

Process Manager I/O Installation

(PM/APM/HPM)

PM20-520

**Implementation
PM/APM/HPM - 3**

***Process Manager I/O
Installation***
(PM/APM/HPM)

**PM20-520
Release 510
CE Compliant
8/96**

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About This Publication

This publication provides information for the installation of individual Field Termination Assemblies (FTAs) and their associated components, such as Power Adaptors, Distribution Panels, and Input/Output Processors (IOPs). I/O Link Extender components are also included in this document.

The FTAs and their associated components are interchangeable with the Process Manager (PM), Advanced Process Manager (APM), and High-Performance Process Manager (HPM).

Sometimes, references to the Process Manager (PM) apply for the Process Manager, Advanced Process Manager, and High-Performance Process Manager unless noted as applying to only one subsystem such as the Advanced Process Manager or the High-Performance Process Manager.

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

This publication supports CE Compliant equipment. Equipment designated as “CE Compliant” complies with the European Union EMC and its health and safety directives. Equipment entering European countries after January 1, 1996 require this type of compliance which is identified by the “CE Mark” symbol.

A change bar is used to indicate that a paragraph, table, or illustration has been changed or added because of updated information. A change bar is not used to indicate a correction because of a minor typographical error.

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Standard Symbols

Scope

The standard symbols used in this publication are defined as follows.

ATTENTION

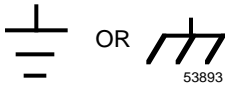
Notes inform the reader about information that is required, but not immediately evident.

CAUTION

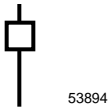
Cautions tell the user that damage may occur to equipment if proper care is not exercised.

WARNING

Warnings tell the reader that potential personal harm or serious economic loss may happen if instructions are not followed.



Ground connection to building safety ground.



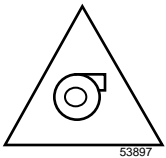
Ground stake for building safety ground.



Electrical Shock Hazard—can be lethal.



Electrical Shock Hazard—can be lethal.



Rotating Fan—can cause personal injury.



Caution—refer to the appropriate installation document.

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Acronyms

AI.....	Analog Input
AO.....	Analog Output
APM.....	Advanced Process Manager
APMM.....	Advanced Process Manager Module
CJR.....	Cold Junction Reference
DISOE.....	Digital Input Sequence Of Events
DI.....	Digital Input
DO.....	Digital Output
FTA.....	Field Termination Assembly
GI.....	Galvanically Isolated
HLAI.....	High Level Analog Input
HPM.....	High-Performance Process Manager
HPMM.....	High-Performance Process Manager Module
IS.....	Intrinsic Safety
I/O.....	Input/Output
IOP.....	Input/Output Processor
LCN.....	Local Control Network
LED.....	Light Emitting Diode
LLAI.....	Low Level Analog Input
LLMux.....	Low Level Analog Input Multiplexer
MRG.....	Master Reference Ground
N/C.....	Normally Closed
N/O.....	Normally Open
OTDR.....	Optical Time Domain Reflectometer
OTD.....	Open Thermocouple Detection
PI.....	Pulse Input
PM.....	Process Manager
PMM.....	Process Manager Module
PVC.....	Polyvinyl Chloride
PV.....	Process Variable
RFI.....	Radio Frequency Interference
RTD.....	Resistance Temperature Device
SDI.....	Serial Device Interface
SFC.....	Smart Field Communicator
SI.....	Serial Interface
STI.....	Smart Transmitter Interface
TC.....	Thermocouple

References

Publication Title	Publication Number	Binder Title	Binder Number
<i>Process Manager Specification and Technical Data</i>	PM03-500	System Summary - 2	TPS 3010-2
<i>Advanced Process Manager Specification and Technical Data</i>	AP03-500	System Summary - 2	TPS 3010-2
<i>High-Performance Process Manager Specification and Technical Data</i>	HP03-500	System Summary - 2	TPS 3010-2
<i>Galvanic Isolation/Intrinsic Safety Specification and Technical Data</i>	GA03-500	System Summary - 2	TPS 3010-2
<i>Process Manager I/O Specification and Technical Data</i>	IO03-500	System Summary - 2	TPS 3010-2
<i>Universal Control Network Specification and Technical Data</i>	UN03-500	System Summary - 2	TPS 3010-2
<i>TPS System Site Planning</i>	SW02-550	System Site Planning - 1	TPS 3020-1
<i>Process Manager/Advanced Process Manager Planning</i>	PM02-501	System Site Planning - 1	TPS 3020-1
<i>High-Performance Process Manager Planning</i>	HP02-500	System Site Planning - 2	TPS 3020-2
<i>Universal Control Network Planning</i>	UN02-501	System Site Planning - 1	TPS 3020-1
<i>Process Manager/Advanced Process Manager Installation</i>	PM20-501	Implementation/PM/APM	TPS 3043
<i>Process Manager/Advanced Process Manager Checkout</i>	PM20-511	Implementation/PM/APM	TPS 3043
<i>High-Performance Process Manager Installation</i>	HP20-500	Implementation/HPM - 3	TPS 3066-3
<i>High-Performance Process Manager Checkout</i>	HP20-510	Implementation/HPM - 3	TPS 3066-3
<i>Process Manager/Advanced Process Manager Service</i>	PM13-501	PM/APM/HPM Service - 1	TPS 3061-1
<i>High-Performance Process Manager Service</i>	HP13-500	PM/APM/HPM Service - 1	TPS 3061-1
<i>Universal Control Network Installation</i>	UN20-500	Installation/Universal Control Network	TPS 3041
<i>Universal Control Network Guidelines</i>	UN12-510	Installation/Universal Control Network	TPS 3041

Section 1 – Introduction

1.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
1.1	Overview.....	1

Purpose of manual This publication provides instruction for the installation of Field Termination Assemblies and, as required, associated components, such as Input/Output Processors (IOPs) and Power Adapters.

FTA subsystem support Most of the FTAs can be installed in and supported by the Process Manager (PM), Advanced Process Manager (APM), and the High-Performance Process Manager (HPM) subsystems. The Serial Interface FTA is an example of an FTA that is not supported by all subsystems. The Process Manager subsystem will not support the Serial Interface FTA.

FTA types The installation instructions for the FTAs are assigned to the sections that follow, based on the type of FTA. There are four major types.

- Analog Input
- Analog Output
- Digital Input
- Digital Output

Some types of FTAs, such as the Serial Interface and Serial Device Interface FTAs, support both input and output signals. These types of FTAs are classified as miscellaneous.

Galvanically Isolated FTAs The Galvanically Isolated (GI) FTAs are represented by the four major types of FTAs, but are assigned to a separate section because of their unique installation requirements.

I/O Link Extender cards I/O Link Extender cards are not FTAs or IOPs, but they are included in this document because they occupy an IOP slot in the card file backplane and provide the I/O Link Interface between local and remote card files that are populated with IOPs.

Continued on next page

1.1 Overview, Continued

FTA section assignments

The types of FTAs and supporting components are assigned to the following sections.

- Section 2—Analog Input FTAs
- Section 3—Analog Output FTAs
- Section 4—Digital Input FTAs
- Section 5—Digital Output FTAs
- Section 6—Pulse Input, Serial Device Interface, Serial Interface FTAs
- Section 7—Galvanically Isolated FTAs
- Section 8—I/O Link Extender

Section 9

Section 9 discusses the recommended methods of mounting and installing Field Termination Assemblies in a Process Manager, Advanced Process Manager, or High-Performance Process Manager cabinet and other enclosures. Proper wiring and grounding practices are also discussed.

Additional installation information

Additional installation information can be found in the *Process Manager/Advanced Process Manager Planning*, *High-Performance Process Manager/Advanced Process Manager Planning*, *Process Manager/Advanced Process Manager Installation*, and *High-Performance Process Manager Installation* manuals.

IOP and FTA specifications with other pertinent information can be found in the *Process Manager Specification and Technical Data* manual, *Advanced Process Manager Specification and Technical Data*, and *Process Manager I/O Specification and Technical Data* manuals.

Continued on next page

1.1 Overview, Continued

CE Compliance

Most of the assemblies discussed in this manual comply with European Compliance directives. CE Compliant and non-CE Compliant assemblies are identified.

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

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

CE Compliant applications always require CE Compliant models of the card files and shielded IOP to FTA cables.

ATTENTION

ATTENTION—References to Master Reference Ground in both the text and illustrations are applicable only to site installations that are not required to comply with European Compliance directives. Ignore installation instructions that pertain to Master Reference Ground for those sites. They must have a single ground system which is a designated Safety Ground.

Conformal coating

Most IOPs and FTAs are available either conformally coated or not conformally coated. See the Process Manager/Advanced Process Manager Planning or High-Performance Process Manager Planning manual for a model list. Conformally coated models of the FTAs and IOPs are identified by the prefix “MC.” Nonconformally coated models are identified by the prefix “MU.” This manual generally references only nonconformally coated model numbers (MU) unless it is appropriate to reference conformally coated model numbers.

Section 2 – Analog Input FTA Installation

2.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
2.1	Overview.....	5
2.2	Low Level Analog Input (LLAI) FTAs	6
2.2.1	RTD Lead Resistance	18
2.3	Low Level Analog Input Multiplexer (LLMux) FTAs.....	20
2.3.1	Thermocouple (TC) LLMux FTAs.....	34
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2.4.3	Smart Transmitter Interface (STI) Applications	76
2.5	Smart Transmitter Interface (STI) FTAs.....	86

Purpose

This section provides information necessary for the proper installation of analog input type Field Termination Assemblies (FTAs). If required for configuration or other purposes, supporting assemblies, such as Input/Output Processors (IOPs) are also included in the installation procedure discussion.



CAUTION, RISK OF ELECTRIC SHOCK

2.2 Low Level Analog Input (LLAI) FTAs

CE Compliance

There several models of the Low Level Analog Input (LLAI) Field Termination Assembly (FTA). Some models are CE Compliant, while some models are not CE Compliant. The CE Compliant models are identified by a part number that ends in “25” or “75.” CE Compliant and non-CE Compliant FTAs have unique model numbers.

The CE Compliant FTAs have an interface connector with a grounded shell that interfaces with the model MU-KFTSxx IOP to FTA cable. This fully shielded FTA cable is required if the FTA is mounted in a cabinet that is separate from the cabinet or cabinet complex in which its associated IOP is installed.

If The FTA is mounted in the same cabinet or cabinet complex as its associated IOP, an unshielded model MU-KFTAxx IOP to FTA cable can be used.

LLAI FTAs and IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 2-1.

Table 2-1 Low Level Analog Input FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAIL01	LLAI FTA with Compression Terminals Single IOP Interface (early version)	51301183-100	N/A
MU-TAIL01	LLAI FTA with Compression Terminals Single IOP Interface	51301107-100	N/A
MU-TAIL02	LLAI FTA with Compression Terminals Single IOP Interface	51304437-100	N/A
MC-TAIL02	LLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304437-150	N/A
MU-TAIL03	LLAI FTA with Compression Terminals Single IOP Interface	N/A	51309202-125*
MC-TAIL03	LLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309202-175*
MU-PAIL01	LLAI IOP	51303991-100	N/A
MU-PAIL02	LLAI IOP	51304481-100	N/A
MC-PAIL02	LLAI IOP—Conformally Coated	51304481-150	N/A

* Requires a model MU-PAIL02 or MC-PAIL02 LLA IOP with revision H (5.1) or greater firmware for proper operation.

Continued on next page

2.2 Low Level Analog Input (LLAI) FTAs, Continued

Description

The Low Level Analog Input (LLAI) FTA provides inputs for up to eight low level analog components, such as thermocouples (TCs) or Resistance Temperature Devices (RTDs). The inputs are isolated and independent, but share a common cable shield bus.

LLAI IOP

The model MU-PAIL01 and MU/MC-PAIL02 Low Level Analog Input IOPs support the model MU-TAIL01 and MU/MC-TAIL02 LLAIs. Only the model MU/MC-PAIL02 LLAIs support the CE Compliant model MU/MC-TAIL03 FTA. The FTAs can be installed in any card file slot.

CAUTION

CAUTION—When either the model MU-PAIL01 LLAIs or an earlier version of the model MU-TAIL01 LLAIs (Honeywell part number 51401183-100) is used, the maximum length of the IOP to FTA cable must not exceed 20 meters (66 feet).

Continued on next page

2.2 Low Level Analog Input (LLAI) FTAs, Continued

Connection diagrams Figures 2-1 and 2-2 are connection diagrams for the non-CE Compliant model MU-TAIL01 and MU/MC-TAIL02 LLAI FTAs and illustrate Thermocouple and Resistance Temperature Device connections. Figures 2-3 and 2-4 are connection diagrams for the CE Compliant model MU/MC-TAIL03 LLAI FTA.

The FTAs have compression-type connection terminals.

Assembly layout illustrations Figure 2-5 illustrates the assembly layout of the model MU/MC-TAIL02 Low Level Analog Input FTA.

Figure 2-6 illustrates the assembly layout of the model MU/MC-TAIL03 Low Level Analog Input FTA.

Thermocouple and RTDs inputs can be mixed Signals from thermocouples, RTDs, and voltage inputs can be mixed on the same FTA as shown in the connection diagrams, Figures 2-1 through 2-4; however, if there is a thermocouple input, the thermocouple input must be connected to channel 1.

Reference junction signal for model MU-TAIL01 and MU/MC-TAIL02 FTAs If one or more thermocouples are connected to the FTA, the Reference Junction signal generated at TB2-17 must be connected to the auxiliary input for the FTA's analog-to-digital converter at terminal TB1-1. See Figure 2-1.

If no thermocouple inputs are present, the connection between TB1-1 and TB2-17 is not required. See Figure 2-2.

Reference junction signal for model MU/MC-TAIL03 CE Compliant FTA Unlike the non-CE-Compliant model MU-TAIL01 and MU/MC-TAIL02 FTAs, the separate wire that is connected between TB1-1 and TB1-17 is not required on the CE Compliant model MU/MC-TAIL03 FTA. Instead, a jumper plug must be used at P1 on the FTA.

If one or more thermocouples are connected to the FTA, the Reference Junction must be connected to the channel 1 auxiliary input A/D converter. This is accomplished by installing the jumper plug between pins 2 and 3 ("TC" position) at P1. See Figures 2-3 and 2-6.

If no thermocouple inputs are connected, install the jumper plug between pins 1 and 2 ("ALL OTHER ANALOG INPUT TYPES" position) at P1. See Figures 2-4 and 2-6.

Continued on next page

2.2 Low Level Analog Input (LLAI) FTAs, Continued

Shield bus connections An internal shield bus connection at every fourth terminal provides connection points for any shielded-pair cables. Connection is also provided at TB2-18 and TB2-19 for daisy-chaining the buses from FTA to FTA. Use conductors at least as heavy as the incoming low level signal wiring. On the last assembly in the chain, connect TB2-19 to the local ground bus bar at the floor of the cabinet. Designation of the local ground bus depends on where the originating signal is referenced as described in the following paragraphs.

ATTENTION

ATTENTION—The LLA IOP and its FTA use a 3-lead RTD configuration. Proper compensation for lead wire resistance depends on the resistance being equal in each leg of the RTD. This includes the lead wire resistance and the Intrinsic Safety device, such as a Zener Barrier. No provision is made to compensate for a lead wire or the Intrinsic Safety device resistance mismatch.

Thermocouple cable shield grounding

Thermocouples are commonly grounded to the process vessel; therefore, ground the thermocouple cable shields to the vessel and cut them off at the FTA end of the cable. For this type of circuit, the FTA internal shield bus is not used and no connection to a local ground bus bar is needed. See Input 1 in Figure 2-1.

RTD cable shield grounding

RTDs have different shield connections because the RTDs are electrically insulated from the process vessel; therefore, cut the shield wires off at the process end and connect the shield wires at the FTA. The FTA internal shield bus then connects to the local Master Reference Ground (MRG) bus bar. See Input 8 in Figure 2-1 or Input 2 in Figure 2-2.

For CE Compliance, the internal shield bus must connect to Safety Ground. See Figures 2-3 and 2-4.

Local code requirements

The FTA is constructed with a 2.2 mm (0.087 inch) separation at each input. Most local electrical codes require that any common mode voltage applied through the signal wires be limited to 150 V maximum. Check the site planning drawings for any external current limiting and install it as specified. Additionally, use only cable approved for the operating voltage and current.

Thermocouple lead wire resistance

Thermocouple lead wire resistance, plus the thermocouple junction resistance, must be less than 1000 ohms because the system may falsely detect an open thermocouple above 1000 ohms.

Continued on next page

2.2 Low Level Analog Input (LLAI) FTAs, Continued

CAUTION

CAUTION—The FTA terminal cover must be installed to provide isothermal operation. Install the LLA I FTA in a cabinet to further minimize temperature gradients that result from air currents.

For the model MU/MC-TAIL03 LLA I FTA, ensure that the metallic cover is aligned, seated, and secured on the FTA's RFI gasket to reduce undesired EMI. Initially, hand tighten the thumbscrews on the cover, and then tighten them approximately 1/2 turn with a screwdriver. Do not overtighten.

ATTENTION

ATTENTION—Because of possible processing conflicts, it is recommended that points not be built for inputs without wires or sensors connected to the input.

- If a point is built for a thermocouple input with Open Thermocouple Detection (OTD) disabled and a voltage input or a resistance (RTD) input without a connected sensor, the point must be placed in the inactive state.
 - If the unused point is activated and the input is a thermocouple point with OTD disabled or a voltage point, connect a jumper wire between the B and C input screws (contacts). See Figures 2-1 and 2-3, Inputs #3 and #5.
 - For an activate input configured as an RTD, connect a jumper wire between screws (contacts) A, B, and C. See Figures 2-2 and 2-4, Inputs #3, #5, and #7.
-

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2.2 Low Level Analog Input (LLAI) FTAs, Continued

Types of thermocouples and extension wires

The types of thermocouples, their extension wires, and the polarity color codes for the United States and Canada are shown in Table 2-2. Other international standards use different color code schemes. Check with your wire supplier for the appropriate color code and polarity.

The positive polarity (+) always connects to terminal B, and the negative (–) polarity always connects to terminal C at the FTA terminal strip. See Figures 2-1 or 2-3. The thermocouple’s negative lead is always red.

Table 2-2 Thermocouple and Thermocouple Extension Wire Polarity Color Codes (U.S. and Canada)

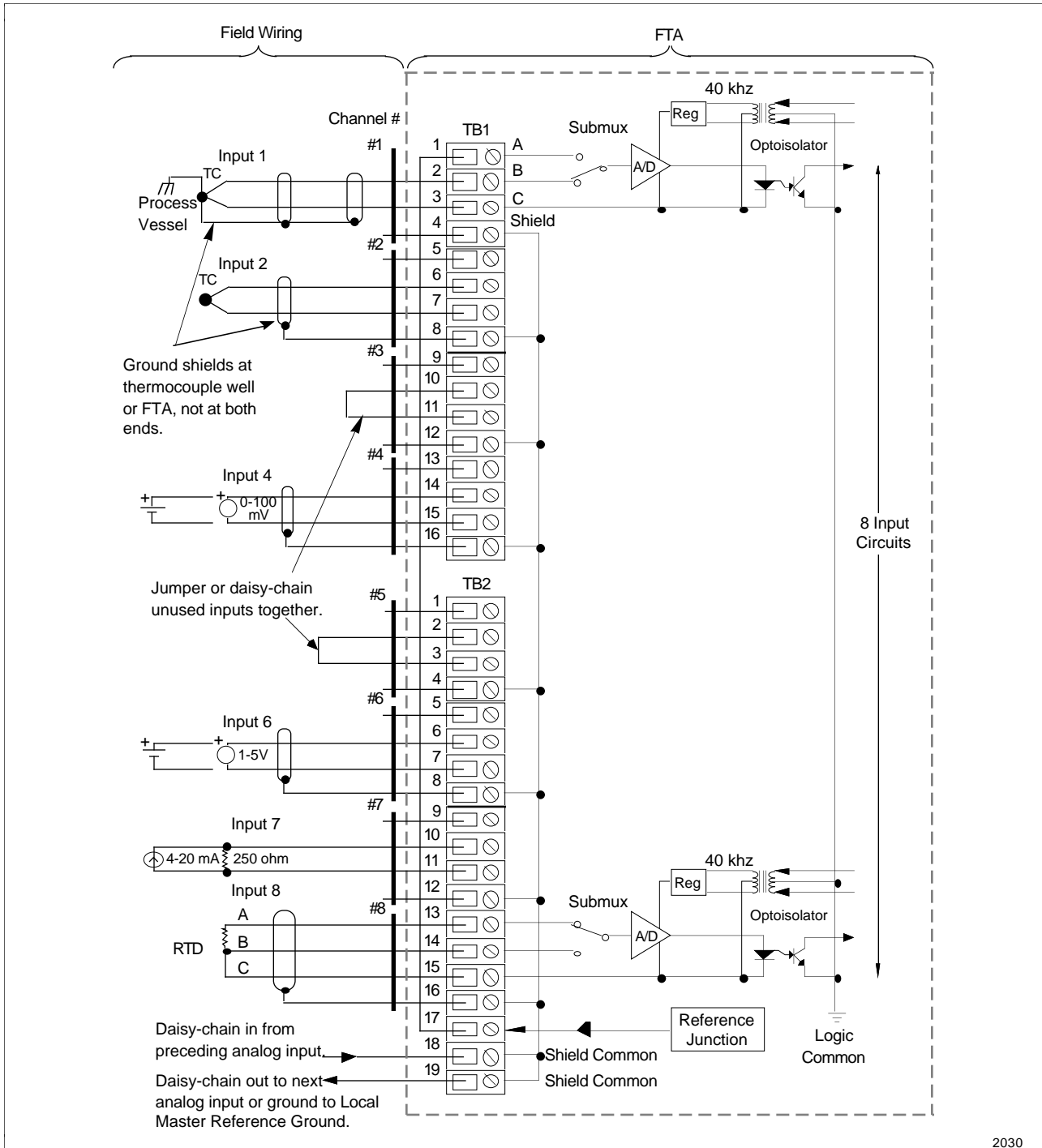
Thermocouple			Thermocouple Extension Wire	
Type	Polarity	Color Code	Polarity	Color Code
B	No Standard Established		+ - Overall cover	Gray Red Gray
E	+ - Overall cover	Purple Red Brown	+ - Overall cover	Purple Red Purple
J	+ - Overall cover	White Red Brown	+ - Overall cover	White Red Black
K	+ - Overall cover	Yellow Red Brown	+ - Overall cover	Yellow Red Yellow
R	No Standard Established		+ - Overall cover	Black Red Green
S	No Standard Established		+ - Overall cover	Black Red Green
T	+ - Overall cover	Blue Red Brown	+ - Overall cover	Blue Red Blue

Continued on next page

2.2 Low Level Analog Input (LLAI) FTAs, Continued

Model
MU-TAIL01/MU-TAIL02
TC connection diagram

Figure 2-1 Model MU-TAIL01/MU-TAIL02 Low Level Analog Input FTA with Thermocouple Connection Diagram—Non-CE Compliant



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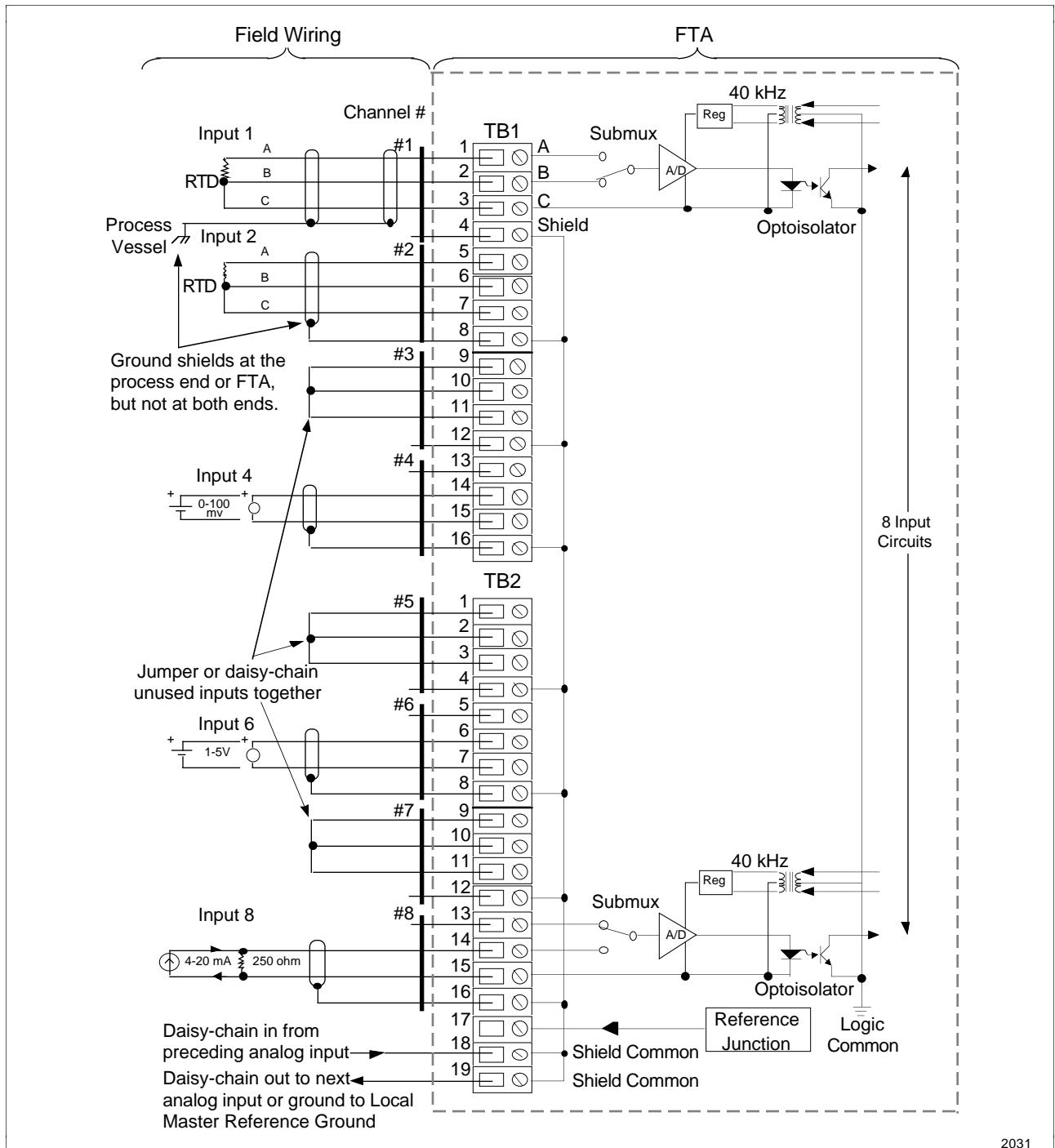
2.2 Low Level Analog Input (LLAI) FTAs, Continued

MU-TAIL01/MU-TAIL02

RTD connection

diagram

Figure 2-2 Model MU-TAIL01/MU-TAIL02 Low Level Analog Input FTA with Resistance Temperature Device Connection Diagram—Non-CE Compliant



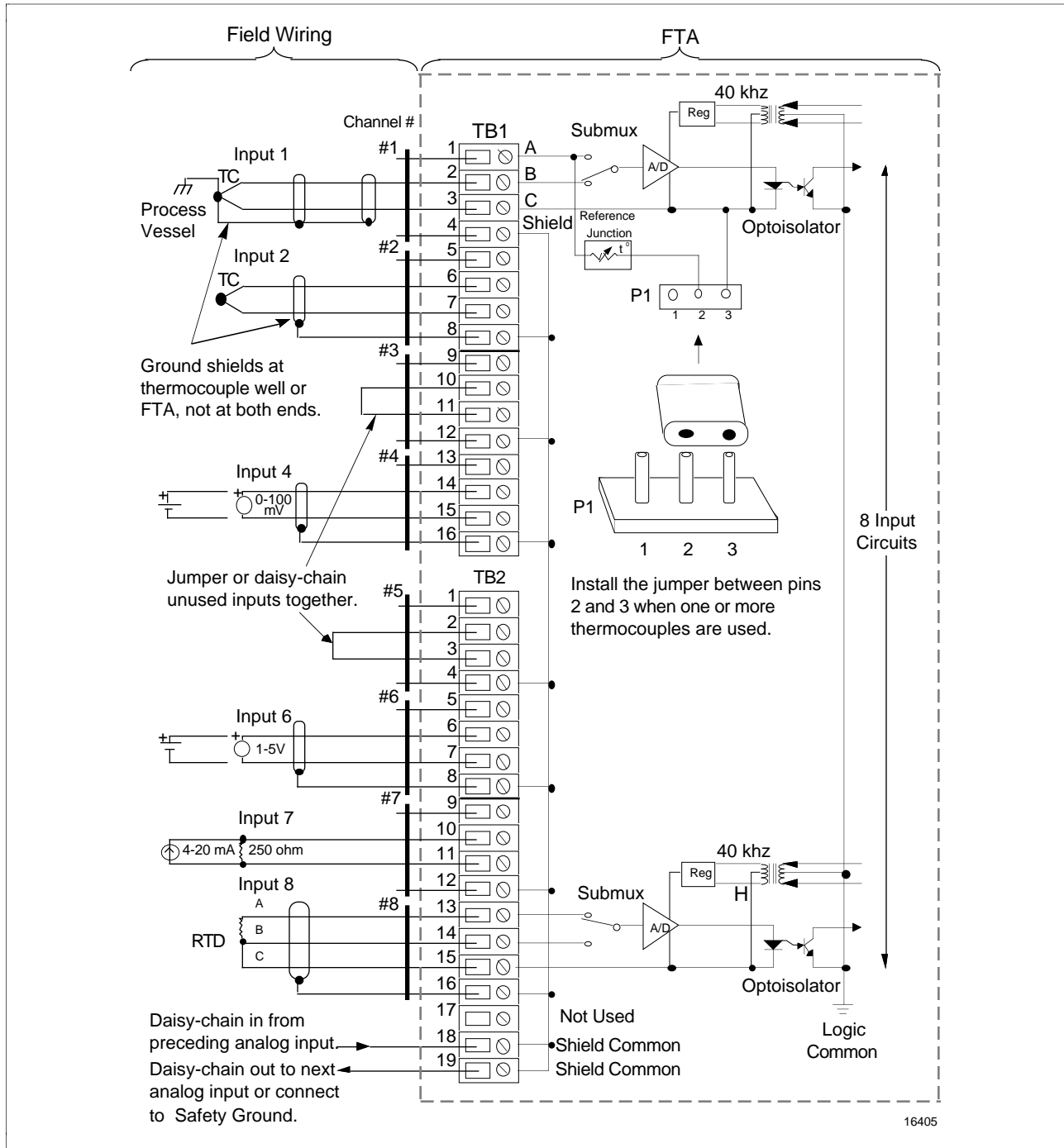
2031

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2.2 Low Level Analog Input (LLAI) FTAs, Continued

Model MU-TAIL03 TC connection diagram

Figure 2-3 Model MU-TAIL03 Low Level Analog Input FTA with Thermocouple Connection Diagram—CE Compliant

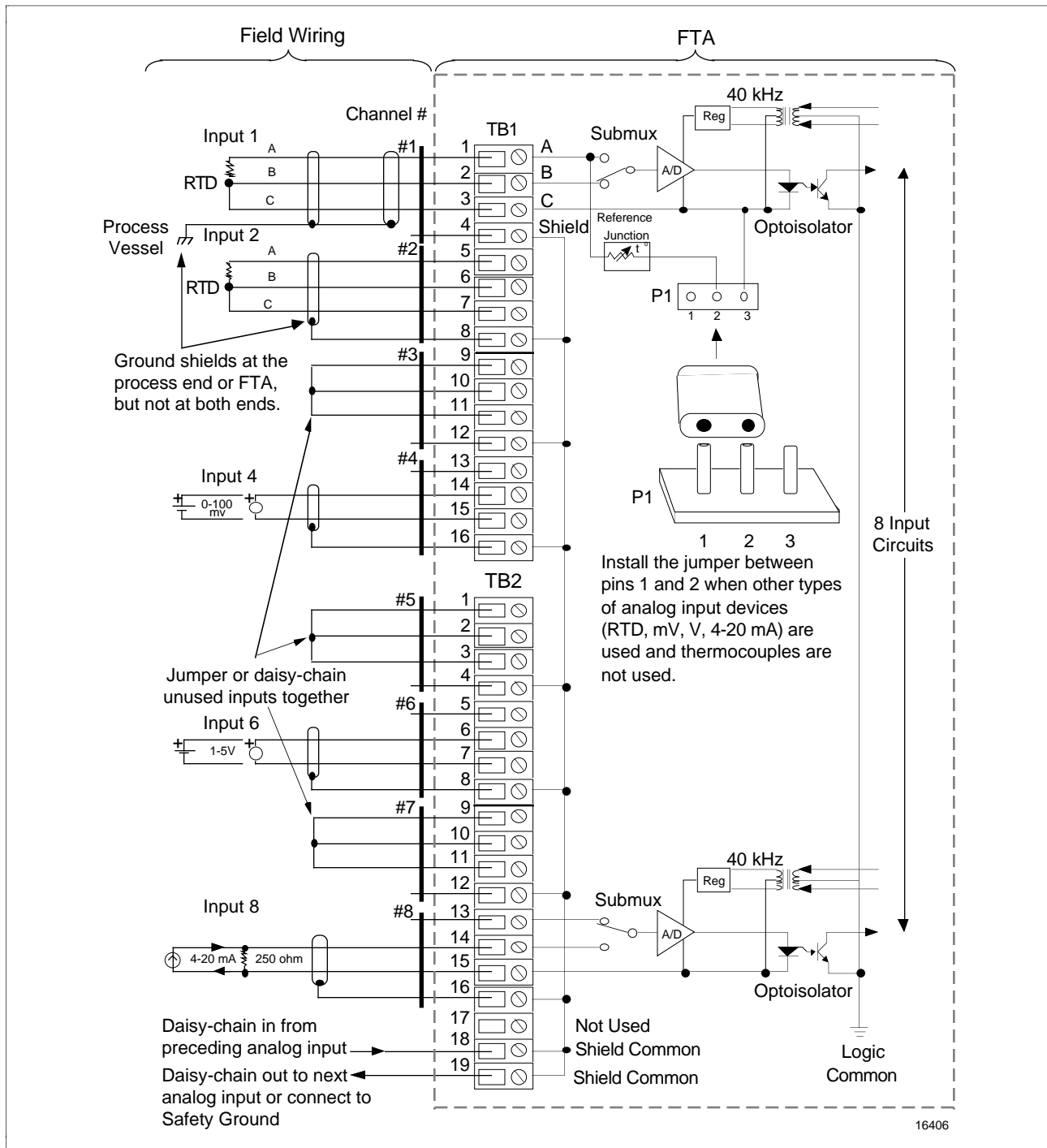


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2.2 Low Level Analog Input (LLAI) FTAs, Continued

MU-TAIL03 RTD connection diagram

Figure 2-4 Model MU-TAIL03 Low Level Analog Input FTA with Resistance Temperature Device Connection Diagram—CE Compliant

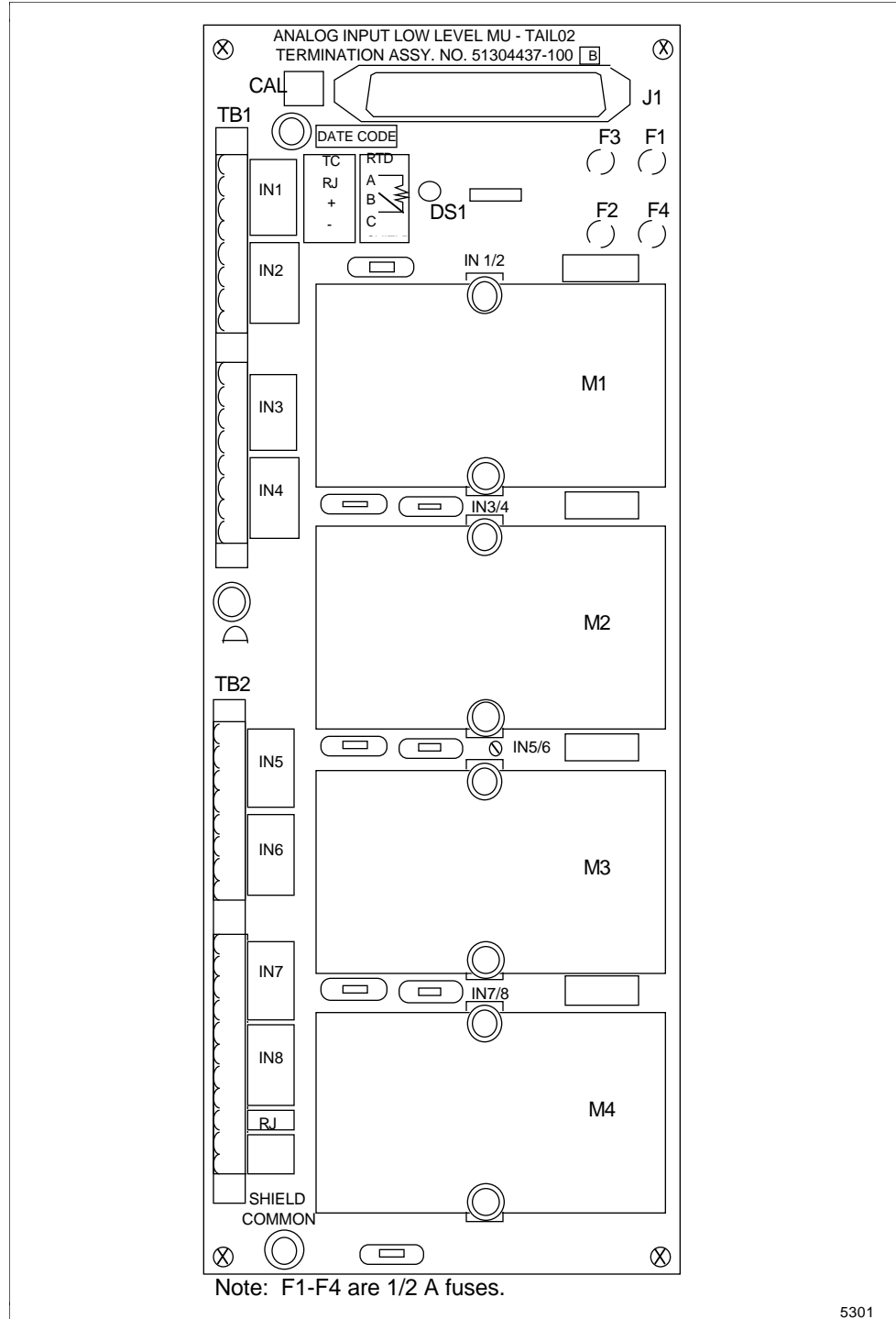


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2.2 Low Level Analog Input (LLAI) FTAs, Continued

Model MU-TAIL02 FTA assembly layout

Figure 2-5 Model MU-TAIL02 Low Level Analog Input FTA Assembly Layout—Non-CE Compliant

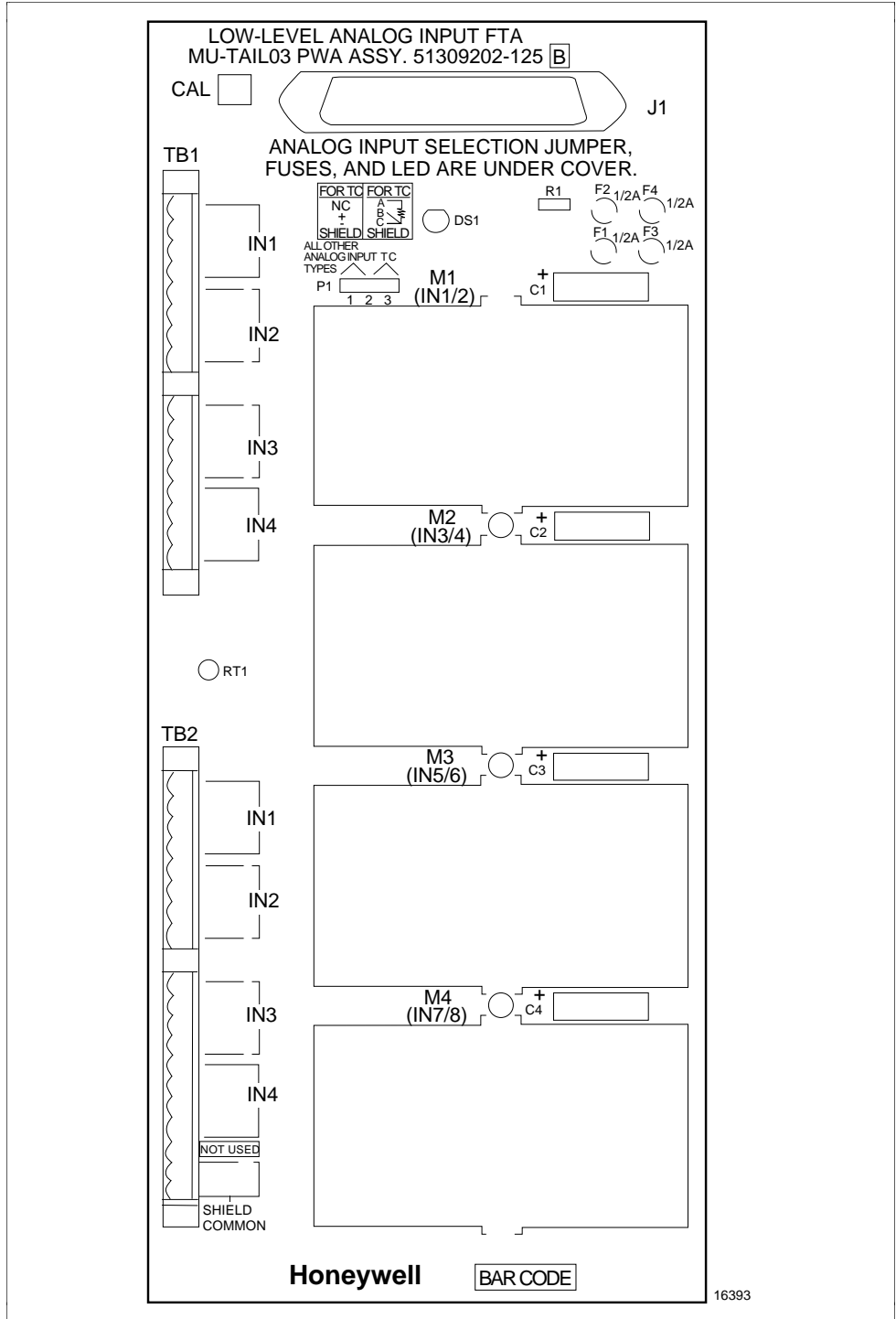


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2.2 Low Level Analog Input (LLAI) FTAs, Continued

Model MU-TAIL03 FTA
assembly layout
(EMI cover removed)

Figure 2-6 Model MU-TAIL03 Low Level Analog Input FTA
Assembly Layout (EMI Cover Removed)—CE Compliant



2.2.1 RTD Lead Resistance

RTD temperature error calculations

The temperature error caused by an RTD lead wire resistance and the Intrinsic Safety (IS) barrier resistance mismatch can be estimated by using the equations shown below.

- $T_{\text{RTD Error PT: 100 ohms}} = (R_A - R_C) (1^\circ \text{ C}/.385 \text{ ohms})$
- $T_{\text{RTD Error NI: 120 ohms}} = (R_A - R_C) (1^\circ \text{ C}/.617 \text{ ohms})$
- $T_{\text{RTD Error CU: 10 ohms}} = (R_A - R_C) (1^\circ \text{ C}/.421 \text{ ohms})$

where $T_{\text{RTD Error}}$ is in degrees C and R_A and R_C are the resistances of the RTD lead connection to the A and C screws, respectively, in ohms.

RTD temperature error measurements

Following installation, the temperature error caused by the RTD lead wire resistance and the intrinsic safety (IS). Barrier resistance mismatch can be estimated by using the following equations and procedure listed in Table 2-3.

- $T_{\text{RTD Error PT: 100 ohm}} = (V_{AB} - V_{BC}) (7300 \text{ ohm/volt}) (1^\circ \text{ C}/.385 \text{ ohm})$
- $T_{\text{RTD Error NI: 120 ohm}} = (V_{AB} - V_{BC}) (7300 \text{ ohm/volt}) (1^\circ \text{ C}/.617 \text{ ohm})$
- $T_{\text{RTD Error CU: 10 ohm}} = (V_{AB} - V_{BC}) (7300 \text{ ohm/volt}) (1^\circ \text{ C}/.421 \text{ ohm})$

Table 2-3 RTD Temperature Error Measurement Procedure

Step	Procedure
1	Connect the RTD to the LLAI FTA using the actual lead wire and the IS Barrier.
2	Short the A, B, and C terminals together at the RTD Sensor.
3	Measure the voltage between A and B (V_{AB}) and the voltage between B and C (V_{BC}) at the LLAI FTA screw terminals.
4	Disconnect the short installed in Step 2 and connect the RTD properly.

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2.2.1 RTD Lead Resistance, Continued

Maximum allowable RTD resistance

Table 2-4 is a list of the maximum allowable lead and intrinsic safety barrier resistance for various types of RTD devices.

Table 2-4 Maximum Allowable RTD Lead and IS Barrier Resistance

RTD Type	Lead Resistance		IS Barrier Resistance	
	Entire Loop	Per Leg	Entire Loop	Per Leg
Pt: 100 ohm DIN char	20 ohms	10 ohms	36 ohms	18 ohms
Pt: 100 ohm JIS char	20 ohms	10 ohms	36 ohms	18 ohms
Ni: 120 ohm Edison type 7 char	20 ohms	10 ohms	36 ohms	18 ohms
Cu: 10 ohm SEER standard char	20 ohms	10 ohms	0 ohms	18 ohms

When connected to an RTD in a Division 1 area, both the lead resistance and the Intrinsic Safety barrier resistance are allowed simultaneously.

2.3 Low Level Analog Input Multiplexer (LLMux) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

There are two models of each type of Low Level Analog Input Multiplexer (LLMux) Field Termination Assemblies. One model is CE Compliant, while the other model is not CE Compliant. The CE Compliant assembly is identified by a part number tab number that ends in “25” or “75.” The CE Compliant and non-CE Compliant FTAs have unique model numbers.

A CE Compliant version of the model MU-TLPA02 Power Adapter must be used with the CE Compliant FTA models. The CE Compliant Power Adapter assembly is identified by a part number tab number that ends in “25” or “75.”

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

Introduction

Any combination of two Thermocouple (TC) or Resistive Temperature Device (RTD) Low Level Analog Input Multiplexer (LLMux) FTAs can be connected to a Power Adapter, which then connects to a model MU-PLAM02 LLMux IOP as shown in Figures 2-7 and 2-8. A single TC or RTD LLMux FTA may also be connected.

Two FTAs per IOP and Power Adapter

Two FTAs can be supported by a single IOP through the model MU-TLPA02 Power Adapter. Each LLMux FTA accepts up to 16 low level analog inputs.

LLMux IOP

The model MU-PLAM02 LLMux IOP supports all LLMux FTA models and can be installed in any card file slot.

FTA mounting size

The FTA is a B-size (12-inch) FTA and mounts on a standard FTA Mounting Channel in the cabinet.

FTA mounting locations

The LLMux FTA can be installed in the same cabinet, or cabinet complex, as the Power Adapter or external to the cabinet.

Continued on next page

2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

LLMux FTAs and IOPs The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 2-5.

Table 2-5 Low Level Analog Input Multiplexer FTA and IOP Models

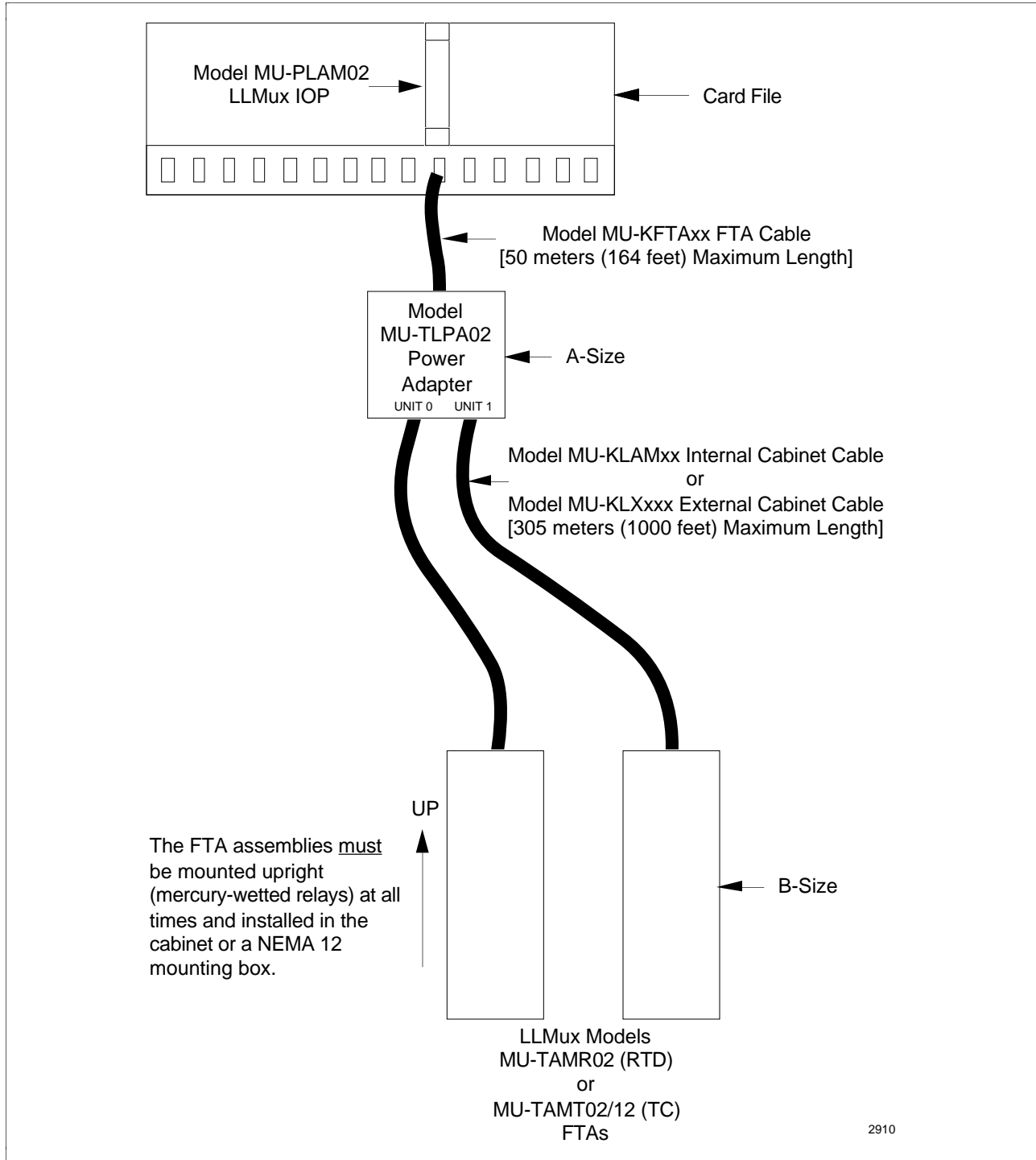
Model Number	First	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAMR02	LLMux RTD FTA with Compression Terminals Single IOP Interface	51304477-100	N/A
MC-TAMR02	LLMux RTD FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304477-150	N/A
MU-TAMR03	LLMux RTD FTA with Compression Terminals Single IOP Interface	N/A	51309218-125
MC-TAMR03	LLMux RTD FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309218-175
MU-TAMT02	LLMux TC FTA with Local CJR Compression Terminals—Single IOP Interface	51401491-100	N/A
MC-TAMT02	LLMux TC FTA with Local CJR Compression Terminals—Single IOP Interface Conformally Coated	51401491-150	N/A
MU-TAMT03	LLMux TC FTA with Local CJR Compression Terminals—Single IOP Interface	N/A	51309223-125
MC-TAMT03	LLMux TC FTA with Local CJR Compression Terminals—Single IOP Interface Conformally Coated	N/A	51309223-175
MU-TAMT12	LLMux TC FTA with Remote CJR Compression Terminals—Dual IOP Interface	51401573-100	N/A
MC-TAMT12	LLMux TC FTA with Remote CJR Compression Terminals—Dual IOP Interface Conformally Coated	51401573-150	N/A
MU-TAMT13	LLMux TC FTA with Remote CJR Compression Terminals—Dual IOP Interface	N/A	51309213-125
MC-TAMT13	LLMux TC FTA with Remote CJR Compression Terminals—Dual IOP Interface Conformally Coated	N/A	51309213-175
MU-TLPA02	Power Adapter	51304467-100	51309204-125
MC-TLPA02	Power adapter—Conformally Coated	51304467-150	51309204-175
MU-PLAM02	LLMux IOP	N/A	51304362-100
MC-PLAM02	LLMux IOP—Conformally Coated	N/A	51304362-150

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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Non-CE Compliant LLMux configuration

Figure 2-7 LLMux Configuration Interconnections—Non-CE Compliant

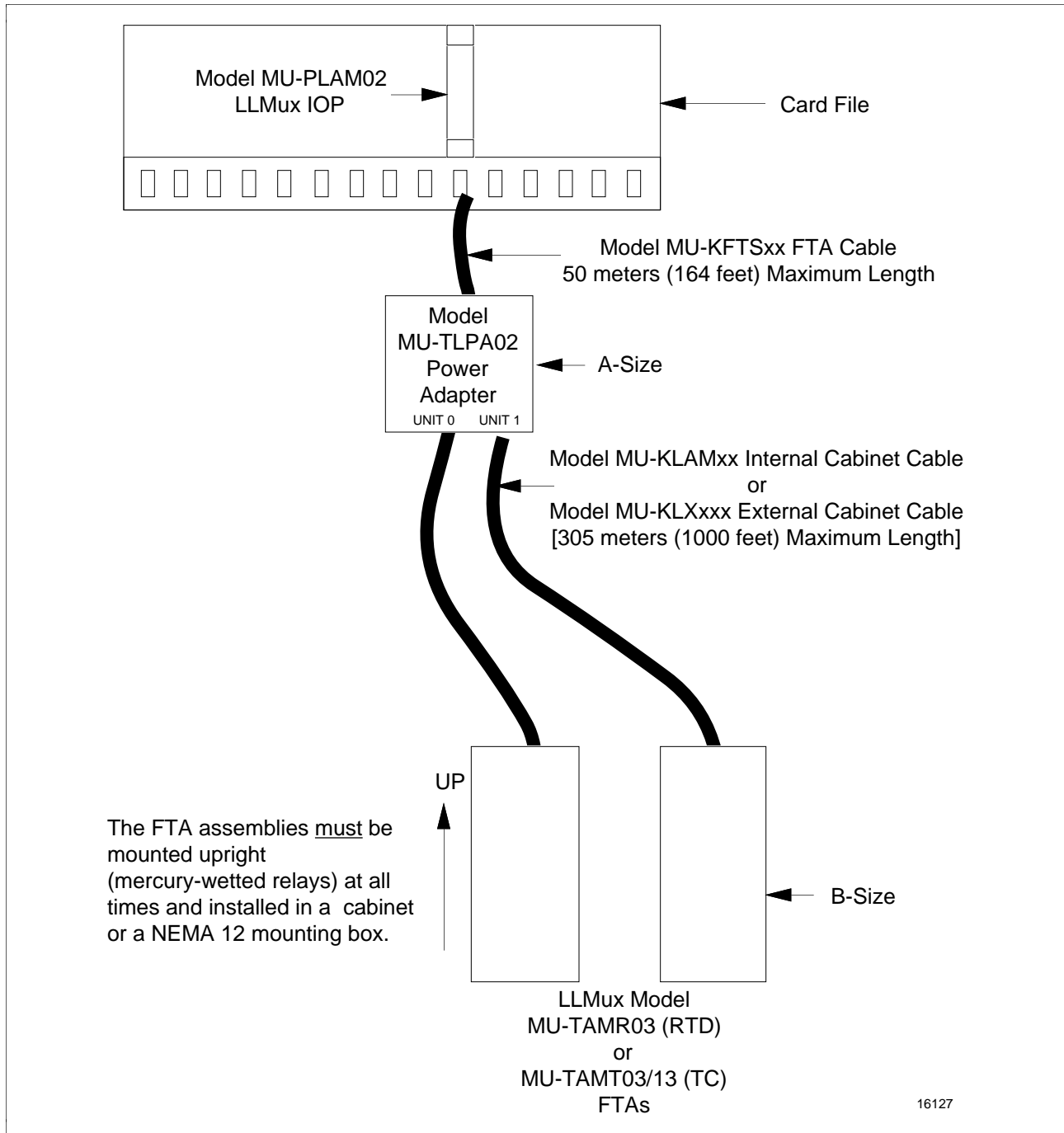


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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

CE Compliant LLMux configuration

Figure 2-8 LLMux Configuration Interconnections—CE Compliant



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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Non-CE Compliant applications of CE Compliant hardware

CE Compliant FTAs (models MU-TAMR03, MU-TAMT03, and MU-TAMT13) can be used for non-CE Compliant applications. They are compatible with both the non-CE Compliant version (51304467-100) and CE Compliant version (51309204-125) of the model MU-TLPA02 Power Adapter.

Figures 2-13 and 2-14 illustrate internal and external cabinet Power Adapter to FTA cabling, respectively. The Power Adapter shown in the illustrations is the non-CE version of the Power Adapter.

The CE Compliant FTA models have a 6-pin Power Adapter interface connector (J6), while non-CE Compliant FTA models use 4-pin connector.

Internal Power Adapter to FTA cabinet cabling

When the LLMux FTA is installed in the same cabinet, or cabinet complex, as the Power Adapter FTA, a model MU-KLAMxx cable (“xx” represents five sizes – 30, 66, 100, 200, and 300 centimeters) is used for the interconnection.

See the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* manual for part numbers.

Non-CE Compliant cable shield grounding

The model MU-KLAMxx 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 a 4-pin connector at the FTA end as shown in Figure 2-9.

This installation is not CE Compliant.

CE Compliant cable shield grounding

The model MU-KLAMxx cable has two individually shielded, twisted-pair wires. The shields of the model MU-KLAMxx cable must be connected to ground at both ends of the cable. The wire and shield connections are made by using the compression terminals in a 6-pin connector on both the Power Adapter and FTA as shown in Figure 2-10.

This installation is CE Compliant.

External Power Adapter to FTA cabinet cabling

When a LLMux FTA is not installed in the same cabinet, or cabinet complex, as the Power Adapter and up to 305 meters (1000 feet) from the Power Adapter, a model MU-KLXxxx cable (“xxx” represents three sizes, 76, 152, and 305 meters, for external cabinet installation) is used for the interconnection.

See the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* manual manual for cable part numbers.

Continued on next page

2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Non-CE Compliant cable shield grounding

The model MU-KLXxxx cable has two twisted-pair wires within a single braided shield. The shield must be grounded only at the Power Adapter end of the cable. The connections are made by using the compression terminals in the 6-pin connector at the Power Adapter end and the 4-pin connector at the FTA end of the cable as shown in Figure 2-11.

This installation is not CE Compliant.

CE Compliant cable shield grounding

The model MU-KLXxxx cable has two twisted-pair wires within a single braided shield. The shield must be connected to ground at both the Power Adapter and FTA ends of the cable. The connections are made by using the compression terminals in a 6-pin connector at both the Power Adapter and FTA ends of the cable as illustrated in Figure 2-12.

This installation is CE Compliant.

Power Adapter assembly layout

Figure 2-15 illustrates the assembly layout of the Power Adapter.

Power Adapter mounting location

The model MU-TLPA02 Power Adapter is the same size as an A-size (6-inch) FTA and can be installed on a standard FTA Mounting Channel.

Non-CE Compliant IOP to Power Adapter cabling

When installing non-CE Compliant assemblies, the IOP to Power Adapter connection is made by using a model MU-KFTAxx cable (the suffix “xx” represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as illustrated in Figure 2-7.

See the *Process Manager/Advanced Process Manager Service* or *Process Manager/Advanced Process Manager Installation* manual for the lengths available.

CE Compliant IOP to Power Adapter cabling

When installing CE Compliant assemblies, the IOP to Power Adapter connection is made by using a model MU-KFTSxx cable (the suffix “xx” represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as shown in Figure 2-8.

See the *Process Manager/Advanced Process Manager Service* or *Process Manager/Advanced Process Manager Installation* manual for the lengths available.

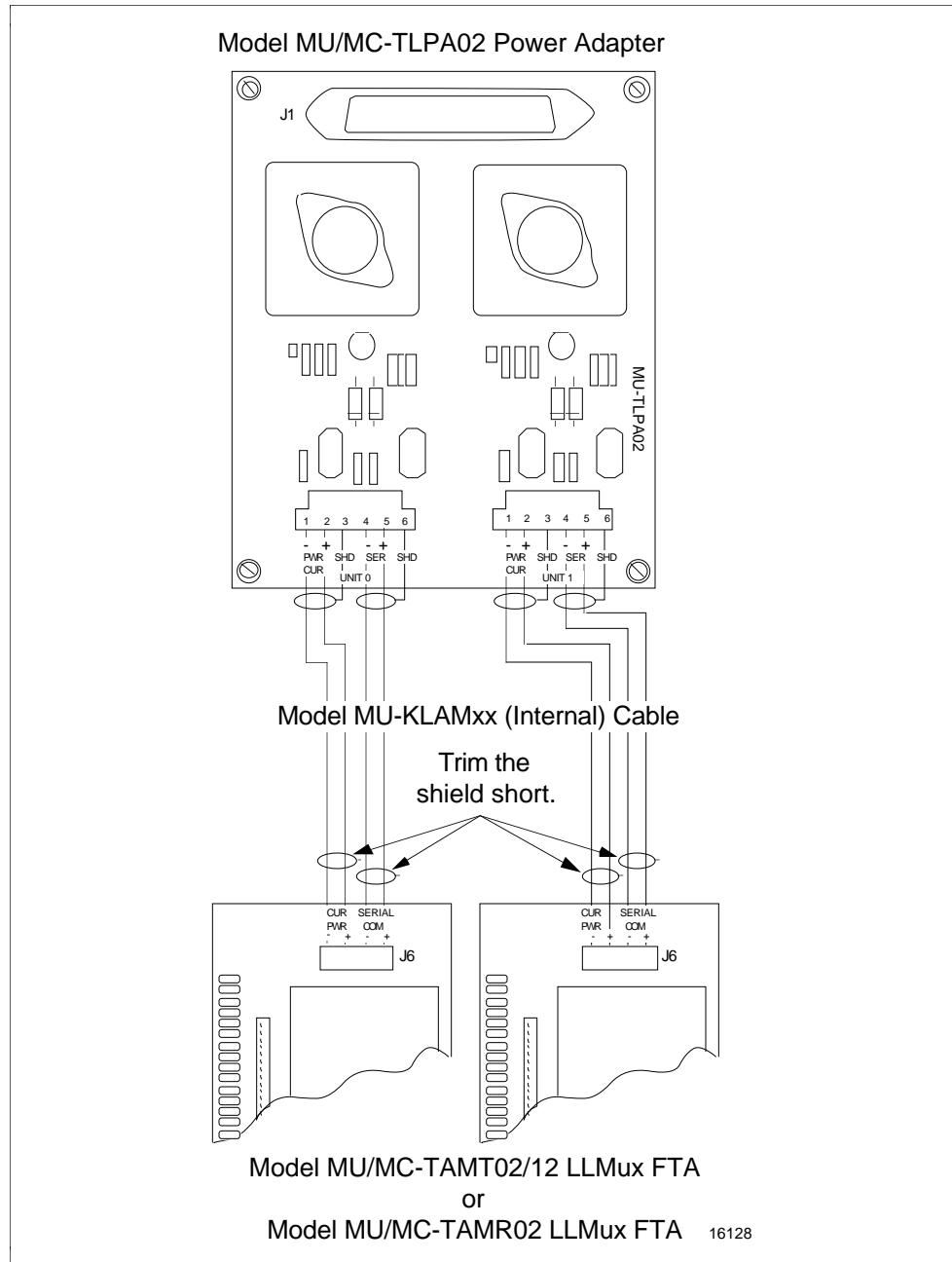
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Non-CE Compliant Power Adapter to FTA internal cabinet cabling

Figure 2-9 illustrates the Power Adapter to LLMux FTA internal cabinet cabling when non-CE Compliant FTA models are used and the Power Adapter assembly is non-CE Compliant.

Figure 2-9 Power Adapter to LLMux FTA Internal Cabinet Cabling—Non-CE Compliant Assemblies



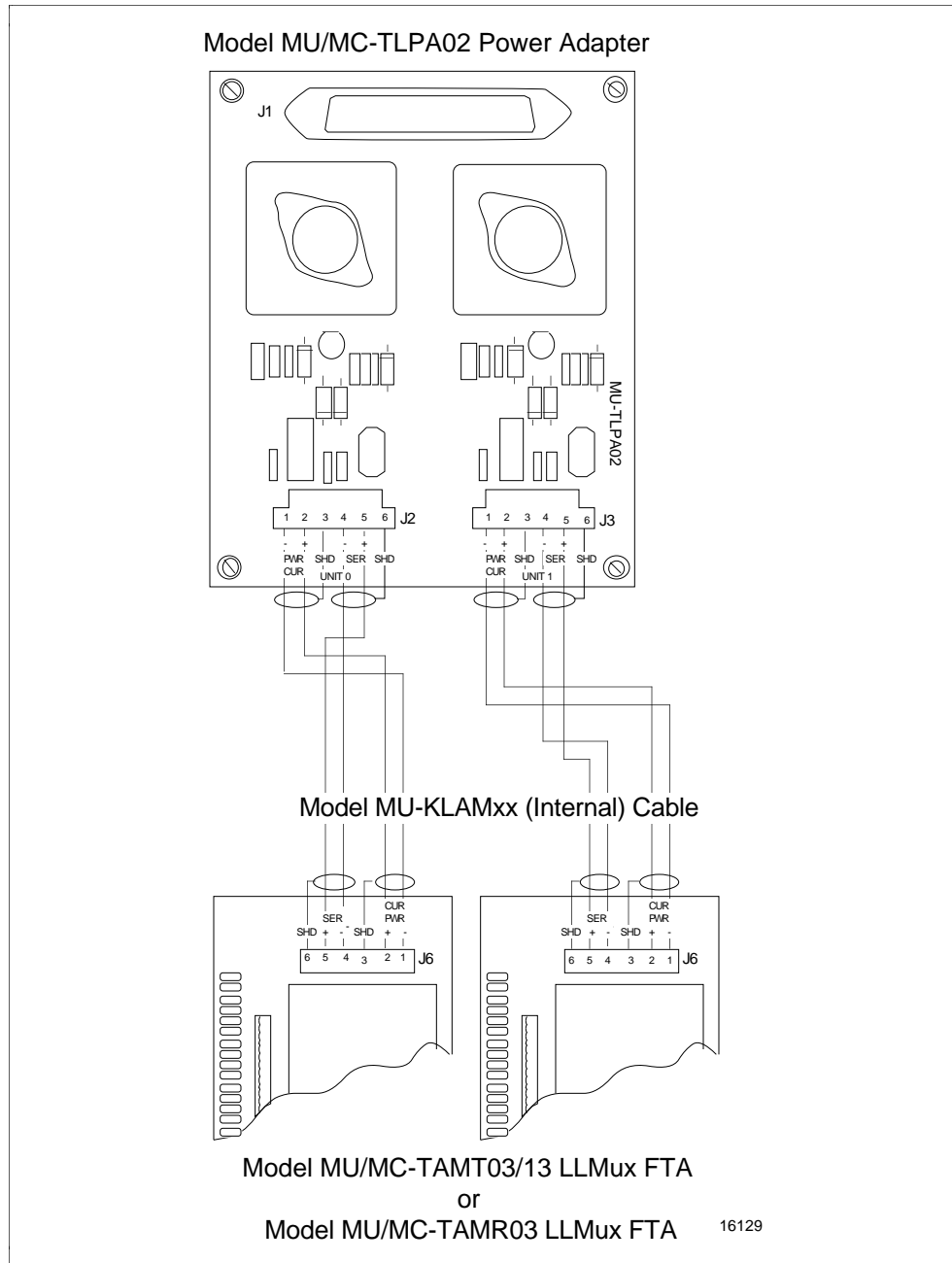
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

CE Compliant Power Adapter to FTA internal cabinet cabling

Figure 2-10 illustrates the Power Adapter to LLMux FTA internal cabinet cabling when CE Compliant FTA models are used and the Power Adapter assembly is CE Compliant.

Figure 2-10 Power Adapter to LLMux FTA Internal Cabinet Cabling—CE Compliant Assemblies



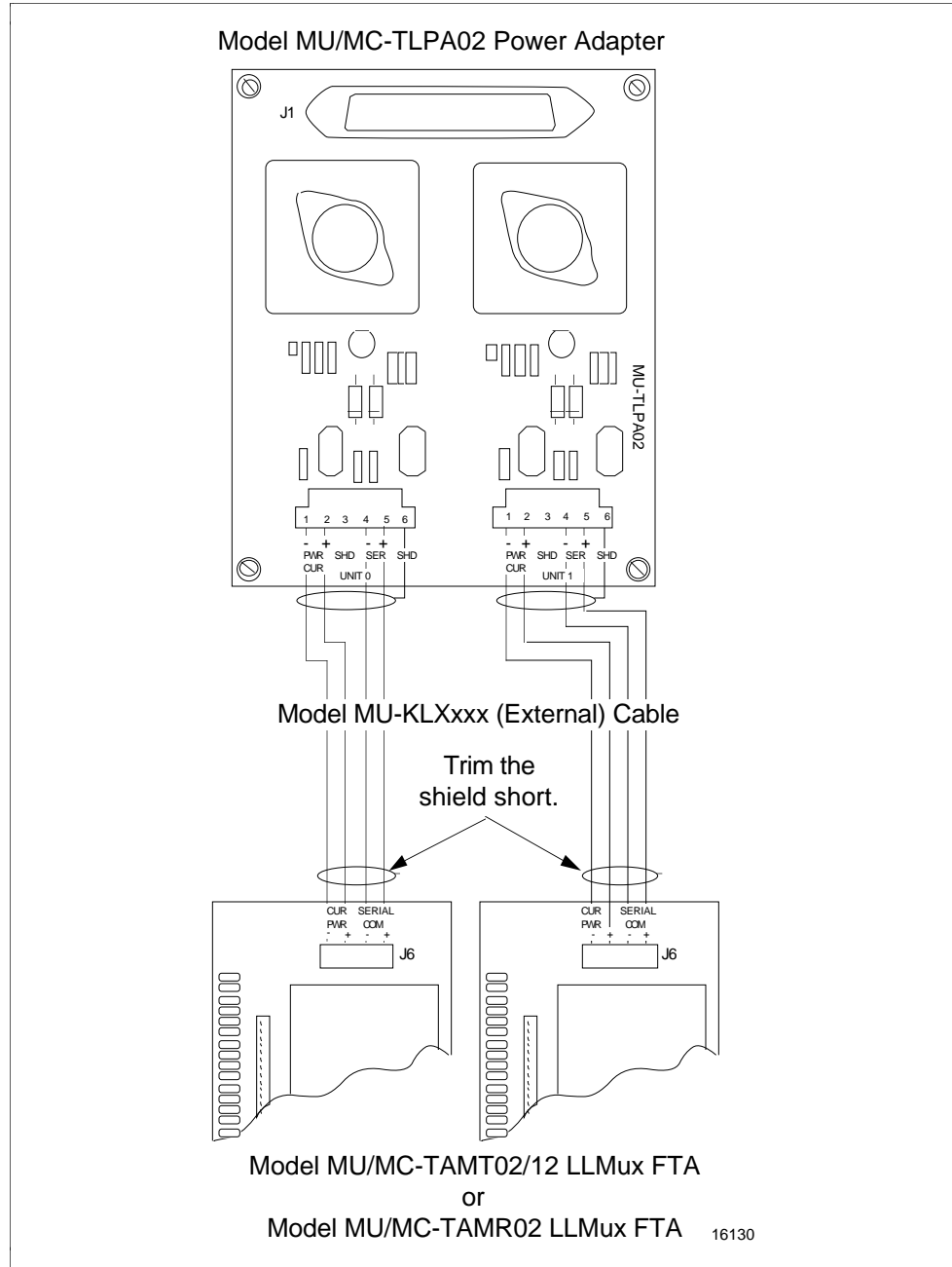
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Non-CE Compliant Power Adapter to FTA external cabinet cabling

Figure 2-11 illustrates the Power Adapter to LLMux FTA External cabinet cabling when non-CE Compliant FTA models are used and the Power Adapter assembly is non-CE Compliant.

Figure 2-11 Power Adapter to LLMux FTA External Cabinet Cabling—Non-CE Compliant Assemblies



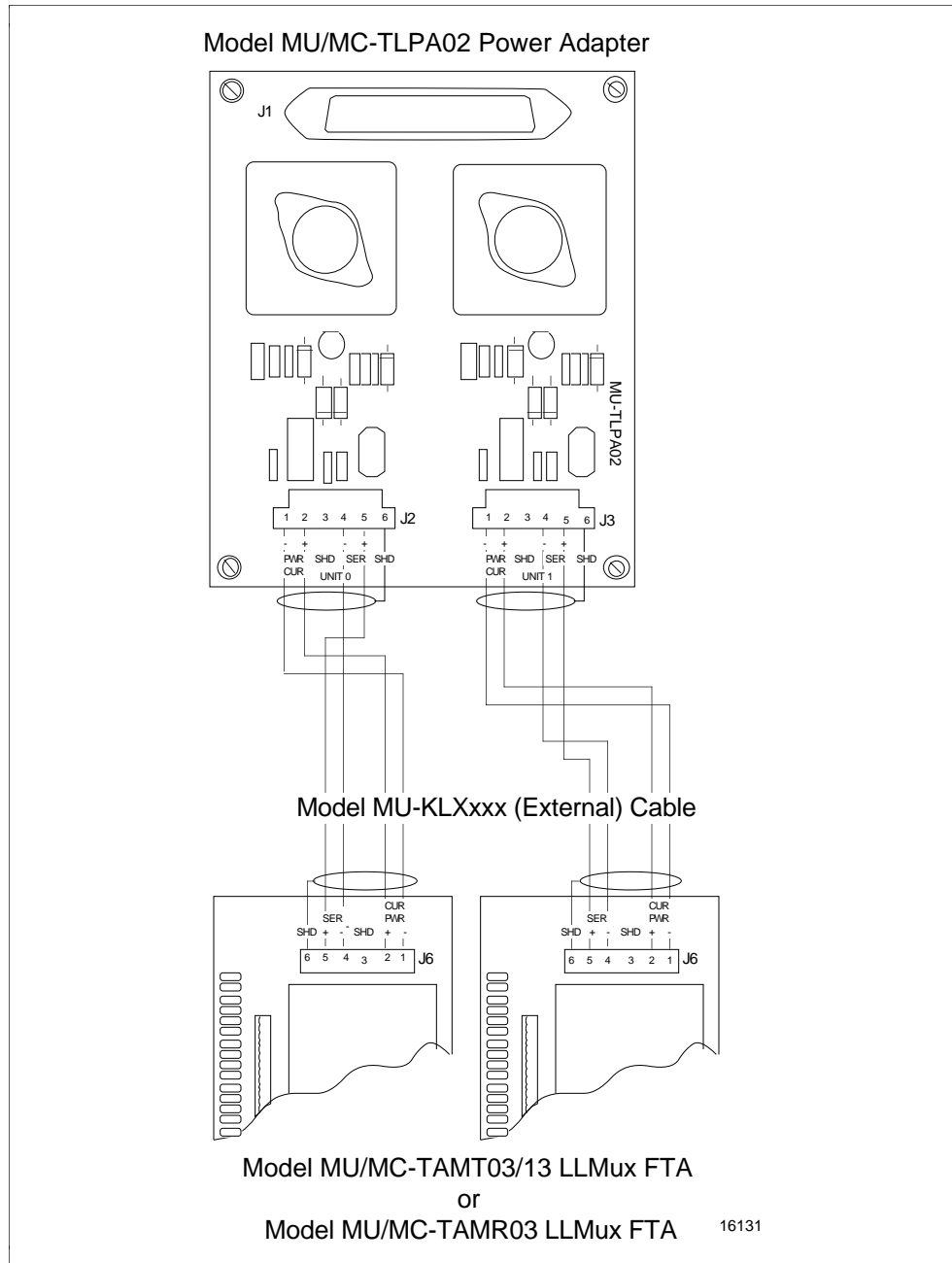
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

CE Compliant Power Adapter to FTA external cabinet cabling

Figure 2-12 illustrates the Power Adapter to LLMux FTA external cabinet cabling when CE Compliant FTA models are used and the Power Adapter assembly is CE Compliant.

Figure 2-12 Power Adapter to LLMux FTA External Cabinet Cabling—CE Compliant Assemblies



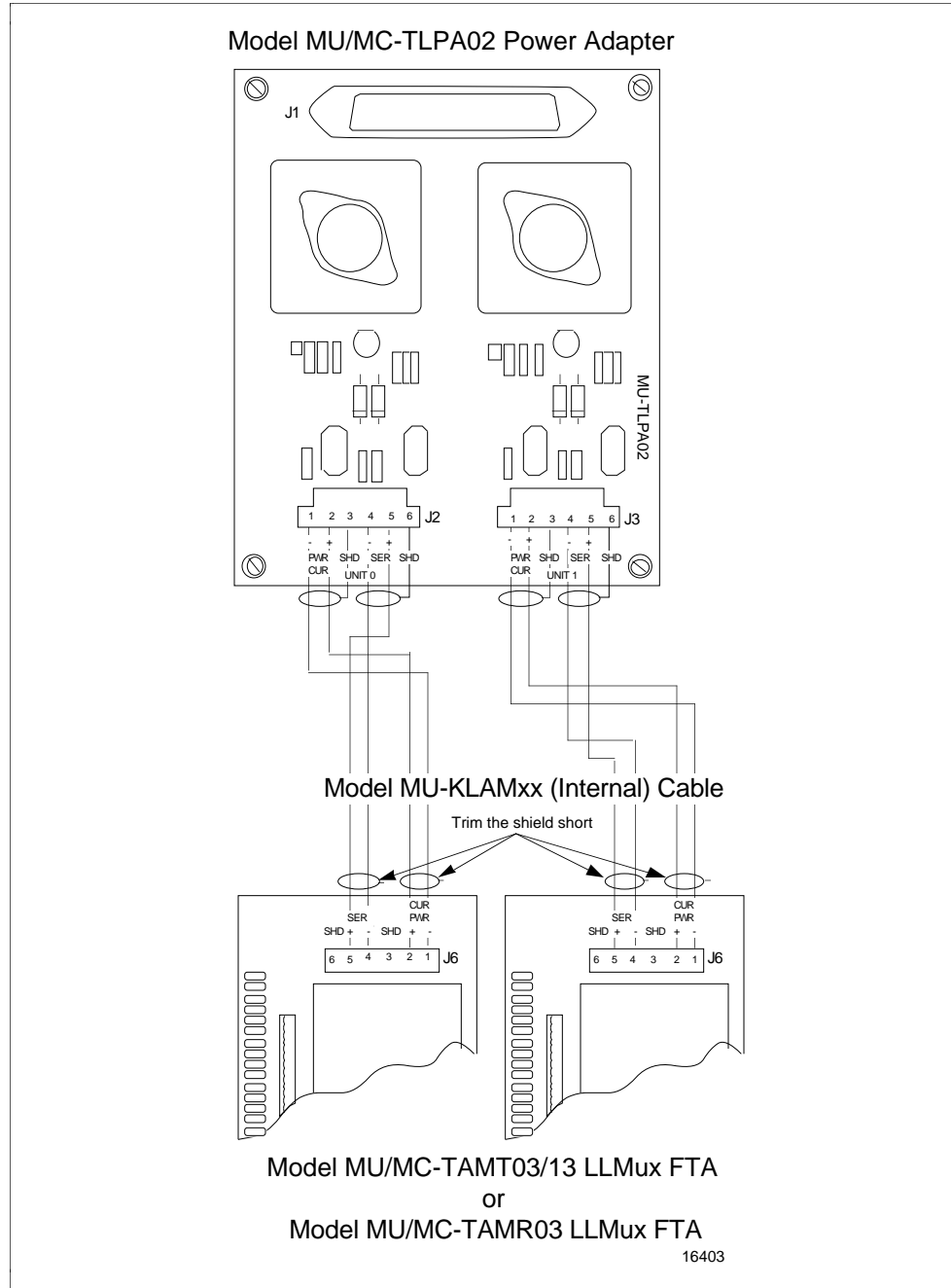
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Power Adapter to FTA internal cabinet cabling

Figure 2-13 illustrates the Power Adapter to LLMux FTA internal cabinet cabling when CE Compliant FTA models are used, but CE Compliance is not a requirement.

Figure 2-13 Power Adapter to LLMux FTA Internal Cabinet Cabling—CE Compliant FTAs



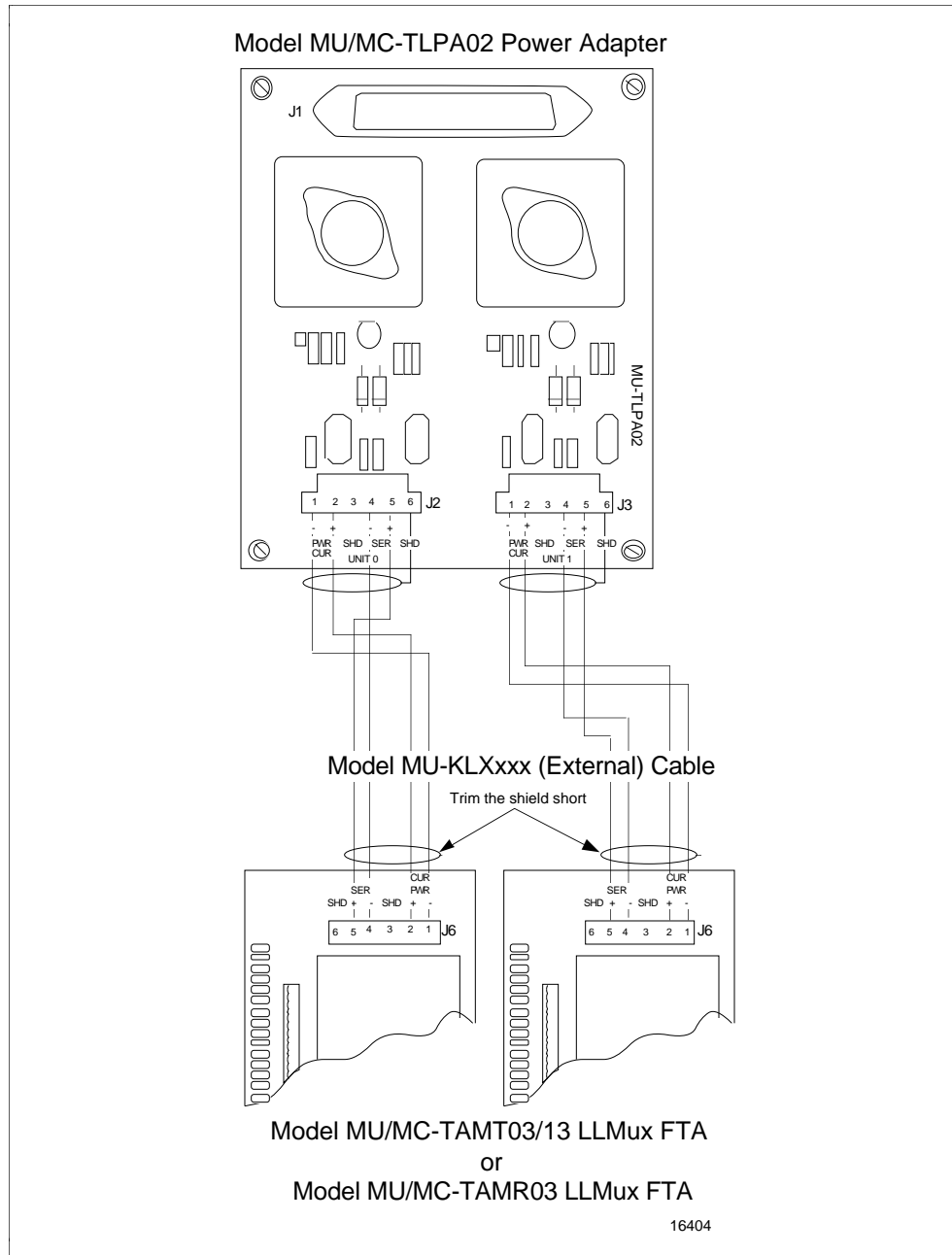
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Power Adapter to FTA External cabinet cabling

Figure 2-14 illustrates the Power Adapter to LLMux FTA external cabinet cabling when CE Compliant FTA models are used, but CE Compliance is not a requirement.

Figure 2-14 Power Adapter to LLMux FTA External Cabinet Cabling—
CE Compliant FTAs

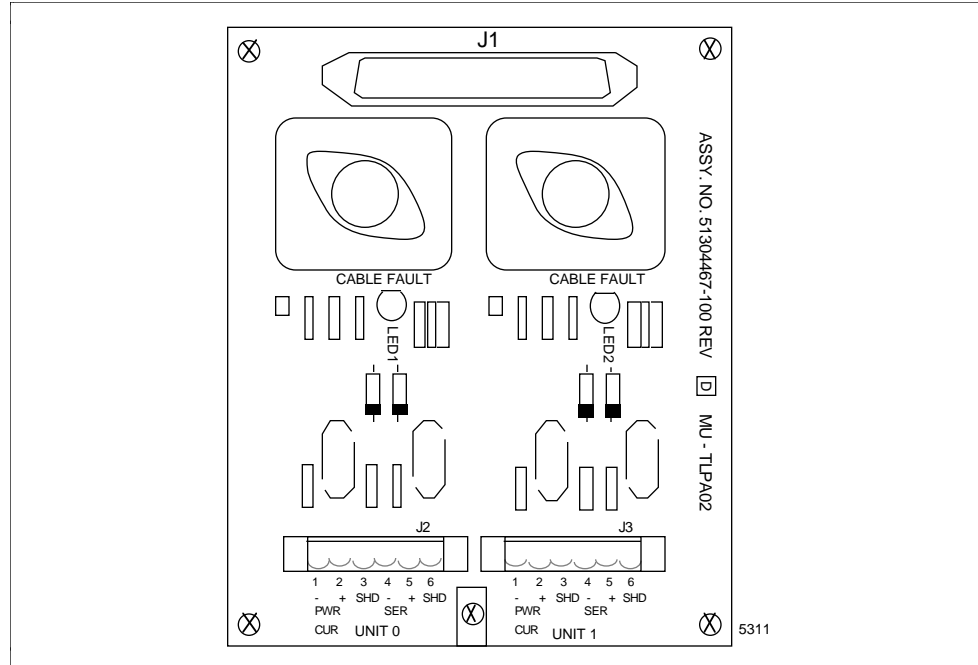


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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Model MU-TLPA02 assembly layout

Figure 2-15 Model MU-TLPA02 Power Adapter Assembly Layout



Power Adapter to FTA cable specifications

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

Model MU-KLAMxx cable

- Manufacturer Type—Belden 9406
- Cable Configuration—Shielded double pair
- Flame Resistance Conformity—CSA FT4
- CSA Type—CMG
- NEC Type—CMG

Model MU-KLXxxx cable

- Manufacturer Type—Belden 83654
- Cable 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

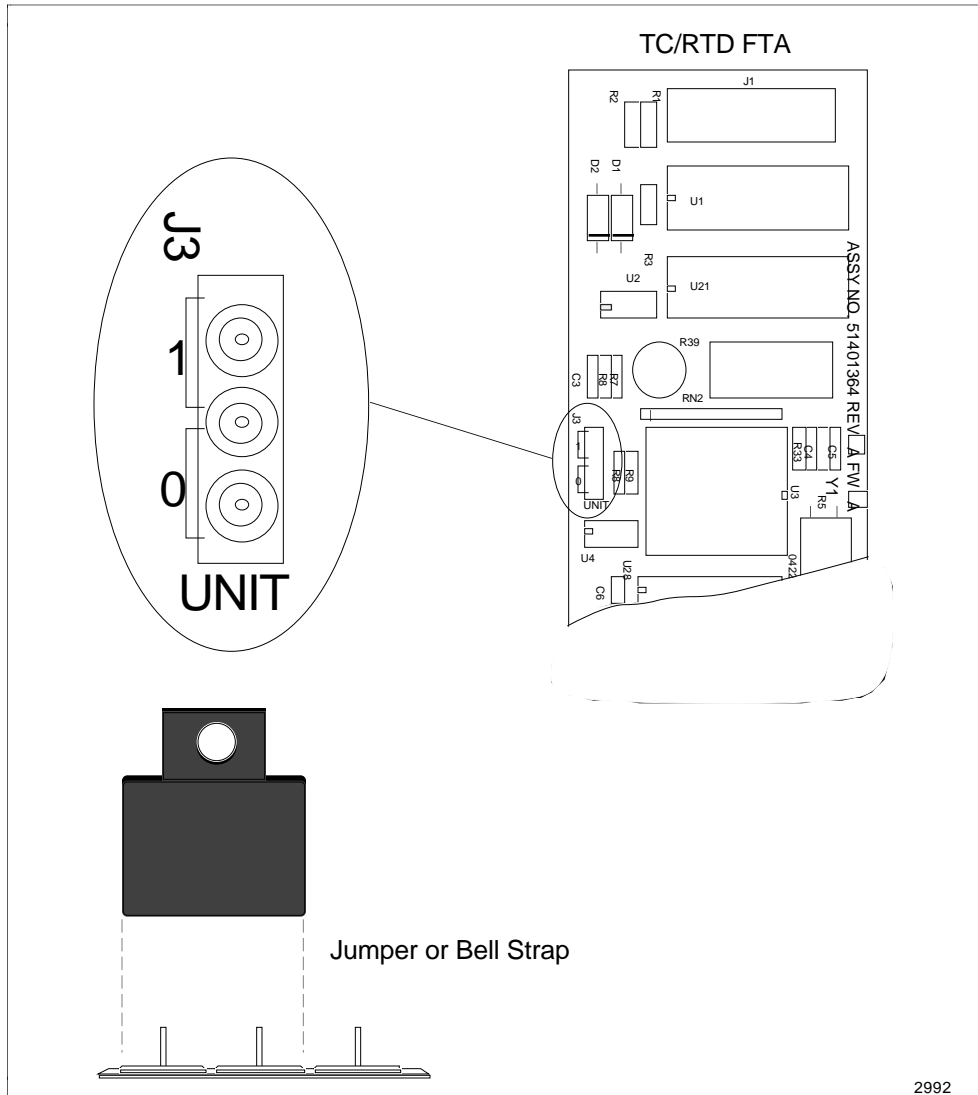
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2.3 Low Level Analog Input Multiplexer (LLMux) FTAs, Continued

Power Adapter configuration

Because the Power Adapter has two connection terminals, identified as **Unit 0** and **Unit 1**, the LLMux FTA must be configured for the selected connection to the Power Adapter by a jumper on the FTA's daughter board as shown in Figure 2-16. Select either **Unit 0** or **Unit 1** with the jumper on the daughter board. The Unit 0 FTA is channels 1 through 16, while the Unit 1 FTA is channels 17 through 32.

Figure 2-16 TC/RTD LLMux FTA Address Selection



2.3.1 Thermocouple (TC) LLMux FTAs

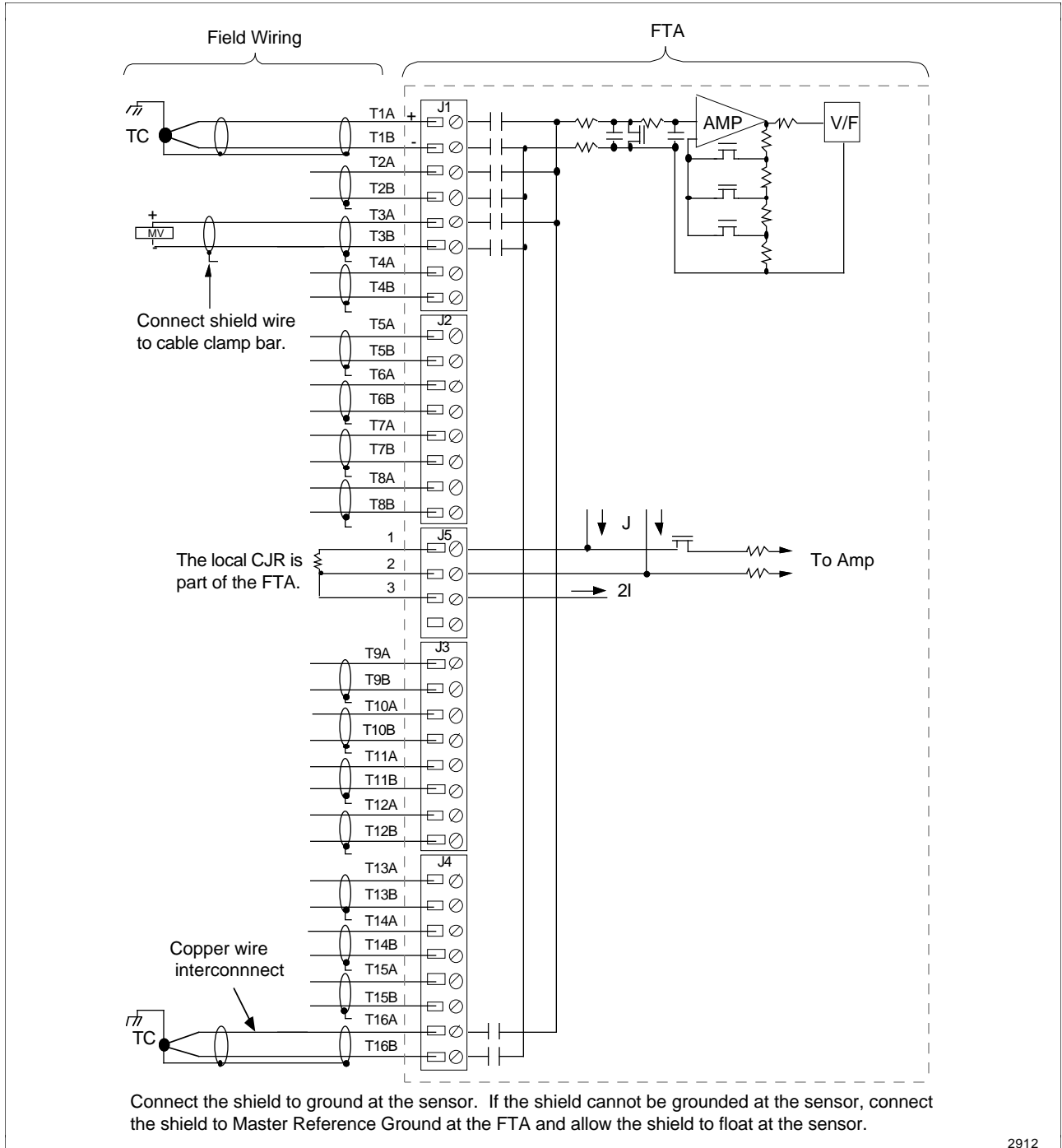
Introduction	Up to 16 thermocouples (TCs) can be connected to each Thermocouple (TC) LLMux FTA.
Connection diagrams	Figures 2-17 and 2-18 are connection diagrams for the model MU-TAMT02 and MU-TAMT03 TC LLMux FTAs, respectively. Figures 2-19 and 2-20 are connection diagrams for the model MU-TAMT12 and MU-TAMT13 TC LLMux FTAs, respectively.
Assembly layout illustrations	Figures 2-21 through 2-24 illustrate the assembly layouts of the model MU-TAMT02, MU-TAMT03, MU-TAMT12, and MU-TAMT13 TC LLMux FTAs, respectively.
Cold Junction Reference	The model MU-TAMT02 and MU-TAMT03 TC LLMux FTAs have a local Cold Junction Reference (CJR) on the assembly, while the model MU-TAMT12 and MU-TAMT13 FTAs provide terminal connections for a remote CJR sensor, Honeywell part number 51304589-100, that can be located remotely up to 50 meters (150 feet) from the FTA, by using model MU-KRCJ00 shielded 3-conductor 1 mm ² (18 AWG) copper wire.
CE Compliance	<p>Figure 2-25 illustrates remote CJR installation requirements. Model MU-KRCJ00 cable must be used between the remote CJR sensor and the model MU-TAMT13 or MC-TAMT13 FTA. Its length is restricted to 50 meters (164 feet). The cable shield must be connected to Safety Ground at both ends of the cable.</p> <p>All remote terminations and the remote CJR sensor assembly must be located in the same cabinet. Figures 2-19 and 2-20 illustrate the remote CJR sensor and FTA connections.</p>
Model MU-KRCJ00 remote CJR cable	<p>The model MU-KRCJ00 cable has the following specifications:</p> <ul style="list-style-type: none">• Manufacturer Type—Belden model 83653, or equivalent• Conductors—Three 1.0 mm² (18 AWG) conductors• Insulation and Jacket—Teflon[®] conductor insulation and jacket• Shielding—Braid over foil• CSA Type—PCC FT 4 FT 6• NEC Type—CMP• Use—Air plenum

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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT02 connection diagram

Figure 2-17 Model MU-TAMT02 Thermocouple LLMux FTA with Local CJR Connection Diagram

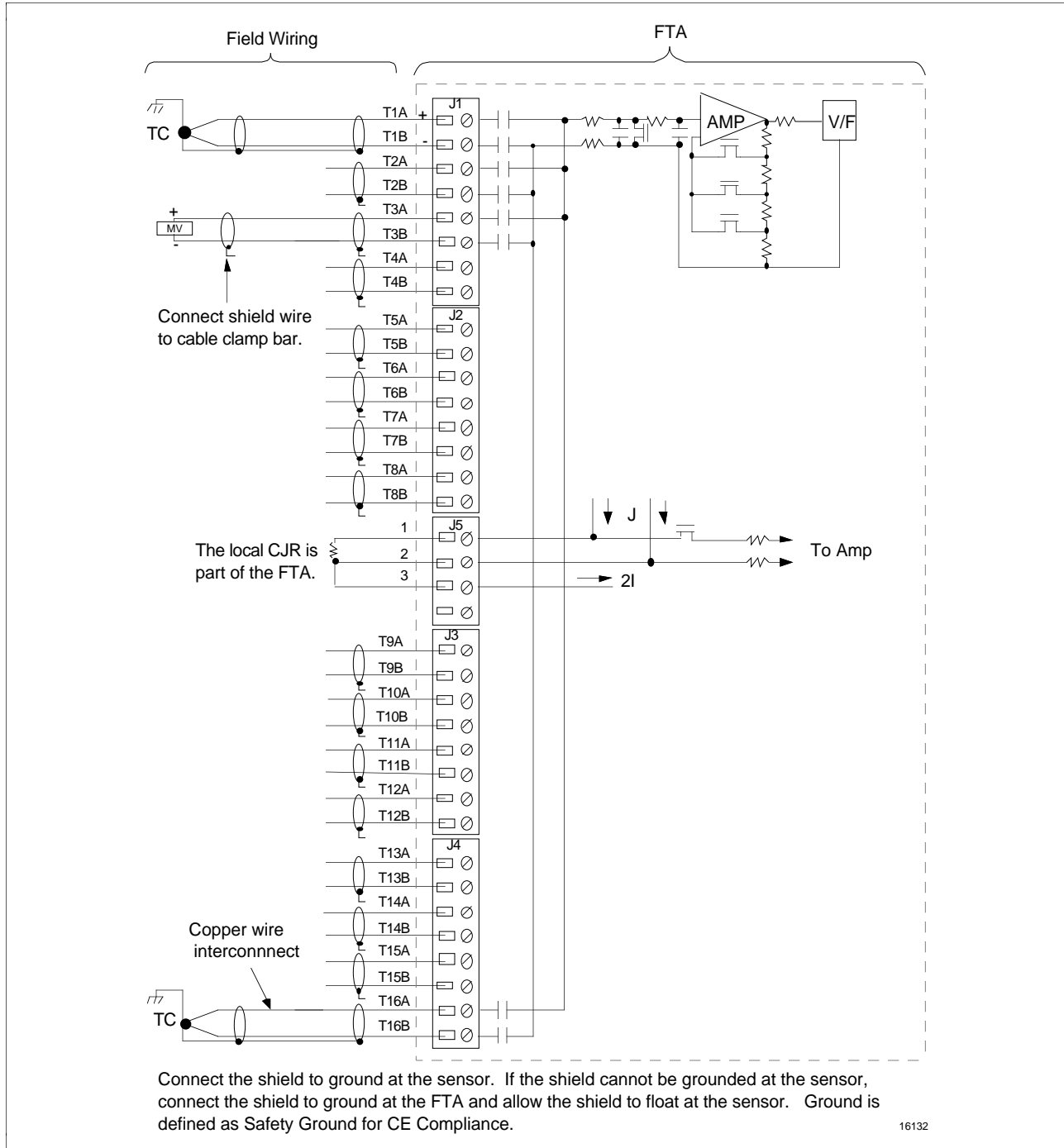


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT03 connection diagram

Figure 2-18 Model MU-TAMT03 Thermocouple LLMux FTA with Local CJR Connection Diagram

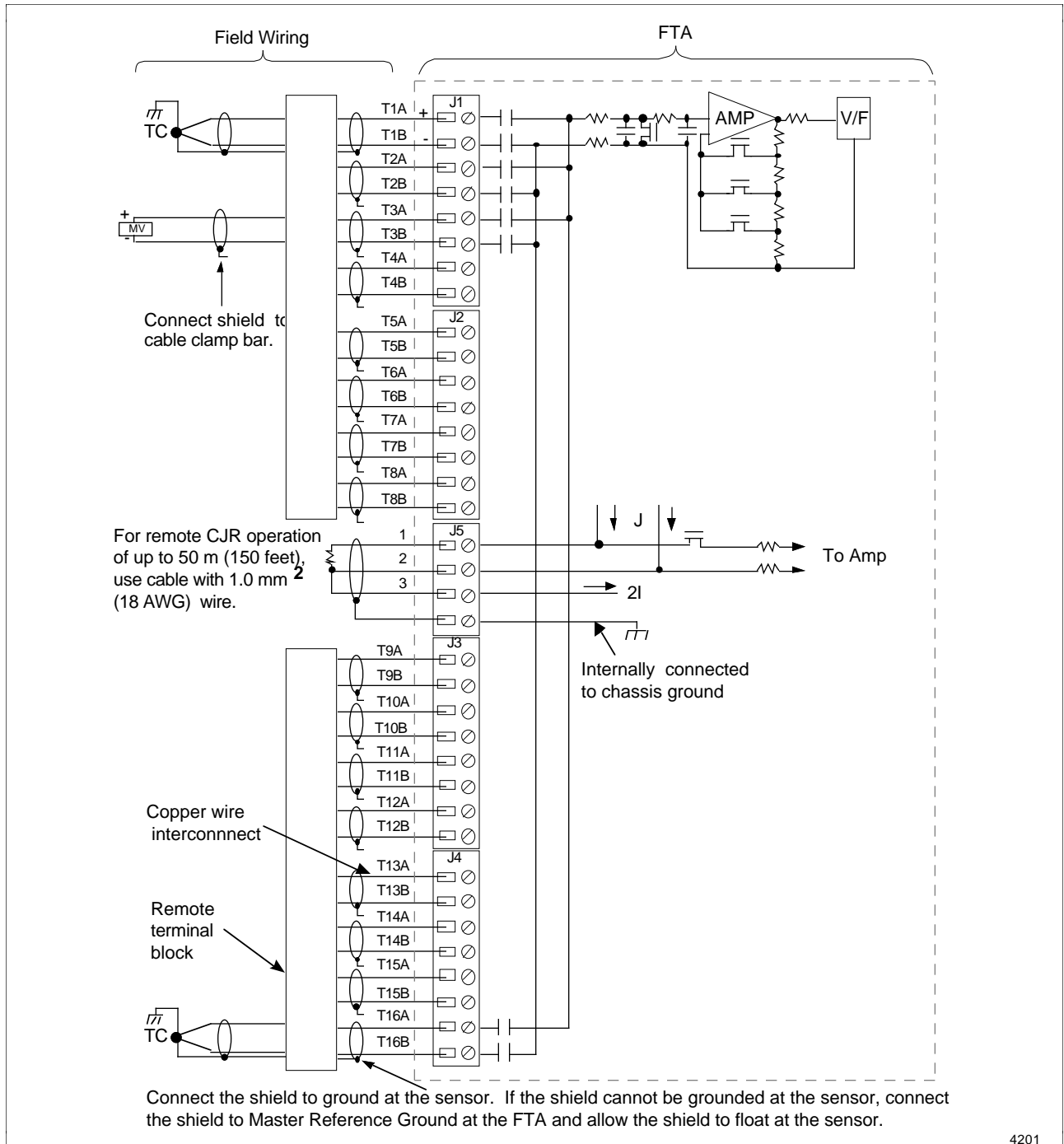


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT12 connection diagram

Figure 2-19 Model MU-TAMT12 Thermocouple LLMux FTA with Remote CJR Connection Diagram

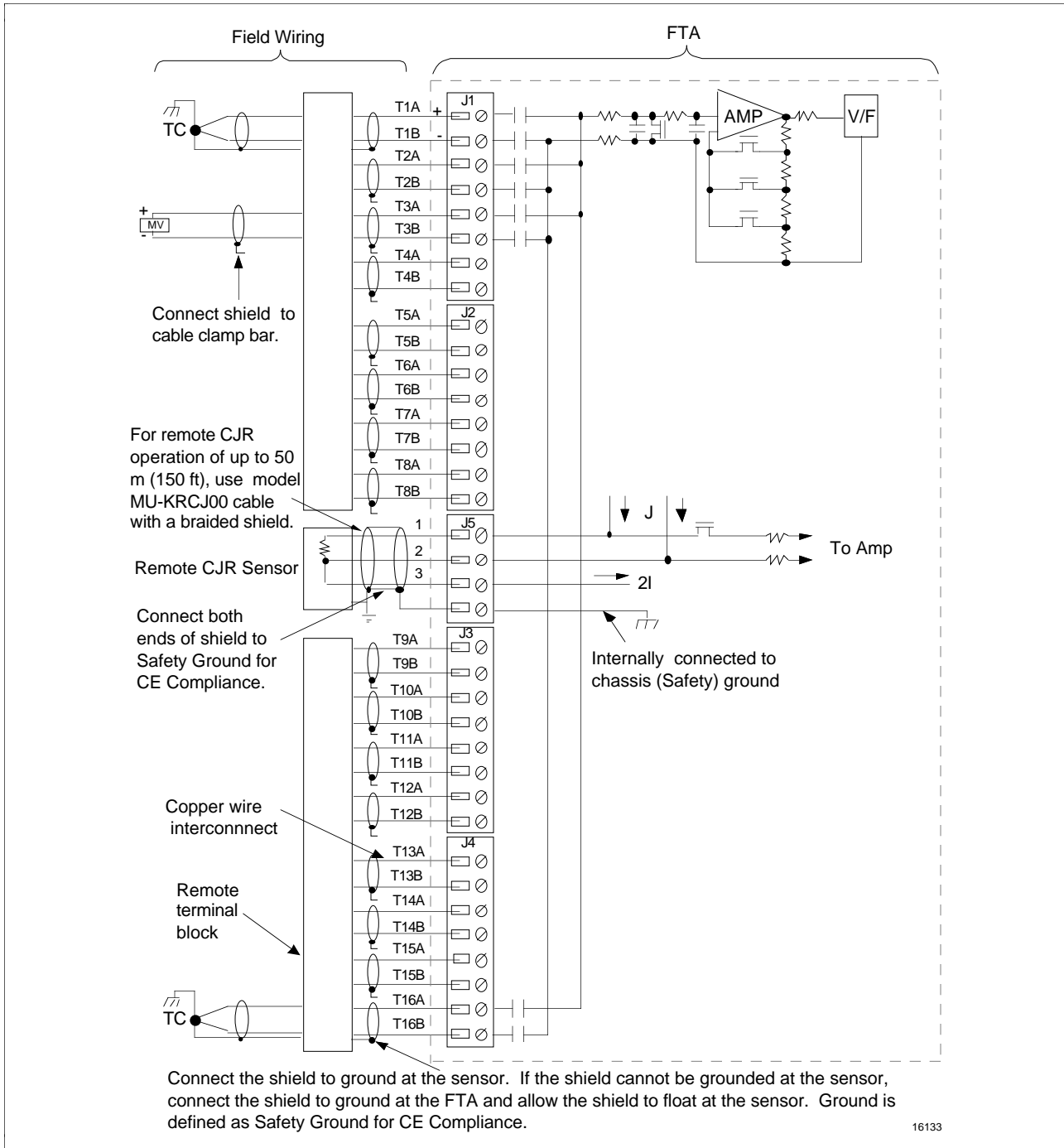


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT13 connection diagram

Figure 2-20 Model MU-TAMT13 Thermocouple LLMux FTA with Remote CJR Connection Diagram

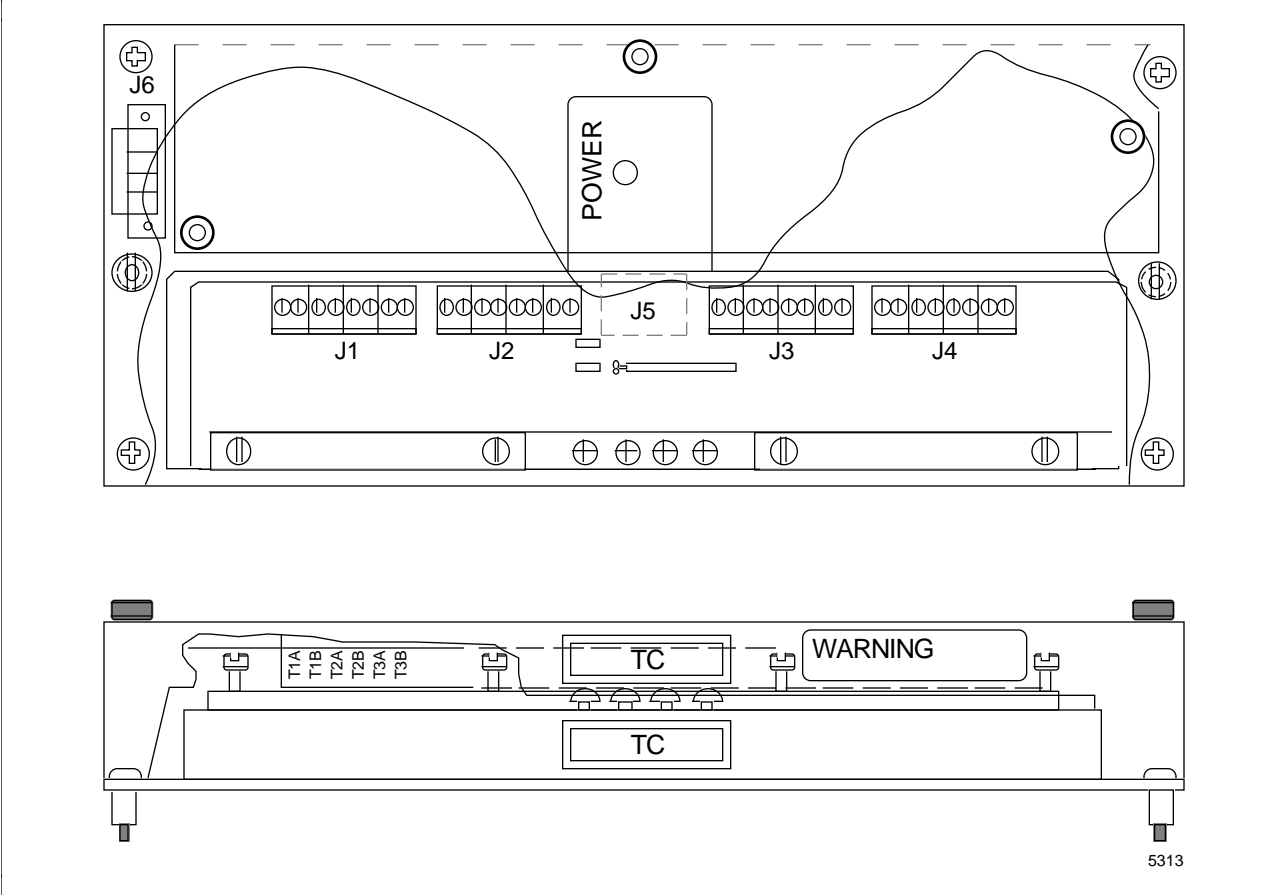


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT02 FTA assembly layout

Figure 2-21 Model MU-TAMT02 Thermocouple LLMux FTA Assembly Layout

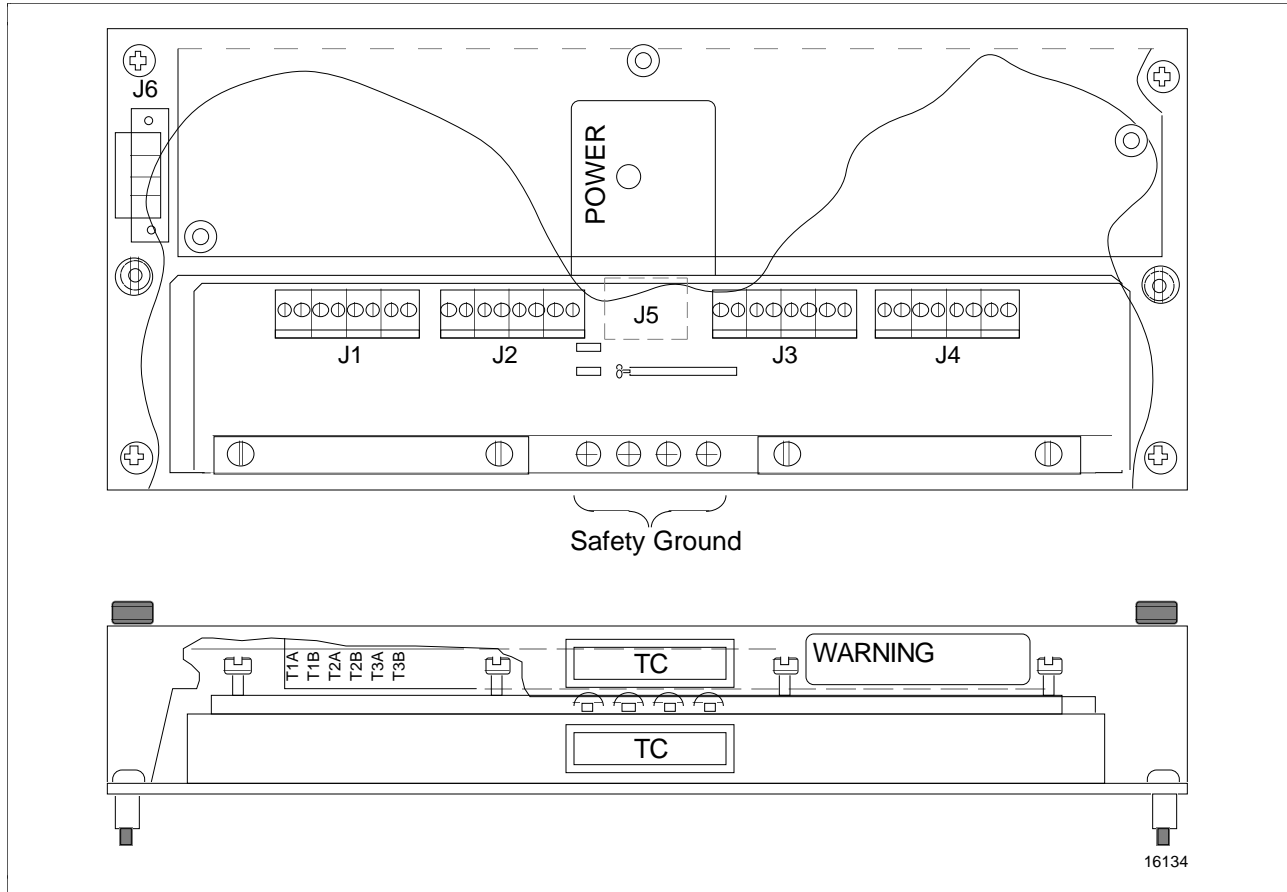


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT03 FTA assembly layout

Figure 2-22 Model MU-TAMT03 Thermocouple LLMux FTA Assembly Layout

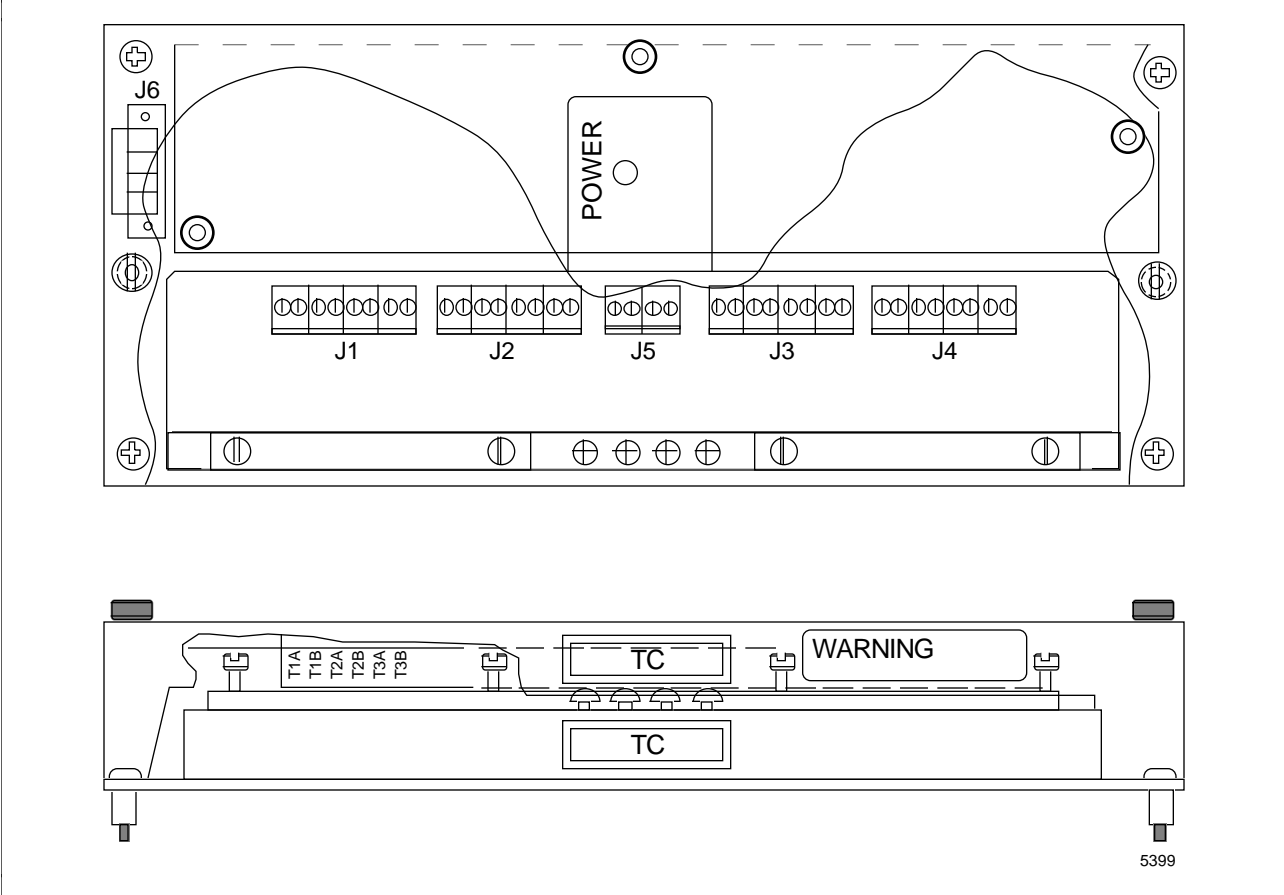


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT12 FTA assembly layout

Figure 2-23 Model MU-TAMT12 Thermocouple LLMux FTA Assembly Layout

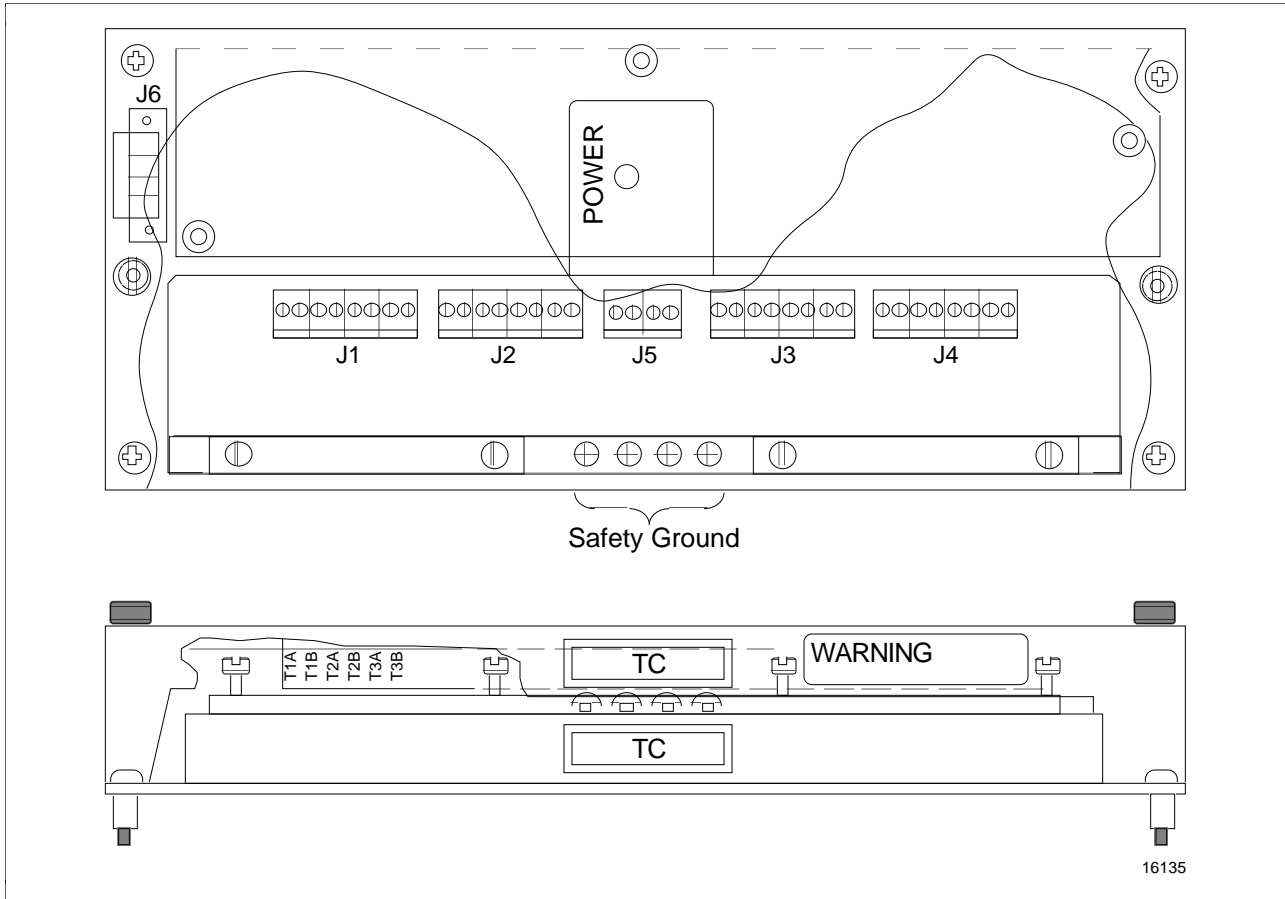


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2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Model MU-TAMT13 FTA assembly layout

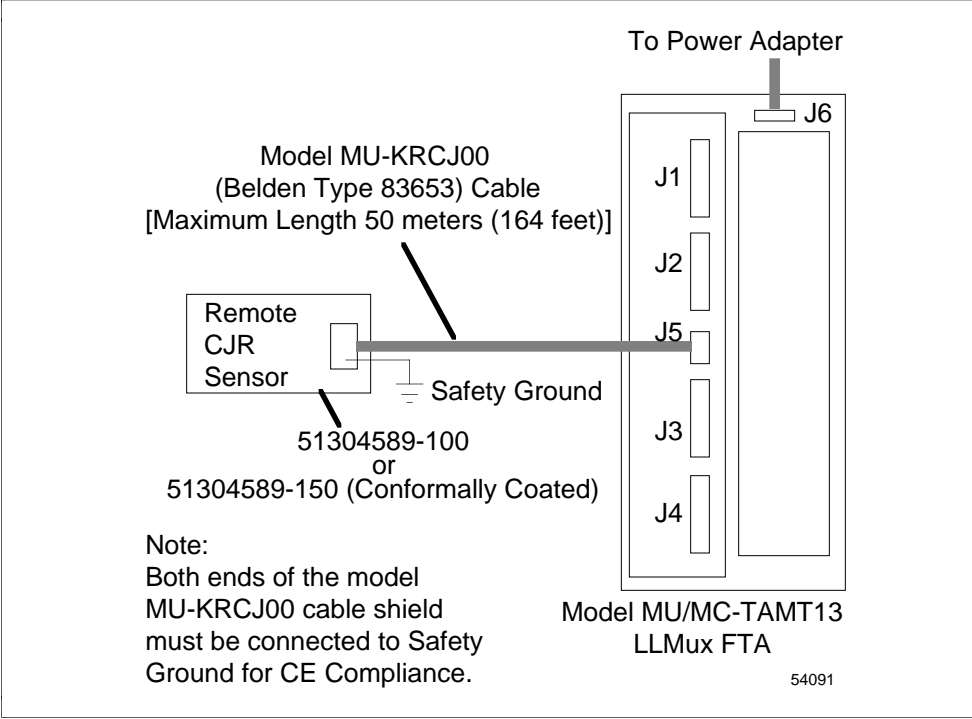
Figure 2-24 Model MU-TAMT13 Thermocouple LLMux FTA Assembly Layout



2.3.1 Thermocouple (TC) LLMux FTAs, Continued

Remote CJR installation

Figure 2-25 Remote CJR Installation



2.3.2 Resistive Temperature Device (RTD) LLMux FTA

Introduction Up to 16 Resistive Temperature Devices (RTDs) can be connected to each Resistive Temperature Device (RTD) LLMux FTA.

Connection diagrams Figures 2-26 and 2-27 are connection diagrams for the model MU-TAMR02 and MU-TAMR03 RTD LLMux FTAs, respectively.

Assembly layout illustrations Figures 2-28 and 2-29 illustrate the assembly layout of the model MU-TAMR02 and MU-TAMR03 RTD LLMux FTAs, respectively.

CAUTION

CAUTION—To reduce the negative affect of ground potential differences, the following cable usage and ground reference selection rules should be considered for the model MU-TAMR02 RTD LLMux FTA only. These rules do not apply for the model MU-TAMR03 RTD LLMux FTA.

- Use a 3-wire cable. Do not share a conductor in a cable between two RTDs.
 - Use a single point of sensor ground reference, or reference to a voltage within the control system common-mode specifications.
 - Terminate the cable shield at only one end to a potential that is close to the potential of the RTD.
 - Try to select a practical route for the RTD cable.
-

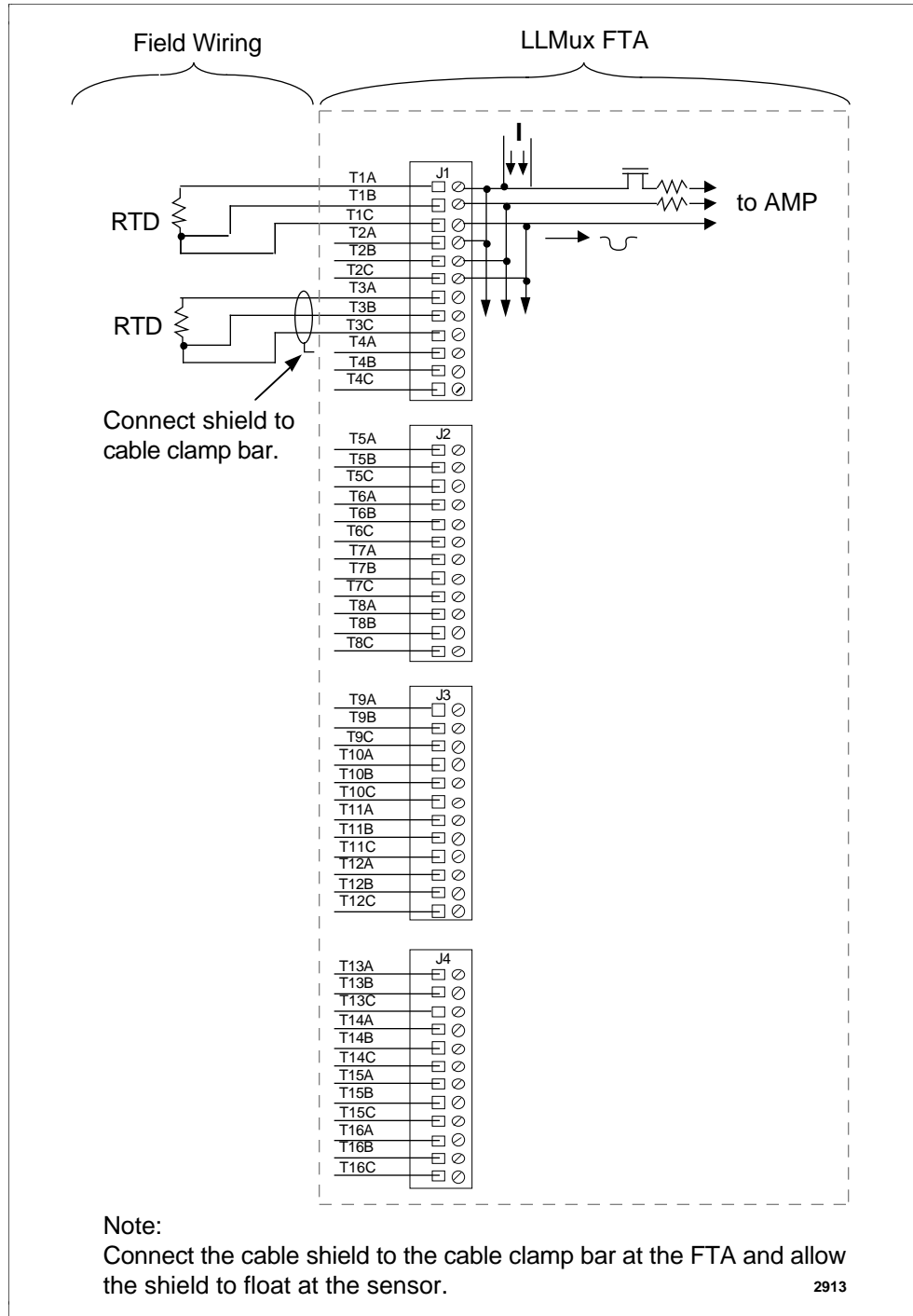
CE Compliance The model MU-TAMR03 RTD LLMux FTA is CE Compliant and requires shielded input wiring with the cable shield connected to Safety Ground at both ends of the cable.

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2.3.2 Resistive Temperature Device (RTD) LLMux FTA, Continued

Model MU-TAMR02 connection diagram

Figure 2-26 Model MU-TAMR02 RTD LLMux FTA Connection Diagram

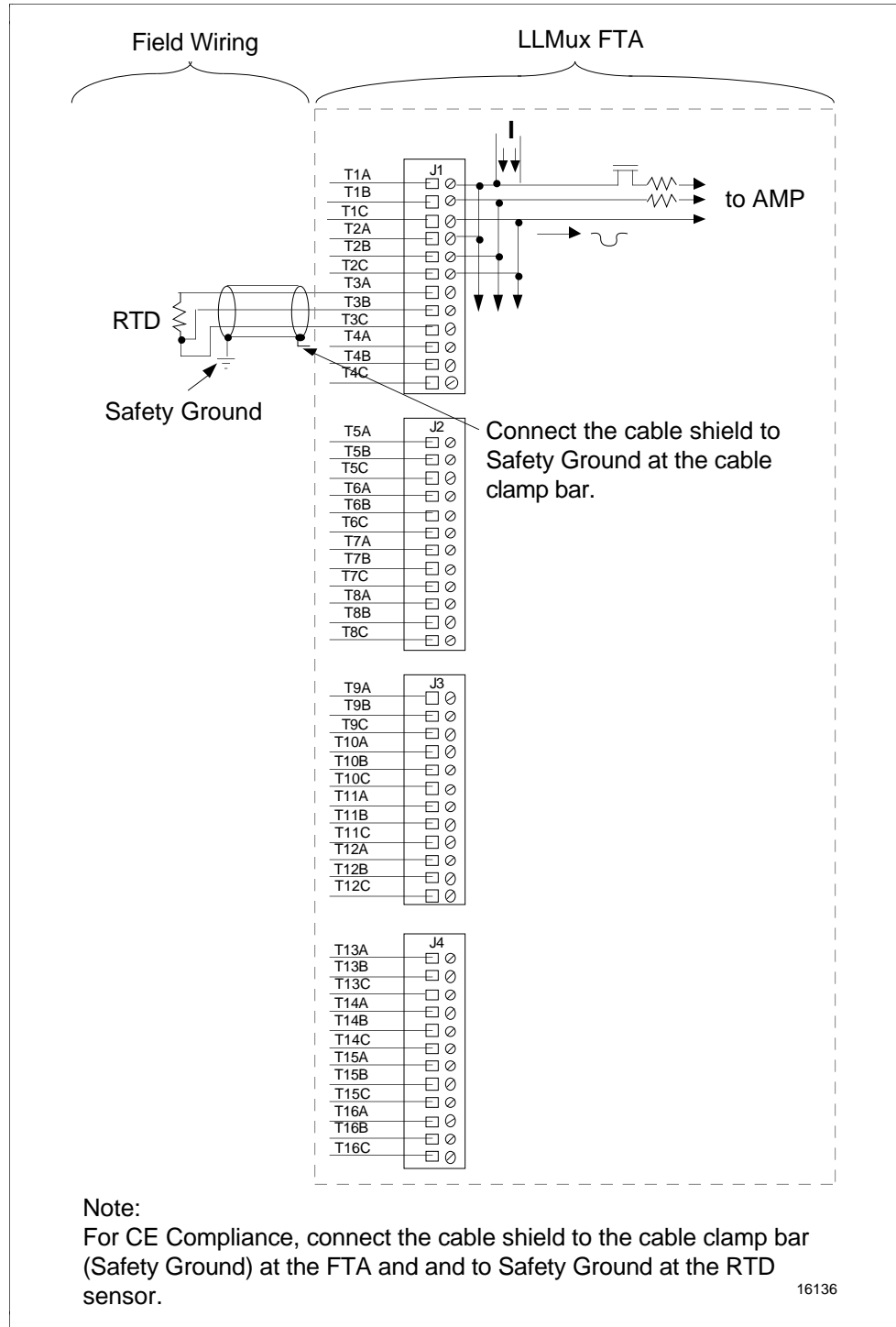


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2.3.2 Resistive Temperature Device (RTD) LLMux FTA, Continued

Model MU-TAMR03 connection diagram

Figure 2-27 Model MU-TAMR03 RTD LLMux FTA Connection Diagram

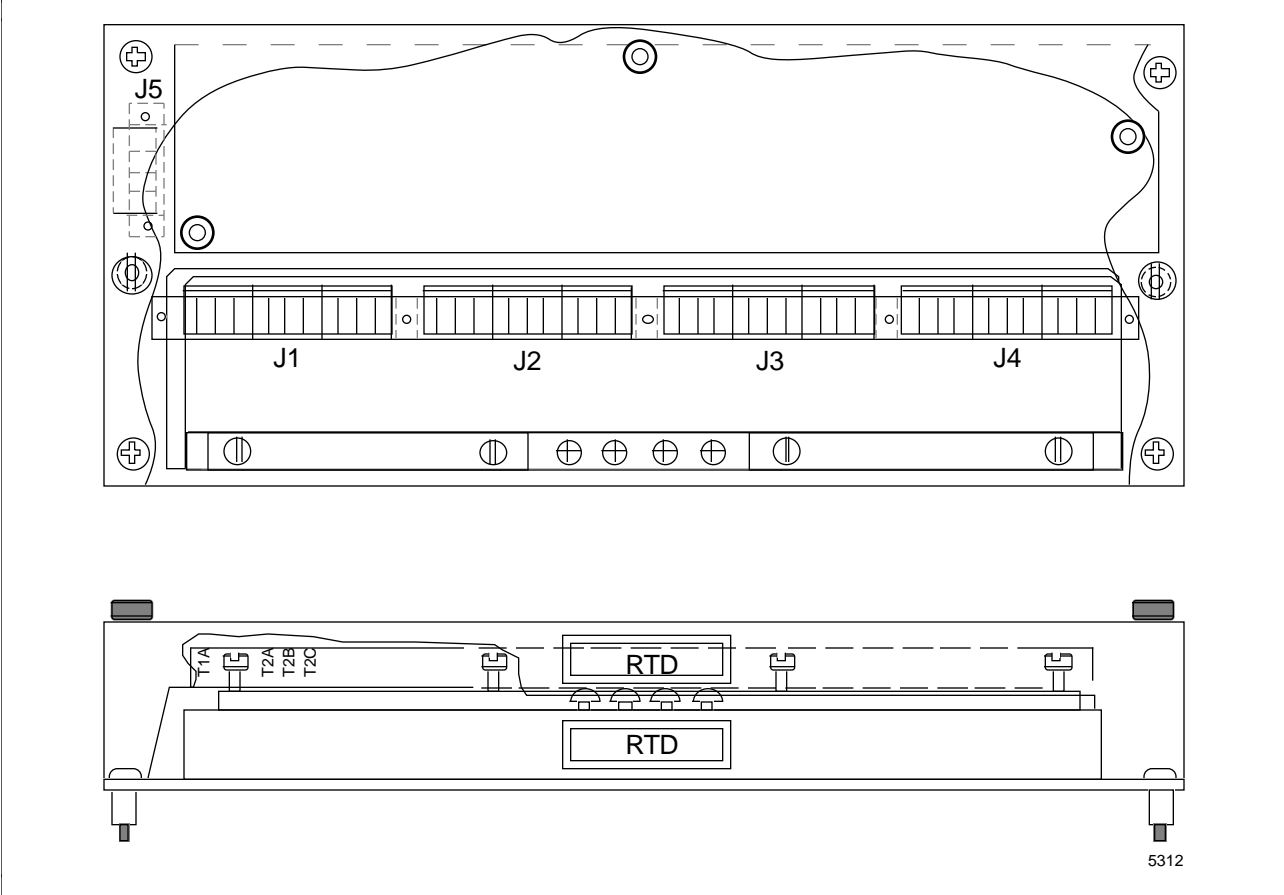


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2.3.2 Resistive Temperature Device (RTD) LLMux FTA, Continued

**Model MU-TAMR02
FTA assembly layout**

Figure 2-28 Model MU-TAMR02 RTD LLMux FTA Assembly Layout

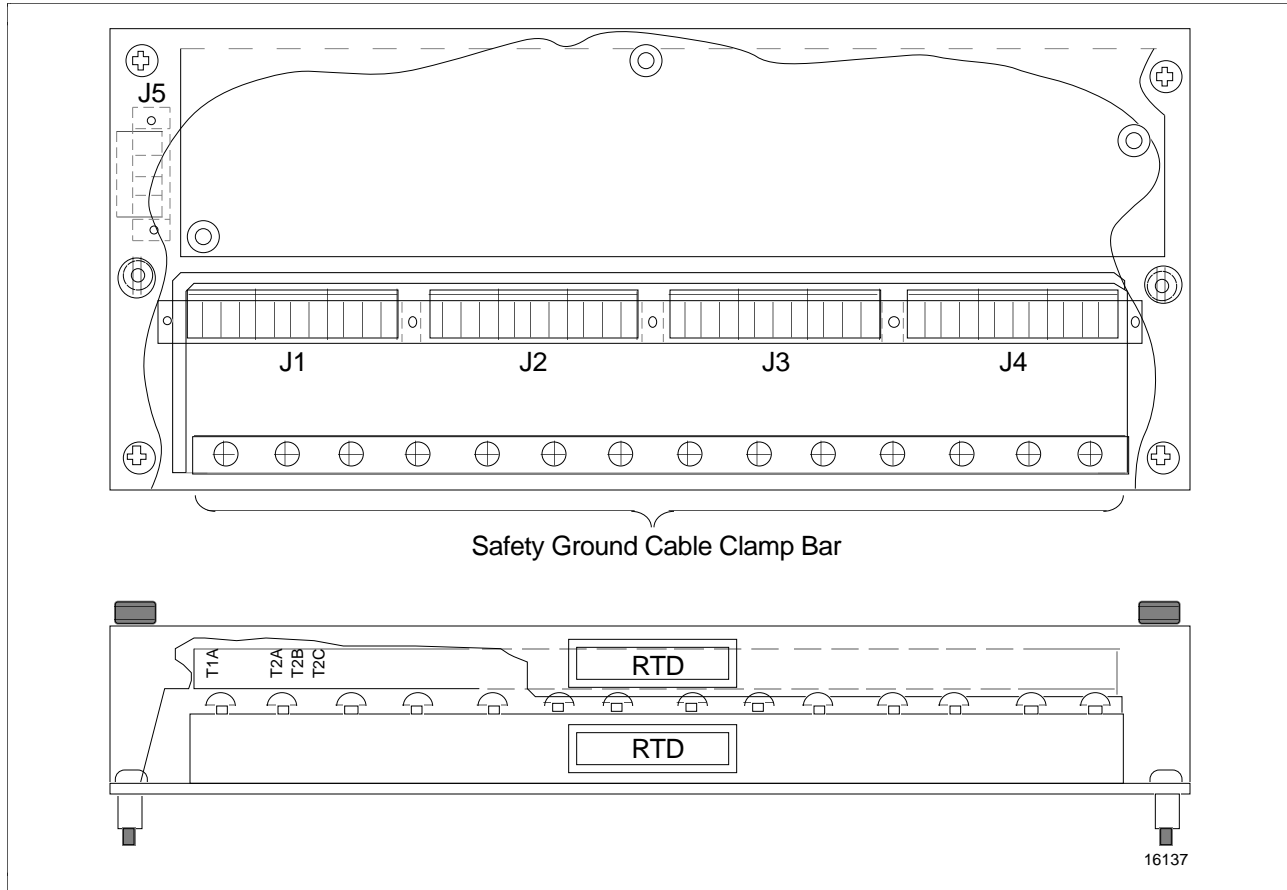


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2.3.2 Resistive Temperature Device (RTD) LLMux FTA, Continued

Model MU-TAMR03 FTA assembly layout

Figure 2-29 Model MU-TAMR03 RTD LLMux FTA Assembly Layout



2.4 High Level Analog Input (HLAI) FTAs

CE Compliance

In most cases, there are two models of each style of High Level Analog Input (HLAI) Field Termination Assemblies, a CE Compliant and non-CE Compliant model. The model MU-TAIH22, MU-TAIH23, and MU-TAIH62 Enhanced Power HLAI FTAs are the exception. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” CE Compliant and non-CE Compliant FTAs have unique model numbers.

The CE Compliant HLAI FTA models do not support Smart Transmitter devices. CE Compliant STI FTAs that do support Smart Transmitter devices are discussed in subsection 2.5.

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

HLAI FTAs and IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 2-6.

Table 2-6 High Level Analog Input FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAIH01	HLAI/STI FTA with Compression Terminals Single IOP Interface	51303956-100	N/A
MU-TAIH02	HLAI/STI FTA with Compression Terminals Single IOP Interface	51304453-100	N/A
MC-TAIH02	HLAI/STI FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304453-150	N/A
MU-TAIH03	HLAI FTA with Compression Terminals Single IOP Interface	N/A	51309136-125
MC-TAIH03	HLAI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309136-175
MU-TAIH12	HLAI/STI FTA with Compression Terminals Redundant IOP Interface	51304337-100	N/A
MC-TAIH12	HLAI/STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304337-150	N/A
MU-TAIH13	HLAI FTA with Compression Terminals Redundant IOP Interface	N/A	51309138-125
MC-TAIH13	HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	N/A	51309138-175

Continued on next page

2.4 High Level Analog Input (HLAI) FTAs, Continued

HLAI FTAs and IOPs,
continued

Table 2-6 High Level Analog Input FTA and IOP Models, Continued

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TAIH22	Enhanced Power HLA/STI FTA with Comp Term Redundant IOP Interface	80366195-100	N/A
MC-TAIH22	Enhanced Power HLA/STI FTA with Comp Term Redundant IOP Interface—Conformally Coated	80366195-150	N/A
MU-TAIH23	Enhanced Power HLA/STI FTA with Comp Terminals Redundant IOP Interface	N/A	80366195-125
MC-TAIH23	Enhanced Power HLA/STI FTA with Comp Terminals Redundant IOP Interface—Conformally Coated	N/A	80366195-175
MU-TAIH52	HLA/STI FTA with Screw Terminals Redundant IOP Interface	51304337-200	N/A
MC-TAIH52	HLA/STI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	51304337-250	N/A
MU-TAIH53	HLA/STI FTA with Screw Terminals Redundant IOP Interface	N/A	51309138-225
MC-TAIH53	HLA/STI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	N/A	51309138-275
MU-TAIH62	Enhanced Power HLA/STI FTA with Screw Term Redundant IOP Interface	80366192-100	N/A
MC-TAIH62	Enhanced Power HLA/STI FTA with Screw Term Redundant IOP Interface—Conformally Coated	80366192-150	N/A
MU-PAIH01	HLA/STI IOP	51303991-200	N/A
MU-PAIH02	HLA/STI IOP	51304489-100	N/A
MC-PAIH02	HLA/STI IOP—Conformally Coated	51304489-150	N/A
MU-PAIH03	HLA/STI IOP	N/A	51304754-100
MC-PAIH03	HLA/STI IOP—Conformally Coated	N/A	51304754-150
MU-PSTX01	STI IOP	51304281-200	N/A
MU-PSTX02	STI IOP	51304516-100	N/A
MC-PSTX02	STI IOP—Conformally Coated	51304516-150	N/A
MU-PSTX03	STIM IOP	N/A	51304516-200
MC-PSTX03	STIM IOP—Conformally Coated	N/A	51304516-250

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2.4 High Level Analog Input (HLAI) FTAs, Continued

Cable shielding	Shielded field wiring is not required for CE Compliance. Shielded IOP to FTA cables are required. Source transmitters may require shielded wiring.
FTA description	The High Level Analog Input (HLAI) FTA accepts up to 16 high level analog inputs. The inputs are configurable as single-ended or differential in relation to Master Reference Ground (MRG).
IOP compatibility	<p>The HLAI IOP can be installed in any IOP card file slot.</p> <p>The model MU-PAIH03 HLAI IOP supports only the model MU-TAIH03, MU-TAIH13, and MU-TAIH53 HLAI FTAs.</p> <p>The model MU-PAIH01 and MU-TAIH02 HLAI IOPs support all other HLAI FTA models.</p>
IOP redundancy	The model MU-TAIH01, MU-TAIH02 and MU-TAIH03 FTAs do not support redundant IOPs. All other FTA models support IOP redundancy.
Connection diagrams	<p>Figures 2-30 through 2-36 are connection diagrams for the compression terminal type model MU-TAIH01, MU-TAIH02, MU-TAIH03, MU-TAIH12, MU-TAIH13, MU-TAIH22, and MU-TAIH23 HLAI FTAs, respectively.</p> <p>Figures 2-37 through 2-39 are connection diagrams for the screw terminal type model MU-TAIH52, MU-TAIH53, and MU-TAIH62 HLAI FTAs, respectively.</p>
Assembly layout illustrations	Figures 2-40 through 2-48 illustrate the assembly layout of the model MU-TAIH02, MU-TAIH03, MU-TAIH12, MU-TAIH13, MU-TAIH22, MU-TAIH23, MU-TAIH52, MU-TAIH53, and MU-TAIH62 HLAI FTAs, respectively.
Smart Transmitter devices support	The CE Compliant model MU-TAIH03, MU-TAIH13, and MU-TAIH53 HLAI FTAs will not support Smart Transmitter devices. Use the model MU-TSTX03, MU-TSTX13, or MU-TSTX53 Smart Transmitter Interface FTAs, which are discussed in subsection 2.5.

Continued on next page

2.4 High Level Analog Input (HLAI) FTAs, Continued

Two-wire 4-20 mA transmitters

Two-wire 4-20 mA transmitters connect directly to the FTA because a 250-ohm resistor is provided on the FTA at each input. Transmitters with a 10-50 mA output require adding a resistor to the field terminals to complement the 250-ohm resistor already in place. Alternately, for a 1-5 volt input, remove the 250-ohm and the zero-ohm resistors on the receiving channel. See Figures 2-30 through 2-34, 2-37, and 2-38. This places the channel in a high impedance differential input mode to prevent loading errors for the signal source.

Current limiting resistors

The 145-ohm (180-ohm for the model MU-TAIH01 FTA) current-limiting resistors for transmitter power at the input terminals usually allow the use of a Power Limited Tray cable for the installation. Check the electrical code.

Zener barriers

The FTAs cannot be used to provide transmitter power through Zener barriers because the FTAs limit current to an amount that is less than required by the Zener barrier.

AI Adapter applications

AI Adapters (80367163-001) on the model MU-TAIH22, MU-TAIH23, and MU-TAIH62 HLA I FTAs allow each channel to be customized for a particular application. Figure 2-40 is an illustration of five applications. In two of the applications, the power module is removed from the channel socket.

The AI Adapter has a current limiter that provides the same function as a conventional fuse when providing transmitter power. Installing the Ground Jumper on the AI Adapter references the channel signal to Safety Ground.

Model MU-TAIH22/23/62 FTAs

The model MU-TAIH23 FTAs supports only an HLA I IOP while the model MU-TAIH22 and MU-TAIH62 FTAs support both HLA I and STI IOPs.

Vertical bus bar

Because the FTA does not have a built-in shield bus, handling a large number of cable shields requires that a vertical bus bar be used. The vertical bus bar with the cable shields connect to the local Master Reference Ground (MRG) at the floor of the cabinet. For CE Compliance, the vertical bus bar must connect to Safety Ground.

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2.4 High Level Analog Input (HLAI) FTAs, Continued

Self-powered transmitters

All transmitter loops must have a single connection to reference ground. If the loop does not have a ground reference connection, it must be provided by the FTA's zero-ohm resistor. If this ground connection is provided by a self-powered transmitter, the zero-ohm resistor on the FTA must be removed. See subsection 2.4.1 for additional information.

When the zero-ohm resistor is removed, the loop ground must not produce more than -7 to +5 volts of common mode voltage onto the loop signal.

If the common mode voltage is outside an HLA IOP's specifications, or the transmitter cannot be isolated from ground, or stable ground conditions do not exist, the transmitter must not be connected to an HLA IOP without the use of an isolator. When an isolator is used, the zero-ohm resistor must not be removed.

Smart Transmitter Interface IOPs

Smart Transmitter Interface (STI) or Smart Transmitter Interface Multivariable (STIM) IOP supports the HLA IOP FTAs. All inputs are connected as 2-wire transmitters. See subsection 2.4.3.

External power source

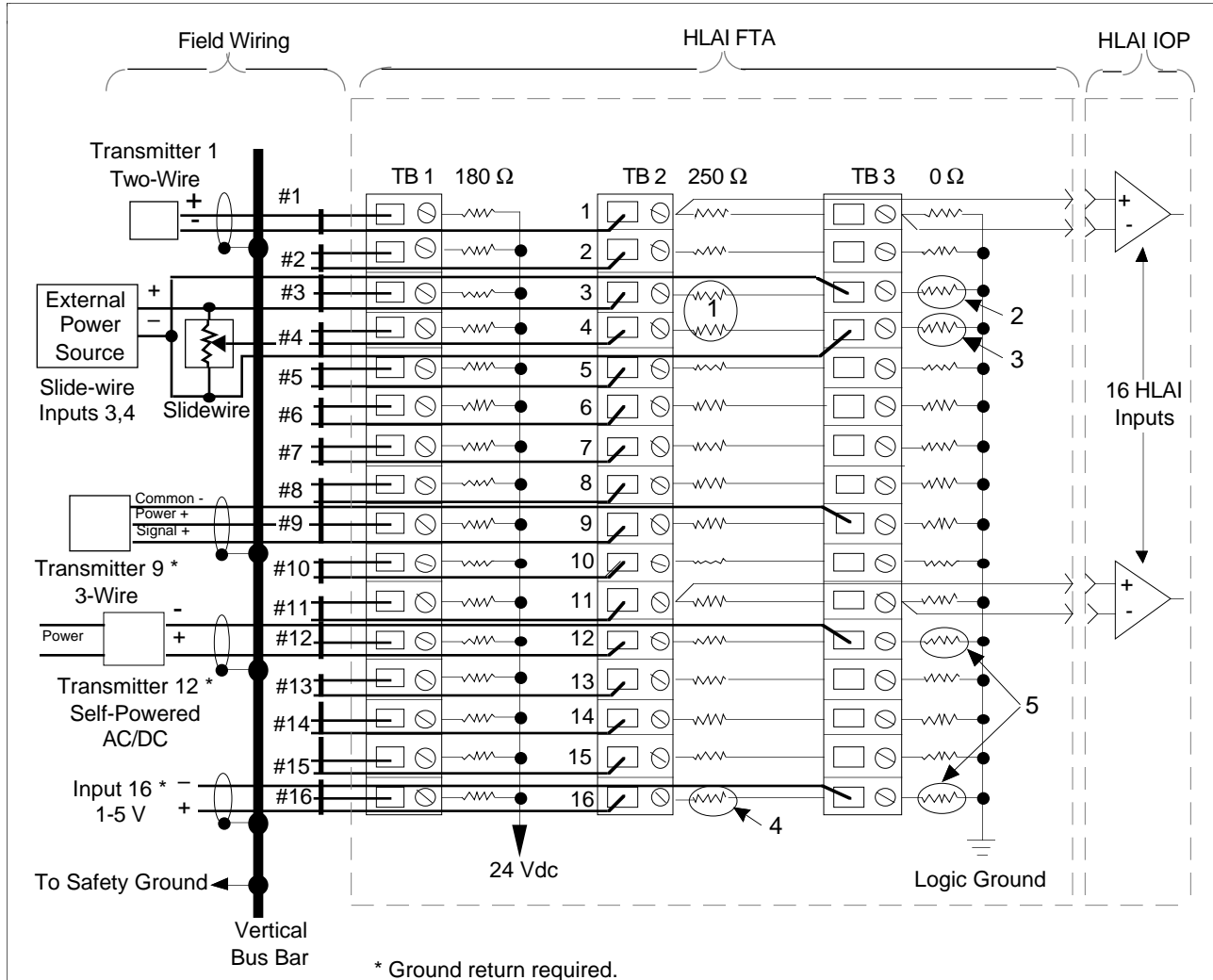
An external power source with an output of $5\text{ V} \pm 10\%$ is required to drive a slidewire. It may be daisy-chained to drive multiple slidewires, but its negative side must not be connected to logic common through more than one zero-ohm resistor on any FTA.

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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH01 FTA connection diagram

Figure 2-30 Model MU-TAIH01 High Level Analog Input FTA Connection Diagram



Implementation Notes

1. Remove the range spools for all the inputs associated with slidewires.
2. The zero Ω resistor is for the negative side of the external power source.
3. Remove the zero Ω resistor on the negative side of the sidewire.
4. Remove the 250 Ω resistor when connected to a differential 1-5 V signal.
5. Remove the 0 Ω resistor when connected to a self-powered nonisolated transmitter or a differential 1-5 V signal.

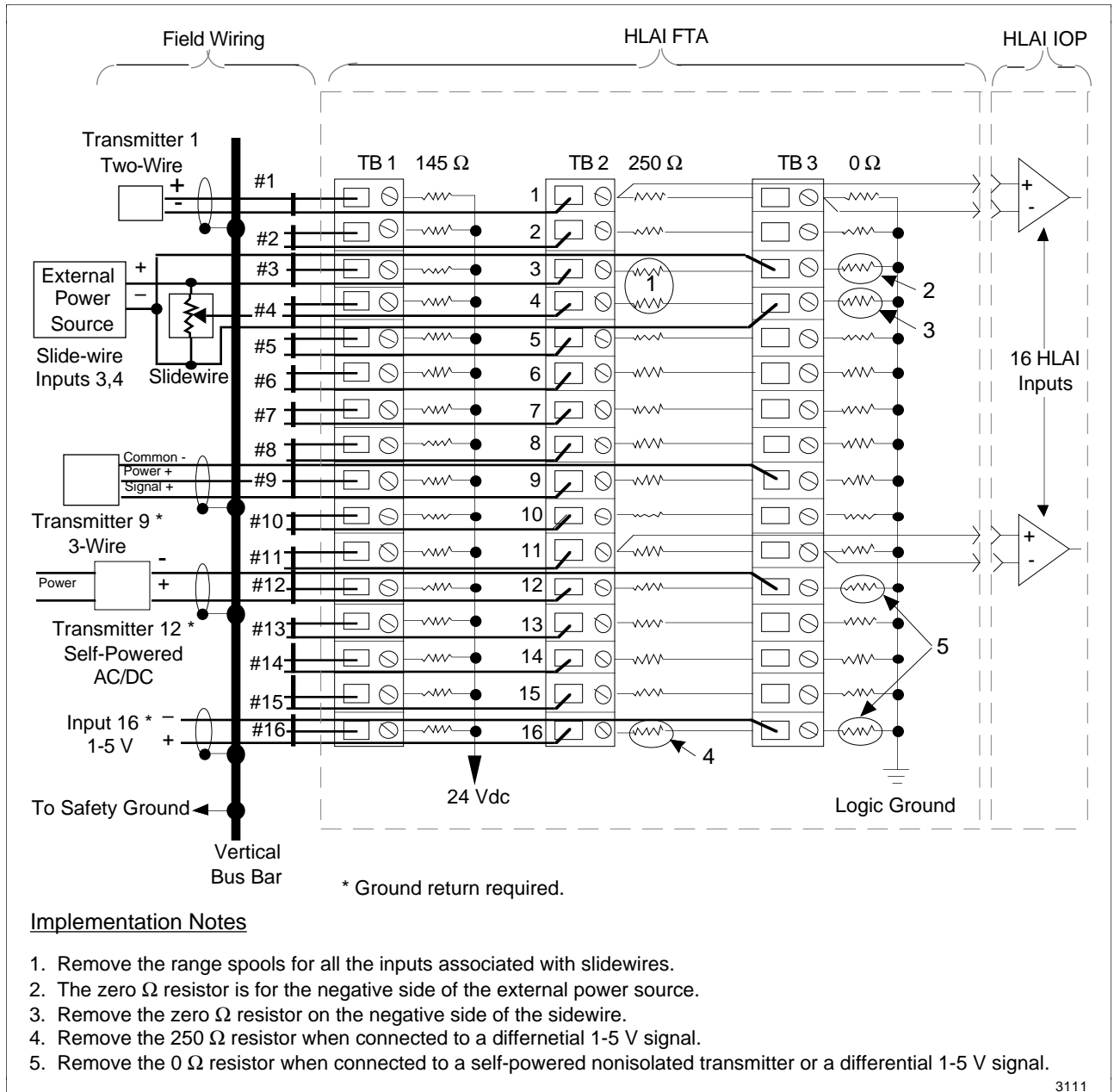
2669

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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH02 FTA connection diagram

Figure 2-31 Model MU-TAIH02 High Level Analog Input FTA Connection Diagram

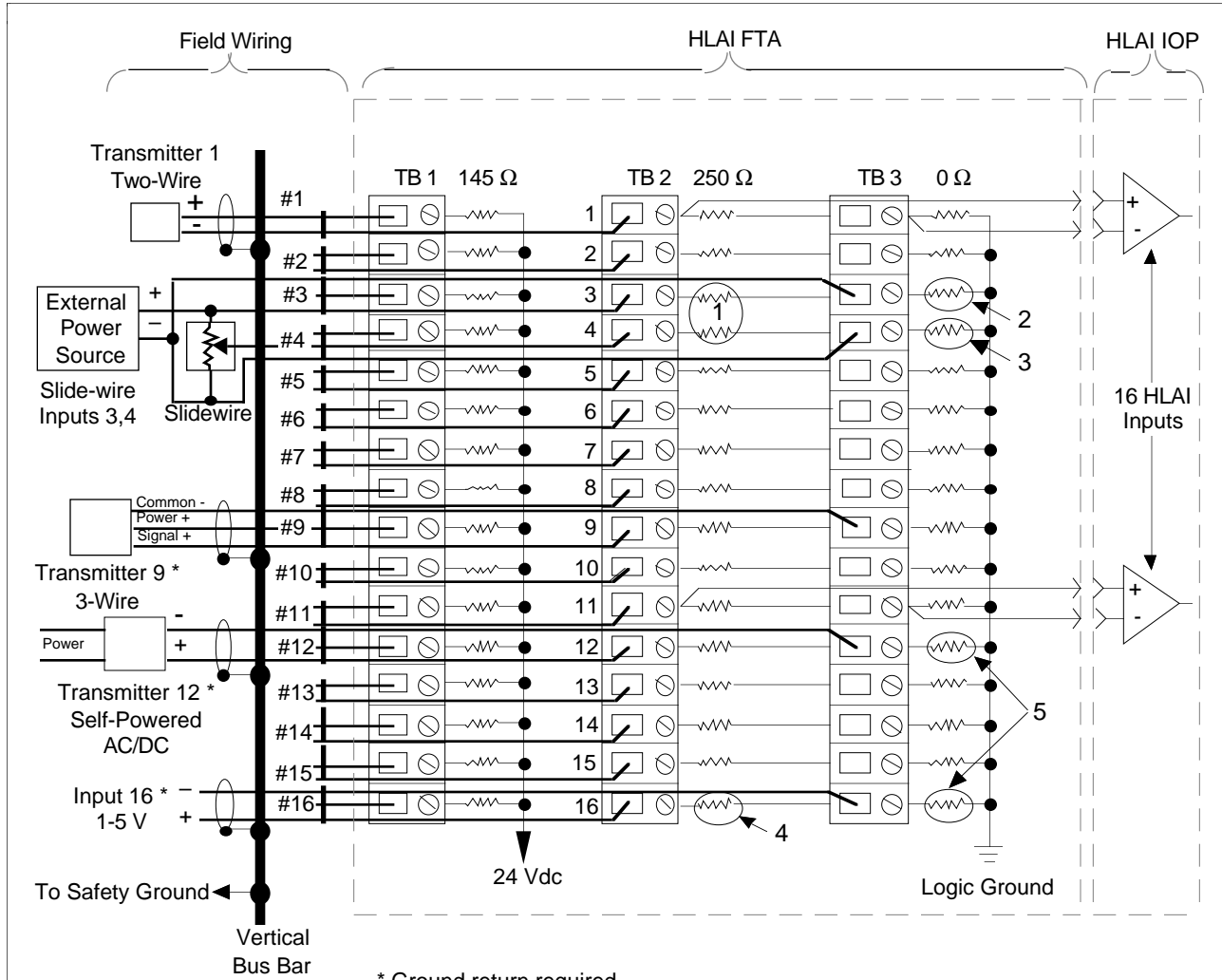


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH03 FTA connection diagram

Figure 2-32 Model MU-TAIH03 High Level Analog Input FTA Connection Diagram



Implementation Notes

1. Remove the range spools for all the inputs associated with slidewires.
2. The zero Ω resistor is for the negative side of the external power source.
3. Remove the zero Ω resistor on the negative side of the sidewire.
4. Remove the 250 Ω resistor when connected to a differential 1-5 V signal.
5. Remove the 0 Ω resistor when connected to a self-powered nonisolated transmitter or a differential 1-5 V signal.

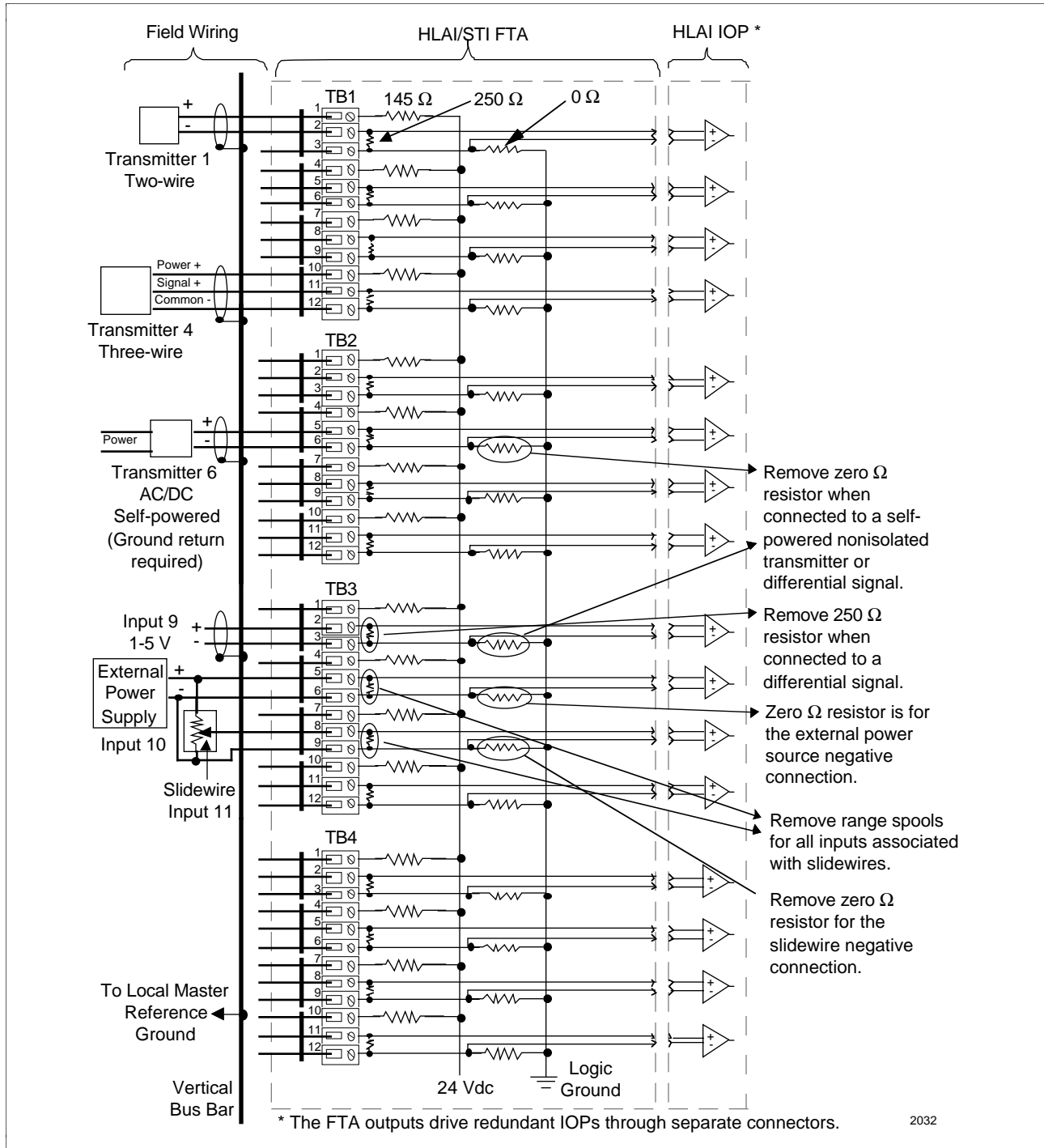
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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH12 FTA connection diagram

Figure 2-33 Model MU-TAIH12 High Level Analog Input FTA Connection Diagram

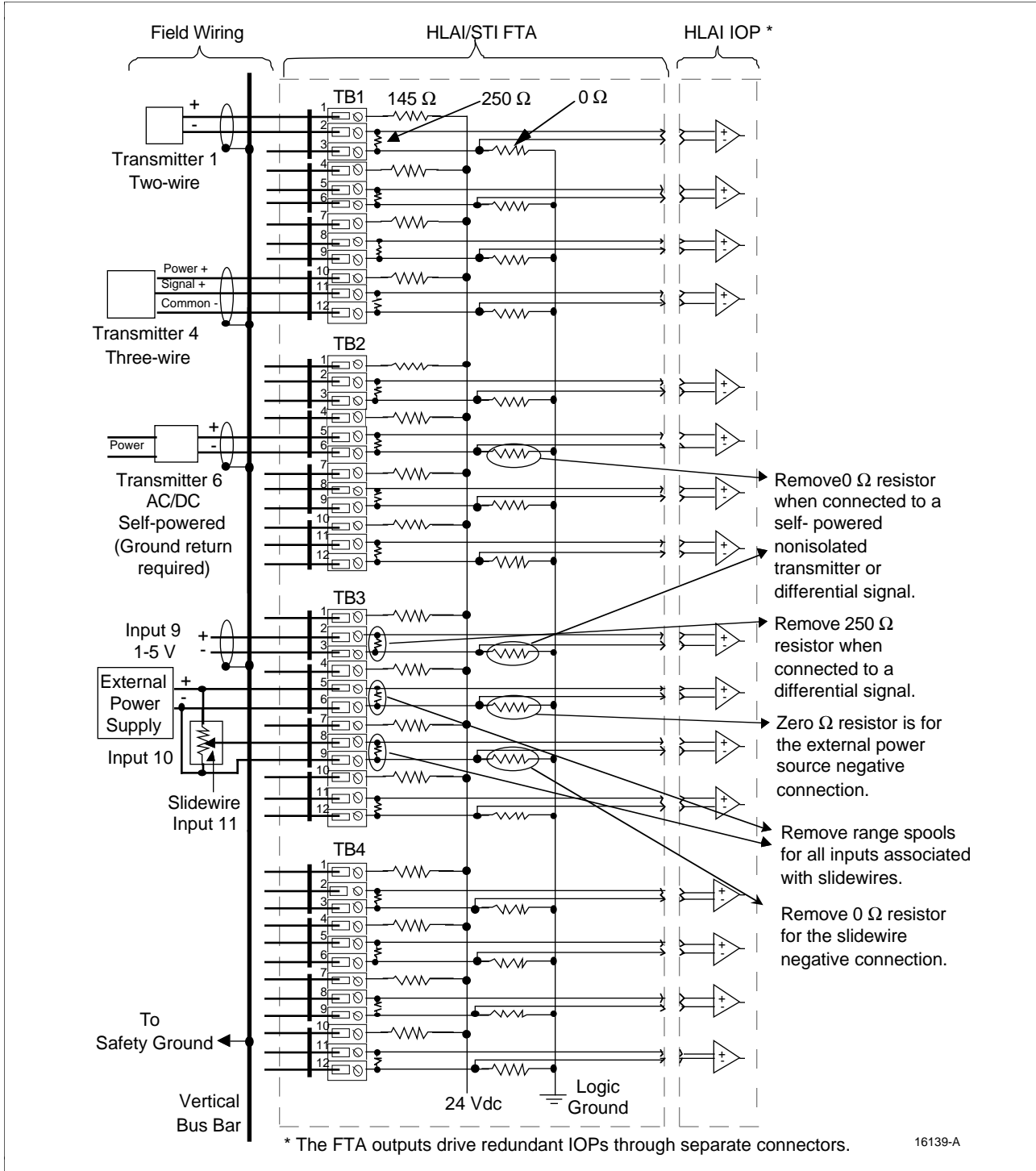


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH13 FTA connection diagram

Figure 2-34 Model MU-TAIH13 High Level Analog Input FTA Connection Diagram

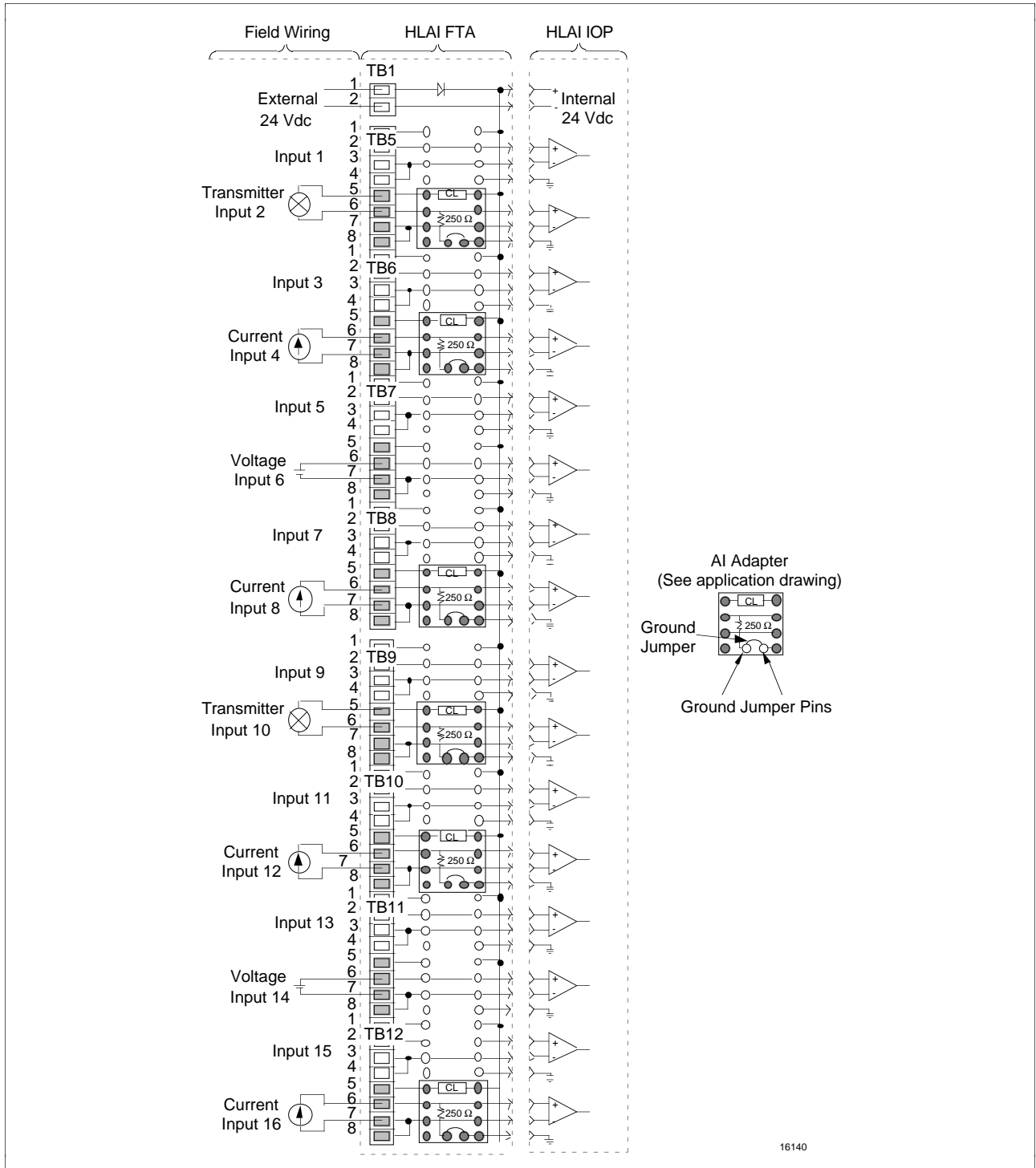


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH22 FTA connection diagram

Figure 2-35 Model MU-TAIH22 Enhanced Power HLA I FTA Connection Diagram

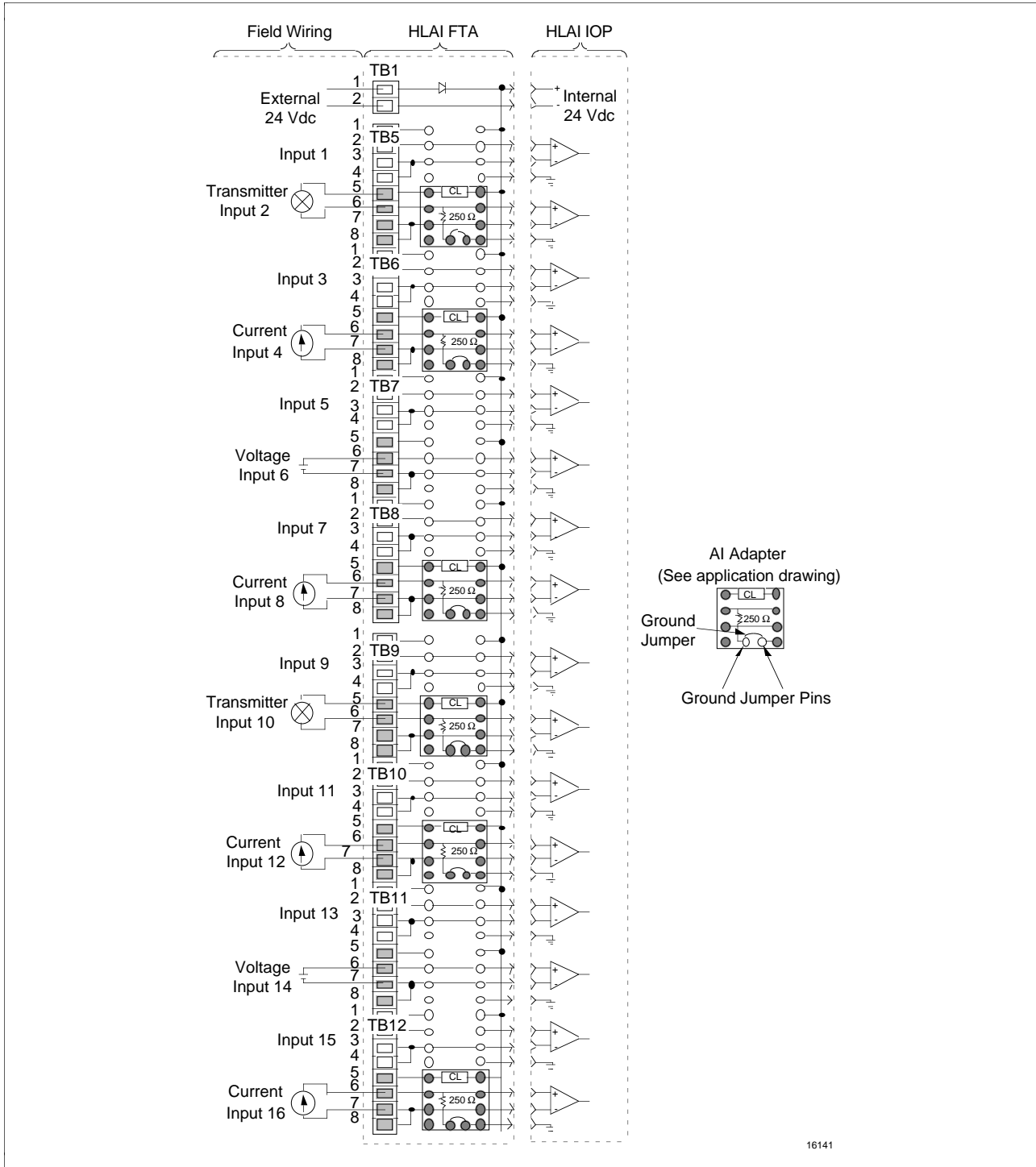


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH23 FTA connection diagram

Figure 2-36 Model MU-TAIH23 Enhanced Power HLA I FTA Connection Diagram

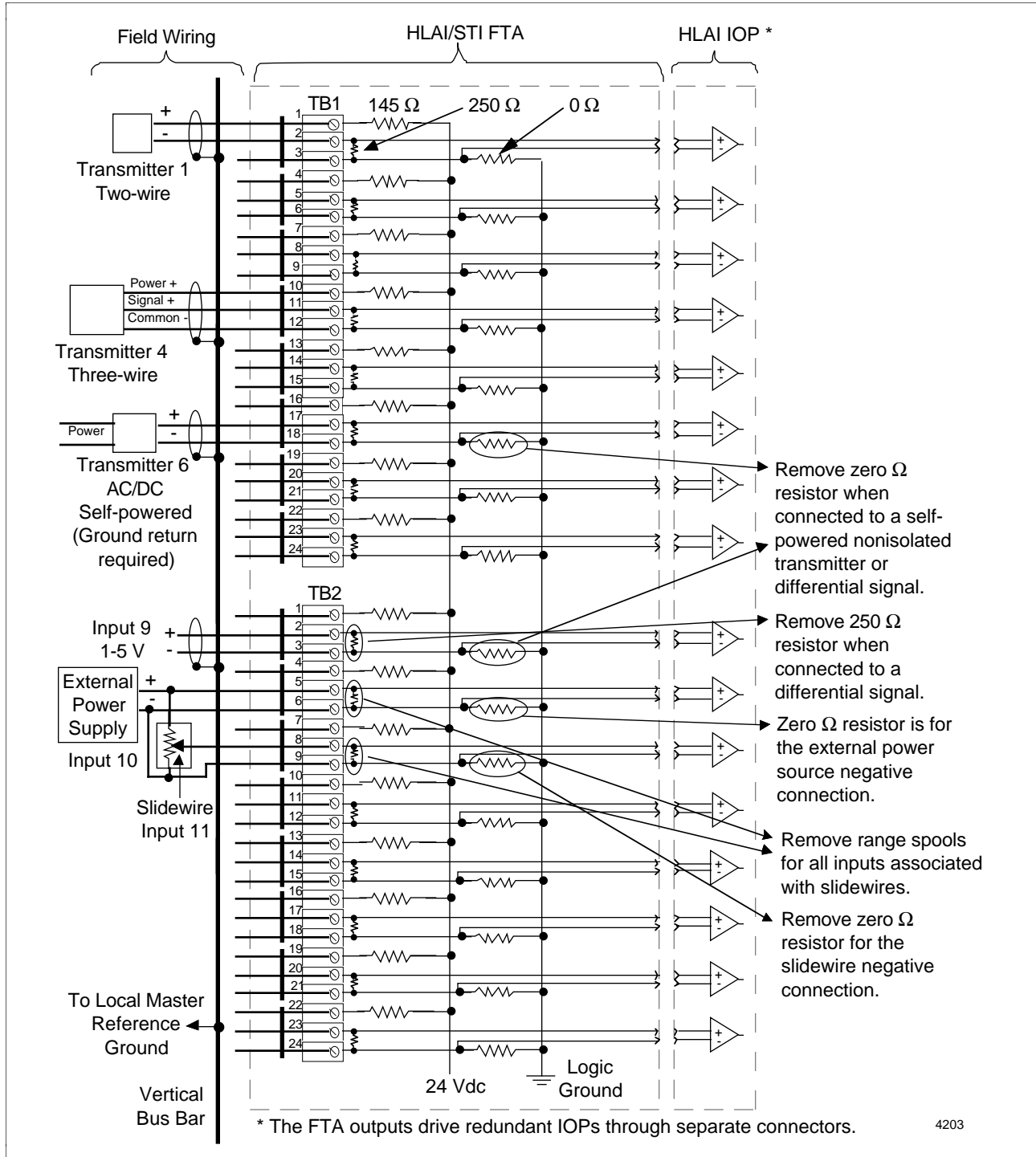


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH52 FTA connection diagram

Figure 2-37 Model MU-TAIH52 High Level Analog Input FTA Connection Diagram

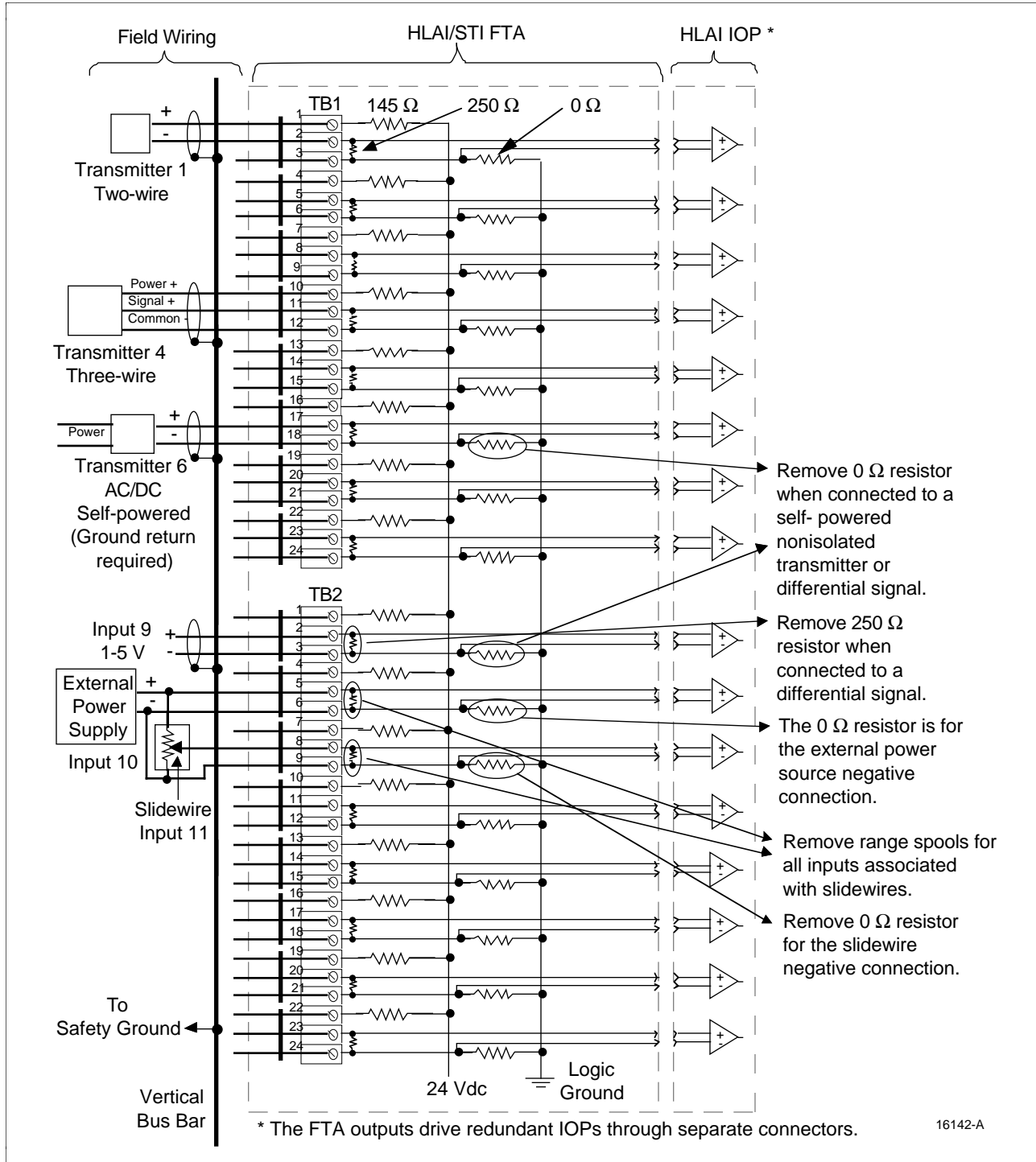


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH53 FTA connection diagram

Figure 2-38 Model MU-TAIH53 High Level Analog Input FTA Connection Diagram

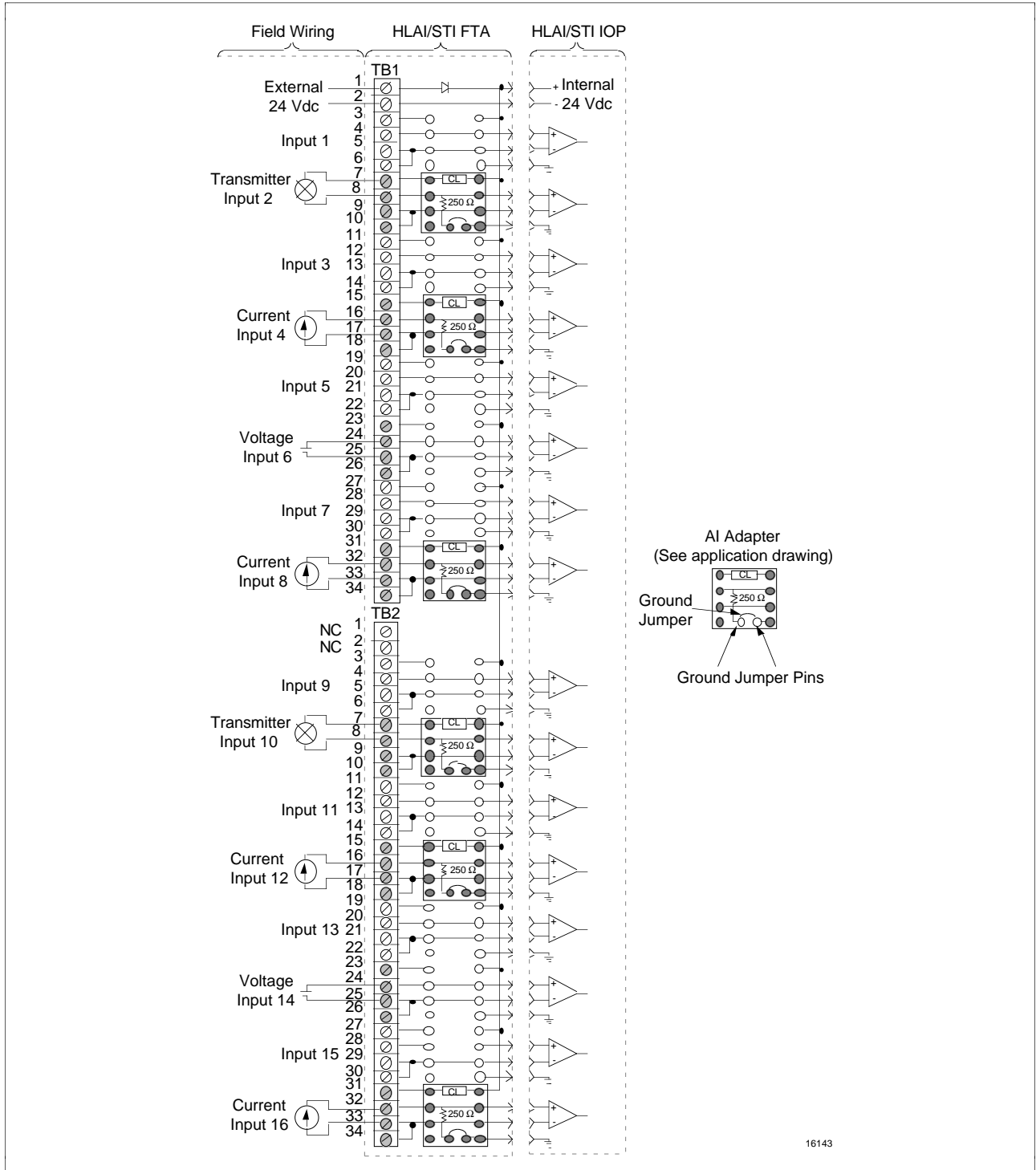


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH62 FTA connection diagram

Figure 2-39 Model MU-TAIH62 Enhanced Power HLA I FTA Connection Diagram

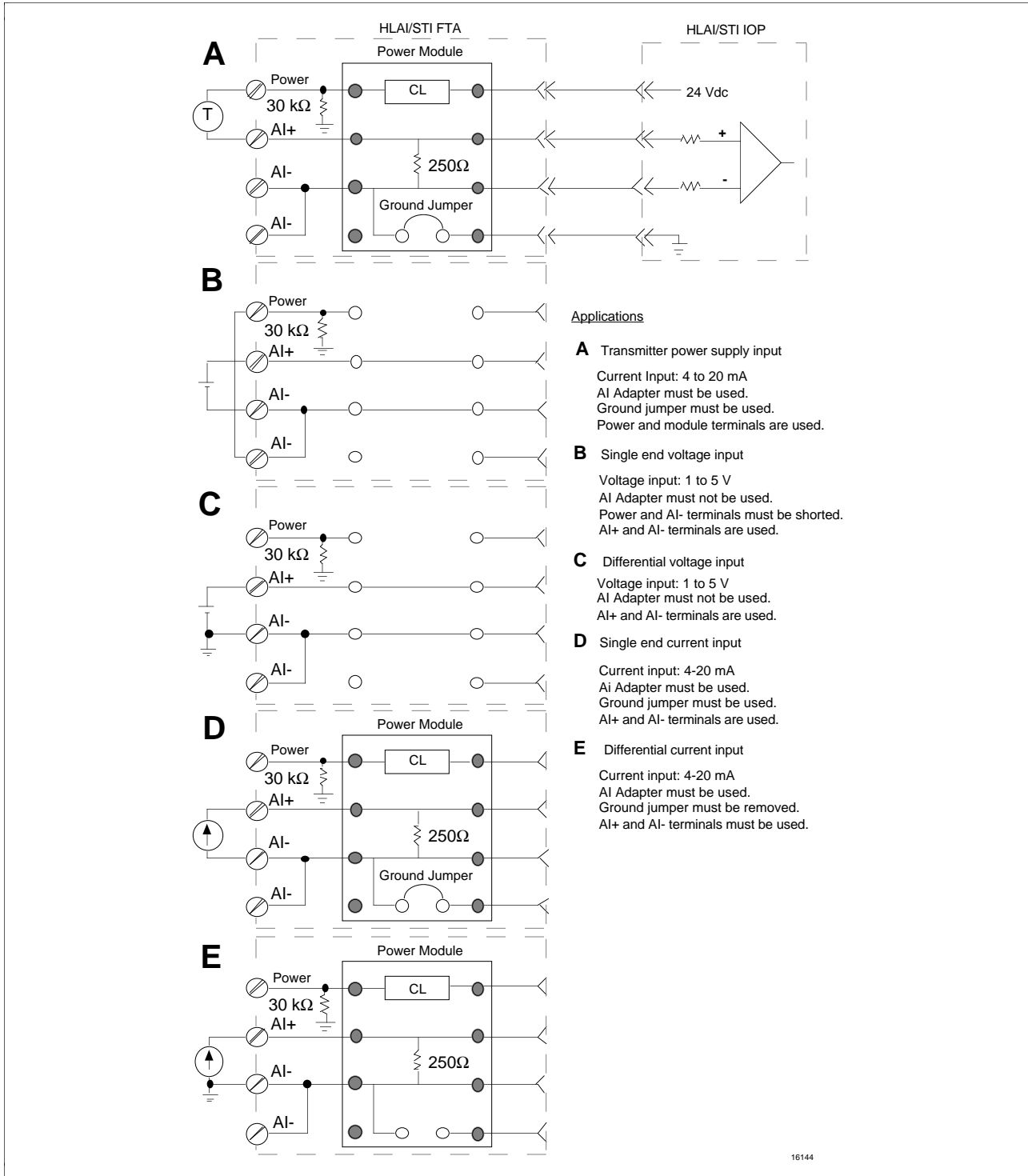


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2.4 High Level Analog Input (HLAI) FTAs, Continued

AI Adapter applications Figure 2-31 illustrates the AI Adapter applications for the model MU-TAIH22, MU-TAIH23, and MU-TAIH62 FTAs.

Figure 2-40 Model MU-TAIH22/23/62 AI Adapter Applications

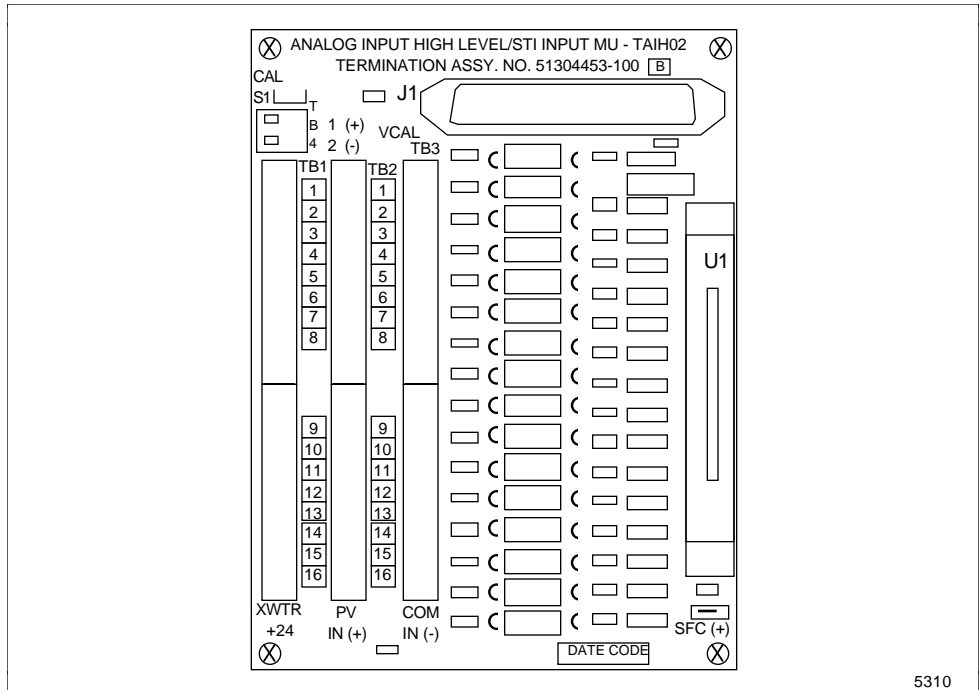


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH02 FTA assembly layout

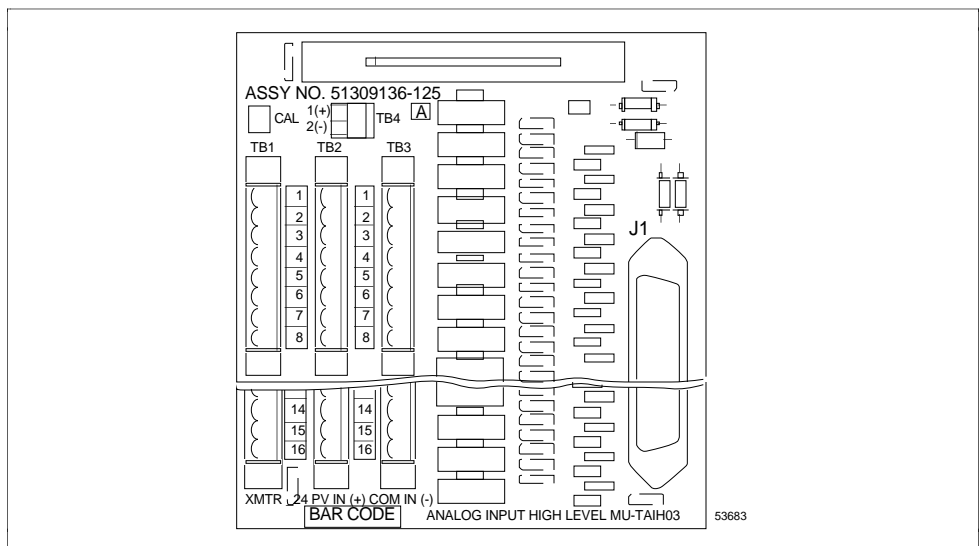
Figure 2-41 Model MU-TAIH02 High Level Analog Input FTA Assembly Layout



5310

Model MU-TAIH03 FTA assembly layout

Figure 2-42 Model MU-TAIH03 High Level Analog Input FTA Assembly Layout



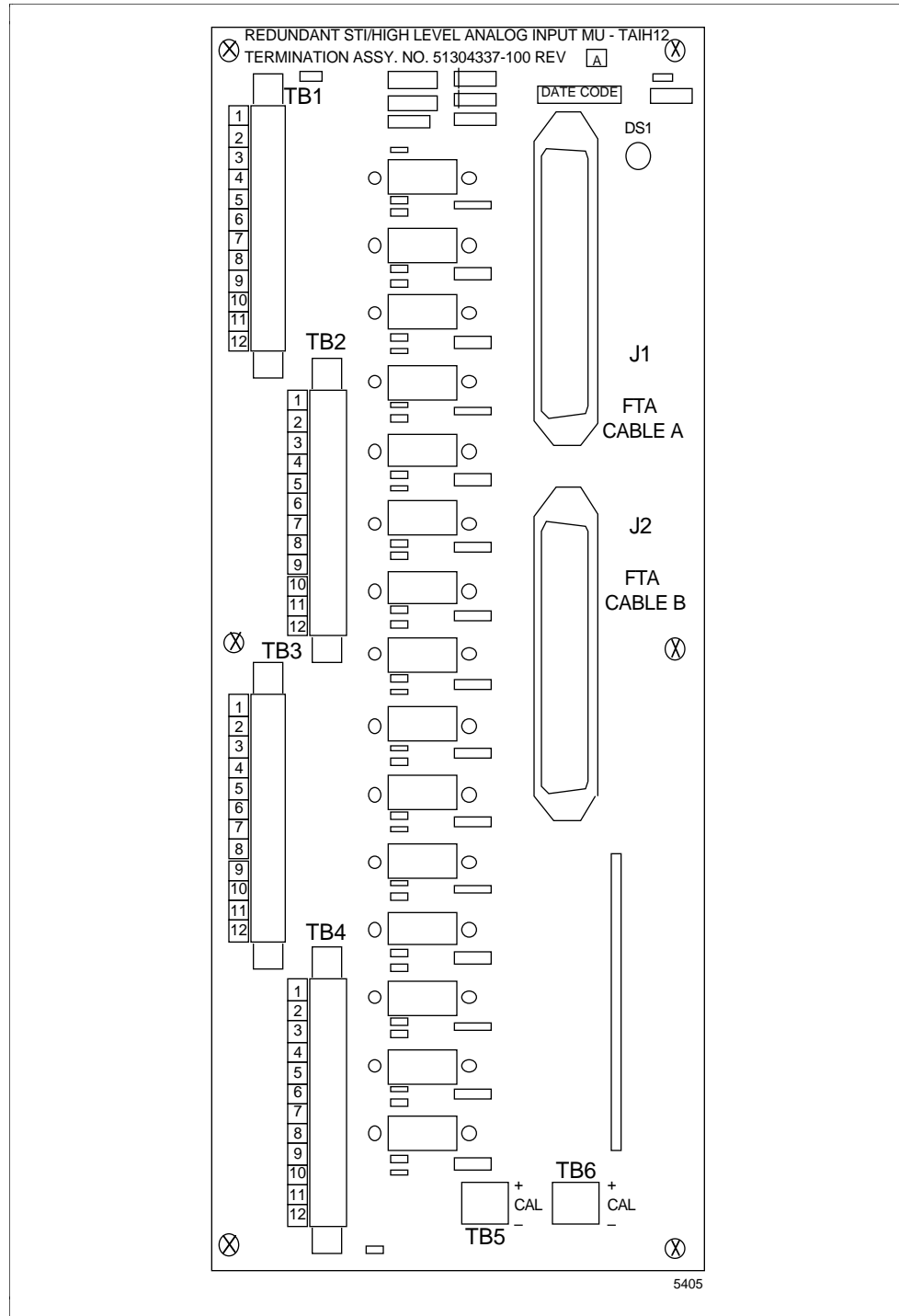
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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH12 FTA assembly layout

Figure 2-43 Model MU-TAIH12 High Level Analog Input FTA Assembly Layout

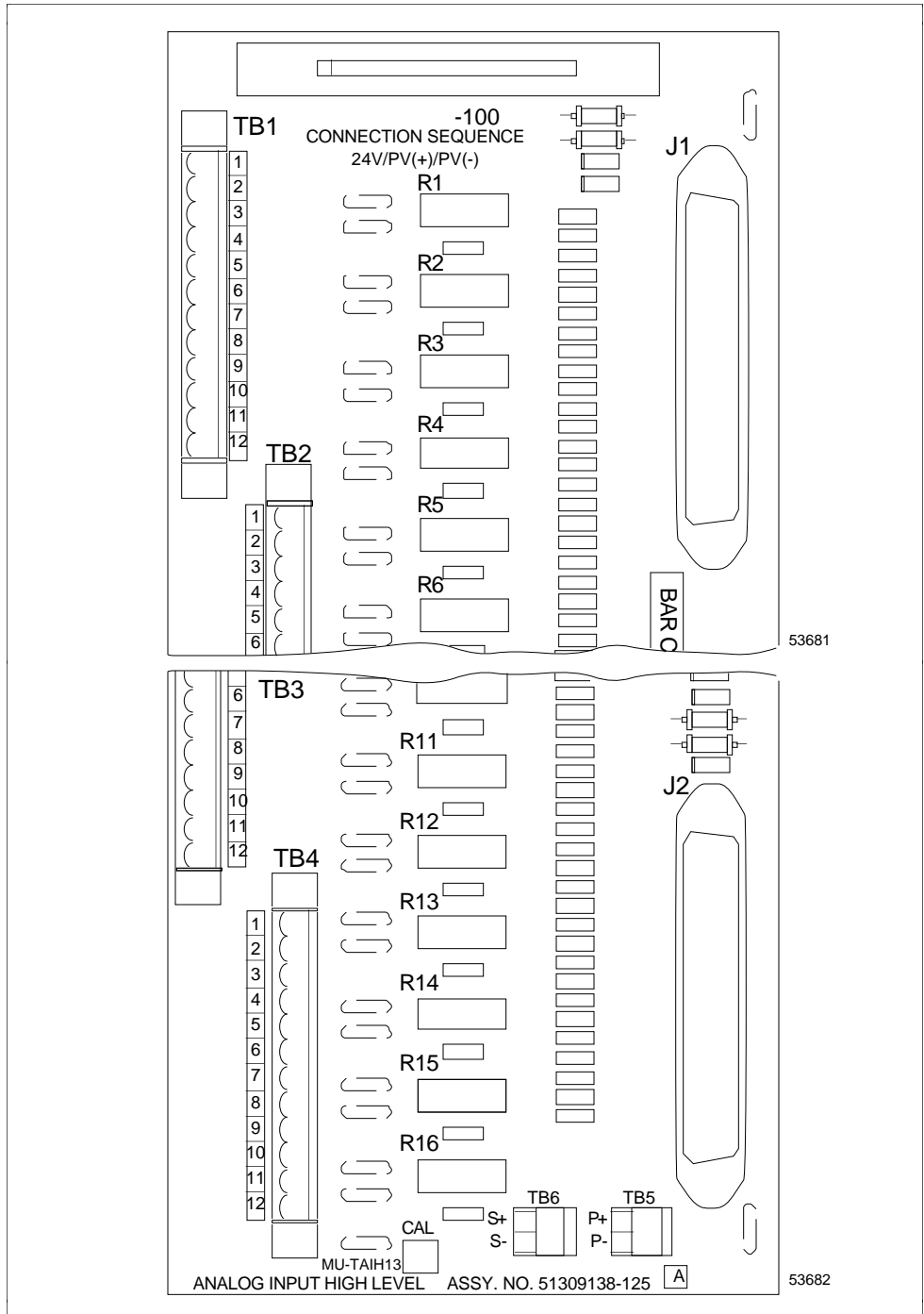


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH13 FTA assembly layout

Figure 2-44 Model MU-TAIH13 High Level Analog Input FTA Assembly Layout

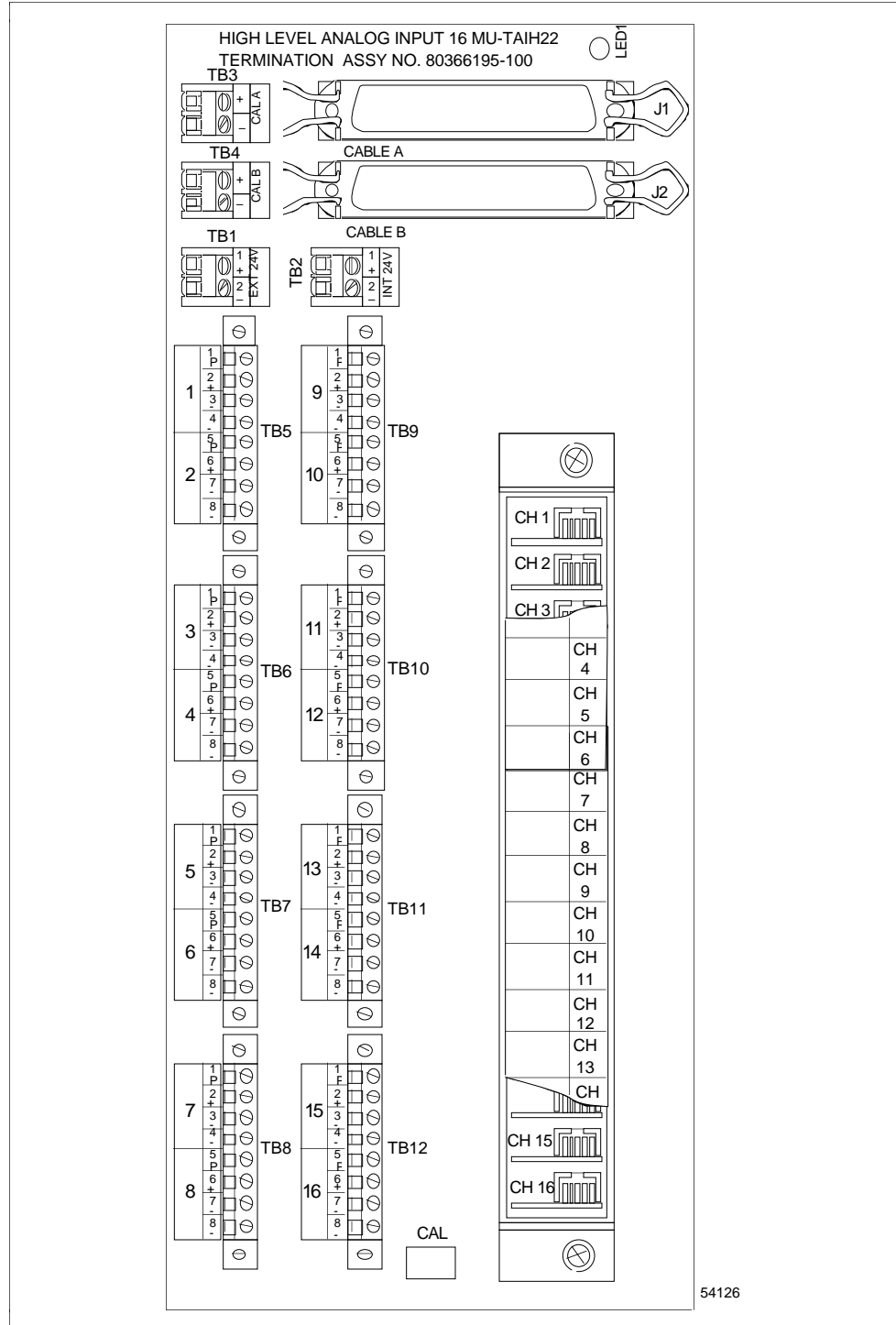


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH22 FTA
assembly layout

Figure 2-45 Model MU-TAIH22 Enhanced Power HLAI FTA
Assembly Layout

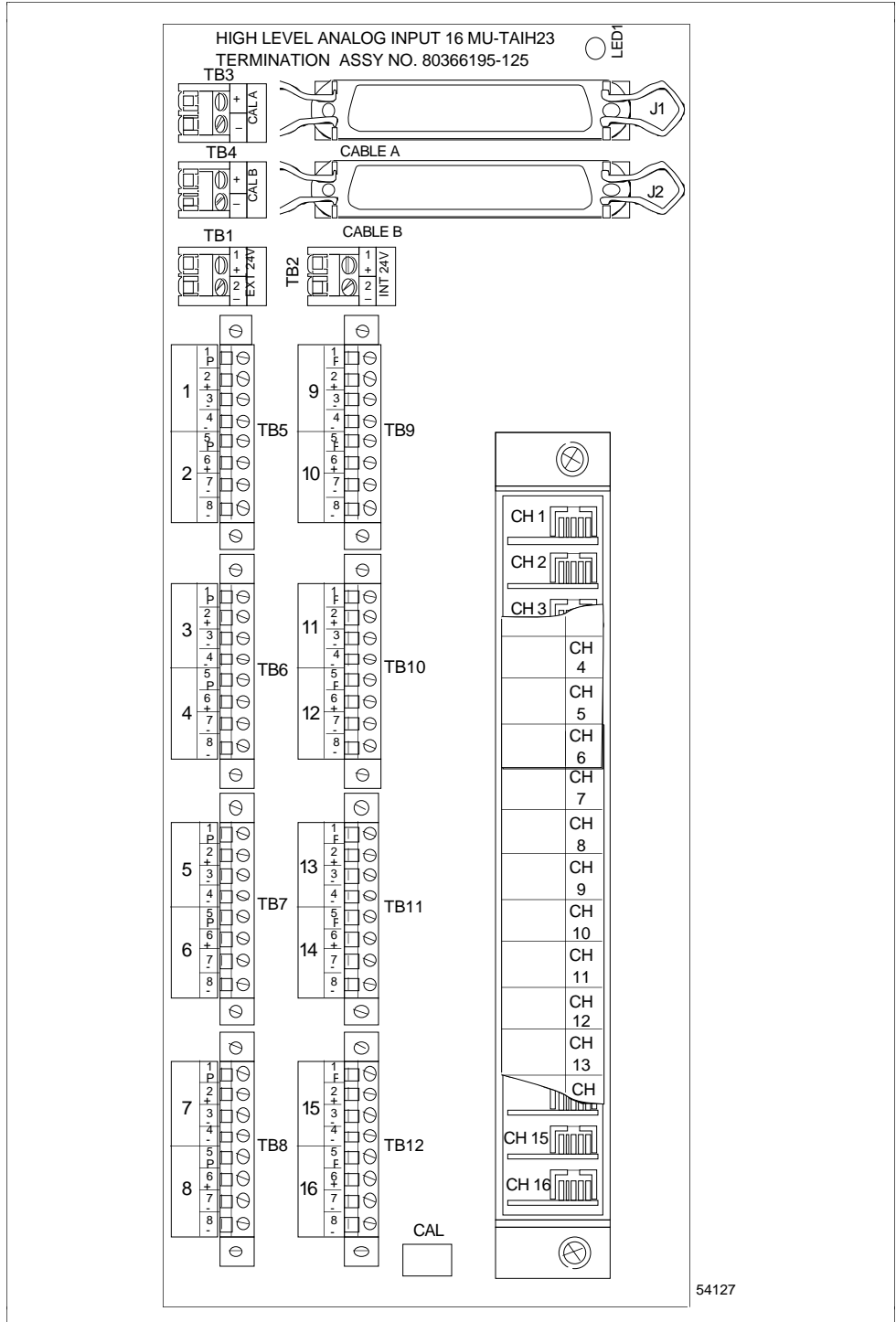


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH23 FTA
assembly layout

Figure 2-46 Model MU-TAIH23 Enhanced Power HLAI FTA
Assembly Layout

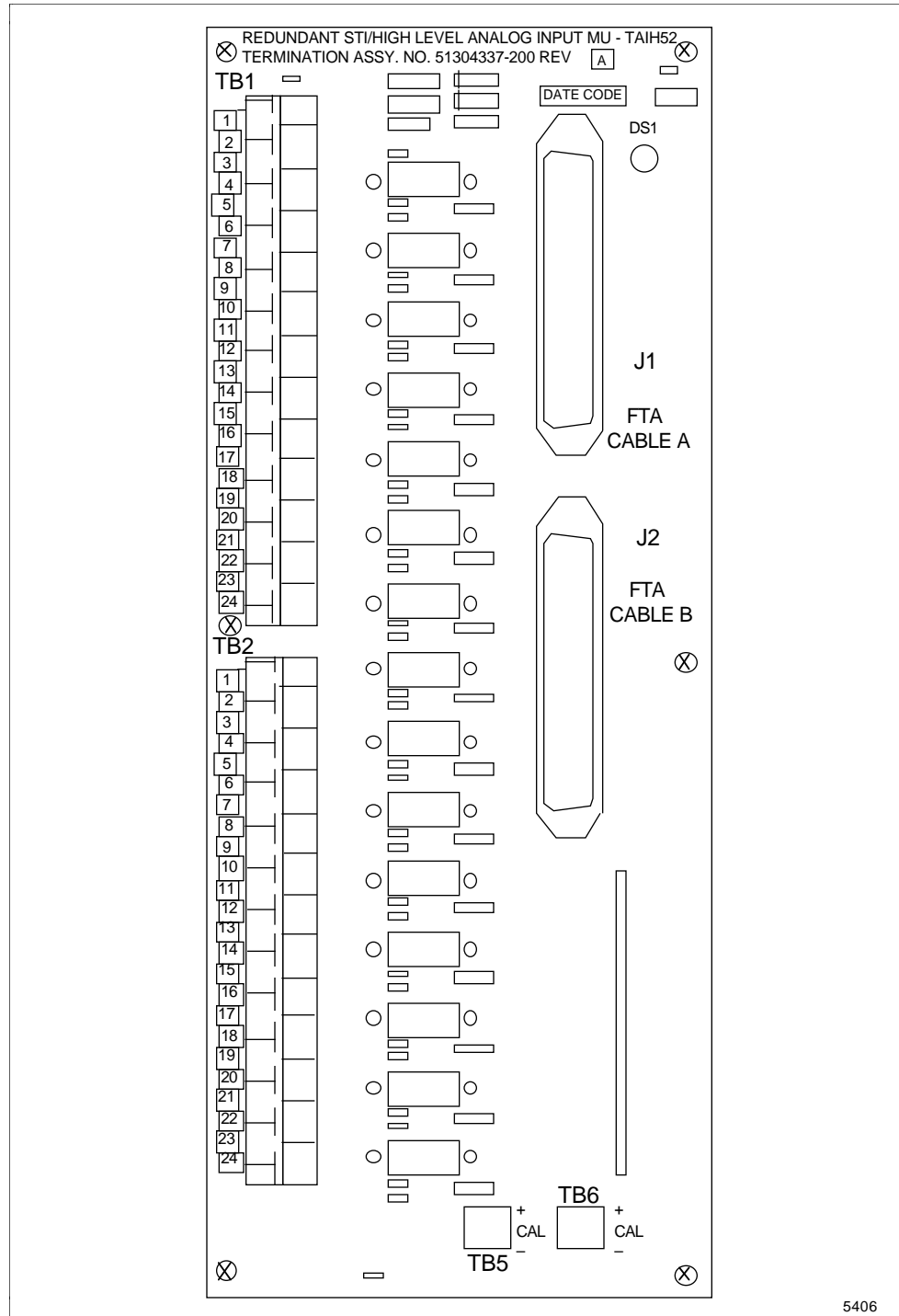


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH52 FTA assembly layout

Figure 2-47 Model MU-TAIH52 High Level Analog Input FTA Assembly Layout

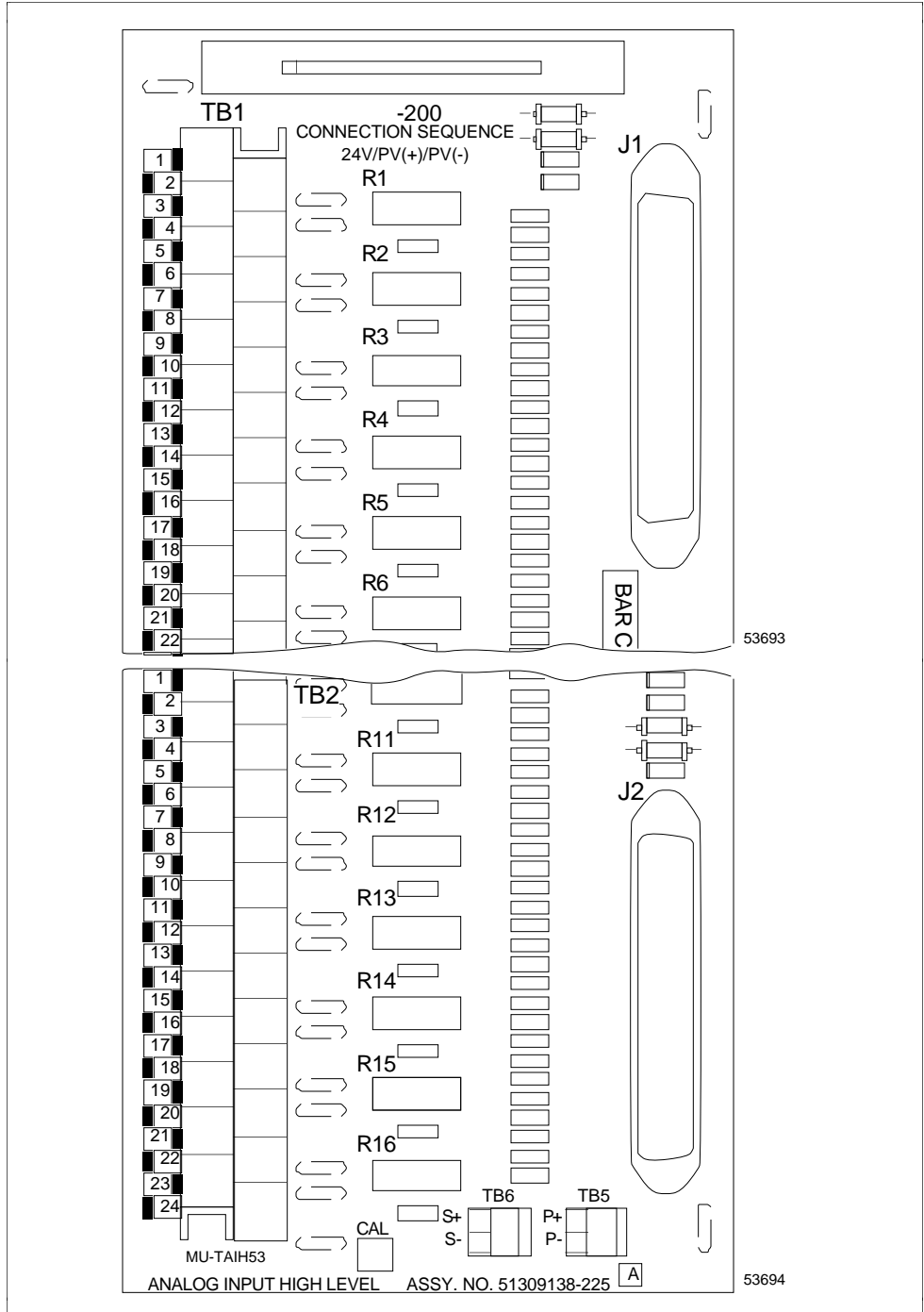


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH53 FTA assembly layout

Figure 2-48 Model MU-TAIH53 High Level Analog Input FTA Assembly Layout

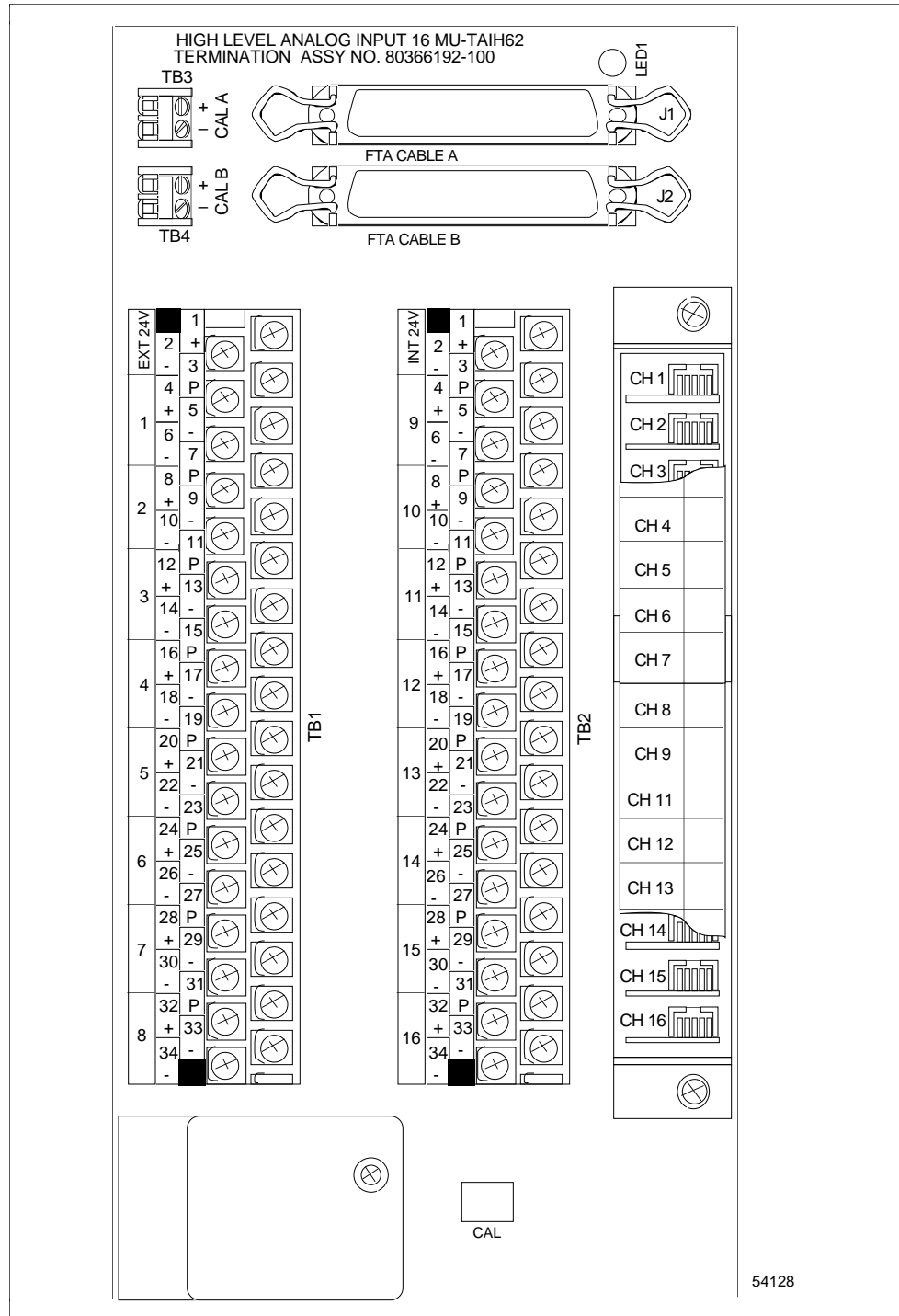


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2.4 High Level Analog Input (HLAI) FTAs, Continued

Model MU-TAIH62 FTA assembly layout

Figure 2-49 Model MU-TAIH62 Enhanced Power HLAI FTA Assembly Layout



2.4.1 Three-Wire and Four-Wire Transmitters

Connection suggestions

Depending upon the situation, use the following instructions when connecting a 3-wire or 4-wire transmitter device to an HLAI FTA. Avoid multiple grounding points in the transmitter loop.

Four-wire, self-powered device isolated from ground

A 4-wire, self-powered device that is isolated from ground is usually powered from 120 Vac and has a pair of output wires providing 4-20 mA dc. The output wires should be connected across an FTA input that does not have its range spool removed. The zero-ohm resistor that connects the (-) side of the transmitter's output to the subsystem's common must not be removed.

If the transmitter's output is 1-5 Vdc, the range spool must be removed and the zero-ohm resistor must not be removed.

Four-wire, self-powered device not isolated from ground

For a 4-wire, self-powered device that is not isolated from ground, the same connection scheme as above applies. It is assumed that "not isolated from ground" implies that the device is at ground potential, or at least within 7 volts of it. Connect the output from the device across the range spool terminals. Remove the zero-ohm resistor. Remove the range spool if the signal is 1-5 Vdc.

Four-wire device powered by an isolated dc power source

For a 4-wire device that is powered by an isolated dc power source, it is assumed that the device receives 24 Vdc operating power on two wires, and two wires provide the device's output to the FTA.

The output from the device is connected to the FTA using the same instructions that apply for a 4-wire, self-powered device that is isolated from ground.

Four-wire device powered by nonisolated subsystem power

For a 4-wire device that is powered by nonisolated subsystem power, it is assumed that the device receives its 24 Vdc operating power from the subsystem and the device's (-) output terminal is common to its (-) power terminal (a 3-wire device). The device's output is isolated from ground, but not from the power common.

If the current required is too high, the user must obtain 24 Vdc power from another source. Use of the model MU-TDPR01 or MU-TDPR02 Digital Input Power Distribution Assembly is recommended. Connect only one device to each fused assembly output.

The 4-20 mA output should be connected across an FTA input that does not have its range spool removed. The zero-ohm resistor that connects the (-) side of the transmitter's output to the subsystem's common must not be removed.

2.4.2 Allowable Field Wiring Resistance

Field wiring resistance calculation

The maximum allowable field wiring resistance between the transmitter and the FTA connection terminal is dependent upon the voltage requirement of the transmitter and the length of the cable between the FTA and the IOP. The cable length between the FTA and redundant IOPs may not be identical. Under worst case conditions, this resistance is given by the following equation.

$$R_{\max} = [(13.70 - V_{\text{tx}})/(.022)] - 1.336(L_{\text{cable}})$$

where: V_{tx} = Voltage required at the transmitter terminal

L_{cable} = Length of the IOP to FTA cable in meters

The above formula is not applicable for the model MU-TAIH22 and MU-TAIH62 Enhanced Power HLAI FTAs because the FTAs feature current-limiting circuitry. Use the following formula instead.

$$R_{\max} = [(15.60 - V_{\text{tx}})/(.022)] - 1.336(L_{\text{cable}})$$

where: V_{tx} = Voltage required at the transmitter terminal

L_{cable} = Length of the IOP to FTA cable in meters

Voltage/resistance graph

Figure 2-50 is a graph of the maximum field wiring resistance versus the transmitter voltage for several FTA cable lengths. This graph, or the equation above, should be used to ensure that field wiring resistance and any miscellaneous circuitry between the transmitter and the FTA will not affect performance.

CAUTION

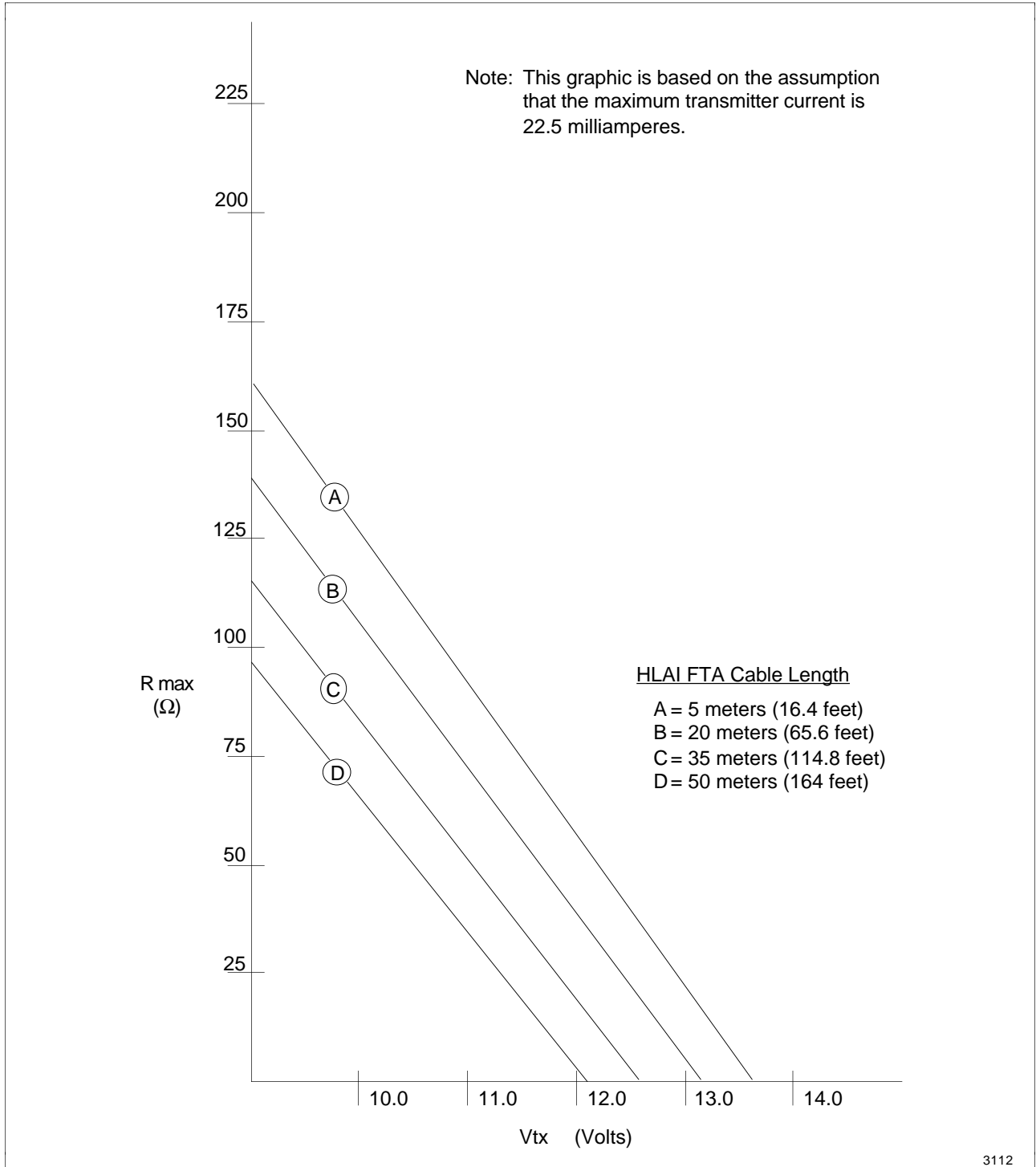
CAUTION—The CE Compliant HLAI FTA models do not require shielded field wiring, but the manufacturer of the field transmitter may require shielded field wiring.

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2.4.2 Allowable Field Wiring Resistance, Continued

HLAI FTA cable resistance graph

Figure 2-50 HLAI FTA Cable Field Resistance Versus Transmitter Voltage



2.4.3 Smart Transmitter Interface (STI) Applications

Introduction

Both the Smart Transmitter Interface (STI)/Smart Transmitter Interface Multivariable (STIM) and the High Level Analog Input (HLAI) IOPs support the non-CE Compliant models of the High Level Analog Input FTAs. When connecting Smart Transmitter devices to the model, MU-TAIH02, MU-TAIH12, MU-TAIH22, MU-TAIH52, or MU-TAIH62 FTA, use the model MU-PSTX01 or MU-PSTX02 Smart Transmitter Interface (STI) IOP, or the model MU-PSTX03 Smart Transmitter Interface Multivariable (STIM) IOP.

CE Compliance

CE Compliant HLAI FTA models MU-TAIH03, MU-TAIH13, MU-TAIH23, and MU-TAIH53 must not be used for a Smart Transmitter device application. The model MU-PSTX01 STI, MU-PSTX02 STI, or MU-PSTX03 STIM IOP will not support these HLAI FTAs.

For Smart Transmitter device applications, use the CE Compliant STI FTA models MU-TSTX03, MU-TSTX13, and MU-TSTX53. They are discussed in subsection 2.5.

Model MU-TAIH22/23/62 FTAs

The model MU-TAIH23 Enhanced Power HLAI FTAs must not be used for a Smart Transmitter device application; however, the model MU-TAIH22 and MU-TAIH62 FTAs can be used for a Smart Transmitter device application.

Connection diagrams

Figures 2-51 and 2-52 are connection diagrams for the compression terminal-type model MU-TAIH01 and MU-TAIH02 FTAs, respectively, when terminating Smart Transmitter devices. These FTAs support a single nonredundant STI or STIM IOP only.

Figures 2-53 and 2-54 are connection diagrams for the compression terminal-type model MU-TAIH12 and MU-TAIH22 FTAs, respectively. Figures 2-55 and 4-56 are a connection diagrams for the screw terminal type model MU-TAIH52 and MU-TAIH62 FTAs, respectively. These FTAs support both nonredundant and redundant IOP configurations.

Continued on next page

2.4.3 Smart Transmitter Interface (STI) Applications, Continued

SFC connections

A Smart Field Communicator (SFC) can be connected to points on the FTAs. Figure 2-57 illustrates connection points on the model MU-TAIH02 FTA. The connection method for the model MU-TAIH01, MU-TAIH03, MU-TAIH12, MU-TAIH13, MU-TAIH52, and MU-TAIH53 FTAs is similar.

Connect the SFC + lead to the +24 Vdc point, **SFC**, for any channel. Connect the SFC – lead to the resistor lead for one of the 16 channels, **R1** (channel 1) through **R16** (channel 16), as shown on the model MU-TAIH02 assembly layout, Figure 2-52.

Figures 2-41, 2-42, 2-43, 2-44, 2-47, and 2-48 illustrate the assembly layout of the model MU-TAIH02, MU-TAIH03, MU-TAIH12, MU-TAIH13, MU-TAIH52, and MU-TAIH53 FTAs, respectively.

Model MU-TAIH22/23/62 FTAs

The model MU-TAIH22, MU-TAIH23, and MU-TAIH62 FTAs do not have a dedicated SFC terminal. When a Smart Field Communicator is used, connect the SFC + lead to the “Power” screw terminal and the SFC – lead to the “AI+” screw terminal of the individual channel. For channel 1, this would be terminals 3 and 4, respectively. For channel 4, this would be terminals 15 and 16, respectively.

Maximum allowable field resistance

The maximum allowable field wiring resistance between the transmitter and the FTA connection terminal is dependent upon the voltage requirement of the transmitter and the length of the cable between the FTA and the IOP. The cable length between the FTA and redundant IOPs may not be identical. Under worst case conditions, this resistance is given by the following equation.

$$R_{\max} = (13.70 - V_{\text{tx}})/(.022) - 1.336(L_{\text{cable}})$$

where: V_{tx} = Voltage required at the transmitter terminal
 L_{cable} = Length of the FTA cable in meters

The above formula is not applicable for the model MU-TAIH62 Enhanced Power HLAI/STI FTA because the FTA features current-limiting circuitry. Use the following formula instead.

$$R_{\max} = [(15.60 - V_{\text{tx}})/(.022)] - 1.336(L_{\text{cable}})$$

where: V_{tx} = Voltage required at the transmitter terminal
 L_{cable} = Length of the IOP to FTA cable in meters

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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

**Voltage/resistance
graph**

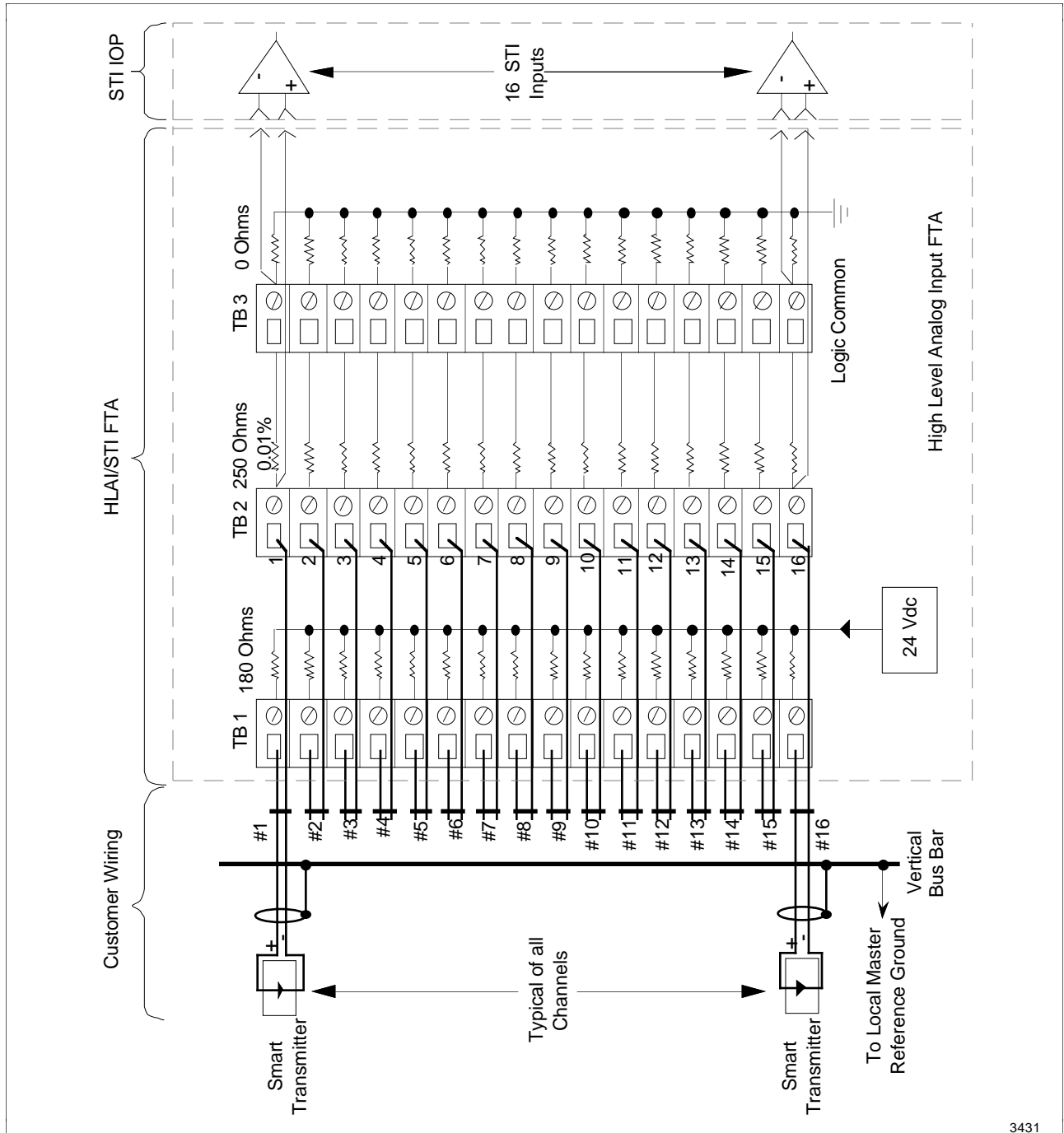
Figure 2-50 is a graph of the maximum field resistance versus the transmitter voltage for several FTA cable lengths. This graph or the equation above should be used to ensure that field wiring resistance, and any miscellaneous circuitry between the transmitter and the FTA will not affect performance.

Continued on next page

2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH01 FTA STI connection diagram

Figure 2-51 Model MU-TAIH01 HLAI FTA—Smart Transmitter Interface Applications Connection Diagram

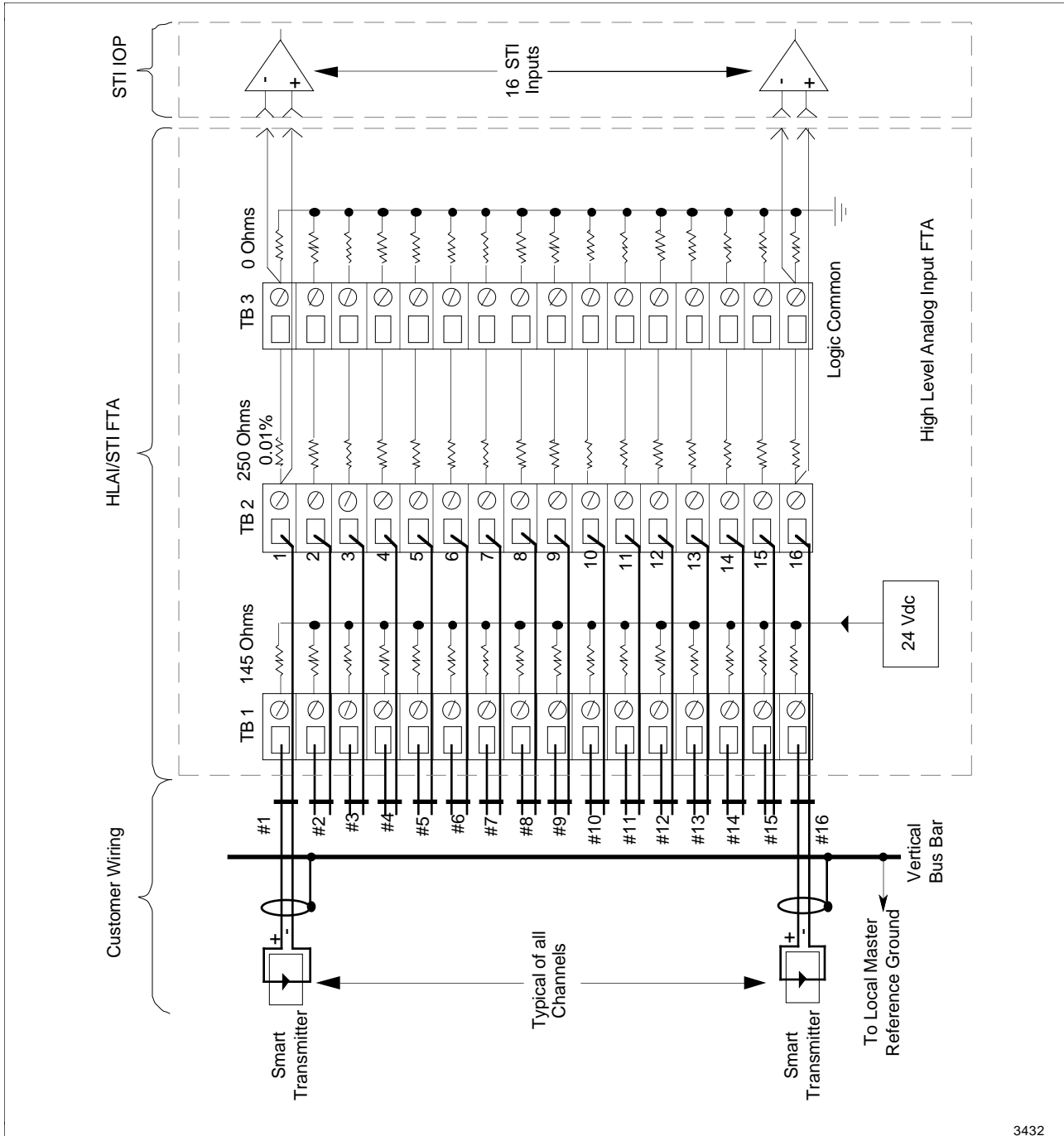


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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH02 FTA STI connection diagram

Figure 2-52 Model MU-TAIH02 HLAI FTA—Smart Transmitter Interface Applications Connection Diagram



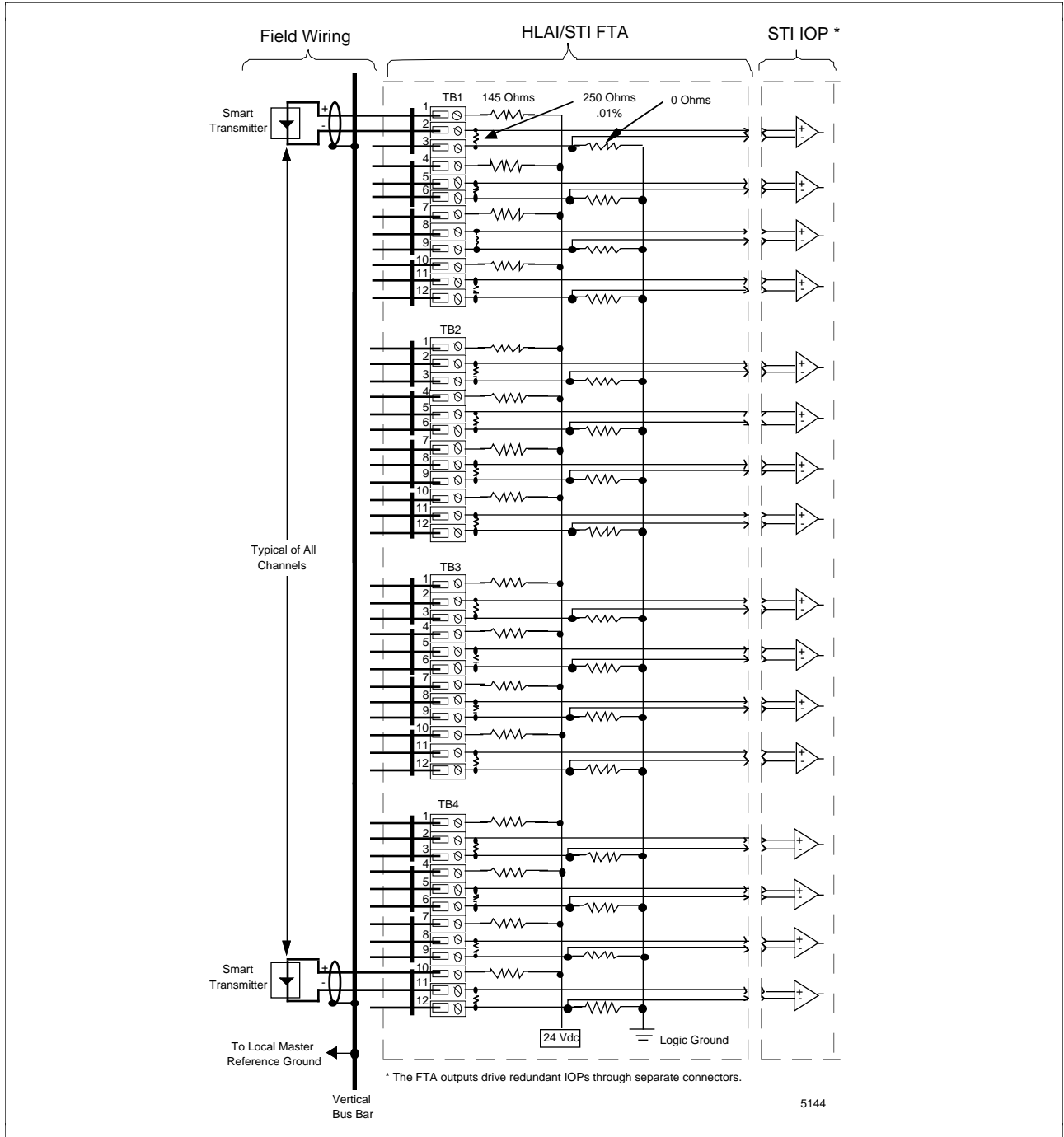
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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH12 FTA STI connection diagram

Figure 2-53 Model MU-TAIH12 HLA/STI FTA—Smart Transmitter Interface Applications
Connection Diagram

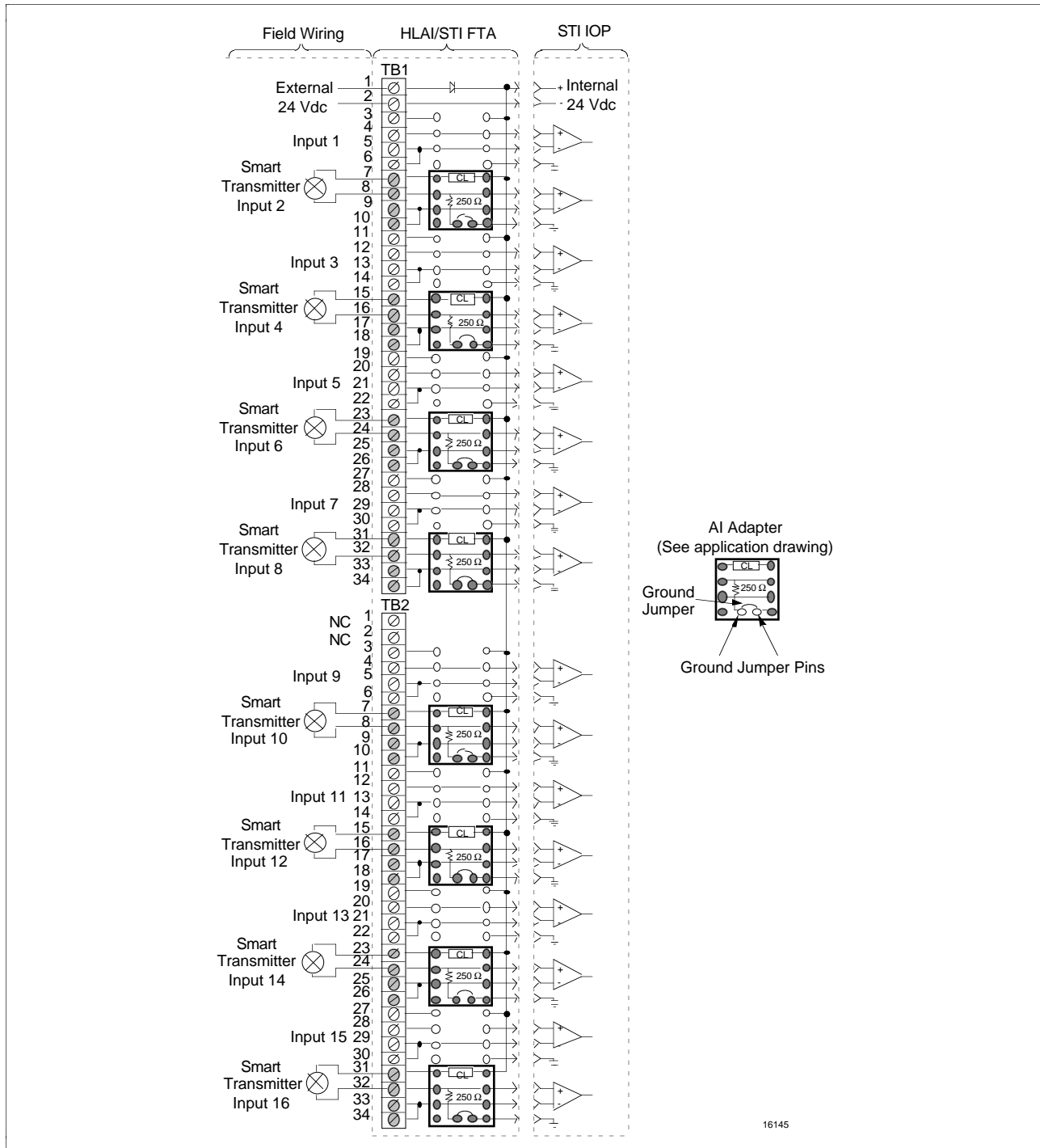


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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH22 FTA STI connection diagram

Figure 2-54 Model MU-TAIH22 HLAI FTA—Smart Transmitter Interface Applications Connection Diagram

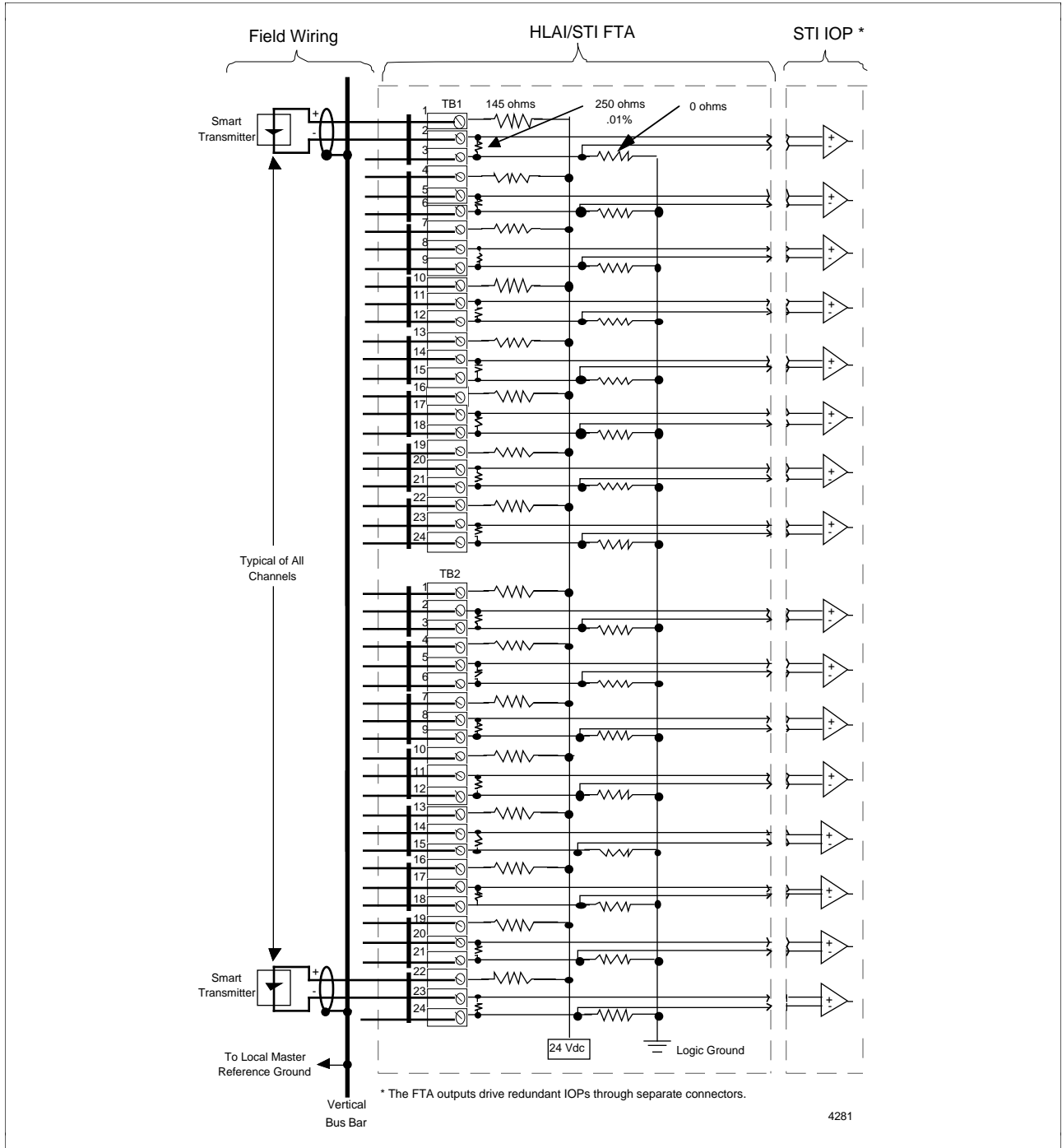


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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH52 FTA STI connection diagram

Figure 2-55 Model MU-TAIH52 HLAI FTA—Smart Transmitter Interface Applications Connection Diagram

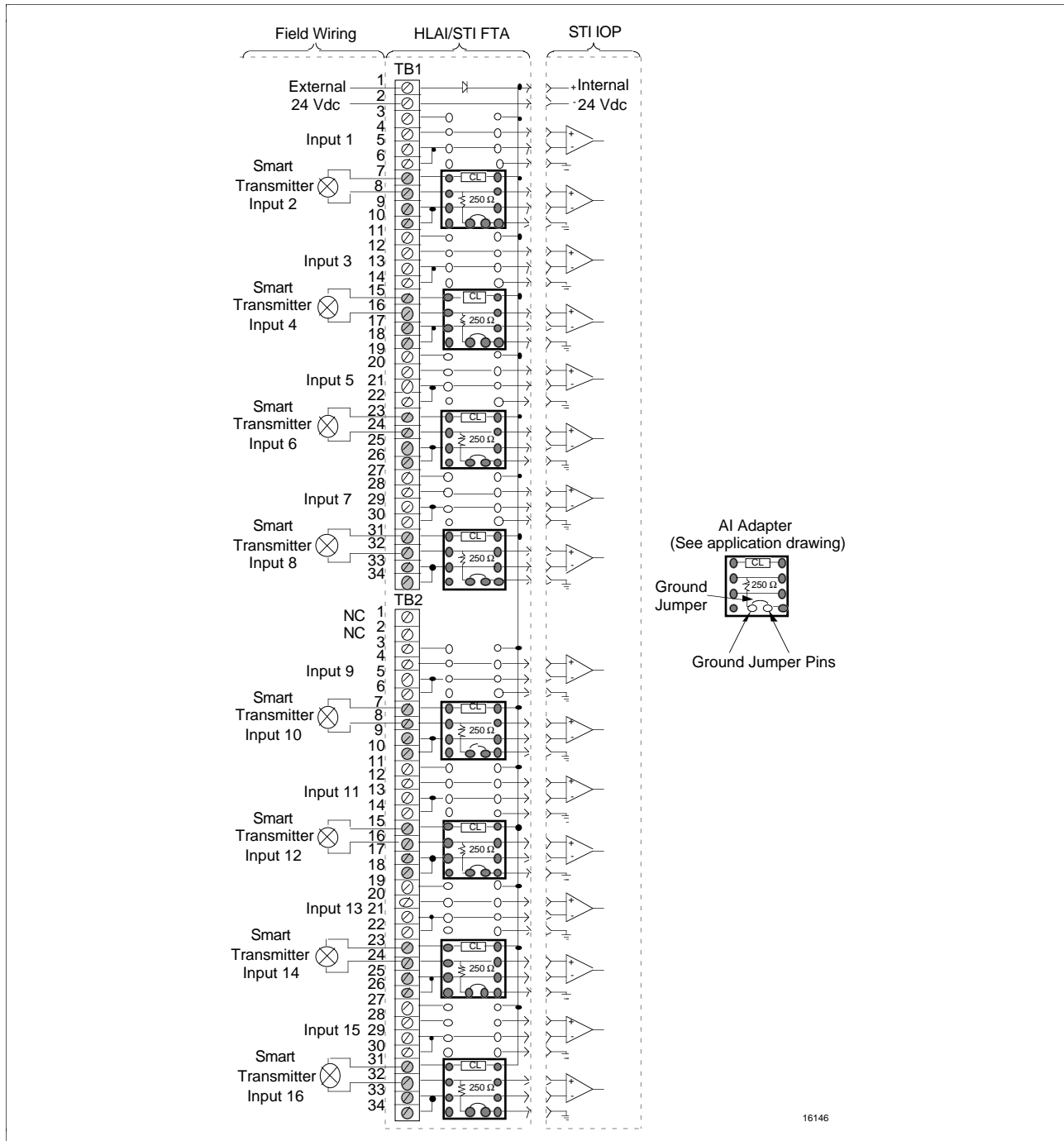


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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH62 FTA STI connection diagram

Figure 2-56 Model MU-TAIH62 HLA/STI FTA—Smart Transmitter Interface Applications Connection Diagram

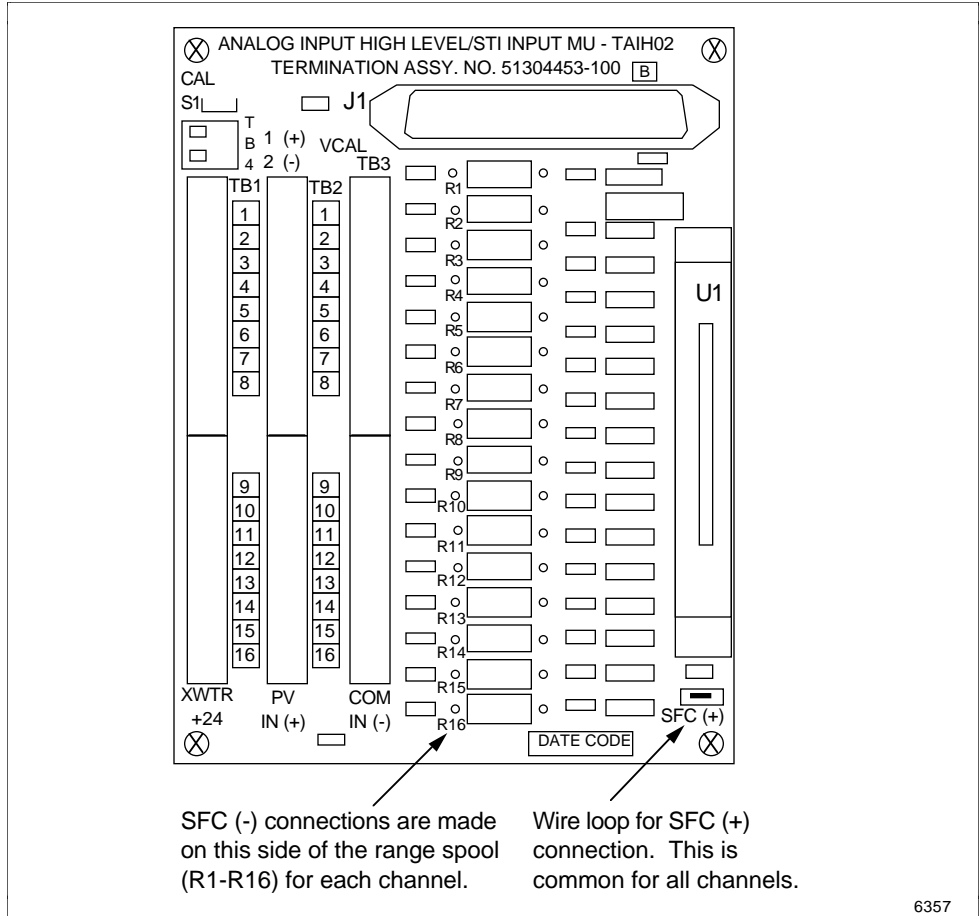


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2.4.3 Smart Transmitter Interface (STI) Applications, Continued

Model MU-TAIH02 FTA assembly layout

Figure 2-57 Model MU-TAIH02 HLAI FTA Assembly Layout—SFC Connections



2.5 Smart Transmitter Interface (STI) FTAs

CE Compliance

All models of the Smart Transmitter Interface (STI) Field Termination Assemblies (FTAs) are CE Compliant. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.”

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

STI FTAs and IOPs

The CE Compliant models with their part numbers are listed in Table 2-7.

Table 2-7 Smart Transmitter Interface FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TSTX03	STI FTA with Compression Terminals Single IOP Interface	N/A	51309140-125
MC-TSTX03	STI FTA with Compression Terminals Single IOP Interface—Conformally Coated	N/A	51309140-175
MU-TSTX13	STI FTA with Compression Terminals Redundant IOP Interface	N/A	51309142-125
MC-TSTX13	STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	N/A	51309142-175
MU-TSTX53	STI FTA with Screw Terminals Redundant IOP Interface	N/A	51309142-225
MC-TSTX53	STI FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	N/A	51309142-275
MU-PSTX02	STI IOP	51304516-100	N/A
MC-PSTX02	STI IOP—Conformally Coated	51304516-150	N/A
MU-PSTX03	STIM IOP	N/A	51304516-200
MC-PSTX03	STIM IOP—Conformally Coated	N/A	51304516-250

CAUTION

CAUTION—The CE Compliant STI FTA models do not require shielded field wiring, but the manufacturer of the field transmitter may require shielded field wiring.

Description

The Smart Transmitter Interface (STI) FTA accepts up to 16 Smart Transmitter device high level analog inputs. The inputs are configurable as single-ended or differential in relation to ground.

Continued on next page

2.5 Smart Transmitter Interface (STI) FTAs, Continued

STIM IOP

The model MU-PSTX02 Smart Transmitter Interface (STI) IOP and model MU-PSTX03 Smart Transmitter Interface Multivariable (STIM) IOP support the Smart Transmitter Interface FTAs and can be installed in any card file slot.

Assembly connection and layout diagrams

Figure 2-58 is a connection diagram for the compression terminal-type model MU-TSTX03 FTA. This FTA supports a single nonredundant STI or STIM IOP only.

Figure 2-59 is a connection diagram for the compression terminal-type model MU-TSTX13 FTA. Figure 2-60 is a connection diagram for the screw terminal type model MU-TSTX53 FTA. These FTAs support both nonredundant and redundant IOP configurations.

Figures 2-61 through 2-63 illustrate the assembly layout of the model MU-TSTX03, MU-TSTX13, and MU-TSTX53 FTAs, respectively.

SFC connections

A Smart Field Communicator (SFC) can be connected to points on the FTAs. Figure 2-61 illustrates connection points on the model MU-TSTX03 FTA. The connection method for the model MU-TSTX13 and MU-TSTX53 FTAs is similar.

Connect the SFC + lead to a +24 Vdc point, **SFC +**, for any channel. Connect the SFC – lead to the inductor lead for one of the 16 channels, **L1** (channel 1) through **L16** (channel 16), as shown on the model MU-TSTX03 assembly layout, Figure 2-61.

Vertical bus bar

Because the FTA does not have a built-in shield bus, handling a large number of cable shields requires the use of a vertical bus bar. The vertical bus bar and any cable shield connect to the local Master Reference Ground (MRG) at the floor of the cabinet. For CE Compliance applications, Safety Ground must be used.

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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Self-powered transmitters

All transmitter loops must have a single connection to reference ground. If the loop does not have a ground reference connection, it must be provided by the FTA's zero-ohm resistor. If this ground connection is provided by a self-powered transmitter, the zero-ohm resistor on the FTA must be removed. See subsection 2.4.1 for additional information.

When the zero-ohm resistor is removed, the loop ground must not produce more than -7 to +5 volts of common mode voltage onto the loop signal.

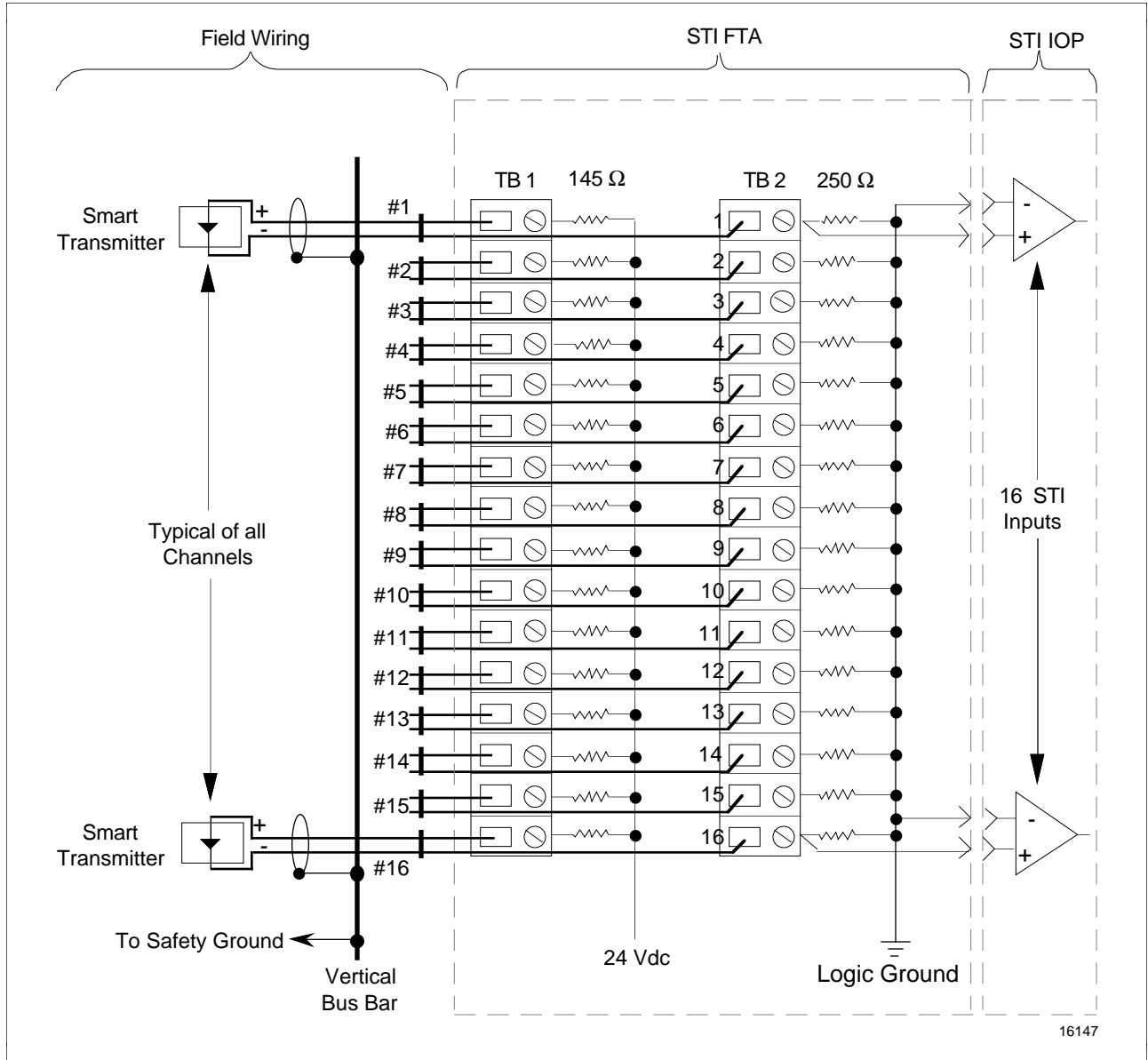
If the common mode voltage is outside the FTA's specifications, or the transmitter cannot be isolated from ground, or stable ground conditions do not exist, the transmitter must not be connected to the FTA without the use of an isolator. When an isolator is used, the zero-ohm resistor must not be removed.

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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Model MU-TSTX03 FTA connection diagram

Figure 2-58 Model MU-TSTX03 Smart Transmitter Interface FTA Connection Diagram

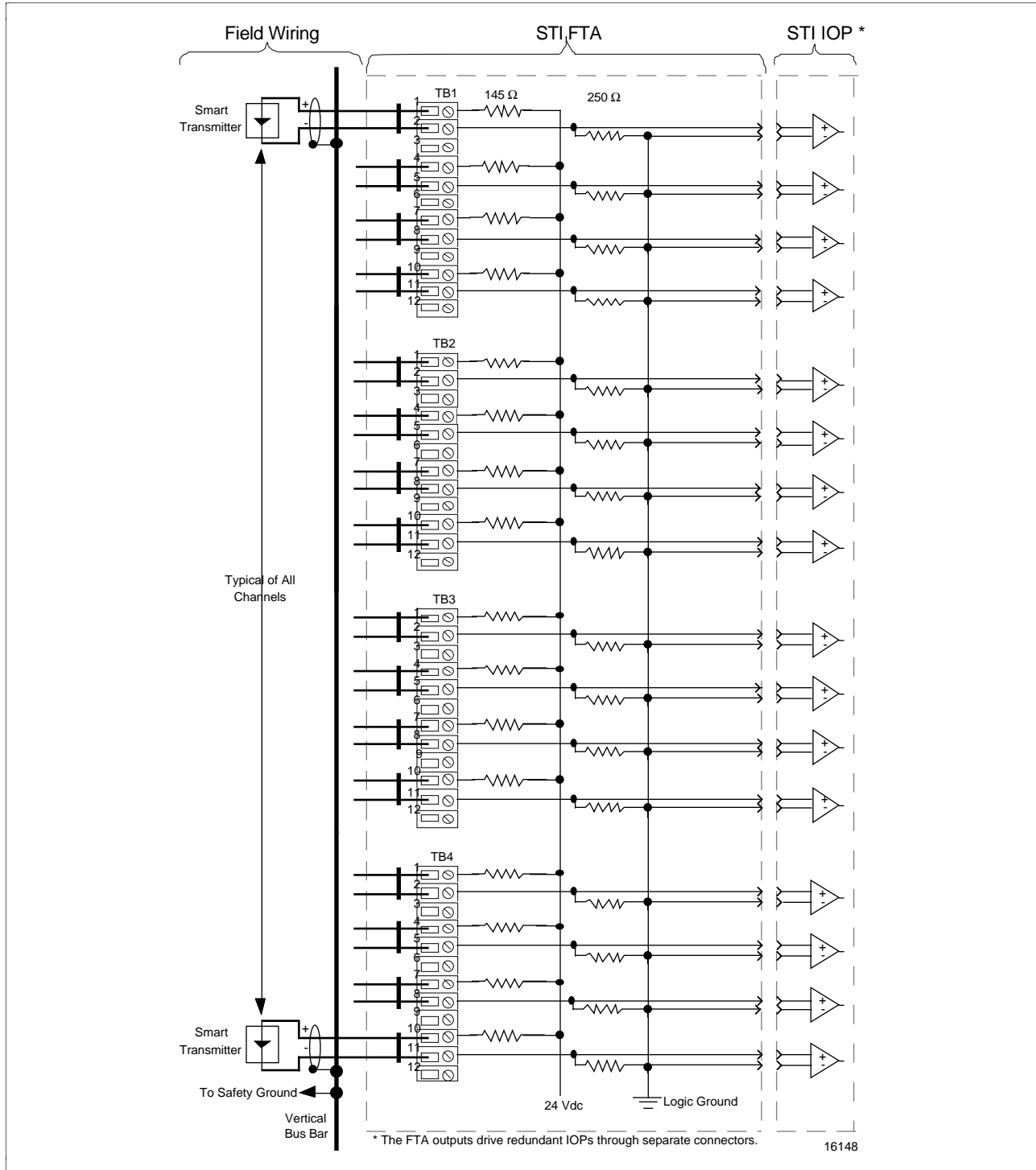


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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Model MU-TSTX13 FTA connection diagram

Figure 2-59 Model MU-TSTX13 Smart Transmitter Interface FTA Connection Diagram

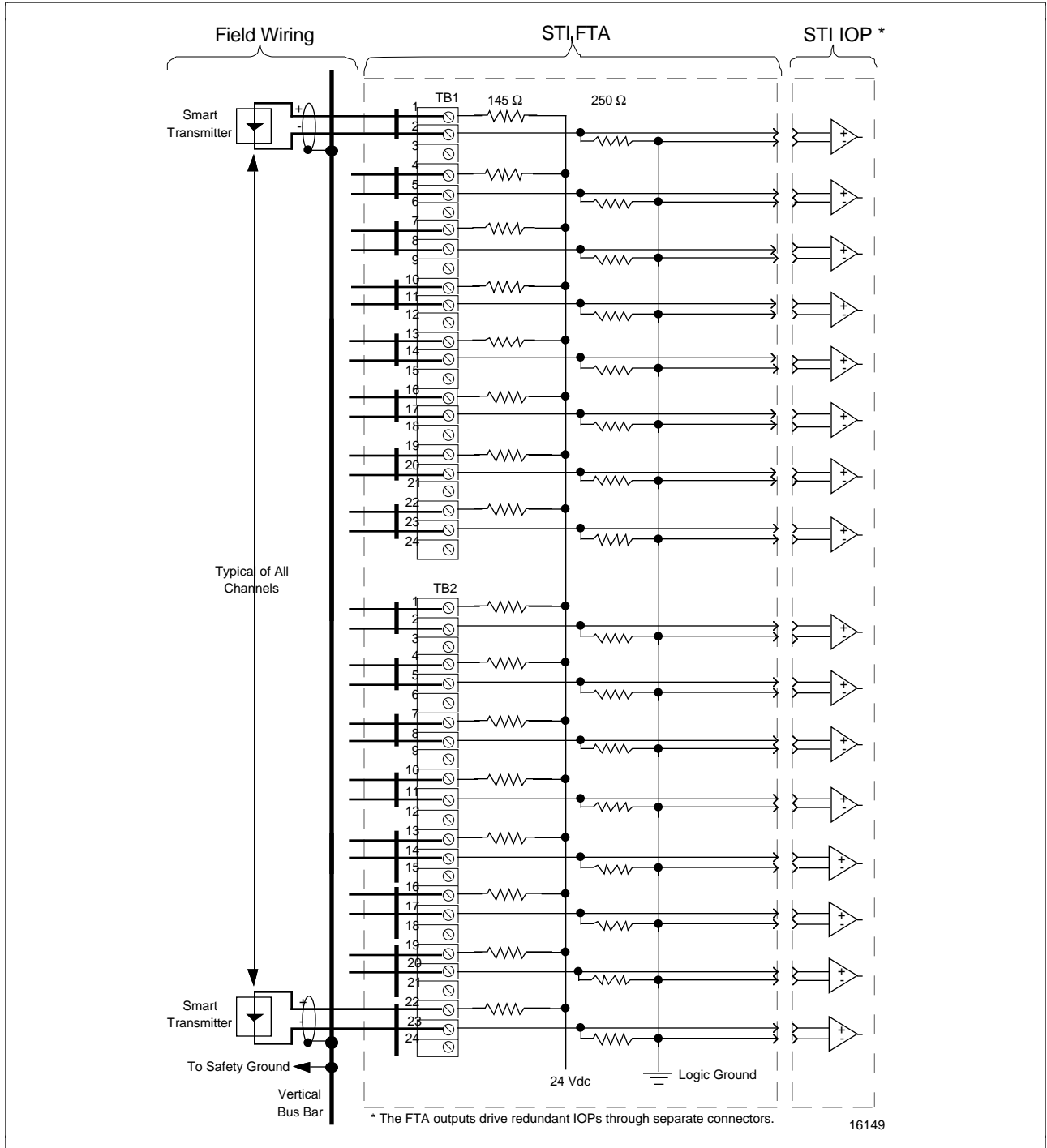


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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Model MU-TSTX53 FTA connection diagram

Figure 2-60 Model MU-TSTX53 Smart Transmitter Interface FTA Connection Diagram

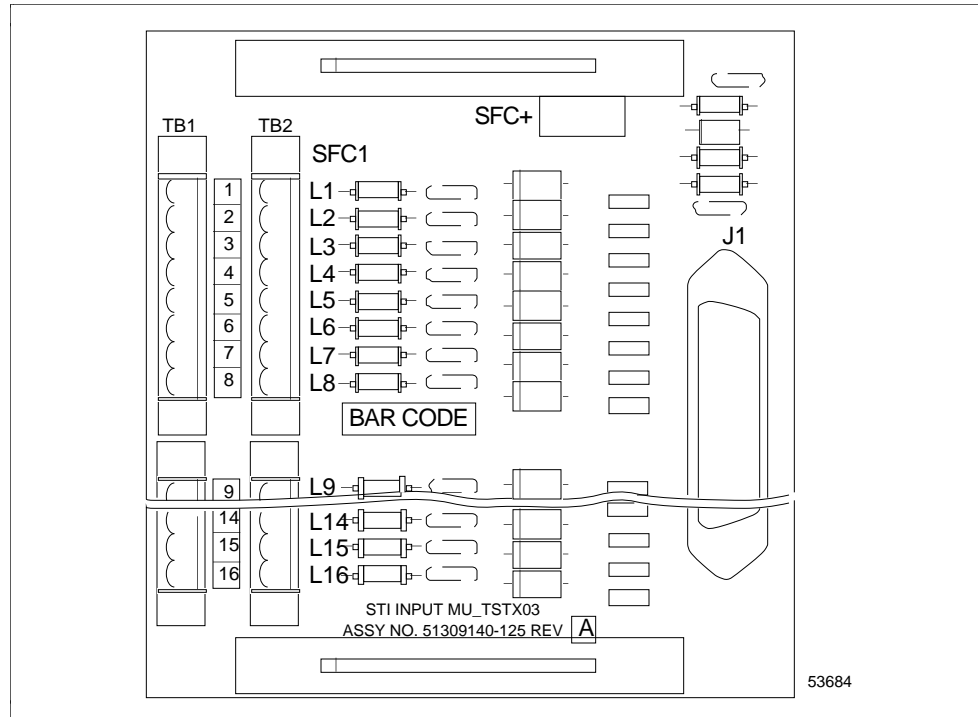


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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Model MU-TSTX03 FTA assembly layout

Figure 2-61 Model MU-TSTX03 Smart Transmitter Interface FTA
Assembly Layout

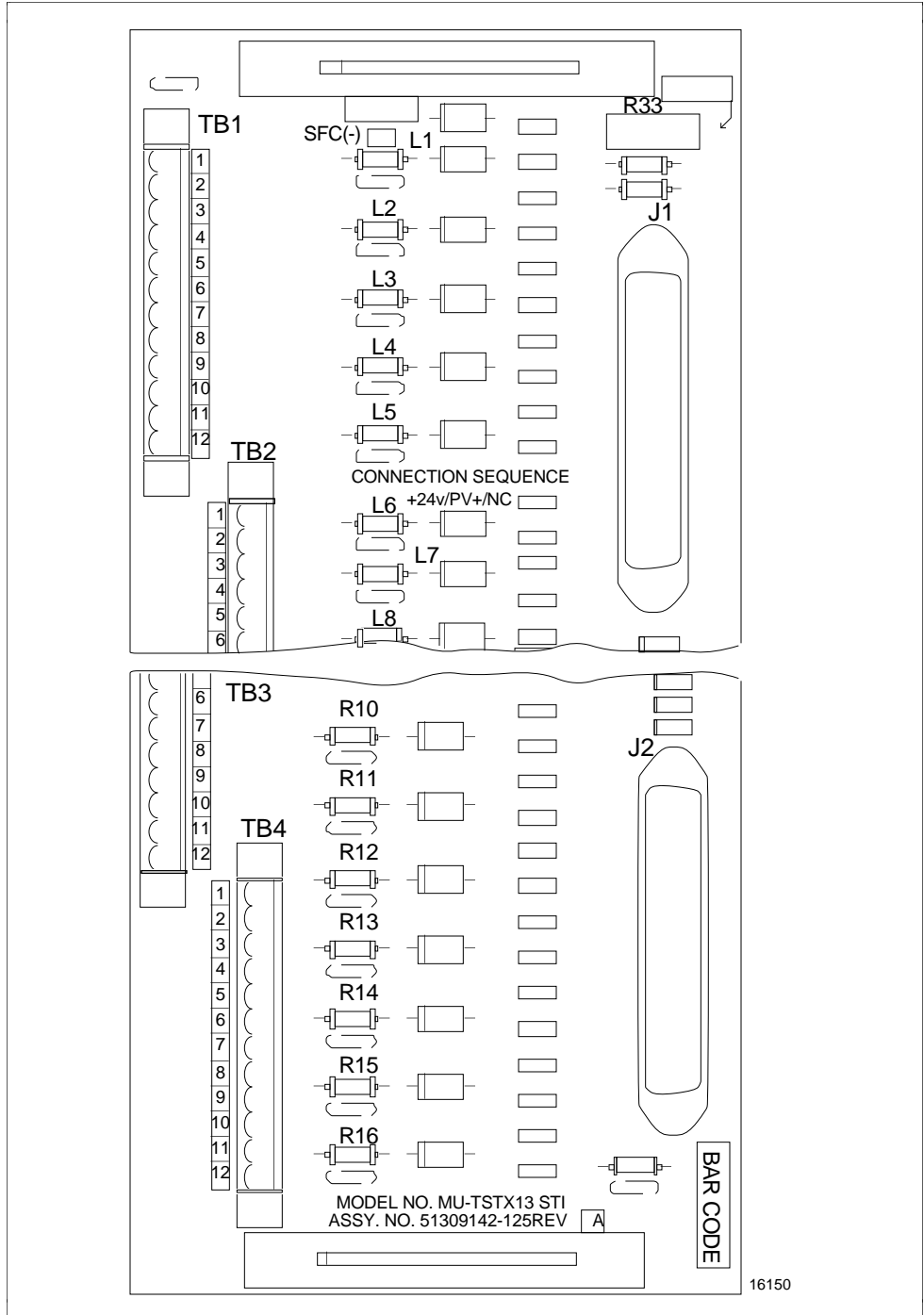


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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Model MU-TSTX13 FTA assembly layout

Figure 2-62 Model MU-TSTX13 Smart Transmitter Interface FTA Assembly Layout

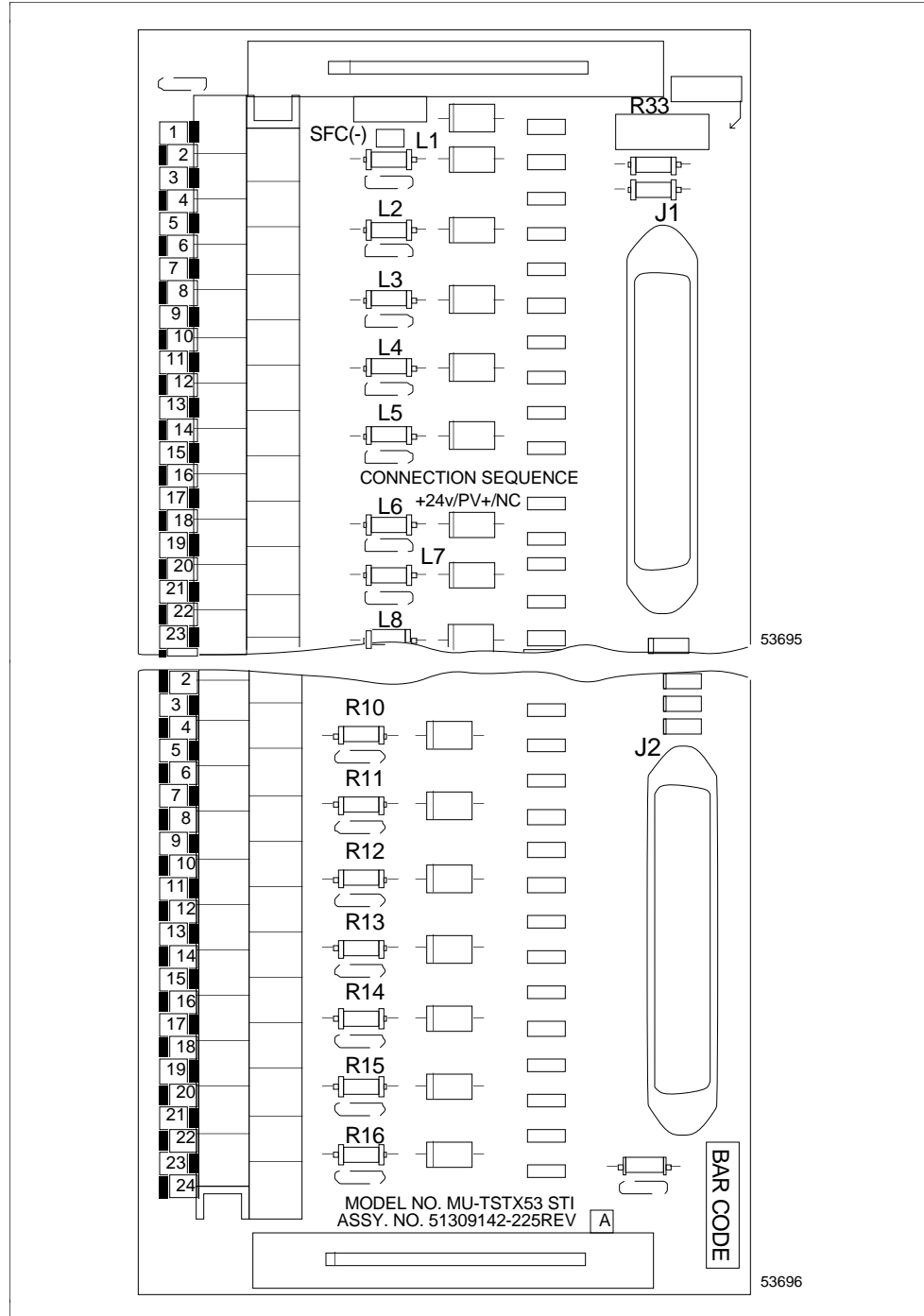


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2.5 Smart Transmitter Interface (STI) FTAs, Continued

Model MU-TSTX53 FTA assembly layout

Figure 2-63 Model MU-TSTX53 Smart Transmitter Interface FTA Assembly Layout



Section 3 – Analog Output FTA Installation

3.1 Overview

Section contents The topics covered in this section are:

	Topic	See Page
3.1	Overview.....	95
3.2	Analog Output (AO) FTAs	95
3.2.1	Model MU-TAOX01/02/12/52 FTAs.....	98
3.2.2	Model MU-TAOY22/23/52/53 FTAs.....	105

Purpose This section provides information necessary for the proper installation of Analog Output Field Termination Assemblies (FTAs). If required for configuration or other purposes, supporting assemblies, such as Input/Output Processors (IOPs), are also included in the installation procedure discussion.

3.2 Analog Output (AO) FTAs

CE Compliance Some Analog Output (AO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable. For CE Compliant applications, The CE Compliant FTA and IOP models must be used with the CE Compliant model shielded IOP to FTA cable and card file.

The model MU-PAOX03 IOP is available as a CE Compliant assembly and as a non-CE Compliant assembly. For CE Compliance, the CE Compliant assembly must be used with the CE Compliant FTAs. The CE Compliant assembly is identified by a part number tab number that ends in “25” or “75.” It does not have a unique model number.

The model MU-PAOY22 Analog Output IOP is a CE Compliant assembly. There is no non-CE Compliant AO IOP assembly.

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3.2 Analog Output (AO) FTAs, Continued

AO FTA and IOP models

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 3-1.

Table 3-1 Analog Output FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
8 Channel (Points) FTAs and IOP			
MU-TAOX01	AO FTA with Compression Terminals Single IOP Interface	51303953-100	N/A
MU-TAOX02	AO FTA with Compression Terminals Single IOP Interface	51304476-100	51304476-125
MC-TAOX02	AO FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304476-150	51304476-175
MU-TAOX12	AO FTA with Compression Terminals Redundant IOP Interface	51304435-100	51304435-125
MC-TAOX12	AO FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304435-150	51304435-175
MU-TAOX52	AO FTA with Screw Terminals Redundant IOP Interface	51304435-200	51304435-225
MC-TAOX52	AO FTA with Screw Terminals Redundant IOP Interface—Conformally Coated	51304435-250	51304435-275
MU-PAOX01	Analog Output IOP	51303985-200	N/A
MU-PAOX02	Analog Output IOP	51304483-100	N/A
MU-PAOX03	Analog Output IOP	51304672-100	51309152-125
MC-PAOX03	Analog Output IOP—Conformally Coated	51304672-150	51309152-175
16 Channel (Points) FTAs and IOP			
MU-TAOY22	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface	80366177-100	80366481-125
MC-TAOY22	AO FTA with Compression Terminals Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80366177-150	80366481-175
MU-TAOY23	AO FTA with Compression Terminals Without Standby Manual Device Connector Redundant IOP Interface	80366177-200	N/A
MC-TAOY23	AO FTA with Compression Terminals Without Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80366177-250	N/A

3.2 Analog Output (AO) FTAs, Continued

AO FTA models,
continued

Table 3-1 Analog Output FTA Models, Continued

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
16 Channel (Points) FTAs and IOP, continued			
MU-TAOY52	AO FTA with Screw Terminals Standby Manual Device Connector Redundant IOP Interface	80364007-100	80366484-125
MC-TAOY52	AO FTA with Screw Terminals Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80364007-150	80366484-175
MU-TAOY53	AO FTA with Screw Terminals Without Standby Manual Device Connector Redundant IOP Interface	80364007-200	N/A
MC-TAOY53	AO FTA with Screw Terminals Without Standby Manual Device Connector Redundant IOP Interface—Conformally Coated	80364007-250	N/A
MU-PAOY22	Analog Output IOP	N/A	80363969-100
MC-PAOY22	Analog Output IOP—Conformally Coated	N/A	80363969-150

CAUTION

CAUTION—The CE Compliant Analog Output FTA models do not require shielded field wiring, but the manufacturer of the valve may require shielded field wiring.

3.2.1 Model MU-TAOX01/02/12/52 FTAs

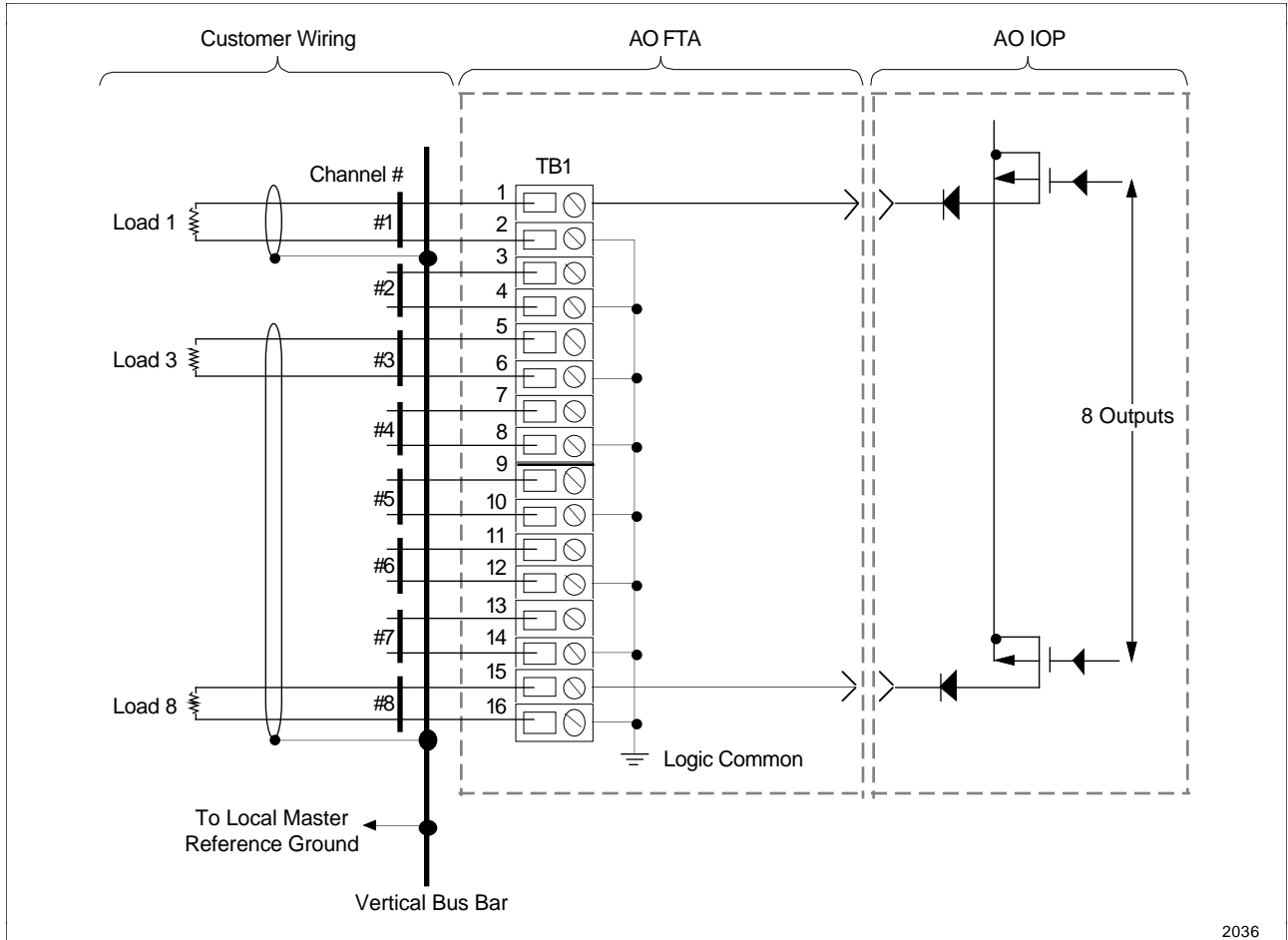
Description	The Analog Output FTA provides eight 4-20 mA outputs to proportioning loads, such as valves. There are three models of the FTA.
IOP compatibility	<p>The model MU-PAOX01, MU-PAOX02 and MU-PAOX03 Analog Output IOPs are compatible only with the model MU-TAOX01, MU-TAOX02, MU-TAOX12, and MU-TAOX52 Analog Output FTAs. These IOPs are not compatible with the model MU-TAOY22, MU-TAOY23, MU-TAOY52, or MU-TAOY53 Analog Output FTAs.</p> <p>Do not mismatch Analog Output IOPs.</p>
IOP redundancy support	The model MU-TAOX12 and MU-TAOX52 Analog Output FTAs support both nonredundant and redundant Analog Output IOP configurations.
Connection diagrams	<p>Figure 3-1 is a connection diagram for the compression terminal-type model MU-TAOX01 and MU-TAOX02 Analog Output FTAs. These FTAs support only a single nonredundant Analog Output IOP.</p> <p>Figure 3-2 is a connection diagram for the compression terminal-type model MU-TAOX12 Analog Output FTA. Figure 3-3 is a connection diagram for the screw terminal type model MU-TAOX52 Analog Output FTA.</p>
Assembly layout illustrations	Figures 3-4 through 3-6 illustrate the assembly layout of the model MU-TAOX02, MU-TAOX12, and MU-TAOX52 FTAs, respectively.
Vertical bus bar	The FTA does not have a built-in bus to accommodate field wiring cable shields. A vertical bus bar that is installed on the FTA Mounting Channel, as described in Section 9, is recommended as a connection point for local Master Reference Ground (MRG). Connect the cable shields to the vertical bus bar and then connect the vertical bus bar to the local Master Reference Ground (MRG) with a 2.5 mm ² (14 AWG) wire. For CE Compliance applications, Safety Ground must be used.
Power Limited Tray cable	Installations can use Power Limited Tray cable. Check the local electrical codes.

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3.2.1 Model MU-TAOX01/02/12/52 FTAs, Continued

Model MU-TAOX02 connection diagram

Figure 3-1 Model MU-TAOX01/MU-TAOX02 Analog Output FTA Connection Diagram



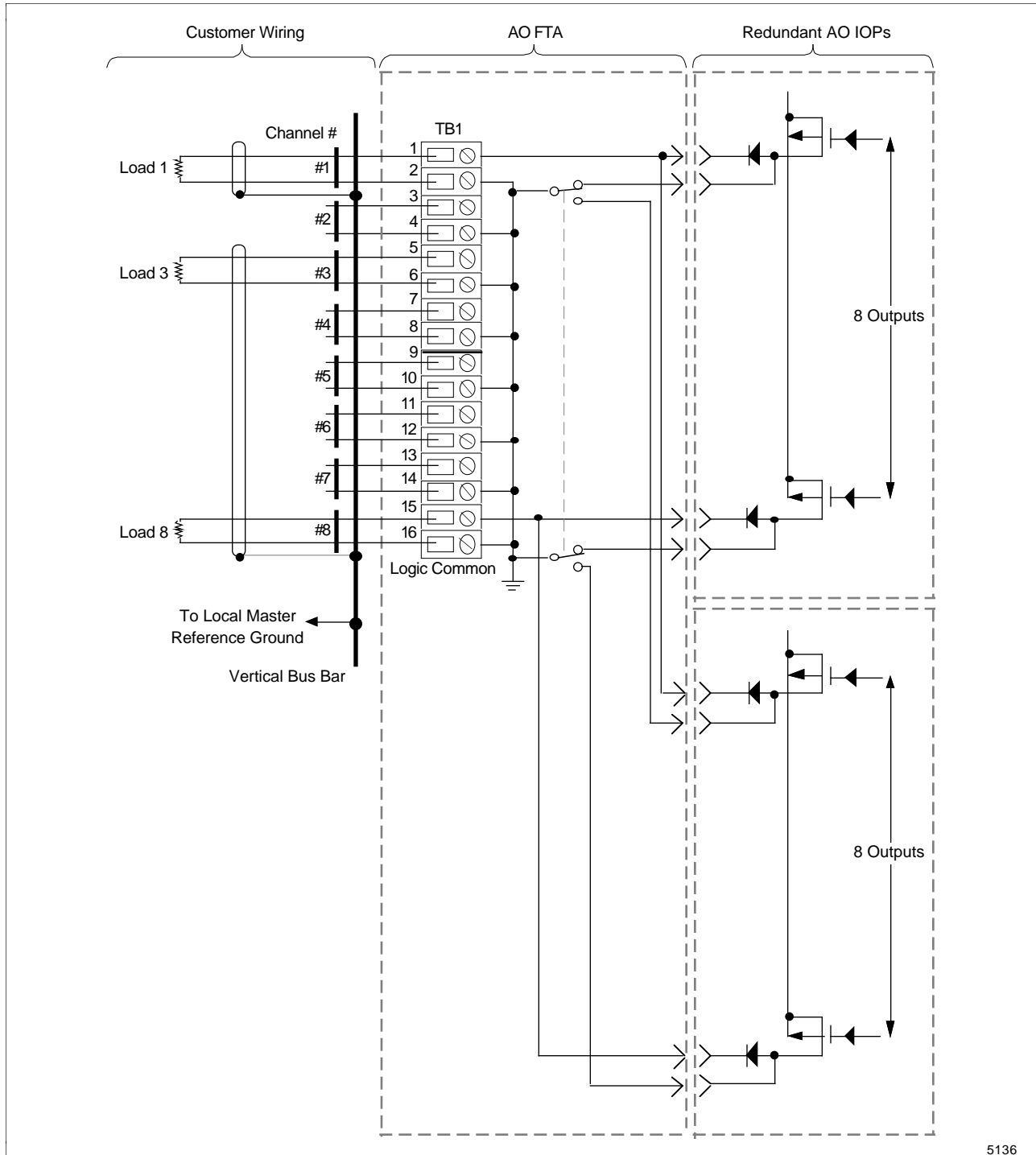
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3.2.1 Model MU-TAOX01/02/12/52 FTAs, Continued

Model MU-TAOX12 connection diagram

Figure 3-2 Model MU-TAOX12 Analog Output FTA Connection Diagram



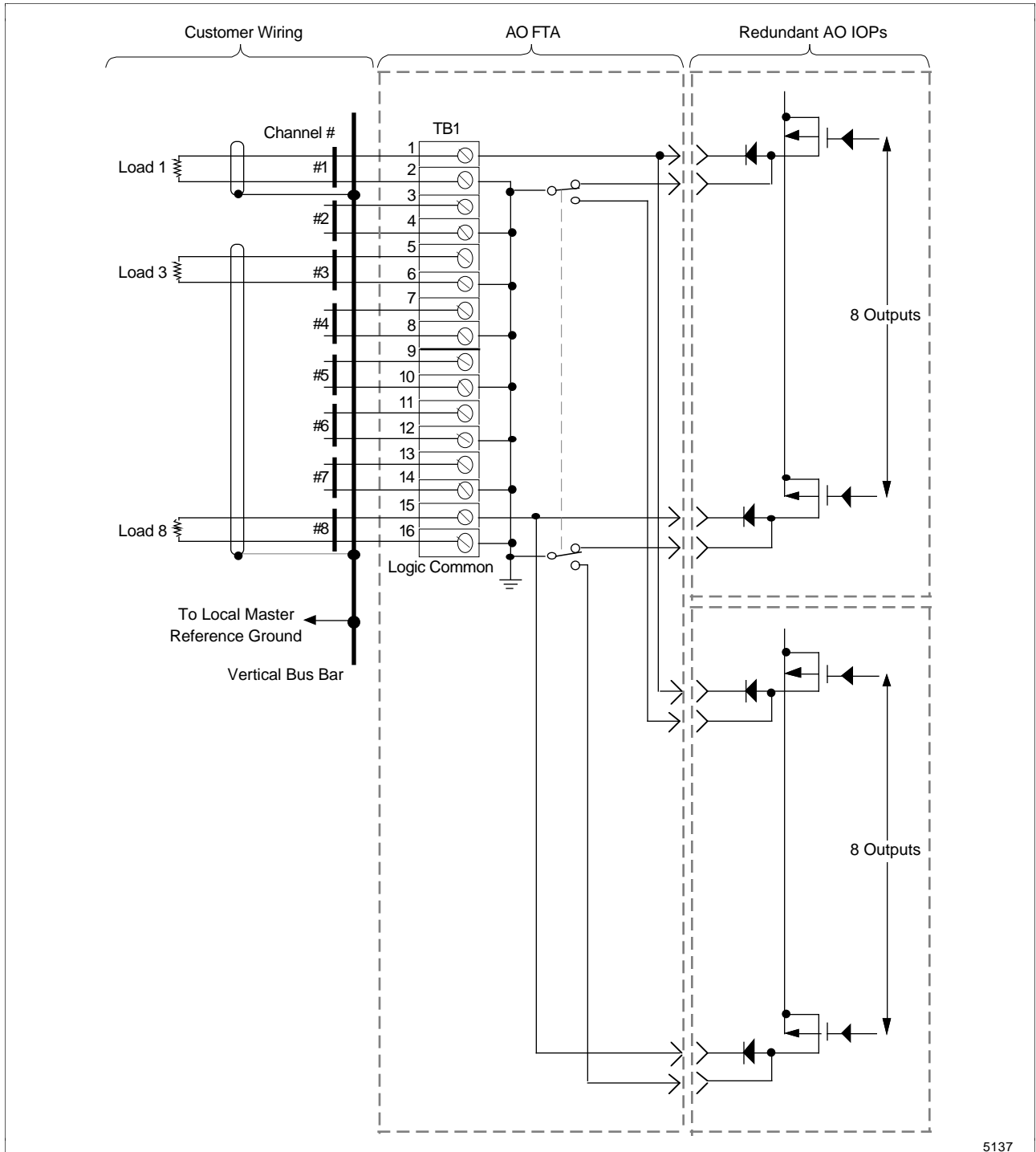
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3.2.1 Model MU-TAOX01/02/12/52 FTAs, Continued

Model MU-TAOX52 connection diagram

Figure 3-3 Model MU-TAOX52 Analog Output FTA Connection Diagram



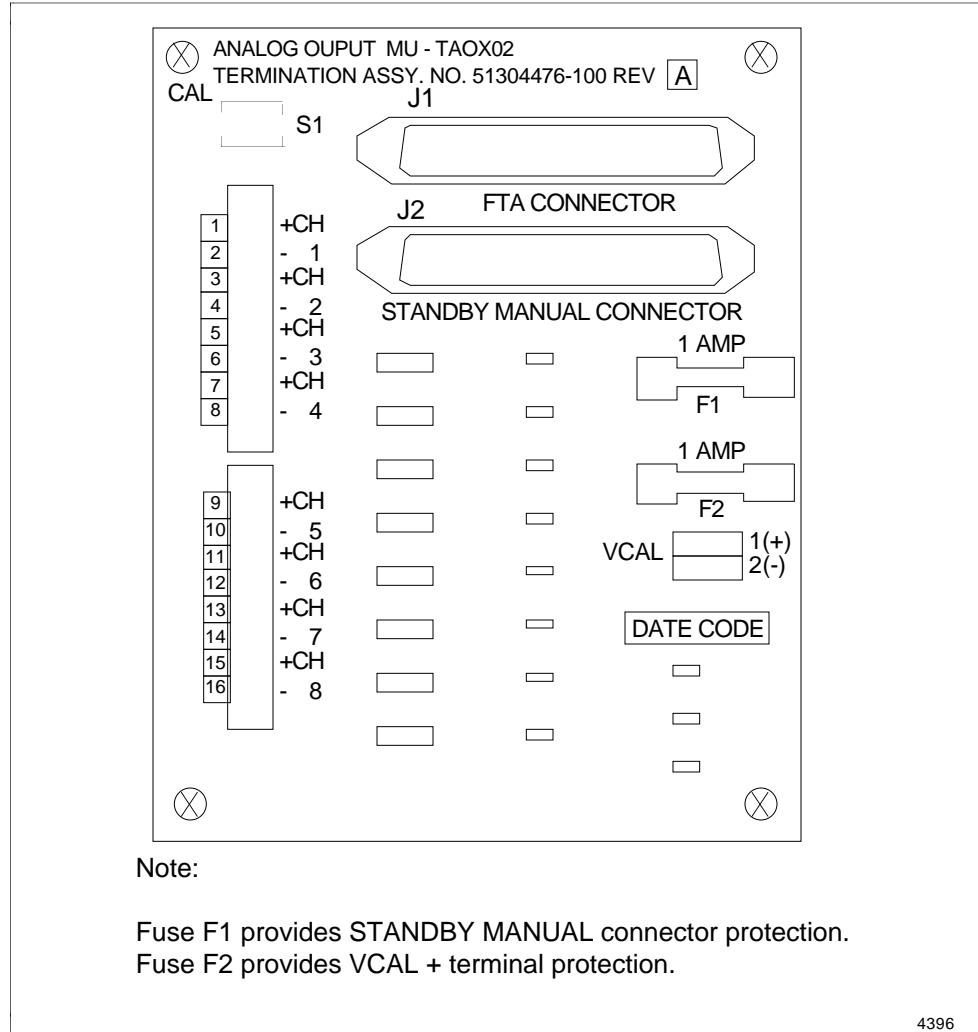
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3.2.1 Model MU-TAOX01/02/12/52 FTAs, Continued

Model MU-TAOX02 FTA assembly layout

Figure 3-4 Model MU-TAOX02 Analog Output FTA Assembly Layout

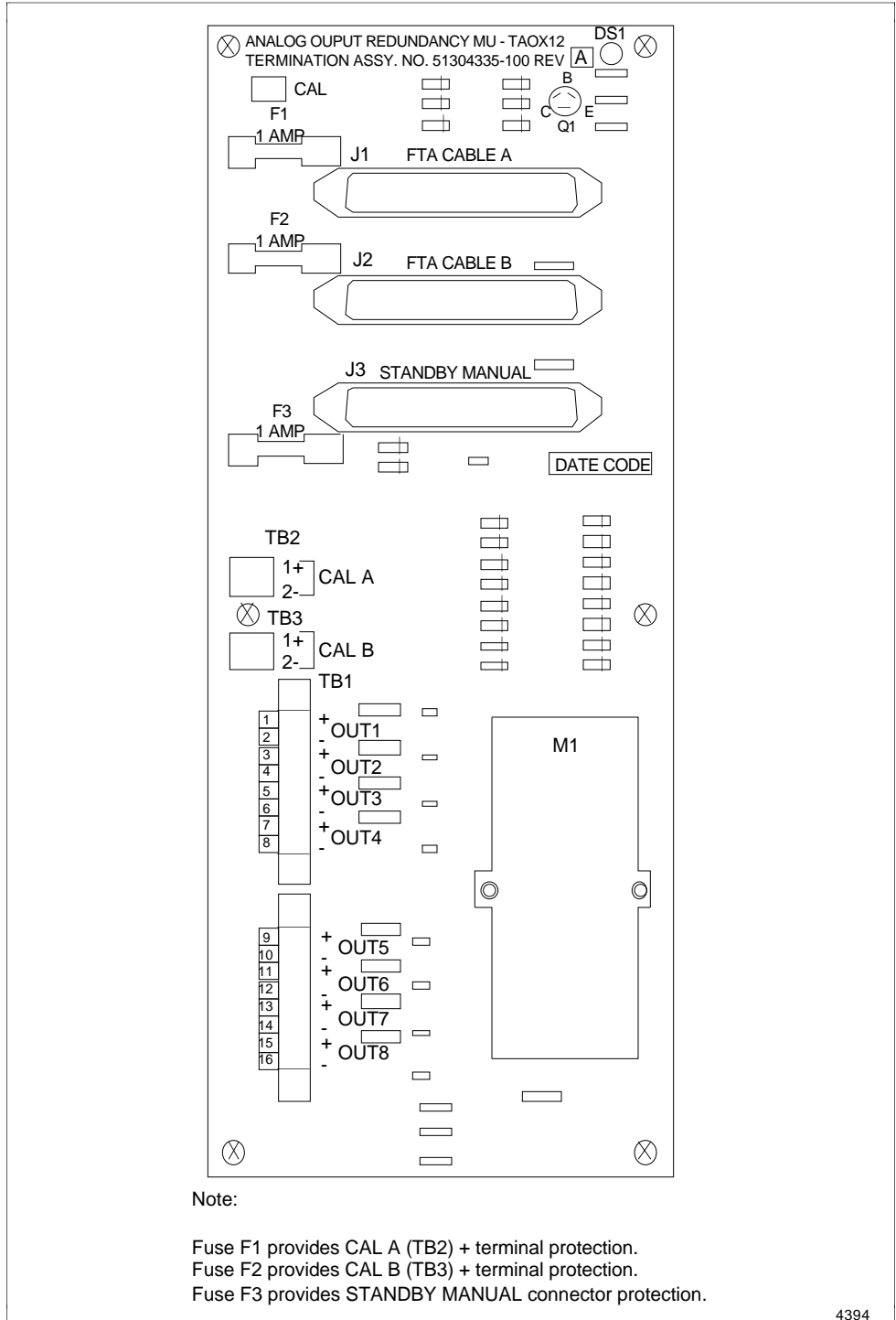


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3.2.1 Model MU-TAOX01/02/12/52 FTAs, Continued

Model MU-TAOX12 FTA assembly layout

Figure 3-5 Model MU-TAOX12 Analog Output FTA Assembly Layout

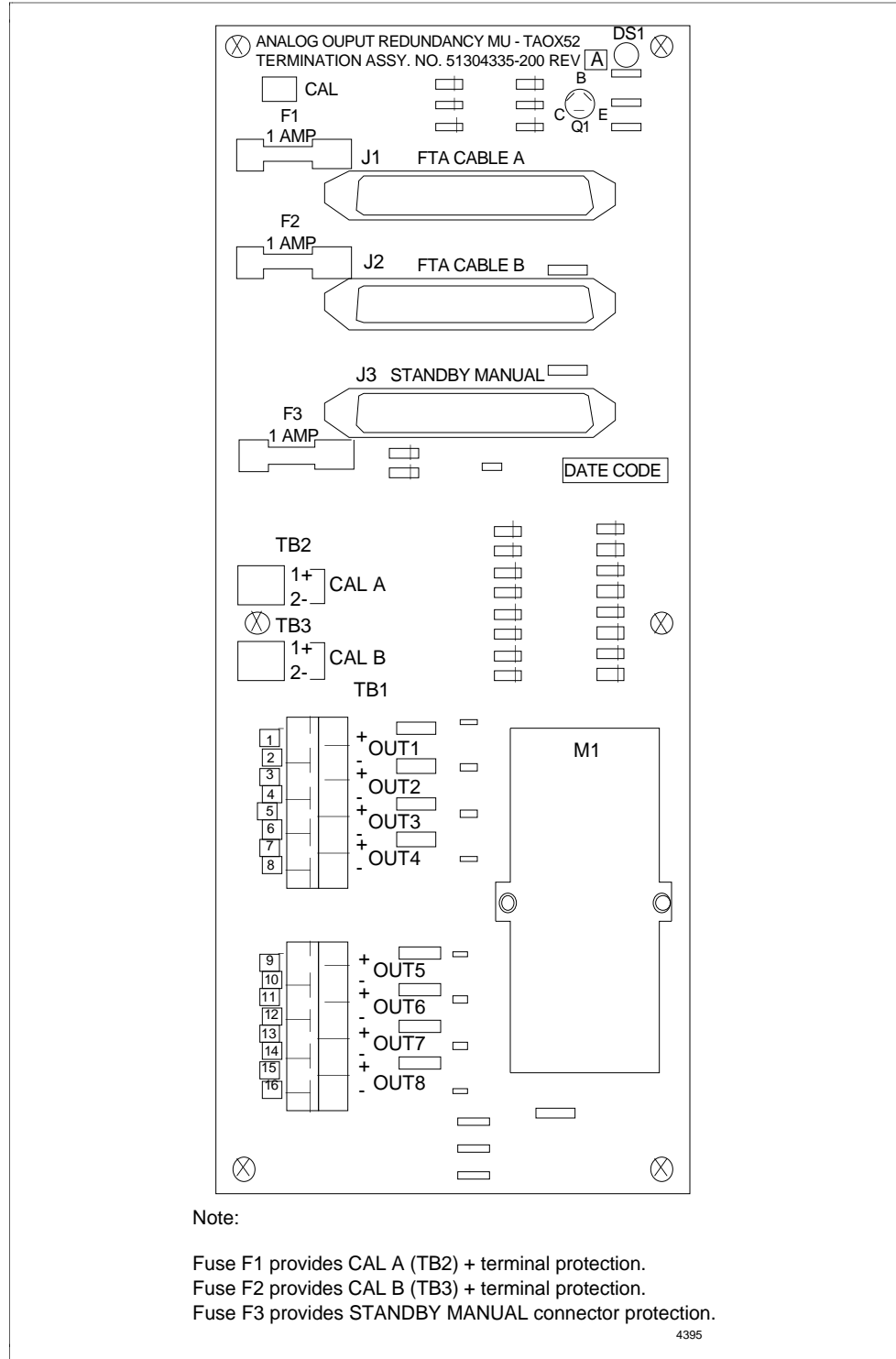


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3.2.1 Model MU-TAOX01/02/12/52 FTAs, Continued

Model MU-TAOX52 FTA assembly layout

Figure 3-6 Model MU-TAOX52 Analog Output FTA Assembly Layout



3.2.2 Model MU-TAOY22/23/52/53 FTAs

Introduction	<p>The Analog Output FTA provides sixteen 4-20 mA outputs to proportioning loads, such as valves. There are four models of the FTA.</p>
Early production models	<p>The assembly layout of the early production non-CE Compliant model MU-TAOY22 and MU-TAOY52 Analog Input FTAs differ from the present assembly layout of the CE Compliant model MU-TAOY22 and MU-TAOY52 AO FTAs. The early production models are identified by the part numbers 80366177-100 and 80364007-100, respectively. The present production models are identified by the part numbers 80366481-125 and 80366484-125, respectively.</p> <p>The major difference in the assemblies, other than CE Compliance, is the labeling of the field wiring terminal connectors.</p> <p>The early production model MU-TAOY22 AO FTA terminal connectors are labeled TB1, TB3, TB5, and TB7, while the present model MU-TAOY22 AO FTA terminal connectors are labeled TB2, TB4, TB6, and TB8.</p> <p>The early production model MU-TAOY52 AO FTA terminal connector is labeled TB2, while the present model MU-TAOY52 AO FTA terminal connector is labeled TB1.</p>
Connection diagrams	<p>Figures 3-7 through 3-12 are connection diagrams for the four models. The model MU-TAOY22 and MU-TAOY23 FTAs have compression connection terminals, while the model MU-TAOY52 and MU-TAOY53 FTAs have screw connection terminals.</p>
Standby Manual device connectors	<p>Model MU-TAOY22 and MU-TAOY52 FTAs provide two connectors, J3 and J4, for connection to an Analog Output Standby Manual device, while the model MU-TAOY23 and MU-TAOY53 FTAs do not provide the connectors. Connector J3 supports outputs (channels) 1 through 8, and connector J4 supports outputs (channels) 9 through 16.</p> <p>A single 1 ampere fuse, F1, provides 24 Vdc power to the Standby Manual connectors.</p>
Assembly layouts	<p>Figures 3-13 through 3-18 illustrate the assembly layout of the model MU-TAOY22, MU-TAOY23, MU-TAOY52, and MU-TAOY53 FTAs.</p>
IOP compatibility	<p>The model MU-TAOY22, MU-TAOY23, MU-TAOY62, and MU-TAOY63 FTAs are compatible with the model MU-PAOY22 IOP only.</p> <p>Do not mismatch Analog Output IOPs.</p>

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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Redundant IOPs support

All models support redundant Analog Output IOPs, but they can also be used in a nonredundant IOP application.

Vertical bus bar

The FTA does not have a built-in bus to accommodate field wiring cable shields. A vertical bus bar that is installed on the FTA Mounting Channel, as described in Section 9, is recommended if there are too many circuits to be accommodated by the local Master Reference Ground (MRG) at the floor of the cabinet. Connect the shields to the vertical bus bar and then connect the vertical bus bar to Master Reference Ground with a 2.5 mm² (14 AWG) wire. For CE Compliance applications, Safety Ground must be used.

Power Limited Tray cable

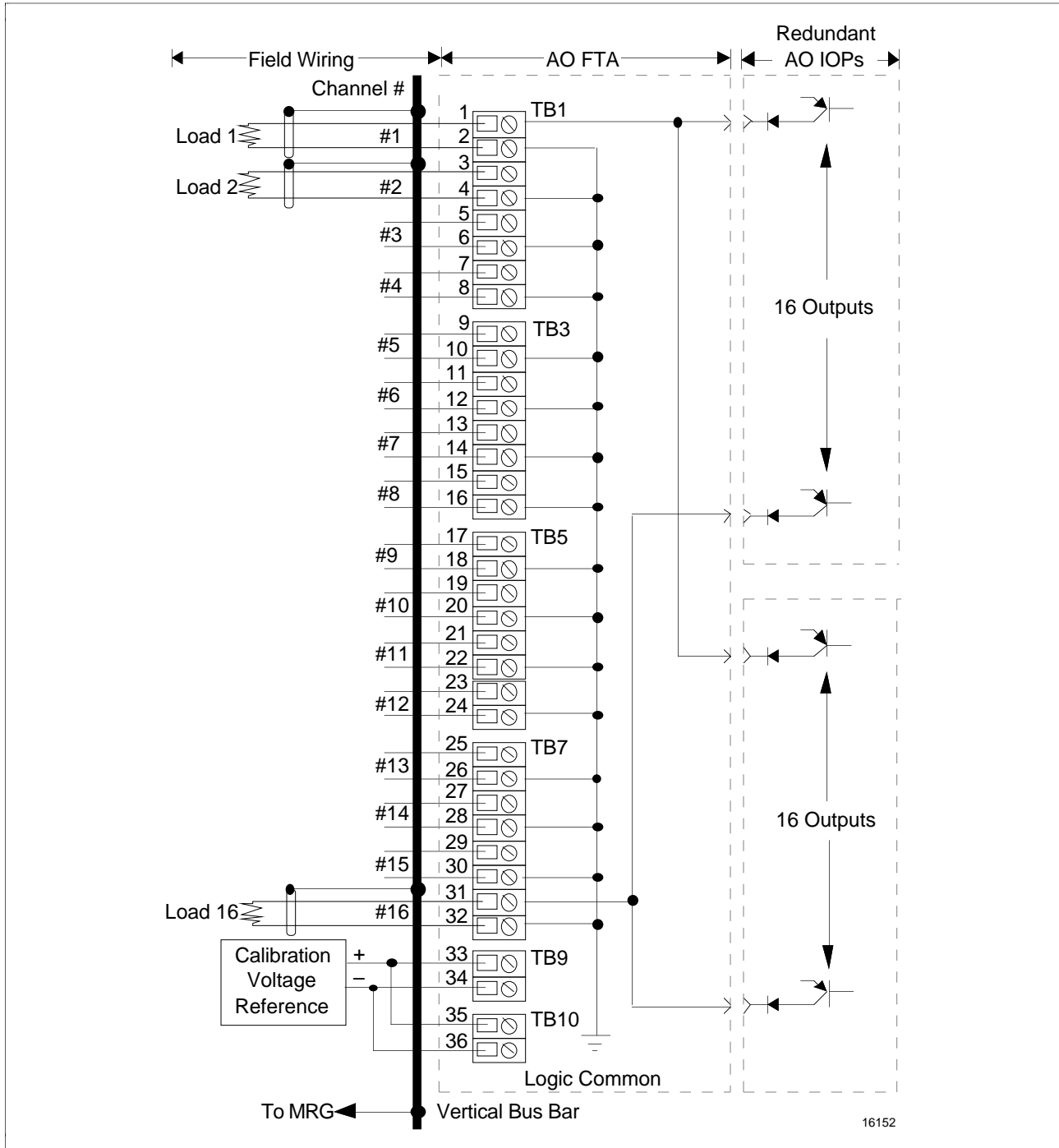
Power Limited Tray cable can be used when installing the FTAs. Check the local electrical code.

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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY22 connection diagram (non-CE Compliant)

Figure 3-7 Model MU-TAOY22 Analog Output FTA Connection Diagram—Non-CE Compliant

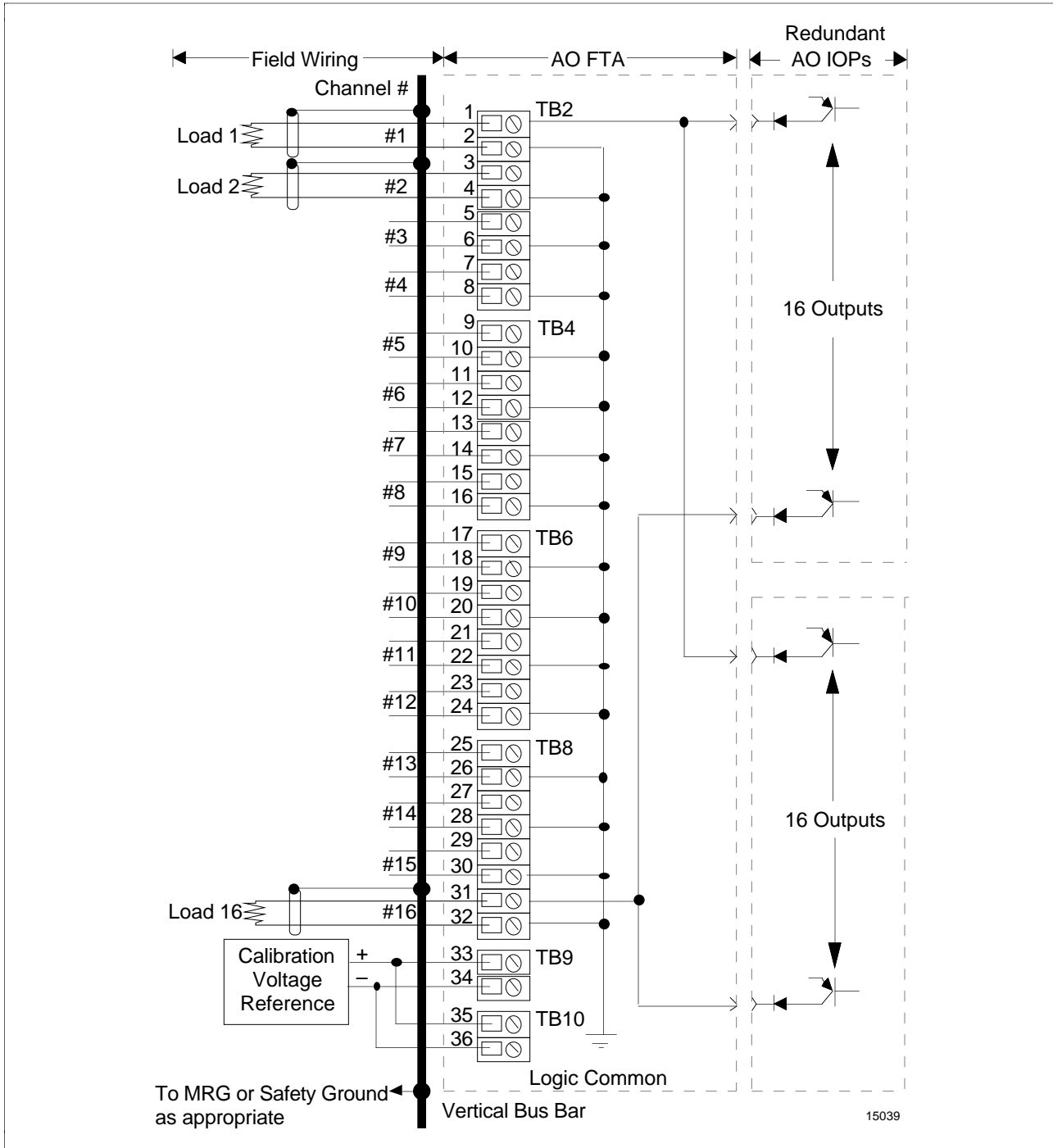


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY22 connection diagram (CE Compliant)

Figure 3-8 Model MU-TAOY22 Analog Output FTA Connection Diagram—CE Compliant

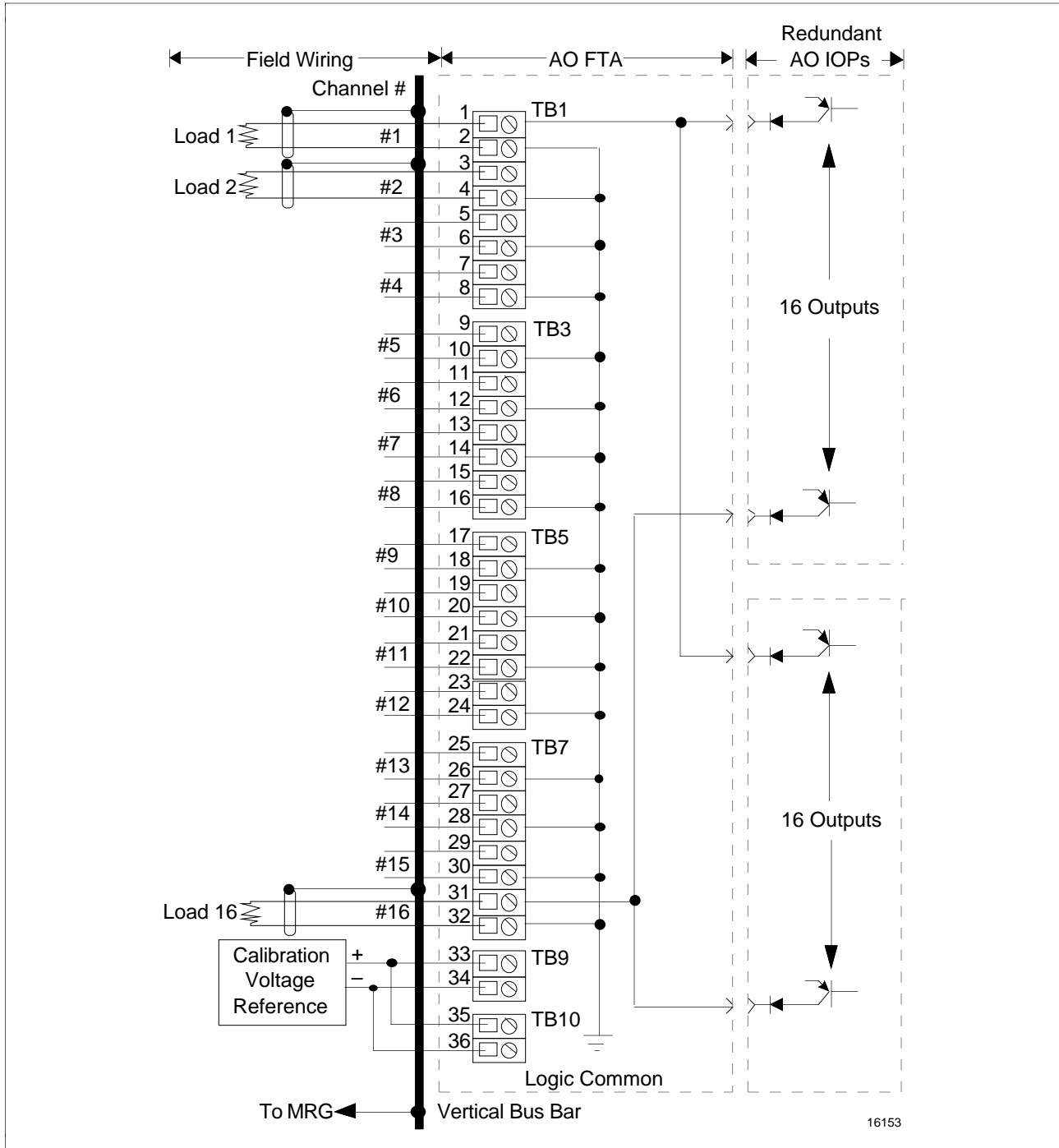


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY23 connection diagram (non-CE Compliant)

Figure 3-9 Model MU-TAOY23 Analog Output FTA Connection Diagram—Non-CE Compliant

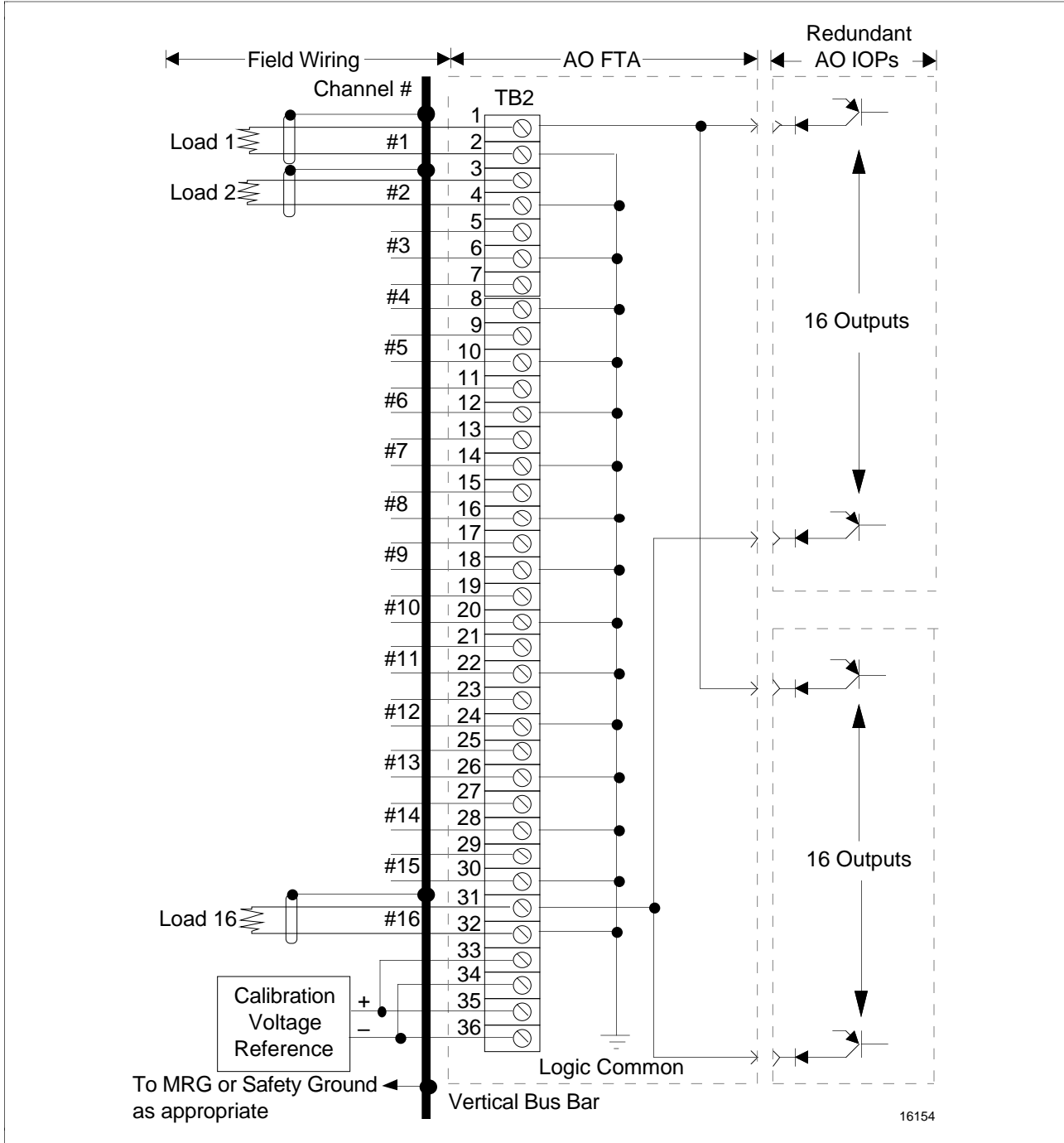


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY52 connection diagram (non-CE Compliant)

Figure 3-10 Model MU-TAOY52 Analog Output FTA Connection Diagram—Non-CE Compliant

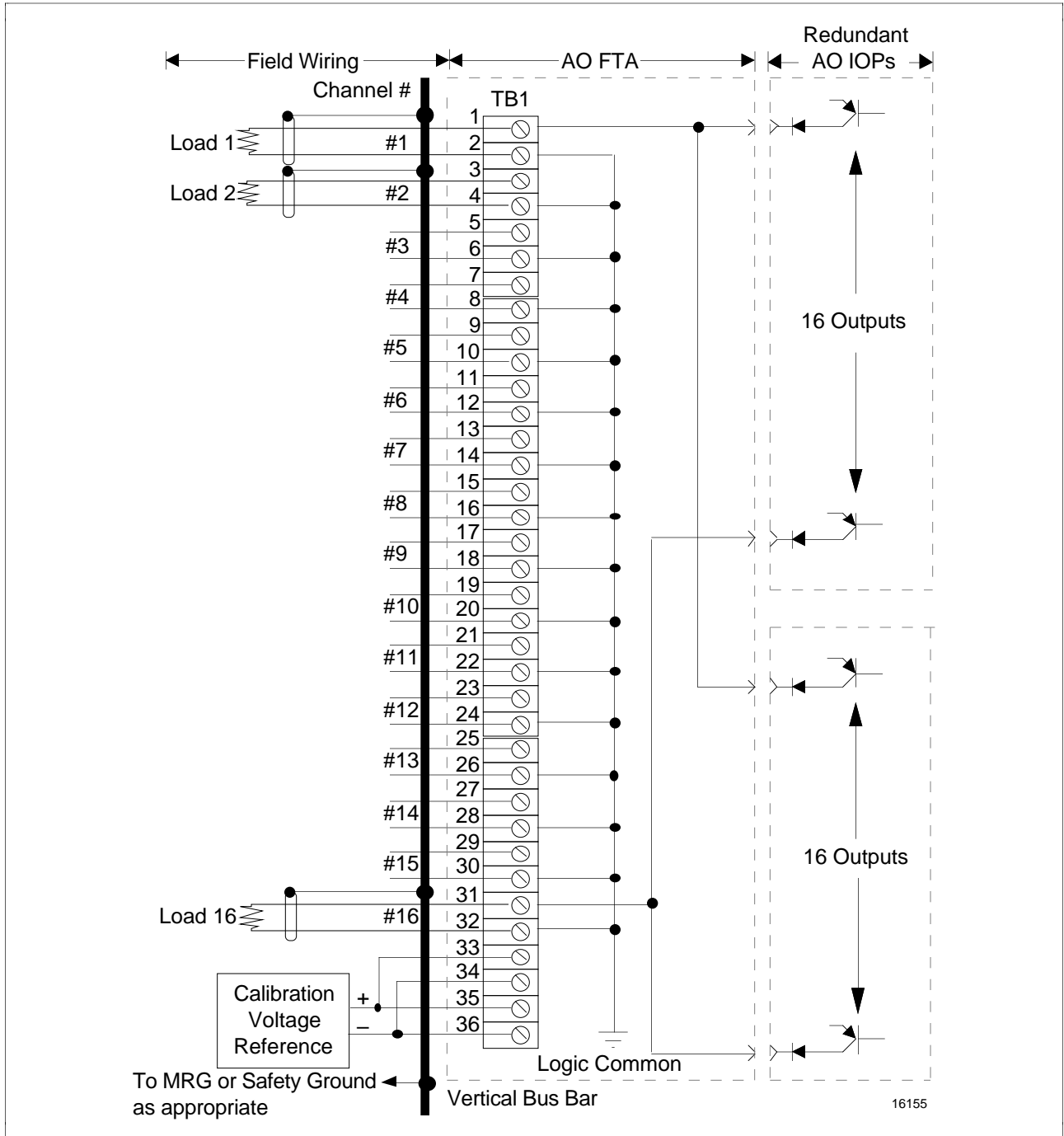


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY52 connection diagram (CE Compliant)

Figure 3-11 Model MU-TAOY52 Analog Output FTA Connection Diagram—CE Compliant

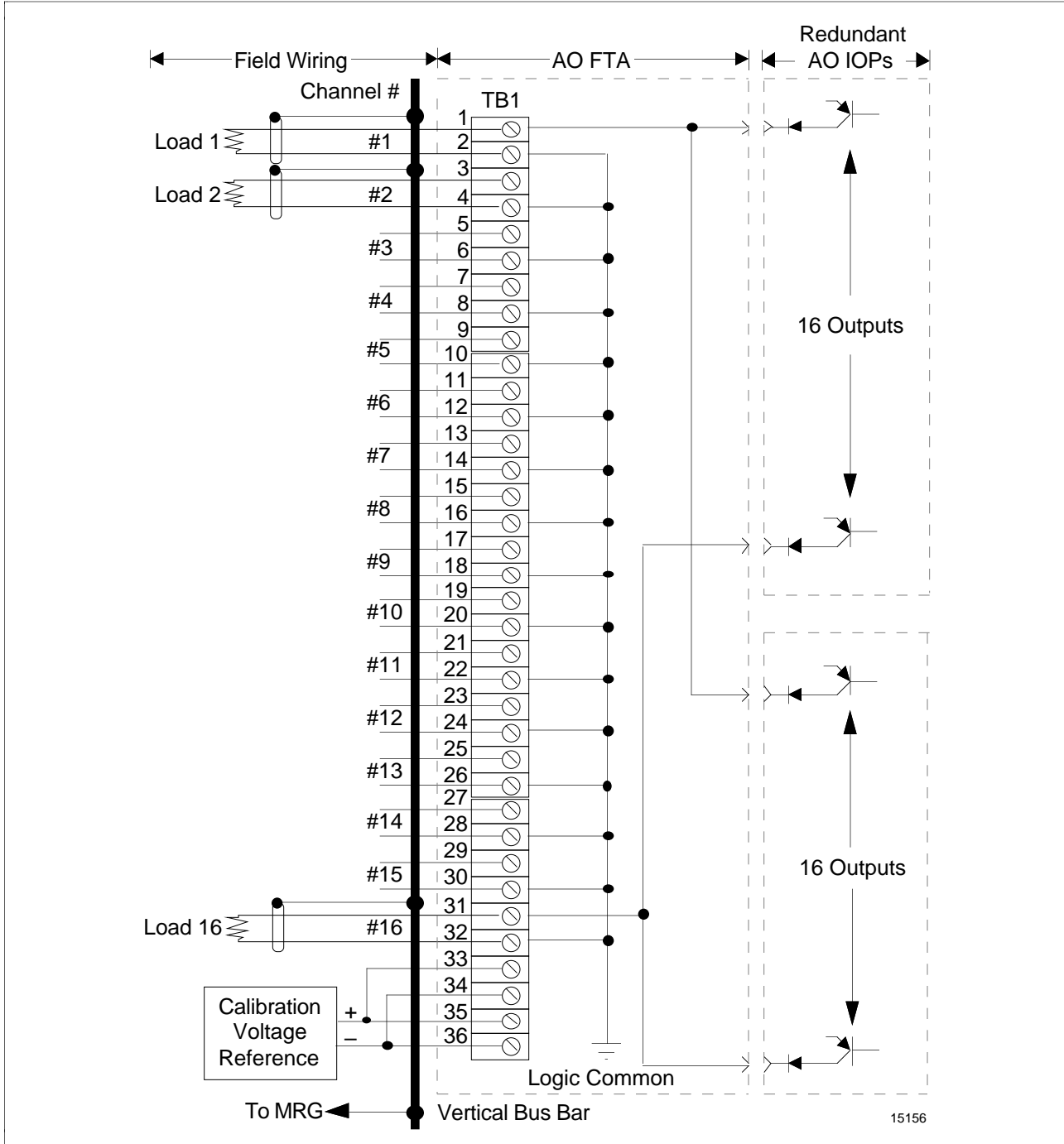


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY53 connection diagram (non-CE Compliant)

Figure 3-12 Model MU-TAOY53 Analog Output FTA Connection Diagram—Non-CE Compliant

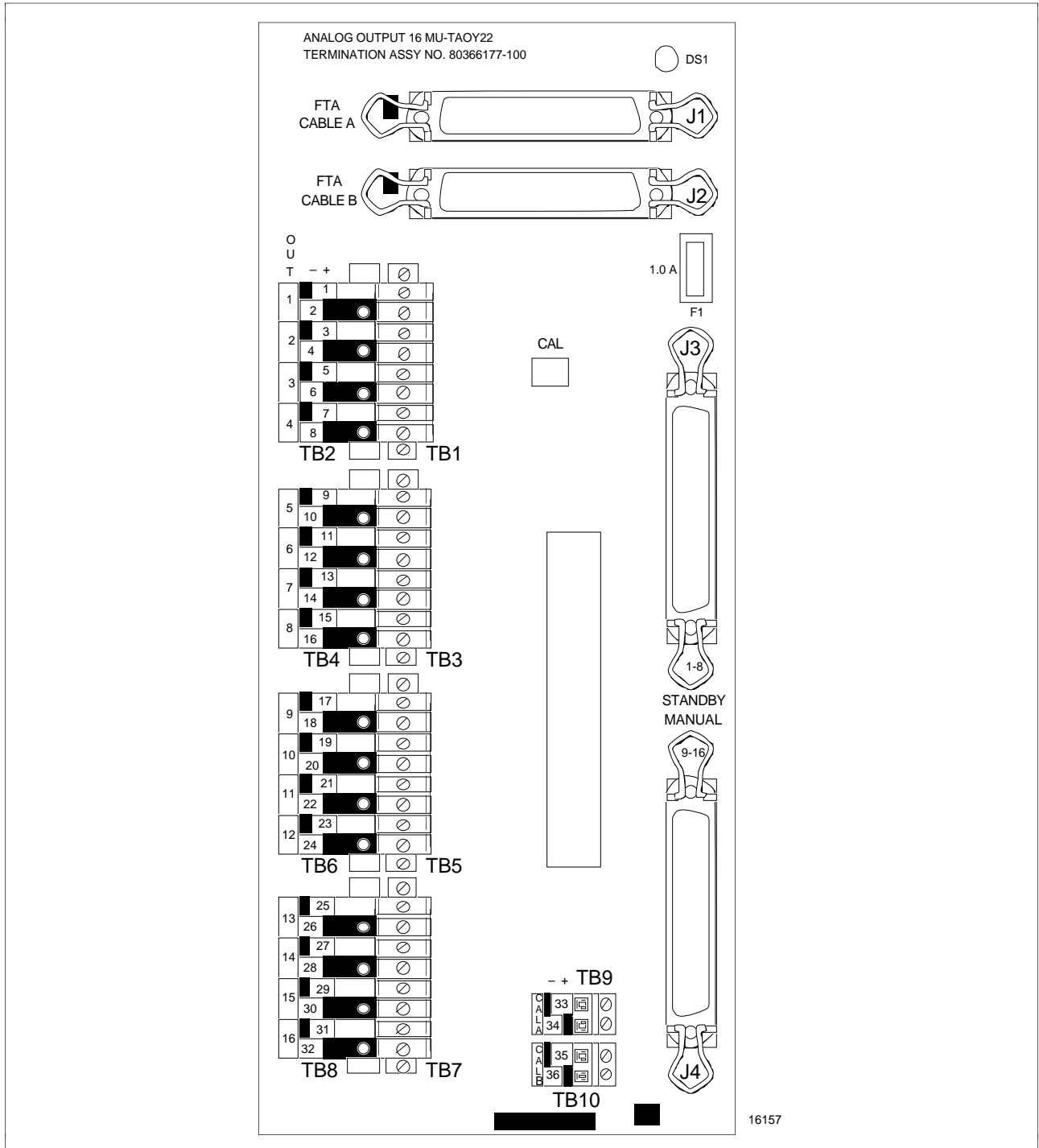


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY22 FTA assembly layout (non-CE Compliant)

Figure 3-13 Model MU-TAOY22 Analog Output FTA Assembly Layout—Non-CE Compliant

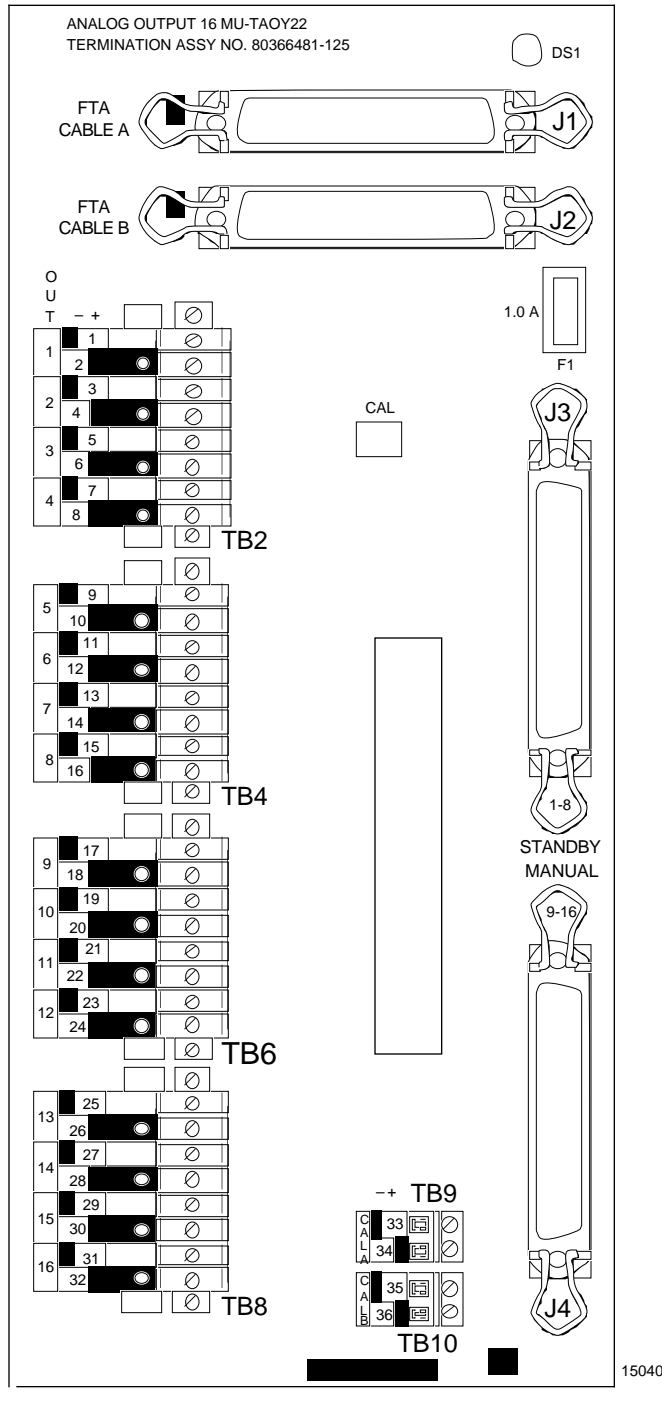


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY22 FTA assembly layout (CE Compliant)

Figure 3-14 Model MU-TAOY22 Analog Output FTA Assembly Layout—CE Compliant

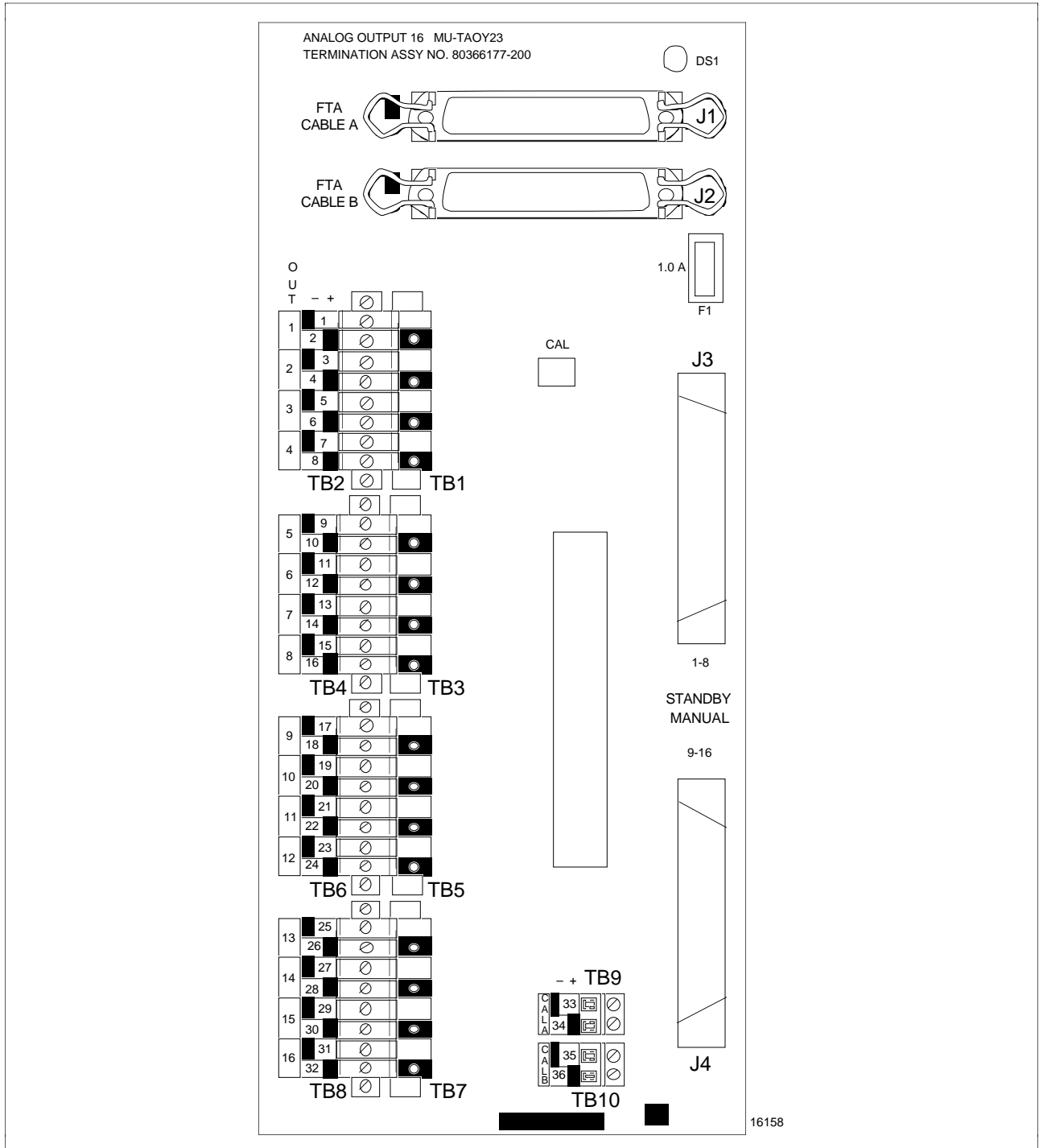


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY23 FTA assembly layout (non-CE Compliant)

Figure 3-15 Model MU-TAOY23 Analog Output FTA Assembly Layout—Non-CE Compliant

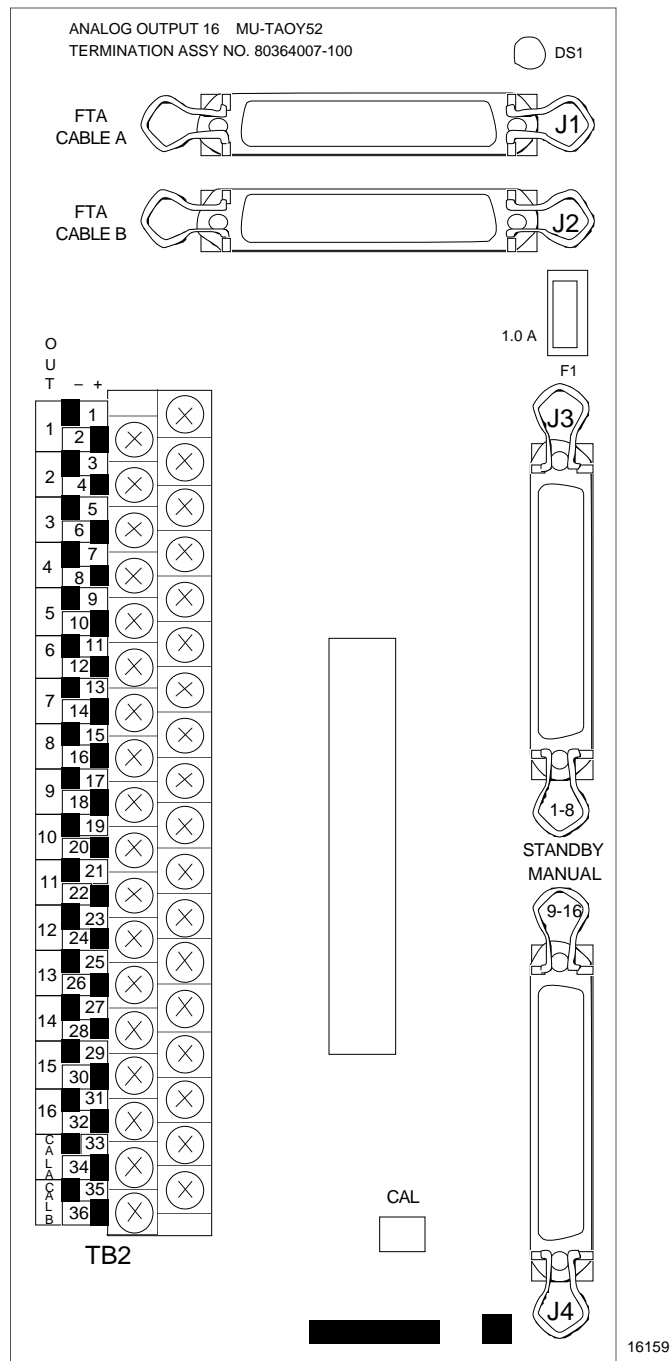


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY52 FTA assembly layout (non-CE Compliant)

Figure 3-16 Model MU-TAOY52 Analog Output FTA Assembly Layout—Non-CE Compliant

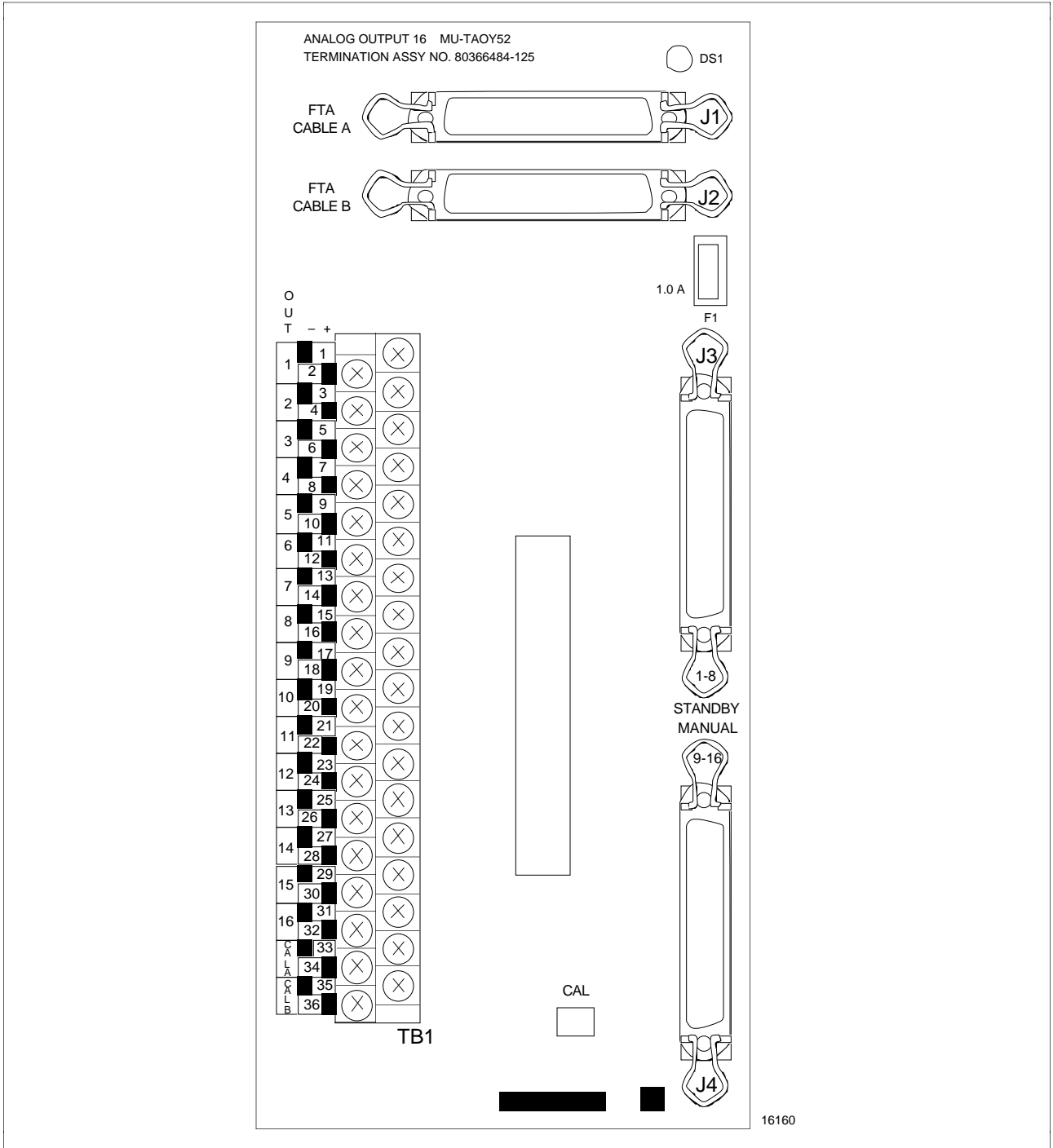


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY52 FTA assembly layout (CE Compliant)

Figure 3-17 Model MU-TAOY52 Analog Output FTA Assembly Layout—CE Compliant

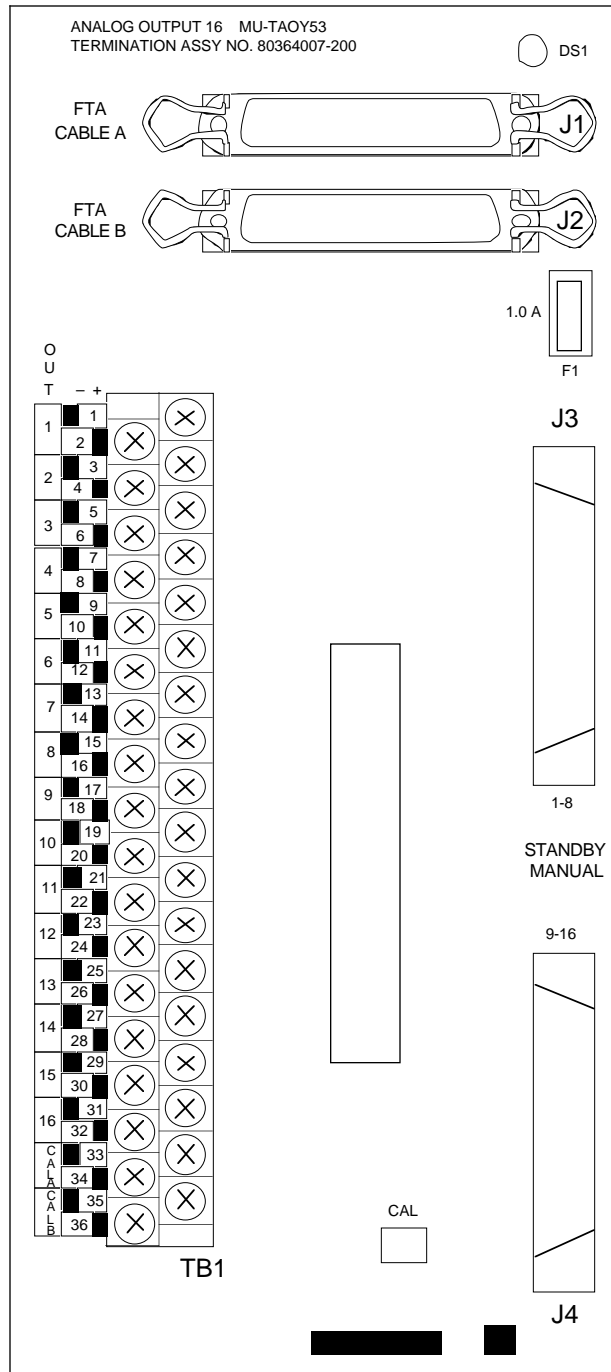


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3.2.2 Model MU-TAOY22/23/52/53 FTAs, Continued

Model MU-TAOY53 FTA assembly layout (non-CE Compliant)

Figure 3-18 Model MU-TAOY53 Analog Output FTA Assembly Layout—Non-CE Compliant



Section 4 – Digital Input FTA Installation

4.1 Overview

Section contents The topics covered in this section are:

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4.1	Overview.....	119
4.2	24 Vdc Digital Input (DI) FTAs.....	119
4.2.1	Model MU-TDID11/12/52/72 FTAs.....	126
4.2.2	Model MU-TDIY22/62 FTAs.....	133
4.3	120 Vac Digital Input (DI) FTAs.....	138
4.3.1	Cable Capacitance.....	147
4.4	240 Vac Digital Input (DI) FTAs.....	148
4.4.1	Cable Capacitance.....	155

Purpose This section provides information necessary for the proper installation of digital input-type Field Termination Assemblies (FTAs). If required for configuration or other purposes, supporting assemblies such as Input/Output Processors (IOPs) are also included in the installation procedure discussion.

4.2 24 Vdc Digital Input (DI) FTAs

CE Compliance Some 24 Vdc Digital Input (DI) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are generally identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

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

Continued on next page

4.2 24 Vdc Digital Input (DI) FTAs, Continued

24 Vdc DI FTA and DI IOP models The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 4-1.

Table 4-1 24 Vdc Digital Input FTA and DI IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
32 Channel (Point) FTAs and IOP			
MU-TDID11	24 Vdc DI FTA with Compression Terminals	51301201-100	N/A
MU-TDID12	24 Vdc DI FTA with Compression Terminals	51304441-100	51304441-125
MC-TDID12	24 Vdc DI FTA with Compression Terminals Conformally Coated	51304441-150	51304441-175
MU-TDID52	24 Vdc DI FTA with Screw Terminals	51304441-200	51304441-225
MC-TDID52	24 Vdc DI FTA with Screw Terminals Conformally Coated	51304441-250	51304441-275
MU-TDID72	24 Vdc DI FTA with Screw Terminals	51303928-100	N/A
MC-TDID72	24 Vdc DI FTA with Screw Terminals Conformally Coated	51303928-150	N/A
MU-PDIX01	DI IOP	51303997-200	N/A
MU-PDIX02	DI IOP	N/A	51304485-100
MC-PDIX02	DI IOP—Conformally Coated	N/A	51304485-150
32 Channel (Point) FTAs and IOP			
MU-TDIY22	24 Vdc DI FTA with Compression Terminals	80366180-100	80366180-125
MC-TDIY22	24 Vdc DI FTA with Compression Terminals Conformally Coated	80366180-150	80366180-175
MU-TDIY62	24 Vdc DI FTA with Screw Terminals	80364010-100	80364010-125
MC-TDIY62	24 Vdc DI FTA with Screw Terminals Conformally Coated	80364010-150	80364010-175
MU-PDIY22	DI IOP	N/A	80363972-100
MC-PDIY22	DI IOP—Conformally Coated	N/A	80363972-150

Description

The 24 Vdc Digital Input (DI) FTA accommodates 32 contact inputs that share an isolated common return.

Continued on next page

4.2 24 Vdc Digital Input (DI) FTAs, Continued

Terminal type models

The model MU-TDID11 and MU-TDID12 24 Vdc Digital Input FTAs are compression terminal type FTAs.

The model MU-TDID52 and MU-TDID72 24 Vdc DI FTAs are screw terminal-type FTAs. The model MU-TDID52 24 Vdc DI FTA has fixed-screw terminal connectors, while the model MU-TDID72 24 Vdc DI FTA has removable-screw terminal connectors.

The model MU-TDIY22 24 Vdc DI FTA, with compression terminals, and the model MU-TDIY62 24 Vdc DI FTA, with screw terminals, are the latest production 24 Vdc Digital Input FTAs and are compatible only with the model MU-TDIY22 Digital Input IOP.

IOP compatibility

The model MU-PDIX01 Digital Input IOP is compatible with the model MU-TDID11, MU-TDID12, MU-TDID52, and MU-TDID72 24 Vdc DI FTAs but is not to be used for CE Compliant applications.

The model MU-PDIX02 Digital Input IOP is compatible with the model MU-TDID11, MU-TDID12, MU-TDID52, and MU-TDID72 24 Vdc DI FTAs and is CE Compliant.

The model MU-PDIY22 Digital Input IOP is compatible only with the model MU-TDIY22 and MU-TDIY62 24 Vdc DI FTAs.

Digital Input Power Distribution Assembly

An external 24 Vdc power source can be connected to the FTAs for the process control contacts. The Digital Input Power Distribution Assembly provides fused 24 Vdc from the Power System for this purpose. Figure 4-1 is an illustration of the Digital Input Power Distribution Assembly's cable and wiring connections.

Figure 4-2 is a schematic for the early production 16-terminal model MU-TDPR01 Digital Input Power Distribution Assembly, and Figure 4-3 is a schematic for the later production 12-terminal model MU-TDPR02 Digital Input Power Distribution Assembly.

Figures 4-4 and 4-5 illustrate the layouts of the assemblies. Pairs of terminals are provided on the assembly for the 24 Vdc connections. The assemblies have the same mounting dimensions as an A-size FTA.

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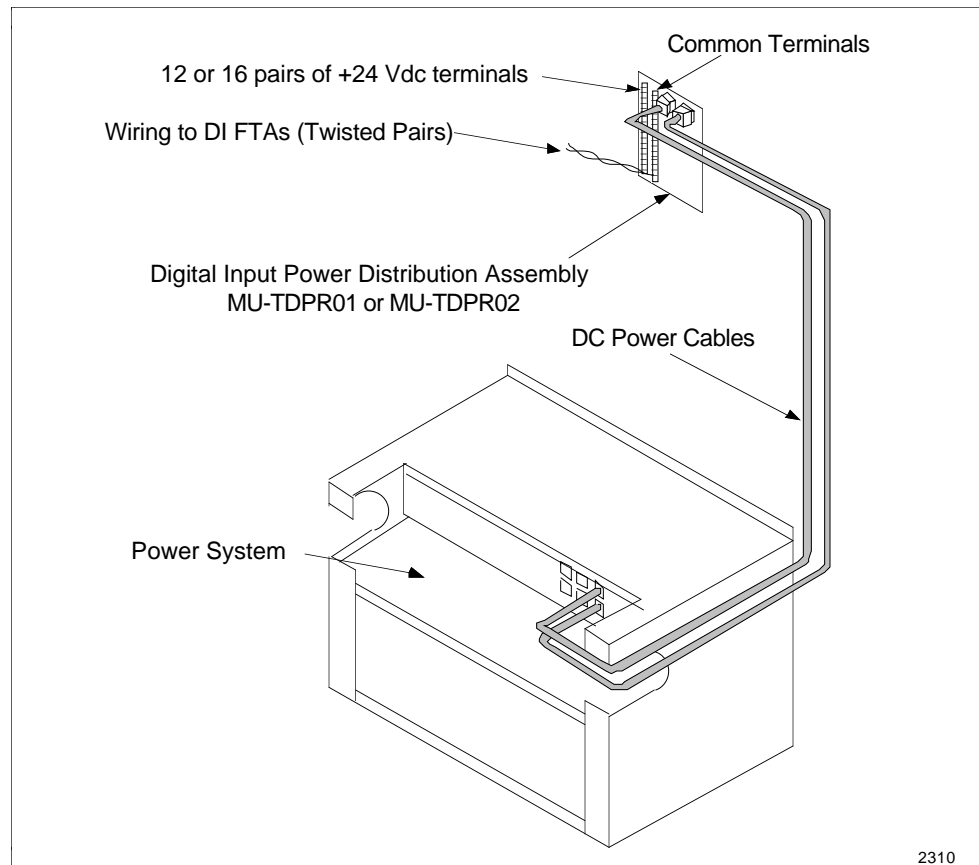
4.2 24 Vdc Digital Input (DI) FTAs, Continued

Field wiring cable shield grounding

Because the FTA does not have a built-in shield bus, the termination of each wire-pair cable shield requires the use of a vertical bus bar on the FTA Mounting Channel. Except when the cable shield is already grounded at the process, the cable shield must connect to the same local Safety Ground (CE Compliant) or Master Reference Ground (MRG) reference used by the process control contact power source. Use a 2.5 mm² (14 AWG) or larger wire to connect the vertical bus bar to the ground reference.

DI Power Distribution Assembly wiring and cable installation

Figure 4-1 Digital Input Power Distribution Assembly Wiring and Cable Installation

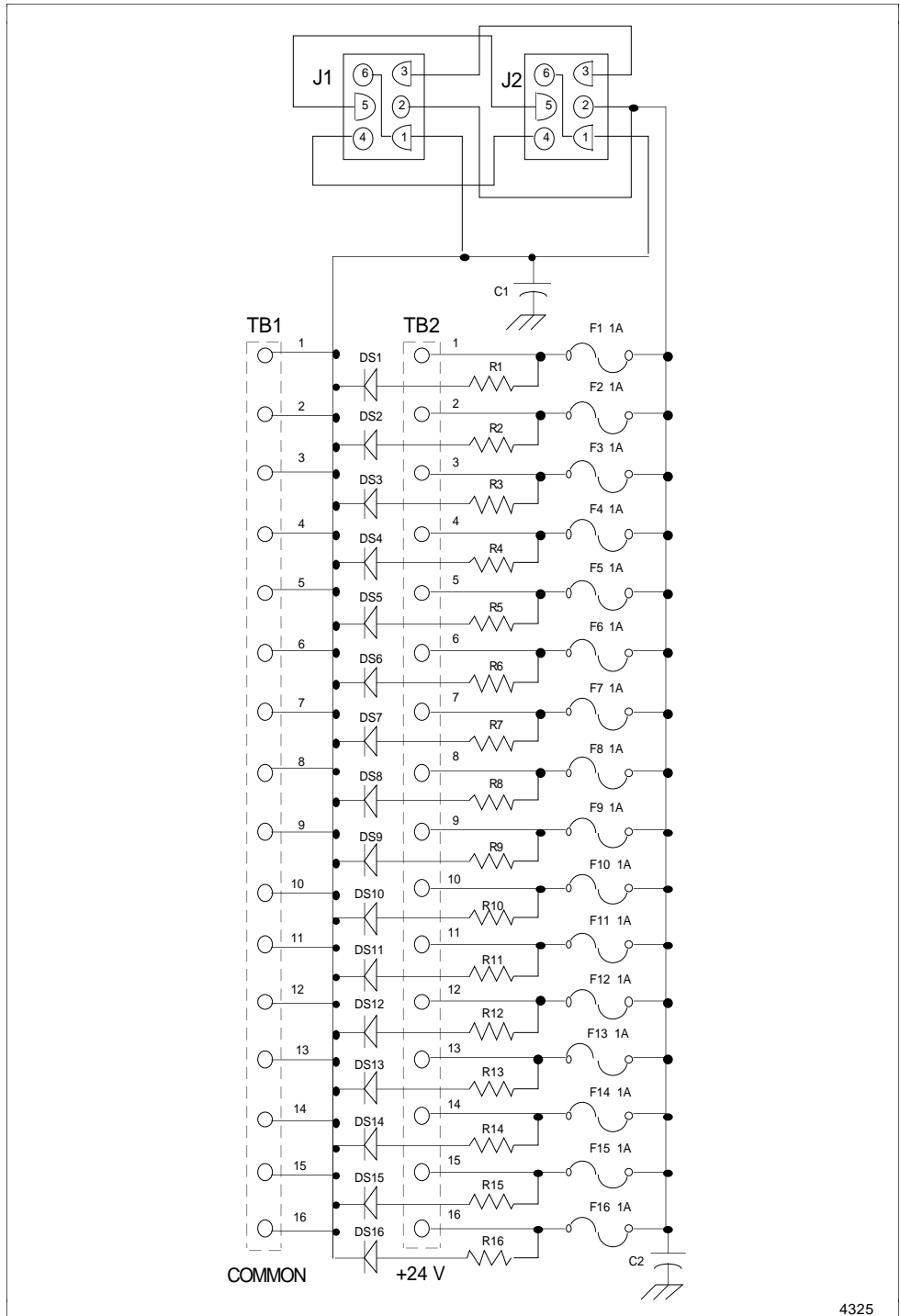


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4.2 24 Vdc Digital Input (DI) FTAs, Continued

Model MU-TDPR01
assembly schematic

Figure 4-2 Model MU-TDPR01 Digital Input Power Distribution
Assembly Schematic

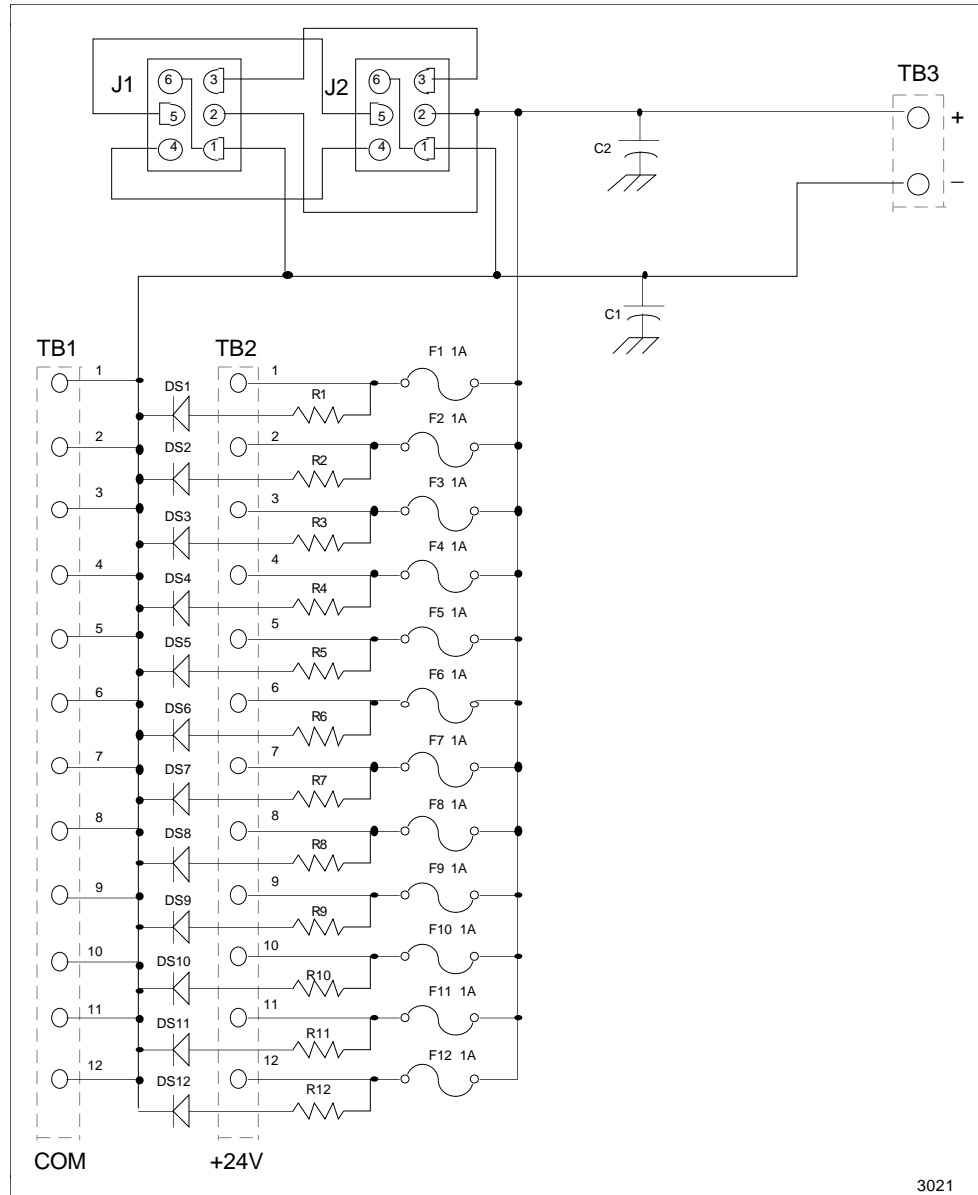


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4.2 24 Vdc Digital Input (DI) FTAs, Continued

Model MU-TDPR02
assembly schematic

Figure 4-3 Model MU-TDPR02 Digital Input Power Distribution
Assembly Schematic

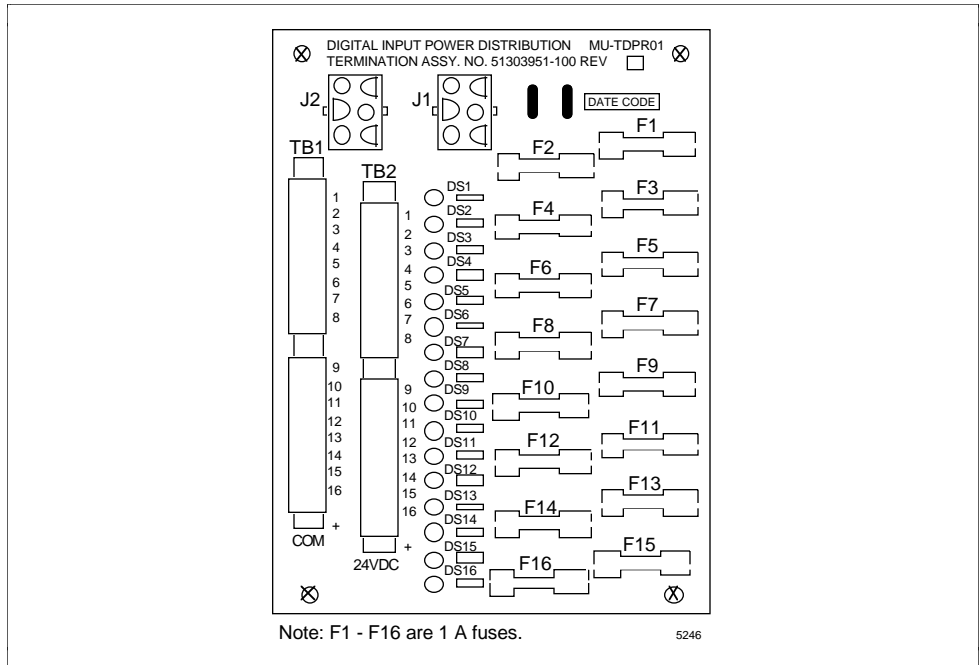


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4.2 24 Vdc Digital Input (DI) FTAs, Continued

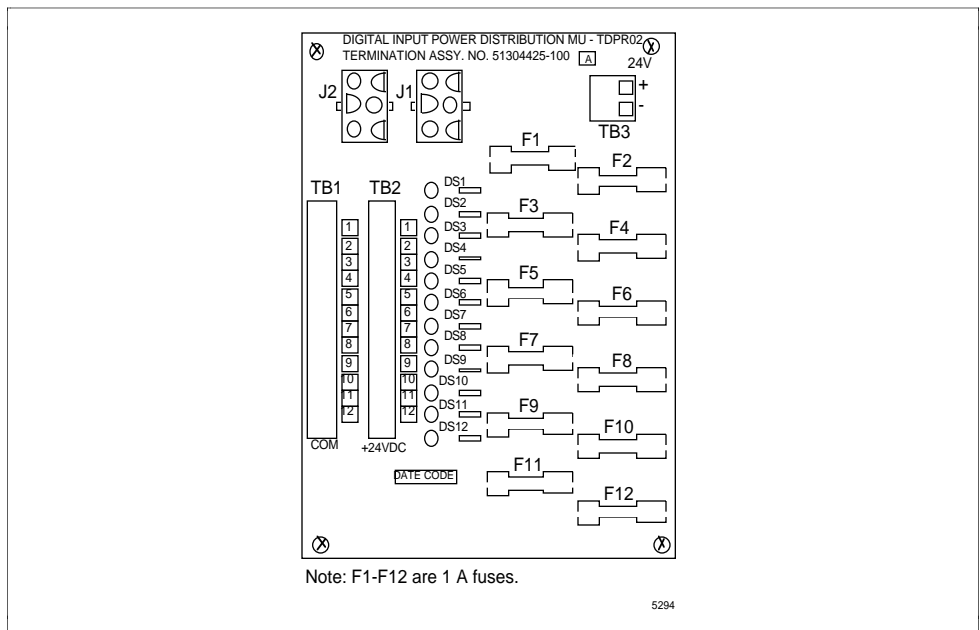
Model MU-TDPR01 assembly layout

Figure 4-4 Model MU-TDPR01 Digital Input Power Distribution Assembly Layout



Model MU-TDPR02 assembly layout

Figure 4-5 Model MU-TDPR02 Digital Input Power Distribution Assembly Layout



4.2.1 Model MU-TDID11/12/52/72 FTAs

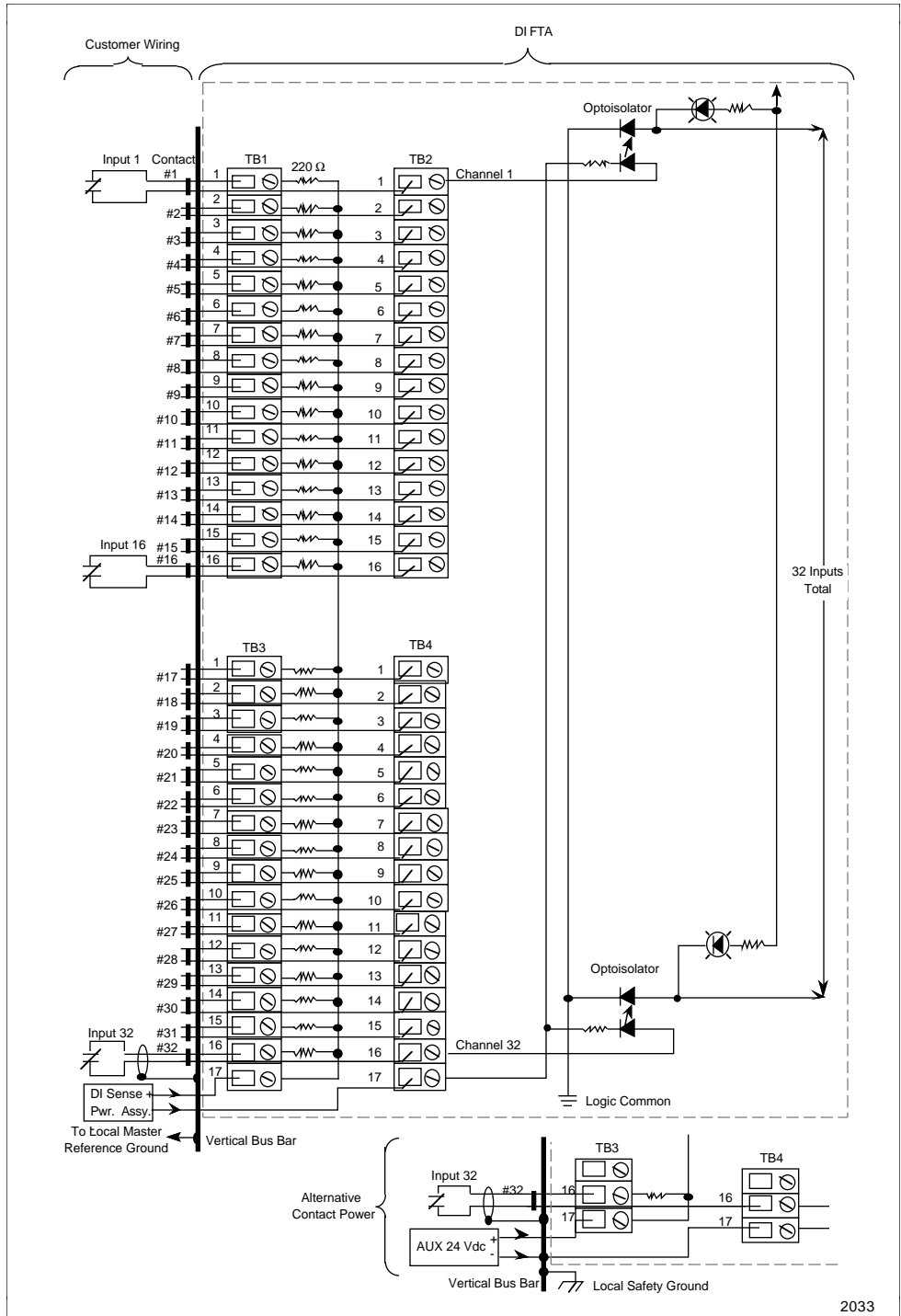
Connection diagrams	<p>Figures 4-6 and 4-7 are connection diagrams for the compression terminal-type model MU-TDID11 and MU-TDID12 24 Vdc Digital Input FTAs, respectively.</p> <p>Figure 4-8 is a connection diagram for the screw terminal-type model MU-TDID52 and MU-TDID72 24 Vdc DI FTAs.</p>
Assembly layout illustrations	<p>Figures 4-9 through 4-11 illustrate the assembly layout of the model MU-TDID12, MU-TDID52, and MU-TDID72 FTAs, respectively. The model MU-TDID52 24 Vdc DI FTA has fixed screw terminal connectors, while the model MU-TDID72 24 Vdc DI has removable screw terminal connectors.</p>
24 Vdc power source connections	<p>The model MU-TDID12, MU-TDID52, and MU-TDID72 24 Vdc DI FTAs require that a 24 Vdc power source be connected to TB1-65 (+) and TB1-66 (-) for the process control contacts.</p> <p>The model MU-TDID11 24 Vdc DI FTA requires that a 24 Vdc power source be connected to TB3-17 (+) and TB4-17 (-) for the process control contacts.</p> <p>Either an internal or external 24 Vdc power source can be used.</p>
Internal 24 Vdc source	<p>The model MU-TDID12, MU-TDID52, and MU-TDID72 24 Vdc DI FTAs provide an internal source of 24 Vdc at TB1-67 (+) and TB1-68 (-). Connect TB1-65 (+) to TB1-67 (+) and TB1-66 (-) to TB1-68 (-).</p> <p>The model MU-TDID11 24 Vdc DI FTA does not optionally provide an internal 24 Vdc.</p>
CAUTION	<p>CAUTION—When an internal 24 Vdc power source is used, be aware that if the 24 Vdc is accidentally shorted to ground, power will be removed from the Digital Input IOP because 24 Vdc power for both the IOP and FTA is sourced through the IOP’s backplane fuse. For this reason, an external 24 Vdc source is recommended.</p>
External 24 Vdc source	<p>The external source can be provided by a Digital Input Power Distribution Assembly, models MU-TDPR01 or MU-TDPR02, or a user-supplied auxiliary 24 Vdc source to the terminals on the 24 Vdc DI FTA. See the appropriate connection diagram.</p>

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4.2.1 Model MU-TDID12/52/72 FTAs, Continued

Model MU-TDID11 FTA connection diagram

Figure 4-6 Model MU-TDID11 24 Vdc Digital Input FTA Connection Diagram



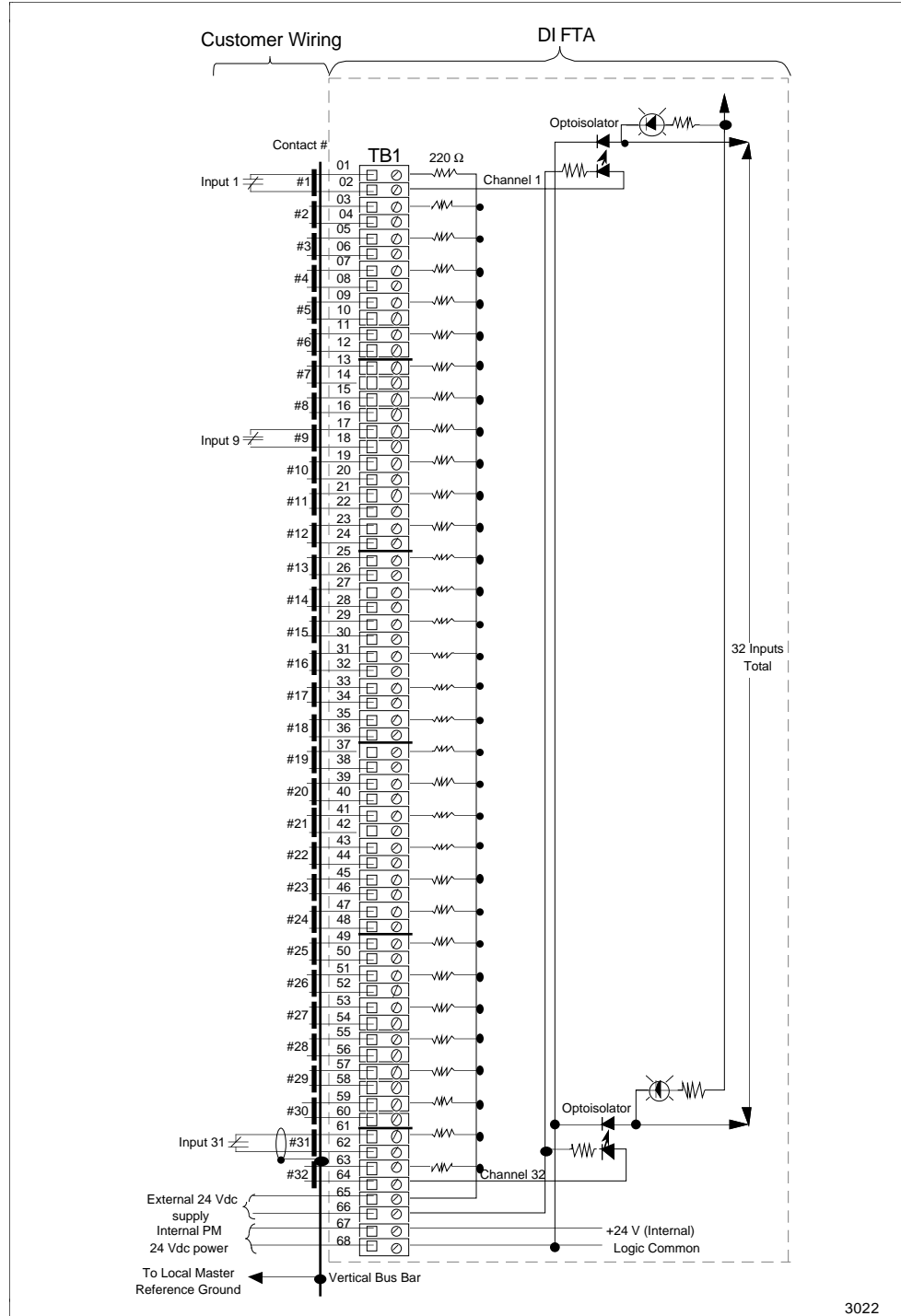
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4.2.1 Model MU-TDID12/52/72 FTAs, Continued

Model MU-TDID12 FTA connection diagram

Figure 4-7 Model MU-TDID12 24 Vdc Digital Input FTA Connection Diagram

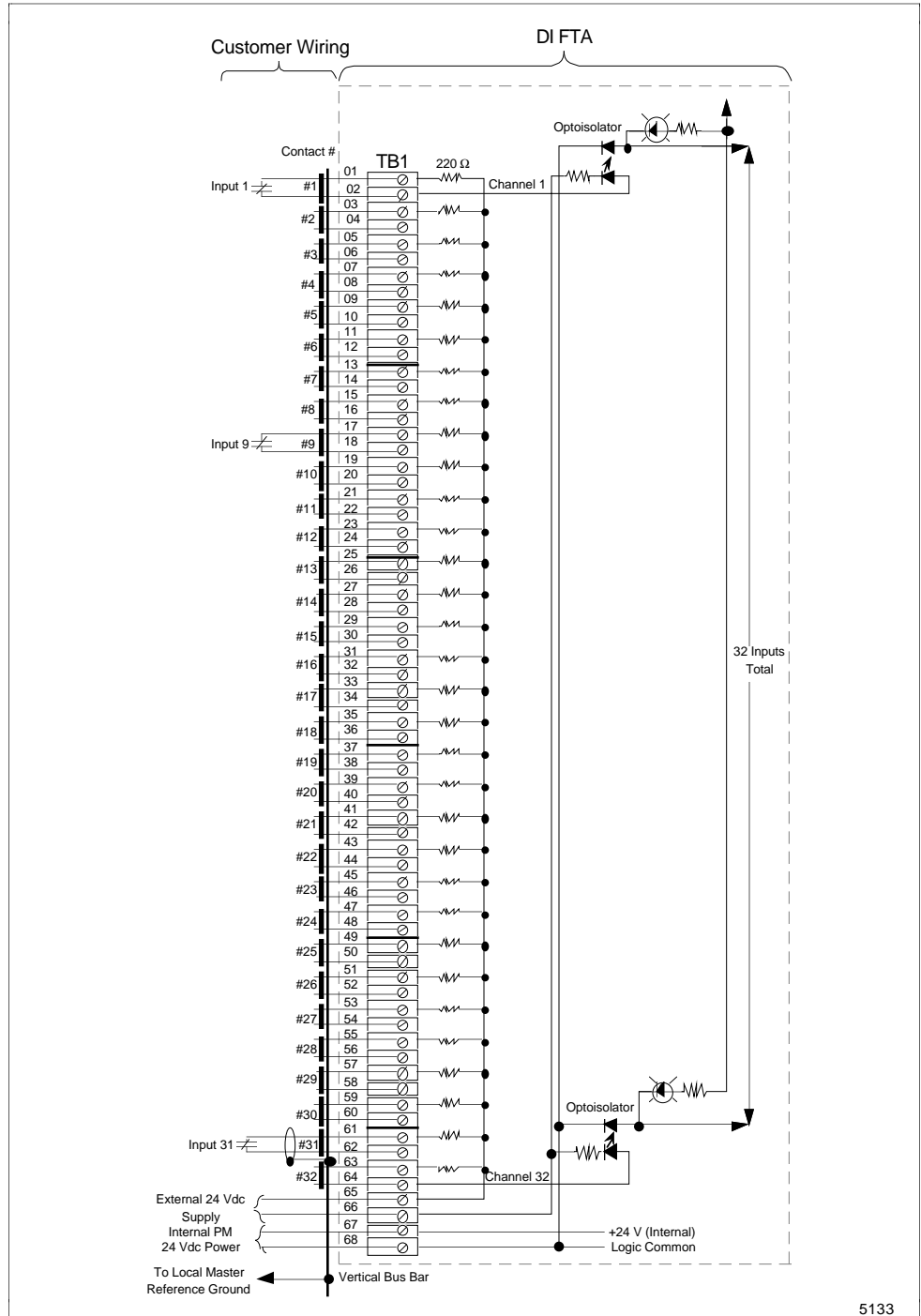


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4.2.1 Model MU-TDID12/52/72 FTAs, Continued

Model MU-TDID52/72 FTA connection diagram

Figure 4-8 Model MU-TDID52/72 24 Vdc Digital Input FTA Connection Diagram

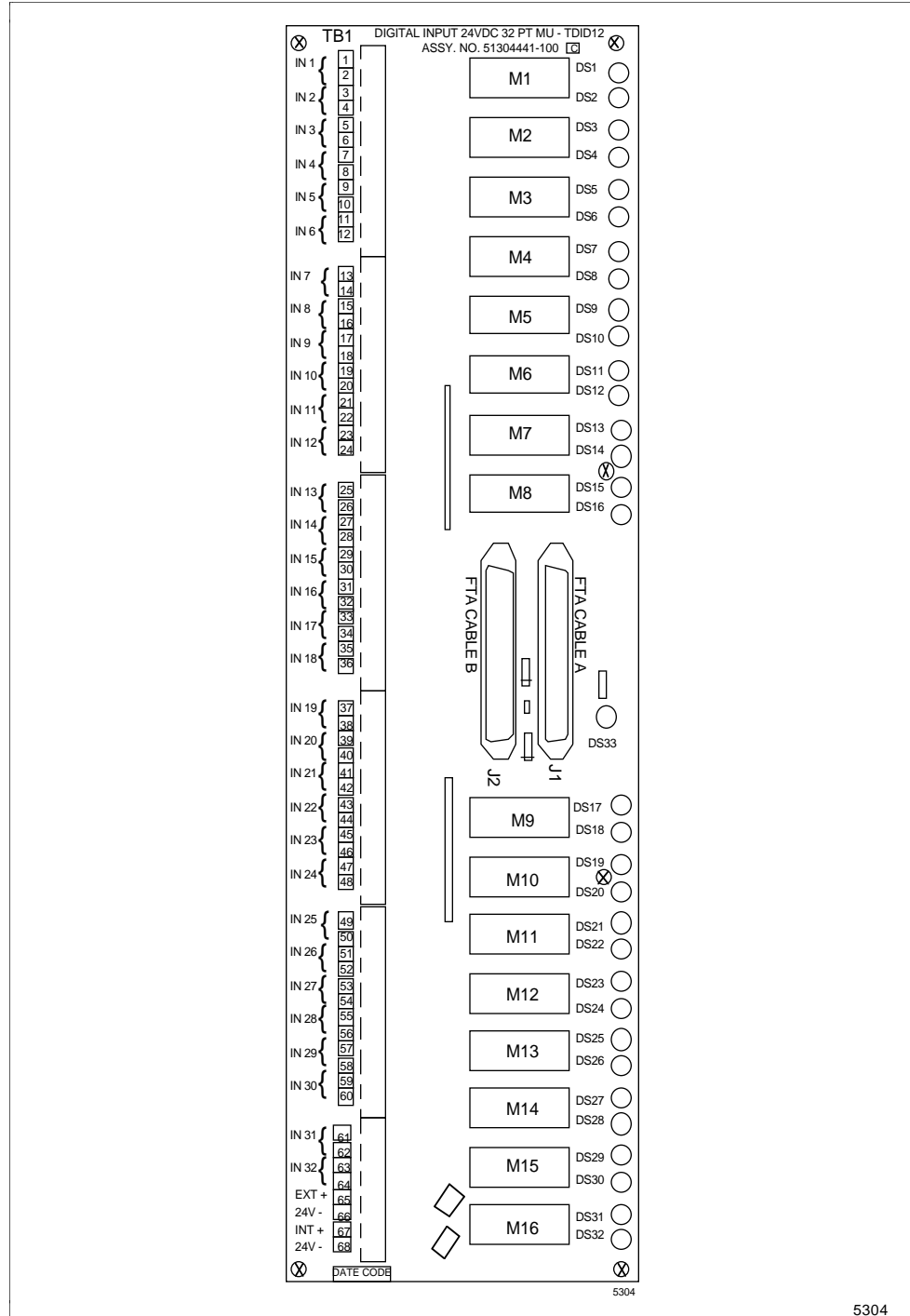


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4.2.1 Model MU-TDID12/52/72 FTAs, Continued

Model MU-TDID12 FTA assembly layout

Figure 4-9 Model MU-TDID12 24 Vdc Digital Input FTA Assembly Layout

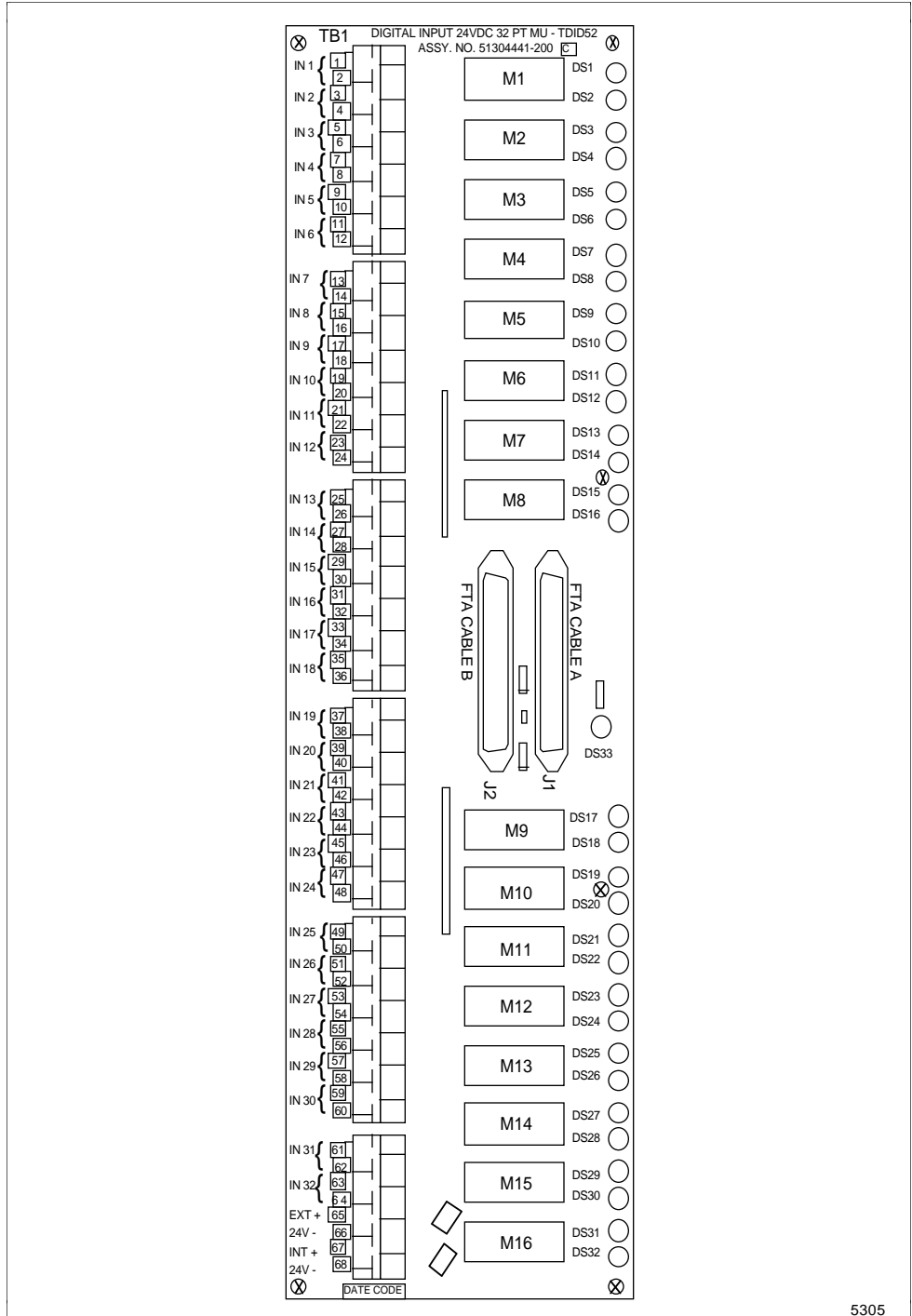


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4.2.1 Model MU-TDID12/52/72 FTAs, Continued

Model MU-TDID52 FTA assembly layout

Figure 4-10 Model MU-TDID52 24 Vdc Digital Input FTA
Assembly Layout

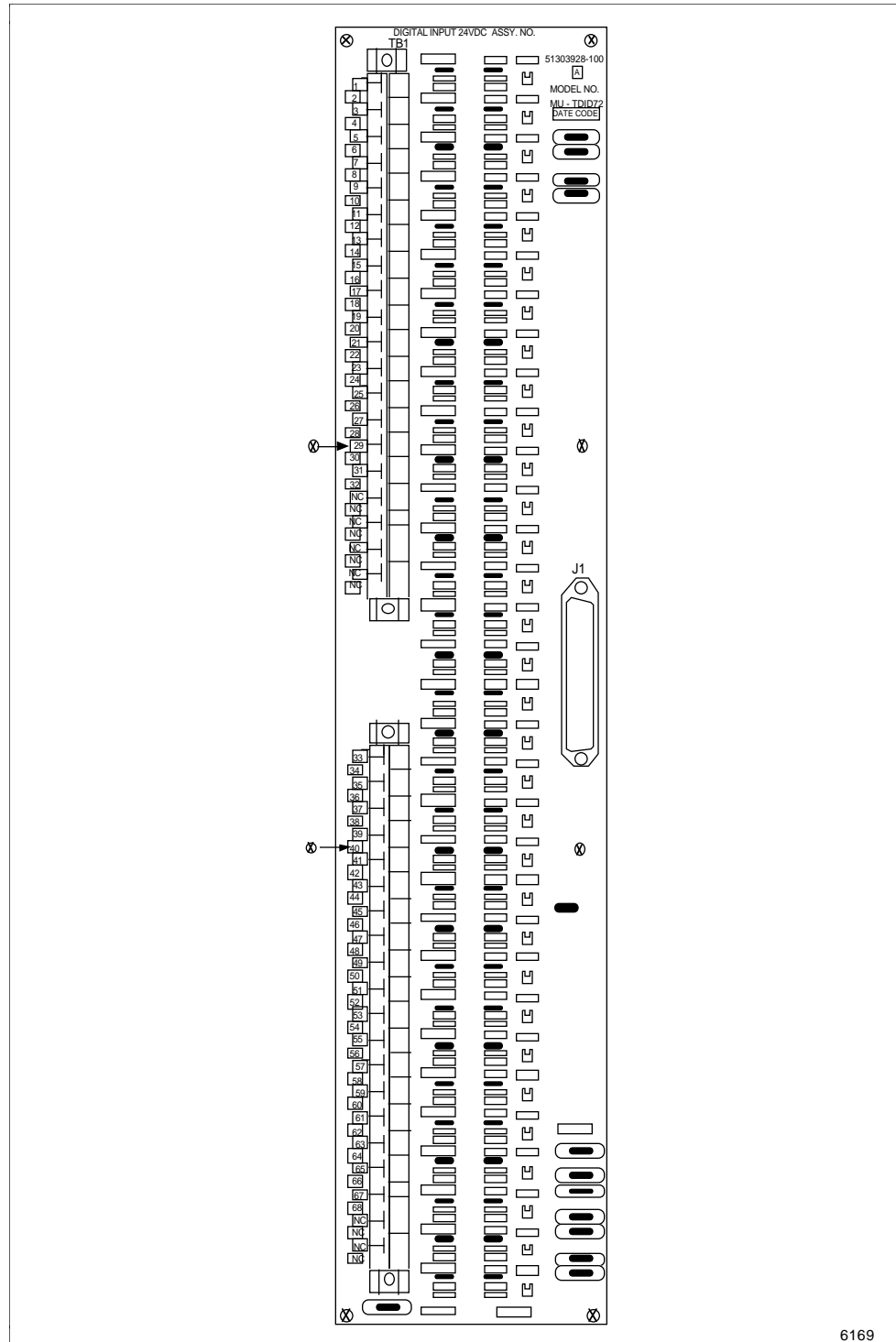


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4.2.1 Model MU-TDID12/52/72 FTAs, Continued

Model MU-TDID72 FTA assembly layout

Figure 4-11 Model MU-TDID72 24 Vdc Digital Input FTA Assembly Layout



4.2.2 Model MU-TDIY22/62 FTAs

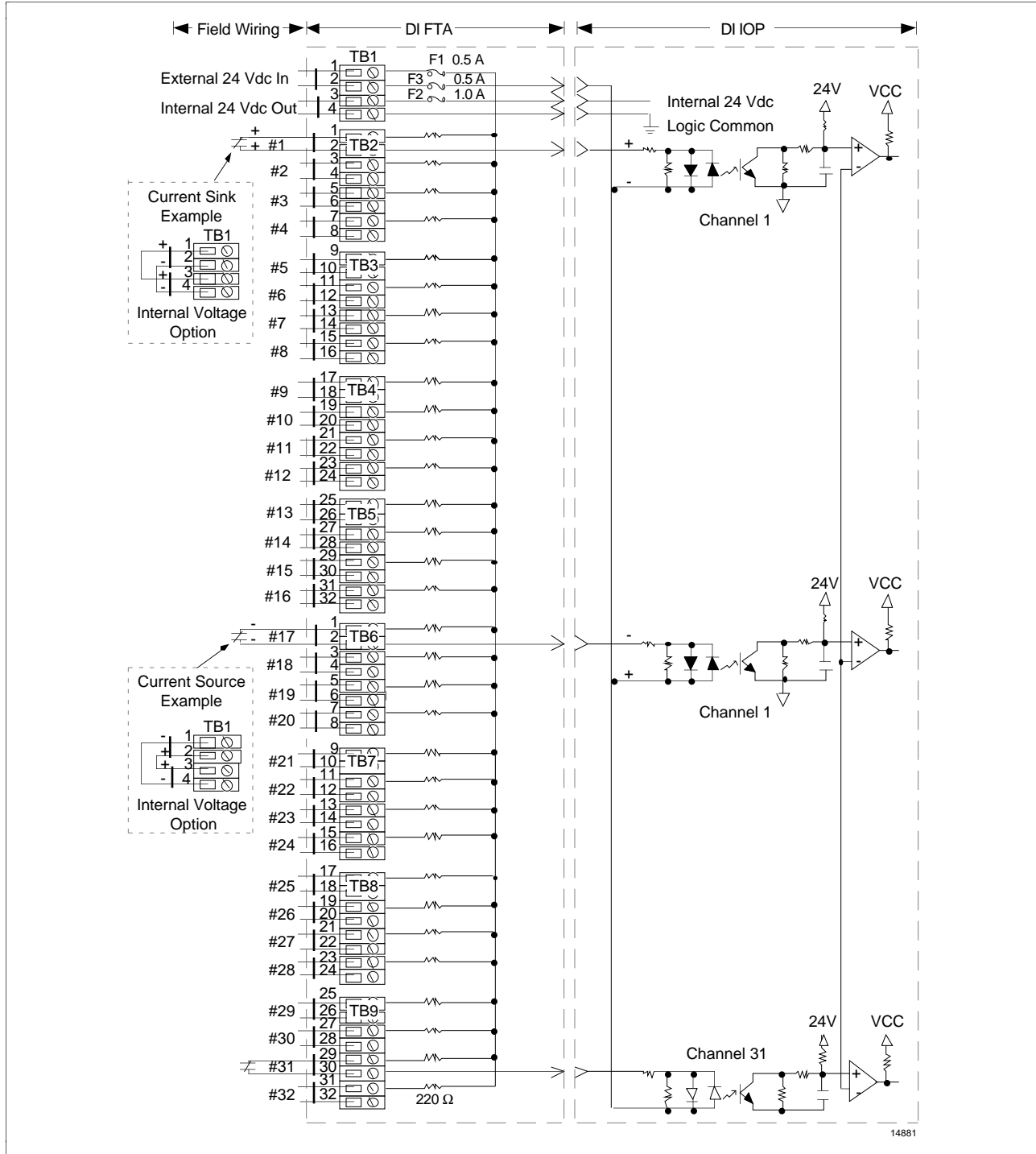
Connection diagrams	Figures 4-12 and 4-13 are connection diagrams for latest production models of the 24 Vdc Digital Input FTA, the compression terminal-type model MU-TDIY22 FTA and the screw terminal-type model MU-TDIY62 FTA, respectively.
Assembly layout illustrations	Figures 4-14 and 4-15 illustrate the assembly layout illustrations of the model MU-TDIY22 and MU-TDIY62 FTAs, respectively.
IOP compatibility	The model MU-PDIY22 Digital Input IOP is compatible only with the model MU-TDIY22 and MU-TDIY62 24 Vdc DI FTAs. Do not mismatch Digital Output IOPs.
24 Vdc power source	The FTAs require the connection of a 24 Vdc power source to TB1-1 and TB1-2 for the process control contacts. Optionally, the positive (+) or negative (-) side of the power source can be reversely connected to the terminals to provide either a current source or current sink application. Either an internal or external 24 Vdc power source can be used.
Model MU-TDIY22 internal 24 Vdc power source	The Model MU-TDIY22 FTA provides an internal source of 24 Vdc at TB1-3 and TB1-4. Connect TB1-3 to TB1-1 and TB1-4 to TB1-2 for a current sink application. Connect TB1-4 to TB1-1 and TB1-3 to TB1-2 for a current source application. See Figure 4-12.
Model MU-TDIY62 internal 24 Vdc power source	The Model MU-TDIY62 FTA provides an internal source of 24 Vdc at TB2-1 and TB2-2. Connect TB2-1 to TB1-1 and TB2-2 to TB1-2 for a current sink application. Connect TB2-2 to TB1-1 and TB2-1 to TB1-2 for a current source application. See Figure 4-13.
IOP protection	The internal 24 Vdc power for both the IOP and FTA is sourced through the IOP's backplane fuse (2.0 A); however, if the 24 Vdc is accidentally shorted to ground, power will not be removed from the Digital Input IOP because a 1.0 A fuse, F2, provides protection.
External 24 Vdc source	An external 24 Vdc source for the process control contacts is recommended. The external source can be from either a Digital Input Power Distribution Assembly, models MU-TDPR01 or MU-TDPR02, or a user-supplied auxiliary 24 Vdc power source.
Input power source protection	Two fuses, F1 (0.5 A) and F3 (0.5 A), provide overcurrent protection for the input 24 Vdc power source at TB1-1 and TB1-2.

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4.2.2 Model MU-TDIY22/62 FTAs, Continued

Model MU-TDIY22 FTA connection diagram

Figure 4-12 Model MU-TDIY22 24 Vdc Digital Input FTA Connection Diagram

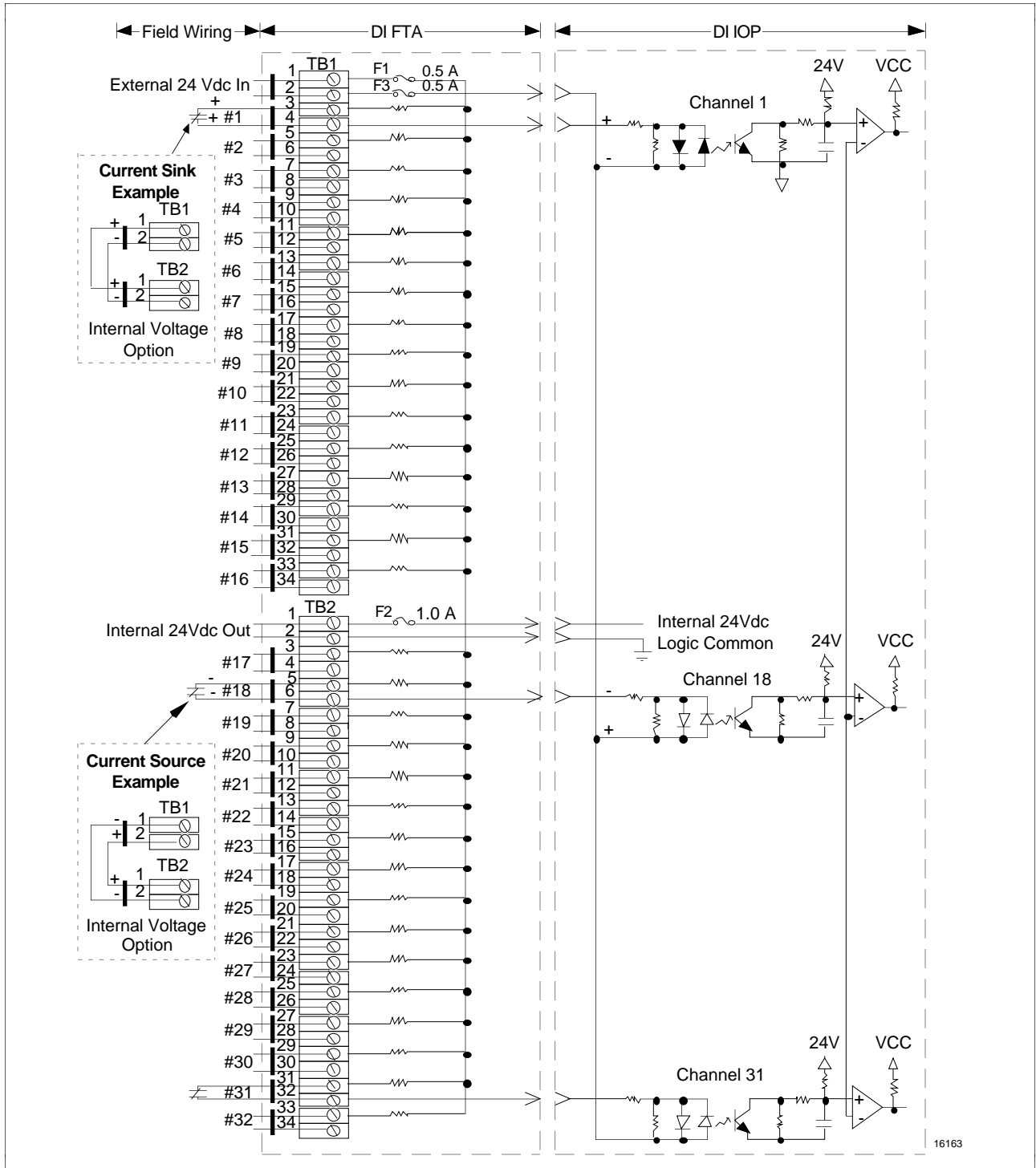


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4.2.2 Model MU-TDIY22/62 FTAs, Continued

Model MU-TDIY62 FTA connection diagram

Figure 4-13 Model MU-TDIY62 24 Vdc Digital Input FTA Connection Diagram

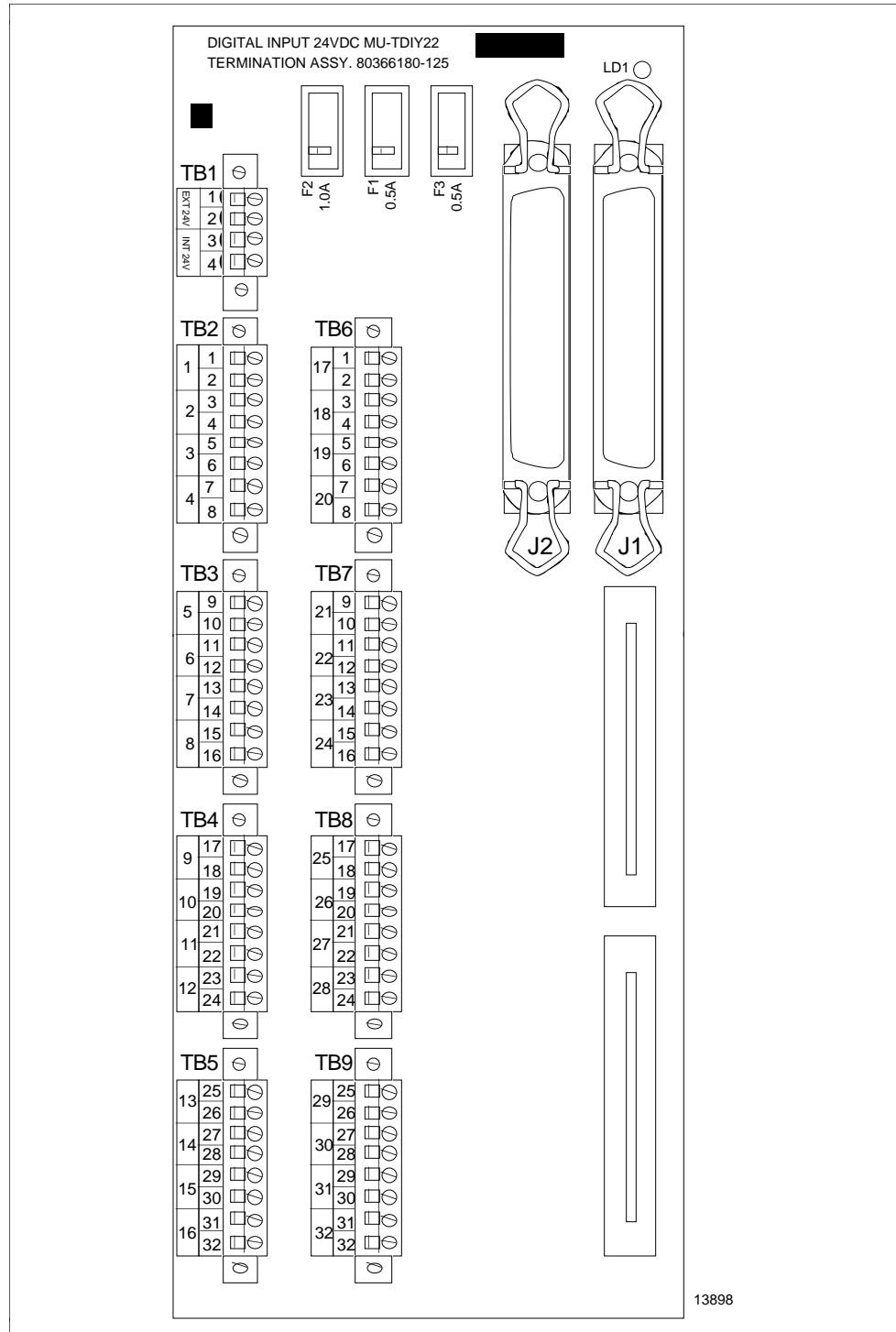


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4.2.2 Model MU-TDIY22/62 FTAs, Continued

Model MU-TDIY22 FTA assembly layout

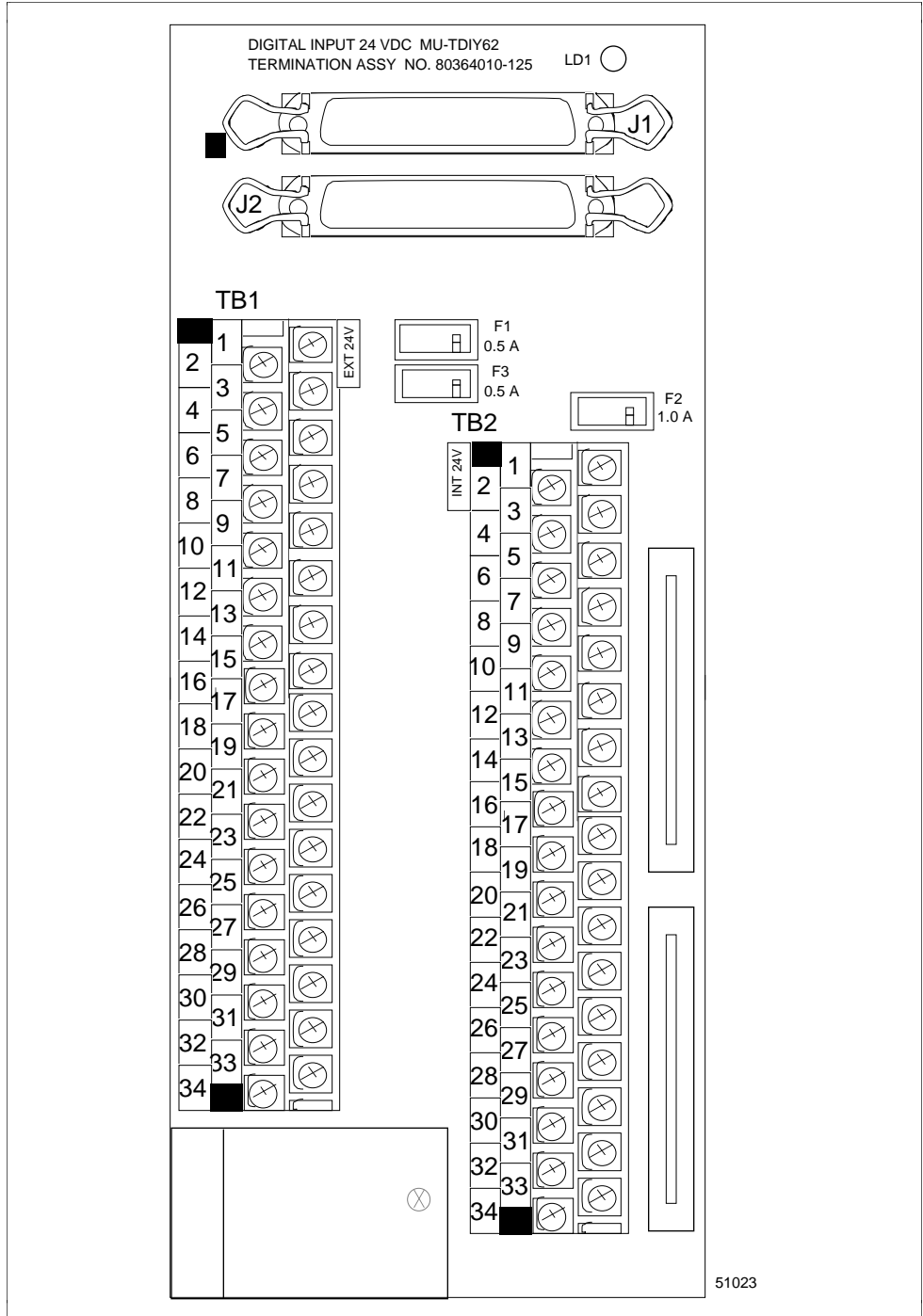
Figure 4-14 Model MU-TDIY22 24 Vdc Digital Input FTA Assembly Layout



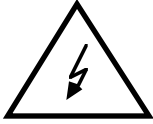
4.2.2 Model MU-TDIY22/62 FTAs, Continued

Model MU-TDIY62 FTA assembly layout

Figure 4-15 Model MU-TDIY62 24 Vdc Digital Input FTA
Assembly Layout



4.3 120 Vac Digital Input (DI) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

Some 120 Vac Digital Input (DI) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

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

120 Vac DI FTA and DI IOP models

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 4-2.

Table 4-2 120 Vac Digital Input FTA and DI IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDIA11	120 Vac DI FTA with Compression Terminals	51301186-100	N/A
MU-TDIA12	120 Vac DI FTA with Compression Terminals	51304439-100	51304439-125
MC-TDIA12	120 Vac DI FTA with Compression Terminals Conformally Coated	51304439-150	51304439-175
MU-TDIA52	120 Vac DI FTA with Screw Terminals	51304439-200	51304439-225
MC-TDIA52	120 Vac DI FTA with Screw Terminals Conformally Coated	51304439-250	51304439-275
MU-TDIA72	120 Vac DI FTA with Screw Terminals	51303930-100	N/A
MC-TDIA72	120 Vac DI FTA with Screw Terminals Conformally Coated	51303930-150	N/A
MU-PDIX01	DI IOP	51303997-200	N/A
MU-PDIX02	DI IOP	N/A	51304485-100
MC-PDIX02	DI IOP—Conformally Coated	N/A	51304485-150

Introduction

The 120 Vac Digital Input (DI) FTA accommodates 32 individually isolated ac inputs.

IOP compatibility

The model MU-PDIX01 and MU-PDIX02 Digital Input IOPs are compatible with all 120 Vac Digital Input FTA models.

Continued on next page

4.3 120 Vac Digital Input (DI) FTAs, Continued

Connection diagrams

The early production compression terminal-type 120 Vac DI FTA, model MU-TDIA11 FTA, provides groups of eight inputs sharing an isolated common return as illustrated by the connection diagram in Figure 4-16.

The compression terminal-type model MU-TDIA12 FTA, and the screw terminal-type models MU-TDIA52 and MU-TDIA72 FTAs provide 32 separately isolated inputs. See Figures 4-17 through 4-19, respectively for the connection diagrams.

Assembly layout illustrations

Figures 4-20 through 4-22 illustrate the assembly layout of the models MU-TDIA12, MU-TDIA52 and MU-TDIA72 FTAs, respectively. The model MU-TDIA52 FTA employs fixed-screw terminal connectors, while the model MU-TDIA72 FTA employs removable-screw terminal connectors.

Proper cabling

Signals from the FTA are normally considered as signals from a power circuit and therefore are subject to electrical codes. Use only cable approved for the operating voltage and current-limiting.

Vertical bus bar usage

There is usually a safety/shield conductor for each circuit. Because the FTA does not have a built-in bus to accommodate a large number of safety ground wires, use a vertical bus bar. Connect each shield/ground to the vertical bus and connect the vertical bus to the local Safety Ground bus bar with a 2.5 mm² (14 AWG) wire. Any cable shield/ground connects to the local Safety Ground at the cabinet entry.

Excessive cable capacitance

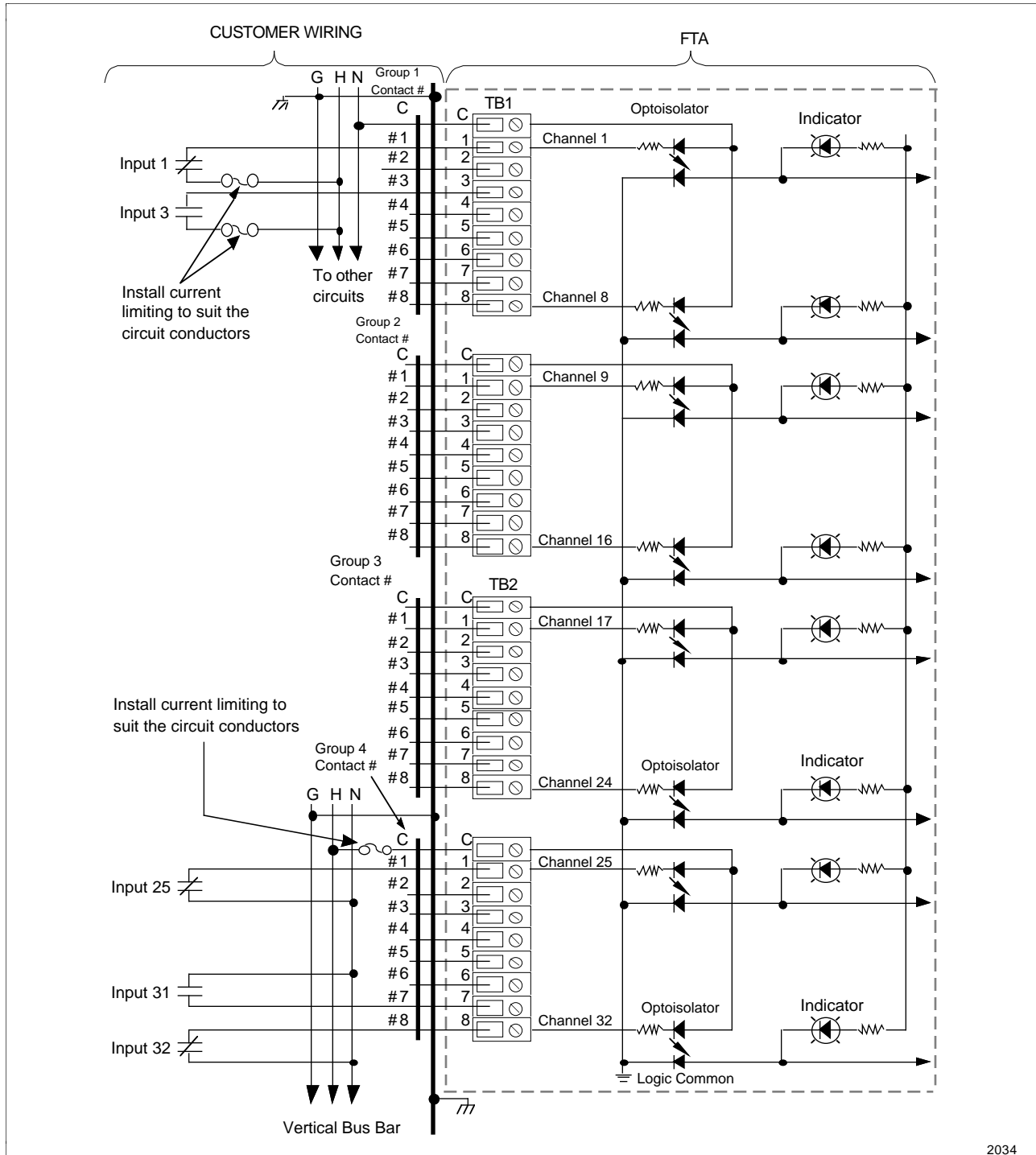
Excessive cable capacitance can prevent the FTA from detecting a valid open contact condition. Capacitance depends on the insulation materials and cable length.

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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA11 FTA connection diagram

Figure 4-16 Model MU-TDIA11 120 Vac Digital Input FTA Connection Diagram

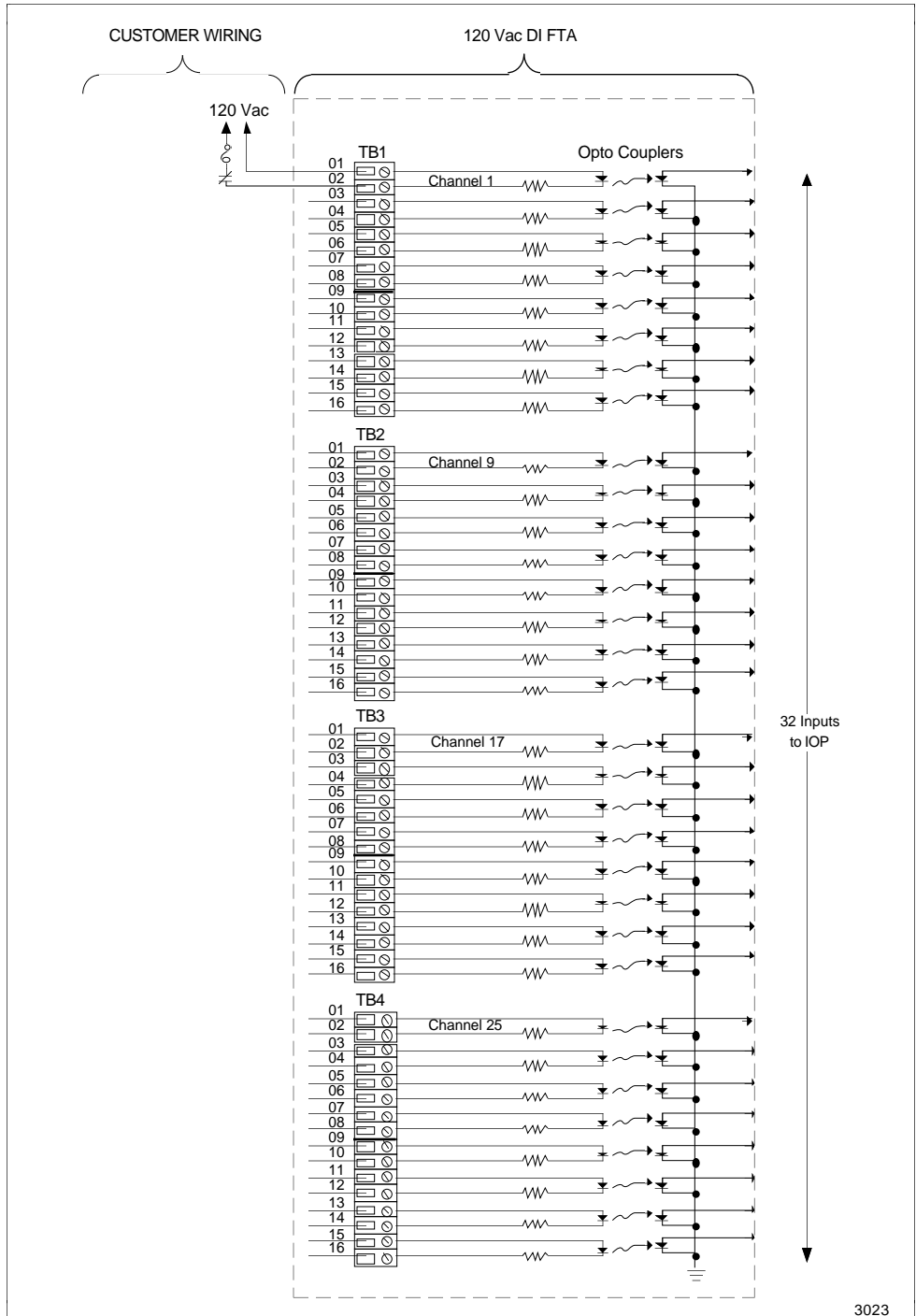


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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA12 FTA connection diagram

Figure 4-17 Model MU-TDIA12 120 Vac Digital Input FTA Connection Diagram

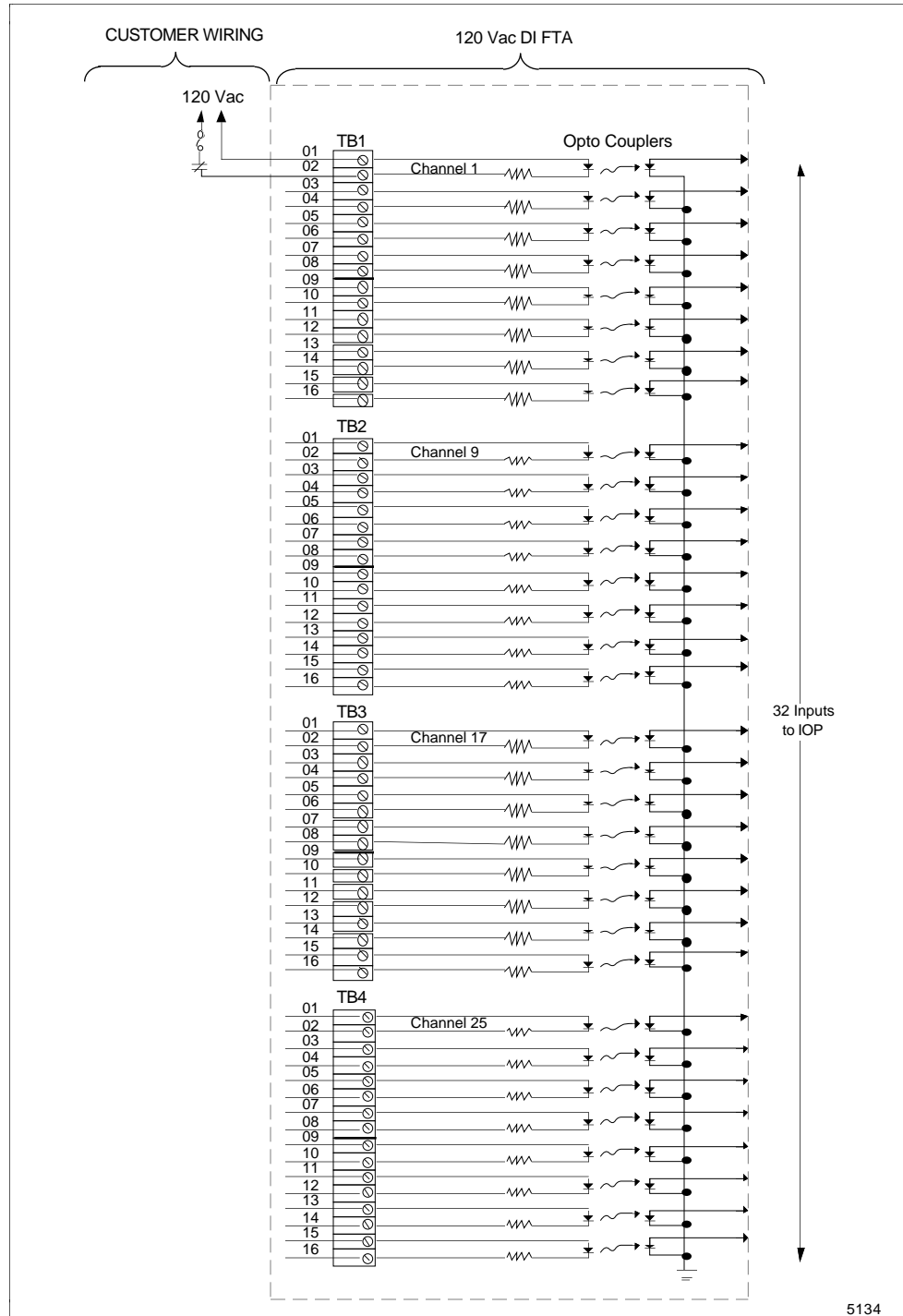


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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA52 FTA connection diagram

Figure 4-18 Model MU-TDIA52 120 Vac Digital Input FTA Connection Diagram



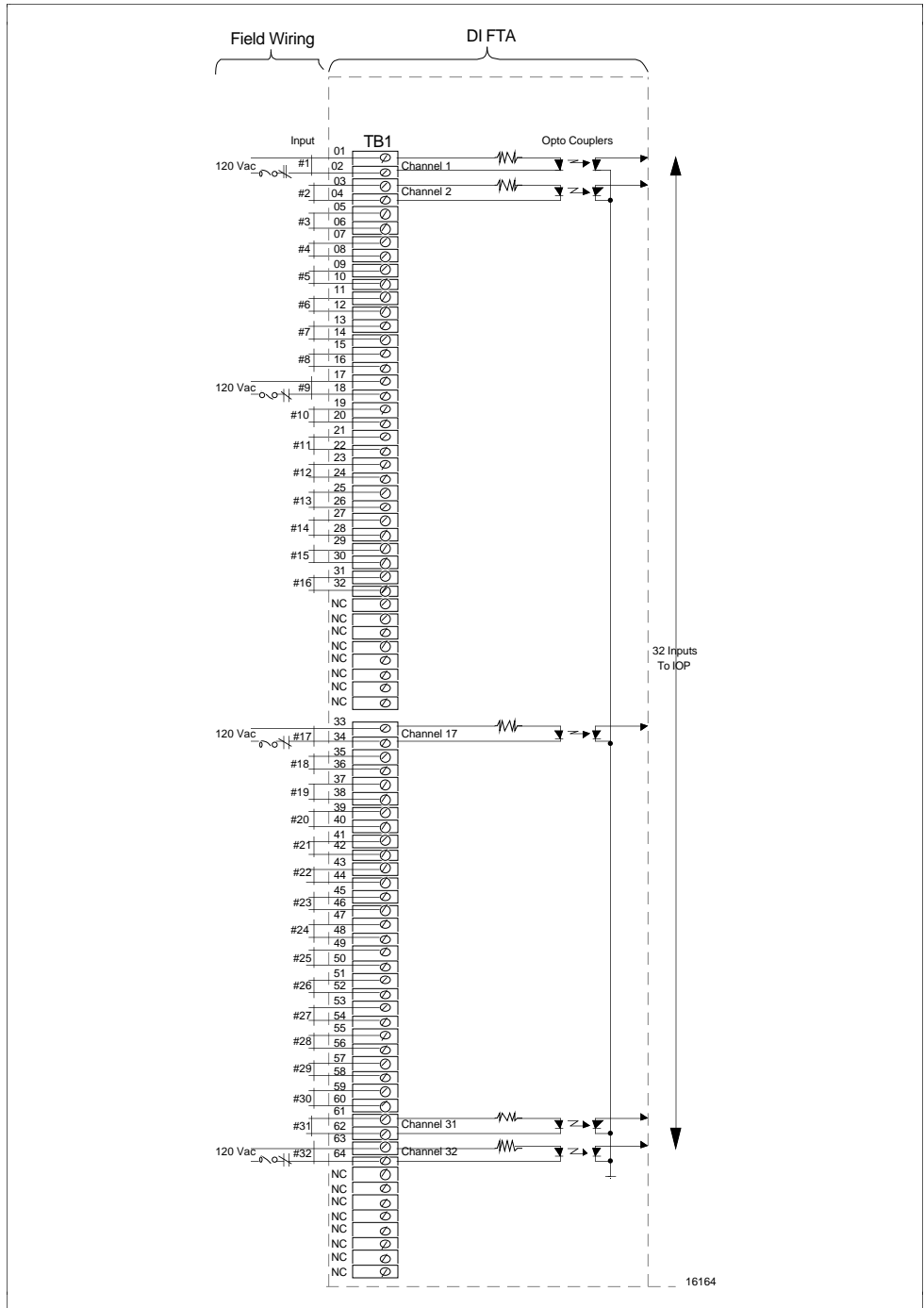
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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA72 FTA connection diagram

Figure 4-19 Model MU-TDIA72 120 Vac Digital Input FTA Connection Diagram

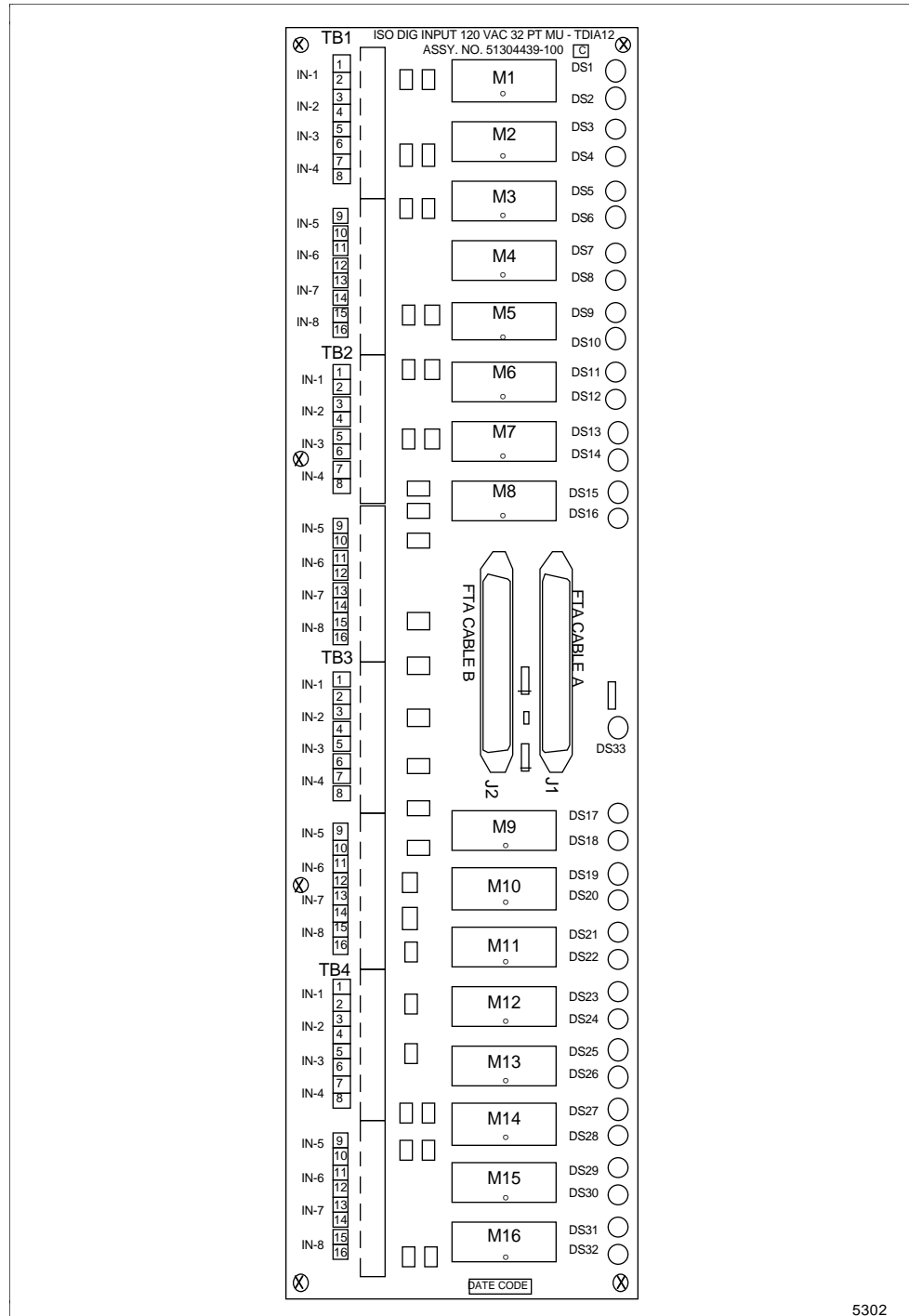


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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA12 FTA assembly layout

Figure 4-20 Model MU-TDIA12 120 Vac Digital Input FTA Assembly Layout

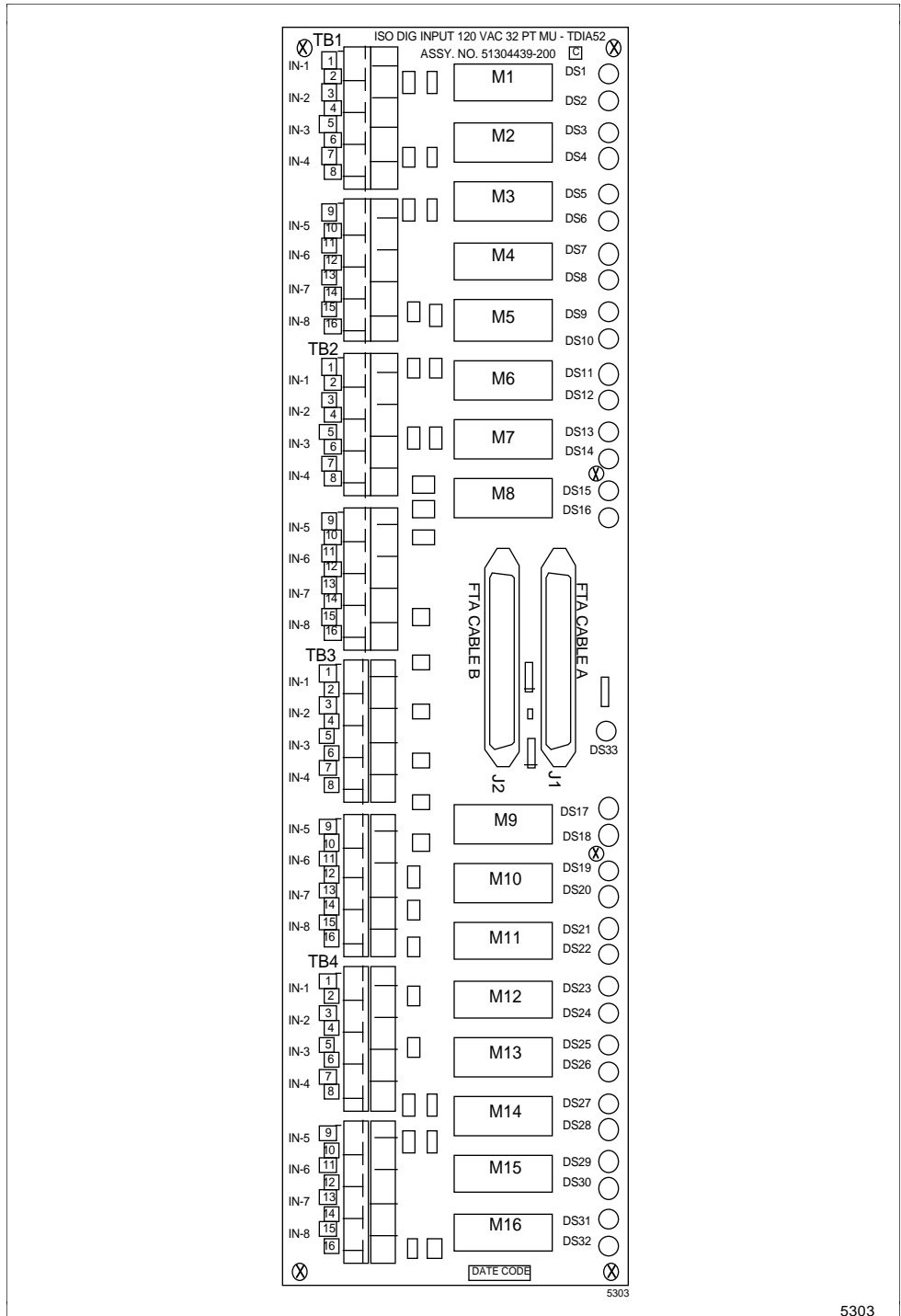


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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA52 FTA assembly layout

Figure 4-21 Model MU-TDIA52 120 Vac Digital Input FTA Assembly Layout

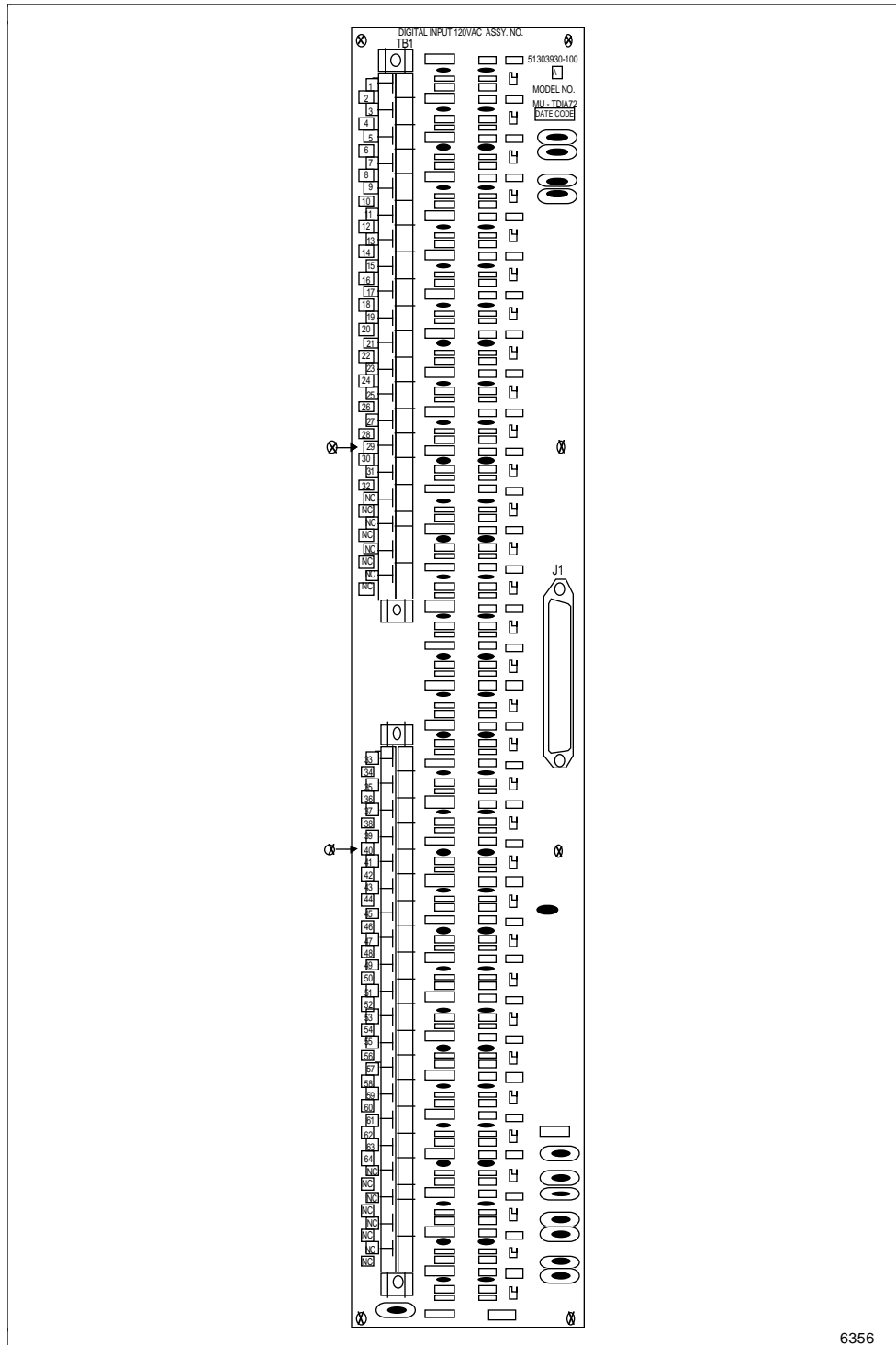


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4.3 120 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA72 FTA assembly layout

Figure 4-22 Model MU-TDIA72 120 Vac Digital Input FTA Assembly Layout



4.3.1 Cable Capacitance

Introduction

Cable capacitance increases with cable length to where an ac input FTA senses a false closed contact condition. The maximum acceptable cable length is calculated as follows.

Cable capacitance calculation

If eight 120 Vac contact signals with a common neutral return are sent to the FTA, similar to Group 1 in Figure 4-16, assume all the conductors are twisted together in one cable and let all contacts but one be closed. The FTA will have a minimum hold-off current of 1.15 mA, leakage in excess of 1.15 mA, and a channel may be activated. The capacitance that can cause this current flow is calculated as

$$I = E/X_C$$

where: $I = 1.15 \times 10^{-3}$ amperes

since: $X_C = 1/(2\pi fC)$,

$E/X_C = E2\pi fC = 1.15 \times 10^{-3}$ amperes

or, for 120 Vac at 60 Hz,

$120 \times 2 \times \pi \times 60 \times C = 1.15 \times 10^{-3}$ amperes

thus: $C = 2.54 \times 10^{-8}$ farads.

The capacitance of a conductor insulated with Polyvinyl Chloride (PVC) can exceed 394 pf/m (120 pf/ft) for all other conductors in the cable. The total cable length that gives 2.54×10^{-8} farads of capacitance is calculated as

pf x length = 2.54×10^{-8} farads

$3.94 \times 10^{-10} \times L = 2.54 \times 10^{-8}$ farads

$L = 64.5$ meters (211.5 feet)

This calculated length will almost certainly cause a false closure indication. The value of 1.15 mA is a worst-case value at -40°C . The typical worst-case value at 25°C is 1.37 mA.

Lower capacitance cable

Cable is available with much lower capacitance insulation, such as polycarbonate. When a lower cable capacitance still is not acceptable for the desired distance, individually shielded contact conductors are required.

4.4 240 Vac Digital Input (DI) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

Some 240 Vac Digital Input (DI) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

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

240 Vac DI FTA and DI IOP models

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 4-3.

Table 4-3 240 Vac Digital Input FTA and DI IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDIA21	240 Vac DI FTA with Compression Terminals	51304219-100	N/A
MU-TDIA22	240 Vac DI FTA with Compression Terminals	51304431-100	51304431-125
MC-TDIA22	240 Vac DI FTA with Compression Terminals Conformally Coated	51304431-150	51304431-175
MU-TDIA62	240 Vac DI FTA with Screw Terminals	51304431-200	51304431-225
MC-TDIA62	240 Vac DI FTA with Screw Terminals Conformally Coated	51304431-250	51304431-275
MU-PDIX01	DI IOP	51303997-200	N/A
MU-PDIX02	DI IOP	N/A	51304485-100
MC-PDIX02	DI IOP—Conformally Coated	N/A	51304485-150

Description

The 240 Vac Digital Input (DI) FTA is similar to the 120 Vac Digital Input FTA, except it accommodates a higher operating voltage, a lower sense current, and the inputs of all 240 Vac DI FTA models are arranged in groups of eight channels, each with a common return for the group.

IOP compatibility

The model MU-PDIX01 and MU-PDIX02 Digital Input IOPs are compatible with all the 240 Vac Digital Input FTA models.

Continued on next page

4.4 240 Vac Digital Input (DI) FTAs, Continued

Connection diagrams

Figures 4-23 and 4-24 are connection diagrams for the compression terminal-type model MU-TDIA21 and MU-TDIA22 240 Vac DI FTAs, respectively.

Figure 4-25 is a connection diagram for the screw terminal-type model MU-TDIA62 240 Vac DI FTA.

Assembly layout illustrations

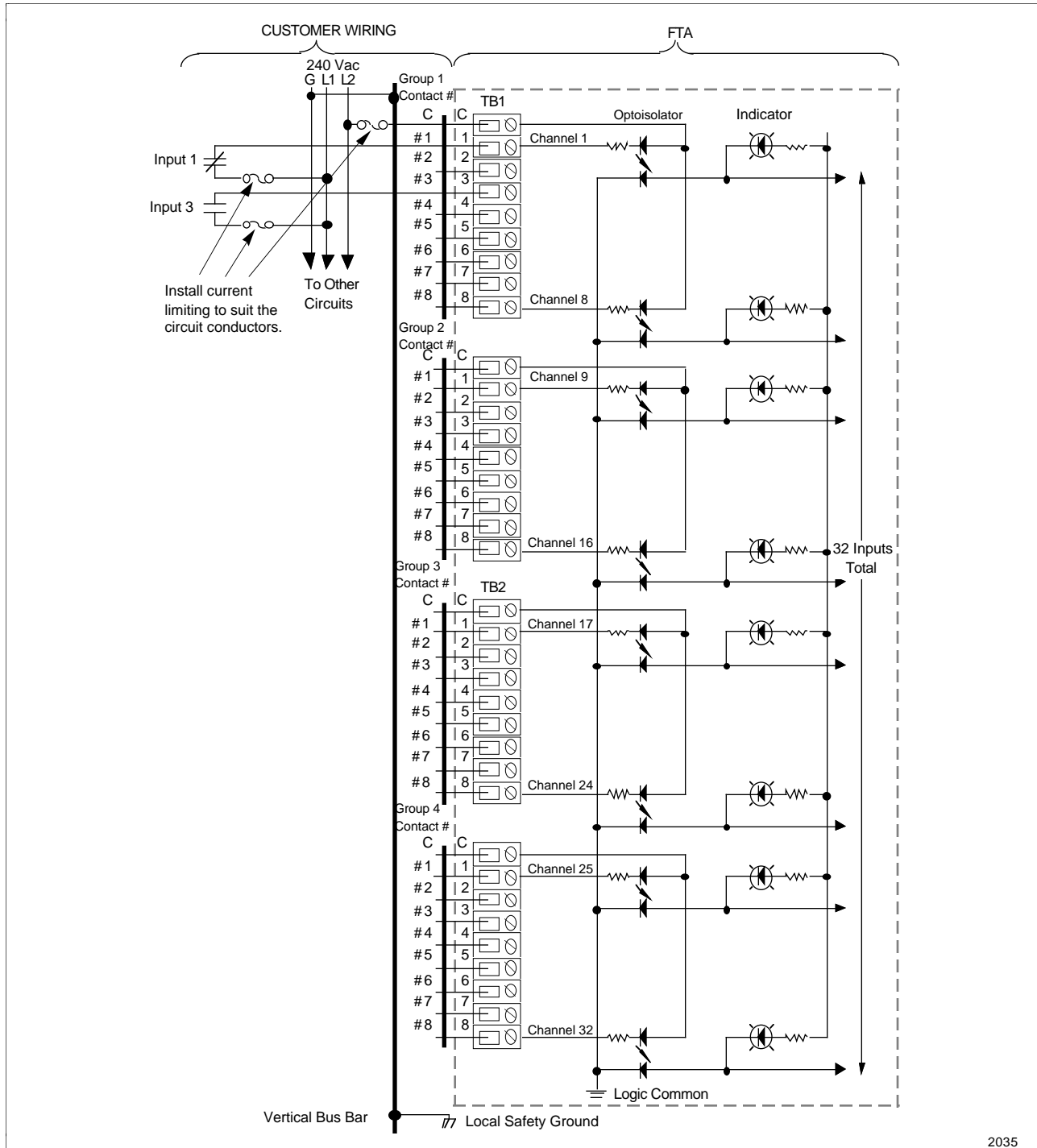
Figures 4-26 and 4-27 illustrate the assembly layout of the model MU-TDIA22 and MU-TDIA62 240 Vac Digital Input FTAs, respectively.

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4.4 240 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA21 FTA connection diagram

Figure 4-23 Model MU-TDIA21 240 Vac Digital Input FTA Connection Diagram



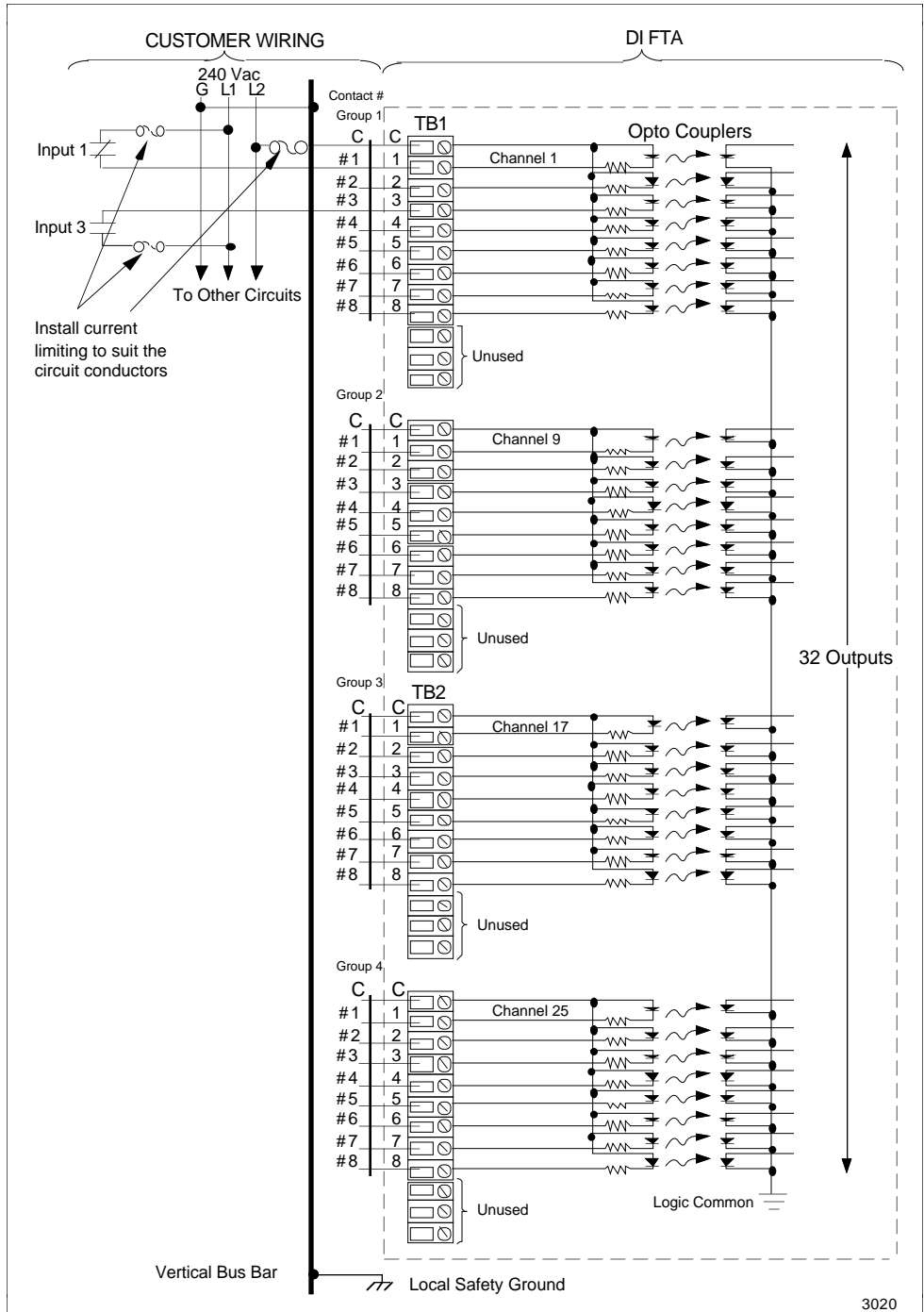
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4.4 240 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA22 FTA connection diagram

Figure 4-24 Model MU-TDIA22 240 Vac Digital Input FTA Connection Diagram



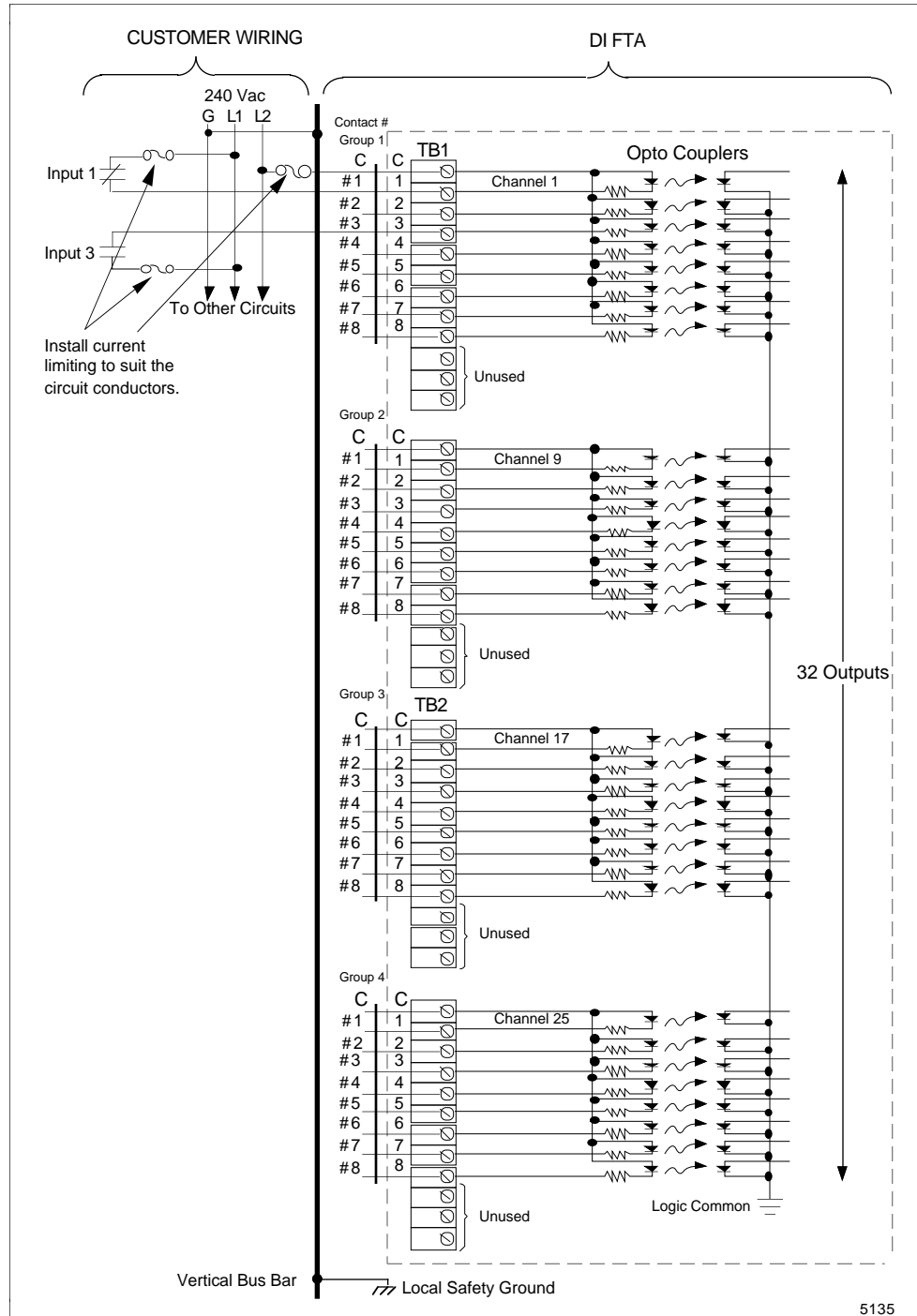
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4.4 240 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA62 FTA connection diagram

Figure 4-25 Model MU-TDIA62 240 Vac Digital Input FTA Connection Diagram

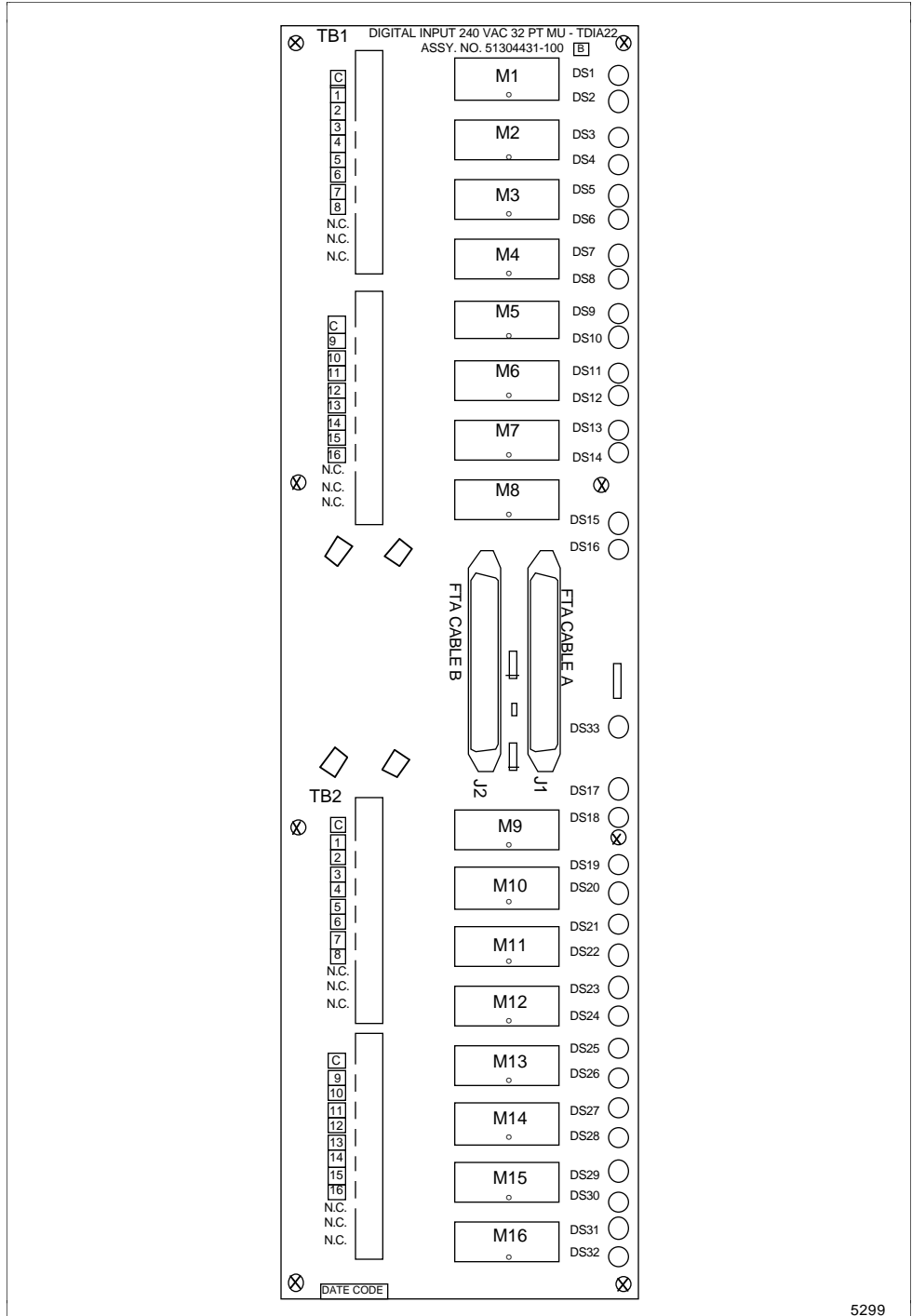


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4.4 240 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA22 FTA assembly layout

Figure 4-26 Model MU-TDIA22 240 Vac Digital Input FTA Assembly Layout

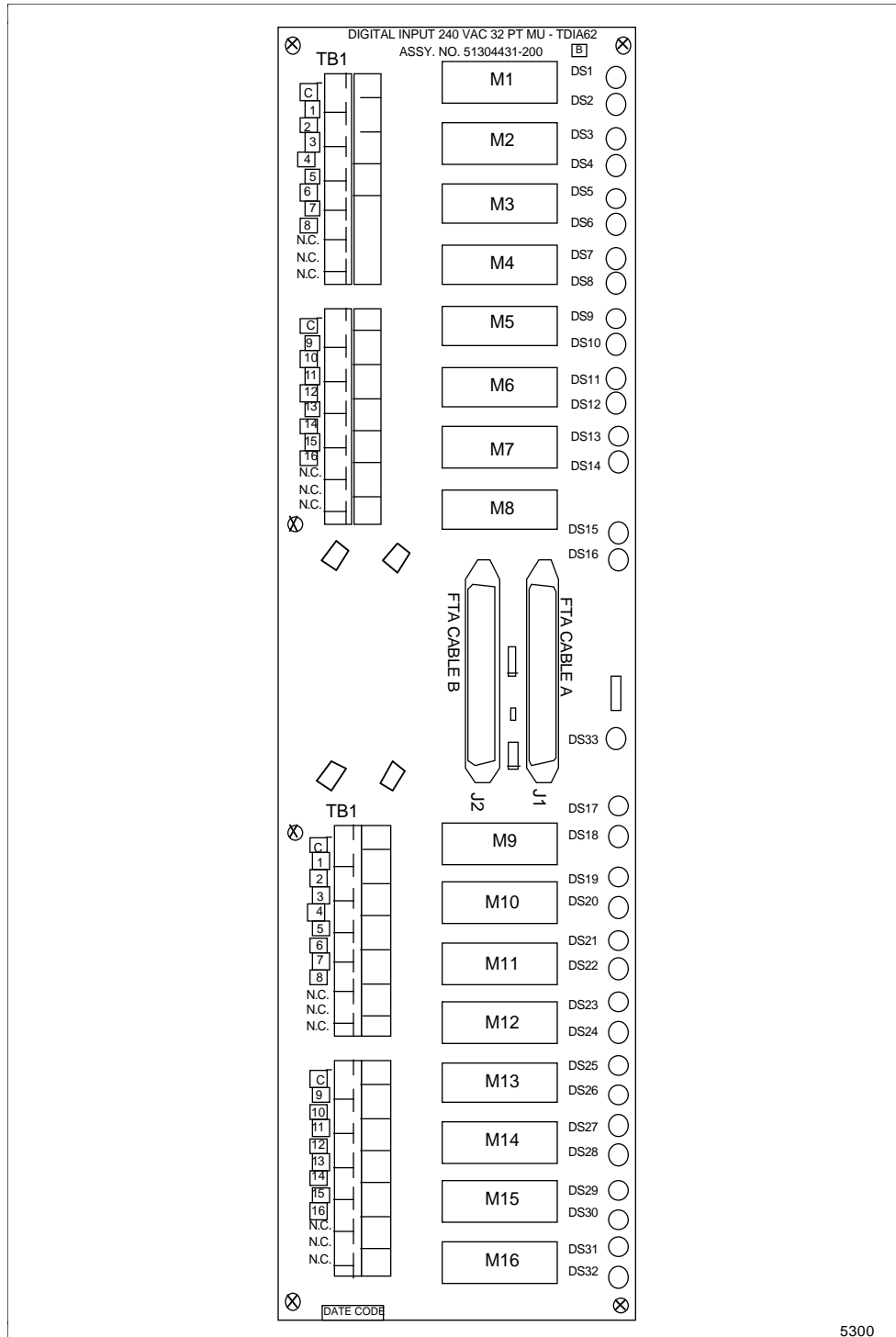


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4.4 240 Vac Digital Input (DI) FTAs, Continued

Model MU-TDIA62 FTA assembly layout

Figure 4-27 Model MU-TDIA62 240 Vac Digital Input FTA Assembly Layout



4.4.1 Cable Capacitance

Introduction

Cable capacitance increases with cable length to where an ac input FTA senses a false closed-contact condition. The maximum acceptable cable length is calculated as follows.

Cable capacitance calculation

If eight 120 Vac contact signals with a common neutral return are sent to the FTA, similar to Group 1 in Figure 4-23, assume all the conductors are twisted together in one cable and assume all contacts but one is closed. The FTA will have a minimum hold-off current of 1.15 mA, leakage in excess of 1.15 mA, and a channel may be activated. The capacitance that can cause this current flow is calculated as

$$I = E/X_C$$

where: $I = 1.15 \times 10^{-3}$ amperes

since: $X_C = 1/(2\pi fC)$,

$E/X_C = E2\pi fC = 1.15 \times 10^{-3}$ amperes

or, for 120 Vac at 60 Hz,

$120 \times 2 \times \pi \times 60 \times C = 1.15 \times 10^{-3}$ amperes

thus: $C = 2.54 \times 10^{-8}$ farads.

The capacitance of a conductor insulated with Polyvinyl Chloride (PVC) can exceed 394 pf/m (120 pf/ft) for all other conductors in the cable. The total cable length that gives 2.54×10^{-8} farads of capacitance is calculated as

pf x length = 2.54×10^{-8} farads

$3.94 \times 10^{-10} \times L = 2.54 \times 10^{-8}$ farads

$L = 64.5$ meters (211.5 feet)

This calculated length will almost certainly cause a false closure indication. The value of 1.15 mA is a worst-case value at -40°C . The typical worst-case value at 25°C is 1.37 mA estimated.

Lower capacitance cable

Cable is available with much lower capacitance insulation, such as polycarbonate. When a lower cable capacitance still is not acceptable for the desired distance, individually shielded contact conductors are required.

Section 5 – Digital Output FTA Installation

5.1 Overview

Section contents The topics covered in this section are:

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5.3	24 Vdc Isolated Digital Output (DO) FTAs.....	165
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Purpose This section provides information necessary for the proper installation of digital output-type Field Termination Assemblies (FTAs). If required for configuration or other purposes, supporting assemblies, such as Input/Output Processors (IOPs), are also included in the installation procedure discussion.

5.2 24 Vdc Nonisolated Digital Output (DO) FTAs

Description The 24 Vdc nonisolated Digital Output (DO) FTA provides 16 nonisolated digital outputs for low current loads such as lamps and relays.

CE Compliance None of the 24 Vdc nonisolated Digital Output (DO) Field Termination Assemblies are CE Compliant. The model MU-TDOD14 and MU-TDOD54 3-30 Vdc Digital Output FTAs are recommended for CE Compliance applications.

Continued on next page

5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

24 Vdc nonisolated DO FTAs and DO IOPs Table 5-1 is a list of 24 Vdc nonisolated Digital Output FTA Models.

Table 5-1 24 Vdc Nonisolated Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOD11	24 Vdc Nonisolated DO FTA Compression Terminals	51301220-100	N/A
MU-TDOD12	24 Vdc Nonisolated DO FTA Compression Terminals	51304446-100	N/A
MC-TDOD12	24 Vdc Nonisolated DO FTA Compression Terminals—Conformally Coated	51304446-150	N/A
MU-TDOD52	24 Vdc Nonisolated DO FTA—Screw Terminals	51304446-200	N/A
MC-TDOD52	24 Vdc Nonisolated DO FTA Screw Terminals—Conformally Coated	51304446-250	N/A
MU-PDOX01	Digital Output IOP	51303994-200	N/A
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

CAUTION

CAUTION—The output terminals of the FTA are directly connected to the electronics in the associated Digital Output IOP through the IOP to FTA cable. With no isolation between the FTA field terminals and the electronics in the IOP, any noise or voltage induced into the field wiring will be injected into the IOP electronics. This could result in temporary or permanent failure in the IOP. A worst case scenario would be a voltage spike that propagates to the card file backplane and damages other cards, possibly causing the PM, APM, or HPM to fail. It's also possible that a redundant PMM, APMM, or HPMM configuration could fail.

Because there is no isolation, the FTA output terminals must not be wired directly to a field device. An isolation relay must be used between the FTA output terminals and a field device.

Continued on next page

5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

IOP compatibility

The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are compatible with all 24 Vdc nonisolated DO FTA models.

Recommended installation practices

The IOP and FTA must be located in the control room, or some similar structure, and connected only to other isolated components. The FTA outputs are designed to drive only light duty relays, solenoids, and small lamps.

The IOP drivers are open collector (current sinking) transistors connected to logic ground. Only the low side of the load should be connected to the driver. The high side of the load must be connected to +24 Vdc. The maximum current must not exceed 100 mA.

Connection diagrams

Figure 5-1 is a connection diagram for the compression terminal-type model MU-TDON11 and MU-TDON12 24 Vdc nonisolated Digital Output FTAs.

Figure 5-2 is a connection diagram for the screw terminal-type model MU-TDON52 24 Vdc nonisolated DO FTA.

Assembly layout illustrations

Figures 5-3 and 5-4 illustrate the assembly layout of the model MU-TDON12 and MU-TDON52 24 Vdc nonisolated Digital Output FTAs, respectively.

Signals internally referenced to ground

The signals are internally referenced to logic common and local Master Reference Ground (MRG).

Diode suppression

An inductive load, such as a relay or solenoid, must be suppressed by installing a diode across the load connection at the load as illustrated for Load 16 in Figures 5-1 and 5-2.

Vertical bus bars

The vertical bus bar illustrated in Figures 5-1 and 5-2 that provides grounding for the signal cable shields is attached to the FTA Mounting Channel that the FTA is mounted on. Use a 2.5 mm² (14 AWG) wire to ground the bus bar to Master Reference Ground. For a CE Compliance application, Safety Ground must be used.

Field circuit fuses

The branch circuit fuses in Figures 5-1 and 5-2 are not standard Honeywell assemblies. Mount the outside vendor-purchased fuse blocks on the side of the cabinet beside the FTA.

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5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

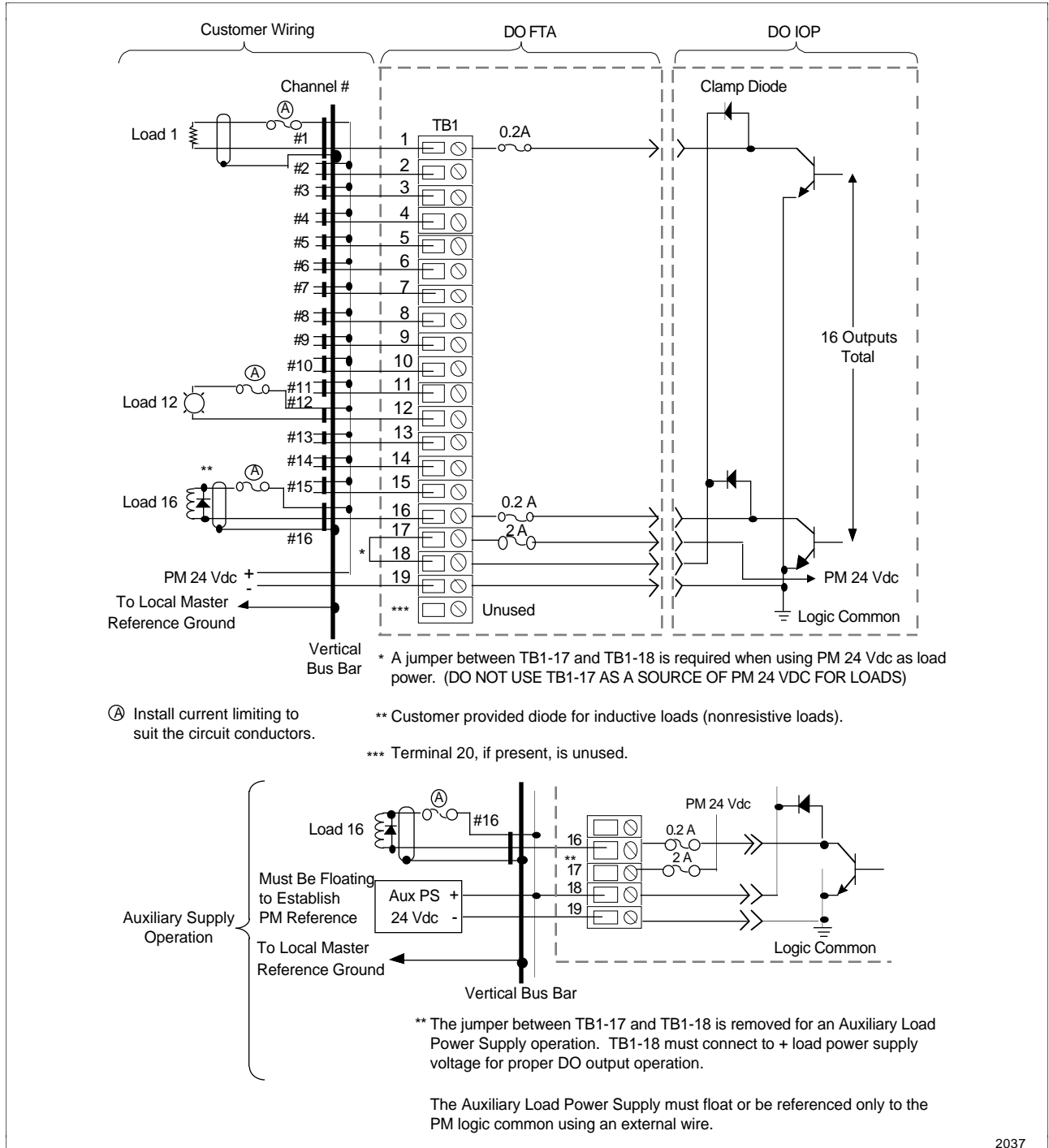
Use approved cable	Use only cable approved for circuit current limiting and proper operating voltage.
24 Vdc connections	The FTA has internal clamping diodes to clamp inductive loads such as relays and solenoids. The diodes have a common bus that is available at TB1-18.
Internal 24 Vdc power	Figures 5-1 and 5-2 illustrate how the clamping bus at TB1-18 is connected to TB1-17 when using the internal 24 Vdc that is available in the FTA.
External 24 Vdc power	It also demonstrates how the clamping bus at TB1-18 can be connected to an external 24 Vdc power source when not using the FTA's internal 24 Vdc power.
CAUTION	CAUTION—When using an external 24 volt power source, a ground return is an absolute requirement.
TB1-18 connection	Connection of the 24 Vdc power source to TB1-18 is important and is required internally by the 24 Vdc Digital Output IOP as a reference voltage when the digital outputs are checked by the IOP during a readback diagnostic. Without the proper TB1-18 connection to the 24 Vdc power source, the IOP will not operate correctly.
CAUTION	CAUTION—The FTA will not operate properly unless connections to TB1-17, TB1-18, and TB1-19 are made according to Figures 5-1 and 5-2.

Continued on next page

5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

Model MU-TDON11/12 connection diagram

Figure 5-1 Model MU-TDON11/MU-TDON12 24 Vdc Nonisolated Digital Output FTA Connection Diagram

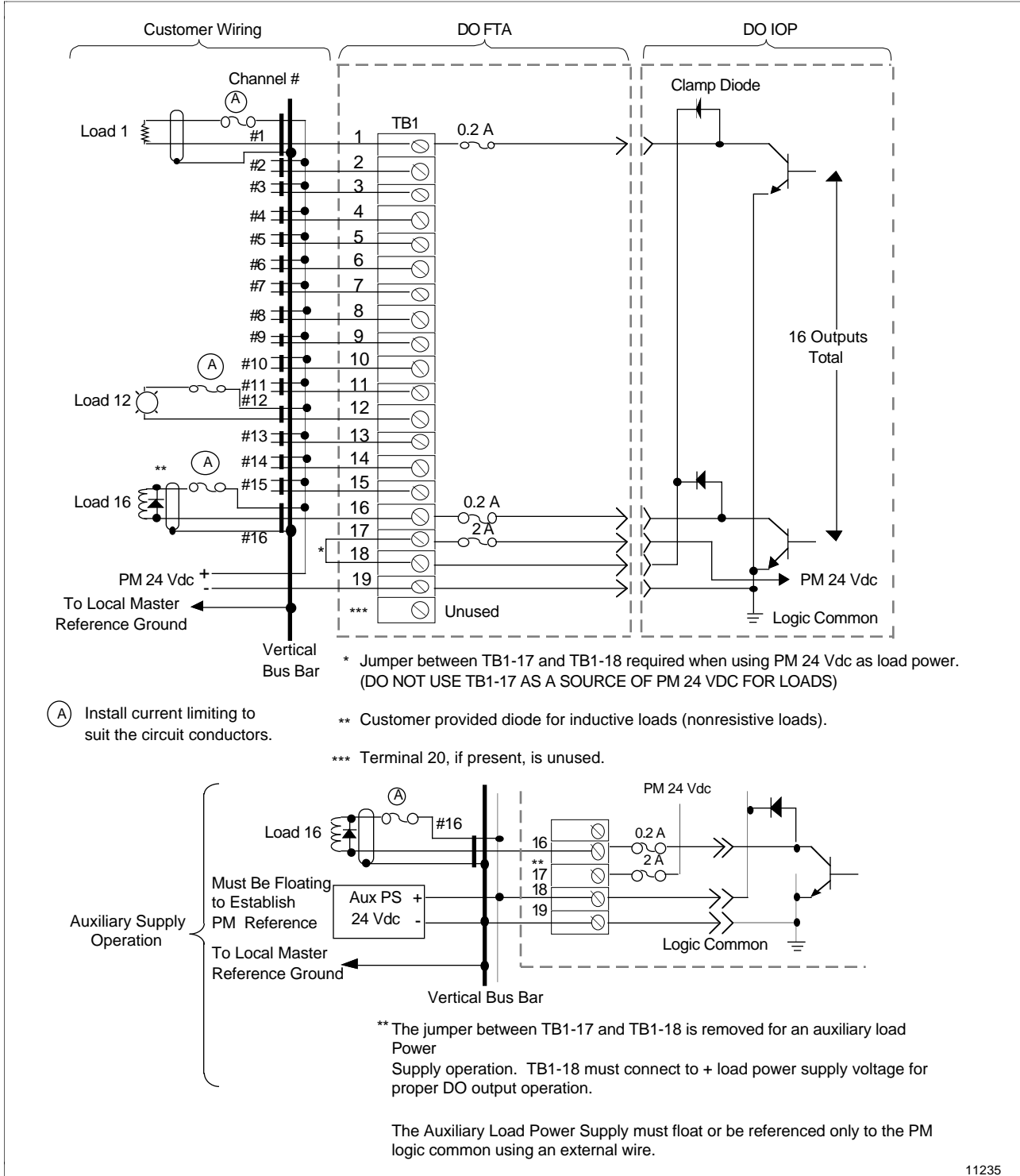


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5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

Model MU-TDON52 connection diagram

Figure 5-2 Model MU-TDON52 24 Vdc Nonisolated Digital Output FTA Connection Diagram

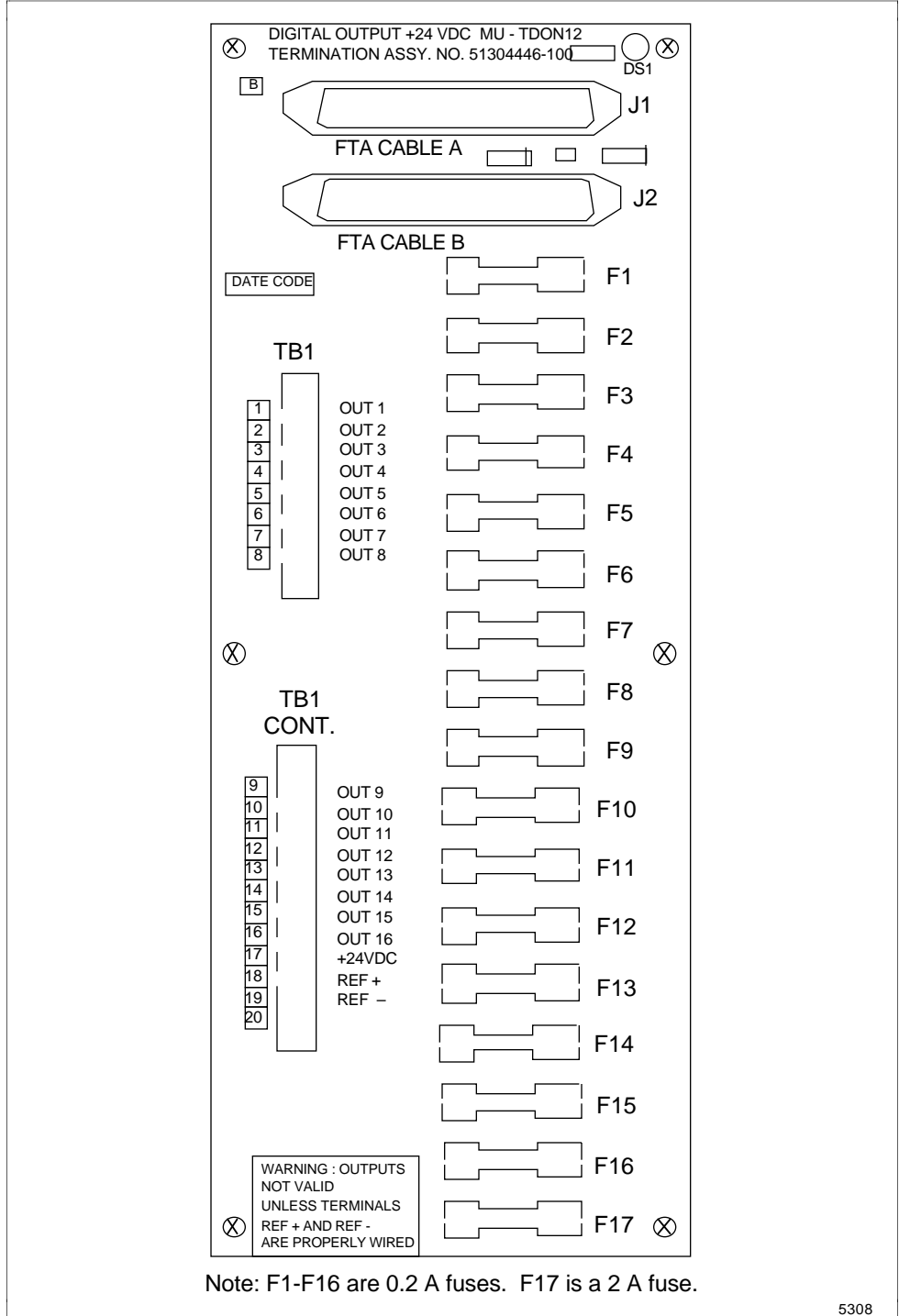


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5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

Model MU-TDON12 FTA assembly layout

Figure 5-3 Model MU-TDON12 24 Vdc Nonisolated Digital Output FTA Assembly Layout

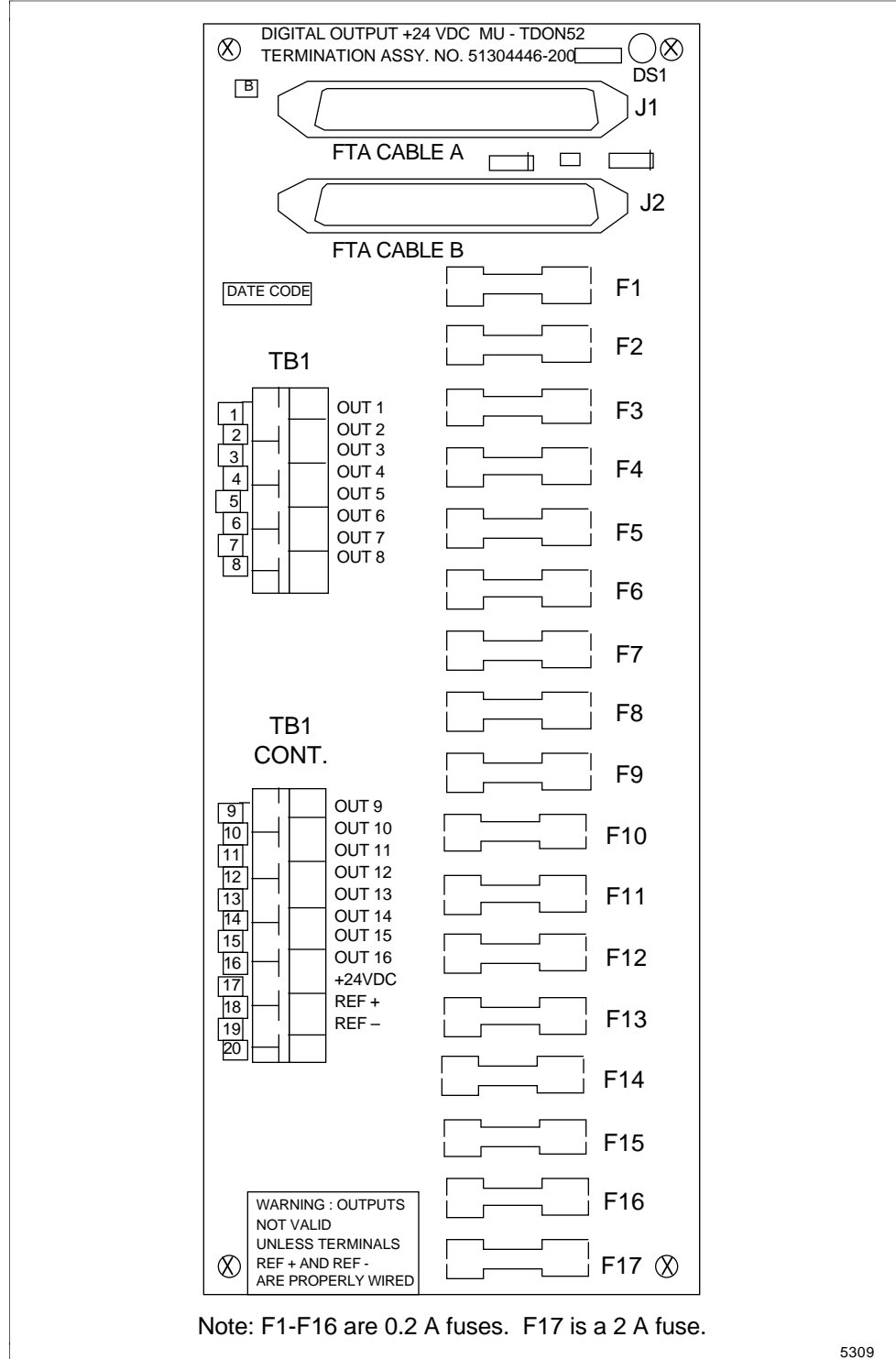


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5.2 24 Vdc Nonisolated Digital Output (DO) FTAs, Continued

Model MU-TDON52 FTA assembly layout

Figure 5-4 Model MU-TDON52 24 Vdc Nonisolated Digital Output
FTA Assembly Layout



5.3 24 Vdc Isolated Digital Output (DO) FTAs

Description The 24 Vdc isolated Digital Output (DO) FTAs provide 32 isolated digital outputs. The output drivers in the IOP are optically isolated from PM/APM/HPM common and can drive loads requiring up to 500 mA at 24 Vdc.

CE Compliance None of the 24 Vdc isolated Digital Output (DO) FTAs are CE Compliant. For CE Compliance applications, the model MU-TDOD14 and MU-TDOD54 3-30 Vdc Digital Output FTAs are recommended.

24 Vdc Isolated DO FTAs and DO IOPs Table 5-2 is a list of 24 Vdc isolated Digital Output FTA Models.

Table 5-2 24 Vdc Isolated Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOY22	24 Vdc Isolated DO FTA Compression Terminals	80366183-100	80366183-125
MC-TDOY22	24 Vdc Isolated DO FTA Compression Term—Conformally Coated	80366183-150	80366183-175
MU-TDOY62	24 Vdc Isolated DO FTA—Screw Terminals	80364013-100	80364013-125
MC-TDOY62	24 Vdc Isolated DO FTA Screw Terminals—Conformally Coated	80364013-150	80364013-175
MU-PDOY22	Digital Output IOP	N/A	80363975-100
MC-PDOY22	Digital Output IOP—Conformally Coated	N/A	80363975-150

Introduction The isolated 24 Vdc Digital Output (DO) FTAs provide 32 isolated digital outputs. The output drivers in the IOP are optically isolated from PM, APM, or HPM common and can drive loads requiring up to 500 mA at 24 Vdc.

ATTENTION

ATTENTION—Only the model MU-PDOY22 IOP can be used with the isolated 24 Vdc Digital Output FTA. Any other IOP model does not provide the proper IOP to FTA interface.

FTA placement The FTAs can be installed in the field, or in a control room or similar structure.

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5.3 24 Vdc Isolated Digital Output (DO) FTAs, Continued

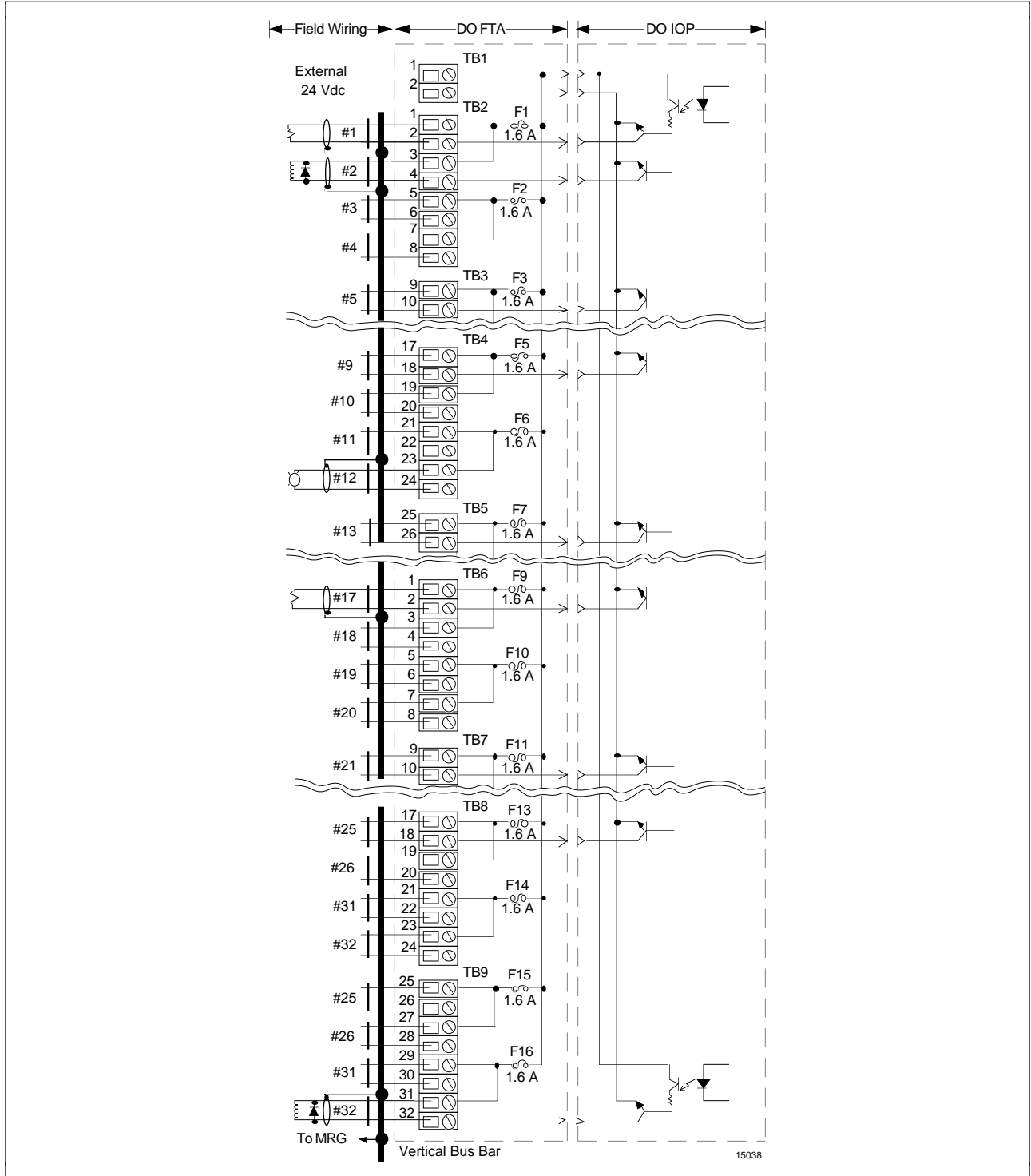
External power source	<p>The external 24 Vdc power source that is provided by the user must be connected to TB1-1 (+) and TB1-2 (-) for the FTA output loads.</p> <p>To guarantee signal isolation, the 24 Vdc external power source must be an independent power supply. It must not be the HPM, PM, or APM Power System that provides power to the FTA through the IOP. The external power source must be capable of providing up to 5 amperes for the 32 channels (points).</p>
Assembly connection and layout diagrams	<p>Figure 5-5 is a connection diagram for the compression terminal-type model MU-TDOY22 FTA, and Figure 5-6 is a connection diagram for the screw terminal-type model MU-TDOY62 FTA.</p> <p>Figures 5-7 and 5-8 illustrate the assembly layout of the model MU-TDOY22 and model MU-TDOY62 FTAs, respectively.</p>
Vertical bus bars	<p>The vertical bus bar illustrated in Figures 5-5 and 5-6 that provides grounding for the signal cable shields is attached to the FTA Mounting Channel that the FTA is mounted on. Use a 2.5 mm² (14 AWG) wire to ground the bus bar to Master Reference Ground. For CE Compliance applications, Safety Ground must be used.</p>
Use approved cable	<p>Use only cable approved for circuit current limiting and proper operating voltage.</p>
Model MU-TDOY22 FTA fuse protection	<p>Sixteen fast-action 1.6 A fuses provide protection for each pair of output circuits. See Figure 5-5.</p>
Model MU-TDOY62 FTA fuse protection	<p>Four fast-action 1.6 A fuses provide protection for each group of eight output circuits. See Figure 5-6.</p>
CAUTION	<p>CAUTION—An inductive load, such as a relay or solenoid, must be suppressed by installing a diode across the load connection at the load as illustrated for Load 2 in Figures 5-5 and 5-6.</p>
FTA size	<p>The FTA is a B size (4.75 inches wide by 12.0 inches long).</p>

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5.3 24 Vdc Isolated Digital Output (DO) FTAs, Continued

Model MU-TDOY22 connection diagram

Figure 5-5 Model MU-TDOY22 24 Vdc Isolated Digital Output FTA Connection Diagram

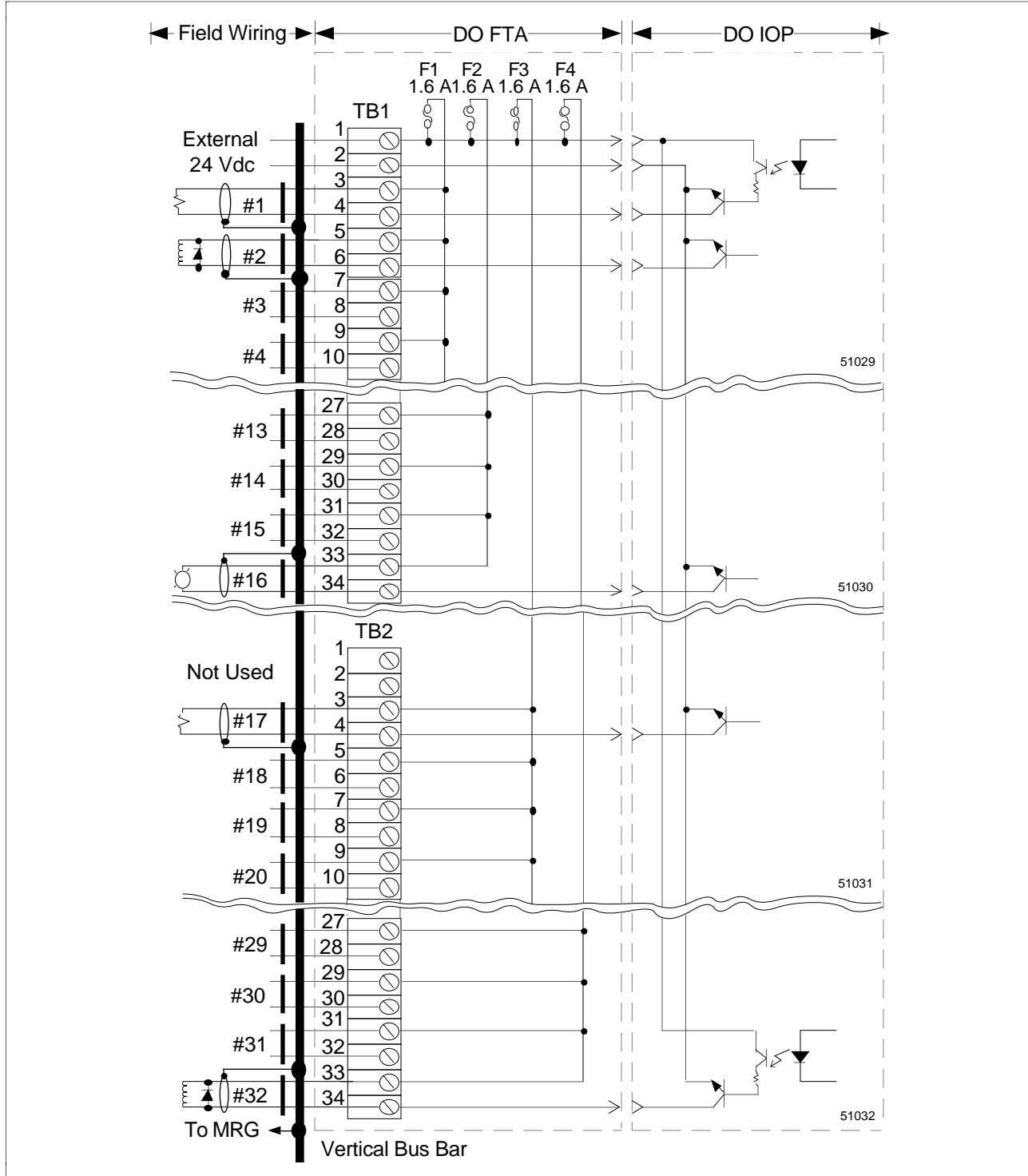


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5.3 24 Vdc Isolated Digital Output (DO) FTAs, Continued

Model MU-TDOY62 connection diagram

Figure 5-6 Model MU-TDOY62 24 Vdc Isolated Digital Output FTA Connection Diagram

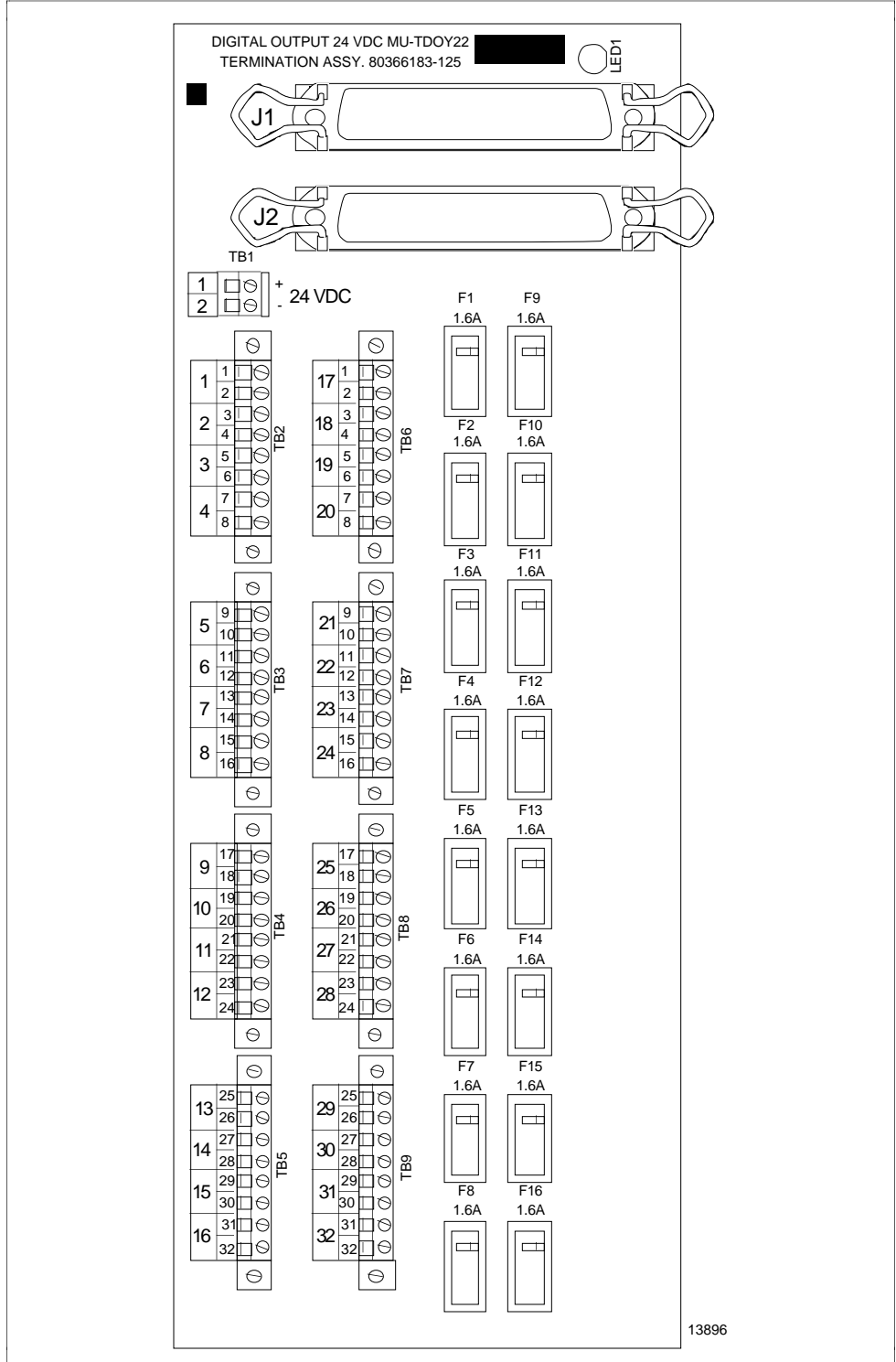


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5.3 24 Vdc Isolated Digital Output (DO) FTAs, Continued

Model MU-TDOY22
FTA assembly layout

Figure 5-7 Model MU-TDOY22 24 Vdc Isolated Digital Output FTA Assembly Layout

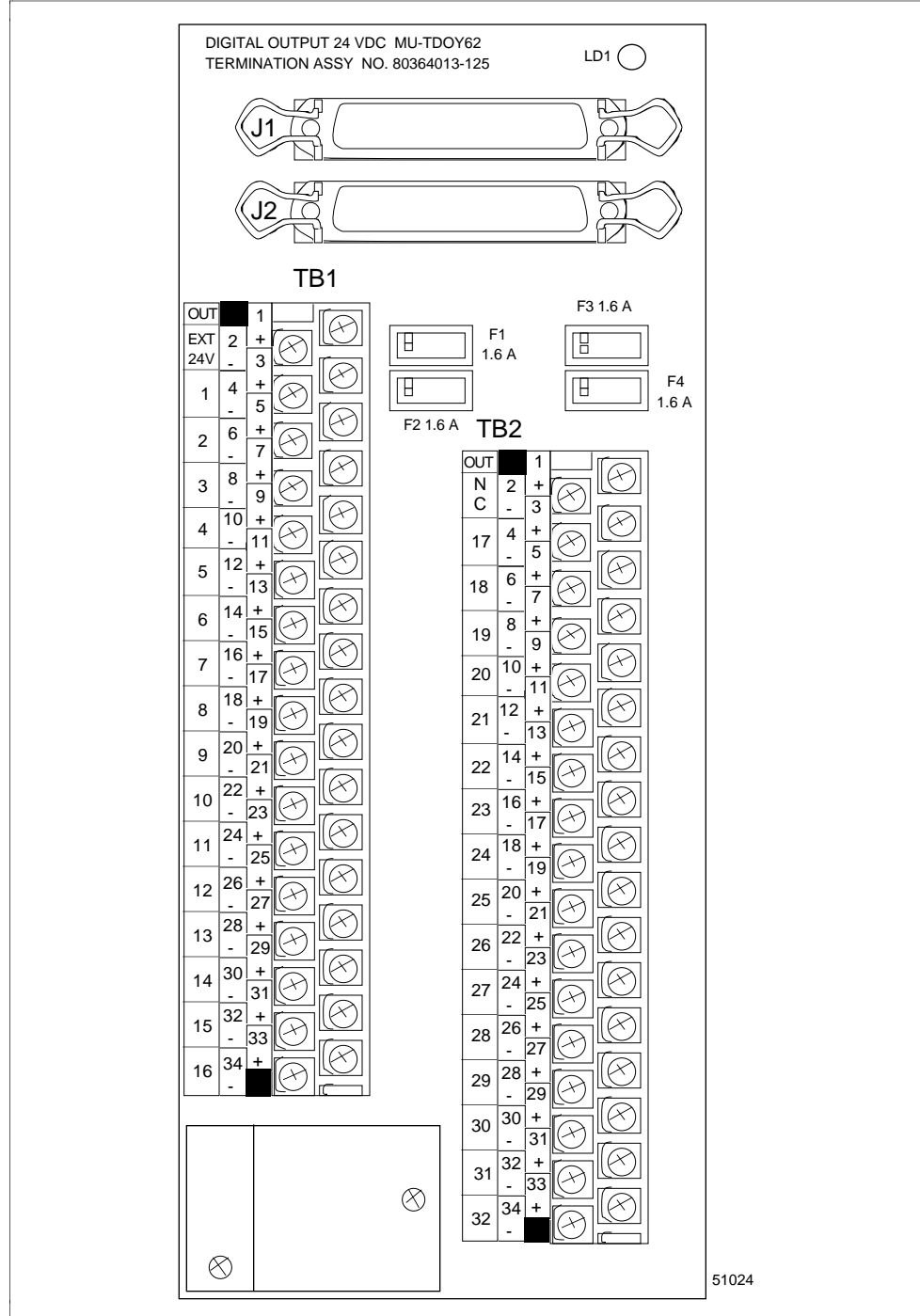


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5.3 24 Vdc Isolated Digital Output (DO) FTAs, Continued

Model MU-TDOY62
FTA assembly layout

Figure 5-8 Model MU-TDOY62 24 Vdc Isolated Digital Output FTA Assembly Layout



5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs

CE Compliance

Some 3-30 Vdc solid-state Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.”

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

3-30 Vdc SS DO FTAs and DO IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 5-3.

Table 5-3 3-30 Vdc Solid-State Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOD11	3-30 Vdc SS DO FTA—Compression Terminals	51301220-100	N/A
MU-TDOD12	3-30 Vdc SS DO FTA—Compression Terminals	51304423-100	N/A
MC-TDOD12	3-30 Vdc SS DO FTA Compression Terminals—Conformally Coated	51304423-150	N/A
MU-TDOD13	3-30 Vdc SS DO FTA—Compression Terminals	51304650-100	N/A
MC-TDOD13	3-30 Vdc SS DO FTA Compression Terminals—Conformally Coated	51304650-150	N/A
MU-TDOD14	3-30 Vdc SS DO FTA—Compression Terminals	N/A	51309153-125
MC-TDOD14	3-30 Vdc SS DO FTA Compression Terminals—Conformally Coated	N/A	51309153-175
MU-TDOD52	3-30 Vdc SS DO FTA—Screw Terminals	51304423-200	N/A
MC-TDOD52	3-30 Vdc SS DO FTA Screw Terminals—Conformally Coated	51304423-250	N/A
MU-TDOD53	3-30 Vdc SS DO FTA—Screw Terminals	51304650-200	N/A
MC-TDOD53	3-30 Vdc SS DO FTA Screw Terminals—Conformally Coated	51304650-250	N/A
MU-TDOD54	3-30 Vdc SS DO FTA —Screw Terminals	N/A	51309153-225
MC-TDOD54	3-30 Vdc SS DO FTA Screw Terminals—Conformally Coated	N/A	51309153-275
MU-PDOX01	Digital Output IOP	51303994-200	N/A
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Description	The 3-30 Vdc solid-state Digital Output (DO) FTA provides 16 direct current power outputs that are isolated from each other and the subsystem.
IOP compatibility	The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are compatible with all 3-30 Vdc solid-state DO FTA models.
Connection diagrams	<p>Figure 5-9 is a connection diagram for the compression terminal-type model MU-TDOD11 and MU-TDOD12 3-30 Vdc solid-state Digital Output FTAs. Figures 5-10 and 5-11 are connection diagrams for the compression terminal-type model MU-TDOD13 and MU-TDOD14 3-30 Vdc solid-state DO FTAs, respectively.</p> <p>Figures 5-12 through 5-14 are connection diagrams for the screw terminal-type model MU-TDOD52, MU-TDOD53, and MU-TDOD54 3-30 Vdc solid-state Digital Output FTAs, respectively.</p>
Assembly layout illustrations	Figures 5-15 through 5-20 illustrate the assembly layout for the model MU-TDOD12, MU-TDOD13, MU-TDOD14, MU-TDOD52, MU-TDOD53, and MU-TDOD54 3-30 Vdc solid-state Digital Output FTAs, respectively.
Observe polarity	The + and - output polarity must be strictly observed for each output. Signals from the FTA are normally considered as power circuits and, therefore, are subject to electrical codes. Check your site planning drawings and use only cable approved for the voltage and current limiting.
Vertical bus bars	The vertical bus bars shown in the connection diagrams are not a standard Honeywell assembly. Mount the outside-vendor-purchased bars on the side of the cabinet beside the FTA. Use a 2.5 mm ² (14 AWG) wire to connect the Safety Ground bus to local Safety Ground.
Cable shield connections	Any cable shield/ground connects to the local Safety Ground at the cabinet entry.

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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Connection schemes

In the connection diagrams, two different load connection schemes are shown. For loads 1 through 8, a 5 Vdc load power source is used and the FTA solid-state switches source current to the loads. For loads 9 through 16, a 24 Vdc load power source is used and the FTA solid-state switches sink current from the loads. Either type of connection is satisfactory as long as the + and – output polarity of each output is observed for both the FTA solid-state relay and the load. As examples, the proper direction of current flow is shown for loads 8 and 16.

ATTENTION

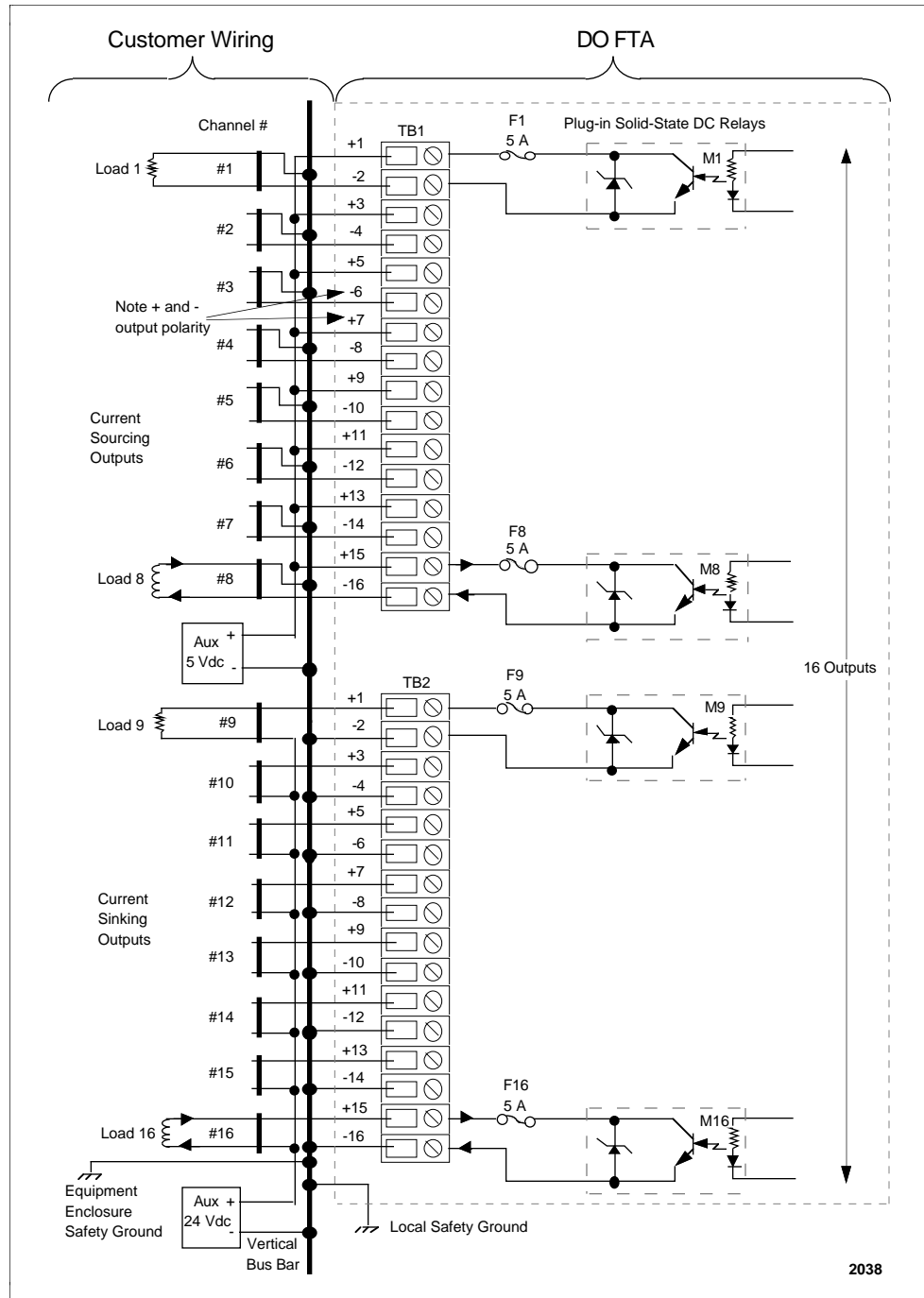
ATTENTION—Each solid-state relay is a normally open power transistor switch with load switching characteristics. Surge current ratings for inductive loads are normally nonrepetitive, meaning that sufficient recovery time must occur between successive surges to allow the power transistor junction temperature to return to normal. The recovery time is longer for larger surge currents and/or higher ambient temperatures. Typical recovery time is about 30 seconds for an 8 amp, 50 millisecond surge, and about five minutes for a 5 amp, 1 second surge.

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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD11
 MU-TDOD12 FTA
 connection diagram

Figure 5-9 Model MU-TDOD11/MU-TDOD12 3-30 Vdc Solid-State Digital Output FTA Connection Diagram



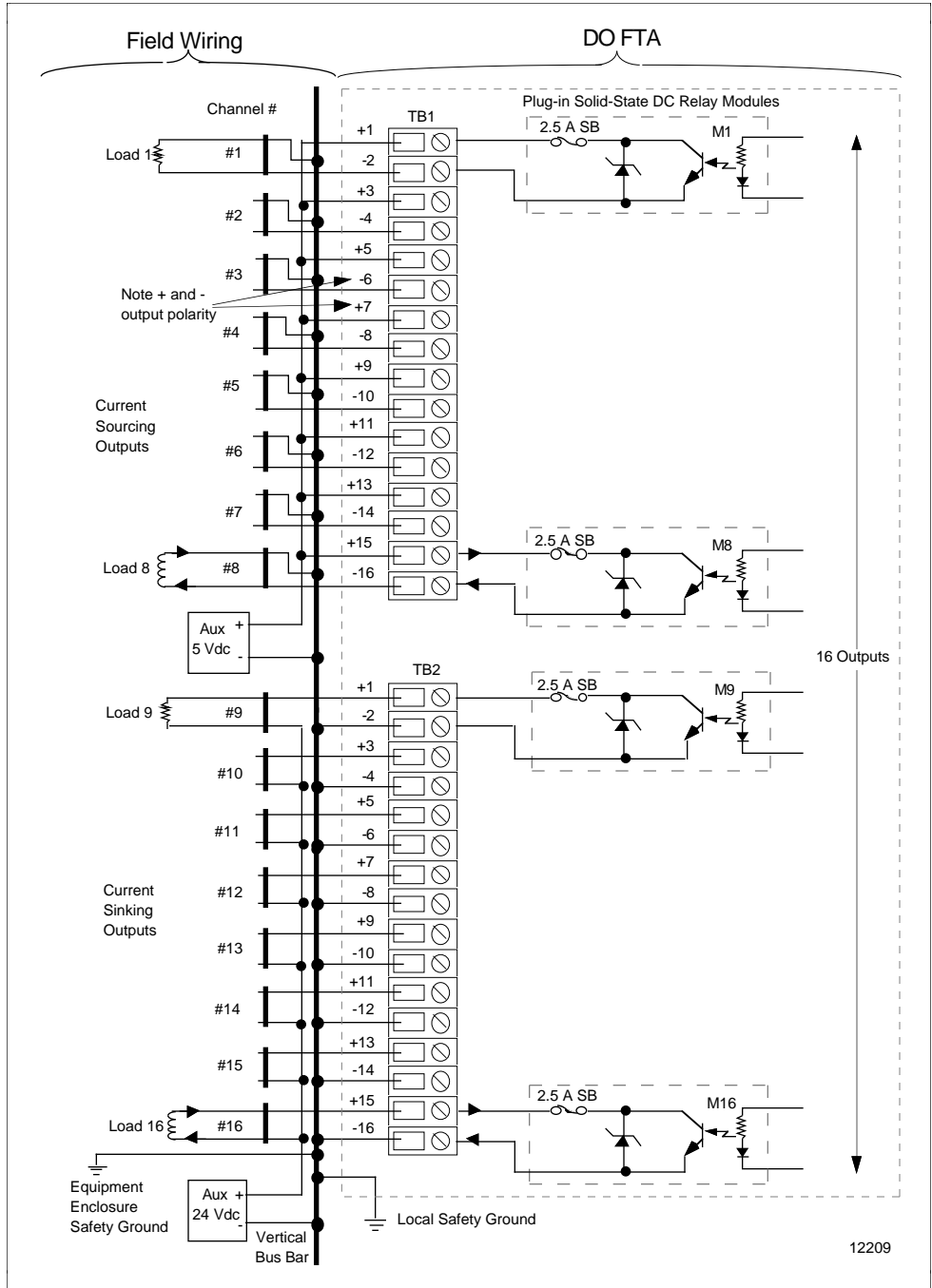
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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD13
FTA connection
diagram

Figure 5-10 Model MU-TDOD13 3-30 Vdc Solid-State Digital Output FTA Connection Diagram

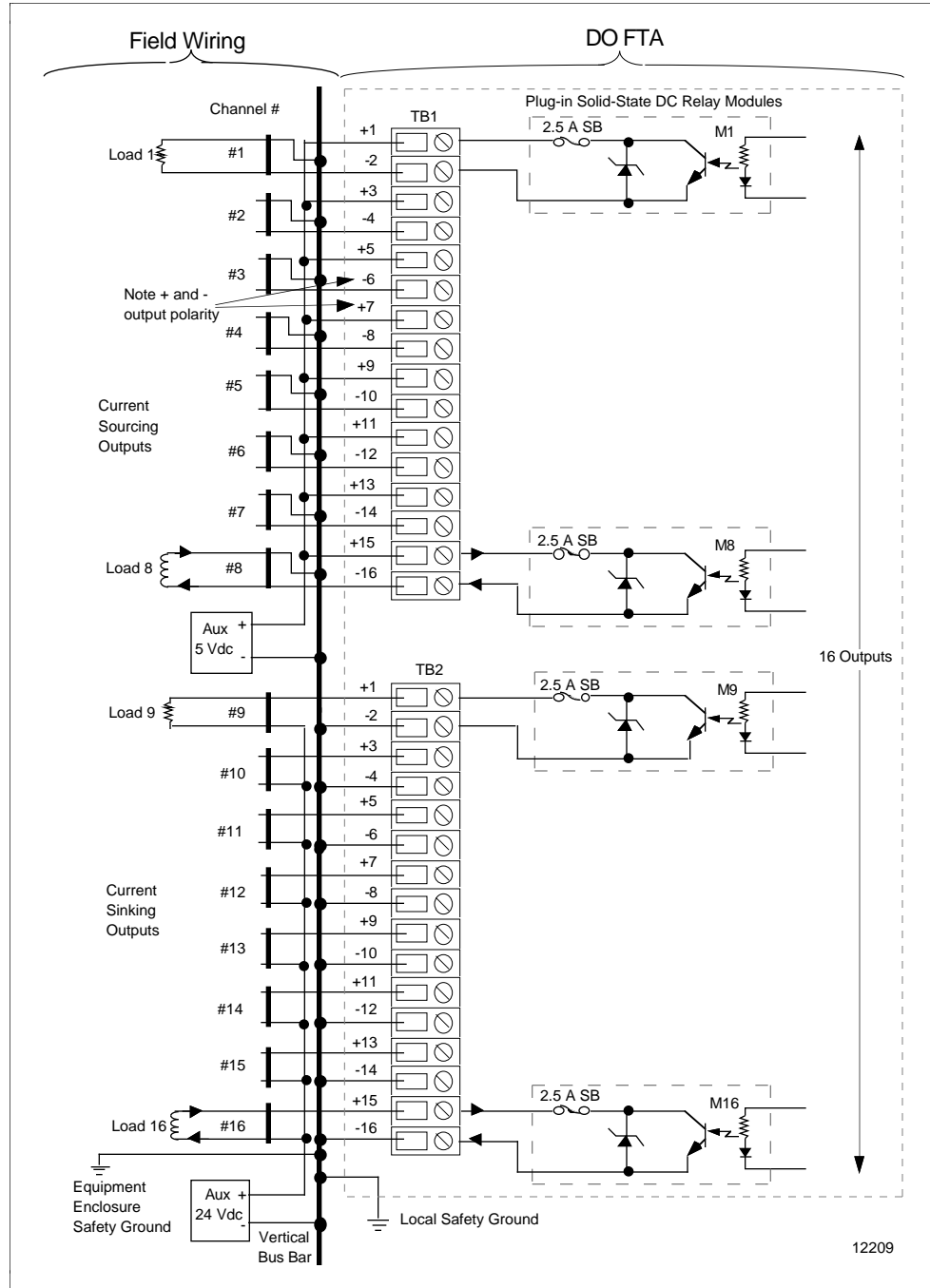


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD14
FTA connection
diagram

Figure 5-11 Model MU-TDOD14 3-30 Vdc Solid-State Digital Output FTA Connection Diagram

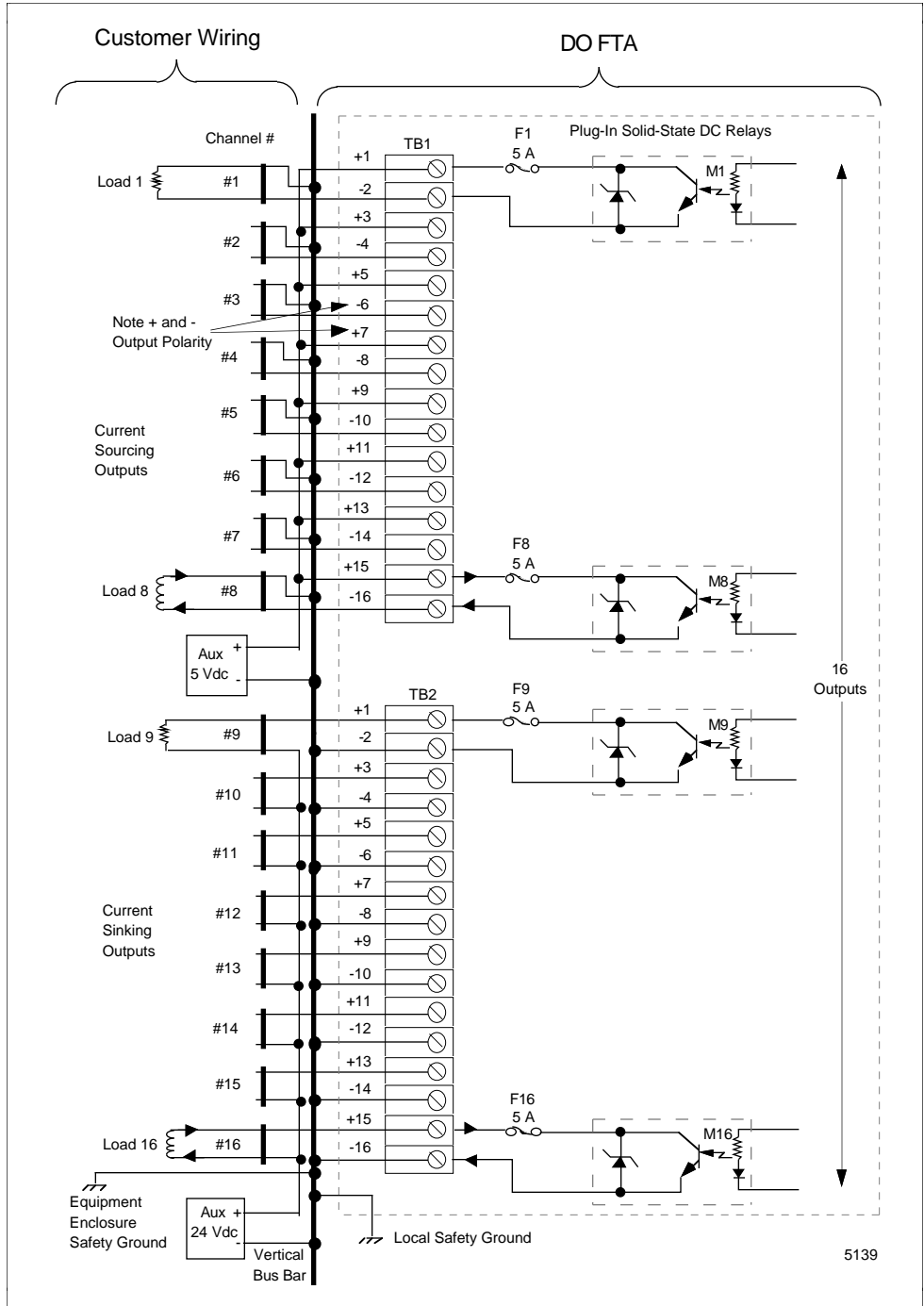


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD52
FTA connection
diagram

Figure 5-12 Model MU-TDOD52 3-30 Vdc Solid-State Digital Output FTA Connection Diagram

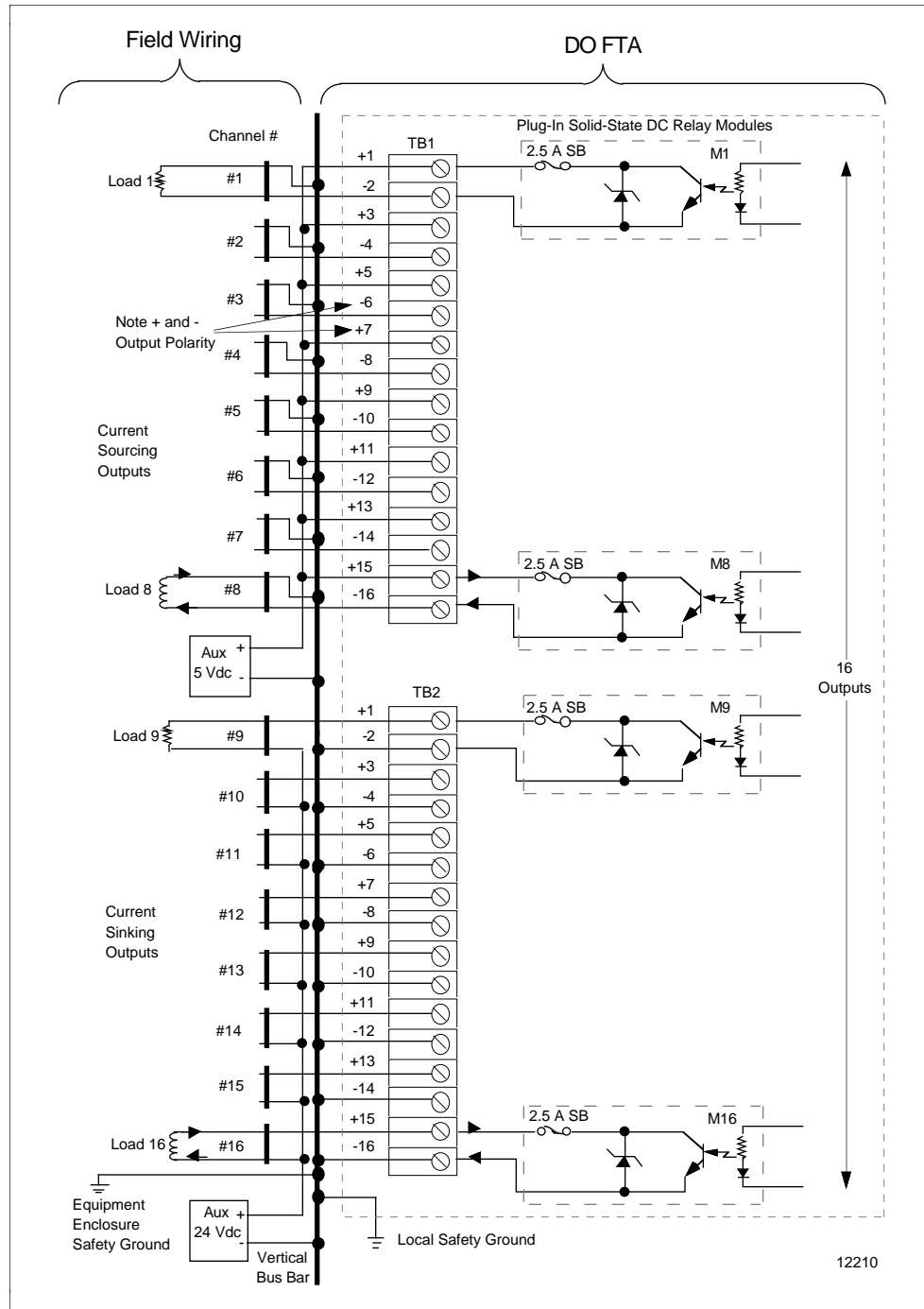


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD53
FTA connection
diagram

Figure 5-13 Model MU-TDOD53 3-30 Vdc Solid-State Digital Output FTA Connection Diagram

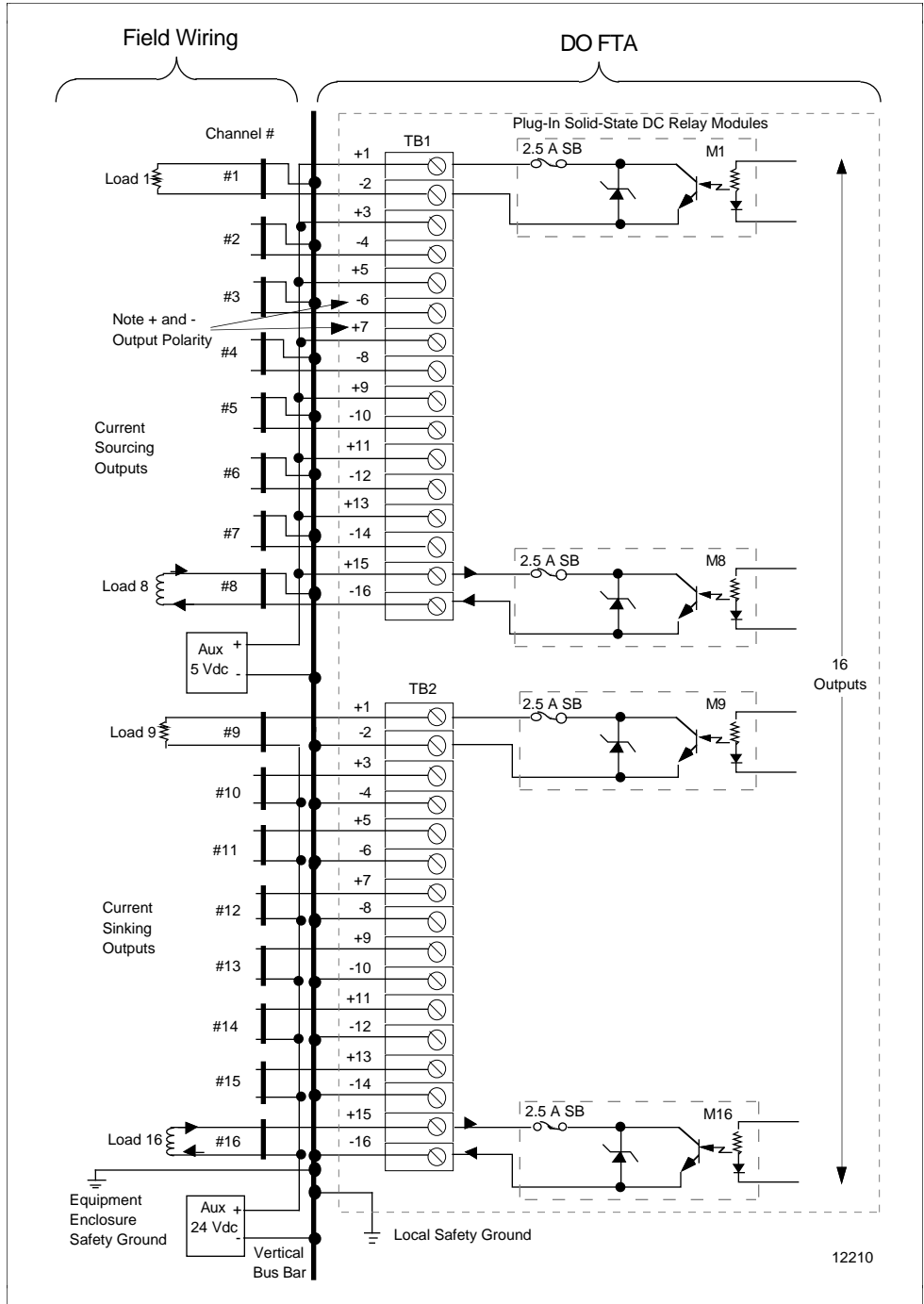


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD54
FTA connection
diagram

Figure 5-14 Model MU-TDOD54 3-30 Vdc Solid-State Digital Output FTA Connection Diagram

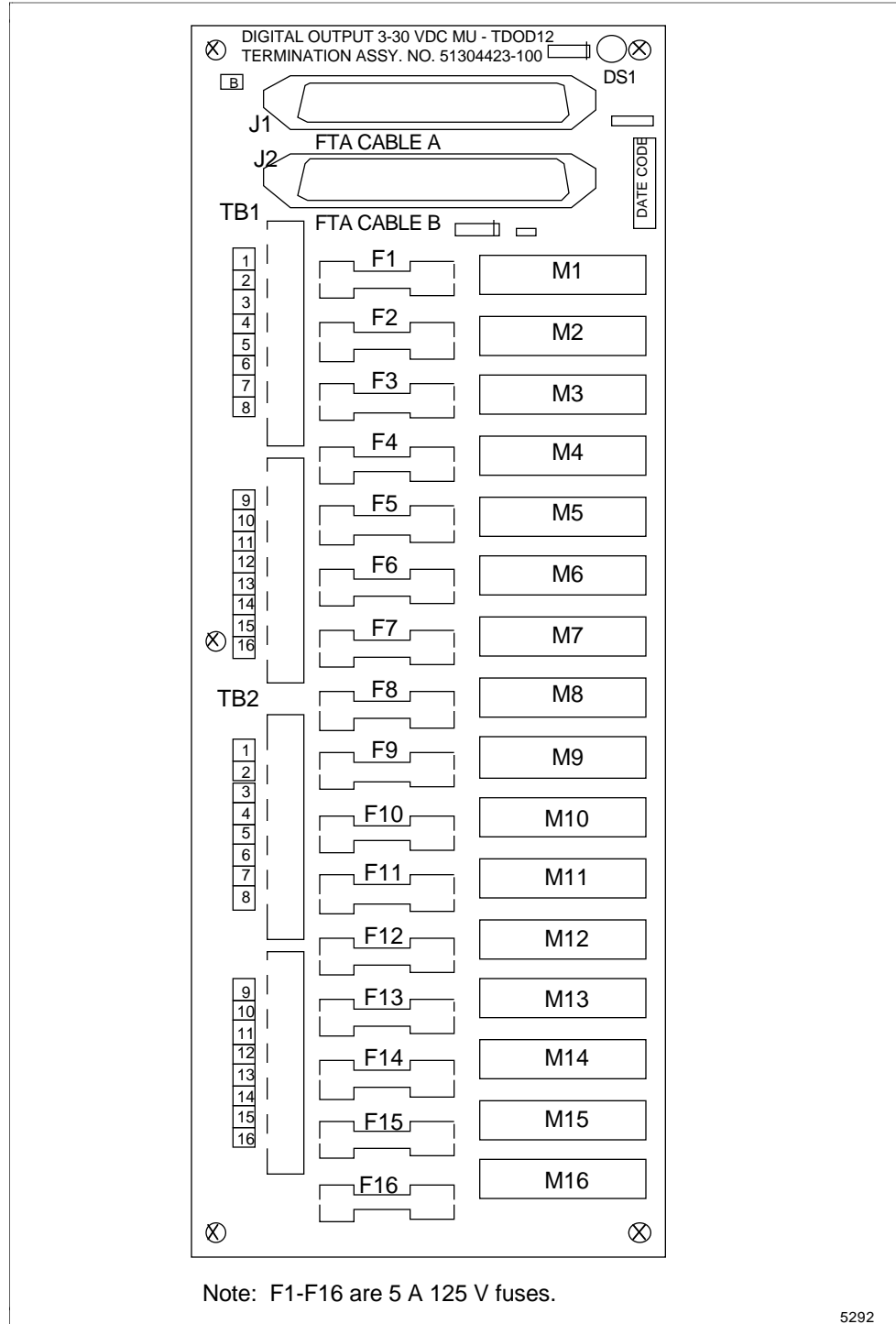


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD12 FTA assembly layout

Figure 5-15 Model MU-TDOD12 3-30 Vdc Solid-State Digital Output FTA Assembly Layout

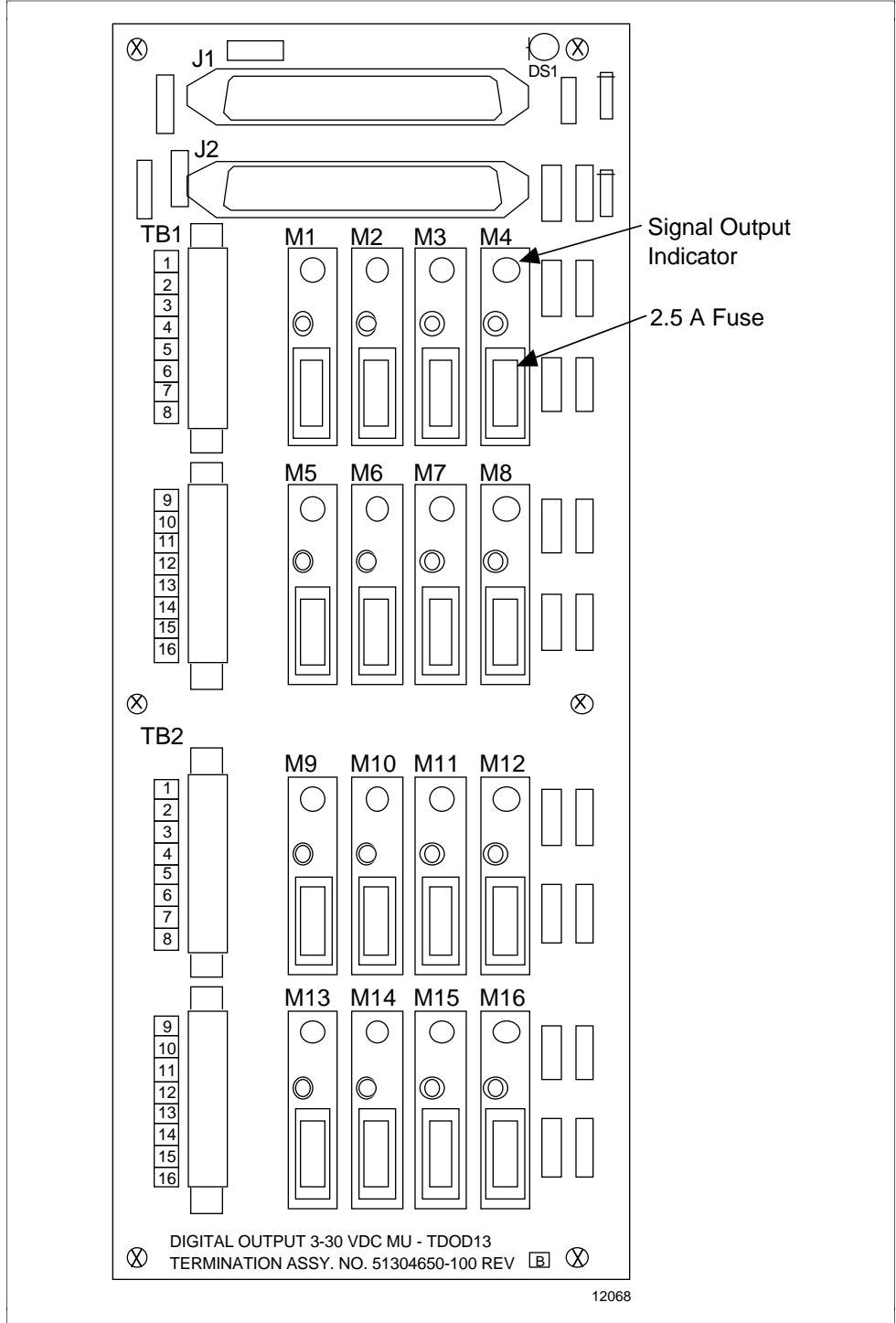


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD13 FTA assembly layout

Figure 5-16 Model MU-TDOD13 3-30 Vdc Solid-State Digital Output FTA Assembly Layout

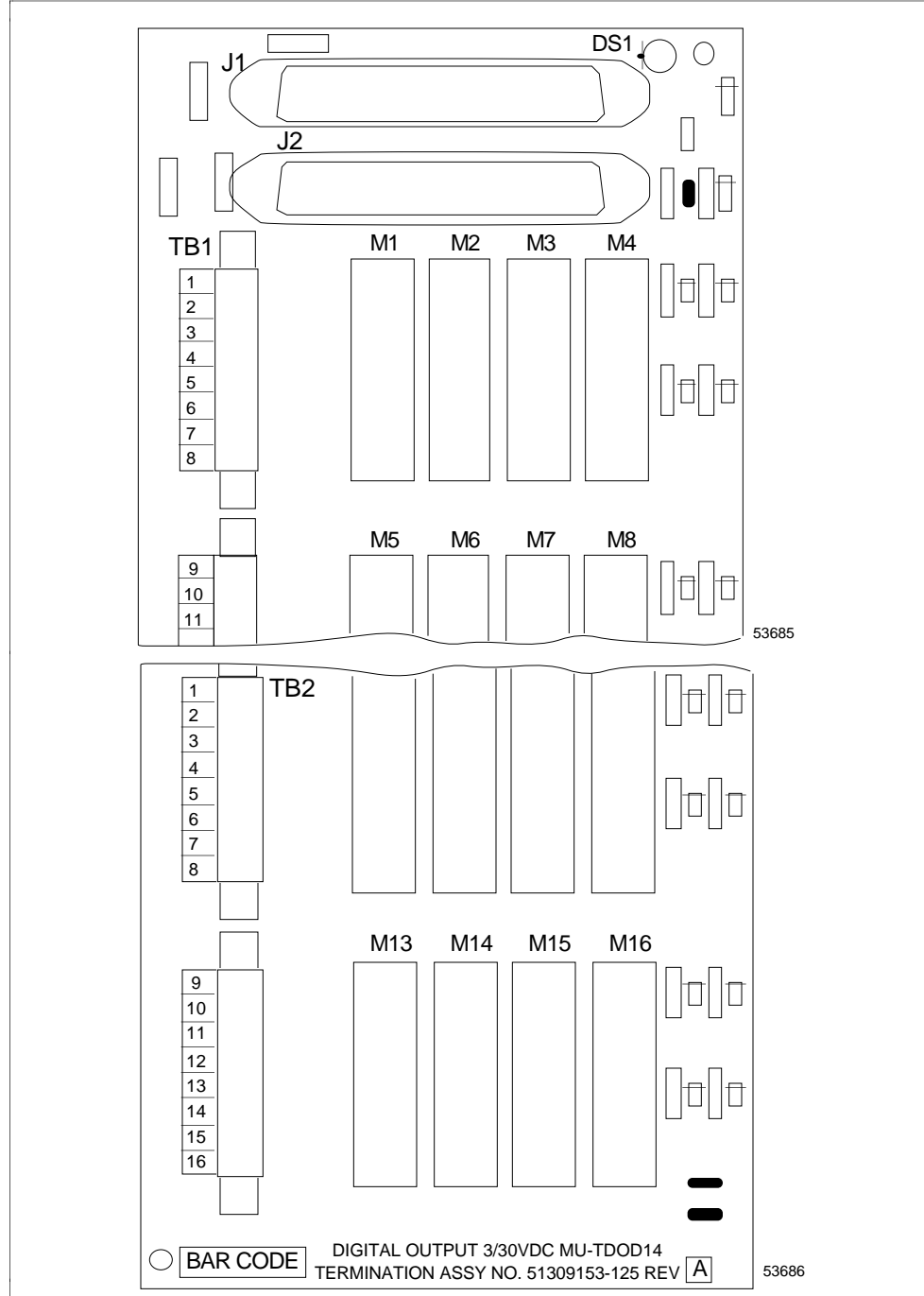


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD14 FTA assembly layout

Figure 5-17 Model MU-TDOD14 3-30 Vdc Solid-State Digital Output FTA Assembly Layout



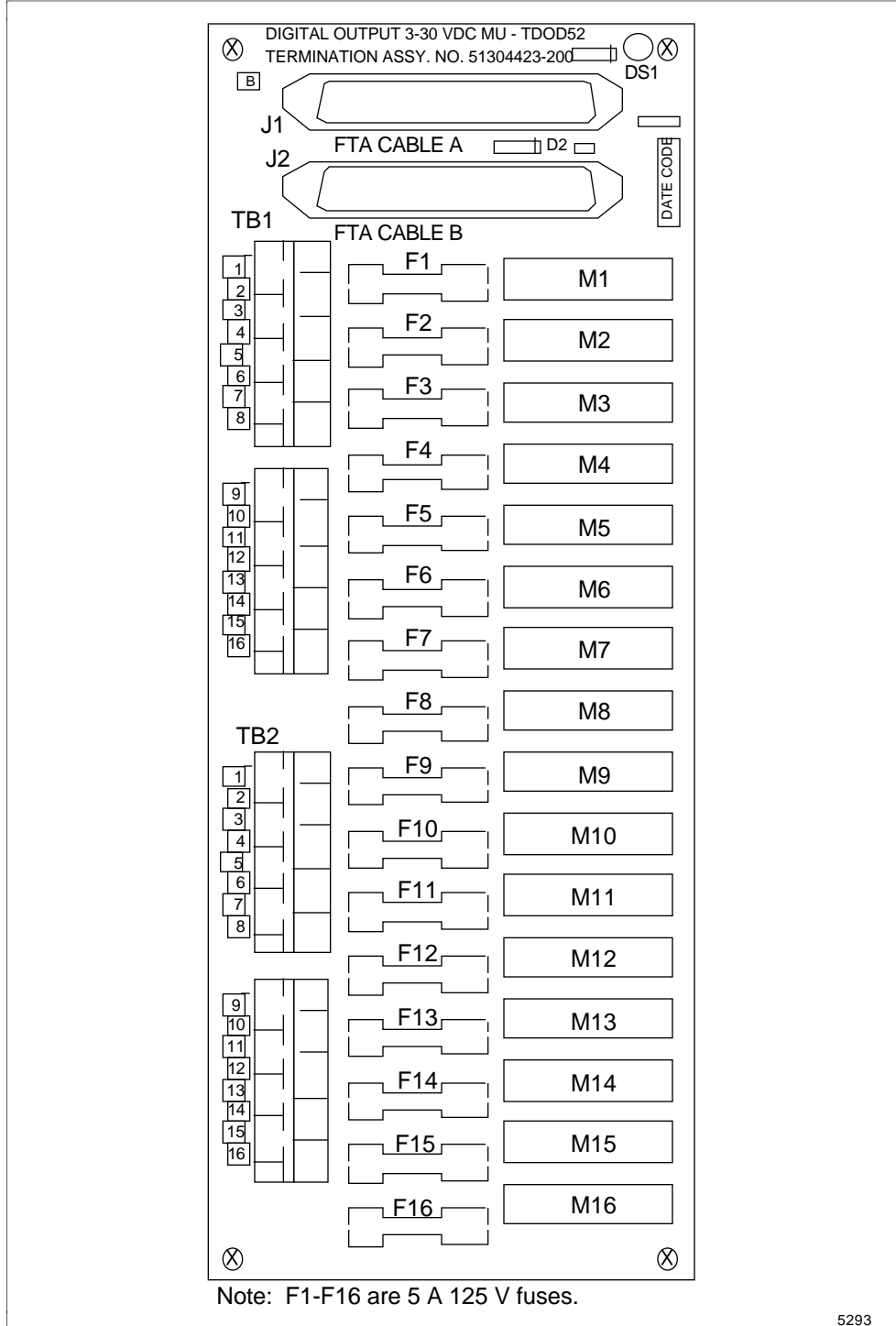
Modules M1 through M16 contain 2.5 A time-delay fuses.

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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD52
FTA assembly layout

Figure 5-18 Model MU-TDOD52 3-30 Vdc Solid-State Digital Output FTA Assembly Layout

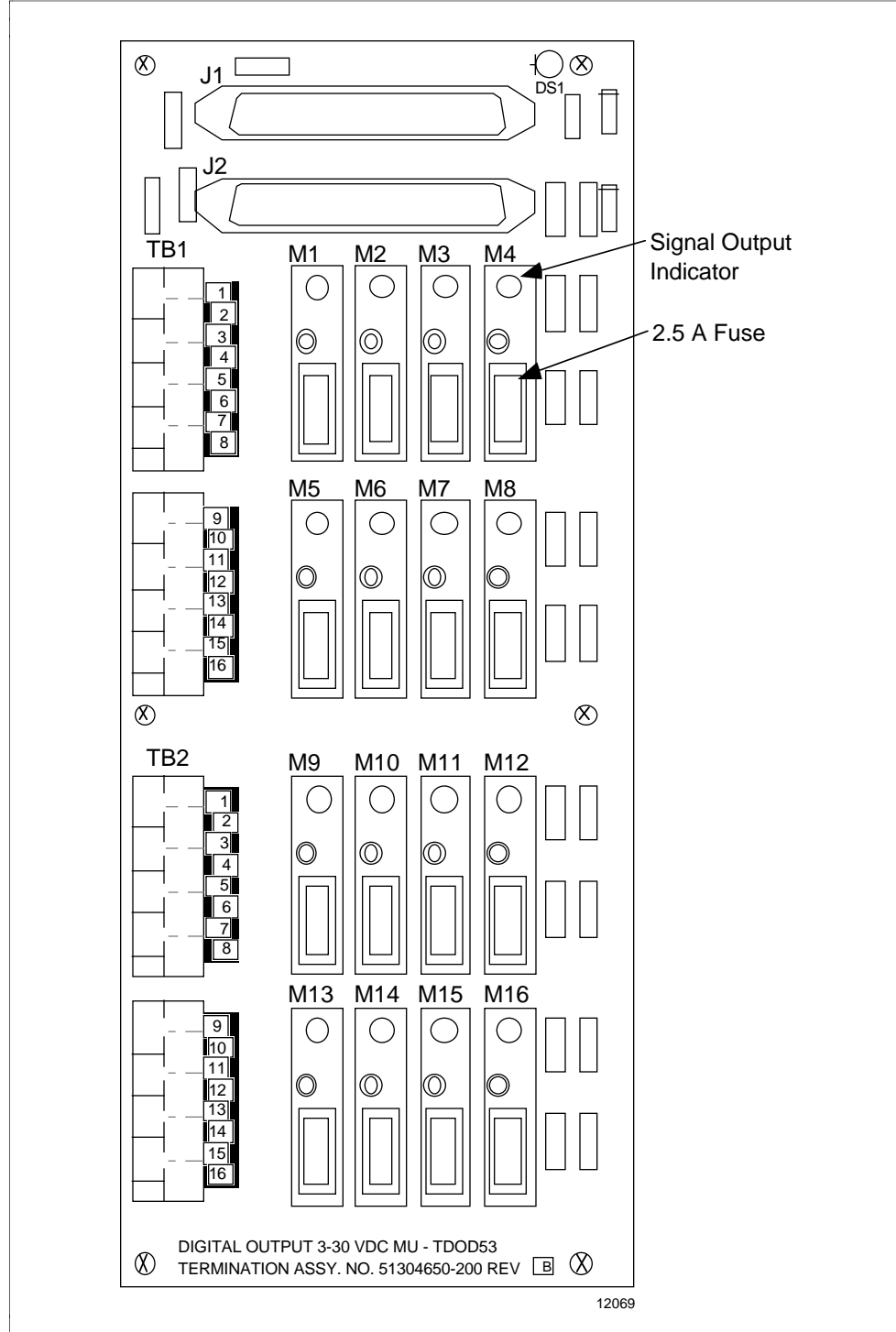


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD53
FTA assembly layout

Figure 5-19 Model MU-TDOD53 3-30 Vdc Solid-State Digital Output FTA Assembly Layout

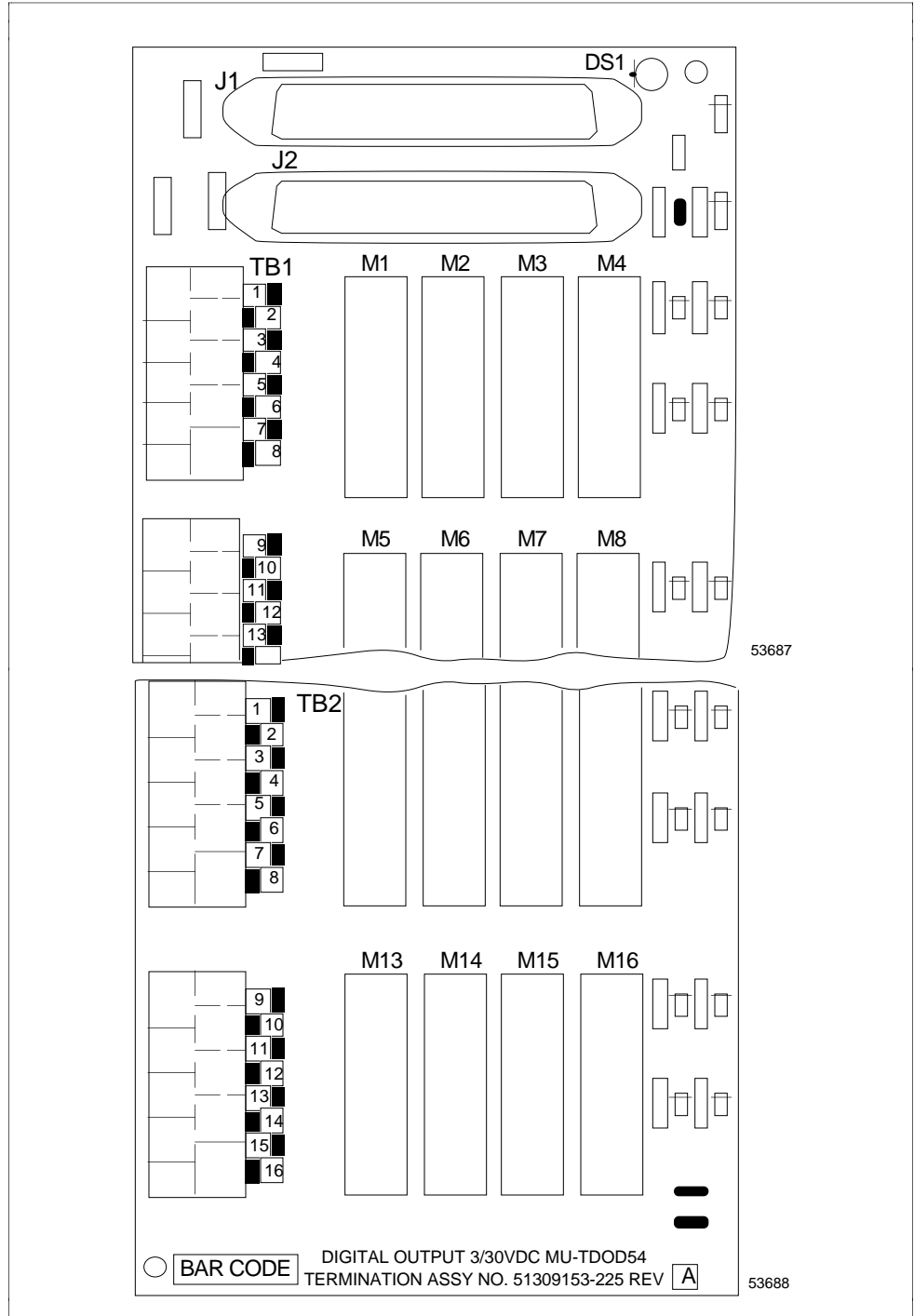


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5.4 3-30 Vdc Solid-State Digital Output (DO) FTAs, Continued

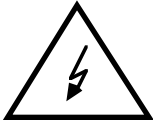
Model MU-TDOD54 FTA assembly layout

Figure 5-20 Model MU-TDOD54 3-30 Vdc Solid-State Digital Output FTA Assembly Layout



Modules M1 through M16 contain 2.5 A time-delay fuses.

5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

Some 31-200 Vdc solid-state Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. Generally, CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.”

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

31-200 Vdc SS DO FTAs and DO IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 5-4.

Table 5-4 31-200 Vdc Solid-State Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOD21	31-200 Vdc SS DO FTA Compression Terminals	51301223-100	N/A
MU-TDOD22	31-200 Vdc SS DO FTA Compression Terminals	51304428-100	N/A
MC-TDOD22	31-200 Vdc SS DO FTA Compression Terminals—Conformally Coated	51304428-150	N/A
MU-TDOD23	31-200 Vdc SS DO FTA Compression Terminals	N/A	51309154-125
MC-TDOD23	31-200 Vdc SS DO FTA Compression Terminals—Conformally Coated	N/A	51309154-175
MU-TDOD62	31-200 Vdc SS DO FTA—Screw Terminals	51304428-200	N/A
MC-TDOD62	31-200 Vdc SS DO FTA Screw Terminals—Conformally Coated	51304428-250	N/A
MU-TDOD63	31-200 Vdc SS DO FTA—Screw Terminals	N/A	51309154-225
MC-TDOD63	31-200 Vdc SS DO FTA Screw Terminals—Conformally Coated	N/A	51309154-275
MU-PDOX01	Digital Output IOP	51303994-200	N/A
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Description	The 31-200 Vdc solid-state Digital Output (DO) FTA provides 16 isolated dc power outputs.
IOP compatibility	The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are compatible with all 31-200 Vdc solid-state DO FTA models.
Connection diagrams	<p>Figure 5-21 is a connection diagram for the compression terminal-type model MU-TDOD21 and MU-TDOD22 31-200 Vdc solid-state Digital Output FTAs. Figure 5-22 is a connection diagram for the compression terminal-type model MU-TDOD23 31-200 Vdc solid-state DO FTA.</p> <p>Figures 5-23 and 5-24 are connection diagrams for the screw terminal-type model MU-TDOD62 and MU-TDOD63 31-200 Vdc solid-state Digital Output FTAs, respectively.</p>
Assembly layout illustrations	Figures 5-25 through 5-28 illustrate the assembly layout for the model MU-TDOD22, MU-TDOD23, MU-TDOD62, and MU-TDOD63 31-200 Vdc solid-state Digital Output FTAs, respectively.
Wiring considerations	Wiring considerations are similar to the 3-30 Vdc solid-state Digital Output FTA that are described in the previous subsection.
Signals subject to electrical codes	Signals from the FTA are normally considered as power circuits and therefore are subject to electrical codes. Check your site planning drawings and use only cable approved for the voltage and current limiting.
Vertical bus bars	The vertical bus bar shown in the connection diagrams, Figures 5-21 through 5-24, is a Honeywell part. The bar is mounted on an FTA Mounting Channel. Use a 2.5 mm ² (14 AWG) wire to connect the Safety Ground bus to local Safety Ground.
Cable shield connections	Any cable shield/ground connects to the local Safety Ground at the cabinet entry.

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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Connection schemes

In Figures 5-21 and 5-22, two different load-connection schemes are shown. For loads 1 through 8, the FTA solid-state switches source current to the loads. For loads 9 through 16, the FTA solid-state switches sink current from the loads. Either type of connection is satisfactory as long as the + and – output polarity of each output is observed for both the FTA solid-state relay and the load. As examples, the proper direction of current flow is shown for loads 9 and 16.

ATTENTION

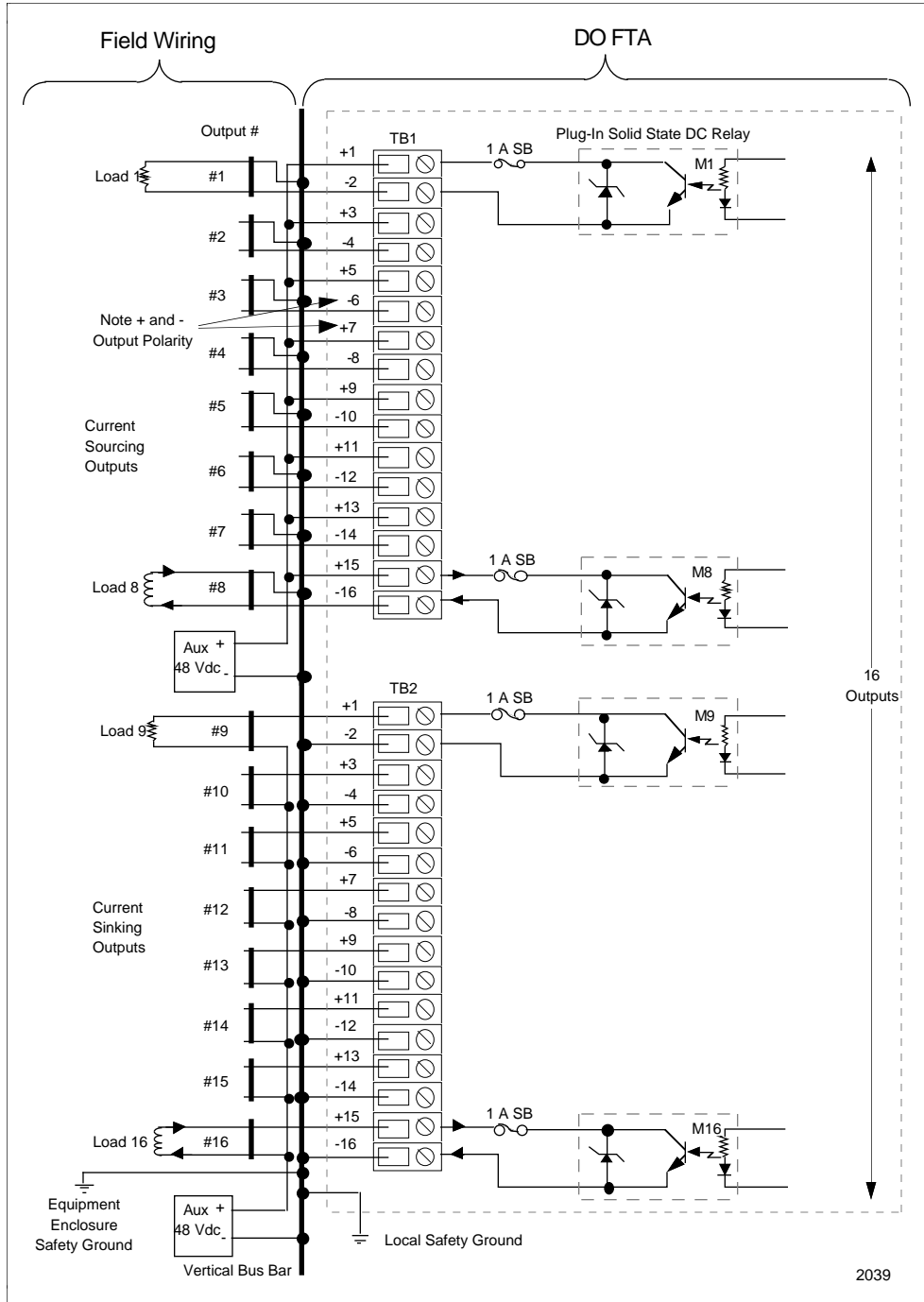
ATTENTION—Each solid-state relay is a normally open power transistor switch with load switching characteristics. Surge current ratings for inductive loads are normally nonrepetitive, meaning that sufficient recovery time must occur between successive surges to allow the power transistor junction temperature to return to normal. The recovery time is longer for larger surge currents and/or higher ambient temperatures. Typical recovery time is about 30 seconds for an 8 amp, 50 millisecond surge and about five minutes for a 5 amp, 1 second surge.

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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD21
 MU-TDOD22
 connection diagram

Figure 5-21 Model MU-TDOD21/MU-TDOD22 31-200 Vdc Solid-State Digital Output FTA Connection Diagram

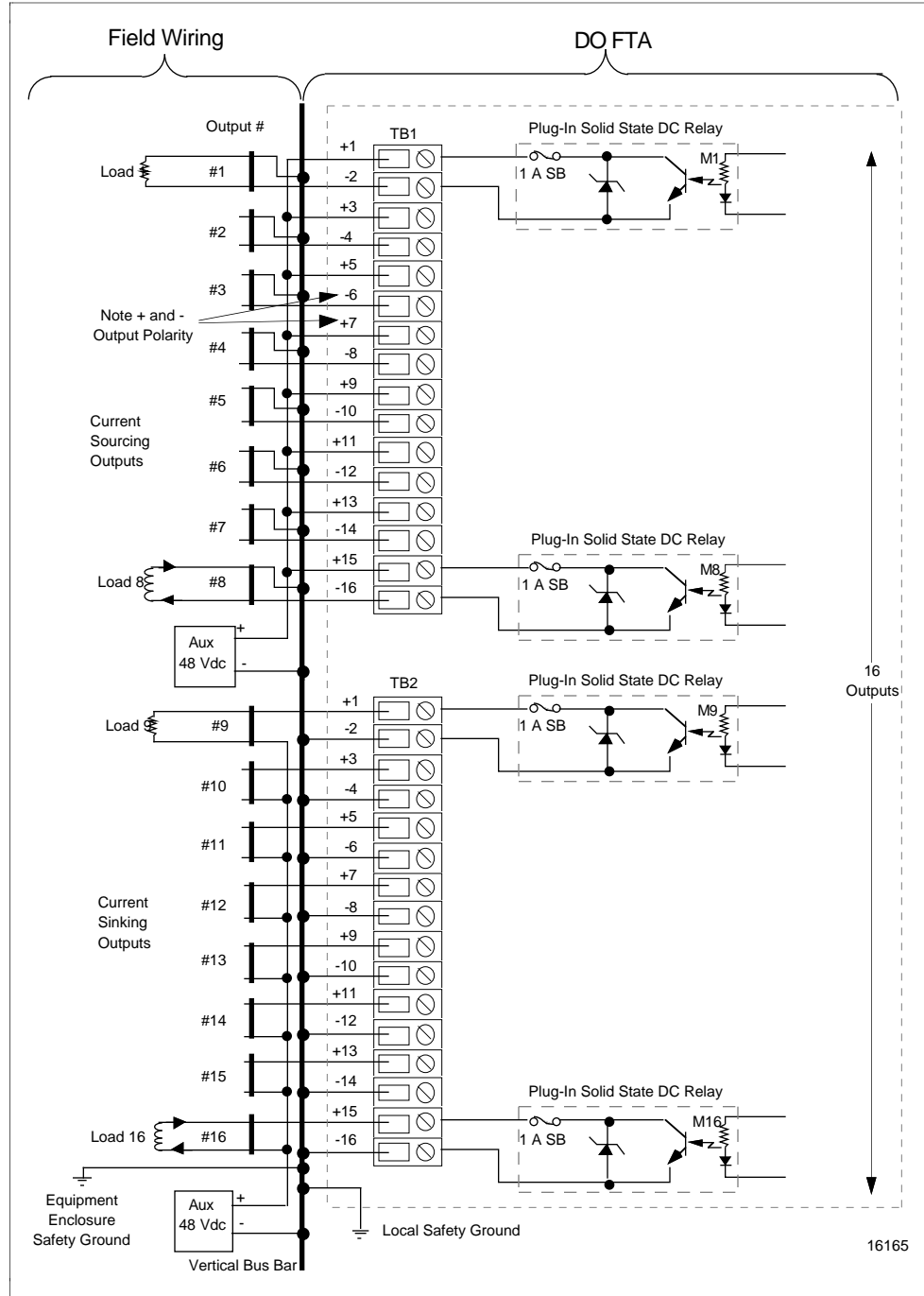


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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD23 connection diagram

Figure 5-22 Model MU-TDOD23 31-200 Vdc Solid-State Digital Output FTA Connection Diagram

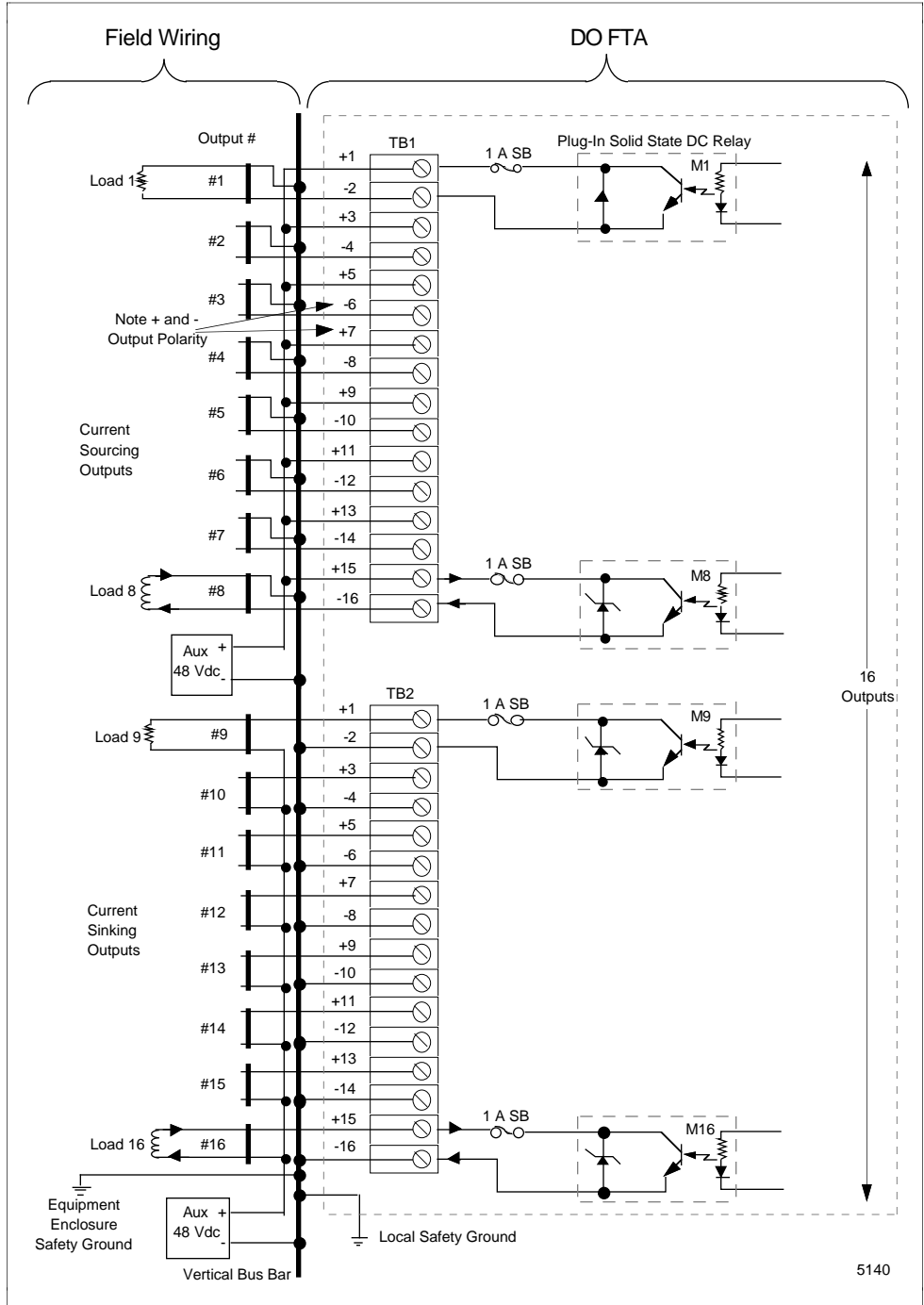


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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD62 connection diagram

Figure 5-23 Model MU-TDOD62 31-200 Vdc Solid-State Digital Output FTA Connection Diagram

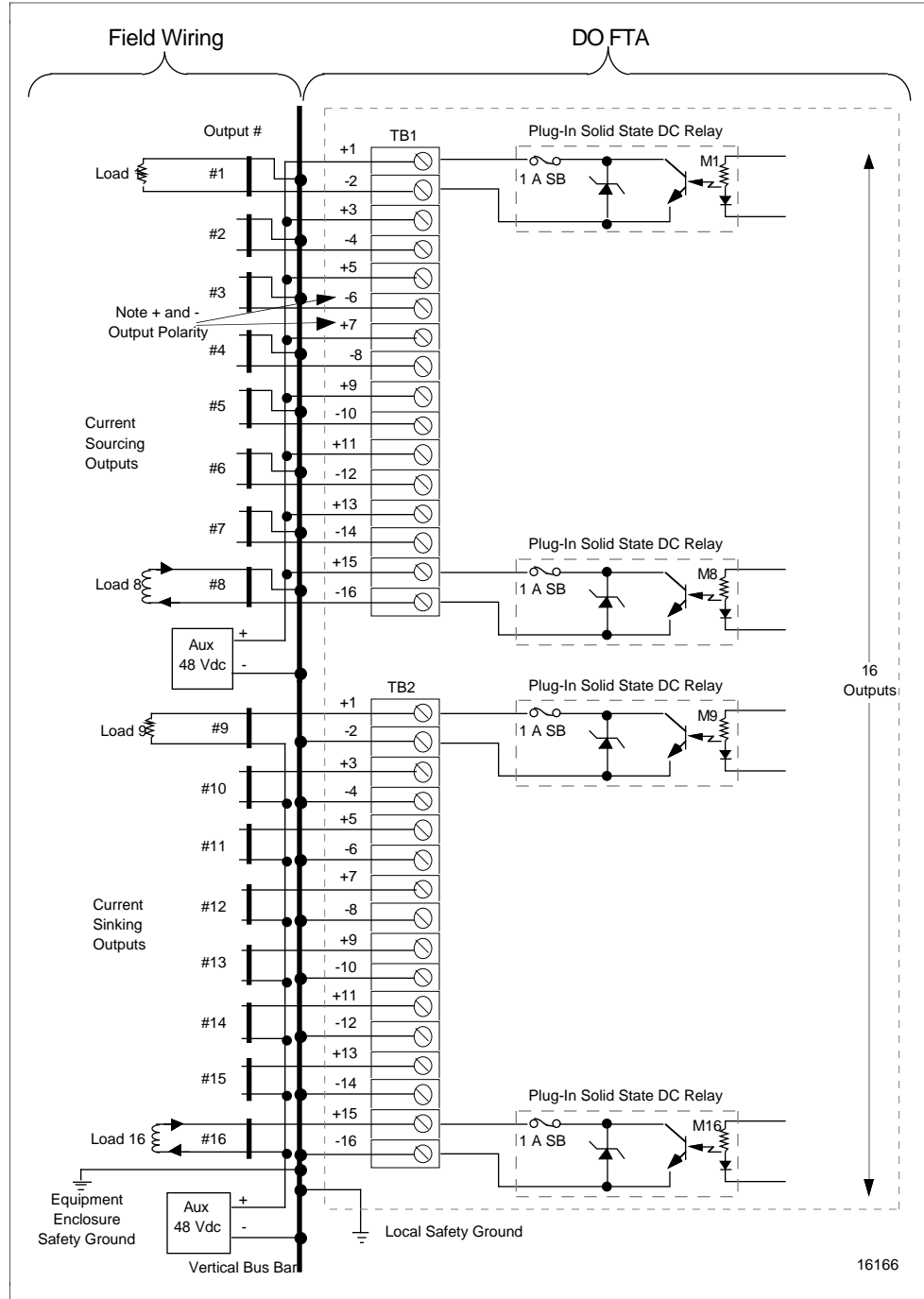


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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD63 connection diagram

Figure 5-24 Model MU-TDOD63 31-200 Vdc Solid-State Digital Output FTA Connection Diagram

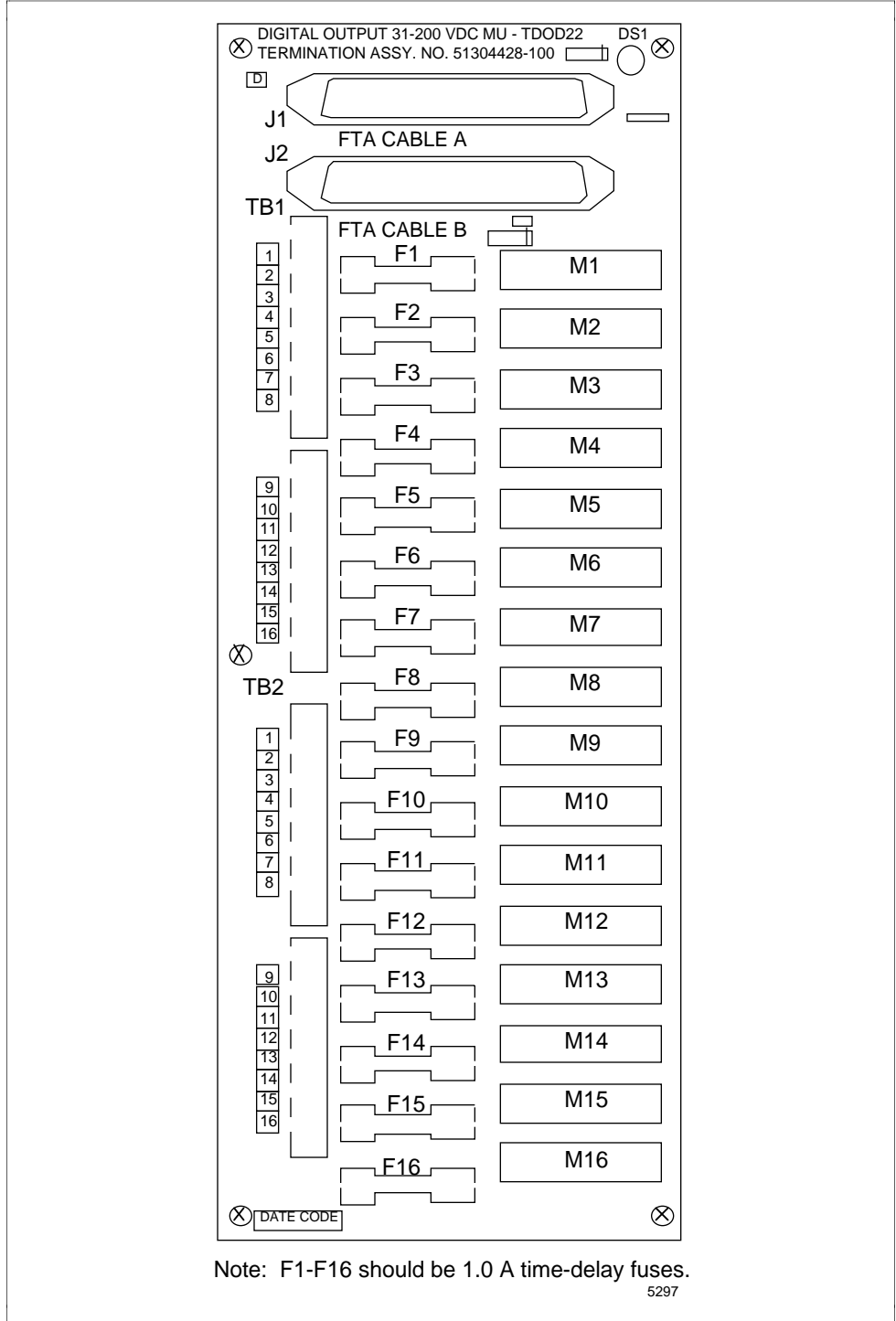


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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD22
assembly layout

Figure 5-25 Model MU-TDOD22 31-200 Vdc Solid-State Digital Output FTA Assembly Layout

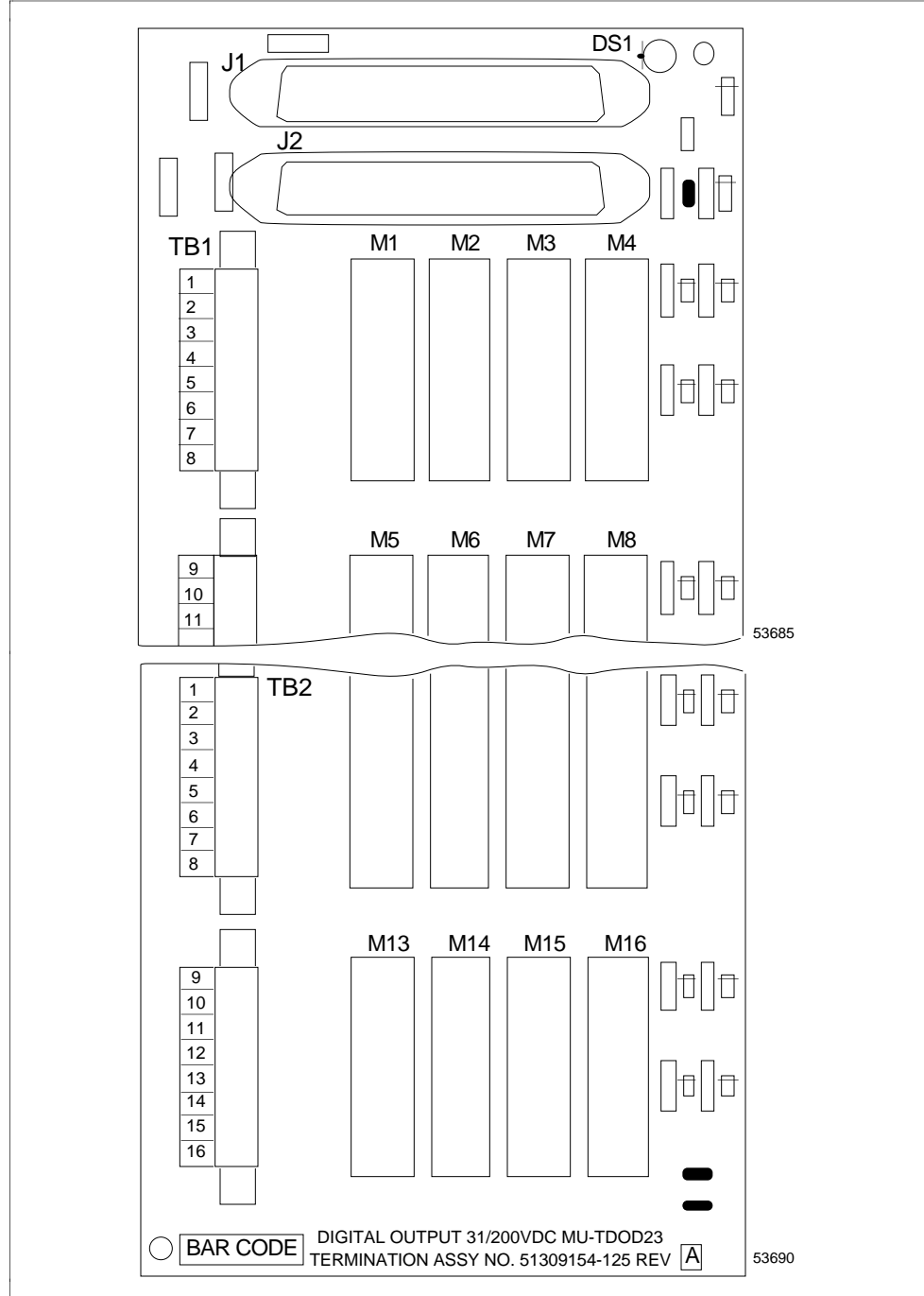


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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

**Model MU-TDOD23
assembly layout**

Figure 5-26 Model MU-TDOD23 31-200 Vdc Solid-State Digital Output FTA Assembly Layout



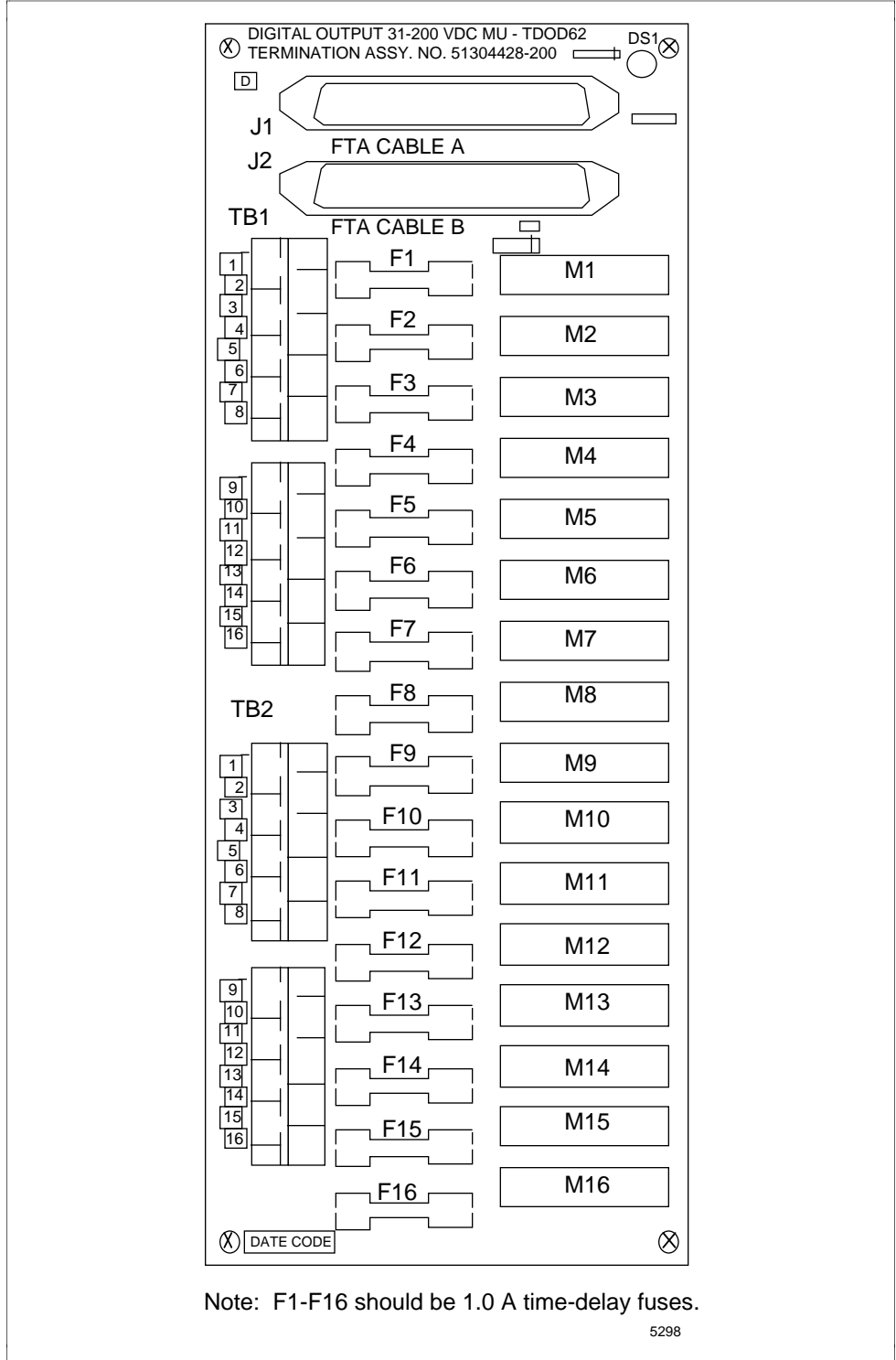
Modules M1 through M16 contain 1.0 A time-delay fuses.

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5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOD62
assembly layout

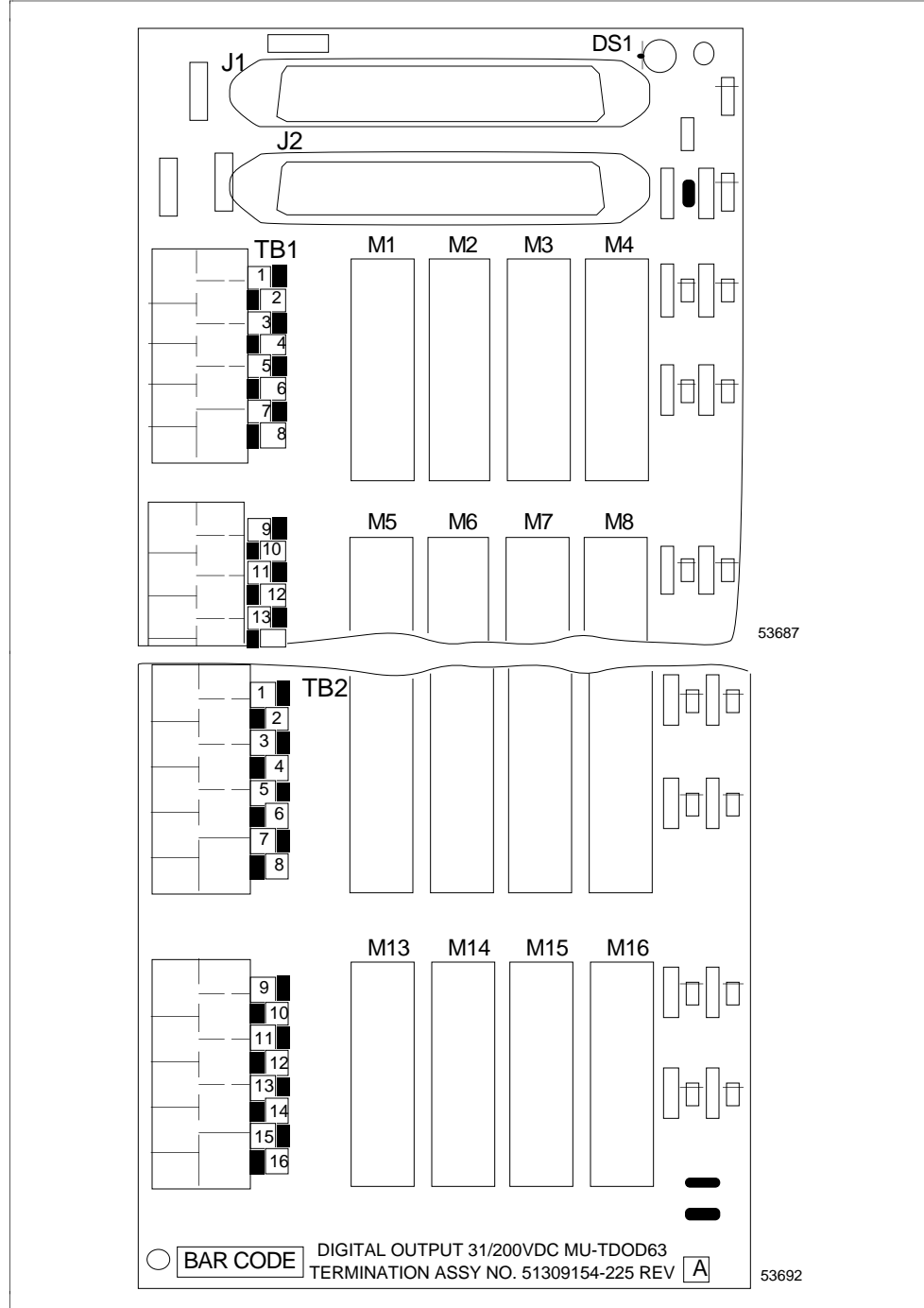
Figure 5-27 Model MU-TDOD62 31-200 Vdc Solid-State Digital Output FTA Assembly Layout



5.5 31-200 Vdc Solid-State Digital Output (DO) FTAs, Continued

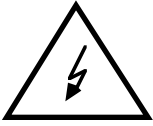
**Model MU-TDOD63
assembly layout**

Figure 5-28 Model MU-TDOD63 31-200 Vdc Solid-State Digital Output FTA Assembly Layout



Modules M1 through M16 contain 1.0 A time-delay fuses.

5.6 120/240 Vac Solid-State Digital Output (DO) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

Some 120/240 Vac solid-state Digital Output (DO) Field Termination Assemblies are CE Compliant, and others are not. CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

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

120/240 Vac SS DO FTAs and DO IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 5-5.

Table 5-5 120/240 Vac Solid-State Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOA11	120/240 Vac SS DO FTA Compression Terminals	51301157-100	N/A
MU-TDOA12	120/240 Vac SS DO FTA Compression Terminals	51304408-100	N/A
MC-TDOA12	120/240 Vac SS DO FTA Compression Terminals—Conformally Coated	51304408-150	N/A
MU-TDOA13	120/240 Vac SS DO FTA Compression Terminals	51304648-100	51304648-125
MC-TDOA13	120/240 Vac SS DO FTA Compression Terminals—Conformally Coated	51304648-150	51304648-175
MU-TDOA52	120/240 Vac SS DO FTA—Screw Terminals	51304408-200	N/A
MC-TDOA52	120/240 Vac SS DO FTA Screw Terminals—Conformally Coated	51304408-250	N/A
MU-TDOA53	120/240 Vac SS DO FTA—Screw Terminals	51304648-200	51304648-225
MC-TDOA53	120/240 Vac SS DO FTA Screw Terminals—Conformally Coated	51304648-250	51304648-275
MU-PDOX01	Digital Output IOP	51303994-200	N/A
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Description	The 120/240 Vac solid-state Digital Output (DO) FTA provides 16 independent solid-state ac power outputs. The compatible IOP and FTA support 16 control points (channels).
IOP compatibility	The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are compatible with all 120/240 Vac solid-state DO FTA models.
Connection diagrams	<p>Figure 5-29 is a connection diagram for the compression terminal-type model MU-TDOA11 and MU-TDOA12 120/240 Vac solid-state Digital Output FTAs. Figure 5-30 is a connection diagram for the compression terminal-type model MU-TDOA13 120/240 Vac solid-state DO FTA.</p> <p>Figures 5-31 and 5-32 are connection diagrams for the screw terminal-type model MU-TDOA52 and MU-TDOA53 120/240 Vac solid-state DO FTAs, respectively.</p>
Assembly layout illustrations	Figures 5-33 through 5-36 illustrate the assembly layout for the model MU-TDOA12, MU-TDOA13, MU-TDOA52, and MU-TDOA53 120/240 Vac solid-state Digital Output FTAs, respectively.
Surge current and recovery time	Each solid-state relay is a normally open triac switch with 0 voltage turn-on and 0 current turn-off load switching characteristics. Surge current ratings for inductive loads are normally nonrepetitive, meaning that sufficient recovery time must occur between successive surges to allow the triac junction temperature to return to normal. The recovery time is longer for larger surge currents and/or higher ambient temperatures. Typical recovery times vary between 30 seconds for 10 amp surges to 5 minutes for 50 amp surges.
Power phase	Out-of-phase 120 Vac load power can be used for adjacent outputs because inter-output circuitry is rated for 240 Vac rms. When using 240 Vac load power, adjacent channels must use the same load power phase to avoid exceeding the 240 Vac inter-channel limit.

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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Solid-state relay ratings Below 50°C ambient (outside the cabinet), each solid-state relay is rated for 2 amps for 120 Vac or 240 Vac rms loads. Above 50°C ambient, the total rating for a pair of adjacent outputs, such as outputs 1 and 2 and outputs 2 and 3, etc., must be limited to no more than 2.5 amperes, although the individual limit of 2 amperes remains.

ATTENTION

ATTENTION—Loads with a power factor less than 0.5 can damage the solid-state relays used on the FTA and cause improper operation of the loads. For such loads, additional snubbing must be provided across the FTA (solid-state relay) terminals to protect the solid-state switch (a snubber placed across the load terminals may not protect as well). A recommended snubber is a 100-ohm resistor in series with a 0.1-microfarad capacitor (400 Vdc rating for 120 Vac loads, or 600 Vdc rating for 240 Vac loads).

Power Factor calculation

EXAMPLE

A 120 Vac motor starter load has a measured dc resistance of 55 ohms and a specified steady-state running current equal to 230 milliamps; therefore, the total impedance is 120 Vac divided by 230 milliamps or 522 ohms. The reactive component of impedance (X) can be found from the equation:

$$X = \sqrt{Z^2 - R^2}$$

where: R = DC resistance

Z = Total impedance

In this example, X is calculated to be 519 ohms.

The Power Factor (PF) is then calculated as

$$PF = \cosine(\arctan X/R) = \cosine(\arctan 519/55) = \cosine 83.9^\circ = 0.105.$$

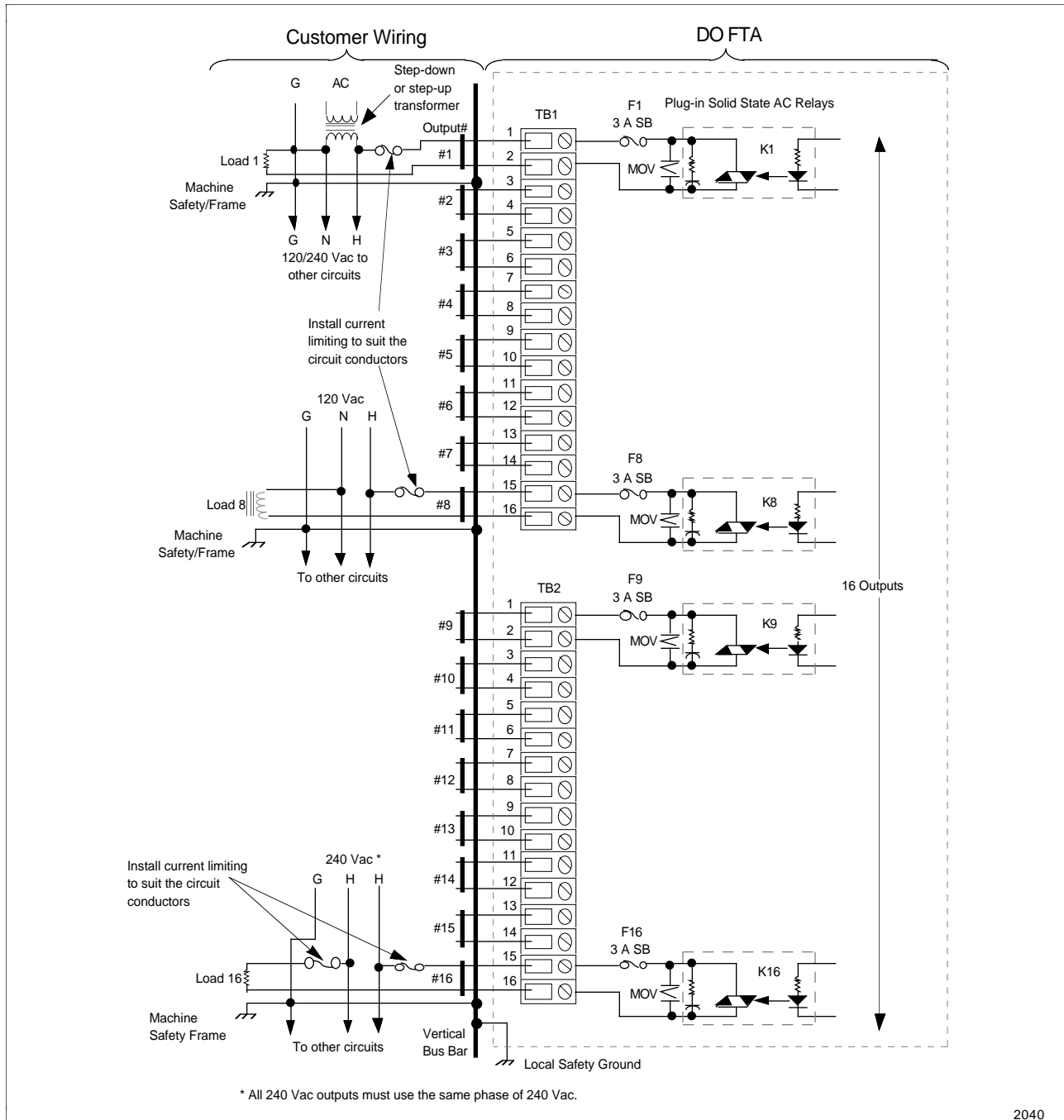
Therefore, the calculated power factor is below the minimum recommended 0.5 and additional snubbing must be added as described above.

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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

**Model MU-TDOA11
MU-TDOA12
connection diagram**

Figure 5-29 Model MU-TDOA11/MU-TDOA12 120/240 Vac Solid-State Digital Output FTA Connection Diagram

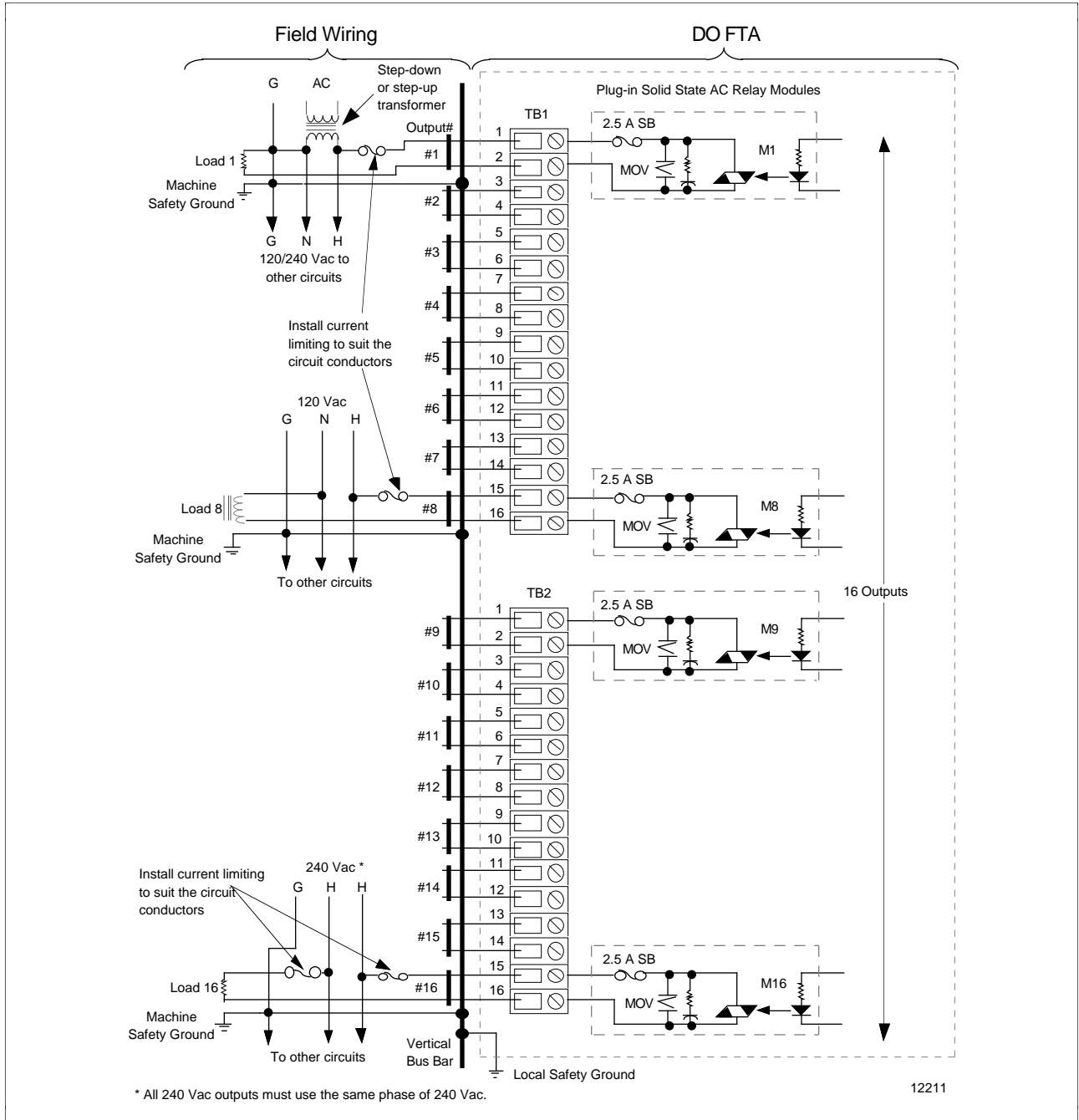


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA13 connection diagram

Figure 5-30 Model MU-TDOA13 120/240 Vac Solid-State Digital Output FTA Connection Diagram

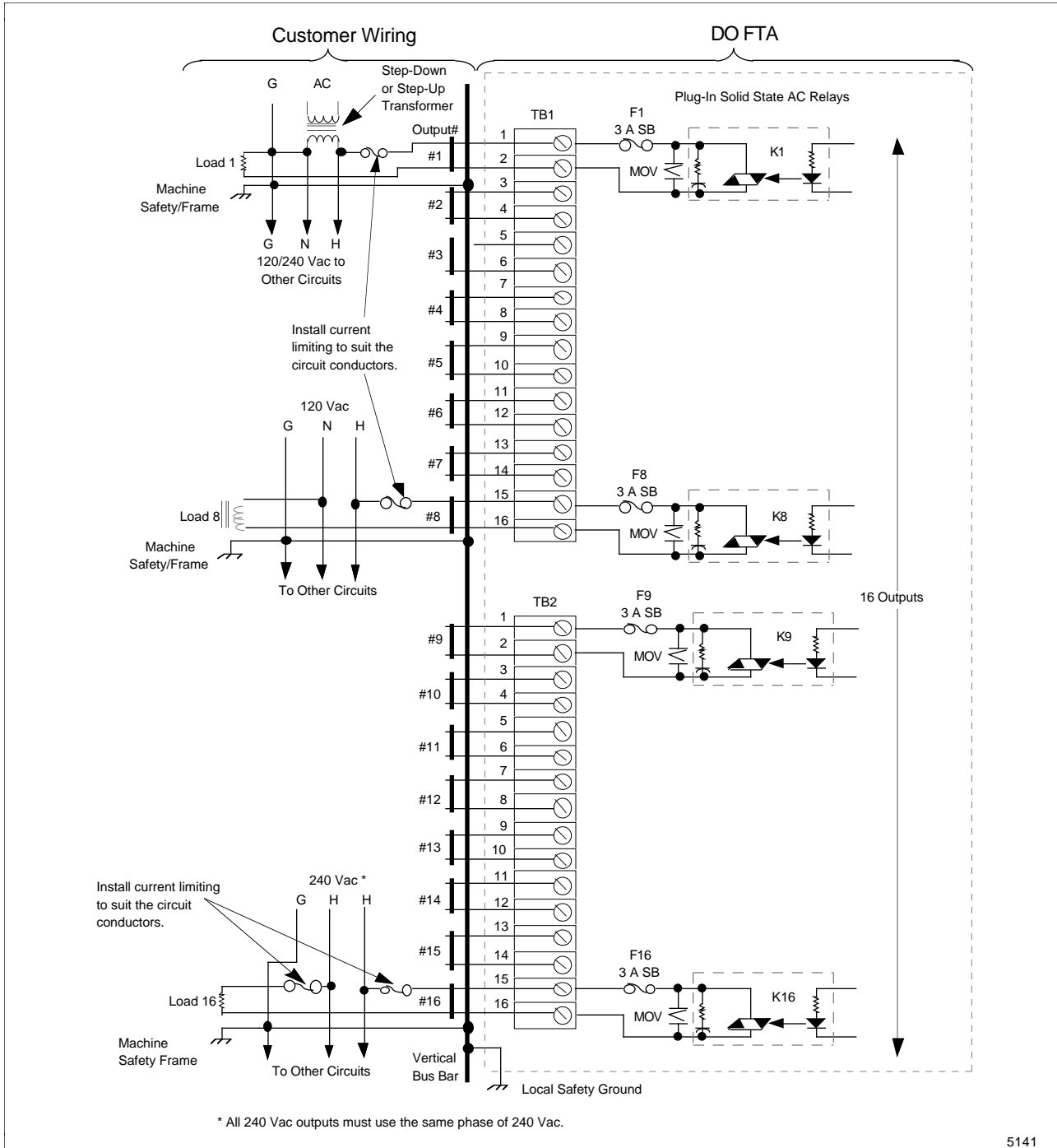


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA52 connection diagram

Figure 5-31 Model MU-TDOA52 120/240 Vac Solid-State Digital Output FTA Connection Diagram

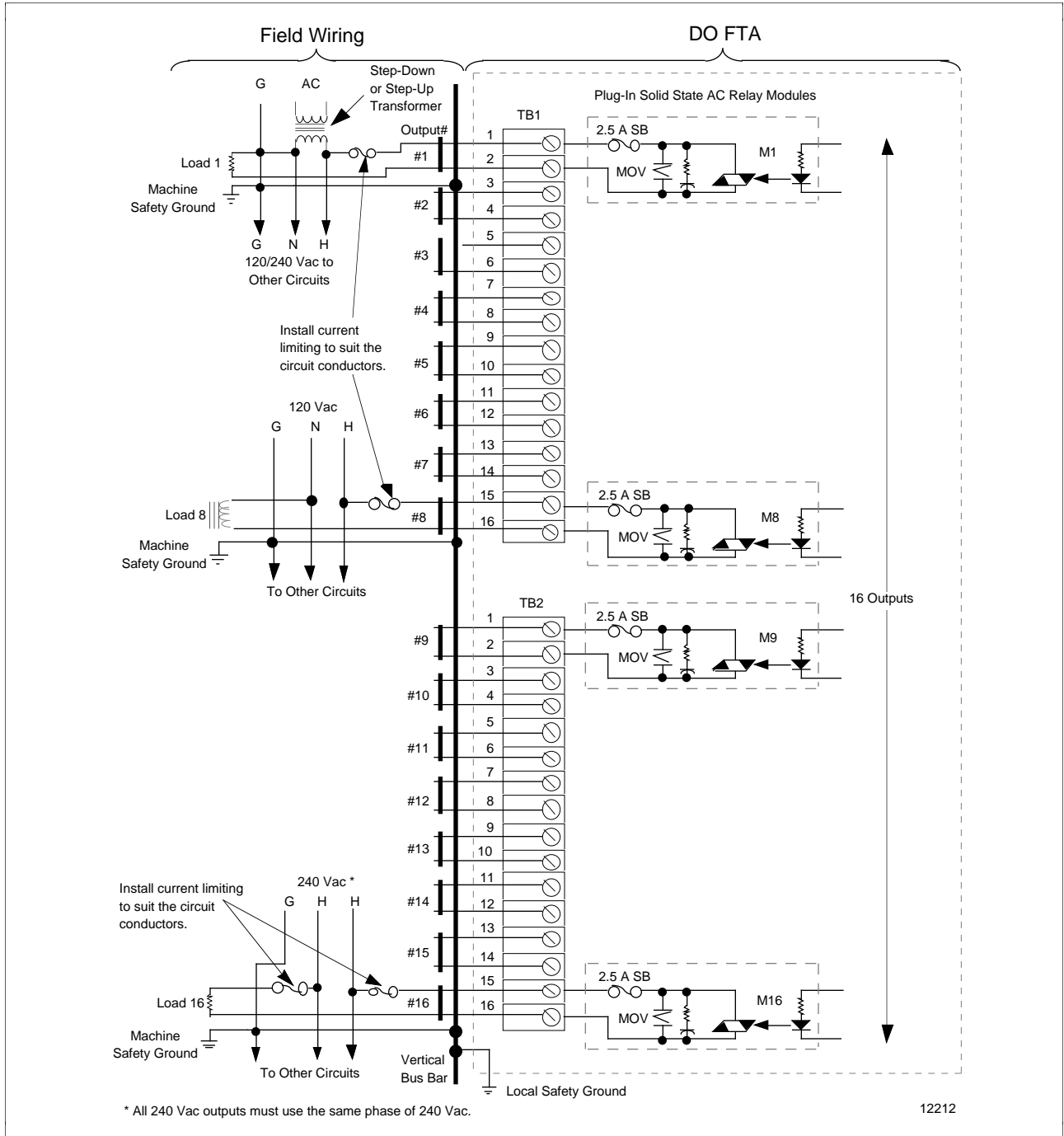


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA53 connection diagram

Figure 5-32 Model MU-TDOA53 120/240 Vac Solid-State Digital Output FTA Connection Diagram

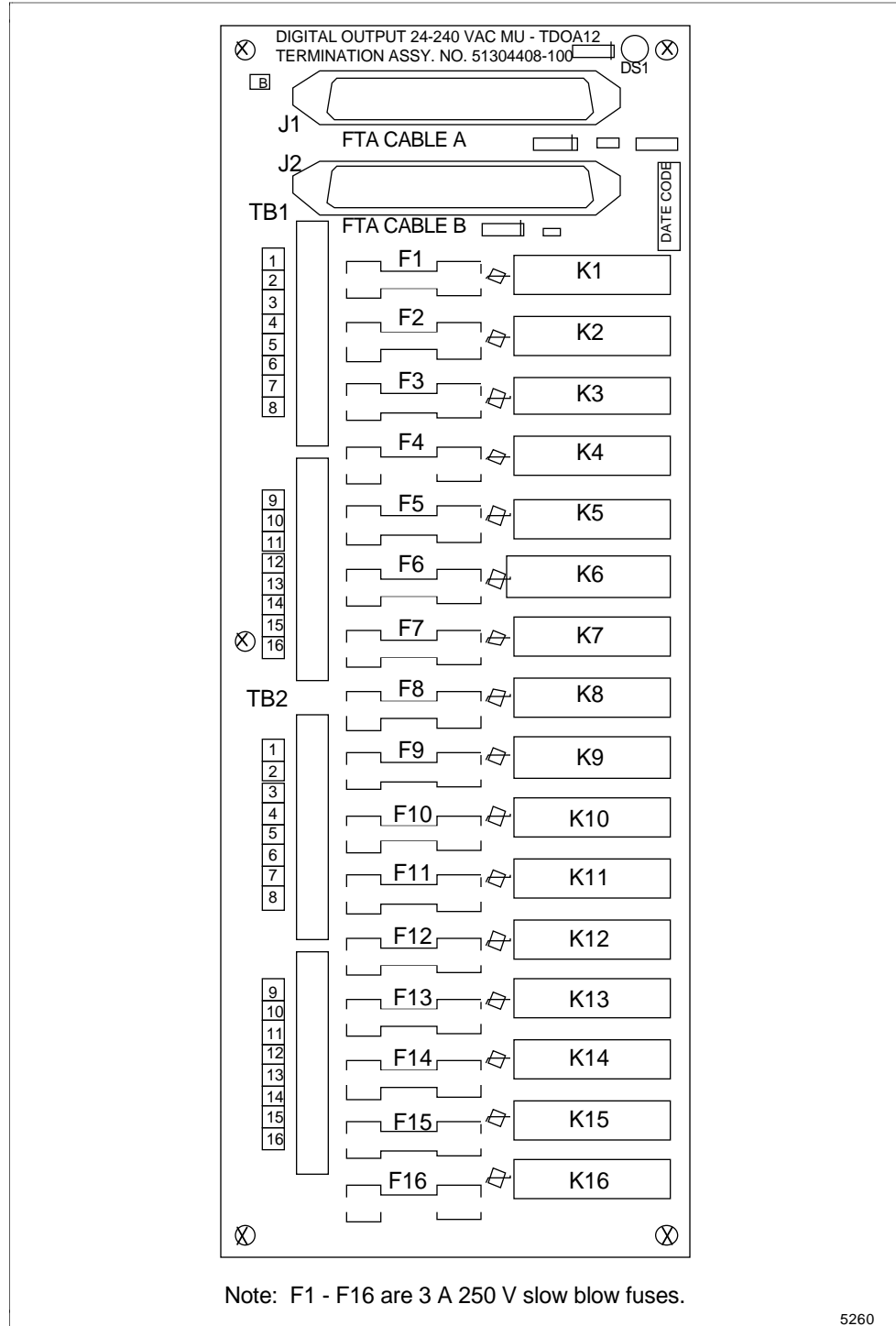


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA12 FTA assembly layout

Figure 5-33 Model MU-TDOA12 120/240 Vac Solid-State Digital Output FTA Assembly Layout

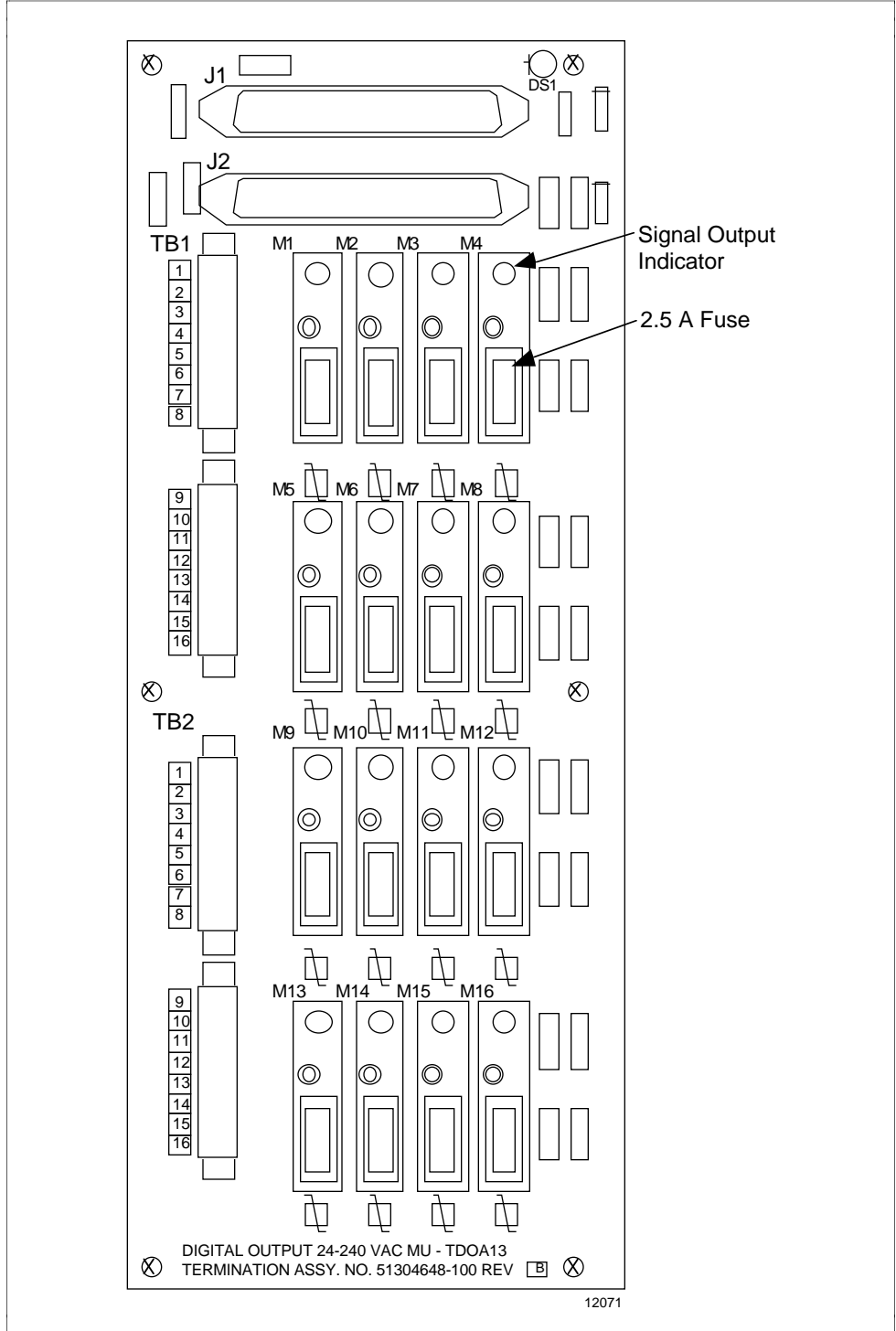


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA13
FTA assembly layout

Figure 5-34 Model MU-TDOA13 120/240 Vac Solid-State Digital Output FTA Assembly Layout

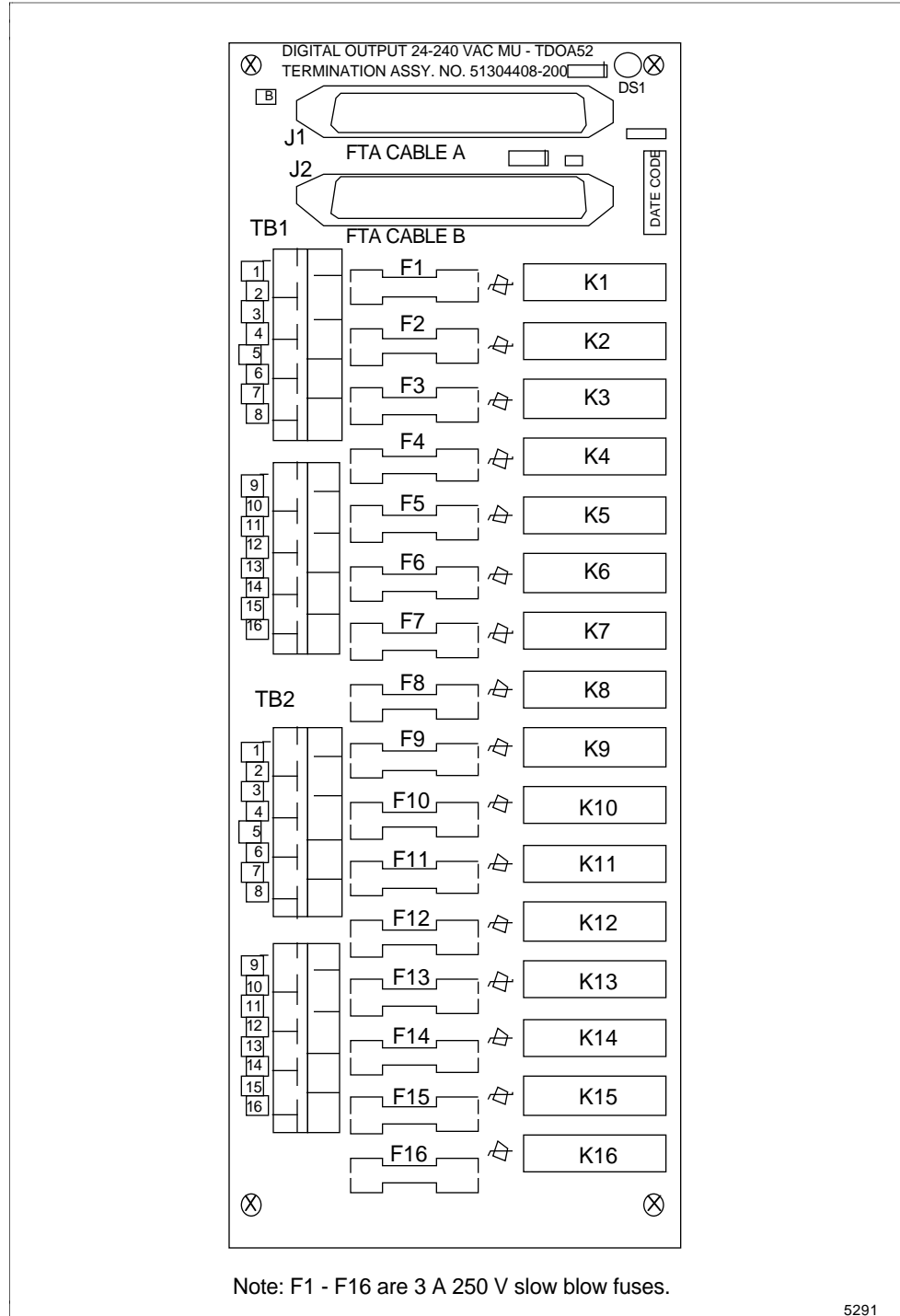


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA52 FTA assembly layout

Figure 5-35 Model MU-TDOA52 120/240 Vac Solid-State Digital Output FTA Assembly Layout

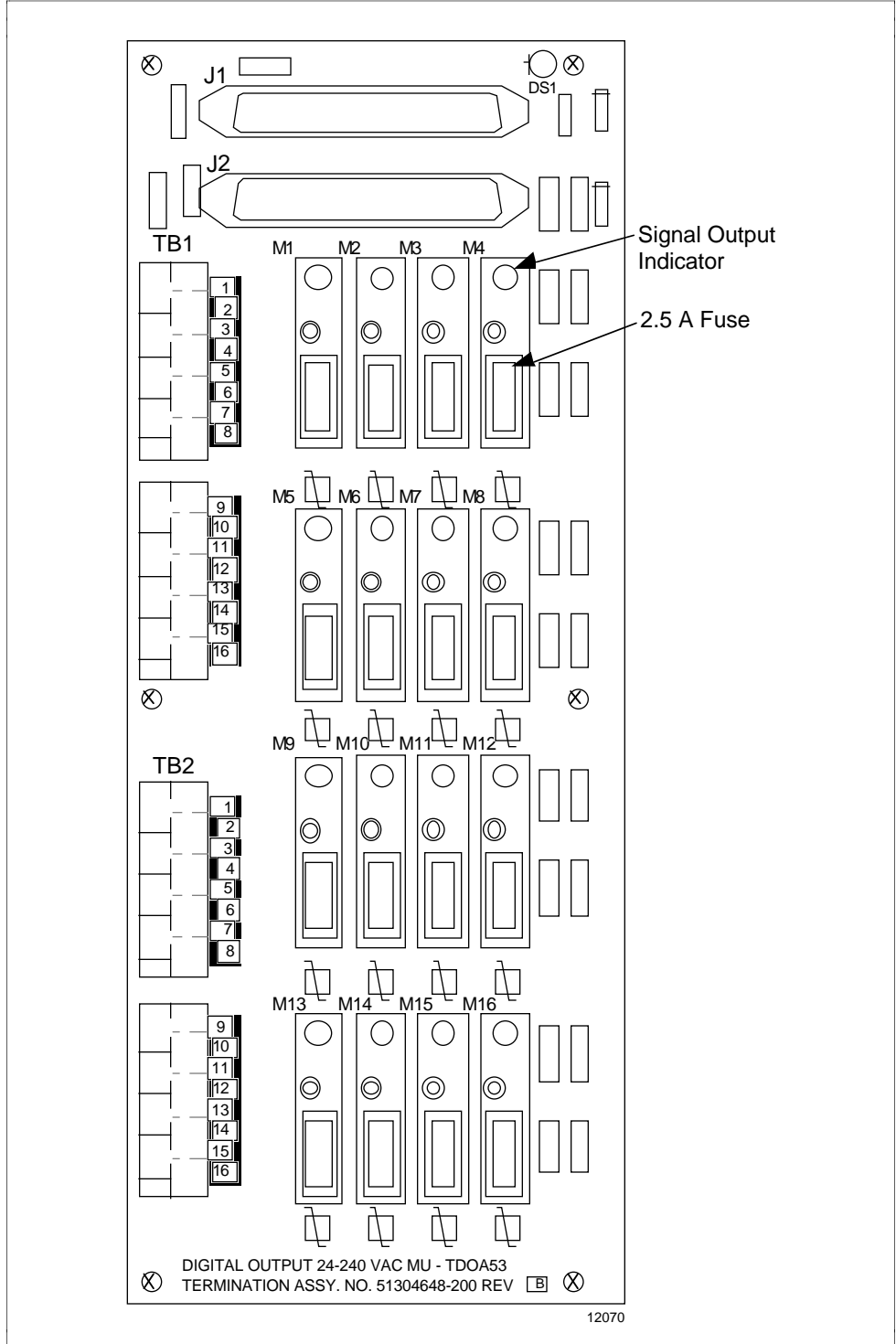


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5.6 120/240 Vac Solid-State Digital Output (DO) FTAs, Continued

Model MU-TDOA53 FTA assembly layout

Figure 5-36 Model MU-TDOA53 120/240 Vac Solid-State Digital Output FTA Assembly Layout



5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

Some 120 Vac/125 Vdc relay Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

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

120 Vac/125 Vac relay DO FTAs and DO IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 5-6.

Table 5-6 120 Vac/125 Vdc Relay Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TDOR11	120 Vac/120 Vdc Relay DO FTA Compression Terminals	51301191-100	N/A
MU-TDOR12	120 Vac/120 Vdc Relay DO FTA Compression Terminals	51304443-100	51309148-125
MC-TDOR12	120 Vac/120 Vdc Relay DO FTA Compression Terminals—Conformally Coated	51304443-150	51309148-175
MU-TDOR52	120 Vac/120 Vdc Relay DO FTA Screw Terminals	51304443-200	51309148-225
MC-TDOR52	120 Vac/120 Vdc Relay DO FTA Screw Terminals—Conformally Coated	51304443-250	51309148-275
MU-PDOX01	Digital Output IOP	51303994-200	N/A
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150

Description

The 120 Vac/125 Vdc relay Digital Output (DO) FTA has 16 independent electromechanical relays for ac or dc power outputs. The compatible IOP and the FTA support 16 control points (channels).

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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

IOP compatibility	The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are compatible with all 120 Vac/125 Vdc relay Digital Output FTAs models.
Contact arc suppression	Refer to subsection 5.7.1 for a discussion of noise suppression and contact arc suppression. Design calculations for the component values can be found in 5.7.2.
Connection diagrams	<p>Figure 5-37 is a connection diagram for the compression terminal-type model MU-TDOR11 and MU-TDOR12 120 Vac/125 Vdc relay Digital Output FTAs.</p> <p>Figure 5-38 is a connection diagram for the screw terminal-type model MU-TDOR52 120 Vac/125 Vdc relay DO FTA.</p>
Assembly layout illustrations	<p>Figure 5-39 illustrates the Non-CE Compliant assembly, 51304443-1xx, of the model MU-TDOR12 120 Vac/125 Vdc relay Digital Output FTA. Figure 5-40 illustrates the CE Compliant assembly, 51309148-1xx, of the model MU-TDOR12 120 Vac/125 Vdc relay DO FTA.</p> <p>Figure 5-41 illustrates the Non-CE Compliant assembly, 51304443-2xx, of the model MU-TDOR52 120 Vac/125 Vdc relay Digital Output FTA. Figure 5-42 illustrates the CE Compliant assembly, 51309148-2xx, of the model MU-TDOR52 120 Vac/125 Vdc relay DO FTA.</p>
Electrical codes	Signals from the FTA are normally considered as signals from power circuits and therefore are subject to electrical codes. Use only cable approved for the operating voltage and current limiting.
Vertical bus bar	There is usually a safety conductor for each circuit. A vertical bus bar is usually also required to handle the volume of Safety Ground conductors used with these FTAs. Connect each Safety Ground to the vertical bus and connect the vertical bus bar to the local Safety Ground bus bar with a 2.5 mm ² (14 AWG) wire.
Out of phase power	Out of phase 120 Vac load power can be used with adjacent outputs because the inter-output circuitry is rated for 240 Vac rms.
Cable shield grounding	Any cable shield/ground connects to Safety Ground at the cabinet entry.

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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

Normally open/closed relay contact selection

The orientation of a pair of wire jumpers on the FTA for each relay, K1 (channel 1) through K16 (channel 16), determines the relay's normal (deenergized) contact output to the channel's terminals. When the jumpers are positioned horizontally, the normally open (N/O) relay contacts are selected. If the jumpers are positioned vertically, the relay's normally closed (N/C) contacts are connected to the channel's terminals. The connection diagrams illustrate examples of relay contact selection.

ATTENTION

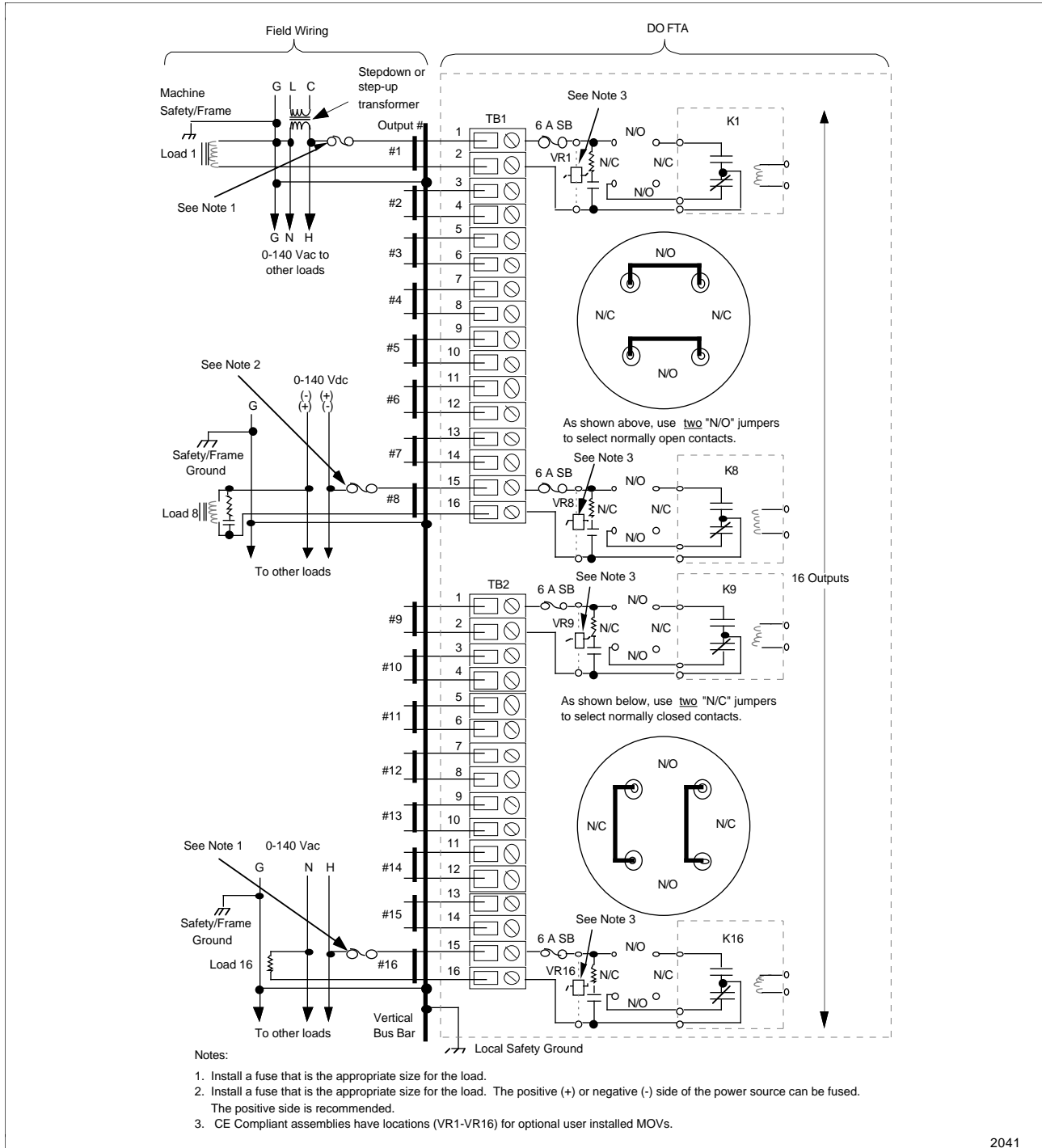
ATTENTION—The 51301191-100 assembly and some older versions of the 51304443-xxx assembly have noninsulated (bare) wire jumpers. The bare wire jumpers are more easily handled by using long nose pliers and must be handled only when no load power is present at the FTA terminals. All 51309148-xxx assemblies have insulated wire jumpers; however, as a safety precaution, the wire jumpers should only be handled when no load power is present at the field terminals.

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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

Model MU-TDOR11 MU-TDOR12 FTA connection diagram

Figure 5-37 Model MU-TDOR11/MU-TDOR12 120 Vac/125 Vdc Relay Digital Output FTA Connection Diagram

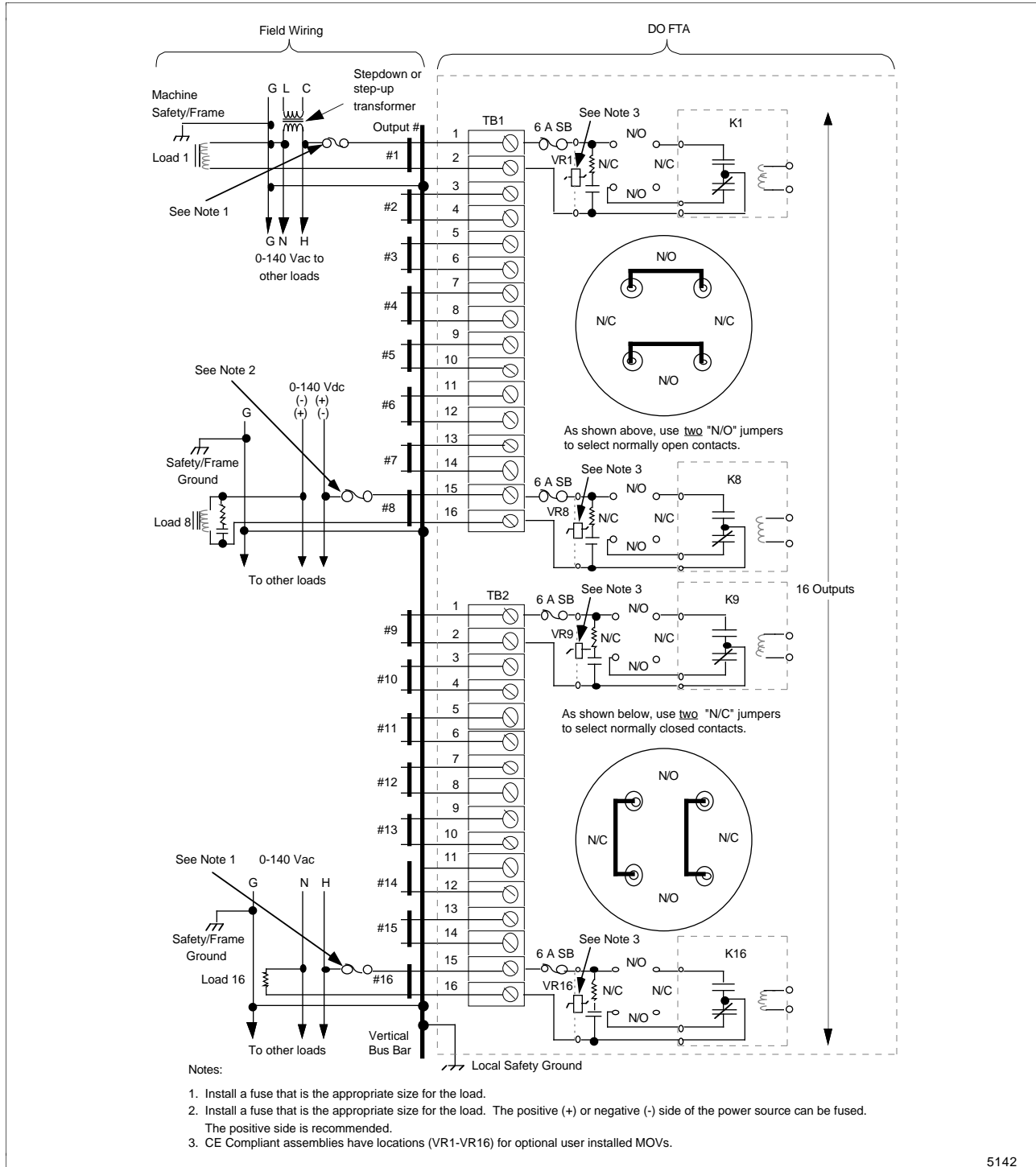


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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

Model MU-TDOR52 connection diagram

Figure 5-38 Model MU-TDOR52 120 Vac/125 Vdc Relay Digital Output FTA Connection Diagram



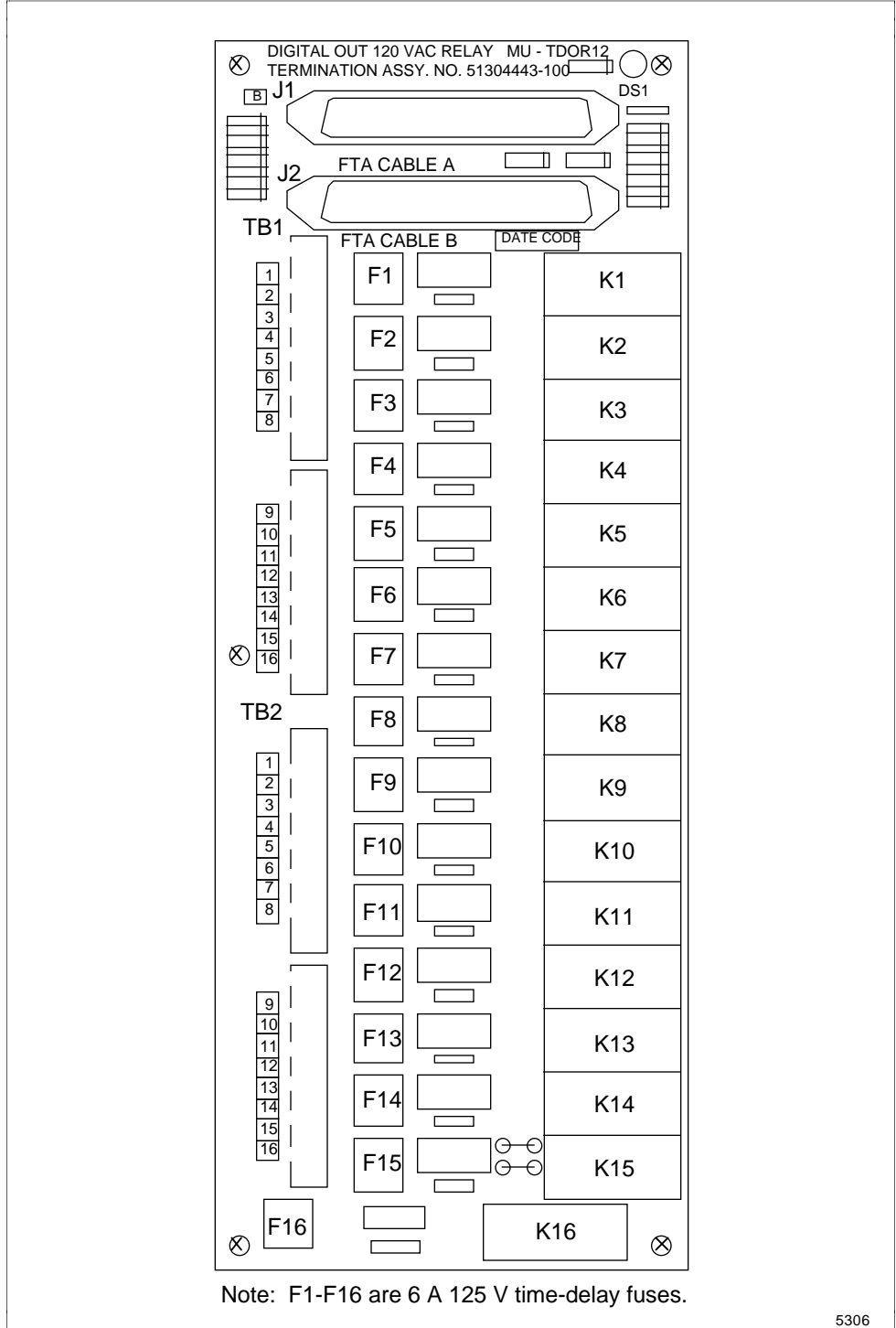
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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

**Model MU-TDOR12
FTA assembly layout**

Figure 5-39 Model MU-TDOR12 120 Vac/125 Vdc Relay Digital Output FTA Assembly Layout—Non-CE Compliant

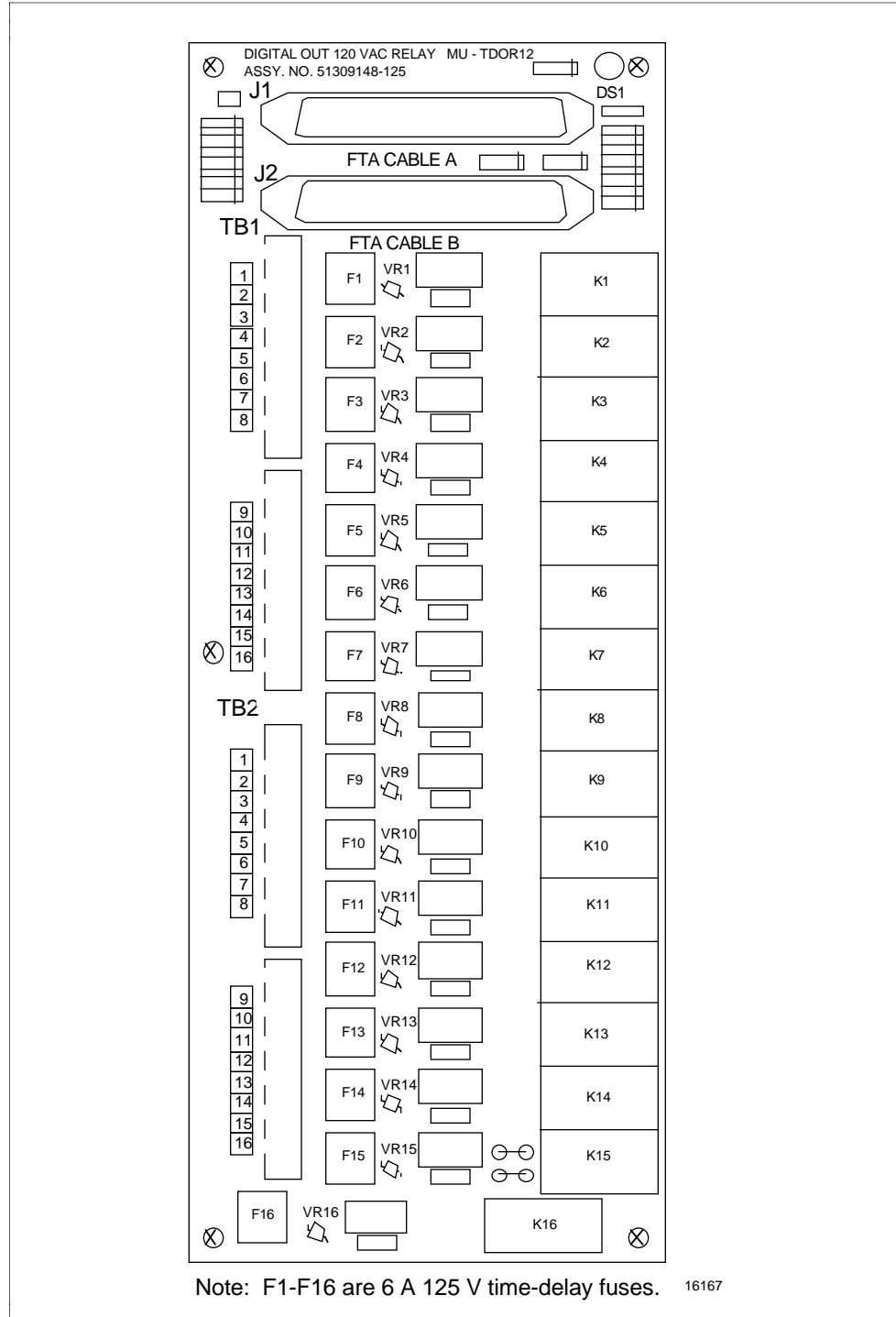


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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

Model MU-TDOR12 FTA assembly layout

Figure 5-40 Model MU-TDOR12 120 Vac/125 Vdc Relay Digital Output FTA Assembly Layout—CE Compliant

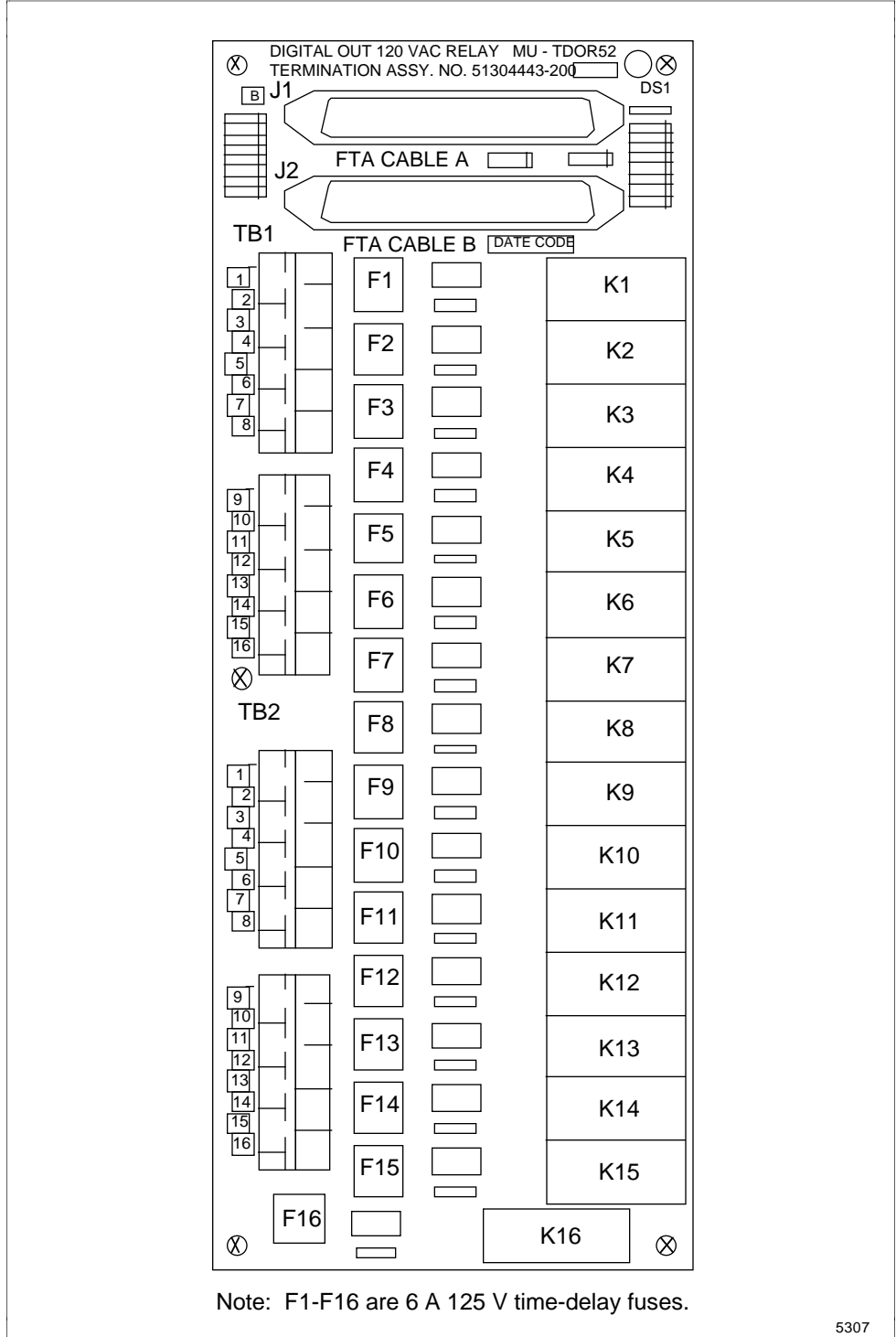


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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

Model MU-TDOR52 FTA assembly layout

Figure 5-41 Model MU-TDOR52 120 Vac/125 Vdc Relay Digital Output FTA Assembly Layout—Non-CE Compliant

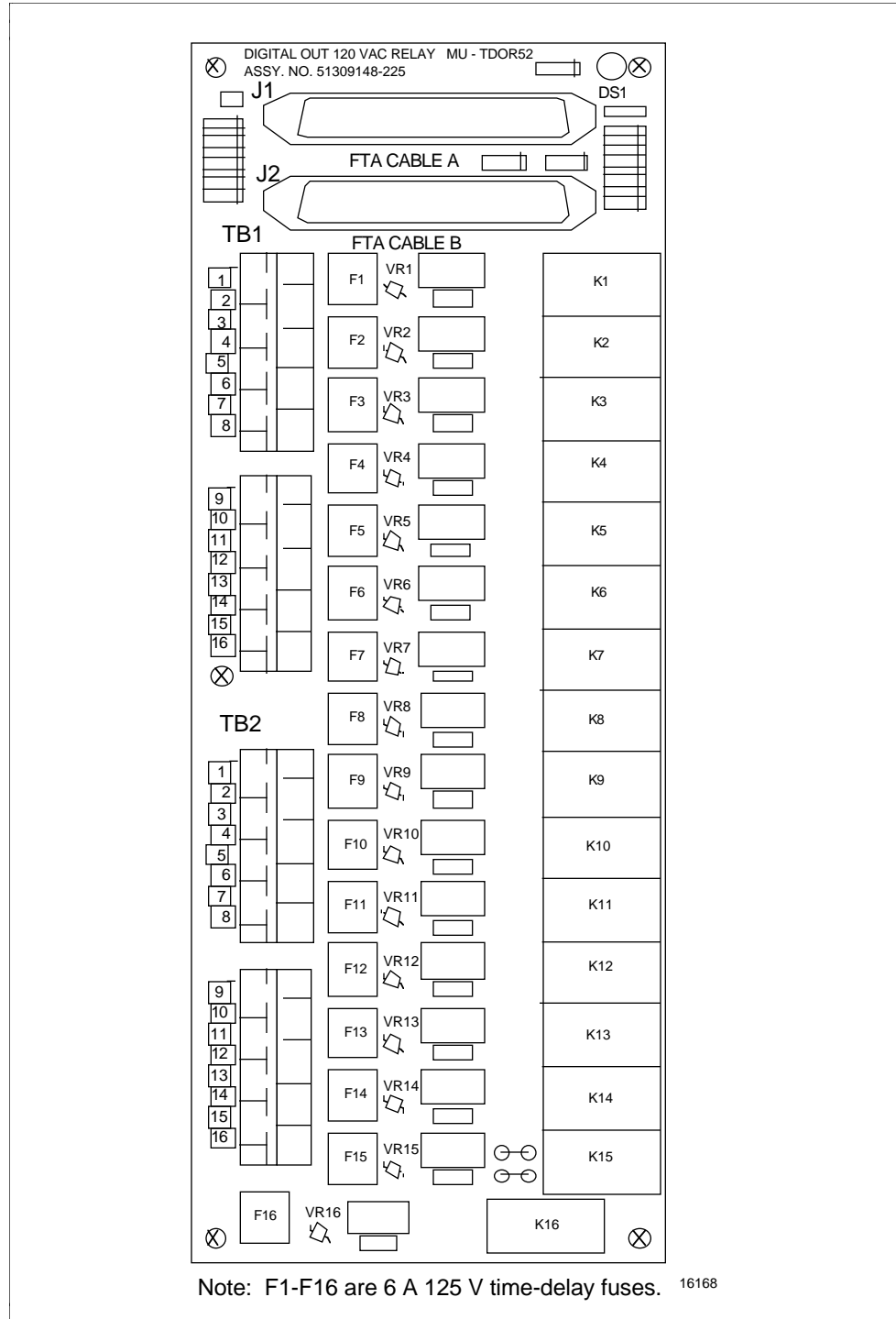


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5.7 120 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

Model MU-TDOR52
FTA assembly
layout

Figure 5-42 Model MU-TDOR52 120 Vac/125 Vdc Relay Digital Output FTA Assembly Layout—CE Compliant



5.7.1 Noise Suppression at the Source

Introduction

In general, when good wiring practices are used with well designed digital electrical equipment, no additional noise (EMI) suppression is necessary; however, in some severe electrical environments, the magnitude of the noise is so great that it must be suppressed at the source. For most control situations, the main sources of noise are motor starters, contactors, relays, solenoids, and other switching gear.

For this reason, many manufacturers of these devices supply “surge suppressors” that mount directly on the noise source; for example, on the coil of a relay control or motor starter. For those devices that do not have accessory “surge suppressors,” resistance-capacitance (RC) circuits and/or transient voltage limiters such as Metal Oxide Varistors (MOVs) can be added where needed to mitigate excessive EMI. Suppression devices can be applied at two locations; at the load and/or at the switch contacts.

It cannot be emphasized too strongly that transient overvoltages that are caused by the switching of reactive loads should be suppressed at the source rather than allowed to pollute the power mains and the surrounding environment. It should also be noted that RC snubbers are not a substitute for suppression devices at the field loads nor are they meant to provide power factor correction.

Suppression at the inductive load

Before deenergizing an inductive load, such as a relay or solenoid coil, a certain amount of energy is stored in the load. When the relay contact opens, deenergizing the load, a high voltage transient is produced. As illustrated in Figure 5-43, a MOV or RC circuit in parallel with the load that is as physically close to the load as possible provides a place where this transient energy can be dissipated.

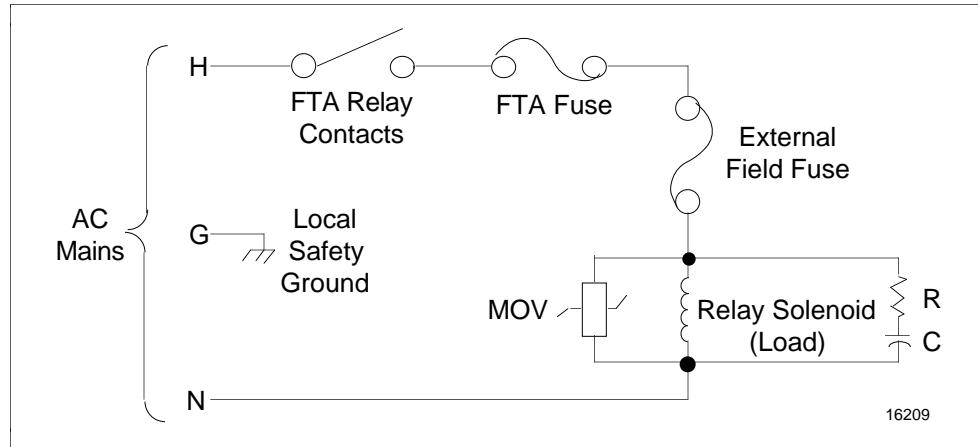
If there is no MOV or RC snubber circuit, however, the transient energy can create a visible arc across the opening contacts. The arc contributes to electrical noise in the installed environment and degrades the life of the relay contacts.

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5.7.1 Noise Suppression at the Source, Continued

Inductive load transient overvoltage and EMI suppression schematic

Figure 5-43 Inductive Load Transient Overvoltage and EMI Suppression



Recommended load MOV devices

Table 5-7 lists the recommended MOV device part numbers and specifications for a typical vendor (Harris Semiconductor) that can be used for general purpose applications at an inductive load. Consult the manufacturer of your particular load to determine if a suppression device is included or if a supplemental suppression device is required.

Table 5-7 Inductive Load MOV Vendor Part Numbers and Ratings

Description/Specification	Light Duty Usage (120/240 Vac Mains)	Heavy Duty Usage (Motor Control on 120/240 Vac Mains)
Maximum Continuous RMS Rating (+85°C)	275 Vac	320 Vac
Maximum DC Voltage (+85°C)	369 Vdc	420 Vdc
Energy Rating (10/1000 us)	75 Joules	90 Joules
Part Number (Harris Semiconductor)	V275LA20A	V320LA20A
Device Marking	275L20	320L20

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5.7.1 Noise Suppression at the Source, Continued

Contact suppression

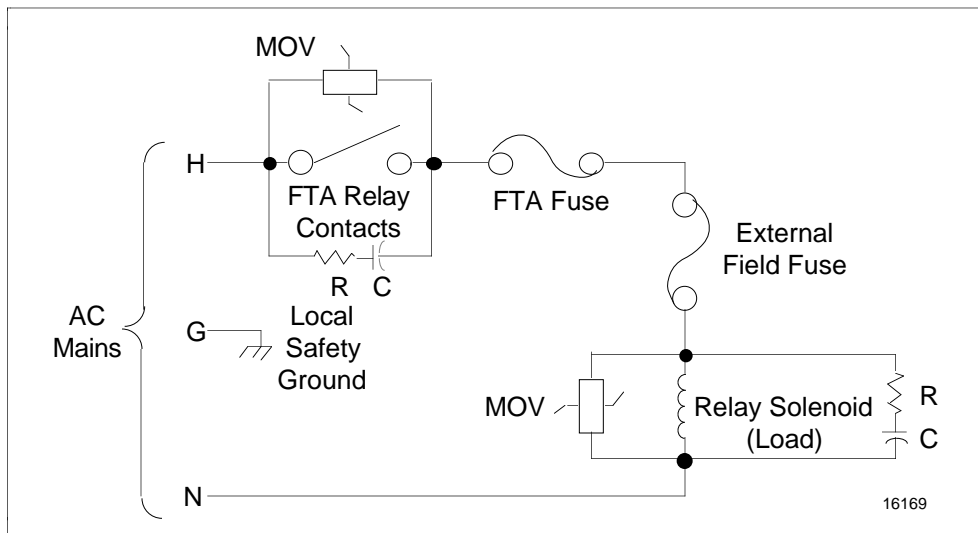
Another way to suppress an arc is to connect an MOV or RC circuit across the relay contacts as illustrated in Figure 5-44. The arc suppression network component values on the FTA have been properly coordinated for use with the ac power mains to maximize relay contact life for load currents of up to 1 ampere for 120 Vac models and 0.5 amperes for 240 Vac models.

If the relay contacts are used for higher load currents without additional suppression, contact life will be reduced. For higher load currents, extra arc suppression with a resistor and capacitor (RC) is required as illustrated in Figure 5-44. The design calculations for the additional external component values are found in subsection 5.7.2.

Both the 120 Vac/125 Vdc and 240 Vac/125 Vdc relay Digital Output FTAs can also accommodate dc loads of up to 125 Vdc, and both types of FTAs use relays that are rated for 240 Vac. The RC snubber values are different on the two types of FTA assemblies.

Relay contacts transient overvoltage and EMI suppression schematic

Figure 5-44 Relay Contacts Transient Overvoltage and EMI Suppression



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5.7.1 Noise Suppression at the Source, Continued

Recommended FTA MOV devices

On the CE Compliant assemblies, a space is provided for the user to optionally install an MOV for each of the 16 channels. The recommended components must have crimped leads for ease of soldering to the assembly and can be purchased from Harris Semiconductor. The part numbers and specifications are listed in Table 5-8.

Table 5-8 FTA Contacts MOV Vendor Part Numbers and Ratings

Description/Specification	Light Duty Usage (120/240 Vac Mains)	Heavy Duty Usage (Motor Control on 120/240 Vac Mains)
Maximum Continuous RMS Rating (+85°C)	275 Vac	420 Vac
Maximum DC Voltage (+85°C)	369 Vdc	560 Vdc
Energy Rating (10/1000 us)	45 Joules	45 Joules
Part Number (Harris Semiconductor)	V275LC10	V420LC10
Device Marking	275L	420L

RC snubber or MOV leakage current

Ideally, when a relay contact opens, no current can flow through it to the load it controls. Because the RC snubber circuit is connected in shunt with the relay contacts, an ac current path is established. The magnitude of the current that flows is dependent on the ac supply, the frequency, the snubber's values, and the load. In some control applications where high impedance loads such as solid-state relays are used, the snubber leakage current will cause a voltage drop across the load and possibly prevent deactivation of the load even though the relay contacts are open.

Typical RC snubber leakage currents

Typical leakage current in the snubber is listed in Table 5-9 for the FTA models.

Table 5-9 Typical FTA RC Snubber Leakage Current

FTA Model	120 Vac @ 60 Hz	208 Vac @ 60 Hz	240 Vac @ 50 Hz
MU-TDOR12/52	4.52 mA rms	N/A	N/A
MU-TDOR22/62	N/A	1.73 mA rms	1.66 mA

MOV leakage current

The leakage current in a MOV is in the microampere range and is therefore negligible when compared to the RC snubber current. For dc supplies and loads, no appreciable leakage current flows in the snubber or load because the capacitor blocks the dc component. Removal of the snubber circuit for reactive or resistive loads is not recommended because the result will be decreased contact life.

5.7.2 Contact Arc Suppressor Selection

Introduction

Calculation for a resistor-capacitor contact arc suppressor is as follows:

Let I_p be the contact current immediately before opening, either average dc or peak ac.

Let E_p be the supply voltage before the closing of the contacts, either average dc or peak ac.

Capacitor selection formula

Calculate the suppression capacitor C from the formula:

$$C = I_p^2 / 10 \text{ microfarads}$$

The current used in the calculation should be reduced by 1 ampere (120 Vac FTA) or 0.5 ampere (240 Vac FTA) because the suppression circuit on the assembly already accommodates this level. Should a capacitance less than 0.001 microfarads be calculated, use 0.001 microfarads instead.

Resistor selection formula

Calculate the suppression resistor R from the formula

$$R = E_p / (10 \times I_p (1 + 50/E_p)) \text{ ohms}$$

As above, deduct 1 ampere before performing the calculation because the suppression circuit on the FTA already accommodates this level. Should a resistance of less than 0.5 ohms be calculated, use 0.5 ohms instead.

An example

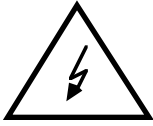
A 2 ampere ac rms 240 Vac load has a peak current of $2 \times \sqrt{2} = 2.83$ amperes. Because the FTA already has 0.5 ampere peak of contact suppression on the FTA, calculate the suppressor for $2.83 - 0.5 = 2.33$ amperes. The peak voltage for 240 Vac is $240 \times \sqrt{2} = 339$ volts.

$$\begin{aligned} C &= 2.33^2 / 10 \\ &= 0.54 \text{ microfarad} \end{aligned}$$

$$\begin{aligned} R &= 339 / (10 \times 2.33 (1 + 50/339)) \\ &= 12.85 \text{ ohms} \end{aligned}$$

Install the arc suppressor across the FTA terminals to protect the relay contacts from excessive arcing.

5.8 240 Vac/125 Vdc Relay Digital Output (DO) FTAs



CAUTION, RISK OF ELECTRIC SHOCK

CE Compliance

Some 240 Vac/125 Vdc relay Digital Output (DO) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

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

240 Vac/125 Vdc relay DO FTAs and DO IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 5-10.

Table 5-10 240 Vac/125 Vdc Relay Digital Output FTA and DO IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
16 Channel (Point) FTAs – 16 Channel (Point) IOP			
MU-TDOR21	240 Vac/125 Vdc Relay DO FTA Compression Terminals	51301194-100	N/A
MU-TDOR22	240 Vac/125 Vdc Relay DO FTA Compression Terminals	51304427-100	51309150-125
MC-TDOR22	240 Vac/125 Vdc Relay DO FTA Compression Terminals—Conformally Coated	51304427-150	51309150-175
MU-TDOR62	240 Vac/125 Vdc Relay DO FTA Screw Terminals	51304427-200	51309150-225
MC-TDOR62	240 Vac/125 Vdc Relay DO FTA Screw Terminals—Conformally Coated	51304427-250	51309150-275
MU-PDOX01	Digital Output IOP	51303994-200	N/A
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150
16 Channel (Point) FTAs – 32 Channel (Point) IOP			
MU-TDOY23	240 Vac/125 Vdc Relay DO FTA Compression Terminals	80366189-100	80366189-125
MC-TDOY23	240 Vac/125 Vdc Relay DO FTA Compression Terminals—Conformally Coated	80366189-150	80366189-175

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5.8 240 Vac/125 Vdc Relay Digital Output (DO) FTAs, Continued

240 Vac/125 Vdc relay
DO FTAs and DO IOPs,
continued

Table 5-10 240 Vac/125 Vdc Relay Digital Output FTA and DO IOP Models, Continued

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
32 Channel (Point) FTAs – 16 Channel (Point) IOP, continued			
MU-TDOY63	240 Vac/125 Vdc Relay DO FTA Screw Terminals	80366186-100	80366186-125
MC-TDOY63	240 Vac/125 Vdc Relay DO FTA Screw Terminals—Conformally Coated	80366186-150	80366186-175
MU-PDOY22	Digital Output IOP	N/A	80363975-100
MC-PDOY22	Digital Output IOP—Conformally Coated	N/A	80363975-150

Introduction

The 240 Vac/125 Vdc relay Digital Output (DO) FTA has 16 independent electromechanical relays for ac or dc power outputs. The compatible IOP and the FTA support 16 control points (channels).

Electrical codes

Signals from the FTA are normally considered as signals from power circuits and therefore are subject to electrical codes. Use only cable approved for the operating voltage and current limiting.

Vertical bus bars

There is usually a safety wire for each circuit. A vertical bus bar is usually required to handle the volume of Safety Ground wires used with the FTAs. Connect each Safety Ground wire to the vertical bus bar and then connect the vertical bus bar to the local Safety Ground bus bar with a 2.5 mm² (14 AWG) wire.

Out of phase power

Adjacent channels must use the same load power phase to avoid exceeding the 240 Vac interchannel circuitry limit.

Cable shield grounding

Any cable shield/ground must connect to Safety Ground at the cabinet entry.

Contact arc suppression

Refer to subsection 5.7.1 for a discussion of noise suppression and contact arc suppression. Design calculations for the component values can be found in subsection 5.8.3.

5.8.1 Model MU-TDOR22/62 FTAs

IOP compatibility

The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are compatible with the model MU-TDOR21, MU-TDOR22, and MU-TDOR62 240 Vac/125 Vdc relay Digital Output FTAs only.

The model MU-PDOY22 Digital Output IOP is not compatible with these FTAs.

Do not mismatch Digital Output IOPs.

Connection diagrams

Figure 5-45 is a connection diagram for the compression terminal-type model MU-TDOR22 240 Vac/125 Vdc relay Digital Output FTA.

Figure 5-46 is a connection diagram for the screw terminal-type model MU-TDOR62 240 Vac/125 Vdc relay DO FTA.

Assembly layout illustration

Figure 5-47 illustrates the Non-CE Compliant assembly, 51304443-1xx, of the model MU-TDOR22 240 Vac/125 Vdc relay Digital Output FTA. Figure 5-48 illustrates the CE Compliant assembly, 51309148-1xx, of the model MU-TDOR22 240 Vac/125 Vdc relay DO FTA.

Figure 5-49 illustrates the Non-CE Compliant assembly, 51304443-2xx, of the model MU-TDOR62 240 Vac/125 Vdc relay Digital Output FTA. Figure 5-50 illustrates the CE Compliant assembly, 51309148-2xx, of the model MU-TDOR62 240 Vac/125 Vdc relay DO FTA.

Normally open/closed relay contact selection

The orientation of a pair of wire jumpers on the FTA for each relay, K1 (channel 1) through K16 (channel 16), determines the relay's normal (deenergized) contact output to the channel's terminals. When the jumpers are positioned horizontally, the normally open (N/O) relay contacts are selected. If the jumpers are positioned vertically, the relay's normally closed (N/C) contacts are connected to the channel's terminals. The connection diagrams illustrate examples of relay contact selection.

ATTENTION

ATTENTION—The 51301194-100 assembly and some older versions of the 51304427-xxx assembly have noninsulated (bare) wire jumpers. The bare wire jumpers are more easily handled by using long nose pliers and must be handled only when no load power is present at the FTA terminals.

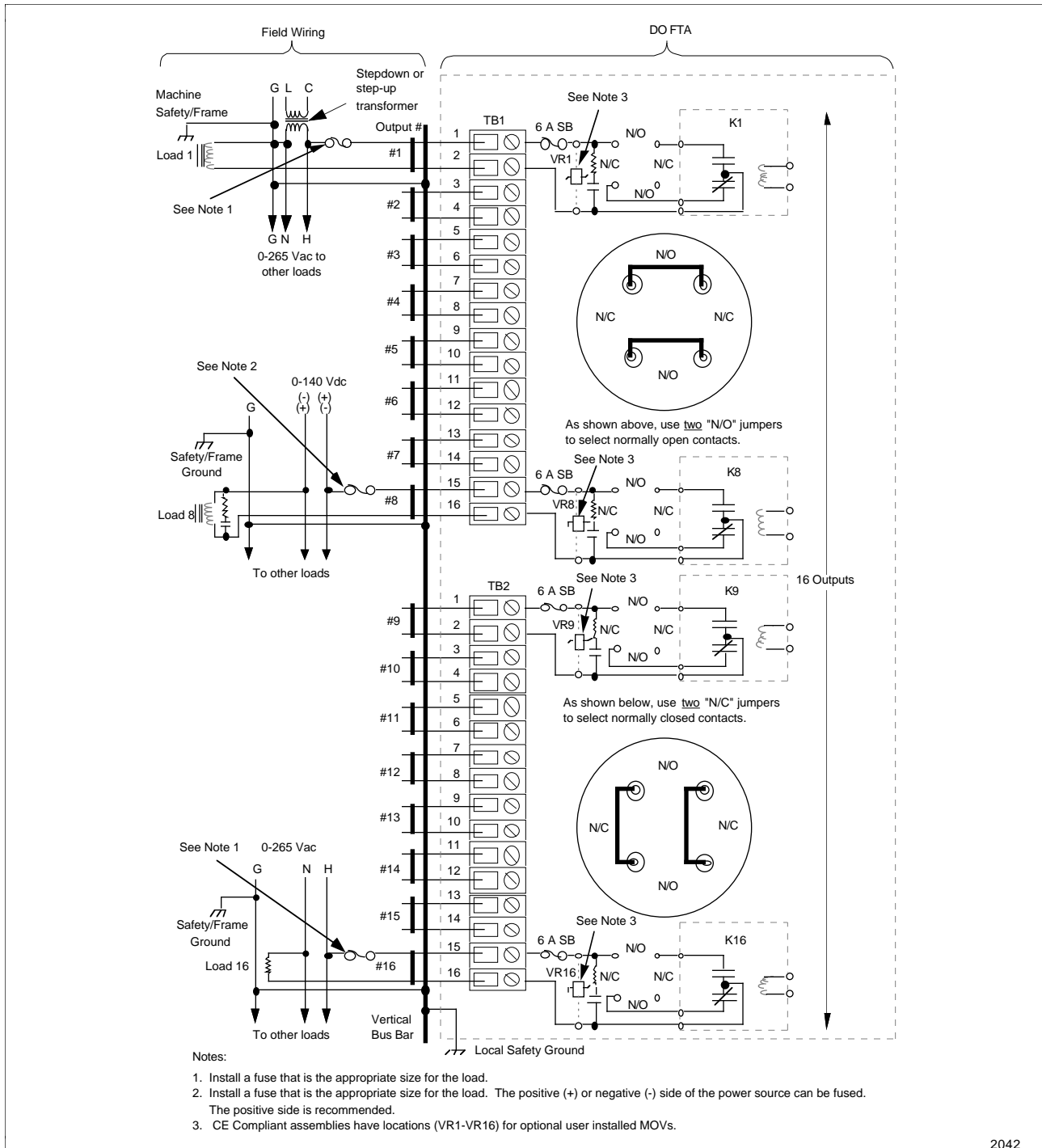
All 51309150-xxx assemblies have insulated wire jumpers. As a safety precaution, the wire jumpers should be handled only when no load power is present at the field terminals.

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5.8.1 Model MU-TDOR22/62 FTAs, Continued

Model MU-TDOR21 MU-TDOR22 connection diagram

Figure 5-45 Model MU-TDOR21/MU-TDOR22 240 Vac/125 Vdc Relay Digital Output FTA Connection Diagram

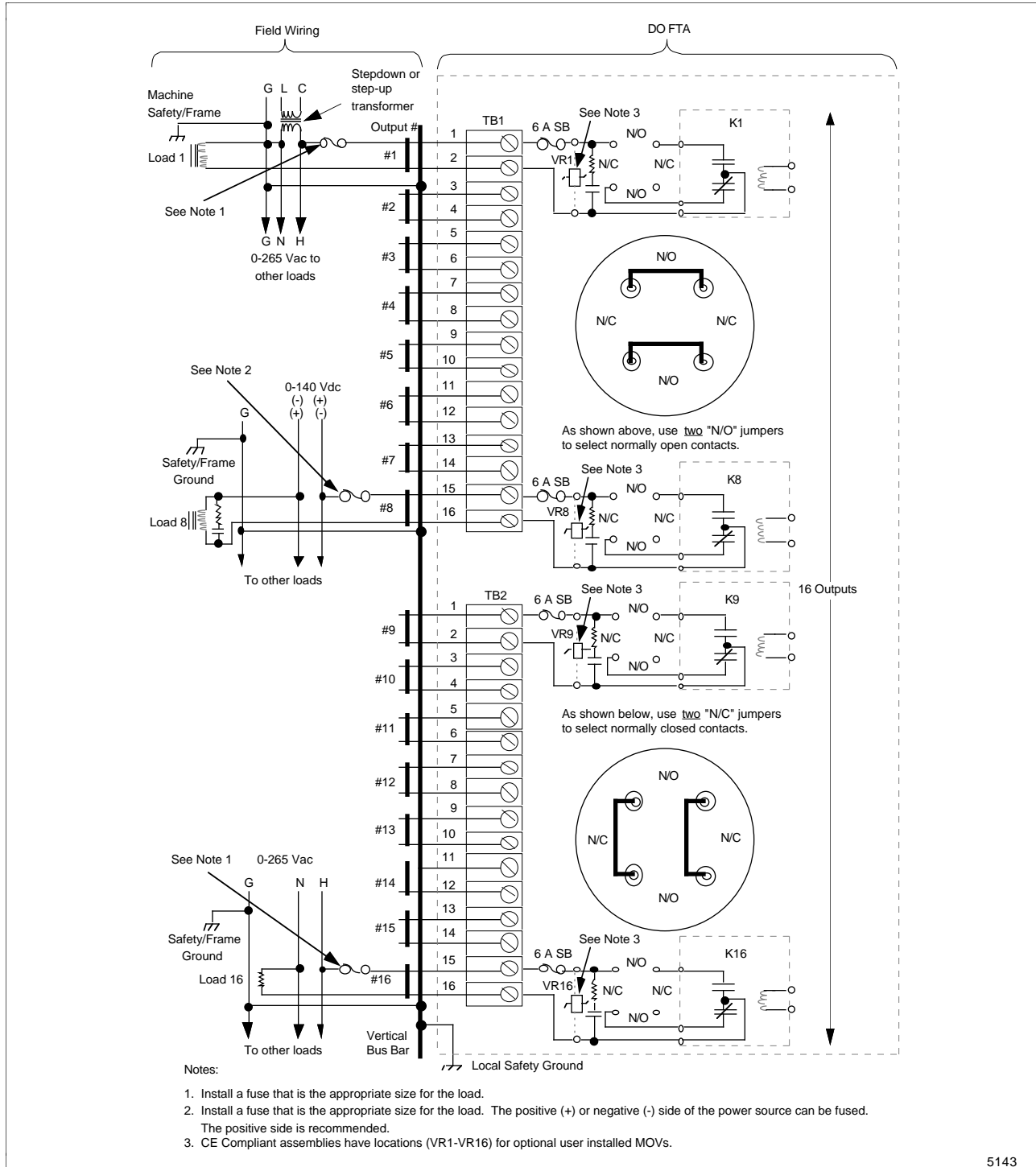


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5.8.1 Model MU-TDOR22/62 FTAs, Continued

Model MU-TDOR62 connection diagram

Figure 5-46 Model MU-TDOR62 240 Vac/125 Vdc Relay Digital Output FTA Connection Diagram



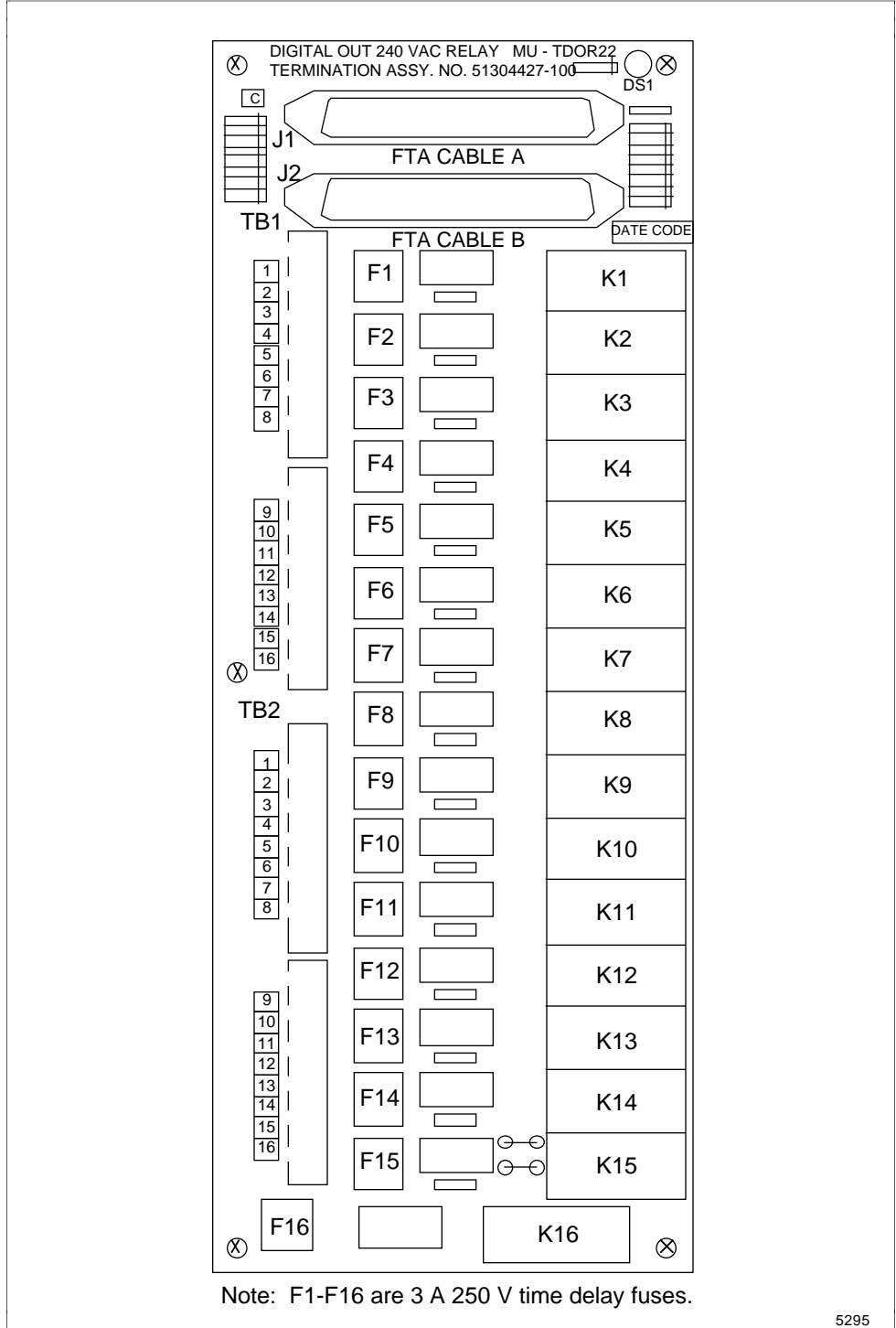
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5.8.1 Model MU-TDOR22/62 FTAs, Continued

Model MU-TDOR22 FTA assembly layout

Figure 5-47 Model MU-TDOR22 240 Vac/125 Vdc Relay Digital Output
FTA Assembly Layout—Non-CE Compliant

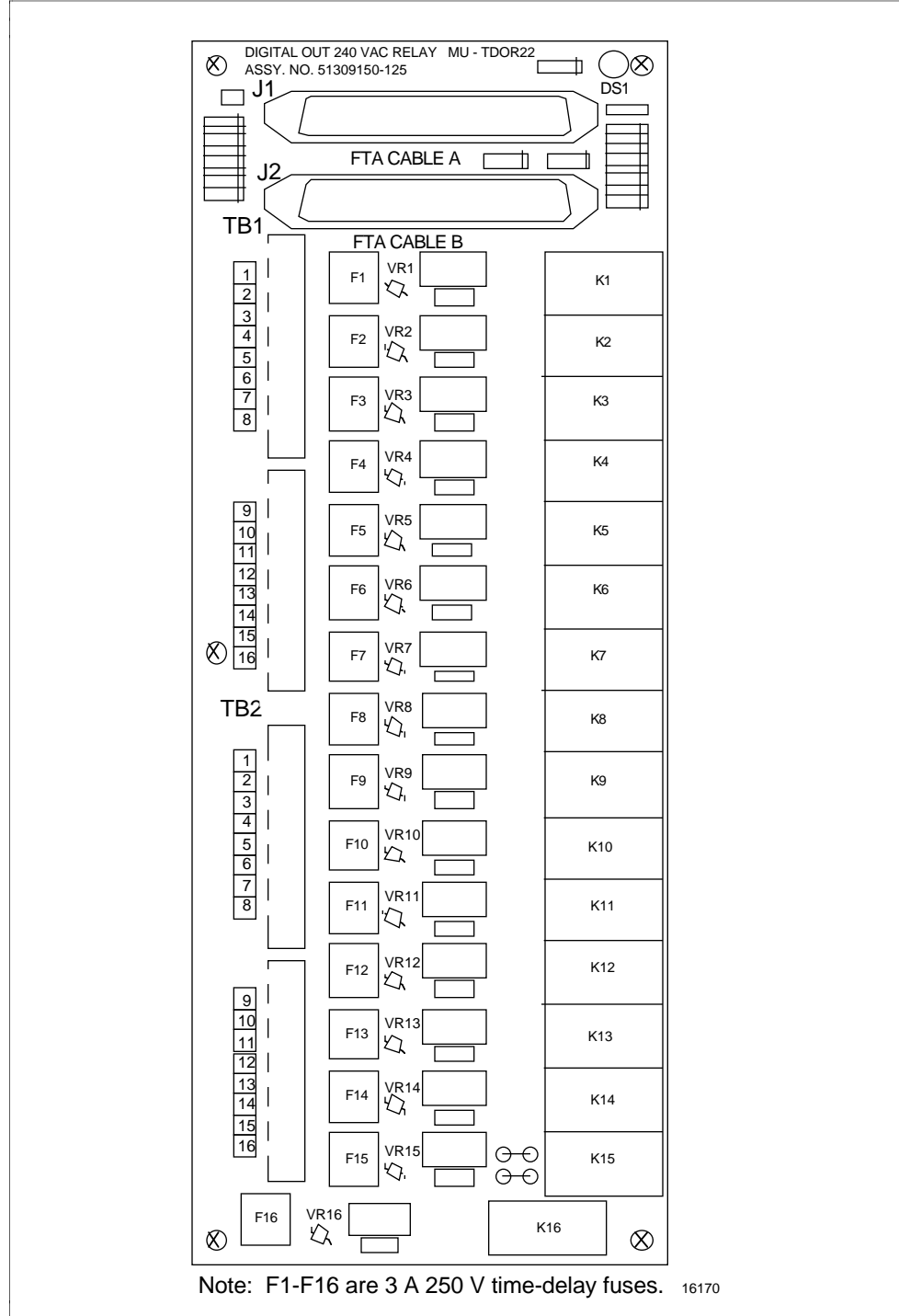


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5.8.1 Model MU-TDOR22/62 FTAs, Continued

Model MU-TDOR22 FTA assembly layout

Figure 5-48 Model MU-TDOR22 240 Vac/125 Vdc Relay Digital Output
FTA Assembly Layout—CE Compliant

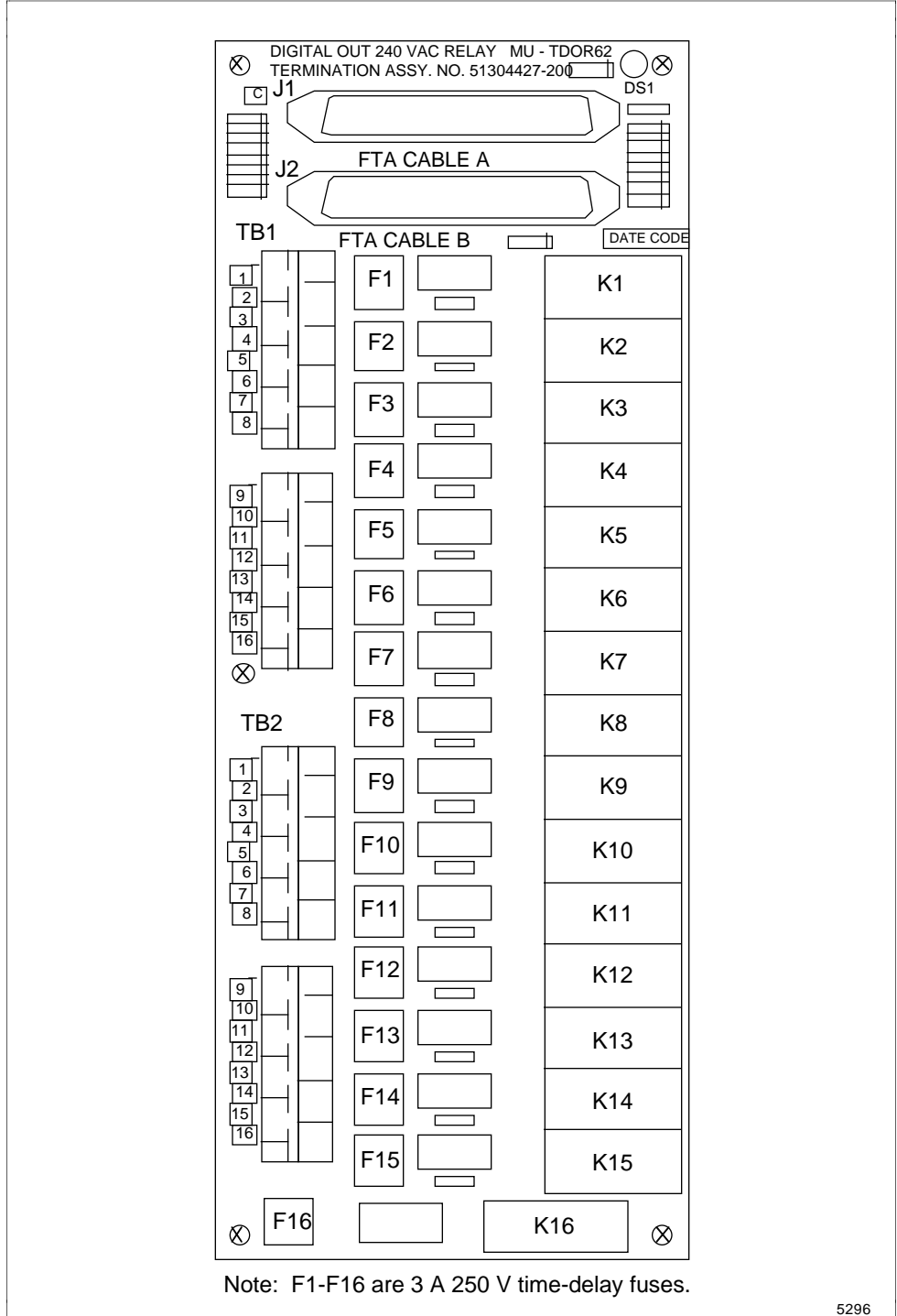


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5.8.1 Model MU-TDOR22/62 FTAs, Continued

Model MU-TDOR62 FTA assembly layout

Figure 5-49 Model MU-TDOR62 240 Vac/125 Vdc Relay Digital Output FTA Assembly Layout—Non-CE Compliant

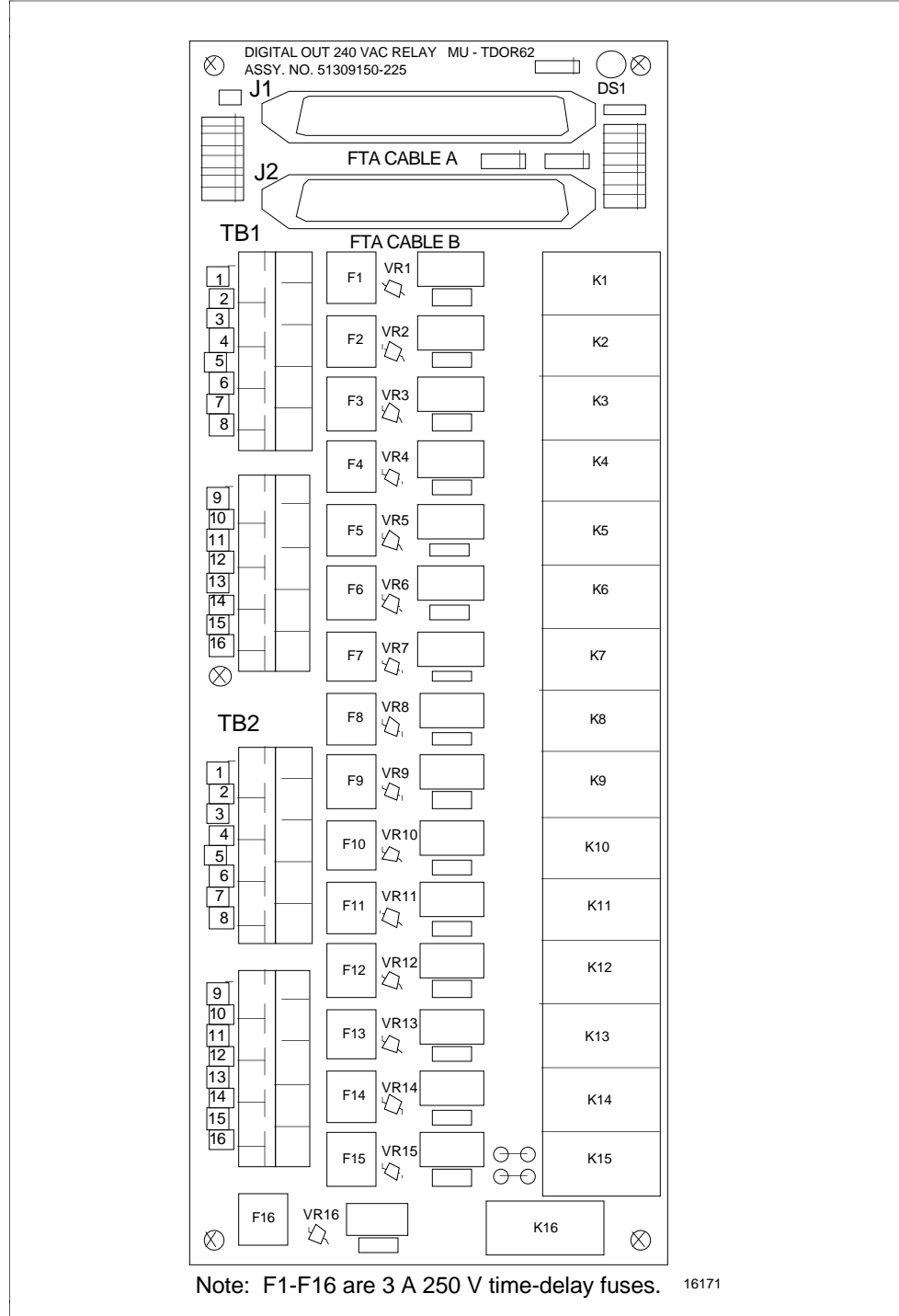


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5.8.1 Model MU-TDOR22/62 FTAs, Continued

Model MU-TDOR62 FTA assembly layout

Figure 5-50 Model MU-TDOR62 240 Vac/125 Vdc Relay Digital Output FTA Assembly Layout—CE Compliant



5.8.2 Model MU-TDOY23/63 FTAs



CAUTION, RISK OF ELECTRIC SHOCK

Assembly connection and layout diagrams

Figure 5-52 is a connection diagram for the compression terminal-type model MU-TDOY23 FTA. Figure 5-53 is a connection diagram for the screw terminal-type model MU-TDOY63 FTA.

Figures 5-54 and 5-55 show the assembly layout for the model MU-TDOY23 and MU-TDOY63 FTAs, respectively.

IOP compatibility

The model MU-TDOY23 and MU-TDOY63 FTAs are compatible with the model MU-PDOY22 IOP only. The model MU-PDOX01 and MU-PDOX02 Digital Output IOPs are not compatible with these FTAs. Do not mismatch Digital Output IOPs.

32 point IOP

The model MU-PDOY22 IOP supports 32 points (output circuits). Because the model MU-TDOY23 and MU-TDOY63 FTAs provide only 16 output circuits, two FTAs must be used for the IOP's 32-point capability.

FTA bridge cable

An interface between the FTAs is provided by a bridge cable. Two lengths, model MU-KBFT01 (1.0 meter) or model MU-KBFT02 (2 meters), are available. The Honeywell part numbers are 80366198-100 and 80366198-200, respectively. J3 is the FTA bridge connector.

Channel assignments

Connect the IOP, or IOPs when redundant, to only one FTA. The FTA selected is assigned channels 1 through 16 by the IOP. The "bridged" FTA is assigned channels 17 through 32.

Normally open/closed relay contact selection

The orientation of a wire jumper on the FTA for each relay, K1 (channel 1 or 17) through K16 (channel 16 or 32), determines the relay's normal (deenergized) contact output to the channel's field terminals. The jumper positioners are designated P20 through P35, respectively. When the jumper is positioned horizontally, the normally open (NO) relay contacts are selected. If the jumper is positioned vertically, the relay's normally closed (NC) contacts are connected to the channel's field terminals. The connection diagrams, Figures 5-52 and 5-53, illustrate examples of the relay contact selection.

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5.8.2 Model MU-TDOY23/63 FTAs, Continued

Reverse voltage suppression

The FTA offers optional reverse voltage suppression when the relay output load includes a large inductance. It can be selected individually for each channel by inserting a jumper in positions P1 through P16 for channels 1 through 16 (17 through 36), respectively. Installing the jumper places a resistor-capacitor (RC) network across the relay contacts.

ATTENTION

ATTENTION—The bare-wire jumpers are easily inserted by using long nose pliers, but only when no load power is present at the FTA terminals.

FTA configuration pinning

Because the model MU-PDOY22 IOP supports 32 channels and the FTA supports only 16 channels, a method of pinning is provided to signal the IOP(s) that an FTA is present or absent.

FTA Missing status

In a configuration where two FTAs are required, the “FTA Missing” status must be detected when only one FTA is present; however, in a configuration where only one FTA is required, the “FTA Missing” status must not be detected when only one FTA is present. A pinning method on the FTA(s) signals whether one or two FTA are required.

Four jumper positions are provided on the FTA to indicate the FTA configuration. The jumper positions are P17, P18, P19, and P36. The jumper combinations are listed in Table 5-11.

Table 5-11 Model MU-TDOY23/63 FTA Configuration Jumper Selection

	Single FTA Configuration (Position Selection)	Dual FTA Configuration (Position Selection)
FTA 1	P17 and P18	P19 and P36
FTA 2	None	P17 and P18

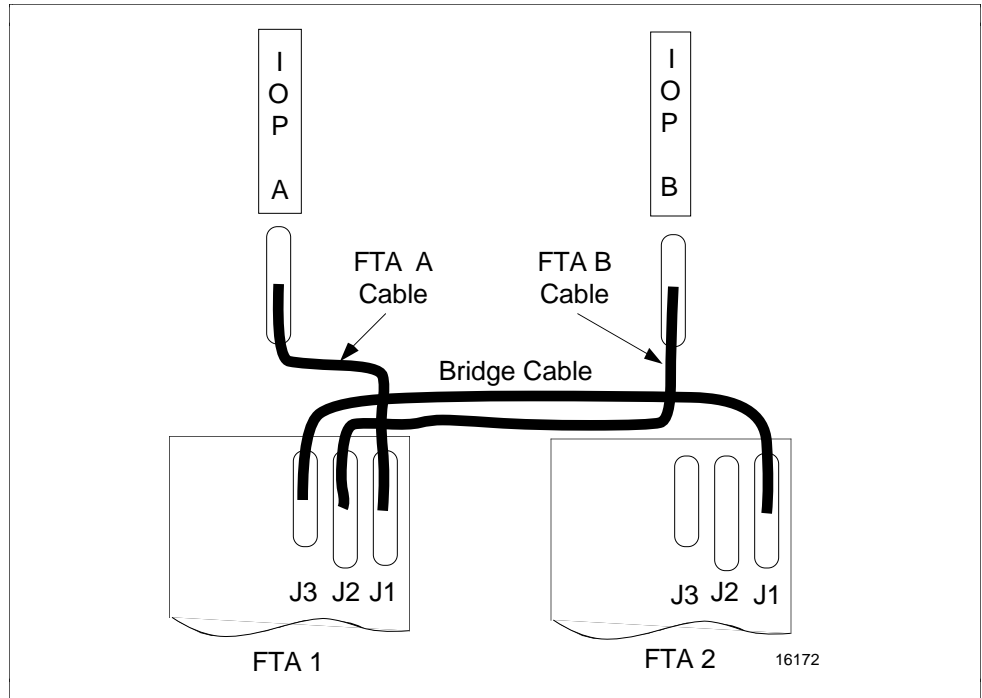
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5.8.2 Model MU-TDOY23/63 FTAs, Continued

FTA cabling diagram

Figure 5-51 is a typical IOP to FTA cabling diagram. When FTA Cable A is disconnected, IOP A detects an “FTA Missing” status. When FTA Cable B is disconnected, IOP B detects an “FTA Missing” status. When the bridge cable is disconnected in a dual FTA configuration, both IOP A and IOP B detect an “FTA Missing” status. IOP B must be configured as redundant to detect an “FTA Missing” status.

Figure 5-51 Model MU-TDOY23/63 FTA Cabling Diagram

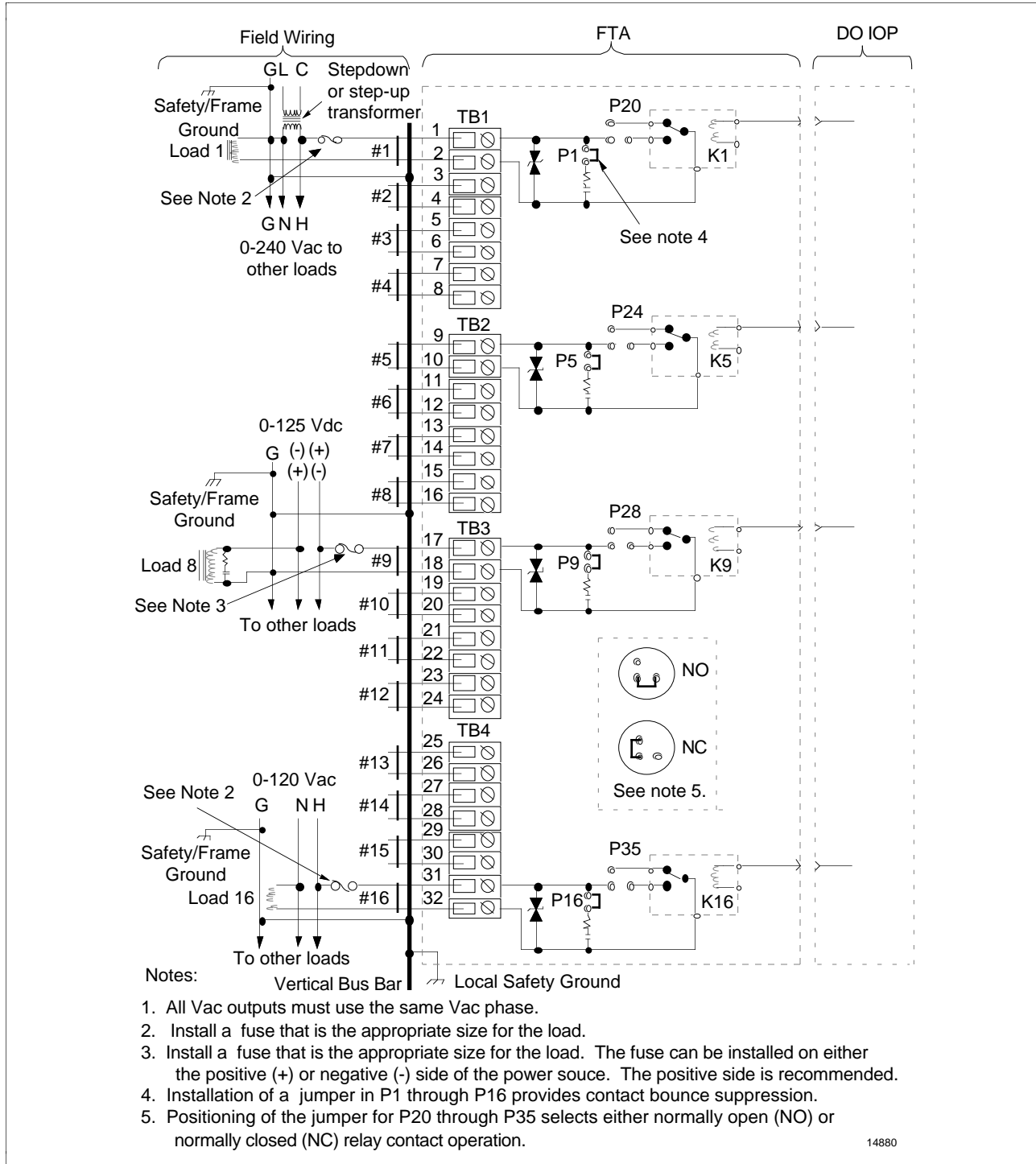


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5.8.2 Model MU-TDOY23/63 FTAs, Continued

Model MU-TDOY23 connection diagram

Figure 5-52 Model MU-TDOY23 240 Vac/125 Vdc Relay Digital Output FTA Connection Diagram

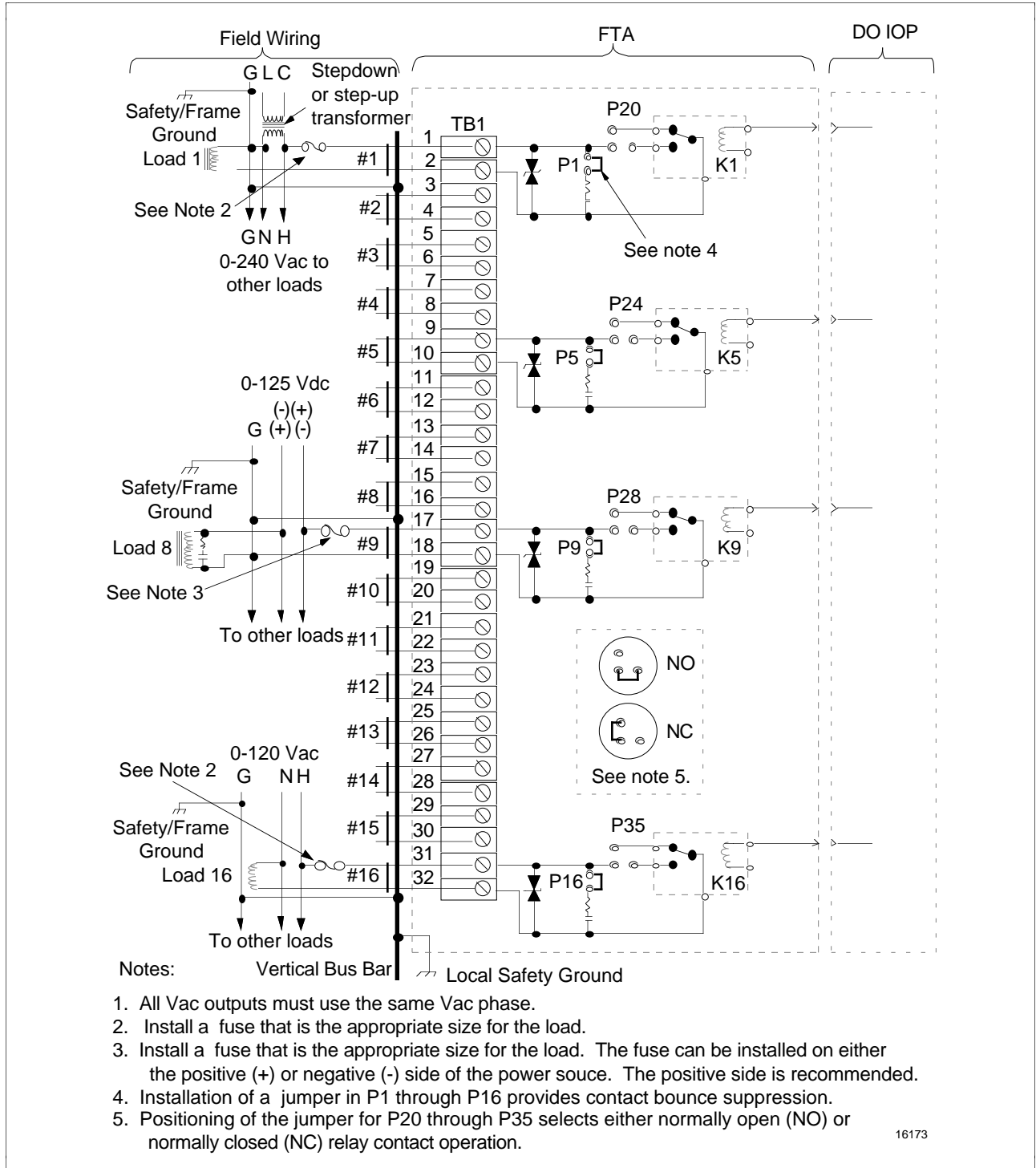


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5.8.2 Model MU-TDOY23/63 FTAs, Continued

Model MU-TDOY63 connection diagram

Figure 5-53 Model MU-TDOY63 240 Vac/125 Vdc Relay Digital Output FTA
Connection Diagram

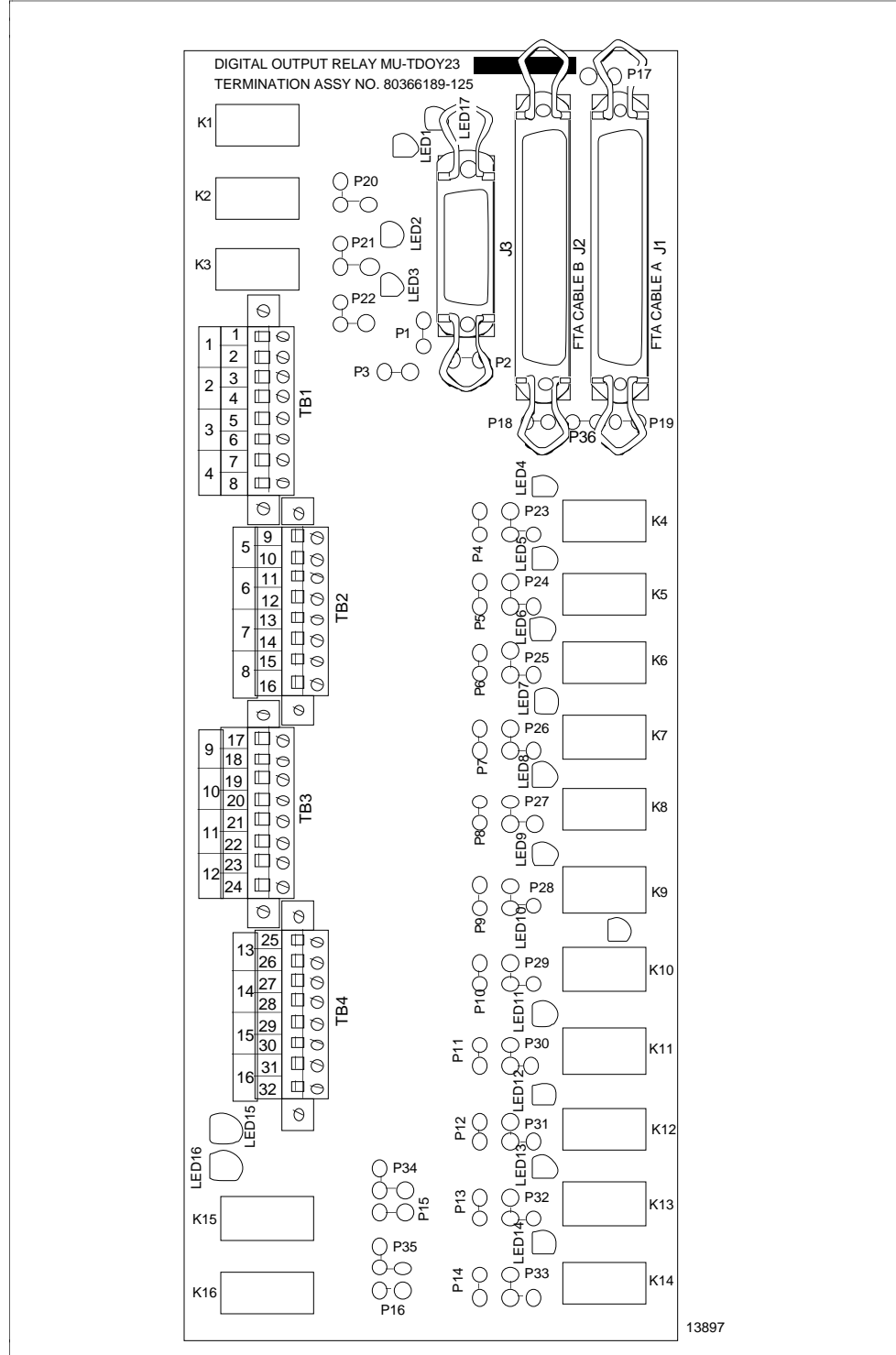


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5.8.2 Model MU-TDOY23/63 FTAs, Continued

Model MU-TDOY23 assembly layout

Figure 5-54 Model MU-TDOY23 240 Vac/125 Vdc Relay FTA
Digital Output FTA Assembly Layout

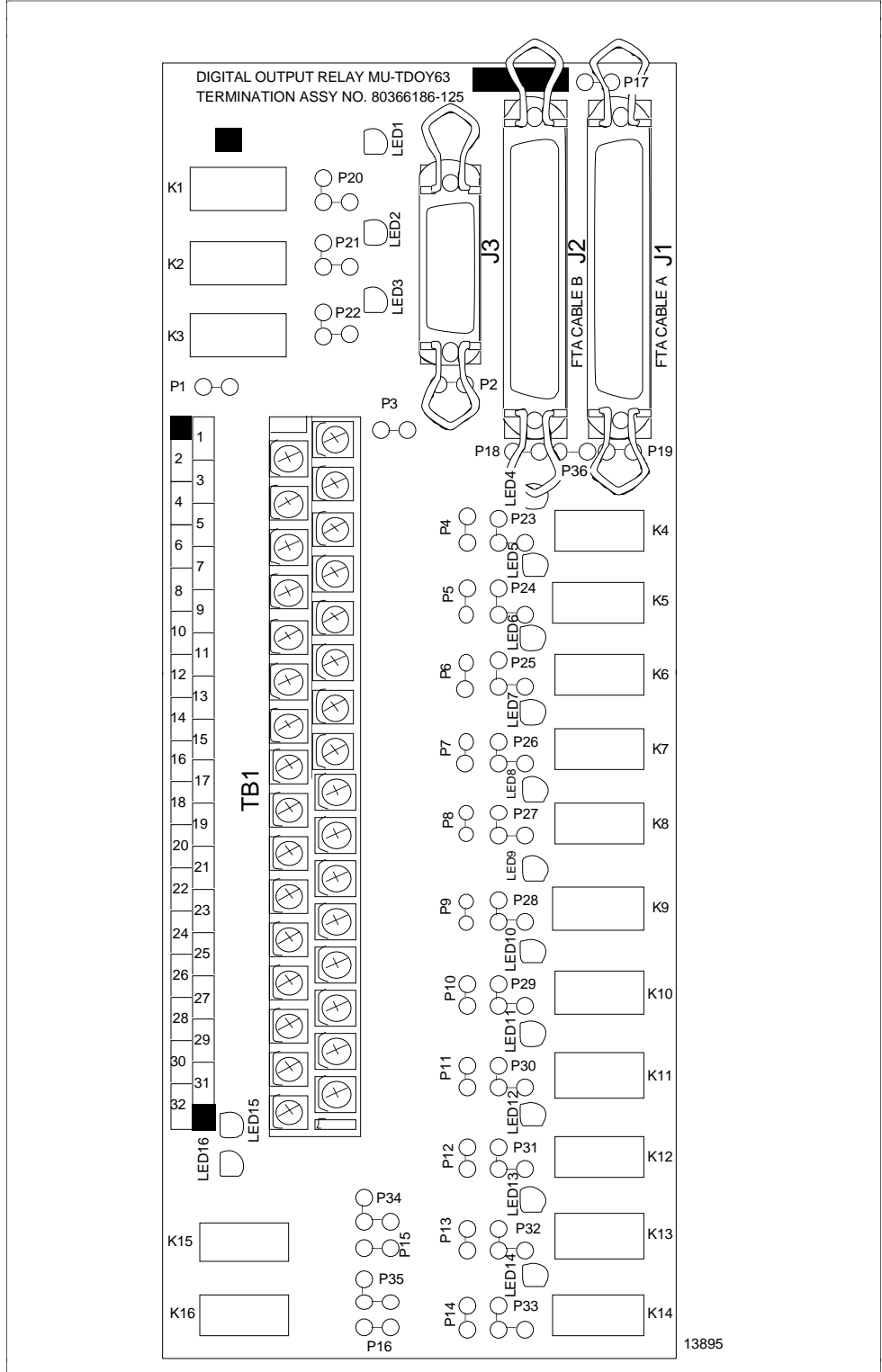


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5.8.2 Model MU-TDOY23/63 FTAs, Continued

Model MU-TDOY63 assembly layout

Figure 5-55 Model MU-TDOY63 240 Vac/125 Vdc Relay FTA
Digital Output FTA Assembly Layout



5.8.3 Contact Arc Suppressor Selection

Introduction

Calculation for a resistor-capacitor contact arc suppressor is as follows:

Let I_p be the contact current immediately before opening, either average dc or peak ac.

Let E_p be the supply voltage before the closing of the contacts, either average dc or peak ac.

Capacitor selection formula

Calculate the suppression capacitor C from the formula:

$$C = I_p^2 / 10 \text{ microfarads}$$

The current used in the calculation should be reduced by 1 ampere (120 Vac FTA) or 0.5 ampere (240 Vac FTA) because the suppression circuit on the FTA already accommodates this level. Should a capacitance less than 0.001 microfarads be calculated, use 0.001 microfarads instead.

Resistor selection formula

Calculate the suppression resistor R from the formula

$$R = E_p / (10 \times I_p (1 + 50/E_p)) \text{ ohms}$$

As above, deduct 0.5 ampere before performing the calculation because the suppression circuit on the FTA already accommodates this level. Should a resistance of less than 0.5 ohms be calculated, use 0.5 ohms instead.

An example

A 2-ampere ac rms 240 Vac load has a peak current of $2 \times \sqrt{2} = 2.83$ amperes. Because the FTA already has 0.5 ampere peak of contact suppression on the FTA, calculate the suppressor for $2.83 - 0.5 = 2.33$ amperes. The peak voltage for 240 Vac is $240 \times \sqrt{2} = 339$ volts.

$$\begin{aligned} C &= 2.33^2 / 10 \\ &= 0.54 \text{ microfarad} \end{aligned}$$

$$\begin{aligned} R &= 339 / (10 \times 2.33 (1 + 50/339)) \\ &= 12.85 \text{ ohms} \end{aligned}$$

Install the arc suppressor across the FTA terminals to protect the relay contacts from excessive arcing.

Section 6 – Miscellaneous FTA Installation

6.1 Overview

Section contents The topics covered in this section are:

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Purpose

This section provides information necessary for the proper installation of miscellaneous Field Termination Assemblies (FTAs). If required for configuration or other purposes, supporting assemblies, such as Input/Output Processors (IOPs), are also included in the installation procedure discussion.

6.2 Pulse Input (PI) FTAs

CE Compliance

Some Pulse Input (DI) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. The CE Compliant assemblies are identified by a part number tab number that ends in “25” or “75.” They do not have a unique model number.

CE Compliant FTAs have an FTA connector with a grounded body that accepts the CE Compliant model MU-KFTSxx IOP to FTA cable. If the FTA is remotely mounted in a CE Compliant environment (external to the cabinet), then the use of the model MU-KFTSxx IOP to FTA cable is mandatory.

PI FTAs and IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 6-1.

Table 6-1 Pulse Input FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TPIX12	Pulse Input FTA with Compression Terminals	51304084-100	51304084-125
MC-TPIX12	Pulse Input FTA with Compression Terminals Conformally Coated	51304084-150	51304084-175
MU-TPIX52	Pulse Input FTA with Screw Terminals	51304084-200	51304084-225
MC-TPIX52	Pulse Input FTA with Screw Terminals Conformally Coated	51304084-250	51304084-275
MU-PPIX02	Pulse Input IOP	N/A	51304386-100
MC-PPIX02	Pulse Input IOP – Conformally Coated	N/A	51304386-150

Description

The Pulse Input FTA accepts up to eight input sensors. It is compatible with 2-wire or 3-wire (self-powered) devices. Figure 6-1 is a connection diagram for the compression terminal-type model MU-TPIX12 FTA. Figure 6-2 is a connection diagram for the screw terminal-type model MU-TPIX52 FTA. Both models presently support only a nonredundant application. Each channel has the following four dedicated terminals in the following order on the FTA terminal connectors:

- Sensor power output (24 Vdc nominal)
- Positive input
- Negative (common) input
- Cable shield connection

Continued on next page

6.2 Pulse Input (PI) FTAs, Continued

Self-powered 2-wire sensor

Connect the positive and negative outputs of a self-powered 2-wire sensor that requires no pullup resistors to the corresponding FTA inputs. For example, connect the positive lead of the sensor to TB1-6 and the common lead to TB1-7 for channel 2. Connect the cable shield to TB1-8.

FTA current sink configuration selection

The jumper, **W2** on the FTA, must be installed if the transmitter can sink the available amount of current. See the assembly layouts, Figures 6-3 and 6-4, as an aid in locating jumpers **W1-W8** on the model MU-TPIX12 and MU-TPIX52 FTAs, respectively.

A self-powered 2-wire sensor (for example; contact closure, open collector) would be connected in the same way and the corresponding jumper must be installed.

See the *Process Manager I/O Specification and Technical Data* manual for additional information.

3-wire sensor

A 3-wire sensor must have its power input lead connected to the corresponding sensor power output terminal (for example, TB-1 in Figure 6-1) on the FTA. The other signal connections are the same as a 2-wire sensor above.

Pull-down loads

SP1-SP8, 3.6 kohm pull-down loads, can be installed on the FTA to accommodate open emitter devices. This is a factory special order and the resistors will not be installed on the standard FTA. Installation of the pull-down(s) must be requested when the FTA is ordered.

Shielded twisted-pair cable

Transmitter signals must use a shielded twisted-pair cable. Shield connections can be daisy-chained between FTAs and tied to the local Master Reference Ground (MRG) at a single point.

Self-powered transmitter

A self-powered transmitter must have either a floating power source or be referenced only to the subsystem's logic common.

CAUTION

CAUTION—Sine wave signals must not be mixed on the same FTA with square waves or contact closures.

Pullup resistor use

The use of FTA pullup resistors is recommended at all inputs driven by a transmitter that can sink the available current and at all unused channel inputs. See the *Process Manager I/O Specification and Technical Data* manual for the amount of current supplied by the pullup resistor.

Continued on next page

6.2 Pulse Input (PI) FTAs, Continued

Critical inputs

For critical inputs, a transmitter that permits the use of a pullup resistor is recommended. It must be capable of sinking the current. The use of a pullup resistor aids in detection of a bad PV. See the *Process Manager I/O Specification and Technical Data* manual for the amount of current supplied by the pullup resistor.

Frequency range filter selection

The FTA provides basic analog filtering and some amount of noise immunity. There are eight jumpers, one for each channel on the Pulse Input IOP card that provide the user with additional selective frequency filtering for each input signal. The three jumper-selectable frequency ranges are 1 kHz, 10 kHz, and 20 kHz. The 20 kHz frequency range is the default (storage position) selection. See Figure 6-5 for assistance in locating the jumpers and in implementing the filtering selection.

WARNING

WARNING—Incorrect filter frequency range selection may inadvertently block the desired pulse input signal. Contact your Honeywell Technical Representative for advice in the selection of the proper frequency range jumper position for each active input channel.

Unacceptable noise filtering

Filtering should be used if an unacceptable amount of noise is present.

Less than 1 kHz input

The “L” or 1 kHz position provides the most filtering, but should be used only when transmitter signals are lower than 1 kHz in frequency, or pulse on/off dwell times are greater than 500 microseconds.

Less than 10 kHz input

The “H” or 10 kHz position provides less filtering than the “L” position, but should be used only when the transmitter signals are lower than 10 kHz in frequency, or pulse on/off dwell times are greater than 50 microseconds.

Less than 20 kHz input

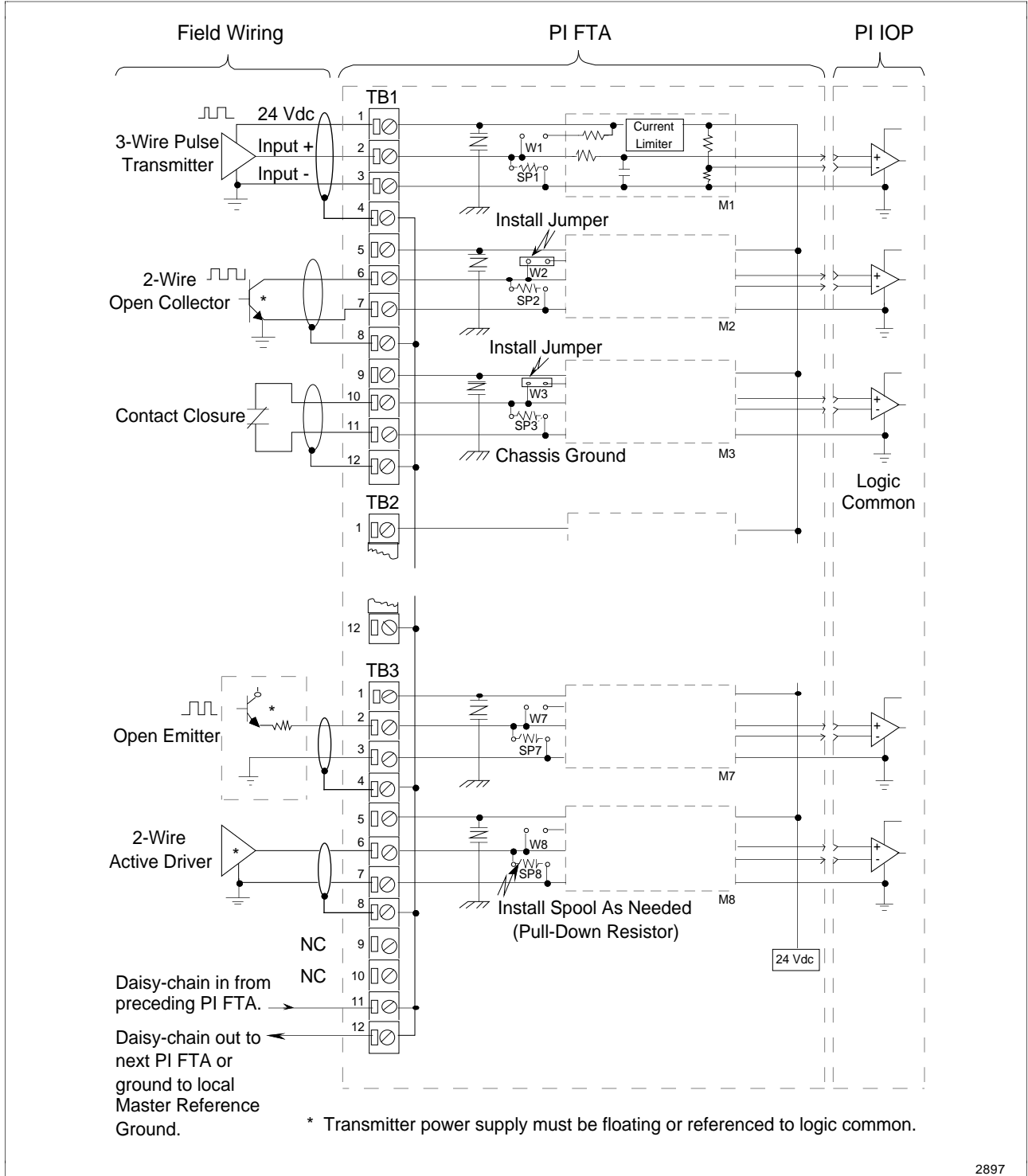
The default position allows operation at the maximum frequency, 20 kHz. Internal filters on the IOP provide noise suppression above 20 kHz. See the parameter specifications in the *Process Manager I/O Specification and Technical Data* manual.

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6.2 Pulse Input (PI) FTAs, Continued

Model MU-TPIX12 connection diagram

Figure 6-1 Model MU-TPIX12 Pulse Input FTA Connection Diagram



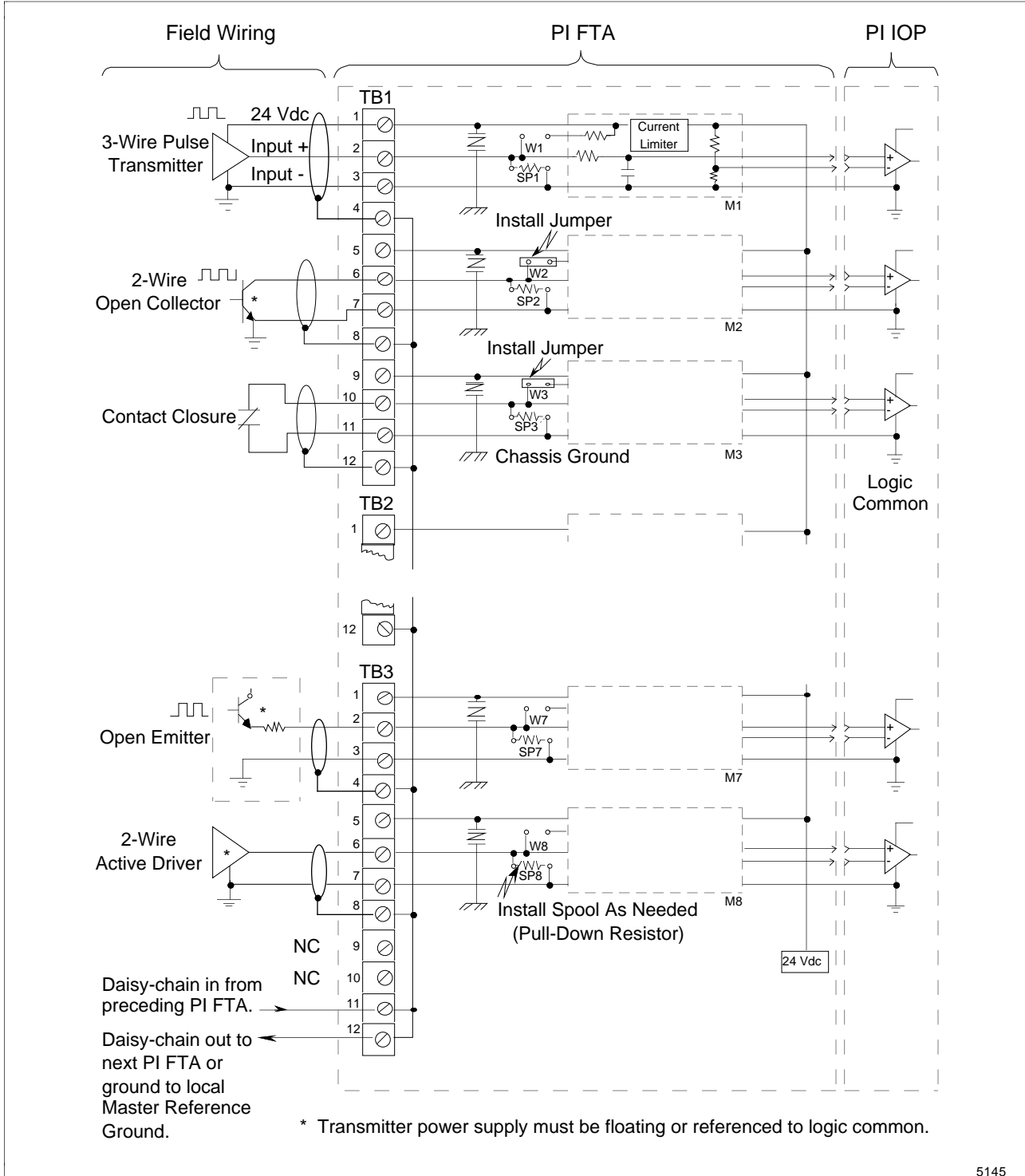
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6.2 Pulse Input (PI) FTAs, Continued

Model MU-TPIX52 connection diagram

Figure 6-2 Model MU-TPIX52 Pulse Input FTA Connection Diagram



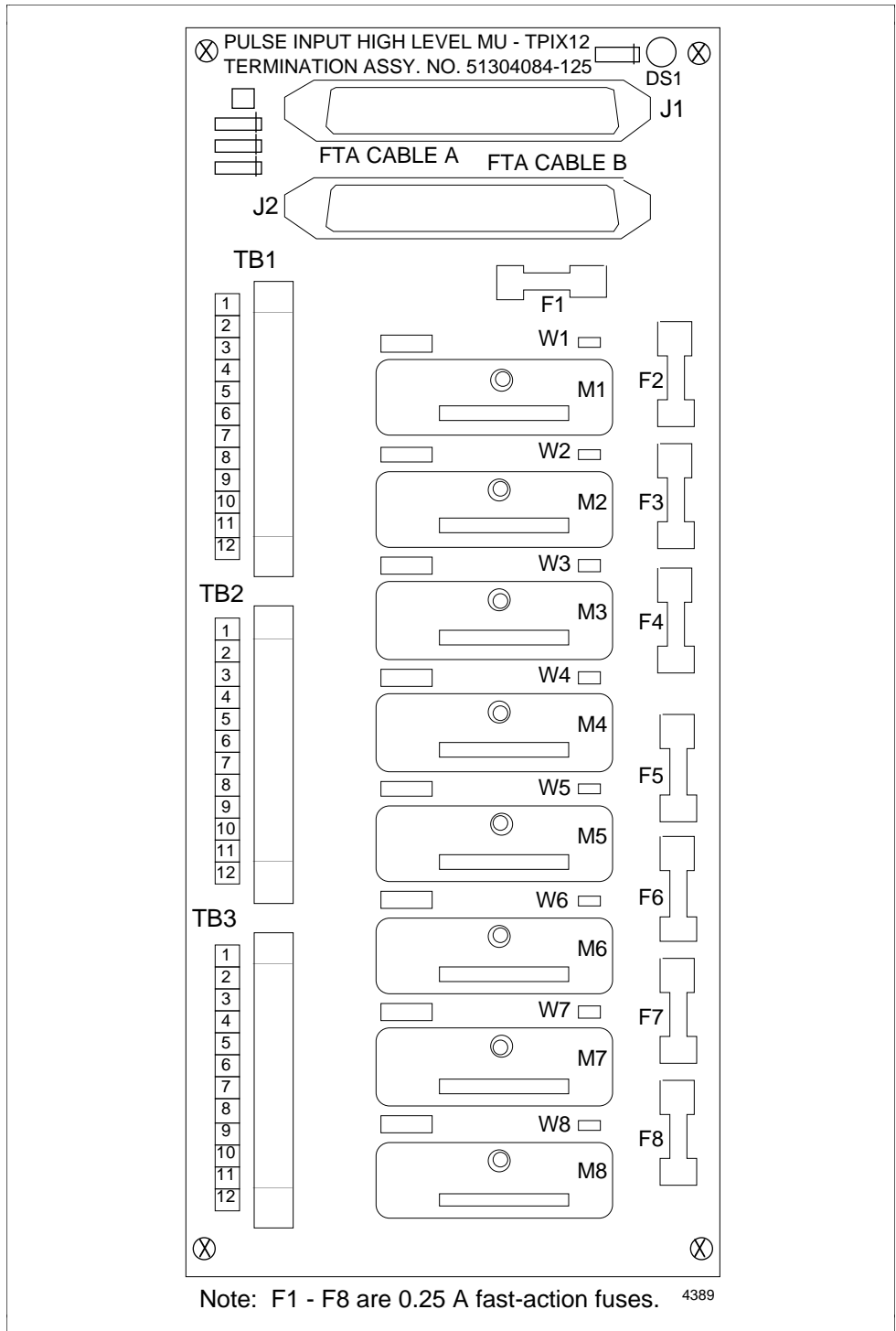
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6.2 Pulse Input (PI) FTAs, Continued

Model MU-TPIX12 assembly layout

Figure 6-3 Model MU-TPIX12 Pulse Input FTA Assembly Layout

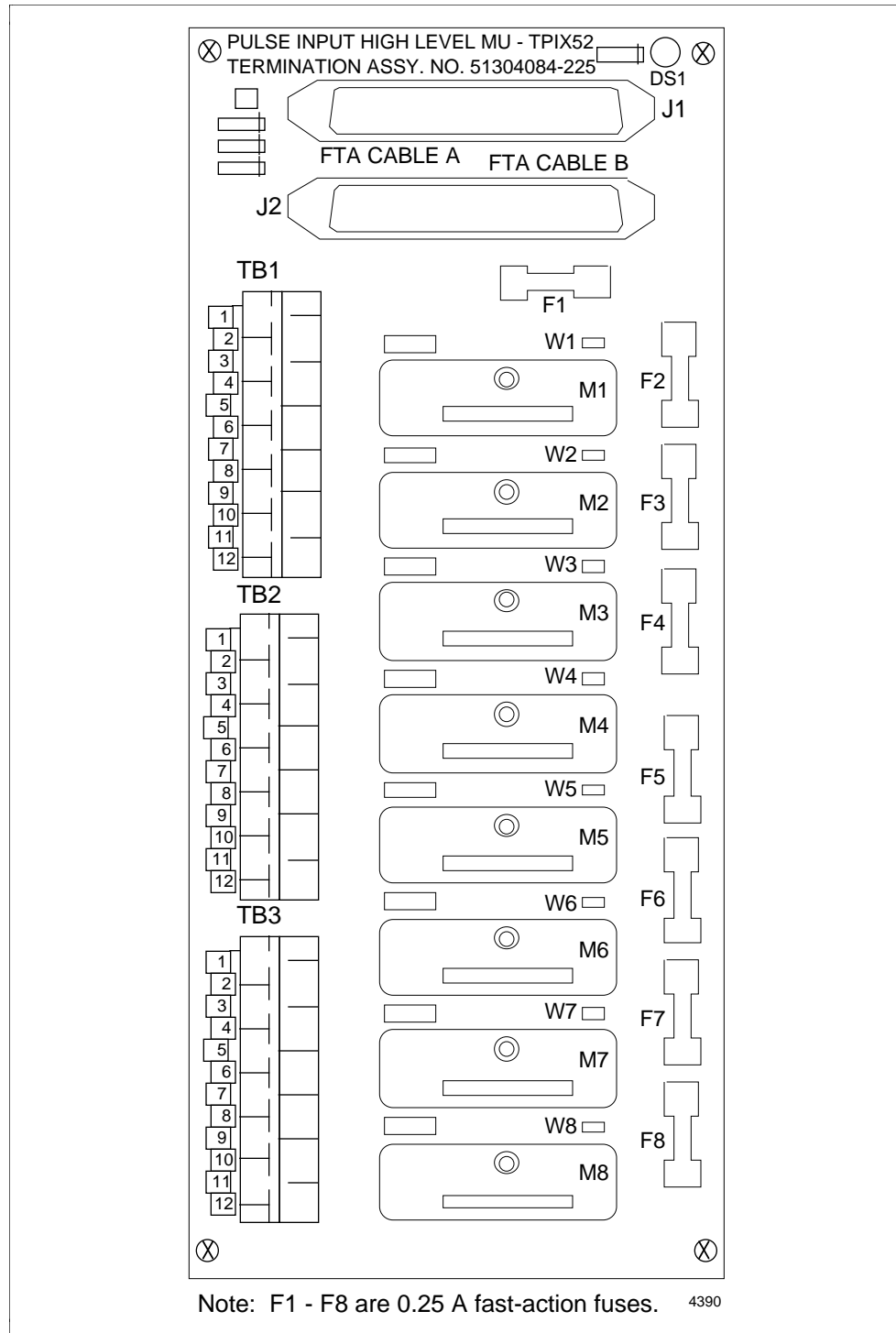


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6.2 Pulse Input (PI) FTAs, Continued

Model MU-TPIX52
assembly layout

Figure 6-4 Model MU-TPIX52 Pulse Input FTA Assembly Layout

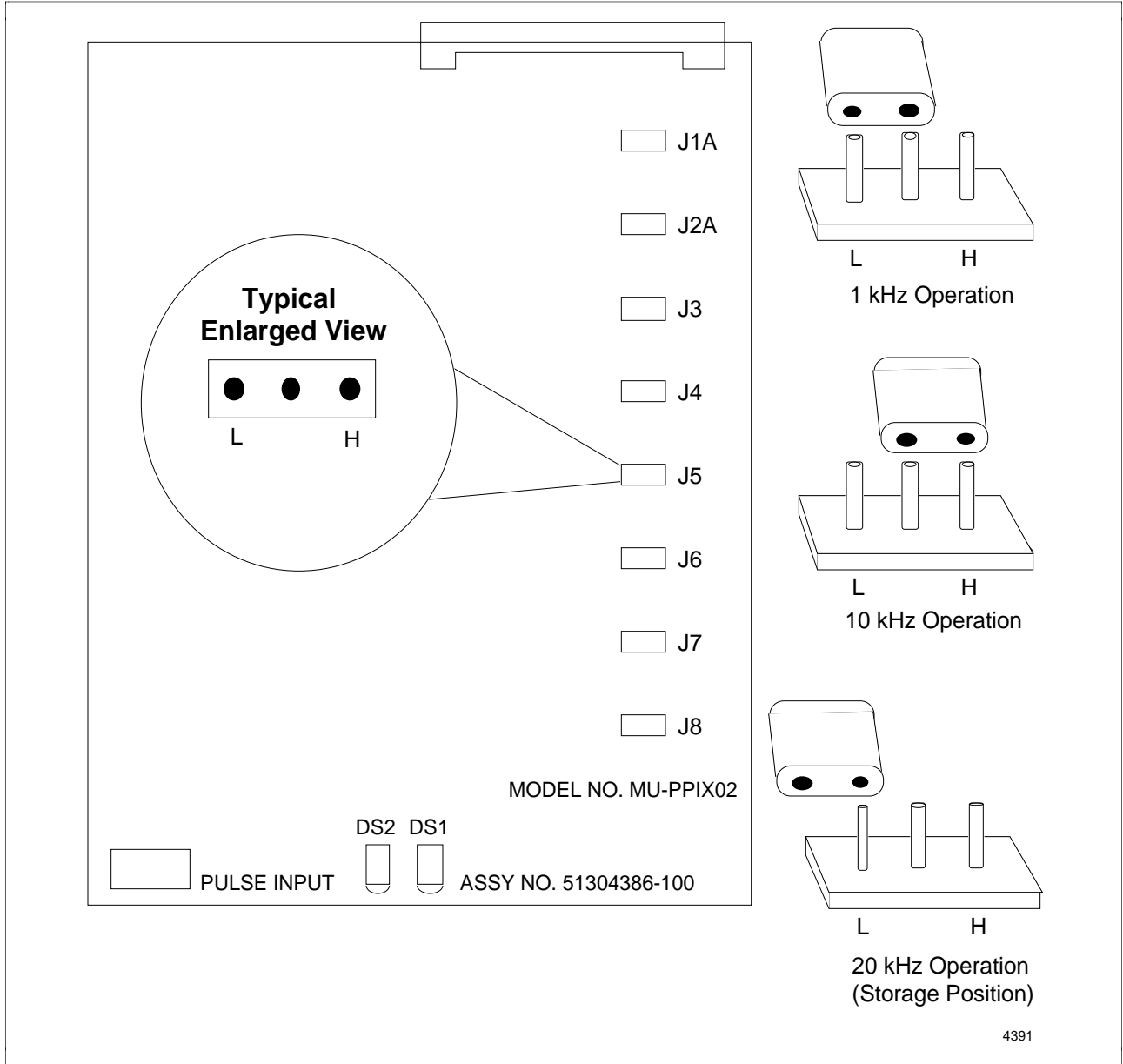


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6.2 Pulse Input (PI) FTAs, Continued

Model MU-PPIX02 assembly layout

Figure 6-5 Model MU-PPIX02 Pulse Input IOP Pinning



6.3 Serial Device Interface (SDI) FTAs

CE Compliance None of the Serial Device Interface FTA models are CE Compliant.

SDI FTAs and IOPs Table 6-2 is a list of Serial Device Interface FTA models.

Table 6-2 Serial Device Interface FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TSDT02	Serial Device Interface FTA—Toledo 8142	51303932-201	N/A
MC-TSDT02	Serial Device Interface FTA—Toledo 8142 Conformally Coated	51303932-251	N/A
MU-TSDM02	Serial Device Interface FTA—Manual/Auto Station	51303932-202	N/A
MC-TSDM02	Serial Device Interface FTA—Manual/Auto Station Conformally Coated	51303932-252	N/A
MU-TSDU02	Serial Device Interface FTA—UDC 6000	51303932-203	N/A
MC-TSDU02	Serial Device Interface FTA—UDC 6000 Conformally Coated	51303932-253	N/A
MU-PSDX02	Serial Interface Device IOP	51304362-200	N/A
MC-PSDX02	Serial Interface Device IOP—Conformally Coated	51304362-250	N/A

Introduction This subsection provides instructions for the installation of the Serial Device Interface, which is composed of a Serial Device Interface IOP, Power Adapter, and one or two Serial Device Interface FTAs. Figure 6-6 illustrates a typical Serial Device Interface installation.

Description The Serial Device Interface FTA provides both EIA-232 (RS-232) and EIA-422/485 (RS-422/485) interfaces for asynchronous serial communications devices. The firmware resident in the plug-in module, M1, on the FTA is preprogrammed at the factory to accommodate the associated IOP and the selected communications interface-type, EIA-232 or EIA-422/485.

A single Serial Device Interface IOP supports two serial channels through the Power Adapter. One or two Serial Device Interface FTAs can be connected to the Power Adapter.

ATTENTION

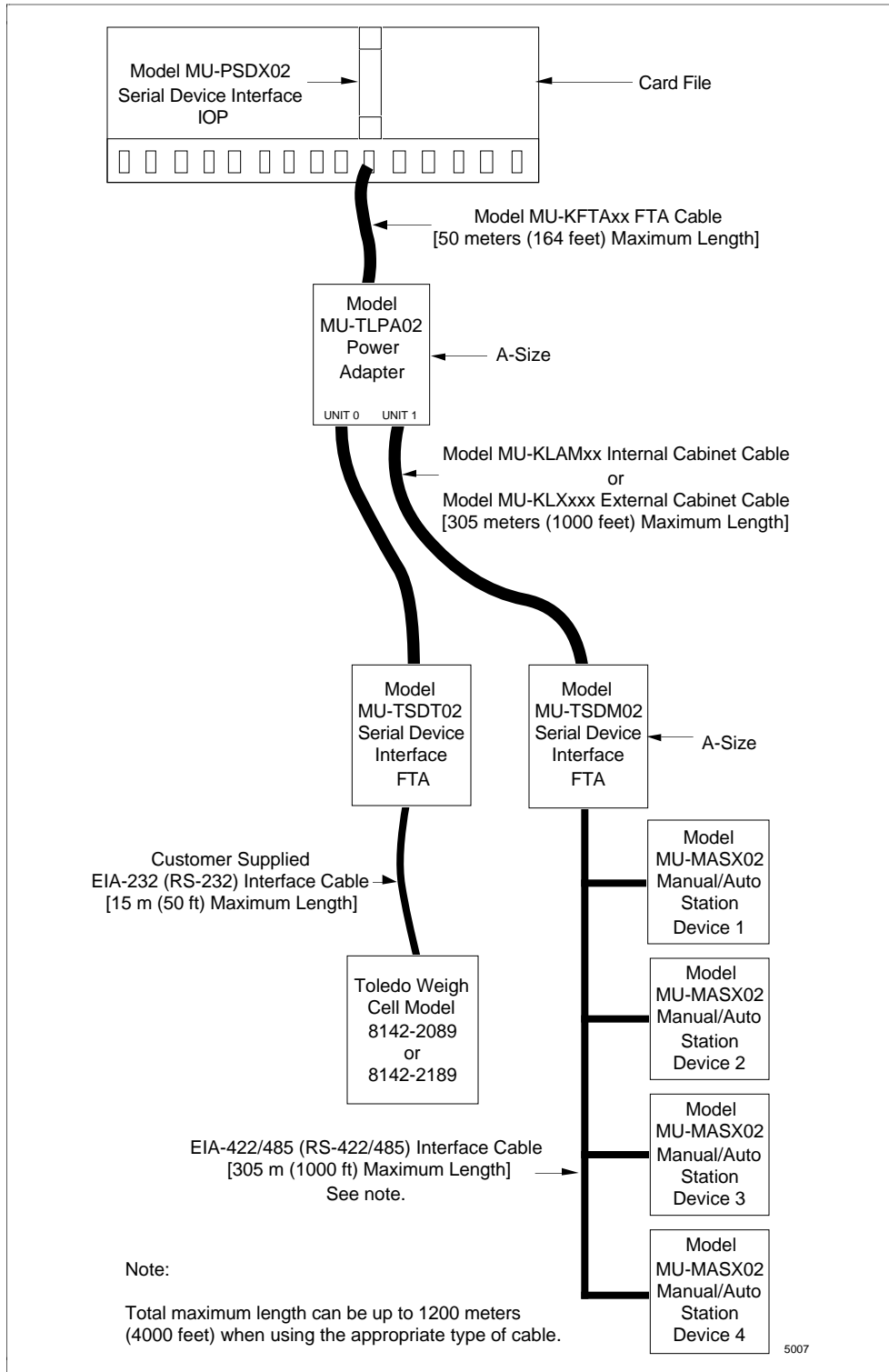
ATTENTION—The EIA-422/485 interface can be configured as a multidrop interface in which several peripheral devices can be connected as shown in Figure 6-6.

Continued on next page

6.3 Serial Device Interface (SDI) FTAs, Continued

Typical SDI installation

Figure 6-6 Typical Serial Device Interface Installation



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6.3 Serial Device Interface (SDI) FTAs, Continued

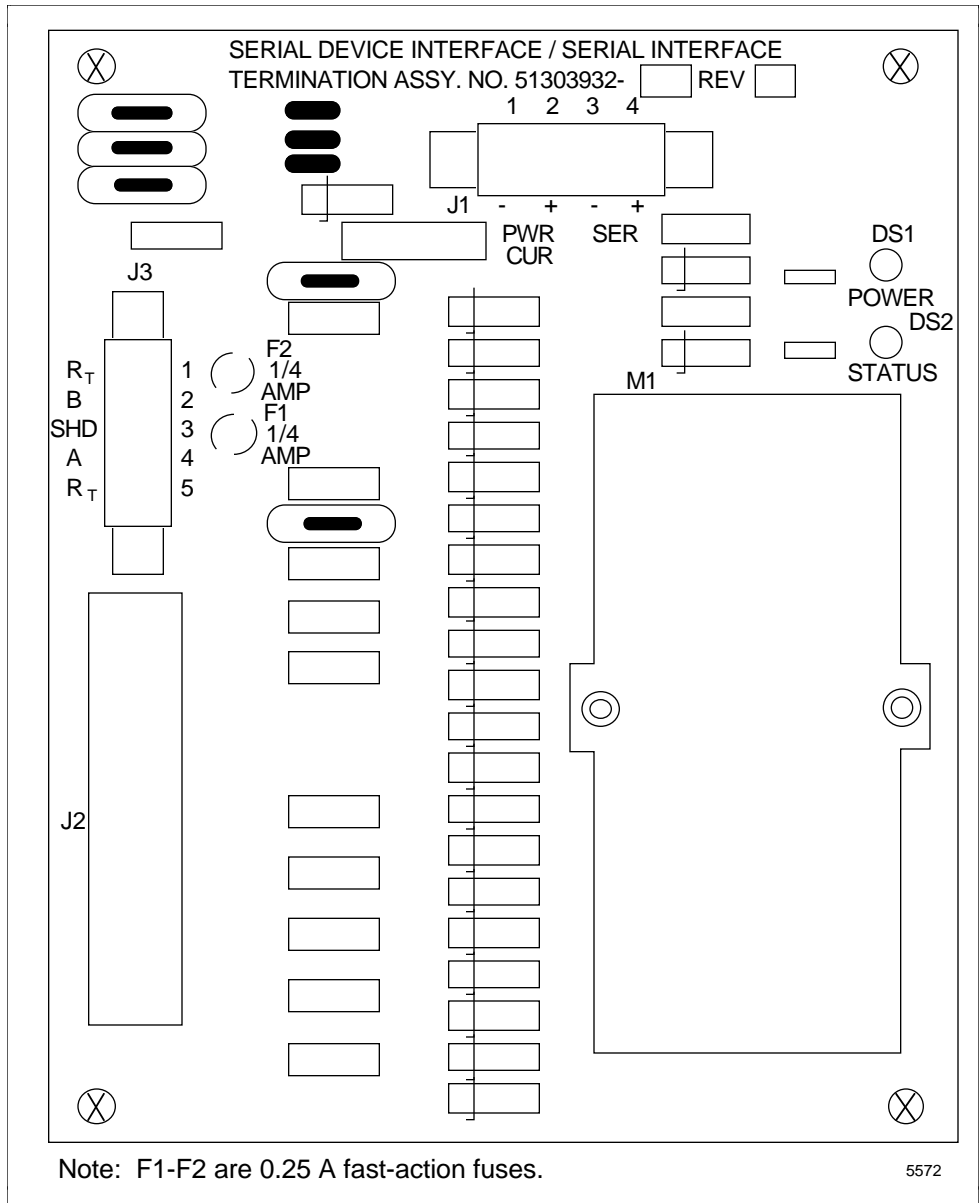
Two types of serial interfaces	Two Serial Device Interface FTAs can be connected to a single Serial Device Interface IOP through the Power Adapter. Each Serial Device Interface FTA has a single asynchronous serial communications interface that supports standards EIA-232 (RS-232) or EIA-422/485 (RS-422/485), using either a DB-25 or a 5-terminal compression connector, respectively. Figure 6-7 illustrates the assembly layout of the Serial Device Interface/Serial Interface FTA.
IOP placement	The model MU-PSDX02 Serial Device Interface IOP can be installed in any card file slot.
FTA size	The FTA is an A-size (6-inch) FTA and installs on a standard FTA Mounting Channel.
Power Adapter	The model MU-TLPA02 Power Adapter is the same size as an A-size (6-inch) FTA and installs on a standard FTA Mounting Channel.
Grounding rules	If the Power Adapter or the Serial Device Interface FTA is installed external to the cabinet, proper grounding and mounting rules must be observed. Refer to Section 9 for the recommended method of mounting and grounding the FTA.
IOP to Power Adapter interface	The IOP to Power Adapter connection is made using a model MU-KFTAxx cable (the suffix “xx” represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as shown in Figure 6-6.
FTA placement	<p>The Serial Device Interface FTA can be installed in the same cabinet as the Serial Device Interface IOP, or externally up to 305 meters (1000 feet) from the Power Adapter by using model MU-KLXxxx cable (the suffix “xxx” represents the length of the cable in meters).</p> <p>Use a model MU-KLAMxx cable (the suffix “xx” represents the length of the cable in centimeters) when installing the FTA inside the cabinet.</p>
Cable length availability	See the <i>Process Manager/Advanced Process Manager Service</i> or <i>High-Performance Process Manager Service</i> or <i>High-Performance Process Manager Service</i> manual manual for cable lengths.

Continued on next page

6.3 Serial Device Interface (SDI) FTAs, Continued

SDI FTA assembly layout

Figure 6-7 Serial Device Interface FTA Assembly Layout



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6.3 Serial Device Interface (SDI) FTAs, Continued

Three FTA interfaces

The Serial Device Interface FTA's three interfaces, Power Adapter, EIA-422/485 (RS-422/485), and EIA-232 (RS-232) are defined in Tables 6-3, 6-4, and 6-5, respectively.

FTA to Power Adapter interface

Table 6-3 J1—Serial Device Interface FTA to Power Adapter Interface

Interface Terminal	Description
1	Power Current (-)
2	Power Current (+)
3	Serial (-)
4	Serial (+)

EIA-422/485 interface

Table 6-4 J3—Serial Device Interface FTA EIA-422/485 Interface

Connector Terminal	Description
1, 5	R _T (Termination—Install a 120 Ω, 1/2 watt termination resistor between these two terminals.)
2	B (Data +)
3	SHD (Cable Shield)
4	A (Data -)

Continued on next page

6.3 Serial Device Interface (SDI) FTAs, Continued

EIA-232 interface

Table 6-5 J2—Serial Device Interface FTA EIA-232 Interface

Connector Pin	Description
1	Chassis Ground (FG)
2	Transmit Data (TD)
3	Receive Data (RD)
4	Request To Send (RTS)
5	Clear To Send (CTS)
6	Data Set Ready (DSR)
7	Logic Ground (SG)
8	Data Carrier Detect (DCD)
9	Reserved
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	Data Terminal Ready (DTR)
21	
22	
23	
24	
25	

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6.3 Serial Device Interface (SDI) FTAs, Continued

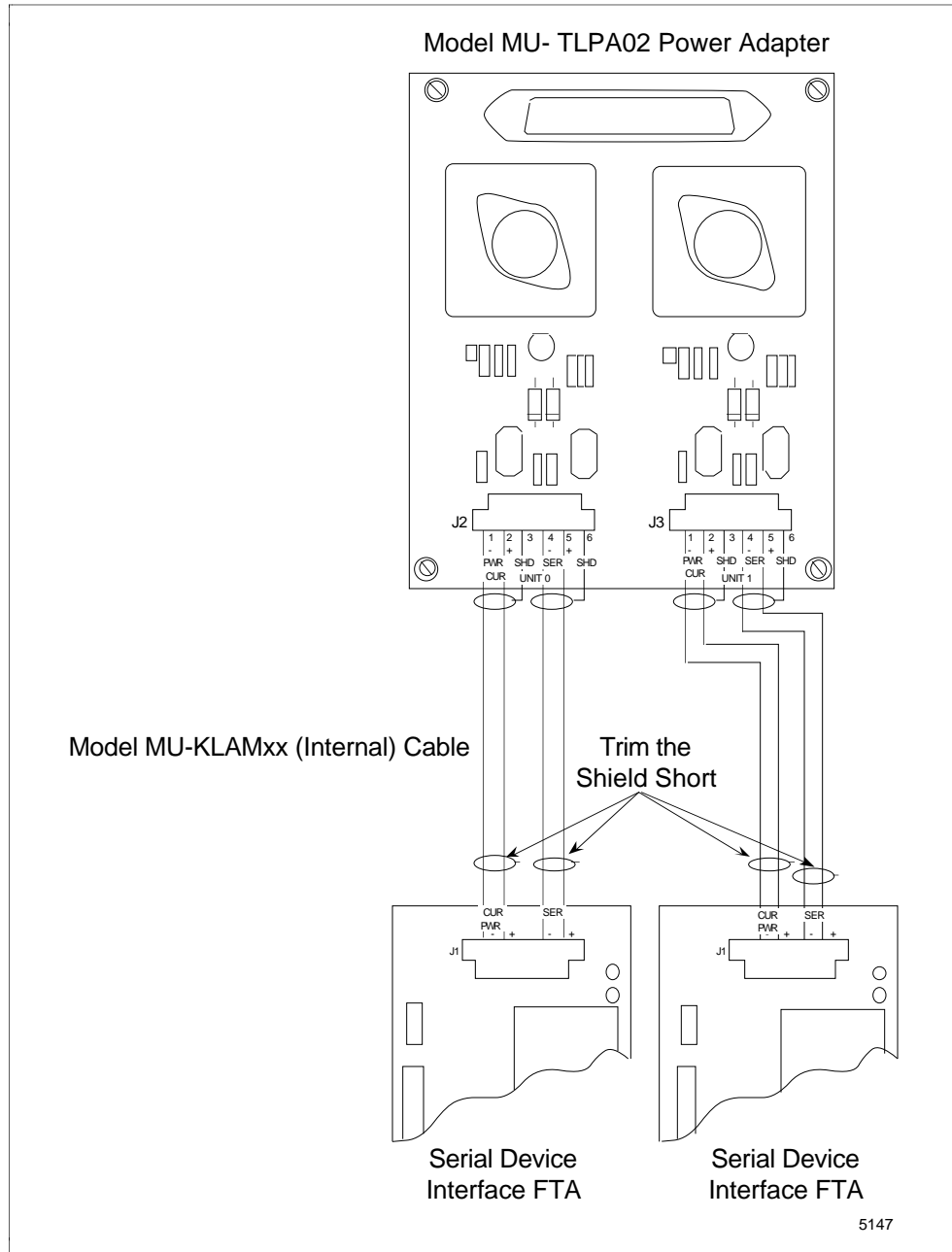
EIA-232 cable length limitation	The EIA-232 cable is limited to a distance of 15 meters (50 feet). The cable must be supplied by the user and terminate in a DB-25 connector.
EIA-422/485 cable length limitation	EIA-422/485 cable is limited to a distance of 305 meters (1000 feet); however, the total length can be 1200 meters (4000 feet) with the appropriate interface cable.
Power Adapter to FTA cable specifications	The model MU-KLAMxx (internal) and model MU-KLXxxx (external) cables have the following specifications.
Model MU-KLAMxx cable	<ul style="list-style-type: none">• Manufacturer Type—Belden 9406• Cable Configuration—Shielded double pair• Flame Resistance Conformity—CSA FT4• CSA Type—CMG• NEC Type—CMG
Model MU-KLXxxx cable	<ul style="list-style-type: none">• Manufacturer Type—Belden 83654• Cable 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
FTA to Power Adapter interface	The Serial Device Interface FTA to Power Adapter connection is made by using either model MU-KLAMxx cable (five lengths, 30, 66, 100, 200, and 300 centimeters for internal cabinet installation) or model MU-KLXxxx cable (three lengths, 76, 152, and 305 meters for external cabinet installation).

Continued on next page

6.3 Serial Device Interface (SDI) FTAs, Continued

Internal cabinet cabling The model MU-KLAMxx cable has two individually shielded, twisted-pair wires. The shield wires must be connected to ground at the Power Adapter end of the cable only. The wire connections are made by using compression terminals in a 6-terminal connector at the Power Adapter end and a 4-terminal connector at the FTA end of the cable as shown in Figure 6-8.

Figure 6-8 Power Adapter to Serial Device Interface FTA
Internal Cabinet Cabling

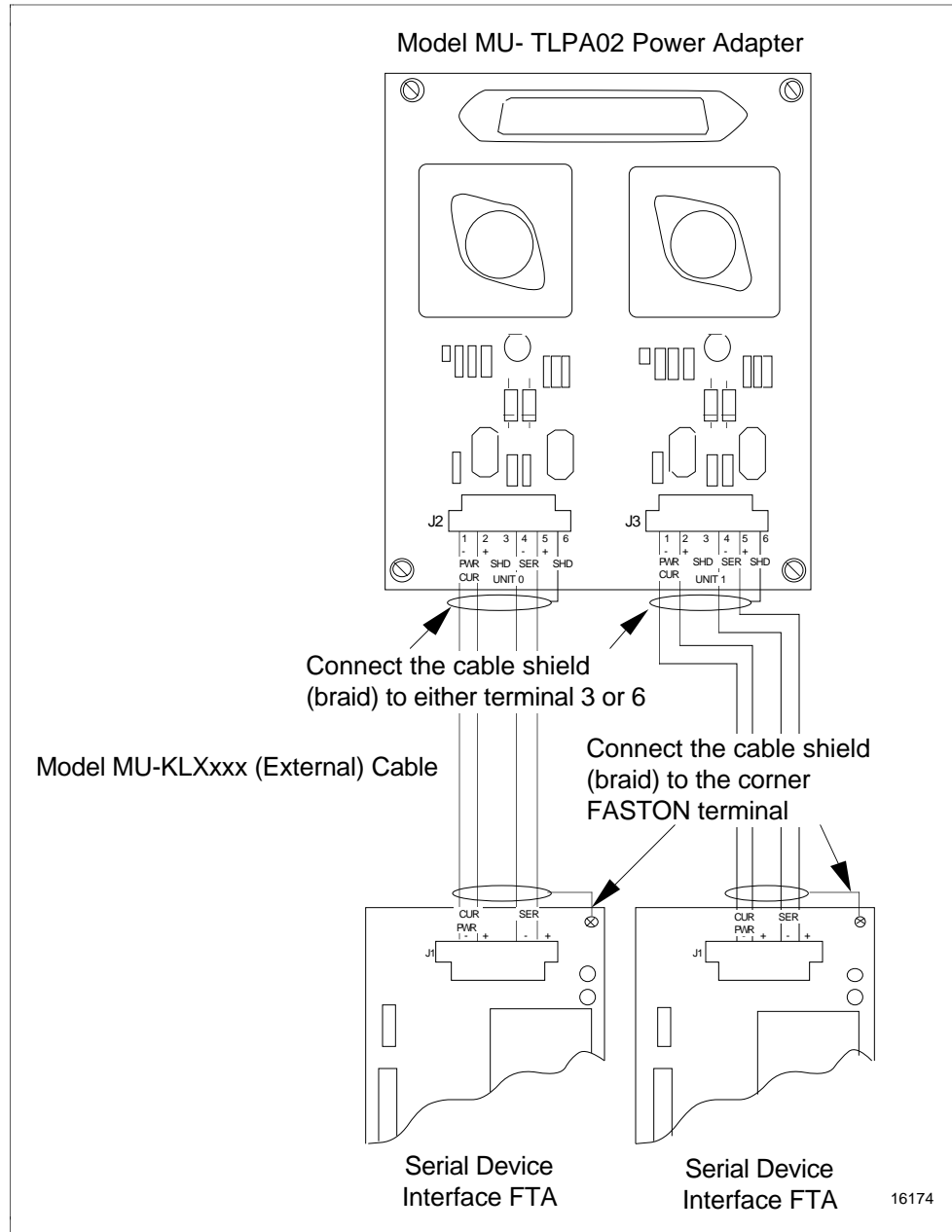


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6.3 Serial Device Interface (SDI) FTAs, Continued

External cabinet cabling The model MU-KLXxxx external cabinet cable has four wires with a single braided shield. The braided shield must be connected at both the Power Adapter and FTA ends of the cable as illustrated in Figure 6-9.

Figure 6-9 Power Adapter to Serial Device Interface FTA
External Cabinet Cabling



Continued on next page

6.3 Serial Device Interface (SDI) FTAs, Continued

FTA to field device cable specifications

The cables listed below 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 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

- Manufacturer Type—Belden 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

- Manufacturer Type—Belden 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
-

6.3.1 Model MU-TSDT02 SDI EIA-232 Interface

Description

The model MU-TSDT02 Serial Device Interface FTA, in combination with the model MU-PSDX02 IOP and the model MU-TLPA02 Power Adapter, provides an EIA-232 (RS-232) communications interface for the Toledo Weigh Cell devices, models 8142-2089 and 8142-2189, as shown in Figure 6-10.

EIA-232 interface

The interface connection to the device is through the DB-25-type connector, J2, on the FTA, which is illustrated on the FTA assembly layout, Figure 6-7. Table 6-5 lists the pin connections. The EIA-232 interface cable must not exceed 15 meters (50 feet) in length.

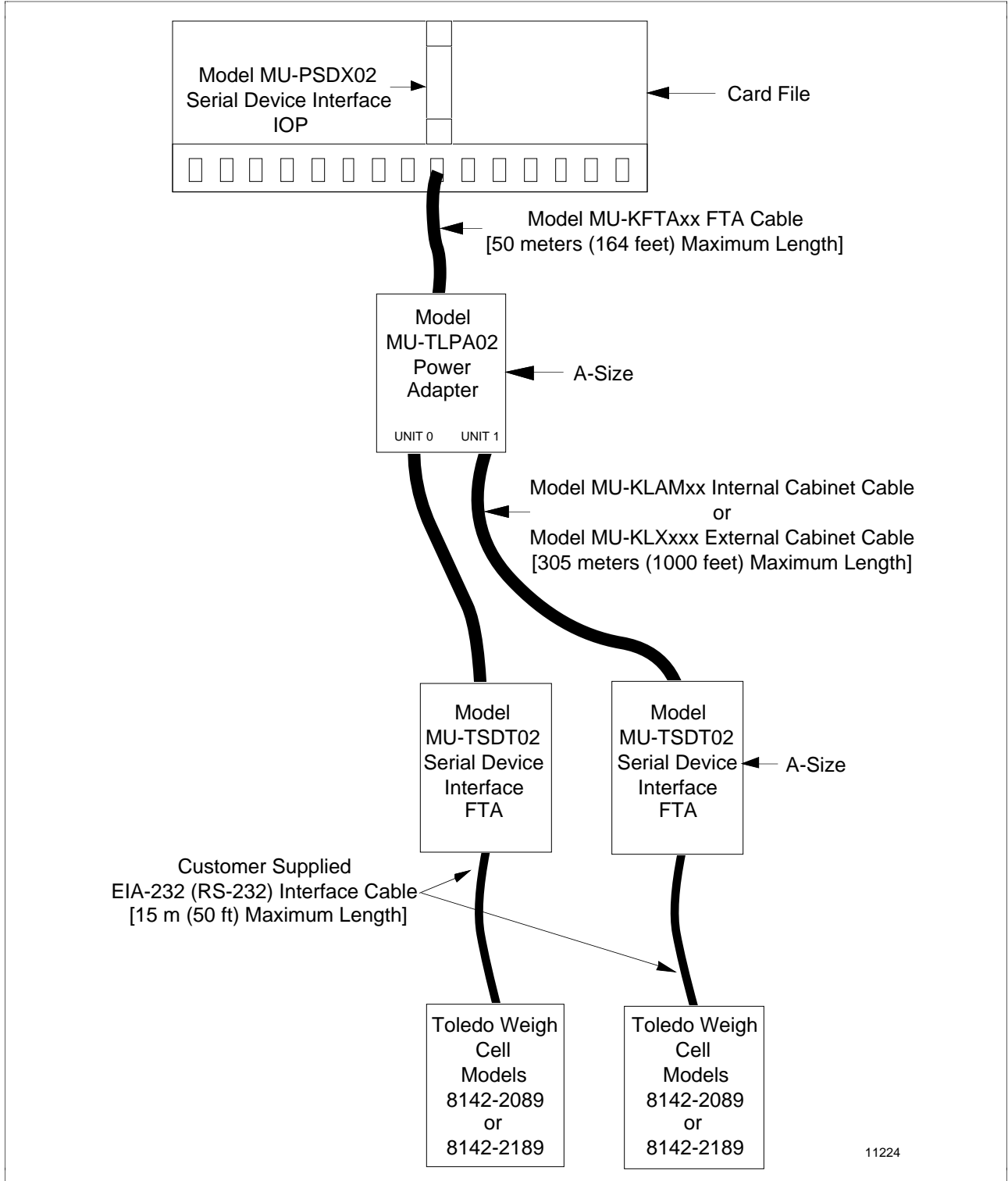
The cable must be of quality construction and have an overall braided shield. The braided shield must be connected to the DB-25 connector's metallic shell at each end of the cable.

Continued on next page

6.3.1 Model MU-TSDT02 SDI EIA-232 Interface, Continued

Model MU-TSDT02 interconnections

Figure 6-10 Model MU-TSDT02 (Toledo Weigh Cell) SDI FTA Interconnections



6.3.2 Model MU-TSDM02 SDI EIA-422/485 Interface

Description

The model MU-TSDM02 Serial Device Interface FTA, in combination with the model MU-PSDX02 IOP and the Power Adapter, provides an EIA-422/485 (RS-422/485) communications interface for the model MU-MASX02 Manual/Auto Station device as shown in Figure 6-11.

Does not support control loop wiring

The Serial Device Interface supplements the typical control loop field wiring to High Level Analog Input and Analog Output FTAs. The control loop field wiring does not connect to the Serial Device Interface FTA.

EIA-422/485 wiring rules

The Serial Device Interface FTA EIA-422/485 (RS-422/485) interface is provided by a connector with five compression terminals, J3, as shown in Figure 6-7. The signal, terminating resistor required, and shield ground assignments are listed in Table 6-4. The following guidelines apply for the interface.

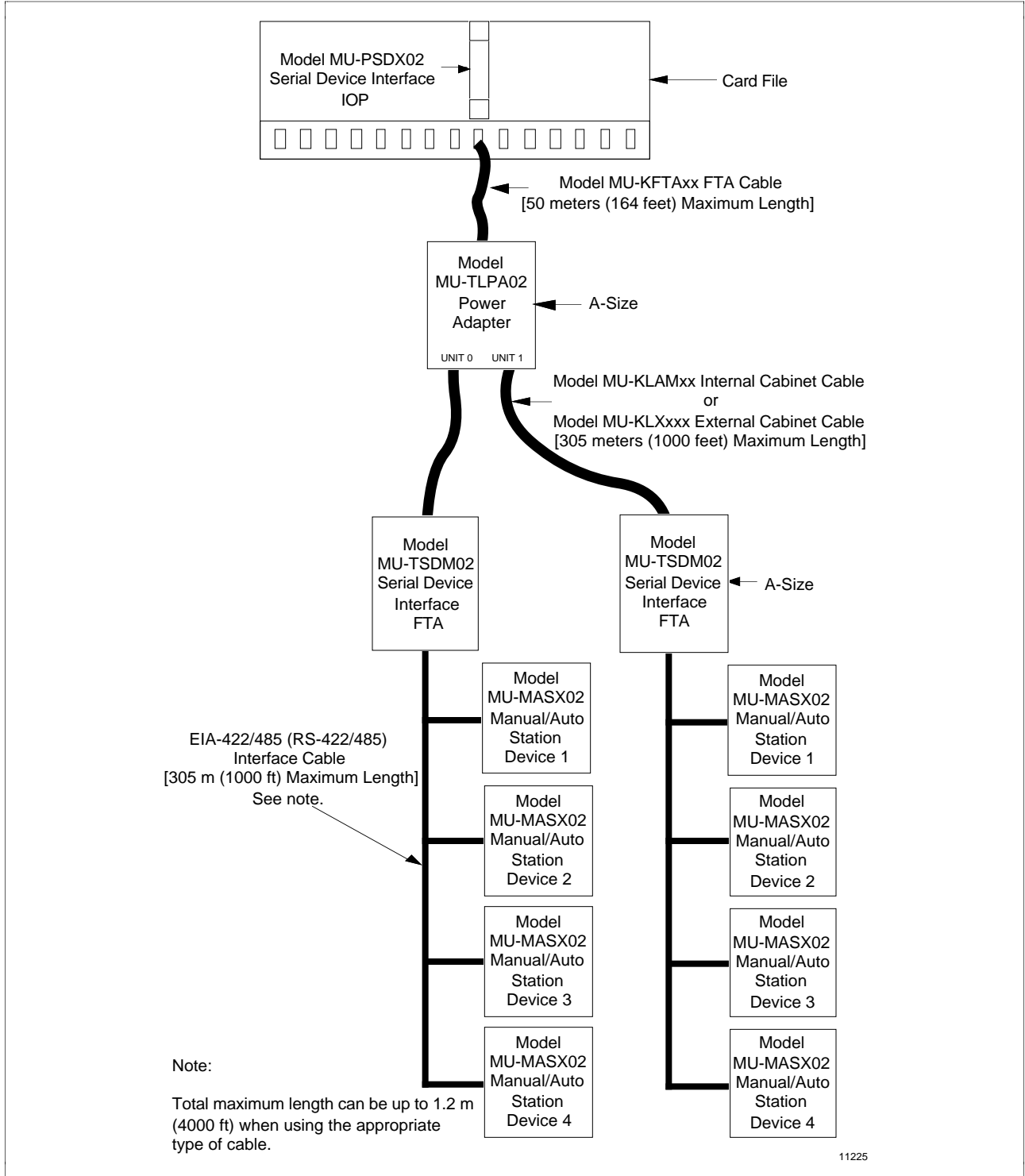
- Up to four Manual/Auto Stations can be connected to the EIA-422/485 interface.
 - The interface must be no longer than 305 meters (1000 feet) with Belden 9271 cable or 1200 meters (4000 feet) with either Belden 89182 or Belden 9182 cable.
 - To avoid potential ground loops, the signal cable shield must be connected to the **SHD** (shield) terminal only at the FTA end of the cable.
 - To minimize signal reflections, a 120-ohm, 0.5-watt resistor should be connected between terminals 1 and 5. The **B** (Data +) and **A** (Data –) signals should be similarly terminated with a 120-ohm resistor on the device at the extreme end of the cable. Figure 6-12 illustrates the method of terminating the EIA-422/485 interface.
 - Two 0.25 A fuses, F1 and F2, protect the FTA from excessive current on the data lines as shown in the Serial Device Interface FTA assembly layout illustration, Figure 6-7.
-

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6.3.2 Model MU-TSDM02 SDI EIA-422/485 Interface, Continued

Model MU-TSDM02 interconnections

Figure 6-11 Model MU-TSDM02 (Manual/Auto Station) SDI FTA Interconnections

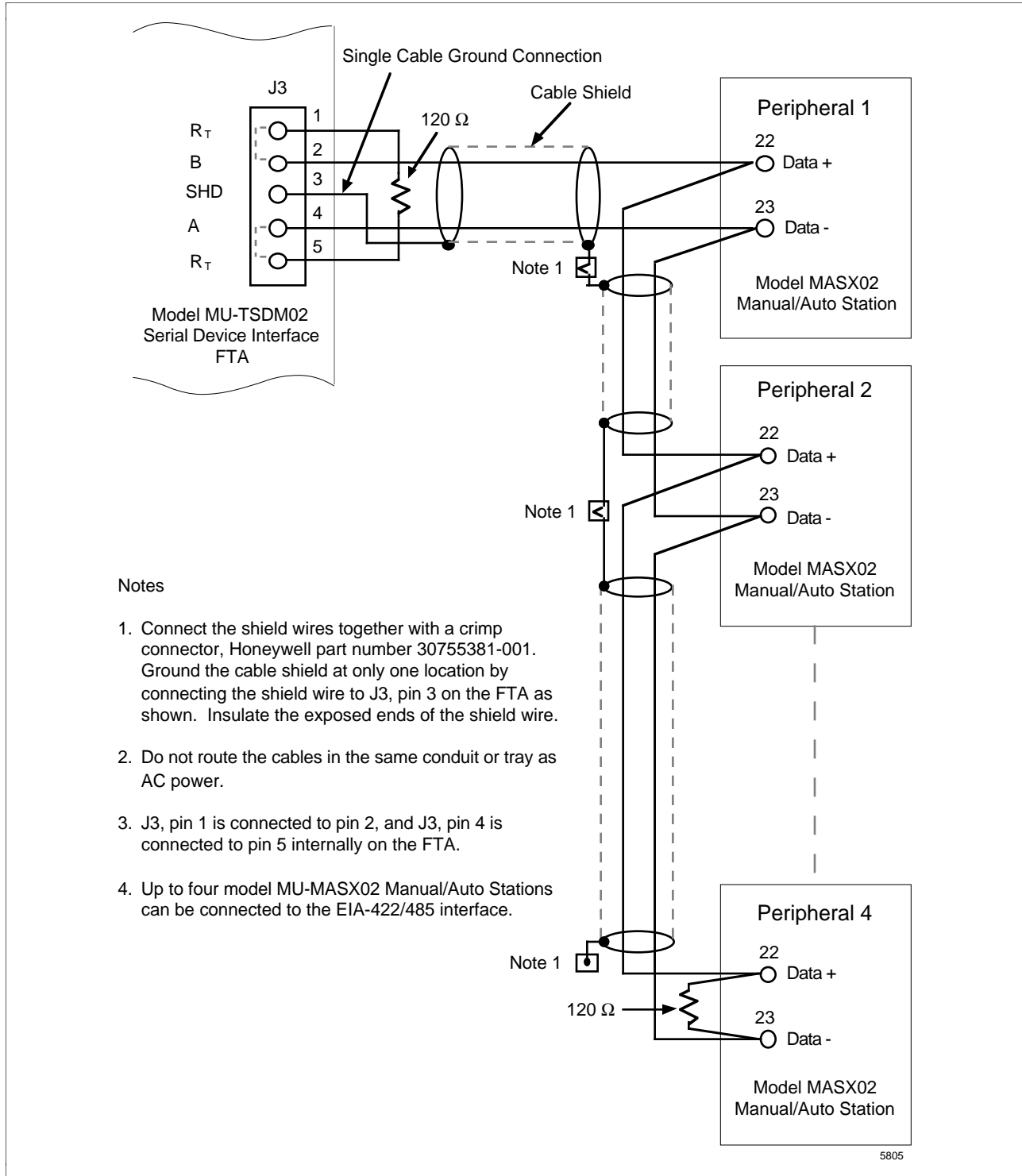


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6.3.2 Model MU-TSDM02 SDI EIA-422/485 Interface, Continued

Model MU-TSDM02 EIA-422/485 interface

Figure 6-12 Model MU-TSDM02 (Manual/Auto Station) SDI FTA EIA-422/485 Interconnections and Termination

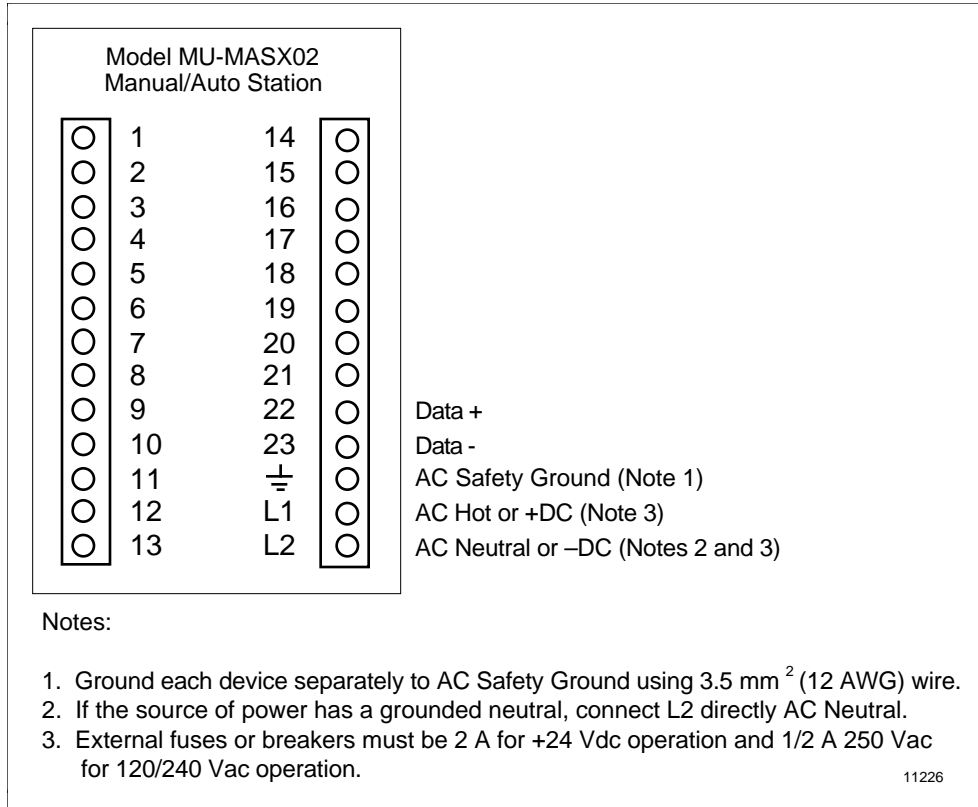


6.3.3 Model MU-MASX02 Manual/Auto Station Connections

Connection diagram

The EIA-422/485 interface and power connection diagram for the model MU-MASX02 Manual/Auto Station is shown in Figure 6-13. Details for terminating the EIA-422/485 interface are illustrated in Figure 6-12.

Figure 6-13 Model MU-MASX02 Manual/Auto Station Connections



Connection guidelines

Use the following connection guidelines when installing the Manual/Auto Station.

- The Manual/Auto Station is adaptable to 24 Vdc or 120/240 Vac power that must be fused. Use 2-ampere fuses or circuit breakers for 24 Vdc operation or 0.5-ampere 250 V fuses for 120/240 Vac operation.
- The shielded cable that provides the EIA-422/485 interface to the model MU-TSDM02 FTA must be grounded only at the FTA end of the cable.
- The EIA-422/485 interface cable should not be routed in the same conduit or tray as the ac power.

6.3.4 Model MU-TSDU02 SDI EIA-422/485 Interface

Description

The model MU-TSDU02 Serial Device Interface FTA, in combination with the model MU-PSDX02 IOP and the Power Adapter, provides an EIA-422/485 (RS-422/485) communications Modbus interface for numerous models of the Honeywell UDC 6000 as shown in Figure 6-14.

EIA-422/485 wiring rules

The Serial Device Interface FTA EIA-422/485 (RS-422/485) interface is provided by a connector with five compression terminals, J3, as shown in Figure 6-7. Signal and ground assignments are listed in Table 6-4. The following guidelines apply for the interface.

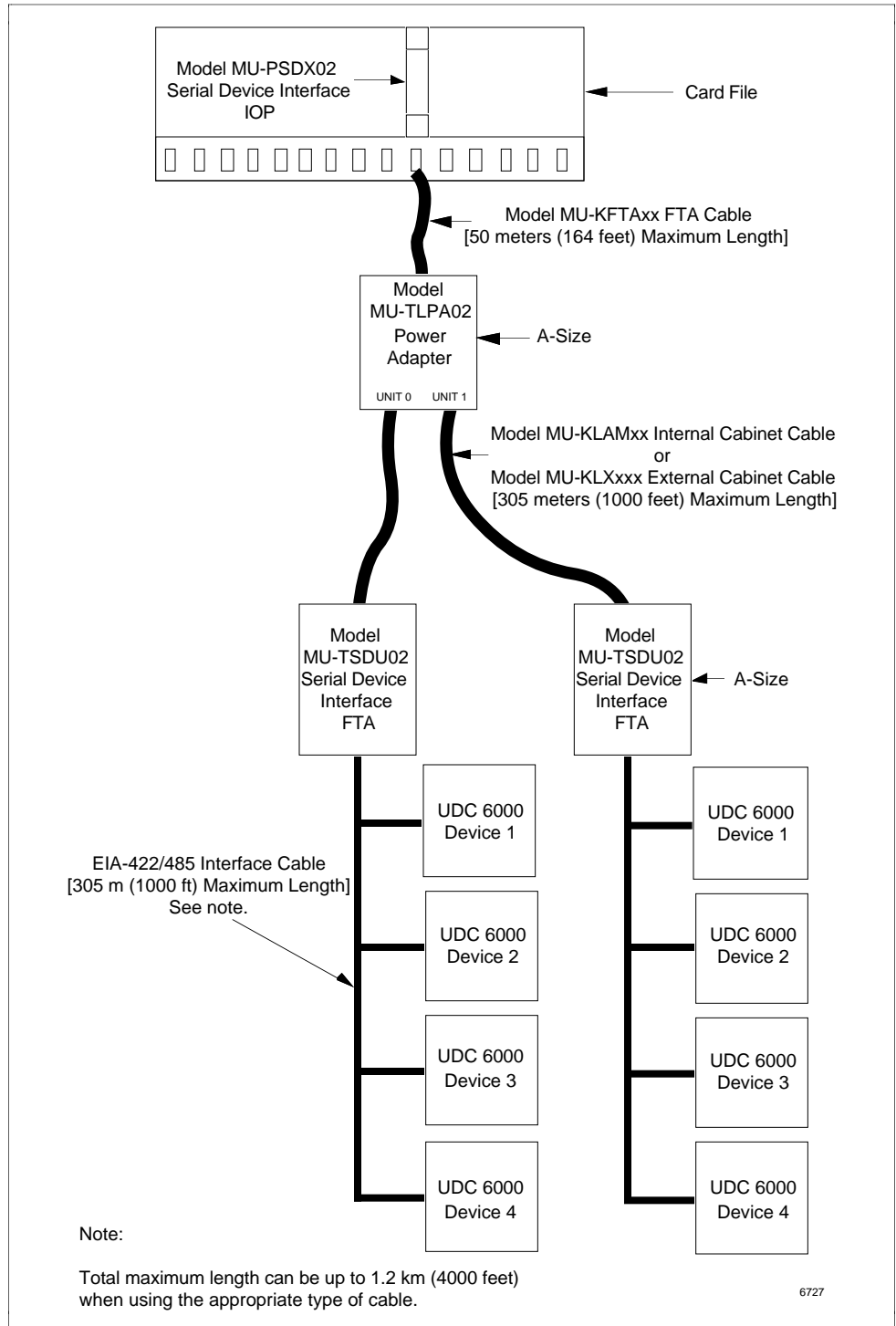
- Up to four UDC 6000s can be connected to the EIA-422/485 interface.
 - The interface must be no longer than 305 meters (1000 feet) with Belden 9271 cable or 1200 meters (4000 feet) with either Belden 89182 or Belden 9182 cable.
 - To avoid potential ground loops, the signal cable shield must be connected to the **SHD** (shield) terminal only at the FTA end of the cable.
 - To minimize signal reflections, a 120-ohm, 0.5-watt resistor should be connected between terminals 1 and 5. The **B** (Data +) and **A** (Data –) signals should be similarly terminated with a 120-ohm resistor on the device at the extreme end of the cable. Figure 6-15 illustrates the method of terminating the EIA-422/485 interface.
 - Two 0.25 A fuses, F1 and F2, protect the FTA from excessive current on the data lines as shown in the Serial Device Interface FTA assembly layout illustration, Figure 6-7.
-

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6.3.4 Model MU-TSDU02 SDI EIA-422/485 Interface, Continued

Model MU-TSDU02 interconnections

Figure 6-14 Model MU-TSDU02 (UDC 6000 Modbus) SDI FTA Interconnections

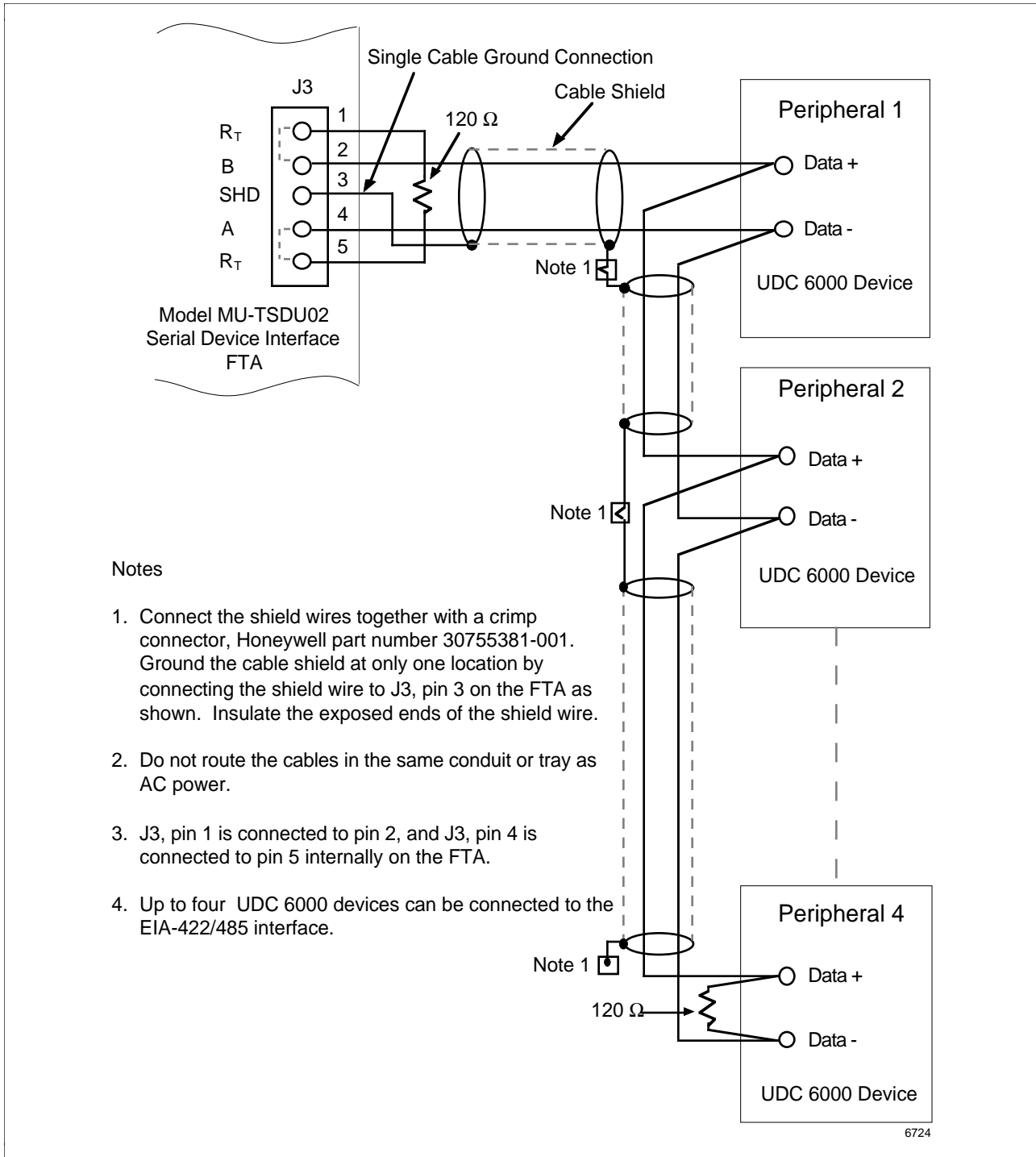


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6.3.4 Model MU-TSDU02 SDI EIA-422/485 Interface, Continued

Model MU-TSDU02 EIA-422/485 connections

Figure 6-15 Model MU-TSDU02 (UDC 6000 Modbus) SDI FTA EIA-422/485 Interconnections and Termination



6.4 Serial Interface (SI) FTAs

CE Compliance

Some Serial Interface (SI) Field Termination Assemblies are CE Compliant, while others are not CE Compliant. CE Compliant Serial Interface assemblies are identified by a part number tab number that ends in “26,” “28,” “76,” or “78.” 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.

SI FTAs and IOPs

The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 6-6.

Table 6-6 Serial Interface FTA and IOP Models

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-TSIM12	Serial Interface FTA—Modbus	51303932-401	51303932-426
MC-TSIM12	Serial Interface FTA—Modbus Conformally Coated	51303932-451	51303932-476
MU-TSIA12	Serial Interface FTA—Allen-Bradley	51303932-403	51303932-428
MC-TSIA12	Serial Interface FTA—Allen-Bradley Conformally Coated	51303932-453	51303932-478
MU-PSIM11	Serial Interface IOP	N/A	51304362-300
MC-PSIM11	Serial Interface IOP—Conformally Coated	N/A	51304362-350

Introduction

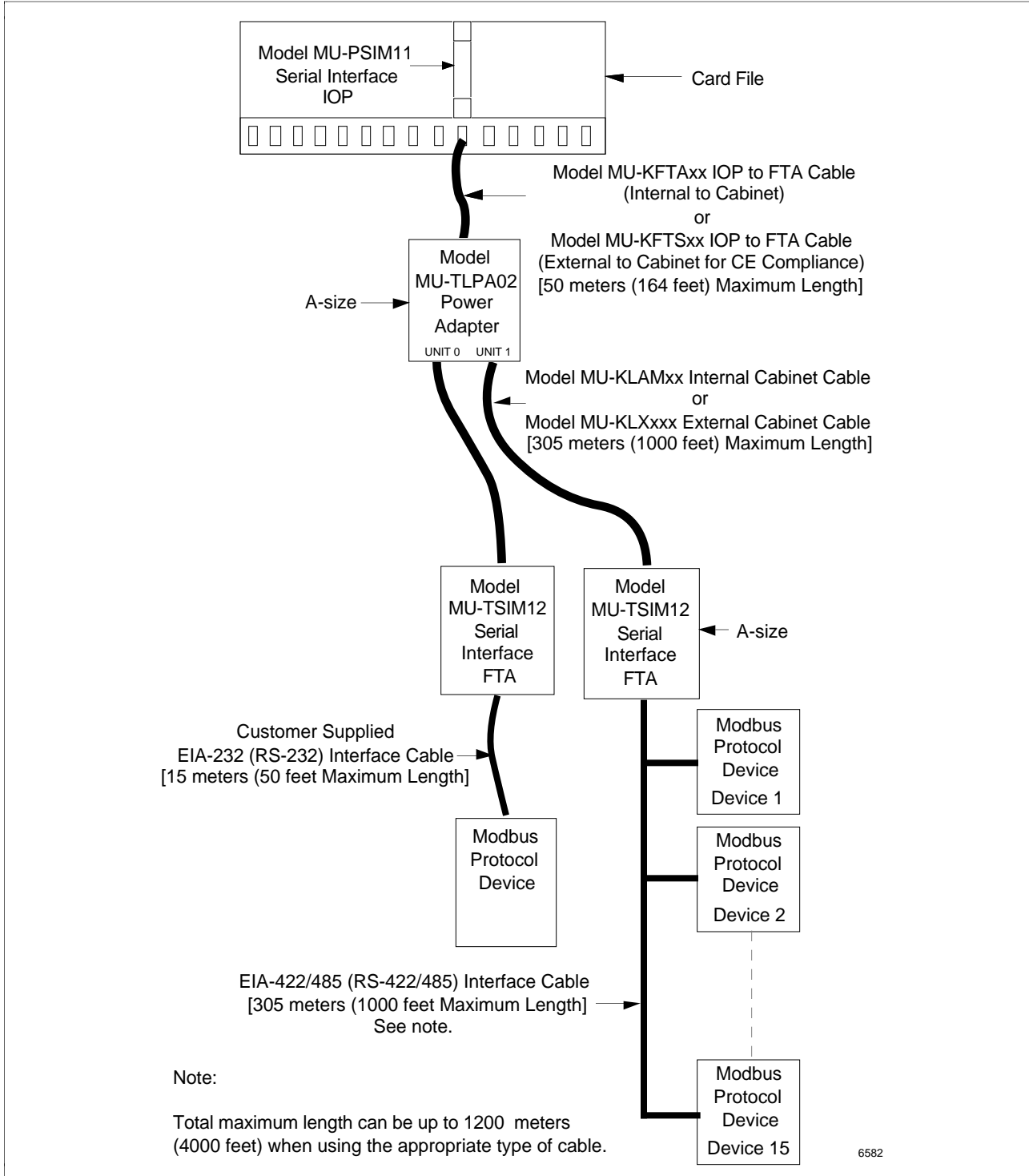
This subsection covers the installation of the Serial Interface, which is composed of a Serial Interface IOP, Power Adapter, and one or two Serial Interface FTAs. Figure 6-16 illustrates a typical Serial Interface installation.

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6.4 Serial Interface FTAs, Continued

Typical SI installation

Figure 6-16 Typical Serial Interface Installation



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6.4 Serial Interface FTAs, Continued

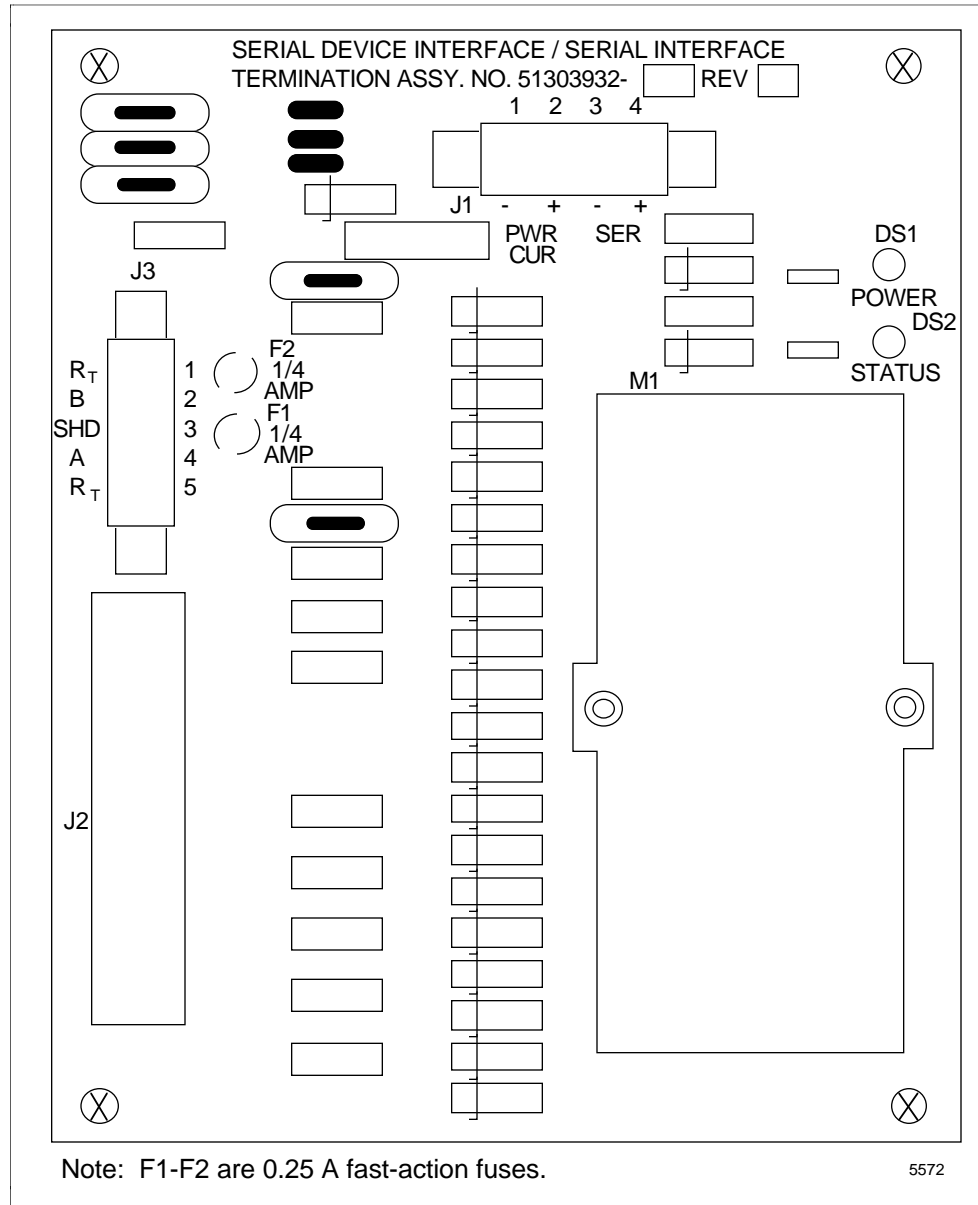
Description	The Serial Interface FTA provides both EIA-232 (RS-232) and EIA-422/485 (RS-422/485) interfaces for asynchronous serial communications devices. The firmware resident in the plug-in module, M1, on the FTA is preprogrammed at the factory to accommodate the associated IOP and both communications interface types, EIA-232 or EIA-422/485. Selection of the interface for the model MU-TSIM12 Serial Interface FTA is by software configuration.
IOP placement	The model MU-PSIM11 Serial Interface IOP can be installed in any available card file slot.
Two types of serial interface	Two model MU-TSIA12 or MU-TSIM12 Serial Interface FTAs can be connected to a single Serial Interface IOP through the Power Adapter. Each Serial Interface FTA has a single asynchronous serial communications interface that supports standards EIA-232 (RS-232) or EIA-422/485 (RS-422/485), using either a DB-25 or a 5-terminal compression connector, respectively. Figure 6-17 illustrates the assembly layout of the Serial Interface FTA.
EIA-232 or 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, using either a DB-25- or a 5-terminal compression-type connector, respectively.
Power Adapter	The model MU-TLPA02 Power Adapter is the same size as an A-size (6-inch) FTA and installs on a standard FTA Mounting Channel.
FTA size	The Serial Interface FTA is an A-size (6-inch) FTA and installs on a standard FTA Mounting Channel.
Grounding rules	If the Power Adapter or the Serial Interface FTA is installed external to the cabinet, proper grounding and mounting rules must be observed. For CE Compliant applications, the Power Adapter and Serial Interface FTA must be mounted in a cabinet or cabinet complex. See Section 9 for the recommended mounting and grounding methods.

Continued on next page

6.4 Serial Interface (SI) FTAs, Continued

SI assembly layout

Figure 6-17 Serial Interface FTA Assembly Layout



Continued on next page

6.4 Serial Interface (SI) FTAs, Continued

Three interfaces

The Serial Interface FTA's three interfaces, Power Adapter, EIA-422/485 (RS-422/485), and EIA-232 (RS-232) are defined in Tables 6-7, 6-8, and 6-9, respectively.

FTA to Power Adapter interface

Table 6-7 J1 – Serial Interface FTA to Power Adapter Interface

Connector Terminal	Description
1	Power Current (–)
2	Power Current (+)
3	Serial (–)
4	Serial (+)

EIA-422/485 interface

Table 6-8 J3 – Serial Interface FTA EIA-422/485 Interface

Connector Terminal	Description
1, 5	R _T (Termination—Install a 120 Ω, 1/2 watt termination resistor between these two terminals.)
2	B (Data +)
3	SHD (Cable Shield)
4	A (Data –)

EIA-422/485 cable length limitation

EIA-422/485 cable is limited to a distance of 305 meters (1000 feet); however, the total length can be 1200 meters (4000 feet) with the appropriate interface cable.

Continued on next page

6.4 Serial Interface (SI) FTAs, Continued

EIA-232 interface

Table 6-9 J2—Serial Interface FTA EIA-232 Interface

Connector Pin	Description
1	Chassis Ground (FG)
2	Transmit Data (TD)
3	Receive Data (RD)
4	Request To Send (RTS)
5	Clear To Send (CTS)
6	Data Set Ready (DSR)
7	Logic Ground (SG)
8	Data Carrier Detect (DCD)
9	Reserved
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	Data Terminal Ready (DTR)
21	
22	
23	
24	
25	

Continued on next page

6.4 Serial Interface (SI) FTAs, Continued

IOP to Power Adapter interface

The IOP to Power Adapter connection is made by using a model MU-KFTA_{xx} or model MU-KFTS_{xx} cable (the suffix “xx” represents the length of the cable in meters) in 12 lengths, up to 50 meters (164 feet) in length, as shown in Figure 6-16.

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.

FTA placement

The Serial Interface FTA can be installed in the same cabinet as the Serial Interface IOP, or externally up to 305 meters (1000 feet) from the Power Adapter by using model MU-KLX_{xxx} cable (the suffix “xxx” represents the length of the cable in meters).

Use a model MU-KLAM_{xx} cable (the suffix “xx” represents the length of the cable in centimeters) when installing the FTA inside the cabinet.

Cable length availability

See the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* or *High-Performance Process Manager Service* manual for cable lengths.

Power Adapter to FTA cable specifications

The model MU-KLAM_{xx} (internal) and model MU-KLX_{xxx} (external) cables have the following specifications.

Model MU-KLAM_{xx} cable

- Manufacturer Type—Belden 9406
 - Cable Configuration—Shielded double pair
 - Flame Resistance Conformity—CSA FT4
 - CSA Type—CMG
 - NEC Type—CM
-

Model MU-KLX_{xxx} cable

- Manufacturer Type—Belden 83654
 - Cable 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
-

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6.4 Serial Interface (SI) FTAs, Continued

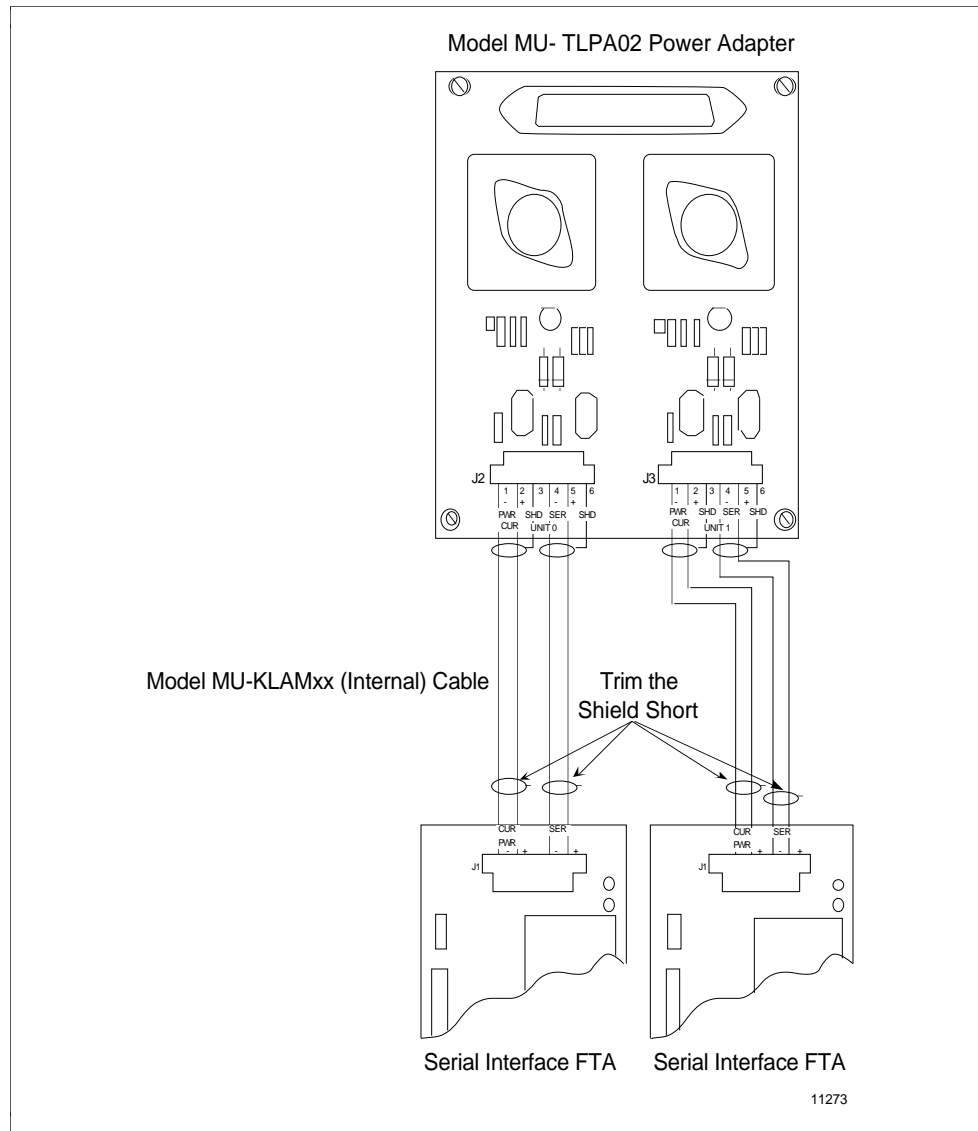
FTA to Power Adapter interface

The Serial Interface FTA to Power Adapter connection is made by using either model MU-KLAMxx cable (five lengths, 30, 66, 100, 200, and 300 centimeters for internal cabinet installation) or model MU-KLXxxx cable (three lengths, 76, 152, and 305 meters for external cabinet installation).

Internal cabinet cabling

The internal cabinet cable has two individually shielded, twisted-pair wires. The shields are connected to ground at the Power Adapter end only. The wire connections are made by using compression terminals in a 6-terminal connector at the Power Adapter end and a 4-terminal connector at the FTA end as shown in Figure 6-18.

Figure 6-18 Power Adapter to Serial Interface FTA
Internal Cabinet Cabling

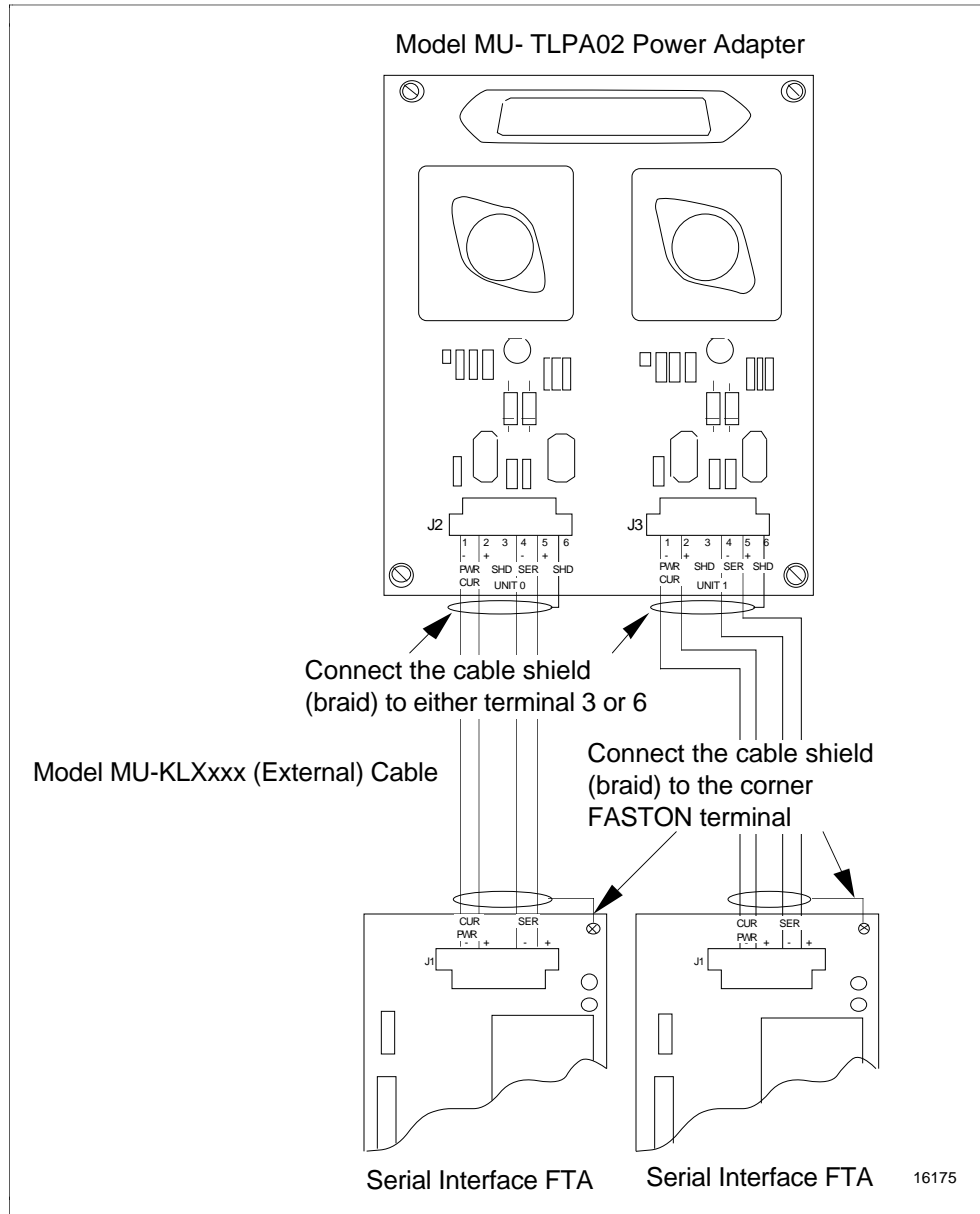


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6.4 Serial Interface (SDI) FTAs, Continued

External cabinet cabling The model MU-KLXxxx external cabinet cable has four wires with a single braided shield. The braided shield must be connected at both the Power Adapter and FTA ends as illustrated in Figure 6-19.

Figure 6-19 Power Adapter to Serial Interface FTA
External Cabinet Cabling



Continued on next page

6.4 Serial Interface (SDI) FTAs, Continued

FTA to field device cable specifications

The cables listed below are acceptable 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 89182
 - Cable 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

- Manufacturer Type—Belden 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

- Manufacturer Type—Belden 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
-

6.4.1 Model MU-TSIA12 SI EIA-232 Interface

Description

The model MU-TSIA12 Serial Interface FTA, in combination with the model MU-PSIM11 IOP and the model MU-TLPA02 Power Adapter, provides an EIA-232 (RS-232) communications interface for the Allen-Bradley PLC-2, PLC-3, or PLC-5 devices with an EIA-232 interface as shown in Figure 6-20.

EIA-232 interface

The interface connection to the device is through the DB-25-type connector, J2, on the FTA, which is illustrated on the FTA assembly layout, Figure 6-17. Table 6-9 lists the pin connections. The EIA-232 interface cable should not exceed 15 meters (50 feet) in length.

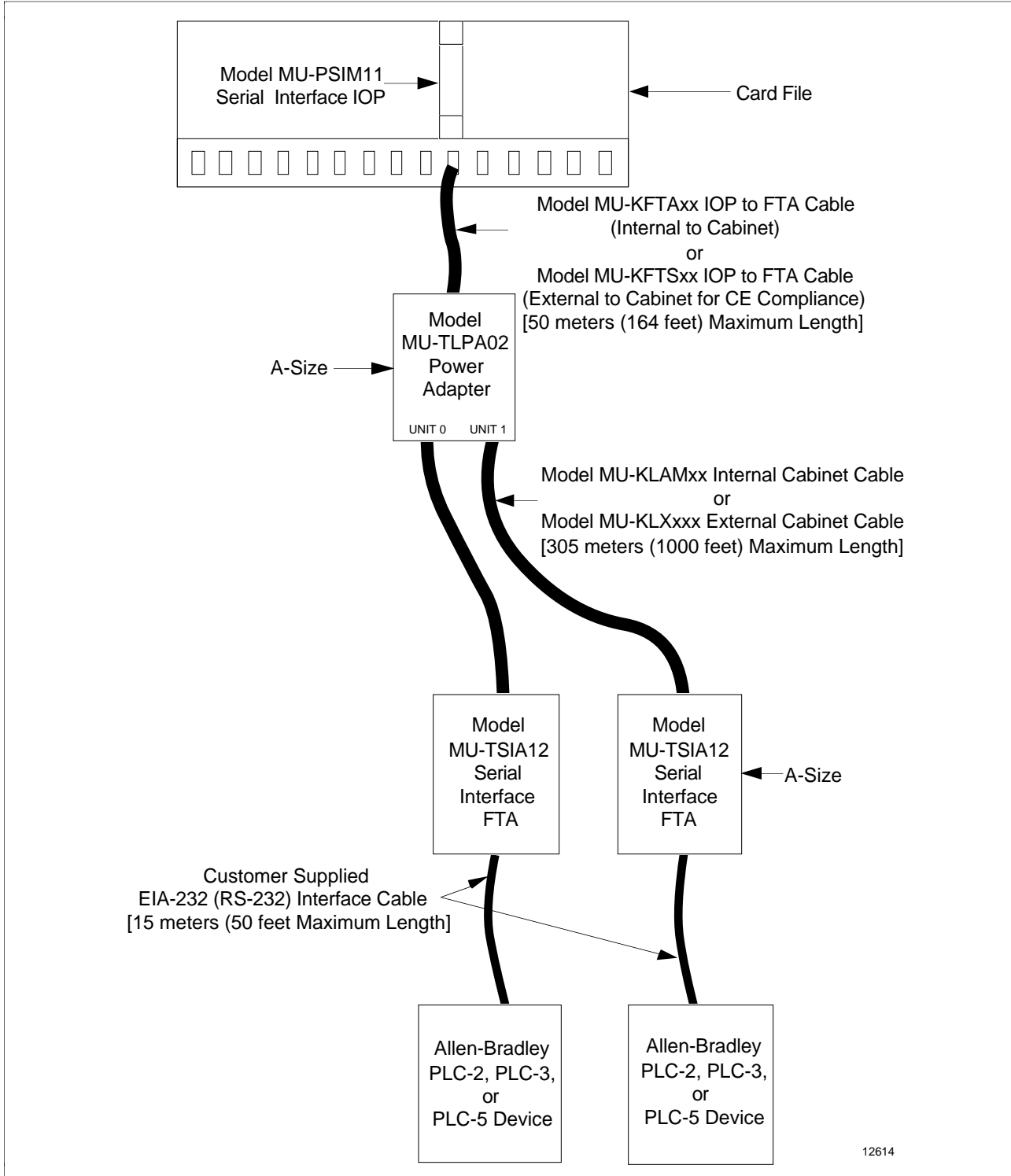
The cable must be of quality construction and have an overall braided shield. The braided shield must be connected to the DB-25 connector's metallic shell at each end of the cable.

Continued on next page

6.4.1 Model MU-TSIA12 SI EIA-232 Interface, Continued

Model MU-TSIA12 EIA-232 connections

Figure 6-20 Allen-Bradley Serial Interface FTA EIA-232 Interconnections



6.4.2 Model MU-TSIM12 SI EIA-232 Interface

Description

The model MU-TSIM12 Serial Interface FTA, in combination with the model MU-PSIM11 IOP and the model MU-TLPA02 Power Adapter, provides a Modbus RTU EIA-232 (RS-232) communications interface for a peripheral with a EIA-232 interface as shown in Figure 6-21.

EIA-232 interface

The interface connection to the device is through the DB-25-type connector, J2, on the FTA, which is illustrated on the FTA assembly layout, Figure 6-17. Table 6-9 lists the pin connections. The EIA-232 interface cable should not exceed 15 meters (50 feet) in length.

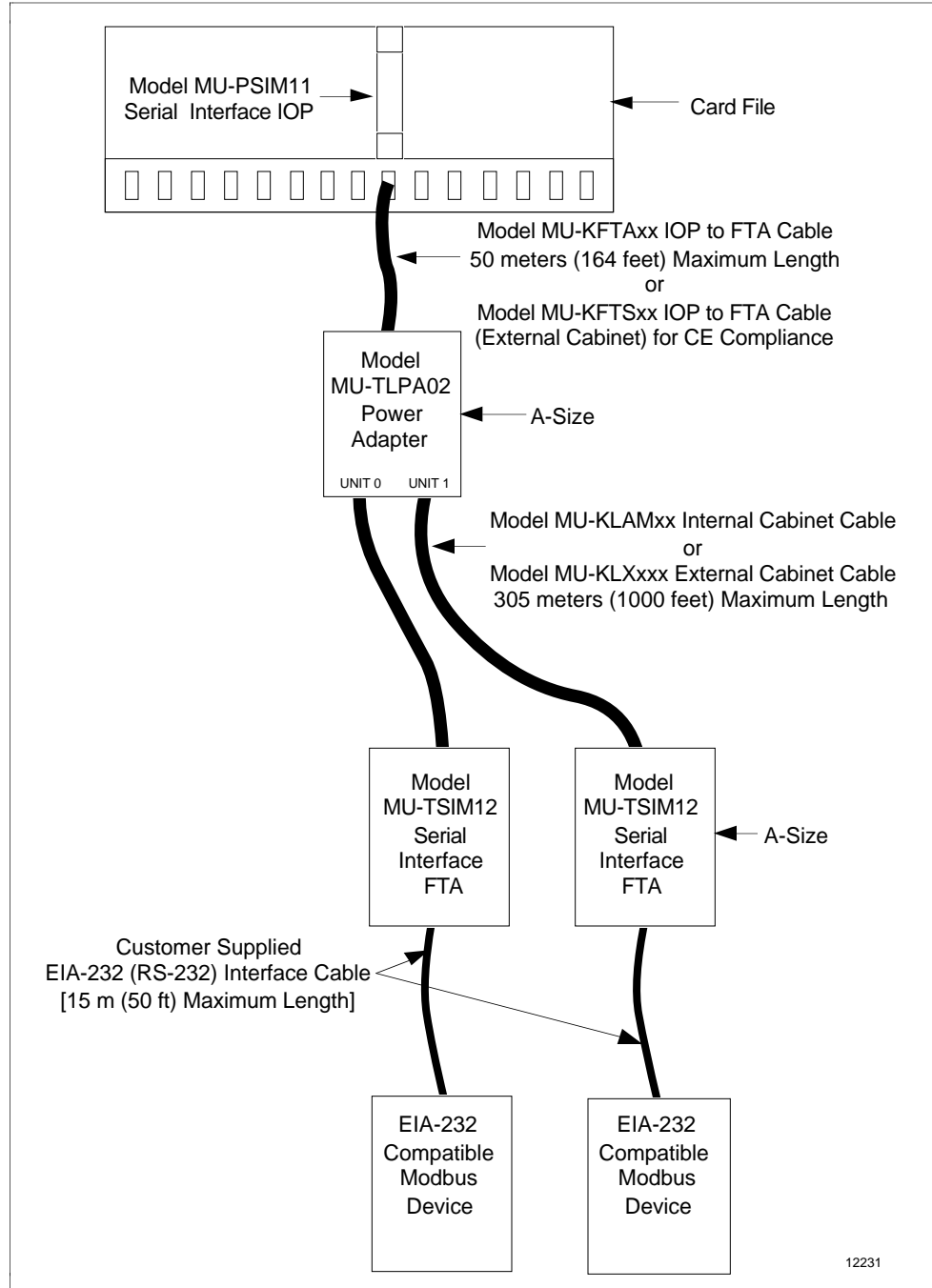
The cable must be of quality construction and have an overall braided shield. The braided shield must be connected to the DB-25 connector's metallic shell at each end of the cable.

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6.4.2 Model MU-TSIM12 SI EIA-232 Interface, Continued

Model MU-TSIM12 EIA-232 connections

Figure 6-21 Modbus RTU Serial Interface FTA EIA-232 Interconnections



6.4.3 Model MU-TSIM12 SI EIA-422/485 Interface

Description

The model MU-TSIM22 Serial Interface FTA, in combination with the model MU-PSIM11 IOP and the Power Adapter, provides an EIA-422/485 (RS-422/485) communications interface for peripherals that have an EIA-422/485 interface as shown in Figure 6-22.

EIA-422/485 wiring rules

The Serial Interface FTA EIA-422/485 (RS-422/485) interface is provided by a connector with five compression terminals, J3, as shown in Figure 6-17. Signal and ground assignments are listed in Table 6-8. The following guidelines apply for the interface.

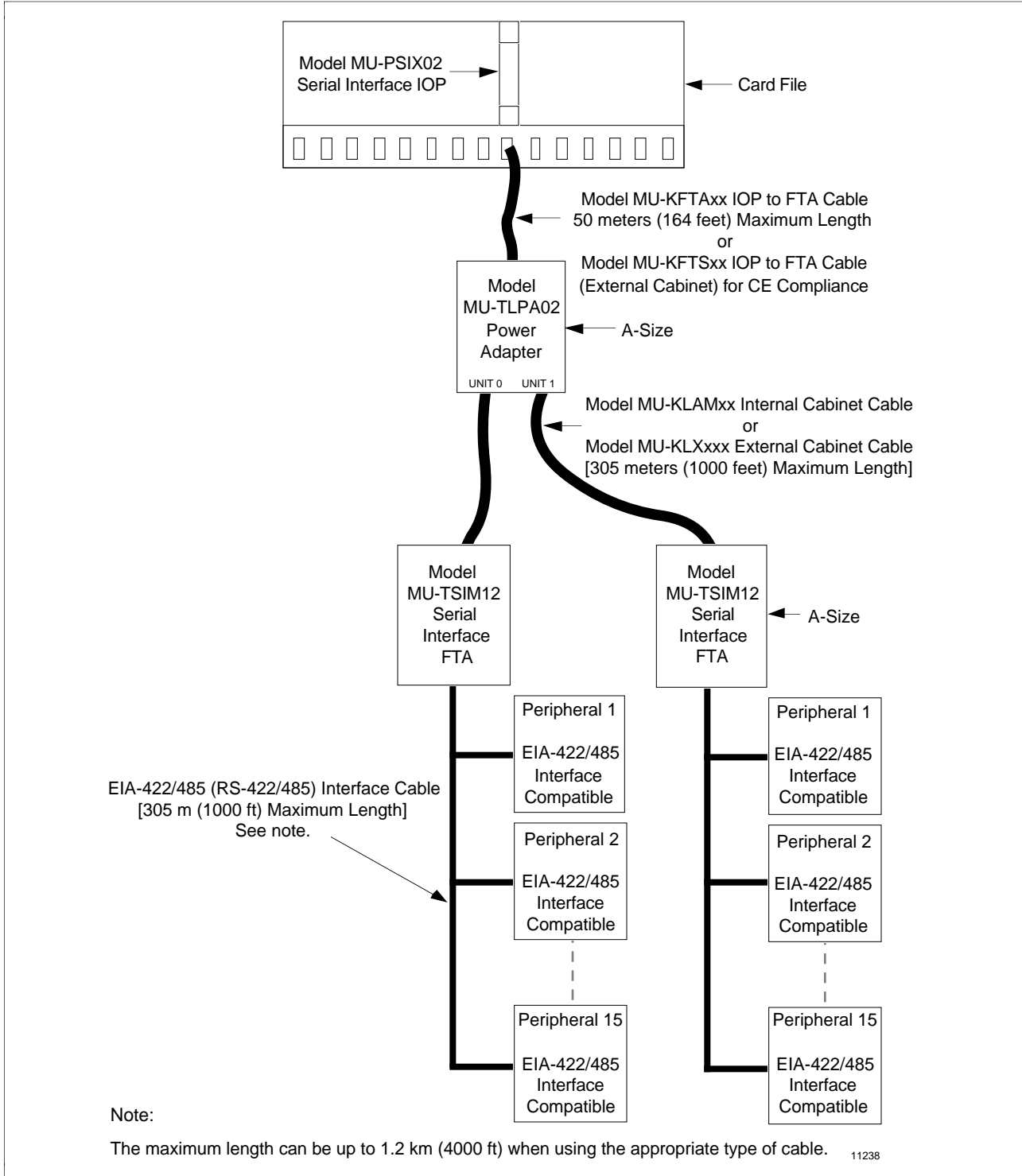
- Up to 15 devices can be connected to the EIA-422/485 interface.
 - The interface must be no longer than 305 meters (1000 feet) with Belden 9271 cable or 1200 meters (4000 feet) with either Belden 89182 or Belden 9182 cable.
 - To avoid potential ground loops, the signal cable shield must be connected to the **SHD** (shield) terminal only at the FTA end of the cable.
 - To minimize signal reflections, a 120-ohm, 0.5-watt resistor should be connected between terminals 1 and 5. The **B** (Data +) and **A** (Data –) signals should be similarly terminated with a 120-ohm resistor on the device at the extreme end of the cable. Figure 6-23 illustrates the method of terminating the EIA-422/485 interface.
 - Two 0.25 A fuses, F1 and F2, protect the FTA from excessive current on the data lines as shown in the Serial Device Interface FTA assembly layout illustration, Figure 6-17.
-

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6.4.3 Model MU-TSIM12 SI EIA-422/485 Interface, Continued

SI EIA-422/485 interconnections

Figure 6-22 Serial Interface FTA EIA-422/485 Interconnections

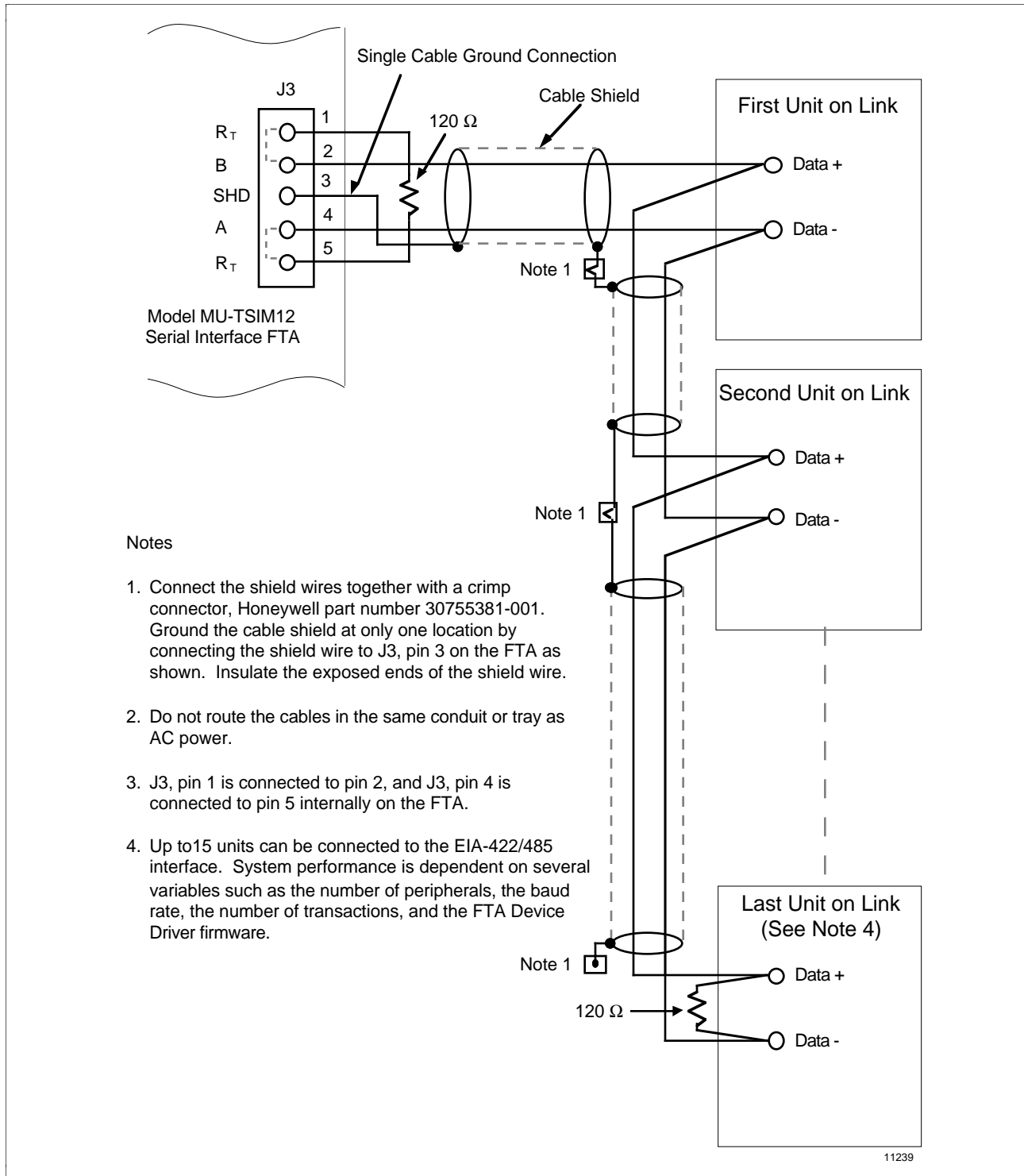


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6.4.3 Model MU-TSIM12 SI EIA-422/485 Interface, Continued

SI EIA-422/485 connections

Figure 6-23 Model MU-TSIM12 Serial Interface FTA EIA-422/485 Interconnections and Termination



6.5 Digital Input Sequence of Events (DISOE) IOP

Introduction

The Digital Input Sequence Of Events (DISOE) IOP does not have a dedicated FTA, but instead is compatible with FTAs such as the 24 Vdc, 120 Vac, and 240 Vac Digital Input FTAs. When the DISOE IOP is paired with the 24 Vdc Digital Input FTA, the module is capable of time stamping digital inputs with a 1-millisecond resolution, relative to the time-of-day as known on the Local Control Network (LCN). When paired with the 120 Vac or 240 Vac Digital Input FTA, the 1 millisecond resolution cannot be achieved.

Installation instructions

The 24 Vdc Digital Input (DI) FTA can be installed in either the same cabinet, or remotely. Up to 32 field contacts can be connected to the FTA. Power for the contact sensing is provided external to the DISOE IOP connected to the FTA. The external power source can be provided by the customer, but generally the source is Honeywell-provided by the 24 Vdc Digital Input Power Distribution Assembly. See subsection 4.2 for an explanation of the connection and wiring requirements for the 24 Vdc Digital Input FTA and the 24 Vdc Digital Input Power Distribution Assembly.

Section 7 – Galvanically Isolated FTA Installation

7.1 Overview

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Purpose This section provides information necessary for the proper installation of Galvanically Isolated Field Terminal Assemblies (FTAs). Additional information concerning the FTAs can be found in the *Process Manager/Advanced Process Manager Planning* or *High-Performance Process Manager Planning* manual and the *Galvanic Isolation/Intrinsic Safety Specification and Technical Data* manuals.

7.2 Description

Introduction A family of Field Termination Assemblies (FTAs) that accept plug-in Galvanic Isolation Modules is available. The FTAs are compatible with the IOPs that support the companion “standard” FTAs.

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

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

Continued on next page

7.2 Description, Continued

Galvanically Isolated FTAs The CE Compliant and non-CE Compliant models with their part numbers are listed in Table 7-1.

Table 7-1 Galvanically Isolated FTAs

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MU-GAIH12	HLAI FTA with Compression Terminals Redundant IOP Interface	51304636-100	N/A
MC-GAIH12	HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304636-150	N/A
MU-GAIH13	HLAI/STI FTA with Compression Terminals Redundant IOP Interface	51304718-100	51304718-125
MC-GAIH13	HLAI/STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304718-150	51304718-175
MU-GAIH14	HLAI/STI FTA with Compression Terminals Redundant IOP Interface	51304730-100	51304730-125
MC-GAIH14	HLAI/STI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304730-150	51304730-175
MU-GAIH22	HLAI FTA with Compression Terminals Redundant IOP Interface	51304748-100	51304748-125
MC-GAIH22	HLAI FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304748-150	51304748-175
MU-GAIH82	HLAI FTA with Crimp Terminals Redundant IOP Interface	51304636-300	N/A
MC-GAIH82	HLAI FTA with Crimp Terminals Redundant IOP Interface—Conformally Coated	51304636-350	N/A
MU-GAIH83	HLAI/STI FTA with Crimp Terminals Redundant IOP Interface	51304718-300	51304718-325
MC-GAIH83	HLAI/STI FTA with Crimp Terminals Redundant IOP Interface—Conformally Coated	51304718-350	51304718-375
MU-GAIH84	HLAI/STI FTA with Crimp Terminals Redundant IOP Interface	51304730-300	51304730-325
MC-GAIH84	HLAI/STI FTA with Crimp Terminals Redundant IOP Interface—Conformally Coated	51304730-350	51304730-375
MU-GAIH92	HLAI FTA with Crimp Terminals Redundant IOP Interface	51304748-300	51304748-325
MC-GAIH92	HLAI FTA with Crimp Terminals Redundant IOP Interface—Conformally Coated	51304748-350	51304748-325
MU-PAIH02	HLAI IOP	51304489-100	N/A

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7.2 Description, Continued

Galvanically Isolated FTAs, continued

Table 7-1 Galvanically Isolated FTAs, Continued

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-PAIH02	HLAI IOP—Conformally Coated	51304489-150	N/A
MU-PAIH03	HLAI IOP	N/A	51304754-100
MC-PAIH03	HLAI IOP—Conformally Coated	N/A	51304754-150
MU-PSTX02	STI IOP	51304516-100	N/A
MC-PSTX02	STI IOP—Conformally Coated	51304516-150	N/A
MU-PSTX03	STIM IOP	N/A	51304516-200
MC-PSTX03	STIM IOP—Conformally Coated	N/A	51304516-250
MU-GAOX02	AO FTA with Compression Terminals Single IOP Interface	51304638-100	51304638-125
MC-GAOX02	AO FTA with Compression Terminals Single IOP Interface—Conformally Coated	51304638-150	51304638-175
MU-GAOX12	AO FTA with Compression Terminals Redundant IOP Interface	51304638-500	51304638-525
MC-GAOX12	AO FTA with Compression Terminals Redundant IOP Interface—Conformally Coated	51304638-550	51304638-575
MU-GAOX72	AO FTA with Crimp Terminals Single IOP Interface	51304638-300	51304638-325
MC-GAOX72	AO FTA with Crimp Terminals Single IOP Interface—Conformally Coated	51304638-350	51304638-375
MU-GAOX82	AO FTA with Crimp Terminals Redundant IOP Interface	51304638-700	51304638-725
MC-GAOX82	AO FTA with Crimp Terminals Redundant IOP Interface—Conformally Coated	51304638-750	51304638-775
MU-PAOX03	Analog Output IOP	51304672-100	51309152-125
MC-PAOX03	Analog Output IOP—Conformally Coated	51304672-150	51309152-175
MU-GDID12	DI FTA with Compression Terminals	51304640-100	51304640-125
MC-GDID12	DI FTA with Compression Terminals Conformally Coated	51304640-150	51304640-175
MU-GDID13	DI FTA with Compression Terminals	51304728-100	51304728-125

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7.2 Description, Continued

Galvanically Isolated FTAs, continued

Table 7-1 Galvanically Isolated FTAs, Continued

Model Number	Description	Non-CE Compliant Part Number	CE Compliant Part Number
MC-GDID13	DI FTA with Compression Terminals Conformally Coated	51304728-150	51304728-175
MU-GDID82	DI FTA with Crimp Terminals	51304640-300	51304640-325
MC-GDID82	DI FTA with Crimp Terminals—Conformally Coated	51304640-350	51304640-375
MU-GDID83	DI FTA with Crimp Terminals	51304728-300	51304728-325
MC-GDID83	DI FTA with Crimp Terminals—Conformally Coated	51304728-350	51304728-375
MU-PDIX02	DI IOP	N/A	51304485-100
MC-PDIX02	DI IOP—Conformally Coated	N/A	51304485-150
MU-GDOD12	DO FTA with Compression Terminals	51304642-100	51304642-125
MC-GDOD12	DO FTA with Compression Terminals Conformally Coated	51304642-150	51304642-175
MU-GDOD82	DO FTA with Crimp Terminals	51304642-300	51304642-325
MC-GDOD82	DO FTA with Crimp Terminals—Conformally Coated	51304642-350	51304642-375
MU-GDOL12	DO LFD FTA with Compression Terminals	51304736-100	51304736-125
MC-GDOL12	DO LFD FTA with Compression Terminals Conformally Coated	51304736-150	51304736-175
MU-GDOL82	DO LFD FTA with Crimp Terminals	51304736-300	51304736-325
MC-GDOL82	DO LFD FTA with Crimp Terminals Conformally Coated	51304736-350	51304736-375
MU-PDOX02	Digital Output IOP	N/A	51304487-100
MC-PDOX02	Digital Output IOP—Conformally Coated	N/A	51304487-150
MU-GPRD02	Power Distribution Assembly	51304644-100	51304644-125
MC-GPRD02	Power Distribution Assembly—Conformally Coated	51304644-150	51304644-175
MU-GLFD02	Line Fault Detection Combiner Panel	51304732-100	51304732-125
MC-GLFD02	Line Fault Detection Combiner Panel Conformally Coated	51304732-150	51304732-175
MU-GMAR52	Marshalling Panel	51304646-100	51309156-125
MC-GMAR52	Marshalling Panel—Conformally Coated	51304646-150	51309156-175

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7.2 Description, Continued

FTA size

All the FTA assemblies are approximately 309 by 124 millimeters (12 inches by 4.9 inches), which is the FTA B-size classification for mounting. To provide better heat dissipation, they are normally installed on 61-centimeter FTA Mounting Channels that are orientated horizontally in the cabinet.

Mounting considerations

Because of cooling considerations, they are mounted on 2-foot long horizontally orientated FTA Mounting Channels. They should not be mounted on the vertically orientated FTA Mounting Channels that the standard FTAs are mounted on.

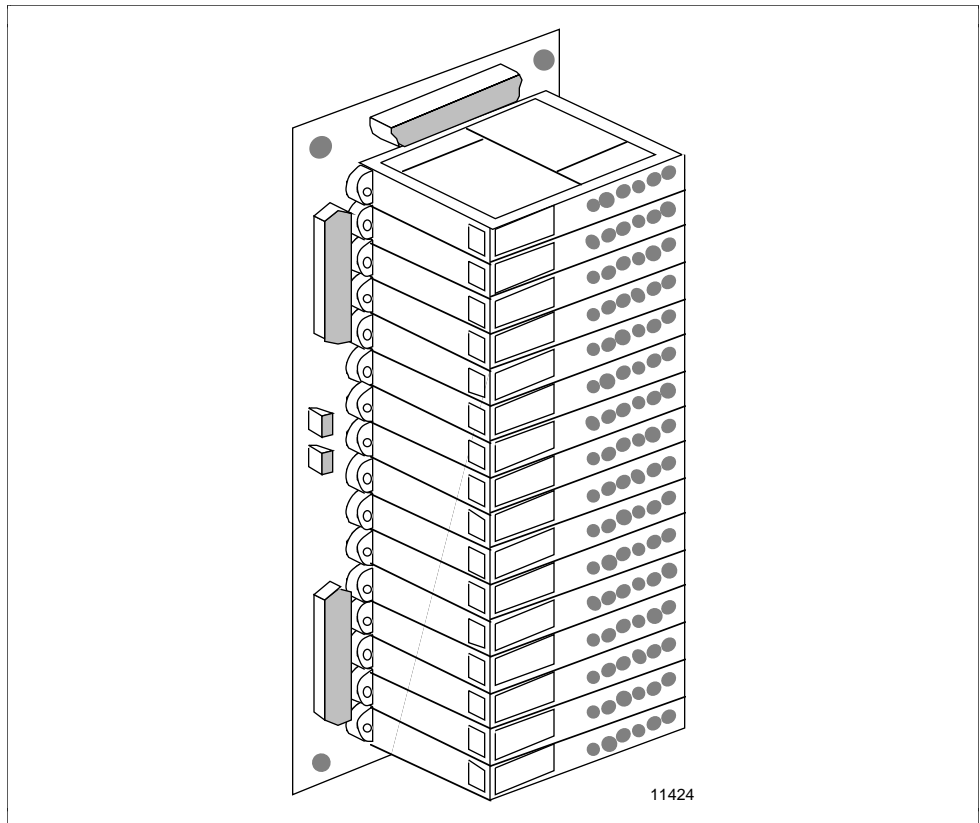
FTA to IOP cabling

The standard 50-pin FTA to IOP cable, model MU-KFTAxx (the suffix “xx” represents the length of the cable in meters), is used to connect the FTA to its associated IOP(s) when the FTA is resident in the same cabinet or cabinet complex.

Analog Input FTA illustration

Figure 7-1 is an illustration of a Galvanically Isolated Analog Input FTA.

Figure 7-1 Galvanically Isolated Analog Input FTA

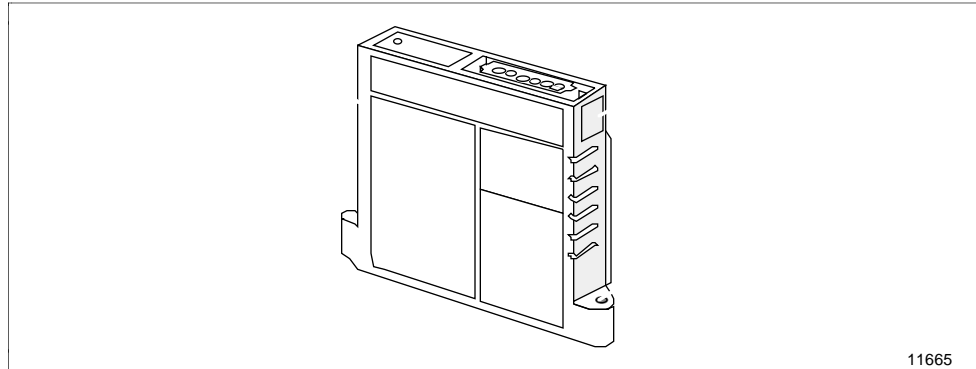


7.2.1 Field Wiring Connections

Typical Galvanic Isolation Module

Field signal connections are made at the plug-in Galvanic Isolation Module on the FTA. In general, the Galvanic Isolation Module provides terminal connections for one field device. The exception is the Galvanic Isolation Module on the Digital Input FTA. It provides terminal connections for two field devices. Figure 7-2 is an illustration of a typical Galvanic Isolation Module.

Figure 7-2 Typical Galvanic Isolation Module



Field wiring connections

The FTAs do not have field terminal connectors mounted directly on the assembly's printed circuit board as the standard FTAs do; instead, field wires are connected to compression-type or crimp-type connectors that mate with the connector on the individual Galvanic Isolation Module. The Compression-type connectors accommodate size 0.3 to 3.5 mm² (12 to 22 AWG) wiring, while the crimp-type connectors accommodate size 0.5 to 2.5 mm² (14 to 20 AWG) wiring.

Module plug-in capability

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

Easy module removal

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.

Cable shield connection

Spare wires and cable shields are terminated in the normal manner. Because the FTA does not have a built-in shield bus, the accommodation of a large number of shield wires requires the use of a horizontal bus bar that is installed on the FTA Mounting Channel and connected to the local Master Reference Ground (MRG). The horizontal bus bar is described in Section 9.

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7.2.1 Field Wiring Connections, Continued

Compression or pluggable terminals

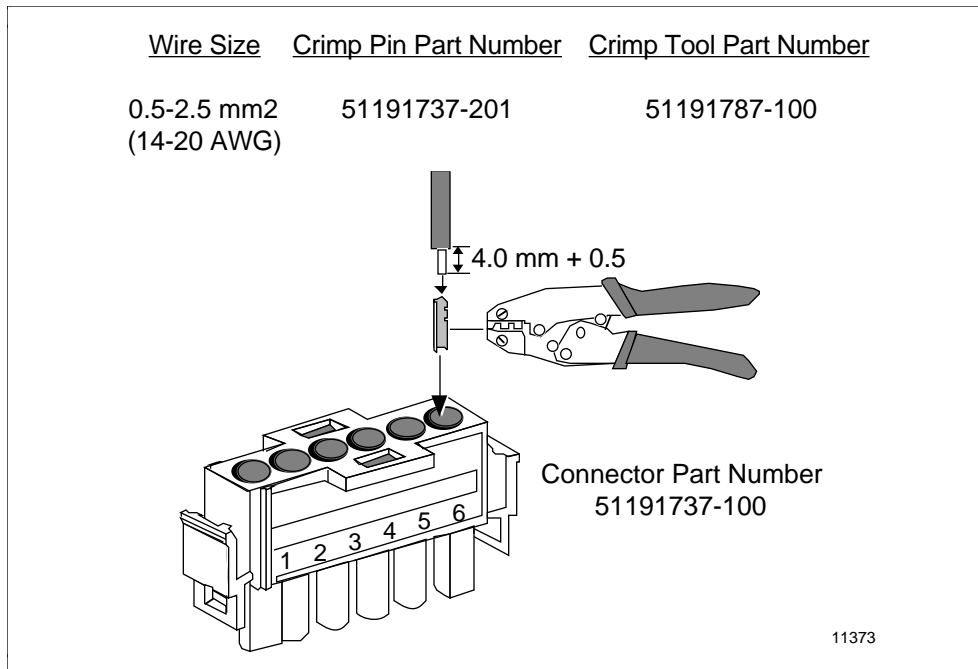
Compression-type or crimp-type pluggable 6-terminal connectors can be specified for the Galvanic Isolation Modules. The model number for the FTA specifies the connector type. If the model number ends in 02, 12, 13, 14, or 22, such as MU-GAOX02, MU-GAIH12, MU-GAIH13, MU-GAIH14, or MU-GAIH22, compression-type 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.

Crimp pin-type terminal connectors

The female crimp pins are installed over the stripped end of the wiring, before its insertion into a compression terminal-type connector where it is locked into place by the crimp-type connector. Size 0.5 to 2.5 mm² (14 to 20 AWG) wiring is accommodated with a crimp pin as shown in Figure 7-3. The female crimp pins, that are inserted into the connector, mate with companion male pins in the 6-pin connector on the Galvanic Isolation Module. An extraction tool must be used to remove the female crimp pin.

The crimp-type terminal connector is locked into place by tabs at the sides of the connector.

Figure 7-3 Crimp-Type Terminal Connector



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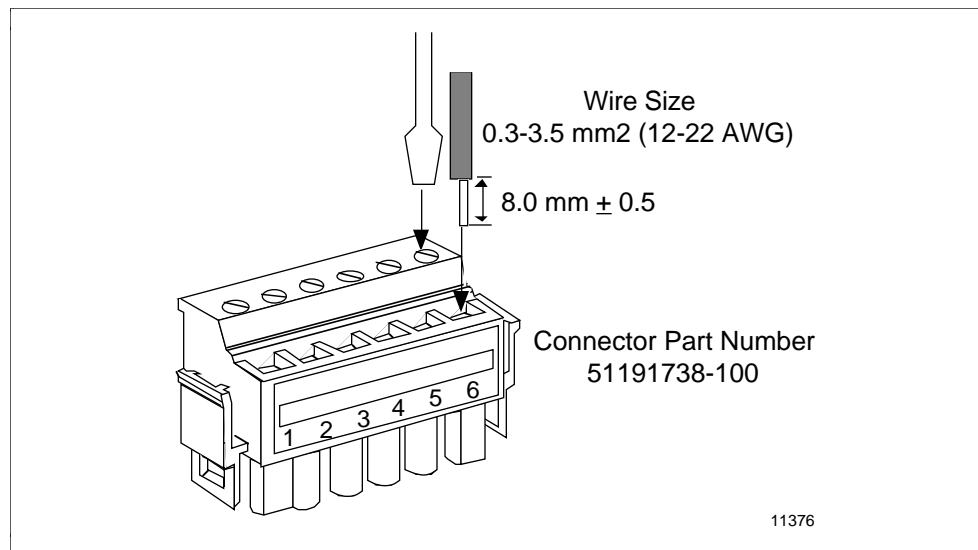
7.2.1 Field Wiring Connections, Continued

Compression-type terminal connector

The compression-type terminal connector accepts size 0.3 to 3.5 mm² (12 to 22 AWG) wire. The wire is stripped to a length of 8.0 millimeters, inserted into the 6-pin terminal connector, and held in place by tightening a dedicated screw as shown in Figure 7-4. Like the crimp-type terminal connector, the compression-type connector's female pins mate with companion male pins in the 6-pin connector on the Galvanic Isolation Module. Unlike the crimp-type terminal connector, six pins are always present and cannot be extracted. The inserted wires are removed by loosening the dedicated screw.

The compression-type terminal connector is locked into place by tabs at the sides of the connector.

Figure 7-4 Compression-Type Terminal Connector



7.2.2 FTA Types

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 device high drive and voltage outputs 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
-

FTAs support redundancy

Presently, only the Analog Input or Smart Transmitter Interface and the Analog Output types of FTAs have software available to support IOP redundancy. There are also nonredundant models of the Analog Output FTA, models MU-GAOX02 and MU-GAOX72.

IOP connectors

Each type of FTA has two 50-pin FTA cable connectors that provide connections to two IOPs when IOP redundancy is supported. Digital Input and Digital Output types of IOPs are not supported.

Activity indicator

A green LED on the FTA indicates IOP activity. The indicator is illuminated when the primary IOP (A) is active.

Continued on next page

7.2.2 FTA Types, Continued

Standby Manual Device The Analog Output FTA has a unique 50-pin connector that accepts control signals from the Analog Standby Manual Device to control the output signals of the FTA. The Digital Output FTA accepts control signals from the Digital Standby Manual Device through one of its IOP interface connectors.

Auxiliary connector Some FTA types, such as the High Level Analog Input, Digital Input and Digital Output FTAs, have a single 50-pin auxiliary connector that supports a particular auxiliary function. The function(s) is described in the pertinent FTA subsection that follow.

7.2.3 Power Requirements

Introduction The power requirement for the FTAs is a nominal +24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is discussed in subsection 7.9.

Redundant power connectors The FTAs have dual 2-pin power connectors for power source redundancy. Power for the two connectors can be provided by a single power source or a separate power source. Diodes on the FTA that “or” the two power sources prevent the two power sources from shorting together.

FTA fusing Each Galvanic Isolation Module is internally fused and the fuse cannot be replaced in the field; however, there are fuses on the FTA assembly and they can be replaced in the field.

Temperature and humidity parameters 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.

7.2.4 Horizontal FTA Mounting Channels

Overview

Standard FTAs mount on 92-centimeter (36-inch) long FTA Mounting Channels that are installed vertically in the cabinet. Galvanically Isolated FTAs must always mount on 61-centimeter (24-inch) long FTA Mounting Channels that are installed horizontally in the cabinet to provide better heat dissipation for the FTAs.

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 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 Marshalling Panel, if applicable, is toward the top of the cabinet.

One or two FTAs can be mounted on each FTA Mounting Channel.

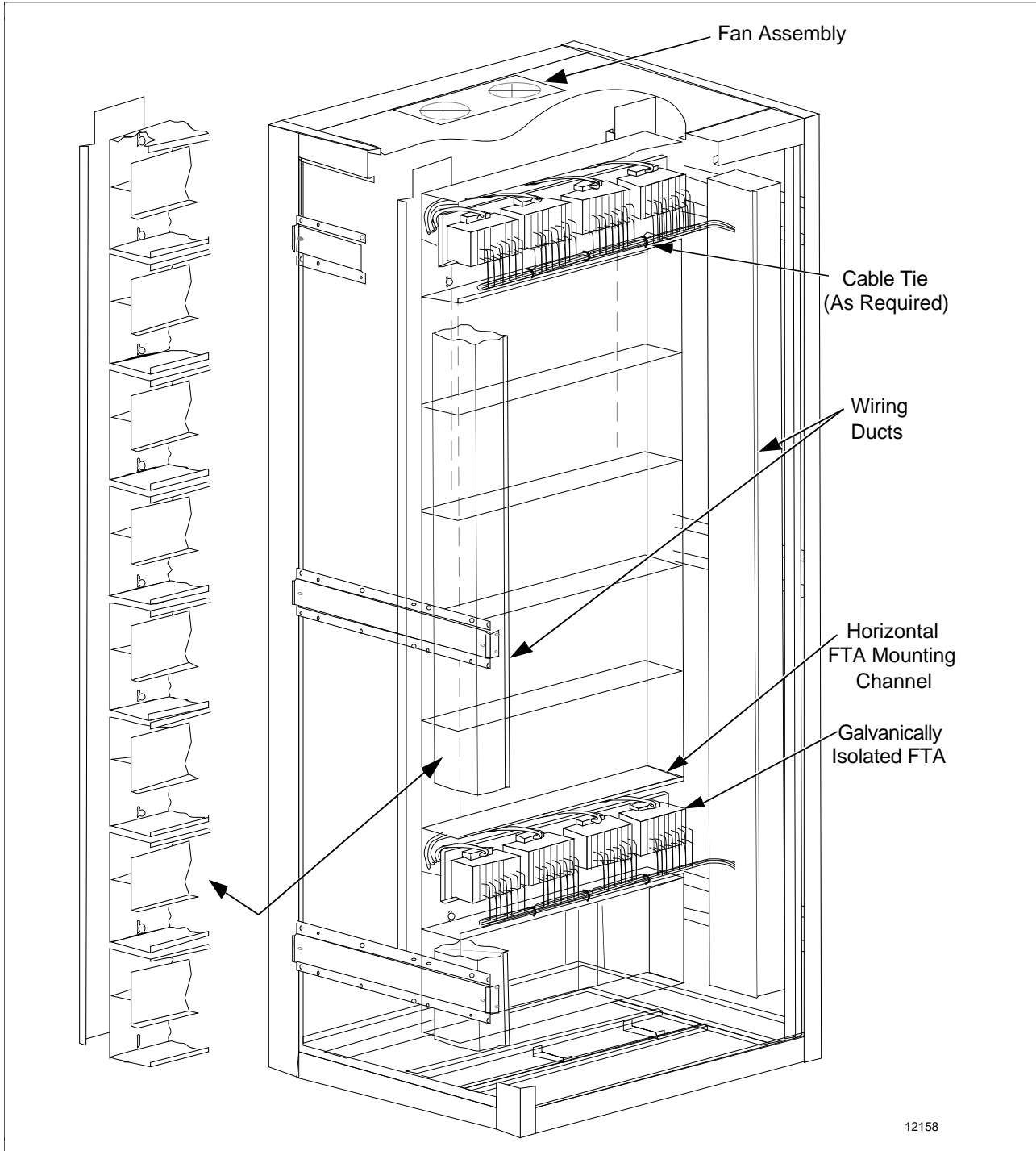
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7.2.4 Horizontal FTA Mounting Channels, Continued

FTA Mounting Channels installed horizontally in cabinet

Figure 7-5 is an illustration of a cabinet with horizontally installed FTA Mounting Channels.

Figure 7-5 Cabinet with Horizontally Installed FTA Mounting Channels



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7.2.4 Horizontal FTA Mounting Channels, Continued

Reasons for horizontal FTA mounting

There are two reasons for mounting the FTAs on separate horizontally orientated FTA Mounting Channels.

- Installation of both Galvanically Isolated FTAs 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 a safety violation.
- The design and current requirements of the Galvanic Isolation Modules is such that they dissipate more heat if they have a horizontal orientation.

Field wire routing

The field wires that connect to the FTA are routed to the right in the lower channel and out of the cabinet by going up or down the right side of the cabinet.

The field wires must be routed so that a minimum 2-inch separation is maintained from other wires or electrical components. The wiring can be separated from other wiring by a metal divider that is grounded to Safety Ground or a conductive divider.

FTA cable routing

The cables that connect the FTA to its associated IOP(s), the Power Distribution Assembly, or 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.

Cabinet fan assembly requirements

Because of the increased heat dissipation requirements of Galvanically Isolated FTAs, cabinet fan assemblies are mandatory on both sides of a dual-access cabinet. The single-access cabinet also requires a cabinet fan assembly. Horizontal FTA Mounting Channels will install only on the cabinet's center structure and not at the sides of the cabinet.

Galvanically Isolated and standard FTAs together

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.

Both FTA Mounting Channels types permitted

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.

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7.2.4 FTA Mounting Channels, Continued

Marshalling Panel mounting

The model MU-GMAR52 Marshalling Panel can be mounted on either a horizontally or vertically installed FTA Mounting Channel. If it is mounted on a horizontally installed FTA Mounting Channel, no standard 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 side of the cabinet.

Power Distribution Assembly mounting

The model MU-GPRD02 Power Distribution Assembly can be mounted on either a horizontally or vertically installed FTA Mounting Channel. If it is mounted on a horizontally installed FTA Mounting Channel and a Galvanically Isolated FTA is also mounted on the FTA Mounting Channel, the Power Distribution Assembly must be mounted at the left side of the FTA Mounting Channel with a 6-inch gap separating the components.

Cabling to the Power Distribution Assembly must be routed in the upper 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. Install the Power System at the top of the cabinet if the FTA's field wiring entry is at the bottom of the cabinet so the field wires are not routed near the Power System. If the field wiring entry is at the top of the cabinet, install the Power System at the bottom of the cabinet.

7.3 High Level Analog Input (HLAI) FTAs

7.3.1 Model MU-GAIH12/MU-GAIH82 FTAs

7.3.1.1 Description

Introduction

The model MU-GAIH12/MU-GAIH82 High Level Analog Input (HLAI) FTA accommodates up to 16 high level dc signals. The FTA provides 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, generating a 1 to 5 Vdc signal to the associated IOP.

Field transmitter compatibility

The FTA is suitable for conventional field transmitters only.

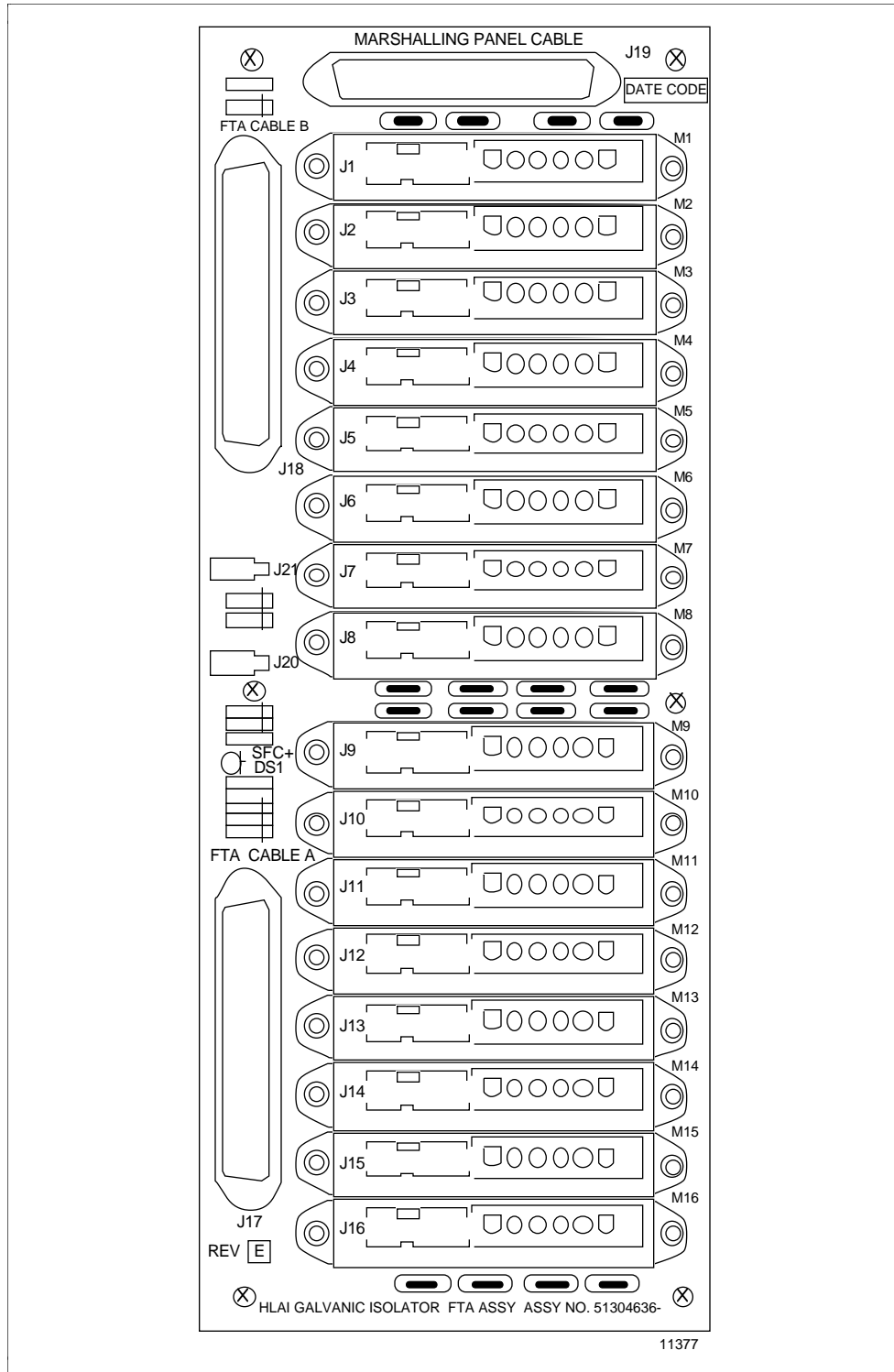
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7.3.1.1 Description, Continued

Model MU-GAIH12/82 assembly layout

Figure 7-6 is an illustration of the FTA assembly layout.

Figure 7-6 Model MU-GAIH12/82 HLAI FTA Assembly Layout



7.3.1.2 Signal Connectors

Two IOP connectors Two 50-pin connectors, J17 and J18, labeled **FTA CABLE A** and **FTA CABLE B** provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable, in which case the J17 connector is used.

One auxiliary connector One 50-pin auxiliary connector, J19, labeled **MARSHALLING PANEL CABLE** provides signals for remote monitoring and alarming systems.

7.3.1.3 Field Wiring Input Signals

Introduction Each Galvanic Isolation Module on the HLAI FTA provides a floating dc source for energizing conventional 2-wire or 3-wire 4-20 mA transmitters. The Galvanic Isolation Module accurately repeats the input current. The module's 4-20 mA output current is converted into a 1 to 5 volt signal across a 250-ohm high precision resistor and presented to the associated IOP.

Safety description The safety description for the Galvanic Isolation Module is

- 28 Vdc maximum
- 300 ohms
- 93 milliamps maximum

Field device connections Each Galvanic Isolation Module accepts one field device connection. See Figure 7-7 for a functional representation and connection diagram of the model MU-GAIH12/MU-GAIH82 High Level Analog (HLAI) FTA.

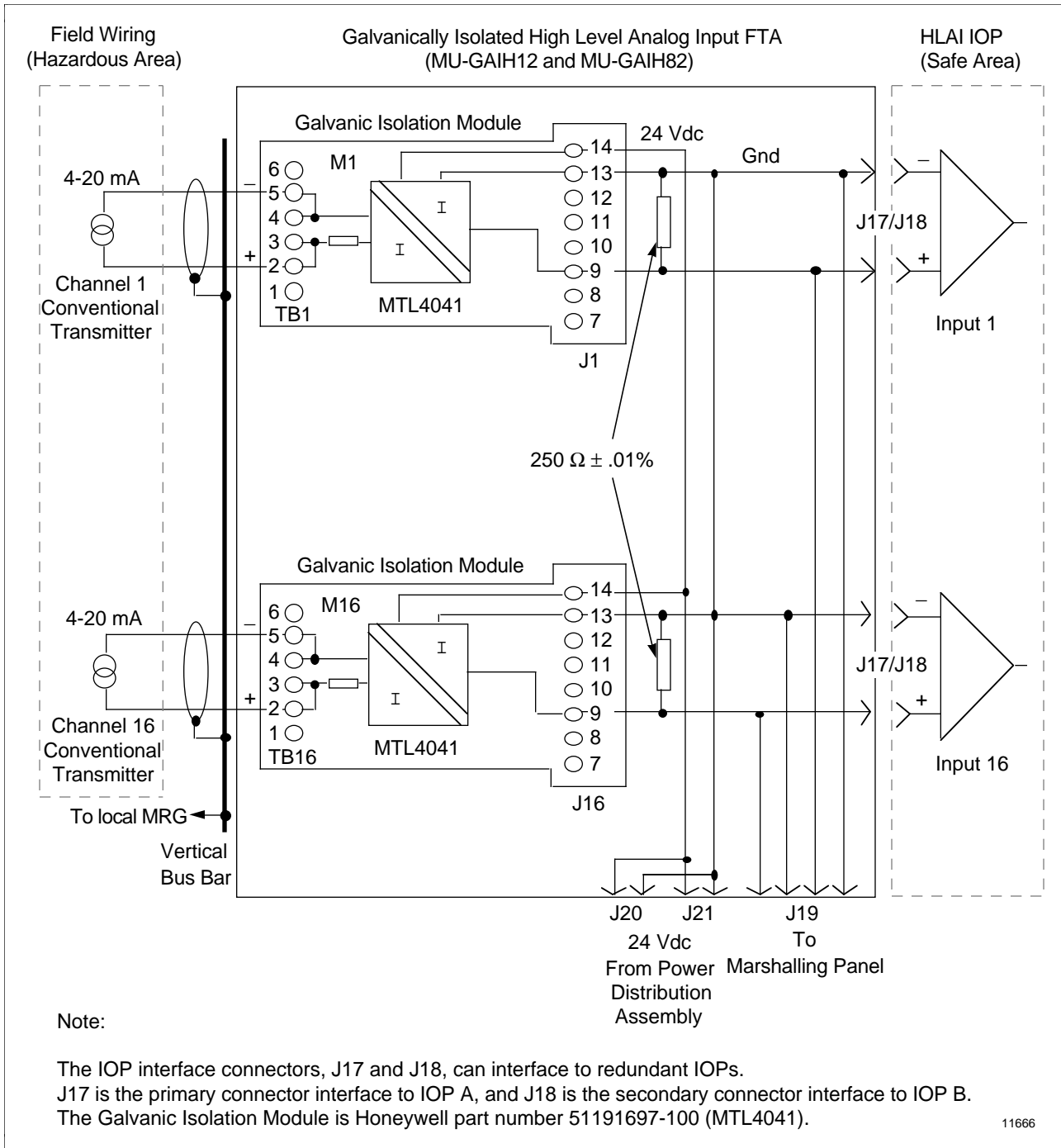
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7.3.1.3 Field Input Signals, Continued

Model MU-GAIH12/82 connection diagram

Figure 7-7 is a connection diagram for the model MU-GAIH12/MU-GAIH82 High Level Analog Input FTA.

Figure 7-7 Model MU-GAIH12/82 HLAI FTA Connection Diagram



7.3.1.4 MARSHALLING PANEL CABLE Connector

PV signals available One to five Vdc PV signals are available at the **MARSHALLING PANEL CABLE** connector, J19. These signals are available from across the same high precision 250-ohm resistors that are used to provide control signals to the High Level Analog Input IOP to which the FTA is connected. Because it is a control signal that the IOP senses, the recording or monitoring system connected to the screw terminals of the Marshalling Panel must provide a high impedance of at least 1 megohm to avoid affecting the accuracy of the signal.

Marshalling Panel interface 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 they are available at screw terminals. If the Marshalling Panel is installed outside the cabinet or cabinet complex, use the model MU-KFTSxx shielded cable. See subsection 7.8 for a description of the Marshalling Panel.

7.3.1.5 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.

7.3.1.6 Power Connectors

Power requirement The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is described in subsection 7.9.

Dual power connectors The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.3.1.7 Current Consumption

Power Consumption The FTA consumes 1.28 amperes at 24 Vdc with a 20 mA signal present at all inputs. This is 30.7 watts of power.

Power dissipation The power dissipation of the FTA is 25 watts with a 20 mA signal present at all inputs.

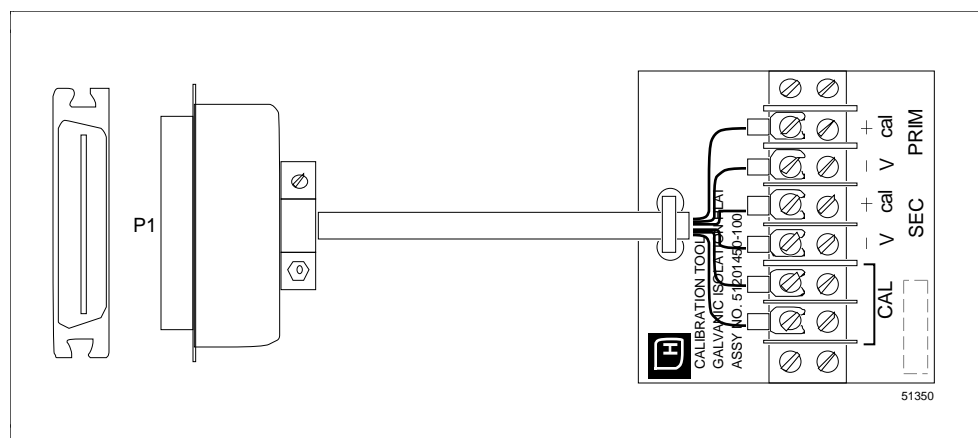
7.3.1.8 IOP Calibration

Introduction Because of circuit density on the FTA board assembly, IOP calibration terminals, similar to those on a standard FTA, could not be added to the assembly. Instead, unused terminals in the auxiliary connector provide a calibration interface to the Galvanic Isolation HLAI Calibration tool, Honeywell part number 51201450.

Calibration terminals The signals required for calibration of the HLAI IOP are provided at the screw terminals at the end of the tool's cable when the cable is connected to the auxiliary connector on the HLAI FTA. The calibration procedure is the same procedure used for the standard HLAI FTA. The procedure can be found in the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* manual.

Galvanic Isolation HLAI Calibration tool Figure 7-8 is an illustration of the Galvanic Isolation HLAI Calibration tool.

Figure 7-8 Galvanic Isolation HLAI Calibration Tool (51201450)



7.3.2 Model MU-GAIH13/MU-GAIH83 FTAs

7.3.2.1 Description

Introduction

The model MU-GAIH13/MU-GAIH83 High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTA accommodates up to 16 high level dc signals. The FTA provides 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, generating a 1 to 5 Vdc signal to the associated 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 **TotalPlant** Solution (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 (SFC+ and the channel’s spool resistor, R1-R16). The communicator can also be connected to the field-side terminals on the Galvanic Isolation Module.

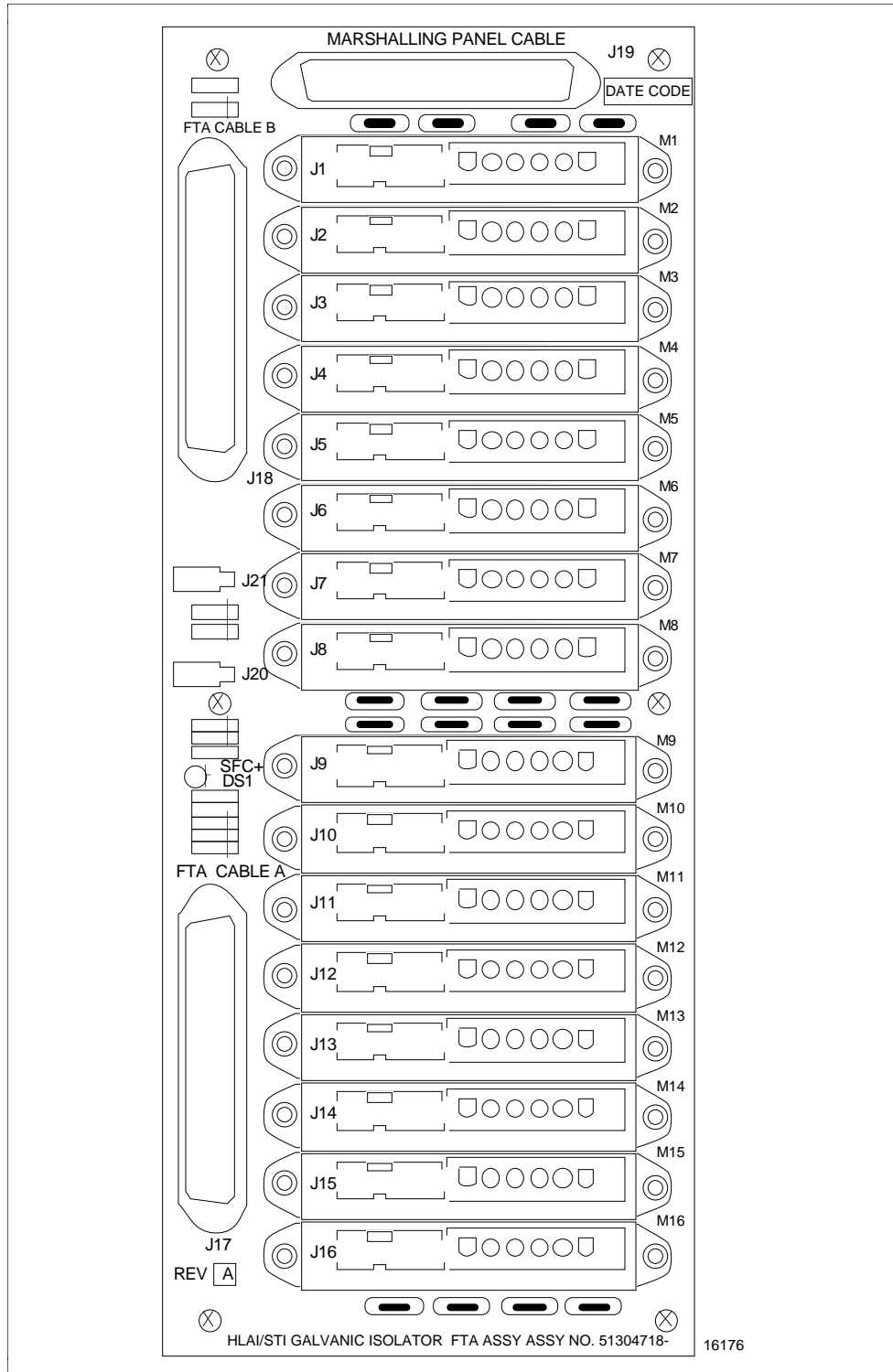
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7.3.2.1 Description, Continued

**Model MU-GAIH13/83
assembly layout**

Figure 7-9 is an illustration of the FTA assembly layout.

Figure 7-9 Model MU-GAIH13/83 HLAI FTA Assembly Layout



7.3.2.2 Signal Connectors

Two IOP connectors	Two 50-pin connectors, J17 and J18, labeled FTA CABLE A and FTA CABLE B provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.
One auxiliary connector	One 50-pin auxiliary connector, J19, labeled MARSHALLING PANEL CABLE provides signals for remote monitoring and alarming systems.

7.3.2.3 Field Wiring Input Signals

Introduction	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. The Galvanic Isolation Module accurately repeats the input signal. The Galvanic Isolation Module's 4-20 mA output current is converted into a 1 to 5 volt signal across a 250-ohm high precision resistor and presented to the associated IOP.
Safety description	The safety description for the Galvanic Isolation Module is <ul style="list-style-type: none">• 28 Vdc maximum• 300 ohms• 93 milliamps maximum
Field device connections	Each Galvanic Isolation Module accepts one field device connection. See Figure 7-10 for a functional representation and connection diagram of the model MU-GAIH13/MU-GAIH83 High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTA.

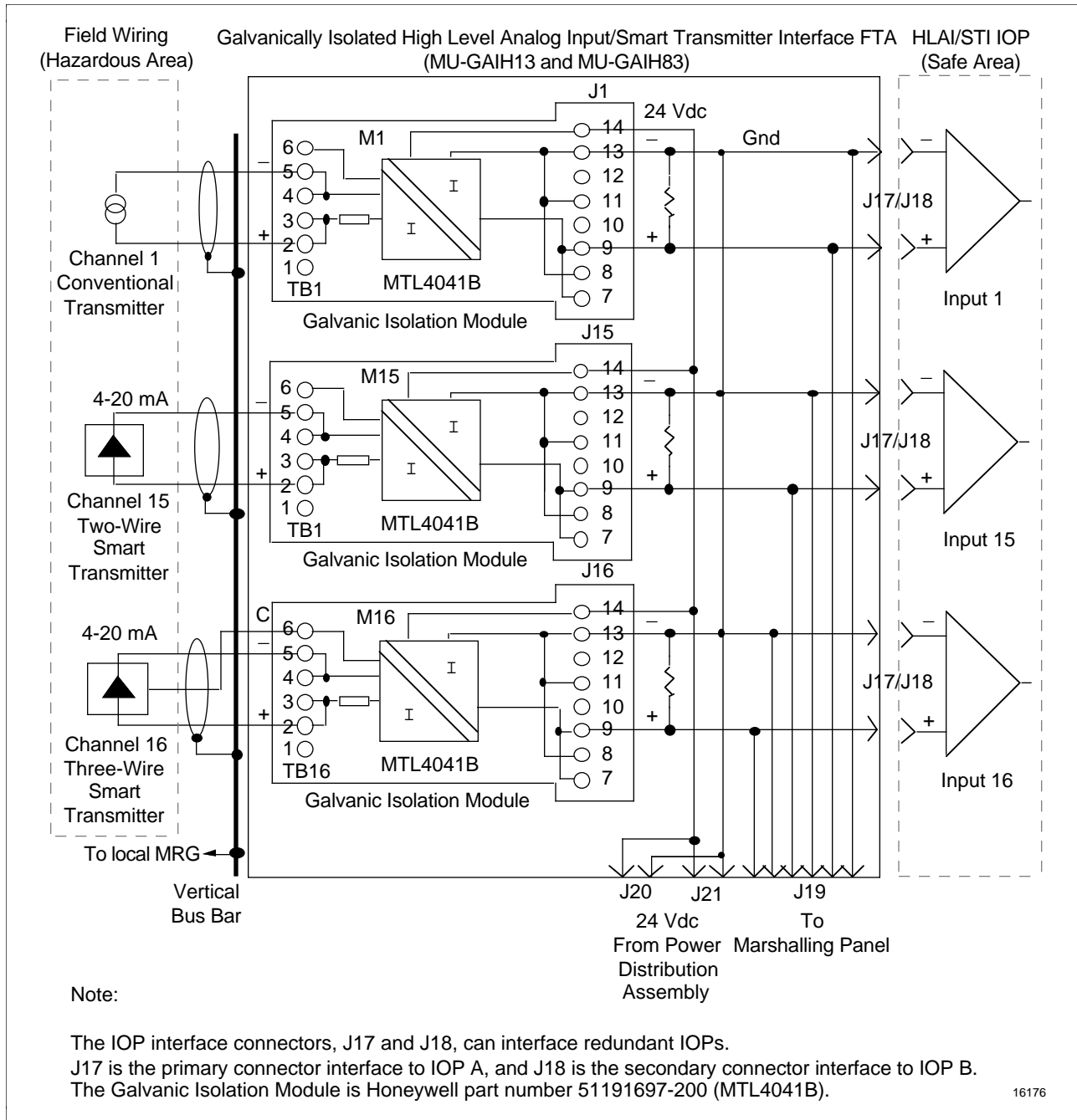
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7.3.2.3 Field Input Signals, Continued

Model MU-GAIH13/83 connection diagram

Figure 7-10 is a connection diagram for the model MU-GAIH13/MU-GAIH83 HLAI/STI FTA.

Figure 7-10 Model MU-GAIH13/83 HLAI/STI FTA Connection Diagram



7.3.2.4 MARSHALLING PANEL CABLE Connector

PV signals available

One to five Vdc PV signals are available at the **MARSHALLING PANEL CABLE** connector, J19. These signals are available from across the same high precision 250-ohm resistors used to provide control signals to the High Level Analog Input IOP to which the FTA is connected. Because it is a control signal that the IOP senses, the recording or monitoring system connected to the screw terminals of the Marshalling Panel must provide a high impedance of at least 1 megohm to avoid affecting the accuracy of the signal.

Marshalling Panel interface

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 they are available at screw terminals. If the Marshalling Panel is installed outside the cabinet or cabinet complex, use the model MU-KFTSxx shielded cable. See subsection 7.8 for a description of the Marshalling Panel.

7.3.2.5 Indicators

Primary IOP active indicator

A green indicator on the FTA assembly 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.

7.3.2.6 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. See Figure 7-10.

7.3.2.7 Power Connectors

Power requirement The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 described in subsection 7.9.

Dual power connectors The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.3.2.8 Current Consumption

Power consumption The FTA consumes 1.28 amperes at 24 Vdc with a 20 mA signal present at all inputs. This represents to 30.7 watts of power.

Power dissipation The power dissipation of the FTA is 25 watts with a 20 mA signal present at all inputs.

7.3.2.9 IOP Calibration

Introduction Because of circuit density on the FTA board assembly, IOP calibration terminals, similar to those on a standard FTA, could not be added to the assembly. Instead, unused terminals in the auxiliary connector provide a calibration interface to the Galvanic Isolation HLAI Calibration tool, Honeywell part number 51201450.

Calibration terminals The signals required for calibration of the HLAI IOP are provided at the screw terminals at the end of the tool’s cable when the cable is connected to the auxiliary connector on the HLAI FTA. The calibration procedure is the same procedure used for the standard HLAI FTA. The procedure can be found in the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* manual. Figure 7-8 is an illustration of the Galvanic Isolation HLAI Calibration tool.

7.3.3 Model MU-GAIH14/MU-GAIH84 FTAs

7.3.3.1 Description

Introduction

The model MU-GAIH14/MU-GAIH84 High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTA accommodates 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 that its safety specifications are different and the available field terminal voltage is higher. This permits longer field wiring.

The FTA provides 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, generating a 1 to 5 Vdc signal to the associated 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 transmitter can be calibrated, interrogated, or tested from the TDC 3000^X, or from a hand-held communicator connected to the field connector terminals on the Galvanic Isolation Module or connected across points on the FTA assembly (**TP1** and the channel’s spool resistor, R1-R16). The communicator can also be connected to the field-side terminals on the Galvanic Isolation Module.

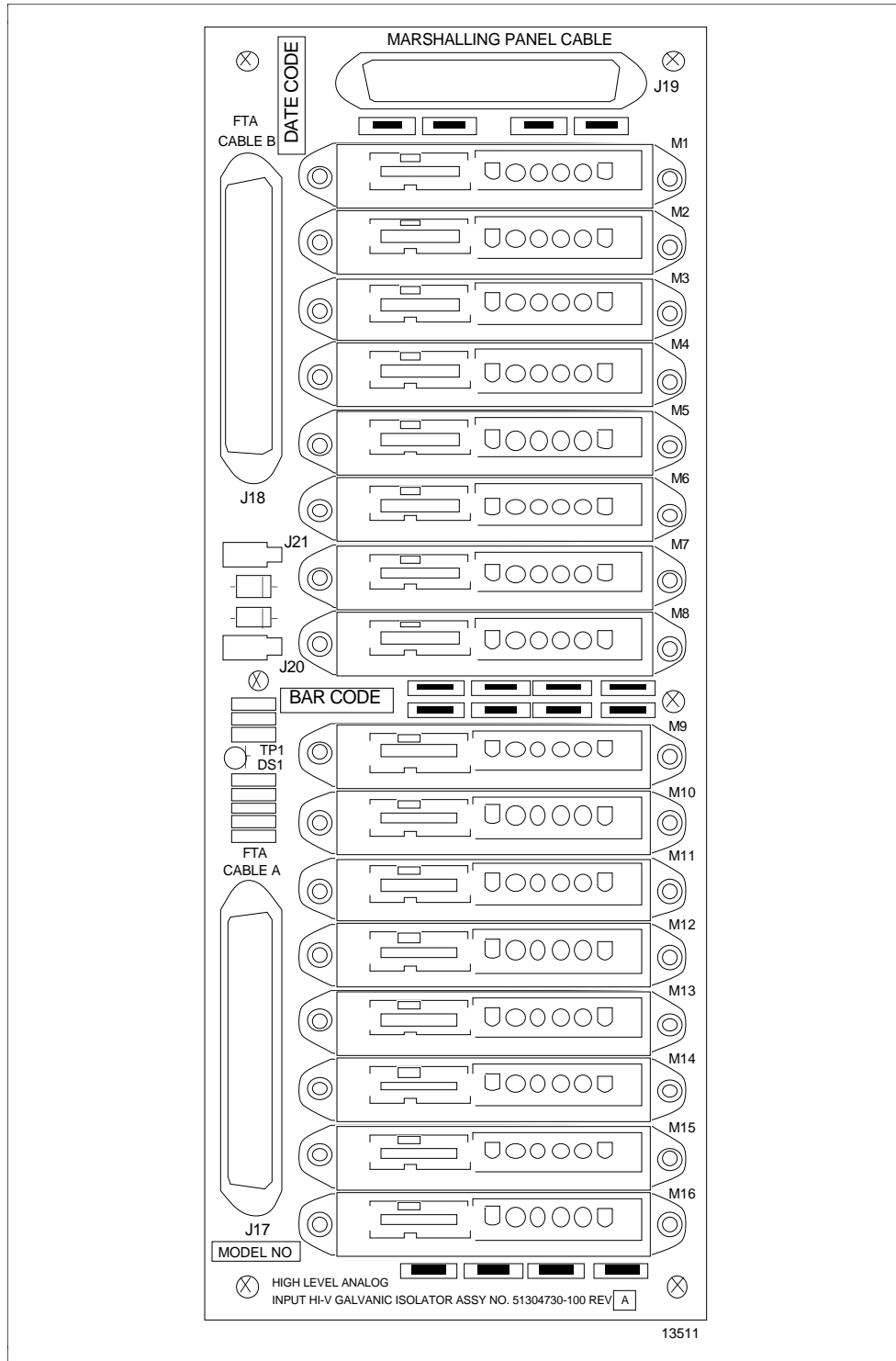
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7.3.3.1 Description, Continued

Model MU-GAIH14/84 assembly layout

Figure 7-11 is an illustration of the FTA assembly layout.

Figure 7-11 Model MU-GAIH14/84 HLAI FTA Assembly Layout



7.3.3.2 Signal Connectors

Two IOP connectors Two 50-pin connectors, J17 and J18, labeled **FTA CABLE A** and **FTA CABLE B** provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.

One auxiliary connector One 50-pin auxiliary connector, J19, labeled **MARSHALLING PANEL CABLE** provides signals for remote monitoring and alarming systems.

7.3.3.3 Field Wiring Input Signals

Introduction 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. The Galvanic Isolation Module accurately repeats the input signal. The Galvanic Isolation Module's 4-20 mA output current is converted into a 1 to 5 volt signal across a 250-ohm high precision resistor and presented to the associated IOP.

Safety description The safety description for the Galvanic Isolation Module is

- 28 Vdc maximum
 - 234 ohms
 - 119 milliamps maximum
-

Field device connections Each Galvanic Isolation Module accepts one field device connection. See Figure 7-11 for a functional representation and connection diagram of the model MU-GAIH14/MU-GAIH84 High Level Analog Input/Smart Transmitter Interface (HLAI/STI) FTA.

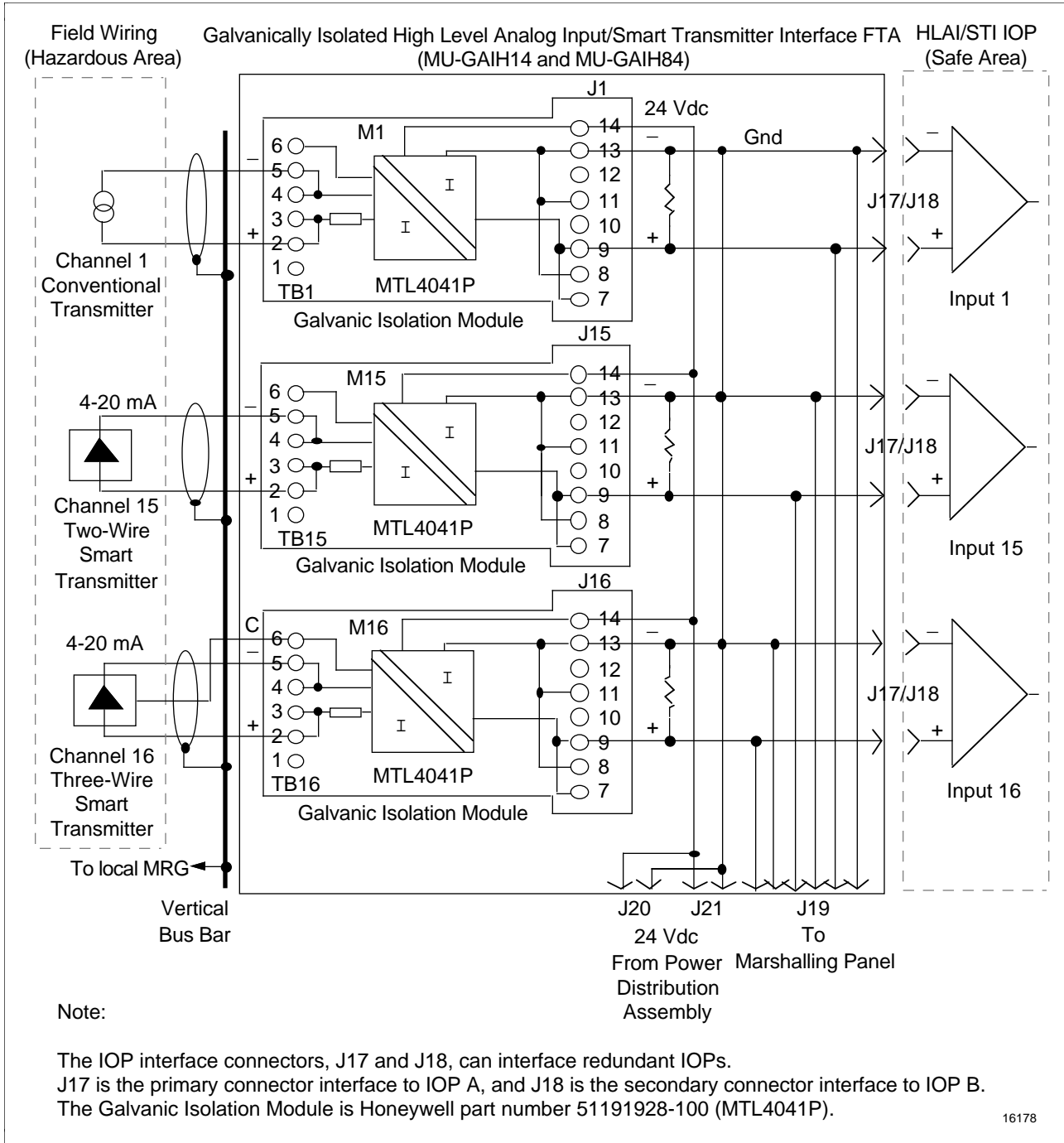
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7.3.3.3 Field Input Signals, Continued

Model MU-GAIH14/84 connection diagram

Figure 7-12 is a connection diagram for the model MU-GAIH14/MU-GAIH84 HLAI/STI FTA.

Figure 7-12 Model MU-GAIH14/84 HLAI/STI FTA Connection Diagram



7.3.3.4 MARSHALLING PANEL CABLE Connector

PV signals available

One to five Vdc PV signals are available at the **MARSHALLING PANEL CABLE** connector, J19. These signals are available from across the same high precision 250-ohm resistors used to provide control signals to the High Level Analog Input IOP to which the FTA is connected. Because it is a control signal that the IOP senses, the recording or monitoring system connected to the screw terminals of the Marshalling Panel must provide a high impedance of at least 1 megohm to avoid affecting the accuracy the signal.

Marshalling Panel interface

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 they are available at screw terminals. If the Marshalling Panel is installed outside the cabinet or cabinet complex, use the model MU-KFTSxx shielded cable. See subsection 7.8 for a description of the Marshalling Panel.

7.3.3.5 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.

7.3.3.6 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. See Figure 7-12.

7.3.3.7 Power Connectors

Power requirement The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is described in subsection 7.9.

Dual power connectors The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.3.3.8 Current Consumption

Power consumption The FTA consumes 1.2 amperes at 24 Vdc with a 20 mA signal present at all inputs. This is equivalent to 28.2 watts.

Power dissipation The power dissipation of the FTA is 20.8 watts with a 20 mA signal present at all inputs.

7.3.3.9 IOP Calibration

Introduction Because of circuit density on the FTA board assembly, IOP calibration terminals, similar to those on a standard FTA, could not be added to the assembly. Instead, unused terminals in the auxiliary connector provide a calibration interface to the Galvanic Isolation HLAI Calibration tool, Honeywell part number 51201450.

Calibration terminals The signals required for calibration of the HLAI IOP are provided at the screw terminals at the end of the tool’s cable when the cable is connected to the auxiliary connector on the HLAI FTA. The calibration procedure is the same procedure used for the standard HLAI FTA. The procedure can be found in the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* manual. Figure 7-8 is an illustration of the Galvanic Isolation HLAI Calibration tool.

7.3.4 Model MU-GAIH22/MU-GAIH92 FTAs

7.3.4.1 Description

Introduction

The model MU-GAIH22/MU-GAIH92 High Level Analog Input (HLAI) FTA accommodates up to 16 high level dc signals. The FTA provides 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 generate a 1 to 5 Vdc signal to the associated IOP.

The model MU-GAIH22/MU-GAIH92 FTA is similar to the model MU-GAIH14/MU-GAIH84 FTA, 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.

Not suitable for Smart transmitters

The FTA is suitable for conventional transmitters only, not “smart” transmitters.

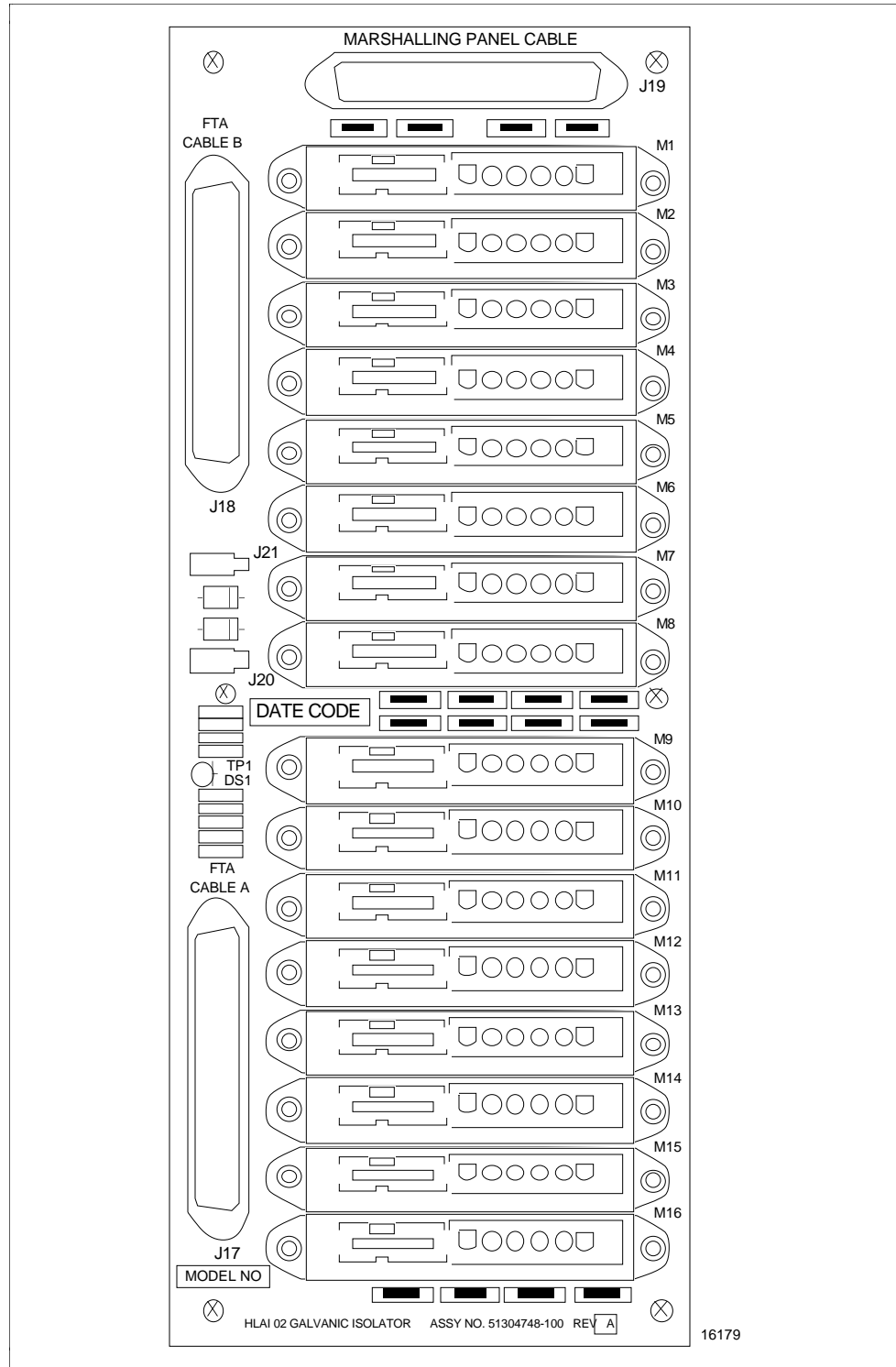
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7.3.4.1 Description, Continued

Model MU-GAIH22/92
assembly layout

Figure 7-13 is an illustration of the FTA assembly layout.

Figure 7-13 Model MU-GAIH22/92 HLAI FTA Assembly Layout



7.3.4.2 Signal Connectors

Two IOP connectors Two 50-pin connectors, J17 and J18, labeled **FTA CABLE A** and **FTA CABLE B** provide the interfaces to redundant IOPs. A nonredundant configuration is also acceptable.

One auxiliary connector One 50-pin auxiliary connector, J19, labeled **MARSHALLING PANEL CABLE** provides 4-20 mA signals to auxiliary devices.

7.3.4.3 Field Wiring Input Signals

Introduction Each Galvanic Isolation Module on the HLAI FTA provides a floating dc source for energizing conventional 2-wire or 3-wire, 4-20 mA transmitters. The Galvanic Isolation Module accurately converts the input current into a 1 to 5 volt output signal to the associated IOP.

Safety description The safety description for the Galvanic Isolation Module is

- 28 Vdc maximum
- 300 ohms
- 93 milliamps maximum

Field device connections Each Galvanic Isolation Module accepts one field device connection. See Figure 7-14 for a functional representation and connection diagram of the model MU-GAIH22/MU-GAIH92 High Level Analog Input (HLAI) FTA.

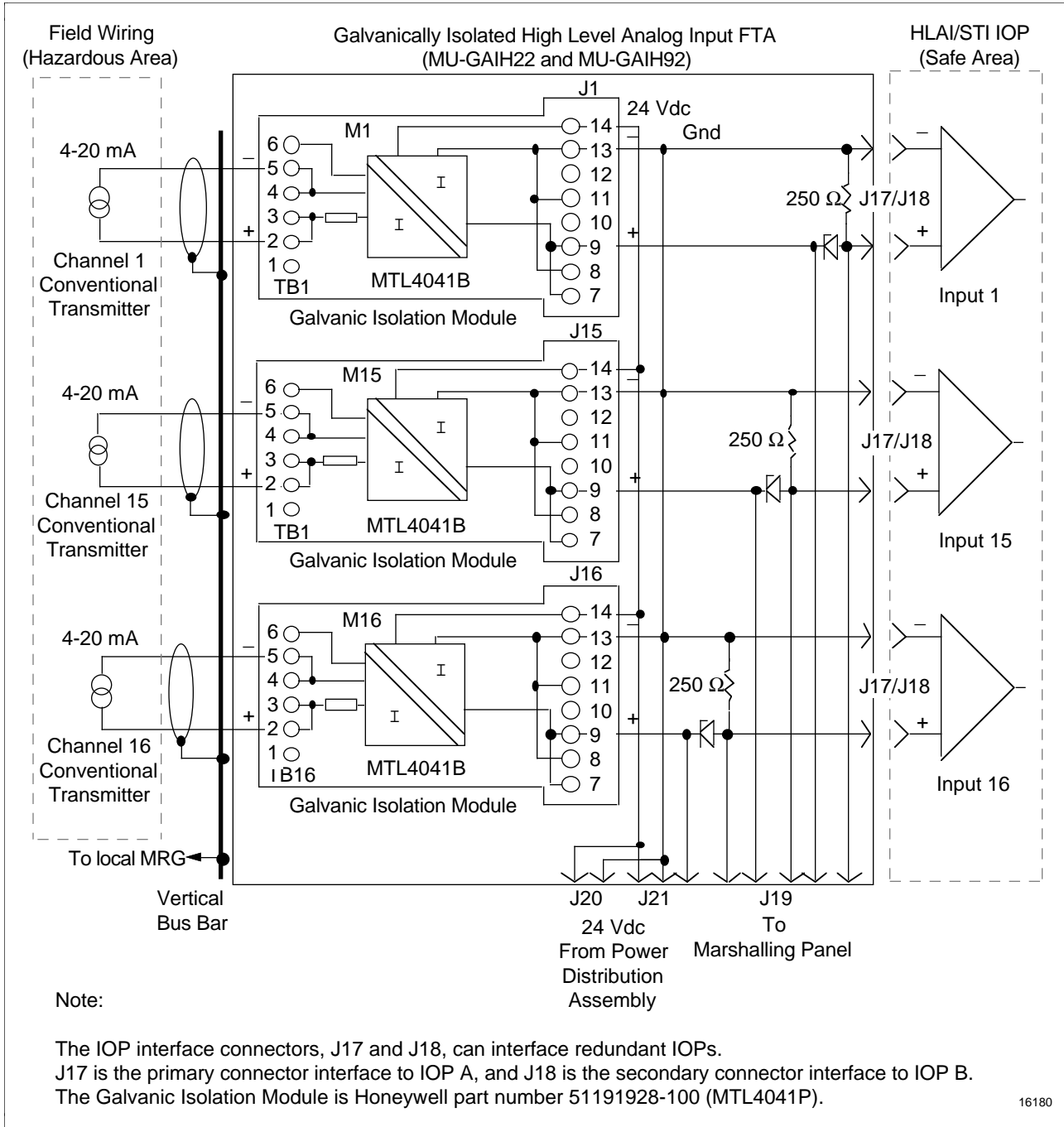
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7.3.4.3 Field Input Signals, Continued

Model MU-GAIH22/92 connection diagram

Figure 7-14 is a connection diagram for the model MU-GAIH22/MU-GAIH92 HLAI FTA.

Figure 7-14 Model MU-GAIH22/92 HLAI FTA Connection Diagram



7.3.4.4 MARSHALLING PANEL CABLE Connector

PV signals available 4-20 mA Vdc PV signals are available at the **MARSHALLING PANEL CABLE** connector, J19. These are the same signals that the Galvanic Isolation Module provides the High Level Analog Input IOP to which the FTA is connected. 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.

Marshalling Panel interface 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 they are available at screw terminals. If the Marshalling Panel is installed outside the cabinet or cabinet complex, use the model MU-KFTSxx shielded cable. See subsection 7.8 for a description of the Marshalling Panel.

7.3.4.5 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.

7.3.4.6 Power Connectors

Power requirement The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is described in subsection 7.9.

Dual power connectors The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.3.4.7 Current Consumption

Power consumption The FTA consumes 1.2 amperes at 24 Vdc with a 20 mA signal present at all inputs. This is equivalent to 28.8 watts.

Power dissipation The power dissipation of the FTA is 20.8 watts with a 20 mA signal present at all inputs.

7.3.4.8 IOP Calibration

Introduction Because of circuit density on the FTA board assembly, IOP calibration terminals, similar to those on a standard FTA, could not be added to the assembly. Instead, unused terminals in the auxiliary connector provide a calibration interface to the Galvanic Isolation HLAI Calibration tool, Honeywell part number 51201450.

Calibration terminals The signals required for calibration of the HLAI IOP are provided at the screw terminals at the end of the tool's cable when the cable is connected to the auxiliary connector on the HLAI FTA. The calibration procedure is the same procedure used for the standard HLAI FTA. The procedure can be found in the *Process Manager/Advanced Process Manager Service* or *High-Performance Process Manager Service* manual. Figure 7-8 is an illustration of the Galvanic Isolation HLAI Calibration tool.

7.4 Analog Output (AO) FTAs

7.4.1 Model MU-GAOX02/72 and MU-GAOX12/82 FTAs

7.4.1.1 Description

Introduction

The Galvanically Isolated Analog Output (AO) FTAs isolate up to eight 4-20 mA signals that can drive current-to-pressure (I/P) transducers, position actuators, or any load of 750-ohms or less from the associated Analog Output IOP.

Four FTA models

There are four models of the FTA. Two of the models are capable of switching between redundant IOPs.

Model descriptions

The crimp-type terminal model MU-GAOX02 FTA and the compression-type terminal model MU-GAOX72 FTA are nonredundant models, while the screw-type terminal model MU-GAOX12 FTA and the compression-type terminal model MU-GAOX82 FTA are redundant models.

Same assembly layout

Both the nonredundant and redundant models of the FTA use the same assembly layout. See Figure 7-15 for an illustration of the FTA assembly layout. The nonredundant models of the FTA, MU-GAOX02 and MU-GAOX72, have the IOP switching module, M9, removed. Only the “FTA Cable A” connector, J9, is used to connect to the single IOP.

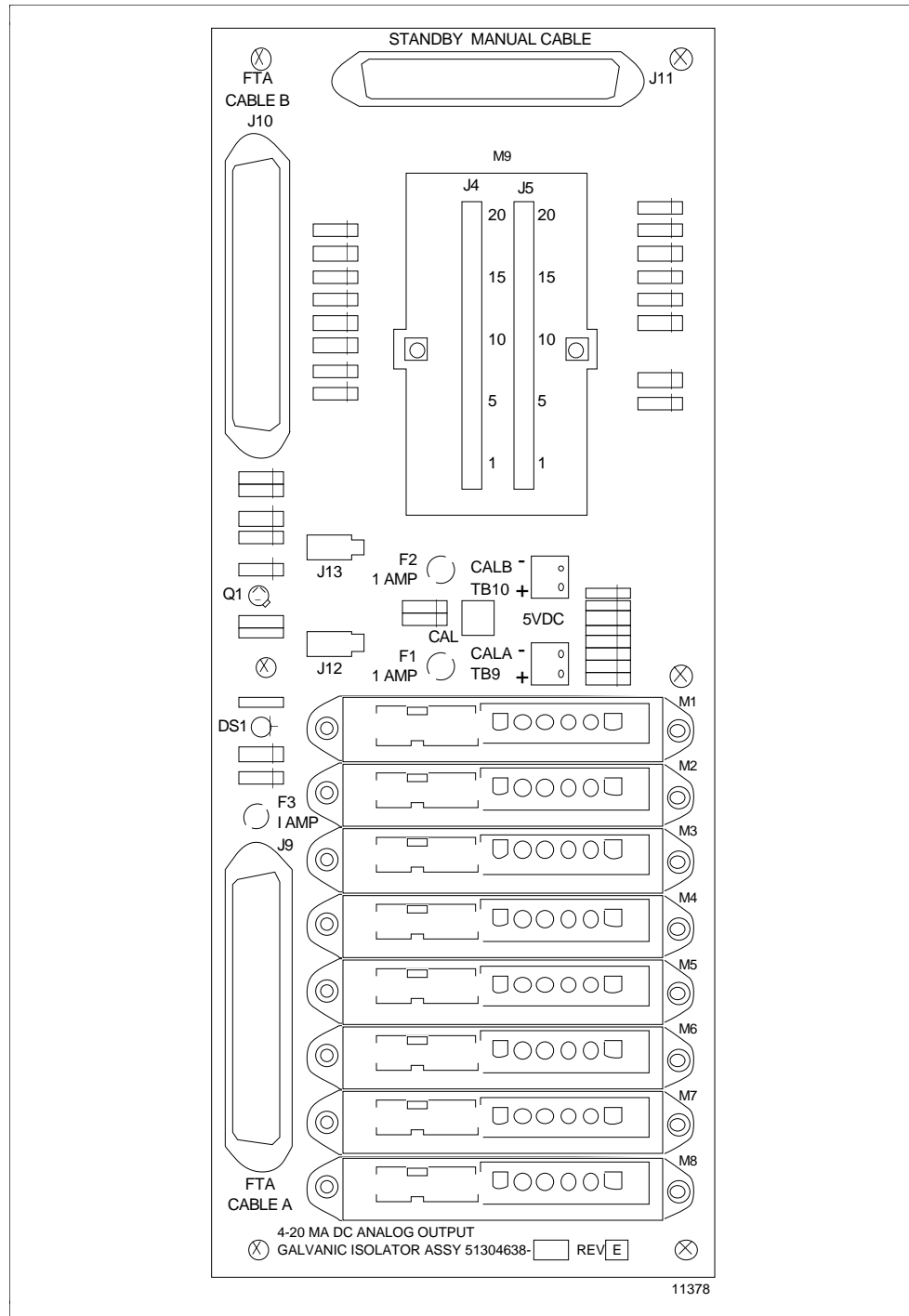
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7.4.1.1 Description, Continued

Model MU-GAOX02/72 and MU-GAOX12/82 assembly layout

Figure 7-15 is an illustration of the model MU-GAOX02/72 and MU-GAOX12/82 Analog Output FTA assembly layout.

Figure 7-15 Models MU-GAOX02/72 and MU-GAOX12/82 Analog Output FTA Assembly Layout



7.4.1.2 Signal Connectors

Nonredundant models	For the nonredundant models, MU-GAOX02 and MU-GAOX72, a single 50-pin connector, J9, labeled FTA CABLE A provides the interface to the IOP, using a model MU-KFTAxx cable (the suffix “xx” represents the length of the cable in meters).
Redundant models	For the redundant models, MU-GAOX12 and MU-GAOX82, two 50-pin connectors, J9 and J10, labeled FTA CABLE A and FTA CABLE B provide the interfaces to redundant IOPs by using two model MU-KFTAxx cables. A nonredundant configuration is also acceptable.
Standby Manual Device connector	One 50-pin connector, J11, labeled STANDBY MANUAL CABLE accepts signals from an Analog Standby Manual Device, permitting removal and replacement of an IOP while operational.

7.4.1.3 Field Wiring Output Signals

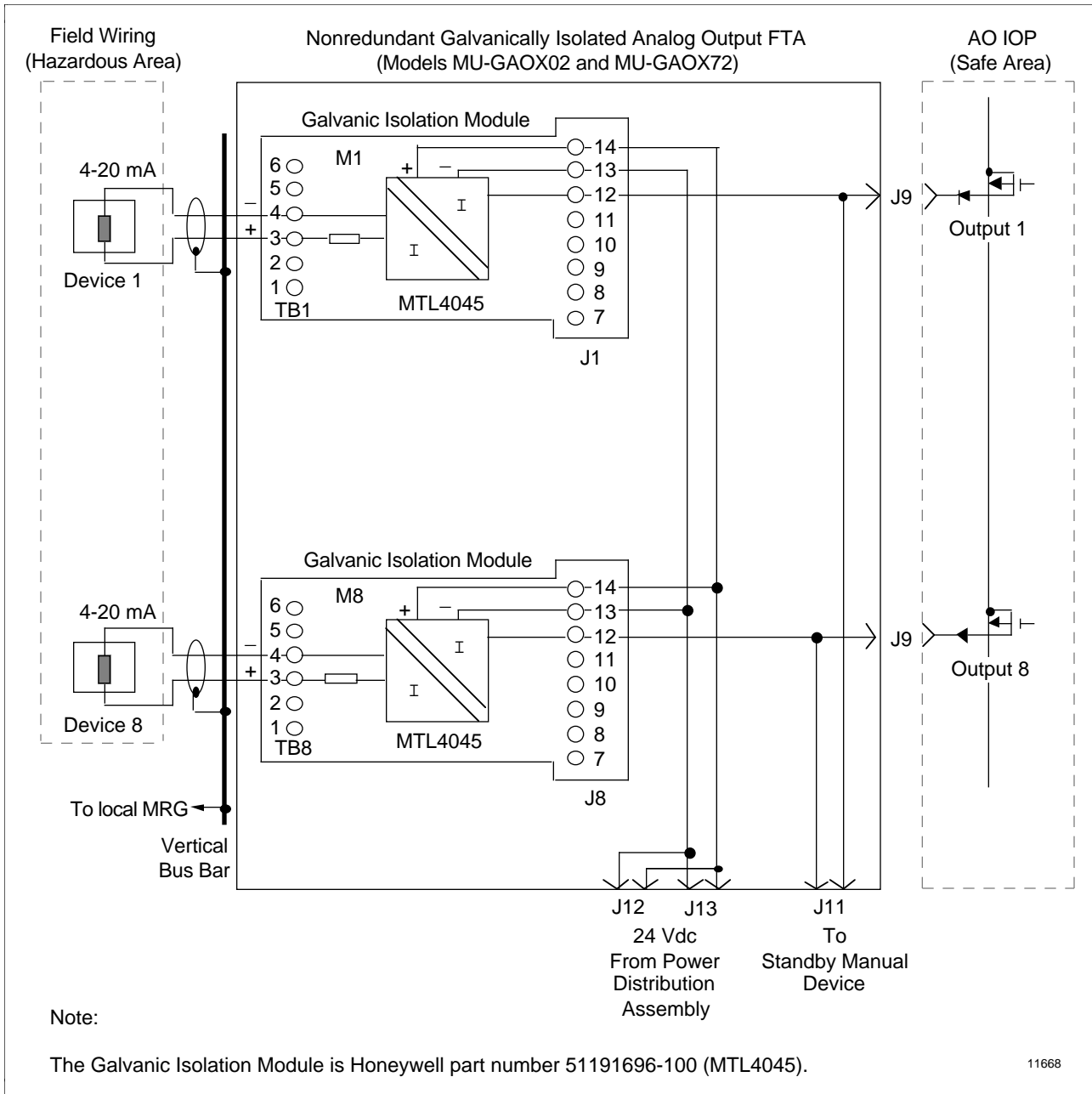
Load resistance	The FTA provides 4-20 mA for control of field devices that are Galvanically Isolated from all other circuits. The load resistance can be no greater than 750-ohms. The signal output dynamic impedance is greater than 1 megohm.
Connection diagrams	Each Galvanic Isolation Module accepts one field device connection on terminals 3 and 4. Figure 7-16 is a functional representation and connection diagram of the Galvanically Isolated model MU-GAOX02 and model MU-GAOX72 Analog Output FTAs. Figure 7-17 is a functional representation and connection diagram of the Galvanically Isolated model MU-GAOX12 and model MU-GAOX82 Analog Output FTAs.
Safety description	The safety description for each Galvanic Isolation Module input is <ul style="list-style-type: none">• 28 volts maximum• 300 ohms• 93 milliamps maximum

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7.4.1.3 Field Wiring Output Signals, Continued

Model MU-GAOX02/72 connection diagram Figure 7-16 is a connection diagram for the model MU-GAOX02/MU-GAOX72 Analog Output FTA

Figure 7-16 Model MU-GAOX02/72 Analog Output FTA Connection Diagram

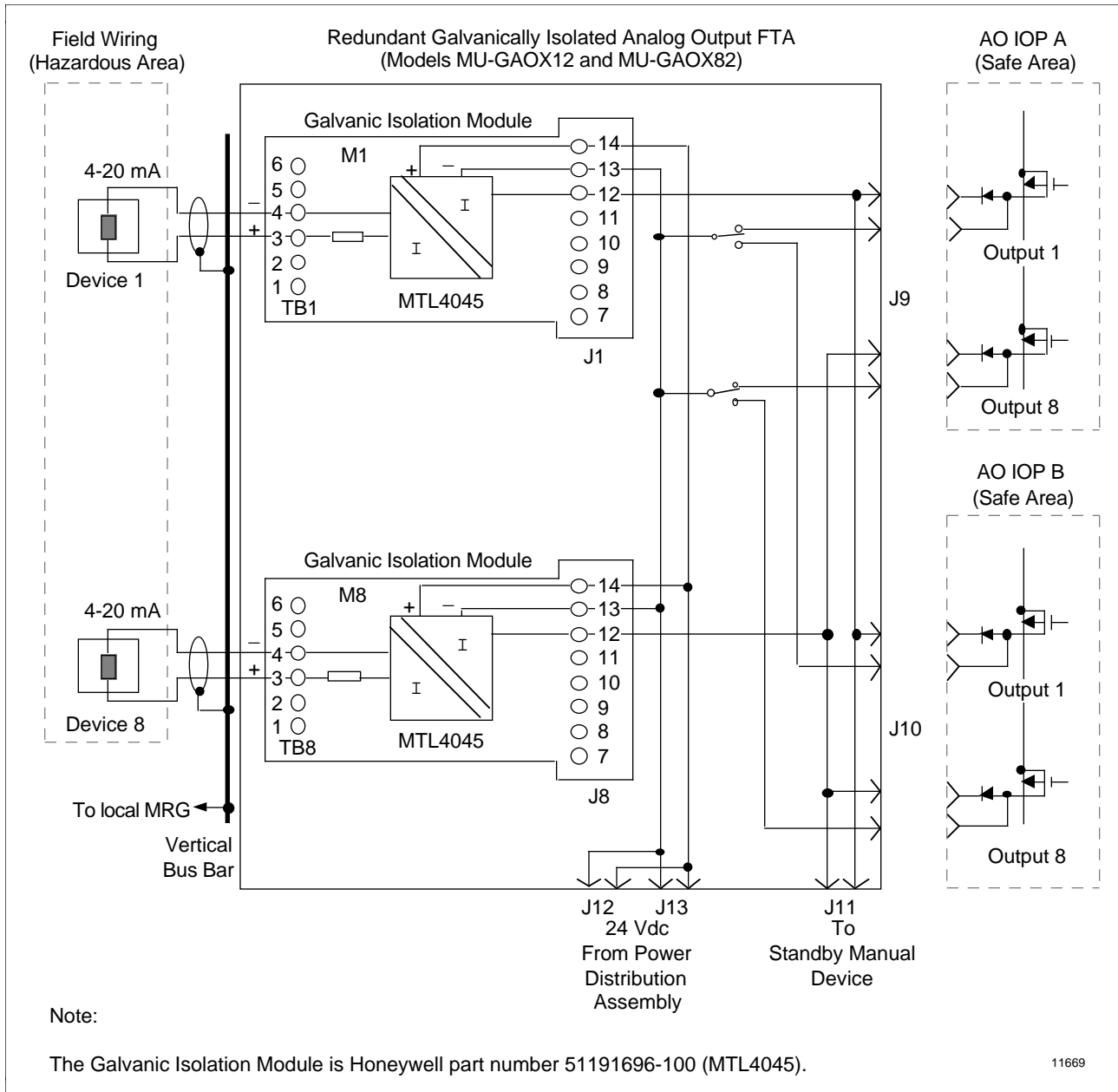


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7.4.1.3 Field Wiring Output Signals, Continued

Model MU-GAOX12/82 connection diagram Figure 7-17 is a connection diagram for the model MU-GAOX12/MU-GAOX82 Analog Output FTA

Figure 7-17 Model MU-GAOX12/82 Analog Output FTA Connection Diagram



7.4.1.4 Line-Fault Detection

Line fault detection	In the event of an open or shorted 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 Analog Output IOP to detect the open or shorted field circuit and indicate a wiring problem to the user.
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7.4.1.5 Calibration

Nonredundant models	As illustrated in Figure 7-15, two screw terminals labeled TB9 + and TB9 - are used on the nonredundant model MU-GAOX02 and MU-GAOX72 FTAs to calibrate the IOP.
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Redundant models	As illustrated in Figure 7-15, four screw terminals are used on the redundant model MU-GAOX12 and MU-GAOX82 FTAs to calibrate the primary and secondary IOPs. Terminals TB9 + and TB9 - are used to calibrate the primary IOP (A), while terminals TB10 + and TB10 - are used to calibrate the secondary IOP (B).
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Calibration initiation	Two touch pads, located between the TB9 and TB10 terminals, provide a means of initiating the calibration procedure in one of the IOPs by shorting the two pads together.
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7.4.1.6 Indicators

Primary IOP active indicator	A green indicator on the FTA illuminates when the primary IOP (A) has control of the FTA.
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GI Module indicator	A green indicator on each Galvanic Isolation Module illuminates when power is applied to the module.
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7.4.1.7 Power Connectors

Power requirements The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is discussed in subsection 7.9.

Two connectors The FTA has dual 2-pin power connectors, J12 and J13, 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.

7.4.1.8 Current Consumption

Power consumption The FTA consumes 0.42 amperes at 24 Vdc with a 20 mA signal at all outputs which represents 10.5 watts of power.

Power dissipation The power dissipation for the FTA is 9.6 watts with all outputs providing 20 mA of current.

7.5 24 Vdc Digital Input (DI) FTAs

7.5.1 Model MU-GDID12/MU-GDID82 FTAs

7.5.1.1 Description

Introduction

The model MU-GDID12/MU-GDID82 Digital Input (DI) FTA accommodates up to 32 switch or proximity detector inputs from a hazardous area, isolates the signals, and presents them to the associated Digital Input IOP in a safe area. The phase of the input signals is selectable, allowing the alarm condition to be chosen for either state of the sensor. This is accomplished with two switches, one for each input, on the top of the Galvanic Isolation Modules.

Line-fault detection

Individual line-fault detection is provided, signaling a contact change in the event the field wires are shorted or open. Switches are provided on the Galvanic Isolation Modules to optionally defeat the line-fault detection on an individual input basis.

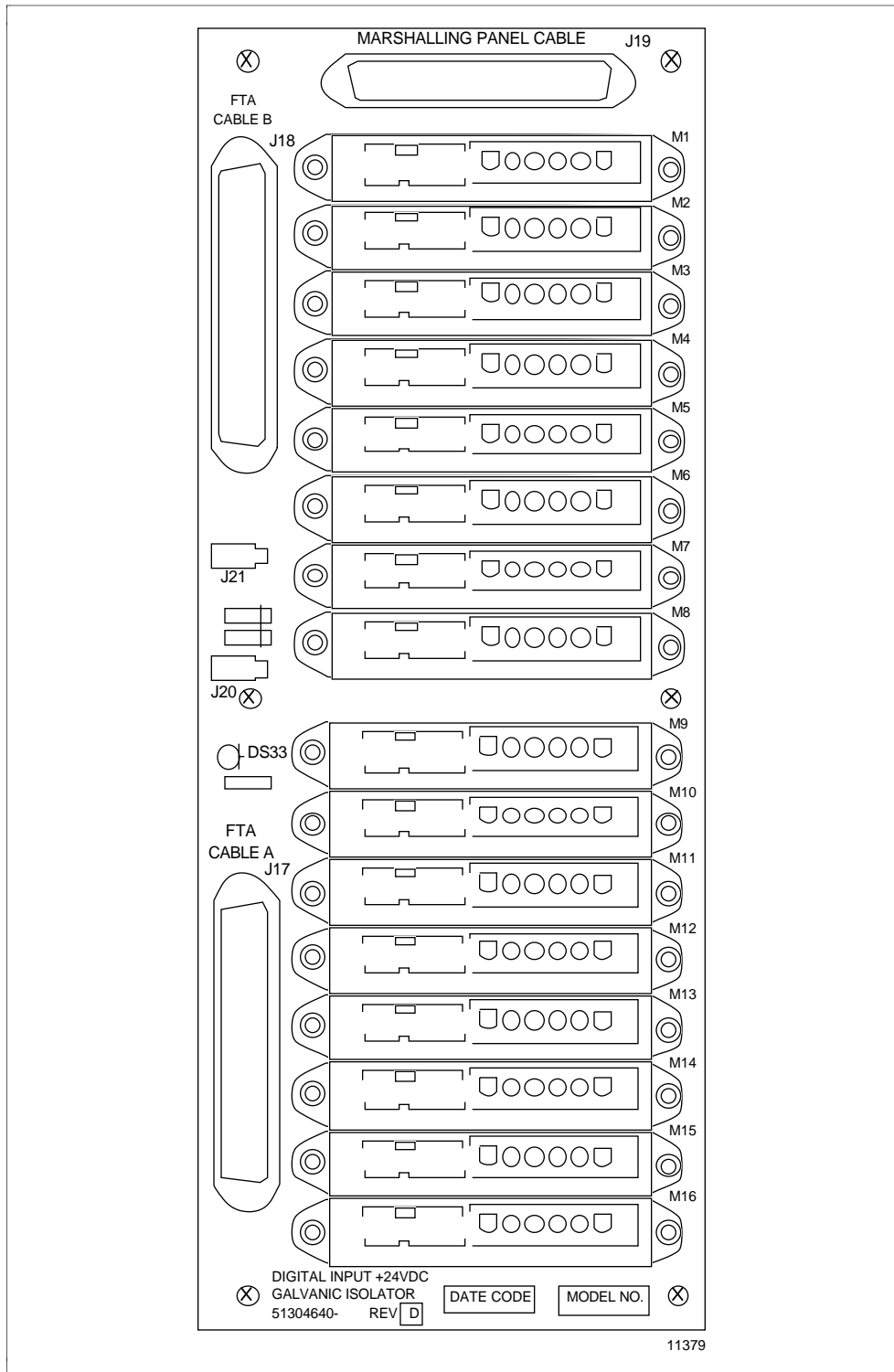
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7.5.1.1 Description, Continued

Model MU-GDID12/82 FTA assembly layout

Figure 7-18 is an illustration of the FTA assembly layout.

Figure 7-18 Model MU-GDID12/82 24 Vdc DI FTA Assembly Layout



7.5.1.2 Signal Connectors

Two IOP connectors	Two 50-pin connectors, J17 and J18, labeled FTA CABLE A and FTA CABLE B provide the interfaces to redundant IOPs. Presently, redundant Digital Input IOPs are not supported. J17 may be used for the IOP cable connection.
One auxiliary connector	One 50-pin auxiliary connector, J19, labeled MARSHALLING PANEL CABLE provides signals for remote monitoring and alarming systems.

7.5.1.3 Field Input Signals

Field sources	<p>Field source can be the input from a contact or proximity switch. The following input parameters for the source must be considered:</p> <ul style="list-style-type: none">• A sensed current of less than 2 kohms resistance is interpreted as a closure.• A sensed current of more than 10 kohms resistance is interpreted as an open.• The hysteresis is nominally 650 ohms.• The voltage applied to the sensor is 7.7 to 9.0 Vdc from 1 kohm resistance.
Safety description	<p>The safety description for each Galvanic Isolation Module input is</p> <ul style="list-style-type: none">• 10.5 volts maximum• 800 ohms• 14 milliamps maximum
Two inputs	<p>Each Galvanic Isolation Module accepts two field devices. The two inputs connect to terminals 1 and 2, and 4 and 5. See Figure 7-19 for a functional representation and connection diagram of the model MU-GDID12/MU-GDID82 24 Vdc Digital Input FTA.</p>

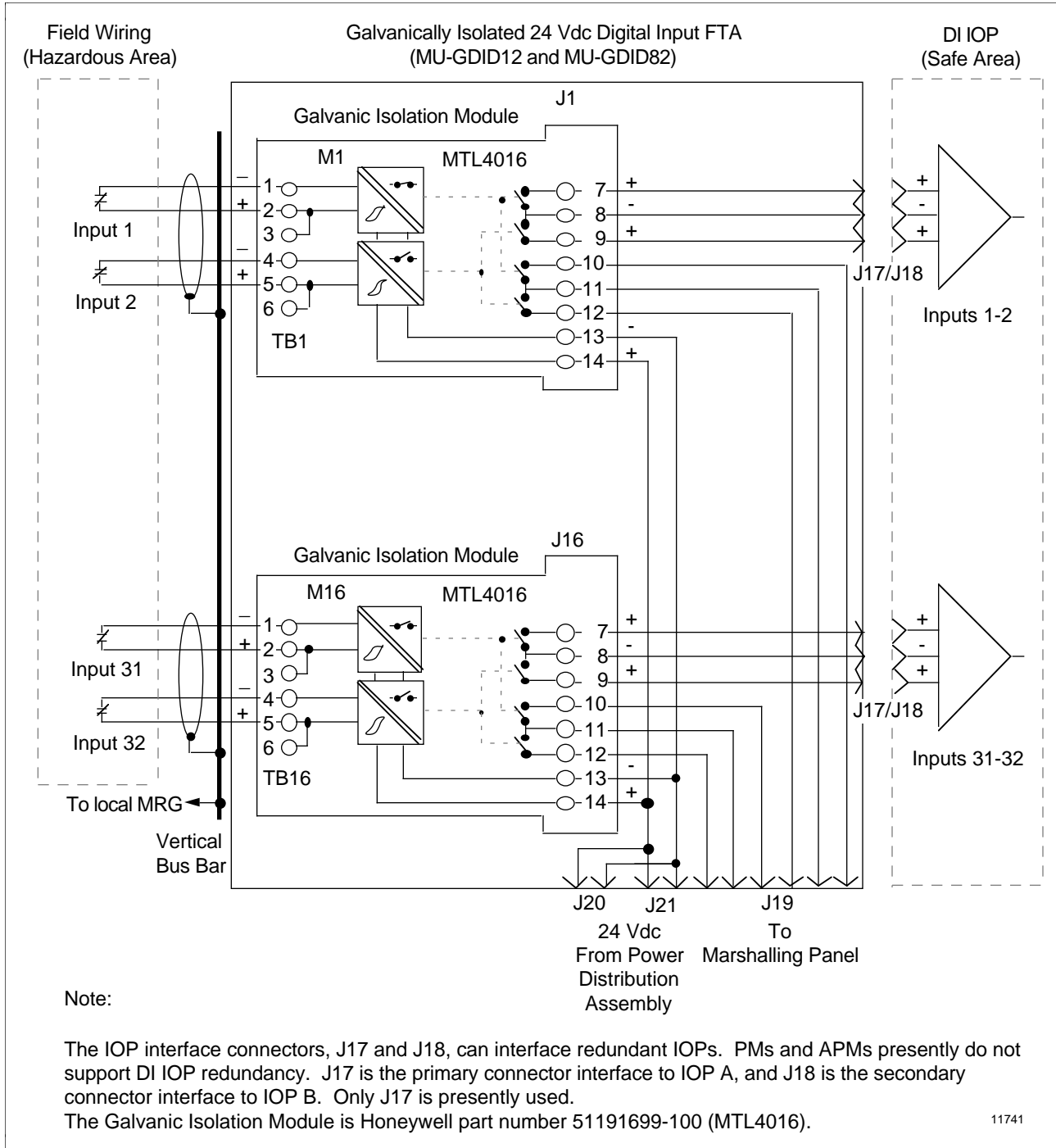
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7.5.1.3 Field Input Signals, Continued

Model MU-GDID12/82 connection diagram

Figure 7-19 is a connection diagram for the model MU-GDID12/MU-GDID82 24 Vdc Digital Input FTA.

Figure 7-19 Model MU-GDID12/82 24 Vdc Digital Input FTA Connection Diagram



7.5.1.4 Fault-Line Detection

Open line detection

The Galvanic Isolation Module will indicate a line fault 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 may 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.

7.5.1.5 MARSHALLING PANEL CABLE Connector

Auxiliary signals

Duplicate floating dry contacts, that track the action of the signals presented to the IOP, are provided at the **MARSHALLING PANEL CABLE** connector, J19. There are two sets of contacts in each module, isolated from the system, but not isolated from each other (three wires per isolator). 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 7.8 for a description of the Marshalling Panel.

7.5.1.6 Indicators

Primary IOP active indicator

A green indicator 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.

7.5.1.7 Power Connectors

Power requirement The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 7.9.

Dual power connectors The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.5.1.8 Current Consumption

Power consumption The FTA consumes 0.72 amperes at 24 Vdc with all inputs active. This represents 17.3 watts of power.

Power dissipation Power dissipation is 16 watts with all inputs active.

7.5.2 Model MU-GDID13/MU-GDID83 FTAs

7.5.2.1 Description

Introduction

The model MU-GDID13/MU-GDID83 Digital Input (DI) FTA accommodates up to 32 switch or proximity detector inputs from a hazardous area, isolates the signals, and presents them to the associated 24 Vdc Digital Input IOP in a 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.

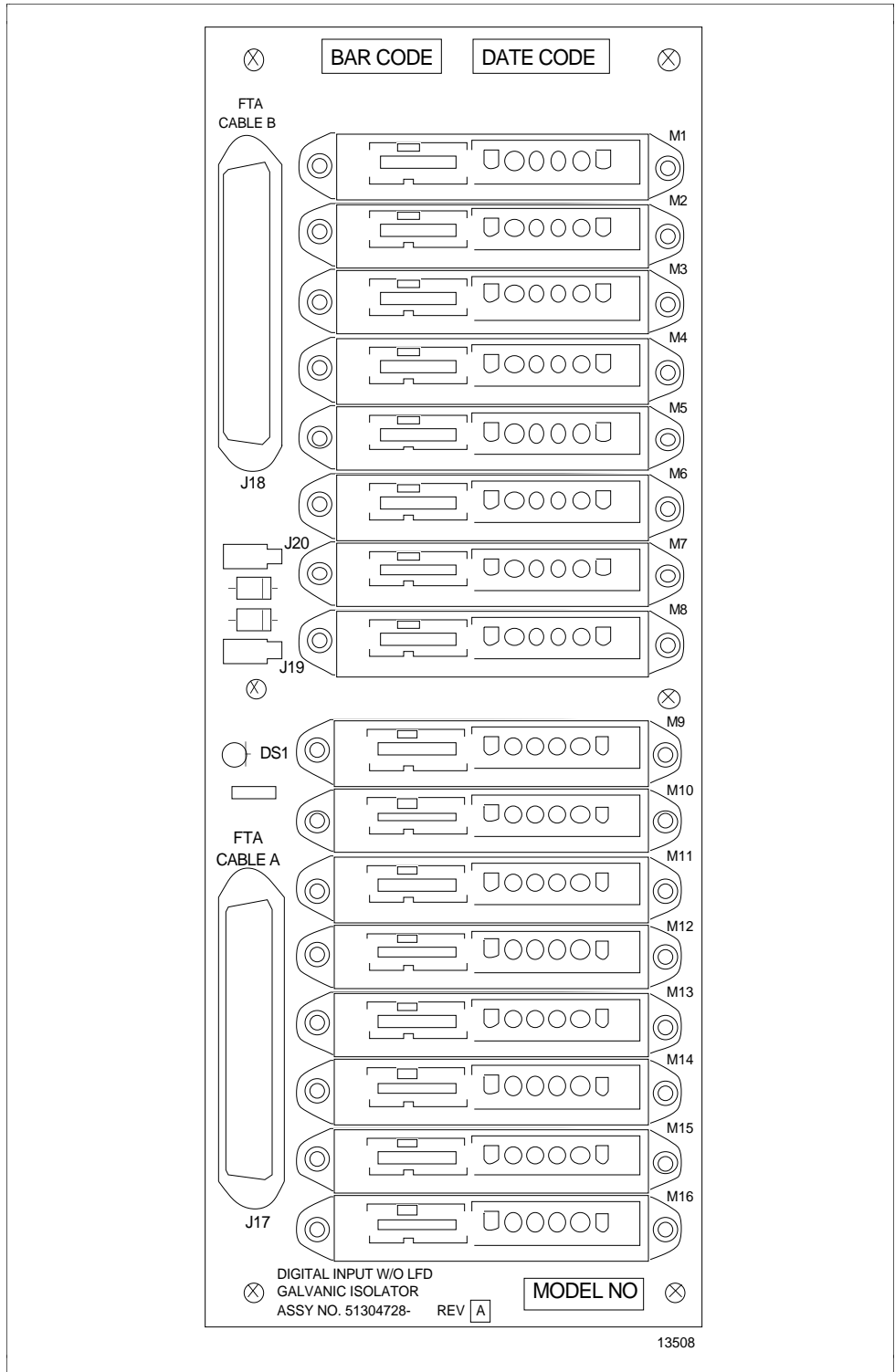
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7.5.2.1 Description, Continued

Model MU-GDID13/83
FTA assembly layout

Figure 7-20 is an illustration of the FTA assembly layout.

Figure 7-20 Model MU-GDID13/83 24 Vdc DI FTA Assembly Layout



7.5.2.2 Signal Connectors

Two IOP connectors Two 50-pin connectors, J17 and J18, labeled **FTA CABLE A** and **FTA CABLE B** provide the interfaces to redundant IOPs. Presently, redundant Digital Input IOPs are not supported. J17 must be used for the IOP cable connection.

7.5.2.3 Field Input Signals

Field sources Field source can be the input from a contact or proximity switch. The following input parameters for the source must be considered:

- A sensed current of less than 2 kohms resistance is interpreted as a closure.
- A sensed current of more than 10 kohms resistance is interpreted as an open.
- The hysteresis is nominally 650 ohms.
- The voltage applied to the sensor is 7.7 to 9.0 Vdc from 1 kohms resistance.

Safety description The safety description for each Galvanic Isolation Module input is

- 10.5 volts maximum
- 800 ohms
- 14 milliamps maximum

Two inputs Each Galvanic Isolation Module accepts two field devices. The two inputs connect to terminals 1 and 2, and 4 and 5. See Figure 7-21 for a functional representation and connection diagram of the model MU-GDID13/MU-GDID83 24 Vdc Digital Input FTA.

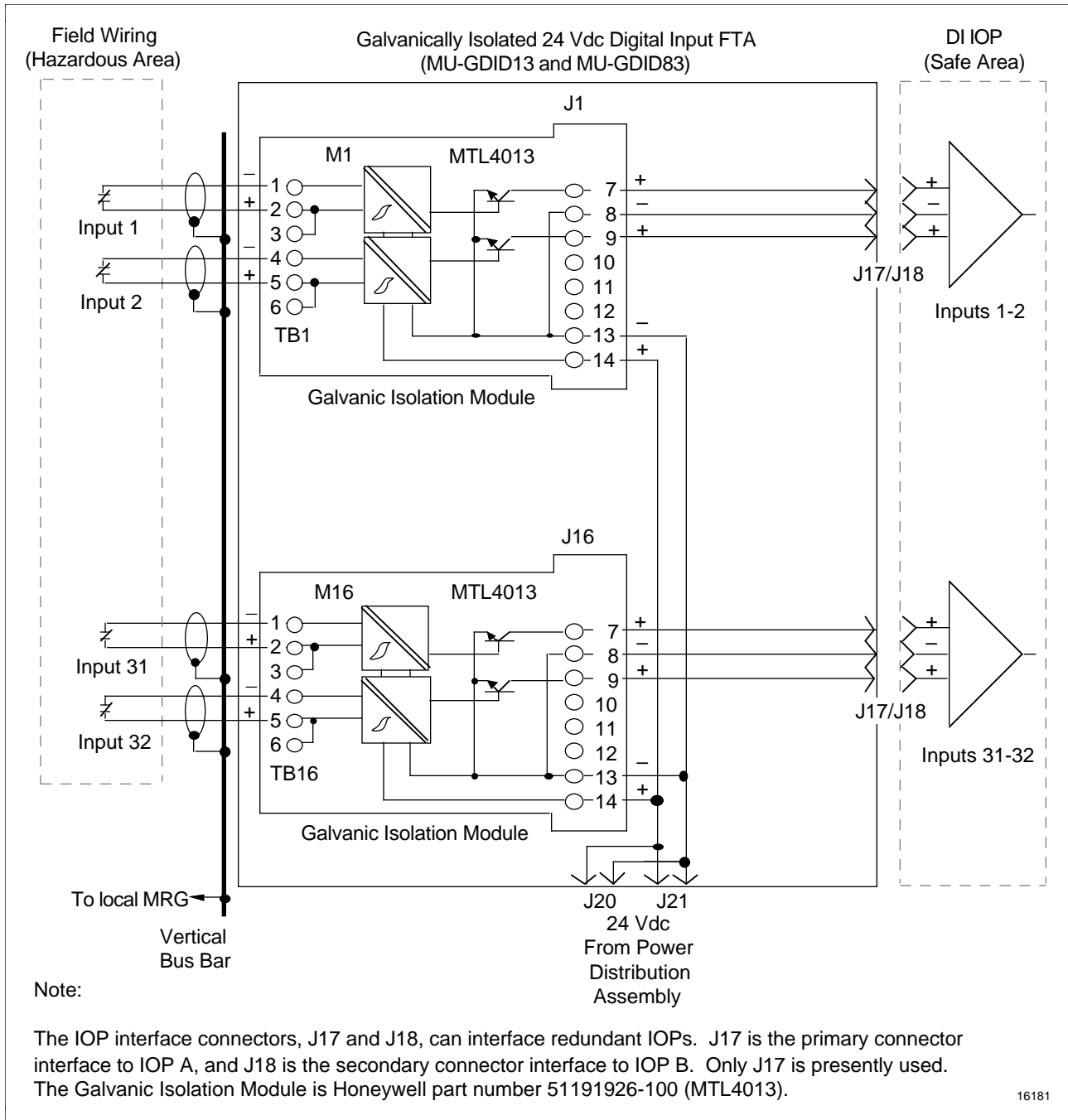
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7.5.2.3 Field Input Signals, Continued

Model MU-GDID13/83 connection diagram

Figure 7-21 is a connection diagram for the model MU-GDID13/MU-GDID83 24 Vdc Digital Input FTA.

Figure 7-21 Model MU-GDID13/83 24 Vdc Digital Input FTA Connection Diagram



7.5.2.4 Indicators

Primary IOP active indicator	A green indicator 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.

7.5.2.5 Power Connectors

Power requirement	The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is discussed in subsection 7.9.
Dual power connectors	The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.5.2.6 Current Consumption

Power consumption	The FTA consumes 0.56 amperes at 24 Vdc with all inputs active. This represents 13.4 watts of power.
Power dissipation	Power dissipation is 14.4 watts with all inputs active.

7.6 24 Vdc Digital Output (DO) FTAs

7.6.1 Model MU-GDOD12/MU-GDOD82 FTAs

7.6.1.1 Description

Introduction

The model MU-GDOD12/MU-GDOD82 24 Vdc Digital Output (DO) FTA can drive up to 16 certified intrinsically safe loads in a hazardous area. The load can be a solenoid or an alarm, as well as a nonenergy-storing “simple apparatus,” such as an LED.

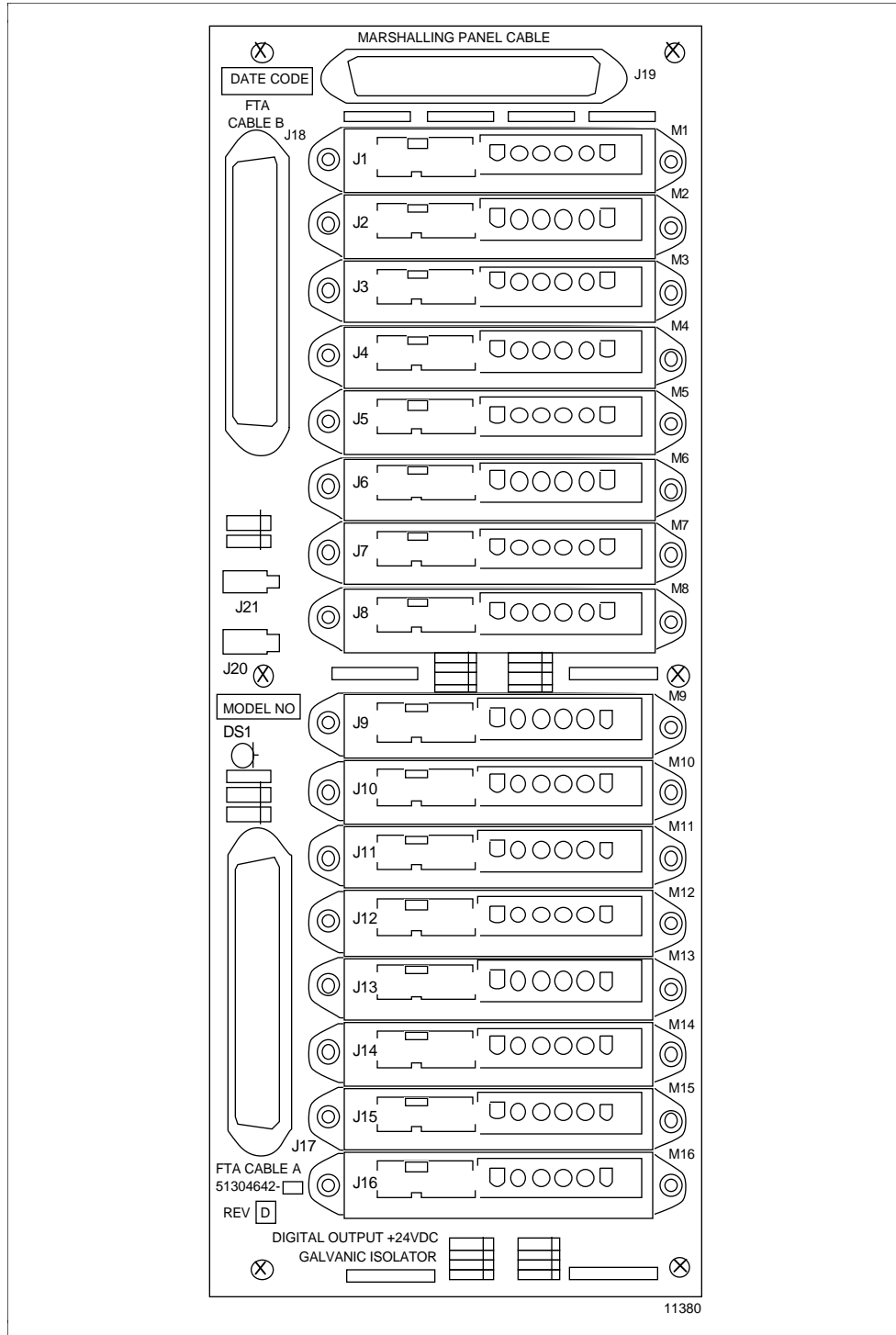
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7.6.1.1 Description, Continued

Model MU-GDOD12/82 assembly layout

Figure 7-22 is an illustration of the model MU-GDOD12/MU-GDOD82 24 Vdc Digital Output FTA assembly layout.

Figure 7-22 Model MU-GDOD12/82 24 Vdc DO FTA Assembly Layout



7.6.1.2 Signal Connectors

IOP connectors	Two 50-pin connectors J17 and J18, labeled FTA CABLE A and FTA CABLE B provide the interfaces to redundant IOPs through model MU-KFTA _{xx} cables (the suffix “xx” represents the length of the cable in meters). Presently, Digital Output IOP redundancy is not supported; therefore, only the IOP A interface, J17, is used for nonredundant operation.
Auxiliary connector	A 50-pin auxiliary connector, J19, labeled MARSHALLING PANEL CABLE accepts signals from an emergency shutdown subsystem.

7.6.1.3 Field Output Signals

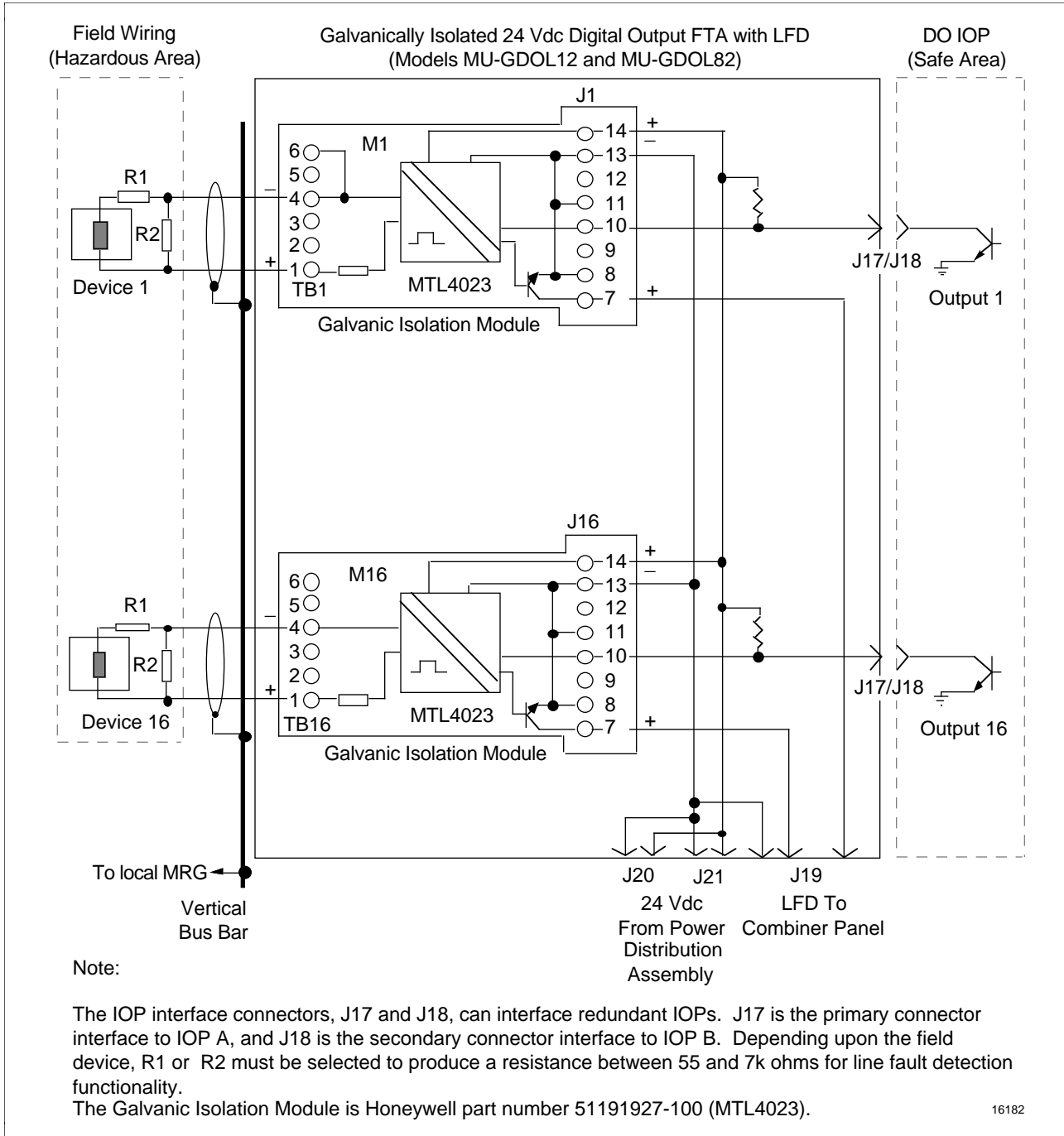
Output signal parameters	Terminals 1 and 4 on each Galvanic Isolation Module provide a maximum of 25.5 volts with a source resistance of 232-ohms. The minimum output voltage varies from 22 volts at 0 current to 10 volts at 50 milliamps.
Connection diagram	Each Galvanic Isolation Module accepts one field device connection. See Figure 7-25 for a functional representation and connection diagram of the Galvanically Isolated model MU-GDOD12/MU-GDOD82 24 Vdc Digital Output FTA.
Safety description	The safety description for each Galvanic Isolation Module output is 232-ohms at 25.5 volts, or 110 mA.

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7.6.1.3 Field Output Signals, Continued

Model MU-GDOD12/82 connection diagram Figure 7-23 is a connection diagram for a model MU-GDOD12/MU-GDOD82 24 Vdc Digital Output FTA.

Figure 7-23 Model MU-GDOD12/MU-GDOD82 24 Vdc Digital Output FTA Connection Diagram



7.6.1.4 MARSHALLING PANEL CABLE Connector

Introduction

The **MARSHALLING PANEL CABLE** connector, J19, provides an input for control signals from an emergency shutdown subsystem that is user-supplied. The shutdown system must provide potential-free floating sets of contacts. When one of the contacts is closed, a corresponding FTA output is disabled (deenergized), regardless of the output state command from the IOP.

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 7.8 for a description of the Marshalling Panel.

7.6.1.5 Indicators

Primary IOP control indicator

A green indicator 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.

7.6.1.6 Power Connectors

Power requirement

The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is discussed in subsection 7.9.

Dual power connectors

The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.6.1.7 Current Consumption

Power consumption	The FTA consumes 1.10 amperes with a 350-ohm load (typical solenoid valve) at all the Galvanic Isolation Module outputs.
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Power dissipation	The power dissipation is 18.7 watts with a 350-ohm load at all the Galvanic Isolation Module outputs.
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7.6.2 Model MU-GDOL12/MU-GDOL82 FTAs

7.6.2.1 Description

Introduction	The Galvanically Isolated model MU-GDOL12/MU-GDOL82 Digital Output (DO) FTA can drive up to 16 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.
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No 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 shutdown device. Instead, each input channel has line fault detection circuitry that causes a contact closure that is present at an auxiliary connector.
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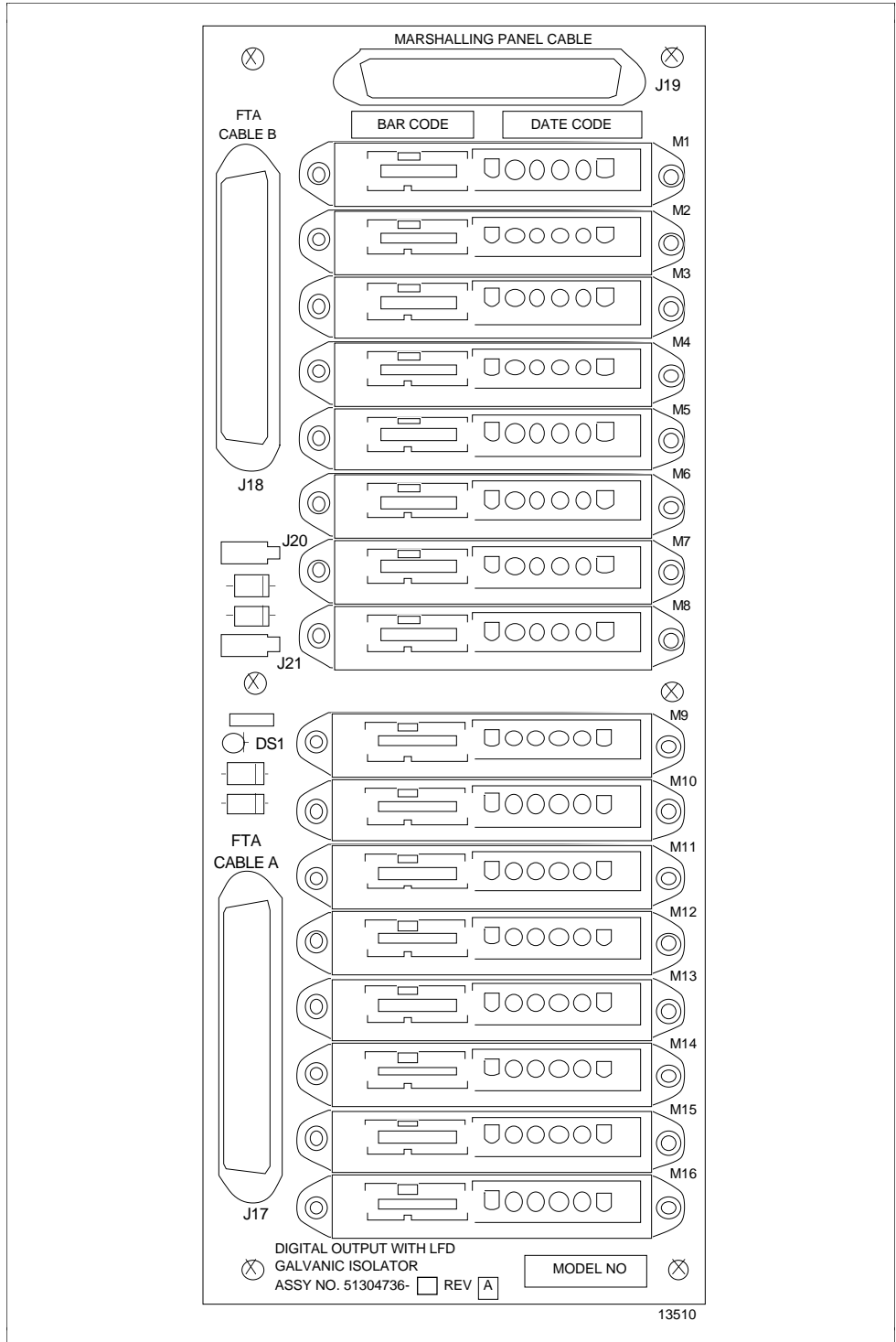
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7.6.2.1 Description, Continued

Model MU-GDOL12/82 assembly layout

Figure 7-24 is an illustration of the model MU-GDOL12/MU-GDOL82 24 Vdc Digital Output FTA assembly layout.

Figure 7-24 Model MU-GDOL12/82 24 Vdc DO FTA Assembly Layout



7.6.2.2 Signal Connectors

IOP connectors	Two 50-pin connectors, J17 and J18, labeled FTA CABLE A and FTA CABLE B provide the interfaces to redundant IOPs through model MU-KFTA _{xx} cables (the suffix “xx” represents the length of the cable in meters). Presently, Digital Output IOP redundancy is not supported; therefore, only the IOP A interface, J17, is used for nonredundant operation.
Auxiliary connector	A 50-pin connector, J19, labeled MARSHALLING PANEL CABLE provides contact closure line fault signals from each of the 16 channels.

7.6.2.3 Field Output Signals

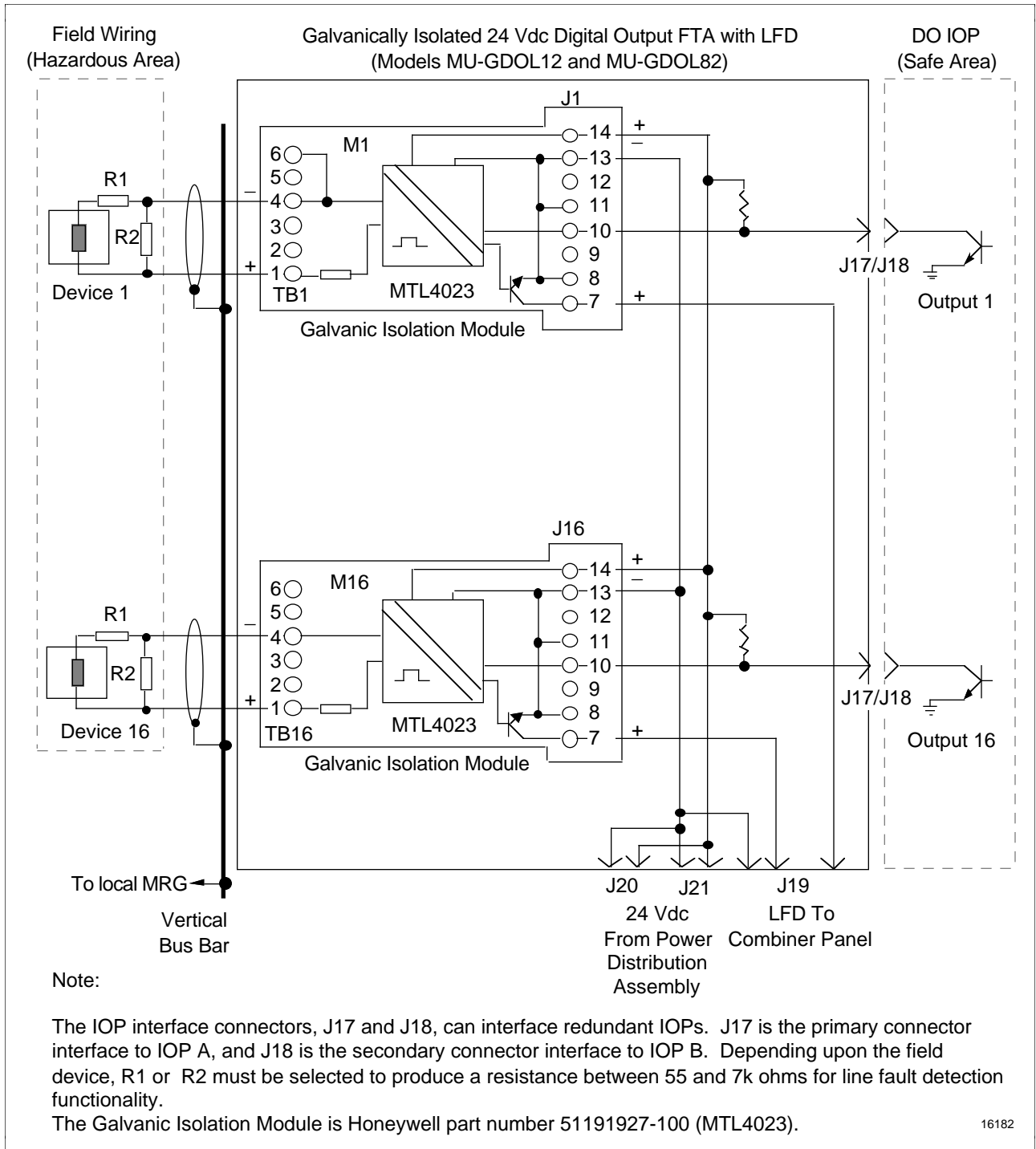
Output signal parameters	Terminals 1 and 4 on each Galvanic Isolation Module provide a maximum of 25.5 volts with a source resistance of 176 ohms. The minimum output voltage varies from 22 volts at 0 current to 10 volts at 50 milliamps.
Connection diagram	Each Galvanic Isolation Module accepts one field device connection. See Figure 7-25 for a functional representation and connection diagram of the Galvanically Isolated model MU-GDOL12/MU-GDOL82 24 Vdc Digital Output FTA.
Safety description	The safety description for each Galvanic Isolation Module output is 170-ohms at 25.5 volts, or 150 mA.

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7.6.2.3 Field Output Signals, Continued

Model MU-GDOL12/82 connection diagram Figure 7-25 is a connection diagram for a model MU-GDOL12/MU-GDOL82 24 Vdc Digital Output FTA.

Figure 7-25 Model MU-GDOL12/MU-GDOL82 24 Vdc Digital Output FTA Connection Diagram



7.6.2.4 Line Fault Detection (LFD)

Introduction

The Galvanic Isolation Module will signal a line fault at the auxiliary connector if a field wire is open or shorted. An open wire is defined as a resistance of 7 kohms, or greater and shorted wire is defined as less than 55-ohms resistance.

Solid-state switch outputs

Sixteen line fault signals, one for each channel, are available at the **MARSHALLING PANEL CABLE** connector, J19. Each output is driven by the collector of a solid-state switch that is not terminated. The switch assumes an “open” state when a line fault occurs..

ATTENTION

ATTENTION—To use this feature the device must be installed with series and shunt resistors, if necessary, so that the load is between 55 ohms and 7 kohms. See Figure 7-25.

7.6.2.5 MARSHALLING PANEL CABLE Connector

Introduction

The **MARSHALLING PANEL CABLE** connector, J19, 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 **MARSHALLING PANEL CABLE** connector and is not terminated in the module or on the FTA assembly. See Figure 7-25.

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 μ A
 - 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 a Digital Input IOPs, model MU-PDIX02. See subsection 7.7 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 7.8 for a description of the Marshalling Panel.

7.6.2.6 Indicators

Primary IOP control indicator	A green indicator 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.

7.6.2.7 Power Connectors

Power requirement	The power requirement for the FTA is a nominal 24 Vdc. Because of the large additional amount of power the 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 through a Power Distribution Assembly. The Power Distribution Assembly is discussed in subsection 7.9.
Dual power connectors	The FTA has dual 2-pin power connectors, J20 and J21, 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.

7.6.2.8 Current Consumption

Power consumption	The FTA consumes 1.10 amperes with a 350-ohm load (typical solenoid valve) at all the Galvanic Isolation Module outputs.
Power dissipation	The power dissipation is 18.7 watts with a 350-ohm load at all the Galvanic Isolation Module outputs.

7.7 Combiner Panel

7.7.1 Description

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. The Combiner Panel’s assembly layout is illustrated in Figure 7-26.
LFD input connectors	Two connectors, J1 and J2, connect to the MARSHALLING PANEL CABLE connector, J19, on two Digital Output FTAs that have line fault-detection capability. Presently, the model MU-GDOL12 and MU-GDOL82 FTAs provide this feature. The standard IOP to FTA cable is used to provide the connections.
IOP output connectors	The combined 32 LFD outputs are available at both the J3 and J4 connectors. J3 connects to IOP A and J4 connects to its redundant partner, IOP B, if one exists. The standard IOP to FTA cable is used to provide the connections.
Primary IOP active indicator	The green LED indicator is illuminated when IOP A is active.

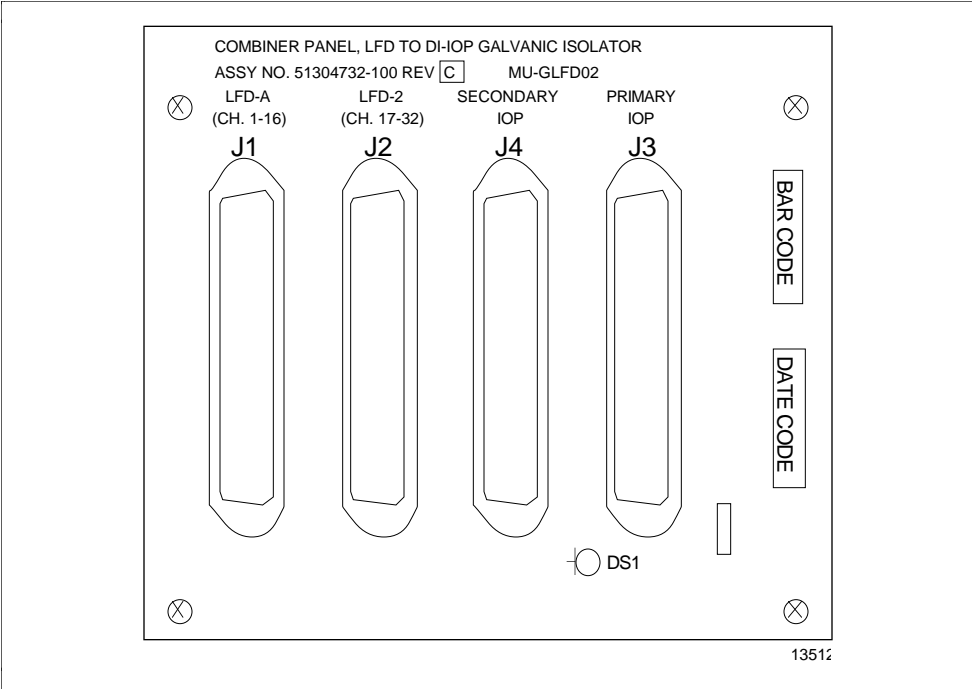
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7.7.1 Description, Continued

Model MU-GLFD02 assembly layout

Figure 7-26 is an illustration of the model MU-GLFD02 Combiner Panel assembly layout.

Figure 7-26 Model MU-GLFD02 Combiner Panel Assembly Layout



7.8 Marshalling Panel

7.8.1 Description

Introduction The model MU-GMAR52 Marshalling Panel is similar in shape and appearance to a “B” size FTA, except it is void of electronic circuitry, but does provide surge and ESD protection for the field wiring terminals. A 50-pin connector is provided on the assembly that accepts FTA interface signals.

Screw terminals Screw terminal connectors are available for the connection of the field wiring. See Figure 7-27 for an illustration of the assembly layout. Figure 7-28 illustrates the typical interconnections when a Marshalling Panel is installed in a cabinet.

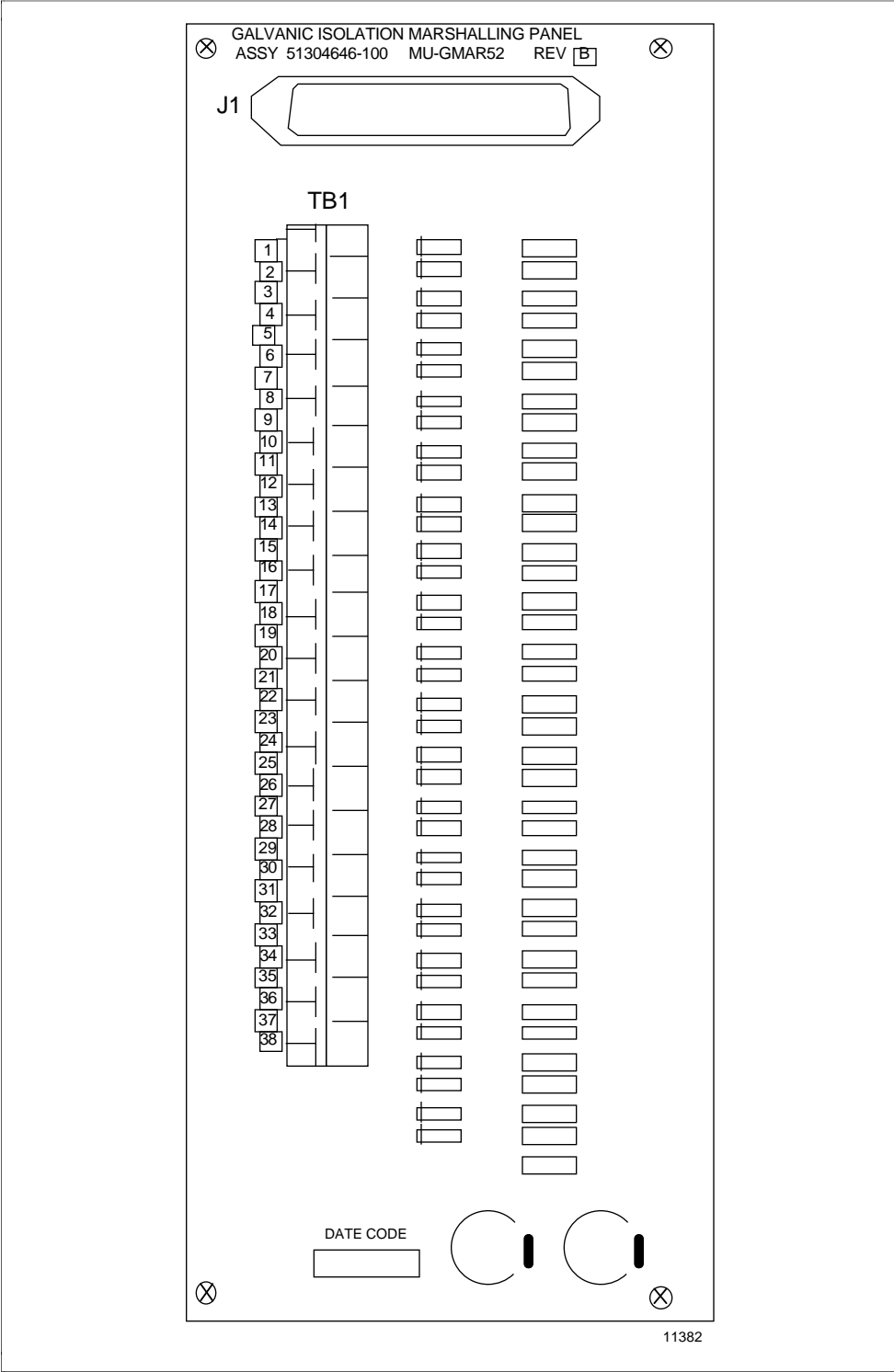
Signal user accessibility The Marshalling Panel was developed primarily to provide user-accessibility to the signals from the auxiliary connectors on the Galvanically Isolated FTAs, but it can be used as a general purpose marshalling panel in the subsystem.

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7.8.1 Description, Continued

Marshalling Panel assembly layout

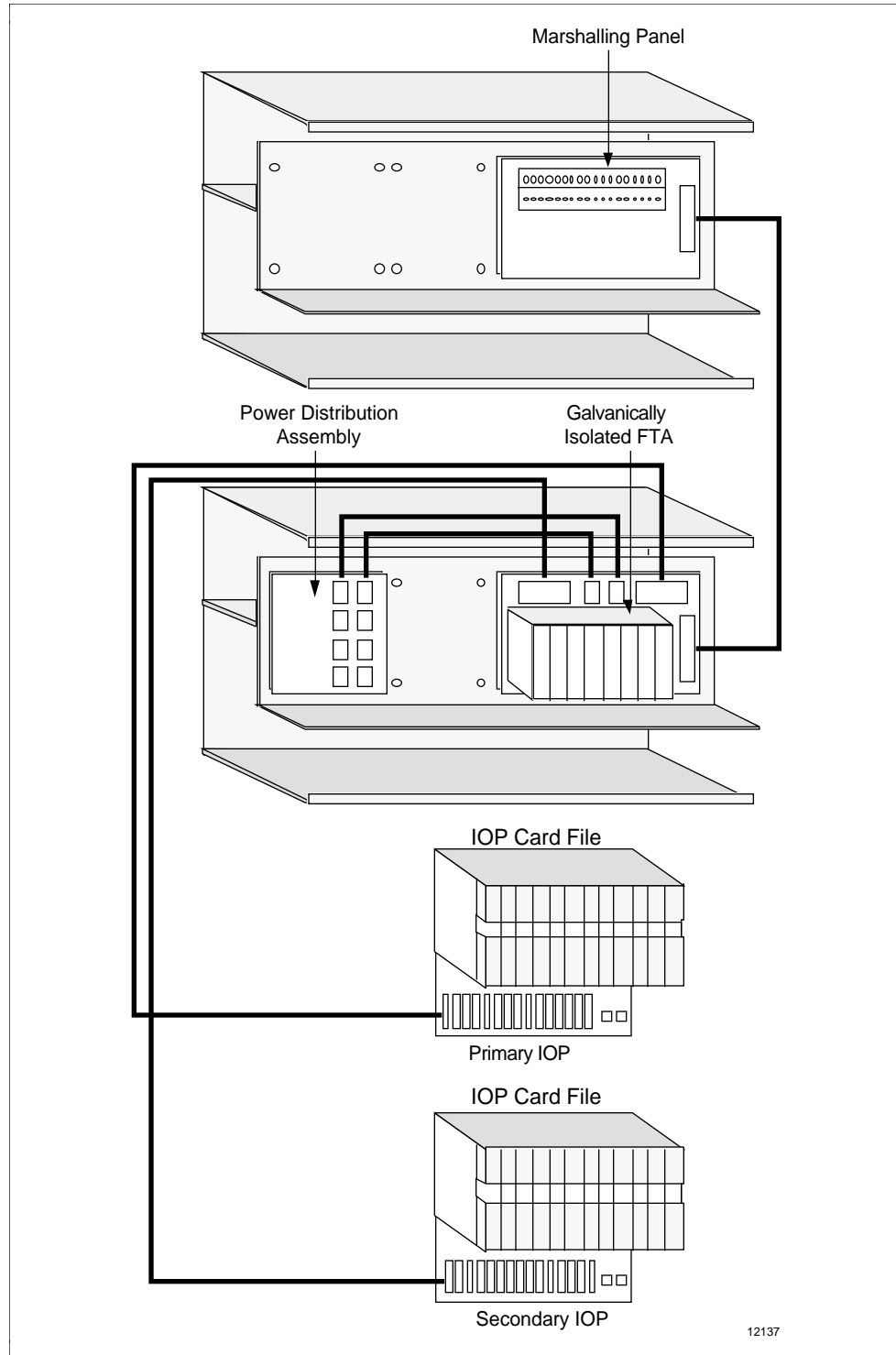
Figure 7-27 Model MU-GMAR52 Marshalling Panel Assembly Layout



7.8.1 Description, Continued

Marshalling Panel cabinet interconnection

Figure 7-28 Typical Marshalling Panel Cabinet Interconnections



7.8.2 Configurations

Six configurations

The screw terminals of the Marshalling Panel assume various configurations, which are dependent upon the model of FTA to which its 50-pin connector, J1, is connected through a model MU-KFTA_{xx} cable (the suffix “xx” represents the length of the cable in meters).

The configurations are discussed in the following subsections.

7.8.2.1 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.

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.

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7.8.2.1 High Level Analog Input FTAs, Continued

1-5 Vdc HLAI/STI FTA signals

Table 7-2 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to one of the above FTAs through its 50-pin auxiliary connector.

Table 7-2 HLAI/STI FTA Marshalling Panel Signals
(Models MU-GAIH12/13/14/82/83/84)

Terminal Numbers	Description	
1 and 2	Channel 1 +	Channel 1 –
3 and 4	Channel 2 +	Channel 2 –
5 and 6	Channel 3 +	Channel 3 –
7 and 8	Channel 4 +	Channel 4 –
9 and 10	Channel 5 +	Channel 5 –
11 and 12	Channel 6 +	Channel 6 –
13 and 14	Channel 7 +	Channel 7 –
15 and 16	Channel 8 +	Channel 8 –
17 and 18	Channel 9+	Channel 9 –
19 and 20	Channel 10 +	Channel 10 –
21 and 22	Channel 11 +	Channel 11 –
23 and 24	Channel 12 +	Channel 12 –
25 and 26	Channel 13 +	Channel 13 –
27 and 28	Channel 14 +	Channel 14 –
29 and 30	Channel 15 +	Channel 15 –
31 and 32	Channel 16 +	Channel 16 –
33	Not used	
34	Not used	
35	Not used	
36	Not used	
37	Signal ground	
38	Signal ground	

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7.8.2.1 High Level Analog Input FTAs, Continued

4-20 mA FTA

The model MU-GAIH22/92 HLAI FTA provides 4 to 20 mA signals.

Subsystem input impedance

The subsystem must have an input impedance of 250-ohms or less.

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.

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7.8.2.1 High Level Analog Input FTAs, Continued

4-20 mA HLAI FTA signals

Table 7-3 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to the FTA through its 50-pin auxiliary connector.

Table 7-3 HLAI/STI FTA Marshalling Panel Signals
(Model MU-GAIH22/92)

Terminal Numbers	Description
1	Channel 1 (4-20 mA return)
2	Channel 1 (4-20 mA)
3	Channel 2 (4-20 mA return)
4	Channel 2 (4-20 mA)
5	Channel 3 (4-20 mA return)
6	Channel 3 (4-20 mA)
7	Channel 4 (4-20 mA return)
8	Channel 4 (4-20 mA)
9	Channel 5 (4-20 mA return)
10	Channel 5 (4-20 mA)
11	Channel 6 (4-20 mA return)
12	Channel 6 (4-20 mA)
13	Channel 7 (4-20 mA return)
14	Channel 7 (4-20 mA)
15	Channel 8 (4-20 mA return)
16	Channel 8 (4-20 mA)
17	Channel 9 (4-20 mA return)
18	Channel 9 (4-20 mA)
19	Channel 10 (4-20 mA return)
20	Channel 10 (4-20 mA)
21	Channel 11 (4-20 mA return)
22	Channel 11 (4-20 mA)
23	Channel 12 (4-20 mA return)
24	Channel 12 (4-20 mA)

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7.8.2.1 High Level Analog Input FTAs, Continued

4-20 mA HLAI FTA signals, continued

Table 7-3 HLAI FTA Marshalling Panel Signals (Model MU-GAIH22/92), Continued

Terminal Numbers	Description
25	Channel 13 (4-20 mA return)
26	Channel 13 (4-20 mA)
27	Channel 14 (4-20 mA return)
28	Channel 14 (4-20 mA)
29	Channel 15 (4-20 mA return)
30	Channel 15 (4-20 mA)
31	Channel 16 (4-20 mA return)
32	Channel 16 (4-20 mA)
33	Not used
34	Not used
35	Not used
36	Not used
37	Signal ground
38	Signal ground

7.8.2.2 Digital Input FTA

**Model MU-GDID12/82
FTA configuration**

The model MU-GDID12/82 Digital Input FTA Marshalling Panel configuration provides an interface to the potential-free sets of contacts, that are isolated from the inputs to the IOP to which the FTA is connected. The contact rating is 10 W, 0.5 A at 35 Vdc.

Relay contact interface

Each Galvanic Isolation Module on the FTA has two double-pole on/off reed relays, one for each channel. One set of relay contacts is connected to the IOP and the second set of relay contacts is connected to the Marshalling Panel through the FTA's auxiliary connector. The contact closure interface to the Marshalling Panel mimics the FTA's contact closure interface to the IOP.

Applications

The typical applications for the sets of contacts are inputs to sequence of events recorders, monitoring systems, and shutdown systems.

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7.8.2.2 Digital Input FTA, Continued

Model MU-GDID12/82 FTA interface

Table 7-4 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to the FTA through its 50-pin auxiliary connector.

Table 7-4 Digital Input Marshalling Panel Signals
(Model MU-GDID12/72)

Terminal Numbers	Description
1	Channel 1 contact
2	Channel 2 contact
3	Channel 3 contact
4	Channel 4 contact
5	Channel 5 contact
6	Channel 6 contact
7	Channel 7 contact
8	Channel 8 contact
9	Channel 9 contact
10	Channel 10 contact
11	Channel 11 contact
12	Channel 12 contact
13	Channel 13 contact
14	Channel 14 contact
15	Channel 15 contact
16	Channel 16 contact
17	Channel 17 contact
18	Channel 18 contact
19	Channel 19 contact
20	Channel 20 contact
21	Channel 21 contact
22	Channel 22 contact
23	Channel 23 contact
24	Channel 24 contact

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7.8.2.2 Digital Input FTA, Continued

Model MU-GDID12/82
FTA interface,
continued

Table 7-4 Digital Input Marshalling Panel Signals
(Model MU-GDID12/72), Continued

Terminal Numbers	Description
25	Channel 25 contact
26	Channel 26 contact
27	Channel 27 contact
28	Channel 28 contact
29	Channel 29 contact
30	Channel 30 contact
31	Channel 31 contact
32	Channel 32 contact
33	Contact common
34	Contact common
35	Contact common
36	Contact common
37	Signal ground
38	Signal Ground

7.8.2.3 Digital Output FTAs

Model MU-GDOD12/82 FTA configuration The Digital Output configuration for the model MU-GDOD12/82 FTA provides an interface by which a contact closure can individually deenergize a Galvanic Isolation Module digital output. For example, an “on” output signal from the IOP for a channel can be “overwritten” by a control signal from the Marshalling Panel.

Applications The inputs can be control signals from an emergency shutdown subsystem that is user-supplied.

Relay contact interface The override signal cannot force an output “on,” only “off.” The shutdown subsystem must provide potential-free floating sets of contacts. When a contact is closed, a corresponding FTA channel output is disabled (deenergized), regardless of the output state command from the IOP.

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7.8.2.3 Digital Output FTAs, Continued

**Model MU-GDOD12/82
FTA interface**

Table 7-5 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a model MU-GDOD12/82 Digital Output FTA through its 50-pin auxiliary connector.

Table 7-5 Digital Output Marshalling Panel Signals
(Model MU-GDOD12/82)

Terminal Numbers	Description
Short between 1 and 2	Disables Channel 1
Short between 3 and 4	Disables Channel 2
Short between 5 and 6	Disables Channel 3
Short between 7 and 8	Disables Channel 4
Short between 9 and 10	Disables Channel 5
Short between 11 and 12	Disables Channel 6
Short between 13 and 14	Disables Channel 7
Short between 15 and 16	Disables Channel 8
Short between 17 and 18	Disables Channel 9
Short between 19 and 20	Disables Channel 10
Short between 21 and 22	Disables Channel 11
Short between 23 and 24	Disables Channel 12
Short between 25 and 26	Disables Channel 13
Short between 27 and 28	Disables Channel 14
Short between 29 and 30	Disables Channel 15
Short between 31 and 32	Disables Channel 16
33	Not used
34	Not used
35	Not used
36	Not used
37	Signal ground
38	Signal ground

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7.8.2.3 Digital Output FTAs, Continued

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.

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7.8.2.3 Digital Output FTAs, Continued

Model MU-GDOL12/82 interface

Table 7-6 is a list of the signals available at the screw terminals of the Marshalling Panel when it is connected to a model MU-GDOL12/82 Digital Output FTA through its 50-pin auxiliary connector.

Table 7-6 Digital Output Marshalling Panel Signals
(Model MU-GDOL12/72)

Terminal Numbers	Description
1	Channels 1 LFD
2	Channels 2 LFD
3	Channels 3 LFD
4	Channels 4 LFD
5	Channels 5 LFD
6	Channels 6 LFD
7	Channels 7 LFD
8	Channels 8 LFD
9	Channels 9 LFD
10	Channels 10 LFD
11	Channels 11 LFD
12	Channels 12 LFD
13	Channels 13 LFD
14	Channels 14 LFD
15	Channels 15 LFD
16	Channels 16 LFD
17	Not used
18	Not used
19	Not used
20	Not used
21	Not used
22	Not used
23	Not used
24	Not used

Continued on next page

7.8.2.3 Digital Output FTAs, Continued

Model MU-GDOL12/82
FTA interface,
continued

Table 7-6 Digital Output Marshalling Panel Signals
(Model MU-GDOL12/72), Continued

Terminal Numbers	Description
25	Not used
26	Not used
27	Not used
28	Not used
29	Not used
30	Not used
31	Not used
32	Not used
33	Contact common
34	Contact common
35	Contact common
36	Contact common
37	Signal ground
38	Signal Ground

7.9 Power Distribution Assembly

7.9.1 Description

Introduction

The model MU-GPRD02 Power Distribution Assembly provides individually fused 24 Vdc power for the Galvanically Isolated FTAs. The dc power is supplied to the Power Distribution Assembly by the same type of 6-pin connector cable, model MU-KDPRxx (the suffix “xx” represents the length of the cable in meters), used to supply power to the card files from the Power System. The Power Distribution Assembly has two input power connectors that provide for redundancy cables and protects the system from a single cable or connector failure.

Mounting size

The Power Distribution Assembly has the same mounting dimensions as an A-size FTA.

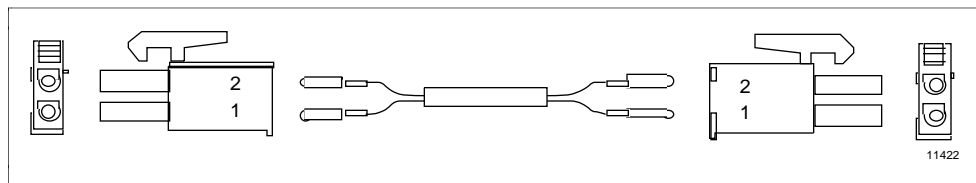
Eight 2-pin connectors

The Power Distribution Assembly has eight 2-pin connectors into which model MU-KGPR05 (51109620-xxx) 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. Figure 7-29 is an illustration of the 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.

Figure 7-29 Model MU-KGPRxx (51109620-xxx) Power Cable

**CE Compliance version**

When the Galvanic Isolation Power Distribution Assembly is located external to the cabinet or cabinet complex that contains the power source (Power System), the CE Compliant version of the assembly must be used.

The CE Compliant version of the Galvanic Isolation Power Distribution Assembly is the 51304644-125 assembly. It can be identified by FASTON receptors on the assembly that provides a ground point for the model MU-KSPRxx power cable’s shield drain wire.

Continued on next page

7.9.1 Description, Continued

Model MU-KSPRxx power cables

Model MU-KSPRxx (the suffix “xx” represents the length of the cable in meters) power cables are shielded cables. They are identified by shield drain wires terminated in lugs at each end of the cable. The Power System end of the cable shield must not be grounded and the drain wire must be either clipped or tapped to the cable.

Two conductor cable

The model MU-KSPRxx power cable is a 2-conductor cable and cannot be used to provide power to card files because 3.9 Vdc and 6 Vac are missing from the cable. Use the model MU-KDPRxx cable for card file power.

Power cable model list

Table 7-7 lists the model numbers of power cables that are CE Compliant and not CE Compliant.

Table 7-7 Power Cables

Cable Length (Meters/Feet)	Non-CE Compliant Model Number	CE Compliant Model Number
1.0/3.3	Part Number 51201397-001	
1.5/4.9	Part Number 51201397-915	
2.0/6.6	MU-KDPR02	
4.0/13.1	MU-KDPR04	
5.0/16.4	MU-KDPR05	MU-KSPR05
10.0/32.8	MU-KDPR10	MU-KSPR10
15.0/49.2	MU-KDPR15	MU-KSPR15
20.0/65.6	MU-KDPR20	MU-KSPR20
30.0/98.4	MU-KDPR30	MU-KSPR30
40.0/131.2	MU-KDPR40	MU-KSPR40
50.0/164.0	MU-KDPR50	MU-KSPR50

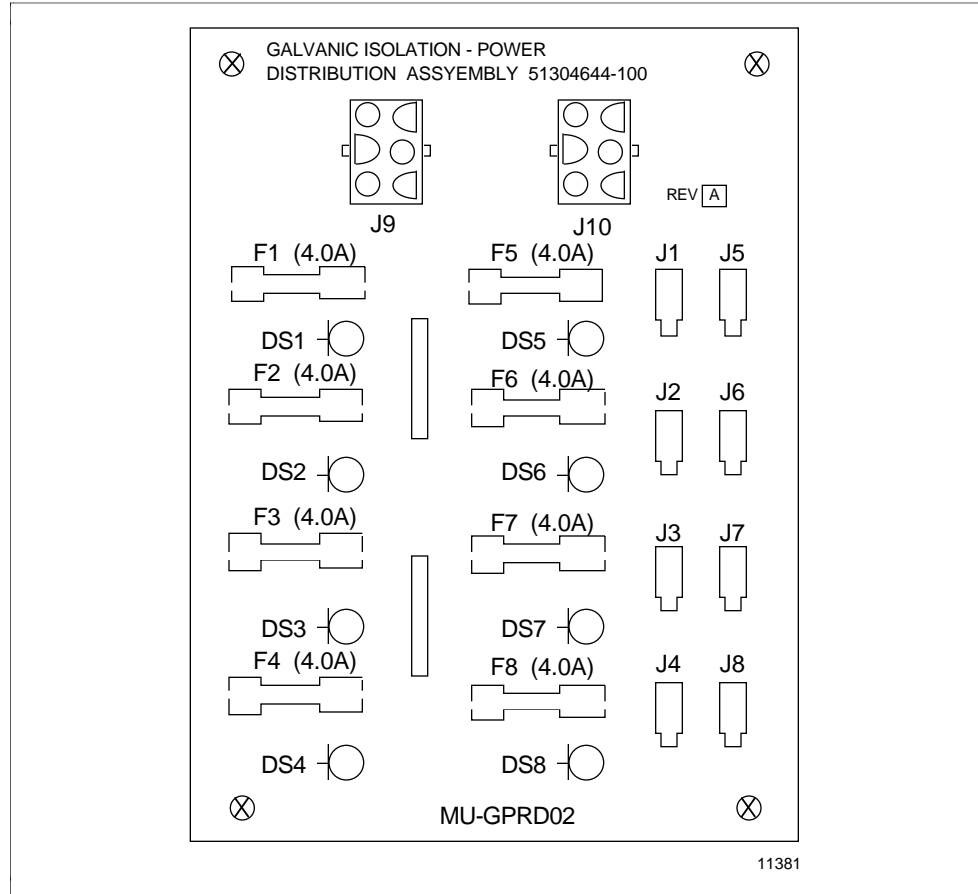
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7.9.1 Description, Continued

Power Distribution Assembly layout

Figure 7-30 is an illustration of the Power Distribution Assembly layout.

Figure 7-30 Galvanic Isolation Power Distribution Assembly Layout



7.9.2 Power Distribution

Power usage

Galvanically Isolated FTAs use more 24 Vdc power than standard FTAs. Because of the increased demand, the Galvanic Isolation Power Distribution Assembly, model MU-GPRD02, is used to directly supply power to the FTAs. The power for a standard FTA is provided from the IOP through the cable that connects the IOP to the FTA. The Power Distribution Assembly(s) can be installed on the same FTA Mounting Channel as the FTA(s), but a spacing of at least 6 inches must exist between a Power Distribution Assembly and an FTA installed on an FTA Mounting Channel.

Connector orientation when mounting

If a Power Distribution Assembly is installed on an FTA Mounting Channel with Galvanically Isolated FTAs, it must be installed with its 6-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 wire routing

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 can be provided for separation.

Cabinet mounting placement

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

Upper and lower channel cable routing

All power cables must be routed in the upper channel of the FTA Mounting Channel. The field wires to the Galvanically Isolated FTAs are always routed in the lower channel of the FTA Mounting Channel. No other wires, other than field wires to Galvanically Isolated FTAs, are permitted to be routed in the lower channel of the FTA Mounting Channel.

7.9.3 Cabling to the Power System

Introduction	Model MU-KDPR _{xx} (the suffix “xx” represents the length of the cable in meters) power cables connect the 6-pin power connectors on the Power System to the 6-pin connectors on the Power Distribution Assembly.
CE Compliance	See subsection 7.9.1 concerning the use of model MU-KSPR _{xx} power cables in place of model MU-KDPR _{xx} cables for CE compliance when the Galvanic Isolation Power Distribution Assembly is located external to the cabinet or cabinet complex that contains the power source.
Power redundancy	Power redundancy is provided by two power cables connected to each Power Distribution Assembly.
Amperage limitation	The cables can be daisy-chained to up to four Power Distribution Assemblies, provided the current through the series of MU-KDPR _{xx} cables to the farthest away Power Distribution Assembly does not exceed 12 amperes of 24 Vdc power. The 12 ampere limitation should assume that one of the redundant cables has failed, breaking the power loop.
Allowable cable length	The allowable total length of the model MU-KDPR _{xx} 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 0.5 volt drop for the series of cables. Once again, assume that one of the redundant cables has failed when calculating the length.

7.9.4 Cabling to the FTAs

Introduction	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. Each FTA must have two cables connected to it to provide a redundant source of power. Cabling can be daisy-chained to <u>two</u> FTAs.
Allowable cable length	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 0.5 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 component configuration	A typical cabinet side might have 16 FTAs, 2 Power Distribution Assemblies, and a 12-inch unused length of FTA Mounting Channel.

7.9.5 Subsystem Power Considerations

Introduction	Use the following recommendations for planning your Galvanic Isolation FTA power system configuration and power cabling when the subsystem consists of either nonredundant or redundant IOPs.
Avoid disassociated power systems	Avoid providing 24 Vdc power to the Galvanically Isolated FTAs from a separate power system that is “disassociated” from the subsystem’s 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.
Power assignment	<p>If redundant PMMs, APMMs, or 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.</p> <p>If redundant PMMs, APMMs, or 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.</p>

Section 8 – I/O Link Extender Installation

8.1 Overview

Section contents The topics covered in this section are:

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Purpose

This section covers the installation of two types of I/O Link Extender cards and associated Fiber Optic Coupler modules. The installation of the fiber optic cable is contracted to private contractors.

8.2 Description

Introduction	<p>The I/O Link Extender provides the ability to locate IOP card files, with their associated FTAs, remotely up to 8 kilometers (5 miles) from a local PMM, APMM, HPMM, or IOP card file. The connection is made by using fiber optic transmission cable driven and terminated by a Fiber Optic Coupler module that is installed in the connector located directly below the card file slot in which the I/O Link Extender card is installed. Each I/O Link Extender consists of two I/O Link Extender cards and their associated Fiber Optic Coupler modules, one for Link A and one for Link B, that occupy two slots in the card file at both the central site (PMM, APMM, HPMM, or IOP card file) and remote site (IOP card file(s)) ends of the fiber optic link. Each A and B link fiber optic cable is composed of a pair of fibers, designated transmit and receive.</p>
Two types of I/O Link Extenders	<p>The installation of two types of I/O Link Extender cards and their associated Fiber Optic Coupler modules is discussed in this section.</p>
Standard I/O Link Extender	<p>The “Standard” I/O Link Extender card provides remote extension of IOP card files up to 1.3 kilometers (4000 feet) from the local PMM, APMM, HPMM, or IOP card file. An associated Fiber Optic Coupler module provides attachment for one, two, or three fiber optic cables at the local card file. A second Fiber Optic Coupler module terminates a single optic cable at the remote IOP card file.</p>
Long Distance I/O Link Extender	<p>The “Long Distance” I/O Link Extender card provides remote extension of IOP card files up to 8 kilometers (5 miles) from the local card file. An associated Fiber Optic Coupler module, capable of driving and terminating a single fiber optic cable, is installed at both the local card file and the remote IOP card file.</p>
I/O Link Extenders can be mixed	<p>There can be a mix of Standard and Long Distance I/O Link Extenders in a subsystem; however, both ends of the “A” and “B” links must be the same type.</p>

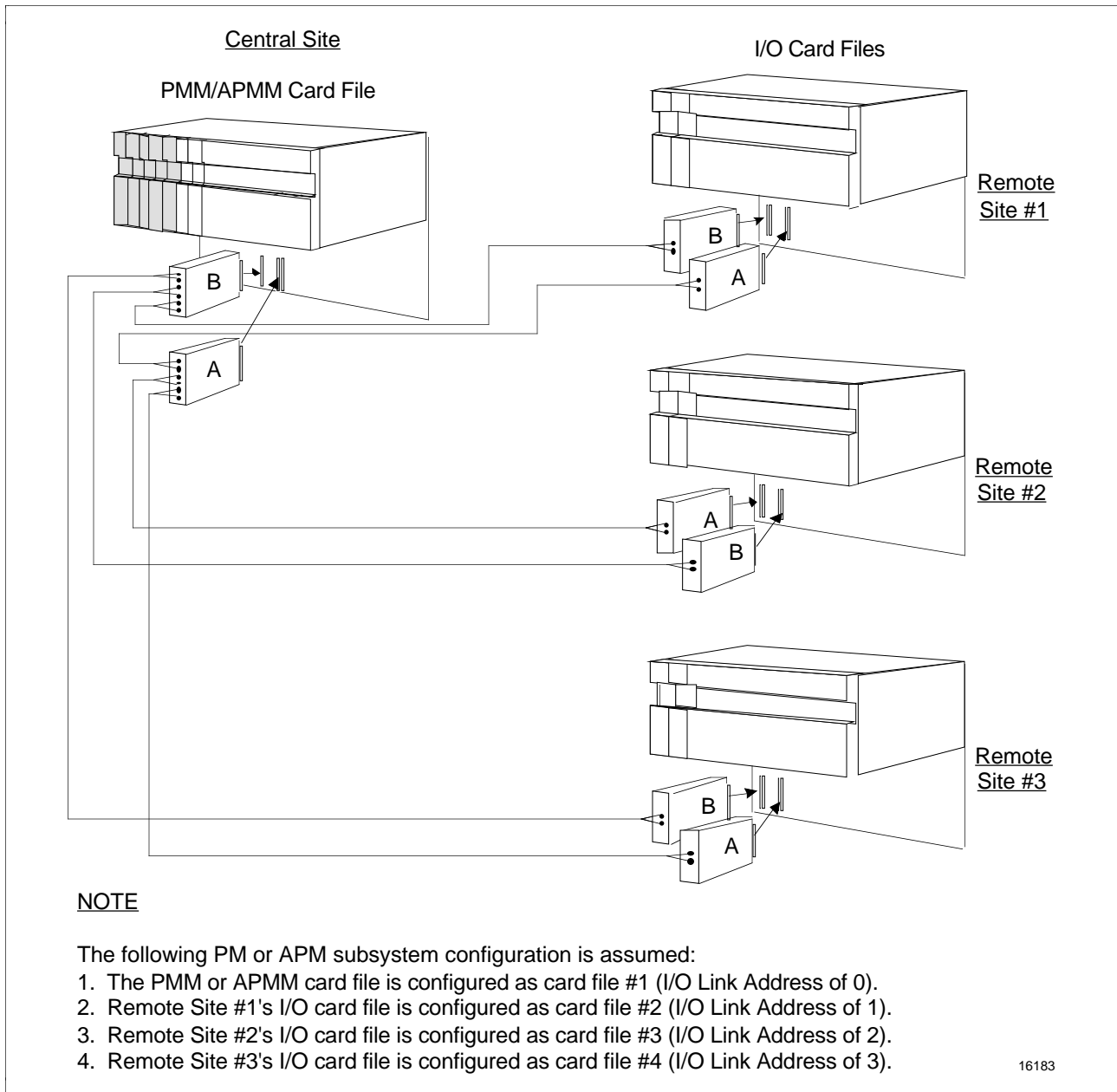
8.3 I/O Link Extender Card

8.3.1 Standard I/O Link Extender

Nonredundant PMM/APMM/HPMM configuration

Two I/O Link Extender cards and their associated Fiber Optic Coupler modules are required at each end of the I/O link extension, one for Link A and one for Link B. The cards are normally installed in adjacent card file slots as illustrated in Figure 8-1 for a nonredundant PMM or APMM configuration.

Figure 8-1 Standard I/O Link Extender Interconnections with Nonredundant PMM or APMM

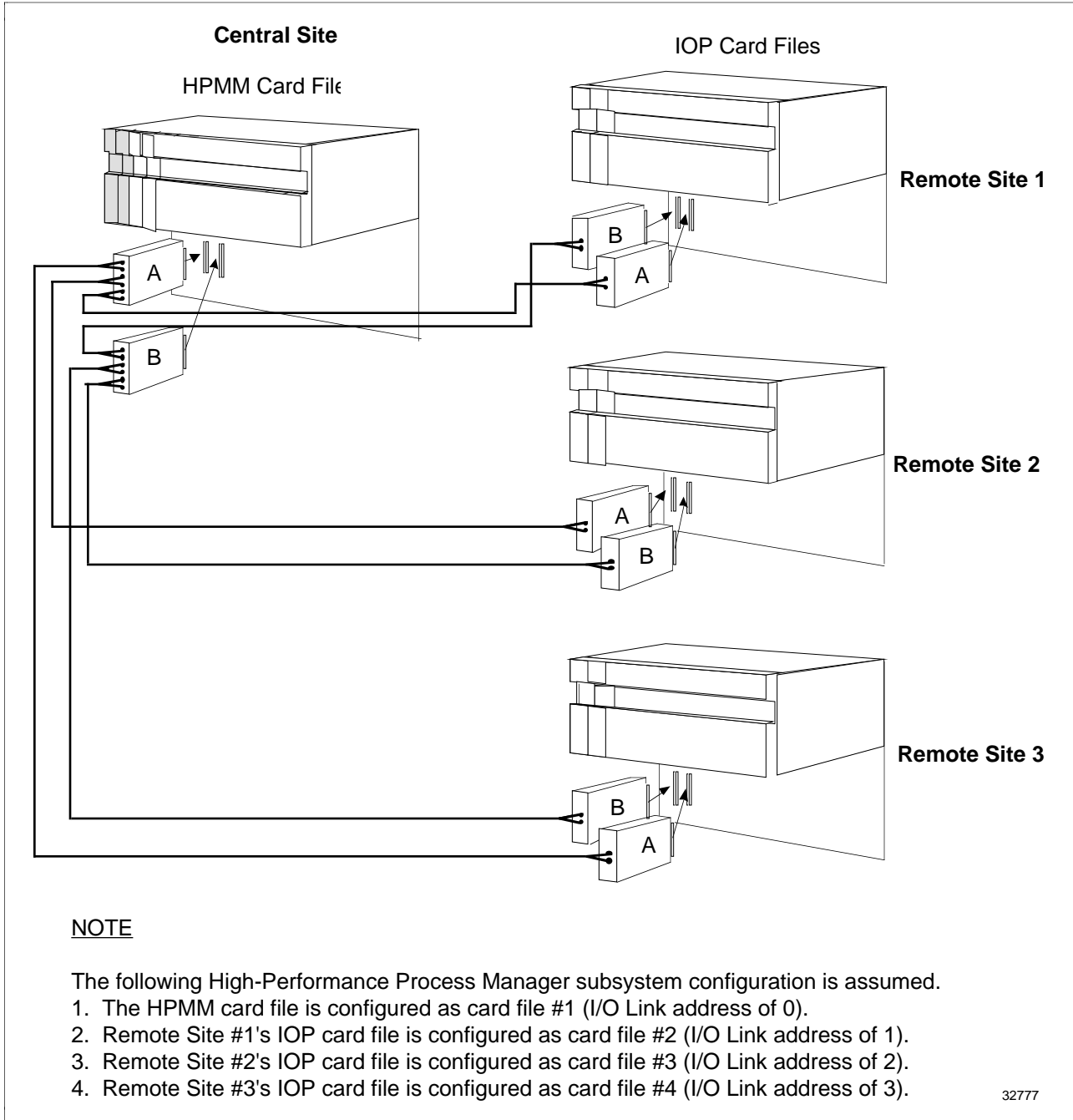


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8.3.1 Standard I/O Link Extender, Continued

Nonredundant HPMM configuration Figure 8-2 illustrates a nonredundant HPMM configuration.

Figure 8-2 Standard I/O Link Extender Interconnections with Nonredundant HPMM



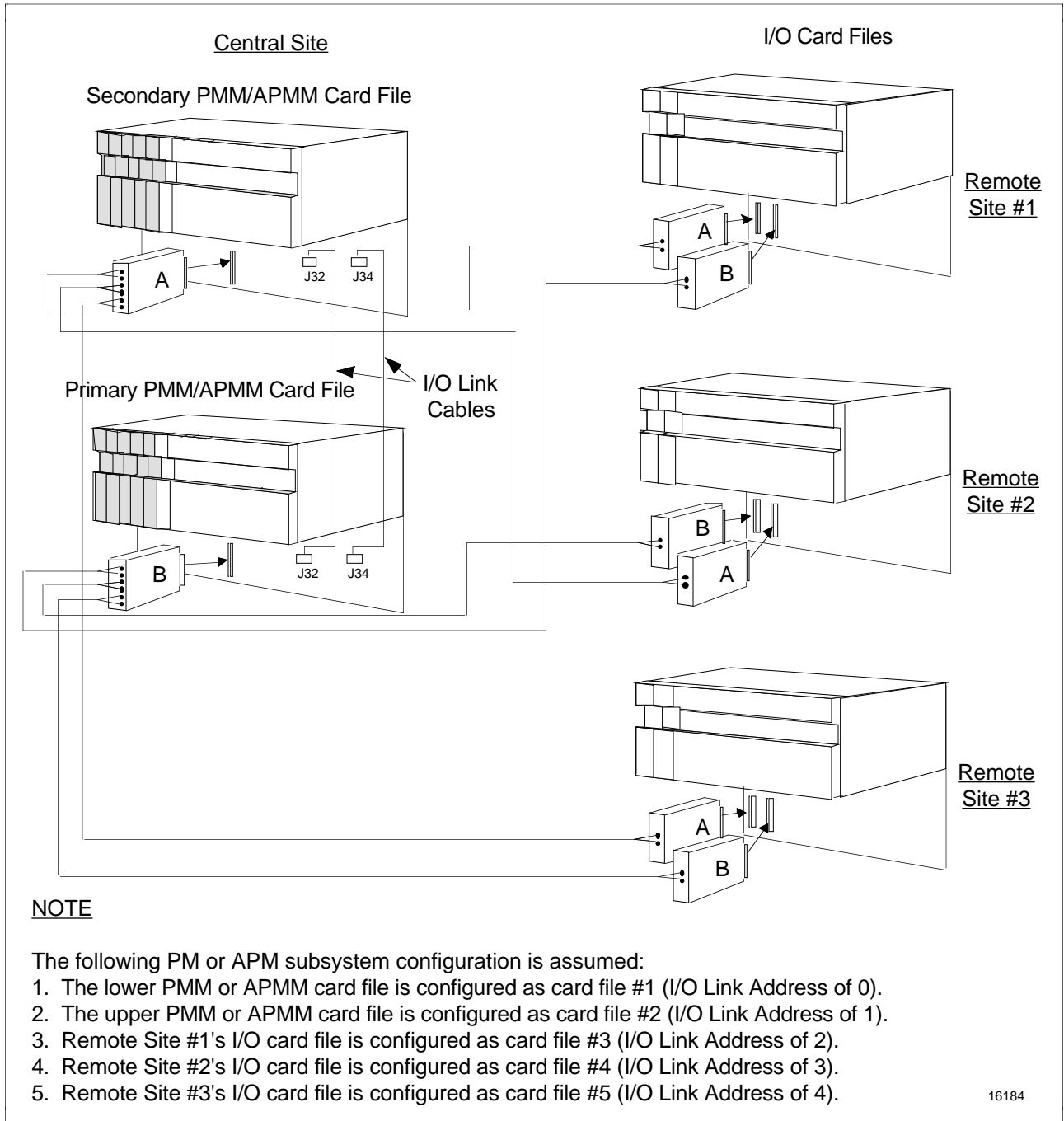
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8.3.1 Standard I/O Link Extender, Continued

Redundant PMM/APMM/HPMM configuration

In the case of separate redundant PMM, APMM, or HPMM card files, where Link A is installed in the one PMM, APMM, or HPMM card file and Link B is installed in the other PMM, APMM, or HPMM card file, the same slot must be used in both card files as illustrated in Figure 8-3.

Figure 8-3 Standard I/O Link Extender Interconnections with Redundant PMMs or APMMs



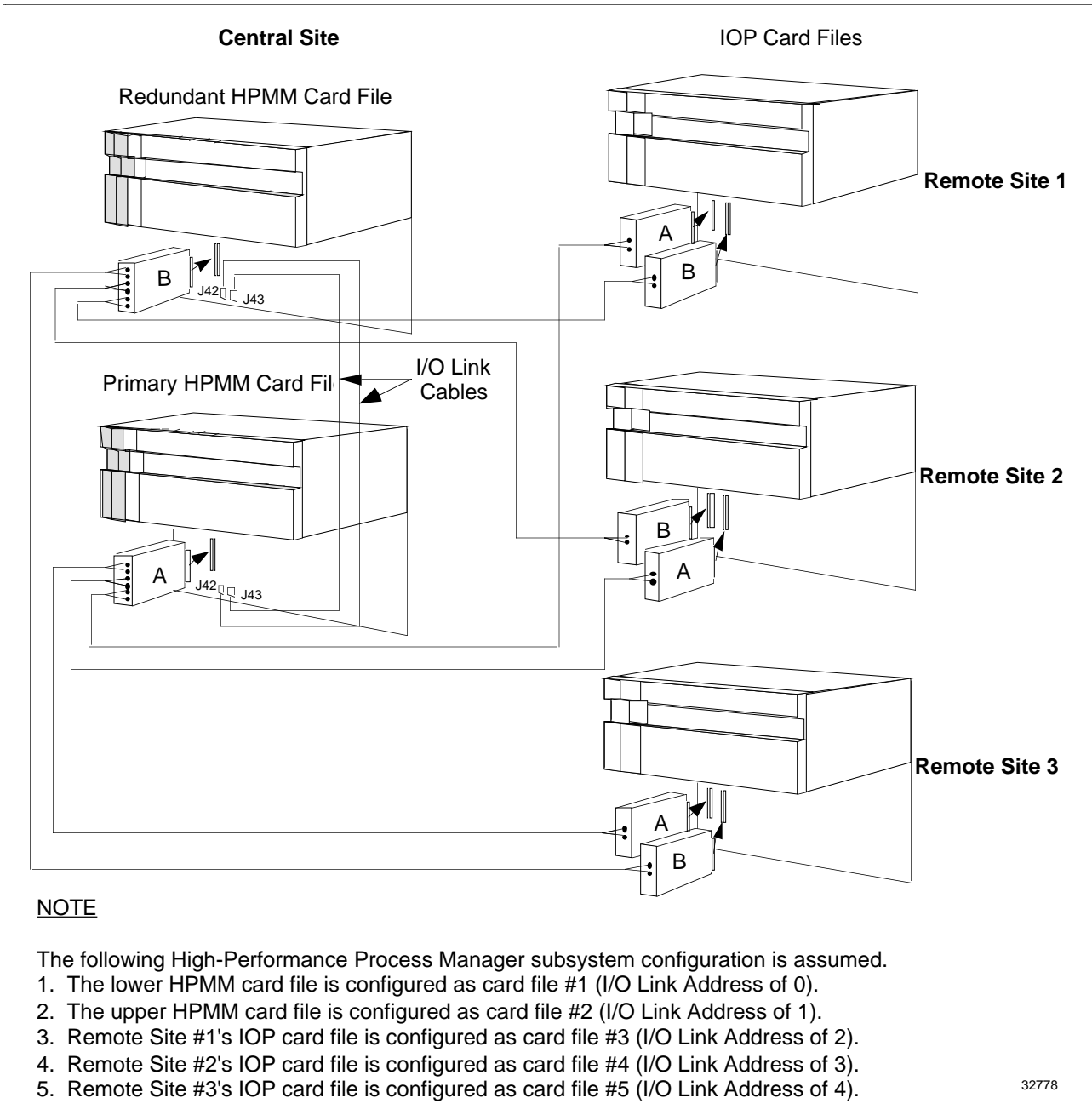
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8.3.1 Standard I/O Link Extender, Continued

Redundant HPMM configuration

Figure 8-4 illustrates a redundant HPMM configuration.

Figure 8-4 Standard I/O Link Extender Interconnections with Redundant HPMMs



Continued on next page

8.3.1 Standard I/O Link Extender, Continued

Fiber optic cable length 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.

Link A and Link B determination The slot position and the card file in which the I/O Link Extender card/Fiber Optic Coupler module set is installed determines whether the I/O link extension is Link A or Link B. The card file is assigned an I/O Link address number by configuration. See the *Process Manager/Advanced Process Manager Installation* or *High-Performance Process Manager Installation* manual for an explanation. If the card file number and the card slot number are both an odd or even number, the IOP will drive Link A. If they are different, the card will drive Link B. Both ends of the link must have the same link designation (A or B) when connecting the fiber optic cable. After installation of the link and upon applying power to the equipment, the link selection is indicated by one of two LEDs on the front of the Fiber Optic Coupler module housing.

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

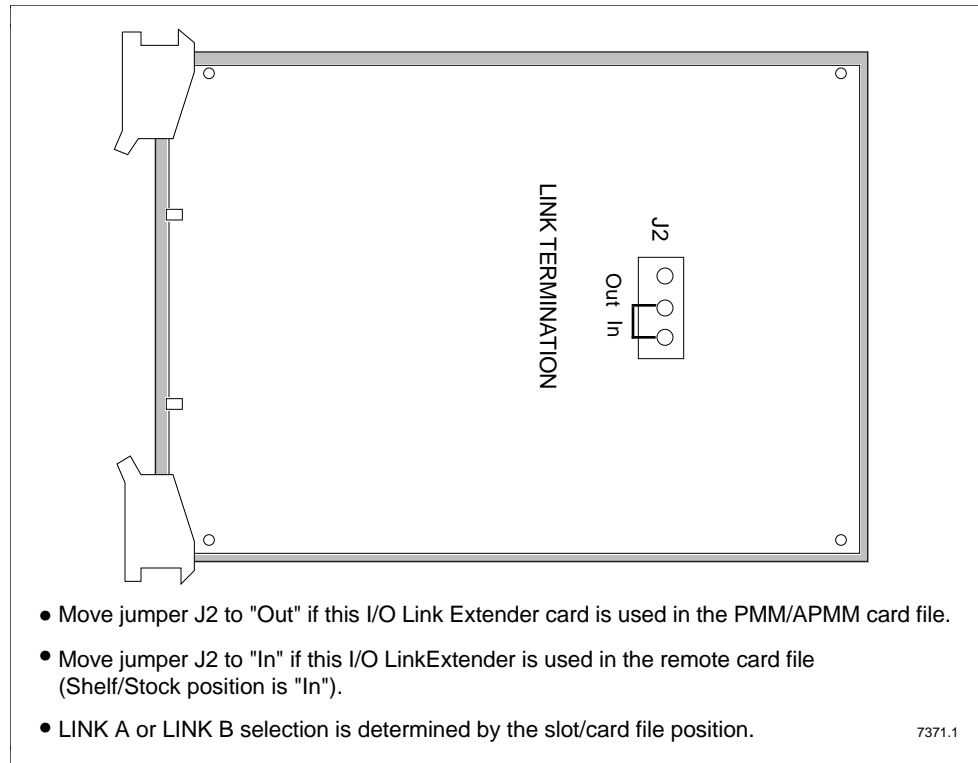
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8.3.1 Standard I/O Link Extender, Continued

Standard Extender card termination jumper

To provide termination, the I/O Link Extender card has available jumper selectable terminators. The **LINK TERMINATION** jumper, **J2**, has two positions, “**IN**” and “**OUT**.” At the PMM, APMM, HPMM, or local IOP card file end of the fiber link, the jumper must be placed in the “**OUT**” position. The opposite is true at the remote end of the fiber link. The jumper must be placed in the “**IN**” position. See Figure 8-5 for the location of the jumper on the standard I/O Link Extender card.

Figure 8-5 Standard I/O Link Extender Card Termination Jumper



8.3.2 Long distance I/O Link Extender

Nonredundant PMM/APMM/HPMM configuration

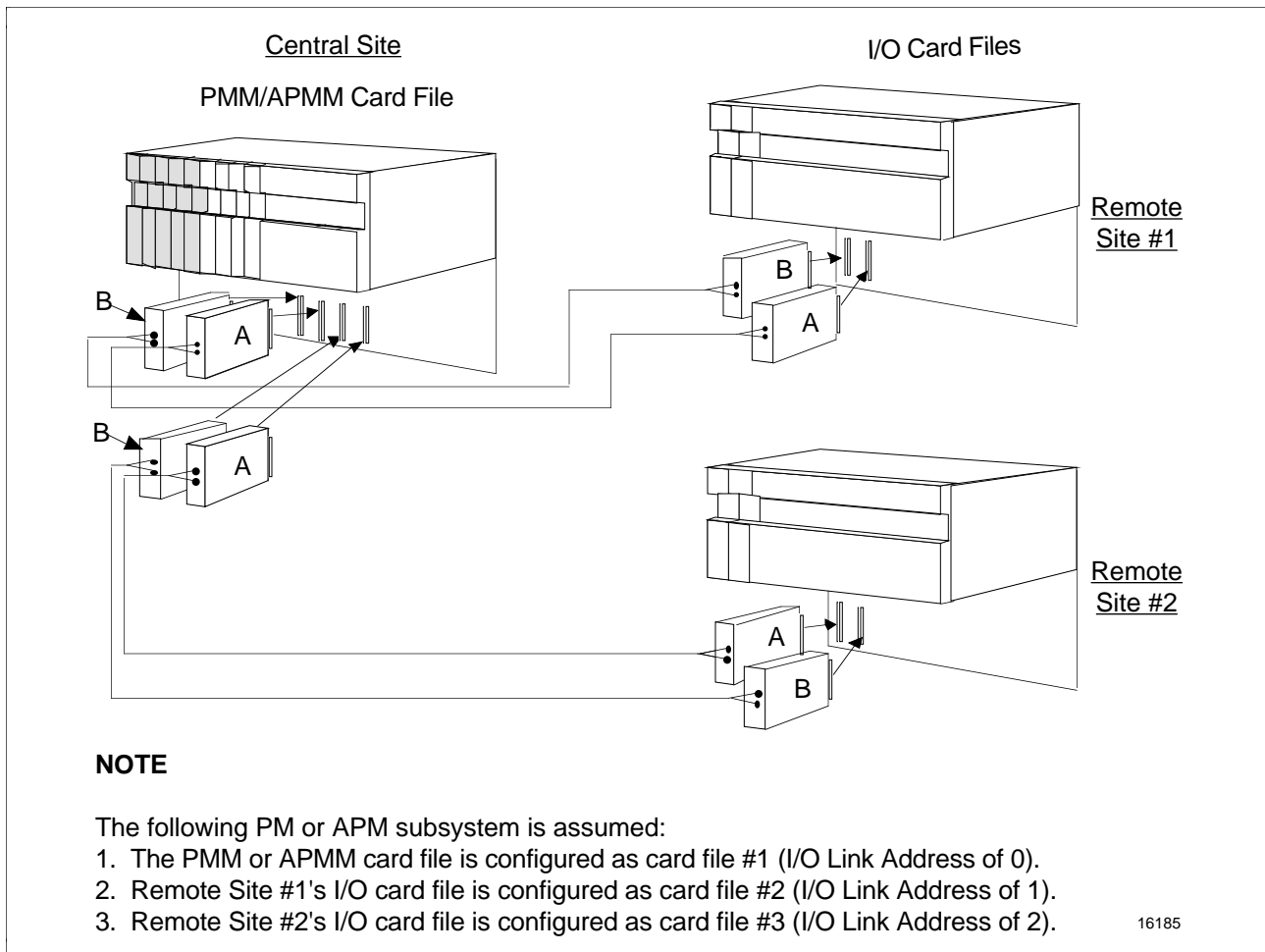
Two I/O Link Extender cards and their associated Fiber Optic Coupler modules are required at each end of the I/O link extension, one for Link A and one for Link B. The links are normally installed in adjacent card file slots as illustrated in Figure 8-6.

Link A and B selection is determined by jumper selection on the I/O Link Extender card. See Figure 8-10.

Nonredundant PMM or APMM configuration

Figure 8-6 illustrates a nonredundant PMM or APMM configuration.

Figure 8-6 Long Distance I/O Link Extender Interconnections with Nonredundant PMM or APMM

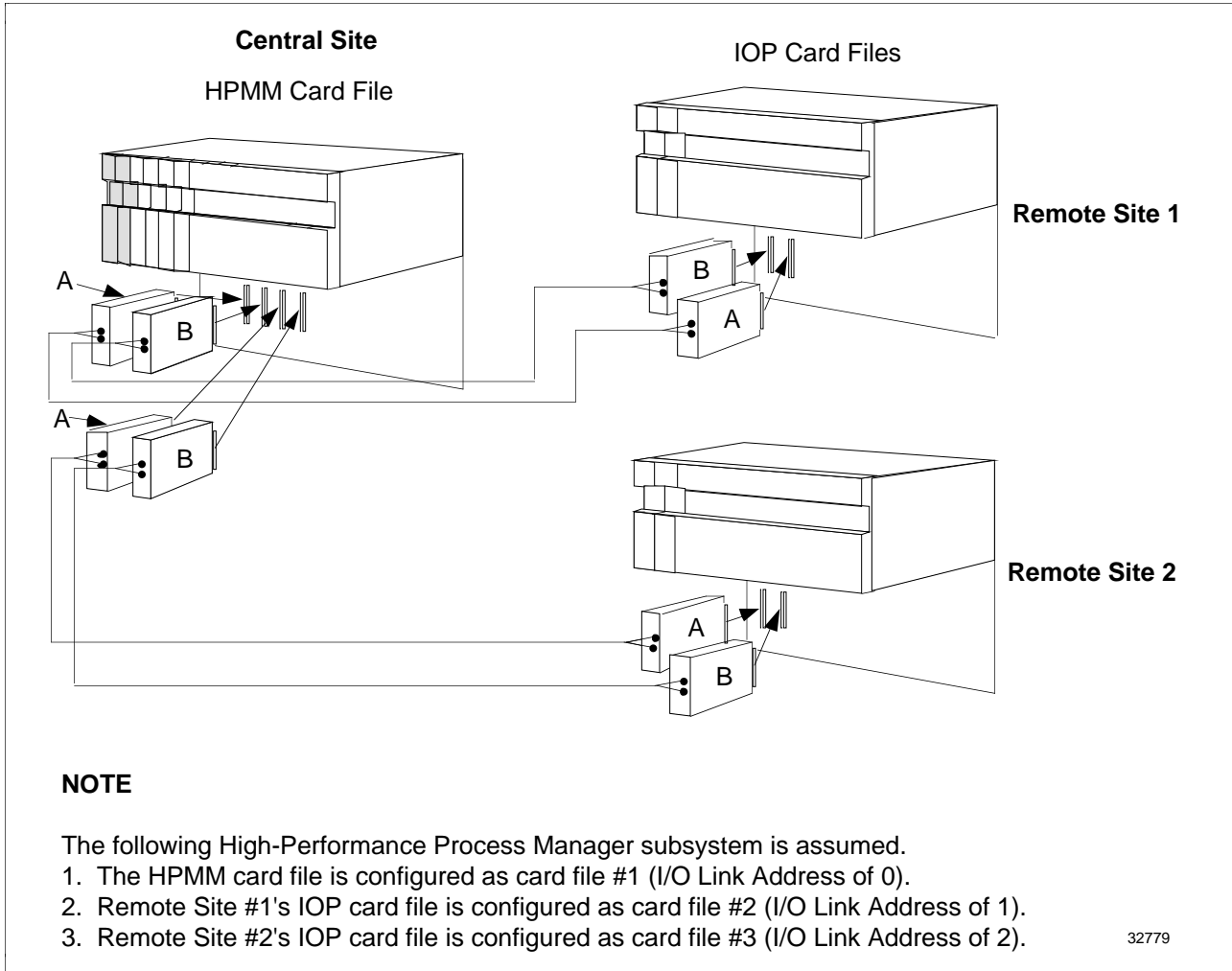


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8.3.2 Long distance I/O Link Extender, Continued

Nonredundant HPMM configuration Figure 8-7 illustrates a nonredundant HPMM configuration.

Figure 8-7 Long Distance I/O Link Extender Interconnections with Nonredundant HPMM



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8.3.2 Long distance I/O Link Extender, Continued

Redundant PMM/APMM/HPMM configuration

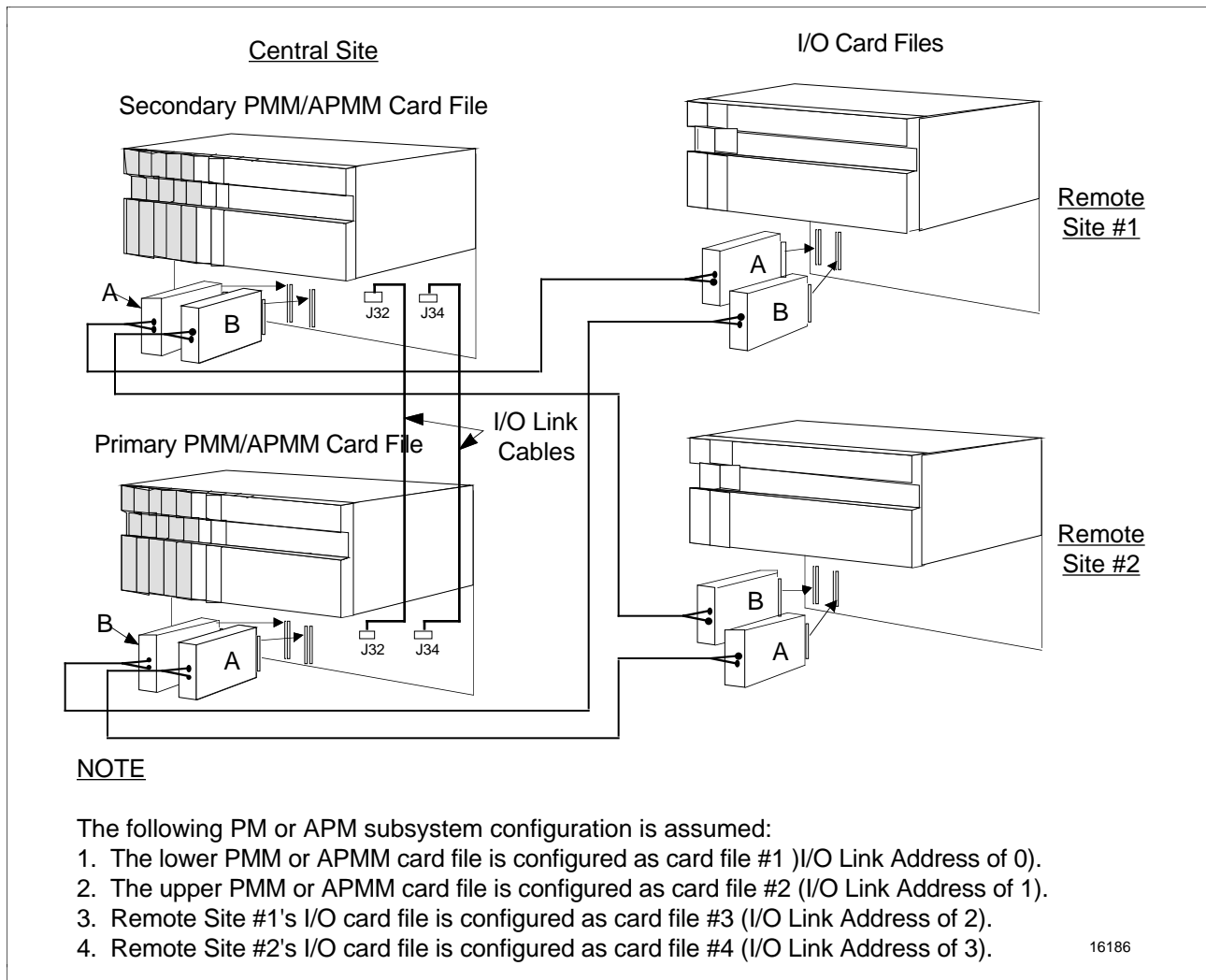
In the case of separate redundant PMM, APMM, or HPMM card files, where Link A is installed in the one PMM, APMM, or HPMM card file and Link B is installed in the other card file, the same slot must be used in both PMM, APMM, or HPMM card files.

Link A and B selection is determined by jumper selection on the I/O Link Extender card. See Figure 8-10.

Redundant PMM or APMM configuration

Figure 8-8 illustrates a redundant PMM or APMM configuration.

Figure 8-8 Long Distance I/O Link Extender Interconnections with Redundant PMMs or APMMs



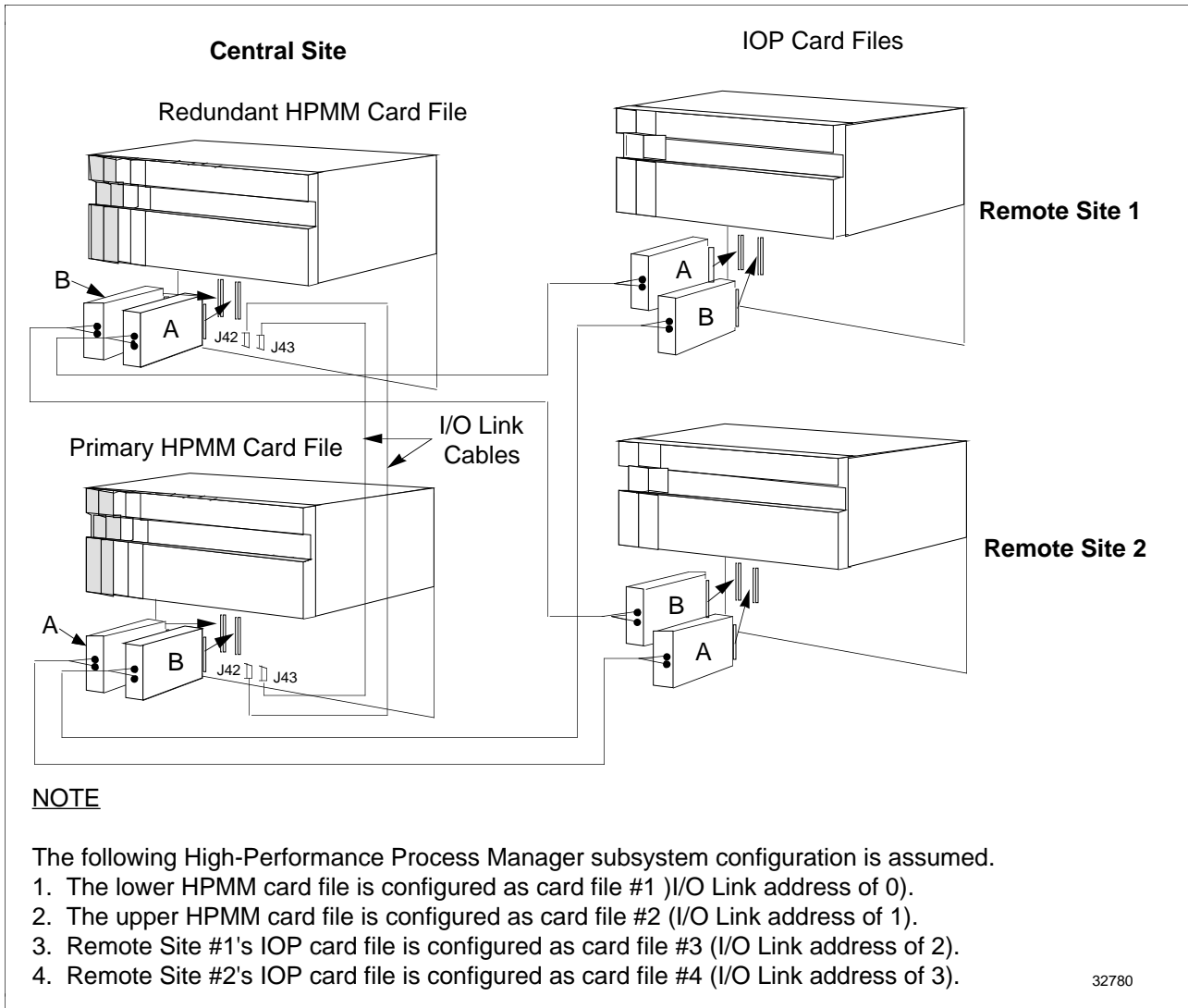
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8.3.2 Long distance I/O Link Extender, Continued

Redundant HPMM configuration

Figure 8-9 illustrates a redundant HPMM configuration.

Figure 8-9 Long Distance I/O Link Extender Interconnections with Redundant HPMMs



Fiber optic cable length

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.

Continued on next page

8.3.2 Long distance I/O Link Extender, Continued

Link A and Link B determination

Before installing the I/O Link Extender card in its card file slot, it must be configured as Link A or Link B by jumper selection on the card. The jumper location is labeled **A/B LINK SELECTION** and has two positions labeled **LINK A** and **LINK B**. Placing the jumper in the desired position provides the selection. After installation of the link and upon applying power to the equipment, the link selection is indicated by one of two LEDs on the front of the Fiber Optic Coupler module housing. See Figure 8-10 for the location of the jumper on the I/O Link Extender card.

I/O link termination

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

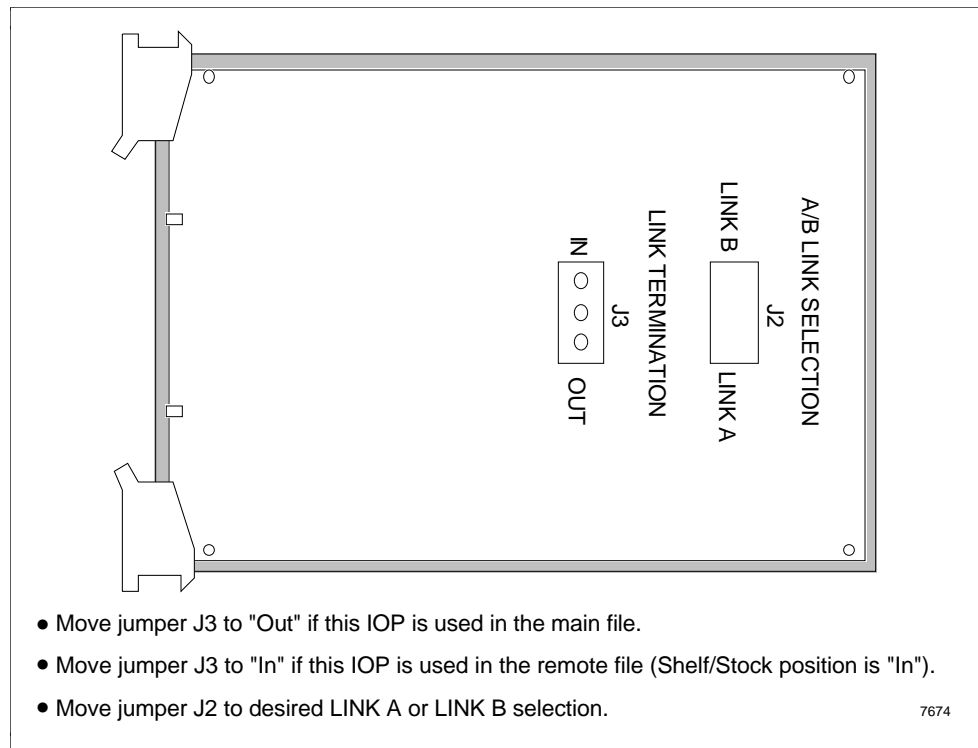
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8.3.2 Long distance I/O Link Extender, Continued

Long Distance Extender card termination jumper

To provide termination, the I/O Link Extender card has jumper selectable terminators available. The **LINK TERMINATION** jumper, **J2**, has two positions, “**IN**” and “**OUT**.” At a PMM, APMM, or HPMM card file end of a fiber link, the jumper must be placed in the “**OUT**” position. The opposite is true at the remote end of the fiber link. The jumper must be placed in the “**IN**” position. See Figure 8-10 for the location of the jumper on the Long Distance I/O Link Extender card.

Figure 8-10 Long Distance I/O Link Extender Card Termination Jumper



8.4 Fiber Optic Coupler Modules

ATTENTION

A Fiber Optic Coupler module cannot be installed in slots 1 or 2 in a CE Compliant Left 7-Slot IOP (MU/MC-HPFI03) or 15-Slot IOP (MU/MC-HPFI23) card file, or in slots 9 or 10 in a CE Compliant Right 7-Slot IOP (MU/MC-HPFI13) card file because of mechanical restrictions.

Two couplers required

Two Fiber Optic Coupler modules are required at each end of the I/O link extension, one for Link A and one for Link B. The couplers must be installed in the connector that is located directly under the card slot that contains the I/O Link Extender card.

CE Compliance

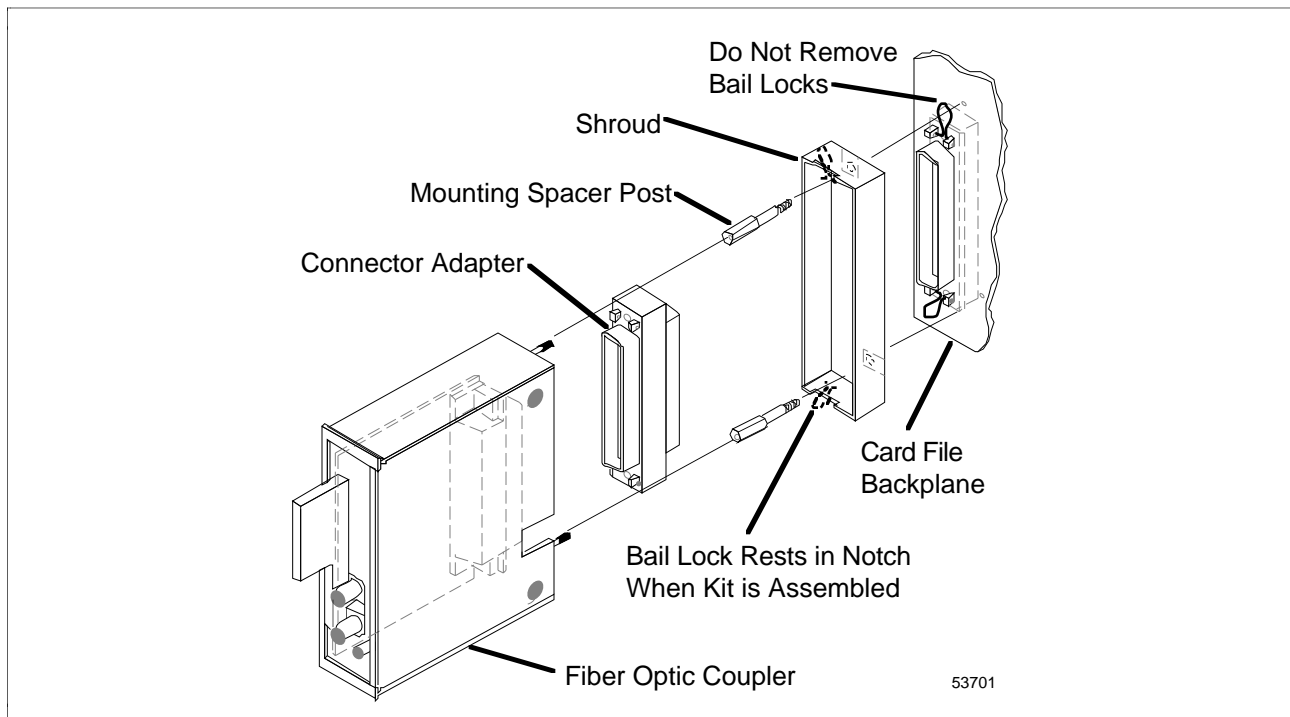
When installing Fiber Optic Coupler modules in CE Compliant card files, models MU-IOFX03, MU-PMFX03, or MU-PMFR03, a model MU-ILES01 adapter kit must be used.

Model MU-ILES01 adapter kit

The kit consists of a connector adapter, shroud, and mounting spacers as illustrated in Figure 8-11. The kit must be used because the card file's ground plate prevents the Fiber Optic Coupler module from seating in the backplane connector.

Assemble the Fiber Optic Coupler module and adapter kit as shown in Figure 8-11. Do not remove the connector bail locks and tighten the mounting spacers securely. Do not over tighten.

Figure 8-11 I/O Link Extender Adapter Kit



8.4.1 Standard I/O Link Extender

Choice of couplers

A choice of two Fiber Optic Coupler modules is available for use, a single interface and a triple interface coupler. Depending on the application, the appropriate Fiber Optic Coupler module is selected that can interface one, two, or three fiber optic cables and is installed in the connector directly below the I/O Link Extender card slot at the PMM, APMM, HPMM, or local IOP card file end of the fiber link. A single interface Fiber Optic Coupler module is used as the remote terminating Fiber Optic Coupler module and installed in the connector located directly under the terminating remote I/O Link Extender card slot.

Transmit and receive links

Connection to the fiber optic cable is accomplished by ST-type connectors. Because the links are duplex and a separate fiber is required for transmit and receive, a pair of ST-type connectors are used at each end of the fiber link. Labeling on the front of the Fiber Optic Coupler module housing identifies each pair connection. **T1** and **R1** are the first pair and where applicable, **T2** and **R2**, and **T3** and **R3**, are the second and third pairs, respectively. See Figure 8-7 for a front view of the triple interface Fiber Optic Coupler module.

LED indicators

Two LED indicators, labeled **A** and **B**, identify the link connection as Link A or Link B. The designation is based on the card file slot and the card file's configured I/O link address as illustrated in Figures 8-1 through 8-6.

8.4.2 Long Distance I/O Link Extender

One coupler

There is one type of Fiber Optic Coupler module and it accommodates one fiber Optic link. Additional I/O Link Extender cards and associated Fiber Optic Coupler modules can be installed to increase the number of fiber links.

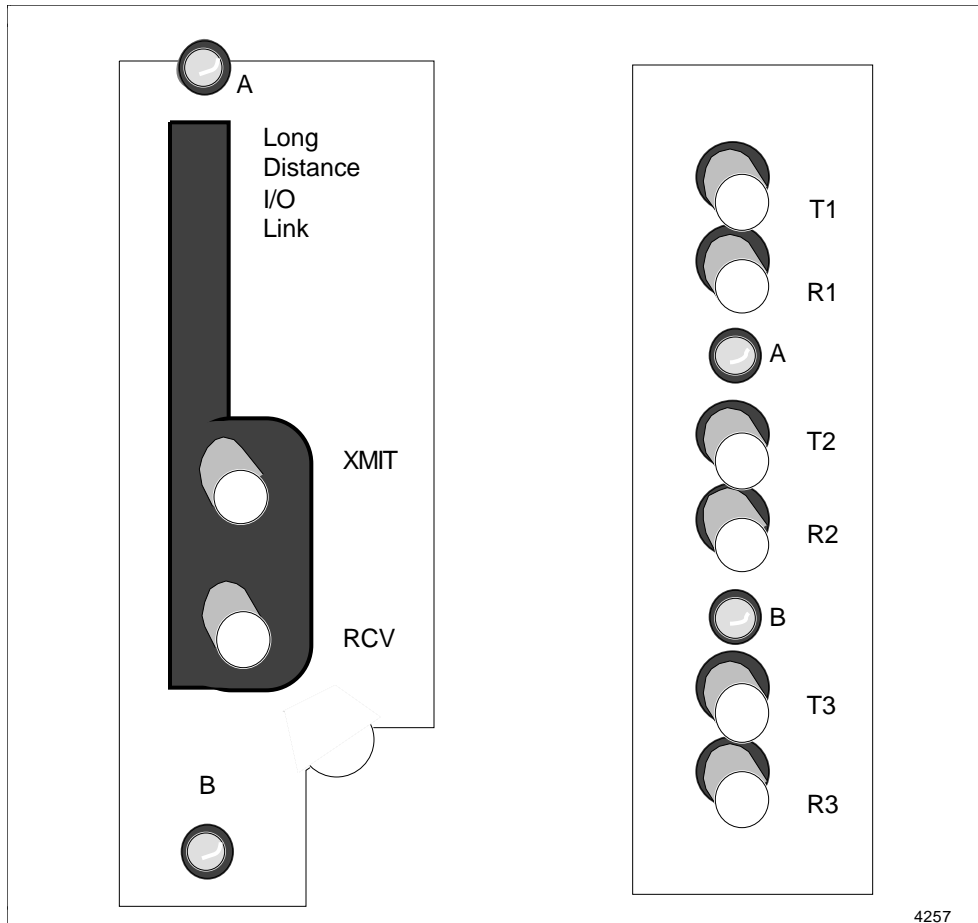
Transmit and receive links

Connection to the fiber optic cable is accomplished by ST-type connectors. Because the links are duplex and a separate fiber is required for transmit and receive, a pair of ST-type connectors is required at each end of the fiber link. The front of the coupler housing identifies the connections as **XMT** (transmit) and **RCV** (receive). See Figure 8-12 for a front view of the Fiber Optic Coupler module.

Led indicators

The cable option, Link A or Link B, determined by a jumper selection on the associated I/O Link Extender card, is indicated by LED indicators, labeled **A** and **B**, on the front of the Fiber Optic Coupler module housing as illustrated in Figure 8-12.

Figure 8-12 I/O Link Extender Fiber Optic Coupler Module Front Views



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8.4.2 Long Distance I/O Link Extender, Continued

CAUTION

CAUTION—The older Long Distance Fiber Optic Coupler module, part number 51201616-1xx, is incompatible with the newer Long Distance Fiber Optic Coupler module, part number 51309208-1xx, at distances of less than 4 kilometers. You cannot mix the newer coupler (51309208-1xx) with the older coupler (51201616-1xx).

The optical levels at which the newer coupler operates are incompatible with those of the older coupler at distances of less than 4 kilometers. Mixing the couplers can result in receiver overdrive at distances of less than 4 kilometers. Although no damage to either component will occur, unreliable I/O Link Extender operation may result.

To ensure reliable operation of the I/O Link Extender, the coupler at both ends of the fiber link must have the same part number.

8.5 Fiber Optic Cable

Multiple fibers

The fiber optic cable has multiples of two 62.5 micron fibers for each connection. A 4-fiber cable would allow Link A and Link B to be in the same cable if they were terminated close to each other in the same cabinet.

Spare fibers recommended

Because the fibers are glass, it is recommended that spares be included in the fiber optic cable. The cost of additional fibers is small compared to cable replacement, a sufficient number of spares should be specified.

Cable loss parameters

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

Indoor and outdoor cables

If outdoor cable is used to connect the two I/O Link Extender cards together, the cable will be too rigid to install inside the cabinet. To accommodate this, a short piece of cable, long enough to reach from the cable duct to the Fiber Optic Coupler module, can be spliced to each outdoor cable. Remember to include the signal loss for each splice when calculating the Loss Budget.

ST-type connector cable assemble

Honeywell can provide short fiber optic ST-type connector cable assemblies. Order by part number 51195498-xxx, where tab -xxx is the length of the cable.

8.6 Fiber Optic Cable Connections

St-type connectors

The fiber optic cable to Fiber Optic Coupler module connection uses an ST-type connector. The connectors are to be provided by the fiber optic cable contractor.

Transmit and receive fibers

Two fibers are required for each fiber optic link. For Link A, one fiber of the pair connects the optical transmitter in the Fiber Optic Coupler module at the PMM, APMM, HPMM, or local IOP card file end with the optical receiver in the Fiber Optic Coupler module at the remote IOP card file end. The second fiber of the pair connects the optical receiver in the Fiber Optic Coupler module at the PMM, APMM, HPMM, or local IOP card file with the optical transmitter in the Fiber Optic Coupler module at the remote IOP card file. Link B connects in the same manner. See Figure 8-12 for a view of the Fiber Optic Coupler module connector labels.

8.7 Required OTDR Test

Perform OTDR test

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

8.8 Power Loss Measurements

After installation

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

Acceptable power loss parameters

This measurement must be at least -24 db for the standard and -29 db for the long distance fiber optic link. See the Loss Budget calculation in the *Process Manager/Advanced Process Manager Planning* or *High-Performance Process Manager Planning* manual.

Equipment list

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

- Hewlett Packard Model 8152A Optical Average Power Meter
 - Hewlett Packard Model 81520A Optical Head
 - Hewlett Packard Model 81000VA ST Connector Adapter

 - Intelco Model 131 Meter
 - Intelco Model 2510 ST Adapter

 - Laser Precision AM-3500 Meter
(specify ST Adapter when ordering)

 - Photodyne Model 17XT Optical Power Meter
 - Photodyne Model 2041 ST Adapter Cap

 - Tektronics Model 2815 Optoscope
(Specify Option 27 to get ST connectors)
-

Section 9 – FTA Installation Considerations

9.1 Overview

Section contents The topics covered in this section are:

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Purpose

Field Termination Assemblies (FTAs) for the Process Manager (PM), Advanced Process Manager (APM), and High-Performance Process Manager (HPM) are often installed in facility terminal panels rather than in PM, APM, or HPM cabinets. They connect to the PM, APM, and HPM as described in the *Process Manager/Advanced Process Manager Installation* and *High-Performance Process Manager Installation* manuals.

Rules for the layout of the FTA Mounting Channels, mounting the Field Termination Assemblies, and for proper segregation of the field wiring to eliminate crosstalk are described in the following subsections.

9.2 FTA Selection and Mounting Considerations

Overview

FTA selection is generally based on the number of channels in the FTA, the FTA's mounting size, and the field wiring terminal type on the FTA. The applicable information is summarized in Tables 9-1 and 9-2. The FTAs are listed by model number.

Calculating the number of FTAs needed

The number of FTAs required to support a given number of field inputs and output can be calculated by the following example. Assume that the Process Manager, Advanced Process Manager, or High-Performance Process Manager is required to process eighty 24 Vdc digital inputs, forty high level analog inputs, and twelve 4-20 mA analog outputs. From Table 9-1, it can be seen that you will need three 24 Vdc Digital Input FTAs for the digital inputs, three High Level Analog Input FTAs for the analog inputs, and two Analog Output FTAs for the analog outputs.

FTA mounting sizes

Tables 9-1 and 9-2 list the FTA Mounting Channel size, A, B, and C, for the various FTAs. As illustrated in Figure 9-1, an FTA that is A-size requires one space totaling 15.2 centimeters (6 inches) of FTA Mounting Channel, while a B-size FTA is bigger and requires two spaces totaling 30.7 centimeters (12.1 inches) of FTA Mounting Channel. C-size FTAs require three spaces, or 46.2 centimeters (18.2 inches).

Standard FTA terminal types

Table 9-1 lists the standard FTA's type of field wiring terminals. There are three types.

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

Continued on next page

9.2 FTA Selection and Mounting Considerations, Continued

Standard FTAs

Table 9-1 Standard FTA Channels and Mounting Size

Model Number	Description	Terminal Type	Channels	Mounting Size
MU/MC-TAIL02	Low Level Analog Input (Single IOP)	C	8	B
MU/MC-TAIL03	Low Level Analog Input (Single IOP)	C	8	B
MU/MC-TAMR02	Low Level Analog Input Multiplexer RTD (Single IOP)	C	16	B
MU/MC-TAMR03	Low Level Analog Input Multiplexer RTD (Single IOP)	C	16	B
MU/MC-TAMT02	Low Level Analog Input Multiplexer TC—Local CJR (Single IOP)	C	16	B
MU/MC-TAMT03	Low Level Analog Input Multiplexer TC—Local CJR (Single IOP)	C	16	B
MU/MC-TAMT12	Low Level Analog Input Multiplexer TC—Remote CJR (Single IOP)	C	16	B
MU/MC-TAMT13	Low Level Analog Input Multiplexer TC—Remote CJR (Single IOP)	C	16	B
MU/MC-TAIH02	High Level Analog Input/STI (Single IOP)	C	16	A
MU/MC-TAIH03	High Level Analog Input (Single IOP)	C	16	A
MU/MC-TAIH12	High Level Analog Input/STI	C	16	B
MU/MC-TAIH13	High Level Analog Input	C	16	B
MU/MC-TAIH22	Enhanced Power High Level Analog Input/STI	C	16	B
MU/MC-TAIH23	Enhanced Power High Level Analog Input	C	16	B
MU/MC-TAIH52	High Level Analog Input/STI	S	16	B
MU/MC-TAIH53	High Level Analog Input	S	16	B
MU/MC-TAIH62	Enhanced Power High Level Analog Input/STI	S	16	B
MU/MC-TSTX03	Smart Transmitter Interface (Single IOP)	C	16	A
MU/MC-TSTX13	Smart Transmitter Interface	C	16	B
MU/MC-TSTX53	Smart Transmitter Interface	C	16	B
MU/MC-TAOX02	Analog Output (Single IOP)	C	8	A
MU/MC-TAOX12	Analog Output	C	8	B

Continued on next page

9.2 FTA Selection and Mounting Considerations, Continued

Standard FTAs, continued

Table 9-1 Standard FTA Channels and Mounting Size, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MU/MC-TAOX52	Analog Output	S	8	B
MU/MC-TAOY22	Analog Output With Standby Manual connectors	C	16	B
MU/MC-TAOY23	Analog Output Without Standby Manual connectors	C	16	B
MU/MC-TAOY52	Analog Output With Standby Manual connectors	S	16	B
MU/MC-TAOY53	Analog Output Without Standby Manual connectors	S	16	B
MU/MC-TDID12	24 Vdc Digital Input	C	32	C
MU/MC-TDID52	24 Vdc Digital Input	S	32	C
MU/MC-TDID72	24 Vdc Digital Input (Single IOP)	RS	32	C
MU/MC-TDIY22	24 Vdc Digital Input	C	32	B
MU/MC-TDIY62	24 Vdc Digital Input	S	32	B
MU/MC-TDIA12	120 Vac Digital Input	C	32	C
MU/MC-TDIA52	120 Vac Digital Input	S	32	C
MU/MC-TDIA72	120 Vac Digital Input (Single IOP)	RS	32	C
MU/MC-TDIA22	240 Vac Digital Input	C	32	C
MU/MC-TDIA62	240 Vac Digital Input	S	32	C
MU/MC-TDON12	24 Vdc Nonisolated Digital Output	C	16	B
MU/MC-TDON52	24 Vdc Nonisolated Digital Output	S	16	B
MU/MC-TDOY22	24 Vdc Isolated Digital Output	C	32	B
MU/MC-TDOY62	24 Vdc Isolated Digital Output	S	32	B
MU/MC-TDOD12	3-30 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD13	3-30 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD14	3-30 Vdc Solid-State Digital Output	C	16	B

Continued on next page

9.2 FTA Selection and Mounting Considerations, Continued

Standard FTAs, continued

Table 9-1 Standard FTA Channels and Mounting Size, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MU/MC-TDOD52	3-30 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD53	3-30 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD54	3-30 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD22	31-200 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD23	31-200 Vdc Solid-State Digital Output	C	16	B
MU/MC-TDOD62	31-200 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOD63	31-200 Vdc Solid-State Digital Output	S	16	B
MU/MC-TDOA12	120/240 Vac Solid-State Digital Output	C	16	B
MU/MC-TDOA13	120/240 Vac Solid-State Digital Output	C	16	B
MU/MC-TDOA52	120/240 Vac Solid-State Digital Output	S	16	B
MU/MC-TDOA53	120/240 Vac Solid-State Digital Output	S	16	B
MU/MC-TDOR12	120 Vac/125 Vdc Relay Digital Output	C	16	B
MU/MC-TDOR52	120 Vac/125 Vdc Relay Digital Output	S	16	B
MU/MC-TDOR22	240 Vac/125 Vdc Relay Digital Output	C	16	B
MU/MC-TDOR62	240 Vac/125 Vdc Relay Digital Output	S	16	B
MU/MC-TDOY23	240 Vac/125 Vdc Relay Digital Output	C	16	B
MU/MC-TDOY63	240 Vac/125 Vdc Relay Digital Output	S	16	B
MU/MC-TPIX12	Pulse Input	C	8	B
MU/MC-TPIX52	Pulse Input	S	8	B
MU/MC-TSDT02	Serial Device Interface—Toledo Weigh Cell	C	1	A
MU/MC-TSDM02	Serial Device Interface—Manual/Auto Station	C	1	A
MU/MC-TSDU02	Serial Device Interface—UDC 6000 Modbus	C	1	A
MU/MC-TSIA12	Serial Interface—Allen-Bradley	C	1	A
MU/MC-TSIM12	Serial Interface—Modbus RTU	C	1	A

Continued on next page

9.2 FTA Selection and Mounting Considerations, Continued

Standard FTAs, continued

Table 9-1 Standard FTA Channels and Mounting Size, Continued

Model Number	Description	Terminal Type	Channels	Mounting Size
MU/MC-TDPR01	Digital Input Power Distribution Assembly 16 outputs	S	N/A	A
MU/MC-TDPR02	Digital Input Power Distribution Assembly 12 outputs	S	N/A	A
MU/MC-TLPA02	Power Adapter (supports LLMux, SDI, and SI)	C	2	A

Continued on next page

9.2 FTA Selection and Mounting Considerations, Continued

Galvanically Isolated FTA terminal types

Table 9-2 lists the Galvanically Isolated FTA's type of field wiring terminals.

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

Table 9-2 Galvanically Isolated FTA Channels and Mounting Size

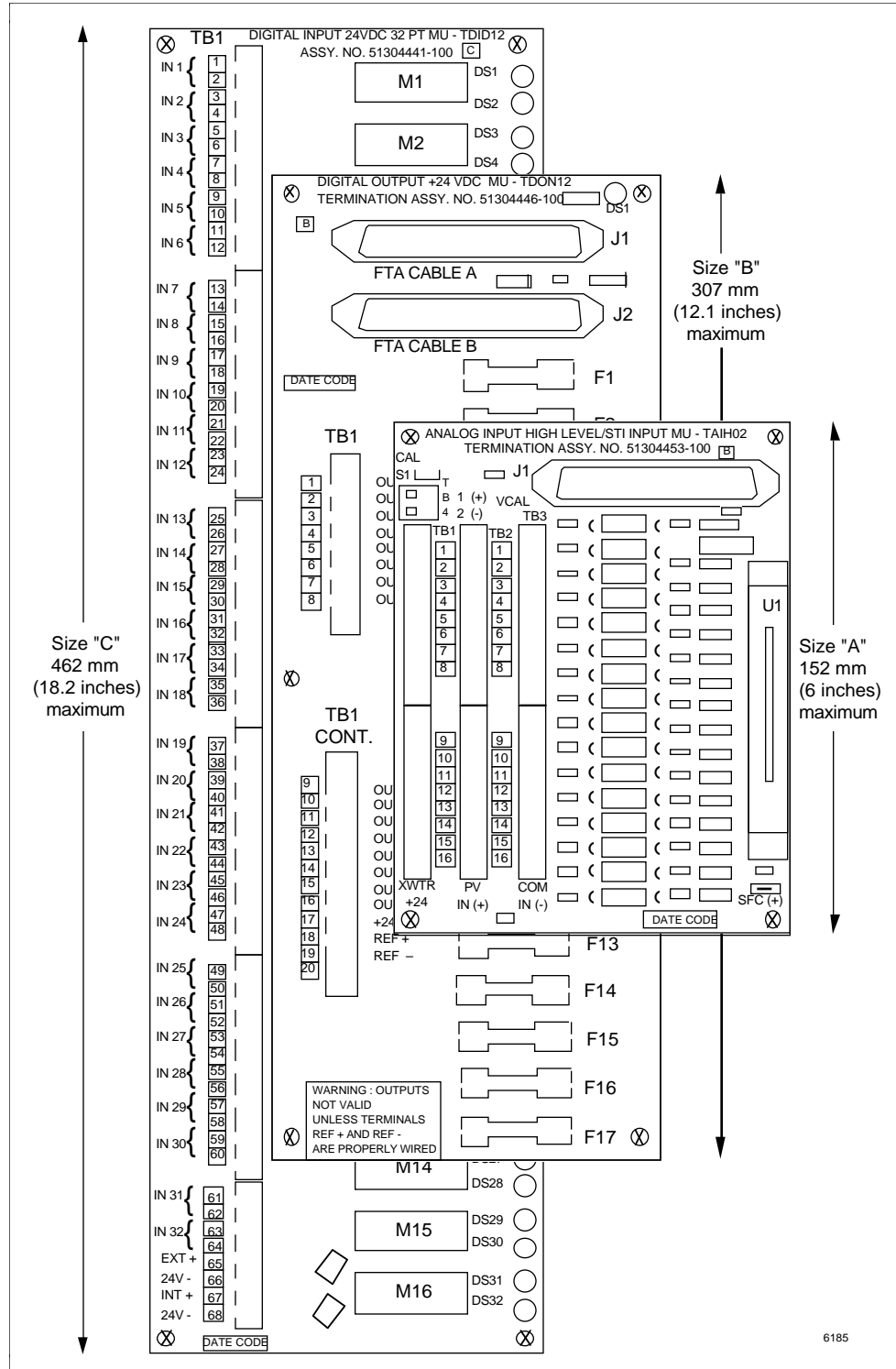
Model Number	Description	Terminal Type	Channels	Mounting Size
MU/MC-GAIH12	High Level Analog Input	C	16	B
MU/MC-GAIH82	High Level Analog Input	CR	16	B
MU/MC-GAIH13	High Level Analog Input/Smart Trans Interface	C	16	B
MU/MC-GAIH83	High Level Analog Input/Smart Trans Interface	CR	16	B
MU/MC-GAIH14	High Level Analog Input/Smart Trans Interface (High drive)	C	16	B
MU/MC-GAIH84	High Level Analog Input/Smart Trans Interface (High drive)	CR	16	B
MU/MC-GAIH22	High Level Analog Input (Auxiliary receiver output)	C	16	B
MU/MC-GAIH92	High Level Analog Input (Auxiliary receiver output)	CR	16	B
MU/MC-GAOX02	Analog Output (Single IOP)	C	8	B
MU/MC-GAOX72	Analog Output (Single IOP)	CR	8	B
MU/MC-GAOX12	Analog Output	C	8	B
MU/MC-GAOX82	Analog Output	CR	8	B
MU/MC-GDID12	24 Vdc Digital Input (Contact output to IOP)	C	32	B
MU/MC-GDID82	24 Vdc Digital Input (Contact output to IOP)	CR	32	B
MU/MC-GDID13	24 Vdc Digital Input (Solid-state output to IOP)	C	32	B
MU/MC-GDID83	24 Vdc Digital Input (Solid-state output to IOP)	CR	32	B
MU/MC-GDOD12	24 Vdc Digital Output (Contact output to IOP)	C	16	B
MU/MC-GDOD82	24 Vdc Digital Output (Contact output to IOP)	CR	16	B
MU/MC-GDOL12	24 Vdc Digital Input (Line Fault Detection)	C	16	B
MU/MC-GDOL82	24 Vdc Digital Input (Line Fault Detection)	CR	16	B
MU/MC-GLFD02	Combiner Panel	S	N/A	A
MU/MC-GPRD02	Power Distribution Assembly	N/A	N/A	A
MU/MC-GMAR52	Marshalling Panel	S	N/A	B

Continued on next page

9.2 FTA Selection and Mounting Considerations, Continued

FTA sizes

Figure 9-1 FTA Mounting Sizes



9.3 FTA Mounting Channel Requirements

Introduction

The number of FTA Mounting Channels required to mount FTAs depends on the number of FTAs and their size, A, B, or C. As an example of an FTA Mounting Channel usage calculation, use the example in subsection 9.2.

Calculating the requirements

Referencing Table 9-1, three standard 24 Vdc Digital Input FTAs require six mounting spaces on an FTA Mounting Channel, three standard High Level Analog Input FTAs require three mounting spaces, and two standard Analog Output FTAs require two mounting spaces. An A-size FTA requires 1 mounting space and a B-size FTA requires 2 mounting spaces. A C-size FTA requires 3 mounting spaces. The total FTA Mounting Channel requirement is 11 spaces. At 15.2 centimeters (6 inches) for each space, a minimum of 167.2 centimeters (66 inches) of FTA Mounting Channel is required.

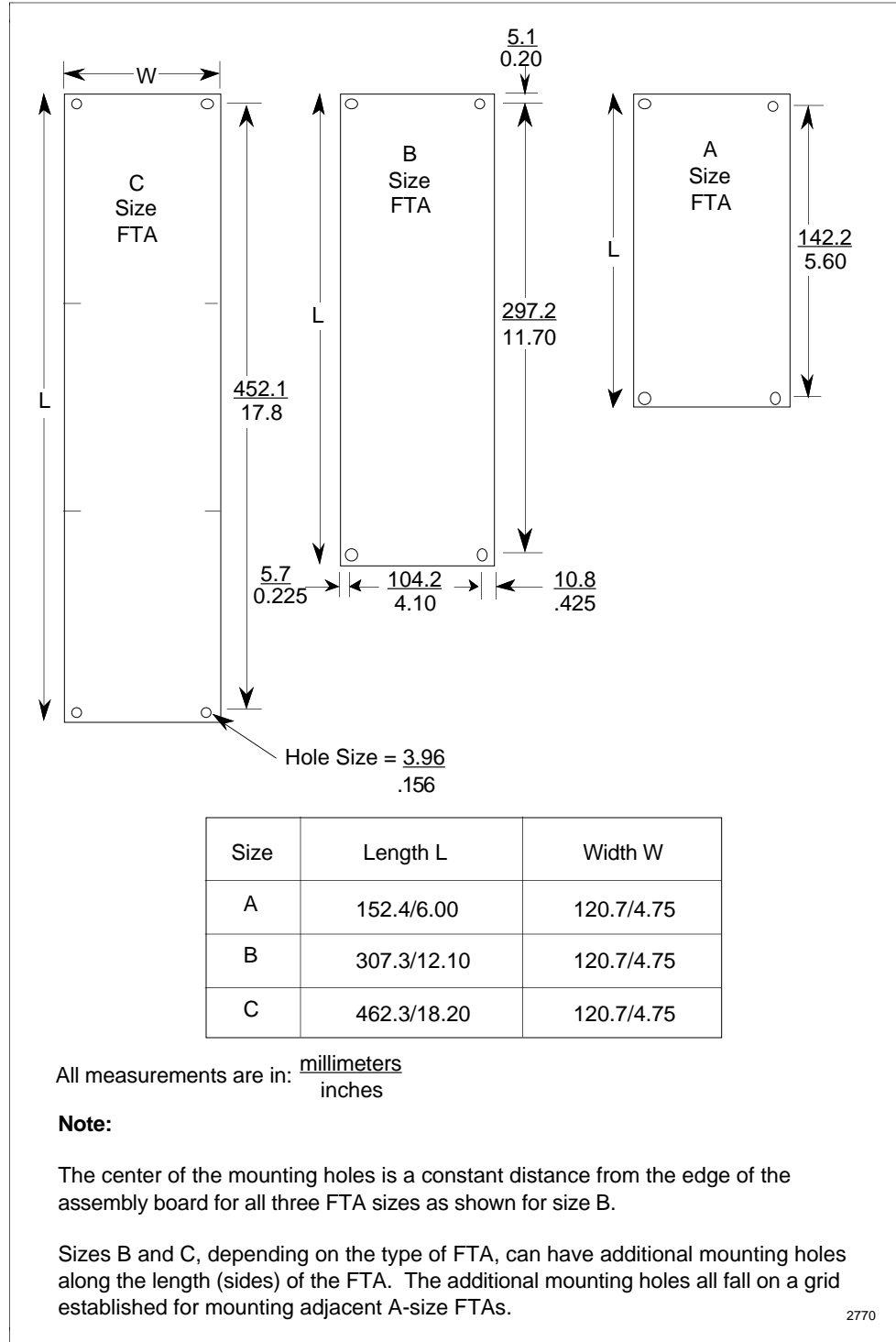
Figure 9-2 illustrates the mounting dimensions of the three FTA sizes.

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9.3 FTA Mounting Channel Requirements, Continued

FTA mounting dimensions

Figure 9-2 FTA Mounting Dimensions



9.4 Vertical FTA Mounting Channels

Two channel widths	Vertical FTA Mounting Channels are available in two widths, standard and wide, both of which are 92.9 centimeters (36.6 inches) in length. They differ only in the width of the field wiring trough.
Number of mounting spaces	As shown in Figures 9-3 and 9-4, both widths have six "A" size, three "B" size, or two "C" size FTA mounting spaces. Mixtures of different sizes in any order are permissible.
Placement of the FTA Mounting Channel	A single FTA Mounting Channel will fill the lower half of a single door cabinet that already has a Power System and one card file. At the back of a dual-access cabinet, two FTA Mounting Channels can be placed one above the other to provide placement of FTAs from top to bottom in a cabinet.
Wide FTA Mounting Channel usage	The larger width FTA Mounting Channel provides more space for the installation of field wiring and also accommodates a Vertical Bus Bar for the cable shields/grounds.
Additional installation information	See Figures 9-3 and 9-4 for installation details. Additional details can be found in the <i>Process Manager/Advanced Process Manager Planning</i> or <i>High-Performance Process Manager Planning</i> manual.

9.4.1 Vertical Bus Bar

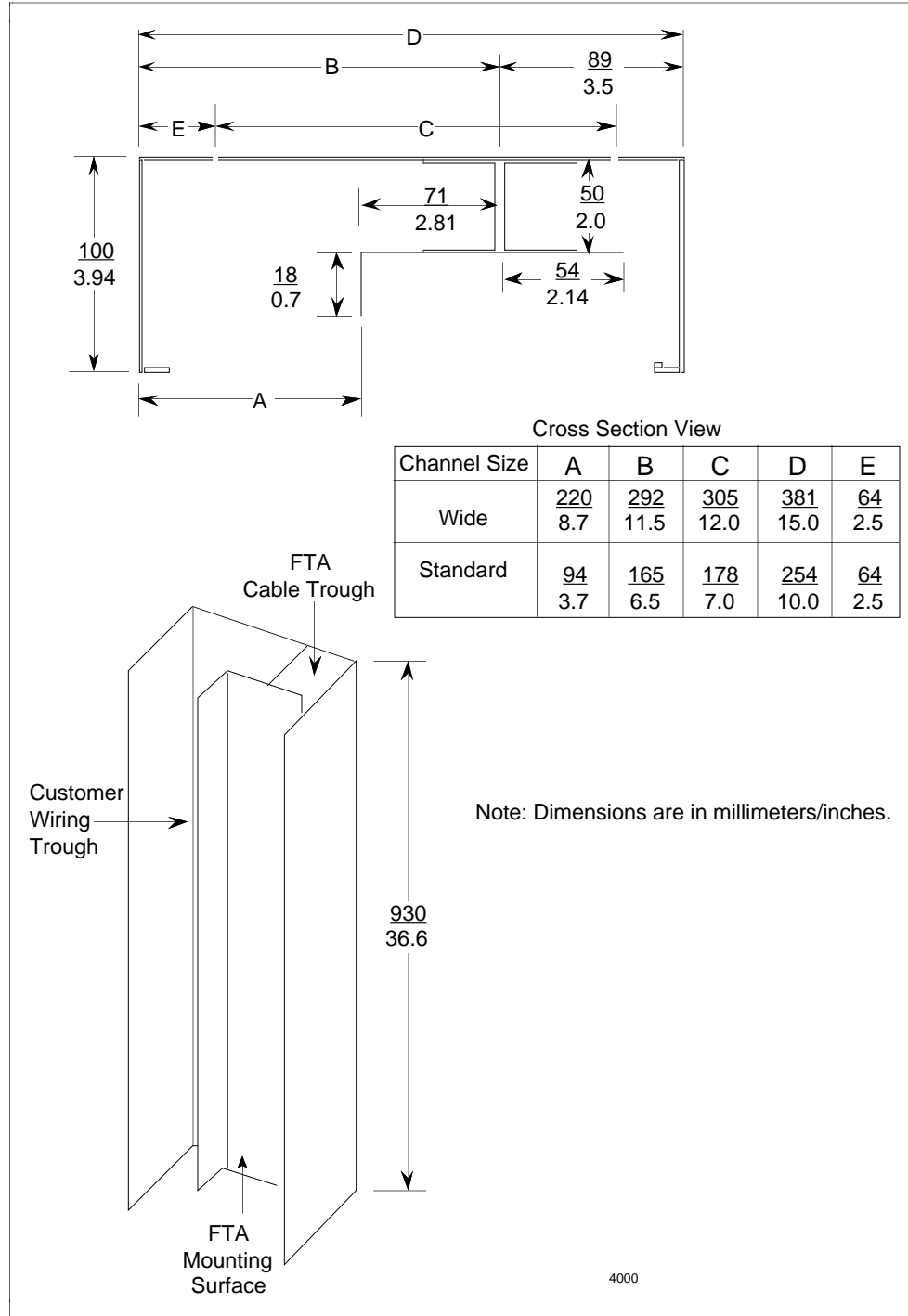
Description	The 27.8-centimeter (10.75-inch) wide FTA Mounting Channel has holes drilled and tapped that provide for mounting a Vertical Bus Bar that terminates cable shields or Safety Ground wires. The FTA Vertical Bus Bar fits the 93 centimeter (36.6 inch) long FTA Mounting Channel.
Wire connectors	See your Honeywell Sales Engineer for information on how to order extra wire connectors that can connect to the bus bars.

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9.4.1 Vertical Bus Bar, Continued

Vertical FTA Mounting Channel dimensions

Figure 9-3 Vertical FTA Mounting Channel Dimensions

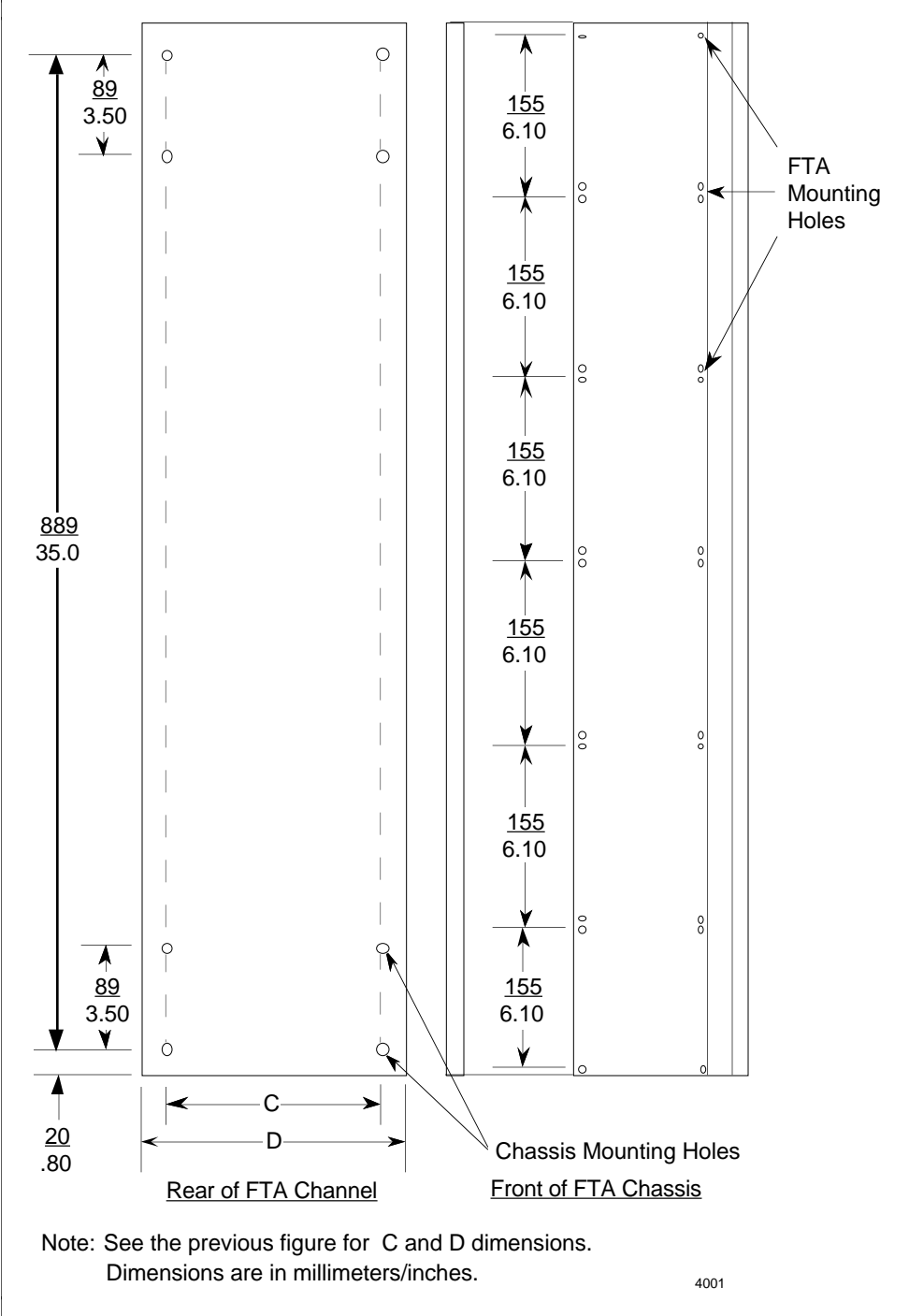


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9.4.1 Vertical Bus Bar, Continued

Mounting and installation holes

Figure 9-4 Vertical FTA Mounting Channel Mounting and Installation Holes



9.5 Horizontal FTA Mounting Channel

Description	Galvanically Isolated FTAs are mounted on horizontal FTA Mounting Channels in the cabinet. The horizontal 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.
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.
Dual access cabinet 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 9-5.
Additional information	See Figures 9-6 and 9-7 for installation details. Additional details can be found in the <i>Process Manager/Advanced Process Manager Planning</i> or <i>High-Performance Process Manager Planning</i> manual.

9.5.1 Horizontal Bus Bar

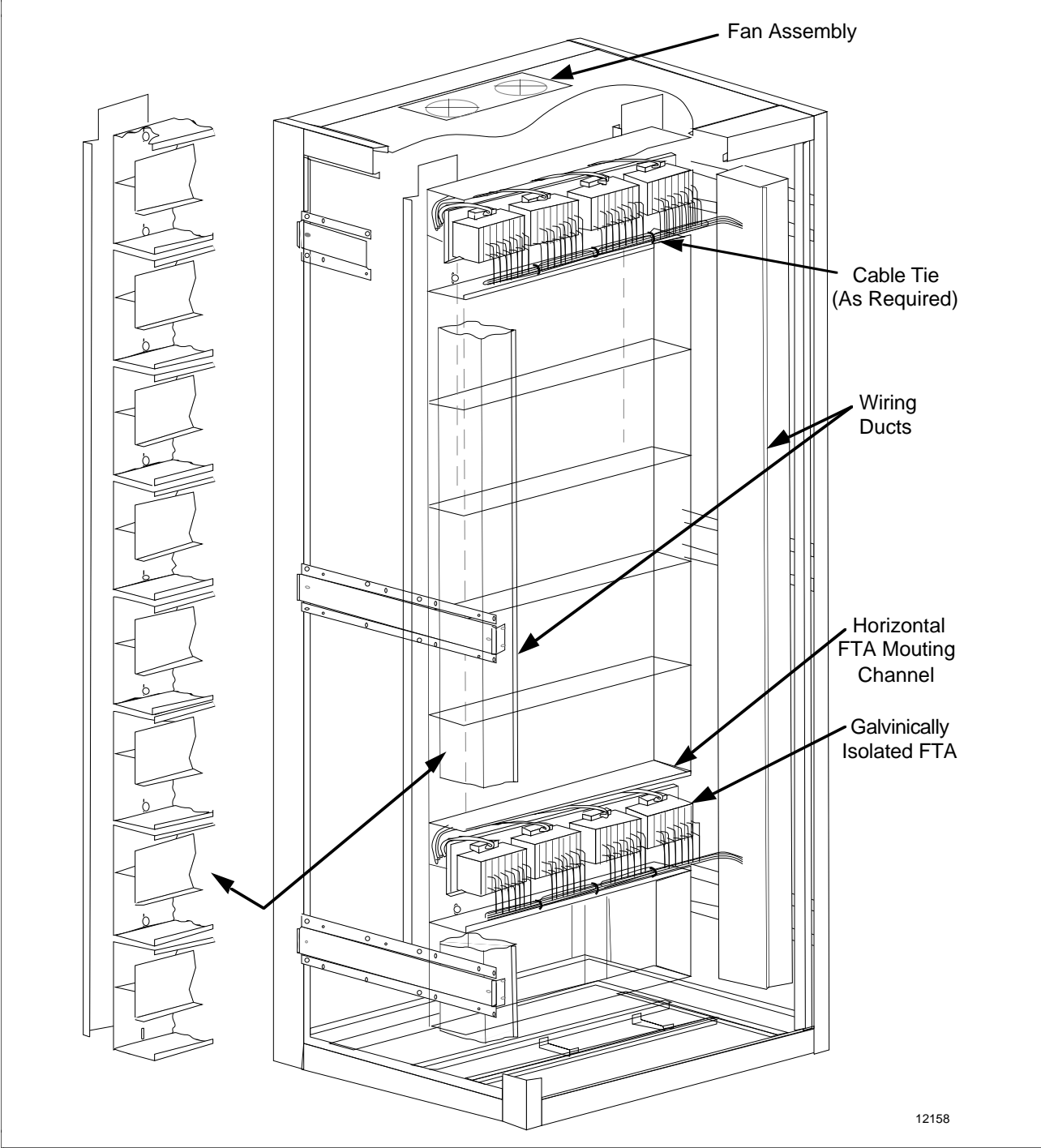
Description	The horizontal FTA Mounting Channel has holes drilled and tapped that provide for mounting a Horizontal Bus Bar that terminates cable shields or Safety Ground wires.
Wire connectors	See your Honeywell Sales Engineer for information on how to order extra wire connectors that connect to the bus bars.

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9.5.1 Horizontal Bus Bar, Continued

FTA Mounting Channel cabinet installation

Figure 9-5 Horizontal FTA Mounting Channel Cabinet Installation

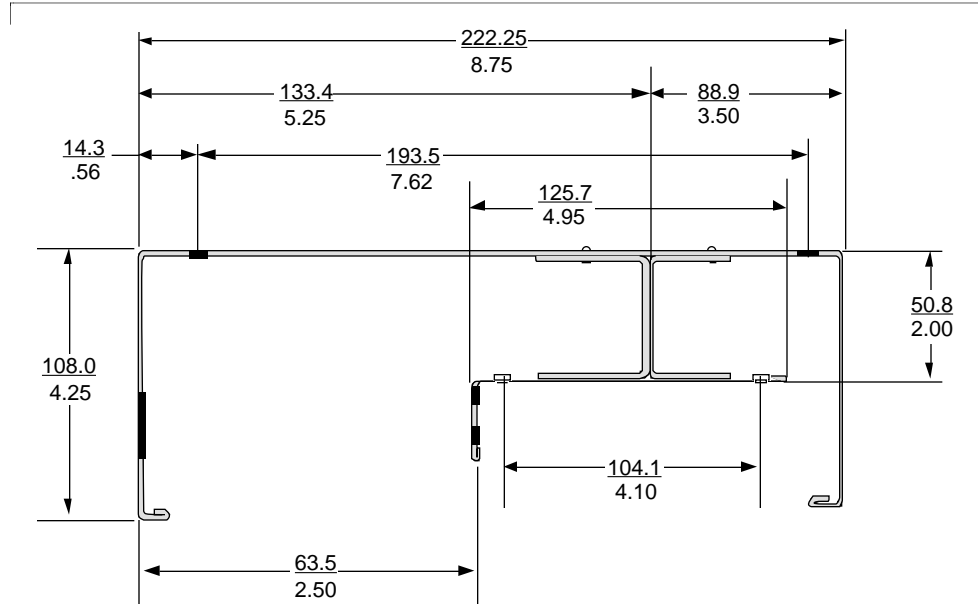


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9.5.1 Horizontal Bus Bar, Continued

FTA Mounting Channel dimensions

Figure 9-6 Horizontal FTA Mounting Channel Dimensions

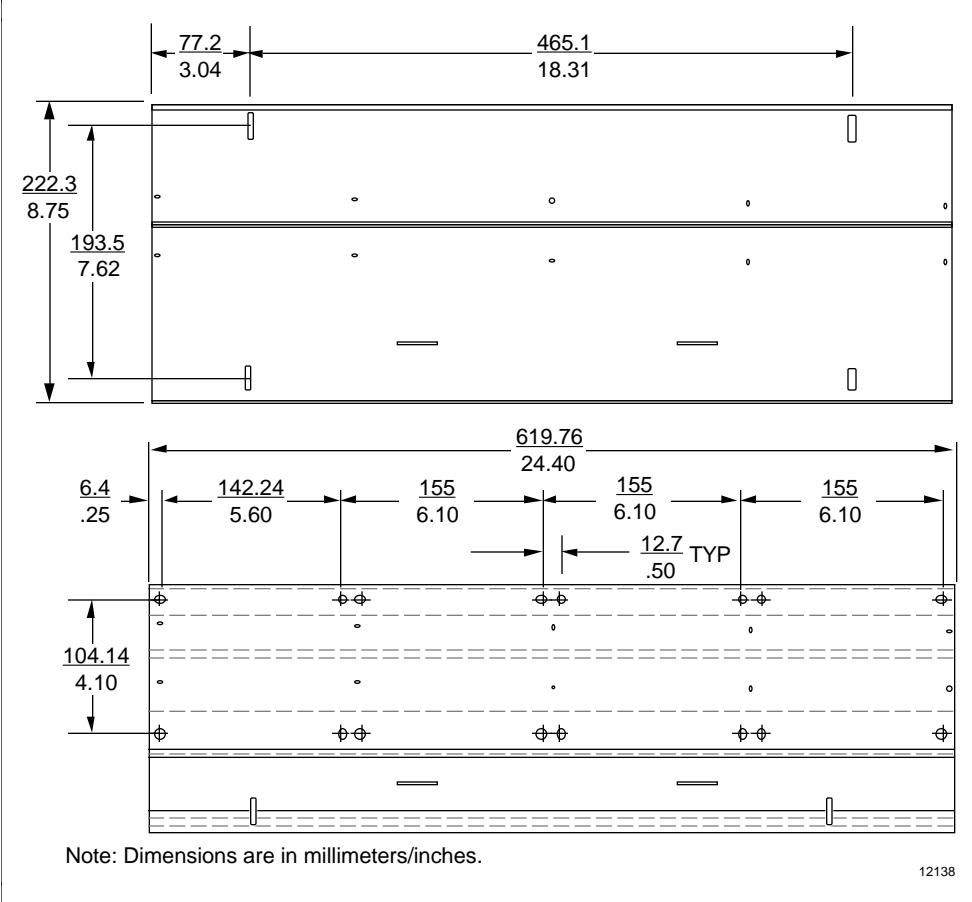


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9.5.1 Horizontal Bus Bar, Continued

FTA Mounting Channel installation holes

Figure 9-7 Horizontal FTA Mounting Channel Mounting Holes for Installation



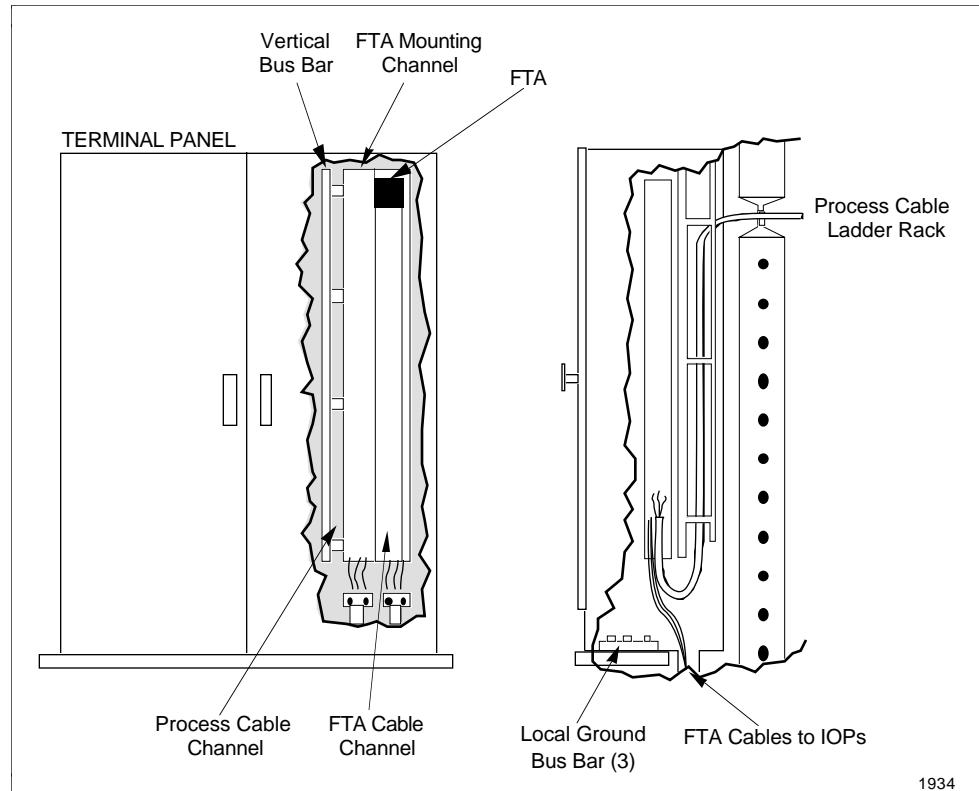
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9.6 FTA Mounting Channel Terminal Panel Installation

Introduction

The vertical FTA Mounting Channels can be installed in Process Manager, Advanced Process Manager, or High-Performance Process Manager cabinet, or in facility terminal panels. Figure 9-8 shows the FTA Mounting Channel in a facility terminal panel.

Figure 9-8 FTA Mounting Channel Terminal Panel Installation



Installation method

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

Installing Galvanically Isolated FTAs

See Section 7 in this manual and the *Process Manager/Advanced Process Manager Planning* or *High-Performance Process Manager Planning* manual for a discussion about the use of the FTA Mounting Channels when installing Galvanically Isolated FTAs.

9.7 FTA Configurations

Wiring category assignment

By assigning FTAs to the proper category, 1 or 2, as listed in Table 9-3 when installing standard FTAs and routing the process wiring, problems with wiring crosstalk can be minimized. The installation configuration of the FTAs must be compatible with the wire routing.

Table 9-3 Process Control Signal Wiring Categories

Category	Description
1	Low level analog input High level analog input and output Smart Transmitter Interface 0-30 Vdc/ac RMS working digital input and output
2	31-130 Vdc/ac rms working digital input and output 131-250 Vdc/ac rms working digital input and output

FTA installation hierarchy

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

Mixing category signal types

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

Facility terminal panels usage

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

Separate wiring to standard and Galvanically Isolated FTAs

The routing of wiring that is connected to Galvanically Isolated FTAs and supporting components is governed by specific requirements discussed in this manual and in the *Process Manager/Advanced Process Manager Planning* and *High-Performance Process Manager Planning* manuals. The wiring to Galvanically Isolated FTAs and standard FTAs must be separated. The two types of FTAs are restricted to installation on FTA Mounting Channels that are dedicated to the type of FTAs, the probability of the wiring mixing in the cabinet is not likely. If the wiring for the two types of FTAs is routed in opposite directions, one type upward and the other type downward, separation is guaranteed in the cabinet.

9.8 Special Configurations

Introduction

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

Wiring rules

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

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

9.9 FTA Mounting

FTA mounting method The FTAs mount using threaded holes in the FTA Mounting Channel. When installing an FTA, care should be taken to avoid cross-threading the hole.

9.9.1 Remote FTA Installation

Introduction For best system performance and reliability, it is recommended that FTAs be installed in a metal enclosure. Most FTAs are more than cable termination assemblies. In many cases, they are also composed of electrical circuits or modules. These circuits benefit from the protection of an enclosure similar to a Process Manager, Advanced Process Manager, or High-Performance Process Manager cabinet.

Cabinet protection A cabinet provides significant protection against dirt, sudden temperature changes, electrical interference, and incidental contact with the electrical circuits or the connecting terminals. The cabinet may be single sided floor access structure, or a metal box. A metal enclosure is recommended for maximum protection against radiated electrical and magnetic disturbances. The enclosure also provides buffering against sudden temperature changes, which would influence the accuracy of low level analog inputs. In addition, protection from induced electrical surges and disturbances, which could be coupled into field cable conductors, relies on well grounded FTA mounting facilities to protect the system from these transients.

Signal degradation outside a cabinet FTAs installed outside a cabinet may exhibit some degradation in performance or reliability because of the absence of the protective cabinet.

Installation practices outside a cabinet When FTAs are not mounted in a Process Manager, Advanced Process Manager, or High-Performance Process Manager cabinet, certain practices should be adhered to for maximum system performance and reliability. The recommended practices are discussed below.

Install FTAs in a metal enclosure FTAs must be installed in a metal enclosure for best performance.

Install FTAs on an FTA Mounting Channel The FTAs must be installed on FTA Mounting Channels, which have been previously described, and the FTAs must be mounted vertically. Installing FTAs in any other position, or without the use of an FTA Mounting Channel, can alter the anticipated design air flow, causing undesirable hot spots.

Continued on next page

9.9.1 Remote FTA Installation, Continued

Mount the FTA upright The FTAs must also be mounted in their upright position, as opposed to their upside-down position. The orientation of the FTA can usually be determined by the silkscreen lettering on the assembly. Also, the FTA to IOP cable connectors are generally located at the top of the assembly.

FTA mounting hierarchy Table 9-4 lists the recommended order in which the FTAs should be installed in the mounting area is defined below. Mounting areas should be separated into classes, one class accommodating signals of 30 volts or less, and a second that accommodates signals greater than 30 volts. Low level analog signals are included in the first class. Field and IOP to FTA cables should be secured with cable tie-downs.

Table 9-4 FTA Mounting Hierarchy

Area	Order	Function
1	1	High Level Analog Input
1	2	Smart Transmitter Interface
1	3	Pulse Input
1	4	Analog Output
1	5	Low Level Analog Input
1	6	Power Adapter (LLMux)
1	7	Low Level Analog Input Multiplexer
1	8	Power Adapter (SDI)
1	9	Serial Device Interface
1	10	24 Vdc Digital Input
1	11	24 Vdc Nonisolated Digital Output
1	12	3-30 Vdc Solid-State Digital Output
2	1	120 Vac Digital Input
2	2	240 Vac Digital Input
2	3	31-200 Vdc Solid-State Digital Output
2	4	24-240 Vac Solid-State Digital Output
2	5	120 Vac/125 Vdc Relay Digital Output
2	6	240 Vac/125 Vdc Relay Digital Output

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9.9.1 Remote FTA Installation, Continued

All metallic members must be grounded

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

Bond cabinet to Safety Ground

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

Structural members must be grounded

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

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