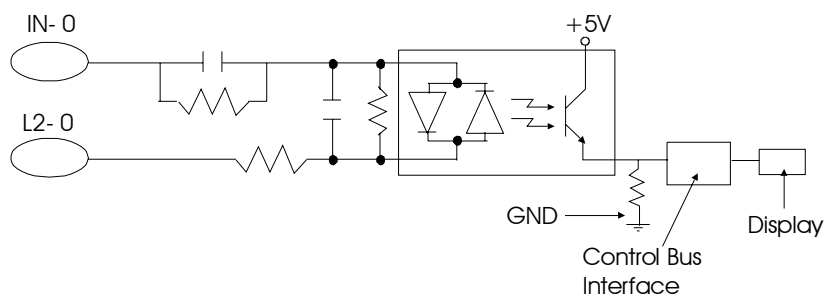
All terminals with the same name are connected together on the module.
For example, L2 – 15 pins 32 and 24 are connected.



CAUTION

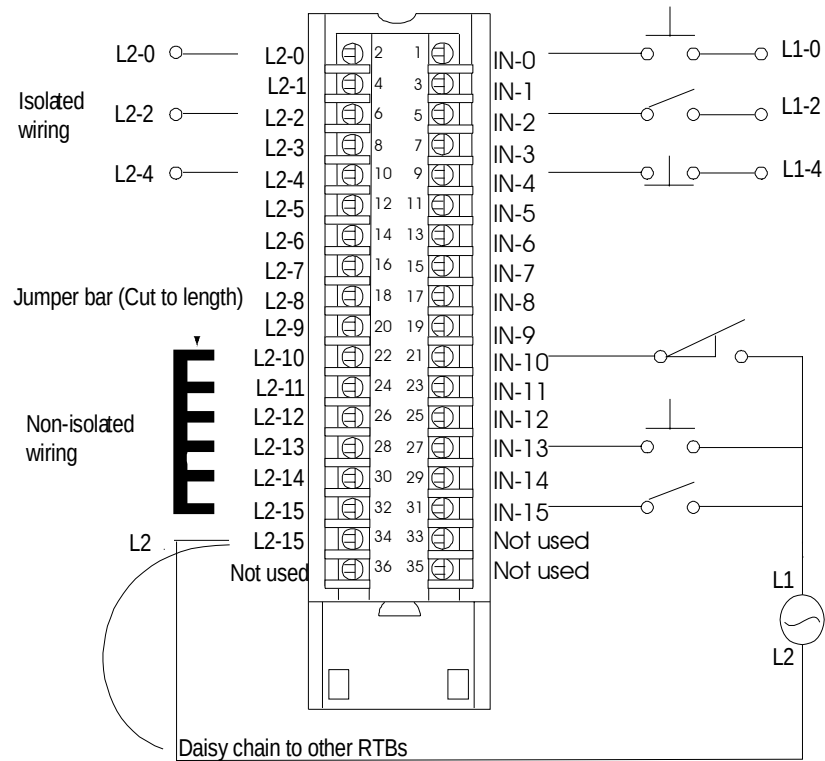
This input module permits the field-side input device (switch) to be located on either the hot or neutral side of the source, unless the modules shorting bar has been installed. In this case, the input device must be installed on the hot side of the source.

Simplified Schematic



Pin Outs and Wiring Example

TC-IDK161/TK-IDK161



Notes: All terminals with the same name are connected together on the module. For example, L2 can be connected to any terminal marked L2 – 15.

When you use the second L2 – 15 terminal to daisy chain to other RTBs, always connect the daisy chain to the terminal directly connected to the supply wire, as shown in the example above.

TC-IDW161/TK-IDW161 – 16-point/220(159-265) Vac Isolated discrete AC input module



ATTENTION

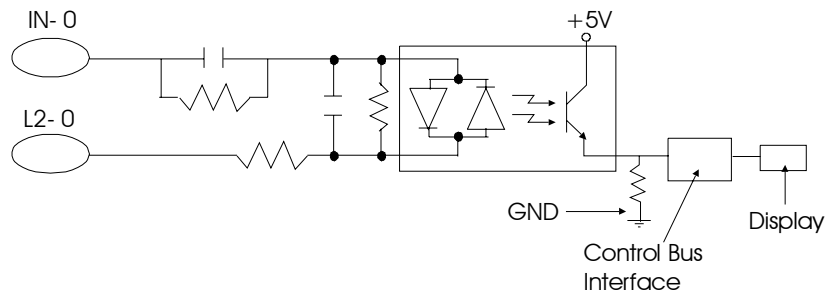
All terminals with the same name are connected together on the module.
For example, L2 – 15 pins 32 and 34 are connected.



CAUTION

This input module permits the field-side input device (switch) to be located on either the hot or neutral side of the source, unless the modules shorting bar has been installed. In this case, the input device must be installed on the hot side of the source.

Simplified Schematic



Appendix A – I/O Module Wiring Reference

Discrete AC Input Module Wiring

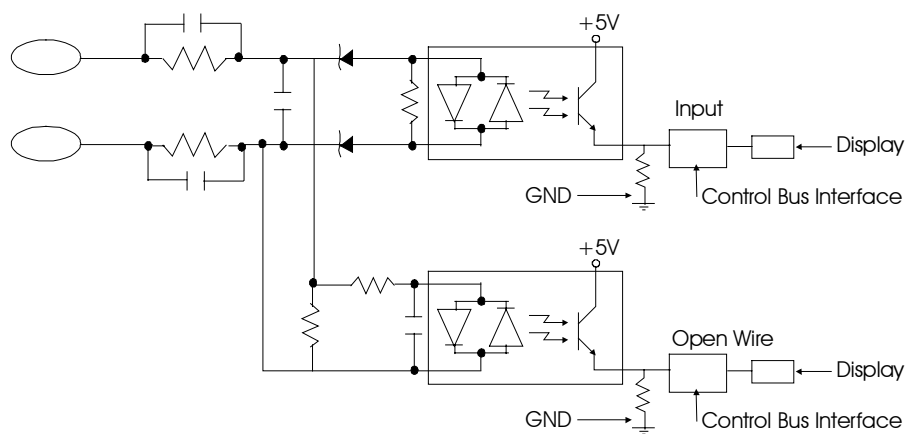
TC-IDX081/TK-IDX081 – 8-point/120(79-132) Vac Diagnostic



ATTENTION

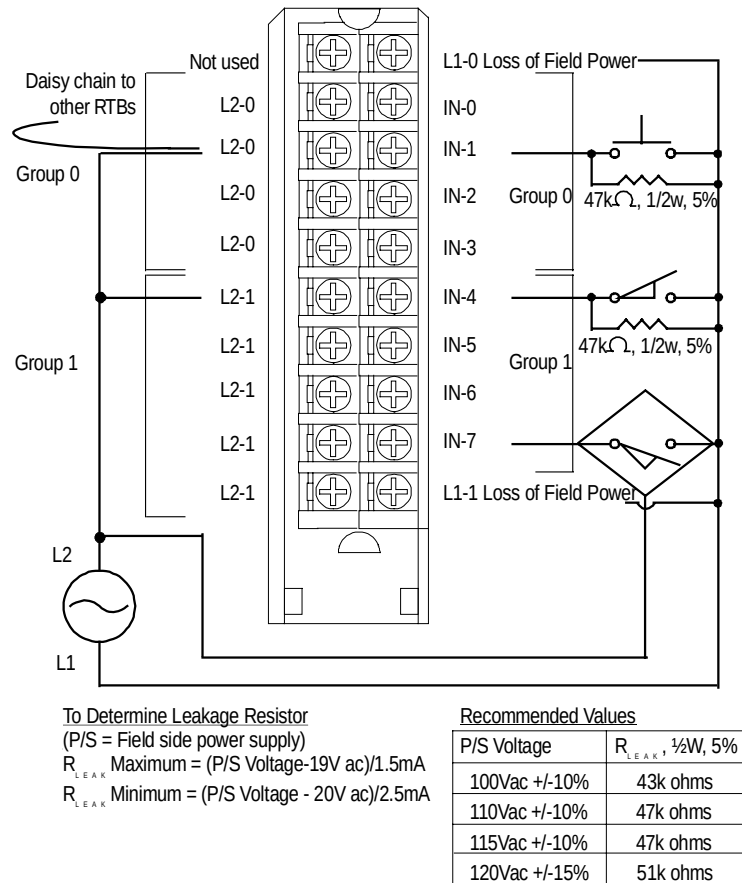
All terminals with the same name are connected together on the module.
For example, L2 – 0 pins 4,6,8 and 10 are connected.

Simplified Schematic



Pin Outs and Wiring Example

TC-IDX081/TK-IDX081



Notes: All terminals with the same name are connected together on the module. For example, L2 can be connected to any terminal marked L2-0.

This warning example shows a single voltage source.

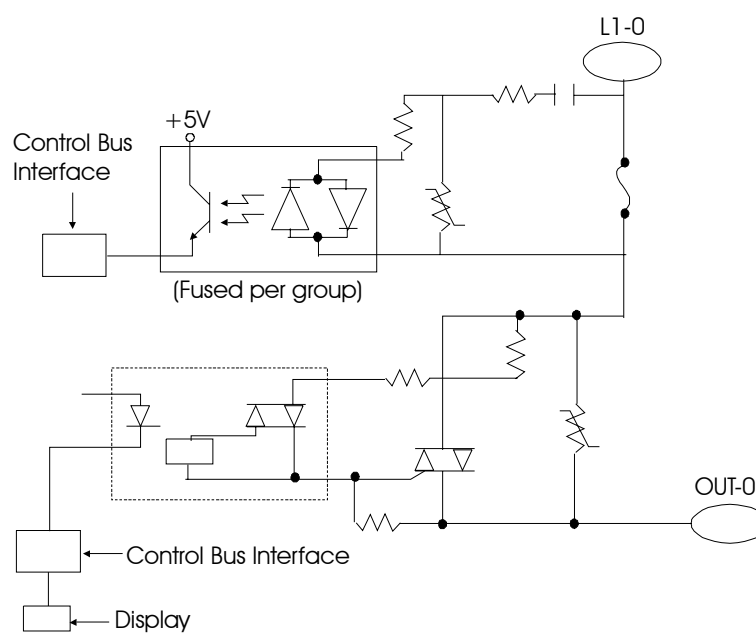
When you daisy chain from a group to other RTB's, always connect the daisy chain to the terminal directly connected to the supply wire, as shown above.

Resistors are not necessary if Wire Off diagnostic is used.

Discrete AC Output module Wiring

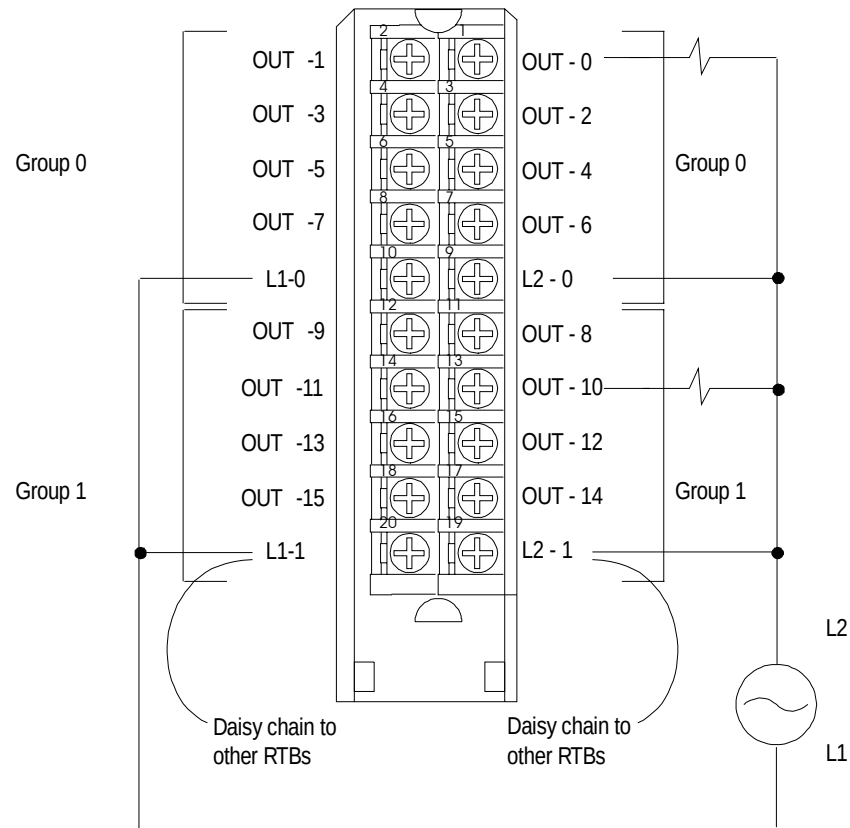
TC-ODA161/TK-ODA161 – 16-point/120/220(74-265) Vac

Simplified Schematic



Pin Outs and Wiring Example

TC-ODA161/TK-ODA161



Notes: When you daisy chain from a group to another RTB, always connect the daisy chain to the terminal directly connected to the supply wire as shown.

This wiring example shows a single voltage source.

TC-ODK161/TK-ODK161 – 16-point/120/220(74-265) Vac Isolated



ATTENTION

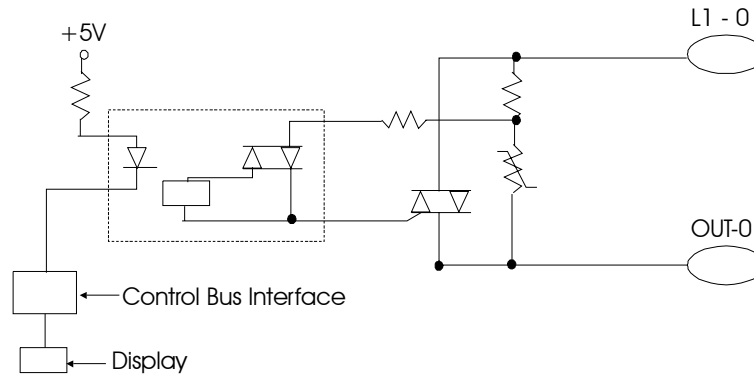
All terminals with the same name are connected together on the module.
For example, L1 – 15 pins 32 and 34 are connected.



ATTENTION

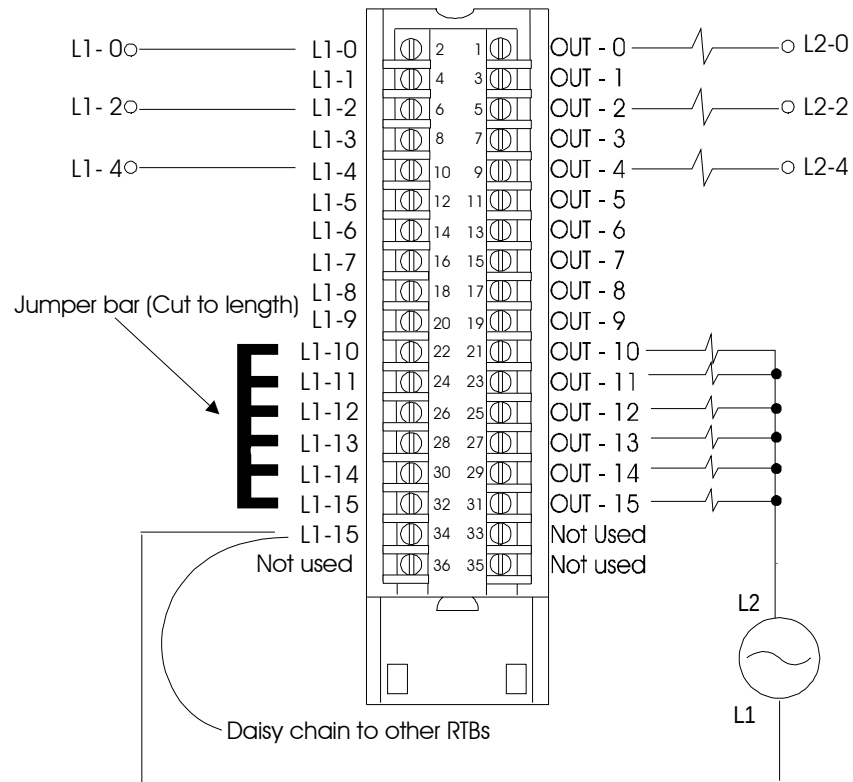
This output module permits the field-side output device (load) to be located on either the Hot or Neutral side of the source, unless the module's shorting bar has been insulated. In this case, the device must be installed on the neutral side of the source.

Simplified Schematic



Pin Outs and Wiring Example

TC-ODK161/TK-ODK161



Notes: All terminals with the same name are connected together on the module.

For example, L1 can be connected to either terminal marked L1 – 15.

When you use the second L1 – 15 terminal to daisy chain to other RTB's, always connect the daisy chain to the terminal directly connected to the supply wire, as shown in the example.

Appendix A – I/O Module Wiring Reference

Discrete AC Output module Wiring

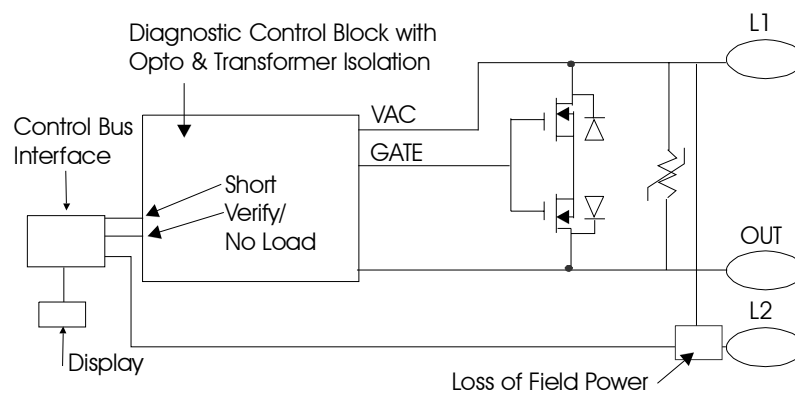
TC-ODX081/ TK-ODX081 – 8-point/120(17-132) Vac Diagnostic



ATTENTION

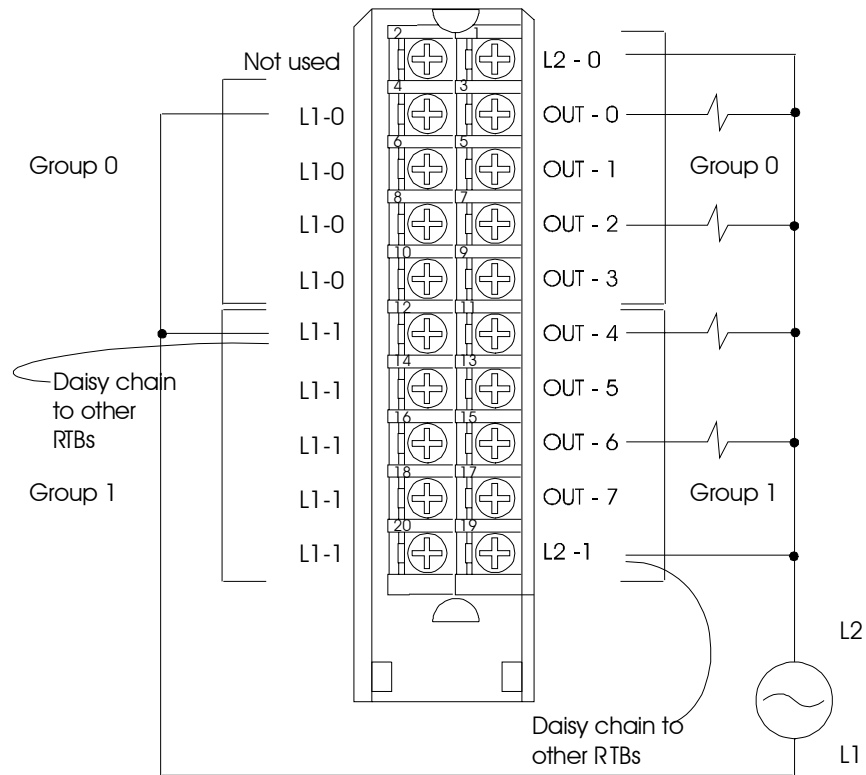
All terminals with the same name are connected together on the module.
For example, L1 – 0 pins 4, 6, 8 and 10 are connected.

Simplified Schematic



Pin Outs and Wiring Example

TC-ODX081/TK-ODX081



Notes: All terminals with the same name are connected together on the module. For example, L1 can be connected to any terminal marked L1 – 0.

When you daisy chain from a group to another RTB, always connect the daisy chain to the terminal directly connected to the supply wire, as shown.

This wiring example shows a single voltage source.

Discrete DC Input Module Wiring

TC-IDD321/TK-IDD321 – 32-point/24(10-30) Vdc



ATTENTION

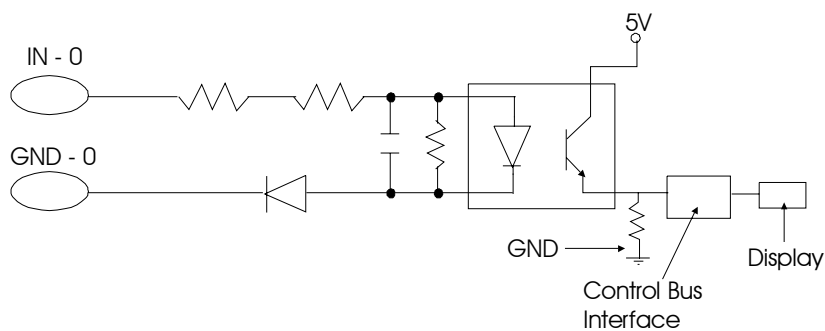
All terminals with the same name are connected together on the module.
For example, GND-0 pins 17 and 18 are connected.



CAUTION

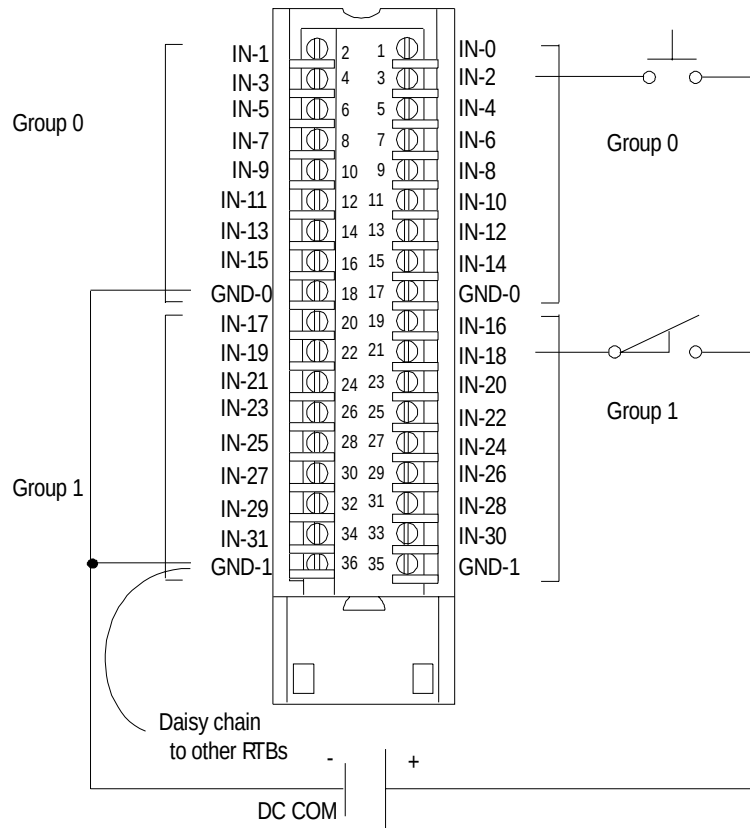
This input module permits the field-side input device (switch) to be located on either the positive or negative side of the source.

Simplified Schematic



Pin Outs and Wiring Example

TC-IDD321/TK-IDD321



Notes: All terminals with the same name are connected together on the module. For example, DC COM can be connected to either terminal marked GND-1.

When you daisy chain to other RTB's, always connect the daisy chain to the terminal directly connected to the supply wire, as shown in the example above.

This wiring example shown a single voltage source.

TC-IDJ161/TK-IDJ161 – 16-point/24(10-30) Vdc Isolated



ATTENTION

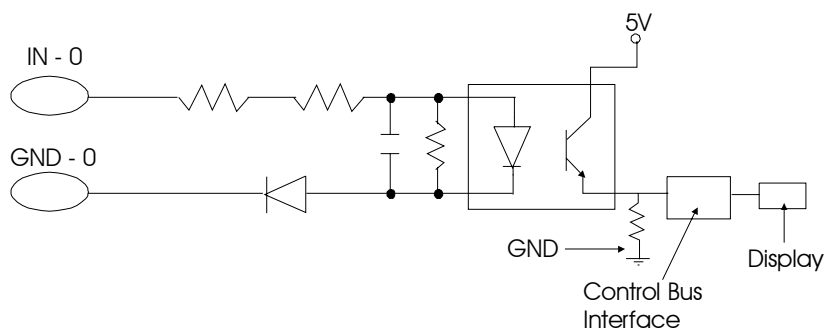
All terminals with the same name are connected together on the module.
For example, GND–15 pins 32 and 24 are connected.



CAUTION

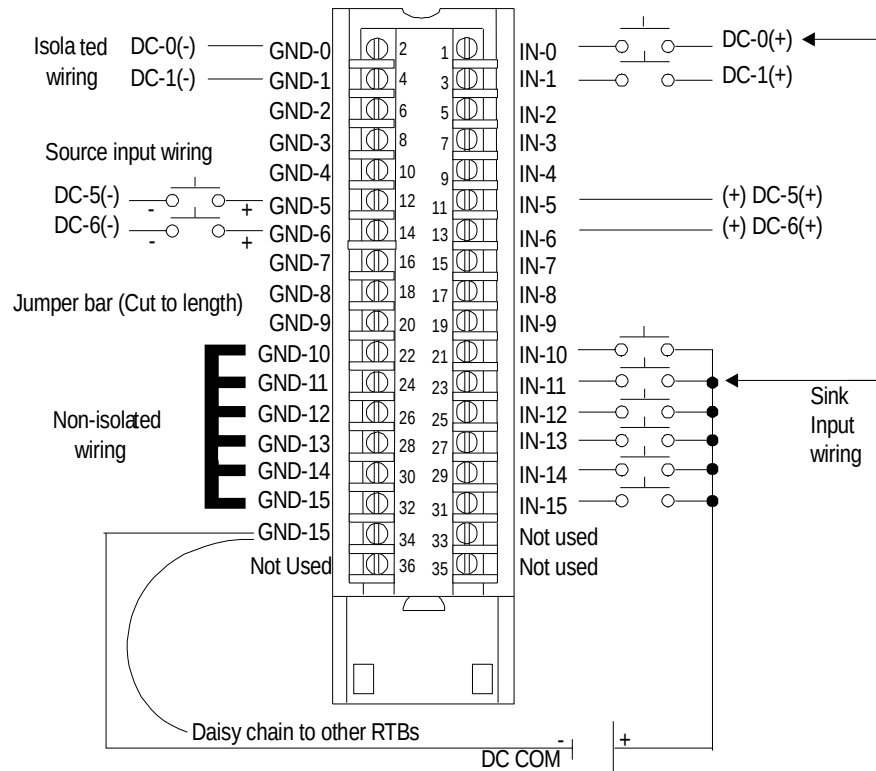
This input module permits the field-side input device (switch) to be located on either the positive or negative side of the source, unless the modules shorting bar has been installed. In this case, the input device must be installed on the positive side of the source.

Simplified Schematic



Pin Outs and Wiring Example

TC-IDJ161/TK-IDJ161



Notes: All terminals with the same name are connected together on the module. For example, DC (-) can be connected to either terminal marked GND – 15.

When you use the second GND–15 terminal to daisy chain the other RTB's, always connect the daisy chain to the terminal directly connected to the supply wire, as shown in the example above.

Each input can be wired in a sink or source configuration as shown.

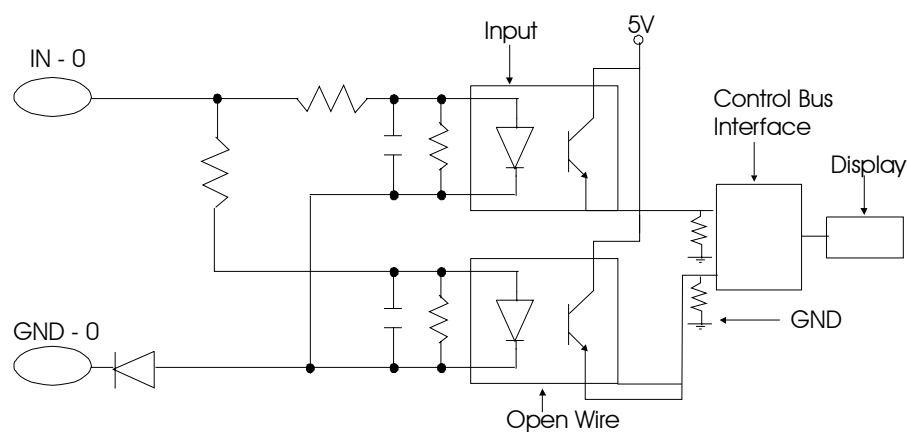
TC-IDX161/TK-IDX161 – 16-point/24(10–30) Vdc Diagnostic



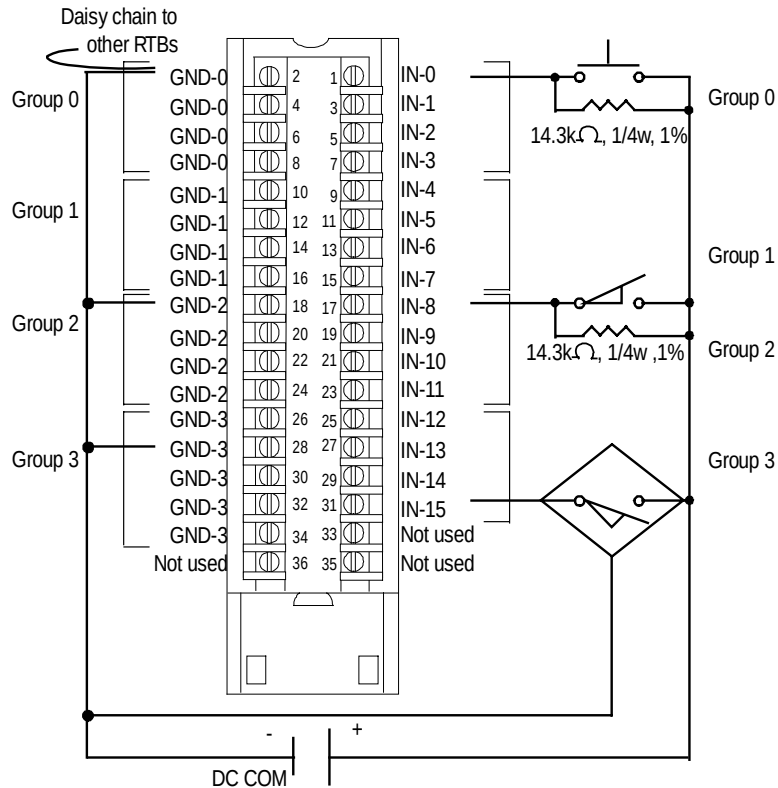
ATTENTION

All terminals with the same name are connected together on the module.
For example, GND–0 pins 2, 4, 6 and 8 are connected.

Simplified Schematic



Pin Outs and Wiring Example
TC-IDX161/TK-IDX161



To Determine Leakage Resistor
(P/S = Field side power supply)
 $R_{LEAK} \text{ Maximum} = (P/S \text{ Voltage} - 4.6Vdc) / 1.21mA$
 $R_{LEAK} \text{ Minimum} = (P/S \text{ Voltage} - 5Vdc) / 1.5mA$

Recommended Values

P/S Voltage	R_{LEAK} , 1/4W, 1%
12Vdc +/-6%	5.23k ohms
24Vdc +/-6%	14.3k ohms

Notes: All terminals with the same name are connected together on the module. For example, DC COM can be connected to any terminal Marked GND-0.

When you daisy chain from a group to other RTB's, always connect the daisy chain to the terminal directly connected to the supply wire, as shown above.

This wiring example shown a single voltage source.

Resistors are not necessary if Wire Off diagnostic is not used.

Discrete DC Output Module Wiring

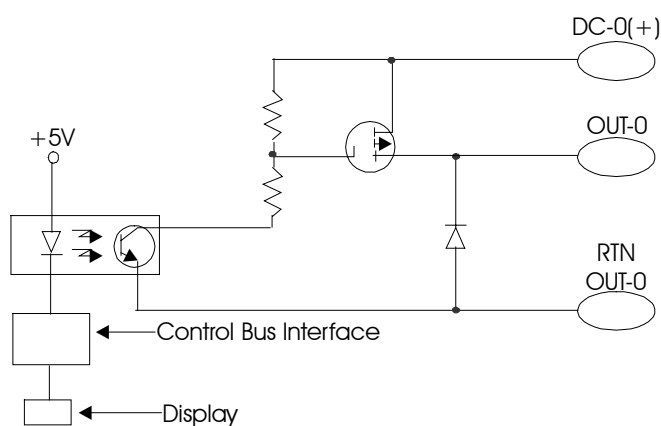
TC-ODD321/TK-ODD321 – 32-point/24(10-31) Vdc



CAUTION

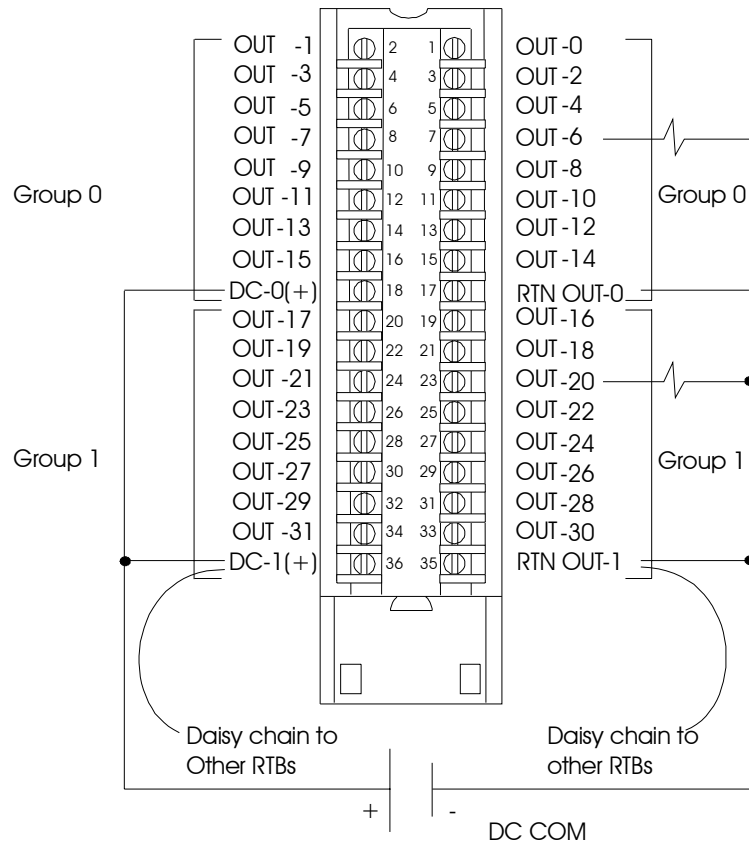
This output module permits the field-side output device (load) to be located on either the positive or negative side of the source.

Simplified Schematic



Pin Outs and Wiring Example

TC-ODD321/TK-ODD321



Notes: When you daisy chain from a group to another RTB, always connect the daisy chain to the terminal directly connected to the supply wire, as shown

This wiring example uses a single voltage source.

TC-ODJ161/TK-ODJ161 – 16-point/24 (10-30) Vdc Isolated



ATTENTION

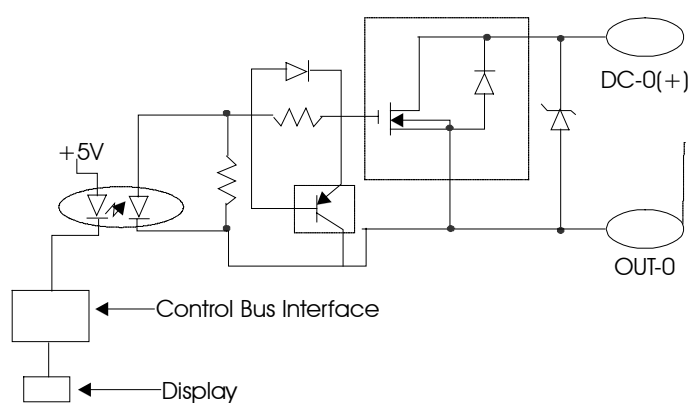
All terminals with the same name are connected together on the module.
For example, DC-15(+) pins 32 and 34 are connected.



CAUTION

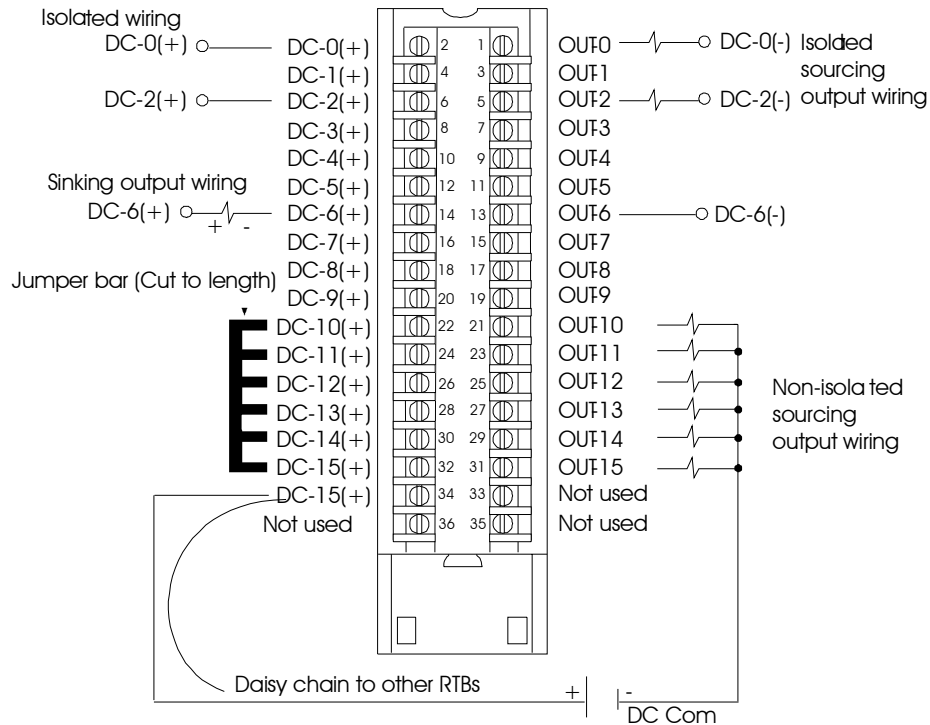
This output module permits the field-side output device (load) to be located on either the positive or negative side of the source, unless the modules shorting bar has been installed. In this case, the output device must be installed on the output side of the source.

Simplified Schematic



Pin Outs and Wiring Example

TC-ODJ161/TK-ODJ161



Notes: all terminals with the same name are connected together on the module. For example, DC(+) can be connected to either terminal marked DC-15.

When you use the second DC-15(+) terminal to daisy chain to other RTB's, always connect the daisy chain to the terminal directly connected to the supply wire, as shown.

Outputs can be wired in a sink or source configuration as shown.

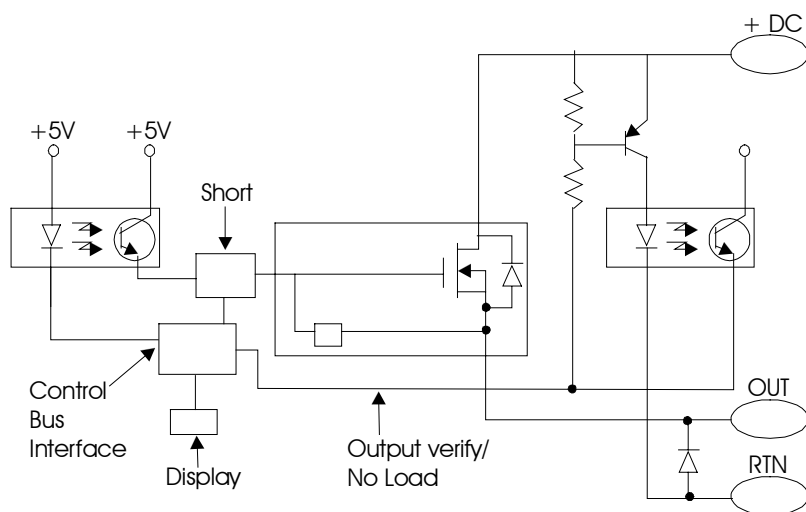
TC-ODX161/TK-ODX161 – 16-point/24(19–30) Vdc Diagnostic



ATTENTION

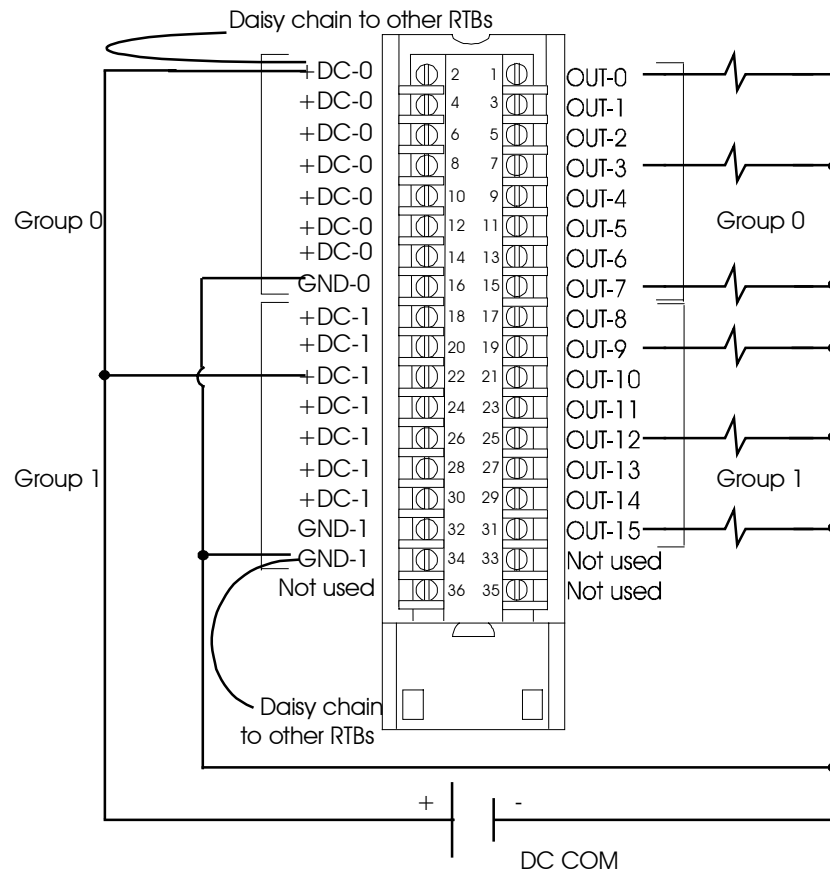
All terminals with the same name are connected together on the module.
For example, +DC–0 pins 2,4,6,8,10,12 and 14 are connected.

Simplified Schematic



Pin Outs and Wiring Example

TC-ODX161/TK-ODX161



Notes: All terminals with the same name are connected together on the module. For example, DC COM can be connected to either terminal marked GND – 1.

When you daisy chain from a group to another RTB, always connect the daisy chain to the terminal directly connected to the supply wire, as shown.

This wiring example shown a single voltage source.

Contact/Relay Module Wiring

TC-ORC161/TK-ORC161 – 16-point/10-265 Vac, 5-150 Vdc Isolated Contact

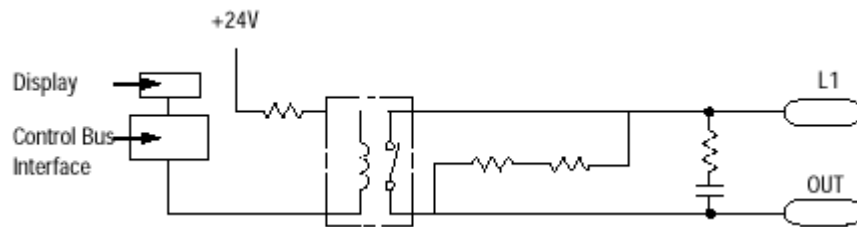


ATTENTION

- All terminals with the same name are connected together on the module. For example, L1 can be connected to either terminal marked L1-15.
- This module receives power from the chassis power supply and requires 2 sources of power from the backplane:
 - 150mA at 5.1Vdc
 - 150mA at 24Vdc

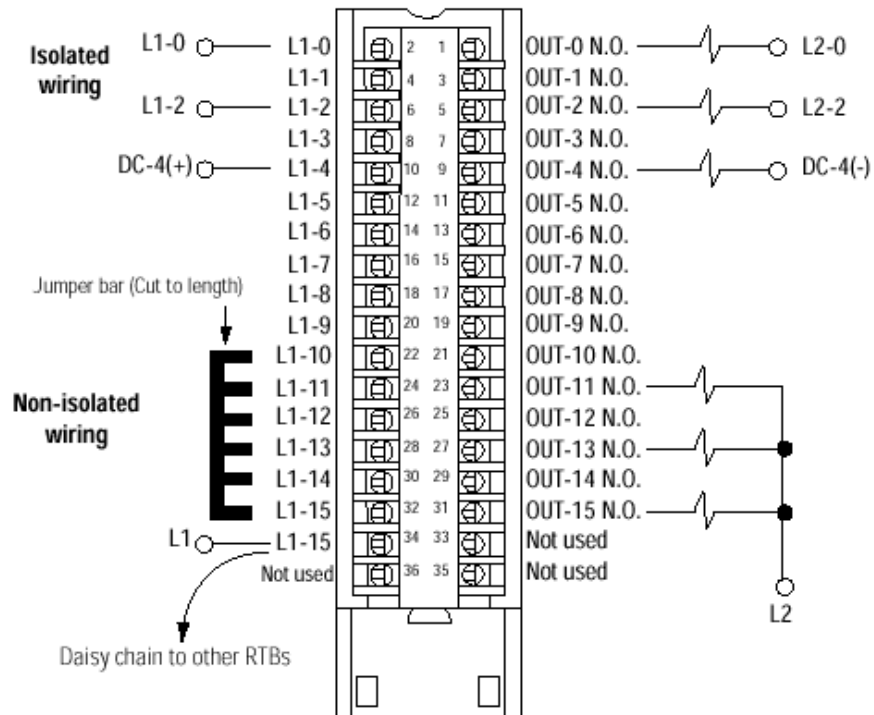
Add this current/power value (4.4W) to the requirements of all other modules in the chassis to prevent overloading the power supply. Field output supply power should be limited to 10KVA available short circuit power.

Simplified Schematic



Pin Outs and Wiring Example

TC-ORC161/TK-ORC161



Notes: Do not physically connect more than two wires to a single RTB terminal. When you use the second L1-15 terminal to daisy chain to other RTBs, always connect the daisy chain as shown.

If separate power sources are used, do not exceed the specified isolation voltage.

**TC-ORC081/TK-ORC081 – 8-point (8 Normally Open, 8 Normally Closed)/10-265
Vac, 5-150 Vdc Isolated Relay**

Appendix A – I/O Module Wiring Reference

Contact/Relay Module Wiring

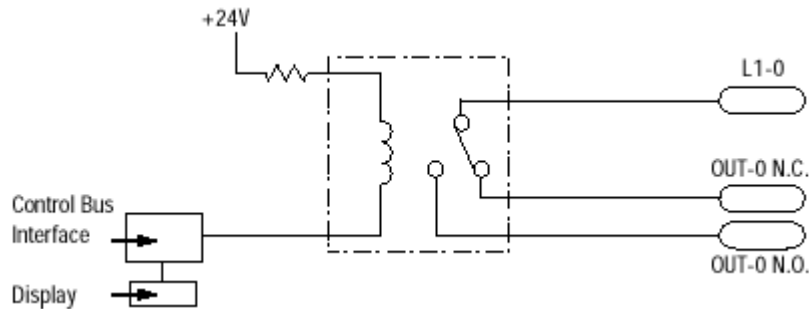


ATTENTION

- All terminals with the same name are connected together on the module. For example, L1-0 can be connected to either terminal marked L1-0.
- This module receives power from the chassis power supply and requires 2 sources of power from the backplane:
 - 100mA at 5.1Vdc
 - 100mA at 24Vdc

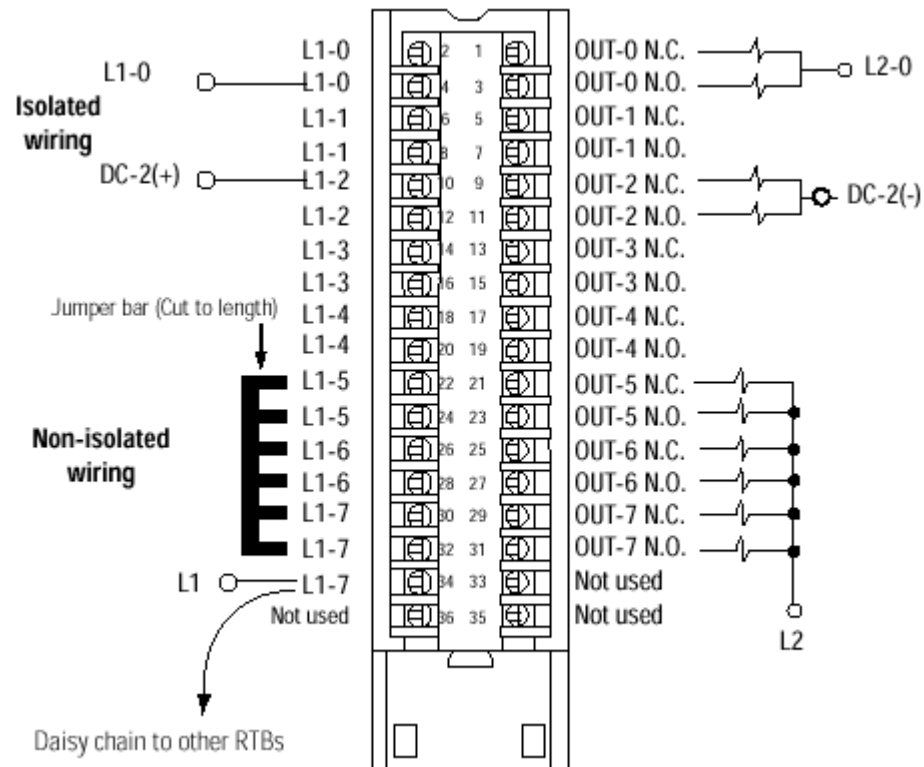
Add this current/power value (2.9W) to the requirements of all other modules in the chassis to prevent overloading the power supply. Field output supply power should be limited to 10KVA available short circuit power.

Simplified Schematic



Pin Outs and Wiring Example

TC-ORC081/TK-ORC081



Notes: Do not physically connect more than two wires to a single RTB terminal. When you use the third L1-17 terminal to daisy chain to other RTBs, always connect the daisy chain as shown.

If separate power sources are used, do not exceed the specified isolation voltage.

Pulse Input Module Wiring

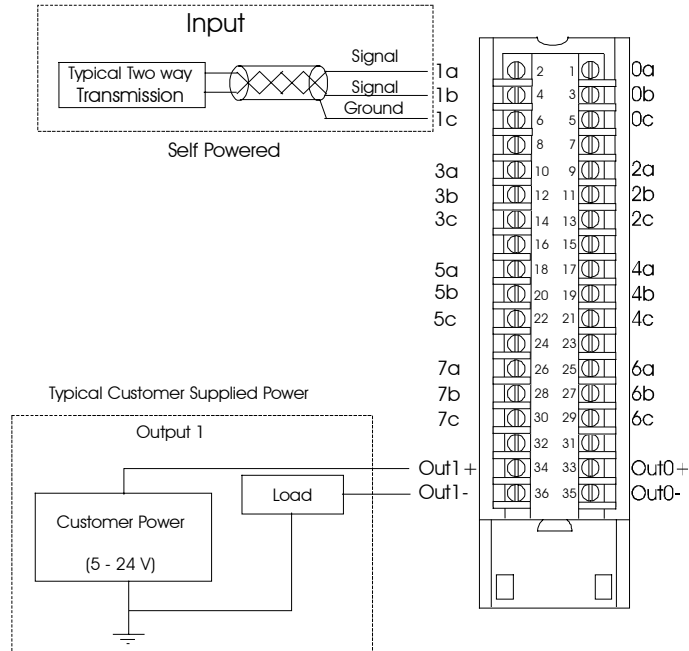
TC-MDP081/TK-MDP081 – 8-point/5-24 Vdc Pulse Input Module

Appendix A – I/O Module Wiring Reference

Pulse Input Module Wiring

Pin Outs and Wiring Example

TC-MDP081/TK-MDP081 Pulse Input Module



Notes: Diagram shows how 8 transmitters interface to the 36 positions terminal block.

- For instance, Transmitter 0 connects to Pins 1, 3 and 5 where:
 - Pin 1 is Signal
 - Pin 3 is Signal Common
 - Pin 5 is Chassis Ground Shield Connection

Output Channel 0 connects to Pins 33 and 35 and Output Channel 1 connects to Pins 34 and 36.

Appendix B

CSA Hazardous Location Approval

About CSA

CSA certifies products for general use as well as for use in hazardous locations. Actual CSA certification is indicated by the product label as shown below, and not by statements in any user documentation.

Example of the CSA certification product label:



CSA logo is a registered trademark of the Canadian Standards Association.

CSA Certification

To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for this CSA-certified industrial control product:

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.
- The products having the appropriate CSA markings (that is, Class I, Division 2, Groups A, B, C, D) are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.

Temperature Ratings



ATTENTION

Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class I, Division 2 location.

The temperature code rating is marked on the product label as shown.



CL I, DIV 2
GP A,B,C,D
TEMP



Look for
temperature code

Notices

The following warnings apply to products having CSA certification for use in hazardous locations.



WARNING: Explosion hazard!

- Substitution of components may impair suitability for Class I, Division 2.
 - Do not replace components unless power has been switched off or the area is known to be non-hazardous.
 - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
 - Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lbf) separating force applied for a minimum of one minute.
 - If the Product contains batteries, they must only be changed in an area known to be non-hazardous.
-

Approbation d'utilisation dans des environnements dangereux par la CSA

La CSA

La CSA certifie des produits pour une utilisation générale aussi bien que pour une utilisation en environnements dangereux. La certification CSA en vigueur est indiquée par l'étiquette produit et non par des indications dans la documentation utilisateur.

Exemple d'étiquette de certification d'un produit par la CSA:



La certification CSA

Pour satisfaire à la certification CSA en environnements dangereux, les informations suivantes font partie intégrante de la documentation des produits de commande industrielle certifiés.

- Cet équipement ne convient qu'à une utilisation en environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux.
- Les produits portant le marquage CSA approprié (c'est-à-dire Classe 1, Division 2, Groupes A, B, C, D) sont certifiés pour une utilisation avec d'autres équipements, les combinaisons d'applications et d'utilisations étant déterminées par la CSA ou le bureau local d'inspection qualifié.

Appendix B

Approbation d'utilisation dans des environnements dangereux par la CSA

Autour de température



ATTENTION

De par la nature modulaire des systèmes de commande programmables, le produit ayant le code de température le plus élevé détermine le code de température global du système dans un environnement de Classe 1, Division 2.

Le code de température est indiqué sur l'étiquette produit.



CL I, DIV 2
GP A,B,C,D
TEMP



Le code de
température est

Discerner

Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour une utilisation en environnements dangereux.

**AVERTISSEMENT:** Risque d'explosion

- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnements de Classe 1, Division 2.
 - Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de remplacer des composants.
 - Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
 - Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs fournis par l'utilisateur pour se brancher aux circuits externes de cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres, de sorte que les connexions résistent à une force de séparation de 15 Newtons (1,5 kg - 3,4 lbf.) appliquée pendant au moins une minute.
 - S'assurer que l'environnement est classé non dangereux avant de changer les piles.
-

Le sigle CSA est une marque déposée de l'Association des Standards pour le Canada.

Appendix B

Approbation d'utilisation dans des environnements dangereux par la CSA

Appendix C – PM I/O FTA Reference

Overview

This section provides descriptions for all of the various standard FTAs associated with Process Manager I/O processors. Connection diagrams and assembly layout drawings are provided for each FTA to aid in wiring of field devices to the control system.



ATTENTION

If you are using Galvanically Isolated FTAs for your process application, refer to [Appendix D](#).

The FTAs are organized according to signal types.

- [Analog Input](#)
- [Analog Output](#)
- [Digital Input](#) and
- [Digital Output](#)

Analog Input (AI) FTA Wiring

Analog Input FTA Types

There are a variety of FTAs that accept analog input signals. These FTA types are listed in the following table according to analog signal level (high level or low level) and signal type (Thermocouple, RTD, or smart transmitter output) transmitted from the field device.

Analog Input Standard FTA Types

Model Number Group	Input Type	Description
MU/MC-TAILxx	<u>Low Level Analog Input (LLAI)</u>	Low Level Analog Input (LLAI) FTAs provide inputs for up to eight low level analog components, such as thermocouples (TCs) or Resistance Temperature Devices (RTDs).
MU/MC-TAMTxx MU/MC-TAMRxx	<u>Low Level Analog Input Multiplexer (LLMux)</u>	The FTA accepts one set of low level analog inputs, such as thermocouples (TC) or Resistance Temperature Detectors (RTDs). The set of inputs must be either thermocouples or RTDs. The inputs are sequentially multiplexed. One or two FTAs of either type can be connected to one Power Adapter assembly and its IOP.
MU/MC-TLPA02	N/A	<u>Power adapter that supports LLMux FTAs.</u>
MU/MC-GRMT01	<u>Remote Hardened Multiplexer (RHMUX)</u>	The RHMUX FTA provides inputs for 0 to 100-millivolt and/or thermocouple devices and is installed in a NEMA 4 or 4X enclosure to operate in a Division 1, Class I, Group A and B hazardous location.
MU/MC-TAIHxx	<u>High Level Analog Input /STI</u>	Accepts high level analog inputs. The inputs are configurable as single-ended or differential in relation to logic ground. The FTA is also used to interface Smart Transmitter devices.
MU/MC-TSTXxx	Smart Transmitter Interface	See <u>Smart Transmitter Interface (STI) FTA Wiring.</u>

Low Level Analog Input (LLAI) FTAs

The Low Level Analog Input (LLAI) FTA provides inputs for up to eight low level analog components, such as thermocouples (TCs) or Resistance Temperature Devices (RTDs). The inputs are isolated and independent, but share a common cable shield bus.

CE Compliance

There are two models of each type of Low Level Analog Input (LLAI) FTAs. One model is CE compliant, while the other model is not CE compliant. The CE compliant and non-CE compliant FTAs have unique model numbers. The CE compliant assembly is identified by a part number tab number that ends in “25” or “75,” as shown in the following table.

CE compliant FTAs have an FTA connector with a grounded body that accepts the CE compliant model MU-KFTSxx IOP to FTA cable. This fully shielded FTA cable is required if the FTA is mounted in a cabinet that is separate from the cabinet or cabinet complex in which its associated IOP is installed. If The FTA is mounted in the same cabinet or cabinet complex as its associated IOP, an unshielded model MU-KFTAxx IOP to FTA cable can be used. Shielded field wiring is not required for CE Compliance however, shielded IOP to FTA cables are required.

The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table.

Low Level Analog Input (LLAI) FTAs and IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAIL01	LLAI FTA with Compression Terminals Single IOP Interface (early version)	51301183-100	N/A
MU-TAIL01	LLAI FTA with Compression Terminals Single IOP Interface	51301107-100	N/A
MU-TAIL02	LLAI FTA with Compression Terminals Single IOP Interface	51304437-100	N/A
MC-TAIL02	LLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304437-150	N/A
MU-TAIL03	LLAI FTA with Compression Terminals Single IOP Interface	N/A	51309202-125 *
MC-TAIL03	LLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309202-175 *

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
Supporting IOPs			
MU-PAIL02	LLAI IOP	N/A	51304481-100
MC-PAIL02	LLAI IOP—Conformally Coated	N/A	51304481-150
* Requires a model MU-PAIL02 or MC-PAIL02 LLA I IOP with revision H (5.1) or greater firmware for proper operation.			

IOP compatibility

The model MU/MC-PAIL02 Low Level Analog Input IOPs support the model MU-TAIL01 and MU/MC-TAIL02 LLA I FTAs. Only the model MU/MC-PAIL02 LLA I IOP supports the CE Compliant model MU/MC-TAIL03 FTA. The IOPs can be installed in any card file slot.

CAUTION

When an earlier version of the model MU-TAIL01 LLA I FTA (Honeywell part number 51301183-100) is used, the maximum length of the IOP to FTA cable must not exceed 20 meters (66 feet).

Table 10 Low Level Analog Input FTA Connection Drawings

Low Level Analog Input	Connection Diagram	Assembly Layout
FTA Model	<u>MU/MC-TAIL01/TAIL02</u> Thermocouple inputs	<u>MU/MC-TAIL02</u>
	<u>MU/MC-TAIL01/TAIL02</u> RTD inputs	<u>MU/MC-TAIL02</u>
	<u>MU/MC-TAIL03</u> Thermocouple inputs	<u>MU/MC-TAIL03</u>
	<u>MU/MC-TAIL03</u> RTD inputs	<u>MU/MC-TAIL03</u>

Thermocouple and RTDs inputs can be mixed

Signals from thermocouples, RTDs, and voltage inputs can be mixed on the same FTA as shown in the connection diagrams, however, if there is a thermocouple input, the thermocouple input must be connected to channel 1.

Reference junction signal for model MU-TAIL01 and MU/MC-TAIL02 FTAs

If one or more thermocouples are connected to the FTA, the Reference Junction signal generated at TB2-17 must be connected to the auxiliary input for the FTA's analog-to-digital converter at terminal TB1-1. See Figure 15.

If no thermocouple inputs are present, the connection between TB1-1 and TB2-17 is not required. See Figure 16.

Reference junction signal for model MU/MC-TAIL03 CE Compliant FTA

Unlike the non-CE-Compliant model MU-TAIL01 and MU/MC-TAIL02 FTAs, the separate wire that is connected between TB1-1 and TB2-17 is not required on the CE Compliant model MU/MC-TAIL03 FTA. Instead, a jumper plug must be used at P1 on the FTA.

If one or more thermocouples are connected to the FTA, the Reference Junction must be connected to the channel 1 auxiliary input A/D converter. This is accomplished by installing the jumper plug between pins 2 and 3 ("TC" position) at P1. See Figure 17 and Figure 20.

If no thermocouple inputs are connected, install the jumper plug between pins 1 and 2 ("ALL OTHER ANALOG INPUT TYPES" position) at P1. See Figure 18 and Figure 20.

Shield bus connections

An internal shield bus connection at every fourth terminal provides connection points for any shielded-pair cables. Connection is also provided at TB2-18 and TB2-19 for daisy-chaining the buses from FTA to FTA. Use conductors at least as heavy as the incoming low level signal wiring. On the last assembly in the chain, connect TB2-19 to the local ground bus bar at the floor of the cabinet. Designation of the local ground bus depends on where the originating signal is referenced as described in the following paragraphs.



ATTENTION

The LLA IOP and its FTA use a 3-lead RTD configuration. Proper compensation for lead wire resistance depends on the resistance being equal in each leg of the RTD. This includes the lead wire resistance and the Intrinsic Safety device, such as a Zener Barrier. No provision is made to compensate for a lead wire or the Intrinsic Safety device resistance mismatch.

Thermocouple cable shield grounding

Thermocouples are commonly grounded to the process vessel; therefore, ground the thermocouple cable shields to the vessel and cut them off at the FTA end of the cable. For this type of circuit, the FTA internal shield bus is not used and no connection to a local ground bus bar is needed. See Input 1 in Figure 15 or Figure 17.

RTD cable shield grounding

RTDs have different shield connections because the RTDs are electrically insulated from the process vessel; therefore, cut the shield wire off at the process end and connect the shield wires at the FTA. The FTA internal shield bus then connects to the local Master Reference Ground (MRG) bus bar. See Input 8 in Figure 15 or Input 2 in Figure 16.

For CE Compliance, the internal shield bus must connect to Safety Ground. See Figure 17 and Figure 18.

Local code requirements

The FTA is constructed with a 2.2 mm (0.087 inch) separation at each input. Most local electrical codes require that any common mode voltage applied through the signal wires be limited to 150 V maximum. Check the site planning drawings for any external current limiting and install it as specified. Additionally, use only cable that is Approved for the operating voltage and current.

Thermocouple lead wire resistance

Thermocouple lead wire resistance, plus the thermocouple junction resistance, must be less than 1000 ohms because the system may falsely detect an open thermocouple above 1000 ohms.

CAUTION

The FTA terminal cover must be installed to provide isothermal operation. Install the LLAI FTA in a cabinet to further minimize temperature gradients that result from air currents.

For the model MU/MC-TAIL03 LLAI FTA, ensure that the metallic cover is aligned, seated, and secured on the FTA's RFI gasket to reduce undesired EMI. Initially, hand tighten the thumbscrews on the cover, and then tighten them approximately 1/2 turn with a screwdriver. Do not overtighten.

Allow proper warm up time

Thermo stabilization for the model MU/MC-TAIL03 FTA requires at least 90 minutes. Allow at least 90 minutes of warm up time before taking thermocouple measurements. The terminal cover must be installed to provide isothermal operation. For the model MU/MC-TAIL03 LLAI FTA, ensure that the metallic EMI cover is securely in place during the 90 minute warm up period and during routine operation. The EMI cover is an integral part of the thermo design because it has thermo mass.

If the input source is an RTD, millivolts, voltage, or milliamps, the warm up period can be reduced to 30 minutes.

**ATTENTION**

Because of possible processing conflicts, it is recommended that points not be built for inputs without wires or sensors connected to the input.

- If a point is built for a thermocouple input with Open Thermocouple Detection (OTD) disabled and a voltage input or a resistance (RTD) input without a connected sensor, the point must be placed in the inactive state.
- If the unused point is activated and the input is a thermocouple point with OTD disabled or a voltage point, connect a jumper wire between the B and C input screws (contacts). See Figure 15 and Figure 17, Inputs #3 and #5.
- For an activate input configured as an RTD, connect a jumper wire between screws (contacts) A, B, and C. See Figure 16 and Figure 18, Inputs #3, #5, and #7.

Types of thermocouples and extension wires

The types of thermocouples, their extension wires, and the polarity color codes for the United States and Canada are shown in the following table. Other international standards use different color code schemes. Check with your wire supplier for the appropriate color code and polarity.

The positive polarity (+) always connects to terminal B, and the negative (–) polarity always connects to terminal C at the FTA terminal strip. See Figure 15 or Figure 17. The thermocouple’s negative lead is always red.

**Thermocouple and Thermocouple Extension Wire Polarity Color Codes
(U.S. and Canada)**

Thermocouple			Thermocouple Extension Wire	
Type	Polarity	Color Code	Polarity	Color Code
B	No Standard Established		+ - Overall cover	Gray Red Gray
E	+ - Overall cover	Purple Red Brown	+ - Overall cover	Purple Red Purple
J	+ - Overall cover	White Red Brown	+ - Overall cover	White Red Black
K	+ - Overall cover	Yellow Red Brown	+ - Overall cover	Yellow Red Yellow
R	No Standard Established		+ - Overall cover	Black Red Green
S	No Standard Established		+ - Overall cover	Black Red Green
T	+ - Overall cover	Blue Red Brown	+ - Overall cover	Blue Red Blue

Model MU-TAIL01/MU-TAIL02 low level analog input FTA with thermocouple connection diagram—non-CE compliant

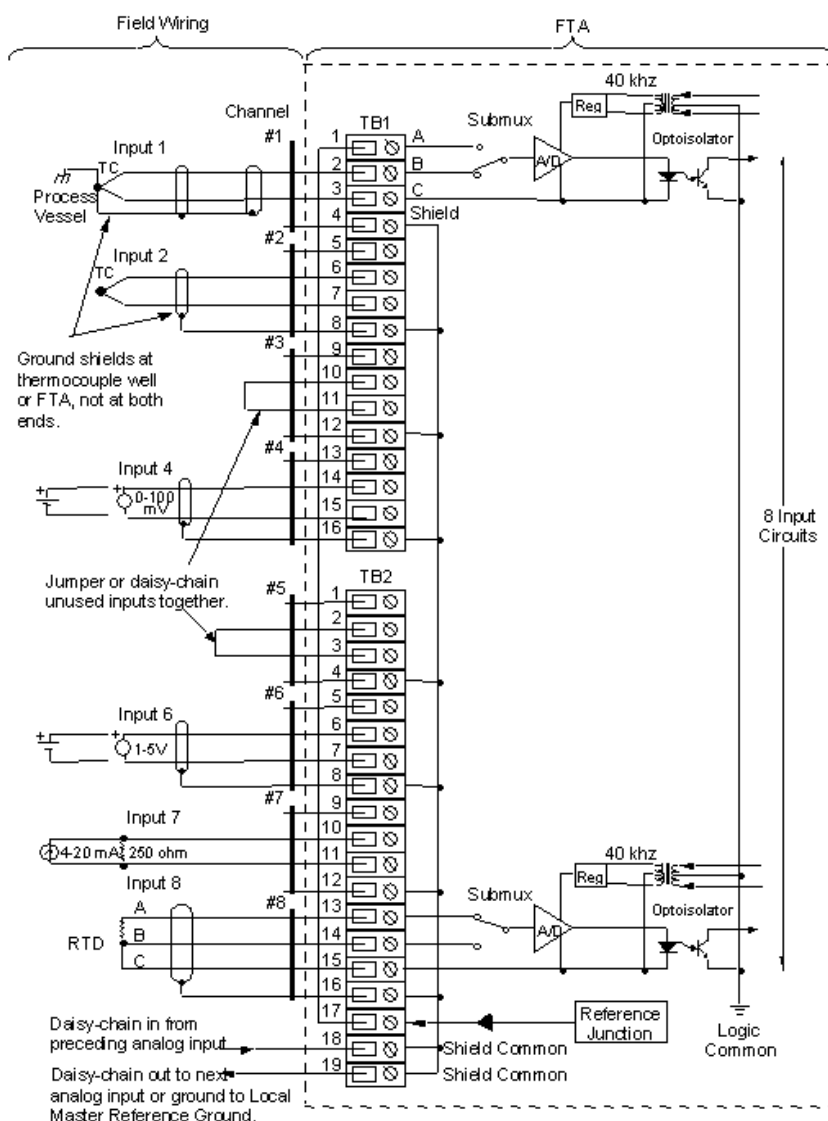


Figure 15 Model MU-TAIL01/MU-TAIL02 FTA Connection Diagram

Model MU-TAIL01/MU-TAIL02 low level analog input FTA with RTD connection diagram—non-CE compliant

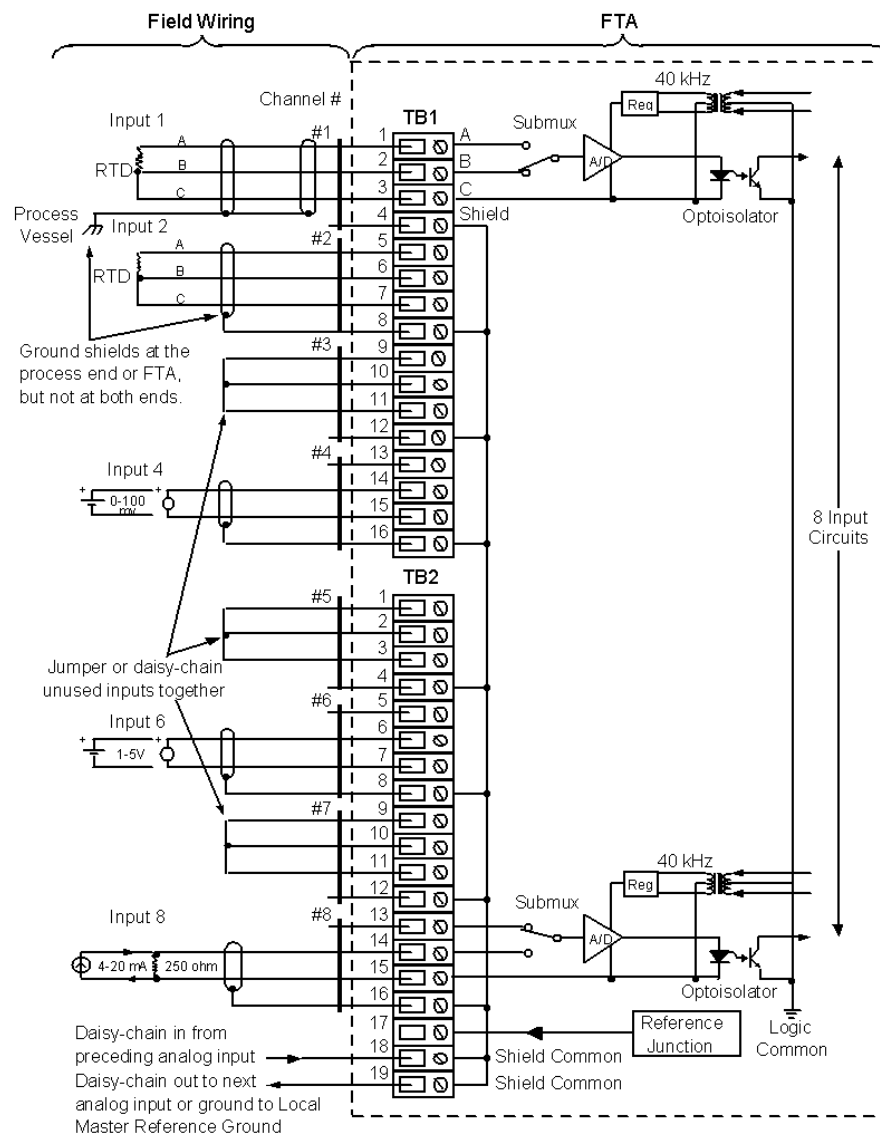


Figure 16 Model MU-TAIL01/MU-TAIL02 FTA with RTD Connection Diagram

Model MU-TAIL03 low level analog input FTA with thermocouple connection diagram—CE compliant

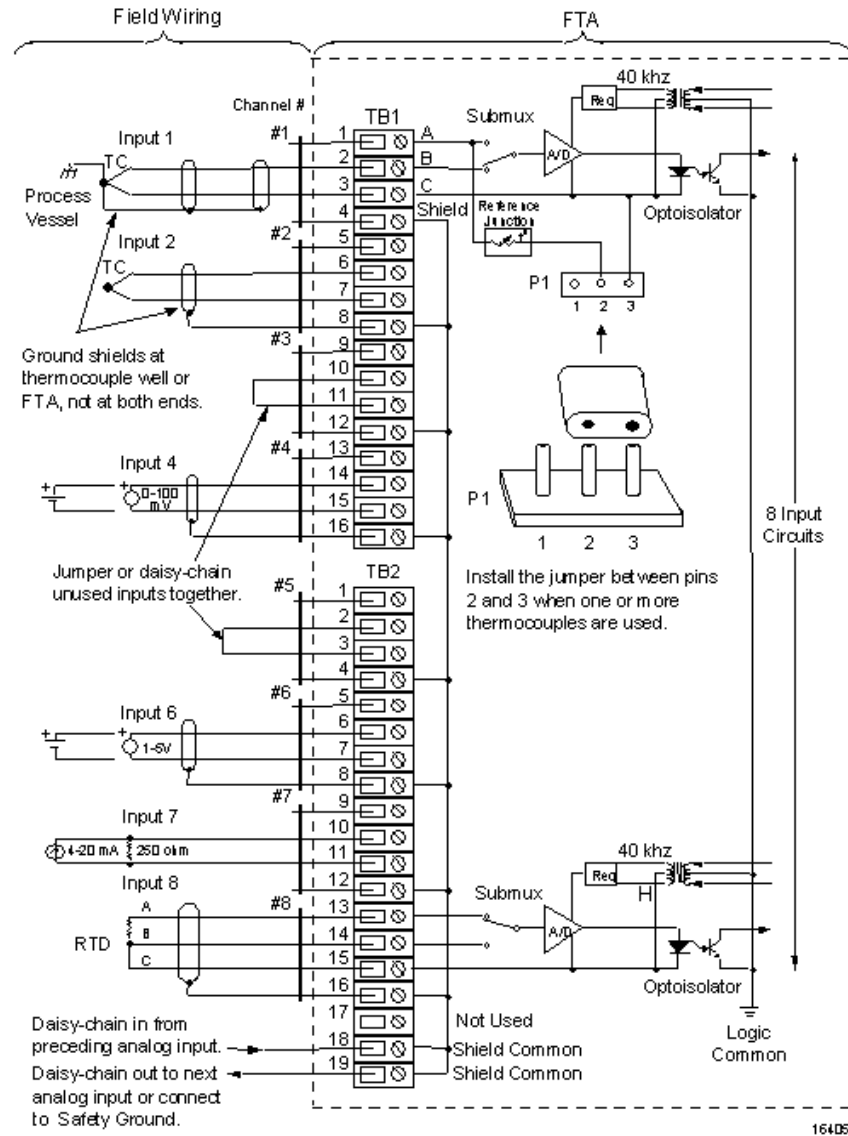


Figure 17 Model MU-TAIL03 FTA with TC Connection Diagram

**Model MU-TAIL03 low level analog input FTA with RTD connection diagram
—CE compliant**

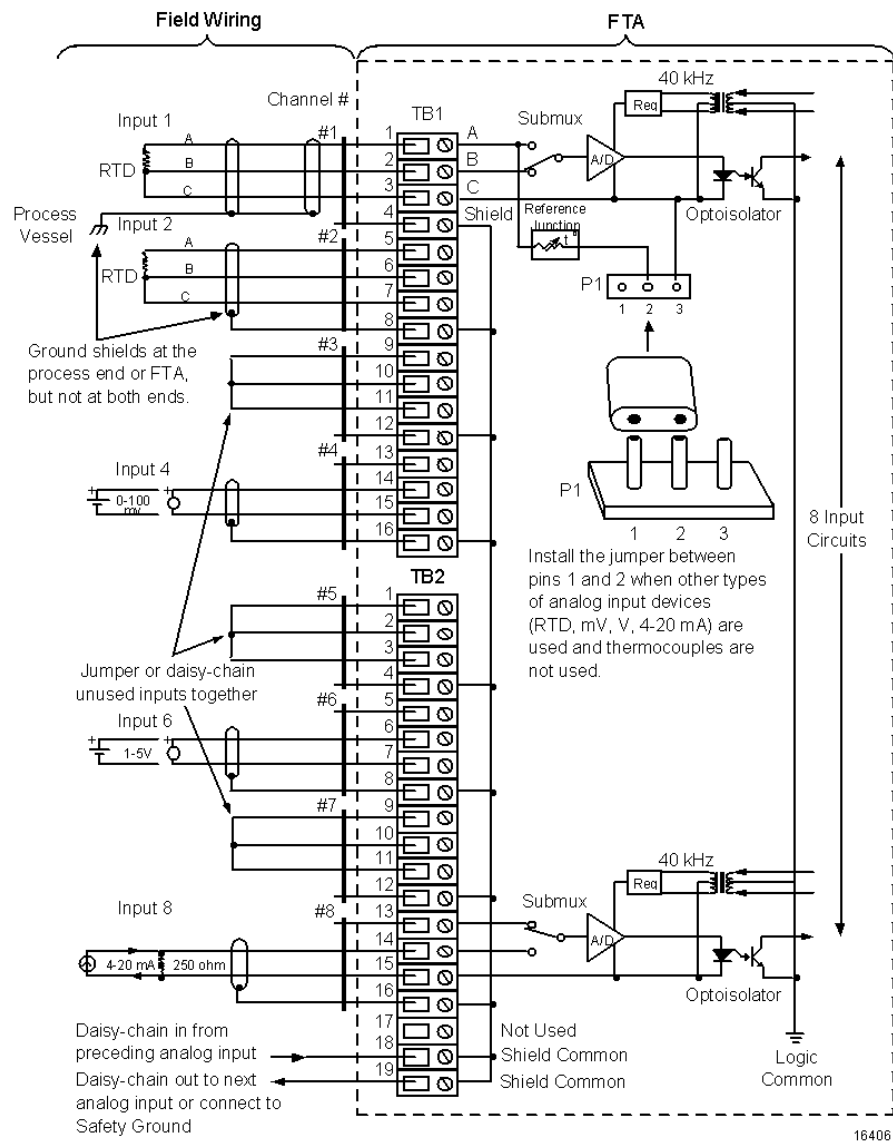


Figure 18 Model MU-TAIL03 FTA with RTD Connection Diagram

Model MU-TAIL02 low level analog input FTA assembly layout —non-CE compliant

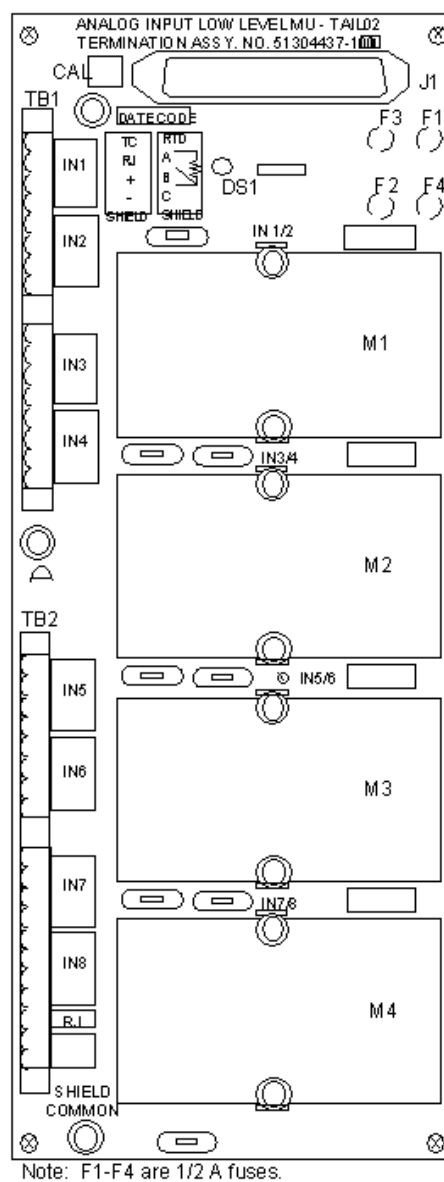


Figure 19 Model MU-TAIL02 FTA Assembly Layout

**Model MU-TAIL03 low level analog input FTA assembly layout
 —CE compliant**

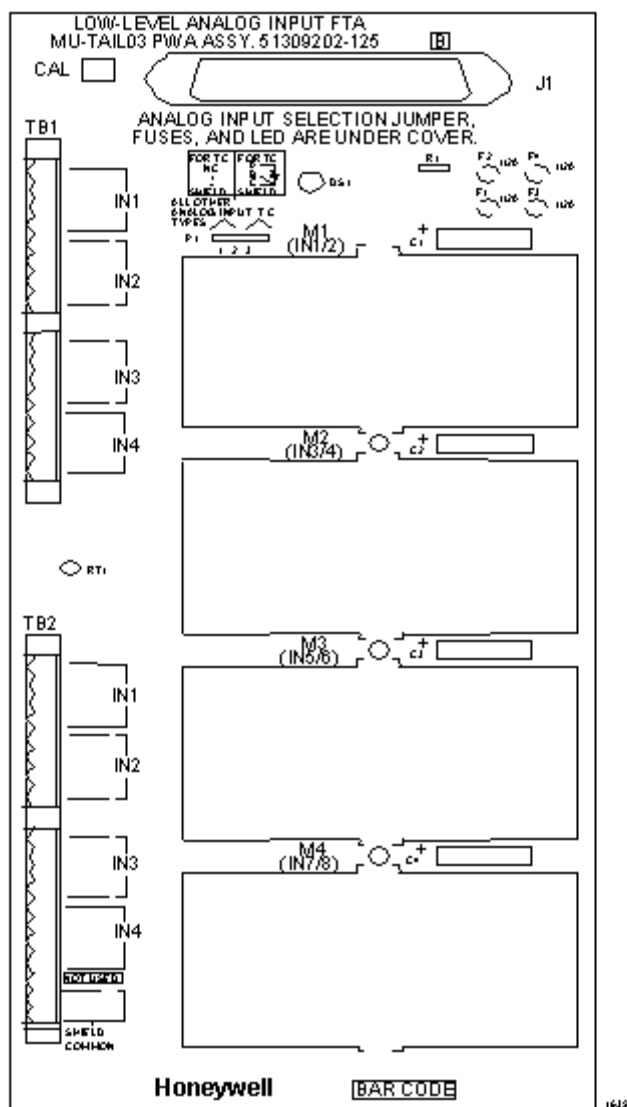


Figure 20 Model MU-TAIL03 FTA Assembly Layout (EMI Cover Removed)

RTD Lead Resistance

RTD temperature error calculations

The temperature error caused by an RTD lead wire resistance and the Intrinsic Safety (IS) barrier resistance mismatch can be estimated by using the equations shown below.

- $T_{\text{RTD Error PT: 100 ohms}} = (R_A - R_C) (1^\circ \text{ C}/.385 \text{ ohms})$
- $T_{\text{RTD Error NI: 120 ohms}} = (R_A - R_C) (1^\circ \text{ C}/.617 \text{ ohms})$
- $T_{\text{RTD Error CU: 10 ohms}} = (R_A - R_C) (1^\circ \text{ C}/.421 \text{ ohms})$

where $T_{\text{RTD Error}}$ is in degrees C and R_A and R_C are the resistances of the RTD lead connection to the A and C screws, respectively, in ohms.

RTD temperature error measurements

Following installation, the temperature error caused by the RTD lead wire resistance and the intrinsic safety (IS). Barrier resistance mismatch can be estimated by using the following equations and the following procedure.

- $T_{\text{RTD Error PT: 100 ohms}} = (V_{AB} - V_{BC}) (7300 \text{ ohm/volt}) (1^\circ \text{ C}/.385 \text{ ohm})$
- $T_{\text{RTD Error NI: 120 ohms}} = (V_{AB} - V_{BC}) (7300 \text{ ohm/volt}) (1^\circ \text{ C}/.617 \text{ ohm})$
- $T_{\text{RTD Error CU: 10 ohms}} = (V_{AB} - V_{BC}) (7300 \text{ ohm/volt}) (1^\circ \text{ C}/.421 \text{ ohm})$

RTD Temperature Error Measurement Procedure

Step	Action
1	Connect the RTD to the LLAI FTA using the actual lead wire and the IS Barrier.
2	Short the A, B, and C terminals together at the RTD Sensor.
3	Measure the voltage between A and B (V_{AB}) and the voltage between B and C (V_{BC}) at the LLAI FTA screw terminals.
4	Disconnect the short installed in Step 2 and connect the RTD properly.

Maximum allowable RTD resistance

The following table is a list of the maximum allowable lead and Intrinsic Safety Barrier resistance for various types of RTD devices.

Maximum Allowable RTD Lead and IS Barrier Resistance

RTD Type	Lead Resistance		IS Barrier Resistance	
	Entire Loop	Per Leg	Entire Loop	Per Leg
Pt: 100 ohm DIN char	20 ohms	10 ohms	36 ohms	18 ohms
Pt: 100 ohm JIS char	20 ohms	10 ohms	36 ohms	18 ohms
Ni: 120 ohm Edison type 7 char	20 ohms	10 ohms	36 ohms	18 ohms
Cu: 10 ohm SEER standard char	20 ohms	10 ohms	0 ohms	18 ohms
When connected to an RTD in a Division 1 area, both the lead resistance and the Intrinsic Safety barrier resistance are allowed simultaneously.				

Low Level Analog Input Multiplexer (LLMux) FTAs

Two types of Low Level Analog Input Multiplexer (LLMux) FTAs accept inputs from either Thermocouples (TC) or Resistive Temperature Detectors (RTDs). Each FTA accepts up to 16 low level analog inputs. All LLMux FTAs are a B (12 inch) mounting size.

CE Compliance

There are two models of each type of Low Level Analog Input Multiplexer (LLMux) Field Termination Assemblies. One model is CE compliant, while the other model is not CE compliant. The CE compliant and non-CE compliant FTAs have unique model numbers. The CE compliant assembly is identified by a part number tab number that ends in “25” or “75,” as shown in the following table.

A CE compliant version of the model MU-TLPA02 Power Adapter **must** be used with the CE compliant FTA models. The CE compliant power adapter assembly is also identified by a part number tab number that ends in “25” or “75.”

CE compliant FTAs and power adapters have an FTA connector with a grounded body that accepts the CE compliant model MU-KFTSxx IOP to FTA cable.

LLMux FTAs and associated hardware

LLMux Analog Input Standard FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAMR02	LLMux RTD FTA with Compression Terminals, Single IOP Interface	51304477-100	N/A
MC-TAMR02	LLMux RTD FTA with Compression Terminals, Single IOP Interface—Conformally Coated	51304477-150	N/A
MU-TAMR03	LLMux RTD FTA with Compression Terminals, Single IOP Interface	N/A	51309218-125
MC-TAMR03	LLMux RTD FTA with Compression Terminals, Single IOP Interface—Conformally Coated	N/A	51309218-175
MU-TAMT02	LLMux TC FTA with Local CJR, Compression Terminals, Single IOP Interface	51401491-100	N/A
MC-TAMT02	LLMux TC FTA with Local CJR, Compression Terminals, Single IOP Interface—Conformally Coated	51401491-150	N/A
MU-TAMT03	LLMux TC FTA with Local CJR, Compression Terminals, Single IOP Interface	N/A	51309223-125

Appendix C – **PM I/O FTA Reference**
Analog Input (AI) FTA Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-TAMT03	LLMux TC FTA with Local CJR, Compression Terminals, Single IOP Interface—Conformally Coated	N/A	51309223- 175
MU-TAMT12	LLMux TC FTA with Remote CJR, Compression Terminals, Dual IOP Interface	51401573- 100	N/A
MC-TAMT12	LLMux TC FTA with Remote CJR, Compression Terminals Dual IOP Interface—Conformally Coated	51401573- 150	N/A
MU-TAMT13	LLMux TC FTA with Remote CJR, Compression Terminals, Dual IOP Interface	N/A	51309213- 125
MC-TAMT13	LLMux TC FTA with Remote CJR, Compression Terminals, Dual IOP Interface—Conformally Coated	N/A	51309213- 175
MU-TLPA02	Power Adapter	51304467- 100	51309204- 125
MC-TLPA02	Power adapter—Conformally Coated	51304467- 150	51309204- 175
<i>Supporting IOPs</i>			
MU-PLAM02	LLMux IOP	N/A	51304362- 100
MC-PLAM02	LLMux IOP—Conformally Coated	N/A	51304362- 150

LLMux IOP

The model MU-PLAM02 LLMux IOP supports all LLMux FTA models and can be installed in any card file slot. A single IOP supports up to two FTAs through use of a power adapter, model MU-TLPA02. Any combination of two TC or RTD LLMux FTAs can be connected to a power adapter, which then connects to a LLMux IOP as shown in the following figure. A single TC or RTD LLMux FTA may also be connected.

Non-CE Compliant applications of CE Compliant hardware

CE Compliant FTAs (models MU-TAMT03, MU-TAMT13, and MU-TAMR03) can be used for non-CE Compliant applications. They are compatible with both the non-CE Compliant version (51304467-100) and CE Compliant version (51309204-125) of the model MU-TLPA02 Power Adapter.

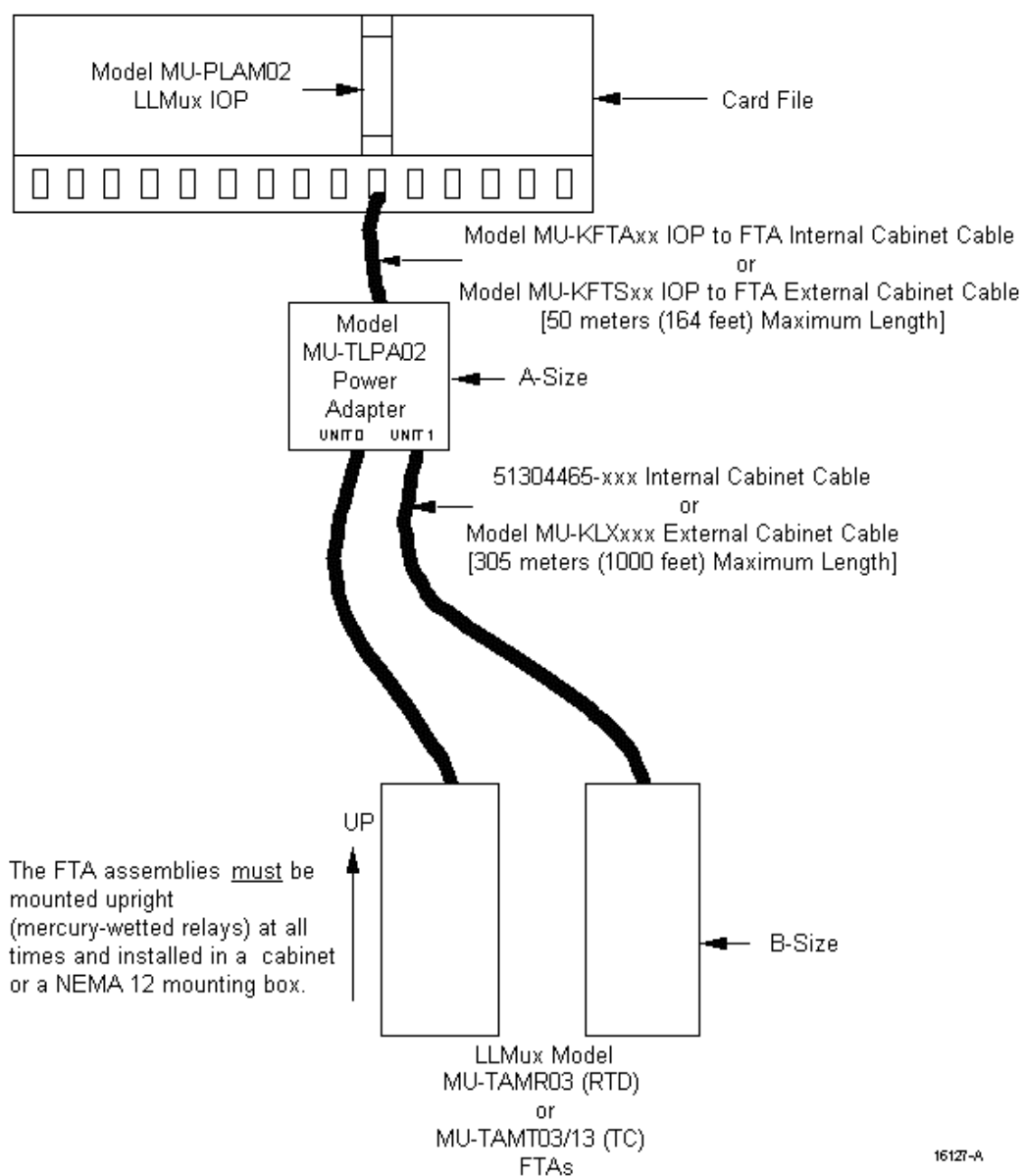
The CE Compliant FTA models have a 6-pin Power Adapter interface connector (J6), while non-CE Compliant FTA models use 4-pin connector.

IOP to Power Adapter cabling

When both the IOP and Power Adapter are installed in the same cabinet or cabinet complex (internal), the IOP to Power Adapter connection is made by using a model MU-KFTAxx cable (the suffix “xx” in the model number represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as illustrated in the following figure.

When the Power Adapter is installed external to the cabinet in which the IOP is installed, the IOP to Power Adapter connection must be made by using a model MU-KFTSxx cable in 12 lengths, up to 50 meters (164 feet) in length, as shown in the following figure.

Appendix C – PM I/O FTA Reference
Analog Input (AI) FTA Wiring

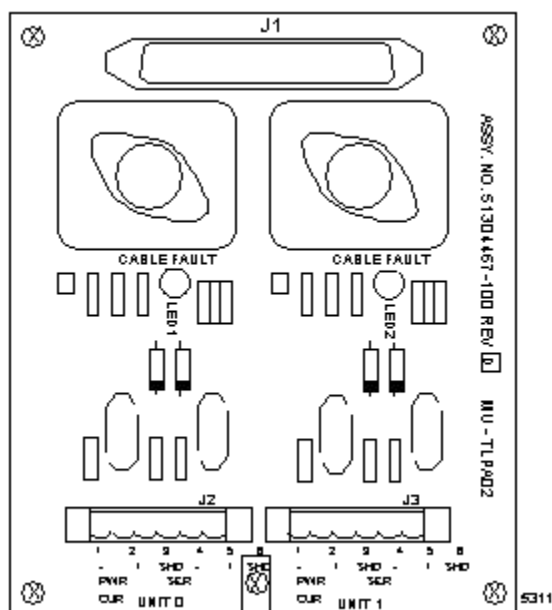


16127-A

LLMux Interconnections

Power Adapter mounting location

The model MU-TLPA02 power adapter is the same size as an A-size (6-inch) FTA and can be installed on a standard FTA mounting channel. The following figure illustrates the assembly layout of the Power Adapter.



Model MU-TLPA02 Power Adapter Layout

Power Adapter to FTA cabling

When the LLMux FTA is installed in the same cabinet, or cabinet complex, as the Power Adapter FTA, a 51304465-xxx cable (“xxx” represents five sizes – 30, 66, 100, 200, and 300 centimeters) must be used for the interconnection. The cabling applies for both CE Compliant and non-CE Compliant applications. Refer to the following figure for an example of CE Compliant applications.

The following table lists the 51304465-xxx cable lengths that are available and their part numbers. The cable is not to be used for external cabinet wiring. Use the model MU-KLXxxx cable for external cabinet wiring.

LLMux to Power Adapter Internal Cabinet Cable–51304465

Part Number	Length (Centimeters)
51304465-100	30
51304465-200	66
51304465-300	100
51304465-400	200
51304465-500	300

When an LLMux FTA is not installed in the same cabinet, or cabinet complex, as the Power Adapter and up to 305 meters (1000 feet) from the Power Adapter, a model MU-KLXxxx cable (“xxx” represents three sizes, 76, 152, and 305 meters, for external cabinet installation) is used for the interconnection.

MU-KLXxxx cable shield grounding

The model MU-KLXxxx cable has four wires with a single-braided shield. The shield must be grounded only at the Power Adapter end of the cable. The connections are made by using the compression terminals in the 6-pin connector on the Power Adapter and the 4-pin or 6-pin connector on the FTA end of the cable. This installation is not CE Compliant.

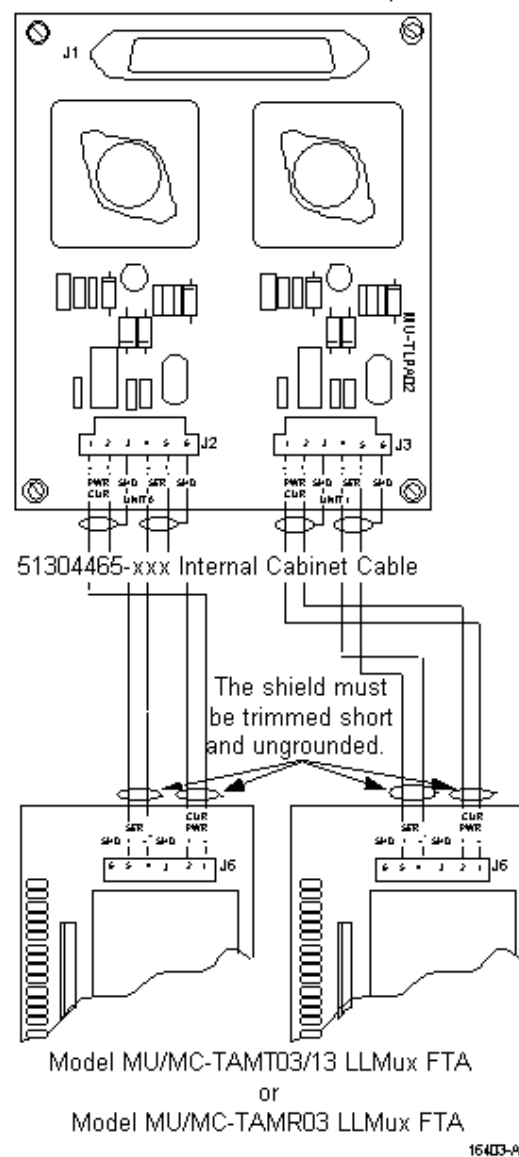
For a CE Compliant installation of the MU-KLXxxx cable, the shield must be connected to ground at both the Power Adapter and FTA ends of the cable. The connections are made by using the compression terminals in the 6-pin connector at both the Power Adapter and FTA ends of the cable as illustrated in the second figure below.

Power Adapter to FTA cable specifications

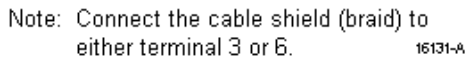
The 51304465-xxx (used for internal cabinet cabling) and model MU-KLXxxx (used for external cabinet cabling) have the following specifications.

Specification	Power Adapter to FTA Cable Type	
	51304465-xxx	MU-KLXxxx
Manufacturer Type	Belden 9406	Belden 83654
Cable Configuration	Shielded Double Pair	Shielded Double Pair (Teflon jacket)
Flame Resistance Conformity	CSA FT4	CSA FT4/FT6 and UL910
CSA Type	CMG	CMP
NEC Type	CMG	CMP
Temperature Rating		-70 to +200 degrees C

Model MU/MC-TLPA02 Power Adapter



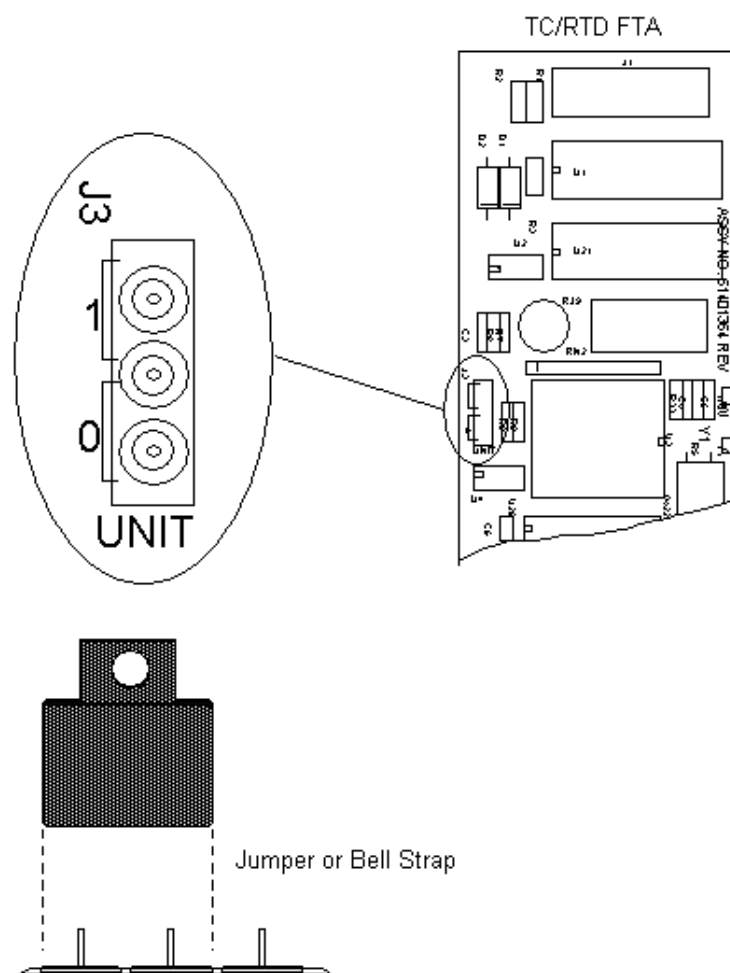
**CE Compliant Power Adapter to LLMux FTA Internal Cabinet Cabling for
 MU/MC-TAMT03/13 or MU/MC-TAMR03 FTA**



R200 11/03	Experion PKS Control Hardware and ControlNet Installation Guide Honeywell	373 Part I

Power Adapter configuration

Because the Power Adapter has two connection terminals, identified as **Unit 0** and **Unit 1**, the LLMux FTA must be configured for the selected connection to the Power Adapter by a jumper on the FTA's daughter board as shown in the following figure. Select either **Unit 0** or **Unit 1** with the jumper on the daughter board. The Unit 0 FTA is channels 1 through 16, while the Unit 1 FTA is channels 17 through 32.



LLMux FTA Address Selection

Thermocouple (TC) LLMux FTAs

Up to 16 thermocouples (TCs) can be connected to each Thermocouple (TC) LLMux FTA. Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the TC LLMux FTAs are given in the following figures listed in Table 11.

Table 11 TC LLMux FTA Connection Drawings

Thermocouple LLMux	Connection Diagram	Assembly Layout
FTA Model	<u>MU/MC-TAMT02</u>	<u>MU/MC-TAMT02</u>
	<u>MU/MC-TAMT03</u>	<u>MU/MC-TAMT03</u>
	<u>MU/MC-TAMT12</u>	<u>MU/MC-TAMT12</u>
	<u>MU/MC-TAMT13</u>	<u>MU/MC-TAMT13</u>

Cold Junction Reference

The model MU-TAMT02 and MU-TAMT03 TC LLMux FTAs have a local Cold Junction Reference (CJR) on the assembly, while the model MU-TAMT12 and MU-TAMT13 FTAs provide terminal connections for a remote CJR sensor, Honeywell part number 51304589-100, that can be located remotely up to 50 meters (150 feet) from the FTA, by using model MU-KRCJ00 shielded 3-conductor 1 mm² (18 AWG) copper wire.

CE Compliance

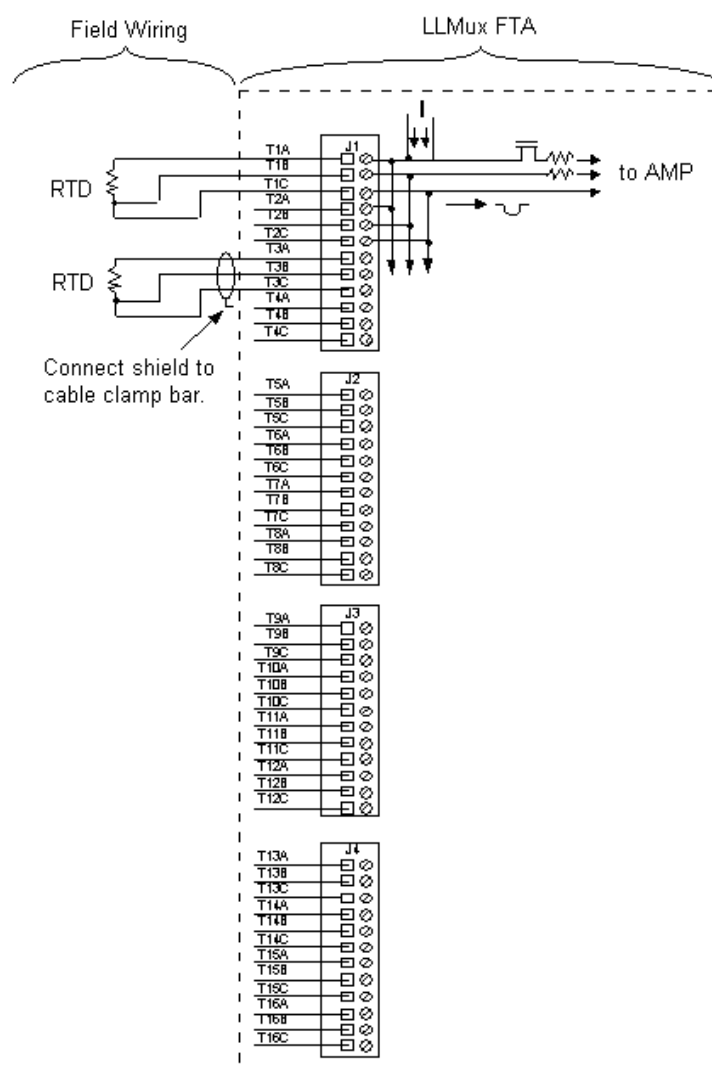
Figure 25 illustrates remote CJR installation requirements. Model MU-KRCJ00 cable must be used between the remote CJR sensor and the model MU-TAMT13 or MC-TAMT13 FTA. Its length is restricted to 50 meters (164 feet). The cable shield must be connected to Safety Ground at both ends of the cable.

All remote terminations and the remote CJR sensor assembly must be located in the same cabinet. Figure 23 and Figure 24 illustrate the remote CJR sensor and FTA connections.

The model MU-KRCJ00 cable has the following specifications:

- Manufacturer Type—Belden model 83653, or equivalent
Conductors—Three 1.0 mm² (18 AWG) conductors
- Insulation and Jacket—Teflon[®] conductor insulation and jacket
- Shielding—Braid over foil
- CSA Type—PCC FT 4 FT 6
- NEC Type—CMP
- Use—Air plenum

Model MU-TAMT02 thermocouple LLMux FTA with local CJR connection diagram



Note:
Connect the cable shield to the cable clamp bar at the FTA and allow the shield to float at the sensor.

29 13

Figure 21 Model MU-TAMT02 FTA with Local CJR Connection Diagram

Model MU-TAMT03 thermocouple LLMux FTA with local CJR connection diagram

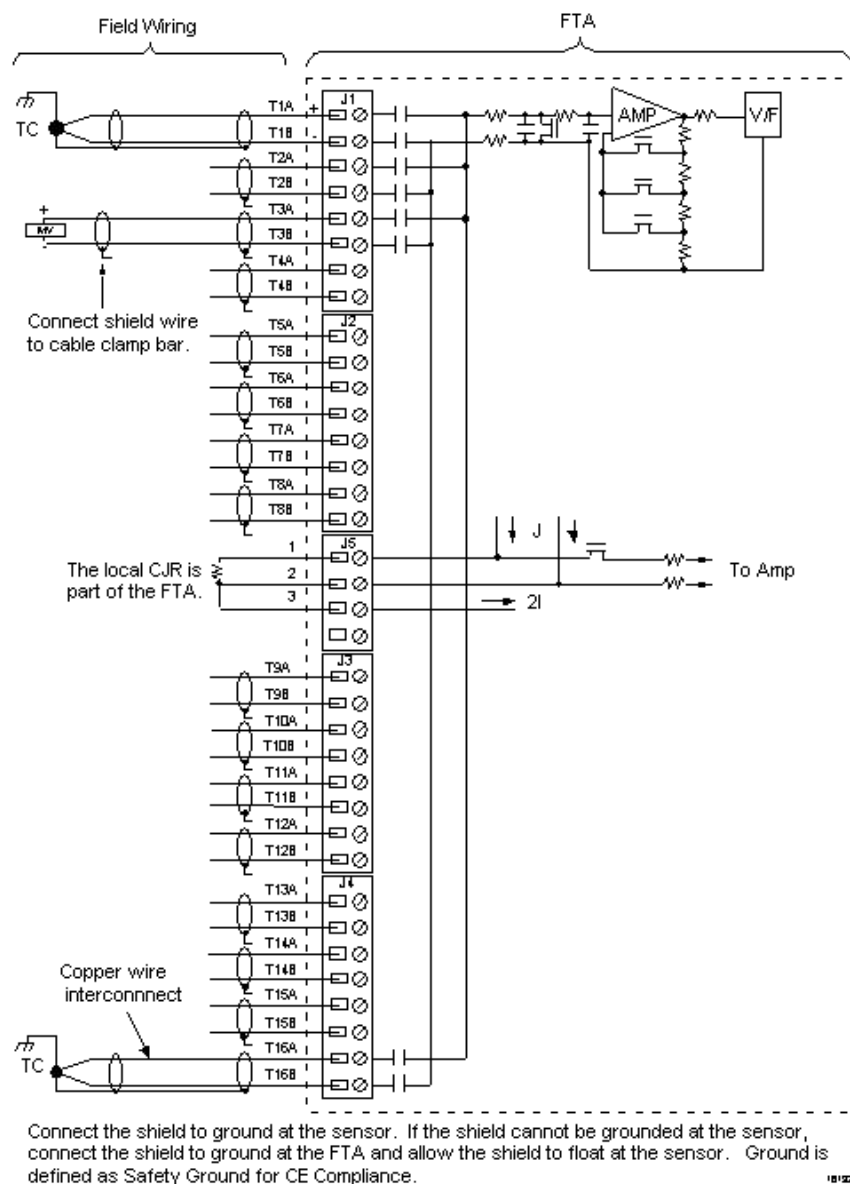


Figure 22 Model MU-TAMT03 FTA with Local CJR Connection Diagram

Model MU-TAMT12 thermocouple LLMux FTA with remote CJR connection diagram

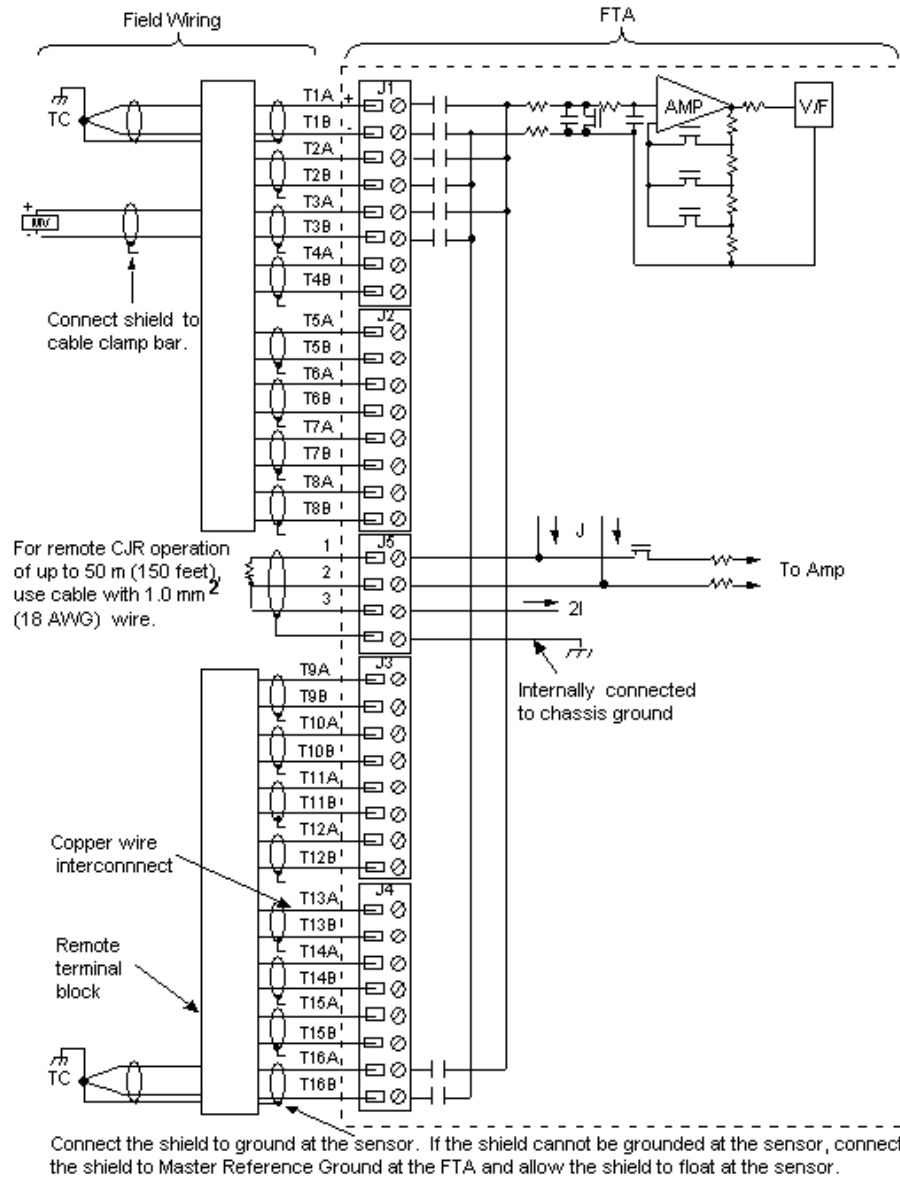


Figure 23 Model MU-TAMT12 FTA with Remote CJR Connection Diagram

Model MU-TAMT13 thermocouple LLMux FTA with remote CJR connection diagram

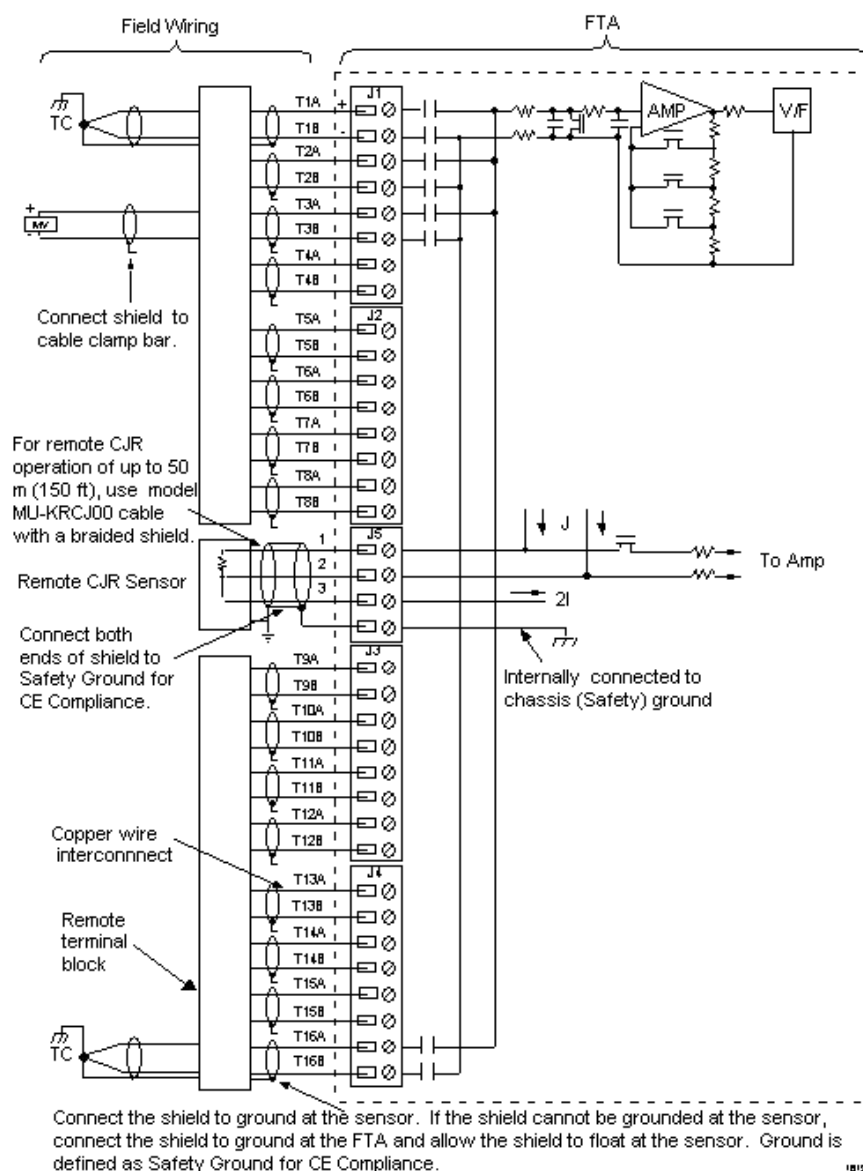
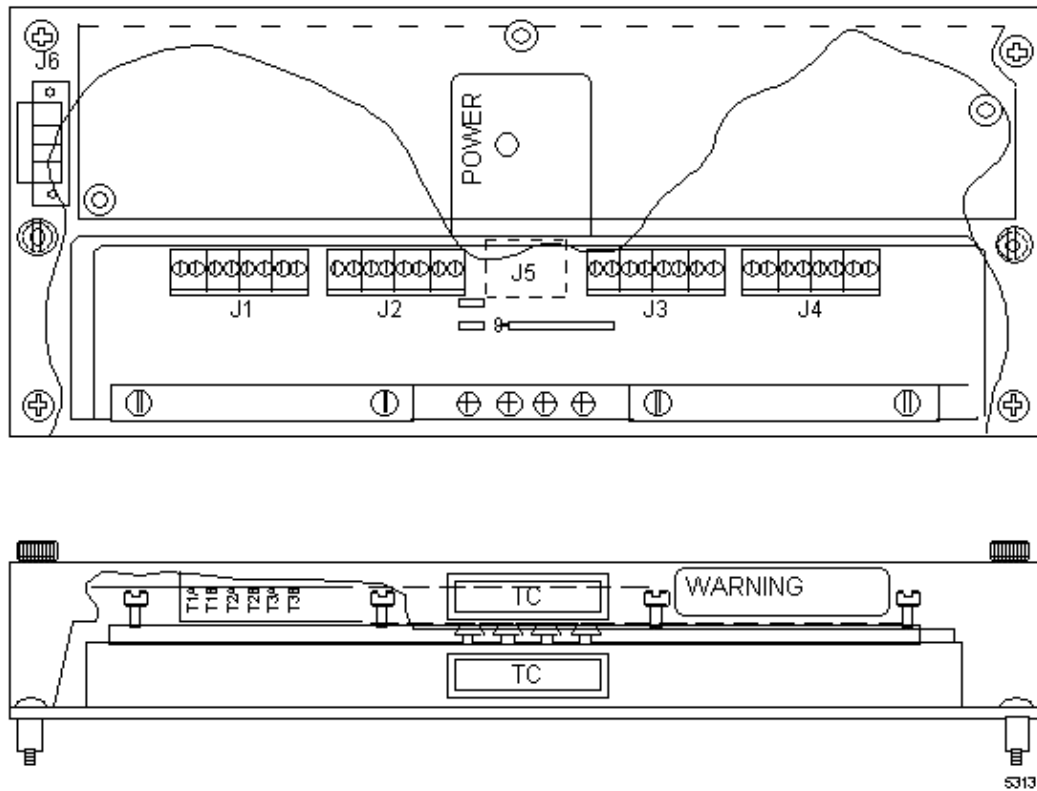
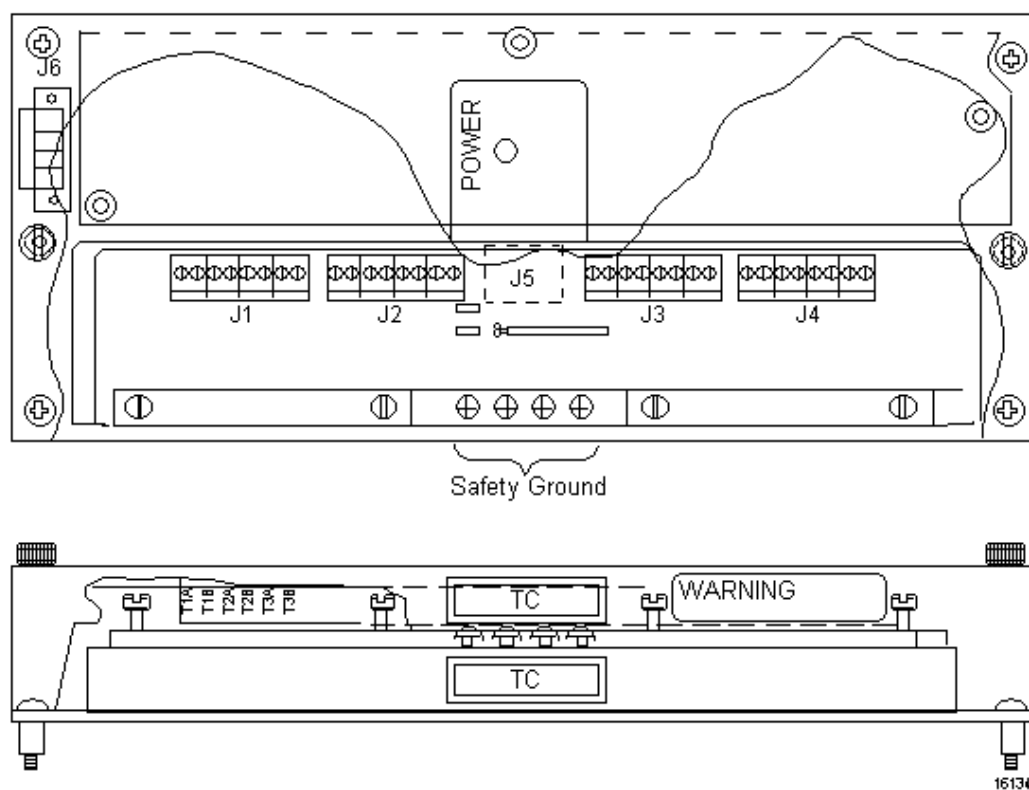


Figure 24 Model MU-TAMT13 FTA with Remote CJR Connection Diagram

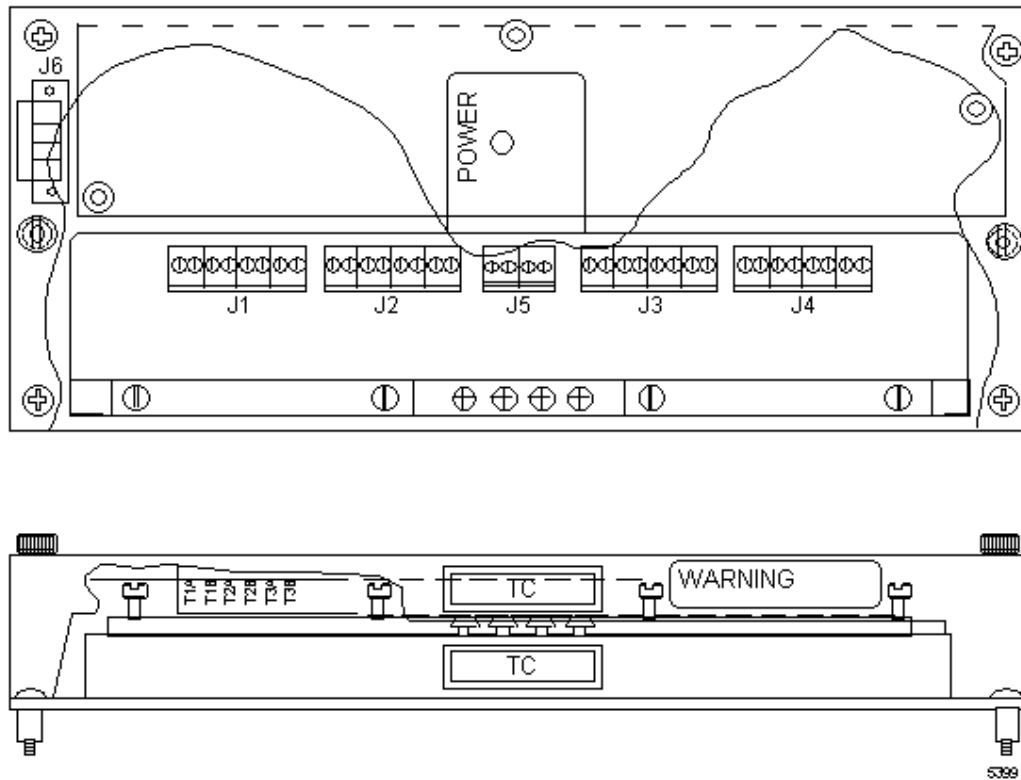
Model MU-TAMT02 thermocouple LLMux FTA assembly layout



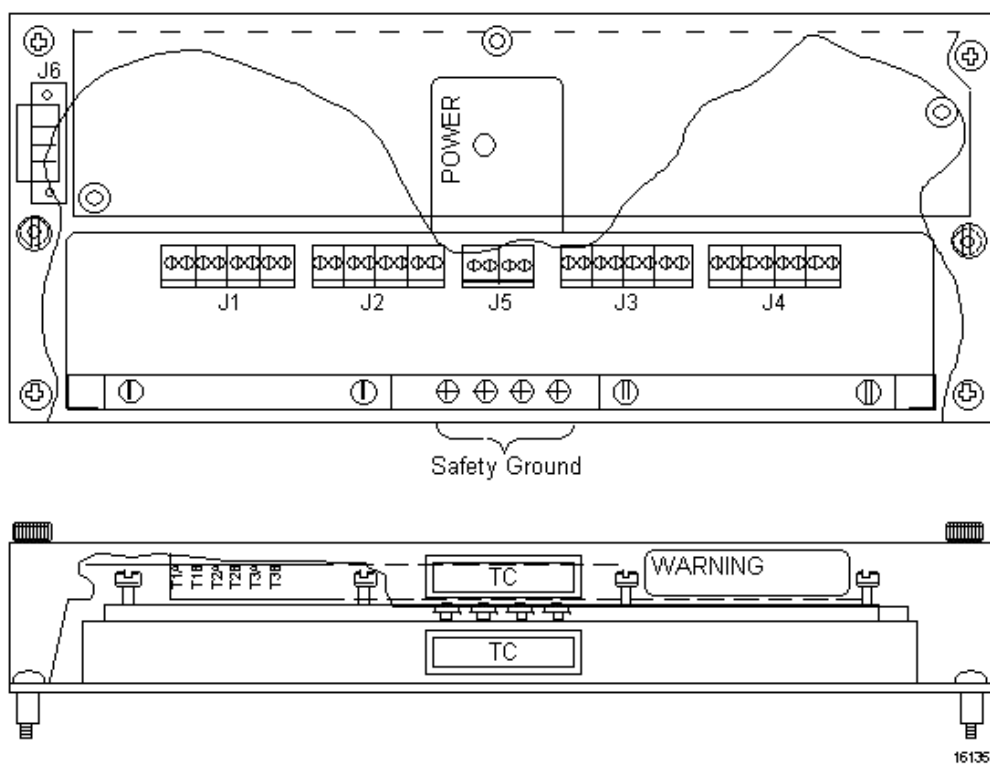
Model MU-TAMT03 thermocouple LLMux FTA assembly layout



Model MU-TAMT12 thermocouple LLMux FTA assembly layout



Model MU-TAMT13 thermocouple LLMux FTA assembly layout



Remote CJR installation

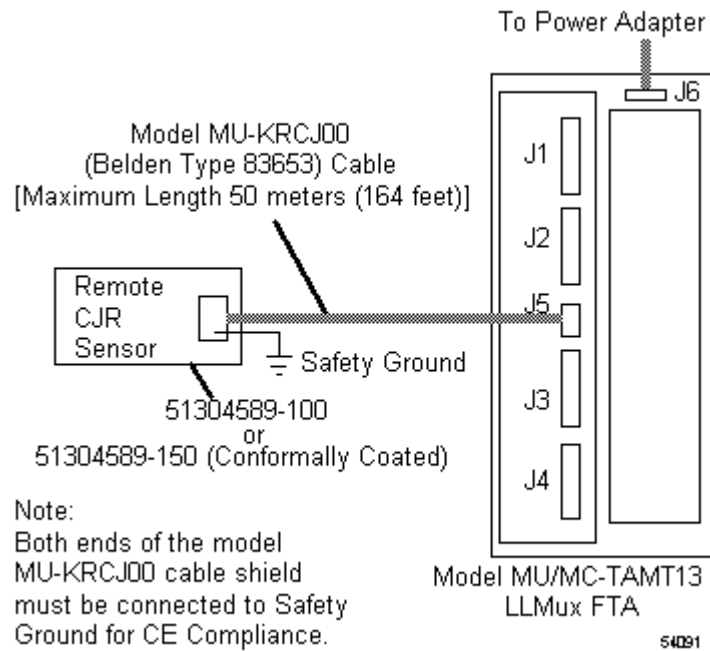


Figure 25 Remote CJR Installation

Resistive Temperature Device (RTD) LLMux FTAs

Up to 16 Resistive Temperature Devices (RTDs) can be connected to each Resistive Temperature Device (RTD) LLMux FTA. Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the RTD LLMux FTAs are given in the following figures listed in Table 12.

Table 12 RTD LLMux FTA Connection Drawings

RTD LLMux	Connection Diagram	Assembly Layout
FTA Model	<u>MU/MC-TAMR02</u>	<u>MU/MC-TAMR02</u>
	<u>MU/MC-TAMR03</u>	<u>MU/MC-TAMR03</u>

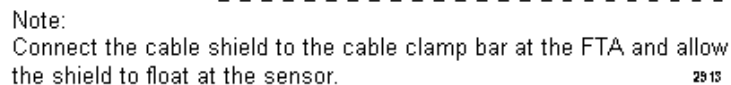
CAUTION

To reduce the negative affect of ground potential differences, the following cable usage and ground reference selection rules should be considered for the model MU-TAMR02 RTD LLMux FTA only. These rules do not apply for the model MU-TAMR03 RTD LLMux FTA.

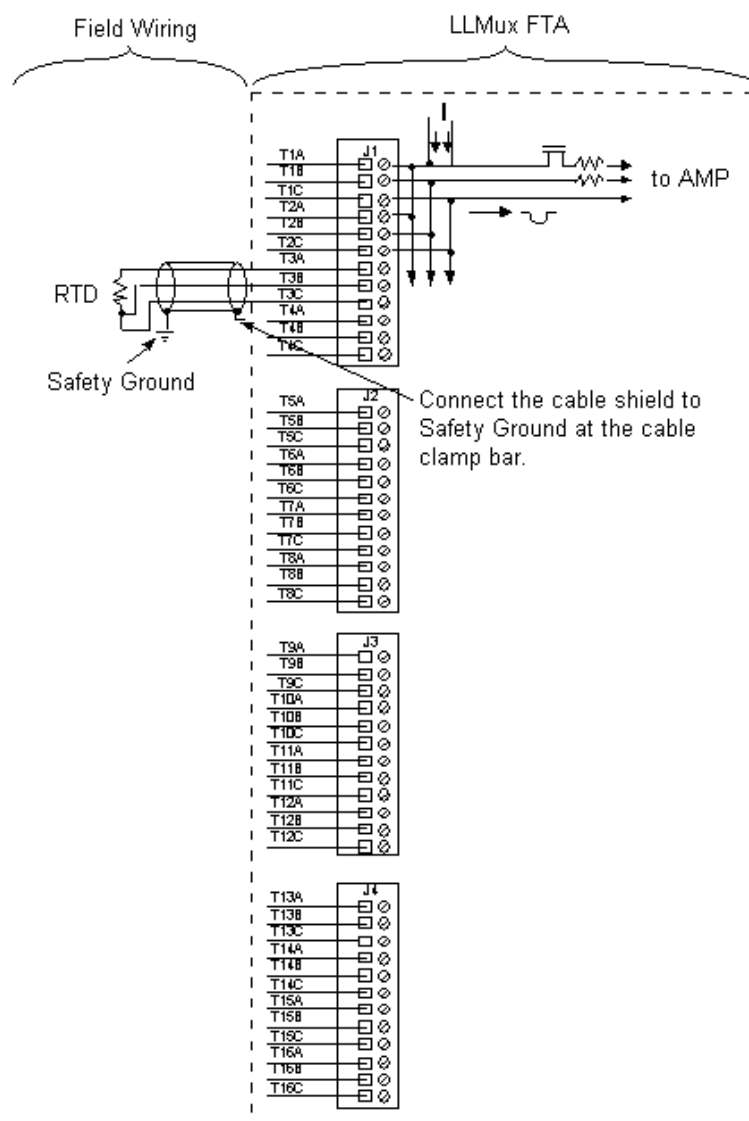
- Use a 3-wire cable. Do not share a conductor in a cable between two RTDs.
 - Use a single point of sensor ground reference, or reference to a voltage within the control system common-mode specifications.
 - Terminate the cable shield at only one end to a potential that is close to the potential of the RTD.
 - Try to select a practical route for the RTD cable.
-

CE Compliance for field wiring

The model MU-TAMR03 RTD LLMux FTA is CE Compliant and requires shielded input wiring with the cable shield connected to Safety Ground at both ends of the cable.



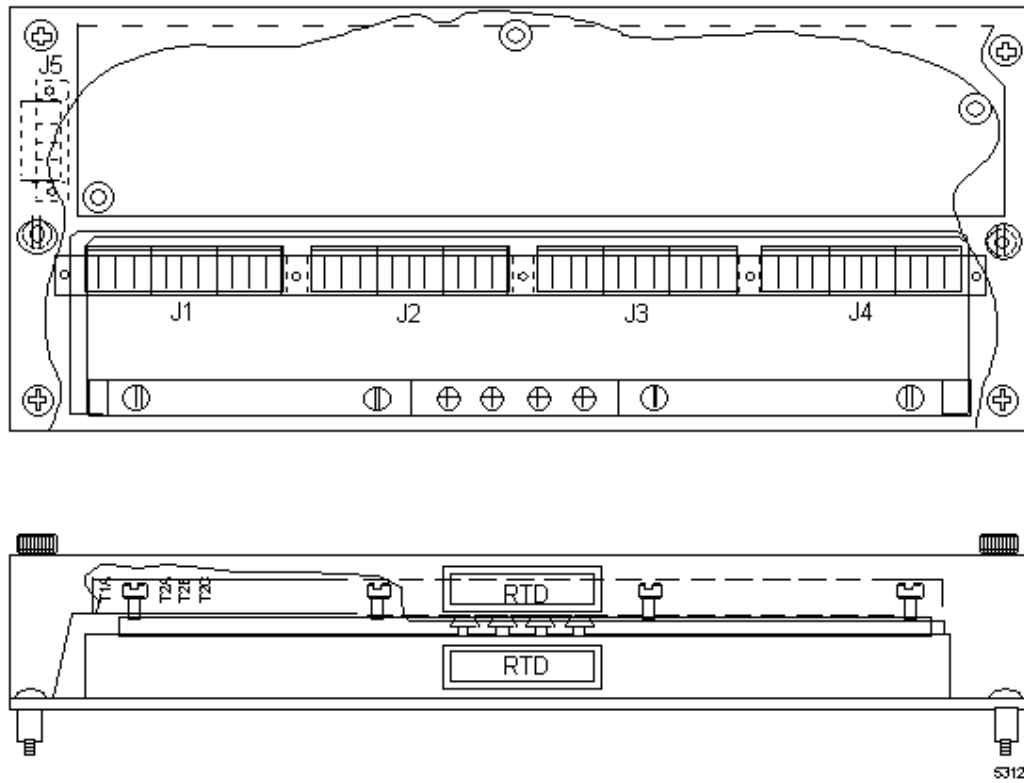
Model MU-TAMR03 RTD LLMux FTA connection diagram



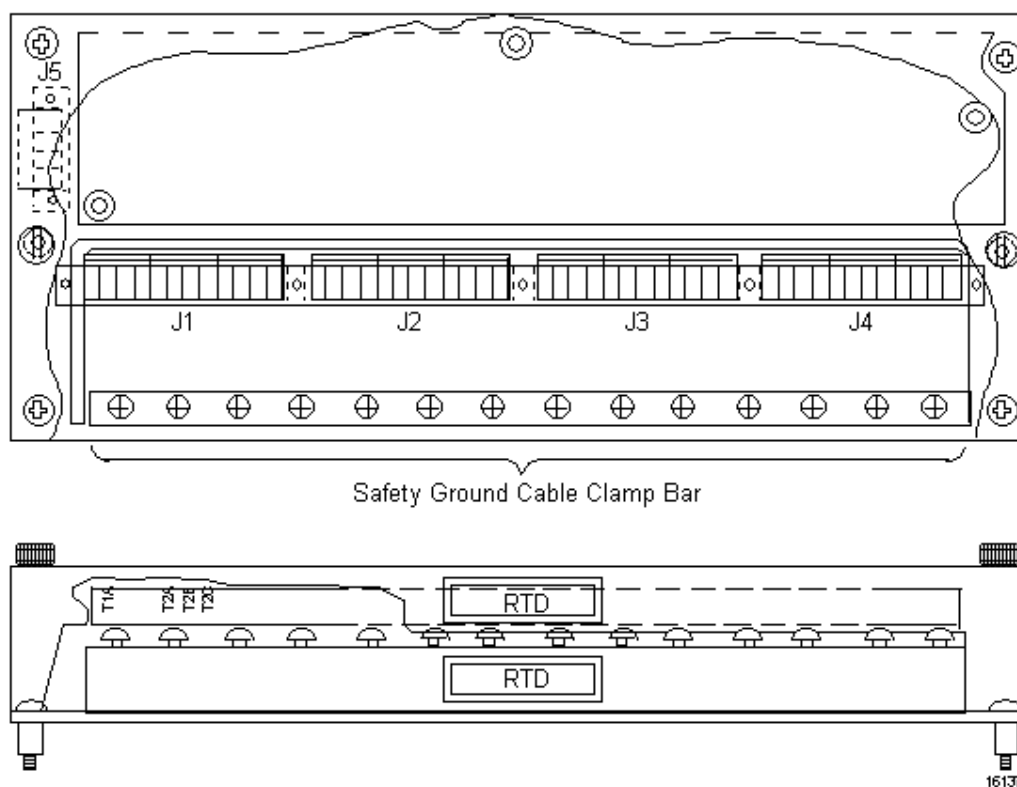
Note:
 For CE Compliance, connect the cable shield to the cable clamp bar (Safety Ground) at the FTA and to Safety Ground at the RTD sensor.

16136

Model MU-TAMR02 RTD LLMux FTA assembly layout



Model MU-TAMR03 RTD LLMux FTA assembly layout



Remote Hardened Multiplexer (RHMUX) FTA

One or two Remote Hardended MUX (RHMUX) Thermocouple (TC) FTAs can be connected to either an Intrinsically Safe (IS) Power Adapter or a Non-Incendive (NI) Power Adapter. The Power Adapter also connects to a model MU/MC-PRHM01 RHMUX IOP as illustrated in Figure 26 and Figure 27.

The RHMUX IS Power Adapter and the NI Power Adapter are functionally the same. Both models of the Power Adapter are Galvanically Isolated from the FTA.

The RHMUX FTA supports 0 to 100-millivolt inputs and thermocouple inputs. RTD inputs are not supported.

The model MU/MC-PRHM01 IOP supports 32 inputs from two RHMUX FTAs.

CE Compliance

All the assemblies that constitute the Remote Hardened Multiplexer (RHMUX) are CE Compliant. However, the installation is CE Compliant only when the recommended cabling method is used and properly installed.

Intrinsic Safety

The RHMUX is approved as Intrinsically Safe and Nonincendive for use in hazardous locations. However, the RHMUX assemblies can also be used in areas that are classified as nonhazardous.

Control drawings

The approvals for the RHMUX subsystem are valid only if the appropriate Honeywell control drawing is followed. Drawing 51204105 covers Intrinsically Safe installations and drawing 51204185 covers Nonincendive installations.

RHMUX assemblies

The RHMUX assembly models with their part numbers are listed in the following table

Remote Hardened Multiplexer FTA, Power Adapter and IOP Models

Model No.	Assembly Description	CE Compliant Part Number
MC-GRMT01	RHMUX TC FTA with Local CJR Screw Terminals – Conformally Coated	51404106-175
MU-GRPA01	Intrinsically Safe RHMUX Power Adapter	51304724-125
MC-GRPA01	Intrinsically Safe RHMUX Power Adapter Conformally Coated	51304724-175
MU-TRPA01	Non-Incendive RHMUX Power Adapter	51304722-125
MC-TRPA01	Non-Incendive RHMUX Power Adapter Conformally Coated	51304722-175
<i>Supporting IOPs</i>		
MU-PRHM01	RHMUX IOP	51404109-125
MC-PRHM01	RHMUX IOP—Conformally Coated	51404109-175
<i>RHMUX FTA Enclosures</i>		
MU-CMSS03	NEMA 4X Stainless Steel Enclosure (35.6 cm wide x 40.7 cm high x 15.2 cm deep)	51309250-100
MU-CMSC03	NEMA 4X Painted Carbon Steel Enclosure (35.6 cm wide x 40.7 cm high x 15.2 cm deep)	51309250-200

Compatibility

The RHMUX assemblies are compatible only with each other. The assemblies are not compatible with the LLMux assemblies.

RHMUX Power Adapter mounting

The RHMUX Power Adapter must be mounted in the same cabinet, or cabinet complex, as the IOP.

The model MU/MC-GRPA01 Intrinsically Safe RHMUX Power Adapter is the same size as an A-size (6-inch) FTA and can be installed on a standard FTA mounting channel. The assembly layout of the model MU/MC-GRPA01 is shown in Figure 28.

The model MU/MC-TRPA01 Non-Incendive RHMUX Power Adapter is the same size as a B-size (12-inch) FTA and can be installed on a standard FTA mounting channel. The assembly layout of the model MU/MC-TRPA01 is shown in Figure 29.

RHMUX FTA mounting

The RHMUX FTA dimensions of approximately 13 inches by 13 inches cannot be accommodated by an FTA mounting channel in a control cabinet and is not intended to be mounted in a control cabinet. Figure 30 illustrates the assembly layout of the FTA.

The RHMUX FTA can be installed in areas where incendive or explosive material exist when approved by local authorities. The RHMUX agency approvals are valid only when the FTA is mounted in a 35.6 W x 40.7 H x 15.2 D-centimeter (14 W x 16 H x 6 D-inch) model MU-CMSC03 NEMA 4 or model MU-CMSS03 NEMA 4X sealed enclosure that are offered by Honeywell. Figure 31 is an illustration of the enclosure.

The model MU-CMSS03 enclosure is Approved for Division 1 and Division 2, Class I, II, and III locations. The model MU-CMSC03 enclosure is Approved for Division 1 and Division 2, Class I locations only. FM, CSA, and KEMA (CENELEC) approvals are not valid for other enclosures.

Power Adapter to remote FTA cable length

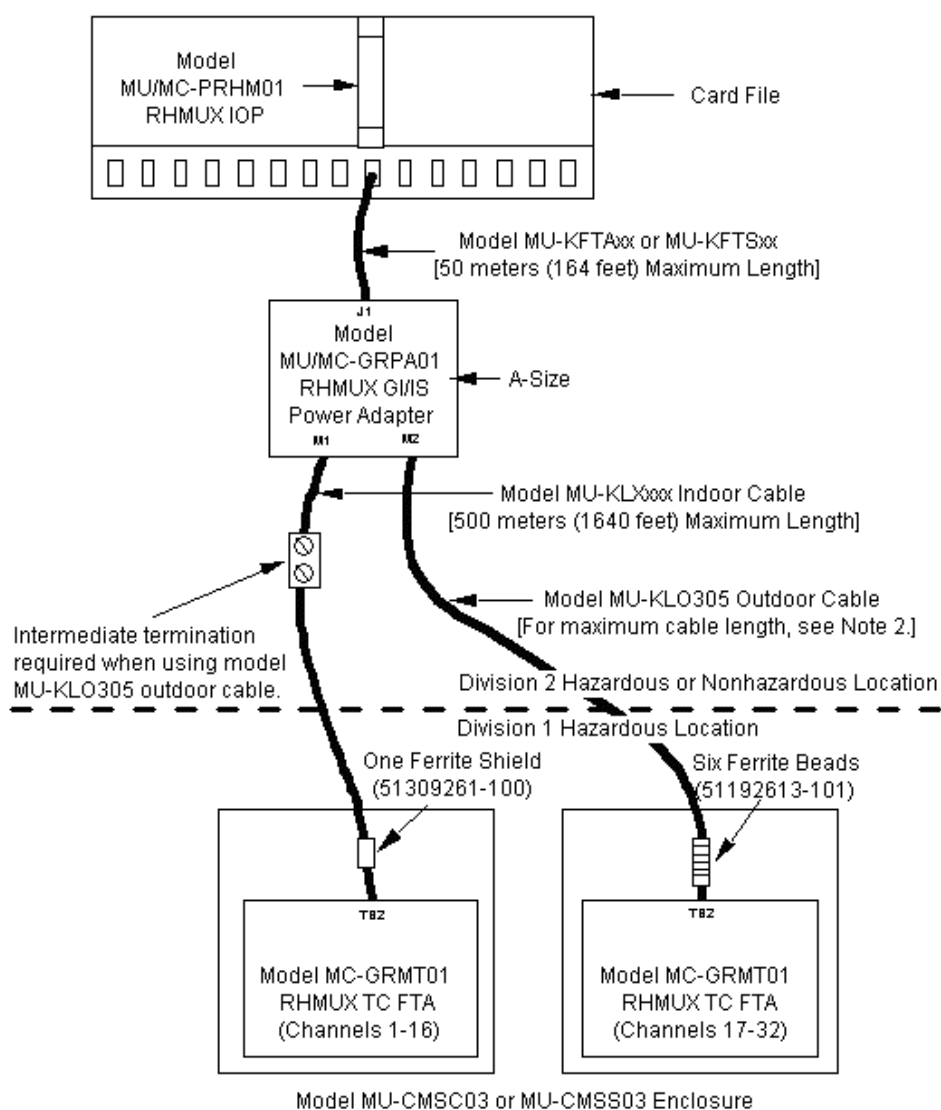
The maximum acceptable cable length between the Power Adapter and the RHMUX FTA depends primarily upon the type of cable that is used. For Division 1, Class I, Group A and B hazardous locations, there is an additional length restriction.

The model MU-KLXxxx or MU-KLO305 cable can be used in any location for runs of up to 500 meters (1640 feet) between the Power Adapter and the FTA, as long as the cable does not get wet. If the cable is exposed to precipitation, the model MU-KLO305 cable must be used.

For Division 1, Class I, Group A and B hazardous locations, the model MU-KLO305 cable is used for runs of up to 1400 meters (4590 feet) between the Power Adapter and the FTA. For all other locations, the model MU-KLO305 cable is used for runs of up to 2000 meters (6560 feet).

Intrinsically Safe RHMUX application

Figure 26 illustrates an Intrinsically Safe application for the RHMUX assemblies. For valid agency Approvals, the installation must comply with Honeywell control drawing 51204105.



Notes: 1. For CE Compliance, use ferrite shield or beads.

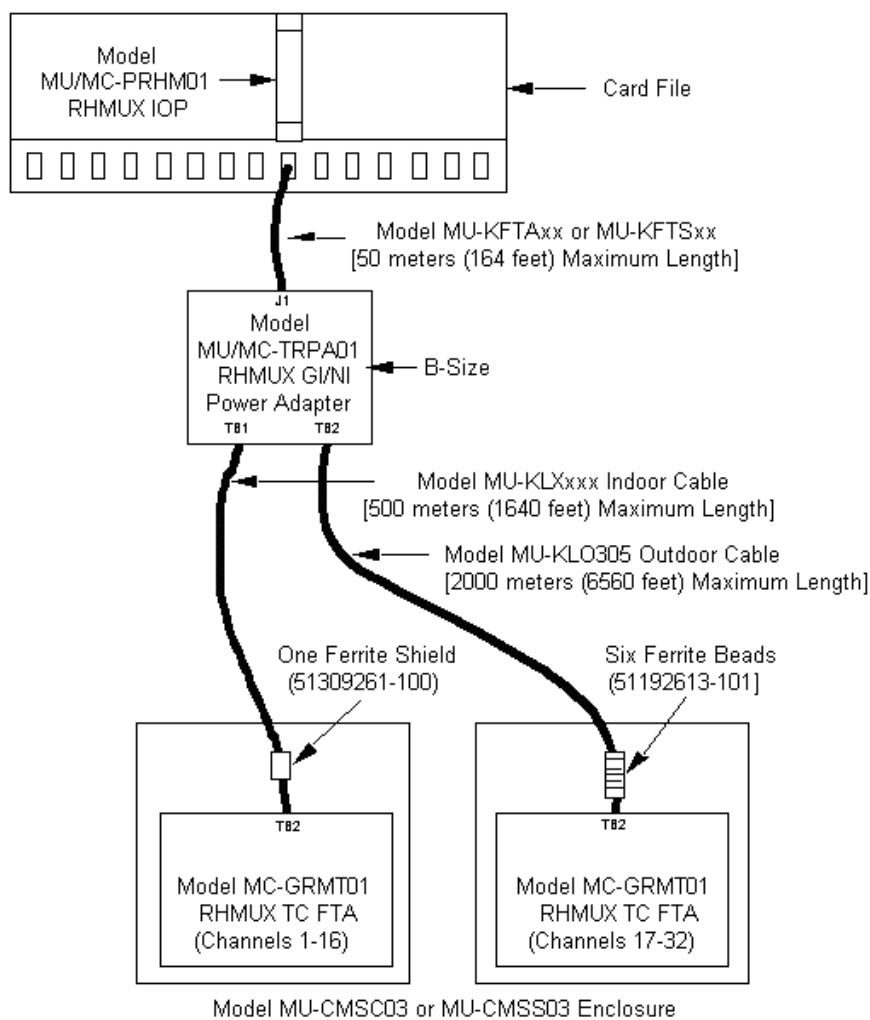
2. 1400 meters (4590 feet) Maximum Length for Class I, Group A or B.
2000 meters (6560 feet) Maximum Length for all other locations.

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Figure 26 RHMUX Intrinsically Safe Configuration Interconnections

Nonincendive RHMUX application

Figure 27 illustrates a Nonincendive application for the RHMUX assemblies. For valid agency Approvals, the installation must comply with Honeywell control drawing 51204185.



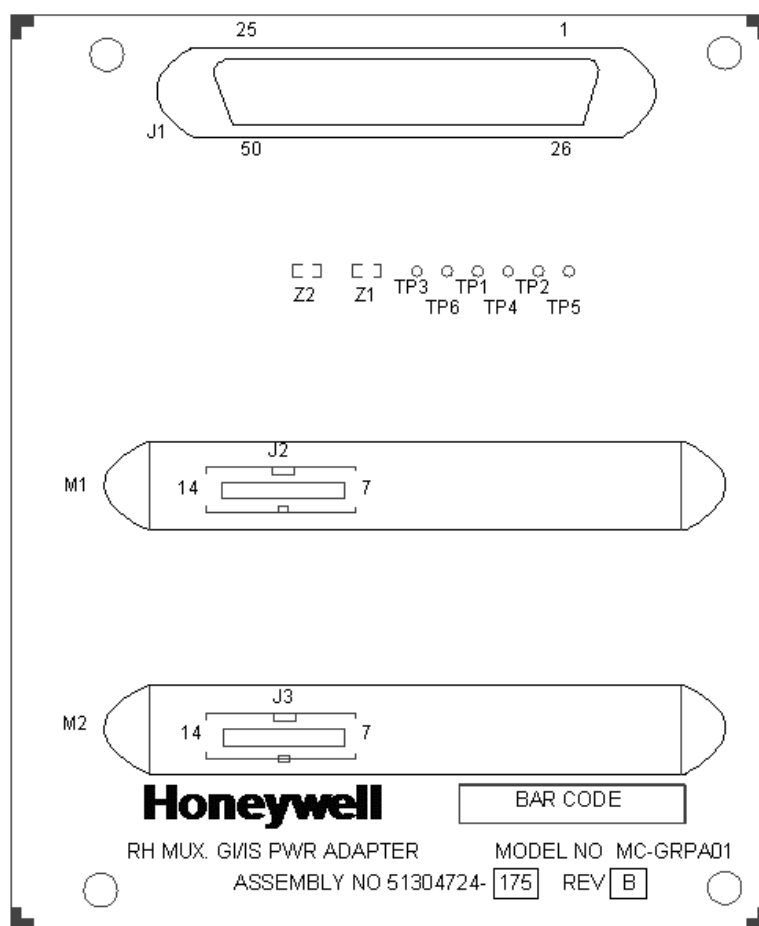
Note: For CE Compliance, use ferrite shield or beads.

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Figure 27 RHMUX Nonincendive Configuration Interconnections

Model MU/MC-GRPA01 assembly layout

Figure 28 illustrates the assembly layout of the model MU/MC-GRPA01 RHMUX Intrinsically Safe Power Adapter. The connector (J2 or J3) at the top of each module (M1 or M2) provides the interface to one RHMUX thermocouple FTA.



Note: The RHMUX Thermocouple FTA interface terminals (1-6) are located on the top of the Zener barrier modules (M1 and M2). The mating connectors (Honeywell part number 51191738-100) are provided with the Power Adapter.

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Figure 28 Model MU/MC-GRPA01 RHMUX IS Power Adapter Assembly Layout

Model MU/MC-TRPA01 assembly layout

Figure 29 illustrates the assembly layout of the model MU/MC-TRPA01 RHMUX Non-Incendive Power Adapter. Mating connectors for TB1 and TB2 (Honeywell part number 51195776-100) are provided with the Power Adapter.

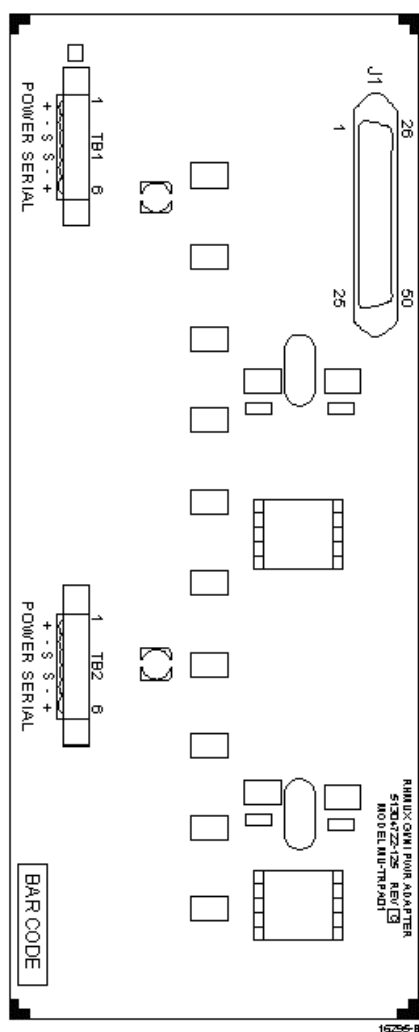


Figure 29 Model MU/MC-TRPA01 RHMUX NI Power Adapter Assembly Layout

Model MC-GRMT01 assembly layout

Figure 30 illustrates the assembly layout of the model MC-GRMT01 RHMUX Thermocouple FTA.

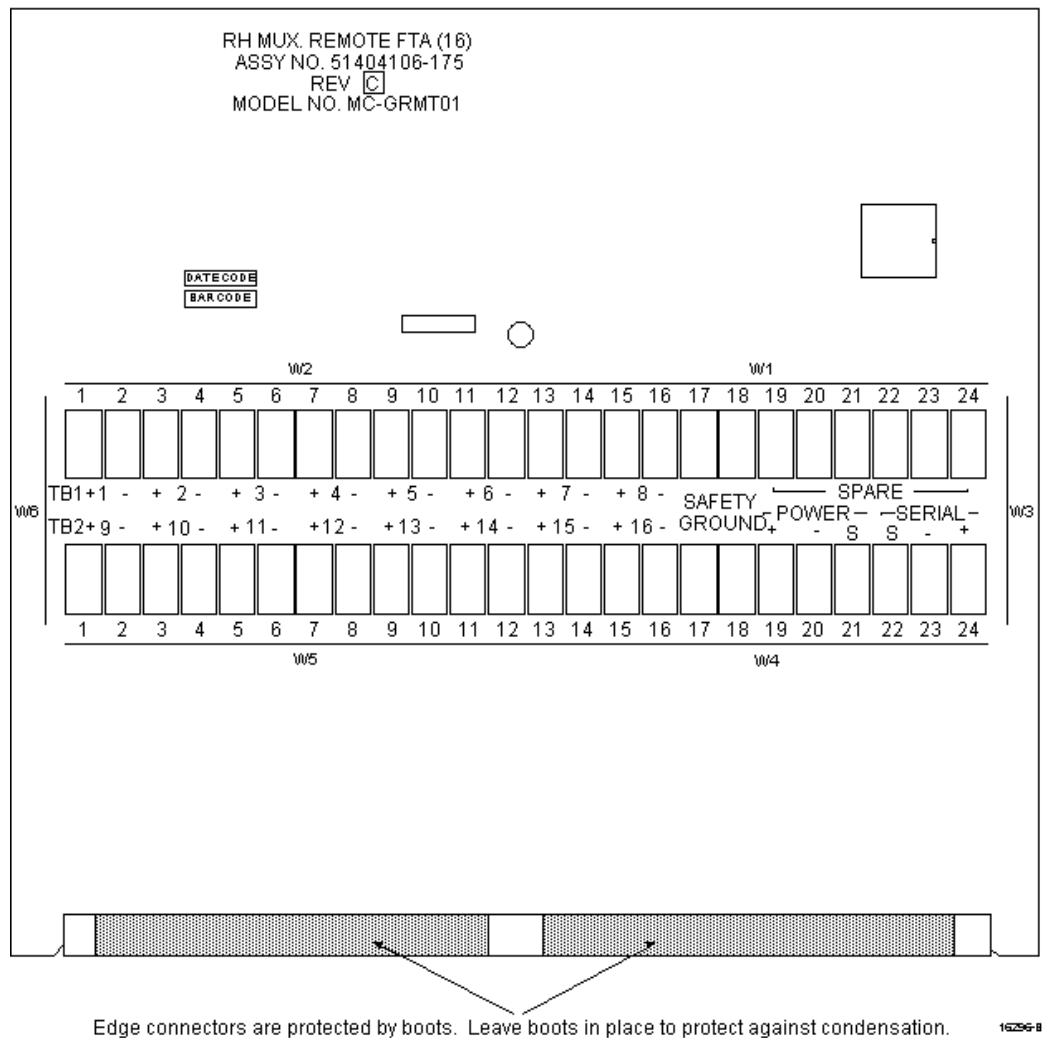
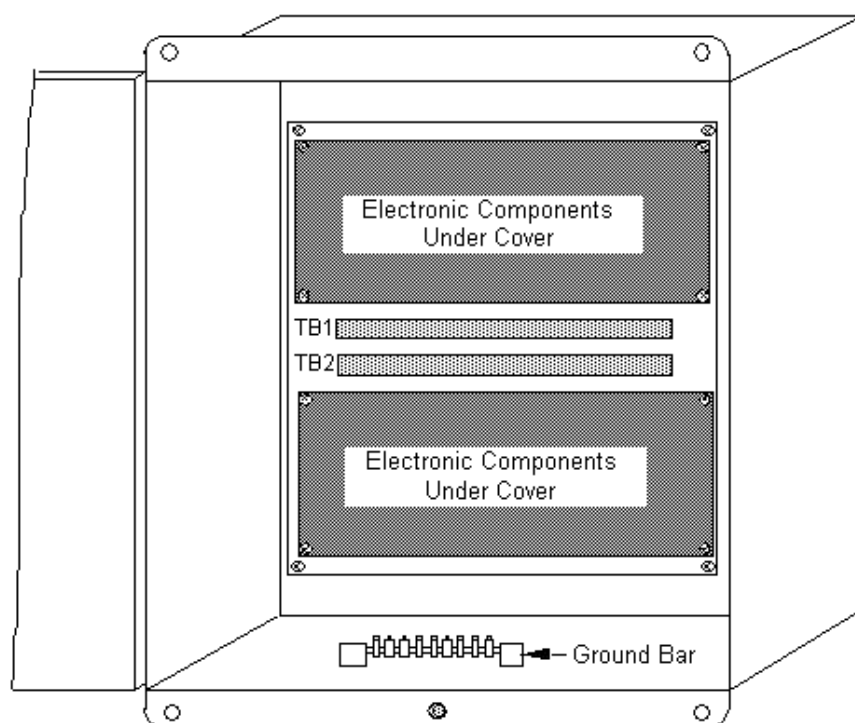


Figure 30 Model MC-GRMT01 RHMUX Thermocouple FTA Assembly Layout

RHMUX FTA enclosure

Figure 31 is an illustration of the RHMUX FTA installed in the model MU-CMSC03 (NEMA 4)/MU-CMSS03 (NEMA 4X) enclosure.



Model MU-CMSC03 (NEMA 4)/Model MU-CMSS03 (NEMA 4X) Enclosure

16667-A

Figure 31 Model MU-CMSC03/MU-CMSS03 Enclosure Illustration

IOP to Power Adapter Cabling

Non-CE Compliant IOP to Power Adapter cabling application - For a non-CE Compliant application, the IOP to Power Adapter connection can be made by using a model MU-KFTAxx cable (the suffix “xx” in the model number represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as illustrated in Figure 26 or Figure 27.

CE Compliant IOP to Power Adapter cabling application - For a CE Compliant application, the IOP to Power Adapter connection can be made by using a model MU-KFTSxx cable (the suffix “xx” in the model number represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as shown in Figure 26 or Figure 27.

For the available cable part numbers, see Spare Parts in *Troubleshooting and Maintenance Guide*.

Power Adapter to RHMUX FTA Cabling

Two types of cables are available for the connection between the Power Adapter to the FTA. Both types of cables consist of four color-coded conductors in a single-twist configuration with a foil shield. A single drain wire is provided for the shield.

The cables differ in the gauge of the conductor, the jacket material, and the application of the cable. Typical applications for the cables are illustrated in Figure 32.

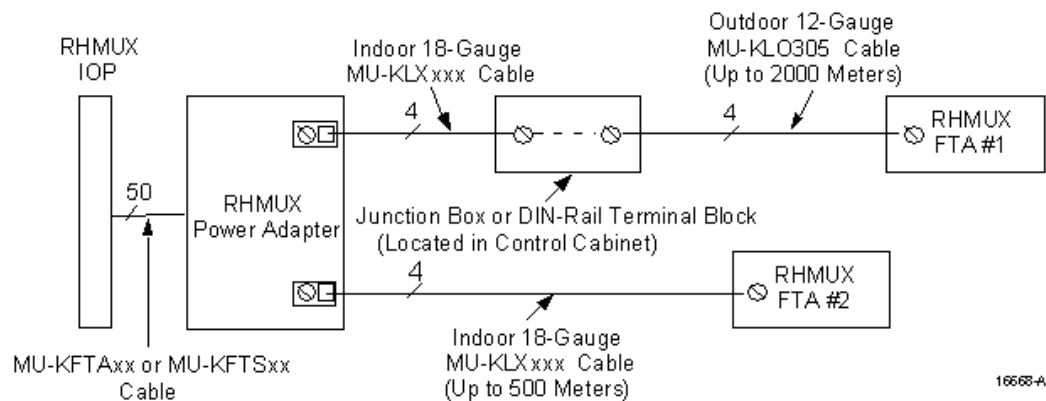


Figure 32 Typical RHMUX Power Adapter to FTA Cable Applications

Indoor environment FTA to Power Adapter cabling

When the Power Adapter to RHMUX FTA cable will be less than 500 meters in length and will be installed indoors or in conduit without the threat of moisture, the model MU-KLXxxx cable (“xxx” represents three lengths – 76, 152, and 305 meters) with stripped wire ends can be used for the interconnection. Custom lengths of the cable can also be ordered with the 51192139-104 assembly number.

The cable can be used for non-CE Compliant, CE Compliant, Intrinsically Safe, Nonincendive, and nonhazardous applications.

The cable is Belden type 83654, which is a four-conductor, single-twist, shielded cable with a Teflon jacket. Each conductor is 18 gauge. The outside diameter of the cable is 5.26 millimeters (0.207 inches) with a minimum bend radius of 57 millimeters (2.25 inches). For the available cable part numbers, see Spare Parts in *Troubleshooting and Maintenance Guide*.

Model MU-KLXxxx cable specifications

The model MU-KLXxxx cable has the following specifications.

Specification	Description
Manufacturer Type	Belden 83654
Cable Configuration	Shielded 18-gauge four-conductor single twist (TEFLON jacket)
Flame Resistance Conformity	CSA FT4/FT6 and UL910
CSA Type	CMP
NEC Type	CMP
Temperature Rating	-70 °C to +200 °C

Emission control for CE Compliant applications

For CE Compliant applications, a ferrite shield is required to control emissions. The required device is a clamp-on shield, Honeywell part number 51309261-100, and is included in the hardware kit that is provided with the Honeywell-recommended enclosure. The shield must be clamped on the cable inside the enclosure. The shield does not affect RHMUX operation and can be omitted for non-CE Compliant applications

Cable shield grounding

For a non-CE Compliant or CE Compliant applications, the shield of the cable between the Power Adapter and FTA must be connected to Shield Ground (S) at both ends of the cable. The wire and shield connections are made by using the compression terminals in a 6-terminal connector on the Power Adapter and the screw terminals on the FTA as illustrated in Figure 33 and Figure 34.

Both installations are for non-CE Compliant or CE Compliant applications.

Outdoor environment Power Adapter to FTA cabling

When the Power Adapter to RHMUX FTA cable is installed outdoors with the threat of moisture, or a cable length greater than 500 meters is required, model MU-KLO305 cable must be used for the interconnection. Custom lengths of the cable can also be ordered with the 51197597-100 assembly number, or directly from Belden, the manufacturer.

The cable can be used for non-CE Compliant, CE Compliant, Intrinsically Safe, Nonincendive, and nonhazardous applications.

The cable is Belden type YC41926, which is a four-conductor, shielded cable, with an armored jacket. Each conductor is 12 gauge. The outside diameter of the cable is 15.7 millimeters (0.62 inches) with a minimum bend radius of 191 millimeters (7.5 inches).

The cable will tolerate moisture from normal precipitation, but the cable must not be submerged and is not suitable for direct burial in this application.

The cable's 12-gauge conductors will not fit the terminals on the Power Adapter. An intermediate terminal block, such as a Weidmuller DIN-rail terminal block, is required. No intermediate termination is required for the RHMUX FTA when crimp terminals are used. For the cable part numbers, see Spare Parts in *Troubleshooting and Maintenance Guide*.

Model MU-KLO305 cable specifications

The model MU-KLO305 cable has the following specifications.

Specification	Description
Manufacturer Type	Belden YC41926
Cable Configuration	Shielded 12-gauge four-conductor single twist (armored jacket)
CE Compliant	
PLTC or ITC, 300 volts	
Vertical Tray Flame Test	UL1581/IEEE383
Length	305 meters (1000 feet)

Emission control for CE Compliant applications

For CE Compliant applications, six ferrite beads are required to control emissions. The required beads are Honeywell part number 51192613-101 and are included in the hardware kit that is provided with the Honeywell recommended enclosure. The beads must be slipped over the cable inside the enclosure. Place nylon cable ties at each end of the bead-stack to hold the beads in place. The beads do not affect RHMUX operation and can be omitted for non-CE Compliant applications.

Cable shield grounding

For a non-CE Compliant or CE Compliant applications, the shield of the cable between the Power Adapter and FTA must be connected to Shield Ground (S) at both the Power Adapter and FTA ends of the cable. The connections are made by using the compression terminals in a 6-pin connector at Power Adapter end of the cable and the screw terminals on the FTA as illustrated in Figure 33 and Figure 34.

Both installations are for non-CE Compliant or CE Compliant applications.

IS Power Adapter to FTA cabling

Figure 33 illustrates cabling between the Intrinsically Safe Power Adapter and the FTA.

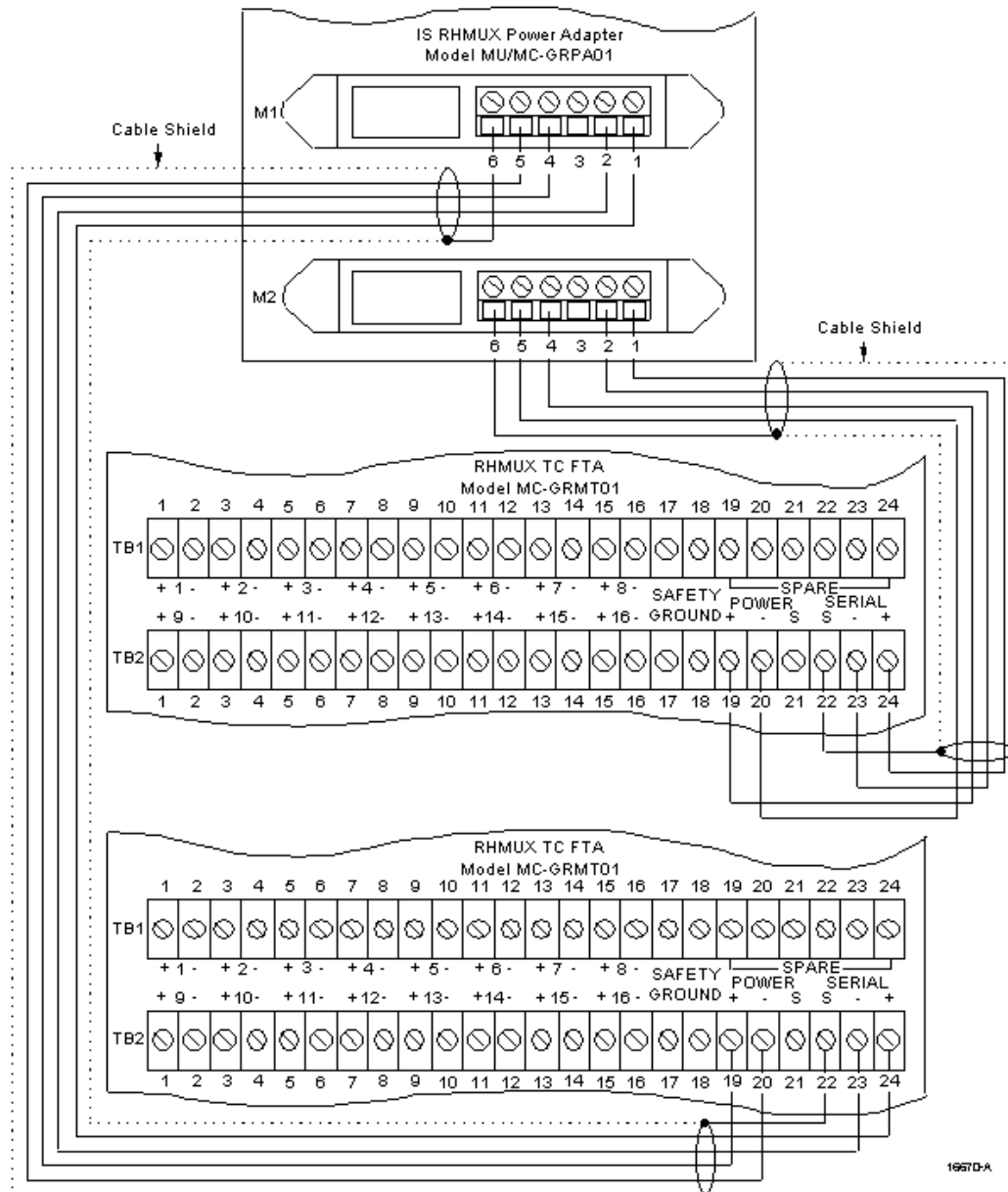


Figure 33 RHMUX IS Power Adapter to FTA Cabling

NI Power Adapter to FTA cabling

Figure 34 illustrates cabling between the Non-Incendive Power Adapter and the FTA.

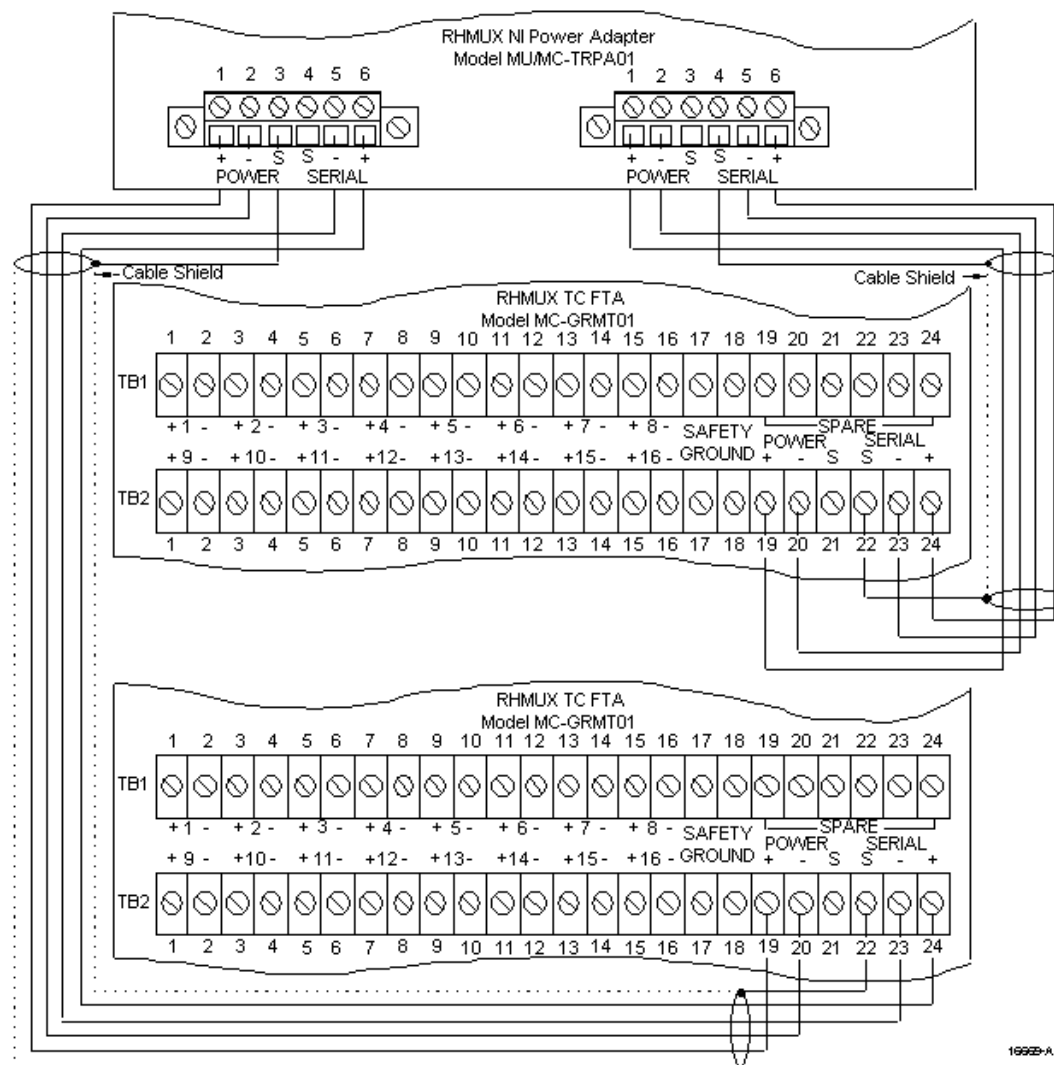


Figure 34 RHMUX NI Power Adapter to FTA Cabling

Isolation of outdoor cable shield from armor cladding

The model MU-KLO305 outdoor cable has a foil shield and waterproof aluminum cladding. Care must be taken to prevent the shield from shorting to the cladding or to Safety Ground. Refer to Figure 35.

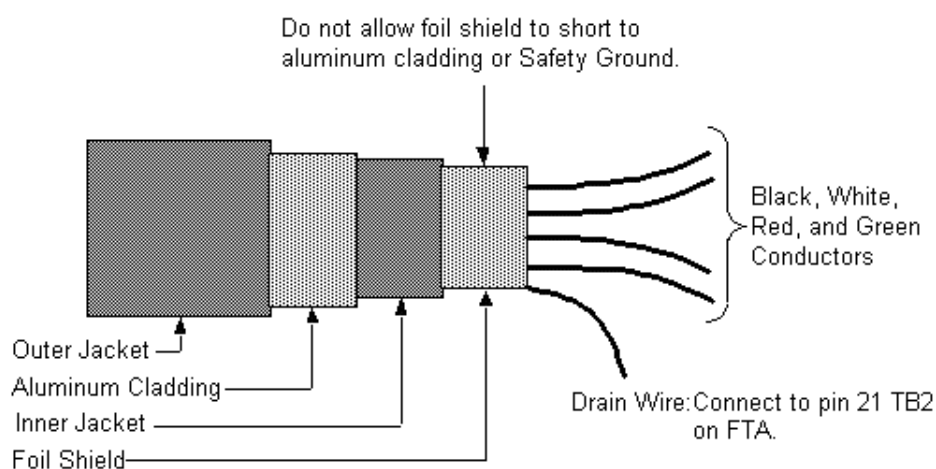


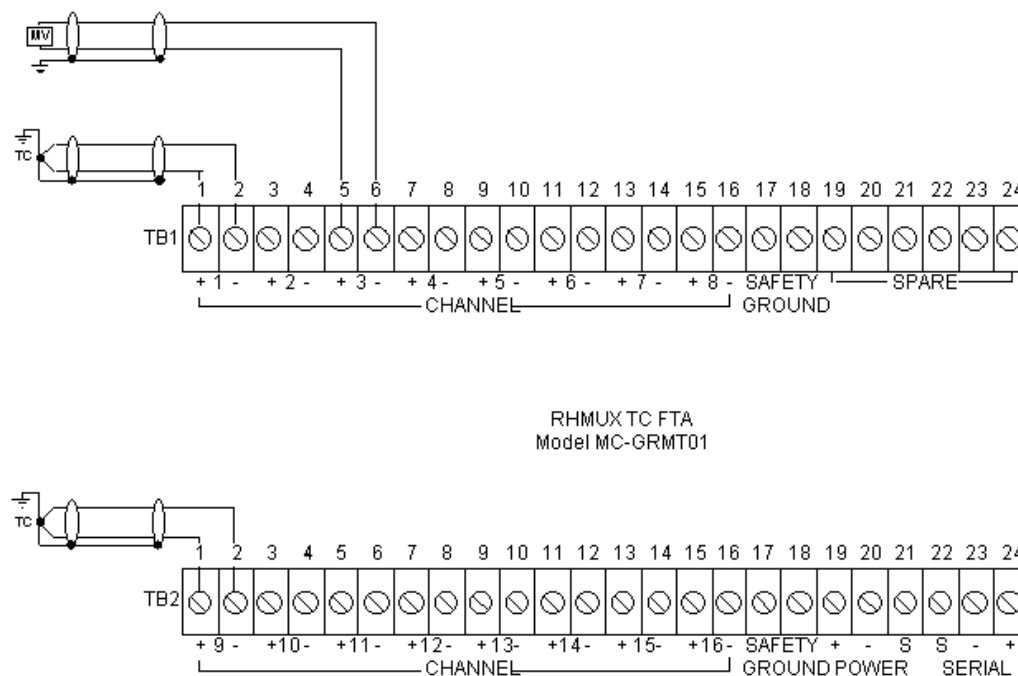
Figure 35 Model MU-KLO305 Cable Construction

RHMUX Thermocouple (TC) FTA Field Wiring

Up to 16 thermocouples (TCs) can be connected to the Thermocouple (TC) RHMUX FTA. The FTA has a local Cold Junction Reference (CJR) on the assembly. Figure 30 illustrates the assembly layout of the model MC-GRMT01 RHMUX TC FTA.

Model MC-GRMT01 connection diagram

Figure 36 is a connection diagram for the model MC-GRMT01 RHMUX TC FTA.



Notes: 1. Connect the cable shield to ground at the sensor. If the cable shield cannot be grounded at the sensor, connect the cable shield to the enclosure's ground bar and allow the cable shield to float at the sensor.

The ground bar is isolated from the enclosure which allows the user to choose an appropriate ground.

For CE Compliant applications, the enclosure's ground bar should be connected to one of the SAFETY GROUND terminals on the RHMUX FTA.

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Figure 36 Model MC-GRMT01 RHMUX Thermocouple FTA Connection Diagram

High Level Analog Input (HLAI) FTAs

The High Level Analog Input (HLAI) FTA accepts up to 16 high level analog inputs. The inputs are configurable as single-ended or differential in relation to Master Reference Ground (MRG). The FTA is also used to interface Smart Transmitter devices.

CE Compliance

In most cases, there are two models of each style of High Level Analog Input (HLAI) Field Termination Assemblies, a CE Compliant and non-CE Compliant model. The model MU-TAIH22, MU-TAIH23, and MU-TAIH62 Enhanced Power HLAIs are the exception. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” CE Compliant and non-CE Compliant FTAs have unique model numbers.

The CE Compliant HLAIs do not support Smart Transmitter devices. CE Compliant STI FTAs that do support Smart Transmitter devices are described in [Smart Transmitter Interface \(STI\) FTA Wiring](#).

CE Compliant FTAs have an FTA connector with a grounded body that interfaces with the CE Compliant model MU-KFTSxx IOP to FTA cable. The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table.

Shielded field wiring is not required for CE Compliance. Shielded IOP to FTA cables are required. Source transmitters may require shielded wiring.

High Level Analog Input FTAs and IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAIH01	HLAI/STI FTA with Compression Terminals Single IOP Interface	51303956-100	N/A
MU-TAIH02	HLAI/STI FTA with Compression Terminals Single IOP Interface	51304453-100	N/A
MC-TAIH02	HLAI/STI FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304453-150	N/A
MU-TAIH03	HLAI FTA with Compression Terminals Single IOP Interface	N/A	51309136-125
MC-TAIH03	HLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309136-175

Appendix C – **PM I/O FTA Reference**
Analog Input (AI) FTA Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAIH04	HART-Compatible HLAI FTA with Compression Terminals Single IOP Interface	N/A	51305900- 125
MC-TAIH04	HART-Compatible HLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51305900- 175
MU-TAIH12	HLAI/STI FTA with Compression Terminals Redundant IOP Interface	51304337-100	N/A
MC-TAIH12	HLAI/STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304337-150	N/A
MU-TAIH13	HLAI FTA with Compression Terminals Redundant IOP Interface	N/A	51309138- 125
MC-TAIH13	HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	N/A	51309138- 175
MU-TAIH14	HART-Compatible HLAI FTA with Compression Terminals Redundant IOP Interface	51305887-100	N/A
MC-TAIH14	HART-Compatible HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51305887-150	N/A
MU-TAIH15	HART-Compatible HLAI FTA with Compression Terminals Redundant IOP Interface	N/A	51305863- 125
MC-TAIH15	HART-Compatible HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	N/A	51305863- 175
MU-TAIH22	Enhanced Power HLAI/STI FTA with Compression Terminals Redundant IOP Interface	80366195-100	N/A

Appendix C – PM I/O FTA Reference
Analog Input (AI) FTA Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-TAIH22	Enhanced Power HLAI/STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	80366195-150	N/A
MU-TAIH23	Enhanced Power HLAI FTA with Compression Terminals Redundant IOP Interface	N/A	80366195-125
MC-TAIH23	Enhanced Power HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	N/A	80366195-175
MU-TAIH52	HLAI/STI FTA with Screw Terminals Redundant IOP Interface	51304337-200	N/A
MC-TAIH52	HLAI/STI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	51304337-250	N/A
MU-TAIH53	HLAI FTA with Screw Terminals Redundant IOP Interface	N/A	51309138-225
MC-TAIH53	HLAI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	N/A	51309138-275
MU-TAIH54	HART-Compatible HLAI FTA with Screw Terminals Redundant IOP Interface	N/A	51305863-225
MC-TAIH54	HART-Compatible HLAI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	N/A	51305863-275
MU-TAIH62	Enhanced Power HLAI/STI FTA with Screw Terminals Redundant IOP Interface	80366192-100	N/A
MC-TAIH62	Enhanced Power HLAI/STI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	80366192-150	N/A

Appendix C – **PM I/O FTA Reference**
Analog Input (AI) FTA Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
Supporting IOPs			
MU-PAIH02	HLAI IOP	51304489-100	N/A
MC-PAIH02	HLAI IOP—Conformally Coated	51304489-150	N/A
MU-PAIH03	HLAI IOP	N/A	51304754-100
MC-PAIH03	HLAI IOP—Conformally Coated	N/A	51304754-150
MC-PHAI01	HLAIHART IOP —Conformally Coated	N/A	51403479-150
MU-PSTX02	STI IOP	51304516-100	N/A
MC-PSTX02	STI IOP—Conformally Coated	51304516-150	N/A
MU-PSTX03	STI_MV IOP	N/A	51304516-200
MC-PSTX03	STI_MV IOP—Conformally Coated	N/A	51304516-250

HLAI IOP compatibility and redundancy

The HLA IOPs can be installed in any IOP card file slot. The model MU-PAIH03 HLA IOP supports only the model MU-TAIH03, MU-TAIH13, and MU-TAIH53 HLA I FTAs.

The model MU-PAIH01 HLA I HART IOP supports only the model MU-TAIH14, MU-TAIH15, and MU-TAIH54 HART compatible FTAs.

The model MU-PAIH02 HLA I IOP supports all other HLA I FTA models.

The model MU-TAIH01, MU-TAIH02 and MU-TAIH03 FTAs do not support redundant IOPs. All other FTA models support IOP redundancy.

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the HLA I FTAs are given in the following figures listed in Table 13.

Table 13 HLA I FTA Connection Drawings

High Level Analog Input	Connection Diagram	Assembly Layout
FTA Model	<u>MU -TAIH01</u>	
	<u>MU/MC-TAIH02</u>	<u>MU/MC-TAIH02</u>
	<u>MU/MC-TAIH03</u>	<u>MU/MC-TAIH03</u>
	<u>MU/MC-TAIH12</u>	<u>MU/MC-TAIH12</u>
		<u>MU/MC-TAIH14</u>
	<u>MU/MC-TAIH13</u>	<u>MU/MC-TAIH13</u>
		<u>MU/MC-TAIH15</u>
	<u>MU/MC-TAIH22</u>	<u>MU/MC-TAIH22</u>
	<u>MU/MC-TAIH23</u>	<u>MU/MC-TAIH23</u>
	<u>MU/MC-TAIH52</u>	<u>MU/MC-TAIH52</u>
	<u>MU/MC-TAIH53</u>	<u>MU/MC-TAIH53</u>
		<u>MU/MC-TAIH54</u>
	<u>MU/MC-TAIH62</u>	<u>MU/MC-TAIH62</u>

Smart Transmitter devices support

The CE Compliant model MU-TAIH03, MU-TAIH13, and MU-TAIH53 HLAI FTAs do not support Smart Transmitter devices. Use the model MU-TSTX03, MU-TSTX13, or MU-TSTX53 Smart Transmitter Interface FTAs, which are described in [Smart Transmitter Interface \(STI\) FTA Wiring](#).

Model MU-TAIH22/23/62 FTAs

The model MU-TAIH23 FTAs supports only an HLAI IOP while the model MU-TAIH22 and MU-TAIH62 FTAs support both HLAI and STI IOPs.

Two-wire 4-20 mA transmitters

Two-wire 4-20 mA transmitters connect directly to the FTA because a 250-ohm resistor is provided on the FTA at each input. Transmitters with a 10-50 mA output require adding a resistor to the field terminals to complement the 250-ohm resistor already in place. Alternately, for a 1-5 volt input, remove the 250-ohm and the zero-ohm resistors on the receiving channel. See Figure 37 through Figure 41, Figure 44 and Figure 45. This places the channel in a high impedance differential input mode to prevent loading errors for the signal source.

Current limiting resistors

The 145-ohm (180-ohm for the model MU-TAIH01 FTA) current-limiting resistors for transmitter power at the input terminals usually allow the use of a Power Limited Tray cable for the installation. Check the electrical code.

Zener barriers

The FTAs cannot be used to provide transmitter power through Zener barriers because the FTAs limit current to an amount that is less than required by the Zener barrier.

AI Adapter applications

AI Adapters (80367163-001) on the model MU-TAIH22, MU-TAIH23, and MU-TAIH62 HLAI FTAs allow each channel to be customized for a particular application. Figure 47 is an illustration of five applications. In two of the applications, the power module is removed from the channel socket.

The AI Adapter has a current limiter that provides the same function as a conventional fuse when providing transmitter power. Installing the Ground Jumper on the AI Adapter references the channel signal to Safety Ground.

Vertical bus bar

Because the FTA does not have a built-in shield bus, handling a large number of cable shields requires that a vertical bus bar be used. The vertical bus bar and any cable shield connect to the local Master Reference Ground (MRG) at the floor of the cabinet. For CE Compliance, the vertical bus bar must connect to Safety Ground.

Self-powered transmitters

All transmitter loops must have a single connection to reference ground. If the loop does not have a ground reference connection, it must be provided by the FTA's zero-ohm resistor. If this ground connection is provided by a self-powered transmitter, the zero-ohm resistor on the FTA must be removed. See [Connecting 3-Wire and 4-Wire Transmitters to HLAI FTAs](#) for additional information.

When the zero-ohm resistor is removed, the loop ground must not produce more than -7 to +5 volts of common mode voltage onto the loop signal.

If the common mode voltage is outside an HLAI IOP's specifications, or the transmitter cannot be isolated from ground, or stable ground conditions do not exist, the transmitter must not be connected to an HLAI FTA without the use of an isolator. When an isolator is used, the zero-ohm resistor must not be removed.

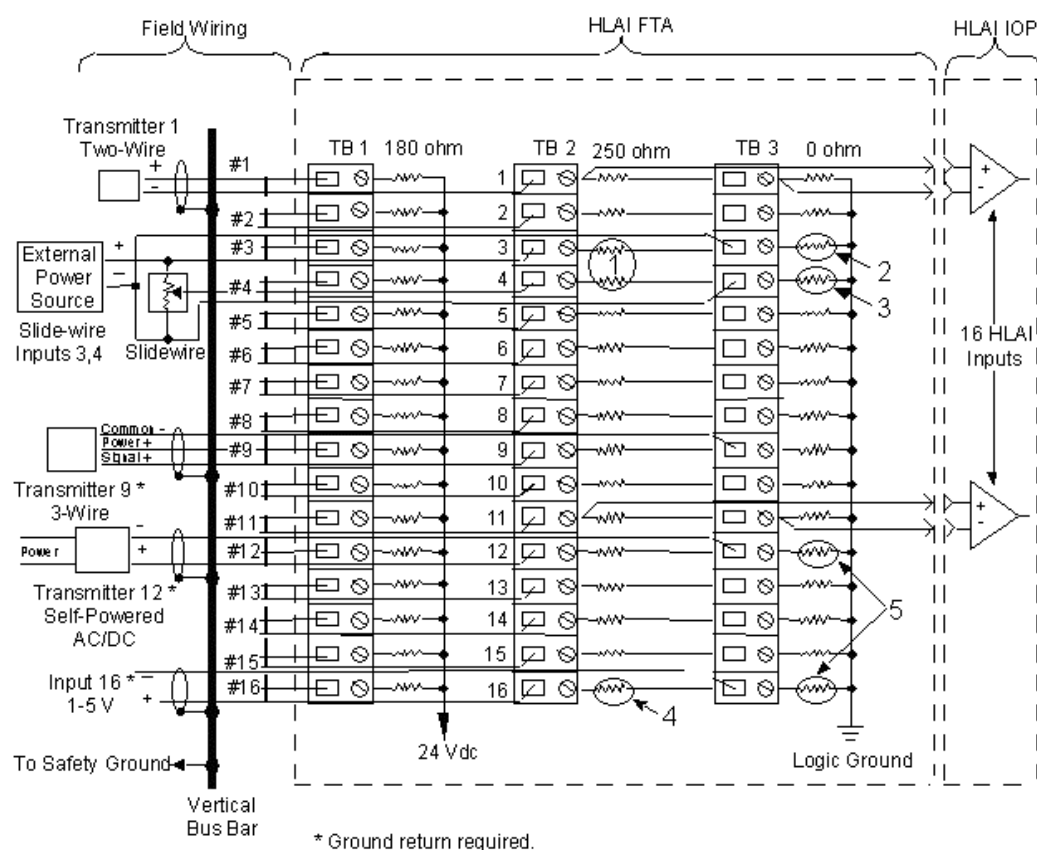
Smart Transmitter Interface IOPs

Smart Transmitter Interface (STI) or Smart Transmitter Interface Multivariable (STI_MV) IOP supports the HLAI/STI FTAs. All inputs are connected as 2-wire transmitters. See [Smart Transmitter Interface \(STI\) Applications](#).

External power source

An external power source with an output of 5 V $\pm$ 10% is required to drive a slidewire. It may be daisy-chained to drive multiple slidewires, but its negative side must not be connected to logic common through more than one zero-ohm resistor on any FTA.

Model MU-TAIH01 high level analog input FTA connection diagram

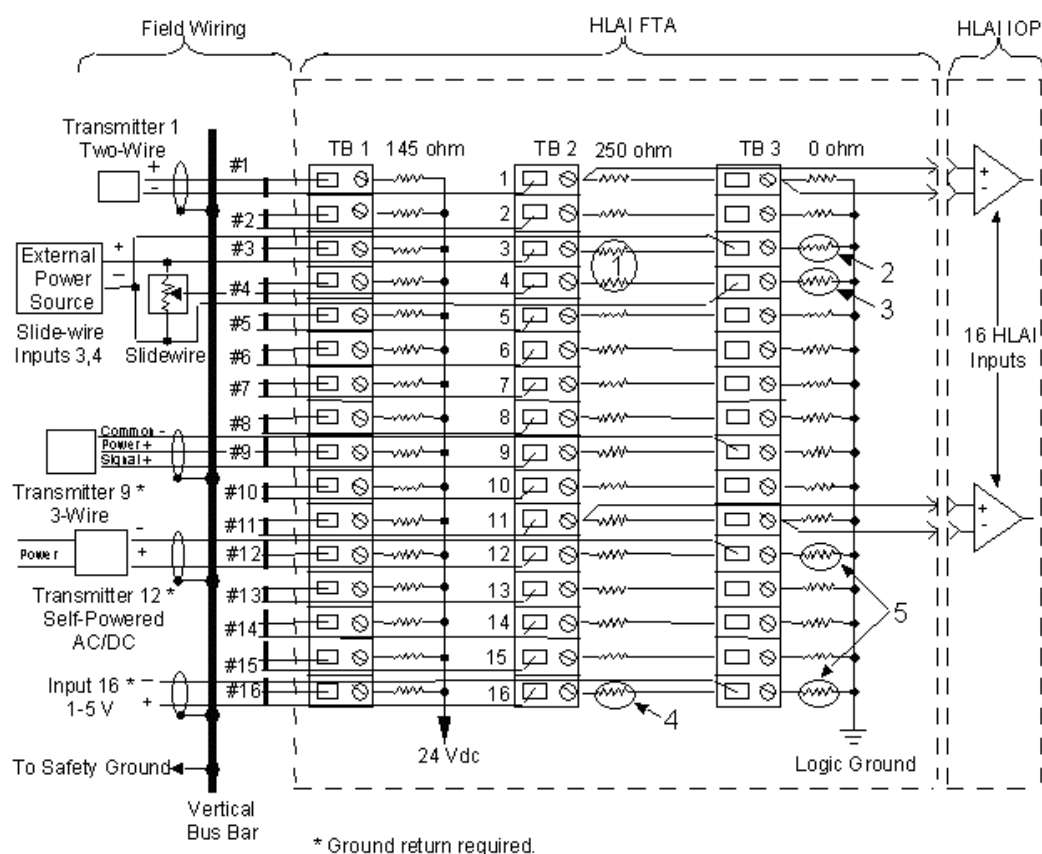


Implementation Notes

1. Remove the range spools for all the inputs associated with slidewires.
2. The zero ohm resistor is for the negative side of the external power source.
3. Remove the zero ohm resistor on the negative side of the slidewire.
4. Remove the 250 ohm resistor when connected to a differential 1-5 V signal.
5. Remove the 0 ohm resistor when connected to a self-powered nonisolated transmitter or a differential 1-5 V signal.

Figure 37 Model MU-TAIH01 FTA Connection Diagram

Model MU-TAIH02 high level analog input FTA connection diagram

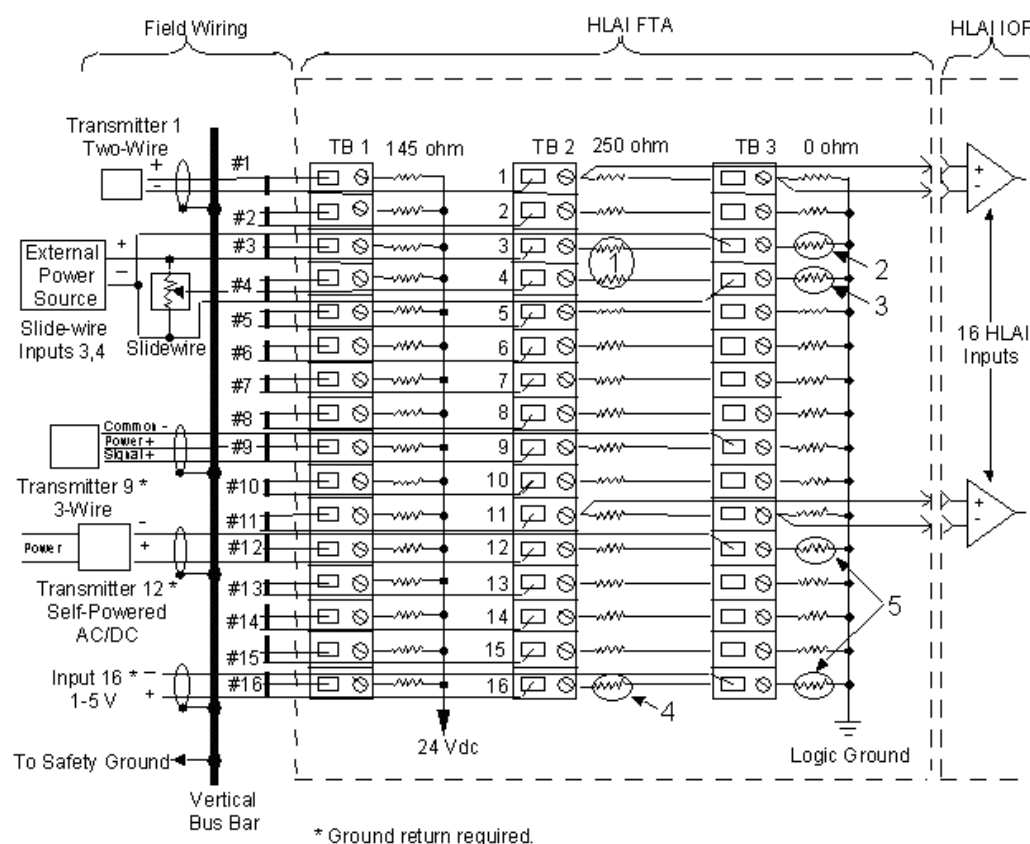


Implementation Notes

1. Remove the range spools for all the inputs associated with slidewires.
2. The zero ohm resistor is for the negative side of the external power source.
3. Remove the zero ohm resistor on the negative side of the slidewire.
4. Remove the 250 ohm resistor when connected to a differential 1-5 V signal.
5. Remove the 0 ohm resistor when connected to a self-powered nonisolated transmitter or a differential 1-5 V signal.

Figure 38 Model MU-TAIH02 FTA Connection Diagram

Model MU-TAIH03 high level analog input FTA connection diagram



Implementation Notes

1. Remove the range spools for all the inputs associated with slidewires.
2. The zero ohm resistor is for the negative side of the external power source.
3. Remove the zero ohm resistor on the negative side of the slidewire.
4. Remove the 250 ohm resistor when connected to a differential 1-5 V signal.
5. Remove the 0 ohm resistor when connected to a self-powered nonisolated transmitter or a differential 1-5 V signal.

16138

Figure 39 Model MU-TAIH03 FTA Connection Diagram

Model MU-TAIH12 high level analog input FTA connection diagram

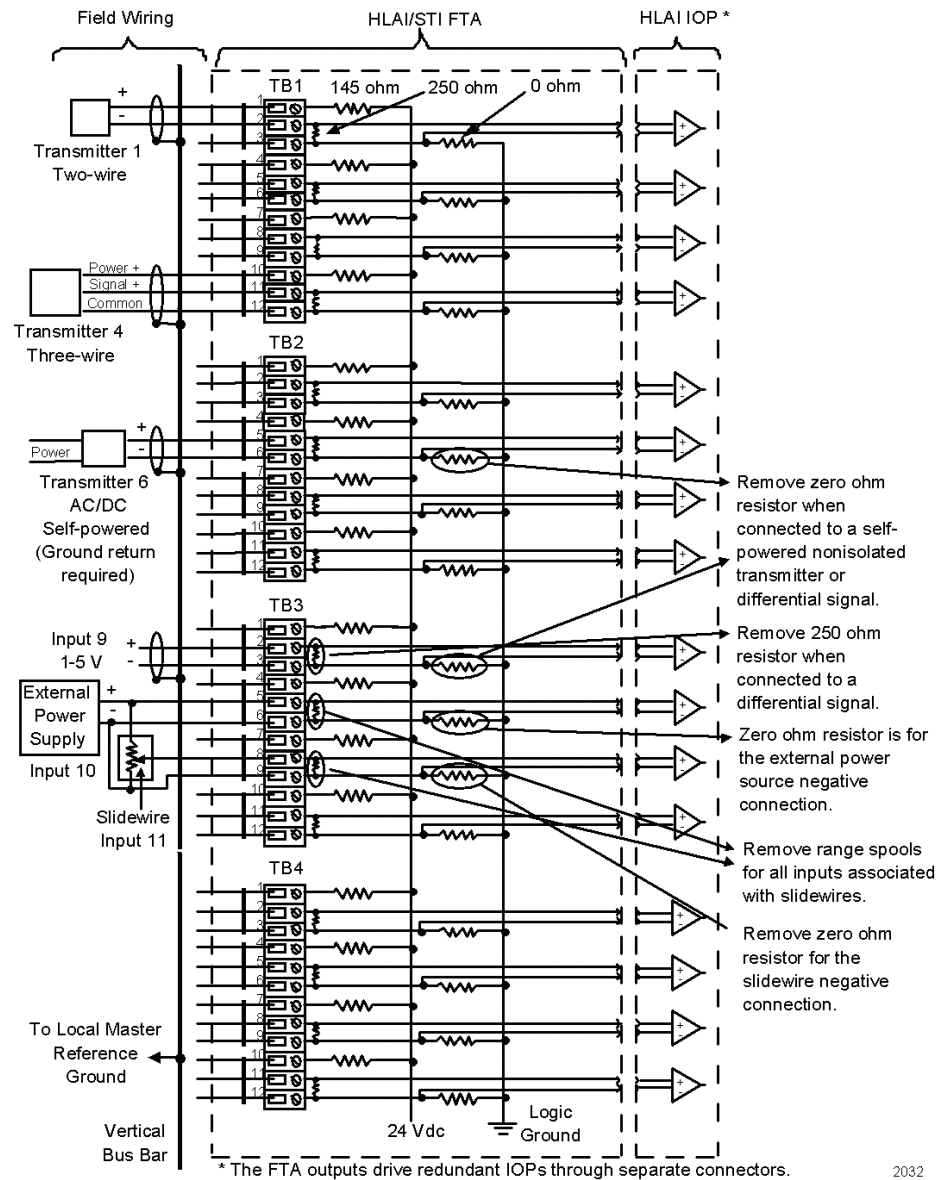


Figure 40 Model MU-TAIH12 FTA Connection Diagram

Model MU-TAIH13 high level analog input FTA connection diagram

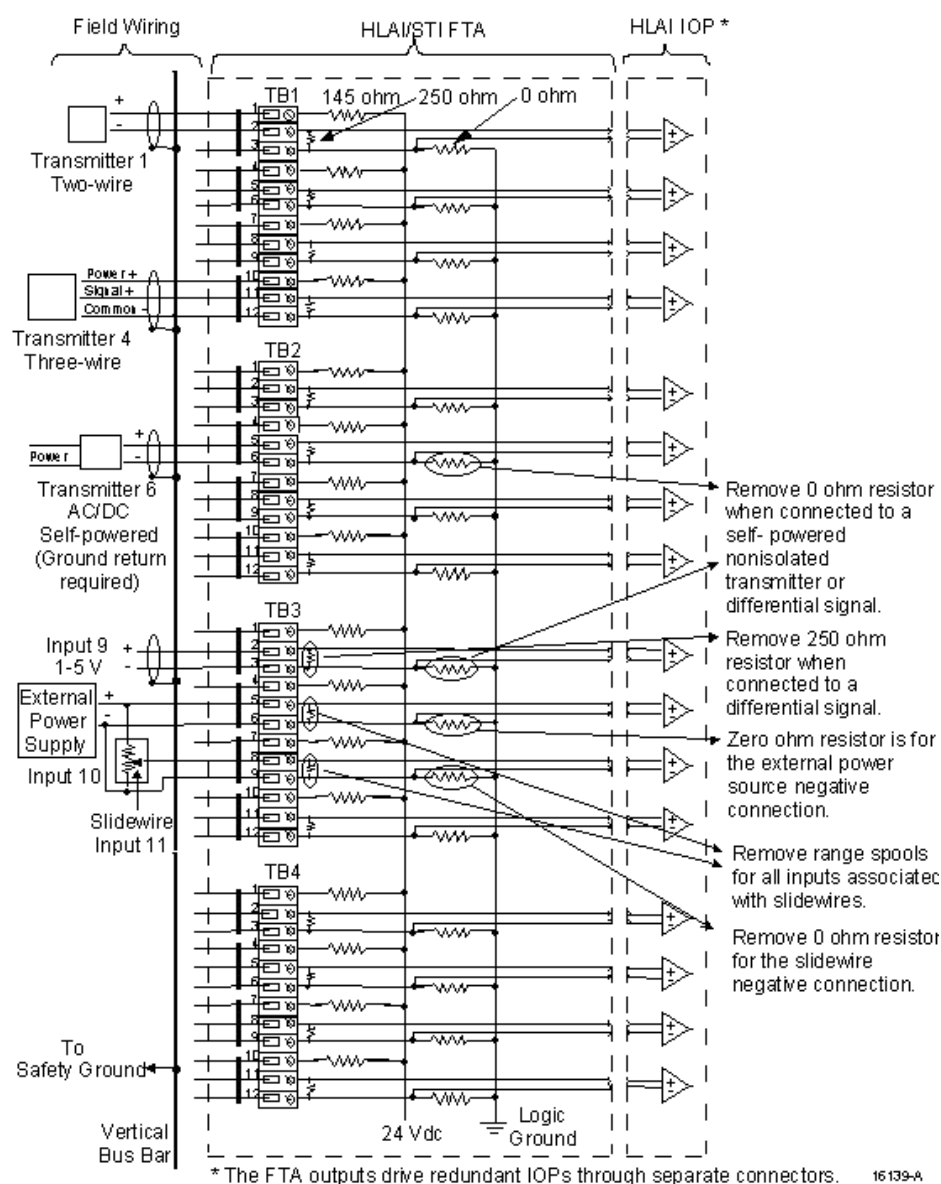


Figure 41 Model MU-TAIH13 FTA Connection Diagram

Model MU-TAIH22 enhanced power HLAI FTA connection diagram

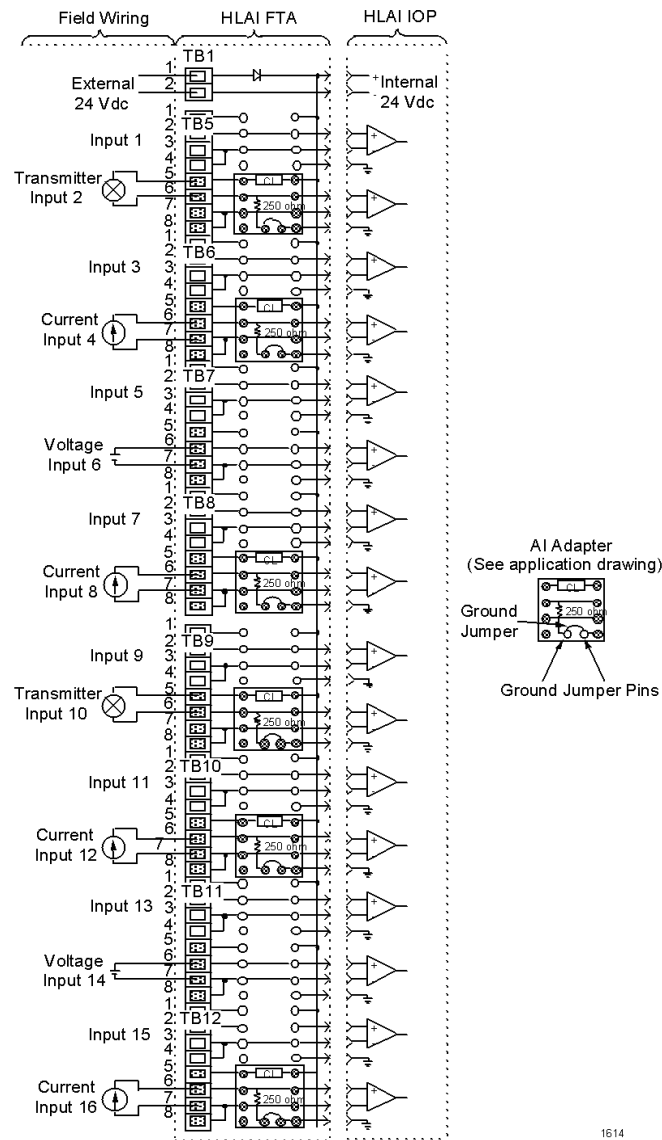


Figure 42 Model MU-TAIH22 Enhanced Power HLAI FTA Connection Diagram

Model MU-TAIH23 enhanced power HLAI FTA connection diagram

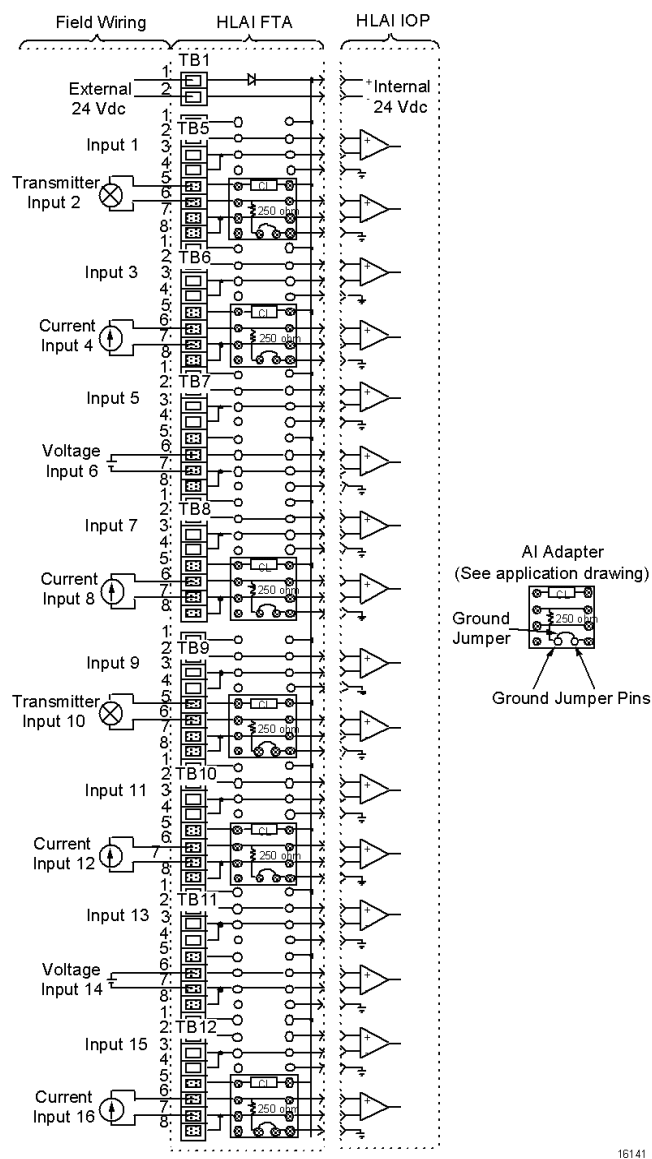


Figure 43 Model MU-TAIH23 Enhanced Power HLAI FTA Connection Diagram

Model MU-TAIH52 high level analog input FTA connection diagram

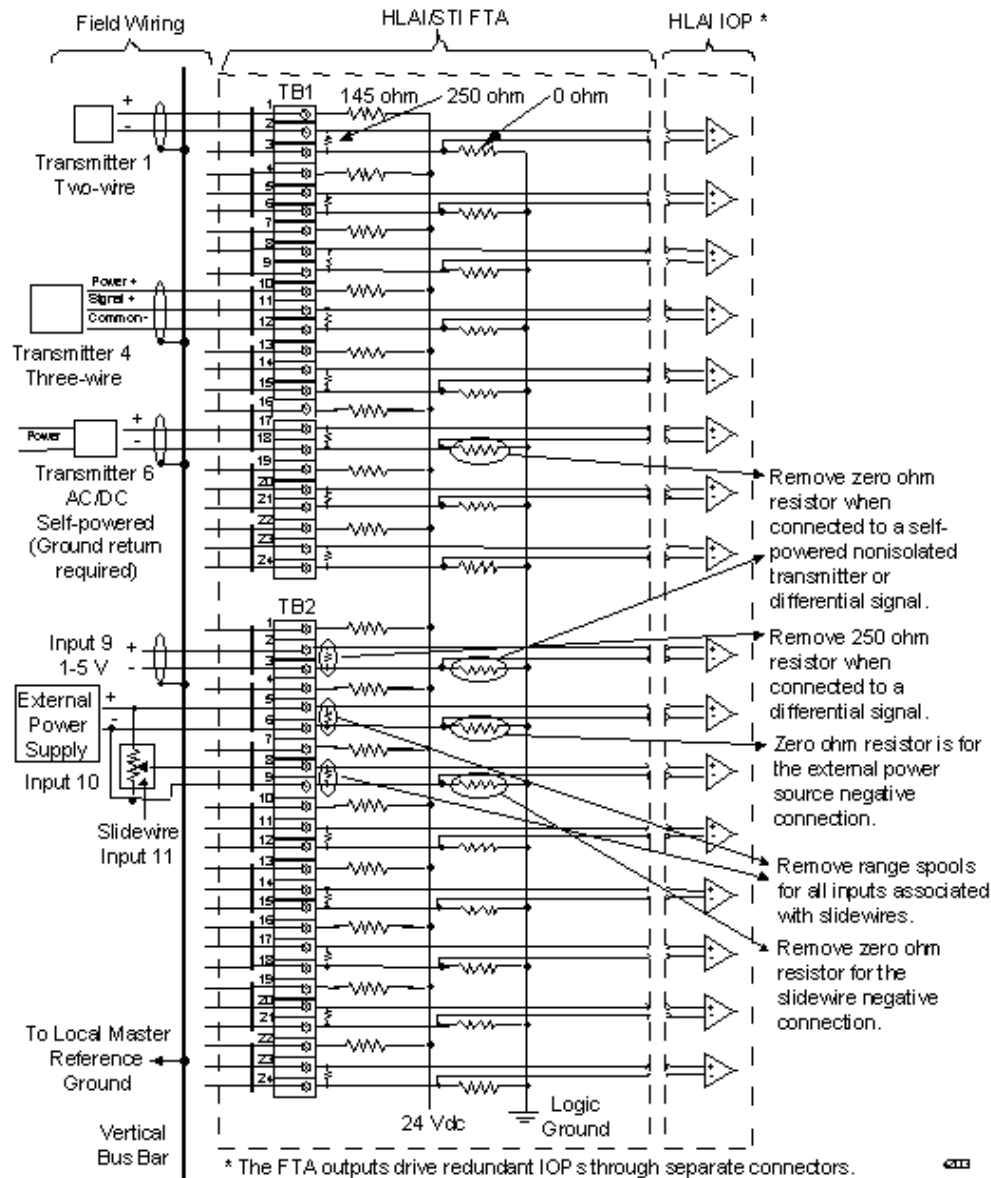


Figure 44 Model MU-TAIH52 FTA Connection Diagram

Model MU-TAIH53 high level analog input FTA connection diagram

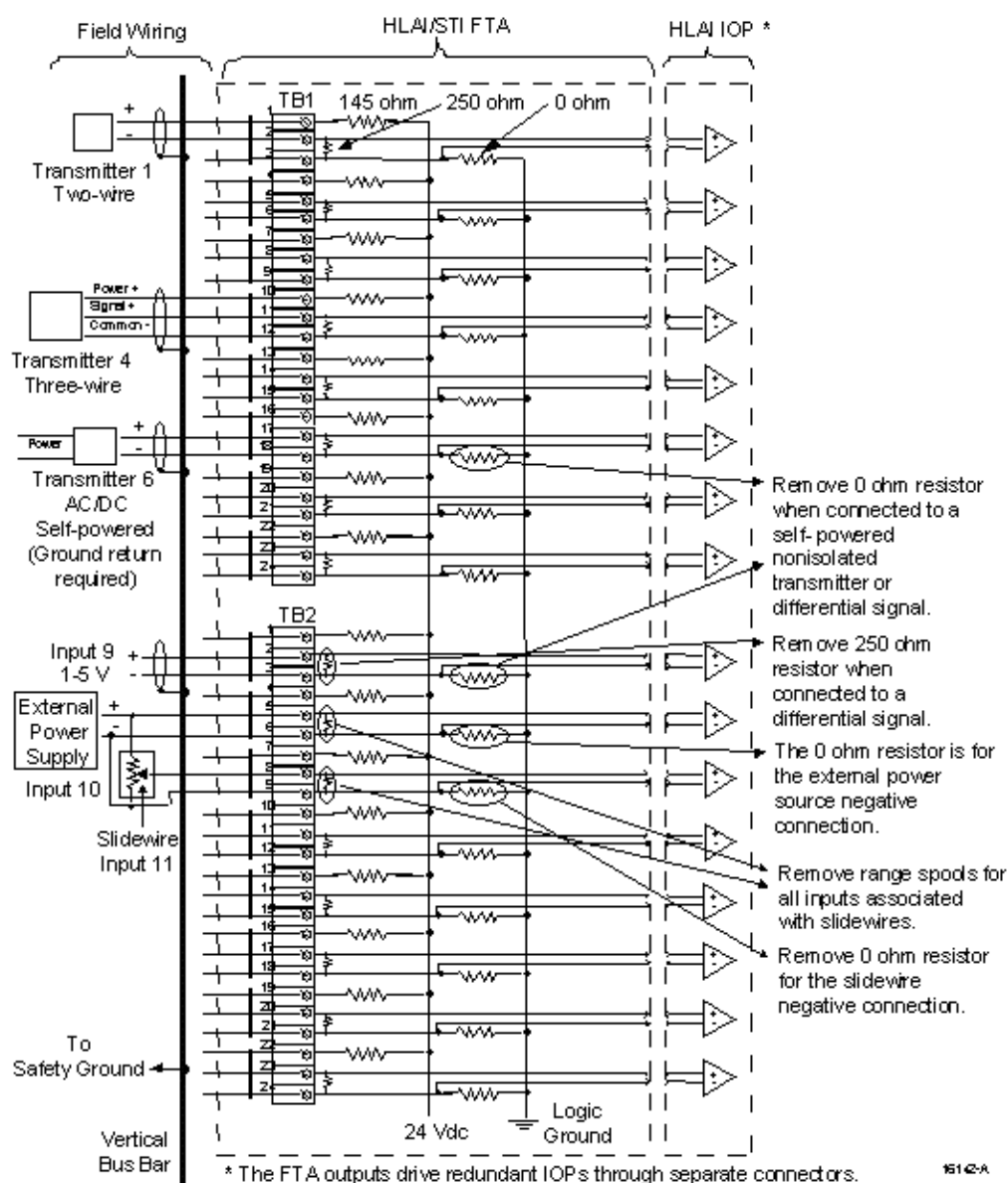


Figure 45 Model MU-TAIH53 FTA Connection Diagram

Model MU-TAIH62 enhanced power HLAI FTA connection diagram

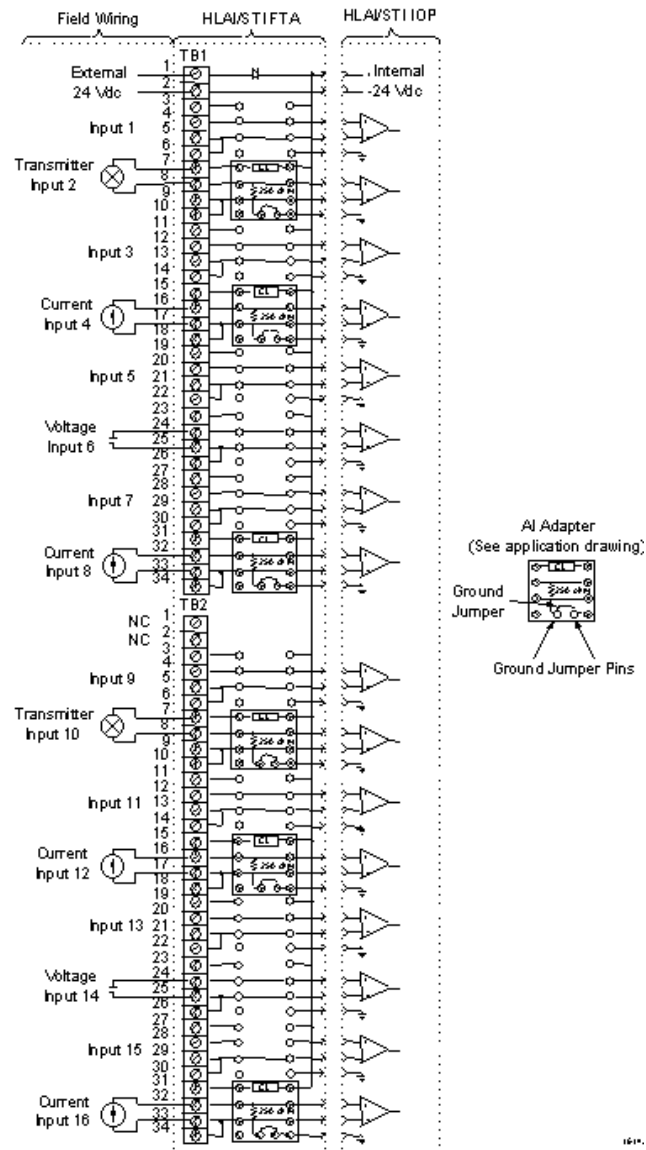


Figure 46 Model MU-TAIH62 Enhanced Power HLAI FTA Connection Diagram

AI Adapter applications

Figure 47 illustrates the AI Adapter applications for the model MU-TAIH22, MU-TAIH23, and MU-TAIH62 FTAs.

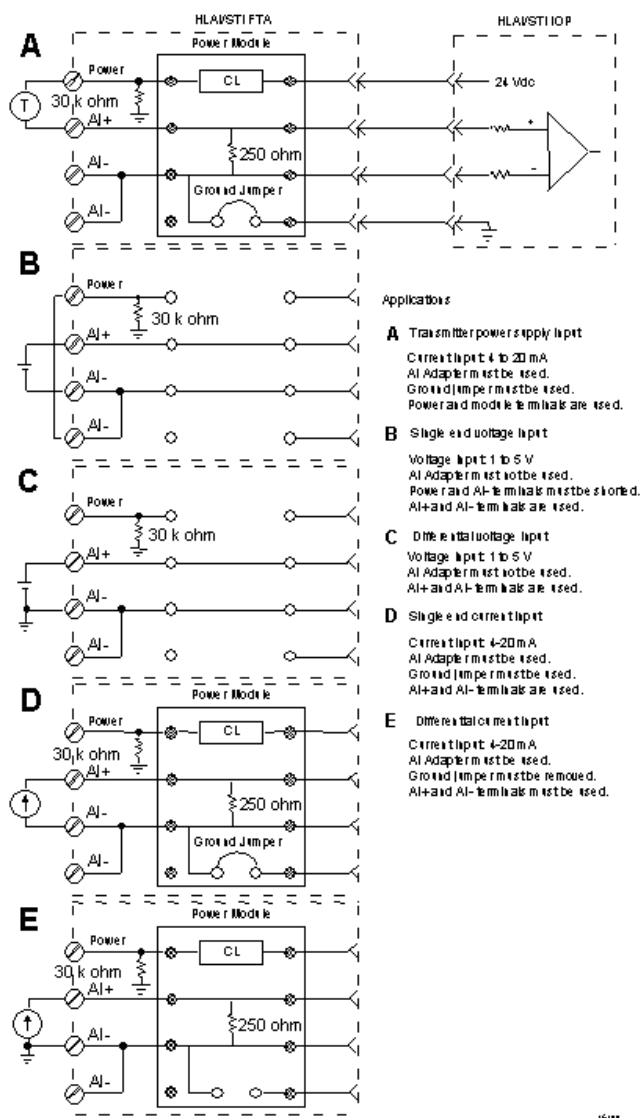
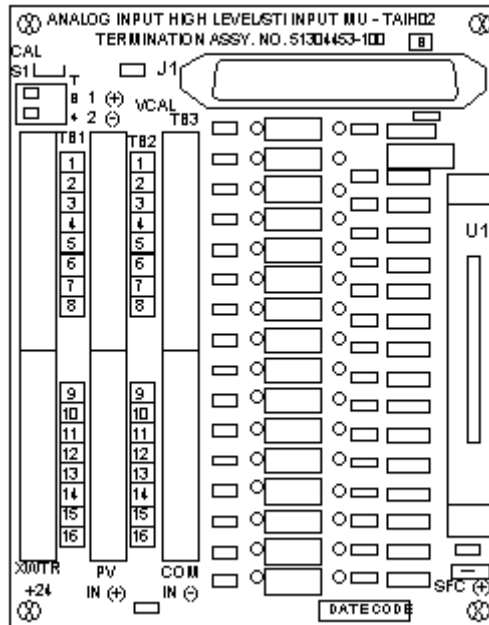
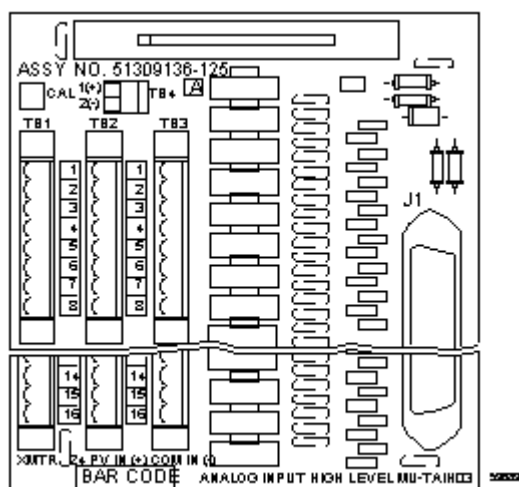


Figure 47 Model MU-TAIH22/23/62 AI Adapter Applications

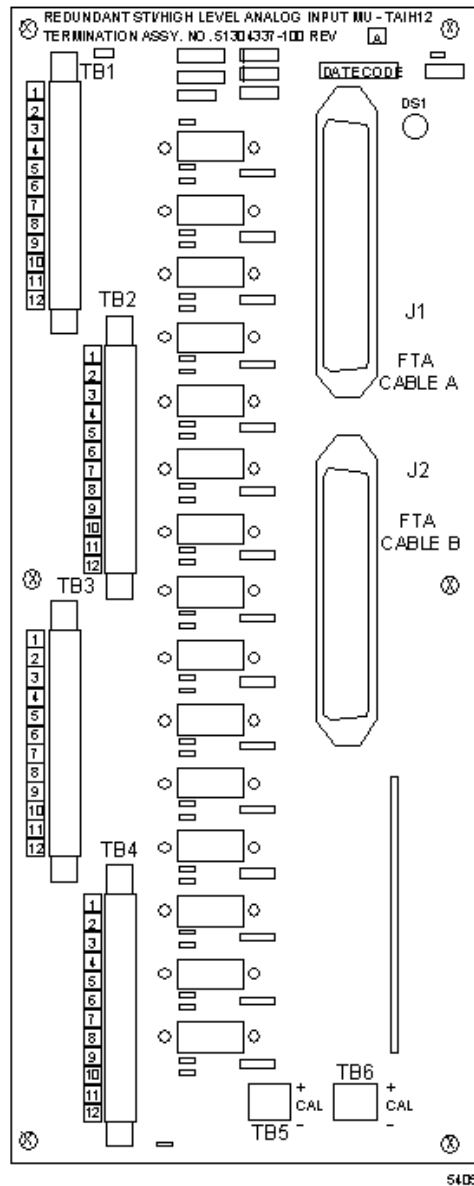
Model MU-TAIH02 high level analog input FTA assembly layout



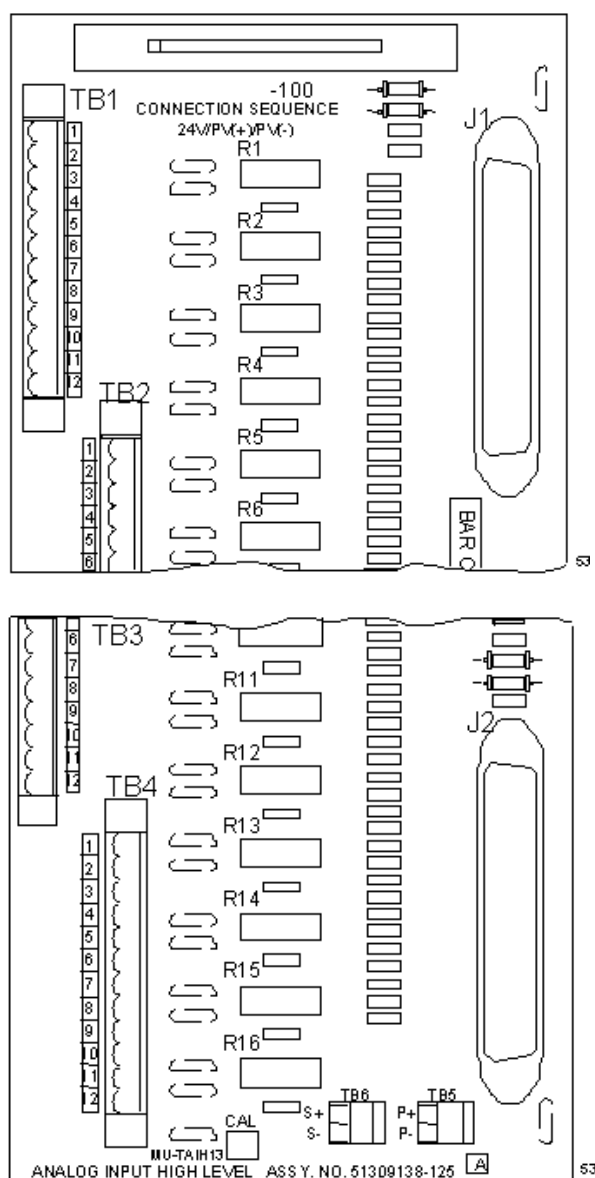
Model MU-TAIH03 high level analog input FTA assembly layout



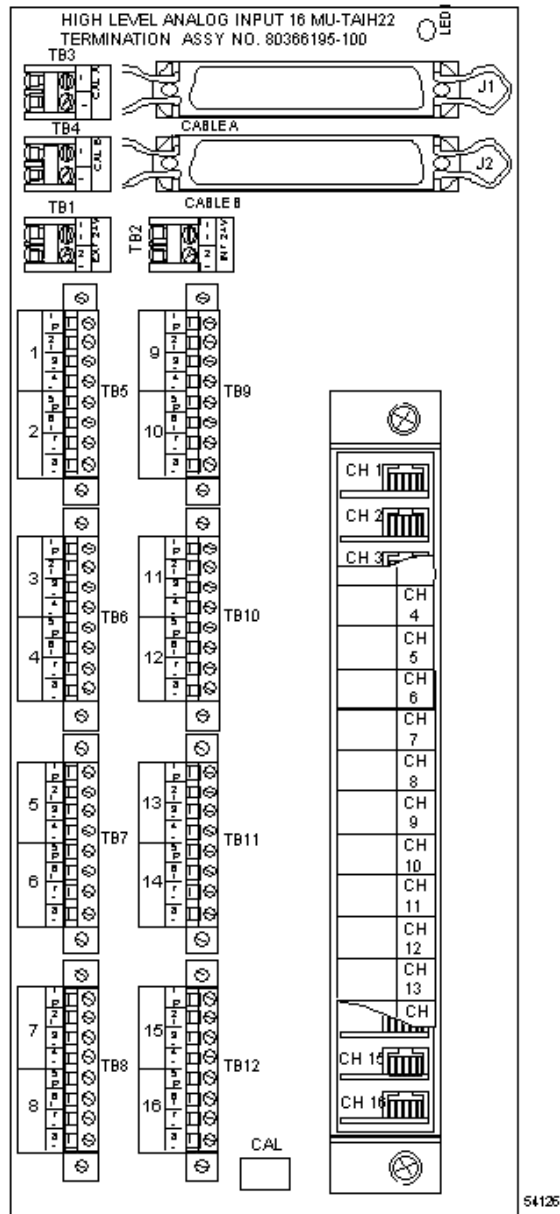
Model MU-TAIH12/14 high level analog input FTA assembly layout



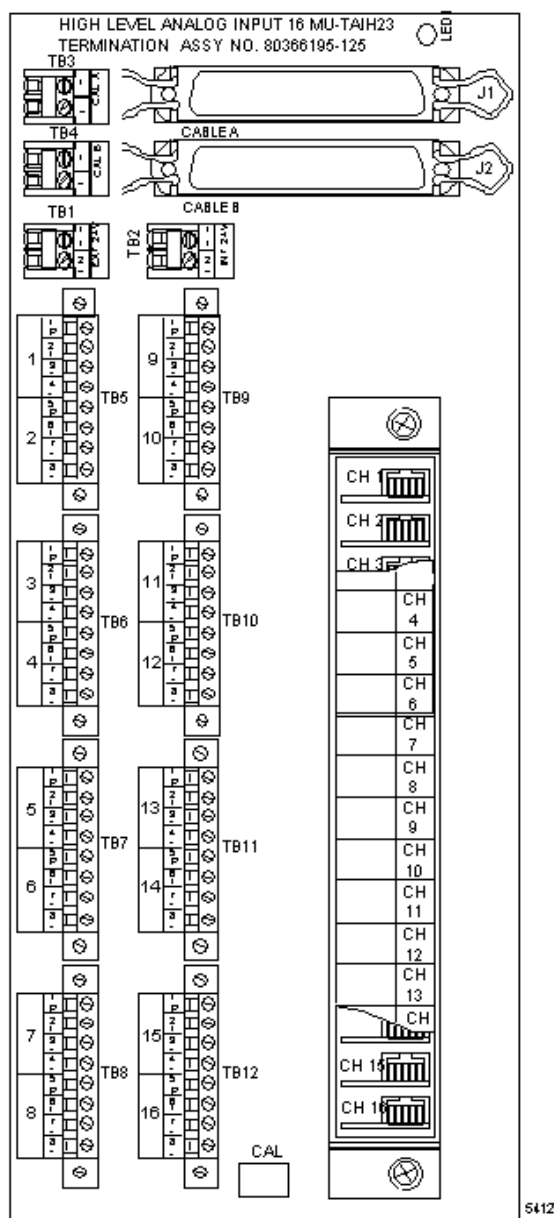
Model MU-TAIH13/15 high level analog input FTA assembly layout



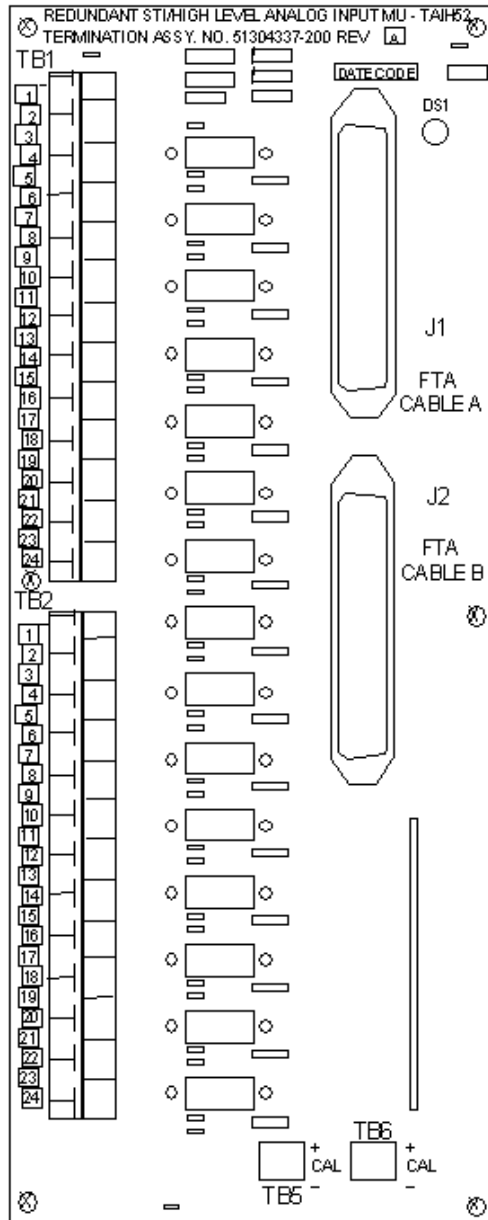
Model MU-TAIH22 enhanced power high level analog input FTA assembly layout



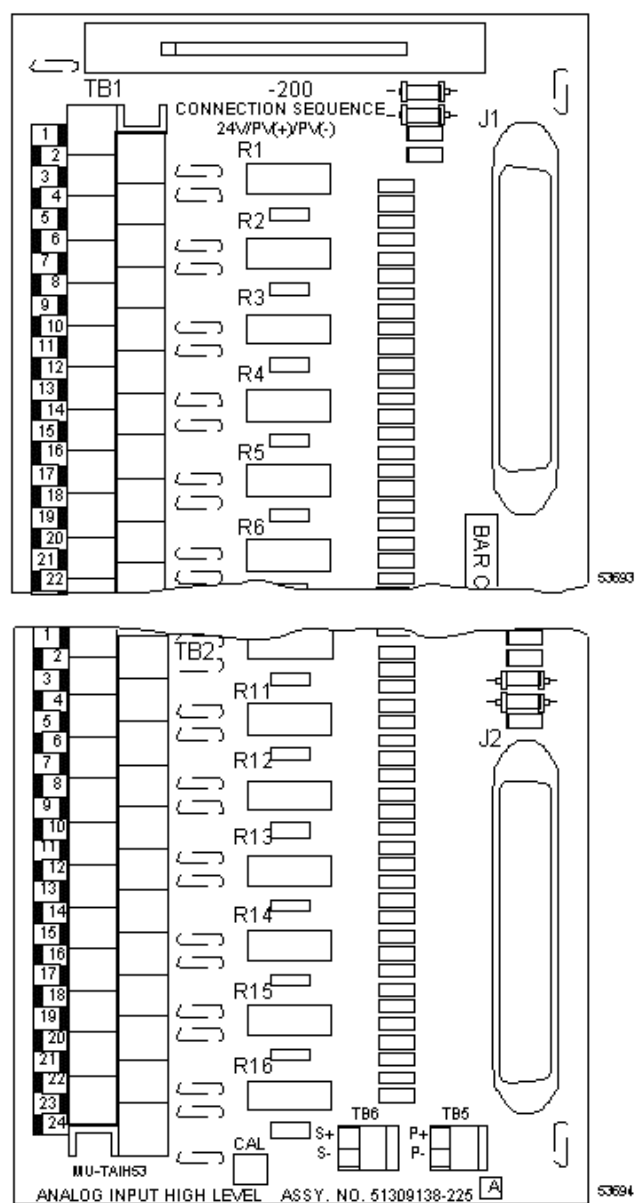
Model MU-TAIH23 enhanced power high level analog input FTA assembly layout



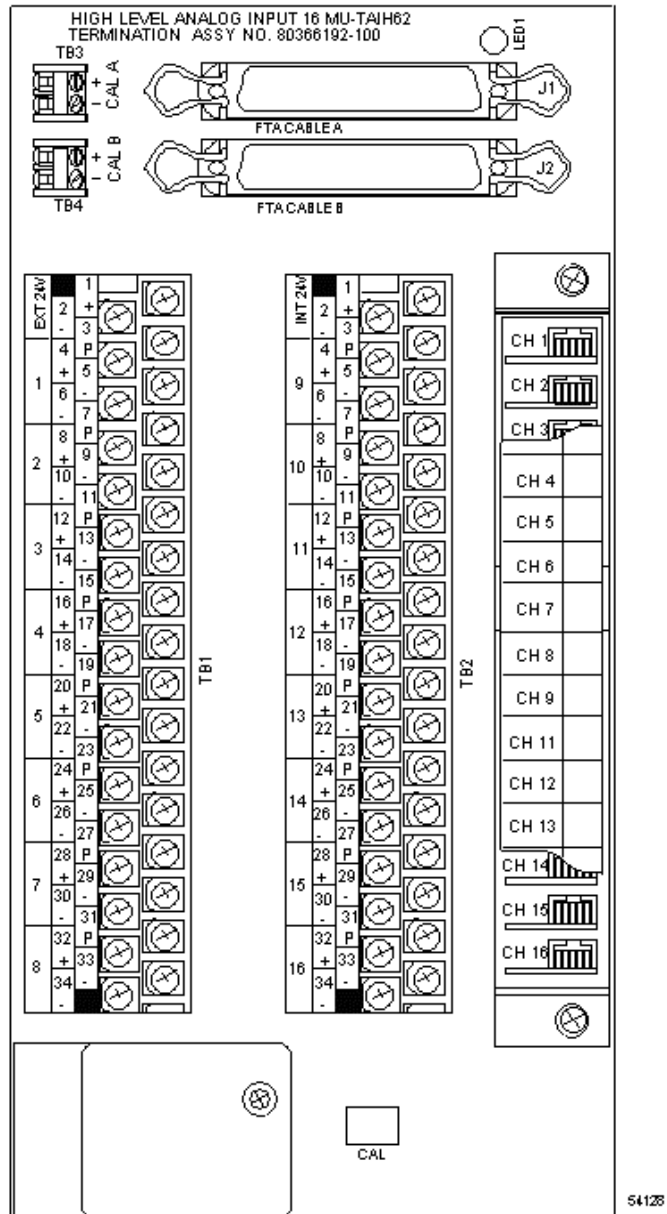
Model MU-TAIH52 high level analog input FTA assembly layout



Model MU-TAIH53/54 high level analog input FTA assembly layout



Model MU-TAIH62 enhanced power high level analog input FTA assembly layout



Analog Input Open Wire Detection

PM I/O provides you with a wide choice of configurations and options. There are three types of Process Variable (PV) input signals available to you:

1. Digital transmitter (DE Mode on Honeywell transmitters),
2. Conventional 4-20 mA
3. 1-5 Vdc signal input.

All of the choices provide satisfactory control. However, the choice will affect the speed at which a bad PV can be detected, if there is an open or broken connection.

- **Digital transmitter PV**

If a Honeywell digital transmitter is selected as the PV input and connected to a Honeywell Smart Transmitter Interface (STI) IOP, the nature of the digital communications provides near instantaneous controller notification of the transmitter's failure. The PV is declared bad and control action that the user selected for the device is initiated. A digital transmitter PV is the preferred choice.

- **4-20 mA PV**

If a conventional 4-20 mA current input is selected as the PV input, the HLAI IOP cannot differentiate between the signal decay from a broken wire, faulty transmitter, or a significant process change. While a broken signal lead will cause the signal across the input range resistor to decay, some transmitter faults may even drive the signal upscale.

The PV will not be declared bad until it exceeds the conversion range or the extended limits. Until a limit is encountered or the range is exceeded, the resultant control action for this varying PV will be the same as for a true process variable.

The 250-ohm dropping resistor acts as a low impedance shunt in the internal RC input filter network that exists to filter out normal mode 50/60 Hz and process noise. Depending upon when the wire break occurs relative to when the signal input channel is scanned, the residual voltage in the RC network may be very close or quite different from the actual input voltage before the break. Since the time constant of the internal RC network is 172 milliseconds, the worst case transition time from PVEUHI to PVEULO is approximately 280 milliseconds.

This choice is acceptable when the delay in determining a bad PV can be tolerated.

- **1-5 Vdc PV**

For 1-5 Vdc signals, the shunt resistor is removed to provide a direct input to the FTA. To maintain accuracy and minimize errors, the voltage inputs are high impedance. Without the range resistor, the decay time of the input capacitance is indeterminate. A broken wire can cause the PV to move slowly up scale or down scale. If the value is within the range limits, the controller will respond to the value as if it is a process change until a limit is encountered.

The 1-5 Vdc PV input is the least desirable of the PV input choices.

Connecting 3-Wire and 4-Wire Transmitters to HLAI FTAs

Depending upon the situation, use the following instructions when connecting a 3-wire or 4-wire transmitter device to an HLAI FTA.



ATTENTION

Avoid multiple grounding points in the transmitter loop.

- **Four-wire, self-powered device isolated from ground**

A 4-wire, self-powered device that is isolated from ground is usually powered from 120 Vac and has a pair of output wires providing 4-20 mA dc. The output wires should be connected across an FTA input that does not have its range spool removed. The zero-ohm resistor that connects the (-) side of the transmitter's output to the subsystem's common must not be removed.

If the transmitter's output is 1-5 Vdc, the range spool must be removed and the zero-ohm resistor must not be removed.

- **Four-wire, self-powered device not isolated from ground**

For a 4-wire, self-powered device that is not isolated from ground, the same connection scheme as above applies. It is assumed that "not isolated from ground" implies that the device is at ground potential, or at least within 7 volts of it. Connect the output from the device across the range spool terminals. Remove the zero-ohm resistor. Remove the range spool if the signal is 1-5 Vdc.

- **Four-wire device powered by an isolated dc power source**

For a 4-wire device that is powered by an isolated dc power source, it is assumed that the device receives 24 Vdc operating power on two wires, and two wires provide the device's output to the FTA.

The output from the device is connected to the FTA using the same instructions that apply for a 4-wire, self-powered device that is isolated from ground.

- **Four-wire device powered by nonisolated subsystem power**

For a 4-wire device that is powered by nonisolated subsystem power, it is assumed that the device receives its 24 Vdc operating power from the subsystem and the device's (-) output terminal is common to its (-) power terminal (a 3-wire device). The device's output is isolated from ground, but not from the power common.

If the current required is too high, the user must obtain 24 Vdc power from another source. Use of the model MU-TDPR02 Digital Input Power Distribution Assembly is recommended.

Connect only one device to each fused assembly output.

The 4-20 mA output should be connected across an FTA input that does not have its range spool removed. The zero-ohm resistor that connects the (-) side of the transmitter's output to the subsystem's common must not be removed.

Allowable Field Wiring Resistance

Calculating field wiring resistance

The maximum allowable field wiring resistance between the transmitter and the FTA connection terminal is dependent upon the voltage requirement of the transmitter and the length of the cable between the FTA and the IOP. The cable length between the FTA and redundant IOPs may not be identical. Under worst case conditions, this resistance is given by the following equation.

$$R_{\max} = [(13.70 - V_{tx}) / (.022)] - 1.336(L_{\text{cable}})$$

where: V_{tx} = Voltage required at the transmitter terminal

L_{cable} = Length of the IOP to FTA cable in meters

The above formula is not applicable for the model MU-TAIH22 and MU-TAIH62 Enhanced Power HLAI FTAs because the FTAs feature current-limiting circuitry. Use the following formula instead.

$$R_{\max} = [(15.60 - V_{tx}) / (.022)] - 1.336(L_{\text{cable}})$$

where: V_{tx} = Voltage required at the transmitter terminal

L_{cable} = Length of the IOP to FTA cable in meters

Voltage/resistance graph

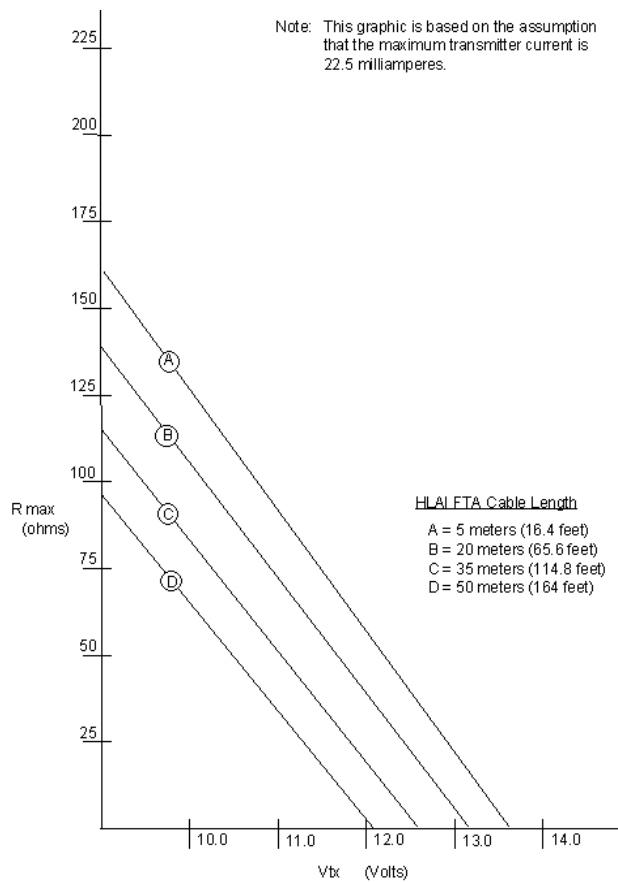
A graph of the maximum field wiring resistance versus the transmitter voltage for several FTA cable lengths is shown in the following figure. This graph, or the equation above,

should be used to ensure that field wiring resistance and any miscellaneous circuitry between the transmitter and the FTA will not affect performance.



ATTENTION

The CE Compliant HLAI FTA models do not require shielded field wiring, but the manufacturer of the field transmitter may require shielded field wiring



HLAI FTA Cable Field Resistance Versus Transmitter Voltage

Smart Transmitter Interface (STI) Applications

Both the Smart Transmitter Interface (STI)/Smart Transmitter Interface Multivariable (STI_MV) and the High Level Analog Input (HLAI) IOPs support the non-CE Compliant models of the High Level Analog Input FTAs. When connecting Smart Transmitter devices to the model, MU-TAIH02, MU-TAIH12, MU-TAIH22, MU-TAIH52, or MU-TAIH62 FTA, use the model MU-PSTX01 or MU-PSTX02 Smart Transmitter Interface (STI) IOP, or the model MU-PSTX03 Smart Transmitter Interface Multivariable (STI_MV) IOP.

CE Compliance

CE Compliant HLA I FTA models MU-TAIH03, MU-TAIH13, MU-TAIH23, and MU-TAIH53 must not be used for a Smart Transmitter device application. The model MU-PSTX01 STI, MU-PSTX02 STI, or MU-PSTX03 STI_MV IOP will not support these HLA I FTAs.

For Smart Transmitter device applications, use the CE Compliant STI FTA models MU-TSTX03, MU-TSTX13, and MU-TSTX53. They are described in [Smart Transmitter Interface \(STI\) FTA wiring](#).

Model MU-TAIH22/23/62 FTAs

The model MU-TAIH23 Enhanced Power HLA I FTAs must not be used for a Smart Transmitter device application; however, the model MU-TAIH22 and MU-TAIH62 FTAs can be used for a Smart Transmitter device application.

Connection diagrams

Connection diagrams to aid in connecting field wiring for smart transmitter interface applications and assembly layout drawings that show the physical layout of the HLAI FTAs are given in the following figures listed in Table 14.

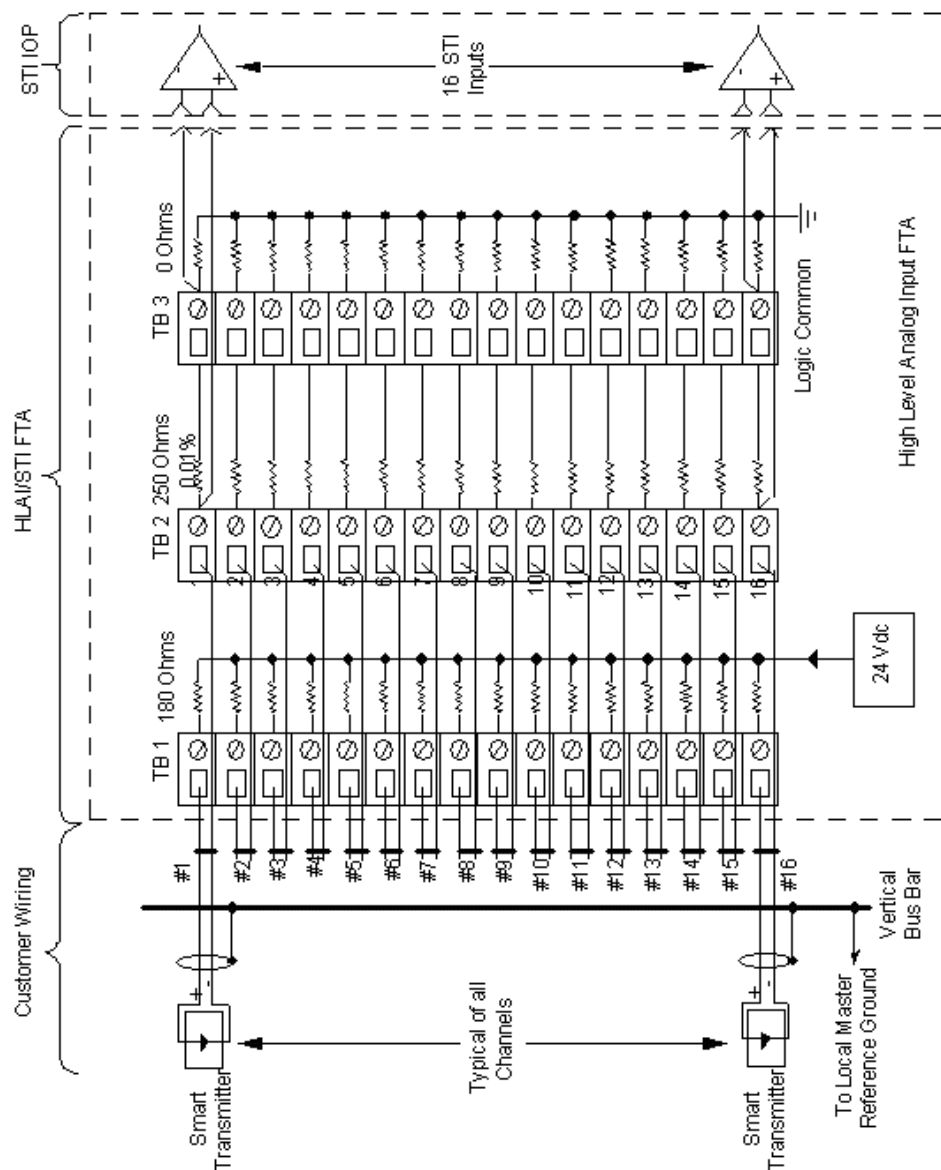
Table 14 HLAI FTA Connection Drawings for STI Applications

High Level Analog Input	STI Applications Connection Diagram
FTA Model	<u>MU-TAIH01</u> *
	<u>MU/MC-TAIH02</u> *
	<u>MU/MC-TAIH12</u>
	<u>MU/MC-TAIH22</u>
	<u>MU/MC-TAIH52</u>
	<u>MU/MC-TAIH62</u>
* These FTAs support a single nonredundant STI or STI_MV IOP only. All other FTAs support both nonredundant and redundant IOP configurations.	

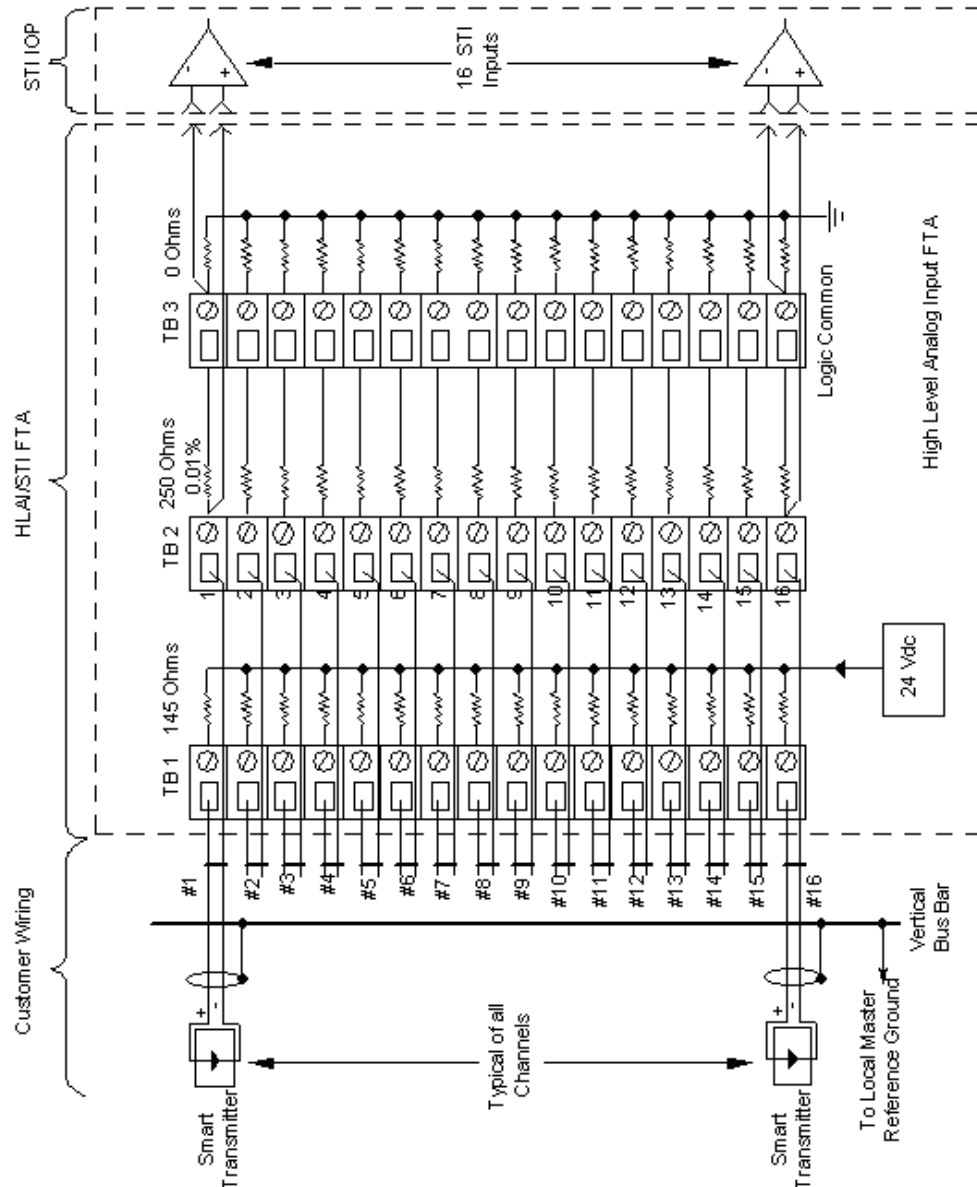
Maximum allowable field resistance

See [Calculating Field Wiring Resistance](#) and [Voltage/resistance graph](#).

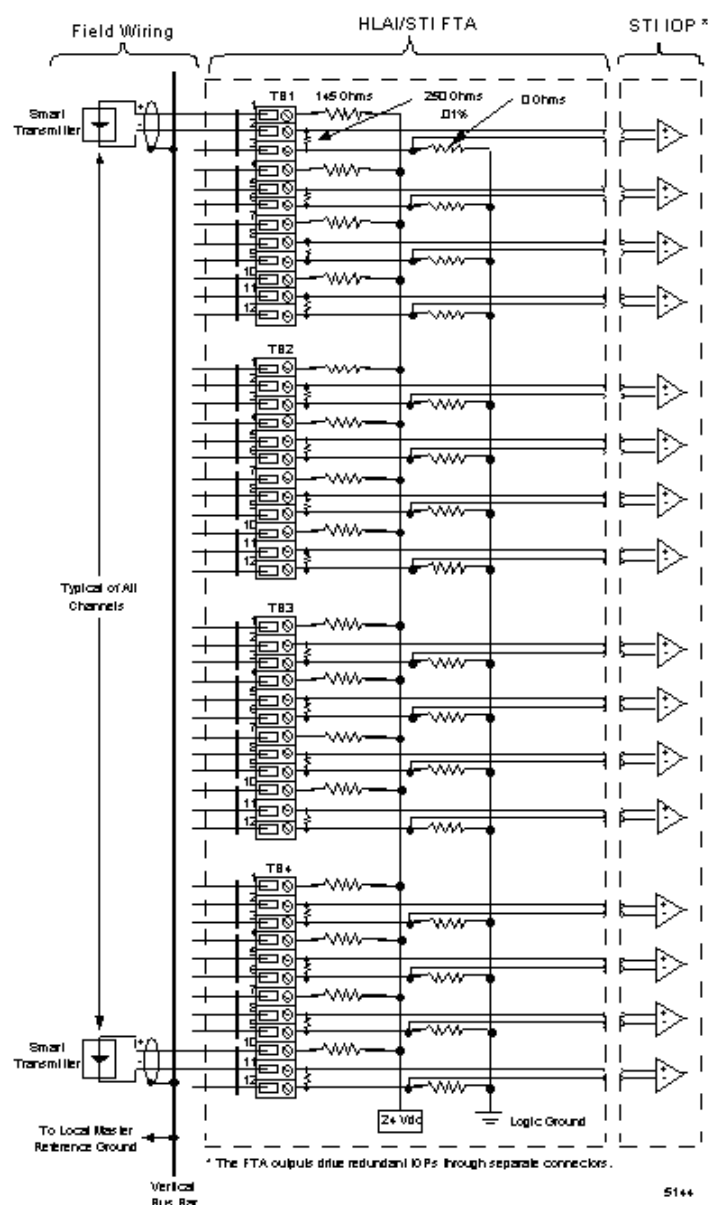
Model MU-TAIH01 FTA —smart transmitter interface applications connection diagram



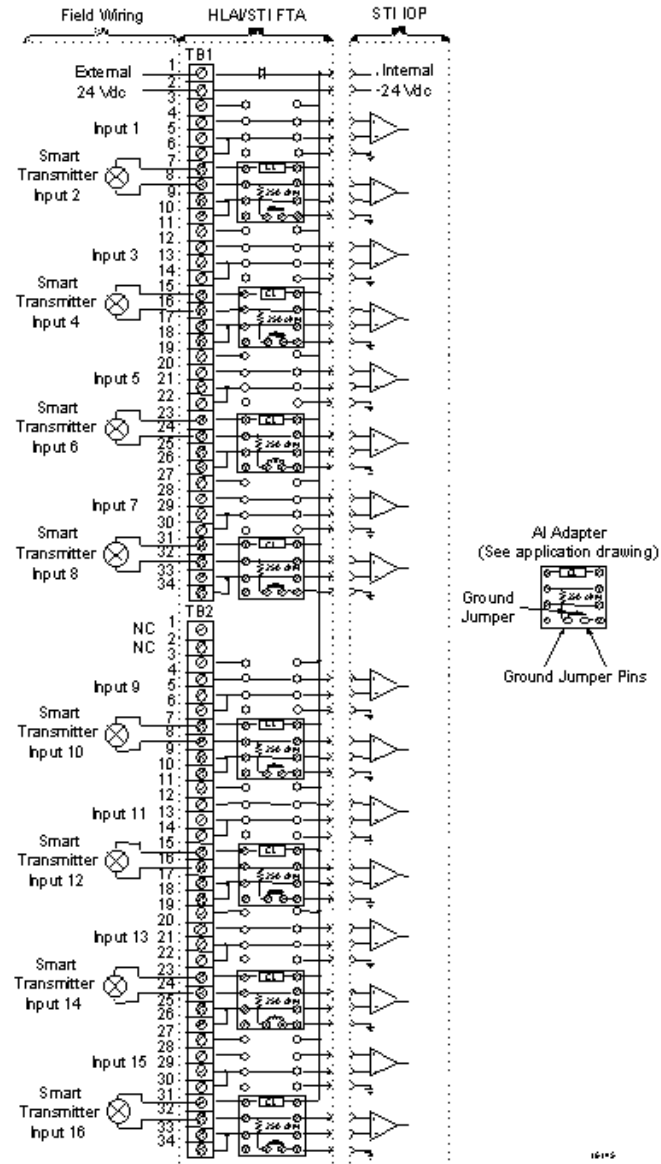
Model MU-TAIH02 FTA —smart transmitter interface applications connection diagram



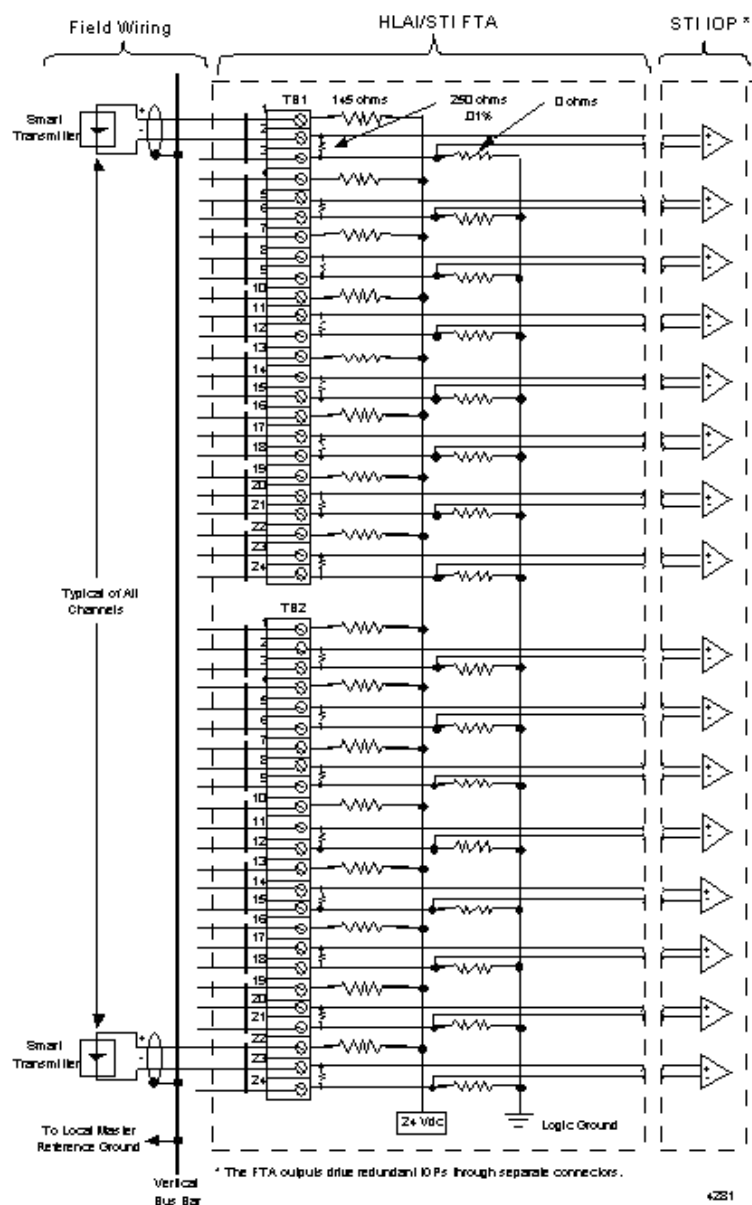
Model MU-TAIH12 FTA —smart transmitter interface applications connection diagram



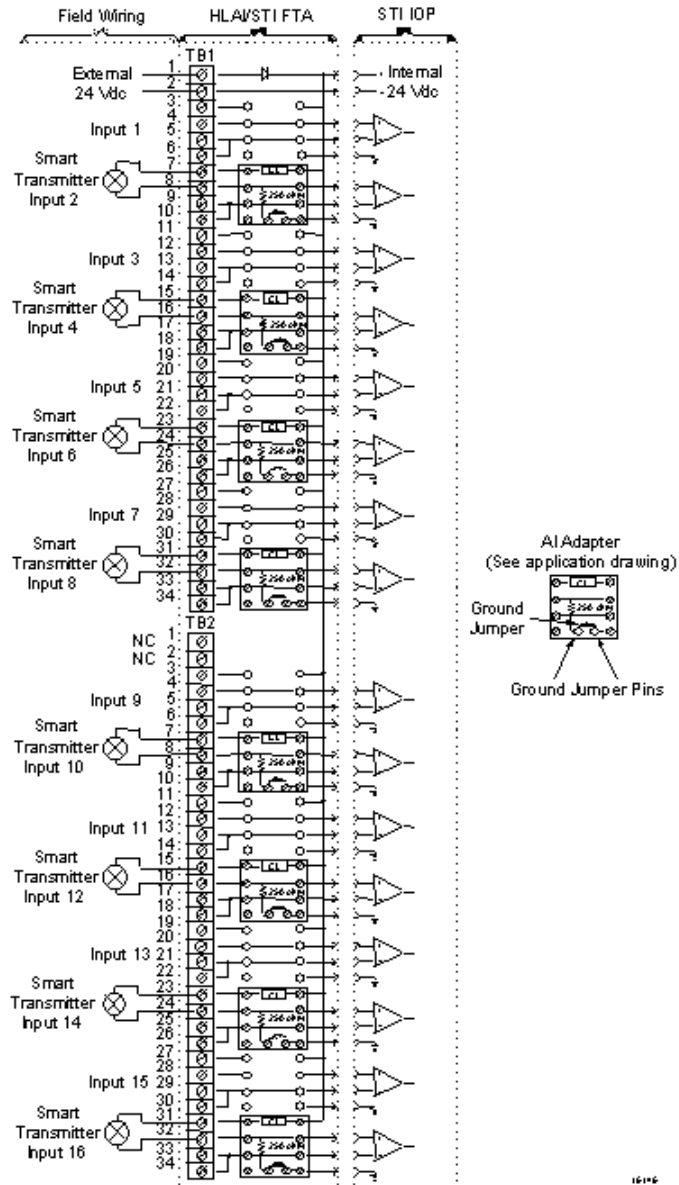
Model MU-TAIH22 FTA —smart transmitter interface applications connection diagram



Model MU-TAIH52 FTA —smart transmitter interface applications connection diagram



Model MU-TAIH62 FTA —smart transmitter interface applications connection diagram



Smart Transmitter Interface (STI) FTA Wiring

The Smart Transmitter Interface (STI) FTA accepts up to 16 Smart Transmitter device high level analog inputs. The inputs are configurable as single-ended or differential in relation to ground.

CE Compliance

All models of the Smart Transmitter Interface (STI) FTAs are CE Compliant. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.”

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.



ATTENTION

The CE Compliant STI FTA models do not require shielded field wiring, but the manufacturer of the field transmitter may require shielded field wiring.

STI FTAs and associated hardware

Smart Transmitter Interface (STI) Standard FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TSTX03	STI FTA with Compression Terminals Single IOP Interface	N/A	51309140-125
MC-TSTX03	STI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309140-175
MU-TSTX13	STI FTA with Compression Terminals Redundant IOP Interface	N/A	51309142-125
MC-TSTX13	STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	N/A	51309142-175
MU-TSTX53	STI FTA with Screw Terminals Redundant IOP Interface	N/A	51309142-225

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-TSTX53	STI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	N/A	51309142-275
Supporting IOPs			
MU-PSTX02	Smart Transmitter Interface (STI) IOP	51304516-100	N/A
MC-PSTX02	Smart Transmitter Interface (STI) IOP — Conformally Coated	51304516-150	N/A
MU-PSTX03	Smart Transmitter Interface Multivariable (STI_MV) IOP	N/A	51304516-200
MC-PSTX03	Smart Transmitter Interface Multivariable (STI_MV) IOP—Conformally Coated	N/A	51304516-250

STI_MV IOP

The model MU-PSTX02 Smart Transmitter Interface (STI) IOP and model MU-PSTX03 Smart Transmitter Interface Multivariable (STI_MV) IOP support the Smart Transmitter Interface FTAs and can be installed in any card file slot.

Connection diagrams and assembly layout

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the STI FTAs are given in the following figures listed in Table 15.

Table 15 STI FTA Connection Drawings

Smart Transmitter Interface (STI)	Connection Diagram	Assembly Layout
FTA Model	<u>MU/MC-TSTX03</u>	<u>MU/MC-TSTX03</u>
	<u>MU/MC-TSTX13</u>	<u>MU/MC-TSTX13</u>
	<u>MU/MC-TSTX53</u>	<u>MU/MC-TSTX53</u>

Vertical bus bar

Because the FTA does not have a built-in shield bus, handling a large number of cable shields requires the use of a vertical bus bar. The vertical bus bar and any cable shield connect to the local Master Reference Ground (MRG) at the floor of the cabinet. For CE Compliance applications, Safety Ground must be used.

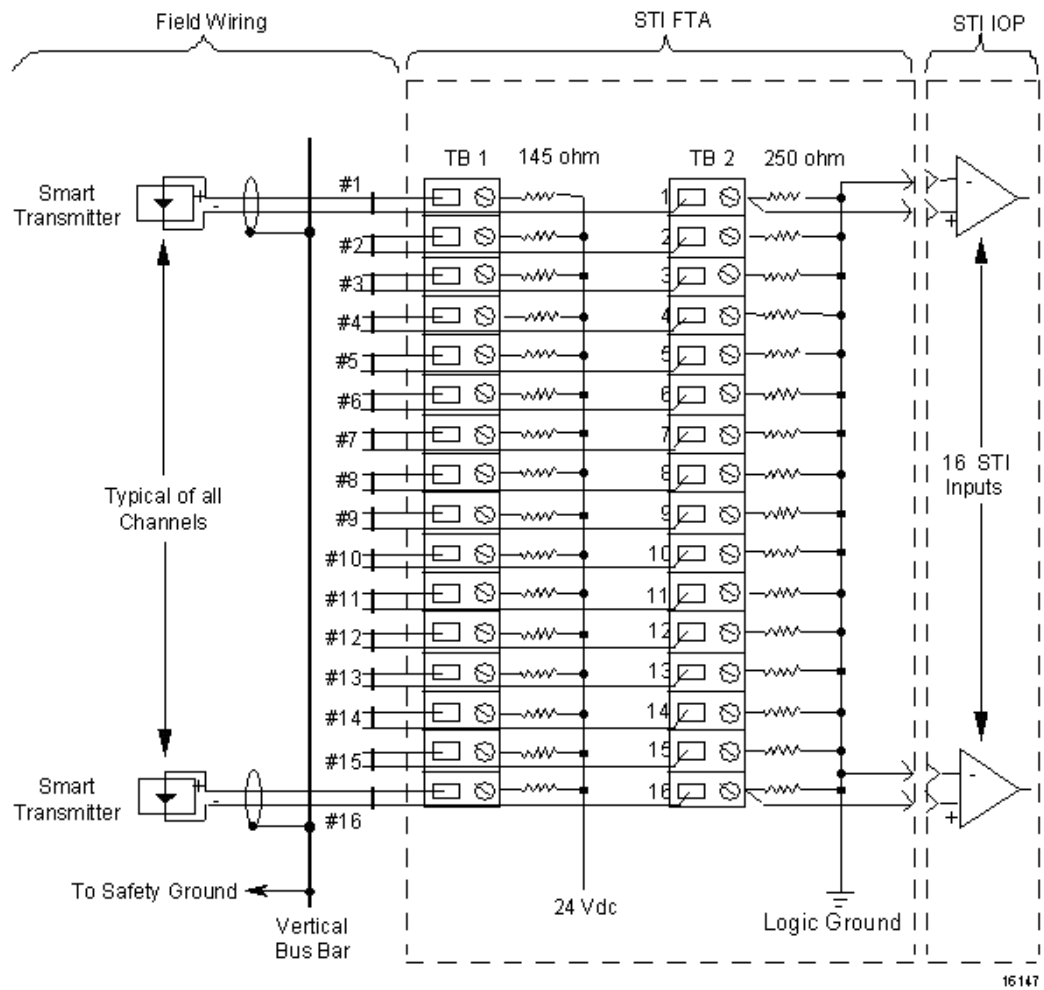
Self-powered transmitters

All transmitter loops must have a single connection to reference ground. If the loop does not have a ground reference connection, it must be provided by the FTA's zero-ohm resistor. If this ground connection is provided by a self-powered transmitter, the zero-ohm resistor on the FTA must be removed.

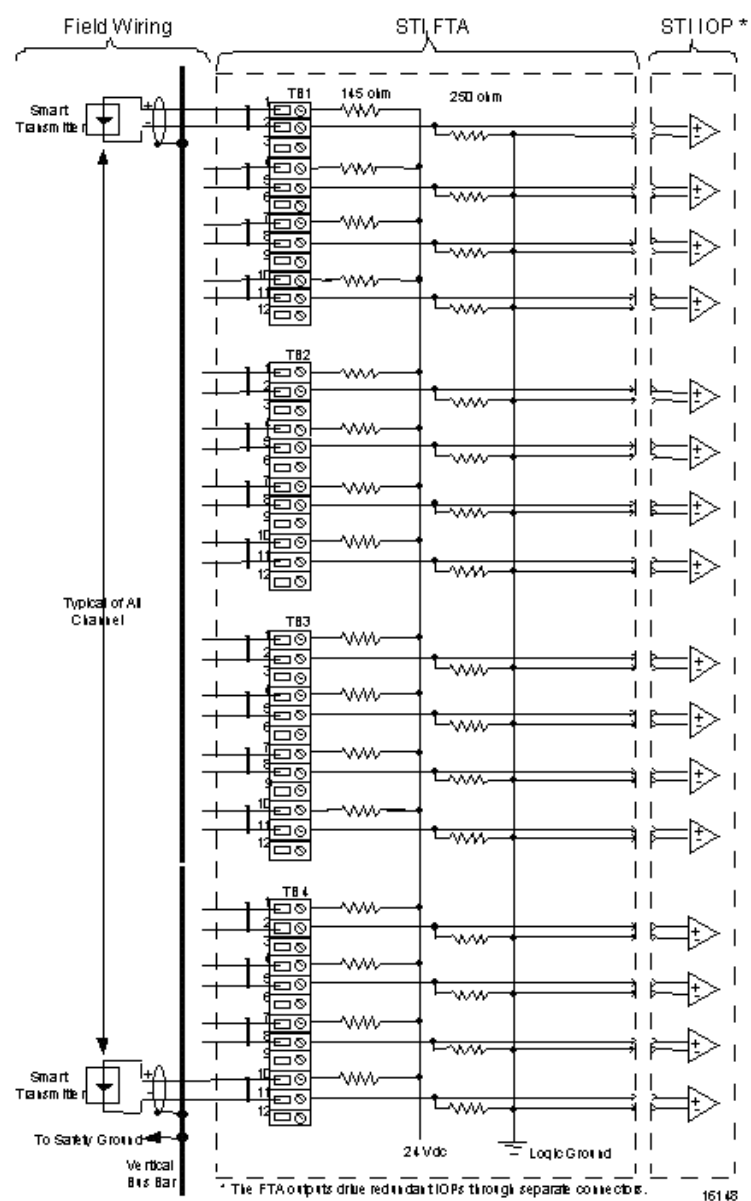
When the zero-ohm resistor is removed, the loop ground must not produce more than -7 to +5 volts of common mode voltage onto the loop signal.

If the common mode voltage is outside the FTA's specifications, or the transmitter cannot be isolated from ground, or stable ground conditions do not exist, the transmitter must not be connected to the FTA without the use of an isolator. When an isolator is used, the zero-ohm resistor must not be removed.

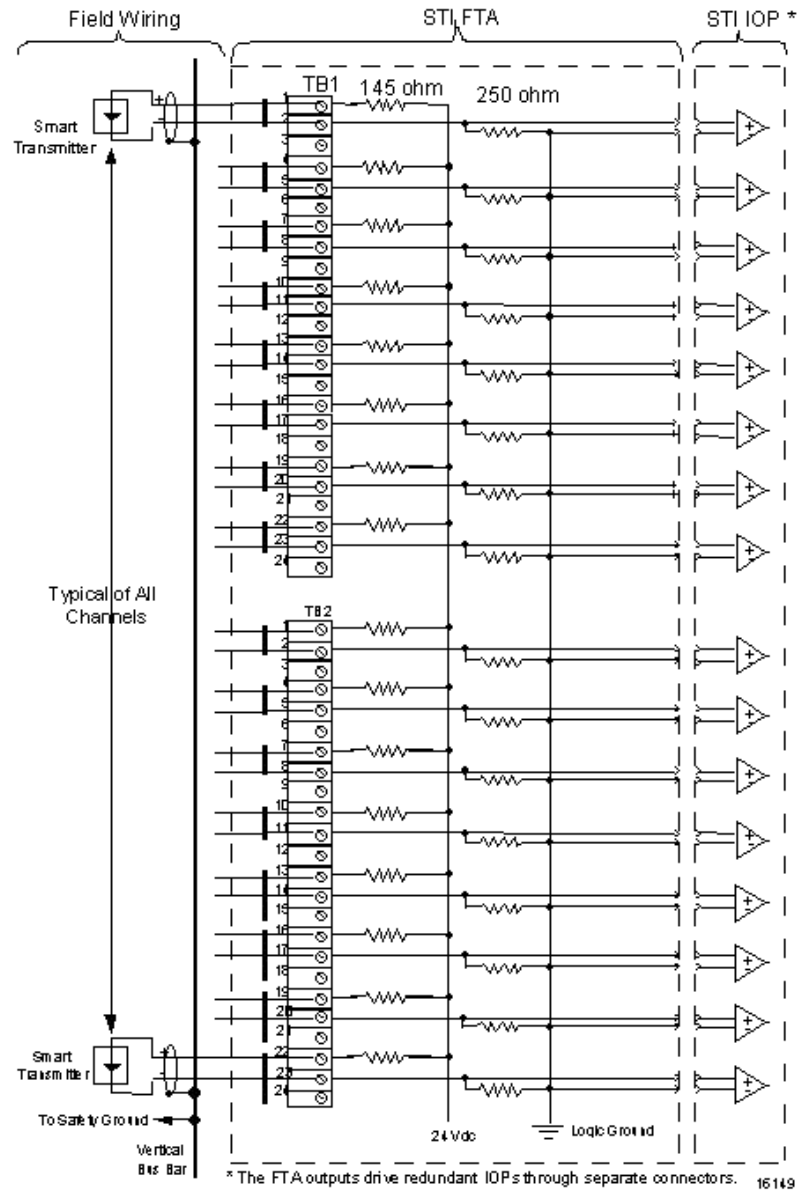
Model MU-TSTX03 smart transmitter interface (STI) FTA connection diagram



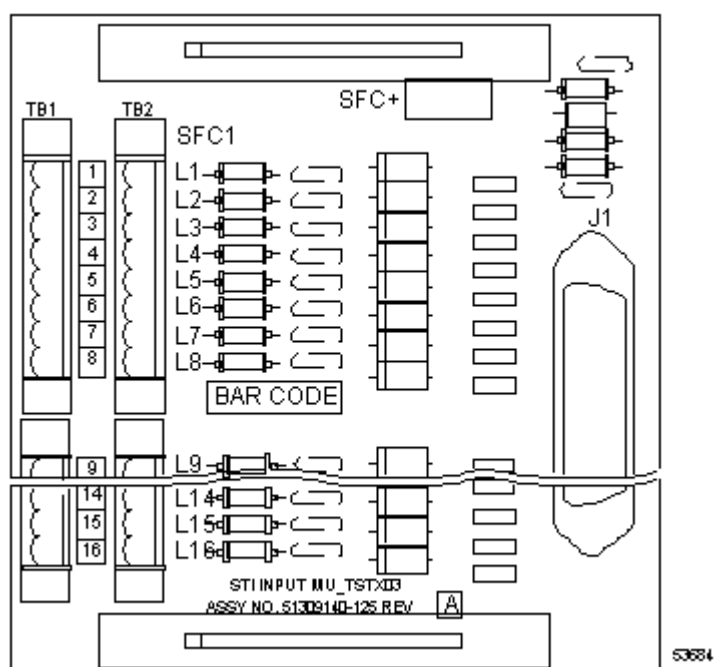
Model MU-TSTX13 smart transmitter interface (STI) FTA connection diagram



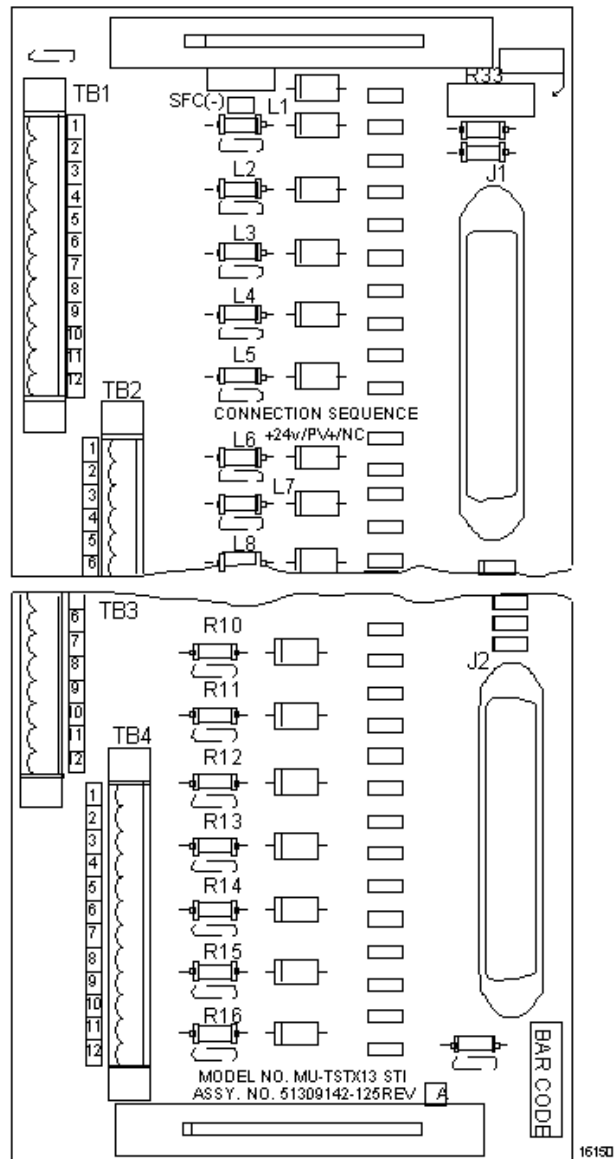
Model MU-TSTX53 smart transmitter interface (STI) FTA connection diagram



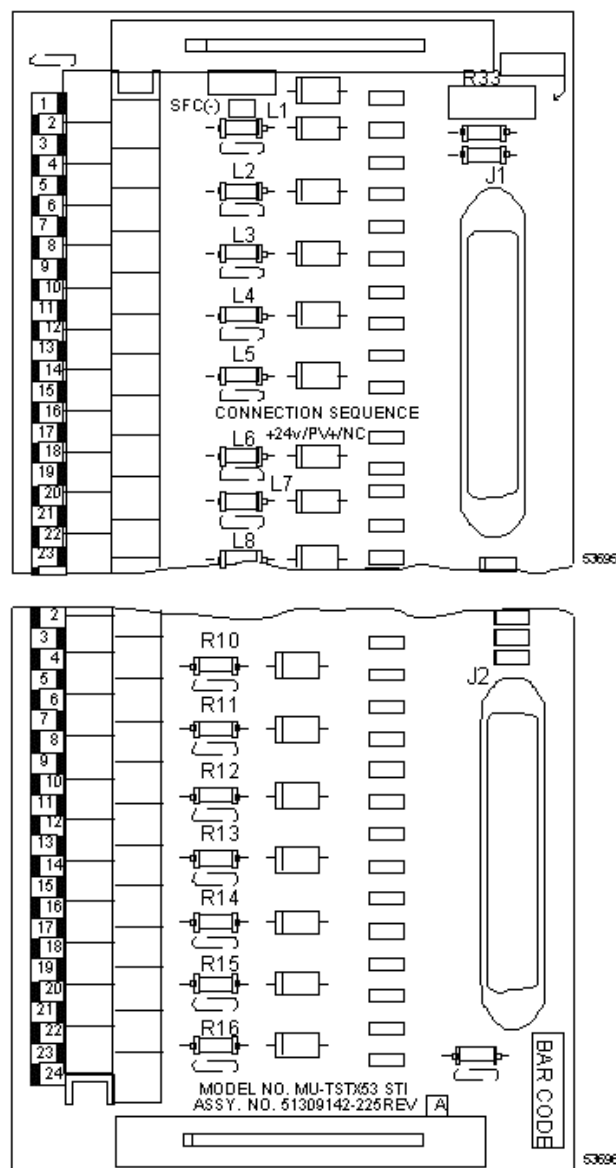
Model MU-TSTX03 smart transmitter interface (STI) FTA assembly layout



Model MU-TSTX13 smart transmitter interface (STI) FTA assembly layout



Model MU-TSTX53 smart transmitter interface (STI) FTA assembly layout



Analog Output (AO) FTA wiring

About AO outputs

Analog Output FTAs provide either eight or sixteen 4-20 mA outputs to proportioning loads, such as valves. There are three types of the AO FTAs:

- 8 channel (point)
- 16 channel (point) with standby manual connection
- 16 channel (point) with filtering to allow operation with HART field devices, and provide a connector for an external HART system.

CE Compliance

Some Analog Output (AO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable. For CE Compliant applications, The CE Compliant FTA and IOP models must be used with the CE Compliant model shielded IOP to FTA cable and card file.

The model MU-PAOX03 IOP is available as a CE Compliant assembly and as a non-CE Compliant assembly. For CE Compliance, the CE Compliant assembly must be used with the CE Compliant FTAs.

The model MU-PAOY22 Analog Output IOP and MC-PHAO01 HART Analog Output IOP are CE Compliant assemblies. These IOPs are not available as non-CE Compliant assemblies.

Both models MU-THAO11 and MC-THAO11 FTAs with a HART interface connector are CE Compliant.

CAUTION

The CE Compliant Analog Output FTA models do not require shielded field wiring, but the manufacturer of the valve may require shielded field wiring

Analog Output (AO) Standard FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
8 Channel Points – FTAS and IOPs			
MU-TAOX01	AO FTA with Compression Terminals Single IOP Interface	51303953-100	N/A
MU-TAOX02	AO FTA with Compression Terminals Single IOP Interface	51304476-100	51304476-125
MC-TAOX02	AO FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304476-150	51304476-175
MU-TAOX12	AO FTA with Compression Terminals Redundant IOP Interface	51304335-100	51304335-125
MC-TAOX12	AO FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304335-150	51304335-175
MU-TAOX52	AO FTA with Screw Terminals Redundant IOP Interface	51304335-200	51304335-225
MC-TAOX52	AO FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	51304335-250	51304335-275
Supporting IOPs			
MU-PAOX02	Analog Output IOP	51304483-100	N/A
MC-PAOX02	Analog Output IOP—Conformally Coated	51304483-150	N/A
MU-PAOX03	Analog Output IOP	51304672-100	51309152-125
MC-PAOX03	Analog Output IOP—Conformally Coated	51304672-150	51309152-175
16 Channel Points – FTAS and IOPs			
MU-THAO11	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface HART connection capability	N/A	51309542-125

Appendix C – PM I/O FTA Reference
Analog Output (AO) FTA wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-THAO11	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface HART connection capability—Conformally Coated	N/A	51309542-175
MU-TAOY22	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface	80366177-100	80366481-125
MC-TAOY22	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80366177-150	80366481-175
MU-TAOY23	AO FTA with Compression Terminals Without Standby Manual Device Connector Redundant IOP Interface	80366177-200	N/A
MC-TAOY23	AO FTA with Compression Terminals Without Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80366177-250	N/A
MU-TAOY24	HART-Compatible AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface	N/A	51305865-125
MC-TAOY24	HART-Compatible AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	N/A	51305865-175
MU-TAOY25	HART-Compatible AO FTA with Compression Terminals Without Standby Manual Device Connector Redundant IOP Interface		N/A
MC-TAOY25	HART-Compatible AO FTA with Compression Terminals Without Standby Manual Device Connector Redundant IOP Interface—Conformally Coated		N/A

Appendix C – **PM I/O FTA Reference**
Analog Output (AO) FTA wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAOY52	AO FTA with Screw Terminals Standby Manual Device Connector Redundant IOP Interface	80364007-100	80366484-125
MC-TAOY52	AO FTA with Screw Terminals Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80364007-150	80366484-175
MU-TAOY53	AO FTA with Screw Terminals Without Standby Manual Device Connector Redundant IOP Interface	80364007-200	N/A
MC-TAOY53	AO FTA with Screw Terminals Without Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80364007-250	N/A
MU-TAOY54	HART-Compatible AO FTA with Screw Terminals Standby Manual Device Connector Redundant IOP Interface	N/A	51305867-125
MC-TAOY54	HART-Compatible AO FTA with Screw Terminals Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	N/A	51305867-175
MU-TAOY55	HART-Compatible AO FTA with Screw Terminals Without Standby Manual Device Connector Redundant IOP Interface		N/A
MC-TAOY55	HART-Compatible AO FTA with Screw Terminals Without Standby Manual Device Connector Redundant IOP Interface—Conformally Coated		N/A
Supporting IOPs			
MU-PAOY22	Analog Output IOP	N/A	80363969-100
MC-PAOY22	Analog Output IOP—Conformally Coated	N/A	80363969-150

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-PHA001	HART Analog Output—Conformally Coated	N/A	51403476-150

IOP compatibility

The following table lists the available analog output IOPs and the compatible FTAs.

AO IOPs and Compatible FTAs

AO IOPs	Compatible AO FTAs
8 Channel Points MU/MC-PAOX02 MU/MC-PAOX03	MU-TAOX01 MU/MC-TAOX02 MU/MC-TAOX12 MU/MC-TAOX52
16 Channel Points MU/MC-PAOY22	MU/MC-TAOY22 MU/MC-TAOY23 MU/MC-TAOY52 MU/MC-TAOY53 MU/MC-THAO11
16 Channel HART MU/MC-PHA001	MU/MC-TAOY24 MU/MC-TAOY25 MU/MC-TAOY54 MU/MC-TAOY55

Note: Do not mismatch Analog Output IOPs.

Connection diagrams and assembly layouts

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the AO FTAs are given in the following figures listed in Table 16.

Table 16 AO FTA Connection Drawings

Analog Output	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TAOX01</u> , <u>MU/MC-TAOX02</u>	<u>MU/MC-TAOX02</u>
	<u>MU/MC-TAOX12</u>	<u>MU/MC-TAOX12</u>
	<u>MU/MC-TAOX52</u>	<u>MU/MC-TAOX52</u>
	<u>MU/MC-TAOY22</u> (Non-CE compliant)	
	<u>MU/MC-TAOY22</u> (CE compliant)	<u>MU/MC-TAOY22</u> (CE compliant)
	<u>MU/MC-TAOY23</u> (Non-CE compliant)	<u>MU/MC-TAOY23</u> (Non-CE compliant)
		<u>MU/MC-TAOY24</u>
	<u>MU/MC-TAOY52</u> (Non-CE compliant)	<u>MU/MC-TAOY52</u> (Non-CE compliant)
	<u>MU/MC-TAOY52</u> (CE compliant)	<u>MU/MC-TAOY52</u> (CE compliant)
	<u>MU/MC-TAOY53</u>	<u>MU/MC-TAOY53</u>
		<u>MU/MC-TAOY54</u>
	<u>MU/MC-THAO11</u>	<u>MU/MC-THAO11</u>

Standby Manual device connectors

Model MU-TAOY22, MU-TAOY24, MU-TAOY52, MU-TAOY54 and MU-THAO11 FTAs provide two connectors, J3 and J4, for connection to an Analog Output Standby Manual device. Connector J3 supports outputs (channels) 1 through 8, and connector J4 supports outputs (channels) 9 through 16.

A single 1 ampere fuse, F1, provides 24 Vdc power to the Standby Manual connectors.

Vertical bus bar

The FTA does not have a built-in bus to accommodate field wiring cable shields. A vertical bus bar that is installed on the FTA mounting channel is recommended as a connection point for local Master Reference Ground (MRG), and is described in [Installation Considerations for FTAs](#). Connect the cable shields to the vertical bus bar and then connect the vertical bus bar to the local Master Reference Ground (MRG) with a 2.5 mm² (14 AWG) wire. For CE Compliance applications, Safety Ground must be used.

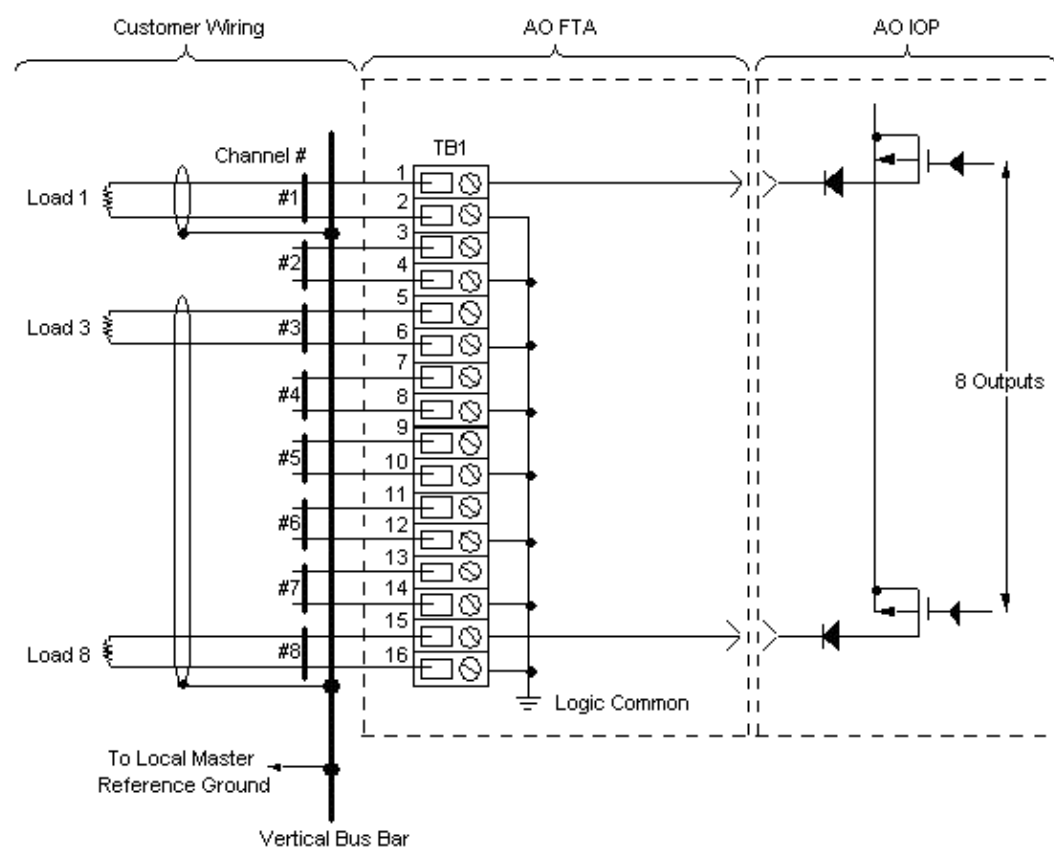
Installations can use Power Limited Tray cable. Check the local electrical codes.

HART connector, MU/MC-THAO11 only

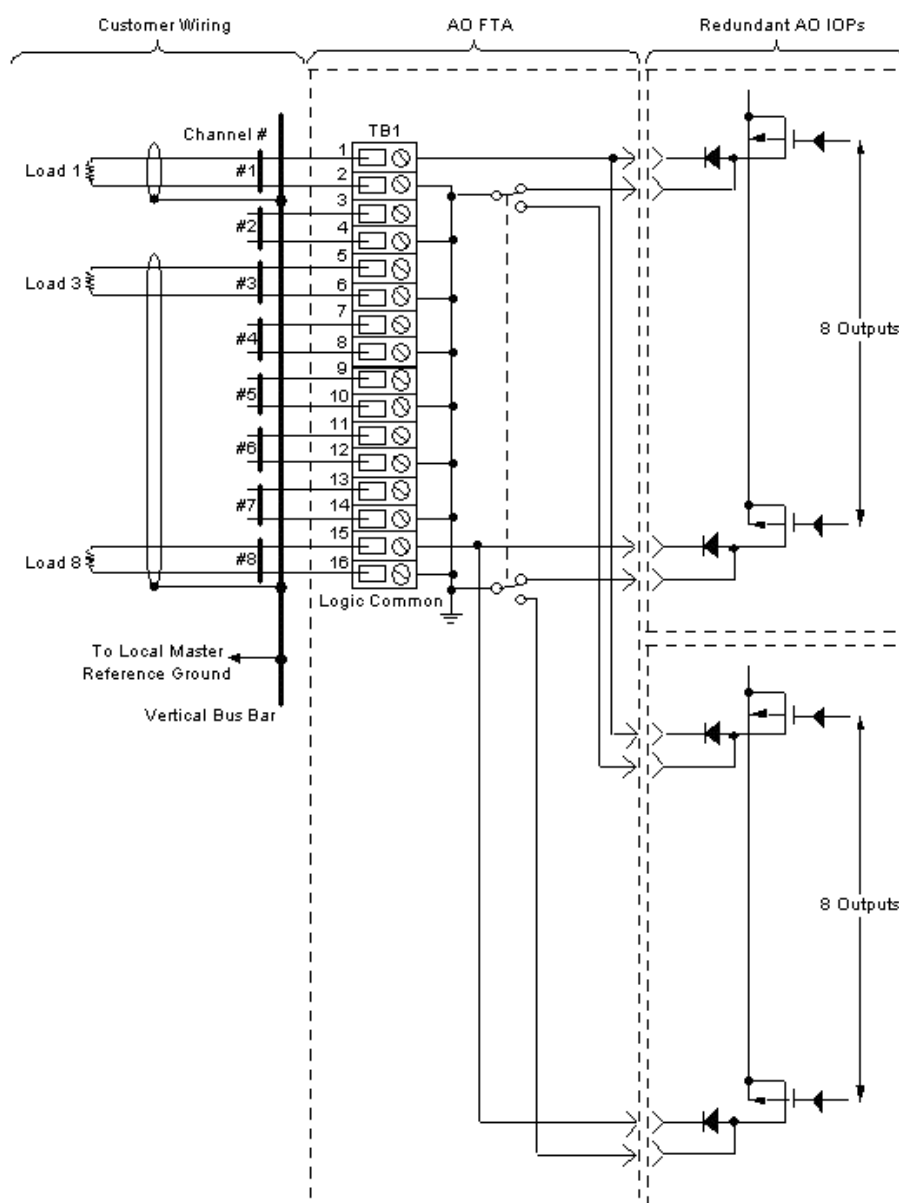
Model MC-THAO11 and MU-THAO11 FTA contain a HART connector that is used to interface to an external HART system. The pinouts of the connector are as follows:

Pins	Usage
1 through 16	Combined 4 to 20 mA / HART signals for Channels 1 through 16, respectively
17 through 20	Ground

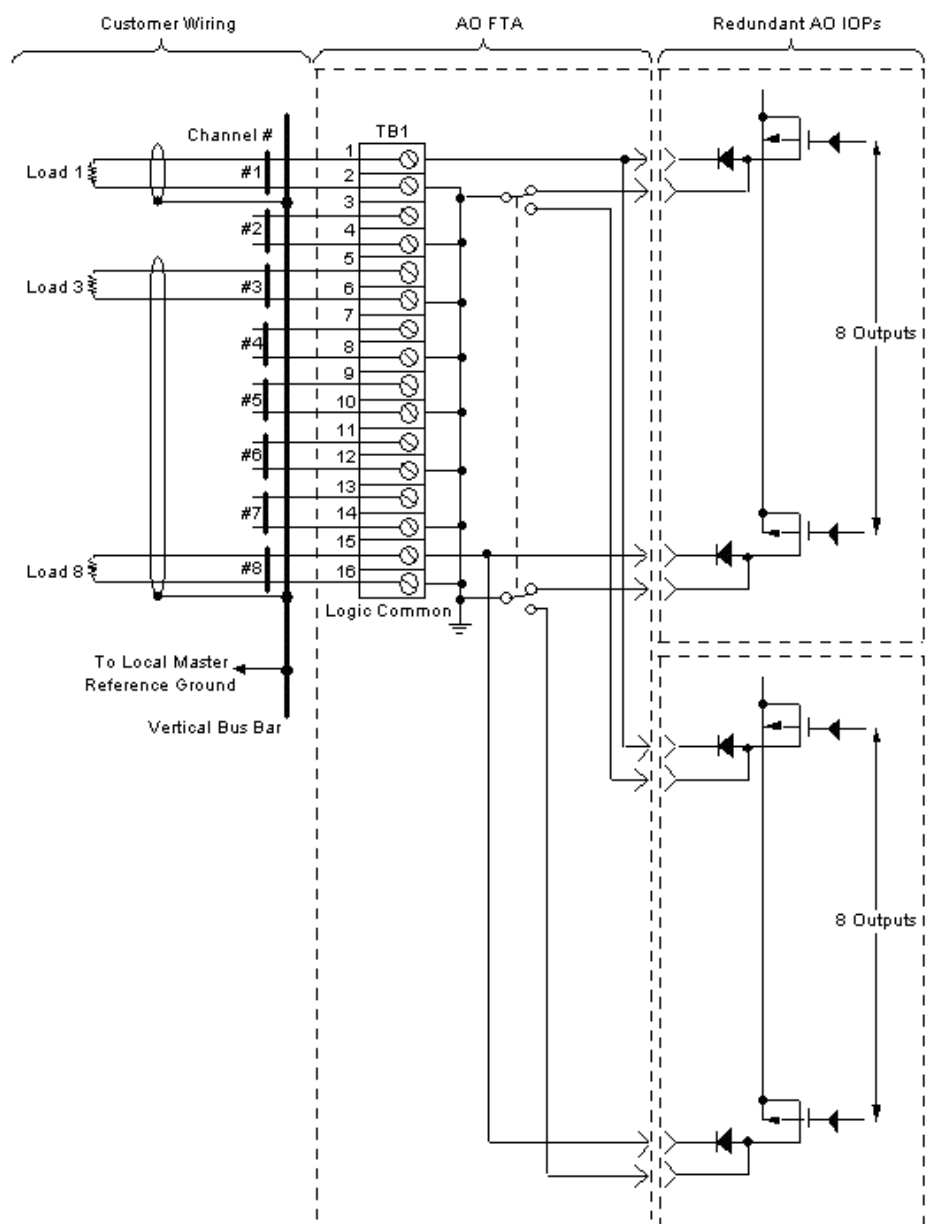
Model MU-TAOX01/MU-TAOX02 analog output FTA connection diagram



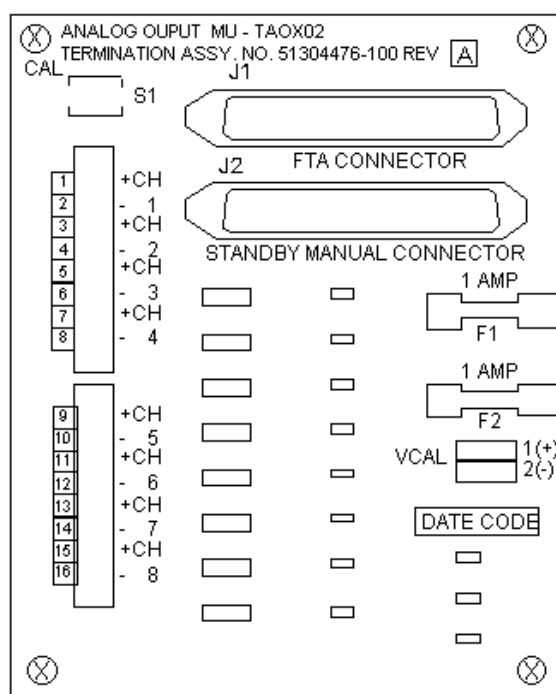
Model MU-TAOX12 analog output FTA connection diagram



Model MU-TAOX52 analog output FTA connection diagram



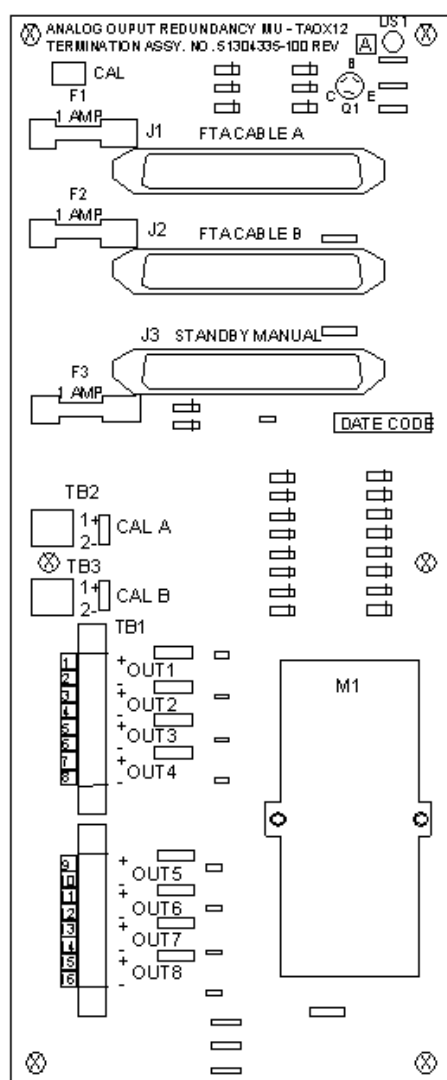
Model MU-TAOX02 analog output FTA assembly layout



Note:

Fuse F1 provides STANDBY MANUAL connector protection.
Fuse F2 provides VCAL + terminal protection.

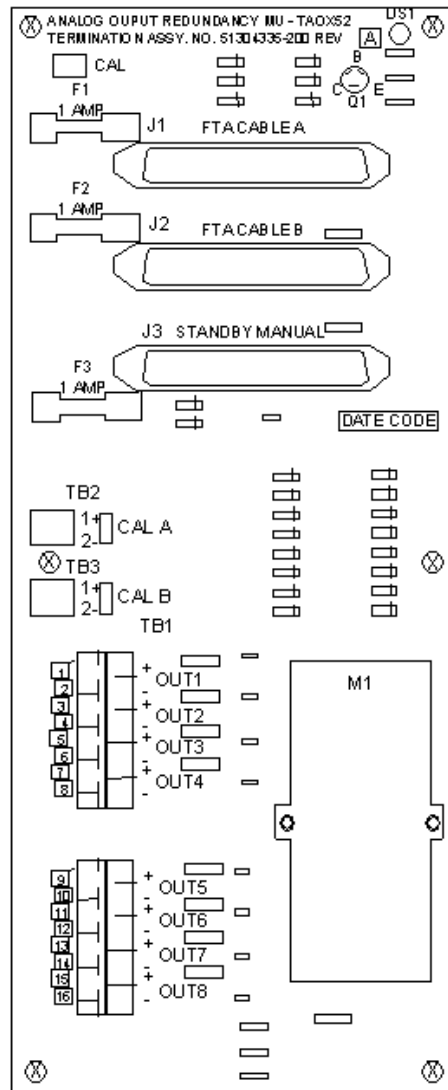
Model MU-TAOX12 analog output FTA assembly layout



Note:

Fuse F1 provides CAL A (TB2) + terminal protection.
 Fuse F2 provides CAL B (TB3) + terminal protection.
 Fuse F3 provides STANDBY MANUAL connector protection.

Model MU-TAOX52 analog output FTA assembly layout

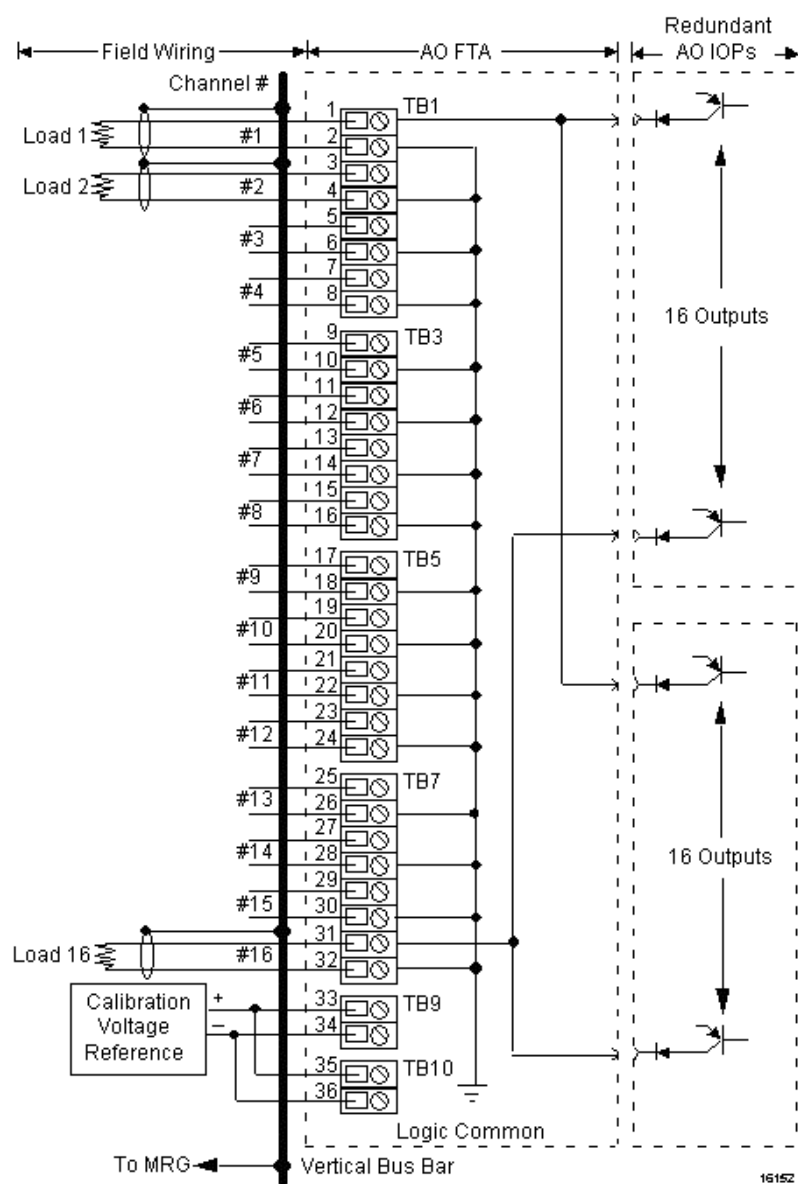


Note:

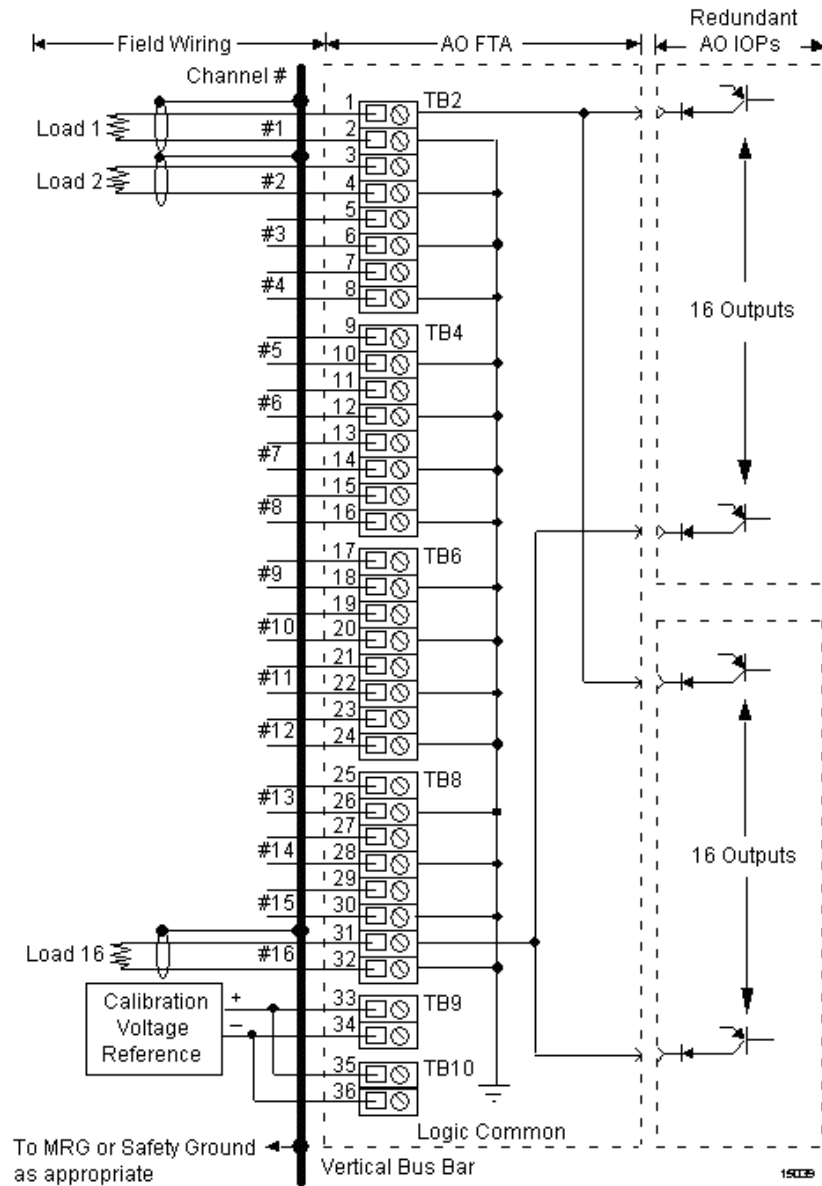
Fuse F1 provides CAL A (TB2) + terminal protection.
Fuse F2 provides CAL B (TB3) + terminal protection.
Fuse F3 provides STANDBY MANUAL connector protection.

CBS

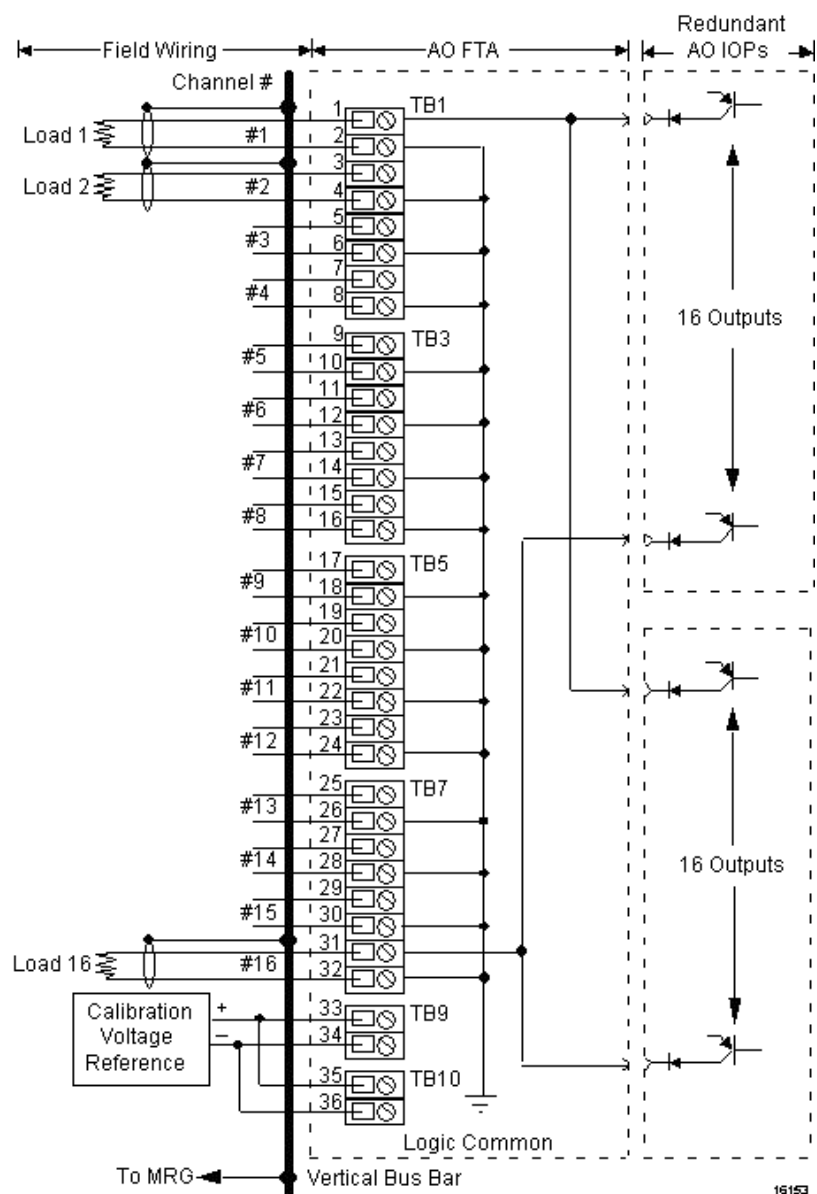
Model MU-TAOY22 analog output FTA connection diagram (non-CE compliant)



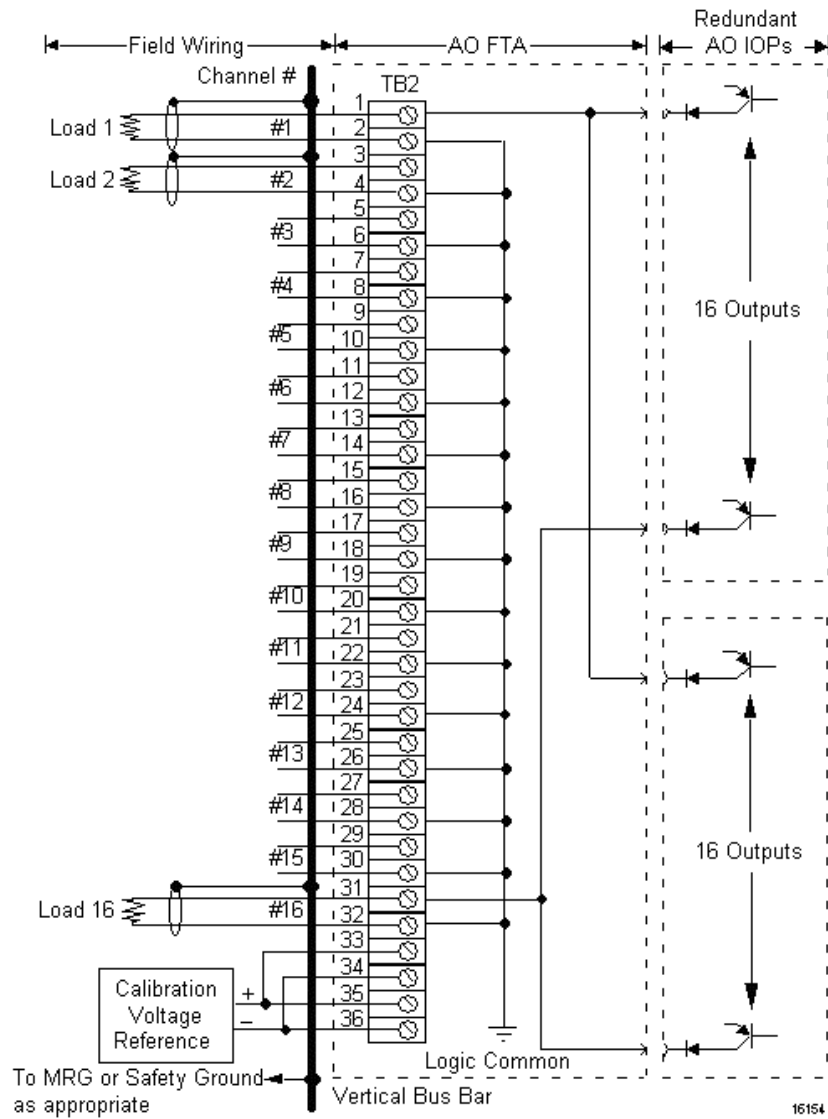
Model MU-TAOY22 analog output FTA connection diagram (CE compliant)



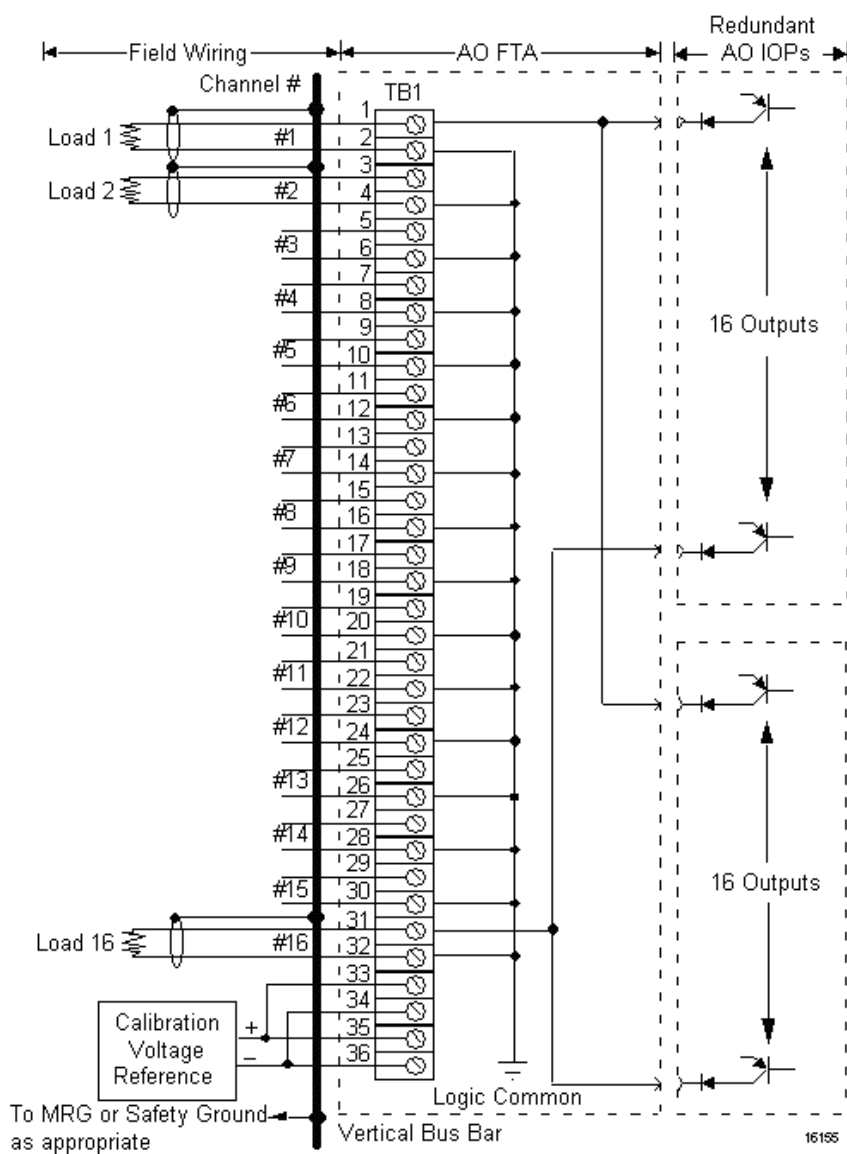
Model MU-TAOY23 analog output FTA connection diagram (non-CE compliant)



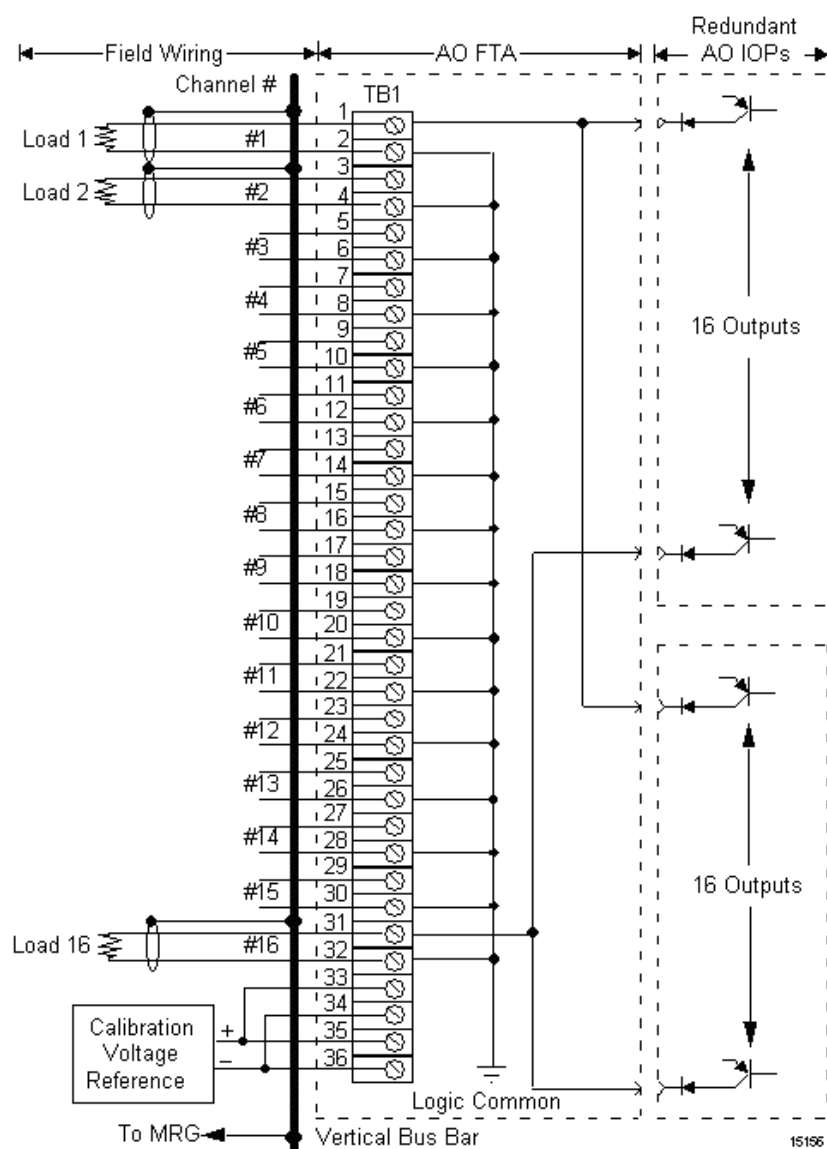
Model MU-TAOY52 analog output FTA connection diagram (non-CE compliant)



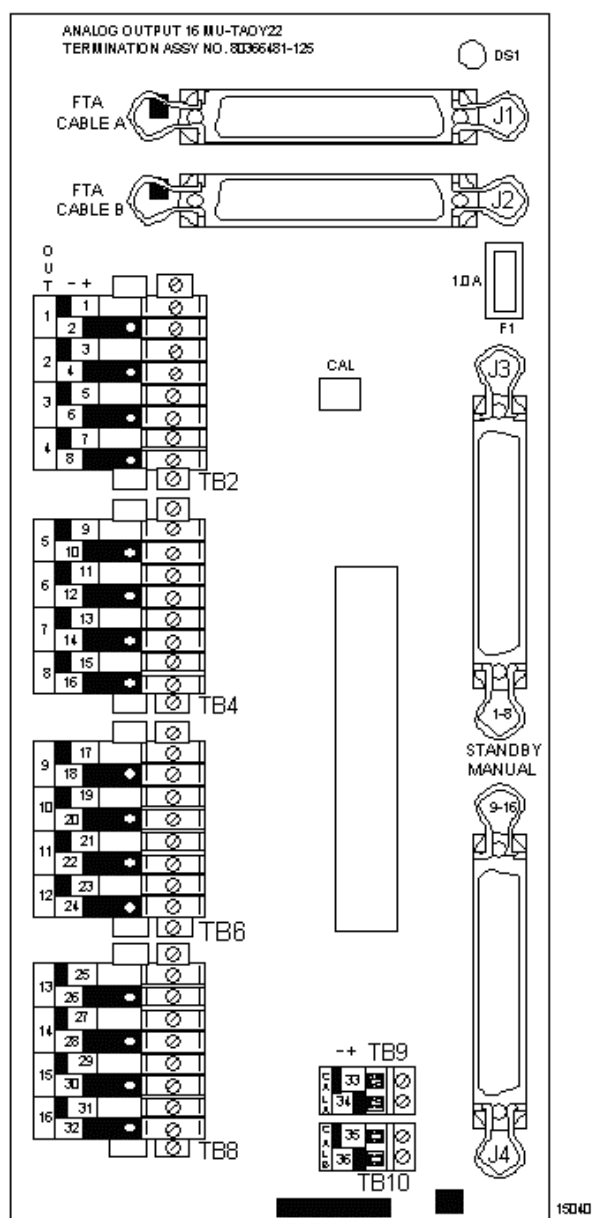
Model MU-TAOY52 analog output FTA connection diagram (CE compliant)



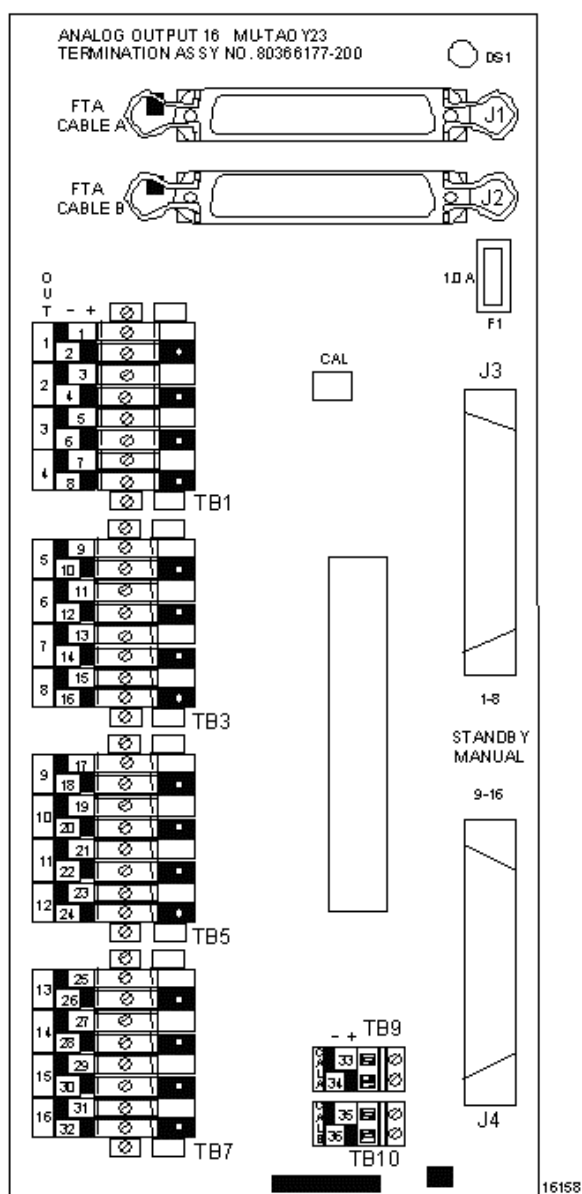
Model MU-TAOY53 analog output FTA connection diagram (non-CE compliant)



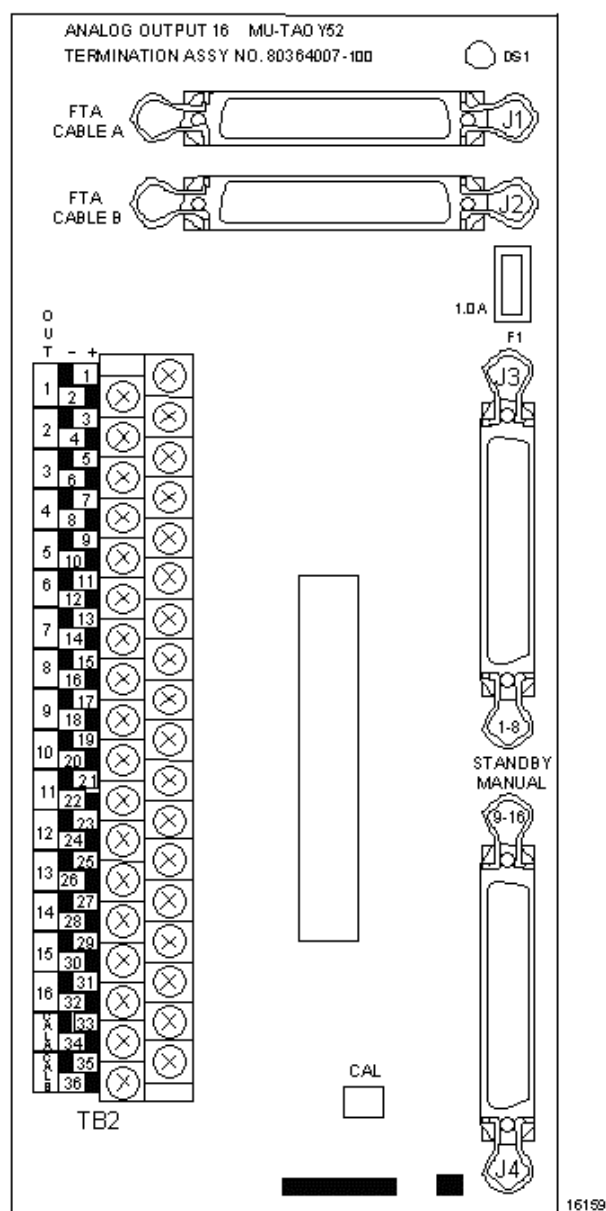
Model MU-TAOY22/24 analog output FTA assembly layout (CE compliant)



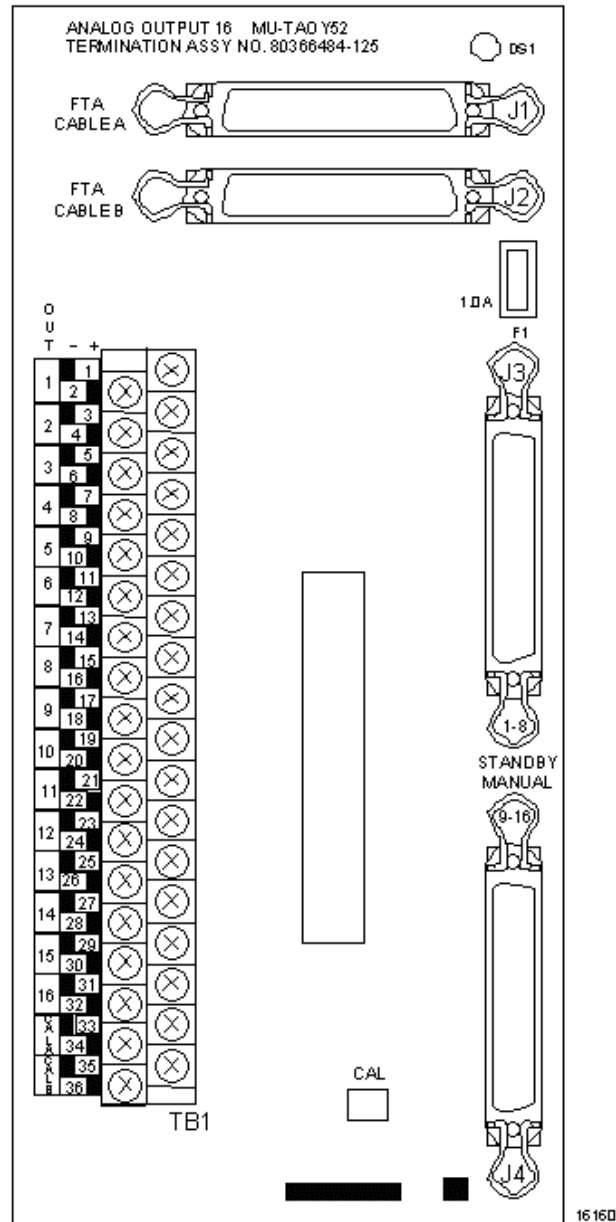
Model MU-TAOY23 analog output FTA assembly layout (non-CE compliant)



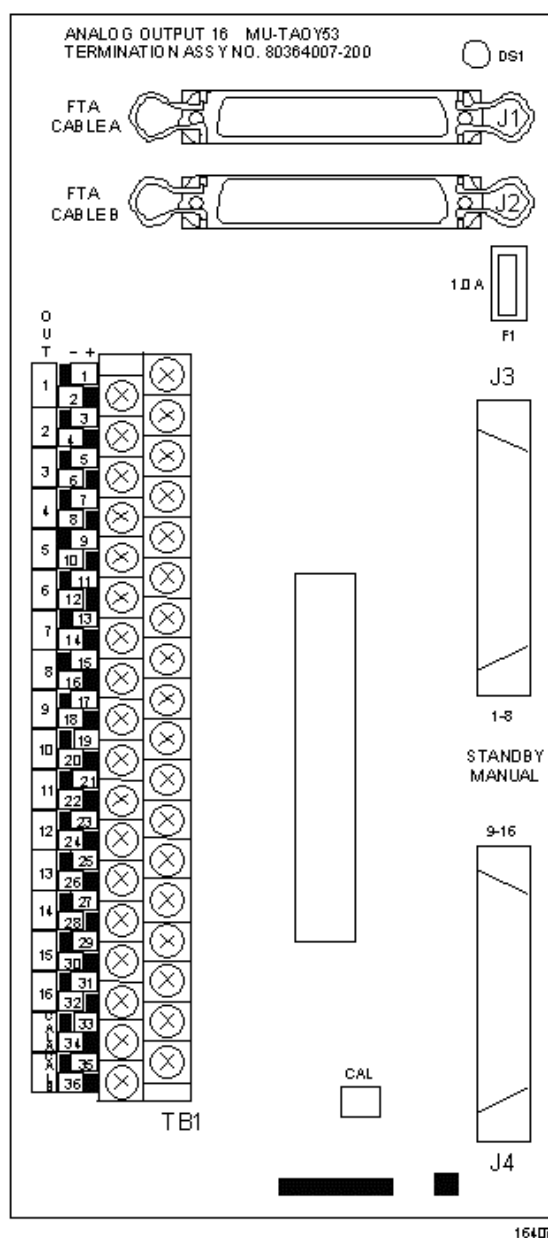
Model MU-TAOY52 analog output FTA assembly layout (non-CE compliant)



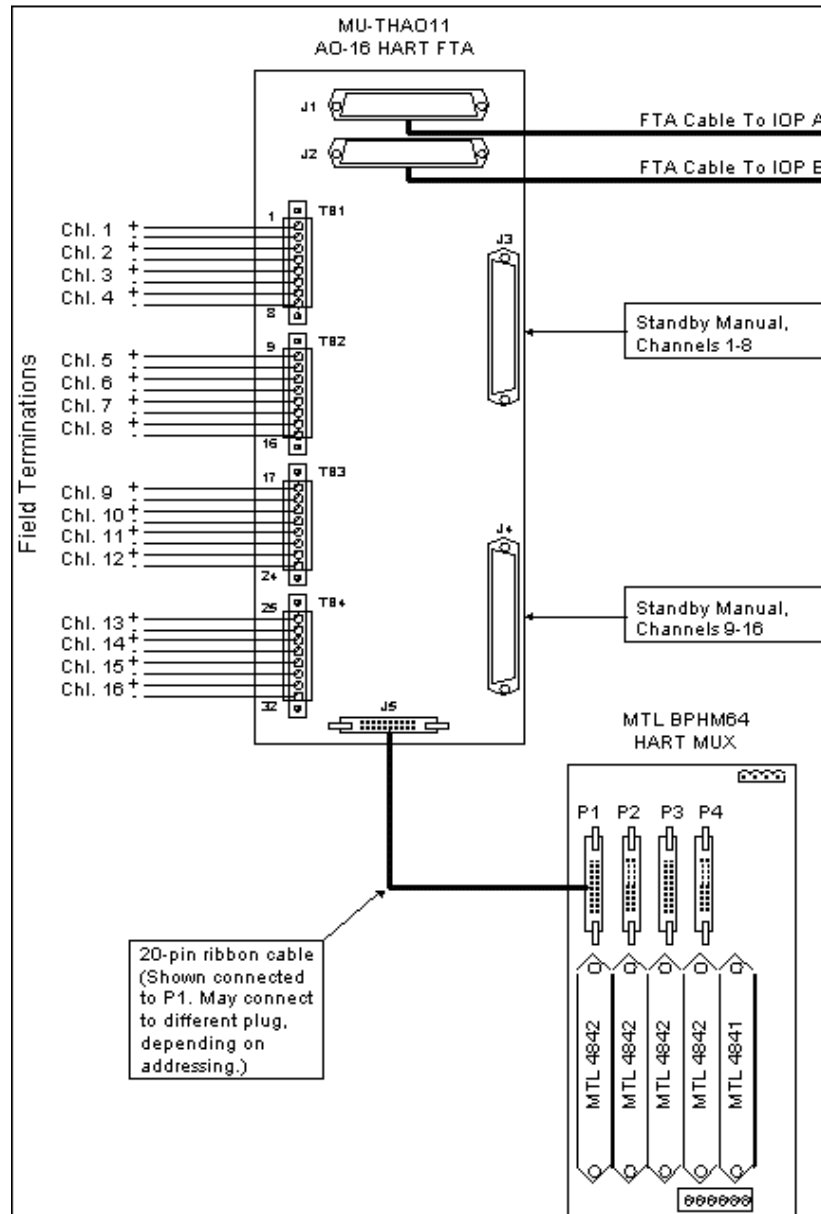
Model MU-TAOY52/54 analog output FTA assembly layout (CE compliant)



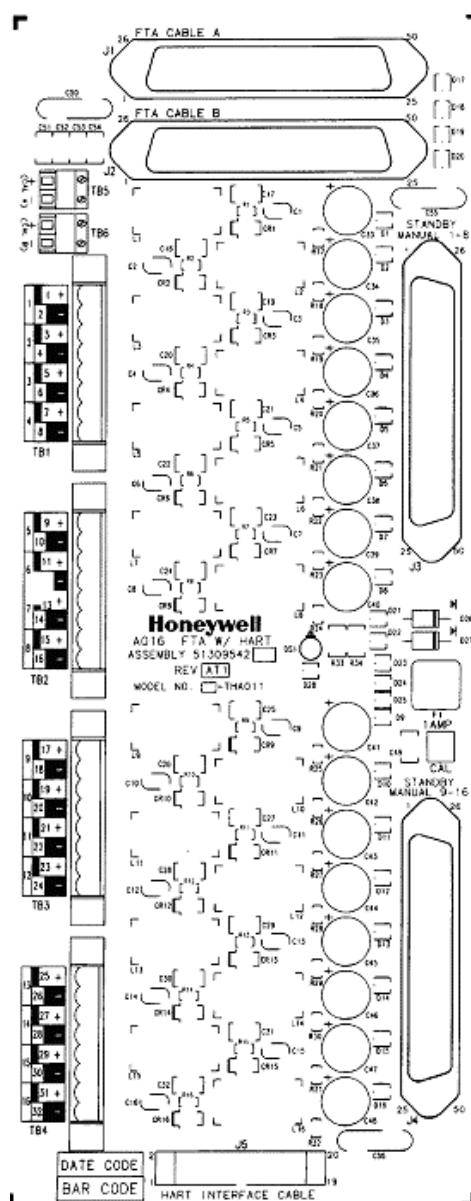
Model MU-TAOY53 analog output FTA assembly layout (non-CE compliant)



Model MU-THAO11 analog output FTA connection diagram (CE compliant)



Model MU-THAO11 analog output FTA assembly layout (CE compliant)



Digital Input (DI) FTA Wiring

About DI FTAs

Three types of standard FTAs accept inputs from digital field devices that use different operating voltages and are described as:

- 24 Vdc Digital Input
- 120 Vac Digital Input, and
- 240 Vac Digital Input.

Digital input model MU-PDIX02 IOP is compatible with all digital input FTA types, with the exception of models MU-TDIY22 and MU-TDIY62 FTAs. Model MU-PDIY22 digital input IOP supports model MU-TDIY22 and MU-TDIY62 FTAs.

24 Vdc Digital Input (DI) FTAs

The 24 Vdc Digital Input (DI) FTA accommodates 32 contact inputs that share an isolated common return. The 24 Vdc DI FTAs require a 24 Vdc power source for the process control contacts. See 24 Vdc power source connections and Digital Input Power Distribution Assembly for additional information.

CE Compliance

Some 24 Vdc Digital Input (DI) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are generally identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.

24 Vdc Digital Input (DI) Standard FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
32 Channel Points – FTAs and IOPs			
MU-TDID11	24 Vdc DI FTA with Compression Terminals	51301201-100	N/A
MU-TDID12	24 Vdc DI FTA with Compression Terminals	51304441-100	51304441-125
MC-TDID12	24 Vdc DI FTA with Compression Terminals Conformally Coated	51304441-150	51304441-175
MU-TDID52	24 Vdc DI FTA with Screw Terminals	51304441-200	51304441-225
MC-TDID52	24 Vdc DI FTA with Screw Terminals Conformally Coated	51304441-250	51304441-275
MU-TDID72	24 Vdc DI FTA with Screw Terminals	51303928-100	N/A
MC-TDID72	24 Vdc DI FTA with Screw Terminals Conformally Coated	51303928-150	N/A
Supporting IOPs			
MU-PDIX02	Digital Input IOP	N/A	51304485-100
MC-PDIX02	Digital Input IOP—Conformally Coated	N/A	51304485-150
32 Channel Points – FTAs and IOPs			
MU-TDIY22	24 Vdc DI FTA with Compression Terminals	80366180-100	80366180-125
MC-TDIY22	24 Vdc DI FTA with Compression Terminals Conformally Coated	80366180-150	80366180-175
MU-TDIY62	24 Vdc DI FTA with Screw Terminals	80364010-100	80364010-125
MC-TDIY62	24 Vdc DI FTA with Screw Terminals Conformally Coated	80364010-150	80364010-175
Supporting IOPs			
MU-PDIY22	Digital Input IOP	N/A	80363972-100
MC-PDIY22	Digital Input IOP—Conformally Coated	N/A	80363972-150

IOP compatibility

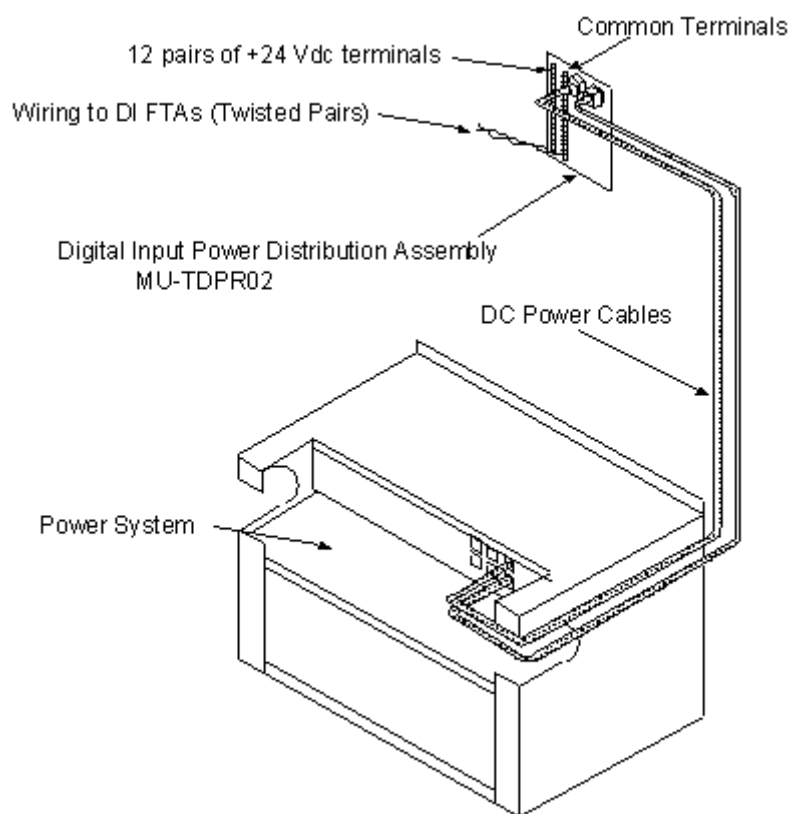
The following table lists the available 24 Vdc digital input IOPs and the compatible FTAs.

DI IOPs and Compatible FTAs

DI IOPs	Compatible DI FTAs
MU/MC-PDIX02	MU-TDID11 MU/MC-TDID12 MU/MC-TDID52 MU/MC-TDID72
MU/MC-PDIY22	MU/MC-TDIY22 MU/MC-TDIY62
Note: Do not mismatch Digital Input IOPs.	

Digital Input Power Distribution Assembly

An external 24 Vdc power source can be connected to the FTAs for the process control contacts. The Digital Input Power Distribution Assembly provides fused 24 Vdc from the Power System for this purpose. The following figure shows the Digital Input Power Distribution Assembly's cable and wiring connections.



Digital Input Power Distribution Assembly Wiring and Cable Installation

Figure 48 illustrates the physical layout of the 12-terminal model MU-TDPR02 Digital Input Power Distribution Assembly. Pairs of terminals are provided on the assembly for the 24 Vdc connections.

The assemblies have the same mounting dimensions as an A-size FTA.

Figure 49 is a schematic for the 12-terminal model MU-TDPR02 Digital Input Power Distribution Assembly.

Model MU-TDPR02 assembly layout

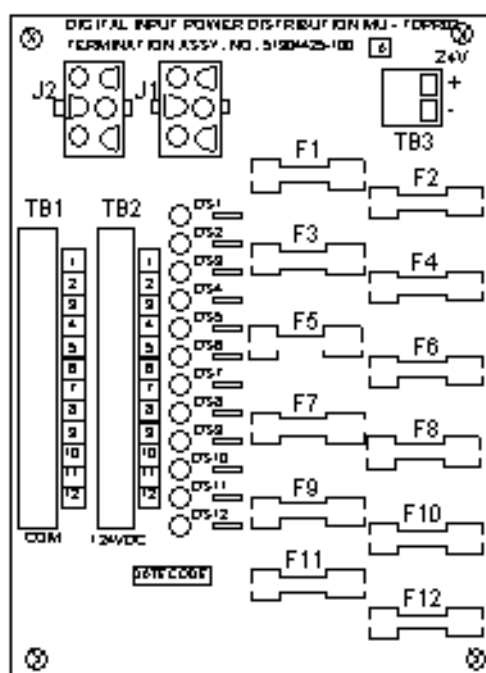


Figure 48 Model MU-TDPR02 Digital Input Power Distribution Assembly Layout

Model MU-TDPR02 assembly schematic

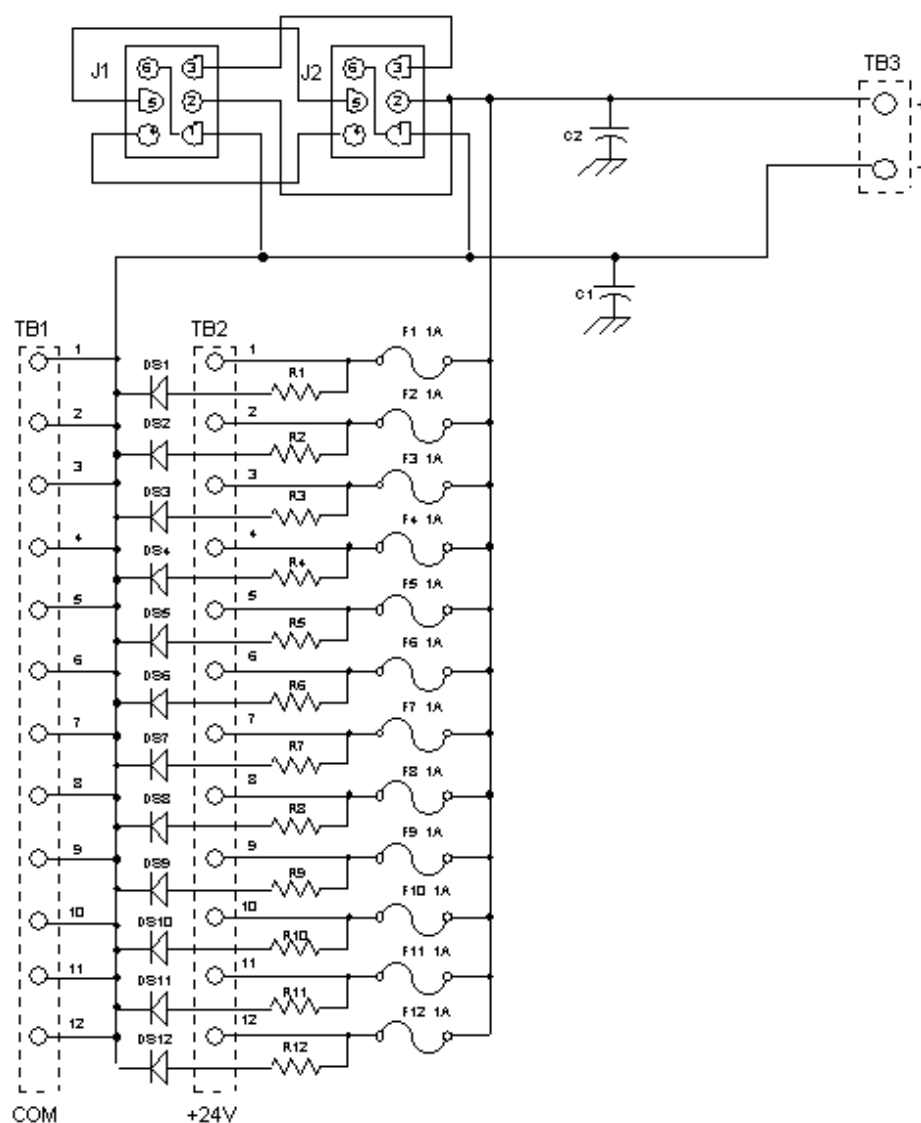


Figure 49 Model MU-TDPR02 Digital Input Power Distribution Assembly Schematic

Connection diagrams and assembly layouts

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the 24 Vdc DI FTAs are given in the following figures listed in Table 17.

Table 17 24 Vdc DI FTA Connection Drawings

24 Vdc Digital Input	Connection Diagram	Assembly Layout
FTA Model	MU-TDID11	
	MU/MC-TDID12	MU/MC-TDID12
	MU/MC-TDID52	MU/MC-TDID52
	MU/MC-TDID72	MU/MC-TDID72
	MU/MC-TDIY22	MU/MC-TDIY22
	MU/MC-TDIY62	MU/MC-TDIY62

Note that the model MU-TDID52 24 Vdc DI FTA has fixed screw terminal connectors, while the model MU-TDID72 has removable screw terminal connectors.

Model MU-TDID11/12/52/72 FTAs

24 Vdc power source connections

The DI FTAs require a 24 Vdc power source for the process control contacts. The power can be supplied either one of two ways:

1. From an external source using the Digital Input Power Distribution Assembly, model MU-TDPR02, or a user-supplied auxiliary 24 Vdc source to the terminals on the 24 Vdc DI FTA. See [Digital Input Power Distribution Assembly](#) and the appropriate FTA connection diagram.
2. Using an internal source using power supplied through the DI IOP backpanel fuse.

CAUTION

When an internal 24 Vdc power source is used, be aware that if the 24 Vdc is accidentally shorted to ground, power will be removed from the Digital Input IOP because 24 Vdc power for both the IOP and FTA is sourced through the IOP's backpanel fuse. For this reason, **an external 24 Vdc source is recommended**

The input terminals on the DI FTAs for the 24 Vdc power source are described in the following table.

DI FTA 24 Vdc Input Terminals

DI FTA Model	24 Vdc Input Terminals on FTA
MU-TDID12	TB1-65 (+)
MU-TDID52	TB1-66 (-)
MU-TDID72	
MU-TDID11	TB3-17 (+)
	TB4-17 (-)

The model MU-TDID12, MU-TDID52, and MU-TDID72 24 Vdc DI FTAs provide an internal source of 24 Vdc (from the IOP backpanel) at TB1-67 (+) and TB1-68 (-). If internal 24 Vdc power is desired, connect:

TB1-65 (+) to TB1-67 (+)

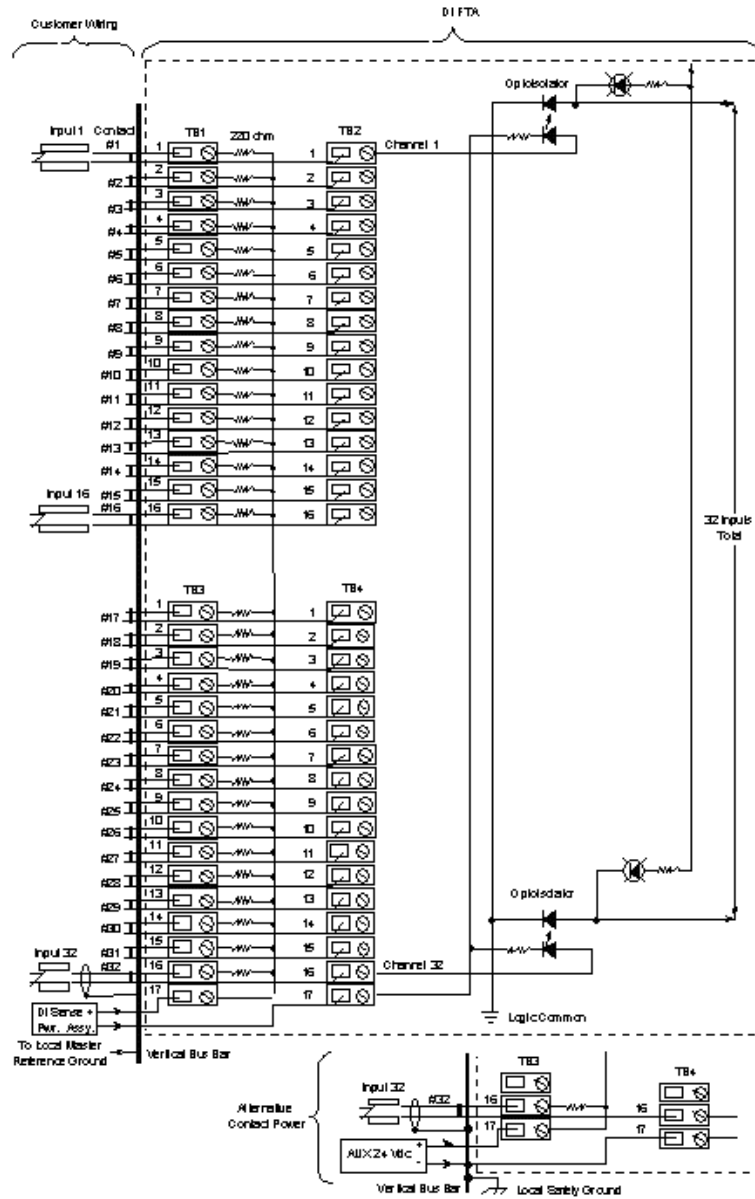
TB1-66 (-) to TB1-68 (-)

The model MU-TDID11 24 Vdc DI FTA does not optionally provide an internal 24 Vdc.

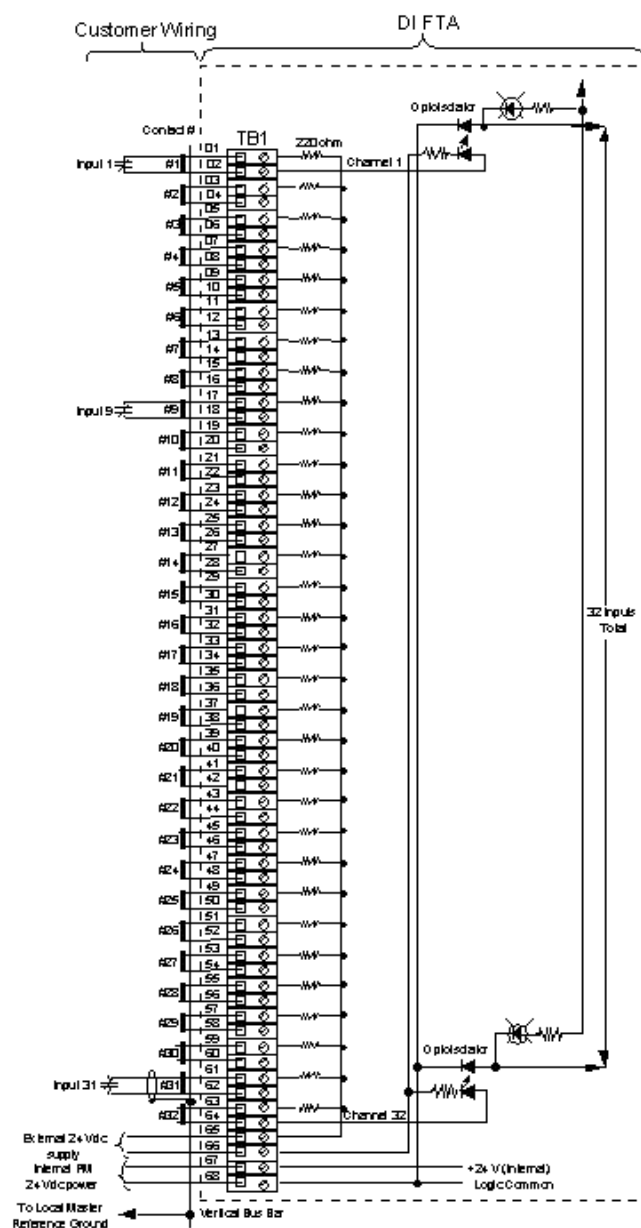
Vertical bus bar for field wiring cable shield grounding

Because the FTA does not have a built-in shield bus, the termination of each wire-pair cable shield requires the use of a vertical bus bar on the FTA mounting channel. Except when the cable shield is already grounded at the process, the cable shield must connect to the same local Safety Ground (CE Compliant) or Master Reference Ground (MRG) reference used by the process control contact power source. Use a 2.5 mm² (14 AWG) or larger wire to connect the vertical bus bar to the ground reference.

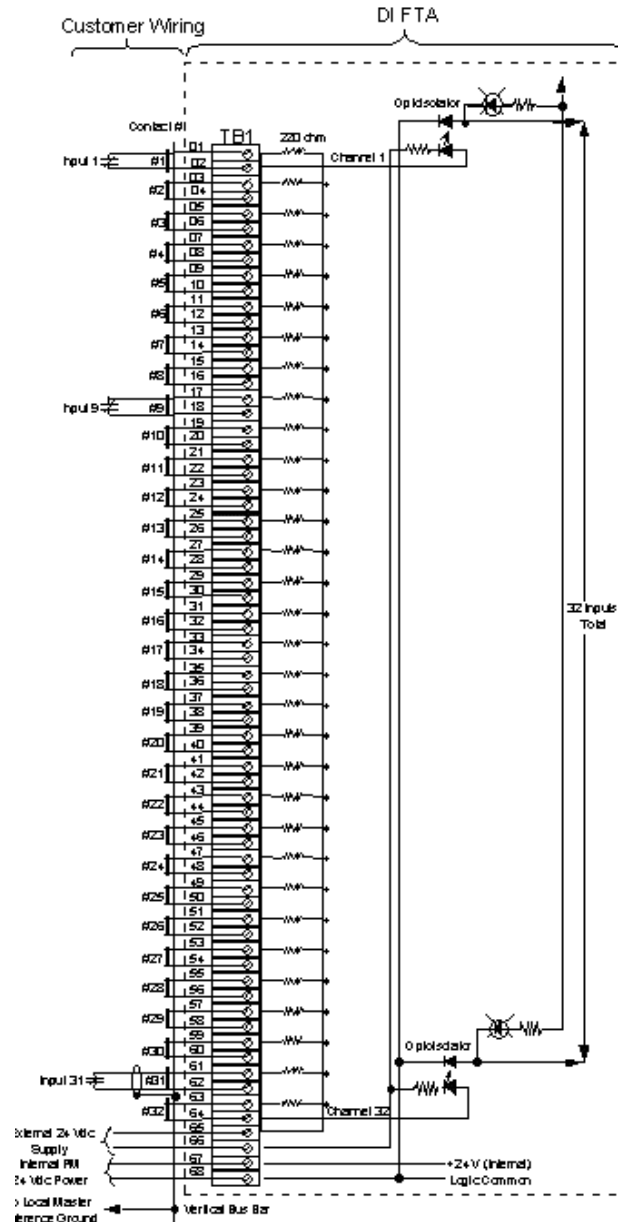
Model MU-TDID11, 24 Vdc digital input FTA connection diagram



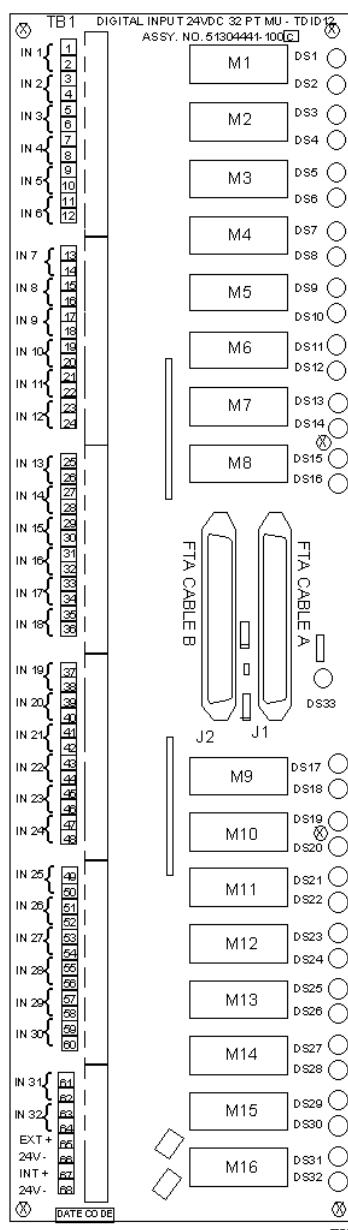
Model MU-TDID12, 24 Vdc digital input FTA connection diagram



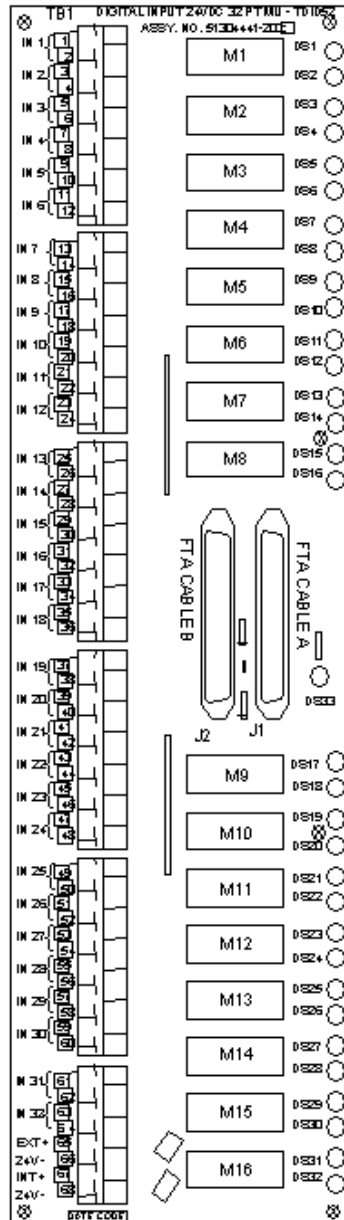
Model MU-TDID52/72, 24 Vdc digital input FTA connection diagram



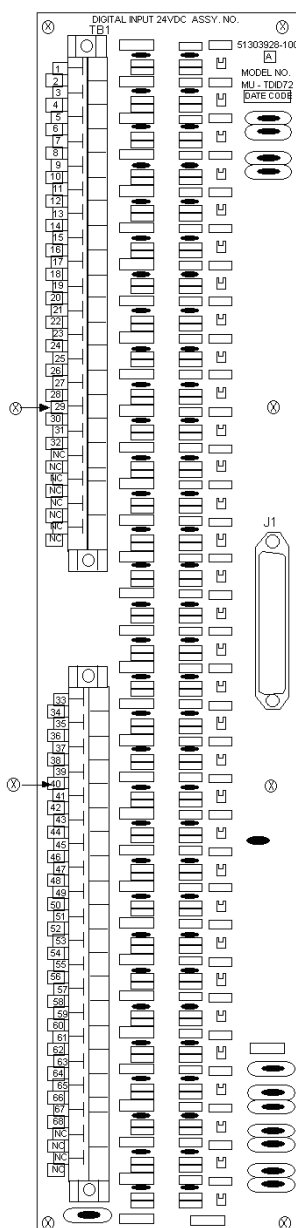
Model MU-TDID12, 24 Vdc digital input FTA assembly layout



Model MU-TDID52, 24 Vdc digital input FTA assembly layout



Model MU-TDID72, 24 Vdc digital input FTA assembly layout



Model MU-TDIY22/62 FTAs

24 Vdc power source

The DI FTAs require a 24 Vdc power source for the process control contacts. The power can be supplied either one of two ways:

3. From an external source using the Digital Input Power Distribution Assembly, model MU-TDPR02, or a user-supplied auxiliary 24 Vdc source to the terminals on the 24 Vdc DI FTA. See [Digital Input Power Distribution Assembly](#) and the appropriate FTA connection diagram.
4. Using an internal source using power supplied through the DI IOP backpanel fuse.

The Model MU-TDIY22 and MU-TDIY62 FTAs require the connection of a 24 Vdc power source to TB1-1 and TB1-2 for the process control contacts. Optionally, the positive (+) or negative (-) side of the power source can be reversely connected to the terminals to provide either a current source or current sink application.

External 24 Vdc source

An external 24 Vdc source for the process control contacts is recommended. The external source can be from either a Digital Input Power Distribution Assembly, model MU-TDPR02, or a user-supplied auxiliary 24 Vdc power source.

Internal 24 Vdc source

The Model MU-TDIY22 FTA provides an internal source of 24 Vdc at TB1-3 and TB1-4. Connect TB1-3 to TB1-1 and TB1-4 to TB1-2 for a current sink application. Connect TB1-4 to TB1-1 and TB1-3 to TB1-2 for a current source application. See Figure 50.

The Model MU-TDIY62 FTA provides an internal source of 24 Vdc at TB2-1 and TB2-2. Connect TB2-1 to TB1-1 and TB2-2 to TB1-2 for a current sink application. Connect TB2-2 to TB1-1 and TB2-1 to TB1-2 for a current source application. See Figure 51.

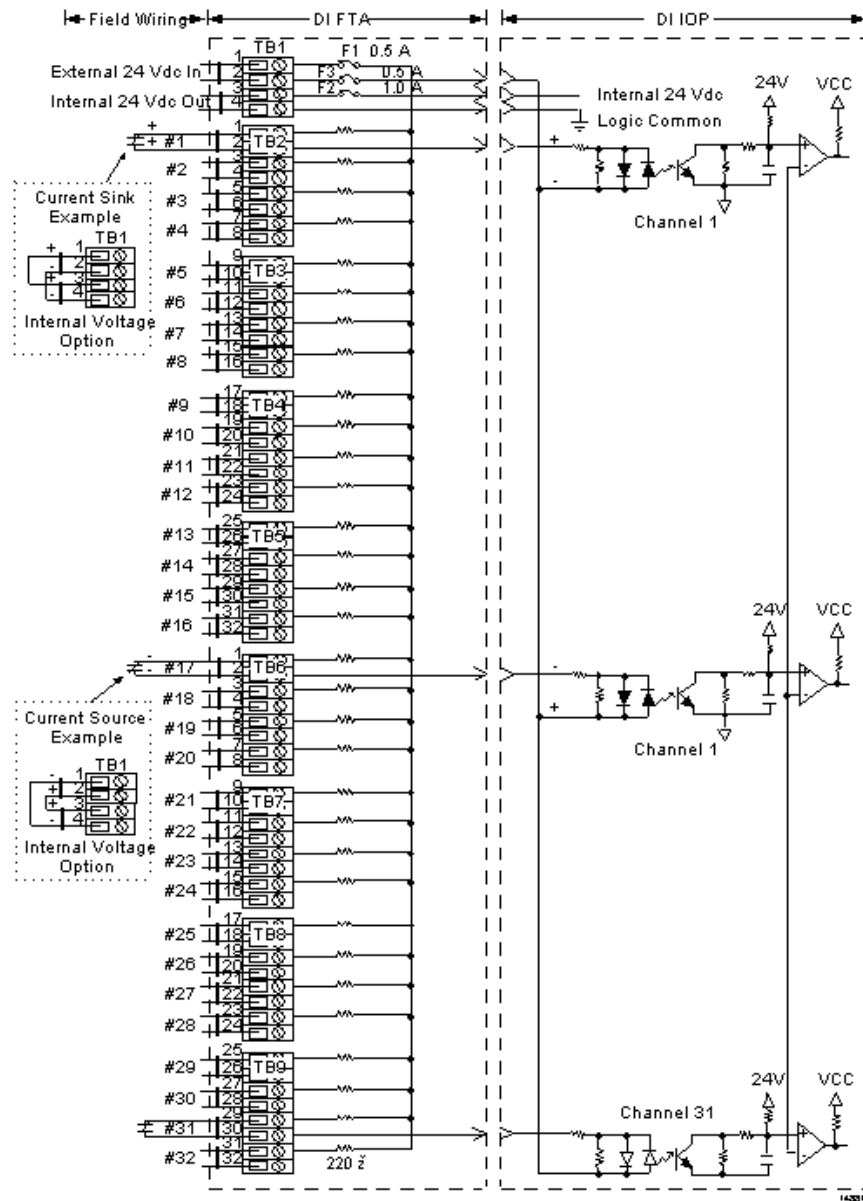
Input power source protection

Two fuses, F1 (0.5 A) and F3 (0.5 A), provide overcurrent protection for the input 24 Vdc power source at TB1-1 and TB1-2.

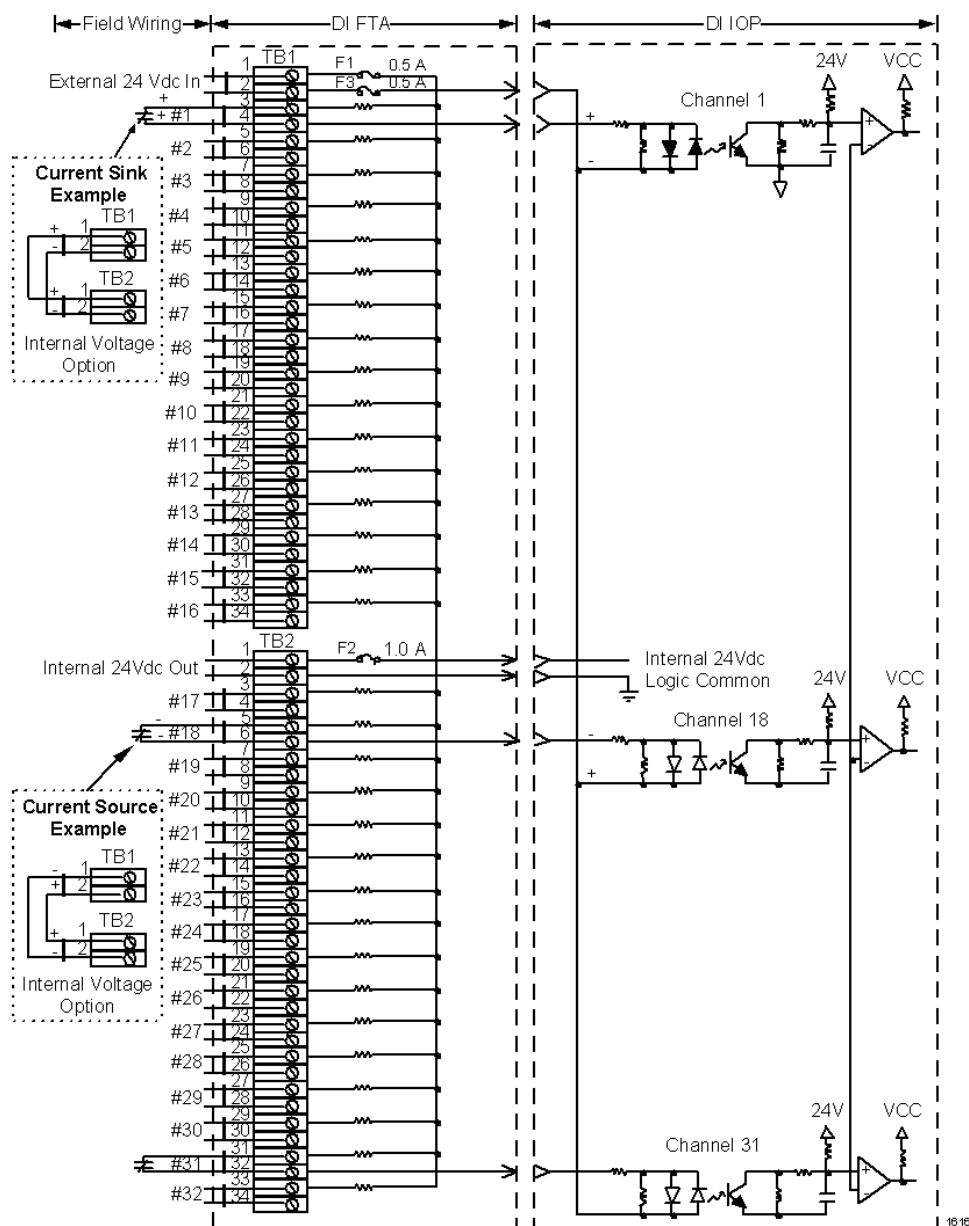
IOP protection

The internal 24 Vdc power for both the IOP and FTA is sourced through the IOP's backpanel fuse (2.0 A); however, if the 24 Vdc is accidentally shorted to ground, power will not be removed from the Digital Input IOP because a 1.0 A fuse, F2, provides protection.

Model MU-TDIY22, 24 Vdc digital input FTA connection diagram



Model MU-TDIY62, 24 Vdc digital input FTA connection diagram



Model MU-TDIY22, 24 Vdc digital input FTA assembly layout

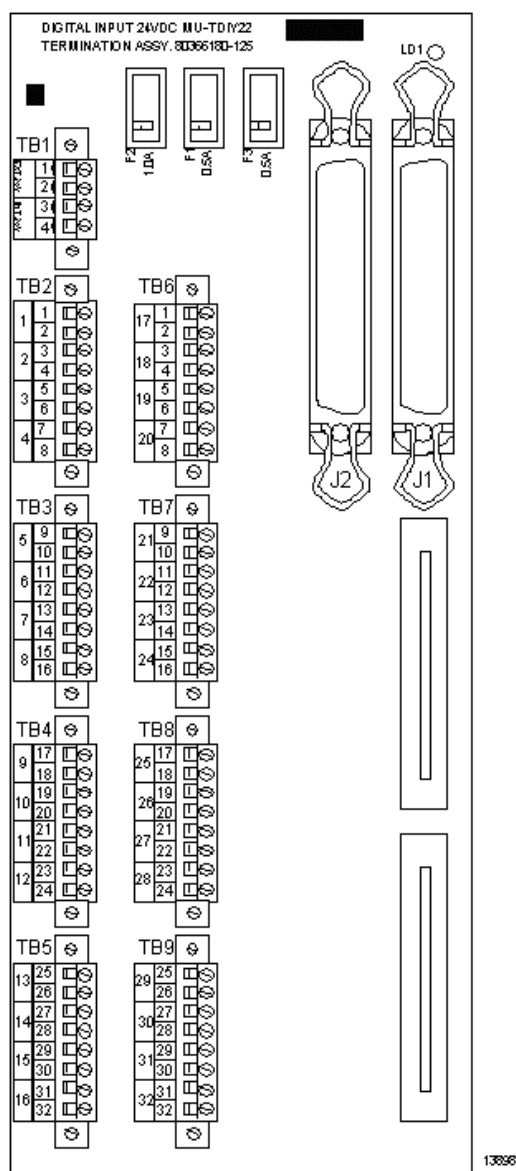


Figure 50 Model MU-TDIY22 24 Vdc Digital Input FTA Assembly Layout

Model MU-TDIY62, 24 Vdc digital input FTA assembly layout

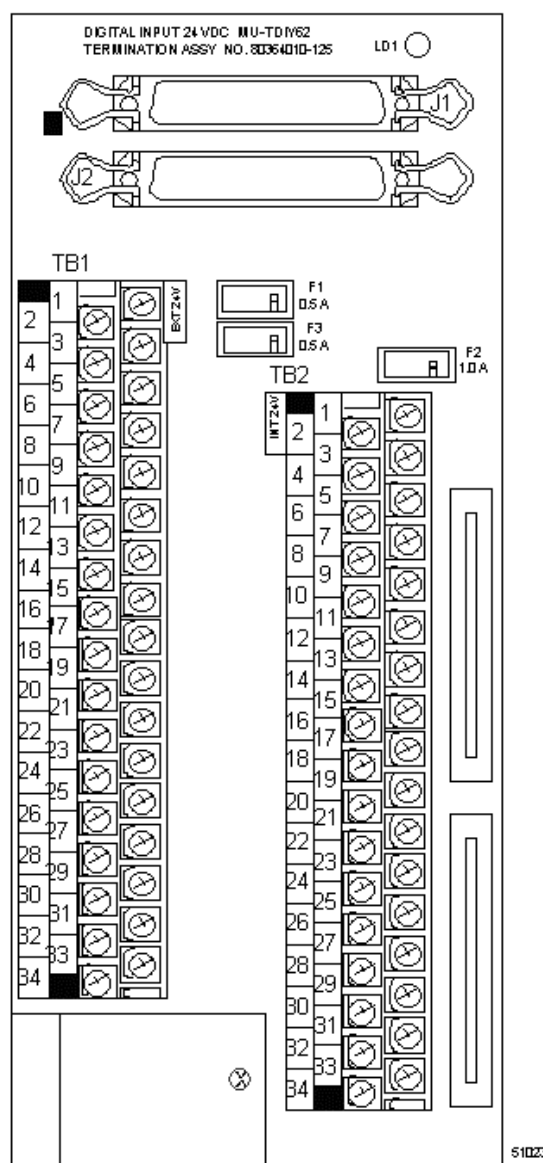


Figure 51 Model MU-TDIY62 24 Vdc Digital Input FTA Assembly Layout

120 Vac Digital Input FTAs

The 120 Vac Digital Input (DI) FTA accommodates 32 individually isolated ac inputs.



SHOCK HAZARD

Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.

CE Compliance

Some 120 Vac Digital Input (DI) FTAs are CE Compliant, while others are not. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.

The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table.

120 Vac Digital Input FTAs and DI IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDIA11	120 Vac DI FTA with Compression Terminals	51301186-100	N/A
MU-TDIA12	120 Vac DI FTA with Compression Terminals	51304439-100	51304439-125
MC-TDIA12	120 Vac DI FTA with Compression Terminals Conformally Coated	51304439-150	51304439-175
MU-TDIA52	120 Vac DI FTA with Screw Terminals	51304439-200	51304439-225
MC-TDIA52	120 Vac DI FTA with Screw Terminals Conformally Coated	51304439-250	51304439-275
MU-TDIA72	120 Vac DI FTA with Screw Terminals	51303930-100	N/A
MC-TDIA72	120 Vac DI FTA with Screw Terminals Conformally Coated	51303930-150	N/A

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
Supporting IOPs			
MU-PDIX02	Digital Input IOP	N/A	51304485-100
MC-PDIX02	Digital Input IOP—Conformally Coated	N/A	51304485-150

IOP compatibility

The model MU-PDIX02 Digital Input IOP is compatible with all 120 Vac Digital Input FTA models.

Connection diagrams and assembly layouts

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the 120 Vac DI FTAs are given in the following figures listed in Table 18.

Table 18 120 Vac DI FTA Connection Drawings

120 Vac Digital Input	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TDIA11</u>	
	<u>MU/MC-TDIA12</u>	<u>MU/MC-TDIA12</u>
	<u>MU/MC-TDIA52</u>	<u>MU/MC-TDIA52</u>
	<u>MU/MC-TDIA72</u>	<u>MU/MC-TDIA72</u>

Note that early production compression terminal-type 120 Vac DI FTA, model MU-TDIA11 FTA, provides groups of eight inputs sharing an isolated common return as illustrated by the connection diagram MU-TDIA11.

All other 120 Vac digital input FTAs provide 32 separately isolated inputs. See the connection diagrams.

The model MU-TDIA52 FTA employs fixed-screw terminal connectors, while the model MU-TDIA72 FTA employs removable-screw terminal connectors.

Proper cabling

Signals from the FTA are normally considered as signals from a power circuit and therefore are subject to electrical codes. Use only cable approved for the operating voltage and current-limiting.

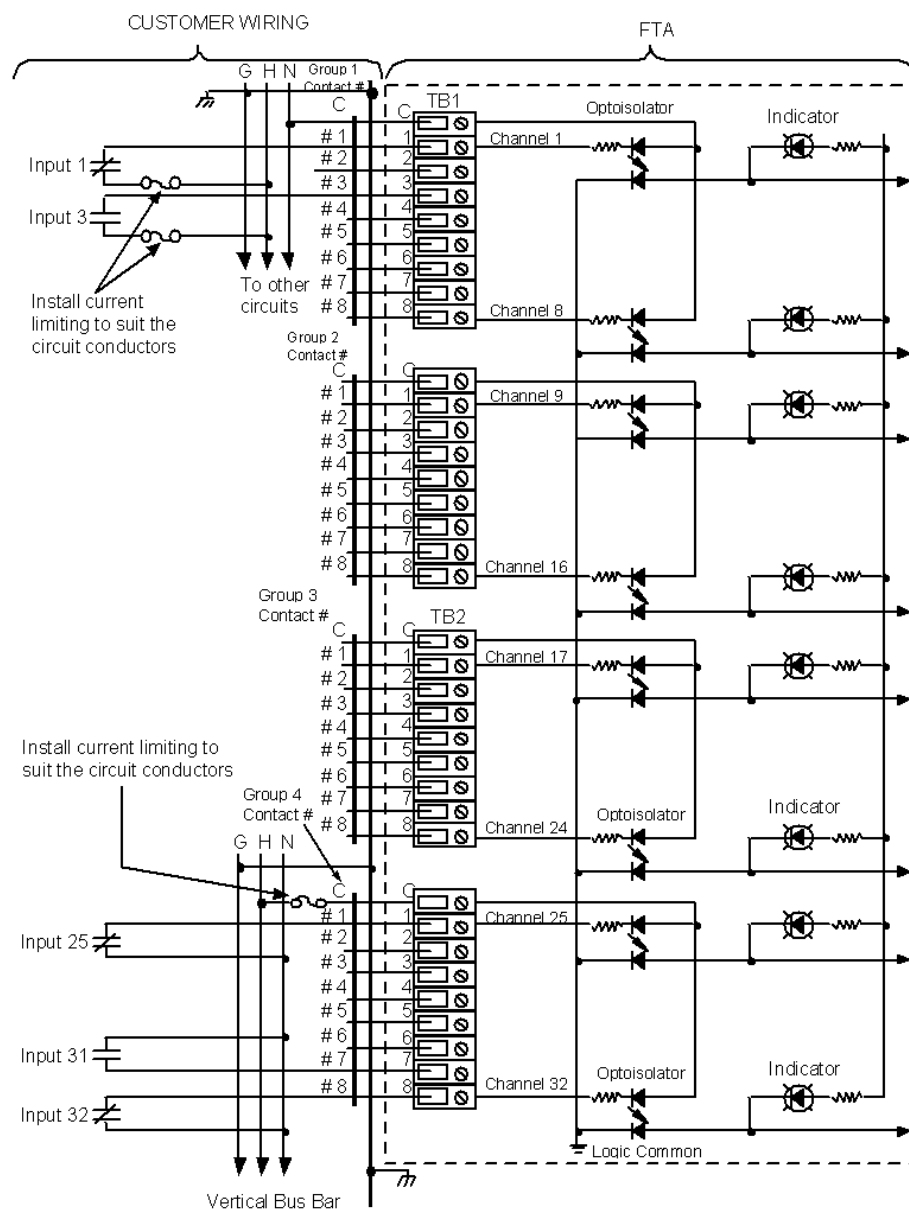
Vertical bus bar usage

There is usually a safety/shield conductor for each circuit. Because the FTA does not have a built-in bus to accommodate a large number of safety ground wires, use a vertical bus bar. Connect each shield/ground to the vertical bus and connect the vertical bus to the local Safety Ground bus bar with a 2.5 mm² (14 AWG) wire. Any cable shield/ground connects to the local Safety Ground at the cabinet entry.

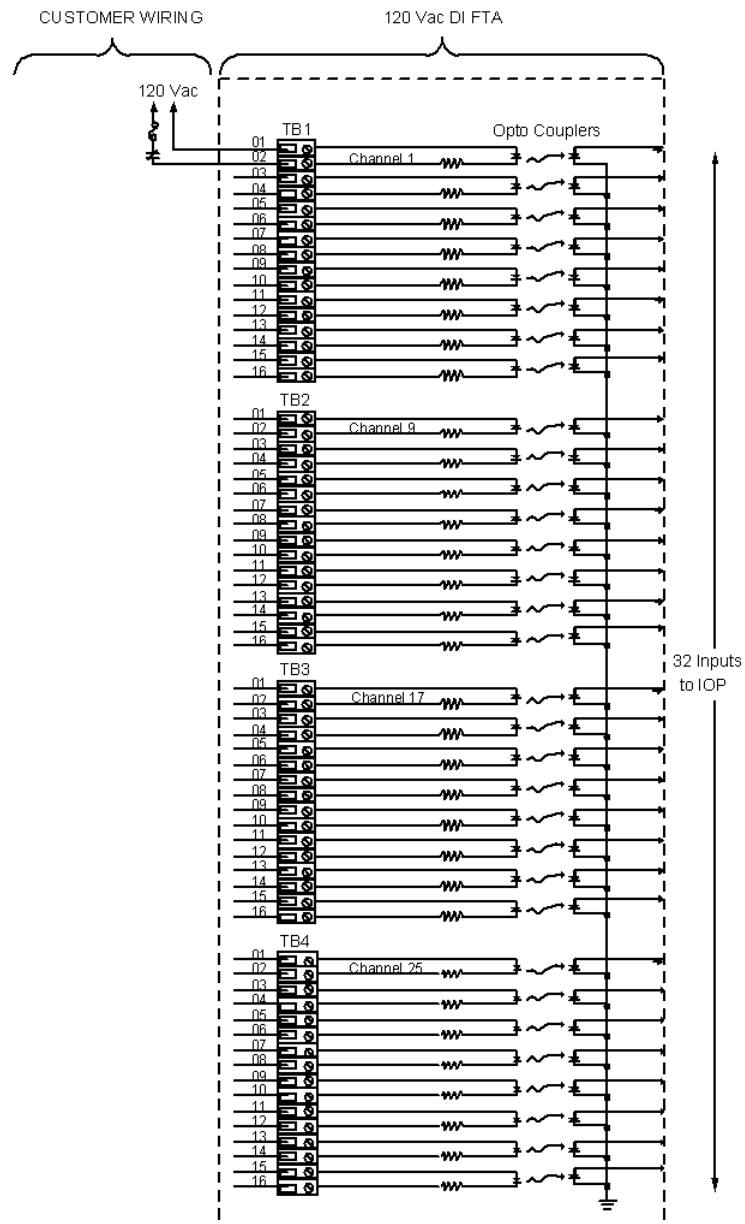
Excessive cable capacitance

Excessive cable capacitance can prevent the FTA from detecting a valid open contact condition. Capacitance depends on the insulation materials and cable length.

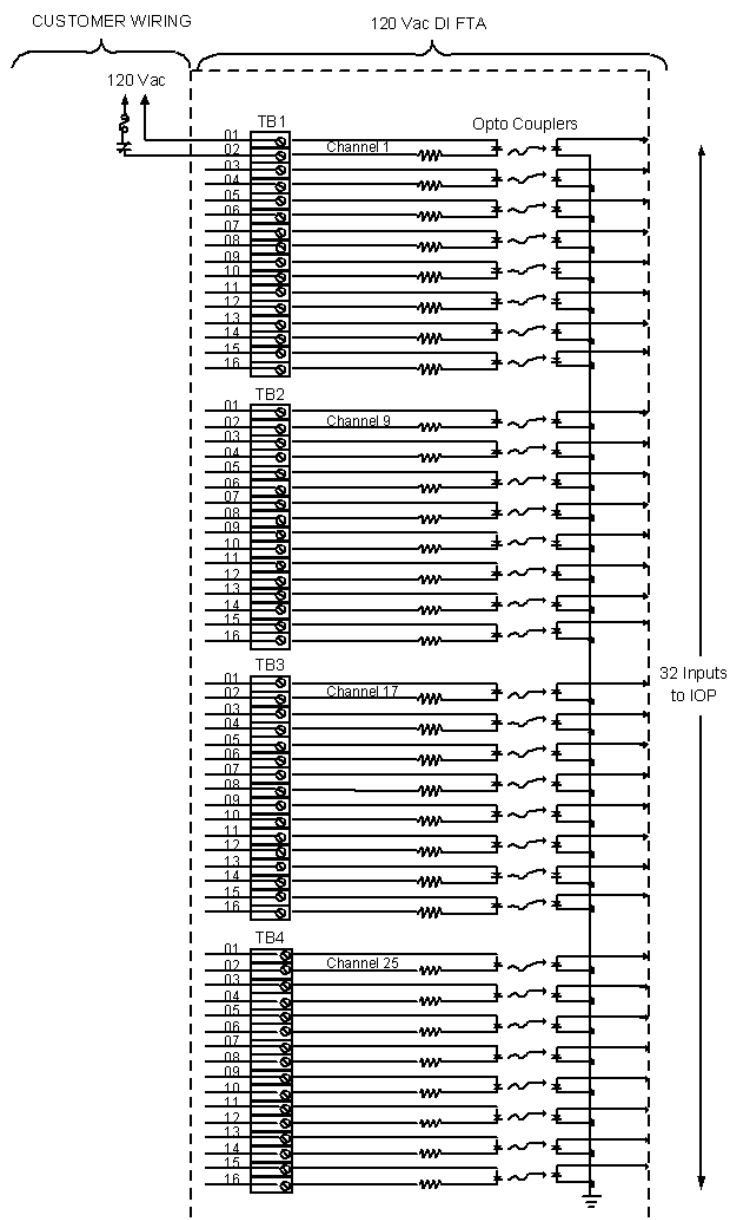
Model MU-TDIA11, 120 Vac digital input FTA connection diagram



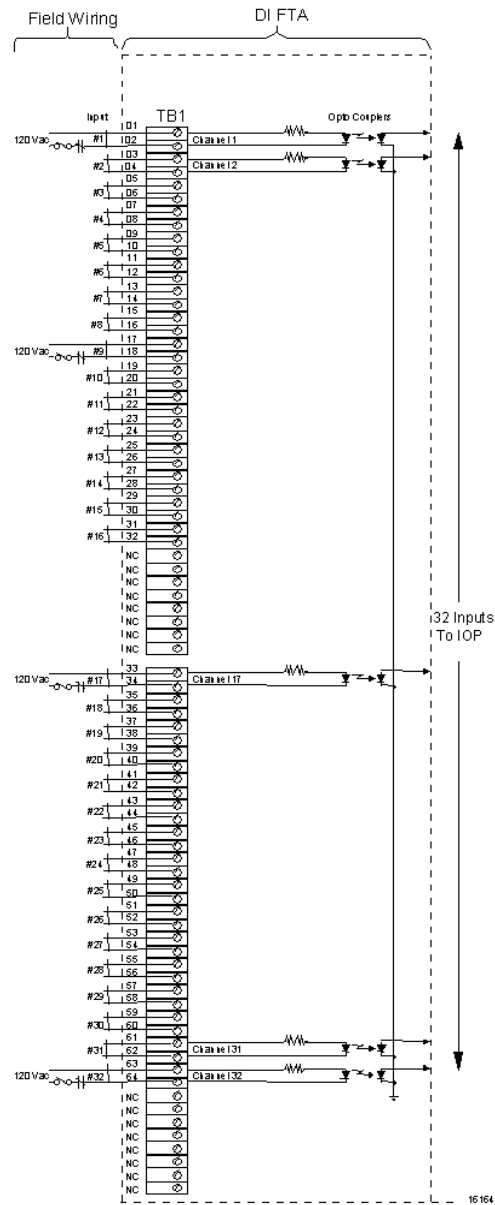
Model MU-TDIA12, 120 Vac digital input FTA connection diagram



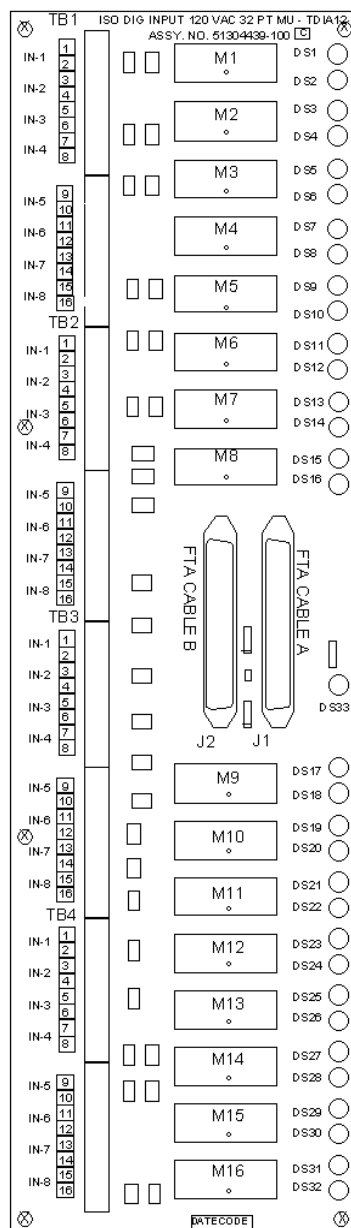
Model MU-TDIA52, 120 Vac digital input FTA connection diagram



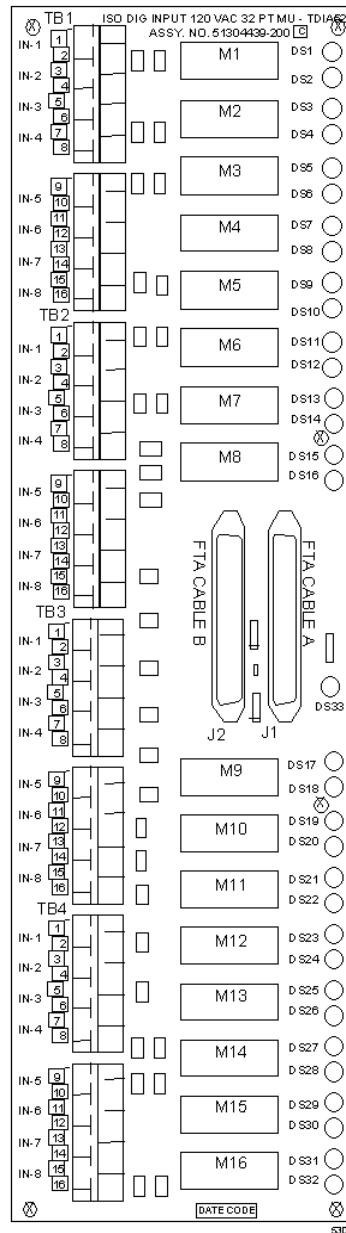
Model MU-TDIA72, 120 Vac digital input FTA connection diagram



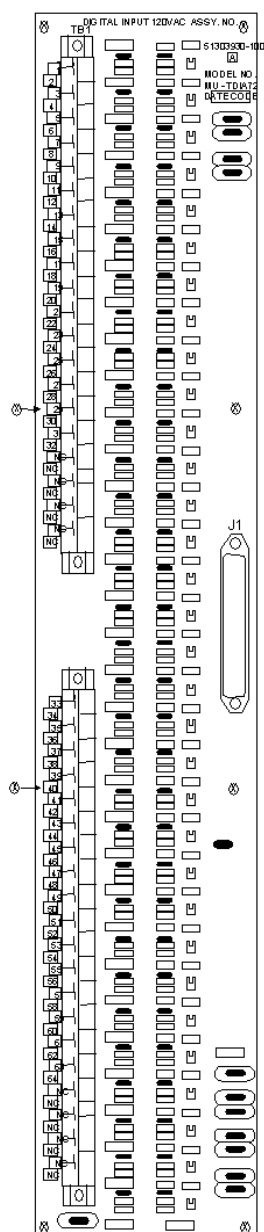
Model MU-TDIA12, 120 Vac digital input FTA assembly layout



Model MU-TDIA52, 120 Vac digital input FTA assembly layout



Model MU-TDIA72, 120 Vac digital input FTA assembly layout



Cable Capacitance

Cable capacitance increases with cable length to where an ac input FTA senses a false closed-contact condition. The maximum acceptable cable length is calculated as follows.

Cable capacitance calculation

If eight 120 Vac contact signals with a common neutral return are sent to the FTA, similar to Group 1 in Model MU-TDIA11 FTA connection diagram, assume all the conductors are twisted together in one cable and assume all contacts but one is closed. The FTA will have a minimum hold-off current of 1.15 mA, leakage in excess of 1.15 mA, and a channel may be activated. The capacitance that can cause this current flow is calculated as

$$I = E/X_C$$

where: $I = 1.15 \times 10^{-3}$ amperes

since: $X_C = 1/(2\pi fC)$,

$$E/X_C = E2\pi fC = 1.15 \times 10^{-3} \text{ amperes}$$

or, for 120 Vac at 60 Hz,

$$120 \times 2 \times \pi \times 60 \times C = 1.15 \times 10^{-3} \text{ amperes}$$

thus: $C = 2.54 \times 10^{-8}$ farads.

The capacitance of a conductor insulated with Polyvinyl Chloride (PVC) can exceed 394 pf/m (120 pf/ft) for all other conductors in the cable. The total cable length that gives 2.54×10^{-8} farads of capacitance is calculated as

$$\text{pf} \times \text{length} = 2.54 \times 10^{-8} \text{ farads}$$

$$3.94 \times 10^{-10} \times L = 2.54 \times 10^{-8} \text{ farads}$$

$$L = 64.5 \text{ meters (211.5 feet)}$$

This calculated length will almost certainly cause a false closure indication. The value of 1.15 mA is a worst-case value at -40°C . The typical worst-case value at 25°C is 1.37 mA estimated.

Lower capacitance cable

Cable is available with much lower capacitance insulation, such as polycarbonate. When a lower cable capacitance still is not acceptable for the desired distance, individually shielded contact conductors are required.

240 Vac Digital Input FTAs

The 240 Vac Digital Input (DI) FTA is similar to the 120 Vac Digital Input FTA, except it accommodates a higher operating voltage, a lower sense current, and the inputs of all 240 Vac DI FTA models are arranged in groups of eight channels, each with a common return for the group.



SHOCK HAZARD

Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.

CE Compliance

Some 240 Vac Digital Input (DI) FTAs are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.

The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table

240 Vac Digital Input FTAs and DI IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDIA21	240 Vac DI FTA with Compression Terminals	51304219-100	N/A
MU-TDIA22	240 Vac DI FTA with Compression Terminals	51304431-100	51304431-125
MC-TDIA22	240 Vac DI FTA with Compression Terminals Conformally Coated	51304431-150	51304431-175
MU-TDIA62	240 Vac DI FTA with Screw Terminals	51304431-200	51304431-225
MC-TDIA62	240 Vac DI FTA with Screw Terminals Conformally Coated	51304431-250	51304431-275
Supporting IOPs			
MU-PDIX02	Digital Input IOP	N/A	51304485-100

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-PDIX02	Digital Input IOP—Conformally Coated	N/A	51304485-150

IOP compatibility

The model MU-PDIX02 Digital Input IOP is compatible with all the 240 Vac Digital Input FTA models.

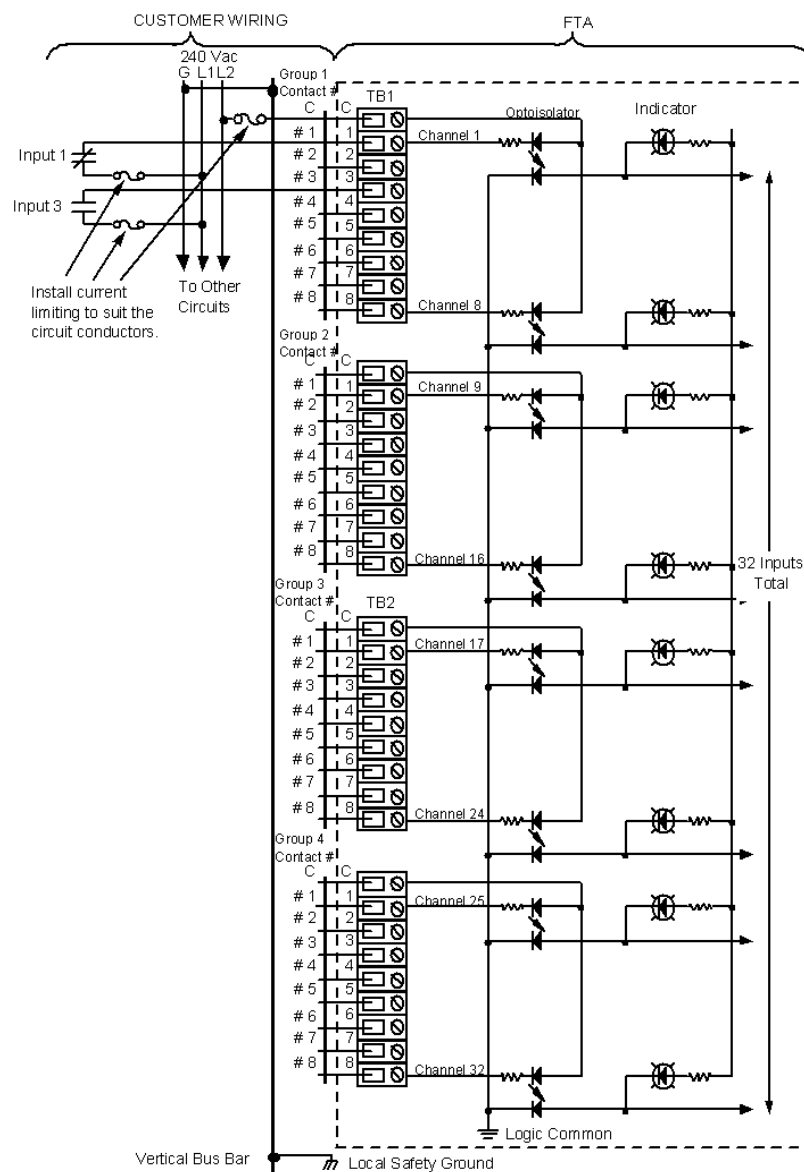
Connection diagrams and assembly layouts

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the 240 Vac DI FTAs are given in the following figures listed in Table 19.

Table 19 240 Vac DI FTA Connection Drawings

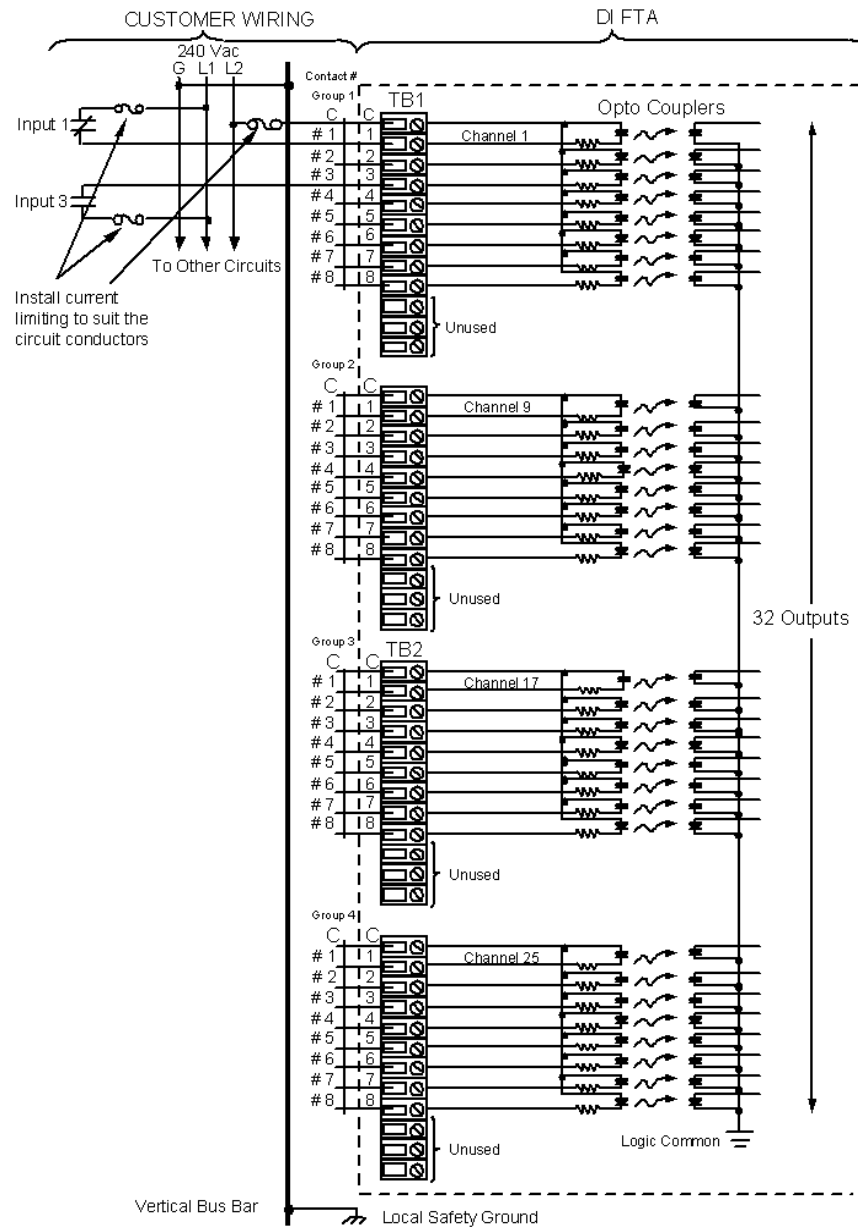
240 Vac Digital Input	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TDIA21</u>	
	<u>MU/MC-TDIA22</u>	<u>MU/MC-TDIA22</u>
	<u>MU/MC-TDIA62</u>	<u>MU/MC-TDIA62</u>

Model MU-TDIA21, 240 Vac digital input FTA Connection Diagram

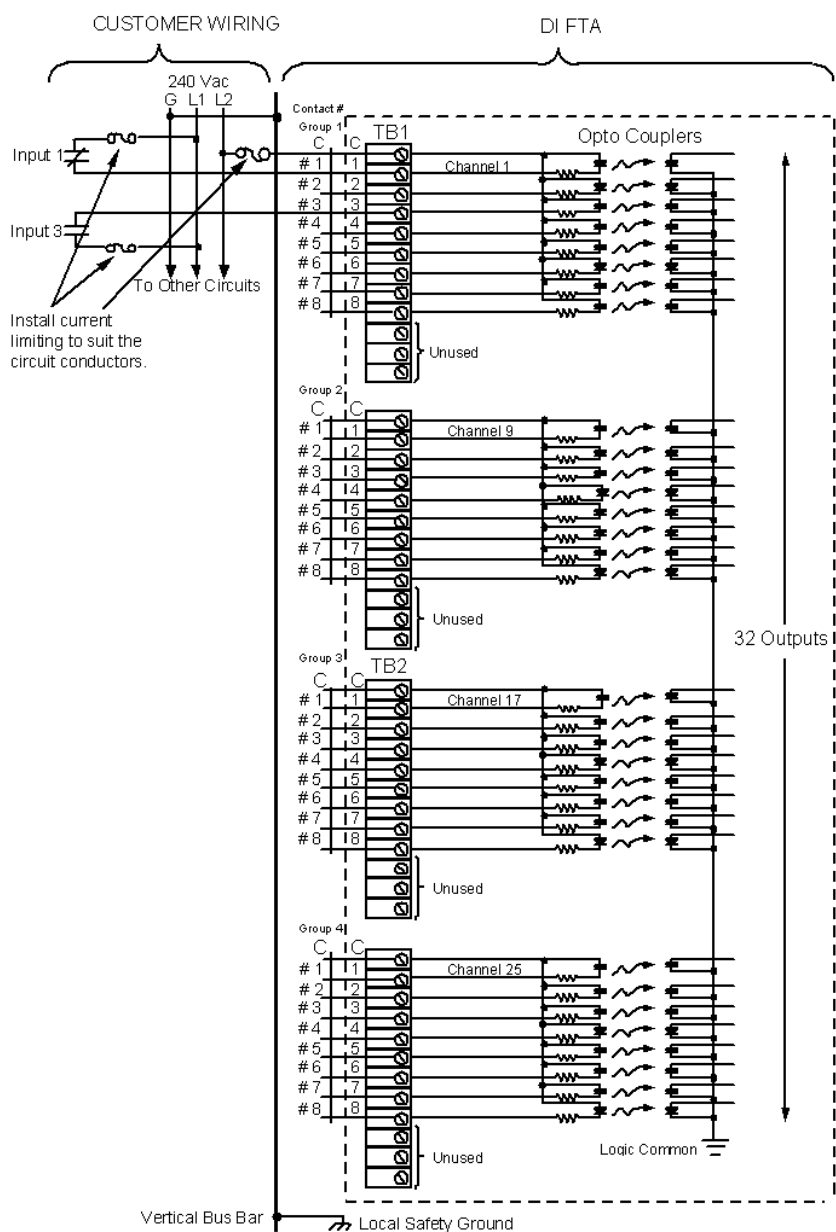


Model MU-TDIA22, 240 Vac digital input FTA Connection Diagram

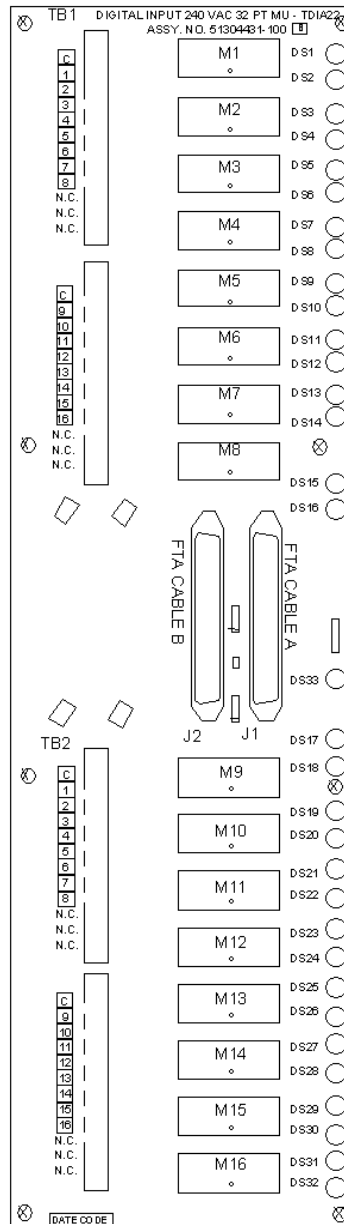
Appendix C – PM I/O FTA Reference
Digital Input (DI) FTA Wiring



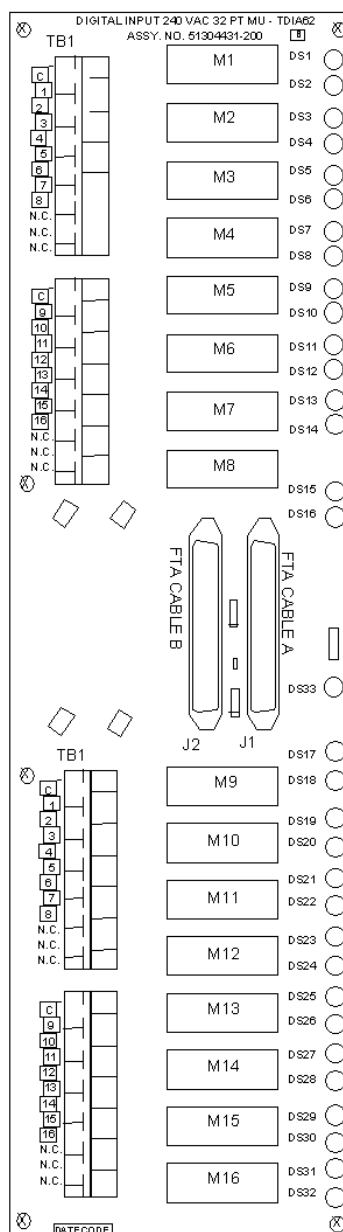
Model MU-TDIA62, 240 Vac digital input FTA Connection Diagram



Model MU-TDIA22, 240 Vac digital input FTA assembly layout



Model MU-TDIA62, 240 Vac digital input FTA assembly layout



Digital Output (DO) Wiring

Overview

Various types of digital output FTAs provide low voltage isolated or nonisolated outputs, solid-state dc power outputs, and high voltage ac and dc relay closures to process field devices. Model number groups and a brief description is given in the following table.

Digital Output FTA Model Numbers and Types

Model Number Group	Output Type	Description
MU/MC-TDONxx	<u>24 Vdc Nonisolated Digital Output (DO)</u>	24 Vdc nonisolated Digital Output (DO) FTAs provide 16 nonisolated digital outputs for low current loads such as lamps and relays.
MU/MC-TDOYxx	<u>24 Vdc Isolated Digital Output (DO)</u>	24 Vdc isolated Digital Output (DO) FTAs provide 32 isolated digital outputs. The output drivers in the IOP are optically isolated from PM common and can drive loads requiring up to 500 mA at 24 Vdc.
MU/MC-TDODxx	<u>3-30 Vdc Solid-State Digital Output (DO)</u>	3-30 Vdc solid-state Digital Output (DO) FTA provides 16 direct current power outputs that are optically isolated from each other and the subsystem.
MU/MC-TDODxx	<u>31-200 Vdc Solid-State Digital Output (DO)</u>	31-200 Vdc solid-state Digital Output (DO) FTAs provide 16 optically isolated dc power outputs.
MU/MC-TDOAxx	<u>120/240 Vac Solid-State Digital Output (DO)</u>	The 120/240 Vac solid-state Digital Output (DO) FTAs provide 16 independent solid-state ac power outputs.
MU/MC-TDORxx	<u>120 Vac/125 Vdc Relay Digital Output (DO)</u>	120 Vac/125 Vdc relay Digital Output (DO) FTAs have 16 independent electromechanical relays for ac or dc power outputs.
MU/MC-TDOYxx	<u>240 Vac/125 Vdc Relay Digital Output (DO)</u>	240 Vac/125 Vdc relay Digital Output (DO) FTAs have 16 independent electromechanical relays for ac or dc power outputs.

24 Vdc Nonisolated Digital Output (DO) FTAs

The 24 Vdc nonisolated Digital Output (DO) FTA provides 16 nonisolated digital outputs for low current loads such as lamps and relays.

CE Compliance

None of the 24 Vdc nonisolated Digital Output (DO) FTAs are CE Compliant. The model MU-TDOD14 and MU-TDOD54 3-30 Vdc Digital Output FTAs are recommended for CE Compliance applications.

The following table is a list of 24 Vdc nonisolated Digital Output FTA Models and compatible digital output IOPs.

24 Vdc Nonisolated Digital Output FTAs and DO IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDON11	24 Vdc Nonisolated DO FTA Compression Terminals	51401220-100	N/A
MU-TDON12	24 Vdc Nonisolated DO FTA Compression Terminals	51304446-100	N/A
MC-TDON12	24 Vdc Nonisolated DO FTA Compression Terminals—Conformally Coated	51304446-150	N/A
MU-TDON52	24 Vdc Nonisolated DO FTA—Screw Terminals	51304446-200	N/A
MC-TDON52	24 Vdc Nonisolated DO FTA Screw Terminals—Conformally Coated	51304446-250	N/A
Supporting IOPs			
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

IOP compatibility

The model MU-PDOX02 Digital Output IOP is compatible with all 24 Vdc nonisolated DO FTA models.

CAUTION

The output terminals of the FTA are directly connected to the electronics in the associated Digital Output IOP through the IOP to FTA cable. With no isolation between the FTA field terminals and the electronics in the IOP, any noise or voltage induced into the field wiring will be injected into the IOP electronics. This could result in temporary or permanent failure in the IOP. A worst case scenario would be a voltage spike that propagates to the card file backplane and damages other cards, possibly causing the IOLIM to fail. It's also possible that a redundant IOP configuration could fail

Because there is no isolation, the FTA output terminals must not be wired directly to a field device. An isolation relay must be used between the FTA output terminals and a field device.

Table 20 24 Vdc Nonisolated DO FTA Connection Drawings

24 Vdc Nonisolated Digital Output	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TDON11</u>	
	<u>MU/MC-TDON12</u>	<u>MU/MC-TDON12</u>
	<u>MU/MC-TDON52</u>	<u>MU/MC-TDON52</u>

Recommended installation practices

The IOP and FTA must be located in the control room, or some similar structure, and connected only to other isolated components. The FTA outputs are designed to drive only light duty relays, solenoids, and small lamps.

The IOP drivers are open collector (current sinking) transistors connected to logic ground. Only the low side of the load should be connected to the driver. The high side of the load must be connected to +24 Vdc. The maximum current must not exceed 100 mA.

Signals internally referenced to ground

The signals are internally referenced to logic common and local Master Reference Ground (MRG).

Diode suppression

An inductive load, such as a relay or solenoid, must be suppressed by installing a diode across the load connection at the load as illustrated for Load 16 in Figure 52 and Figure 53.

Vertical bus bars

The vertical bus bar illustrated in Figure 52 and Figure 53 that provides grounding for the signal cable shields is attached to the FTA mounting channel that the FTA is mounted on. Use a 2.5 mm² (14 AWG) wire to ground the bus bar to Master Reference Ground. For a CE Compliance application, Safety Ground must be used.

Field circuit fuses

The branch circuit fuses in Figure 52 and Figure 53 are not standard Honeywell assemblies. Mount the outside vendor-purchased fuse blocks on the side of the cabinet beside the FTA.

Use approved cable

Use only cable approved for circuit current limiting and proper operating voltage.

24 Vdc connections

The FTA has internal clamping diodes to clamp inductive loads such as relays and solenoids. The diodes have a common bus that is available at TB1-18.

Figure 52 and Figure 53 illustrate how the clamping bus at TB1-18 is connected to TB1-17 when using the **internal 24 Vdc** that is available in the FTA.

It also demonstrates how the clamping bus at TB1-18 can be connected to an **external 24 Vdc power source** when not using the FTA's internal 24 Vdc power.

CAUTION

When using an external 24 volt power source, a ground return is an absolute requirement.

TB1-18 connection

Connection of the 24 Vdc power source to TB1-18 is important and is required internally by the 24 Vdc Digital Output IOP as a reference voltage when the digital outputs are checked by the IOP during a readback diagnostic. Without the proper TB1-18 connection to the 24 Vdc power source, the IOP will not operate correctly.

CAUTION

The FTA will not operate properly unless connections to TB1-17, TB1-18, and TB1-19 are made according to Figure 52 and Figure 53.

Model MU-TDON11/MU-TDON12, 24 Vdc nonisolated DO FTA connection diagram

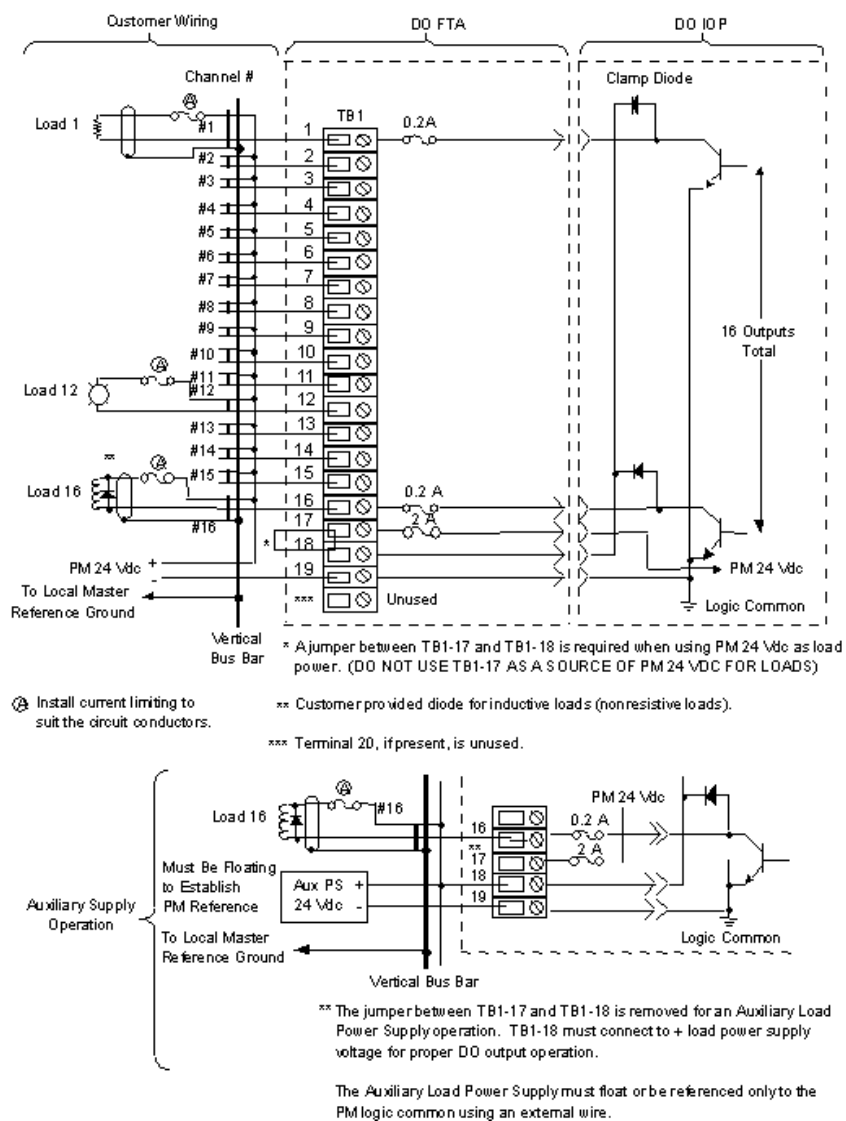


Figure 52 Model MU-TDON11/MU-TDON12 24 Vdc Nonisolated DO FTA Connection Diagram

Model MU-TDON52, 24 Vdc nonisolated digital output FTA connection diagram

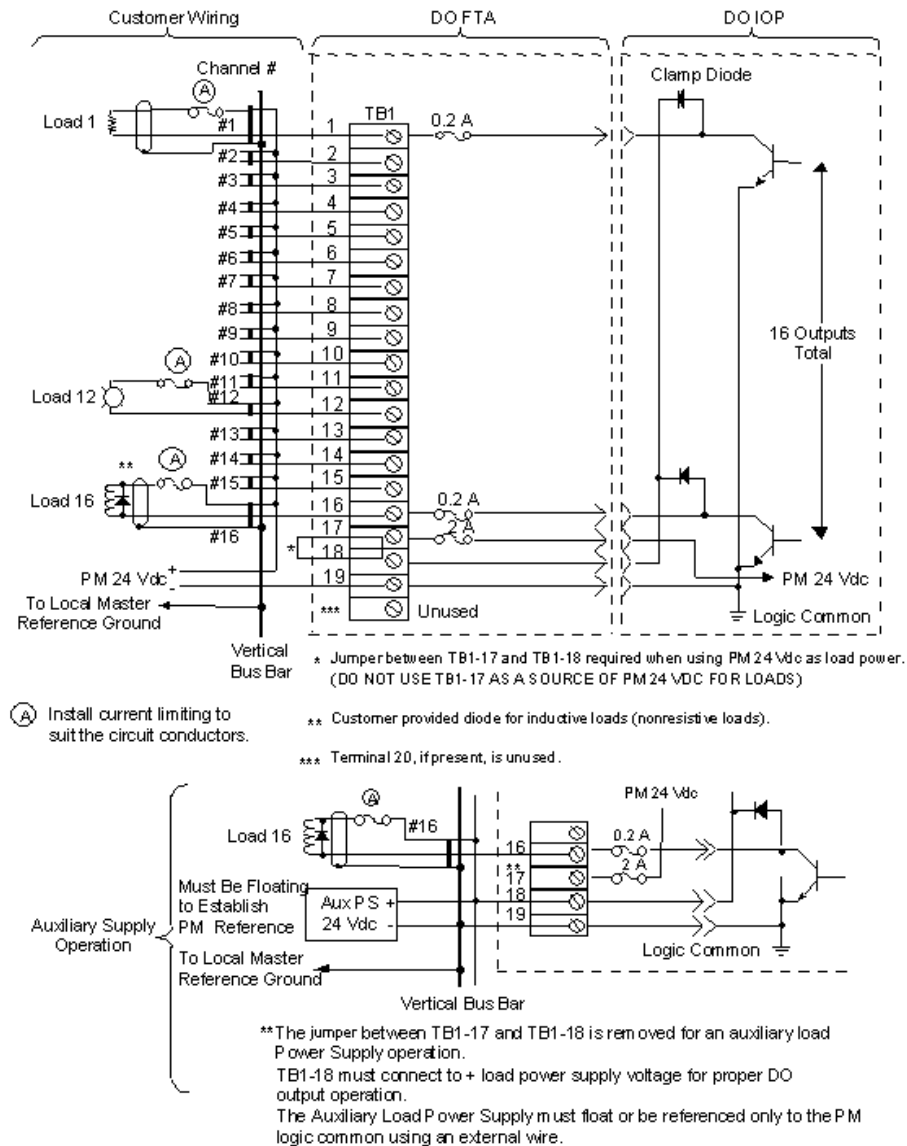
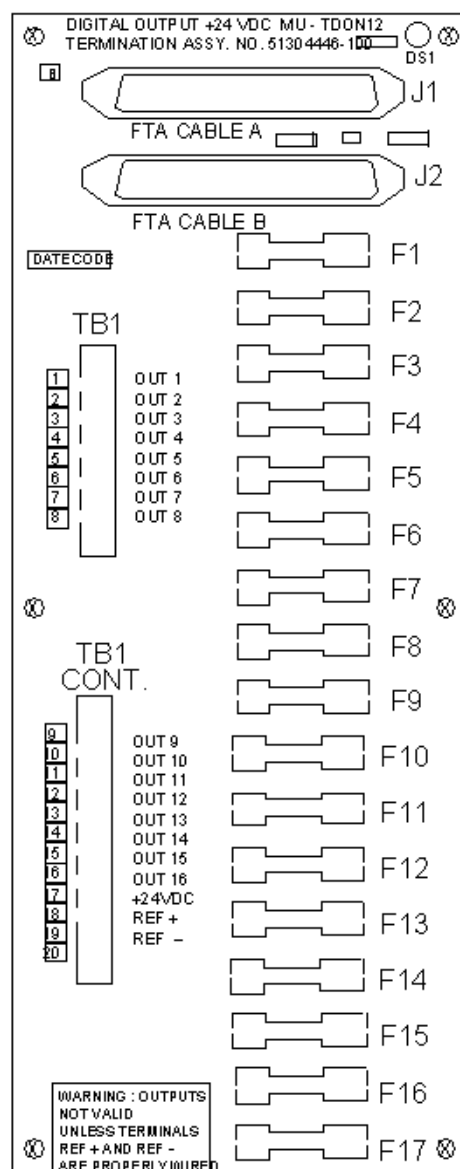


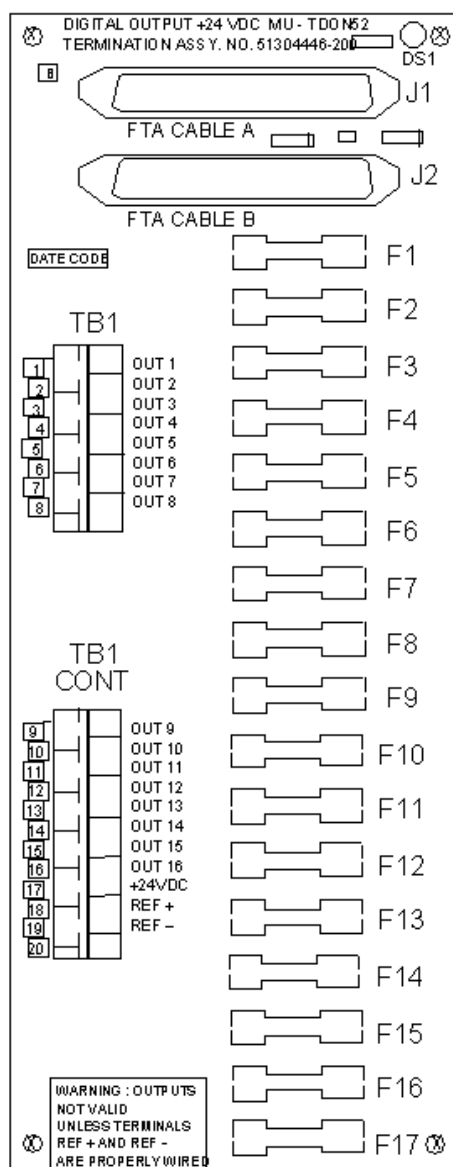
Figure 53 Model MU-TDON52 24 Vdc Nonisolated Digital Output FTA Connection Diagram

Model MU-TDON12, 24 Vdc nonisolated digital output FTA assembly layout



Note: F1-F16 are 0.2 A fuses. F17 is a 2 A fuse.

Model MU-TDOA52, 24 Vdc nonisolated digital output FTA assembly layout



Note: F1-F16 are 0.2 A fuses. F17 is a 2 A fuse.

24 Vdc Isolated Digital Output FTAs

The 24 Vdc isolated Digital Output (DO) FTAs provide 32 isolated digital outputs. The output drivers in the IOP are optically isolated from PM common and can drive loads requiring up to 500 mA at 24 Vdc.

CE Compliance

None of the 24 Vdc isolated DO FTAs are CE Compliant. For CE Compliance applications, the model MU-TDOD14 and MU-TDOD54 3-30 Vdc Digital Output FTAs are recommended.

The following table is a list of 24 Vdc isolated Digital Output FTA Models and compatible digital output IOPs.

24 Vdc Isolated Digital Output (DO) Standard FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOY22	24 Vdc Isolated DO FTA Compression Terminals	80366183-100	80366183-125
MC-TDOY22	24 Vdc Isolated DO FTA Compression Terminals—Conformally Coated	80366183-150	80366183-175
MU-TDOY62	24 Vdc Isolated DO FTA—Screw Terminals	80364013-100	80364013-125
MC-TDOY62	24 Vdc Isolated DO FTA Screw Terminals—Conformally Coated	80364013-150	80364013-175
Supporting IOPs			
MU-PDOY22	Digital Output IOP	N/A	80363975-100
MC-PDOY22	Digital Output IOP—Conformally Coated	N/A	80363975-150

External 24 Vdc power source

An external 24 Vdc power source must be provided by the user and connected to TB1-1 (+) and TB1-2 (-) for the FTA output loads.

To guarantee signal isolation, the 24 Vdc external power source must be an independent power supply. It must not be the PM Power System that provides power to the FTA through the IOP. The external power source must be capable of providing up to 5 amperes for the 32 channels (points).

FTA fuse protection

Model MU-TDOY22 FTA fuse protection is provided by sixteen fast-action 1.6 A fuses for each pair of output circuits. See Figure 54.

Model MU-TDOY62 FTA fuse protection is provided by four fast-action 1.6 A fuses for each group of eight output circuits. See Figure 55.

Connection diagrams and assembly layouts

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the 24 Vdc DO FTAs are given in the following figures listed in Table 21.

Table 21 24 Vdc DO FTA Connection Drawings

24 Vdc Isolated Digital Output	Connection Diagram	Assembly Layout
FTA Model	MU/MC-TDOY22	MU/MC-TDOY22
	MU/MC-TDOY62	MU/MC-TDOY62

Vertical bus bars

The vertical bus bar illustrated in Figure 54 and Figure 55 that provides grounding for the signal cable shields is attached to the FTA mounting channel that the FTA is mounted on. Use a 2.5 mm² (14 AWG) wire to ground the bus bar to Master Reference Ground. For CE Compliance applications, Safety Ground must be used.

Use only cable approved for circuit current limiting and proper operating voltage.

CAUTION

An inductive load, such as a relay or solenoid, must be suppressed by installing a diode across the load connection at the load as illustrated for Load 2 in Figure 54 and Figure 55.

Also see Contact arc suppression.

Model MU-TDOY22, 24 Vdc isolated digital output FTA connection diagram

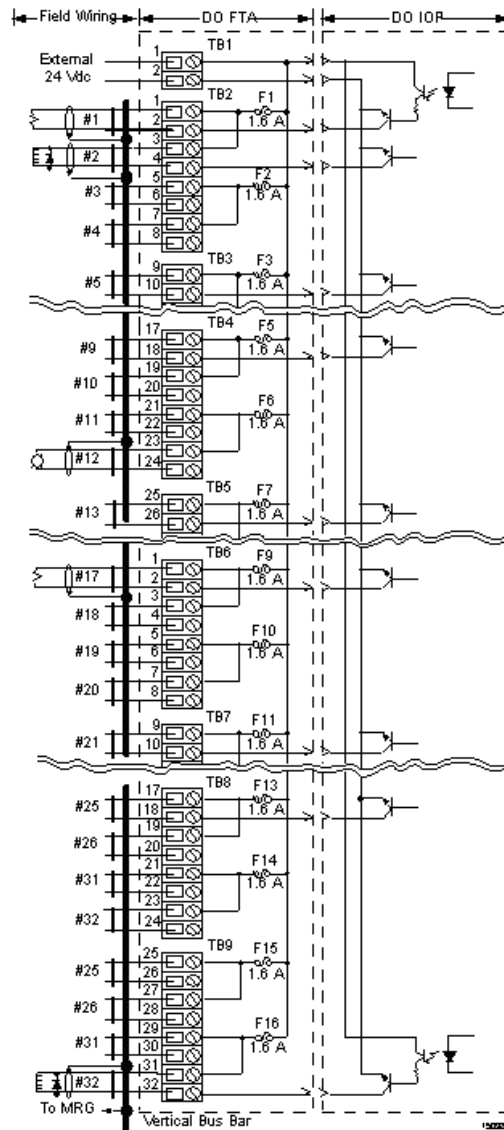


Figure 54 Model MU-TDOY22, 24 Vdc Isolated Digital Output FTA Connection Diagram

Model MU-TDOY62, 24 Vdc isolated digital output FTA connection diagram

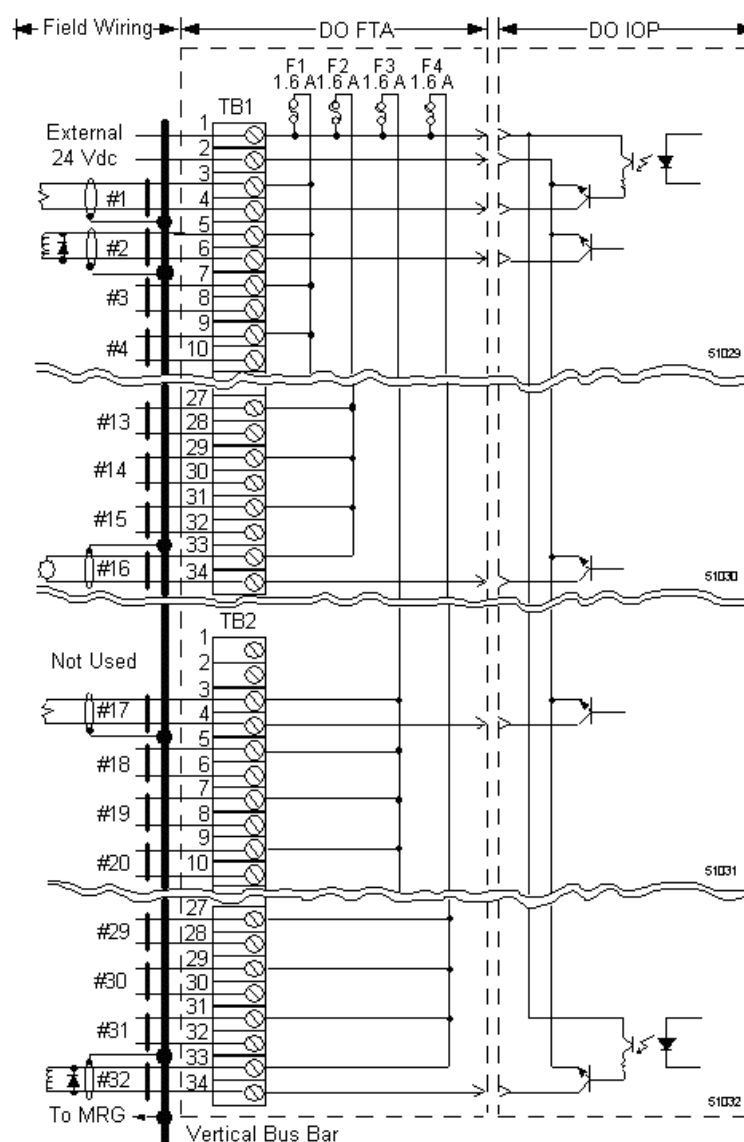
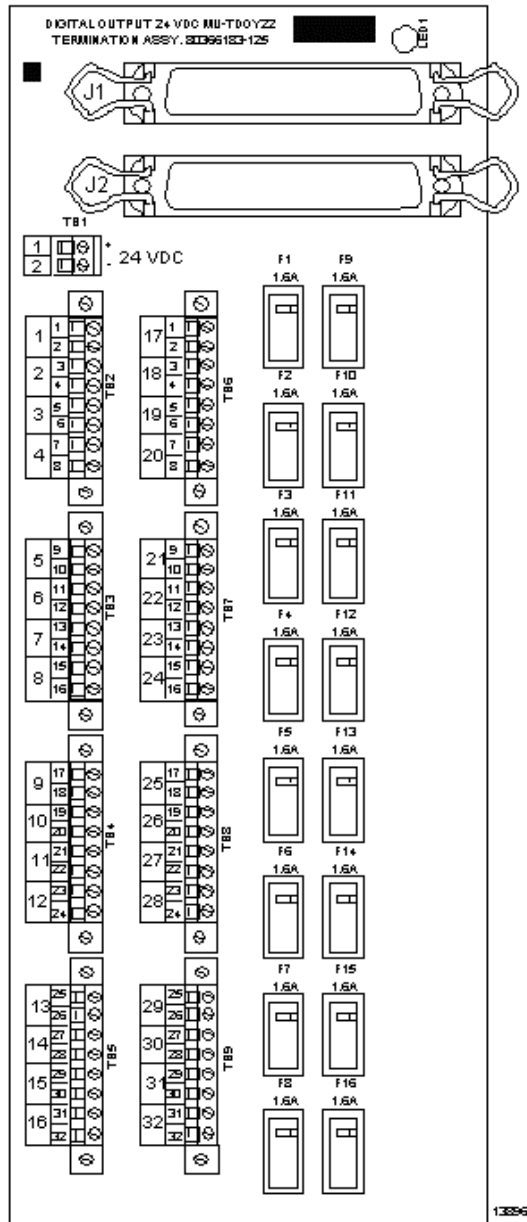
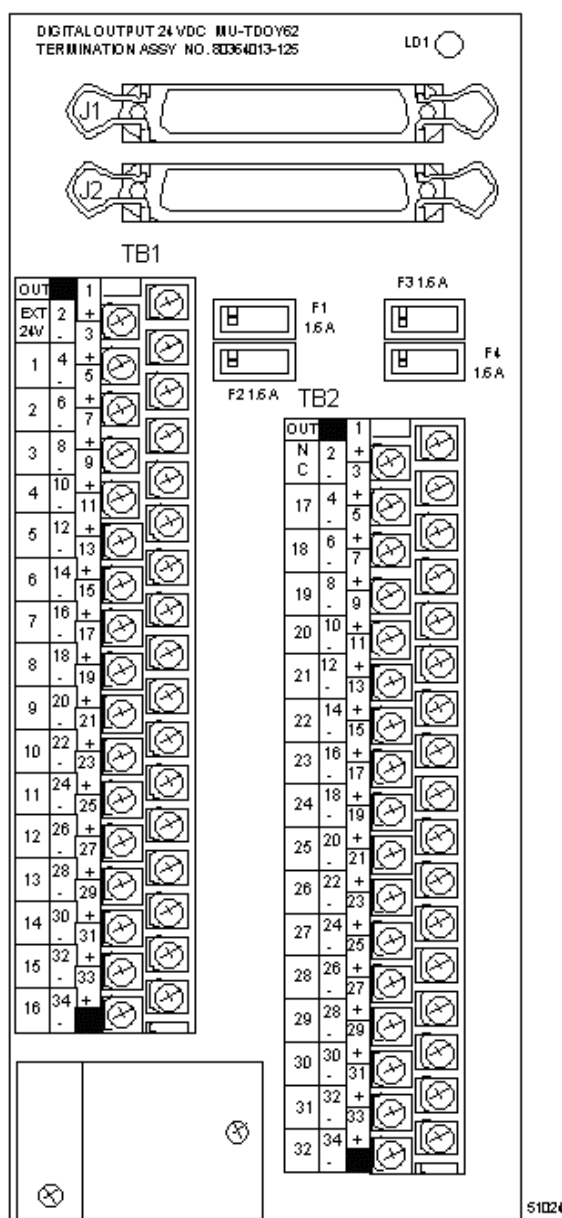


Figure 55 Model MU-TDOY62, 24 Vdc Isolated Digital Output FTA Connection Diagram

Model MU-TDOY22, 24 Vdc isolated digital output FTA assembly layout



Model MU-TDOY62, 24 Vdc isolated digital output FTA assembly layout



3-30 Vdc Solid-State Digital Output (DO) FTAs

The 3-30 Vdc solid-state Digital Output (DO) FTA provides 16 direct current power outputs that are optically isolated from each other and the subsystem.

CE Compliance

Some 3-30 Vdc solid-state Digital Output (DO) FTAs are CE Compliant, while others are not CE Compliant. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.”

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable. The CE Compliant and non-CE Compliant 3-30 Vdc Solid-State Digital Output FTA models with their part numbers are listed in the following table.

3-30 Vdc Solid-State Digital Output FTA and DO IOP Models

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOD11	3-30 Vdc SS DO FTA—Compression Terminals	51301220-100	N/A
MU-TDOD12	3-30 Vdc SS DO FTA—Compression Terminals	51304423-100	N/A
MC-TDOD12	3-30 Vdc SS DO FTA Compression Terminals—Conformally Coated	51304423-150	N/A
MU-TDOD13	3-30 Vdc SS DO FTA—Compression Terminals	51304650-100	N/A
MC-TDOD13	3-30 Vdc SS DO FTA Compression Terminals—Conformally Coated	51304650-150	N/A
MU-TDOD14	3-30 Vdc SS DO FTA—Compression Terminals	N/A	51309153-125
MC-TDOD14	3-30 Vdc SS DO FTA Compression Terminals—Conformally Coated	N/A	51309153-175
MU-TDOD52	3-30 Vdc SS DO FTA—Screw Terminals	51304423-200	N/A

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-TDOD52	3-30 Vdc SS DO FTA Screw Terminals—Conformally Coated	51304423-250	N/A
MU-TDOD53	3-30 Vdc SS DO FTA—Screw Terminals	51304650-200	N/A
MC-TDOD53	3-30 Vdc SS DO FTA Screw Terminals—Conformally Coated	51304650-250	N/A
MU-TDOD54	3-30 Vdc SS DO FTA —Screw Terminals	N/A	51309153-225
MC-TDOD54	3-30 Vdc SS DO FTA Screw Terminals—Conformally Coated	N/A	51309153-275
Supporting IOPs			
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

IOP compatibility

The model MU-PDOX02 Digital Output IOP is compatible with all 3-30 Vdc solid-state DO FTA models.

Table 22 3-30 Vdc SS DO FTA Connection Drawings

3 – 30 Vdc Solid-State Digital Output	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TDOD11</u>	
	<u>MU/MC-TDOD12</u>	<u>MU/MC-TDOD12</u>
	<u>MU/MC-TDOD13</u>	<u>MU/MC-TDOD13</u>
	<u>MU/MC-TDOD14</u>	<u>MU/MC-TDOD14</u>
	<u>MU/MC-TDOD52</u>	<u>MU/MC-TDOD52</u>
	<u>MU/MC-TDOD53</u>	<u>MU/MC-TDOD53</u>
	<u>MU/MC-TDOD54</u>	<u>MU/MC-TDOD54</u>

Observe polarity

The + and - output polarity must be strictly observed for each output. Signals from the FTA are normally considered as power circuits and, therefore, are subject to electrical codes. Check your site planning drawings and use only cable approved for the voltage and current limiting.

Vertical bus bars

The vertical bus bar illustrated in Figure 54 and Figure 55 that provides grounding for the signal cable shields is attached to the FTA mounting channel that the FTA is mounted on. Use a 2.5 mm² (14 AWG) wire to ground the bus bar to Master Reference Ground. For CE Compliance applications, Safety Ground must be used.

Cable shield connections

Any cable shield/ground connects to the local Safety Ground at the cabinet entry.

Connection schemes

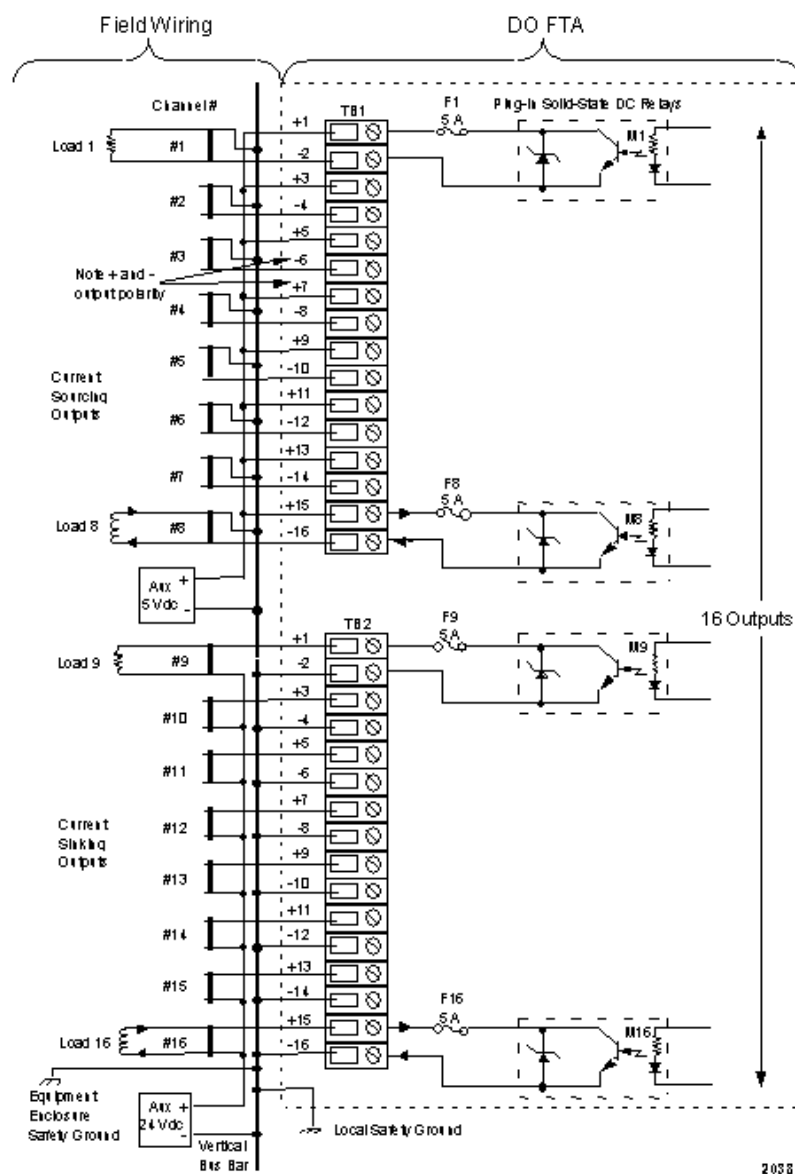
In the connection diagrams, two different load connection schemes are shown. For loads 1 through 8, a 5 Vdc load power source is used and the FTA solid-state switches source current to the loads. For loads 9 through 16, a 24 Vdc load power source is used and the FTA solid-state switches sink current from the loads. Either type of connection is satisfactory as long as the + and – output polarity of each output is observed for both the FTA solid-state relay and the load. As examples, the proper direction of current flow is shown for loads 8 and 16.



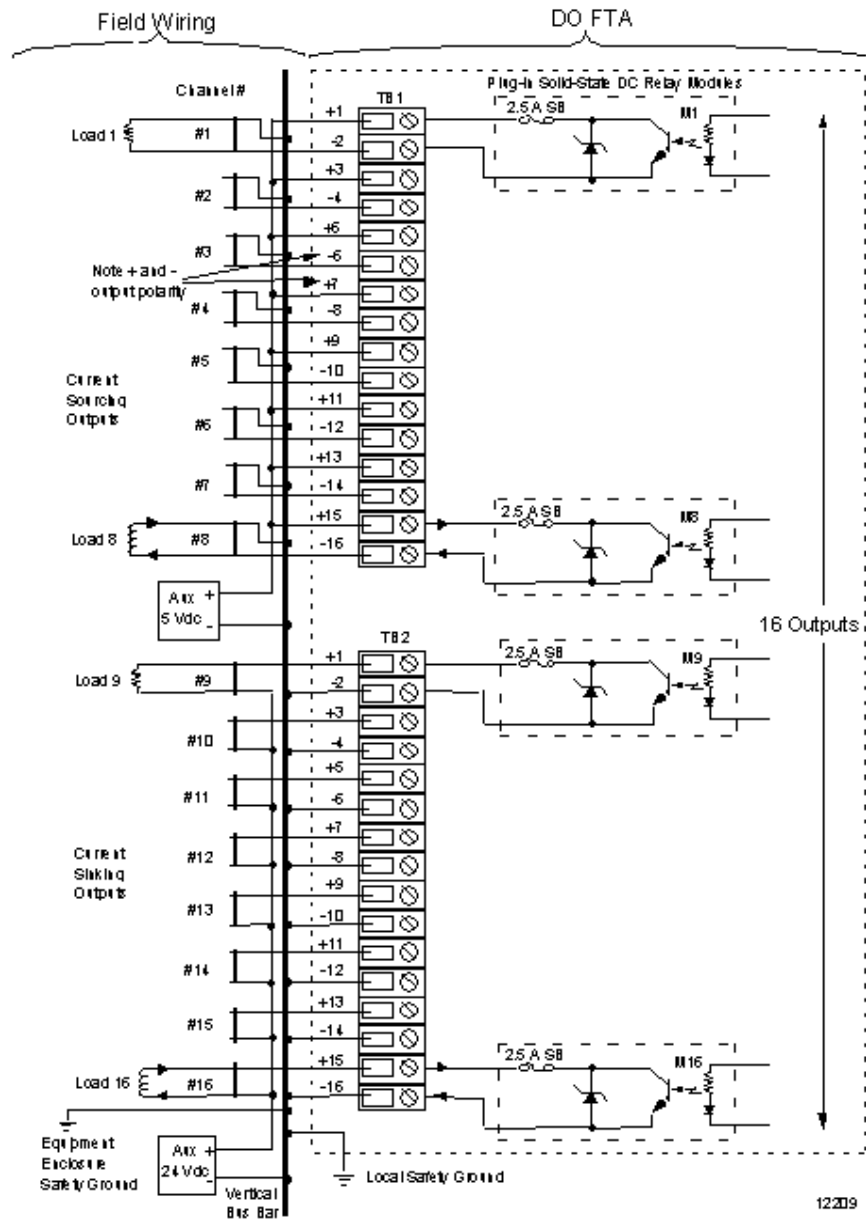
ATTENTION

Each solid-state relay is a normally open power transistor switch with load switching characteristics. Surge current ratings for inductive loads are normally nonrepetitive, meaning that sufficient recovery time must occur between successive surges to allow the power transistor junction temperature to return to normal. The recovery time is longer for larger surge currents and/or higher ambient temperatures. Typical recovery time is about 30 seconds for an 8 amp, 50 millisecond surge, and about five minutes for a 5 amp, 1 second surge.

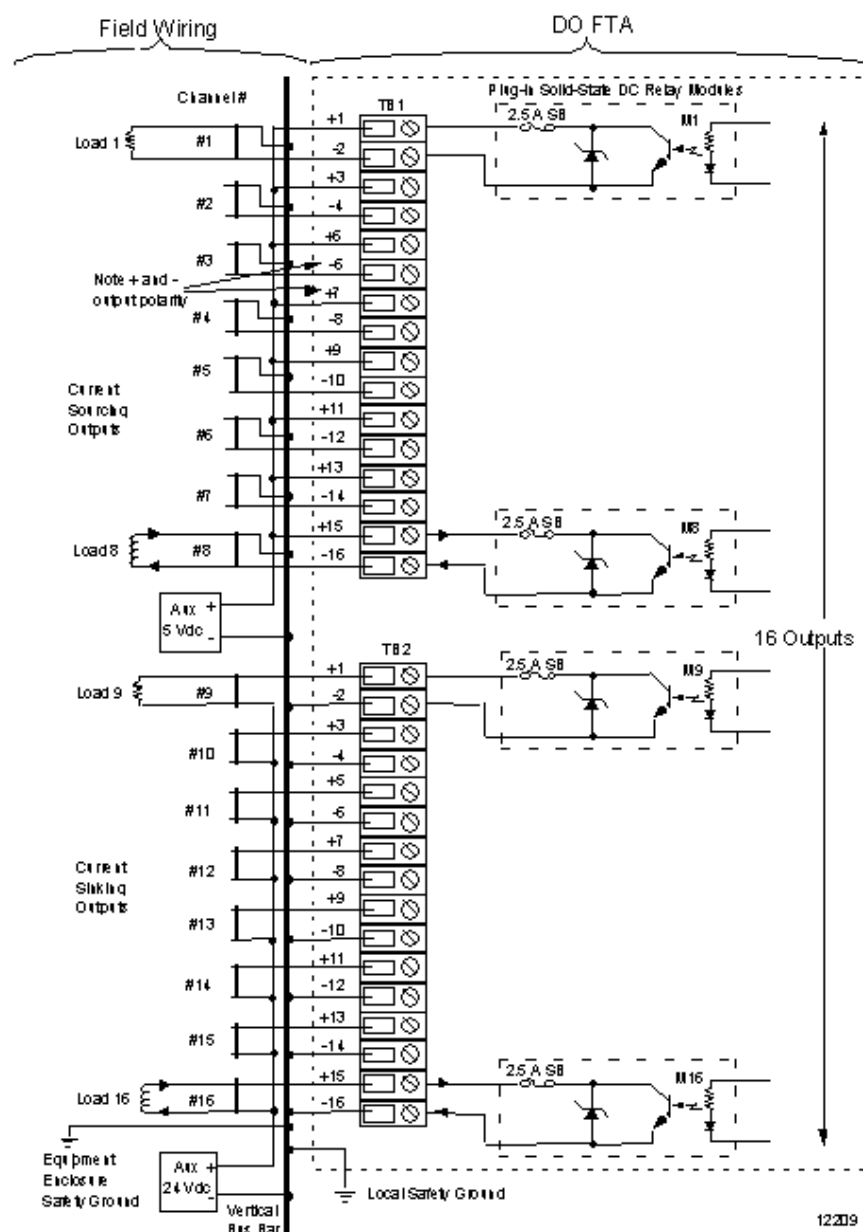
Model MU-TDOD11/MU-TDOD12, 3-30 Vdc solid-state digital output FTA connection diagram



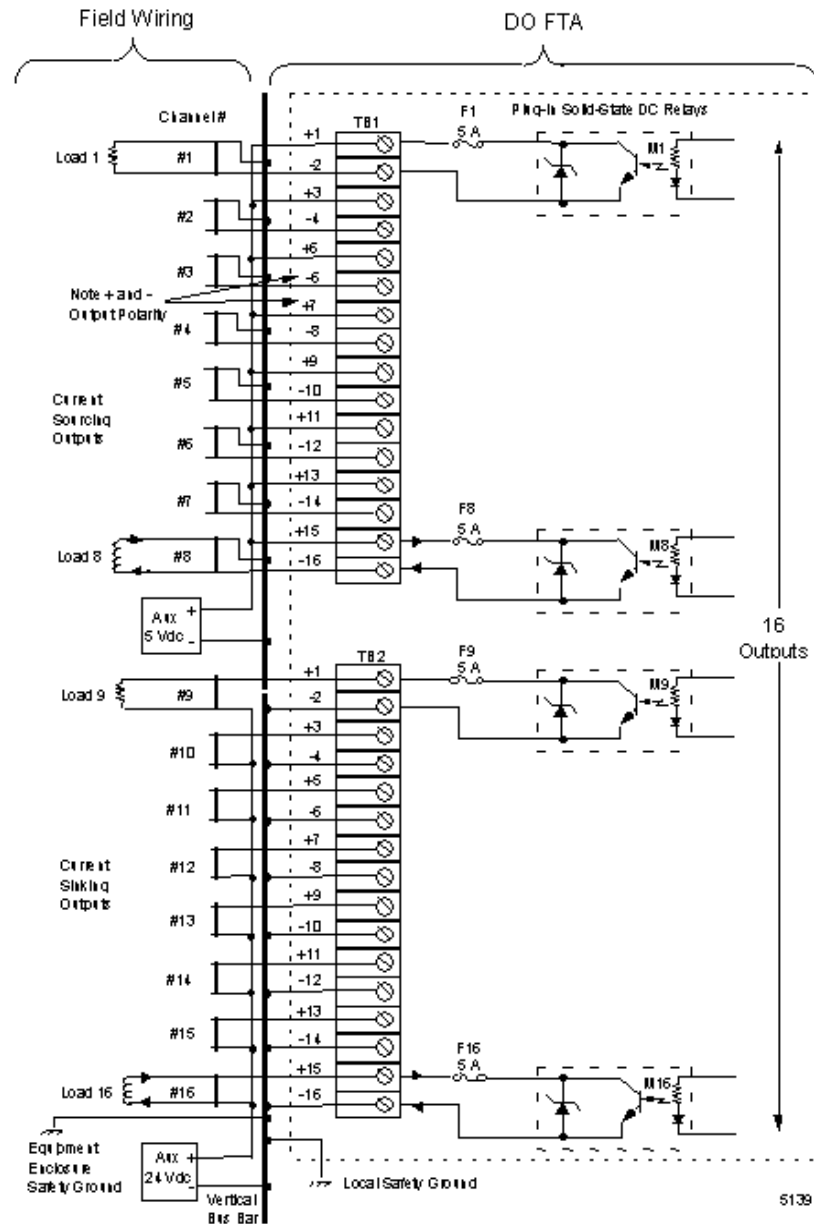
Model MU-TDOD13, 3-30 Vdc solid-state digital output FTA connection diagram



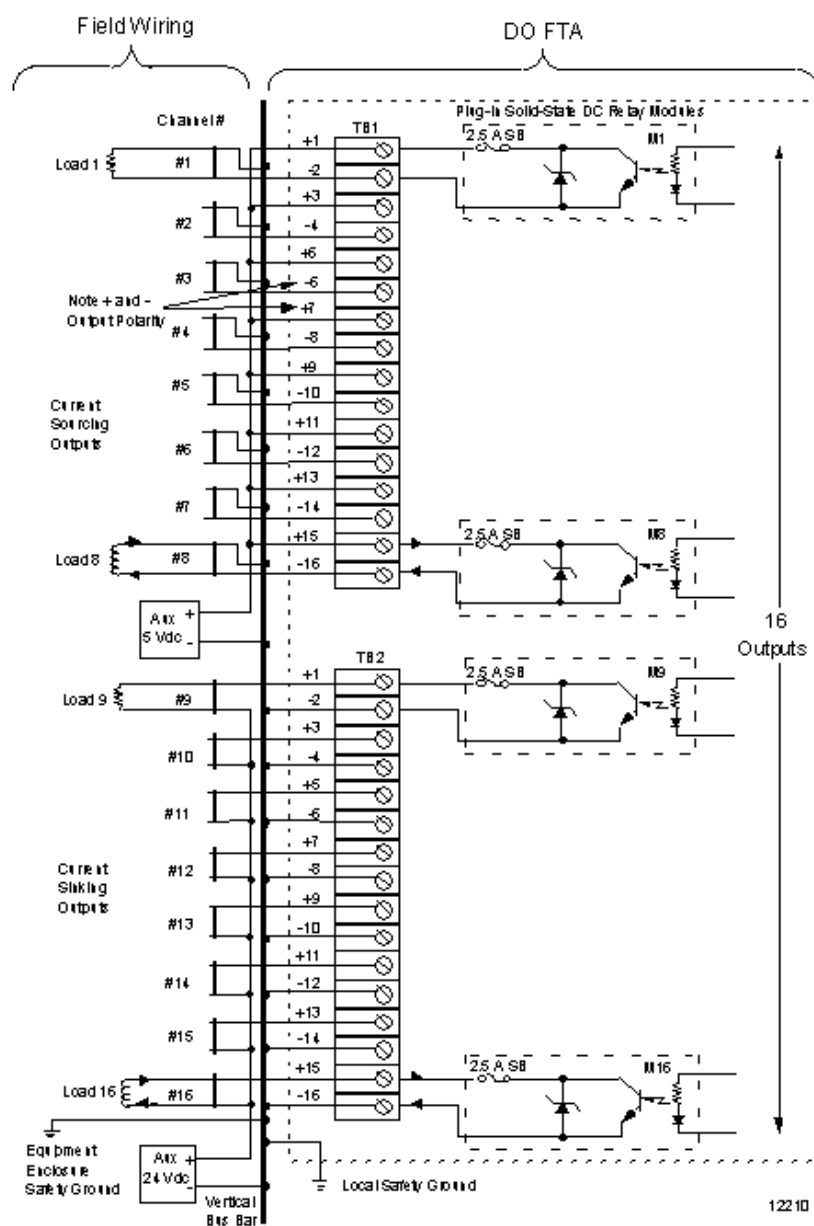
Model MU-TDOD14, 3-30 Vdc solid-state digital output FTA connection diagram



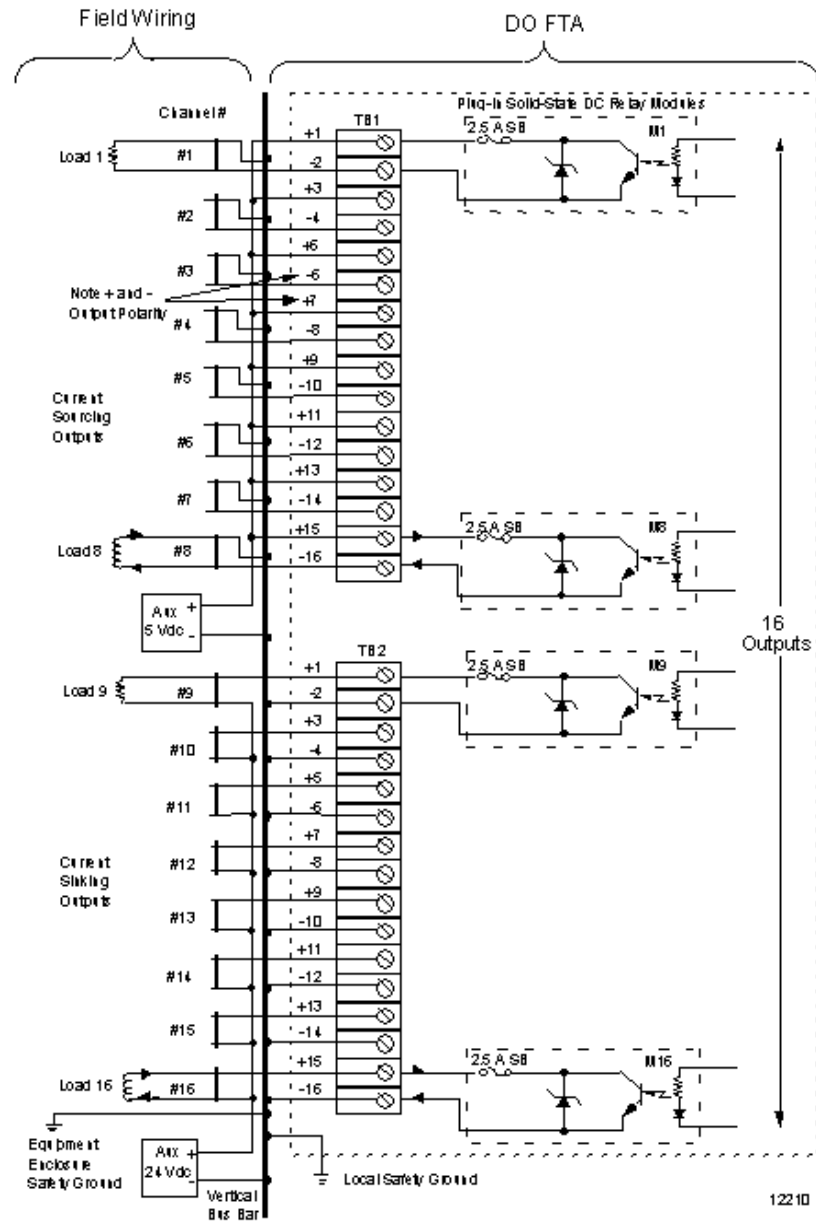
Model MU-TDOD52, 3-30 Vdc solid-state digital output FTA connection diagram



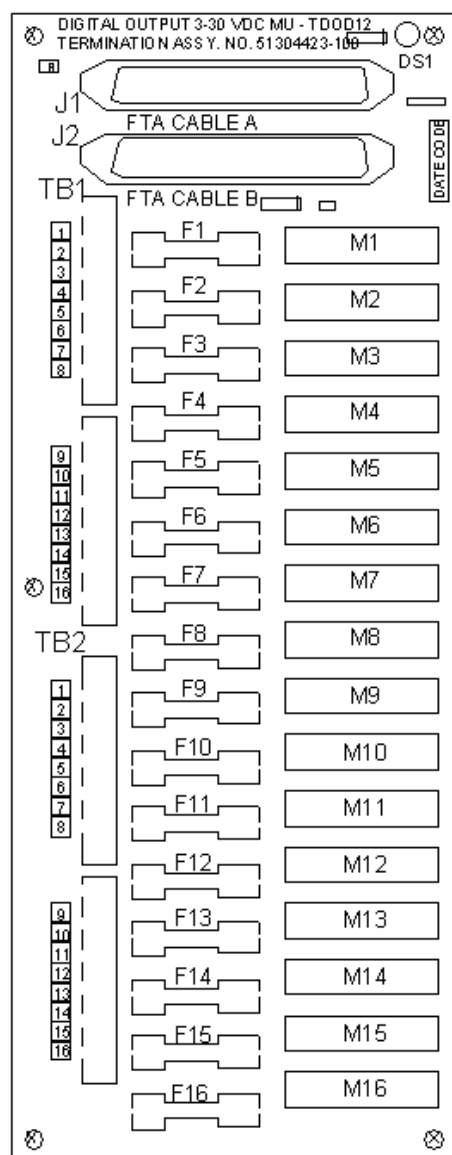
Model MU-TDOD53, 3-30 Vdc solid-state digital output FTA connection diagram



Model MU-TDOD54, 3-30 Vdc solid-state digital output FTA connection diagram

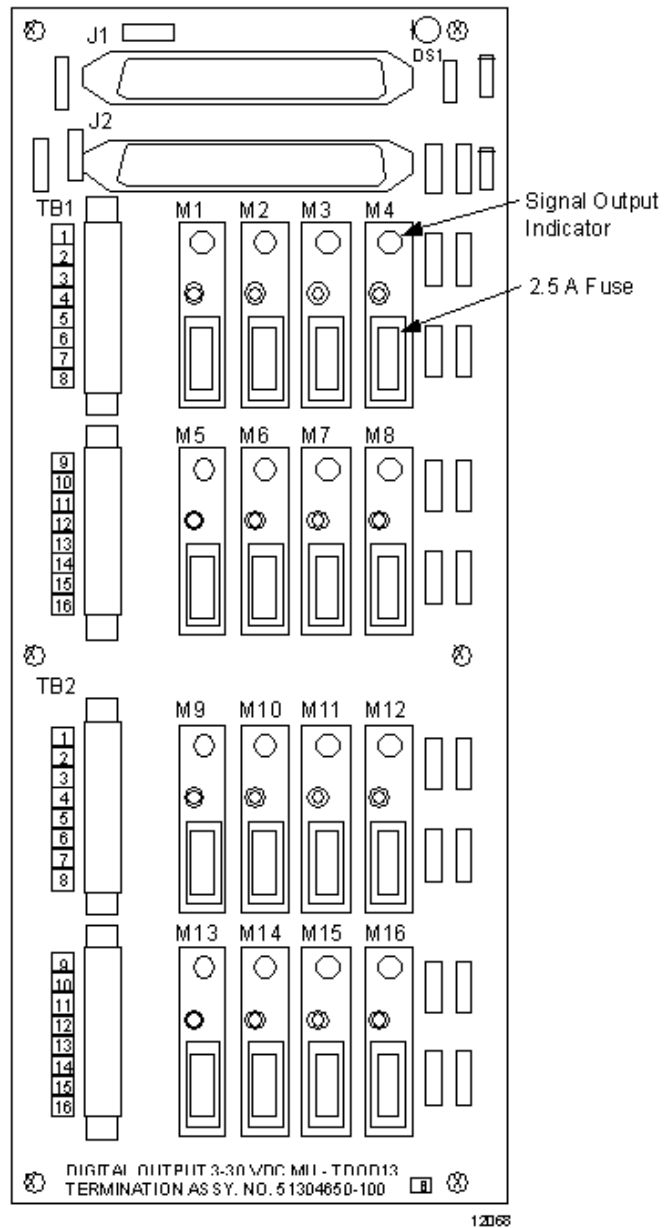


Model MU-TDOD12, 3-30 Vdc solid-state digital output FTA assembly layout

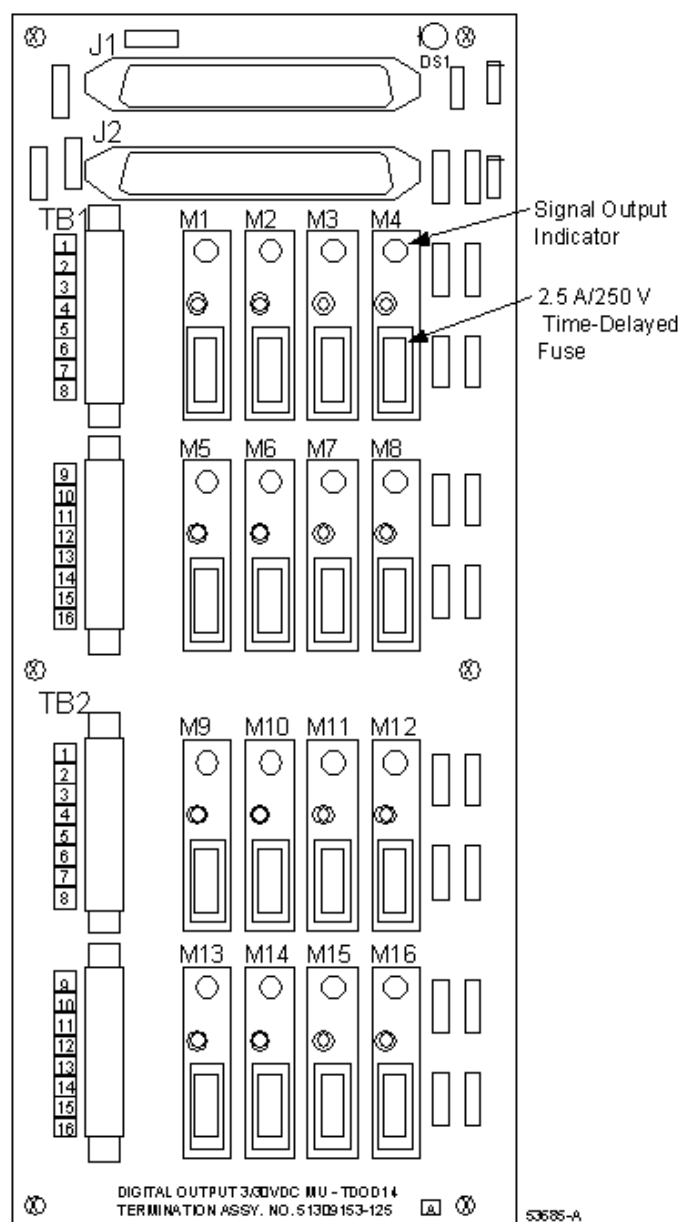


Note: F1-F16 are 5 A 125 V fuses.

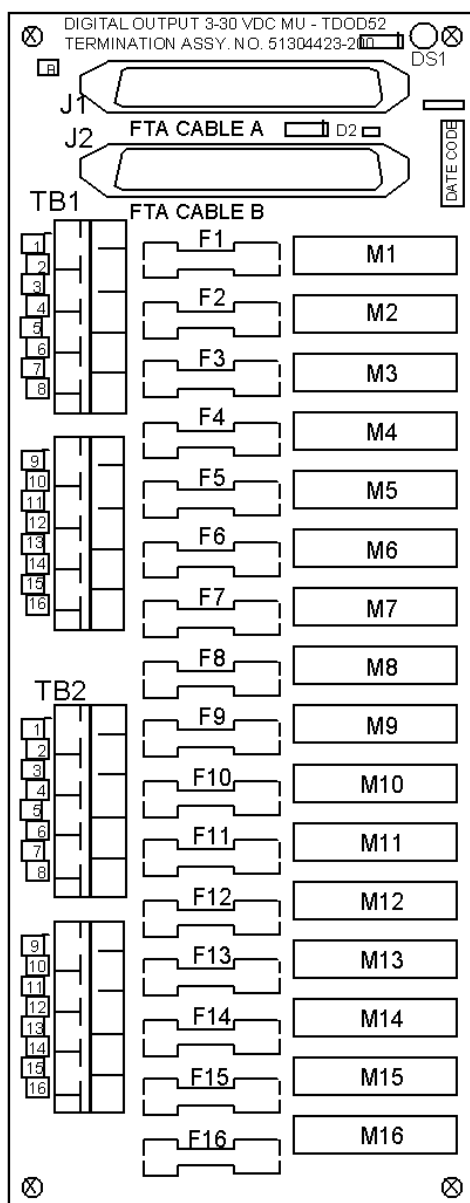
Model MU-TDOD13, 3-30 Vdc solid-state digital output FTA assembly layout



Model MU-TDOD14, 3-30 Vdc solid-state digital output FTA assembly layout

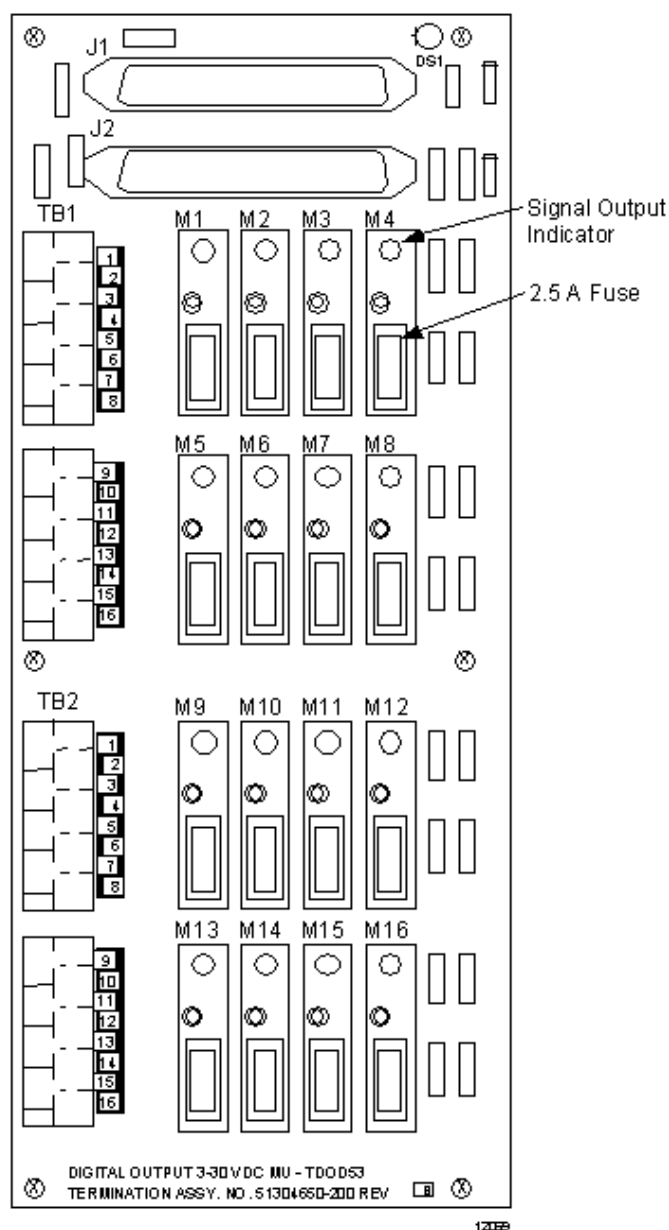


Model MU-TDOD52, 3-30 Vdc solid-state digital output FTA assembly layout

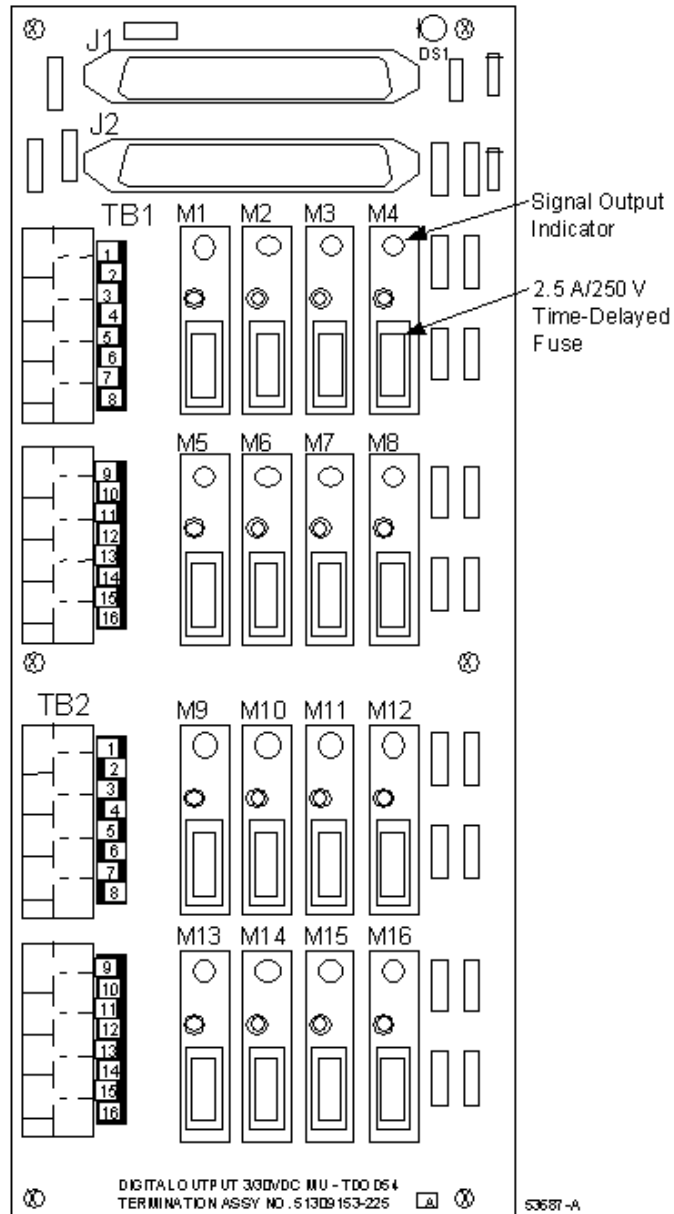


Note: F1-F16 are 5 A 125 V fuses.

Model MU-TDOD53, 3-30 Vdc solid-state digital output FTA assembly layout



Model MU-TDOD54, 3-30 Vdc solid-state digital output FTA assembly layout



31-200 Vdc Solid-State Digital Output (DO) FTAs

The 31-200 Vdc solid-state Digital Output (DO) FTAs provide 16 optically isolated dc power outputs.



SHOCK HAZARD

Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.

CE Compliance

Some 31-200 Vdc solid-state Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.”

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.

The CE Compliant and non-CE Compliant 31-200 Vdc Solid-State Digital Output FTA models with their part numbers are listed in the following table.

31-200 Vdc Solid-State Digital Output FTAs and DO IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOD21	31-200 Vdc SS DO FTA Compression Terminals	51301223-100	N/A
MU-TDOD22	31-200 Vdc SS DO FTA Compression Terminals	51304428-100	N/A
MC-TDOD22	31-200 Vdc SS DO FTA Compression Terminals—Conformally Coated	51304428-150	N/A
MU-TDOD23	31-200 Vdc SS DO FTA Compression Terminals	N/A	51309154-125
MC-TDOD23	31-200 Vdc SS DO FTA Compression Terminals—Conformally Coated	N/A	51309154-175
MU-TDOD62	31-200 Vdc SS DO FTA—Screw Terminals	51304428-200	N/A
MC-TDOD62	31-200 Vdc SS DO FTA Screw Terminals—Conformally Coated	51304428-250	N/A

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOD63	31-200 Vdc SS DO FTA—Screw Terminals	N/A	51309154-225
MC-TDOD63	31-200 Vdc SS DO FTA Screw Terminals—Conformally Coated	N/A	51309154-275
Supporting IOPs			
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

IOP compatibility

The model MU-PDOX02 Digital Output IOP is compatible with all 31-200 Vdc solid-state DO FTA models.

Table 23 31-200 Vdc Solid-State DO FTA Connection Drawings

13 – 200 Vdc Solid-State Digital Output	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TDOD21</u>	
	<u>MU/MC-TDOD22</u>	<u>MU/MC-TDOD22</u>
	<u>MU/MC-TDOD23</u>	<u>MU/MC-TDOD23</u>
	<u>MU/MC-TDOD62</u>	<u>MU/MC-TDOD62</u>
	<u>MU/MC-TDOD63</u>	<u>MU/MC-TDOD63</u>

Observe polarity

The + and - output polarity must be strictly observed for each output.

Signals subject to electrical codes

Signals from the FTA are normally considered as power circuits and therefore are subject to electrical codes. Check your site planning drawings and use only cable approved for the voltage and current limiting.

Vertical bus bars

The vertical bus bar shown in the connection diagrams is a Honeywell part. The bar is mounted on an FTA mounting channel. Use a 2.5 mm² (14 AWG) wire to connect the Safety Ground bus to local Safety Ground.

Cable shield connections

Any cable shield/ground connects to the local Safety Ground at the cabinet entry.

Connection schemes

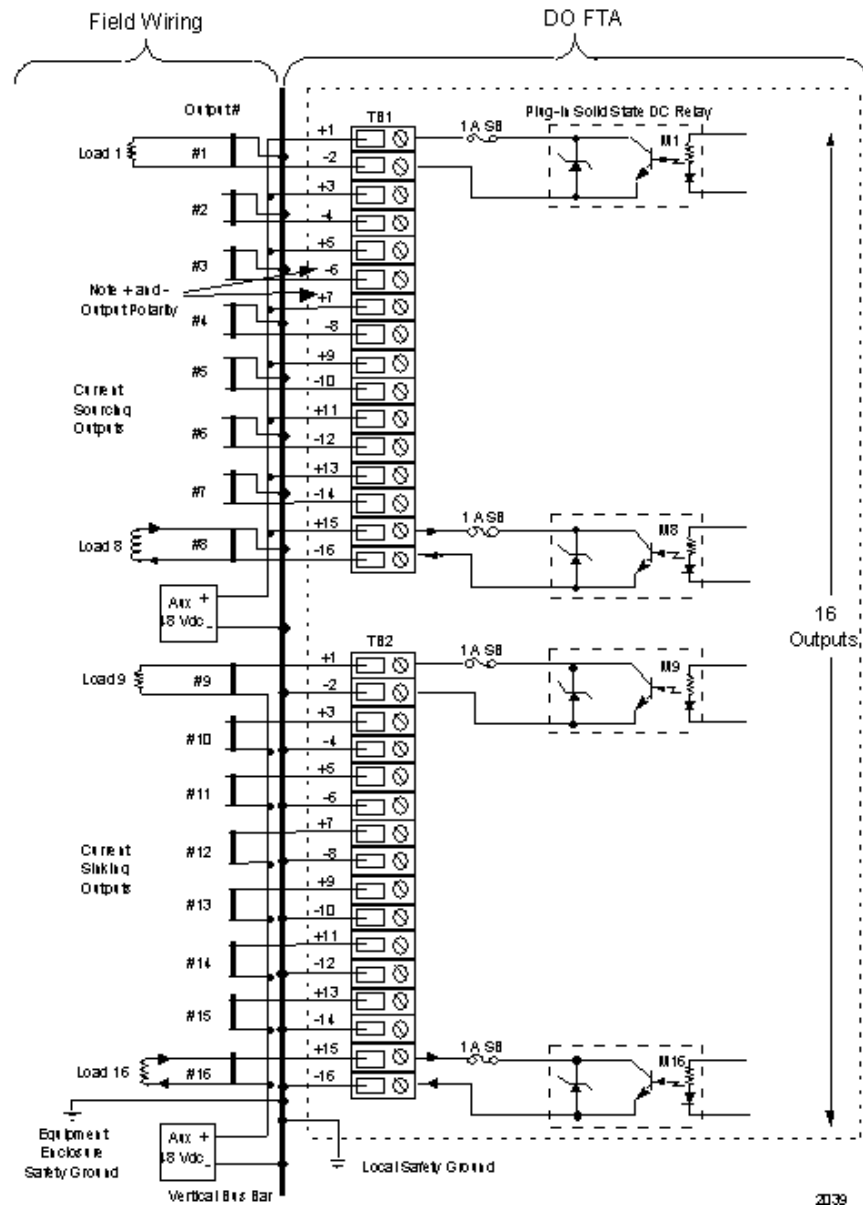
In the following connection diagrams, two different load-connection schemes are shown. For loads 1 through 8, the FTA solid-state switches source current to the loads. For loads 9 through 16, the FTA solid-state switches sink current from the loads. Either type of connection is satisfactory as long as the + and – output polarity of each output is observed for both the FTA solid-state relay and the load. As examples, the proper direction of current flow is shown for loads 9 and 16.



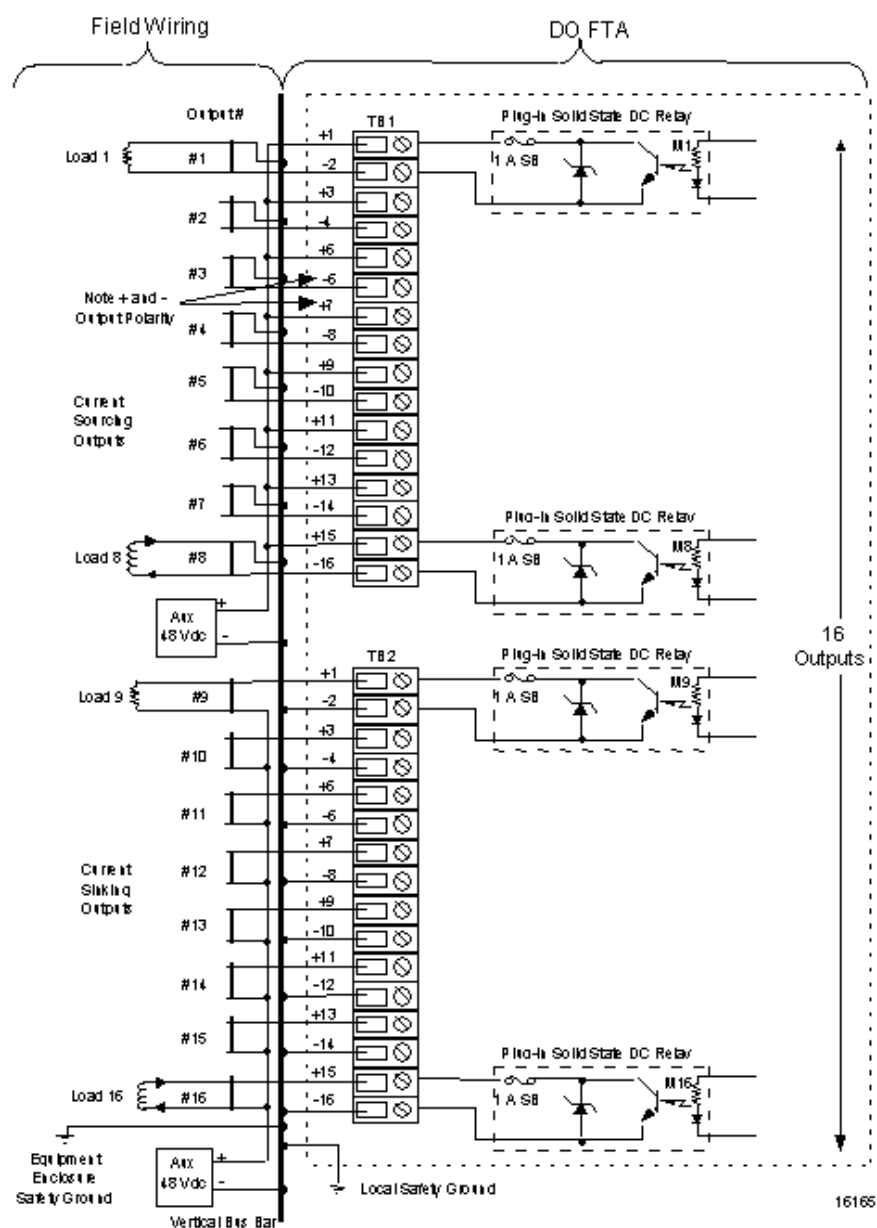
ATTENTION

Each solid-state relay is a normally open power transistor switch with load switching characteristics. Surge current ratings for inductive loads are normally nonrepetitive, meaning that sufficient recovery time must occur between successive surges to allow the power transistor junction temperature to return to normal. The recovery time is longer for larger surge currents and/or higher ambient temperatures. Typical recovery time is about 30 seconds for an 8 amp, 50 millisecond surge and about five minutes for a 5 amp, 1 second surge.

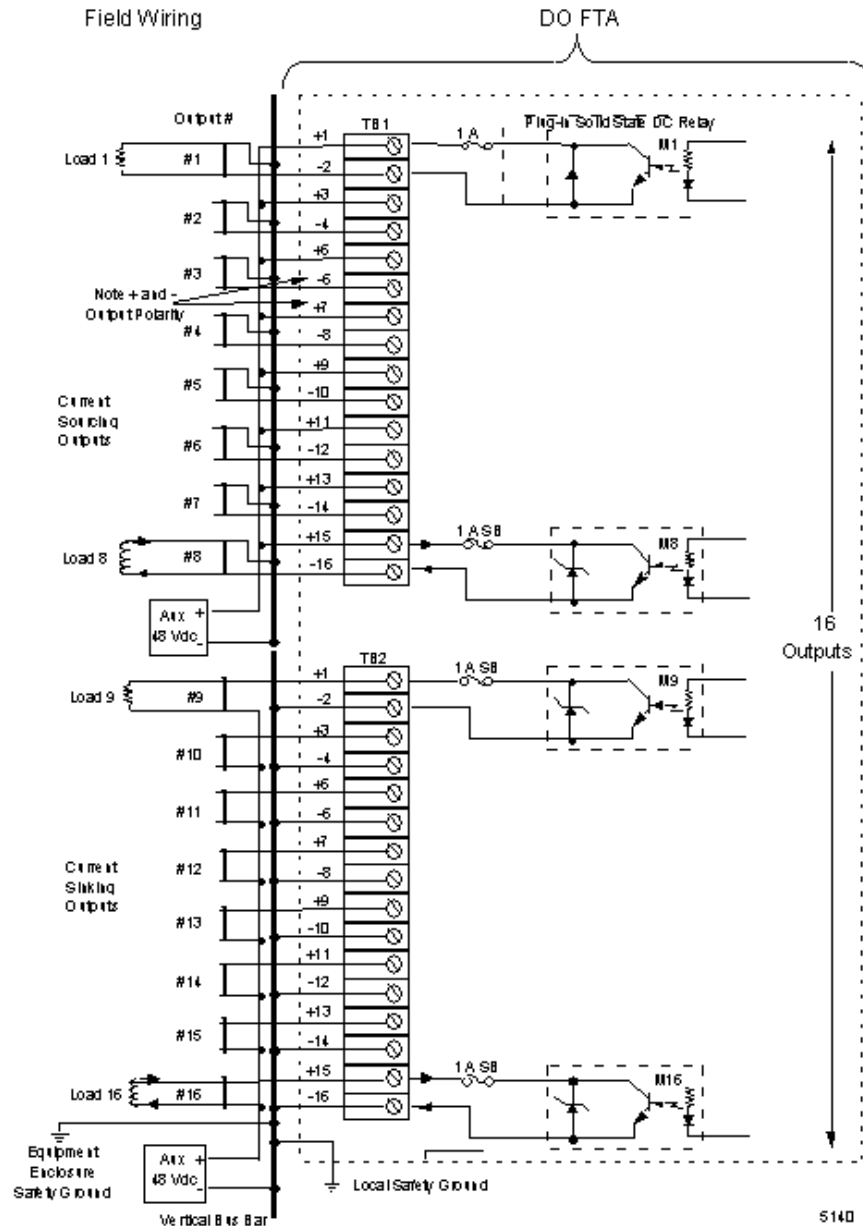
Model MU-TDOD21/MU-TDOD22, 31-200 Vdc SS DO FTA connection diagram



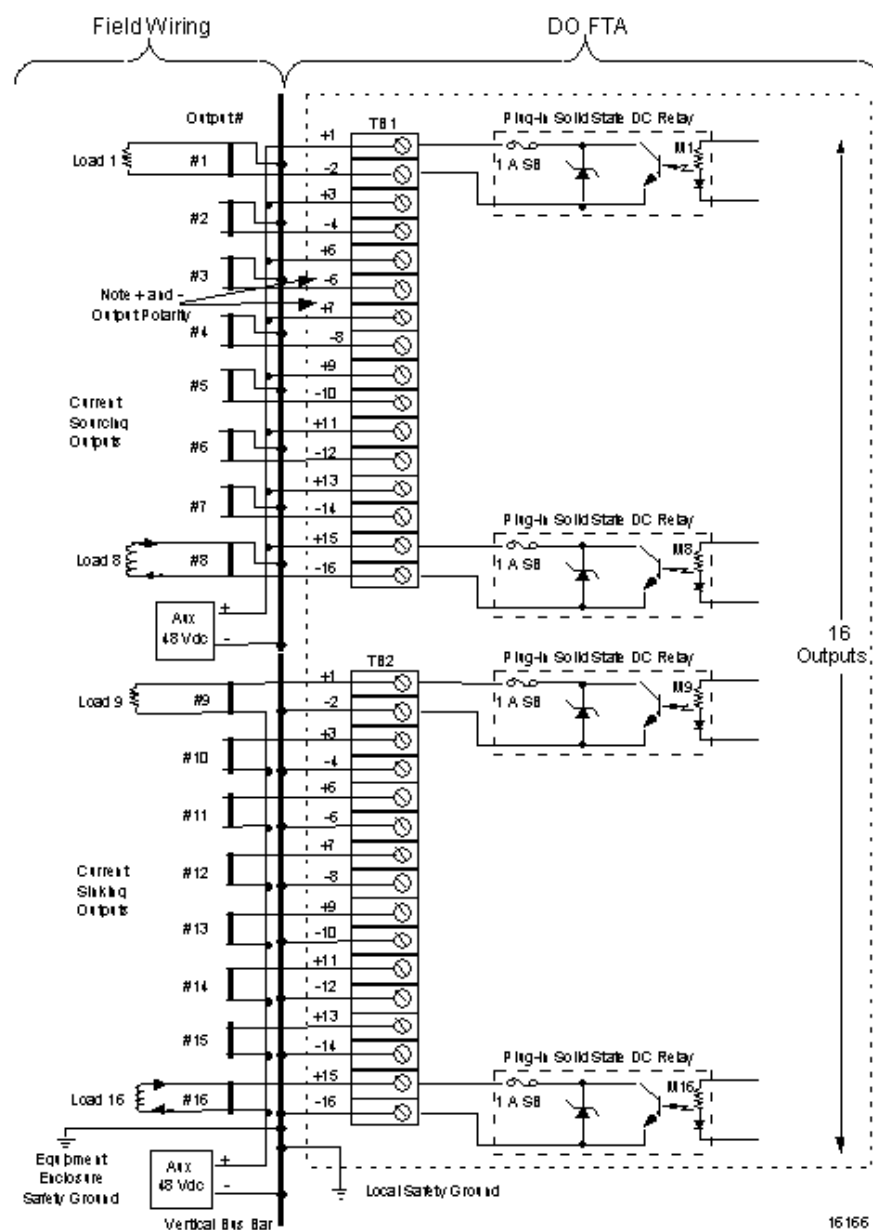
Model MU-TDOD23, 31-200 Vdc solid-state digital output FTA connection diagram



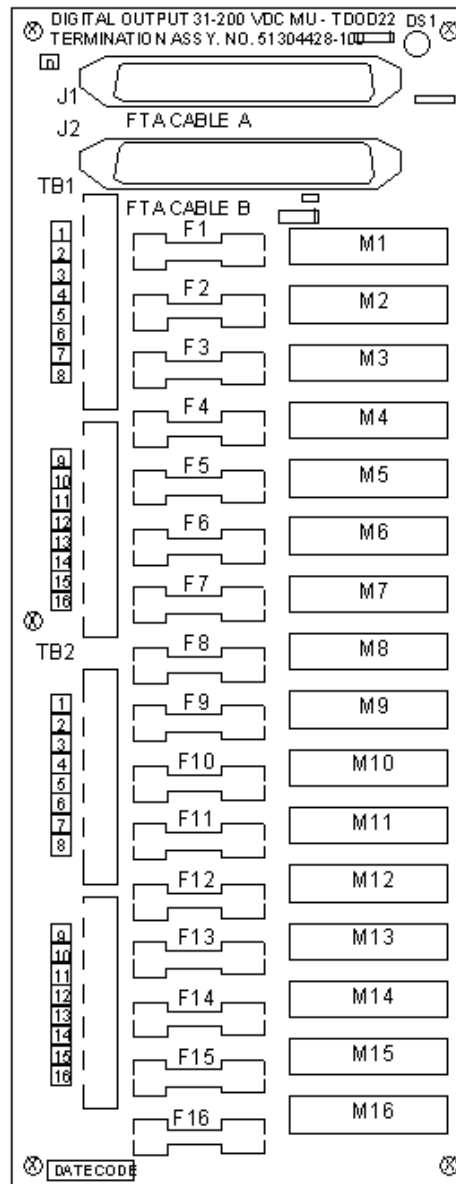
Model MU-TDOD62, 31-200 Vdc solid-state digital output FTA connection diagram



Model MU-TDOD63, 31-200 Vdc solid-state digital output FTA connection diagram

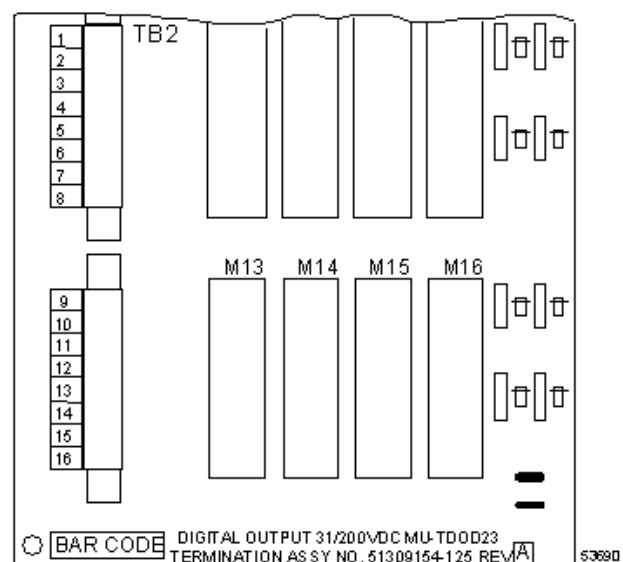
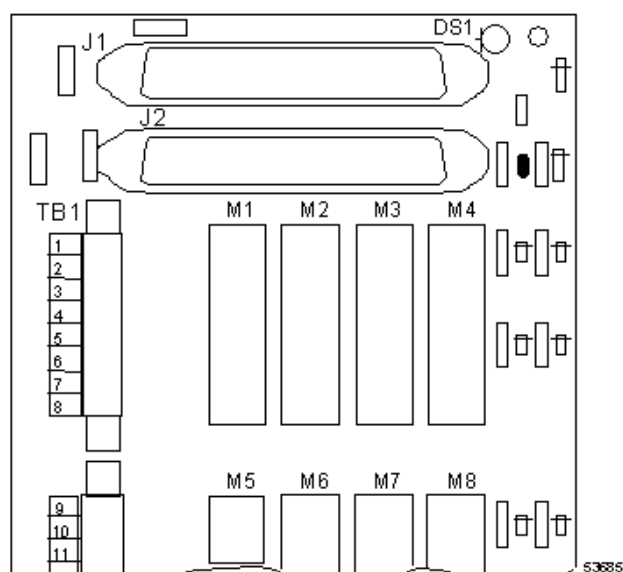


Model MU-TDOD22, 31-200 Vdc solid-state digital output FTA assembly layout

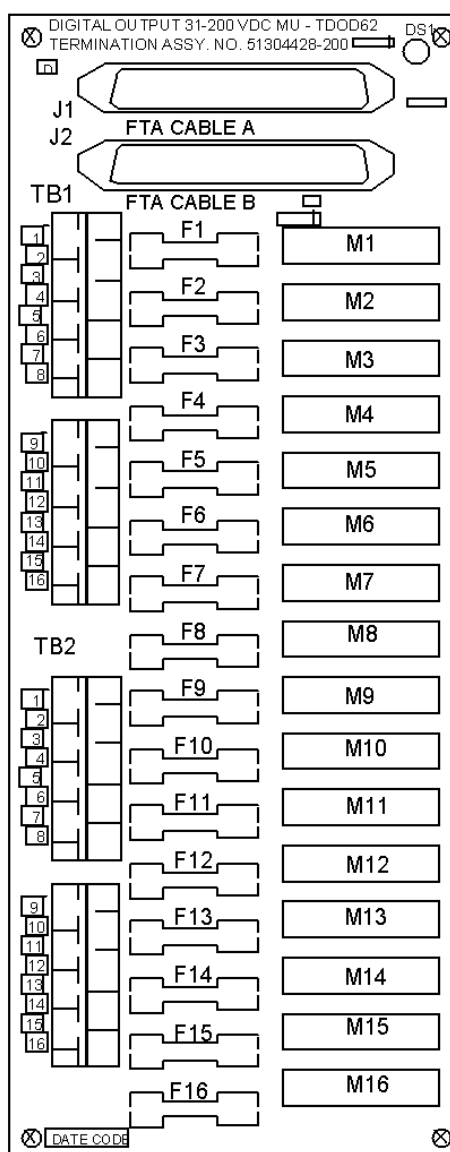


Note: F1-F16 should be 1.0 A time-delay fuses.

Model MU-TDOD23, 31-200 Vdc solid-state digital output FTA assembly layout



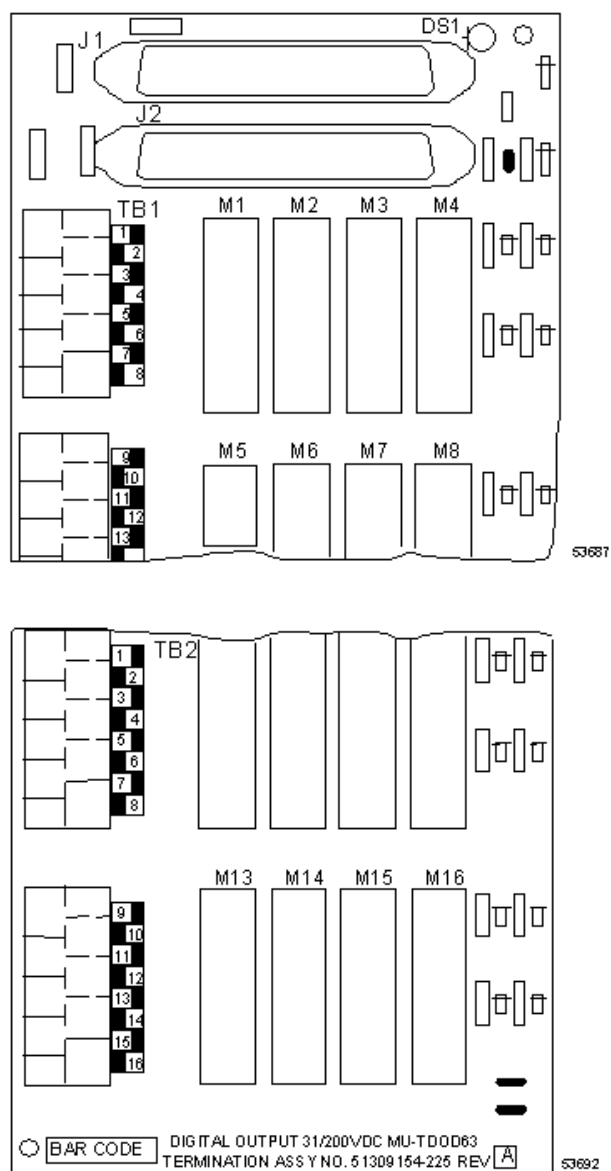
Model MU-TDOD62, 31-200 Vdc solid-state digital output FTA assembly layout



Note: F1-F16 should be 1.0 A time-delay fuses.

5298

Model MU-TDOD63, 31-200 Vdc solid-state digital output FTA assembly layout



Modules M1 through M16 contain 1.0 A time-delay fuses.

120/240 Vac Solid-State Digital Output (DO) FTAs

The 120/240 Vac solid-state Digital Output (DO) FTA provides 16 independent solid-state ac power outputs. The compatible IOP and FTA support 16 control points (channels).



SHOCK HAZARD

Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible..

CE Compliance

Some 120/240 Vac solid-state Digital Output (DO) Field Termination Assemblies are CE Compliant, and others are not. CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.

The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table.

120/240 Vac Solid-State Digital Output FTAs and DO IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOA11	120/240 Vac SS DO FTA Compression Terminals	51301157-100	N/A
MU-TDOA12	120/240 Vac SS DO FTA Compression Terminals	51304408-100	N/A
MC-TDOA12	120/240 Vac SS DO FTA Compression Terminals—Conformally Coated	51304408-150	N/A
MU-TDOA13	120/240 Vac SS DO FTA Compression Terminals	51304648-100	51304648-125
MC-TDOA13	120/240 Vac SS DO FTA Compression Terminals—Conformally Coated	51304648-150	51304648-175
MU-TDOA52	120/240 Vac SS DO FTA—Screw Terminals	51304408-200	N/A

Appendix C – **PM I/O FTA Reference**
Digital Output (DO) Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-TDOA52	120/240 Vac SS DO FTA Screw Terminals—Conformally Coated	51304408-250	N/A
MU-TDOA53	120/240 Vac SS DO FTA—Screw Terminals	51304648-200	51304648-225
MC-TDOA53	120/240 Vac SS DO FTA Screw Terminals—Conformally Coated	51304648-250	51304648-275
Supporting IOPs			
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

IOP compatibility

The model MU-PDOX02 Digital Output IOP is compatible with all 120/240 Vac solid-state DO FTA models.

Table 24 120/240 Vac Solid-State Digital Output FTA Connection Drawings

120/240 Vac Solid-State Digital Output	Connection Diagram	Assembly Layout
FTA Model	<u>MU- TDOA11</u>	
	<u>MU/MC-TDOA12</u>	<u>MU/MC-TDOA12</u>
	<u>MU/MC-TDOA13</u>	<u>MU/MC-TDOA13</u>
	<u>MU/MC-TDOA52</u>	<u>MU/MC-TDOA52</u>
	<u>MU/MC-TDOA53</u>	<u>MU/MC-TDOA53</u>

Power phase

Out-of-phase 120 Vac load power can be used for adjacent outputs because inter-output circuitry is rated for 240 Vac rms. When using 240 Vac load power, adjacent channels must use the same load power phase to avoid exceeding the 240 Vac inter-channel limit.

Surge current and recovery time

Each solid-state relay is a normally open triac switch with 0 voltage turn-on and 0 current turn-off load switching characteristics. Surge current ratings for inductive loads are normally nonrepetitive, meaning that sufficient recovery time must occur between successive surges to allow the triac junction temperature to return to normal. The recovery time is longer for larger surge currents and/or higher ambient temperatures. Typical recovery times vary between 30 seconds for 10 amp surges to 5 minutes for 50 amp surges.

Solid-state relay ratings

Below 50 °C ambient (outside the cabinet), each solid-state relay is rated for 2 amps for 120 Vac or 240 Vac rms loads. Above 50 °C ambient, the total rating for a pair of adjacent outputs, such as outputs 1 and 2 and outputs 2 and 3, etc., must be limited to no more than 2.5 amperes, although the individual limit of 2 amperes remains.

CAUTION

Loads with a power factor less than 0.5 can damage the solid-state relays used on the FTA and cause improper operation of the loads. For such loads, additional snubbing must be provided across the FTA (solid-state relay) terminals to protect the solid-state switch (a snubber placed across the load terminals may not protect as well). A recommended snubber is a 100-ohm resistor in series with a 0.1-microfarad capacitor (400 Vdc rating for 120 Vac loads, or 600 Vdc rating for 240 Vac loads).

Power Factor calculation

EXAMPLE

A 120 Vac motor starter load has a measured dc resistance of 55 ohms and a specified steady-state running current equal to 230 milliamps; therefore, the total impedance is 120 Vac divided by 230 milliamps or 522 ohms. The reactive component of impedance (X) can be found from the equation:

$$X = \sqrt{Z^2 - R^2}$$

where: R = DC resistance
Z = Total impedance

In this example, X is calculated to be 519 ohms.

The Power Factor (PF) is then calculated as:

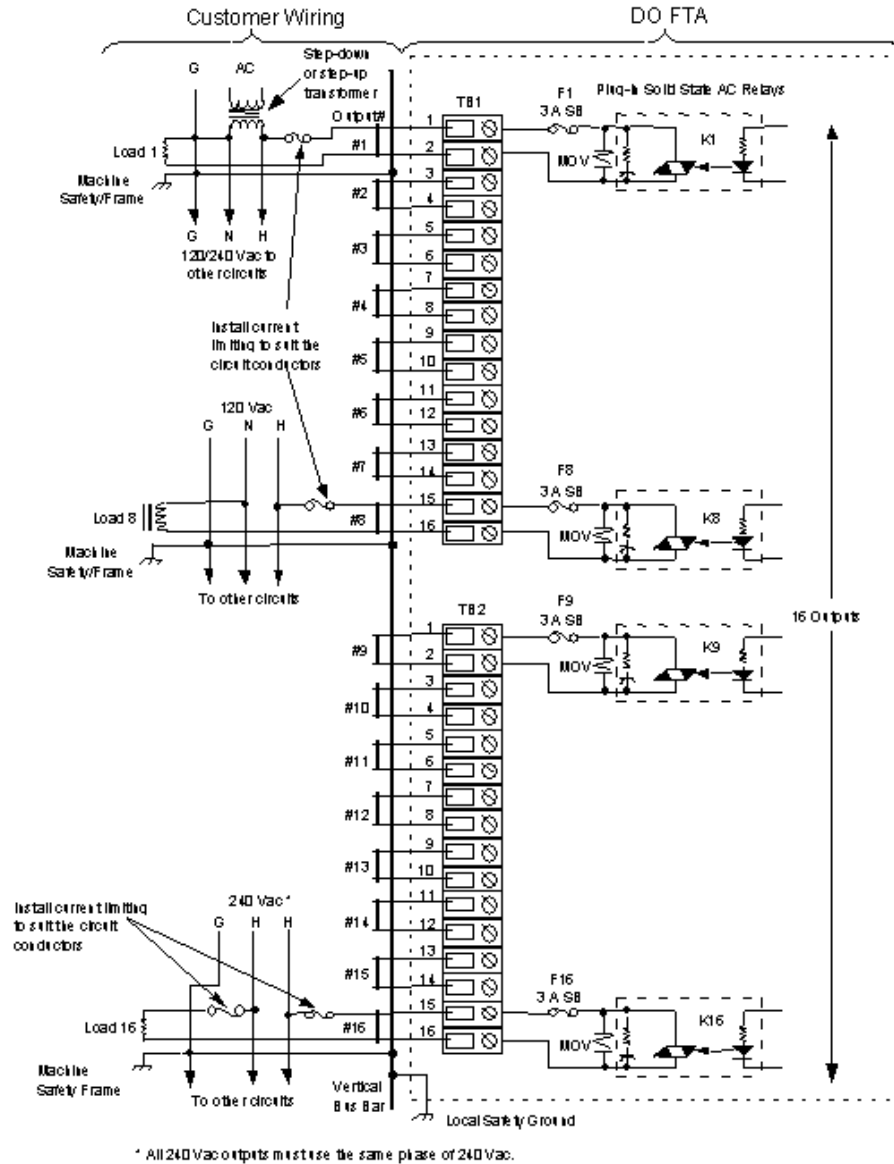
$$PF = \cosine(\arctan X/R) = \cosine(\arctan 519/55) = \cosine 83.9^\circ = 0.105.$$

Therefore, the calculated power factor is below the minimum recommended 0.5 and additional snubbing must be added as described in the CAUTION above.

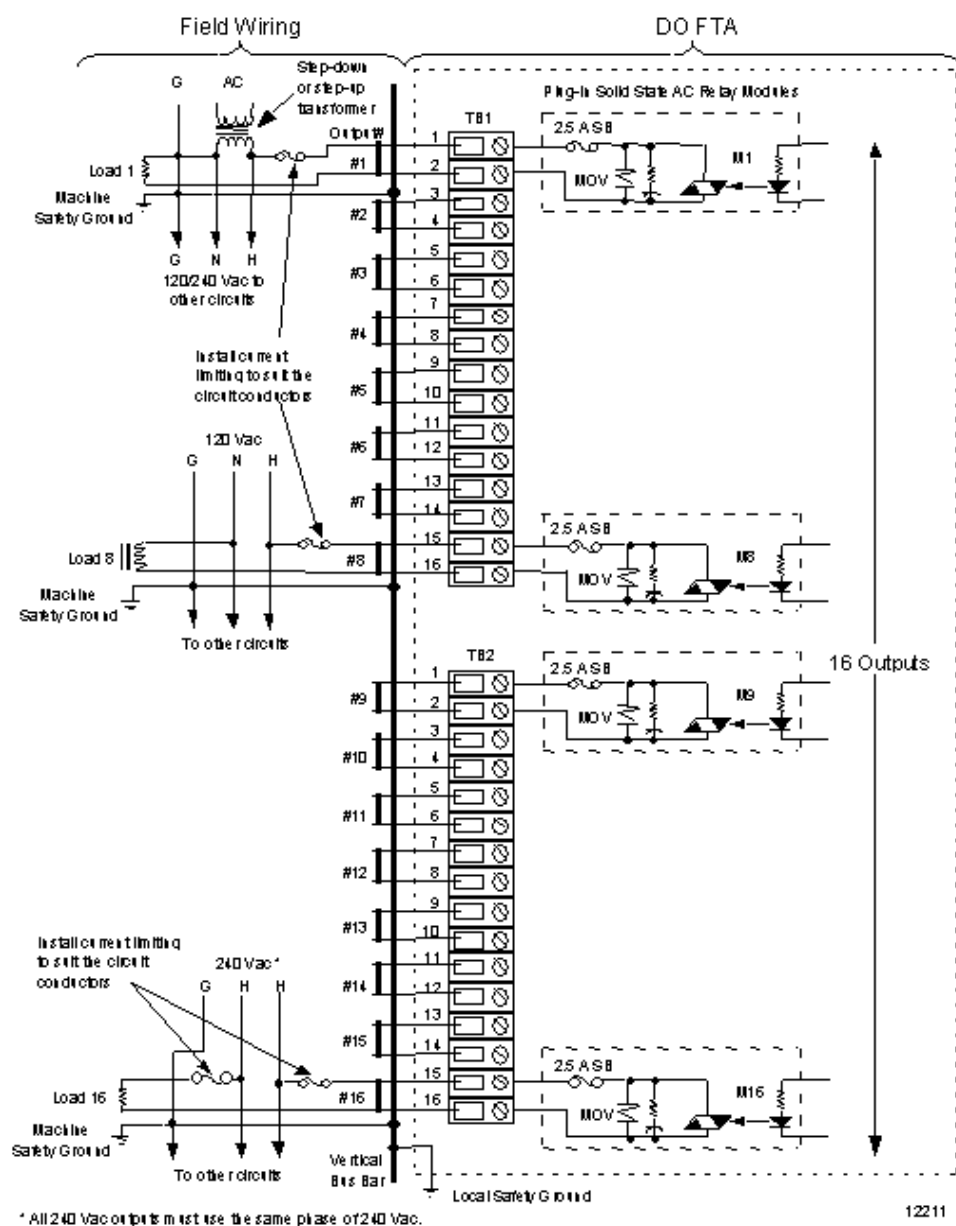
Vertical bus bar

There is usually a safety conductor for each circuit. A vertical bus bar is usually also required to handle the volume of Safety Ground conductors used with these FTAs. Connect each Safety Ground to the vertical bus and connect the vertical bus bar to the local Safety Ground bus bar with a 2.5 mm² (14 AWG) wire.

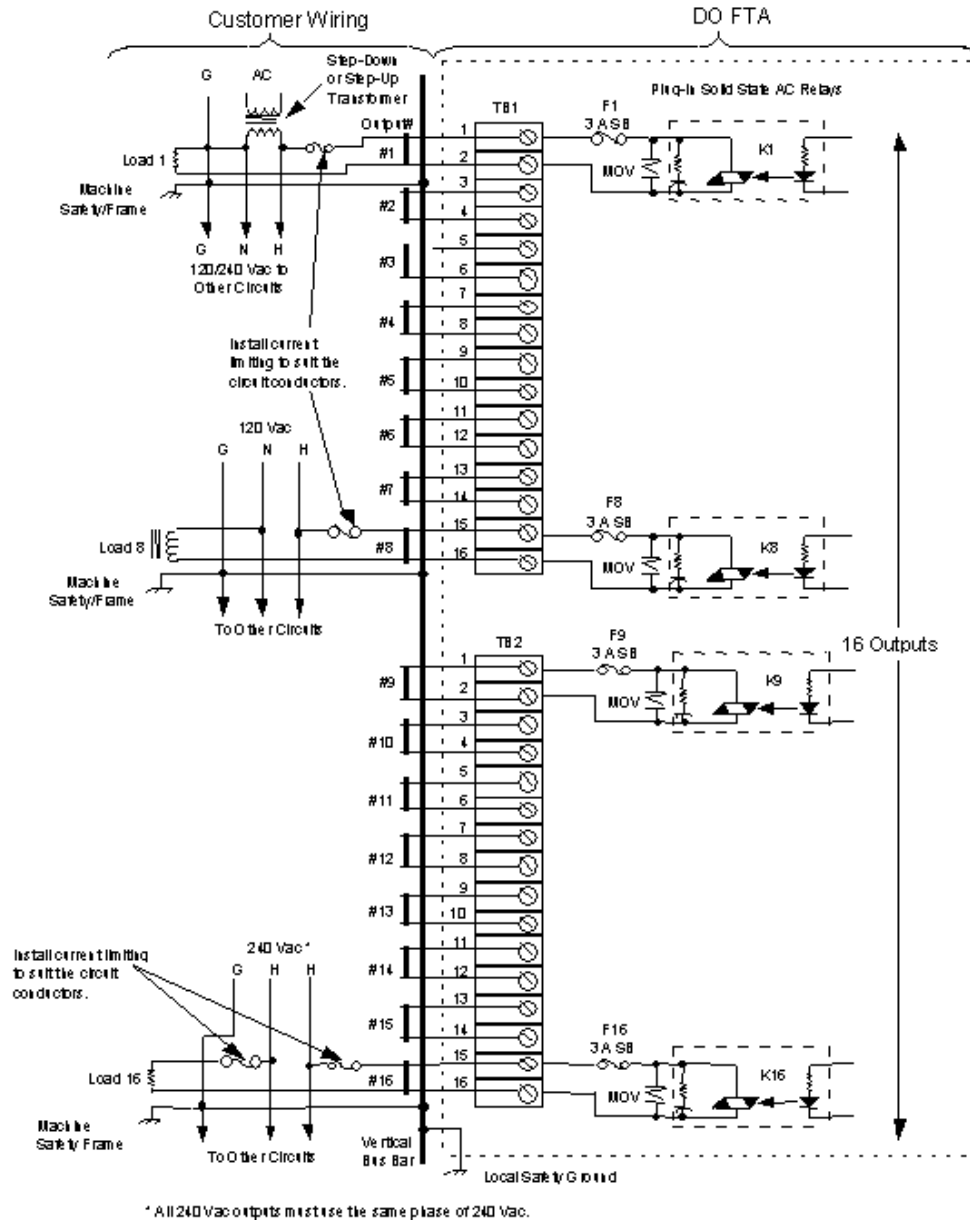
Model MU-TDOA11/MU-TDOA12, 120/240 Vac solid-state digital output FTA connection diagram



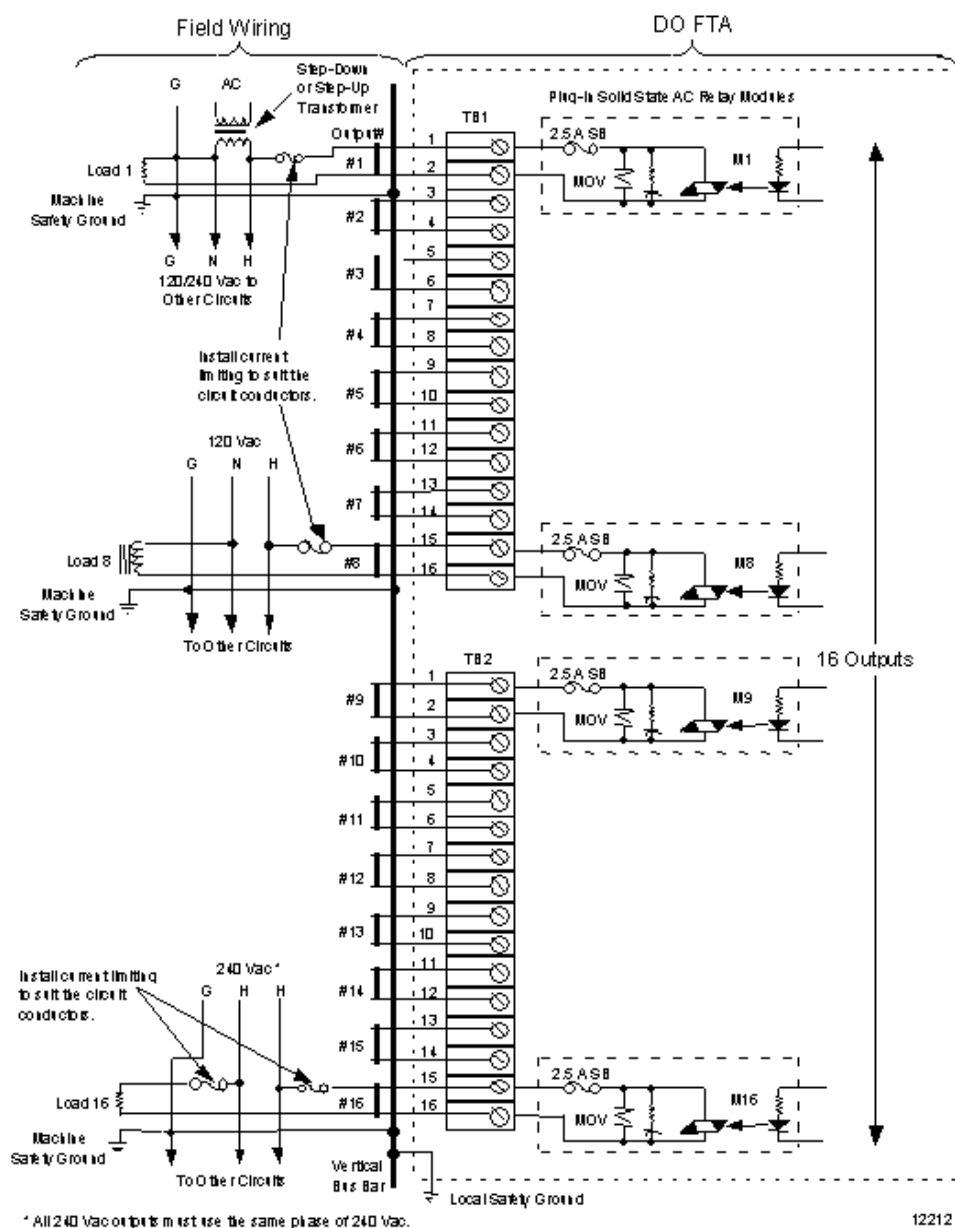
Model MU-TDOA13, 120/240 Vac solid-state digital output FTA connection diagram



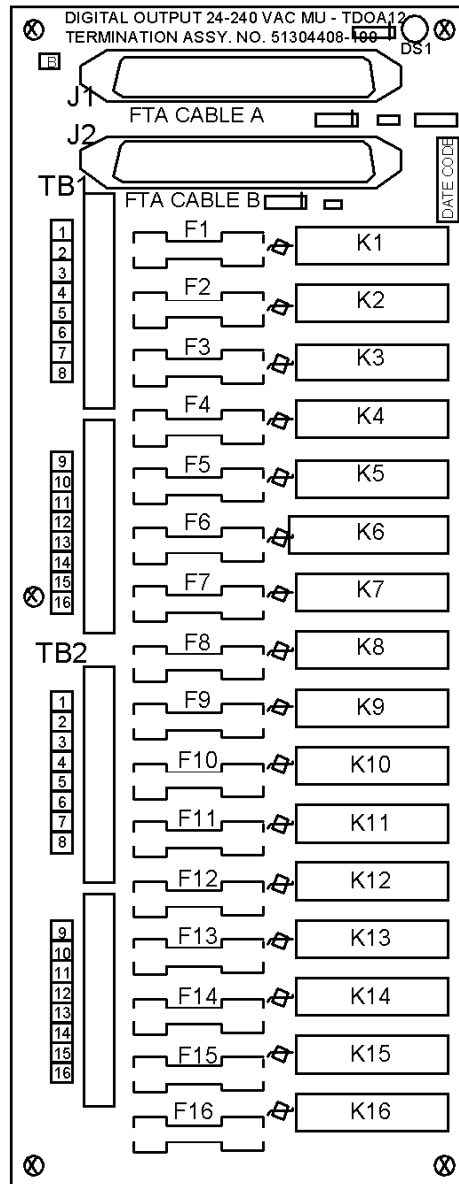
Model MU-TDOA52, 120/240 Vac solid-state digital output FTA connection diagram



Model MU-TDOA53, 120/240 Vac solid-state digital output FTA connection diagram

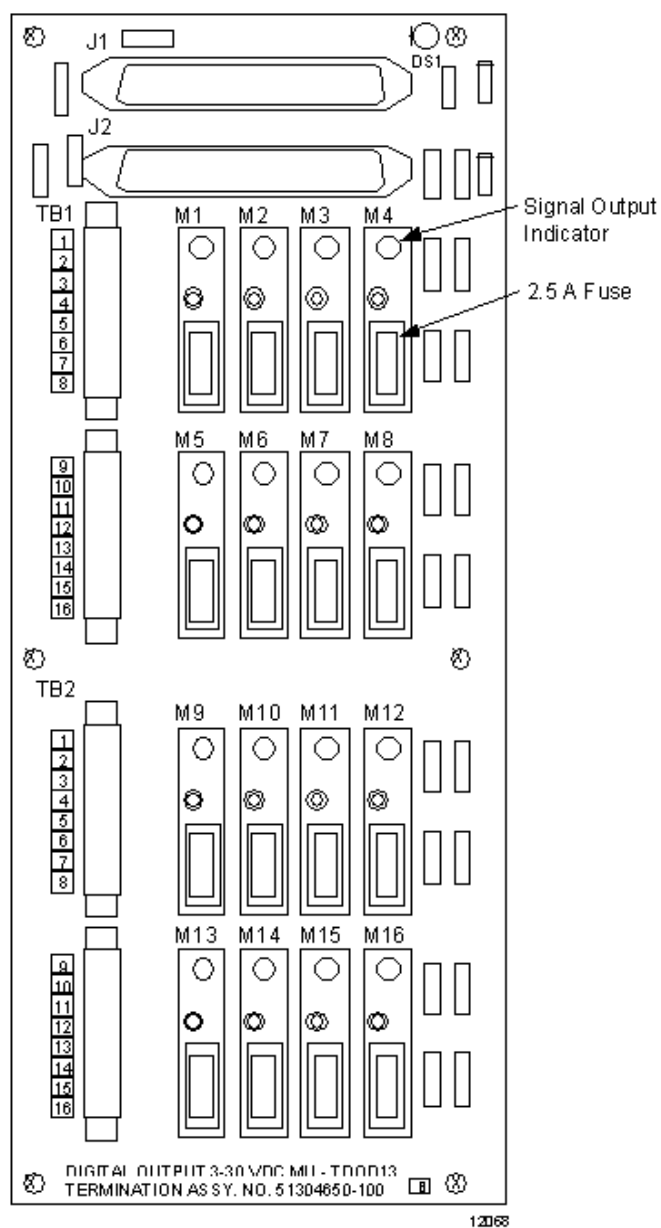


Model MU-TDOA12, 120/240 Vac solid-state digital output FTA assembly layout

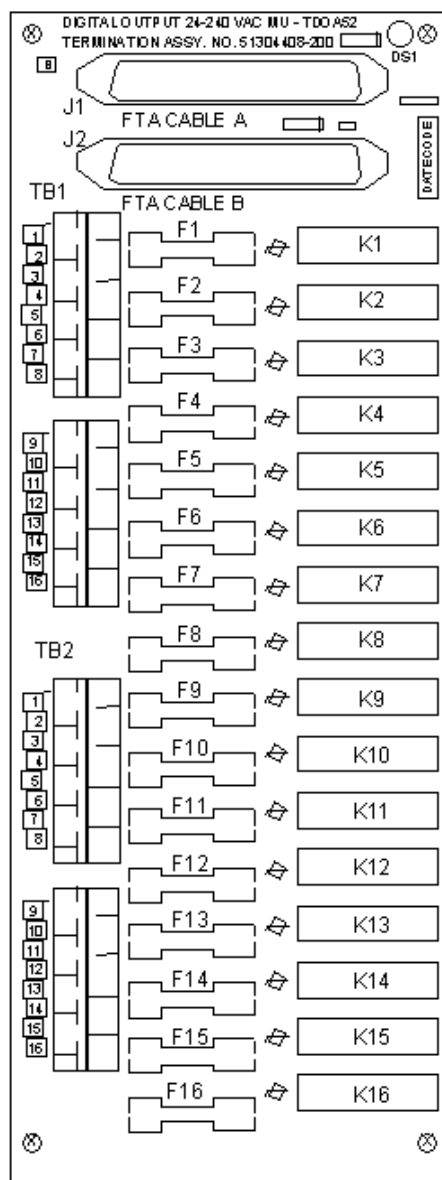


Note: F1 - F16 are 3 A 250 V slow blow fuses.

Model MU-TDOA13, 120/240 Vac solid-state digital output FTA assembly layout

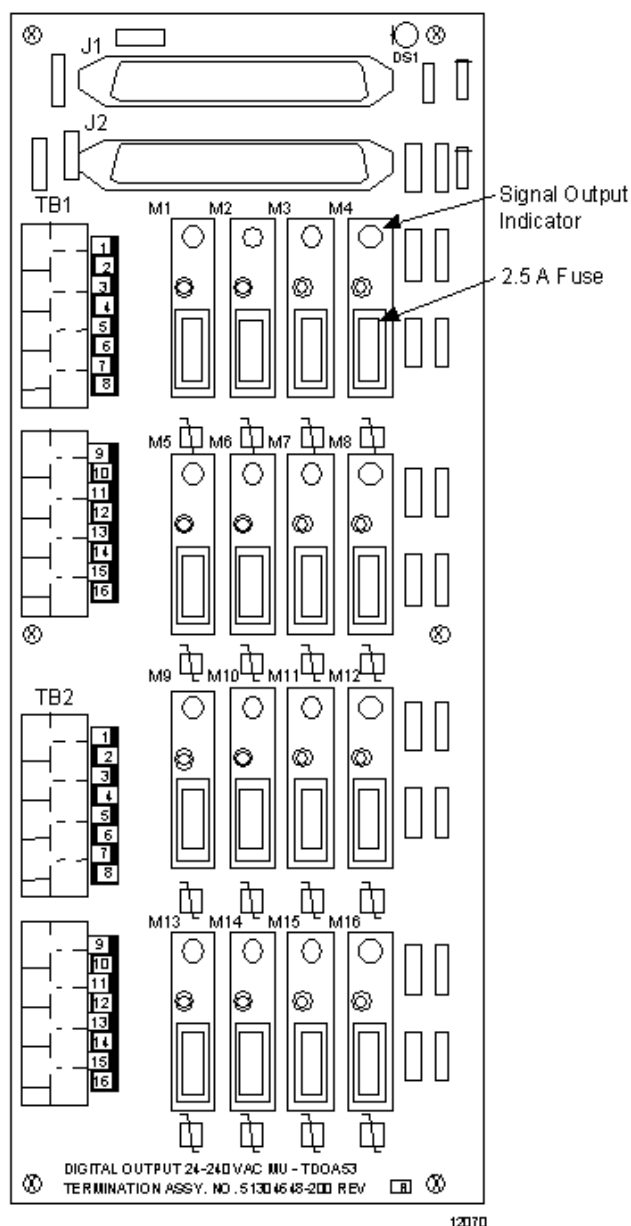


Model MU-TDOA52, 120/240 Vac solid-state digital output FTA assembly layout



Note: F1 - F16 are 3 A 250 V slow blow fuses.

Model MU-TDOA53, 120/240 Vac solid-state digital output FTA assembly layout



120 Vac/125 Vdc Relay Digital Output (DO) FTAs

The 120 Vac/125 Vdc relay Digital Output (DO) FTA has 16 independent electromechanical relays for ac or dc power outputs. The compatible IOP and the FTA support 16 control points (channels).



SHOCK HAZARD

Risk of electrical shock: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible..

CE Compliance

Some 120 Vac/125 Vdc relay Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable.

The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table.

120 Vac/125 Vdc Relay Digital Output FTAs and DO IOPs

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOR11	120 Vac/125 Vdc Relay DO FTA Compression Terminals	51301191-100	N/A
MU-TDOR12	120 Vac/125 Vdc Relay DO FTA Compression Terminals	51304443-100	51309148-125
MC-TDOR12	120 Vac/125 Vdc Relay DO FTA Compression Terminals—Conformally Coated	51304443-150	51309148-175
MU-TDOR52	120 Vac/125 Vdc Relay DO FTA Screw Terminals	51304443-200	51309148-225
MC-TDOR52	120 Vac/125 Vdc Relay DO FTA Screw Terminals—Conformally Coated	51304443-250	51309148-275

Appendix C – **PM I/O FTA Reference**
Digital Output (DO) Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
Supporting IOPs			
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

IOP compatibility

The model MU-PDOX02 Digital Output IOP is compatible with all 120 Vac/125 Vdc relay Digital Output FTAs models.

Table 25 120 Vac/125 Vdc Relay DO FTA Connection Drawings

120 Vac/125 Vdc Relay Digital Output	Connection Diagram	Assembly Layout
FTA Model	<u>MU-TDOR11</u>	
	<u>MU/MC-TDOR12</u>	<u>MU/MC-TDOR12</u> (Non-CE compliant)
		<u>MU/MC-TDOR12</u> (CE compliant)
	<u>MU/MC-TDOR52</u>	<u>MU/MC-TDOR52</u> (Non-CE compliant)
		<u>MU/MC-TDOR52</u> (CE compliant)

Electrical codes

Signals from the FTA are normally considered as signals from power circuits and therefore are subject to electrical codes. Use only cable approved for the operating voltage and current limiting.

Out of phase power

Out of phase 120 Vac load power can be used with adjacent outputs because the inter-output circuitry is rated for 240 Vac rms.

Vertical bus bar

There is usually a safety conductor for each circuit. A vertical bus bar is usually also required to handle the volume of Safety Ground conductors used with these FTAs. Connect each Safety Ground to the vertical bus and connect the vertical bus bar to the local Safety Ground bus bar with a 2.5 mm² (14 AWG) wire.

Cable shield grounding

Any cable shield/ground connects to Safety Ground at the cabinet entry.

Contact arc suppression

See [Contact arc suppression](#) for a discussion of noise suppression and contact arc suppression. Design calculations for the component values also can be found there.

Normally open/closed relay contact selection

The orientation of a pair of wire jumpers on the FTA for each relay, K1 (channel 1) through K16 (channel 16), determines the relay's normal (deenergized) contact output to the channel's terminals. When the jumpers are positioned horizontally, the normally open (N/O) relay contacts are selected. If the jumpers are positioned vertically, the relay's normally closed (N/C) contacts are connected to the channel's terminals. The connection diagrams illustrate examples of relay contact selection.

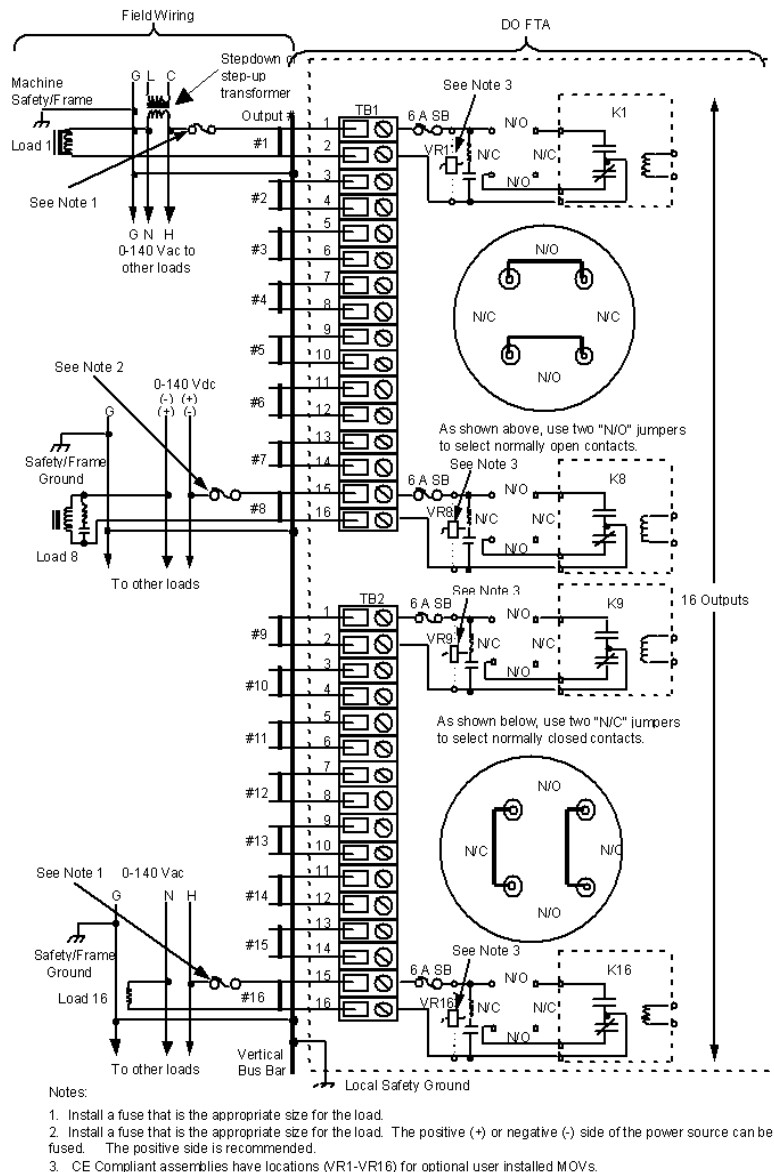


ATTENTION

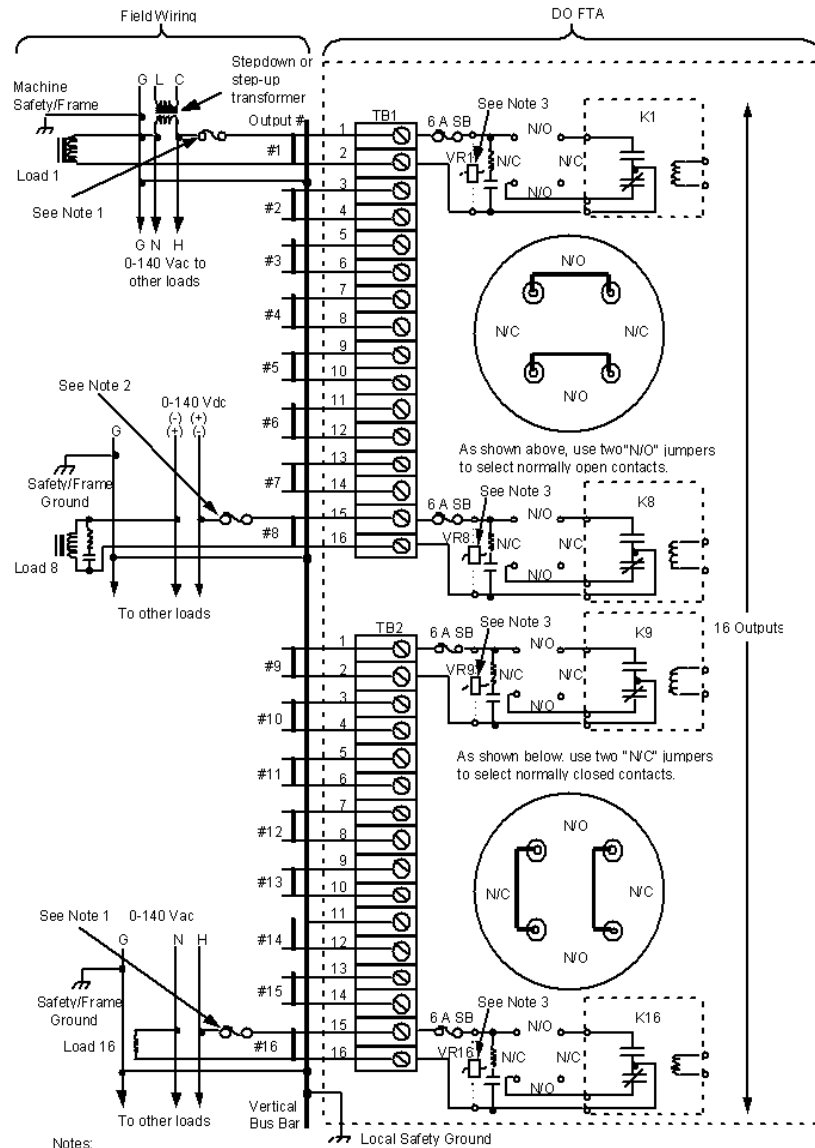
The 51301191-100 assembly and some older versions of the 51304443-xxx assembly have noninsulated (bare) wire jumpers. The bare wire jumpers are more easily handled by using long nose pliers and must be handled only when no load power is present at the FTA terminals

All CE-compliant FTA assemblies (51309148-xxx) have insulated wire jumpers; however, as a safety precaution, the wire jumpers should only be handled when no load power is present at the field terminals.

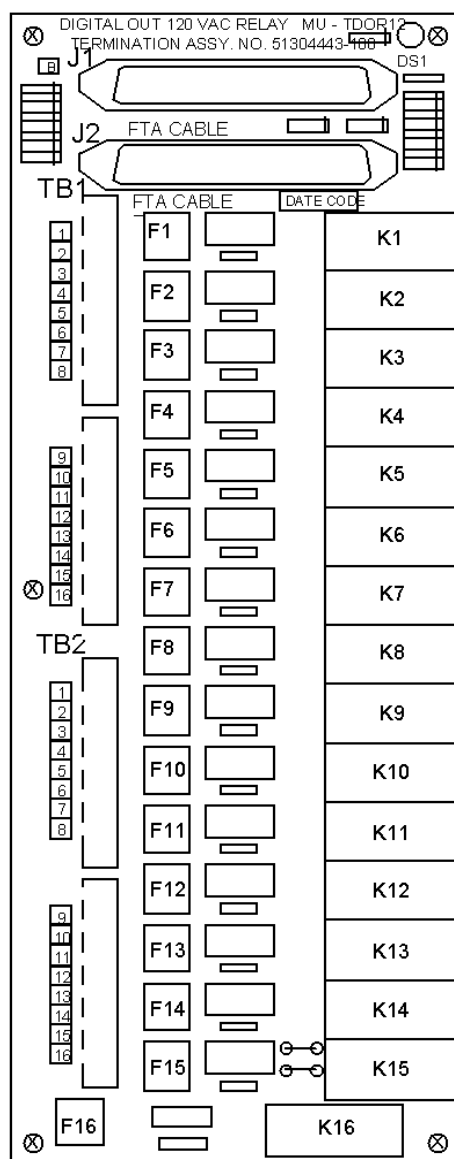
Model MU-TDOR11/MU-TDOR12, 120 Vac/125 Vdc relay digital output FTA connection diagram



Model MU-TDOR52, 120 Vac/125 Vdc relay digital output FTA connection diagram

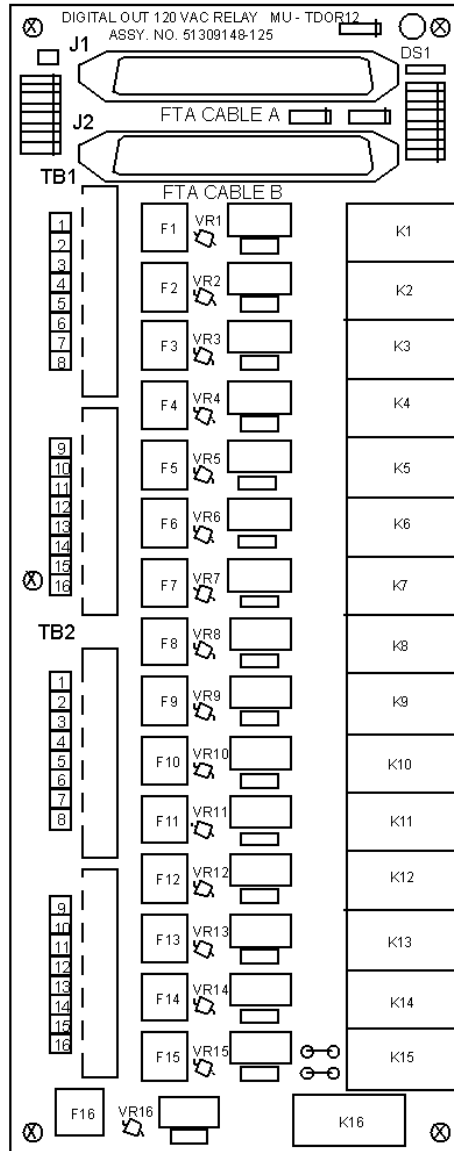


Model MU-TDOR12, 120 Vac/125 Vdc relay digital output FTA assembly layout — non-CE compliant



Note: F1-F16 are 6 A 125 V time-delay fuses.

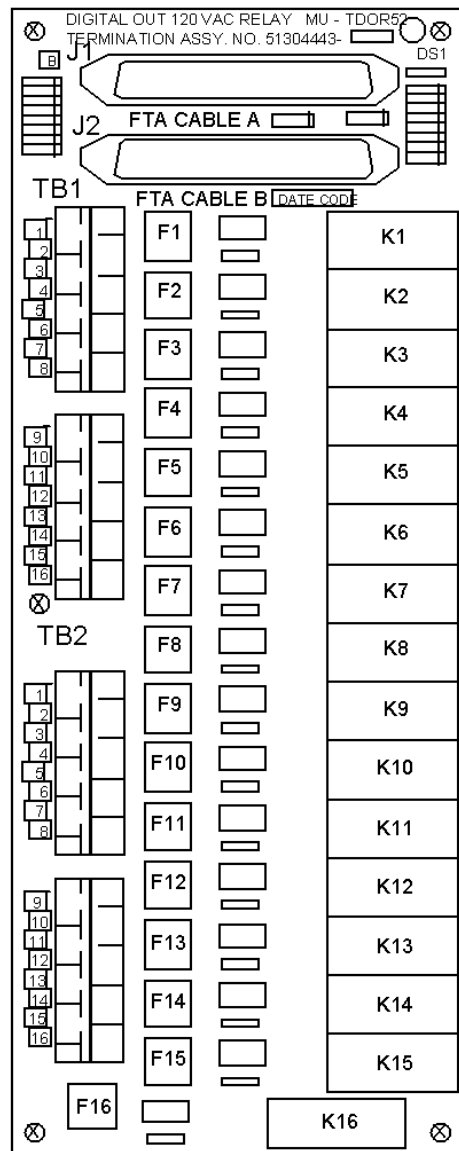
**Model MU-TDOR12, 120 Vac/125 Vdc relay digital output FTA assembly layout
—CE compliant**



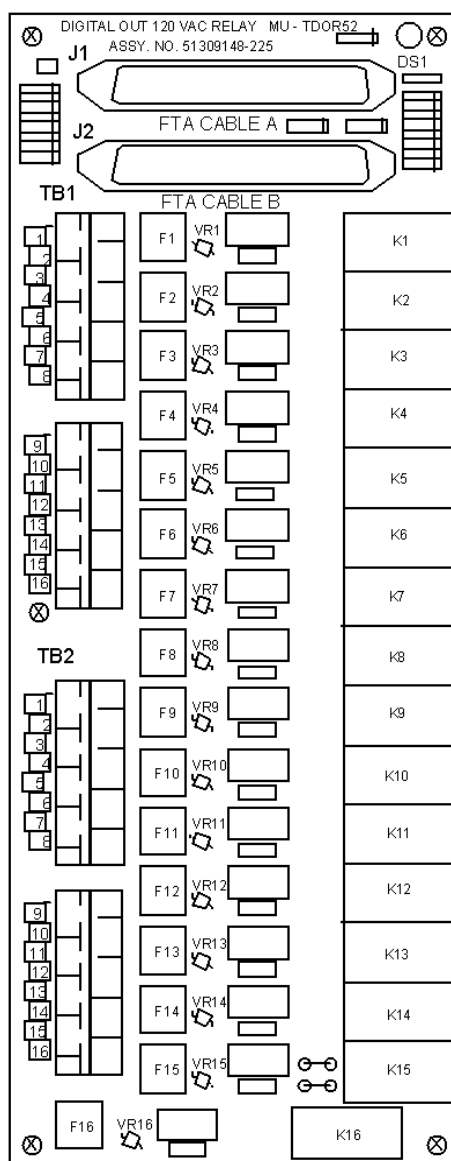
Note: F1-F16 are 6 A 125 V time-delay fuses.

16167

Model MU-TDOR52, 120 Vac/125 Vdc relay digital output FTA assembly layout — non-CE compliant



**Model MU-TDOR52, 120 Vac/125 Vdc relay digital output FTA assembly layout
—CE compliant**



Note: F1-F16 are 6 A 125 V time-delay fuses. 16168

240 Vac/125 Vdc Relay Digital Output (DO) FTAs



SHOCK HAZARD

CAUTION, RISK OF ELECTRIC SHOCK

The 240 Vac/125 Vdc relay Digital Output (DO) FTA has 16 independent electromechanical relays for ac or dc power outputs. The compatible IOP and the FTA support 16 control points (channels). These FTA models and part numbers are listed in the following table.

CE Compliance

Some 240 Vac/125 Vdc relay Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable. The CE Compliant and non-CE Compliant models with their part numbers are listed in the following table.

240 Vac/125 Vdc Relay Digital Output FTAs and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOY23	240 Vac/125 Vdc Relay DO FTA Compression Terminals	80366189-100	80366189-125
MC-TDOY23	240 Vac/125 Vdc Relay DO FTA Compression Terminals—Conformally Coated	80366189-150	80366189-175
MU-TDOY63	240 Vac/125 Vdc Relay DO FTA Screw Terminals	80366186-100	80366186-125
MC-TDOY63	240 Vac/125 Vdc Relay DO FTA Screw Terminals—Conformally Coated	80366186-150	80366186-175
Supporting IOPs			
MU-PDOY22	Digital Output IOP	N/A	80363975-100
MC-PDOY22	Digital Output IOP—Conformally Coated	N/A	80363975-150

Electrical codes

Signals from the FTA are normally considered as signals from power circuits and therefore are subject to electrical codes. Use only cable approved for the operating voltage and current limiting.

Adjacent channels must use the same load power phase to avoid exceeding the 240 Vac interchannel circuitry limit.

Vertical bus bar and cable shield grounding

There is usually a safety wire for each circuit. A vertical bus bar is usually required to handle the volume of Safety Ground wires used with the FTAs. Connect each Safety Ground wire to the vertical bus bar and then connect the vertical bus bar to the local Safety Ground bus bar with a 2.5 mm² (14 AWG) wire.

Any cable shield/ground must connect to Safety Ground at the cabinet entry.

Contact arc suppression

See [Contact arc suppression](#) for a discussion of noise suppression and contact arc suppression. Design calculations for the component values also can be found there.

Model MU-TDOY23/63 FTAs



SHOCK HAZARD

CAUTION, RISK OF ELECTRIC SHOCK.

The model MU-PDOY22 IOP supports 32 points (output circuits). Because the model MU-TDOY23 and MU-TDOY63 FTAs provide only 16 output circuits, two FTAs must be used to take advantage of the IOP's 32-point capability.

FTA configuration pinning

Because the model MU-PDOY22 IOP supports 32 channels and the FTA supports only 16 channels, a method of pinning is provided to signal the IOP(s) that an FTA is present or absent.

In a configuration where two FTAs are required, the “FTA Missing” status must be detected when only one FTA is present; however, in a configuration where only one FTA is required, the “FTA Missing” status must not be detected when only one FTA is present. A pinning method on the FTA(s) signals whether one or two FTAs are required.

Four jumper positions are provided on the FTA to indicate the FTA configuration. The jumper positions are P17, P18, P19, and P36. The jumper combinations are listed in the following table.

Model MU-TDOY23/63 FTA Configuration Jumper Selection

	Single FTA Configuration (Position Selection)	Dual FTA Configuration (Position Selection)
FTA 1	P17 and P18	P19 and P36
FTA 2	None	P17 and P18

FTA cabling diagram

Figure 56 is a typical IOP to FTA cabling diagram. An interface between the two FTAs is provided by a bridge cable. Two lengths, model MU-KBFT01 (1.0 meter) or model MU-KBFT02 (2 meters), are available. The Honeywell part numbers are 80366198-100 and 80366198-200, respectively. J3 is the FTA bridge connector.

Connect the IOP, or IOPs when redundant, to only one FTA. The FTA selected is assigned channels 1 through 16 by the IOP. The “bridged” FTA is assigned channels 17 through 32.

When FTA A cable is disconnected, IOP A detects an “FTA Missing” status. When FTA B cable is disconnected, IOP B detects an “FTA Missing” status. When the bridge cable is disconnected in a dual FTA configuration, both IOP A and IOP B detect an “FTA Missing” status. IOP B must be configured as redundant to detect an “FTA Missing” status.

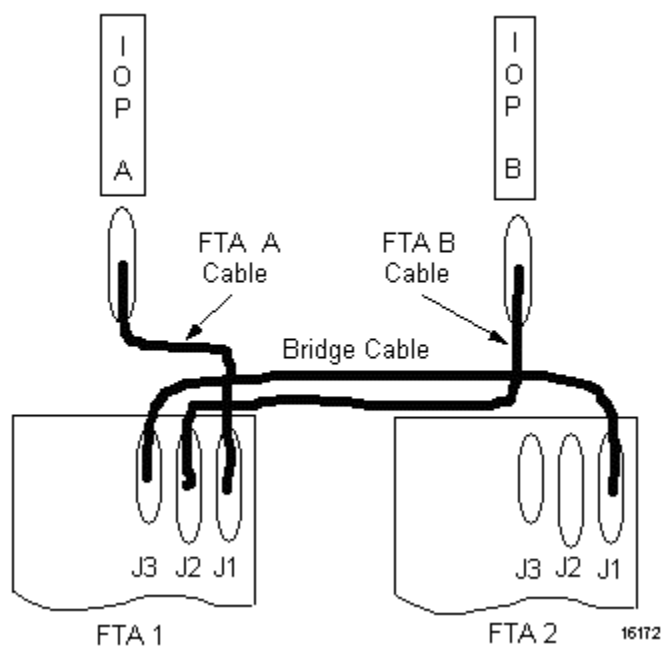


Figure 56 Model MU-TDOY23/63 FTA Cabling Diagram

Normally open/closed relay contact selection

The orientation of a wire jumper on the FTA for each relay, K1 (channel 1 or 17) through K16 (channel 16 or 32), determines the relay's normal (deenergized) contact output to the channel's field terminals. The jumper positioners are designated P20 through P35, respectively. When the jumper is positioned horizontally, the normally open (NO) relay contacts are selected. If the jumper is positioned vertically, the relay's normally closed (NC) contacts are connected to the channel's field terminals. The following connection diagrams for model MU-TDOY23 and MU-TDOY63 illustrate examples of the relay contact selection.

Reverse voltage suppression

The FTA offers optional reverse voltage suppression when the relay output load includes a large inductance. It can be selected individually for each channel by inserting a jumper in positions P1 through P16 for channels 1 through 16 (17 through 36), respectively. Installing the jumper places a resistor-capacitor (RC) network across the relay contacts.

CAUTION

The bare-wire jumpers are easily inserted by using long nose pliers, but only when no load power is present at the FTA terminals.

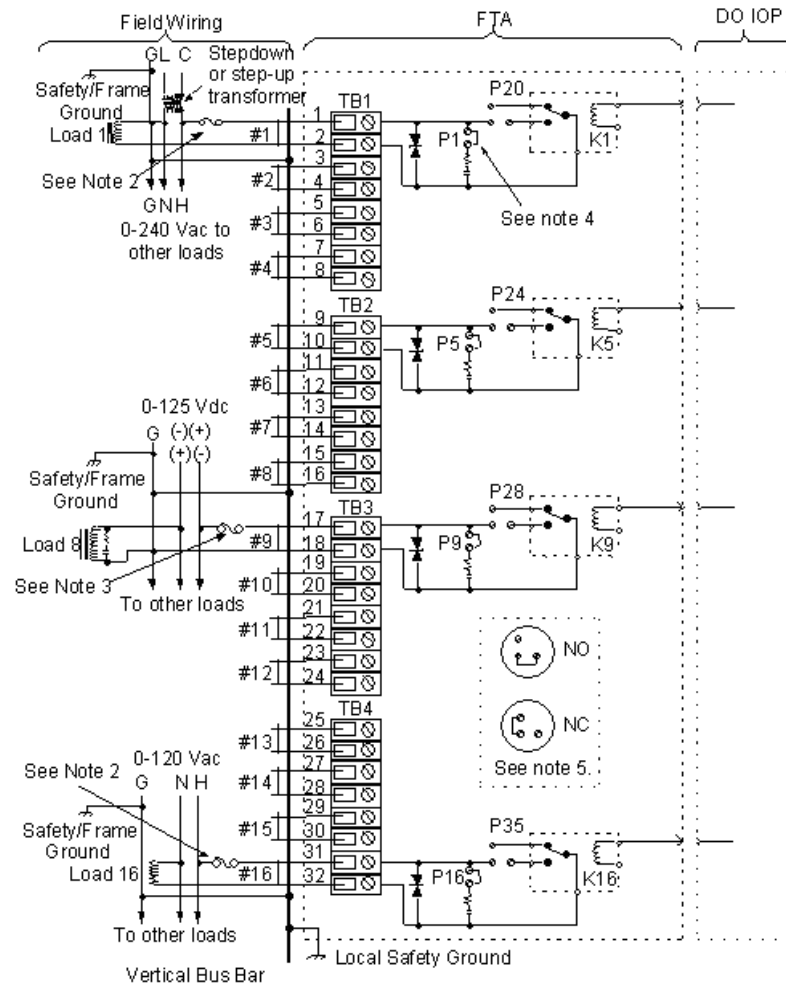
Connection diagrams and assembly layouts

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of 240 Vac/125 Vdc Relay DO FTAs are given in the following figures listed in Table 26.

Table 26 240 Vac/125 Vdc Relay DO FTA Connection Drawings

240 Vac/125 Vdc Relay Digital Output	Connection Diagram	Assembly Layout
FTA Model	MU/MC-TDOY23	MU/MC-TDOY23
	MU/MC-TDOY63	MU/MC-TDOY63

Model MU-TDOY23, 240 Vac/125 Vdc relay digital output FTA connection diagram

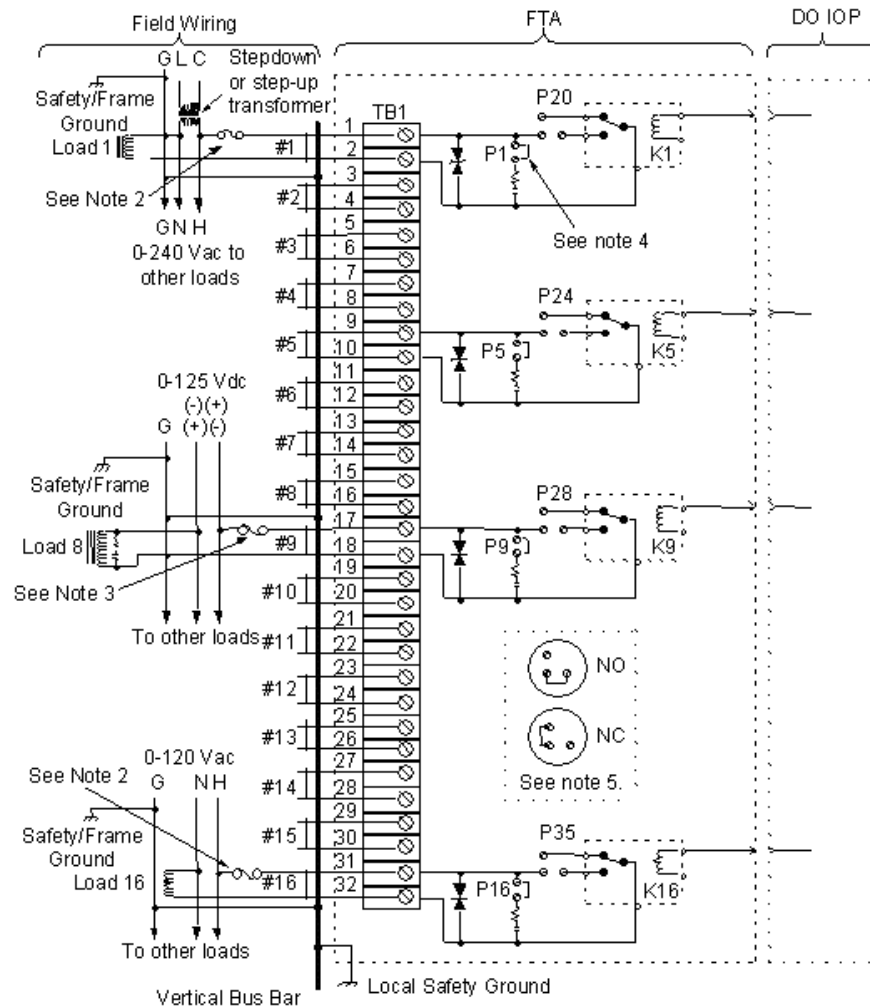


Notes:

1. All 240 Vac outputs must use the same Vac phase. 120 Vac outputs can use different phases.
2. Install a fuse that is the appropriate size for the load.
3. Install a fuse that is the appropriate size for the load. It can be installed on either the positive (+) or negative (-) side (positive side is recommended) of the power source.
4. Installation of a jumper in P1 through P16 provides contact bounce suppression.
5. Positioning of the jumper for P20 through P35 selects either normally open (NO) or normally closed (NC) relay contact operation.

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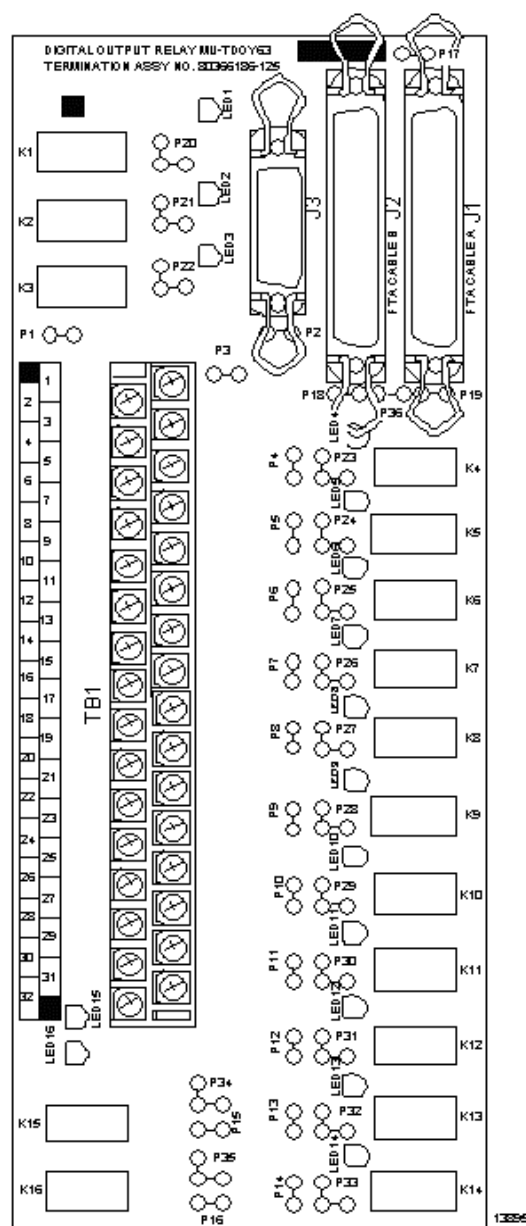
Model MU-TDOY63, 240 Vac/125 Vdc relay digital output FTA connection diagram



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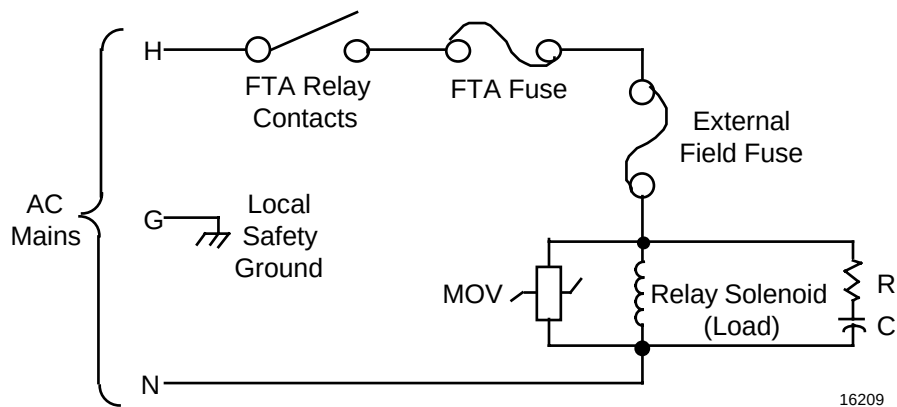
Model MU-TDOY63, 240 Vac/125 Vdc relay digital output FTA assembly layout



Contact Arc Suppression

Before deenergizing an inductive load, such as a relay or solenoid coil, a certain amount of energy is stored in the load. When the relay contact opens, deenergizing the load, a high voltage transient is produced. As illustrated in the following figure, a MOV or RC circuit in parallel with the load that is as physically close to the load as possible provides a place where this transient energy can be dissipated.

If there is no MOV or RC snubber circuit, however, the transient energy can create a visible arc across the opening contacts. The arc contributes to electrical noise in the installed environment and degrades the life of the relay contacts.

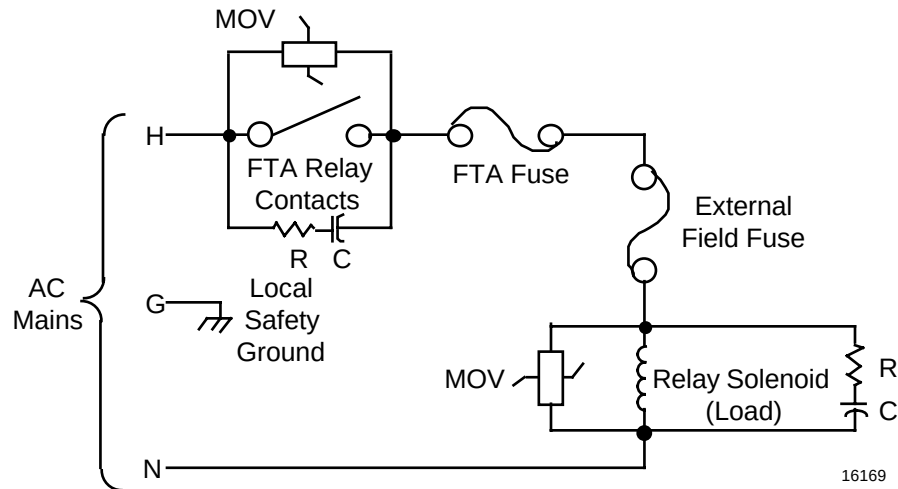


Inductive Load Transient Overvoltage and EMI Suppression

One way to suppress an arc is to connect an MOV or RC circuit across the relay contacts as illustrated in the following figure. The arc suppression network component values on the FTA have been properly coordinated for use with the ac power mains to maximize relay contact life for load currents of up to 1 ampere for 120 Vac models and 0.5 amperes for 240 Vac models.

If the relay contacts are used for higher load currents without additional suppression, contact life will be reduced. For higher load currents, extra arc suppression with a resistor and capacitor (RC) is required as illustrated in the following figure. The design calculations for the additional external component values are found in Contact arc suppressor selection.

Both the 120 Vac/125 Vdc and 240 Vac/125 Vdc relay Digital Output FTAs can also accommodate dc loads of up to 125 Vdc, and both types of FTAs use relays that are rated for 240 Vac. The RC snubber values are different on the two types of FTA assemblies.



Relay Contacts Transient Overvoltage and EMI Suppression

Contact arc suppressor selection

Calculation for a resistor-capacitor contact arc suppressor is as follows:

Let I_p be the contact current immediately before opening, either average dc or peak ac.

Let E_p be the supply voltage before the closing of the contacts, either average dc or peak ac.

Capacitor selection formula

Calculate the suppression capacitor C from the formula:

$$C = I_p^2 / 10 \text{ microfarads}$$

The current used in the calculation should be reduced by 1 ampere (120 Vac FTA) or 0.5 ampere (240 Vac FTA) because the suppression circuit on the FTA already accommodates this level. Should a capacitance less than 0.001 microfarads be calculated, use 0.001 microfarads instead.

Resistor selection formula

Calculate the suppression resistor R from the formula

$$R = E_p / (10 \times I_p^{(1 + 50/E_p)}) \text{ ohms}$$

As above, deduct 0.5 ampere before performing the calculation because the suppression circuit on the FTA already accommodates this level. Should a resistance of less than 0.5 ohms be calculated, use 0.5 ohms instead.

An example

A 2-ampere ac rms 240 Vac load has a peak current of $2 \times \sqrt{2} = 2.83$ amperes. Because the FTA already has 0.5 ampere peak of contact suppression on the FTA, calculate the suppressor for $2.83 - 0.5 = 2.33$ amperes. The peak voltage for 240 Vac is $240 \times \sqrt{2} = 339$ volts.

$$\begin{aligned} C &= 2.33^2 / 10 \\ &= 0.54 \text{ microfarad} \\ R &= 339 / (10 \times 2.33^{(1 + 50/339)}) \\ &= 12.85 \text{ ohms} \end{aligned}$$

Install the arc suppressor across the FTA terminals to protect the relay contacts from excessive arcing.

Appendix D – GI FTA Reference

Overview

Galvanically Isolated (GI) FTAs can be used to provide an intrinsically safe interface directly to hazardous-area processes. A variety of GI FTAs are available for analog output, analog input, digital input and digital output and are described in the following table.

Model Number Group	Signal Type	Description
MU/MC-GAIHxx	<u>High Level Analog Input (HLAI)</u>	High Level Analog Input (HLAI) galvanically isolated FTAs accommodate up to 16 high level dc signals. The FTAs provide dc power to energize a 2-wire or 3-wire, 4-20 mA transmitter in a hazardous area and repeat the current accurately in another circuit to drive a range spool in the safe area, generating a 1 to 5 Vdc signal to the associated IOP
MU/MC-GAOXxx MU/MC-GHAOxx	<u>Analog Output (AO)</u>	Galvanically isolated Analog Output (AO) FTAs isolate up to eight 4-20 mA signals that can drive current-to-pressure (I/P) transducers, position actuators, or any load of 750-ohms or less from the associated Analog Output IOP.
MU/MC-GDIDxx	<u>Digital Input (DI)</u>	Digital Input (DI) galvanically isolated FTAs accommodate up to 32 switch or proximity detector inputs from a hazardous area, isolates the signals, and presents them to the associated Digital Input IOP in a safe area
MU/MC-GDODxx MU/MC-GDOLxx	<u>Digital Output (DO)</u>	Digital Output (DO) galvanically isolated FTA can drive up to 16 certified intrinsically safe loads in a hazardous area. The load can be a solenoid or an alarm, as well as a nonenergy-storing "simple apparatus," such as an LED.

Appendix D – GI FTA Reference

High Level Analog Input (HLAI) GI FTA Wiring

High Level Analog Input (HLAI) GI FTA Wiring

All High Level Analog Input (HLAI) Galvanically Isolated FTAs accommodate up to 16 high level dc signals. The FTAs provide dc power to energize a 2-wire or 3-wire, 4-20 mA transmitter in a hazardous area and repeat the current accurately in another circuit to drive a range spool in the safe area, generating a 1 to 5 Vdc signal to the associated IOP.

FTA Compatibility

All FTAs are suitable for conventional field transmitters, while some FTA models also support HART and other “smart” transmitters whose digital communication signals are superimposed on a standard 4-20 mA signal. The available HLAI galvanically isolated FTA models are listed in the following table with a brief description and the listed part numbers for both CE compliant and non-CE compliant versions.

Review Appendix F of the *Planning Guide* for more detailed descriptions of each FTA.

Analog Input Galvanically Isolated FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GAIH12	High Level Analog Input FTA— voltage outputs to both the IOP and an auxiliary connector	51304636-100	N/A
MC-GAIH12	High Level Analog Input FTA— voltage outputs to both the IOP and an auxiliary connector – Conformally coated	51304636-150	N/A
MU-GAIH82	High Level Analog Input FTA— voltage outputs to both the IOP and an auxiliary connector	51304636-300	N/A
MC-GAIH82	High Level Analog Input FTA— voltage outputs to both the IOP and an auxiliary connector – Conformally coated	51304636-350	N/A
MU-GAIH13	High Level Analog Input/HART/Smart Transmitter Interface FTA— voltage outputs to both the IOP and an auxiliary connector	51304718-100	51304718-125

Appendix D – GI FTA Reference
High Level Analog Input (HLAI) GI FTA Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-GAIH13	High Level Analog Input/HART/Smart Transmitter Interface FTA— voltage outputs to both the IOP and an auxiliary connector – Conformally coated	51304718-150	51304718-175
MU-GAIH83	High Level Analog Input/Smart Transmitter Interface FTA— voltage outputs to both the IOP and an auxiliary connector	51304718-300	51304718-325
MC-GAIH83	High Level Analog Input/Smart Transmitter Interface FTA— voltage outputs to both the IOP and an auxiliary connector – Conformally coated	51304718-350	51304718-375
MU-GAIH14	High Level Analog Input/HART/Smart Transmitter Interface FTA— with device high drive and voltage outputs to both the IOP and an auxiliary connector	51304730-100	51304730-125
MC-GAIH14	High Level Analog Input/HART/Smart Transmitter Interface FTA— with device high drive and voltage outputs to both the IOP and an auxiliary connector – Conformally coated	51304730-150	51304730-175
MU-GAIH84	High Level Analog Input/Smart Transmitter Interface FTA— with device high drive and voltage outputs to both the IOP and an auxiliary connector	51304730-300	51304730-325
MC-GAIH84	High Level Analog Input/Smart Transmitter Interface FTA— with device high drive and voltage outputs to both the IOP and an auxiliary connector – Conformally coated	51304730-350	51304730-375

Appendix D – GI FTA ReferenceHigh Level Analog Input (HLAI) GI FTA Wiring

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GAIH22	High Level Analog Input/HART Transmitter FTA— with voltage outputs to the IOP and current outputs to an auxiliary connector (Auxiliary receiver output)	51304748-100	51304748-125
MC-GAIH22	High Level Analog Input/HART Transmitter FTA— with voltage outputs to the IOP and current outputs to an auxiliary connector (Auxiliary receiver output) – Conformally coated	51304748-150	51304748-175
MU-GAIH92	High Level Analog Input FTA— with voltage outputs to the IOP and current outputs to an auxiliary connector (Auxiliary receiver output)	51304748-300	51304748-325
MC-GAIH92	High Level Analog Input FTA— with voltage outputs to the IOP and current outputs to an auxiliary connector (Auxiliary receiver output) – Conformally coated	51304748-350	51304748-325

Cable connections to FTAs

FTA Connector	Connection Used For . . .
J17	FTA Cable A
J18	FTA Cable B (for redundant IOPs)
J19	Marshalling Panel
J20 and J21	24V dc input from Power Distribution Assembly

Field wiring input signals

Each Galvanic Isolation Module on the HLAI FTA provides a floating dc source for energizing conventional 2-wire or 3-wire 4-20 mA transmitters. The Galvanic Isolation Module accurately repeats the input current. The module's 4-20 mA output current is converted into a 1 to 5 volt signal across a 250-ohm high precision resistor and presented to the associated IOP.

Assembly layout drawings and connection diagrams

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the HLAI GI FTAs are given in the following figures listed in Table 27.

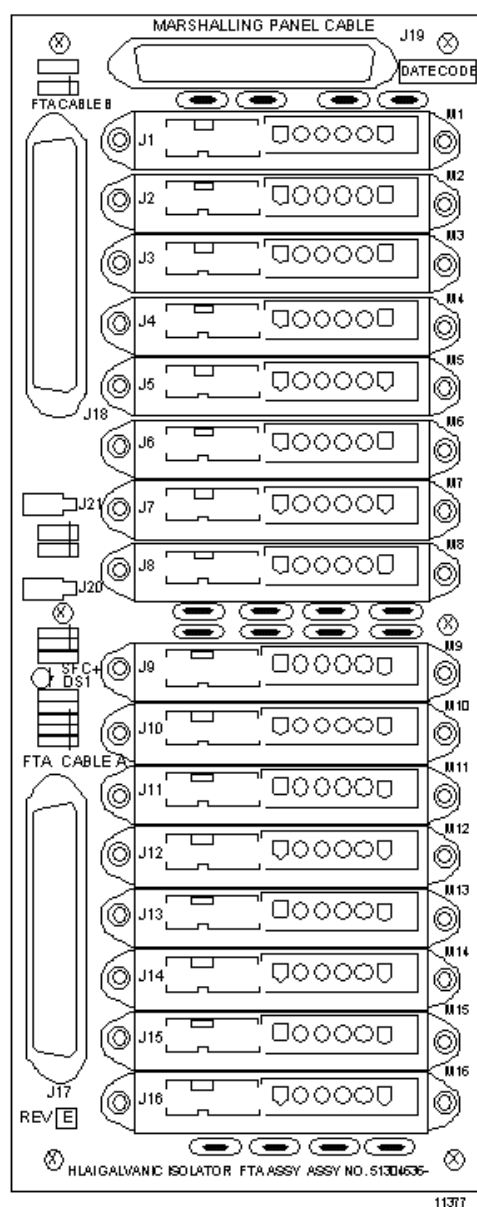
Table 27 HLAI GI FTA Connection Drawings

High Level Analog Input Galvanically Isolated	Assembly Layout	Connection Diagram
FTA Model	<u>MU/MC-GAIH12/82</u>	<u>MU/MC-GAIH12/82</u>
	<u>MU/MC-GAIH13/83</u>	<u>MU/MC-GAIH13/83</u>
	<u>MU/MC-GAIH14/84</u>	<u>MU/MC-GAIH14/84</u>
	<u>MU/MC-GAIH22/92</u>	<u>MU/MC-GAIH22/92</u>

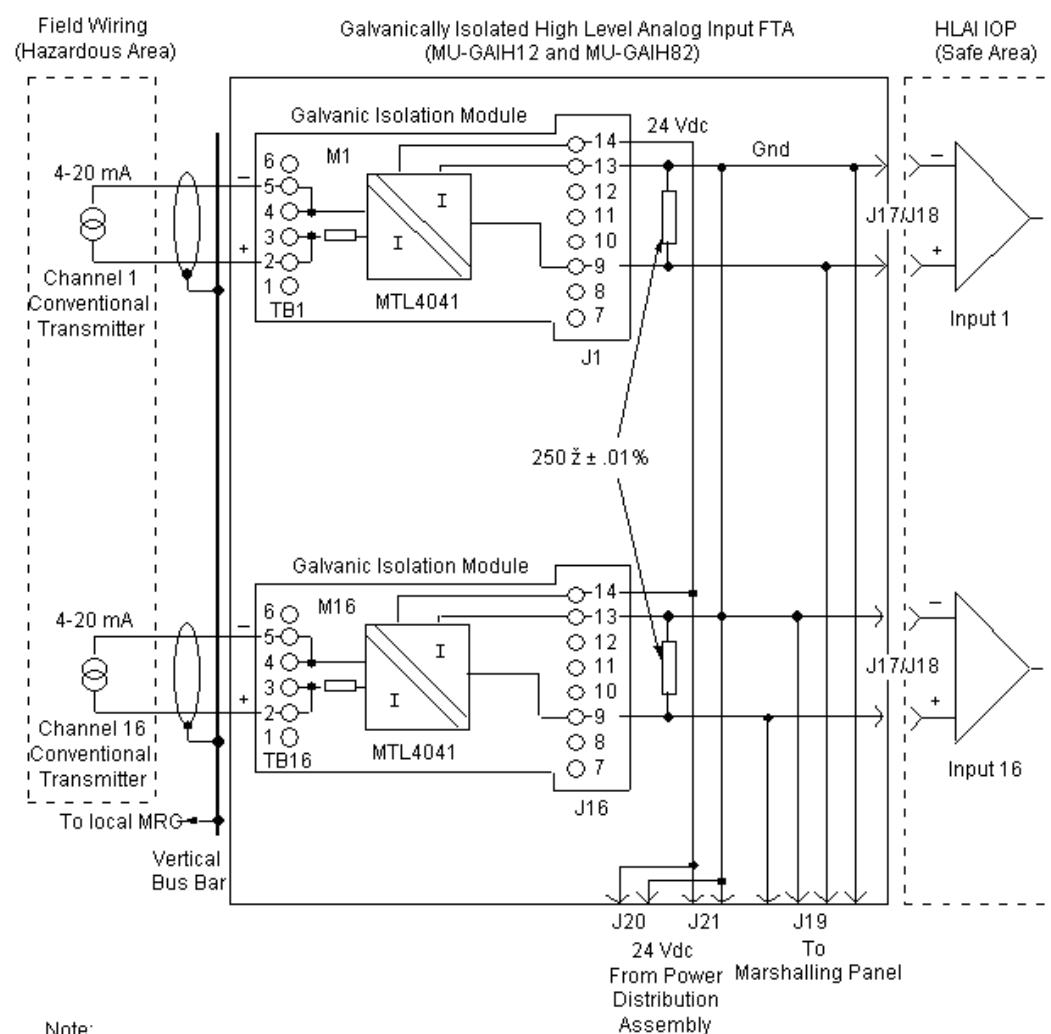
Appendix D – GI FTA Reference

High Level Analog Input (HLAI) GI FTA Wiring

Model MU-GAIH12/82 high level analog input GI FTA assembly layout



Model MU-GAIH12/82 high level analog input GI FTA connection diagram



Note:

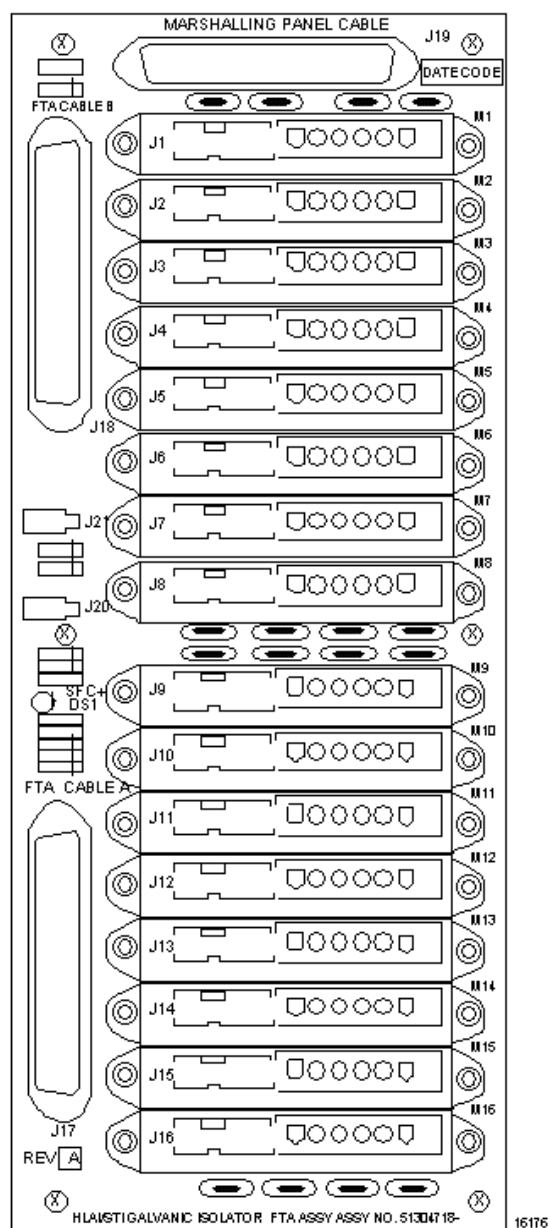
The IOP interface connectors, J17 and J18, can interface to redundant IOPs.
J17 is the primary connector interface to IOP A, and J18 is the secondary connector interface to IOP B.
The Galvanic Isolation Module is Honeywell part number 51191697-100 (MTL4041).

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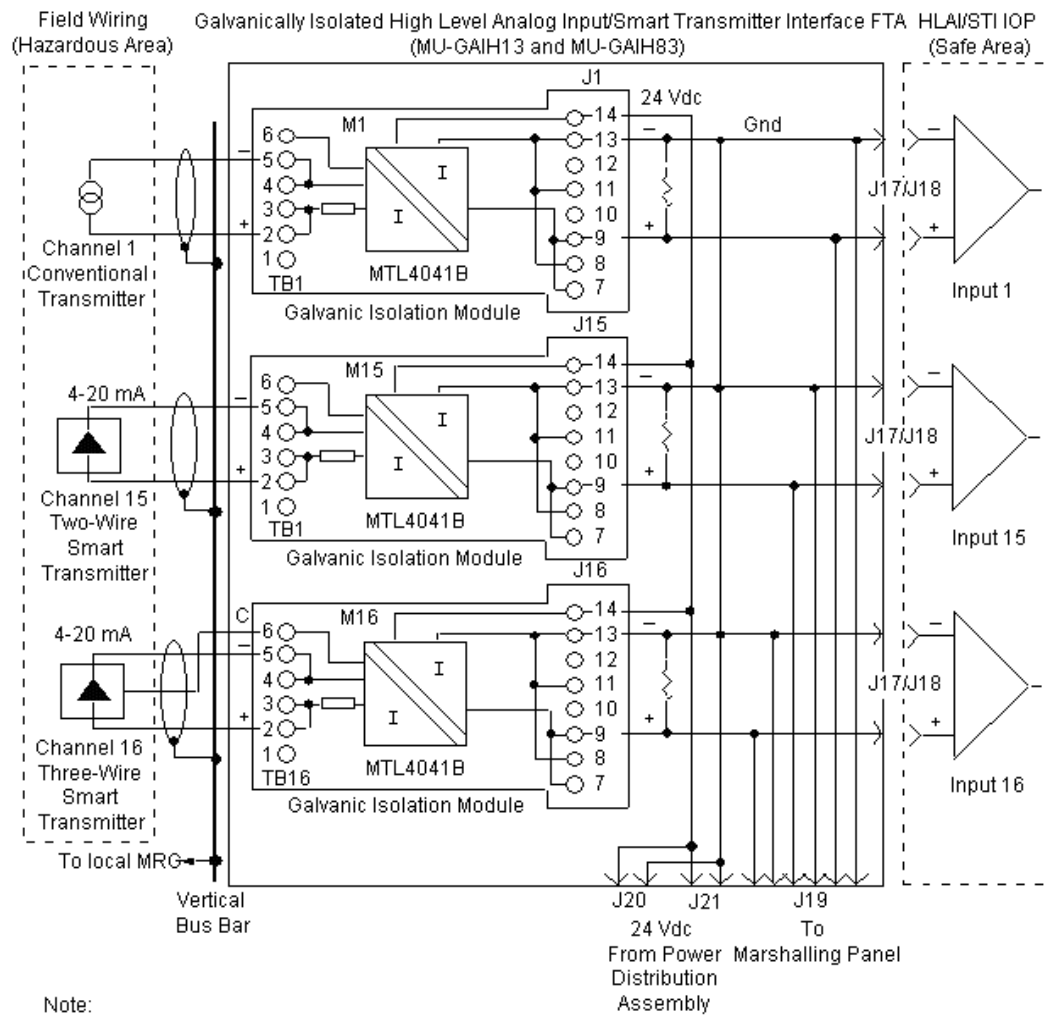
Appendix D – GI FTA Reference

High Level Analog Input (HLAI) GI FTA Wiring

Model MU-GAIH13/83 high level analog input GI FTA assembly layout



Model MU-GAIH13/83 high level analog input GI FTA connection diagram

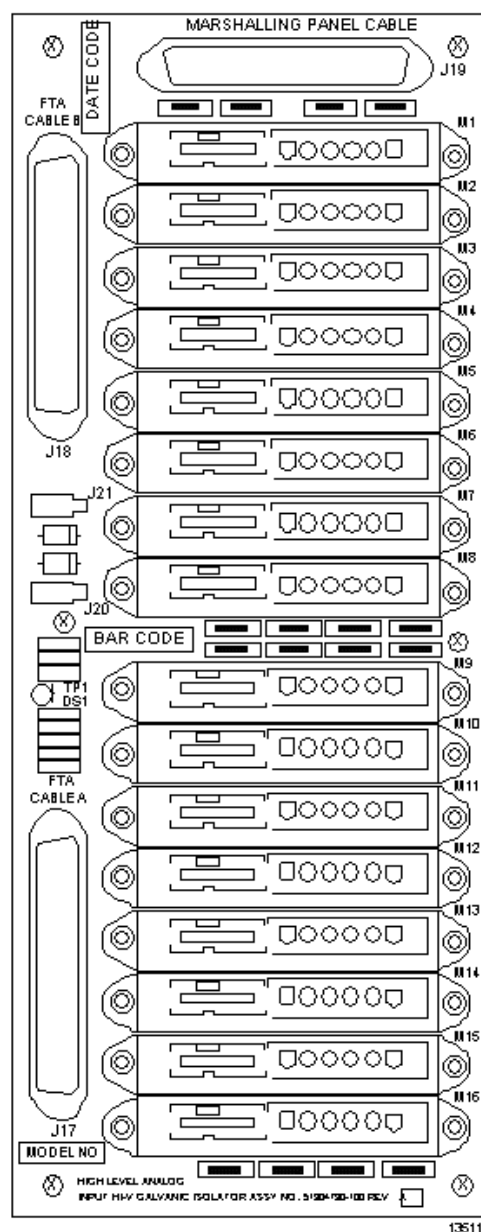


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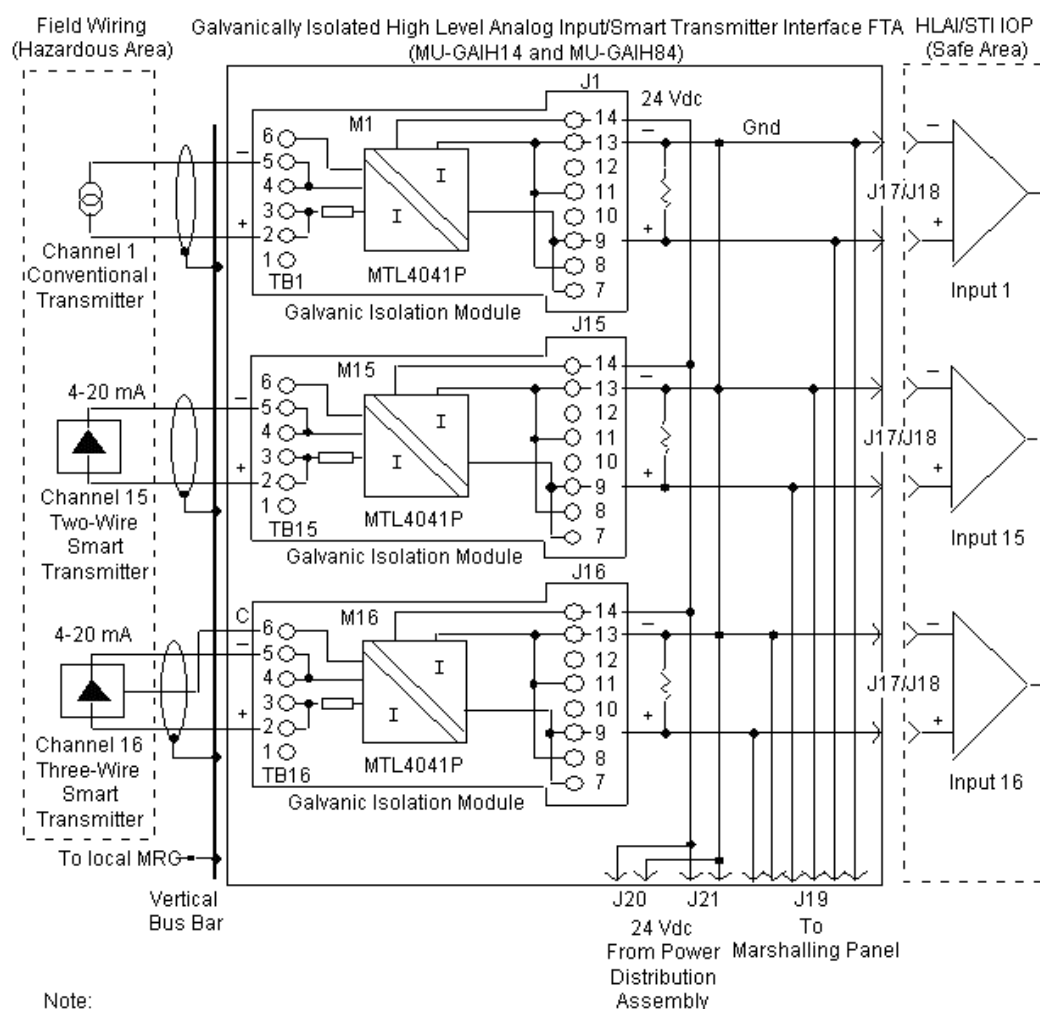
Appendix D – GI FTA Reference

High Level Analog Input (HLAI) GI FTA Wiring

Model MU-GAIH14/84 high level analog input GI FTA assembly layout



Model MU-GAIH14/84 high level analog input GI FTA connection diagram

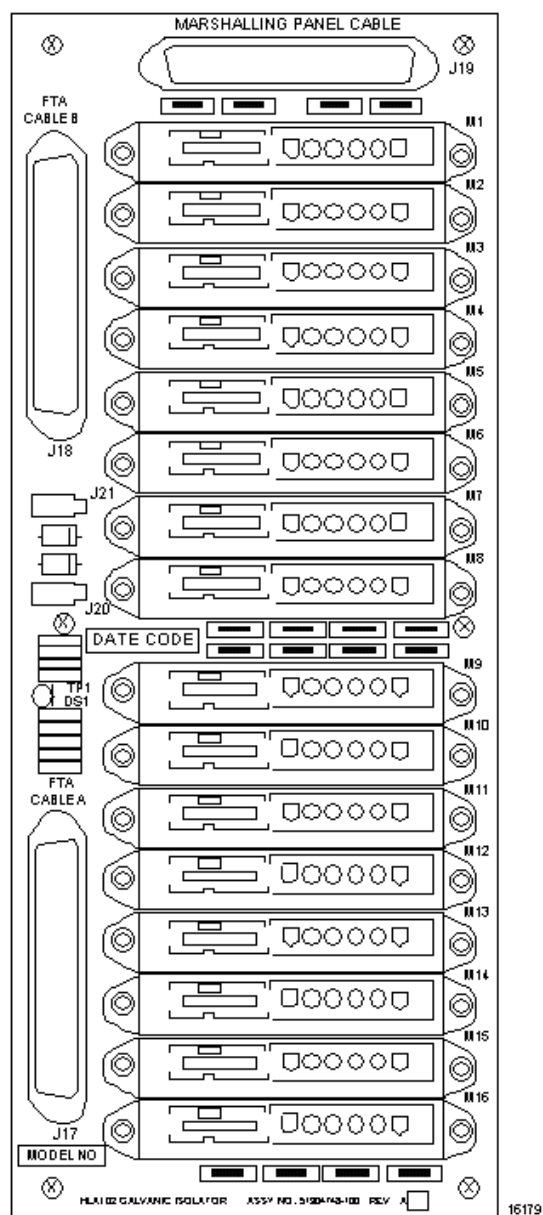


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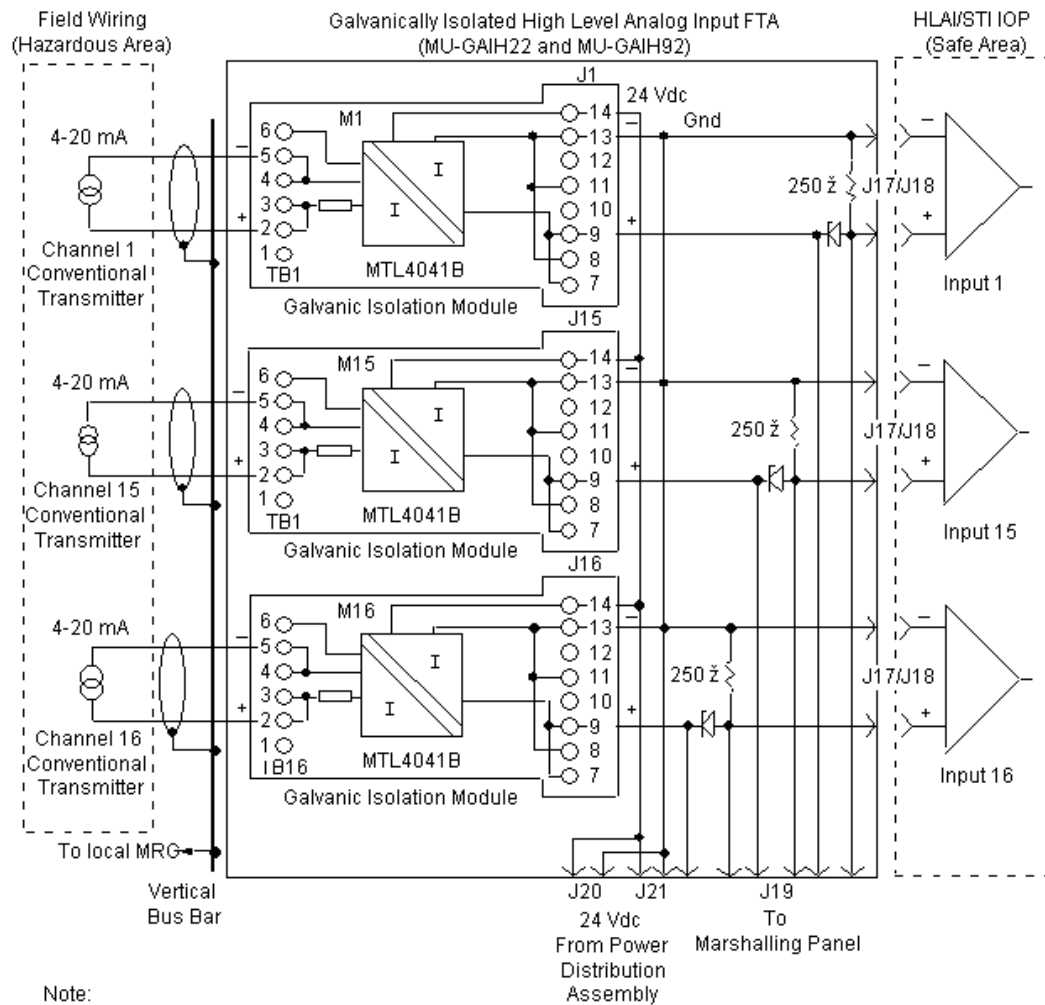
Appendix D – GI FTA Reference

High Level Analog Input (HLAI) GI FTA Wiring

Model MU-GAIH22/92 high level analog input GI FTA assembly layout



Model MU-GAIH22/92 high level analog input GI FTA connection diagram



Note:

The IOP interface connectors, J17 and J18, can interface redundant IOPs.
J17 is the primary connector interface to IOP A, and J18 is the secondary connector interface to IOP B.
The Galvanic Isolation Module is Honeywell part number 51191928-100 (MTL4041P).

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Analog Output (AO) GI FTA Wiring

The Galvanically Isolated Analog Output (AO) FTAs isolate up to eight 4-20 mA signals that can drive current-to-pressure (I/P) transducers, position actuators, or any load of 750-ohms or less from the associated Analog Output IOP.

Review Appendix F of the *Planning Guide* for more detailed descriptions of each FTA.

Analog Output Galvanically Isolated FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GAOX02	Analog Output (Single IOP) FTA— with Line Fault Detection in the IOP	51304638-100	51304638-125
MC-GAOX02	Analog Output (Single IOP) FTA— with Line Fault Detection in the IOP— Conformally Coated	51304638-150	51304638-175
MU-GAOX72	Analog Output (Single IOP) FTA— with Line Fault Detection in the IOP	51304638-500	51304638-525
MC-GAOX72	Analog Output (Single IOP) FTA— with Line Fault Detection in the IOP— Conformally Coated	51304638-550	51304638-575
MU-GHAO11	Analog Output FTA— with HART connection capability	N/A	51309540-125
MC-GHAO11	Analog Output FTA— with HART connection capability— Conformally Coated	N/A	51309540-175
MU-GHAO21	HART Analog Output FTA	N/A	51305869-125
MC-GHAO21	HART Analog Output FTA— Conformally Coated	N/A	51305869-175
MU-GAOX12	Analog Output FTA— with Line Fault Detection in the IOP	51304638-300	51304638-325
MC-GAOX12	Analog Output FTA— with Line Fault Detection in the IOP— Conformally Coated	51304638-350	51304638-375
MU-GAOX82	Analog Output FTA— with Line Fault	51304638-700	51304638-725

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
	Detection in the IOP		
MC-GAOX82	Analog Output FTA— with Line Fault Detection in the IOP— Conformally Coated	51304638-750	51304638-775

Cable connections to FTAs

FTA Connector	Connection Used For . . .
J9	FTA Cable A
J10	FTA Cable B (for redundant IOPs)
J11	Standby Manual device
J12 and J13	24V dc input from Power Distribution Assembly

Field wiring input signals

The FTA provides 4-20 mA for control of field devices that are Galvanically Isolated from all other circuits. The load resistance can be no greater than 750-ohms. The signal output dynamic impedance is greater than 1 megohm.

Model MC-GHA011 and MU-GHA011 FTAs contain a HART connector that is used to interface to an external HART system.

Model MC-GHA021 and MU-GHA021 FTAs support HART transmitters whose digital communication signals are superimposed on a standard 4-20 mA signal.

Assembly layout drawings and connection diagrams

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the AO GI FTAs are given in the following figures listed in Table 28.

Table 28 AO GI FTA Connection Drawings

Analog Output Galvanically Isolated	Assembly Layout	Connection Diagram

Appendix D – GI FTA Reference
Analog Output (AO) GI FTA Wiring

Analog Output Galvanically Isolated	Assembly Layout	Connection Diagram
FTA Model	<u>MU/MC-GAOX02</u> <u>MU/MC-GAOX72</u>	<u>MU/MC-GAOX02</u> <u>MU/MC-GAOX72</u>
	<u>MU/MC-GAOX12</u> <u>MU/MC-GAOX82</u>	<u>MU/MC-GAOX12</u> <u>MU/MC-GAOX82</u>
	<u>MU/MC-GHAO11</u>	<u>MU/MC-GHAO11</u>
	<u>MU/MC-GHAO21</u>	

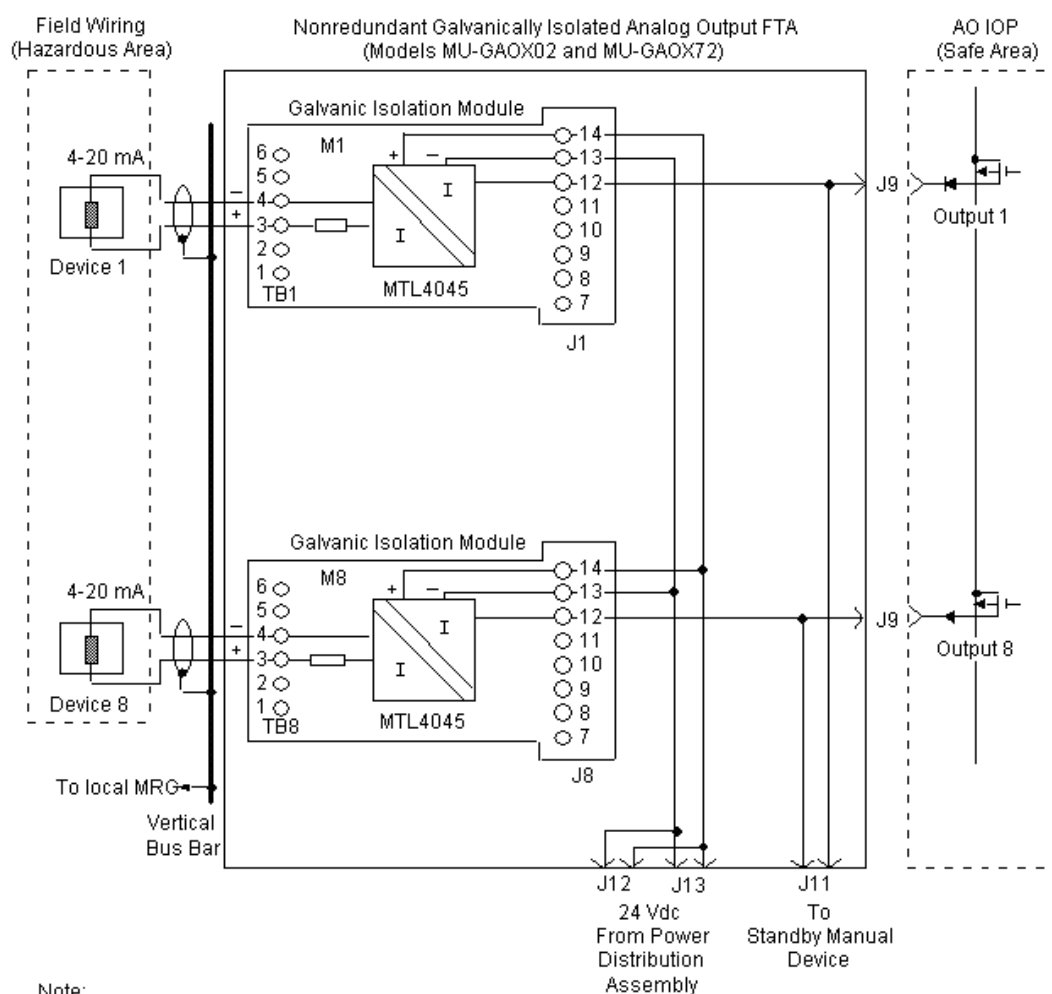
Model MU-GAOX02, MU-GAOX72, MU-GAOX12 and MU-GAOX82 analog output GI FTA assembly layout



Appendix D – GI FTA Reference

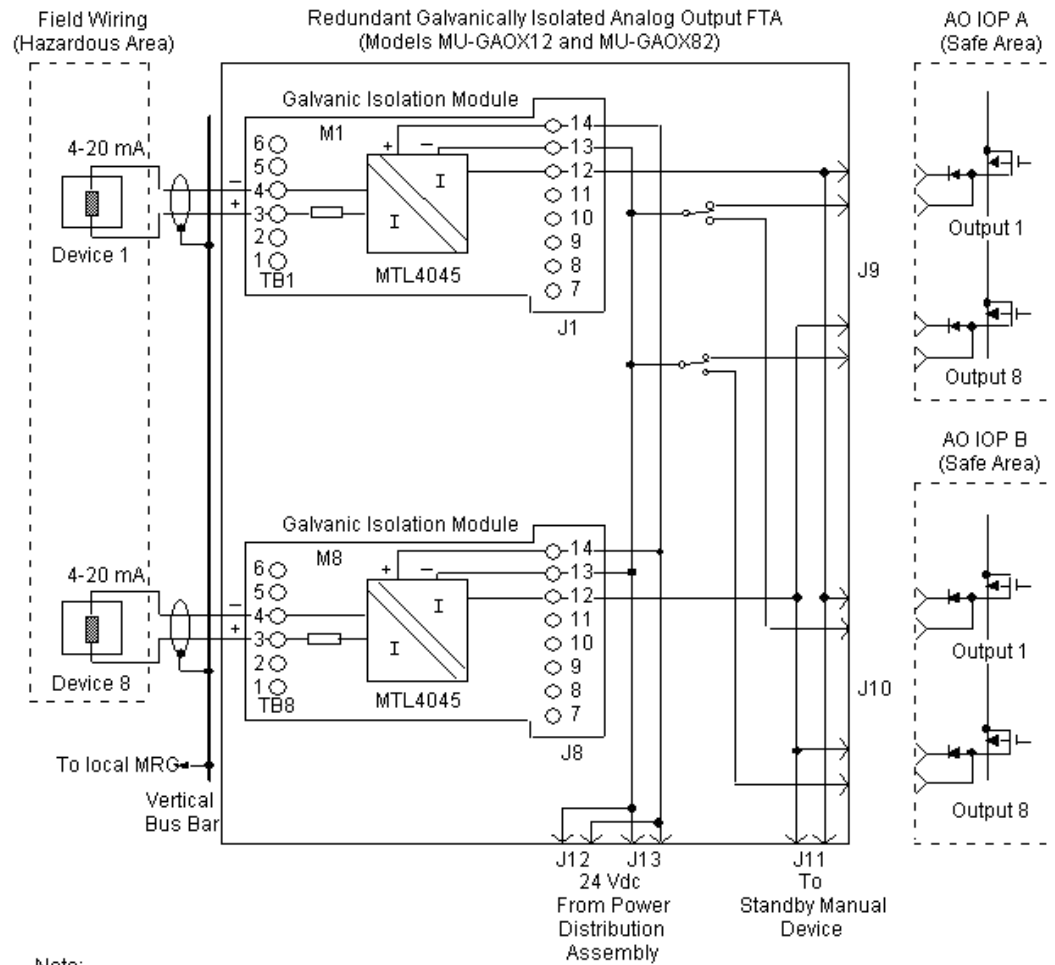
Analog Output (AO) GI FTA Wiring

Model MU-GAOX02 and MU-GAOX72 analog output GI FTA connection diagram



11992

Model MU-GAOX12 and MU-GAOX82 analog output GI FTA connection diagram



Note:

The Galvanic Isolation Module is Honeywell part number 51191696-100 (MTL4045).

11999

Model MC-GHAO11 and MU-GHAO11 FTAs

The Galvanically Isolated Analog Output (AO) FTAs isolate up to sixteen 4-20 mA signals that can drive current-to-pressure (I/P) transducers, position actuators, or any load of 870-ohms or less from the associated Analog Output IOP. Model MC-GHAO11 and MU-GHAO11 FTAs incorporate filters to allow connection to HART field devices, and provide a connector for use with an external HART multiplexer system.

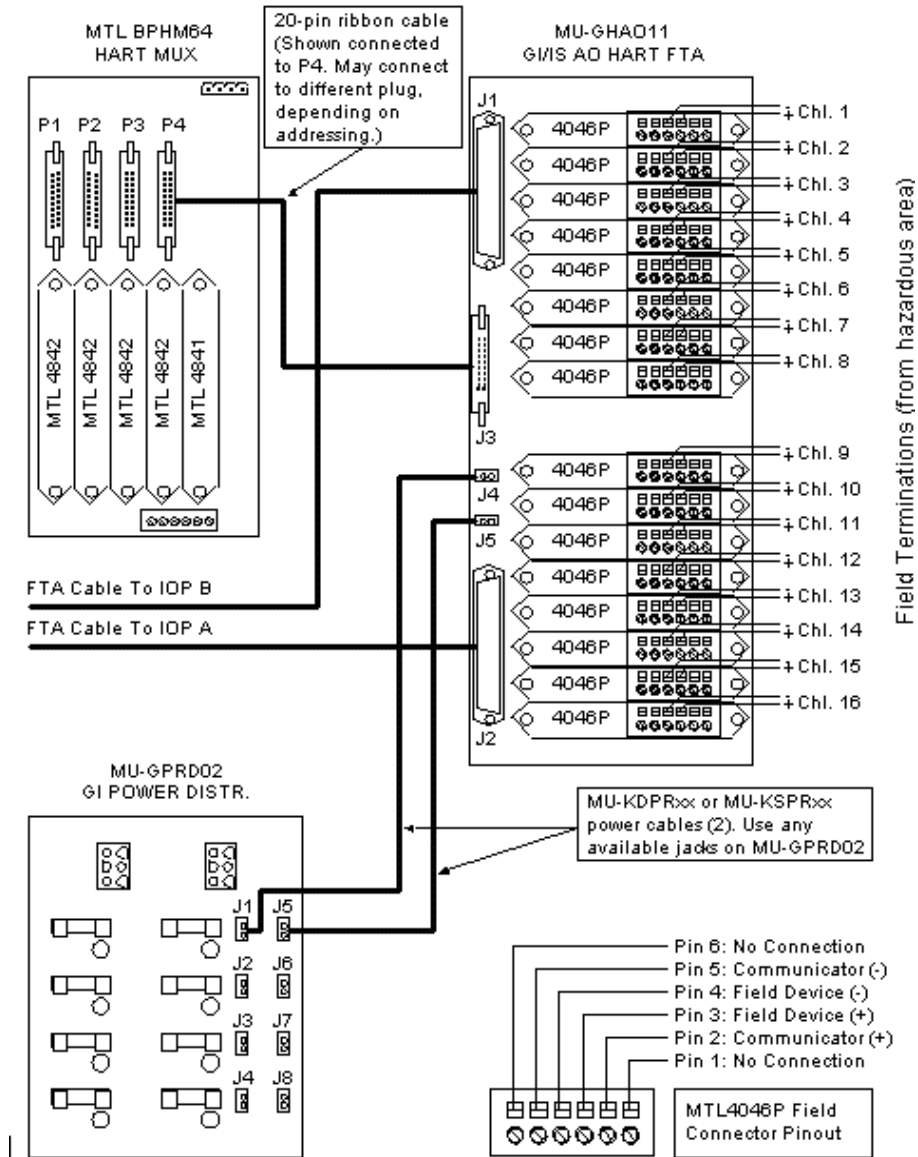
Model MC-GHAO11 and MU-GHAO11 FTAs contain a HART connector (J3) that is used to interface to an external HART system. The pinouts of the connector are as follows:

Pins	Usage
1 through 16	Combined 4 to 20 mA / HART signals for Channels 1 through 16, respectively
17 through 20	Ground

Model MC-GHAO21 and MU-GHAO21 FTAs

The Galvanically Isolated Analog Output (AO) FTAs isolate up to sixteen 4-20 mA signals from the associated analog output IOP. When used with the AO16HART IOP, model MC-PHAO01, the FTAs also support HART communications between connected HART enabled field devices and the AO16HART IOP.

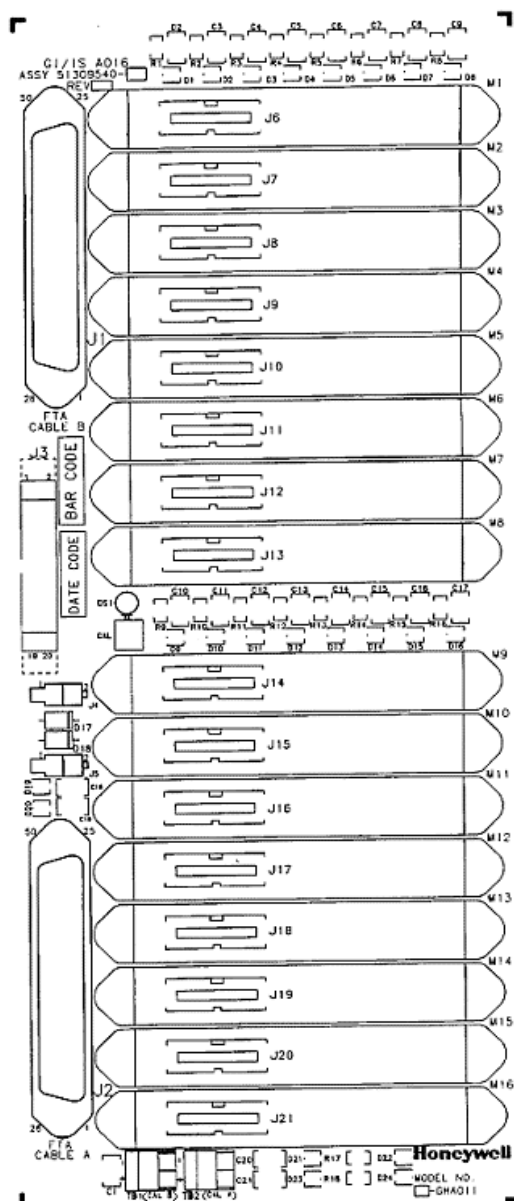
Model MU-GHAO11 analog output/HART GI FTA connection diagram —CE compliant



Appendix D – GI FTA Reference

Analog Output (AO) GI FTA Wiring

Model MU-GHAO11 and MU-GHAO21 analog output/HART GI FTA assembly layout —CE compliant



Digital Input (DI) GI FTA Wiring

The Digital Input (DI) galvanically isolated FTAs accommodate up to 32 switch or proximity detector inputs from a hazardous area, isolates the signals, and presents them to the associated Digital Input IOP in a safe area.

The available DI galvanically isolated FTA models are listed in the following table with a brief description and the listed part numbers for both CE compliant and non-CE compliant versions

Review Appendix F of the *Planning Guide* for more detailed descriptions of each FTA.

Digital Input Galvanically Isolated FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GDID12	Digital Input FTA with Compression Terminals, Individual line-fault detection and auxiliary connector	51304640-100	51304640-125
MC-GDID12	Digital Input FTA with Compression Terminals, Individual line-fault detection and auxiliary connector— Conformally Coated	51304640-150	51304640-175
MU-GDID13	Digital Input FTA with Compression Terminals	51304728-100	51304728-125
MC-GDID13	Digital Input FTA with Compression Terminals— Conformally Coated	51304728-150	51304728-175
MU-GDID82	Digital Input FTA with Crimp Terminals, Individual line-fault detection and auxiliary connector	51304640-300	51304640-325
MC-GDID82	Digital Input FTA with Crimp Terminals, Individual line-fault detection and auxiliary connector—Conformally Coated	51304640-350	51304640-375
MU-GDID83	Digital Input FTA with Crimp Terminals	51304728-300	51304728-325
MC-GDID83	Digital Input FTA with Crimp Terminals—Conformally Coated	51304728-350	51304728-375

Input signal phase and FTA features

The phase of the input signals is selectable on the model MU-GDID12 and MU-GDID82 FTAs, allowing the alarm condition to be chosen for either state of the sensor. This is accomplished with two switches, one for each input, on the top of the Galvanic Isolation Modules.

The phase of the input signals is NOT selectable on the model MU-GDID13 and MU-GDID83 FTAs. The phase of the Galvanic Isolation Module's input to output signals are not selectable on the module, and the module's signal outputs are solid-state, instead of contacts. Also, the models MU-GDID13 and MU-GDID83 FTAs have no auxiliary output connector.

Cable connections to FTAs

FTA Connector	Connection Used For . . .
J17	FTA Cable A
J18	FTA Cable B (for redundant IOPs)
J19	Marshalling Panel connector *
J20 and J21	24V dc input from Power Distribution Assembly
* Model MU-GDID12 and MU-GDID82 only.	

Field wiring input signals

Field source can be the input from a contact or proximity switch. The following input parameters for the source must be considered:

- A sensed current of less than 2 k ohms resistance is interpreted as a closure.
- A sensed current of more than 10 k ohms resistance is interpreted as an open.
- The hysteresis is nominally 650 ohms.
- The voltage applied to the sensor is 7.7 to 9.0 Vdc from 1 k ohm resistance.

Each Galvanic Isolation Module accepts two field devices. The two inputs connect to terminals 1 and 2, and 4 and 5.

Assembly layout drawings and connection diagrams

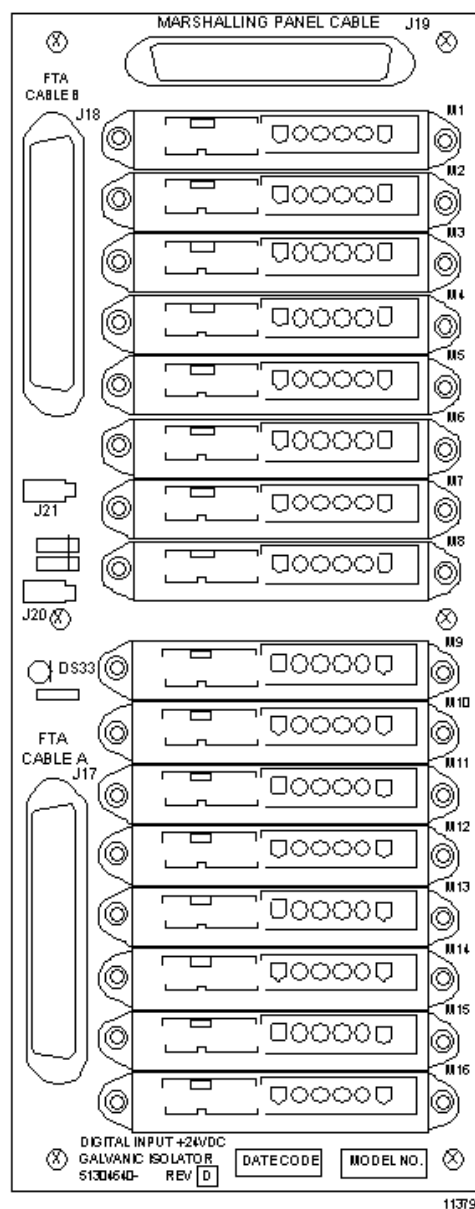
Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the DI GI FTAs are given in the following figures listed in Table 29.

Table 29 DI GI FTA Connection Drawings

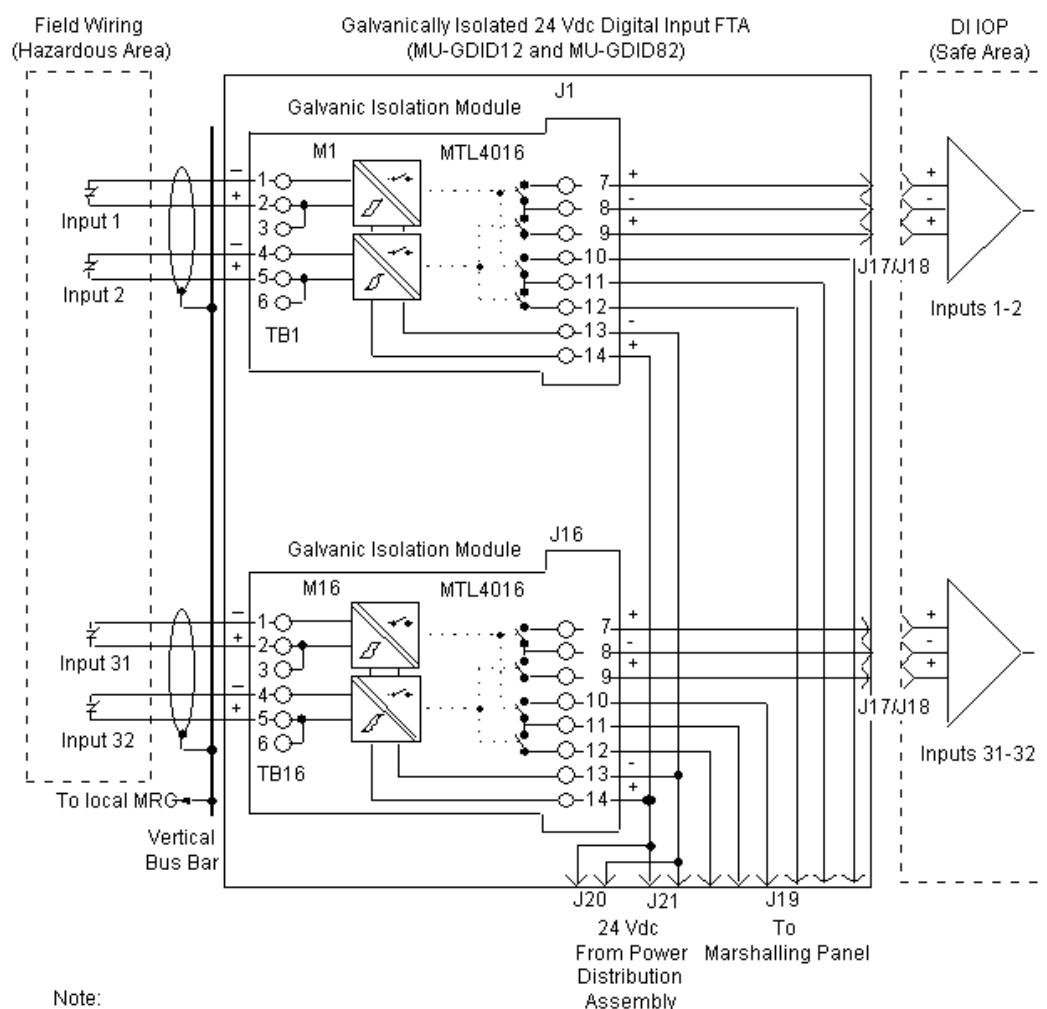
Digital Input Galvanically Isolated	Assembly Layout	Connection Diagram
FTA Model	<u>MU-GDID12</u> <u>MU-GDID82</u>	<u>MU-GDID12</u> <u>MU-GDID82</u>
	<u>MU-GDID13</u> <u>MU-GDID83</u>	<u>MU-GDID13</u> <u>MU-GDID83</u>

Appendix D – GI FTA Reference
Digital Input (DI) GI FTA Wiring

Model MU-GDID12 and MU-GDID82 digital input GI FTA assembly layout



Model MU-GDID12 and MU-GDID82 digital input GI FTA connection diagram



Note:

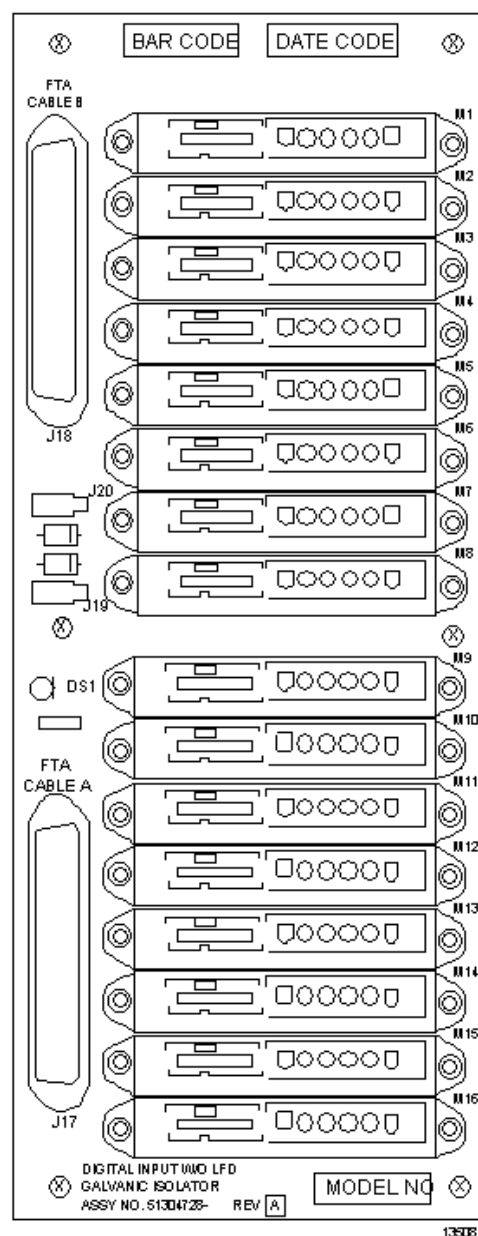
The IOP interface connectors, J17 and J18, can interface redundant IOPs. PMs and APMs presently do not support DI IOP redundancy. J17 is the primary connector interface to IOP A, and J18 is the secondary connector interface to IOP B. Only J17 is presently used.

The Galvanic Isolation Module is Honeywell part number 51191699-100 (MTL4016).

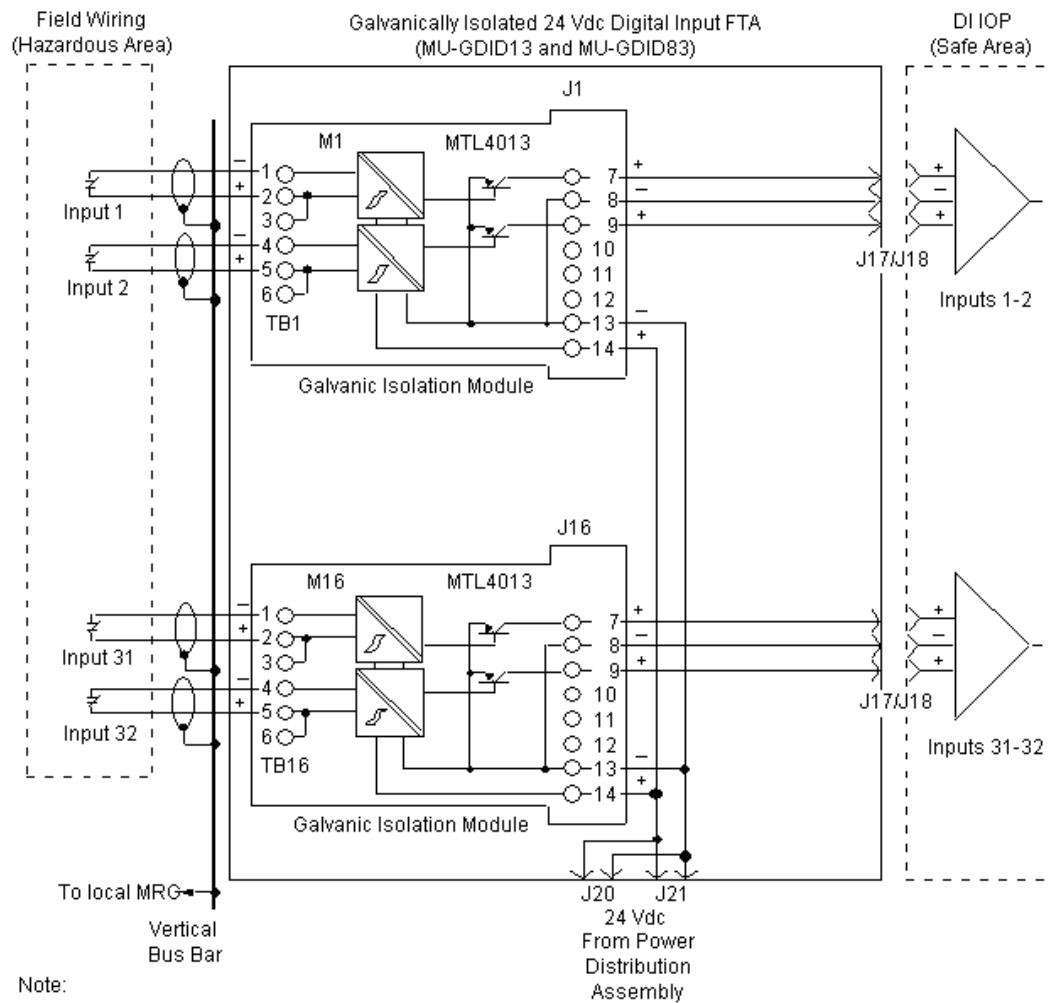
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Appendix D – GI FTA Reference
Digital Input (DI) GI FTA Wiring

Model MU-GDID13 and MU-GDID83 digital input GI FTA assembly layout



Model MU-GDID13 and MU-GDID83 digital input GI FTA connection diagram



The IOP interface connectors, J17 and J18, can interface redundant IOPs. J17 is the primary connector interface to IOP A, and J18 is the secondary connector interface to IOP B. Only J17 is presently used. The Galvanic Isolation Module is Honeywell part number 51191926-100 (MTL4013).

16181

Digital Output (DO) GI FTA Wiring

The Digital Output (DO) Galvanically Isolated FTA can drive up to 16 certified intrinsically safe loads in a hazardous area. The load can be a solenoid or an alarm, as well as a nonenergy-storing “simple apparatus,” such as an LED.

An auxiliary connector on the model MC-GDOD12 and MC-GDOD82 FTAs provide an input for control signals from an emergency shutdown subsystem that is user-supplied. The shutdown system must provide potential-free floating sets of contacts. When one of the contacts is closed, a corresponding FTA output is disabled (deenergized), regardless of the output state command from the IOP.

The model MU-GDOL12 and MC-GDOL82 FTAs do not have the capability to accept output override signals from a shutdown device. Instead, each input channel has line fault detection circuitry that causes a contact closure that is present at an auxiliary connector.

The available DO galvanically isolated FTA models are listed in Table 1 with a brief description and the listed part numbers for both CE compliant and non-CE compliant versions.

Review Appendix F of the *Planning Guide* for more detailed descriptions of each FTA.

Digital Output Galvanically Isolated FTA Types and Part Numbers

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GDOD12	DO FTA with Compression Terminals with 16 output override inputs from an auxiliary connector	51304642-100	51304642-125
MC-GDOD12	DO FTA with Compression Terminals with 16 output override inputs from an auxiliary connector — Conformally Coated	51304642-150	51304642-175
MU-GDOD82	DO FTA with Crimp Terminals with 16 output override inputs from an auxiliary connector	51304642-300	51304642-325
MC-GDOD82	DO FTA with Crimp Terminals with 16 output override inputs from an auxiliary connector — Conformally Coated	51304642-350	51304642-375

Model No.	FTA Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GDOL12	DO LFD FTA with Compression Terminals and Line Fault Detection	51304736-100	51304736-125
MC-GDOL12	DO LFD FTA with Compression Terminals and Line Fault Detection—Conformally Coated	51304736-150	51304736-175
MU-GDOL82	DO LFD FTA with Crimp Terminals and Line Fault Detection	51304736-300	51304736-325
MC-GDOL82	DO LFD FTA with Crimp Terminals and Line Fault Detection—Conformally Coated	51304736-350	51304736-375

Cable connections to FTAs

FTA Connector	Connection Used For . . .
J17	FTA Cable A
J18	FTA Cable B (for redundant IOPs)
J19	Marshalling Panel connector
J20 and J21	24V dc input from Power Distribution Assembly

Field wiring output signals

Terminals 1 and 4 on each Galvanic Isolation Module provide a maximum of 25.5 volts with a source resistance of 232-ohms for model MU-GDOD12/MU-GDOD82, (or 176 ohms for model MU-GDOL12/MU-GDOL82). The minimum output voltage varies from 22 volts at 0 current to 10 volts at 50 milliamps.

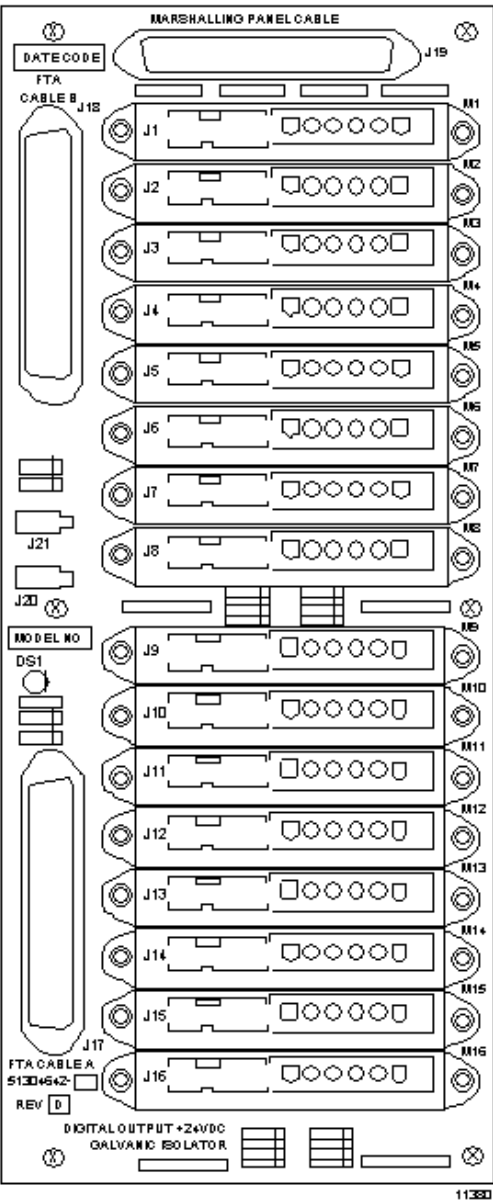
Assembly layout drawings and connection diagrams

Connection diagrams to aid in connecting field wiring and assembly layout drawings that show the physical layout of the DO GI FTAs are given in the following figures listed in Table 30.

Table 30 DO GI FTA Connection Drawings

Digital Output Galvanically Isolated	Assembly Layout	Connection Diagram
FTA Model	<u>MU-GDOD12</u> <u>MU-GDOD82</u>	<u>MU-GDOD12</u> <u>MU-GDOD82</u>
	<u>MU-GDOL12</u> <u>MU-GDOL82</u>	<u>MU-GDOL12</u> <u>MU-GDOL82</u>

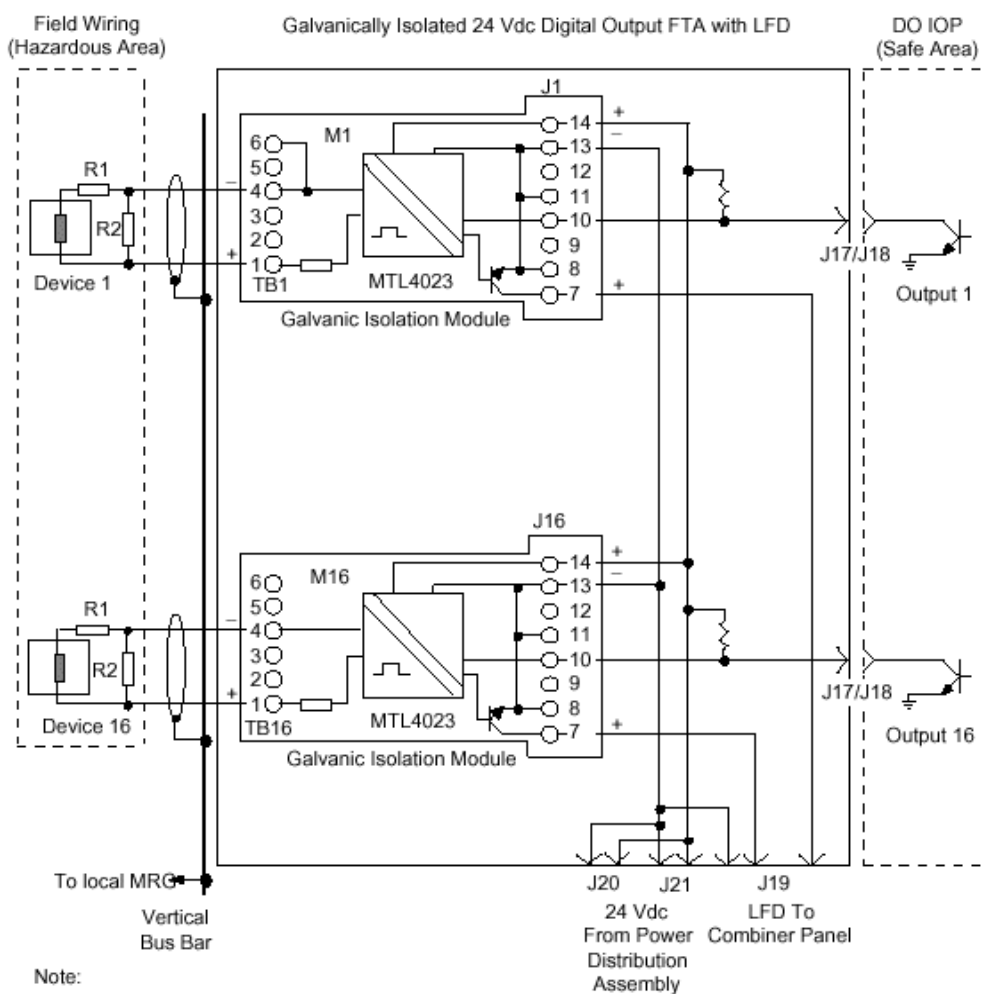
Model MU-GDOD12 and MU-GDOD82 digital output GI FTA assembly layout



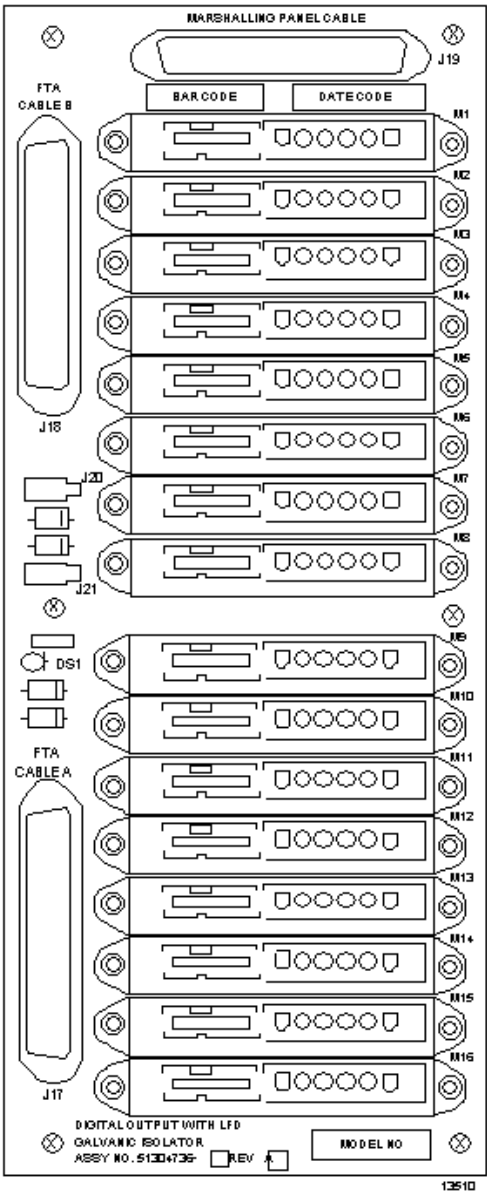
Appendix D – GI FTA Reference

Digital Output (DO) GI FTA Wiring

Model MU-GDOD12 and MU-GDOD82 digital output GI FTA connection diagram



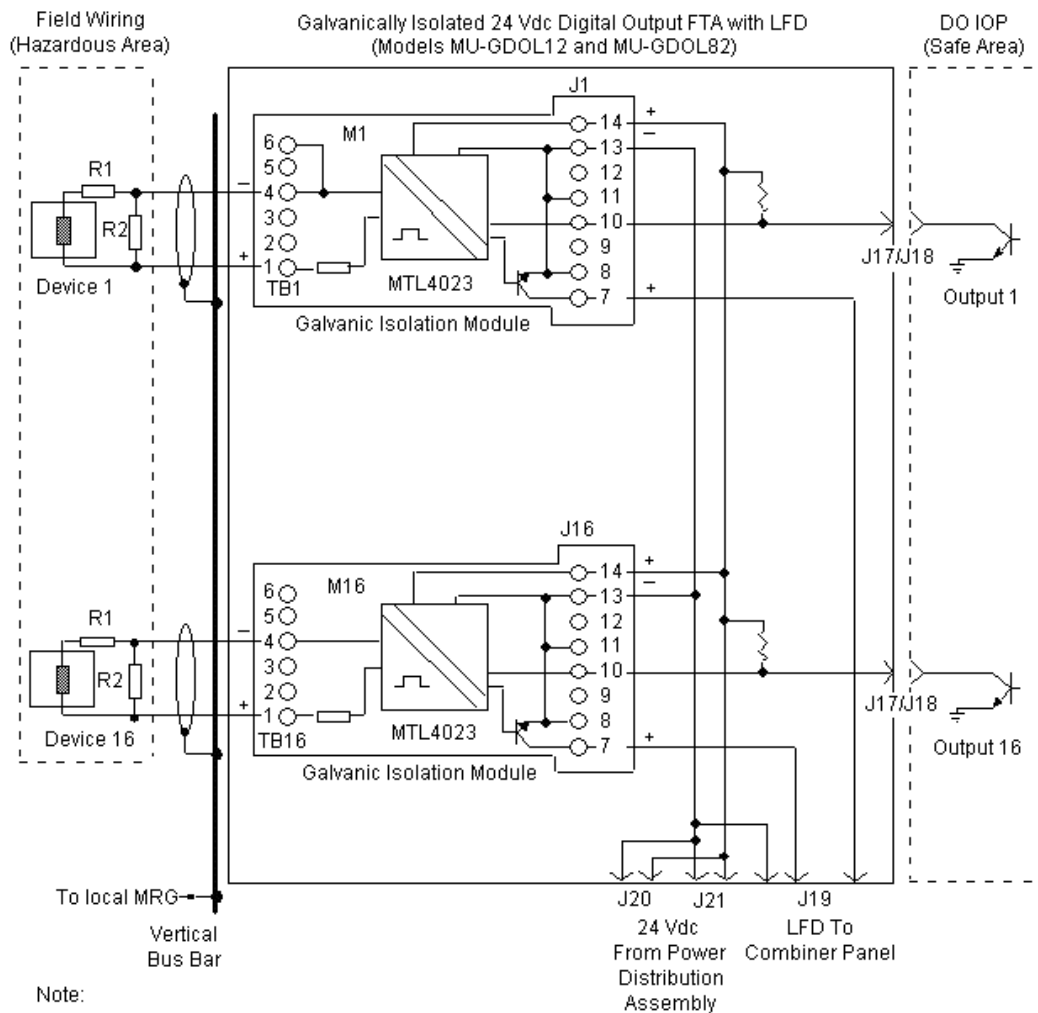
Model MU-GDOL12 and MU-GDOL82 digital output GI FTA assembly layout



Appendix D – GI FTA Reference

Digital Output (DO) GI FTA Wiring

Model MU-GDOL12 and MU-GDOL82 digital output GI FTA connection diagram



The IOP interface connectors, J17 and J18, can interface redundant IOPs. J17 is the primary connector interface to IOP A, and J18 is the secondary connector interface to IOP B. Depending upon the field device, R1 or R2 must be selected to produce a resistance between 55 and 7k ohms for line fault detection functionality.

The Galvanic Isolation Module is Honeywell part number 51191927-100 (MTL4023).

16182

Combiner Panel, Model MU-GLFD02

The model MU-GLFD02 Combiner Panel combines the Line Fault Detection (LFD) outputs (16) of two Digital Output FTAs and provides these signals (32) to redundant Digital Input IOPs for integration.

The Combiner Panel is similar in shape and appearance to an “A” size FTA and contains four 50-pin phone-type connectors and a single green LED indicator. The Combiner Panel’s assembly layout is illustrated in Figure 57.

Combiner panel assembly layout

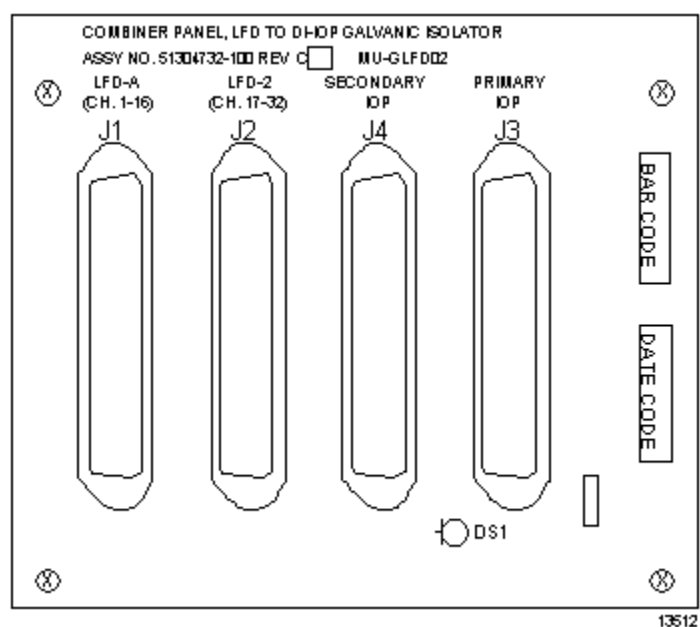


Figure 57 Model MU-GLFD02 Combiner Panel Assembly Layout

LFD input connectors

Two connectors, J1 (LFD-A) and J2 (LFD-2), connect to the **MARSHALLING PANEL CABLE** connector, J19, on two Digital Output FTAs that have line fault-detection capability. Presently, the model MU-GDOL12 and MU-GDOL82 FTAs provide this feature. The standard IOP to FTA cable (MU-KFTAxx) is used to provide the connections.

IOP output connectors

The combined 32 LFD outputs are available at both the J3 and J4 connectors. J3 connects to IOP A and J4 connects to its redundant partner, IOP B, if one exists. The standard IOP to FTA cable is used to provide the connections.

Marshalling Panel, Model MU-GMAR52

The model MU-GMAR52 Marshalling Panel was developed primarily to provide user-accessibility to the signals from the auxiliary connectors on the Galvanically Isolated FTAs, but it can be used as a general purpose marshalling panel in the subsystem.

The Marshalling Panel is similar in shape and appearance to a “B” size FTA, except it is void of electronic circuitry, but does provide surge and ESD protection for the field wiring terminals. A 50-pin connector is provided on the assembly that receives or sends signals to the safe side of the FTA to which it is connected. The suffix "MC" of the model number indicates that the marshalling panel or FTA is conformally coated.



ATTENTION

Although the Marshalling Panel is used with the FTAs, the signals present are **not** intrinsically safe or inherently Galvanically Isolated. Therefore, the signals on the Marshalling Panel cannot be exposed to a Division 1, Zone 0 or Zone 1 environment.

Screw terminal connectors are available for the connection of the field wiring. See Figure 58 for an illustration of the assembly layout. Figure 59 illustrates the typical interconnections when a Marshalling Panel is mounted on a horizontal FTA mounting channel that does not contain a Galvanically Isolated FTA in a cabinet. Marshalling Panels can also be mounted on a vertical, non-inverted, FTA mounting channel.

Marshalling panel assembly layout

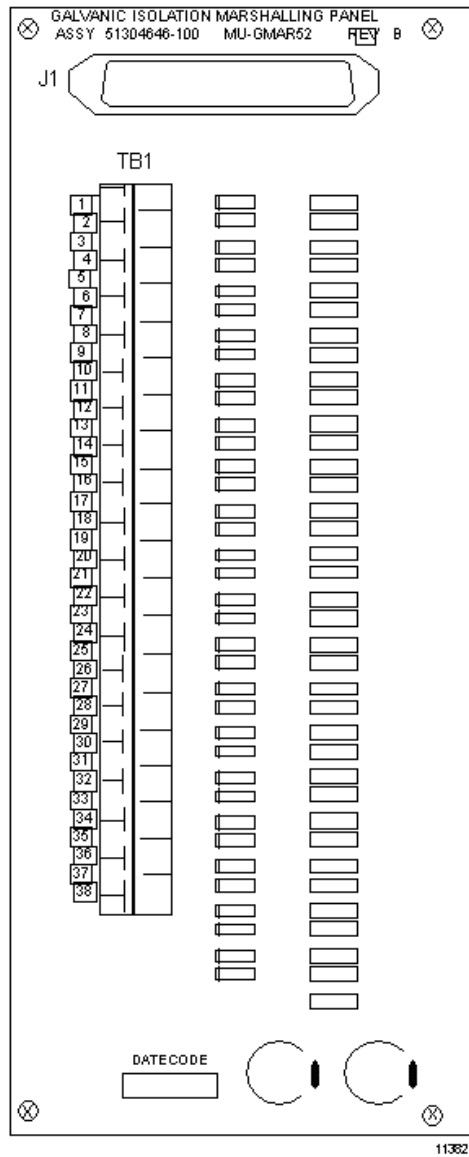


Figure 58 Model MU-GMAR52 Marshalling Panel Assembly Layout

Marshalling panel cabinet interconnection

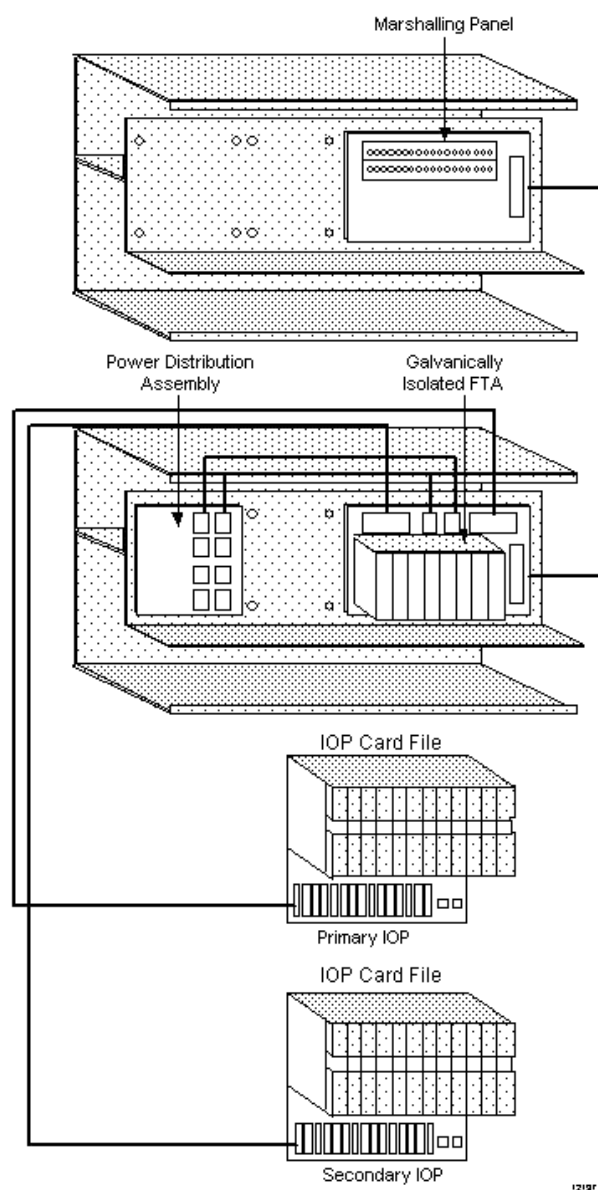


Figure 59 Typical Marshalling Panel Cabinet Interconnections

Signals available at screw terminals

The screw terminals of the Marshalling Panel assume various configurations, which are dependent upon the model of FTA (HLAI, AO, DI, DO) to which it is connected. Model MU-KFTAx_{xx} cable (the suffix “xx” in the model number represents the length of the cable in meters) is used to connect the FTA auxiliary connector to J1 of the marshalling panel.

The following subsections describe the various configurations that are available at the marshalling panel screw terminals when the marshalling panel is connected to a given FTA.

High level analog input FTAs

When used with High Level Analog Input (HLAI) FTA or High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTA, the Marshalling Panel provides either 1 to 5 volt or 4 to 20 mA PV signals.

The 1 to 5 volt signals are the same signals that the HLAI or STI IOP receives.

The 4 to 20 mA signals must be returned to the FTA to produce the 1 to 5 volt signal across a spool resistor that the IOP requires.

The following FTAs provide 1 to 5 volt signals to the marshalling panel:

- Model MU-GAIH12/82 HLAI FTA
- Model MU-GAIH13/83 HLAI/STI FTA
- Model MU-GAIH14/84 HLAI/STI FTA

Table 31 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to one of the above FTAs through its 50-pin auxiliary connector.

The signals are intended to be connected to a user-provided recording or monitoring device.



ATTENTION

The recording or monitoring device must have an input impedance of 1 megohm, or greater, to avoid loading down the signals and introducing errors into the IOP.

The signal wires must be separated from other wires or cables that might induce noise onto the signals. It is suggested that you use a properly grounded, shielded, twisted-pair cable to carry the signals to the recording or monitoring device.

Table 31 HLA/STI FTA Marshalling Panel Signals (1 to 5 Vdc)

Terminal Numbers	Description	
1 and 2	Channel 1 +	Channel 1 –
3 and 4	Channel 2 +	Channel 2 –
5 and 6	Channel 3 +	Channel 3 –
7 and 8	Channel 4 +	Channel 4 –
9 and 10	Channel 5 +	Channel 5 –
11 and 12	Channel 6 +	Channel 6 –
13 and 14	Channel 7 +	Channel 7 –
15 and 16	Channel 8 +	Channel 8 –
17 and 18	Channel 9+	Channel 9 –
19 and 20	Channel 10 +	Channel 10 –
21 and 22	Channel 11 +	Channel 11 –
23 and 24	Channel 12 +	Channel 12 –
25 and 26	Channel 13 +	Channel 13 –
27 and 28	Channel 14 +	Channel 14 –
29 and 30	Channel 15 +	Channel 15 –
31 and 32	Channel 16 +	Channel 16 –
33	Not used	
34	Not used	
35	Not used	
36	Not used	
37	Signal ground	
38	Signal ground	

4-20 mA HLAI FTA signals

The model MU-GAIH22 and model MU-GAIH92 HLAI FTAs provide 4 to 20 mA signals to the marshalling panel. The signals are intended to be connected to a user-provided recording or monitoring device.



ATTENTION

The recording or monitoring device must have an input impedance of 250-ohms or less.

The signal wires must be separated from other wires or cables that might induce noise onto the signals. It is suggested that you use a properly grounded, shielded, twisted-pair cable to carry the signals to the recording or monitoring device

Table 32 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to the Model MU-GAIH22/92 FTA through its 50-pin auxiliary connector.

Table 32 HLAI/STI FTA Marshalling Panel Signals (4 to 20 mA)

Terminal Numbers	Description
1	Channel 1 (4-20 mA return)
2	Channel 1 (4-20 mA)
3	Channel 2 (4-20 mA return)
4	Channel 2 (4-20 mA)
5	Channel 3 (4-20 mA return)
6	Channel 3 (4-20 mA)
7	Channel 4 (4-20 mA return)
8	Channel 4 (4-20 mA)
9	Channel 5 (4-20 mA return)
10	Channel 5 (4-20 mA)
11	Channel 6 (4-20 mA return)
12	Channel 6 (4-20 mA)

Appendix D – GI FTA Reference
Marshalling Panel, Model MU-GMAR52

Terminal Numbers	Description
13	Channel 7 (4-20 mA return)
14	Channel 7 (4-20 mA)
15	Channel 8 (4-20 mA return)
16	Channel 8 (4-20 mA)
17	Channel 9 (4-20 mA return)
18	Channel 9 (4-20 mA)
19	Channel 10 (4-20 mA return)
20	Channel 10 (4-20 mA)
21	Channel 11 (4-20 mA return)
22	Channel 11 (4-20 mA)
23	Channel 12 (4-20 mA return)
24	Channel 12 (4-20 mA)
25	Channel 13 (4-20 mA return)
26	Channel 13 (4-20 mA)
27	Channel 14 (4-20 mA return)
28	Channel 14 (4-20 mA)
29	Channel 15 (4-20 mA return)
30	Channel 15 (4-20 mA)
31	Channel 16 (4-20 mA return)
32	Channel 16 (4-20 mA)
33	Not used
34	Not used
35	Not used
36	Not used
37	Signal ground

Terminal Numbers	Description
38	Signal ground

Digital input FTAs

The model MU-GDID12/82 Digital Input FTA Marshalling Panel configuration provides an interface to the potential-free sets of contacts, that are isolated from the inputs to the IOP to which the FTA is connected. The contact rating is 10 W, 0.5 A at 35 Vdc.

Each Galvanic Isolation Module on the FTA has two double-pole on/off reed relays, one for each channel. One set of relay contacts is connected to the IOP and the second set of relay contacts is connected to the Marshalling Panel through the FTA's auxiliary connector. The contact closure interface to the Marshalling Panel mimics the FTA's contact closure interface to the IOP.

The typical applications for the sets of contacts are inputs to sequence of events recorders, monitoring systems, and shutdown systems.

Table 33 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to the model MU-GDID12/82 FTAs through its 50-pin auxiliary connector.

Table 33 Digital Input Marshalling Panel Signals (Relay contacts)

Terminal Numbers	Description
1	Channel 1 contact
2	Channel 2 contact
3	Channel 3 contact
4	Channel 4 contact
5	Channel 5 contact
6	Channel 6 contact
7	Channel 7 contact
8	Channel 8 contact
9	Channel 9 contact
10	Channel 10 contact

Appendix D – GI FTA Reference
Marshalling Panel, Model MU-GMAR52

Terminal Numbers	Description
11	Channel 11 contact
12	Channel 12 contact
13	Channel 13 contact
14	Channel 14 contact
15	Channel 15 contact
16	Channel 16 contact
17	Channel 17 contact
18	Channel 18 contact
19	Channel 19 contact
20	Channel 20 contact
21	Channel 21 contact
22	Channel 22 contact
23	Channel 23 contact
24	Channel 24 contact
25	Channel 25 contact
26	Channel 26 contact
27	Channel 27 contact
28	Channel 28 contact
29	Channel 29 contact
30	Channel 30 contact
31	Channel 31 contact
32	Channel 32 contact
33	Contact common
34	Contact common
35	Contact common

Terminal Numbers	Description
36	Contact common
37	Signal ground
38	Signal Ground

Digital output FTAs

The marshalling panel configuration for the model MU-GDOD12/82 Digital Output FTA provides an interface by which a contact closure can individually deenergize a Galvanic Isolation Module digital output. For example, an “ON” output signal from the IOP for a channel can be “overwritten” by a control signal input from the Marshalling Panel.

The inputs can be control signals from an emergency shutdown subsystem that is user-supplied.

The control signal cannot force an output “ON,” only “OFF.” The shutdown subsystem must provide potential-free floating sets of contacts. When a contact is closed, a corresponding FTA channel output is disabled (deenergized), regardless of the output state command from the IOP.

is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a model MU-GDOD12/82 Digital Output FTA through its 50-pin auxiliary connector.

Table 34 Digital Output Marshalling Panel Signals (Contact Closure)

Terminal Numbers	Description
Short between 1 and 2	Disables Channel 1
Short between 3 and 4	Disables Channel 2
Short between 5 and 6	Disables Channel 3
Short between 7 and 8	Disables Channel 4
Short between 9 and 10	Disables Channel 5
Short between 11 and 12	Disables Channel 6
Short between 13 and 14	Disables Channel 7
Short between 15 and 16	Disables Channel 8
Short between 17 and 18	Disables Channel 9
Short between 19 and 20	Disables Channel 10
Short between 21 and 22	Disables Channel 11
Short between 23 and 24	Disables Channel 12
Short between 25 and 26	Disables Channel 13
Short between 27 and 28	Disables Channel 14
Short between 29 and 30	Disables Channel 15
Short between 31 and 32	Disables Channel 16
33	Not used
34	Not used
35	Not used
36	Not used
37	Signal ground
38	Signal ground

Model MU-GDOL12/82 configuration

The marshalling panel configuration for the model MU-GDOL12/82 Digital Output FTA is an interface that represents input-channel line fault detection from the FTA. Line Fault Detection (LFD) circuitry in each Galvanic Isolation Module controls a solid-state switch output at the FTA's auxiliary connector. Upon detection of a line fault, the Galvanic Isolation Module deenergizes the solid-state switch that has its emitter connected to logic ground.

The collector of the solid-state switch is the output to the auxiliary connector and is not terminated in the module or on the FTA assembly.

is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a model MU-GDOL12/82 Digital Output FTA through its 50-pin auxiliary connector.

Table 35 Digital Output Marshalling Panel Signals (Solid-state switch inputs)

Terminal Numbers	Description
1	Channel 1 contact
2	Channel 2 contact
3	Channel 3 contact
4	Channel 4 contact
5	Channel 5 contact
6	Channel 6 contact
7	Channel 7 contact
8	Channel 8 contact
9	Channel 9 contact
10	Channel 10 contact
11	Channel 11 contact
12	Channel 12 contact
13	Channel 13 contact
14	Channel 14 contact

Appendix D – GI FTA Reference
Marshalling Panel, Model MU-GMAR52

Terminal Numbers	Description
15	Channel 15 contact
16	Channel 16 contact
17	Channel 17 contact
18	Channel 18 contact
19	Channel 19 contact
20	Channel 20 contact
21	Channel 21 contact
22	Channel 22 contact
23	Channel 23 contact
24	Channel 24 contact
25	Channel 25 contact
26	Channel 26 contact
27	Channel 27 contact
28	Channel 28 contact
29	Channel 29 contact
30	Channel 30 contact
31	Channel 31 contact
32	Channel 32 contact
33	Contact common
34	Contact common
35	Contact common
36	Contact common
37	Signal ground
38	Signal Ground

Power Distribution Assembly, Model MU-GPRD02

The model MU-GPRD02 Power Distribution Assembly (PDA) provides individually fused 24 Vdc power for the Galvanically Isolated FTAs. The dc power is supplied to the power distribution assembly by the same type of 6-pin connector cable, model MU-KDPRxx (the suffix “xx” in the model number represents the length of the cable in meters), used to supply power to the card files from the Power System. An assembly layout drawing of the PDA is shown in Figure 60. The power distribution assembly has two input power connectors (J9 and J10) that provide for redundancy cables and protects the system from a single cable or connector failure.

The power distribution assembly has the same mounting dimensions as an A-size FTA.

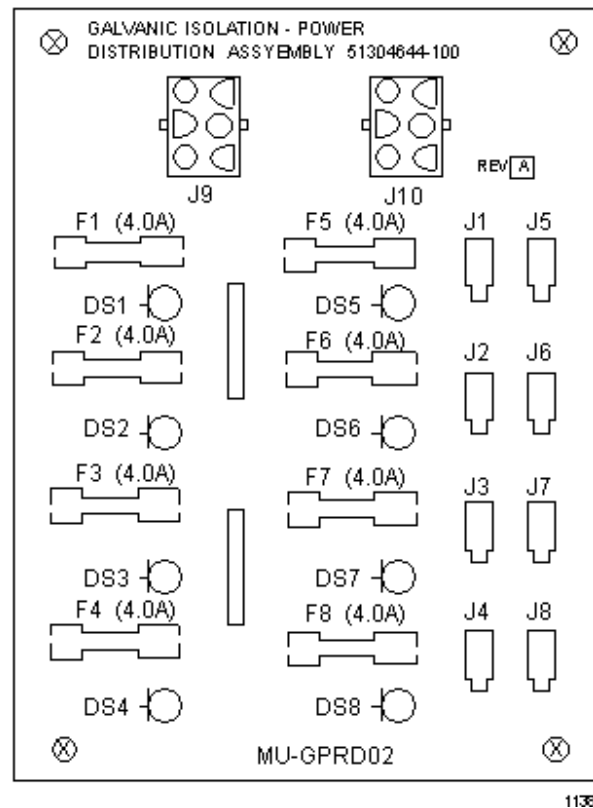


Figure 60 Galvanic Isolation Power Distribution Assembly Layout

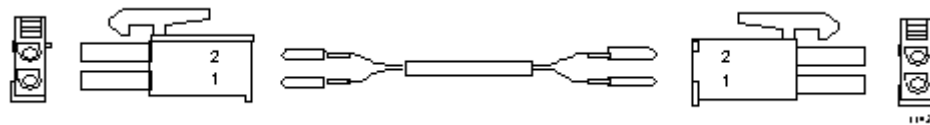
Appendix D – GI FTA Reference

Power Distribution Assembly, Model MU-GPRD02

The power distribution assembly has eight 2-pin connectors (J1 through J8) into which 2-wire power cables, model MU-KGPRxx, can be connected to supply the 24 Vdc power to the power connectors on the Galvanically Isolated FTAs.

Power Cables

Two power cable lengths can be ordered by model number. Model MU-KGPR05 is a 5-meter cable and model MU-KGPR10 is a 10-meter cable. Other lengths are available, but the cable must be ordered by part number. The available lengths are 20, 30, 40, 50, 80, 120, 160, 195, and 395 inches. Order by Honeywell part number 51109620-xxx, where “xxx” represents the length of the cable in inches. An illustration of the cable is shown in the following figure.



Model MU-KGPRxx (51109620-xxx) Power Cable

CE Compliant power cable

When the Galvanic Isolation Power Distribution Assembly is located external to the cabinet or cabinet complex that contains the power source (Power System), the CE Compliant version of the 6-connector cable must be used (Model MU-KSPRxx).

Model MU-KSPRxx (the suffix “xx” in the model number represents the length of the cable in meters) power cables are shielded cables. They are identified by shield drain wires terminated in lugs at each end of the cable. The drain wire at the far end of the cable shield must be attached to the FASTON terminal on the model MU-GPRD02 power distribution assembly. The Power System end of the cable shield must not be grounded and the drain wire must be either clipped or taped to the cable.

Power cable model list summary

Power Cable Model No.	Description	Use
MU-KDPRxx	6-pin connector cable	Connects power system to IOP card file, and Connects power system to Power Distribution Assembly
MU-KSPRxx *	6-pin connector cable (shielded)	Connects power system to externally located Power Distribution Assembly only. CE Compliant installations.
MU-KGPRxx Part No. (51109620-xxx)	2-pin connector cable	Connects Power Distribution Assembly to Galvanically isolated FTAs.
* Do not use to connect power system to IOP card file.		

Power distribution assembly mounting

See [Marshalling Panel](#) for a typical cabinet installation illustration. See [Power Distribution Assembly mounting](#) for additional installation information.

Appendix D – GI FTA Reference

Power Distribution Assembly, Model MU-GPRD02

Part II

ControlNet Installation Guide



System Cabling and Wiring Installation

Introduction

Experion PKS system cabling and wiring

Your Experion PKS system's cable and wiring requirements can be broken down into four basic categories: Ethernet Plant Information Network (PIN), Supervisory ControlNet Network, I/O ControlNet Network, and Field Wiring, as illustrated in Figure1.

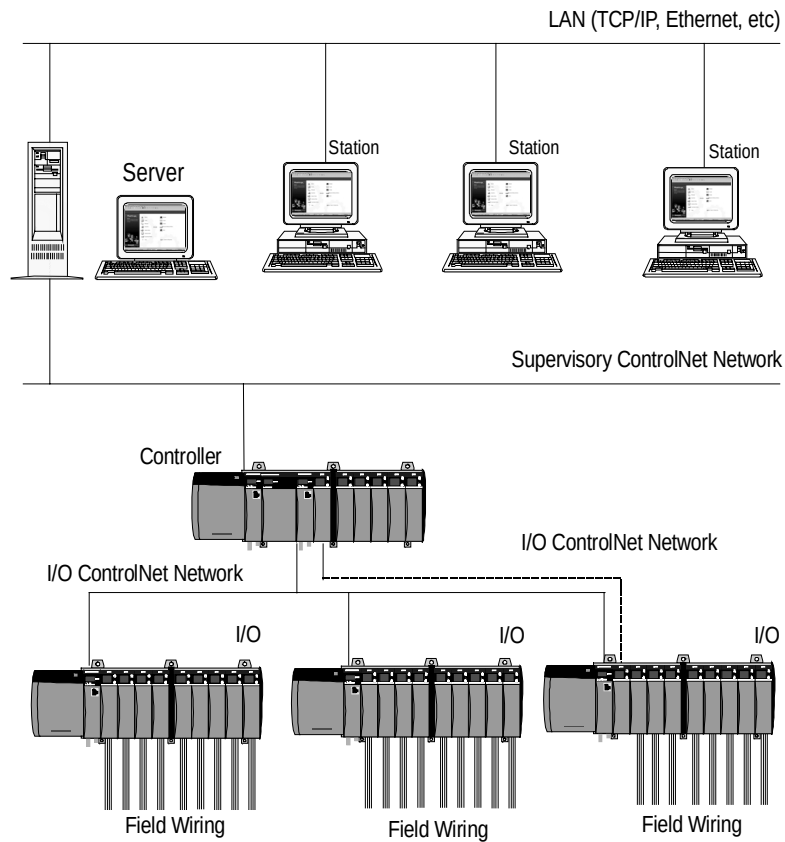


Figure 61 Experion PKS system topology

LAN (TCP/IP - Ethernet)

Your Experion PKS system uses a local area network (LAN, see Figure, 1) for server-to-station and station-to-server communications. This network may also provide links to other higher order networks and communication systems.

Installation of the LAN used by the Experion PKS system is NOT included in the procedures provided by this guide.



REFERENCE - EXTERNAL

For information concerning the installation of the cables and network hardware associated with LAN networks, please refer to your site documentation; network supplier provided documentation, or any of the many books on this subject.

ControlNet Network

Your Experion PKS system's ControlNet networks (see Figure, 1) are often thought of in terms of supervisory and I/O level. These terms identify the purpose of each level. However, these two levels are physically identical in their hardware, configuration, and communications needs.

Installation of the ControlNet network is defined and described in the procedures provided by this guide. To begin installing your ControlNet network, refer to *Before You Begin* in this guide.

Field Wiring

As with any control system, field wiring (see Figure 1), in all its forms, provides the vital link between the I/O modules and the process-connected sensing, measurement and control devices.

Installation of field wiring is NOT included in the procedures provided by this guide.



REFERENCE - INTERNAL

For information concerning:

- Pin outs of Experion PKS chassis I/O modules, refer to the *Experion PKS Control Hardware Installation Guide*
 - Standard rules, considerations and planning, refer to the *Control Hardware Planning Guide*
 - Specific field-device wiring requirements, refer to your site documentation or that provided by the device manufacturer.
-

Power and ground

Your Experion PKS system requires power and ground to be provided to the servers, stations, and controller and I/O chassis. Individual field devices may also require power and ground connections.

Installation of power and ground, outside of that required by your ControlNet network itself, is NOT included in the procedures provided by this guide.



REFERENCE - INTERNAL

For information concerning power and ground requirements and installation of:

- Servers and stations of your Experion PKS system, refer to your site documentation and that provided by the computer's manufacturer.
 - Standard rules, considerations and planning, refer to the *Control Hardware Planning Guide*.
 - Specific field-device wiring requirements, refer to your site documentation or that provided by the device manufacturer.
 - ControlNet modules, refer to the *Experion PKS Control Hardware Installation Guide*.
 - ControlNet network and components, excluding ControlNet modules, refer to the following topics in this guide.
 - *Preparing to Install ControlNet Components*
 - *Mounting Taps*
 - *Installing Repeaters*
 - *Building ControlNet Cables*
 - *Installing Trunk Cable*
 - *Connecting and Terminating Cables*
-

Before You Begin

Planning

All planning activities should be completed before you begin installing cable and wiring.



REFERENCE - EXTERNAL

For more information concerning planning activities, refer to:

- your site documentation
 - the *Control Hardware Planning Guide*
-

Obtain Documentation

Before installing any Experion PKS cabling or wiring, obtain all available and pertinent documentation. This should include all documentation supplied by Honeywell, your site's engineering documentation, and that from any additional third party suppliers whose products are involved in this installation. Additionally, you should obtain any applicable regulatory documentation that applies to your installation.

General Installation Checklist

Regardless of your specific case, consider the following installation checklist:

- Carefully review all available Honeywell and site engineering documentation, paying close attention to cautionary notes.
- Install your Experion PKS system in accordance with the current edition of the National Electric Code ANSI/NFPA 70, the Canadian Electrical Code, and other regulatory agencies governing your particular application.
- Use technically qualified personnel to install and service your Experion PKS system and components.

Conduct environmental checks

Using the *Control Hardware Planning Guide* and the Experion PKS specifications available online, be sure that all environmental guidelines and requirements have been taken into consideration before installing your ControlNet network.

The Experion PKS specifications can be found on the Honeywell website:
<http://www.acs.honeywell.com>. Just follow the Experion PKS product links.

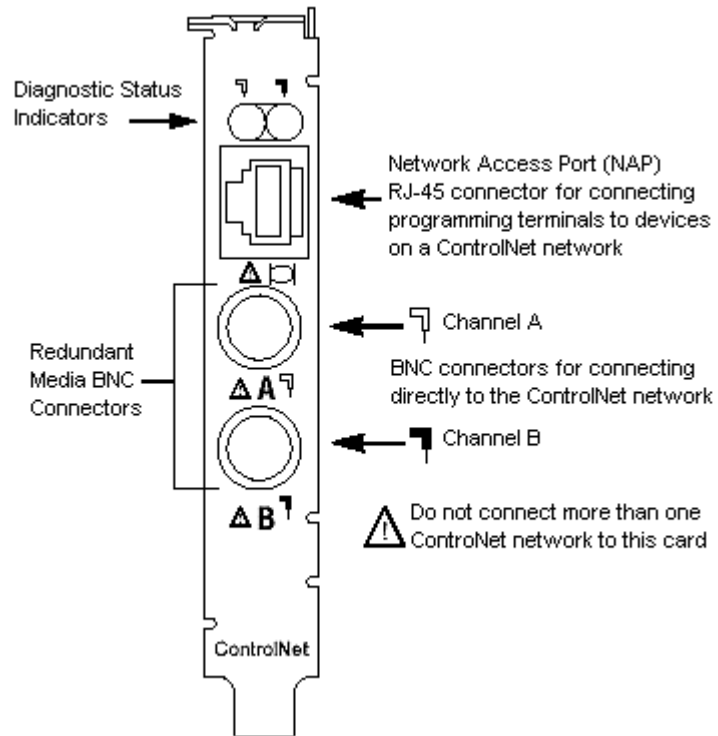
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ControlNet PCIC Card Installation

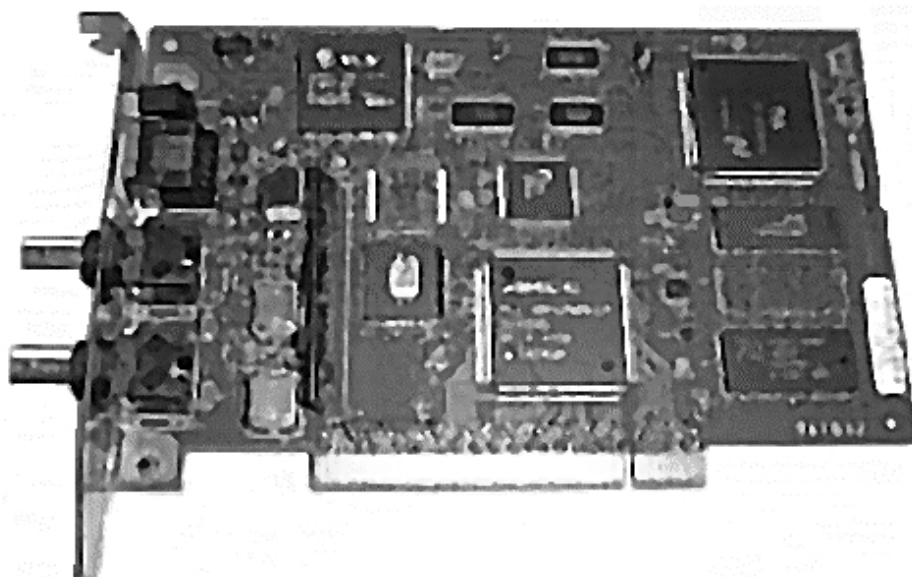
ControlNet PCIC Card Introduction

About the PCIC card

The Peripheral Component Interconnect communication (PCIC) interface card lets a PCI Local bus compatible computer communicate directly with other ControlNet products.



Front View



Component Side View

Compliance to European Union Directives

This product has the CE mark (on its packaging) and is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

Directive	Description
EMC	This product is tested to meet Council Directive 89/ 336/ EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file: • EN 50081- 2EMC – Generic Emission Standard, Part 2 – Industrial Environment • EN 50082- 2EMC – Generic Immunity Standard, Part 2 – Industrial Environment This product is intended for use in an industrial environment.
Low Voltage	This product is tested to meet Council Directive 73/ 23/ EEC Low Voltage, by applying the safety requirements of EN 61131– 2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

Component handling guidelines



ESD

The PCIC card uses CMOS technology, which is highly sensitive to electrostatic discharge (ESD). ESD may be present whenever you are handling the card. Handling a card without any ESD protection can cause internal circuit damage that may not be apparent during installation or initial use. Follow these guidelines when you handle a card:

- Touch a grounded object to discharge static potential,
 - Wear an approved wrist-strap grounding device,
 - Do not touch the connector pins,
 - Do not touch circuit components on the card,
 - If available, use a static safe workstation,
 - When not in use, keep the card in its static shield box or bag.
-



ATTENTION

Remember, a computer with ac power disconnected is **not** a grounded object.

A word about PCIC card drivers

The following releases of Rockwell Software's RSLinx include the device drivers for the PCIC card:

- RSLinx 2.1 Service Pack 2 and later
- RSLinx 2.2 and later

Refer to online Help in RSLinx for information on configuring the driver for the PCIC card. For more information about RSLinx, visit, <http://www.software.rockwell.com>.

Installing the PCIC Card

Prerequisites

- Be sure you know how to install hardware in your computer. And, have the computer's documentation available for reference.
- Be sure you have installed the operating system for your computer and configured your options.
- Be sure you are wearing a grounding wrist strap before you handle the card.
- Be sure you have a Phillips-head and flat-head screwdriver on hand.

Accessing the expansion slots

Use the following procedure to access the PCI local bus expansion slots in your computer. Refer to the computer manufacturer's documentation for details, if required.

Step	Action
1	Turn OFF the power switch to remove power from the computer.
2	Remove the computer's cover.
3	• Select a vacant PCI local bus expansion slot. • Remove the slot's expansion cover on the back (rear bracket) of the computer.
4	Go to the next section <i>Inserting the PCIC card</i> .

ControlNet PCIC Card Installation

Installing the PCIC Card

Inserting the PCIC card

Use the following procedure to insert the PCIC card into the computer's PCI local bus expansion slot.

Step	Action
1	Insert the PCIC card into the edge connector for the selected slot.
2	Install the expansion slot screw to secure the card in its slot.
3	Turn ON the power switch and wait for the computer to power up. • If the computer powers up correctly, go to Step 4. • If the computer hang ups, you probably have a memory or I/O conflict. Remove all other cards and try again. If the computer still hangs up, call our Technical Assistance Center.
4	Replace the computer's cover.
5	Connect the ControlNet network to the PCIC card connectors. See the section <i>Connecting to the Server ControlNet Interface module for the PC</i> in this document for details.

ControlNet Network Component Installation

Preparing to Install ControlNet Components

Prepare for installation



REFERENCE - INTERNAL

Before you begin to install your ControlNet networks, please review *Control Hardware Planning Guide* to ensure that all pre-installation planning and activities have been considered.

Components



REFERENCE - INTERNAL

For a listing of the components associated with the ControlNet network, refer to the *Control Hardware Planning Guide*.

Agency approval



REFERENCE - INTERNAL

For a listing of agency approvals, and specific details concerning these approvals, refer to the Experion PKS specifications.

The Experion PKS specifications can be found on the Honeywell website: <http://www.acs.honeywell.com>. Just follow the Experion PKS product links.

Planning

All ControlNet network planning activities should be completed before you begin installation.



REFERENCE - INTERNAL

For more information concerning planning activities, refer to *your site documentation* and the following topics in ControlNet Configuration section of the *Planning Guide*.

- *Planning Overview*
 - *Planning Your Link and Segment Configurations*
 - *Connecting Your Links and Segments*
 - *Planning Your Physical Media*
 - *Planning for Your Cable Connectors*
 - *Planning for Your Taps*
 - *Planning Your Nodes*
 - *Planning for Terminators*
 - *Planning Your ControlNet Addressing*
-

ESD/EMI Immunity



REFERENCE - INTERNAL

For more information concerning ESD/EMI Immunity planning, guidelines, and practices, refer to:

- *Planning for Static Electricity Minimization*
 - *Planning for Interference Minimization*
 - *Planning Raceway Layouts*
 - *Planning for Bonding and Grounding*
 - *Planning for Power Distribution*
 - *Suppressing Power Surges*
 - *Planning Enclosure Lighting*
 - *Avoiding Unintentional Momentary Turn-on of Outputs*
-

Mounting Taps

Rules

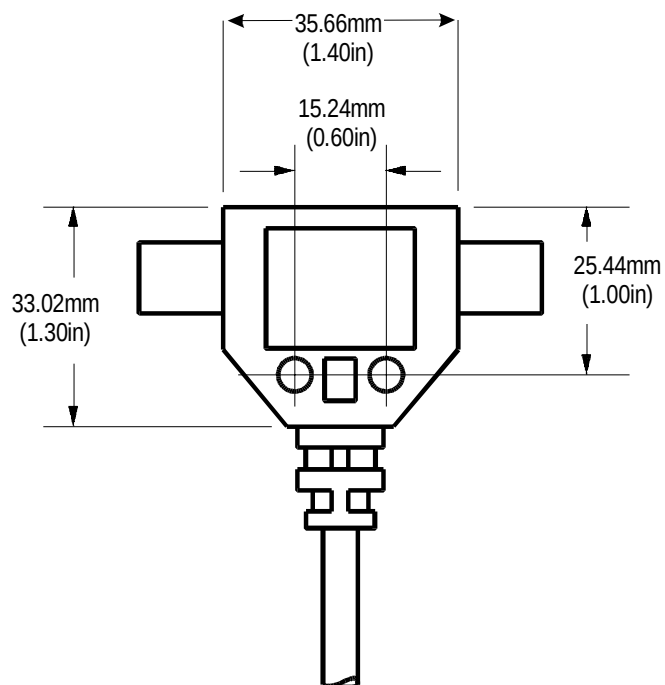
The following general rules should be applied when mounting taps:

- There is no minimum trunk cable length requirement between taps. Adjacent taps can be connected (without a trunk cable at all) using a barrel connector (TC-MC3BNC).
- Make sure the mounting location is convenient for your cable routing.
- Make sure the mounting location does not cause any cable bend-radii to exceed the limits given in *Installing Trunk Cable*.
- Do not mount the tap in a position that routes the drop-cable or trunk-cable over any ac power terminals on nearby modules.

For more details on selecting where to mount taps, refer to the *Control Hardware Planning Guide*.

Mounting dimensions

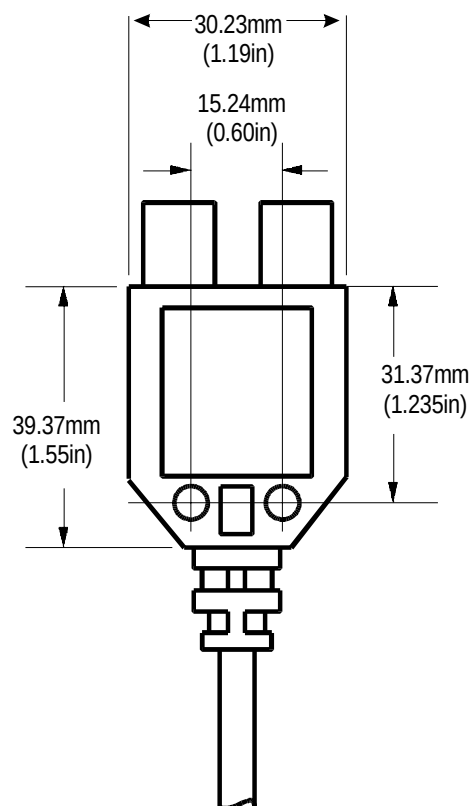
T-tap



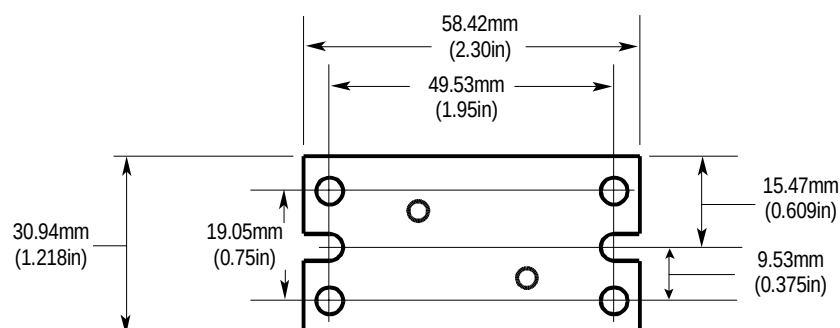
ControlNet Network Component Installation

Mounting Taps

Y-tap



Universal Mounting Bracket



Mounting taps

You can mount your ControlNet taps (Y-tap and T-tap):

- to a universal mounting bracket (included with the tap), and then mount the tap and bracket as an assembly
- through the body holes in the tap using:
 - screws and flat washers
 - a tie wrap



ATTENTION

When using the Through-body-hole mounting method to attach taps, the mounting surface may be conductive and/or grounded because of the electrical isolation provided by the body holes.

Once you have mounted your taps, you can discard any unused universal mounting brackets.



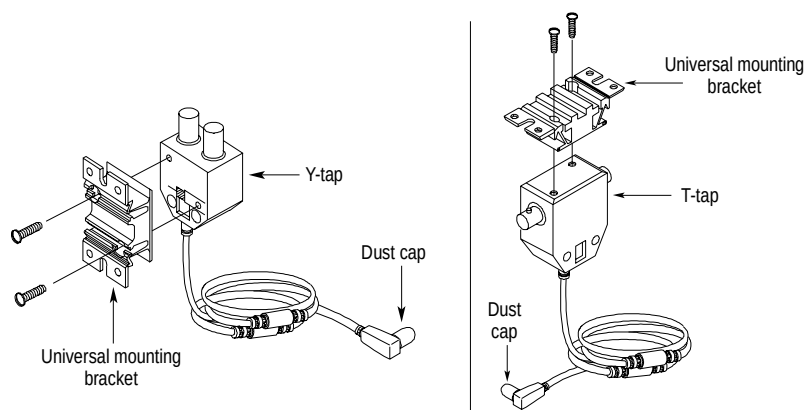
CAUTION

Do not allow any metal portions of the tap, such as the universal mounting bracket screws or connectors, to contact any conductive material. This contact could cause noise on the network.

ControlNet Network Component Installation

Mounting Taps

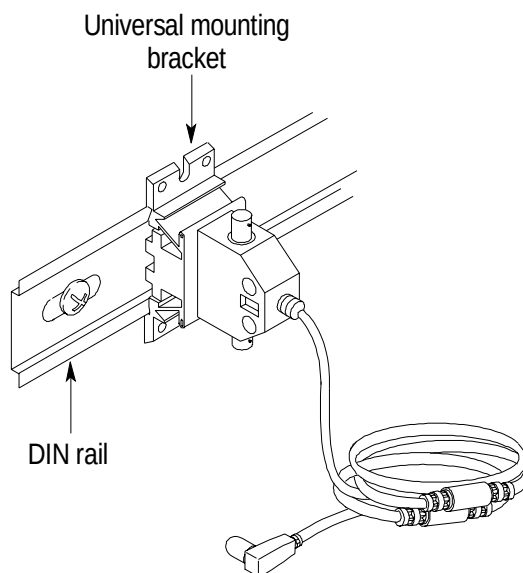
Step	Action
1	If you are using: - the through-body-hole mounting method, go to Step 4. - a universal mounting bracket, go to Step 2.
2	Align the bracket with the mounting holes on the tap.
3	Using the screws provided, attach the tap to the universal mounting bracket.



Mount the tap and bracket (if used) to a suitable fixture using the appropriate method.

Step	Action

DIN Rail Mounting



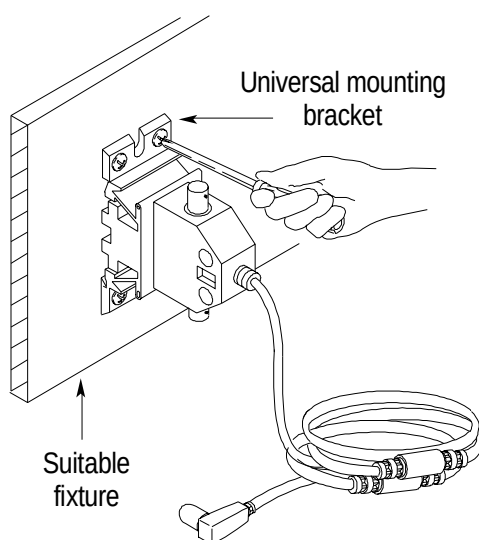
ControlNet Network Component Installation

Mounting Taps

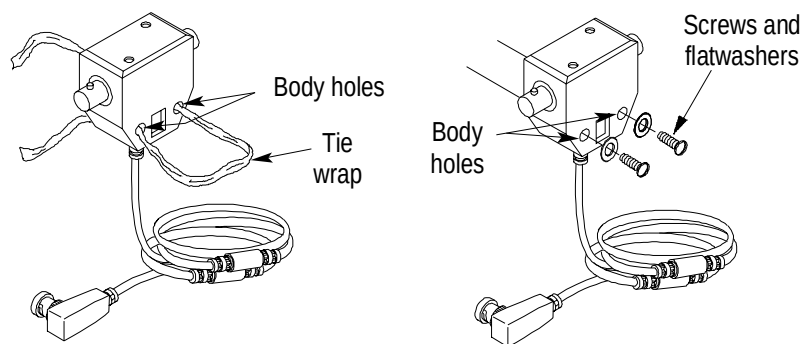
Step

Action

Flat Surface Mounting



Through Body Hole Mounting





CAUTION

Do not over-tighten the screws. Doing so can damage the tap. Applied torque should be 0.2–0.4 N•M (1–2 ft-lbs.).

Identifying drop-cables



ATTENTION

If you have not already done so, this is a good time to apply identification to your drop-cables. For more information regarding drop-cable identification, refer to the Planning Guide, ControlNet Configuration, Planning Your Taps, *Planning for drop-cable identification*.

Identifying the drop-cables from the taps you install makes locating system parts and troubleshooting the system much easier. Drop-cable labels are included with each tap kit.

Step	Action
1	After installing your tap, locate the drop-cable identifying labels in your tap kit.
2	Apply labels as follows: • Apply one red A label at the Supervisory ControlNet (A) drop cable connector. • Apply one yellow B label at the Supervisory ControlNet (B) drop cable connector. • Apply two red A labels at the I/O ControlNet (A) drop cable connector. • Apply two yellow B labels at the I/O ControlNet (B) drop cable connector.
3	If desired, you may use this marking code system for module connections, taps, and trunk cables.
4	Save any unused labels for future use.

Installing Repeaters

Rules

The following general rules must be applied when mounting either the model 9904-RPT or the model 9904-RPTD:

- Air flow, in/out of the air holes on the top and bottom of the repeater, for proper ventilation, must not be impeded. Make sure there is a minimum of 5.1 cm (2 in) from surrounding equipment.
- For proper ventilation, air flow through holes on the top and bottom of the repeater must not be blocked. Make sure NEMA enclosures must be employed in environments where protection from dust, moisture or corrosive atmospheres is required.
- Mount to a grounded metal plate if possible.

For more details on selecting where to use repeaters, refer to the Control Hardware Planning Guide, *Connecting your Links and Segments*.

Mounting dimensions

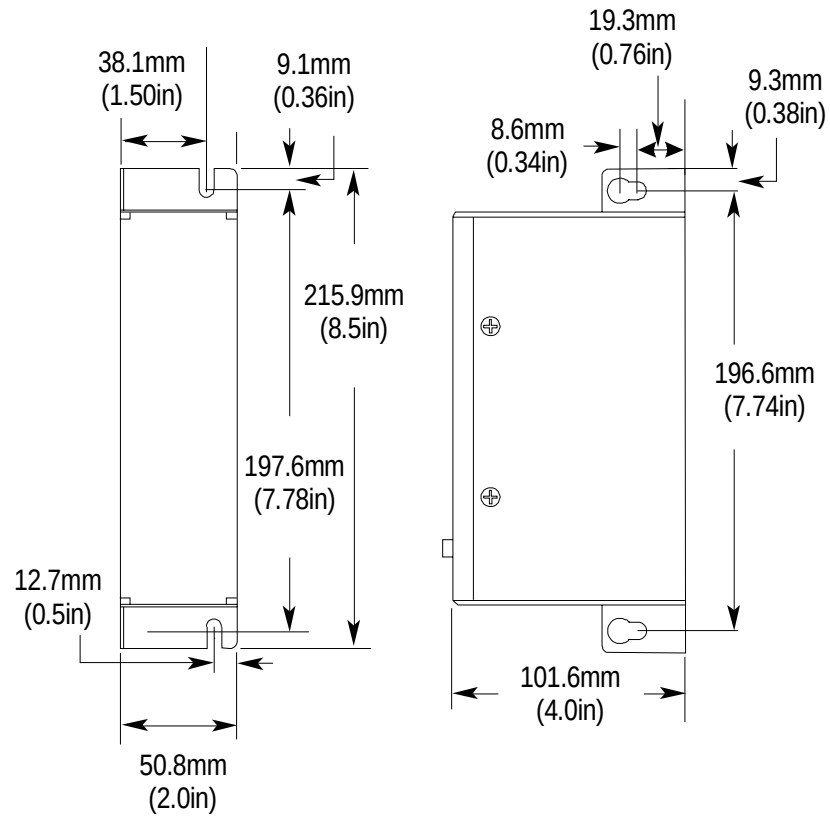


Figure 2 Repeater mounting dimensions

Mounting your repeater

Mount your repeaters following the:

- specifications set forth in your site documentation
- rules defined for repeater installation (see Installing Repeaters, *Rules* in this section)
- *mounting dimensions* provided

Grounding your repeater

Keeping the ground lead as short as possible, use a #14 AWG wire to connect the repeater to the ground bus. Also refer to *Power/Ground, Compliance* in the *Control Hardware Planning Guide*.

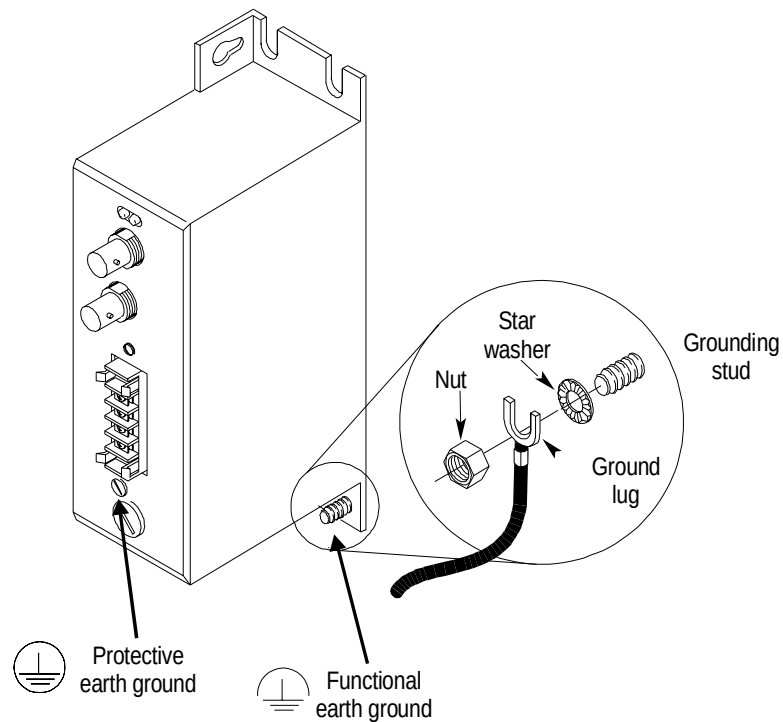


Figure 3 Grounding repeaters

Connecting ControlNet cables to your repeater



REFERENCE - INTERNAL

For information concerning connecting ControlNet cables to your repeater(s), refer to *Connecting to Repeaters* in this guide.

Connecting power and relay circuitry

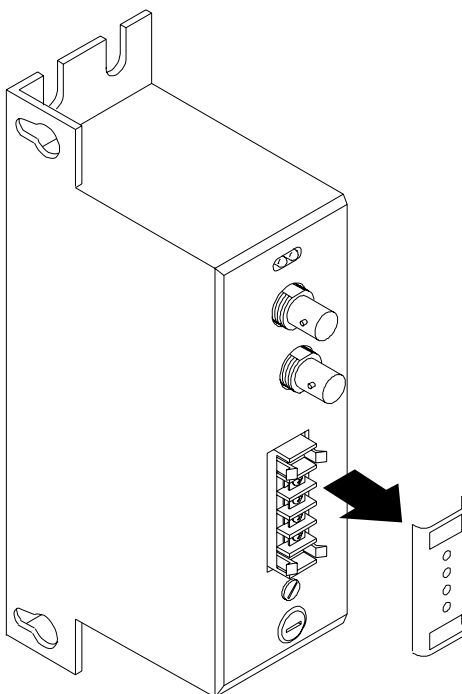


CAUTION

If you are using DC to power the repeater, L1 is positive (+) and L2/N is negative (-).

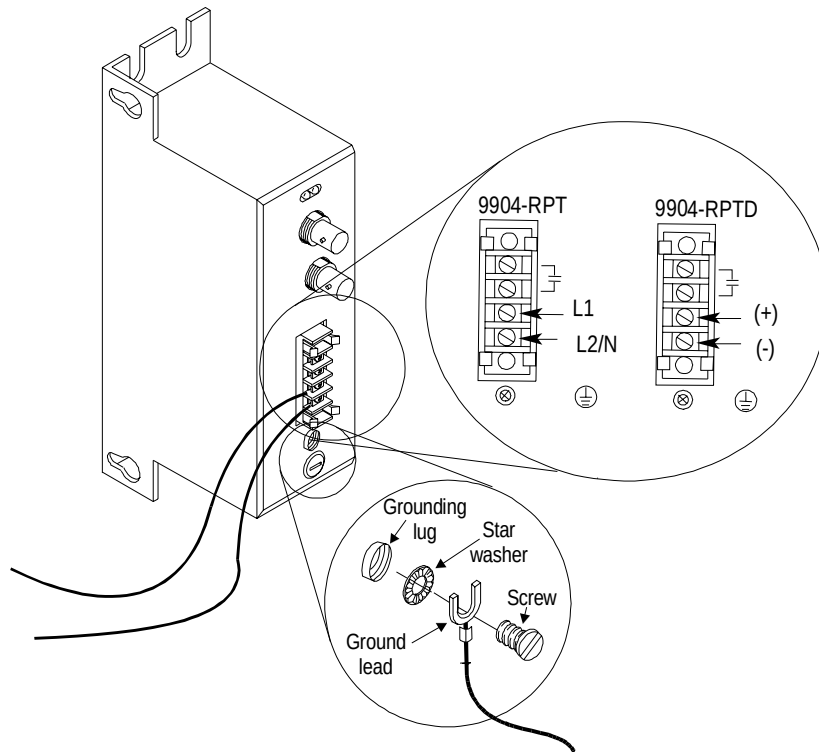
See Step 2 of the following procedure.

Step	Action
1	Remove the terminal strip cover.



Step	Action

2	Connect power to the repeater.



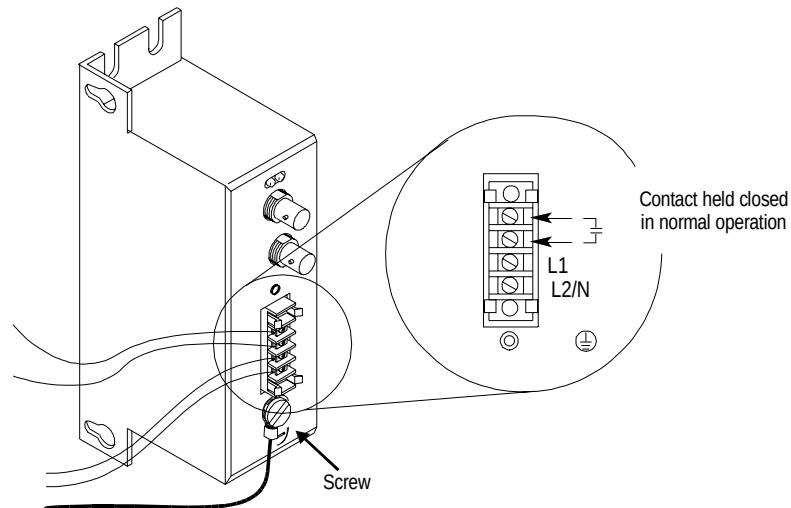
3 If you are:

- using the fault-relay terminals, go to Step 4
- not using the fault-relay terminals, go to Step 5

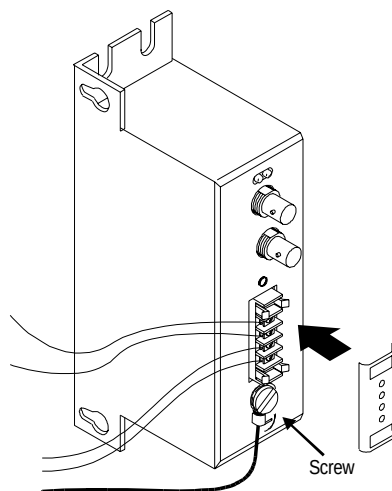
ControlNet Network Component Installation

Installing Repeaters

Step	Action
4	Connect your relay circuitry to the fault-relay terminals.



5	Replace the terminal strip cover.



Building ControlNet Trunk Cables

Preparing to Build ControlNet Trunk Cabling

Before you begin

ControlNet trunk cables may be purchased in pre-built lengths, or you may build your own. The following installation procedures apply to building your own trunk cables, and also apply to the modification or repair of existing (pre-built or your own built) trunk cables.

Materials needed

In order to build your own ControlNet trunk cables you will need ControlNet-certified trunk cable and connectors, cable stripping and connector crimping tools, and test equipment to test the cables after assembly. Honeywell provides the following to aid you in the construction of your own cables.

- ControlNet-certified trunk cable (TC-KCC900), available on a reel in 275 meter (900 feet) lengths.
- Trunk Cable Connectors (TC-MC1BNC), packaged two to a set (one for each end).
- ControlNet Coax Network Toolkit (9904-CTK)



REFERENCE - INTERNAL

Refer to the following topics in this guide for additional information regarding:

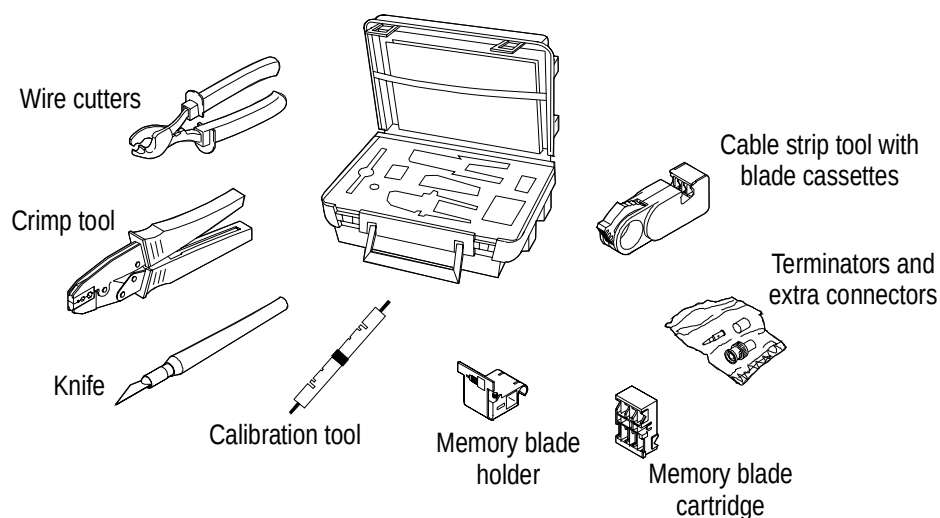
- *Tools Needed*
 - *Installing Cable Connectors*
-

Building ControlNet Trunk Cables

Preparing to Build ControlNet Trunk Cabling

Tools needed

To build your own or modify existing ControlNet trunk cables, we recommend you use the tools in the ControlNet Coax Network Toolkit, model 9904-CTK. The tools in this kit are designed for use when stripping coaxial cable and installing cable connectors. Other tools, such as an Ohmmeter and a Time Domain Reflectometer (TDR), may be necessary to install and test the cable itself.



Bulk cable testing

If you have ordered raw bulk ControlNet trunk cable TC-KCC900 from Honeywell, or ControlNet-certified trunk cable from some other source, you may want to test it for structural return loss prior to beginning to build your trunk sections.

You should always follow any pre-established procedures for testing raw bulk cable at your site. If these procedures do not exist, the following will help you determine if you should test your raw bulk cable:

- Advantages—
 - You can determine if a raw bulk reel of cable is bad.
 - You minimize time lost building individual trunk cable sections from bad raw cable.
- Disadvantages—
 - Not knowing where in the cable's length it is bad, nor how many bad spots it may have.
 - You must install temporary connectors onto both ends of the raw cable to perform the test.
 - It can be difficult to accurately test very long lengths of cable due to its greater inherent attenuation.



REFERENCE - INTERNAL

If you have determined you will test the raw bulk cable, refer to this document, *Installing Cable Connectors, Testing stripped cable for electrical shorts and continuity*.

Please note that testing by more elaborate means, such as a Time Domain Reflectometer (TDR), is more appropriate after your trunk cables have been built.

Adjusting the cutting blades

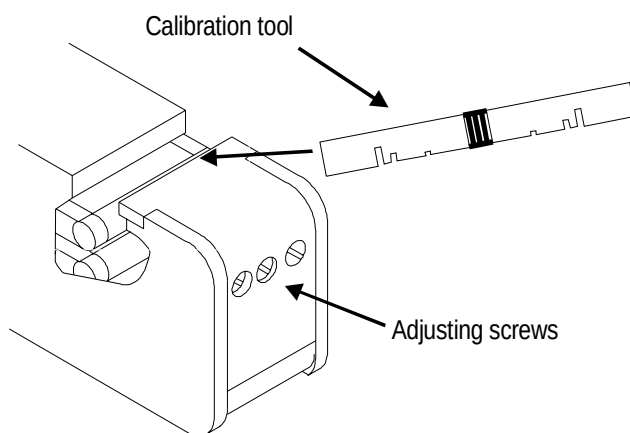


CAUTION

The cut adjustments described in the following procedure must be precise. Adjustments as small as 1/12 to 1/8 of a turn can make the difference between a perfect and an imperfect cut.

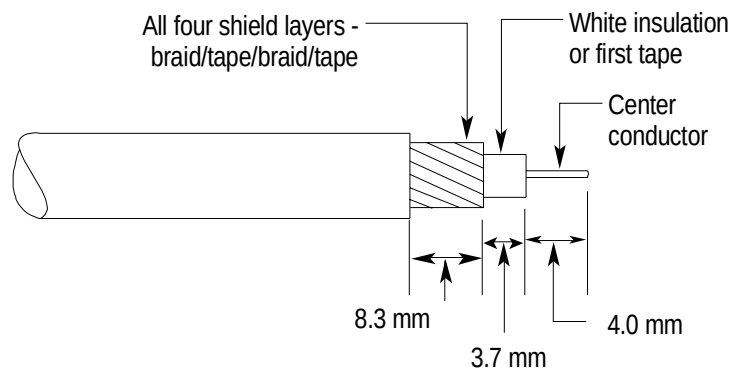
Do not over-tighten the screws of the cable strip tool. The blades should not bend, shift, or penetrate the calibration tool.

Step	Action
1	Place the calibration tool into the cable strip tool. Install the narrow end facing forward for FEP cable or the wider end facing forward for PVC cable. Ensure that the grooves in the calibration tool are aligned with the blades in the cable strip tool.



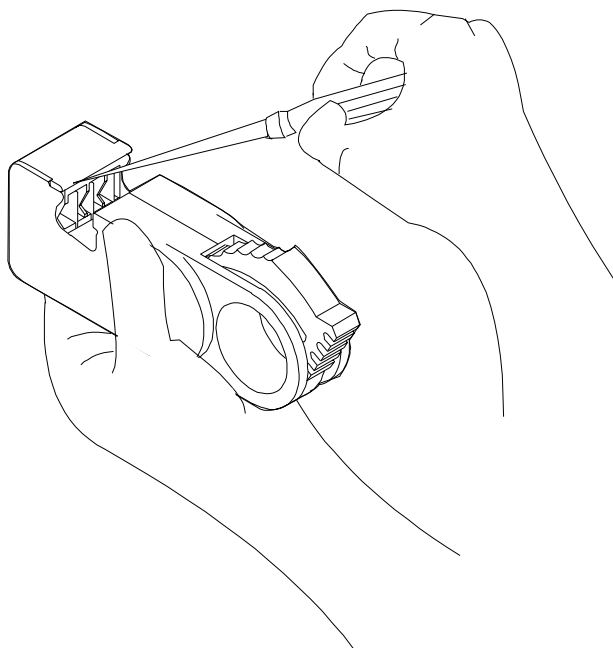
- 2 Tighten the handle of the cable strip tool so that the calibration tool is locked in place.

Step	Action
3	Adjust the blade cutting depth for each blade so that they just touch the calibration tool. To do this, turn the three screws located in the memory-blade holder. Each screw adjusts the corresponding blade in the blade cassette. To: • increase the cut depth, turn the screw clockwise • decrease the cut depth, turn the screw counter-clockwise
4	Retract the handle of the cable strip tool.
5	Remove the calibration tool from the cable strip tool.
6	If the previous steps have been performed correctly, using the cable strip tool will make cuts of the following dimensions in the cable: • Cut 1 cuts the outer sheath without cutting the outer wire braid. • Cut 2 cuts the outer sheath, the three outer shields, and possibly the inner tape shield. The insulation may be scored slightly, but should not have a deep cut. • Cut 3 cuts all layers of the cable down to the center conductor. This cut should not score the center conductor.

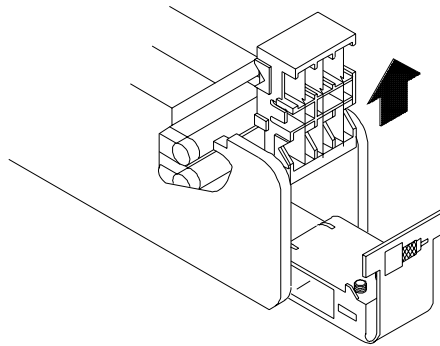


Reversing and replacing the cutting blades

Step	Action
1	Use a screwdriver to lift the memory-blade holder and swing it back.



Step	Action
2	Slide the memory-blade cartridge out of the strip tool.

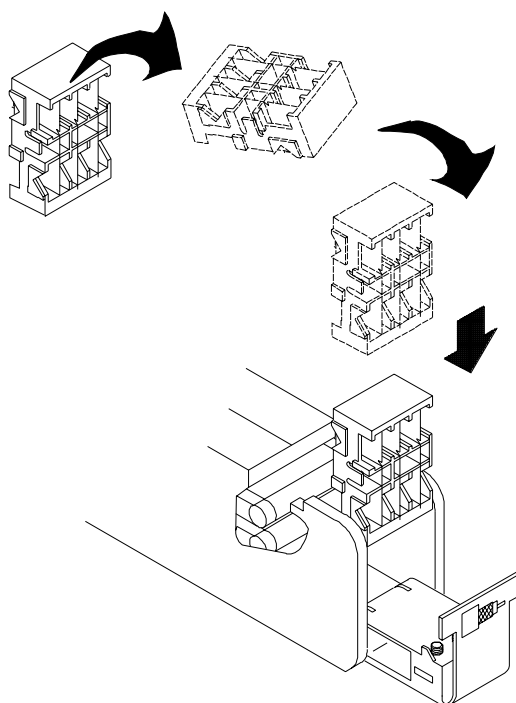


- 3** If you are:
- reversing the memory-blade cartridge to use its second set of blades, go to Step 4.
 - replacing the memory-blade cartridge, go to Step 5.

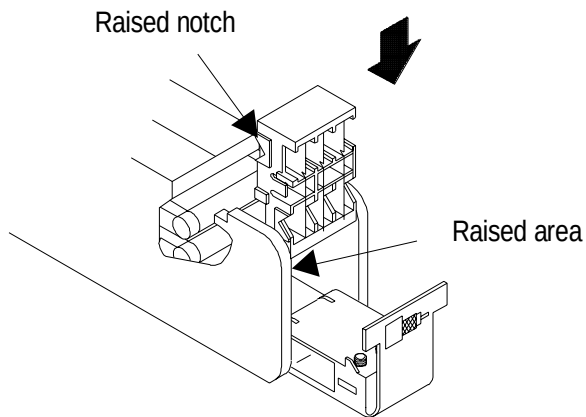
Building ControlNet Trunk Cables

Preparing to Build ControlNet Trunk Cabling

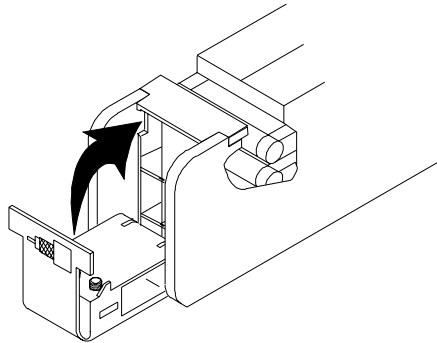
Step	Action
4	Flip the memory-blade cartridge, and slide it back into the strip tool. Skip Step 5, and go to Step 6.



Step	Action
5	Align the memory-blade cartridge (the side with the raised notches) to the raised area on the inside of the strip tool and slide the new memory-blade cartridge in. The blades should be on top as you slide the cartridge in.



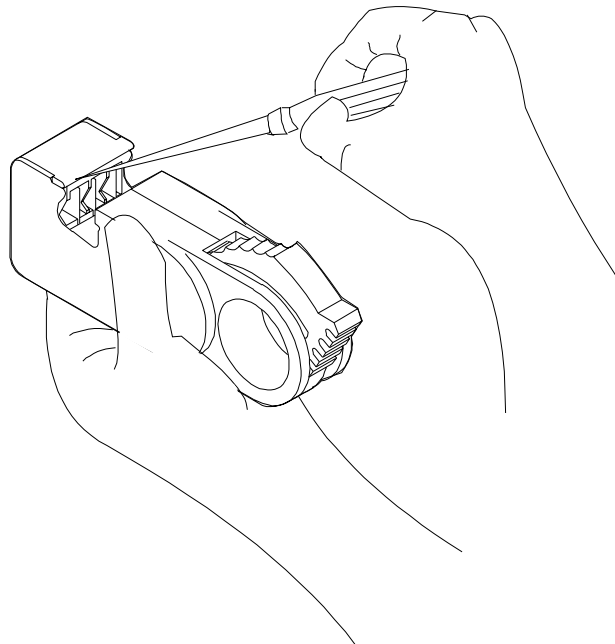
- 6 Swing the memory-blade holder closed.



Changing the memory-blade holder

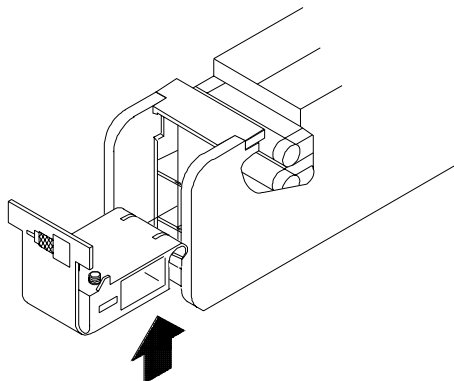
You received two memory-blade holders with your cable strip tool; one is for standard PVC-CL2 cable, and the other is for plenum FEP-CL2P cable. You need to install the appropriate memory-blade holder for the types of cable you are stripping (PVC or FEP).

Step	Action
1	Lift the latches on the memory-blade holder, and swing back the holder.

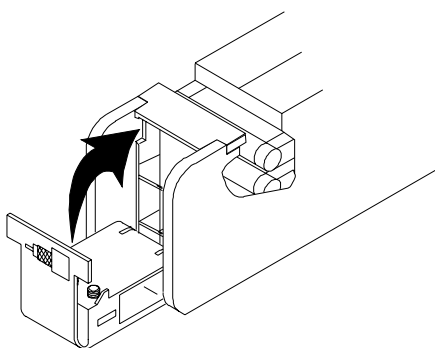


Step	Action

2	Snap the memory-blade holder off the rod, and remove it from the strip tool.



3	Position the appropriate memory-blade holder on the rod and snap the holder into place.
4	Swing the memory-blade holder closed.



Installing cable connectors

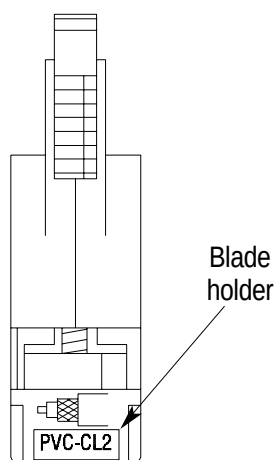
Stripping the cable



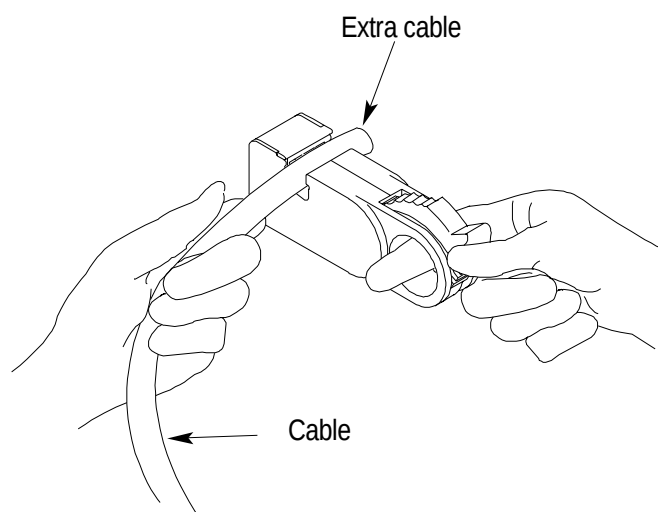
CAUTION

When cutting cable sections, make them long enough to route from one tap to the next with sufficient slack so that the *bend radius* does not exceed the defined requirements.

Step	Action
1	Verify that you have the proper memory-blade holder installed for the type of cable you are using (PVC-CL2 or FEP-CL2P). Refer to <i>Changing the Memory Blade Holder</i> , in this section, if you need to change the memory-blade holder.



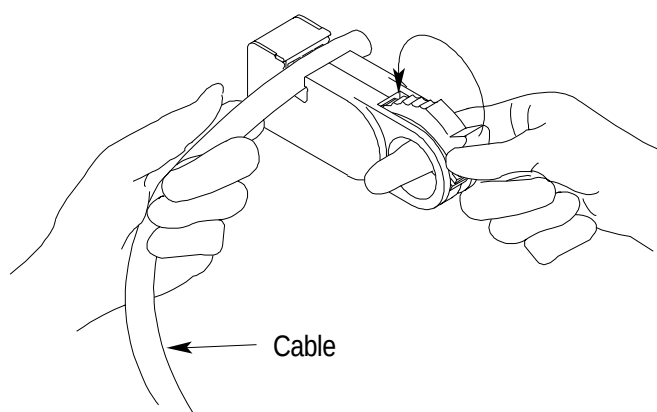
Step	Action
2	Insert the cable into the cable strip tool's cutting chamber so that extra cable, approximately 25.4 mm (1 in), extends beyond the edge of the tool. The cutting chamber houses the center conductor that will be exposed when the cable is stripped.



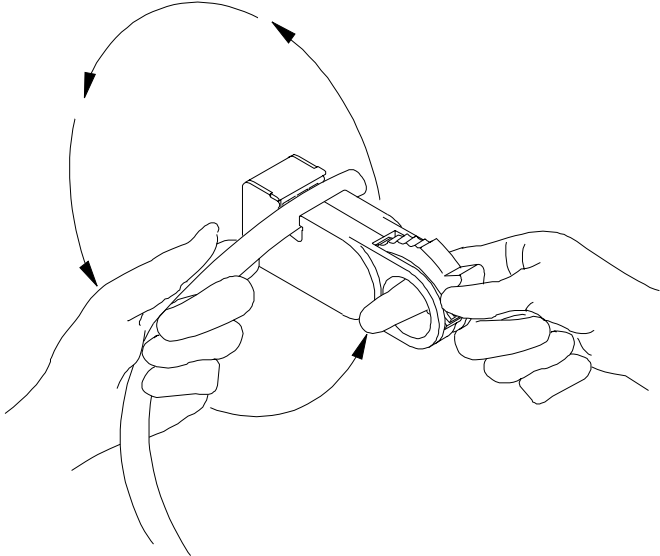
Building ControlNet Trunk Cables

Installing cable connectors

Step	Action
3	Lock the cable into place by moving the chamber-gauge ring forward until it meets the cable, with slight resistance. The gauge moves two rollers toward the cable and regulates the depth of the cut. The gauge will "click" as it moves from one stage to the next.



Step	Action
4	Holding the cable in one hand, place the index finger of your other hand inside the chamber-gauge ring. Turn the strip tool 360° around the cable. Make four or five full rotations until the strip tool glides easily around the cable.

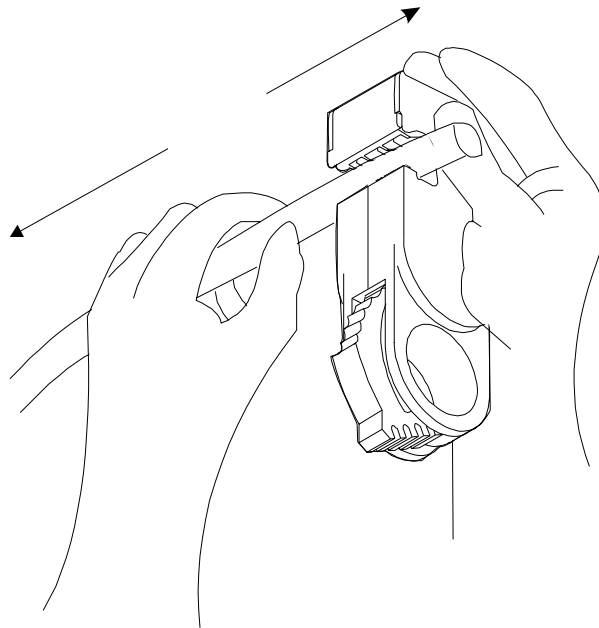


5	Continue repeating Steps 3 and 4, moving the chamber-gauge ring forward one notch each time you repeat the steps until you reach the last notch. Each time you move the chamber ring forward a notch, the strip tool makes a deeper cut into the cable. On your last repetition of Steps 3 and 4, apply sufficient pressure on the chamber-gauge ring to ensure the ring has reached the last stage.

Building ControlNet Trunk Cables

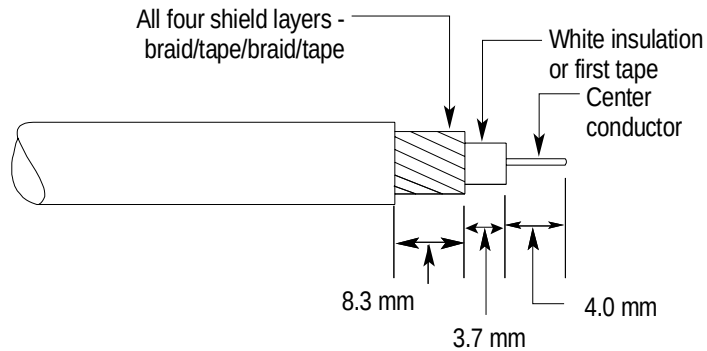
Installing cable connectors

Step	Action
6	After you have moved the chamber-gauge ring to the last position and turned the strip tool the final time, move the chamber-gauge ring backward to release the strip tool, and remove it from the cable. • move the chamber-gauge ring backward to release the strip tool, and remove it from the cable. • strip away the appropriate portion of the cable, without using the strip tool. • clean the remaining cable parts from the strip chamber after each use.



- 7 Using only your hands (without using the strip tool) strip away the appropriate portions/layers of the cable.

Step	Action
8	Examine the resulting cuts. The various layers, as illustrated below, should now be exposed. • If you do not see the three distinct layers of cable, snip off the end with wire cutters, and repeat the entire cable-stripping process. • If stripping problems persist, the strip tool may need adjustment. In this case, refer to <i>Adjusting the Cutting Blades</i> in this section.

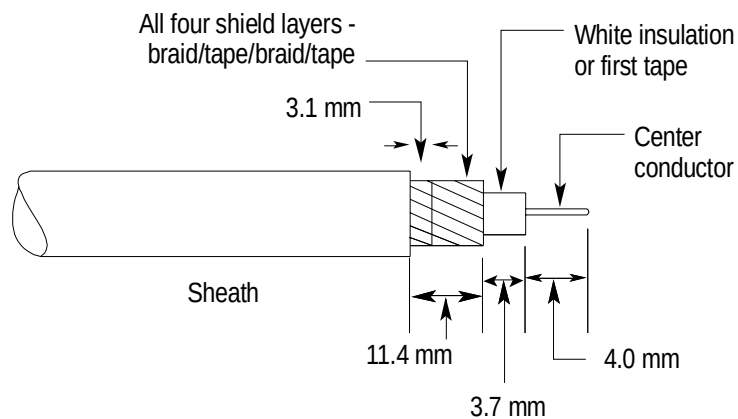


- 9 If you are using:
- FEP cable, go to Step 10 before completing Step 11.
 - PVC cable, skip Step 10, and go to Step 11.

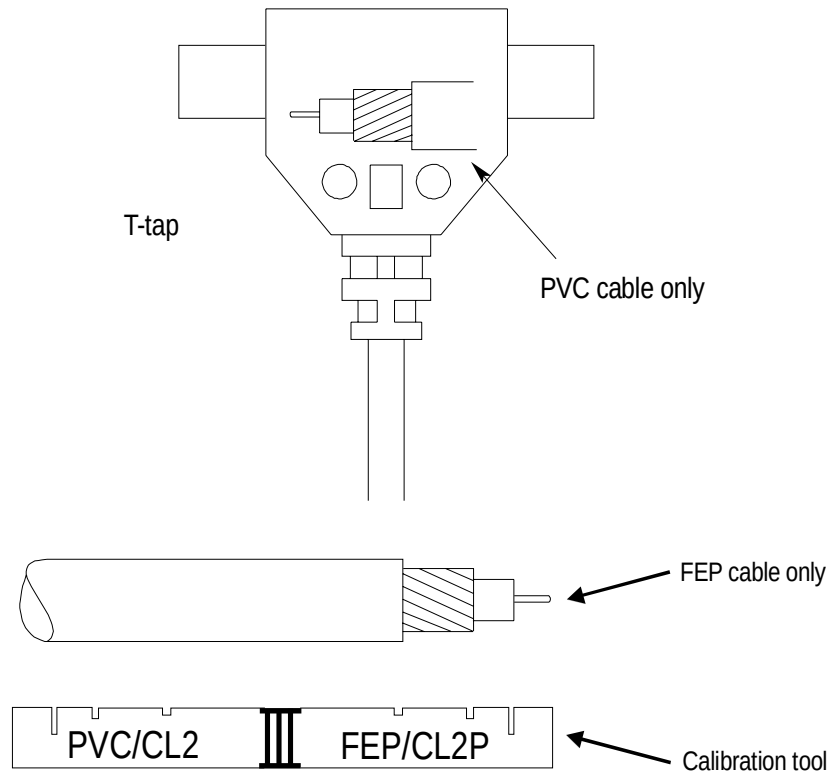
Building ControlNet Trunk Cables

Installing cable connectors

Step	Action
10	For plenum FEP cable, cut off an additional 3.1 mm (approximately 1/8 in) of the outer sheath with the knife from the toolkit.

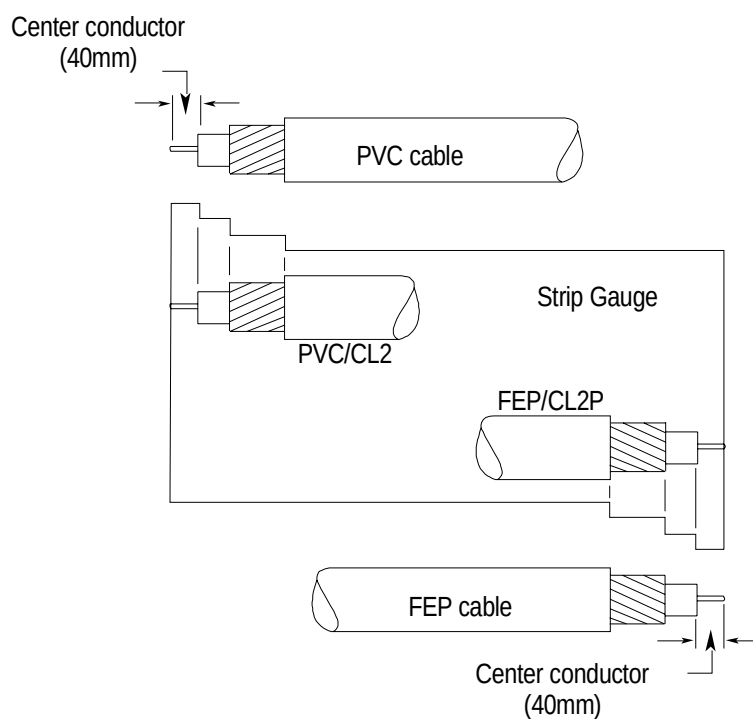


Step	Action
11	Make sure the center conductor is 4.0 mm (0.157 in.) in length and clean/free of any insulation residue. For PVC cable, use the imprint guide on the back of the ControlNet tap or the strip gauge to verify this. For FEP cable, use the small end of the calibration tool to verify this. • If the center conductor is too <i>long</i>, cut off the excess with wire cutters. • If the center conductor is too <i>short</i>, repeat the entire cable-stripping process.



Building ControlNet Trunk Cables

Installing cable connectors



CAUTION

Inspect the stripped cable, checking for any braid stranding that may not have been cut at the proper length. Even one strand coming in contact with the center conductor could short out the cable. If any such strands are found, cut them to the correct length.

Testing stripped cable for electrical shorts and continuity

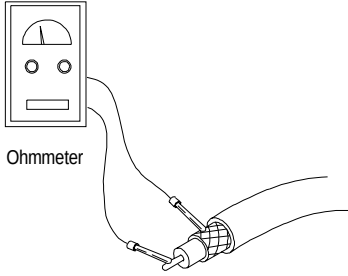
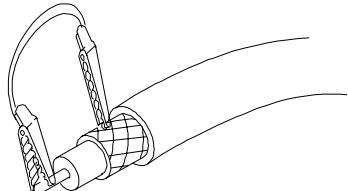


ATTENTION

This procedure may be used to test cut and stripped lengths of raw trunk cable for electrical shorts and continuity. This test will be repeated once the connectors have been attached to both ends.

Other, more elaborate testing for structural return loss, such as with a Time Domain Reflectometer (TDR), may also be performed, but are more appropriate after your trunk cables have been built.

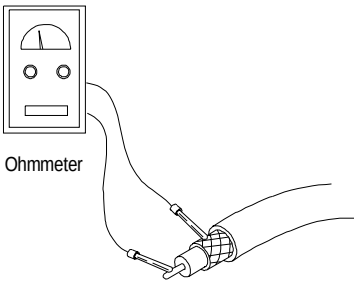
Before attaching connectors to your trunk cable, test for electrical shorts and continuity.

Step	Action	Result
1	Using an ohmmeter or continuity tester, test for a short between the center conductor and the shield.	If the resistance reading indicates: - there is <u>no short</u>, go to Step 2. - that a <u>short exists</u>, inspect the ends of the cable for short circuits. If you are unable to locate a short, replace the trunk-cable section.
		
2	Connect a temporary short between the center conductor and the shield at one end of the cable.	

Building ControlNet Trunk Cables

Installing cable connectors

Step	Action	Result
3	At the other end of the cable, use an ohmmeter or continuity tester to test for electrical continuity.	If the resistance reading indicates: • there is <u>no short</u>, discard the trunk-cable section. • that a <u>short exists</u>, proceed with connector installation on that section of trunk-cable.



The diagram shows a rectangular ohmmeter with a semi-circular scale at the top, two small circular buttons in the middle, and a rectangular display at the bottom. Two test leads are connected to the ohmmeter. One lead is inserted into a cable connector, and the other lead is touching the metal braid of the same connector. The cable connector is shown in cross-section, revealing internal wires and a central pin. The label 'Ohmmeter' is positioned below the device.

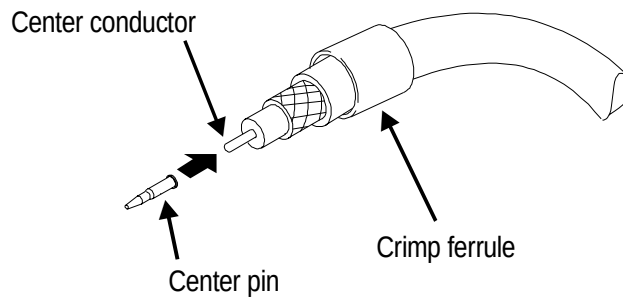
Attaching connectors to the cable



CAUTION

Many network problems are due to improperly installed connectors. You should have tight-fitting connectors on the ends of all your trunk cables. If it is loose or comes off, snip off the connector and install a new one.

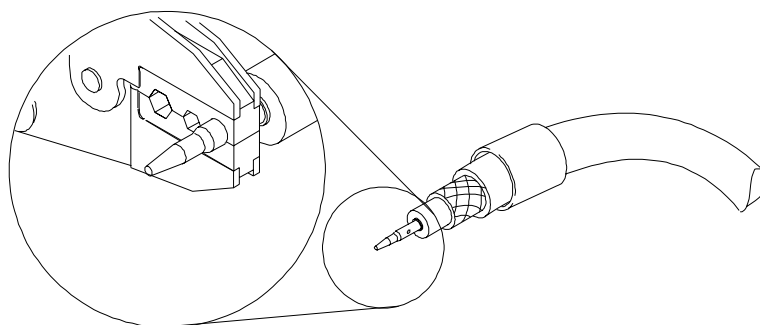
Step	Action
1	Slip the crimp ferrule onto the cable. Push it back to the sheath area to keep it out of the way for the moment.
2	Place the center pin over the center conductor. Make sure that the center pin slips completely onto the center conductor. The back shoulder of the center pin should be up against the white insulation. If it is not, recheck the length of the center conductor.



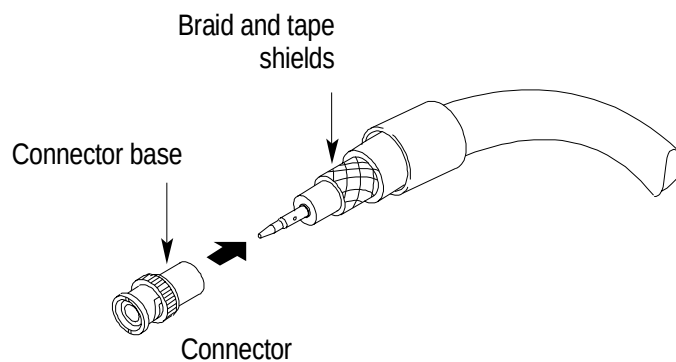
Building ControlNet Trunk Cables

Installing cable connectors

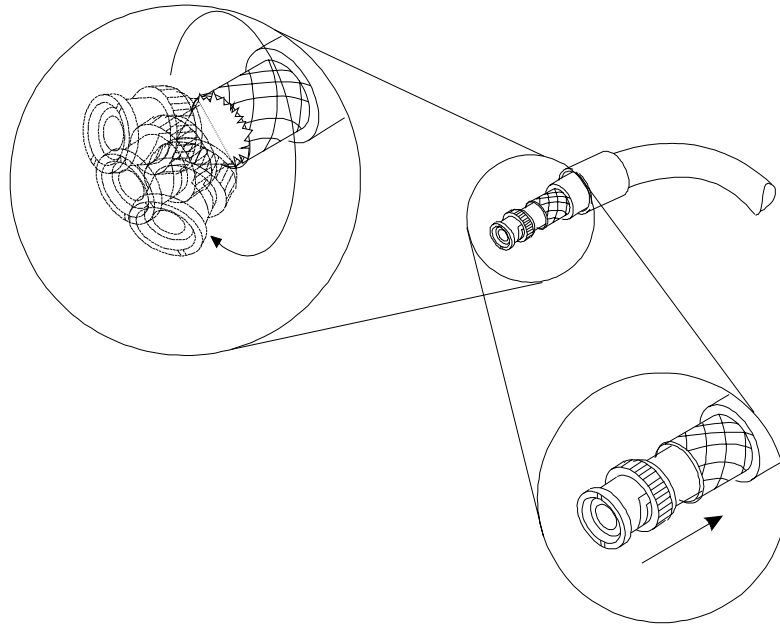
Step	Action
3	With the center pin in place, use the crimp tool to crimp the pin completely onto the center connector. (The smaller hexagonal notch on the crimp tool is for crimping the center pin onto the center connector.)



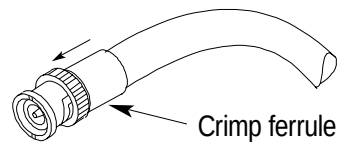
- 4 Slide the ControlNet connector onto the cable.



Step	Action
5	Without any inward pressure, move the connector in a circular motion to work the connector base underneath the three outer shields. Once a gap has opened up between the inner shield tape and the three outer shields, start applying inward pressure to seat the connector base under the three outer shields (braid/tape/braid). NOTE: The shield wires are pliable and may fray slightly.

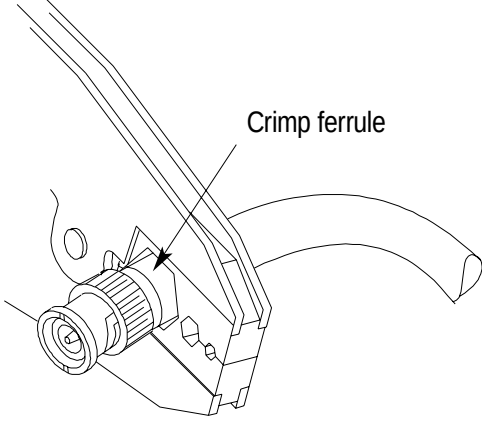


- 6 Slide the crimp ferrule over the three outer shields and connector base, until the ferrule meets the shoulder on the connector.



Building ControlNet Trunk Cables

Installing cable connectors

Step	Action
7	To crimp the ferrule, position the crimp tool on the ferrule, as close as possible to the connector base and ferrule meeting line. Press the tool tightly around the ferrule, until the crimp tool allows release.
	
8	Pull the connector to verify that it is securely attached. If it is loose or comes off, remove it and install a new one. Note: it may be necessary to cut back and re-strip the end of the cable if that is the cause of the loose connector.

Testing finished cables



Caution

Always test your finished trunk cable segments before connecting them to a new or established ControlNet network. For finished cable testing, refer to this document, *Testing ControlNet Cables*:

- Preparing to Test ControlNet Trunk Cables
 - Testing Using an Ohmmeter, and
 - *Testing Using a Time Domain Reflectometer*
-

Testing ControlNet Trunk Cables

Preparing to Test ControlNet Trunk Cables

Before you begin

Two tests are covered here:

- *Testing using an Ohmmeter*, and
- Testing using a Time Domain Reflectometer (TDR).

When to use these tests

These tests have two primary uses:

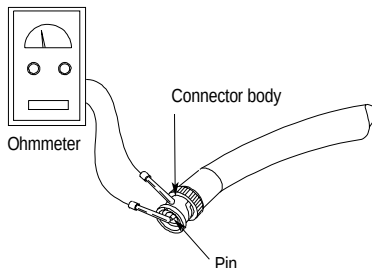
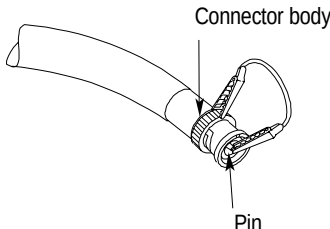
- after building ControlNet trunk cable segments from certified raw cable, or
- when troubleshooting your ControlNet network and a cable segment is determined to be suspect.

Testing using an Ohmmeter

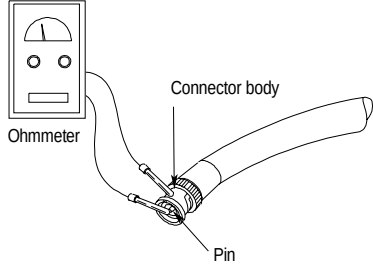
About this test procedure

This procedure is used to test completed sections of trunk cable for electrical shorts and continuity. It is identical to the procedure performed after cutting and stripping raw cable lengths, except that the connectors have now been attached.

Testing for electrical shorts and continuity using an ohmmeter

Step	Action	Result
1	Connect an ohmmeter or continuity tester between the connector body and pin.	If the resistance reading indicates: - there is <u>no short</u>, continue with Step 3. - that a <u>short exists</u>, use your wire cutters to cut off the connector, <i>install a new connector</i>, and begin testing again.
		
2	Connect a temporary short between the pin and connector body at one end of the cable.	

Testing ControlNet Trunk Cables
Testing using an Ohmmeter

Step	Action	Result
3	At the other end of the cable, use an ohmmeter or continuity tester to test for electrical continuity. 	If the resistance reading indicates: • there is <u>no short</u>, replace the trunk-cable section. • that a <u>short exists</u>, proceed with connector installation on that section of trunk cable.
4	If the cable passes continuity testing, it should then be further tested (using a TDR or return-loss meter) for 75 ohm impedance at 10Mhz.	



CAUTION

Replace the trunk-cable section if problems persist with the cable after completing these tests.

Testing ControlNet Trunk Cables

Testing using a Time Domain Reflectometer (TDR)

Testing using a Time Domain Reflectometer (TDR)

Tools needed

A Time Domain Reflectometer (TDR) is required to perform these tests. Two potential TDRs for use with these procedures are the:

- Tektronics 1502, which has a range of 0 to 2000 feet with a 6 in resolution.
- Tektronics 1503, which has a range of 0 to 50,000 ft with a 3 ft resolution

Test equipment setup

Setup your TDR cable tester as indicated in the following table.

Table 36 Time Domain Reflectometer (TDR) Setup

Parameter	Setting
Power	On (or Out)
Return Loss (0 to 60 dB)	0 dB (or Sensitivity)
Return Loss (Fine)	0 dB (or Sensitivity)
Feet/Div (Red) (X10/X100)	X10
Feet/Div (50 to .5)	.5
Noise Filter	Out
Position & Fine	Base Line in Center
Intensity	As required
Focus	As required
Distance	000
Impedance 50 Ohms	Out
Impedance 75 Ohms	In
Impulse Width 100 nsec	In (or Short Pulse)
Impulse Width 100 nsec	Out (or Medium Pulse)
Impulse Width 1000 nsec	Out (or Long Pulse)
Cable Dielectric Solid Poly	Out
Cable Dielectric Foam Poly	In (or .79 Distance Cal)
Cable Dielectric Var	As is
Zero Ref (Set)	First Pulse on Left of Screen
0 dB Set	As is

Testing ControlNet Trunk Cables

Testing using a Time Domain Reflectometer (TDR)

Test procedure

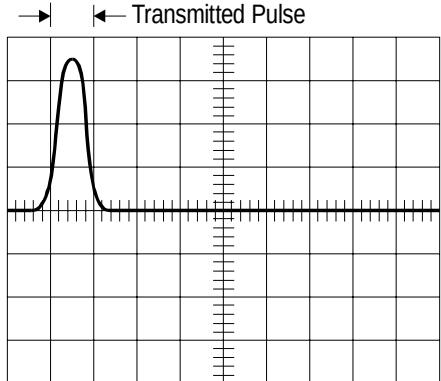


CAUTION

To ensure valid testing, please observe the following cautionary notes:

- Do NOT connect together and attempt to test multiple lengths of ControlNet trunk cable. Doing so will invalidate the test and will not ensure accurate results.
 - Both ends of every ControlNet trunk cable section must be tested.
 - Keep the TDR batteries (if used) fully charged.
 - The cables connectors must be installed using the correct tools. If it appears the connection was made with pliers, channel-locks, or vice-grips, **reject** the cable.
 - Look for folds or kinks in the cable sheathing, indicating that the minimum bend-radius was exceeded; **reject** the cable.
 - Do not compromise on the accuracy of the test terminator. This test procedure depends on the delta difference between the terminator and the cable section under test.
-

Test each length of cable, one at a time, using the following procedure.

Step	Action
1	With no cable connected, verify that your TDR screen appears as shown. Settings are: • X10 & .5ft/Div • 0 dB & 0 dB Loss 

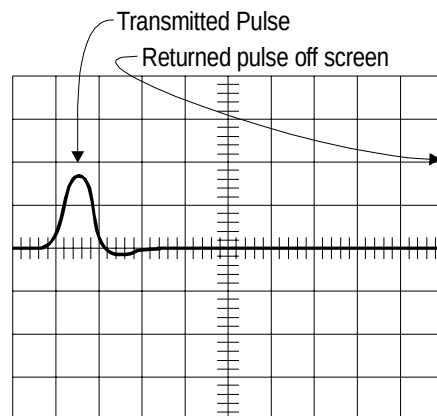
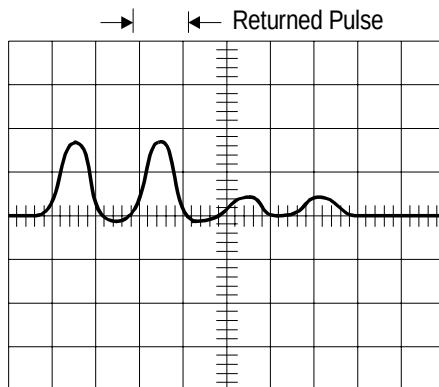
- 2** Connect one end of your cable to the cable jack on the TDR; do **NOT** terminate the loose end. You screen should appear as shown in one of the following figures.

If your settings are:

- 2 m (6.5 ft) example
- X10 & .5ft/Div
- 0 dB & 0 dB Loss
- No Terminator

If your settings are:

- 15 m (50 ft) example
- X10 & .5ft/Div
- 0 dB & 0 dB Loss
- No Terminator



- 3** Using both the Zero Ref and Distance controls, position the second pulse with its peak on the vertical center line of the TDR's screen. Use the Position control to center the horizontal base line.
- 4** Attach and detach a terminator from the loose end of the cable several times to verify that it is the *returned* pulse and not the *transmitted* pulse in the center of the screen.

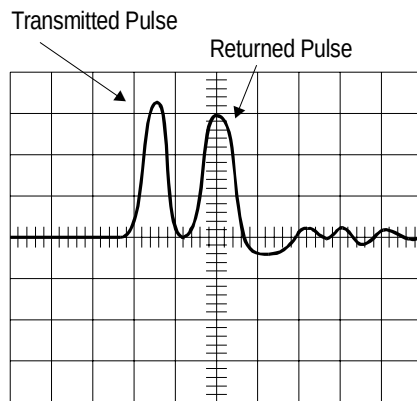
Testing ControlNet Trunk Cables

Testing using a Time Domain Reflectometer (TDR)

- 5** With the terminator off and using the Return Loss fine control (and 0 dB Set if necessary), adjust the return pulse to three divisions high while keeping the base line on the horizontal center line. Your screen should appear as shown in one of the following figures.

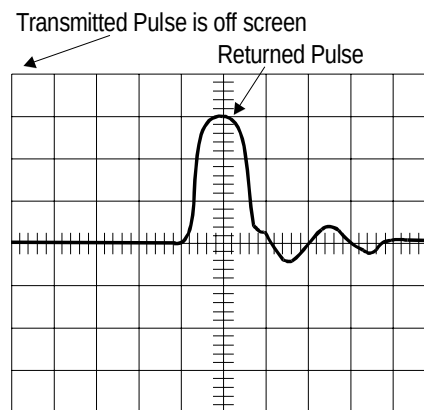
If your settings are:

- 2 m (6.5 ft) example
- X10 & .5ft/Div
- 0 dB & 4 dB Loss
- No Terminator



If your settings are:

- 15 m (50 ft) example
- X10 & .5ft/Div
- 0 dB & 5 dB Loss
- No Terminator



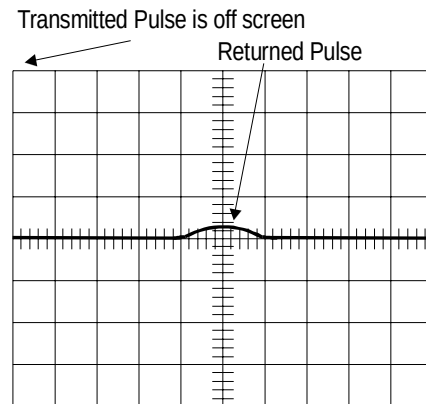
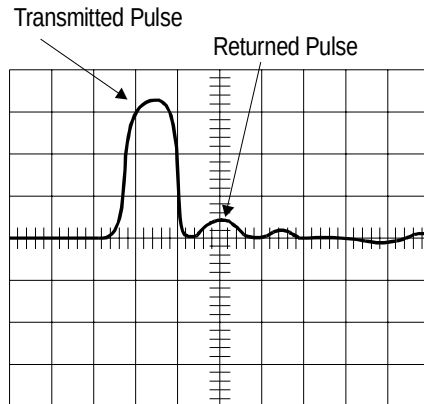
- 6** Connect the selected terminator to the free end of the cable under test. Your screen should appear as shown in either the following figures.

If your settings are:

- 2 m (6.5 ft) example
- X10 & .5ft/Div
- 0 dB & 4 dB Loss
- Terminator connected

If your settings are:

- 15 m (50 ft) example
- X10 & .5ft/Div
- 0 dB & 5 dB Loss
- Terminator connected



- 7** Observe the Return Loss (dB) settings, add 34 dB of gain to this value and then adjust the Return Loss (dB) control to this new calculated setting.

For example:

- zero (0) on Main, zero (0) on Fine = 30 on Main, 4 on Fine
- zero (0) on Main, 5 on Fine = 30 on Main, 9 on Fine

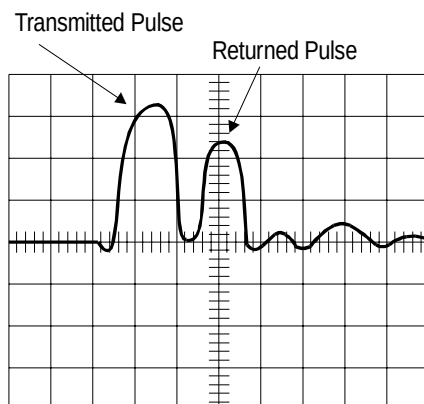
Testing ControlNet Trunk Cables

Testing using a Time Domain Reflectometer (TDR)

- 8** Adjust the Position and Fine controls until the left and right base lines are on the center line. Your screen should appear as shown in one of the following figures.

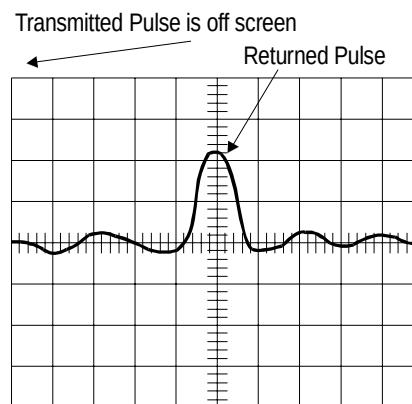
If your settings are:

- 2 m (6.5 ft) example
- X10 & .5ft/Div
- 30 dB & 8 dB Loss
- Terminator connected



If your settings are:

- 15 m (50 ft) example
- X10 & .5ft/Div
- 30 dB & 9 dB Loss
- Terminator connected



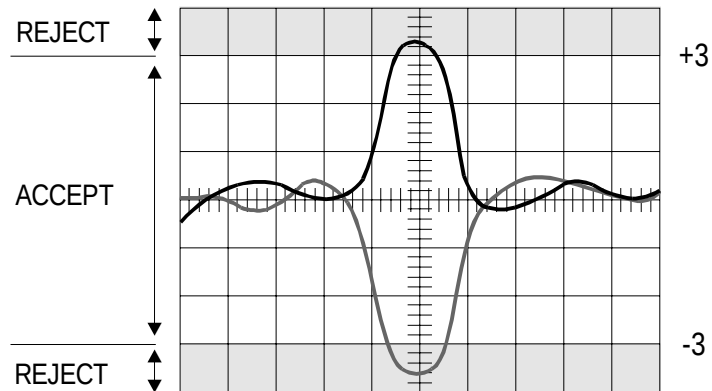
9

If...

Then...

any part of the return pulse is three (3) or more divisions from the base line (in either direction)...

the section of ControlNet trunk cable is **Rejected.**

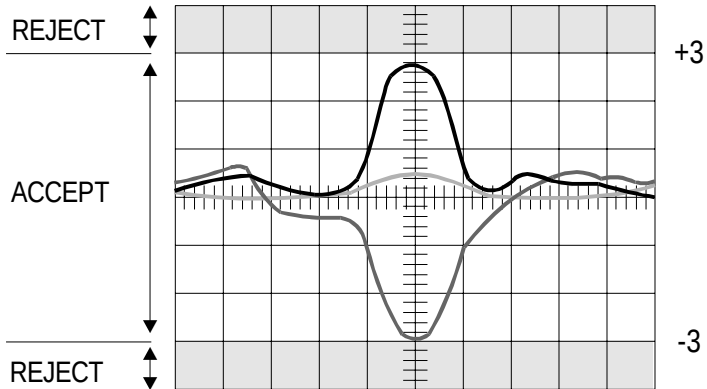


If...

Then...

the return pulse is less than +/- three (3) divisions...

the section of ControlNet trunk cable is **Accepted.**



Testing ControlNet Trunk Cables

Testing using a Time Domain Reflectometer (TDR)

If...

any part of the trace between the transmitted pulse and the returned pulse is three (3) or more divisions from the base line (in either direction)...

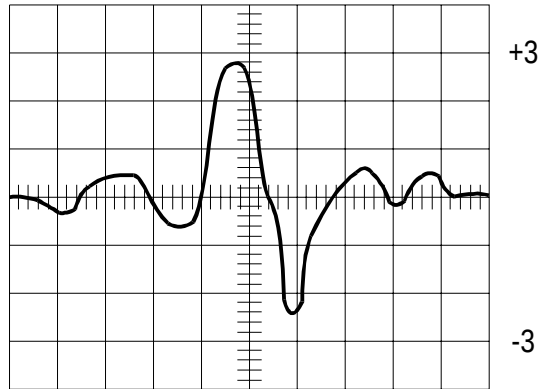
Then...

the section of ControlNet trunk cable is **Rejected**.

If...

the terminator is producing a trace such as the following... the terminator is **Rejected**.

Then...



- 10** Tag all rejected ControlNet trunk cable sections as rejected/failed, and take all necessary steps to replace them..
-



ATTENTION

If Steps 1 through 8 are performed very carefully, Step 9 can be repeated many times for the same length of ControlNet trunk cable without any adjustments.

ControlNet Cable Installation

Preparing to Install ControlNet Cabling

Before you begin

ControlNet trunk cables may be purchased in pre-built (factory-assembled) lengths, or you may build your own. The following installation procedures apply to both pre-built and custom built options.

ControlNet drop cables are supplied as part of taps in tap kits and are a fixed one-meter length that can't be changed, so you can't build our own.

Pre-built cables

Table 2 lists the pre-built cables available from Honeywell.

Table 2 Pre-built ControlNet cables

Component	Type	Model Number
1 meter trunk cable, with connectors	PVC-CL2	TC-KCCX01
3 meter trunk cable, with connectors	PVC-CL2	TC-KCCX03
10 meter trunk cable, with connectors	PVC-CL2	TC-KCCX10
30 meter trunk cable, with connectors	PVC-CL2	TC-KCCX30
50 meter trunk cable, with connectors	PVC-CL2	TC-KCCX50
100 meter trunk cable, with connectors	PVC-CL2	TC-KCC100
200 meter trunk cable, with connectors	PVC-CL2	TC-KCC200
500 meter trunk cable, with connectors	PVC-CL2	TC-KCC500
ControlNet Network Access Cable	PVC-CL2	9904-CP
ControlNet T-tap Drop Cable w/right angle connectors	PVC-CL2	9904-TPR
ControlNet T-tap Drop Cable w/straight connectors	PVC-CL2	9904-TPS
ControlNet Y-tap Drop Cable w/right angle connectors	PVC-CL2	9904-TPYR

ControlNet Cable Installation

Preparing to Install ControlNet Cabling

Component	Type	Model Number
ControlNet Y-tap Drop Cable w/ straight connectors	PVC-CL2	9904-TPYR



ATTENTION

In addition to the pre-built trunk cables, you may elect to build your own trunk cables. Honeywell provides the following to aid you in the construction of your own cables.

- ControlNet-certified trunk cable TC-KCC900), available on a reel in 275 meter (900 feet) lengths.
- Trunk Cable Connectors (TC-MC1BNC), packaged two to a set (one for each end).
- ControlNet Coax Cable Toolkit (9904-CTK)
- The standard PVC trunk cable supplied as TC-KCC900 and also in TC-KCCX01 through TC-KCC500 cable assemblies in Table 2 above is ControlNet-qualified quad-shield RG6/U type with black PVC jacket for indoor use or outdoor use in conduit (suitably protected from UV light and moisture, for longest life) according to Honeywell purchase specification 51192416. The cable has UL/NEC rating CMR or CL2R as well as CSA/CEC rating CMR, and passes the UL-1666 Vertical Riser flame test. The cable jacket is marked with "ControlNet" and "(UL) CL2R or CMR or C(UL) CMR" approval information. Cable minimum bend radius is 3 inches. Temperature rating is -30 to +75 degrees C.

Other types of non-standard trunk cable (some with FEP construction) are available from Honeywell and ControlNet cable suppliers for special environmental applications such as direct burial, plenums, etc. Refer to the Control Hardware Planning Guide, *Determining what type of cable you need*.

Installing Trunk Cable



CAUTION

Install your trunk cable, observing:

- your cable supplier's installation instructions.
- your site engineering documentation.
- the guidelines provided in the Control Hardware Planning Guide and in the Experion PKS specifications. The Experion PKS specifications can be found on the Honeywell website: <http://www.acs.honeywell.com>. Just follow the Experion PKS product links.

Wiring external to enclosures

When pulling your trunk cable through multiple conduit bends, follow these specifications.

Table 3 External coaxes pull-strength and bend radius

For	pull strength shouldn't exceed	minimum allowed bend radius
PVC	42.75 kg (95 lbs.)	76.2 mm (3.0 in)
FEP	61.65 kg (137 lbs.)	69.9 mm (2.75 in)

Wiring inside enclosures

When your trunk cable is not being pulled through conduit, follow these specifications.

Table 4 Internal coax bend radius

For	Bend radius shouldn't exceed
PVC	38.1 mm (1.5 in)
FEP	35.6 mm (1.4 in)
Tap drop-cable	25.4 mm (1.0 in)

Connecting and Terminating Cables



CAUTION

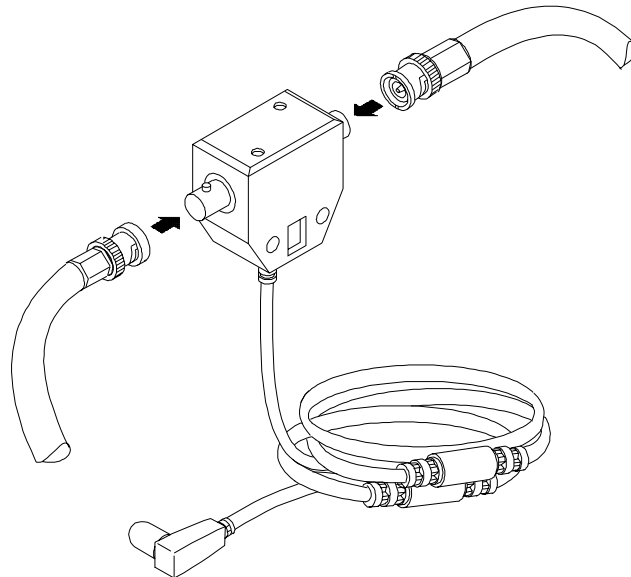
DO NOT disconnect the media of the surviving channel of a dual media network when a media fault occurs and the system is ON-LINE. For example, if the "A" channel is faulty and requires troubleshooting, **DO NOT** disconnect anything on the "B" channel (trunks, drops, terminators) while the system is ON-LINE.

DO NOT disconnect the media (trunks, drops, terminators) of single media networks while the system is ON-LINE.

All ControlNet BNC connections require a "push-on, twist, and lock/snap" sequence. Connections not locked/snapped may result in improper ControlNet network operation.

Connecting trunk cable sections to taps

Connect the trunk cable sections to the tap's BNC connectors.



Terminating cable segments

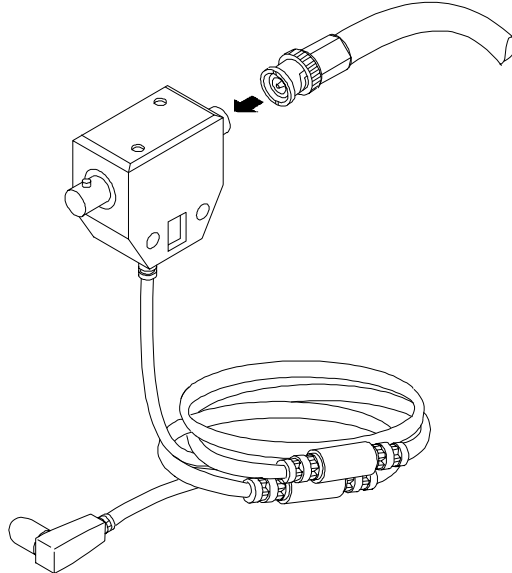
To eliminate signal reflections from the ends of the ControlNet network trunk segment, you must attach a ControlNet 75 ohm trunk terminator to the first and last taps on the segment. (The terms “first” and “last” refer to the physical location of the node along the trunk cable.)



CAUTION

The taps on the ends of the segment have only one cable attached to them. This leaves an open, or unterminated, end on the segment. Signals transmitted along the cable will reflect off these unterminated ends and interfere with transmission. The trunk terminator is used to eliminate these reflections.

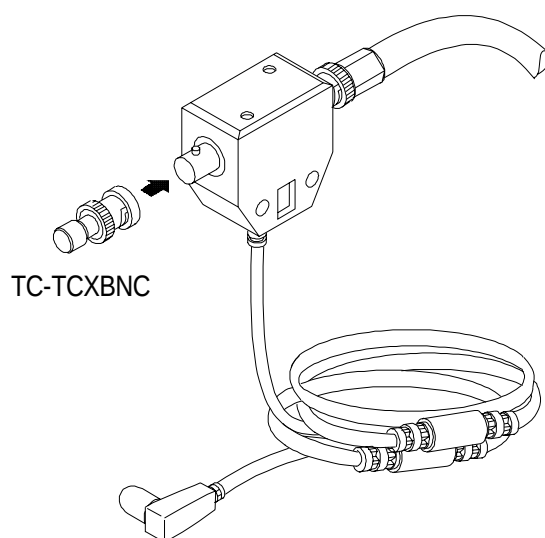
Step	Action
1	Connect one end of the trunk-cable section to one of the tap's BNC connectors.



ControlNet Cable Installation

Connecting and Terminating Cables

Step	Action
2	Install a 75 ohm terminator onto the tap's other BNC connector.



3	Repeat Steps 1 and 2 at the other end of the ControlNet segment.
-

Connecting ControlNet devices

After connecting trunk cables to taps and terminating the segments per previous topics in this section, you may now connect ControlNet-compatible devices (chassis-installed interface modules, repeaters, etc.) to the drop-cables.



WARNING

To guard against inadvertent ControlNet outage on a redundant media ControlNet network, remove power from the ControlNet node (CNI) before removing the ControlNet cables. This will ensure that the network will not be dropped if one of the redundant ControlNet cables has already been disconnected or broken. The CNI supports RIUP (Removal/Insertion Under Power) which enables the removal of the CNI while the ControlNet chassis remains powered.

Before considering Removal and Insertion under Power (RIUP) on any module, refer to the *Control Hardware Installation Guide, Removal and Insertion Under Power (RIUP) function guidelines*.



CAUTION

ControlNet devices are never connected directly to the trunk cable, but only through a tap/drop-cable assembly.

In general, remove and save the tap's dust cap (installed at the loose end of the tap's integral drop-cable) and connect the loose end of the drop-cable to the proper mating connector on the ControlNet device.

If the ControlNet Node supports...	then...
non-redundant ControlNet cabling (Cable A only),	only one drop-cable may be connected to the node.
redundant ControlNet cabling (Cable A and Cable B),	two drop-cables may be connected to the node, one from the tap on Cable A and one from the tap on Cable B

ControlNet Cable Installation

Connecting and Terminating Cables



REFERENCE - INTERNAL

For details concerning the connection of ControlNet devices to the trunk cable via the tap and drop-cable assembly, refer to:

- *Connecting to Repeaters* in this section, and
 - *Connecting ControlNet Network Cables* in the *Control Hardware Installation Guide*
-

Connecting to repeaters

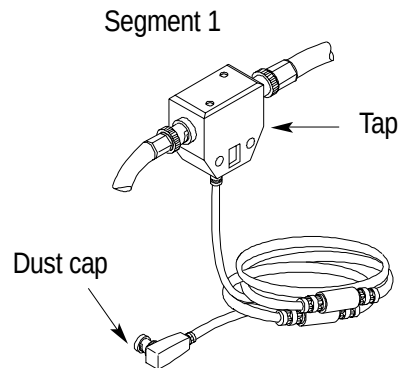


CAUTION

Consider the following cautionary measures when connecting repeaters:

- Do not allow any metal portions of the tap to contact any conductive material. Such contact can cause noise on the network.
- If you disconnect the tap from the repeater, place the dust cap or tap dummy load (TC-TCAP) back on the straight or right-angle connector to prevent the connector from accidentally contacting a metallic-grounded surface.
- To prevent inadvertent reversal of the tap connections (resulting in incorrect LED displays and troubleshooting), check the tap drop-cable for a label indicating the attached segment before making your connection.

Step	Action
1	Remove and save the dust cap located on the straight or right-angle connector of the designated tap on the first segment (Segment 1).



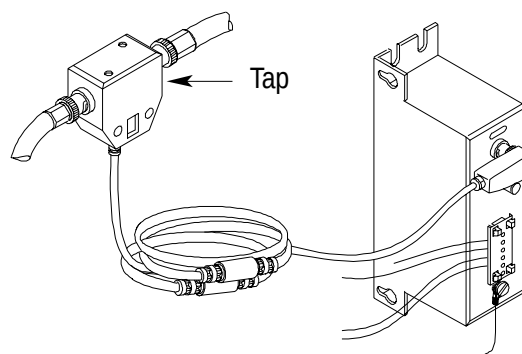
- 2 Remove and discard the dust caps from the repeater BNC jacks.

ControlNet Cable Installation

Connecting and Terminating Cables

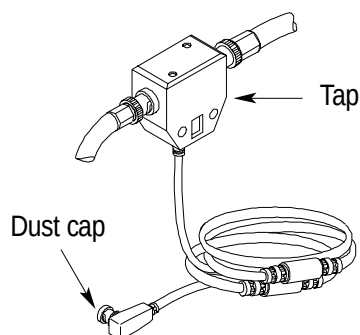
Step	Action
3	Connect the designated tap drop-cable's straight or right-angle connector to the BNC connector on the repeater labeled as 1.

Segment 1

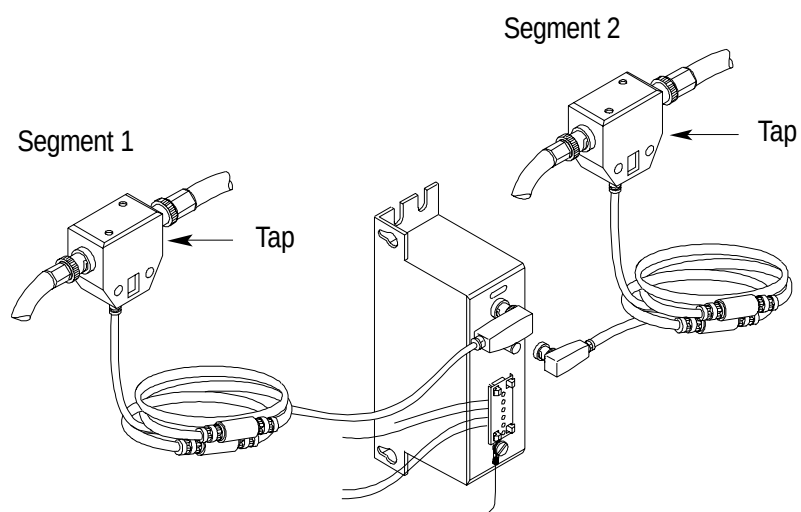


- 4 Remove (and save) the dust cap located on the straight or right-angle connector of the designated tap on the second segment (segment 2).

Segment 2



Step	Action
5	Connect this tap's straight or right-angle connector to the BNC connector on the repeater labeled as 2.



Connecting to ControlNet Interface modules



REFERENCE - INTERNAL

The following procedure describes connecting drop-cables from your ControlNet taps to ControlNet modules in your controller or I/O chassis. For the procedures for connecting drop-cables to the PCIC card in your EXPERION PKS Server, refer to Connecting to the Server ControlNet Interface module for the PC.

Step	Action
1	Remove and save the drop-cable's dust cap (located on the straight or right-angle connector).

Segment 1

Dust cap

Tap

2	Connect the tap's straight or right-angle connector to your CNI.
If your ControlNet module supports...	Connect the drop-cable's connector...
non-redundant media only (models TC-CCN013 and TK-CCN013)	to the Cable A connector on the ControlNet module.
redundant media (models TC-CCR013 and TK-CCR013)	From tap's drop-cable: - A to connector A on the ControlNet module. - B to connector B on the ControlNet module.

Connecting to the Server ControlNet Interface module for the PC



REFERENCE - INTERNAL

The following procedure describes connecting drop-cables from your ControlNet taps to PCIC cards in your EXPERION PKS Server. For the procedures for connecting drop-cables to the ControlNet modules in your controller or I/O chassis, refer to *Connecting to ControlNet Interface Modules*.

CAUTION

Do not connect more than one ControlNet network to the PCIC card. If you attempt to connect a second network to the card, your communication system will operate erratically.

If you connect the PCIC card to a ControlNet network that does not support redundant media, connect the tap drop-cable to the BNC connector labeled channel A. Channel B is left open.

If the ControlNet network is redundant, connect all devices on the network to the same cable for the same channel. All channel A connectors connect to one cable and all channel B connectors connect to the other. Also, make sure you follow established conventions and standards for identifying drop-cables as described in the Planning Guide, *Planning Your Taps*, *Planning for drop-cable identification*.

The PCIC (model TC-PCIC01) cards for the computer include three connectors for connecting to your ControlNet network (see Figure, 4). These connectors provide two basic options for connecting the card's host computer to the network.

- **Network Access Port (NAP):** This connector is **not** for general use with Experion PKS systems.
- **Redundant Media** Cable A and B connectors (BNC-type) are used to provide direct connection to your ControlNet Network.

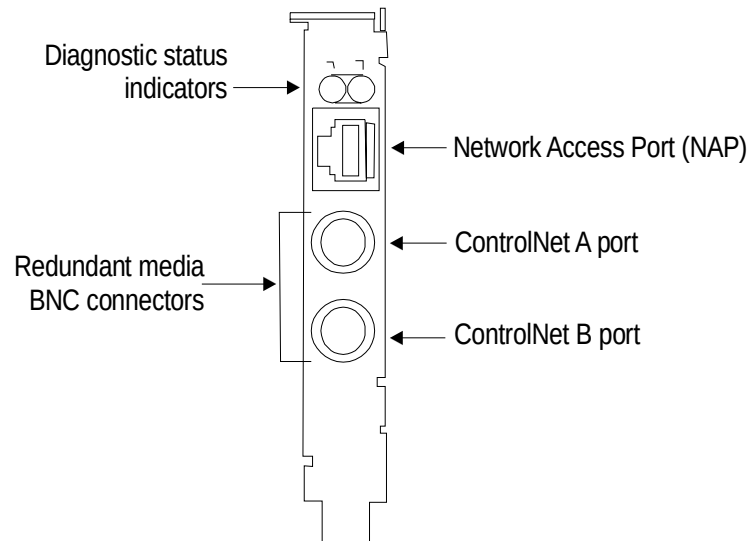
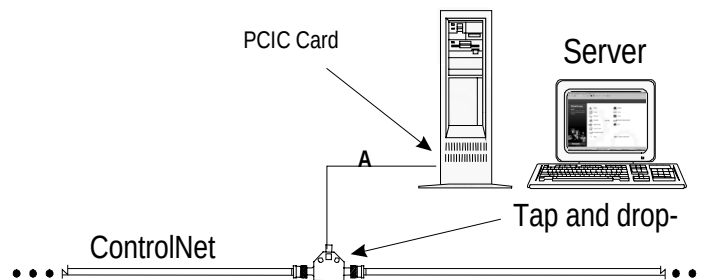
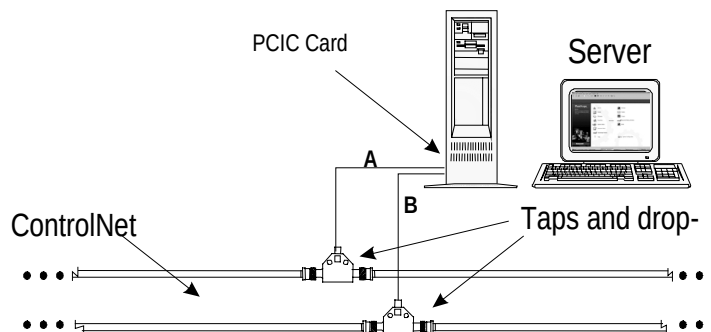


Figure 4 Connectors on PCIC cards

Step	Action
1	If you are implementing: - a non-redundant ControlNet media, go to Step 2 - a redundant ControlNet media, skip Step 2 and go to Step 3
2	To connect non-redundant (single-media) ControlNet configuration, connect your drop-cable to the ControlNet A BNC connector on the PCIC card in the computer.



- 3 To connect redundant (dual-media) ControlNet configuration, connect your drop-cable from the—
- “A” ControlNet tap to the ControlNet “A” BNC connector on the PCIC card in the computer, and
 - “B” ControlNet tap to the ControlNet “B” BNC connector on the PCIC card in the computer.



ControlNet Cable Installation

Connecting and Terminating Cables

Step	Action
	WARNING In both redundant and non-redundant ControlNet configurations, do not mix A and B connections. Follow established conventions and standards for identifying drop-cables as described in the Planning Guide, ControlNet Configuration, Planning Your Taps, <i>Planning for drop-cable identification</i>.

Connecting Tap Dummy Loads

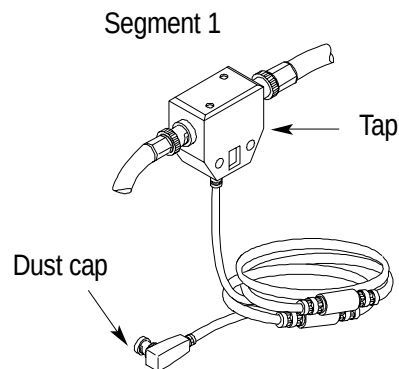


CAUTION

A Tap Dummy Load is not permitted to be used as a trunk termination on a trunk port of a tap. Trunk terminators have 75 Ohm impedance. Tap Dummy Loads are higher impedance than trunk terminators and are only designed to terminate drop cables. Refer to *Terminating cable segments* for instructions on terminating cable segments.

The following procedure describes connecting a Tap Dummy Load (TDL) to the drop cable of a ControlNet tap. TDL's are used to properly terminate unconnected drop cables (e.g., spares for future expansion, local service connector, etc.).

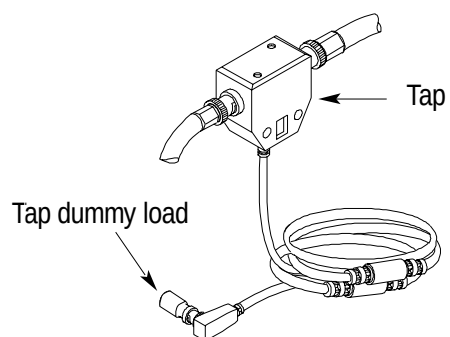
Step	Action
1	Remove and save the drop-cable's dust cap (located on the straight or right angle connector).



ControlNet Cable Installation

Connecting and Terminating Cables

Step	Action
2	Connect the Tap Dummy Load to the drop cable connector.



Appendix A

CSA Hazardous Location Approval

About CSA

CSA certifies products for general use as well as for use in hazardous locations. Actual CSA certification is indicated by the product label as shown below, and not by statements in any user documentation.

Example of the CSA certification product label:



CSA logo is a registered trademark of the Canadian Standards Association.

CSA Certification

To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for this CSA-certified industrial control product:

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.
- The products having the appropriate CSA markings (that is, Class I, Division 2, Groups A, B, C, D) are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.

Temperature Ratings



ATTENTION

Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class I, Division 2 location.

The temperature code rating is marked on the product label as shown.



CL I, DIV 2
GP A,B,C,D
TEMP



Look for
temperature code

Notices

The following warnings apply to products having CSA certification for use in hazardous locations.



WARNING: Explosion hazard!

- Substitution of components may impair suitability for Class I, Division 2.
 - Do not replace components unless power has been switched off or the area is known to be non-hazardous.
 - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
 - Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lbf) separating force applied for a minimum of one minute.
 - If the Product contains batteries, they must only be changed in an area known to be non-hazardous.
-

Approbation d'utilisation dans des environnements dangereux par la CSA

La CSA

La CSA certifie des produits pour une utilisation générale aussi bien que pour une utilisation en environnements dangereux. La certification CSA en vigueur est indiquée par l'étiquette produit et non par des indications dans la documentation utilisateur.

Exemple d'étiquette de certification d'un produit par la CSA:



CL I, DIV 2
GP A,B,C,D
TEMP



La certification CSA

Pour satisfaire à la certification CSA en environnements dangereux, les informations suivantes font partie intégrante de la documentation des produits de commande industrielle certifiés.

- Cet équipement ne convient qu'à une utilisation en environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux.
- Les produits portant le marquage CSA approprié (c'est-à-dire Classe 1, Division 2, Groupes A, B, C, D) sont certifiés pour une utilisation avec d'autres équipements, les combinaisons d'applications et d'utilisations étant déterminées par la CSA ou le bureau local d'inspection qualifié.

Appendix A

Approbation d'utilisation dans des environnements dangereux par la CSA

Autour de température



ATTENTION

De par la nature modulaire des systèmes de commande programmables, le produit ayant le code de température le plus élevé détermine le code de température global du système dans un environnement de Classe 1, Division 2.

Le code de température est indiqué sur l'étiquette produit.



CL I, DIV 2
GP A,B,C,D
TEMP



Le code de
température est

Discerner

Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour une utilisation en environnements dangereux.

**AVERTISSEMENT:** Risque d'explosion

- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnements de Classe 1, Division 2.
 - Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de remplacer des composants.
 - Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
 - Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs fournis par l'utilisateur pour se brancher aux circuits externes de cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres, de sorte que les connexions résistent à une force de séparation de 15 Newtons (1,5 kg - 3,4 lbf.) appliquée pendant au moins une minute.
 - S'assurer que l'environnement est classé non dangereux avant de changer les piles.
-

Le sigle CSA est une marque déposée de l'Association des Standards pour le Canada.

Appendix A

Approbation d'utilisation dans des environnements dangereux par la CSA

Fax Transmittal		Fax No.: (602) 313-4842	
Reader Comments			
To: Automation College			
From: Name		Date:	
Title:			
Company:			
Address:			
City:		State:	Zip:
Telephone:		Fax:	
Control Hardware and ControlNet Installation Guide, Release 200, 11/03			
Comments:			
You may also call 800-822-7673 (available in the 48 contiguous states except Arizona; in Arizona call 602-313-5558), email us at College.Automation@honeywell.com, or write to:			
Honeywell International Inc.		Experion PKS	
Automation and Control Solutions		Knowledge Building Tools	
1100 Virginia Drive			
Fort Washington, PA 19034			