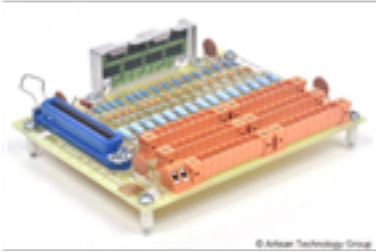
Honeywell MU-TAIH02

High Input Analog / STI Input Terminal Assembly



$695.00

In Stock

Qty Available: 5+

Used and in Excellent Condition

Open Web Page

https://www.artisantg.com/77019-2

ARTISAN TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group

(217) 352-9330 | sales@artisantg.com | artisantg.com

All trademarks, brandnames, and brands appearing herein are the property of their respective owners.

- Critical and expedited services
- In stock / Ready-to-ship
- We buy your excess, underutilized, and idle equipment
- Full-service, independent repair center

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

Honeywell

High-Performance Process Manager Planning

HP02-500

Total Plant

Honeywell

System Site Planning - 2

High-Performance Process Manager Planning

HP02-500
Release 530
CE Compliant
3/98

Total Plant

Copyright, Notices, and Trademarks

© Copyright 1995 - 1998 by Honeywell Inc.

Revision 05 – March 20, 1998

While this information is presented in good faith and believed to be accurate, Honeywell disclaims the implied warranties of merchantability and fitness for a particular purpose and makes no express warranties except as may be stated in its written agreement with and for its customer.

In no event is Honeywell liable to anyone for any indirect, special or consequential damages. The information and specifications in this document are subject to change without notice.

TotalPlant, TDC 3000, Process Manager, and SMARTLINE are U.S. registered trademarks of Honeywell Inc.

Honeywell
Industrial Automation and Control
Automation College
2820 West Kelton Lane
Phoenix, AZ 85023

1-800-852-3211

About This Publication

This manual provides information necessary to properly plan the installation of a High-Performance Process Manager (HPM) subsystem at a TPS system site. The subsystem encompasses the High-Performance Process Manager and the Network Interface Module (NIM), which is resident on the Universal Control Network (UCN), a network associated with the TPS system Local Control Network (LCN). The amount of information that this publication provides depends on your personal experience and the process that the High-Performance Process Manager will control and monitor.

The experienced planner, a person involved in the installation of TPS system's Basic or LCN equipment, will find that some information is familiar. However, regardless of your past experience, you must read Section 4 in this manual to enhance your knowledge of the process control connections available, and also reference the *TPS System Site Planning, Universal Control Network Planning, and Universal Control Network Installation* manuals to prepare yourself for the connection of the High-Performance Process Manager to the Universal Control Network.

In some cases, control room expansion will be part of installing the High-Performance Process Manager. If this is the case, use the *LCN Planning* and *LCN Installation* manuals to plan for expansion of the network.

This publication supports **TotalPlant** Solution (TPS) system network software Release 530 or earlier software releases. TPS is the evolution of TDC 3000^{X}.

The publication supports CE Compliant equipment. Any equipment designated as "CE Compliant" complies with the European Union EMC and its health and safety directives. All equipment entering the European countries after January 1, 1996 require this type of compliance, denoted by the "CE Mark."

Standard Symbols

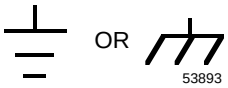
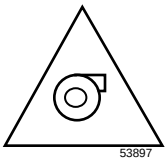
Scope	The standard symbols used in this publication are defined as follows.
ATTENTION	Notes inform the reader about information that is required, but not immediately evident.
CAUTION	Cautions tell the user that damage may occur to equipment if proper care is not exercised.
WARNING	Warnings tell the reader that potential personal harm or serious economic loss may happen if instructions are not followed.
 53893	Ground connection to building safety ground.
53894	Ground stake for building safety ground.
53895	Electrical Shock Hazard—can be lethal.
53896	Electrical Shock Hazard—can be lethal.
 53897	Rotating Fan—can cause personal injury.
	Caution—refer to the appropriate installation document.

Table of Contents

SECTION 1 – INTRODUCTION 1

1.1 Overview 1

SECTION 2 – HPM DESCRIPTION 3

2.1 Overview 3
2.2 Card Files 5
2.2.1 HPMM Card Files 6
2.2.2 Input/Output Processor (IOP) Card Files 12
2.3 Input/Output Processor (IOP) Cards 16
2.3.1 IOP Redundancy 17
2.4 I/O Link Extender (Fiber Optic Link) 19
2.5 Field Termination Assemblies (FTAs) 24
2.6 Power Systems 36
2.7 Cabinet Configurations 41

SECTION 3 – POWER REQUIREMENTS 45

3.1 Overview 45
3.2 Backup Strategy 46
3.3 Quality 48
3.4 Power Draw 51
3.4.1 Typical 24 Vdc Power Draw Calculations 53
3.4.2 Single Power System Calculation Example 58
3.4.3 Dual Power System Calculation Example 59
3.4.4 HPM AC Power Draw 60
3.4.5 Crest Factor 61
3.4.6 Inrush Current 62
3.5 Substation Sizing 64
3.6 Circuit Breaker Sizing 65
3.7 Custom UPS and Power Factor 66
3.8 Automatic Bypass Switch 66
3.9 Surge Protection 67
3.10 Grounded Conductor 68
3.11 Redundant Safety Grounds 68
3.12 Emergency Shutdown 68
3.13 Trays and Conduits 68
3.14 Existing TPS System AC Power 69

SECTION 4 – PROCESS WIRING 71

4.1 Overview 71
4.2 FTA Selection 72
4.3 Cabinet Entry 80
4.4 Signal Tray Wiring Compatibility 81
4.5 Process Wiring Termination 82

SECTION 5 – HAZARDOUS ENVIRONMENT PLANNING 83

5.1 Overview 83
5.2 Hazardous Area Classifications 84
5.3 Mounting and Operating the HPM in a Division 2 Location 86
5.4 Field Wiring in Hazardous Locations 100

SECTION 6 – CORROSION PROTECTION PLANNING 103

6.1 Overview 103
6.2 Model Numbers 106

Table of Contents

SECTION 7 – CE COMPLIANCE 115

7.1 Overview 115
7.2 Card Files 116
7.3 HPMM Cards 117
7.4 IOPs 117
7.5 FTAs 120
7.6 I/O Link Extender 129
7.7 IOP to FTA Cables 130
7.8 Power Cables 131
7.9 I/O Link Interface Cables 136
7.10 UCN Trunk Cable Taps 137
7.11 Cabinets 139

SECTION 8 – MODEL MU-CBSM01/MU-CBDM01 CABINETS 141

8.1 Overview 141
8.2 Cabinet Description 144
8.3 Card File and Power System Configurations 148
8.4 Card File and Power System Description 150
8.5 FTA Mounting Channel Description 154
8.5.1 Vertical FTA Mounting Channels 155
8.5.2 Horizontal FTA Mounting Channel 159
8.6 Cabinet Floor Planning 163

SECTION 9 – MODEL MU-CBSX01/MU-CBDX01 CABINETS 165

9.1 Overview 165
9.2 Cabinet Description 169
9.3 Card File and Power System Configurations 173
9.4 Card File and Power System Description 175
9.5 FTA Mounting Channel Descriptions 179
9.5.1 Vertical FTA Mounting Channels 180
9.5.2 Horizontal FTA Mounting Channel 184
9.6 Cabinet Floor Planning 188

SECTION 10 – REDUNDANCY PLANNING 189

10.1 Overview 189
10.2 Redundant HPMM Configurations 189
10.3 Redundant IOP Placement 194
10.4 Redundancy Support 195
10.4.1 Power System 195
10.4.2 HPMM to I/O 195

Table of Contents

SECTION 11 – I/O LINK EXTENDER PLANNING 197

11.1 Overview 197
11.2 Description 198
11.3 Fiber Optic Cable Routing 204
11.3.1 Direct Burial 204
11.3.2 Aerial Lashing 204
11.3.3 Vertical Installations 205
11.3.4 Indoor Requirements 205
11.3.5 Loose Buffered Cable 205
11.3.6 Number of Fibers 206
11.3.7 Cable Installation 206
11.4 Indoor Cable Bend Radius 207
11.5 Cable Construction 207
11.6 Cable Splices and Connections 208
11.7 Signal Loss Budget 210
11.7.1 Standard I/O Link Extender 210
11.7.2 Long Distance I/O Link Extender 212
11.8 Power Level Measurement 213

SECTION 12 – LOW LEVEL MULTIPLEXER PLANNING 215

12.1 Overview 215
12.2 LLMux Version 216
12.2.1 LLMux Configurations 216
12.2.2 LLMux IOP Placement 219
12.2.3 LLMux Power Adapter Placement 219
12.2.4 LLMux FTA Placement 219
12.2.5 Remote CJR Installation 222
12.3 RHMUX Version 223
12.3.1 RHMUX Configurations 223
12.3.2 RHMUX IOP Placement 228
12.3.3 RHMUX Power Adapter Placement 228
12.3.4 RHMUX FTA Placement 228

SECTION 13 – SERIAL DEVICE INTERFACE PLANNING 233

13.1 Overview 233
13.2 Serial Device Interface Configurations 233
13.3 Serial Device Interface IOP Placement 235
13.4 Power Adapter Placement 235
13.5 IOP to Power Adapter Cabling 235
13.6 Serial Device Interface FTA Placement 236
13.7 FTA to Power Adapter Cabling 236
13.8 FTA Field Cabling 238
13.9 Serial Device Interface FTA Models 239

SECTION 14 – SERIAL INTERFACE PLANNING 241

14.1 Overview 241
14.2 Serial Interface Configurations 241
14.3 Serial Interface IOP Placement 247
14.4 Power Adapter Placement 247
14.5 IOP to Power Adapter Cabling 247
14.6 Serial Interface FTA Placement 248
14.7 FTA to Power Adapter Cabling 248
14.8 FTA Field Cabling 250
14.9 Serial Interface FTA Models 251
14.10 Communications Interface Specifications 252

Table of Contents

SECTION 15 – GALVANICALLY ISOLATED FTA PLANNING..... 253

15.1 Overview..... 253
15.2 Description..... 255
15.3 Features..... 264
15.3.1 IOP Redundancy..... 264
15.3.2 Analog and Digital Output Standby Manual Devices..... 264
15.3.3 Auxiliary Inputs/Outputs..... 265
15.3.4 Power Requirements..... 267
15.3.5 Field Wiring Connections..... 268
15.3.6 Ambient Temperature Limits..... 268
15.3.7 FTA Mounting Channels..... 269
15.4 Power Distribution..... 273
15.4.1 Power Distribution Assembly..... 274
15.4.2 Cabling to Power Distribution Assemblies..... 275
15.4.3 Cabling to FTAs..... 275
15.4.4 Power Considerations..... 276
15.5 High Level Analog Input (HLAI) FTAs..... 277
15.5.1 Model MU-GAIH12/MU-GAIH82 FTA..... 277
15.5.1.1 Description..... 277
15.5.1.2 Connectors..... 277
15.5.1.3 Field Wiring Input Signals..... 277
15.5.1.4 Auxiliary Connector Output..... 278
15.5.1.5 Indicators..... 278
15.5.1.6 Current Consumption..... 278
15.5.1.7 Isolation and Safety..... 278
15.5.2 Model MU-GAIH13/MU-GAIH83 FTA..... 279
15.5.2.1 Description..... 279
15.5.2.2 Connectors..... 279
15.5.2.3 Field Wiring Input Signals..... 280
15.5.2.4 Auxiliary Connector Output..... 280
15.5.2.5 Indicators..... 280
15.5.2.6 Hand-Held Communicator..... 281
15.5.2.7 Current Consumption..... 281
15.5.2.8 Isolation and Safety..... 281
15.5.3 Model MU-GAIH14/MU-GAIH84 FTA..... 282
15.5.3.1 Description..... 282
15.5.3.2 Connectors..... 282
15.5.3.3 Field Wiring Input Signals..... 283
15.5.3.4 Auxiliary Connector Output..... 283
15.5.3.5 Indicators..... 283
15.5.3.6 Hand-Held Communicator..... 284
15.5.3.7 Current Consumption..... 284
15.5.3.8 Isolation and Safety..... 284
15.5.4 Model MU-GAIH22/MU-GAIH92 FTA..... 285
15.5.4.1 Description..... 285
15.5.4.2 Connectors..... 285
15.5.4.3 Field Wiring Input Signals..... 286
15.5.4.4 Auxiliary Connector Output..... 286
15.5.4.5 Indicators..... 286
15.5.4.6 Current Consumption..... 287
15.5.4.7 Isolation and Safety..... 287

Table of Contents

15.6 24 Vdc Digital Input FTAs 288
15.6.1 Model MU-GDID12/MU-GDID82 FTA 288
15.6.1.1 Description 288
15.6.1.2 Connectors 288
15.6.1.3 Field Wiring Input Signals 289
15.6.1.4 Line-Fault Detection 289
15.6.1.5 Auxiliary Connector Output 289
15.6.1.6 Indicators 290
15.6.1.7 Current Consumption 290
15.6.1.8 Isolation and Safety 290
15.6.2 Model MU-GDID13/MU-GDID83 FTA 291
15.6.2.1 Description 291
15.6.2.2 Connectors 291
15.6.2.3 Field Wiring Input Signals 291
15.6.2.4 Indicators 292
15.6.2.5 Current Consumption 292
15.6.2.6 Isolation and Safety 292
15.7 Analog Output FTAs 293
15.7.1 Model MU-GAOX02/72 and MU-GAOX12/82 FTAs 293
15.7.1.1 Description 293
15.7.1.2 Connectors 293
15.7.1.3 Field Wiring Output Signals 293
15.7.1.4 Line-Fault Detection 294
15.7.1.5 Calibration 294
15.7.1.6 Indicators 294
15.7.1.7 Current Consumption 294
15.7.1.8 Isolation and Safety 295
15.8 24 Vdc Digital Output FTAs 296
15.8.1 Model MU-GDOD12/MU-GDOD82 FTA 296
15.8.1.1 Description 296
15.8.1.2 Signal Connectors 296
15.8.1.3 Field Wiring Output Signals 296
15.8.1.4 Auxiliary Connector 297
15.8.1.5 Indicators 297
15.8.1.6 Standby Manual Device Connector 297
15.8.1.7 Current Consumption 298
15.8.1.8 Isolation and Safety 298
15.8.2 Model MU-GDOL12/MU-GDOL82 FTA 299
15.8.2.1 Description 299
15.8.2.2 Signal Connectors 299
15.8.2.3 Field Wiring Output Signals 299
15.8.2.4 Auxiliary Connector 300
15.8.2.5 Indicators 300
15.8.2.6 Standby Manual Device Connector 301
15.8.2.7 Current Consumption 301
15.8.2.8 Isolation and Safety 301
15.9 Combiner Panel 302
15.10 Marshalling Panel 303
15.10.1 Description 303
15.10.2 Configurations 304
15.10.2.1 High Level Analog Input FTAs 304
15.10.2.2 Digital Input FTAs 305
15.10.2.3 Digital Output FTAs 306

Figures

Figure 2-1 Nonredundant HPMM Cabinet Layout 4
Figure 2-2 Left 7-Slot HPMM Card File 7
Figure 2-3 Right 7-Slot HPMM Card File 9
Figure 2-4 15-Slot HPMM Card File 11
Figure 2-5 Left 7-Slot IOP Card File 13
Figure 2-6 Right 7-Slot IOP Card File 14
Figure 2-7 15-Slot IOP Card File 15
Figure 2-8 HLAI FTA with Redundant HLAI IOPs 17
Figure 2-9 Analog Output FTA with Redundant Analog Output IOPs 18
Figure 2-10 Standard I/O Link Extender Interconnections with Nonredundant HPMM 20
Figure 2-11 Standard I/O Link Extender Interconnections with Redundant HPMMs 21
Figure 2-12 Long Distance I/O Link Extender Interconnections with Nonredundant HPMM 22
Figure 2-13 Long Distance I/O Link Extender Interconnections with Redundant HPMMs 23
Figure 2-14 Field Termination Assembly (FTA) Sizes 28
Figure 2-15 Typical Vertical FTA Mounting Channel Layout 30
Figure 2-16 Typical FTA Compression Terminal Connector 31
Figure 2-17 Typical FTA Fixed-Screw Terminal Connector 32
Figure 2-18 Typical FTA Removable-Screw Terminal Connector 32
Figure 2-19 Crimp-Pin Galvanic Isolation Module Terminal Connector 33
Figure 2-20 Compression-Type Galvanic Isolation Module 34
Figure 2-21 FTA Marshalling Panel Assembly Layout 35
Figure 2-22 Standard Power System—Model MU-PSRX03 37
Figure 2-23 Standard Power System—Model MU-PSRX04 38
Figure 2-24 AC Only Power System—Not for CE Compliant Applications 40
Figure 2-25 Single Cabinet with Redundant HPMMs 42
Figure 2-26 Complexed Cabinets with Redundant HPMMs 43
Figure 2-27 Local Complexed Cabinets with Redundant HPMMs 44
Figure 3-1 Subsystem AC Power and Ground Connections—Multi-Ground System 49
Figure 3-2 Subsystem AC Power and Ground Connections—Single-Ground System 50
Figure 4-1 Field Termination Assembly (FTA) Sizes 73
Figure 4-2 Field Termination Assembly (FTA) Mounting Dimensions 74
Figure 6-1 Conformal Coating Symbol 105
Figure 7-1 I/O Link Extender Adapter Kit 129
Figure 7-2 Two-Port UCN Cable Tap 137
Figure 7-3 Four-Port UCN Cable Tap 138
Figure 7-4 Eight-Port UCN Cable Tap 138
Figure 8-1 Single-Access Cabinet 142
Figure 8-2 Dual-Access Cabinet 143
Figure 8-3 Single-Access Cabinet Bottom Cable Entry Slots 144
Figure 8-4 Dual-Access Cabinet Bottom Cable Entry Slots 145
Figure 8-5 Cabinet Interior Dimensions 147
Figure 8-6 Typical Single-Access Cabinet Assembly Layout 148
Figure 8-7 Typical Dual-Access Cabinet Assembly Layout 149
Figure 8-8 7-Slot Card File Installation Dimensions 150
Figure 8-9 15-Slot Card File Installation Dimensions 151
Figure 8-10 Installation of 7-Slot and 15-Slot Card Files 152
Figure 8-11 Power System Installation Dimensions 153
Figure 8-12 Typical Vertical FTA Mounting Channel Configurations 156
Figure 8-13 Vertical FTA Mounting Channel Dimensions 157
Figure 8-14 Vertical FTA Mounting Channel Installation Holes 158
Figure 8-15 Horizontal FTA Mounting Channel Cabinet Layout 160
Figure 8-16 Horizontal FTA Mounting Channel Dimensions 161

Figures

Figure 8-17 Horizontal FTA Mounting Channel Installation Holes 162
Figure 8-18 Cabinet Floor Planning Template 163
Figure 9-1 Single-Access Cabinet 166
Figure 9-2 Dual-Access Cabinet 167
Figure 9-3 Cabinet Base Panel Grounding Procedure 168
Figure 9-4 Cabinet Panel and Door Grounding Procedure 168
Figure 9-5 Single-Access Cabinet Bottom Cable Entry 169
Figure 9-6 Dual-Access Cabinet Bottom Cable Entry 170
Figure 9-7 Cabinet Interior Dimensions 172
Figure 9-8 Typical Single-Access Cabinet Assembly Layout 173
Figure 9-9 Typical Dual-Access Cabinet Assembly Layout 174
Figure 9-10 7-Slot Card File Installation Dimensions 175
Figure 9-11 15-Slot Card File Installation Dimensions 176
Figure 9-12 Installation of 7-Slot and 15-Slot Card Files 177
Figure 9-13 Power System Installation Dimensions 178
Figure 9-14 FTA Mounting Channel Configurations 181
Figure 9-15 FTA Mounting Channel Dimensions 182
Figure 9-16 FTA Mounting Channel Mounting FTA Installation Holes 183
Figure 9-17 Horizontal FTA Mounting Channel Cabinet Layout 185
Figure 9-18 Horizontal FTA Mounting Channel Dimensions 186
Figure 9-19 Horizontal FTA Mounting Channel Installation Holes 187
Figure 9-20 Cabinet Floor Planning Template 188
Figure 10-1 Single Cabinet with Redundant HPMMs 191
Figure 10-2 Dual Cabinets with Redundant HPMMs 192
Figure 10-3 Redundant HPMM Configuration Cabling 193
Figure 10-4 Local/Remote Cabinet Configuration 196
Figure 11-1 Standard I/O Link Extender Interconnections with Single HPMM 199
Figure 11-2 Standard I/O Link Extender Interconnections with Redundant HPMMs 200
Figure 11-3 Long Distance I/O Link Extender Interconnections with Single HPMM 201
Figure 11-4 Long Distance I/O Link Extender Interconnections with Redundant HPMMs 202
Figure 11-5 Remote Site Multi-IOP Card File I/O Link Interface Cabling 203
Figure 11-6 ST-Type Connector 209
Figure 12-1 LLMux Configuration Interconnections – CE Compliant 218
Figure 12-2 Remote CJR Installation 222
Figure 12-3 Nonincendive RHMUX Configuration Interconnections 226
Figure 12-4 Intrinsically Safe RHMUX Configuration Interconnections 227
Figure 13-1 Serial Device Interface Interconnections 234
Figure 14-1 Serial Interface FTA to Modbus Device EIA-232 and EIA-422/485 Interconnections 243
Figure 14-2 Serial Interface FTA to Modbus Device EIA-422/485 Interconnections 244
Figure 14-3 Serial Interface FTA to Peripheral Device EIA-422/485 Interconnections 245
Figure 14-4 Serial Interface FTA to Allen-Bradley Device EIA-232 Interconnections 246
Figure 15-1 Typical Galvanically Isolated FTA 259
Figure 15-2 Galvanic Isolation Module 260
Figure 15-3 Crimp-Type Galvanic Isolation Module Terminal Connector 261
Figure 15-4 Compression-Type Galvanic Isolation Module Terminal Connector 262
Figure 15-5 Galvanically Isolated FTA with Auxiliary Connector 266
Figure 15-6 Cabinet with Horizontally Installed FTA Mounting Channels 270

Tables

Table 2-1 Card File Models 5
Table 2-2 Standard Field Termination Assembly Types 25
Table 2-3 Galvanically Isolated Field Termination Assembly Types 27
Table 3-1 HPM Assembly 24 Vdc Power Usage 54
Table 3-2 Single Power System Calculation Example 58
Table 3-3 Dual Power System Calculation Example (Power System 1) 59
Table 3-4 Dual Power System Calculation Example (Power System 2) 60
Table 4-1 Standard FTAs and Associated Assemblies 75
Table 4-2 Galvanically Isolated FTAs and Associated Assemblies 78
Table 5-1 Hazardous Area Classifications 84
Table 5-2 HPM Equipment Approved for Use in a Division 2 Area 87
Table 5-3 Nonincendive FTA Types 101
Table 5-4 FTA Cable and Load Parameters 102
Table 6-1 Environment Minimum Equipment Requirement 103
Table 6-2 Harsh Environment Definitions from ANSI/ISA-S71.04-1985 104
Table 6-3 Conformally Coated Assembly Model Numbers 107
Table 7-1 Card Files 116
Table 7-2 IOPs—Nonconformally Coated 118
Table 7-3 IOPs—Conformally Coated 119
Table 7-4 Field Termination Assemblies—Nonconformally Coated 120
Table 7-5 Field Termination Assemblies—Conformally Coated 125
Table 7-6 IOP to FTA Cables 130
Table 7-7 Non-CE Compliant Subsystem Power Cables 133
Table 7-8 CE Compliant Subsystem Power Cables 134
Table 7-9 Power Cables without I/O Link Protector Module 135
Table 7-10 I/O Link Interface Cable Sets 136
Table 11-1 Minimum Bend Radius for Indoor Cable 207
Table 11-2 Standard Optical Power Loss 211
Table 11-3 Standard Fiber Optic Cable Losses (@ 850 nm) 211
Table 11-4 Long Distance Optical Power Loss 213
Table 11-5 Long distance Fiber Optic Cable Losses (@ 1300 nm) 213
Table 12-1 LLMux Assembles 216
Table 12-2 RHMUX Assemblies 223
Table 14-1 Serial Interface FTAs 241
Table 14-2 Serial Interface EIA-232 Specifications 252
Table 14-3 Serial Interface EIA-422/485 Specifications 252
Table 15-1 CE Compliant Galvanically Isolated FTAs—Nonconformally Coated 256
Table 15-2 CE Compliant Galvanically Isolated FTAs—Conformally Coated 257
Table 15-3 Galvanically Isolated FTA Power Requirements 267

Acronyms

AC	Alternating Current
ANSI	American National Standards Institute
AO	Analog Output
AWG	American Wire Gauge
CJR	Cold Junction Reference
CMOS	Complementary Metal Oxide Semiconductor
DC	Direct Current
DISOE	Digital Input Sequence of Events
DI	Digital Input
DO	Digital Output
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
FM	Factory Mutual Research, Inc.
FTA	Field Termination Assembly
GI	Galvanic Isolation
HLAI	High Level Analog Input
HPM	High-Performance Process Manager
HPMM	High-Performance Process Manager Module
IS	Intrinsic Safety
I/O	Input/Output
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineering
ISA	Instrument Society of America
ISO	International Standards Organization
LCN	Local Control Network
LFD	Line Fault Detection
LLAI	Low Level Analog Input
LLMux	Low Level Analog Input Multiplexer
MRG	Master Reference Ground
NE	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Agency
NiCad	Nickel Cadmium
NIM	Network Interface Module
PI	Pulse Input
PSM	Power Supply Module
PS	Power System
PVC	Polyvinyl Chlorine
PV	Process Variable
RHMUX	Remote Hardened Low Level Analog Input Multiplexer
RTD	Resistive Temperature Device
RTU	Remote Terminal Unit
SDI	Serial Device Interface
SI	Serial Interface
STI	Smart Transmitter Interface
STIM	Smart Transmitter Interface Multivariable
TC	Thermocouple
UCN	Universal Control Network
UV	Ultra Violet

References

Publication Title	Publication Number	Binder Title	Binder Number
High-Performance Process Manager Specification and Technical Data	HP03-500	System Summary - 2	TPS 3010-2
High-Performance Process Manager Installation	HP20-500	Implementation/ High-Performance Process Manager - 3	TPS 3066-3
High-Performance Process Manager Checkout	HP20-510	Implementation/ High-Performance Process Manager - 3	TPS 3066-3
High-Performance Process Manager Service	HP13-500	PM/APM/HPM Service - 1	TPS 3061-1
Process Manager I/O Specification and Technical Data	IO03-500	System Summary - 2	TPS 3010-2
Process Manager I/O Installation	PM20-520	Implementation/ High-Performance Process Manager - 3	TPS 3066-3
TPS System Site Planning	SW02-550	System Site Planning - 1	TPS 3020-1
Universal Control Network Specification and Technical Data	UN03-500	System Summary - 2	TPS 3010-2
Universal Control Network Planning	UN02-501	System Site Planning - 1	TPS 3020-1
Universal Control Network Installation	UN20-500	Installation/Universal Control Network	TPS 3041
Universal Control Network Guidelines	UN12-510	Installation/Universal Control Network	TPS 3041
Local Control Network Planning	SW02-501	System Site Planning - 1	TPS 3020-1
LCN System Installation	SW20-500	LCN Installation	TPS 3025
LCN System Checkout	SW20-510	LCN Installation	TPS 3025
LCN Guidelines - Implementation, Troubleshooting, and Service	LC09-510	LCN Installation	TPS 3025

Section 1 – Introduction

1.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
1.1	Overview	1

The manual's purpose

This manual is intended for planning the installation of a High-Performance Process Manager (HPM) subsystem at a TPS system site. The High-Performance Process Manager subsystem is a device on the Universal Control Network (UCN) that includes the Network Interface Module (NIM). Process Managers (PMs), Advanced Process Managers (APMs), and Logic Managers (LMs) may also be resident on the network.

The manual's contents

Planning includes the consideration of the High-Performance Process Manager cabinet layout, process wiring techniques, Division 2 environment equipment approval, conformal coating of the assemblies to protect against a corrosive environment, HPMM and IOP redundancy, and unique hardware features, such as fiber optic I/O Link Extenders, Low Level Analog Input Multiplexer FTAs, Serial Device Interface FTAs, Serial Interface FTAs, and Galvanically Isolated FTAs.

Information not covered

Neither installation, power on checkout, or service of the High-Performance Process Manager, nor planning for the Local Control Network (LCN) is addressed in this manual. See the related reference documentation for information about these topics.

Section 2 – HPM Description

2.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
2.1	Overview	3
2.2	Card Files	5
2.2.1	HPMM Card Files	6
2.2.2	Input/Output Processor (IOP) Card Files	13
2.3	Input/Output Processor (IOP) Cards	17
2.3.1	IOP Redundancy	18
2.4	I/O Link Extender (Fiber Optic Link)	20
2.5	Field Termination Assemblies (FTAs)	25
2.6	Power Systems	36
2.7	Cabinet Configurations	41

HPM major assemblies

The High-Performance Process Manager subsystem (HPM) consists of major assemblies described in the following subsections. The major High-Performance Process Manager assemblies are

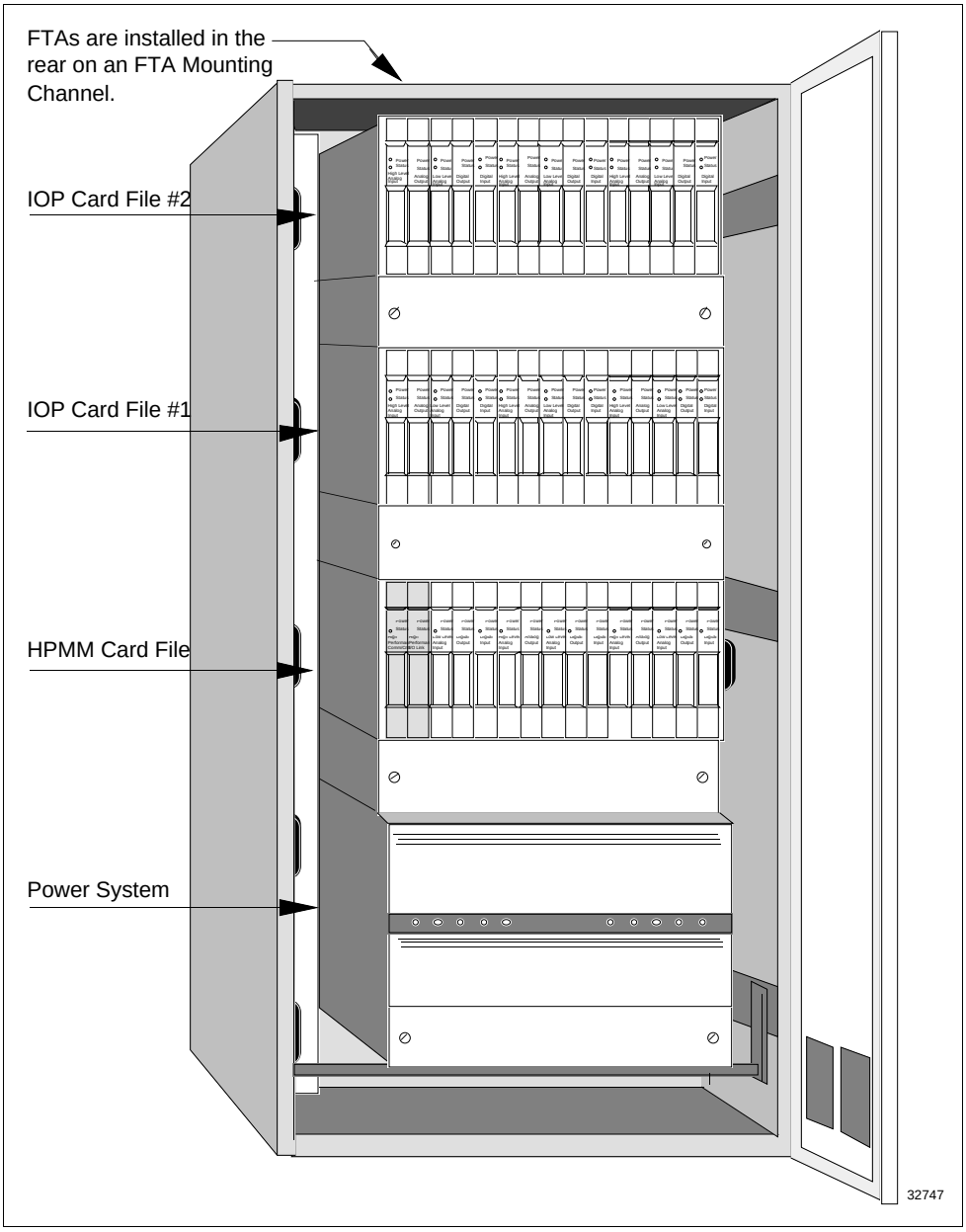
- High-Performance Process Manager Module (HPMM) card file
- Input/Output Processor (IOP) card file
- Input/Output Processor (IOP) card
- I/O Link Extender
- Field Termination Assembly (FTA)
- Power System

Continued on next page

Nonredundant HPM cabinet layout

Figure 2-1 is an illustration of a single High-Performance Process Manager cabinet containing a nonredundant High-Performance Process Manager Module (HPMM) with supporting assemblies. The HPMM cards (2) and the IOPs cards are installed in 15-Slot HPMM card files. IOP cards occupy the IOP card files.

Figure 2-1 Nonredundant HPMM Cabinet Layout



2.2 Card Files

Introduction

There are nine card file models. Three models are not CE Compliant and six models are CE Compliant. Table 2-1 lists the nine card file models. All models are also available with conformal coating (a model number with a prefix of MC, rather than MU).

Table 2-1 Card File Models

Card File Description	CE Compliant	Non-CE Compliant
Left 7-Slot HPMM or IOP	N/A	MU-HPFH01
Right 7-Slot HPMM or IOP	N/A	MU-HPFH11
15-Slot HPMM or IOP	N/A	MU-HPFX02
Left 7-Slot HPMM	MU-HPFH03	N/A
Right 7-Slot HPMM	MU-HPFH13	N/A
15-Slot HPMM	MU-HPFX03	N/A
Left 7-Slot IOP	MU-HPFI03	N/A
Right 7-Slot IOP	MU-HPFI13	N/A
15-Slot IOP	MU-HPFI23	N/A

Non-CE Compliant card file models

The non-CE Compliant card file models can be designated as an HPMM card file or an IOP card file by either installing an HPMM card set in the two left-most card slots or installing IOP cards.

CE Compliant card file models

Unlike the non-CE Compliant card file models, the CE Compliant card file models are designated either an HPMM card file or an IOP card file because even though their is no electrical difference in the backpanel, they differ mechanically. The addition of a ground plate and filtered IOP connectors in the two left-most slots prohibits the installation of an HPMM card set.

The card file is designated an IOP card file when the ground plate and filtered connectors are present.

The card file is designated an HPMM card file when the ground plate and filtered connectors are absent.

Conversion kit

A CE Compliant HPMM card file can be converted to an IOP card file with a model MU-ZPFI03 upgrade kit. The kit adds 2 filtered IOP adapter connectors to the two left-most card slots and a ground plate extension.

2.2.1 HPMM Card Files

Three types of HPM card files

There are three types of HPMM card files. The two left-most slots of each type are populated by the three assemblies that comprise the HPMM. The remaining slots accommodate IOPs.

If the card file is a non-CE Compliant card file, the two left-most slots of each type can also accommodate IOPs with no alterations. The card file is then designated an IOP card file.

HPMM description

The High-Performance Process Manager Module (HPMM) is composed of two card assemblies that install in the two left-most slots in a 7-Slot or 15-Slot card file, and a UCN interface module that mounts and connects to the 50-pin connector that is directly below the left-most card.

The three HPMM assemblies are identified as follows:

- High-Performance Communications/Control (High-Performance Comm/Control) card
- High-Performance I/O Link Interface (High-Performance I/O Link) card
- High-Performance UCN Interface (HPM UCN Interface) module

The HPM UCN Interface module connects to the 50-pin connector below the High-Performance Comm/Control card.

Left 7-Slot HPMM card file description

The Left 7-Slot card file accepts the two HPMM cards and the HPM UCN Interface module that comprise the HPMM, and accommodates up to five IOP cards. The card slots are numbered 1 through 7, starting at the left-most position.

The High-Performance Comm/Control and High-Performance I/O Link cards occupy slots 1 and 2, while the HPM UCN Interface module mounts below slot 1 and connects to its 50-pin connector.

Slots 3 through 7 can accommodate IOP cards. The IOP card slots assume numerical I/O Link Interface addresses of 3 through 7 and binary I/O Link Interface addresses of 2 through 6.

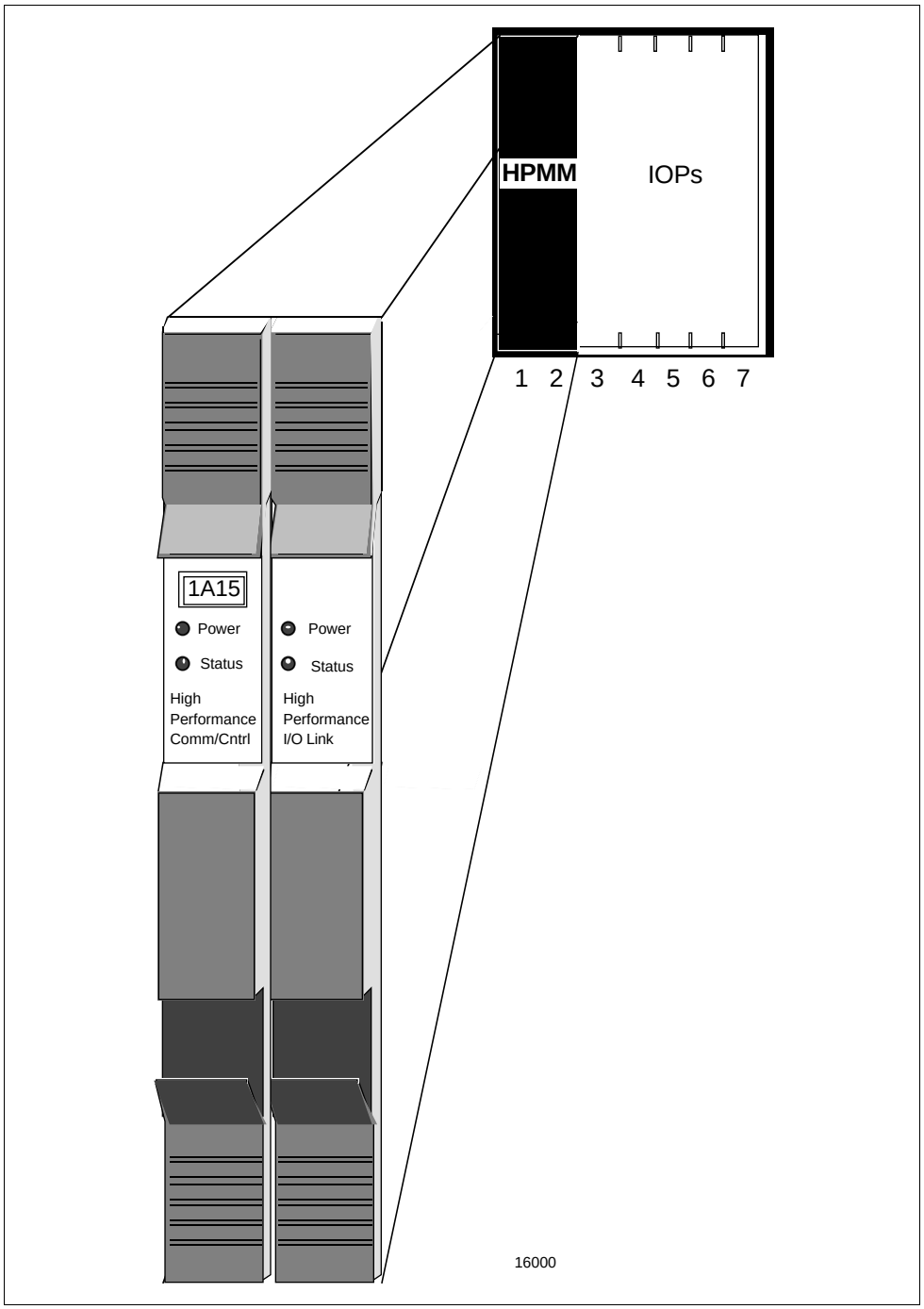
Continued on next page

2.2.1 HPMM Card Files, Continued

Left 7-Slot HPMM card file illustration

Figure 2-2 is an illustration of a Left 7-Slot HPMM card file and the two HPMM cards that occupy slots 1 and 2.

Figure 2-2 Left 7-Slot HPMM Card File



Continued on next page

2.2.1 HPMM Card Files, Continued

Right 7-Slot HPMM card file description

The description of the Right 7-Slot HPMM card file is identical to the Left 7-Slot HPMM card file, except the two HPMM cards and the UCN interface module occupy slots 9 and 10. The card slots are numbered 9 through 15.

Slots 11 through 15 accommodate IOP cards. The IOP card slots assume numerical I/O Link Interface addresses of 11 through 15 and binary I/O Link Interface addresses of 10 through 14.

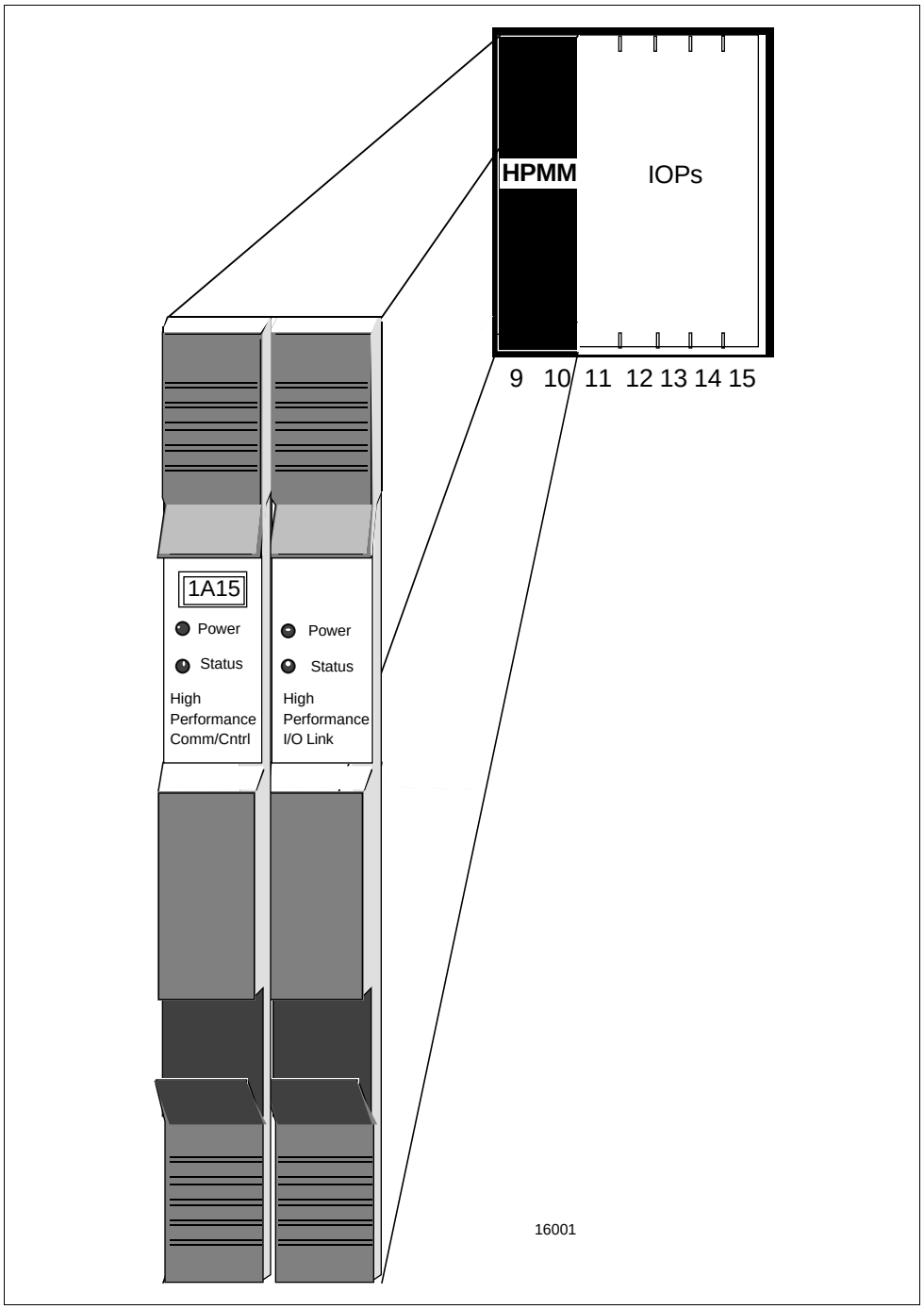
Continued on next page

2.2.1 HPMM Card Files, Continued

Right 7-Slot HPMM card file illustration

Figure 2-3 is an illustration of a Right 7-Slot HPMM card file and the two HPMM cards that occupy slots 9 and 10.

Figure 2-3 Right 7-Slot HPMM Card File



Continued on next page

2.2.1 HPMM Card Files, Continued

15-Slot HPMM card file description

The 15-Slot card file accepts the two HPMM cards and the UCN interface module that comprise the HPMM, and accommodates up to thirteen IOP cards. The card slots are numbered 1 through 15, starting at the left-most position.

The High-Performance Comm/Control and High-Performance I/O Link cards occupy slots 1 and 2, while the HPM UCN Interface module mounts below slot 1 in its 50-pin connector.

Slots 3 through 15 can accommodate IOP cards. The IOP card slots assume numerical I/O Link Interface addresses of 3 through 15 and binary I/O Link Interface addresses of 2 through 14.

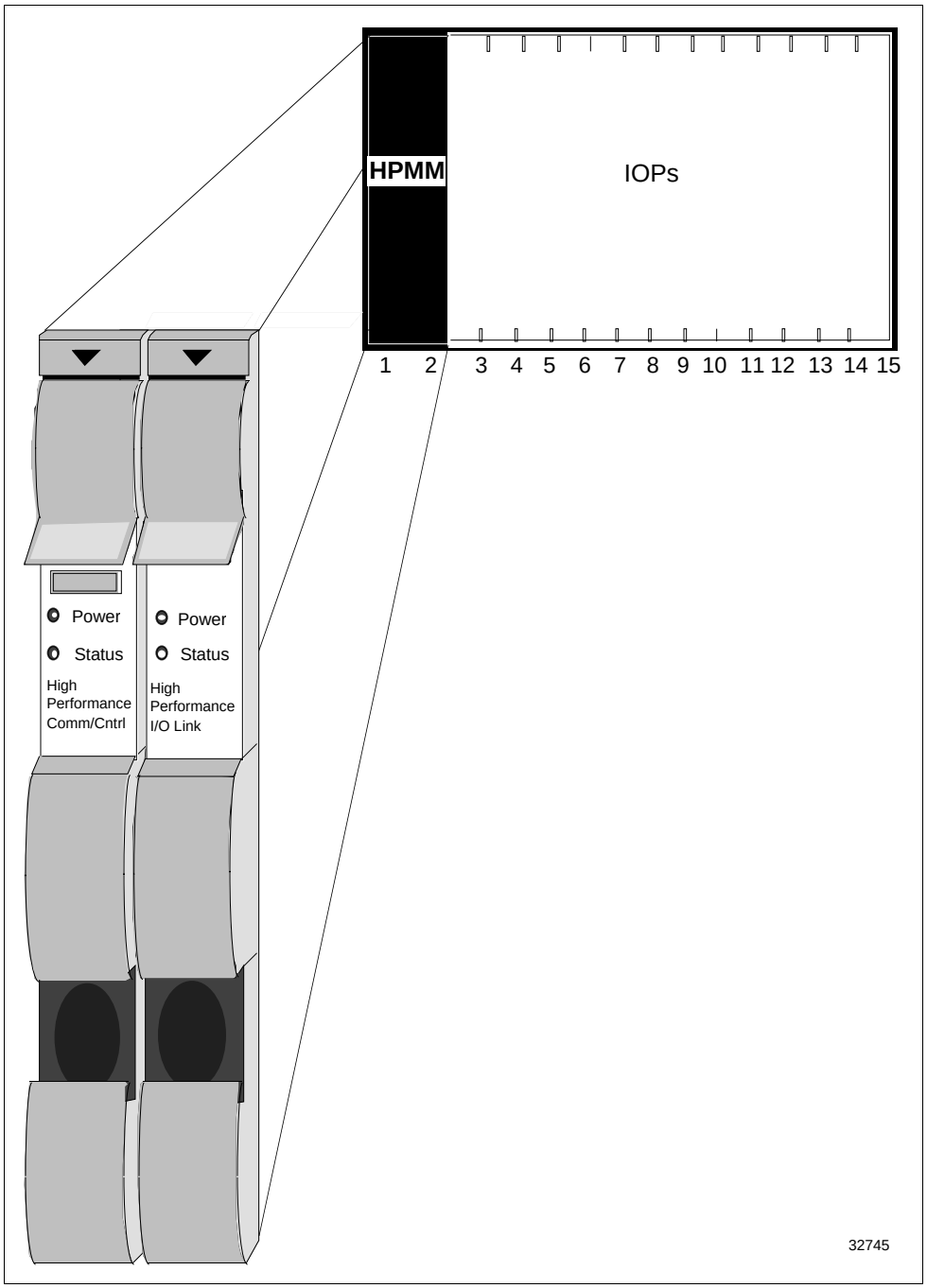
When populated with the HPMM cards, the card file is designated a 15-Slot HPMM card file.

Continued on next page

15-Slot HPMM card file illustration

Figure 2-4 is an illustration of a 15-Slot HPMM card file and the two HPMM cards that occupy slots 1 and 2.

Figure 2-4 15-Slot HPMM Card File



Continued on next page

2.2.1 HPMM Card Files, Continued

7-Slot HPMM card file usage

The two types of 7-Slot HPMM card files are intended to be used in a small HPM subsystem.

When the subsystem consists of nonredundant HPMMs, a Left 7-Slot HPMM card file must be installed. For a subsystem that requires redundant HPMMs, Left and Right 7-Slot HPMM card files are installed. Both card files are assigned the same the same I/O Link Interface address. There is no slot 8 because the card file slots are numbered 1 through 7 and 9 through 15.

15-Slot HPMM card file usage

The 15-Slot HPMM card file is intended for use in a larger HPM subsystem, either with nonredundant or redundant HPMMs. Unlike the 7-Slot HPMM card file, there is no “loss” of a card slot.

HPMM functionality

The HPMM provides the following functions:

- Communications with the Local Control Network (LCN) Network Interface Module (NIM) through the Universal Control Network (UCN)
- A Communications processor (Motorola 68LC040)
- Communications through the I/O Link Interface with Input/Output Processors (IOPs) and I/O Link Extenders
- A Control processor (Motorola 68040)
- Separate and shared memory for the Communications and Control processors
- An I/O Link processor (Intel 80C32) with SRAM
- HPMM redundancy control

2.2.2 Input/Output Processor (IOP) Card Files

IOP card file descriptions

The 7-Slot and 15-Slot IOP card files are electrically identical to the HPMM card files, except that an HPMM card set is not installed in the card file. IOPs can be installed in the two left-most card slots.

Non-CE Compliant card files

Non-CE Compliant HPMM and IOP card files differ only in the application. Electrically and mechanically, their backpanels are the same. The card file model numbers are the same.

CE Compliant card files

CE Compliant HPMM and IOP card files differ mechanically. IOP card files have filtered IOP connectors and connector ground plates. Electrically, their backpanels are the same. The card file model numbers are different.

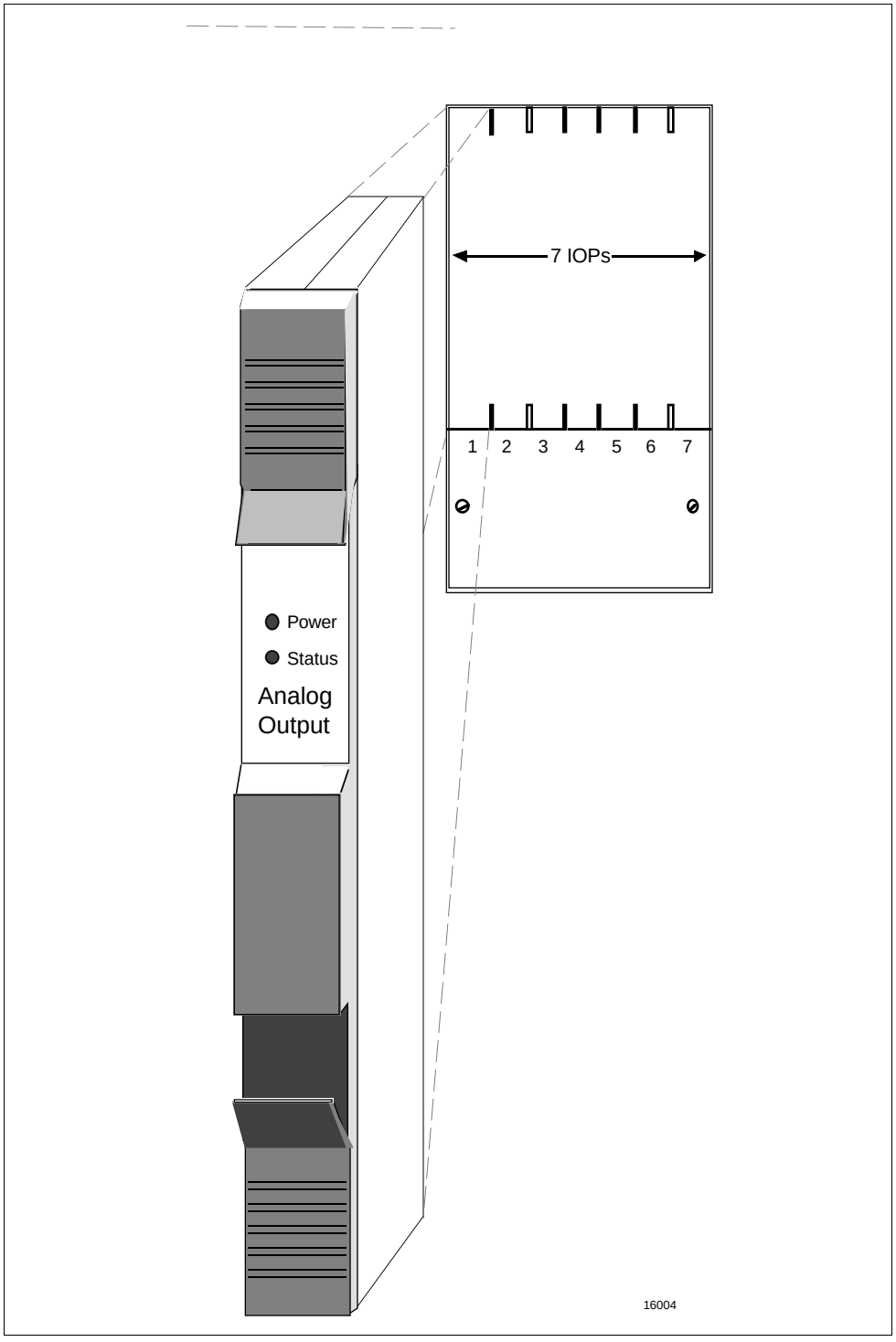
Continued on next page

2.2.2 Input/Output Processor (IOP) Card Files, Continued

Left 7-Slot IOP card file

Figure 2-5 illustrates a Left 7-Slot IOP card file.

Figure 2-5 Left 7-Slot IOP Card File



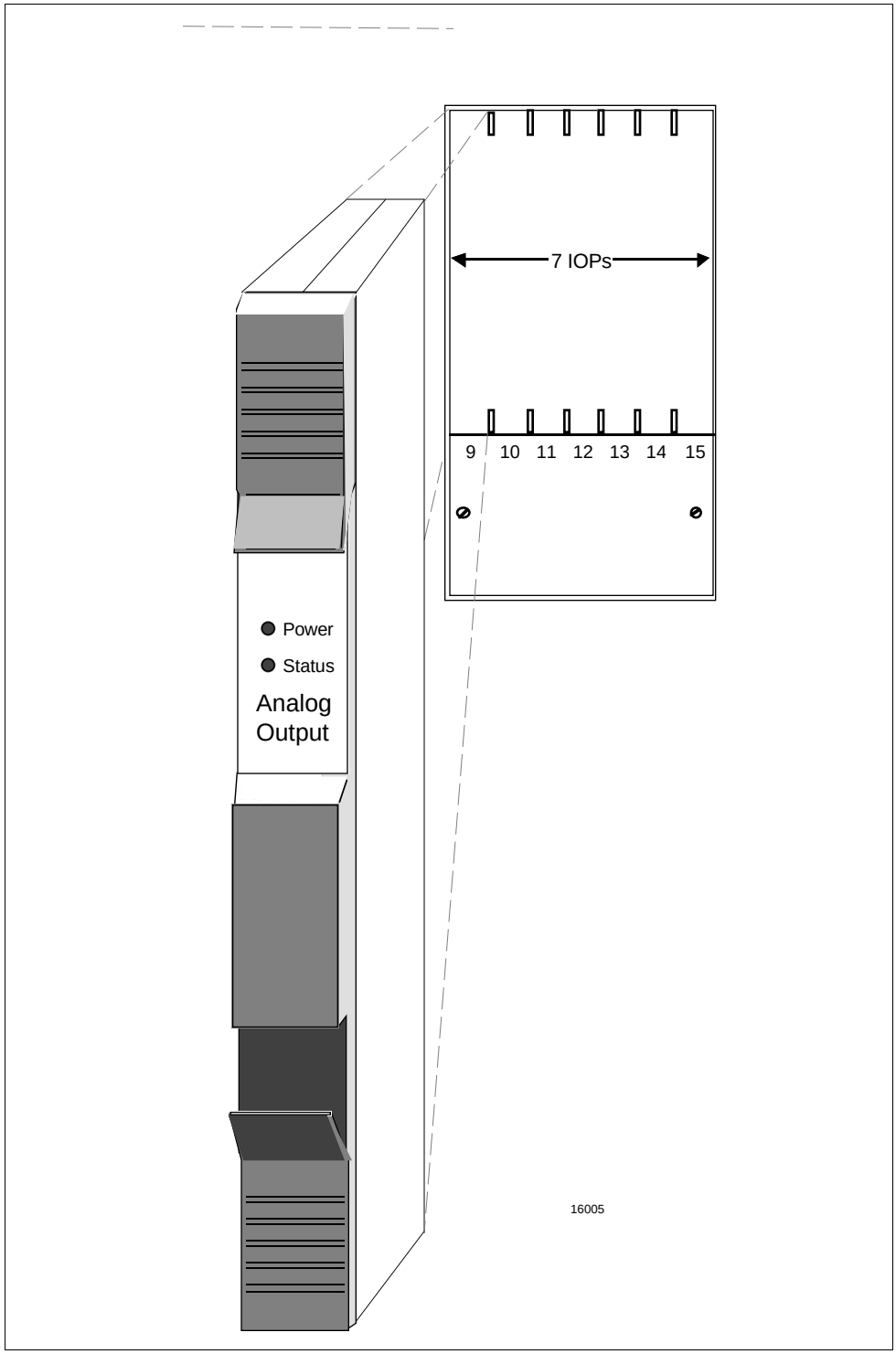
Continued on next page

2.2.2 Input/Output Processor (IOP) Card Files, Continued

Right 7-Slot IOP card file

Figure 2-6 illustrates a Left 7-Slot IOP card file.

Figure 2-6 Right 7-Slot IOP Card File



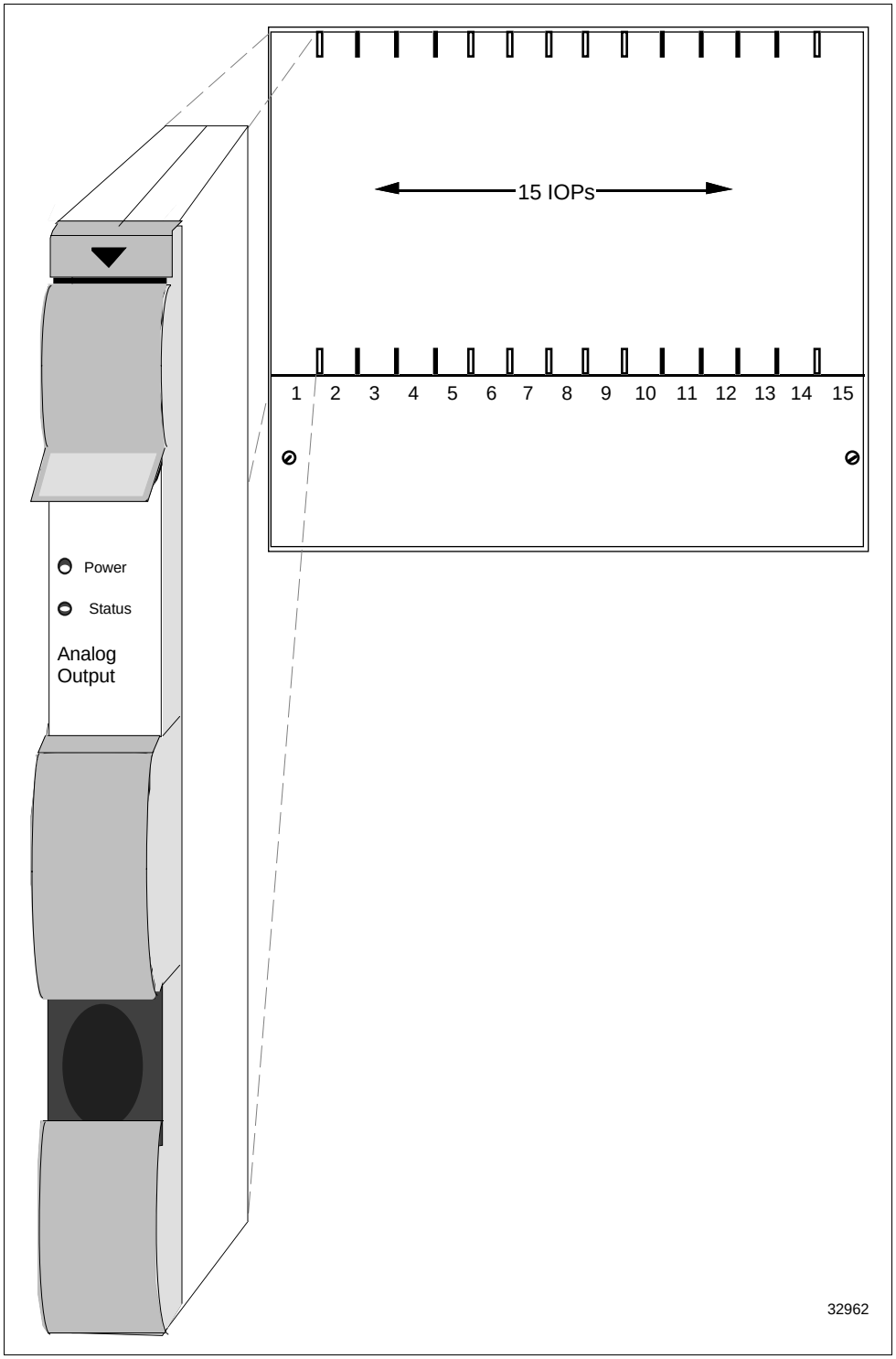
Continued on next page

2.2.2 Input/Output Processor (IOP) Card Files, Continued

15-Slot IOP card file

Figure 2-7 illustrates a 15-Slot IOP card file.

Figure 2-7 15-Slot IOP Card File



2.3 Input/Output Processor (IOP) Cards

Types of Input/Output Processors (IOPs)

There are thirteen types of Input/Output Processor (IOP) card assemblies. Some IOP card types interface with more than one type of Field Termination Assembly (FTA). The functional types of IOPs are

- High Level Analog Input (HLAI)
- Low Level Analog Input (LLAI)
- Low Level Analog Multiplexer (LLMux)
- Remote Hardened Low Level Analog Multiplexer (RHMUX)
- Digital Input (DI)
- Analog Output (AO)
- Digital Output (DO)
- Smart Transmitter Interface (STI)
- Smart Transmitter Interface Multivariable (STIM)
- Pulse Input (PI)
- Digital Input Sequence of Events (DISOE)
- Serial Device Interface (SDI)
- Serial Interface (SI)

Card file configurations

Additional IOP card file slots can be added to any High-Performance Process Manager subsystem. Each IOP card file accommodates up to 7 or 15 IOPs as illustrated in Figures 2-5 through 2-7. A total of eight 15-Slot card files or 7-Slot card file pairs (Left and Right), including HPMM card files, can exist in a High-Performance Process Manager subsystem. However, the limit is eight because each 15-Slot card file and pair of 7-Slot card files must be assigned an I/O Link Interface address between 0 and 7.

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

A total of 40 primary IOPs, 40 secondary (redundant) IOPs, and 3 I/O Link Extenders (a maximum of 8 I/O Link Extender cards) can exist in a single High-Performance Process Manager subsystem.

2.3.1 IOP Redundancy

IOP redundancy

The HPM subsystem supports IOP redundancy for the following types of IOPs:

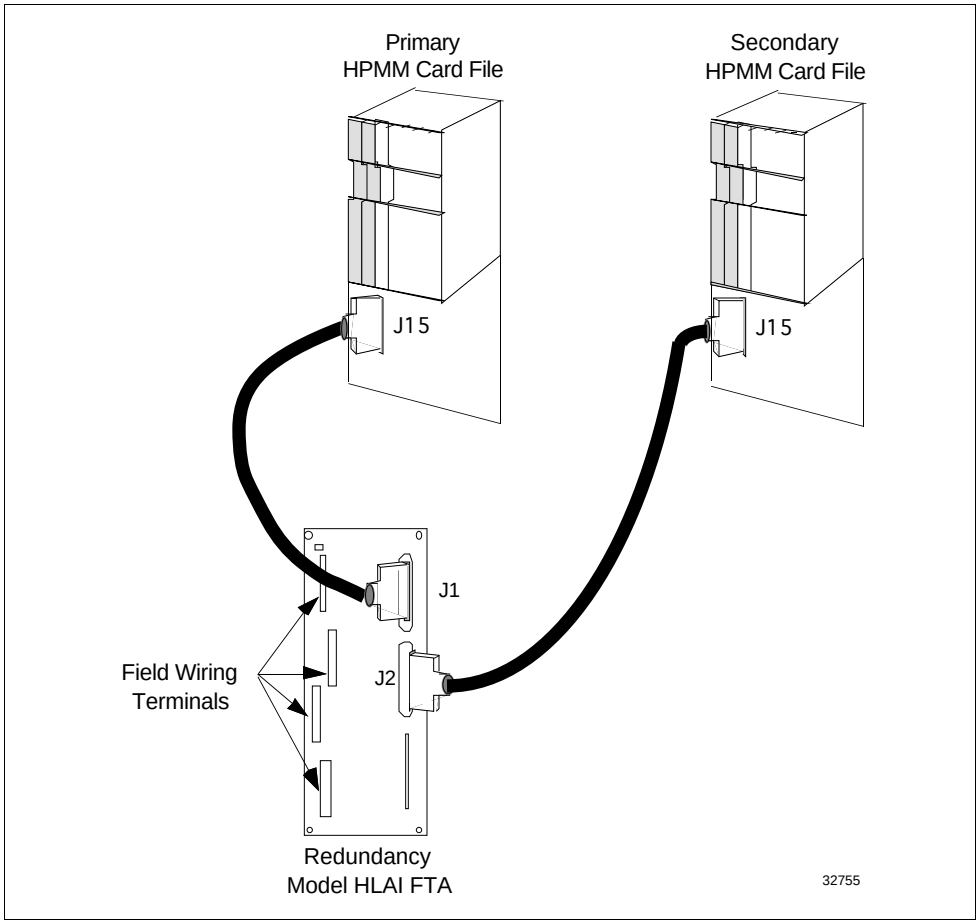
- High Level Analog Input (HLAI)
- Smart Transmitter Interface (STI or STIM)
- Analog Output (AO)
- Digital Input (DI)
- Digital Input Sequence of Events (DISOE)
- Digital Output (DO)

Presently, not all Digital Input and Digital Output IOP models support redundancy.

Redundant HLAI IOPs

A pair of IOPs can be connected in a redundant configuration with both IOPs connected by separate cables to the same FTA. Figure 2-8 illustrates an HLAI FTA that interfaces with a pair of HLAI IOPs that are installed in separate card files.

Figure 2-8 HLAI FTA with Redundant HLAI IOPs

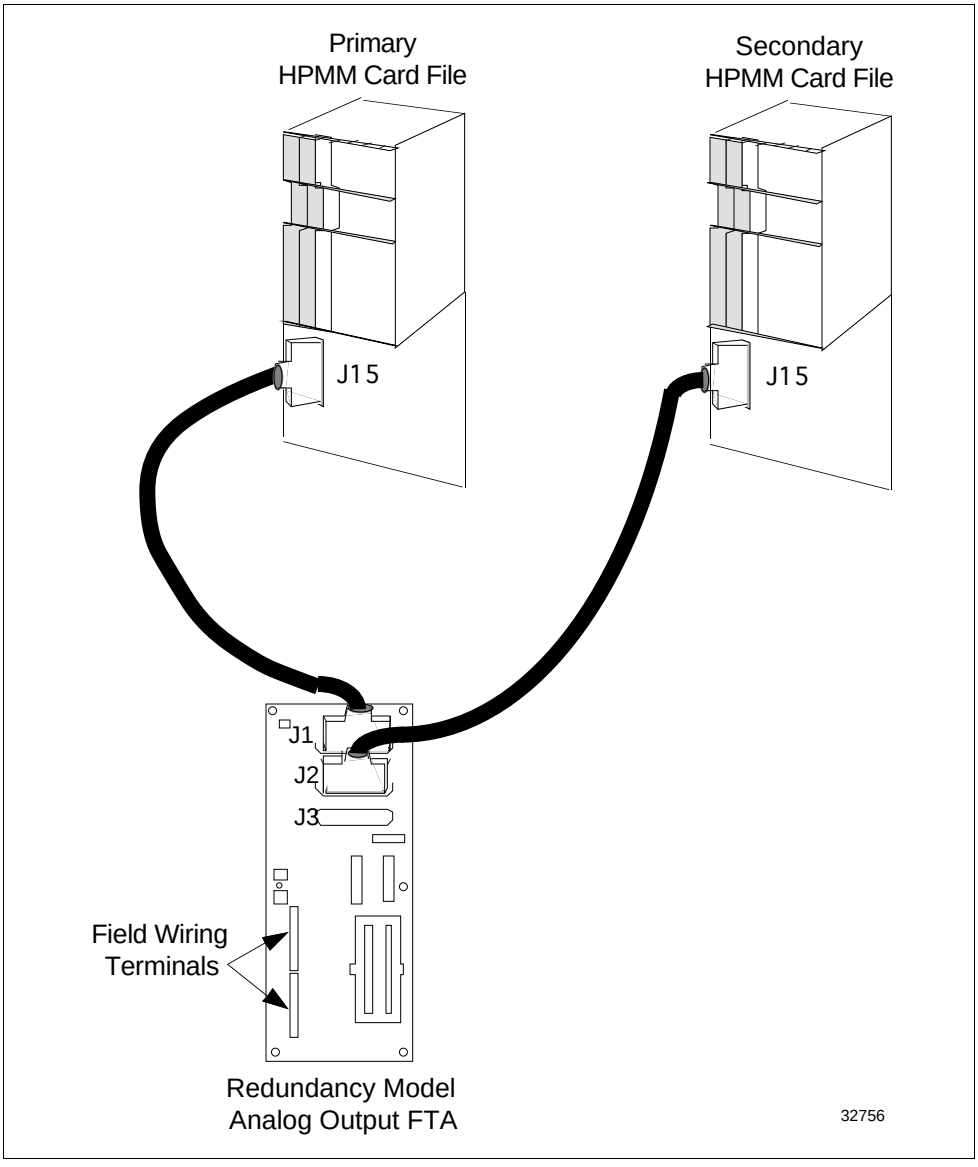


Continued on next page

Redundant AO IOPs

Output type FTAs can also interface with two IOPs with separate cables, and an automatic selector switch on the FTA selects which IOP's output drives the field wiring terminal connectors on the FTA. Figure 2-9 is an illustration of an Analog Output (AO) FTA interface with two Analog Output IOPs.

Figure 2-9 Analog Output FTA with Redundant Analog Output IOPs



2.4 I/O Link Extender (Fiber Optic Link)

Introduction

The I/O Link Extender provides the ability to locate 7-Slot or 15-Slot IOP card files and associated FTAs up to 8 kilometers (5 miles) from the HPMM(s). Two types of I/O Link Extenders and their associated fiber optic couplers are available, the "Standard" I/O Link Extender that provides up to a 1.3 kilometer (4000 feet) link, and the "Long Distance" I/O Link Extender which provides up to an 8 kilometers (5 miles) link. The connection is made using a pair of fiber optic transmission cables, driven and terminated by a fiber optic coupler that mates with the connector located directly below the card file slot in which the I/O Link Extender card is installed.

Features

An I/O Link Extender consists of two pairs I/O Link Extender cards, one for Link A and one for Link B, and associated fiber optic couplers at each end of the fiber optic link. The I/O Link Extender cards and their fiber optic couplers occupy two slots in an HPMM or IOP card file.

Remote card files

Every remote card file, or complex of IOP card files, requires two I/O Link Extender cards and two fiber optic couplers, one for Link A and one for Link B.

Fiber optic cable length

The maximum fiber optic cable length is dependent upon the number of splices and quality of the cable (dB loss per meter of cable). This maximum can be between 0.98 and 1.3 kilometers for the Standard I/O Link Extender and 8 kilometers for the Long Distance I/O Link Extender.

I/O Link Extender planning

I/O Link Extender planning can be found in Section 11 in this manual.

Standard I/O Link Extender

Each Standard I/O Link Extender card has an associated fiber optic coupler that can drive up to three pair of fiber optic cables. Each cable pair is terminated by a fiber optic coupler that terminates one fiber optic pair.

The Standard I/O Link Extender card will drive and terminate Link A or Link B, depending upon the card file number and slot number number. If the card file number and slot number number are both odd or both even, the card will drive Link A. If the card file number and slot number number are not both odd or both even, the card will drive Link B.

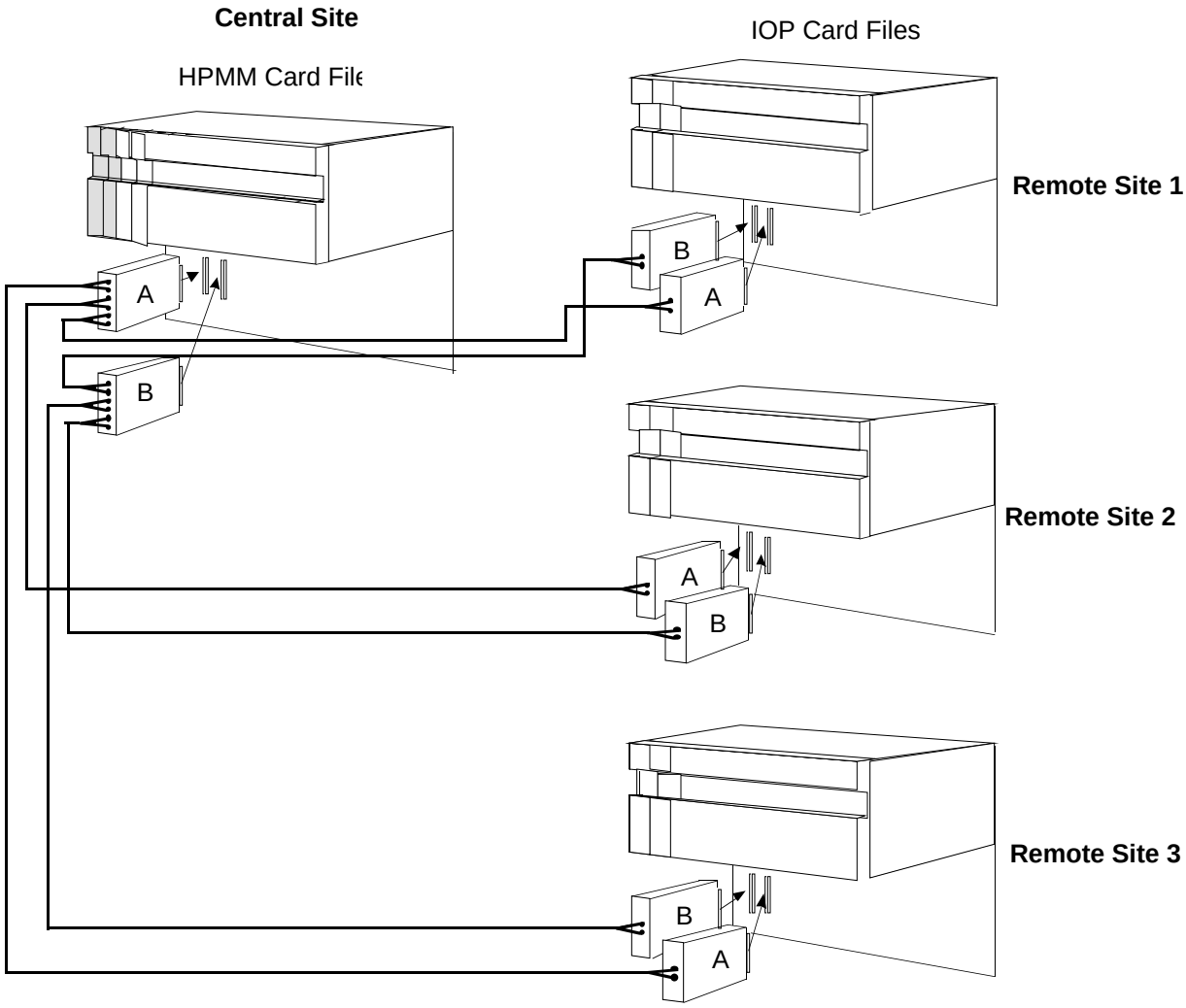
Two Standard I/O Link Extender cards, connecting up to six remote card files, can be installed in a HPMM card file, but the maximum number of primary IOPs is still 40 (plus 40 redundant IOPs).

Continued on next page

Standard I/O Link Extender connections nonredundant HPMM

Figure 2-10 illustrates the interconnections for a Standard I/O Link Extender in a High-Performance Process Manager that contains a nonredundant HPMM.

Figure 2-10 Standard I/O Link Extender Interconnections with Nonredundant HPMM



NOTE

The following High-Performance Process Manager subsystem configuration is assumed.
1. The HPMM card file is configured as card file #1 (I/O Link address of 0).
2. Remote Site #1's IOP card file is configured as card file #2 (I/O Link address of 1).
3. Remote Site #2's IOP card file is configured as card file #3 (I/O Link address of 2).
4. Remote Site #3's IOP card file is configured as card file #4 (I/O Link address of 3).

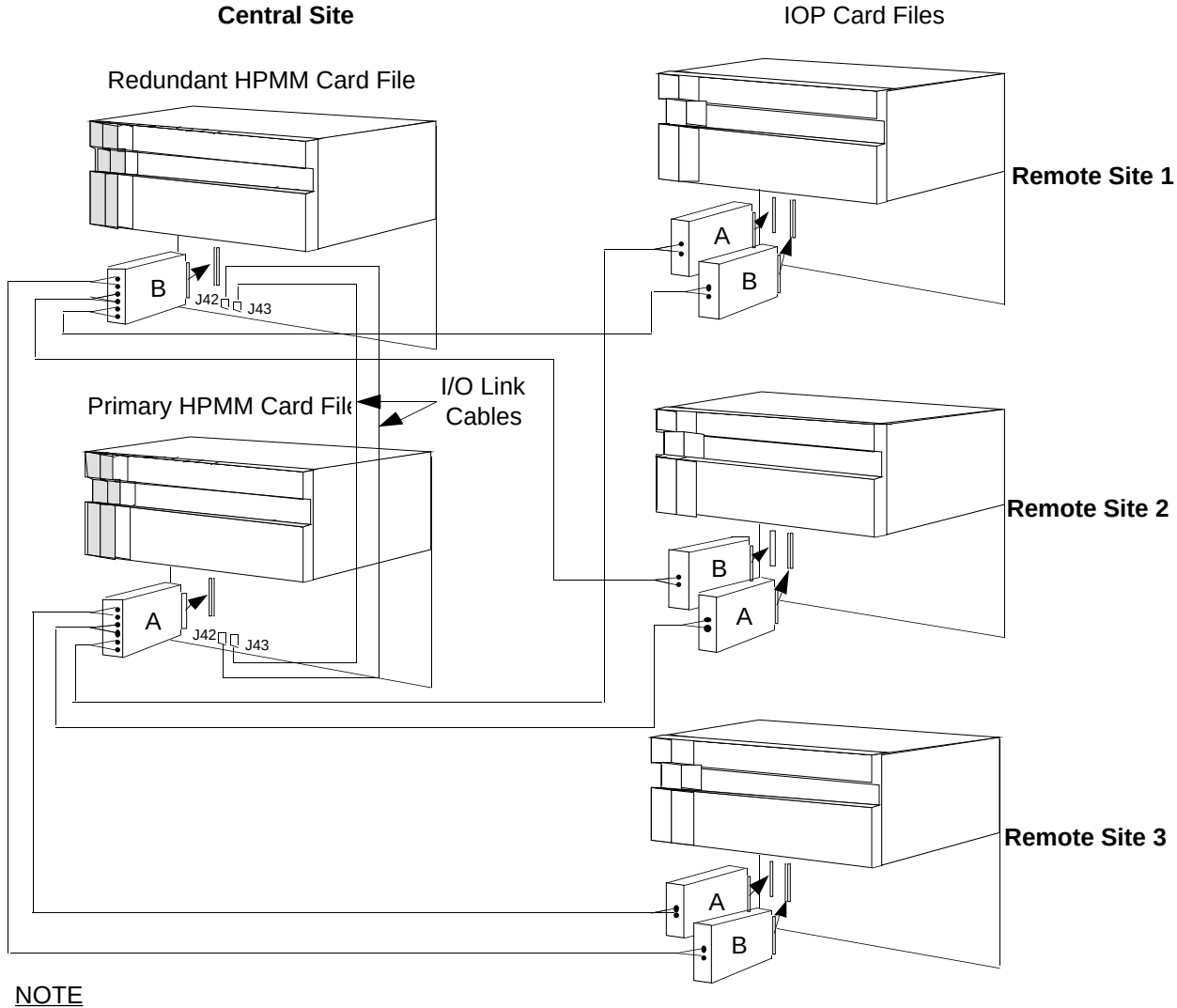
32777

Continued on next page

Standard I/O Link Extender connections redundant HPMMs

Figure 2-11 illustrates the interconnections for a Standard I/O Link Extender in a High-Performance Process Manager that contains redundant HPMMs.

Figure 2-11 Standard I/O Link Extender Interconnections with Redundant HPMMs



NOTE

The following High-Performance Process Manager subsystem configuration is assumed.

1. The lower HPMM card file is configured as card file #1 (I/O Link Address of 0).
2. The upper HPMM card file is configured as card file #2 (I/O Link Address of 1).
3. Remote Site #1's IOP card file is configured as card file #3 (I/O Link Address of 2).
4. Remote Site #2's IOP card file is configured as card file #4 (I/O Link Address of 3).
5. Remote Site #3's IOP card file is configured as card file #5 (I/O Link Address of 4).

32778

Continued on next page

Long Distance I/O Link Extender

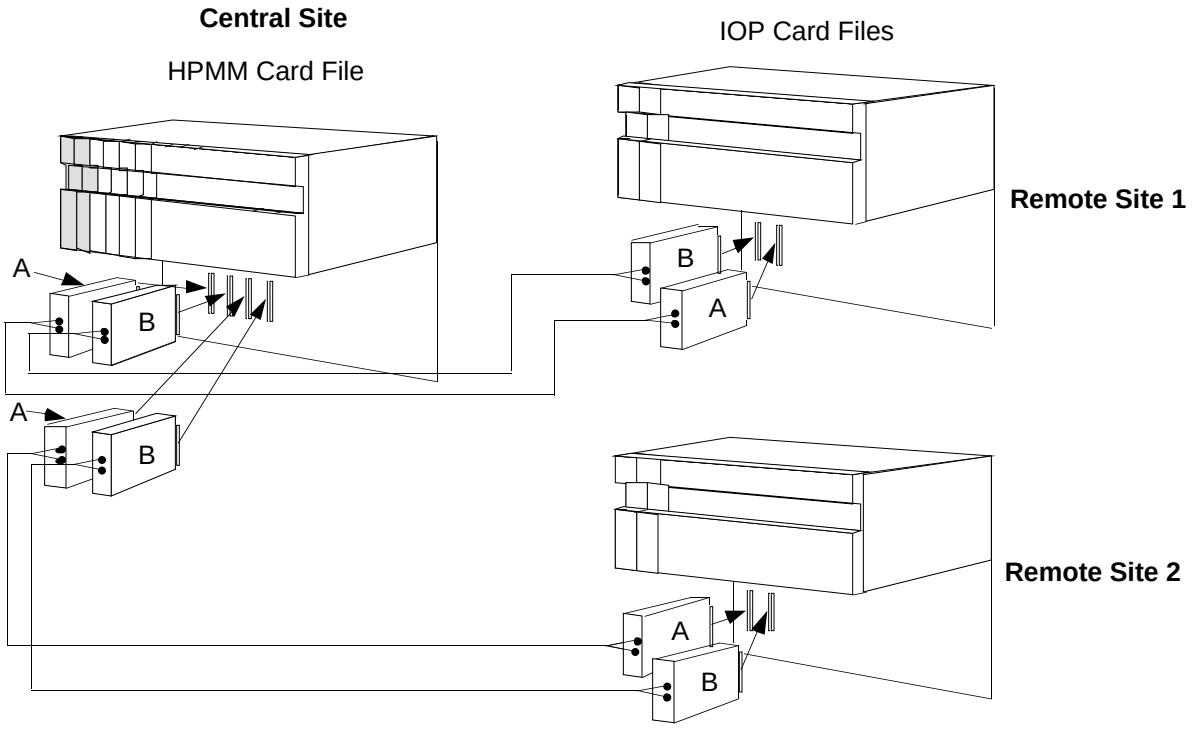
Each Long Distance I/O Link Extender card has an associated fiber optic coupler that drives a single pair of fiber optic cables. Each cable pair is terminated by a fiber optic coupler that terminates one fiber optic pair.

The Link A or Link B selection for the Long Distance I/O Link Extender is determined by a jumper on the card.

Long Distance I/O Link Extender connections nonredundant HPMM

Figure 2-12 illustrates the interconnections for a Long Distance I/O Link Extender in a High-Performance Process Manager that has a nonredundant HPMM.

Figure 2-12 Long Distance I/O Link Extender Interconnections with Nonredundant HPMM



NOTE

The following High-Performance Process Manager subsystem is assumed.
1. The HPMM card file is configured as card file #1 (I/O Link Address of 0).
2. Remote Site #1's IOP card file is configured as card file #2 (I/O Link Address of 1).
3. Remote Site #2's IOP card file is configured as card file #3 (I/O Link Address of 2).

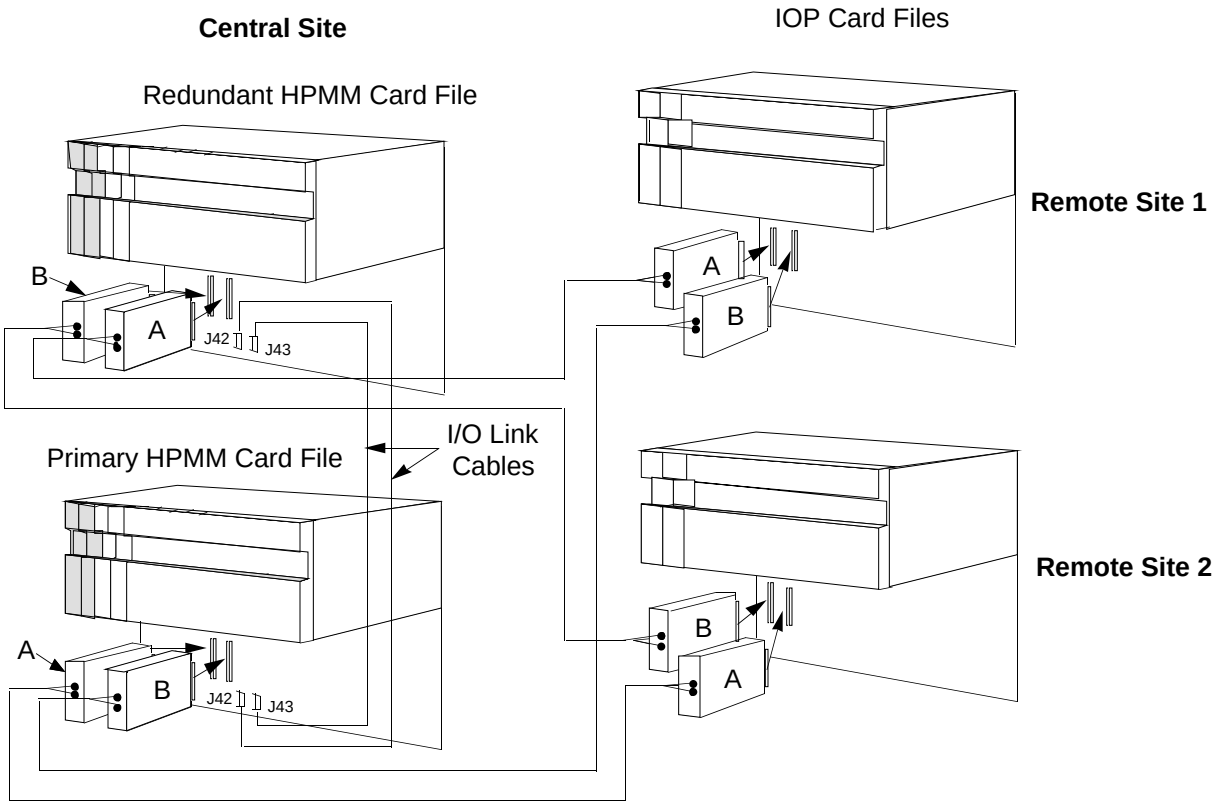
32779

Continued on next page

Long Distance I/O Link Extender connections redundant HPMMs

Figure 2-13 illustrates the interconnections for a Long Distance I/O Link Extender in a High-Performance Process Manager that has redundant HPMMs.

Figure 2-13 Long Distance I/O Link Extender Interconnections with Redundant HPMMs



NOTE

The following High-Performance Process Manager subsystem configuration is assumed.

1. The lower HPMM card file is configured as card file #1)I/O Link address of 0).
2. The upper HPMM card file is configured as card file #2 (I/O Link address of 1).
3. Remote Site #1's IOP card file is configured as card file #3 (I/O Link address of 2).
4. Remote Site #2's IOP card file is configured as card file #4 (I/O Link address of 3).

32780

2.5 Field Termination Assemblies (FTAs)

Description

Terminal connectors on the Field Termination Assembly (FTA) provide the connection points for the process control wiring. Fuses, relays, and resistors protect the FTA circuitry, and sense, condition, or operate the connected device. The FTA communicates with an associated IOP, which in turn communicates with the HPMM(s) through the I/O Link Interface.

FTAs types

Standard types of FTAs, as described in Table 2-2, interface the field wiring and provide communication with an associated IOP. They are categorized as "standard" because Galvanically Isolated FTAs are also available as described in Table 2-3.

Continued on next page

Standard FTAs

Standard FTA types are listed in Table 2-2.

Table 2-2 Standard Field Termination Assembly Types

FTA Type	Description
High Level Analog Input/ Smart Transmitter Interface (HLAI/STI)	Accepts high level analog inputs. The inputs are configurable as single-ended or differential in relation to logic ground. The FTA is also used to interface Smart Transmitter devices.
High Level Analog Input (HLAI)	Accepts high level analog inputs. The inputs are configurable as single-ended or differential in relation to logic ground.
Smart Transmitter Interface (STI)	Interfaces with Smart Transmitter devices. The interface is referenced to logic ground. The Smart Transmitter provides field isolation.
Low Level Analog Input (LLAI)	Can be configured to accept low-level or high-level analog inputs. Low-level analog inputs include Thermocouples (TC), Resistance Temperature Detectors (RTDs), or millivolt sources. High-level inputs such as voltage sources (0-5 V) and 4-20 milliamp current loop devices are acceptable.The inputs are isolated from each other and the HPM, but share a common bus for field wire shields.
Low Level Analog Input Multiplexer (LLMux or RHMUX)	The FTA accepts one set of low level analog inputs, such as thermocouples (TC) or Resistance Temperature Detectors (RTDs). The set of inputs must be either thermocouples or RTDs. The inputs are sequentially multiplexed. One or two FTAs of either type can be connected to one Power Adapter assembly and its IOP.
Analog Output (AO)	Provides 4-20 mA analog outputs to proportioning loads such as valves.
120 Vac Digital Input (DI)	Accepts ac digital inputs. All inputs are isolated from each other. Two versions of the FTA are available, with pluggable and without pluggable input modules.
240 Vac Digital Input (DI)	Similar to the 120 Vac DI FTA, except it has a higher operating voltage and a lower sense current. The inputs are in four groups of eight circuits with a common return for each group. Groups are isolated from each other.
24 Vdc Digital Input (DI)	Accepts contacts grouped with an isolated common return. Two versions of the FTA are available, with pluggable and without pluggable input modules.
120/240 Vac Solid-State Digital Output (DO)	Provides solid-state ac digital outputs that are isolated from each other and the HPM.
3-30 Vdc Solid-State Digital Output (DO)	Provides dc digital outputs that are isolated from each other and the HPM.
31-200 Vdc Solid-State Digital Output (DO)	Provides dc digital outputs that are isolated from each other and the HPM.
24 Vdc Nonisolated Digital Output (DO)	Provides nonisolated digital outputs to loads such as lamps and relays. The signals are referenced to logic common.
120 Vac/125 Vdc Relay Digital Output (DO)	Provides independent electromechanical relays for ac or dc digital outputs.

Continued on next page

Standard FTAs,
continued

Table 2-2 Standard Field Termination Assembly Types, Continued

FTA Type	Description
240 Vac/125 Vdc Relay Digital Output (DO)	Provides independent electromechanical relays for ac or dc digital outputs.
Pulse Input (PI)	Accepts eight inputs, each with a 32-bit counter, and have a frequency range of dc to 20 kHz. The inputs are referenced to logic ground.
Serial Device interface (SDI Toledo)	The SDI FTA provides an EIA-232 (RS-232) asynchronous serial communications interface for a model 8142-2084 or 8142-2184 Toledo Weigh Cell peripheral manufactured by Toledo Scale Inc.
Serial Device interface (SDI M/A Station)	The SDI FTA provides an EIA-422/485 (RS-422/485) asynchronous serial communications interface for up to four model MU-MASX02 Manual/Auto Station peripherals manufactured by Honeywell Inc.
Serial Device interface (SDI UDC 6000)	The SDI FTA provides an EIA-422/485 (RS-422/485) asynchronous serial communications interface for up to four UDC 6000 Modbus peripherals manufactured by Honeywell Inc.
Serial Interface (SI Modbus RTU)	The SI FTA provides either an EIA-232 (RS-232) asynchronous serial communications interface for one Modbus compatible device or an EIA-422/485 (RS-422/485) asynchronous serial communications interface for up to 15 Modbus RTU compatible devices.
Serial Interface (Allen-Bradley)	The SI FTA accommodates a single EIA-232 compatible Allen-Bradley device through its EIA-232 interface.

Continued on next page

Galvanically Isolated FTAs

Galvanically Isolated FTA types are listed in Table 2-3.

Table 2-3 Galvanically Isolated Field Termination Assembly Types

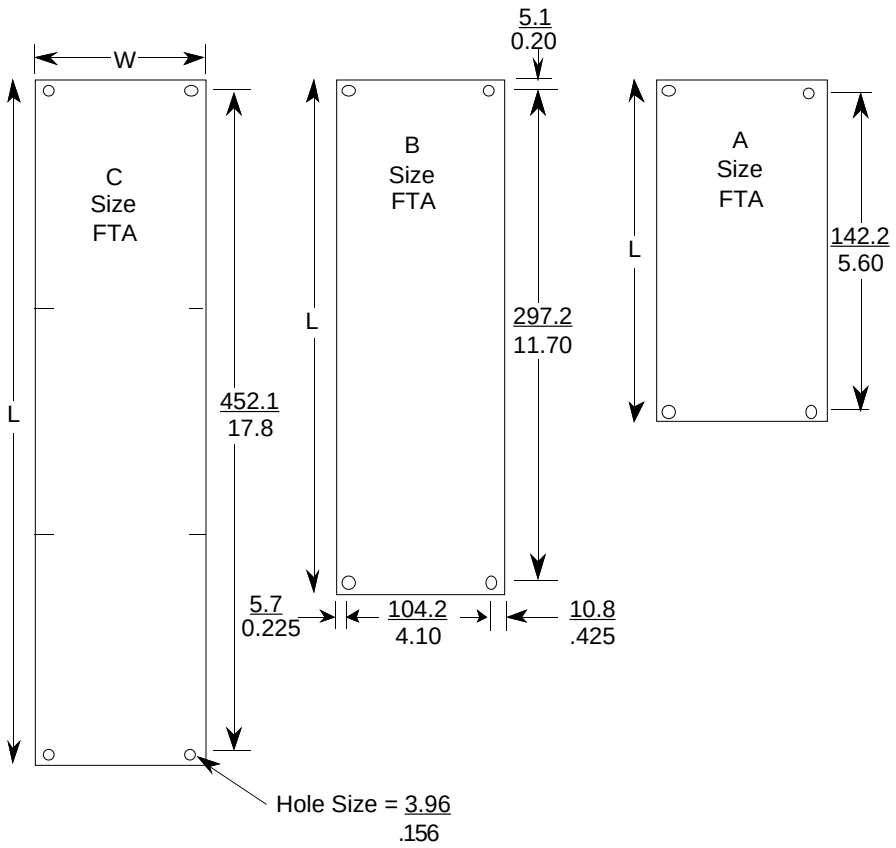
FTA Type	Description
Remote Hardened Low Level Analog Input Multiplexer (RHMUX)	Accepts one set of low-level analog inputs. The inputs are sequentially multiplexed and can be either thermocouple (TC) or millivolt (Mv). One or two FTAs can be connected to its Power Adapter assembly and IOP.
Remote Hardened Multiplexer Non-Incendive Power Adapter (RHMUX NIPA)	The RHMUX NI Power Adapter provides the interface between an RHMUX IOP and one or two RHMUX FTAs, which can be mounted in a Division 2, Zone 1, or nonhazardous location.
Remote Hardened Multiplexer Intrinsically Safe Power Adapter (RHMUX ISPA)	The RHMUX IS Power Adapter provides the interface between an RHMUX IOP and one or two RHMUX FTAs, which can be mounted in a Division 1 or Zone 0 location.
High Level Analog Input (HLAI/STI)	The HLAI/STI FTA accepts high level analog inputs. All inputs are isolated from ground and each other. The FTA is also used to interface Smart Transmitter devices.
High Level Analog Input (HLAI)	The HLAI FTA accepts high level analog inputs. All inputs are isolated from ground and each other.
24 Vdc Digital Input (DI)	The 24 Vdc DI FTA accepts contact inputs. All inputs are isolated from each other.
Analog Output (AO)	The AO FTA provides isolated 4-20 mA outputs to proportioning loads such as valves.
24 Vdc Digital Output (DO)	The 24 Vdc DO FTA provides isolated digital outputs to loads such as solenoid valves or lamps.

Continued on next page

Three physical sizes

The standard FTAs have three physical sizes as illustrated in Figure 2-14. The Galvanically Isolated FTAs are one size only, B-size.

Figure 2-14 Field Termination Assembly (FTA) Sizes



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

All measurements are in: millimeters / inches

Note:

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

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

2770

Continued on next page

FTA Mounting Channels

The FTAs are installed at the rear or front of a dual-access cabinet on one or more FTA Mounting Channels. In a single-access cabinet, the FTAs are mounted on FTA Mounting Channels at the front of the cabinet. The FTA Mounting Channels also function as cable and wiring channels, or troughs. The standard and Galvanically Isolated FTAs must not be mounted on the same FTA Mounting Channel. Mounting both types of FTAs on the same FTA Mounting Channel is an Intrinsic Safety violation because the field wiring must not be routed in the same channel.

Mounting orientation

Both standard (non-Galvanically Isolated) and Galvanically Isolated FTAs can be mounted on vertically oriented 3-foot long FTA Mounting Channel segments; however, Standard and Galvanically Isolated FTAs must not be mounted on the same FTA Mounting Channels.

Galvanically Isolated FTAs can be mounted on an FTA Mounting Channel that is above or below an FTA Mounting Channel that has standard FTAs mounted on it.

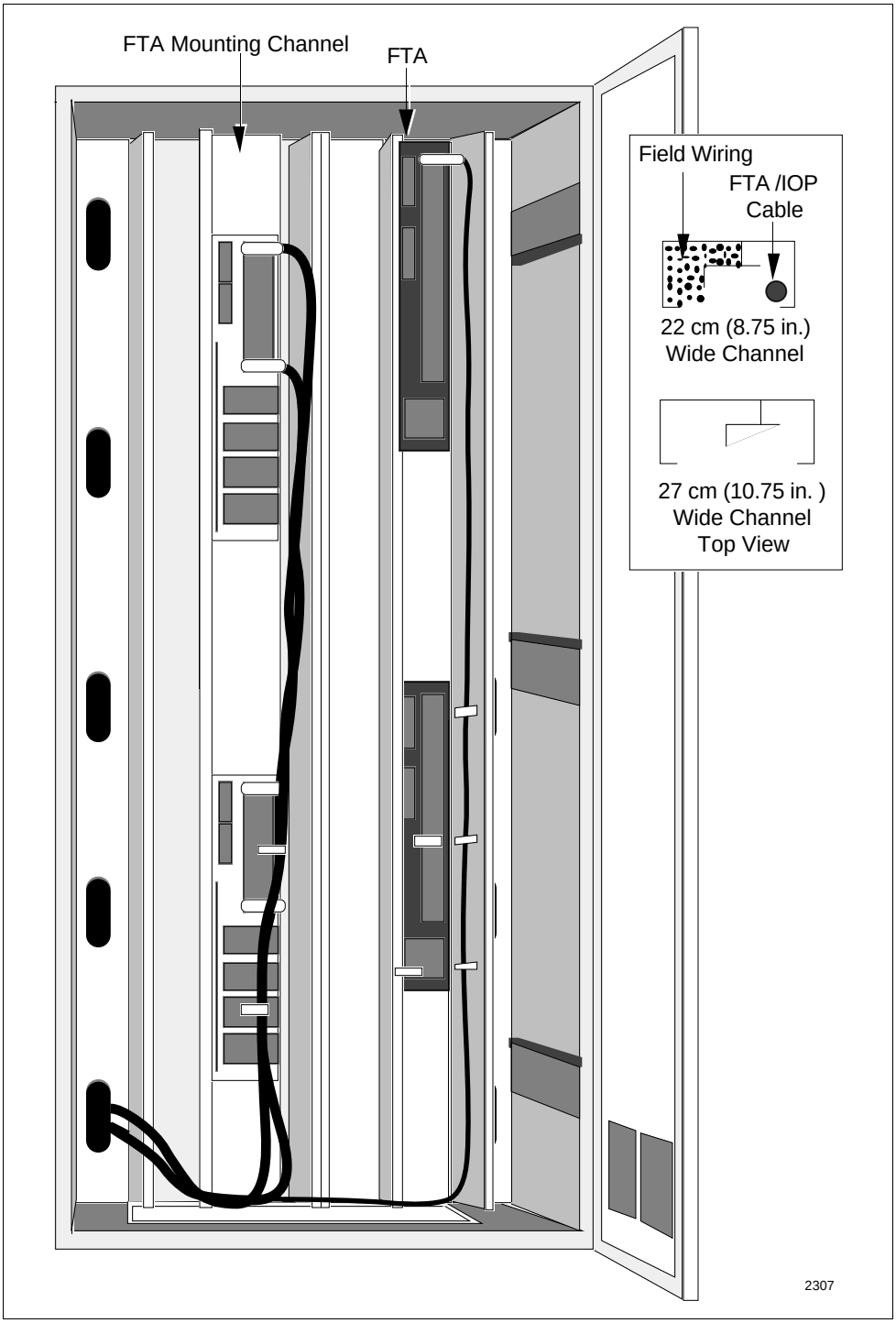
Optionally, Galvanically Isolated FTAs can also be mounted on horizontally oriented 2-foot long FTA Mounting Channels. Standard FTAs must not be mounted on horizontal FTA Mounting Channels.

Continued on next page

Typical cabinet layout

A typical cabinet layout of FTA Mounting Channels that demonstrates the installation of standard FTAs in a dual-access High-Performance Process Manager cabinet is shown in Figure 2-15.

Figure 2-15 Typical Vertical FTA Mounting Channel Layout



Continued on next page

Compression or screw terminals available

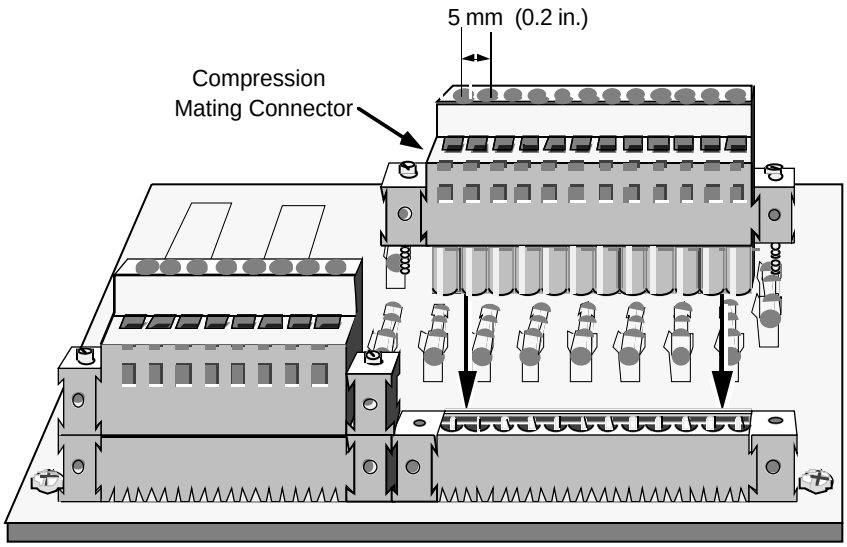
Most standard FTA types are available with either compression-type or screw-type terminal connectors. Some exceptions are the 6-inch Analog Output (AO), 6-inch High Level Analog Input (HLAI), 6-inch Low Level Analog Input Multiplexer (LLMux), and the 6-inch Digital Input Power Distribution Assembly, which are available with compression-type terminal connectors only. The Remote Hardened Low Level Analog Input Multiplexer (RHMUX) mounts in a separate enclosure and is available only with screw-type terminal connectors. The number of terminals for both the compression-type and screw-type terminal connector can vary depending on the type of standard FTA.

All Galvanically Isolated FTAs are available with both crimp pin-type and compression-type terminal connectors. The Marshalling Panel that is used with Galvanically Isolated FTAs is available only with screw-type terminal connectors. See Section 15 for a description of the Marshalling Panel.

FTA compression-type terminal connector

Figure 2-16 is an illustration of a typical compression-type terminal connector connection to a standard FTA.

Figure 2-16 Typical FTA Compression Terminal Connector



Compression Mating Connector

Number of Connections	Honeywell Part Number
8	511190694 - 108, - 208, - 408
11	- 111, - 411
12	- 112, - 412

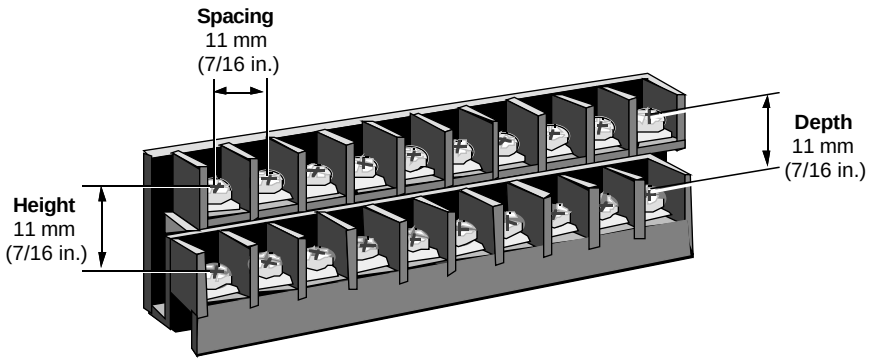
4401

Continued on next page

FTA fixed-screw terminal connector

Figure 2-17 illustrates a typical fixed-screw terminal connector as it would appear on a standard FTA.

Figure 2-17 Typical FTA Fixed-Screw Terminal Connector



Screw Terminal Strip Sizes

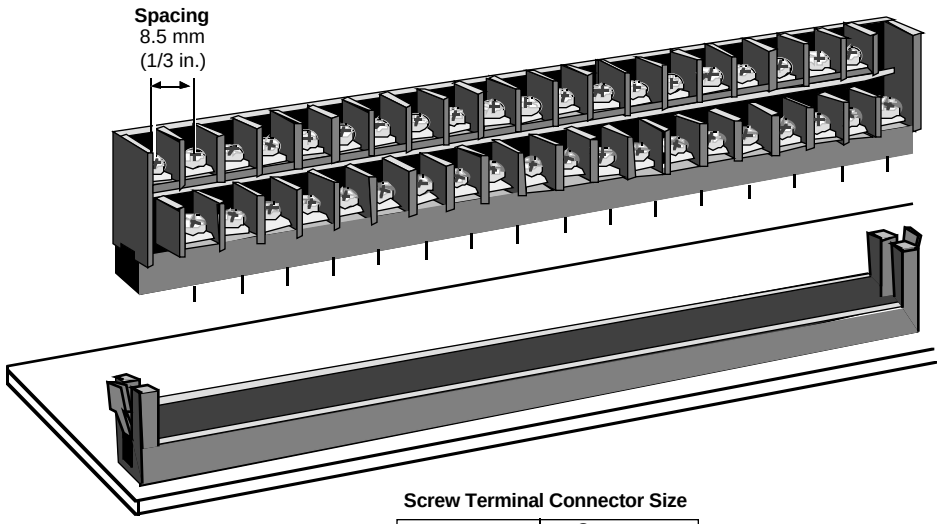
Number of Terminals	Connector Length
8	52 mm (2.0 in.)
12	74 mm (2.9 in.)
24	140 mm (5.5 in.)

4400

FTA removable-screw connector

Figure 2-18 illustrates a typical removable-screw terminal connector.

Figure 2-18 Typical FTA Removable-Screw Terminal Connector



Screw Terminal Connector Size

Number of Terminals	Connector Length
40	176 mm (6.9 in.)

6170

Continued on next page

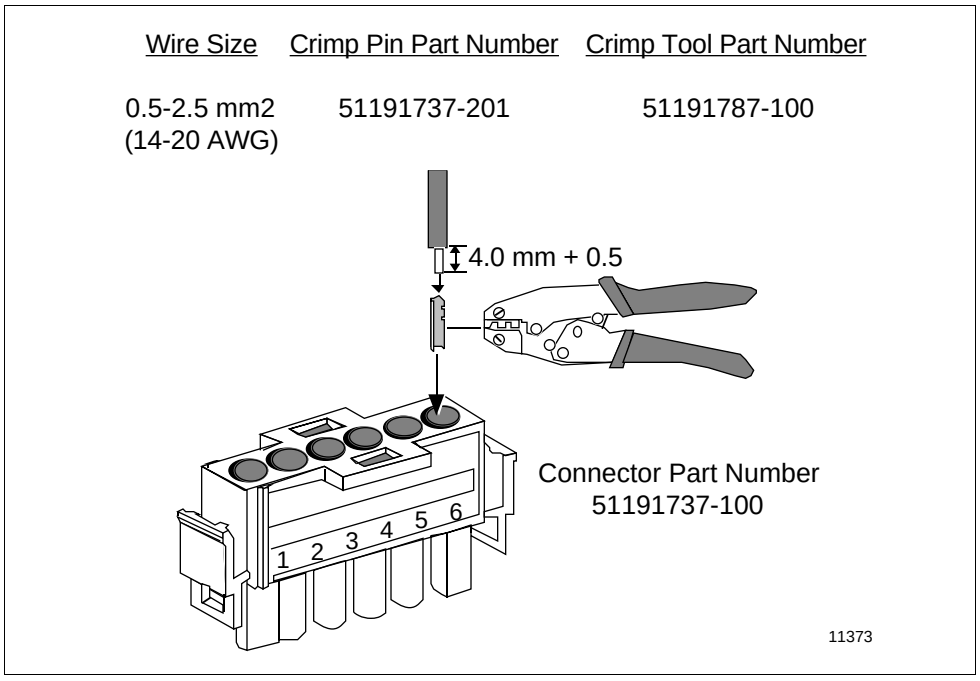
Galvanic Isolation Module connectors

Figures 19 and 20 illustrate the crimp pin-type and compression-type terminal connectors for the Galvanically Isolated FTAs, respectively. The connectors on the Galvanic Isolation Modules have six terminals. Depending on the type of terminal connector, the terminals accept size 0.3 to 3.5 mm^2 (12 to 22 AWG) wiring.

Crimp pin-type terminal connector

Figure 2-19 illustrates the crimp-pin type Galvanic Isolation Module terminal connector.

Figure 2-19 Crimp-Pin Galvanic Isolation Module Terminal Connector

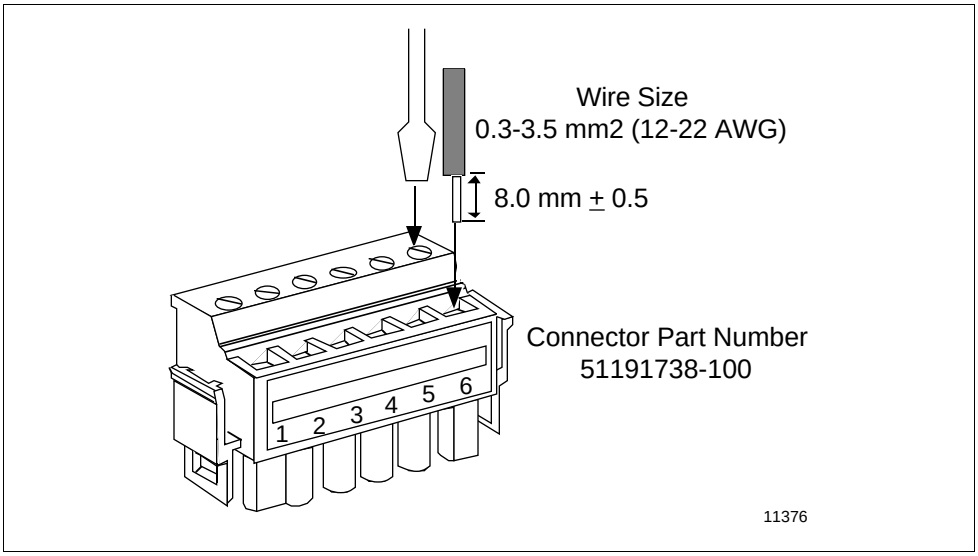


Continued on next page

Compression-type terminal connector

Figure 2-20 illustrates the compression-type Galvanic Isolation Module terminal connector.

Figure 2-20 Compression-Type Galvanic Isolation Module Terminal Connector



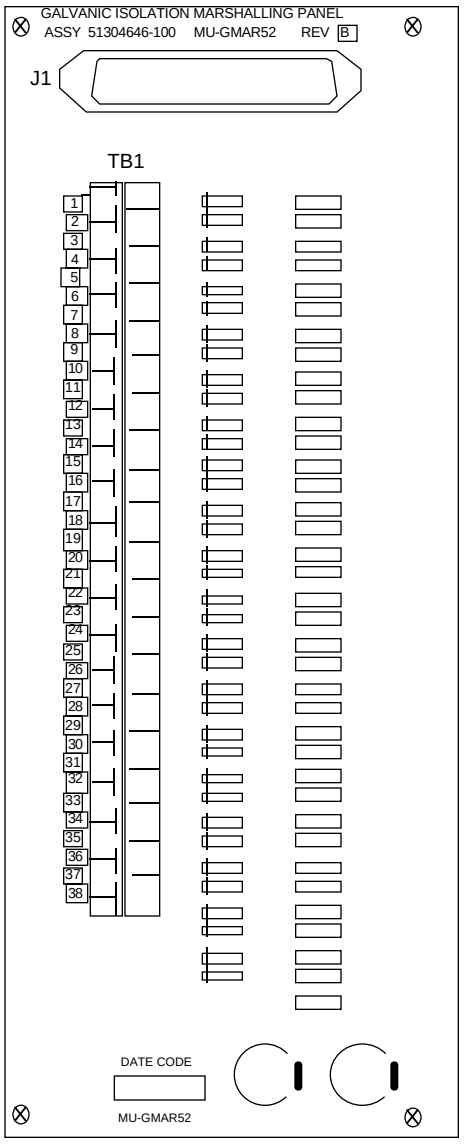
Continued on next page

Marshalling Panel

The Marshalling Panel was developed to provide access to the signals from the auxiliary connectors on the Galvanically Isolated FTAs. It can also be used as a general purpose Marshalling Panel in the High-Performance Process Manager subsystem.

Figure 2-21 illustrates an assembly layout of the panel. The Marshalling Panel, model MU-GMAR52, is similar in shape and appearance to a "B" size FTA (see Figure 2-14). The assembly provides surge and ESD protection for the field wiring terminals. A 50-pin connector is provided on the assembly that accepts an IOP to FTA cable.

Figure 2-21 FTA Marshalling Panel Assembly Layout



2.6 Power Systems

Power System features

The High-Performance Process Manager Power System provides

- 24 Vdc power for operation of all HPMM cards, IOP cards, and FTAs
- A nominal 3.6 Vdc battery output for backup of the HPMM and IOP memory circuits.
- A nominal 0.25 ampere, 6 Vac output for operation of a LLAI line frequency clock circuit.

Two types of Power Systems

There are two types of Power Systems.

- Standard Power System
- AC Only Power System

Standard Power System

The Standard Power System has many features that include

- An optional redundant Power Supply Module (model MU-PSRX03/04).
- Either 120 Vac or 240 Vac input power. A single or dual source of input power can be connected when the optional redundant Power Supply Module option is implemented.
- Single and redundant Power Supply Module failure detection.
- CMOS memory NiCad battery backup (3.6 Vdc) for 12 hours (model MU-PSRX03) or 45 hours (model MU-PSRX04) backup with failure detection.
- An optional 48 Vdc Battery Backup Module (model MU-PSRB03/04) with a disconnect switch that backs up the 24 Vdc for 25 minutes.

Redundant Power Supply Modules

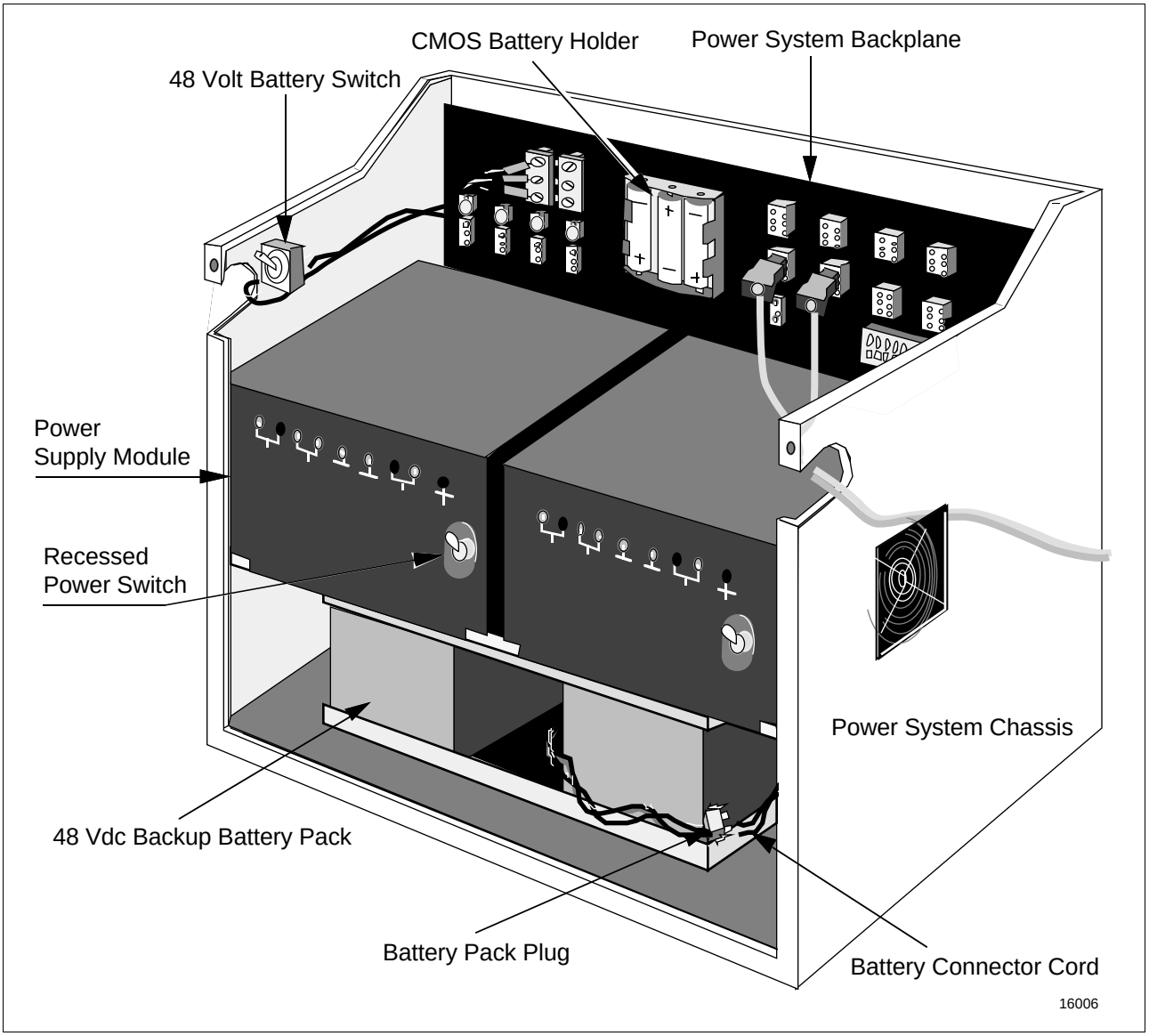
Redundant Power Supply Modules are recommended when the Power System provides power for redundant HPMMs. If the redundant HPMMs are resident in separate cabinets with their own Power System, a Power System with a single Power Supply Module is acceptable, though not fully recommended.

Continued on next page

Model MU-PSRX03 Standard Power System

The layout of the model MU-PSRX03 Standard Power System is illustrated in Figure 2-22.

Figure 2-22 Standard Power System—Model MU-PSRX03

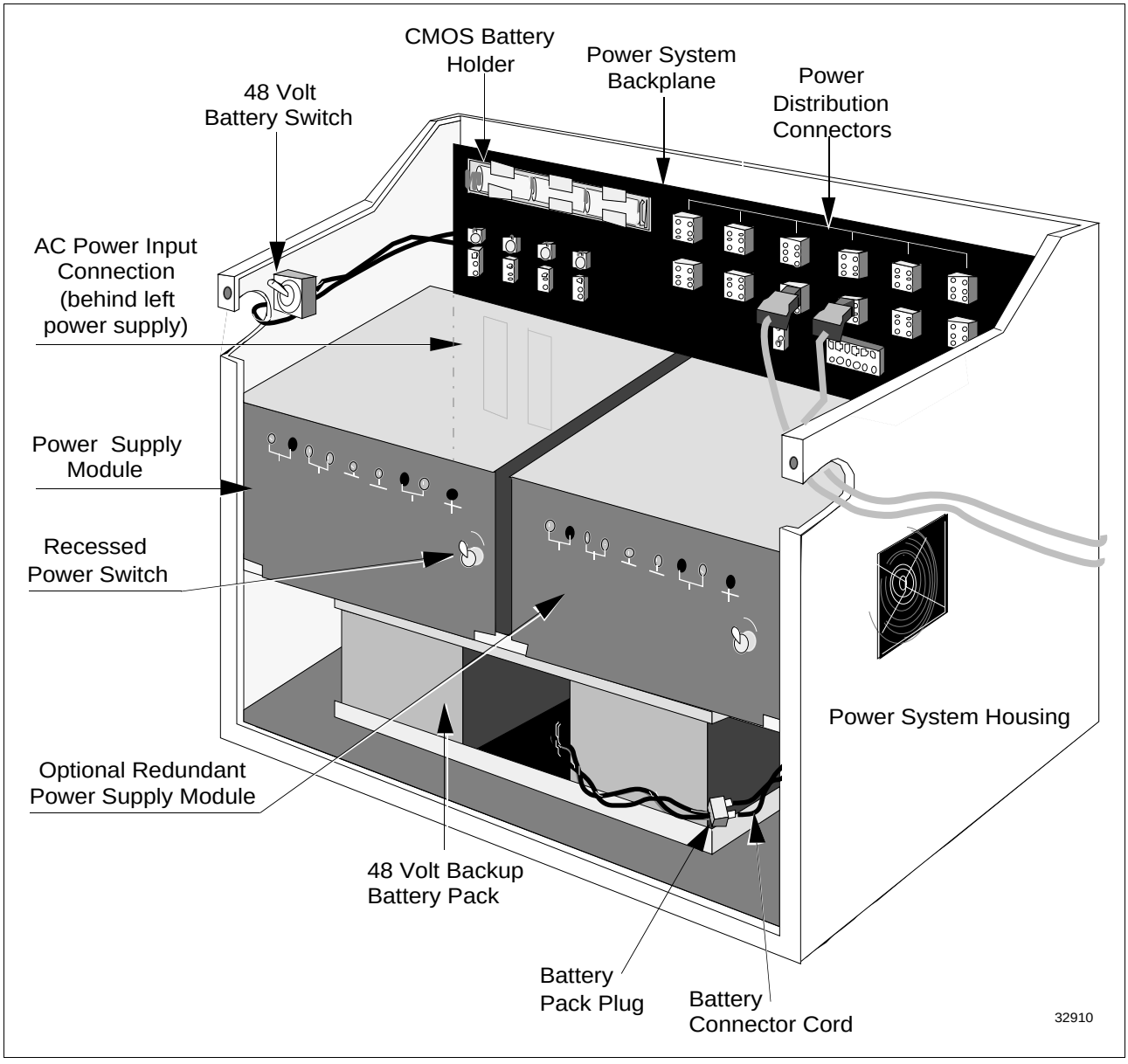


Continued on next page

Model MU-PSRX04 Standard Power System

The layout of the model MU-PSRX04 Standard Power System is illustrated in Figure 2-23.

Figure 2-23 Standard Power System—Model MU-PSRX04



Continued on next page

AC Only Power System

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

Alkaline batteries are used instead of rechargeable NiCad batteries for CMOS data retention in the AC Only Power System.

ATTENTION

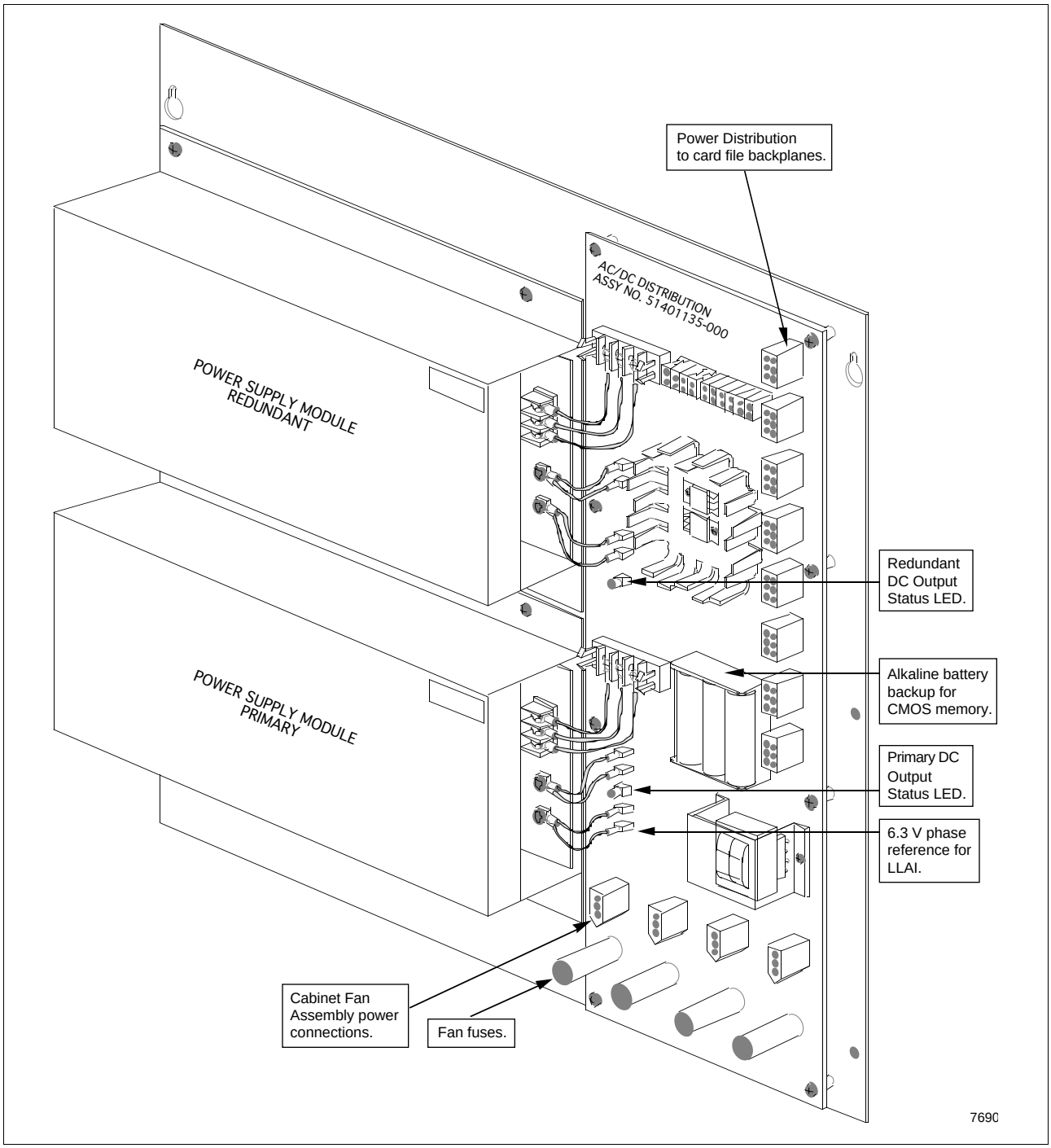
ATTENTION—The AC Only Power System must not be used in CE Compliant applications.

Continued on next page

AC Only Power System illustration

The layout of the AC Only Power System is illustrated in Figure 2-24.

Figure 2-24 AC Only Power System—Not for CE Compliant Applications



2.7 Cabinet Configurations

Cabinet configurations

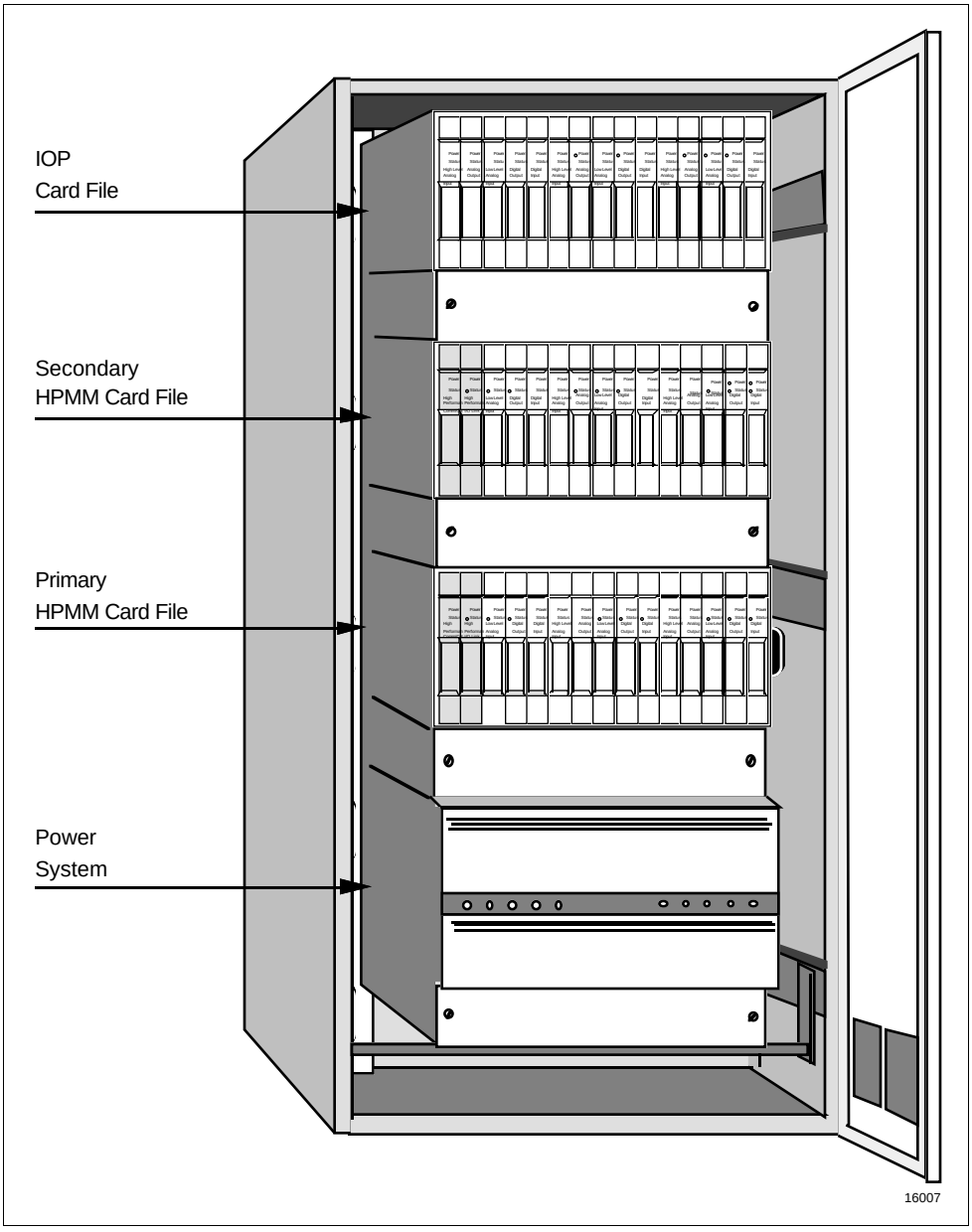
The High-Performance Process Manager subsystem can have various cabinet configurations. Cabinets can be complexed together or remotely separated. The HPMM and IOP card files can share the same Power System or have independent Power Systems. If the HPMMs share the same Power System, the Power System should contain redundant Power Supply Modules.

Continued on next page

Redundant HPMMs in a single cabinet

Figure 2-25 is an illustration of a single High-Performance Process Manager cabinet containing two HPMM card files in a redundant HPMM configuration and one IOP card file. The HPMM card files and the IOP card file share the same Power System.

Figure 2-25 Single Cabinet with Redundant HPMMs

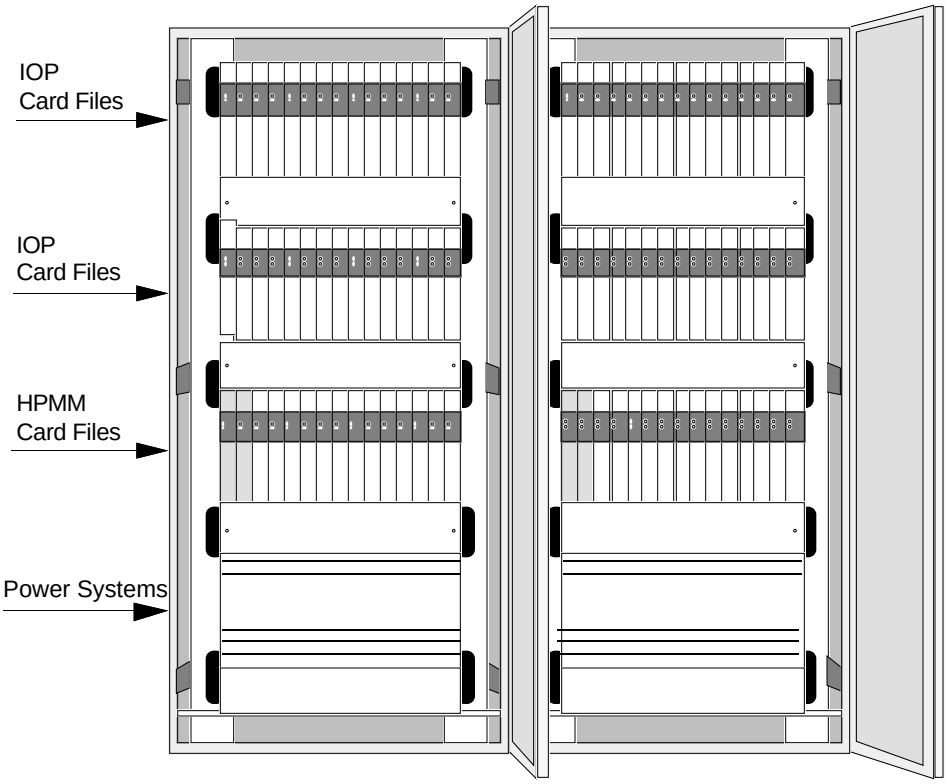


Continued on next page

Redundant HPMMs in complexed cabinets

Two cabinets that are complexed together is illustrated in Figure 2-26. The redundant pair of HPMM card files are installed in separate cabinets. The purpose is to provide independent power for the HPMM card files and their associated IOP card files.

Figure 2-26 Complexed Cabinets with Redundant HPMMs

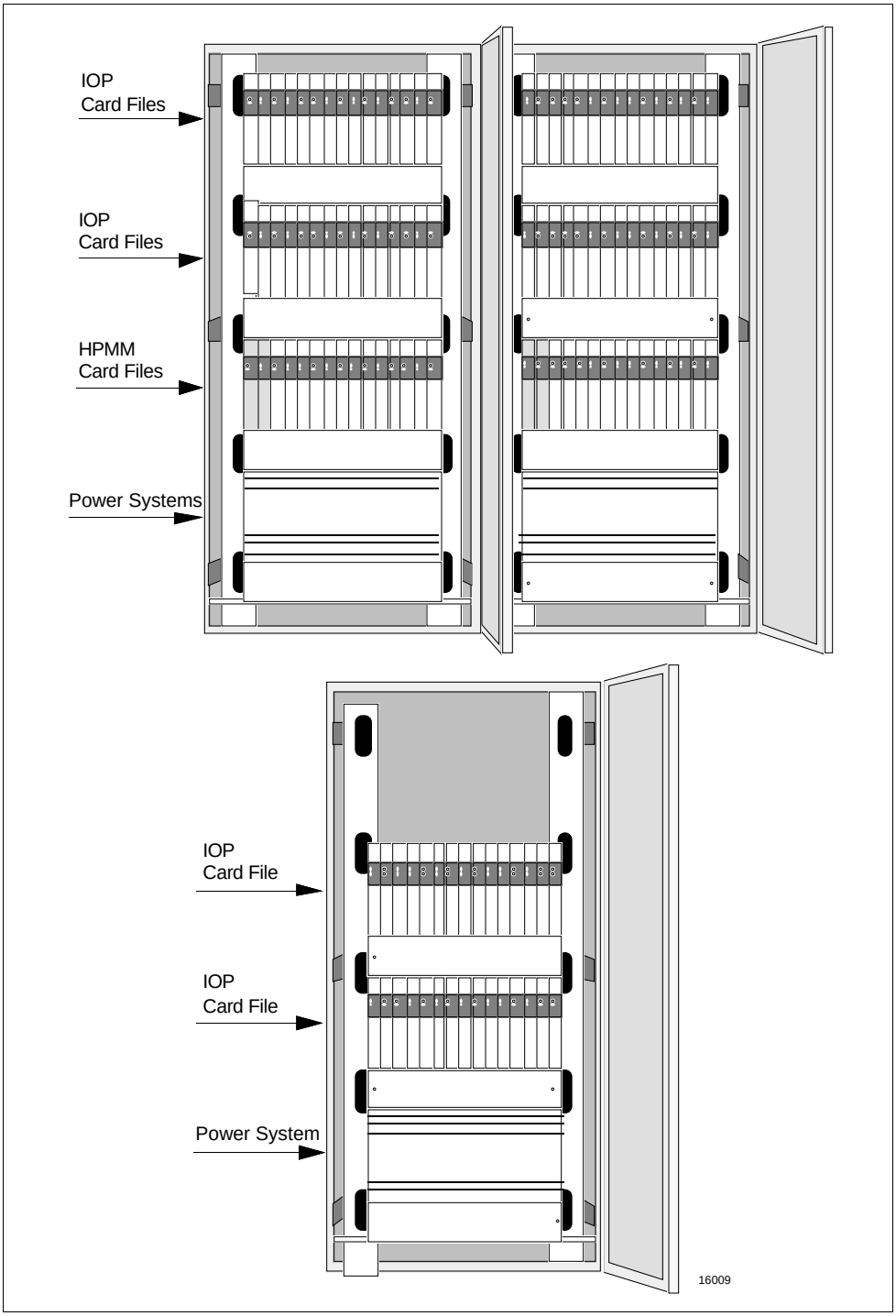


Continued on next page

Local and remote HPM cabinets

Figure 2-27 illustrates a 2-cabinet complex with redundant HPMM card files and a remote cabinet that contains IOP card files. Communication with the remote cabinet is provided by fiber optic I/O Link Extenders.

Figure 2-27 Local Complexed Cabinets with Redundant HPMMs and a Remote I/O Cabinet



Section 3 – Power Requirements

3.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
3.1	Overview	45
3.2	Backup Strategy	46
3.3	Quality	48
3.4	Power Draw	51
3.4.1	Typical 24 Vdc Power Draw Calculations	53
3.4.2	Single Power System Calculation Example	58
3.4.3	Dual Power System Calculation Example	59
3.4.4	HPM AC Power Draw	60
3.4.5	Crest Factor	61
3.4.6	Inrush Current	62
3.5	Substation Sizing	64
3.6	Circuit Breaker Sizing	65
3.7	Custom UPS and Power Factor	66
3.8	Automatic Bypass Switch	66
3.9	Surge Protection	67
3.10	Grounded Conductor	68
3.11	Redundant Safety Grounds	68
3.12	Emergency Shutdown	68
3.13	Trays and Conduits	68
3.14	Existing TPS System AC Power	69

Introduction

This section provides the user with information to plan adequate ac power service for his High-Performance Process Manager (HPM) subsystem. The section also aids the user in planning a power backup strategy when the primary source fails.

Power backup planning

A well planned power system for the High-Performance Process Manager minimizes subsystem downtime. In this section, we explore various paths for handling the loss of subsystem ac power. The selected path dictates whether a given HPM needs the optional dual Power Supply Modules and/or a battery backup for the 24 Vdc. This definition of the power equipment in an HPM allows the ac power system requirements to be defined in detail.

3.2 Backup Strategy

Planning strategy

There are several planning strategies for handling a loss of ac power to the HPM. This strategy takes advantage of any or all of the following:

- An optional battery backup for the 24 Vdc
- An optional secondary Power Supply Module
- An optional automatic ac transfer switch
- An Uninterruptible Power Supply (UPS)

Power continuity

Power continuity is established by the use of the optional battery backup for 24 Vdc. This battery backup option is available with the redundant Power Supply Module option. When an ac power loss occurs, the battery carries a full load of 20 amperes for minimum of 25 minutes. If 25 minutes is not sufficient, consider another backup source to provide ac power.

Two ac power sourcing methods

There are two methods in which two separate sources of ac power for an HPM subsystem can be implemented.

First method

The first method takes advantage of the HPM's redundant Power Supply Module option. The two Power Supply Modules can be wired to operate from two separate ac feeder sources as illustrated in Figure 3-1 or 3-2. The two ac feeder sources do not have to be of the same phase, frequency, voltage, or from the same service as long as each meets the power quality requirements discussed in subsection 3.3.

Second method

The second method, by which two ac feeder sources can be implemented, is through an automatic transfer switch. The HPM does not need redundant Power Supply Modules or dual ac feeders for this approach because the transfer switch provides only one ac output. The automatic transfer switch can detect an ac failure and execute a transfer of its load from one service to another in 5 milliseconds. The HPM will perform without compromise even if this cycle requires 10 milliseconds.

Better continuity of HPM power

The use of the battery backup option in an HPM with redundant Power Supply Modules further enhances the continuity of power.

Continued on next page

Uninterruptible Power Supply (UPS)

A second source of ac power can come from a public utility, another plant, or can be generated from an Uninterruptible Power Supply (UPS). In any case, an automatic or manual transfer switch is needed to complete the installation. Consider the case in which a nearby public utility ac feeder provides backup for the process facility steam plant. An automatic transfer switch should be installed to transfer from the steam plant's ac feeder to the public utility's ac feeder. A switch with maximum transfer time of 10 ms in both directions is recommended. The UPS offers even more possibilities.

UPS description

The UPS consists of a battery charger, a large battery, and a chopper to convert the battery's dc power into quality ac power. The UPS is always on and is always supplying power to its load through the battery that is on a float charge. Should the ac input fail, the UPS continues to serve the load without any changes and it will continue to operate until the battery is discharged, or the ac input to the UPS charger is restored. The capacity of the battery pack is specified by the UPS manufacturer and will provide many hours of backup.

UPS transfer switches

The UPS usually has two transfer switches. A switch on the output of the UPS automatically transfers the loads to plant power in case of failure in the UPS. A second transfer switch to the UPS input charger allows manual transfer to public utility power if there is extended failure of plant power. A UPS with two ac sources provides the means for several backup strategies. The HPM offers additional permutations with its optional redundant Power Supply Modules, dual-feeds, and battery backup. The need for all of this backup redundancy depends on how important it is to have a working control system when plant power is out for an extended period.

Power quality

After the overall power system strategy is selected, the quality and the quantity of power must next be determined.

3.3 Quality

Quality requirements

The HPM is typically connected to ac power as illustrated in Figure 3-1 or 3-2. It operates on any ac source that meets the following requirements:

- Voltage: 100-132/187-264 Vac, single phase
- Frequency: 47-63 Hz
- Total Harmonic Distortion (THD): 8% maximum
- Power dropout: 10 ms maximum

Verification

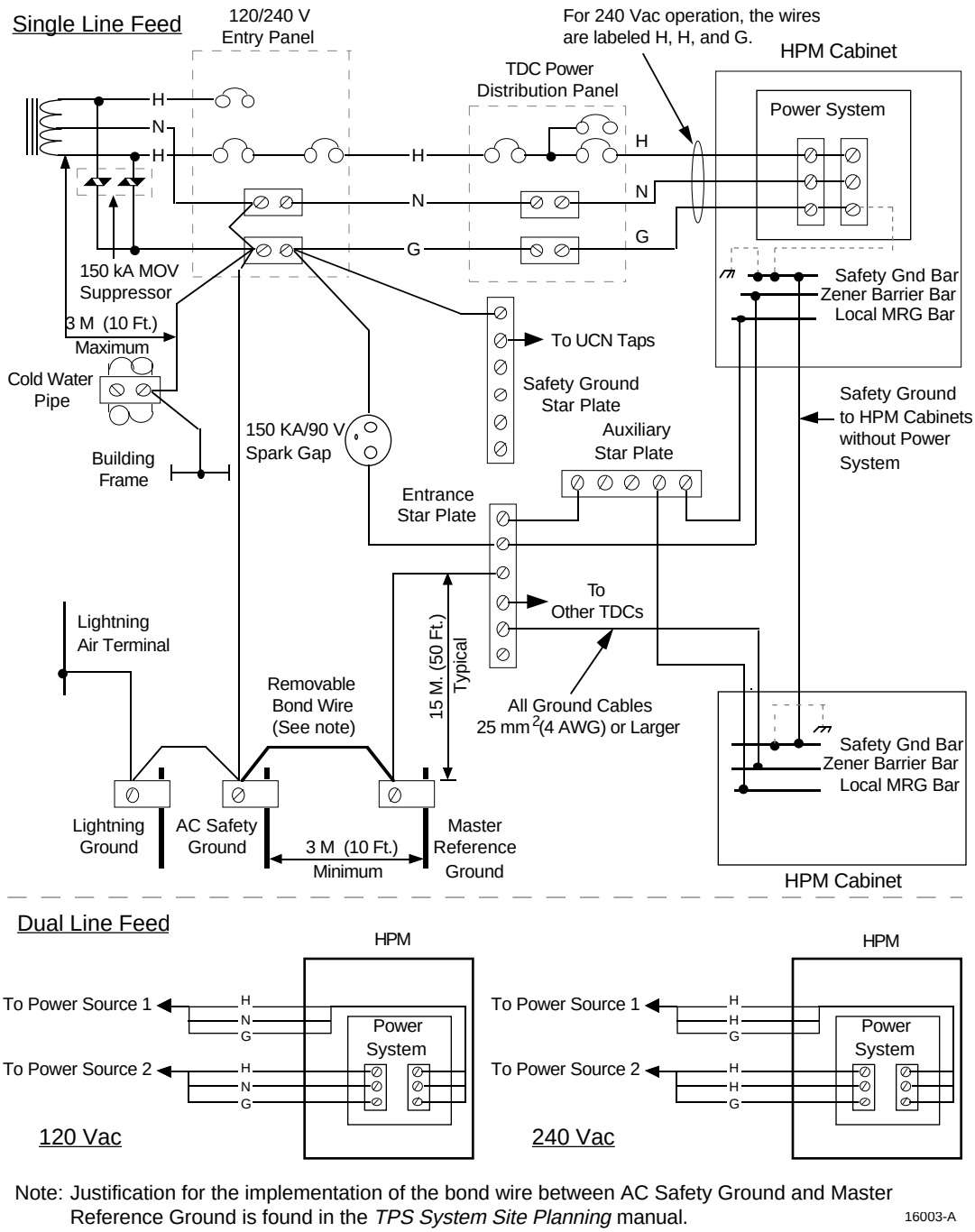
Techniques and equipment for verifying the above electrical power system parameters are described in the *High-Performance Process Manager Checkout* manual. Existing instrument power at most sites usually meets the above requirements.

Continued on next page

AC power and ground

Figure 3-1 illustrates the ac power and ground connections for a typical multi-ground HPM installation that includes Master Reference Ground (MRG). The ground system is non-CE Compliant.

Figure 3-1 Subsystem AC Power and Ground Connections—Multi-Ground System



Note: Justification for the implementation of the bond wire between AC Safety Ground and Master Reference Ground is found in the *TPS System Site Planning* manual.

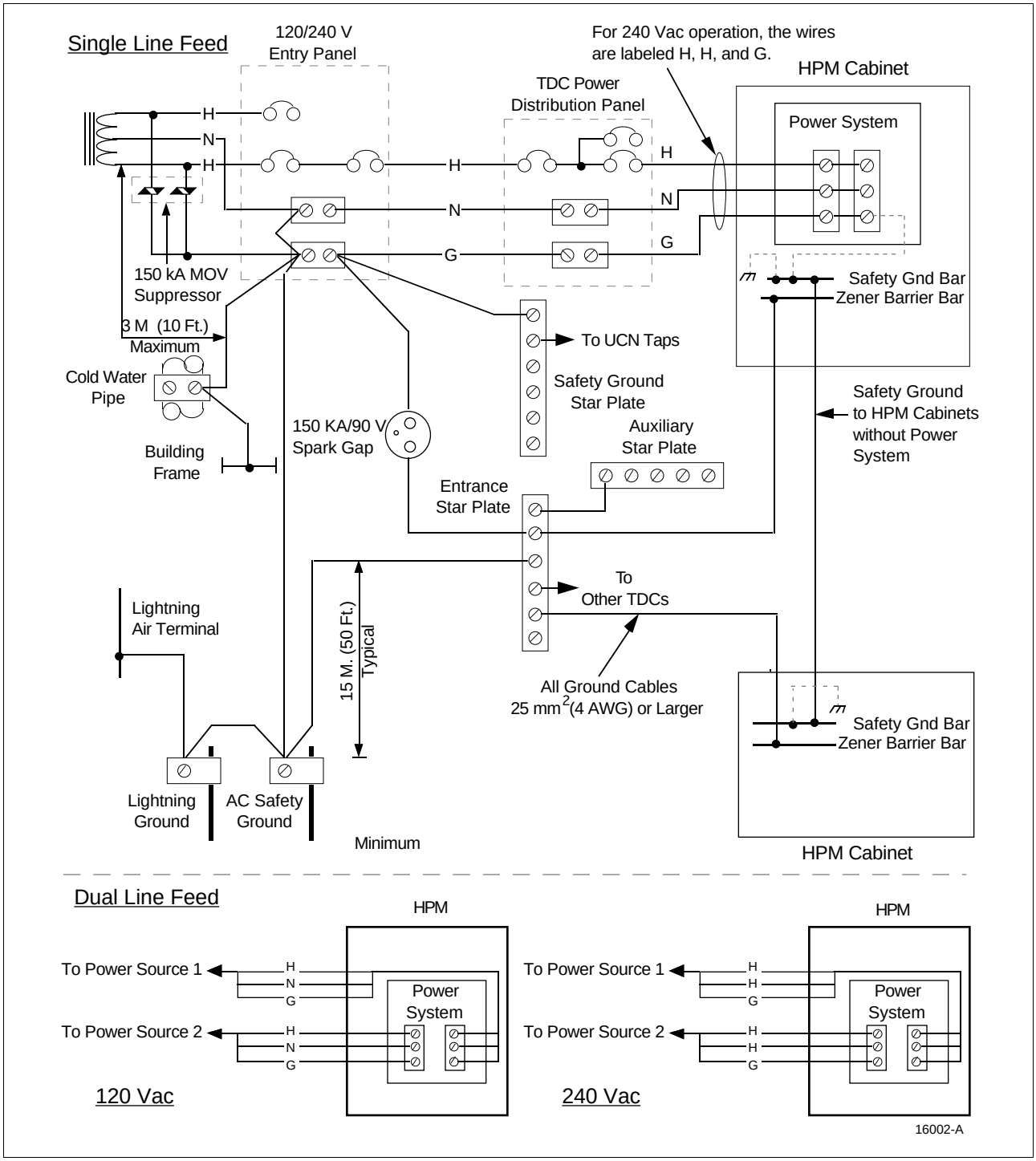
16003-A

Continued on next page

AC power and ground

Figure 3-2 illustrates the ac power and ground connections for a typical single-ground HPM installation that is designated Safety Ground. The Safety Ground system is CE Compliant.

Figure 3-2 Subsystem AC Power and Ground Connections—Single-Ground System



3.4 Power Draw

Introduction

The power requirements for a High-Performance Process Manager (HPM) can necessitate the installation of one or more Power Systems in a cabinet complex. This requirement depends on the number and types of High-Performance Process Manager Modules (HPMMs), Input Output Processors (IOPs), and Field Termination Assemblies (FTAs) in the subsystem. In a large High-Performance Process Manager subsystem with redundant HPMMs and redundant IOPs, it may be desirable to install the HPMMs in separate cabinets with a Power System in each cabinet. With this configuration, a power failure in one Power System does not result in the failure of both the primary and secondary HPMMs and IOPs.

Power loading and initial inrush

Other considerations are the nonlinear loading and initial inrush that the Power System subassembly applies to the ac source when power is applied.

Fuse clearing

Clearing of the fuse (3 A) in the High-Performance I/O Link card in the HPMM may require additional current that a single Power Supply cannot adequately provide; therefore, a Power System with redundant Power Supply Modules is recommended.

Power System load requirements

Each Power System's load requirements must be examined as a function of the options that are installed in the High-Performance Process Manager. These demands are discussed in the *TPS System Site Planning* manual.

Power System considerations

Each Power System can provide up to 20 A of 24 Vdc power. By calculating the total current requirement, you can determine how many Power Systems are required. If more than one Power System is required, it may be desirable to connect each High-Performance Process Manager Module (HPMM) to a separate Power System. It may also be desirable to connect the "A" IOP and "B" IOP of a redundant pair to separate Power Systems.

Previously, Figure 2-25 illustrated a typical High-Performance Process Manager subsystem with redundant HPMMs in the same cabinet. Figure 2-26 illustrated a typical large subsystem in a cabinet complex with the redundant HPMMs in separate cabinets. Figure 2-25 illustrated a local cabinet complex with the redundant HPMMs in separate cabinets, and a remote cabinet with IOP card files.

Continued on next page

Provide adequate power

Generally, power for a subsystem with redundant HPMMs with up to 35 IOPs can be adequately provided by one Power System. A subsystem with redundant I/O may need additional Power Systems. The power calculation is made using the information provided in this subsection.

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

3.4.1 Typical 24 Vdc Power Draw Calculations

Overview

Two examples of +24 Vdc power requirement calculations are illustrated in subsections 3.3 and 3.4. The Single Power System Example assumes a single cabinet with a dedicated Power System. The Dual Power System Example assumes a dual cabinet complex with each cabinet having a dedicated separate Power System.

Power calculation procedure

The calculations are based on the power requirements of the assemblies listed in Table 3-1. The current requirements are based on the typical maximum, assuming all channels are in use. Use the following steps to calculate the number of each type of IOP and associated FTA that an individual Power System must support.

1. Determine the number of channels needed for each type of IOP and associated FTA. Divide the total number by the number of channels that are available in the IOP. For example, using Table 3-1, if 256 High Level Analog Input (HLAI) IOP channels are needed, 16 IOPs and FTAs are required (256 channels ÷ 16 channels per IOP = 16 IOPs and 16 FTAs).
2. Multiply the number of IOPs by the current requirement for the type of IOP. For example, 16 model MU-PAIH02 HLAI IOPs require 2928 mA (16 HLAI IOPs x 183 mA = 2928 mA or 2.928 A). The current requirement is added to the **Total Module Current** for the Power System.
3. Multiply the number of FTAs by the current requirement for the type of FTA. For example, 16 model MU-TAIH12/52 HLAI FTAs require 5120 mA (16 HLAI FTAs x 320 mA = 5120 mA or 5.12 A). The current requirement is added to the **Total Module Current** for the Power System.
4. If redundant IOPs are required in the same Power System, double the IOP type count. For example, 16 redundant HLAI channels, A and B, require two IOPs (16 channels ÷ 16 channels per IOP x 2 = 2 IOPs). When the redundant IOPs reside in separate Power Systems, half the IOP power requirement is added to each Power System's Module Current power requirement (IOP A and IOP B).
5. To determine the **Total Module Current**, add together the total current for both the IOPs and their associated FTAs. For example, using Table 3-1, 256 HLAI channels require 2928 mA of IOP current and 5120 mA of FTA current (256 HLAI channels = 2928 mA+ 5120 mA = 8048 mA or 8.048 A).

Continued on next page

3.4.1 Typical 24 Vdc Power Draw Calculations, Continued

Assembly 24 Vdc power usage

Table 3-1 is a list of the power usage for High-Performance Process Manager assemblies.

Table 3-1 HPM Assembly 24 Vdc Power Usage

Description	Model Number	Channels	Assembly Current (Milliamps)
Left 7-Slot Card File—Slots 1-7, non-CE Compliant	MU-HPFH01	N/A	0
Left 7-Slot HPMM Card File—Slots 1-7, CE Compliant	MU-HPFH03	N/A	0
Right 7-Slot Card File—Slots 9-15, non-CE Compliant	MU-HPFH11	N/A	0
Right 7-Slot HPMM Card File—Slots 9-15, CE Compliant	MU-HPFH13	N/A	0
15-Slot Card File—Slots 1-15, non-CE Compliant	MU-HPFX02	N/A	0
15-Slot HPMM Card File—Slots 1-15, CE Compliant	MU-HPFX03	N/A	0
Left 7-Slot IOP Card File—Slots 1-7, CE Compliant	MU-HPFI03	N/A	0
Right 7-Slot IOP Card File—Slots 9-15, CE Compliant	MU-HPFI13	N/A	0
15-Slot IOP Card File—Slots 1-15, CE Compliant	MU-HPFI23	N/A	0
IOP Card File	MU-IOFX02	N/A	0
Nonredundant HPMM Card Set	MU-HPMS01	N/A	1375
Redundant HPMM Card Set	MU-HPMR01	N/A	2700
LLAI IOP Card	MU-PAIL02	8	58
LLMux IOP Card	MU-PLAM02	16	70
RHMUX IOP Card (requires an IS or NI Power Adapter)	MU-PRHM01	32	100
HLAI IOP Card	MU-PAIH02	16	183
HLAI IOP Card	MU-PAIH03	16	155
STI IOP Card	MU-PSTX02	16	100
STIM IOP Card	MU-PSTX03	16	100
AO IOP Card	MU-PAOX02	8	100
AO IOP Card	MU-PAOX03	8	100
AO IOP Card	MU-PAOY22	16	112
DI IOP Card	MU-PDIX02	32	90
DI IOP Card	MU-PDIY22	32	89
DISOE IOP Card	MU-PDIS11	32	210
DISOE IOP Card	MU-PDIS12	32	210
DO IOP Card	MU-PDOX02	16	64
DO IOP Card	MU-PDOY22	32	98

Continued on next page

Assembly 24 Vdc power usage, continued

Table 3-1 HPM Assembly 24 Vdc Power Usage, Continued

Description	Model Number	Channels	Assembly Current (Milliamps)
PI IOP Card	MU-PPIX02	8	208
SDI IOP Card	MU-PSDX02	2	70
SI IOP Card	MU-PSIM11	2	70
LLAI FTA	MU-TAIL02	8	350
LLAI FTA	MU-TAIL03	8	350
LLMux—RTD FTA	MU-TAMR02	16	185
LLMux—RTD FTA	MU-TAMR03	16	185
LLMux—TC/Local CJR FTA	MU-TAMT02	16	185
LLMux—TC/Local CJR FTA	MU-TAMT03	16	185
LLMux—TC/Remote CJR FTA	MU-TAMT12	16	185
LLMux—TC/Remote CJR FTA	MU-TAMT13	16	185
RHMUX—TC/Local CJR FTA (ISPA or NIPA provides power to FTA)	MC-GRMT01	16	0
RHMUX GI/IS Power Adapter (ISPA)	MU-GRPA01	32 *	300
RHMUX GI/NI Power Adapter (NIPA)	MU-TRPA01	32 *	575
HLAI/STI FTA	MU-TAIH02	16	320
HLAI FTA	MU-TAIH03	16	320
HLAI/STI FTA	MU-TAIH12/52	16	320
HLAI FTA	MU-TAIH13/53	16	320
HLAI/STI FTA	MU-TAIH22/62	16	320
HLAI FTA	MU-TAIH23	16	320
STI FTA	MU-TSTX03	16	320
STI FTA	MU-TSTX13/53	16	320

* An RHMUX Power Adapter provides the interface between one RHMUX IOP and one or two RHMUX FTAs. Each RHMUX FTA has 16 input channels providing a total of 32 inputs for the RHMUX subsystem.

Continued on next page

Assembly 24 Vdc power usage, continued

Table 3-1 HPM Assembly 24 Vdc Power Usage, Continued

Description	Model Number	Channels	Assembly Current (Milliamps)
AO FTA	MU-TAOX02	8	160
AO FTA	MU-TAOX12/52	8	171
AO FTA	MU-TAOY22/52	16	324
AO FTA	MU-TAOY23/53	16	324
24 Vdc DI FTA	MU-TDID12/52	32	408
24 Vdc DI FTA	MU-TDID72	32	410
24 Vdc Power Distribution Assembly	MU-TDPR02	12	200
24 Vdc DI FTA	MU-TDIY22/62	32	196
120 Vdc DI FTA	MU-TDIA12/52	32	192
120 Vdc DI FTA	MU-TDIA72	32	200
240 Vdc DI FTA	MU-TDIA22/62	32	192
24 Vdc Nonisolated DO FTA	MU-TDON12/52	16	0
24 Vdc Isolated DO FTA	MU-TDOY22/62	32	004
3-30 Vdc Solid-State DO FTA	MU-TDOD12/52	16	160
3-30 Vdc Solid-State DO FTA	MU-TDOD13/53	16	160
3-30 Vdc Solid-State DO FTA	MU-TDOD14/54	16	160
31-200 Vdc Solid-State DO FTA	MU-TDOD22/62	16	160
5-200 Vdc Solid-State DO FTA	MU-TDOD23/63	16	160
24-240 Vac Solid-State DO FTA	MU-TDOA12/52	16	160
120/240 Vac Solid-State DO FTA	MU-TDOA13/53	16	160
120 Vac/125 Vdc Relay DO FTA	MU-TDOR12/52	16	470
240 Vac/125 Vac Relay DO FTA	MU-TDOR22/62	16	470
240 Vac/125 Vac Relay DO FTA	MU-TDOY23/63	16	228
PI FTA	MU-TPIX12/52	8	136

Continued on next page

Assembly 24 Vdc power usage, continued

Table 3-1 HPM Assembly 24 Vdc Power Usage, Continued

Description	Model Number	Channels	Assembly Current (Milliamps)
SDI FTA—Toledo Scale Cell	MU-TSDT02	1	65
SDI FTA—Manual/Auto Station	MU-TSDM02	1	65
SDI FTA—UDC6000	MU-TSDU02	1	65
Manual/Auto Station	MU-MASX02	N/A	800
SI FTA—Allen-Bradley	MU-TSIA12	1	65
SI FTA—Modbus	MU-TSIM12	1	65
Power Adapter (LLMux, SDI, SI FTAs)	MU-TLPA02	2	360
Galvanically Isolated HLAI FTA	MU-GAIH12/82	16	1200
Galvanically Isolated HLAI/STI FTA	MU-GAIH13/83	16	1200
Galvanically Isolated HLAI/STI FTA	MU-GAIH14/84	16	1200
Galvanically Isolated HLAI FTA	MU-GAIH22/92	16	1200
Galvanically Isolated AO FTA	MU-GAOX02/72	8	440
Galvanically Isolated AO FTA	MU-GAOX12/82	8	440
Galvanically Isolated 24 Vdc DI FTA	MU-GDID12/82	32	800
Galvanically Isolated 24 Vdc DI FTA	MU-GDID13/83	32	800
Galvanically Isolated 24 Vdc DO FTA	MU-GDOD12/82	16	1800
Galvanically Isolated 24 Vdc DO FTA	MU-GDOL12/82	16	1800
Combiner Panel	MU-GLFD02	N/A	0
Marshalling Panel	MU-GMAR02	N/A	0
Galvanic Isolation Power Distribution Assembly	MU-GPRD02	N/A	160
Long Distance I/O Link Extender Cards/Couplers	MU-ILDX02	N/A	300
Long Distance I/O Link Extender Cards/Couplers	MU-ILDX03	N/A	300
Standard I/O Link Extender Cards/Couplers	MU-IOLM02	N/A	196
Standard I/O Link Extender Cards/Couplers	MU-IOLX02	N/A	190
Analog Output Standby Manual with case	MU-SMAC02	4	250
Analog Output Standby Manual - Digital	51401926-100	8	2200
Digital Output Standby Manual with case	MU-SMDC02	16	70
Digital Output Standby Manual without case	MU-SMDX02	16	100

3.4.2 Single Power System Calculation Example

Power calculation example

The following example in Table 3-2 meets the requirement that the total calculated current for an individual Power System be less than, or equal to 20 amperes.

Table 3-2 Single Power System Calculation Example

Assemblies	Total IOP/Module Current	Total FTA Current
Redundant HPMMs	2.700 A	N/A
High Level Analog Input (HLAI) IOPs, nonredundant (256 channels ÷ 16 channels/IOP = 16 IOPs x 183 mA = 2928 mA) (16 FTAs x 320 mA = 5120 mA)	2.928 A	5.120 A
High Level Analog Input (HLAI) IOPs, redundant A & B (16 channels x 2 = 32 channels ÷ 16 channels/IOP = 2 IOPs x 183 mA = 366 mA) (1 FTA x 320 mA = 320 mA)	0.366 A	0.320 A
Analog Output (AO) IOPs, nonredundant (120 channels ÷ 8 channels/IOP = 15 IOPs x 100 mA = 1500 mA) (8 FTAs x 171 mA = 1368 mA)	1.500 A	1.368 A
Analog Output (AO) IOPs, redundant A & B (16 channels x 2 = 32 channels ÷ 8 channels/IOP = 4 IOPs x 100 mA = 400 mA) (2 FTAs x 171 mA = 342 mA)	0.400 A	0.342 A
Subtotals	7.894 A	7.150 A

Total Power System Current = 7.894 + 7.150 = 15.044 A

3.4.3 Dual Power System Calculation Example

Calculation examples

The following examples in Table 3-3 and 3-4 meet the requirement that the total calculated current for an individual Power System be less than, or equal to 20 amperes.

Power System 1 calculation

Table 3-3 Dual Power System Calculation Example (Power System 1)

Power System 1		
Assemblies	**Total IOP/Module Current**	**Total FTA Current**
Single HPMM	1.375 A	N/A
High Level Analog Input (HLAI) IOPs, nonredundant (80 channels ÷ 16 channels/IOP = 5 IOPs x 183 mA = 915 mA) (16 FTAs x 320 mA = 5120 mA)	0.915 A	1.600 A
High Level Analog Input (HLAI) IOPs, redundant A (240 channels = 16 channels/IOP = 15 IOPs x 183 mA = 2740 mA) (15 FTA x 320 mA = 4800 mA)	2.740 A	4.800 A
Analog Output (AO) IOPs, nonredundant (40 channels ÷ 8 channels/IOP = 5 IOPs x 100 mA = 500 mA) (5 FTAs x 171 mA = 855 mA)	0.500 A	0.855 A
Analog Output (AO) IOPs, redundant A (120 channels ÷ 8 channels/IOP = 15 IOPs x 100 mA = 1500 mA) (15 FTAs x 171 mA = 2565 mA)	1.500 A	2.565 A
Subtotals	7.030 A	9.820 A

Total Power System 1 Current = 7.03 + 9.82 = 16.85 A

Continued on next page

3.4.3 Dual Power System Calculation Example, Continued

Power System 2 calculation

Table 3-4 Dual Power System Calculation Example (Power System 2)

Power System 2		
Assemblies	**Total IOP/Module Current**	**Total FTA Current**
Single HPMM	1.375 A	N/A
High Level Analog Input (HLAI IOPs, redundant B (240 channels = 16 channels/IOP = 15 IOPs x 183 mA = 2740 mA) (15 FTA x 320 mA = 4800 mA)	2.740 A	4.800 A
Analog Output (AO) IOPs, redundant B (120 channels ÷ 8 channels/IOP = 15 IOPs x 100 mA = 1500 mA) (15 FTAs x 171 mA = 2565 mA)	1.500 A	2.565 A
Subtotals	6.615 A	7.365 A

Total Power System 2 Current = 6.615 + 7.365 = 13.98 A

3.4.4 HPM AC Power Draw

Introduction

After you have determined the number of Power Systems that will be required, the subsystem's ac power, substation sizing requirement, and heat generation can be determined.

Maximum power requirements

Provide enough power for fully loaded HPM Power Systems rather than designing only for the existing dc power loads. A Power System with redundant Power Supply Modules that is providing 20 amperes of 24 Vdc power and is charging its 48 vdc backup battery has an ac line draw of 7.6 amperes rms at 120 Vac.

A Power System with a single Power Supply Module that has a 20 ampere 24 Vdc load has an ac line draw of 7.1 amperes rms at 120 Vac.

When operating at 240 Vac, halve the ac current requirement.

3.4.5 Crest Factor

Introduction

Power Systems that were manufactured before November 1994 used a Power Supply Module that is black-colored and was manufactured by the Cherokee Company. The Power Supply Module has a higher crest factor than the Power Supply Module that is currently used in the Power System. The current Power Supply Module is silver-colored and manufactured by Bikor Corporation.

Early production Power Supply Module

The crest factor for the black-colored Cherokee Power Supply Module is 2.2. This means that the current draw from the ac power line is not sinusoidal but has a peak value of 2.2 times the rms current value.

A linear load has a peak current value of 1.414 times the rms value; therefore, the peak value of the current draw from the ac line for this type of Power Supply Module is 1.6 times higher than it would be if the Power Supply Module is a perfectly linear load.

Later production Power Supply Module

The crest factor for the silver-colored Bikor Power Supply Module is 1.7 (worst case). The peak current drawn from the ac power line is 1.7 times the rms current value. The peak value of the current draw from the ac line for the Power Supply Module is 1.2 times higher than it would be if the Power Supply Module is a perfectly linear load.

AC power source sizing

Size the ac substation transformer and/or the UPS to accommodate peak current rather than rms current. This will prevent a distortion problem in the line voltage that is caused by current spikes in the load. Circuit breakers and conductors are still sized by using rms values.

The substation transformer and/or UPS may be providing power to different loads at the facility that have different crest factors. To properly size the substation transformer and/or UPS, you must calculate a crest factor for the aggregate load. To do this, calculate the total peak current and the total rms current for all the loads. The aggregate load crest factor is the ratio of these two values.

3.4.6 Inrush Current

Introduction

This discussion assumes that the Power Supply Module is operating from a 120 Vac line source.

Power systems that were manufactured before November 1994 used a Power Supply Module that was black-colored and was manufactured by the Cherokee Company. The Power Supply Module has a higher inrush current than the Power Supply Module that is currently used in the Power System. The current Power Supply Module is silver-colored and manufactured by Bikor Corporation.

Early production Power Supply Module

When power is initially applied, the black-colored Cherokee Power Supply Module has a worst case instantaneous peak inrush of 85 amperes that declines to 27 amperes peak within two milliseconds. Within five seconds, it then declines to the normal operating repetitive peak current.

For 240 volt operation, the inrush current is doubled.

Two Power Supply Modules on the same circuit breaker will draw twice as much current.

Later production Power Supply Module

The silver-colored Bikor Power Supply Module has an inrush current of 35 amperes for the first half-cycle. After initially applying power to the Power Supply Module, the current diminishes during each half-cycle until the steady-state current is reached within five ac line cycles.

Two Power Supply Modules on the same circuit breaker will draw twice as much current.

Continued on next page

Solving the Inrush problem

A substation or UPS can handle the Inrush current by using one of several methods:

- When powering up a large system with many devices, the surge is large and the ac source may take 10 cycles or more to reach specifications; however, because the system is not operational, a slow power-up is not important.
- A substation transformer or a UPS may already include an inherent surge allowance, such as a 50% overload capability while meeting all other specification requirements.
- A larger substation may be purposely selected to include the Inrush as steady state current. For example, applying power to a redundant HPM Power System creates an Inrush of 54 amperes peak. Because the redundant Power Supply Modules already requires a steady state operating current of 8.6 amperes ac rms with a Crest Factor of 2.09, the substation already provides (8.6 x 2.09 =) 18 amperes peak. Therefore, the example substation needs to be increased in size by (54 - 18 =) 36 amperes peak to handle the surge to service the particular HPM Power System.
- When the UPS is too small to provide a workable Inrush capability, it can be split into even smaller units so that each HPM has its own unit. As such, servicing an HPM may cause a momentary fold-back of its UPS, but the other units are unaffected.

The following discussion on substation sizing considers all the previous current requirements and allows an extra 36 amperes peak for Inrush to service one redundant HPM Power Supply Module at a time. The discussion also assumes that the current production silver-colored Bikor Power Supply Module is in use.

3.5 Substation Sizing

Conversion example

The published current rating for a substation transformer or UPS is created with the assumption that it will be used for a linear load. A linear load has a Crest Factor of $\sqrt{2}$. Because the load Crest Factor for electronic equipment is not $\sqrt{2}$, conversion is required. This is accomplished by converting all the TPS system rms amperages to peak values as illustrated in the following example.

Load Description	RMS Draw (Amperes)	Crest Factor	Peak Draw (Amperes)
HPMMs (5)	38.0	1.7	38 x 1.7 = 64.6
Operator Console CRTs	35.0	2.27	35 x 2.27 = 79.5
Subtotals	73.0		144.1
Future Expansion	x 1.33		x 1.33
HPM Inrush Allowance			36.0
Total	97.0		228.0

No Inrush allowance for the LCN Operator Console is required. The soft-start power supplies have a maximum Inrush of 10 amperes, so they are easily accommodated by the 36 ampere allowance for the HPMs.

The 228 ampere peak is derated by $\sqrt{2}$ for the purpose of selecting a transformer; thus, a 161 ampere (228 amperes peak $\div \sqrt{2}$) linear-load handling capacity transformer is required. In other words, it is now known that a 161 linear-ampere ac rms transformer can deliver the required 228 ampere peaks.

You will need a 20 kVA (120 V x 161 A) transformer, either for 120 V, 240 V, or 208 V line-to-line grounded Y. Conductors and breakers are sized using the 97 amperes rms calculation.

Substation and UPS requirements

As previously calculated, an off-the-shelf substation or UPS must have a Volt-Amperes (VA) capacity that is significantly greater than the rms total for the load. A custom designed substation or UPS can be designed so that the peak and RMS requirements for electronic loads coincide. Significant economies are possible. See subsection 3.7.

3.6 Circuit Breaker Sizing

AC feeder

For an HPM with one 24 Vdc Power Supply Module, one ac feeder is used. With two Power Supply Modules, one or two feeders may be used. See Figure 3-1 or 3-2.

Circuit breakers

The ac feeder conductors require current limiting for protection. Circuit breakers used for this purpose are to be sized for the ac rms current and are not to be adjusted for the Crest Factor.

One Power Supply Module

An HPM with one 24 Vdc Power Supply Module requires one ac feeder and has a worst case ac line draw of 7.1 amperes ac rms. Local electrical codes usually require that the feeder circuit breaker be sized at 125% of its noncontinuous-plus-continuous load. The ac feeder requires a 10-ampere circuit breaker. This is the nearest common size that gives a 125% over sizing allowance.

Two Power Supply Modules

For an HPM with two 24 Vdc Power Supply Modules on one ac feeder, the total worst case draw is 7.6 amperes ac rms. Again, a 10-ampere circuit breaker is required.

Two Power Supply Modules on two ac feeders

For an HPM with two Power Supply Modules on two ac feeders, either Power Supply Module can draw 7.6 amperes ac rms, or there can be some random proportioning. As such, each feeder needs a 10-ampere circuit breaker. When using two Power Systems for one HPM, two ac feeders are required. Both Power Systems should be connected to both ac feeders.

ATTENTION

ATTENTION—Do not use a circuit breaker larger than 15 amperes. The Power System wiring is not rated to handle a larger feeder.

3.7 Custom UPS and Power Factor

Introduction

Frequently, the UPS and substation components are designed specifically for each installation. Significant economies are possible by specifying the load as thoroughly as possible. The designers will then optimize the design for the exact combination of ac rms current, repetitive peak current, Inrush, and distortion.

Power Supply Module power factor

Power systems that were manufactured before November 1994 used a Power Supply Module that was black-colored and was manufactured by the Cherokee Company. The current Power Supply Module is silver-colored and manufactured by Bikor Corporation. The black-colored Cherokee Power Supply Module has a power factor of 0.8 over a broad range of loads. The current silver-colored Bikor Power Supply Module has a power factor-correction feature incorporated into the design. Its power factor is greater than 0.95.

3.8 Automatic Bypass Switch

Introduction

An automatic bypass switch is often included in the power source to allow instantaneous transfer between two ac sources. Both the primary and backup power sources should be of instrument grade. Transfer to a substandard power source in an emergency does not always happen.

Transfer time requirement

The switch transfer time should be less than 10 milliseconds in both directions. This allows maintenance personnel to freely operate the switch without disturbing the operation. Additional discussion about transfer switches can be found in subsection 3.2.

3.9 Surge Protection

Introduction

Any instrument power distribution panel should have some transient protection. See Figure 3-1 or 3-2.

Protector usefulness

A protector is useful under the following conditions:

- Should an ac feeder develop a short circuit, its circuit breaker may not open until peak currents have reached 10,000 amperes or more. The sudden interruption of such a large current when a circuit breaker opens injects a severe transient into the rest of the electrical system.
- HPM servicing may require that the Power Supply Modules be turned off and on. Even at normal load currents, significant transients may be generated in the distribution panel.
- Lightning may strike the facility power feeder and send significant transients into the instrument system.

Power Supply Module performance

The HPM Power Supply Module is rated to perform to all its specifications while handling a variety of transients, such as a 3 kV impulse for 8 x 20 microseconds. This provides a safety factor to allow for feed through when the surge protector operates.

MOV protector

A Metallic Oxide Varistor (MOV) is the preferred power line protector. Compared to a protector based on a spark gap, the MOV protector does not short circuit the power along with the transient. Use a 150 kA unit. Overcapacity here does not carry a penalty.

A suitable protector can be purchased from Lightning Protection Corporation in Santa Barbara, CA at telephone number 805-967-5089. For a 120/240 Vac system, use Model 20208.

3.10 Grounded Conductor

Power source's grounded conductor

The power source to the HPM may or may not have a grounded conductor. This does not make any difference to the HPM as long as local electrical codes are satisfied.

3.11 Redundant Safety Grounds

Introduction

The electronics in the HPM are insulated from its enclosures. The use of metal conduits to the enclosures does not affect operation of the equipment. The placement of cabinets on metal floors, the bonding of the cabinets to metal floor supports, cabinets touching metal structure, or the purposeful installation of redundant safety grounds also does not effect the operation of the equipment.

Reference

Grounding is discussed in the *TPS System Site Planning* manual. Grounding also relates to lightning protection that is also discussed in the *TPS System Site Planning* manual.

3.12 Emergency Shutdown

Introduction

Electrical codes may require the ability to shut down system power from principal exit doors. This emergency shutdown requirement is satisfied most economically by placing the instrument power distribution panel within arm's length of the room exit. See the room layout in Figure 2-1.

3.13 Trays and Conduits

Raised floor

Power and signal wiring in the electronics room is easily accommodated by using a raised floor. The space underneath the floor becomes one large wiring tray. Power and signal cables for the HPM m ay be routed together as long as the cabling is approved for the circuits being handled. Contact or relay signals must be in shielded cables to prevent contact arcing from inducing Electromagnetic Interference (EMI) into other signal cables.

Continued on next page

3.13 Trays and Conduits, Continued

FTA cables

The 50-conductor FTA cables may exit the HPM cabinets and go to facility terminal panels that incorporate FTAs. This is discussed in detail in the *High-Performance Process Manager Installation* manual. The cables have 24 volts from a Class 1 Power Limited source as defined in the National Electrical Code (NEC) in the USA. This usually requires that the FTA cables are installed in their own trays (the connectors are too big to pull through conduit) if they leave the cabinet. The dedicated trays are considered as an extension of the HPM cabinet.

Field circuit

Field circuits are different. Most are limited in the FTAs to Class 2 Power Limited source requirements. This allows a great deal of freedom in their installation as discussed in the Section 5 of this manual.

Cable segregation

Refer to Figure 2-1 for the following discussion. Local codes may require that all wiring be placed in enclosed metal trays or conduit. It is then recommended that the circuits to an HPM be segregated into separate trays or compartment as follows:

- Power cables should be placed in one tray/conduit. The need for a cover depends on local codes. All safety ground conductors also use this tray. The ac circuit cables in this tray usually originate at the instrument ac distribution panel.
- Process signals at 30 volts ac/dc peak or less go into their own tray/conduit. This includes 1-5 V/4-20 mA, alarm contacts, UCN coaxial cables, and Master Reference Ground (MRG) cables. All signals in the tray usually originate at the 0-30 volt signal terminal panel.
- Signals above 30 volts, although normally considered as power circuits, should route through their own tray/conduit. All signals in this tray usually originate at the facility 31-250 volt signal terminal panel.
- FTA cables leaving cabinets usually need their own tray as discussed previously.

Intrinsic Safety

Intrinsic Safety systems with zener barriers or current limiting resistors usually require another conduit or tray compartment. This is covered in Section 5 of this manual.

3.14 Existing TPS System AC Power

Power compatibility

The power required for the HPM is compatible with power provided for all other TPS systems. Connect the HPM to existing TPS system's power when it is convenient.

Section 4 – Process Wiring

4.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
4.1	Overview	71
4.2	FTA Selection	72
4.3	Cabinet Entry	79
4.4	Signal Tray Wiring Compatibility	80
4.5	Process Wiring Termination	81

Introduction

The process control signal wires connect to the High-Performance Process Manager (HPM) at the Field Termination Assemblies (FTAs). The type of FTA selected is dependent upon the process equipment. There are 16 types of FTAs to choose from. Some of the FTA types support IOP redundancy. Some FTA types provide Galvanic Isolation and are for Intrinsically Safe applications.

ATTENTION

ATTENTION—In the past, it was a requirement that Galvanically Isolated, Intrisically Safe (GI/IS) FTAs had to be mounted on horizontally oriented FTA Mounting Channels in an HPM cabinet. The requirement is no longer needed because of component and design improvements.

Galvanically Isolated FTAs can now be mounted on vertically oriented FTA Mounting Channels; however, there is still a requirement that Galvanically Isolated FTAs and standard (non-Galvantically Isolated) FTAs, and the wiring to them, be properly separated in the cabinet.

Any FTA Mounting Channels on which Galvanically Isolated FTAs will be mounted must be installed in an inverted (upside down from the normal) position.

FTA mounting

FTAs are installed on FTA Mounting Channels that are located in the front of a single-access HPM cabinet, and in the rear and/or front of a dual-access cabinet. The number of FTA Mounting Channels that can be accommodated in a cabinet is dependent upon whether the cabinet is single access or dual access, and whether standard or wide FTA Mounting Channels are installed. See Section 8 or 9 for a detailed description of the cabinets and their FTA Mounting Channels.

Continued on next page

4.1 Overview, Continued

ATTENTION

The field wiring to Galvanically Isolated FTAs must be routed such that a strict 2-inch minimum separation is maintained between any other wiring, cable, or electrical part, or be separated by a divider that is grounded metal or nonconductive material.

FTA Mounting Channels

FTA Mounting Channels are available in two sizes, standard and wide, to better accommodate the amount of process control wiring that connects to the FTAs. The FTA Mounting Channels provide both a mounting surface for the FTAs and dual channels (troughs) to route the FTA to IOP cabling, and the process control wiring.

The standard (non-Galvanically Isolated) FTA to IOP or Power Distribution Assembly cabling is routed in the right channel, and the process control wiring is routed in the left channel. The reverse is true for Galvanically Isolated FTAs because the FTA Mounting Channel is installed in an inverted position.

Power Distribution and Marshalling Panels

The model MU/MC-GPRD02 Power Distribution Panel can be mounted on any FTA Mounting Channel that is installed in the normal or inverted position; however, proper wiring separation must be observed.

The model MU/MC-GMAR52 Marshalling Panel must not be mounted on an FTA Mounting Channel that has a Galvanically Isolated FTA mounted on it.

4.2 FTA Selection

Overview

The FTA has circuits that convert the process control signals to voltage and current levels that can be accommodated by the High-Performance Process Manager electronics. There are a number of FTA types with each type designed for a specific type of signal.

Rules

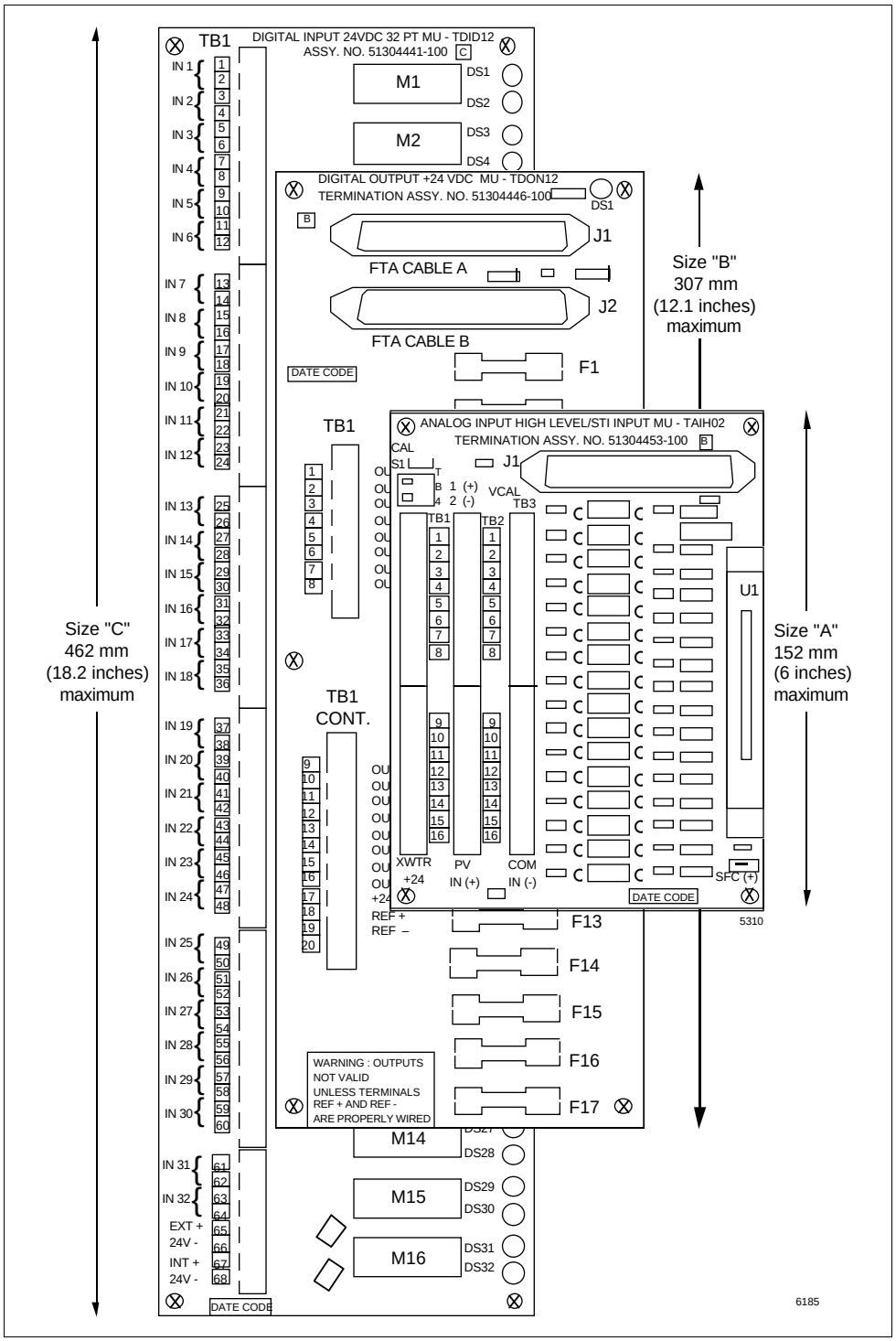
Rules for selecting the appropriate FTAs, installing, configuring, and the connections to the associated IOP and the process control signals, are discussed in detail in the *Process Manager I/O Installation* manual.

Continued on next page

FTA sizes

The assembly layouts of three physical sizes of FTAs are illustrated in Figure 4-1.

Figure 4-1 Field Termination Assembly (FTA) Sizes

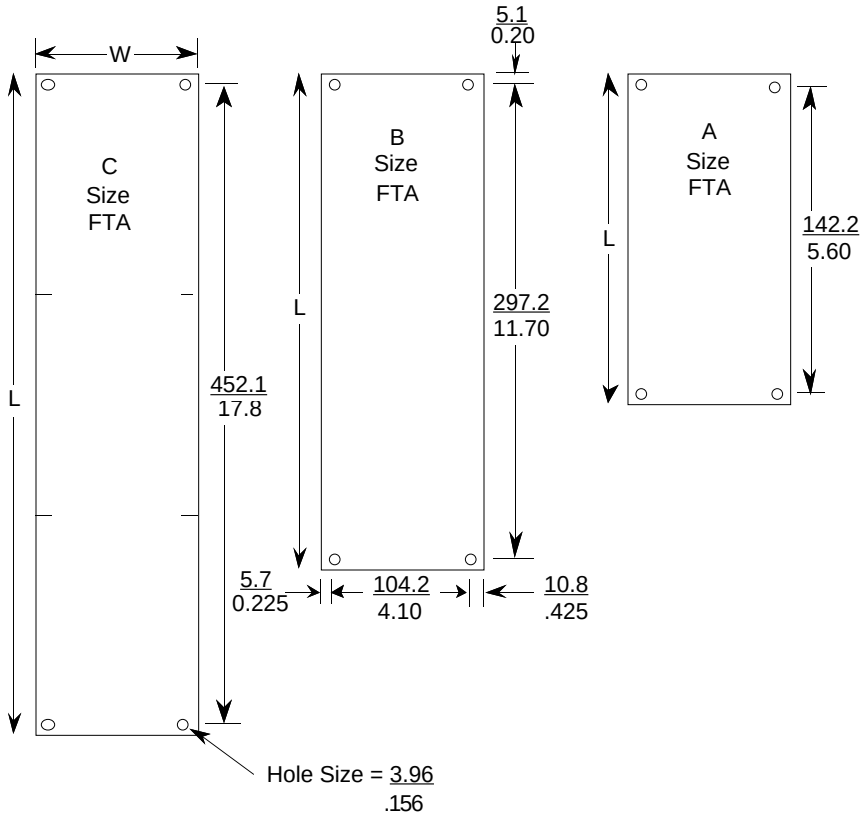


Continued on next page

FTA sizes, continued

As a function of the type and number of process control signals the FTA interfaces, FTAs are produced in three different sizes, size A, B, and C. The size dimensions are shown in Figure 4-2.

Figure 4-2 Field Termination Assembly (FTA) Mounting Dimensions



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

All measurements are in: millimeters / inches

Note:

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

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

2770

Continued on next page

FTA types

Because of FTA size differences, the number of FTAs that can be installed in a cabinet will vary. Tables 4-1 and 4-2 are lists of FTAs and support assemblies by model number. When appropriate, the FTA's or supporting assembly's field terminal connector type, number of input or output signal channels, and mounting size are listed.

Standard FTAs

For standard types of FTAs, the terminal connector types are compression (C), nonremovable screw (S), and removable screw (RS).

Table 4-1 Standard FTAs and Associated Assemblies

Model Number	Description	Terminal Type	Channels	Mounting Size
MU-TAIH02	High Level Analog Input/STI (Single IOP)	C	16	A
MU-TAIH03	High Level Analog Input (Single IOP)	C	16	A
MU-TAIH12	High Level Analog Input/STI	C	16	B
MU-TAIH13	High Level Analog Input	C	16	B
MU-TAIH22	Enhanced Power High Level Analog Input/STI	C	16	B
MU-TAIH23	Enhanced Power High Level Analog Input	C	16	B
MU-TAIH52	High Level Analog Input/STI	S	16	B
MU-TAIH53	High Level Analog Input	S	16	B
MU-TAIH62	Enhanced Power High Level Analog Input/STI	S	16	B
MU-TSTX03	Smart Transmitter Interface (Single IOP)	C	16	A
MU-TSTX13	Smart Transmitter Interface	C	16	B
MU-TSTX53	Smart Transmitter Interface	S	16	B
MU-TAIL02	Low Level Analog Input (Single IOP)	C	8	B
MU-TAIL03	Low Level Analog Input (Single IOP)	C	8	B
MU-TAMR02	Low Level Analog Input Multiplexer—RTD (Single IOP)	C	16	B
MU-TAMR03	Low Level Analog Input Multiplexer—RTD (Single IOP)	C	16	B
MU-TAMT02	Low Level Analog Input Multiplexer—TC—Local CJR (Single IOP)	C	16	B
MU-TAMT03	Low Level Analog Input Multiplexer—TC—Local CJR (Single IOP)	C	16	B
MU-TAMT12	Low Level Analog Input Multiplexer—TC—Remote CJR (Single IOP)	C	16	B
MU-TAMT13	Low Level Analog Input Multiplexer—TC—Remote CJR (Single IOP)	C	16	B

Continued on next page

Standard FTAs, continued

Table 4-1 Standard FTAs and Associated Assemblies, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MC-GRMT01	Remote Hardened Low Level Analog Input Multiplexer TC Local CJR	S	16	Non Standard
MU-GRPA01	RHMUX GI/IS Power Adapter	C	2	A
MU-TRPA01	RHMUX GI/NI Power Adapter	C	2	B
MU-TAOX02	Analog Output (Single IOP)	C	8	A
MU-TAOX12	Analog Output	C	8	B
MU-TAOX52	Analog Output	S	8	B
MU-TAOY22	Analog Output with Standby Manual Connector	C	16	B
MU-TAOY23	Analog Output without Standby Manual Connector	C	16	B
MU-TAOY52	Analog Output with Standby Manual Connector	S	16	B
MU-TAOY53	Analog Output without Standby Manual Connector	S	16	B
MU-TDID12	24 Vdc Digital Input	C	32	C
MU-TDID52	24 Vdc Digital Input	S	32	C
MU-TDID72	24 Vdc Digital Input (Single IOP)	RS	32	C
MU-TDIY22	24 Vdc Digital Input	C	32	B
MU-TDIY62	24 Vdc Digital Input	S	32	B
MU-TDIA12	120 Vdc Digital Input	C	32	C
MU-TDIA52	120 Vdc Digital Input	S	32	C
MU-TDIA72	120 Vdc Digital Input (Single IOP)	RS	32	C
MU-TDIA22	240 Vdc Digital Input	C	32	C
MU-TDIA62	240 Vdc Digital Input	S	32	C
MU-TDON12	24 Vdc Nonisolated Digital Output	C	16	B
MU-TDON52	24 Vdc Nonisolated Digital Output	S	16	B
MU-TDOY22	24 Vdc Isolated Digital Output	C	32	B
MU-TDOY62	24 Vdc Isolated Digital Output	S	32	B

Continued on next page

Standard FTAs, continued

Table 4-1 Standard FTAs and Associated Assemblies, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MU-TDOD12	3-30 Vdc Solid-State Digital Output	C	16	B
MU-TDOD13	3-30 Vdc Solid-State Digital Output	C	16	B
MU-TDOD14	3-30 Vdc Solid-State Digital Output	C	16	B
MU-TDOD52	3-30 Vdc Solid-State Digital Output	S	16	B
MU-TDOD53	3-30 Vdc Solid-State Digital Output	S	16	B
MU-TDOD54	3-30 Vdc Solid-State Digital Output	S	16	B
MU-TDOD22	31-200 Vdc Solid-State Digital Output	C	16	B
MU-TDOD23	31-200 Vdc Solid-State Digital Output	C	16	B
MU-TDOD62	31-200 Vdc Solid-State Digital Output	S	16	B
MU-TDOD63	31-200 Vdc Solid-State Digital Output	S	16	B
MU-TDOA12	120/240 Vac Solid-State Digital Output	C	16	B
MU-TDOA13	120/240 Vac Solid-State Digital Output	C	16	B
MU-TDOA52	120/240 Vac Solid-State Digital Output	S	16	B
MU-TDOA53	120/240 Vac Solid-State Digital Output	S	16	B
MU-TDOR12	120 Vac/125 Vdc Relay Digital Output	C	16	B
MU-TDOR52	120 Vac/125 Vdc Relay Digital Output	S	16	B
MU-TDOY23	120 Vac/125 Vdc Relay Digital Output	C	16	B
MU-TDOY63	120 Vac/125 Vdc Relay Digital Output	S	16	B
MU-TDOR22	240 Vac/125 Vdc Relay Digital Output	C	16	B
MU-TDOR62	240 Vac/125 Vdc Relay Digital Output	S	16	B
MU-TPIX12	Pulse Input	C	8	B
MU-TPIX52	Pulse Input	S	8	B
MU-TSDT02	Serial Device Interface—Toledo Weigh Cell	DB-25	1	A
MU-TSDM02	Serial Device Interface—Manual/Auto Station	C	1	A
MU-TSDU02	Serial Device Interface—UDC 6000 Modbus	C	1	A
MU-TSIA12	Serial Interface—Allen-Bradley	DB-25	1	A

Continued on next page

Standard FTAs, continued

Table 4-1 Standard FTAs and Associated Assemblies, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MU-TSIM12	Serial Interface—Modbus RTU	C/DB-25	1	A
MU-TDPR01	Digital Input Power Distribution Assembly—16 outputs	S	N/A	A
MU-TDPR02	Digital Input Power Distribution Assembly—12 outputs	S	N/A	A
MU-TLPA02	Power Adapter (supports LLMux, SDI, and SI)	C	2	A

Galvanically Isolated FTAs

For Galvanically Isolated FTAs, the terminal connector types are compression (C) and crimp pin (CP). The Marshalling Panel has nonremovable screw (S) terminals.

Table 4-2 Galvanically Isolated FTAs and Associated Assemblies

Model Number	Description	Terminal Type	Channels	Mounting Size
MC-GRMT01	Remote Hardened Low Level Analog Input Multiplexer TC with Local CJR	S	16	Non Standard
MU-TRPA01 *	Remote Hardened Non-Incendive Power Adapter	C	2	B
MU-GRPA01 *	Remote Intrinsically Safe Power Adapter	C	2	A
MU-GAIH12	High Level Analog Input	C	16	B
MU-GAIH82	High Level Analog Input	CP	16	B
MU-GAIH13	High Level Analog Input/Smart Transmitter Interface	C	16	B
MU-GAIH83	High Level Analog Input/Smart Transmitter Interface	CP	16	B
MU-GAIH14	High Level Analog Input/Smart Transmitter Interface (High drive)	C	16	B
MU-GAIH84	High Level Analog Input/Smart Transmitter Interface (High drive)	CP	16	B
MU-GAIH22	High Level Analog Input (Auxiliary receiver output)	C	16	B
MU-GAIH92	High Level Analog Input (Auxiliary receiver output)	CP	16	B

* The RHMUX Power Adapter receives +24 V power through the cable that interfaces with the RHMUX IOP, not the GI Power Distribution Assembly (MU-GPDR02). The Power Adapter provides the interface between one RHMUX IOP and two RHMUX FTAs.

Continued on next page

Galvanically Isolated FTAs, continued

Table 4-2 Galvanically Isolated FTAs and Associated Assemblies, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MU-GAOX02	Analog Output (Single IOP)	C	8	B
MU-GAOX72	Analog Output (Single IOP)	CP	8	B
MU-GAOX12	Analog Output	C	8	B
MU-GAOX82	Analog Output	CP	8	B
MU-GDID12	24 Vdc Digital Input (Contact output to IOP)	C	32	B
MU-GDID82	24 Vdc Digital Input (Contact output to IOP)	CP	32	B
MU-GDID13	24 Vdc Digital Input (Solid-state output to IOP)	C	32	B
MU-GDID83	24 Vdc Digital Input (Solid-state output to IOP)	C	32	B
MU-GDOD12	24 Vdc Digital Output (Contact output to IOP)	C	16	B
MU-GDOD82	24 Vdc Digital Output (Contact output to IOP)	CP	16	B
MU-GDOL12	24 Vdc Digital Input (Line Fault Detection)	C	16	B
MU-GDOL82	24 Vdc Digital Input (Line Fault Detection)	CP	16	B
MU-GLFD02	Combiner Panel	N/A	N/A	A
MU-GPRD02	Power Distribution Assembly	N/A	N/A	A
MU-GMAR52	Marshalling Panel	S	N/A	B

4.3 Cabinet Entry

Cabinet Access

The process control signal cables enter the High-Performance Process Manager cabinet through either the top or bottom.

Bottom entry

For bottom entry, the cabinet floor has sliding plates that are retained by cage nuts or Allen screws. The plates can be adjusted to vary the size of the entry slots.

Top entry

When top entry is desired, the top panel is removed by extracting the cabinet lifting eye-bolts, and then punching entry holes in the panel as needed.

CAUTION

CAUTION—Do not attempt to punch holes in the panel while it is still mounted on the cabinet. This may cause metal debris from the panel to drop down onto the cabinet equipment and result in electrical damage when power is applied to the equipment.

Cable clamping

For either top or bottom entry, the cables should be clamped firmly to the inside of the cabinet. The clamping should be able to withstand approximately a 45 kg (100 pound) pull. The cabinet is special because it includes a cable clamp rail at the bottom. The rail can be remounted at the top if required.

Reference

See Section 8 or 9 for a illustration that shows the floor FTA cable entry points for the type of cabinet installed.

4.4 Signal Tray Wiring Compatibility

Wiring rules

The process wiring to the High-Performance Process Manager should be segregated by signal level in different trays or conduits to minimize cross talk. The segregation rules are as follows:

- Millivolt signals from electrical components, such as thermocouples, low voltage dc signals, 1-5 V/4-20 mA, and digital/contact circuits with voltages less than 30 Vac peak/DC, should be in individual cables that provide a protective shield. They can all be routed in the same cable tray. The tray can also include UCN coaxial cables, Master Reference Ground cables (Safety Ground cables in a CE Compliant installation) cables, and 50-conductor FTA to IOP cables.
- Circuits running at higher voltages, or nonshielded circuits at any voltage, belong in their own metal tray compartment or conduit. Thermocouple signals with a common mode of over 30 Vdc are also in this latter category.
- Wiring to Galvanically Isolated FTA must be separated from all other wiring.

More information can be found in the *High-Performance Process Manager Installation*, *Process Manager I/O Installation*, or the *TPS System Site Planning* manuals.

4.5 Process Wiring Termination

Compression terminals

Most of the standard types of FTAs are available with compression-type terminal connectors that mate with the FTA's connectors. To connect to an FTA with compression-type terminal connectors, the wire insulation is striped for 75 millimeters (3/8 inch), plus or minus 3 millimeters (1/8 inch), inserted into the connector terminal, and then held by tightening the individual terminal screw. The connector accepts 0.3 to 2.5 mm^2 (14 to 22 AWG) stranded wire. It also accepts two 1.0 mm^2 (18 AWG) stranded wires, or a single 3.5 mm^2 (12 AWG) solid wire. Figure 2-11 is a illustration of a typical compression-type terminal connector.

Screw terminals

Some standard FTAs are available with screw-type terminal connectors that can accept the installation of a wire lug at the end of the wire. Refer to Figure 2-12 for an illustration of a typical fixed-screw type terminal connector and Figure 2-13 for an illustration of a typical removable-screw type terminal connector.

Pluggable connectors

The Galvanically Isolated FTAs do not have field terminal connectors mounted directly on the assembly's printed circuit board as the standard FTAs do, but instead field wires are connected to compression-type or crimp pin-type pluggable connectors that mate with the connector on the individual Galvanic Isolation Module. The compression-type connectors accommodate size 0.3 to 3.5 mm^2 (12 to 22 AWG) wiring, while the crimp-type terminal connectors accommodate size 0.5 to 2.5 mm^2 (14 to 20 AWG) wiring. Figures 2-14 and 2-15 are illustrations of the crimp pin-type and compression-type pluggable terminal connectors, respectively.

FTA signal requirements

The wiring schematics, terminal connections, and other details for wiring each type of FTA are discussed in detail in the *Process Manager I/O Installation* manual. Refer to this manual for special installation requirements for some FTAs, such as the Low Level Analog Input Multiplexer, Serial Device Interface, and Serial Interface FTAs.

Section 5 – Hazardous Environment Planning

5.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
5.1	Overview	83
5.2	Hazardous Area Classifications	84
5.3	Mounting and Operating the HPM in a Division 2 Location	86
5.4	Field Wiring in Hazardous Locations	100

Introduction

Certain processes handle ignitible or explosive materials. Local electrical codes require that electrical devices that are located in, or connected to, such process areas have some type of control to prevent accidental ignition of the process material. Terminology used to discuss these installations is defined in this section, followed by specific requirements for the High-Performance Process Manager (HPM). For information about intrinsic safety applications, see your Honeywell Sales Engineer.

5.2 Hazardous Area Classifications

National Electrical Code

Hazardous materials are classified by a variety of terms. The terminology for the National Electrical Code (NEC) that is used in the United States is summarized in Table 5-1. The table is not complete. Check your own local electrical codes for additional information and definition.

Table 5-1 Hazardous Area Classifications

NEC	Environment
Class I	Explosive gases or vapors are present.
Class II	Combustible dusts are present.
Class III	Ignitible fibers or flyings are present.
Division 1	A location where a hazardous concentration of gases or vapors exists approximately 10-100% of the time (subject to interpretation as above).
Division 1	A location where a hazardous concentration of gases or vapors exists approximately 1-10% of the time (subject to interpretation as above).
Division 2	A location where a hazardous concentration of gases or vapors exists approximately 0.1-1% of the time (subject to interpretation as above).
Nonhazardous	Hazardous vapors exist less than .1% of the time.
Group A	A hazardous atmosphere containing acetylene or other similar gases or vapors.
Group B	A hazardous atmosphere containing hydrogen or other similar gases or vapors.
Group C	A hazardous atmosphere containing ethylene or other similar gases or vapors.
Group D	A hazardous atmosphere containing pentane or other similar gases or vapors.
Group E	A hazardous atmosphere containing metal dust, such as aluminum.
Group F	A hazardous atmosphere containing carbon black, coal, or coke dust.

Continued on next page

Interpretation of Division 2 rules

Electrical equipment can be mounted in an NEC Division 2 location as long as it does not create a fire hazard during normal operation or routine maintenance. In other words, the equipment does not produce electrical sparks or have hot surface temperatures that are sufficient to ignite the hazardous vapors that may be present.

The equipment is allowed to produce sparks or hot surfaces if it malfunctions because there is a low probability that there will be hazardous vapors present at the same time as the malfunction.

The equipment is allowed to produce sparks or hot surfaces during repair or restorative maintenance because the personnel performing the maintenance are expected to be aware of the danger and to detect the presence of hazardous vapors before starting the work.

5.3 Mounting and Operating the HPM in a Division 2 Location

Factory Mutual approval

Many of the devices in a High-Performance Process Manager subsystem have been examined and certified by Factory Mutual (FM) as safe for mounting in Class 1, Division 2 locations. Certain other devices such as a Field Termination Assembly (FTA) that contains unsealed relay contacts is not approved for these applications. Table 5-2 is a list of the approved devices. When an HPM cabinet is intended to be mounted in a Division 2 location, it must be contain only the approved devices. A label that displays the FM logo is attached to the cabinet.

HPM placement considerations

The considerations for High-Performance Process Manager placement are

- Use only those High-Performance Process Manager assemblies that have been certified for safe usage in Division 2 locations, or
- Locate the High-Performance Process Manager in a nonhazardous area, or
- Purge the High-Performance Process Manager enclosure or the High-Performance Process Manager area of gasses or vapors.

HPM placement publications

In the USA, the Division 2 or nonhazardous area for placing High-Performance Process Manager enclosures can be selected by using publications such as the National Fire Protection Agency (NFPA) publication *#497, Classification of Class I Hazardous Locations for Electrical Installations in Chemical Plants*. Should no Division 2 or nonhazardous area exist, purged/pressurized enclosures or buildings are needed. Suitable purge techniques are described in local electrical code documents such as the NFPA *#496, Purged and Pressurized Enclosures for Electrical Equipment.*

Continued on next page

Approved Division 2 area equipment

Table 5-2 lists the High-Performance Process Manager equipment that is approved for operation in Division 2 areas.

Table 5-2 HPM Equipment Approved for Use in a Division 2 Area

Model Number	Description
IOPs	
MU-PAIH03	High Level Analog Input (HLAI)
MU-PAIL02	Low level Analog Input (LLAI)
MU-PAOX03	Analog Output (AO)
MU-PAOY22	Analog Output (AO)
MU-PDIS12	Digital Input Sequence of Events (DI)
MU-PDIX02	Digital Input (DI)
MU-PDIY22	Digital Input (DI)
MU-PDOX02	Digital Output (DO)
MU-PDOY22	Digital Output (DO)
MU-PLAM02	Low Level Multiplexer (LLMux)
MU-PRHM01	Remote Hardened Low Level Multiplexer (RHMUX)
MU-PPIX02	Pulse Input (PI)
MU-PSDX02	Serial Device Interface (SDI)
MU-PSIM11	Serial Interface (SI)
MU-PSTX03	Smart Transmitter Interface (STIM)

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Standard FTA Components	
MU-TAIH02	High Level Analog Input/STI with compression terminals
MU-TAIH03	High Level Analog Input/STI with compression terminals
MU-TAIH12	High Level Analog Input/STI with compression terminals
MU-TAIH13	High Level Analog Input/STI with compression terminals
MU-TAIH22	High Level Analog Input/STI with compression terminals
MU-TAIH23	High Level Analog Input with compression terminals
MU-TAIH52	High Level Analog Input/STI with screw terminals
MU-TAIH53	High Level Analog Input/STI with screw terminals
MU-TAIH62	High Level Analog Input/STI with screw terminals
MU-TAIL02	Low Level Analog Input with compression terminals
MU-TAIL03	Low Level Analog Input with compression terminals
MU-TAMR02	LLMux Analog Input RTD with compression terminals
MU-TAMR03	LLMux Analog Input RTD with compression terminals
MU-TAMT02	LLMux Analog Input TC with compression terminals
MU-TAMT03	LLMux Analog Input TC with compression terminals
MU-TAMT12	LLMux Analog Input TC with remote CJR, compress terminals
MU-TAMT13	LLMux Analog Input TC with remote CJR, compress terminals
MU-TAOX02	Analog Output with compression terminals
MU-TAOX12	Analog Output with compression terminals
MU-TAOX52	Analog Output with screw terminals
MU-TAOY22	Analog Output with compress terminals, with Standby Manual
MU-TAOY23	Analog Output with comp terminals, without Standby Manual
MU-TAOY52	Analog Output with screw terminals, with Standby Manual
MU-TAOY53	Analog Output with screw terminals, without Standby Manual

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Standard FTA Components, continued	
MU-TDIA12	120 Vac Digital Input with compression terminals
MU-TDIA22	240 Vac Digital Input with compression terminals
MU-TDIA52	120 Vac Digital Input with fixed screw terminals
MU-TDIA62	240 Vac Digital Input with fixed screw terminals
MU-TDID12	24 Vdc Digital Input with compression terminals
MU-TDID52	24 Vdc Digital Input with fixed-screw terminals
MU-TDID72	24 Vdc Digital Input with removable-screw terminals
MU-TDIY22	24 Vdc Digital Input with compression terminals
MU-TDIY62	24 Vdc Digital Input with screw terminals
MU-TDOA12	120/240 Vac Solid-State Digital Output with Comp terminals
MU-TDOA13	120/240 Vac Solid-State Digital Output with Comp terminals
MU-TDOA52	120/240 Vac Solid-State Digital Output with Screw terminals
MU-TDOA53	120/240 Vac Solid-State Digital Output with Screw terminals
MU-TDOD12	3-30 Vdc Digital Output with compression terminals
MU-TDOD13	3-30 Vdc Digital Output with compression terminals
MU-TDOD14	3-30 Vdc Digital Output with compression terminals
MU-TDOD22	31-200 Vdc Digital Output with compression terminals
MU-TDOD23	5-200 Vdc Digital Output with compression terminals
MU-TDOD52	3-30 Vdc Digital Output with screw terminals
MU-TDOD53	3-30 Vdc Digital Output with screw terminals
MU-TDOD54	3-30 Vdc Digital Output with screw terminals
MU-TDOD62	31-200 Vdc Digital Output with fixed-screw terminals
MU-TDOD63	5-200 Vdc Digital Output with screw terminals

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Standard FTA Components, continued	
MU-TDON12	24 Vdc Nonisolated Digital Output with compress terminals
MU-TDON52	24 Vdc Nonisolated Digital Output with screw terminals
MU-TDOY22	24 Vdc Isolated Digital Output with compression terminals
MU-TDOY62	24 Vdc Isolated Digital Output with screw terminals
MU-TDPR02	Digital Input Power Distribution Assembly
MU-TLPA02	Power Adapter (LLMux, SDI, SI)
MU-TPIX12	Pulse Input with compression terminals
MU-TPIX52	Pulse Input with screw terminals
MU-TSDM02	Serial Device Interface—Manual/Auto Station
MU-TSDT02	Serial Device Interface—Toledo Weigh Cell
MU-TSIM12	Serial Interface—Modbus EIA-232
MU-TSTX03	Smart Transmitter Interface with compression term
MU-TSTX13	Smart Transmitter Interface with compression term
MU-TSTX53	Smart Transmitter Interface with screw terminals

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Galvanically Isolated FTA Components	
MC-GRMT01	RHMUX Analog Input TC with screw terminals
MU-GRPA01	RHMUX GI/IS Power Adapter with compression terminals
MU-TRPA01	RHMUX GI/NI Power Adapter with compression terminals
MU-GAIH12	High Level Analog Input with compression terminals
MU-GAIH13	HLAI/STI with compression terminals
MU-GAIH14	HLAI/STI with compression terminals
MU-GAIH22	High Level Analog Input with compression terminals
MU-GAIH82	High Level Analog Input with crimp terminals
MU-GAIH83	HLAI/STI with crimp terminals
MU-GAIH84	HLAI/STI with crimp terminals
MU-GAIH92	High Level Analog Input with crimp terminals
MU-GAOX02	Analog Output with compression terminals
MU-GAOX12	Analog Output with compression terminals
MU-GAOX72	Analog Output with crimp term
MU-GAOX82	Analog Output with crimp terminals
MU-GDID12	Digital Input with compression terminals
MU-GDID13	Digital Input with compression terminals
MU-GDID82	Digital Input with crimp terminals
MU-GDID83	Digital Input with crimp terminals
MU-GDOD12	24 Vdc Digital Output with compression terminals
MU-GDOD82	24 Vdc Digital Output with crimp terminals
MU-GDOL12	24 Vdc Digital Output with compression terminals
MU-GDOL82	24 Vdc Digital Output with crimp terminals

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Galvanically Isolated FTA Components, continued	
MU-GLFD02	Combiner Panel
MU-GMAR52	Marshalling Panel
MU-GPRD02	Power Distribution Assembly
I/O Link Extenders	
MU-IOLM02	Standard I/O Link Extender—Local Card File
MU-IOLX02	Standard I/O Link Extender—Remote Card File
MU-ILDX03	Long Distance I/O Link Extender
HPMM Card Sets	
MU-HPMS01	Nonredundant HPMM Card Set
MU-HPMR01	Redundant HPMM Card Sets
Card File Assemblies	
MU-HPFH01	Left 7-Slot Card File Assembly
MU-HPFH03	Left 7-Slot HPMM Card File Assembly
MU-HPFH11	Right 7-Slot Card File Assembly
MU-HPFH13	Right 7-Slot HPMM Card File Assembly
MU-HPFX02	15-Slot Card File Assembly
MU-HPFX03	15-Slot HPMM Card File Assembly
MU-HPFI03	Left 7-Slot IOP Card File Assembly
MU-HPFI13	Right 7-Slot IOP Card File Assembly
MU-HPFI23	15-Slot IOP Card File Assembly

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Cables	
MU-KTPC00	FTA to IOP, DIN to DIN connector
MU-KTPC05	FTA to IOP, DIN to DIN connector—5 meters
MU-KTPC10	FTA to IOP, DIN to DIN connector—10 meters
MU-KTPC15	FTA to IOP, DIN to DIN connector—15 meters
MU-KTPC20	FTA to IOP, DIN to DIN connector—20 meters
MU-KTPC25	FTA to IOP, DIN to DIN connector—25 meters
MU-KTPC30	FTA to IOP, DIN to DIN connector—30 meters
MU-KTPC35	FTA to IOP, DIN to DIN connector—35 meters
MU-KTPC40	FTA to IOP, DIN to DIN connector—40 meters
MU-KTPC45	FTA to IOP, DIN to DIN connector—45 meters
MU-KTPC50	FTA to IOP, DIN to DIN connector—50 meters
MU-KFTA00	FTA to IOP, phone to phone connector
MU-KFTA05	FTA to IOP, phone to phone connector—5 meters
MU-KFTA10	FTA to IOP, phone to phone connector—10 meters
MU-KFTA15	FTA to IOP, phone to phone connector—15 meters
MU-KFTA20	FTA to IOP, phone to phone connector—20 meters
MU-KFTA25	FTA to IOP, phone to phone connector—25 meters
MU-KFTA30	FTA to IOP, phone to phone connector—30 meters
MU-KFTA35	FTA to IOP, phone to phone connector—35 meters
MU-KFTA40	FTA to IOP, phone to phone connector—40 meters
MU-KFTA45	FTA to IOP, phone to phone connector—45 meters
MU-KFTA50	FTA to IOP, phone to phone connector—50 meters

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Cables, continued	
MU-KFTS00	FTA to IOP, phone to phone connector
MU-KFTS05	FTA to IOP, phone to phone connector—5 meters
MU-KFTS10	FTA to IOP, phone to phone connector—10 meters
MU-KFTS15	FTA to IOP, phone to phone connector—15 meters
MU-KFTS20	FTA to IOP, phone to phone connector—20 meters
MU-KFTS25	FTA to IOP, phone to phone connector—25 meters
MU-KFTS30	FTA to IOP, phone to phone connector—30 meters
MU-KFTS35	FTA to IOP, phone to phone connector—35 meters
MU-KFTS40	FTA to IOP, phone to phone connector—40 meters
MU-KFTS45	FTA to IOP, phone to phone connector—45 meters
MU-KFTS50	FTA to IOP, phone to phone connector—50 meters
MU-KSPR00	Remote Power Distribution
MU-KSPR05	Remote Power Distribution—5 meters
MU-KSPR10	Remote Power Distribution—10 meters
MU-KSPR15	Remote Power Distribution—15 meters
MU-KSPR20	Remote Power Distribution—20 meters
MU-KSPR25	Remote Power Distribution—25 meters
MU-KSPR30	Remote Power Distribution—30 meters
MU-KSPR35	Remote Power Distribution—35 meters
MU-KSPR40	Remote Power Distribution—40 meters
MU-KSPR45	Remote Power Distribution—45 meters
MU-KSPR50	Remote Power Distribution—50 meters

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Cables, continued	
MU-KFTD00	FTA to IOP, DIN to phone connector
MU-KFTD05	FTA to IOP, DIN to phone connector—5 meters
MU-KFTD10	FTA to IOP, DIN to phone connector—10 meters
MU-KFTD15	FTA to IOP, DIN to phone connector—15 meters
MU-KFTD20	FTA to IOP, DIN to phone connector—20 meters
MU-KFTD25	FTA to IOP, DIN to phone connector—25 meters
MU-KFTD30	FTA to IOP, DIN to phone connector—30 meters
MU-KFTD35	FTA to IOP, DIN to phone connector—35 meters
MU-KFTD40	FTA to IOP, DIN to phone connector—40 meters
MU-KFTD45	FTA to IOP, DIN to phone connector—45 meters
MU-KFTD50	FTA to IOP, DIN to phone connector—50 meters
MU-KDPR00	Power Distribution
MU-KDPR05	Power Distribution—5 meters
MU-KDPR10	Power Distribution—10 meters
MU-KDPR15	Power Distribution—15 meters
MU-KDPR20	Power Distribution—20 meters
MU-KDPR25	Power Distribution—25 meters
MU-KDPR30	Power Distribution—30 meters
MU-KDPR35	Power Distribution—35 meters
MU-KDPR40	Power Distribution—40 meters
MU-KDPR45	Power Distribution—45 meters
MU-KDPR50	Power Distribution—50 meters

Continued on next page

5.3 Mounting and Operating the HPM in a Division 2 Location, Continued

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Cables, continued	
MU-KLAM00	LLMux FTA to Power Adapter (internal to cabinet)
MU-KLX076	SDI, SI, LLMux, RHMUX FTA to Power Adapter – 76 meters (external to cabinet)
MU-KLX152	SDI, SI, LLMux, RHMUX FTA to Power Adapter – 152 meters (external to cabinet)
MU-KLX305	SDI, SI, LLMux, RHMUX FTA to Power Adapter – 305 meters (external to cabinet)
MU-KLO305	RHMUX FTA to Power Adapter – 305 meters (external to cabinet)
MU-KSX030	SDI/SI FTA to EIA-422/485—30 meters
MU-KSX152	SDI/SI FTA to EIA-422/485—152 meters
MU-KSX305	SDI/SI FTA to EIA-422/485—305 meters
MU-KGPR00	Galvanic Isolation Power Distribution Cable
MU-KGPR05	Galvanic Isolation Power Distribution Cable—5 meters
MU-KGPR10	Galvanic Isolation Power Distribution Cable—10 meters
MU-KBFT01	FTA I/O Bridge—0.5 meter
MU-KBFT02	FTA I/O Bridge—2 meters

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
UCN Cables	
MU-NKT002	UCN Trunk Cable—2.5 meters
MU-NKT005	UCN Trunk Cable—5 meters
MU-NKT010	UCN Trunk Cable—10 meters
MU-NKT020	UCN Trunk Cable—20 meters
MU-NKT030	UCN Trunk Cable—30 meters
MU-NKT050	UCN Trunk Cable—50 meters
MU-NKT100	UCN Trunk Cable—100 meters
MU-NKT200	UCN Trunk Cable—200 meters
MU-NKT400	UCN Trunk Cable—400 meters
MU-NKT600	UCN Trunk Cable—600 meters
MU-NKD000	UCN Drop Cable Set (pair)
MU-NKD002	UCN Drop Cable Set—2 meters (pair)
MU-NKD005	UCN Drop Cable Set—5 meters (pair)
MU-NKD010	UCN Drop Cable Set—10 meters (pair)
MU-NKD020	UCN Drop Cable Set—20 meters (pair)
MU-NKD030	UCN Drop Cable Set—30 meters (pair)
MU-NKD040	UCN Drop Cable Set—40 meters (pair)
MU-NKD050	UCN Drop Cable Set—50 meters (pair)
MU-NTAP02	UCN 2-Drop Tap Assembly Kit (pair)
MU-NTAP04	UCN 4-Drop Tap Assembly Kit (pair)
MU-NTAP08	UCN 8-Drop Tap Assembly Kit (pair)
MU-NKTK01	UCN Drop Connector Kit/RG-11
MU-NKDK01	UCN Drop Connector Kit/RG-6
MU-NCSK01	UCN Trunk Splice Kit

Continued on next page

Approved Division 2 area equipment. continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Power Systems	
MU-PSSX03	Power System, single Power Supply Module (PSM)
MU-PSRX03	Power System, redundant Power Supply Modules
MU-PSRB03	Power System, redundant PSMs with Battery Pack
MU-PSSX04	Power System, single Power Supply Module
MU-PSRX04	Power System, redundant Power Supply Modules
MU-PSRB04	Power System, redundant PSMs with Battery Pack
MU-PAS121	AC Only Power System, single PSM, 120 Vac 16 A
MU-PAR121	AC Only Power System, redund PSMs, 120 Vac 16 A
MU-PAS221	AC Only Power System, single PSM, 220 Vac 16 A
MU-PAR221	AC Only Power System, redund PSMs, 220 Vac 16 A
MU-PAS111	AC Only Power System, single PSM, 120 Vac 8 A
MU-PAR111	AC Only Power System, redundant PSMs, 120 Vac 8 A
MU-PAS211	AC Only Power System, single PSM, 220 Vac 8 A
MU-PAR211	AC Only Power System, redundant PSMs, 220 Vac 8 A
Standby Manual Devices	
MU-SMAC02	Analog Output Standby Manual Device with case and cable
MU-SMDC02	Digital Output Standby Manual Device with case
MU-SMDX02	Digital Output Standby Manual Device with cable
Miscellaneous	
MU-MASX02	Manual/Auto Station model PC6001U2M040A0

Continued on next page

Approved Division 2 area equipment, continued

Table 5-2 HPM Equipment Approved for Use in Division 2 Areas, Continued

Model Number	Description
Cabinet Hardware	
MU-CBDX01	Dual Access Cabinet, Rittal
MU-CBSX01	Single Access Cabinet, Rittal
MU-TMCN01	Narrow FTA Mounting Channel, Rittal
MU-TMCN02	Narrow FTA Mounting Channel with ground bar, Rittal
MU-TMCW01	Wide FTA Mounting Channel, Rittal
MU-TMCW02	Wide FTA Mounting Channel with ground bar, Rittal
MU-CBDM01	Dual Access Cabinet, NEMA 1
MU-CBSM01	Single Access Cabinet, NEMA 1
MU-TMCN11	Narrow FTA Mounting Channel, NEMA 1
MU-TMCN12	Narrow FTA Mounting Channel with ground bar, NEMA 1
MU-TMCW11	Wide FTA Mounting Channel, NEMA 1
MU-TMCW12	Wide FTA Mounting Channel with ground bar, NEMA 1
MU-TSGB01	FTA Shield Grounding Bar
Cabinet Fan Assemblies	
MU-FAN501	Cabinet Fan Assembly, 240 Vac
MU-FAN601	Cabinet Fan Assembly, 120 Vac
MU-FAN511	Cabinet Fan Assembly with alarm, 240 Vac
MU-FAN611	Cabinet Fan Assembly with alarm, 120 Vac

5.4 Field Wiring in Hazardous Locations

Nonincendive FTAs (current limiting)

Some of the Field Termination Assemblies (FTAs) that are used in the High-Performance Process Manager subsystem have resistors in the output circuits to limit the current available to the field terminals. These output circuits have been examined and certified by Factory Mutual as being Nonincendive.

This means that if the field wires are accidently opened, shorted, or grounded and the HPM is operating normally, the wiring will not release enough energy to cause ignition in the specified flammable atmosphere.

Table 5-3 is a list of the analog input, analog output, and digital input FTAs that have Nonincendive outputs.

Also, when digital output circuits of a digital output FTA are current and voltage limited to suitable levels by the user, the digital output FTA can also be considered Nonincendive.

Cable and load parameters (entity parameters)

To ensure that the field circuits are incapable of igniting a specified flammable vapor, the size of the cable and load parameters must be known and controlled. Table 5-3 provides the maximum permissible values of the parameters for each of FTAs that are listed in the table.

Electrical code approval

In general, field wiring in Division 2 hazardous locations must be done according to local codes; however, in some jurisdictions, Nonincendive wires need not conform to the normal Division 2 wiring rules, but can use wiring methods that are suitable for ordinary locations.

See ANSI/ISA S12.12, the section "Electrical Equipment For Use In Class I, Division 2 Hazardous [Classified] Locations."

Current limiting resistor value

The value of the resistors on the listed FTAs were selected to assure worst case short circuit currents in a hazardous area of less than 150 milliamps for normal operating equipment. According to NFPA publication #493, *Intrinsically Safe Apparatus for Use in Division 1 Hazardous Locations*, 150 milliamps from a 24 Vdc source is below the ignition threshold in a resistive circuit for gases in Groups A through D environments.

Continued on next page

Nonincendive FTAs

Wiring to the FTAs that are listed in Table 5-3 has been approved as Nonincendive wiring by Factory Mutual Research, Inc. When the wiring is opened, shorted, or grounded and the High-Performance Process Manager is in its normal operating state, the wiring cannot release enough energy to cause the ignition of a flammable atmosphere.

Table 5-3 Nonincendive FTA Types

FTA Type	FTA Models
Low Level Analog Input	MU/MC-TAIL01 MU/MC-TAIL02 MU/MC-TAIL03
High Level Analog Input	MU/MC-TAIH01 MU/MC-TAIH02 MU/MC-TAIH03 MU/MC-TAIH12 MU/MC-TAIH13 MU/MC-TAIH52 MU/MC-TAIH53
Smart Transmitter Interface Input	MU/MC-TSTX03 MU/MC-TSTX13 MU/MC-TSTX53
Pulse Input	MU/MC-TPIX12 MU/MC-TPIX52
4-20 mA Analog Output	MU/MC-TAOX01 MU/MC-TAOX02 MU/MC-TAOX12 MU/MC-TAOX52 MU/MC-TAOY22 MU/MC-TAOY23 MU/MC-TAOY52 MU/MC-TAOY53
24 Vdc Digital Input	MU/MC-DID11 MU/MC-DID12 MU/MC-DID52 MU/MC-DID72 MU/MC-DIY22 MU/MC-DIY62

Continued on next page

Cable size and load parameters

To ensure that the circuits are incapable of igniting a specific flammable atmosphere, the size of cable and load parameters must be controlled. The maximum values are given in Table 5-4.

Table 5-4 FTA Cable and Load Parameters

Parameter	Maximum Allowable Values					
FTA Model Number (MU- or MC-)	TPIX12 TPIX52	TAIL01 TAIL02 TAIL03	TAIH01 TAIH02 TAIH03 TAIH12 TAIH13 TAIH52 TAIH53 TSTX03 TSTX13 TSTX53	TAIH22 TAIH23 TAIH62	TAOX01 TAOX02 TAOX12 TAOX52 TAOY22 TAOY23 TAOY52 TAOY53	TDID12 TDID52 TDID72
V_{OC}*—Maximum Open Circuit Voltage	26 Vdc	9 Vdc	26 Vdc	26 Vdc	26 Vdc	30 Vdc
I_{SC}*—Maximum Short Circuit Current	63 mA	0.3 mA	186 mA	40 mA	22 mA	152 mA
C_a—Maximum Allowable Connected Cable Capacitance	0.4 µF	15 µF	0.4 µF	0.4 µF	0.4 µF	0.25 µF
L_a—Maximum Allowable Cable Inductance	17 mH	1 H	2.3 mH	35 mH	130 mH	3 mH
C_n—Maximum Allowable Connected Capacitance (Cable + Load)	0.4 µF	15 µF	0.4 µF	0.4 µF	0.4 µF	0.25 µF
L_n—Maximum Allowable Connected Inductance (Cable + Load)	17 mH	1 H	150 mH	150 mH	130 mH	400 mH

* Controlled by the High-Performance Process Manager design.

ATTENTION

ATTENTION—The data in Table 5-4 is controlled by the Honeywell drawing 51109499 and cannot be changed without the approval of Factory Mutual Research, Inc.

Section 6 – Corrosion Protection Planning

6.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
6.1	Overview	103
6.2	Model Numbers	106

Introduction

Corrosion is one of the leading causes of electronic printed circuit assembly board failure in harsh environments. Conformal coating of the assembly's printed circuits and components provides a solution for the problem. Conformally coated assemblies are completely covered with a thin layer of a special plastic material that is resistant to the corrosive effects of humidity and most chemical gases.

ATTENTION

Table 6-1 recommends the minimum equipment requirement that is based on environmental classification tests at the site where the equipment is installed.

Table 6-1 Environment Minimum Equipment Requirement

Environment Classification	Minimum Equipment Requirement
Mild (G1)	Non-conformally coated
Moderate (G2)	Conformally coated
Harsh (G3)	Conformally coated
Severe (Gx)	Conformally coated and installed in an environmentally hardened enclosure

G3 rating

All coated assemblies will withstand the effects of a G3 (harsh) rated environment. Uncoated boards are rated for mild (G1) environments. A harsh environment is defined by ANSI/ISA-S71.04-1985, "Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminates."

Continued on next page

Environmental harshness levels

Table 6-2 defines environmental harshness levels for airborne contaminates.

Table 6-2 Harsh Environment Definitions from ANSI/ISA-S71.04-1985

Severity Level		G1 (Mild)	G2 (Moderate)	G3 (Harsh)	Gx (Severe)
Copper Reactivity Level (Angstroms/Month)		<300	<1000	<2000	≥2000
Contaminant Gas		**Concentration (Parts/Billion)**			
Group A	**H_2S**	<3	<10	<50	≥50
	SO_2, SO_3	<10	<100	<300	≥300
	Cl_2	<1	<2	<10	≥10
	NO_X	<50	<125	<1250	≥1250
Group B	**HF**	<1	<2	<10	≥10
	NH_3	<500	<10,000	<25,000	≥25,000
	O_3	<2	<25	<100	≥100

Gas concentrations

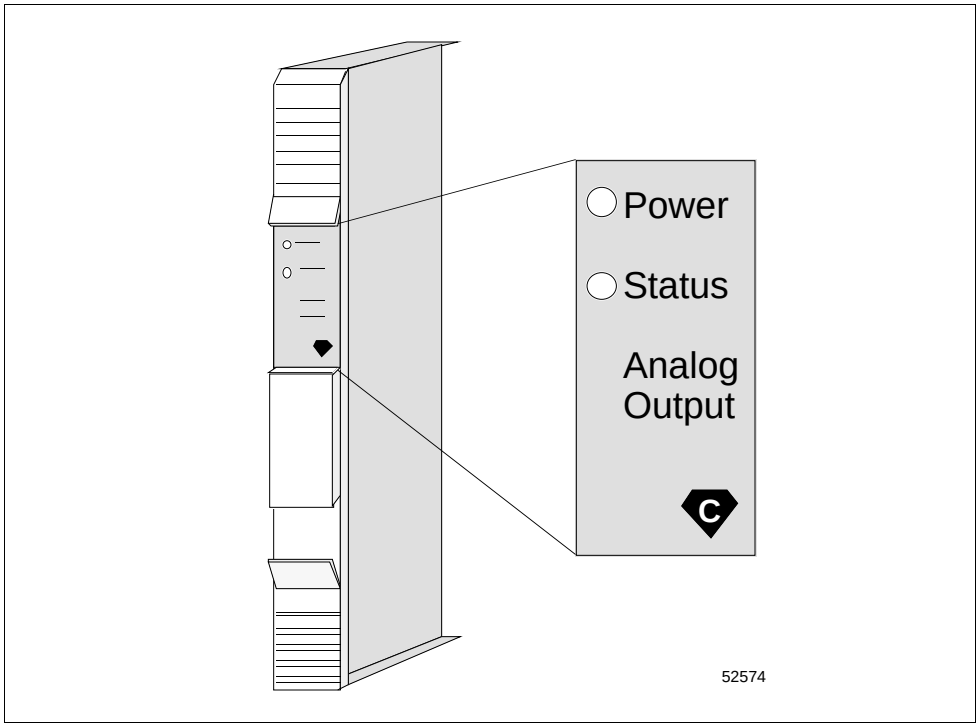
Gas concentrations are for reference purposes only and are believed to approximate the reactivity levels, assuming relative humidity is less than 50%. For each 10% increase in relative humidity above 50%, or change in relative humidity by greater than 6%/hour, the severity level can be expected to increase by one level.

Continued on next page

Conformal coating symbol

Conformally coated assemblies can be easily identified by a distinctive symbol located on the assembly. The symbol consists of a “C” that is surrounded by a solid diamond. The diamond universally symbolizes hardness. The symbol is intended to represent the hardened protection against harsh environments that conformal coating provides. Figure 6-1 illustrates the symbol on the faceplate of an Analog Output IOP.

Figure 6-1 Conformal Coating Symbol



Harsh Environment Enclosure

For those users who want to locate their IOPs closer to the process and outside the control room in a severe environment, another level of protection is required. Honeywell offers the availability of a harsh environment IOP enclosure that is capable of withstanding a Gx rated atmosphere. The product includes a sealed NEMA 4x stainless steel enclosure, a special 7-Slot card file with fans for air circulation to house conformally coated IOP and I/O Link Extender cards, and a 24 Vdc Power System that uses components found in the HPM AC Only Power System. There is no active external cooling required for external ambient temperatures of up to 60°C. The IOPs interface with the HPMM(s) in the control room by fiber optic I/O Link Extender. Standard IOP to FTA cables that are enclosed in sealed conduit provide the IOP to associated FTA interface. The FTAs are mounted in sealed NEMA 4x stainless steel enclosures that are provided by the user.

6.2 Model Numbers

Model numbers

Model numbers for conformally coated assemblies and upgrade kits are identified by a “MC” prefix, instead of the normal “MU” prefix for a noncoated assembly. An example would be a conformally coated Low Level Analog Input IOP. Its model number is MC-PAIL02. The model number of the noncoated version of the IOP is MU-PAIL02.

ATTENTION

ATTENTION—The High Level Analog Input and Analog Output IOPs are available only as conformally coated assemblies. There are no noncoated versions available. The model numbers are MC-PAIH03 and MC-PAOX03, respectively.

Assembly numbers

Typically, the part number’s tab for a conformally coated assembly has the format “x5x” (non-CE Compliant) or “x7x” (CE Compliant), where “x” can be any number, 1 through 9. This provides a standard method of identifying conformally coated assemblies.

Continued on next page

Conformally coated model list

Table 6-3 is a list of conformally coated High-Performance Process Manager assemblies.

Table 6-3 Conformally Coated Assembly Model Numbers

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
IOPs			
MC-PAIH03	N/A	51304754-150	High Level Analog Input (HLAI)
MC-PAIL02	N/A	51304481-150	Low level Analog Input (LLAI)
MC-PAOX03	51304672-150	51309152-175	Analog Output (AO)
MC-PAOY22	N/A	80363969-150	Analog Output (AO)
MC-PDIS12	N/A	51402625-175	Digital Input Sequence of Events (DI)
MC-PDIX02	N/A	51304485-150	Digital Input (DI)
MC-PDIY22	N/A	80363972-150	Digital Input (DI)
MC-PDOX02	N/A	51304487-150	Digital Output (DO)
MC-PDOY22	N/A	80363975-150	Digital Output (DO)
MC-PLAM02	N/A	51304362-150	Low Level Multiplexer (LLMux)
MC-PRHM01	N/A	51404109-175	Remote Hardened Low Level Multiplexer (RHMUX)
MC-PPIX02	N/A	51304386-150	Pulse Input (PI)
MC-PSDX02	N/A	51304362-250	Serial Device Interface (SDI)
MC-PSIM11	N/A	51304362-350	Serial Interface (SI)
MC-PSTX02	51304516-150	N/A	Smart Transmitter Interface (STI)
MC-PSTX03	N/A	51304516-250	Smart Transmitter Interface Multivariable (STIM)
Standard FTAs			
MC-TAIH02	51304453-150	N/A	High Level Analog Input/STI with compression term
MC-TAIH03	N/A	51309136-175	High Level Analog Input with compression terminals
MC-TAIH12	51304337-150	N/A	High Level Analog Input/STI with compression term
MC-TAIH13	N/A	51309138-175	High Level Analog Input with compression terminals
MC-TAIH22	80366195-150	N/A	High Level Analog Input/STI with compression term
MC-TAIH23	N/A	80366195-175	High Level Analog Input with compression terminals
MC-TAIH52	51304337-250	N/A	High Level Analog Input/STI with screw terminals

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Standard FTAs, continued			
MC-TAIH53	N/A	51309138-275	High Level Analog Input with screw terminals
MC-TAIH62	80366192-150	N/A	High Level Analog Input/STI with screw terminals
MC-TSTX03	N/A	51309140-175	Smart Transmitter Interface with Compression Term
MC-TSTX13	N/A	51309142-175	Smart Transmitter Interface with Compression Term
MC-TSTX53	N/A	51309142-275	Smart Transmitter Interface with Screw Terminals
MC-TAIL02	51304437-150	N/A	Low Level Analog Input with compression terminals
MC-TAIL03	N/A	51309202-175	Low Level Analog Input with compression terminals
MC-TAMR02	51304477-150	N/A	LLMux Analog Input RTD with compression terminals
MC-TAMR03	N/A	51309218-175	LLMux Analog Input RTD with compression terminals
MC-TAMT02	51401491-150	N/A	LLMux Analog Input TC with compression terminals
MC-TAMT03	N/A	51301491-175	LLMux Analog Input TC with compression terminals
MC-TAMT12	51401573-150	N/A	LLMux Analog Input TC with remote CJR, comp term
MC-TAMT13	N/A	51301573-175	LLMux Analog Input TC with remote CJR, comp term
MC-TAOX02	51304476-150	51304476-175	Analog Output with compression terminals
MC-TAOX12	51304335-150	51304335-175	Analog Output with compression terminals
MC-TAOX52	51304335-250	51304335-275	Analog Output with screw terminals
MC-TAOY22	80366177-150	80366177-175	Analog Output with compression terminals
MC-TAOY23	80366177-250	80366177-275	Analog Output with compression terminals
MC-TAOY52	80364007-150	80364007-175	Analog Output with screw terminals
MC-TAOY53	80364007-250	80364007-275	Analog Output with screw terminals
MC-TDIA12	51304439-150	51304439-175	120 Vac Digital Input with compression terminals
MC-TDIA52	51304439-250	51304439-275	120 Vac Digital Input with fixed-screw terminals
MC-TDIA72	51303930-150	N/A	120 Vac Digital Input with removable-screw terminals
MC-TDIA22	51304431-150	51304431-175	240 Vac Digital Input with compression terminals

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Standard FTAs, continued			
MC-TDIA62	51304431-250	51304431-275	240 Vac Digital Input with fixed-screw terminals
MC-TDID12	51304441-150	51304441-175	24 Vdc Digital Input with compression terminals
MC-TDID52	51304441-250	51304441-275	24 Vdc Digital Input with fixed-screw terminals
MC-TDID72	51303928-150	N/A	24 Vdc Digital Input with removable-screw terminals
MC-TDIY22	80366180-150	80366180-175	24 Vdc Digital Input with compression terminals
MC-TDIY62	80366180-250	80366180-275	24 Vdc Digital Input with fixed-screw terminals
MC-TDOA13	51304648-150	51304648-175	120/240 Vac Solid-State Digital Output w/comp term
MC-TDOA53	51304648-250	51304648-275	120/240 Vac Solid-State Digital Output w/screw term
MC-TDOD13	51304650-150	N/A	3-30 Vdc Digital Output with compression terminals
MC-TDOD14	N/A	51309153-175	3-30 Vdc Digital Output with compression terminals
MC-TDOD22	51304428-150	N/A	31-200 Vdc Digital Output with compression terminals
MC-TDOD23	N/A	51309154-175	31-200 Vdc Digital Output with compression terminals
MC-TDOD53	51304650-250	N/A	3-30 Vdc Digital Output with screw terminals
MC-TDOD54	N/A	51309153-275	3-30 Vdc Digital Output with screw terminals
MC-TDOD62	51304428-250	N/A	31-200 Vdc Digital Output with screw terminals
MC-TDOD63	N/A	51309154-275	31-200 Vdc Digital Output with screw terminals
MC-TDON12	51304446-150	N/A	24 Vdc Nonisolated Digital Output with comp term
MC-TDON52	51304446-250	N/A	24 Vdc Nonisolated Digital Output with screw term
MC-TDOY22	80366183-150	80366183-175	24 Vdc Isolated Digital Output with compression term
MC-TDOY62	80364013-150	80364013-175	24 Vdc Isolated Digital Output with screw terminals
MC-TDOR12	51304443-150	51309148-175	120 Vac/125 Vdc Relay Digital Output with comp term
MC-TDOR52	51304443-250	51309148-275	120 Vac/125 Vdc Relay Digital Output with screw term
MC-TDOR22	51304427-150	51309150-175	240 Vac/125 Vdc Relay Digital Output with comp term
MC-TDOR62	51304427-250	51309150-275	240 Vac/125 Vdc Relay Digital Output with screw term

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Standard FTAs, continued			
MC-TDOY23	80366189-150	80366189-175	240 Vac/125 Vdc Relay Digital Output with comp term
MC-TDOY63	80366185-150	80366185-175	240 Vac/125 Vdc Relay Digital Output with screw term
MC-TDPR02	51304425-150	51304425-175	Digital Input Power Distribution Assembly
MC-TLPA02	51304467-150	51309204-175	Power Adapter
MC-TPIX12	51304084-150	51304084-175	Pulse Input with compression terminals
MC-TPIX52	51304084-250	51304084-275	Pulse Input with screw terminals
MC-TSDM02	51303932-252	N/A	Serial Device Interface—Manual/Auto Station
MC-TSDT02	51303932-251	N/A	Serial Device Interface—Toledo Weigh Cell
MC-TSDU02	51303932-253	N/A	Serial Device Interface—UDC 6000 Modbus
MC-TSIA12	51303932-453	51303932-478	Serial Interface—Allen-Bradley
MC-TSIM12	51303932-451	51303932-476	Serial Interface—Modbus EIA-232
Galvanically Isolated FTAs			
MC-GRMT01	N/A	51404106-175	RHMUX Analog Input with local CJR, screw term
MC-GRPA01	N/A	51304724-175	RHMUX GI/IS Power Adapter with compression term
MC-TRPA01	N/A	51304722-175	RHMUX GI/NI Power Adapter with compression term
MC-GAIH12	51304636-150	N/A	High Level Analog Input with compression terminals
MC-GAIH13	51304718-150	51304718-175	High Level Analog Input/STI with compression term
MC-GAIH14	51304730-150	51304730-175	High Level Analog Input/STI with compression term
MC-GAIH22	51304748-150	51304748-175	High Level Analog Input with compression terminals
MC-GAIH82	51304636-350	N/A	High Level Analog Input with crimp terminals
MC-GAIH83	51304718-350	51304718-375	High Level Analog Input/STI with crimp terminals
MC-GAIH84	51304730-350	51304730-375	High Level Analog Input/STI with crimp terminals
MC-GAIH92	51304748-350	51304748-375	High Level Analog Input with crimp terminals
MC-GAOX02	51304638-150	51304638-175	Nonredundant Analog Output with compression term

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Galvanically Isolated FTAs, continued			
MC-GAOX12	51304638-250	51304638-275	Redundant Analog Output with compression terminal
MC-GAOX72	51304638-350	51304638-375	Nonredundant Analog Output with crimp terminals
MC-GAOX82	51304638-750	51304638-775	Redundant Analog Output with crimp terminals
MC-GDID12	51304640-150	51304640-175	Digital Input with compression terminals
MC-GDID13	51304728-150	51304728-175	Digital Input with compression terminals
MC-GDID82	51304640-350	51304640-375	Digital Input with crimp terminals
MC-GDID83	51304728-350	51304728-375	Digital Input with crimp terminals
MC-GDOD12	51304642-150	51304642-175	24 Vdc Digital Output with compression terminals
MC-GDOD82	51304642-350	51304642-375	24 Vdc Digital Output with crimp terminals
MC-GDOL12	51304736-150	51304736-175	24 Vdc Digital Output with compression terminals
MC-GDOL82	51304736-350	51304736-375	24 Vdc Digital Output with crimp terminals
MC-GLFD02	51304732-150	51304732-175	Combiner Panel
MC-GMAR52	51304646-150	51309156-175	Marshalling Panel
MC-GPRD02	51304644-150	51304644-175	Power Distribution Assembly
I/O Link Extender			
MC-IOLM02			Standard I/O Link Extender—Local Card File
	N/A	51304419-150	Standard I/O Link Extender Card
	N/A	51201557-350	Standard I/O Link Extender Coupler
MC-IOLX02			Standard I/O Link Extender—Remote Card File
	N/A	51304419-150	Standard I/O Link Extender Card
	N/A	51201557-150	Standard I/O Link Extender Coupler
MC-ILDX03			Long Distance I/O Link Extender
	N/A	51304532-150	Long Distance I/O Link Extender Card
	N/A	51309208-150	Long Distance I/O Link Extender Coupler

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Card Files			
MC-HPFH01	51404125-150	N/A	Left 7-Slot Card File Assembly
MC-HPFH03	N/A	51404191-175	Left 7-Slot HPMM Card File Assembly
MC-HPFH11	51404126-150	N/A	Right 7-Slot Card File Assembly
MC-HPFH13	N/A	51404192-175	Right 7-Slot HPMM Card File Assembly
MC-HPFX02	51404127-150	N/A	15-Slot Card File Assembly
MC-HPFX03	N/A	51404193-175	15-Slot HPMM Card File Assembly
MC-HPFI03	N/A	51404191-275	Left 7-Slot IOP Card File Assembly
MC-HPFI13	N/A	51404192-275	Right 7-Slot IOP Card File Assembly
MC-HPFI23	N/A	51404193-275	15-Slot IOP Card File Assembly
HPMM Card Sets			
MC-HPMS01			Nonredundant HPMM Card Set
	N/A	51301635-150	High-Performance Comm/Control Card
	N/A	51301642-150	High-Performance I/O Link Card
	N/A	51302573-150	HPM UCN Interface Module
MC-HPMR01			Redundant HPMM Card Sets
	N/A	51301635-150	High-Performance Comm/Control Card (2)
	N/A	51301642-150	High-Performance I/O Link Card (2)
	N/A	51302573-150	HPM UCN Interface Module (2)
	N/A	51201667-100	Redundancy Cable

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Power System			
MC-PSSX03	N/A	51401217-450	Power System, single Power Supply Module
MC-PSSX04	N/A	51404174-175	Power System, single Power Supply Module
MC-PSRX03	N/A	51401217-550	Power System, redundant Power Supply Modules
MC-PSRX04	N/A	51404174-275	Power System, redundant Power Supply Modules
MC-PSRB03	N/A	51401217-650	Power System, redundant PSMs with Battery Pack
MC-PSRB04	N/A	51404174-375	Power System, redundant PSMs with Battery Pack
MC-PAS121	51401140-150	N/A	AC Only Power System, single PSM, 115 Vac 16 A
MC-PAR121	51401140-250	N/A	AC Only Power System, redund PSMs, 115 Vac 16 A
MC-PAS221	51401140-350	N/A	AC Only Power System, single PSM, 230 Vac 16 A
MC-PAR221	51401140-450	N/A	AC Only Power System, redund PSMs, 230 Vac 16 A
MC-PAS111	51401140-550	N/A	AC Only Power System, single PSM, 115 Vac 8 A
MC-PAR111	51401140-650	N/A	AC Only Power System, redund PSMs, 115 Vac 8 A
MC-PAS211	51401140-750	N/A	AC Only Power System, single PSM, 230 Vac 8 A
MC-PAR211	51401140-850	N/A	AC Only Power System, redund PSMs, 230 Vac 8 A
Standby Manual Devices			
MC-SMAC02	N/A	51401277-250	Analog Output Standby Manual Device w/case, cable
MC-SMDC02	N/A	51304526-150	Digital Output Standby Manual Device w/case, cable
MC-SMDX02	N/A	51304527-150	Digital Output Standby Manual Device with cable
Cabinet Fan Assemblies			
MC-FAN511			Cabinet Fan Assembly with alarm, 240 Vac
	N/A	51303940-250	Cabinet Fan Assembly with alarm, 240 Vac
MC-FAN611			Cabinet Fan Assembly with alarm, 120 Vac
	N/A	51303940-150	Cabinet Fan Assembly with alarm, 120 Vac

Continued on next page

Conformally coated model list, continued

Table 6-3 Conformally Coated Assembly Model Numbers, Continued

Model Number	Non CE Compliant Part Number	CE Compliant Part Number	Description
Miscellaneous			
MC-CBSS01			NEMA 4x Stainless Steel Enclosure (.6 m W x .5 m D x .6 m H) with Left 7-Slot card file
MC-CBSS02			NEMA 4x Stainless Steel Enclosure (.6 m W x .5 m D x .6 m H) with Right 7-Slot card file

Section 7 – CE Compliance

7.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
7.1	Overview	115
7.2	Card Files	116
7.3	HPMM Cards	117
7.4	IOPs	117
7.5	FTAs	120
7.6	I/O Link Extender	129
7.7	IOP to FTA Cables	130
7.8	Power Cables	131
7.9	I/O Link Interface Cables	136
7.10	UCN Trunk Cable Taps	137
7.11	Cabinets	139

Introduction

To meet CE Compliance directives, card files, High-Performance Process Manager Module (HPMM) cards, Field Termination Assemblies (FTAs), Power Systems, and cables, namely IOP to FTA cables, power cables, and I/O Link Interface cables, are available and identified either by model number or by the assembly part number.

Hardware differences

Where applicable, this section describes general differences between the CE Compliant hardware and non-CE Compliant hardware.

Also discussed are the hardware combinations and rules that must be considered for CE Compliance.

CE Compliant hardware identification

Finally, where applicable, each subsection that is devoted to a particular type of hardware identifies the CE Compliant and the non-CE Compliant hardware.

Master Reference Ground

The use of a Master Reference Ground (MRG), which is separate from Safety Ground, is not acceptable for a CE Compliant installation. References to Master Reference Ground must be ignored and a single Safety Ground must be substituted.

CE Compliant installation

Only recommended CE Compliant hardware, cabling, and practices must be considered for a CE Compliant installation. Install only a single ground system.

7.2 Card Files

Introduction

All three card file types are available for CE Compliant applications. The CE Compliant models have three unique features. They are

- Filtered backpanel IOP connectors
- IOP connector ground panel(s)
- Rear backpanel shield

Unlike the non-CE Compliant 7-Slot and 15-Slot card files that are not dedicated HPMM or IOP card files, the CE-Compliant 7-Slot and 15-Slot card files are mechanically either HPMM or IOP card files. 7-Slot or 15-Slot IOP card files will not accept an HPMM card set.

Backpanel ground plane

The backpanel ground panel provides a ground plane for the body of the IOP connectors. The body of the connector in turn provides ground for the IOP to FTA cable shield when mated with the IOP connector.

Rear backpanel shield panel

Like the UCN connector shield enclosure, the backpanel shield panel provides EMI protection at the back of the backpanel.

IOP to FTA cables

Both the model MU-KFTAxx and MU-KFTSxx IOP to FTA cables can be used with both the CE Compliant and non-CE Compliant card files. However, only the CE Compliant card file models and the model MU-KFTSxx IOP to FTA cables together are acceptable as CE Compliant.

Model list

Table 7-1 lists the model numbers of the CE Compliant card files. All models are available without conformal coating (MU) and with conformal coating (MC). The PM/APM technology IOP Only card file is also included because it may exist when a PM or APM is upgraded to an HPM.

Table 7-1 Card Files

Card File Description	Non-Conformally Coated Model Number	Conformally Coated Model Number
Left 7-Slot HPMM	MU-HPFH03	MC-HPFH03
Right 7-Slot HPMM	MU-HPFH13	MC-HPFH13
15-Slot HPMM	MU-HPFX03	MC-HPFX03
Left 7-Slot IOP	MU-HPFI03	MC-HPFI03
Right 7-Slot IOP	MU-HPFI13	MC-HPFI13
15-Slot IOP	MU-HPFI23	MC-HPFI23
IOP Only (PM/APM)	MU-IOFX03	MC-IOFX03

Continued on next page

7.2 Card Files, Continued

Conversion kit

A model MU-ZPFI03 upgrade kit will convert a 7-Slot or 15-Slot HPMM card file to an IOP card file.

7.3 HPMM Cards

Introduction

The High-Performance Process Manager Module (HPMM) card set is CE Compliant.

Conformal coating

The HPMM card set is available with and without conformal coating.

7.4 IOPs

Introduction

Only the model MU-PAOX03 Analog Output IOP is available in a CE Compliant and non-CE Compliant version. All other IOP models are CE Compliant only.

Conformal coating

All IOP cards are available with and without conformal coating.

Continued on next page

Nonconformally coated IOPs

Table 7-2 lists the model numbers of the CE Compliant and non-CE Compliant IOP cards that are not conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-2 IOPs—Nonconformally Coated

IOP Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MU-PAIL02	N/A	51304481-100
LLMux	MU-PLAM02	N/A	51304362-100
RHMUX	MU-PRHM01	N/A	51404109-125
HLAI	MU-PAIH03	N/A	51304754-100
STIM	MU-PSTX03	N/A	51304516-200
AO	MU-PAOX03	51304672-100	51309152-125
AO	MU-PAOY22	N/A	80363969-100
DI	MU-PDIX02	N/A	51304485-100
DI	MU-PDIY22	N/A	80363972-100
DISOE	MU-PDIS12	51402625-125	N/A
DO	MU-PDOX02	N/A	51304487-100
DO	MU-PDOY22	N/A	80363975-100
PI	MU-PPIX02	N/A	51304386-100
SDI	MU-PSDX02	N/A	51304362-200
SI	MU-PSIM11	N/A	51304362-300

Continued on next page

Conformally coated IOPs

Table 7-3 lists the model numbers of the CE Compliant and non-CE Compliant IOP cards that are conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-3 IOPs—Conformally Coated

IOP Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MC-PAIL02	N/A	51304481-150
LLMux	MC-PLAM02	N/A	51304362-150
RHMUX	MC-PRHM01	N/A	51404109-175
HLAI	MC-PAIH03	N/A	51304754-150
STI	MC-PSTX02	N/A	51304516-150
STIM	MC-PSTX03	N/A	51304516-250
AO	MC-PAOX03	51304672-150	51309152-175
AO	MC-PAOY22	N/A	80363969-150
DI	MC-PDIX02	N/A	51304485-150
DI	MC-PDIY22	N/A	80363972-150
DISOE	MC-PDIS12	N/A	51402625-175
DO	MC-PDOX02	N/A	51304487-150
DO	MC-PDOY22	N/A	80363975-150
PI	MC-PPIX02	N/A	51304386-150
SDI	MC-PSDX02	N/A	51304362-250
SI	MC-PSIM11	N/A	51304362-350

7.5 FTAs

Introduction

Many types of FTAs are available that are CE Compliant. Some are identified by a model number that is different than the model number for the non-CE Compliant FTA. Other CE Compliant FTA types have the same model number as the non-CE Compliant FTA, but are generally identified by the tab number of the part number that ends in "25."

The CE Compliant FTAs feature filtered connectors to interface the CE Compliant model MU-KFTSxx IOP to FTA cable(s).

Conformal coating

All FTAs are available with and without conformal coating.

Nonconformally coated FTAs

Table 7-4 is a list of CE Compliant and non-CE Compliant FTAs that are not conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-4 Field Termination Assemblies—Nonconformally Coated

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MU-TAIL02	51304437-100	N/A
LLAI	MU-TAIL03	N/A	51309202-125
LLMux RTD	MU-TAMR02	51304477-100	N/A
LLMux RTD	MU-TAMR03	N/A	51309218-125
LLMux TC	MU-TAMT02	51401491-100	N/A
LLMux TC	MU-TAMT03	N/A	51309223-125
LLMux TC Remote	MU-TAMT12	51401573-100	N/A
LLMux TC Remote	MU-TAMT13	N/A	51309213-125
RHMUX GI/IS Power Adapter	MU-GRPA01	N/A	51304724-125
RHMUX GI/NI Power Adapter	MU-TRPA01	N/A	51304722-125
HLAI/STI	MU-TAIH02	51304453-100	N/A
HLAI/STI	MU-TAIH12	51304337-100	N/A
HLAI/STI	MU-TAIH22	80366195-100	N/A
HLAI/STI	MU-TAIH52	51304337-200	N/A
HLAI/STI	MU-TAIH62	80366192-100	N/A
HLAI	MU-TAIH03	N/A	51309136-125
HLAI	MU-TAIH13	N/A	51309138-125

Continued on next page

Nonconformally coated FTAs, continued

Table 7-4 Field Termination Assemblies—Nonconformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
HLAI	MU-TAIH23	N/A	80369165-125
HLAI	MU-TAIH53	N/A	51309138-225
STI	MU-TSTX03	N/A	51309136-125
STI	MU-TSTX13	N/A	51309138-125
STI	MU-TSTX53	N/A	51309138-225
AO	MU-TAOX02	51304476-100	51304476-125
AO	MU-TAOX12	51304335-100	51304335-125
AO	MU-TAOX52	51304335-200	51304335-225
AO	MU-TAOY22	80366177-100	80366481-125
AO	MU-TAOY23	80366177-200	N/A
AO	MU-TAOY52	80364007-100	80366484-125
AO	MU-TAOY53	80364007-200	N/A
24 Vdc DI	MU-TDID12	51304441-100	51304441-125
24 Vdc DI	MU-TDID52	51304441-200	51304441-225
24 Vdc DI	MU-TDID72	51303928-100	N/A
24 Vdc DI	MU-TDIY22	80366180-100	80366180-125
24 Vdc DI	MU-TDIY62	80364010-100	80364010-125
120 Vac DI	MU-TDIA12	51304439-100	51304439-125
120 Vac DI	MU-TDIA52	51304439-200	51304439-225
120 Vac DI	MU-TDIA72	51303930-100	N/A
240 Vac DI	MU-TDIA22	51304431-100	51304431-125
240 Vac DI	MU-TDIA62	51304431-200	51304431-225
24 Vdc Nonisolated DO	MU-TDON12	51304446-100	N/A
24 Vdc Nonisolated DO	MU-TDON52	51304446-200	N/A
24 Vdc Isolated DO	MU-TDOY22	80366183-100	80366183-125

Continued on next page

Nonconformally coated FTAs, continued

Table 7-4 Field Termination Assemblies—Nonconformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
24 Vdc Isolated DO	MU-TDOY62	80364013-100	80364013-125
3-30 Vdc SS DO	MU-TDOD12	51304423-100	N/A
3-30 Vdc SS DO	MU-TDOD13	51304650-100	N/A
3-30 Vdc SS DO	MU-TDOD14	N/A	51309153-125
3-30 Vdc SS DO	MU-TDOD52	51304423-200	N/A
3-30 Vdc SS DO	MU-TDOD53	51304650-200	N/A
3-30 Vdc SS DO	MU-TDOD54	N/A	51309153-225
31-200 Vac SS DO	MU-TDOD22	51304428-100	N/A
31-200 Vac SS DO	MU-TDOD23	N/A	51309154-125
31-200 Vac SS DO	MU-TDOD62	51304428-200	N/A
31-200 Vac SS DO	MU-TDOD63	N/A	51309154-225
120/240 Vac SS DO	MU-TDOA12	51304408-100	N/A
120/240 Vac SS DO	MU-TDOA13	51304648-100	51304648-125
120/240 Vac SS DO	MU-TDOA52	51304408-200	N/A
120/240 Vac SS DO	MU-TDOA53	51304648-200	51304648-225
120 Vac/125 Vdc Relay DO	MU-TDOR12	51304443-100	51309148-125
120 Vac/125 Vdc Relay DO	MU-TDOR52	51304443-200	51309148-225
240 Vac/125 Vdc Relay DO	MU-TDOR22	51304427-100	51309150-125
240 Vac/125 Vdc Relay DO	MU-TDOR62	51304427-200	51309150-225
240 Vac/125 Vdc Relay DO	MU-TDOY23	80366189-100	80366189-125
240 Vac/125 Vdc Relay DO	MU-TDOY63	80366185-100	80366185-125
PI	MU-TPIX12	51304084-100	51304084-125
PI	MU-TPIX52	51304084-200	51304084-225

Continued on next page

Nonconformally coated FTAs, continued

Table 7-4 Field Termination Assemblies—Nonconformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
SDI—Toledo	MU-TSDT02	51303932-201	N/A
SDI—Manual/Auto	MU-TSDM02	51303932-202	N/A
SDI—Toledo	MU-TSDU02	51303932-203	N/A
SI—Modbus	MU-TSIM12	51303932-401	51303932-426
SI—Allen-Bradley	MU-TSIA12	51303932-403	51303932-428
Power Adapter	MU-TLPA02	51304467-100	51309204-125
DI Power Dist Assembly	MU-TDPR02	51304425-100	51304425-125
GI Power Dist Assembly	MU-GPRD02	51304644-100	51304644-125
GI HLAI/STI	MU-GAIH13	51304718-100	51304718-125
GI HLAI/STI	MU-GAIH14	51304730-100	51304730-125
GI HLAI/STI	MU-GAIH83	51304718-300	51304718-325
GI HLAI/STI	MU-GAIH84	51304730-300	51304730-325
GI HLAI	MU-GAIH12	51304636-100	N/A
GI HLAI	MU-GAIH22	51304748-100	51304748-125
GI HLAI	MU-GAIH82	51304636-300	N/A
GI HLAI	MU-GAIH92	51304748-300	51304748-325
GI AO	MU-GAOX02	51304638-100	51304638-125
GI AO	MU-GAOX12	51304638-500	51304638-525
GI AO	MU-GAOX72	51304638-300	51304638-325
GI AO	MU-GAOX82	51304638-700	51304638-725
GI 24 Vdc DI	MU-GDID12	51304640-100	51304640-125
GI 24 Vdc DI	MU-GDID13	51304728-100	51304728-125
GI 24 Vdc DI	MU-GDID82	51304640-300	51304640-325
GI 24 Vdc DI	MU-GDID83	51304728-300	51304728-325

Continued on next page

Nonconformally coated FTAs, continued

Table 7-4 Field Termination Assemblies—Nonconformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
GI 24 Vdc DO	MU-GDOD12	51304642-100	51304642-125
GI 24 Vdc DO	MU-GDOD82	51304642-300	51304642-325
GI DO with LFD	MU-GDOL12	51304736-100	51304736-125
GI DO with LFD	MU-GDOL82	51304736-300	51304736-325
GI Combiner Panel	MU-GLFD02	51304732-100	51304732-125
GI Marshalling Panel	MU-GMAR52	51304646-100	51309156-125

Continued on next page

Conformally coated FTAs

Table 7-5 is a list of CE Compliant and non-CE Compliant FTAs that are conformally coated. Model numbers and part numbers identify the assemblies.

Table 7-5 Field Termination Assemblies—Conformally Coated

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
LLAI	MC-TAIL02	51304437-150	N/A
LLAI	MC-TAIL03	N/A	51309202-175
LLMux RTD	MC-TAMR02	51304477-150	N/A
LLMux RTD	MC-TAMR03	N/A	51309218-175
LLMux TC	MC-TAMT02	51401491-150	N/A
LLMux TC	MC-TAMT03	N/A	51309223-175
LLMux TC Remote	MC-TAMT12	51401573-150	N/A
LLMux TC Remote	MC-TAMT13	N/A	51309213-175
RHMUX TC Local CJR	MC-GRMT01	N/A	51404106-175
RHMUX GI/IS Power Adapter	MC-GRPA01	N/A	51304724-175
RHMUX GI/NI Power Adapter	MC-TRPA01	N/A	51304722-175
HLAI/STI	MC-TAIH02	51304453-150	N/A
HLAI/STI	MC-TAIH12	51304337-150	N/A
HLAI/STI	MU-TAIH22	80366195-150	N/A
HLAI/STI	MU-TAIH52	51304337-250	N/A
HLAI/STI	MU-TAIH62	80366192-150	N/A
HLAI	MC-TAIH03	N/A	51309136-175
HLAI	MC-TAIH13	N/A	51309138-175
HLAI	MU-TAIH23	N/A	80369165-175
HLAI	MC-TAIH53	N/A	51309138-275
STI	MC-TSTX03	N/A	51309136-175
STI	MC-TSTX13	N/A	51309138-175
STI	MC-TSTX53	N/A	51309138-275

Continued on next page

Conformally coated FTAs, continued

Table 7-5 Field Termination Assemblies—Conformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
AO	MC-TAOX02	51304476-150	51304476-175
AO	MC-TAOX12	51304335-150	51304335-175
AO	MC-TAOX52	51304335-250	51304335-275
AO	MC-TAOY22	80366177-150	80366481-175
AO	MC-TAOY23	80366177-250	N/A
AO	MC-TAOY52	80364007-150	80366484-175
AO	MC-TAOY53	80364007-250	N/A
24 Vdc DI	MC-TDID12	51304441-150	51304441-175
24 Vdc DI	MC-TDID52	51304441-250	51304441-275
24 Vdc DI	MC-TDID72	51303928-150	N/A
24 Vdc DI	MC-TDIY22	80366180-150	80366180-175
24 Vdc DI	MC-TDIY62	80364010-150	80364010-175
120 Vac DI	MC-TDIA12	51304439-150	51304439-175
120 Vac DI	MC-TDIA52	51304439-250	51304439-275
120 Vac DI	MC-TDIA72	51303930-150	N/A
240 Vac DI	MC-TDIA22	51304431-150	51304431-175
240 Vac DI	MC-TDIA62	51304431-250	51304431-275
24 Vdc Nonisolated DO	MC-TDON12	51304446-150	N/A
24 Vdc Nonisolated DO	MC-TDON52	51304446-250	N/A
24 Vdc Isolated DO	MC-TDOY22	80366183-150	80366183-175
24 Vdc Isolated DO	MC-TDOY62	80364013-150	80364013-175
3-30 Vdc SS DO	MC-TDOD12	51304423-150	N/A
3-30 Vdc SS DO	MC-TDOD13	51304650-150	N/A
3-30 Vdc SS DO	MC-TDOD14	N/A	51309153-175
3-30 Vdc SS DO	MC-TDOD52	51304423-250	N/A

Continued on next page

Conformally coated FTAs, continued

Table 7-5 Field Termination Assemblies—Conformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
3-30 Vdc SS DO	MC-TDOD53	51304650-250	N/A
3-30 Vdc SS DO	MC-TDOD54	N/A	51309153-275
31-200 Vac SS DO	MC-TDOD22	51304428-150	N/A
31-200 Vac SS DO	MC-TDOD23	N/A	51309154-175
31-200 Vac SS DO	MC-TDOD62	51304428-250	N/A
31-200 Vac SS DO	MC-TDOD63	N/A	51309154-275
120/240 Vac SS DO	MC-TDOA12	51304408-150	N/A
120/240 Vac SS DO	MC-TDOA13	51304648-150	51304648-175
120/240 Vac SS DO	MC-TDOA52	51304408-250	N/A
120/240 Vac SS DO	MC-TDOA53	51304648-250	51304648-275
120 Vac/125 Vdc Relay DO	MC-TDOR12	51304443-150	51309148-175
120 Vac/125 Vdc Relay DO	MC-TDOR52	51304443-250	51309148-275
240 Vac/125 Vdc Relay DO	MC-TDOR22	51304427-150	51309150-175
240 Vac/125 Vdc Relay DO	MC-TDOR62	51304427-250	51309150-275
240 Vac/125 Vdc Relay DO	MC TDOY23	80366189-150	80366189-175
240 Vac/125 Vdc Relay DO	MC TDOY63	80366185-150	80366185-175
PI	MC-TPIX12	51304084-150	51304084-175
PI	MC-TPIX52	51304084-250	51304084-275
SDI—Toledo	MC-TSDT02	51303932-251	N/A
SDI—Manual/Auto	MC-TSDM02	51303932-252	N/A
SDI—Toledo	MC-TSDU02	51303932-253	N/A
SI—Modbus	MC-TSIM12	51303932-451	51303932-476
SI—Allen-Bradley	MC-TSIA12	51303932-453	51303932-478
Power Adapter	MC-TLPA02	51304467-150	51309204-175

Continued on next page

Conformally coated
FTAs, continued

Table 7-5 Field Termination Assemblies—Conformally Coated, Continued

FTA Type	Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
DI Power Dist Assy	MC-TDPR02	51304425-150	51304425-175
GI Power Dist Assy	MC-GPRD02	51304644-150	51304644-175
GI HLAI/STI	MC-GAIH13	51304718-150	51304718-175
GI HLAI/STI	MC-GAIH14	51304730-150	51304730-175
GI HLAI/STI	MC-GAIH83	51304718-350	51304718-375
GI HLAI/STI	MC-GAIH84	51304730-350	51304730-375
GI HLAI	MU-GAIH12	51304636-150	N/A
GI HLAI	MU-GAIH22	51304748-150	51304748-175
GI HLAI	MU-GAIH82	51304636-350	N/A
GI HLAI	MU-GAIH92	51304748-350	51304748-375
GI AO	MC-GAOX02	51304638-150	51304638-175
GI AO	MC-GAOX12	51304638-550	51304638-575
GI AO	MC-GAOX72	51304638-350	51304638-375
GI AO	MC-GAOX82	51304638-750	51304638-775
GI 24 Vdc DI	MC-GDID12	51304640-150	51304640-175
GI 24 Vdc DI	MC-GDID13	51304728-150	51304728-175
GI 24 Vdc DI	MC-GDID82	51304640-350	51304640-375
GI 24 Vdc DI	MC-GDID83	51304728-350	51304728-375
GI 24 Vdc DO	MC-GDOD12	51304642-150	51304642-175
GI 24 Vdc DO	MC-GDOD82	51304642-350	51304642-375
GI DO with LFD	MC-GDOL12	51304736-150	51304736-175
GI DO with LFD	MC-GDOL82	51304736-350	51304736-375
GI Combiner Panel	MC-GLFD02	51304732-150	51304732-175
GI Marshalling Panel	MC-GMAR52	51304646-150	51309156-175

7.6 I/O Link Extender

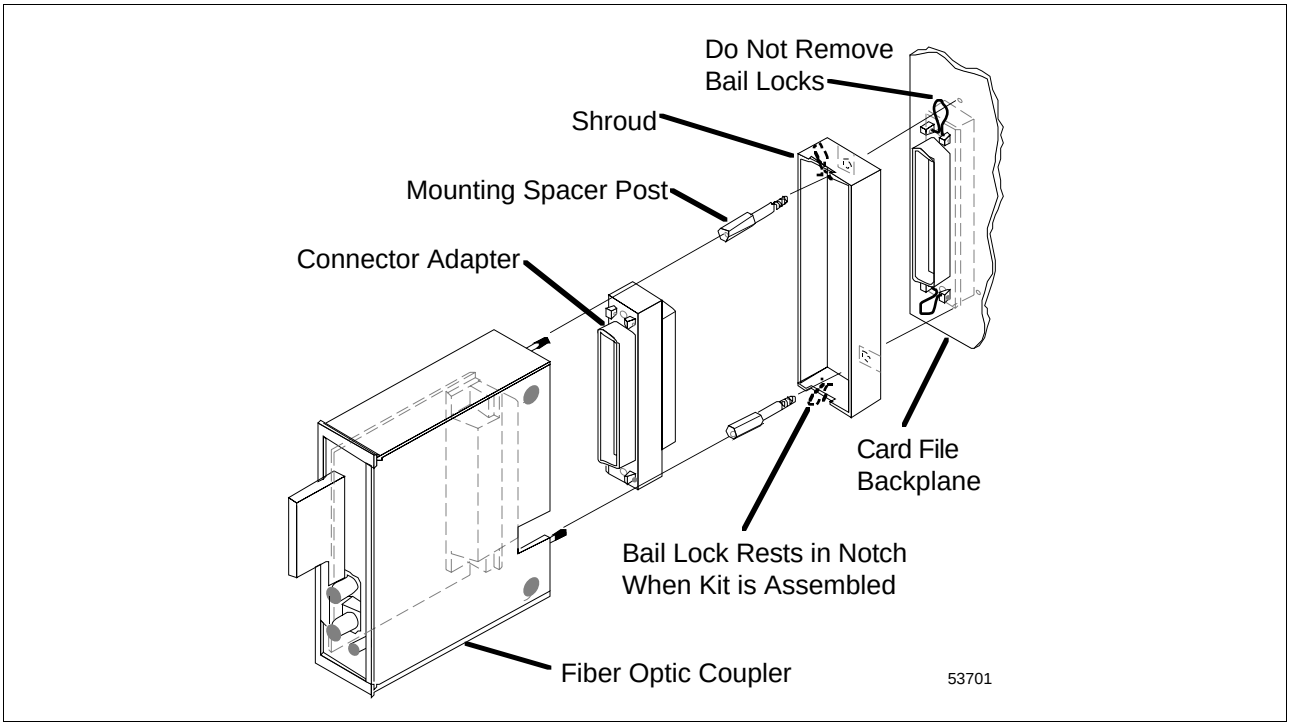
Introduction

The I/O Link Extender cards and Fiber Optic Coupler modules are CE Compliant. There are no non-CE Compliant versions.

I/O Link Extender adapter kit

The model MU-ILES01 adapter kit must be used to install the Fiber Optic Coupler module in the CE Compliant card files. The kit consists of a connector adapter, shroud, and mounting spacers as illustrated in Figure 7-1. See the *Process Manager I/O Installation* manual for installation instructions.

Figure 7-1 I/O Link Extender Adapter Kit



7.7 IOP to FTA Cables

Introduction

Model MU-KFTSxx IOP to FTA cables are shielded cables and are for CE Compliant applications. They are identified by metal connector cases. The non-CE Compliant model MU-KFTAxx IOP to FTA cables are not shielded cables and are identified by the plastic connector case.

CE Compliant

CE Compliance is provided only when the mating connector on the card file backpanel is a filtered connector with a metal case and the mating connector on the FTA is a connector with a metal case. The metal connector case grounds the cable shield at both ends of the cable.

Both the card file and the FTA must be CE Compliant assemblies. See subsections 7.2 and 7.5 for a list of CE Compliant assemblies.

Model list

Table 7-6 lists the model numbers of CE Compliant and non-CE Compliant IOP to FTA cables.

Table 7-6 IOP to FTA Cables

Cable Length (Meters/Feet)	Non-CE Compliant Model Number	CE Compliant Model Number
1.0/3.3	Part Number 51201420-001	Part Number 51204033-001
1.5/4.9	Part Number 51201420-915	Part Number 51204033-915
2.0/6.6	MU-KFTA02	MU-KFTS02
3.0/9.8	MU-KFTA03	MU-KFTS03
4.0/13.1	MU-KFTA04	MU-KFTS04
5.0/16.4	MU-KFTA05	MU-KFTS05
6.0/19.7	MU-KFTA06	MU-KFTS06
8.0/26.2	MU-KFTA08	MU-KFTS08
10.0/32.8	MU-KFTA10	MU-KFTS10
15.0/49.2	MU-KFTA15	MU-KFTS15
20.0/65.6	MU-KFTA20	MU-KFTS20
25.0/82.0	MU-KFTA25	MU-KFTS25
30.0/98.4	MU-KFTA30	MU-KFTS30
35.0/114.8	MU-KFTA35	MU-KFTS35
40.0/131.2	MU-KFTA40	MU-KFTS40
45.0/147.6	MU-KFTA45	MU-KFTS45
50.0/164.0	MU-KFTA50	MU-KFTS50

7.8 Power Cables

Introduction

Tables 7-7, 7-8, and 7-9 list the model and part numbers for power cables that are available for use in an HPM. The power cables that are listed in tables 7-7 and 7-8 have an integral I/O Link protector module attached to the cable. The module protects the I/O Link Interface transceivers from surges when each I/O link Interface cable is routed through a protector module at the card file. The cables that are listed in Table 7-9 do not have protector modules.

For the feature to be effective, all card files in the subsystem (for example, a subsystem being all the card files that are connected to the HPMM(s) through the metallic I/O Link Interface cable) must have the I/O Link protector module feature installed.

New subsystems

New subsystems will have this I/O Link protector module feature. If a subsystem that is without protector modules is being modified, and the I/O Link protector module feature is desired, all the existing power cables that are connected to card files can be upgraded by adding an I/O Link protector module adapter cable to the card file end of each power cable. Since there are two power cables per card file, the adapters are available in sets of two. Power cables to Power Distribution Assemblies do not require any modification (for example, the Digital Input and Galvanic Isolation Power Distribution Assemblies).

The 51195479-xxx I/O Link Interface cable must always be used with the I/O Link protector module in both CE and Non-CE Compliant subsystems.

Non-CE Compliant subsystems

In non-CE Compliant subsystems the 51204126-xxx power cable set must be used to provide power to the card files (see Table 7-7). These power cables have the integral I/O Link protector module feature.

If a system without I/O Link protector modules is being modified, and the feature is desired, all 51201397-xxx power cables must be upgraded by adding a 51204140-100 CE Compliant type I/O Link protector module adapter cable set to the card file end of each power cable set. The appropriate I/O Link Interface cables must then be used with the I/O Link protector modules. The cables are listed in Table 7-9.

For the Digital Input and Galvanic Isolation Power Distribution Assemblies that are mounted inside the cabinet, use the 51201397-xxx power cable.

For power distribution to Digital Input and Galvanic Isolation Power Distribution Assemblies that are located external to the cabinet, use the shielded model MU-KSPRxx power cables that are listed in Table 7-8.

Continued on next page

7.8 Power Cables, Continued

CE Compliant subsystems

For CE Compliant subsystems, a 51204138-xxx power cable set is required to provide power to a card file. This power cable has the integral I/O Link protector module feature. Refer to Table 7-8 for the list of power cables set lengths that are available.

If a subsystem without I/O Link protector modules is being upgraded, and the feature is desired, all 51201397-xxx power cables must be upgraded by adding CE Compliant type 51204140-100 I/O Link protector module adapter cable sets to the card file ends of the existing power cables. The adapter cables are available as a set of two cables that are labeled Link A and Link B. The appropriate I/O Link Interface cables must then be used with the I/O Link protector modules. Refer to Table 7-10 for the list of available I/O Link Interface cable sets.

For the Digital Input and Galvanic Isolation Power Distribution Assemblies that are mounted inside the cabinet, use the 51201397-xxx power cable .

For power distribution to Digital Input and Galvanic Isolation Power Distribution Assemblies that are located external to the cabinet, use the model MU-KSPRxx shielded power cables that are listed in Table 7-8.

Available power cables

Tables 7-7, 7-8, and 7-9 list the model and part numbers for power cables that are available. Power cable part numbers that provide a set of two cables (51204126-xxx and 51204138-xxx) have I/O Link protector modules labeled Link A and Link B and accommodate the I/O Link A and I/O Link B Interface cables, respectively. The other power cable part number (51201397-xxx) and model numbers (MU-KDPRxx and MU-KSPRxx) provide only a single power cable with no I/O Link protector module.

Continued on next page

Non-CE Compliant subsystem power cables

Table 7-7 Non-CE Compliant Subsystem Power Cables

Cable Length (Meters)	**Part Number To Card File With I/O Link Protector Module** (Cable Set)	**Model/Part Number To DI or GI Power Distribution Assembly Without I/O Link Protector Module** (Single Cable – Internal or External to Cabinet)
1.0	51204126-001	51201397-001
1.5	51204126-915	51201397-915
2.0	51204126-002	51201397-002
3.0	51204126-003	51201397-003
4.0	51204126-004	51201397-004
5.0	51204126-005	MU-KDPR05
6.0	51204126-006	51201397-006
10.0	N/A	MU-KDPR10
15.0	N/A	MU-KDPR15
20.0	N/A	MU-KDPR20
30.0	N/A	MU-KDPR30
40.0	N/A	MU-KDPR40
50.0	N/A	MU-KDPR50

Continued on next page

CE Compliant subsystem power cables

Table 7-8 CE Compliant Subsystem Power Cables

Cable Length (Meters)	**Part Number To Card File With I/O Link Protector Module** (Cable Set)	**Model/Part Number To DI or GI Power Distribution Assembly Without I/O Link Protector Module** (Single Cable)	
		Internal to Cabinet	**External to Cabinet**
1.0	51204138-001	51201397-001	N/A
1.5	51204138-915	51201397-915	N/A
2.0	51204138-002	51201397-002	N/A
3.0	51204138-003	51201397-003	N/A
4.0	51204138-004	51201397-004	N/A
5.0	51204138-005	MU-KDPR05	MU-KSPR05
6.0	51204138-006	51201397-006	N/A
10.0	N/A	N/A	MU-KSPR10
15.0	N/A	N/A	MU-KSPR15
20.0	N/A	N/A	MU-KSPR20
30.0	N/A	N/A	MU-KSPR30
40.0	N/A	N/A	MU-KSPR40
50.0	N/A	N/A	MU-KSPR50

Continued on next page

Power cable without protector module

When the I/O Link protection is not implemented, the power cables that are listed in Table 7-9 are used to provide power to the card files in both CE Compliant and non-CE Compliant subsystems. These cables are used in place of the 51204126-xxx and 51204138-xxx power cables that have a I/O Link protector module and are listed in Tables 7-7 and 7-8. Two cables are required for each card file.

Table 7-9 Power Cables without I/O Link Protector Module

Cable Length (Meters)	**Part Number To Card File Without I/O Link Protector Module** (Single Cable)
1.0	51204138-001
1.5	51204138-915
2.0	51204138-002
3.0	51204138-003
4.0	51204138-004
5.0	51204138-005
6.0	51204138-006

7.9 I/O Link Interface Cables

Introduction

For CE Compliance, the shield of an I/O Link Interface cable must be grounded to the card file's metal chassis. FASTON terminals are used to provide the connection.

51195479-xxx I/O Link Interface cables

The 51195479-xxx I/O Link Interface cables are used in both CE and Non-CE Compliant subsystems. This cable does not have a shield grounding lead or terminal. The shield is grounded through a grounding lead that is attached to the I/O Link protector module on the power cable. The end of the grounding lead has a FASTON terminal which must be connected to the appropriate FASTON terminal on the card file's metal chassis.

51204042-xxx I/O Link Interface cables

Prior to the introduction of the I/O Link protection feature, the CE Compliant subsystems used the 51204042-xxx I/O Link Interface cables. This cable can be identified by its shield wires with FASTON terminals.

Upgrading

If a system without I/O Link protector modules is being modified and the feature is desired, all power cables must be upgraded by adding a pair of CE Compliant I/O Link protector module adapter cables to each set of power cables. The 51204042-xxx adapter cables are a set of cables that are labeled Link A and Link B. The set of I/O Link Interface cables must then be replaced with a set 5195479-xxx I/O Link cables . DO NOT use the 51204042-xxx I/O Link Interface cables with the I/O Link protector modules.

Parts list

Table 7-10 lists the part numbers of I/O Link Interface cable sets. Two cables are provided when ordered by the part number.

Table 7-10 I/O Link Interface Cable Sets

Connector Drops	**CE/Non-CE Compliant Part Number** (Used with I/O Link Protector)	**CE Compliant Part Number** (Used without I/O Link Protector)
2	51195479-100	51204042-100
3	51195479-200	51204042-200
4	51195479-300	51204042-300
5	51195479-400	51204042-400
6	51195479-500	51204042-500

7.10 UCN Trunk Cable Taps

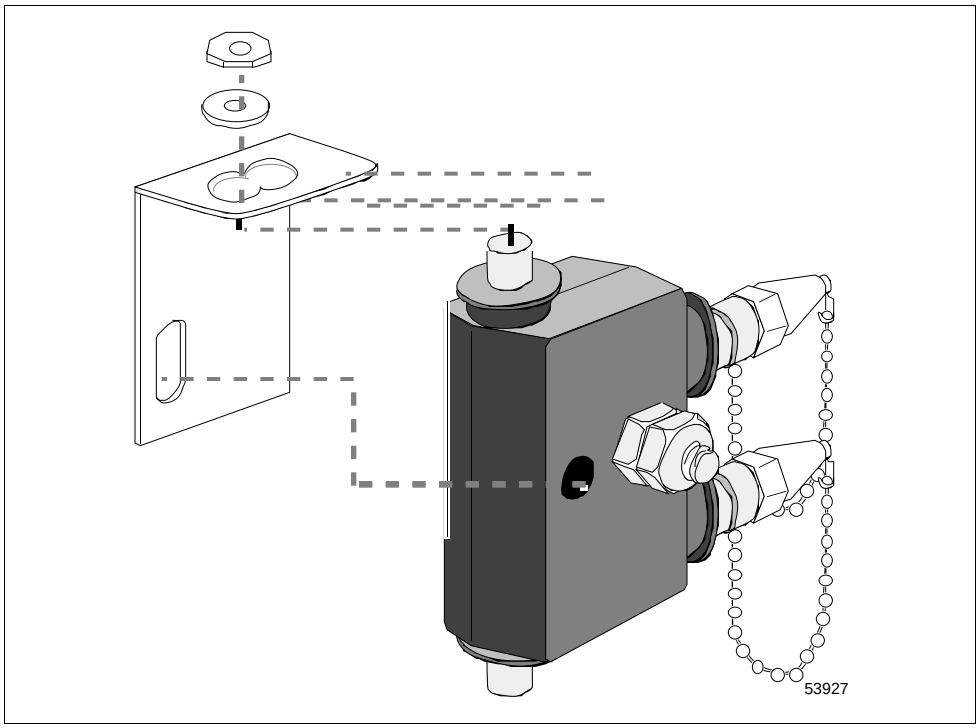
Introduction

A bracket has been added to the UCN cable taps, model numbers MU-NTAP02, MU-NTAP04, and MU-NTAP08, to ensure that the assembly case is properly grounded and CE Compliant. The part numbers for the UCN cable tap models are the same with or without the bracket.

Two-port UCN tap

Figure 7-2 is an illustration of the 2-port UCN cable tap with the added grounding bracket for CE Compliance.

Figure 7-2 Two-Port UCN Cable Tap

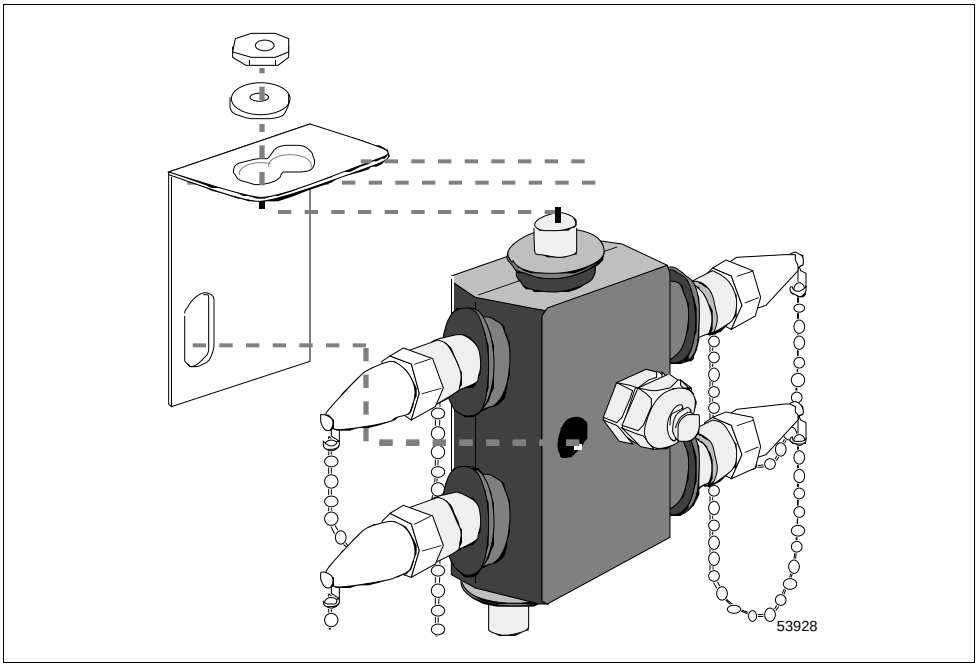


Continued on next page

Four-port UCN tap

Figure 7-3 is an illustration of the 4-port UCN cable tap with the added grounding bracket for CE Compliance.

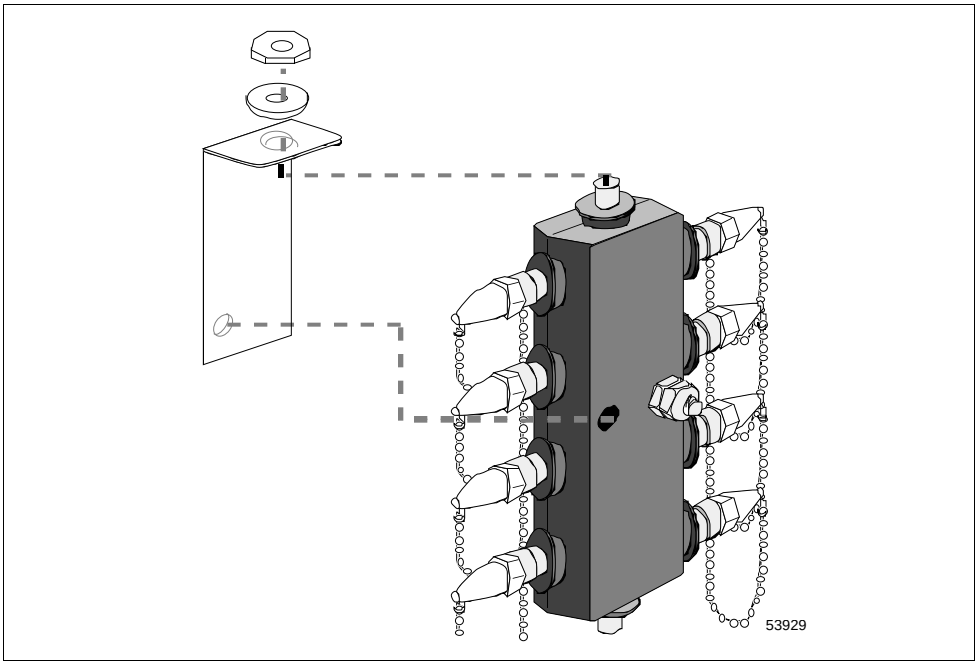
Figure 7-3 Four-Port UCN Cable Tap



Eight-port UCN tap

Figure 7-4 is an illustration of the 8-port UCN cable tap with the added grounding bracket for CE Compliance.

Figure 7-4 Eight-Port UCN Cable Tap



7.11 Cabinets

Introduction

Only the Rittal model MU-CBSX01 and MU-CBDX01 cabinets are CE Compliant; however, older versions of the cabinets are not CE Compliant because the cabinet panels and doors are not appropriately grounded to the cabinet frame. The CE Compliant cabinets are identified by the abundance of ground straps between the cabinet panels and doors.

Illustrations

See Figures 9-3 and 9-4 in Section 9 for illustrations of the CE Compliant cabinets. Note that all cabinet panels and doors are grounded to the cabinet frame. The cabinet frame must be connected to Safety Ground as described in the *TPS System Site Planning* manual.

UCN drop cable taps

For European site installations, all UCN drop cable taps must be installed inside the cabinet or cabinet complex.

UCN drop cables

Drop cables leave cannot leave the cabinet unless they are routed in metal conduit that is connected to Safety Ground.

Section 8 – Model MU-CBSM01/MU-CBDM01 Cabinets

8.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
8.1	Overview	141
8.2	Cabinet Description	144
8.3	Card File and Power System Configurations	148
8.4	Card File and Power System Description	150
8.5	FTA Mounting Channel Description	154
8.5.1	Vertical FTA Mounting Channels	155
8.5.2	Horizontal FTA Mounting Channel	159
8.6	Cabinet Floor Planning	163

Introduction

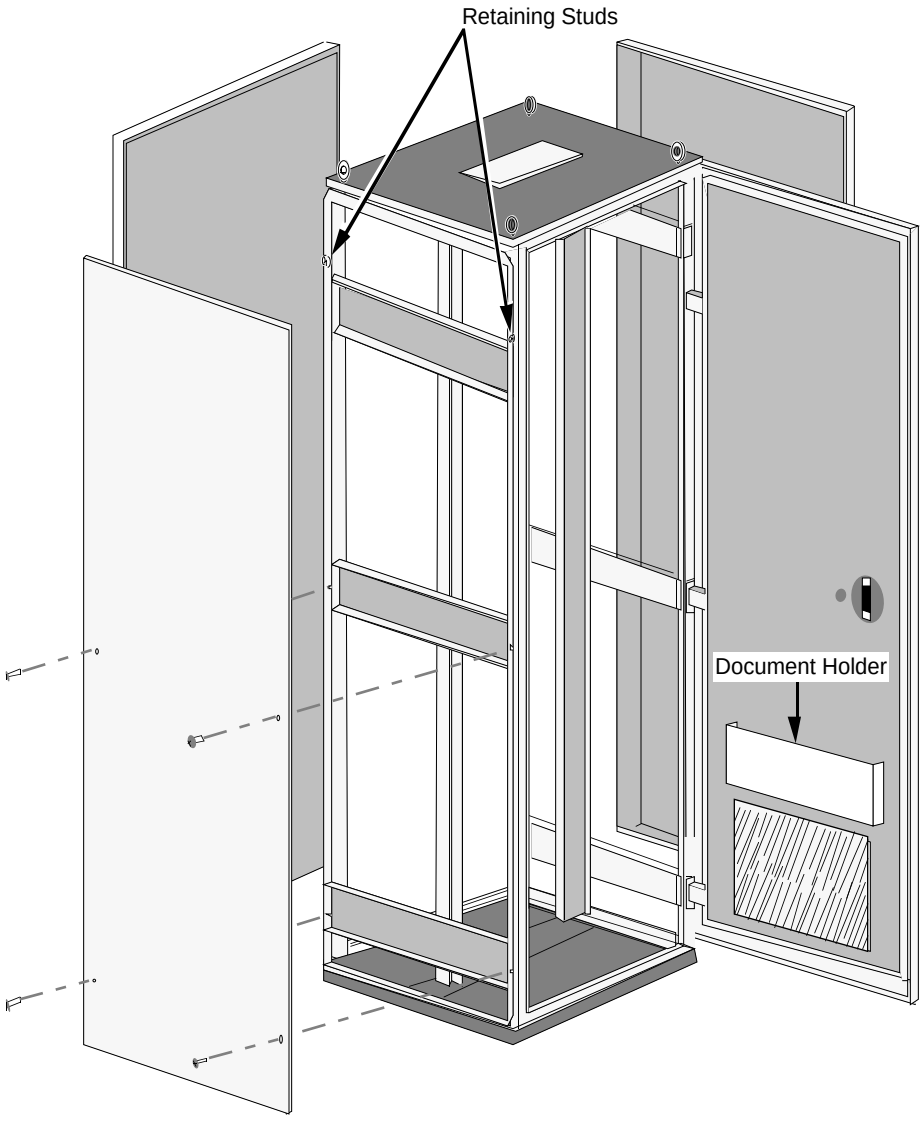
The High-Performance Process Manager (HPM) model MU-CBSM01 and MU-CBDM01 cabinets provide single and dual access, respectively. Access is defined as having a single front door entry or dual front and rear door entry. The model MU-CBSM01 and MU-CBDM01 cabinets are also referred to as Markhon cabinets because Markhon is the manufacturer.

Continued on next page

Single-access cabinet

The single-access cabinet has one equipment entry point and that is in the front of the cabinet through a single door. The High-Performance Process Manager card files, Power System, and the FTA Mounting Channels are installed inside the single-access door. The cabinet side panels can be removed for access. Figure 8-1 is an illustration of a single-access cabinet.

Figure 8-1 Single-Access Cabinet



Dimension	Width	Depth	Height
Single Access	.8 m/31.5 in.	.55 m/21.75	2.1 m/81.5 in.

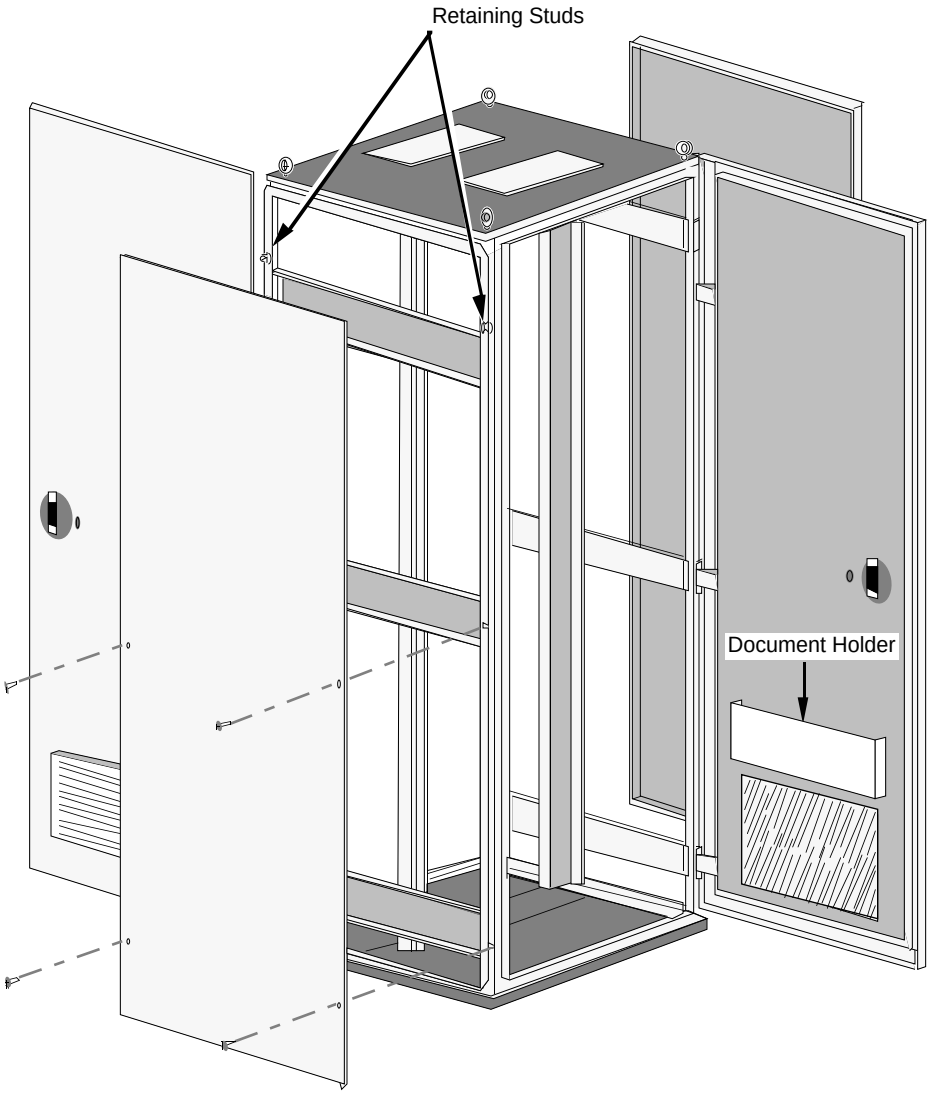
3096

Continued on next page

Dual-access cabinet

The dual-access cabinet has two entry doors. The High-Performance Process Manager card files and the Power System are mounted inside the front access door. The FTA Mounting Channels are normally installed inside the rear door. The cabinet side panels can be removed for access. Figure 8-2 is an illustration of a dual-access cabinet.

Figure 8-2 Dual-Access Cabinet



Dimensions	Width	Depth	Height
Dual Access	.8 m/31.5 in.	.8 m/31.5 in.	2.1 m/81.5 in.

3095

8.2 Cabinet Description

Cabinet dimensions

The single-access cabinet, with the front door, side and rear panels installed, has the following exterior dimensions.

0.8 meters wide x 0.55 meters deep x 2.1 meters high
(31.5 inches x 21.75 inches x 81.5 inches)

The dual access cabinet, with the front and rear doors, and side panels installed, has the following exterior dimensions.

0.8 meters wide x 0.55 meters deep x 2.1 meters high
(31.5 inches x 21.75 inches x 81.5 inches)

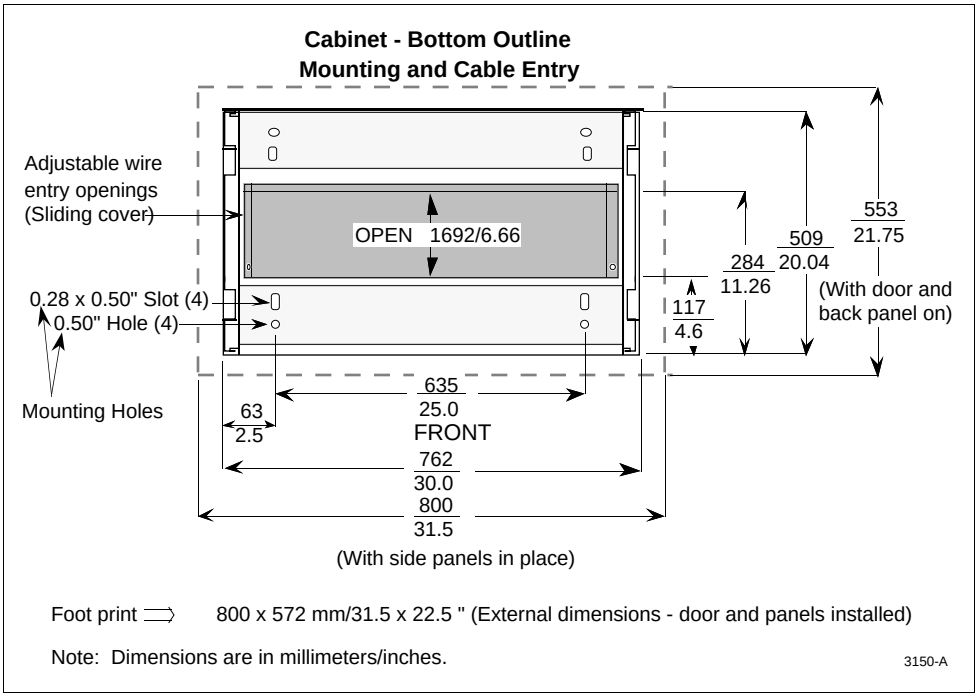
Top and bottom cabinet entry

Both cabinets are NEMA 1 rated and support top and bottom entry for process control wiring. Top entry requires removal of the top panel(s), and/or associated fan assemblies, before entry holes can be punched in the panel. Honeywell will prepunch the holes if specified when ordering the cabinet. Figures 8-3 and 8-4 are illustrations of the bottom cable entry slots for the single and dual cabinets, respectively.

Single-access bottom cable entry slots

Figure 8-3 illustrates the bottom cable entry slots in the single-access cabinet.

Figure 8-3 Single-Access Cabinet Bottom Cable Entry Slots

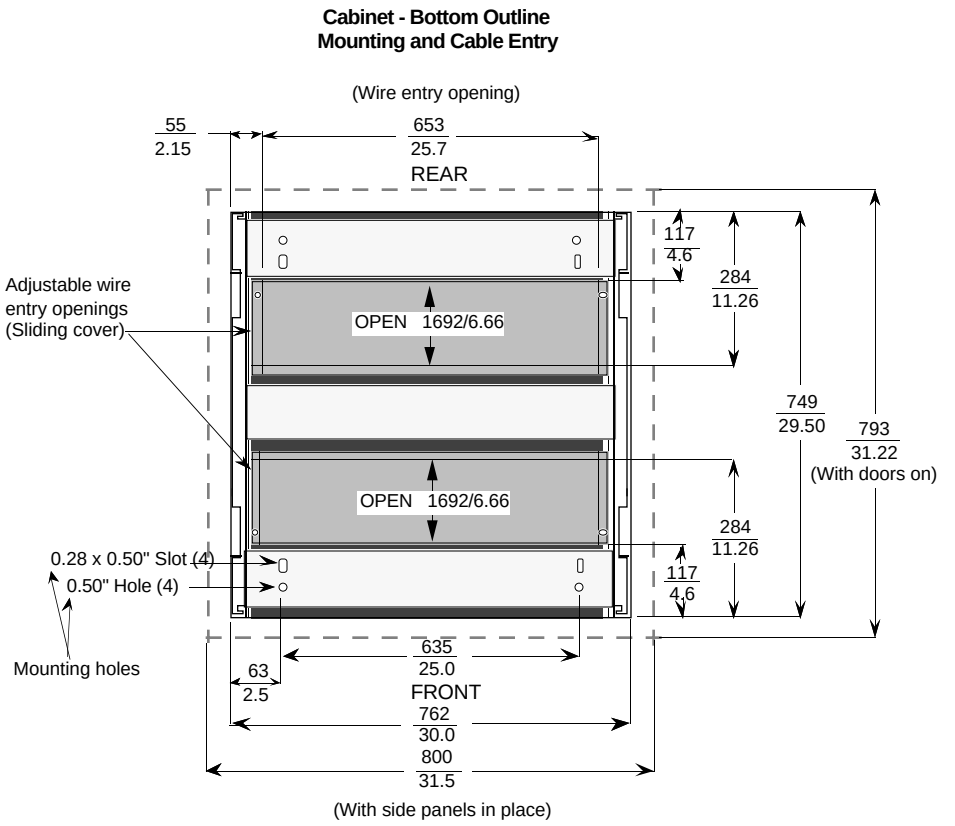


Continued on next page

Dual-access cable bottom entry slots

Figure 8-4 illustrates the bottom cable entry slots in the dual-access cabinet.

Figure 8-4 Dual-Access Cabinet Bottom Cable Entry Slots



Continued on next page

Independent cabinet entry

The dual-access cabinet has two independent entry doors. A single access cabinet has only one entry side. Card files and the Power System, or FTA Mounting Channels can be installed in either side of the cabinet without being constrained by the equipment installed in the other side of the cabinet.

The cabinet can be ordered with doors hinged on either the left or right side. The door latch is recessed and lockable.

Cabinet complexing

A maximum of four cabinets can be complexed together without intervening side panels by a complexing kit, Honeywell part number 51109532-200 (single access cabinet) or 51109532-100 (dual access cabinet).

NEMA 12

NEMA 12 rated cabinets can be ordered from Honeywell.

Cabinet cooling

Cabinet cooling is accomplished by the use of one or more fan assemblies that are mounted over appropriate cutouts in the cabinet top. Use of a fan assembly is mandatory for a cabinet entry side containing card files or a Power System. Because of power dissipation, the cabinet configuration determines if a fan assembly is required for a cabinet entry side containing Field Termination Assemblies (FTAs). A fan assembly is mandatory when Galvanically Isolated FTAs are installed. Fan assemblies are available for voltages and frequencies noted below:

- Cabinet Fan Assembly (240 Vac, 50/60 Hz)
- Cabinet Fan Assembly (120 Vac, 50/60 Hz)

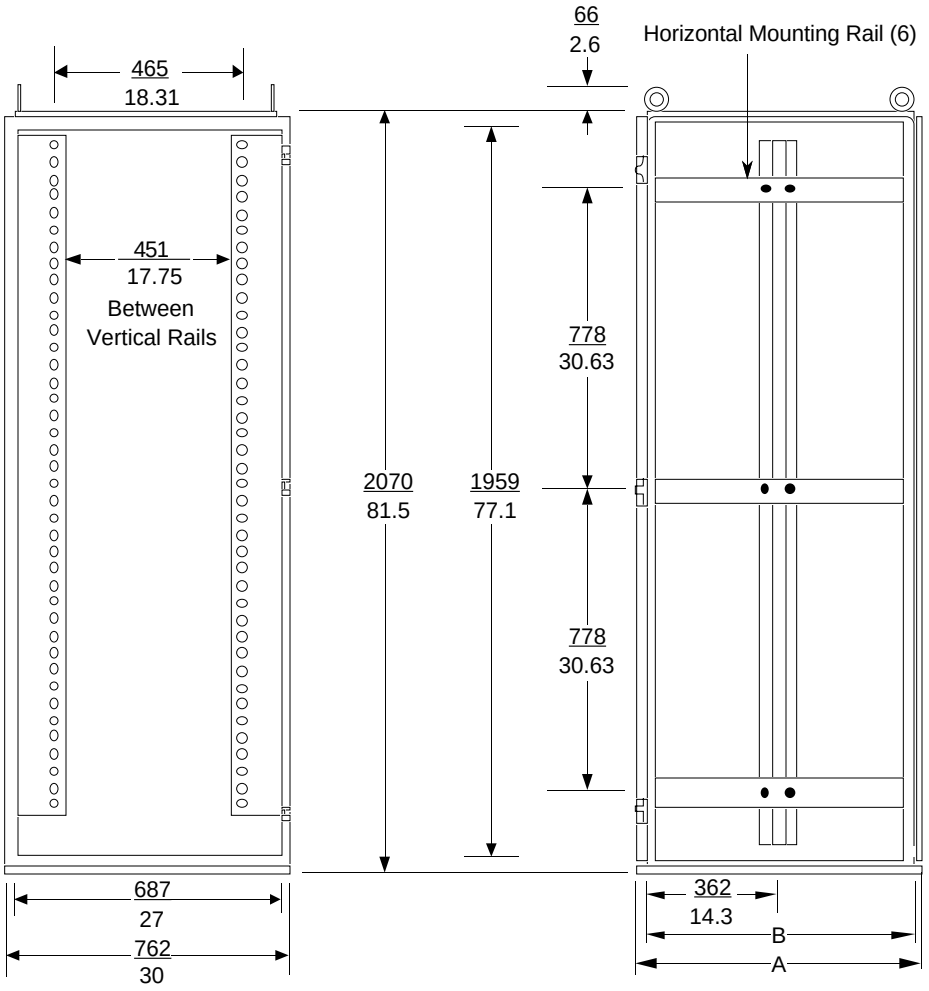
A blank plate is available to cover the hole(s) in the top of the cabinet in the event a fan assembly is not needed. The fan opening cabinet top cover plate is Honeywell part number 51304098-200.

Continued on next page

Cabinet internal structure

As shown in Figure 8-5, the cabinet is provided with an internal structure ("intrastructure") that is capable of accepting card file assemblies, Power Systems, and FTA Mounting Channels. When installing FTAs, FTA Mounting Channels must be specified as discussed in subsection 8.5.

Figure 8-5 Cabinet Interior Dimensions



Cabinet	A	B
Dual Access	793 31.2	749 29.5
Single Access	552 21.7	508 20

Note: Dimensions are in millimeters/inches.

3097

8.3 Card File and Power System Configurations

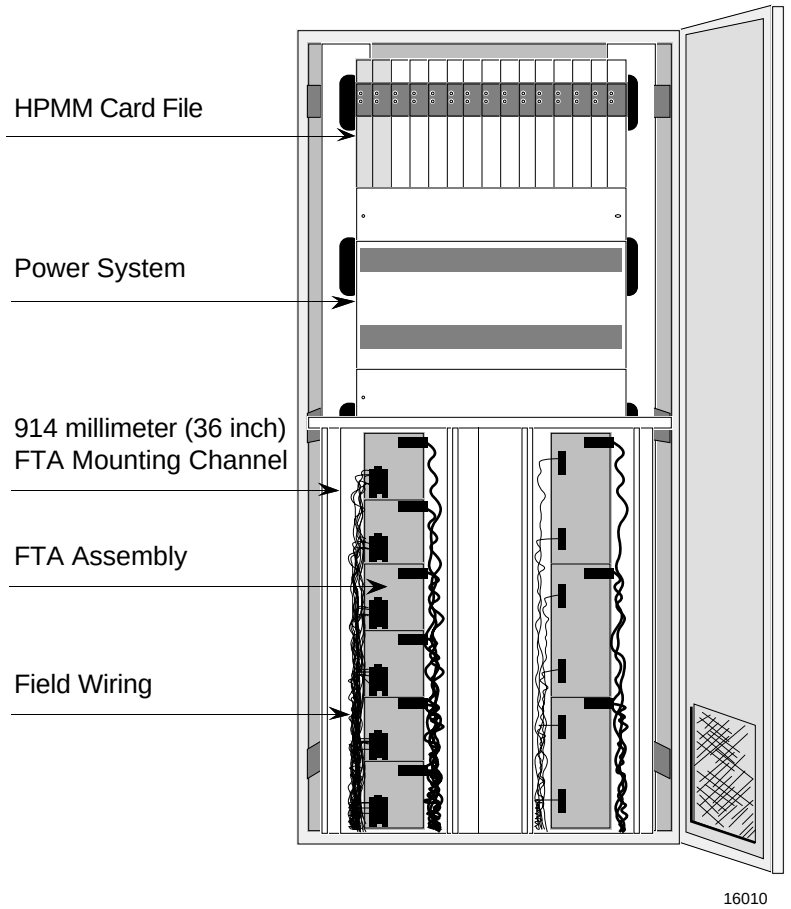
Cabinet layout

The High-Performance Process Manager card files, Power System, and FTA Mounting Channels install in the single- and dual-access cabinets as shown in Figures 8-6 and 8-7, respectively.

Single-access cabinet equipment layout

Figure 8-6 illustrates the equipment layout in a single-access cabinet.

Figure 8-6 Typical Single-Access Cabinet Assembly Layout

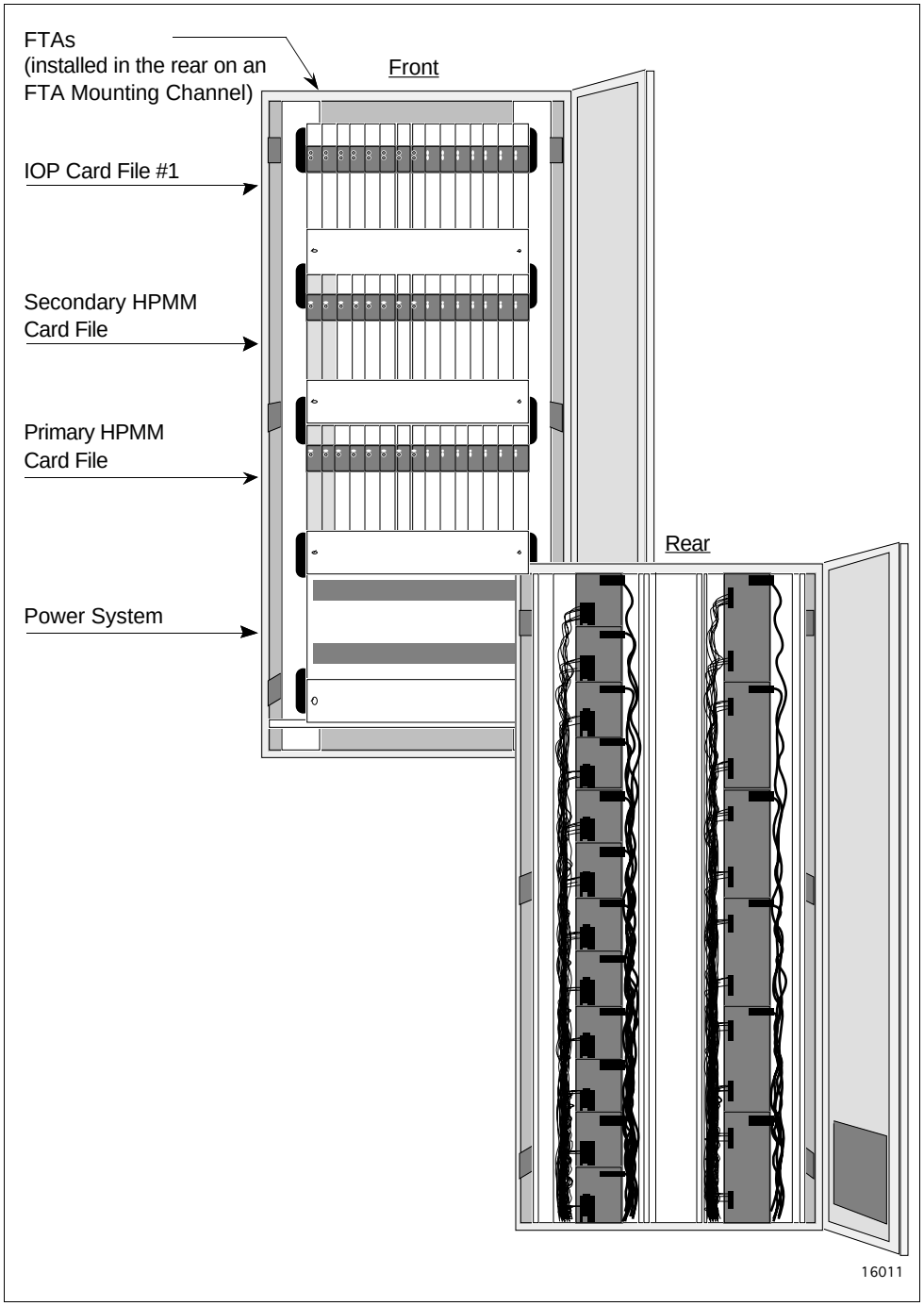


Continued on next page

Dual-access cabinet equipment layout

Figure 8-7 illustrates the equipment layout in a dual-access cabinet.

Figure 8-7 Typical Dual-Access Cabinet Assembly Layout



8.4 Card File and Power System Descriptions

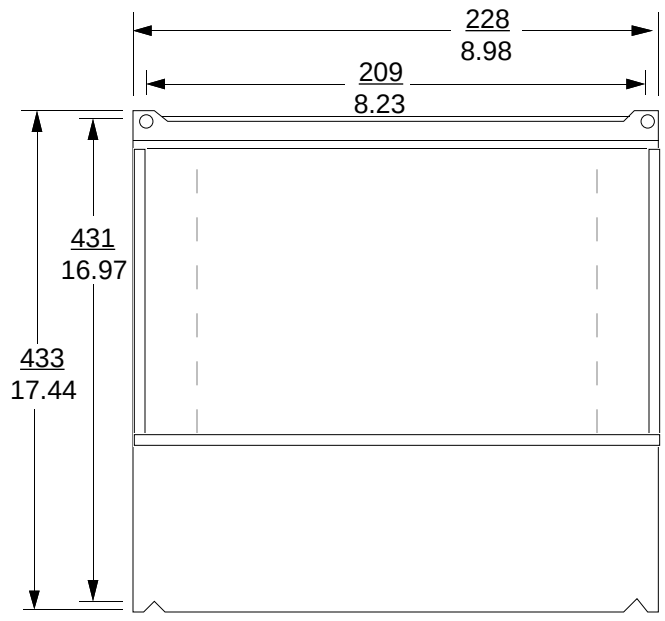
Card file descriptions

There are three types of card file assemblies, Left 7-Slot, Right 7-Slot, and 15-Slot. The Left and Right 7-Slot card files are the same size and are intended to be mounted adjacent to each other on the cabinet's 19" RETMA mounting intrastructure by using appropriate hardware. The 15-Slot card file mounts alone on the 19" RETMA mounting intrastructure.

7-Slot card file dimensions

Figure 8-8 illustrates the 7-Slot card file's installation dimensions.

Figure 8-8 7-Slot Card File Installation Dimensions



Note: Dimensions are in millimeters/inches.

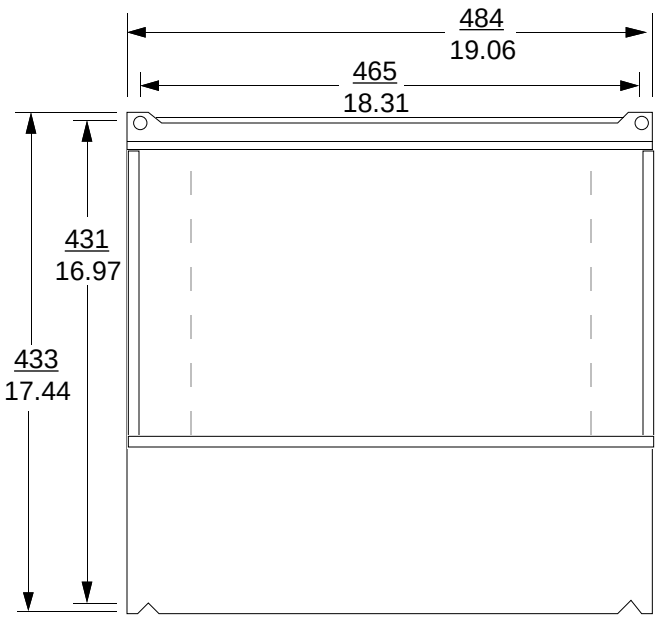
16012

Continued on next page

15-Slot card file dimensions

Figure 8-9 illustrates the 15-Slot card file's installation dimensions.

Figure 8-9 15-Slot Card File Installation Dimensions

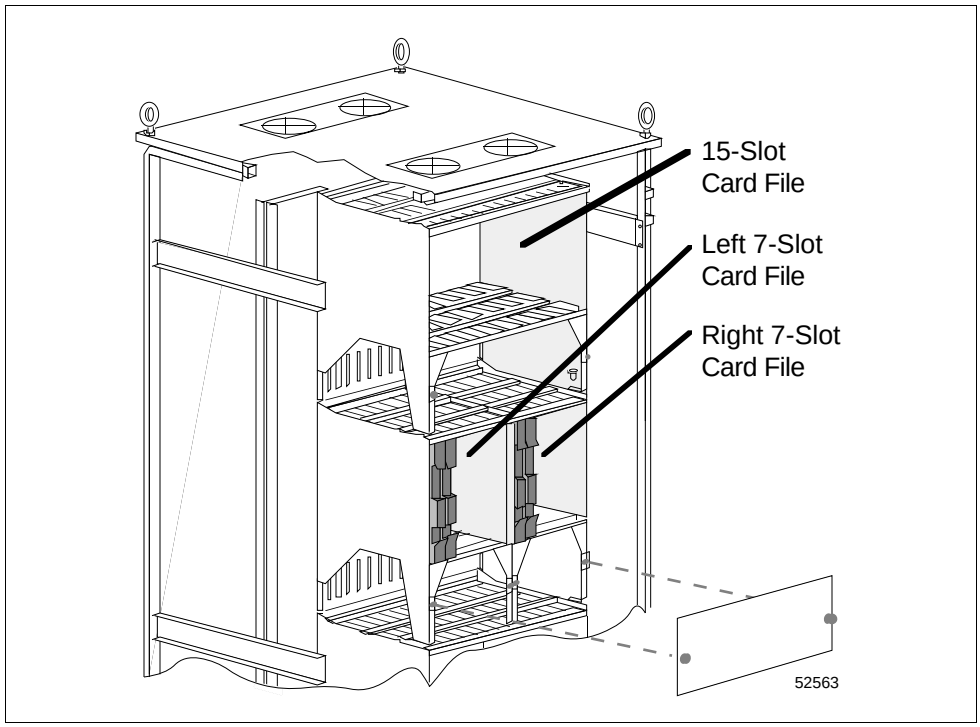


Continued on next page

Installing 7-Slot and 15-Slot card files

Figure 8-10 illustrates the installation of Left and Right 7-Slot and 15-Slot card files in a side-by-side configuration.

Figure 8-10 Installation of 7-Slot and 15-Slot Card Files

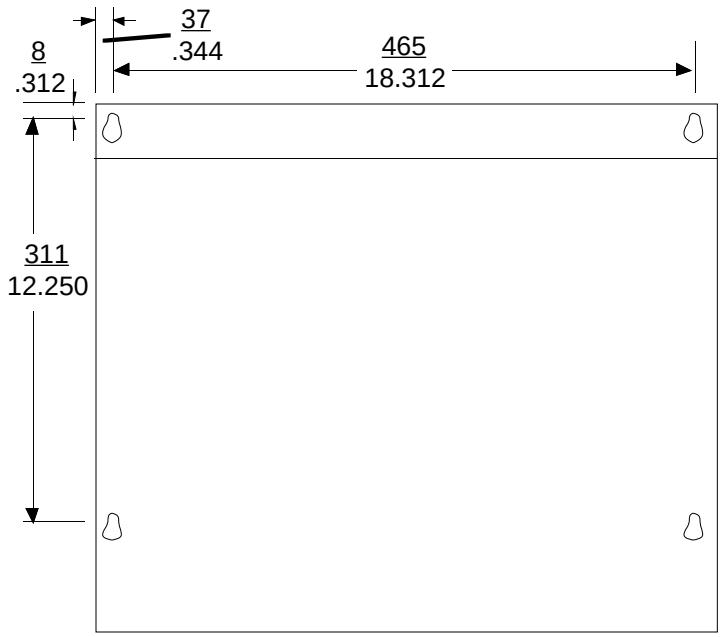


Continued on next page

Power System dimensions

The Power System dimensions are shown in Figure 8-11; it also installs on a 19" RETMA mounting intrastructure.

Figure 8-11 Power System Installation Dimensions



8.5 FTA Mounting Channel Descriptions

ATTENTION

ATTENTION—In the past, it was a requirement that Galvanically Isolated, Intrisically Safe (GI/IS) FTAs had to be mounted on horizontally oriented FTA Mounting Channels in an HPM cabinet. The requirement is no longer needed because of component and design improvements.

Galvanically Isolated FTAs can now be mounted on vertically oriented FTA Mounting Channels; however, there is still a requirement that Galvanically Isolated FTAs and standard (non-Galvantically Isolated) FTAs, and the wiring to them, be properly separated in the cabinet.

Any FTA Mounting Channels on which Galvanically Isolated FTAs will be mounted must be installed in an inverted (upside down from the normal) position.

The horizontal FTA Mounting Channel information in this section is reference information because some existing installations use horizontal FTA Mounting Channels that may require the installation of additional horizontal FTA Mounting Channels for equipment expansion.

FTA sizes and styles

Field Termination Assemblies (FTAs) are produced in three standard sizes that are dependent on the FTA type and circuit requirements.

Size A 15.20 cm (6.0 in.) x 12.0 cm(4.75 in.)

Size B 30.48 cm (12.1 in.) x 12.0 cm (4.75 in.)

Size C 46.22 cm (18.2 in.) x 12.0 cm (4.75 in.)

They mount on FTA Mounting Channels that are attached to the cabinet's intrastructure.

Three styles

Three styles of FTA Mounting Channels are available:

- Wide vertical
- Narrow vertical
- Horizontal

Selection is based on whether standard (non-Galvanically Isolated) or Galvanically Isolated FTAs are installed in the cabinet.

Vertical or horizontal mounting

The FTA Mounting Channels used to mount standard or Galvanically Isolated FTAs are vertically oriented in the cabinet, and the FTA Mounting Channels used to mount Galvanically Isolated FTAs are horizontally oriented in the cabinet.

8.5.1 Vertical FTA Mounting Channels

Overview

Both standard (non-Galvanically Isolated) and Galvanically Isolated FTAs are mounted on a vertically oriented FTA Mounting Channel in the cabinet. The vertical FTA Mounting Channel has two channels (troughs), right and left.

When standard FTAs are mounted on the vertical FTA Mounting Channel, the FTA Mounting Channel is installed in its "normal" position where field wiring enters the left channel and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s) or Power Distribution Assemblies are routed in the right channel of the FTA Mounting Channel.

When Galvanically Isolated FTAs are mounted on the vertical FTA Mounting Channel, the FTA Mounting Channel is installed in its "inverted" position where field wiring enters the right channel and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s) or Power Distribution Assemblies are routed in the left channel of the FTA Mounting Channel.

Galvanically Isolated FTAs and standard FTAs must not be mounted on the same FTA Mounting Channel.

FTA Mounting Channel configurations

The vertical FTA Mounting Channel length, approximately 93 centimeters (36 inches) is approximately half the height of the cabinet. The FTA Mounting Channels can be mounted adjacent to each other in this vertical area. The FTA mounting configurations will allow

- up to four narrow channels or
- up to three wide channels.

The FTA Mounting Channel configurations can be mounted adjacent to each other in the area.below the Power System in a single-access cabinet as shown in Figure 8-6.

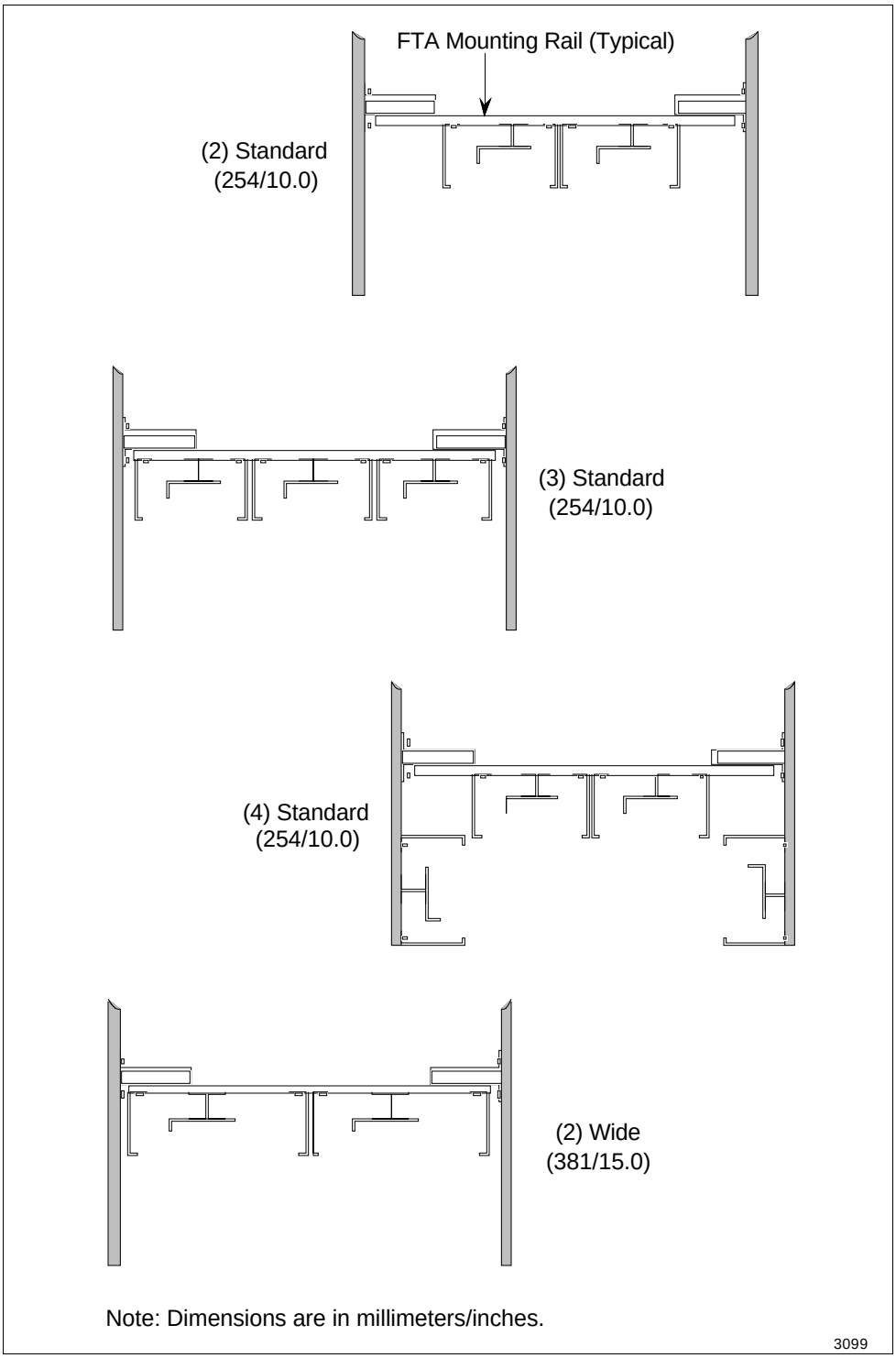
In the dual-access cabinet, one FTA Mounting Channel is normally installed above another, adjacently in pairs, as shown in Figure 8-7.

Continued on next page

Vertical FTA Mounting Channel configurations

Figure 8-12 illustrates four typical vertical FTA Mounting Channel cabinet configurations.

Figure 8-12 Typical Vertical FTA Mounting Channel Configurations



Continued on next page

8.5.1 Vertical FTA Mounting Channels, Continued

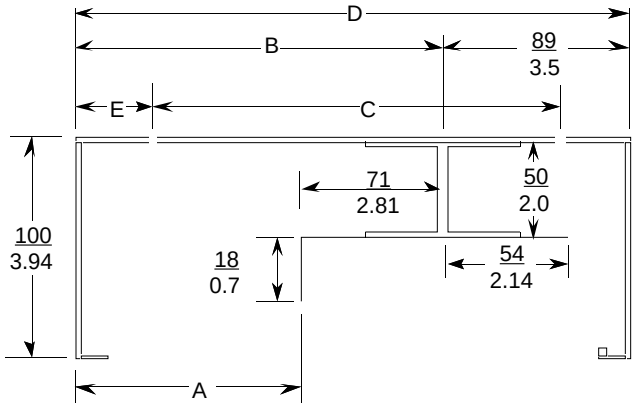
FTA Mounting Channel widths

Vertical FTA Mounting Channels are available in two widths:

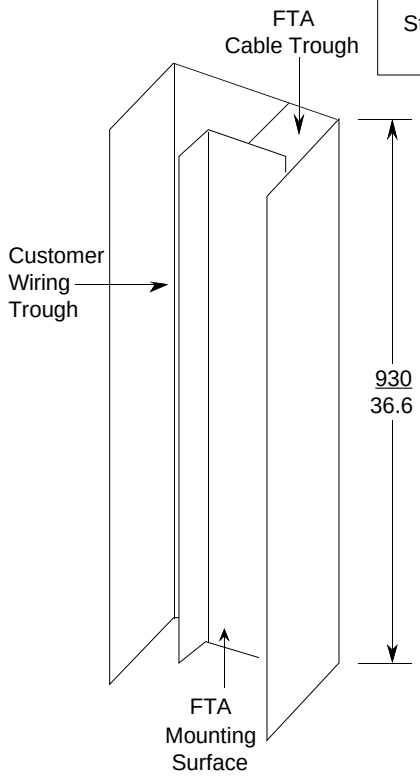
Standard 25.4 cm (10 in.) W x 10.8 cm (4.25 in.) D x 93 cm (36.6 in.) L
Wide 38.1 cm (15 in.) W x 10.8 cm (4.25 in.) D x 93 cm (36.6 in.) L

Figures 8-13 illustrates the FTA Mounting Channel dimensions.

Figure 8-13 Vertical FTA Mounting Channel Dimensions



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



Note: Dimensions are in millimeters/inches.

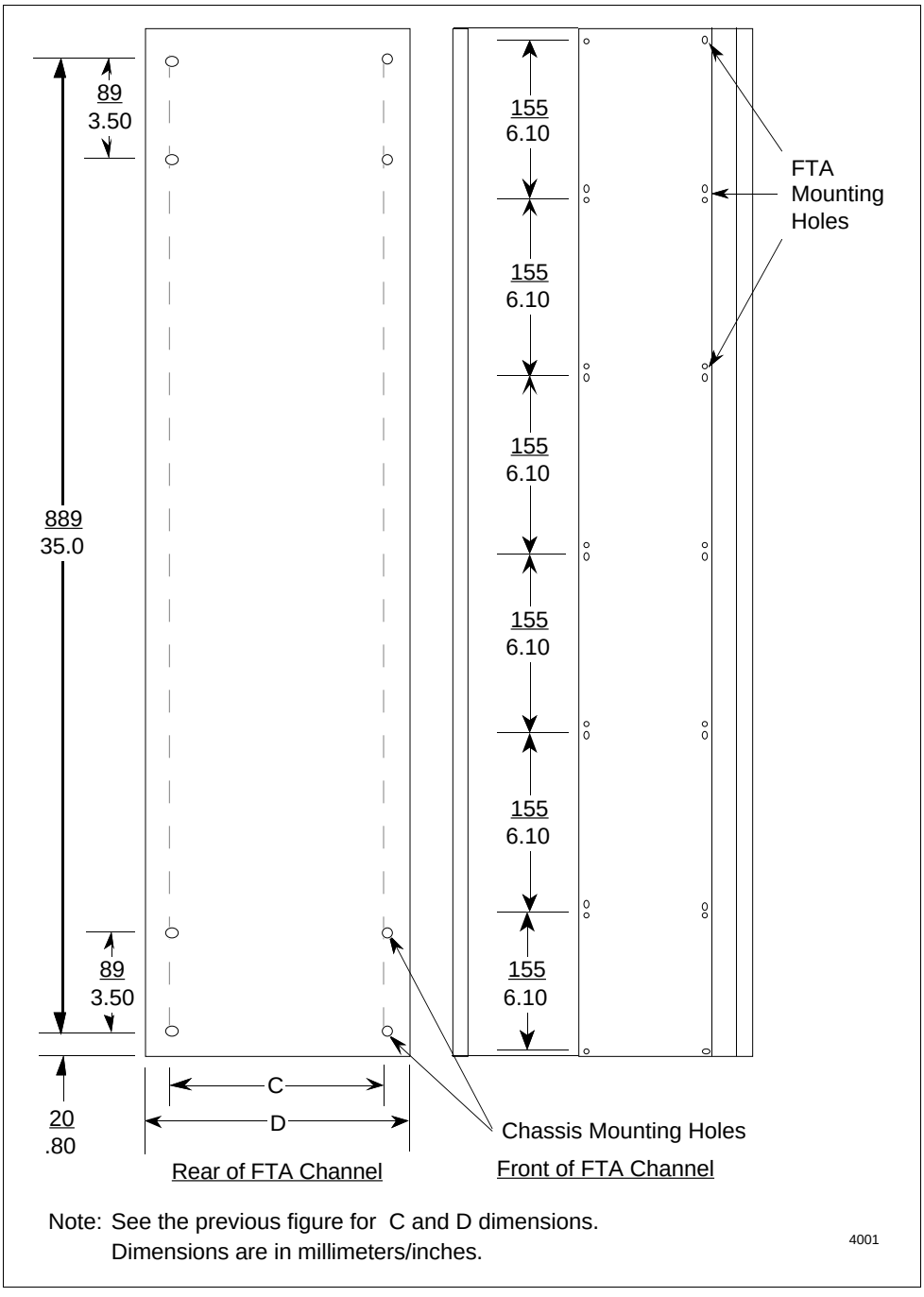
4000

Continued on next page

FTA installation holes

Figure 8-14 illustrates the locations of the FTA mounting holes on the FTA Mounting Channel and the holes used to install the FTA Mounting Channel.

Figure 8-14 Vertical FTA Mounting Channel Installation Holes



Note: See the previous figure for C and D dimensions.
Dimensions are in millimeters/inches.

8.5.2 Horizontal FTA Mounting Channel

Overview

Only Galvanically Isolated FTAs can be mounted on horizontal FTA Mounting Channels in the cabinet. The FTA Mounting Channels have two channels (troughs), upper and lower. Field wiring enters the lower channel from the right side of the cabinet and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s), Power Distribution Assemblies, and Marshalling Panels, if present, are routed in the upper channel of the FTA Mounting Channel from the left side of the cabinet.

Single-access FTA Mounting Channel installation

Up to three of the 62-centimeter (24.4-inch) long horizontal FTA Mounting Channels can be installed below the Power System in a single-access cabinet. A gap of approximately 22.9 centimeters (9 inches), the approximate width of a horizontal FTA Mounting Channel, must be maintained between the FTA Mounting Channels and the Power System.

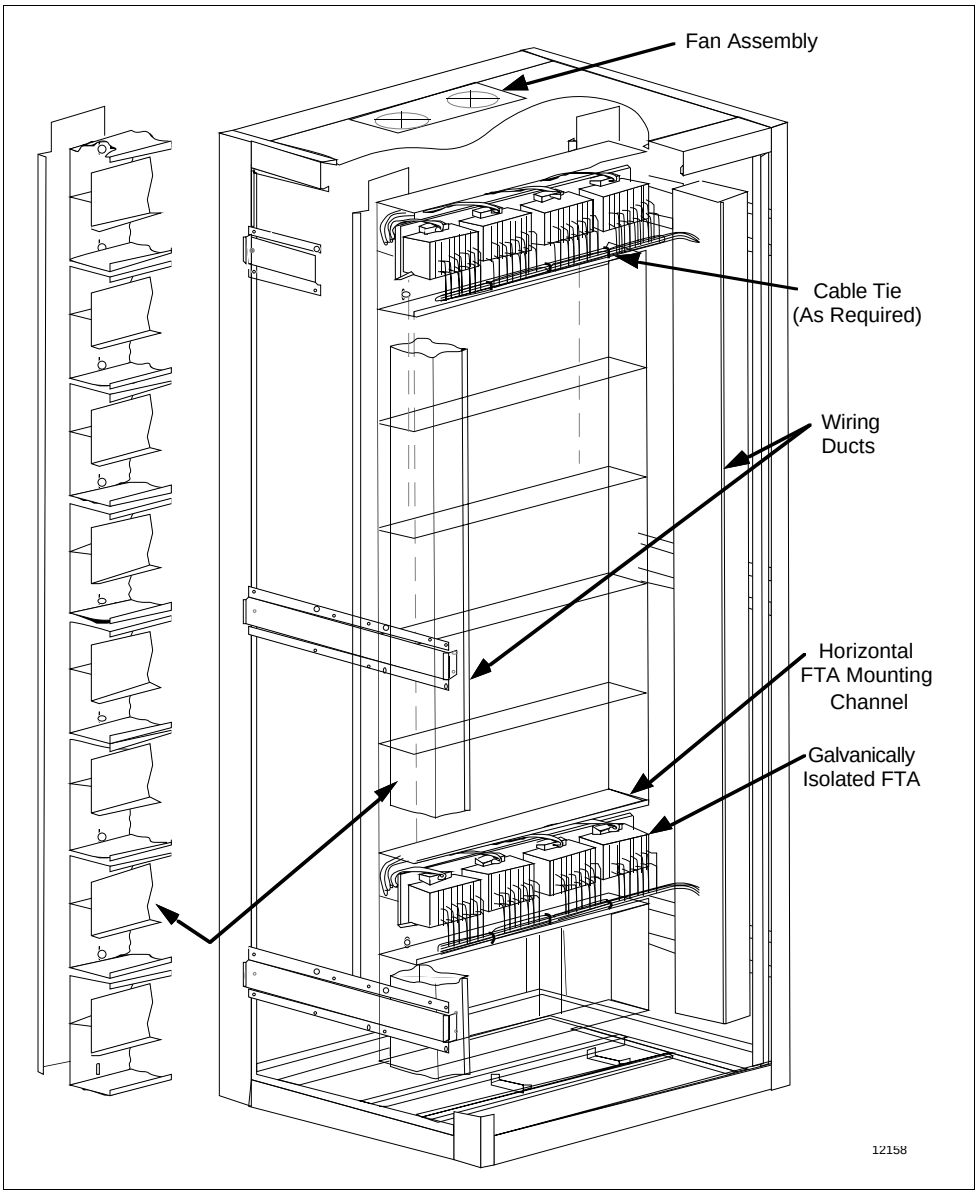
Continued on next page

8.5.2 Horizontal FTA Mounting Channel, Continued

Dual-Access FTA Mounting Channel installation

In the dual-access cabinet, up to eight horizontal FTA Mounting Channels can be installed on one side of a cabinet as shown in Figure 8-15.

Figure 8-15 Horizontal FTA Mounting Channel Cabinet Layout



Continued on next page

8.5.2 Horizontal FTA Mounting Channel, Continued

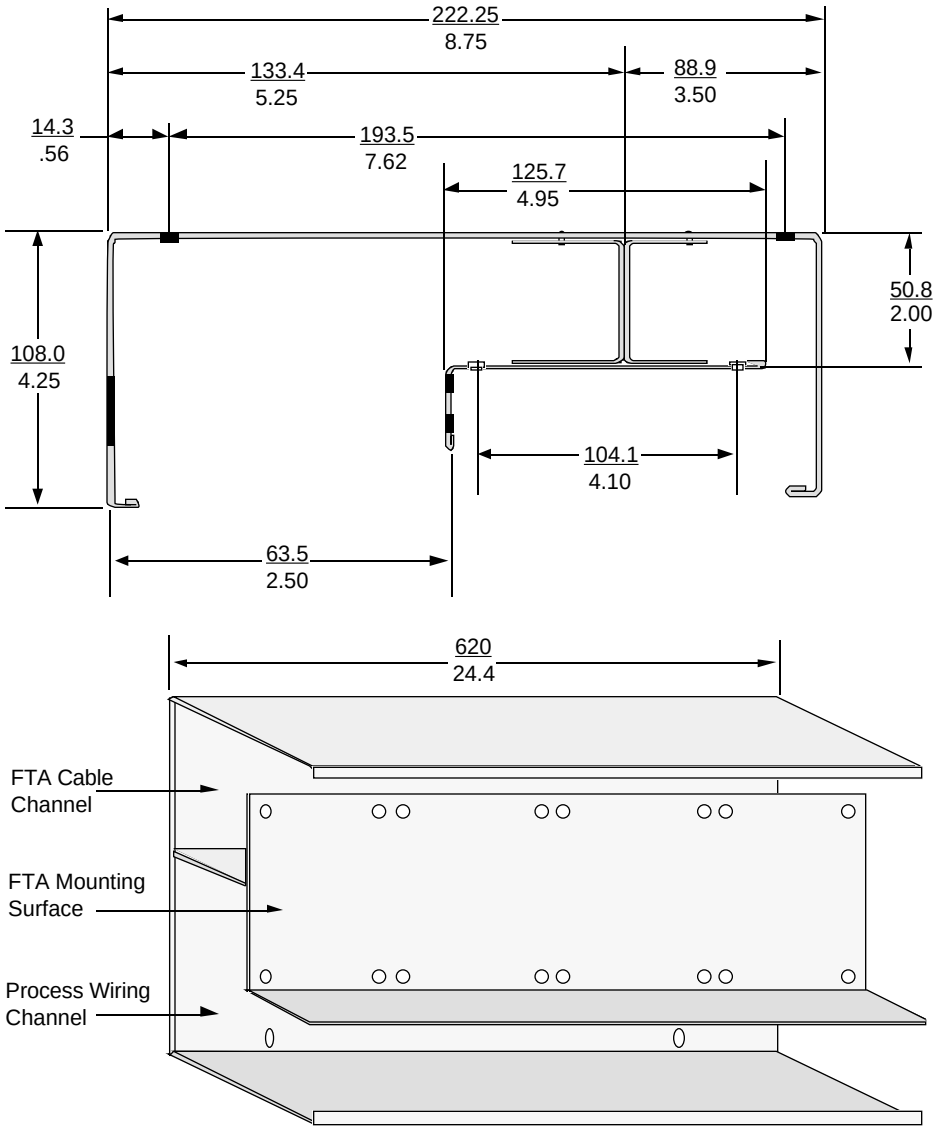
FTA Mounting Channel widths

Horizontal FTA Mounting Channels are available in a single width.

22.2 cm (8.75 in.) W x 10.8 cm (4.25 in.) D x 62.0 cm (24.4 in.) L

Figure 8-16 illustrates the FTA Mounting Channel dimensions.

Figure 8-16 Horizontal FTA Mounting Channel Dimensions

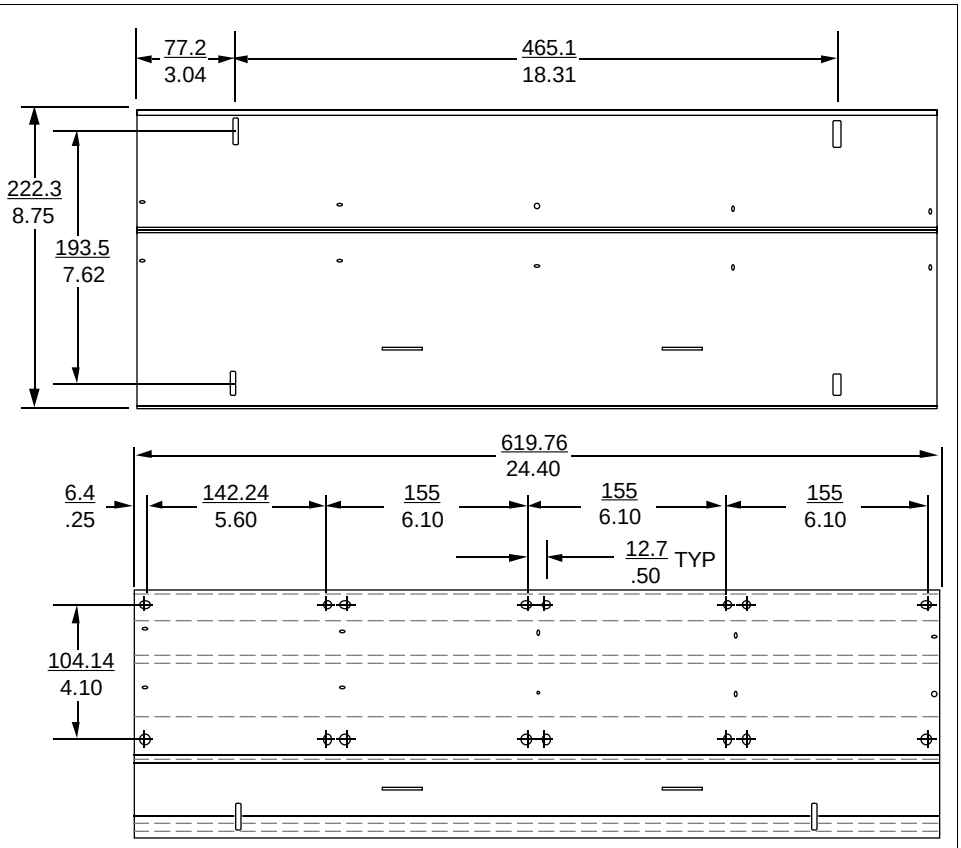


Continued on next page

Horizontal FTA Mounting Channel installation holes

Figure 8-17 illustrates the locations of the FTA mounting holes on the FTA Mounting Channel and the holes used to install the FTA Mounting Channel in the cabinet.

Figure 8-17 Horizontal FTA Mounting Channel Installation Holes

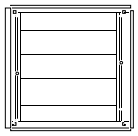


8.6 Cabinet Floor Planning

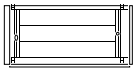
Floor template

Figure 8-18 is cabinet floor template that will help you in plan your facility layout when installing High-Performance Process Manager cabinets.

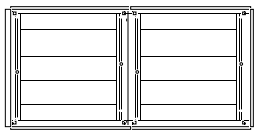
Figure 8-18 Cabinet Floor Planning Template



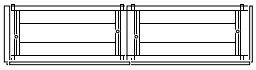
Single Dual Access Cabinet



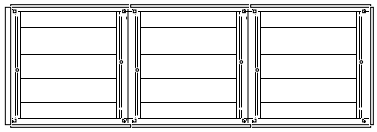
Single Single Access Cabinet



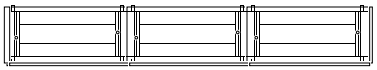
Dual Dual Access Cabinet Complex



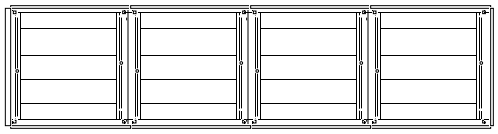
Dual Single Access Cabinet Complex



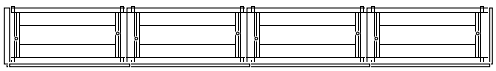
Triple Dual Access Cabinet Complex



Triple Single Access Cabinet Complex



Quad Dual Access Cabinet Complex



Quad Single Access Cabinet Complex

Note:

1. Cabinet scale is 1/4 inch = 1 foot.

2. A dual access cabinet is approximately 30 inches by 30 inches. The side and door panels add 1.5 inches to each cabinet dimension. When cabinets are complexed, 1.5 inches is added to the total complex dimensions.

3. A single access cabinet is approximately 30 inches wide and 21 inches deep. The side panels and the single door panel add 3/4 inch to the cabinet depth and 1.5 inches to the cabinet width. When cabinets are complexed, 3/4 inch is added to the complex depth and 1.5 inches is added to the total complex width.

2868

Section 9 – Model MU-CBSX01/MU-CBDX01 Cabinets

9.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
9.1	Overview	165
9.2	Cabinet Description	169
9.3	Card File and Power System Configurations	173
9.4	Card File and Power System Description	175
9.5	FTA Mounting Channel Descriptions	179
9.5.1	Vertical FTA Mounting Channels	180
9.5.2	Horizontal FTA Mounting Channel	184
9.6	Cabinet Floor Planning	188

Introduction

The High-Performance Process Manager model MU-CBSX01 and MU-CBDX01 cabinets provide single and dual access, respectively. Access is defined as having a single front door entry or dual front and rear door entry. The model MU-CBSX01 and MU-CBDX01 cabinets are also referred to as Rittal cabinets because Rittal is the manufacturer.

CE Compliant

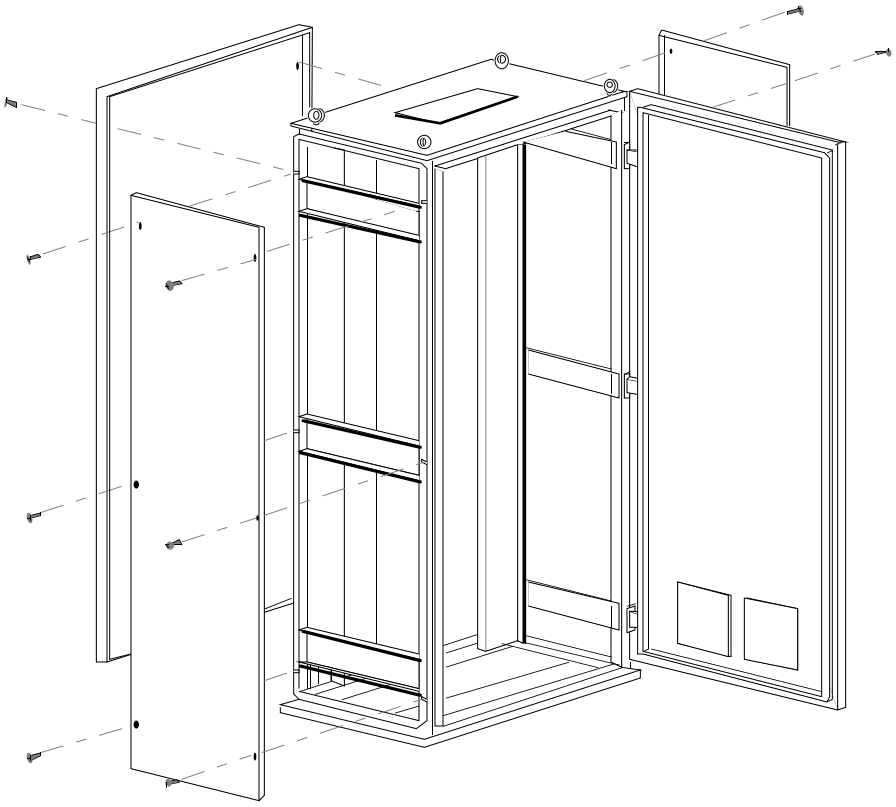
The model MU-CBSX01 and MU-CBDX01 cabinets are CE Compliant.

Continued on next page

Single-access cabinet

The single-access cabinet has one equipment entry point and that is in the front of the cabinet through a single door. The High-Performance Process Manager card files, Power System, and the FTA Mounting Channels are installed inside the single-access door. The cabinet side panels can be removed for access. Figure 9-1 is an illustration of a single-access cabinet.

Figure 9-1 Single-Access Cabinet



Dimension	Width	Depth	Height
Single Access	0.8 m/31.49 in.	0.5 m/19.68 in.	2 m/78.9 in.

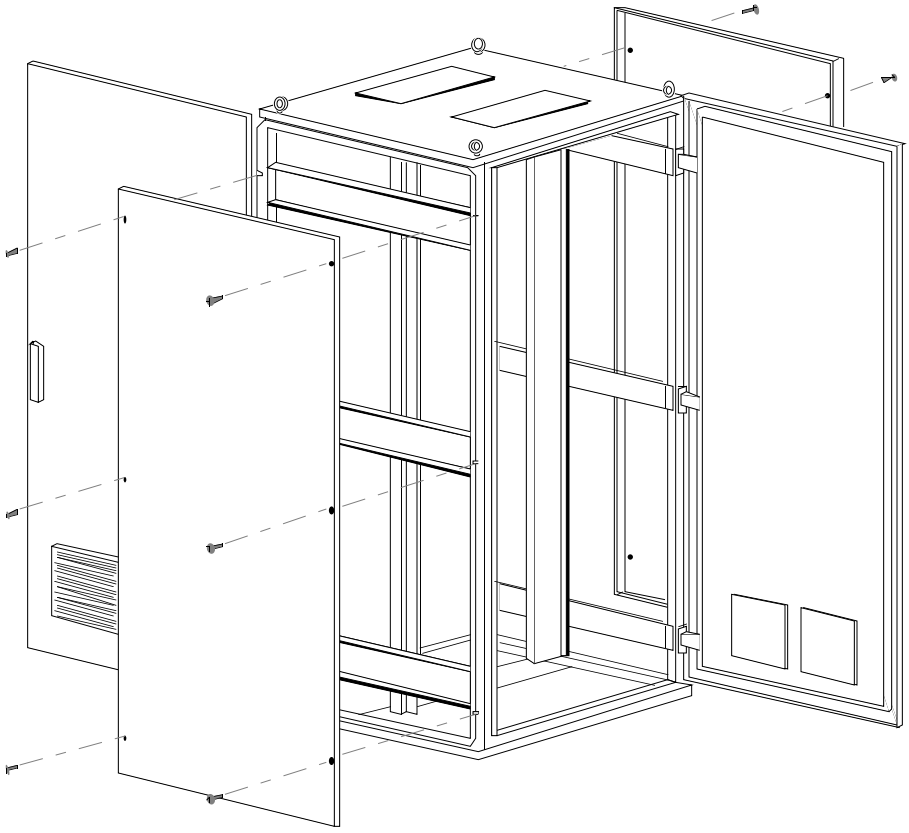
2808

Continued on next page

Dual-access cabinet

The dual-access cabinet has two entry doors. The High-Performance Process Manager card files and the Power System are mounted inside the front access door. The FTA Mounting Channels are normally installed inside the rear door. The cabinet side panels can be removed for access. Figure 9-2 is an illustration of a dual-access cabinet.

Figure 9-2 Dual-Access Cabinet



Dimensions	Width	Depth	Height
Dual Access	0.8 m/31.49 in.	0.8 m/31.49 in.	2 m/78.9 in.

2791

CE Compliance

CE Compliance versions of the cabinet are identified by the abundance of grounding straps inside the cabinet. All panels and doors are grounded to the cabinet frame by the straps. Figures 9-3 and 9-4 illustrate the mechanisms used to ground the cabinet panels and doors.

Figure 9-3 Cabinet Base Panel Grounding Procedure

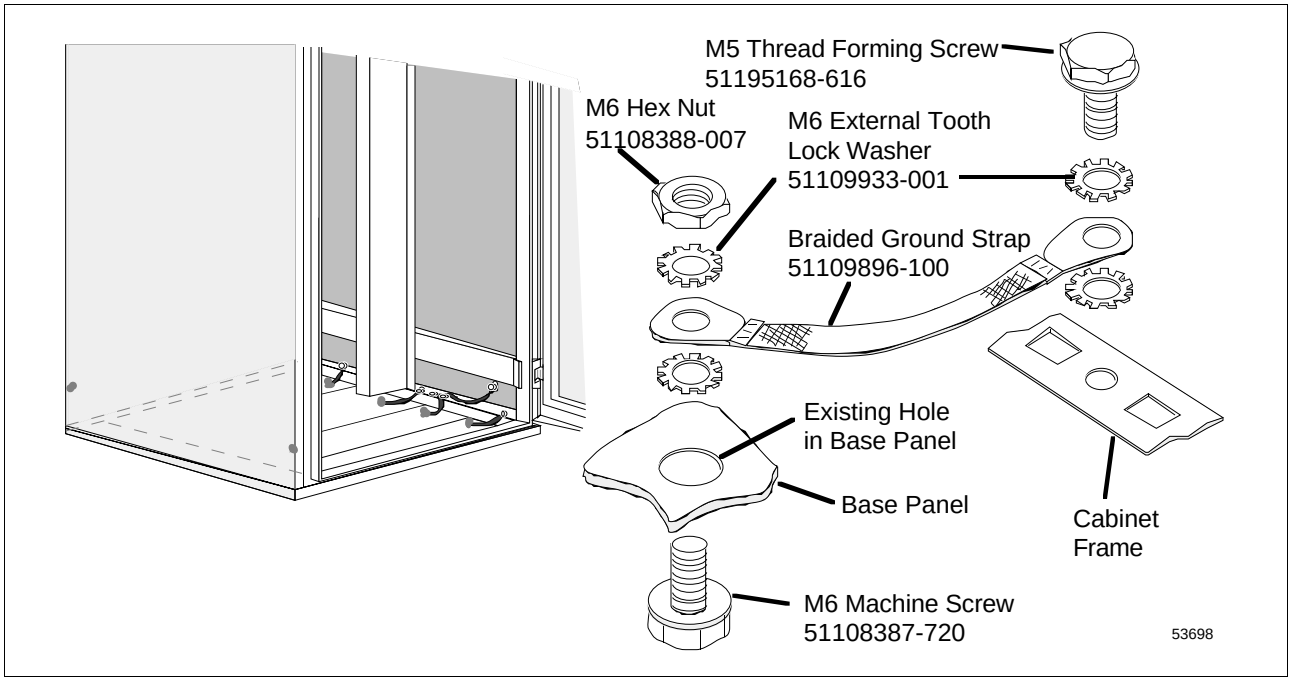
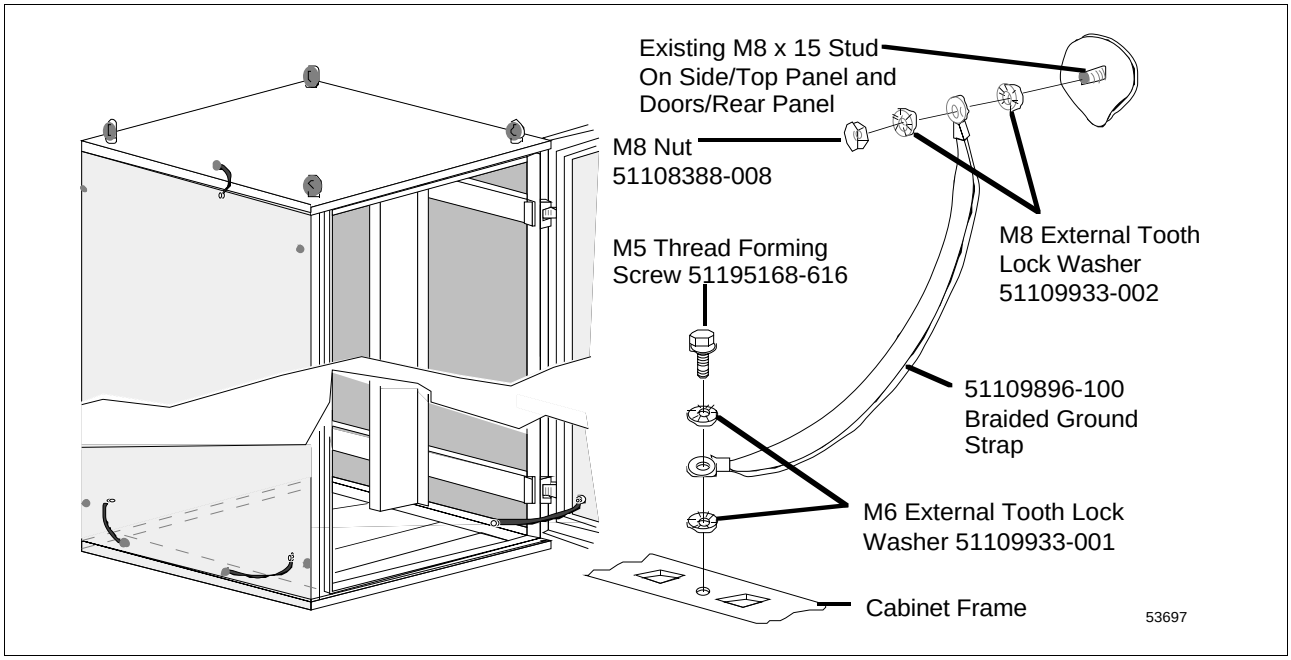


Figure 9-4 Cabinet Panel and Door Grounding Procedure



9.2 Cabinet Description

Cabinet dimensions

The single-access cabinet, with the front door, side and rear panels installed, has the following exterior dimensions.

0.8 meters wide x 0.5 meters deep x 2 meters high
(31.5 inches x 19.7 inches x 78.9 inches)

The dual-access cabinet, with the front and rear doors, and side panels installed, has the following exterior dimensions.

0.8 meters wide x 0.55 meters deep x 2.1 meters high
(31.5 inches x 31.5 inches x 78.9 inches)

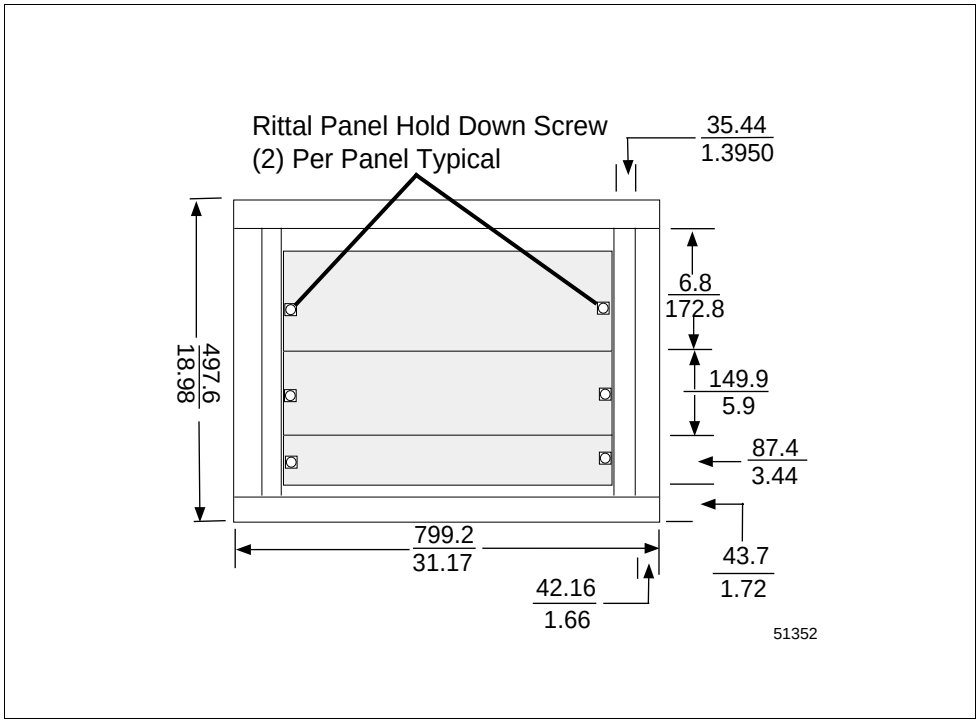
Top and bottom entry

Both cabinets are NEMA 1 rated and support top and bottom entry for process control wiring. Top entry requires removal of the top panel(s), and/or associated fan assemblies, before entry holes can be punched in the panel. Honeywell will prepunch the holes if specified when ordering the cabinet. Figures 9-5 and 9-6 are illustrations of the bottom cable entry slots for the single- and dual-access cabinets, respectively.

Single-access cabinet bottom entry

Figure 9-5 is an illustration of the bottom cable entry for the single-access cabinet.

Figure 9-5 Single-Access Cabinet Bottom Cable Entry

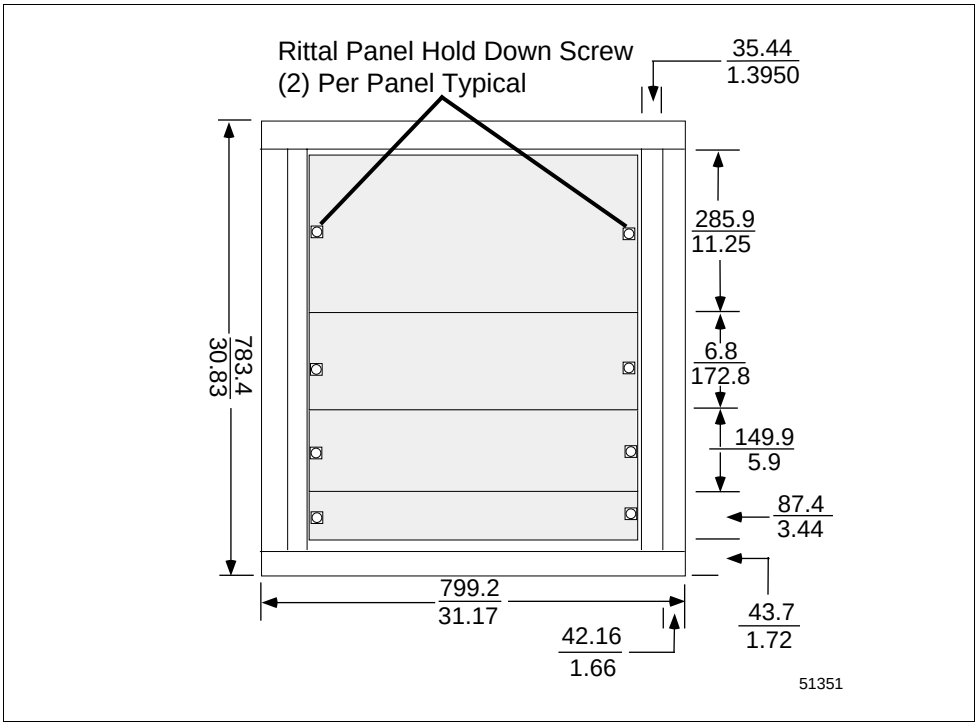


Continued on next page

Dual-access cabinet bottom entry

Figure 9-6 is an illustration of the bottom cable entry for the dual-access cabinet.

Figure 9-6 Dual-Access Cabinet Bottom Cable Entry



Continued on next page

Independent cabinet entry

The dual-access cabinet has two independent entry doors. A single-access cabinet has only one entry door. Card files and the Power System, or FTA Mounting Channels can be installed in either side of the cabinet without being constrained by the equipment installed in the other side of the cabinet.

The cabinet can be ordered with doors hinged on either the left or right side.

Cabinet complexing

A maximum of four cabinets can be complexed together without intervening side panels by a complexing kit, Honeywell part number 51109524-200 (single access cabinet) or 51109524-100 (dual access cabinet).

NEMA 12

NEMA 12 rated cabinets can be ordered from Honeywell.

Cabinet cooling

Cabinet cooling is accomplished by the use of one or more fan assemblies that are mounted over appropriate cutouts in the cabinet top. Use of a fan assembly is mandatory for each cabinet side containing card files or a Power System. Because of power dissipation, the cabinet configuration determines if a fan assembly is required for a cabinet entry side containing Field Termination Assemblies (FTAs). A fan assembly is mandatory when Galvanically Isolated FTAs are installed. Fan assemblies are available for voltages and frequencies noted below:

- Cabinet Fan Assembly (240 Vac, 50/60 Hz)
- Cabinet Fan Assembly (120 Vac, 50/60 Hz)

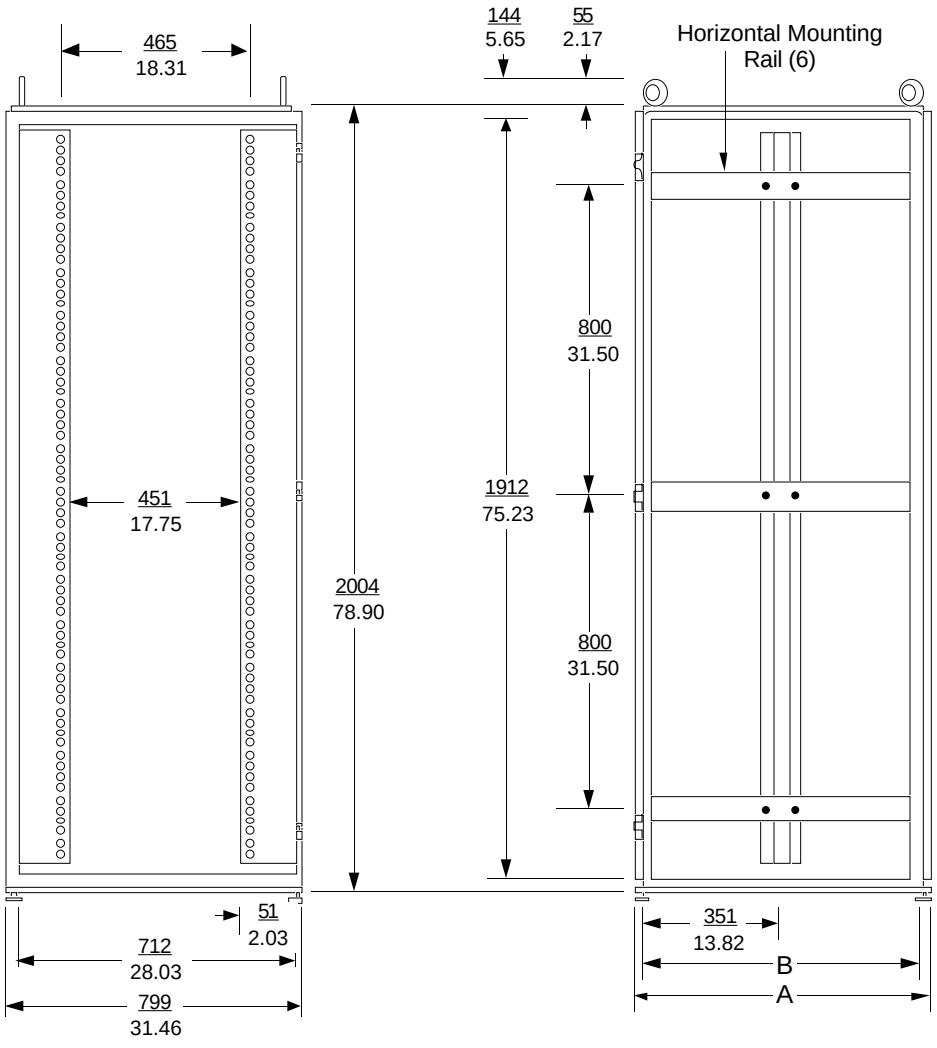
A blank plate is available to cover the hole(s) in the top of the cabinet in the event a fan assembly is not needed. The fan opening cabinet top cover plate is Honeywell part number 51304098-200.

Continued on next page

Cabinet internal intrastructure

As shown in Figure 9-7, the cabinet is provided with an internal structure ("intrastructure") that is capable of accepting card file assemblies, Power Systems, and FTA Mounting Channels. When installing FTAs, FTA Mounting Channels must be specified as discussed in subsection 9.5.

Figure 9-7 Cabinet Interior Dimensions



Cabinet	A	B
Dual Access	789 31.06	702 27.64
Single Access	489 19.25	402 15.83

Note: Dimensions are in millimeters/inches.

2810

9.3 Card File and Power System Configurations

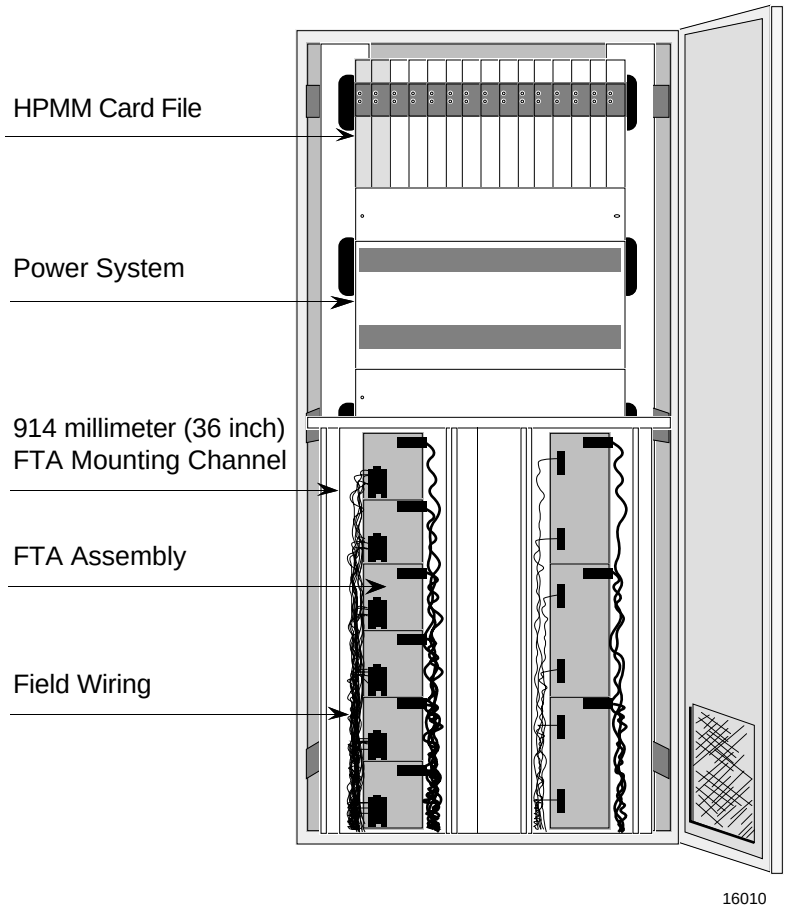
Cabinet layout

The High-Performance Process Manager card files, Power System and FTA Mounting Channels install in the single and dual access cabinets as shown in Figures 9-8 and 9-9, respectively.

Single-access cabinet equipment layout

Figure 9-8 illustrates the equipment layout in a single-access cabinet.

Figure 9-8 Typical Single-Access Cabinet Assembly Layout

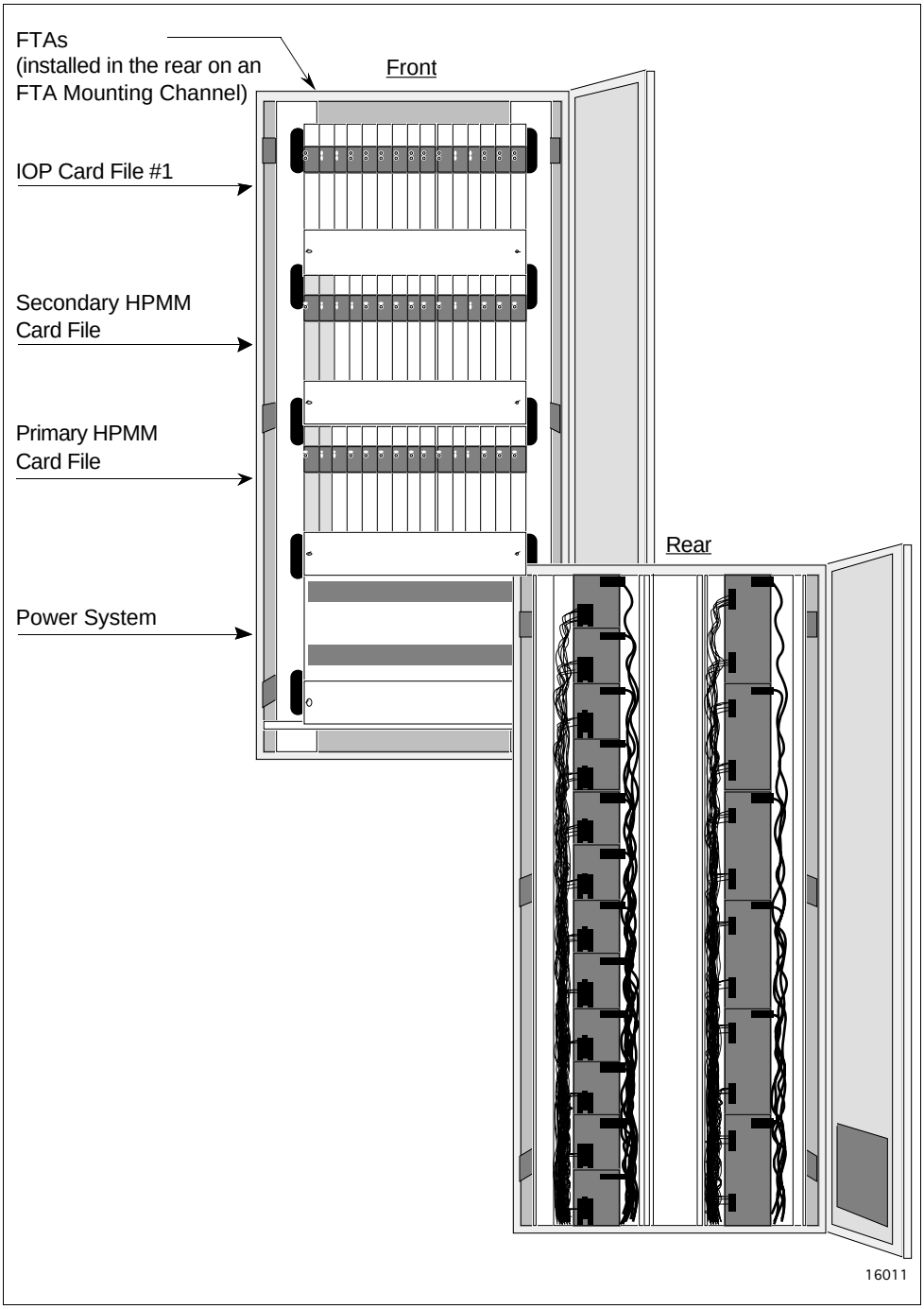


Continued on next page

Dual-access cabinet equipment layout

Figure 9-9 illustrates the equipment layout in a dual-access cabinet.

Figure 9-9 Typical Dual-Access Cabinet Assembly Layout



9.4 Card File and Power System Descriptions

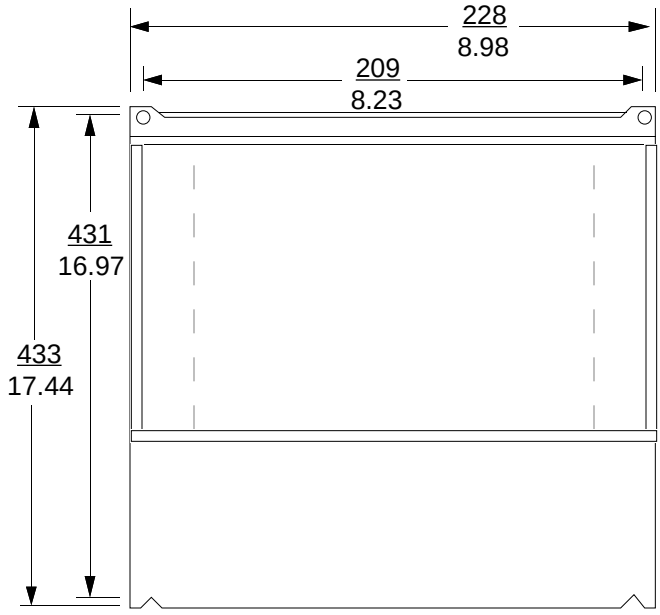
Card file descriptions

There are three types of card file assemblies, Left 7-Slot, Right 7-Slot, and 15-Slot. The Left and Right 7-Slot card files are the same size and are intended to be mounted adjacent to each other on the cabinet's 19" RETMA mounting intrastructure using appropriate hardware. The 15-Slot card file mounts alone on the 19" RETMA mounting intrastructure.

7-Slot card file dimensions

Figure 9-10 illustrates the 7-Slot card file's installation dimensions.

Figure 9-10 7-Slot Card File Installation Dimensions



Note: Dimensions are in millimeters/inches.

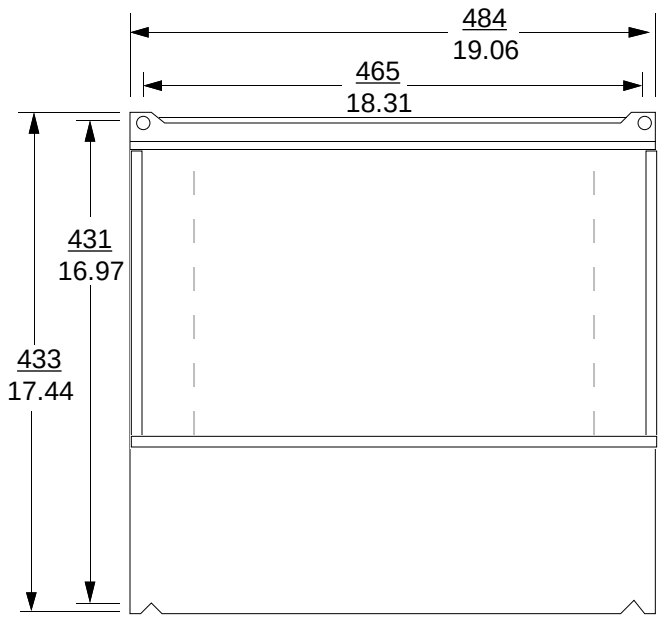
16012

Continued on next page

15-Slot card file dimensions

Figure 9-11 illustrates the 15-Slot card file's installation dimensions.

Figure 9-11 15-Slot Card File Installation Dimensions



Note: Dimensions are in millimeters/inches.

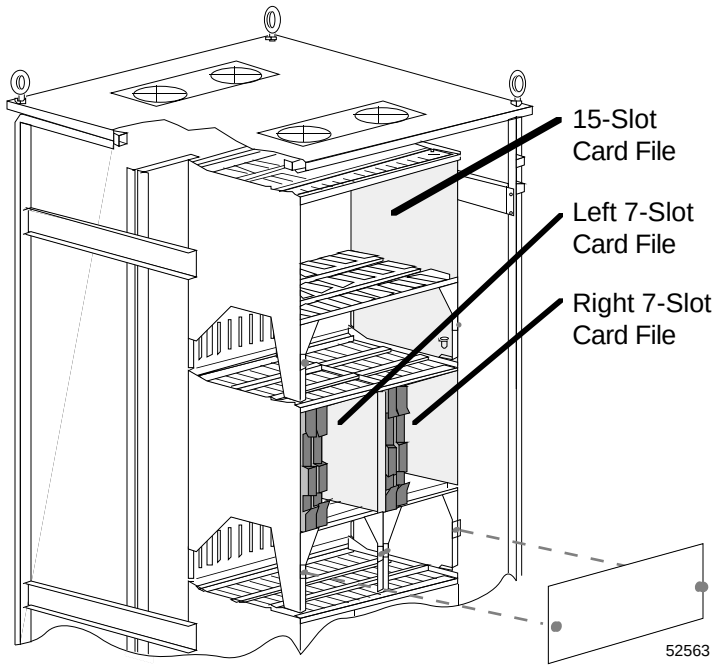
53135

Continued on next page

Installing 7-Slot and 15-Slot card files

Figure 9-12 illustrates the installation of Left and Right 7-Slot and 15-Slot card files in a side-by-side configuration.

Figure 9-12 Installation of 7-Slot and 15-Slot Card Files

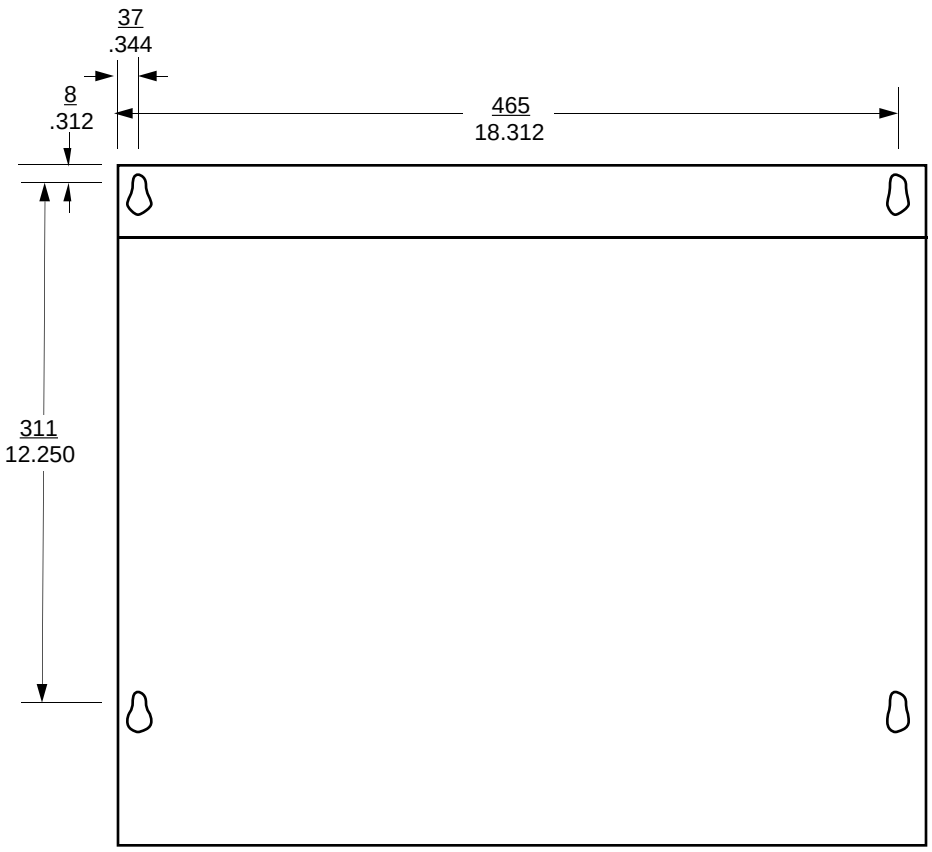


Continued on next page

Power System dimensions

The Power System dimensions are shown in Figure 9-13 and it also installs on a 19" RETMA mounting intrastructure.

Figure 9-13 Power System Installation Dimensions



Note: Dimensions are in millimeters/inches.

2818

9.5 FTA Mounting Channel Descriptions

ATTENTION

ATTENTION—In the past, it was a requirement that Galvanically Isolated, Intrisically Safe (GI/IS) FTAs had to be mounted on horizontally oriented FTA Mounting Channels in an HPM cabinet. The requirement is no longer needed because of component and design improvements.

Galvanically Isolated FTAs can now be mounted on vertically oriented FTA Mounting Channels; however, there is still a requirement that Galvanically Isolated FTAs and standard (non-Galvantically Isolated) FTAs, and the wiring to them, be properly separated in the cabinet.

Any FTA Mounting Channels on which Galvanically Isolated FTAs will be mounted must be installed in an inverted (upside down from the normal) position.

The horizontal FTA Mounting Channel information in this section is reference information because some existing installations use horizontal FTA Mounting Channels that may require the installation of additional horizontal FTA Mounting Channels for equipment expansion.

FTA sizes

Field Termination Assemblies (FTAs) are produced in three standard sizes that are dependent on the FTA type and circuit requirements:

- Size A 15.20 cm (6.0 in.) x 12.0 cm(4.75 in.)
- Size B 30.48 cm (12.1 in.) x 12.0 cm (4.75 in.)
- Size C 46.22 cm (18.2 in.) x 12.0 cm (4.75 in.)

They mount on FTA Mounting Channels that are attached to the cabinet's intrastructure.

Three styles

Three styles of FTA Mounting Channels are available:

- Wide vertical
- Narrow vertical
- Horizontal

Selection is based on whether standard or Galvanically Isolated FTAs are installed in the cabinet.

Vertical or horizontal mounting

The FTA Mounting Channels used to mount standard (non-Galvanically Isolated) or Galvanically Isolated FTAs are vertically oriented in the cabinet, and the FTA Mounting Channels used to mount Galvanically Isolated FTAs are horizontally oriented in the cabinet.

9.5.1 Vertical FTA Mounting Channels

Overview

Both standard (non-Galvanically Isolated) and Galvanically Isolated FTAs are mounted on a vertically oriented FTA Mounting Channel in the cabinet. The vertical FTA Mounting Channel has two channels (troughs), right and left.

When standard FTAs are mounted on the vertical FTA Mounting Channel, the FTA Mounting Channel is installed in its "normal" position where field wiring enters the left channel and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s) or Power Distribution Assemblies are routed in the right channel of the FTA Mounting Channel.

When Galvanically Isolated FTAs are mounted on the vertical FTA Mounting Channel, the FTA Mounting Channel is installed in its "inverted" position where field wiring enters the right channel and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s) or Power Distribution Assemblies are routed in the left channel of the FTA Mounting Channel.

Galvanically Isolated FTAs and standard FTAs must not be mounted on the same FTA Mounting Channel.

Single-access cabinet

The vertical FTA Mounting Channel length of approximately 93 centimeters (36 inches) is approximately half the height of the cabinet, so up to four narrow FTA Mounting Channels and three wide FTA Mounting Channels can be mounted adjacent to each other below the Power System in a single-access cabinet as shown in Figure 9-6.

Dual-access cabinet

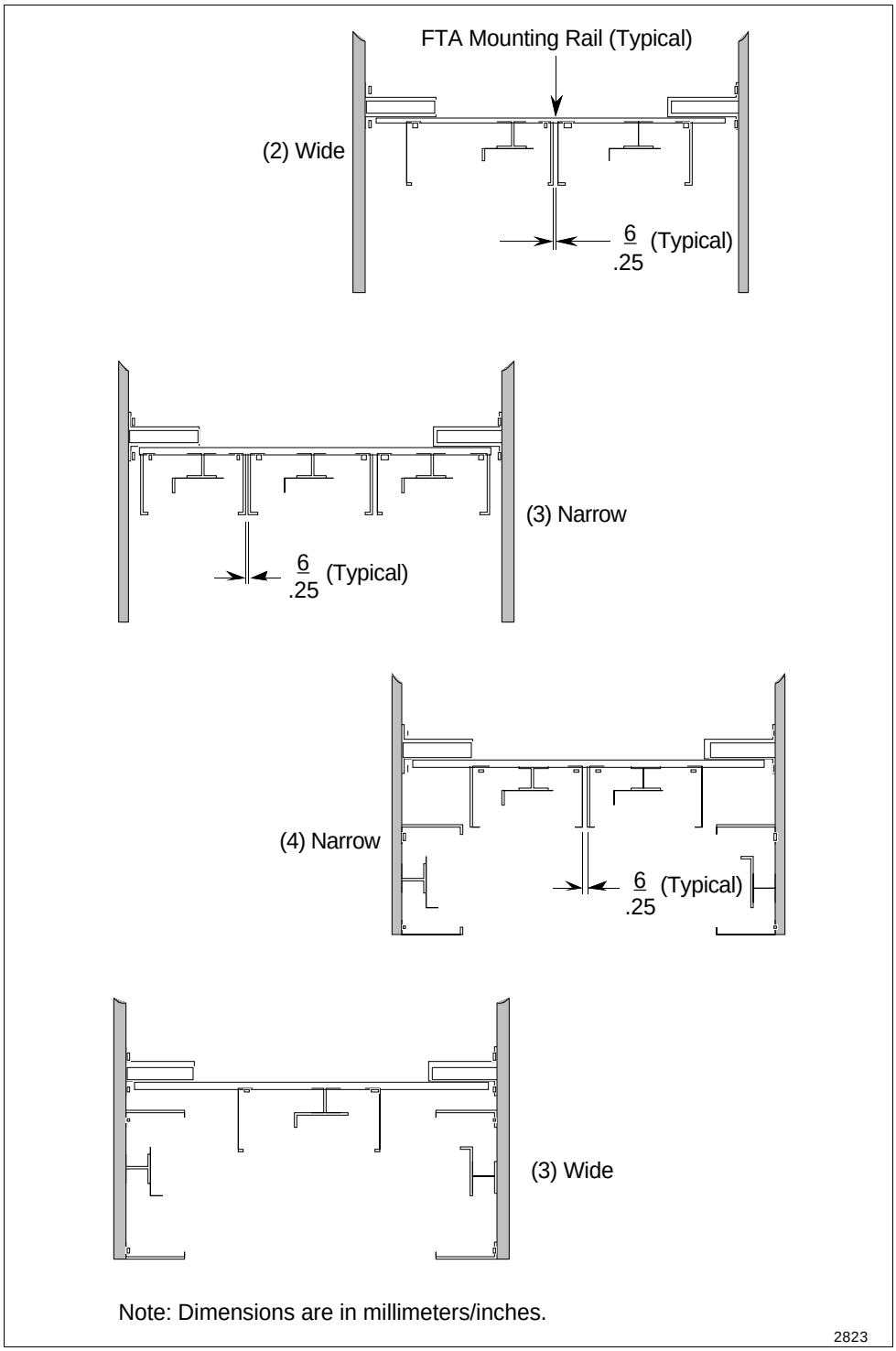
In the dual-access cabinet, one FTA Mounting Channel is normally installed above another, adjacently in pairs, as shown in Figure 9-7.

Continued on next page

Vertical FTA Mounting Channel configurations

Figure 9-14 illustrates four typical vertical FTA Mounting Channel cabinet configurations.

Figure 9-14 FTA Mounting Channel Configurations



Continued on next page

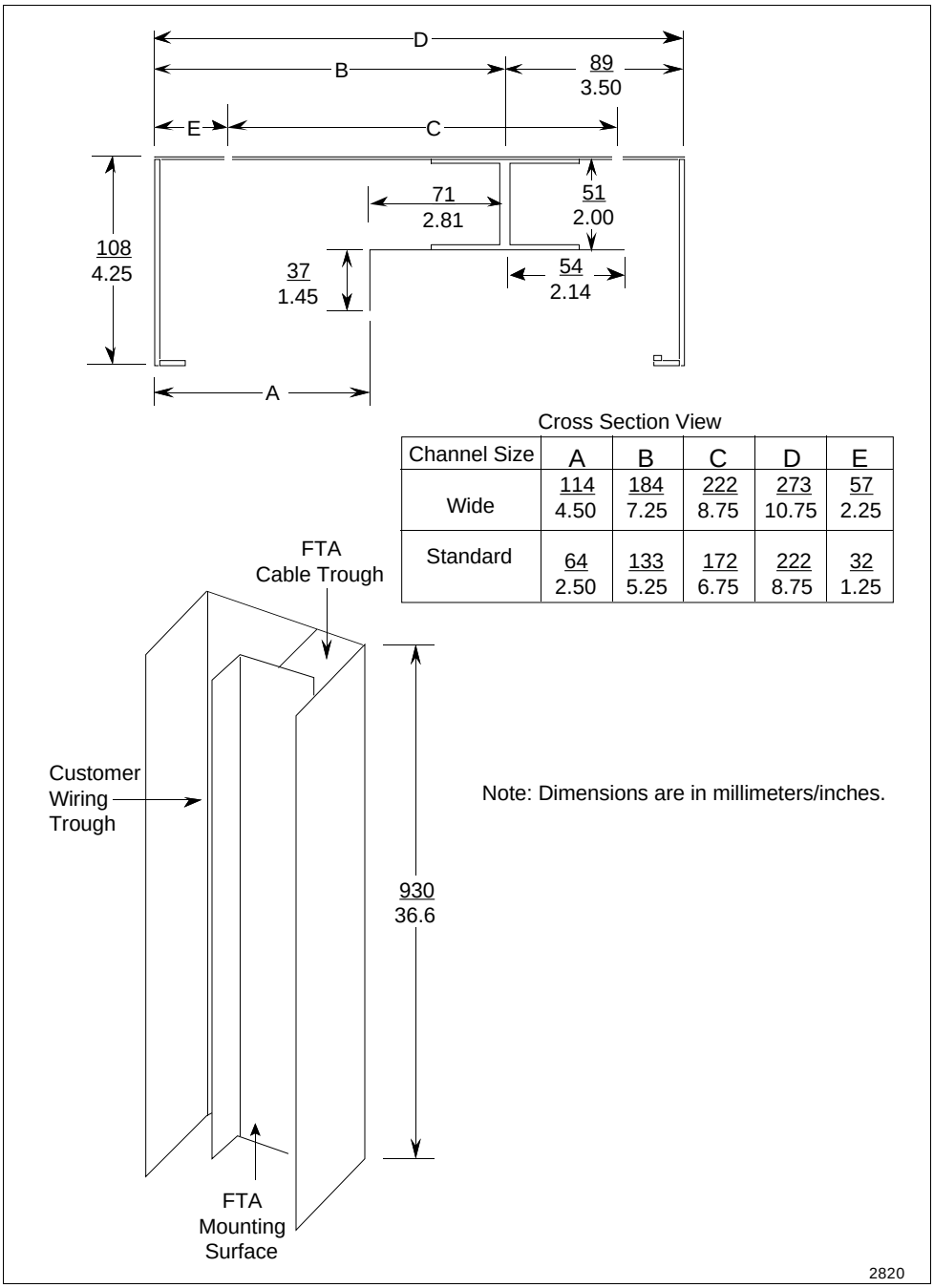
Vertical FTA Mounting Channel widths

Vertical FTA Mounting Channels are available in two widths:

Narrow 22.2 cm (8.75 in.) W x 10.8 cm (4.25 in.) D x 93 cm (36.6 in.) L
Wide 27.3 cm (10.75 in.) W x 10.8 cm (4.25 in.) D x 93 cm (36.6 in.)

Figure 9-15 illustrates the FTA Mounting Channel dimensions.

Figure 9-15 FTA Mounting Channel Dimensions



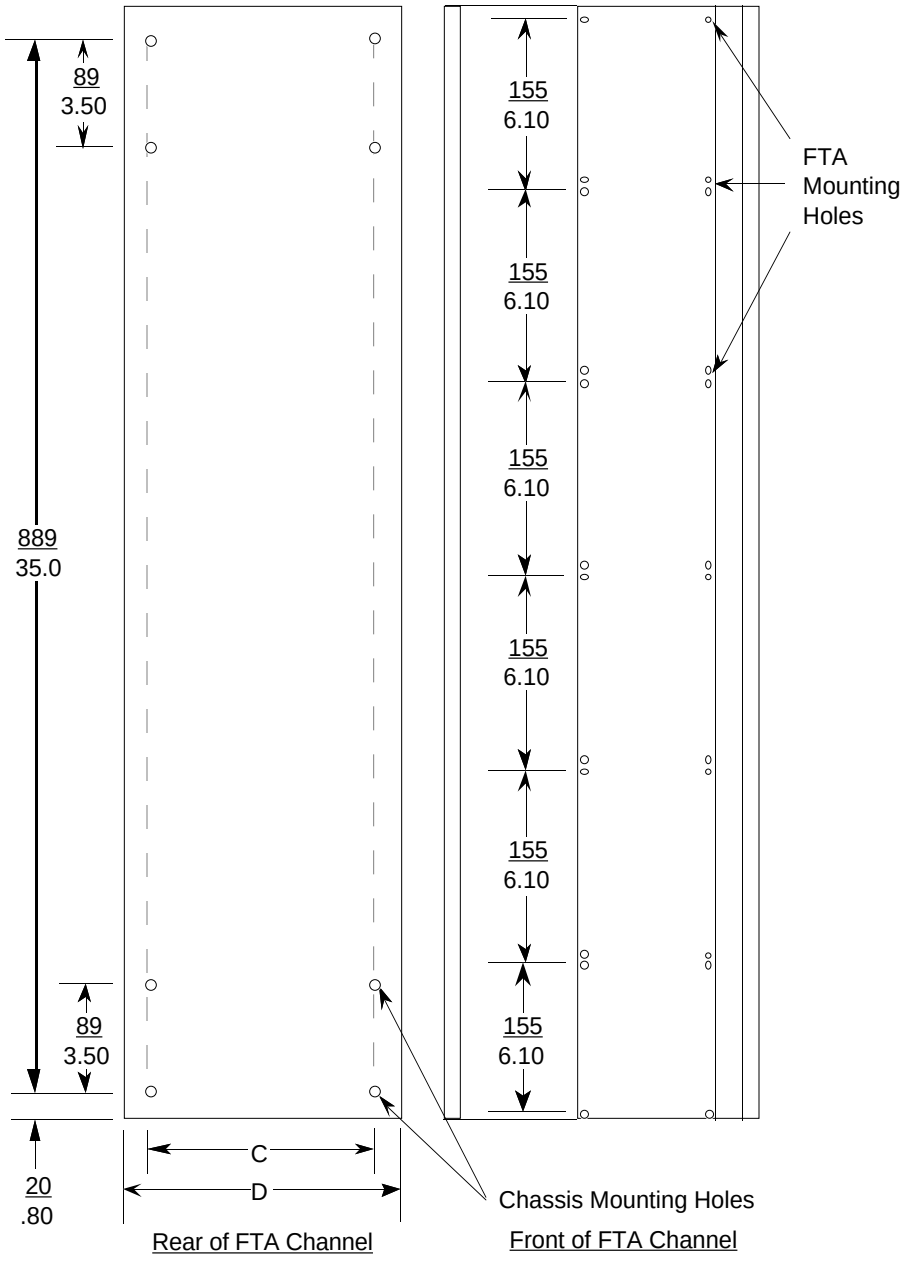
Channel Size	A	B	C	D	E
Wide	114 4.50	184 7.25	222 8.75	273 10.75	57 2.25
Standard	64 2.50	133 5.25	172 6.75	222 8.75	32 1.25

Continued on next page

Vertical FTA Mounting Channel installation holes

Figure 9-16 illustrates the locations of the FTA mounting holes on the FTA Mounting Channel and the holes used to install the FTA Mounting Channel.

Figure 9-16 FTA Mounting Channel Mounting FTA Installation Holes



Note: See the previous figure for C and D dimensions.
Dimensions are in millimeters/inches.

9.5.2 Horizontal FTA Mounting Channel

Overview

Only Galvanically Isolated FTAs can be mounted on horizontal FTA Mounting Channels in the cabinet. The FTA Mounting Channels have two channels (troughs), upper and lower. Field wiring enters the lower channel from the right side of the cabinet and connects to the FTAs. The cables connecting the FTAs to their associated IOP(s), Power Distribution Assemblies, and Marshalling Panels, if present, are routed in the upper channel of the FTA Mounting Channel from the left side of the cabinet.

Single-access FTA Mounting Channel installation

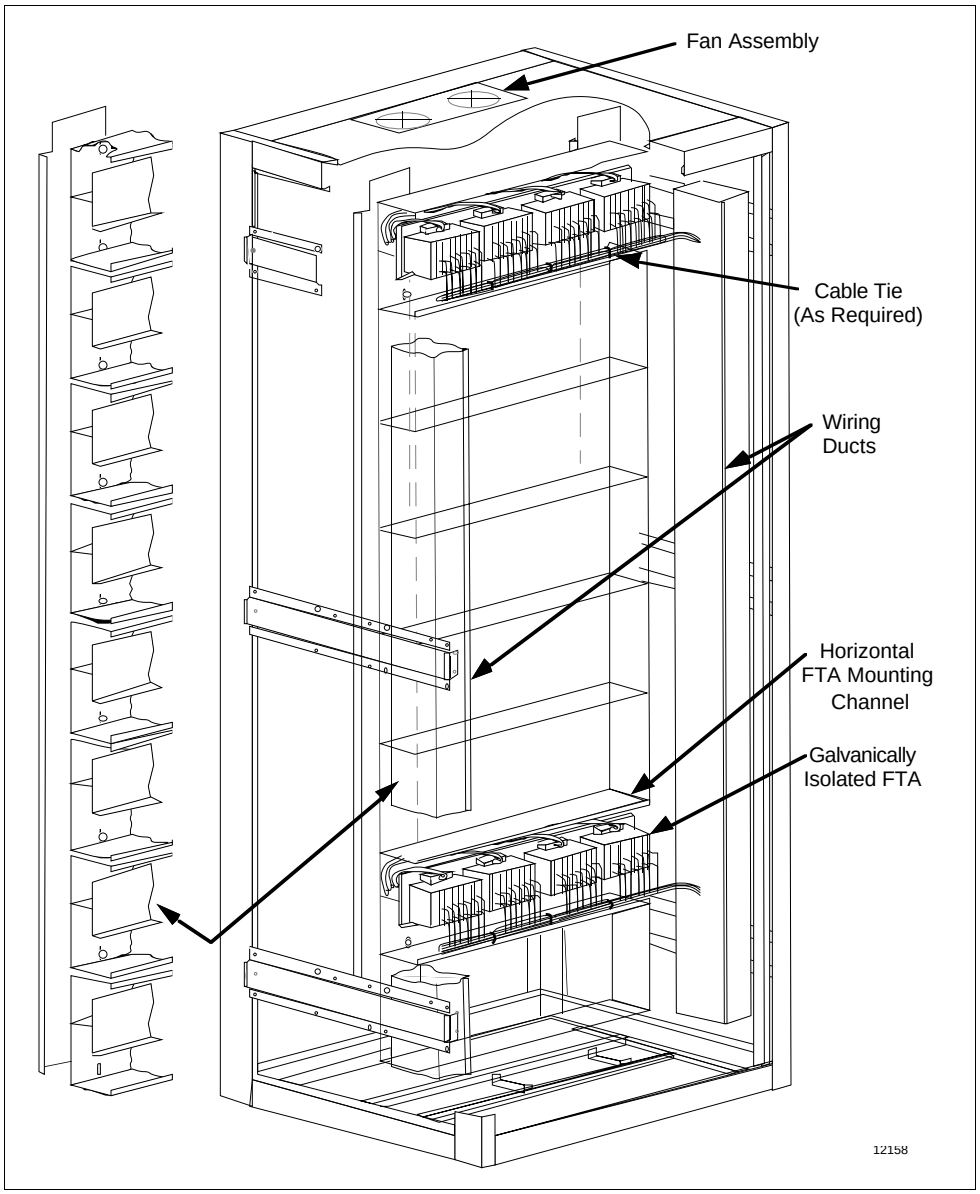
Up to three of the 62-centimeter (24.4-inch) long horizontal FTA Mounting Channels can be installed below the Power System in a single-access cabinet. A gap of approximately 22.9 centimeters (9 inches), the approximate width of a horizontal FTA Mounting Channel, must be maintained between the FTA Mounting Channels and the Power System.

Continued on next page

Dual-access FTA Mounting Channel installation

In the dual-access cabinet, up to eight FTA Mounting Channels can be installed on one side of a cabinet as shown in Figure 9-17.

Figure 9-17 Horizontal FTA Mounting Channel Cabinet Layout



Continued on next page

9.5.2 Horizontal FTA Mounting Channel, Continued

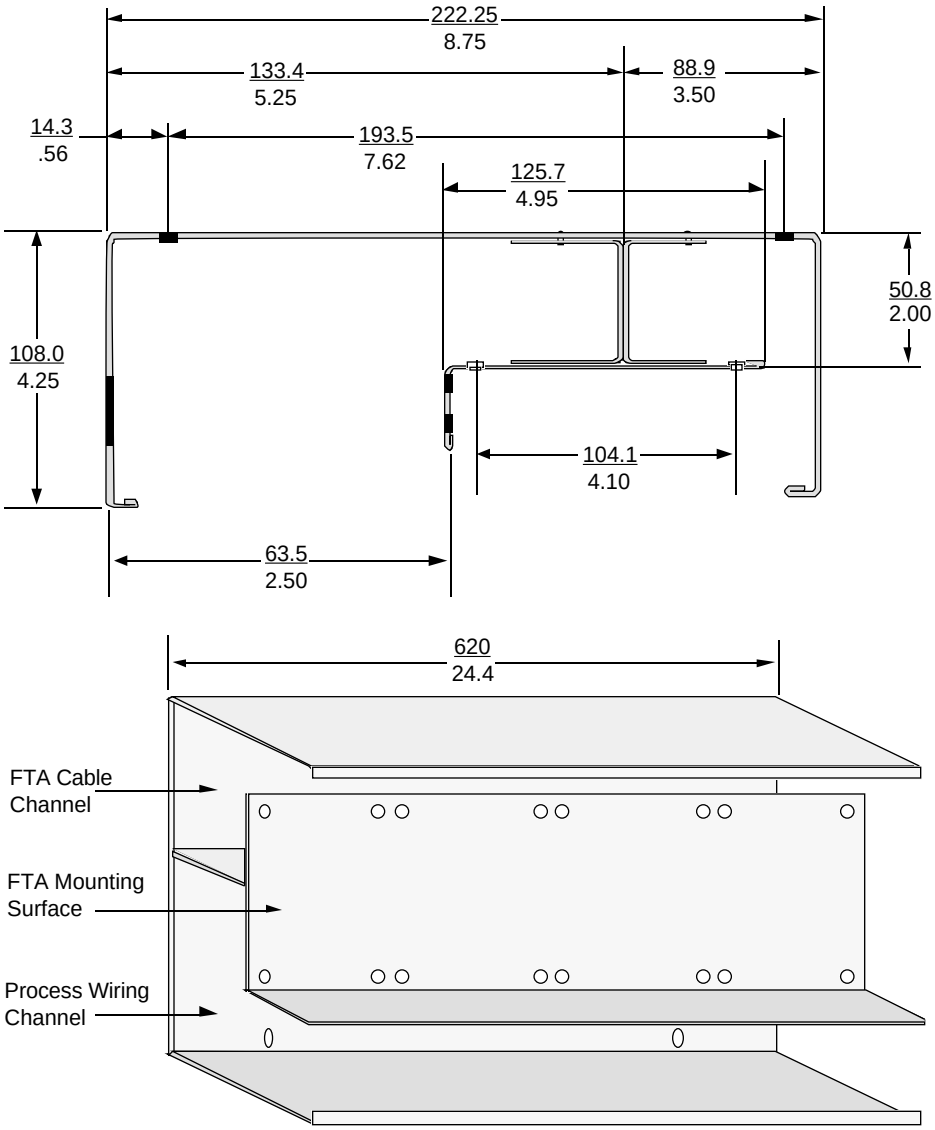
FTA Mounting Channel widths

Horizontal FTA Mounting Channels are available in a single width.

22.2 cm (8.75 in.) W x 10.8 cm (4.25 in.) D x 62.0 cm (24.4 in.) L

Figures 9-18 illustrates the FTA Mounting Channel dimensions.

Figure 9-18 Horizontal FTA Mounting Channel Dimensions



Note: Dimensions are in millimeters/inches.

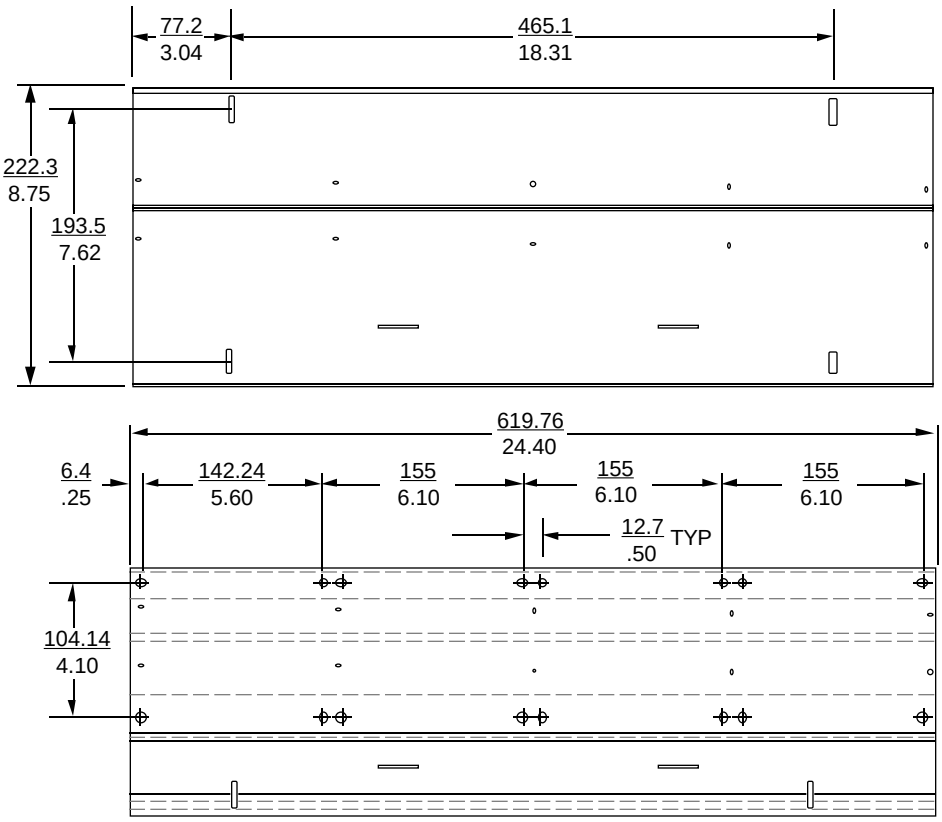
12136

Continued on next page

Horizontal FTA Mounting Channel installation holes

Figure 9-19 illustrates the locations of the FTA mounting holes on the FTA Mounting Channel and the holes used to install the FTA Mounting Channel in the cabinet.

Figure 9-19 Horizontal FTA Mounting Channel Installation Holes

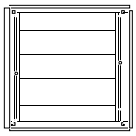


9.6 Cabinet Floor Planning

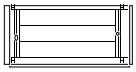
Floor template

Figure 9-20 is cabinet floor template That will help you in plan your facility layout when installing High-Performance Process Manager cabinets.

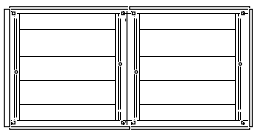
Figure 9-20 Cabinet Floor Planning Template



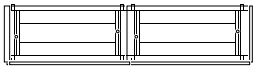
Single Dual Access Cabinet



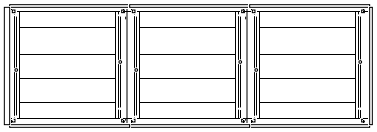
Single Single Access Cabinet



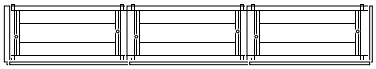
Dual Dual Access Cabinet Complex



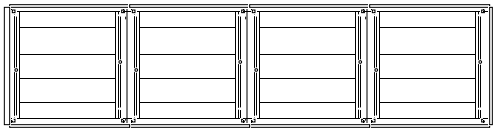
Dual Single Access Cabinet Complex



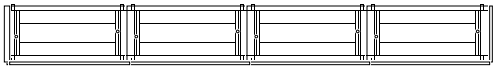
Triple Dual Access Cabinet Complex



Triple Single Access Cabinet Complex



Quad Dual Access Cabinet Complex



Quad Single Access Cabinet Complex

Note:

1. Cabinet scale is 1/4 inch = 1 foot.

2. A dual access cabinet is approximately 30 inches by 30 inches. The side and door panels add 1.5 inches to each cabinet dimension. When cabinets are complexed, 1.5 inches is added to the total complex dimensions.

3. A single access cabinet is approximately 30 inches wide and 21 inches deep. The side panels and the single door panel add 3/4 inch to the cabinet depth and 1.5 inches to the cabinet width. When cabinets are complexed, 3/4 inch is added to the complex depth and 1.5 inches is added to the total complex width.

2868

Section 10 – Redundancy Planning

10.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
10.1	Overview	189
10.2	Redundant HPMM Configurations	189
10.3	Redundant IOP Placement	194
10.4	Redundancy Support	195
10.4.1	Power System	195
10.4.2	HPMM to I/O	195

10.2 Redundant HPMM Configurations

HPMM card file types

HPMM hardware, which consists of the High-Performance Comm/Control and High-Performance I/O Link cards and the HPM UCN Interface module, is available in three unique card file configurations. They are

- Left 7-Slot HPMM card file—An HPMM card set occupies the two left-most card slots (1-2) with five card slots (3-7) that dedicated to IOP cards.
- Right 7-Slot HPMM card file—An HPMM card set occupies the two left-most card slots (9-10) with five card slots (11-15) that are dedicated to IOP cards.
- 15-Slot HPMM card file—An HPMM card set occupies the two left-most card slots (1-2) with thirteen card slots (3-15) that dedicated to IOP cards.

Continued on next page

10.2 Redundant HPMM Configurations, Continued

Redundant 7-Slot HPMM card files

The two types of 7-Slot HPMM card files are intended to be used in a small HPM subsystem.

For a subsystem that requires redundant HPMMs, Left and Right 7-Slot card files are installed. Both card files are assigned the same the same I/O Link Interface address. There is no slot 8 because the card file slots are numbered 1 through 7 and 9 through 15.

Both card files are normally installed in the same cabinet, adjacent to each other, and share the same Power System. If they share the same Power System, it is recommended the Power System have redundant Power Supply Modules.

However, they can be installed in separate cabinets of a cabinet complex and not share the same Power System. If the system is large enough, installing the card files in separate cabinets with separate Power Systems is preferred because subsystem reliability is increased by the use of separate Power Systems.

Redundant 15-Slot HPMM card files

Redundant 15-Slot HPMM card files are ideal for a larger HPM subsystem. They can be installed in the same cabinet, one above the other, and share the same Power System or in separate cabinets of a cabinet complex and not share the same Power System. Installing the card files in separate cabinets with separate Power Systems is preferred because subsystem security is increased greatly by the use of separate Power Systems.

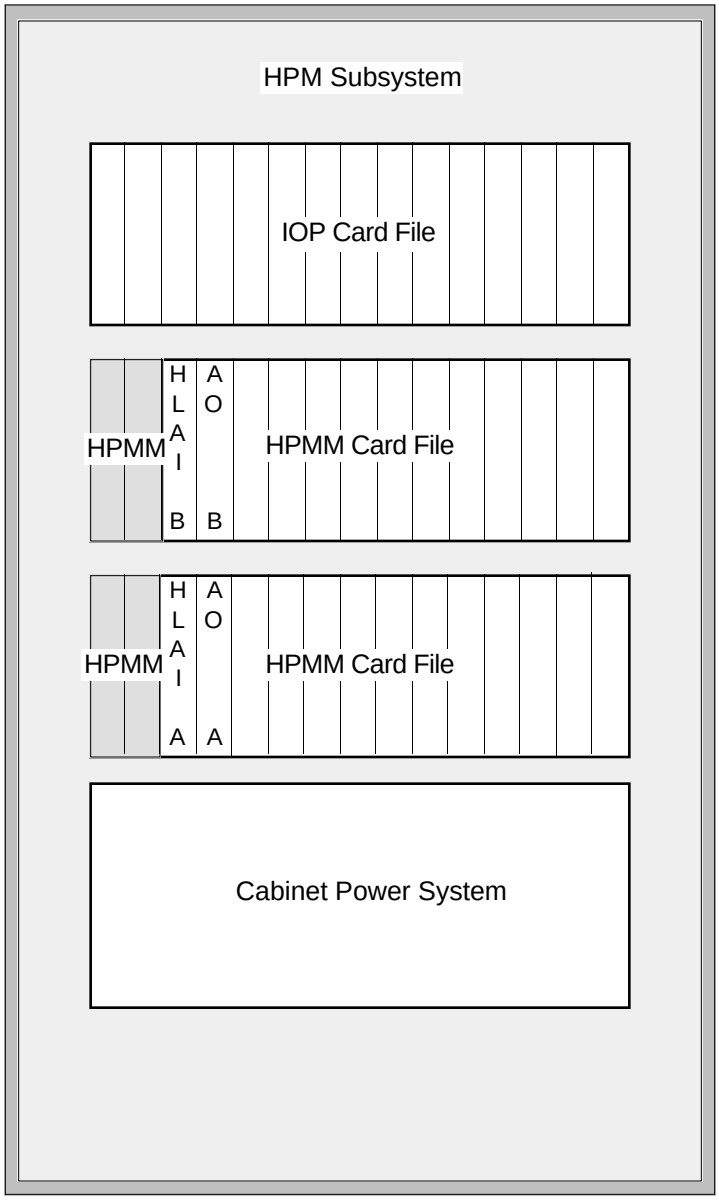
Unlike Left and Right 7-Slot HPMM card files, each 15-Slot HPMM card files must be assigned a unique I/O link address.

Continued on next page

Redundant HPMMs in a single cabinet

Figure 10-1 illustrates a High-Performance Process Manager subsystem with redundant HPMMs that share the same Power System in a single cabinet. The card files are shown with redundant pairs of AO and HLAI IOPs that are labeled "A" and "B." When power is removed from one card file, the backup IOP can maintain communication with their associated FTA.

Figure 10-1 Single Cabinet with Redundant HPMMs



Continued on next page

Redundant HPMMs in separate cabinets

HPMM card files can be located in an adjacent cabinet in a cabinet complex, with each cabinet having an independent Power System.

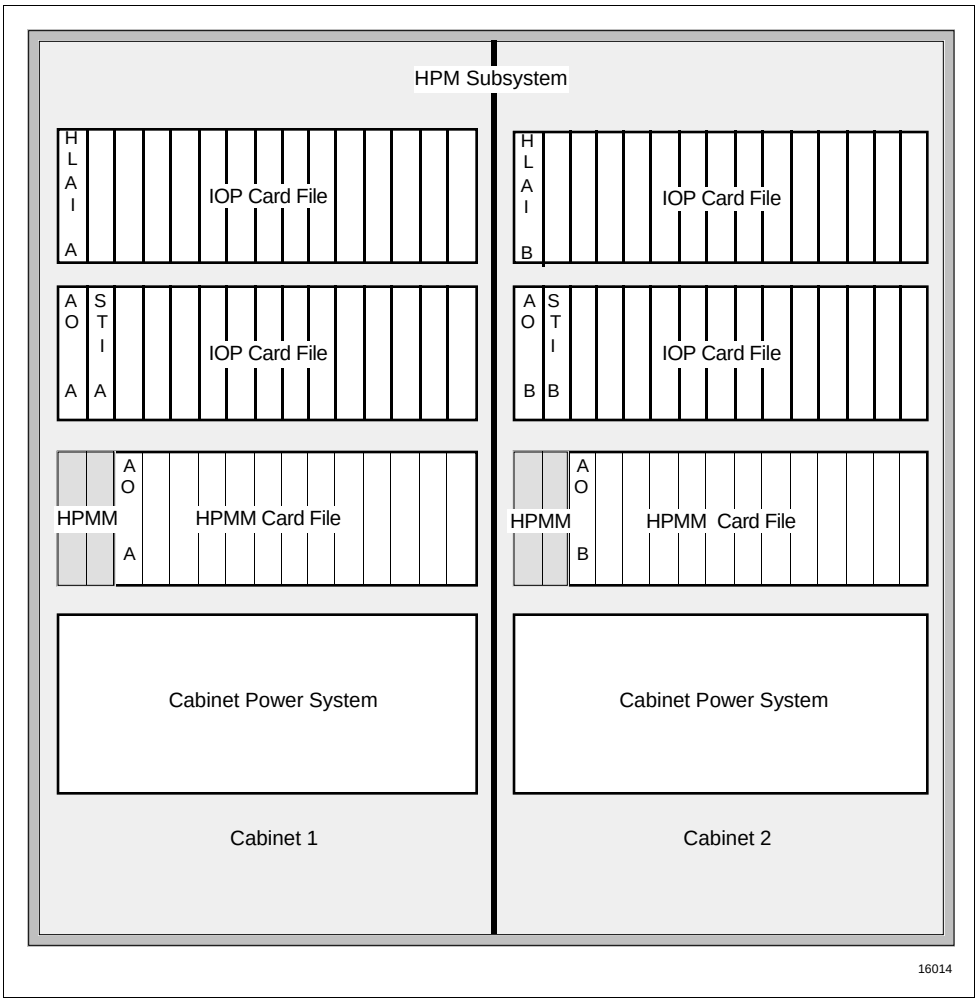
ATTENTION

ATTENTION—This configuration offers the most reliable operation.

Dual cabinet illustration

Figure 10-2 illustrates a High-Performance Process Manager subsystem with redundant HPMMs in separate cabinets, each with an independent Power System. Redundant pairs of HLAI, AO, and STI IOPs are shown and are labeled “A” and “B.”

Figure 10-2 Dual Cabinets with Redundant HPMMs

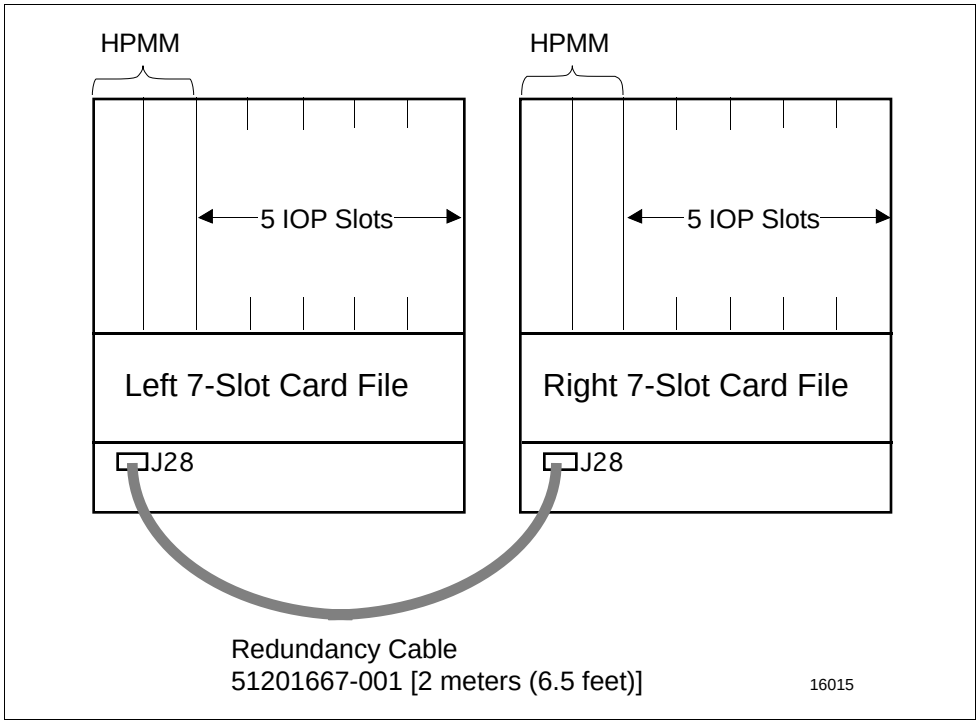


Continued on next page

Redundancy interface cable

If the HPMM card files are located in separate cabinets, the cabinets must be adjacent because the redundancy interface cable between the card files cannot exceed 2 meters (6.5 feet). Figure 10-3 illustrates the redundancy cable connection between the two card files.

Figure 10-3 Redundant HPMM Configuration Cabling



Additional power failure protection

If HPMM card files are located in separate cabinets with independent Power Systems, the installed IOP cards are provided with additional subsystem failure protection. The Power Systems can be connected to different ac line power sources.

It is recommended, however, that the cabinets be complexed together to reduce ground loops that may occur because of ground potential differences.

10.3 Redundant IOP Placement

Recommendations

Most High Level Analog Input (HLAI)/Smart Transmitter Interface (STI), Analog Output (AO), Digital Input (DI), and Digital Output (DO) FTAs support redundant IOP card capability. The redundant IOP card pairs can be installed in any available slot in the card file and function properly; however, to take full advantage of IOP redundancy, consider the following recommendations.

HPMM card files in separate cabinets

Redundant IOP card pairs in a High-Performance Process Manager subsystem with the redundant HPMMs that are located in HPMM card files in separate cabinets of a complex, should be installed in separate card files in separate cabinets. Card files in separate cabinets, with independent Power Systems for both the redundant HPMM card set and IOP cards, provide the maximum subsystem security and availability. Figure 10-2 is an illustration of a typical cabinet complex configuration.

As an aid to system maintenance, the IOP card pairs should also be installed in the same slot number in the separate card files.

HPMM card files in same cabinet

Redundant IOP card pairs in a High-Performance Process Manager subsystem with redundant HPMMs that are located in HPMM card files within the same cabinet should be installed in separate card files. The separate card files can consist of HPMM card files, or an additional IOP card file in the same cabinet as illustrated in Figure 10-1.

If the High-Performance Process Manager subsystem is large enough, an additional card file in another cabinet in the same cabinet complex would provide an ideal location for the installation of one of the IOP card pair. The separate cabinet could have an independent Power System.

As an aid to subsystem maintenance, the IOP card pairs should also be installed in the same slot number in both card files.

Redundant HPMMs recommended for redundant IOPs

Redundant IOP card pairs in a High-Performance Process Manager subsystem with a nonredundant HPMM is not recommended, but is feasible. The pair of IOPs should be installed in separate card files, with independent Power Systems if possible, and installed in the same slot number in each card file as an aid to system maintenance.

ATTENTION

ATTENTION—A remote redundant IOP card installation is functionally possible provided an I/O Link Extender is not installed between the redundant IOP cards.

Both IOP cards of a redundant pair must be located within the distance permitted for the 50-meter FTA to IOP cables.

10.4 Redundancy Support

10.4.1 Power System

Power System capabilities

Assuming no Galvanically Isolated FTAs are installed in a High-Performance Process Manager subsystem, a single Power System can probably support the following HPMM and IOP combinations:

- One HPMM card file and up to 40 physical IOP cards with associated FTAs. This implies support for up to 20 redundant IOP card pairs.
- Two HPMM card files and up to 40 physical IOP cards with their associated FTAs. The Power System will support up to 20 redundant IOP card pairs.
- When only IOP card files are used, such as at a remote location, up to 40 physical IOP cards with their associated FTAs can be installed in the subsystem. The Power System will support up to 20 redundant IOP card pairs.
- Normally, two Power Systems will support 40 redundant IOPs in two cabinets. The exception may be Galvanically Isolated FTAs because they have above normal power requirements.

10.4.2 HPMM to I/O

Guidelines

For a redundant High-Performance Process Manager subsystem, use the following guidelines for HPMM and IOP card file combinations:

- Up to four IOP card files and two HPMM card files can be supported in a redundant local I/O subsystem as shown in Figure 10-2.
- A maximum of 40 redundant IOP card pairs, installed in up to six IOP card files in a remote redundant I/O subsystem, can be supported.
- The total number of card files (a Left and Right 7-Slot card file pair count as one) in a High-Performance Process Manager subsystem cannot exceed eight (the maximum number of I/O Link Interface addresses available).

Continued on next page

Local/remote cabinet configuration

Figure 10-4 is an illustration of a local/remote High-Performance Process Manager subsystem cabinet configuration. Redundant IOP pairs, "A" and "B," are shown for a hypothetical installation.

Figure 10-4 Local/Remote Cabinet Configuration

Section 11 – I/O Link Extender Planning

11.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
11.1	Overview	197
11.2	Description	198
11.3	Fiber Optic Cable Routing	204
11.3.1	Direct Burial	204
11.3.2	Aerial Lashing	204
11.3.3	Vertical Installations	205
11.3.4	Indoor Requirements	205
11.3.5	Loose Buffered Cable	205
11.3.6	Number of Fibers	206
11.3.7	Cable Installation	206
11.4	Indoor Cable Bend Radius	207
11.5	Cable Construction	207
11.6	Cable Splices and Connections	208
11.7	Signal Loss Budget	210
11.7.1	Standard I/O Link Extender	210
11.7.2	Long Distance I/O Link Extender	212
11.8	Power Level Measurement	213

11.2 Description

Introduction

I/O Link Extenders provide the ability to locate a single IOP card file, or a complex of IOP card files, with IOPs and attached FTAs up to 8 kilometers (5 miles) from the HPMM. Two types of I/O Link Extenders and their associated fiber optic couplers are available, the "Standard" I/O Link Extender with up to a 1.3 kilometers link, and the "Long Distance" I/O Link Extender with up to a 8 kilometers link. The connection is made using a pair of fiber optic transmission cables, driven and terminated by a fiber optic coupler that mates with the connector located directly below the I/O Link Extender card in the card file.

I/O Link Extender cards

Each I/O Link Extender consists of two I/O Link Extender cards, one for Link A and one for Link B, that occupy two slots in the HPMM and IOP card file.

Standard I/O Link Interface fiber optic couplers

Each Standard I/O Link Extender card has an associated fiber optic coupler that can drive up to three pair of fiber optic cables. Each cable pair is terminated by a fiber optic coupler that terminates one fiber optic pair.

Long Distance I/O Link Interface fiber optic couplers

Each Long Distance I/O Link Extender card has an associated fiber optic coupler that drives a single pair of fiber optic cables. Each cable pair is terminated by a fiber optic coupler that terminates one fiber optic pair.

Remote card file requirements

Every remote card file requires two I/O Link Extender cards and two fiber optic couplers, one for Link A and one for Link B.

Standard I/O Link Interface assignment

The Standard I/O Link Extender card will drive and terminate Link A or Link B, depending upon the card file number and card file's slot number in which the card is installed. If the card file number and card file's slot number are both odd or both even, the card will drive I/O Link A. If the card file number and card file's slot number are <u>not</u> both odd or both even, the card will drive I/O Link B.

Metallic I/O Link Interface cable required

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

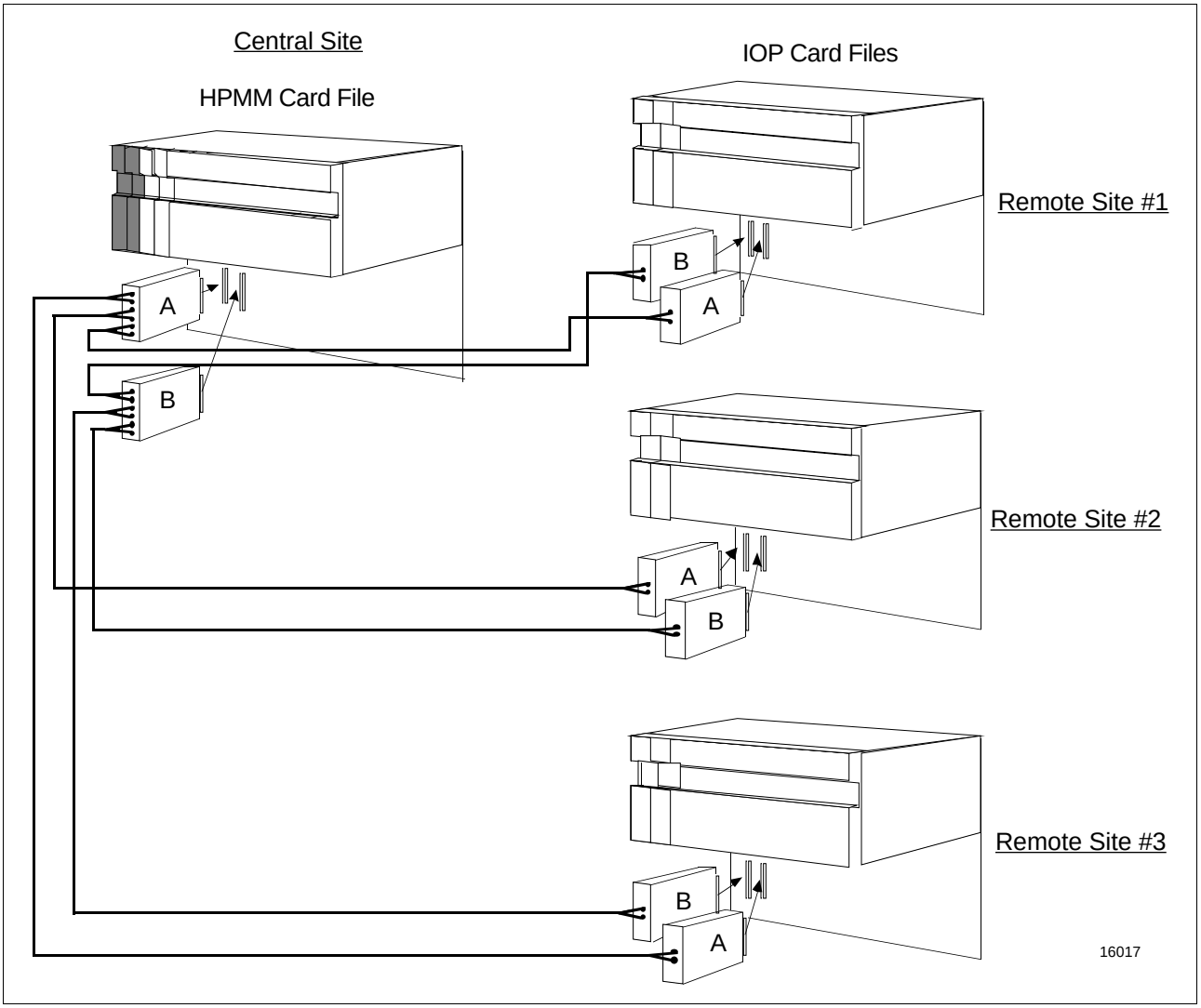
Continued on next page

Single HPMM

Figure 11-1 illustrates the interconnections for a Standard I/O Link Extender in a High-Performance Process Manager that contains a single HPMM. The following HPM subsystem configuration is assumed:

- The HPMM card file is configured as card file #1 (I/O Link Interface address of 0).
- Remote site # 1's I/O card file is configured as card file # 2 (I/O Link Interface address of 1).
- Remote site # 2's I/O card file is configured as card file # 3 (I/O Link Interface address of 2).
- Remote site # 3's I/O card file is configured as card file # 4 (I/O Link Interface address of 3).

Figure 11-1 Standard I/O Link Extender Interconnections with Single HPMM



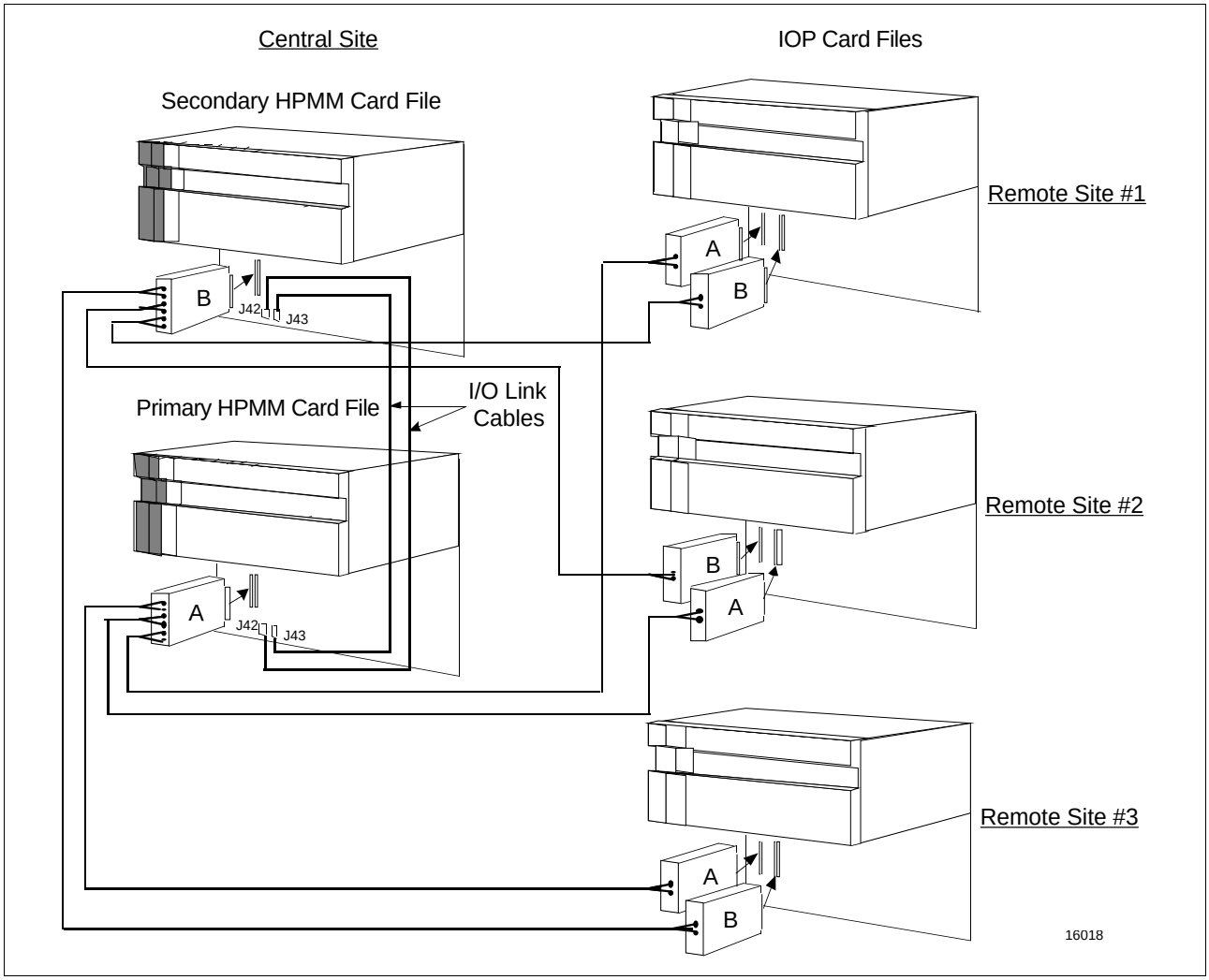
Continued on next page

Redundant HPMMs

Figure 11-2 illustrates the interconnections for a Standard I/O Link Extender in a High-Performance Process Manager that contains redundant HPMMs. The following HPM subsystem configuration is assumed:

- The lower HPMM card file is configured as card file #1 (I/O Link Interface address of 0).
- The upper HPMM card file is configured as card file #2 (I/O Link Interface address of 1).
- Remote site # 1's I/O card file is configured as card file # 3 (I/O Link Interface address of 2).
- Remote site # 2's I/O card file is configured as card file # 4 (I/O Link Interface address of 3).
- Remote site # 3's I/O card file is configured as card file # 5 (I/O Link Interface address of 4).

Figure 11-2 Standard I/O Link Extender Interconnections with Redundant HPMMs



Continued on next page

Long Distance I/O Link Interface assignment

Configuration of the A and B Long Distance I/O Link Extender is determined by a jumper on the I/O Link Extender card.

Metallic I/O Link Interface cable required

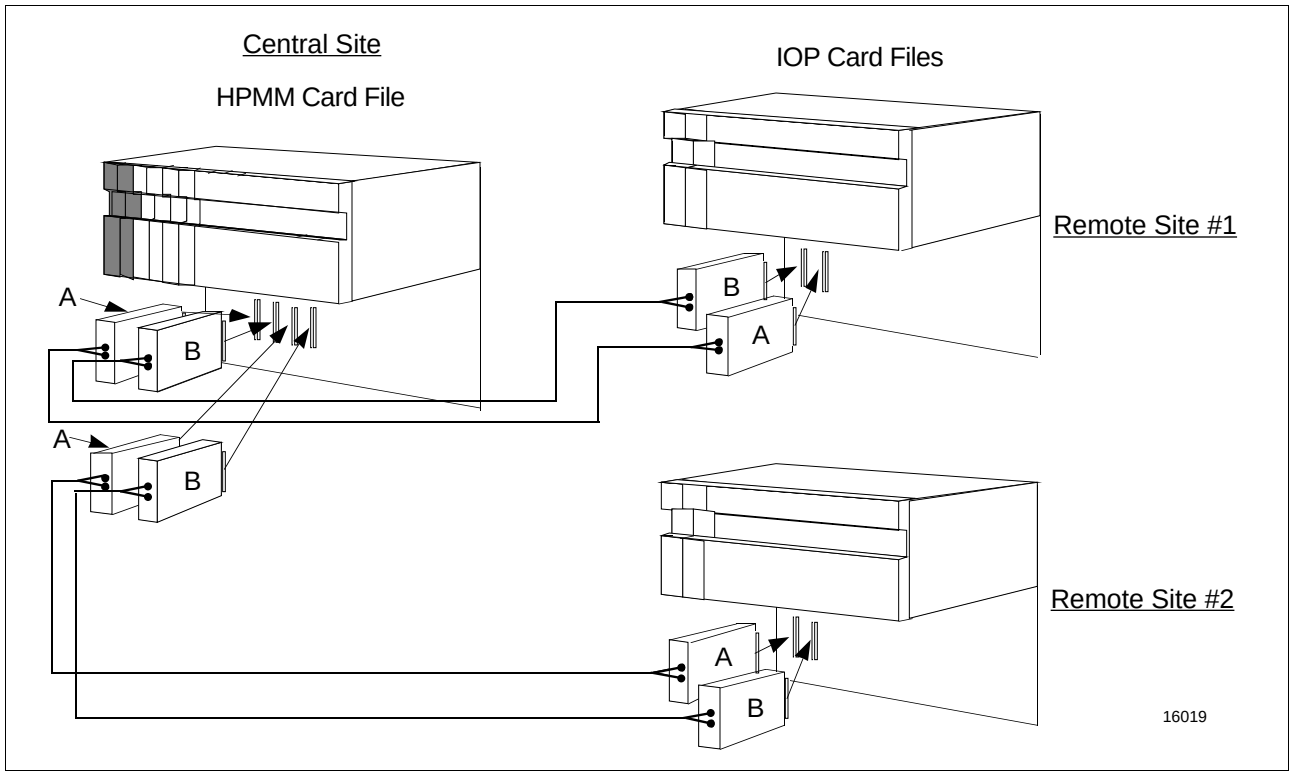
A metallic I/O Link Interface cable is required between redundant HPMM card files for communications with the IOP card slots in the backup HPMM card file.

Nonredundant HPMM

Figure 11-3 illustrates the interconnections for a Long Distance I/O Link Extender in a High-Performance Process Manager that has a single HPMM. The following HPM subsystem configuration is assumed:

- The HPMM card file is configured as card file #1 (I/O Link Interface address of 0).
- Remote site # 1's I/O card file is configured as card file # 2 (I/O Link Interface address of 1).
- Remote site # 2's I/O card file is configured as card file # 3 (I/O Link Interface address of 2).
- Remote site # 3's I/O card file is configured as card file # 4 (I/O Link Interface address of 3).

Figure 11-3 Long Distance I/O Link Extender Interconnections with Single HPMM



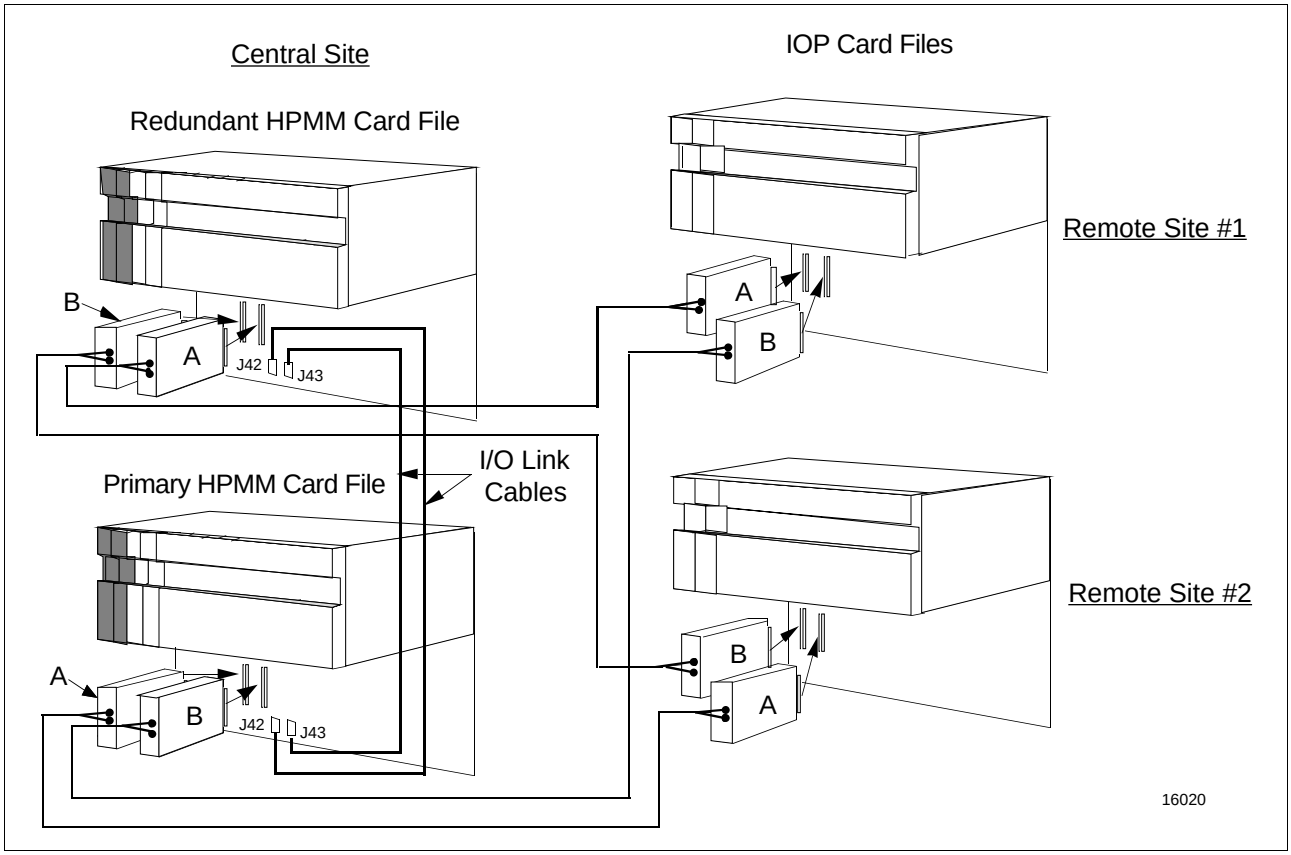
Continued on next page

Redundant HPMMs

Figure 11-4 illustrates the interconnections for a Long Distance I/O Link Extender in a High-Performance Process Manager that has redundant HPMMs. The following HPM subsystem configuration is assumed:

- The lower HPMM card file is configured as card file #1 (I/O Link Interface address of 0).
- The upper HPMM card file is configured as card file #2 (I/O Link Interface address of 1).
- Remote site # 1's I/O card file is configured as card file # 3 (I/O Link Interface address of 2).
- Remote site # 2's I/O card file is configured as card file # 4 (I/O Link Interface address of 3).

Figure 11-4 Long Distance I/O Link Extender Interconnections with Redundant HPMMs



Continued on next page

Number of remote card files

Two Standard I/O Link Extenders, connecting up to six remote card files, can be installed in a HPMM card file, but the maximum number of other primary IOPs is still 40 (plus 40 redundant IOPs).

Maximum fiber optic cable length

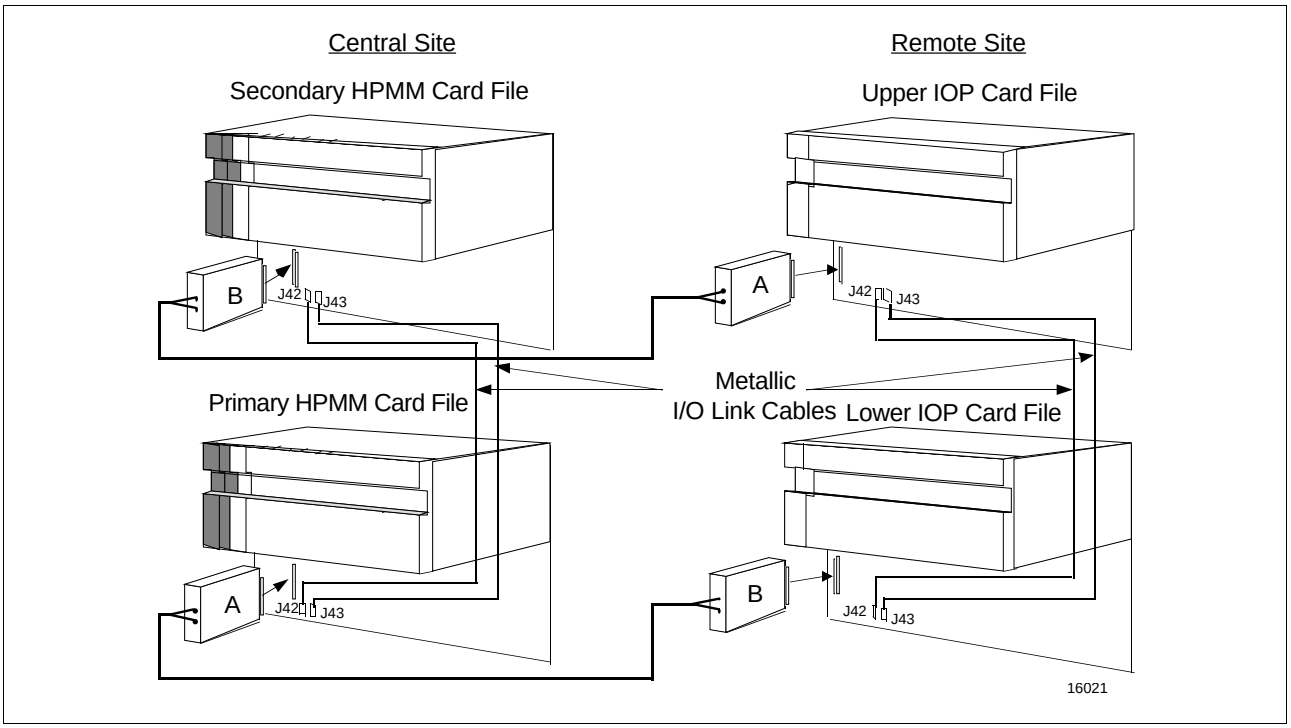
The maximum fiber cable length is dependent upon the number of splices and quality of the cable (dB loss per meter of cable). This maximum can be between 0.98 and 1.3 kilometers for the Standard I/O Link Extender and up to 8 kilometers for the Long Distance I/O Link Extender. See subsection 11.6 for the loss budget calculation.

Remote card file installation

For remote locations consisting of more than one IOP card file, the A and B I/O Link Extender cards are installed in separate card files, and the card files are interconnected with the standard metallic I/O Link Interface cables as shown in Figure 11-5. The following HPM subsystem configuration is assumed:

- The Primary HPMM card file is configured as card file #1 (I/O Link address of 0).
- The Secondary HPMM card file is configured as card file #2 (I/O Link address of 1).
- The remote site's Lower IOP card file is configured as card file #3 (I/O Link address of 2).
- The remote site's Upper IOP card file is configured as card file #4 (I/O Link address of 3).

Figure 11-5 Remote Site Multi-IOP Card File I/O Link Interface Cabling



11.3 Fiber Optic Cable Routing

Routing methods

Fiber optic cable can be routed underground (with direct burial cable), through the air (with outdoor aerial cable), or in cable and electrical wiring trays. Fiber optic cable is immune to interference from electromagnetic fields or transmissions. Fiber optic cable is safe to route through intrinsic safety areas with no danger of explosion.

Cable A and B separation

The A and B fiber links should be routed to the destination by different routes to avoid simultaneous damage or cutting to both cables; however, the maximum difference in fiber optic cable length between Link A and Link B must be less than 500 meters (1640 feet) to limit the communications delay difference between Link A and Link B.

11.3.1 Direct Burial

Under ground burial hazards

Heavy duty cables can be buried directly in the ground. Care should be taken to minimize the effects of freezing water, the heaving of rocks caused by the ground freezing, ground disruption because of construction, and rodents.

Type of cable to use

The most durable jacket material for environmental hazards, such as crushing and abrasion, is polyethylene. An inner layer of steel armor provides additional protection from rodents. Use of heavy duty cables can sometimes be avoided by protecting the cable with conduit or polyethylene pipe.

11.3.2 Aerial Lashing

Aerial lashing methods

Aerial Lashing methods are similar to those used for electrical cables. Most cables are compatible with helical lashing, clamping, or tied mounting.

11.3.3 Vertical Installations

Cable clamping

Cable in vertical trays, raceways, shafts, etc., should be firmly clamped at frequent intervals so that cable weight is supported evenly. Clamping intervals can be as short as one meter (3.3 feet) outdoors to prevent wind slapping and minimize ice loading, or as long as 15 meters (49.2 feet) in interior locations.

Fiber migration

Fiber in vertical installations does not break because of its own weight; however, for vertical runs of 15 meters (49.2 feet), and greater, excess fiber can migrate downward. The crowding of excess fiber at the bottom can cause an increase in attenuation.

Cable loops

This downward migration of fiber in vertical runs can be reduced by placing loops in the cable, approximately 0.3 to 0.5 meter (1 to 1.5 feet) in diameter, at the top, bottom, and at 15-meter (50-foot) intervals.

11.3.4 Indoor Requirements

Cable jacket building code restrictions

Building code requirements frequently do not allow cables with polyethylene jackets. Jackets of polyvinyl chloride are frequently restricted to conduits, while floropolymer or other approved jacked material is required for use in cable trays and air plenums. Cable with suitable jacket material must be selected for the application.

11.3.5 Loose Buffered Cable

Ambient temperature variations

Where ambient temperature variations are 20°C or greater on a daily basis, the life of the fibers can be significantly reduced. In applications where the ambient temperature is not controlled, loose buffered cable must be specified.

Fire code requirements

Loose buffered cable is available in polyethylene jacket material only. Fire codes may dictate that the indoor portion of the cable installation be in metal conduit, or if the temperature is controlled, a splice may be required to convert to a tight buffer cable with a PVC or Fluoride Co-Polymer jacket material.

11.3.6 Number of Fibers

Multi-fiber cable required

Two fibers are required for one link, one for transmit and one for receive. Fiber loss is measured at 22°C ±3° and is usually stated as a mean value. Individual fiber losses may be as much as 25% greater than the mean.

Cable damage possible

As insurance against future damage, such as fiber breakage, or encountering excessive loss in any one fiber, the inclusion of spare fibers should be considered. This is especially important for cables that have high installation cost.

11.3.7 Cable Installation

Use professional installers

It is recommended that the fiber optic cable be installed by professional installation contractors. The installers will provide the cable, install the cable, attach ST-type connectors, and do the OTDR test.

62.5 micron cables

62.5 micron cable usage is controlled by Honeywell purchase specification 51190918 for indoor cable and Honeywell purchase specification 51190919 for outdoor cable.

Indoor cables are available with 2, 4, or 6 fibers.

Outdoor aerial and direct burial cables are available with 4, 6, or 8 fibers.

11.4 Indoor Cable Bend Radius

Cable bend requirements

Fiber optic cable is easily damaged by overbending or kinking the cable, so a minimum bend radius is established for each different cable size and cable construction. Indoor cable is the most flexible and outdoor direct burial cable is the least flexible. Table 11-1 specifies the minimum bend radius for indoor cable.

In the table, short term minimum bend radius refers to the minimum bend radius that is safe during installation. Long term minimum bend radius refers to the minimum bend radius that is safe after the cable installation is completed and settled.

Table 11-1 Minimum Bend Radius for Indoor Cable

Fibers Per Cable	Minimum Bend Radius (Short Term)	Minimum Bend Radius (Long Term)
2	17.0 cm (6.7 in.)	13.0 cm (5.1 in.)
4	22.0 cm (8.7 in.)	16.5 cm (6.6 in.)
6	26.0 cm (6.7 in.)	20.0 cm (7.9 in.)
8	30.0 cm (6.7 in.)	23.0 cm (9.0 in.)

11.5 Cable Construction

Fiber optic cable selection

The selection of fiber optic cable is dependent upon satisfying installation and environmental requirements without exceeding the maximum optical losses. The factors to be considered when selecting the cable are

- The total fiber optic cable losses
- The cable requirements caused by the desired routing. Routing requirements can include direct burial, conduits, trays, raceways, plenums, etc.
- Construction code requirements

Installation precautions

The installation procedures for placement of fiber optic cables are the same as for electrical wires. Care should be taken to avoid yanking, flipping, or wrapping that can result in unnecessary tightening of the fibers. Fiber optic cables should not be subject to foot traffic or crushing forces. Sharp bending and scraping at entrances and covers should be avoided.

11.6 Cable Splices and Connections

Planning the cabling

When planning a system installation, design the system to have the minimum number of splices. For example, convert outdoor cable to indoor cable when entering a cabinet where the bend radius of outdoor cable will not fit in the cabinet. Where this splicing must be made, sufficient cable length must be provided for a splice loop. Thirty to 45 centimeters (12 to 18 inches) on each cable end is the usual allowance for a service loop. Also, when entering the equipment cabinet, sufficient cable length must be allowed for breakout (stripping and fanning out) and termination of the individual fibers.

Cable splice protection

Completed splices cannot withstand tensile forces and must be housed in a strain relief assembly. Moisture entry into the splice can cause degradation of performance; therefore, the splice enclosure must be sealed, and if necessary, the splice encapsulated to minimize moisture entry.

Cable breakout

Breakout eliminates the outer sheath, leaving the more flexible individual fibers for routing within the cabinet. Tight buffer indoor cables (discussed in subsection 11.2.5) provide strength members with each fiber, eliminating the need to use breakout kits to add strength members for each fiber.

Use of a breakout kit

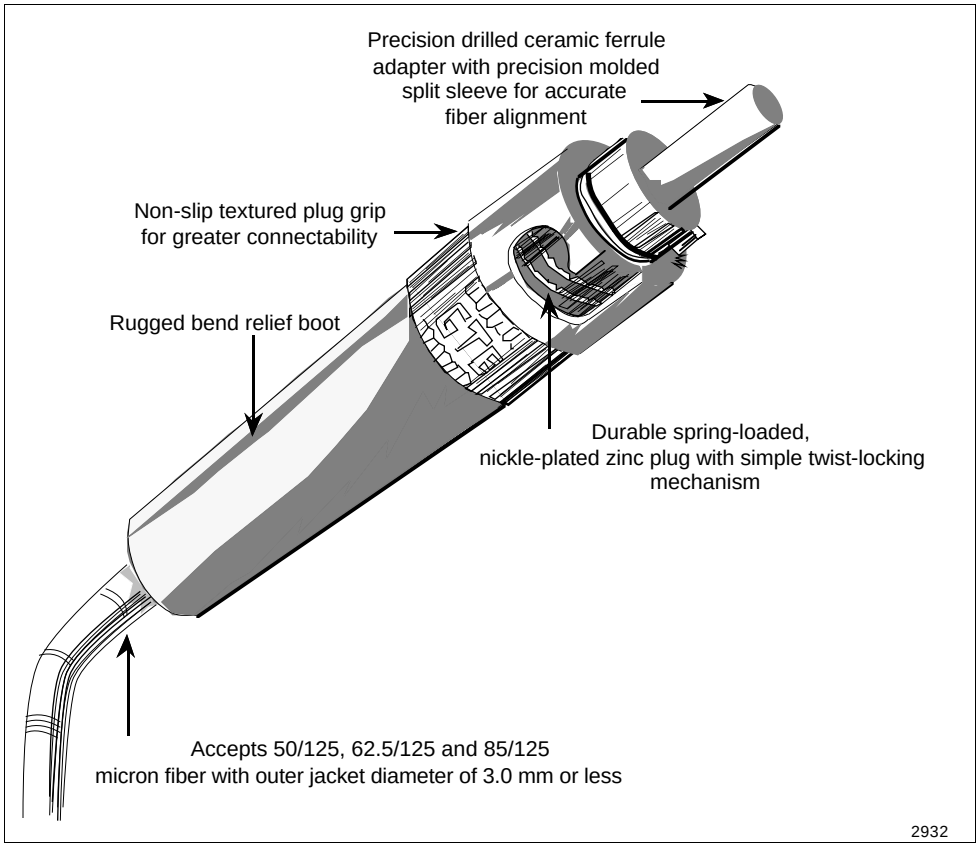
In outdoor loose-buffered, gel-filled cable designs, there is no strength member or protective jacket for the individual fibers. To terminate and use this type of cable requires the use of a breakout or fan-out kit. The kit provides strength members with flexible jackets that are placed over the fibers after the outer jacket is removed. These kits can be installed over fibers as much as ten meters (33 feet) in length. The kit provides fiber protection for in-cabinet routing and termination.

Continued on next page

Cables with connectors preinstalled

If the cable length is accurately determined and the cable does not have to be pulled through a conduit, the cables can be ordered with connectors installed on the ends. This requires less field skill and installation time. ST-type connectors, as shown in Figure 11-6, can also be used as a means of splicing two cables; however, to minimize losses at or near maximum cable lengths, professional installation is required using fusion splices.

Figure 11-6 ST-Type Connector



11.7 Signal Loss Budget

Introduction

The fiber cable signal loss budget is the difference between the transmit power and the minimum receiver sensitivity, minus the desired signal loss margin.

11.7.1 Standard I/O Link Extender

Signal loss budget calculation

The signal loss budget for the Standard I/O Link Extender is calculated as follows.

Transmit Power - Receiver Sensitivity = Budgeted Losses

Component	dB Level
Transmitter (62.5 micron fiber)	-16.0
Receiver	(-) -24.0
	8.0
Less power loss over time	(-) 2.5
Available optical cable power	5.5

ATTENTION

ATTENTION—Because the maximum transmitter output level is –7 dB, and the maximum receiver input level is –10 dB, the receiver may be overdriven on a short link and may require a 3 dB attenuator. Connector allowances for the transmitter and receiver are included in the above power declaration.

Types of splices

Two types of splices are available, mechanical and fusion.

The mechanical-type of splice consists of a glass tube into which the fiber is secured by ultra violet (UV) curable epoxy.

The fusion-type splice is produced by carefully aligning the fibers and then fusing them together by heating the fibers.

In both cases, the signal loss in the resulting splice is very dependent upon the skill of the installer. The losses at all splices and cable installations need to be certified and recorded at the time of installation for future reference as described in subsection 11.8.

Continued on next page

Cable span distance formula

To calculate the maximum distance the cable can reliably span:

$$\frac{5.5 - (\text{losses in splices})}{\text{Maximum cable loss in dB/km}} = \text{D, the distance}$$

The maximum distance for a Premium Performance cable with two fusion splices can be calculated using Tables 11-2 and 11-3.

$$\frac{5.5 - (2 \times 0.3)}{4} = 1.22 \text{ km}$$

The maximum distance for High Performance cable with two mechanical splices can be calculated using Tables 11-2 and 11-3.

$$\frac{5.5 - (2 \times 0.5)}{4} = 1.12 \text{ km}$$

Table 11-2 Standard Optical Power Loss

Type of Splice	Average Loss (dB)	Maximum Loss (dB)
Fusion	0.2	0.3
Mechanical	0.3	0.5
ST-Connector	0.5	0.9

Table 11-3 Standard Fiber Optic Cable Losses (@ 850 nm)

Type of Cable	Average Loss (dB/km)	Maximum Loss (dB/km)
High Performance	3.75	4.0
Premium	3.50	4.0

11.7.2 Long Distance I/O Link Extender

Signal loss budget calculation

The signal loss budget for the Long Distance I/O Link Extender is calculated as follows.

Transmit Power - Receiver Sensitivity = Budgeted Losses

Component	dB Level
Transmitter (62.5 micron fiber)	-18.0
Receiver	(-) -31.5
	13.5
Less power loss over time	(-) 4.5
Available optical cable power	9.0

ATTENTION

ATTENTION—Connector allowances for the transmitter and receiver are included in the optical cable power calculation shown above.

Types of splices

Two types of splices are available, mechanical and fusion.

The mechanical-type of splice consists of a glass tube into which the fiber is secured by ultra violet (UV) curable epoxy.

The fusion-type splice is produced by carefully aligning the fibers and then fusing them together by heating the fibers.

In both cases, the signal loss in the resulting splice is very dependent upon the skill of the installer. The losses at all splices and cable installations need to be certified and recorded at the time of installation for future reference as described in subsection 11.8.

Continued on next page

11.7.2 Long distance I/O Link Extender, Continued

Cable span distance formula

To calculate the maximum distance the cable can reliably span for the model MU-ILDX03 I/O Link Extender, use the following formula.

$$\frac{9.0 - (\text{losses in splices})}{\text{Maximum cable loss in dB/km}} = \text{D, the distance}$$

The maximum distance for a Premium Performance cable with two fusion splices can be calculated using Tables 11-4 and 11-5.

$$\frac{9.0 - (2 \times 0.3)}{2} = 4.2 \text{ km}$$

The maximum distance for High Performance cable with two mechanical splices can be calculated using Tables 11-4 and 11-5.

$$\frac{9.0 - (2 \times 0.5)}{2} = 4.0 \text{ km}$$

Table 11-4 Long Distance Optical Power Loss

Type of Splice	Average Loss (dB)	Maximum Loss (dB)
Fusion	0.2	0.3
Mechanical	0.3	0.5
ST-Connector	0.5	0.9

Table 11-5 Long distance Fiber Optic Cable Losses (@ 1300 nm)

Type of Cable	Average Loss (dB/km)	Maximum Loss (dB/km)
High Performance	1.5	2.0
Premium	1.0	2.0

11.8 Power Level Measurement

Record post installation measurements

After the cables have been connected to the fiber optic transmitters and power has been applied to the equipment, measurements of transmitter output, cable loss and power input to the fiber optic receivers should be recorded for future reference. This procedure is detailed in the *Process Manager I/O Installation* manual.

Section 12 – Low Level Multiplexer Planning

12.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
12.1	Overview	215
12.2	LLMux Version	216
12.2.1	LLMux Configurations	216
12.2.2	LLMux IOP Placement	219
12.2.3	LLMux Power Adapter Placement	219
12.2.4	LLMux FTA Placement	219
12.2.5	Remote CJR Installation	222
12.3	RHMUX Version	223
12.3.1	RHMUX Configurations	223
12.3.2	RHMUX IOP Placement	228
12.3.3	RHMUX Power Adapter Placement	228
12.3.4	RHMUX FTA Placement	228

Introduction

Low Level Analog Input Multiplexer (LLMux) is comprised of three assemblies. They are:

- an IOP
- a Power Adapter
- an FTA

There are two versions of the LLMux and their assemblies are not compatible with each other.

For clarity, the two versions are described as an LLMux and a Remote Hardened Multiplexer (RHMUX). The RHMUX is Approved as Intrinsically Safe and Nonincendive for use in hazardous locations. However, the RHMUX assemblies can also be used in areas that are classified as nonhazardous.

The RHMUX subsystem has the added advantage that the FTA can be located up to 2 kilometers from its Power Adapter.

12.2 LLMux Version

12.2.1 LLMux Configurations

CE Compliance

All models of the Low Level Analog Input Multiplexer (LLMux) Field Termination Assemblies (FTAs), the Power Adapter, and its IOP can be used in a CE Compliant application. However, they must be used with the model MU-KFTSxx IOP to FTA cable and the IOP must be installed in a CE Compliant card file. Table 12-1 lists FTA, Power Adapter, and IOP model and part numbers.

Table 12-1 LLMux Assembles

Model Number	Description	Part Number
MU-TAMR03	LLMux RTD FTA	51309218-125
MC-TAMR03	LLMux RTD FTA – Conformally Coated	51309218-175
MU-TAMT03	LLMux TC FTA	51309223-125
MC-TAMT03	LLMux TC FTA – Conformally Coated	51309223-175
MU-TAMT13	LLMux TC FTA with Remote CJR	51309213-125
MC-TAMT13	LLMux TC FTA with Remote CJR – Conformally Coated	51309213-175
MU-TLPA02	Power Adapter	51309204-125
MC-TLPA02	Power Adapter – Conformally Coated	51309204-175
MU-PLAM02	LLMux IOP	51304362-100
MC-PLAM02	LLMux IOP – Conformally Coated	51304362-150

Compatibility

The LLMux assemblies are compatible only with each other. The assemblies are not compatible with the RHMUX assemblies that are discussed in subsection 12.3.

Continued on next page

12.2.1 LLMux Configurations, Continued

Non-CE Compliance

The FTAs and the Power Adapter can also be used for a non-CE Compliant applications.

Conformal coating

The LLMux FTA, Power Adapter, and IOP assemblies are available with conformal coating. See Table 12-1.

Power Adapter

A CE Compliant version of the model MU-TLPA02 Power Adapter (part number 51309204-125 or 51309204-175) must be used with the LLMux FTA models for CE Compliant applications.

Description

Figure 12-1 illustrates a Low Level Analog Input Multiplexer (LLMux) configuration.

In Figure 12-1, the LLMux FTA, model MU-TAMR03 or MU-TAMT03/13, communicates with a model MU-PLAM02 LLMux IOP through the model MU-TLPA02 Power Adapter. This can be a non-CE Compliant or CE-Compliant application depending upon the model of the card file that is used.

Two types of LLMux FTAs

The LLMux FTAs that connect to the Power Adapter can be either of two types of FTAs; the model MU-TAMT03/13 Thermocouple (TC) FTA or the model MU-TAMR03 Resistive Temperature Device (RTD) FTA. The combination of the FTA mother board and the daughter board determines the type of FTA.

The two LLMux FTAs that connect to the Power Adapter can be the same type, or different types.

Two thermocouple LLMux FTAs

There are two versions of the Thermocouple LLMux FTA. The model MU-TAMT03 FTA has a single local Cold Junction Reference (CJR) interface, while the model MU-TAMT13 FTA has a remote CJR interface. This allows the CJR to be located up to 50 meters (164 feet) from the FTA with the use of appropriate cabling.

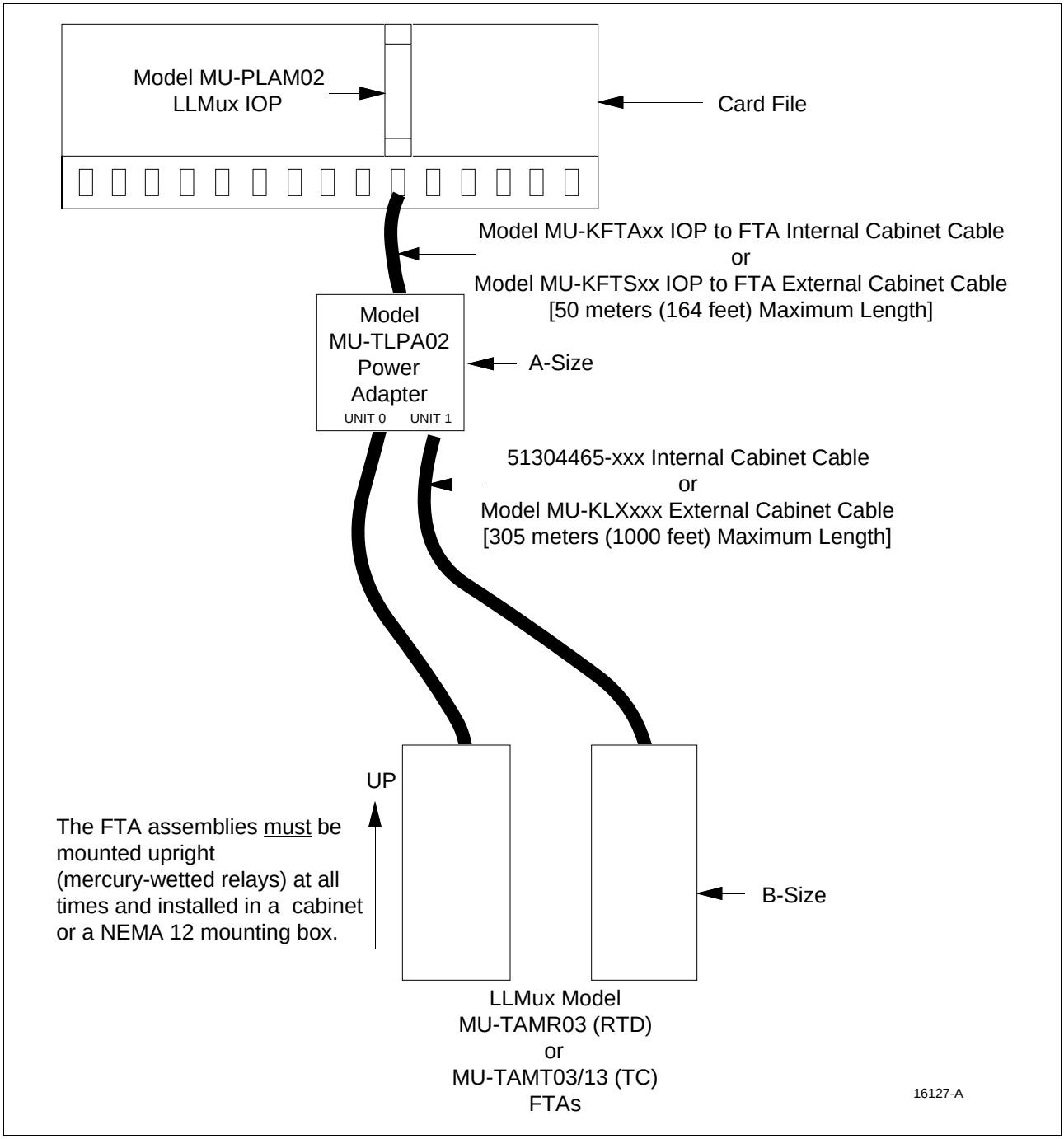
16 LLMux FTA channels

Each type of LLMux FTA has 16 channels that accept low level analog inputs. Two LLMux FTAs connected to a Power Adapter provide 32 channel inputs to the LLMux IOP. This concept causes the LLMux to be known also as the 32 point LLMux.

Continued on next page

CE Compliant LLMux configuration

Figure 12-1 LLMux Configuration Interconnections – CE Compliant



12.2.2 LLMux IOP Placement

Install the IOP in any card file

The LLMux IOP can be installed in any available slot in an HPMM or IOP card file.

12.2.3 LLMux Power Adapter Placement

Within 50 meters of IOP

The LLMux Power Adapter can be installed on any available FTA Mounting Channel that is within 50 meters (164 feet) of the LLMux IOP. The restriction is that the longest IOP to FTA cable cannot exceed 50 meters.

IOP to Power Adapter cable

The IOP to Power Adapter interconnection is provided by a model MU-KFTAxx nonshielded cable (the suffix "xx" represents the length of the cable in meters) in 12 sizes, up to 50 meters (164 feet) in length for internal cabinet applications. A model MU-KFTSxx shielded cable is used for external cabinet applications. See the *High-Performance Manager Service* or *Process Manager/Advanced Process Manager Installation* manual for the lengths that are available.

Power Adapter size

The Power Adapter has the same dimensions as an A-size (6 inches) FTA.

12.2.4 LLMux FTA Placement

FTA size

The LLMux FTA is a B-size (12 inches) FTA

EMI sensitivity

The LLMux FTA is designed to be mounted in a shielded enclosure. This can be accomplished in either of two ways.

- Install the FTA in a standard High-Performance Process Manager cabinet on an FTA Mounting Channel. The FTA must be grounded to the cabinet and the cabinet must be grounded to Safety Ground (building ground).
- Install the FTA in a NEMA 12 box with the FTA Mounting Channel grounded to the box, and the box connected to Safety Ground.

WARNING

WARNING—The practice of mounting an FTA on panel rails is not acceptable because the installed FTA can not be adequately shielded. The FTA must mount on an FTA Mounting Channel.

Continued on next page

12.2.4 LLMux FTA Placement, Continued

Within 305 meters of Power Adapter

The remote LLMux FTA cabinet or NEMA 12 box can be located up to 305 meters (1000 feet) from the Power Adapter. The restriction is that the longest Power Adapter to FTA cable cannot exceed 305 meters (1000 feet).

CAUTION

CAUTION—The remotely-installed FTA's environment must meet the same environmental conditions imposed on equipment installed in Process Manager or Advanced Process Manager cabinets. See Section 5 in this manual and the *TPS System Site Planning* and *Process Manager I/O Installation* manuals for additional information.

Mercury-wetted relay contacts

LLMux FTAs contain relays with mercury-wetted contacts and must be positioned with the LLMux power connector-side up.

Local FTA to Power Adapter cabling

When the LLMux FTA is installed in the same cabinet, or cabinet complex, as the Power Adapter FTA, a 51304465-xxx cable ("xxx" represents five sizes – 30, 66, 100, 200, and 300 centimeters) with stripped wire ends is used for the interconnection. See the *High-Performance Process Manager Service* manual for part numbers.

The cable can be used for both non-CE Compliant and CE Compliant applications.

The cable has two individually shielded, twisted-pair wires. For non-CE Compliant applications, the shields must be connected to ground at the Power Adapter end only, and for CE Compliant applications, the shields must be connected to ground at both ends of the cable. The wire connections are made using the compression terminals in a 6-pin connector at the Power Adapter end and in a 4-pin or 6-pin connector at the FTA end.

External Power Adapter to FTA cabling

When LLMux FTA is not installed in the same cabinet, or cabinet complex, as the Power Adapter and up to 305 meters (1000 feet) from the Power Adapter, a model MU-KLXxxx cable ("xxx" represents three sizes – 76, 152, and 305 meters for external cabinet installation). This is a single-twist, four-conductor Belden type 83654 cable with a braided shield and must be used for the interconnection for a CE Compliance application. See the *High-Performance Process Manager Service* manual for part numbers.

References

For additional LLMux IOP and FTA information, see the *Process Manager I/O Installation* or *High-Performance Process Manager Service* manual.

Continued on next page

Power Adapter to FTA cable specifications

The 51304465-xxx (internal cabinet) and model MU-KLXxxx (external cabinet) cables have the following specifications.

51304465-xxx power cable (internal cabinet use)

- Manufacturer Type – Belden 9406
- Configuration – Shielded double pair
- Flame Resistance Conformity – CSA FT 4
- CSA Type – CMG
- NEC Type – CMG

Model MU-KLXxxx power cable (external cabinet use)

- Manufacturer Type—Belden 83654
- Cable Configuration—Shielded 18-gauge four-conductor single twist (TEFLON jacket)
- Flame Resistance Conformity—CSA FT4/FT6 and UL910
- CSA Type—CMP
- NEC Type—CMP
- Temperature Rating: -70°C to +200°C

Model MU-KRCJ00 remote CJR cable

- Manufacturer Type – Belden model 83653
- Conductors – Three 1.0 mm^2 (18 AWG) conductors
- Insulation and Jacket – Teflon conductor insulation and jacket
- Shielding – Braid over foil
- Flame Resistance Conformity – CSA PCC FT4/FT 6 and UL910
- NEC Type – CMP
- Use – Air plenum

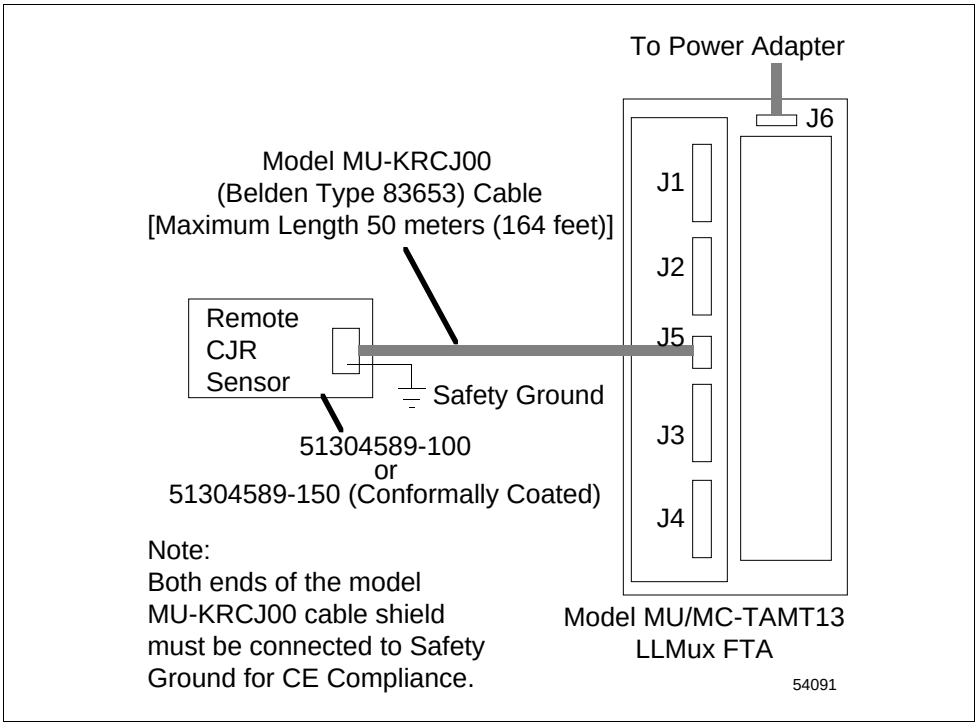
12.2.5 Remote CJR Installation

Installation requirements

Figure 12-2 illustrates remote CJR installation requirements. Model MU-KRCJ00 cable must be used between the remote CJR sensor and the model MU-TAMT13 or MC-TAMT13 FTA. Its length is restricted to 50 meters (164 feet). The cable shield must be connected to Safety Ground at both ends of the cable.

The installation as illustrated is CE Compliant.

Figure 12-2 Remote CJR Installation



12.3 RHMUX Version

12.3.1 RHMUX Configurations

CE Compliance

All models of the Remote Hardened Low Level Analog Input Multiplexer (RHMUX) Field Termination Assembly (FTA), Power Adapters, and IOP can be used in a CE Compliant application. However, they must be used with the model MU-KFTSxx IOP to FTA cable and the IOP must be installed in a CE Compliant card file. A model MU-KLXxxx or MU-KLO305 Power Adapter to FTA four-conductor cable must also be used with a single ferrite shield or six solid ferrite beads, respectively, installed inside the remote enclosure at the FTA end of the cable. Both types of ferrites are included with the Honeywell enclosure.

Table 12-2 lists the FTA, Power Adapter, and IOP model part numbers.

Table 12-2 RHMUX Assemblies

Model Number	Description	Part Number
MC-GRMT01	RHMUX TC FTA with Local CJR Screw Terminals – Conformally Coated	51404106-175
MU-GRPA01	Intrinsically Safe RHMUX Power Adapter	51304724-125
MC-GRPA01	Intrinsically Safe RHMUX Power Adapter Conformally Coated	51304724-175
MU-TRPA01	Non-Incendive RHMUX Power Adapter	51304722-125
MC-TRPA01	Non-Incendive RHMUX Power Adapter Conformally Coated	51304722-175
MU-PRHM01	RHMUX IOP	51404109-125
MC-PRHM01	RHMUX IOP—Conformally Coated	51404109-175
MU-CMSS03	NEMA 4X Stainless Steel Enclosure (35.6 cm wide x 40.7 cm high x 15.2 cm deep)	51309250-100
MU-CMSC03	NEMA 4 Painted Carbon Steel Enclosure (35.6 cm wide x 40.7 cm high x 15.2 cm deep)	51309250-200

Non-CE Compliance

The RHMUX FTA, Power Adapters, and IOP can also be used for non-CE Compliant applications. The model MU-KFTAxx IOP to FTA cable can be substituted for the model MU-KFTSxx cable and a ferrite shield or ferrite beads are not required for the model MU-KLXxxx or MU-KLO305 Power Adapter to FTA cable.

Continued on next page

12.3.1 RHMUX Configurations, Continued

Galvanically Isolated Power Adapters

Both models of the Power Adapter provide Galvanic Isolation between the FTA and the IOP.

Hazardous locations

The RHMUX is designed primarily for Intrinsically Safe applications. However, the RHMUX assemblies can be used in Nonincendive and nonhazardous locations.

Control drawings

The approvals for the RHMUX subsystem are valid only if the appropriate Honeywell control drawing is followed. Drawing 51204105 covers Intrinsically Safe installations and drawing 51204185 covers Nonincendive installations.

Compatibility

The RHMUX assemblies are compatible only with each other. The assemblies are not compatible with the LLMux assemblies that are discussed in subsection 12.2.

Conformal coating

The RHMUX TC FTA is available only with conformal coating. The RHMUX Power Adapter and IOP assemblies are available with or without conformal coating. See Table 12-2.

Description

One or two RHMUX Thermocouple (TC) FTAs can be connected to either an Intrinsically Safe (IS) Power Adapter or a Non-Incendive (NI) Power Adapter. The Power Adapter also connects to a model MU/MC-PRHM01 RHMUX IOP as illustrated in Figures 12-3 and 12-4. Figure 12-3 illustrates a Nonincendive RHMUX application, and Figure 12-4 an Intrinsically Safe RHMUX application.

The model MU/MC-GRPA01 Intrinsically Safe RHMUX Power Adapter and the model MU/MC-TRPA01 Non-Incendive Power Adapter are functionally the same.

The RHMUX FTA supports 0 to 100-millivolt and thermocouple inputs. RTD inputs are not supported.

The model MU/MC-PRHM01 IOP supports 32 inputs from two RHMUX FTAs.

Continued on next page

RHMUX FTA mounting

The RHMUX FTA dimensions of approximately 13 inches by 13 inches cannot be accommodated by an FTA Mounting Channel in an HPM cabinet and is not intended to be mounted in an HPM cabinet.

The RHMUX agency approvals are valid only when the FTA is mounted in a 35.6 W x 40.7 H x 15.2 D-centimeter (14 W x 16 H x 6 D-inch) model MU-CMSC03 NEMA 4 or model MU-CMSS03 NEMA 4X sealed enclosure that are offered by Honeywell.

The model MU-CMSS03 enclosure is Approved for Division 1 and Division 2, Class I, II, and III locations. The model MU-CMSC03 enclosure is Approved for Division 1 and Division 2, Class I locations only.

Model MU/MC-GRPA01 Power Adapter mounting

The model MU/MC-GRPA01 Power Adapter is the same size as an A-size (6-inch) FTA and can be installed on a standard vertical or horizontal FTA Mounting Channel.

Model MU/MC-TRPA01 Power Adapter mounting

The model MU/MC-TRPA01 Power Adapter is the same size as a B-size (12-inch) FTA and can be installed on a standard vertical or horizontal FTA Mounting Channel.

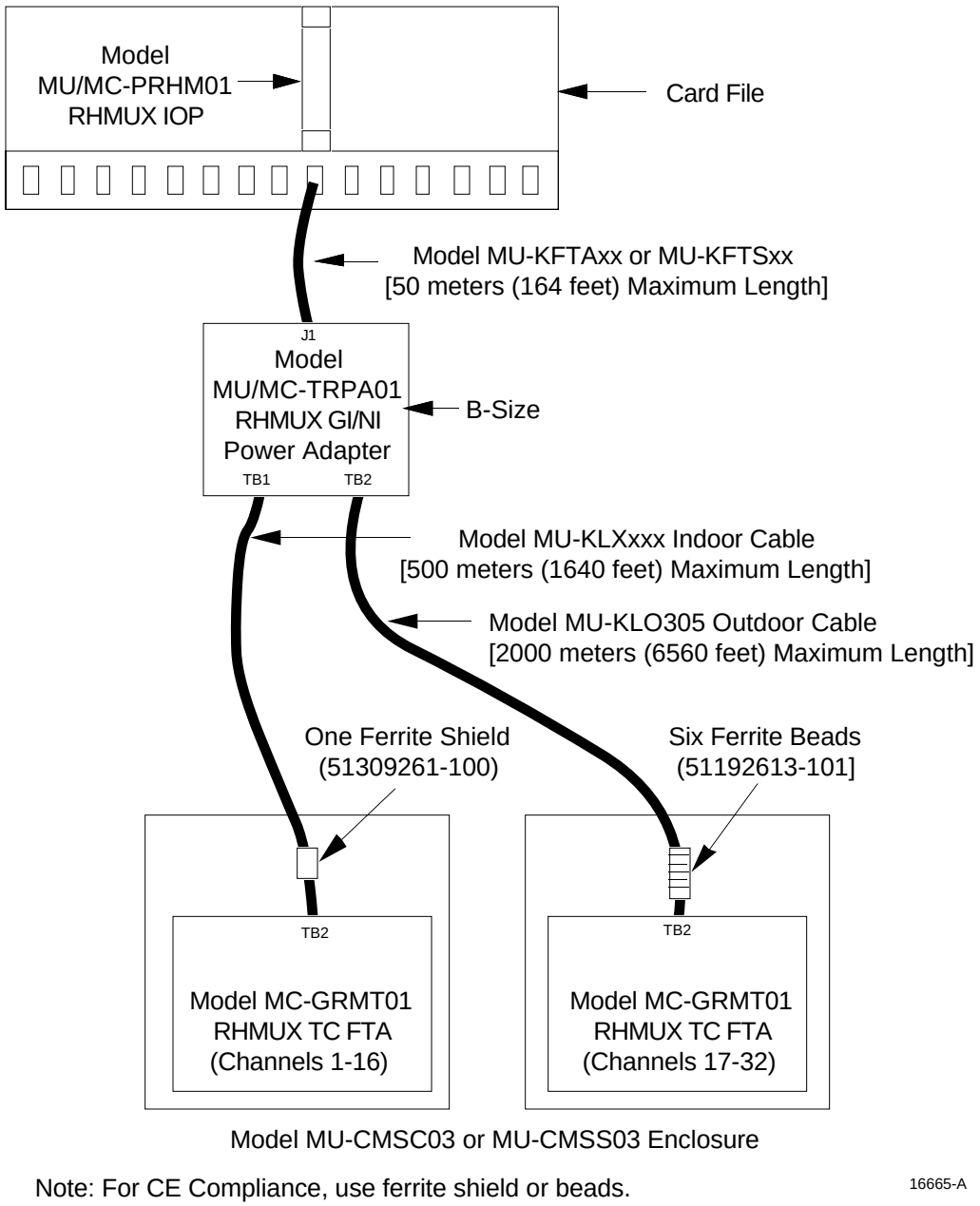
Continued on next page

12.3.1 RHMUX Configurations, Continued

Nonincendive RHMUX application

Figure 12-3 illustrates a Nonincendive application of the RHMUX assemblies. For valid agency approvals, the installation must comply with Honeywell control drawing 51204185.

Figure 12-3 Nonincendive RHMUX Configuration Interconnections

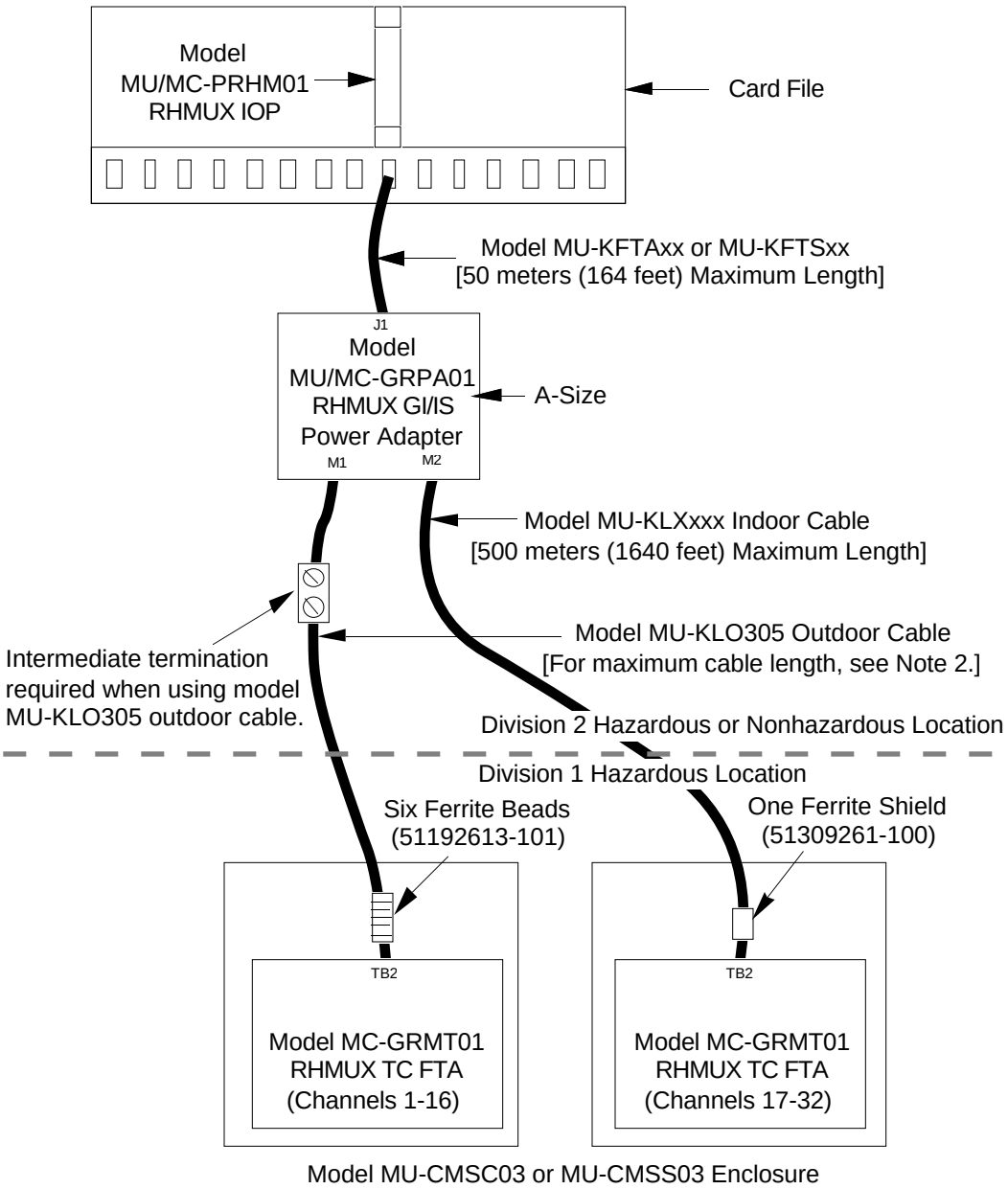


Continued on next page

Intrinsically Safe RHMUX application

Figure 12-4 illustrates an Intrinsically Safe application of the RHMUX assemblies. For valid agency approvals, the installation must comply with Honeywell control drawing 51204105.

Figure 12-4 Intrinsically Safe RHMUX Configuration Interconnections



Notes: 1. For CE Compliance, use ferrite shield or beads.

2. 1400 meters (4590 feet) Maximum Length for Class I, Group A or B.
2000 meters (6560 feet) Maximum Length for all other locations.

16666-A

12.3.2 RHMUX IOP Placement

Install the IOP in any card file

The RHMUX IOP can be installed in any available slot in an HPMM or IOP card file.

12.3.3 RHMUX Power Adapter Placement

Within 50 meters of IOP

The Intrinsically Safe RHMUX and Nonincendive RHMUX Power Adapters can be installed on any available FTA Mounting Channel that is within 50 meters (164 feet) of the RHMUX IOP. The restriction is that the longest IOP to FTA cable cannot exceed 50 meters.

IOP to Power Adapter cable

The IOP to Power Adapter interconnection is provided by a model MU-KFTAxx nonshielded cable (the suffix "xx" represents the length of the cable in meters) in 12 sizes, up to 50 meters (164 feet) in length in a non-CE Compliance application. A model MU-KFTSxx shielded cable must be used for a CE Compliant application. See the *Process High-Performance Process Manager Service* or *High-Performance Process Manager Installation* manual for the lengths that are available.

12.3.4 RHMUX FTA Placement

EMI sensitivity

The RHMUX FTA is designed to be mounted in a shielded enclosure.

The recommended method is to install the FTA in a model MU-CMSC03 NEMA 4 enclosure or model MU-CMSS03 NEMA 4X enclosure with the enclosure connected to Safety Ground.

Power Adapter to remote FTA cable length

The maximum acceptable cable length between the Power Adapter and the FTA depends primarily upon the type of cable that is used. For Division 1, Class I, Group A and B locations, there is an additional length restriction.

The model MU-KLXxxx or MU-KLO305 cable can be used in any location for runs of up to 500 meters (1640 feet) between the Power Adapter and the FTA, as long as the cable is does not get wet. If the cable is exposed to precipitation, the model MU-KLO305 cable must be used.

For Division 1, Class I, Group A and B hazardous locations, the model MU-KLO305 cable is used for runs of up to 1400 meters (4590 feet) between the Power Adapter and the FTA. For all other locations, the model MU-KLO305 cable is used for runs of up to 2000 meters (6560 feet).

Continued on next page

12.3.4 RHMUX FTA Placement, Continued

Within 2000 meters of Power Adapter

Depending on the type of cable used, the remote RHMUX FTA enclosure can be located up to 2000 meters (6560 feet) from the Power Adapter. The restriction is that the longest Power Adapter to FTA cable cannot exceed 2000 meters (6560 feet).

ATTENTION

ATTENTION—The environmental conditions imposed on remotely-installed RHMUX FTA's are less restrictive than the environmental conditions imposed on equipment that is installed in Process Manager or Advanced Process Manager cabinets. The RHMUX FTA has a wider temperature range and can tolerate a condensing atmosphere. See Section 5 in this manual and the *TPS System Site Planning*, *Process Manager I/O Installation*, and *Process Manager I/O Specification and Technical Data* manuals for additional information.

Indoor environment FTA to Power Adapter cabling

When the Power Adapter to RHMUX FTA cable will be less than 500 meters in length and will be installed indoors or in conduit without the threat of moisture, the model MU-KLXxxx cable ("xxx" represents three lengths – 76, 152, and 305 meters) with stripped wire ends can be used for the interconnection. Custom lengths of the cable can also be ordered with the 51192139-104 assembly number.

The cable can be used for non-CE Compliant, CE Compliant, Intrinsically Safe, Nonincendive, and nonhazardous applications.

The cable is Belden type 83654, which is a four-conductor, single-twist, shielded cable with a Teflon jacket. Each conductor is 18 gauge. The outside diameter of the cable is 5.26 millimeters (0.207 inches) with a minimum bend radius of 57 millimeters (2.25 inches).

The cable's shield must be connected to the shield ground terminals (S) that are provided at both the Power Adapter and FTA ends of the cable as illustrated in the *Process Manager I/O Installation* manual. The shield must not be connected to Safety Ground. For CE Compliant applications, a single snap-on ferrite shield (Honeywell part number 51309261-100) must be attached to the cable at the FTA end of the cable, inside the remote enclosure.

Continued on next page

12.3.4 RHMUX FTA Placement, Continued

Outdoor environment Power Adapter to FTA cabling

When the Power Adapter to RHMUX FTA cable will be installed outdoors with the threat of moisture, or a cable length greater than 500 meters is required, a 305-meter model MU-KLO305 cable with stripped wire ends is used for the interconnection. Refer to the *High-Performance Process Manager Service* manual for the cable part numbers.

The cable can be used for non-CE Compliant, CE Compliant, Intrinsically Safe, Nonincendive, and nonhazardous applications.

The cable is a Belden model YC41926 cable which is a four-conductor, shielded, with an armored jacket. Each conductor is 12 gauge. The outside diameter of the cable is 15.7 millimeters (0.62 inches) with a minimum bend radius of 191 millimeters (7.5 inches). The cable can be ordered directly from Belden. Consult with Belden for the spool lengths that are available.

The cable will tolerate moisture from normal precipitation, but the cable must not be submerged and is not suitable for direct burial in this application.

The cable's shield must be connected to the shield ground terminals (S) that are provided at both the Power Adapter and FTA ends of the cable as illustrated in the *Process Manager I/O Installation* manual. The shield must not be connected to Safety Ground. For CE Compliant applications, six ferrite beads (Honeywell part number 51192613-100) must be installed on the cable at the FTA end of the cable, inside the remote enclosure.

The cable's 12-gauge conductors will not fit the terminals on the Power Adapter. An intermediate terminal block, such as a Weidmuller DIN-rail terminal block, is required. No intermediate termination is required for the RHMUX FTA if crimp terminals are used.

References

For additional RHMUX IOP, FTA, and Power Adapter information, refer to the *Process Manager I/O Installation* manual.

Continued on next page

Power Adapter to FTA cable specifications

The model MU-KLXxxx (indoor environment) and model MU-KLO305 (outdoor environment) cables have the following specifications.

Model MU-KLXxxx power cable (indoor environment)

- Manufacturer Type—Belden 83654
- Cable Configuration—Shielded, 18-gauge, four-conductor, single twist (TEFLON jacket)
- Flame Resistance Conformity—CSA FT4/FT6 and UL910
- CSA Type—CMP
- NEC Type—CMP
- Temperature Rating: -70°C to +200°C

Model MU-KLO305 power cable (outdoor environment)

- Manufacturer Type—Belden YC41926
- Cable Configuration—Shielded, 12-gauge, four-conductor, single twist (armored jacket)
- CE Compliant
- PLTC or ITC, 300 volts
- Vertical Tray Flame Test—UL1581/IEEE383
- Temperature Rating: -30°C to +90°C

Section 13 – Serial Device Interface Planning

13.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
13.1	Overview	233
13.2	Serial Device Interface Configurations	233
13.3	Serial Device Interface IOP Placement	235
13.4	Power Adapter Placement	235
13.5	IOP to Power Adapter Cabling	235
13.6	Serial Device Interface FTA Placement	236
13.7	FTA to Power Adapter Cabling	236
13.8	FTA Field Cabling	238
13.9	Serial Device Interface FTA Models	239

13.2 Serial Device Interface Configurations

Overview

There are three models of the Serial Device Interface (SDI) FTA, MU-TSDT02, MU-TSDM02, and MU-TSDU02. All the FTA models interface with the model MU-PSDX02 Serial Device Interface IOP. One or two Serial Device Interface FTAs can communicate with a single model MU-PSDX02 Serial Device Interface IOP through the model MU-TLPA02 Power Adapter.

FTA plug-in module determines application

All models of the Serial Device Interface use the same Serial Device Interface FTA assembly. The firmware that is resident in the FTA's plug-in module, M1, determines the selected serial communications interface type (EIA-232 or EIA-422/485) and the interface application. The FTA is assigned a unique FTA model number depending upon the user's application.

EIA-232 and EIA-422/485 interfaces

The Serial Device Interface FTA has both EIA-232 (RS-232) and EIA-422/485 (RS-422/485) asynchronous serial communications interfaces, one of which is active depending on the FTA model number, using either a DB-25 or a 5-terminal compression terminal connector, respectively. The model MU-TSDT02 FTA supports the EIA-232 interface, and the model MU-TSDM02 and MU-TSDU02 FTAs support the EIA-422/485 interface.

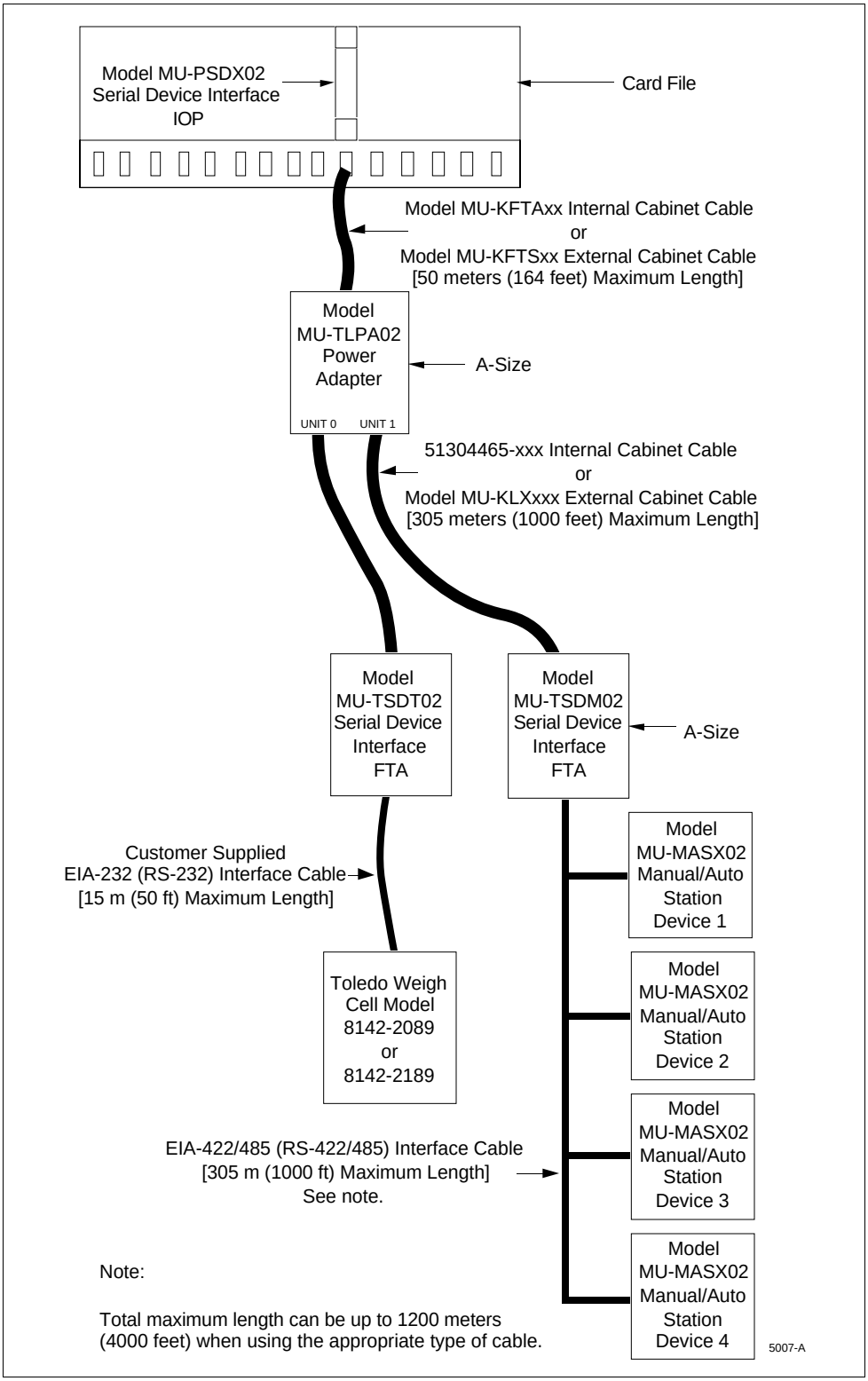
Continued on next page

13.2 Serial Device Interface Configurations, Continued

SDI interface configuration

Figure 13-1 illustrates a typical Serial Device Interface configuration.

Figure 13-1 Serial Device Interface Interconnections



Continued on next page

13.2 Serial Device Interface Configurations, Continued

EIA-232 cable length limitation

The EIA-232 cable is limited to a distance of 15 meters (50 feet). The cable must be supplied by the user and terminate in a DB-25 connector.

ATTENTION

ATTENTION—The EIA-232 interface is a point-to-point interface in which only one serial device can be connected. The EIA-422/485 interface can be configured as a multidrop interface on which up to 15 serial devices can be connected.

13.3 Serial Device Interface IOP Placement

Locating the IOP

The Serial Device Interface IOP can be installed in any available card file slot.

13.4 Power Adapter Placement

Install within 50 meters of IOP

The Power Adapter can be installed on any available FTA Mounting Channel that is within 50 meters (164 feet) of the Serial Device Interface IOP.

Power Adapter size

The Power Adapter has the same dimensions as an A-size (6 inches) FTA.

13.5 IOP to Power Adapter Cabling

Non-CE-Compliant IOP to Power Adapter cabling

The interconnection between the IOP and the Power Adapter is provided by a model MU-KFTAxx cable. The cable is used in non-CE Compliant applications. The suffix "xx" in the model number represents the length of the cable in meters. The cable is available in 12 lengths, up to 50 meters (164 feet). See the *High-Performance Process Manager Service* manual for the exact lengths that are available.

CE-Compliant IOP to Power Adapter cabling

Presently, the Serial Device Interface FTA cannot be used for CE Compliant application.

13.6 Serial Device Interface FTA Placement

Install within 305 meters of Power Adapter

The Serial Device Interface FTA can be installed in the same Process Manager or Advanced Process Manager cabinet as the Serial Device Interface IOP, or remotely, up to 305 meters (1000 feet) from the Power Adapter.

FTA size

The FTA is an A-size (6 inches) FTA and can be installed on an FTA Mounting Channel.

13.7 FTA to Power Adapter Cabling

FTA to Power Adapter cable

The cable connecting the Serial Device Interface FTA to the Power Adapter is a shielded, twisted-pair cable that is supplied by Honeywell. Two types of cables are available, an internal cabinet cable, 51304465-xxx, and an external cabinet cable, model MU-KLXxxx.

The suffix "xxx" represents the length of the cable in centimeters for the 51304465-xxx cable. Five lengths are available, 30, 66, 100, 200, and 300 centimeters.

The suffix "xxx" represents the length of the cable in meters for the model MU-KLXxxx cable. Three lengths are available, 76, 152, and 305 meters.

Internal cabinet or cabinet complex cabling

When the Serial Device Interface FTA is installed in the same cabinet, or cabinet complex, as the Power Adapter, a 51304465-xxx cable with stripped wire ends is used for the interconnection. See the *High-Performance Process Manager Service* manual for available cable lengths.

The cable has two individually shielded, twisted-pair wires. The shields must be connected to ground at the Power Adapter end only. The wire connections are made by using the compression terminals in a 6-pin connector at the Power Adapter end and in a 4-pin or 6-pin connector at the Serial Device Interface FTA end.

Continued on next page

13.7 FTA to Power Adapter Cabling, Continued

External cabinet cabling

When the Serial Device Interface FTA is installed remotely from the Power Adapter, a model MU-KLXxxx cable is used for the interconnection. See the *High-Performance Process Manager Service* manual for available cable lengths.

The cable has a braided shield with twisted-pair wires. The shields must be connected to ground at both Power Adapter end and the FTA end of the cable. The wire connections are made by using the compression terminals in a 6-pin connector at the Power Adapter end and in a 4-pin or 6-pin connector at the Serial Device Interface FTA end.

References

For additional Serial Device Interface IOP and FTA information, see the *Process Manager I/O Installation* or *High-Performance Process Manager Service* manual.

Power Adapter to FTA cable specifications

The 51304465-xxx (internal) and model MU-KLXxxx (external) cables have the following specifications.

51304465-xxxx cable (Internal cabinet use)

- Manufacturer Type—Belden 9406
- Configuration—Shielded double pair
- Flame Resistance Conformity—CSA FT4
- CSA Type—CMG
- NEC Type—CMG

Model MU-KLXxxx cable (External cabinet use)

- Manufacturer Type—Belden 83654
- Configuration—Shielded double pair (TEFLON jacket)
- Flame Resistance Conformity—CSA FT4/FT6 and UL910
- CSA Type—CMP
- NEC Type—CMP
- Temperature Rating: -70°C to +200°C

13.8 FTA Field Cabling

FTA to field device cable specifications

The cables that follow are recommended as EIA-422/485 FTA to field device interface cables and have the following specifications. Honeywell offers the model MU-KSXxxx cable (three lengths—76, 152, and 305 meters, the suffix "xxx" represents the length of the cable in meters). The other two recommended cable types can be purchased directly from the manufacturer.

All the cables are available in lengths up to 305 meters (1000 feet). The total combined length between the FTA and the field devices can be 1200 meters (4000 feet) for the Model MU-KSXxxx and Belden 9182 cables, and 305 meters (1000 feet) for the Belden 9271 cable.

Model MU-KSXxxx cable

- Manufacturer Type—Belden model 89182
- Configuration—Shielded single pair (TEFLON jacket)
- Flame Resistance Conformity—CSA FT4/FT6
- CSA Type—CMP
- NEC Type—CL2P and CMP (Plenum)
- Temperature Rating: -70°C to +200°C

Belden 9182 cable

- Manufacturer Type—Belden model 9182
- Cable Configuration—Shielded single pair
- Flame Retardant
- Flame Resistance Conformity—CSA FT1
- CSA Type—CMX
- NEC Type—CL2X and CMX
- Temperature Rating: -20°C to +60°C

Belden 9271 cable

- Manufacturer Type—Belden model 9271
- Cable Configuration—Shielded single pair
- Flame Retardant
- Flame Resistance Conformity—CSA FT1
- CSA Type—CM
- NEC Type—CM
- Temperature Rating: -40°C to +80°C

13.9 Serial Device Interface FTA Models

Model MU-TSDT02	The model MU-TSDT02 Serial Device Interface FTA accommodates the model 8142-2084 or 8142-2184 Toledo Weigh Cell device, manufactured by Toledo Scale Inc., through its EIA-232 (RS-232) interface.
Model MU-TSDM02	The model MU-TSDM02 Serial Device Interface FTA accommodates up to four model MU-MASX02 Manual/Auto Station devices, manufactured by Honeywell Inc., through its EIA-422/485 (RS-422/485) interface.
Model MU-TSDU02	The model MU-TSDU02 Serial Device Interface FTA accommodates up to four model MU-MASX02 UDC 6000 devices, manufactured by Honeywell Inc., through its EIA-422/485 (RS-422/485) interface.

Section 14 – Serial Interface Planning

14.1 Overview

Section contents

The topics covered in this section are:

	Topic	See Page
14.1	Overview	241
14.2	Serial Interface Configurations	241
14.3	Serial Interface IOP Placement	247
14.4	Power Adapter Placement	247
14.5	IOP to Power Adapter Cabling	247
14.6	Serial Interface FTA Placement	248
14.7	FTA to Power Adapter Cabling	248
14.8	FTA Field Cabling	250
14.9	Serial Interface FTA Models	251
14.10	Communications Interface Specifications	252

14.2 Serial Interface Configurations

CE Compliance

Some Serial Interface (SI) Field Termination Assemblies (FTAs) are CE Compliant, while others are not. The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 14-1. CE Compliant SI assemblies are identified by the tab number of the part number that ends in "26" or "28." They do not have a unique model number.

CE Compliant FTA assemblies have a FASTON terminal that is located at one corner of the FTA. It is secured by the FTA mounting screw and ensures a Safety Ground connection. The terminal is used only when the FTA is mounted at a remote location that is external to the cabinet or cabinet complex in which the Power Adapter is mounted.

For CE Compliant installations, if the Power Adapter is remotely mounted in a cabinet that is separate from the cabinet in which its associated IOP is mounted, it is mandatory that a model MU-KFTSxx shielded IOP to FTA cable be used between the assemblies.

Table 14-1 Serial Interface FTAs

Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TSIM12	51303932-401	51303932-426
MU-TSIA12	51303932-403	51303932-428

Continued on next page

14.2 Serial Interface Configurations, Continued

Introduction

The model MU-TSIM12 or MU-TSIA12 Serial Interface (SI) FTA communicates with the model MU-PSIM11 Serial Interface IOP through the model MU-TLPA02 Power Adapter.

FTA plug-in module determines application

The firmware that is resident in the FTA's plug-in module, M1, identifies it as a Serial Interface FTA and determines the selected serial communications interface type (EIA-232 or EIA-422/485) and the interface application. The FTA is assigned a unique model number depending upon the application.

EIA-232 and EIA-422/485 interfaces

The Serial Interface FTA has both EIA-232 (RS-232) and EIA-422/485 (RS-422/485) asynchronous serial communications interfaces, one of which is active depending on the software-selected application, using either a DB-25 or a 5-terminal compression-type connector, respectively.

The EIA-232 cable is limited to a distance of 15 meters (50 feet). The cable must be supplied by the user and terminate in a DB-25 connector.

ATTENTION

ATTENTION—The EIA-232 interface is a point-to-point interface on which only one serial device can be connected. The EIA-422/485 interface is configured as a multidrop interface on which up to fifteen serial devices can be connected.

Modbus protocol device

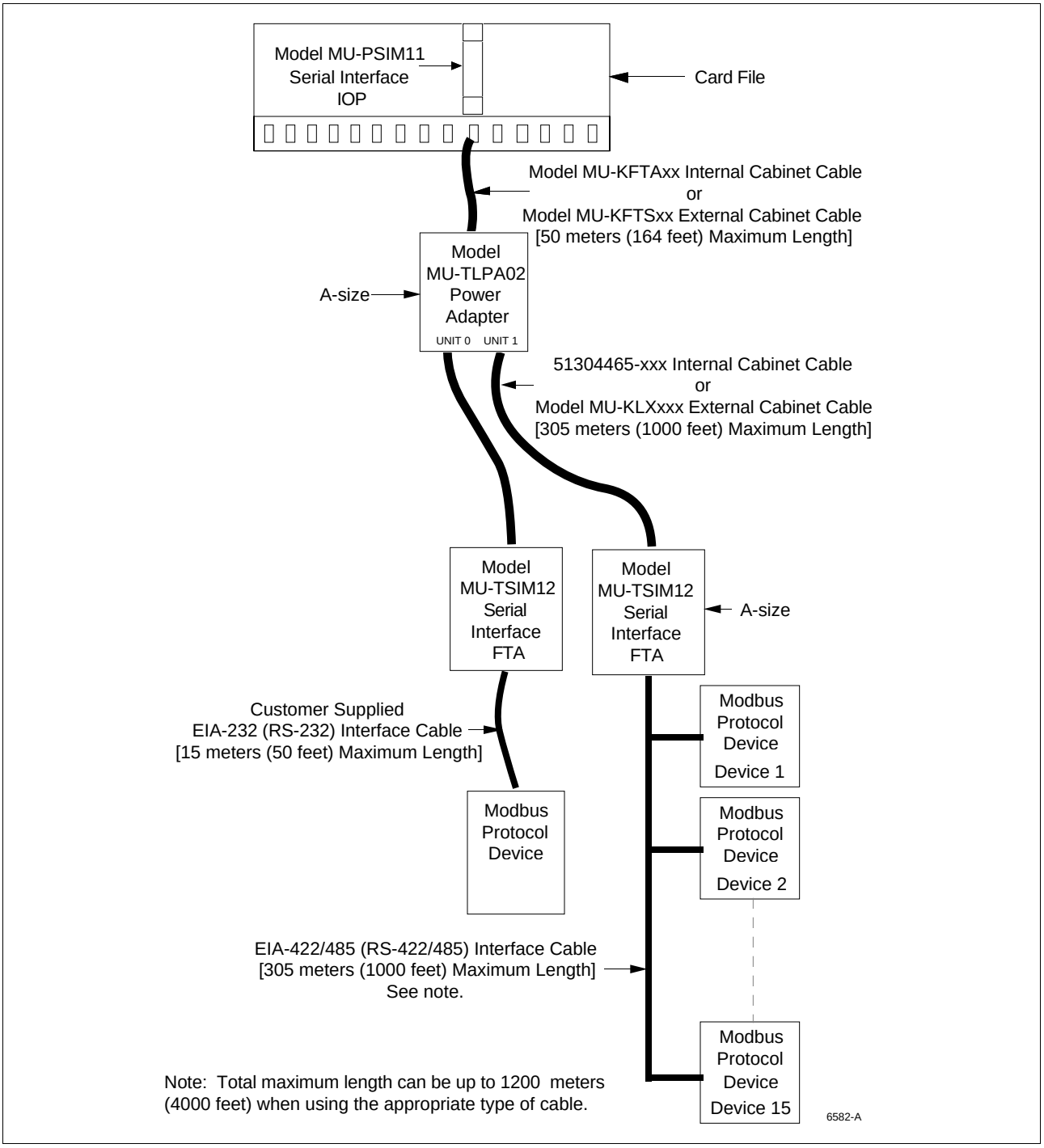
A Modbus protocol device that interfaces with the Serial Interface FTA must qualify as compatible though Honeywell's Multivendor Interface Program.

Continued on next page

Model MU-TSIM12 FTA Modbus EIA-232 and EIA-422/485 interfaces

Figure 14-1 illustrates the model MU-TSIM12 Serial Interface FTA to Modbus device EIA-232 and EIA-422/485 interfaces.

Figure 14-1 Serial Interface FTA to Modbus Device EIA-232 and EIA-422/485 Interconnections

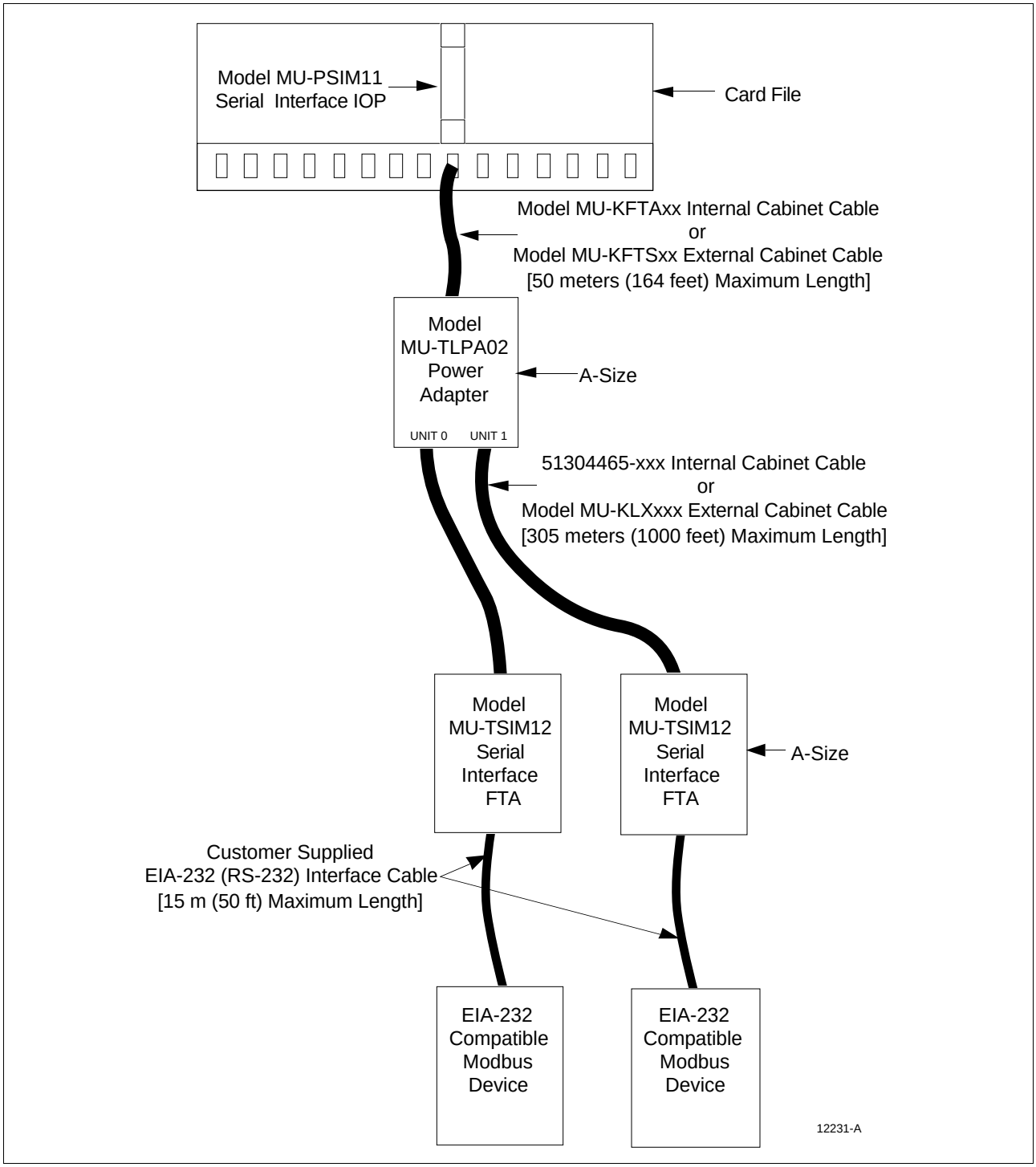


Continued on next page

Model MU-TSIM12 FTA Modbus EIA-422/485 interface

Figure 14-2 illustrates the model MU-TSIM12 Serial Interface FTA to Modbus device EIA-422/485 interface.

Figure 14-2 Serial Interface FTA to Modbus Device EIA-422/485 Interconnections

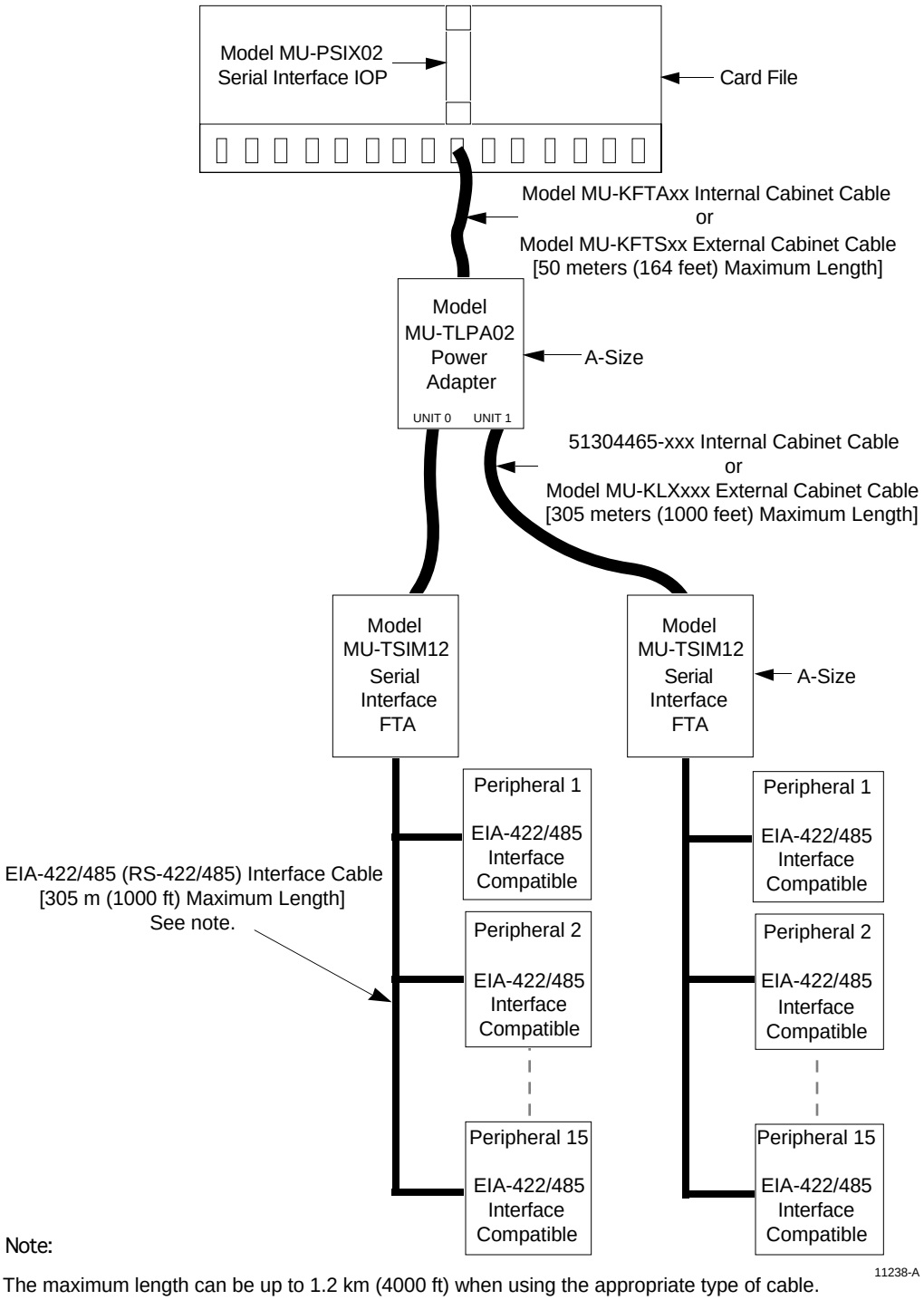


Continued on next page

Model MU-TSIM12 FTA peripheral device EIA-422/485 interface

Figure 14-3 illustrates the model MU-TSIM12 Serial Interface FTA to peripheral device EIA-422/485 interface.

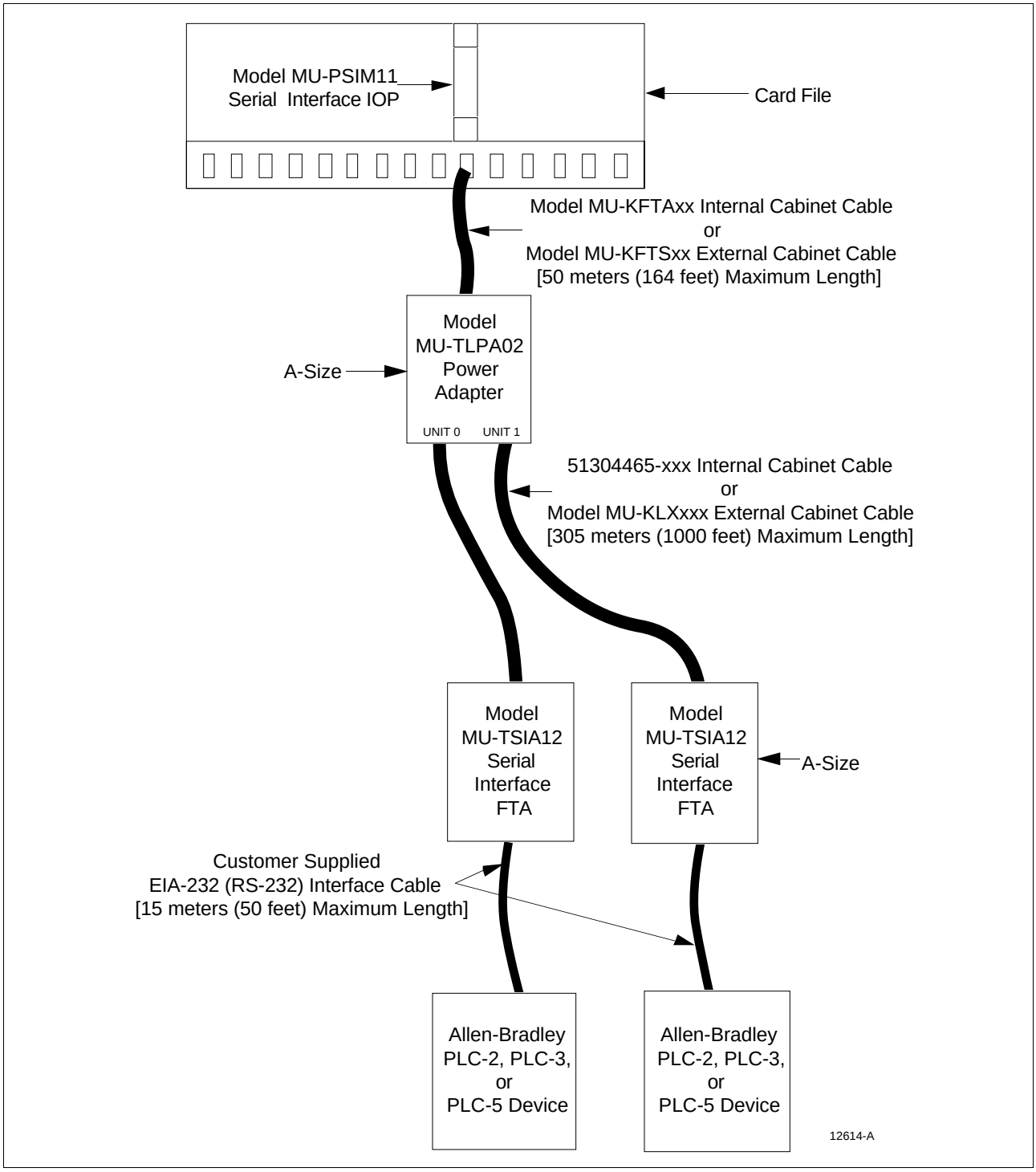
Figure 14-3 Serial Interface FTA to Peripheral Device EIA-422/485 Interconnections



Model MU-TSIA12 FTA Allen-Bradley EIA-232 interface

Figure 14-4 illustrates the model MU-TSIA12 Serial Interface FTA to Allen-Bradley device EIA-232 interface.

Figure 14-4 Serial Interface FTA to Allen-Bradley Device EIA-232 Interconnections



Continued on next page

14.3 Serial Interface IOP Placement

Locating the IOP

The Serial Interface IOP can be installed in any available card file slot.

14.4 Power Adapter Placement

Install within 50 meters of IOP

The Power Adapter can be installed on any available FTA Mounting Channel that is within 50 meters (164 feet) of the Serial Interface IOP.

Power Adapter size

The Power Adapter has the same dimensions as an A-size (6 inches) FTA.

14.5 IOP to Power Adapter Cabling

Non-CE Compliance IOP to Power Adapter cabling

The interconnection between the IOP and the Power Adapter is provided by a model MU-KFTAxx cable. The cable is used in non-CE Compliant applications. The suffix "xx" in the model number represents the length of the cable in meters. The cable is available in 12 lengths, up to 50 meters (164 feet). See the *High-Performance Process Manager Service* manual for the exact lengths that are available.

CE Compliance IOP to Power Adapter cabling

The interconnection between the IOP and the Power Adapter for a CE Compliant application is provided by a model MU-KFTSxx shielded cable. The suffix "xx" represents the length of the cable in meters. The cable is available in 12 lengths, up to 50 meters (164 feet). See the *High-Performance Process Manager Service* manual for the exact lengths that are available.

If the IOP and Power Adapter are located in the same cabinet, or a cabinet complex, the model MU-KFTAxx unshielded IOP to FTA cable can be used instead of the shielded model MU-KFTSxx IOP to FTA cable. See Figures 14-1 through 14-4.

14.6 Serial Interface FTA Placement

Install within 305 meters of Power Adapter

The Serial Interface FTA can be installed in the same cabinet as the Power Adapter, or remotely, up to 305 meters (1000 feet) from the Power Adapter.

FTA size

The FTA is an A-size (6 inches) FTA and is generally installed on an FTA Mounting Channel.

14.7 FTA to Power Adapter Cabling

FTA to Power Adapter cable

The cable connecting the Serial Interface FTA to the Power Adapter is a shielded, twisted-pair cable that is supplied by Honeywell. Two types of cables are available, an internal cabinet cable, 51304465-xxx, and an external cabinet cable, model MU-KLXxxx.

The suffix "xxx" represents the length of the cable in centimeters for the 51304465-xxx cable. Five lengths are available, 30, 66, 100, 200, and 300 centimeters.

The suffix "xxx" represents the length of the cable in meters for the model MU-KLXxxx cable. Three lengths are available, 76, 152, and 305 meters.

Internal cabinet or cabinet complex cabling

When the Serial Interface FTA is installed in the same cabinet, or cabinet complex, as the Power Adapter, a 51304465-xxx cable with stripped wire ends is used for the interconnection. See the *High-Performance Process Manager Service* manual for available cable lengths.

The cable has two individually shielded, twisted-pair wires. The shields must be connected to ground at the Power Adapter end only. The wire connections are made by using the compression terminals in a 6-pin connector at the Power Adapter end and in a 4-pin or 6-pin connector at the Serial Device Interface FTA end.

Continued on next page

External cabinet cabling

When the Serial Interface FTA is installed remotely from the Power Adapter, a model MU-KLXxxx cable is used for the interconnection. See the *High-Performance Process Manager Service* manual for available cable lengths.

The cable has a braided shield with twisted-pair wires. The shields must be connected to ground at both the Power Adapter end and the FTA end of the cable. The wire connections are made by using the compression terminals in a 6-pin connector at the Power Adapter end and in a 4-pin or 6-pin connector at the Serial Interface FTA end.

References

For additional Serial Interface IOP and FTA information, see the *Process Manager I/O Installation* or *High-Performance Process Manager Service* manual.

Power Adapter to FTA cable specifications

The 51304465-xxx (internal) and model MU-KLXxxx (external) cables have the following specifications.

51304465-xxx cable (Internal cabinet use)

- Manufacturer Type—Belden 9406
- Configuration—Shielded double pair
- Flame Resistance Conformity—CSA FT4
- CSA Type—CMG
- NEC Type—CMG

Model MU-KLXxxx cable (External cabinet use)

- Manufacturer Type—Belden 83654
- Configuration—Shielded double pair (TEFLON jacket)
- Flame Resistance Conformity—CSA FT4/FT6 and UL910
- CSA Type—CMP
- NEC Type—CMP
- Temperature Rating: -70°C to +200°C

Continued on next page

14.8 FTA Field Cabling

FTA to field device cable specifications

The cables that follow are recommended as EIA-422/485 FTA to field device interface cables and have the listed specifications. Honeywell offers the model MU-KLXxxx cable (three lengths – 76, 152, and 305 meters, the suffix "xxx" represents the length of the cable in meters). The other two recommended cable types can be purchased directly from the manufacturer.

All the cables are available in lengths up to 305 meters (1000 feet). The total combined length between the FTA and the field devices can be 1200 meters (4000 feet) for the model MU-KLXxxx and Belden model 9182 cables, and 305 meters (1000 feet) for the Belden model 9271 cable.

Model MU-KSXxxx cable

- Manufacturer Type—Belden model 89182
- Configuration—Shielded single pair (TEFLON jacket)
- Flame Resistance Conformity—CSA FT4/FT6
- CSA Type—CMP
- NEC Type—CL2P and CMP (Plenum)
- Temperature Rating: -70°C to +200°C

Belden 9182 cable

- Manufacturer Type—Belden model 9182
- Cable Configuration—Shielded single pair
- Flame Retardant
- Flame Resistance Conformity—CSA FT1
- CSA Type—CMX
- NEC Type—CL2X and CMX
- Temperature Rating: -20°C to +60°C

Belden 9271 cable

- Manufacturer Type—Belden model 9271
- Cable Configuration—Shielded single pair
- Flame Retardant
- Flame Resistance Conformity—CSA FT1
- CSA Type—CM
- NEC Type—CM
- Temperature Rating: -40°C to +80°C

14.9 Serial Interface FTA Models

Model MU-TSIM12 Interface configurations

By configuration, the Honeywell model MU-TSIM12 Serial Interface FTA will accommodate either a single EIA-232 Modbus-compatible device through its EIA-232 interface, or up to 15 EIA-422/485 Modbus-compatible devices through its EIA-422/485 interface.

Model MU-TSIM12 Modbus protocol

The type of device that interfaces the model MU-TSIM12 Serial Interface FTA must be compatible with Modbus RTU protocol. When the EIA-422/485 interface is active, the subsystem performance is dependent upon the number of devices, their baud rate, the number of transactions, and the FTA device driver firmware.

Model MU-TSIA12 Allen-Bradley device

The model MU-TSIA12 Serial Interface FTA accommodates a single EIA-232 compatible Allen-Bradley device through its EIA-232 interface.

14.10 Communications Interface Specifications

Specifications

The EIA-232 or EIA-422/485 interface is configurable for baud rates of 1200, 2400, 4800, 9600, or 19200 with odd, even or no parity, and one stop bit. The default setting is 19200 baud, odd parity with one stop bit.

Table 14-2 lists the EIA-232 interface specifications, while Table 14-3 lists the EIA-422/485 interface specifications.

Table 14-2 Serial Interface EIA-232 Specifications

Description	Specification
Interface Type	Asynchronous serial data
Interface Signals Supported	TXD, \, RTS, CTS, DSR, DTR, DCD, logic ground, chassis ground.
Interface Length	15 meters (maximum cable capacitance of 2500 pF)

Table 14-3 Serial Interface EIA-422/485 Specifications

Description	Specification
Interface Type	Asynchronous half-duplex serial data
Interface Signals Supported	Two-wire differential pair (Terminals A and B) and shield connections
Interface Length	305 meters (up to 1220 meters with Honeywell approved cable)
Number of Devices	15 maximum

Reference

Refer to the *Process Manager I/O Specifications and Technical Data* manual for additional information.

Section 15 – Galvanically Isolated FTA Planning

15.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
15.1	Overview	253
15.2	Description	255
15.3	Features	264
15.3.1	IOP Redundancy	264
15.3.2	Analog and Digital Output Standby Manual Devices	264
15.3.3	Auxiliary Inputs/Outputs	265
15.3.4	Power Requirements	267
15.3.5	Field Wiring Connections	268
15.3.6	Ambient Temperature Limits	268
15.3.7	FTA Mounting Channels	269
15.4	Power Distribution	273
15.4.1	Power Distribution Assembly	274
15.4.2	Cabling to Power Distribution Assemblies	275
15.4.3	Cabling to FTAs	275
15.4.4	Power Considerations	276
15.5	High Level Analog Input (HLAI) FTAs	277
15.5.1	Model MU-GAIH12/MU-GAIH82 FTA	277
15.5.1.1	Description	277
15.5.1.2	Connectors	277
15.5.1.3	Field Wiring Input Signals	277
15.5.1.4	Auxiliary Connector Output	278
15.5.1.5	Indicators	278
15.5.1.6	Current Consumption	278
15.5.1.7	Isolation and Safety	278
15.5.2	Model MU-GAIH13/MU-GAIH83 FTA	279
15.5.2.1	Description	279
15.5.2.2	Connectors	279
15.5.2.3	Field Wiring Input Signals	280
15.5.2.4	Auxiliary Connector Output	280
15.5.2.5	Indicators	280
15.5.2.6	Hand-Held Communicator	281
15.5.2.7	Current Consumption	281
15.5.2.8	Isolation and Safety	281
15.5.3	Model MU-GAIH14/MU-GAIH84 FTA	282
15.5.3.1	Description	282
15.5.3.2	Connectors	282
15.5.3.3	Field Wiring Input Signals	283
15.5.3.4	Auxiliary Connector Output	283
15.5.3.5	Indicators	283
15.5.3.6	Hand-Held Communicator	284
15.5.3.7	Current Consumption	284
15.5.3.8	Isolation and Safety	284
15.5.4	Model MU-GAIH22/MU-GAIH92 FTA	285
15.5.4.1	Description	285
15.5.4.2	Connectors	285

Continued on next page

Section contents,
continued

	Topic	See Page
15.5.4.3	Field Wiring Input Signals	286
15.5.4.4	Auxiliary Connector Output	286
15.5.4.5	Indicators	286
15.5.4.6	Current Consumption	287
15.5.4.7	Isolation and Safety	287
15.6	24 Vdc Digital Input FTAs	288
15.6.1	Model MU-GDID12/MU-GDID82 FTA	288
15.6.1.1	Description	288
15.6.1.2	Connectors	288
15.6.1.3	Field Wiring Input Signals	289
15.6.1.4	Line-Fault Detection	289
15.6.1.5	Auxiliary Connector Output	289
15.6.1.6	Indicators	290
15.6.1.7	Current Consumption	290
15.6.1.8	Isolation and Safety	290
15.6.2	Model MU-GDID13/MU-GDID83 FTA	291
15.6.2.1	Description	291
15.6.2.2	Connectors	291
15.6.2.3	Field Wiring Input Signals	291
15.6.2.4	Indicators	292
15.6.2.5	Current Consumption	292
15.6.2.6	Isolation and Safety	292
15.7	Analog Output FTAs	293
15.7.1	Model MU-GAOX02/72 and MU-GAOX12/82 FTAs	293
15.7.1.1	Description	293
15.7.1.2	Connectors	293
15.7.1.3	Field Wiring Output Signals	293
15.7.1.4	Line-Fault Detection	294
15.7.1.5	Calibration	294
15.7.1.6	Indicators	294
15.7.1.7	Current Consumption	294
15.7.1.8	Isolation and Safety	295
15.8	24 Vdc Digital Output FTAs	296
15.8.1	Model MU-GDOD12/MU-GDOD82 FTA	296
15.8.1.1	Description	296
15.8.1.2	Signal Connectors	296
15.8.1.3	Field Wiring Output Signals	296
15.8.1.4	Auxiliary Connector	297
15.8.1.5	Indicators	297
15.8.1.6	Standby Manual Device Connector	297
15.8.1.7	Current Consumption	298
15.8.1.8	Isolation and Safety	298
15.8.2	Model MU-GDOL12/MU-GDOL82 FTA	299
15.8.2.1	Description	299
15.8.2.2	Signal Connectors	299
15.8.2.3	Field Wiring Output Signals	299
15.8.2.4	Auxiliary Connector	300

Continued on next page

15.1 Overview, Continued

Section contents, continued

	Topic	See Page
15.8.2.5	Indicators	300
15.8.2.6	Standby Manual Device Connector	301
15.8.2.7	Current Consumption	301
15.8.2.8	Isolation and Safety	301
15.9	Combiner Panel	302
15.10	Marshalling Panel	303
15.10.1	Description	303
15.10.2	Configurations	304
15.10.2.1	High Level Analog Input FTAs	304
15.10.2.2	Digital Input FTAs	305
15.10.2.3	Digital Output FTAs	306

Introduction

This section will assist you in planning the installation of Galvanically Isolated FTAs and suggest ways to take advantage of the hardware's versatility.

Installation references

Additional information concerning the FTAs can be found in the *Process Manager I/O Installation* manual and the *Process Manager I/O Specification and Technical Data* manual.

15.2 Description

Introduction

A family of Field Termination Assemblies (FTAs) are available that accept plug-in Galvanic Isolation Modules. These FTAs are used for connecting input and output signals to field devices in Division 1 (Zone 0 and Zone 1) hazardous areas. The FTAs are compatible with the IOPs that support the companion standard FTAs.

Usage advantages

The isolating nature of the intrinsically safe connection removes the necessity to install a potential-equalizing conductor where it is called for in any certification. The resultant simplification and reduction in cost of the installation is a considerable advantage, and makes the use of the Galvanic Isolators the preferred method over conventional shunt-diode safety barriers for this type of installation. There are many occasions when the lack of information about the precise site conditions is solved by using the isolators to minimize installation and security problems.

Continued on next page

CE Compliance

Some Galvanically Isolated Field Termination Assemblies and their supporting assemblies, such as a Combiner Panel, are CE Compliant, while others are not CE Compliant. The CE Compliant and non-CE Compliant models with their part numbers are listed in Tables 15-1 and 15-2. Generally, CE Compliant Galvanically Isolation assemblies are identified by the tab number of the part number that ends in "25." They do not have a unique model number.

The CE Compliant FTAs feature filtered connectors that interface with the CE Compliant model MU-KFTSxx IOP to FTA cable(s).

Nonconformally coated FTAs

Table 15-1 CE Compliant Galvanically Isolated FTAs—Nonconformally Coated

Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GAIH12	51304636-100	N/A
MU-GAIH13	51304718-100	51304718-125
MU-GAIH14	51304730-100	51304730-125
MU-GAIH22	51304748-100	51304748-125
MU-GAIH82	51304636-300	N/A
MU-GAIH83	51304718-300	51304718-325
MU-GAIH84	51304730-300	51304730-325
MU-GAIH92	51304748-300	51304748-325
MU-GAOX02	51304638-100	51304638-125
MU-GAOX12	51304638-500	51304638-525
MU-GAOX72	51304638-300	51304638-325
MU-GAOX82	51304638-700	51304638-725
MU-GDID12	51304640-100	51304640-125
MU-GDID13	51304728-100	51304728-125
MU-GDID82	51304640-300	51304640-325
MU-GDID83	51304728-300	51304728-325
MU-GDOD12	51304642-100	51304642-125
MU-GDOD82	51304642-300	51304642-325

Continued on next page

Nonconformally coated FTAs, continued

Table 15-1 CE Compliant Galvanically Isolated FTAs—Nonconformally Coated, Continued

Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GDOL12	51304736-100	51304736-125
MU-GDOL82	51304736-300	51304736-325
MU-GPRD02	51304644-100	51304644-125
MU-GLFD02	51304732-100	51304732-125
MU-GMAR52	51304646-100	51309156-125

Conformally coated FTAs

Table 15-2 CE Compliant Galvanically Isolated FTAs—Conformally Coated

Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
MC-GAIH12	51304636-150	N/A
MC-GAIH13	51304718-150	51304718-175
MC-GAIH14	51304730-150	51304730-175
MC-GAIH22	51304748-150	51304748-175
MC-GAIH82	51304636-350	N/A
MC-GAIH83	51304718-350	51304718-375
MC-GAIH84	51304730-350	51304730-375
MC-GAIH92	51304748-350	51304748-375
MC-GAOX02	51304638-150	51304638-175
MC-GAOX12	51304638-550	51304638-575
MC-GAOX72	51304638-350	51304638-375
MC-GAOX82	51304638-750	51304638-775
MC-GDID12	51304640-150	51304640-175
MC-GDID13	51304728-150	51304728-175

Continued on next page

Conformally Coated FTAs, continued

Table 15-2 CE Compliant Galvanically Isolated FTAs—Conformally Coated, Continued

Model Number	Non-CE Compliant Part Number	CE Compliant Part Number
MC-GDID82	51304640-350	51304640-375
MC-GDID83	51304728-350	51304728-375
MC-GDOD12	51304642-150	51304642-175
MC-GDOD82	51304642-350	51304642-375
MC-GDOL12	51304736-150	51304736-175
MC-GDOL82	51304736-350	51304736-375
MC-GPRD02	51304644-150	51304644-175
MC-GLFD02	51304732-150	51304732-175
MC-GMAR52	51304646-150	51309156-175

Continued on next page

ATTENTION

ATTENTION—In the past, it was a requirement that Galvanically Isolated, Intrisically Safe (GI/IS) FTAs had to be mounted on horizontally oriented FTA Mounting Channels in an HPM cabinet. The requirement is no longer needed because of component and design improvements.

Galvanically Isolated FTAs can now be mounted on vertically oriented FTA Mounting Channels. However, there is still a requirement that Galvanically Isolated FTAs and standard (non-Galvantically Isolated) FTAs, and the wiring to them, be properly separated in the cabinet.

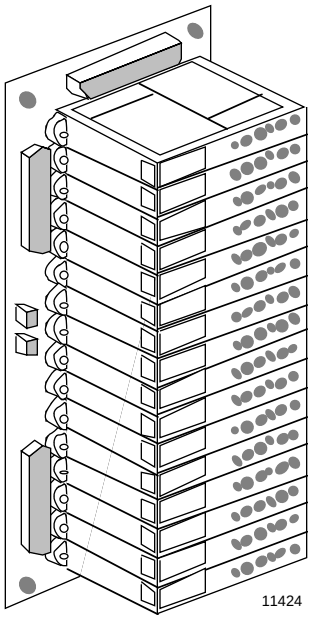
Any FTA Mounting Channels on which Galvanically Isolated FTAs will be mounted must be installed in an inverted (upside down from the normal) position .

The horizontal FTA Mounting Channel information in this section is reference information because some existing installations use horizontal FTA Mounting Channels that may require the installation of additional horizontal FTA Mounting Channels for equipment expansion.

FTA mounting

All the FTA assemblies are approximately 309 by 124 millimeters (12 by 4.9 inches), which is a B-size FTA classification for mounting purposes. The FTAs can be installed on FTA Mounting Channels that are vertically or horizontally positioned in the cabinet. Figure 15-1 is an illustration of a typical Galvanically Isolated FTA.

Figure 15-1 Typical Galvanically Isolated FTA



Continued on next page

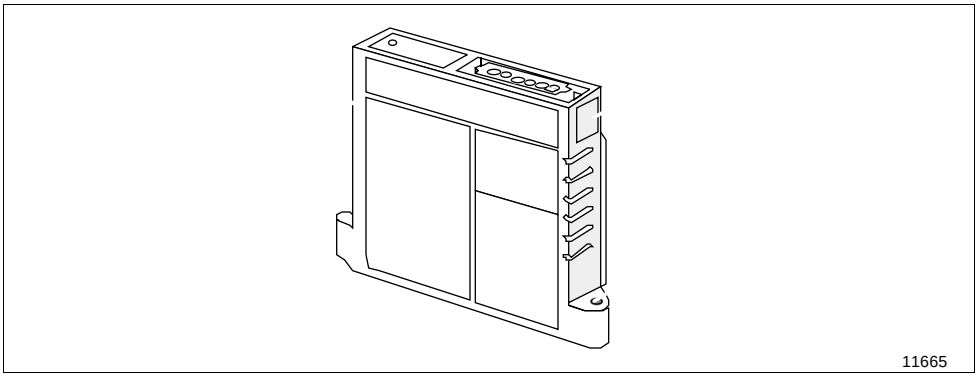
FTA to IOP cable

A 50-pin FTA to IOP cable, model MU-KFTAxx (the suffix “xx” represents the length of the cable in meters), is used to connect non-CE Compliant FTAs to their associated IOP(s). The model MU-KFTSxx IOP to FTA cable is a shielded cable that is used to connect CE Compliant FTAs to their IOP(s) when the cable leaves the cabinet.

Galvanic Isolation Module

Field signal connections are made at the plug-in Galvanic Isolation Module on the FTA. In general, each module provides a terminal connector for one field device connection. The exception is the Galvanic Isolation Module on the Digital Input FTA. This Galvanic Isolation Module provides terminal connectors for two field devices. Figure 15-2 is an illustration of the Galvanic Isolation Module and its mounting orientation on the FTA.

Figure 15-2 Galvanic Isolation Module



Compression or crimp terminal connectors

Compression-type or crimp-type pluggable 6-terminal connectors can be specified for the Galvanic Isolation Modules. The model number for the FTA specifies the connector type. If the model number ends in 02, 12, 13, 14, or 22, such as MU-GAOX02, MU-GAIH12, MU-GAIH13, MU-GAIH14, or MU-GAIH22, compression-type terminal connectors are provided. If the model number ends in 72, 82, 83, 84, or 92, such as MU-GAOX72, MU-GAIH82, MU-GAIH83, MU-GAIH84, or MU-GAIH92, crimp-type terminal connectors are provided.

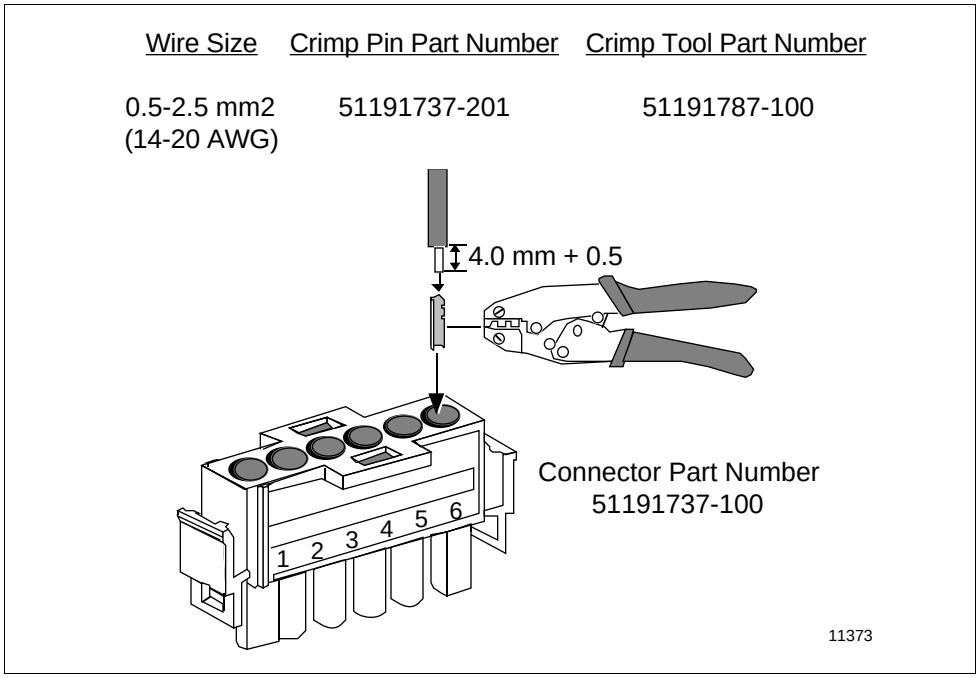
Continued on next page

Crimp-type terminal connectors

The crimp-type of terminal connector accepts size 0.5 to 2.5 mm^2 (14 to 20 AWG) size field wiring. The crimp pin is installed over the end of the field wire that is stripped to a length of 4.0 millimeters with a crimp tool prior to its insertion into the terminal connector. The crimp tool is available in the model MU-GCTK01 Crimp Tool Kit.

The female crimp pin, with the attached field wire, mates with the Galvanic Isolation Module's connector pin, one of six. Figure 15-3 illustrates this procedure.

Figure 15-3 Crimp-Type Galvanic Isolation Module Terminal Connector

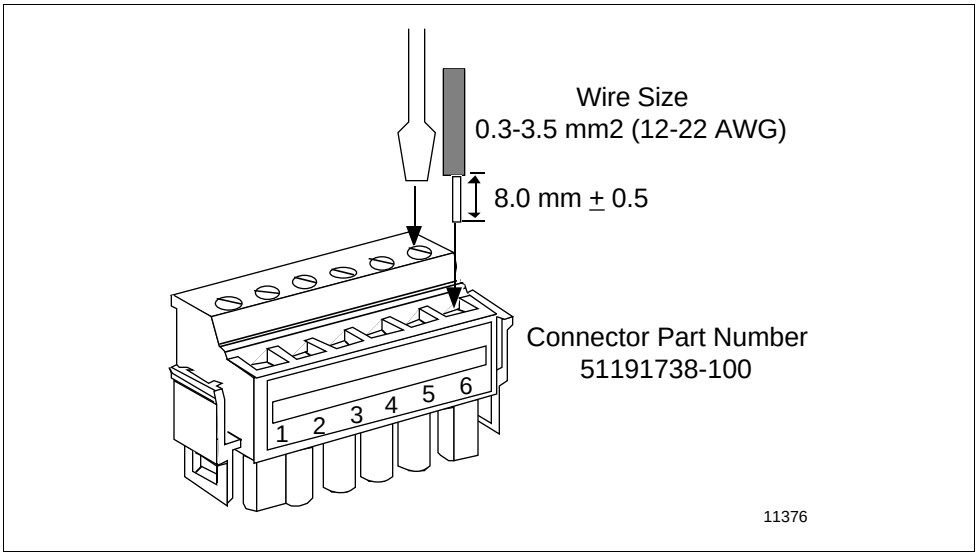


Continued on next page

Compression-type terminal connectors

The compression-type of terminal connector accepts size 0.3 to 3.5 mm^2 (12 to 22 AWG) size field wiring. The end of the field wire is stripped to a length of 8.0 millimeters (0.3 inches), inserted into the proper terminal position, one of six, and secured in place by the tightening of a dedicated screw. Figure 15-4 illustrates this procedure. The terminal connector itself provides the pins that mate with the Galvanic Isolation Module's connector pins.

Figure 15-4 Compression-Type Galvanic Isolation Module Terminal Connector



Continued on next page

Types of FTAs

Numerous types of Galvanically Isolated FTAs are available. They are

- High Level Analog Input (HLAI), models MU-GAIH12 and MU-GAIH82, with voltage outputs to both the IOP and an auxiliary connector
- High Level Analog Input /Smart Transmitter Interface (HLAI/STI), models MU-GAIH13 and MU-GAIH83, with voltage outputs to both the IOP and an auxiliary connector
- High Level Analog Input /Smart Transmitter Interface (HLAI/STI), models MU-GAIH14 and MU-GAIH84, with higher loop resistance capability and voltage output to both the IOP and an auxiliary connector
- High Level Analog Input (HLAI), models MU-GAIH22 and MU-GAIH92, with voltage outputs to the IOP and current outputs to an auxiliary connector
- 24 Vdc Digital Input (DI), models MU-GDID12 and MU-GDID82, with relay outputs to the IOP and an auxiliary connector and Line Fault Detection in the IOP
- 24 Vdc Digital Input (DI), models MU-GDID13 and MU-GDID83, with solid-state voltage outputs to the IOP and no auxiliary connector
- Analog Output (AO), models MU-GAOX02, MU-GAOX12, MU-GAOX72, and MU-GAOX82 with Line Fault Detection in the IOP
- Digital Output (DO), models MU-GDOD12 and MU-GDOD82, with 16 output override inputs from an auxiliary connector
- Digital Output (DO), models MU-GDOL12 and MU-GDOL82 with Line Fault Detection outputs to an auxiliary connector

15.3 Features

Overview

The subsections that follow describe the features that the Galvanically Isolated FTAs provide. Many of the features are standard FTA features.

15.3.1 IOP Redundancy

FTAs support redundancy

Each type of FTA has two 50-pin FTA cable connectors that provide connections to two IOPs to support redundancy. A green LED on the FTA indicates which IOP has control when it is an output type FTA or is active when it is an input type FTA. The indicator identifies the primary IOP (A) FTA.

IOP redundancy support

Only the High Level Analog Input, High Level Analog Input/Smart Transmitter Interface, and Analog Output types of the FTAs have software available that supports IOP redundancy. The nonredundant models of the Analog Output FTA, models MU-GAOX02 and MU-GAOX72, cannot support IOP redundancy.

15.3.2 Analog and Digital Output Standby Manual Devices

Standby Manual Device connector

A 50-pin connector on the Analog Output and 24 Vdc Digital Output FTAs accepts control signals from the Analog Standby Manual Device and Digital Output Standby Manual Device, respectively.

Analog Output FTA

The Analog Output FTA has three 50-pin connectors. Two of the connectors are for redundant IOP connections, and a unique third connector is for connection to the Analog Output Standby Manual Device.

24 Vdc Digital Output FTA

The 24 Vdc Digital Output FTA also has three 50-pin connectors. Two of the connectors provide connection to redundant IOPs, or like the standard 24 Vdc Digital Output FTA, connection to a Digital Output Standby Manual Device. The third connector supports auxiliary signals that are described in the following subsection.

15.3.3 Auxiliary Inputs/Outputs

HLAI/STI FTAs

In addition to the IOP redundancy connectors, the High Level Analog Input/Smart Transmitter Interface FTAs have an auxiliary connector that provides PV signals for recording or monitoring subsystems.

24 Vdc Digital Output FTAs

The model MU-GDOD12/82 24 Vdc Digital Output FTA has an auxiliary connector through which the user can provide signals from a shutdown subsystem to individually deenergize the FTA outputs. The model MU-GDOL12/82 Digital Output FTA provides Line Fault Detection (LFD) signals through the auxiliary connector.

24 Vdc Digital Input FTAs

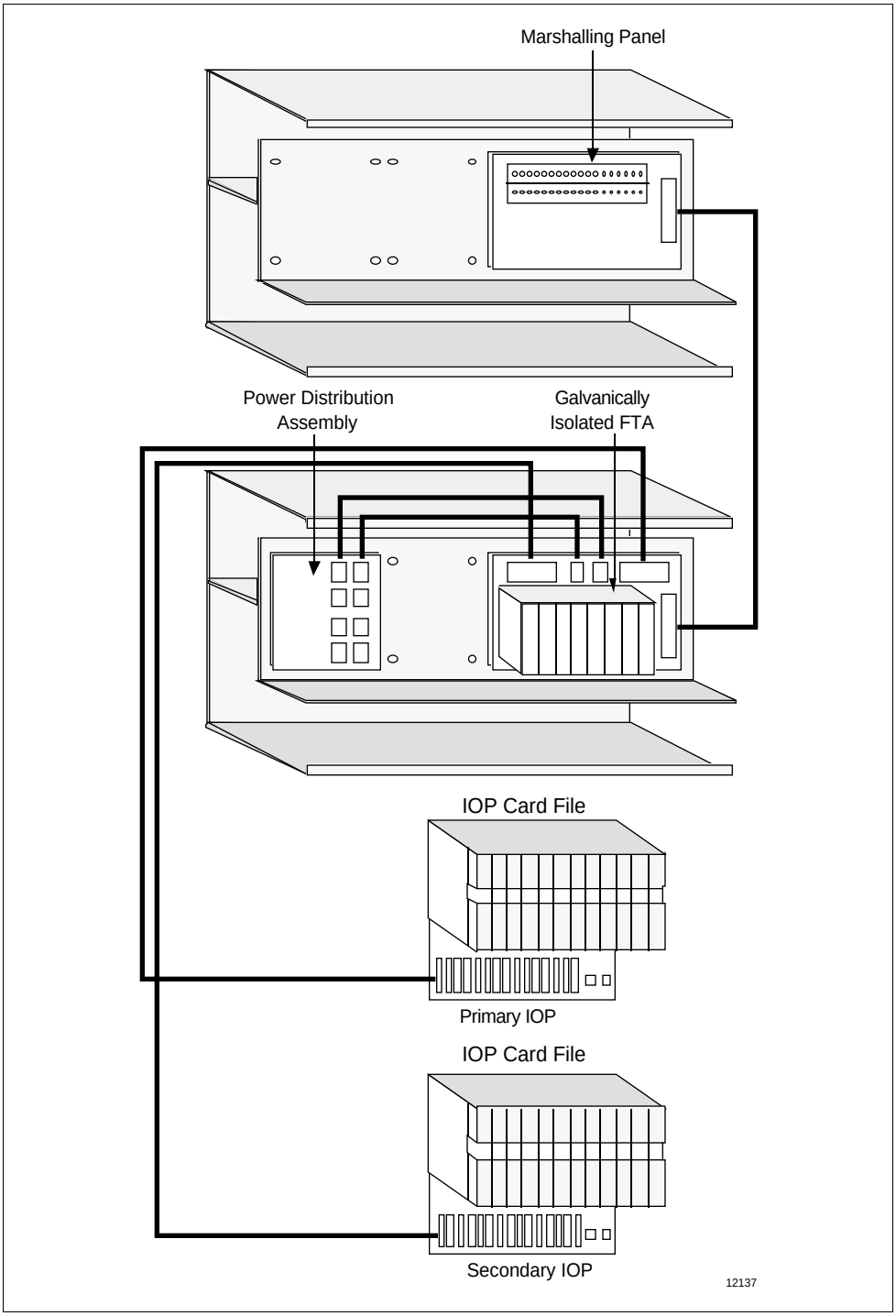
The model MU-GDID12/82 24 Vdc Digital Input FTA has an auxiliary connector to provide signals that can be used to monitor the condition of the FTA's individual input contact sets. There are two sets of contacts per plug-in Galvanic Isolation Module. The contacts are isolated from the subsystem, but not from each other.

Continued on next page

Marshalling Panel

Access to the auxiliary signals is available at screw-type terminals on a Marshalling Panel that is connected by a 50-pin cable to the FTA's auxiliary connector. Figure 15-5 is an illustration of the connections between the Galvanically Isolated FTA, its associated IOP, and the Marshalling Panel.

Figure 15-5 Galvanically Isolated FTA with Auxiliary Connector



15.3.4 Power Requirements

Overview

The power requirement for the FTAs is a nominal 24 Vdc. Because of the large additional amount of power the Galvanically Isolated FTAs require, power to the FTA is not provided directly from the Power System through the associated IOP, as it is for standard FTAs, but instead through a Power Distribution Assembly. The Power Distribution Assembly is discussed in subsection 15.4.1.

Dual power connectors

The FTAs have dual 2-pin power connectors for power redundancy. Power for the two connectors can be provided by a single power source or a separate power source. Diodes on the FTA that "or" the two power sources prevent the two power sources from shorting together.

Galvanic Isolation Module fuses

Each Galvanic Isolation Module is internally fused. The fuse cannot be replaced in the field.

Power Distribution Assembly fuses

Fuses provided on the Power Distribution Assembly can be replaced in the field.

FTA fuses

Fuses provided on the FTA assembly can be replaced in the field.

FTA power requirements

Table 15-3 is a listing of the power requirements at 24 Vdc for the types of Galvanically Isolated FTAs that assumes all inputs/outputs are active.

Table 15-3 Galvanically Isolated FTA Power Requirements

FTA Type	Power Requirement (Amperes)
High Level Analog Input/Smart Transmitter Interface	
MU-GAIH12/82	1.28
MU-GAIH13/83	1.28
MU-GAIH14/84	1.20
MU-GAIH22/92	1.20
Analog Output	
MU-GAOX02/12/72/82	0.45
24 Vdc Digital Input	
MU-GDID12/82	0.72
MU-GDID13/83	0.56
24 Vdc Digital Output	
MU-GDOD12/82	1.10
MU-GDOL12/82	1.10

15.3.5 Field Wiring Connections

Location of terminal connectors

The FTAs do not have field terminal connectors mounted directly on the assembly's printed circuit board as the standard FTAs do, but instead, field wires are connected to crimp-type or screw-type connectors on the individual Galvanic Isolation Module. The connectors accommodate 0.3 to 3.5 mm^2 (12 to 22 AWG) size wiring when not using crimp pins on the wiring ends; 0.5 to 2.5 mm^2 (14 to 20 AWG) size wiring when crimp pins are used.

Prewiring

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

Galvanic Isolation Module replacement

A failed Galvanic Isolation Module can be replaced simply by unplugging the field wire connector on the module, then removing and replacing the module. The individual wires do not have to be disconnected.

Bus bar

Spare wires and cable shields are terminated in the normal manner. Because the FTA does not have a built-in shield bus, the accommodation of a large number of shield wires requires the use of a bus bar that is part of the FTA Mounting Channel and connected to the local Master Reference Ground (Safety Ground for CE Compliance).

15.3.6 Ambient Temperature Limits

Operation limits

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

15.3.7 FTA Mounting Channels

Overview

Standard (non-Galvanically Isolated) FTAs always mount on 92-centimeter (36-inch) long FTA Mounting Channels that are installed vertically in the High-Performance Processor Manager cabinet.

Galvanically Isolated FTAs can be mounted on 61-centimeter (24-inch) long FTA Mounting Channels that are installed horizontally in the cabinet to provide better cooling for the FTAs or on inverted (upside-down from normal orientation) vertical FTA Mounting Channels.

Horizontal FTA Mounting Channel installation

Up to eight horizontal FTA Mounting Channels can be installed in a cabinet with a 6-millimeter (.25-inch) gap between them to accommodate the use of cable ties as necessary.

The horizontal FTA Mounting Channel is installed with the field wiring channel (trough) toward the bottom of the cabinet. The channel (trough) that contains the cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, and the Combiner Panel, if applicable, is toward the top of the cabinet.

One or two FTAs can be mounted on each horizontal FTA Mounting Channel.

Vertical FTA Mounting Channel installation

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

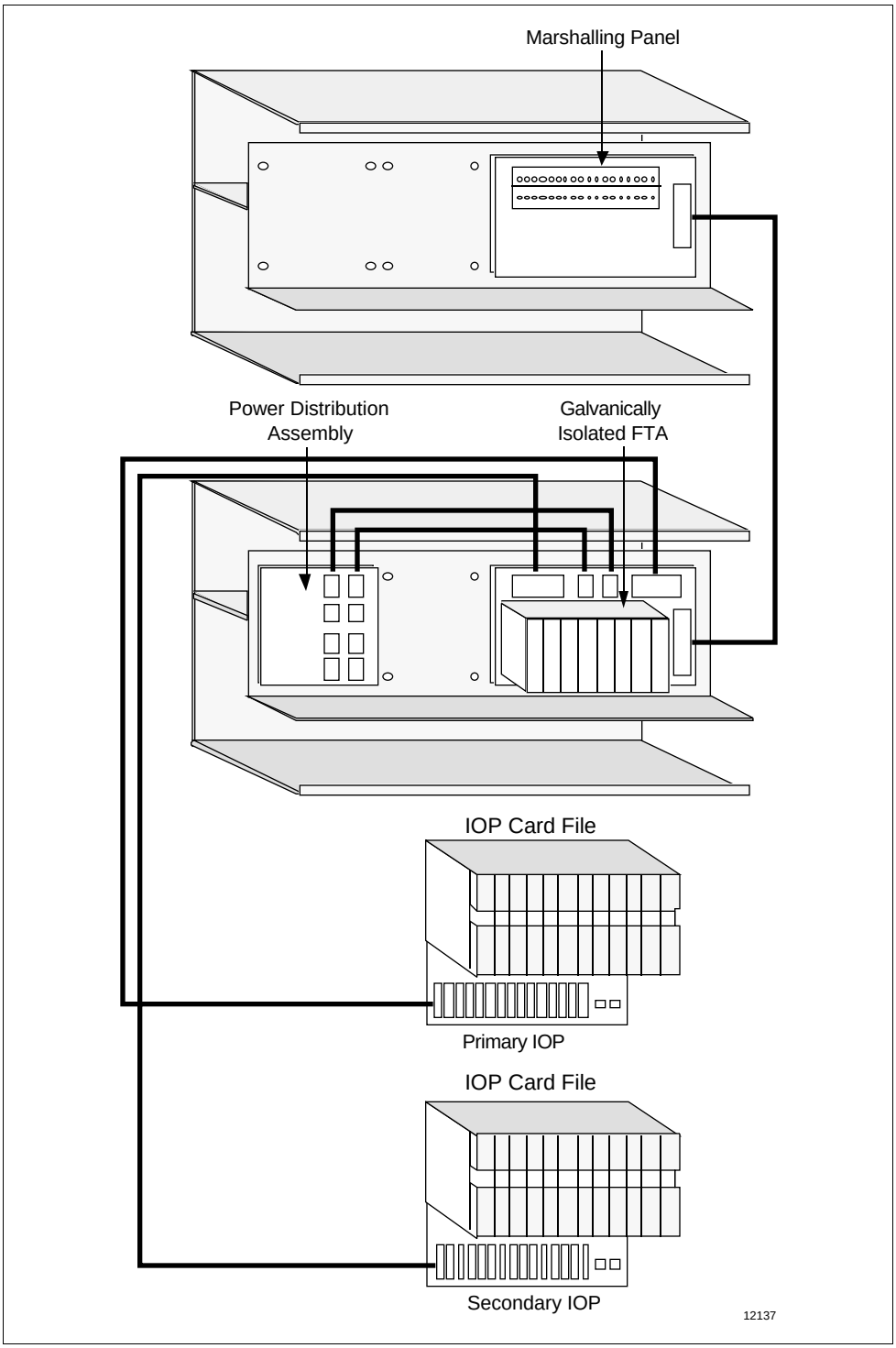
Up to three FTAs can be mounted on each vertical FTA Mounting Channel.

Continued on next page

Cabinet with Horizontal FTA Mounting Channels

Figure 15-6 is an illustration of a cabinet with horizontal FTA Mounting Channels installed.

Figure 15-6 Cabinet with Horizontally Installed FTA Mounting Channels



Continued on next page

15.3.7 FTA Mounting Channels, Continued

Previous horizontal mounting advantages

Previously, there were two reasons for mounting the Galvanically Isolated FTAs on horizontally oriented FTA Mounting Channels.

- Installation of Galvanically Isolated and standard FTAs on the same FTA Mounting Channel is not permitted. Both types of FTAs mounted on the same FTA Mounting Channel would be an Intrinsic Safety violation.
- The design and current requirements of the Galvanic Isolation Modules was such that they operated cooler when they had horizontal orientation.

The heat dissipation requirement is no longer needed because of component and design improvements. The FTAs can now be vertically oriented.

Field wire routing

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

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

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

IOP to FTA cable routing

When FTAs are mounted on a horizontal FTA Mounting Channel, the cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, and the Marshalling Panel, if applicable, must be routed in the upper channel of the FTA Mounting Channel. The routing is to the left in the channel and up or down the left side of the cabinet.

When FTAs are mounted on a vertical FTA Mounting Channel that is installed in an inverted position, the cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, Combiner Panel, and the Marshalling Panel, if applicable, must be routed in the left channel of the FTA Mounting Channel. The routing is up or down the left side of the cabinet.

Cabinet fan assembly requirements

Because of the greater heat dissipation requirements of Galvanically Isolated FTAs, cabinet fan assemblies are mandatory on both sides of a dual-access cabinet. The single-access cabinet also requires a cabinet fan assembly. FTA Mounting Channels must be installed only on the cabinet's center intrastructure and not at the sides of the cabinet.

Continued on next page

Both FTA Mounting Channels types permitted

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

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

Marshalling Panel mounting

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

Power Distribution Assembly mounting

The model MU-GPRD02 Power Distribution Assembly can be mounted on either a horizontally or vertically oriented FTA Mounting Channel. If a Galvanically Isolated FTA is also mounted on the FTA Mounting Channel, the Power Distribution Assembly must be mounted with at least a 6-inch gap separating the assemblies.

Cabling to the Power Distribution Assembly must be routed in the upper or left channel and to the left side of the cabinet, except for the cables carrying power to an FTA mounted on the same FTA Mounting Channel.

Additional Power System

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

15.4 Power Distribution

Power Distribution Assembly

Galvanically isolated FTAs use more 24 Vdc power than standard FTAs. Because of the increased demand, the Power Distribution Assembly, model MU-GPRD02, is used to supply power directly to the FTAs. The power for a standard FTA is provided from the IOP through the cable that connects the IOP to the FTA. The Power Distribution Assembly can be installed on the same FTA Mounting Channel as an FTA, but a spacing of at least 6 inches must exist between a Power Distribution Assembly and an FTA mounted on the same FTA Mounting Channel.

Power Distribution Assembly placement

If a Power Distribution Assembly is installed on an FTA Mounting Channel with a Galvanically Isolated FTA, it must be installed with its eight 2-pin power connectors at the top of the assembly. When the Power Distribution Assembly is installed on a vertical FTA Mounting Channel, it is installed with its 6-pin power connectors at the top of the assembly.

Field wiring restrictions

Field wires terminating on Galvanically Isolated FTAs must be routed at least 2 inches away from any other wires or electrical components, or a nonconductive material or grounded metal barrier must be provided for separation.

Field wiring routing

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

Horizontal FTA Mounting Channel cabling assignment

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

Vertical FTA Mounting Channel cabling assignment

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

15.4.1 Power Distribution Assembly

Overview

The model MU-GPRD02 Galvanic Isolation Power Distribution Assembly provides individually fused 24 Vdc power for the Galvanically Isolated FTAs.

The dc power is supplied to the Galvanic Isolation Power Distribution Assembly by the same type of 6-pin connector cable, model MU-KDPRxx (the suffix "xx" represents the length of the cable in meters), used to supply power to the card files from the High-Performance Process Manager's Power System when the assembly is located in the same cabinet or cabinet complex.

If the Galvanic Isolation Power Distribution Assembly is located external to the cabinet or cabinet complex and CE Compliance is a requirement, model MU-KSPRxx cables must be used. The 2-conductor cable provides only 24 Vdc power.

A single-source or dual-source (redundant) of power can be supplied because the Power Distribution Assembly has two input power connectors.

Eight 2-pin power connectors

The Power Distribution Assembly has eight 2-pin connectors to which 2-wire power cables can be connected to supply the 24 Vdc power to the power connectors on the Galvanically Isolated FTAs.

Model MU-KGPRxx cables

Two power cable lengths can be ordered by model number. Model MU-KGPR05 is a 5-meter cable and model MU-KGPR10 is a 10-meter cable. Other lengths are available, but the cable must be ordered by part number. Standard lengths are 0.5, 0.75, 1, 1.25, 2, 3, 4, 5 (MU-KGPR05), and 10 (MU-KGPR10) meters (20, 30, 40, 50, 80, 120, 160, 195, and 395 inches). Order by Honeywell part number 51109620-xxx, where "xxx" represents the length of the cable in inches.

Same size as A-size FTA

The Power Distribution Assembly has the same mounting dimensions as an A-size FTA.

15.4.2 Cabling to Power Distribution Assemblies

Overview

Model MU-KDPRxx (the suffix "xx" represents the length of the cable in meters) power cables connect the 6-pin power connectors on the Power System with 6-pin connectors on the Power Distribution Assembly. Cable redundancy is provided by two power cables connected to each Power Distribution Assembly.

The cables can be daisy-chained to up to four Power Distribution Assemblies, provided the current through the series of MU-KDPRxx cables to the most distant Power Distribution Assembly from the Power System does not exceed 12 amperes of 24 Vdc power. The 12-ampere limitation assumes that one of the redundant cables has failed and broke the power loop.

Cable length restrictions

The allowable total length of the model MU-KDPRxx cables is also determined by the current through them. The length in meters cannot exceed 33 divided by the amount of current in amperes in the series of cables. This allows a 1/2 volt drop for the series of cables. Once again, assume that one of the redundant cables has failed when calculating the length.

15.4.3 Cabling to FTAs

Overview

The Power Distribution Assembly has eight 2-pin connectors that supply 24 Vdc power to the FTAs through model MU-KGPRxx (the suffix "xx" represents the length of the cable in inches) cables. The cable is not shielded and must not exit the cabinet, unless in conduit, for a CE Compliance application. Each FTA must have two cables connected to it to provide a redundant source of power. The cabling must not be daisy-chained to the FTAs.

Cable length restrictions

The allowable total length of the model MU-KGPRxx cables is also determined by the current through them. The length in meters cannot exceed 13 divided by the amount of current in amperes in the series of cables. In any case, the total length cannot exceed 10 meters. This allows a 1/2 volt drop for the series of cables. When calculating the length, assume that one of the redundant cables has failed, and the other cable(s) is carrying all the current.

Typical cabinet configuration

A typical cabinet side might have 12 FTAs and 3 Power Distribution Assemblies, and a 12-inch unused length of FTA Mounting Channel.

15.4.4 Power Considerations

Recommendations

Use the following recommendations for planning your Galvanically isolated FTA power system configuration and power cabling when the subsystem consists of either nonredundant or redundant IOPs.

Avoid using a non-HPM power source

Avoid providing 24 Vdc power to the Galvanically Isolated FTAs from a separate power system that is "disassociated" from the High-Performance Process Manager Power System. A "disassociated" power system is one that is part of a larger system. Try to use power systems that are local to the loads that they serve.

Use surplus power for the FTAs

If redundant HPMMs are both powered from one Power System, use whatever surplus power there is in the system to power the Galvanically Isolated FTAs. Add another Power System, if necessary.

If redundant HPMMs are each powered by their own Power System, use surplus power from both systems to power the FTAs. If more power is needed for the FTAs, use power from an additional Power System.

15.5 High Level Analog Input (HLAI) FTAs

15.5.1 Model MU-GAIH12/MU-GAIH82 FTA

15.5.1.1 Description

Introduction

The model MU-GAIH12 and MU-GAIH82 High Level Analog Input (HLAI) FTAs accommodate up to 16 high level dc signals. The FTA provides floating dc power to energize a 2-wire or 3-wire, 4-20 mA transmitter in a hazardous area and repeats the current accurately in another circuit to drive a range spool in the safe area that generates a 1 to 5 Vdc signal to the associated HLAI IOP.

Field transmitter compatibility

The FTA is suitable for conventional transmitters only.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.5.1.2 Connectors

Two IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.

One auxiliary connector

One 50-pin auxiliary connector provides signals for remote monitoring and alarming equipment.

15.5.1.3 Field Wiring Input Signals

Signal limits

The acceptable input signal is from a 4-20 mA 2-wire or 3-wire transmitter. It is not expected that any self-powered transmitters will be the source.

With an open circuit, the voltage to the transmitter wires is a maximum 28 volts. At 20 mA of transmitter current, the voltage is a minimum 15 volts.

Field device connections

Each Galvanic Isolation Module accepts one field device connection.

15.5.1.4 Auxiliary Connector Output

Description

The 1 to 5 Vdc PV signals are available at the auxiliary connector. By the use of a model MU-KFTAxx cable (the suffix "xx" represents the cable length of the cable in meters), the signals can be connected to a model MU-GMAR52 Marshalling Panel where they are available at screw terminals. If these signals are connected to monitoring or recording devices, the devices should have at least 1 megohm of input resistance to avoid loading the signals. See subsection 15.10 for a description of the Marshalling Panel.

15.5.1.5 Indicators

Primary IOP active indicator

A green indicator on the FTA illuminates when the primary IOP (A) is active.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.5.1.6 Current Consumption

Maximum power requirement

The FTA consumes 1.28 amperes at 24 Vdc with a 20 mA signal present at all inputs. This represents 30.7 watts of power.

Power dissipation

The power dissipation is 25.0 watts with a 20 mA signal at all inputs.

15.5.1.7 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module separates the two sides.

The safety description for the Galvanic Isolation Module input is

- 28 volts maximum
- 300 ohms
- 93 milliamps maximum

15.5.2 Model MU-GAIH13/MU-GAIH83 FTA

15.5.2.1 Description

Introduction

The model MU-GAIH13 and MU-GAIH83 High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTAs accommodate up to 16 high level dc signals. The FTA provides floating dc power to energize a 2-wire or 3-wire, 4-20 mA transmitter in a hazardous area and repeats the current accurately in another circuit to drive a range spool in the safe area that generates a 1 to 5 Vdc signal to the associated HLAI IOP.

Field transmitter compatibility

The FTA is suitable for conventional and "smart" transmitters whose digital communication signals are superimposed on a standard 4-20 mA signal. The smart transmitter can be calibrated, interrogated, or tested from the TPS system, or from a hand-held communicator connected to the hazardous-side connector terminals on the Galvanic Isolation Module or connected across points on the FTA board.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.5.2.2 Connectors

Two IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.

One auxiliary connector

One 50-pin auxiliary connector provides signals for remote monitoring and alarming equipment.

15.5.2.3 Field Wiring Input Signals

Signal limits

Each Galvanic Isolation Module on the HLAI/STI FTA provides a floating dc source for energizing conventional 2-wire or 3-wire 4-20 mA transmitters or smart transmitters, such as the Honeywell model ST3000 SMARTLINE transmitter, whose digital communications signal is superimposed on a 4-20 mA signal.

With an open circuit, the voltage to the transmitter wires is a maximum 28 volts. At 20 mA of transmitter current, the voltage is a minimum 15 volts.

Field device connections

Each Galvanic Isolation Module accepts one field device connection.

15.5.2.4 Auxiliary Connector Output

Description

The 1 to 5 Vdc PV signals are available at the auxiliary connector. By the use of a model MU-KFTAxx cable (the suffix "xx" represents the cable length of the cable in meters), the signals can be connected to a model MU-GMAR52 Marshalling Panel where they are available at screw terminals. If these signals are connected to monitoring or recording devices, the devices should have at least 1 megohm of input resistance to avoid loading the signals. See subsection 15.10 for a description of the Marshalling Panel.

15.5.2.5 Indicators

Primary IOP active indicator

A green indicator on the FTA illuminates when the primary IOP (A) is active.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.5.2.6 Hand-Held Communicator

Smart Transmitter communication

Terminals 3 and 4 on the Galvanic Isolation Module are internally connected to the two field terminals and can be used to communicate with a smart transmitter.

15.5.2.7 Current Consumption

Maximum power requirement

The FTA consumes 1.28 amperes at 24 Vdc with a 20 mA signal present at all inputs. This represents 30.7 watts of power.

Power dissipation

The power dissipation is 25.0 watts with a 20 mA signal at all inputs.

15.5.2.8 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module separates the two sides.

The safety description for the Galvanic Isolation Module input is

- 28 volts maximum
- 300 ohms
- 93 milliamps maximum

15.5.3 Model MU-GAIH14/MU-GAIH84 FTA

15.5.3.1 Description

Introduction

The model MU-GAIH13 and MU-GAIH83 High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTAs accommodate up to 16 high level dc signals. The model MU-GAIH14/MU-GAIH84 FTA is similar to the model MU-GAIH13/MU-GAIH83 FTA, except for its safety specifications and the available field terminal voltage is higher. This permits longer field wiring.

The FTA provides floating dc power to energize 2-wire or 3-wire, 4-20 mA transmitters in a hazardous area and repeats the current accurately in another circuit to drive a range spool in the safe area that generates a 1 to 5 Vdc signal to the associated HLAI IOP.

Field transmitter compatibility

The FTA is suitable for conventional and "smart" transmitters whose digital communication signals are superimposed on a standard 4-20 mA signal. The smart transmitter can be calibrated, interrogated, or tested from the TPS system, or from a hand-held communicator connected to the hazardous-side connector terminals on the Galvanic Isolation Module or connected across points on the FTA board. The communicator can also be connected to the field-side terminals on the Galvanic Isolation Module.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.5.3.2 Connectors

Two IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.

One auxiliary connector

One 50-pin auxiliary connector provides signals for remote monitoring and alarming equipment.

15.5.3.3 Field Wiring Input Signals

Signal limits

Each Galvanic Isolation Module on the HLAI/STI FTA provides a floating dc source for energizing conventional 2-wire or 3-wire 4-20 mA transmitters or smart transmitters, such as the Honeywell model ST3000 Smartline transmitter, whose digital communications signal is superimposed on a 4-20 mA signal.

With an open circuit, the voltage to the transmitter wires is a maximum 28 volts. At 20 mA of transmitter current, the voltage is a minimum 15 volts.

Field device connections

Each Galvanic Isolation Module accepts one field device connection.

15.5.3.4 Auxiliary Connector Output

Description

The 1 to 5 Vdc PV signals are available at the auxiliary connector. By the use of a model MU-KFTAxx cable (the suffix "xx" represents the cable length of the cable in meters), the signals can be connected to a model MU-GMAR52 Marshalling Panel where they are available at screw terminals. If these signals are connected to monitoring or recording devices, the devices should have at least 1 megohm of input resistance to avoid loading the signals. See subsection 15.10 for a description of the Marshalling Panel.

15.5.3.5 Indicators

Primary IOP active indicator

A green indicator on the FTA illuminates when the primary IOP (A) is active.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.5.3.6 Hand-Held Communicator

Smart Transmitter communication

Terminals 3 and 4 on the Galvanic Isolation Module are internally connected to the two field terminals and can be used to communicate with a smart transmitter.

15.5.3.7 Current Consumption

Maximum power requirement

The FTA consumes 1.2 amperes at 24 Vdc with a 20 mA signal present at all inputs. This represents 28.2 watts of power.

Power dissipation

The power dissipation is 20.8 watts with a 20 mA signal at all inputs.

15.5.3.8 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module separates the two sides.

The safety description for the Galvanic Isolation Module input is

- 28 volts maximum
- 234 ohms
- 119 milliamps maximum

15.5.4 Model MU-GAIH22/MU-GAIH92 FTA

15.5.4.1 Description

Introduction

The model MU-GAIH22 and MU-GAIH92 High Level Analog Input (HLAI) FTAs accommodate up to 16 high level dc signals. The FTA provides floating dc power to energize a 2-wire or 3-wire, 4-20 mA transmitter in a hazardous area and repeats the current accurately in another circuit to drive a range spool in the safe area that generates a 1 to 5 Vdc signal to the associated HLAI IOP.

The model MU-GAIH22 and MU-GAIH92 FTAs is similar to the model MU-GAIH14 and MU-GAIH84 FTAs, except the 4-20 mA output signal from the Galvanic Isolation Module can be routed to an auxiliary receiver through an auxiliary connector before it is sent to the range spool on the FTA to generate the 1-5 Vdc input to the IOP.

Field transmitter compatibility

The FTA is suitable for conventional transmitters only.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.5.4.2 Connectors

Two IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.

One auxiliary connector

One 50-pin auxiliary connector provides 4-20 mA signals to auxiliary devices.

15.5.4.3 Field Wiring Input Signals

Signal limits

The acceptable input signal is from a 4-20 mA 2-wire or 3-wire transmitter. It is not expected that any self-powered transmitters will be the source.

With an open circuit, the voltage to the transmitter wires is a maximum 28 volts. At 20 mA of transmitter current, the voltage is a minimum 15 volts.

Field device connections

Each Galvanic Isolation Module accepts one field device connection.

15.5.4.4 Auxiliary Connector Output

Description

The 1 to 5 Vdc PV signals are available at the auxiliary connector. By the use of a model MU-KFTAxx cable (the suffix "xx" represents the cable length of the cable in meters), the signals can be connected to a model MU-GMAR52 Marshalling Panel where they are available at screw terminals. Because it is the same 4-20 mA signal that the range spool is exposed to, the recording or monitoring system connected to the screw terminals of the Marshalling Panel must provide a low impedance of 250 ohms, or less. See subsection 15.10 for a description of the Marshalling Panel.

15.5.4.5 Indicators

Primary IOP active indicator

A green indicator on the FTA illuminates when the primary IOP (A) is active.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.5.4.6 Current Consumption

Maximum power requirement

The FTA consumes 1.2 amperes at 24 Vdc with a 20 mA signal present at all inputs. This represents 28.8 watts of power.

Power dissipation

The power dissipation is 20.8 watts with a 20 mA signal at all inputs.

15.5.4.7 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module separates the two sides.

The safety description for the Galvanic Isolation Module input is

- 28 volts maximum
- 300 ohms
- 93 milliamps maximum

15.6 24 Vdc Digital Input FTAs

15.6.1 Model MU-GDID12/MU-GDID82 FTA

15.6.1.1 Description

Introduction

The model MU-GDID12 and MU-GDID82 24 Vdc Digital Input (DI) FTAs accommodate up to 32 switch or proximity detector inputs from a hazardous area, isolate the signal, and presents them to the FTA's associated 24 Vdc Digital Input FTA in the safe area. The phase of the input signals is selectable, which allows the alarm condition to be chosen for either state of the sensor. This is accomplished with independent switches on the top of the Galvanic Isolation Modules.

Fault-line detection

Individual line-fault detection is provided, that signals a contact change in the event the field wires are shorted or open. Switches are provided on the Galvanic Isolation Module to optionally defeat the line-fault detection on an individual input basis.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.6.1.2 Connectors

Two IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs. Presently, redundant Digital Input IOPs are not supported.

One auxiliary connector

One 50-pin auxiliary connector provides signals for remote monitoring and alarming systems.

15.6.1.3 Field Wiring Input Signals

Specifications

The input signal specifications and assumptions are as follows:

- Input from a contact or proximity switch.
- A sensed current of less than 2 kohms resistance is interpreted as a closure.
- The hysteresis is nominally 650 ohms.
- The voltage applied to the sensor is 7.7 to 9.0 Vdc for 1 kohms resistance.

15.6.1.4 Line-Fault Detection

Definition

The Galvanic Isolation Module signals a change of state to the IOP if the field wires are open or shorted. An open wire is defined as an input current of less than 100 μA, and a shorted wire is defined as an input current of greater than 6.5 mA.

ATTENTION

ATTENTION—To prevent false triggering of the line-fault detection feature, proximity sensors must be used. If switch inputs are used, they must be fitted with series and shunt resistors so that an open switch provides 22 kohms resistance and a closed switch provides 620 ohms resistance. If this feature is not wanted, it can be disabled by placing two switches on the top of the Galvanic Isolation Module, one for each input, in the "off" position.

15.6.1.5 Auxiliary Connector Output

Auxiliary contact signals

Duplicate floating dry contacts that track the action of the signals presented to the IOP are provided by the auxiliary connector. There are two contacts in each module, isolated from the system, but not isolated from each other (three wires per isolator).

Marshalling Panel connection

By the use of a model MU-KFTAxx cable (the suffix "xx" represents the length of the cable in meters), the signals can be connected to the model MU-GMAR52 Marshalling Panel where the signals are available at screw terminals. See subsection 15.10 for a description of the Marshalling Panel.

15.6.1.6 Indicators

Primary IOP active indicator

A green indictor on the FTA illuminates when the primary IOP (A) is active.

GI module signal indicators

Two amber indicators on each Galvanic Isolation Module, one for each input, illuminates when a “closed” signal is sent to the IOP.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.6.1.7 Current Consumption

Specifications

The FTA consumes 0.72 amperes at 24 Vdc with all inputs in use. This represents 17.3 watts of power.

The power dissipation is 16 watts with all inputs active.

15.6.1.8 Isolation and Safety

Specifications

Isolation is 250 Vac between each input, each auxiliary set of contacts, and the High-Performance Process Manager.

The safety description for each Galvanic Isolation Module input is:

- 10.5 volts maximum
- 800 ohms
- 14 milliamps maximum

15.6.2 Model MU-GDID13/MU-GDID83 FTA

15.6.2.1 Description

Introduction

The model MU-GDID12 and MU-GDID82 24 Vdc Digital Input (DI) FTAs accommodate up to 32 switch or proximity detector inputs from a hazardous area, isolate the signal, and presents them to the FTA's associated 24 Vdc Digital Input FTA in the safe area. The FTA is similar to the model MU-GDID12/MU-GDID82 FTA, except the phase of the Galvanic Isolation Module's input to output signals are not selectable on the module, and the module's signal outputs are solid-state, instead of contacts. Also, the FTA has no auxiliary output connector.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.6.2.2 Connectors

Two IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs. Presently, redundant Digital Input IOPs are not supported.

15.6.2.3 Field Wiring Input Signals

Specifications

The input signal specifications and assumptions are as follows:

- Input from a contact or proximity switch.
- A sensed current of less than 2 kohms resistance is interpreted as a closure.
- The hysteresis is nominally 650 ohms.
- The voltage applied to the sensor is 7.7 to 9.0 Vdc for 1 kohms resistance.

15.6.2.4 Indicators

Primary IOP active indicator

A green indictor on the FTA illuminates when the primary IOP (A) is active.

GI module signal indicators

Two amber indicators on each Galvanic Isolation Module, one for each input, illuminates when a “closed” signal is sent to the IOP.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.6.2.5 Current Consumption

Specifications

The FTA consumes 0.56 amperes at 24 Vdc with all inputs in use. This represents 13.4 watts of power.

The power dissipation is 14.4 watts with all inputs active.

15.6.2.6 Isolation and Safety

Specifications

Isolation is 250 Vac between each input, each auxiliary set of contacts, and the High-Performance Process Manager.

The safety description for each Galvanic Isolation Module input is

- 10.5 volts maximum
- 800 ohms
- 14 milliamps maximum

15.7 Analog Output FTAs

15.7.1 Model MU-GAOX02/72 and MU-GAOX12/82 FTAs

15.7.1.1 Description

Overview

The nonredundant model, MU-GAOX02 and MU-GAOX72, and the redundant model, MU-GAOX12 and MU-GAOX82,Analog Output (AO) FTAs isolate up to eight 4-20 mA signals that can drive current-to-pressure (I/P) transducers, position actuators, or any load of 750 ohms or less, from an associated Analog Output IOP. The two models are identical in performance, with the redundant model capable of being controlled from redundant IOPs.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.7.1.2 Connectors

Two IOP connectors

Two 50-pin connectors on the redundant model of the FTA provide the interfaces to one or two IOPs.

Analog Output Standby Manual connector

One 50-pin connector accepts signals from an Analog Output Standby Manual Device, permitting removal and replacement of an IOP during normal operation of the FTA.

15.7.1.3 Field Wiring Output Signals

Specifications

The FTA provides, nominally, 4-20 mA for control of field devices that are Galvanically Isolated from all other circuits. The load resistance can be no greater than 750 ohms. The signal output's dynamic impedance is greater than 1 megohm.

15.7.1.4 Line-Fault Detection

Description

In the event of an open or short circuit in the field wiring, the resistance sensed at the input to the Galvanic Isolation Module will be a high value. This permits the readback feature of the associated 4-20 mA Analog Output IOP to detect the open or shorted field circuit and report a soft failure to the user.

15.7.1.5 Calibration

Calibration terminals

Four screw terminals are provided on the FTA, two pairs for calibrating the primary and secondary IOPs. A touch pad is provided that initiates the calibration procedure in primary or secondary IOP.

15.7.1.6 Indicators

Primary IOP active indicator

A green indictor on the FTA illuminates when the primary IOP (A) has control of the FTA.

GI module indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

15.7.1.7 Current Consumption

Specifications

Both models of the FTA consume 0.42 amperes at 24 Vdc with a 20 mA signal on all outputs. This represents 10.5 watts of power.

The power dissipation for the FTA is 9.6 watts with all outputs providing 20 mA of current.

15.7.1.8 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module divides the two sides.

The safety description for the output of each Galvanic Isolation Module is

- 28 volts maximum
- 300 ohms
- 93 milliamps maximum

15.8 24 Vdc Digital Output FTAs

15.8.1 Model MU-GDOD12/MU-GDOD82 FTA

15.8.1.1 Description

Introduction

The model MU-GDOD12 and MU-GDOD82 24 Vdc Digital Output (DO) FTA can drive up to 16 suitably certified, intrinsically safe loads in a hazardous area. The loads can be a solenoid or alarm, as well as a nonenergy storing "simple apparatus," such as an LED.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.8.1.2 Signal Connectors

IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs through model MU-KFTAxx cables (the suffix "xx" represents the length of the cable in meters). Presently, Digital Output IOP redundancy is not supported.

Auxiliary connector

One 50-pin auxiliary connector accepts signals from an emergency shutdown system.

15.8.1.3 Field Wiring Output Signals

Specifications

Each output is a voltage source that provides a maximum output voltage of 25.5 Vdc through 232 ohms. The minimum output voltage varies from 22 volts at zero current to 10 volts at 50 milliamps.

15.8.1.4 Auxiliary Connector

Introduction

The auxiliary connector provides an input for control signals from an emergency shutdown system that is user-supplied. The shutdown system must provide potential-free floating sets of contacts. When one of the contacts is closed, a corresponding FTA output is disabled (deenergized), regardless of the output state command from the IOP.

Marshalling Panel connection

By the use of a model MU-KFTAxx cable (the suffix "xx" represents the length of the cable in meters), the signals can be connected to a model MU-GMAR52 Marshalling Panel where the input signals can be connected to screw terminals. See subsection 15.10 for a description of the Marshalling Panel.

15.8.1.5 Indicators

Primary IOP control indicator

A green indictor on the FTA illuminates when the primary IOP (A) has control of the FTA.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

GI module output indicator

An amber indicator on the Galvanic Isolation Module illuminates when the module's output is active.

15.8.1.6 Standby Manual Device Connector

No dedicated connector

There is no dedicated Standby Manual Device connector on the FTA. An IOP connector interface is used by the Digital Output Standby Manual device to control the output of the FTA.

15.8.1.7 Current Consumption

Power consumption

At 25 Vdc and with all outputs active into a 350 ohm load (typical for a solenoid value), the FTA consumes 1.10 amperes.

Power dissipation

The power dissipation is 18.7 watts with all outputs active.

15.8.1.8 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module divides the two sides.

The safety description for the output of each Galvanic Isolation Module is

- 25.5 volts maximum
- 232 ohms
- 110 milliamps maximum

15.8.2 Model MU-GDOL12/MU-GDOL82 FTA

15.8.2.1 Description

Introduction

The model MU-GDOL12 and MU-GDOL82 24 Vdc Digital Output (DO) FTA can drive up to 16 suitably certified, intrinsically safe loads in a hazardous area. The loads can be a solenoid or alarm, as well as a nonenergy storing "simple apparatus," such as an LED.

No output signal override capability

The FTA is similar to the MU-GDOD12/MU-GDOD82 FTA, except it does not have the capability to accept output override signals from a shut-down device through an auxiliary connector.

Line fault detection capability

Instead, each input channel has line fault detection circuitry that causes a contact closure that is present at an auxiliary connector.

References

The *Process Manager I/O Specification and Technical Data* and *Process Manager I/O Installation* manuals provide a more detailed description of the FTA's specifications and additional information.

15.8.2.2 Signal Connectors

IOP connectors

Two 50-pin connectors provide the interfaces to redundant IOPs through model MU-KFTAxx cables (the suffix "xx" represents the length of the cable in meters). Presently, Digital Output IOP redundancy is not supported.

Auxiliary connector

A 50-pin connector provides contact closure line fault signals from each of the 16 channels.

15.8.2.3 Field Wiring Output Signals

Specifications

Each output is a voltage source that provides a maximum output voltage of 25.5 Vdc through 232 ohms. The minimum output voltage varies from 22 volts at zero current to 10 volts at 50 milliamps.

15.8.2.4 Auxiliary Connector

Introduction

The auxiliary connector provides Line Fault Detection signals that are represented by a solid-state signal for each of the FTA's 16 channels. Upon detection of a line fault, the Galvanic Isolation Module deenergizes a solid-state switch that has its emitter connected to logic ground. The collector is the output to the auxiliary connector and is not terminated in the module or on the FTA assembly.

The solid-state switch has the following characteristics:

- Maximum off-state voltage = 35 Vdc
- Maximum on-state voltage = 2 Vdc
- Maximum off-state leakage current = 10 μA
- Maximum on-state current = 50 mA

Combiner Panel connection

By the use of a model MU-KFTAxx cable (the suffix "xx" represents the length of the cable in meters), the signals can be connected to the model MU-GLFD02 Combiner Panel where the signals are combined with 16 other LFD signals from another FTA. The combined 32 signals are available as inputs to redundant Digital Input IOPs, model MU-PDIX02. See subsection 15.9 for a description of the Combiner Panel.

Marshalling Panel connection

Using the same cable, the signals can also be connected to the model MU-GMAR02 Marshalling Panel where the signals are available at screw terminals. See subsection 15.10 for a description of the Marshalling Panel.

15.8.2.5 Indicators

Primary IOP control indicator

A green indictor on the FTA illuminates when the primary IOP (A) has control of the FTA.

GI module power indicator

A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.

GI module output indicator

An amber indicator on the Galvanic Isolation Module illuminates when the module's output is active.

GI module LFD indicator

A red indicator on the Galvanic Isolation Module illuminates when a line fault is detected.

15.8.2.6 Standby Manual Device Connector

No dedicated connector

There is no dedicated Standby Manual Device connector on the FTA. An IOP connector interface is used by the Digital Output Standby Manual device to control the output of the FTA.

15.8.2.7 Current Consumption

Power consumption

At 25 Vdc and with all outputs active into a 350 ohm load (typical for a solenoid value), the FTA consumes 1.10 amperes.

Power dissipation

The power dissipation is 18.7 watts with all outputs active.

15.8.2.8 Isolation and Safety

Specifications

The isolation between the safe-side and hazardous-side of the FTA is 250 Vac. The Galvanic Isolation Module divides the two sides.

The safety description for the output of each Galvanic Isolation Module is

- 25.5 volts maximum
- 170 ohms
- 150 milliamps maximum

15.9 Combiner Panel

Introduction

The model MU-GLFD02 Combiner Panel is similar in shape and appearance to an "A" size FTA and contains four 50-pin phone-type connectors and a single green LED indicator.

Purpose

The purpose of the panel is to combine the Line Fault Detection (LFD) outputs (16) of two Digital Output FTAs and present the signals (32) to redundant Digital Input IOPs for integration.

LFD input connectors

Two connectors on the panel connect to the auxiliary connector on two Digital Output FTAs that have line fault detection capability. Presently, these are the MU-GDOL12/MU-GDOL82 FTAs. The standard IOP to FTA cable is used to provide the connections.

IOP output connectors

The combined 32 LFD outputs are available at two output connectors. One output connector connects to IOP A and the other connector connects to its redundant partner, IOP B. The standard IOP to FTA cable is used to provide the connections.

Primary IOP active indicator

The green LED indicator is illuminated when IOP A is active.

15.10 Marshalling Panel

15.10.1 Description

Introduction	The model MU-GMAR52 Marshalling Panel is similar in shape and appearance to a “B” size FTA. It has 38 screw terminal connections. There is only one version of the Marshalling Panel. The Marshalling Panel has one 50-pin connector that receives or sends signals to the safe side of the FTA to which it is connected.
Complementary	The Marshalling Panel is complementary and provides the ability to repeat signals into or out of the safe side of the Galvanic Isolation Modules mounted on the FTA.
Signals not intrinsically safe	Although the Marshalling Panel is used with the FTAs, the signals present are not intrinsically safe or inherently Galvanically Isolated. Therefore, the signals on the Marshalling Panel cannot be exposed to a Division 1, Zone 0 or Zone 1 environment.
Bus bar may be required	Because the Marshalling Panel does not have a built-in shield bus, providing termination for a large number of shield wires requires the use of a horizontal or vertical bus bar. The horizontal or vertical bus bar is connected to the local Master Reference Ground (Safety Ground for CE Compliance).
Can have general purpose usage	The Marshalling Panel was developed primarily to provide user-accessibility to the signals from the auxiliary connectors on the Galvanically Isolated FTAs, but it can also be used as a general purpose marshalling panel in the High-Performance Process Manager subsystem.
Marshalling Panel mounting	The model MU-GMAR52 Marshalling Panel can be mounted on either a horizontally or vertically oriented FTA Mounting Channel. No Galvanically Isolated or standard (non-Galvanically Isolated) FTAs can also be mounted on the FTA Mounting Channel. Cabling to the Marshalling Panel must be routed in the upper channel and to the left in a horizontal FTA Mounting Channel and in the right channel and to the right in a vertical FTA Mounting Channel.

15.10.2 Configurations

Six configurations

The screw terminals connection of the Marshalling Panel can assume six configurations, depending upon the model of FTA to which its 50-pin connector is connected through a model MU-KFTAxx cable (the suffix "xx" represents the length of the cable in meters).

The configurations are described in the following subsections.

15.10.2.1 High Level Analog Input FTAs

Introduction

When used with High Level Analog Input (HLAI) FTA or High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTA, the Marshalling Panel provides either 1 to 5 volt or 4 to 20 mA PV signals.

1 to 5 V signals

The 1 to 5 volt signals are the same signals that the HLAI or STI IOP receives.

4-20 mA signals

The 4 to 20 mA signals must be returned to the FTA to produce the 1 to 5 volt signal across a spool resistor that the IOP requires.

Recording or monitoring devices

The signals are intended to be connected to a recording or monitoring device that the user provides.

1-5 Vdc FTAs

The following FTAs provide 1 to 5 volt signals:

- Model MU-GAIH12/82 HLAI FTA
- Model MU-GAIH13/83 HLAI/STI FTA
- Model MU-GAIH14/84 HLAI/STI FTA

Subsystem input impedance

The subsystem must have an input impedance of 1 megohm, or greater, to avoid loading down the signals and introducing errors into the IOP.

4-20 mA FTA

The following FTA provides 4 to 20 mA signals:

- Model MU-GAIH22/92 HLAI FTA

Subsystem input impedance

The subsystem must have an input impedance of 250 ohms or less.

Continued on next page

15.10.2.1 High Level Analog Input FTAs, Continued

Cable routing

The signal wires must be separated from other wires or cables that might induce noise onto the signals. It is suggested that you use a properly grounded, shielded, twisted-pair cable to carry the signals to the recording or monitoring device.

Reference

A list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a High Level Analog Input FTA or High Level Analog Input/Smart Transmitter Interface FTA through its 50-pin auxiliary connector can be found in the *Process Manager I/O Installation* manual.

15.10.2.2 Digital Input FTAs

Model MU-GDID12/82 FTA configuration

The model MU-GDID12/82 FTA provides potential free sets of contacts that are isolated from the input to the IOP to which the FTA is connected are available.

Relay contact interface

Each Digital Input Galvanic Isolation Module mounted on the FTA has two double-pole on/off reed relays. One set of the reed relay contacts is connected to the IOP, the second set of relay contacts is connected to the Marshalling Panel. The contact rating is 10 W, 0.5 A at 35 Vdc.

Application

The typical applications for the sets of contacts are inputs to sequence of events recorders, monitoring systems, and shutdown systems.

Reference

A list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a Digital Input FTA through its 50-pin auxiliary connector can be found in the *Process Manager I/O Installation* manual.

15.10.2.3 Digital Output FTAs

Model MU-GDOD12/82 FTA configuration

The Digital Output configuration provides control by contacts or transistors to individually deenergize each Galvanic Isolation Module digital output. For example, an "on" output command from the IOP for a channel can be "overwritten" by a control signal from the Marshalling Panel that forces the output signal "off." The override signal cannot force the output signal "on."

Application

The inputs can be control signals from an emergency shutdown subsystem that is user-supplied.

Reference

A list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a model MU-GDOD12/82 FTA through its 50-pin auxiliary connector can be found in the *Process Manager I/O Installation* manual.

To disable a particular channel, a designated pair of terminals are shorted together.

Model MU-GDOL12/82 configuration

The Digital Output configuration for the model MU-GDOL12/82 FTA is an interface that represents input channel line fault detection from the FTA. Line Fault Detection (LFD) circuitry in each Galvanic Isolation Module controls a solid-state switch output at the FTA's auxiliary connector. Upon detection of a line fault, the Galvanic Isolation Module deenergizes the solid-state switch that has its emitter connected to logic ground.

Solid-state switch inputs

The collector of the solid-state switch is the output to the auxiliary connector and is not terminated in the module or on the FTA assembly.

Reference

A list of the signals that are available at the screw terminals of the Marshalling Panel when it is connected to a model MU-GDOL12/82 FTA through its 50-pin auxiliary connector can be found in the *Process Manager I/O Installation* manual.

Index

24 Vdc Digital Input 288, 291
24 Vdc Digital Output 265, 296, 299
3.6 Vdc battery output 36
48 Vdc Battery Backup Module 36
51304465-xxx cable 236, 248
6 Vac output 36

A

AC Only Power System 39
aerial lashing 204
ambient temperature 205
    limits 268
Analog Output
    FTA 293
    IOP calibration 294
auxiliary connector 265

B

bus bar 268

C, D

cabinet
    blank plate 146, 171
    bottom entry 144, 169
    complex 146, 171
    complexing kit 146
    configurations 41
    dimensions 144
    dual access 71, 143, 167
    entry 80
    entry holes 169
    fan assembly 169
    floor template 163, 188
    internal structure 147, 172
    Markon 141
    placement considerations 86
    remote 44
    Rittal 165
    single 42
    single access 71, 142, 166
    top entry 169
    top panel(s) 144, 169
cabinets
    complexed 43
    dual 43
cable
    clamp rail 80
    clamping 80
    load parameters 102
    model MU-KFTAxx 297
    size 102
calibration, Analog Output IOP 294
card file
    description 153, 178
CJR 217
Class I, Division 2 approved components 100
CMOS memory NiCad battery backup 36
Cold Junction Reference 217
complexing kit 171
compression-type terminal connector 82, 262
connector
    compression-type terminal 31
    screw-type terminal 31
crimp-type terminal connector 82
crimp-type terminal connector 261

E

EIA-232 233, 242
EIA-422/485 233, 242
electrical codes 84

F

fan assembly 144
fiber cable
    bend radius 207
    breakout 208
    breakout kit 208
    burial 204
    clamping 205
    code restrictions 205
    construction 207
    installation planning 208
    installation precautions 207
    loop 205
    migration 205
    multi-fiber 206
    post installation measurements 213
    preinstalled connectors 209
    professional installers 206
    routing 204
    separation 204
    span distance formula 211, 213
    splices 208
    type 204
fiber cable length 203
fiber optic coupler 198
fiber splices 210
Field Termination Assembly 24
field wire
    routing 273
field wiring 273
fire code requirements 205
fixed-screw terminal connector 32
fixed-screw type terminal connector 82
FTA

Digital Input 305
Digital Output 306
dimensions 72
features 264
fuses 267
galvanically isolated 28
mounting 30
Remote Hardened Low Level Analog Input Multiplexer 224
RHMUX 224
rules 72
selection 72
Serial Interface 242
sizes 74, 154
types 28
FTA Mounting Channel 29, 71, 155, 159, 180, 184, 259
number 271
FTA Mounting Channel cabinet configurations 156, 181
FTAs 28

G

Galvanic Isolation Module 255, 260
replacement 268
Galvanic Isolation Power Distribution Assembly 274
galvanically isolated FTA
model numbers 260
galvanically isolated FTA planning 255
galvanically isolated FTAs
types 263

H

High Level Analog Input
FTA 265, 277, 279, 282, 285
horizontal or vertical bus bar 303
HPMM
card file 6
HPMM and IOP card file combinations 195
HPMM to IOP guidelines 195

I, J, K

I/O Link Extender 198
Long Distance 201
Standard 198
IEC 84
independent Power Systems 193
International Electrotechnical Commission 84
Introduction *103*
IOP
redundant 194
Serial Interface 242
IOPs 16

L

Link A 198
Link B 198
LLAI line frequency clock circuit 36
LLMux
FTA placement 219
IOP placement 219
IOP to Power Adapter cable 236, 248
LLMux FTAs 217
Long Distance
I/O Link Extender 198
Long Distance I/O Link Extender 22, 201
loss budget 210
calculation 210
Low Level Analog Input Multiplexer 217

M

Manual/Auto Station 239
Marshalling Panel 266, 297, 303
configurations 304
purpose 303
Master Reference Ground 49
Master Reference Ground (Safety Ground for CE Compliance) 268, 303
metallic I/O Link Interface cables 203
Modbus protocol 242
Modbus RTU 251

model 217
8142-2089 Toledo Weigh Cell 239
8142-2189 Toledo Weigh Cell 239
MC-GRMT01 223
MU-CBDX01 165
MU-GMAR52 278, 280, 283, 286
MU-PLAM02 217
MU-TAMR03 217
MU-TSDT02 233
MU-CBDM01 141
MU-CBSM01 141
MU-CBSX01 165
MU-CMSC03 223
MU-CMSS03 223
MU-GAIH12 277
MU-GAIH13 279, 282
MU-GAIH22 285
MU-GAIH82 277
MU-GAIH83 279, 282
MU-GAIH92 285
MU-GAOX02 293
MU-GAOX12 293
MU-GAOX72 293
MU-GAOX82 293
MU-GDID12 288, 291
MU-GDID82 288, 291
MU-GDOD12 296
MU-GDOD82 296
MU-GDOL12 299
MU-GDOL82 299
MU-GMAR52 289, 303
MU-GPRD02 274
MU-GRPA01 223
MU-KDPRxx cable 274, 275
MU-KFTAxx 304
MU-KGPRxx cable 275
MU-KSXxxx cable 236, 248
MU-MASX02 239
MU-PSDX02 233
MU-TLPA02 217, 233
MU-TRPA01 223
MU-TSDM02 233
MU-TSDU02 233
PRHM01 223
model MU-GDID12/82 24 Vdc Digital Input 265
model MU-GPRD02 273
model MU-GRPA01 Power Adapter 225
model MU-KFTAxx 260
model MU-KLO305 cable specifications 231
model MU-KLXxxx cable specifications 231
model MU-TRPA01 Power Adapter 225
multi-ground system 49
multidrop interface 235, 242

N, O

National Electrical Code 84
NEC 84
NFPA 86

P, Q

pluggable connector 82
Power Adapter 217, 233
power connector
dual 267
power considerations 276
Power Distribution Assembly 267, 273
placement 273
power requirements 267
Power Supply Module 36
Power System 36

R

redundancy interface cable 193
redundant
HPMMs 21, 200
IOPs 194
remote card file 198
remote IOP redundancy 194
removable-screw terminal connector 32
removable-screw type terminal connector 82
RHMUX
assemblies 223
CE Compliance 223
configurations 223
control drawings 224
FTA mounting 225
indoor cabling 229
IOP 224
IOP placement 228
IOP to Power Adapter cable 228
IS application 227
non-CE Compliance 223
Nonincendive application 226
outdoor cabling 230
Power Adapter placement 228
Power Adapter to FTA cable 228
Power Adapters 224

S

Safety Ground 50
screw-type terminal connector 82
SDI
    FTA placement 236, 248
    FTA to Power Adapter cable length 236, 248
    IOP placement 235, 247
Serial Device Interface FTA 233
Serial Device Interface IOP 233
Serial Interface 252
    specifications 252
SI 252
    specifications 252
single cabinet redundancy 191
single HPMM 199
single-ground system 50
spare cable fibers 206
standard FTA 28
Standard I/O Link Extender 198
Standby Manual Device 264
    connector 264

T

TC 217
terminal connectors 268
thermocouple 217
top entry 144
types of fiber splices 210, 212

U

UCN coaxial cables 81
UDC 6000 239

V

Vertical FTA Mounting Channel
    widths 158

W, X, Y, Z

wire size 82
wiring
    rules 100

FAX Transmittal **FAX No.: (602) 313-4842**

TO: Bob Koegel **Total FAX pages:** _____
(including this page)

Reader Comments

Title of Document: **High-Performance Process Manager Planning**

Document Number: **HP02-500** Issue Date: **3/98**

Comments: _____

_____

_____

_____

_____

_____

Recommendations: _____

_____

_____

_____

_____

_____

FROM:

Name: _____ **Date:** _____

Title: _____

Company: _____

Address: _____

City: _____ **State:** _____ **ZIP:** _____

Telephone: _____ **FAX:** _____

You may also call 800-822-7673 (available in the 48 contiguous states except Arizona; in Arizona dial 602-313-5558, or write to:

Honeywell Inc.
Industrial Automation and Control
Automation College
2820 West Kelton Lane
Phoenix, AZ 85023-3028

Honeywell

Industrial Automation and Control

Automation College

2820 W. Kelton Lane

Phoenix, AZ 85023-3028

Helping You Control Your World

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP