Honeywell

Remote Hardened I/O Enclosure Planning, Installation, and Service

PM02-520

Total Plant

Honeywell

Implementation
PM/APM/HPM Optional Devices

Remote Hardened I/O Enclosure Planning, Installation, and Service

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About This Publication

This publication assists the user of the Remote Hardened I/O enclosure to plan, install, and service the enclosure and the Process Manager (PM), Advanced Process Manager (APM), or High-Performance Process Manager (HPM) hardware that is installed in the enclosure. The publication does not attempt to address the planning, installation, or servicing that is associated with any of the hardware with which the enclosure hardware interfaces.

It is expected that the user is familiar with Process Manager, Advanced Process Manager, and High-Performance Process Manager and has access to Process Manager, Advanced Process Manager, and High-Performance Process Manager reference documentation.

This publication supports **TotalPlant** Solution (TPS) System network Release 510. TPS is the evolution of TDC 3000^{X}.

Change bars are used to indicate paragraphs, tables, or illustrations containing changes that have been made to this manual effective with Release 510. Pages revised only to correct minor typographical errors contain no change bars.

Table of Contents

Figures and Tables

Acronyms

APM..... Advanced Process Manager
APMM..... Advanced Process Manager Module
FTA..... Field Termination Assembly
HPM..... High-Performance Process Manager
HPMM..... High-Performance Process Manager Module
I/O..... Input/Output
IEC..... International Electrotechnical Commission
IOP ..... Input/Output Processor
LED ..... Light Emitting Diode
NEMA ..... National Electrical Manufacturers Association
ORU..... Optimum Replaceable Units
PM..... Process Manager
PMM ..... Process Manager Module
RHIO..... Remote Hardened I/O

References

Publication Title	Publication Number	Binder Title	Binder Number
Process Manager/Advanced Process Manager Planning	PM02-501	System Site Planning - 1	TPS 3020-1
Process Manager/Advanced Process Manager Installation	PM20-501	Implementation/PM/APM	TPS 3043
Process Manager/Advanced Process Manager Checkout	PM20-511	Implementation/PM/APM	TPS 3043
Process Manager/Advanced Process Manager Service	PM13-501	PM/APM/HPM Service - 1	TPS 3061-1
Process Manager I/O Installation	PM20-420	Implementation/PM/APM	TPS 3043
High-Performance Process Manager Planning	HP02-500	System Site Planning - 2	TPS 3020-2
High-Performance Process Manager Installation	HP20-500	Implementation/HPM-3	TPS 3066-3
High-Performance Process Manager Checkout	HP20-510	Implementation/HPM	TPS 3066-3
High-Performance Process Manager Service	HP13-500	PM/APM/HPM Service - 1	TPS 3061-1

Section 1 – Introduction

1.1 Overview

Section contents

The topics covered in this section are:

Purpose

The Remote Hardened I/O (RHIO) enclosure provides a means of protecting Process Manager (PM), Advanced Process Manager (APM), or High-Performance Process Manager (HPM) I/O in remotely located severe corrosive environments. The sealed, square (23.6 x 23.6 inch) shaped, stainless steel NEMA 4x enclosure ensures protection for the conformal coated I/O and Power System components that are mounted in the enclosure. The conformal coating has a G3 (Harsh) environment product rating.

Introduction

The RHIO enclosure permits PM, APM, or HPM Input/Output Processor (IOP) hardware to be mounted remotely from the Process Manager Module (PMM), Advanced Process Manager Module (APMM), or High-Performance Process Manager Module (HPMM) in a corrosive hostile location that is not suitable for the PMM, APMM, or HPMM.

The enclosure can be wall, pole, or pedestal mounted.

A fiber optic communication link (I/O Link Extender) is the interface with the PMM, APMM, or HPMM, which can be up to 8 kilometers away.

Conformal coating

All the components are conformally coated to meet a G3 (Harsh) environmental product rating as defined for “Environmental Conditions for Process Measurement and Control Systems:Airborne Contaminants” in ANSI/ISA-S71.04-1985.

Approval body certification

The Remote Hardened I/O enclosure and its components are designed and approved (Factory Mutual) for mounting and use in Class I, Division II, Groups A, B, C, and D locations.

External ambient temperatures

The components in the enclosure are designed to withstand exterior ambient temperatures from -10°C to 60°C. However, when power is first applied to the enclosure at temperatures down to -10°C, a one hour warm-up period is required before operating the equipment inside the enclosure.

1.2 Description

1.2.1 Overview

Introduction

Remote Hardened I/O enclosures are available in two basic hardware configurations. The configurations are:

- a single 7-Slot card file, redundant Power Supply Modules, and an AC/DC Distribution Assembly.
- a single 7-Slot card file

Variations in the basic hardware configurations, such as input ac power requirements or whether a Left (slots 1-7) or Right (slots 9-15) card file is included, produce six models of the enclosure. The models are listed in Table 1-1.

Table 1-1 Remote Hardened I/O Enclosure Model Numbers

Model Number	Card File	Power System
MU-CBSS01	Left 7-Slot	Yes – 120 Vac Input
MU-CBSS02	Right 7-Slot	Yes – 120 Vac Input
MU-CBSS11	Left 7-Slot	None
MU-CBSS12	Right 7-Slot	None
MU-CBSS21	Left 7-Slot	Yes – 240 Vac Input
MU-CBSS22	Right 7-Slot	Yes – 240 Vac Input

All models, as a minimum, include a card file.

A Power System must be included in at least one enclosure at each remote location. The Power Supply Module provides the proper voltages for the card file fans and backpanel assembly. However, power for a card file can also be provided by a Power System in an adjacent enclosure through cabling.

Both the 120 Vac and 240 Vac Power Systems provide 8 amperes of 24 Vdc to power the IOPs, FTAs, and I/O Link Extender cards and fiber optic coupler modules.

Enclosure complexing

A complex of three enclosures can be installed at a single remote site. One enclosure must include a Power System while the other two enclosures may include only a card file. External cabling distributes the power for the card files and fans from the Power System and the I/O Link Interface between the card files.

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I/O Link Extender

A fiber optic data communication between the PMM, APMM, or HPMM and the remote I/O is provided by I/O Link Extender hardware that is installed in slots 1 and 2 of one of the card files.

Conformally coated hardware

The IOP cards that install in the 7-Slot card file, the redundant Power Supply Modules, and the AC/DC Distribution Assembly that controls the Power Supply Modules are conformally coated to provide corrosion protection.

FTA installation

The IOPs' associated Field Termination Assemblies (FTAs) must be mounted in stainless steel enclosures that are similar to the Remote Hardened I/O enclosure. The FTA enclosures can be purchased through Honeywell.

Standard FTA to IOP cables connect the IOPs in the card file to the FTAs. The cable connectors are protected by a conduit that interconnects the Remote Hardened I/O enclosure and the enclosures that house the FTAs.

NEMA 4x integrity

These conduit connections, as well as other enclosure interface connections, must be provided with gaskets that ensure the NEMA 4x integrity of the enclosure. A rain/sun shield is recommended when the enclosure is mounted where it can be exposed to the weather. A sun shield is mandatory if the enclosure is installed outdoors.

Enclosure size

The size of the enclosure is 600 millimeters long, 600 millimeters high, and 400 millimeters deep (23.6 x 23.6 x 15.7 inches).

Weight

The approximate weight of the enclosure that contains a card file and Power System, excluding any IOPs, I/O Link Interface Extender cards, Fiber Optic Coupler modules, and fittings is approximately 31.8 kilograms (70 pounds).

Without the Power System, the weight of the enclosure is approximately 27.2 kilograms (60 pounds).

1.2.2 Enclosure Descriptions

Introduction	The stainless steel enclosure is square shaped with a front door that is hinged on the left side. The door is secured by two latches that require a special tool to operate. The enclosure's construction complies with the National Electrical Manufacturers Association (NEMA) 4x classification. The NEMA type 4x classification is similar to the International Electrotechnical Commission (IEC) classification IP56.
Indoor/outdoor use	Type 4x enclosures are intended for indoor or outdoor use to provide protection against corrosion, wind-blown dust and rain, splashing water, hose-directed water, and external icing. Internal condensation and corrosion protection is provided by the conformal coating of the components inside the enclosure.
Door integrity	The enclosure has a multifold gutter around the door to restrict the entry of water. A special elastic foam gasket around the opening ensures the sealed integrity of the enclosure.
Door security	A double-bit key that is supplied by the manufacturer of the enclosure is required for entrance into the enclosure.
Enclosure grounding	A grounding strap is provided with the enclosure and mounted on studs inside the door and inside the enclosure body to ensure proper common ground between the enclosure body and the door.
Interior hardware	The interior of the enclosure consists of an aluminum alloy mounting panel on which (typically) a 7-Slot card file, AC/DC Distribution Assembly, and redundant Power Supply Modules are mounted. Redundant Power cables between the AC/DC Distribution Assembly and the 7-Slot card file backpanel and fans are also included.
Mounting Panel	The aluminum alloy mounting panel is mounted on four studs at the rear of the enclosure that are threaded to accept 5/16 - 18 nuts.

Continued on next page

1.2.2 Enclosure Descriptions, Continued

Four enclosure types (six models)

The Remote Hardened I/O enclosure is available in four distinct component configurations.

- The first type of enclosure contains a Left 7-Slot card file, AC/DC Distribution Assembly, redundant Power Supply Modules, and redundant DC Power cables between the AC/DC Distribution Assembly and the card file. The two 24 Vdc fans that are mounted on the card file are connected to the AC/DC Distribution Assembly.

  Two models are available. The model MU-CBSS01 enclosure requires 120 Vac, and the model MU-CBSS21 requires 240 Vac.

  Figure 1-1 is an illustration of the enclosure.

- The second type of enclosure contains a Right 7-Slot card file, AC/DC Distribution Assembly, redundant Power Supply Modules, and redundant DC Power cables between the AC/DC Distribution Assembly and the card file. The two 24 Vdc fans that are mounted on the card file are connected to the AC/DC Distribution Assembly.

  Two models are available. The model MU-CBSS02 enclosure requires 120 Vac, and the model MU-CBSS22 requires 240 Vac.

  Figure 1-1 is an illustration of the enclosure.

- The third type of enclosure, model MU-CBSS11, contains only a Left 7-Slot card file. Power for card file and the two 24 Vdc fans must be provided by the AC/DC Distribution Assembly in a model MU-CBSS01, MU-CBSS02, MU-CBSS21, or MU-CBSS22 enclosure.

  Two external DC Power cables and two Fan Power adapter cables provide power to the card file and its two fans from an AC/DC Distribution Assembly in an adjacent enclosure. The cables must be ordered separately.

  Figure 1-2 is an illustration of the enclosure.

- The fourth type of enclosure, model MU-CBSS12, contains only a Right 7-Slot card file. Power for card file and the two 24 Vdc fans must be provided by the AC/DC Distribution Assembly in a model MU-CBSS01, MU-CBSS02, MU-CBSS21, or MU-CBSS22 enclosure.

  Two external DC Power cables and two Fan Power adapter cables provide power to the card file and its two fans from an AC/DC Distribution Assembly in an adjacent enclosure. The cables must be ordered separately.

  Figure 1-2 is an illustration of the enclosure.

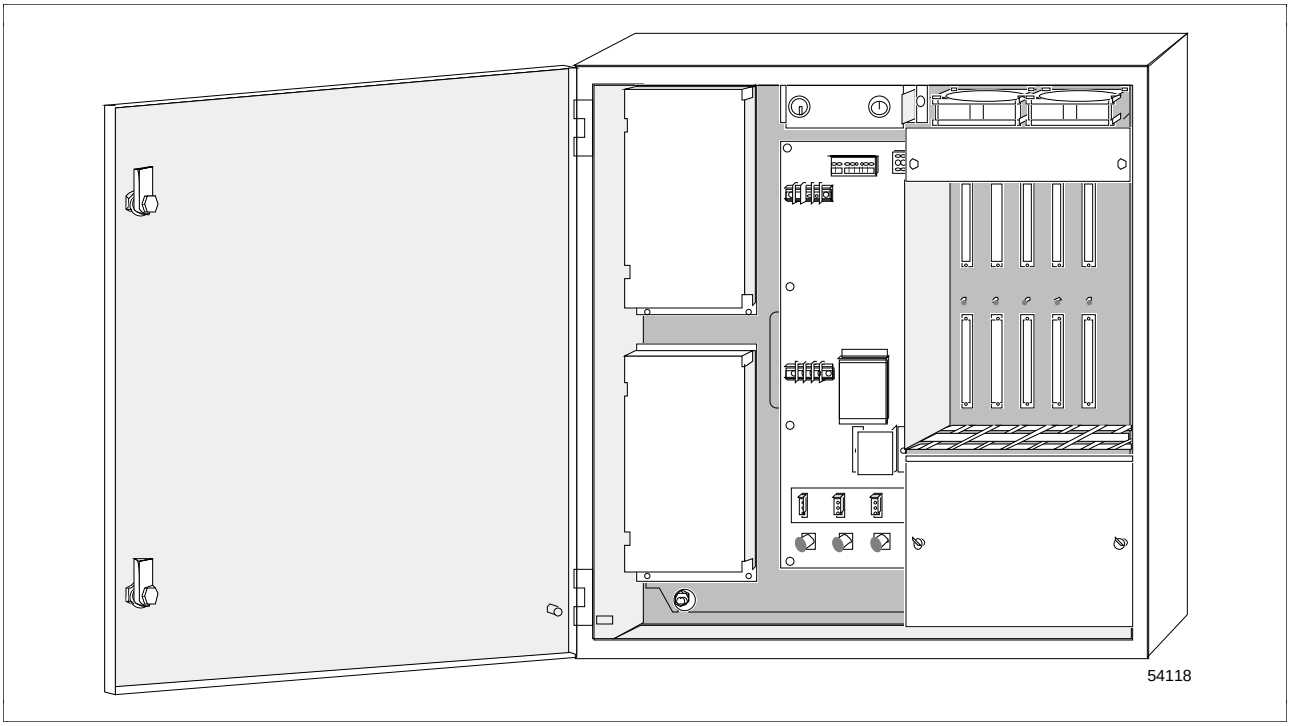
Continued on next page

1.2.2 Enclosure Descriptions, Continued

Enclosure with Power System

Figure 1-1 illustrates the interior of an Remote Hardened I/O enclosure that contains a card file and a Power System.

Figure 1-1 Remote Hardened I/O Enclosure with Power System



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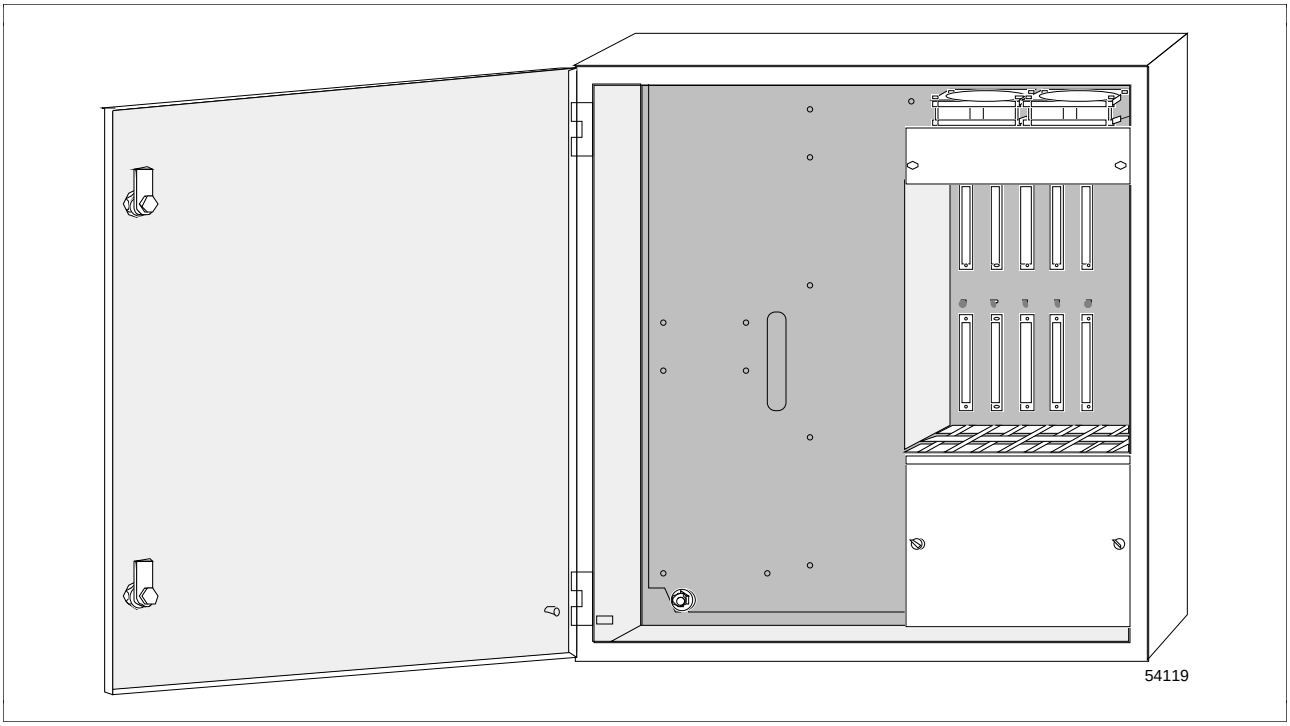
1.2.2 Enclosure Descriptions, Continued

Enclosure without Power System

Figure 1-2 illustrates the interior of an Remote Hardened I/O enclosure that contains only a card file.

Figure 1-2 Remote Hardened I/O Enclosure without Power System



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7-Slot card file

The 7-Slot card file provides the I/O Link Interface communication path between the PMM(s), APMM(s), or HPMM(s), and IOPs through either the I/O Link Interface Extender cards and associated Fiber Optic Coupler modules and/or I/O Link Interface cables. The IOP population, I/O Link Interface Extender cards, and associated Fiber Optic Coupler modules are user options and are not included with the basic enclosure.

One of two types of 7-Slot card files are mounted in the enclosure. The Left 7-Slot card file supports I/O Link Interface slot addresses 1 through 7, and the Right 7-Slot card file supports I/O Link Interface slot addresses 9 through 15. The user must select the appropriate type of 7-Slot card file for the I/O Link Interface address assigned to the card file.

The FTAs associated with the IOPs must be located external to the Remote Hardened I/O enclosure in another user-provided enclosure. Power to the FTA is provided by the associated IOP through the IOP to FTA cable.

Two 24 Vdc fans are mounted on the top of the card file to circulate and distribute air inside the enclosure. Power for the fans is provided by the AC/DC Distribution Assembly that is located in either the same enclosure or an adjacent enclosure.

AC/DC Distribution Assembly

The AC/DC Distribution Assembly provides control and power distribution for the redundant Power Supply Modules. Nominal voltages of 24 Vdc, 3.9 Vdc, and 6 Vac are available to the card file.

Automatic switching between the active and inactive Power Supply Module is provided in case of failure or power loss if each Power Supply Module is provided with an independent ac power source.

The AC/DC Distribution Assembly also includes a battery backup that consists of three Alkaline batteries for the 3.9 Vdc. The 3.9 Vdc is available to power any CMOS memory in the IOPs.

Two green LED indicators provide a visual operational status of the Power Supply Modules.

Two sets of normally closed alarm relay contacts connections are also available to indicate the operational status of the Power Supply Modules.

ATTENTION

The connectors J1 through J4 and their associated fuses, F1 through F4, on the AC/DC Distribution Assembly are not used in the Remote Hardened I/O enclosure application. The AC/DC Distribution Assembly is part of the AC Only Power System in a normal Process Manager or Advanced Process Manager cabinet. J1 through J4 provide ac power for the cabinet fans.

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1.2.2 Enclosure Descriptions, Continued

Power Supply Modules	The redundant Power Supply Modules provide eight amperes of nominal 24 Vdc output power from either a 120 Vac or 240 Vac power source. The Power Supply Module is protected internally by 5-ampere, time-delay line fuse.
Power Supply Module switches	Two switches, SW1 and SW2, control ac power to the primary Power Supply Module, PS1, and redundant Power Supply Module, PS2, respectively. They are keyed switches.

Section 2 – Planning

2.1 Overview

Section contents

The topics covered in this section are:

Introduction

Wall mounting brackets that maintain a NEMA 4x rating are provided with the Remote Hardened I/O enclosure. A pole mounting kit is available as an option.

Power and signal cable entry into the enclosure is through a gland plate that is located on the bottom surface of the enclosure. Cable entry holes must be cut into the gland plate by the user after determining the location and number of holes. The conduit fittings and conduit must maintain the NEMA 4x integrity of the enclosure.

IOP to Field Termination Assembly (FTA) cables must be routed in a suitable channel that provides protection and is large enough to permit cable connector entry between the Remote Hardened I/O enclosure and the enclosure(s) that houses the FTAs. An FTA cable connector requires conduit with at least 76 millimeters (3 inches) of inner diameter to route the cable.

The enclosure(s) that is chosen to house the FTAs must have a NEMA 4x rating. The conduit fittings and conduit must maintain the NEMA 4x integrity of the enclosure.

2.2 Guidelines

Transportation	The enclosure should be transported in an enclosed shock-mounted air van. Precautions should be taken not to exceed vibrational sinusoidal loads of 0.5 Gs.
Weather protection	When installing the enclosure outside where it is exposed to natural elements, a sun shield or rain canopy is mandatory.
Clearance space	A space clearance of at least 76 millimeters (3.0 inches) except for the rear surface must be maintained around the enclosure to ensure proper heat dissipation. Do not place any items on top of the enclosure, or obstruct free air flow around the enclosure in any way.
Field servicing	Field servicing of the enclosure during rain and/or high humidity should be avoided. If unavoidable, precautions should be taken not to wet the interior of the enclosure. When servicing is complete, the interior walls of the enclosure must be wiped with a dry cloth before closing and latching the door.

2.3 Card File Selection

Introduction

A 7-Slot card file is included in all Remote Hardened I/O enclosure models. Three models include a Left 7-Slot card file, and three other models include a Right 7-Slot card file. See Table 1-1 for a list of the models.

The card slots in the Left 7-Slot card file are designated slots 1 through 7, and the card slots in the Right card file are designated slots 9 through 15. There is no slot 8 in either card file.

I/O Link Interface address assignment

Combined Left and Right 7-Slot card files are equivalent to a 15-slot IOP card file, except the eighth card slot is missing and not addressable on the I/O Link Interface. The combined Left and Right 7-Slot card files can be assigned the same I/O Link Interface card file address or separate addresses. The same address is recommended.

Card file selection (single enclosure)

When installing a single enclosure, it is recommended that an enclosure with a Left or Right 7-Slot card file be chosen. Depending upon the ac input power source (120 Vac or 240 Vac), select one of the following Remote Hardened I/O enclosure models.

- MU-CBSS01 – Left 7-Slot card file and 120 Vac Power System
- MU-CBSS02 – Right 7-Slot card file and 120 Vac Power System

or

- MU-CBSS21 – Left 7-Slot card file and 240 Vac Power System
- MU-CBSS22 – Right 7-Slot card file and 240 Vac Power System

Continued on next page

Card file selection (two enclosures)

When installing a complex of two enclosures at a site, it is recommended that enclosures with a Left and Right 7-Slot card file be chosen. The same I/O Link Interface card file address can be assigned to both card files.

If input power of 120 Vac is available, select the following Remote Hardened I/O enclosure models.

- MU-CBSS01 – Left 7-Slot card file and Power System
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS02 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file

If input power of 240 Vac is available, select the following Remote Hardened I/O enclosure models.

- MU-CBSS21 – Left 7-Slot card file and Power System
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS22 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file

Continued on next page

Card file selection (three enclosures)

When installing a complex of three enclosures at a site, it is recommended that two enclosures with a Left 7-Slot card file and one enclosure with a Right 7-Slot card file be chosen. The same I/O Link Interface card file address can be assigned to the enclosures with a Left and Right card file, and a second address can be assigned to the Left card file in the third enclosure.

If input power of 120 Vac is available, select the following Remote Hardened I/O enclosure models.

- MU-CBSS01 – Left 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS02 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file (quantity of 2)

If input power of 240 Vac is available, select the following Remote Hardened I/O enclosure models.

- MU-CBSS21 – Left 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS22 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file (quantity of 2)

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Card file selection (four enclosures)

When installing a complex of four enclosures at a site, it is recommended that the two enclosure configuration that was previously described be duplicated. For most installations, a single 120 Vac or 240 Vac 8 ampere Power System will not be capable of providing power for four enclosures. Therefore, the use of two Power Systems is recommended. The same I/O Link Interface card file address can be assigned to the first pair of enclosures with Left and Right card files, and a second I/O Link Interface address can be assigned to the second pair of enclosures with Left and Right card files.

If input power of 120 Vac is available, select the following Remote Hardened I/O enclosure models.

- MU-CBSS01 – Left 7-Slot card file and Power System
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS02 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file

and

- MU-CBSS01 – Left 7-Slot card file and Power System
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS02 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file

If input power of 240 Vac is available, select the following Remote Hardened I/O enclosure models.

- MU-CBSS21 – Left 7-Slot card file and Power System
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS22 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file

and

- MU-CBSS21 – Left 7-Slot card file and Power System
- MU-CBSS12 – Right 7-Slot card file

or

- MU-CBSS22 – Right 7-Slot card file and Power System
- MU-CBSS11 – Left 7-Slot card file

2.4 Hardware Requirements

Additional hardware procurement

Additional hardware must be procured with the Remote Hardened I/O enclosure(s). Depending upon the application, the following cables and assemblies must be considered. I/O Link Interface cables and power cables are necessary when enclosures are complexed.

- IOPs
- FTAs
- IOP to FTA cables
- NEMA 4x rated FTA enclosure
- FTA Mounting Channels
- I/O Link Extender (Standard or Long Distance)
- Fiber optic cables
- I/O Link Interface cables (Optional – used when complexing enclosures)
- Card file backpanel and fan extension power cables (Optional – used when complexing enclosures)

2.5 FTA Cabinet Selection

Introduction

The Remote Hardened I/O enclosure consists of a NEMA 4x cabinet. When selecting an enclosure to house the FTAs, chose any similar cabinet that will accommodate your FTA requirements. Some general guidelines are:

- FTA Mounting Channels are available in either 36 inch or 72 inch lengths.
- FTA Mounting Channels are available in narrow (8.5 inch) or wide (10.0 inch) widths.
- The FTA Mounting Channel width selection is dependent upon the amount of field wiring that it must accept.

The stainless steel Remote Hardened I/O enclosure is manufactured by Rittal. Examples of standard Rittal cabinets that are similarly constructed and will accommodate FTA Mounting Channels are their AE Compact Enclosure and ES5000 Exclusive Enclosure cabinets.

Assuming an average FTA length of 12 inches, Table 2-1 provides an estimate of the number of FTAs and 36-inch FTA Mounting Channels that some Rittal enclosures will accommodate. All measurements are in inches.

Table 2-1 FTA Enclosures (Rittal)

Part Number	Enclosure Dimensions			FTA Mounting Channels		Available FTA Mounting Space (Inches)		Number of FTAs (12 Inch Length)	
	Height	Width	Depth	Back Mount Only	Back Mount + Sides	Back Mount Only	Back Mount + Sides	Back Mount Only	Back Mount + Sides
AE1016	40	32	12	3**	4**	108	144	9	12
ES5453*	78	31	23	4***	8***	144	288	12	24
ES5453*	78	31	23	6**	14**	216	504	18	42

* A NEMA 4x upgrade must be requested when ordering this enclosure in order to maintain the NEMA 4x rating of the installation.

** Indicates narrow FTA Mounting Channels

*** Indicates wide FTA Mounting Channels

2.6 Conduit Selection

Introduction

In order to maintain the NEMA 4x rating of Remote Hardened I/O enclosure, all cable entries into the enclosure must be through conduit fittings that are certified to meet NEMA 4x specifications.

Recommended vendor

Bridgeport Fitting, Inc., located in Stratford, Connecticut, manufactures a line of fittings that are certified to meet NEMA type 4, watertight, and type 4x, corrosion resistant specifications.

Fitting list

Table 2-2 lists the part numbers and the size of fittings that are manufactured by Bridgeport Fitting, Inc. The fittings are supplied with a bonding screw that is required for Remote Hardened I/O installations.

Table 2-2 Conduit Fittings – Bridgeport Fittings, Inc.

Size (Inches)	Part Number
0.5	161-DC
0.75	162-DC
1.0	163-DC
1.25	164-DC
1.5	165-DC
2.0	166-DC
2.5	167-DC
3.0	168-DC
3.5	169-DC
4.0	170-DC

Type of conduit recommended

It is generally recommended that the conduit used be a rigid service-entrance type conduit that is galvanized and threaded.

Fitting and conduit size selection

Generally, the size of the fitting and conduit is determined by the size of the largest cable connector that must be routed through the conduit because cables normally have attached connectors. The IOP to FTA cable is an example.

In some cases, a cable connector could be removed and reinstalled. The power cable connectors for card file fans that are located in an enclosure with no Power System could be removed at one end and reattached after routing the cables. A smaller fitting and conduit could then be used. This is an acceptable practice since there are only two wires involved. It should not be considered for more complex cables such as the IOP to FTA cable.

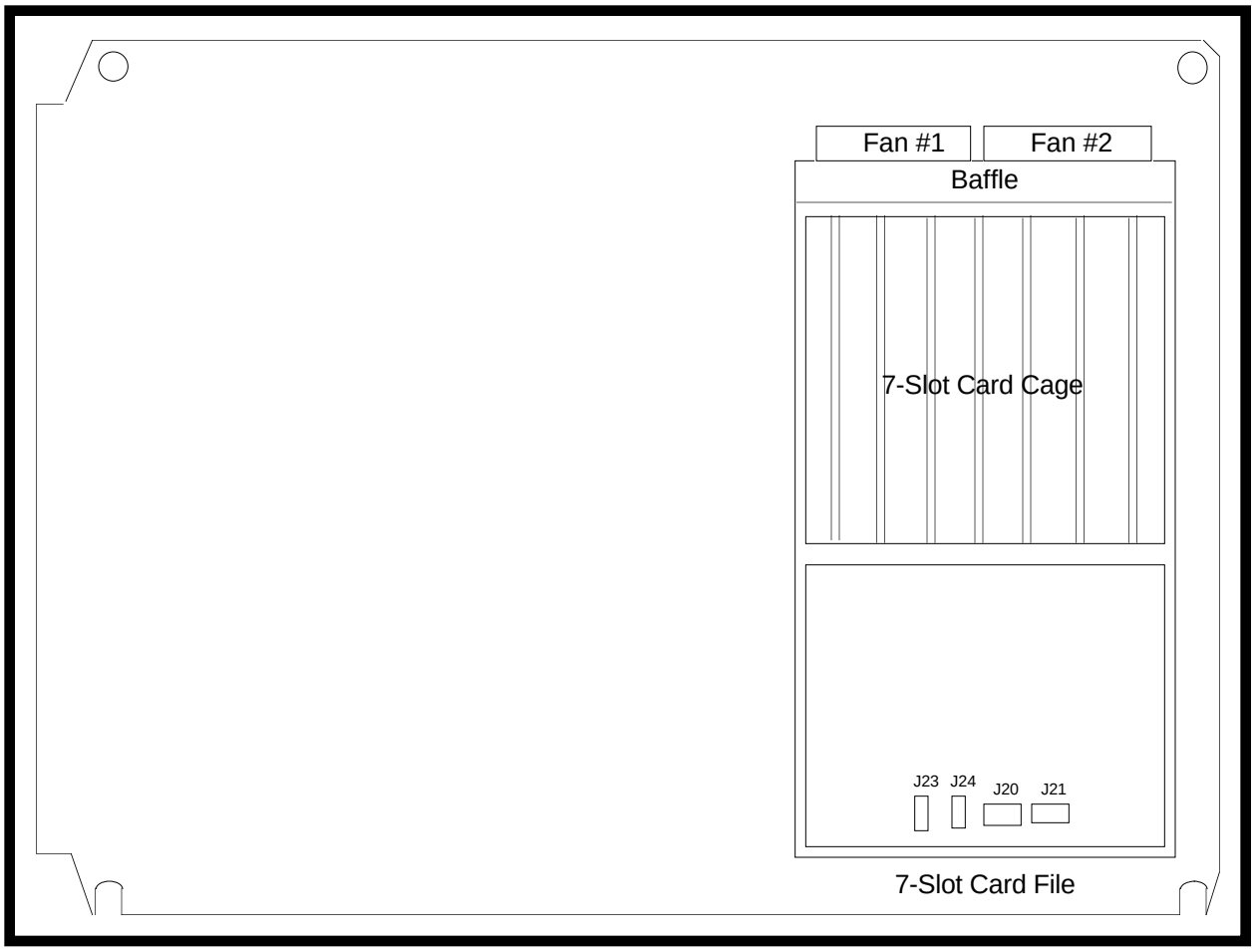
2.7 Cabling Selection

2.7.1 Internal Cabling

Model MU-CBSS11 and MU-CBSS12 enclosures

The model MU-CBSS11 and MU-CBSS12 enclosures contain only a 7-Slot card file with no Power System. No internal power cabling is present. Figure 2-1 illustrates the enclosure layout.

Figure 2-1 Model MU-CBSS11 and MU-CBSS12 Enclosure Layout



External cabling

Power and I/O Link Interface cabling must be provided between the enclosure and the enclosure that contains the Power System and I/O Link Extender hardware.

See subsection 2.7.2 for a list of the external cables that are required. Part numbers are included and where applicable, the model number of the cable is given.

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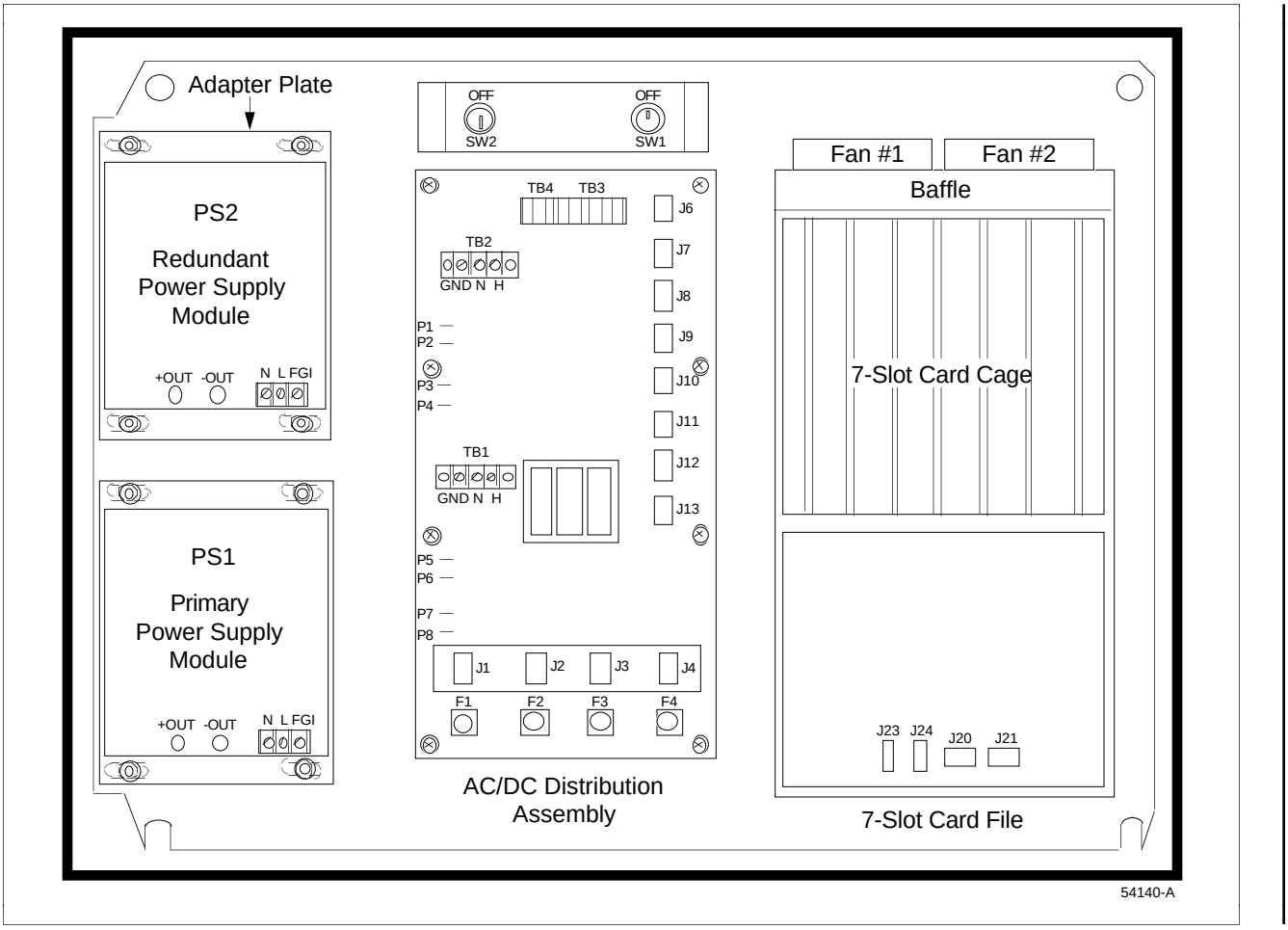
Model MU-CBSS01/02/21/22 enclosure cabling

The model MU-CBSS01, MU-CBSS02, MU-CBSS21, and MU-CBSS22 enclosures contain a card file and a Power System. Internal cabling is provided. Specifically, the following connections are provided in these enclosures. Figure 2-2 illustrates the enclosure layout.

- Input 120/240 Vac between TB1 on the AC/DC Distribution Assembly and the primary Power Supply Module, PS1, through switch SW1
- Input 120/240 Vac between TB2 on the AC/DC Distribution Assembly and the redundant Power Supply Module, PS2, through switch SW2
- 24 Vdc between J12 on the AC/DC Distribution Assembly and J20 on the card file backpanel
- 24 Vdc between J13 on the AC/DC Distribution Assembly and J21 on the card file backpanel
- 24 Vdc between J6 on the AC/DC Distribution Assembly and the card file Fan #2
- 24 Vdc between J7 on the AC/DC Distribution Assembly and the card file Fan #1

Figure 2-2 Model MU-CBSS01/02/21/22 Enclosure Layout



2.7.2 External Cabling Selection

External enclosure cabling considerations

Essentially, the number of openings into the enclosure is dependent upon the particular type (model) of enclosure and whether or not the enclosure is included in an enclosure complex. Openings for the following types of cables must be considered. More than one type of cable can share an opening into the enclosure; for example, ac input power and fiber optic cables.

- AC input power cable(s)
- DC Power cables
- Card file fan power extension cables
- I/O Link Interface cables
- IOP to FTA cables
- Fiber optic cables

Single enclosure

A single enclosure site installation requires an enclosure that contains a Power System. See Figure 2-3 and Table 2-3 for cabling and conduit information. Openings in the enclosure are required for the following cables.

- AC input power cables
- IOP to FTA cables
- Fiber optic cables

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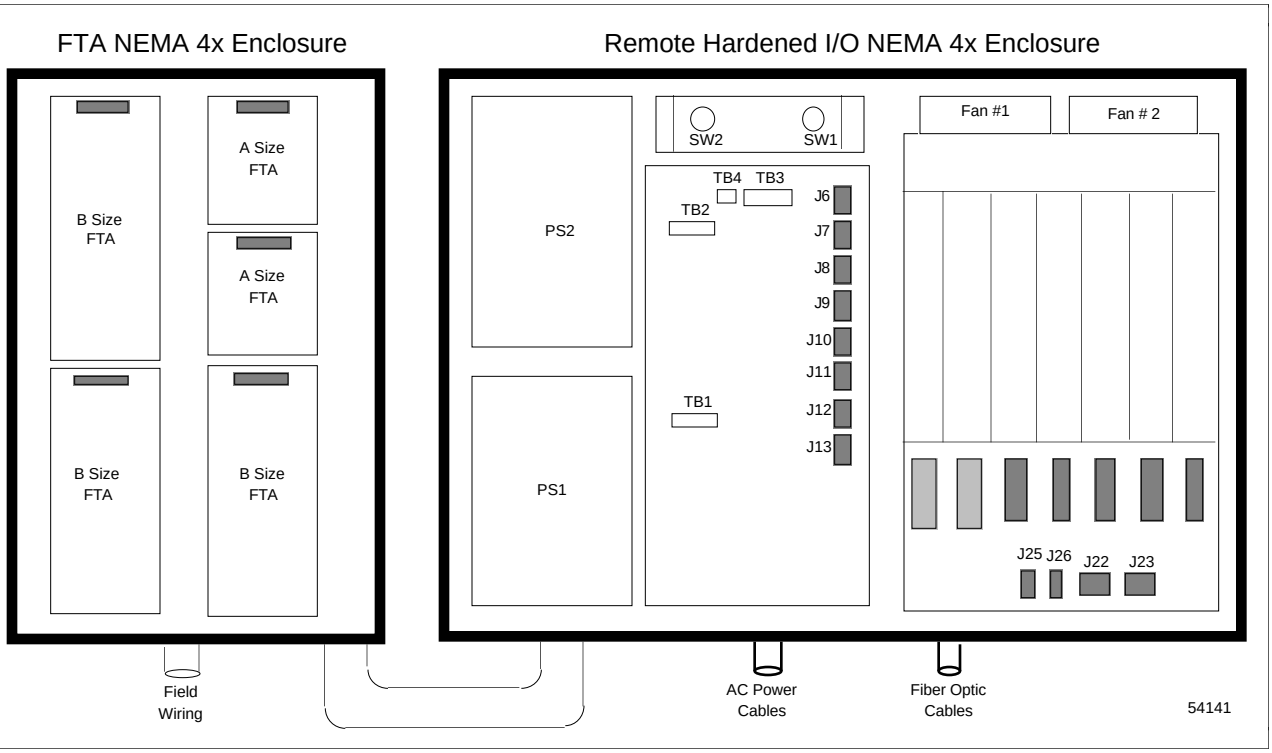
Single enclosure illustration

Figure 2-3 illustrates a single enclosure site installation.

Figure 2-3 Single Enclosure Site Installation



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Single enclosure cabling requirements

Table 2-3 lists the cable requirements for a single enclosure installation.

Table 2-3 Single Enclosure Cable Requirements

Connection Type	Cable Model Number	Length	Connection 1	Connection 2	Note
Primary AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB1	See Note 5
Redundant AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB2	See Note 5
DC Power Cable	MU-KDPR00 See Note 2	Factory Selected	J12 on AC/DC Distribution Assembly	Card File Backpanel J20	
DC Power Cable	MU-KDPR00 See Note 2	Factory Selected	J13 on AC/DC Distribution Assembly	Card File Backpanel J21	
IOP to FTA Cables	MU-KFTAxx	See Note 3	IOP Connector	FTA Connector	
I/O Link Extender Fiber Optic Cable	See Note 4	See Note 4	Coupler Module (MC-IOLX02) in PM, APM, or HPM Cabinet	Coupler Module (MC-IOLX02) in RHIO Enclosure	

Notes:

1. Supplied by user.
2. Shipped with enclosure from factory.
3. “xx” represents the length in meters. Length must not exceed 50 meters (164 feet).
4. Supplied by the user. See the appropriate specifications.

   Indoor cable specification 51190918

   Outdoor cable specification 51190919
5. I/O Link Extender fiber optic cables and ac input power cables can be routed in the same conduit, separate from other cables.

Continued on next page

Multi-enclosure complex

A multi-enclosure complex site installation requires a single enclosure that contains a Power System and one or two additional enclosures that contain only a card file. Figure 2-4 and Table 2-4 illustrate and provide cabling and conduit information when the site installation consists of two enclosures.

Openings in the enclosure that contains the Power System are required for the following types of cables. More than one type of cable can share an opening into the enclosure; for example, ac input power and fiber optic cables.

- AC input power cables
- Card file backpanel power cables
- Card file fan power extension cables
- I/O Link Interface cables
- IOP to FTA cables
- Fiber optic cables

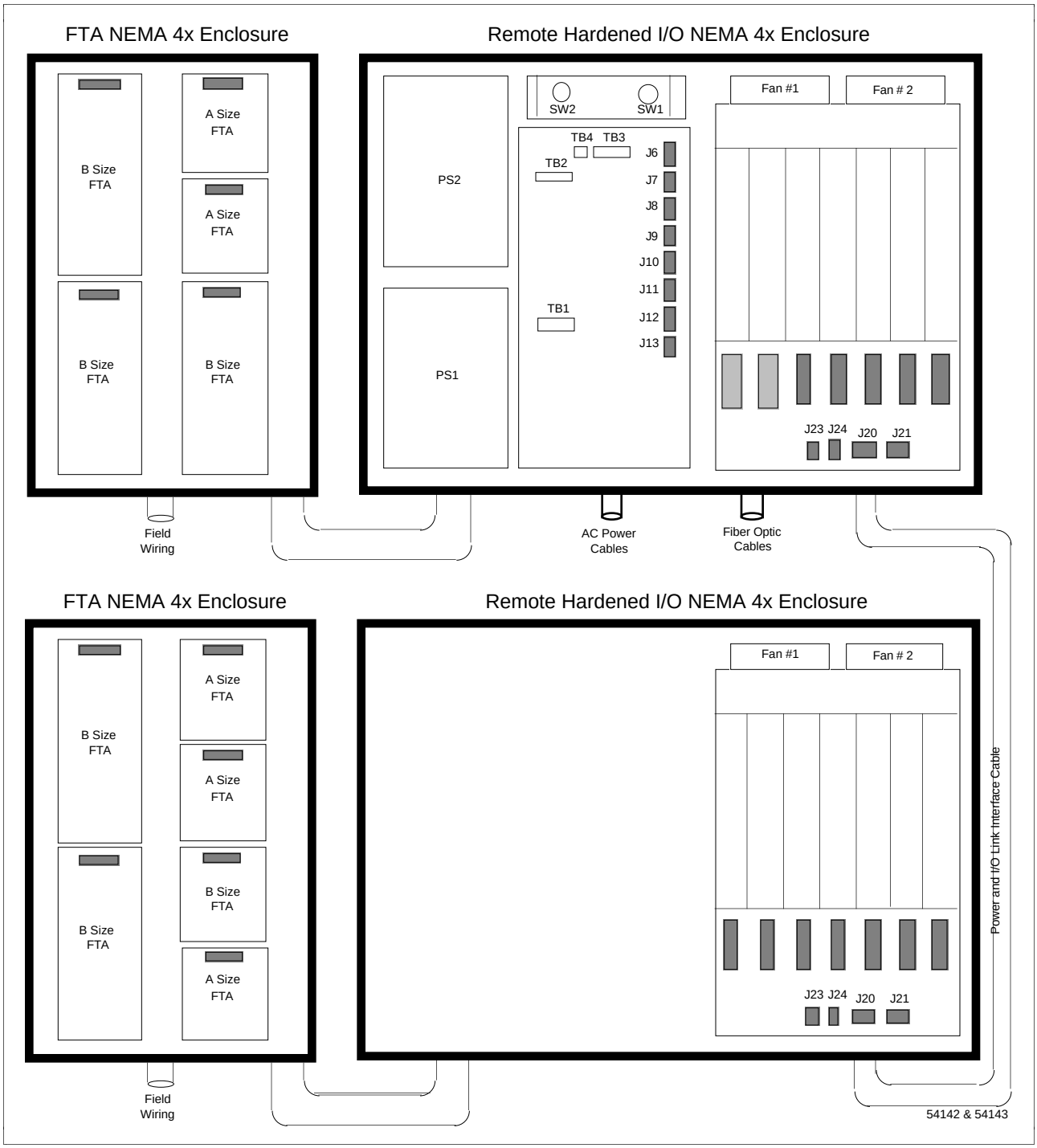
Openings in an enclosure that contains only a card file are required for the following types of cables. More than one type of cable can share an opening into the enclosure; for example, card file backpanel power cables and fan power extension cables.

- Card file backpanel power cables
- Card file fan power extension cables
- I/O Link Interface cables
- IOP to FTA cables

Continued on next page

Two enclosure complex illustration Figure 2-4 illustrates a two enclosure complex site installation.

Figure 2-4 Two Enclosure Complex Site Installation



Continued on next page

Two enclosure complex cabling requirements

Table 2-4 lists two enclosure complex cabling requirements.

Table 2-4 Two Enclosure Complex Cable Requirements

Connection Type	Cable Model Number	Length	Connection 1	Connection 2	Note
Primary AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB1 in PE #1*	See Note 7
Redundant AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB2 in PE #1*	See Note 7
DC Power Cable	MU-KDPR00 See Note 2	Factory Selected	J12 on AC/DC Distribution Assembly in PE #1*	Card File Backpanel J20 in PE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in PE #1*	Card File Backpanel J20 in NPE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in NPE #1*	AC/DC Distribution Assembly J13 in PE #1*	
Fan #1 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J8 in PE #1*	Power Cord for Fan #1 in NPE #1*	
Fan #2 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J9 in PE #1*	Power Cord for Fan #2 in NPE #1*	
IOP to FTA Cables	MU-KFTAxx	See Note 3	IOP Connector	FTA Connector	
I/O Link Extender Fiber Optic Cable	See Note 4	See Note 4	Coupler Module (MC-IOLX02) in PM, APM, or HPM Cabinet	Coupler Module (MC-IOLX02) in RHIO Enclosure	See Note 4 See Note 7
I/O Link Interface Cable Between PE #1* and NPE #1*	51195479-xxx See Note 6	See Note 6	See Note 6	See Note 6	

* PE #1 = Enclosure #1 with a Power System
NPE #1 = Enclosure #2 without a Power System

See page 28 for Table 2-4 comments and notes.

Continued on next page

Table 2-4 notes

Notes:

1. Supplied by user.
2. Shipped with enclosure from factory.
3. “xx” represents the length in meters. Length must not exceed 50 meters (164 feet).
4. Supplied by the user. See the appropriate specifications.

   Indoor cable specification 51190918

   Outdoor cable specification 51190919
5. “xxx” represents the length of the cable in meters. Available in three lengths.
   010 = 10 meters
   005 = 5 meters
   002 = 2 meters
6. The I/O Link Interface cable is available in five lengths with different numbers of connectors. The shortest length, 1.5 meters, has two connectors. The longest length, 7.5 meters, has six connectors. Any of the cable lengths can be used between enclosures; however, the end connectors must always be used. The connectors between the end connectors, if any exist, can be left unconnected.

   Link A is J23 on the card file backpanel. Link B is J24 on the card file backpanel. Link A and Link B must not be cross-connected. Use a separate cable for Link A and Link B.
7. I/O Link Extender fiber optic cables and ac input power cables can be routed in the same conduit, separate from other cables. Card file backpanel and fan power cables, and I/O Link Interface cables can be routed in the same conduit. The IOP to FTA cables must be routed in a separate conduit to the FTA enclosure.

Continued on next page

Three enclosure complex cabling requirements

Table 2-5 provides three enclosure complex cabling requirements.

Table 2-5 Three Enclosure Complex Cable Requirements

Connection Type	Cable Model Number	Length	Connection 1	Connection 2	Note
Primary AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB1 in PE #1*	See Note 7
Redundant AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB2 in PE #1*	See Note 7
DC Power Cable	MU-KDPR00 See Note 2	Factory Selected	J12 on AC/DC Distribution Assembly in PE #1*	Card File Backpanel J20 in PE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in PE #1*	Card File Backpanel J20 in NPE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in NPE #1*	Card File Backpanel J20 in NPE #2*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in NPE #2*	AC/DC Distribution Assembly J13 in PE #1*	
Fan #1 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J8 in PE #1*	Power Cord for Fan #1 in NPE #1*	
Fan #2 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J9 in PE #1*	Power Cord for Fan #2 in NPE #1*	
Fan #3 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J10 in PE #1*	Power Cord for Fan #1 in NPE #2*	
Fan #4 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J11 in PE #1*	Power Cord for Fan #2 in NPE #2*	
IOP to FTA Cables	MU-KFTAxx	See Note 3	IOP Connector	FTA Connector	
I/O Link Extender Fiber Optic Cables	See Note 4	See Note 4	Coupler Module (MC-IOLX02) in PM, APM, or HPM Cabinet	Coupler Module (MC-IOLX02) in RHIO Enclosure	See Note 4 See Note 7
I/O Link Interface Cables	51195479-xxx See Note 6	See Note 6	See Note 6	See Note 6	

Continued on next page

Table 2-5 notes

* PE #1 = Enclosure #1 with a Power System
NPE #1 = Enclosure #2 without a Power System
NPE #2 = Enclosure #3 without a Power System

Notes:

1. Supplied by user.
2. Shipped with enclosure from factory.
3. “xx” represents the length in meters. Length must not exceed 50 meters (164 feet).
4. Supplied by the user. See the appropriate specifications.

   Indoor cable specification 51190918

   Outdoor cable specification 51190919
5. “xxx” represents the length of the cable in meters. Available in three lengths.
   010 = 10 meters
   005 = 5 meters
   002 = 2 meters
6. The I/O Link Interface cable is available in five lengths with different numbers of connectors. The shortest length, 1.5 meters, has two connectors. The longest length, 7.5 meters, has six connectors. Any of the cable lengths can be used between enclosures; however, the end connectors must always be used. The connectors between the end connectors, if any exist, can be left unconnected.

   Link A is J23 on the card file backpanel. Link B is J24 on the card file backpanel. Link A and Link B must not be cross-connected. Use a separate cable for Link A and Link B.
7. I/O Link Extender fiber optic cables and ac input power cables can be routed in the same conduit, separate from other cables. Card file backpanel and fan power cables, and I/O Link Interface cables can be routed in the same conduit. The IOP to FTA cables must be routed in a separate conduit to the FTA enclosure.

Continued on next page

Four enclosure complex cabling requirements

Table 2-6 provides four enclosure complex cabling requirements.

Table 2-6 Four Enclosure Complex Cable Requirements

Connection Type	Cable Model Number	Length	Connection 1	Connection 2	Note
Primary AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB1 in PE #1*	See Note 7
Redundant AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB2 in PE #1*	See Note 7
Primary AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB1 in PE #2*	See Note 7
Redundant AC Input Power Cable(s)	See Note 1	See Note 1	120/240 Vac Source Breaker Panel	AC/DC Distribution Assembly TB2 in PE #2*	See Note 7
DC Power Cable	MU-KDPR00 See Note 2	Factory Selected	AC/DC Distribution Assembly J12 in PE #1*	Card File Backpanel J20 in PE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in PE #1*	Card File Backpanel J20 in NPE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in NPE #1*	AC/DC Distribution Assembly J13 in PE #1*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	AC/DC Distribution Assembly J12 in PE #2*	Card File Backpanel J20 in PE #2*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in PE #2*	Card File Backpanel J20 in NPE #2*	
DC Power Cable	MU-KDPRxx See Note 3	See Note 3	Card File Backpanel J21 in NPE #2*	AC/DC Distribution Assembly J13 in PE #2*	
Fan #1 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J8 in PE #1*	Fan #1 Power Cord in NPE #1*	
Fan #2 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J9 in PE #1*	Fan #2 Power Cord in NPE #1*	

Continued on next page

Four enclosure complex cable requirements, continued

Table 2-6 Four Enclosure Complex Cable Requirements, Continued

Connection Type	Cable Model Number	Length	Connection 1	Connection 2	Note
Fan #3 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J8 in PE #2*	Fan #1 Power Cord in NPE #2*	
Fan #4 External Cable	51201691-xxx See Note 5	See Note 5	AC/DC Distribution Assembly J9 in PE #2*	Fan #2 Power Cord in NPE #2*	
IOP to FTA Cables	MU-KFTAxx	See Note 3	IOP Connector	FTA Connector	
I/O Link Extender Fiber Optic Cables	See Note 4	See Note 4	Coupler Module (MC-IOLX02) in PM, APM, or HPM Cabinet	Coupler Module (MC-IOLX02) in RHIO Enclosure	See Note 4 See Note 7
I/O Link Interface Cables	51195479-xxx See Note 6	See Note 6	See Note 6	See Note 6	

See page 33 for Table 2-6 comments and notes.

Continued on next page

Table 2-6 notes

* PE #1 = Enclosure #1 with a Power System
NPE #1 = Enclosure #2 without a Power System
PE #2 = Enclosure #3 with a Power System
NPE #2 = Enclosure #4 without a Power System

Notes:

1. Supplied by user.
2. Shipped with enclosure from factory.
3. "xx" represents the length in meters. Length must not exceed 50 meters (164 feet).
4. Supplied by the user. See the appropriate specifications.

   Indoor cable specification 51190918

   Outdoor cable specification 51190919
5. "xxx" represents the length of the cable in meters. Available in three lengths.
   010 = 10 meters
   005 = 5 meters
   002 = 2 meters
6. The I/O Link Interface cable is available in five lengths with different numbers of connectors. The shortest length, 1.5 meters, has two connectors. The longest length, 7.5 meters, has six connectors. Any of the cable lengths can be used between enclosures; however, the end connectors must always be used. The connectors between the end connectors, if any exist, can be left unconnected.

   Link A is J23 on the card file backpanel. Link B is J24 on the card file backpanel. Link A and Link B must not be cross-connected. Use a separate cable for Link A and Link B.
7. I/O Link Extender fiber optic cables and ac input power cables can be routed in the same conduit, separate from other cables. Card file backpanel and fan power cables, and I/O Link Interface cables can be routed in the same conduit. The IOP to FTA cables must be routed in a separate conduit to the FTA enclosure.

Section 3 – Installation

3.1 Overview

Section contents

The topics covered in this section are:

Introduction

A Remote Hardened I/O enclosure can be mounted in its planned location before preparing the enclosure for external cable entry. After mounting the enclosure, the gland plate through which the cabling will enter the enclosure should be removed from the enclosure. This guarantees that metal chips will not enter the enclosure and damage the enclosure's electrical components while drilling or cutting the gland plate to accommodate the cable conduit.

Number and types of enclosures

The type of enclosure (with or without Power Supply Modules and an AC/DC Distribution Assembly) and number of enclosures will determine the number, size, and location of the entry holes that must be cut in the gland plate.

Typical installation

The typical site installation includes up to three Remote Hardened I/O enclosures and the user-supplied enclosure(s) that house the supporting FTAs. Conduit must be installed between the Remote Hardened I/O enclosures and the FTA enclosure(s). A conduit fitting or some type of sealed transit device must be used for the entry into the enclosure of ac power cable(s) and fiber optic cables.

3.2 Installation Considerations

Considerations

Consider the requirements before beginning a site installation.

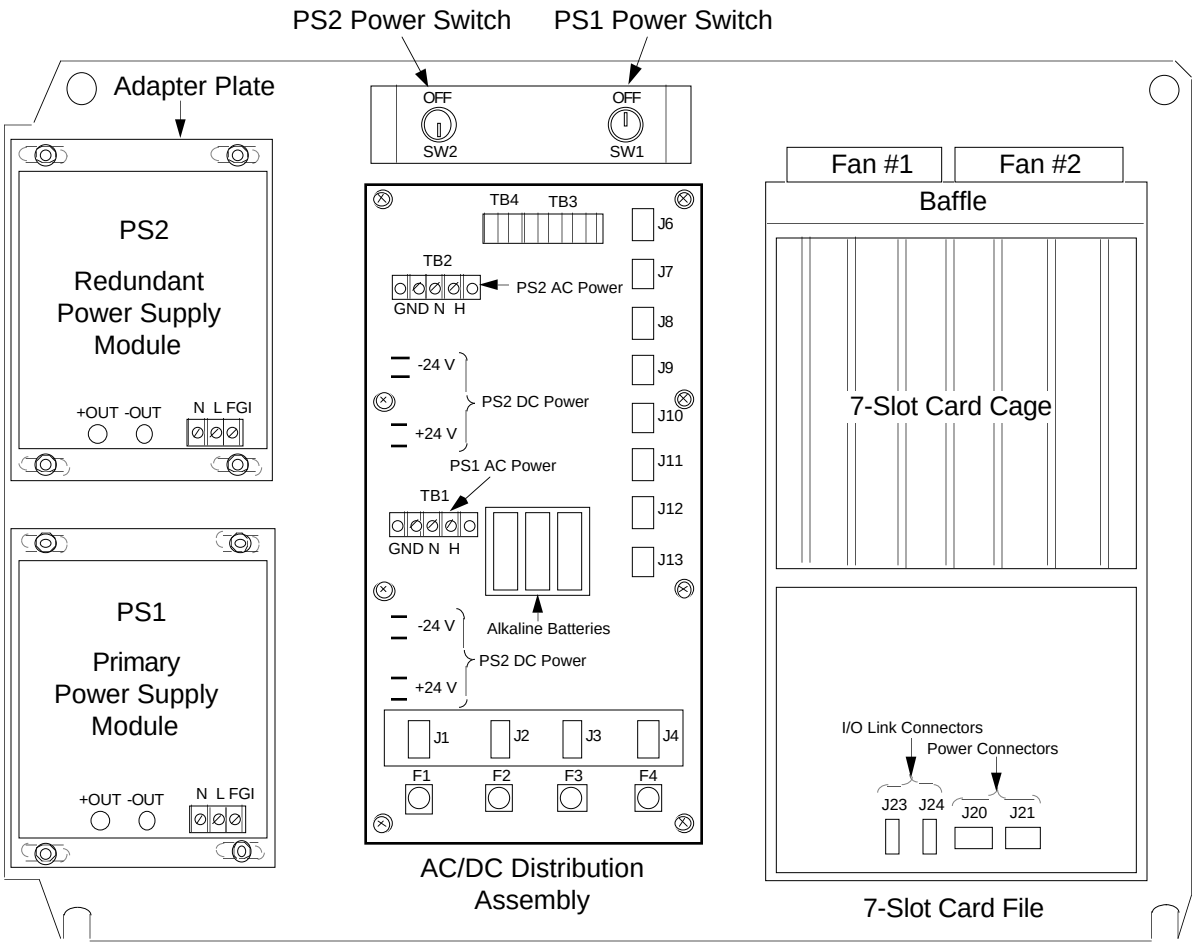
- Power, ground, and FTA to IOP cables, and optionally fiber optic or I/O Link Interface cables must be connected to the components inside each enclosure. The type and number of the cables is dependent upon the hardware configuration.
- A single ac power source or two independent ac power sources must provide power to the redundant Power Supply Modules. In either case, the ac input power lines to the Power Supply Module(s) must be protected by an exterior 15-ampere circuit breaker.

  Battery backup for the Power System's Power supplies, other than the 3.9 Vdc for the IOP's CMOS memory, is not provided with the Remote Hardened I/O enclosure. If power stability is a concern, an uninterruptible power source should be used to provide the ac power.
- Card files must be pinned for their I/O Link Interface address as defined by the Process Manager or Advanced Process Manager subsystem's configuration.
- The I/O Link Interface Extender's A and B fiber optic cables must be correctly connected to the Fiber Optic Coupler modules. The card file's I/O Link Interface address and the slot location of the I/O Link Extender card determine which fiber optic cable will connect to each Fiber Optic Coupler module.

Mounting panel illustration

Figure 3-1 is an illustration on the major components that are installed on the mounting panel inside the enclosure. The location of connectors, terminal boards, and Alkaline batteries on the AC/DC Distribution Assembly are identified. Model MU-CBSS12 and MU-CBSS12 enclosures are without Power Supply Modules, power switches, and an AC/DC Distribution Assembly.

Figure 3-1 Enclosure Mounting Panel Components



Note:

J1-J4 are ac power connectors that are intended to power cabinet fans and are not used in the Remote Hardened I/O enclosure application.

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3.3 Enclosure Mounting

Introduction

Determine where and how the enclosure(s) will be mounted. The enclosure can be mounted on a flat vertical surface or optionally on a pole by using a pole mounting kit. Pedestal mounting is also a consideration.

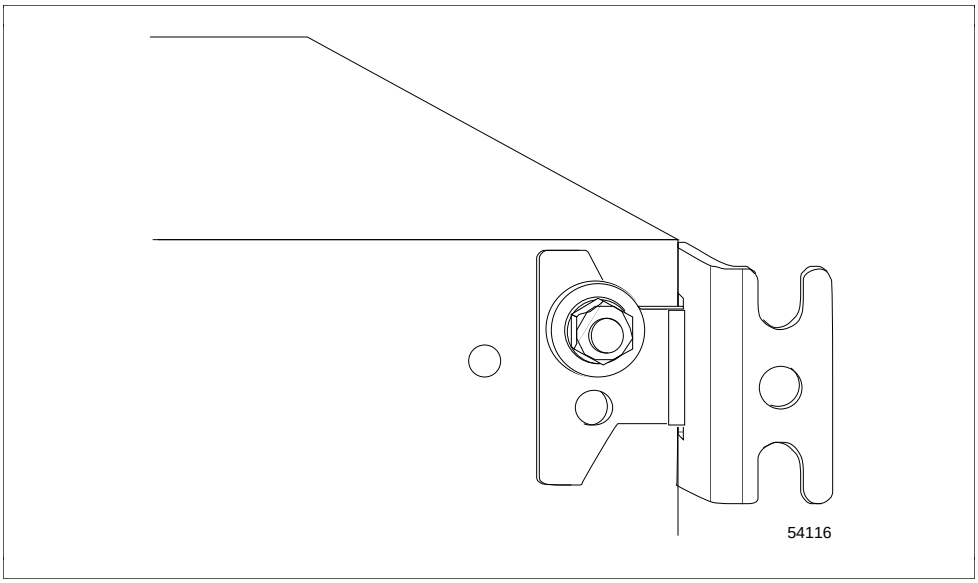
The enclosures must be separated by at least 7.7 centimeters (3.0 inches) to ensure proper surface heat dissipation. Follow the installation guidelines in subsection 2.2.

3.3.1 Vertical Surface Mounting

Introduction

There are four mounting studs at the back of the enclosure to which mounting brackets can be attached as illustrated in Figure 3-2. The mounting brackets and attachment hardware are included with the enclosure.

Figure 3-2 Enclosure Mounting Bracket Attachment



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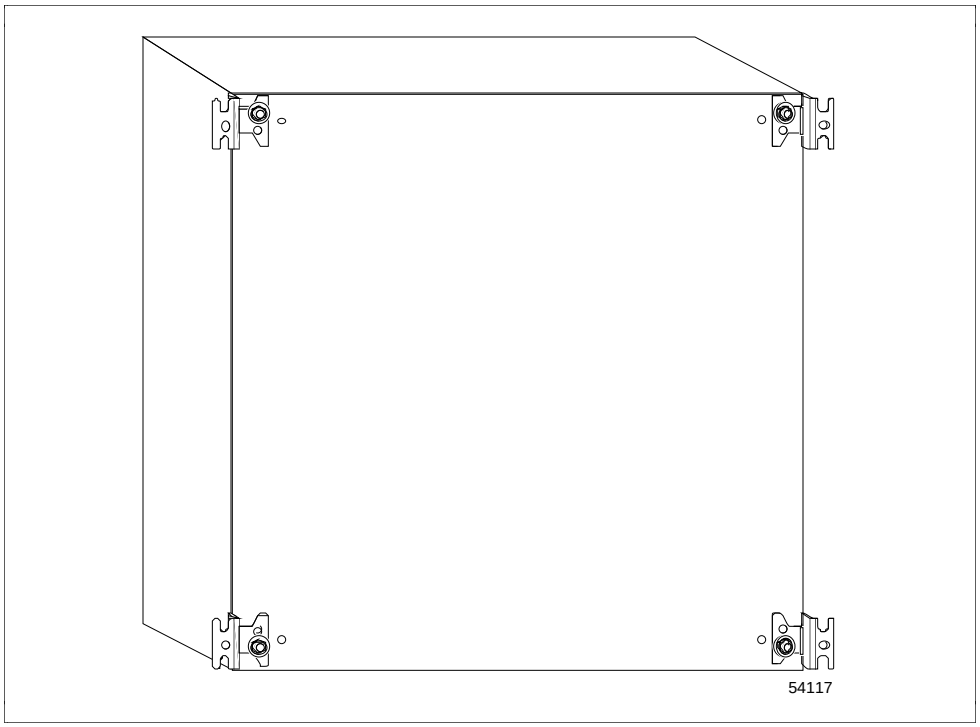
3.3.1 Vertical Surface Mounting, Continued

Bracket mounting method

Figure 3-3 illustrates the enclosure mounting bracket attachment method.

Figure 3-3 Enclosure Mounting Bracket Attachment Method



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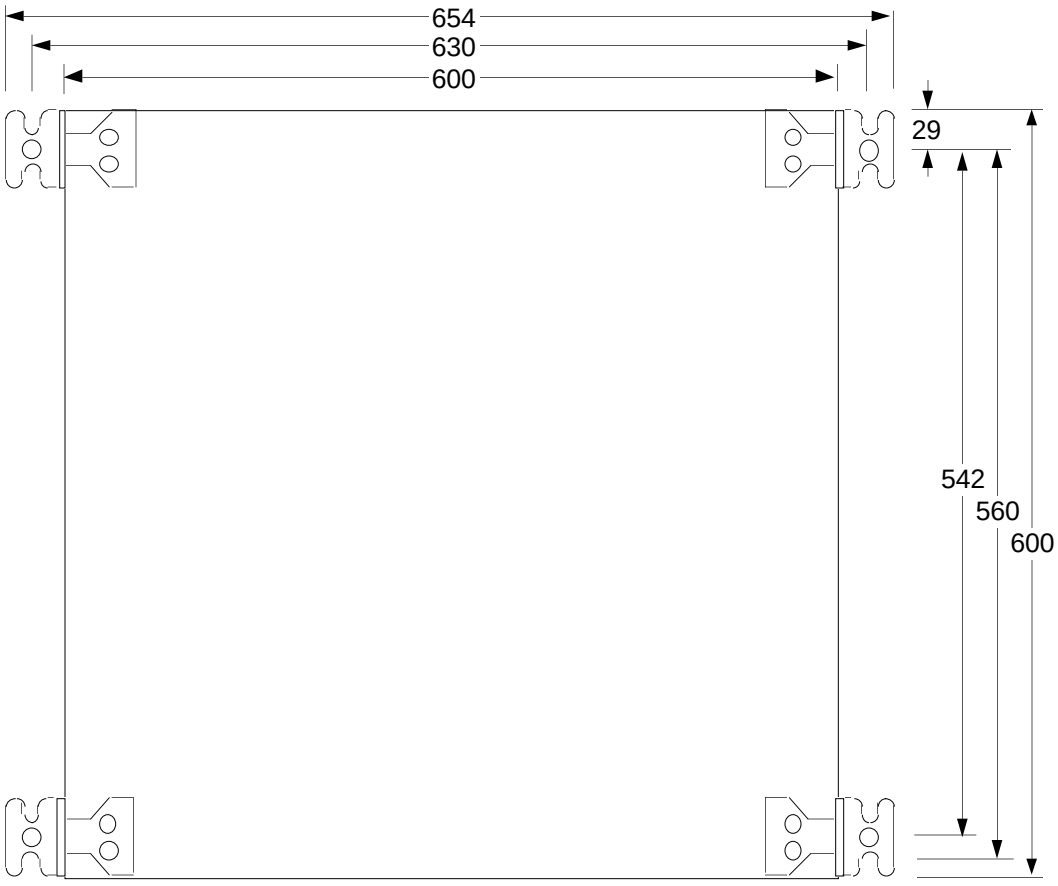
3.3.1 Vertical Surface Mounting, Continued

Enclosure mounting dimensions

Figure 3-4 is the layout of the back of the enclosure with the mounting brackets attached. Mounting dimensions are shown in millimeters.

Figure 3-4 Enclosure Vertical Surface Mounting Dimensions



Note:
All measurements are in millimeters.

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Enclosure vertical surface mounting procedure

Use the following procedure to mount an enclosure on a flat vertical surface.

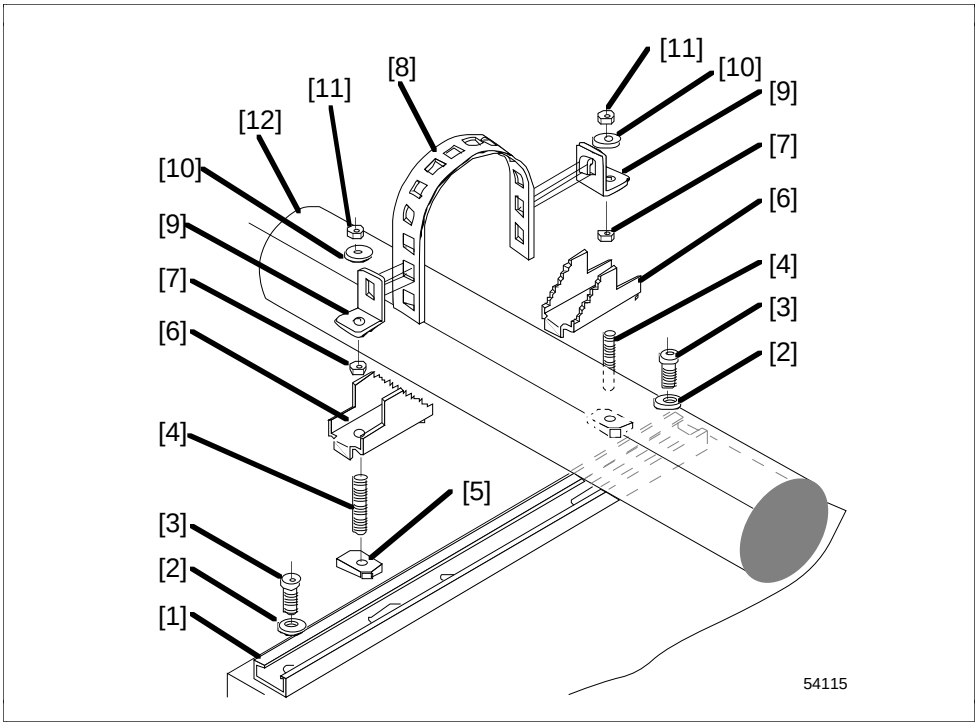
Step	Action
1	Attach the mounting brackets to the enclosure using the four 5/16 - 18 nuts that are included with the brackets. Figure 3-3 illustrates the attachment method.
2	Using the template in Figure 3-4, mark the locations on the vertical surface where four mounting bolts will attach the enclosure to the surface. You may want to position the two bottom bolts so that the bracket slots are used to support the enclosure while the two top bolts are installed. If so, use the 560 millimeter dimension.
3	Drill four holes in the mounting surface that are large enough to accept 3/8 inch diameter bracket mounting bolts.
4	Mount the enclosure on the vertical surface. An enclosure without a Power System weighs approximately 27.2 kilograms (60 pounds), and an enclosure with a Power System weighs approximately 31.8 kilograms (70 pounds). More than one individual should be involved in mounting the enclosure because of the weight.
5	The IOPs and I/O Link Interface Extender cards with associated Fiber Optic Coupler modules can now be installed in the card file. It is recommended that the I/O Link Interface Extender cards and their Fiber Optic Coupler modules be installed in slots 1 and 2 in an enclosure that contains a Power System.

3.3.2 Pole Mounting

Introduction

There are four mounting studs at the back of the enclosure to which mounting brackets can be attached. Optionally, two pole mounting kits, part number 51197530-100, can be used to mount the enclosure on a pole. Figure 3-5 is an illustration of the hardware that is included in the kit and the mounting method.

Figure 3-5 Enclosure Pole Mounting Kit



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Enclosure pole mounting procedure

Use the following procedure to mount an enclosure on a pole.

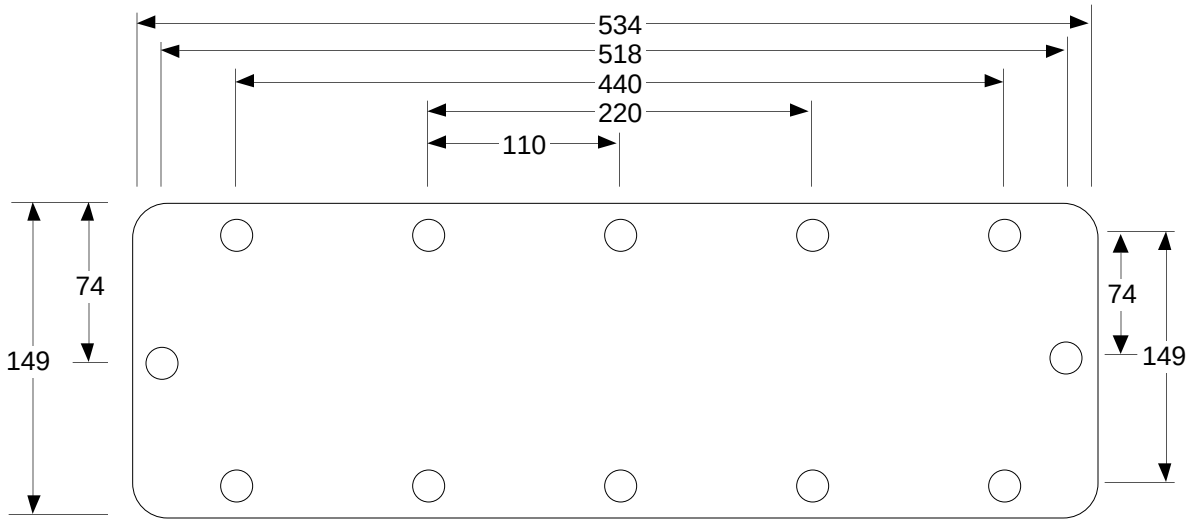
Step	Action
1	Referencing Figure 3-5, loosely assemble together as show n, items 1, 4, 5, 6, and 7 from one of the kits.
2	Attach the assembly to the top of the enclosure as shown with items 2 and 3. Tighten the 5/16 - 18 nuts.
3	Repeat steps 1 and 2 for the second kit. The assembly must attach to the bottom of the enclosure.
4	Mount the enclosure on the pole at the desired height. An enclosure without a Power System weighs approximately 27.2 kilograms (60 pounds), and an enclosure with a Power System weighs approximately 31.8 kilograms (70 pounds). More than one individual should be involved in mounting the enclosure because of the weight.
5	Adjust items 6 so that they are in contact with the pole. Tighten items 4 until they are snug against item 1. Tighten items 7.
6	Add items 8, 9, 10, 11, and 12 to the pole mounting assemblies. Tighten items 11. The enclosure should now be secured against the pole.

3.4 Conduit Installation

Introduction

When multiple Remote Hardened I/O enclosures exist at a site, appropriate size conduit must be installed between the enclosures to route the I/O Link Interface, card file backpanel power, and card file fan power extension cables. Conduit must always be installed between each enclosure and the user-supplied FTA enclosure(s). Figure 3-6 is a dimensional layout of the gland plate.

Figure 3-6 Gland Plate Dimensional Layout



Notes:

1. Material is 1.5 millimeters (0.062 inches) thick.
2. All diminsions are in millimeters.

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Conduit installation procedure

Use the following procedure to install conduit between Remote Hardened I/O enclosures and the FTA enclosure(s).

Step	Action
1	Mark the locations on the enclosure gland plate(s) where openings must be cut or punched for cable entry into the enclosure through conduit or other means. If more than one enclosure is involved, be sure to identify each gland plate with its enclosure. Remove the gland plate and gasket from the enclosure(s).
2	Drill or cut holes in the gland plate(s) where marked for cable entry. Be aware that the IOP to FTA cable connectors are rather large and the conduit must be large enough to accommodate the connector. Remove any metal chips or filings from the plate.
3	Reinstall the gland plate(s) and the gasket. Be sure the plate is properly sealed.
4	Mount the FTA enclosure (user-supplied) at an appropriate location. Before mounting the enclosure, drill or cut holes in the enclosure for cable entry. Remove any metal chips or filings from the enclosure.
5	Install the appropriate size conduit between the Remote Hardened I/O enclosure(s) and the FTA enclosure. If multiple enclosures exist, install conduit between the enclosures to route the I/O Link Interface, card file backpanel power, and card file fan power cables.

3.5 AC Power and Ground Connections

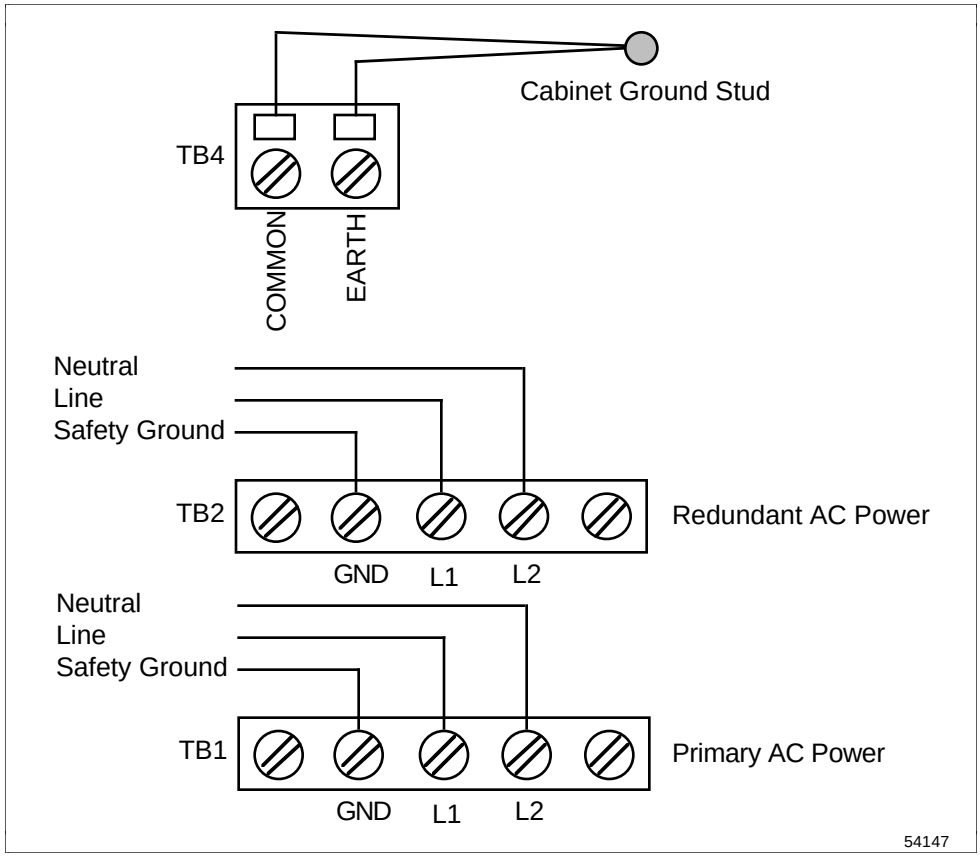
AC Power connections

Figure 3-7 illustrates the ac power and safety ground connections at TB1 and TB2 on the AC/DC Distribution Assembly for the primary and redundant Power Supply Modules when either a single or two independent ac power sources provide power. If there is a single ac power source, TB1 and TB2's terminals must be strapped together.

Ground connections

TB4 provides connection terminals for **EARTH** (Safety Ground) and **COMMON** (optionally Master Reference Ground). The normal practice is to connect both the **EARTH** and **COMMON** terminals to the ground stud inside the enclosure with separate 2.0 mm^2 (14 AWG) wire.

Figure 3-7 AC Power and Ground Connections



3.6 Alarm Contacts

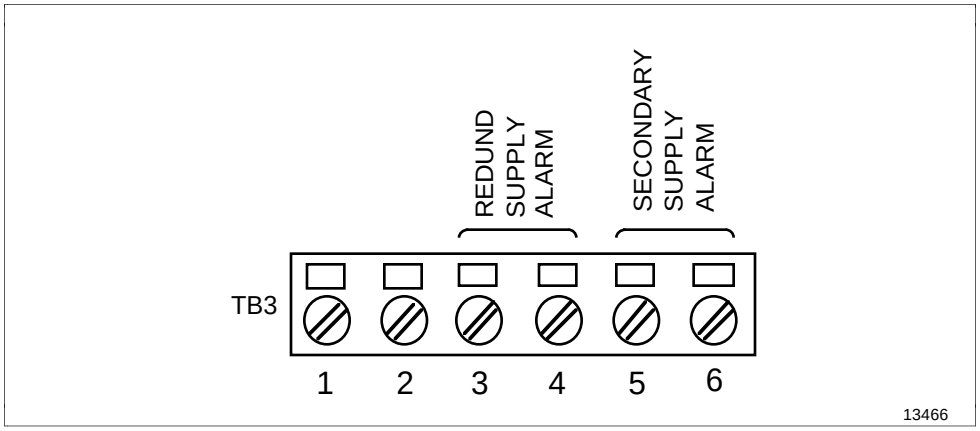
Power Supply Module alarm contacts

Figure 3-8 illustrates the connections at TB3 on the AC/DC Distribution Assembly for the Power Supply Module alarm annunciator contacts. The contacts are normally closed when the Power Supply Module is functional.

There are no alarm contacts for either the fan assemblies or the CMOS battery backup.

Typically, the contacts are connected to the field terminals of a 24 Vdc Digital Input FTA.

Figure 3-8 Power Supply Module Alarm Annunciator Connections



3.7 IOP to FTA Cables

Introduction

The user has the option of installing the IOPs in any of the seven card file slots. However, slots 3 through 7 or slots 11 through 15 are recommended when I/O Link Interface Extender cards are installed in the card file. Typically, they occupy either slots 1 and 2, or slots 9 and 10.

Cable lengths

The cable length must not exceed 50 meters (164 feet). The cables are available in various lengths from Honeywell by model number MU-KFTAxx, starting at 2.0 meters. One meter and 1.5 meter cables can be ordered by part numbers 51201420-001 and 51201420-915, respectively.

Reference

See the *Spare Parts* section in the *Process Manager/Advanced Process Manager Service* manual for a list of cable lengths.

Cable installation

Connect the FTA to IOP cables (model MU-KFTAxx, where "xx" is the length of the cable in meters) to the connectors below the slots occupied by IOPs. Route the other end of the cable to the associated FTA in the user-supplied FTA enclosure. If redundant IOPs are installed, be sure the IOP that is designated "IOP A" connects to the FTA's "**FTA A CONNECTOR**."

3.8 I/O Link Interface Cables

Introduction

When a site installation consists of a complex of Remote Hardened I/O enclosures, communication between the installed IOP cards in the enclosures and the I/O Link Extender cards is provided by an I/O Link Interface. Redundant I/O Link Interface cables must be routed between the enclosures.

Interconnections

The cables are daisy-chained between the enclosures when more than two enclosures are involved.

The distance between connectors is restricted to no more than 2 meters (6.6 feet).

Cable selection

The I/O Link Interface cable is available in five lengths. The shortest length, 1.5 meters, has 2 connectors. The longest cable, 7.5 meters, has 6 connectors with each connector separated by 1.5 meters.

Any of the 5 lengths of cables can be installed between the enclosures in an enclosure complex; however, the end connectors must be used. The connectors between the end connectors, if any exist, can be left unconnected.

See Table 2-3 or 2-4 in subsection 2.7.2 for cable selection.

ATTENTION

I/O Link Interface cables must be routed in conduit between enclosures.

Installation

Route the cables between the enclosures and connect them to J23 for Cable A and J24 for Cable B in each enclosure. Be sure not to cross the A and B cables.

Cable shield grounding

Both I/O Link Interface cables must be grounded at one end. The 7-Slot card file provides that capability. For consistency, install jumpers between the pins at locations J22 and J29 on the card file backpanel in the enclosure that contains the Power System. See Figure 3-1 for the locations of J22 and J29.

3.9 I/O Link Interface Extender

Introduction

The I/O Link Interface Extender cable set consists of two cables that are labeled A and B. The I/O Link Interface Extender cards can be installed in any odd and even numbered card file slots, but it is recommended that they be installed in slots 1 and 2 or 9 and 10 in the same card file. If both cards are not installed in the same card file, the cards must be installed in an odd and even numbered slot in the separate card files, such as slot 1 and slot 10. I/O Link Interface cables between the card files complete the I/O Link Interface communications path.

I/O Link Extender A and B determination

The slots where the I/O Link Extender cards are installed, together with the assigned I/O Link Interface address of the card file, determines which card slot is I/O Link Extender A and which is I/O Link Extender B. The rules are as follows.

Determination rules

If the card file number (1 through 8) and card file's slot number (1 through 7 or 9 through 15) are both an even or odd number, I/O Link Interface Extender cable A must be connected to the slot's Fiber Optic Coupler module. If the card file number and card file's slot number are both <u>not</u> an even or odd number, I/O Link Interface Extender cable B must be connected to the slot's Fiber Optic Coupler module.

Reference

See the I/O Link Extender section in the *Process Manager/Advanced Process Manager Planning* or *Process Manager I/O Installation* manual for a detailed discussion of the I/O Link Extender.

Cable installation

Connect the I/O Link Interface Extender cables to their appropriate Fiber Optic Coupler modules. Be sure the "A" and "B" cables connect to the appropriate Fiber Optic Coupler modules.

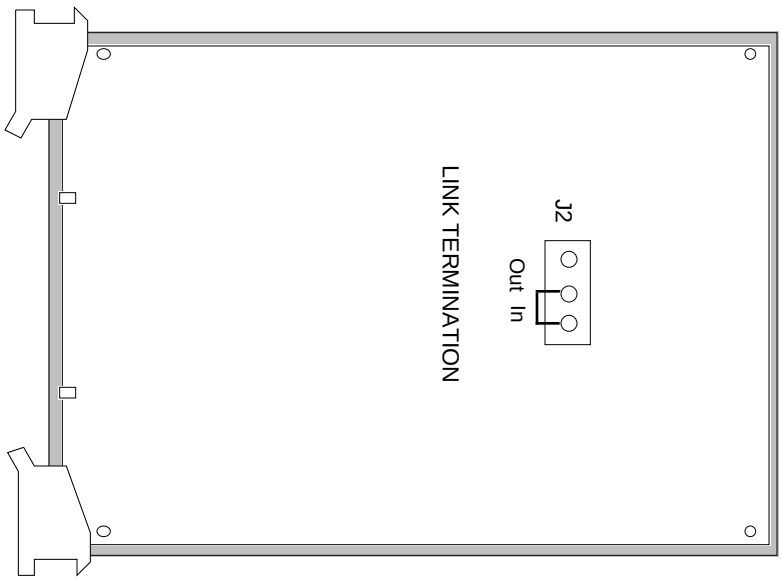
Continued on next page

Standard I/O Link Interface Extender termination

Both Link A and Link B of the I/O Link Interface must be terminated at both ends. The PMM, APMM, HPMM, or local IOP card file provides local I/O Link Interface termination. To provide termination at the remote card file, the I/O Link Interface Extender card has jumper selectable terminators available. The **LINK TERMINATION** jumper, **J2**, has two positions, **IN** and **OUT**. At the PMM, APMM, HPMM, or local IOP card file end of the fiber link, the jumper must be placed in the **OUT** position. The opposite is true at the remote end of the fiber link. The jumper must be placed in the **IN** position. See Figure 3-9 for the location of the jumper on the Standard I/O Link Interface Extender card.

Standard I/O Link Extender card pinning

Figure 3-9 Standard I/O Link Interface Extender Card Pinning



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

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Continued on next page

Long Distance I/O Link Extender link selection

Before installing the Long Distance I/O Link Interface Extender card in its card file slot, it must be configured as Link A or Link B by jumper selection on the card. The jumper location is labeled **A/B LINK SELECTION** and has two positions labeled **LINK A** and **LINK B**. Placing the jumper in the proper position provides the selection. After installation of the link and upon applying power to the equipment, the link selection is indicated by one of two LEDs at the front of the Fiber Optic Coupler module. See Figure 3-10 for the location of the jumper on the Long Distance I/O Link Interface Extender card.

Long Distance I/O Link Interface Extender termination

Both Link A and Link B of the I/O Link Interface must be terminated at both ends. The PMM, APMM, HPMM, or local IOP card file provides local I/O Link Interface termination. To provide termination at the remote card file, the I/O Link Interface Extender card has jumper selectable terminators available. The **LINK TERMINATION** jumper, **J2**, has two positions, " **IN**" and "**OUT**." At the PMM, APMM, HPMM, or local card file end of the fiber optic link, the jumper must be placed in the "**OUT**" position. The opposite is true at the remote end of the fiber optic link. The jumper must be placed in the "**IN**" position. See Figure 3-10 for the location of the jumper on the Long Distance I/O Link Interface Extender card.

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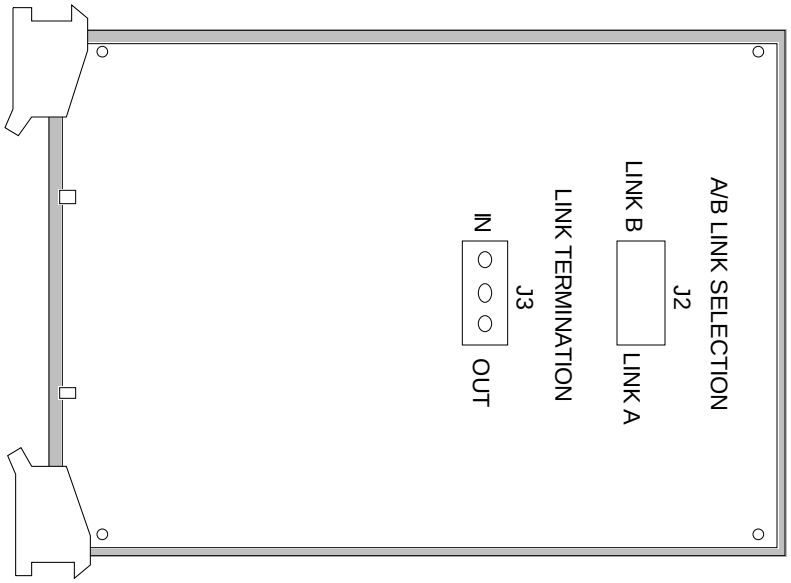
Long Distance I/O Link Interface Extender card pinning

Figure 3-10 Long Distance I/O Link Interface Extender Card Pinning



- Move jumper J3 to "Out" if this IOP is used in the main file.
- Move jumper J3 to "In" if this IOP is used in the remote file (Shelf/Stock position is "In").
- Move jumper J2 to desired LINK A or LINK B selection.

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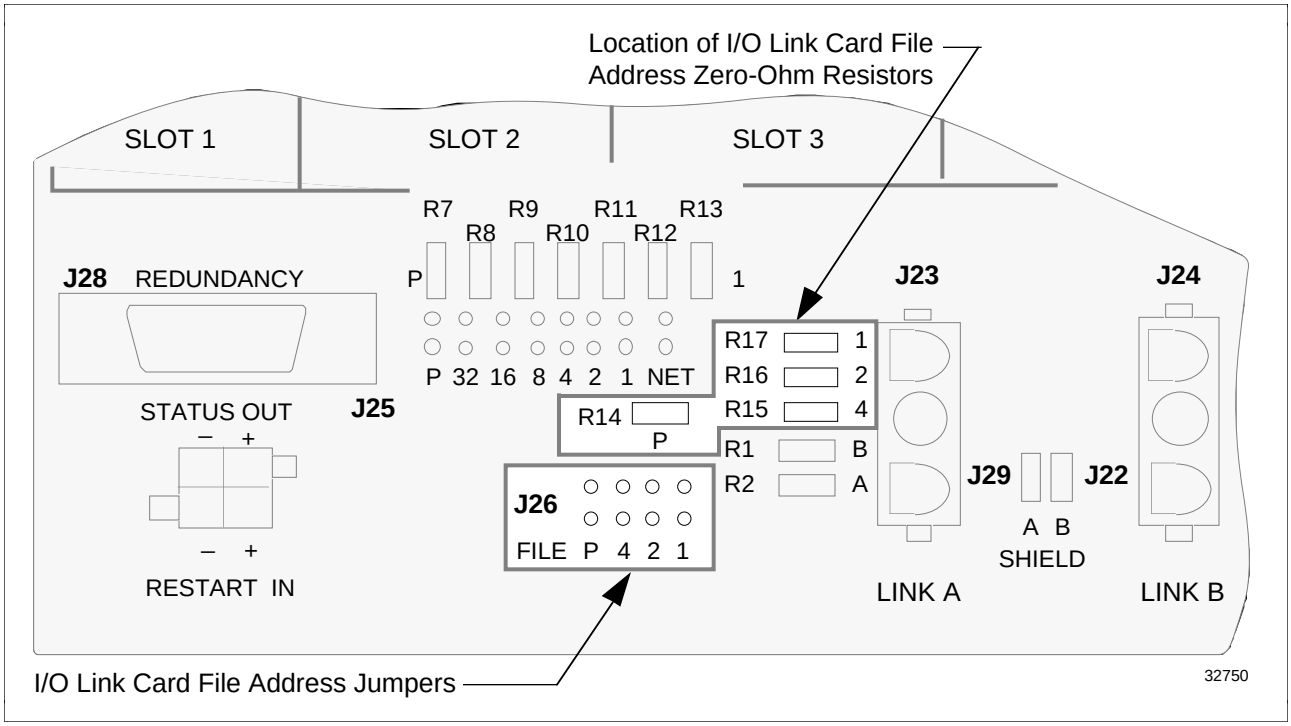
3.10 Card File I/O Link Interface Pinning

Introduction

The assigned I/O Link Interface address for the card file must be selected by proper pinning on the card file's backpanel. Figure 3-11 is an illustration of a section of the Left 7-Slot card file's backpanel where the I/O Link Interface address is selected. The Right 7-Slot card file's backpanel is identical, except the slots are numbered 9 through 15.

Figure 3-11 Card File I/O Link Interface Address Selection



Address selection

The selection is made at J26. There are four jumper positions that are labeled **1**, **2**, **4,** and **P**. The positions **1**, **2**, and **4** represent the binary equivalent of the I/O Link Interface address. The **P** position represents parity. An odd number of jumpers must be installed, so if the I/O Link Interface address is 3, jumpers must be installed in positions **1**, **2**, and **P**. If the I/O Link Interface address is 2, a single jumper is installed in position **2**.

3.11 Enclosure Integrity

Enclosure security

At the completion of the installation, check all openings made in the enclosures for conduit or mounting of the enclosure to ensure that they are sealed to prevent moisture or gases from entering the enclosure.

Section 4 – Service

4.1 Overview

Section contents

The topics covered in this section are:

Introduction

If it becomes necessary to replace or add hardware in the enclosure, recommended disassembly and reassembly procedures should be followed.

4.2 Disassembly

Introduction

When replacing a component on the mounting panel in the enclosure, it is sometimes recommended that the mounting panel be removed from the enclosure. IOPs, I/O Link Interface Extender cards, and Fiber Optic Coupler modules are easily replaced without removing the mounting panel. Be sure the inside of the enclosure is protected from adverse weather conditions while removing the mounting panel or any components.

4.2.1 Mounting Panel Removal

Mounting panel removal procedure

Use the following procedure to remove the mounting panel.

Step	Action
1	Remove power from the enclosure by placing the external ac circuit breakers in the off position.
2	Tag and identify the power and ground wires connected to the AC/DC Distribution Assembly so that they can be correctly reconnected. Disconnect the wires.
3	Tag and identify any Power Supply Module alarm annunciator wires connected to the AC/DC Distribution Assembly so that they can be correctly reconnected. Disconnect the wires.
4	If applicable, disconnect the external DC Power cable from J13.
5	If applicable, disconnect any card file fan power extension cables from J8 through J11.
6	Remove the trim panel at the front of the card file. Tag and identify FTA to IOP and/or fiber optic cables connected to the card file so that they can be correctly reconnected. Disconnect the cables.
7	Loosen, but do not remove the four nuts that hold each Power Supply Module's adapter plate in place. Slide the Power Supply Modules to the right, away from the side of the enclosure.
8	Loosen and remove the four 5/16 - 18 nuts with washers that hold the mounting panel in place. Remove the mounting panel from the enclosure and place it on a clean working surface.
9	Remove the defective component by using one of the procedures in the subsections that follow.

4.2.2 Card File Removal

Card File removal procedure

Use the following procedure to remove the 7-Slot card file.

Step	Action
1	If the mounting panel is still installed in the enclosure, remove the trim panel. The IOP to FTA cables, and if applicable, the I/O Link Interface fiber optic cables and I/O Link Interface cables must be disconnected from the card file.
2	Disconnect the DC Power cables at J20 and J21 on the card file's back plane and the fan power cables at J6 and J7 on the AC/DC Distribution Assembly. If there is no AC/DC Distribution Assembly in the enclosure, disconnect the fan power extension cables from the card file fan power cables.
3	Loosen and remove the four M5 x 0.8 nuts with M5 washers that attach the card file to the mounting panel.
4	Remove the card file from the mounting panel.
5	Remove the IOPs and, if present, I/O Link Interface Extender card(s) and Fiber Optic Coupler module(s).

4.2.3 Power Supply Module Removal

Power Supply Module removal procedure

Use the following procedure to remove a Power Supply Module.

Step	Action
1	Place the appropriate power switch (**SW1** or **SW2**) in the **OFF** position or remove power by placing the external circuit breaker in the off position. Do not operate SW1 or SW2 if the atmosphere in the area is known to be hazardous. If the area is hazardous, use the external circuit breaker to remove power to the Power Supply Module while the enclosure is secured.
2	Disconnect the Power Supply Module's +24 Vdc and -24 Vdc power connections at the terminals **+OUT** and **-OUT**, respectively. See Figure 3-1 for the locations.
3	Disconnect the Power Supply Module's ac power connections at the terminals **N**, **L**, and **FGI**. See Figure 3-1 for the locations.
4	Loosen and remove the four M4 x 0.7 nuts with M4 washers that attach the Power Supply Module's adapter plate to the mounting panel. Remove the Power Supply Module from the mounting panel.
5	Place the Power Supply Module in an inverted position on a clean work surface. Loosen and remove the four #6 - 32 flathead screws that attach the Power Supply Module to its adapter plate.

4.2.4 AC/DC Distribution Assembly Removal

AC/DC Distribution Assembly removal procedure

Use the following procedure to remove an AC/DC Distribution Assembly.

Step	Action
1	If the mounting panel is installed in the enclosure, tag and disconnect the ac power and safety ground wires to TB1 and TB2. Also, tag and disconnect any wires connected to TB3 and/or TB4. See Figure 3-1 for the locations.
2	Tag and disconnect the Power Supply Module(s) 24 V- and 24 V+ spade lug connections on the AC/DC Distribution Assembly. See Figure 3-1 for the locations.
3	Tag and disconnect the Power Supply Module(s) ac power connections at TB1 (Primary) and/or TB2 (Redundant). See Figure 3-1 for the locations.
4	Disconnect the power cables at J6 and J7 (fans), and the DC Power cables at J12 and J13 (card file). If the mounting panel is installed in the enclosure, disconnect any external power cables that are connected to J8 through J11.
5	Loosen and remove the eight M3 x 0.5 screws with M4 washers and standoffs that attach the AC/DC Distribution Assembly to the mounting panel. Remove the AC/DC Distribution Assembly from the mounting panel.

4.3 Reassembly

4.3.1 Mounting Panel Replacement

Mounting panel replacement procedure

Use the following procedure to reinstall the mounting panel in the enclosure. Be sure the components on the mounting panel and the inside of the enclosure are protected from adverse weather conditions while replacing the mounting panel.

Step	Action
1	Install the replacement component on the mounting panel for any component that was removed because it was defective. Reuse the component's attachment hardware. None of the components require electrical adjustments after installation.
2	Reinstall the mounting panel in the enclosure with its mounting hardware by reversing the disassembly procedure. Tighten the mounting panel's attachment hardware and then position the Power Supply Modules tightly against the enclosure's side surface. Tighten their attachment nuts.
3	Reconnect the ac power and safety ground connections at TB1 and/or TB2. See Figure 3-1 for the locations.
4	As appropriate, reconnect any external IOP to FTA cables, I/O Link Interface Extender fiber optic cable(s), I/O Link Interface cables, or power cables that were disconnected prior to the removal of the mounting panel.

4.3.2 Card File Replacement

Card file replacement procedure

Use the following procedure to replace a 7-Slot card file.

Step	Action
1	Pin the card file's I/O Link Interface address at J26 to match the card file that was removed.
2	Position the card file on its mounting studs on the mounting panel.
3	Tighten the four M5 x 0.8 nuts with M5 washers that attach the card file to the mounting panel.
4	Reconnect the DC Power cables at J20 and J21 on the card file's backpanel and the fan power cables at J6 and J7 on the AC/DC Distribution Assembly.
5	If the mounting panel is installed in the enclosure, reconnect the IOP to FTA cables, and if applicable, the I/O Link Interface fiber optic cables and I/O Link Interface cables to the card file.
6	Reinstall the IOPs and/or I/O Link Interface Extender cards in their assigned slots.
7	Replace the trim panel at the front of the card file.

4.3.3 Power Supply Module Replacement

Power Supply Module replacement procedure

Use the following procedure to replace a Power Supply Module.

Step	Action
1	Attach the Power Supply Module to its adapter plate with the four #6 - 32 flathead screws.
2	Position the Power Supply Module on its mounting studs on the mounting panel.
3	If the mounting panel is installed in the enclosure, move the Power Supply Module tightly against the enclosure's side wall and tighten the four M4 x 0.7 nuts with M4 washers that attach the Power Supply Module's adapter plate to the mounting panel. If the mounting panel is not installed in the enclosure, leave the attachment nuts loose.
4	Reconnect the Power Supply Module's +24 Vdc and -24 Vdc power connections at the terminals **+OUT** and **-OUT**, respectively. See Figure 3-1 for the locations.
5	Reconnect the Power Supply Module's ac power connections at the terminals **N**, **L**, and **FGI**. See Figure 3-1 for the locations.

4.3.4 AC/DC Distribution Assembly Replacement

AC/DC Distribution Assembly replacement procedure

Use the following procedure to replace an AC/DC Distribution Assembly.

Step	Action
1	Position the AC/DC Distribution Assembly on the mounting panel and tighten the eight M3 x 0.5 screws with M4 washers and standoffs that attach the AC/DC Distribution Assembly to the mounting panel.
2	Reconnect the power cables at J6 and J7 (fans), and the DC Power cables at J12 and J13 (card file). If the mounting panel is installed in the enclosure, reconnect any external power cables that are connected to J8 through J11.
3	Reconnect the Power Supply Module(s) ac power connections at TB1 (Primary) and/or TB2 (Redundant). See Figure 3-1 for the locations.
4	Reconnect the Power Supply Modules +24 Vdc and -24 Vdc spade lug connections on the AC/DC Distribution Assembly at P1 through P8. See Figure 3-1 for the locations.
5	If the mounting panel is installed in the enclosure, reconnect the ac power and safety ground wires to TB1 and TB2. Also, reconnect any wires connected to TB3 and/or TB4. See Figure 3-1 for the locations.

4.3.5 Preventative Maintenance

CMOS Memory batteries

The three AA-size alkaline batteries on the AC/DC Distribution Assembly provide backup power for the CMOS Memory on the IOP cards. They are not rechargeable and must be replaced periodically. The period should not exceed 6 months, provided there is no sustained loss of power to the CMOS Memory. If there is, replace the batteries after dc power is restored to the enclosure.

Be sure that you observe the correct battery polarity when replacing the batteries. The battery holder indicates the correct polarity.

Section 5 – Spare Parts

5.1 Overview

Section contents

The topics covered in this section are:

Introduction

This section contains an abbreviated list of the Optimum Replaceable Units (ORU) and periodic maintenance replacement parts for the enclosures. They are listed by their Honeywell part number and where applicable, by their model number. Part numbers and model numbers for Field Termination Assemblies (FTAs), I/O Link Interface Extender components, FTA to IOP cables, DC Power cables, and I/O Link Interface cables are listed since they can be added to the enclosures after the initial installation.

For additional or optional equipment part numbers that are not listed in the table, contact your Honeywell Sales Representative or reference the *Process Manager/Advanced Process Manager Service* manual.

5.2 Periodic Maintenance Items

Periodic maintenance parts list

Table 5-1 lists components that may be required during the life of the Remote Hardened I/O enclosure complex.

Table 5-1 Periodic Maintenance Parts List

Name	Description		Part Number
BATTERIES			
Alkaline Battery	Set of 3 AA-size Alkaline batteries		51190467-100
FUSES			
Assembly	Quantity	Description	
7-Slot Card File (51402594-100 or -200)	8	2.0 A Medium Time-delay fuse (F1-8)	30754661-021
3-30 Vdc SS DO FTA (51304423)	16	5.0 A Fast-action fuse 5 x 20 mm	51190582-250
3-30 Vdc SS DO FTA (51304650)	16	2.5 A Time-delay fuse 5 x 20 mm	51190584-225
3-30 Vdc SS DO FTA (51309153)	16	2.5 A Time-delay fuse 5 x 20 mm	51190584-225
31-200 Vdc SS DO FTA (51304428)	16	1.0 A Time-delay fuse 5 x 20 mm	51190584-210
31-200 Vdc SS DO FTA (51309154)	16	1.0 A Time-delay fuse 5 x 20 mm	51190584-210
24-240 Vac SS DO FTA (51304408)	16	3.0 A Time-delay fuse 5 x 20 mm	51190584-230
120/240 Vac SS DO FTA (51304648)	16	2.5 A Time-delay fuse 5 x 20 mm	51190584-225
120 Vac Relay DO FTA (51304443)	16	6.0 A Time-delay fuse 5 x 20 mm	51190584-260
120 Vac Relay DO FTA (51309148)	16	6.0 A Time-delay fuse 5 x 20 mm	51190584-260

Continued on next page

Periodic maintenance parts list, continued

Table 5-1 Periodic Maintenance Parts List, Continued

Name	Description		Part Number
FUSES (Continued)			
Assembly	Quantity	Description	
240 Vac Relay DO FTA (51304427)	16	3.0 A Time-delay fuse 5 x 20 mm	51190584-230
240 Vac Relay DO FTA (51309150)	16	3.0 A Time-delay fuse 5 x 20 mm	51190584-230
24 Vdc Nonisolated DO FTA (51304446)	16 1	0.2 A Fast-action fuse 5 x 20 mm (F1-16) 2.0 A Fast-action fuse 5 x 20 mm (F17)	51190582-120 51190582-220
LLAI FTA (51304437)	4	0.5 A Medium Time-delay fuse (F1-4)	30754661-014
LLAI FTA (51309202)	4	0.5 A Medium Time-delay fuse (F1-4)	30754661-014
DI Power Distribution Assy (51304425)	12	1.0 A Fast-action fuse 5 x 20 mm (F1-12)	51190582-210
SI/SDI FTA (51303932)	2	0.25 A Medium Time-delay fuse (F1-2)	30754661-011
Nonredundant AO FTA (51304476)	2	1.0 A Fast-action fuse 5 x 20 mm (F1-2)	51190582-210
Redundant AO FTA (51304335)	3	1.0 A Fast-action fuse 5 x 20 mm (F1-3)	51190582-210
Pulse Input FTA (51304084)	8	0.25 A Fast-action fuse 5 x 20 mm (F1-8)	51190582-125
Fuseholder Puller	Fuseholder extractor		51190586-100

5.3 Optimum Replaceable Units (ORUs)

ORU parts Lists

This subsection identifies the assemblies that may be required for maintenance during the life of the Remote Hardened I/O or FTA enclosure. Maintenance procedures are found in this manual. Additional information can be found in the *Process Manager/Advanced Process Manager Installation* and *Process Manager I/O Installation* manuals.

When applicable, all replacement assemblies must be conformally coated.

Cables and conformally coated ORU parts list

Table 5-2 is a parts list of cables and conformally coated ORU assemblies.

Table 5-2 Cables and Conformally Coated ORU Parts List

Name	Description		Part Number
CABLES			
Power System Cables	Power System to card file		
	MU-KDPR01	1 meter	51201397-001
		1.5 meters	51201397-915
	MU-KDPR02	2 meters	51201397-002
		3 meters	51201397-003
Fan Power Extension Cables	Card file power extension		
		2 meters	51201691-002
		5 meters	51201691-005
		10 meters	51201691-010
Power Adapter External Cable	Power Adapter to FTA cable (External to the cabinet)		
	MU-KLX076	76 meters	51190696-076
	MU-KLX152	152 meters	51190696-152
	MU-KLX305	305 meters	51190696-305
Power Adapter Internal Cable	Power Adapter to FTA cable (Internal to the cabinet)		
	MU-KLAM01	30 centimeters	51304465-100
	MU-KLAM02	66 centimeters	51304465-200
	MU-KLAM03	100 centimeters	51304465-300
	MU-KLAM04	200 centimeters	51304465-400
	MU-KLAM05	300 centimeters	51304465-500
I/O Link Interface Cable (Set of two)	Card file communication cable		
		Two drop in cabinet	51195479-100
		Three drop in cabinet	51195479-200

Continued on next page

Cables and conformally coated ORU parts list, continued

Table 5-2 Cables and Coated ORU Parts List, Continued

Name	Description		Part Number
CABLES (Continued)			
IOP to FTA Cable	IOP to FTA cable		
		1 meter	51201420-001
		1.5 meters	51201420-915
	MU-KFTA02	2.0 meters	51201420-002
	MU-KFTA03	3.0 meters	51201420-003
	MU-KFTA04	4.0 meters	51201420-004
	MU-KFTA05	5.0 meters	51201420-005
		6.0 meters	51201420-006
	MU-KFTA08	8.0 meters	51201420-008
	MU-KFTA10	10.0 meters	51201420-010
	MU-KFTA15	15.0 meters	51201420-015
	MU-KFTA20	20.0 meters	51201420-020
	MU-KFTA25	25.0 meters	51201420-025
	MU-KFTA30	30.0 meters	51201420-030
	MU-KFTA35	35.0 meters	51201420-035
	MU-KFTA40	40.0 meters	51201420-040
	MU-KFTA45	45.0 meters	51201420-045
	MU-KFTA50	50.0 meters	51201420-050
POWER SYSTEM			
Power Supply Module	8 A, 120/240 Vac Power Supply Module		51190465-150
AC/DC Distribution Assembly	120 Vac power control and distribution assembly		51401135-150
AC/DC Distribution Assembly	240 Vac power control and distribution assembly		51401135-350
Power Switch	Keyed power switch		51192144-100
CARD FILE ASSEMBLY			
Left 7-Slot Card File Assembly	7-Slot Card File Assembly (slots 1 through 7)		51402594-150
Right 7-Slot Card File Assembly	7-Slot Card File Assembly (slots 9 through 15)		51402594-250
Left 7-Slot Card File Backpanel	7-Slot Card File Backpanel (slots 1 through 7)		51401626-150
Right 7-Slot Card File Backpanel	7-Slot Card File Backpanel (slots 9 through 15)		51401629-150
Card File Fan	Card file 24 Vdc fan		51190985-100
MISCELLANEOUS			
Gland Plate	Enclosure gland plate		51201687-100

Continued on next page

Cables and conformally coated ORU parts list, continued

Table 5-2 Cables and Coated ORU Parts List, Continued

Name		Description	Part Number
IOP CARDS			
HLAI IOP	(MC-PAIH02)	High Level Analog Input card	51304489-150
HLAI IOP	(MC-PAIH03)	High Level Analog Input card	51304754-150
LLAI IOP	(MC-PAIL02)	Low Level Analog Input card	51304481-150
LLMux IOP	(MC-PLAM02)	Low Level Multiplexer card	51304362-150
DI IOP	(MC-PDIX02)	Digital Input card	51304485-150
AO IOP	(MC-PAOX02)	Analog Output card	51304483-150
AO IOP	(MC-PAOX03)	Analog Output card ((Replaced by 51309152-175)	51304672-150
AO IOP	(MC-PAOX03)	Analog Output card	51309152-175
DO IOP	(MC-PDOX02)	Digital Output card	51304487-150
STI IOP	(MC-PSTX02)	Smart Transmitter Interface	51304516-250
STIM IOP	(MC-PSTX03)	Smart Transmitter Interface Multivariable	51304281-250
PI IOP	(MC-PPIX02)	Pulse Input card	51304386-150
SDI IOP	(MC-PSDX02)	Serial Device Interface card	51304362-250
SI IOP	(MC-PSIM11)	Serial Interface card	51304362-350
DISOE IOP	(MC-PDIS11)	Digital Input Sequence Of Events card	51304690-150
Slot Filler Card		Slot filler card	51304260-250
I/O LINK EXTENDER COMPONENTS			
Standard I/O Link Extender (MC-IOLM02)		Standard I/O Link Extender card Standard fiber optic Tx/Rx coupler (1) Standard fiber optic Tx/Rx coupler (3)	51304419-150 51201557-150 51201557-350
Long Distance I/O Link Extender (MC-ILDX02 – Replaced by MC-ILDX03)		Long Distance I/O Link Extender card Long Distance fiber optic Tx/Rx coupler (1)	51304532-150 51201616-150
Long Distance I/O Link Extender (MC-ILDX03)		Long Distance I/O Link Extender card Long Distance fiber optic Tx/Rx coupler (1)	51304532-150 51309208-150

Continued on next page

Cables and conformally coated ORU parts list, continued

Table 5-2 Cables and Coated ORU Parts List, Continued

Name	Description	Part Number
FTA COMPONENTS		
HLAI/STI FTA (MC-TAIH02)	HLAI/STI with compression terminals	51304453-150
HLAI/STI FTA (MC-TAIH12)	HLAI/STI with compression terminals	51304337-150
HLAI/STI FTA (MC-TAIH22)	HLAI/STI with compression terminals	80366195-150
	AI Adapter Module for the above FTA	80367163-001
HLAI/STI FTA (MC-TAIH52)	HLAI/STI with screw terminals	51304337-250
HLAI/STI FTA (MC-TAIH62)	HLAI/STI with screw terminals	80366192-150
	AI Adapter Module for the above FTA	80360713-001
HLAI FTA (MC-TAIH03)	HLAI with compression terminals	51309136-175
HLAI FTA (MC-TAIH13)	HLAI with compression terminals	51309138-175
HLAI FTA (MC-TAIH23)	HLAI with compression terminals	80369165-175
	AI Adapter Module for the above FTA	80367163-001
HLAI FTA (MC-TAIH53)	HLAI with screw terminals	51309138-275
STI FTA (MC-TSTX03)	STI with compression terminals	51309140-175
STI FTA (MC-TSTX13)	STI with compression terminals	51309142-175
STI FTA (MC-TSTX53)	STI with screw terminals	51309142-275
LLAI FTA (MC-TAIL02)	LLAI FTA with compression terminals (Replaced by MC-TAIL03)	51304437-150
	Daughter module for above FTA	51304085-150
LLAI FTA (MC-TAIL03)	LLAI FTA with compression terminals	51309202-175
LLMux FTA (MC-TAMT02)	LLMux local TC with compression terminals (Replaced by MC-TAMT03)	51401491-150
	LLMux Analog board for above FTA	51401564-100
LLMux FTA (MC-TAMT03)	LLMux local TC with compression terminals	51409223-175
LLMux FTA (MC-TAMT12)	LLMux remote TC with compression terminals (Replaced by MC-TAMT13)	51401573-150
	LLMux Analog board for above FTA	51401564-100
	LLMux remote sensor board for above FTA	51304589-150
LLMux FTA (MC-TAMT13)	LLMux remote TC with compression terminals	51409213-175
LLMux FTA (MC-TAMR02)	LLMux RTD with compression terminals (Replaced by MC-TAMR03)	51304477-150
	LLMux daughter board for above FTA	51401364-100
LLMux FTA (MC-TAMR03)	LLMux RTD with compression terminals	51309218-125
AO FTA (MC-TAOX02)	Analog Output with compression terminals	51304476-175
AO FTA (MC-TAOX12)	Analog Output with compression terminals	51304335-175
AO FTA (MC-TAOX52)	Analog Output with screw terminals	51304335-275
	Plug-in module for above FTAs	51304338-100

Continued on next page

Cables and conformally coated ORU parts list, continued

Table 5-2 Cables and Coated ORU Parts List, Continued

Name	Description	Part Number
FTA COMPONENTS (Continued)		
DI 120 Vac FTA (MC-TDIA12)	Digital Input 120 Vac with compression terminals	51304439-175
DI 120 Vac FTA (MC-TDIA52)	Digital Input 120 Vac with fixed-screw terminals	51304439-275
	Plug-in module for above FTAs	51190523-200
DI 120 Vac FTA (MC-TDIA72)	Digital Input 120 Vac with removable-screw term	51303930-150
DI 240 Vac FTA (MC-TDIA22)	Digital Input 240 Vac with compression terminals	51304431-175
DI 240 Vac FTA (MC-TDIA62)	Digital Input 240 Vac with fixed-screw terminals	51304431-275
	Plug-in module for above FTAs	51190523-300
DI 24 Vdc FTA (MC-TDID12)	Digital Input 24 Vdc with compression terminals	51304441-175
DI 24 Vdc FTA (MC-TDID52)	Digital Input 24 Vdc with fixed-screw terminals	51304441-275
	Plug-in module for above FTAs	51190523-100
DI 24 Vdc FTA (MC-TDID72)	Digital Input 24 Vdc with removable-screw term.	51303928-150
DO 120/240 Vac FTA (MC-TDOA12)	DO 120/240 Vac SS with fixed-compression term (Replaced by MC-TDOA13)	51304408-150
DO 120/240 Vac FTA (MC-TDOA52)	DO 120/240 Vac SS with fixed-screw terminals (Replaced by MC-TDOA53)	51304408-250
	Solid-state relay plug-in module for above FTAs	51190516-400
DO 120/240 Vac FTA (MC-TDOA13)	DO 24-240 Vac SS with removable-comp term.	51304648-175
DO 120/240 Vac FTA (MC-TDOA53)	DO 24-240 Vac SS with removable-screw term.	51304648-275
	Solid-state relay plug-in module for above FTAs	51190516-332
DO 3-30 Vdc FTA (MC-TDOD12)	DO 3-30 Vdc SS with fixed-compression terminals (Replaced by MC-TDOD13)	51304423-150
DO 3-30 Vdc FTA (MC-TDOD52)	DO 3-30 Vdc SS with fixed-screw terminals (Replaced by MC-TDOD53)	51304423-250
	Solid-state relay plug-in module for above FTAs	51190516-405
DO 3-30 Vdc FTA (MC-TDOD13)	DO 3-30 Vdc SS with removable-comp terminals	51304650-150
DO 3-30 Vdc FTA (MC-TDOD53)	DO 3-30 Vdc SS with removable-screw terminals	51304650-250
	Solid-state relay plug-in module for above FTAs	51190516-132
DO 3-30 Vdc FTA (MC-TDOD14)	DO 3-30 Vdc SS with fixed-compression terminals	51309153-175
DO 3-30 Vdc FTA (MC-TDOD54)	DO 3-30 Vdc SS with fixed-screw terminals	51309153-275
	Solid-state relay plug-in module for above FTAs	51190516-134
DO 31-200 Vac FTA (MC-TDOD22)	DO 31-200 Vdc SS with compression terminals	51304428-150
DO 31-200 Vac FTA (MC-TDOD62)	DO 31-200 Vdc SS with screw terminals	51304428-250
	Solid-state relay plug-in module for above FTAs	51190516-402
DO 31-200 Vac FTA (MC-TDOD23)	DO 31-200 Vdc SS with compression terminals	51309154-175
DO 31-200 Vac FTA (MC-TDOD63)	DO 31-200 Vdc SS with screw terminals	51309154-275
	Solid-state relay plug-in module for above FTAs	51190516-404

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Cables and conformally coated ORU parts list, continued

Table 5-2 Cables and Coated ORU Parts List, Continued

Name	Description	Part Number
FTA COMPONENTS (Continued)		
DO 24 Vdc FTA (MC-TDON12)	DO 24 Vdc 100 ma nonisolated with comp. term.	51304446-150
DO 24 Vdc FTA (MC-TDON52)	DO 24 Vdc 100 ma nonisolated with screw term.	51304446-250
DO 120 Vac Relay (MC-TDOR12)	DO 120 Vac/125 Vdc with compression terminals (Replaced by 51309148-125)	51304443-150
DO 120 Vac Relay (MC-TDOR52)	DO 120 Vac/125 Vdc with screw terminals (Replaced by 51309148-225)	51304443-250
	Relay plug-in module for above assemblies	51191945-100
DO 120 Vac Relay (MC-TDOR12)	DO 120 Vac/125 Vdc with compression terminals	51309148-175
DO 120 Vac Relay (MC-TDOR52)	DO 120 Vac/125 Vdc with screw terminals	51309148-275
	Relay plug-in module for above assemblies	51191945-100
DO 240 Vac Relay (MC-TDOR22)	DO 240 Vac/125 Vdc with compression terminals (Replaced by 51309150-125)	51304427-150
DO 240 Vac Relay (MC-TDOR62)	DO 240 Vac/125 Vdc with screw terminals (Replaced by 51309150-225)	51304427-250
	Relay plug-in module for above assemblies	51191945-100
DO 240 Vac Relay (MC-TDOR22)	DO 240 Vac/125 Vdc with compression terminals	51309150-175
DO 240 Vac Relay (MC-TDOR62)	DO 240 Vac/125 Vdc with screw terminals	51309150-275
	Relay plug-in module for above assemblies	51191945-100

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Cables and conformally coated ORU parts list, continued

Table 5-2 Cables and Coated ORU Parts List, Continued

Name	Description	Part Number
FTA COMPONENTS (Continued)		
Pulse Input FTA (MC-TPIX12)	Pulse Input with compression terminals	51304084-175
Pulse Input FTA (MC-TPIX52)	Pulse Input with screw terminals	51304084-275
	Plug-in module for above FTAs	51201602-100
Serial Device Interface FTA (MC-TSDT02)	Serial Device Interface (Toledo 8142) FTA	51303932-251
	Plug-in module for above FTA	51303934-201
Serial Device Interface FTA (MC-TSDM02)	Serial Device Interface (Manual/Auto Station)	51303932-252
	Plug-in module for above FTA	51303934-202
Serial Device Interface FTA (MC-TSDU02)	Serial Device Interface (UDC 6000)	51303932-253
	Plug-in module for above FTA	51303934-203
Serial Interface (MC-TSIM12)	Serial Interface (Modbus)	51303932-476
	Plug-in module for above FTA	51303934-401
Serial Interface (MC-TSIA12)	Serial Interface (Allen-Bradley)	51303932-478
	Plug-in module for above FTA	51303934-403
Power Adapter (MC-TLPA02)	Power Adapter (used with LLMux, SDI, and SI)	51309204-175
DI Power Dist Assy (MC-TDPR02)	Digital Input Power Distribution Assembly	51304425-175
DO Standby Manual (MC-SMDC02)	Digital Output Standby Manual Device with case	51304526-150
DO Standby Manual (MC-SMDX02)	Digital Output Standby Manual Device with case and cable	51304527-150
AO Standby Manual (MC-SMAC02)	Analog Output Standby Manual Device Assy with cable	51401277-150

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