10 6-Channel F Analog Input HART MTA

Part No. 6ES7650-1AH61-5XX0

10.1 Description

This section contains installation information and requirements for the Siemens Marshalled Termination Assembly (MTA) (6ES7650-1AH61-5XX0) designed to interface with the Siemens ET 200M 6-Channel F Analog Input HART Module (6ES7 336-4GE00-0AB0).

10.2 Features

The following features have been incorporated into this MTA:

- Redundant power connections
- LED indication of redundant power supply condition
- Power monitor plug-in available (optional)
- LED indication of power supply to the field device on an individual channel basis
- Per channel fusing of field power
- Dual connectors for redundant I/O Module operation
- Diode boards are pluggable for maintenance
- Per module power fusing
- Shield connections available for channel cabling
- Ground stud for connecting shield to earth ground
- Power input and field terminations are pluggable for easy maintenance
- Connectivity for HART Handheld Terminal (HHT) per channel

10.3 Operation

The Fail-Safe Analog Input HART (FAIH) MTA consists of the

- Main board
- Two diode boards

The diode board marked **1** (MLFB 6ES7650-1BC51-0XX0 or 6ES7650-1BC50-0XX0) uses 6.2 VDC zener diodes. The diode board marked **2** (MLFB 6ES7650-1BB51-0XX0 or 6ES7650-1BB50-0XX0) uses 5.6 VDC zener diodes. The two diode boards make maintenance of redundant modules possible. The diode boards plug in to the main board and can be removed for testing and maintenance without affecting operation of the input module.

Power is supplied via the two removable power connectors which are retained by screws and marked **L+A**, **MA**, and **L+B**, **MB**. Each has a LED to indicate the presence of voltage over 15 VDC. The LEDs are marked **A POWER** and **B POWER**. There is also a connector (**J3**) for a Power Monitor board used to indicate the presence of both A and B power. See Section 19, *Power Monitor Board* (6ES7650-1BA02-0XX0).

Incoming power from **A** and **B** is diode OR'd, in **CR106**, to provide the MTA and the module power from either input source. The output from **CR106** is sent to the I/O modules via the module fuses and to the channels via the channel fuses. Module Fuse 1 (**F100**) supplies the I/O Module plugged into **J1** and Module Fuse 2 (**F101**) supplies power to the I/O Module plugged into **J2**.

Each channel has an LED to indicate the presence of power and the fuse status. If there is no power or the fuse is open, then the LED remains off. If there is power and the fuse is good, then the LED is illuminated.

Field Terminals, Channel + (**Ix+)**, Channel – (**Ix-***)*, Sensor power (**PWRx**) and Shield (**SHx**), connect to the field devices. **PWRx** is the +24 VDC power feed and is fused on a channel-by-channel basis. The field termination connector is removable for ease of wiring maintenance and is retained by friction.

For redundant I/O Modules, the **Ix-** connects to the I/O modules input via **J1** and **J2**. If both modules are present, then the diodes on boards **1** and **2** are passive, but ensure that if either module is removed for maintenance, the input signals to the remaining module are not interrupted. Redundant operation uses the MTA, two zener diode boards, and two FAI modules. A simplified diagram of redundant use of the FAI module and MTA is shown in Figure 10–1

For a non-redundant I/O module, the **Ix-** connects to the I/O module input via the diodes on Diode Board **1**. The diodes on Diode Board **1** conduct the signal to the non-redundant module plugged into **J2**. In this case the diodes on board **2** are passive. Non-redundant modules could be plugged into **J1** or **J2**. Non-redundant operation uses the MTA, two Zener Diode Boards, and the FAI module. A simplified diagram of Non-redundant use of the FAI module and MTA is shown in Figure 10–2.

Note

Use of the FAIH MTA for non-redundant operation requires that the FAI I/O to MTA cable be installed into **J2** on the MTA.

Figure 10–1 Redundant FAIH Interface

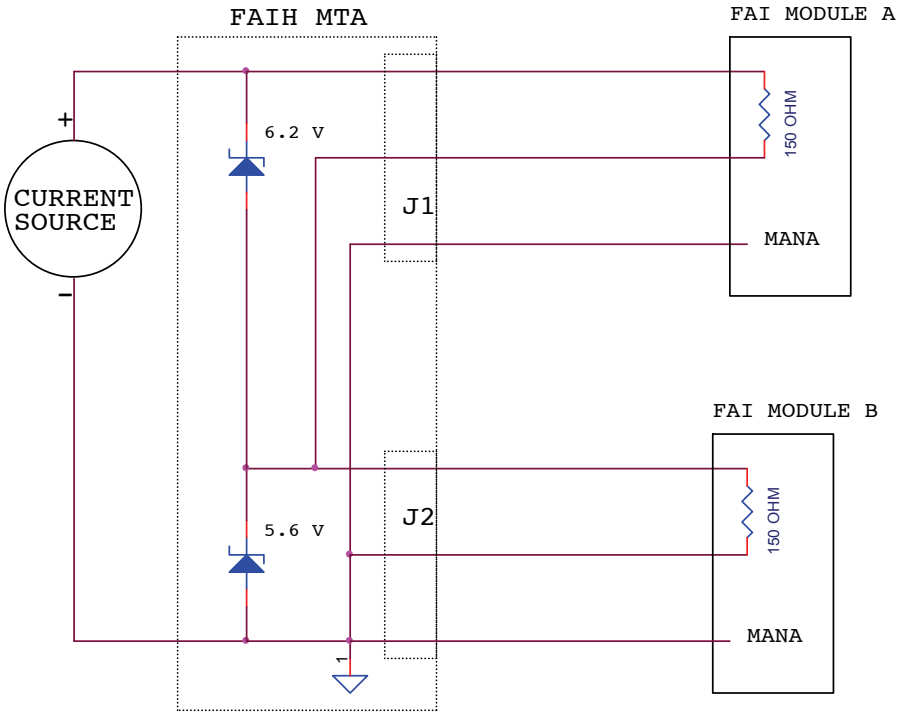
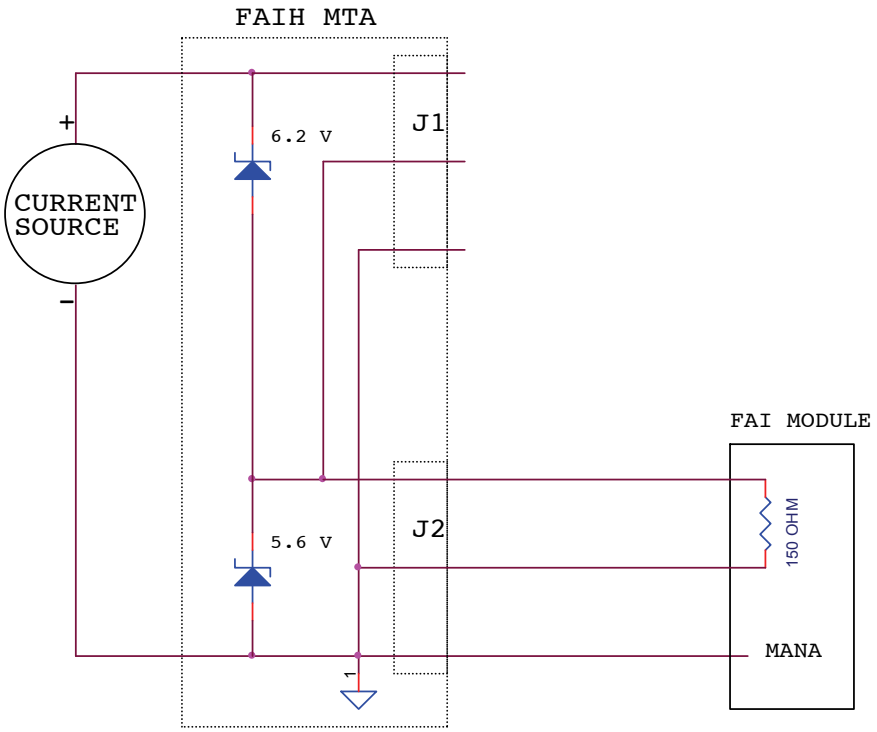


Figure 10–2 Non-Redundant FAI Interface



10.4 Installation Requirements

See Section 2, *Installation*, before performing any installation and observe all warnings

A common interconnecting cable (6ES7922-3BD00-0AU0 or 6ES7922-3BJ00-0AU0), supporting six analog input channels, interconnects the analog input termination assembly to the 6-channel analog input module (6ES7 336-4GE00-0AB0).

It may be necessary to modify the printed circuit board as follows:

To disconnect the interconnecting cable shield from ground at the MTA only, cut and remove the shield disconnect jumper, **W100** and **W101**, for the associated cable.

Note

To separate channel input low from power supply common, cut and remove the jumper **W200**. This will provide isolation between the all the inputs and power return.

10.5 Maintenance

See Section 3, *Maintenance*, before performing any maintenance and observe all warnings.

Under normal operation, the **A/B Power LED,** the **Module 1/2 Fuse LED,** and all the **Channel Fuse LEDs** are on. If all are off, check the power supply to MTA. If the **A/B Power LED** is off, check the power supply to the MTA. If the **Module 1/2 Fuse LED** is off, check and replace the module fuse. If the **Channel Fuse LED** is off, check the channel fuse and replace as necessary.

Periodically the diode boards should be tested to verify that the zener diodes will operate correctly. Testing consists of connecting a DC power supply with a current-limiting series resistor across each diode. The power supply should provide <=20 mA at 15 to 24 VDC. The voltage measured across the zener diodes on the #1 board should be the device's nominal specification of 6.2 VDC and on the #2 board should be the device's nominal specification of 5.6 VDC.

Note

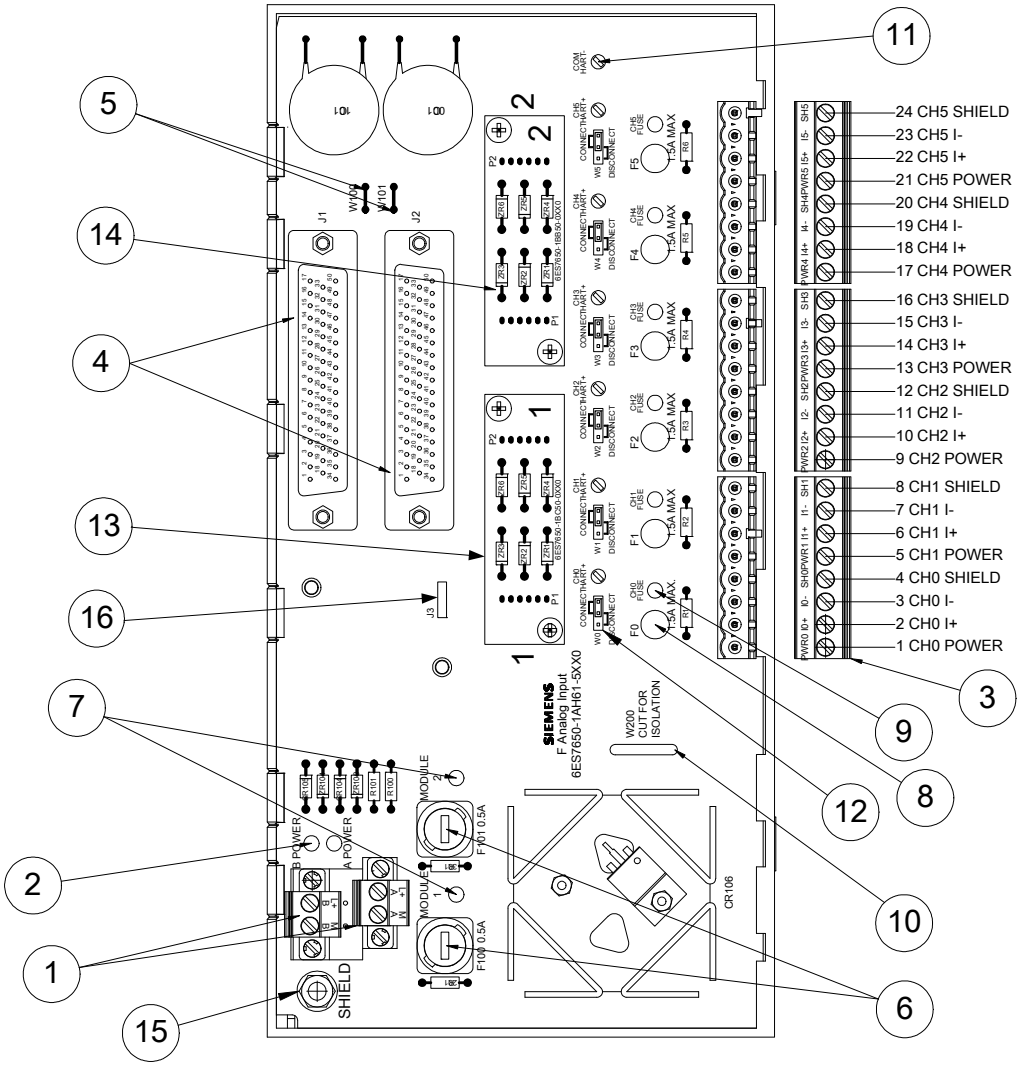
Correct power down and power up of the FAI module is crucial to the proper operation of the system. The proven procedure for removal and re-installation of the FAI module is as follows:

1. Remove the MTA-I/O cable connector from the FAI module.
2. Remove the FAI module from the backplane.
3. Perform FAI module maintenance as required.
4. Reinstall the FAI module into the backplane.
5. Reinstall the MTA-I/O cable connector onto the FAI module.

10.6 6-Channel F Analog Input HART Marshalled Termination Assembly

Figure 10–3 shows the basic parts of the 6-Channel F Analog Input HART MTA.

Figure 10–3 6-Channel F Analog Input HART Marshalled Termination Assembly (6ES7650-1AH61-5XX0)



Key to numbered items in Figure 10–3:	
Item	**Description**
1	Input power connections
2	Input power indicators
3	Field wiring connections
4	I/O module connections
5	Shield disconnect jumper (W100 & W101)
6	Module power fuses
7	Module power fuse indicators
8	Channel power fuse (1 of 6)
9	Channel power fuse indicator (1 of 6)
10	Input isolation Jumper (W200)
11	HART connectivity terminals (1 of 7)
12	Channel Input Disconnect Jumper (W0 – W5)
13	6.2V Zener Diode Boards (1)
14	5.6V Zener Diode Boards (2)
15	Shield Ground Stud for connecting to earth ground
16	Connector for Power Monitor Board

10.7 Technical Specifications

Technical Specifications for 6-Channel F Analog Input HART MTA (6ES7650-1AH61-5XX0)	
Dimensions - See Section 1, Figure 1.3, Long Version	
Mounting	
DIN Rail	35mm (deep top hat style)
Power Input	
Voltage Input for Single or Redundant Feed	21.6 to 28.8 VDC
Current Consumption (nominal ratings; all channels connected)	
Inrush	9.368 A maximum (Includes 9.000 A for transmitter inrush)
Normal	0.5 A maximum
Terminal Block Wire Sizes	TB100 & TB101
Wire Size – US	24 – 14 gauge AWG
Wire Size – Metric	0,205 – 2,08 mm sq.
Power Supply Specifications	See Module Specs
Fuse Ratings	
Individual channel - Normal	0.1 A Fast blow (Littelfuse P/N: 273.100) (Siemens Spare P/N: A5E01568889)
Individual channel – Optional - Recommended for 4 wire transmitters	1.5 A Fast blow (Littelfuse P/N: 273 01.5) (Siemens Spare P/N: A5E01568886)
Module Power	0.5 A (Bussmann P/N: GMA-0.5A) (Siemens Spare P/N: A5E01568885)
Indicators	
Input Power	Green LED on when input power available
Module Power	Green LED on when module power available
Channel Power	Green LED on when sensor power available
Field Terminal Block Wire Sizes TB1 – TB3	
Wire Size – US	24 – 14 gauge AWG
Wire Size – Metric	0,205 – 2,08 mm sq.
Environmental	
Ambient Temperature	-25C to +60C
Humidity	5% to 95% Non-condensing
Approvals	
MTA Agency Approvals	See Preface section, Approvals Table
Max achievable Safety Integrity Level in safety mode	
In Accordance with IEC 61508	SIL 3
Fail-safe performance characteristics	
Low demand mode (average probability of failure on demand) per channel	PFDavg <1E-4 @ 60C
High Demand continuous mode (probability of dangerous failure per hour per channel)	PFH < 1E-9
Proof-test interval	20 years

Note

When using a 1.5A channel fuse it is possible that one or more of the zener diodes on the two Zener Diode Boards may be damaged in the event of a short circuit in the field. It is recommended that the diode boards be tested or replaced in the event a 1.5A channel fuse opens.

Note

Fuses are available as spare parts from Siemens.

Fuse information can be found at:

http://www.littelfuse.com

http://www.bussmann.com

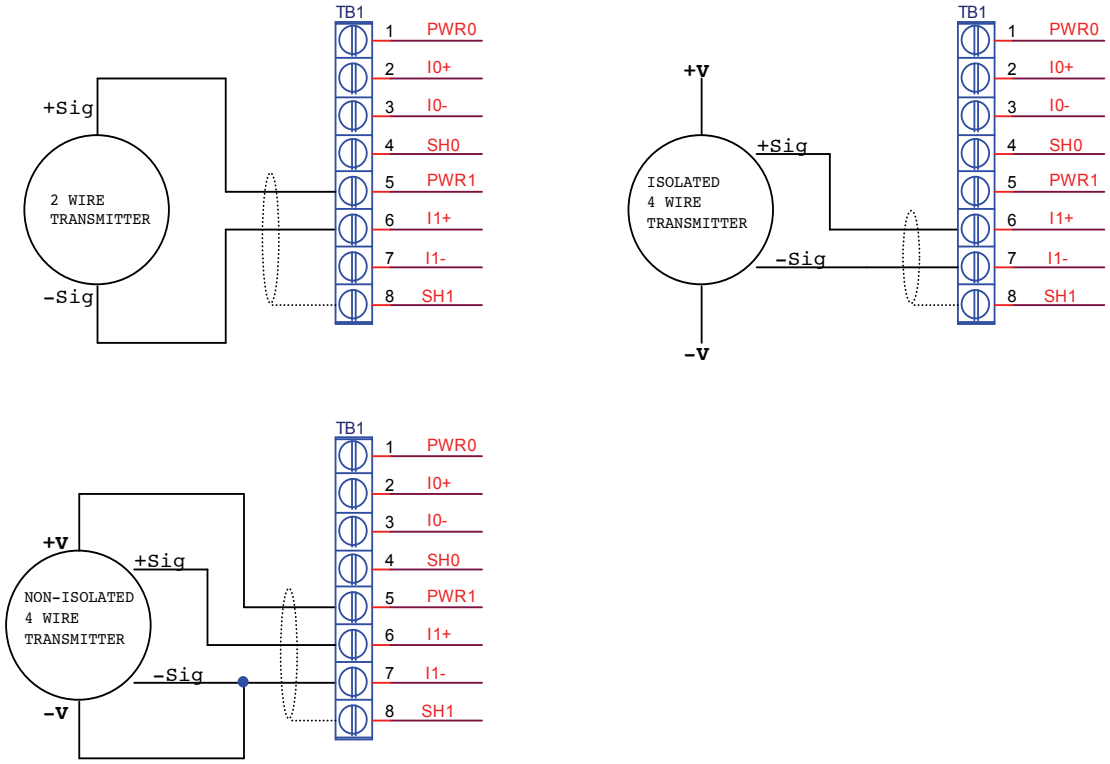
10.8 Changes to the Technical Specifications for 6-Channel F ANALOG INPUT HART Module (6ES7 336-4GE00-0AB0)

This section contains changes to the I/O module specifications when it is used with the MTA.

Changes for 6-Channel F Analog Input HART MTA (6ES7650-1AH61-5XX0)	
Transmitter Connections	Only 1 transmitter can be connected to a channel.
Output voltage for 2 wire transducer and cable with 22 mA transducer current	14 V @ 24 V Supply*
Fail-safe Performance Characteristics	Adds a dangerous undetected failure rate (2.4 FIT for 6 channels) to the FAI module in any configuration.
Sensor Supply	The FAI module internal sensor supply outputs are not used when using the FAIH MTA.
Protection against short circuit with external sensor supply	No external fuse required. The FAIH MTA limits current.
* If the output voltage is not sufficient for a 2 wire transmitter, safety barrier and field wiring, it is recommended that a 4 wire transmitter be used.	

10.9 Typical Transmitter Connection to Field Terminals

Figure 10–4 Transmitter Connection to Field Terminals



10.10 Hardware Configuration

For hardware configuration refer to the manual *S7-300 Automation System Fail-Safe Signal Modules* (document number A5E00085586).

10.11 Technical Specifications for 6-Channel F ANALOG INPUT HART Module (6ES7 336-4GE00-0AB0)

Note

For a complete functional description and the most current technical specifications for this module, refer to the manual *S7-300 Automation System Fail-Safe Signal Modules* (document number A5E00085586).

10.12 Zener Diode Boards

Part No. 6ES7650-1BB51-0XX0 or 6ES7650-1BB50-0XX0 and 6ES7650-1BC51-0XX0 or 6ES7650-1BC50-0XX0

10.12.1 Description

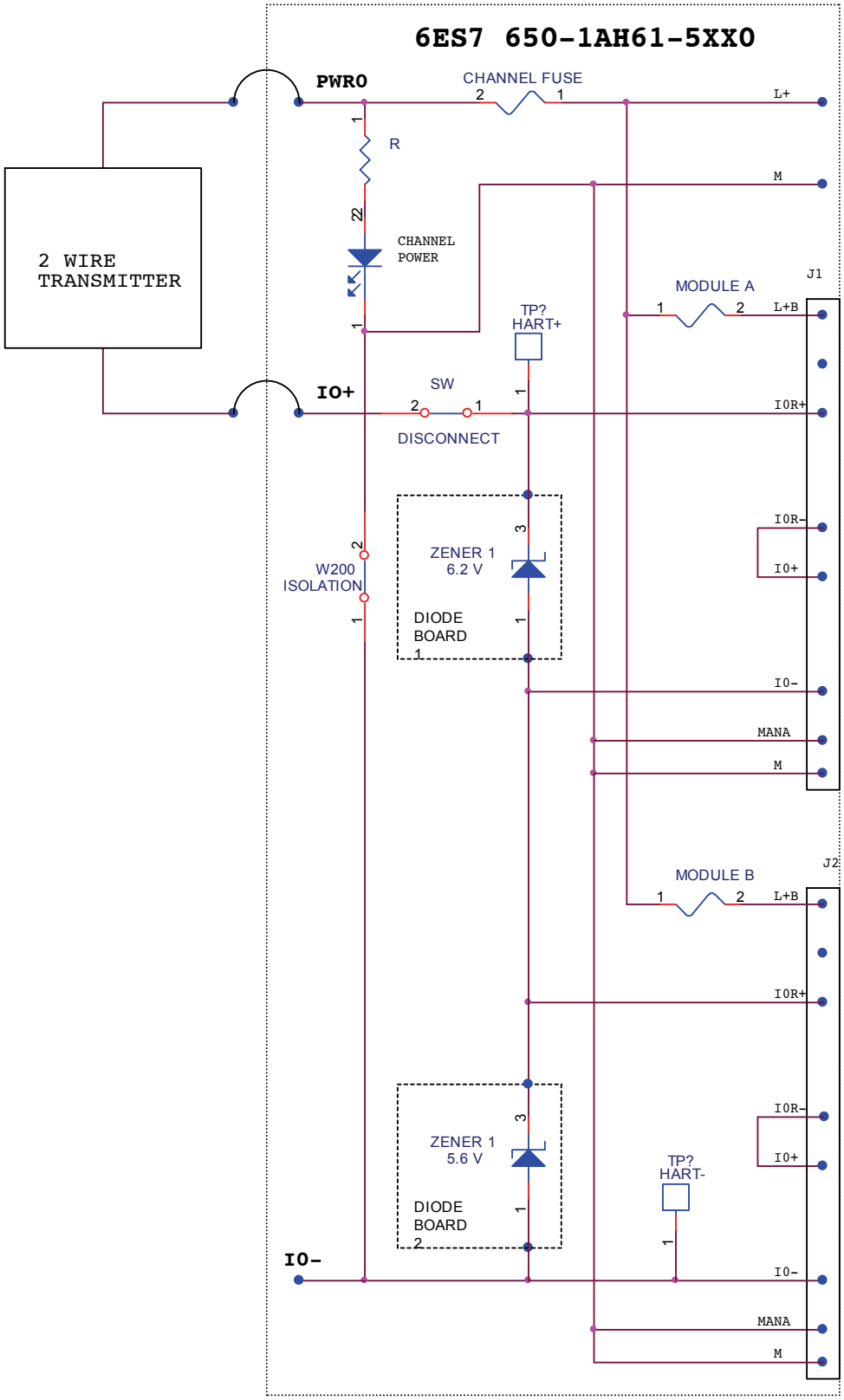
This section contains installation information and requirements for the two Siemens Zener Diode Boards. The 6.2 VDC (6ES7650-1BC51-0XX0 or 6ES7650-1BC50-0XX0) and the 5.6 VDC (6ES7650-1BB51-0XX0 or 6ES7650-1BB50-0XX0) are used on the ET200M Marshalled Termination Assembly (MTA) (6ES7650-1AH51-5XX0 or 6ES7650-1AH50-5XX0) designed to interface with the Siemens ET 200M 6-Channel F Analog Input HART Module (6ES7 336-4GE00-0AB0).

Note: The two part numbers for the 5.6 V Diode Board are interchangeable. The two part numbers for the 6.2 V Diode Board are also interchangeable. Do not interchange 5.6 V Diode Boards with 6.2 V Diode Boards.

10.12.2 Operation

The 6.2 VDC and the 5.6 VDC Zener Diode Board allows proper operation of the 6 Channel Failsafe Analog Input Module with the MTA. Diodes are placed in parallel with the module inputs. One diode spans one channel on one module; therefore, one diode board handles one module. The diodes are normally not conducting but when a module or the interconnecting cable is removed; the diodes conduct and keep the current constant for the other module. In a redundant system none of the diodes normally conducts, but in a non-redundant system one set is always conducting. Figure 10–5 shows a simplified schematic.

Figure 10–5 Diode Board Interfaces



10.12.3 Installation Requirements

See Section 2, *Installation*, before performing any installation and observe all warnings

The 6.2 VDC Zener Diode Board, marked **1** is plugged into **J100** and **J101** on the FAI MTA. It is mechanically held down by two captive screws and standoffs. See Figure 10–7.

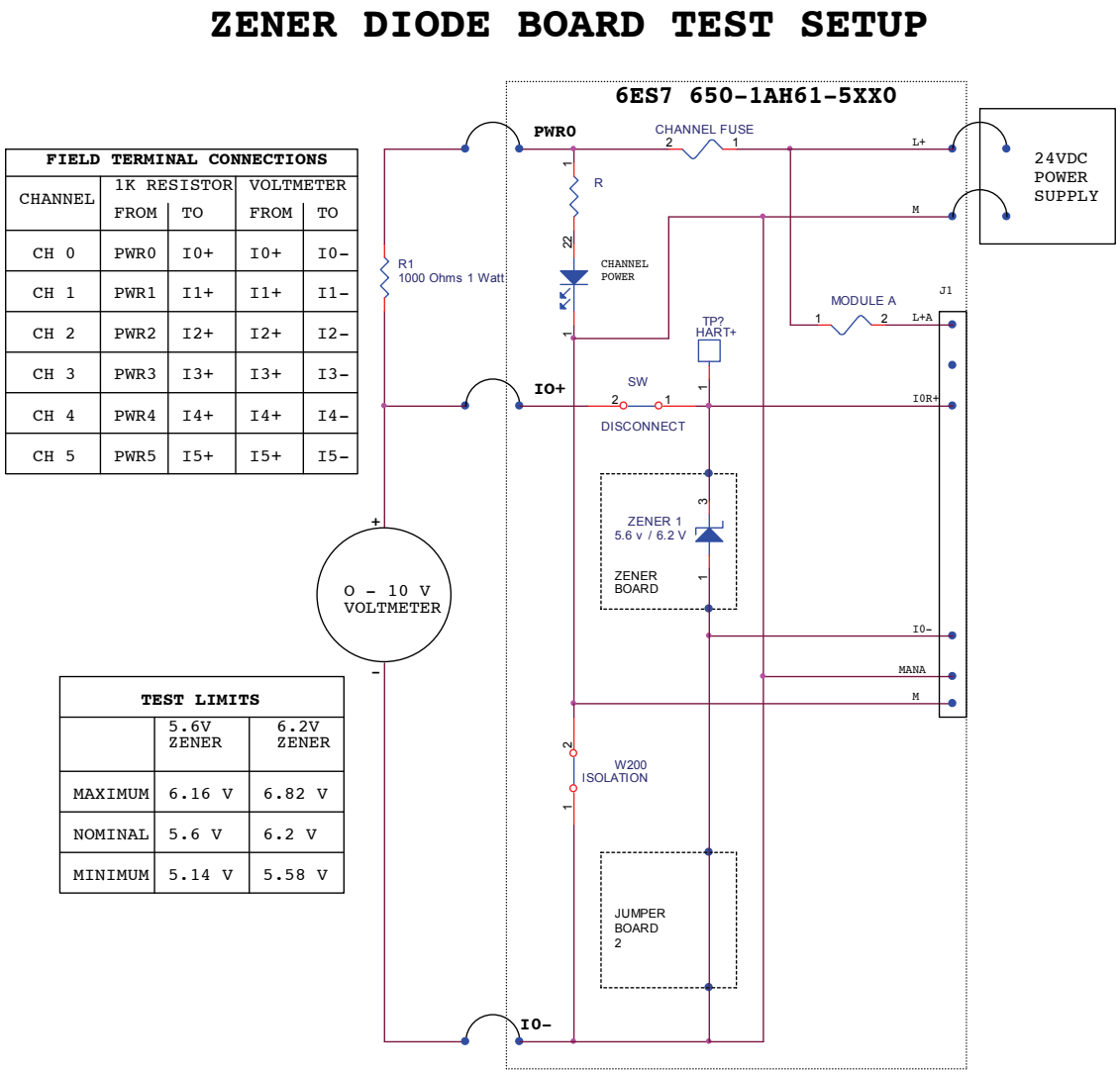
The 5.6 VDC Zener Diode Board, marked **2** is plugged into **J200** and **J201** on the FAI MTA. It is mechanically held down by two captive screws and standoffs. See Figure 10–8.

10.12.4 Maintenance

See Section 3, *Maintenance*, before performing any maintenance and observe all warnings

Under normal operation, the diodes on the diode board do not conduct. Periodic maintenance of the FAI modules requires that the diode boards operate correctly, so the diode boards should be tested before one of the redundant modules is removed from service.

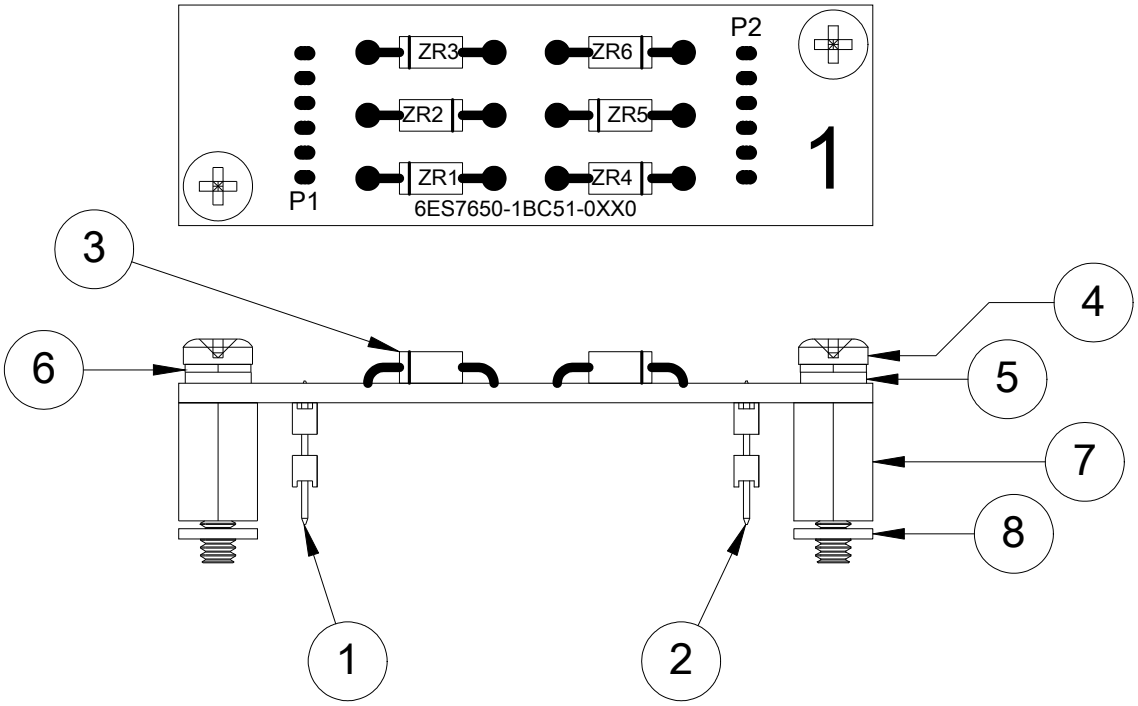
Figure 10–6 5.6V Diode Board Test Setup



10.13 Diode Board Assembly

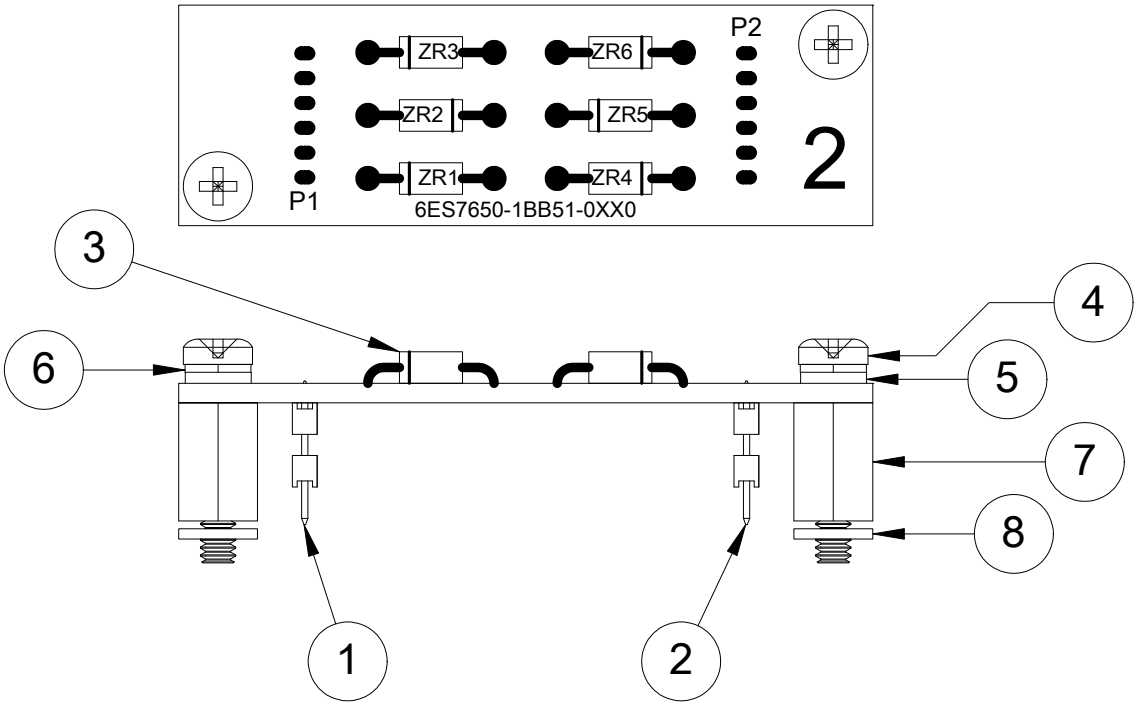
The two figures below show the basic parts of the diode boards.

Figure 10–7 6.2V Diode Board Assembly



Key to numbered items in Figure 10–7:	
Item	**Description**
1	P1
2	P2
3	6.2V Zener Diode (1 of 6)
4	Screw
5	Flat washer
6	Lock Washer
7	Standoff
8	Retaining Washer

Figure 10–8 5.6V Diode Board Assembly



Key to numbered items in Figure 10–8:	
Item	**Description**
1	P1
2	P2
3	5.6V Zener Diode (1 of 6)
4	Screw
5	Flat washer
6	Lock Washer
7	Standoff
8	Retaining Washer

10.14 Input Sharing

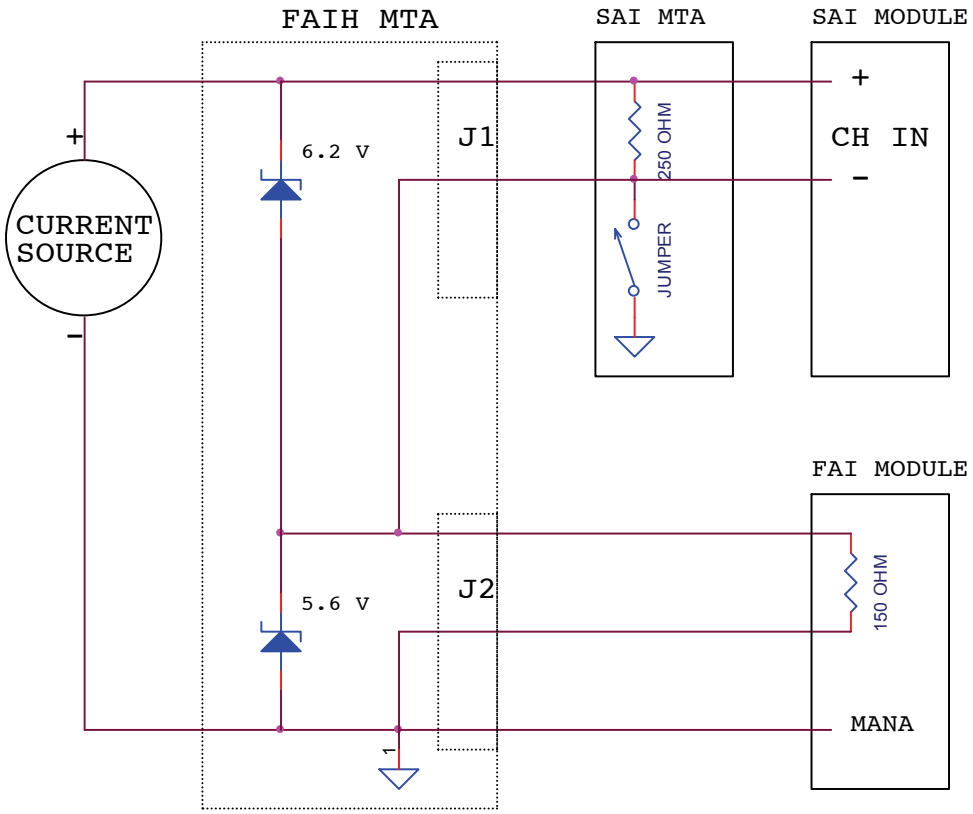
10.14.1 Description

This section contains information and requirements for input sharing between a Failsafe Analog Input module (6ES7 336-4GE00-0AB0) and a Standard Analog Input Module (6ES7 331-7NF00-0AB0, E-Stand 5 or higher), using the Siemens FAIH Marshalled Termination Assembly (MTA) (6ES7650-1AH61-5XX0 and the Siemens AI Marshalled Termination Assembly (MTA) (6ES7650-1AA51-2XX0 or 6ES7650-1AA50-2XX0).

10.14.2 Purpose

Input sharing allows the transmitter signal to be distributed to both the Fail-Safe Analog Input Module and the Standard Analog Input Module. Both systems will then receive the same input data.

Figure 10–9 FAIH SAI Input Sharing



10.14.3 Operation

The signal source is connected to the FAIH MTA in the normal manner. The cable plugged into J1 is wired from IxR+ to Ix+ on TBy of the Standard Analog Input (SAI) MTA (6ES7650-1AA51-2XX0 or 6ES7650-1AA50-2XX0) and the Ix- pin to Ix- on TBy of the SAI MTA. The SAI MTA input jumpers (W0 – W7) are set for current mode and the isolation jumpers (W8 – W15) are cut for each channel connected to the FAIH MTA. The SAI Module is connected to the SAI MTA using the standard cable. See Table 1-2.

10.14.4 FAIH MTA to SAI MTA Cable

The FAIH MTA to SAI MTA Input Sharing cable uses only 13 conductors. The FAIH Channel 0 to Channel 5 input signals have been mapped to Channels 0 through 5 on the SAI MTA. Channels 6 & 7 of the SAI can be used for other inputs. The cable connections can be seen in the table below.

The FAIH MTA to SAI MTA Input Sharing cable is custom manufactured on a project basis. See the project manager to for more information.

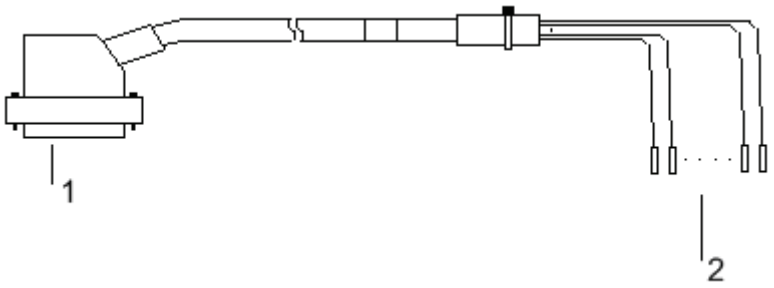
The assembly view of the cable can be seen in Figure 10–10.

Table 10–1 FAIH MTA to SAI MTA Cable

FAIH Channel	FAIH MTA Signal	FAIH MTA D50M Pin	SAI MTA Field Terminal	SAI MTA Signal	SAI Channel
CH 0+	I0R+	19	TB1 PIN 2	I0+	CH 0+
CH 0-	I0-	27	TB1 PIN 3	I0-	CH 0-
CH 1+	I1R+	20	TB1 PIN 6	I1+	CH 1+
CH 1-	I1-	28	TB1 PIN 7	I1-	CH 1-
CH 2+	I2R+	38	TB1 PIN 10	I2+	CH 2+
CH 2-	I2-	46	TB1 PIN 11	I2-	CH 2-
CH 3+	I3R+	23	TB1 PIN 14	I3+	CH 3+
CH 3-	I3-	47	TB1 PIN 15	I3	CH 3-
CH 4+	I4R+	40	TB2 PIN 2	I4+	CH 4+
CH 4-	I4-	15	TB2 PIN 3	I4-	CH 4-
CH 5+	I5R+	8	TB2 PIN 6	I5+	CH 5+
CH 5-	I5-	16,17, 32	TB2 PIN 7	I5-	CH 5-
	Shield	Shield	TB1 PIN 4[6]	SH0	

[6] The shield connection to the SAI MTA is optional and should be investigated for safe operation before use

Figure 10–10 FAIH MTA to SAI MTA Interconnecting Cable



Key to numbered items in Figure 10–10:

Item	Part Name
1	50-PIN FEMALE sub-D connector
2	Wires with crimped pins

10.14.5 Hardware Configuration

FAI: Redundancy not supported. The HW configuration should be setup for Non-redundant operation.

SAI: The SAI MTA supports redundancy for the Standard Modules and redundant modules can be used, as selected by the user. See section 4.10.

Addresses

FAI: Input address and process image should be set to the user preferences.

SAI: Input address and process image should be set to the user preferences. See section 4.10.

Inputs

FAI: Set to user preferences.

SAI: Under the **Inputs** tab the **Measuring Type** should be set to **4DMU** (current) with **Measuring Range** set to **4..20 mA**. All other settings are up to the user. See section 4.10.

Because the FAI has only 6 inputs the SAI will only use 6 inputs for the sharing operation. The other two inputs can be used for other analog signals.

Redundancy

FAI: Redundancy not supported. The HW configuration should be setup for non-redundant operation.

SAI: The SAI MTA supports redundant and non-redundant operation. See section 4.10.