Series 5 Vanguard
Duplex Analog I/O FTA
FTA-544

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Figure 1   FTA-544 Duplex Analog I/O Local FTA

This document specifies the duplex analog Field Termination Assembly (FTA-544). This local FTA provides wiring terminals, signal isolation, and signal conditioning for up to 11 analog input and 3 analog output signals in duplex Vanguard control systems.

See the following user manuals for installation and maintenance details:

- *Vanguard Duplex System Installation* manual [UM5105]
- *Vanguard Duplex System Maintenance* manual [UM5106]

Description

Connector A on the FTA-544 connects to the IOC transition module TIOC-555HD of the Primary IOC using an FTAC cable. Connector B on the FTA-544 connects to the IOC transition module of the Backup IOC using a separate FTAC cable. A second FTA-544 can be connected to the same duplex IOC pair to gain additional I/O:

- FTA 1 connector provides 11 analog inputs and 3 analog outputs using CCC conditioning modules
- FTA 2 connector provides 11 additional analog inputs and 3 additional analog outputs using CCC conditioning modules

Refer to the following data sheet for information on connecting local FTAs to the TIOC transition module:

- *Vanguard Local FTA Cable Assembly* [DS5207]

LED Indicators

The LED indicators on the FTA-544 can be seen in Figure 1 and are described in Table 1 on page 2. There is a red and green Healthy LED indicator for the FTA. Green LED (CR9-CR13) indicates the FTA is healthy and in control of the outputs. Red LED (CR8-CR12) indicates the FTA is not healthy and the output are disconnected. There are green LED indicators for the two power inputs (CR3-CR4).

Table 1   Duplex FTA-544 Indicator States

LED Status Indicator States						
CR3	CR4	CR8	CR9	CR12	CR13	Description
ON	–	–	–	–	–	Green: Power and Fuse Good for 24VA
–	ON	–	–	–	–	Green: Power and Fuse Good for 24VB
–	–	ON	OFF	–	–	Red: Healthy A (primary) fault: A outputs disconnected
–	–	OFF	ON	–	–	Green: Healthy A (primary): A in control of outputs
–	–	–	–	ON	OFF	Red: Healthy B (backup) fault: B outputs disconnected
–	–	–	–	OFF	ON	Green: Healthy B (backup): B in control of outputs

Cold Junction Compensation

A Cold Junction Compensation (CJC) thermistor is mounted near the terminal block of each input channel, refer to Figure 2 and Figure 5 on page 6. Include them in the circuits in which thermocouple local conditioning modules are installed by installing the corresponding jumper (JP1-J11).

See *Analog Thermocouple Input* [DS5215] and *Analog Thermocouple Input* [DS5216] for additional detailed installation information.

Note: Jumpers JP1-JP11 must be removed when using local conditioning modules other than thermocouple types.
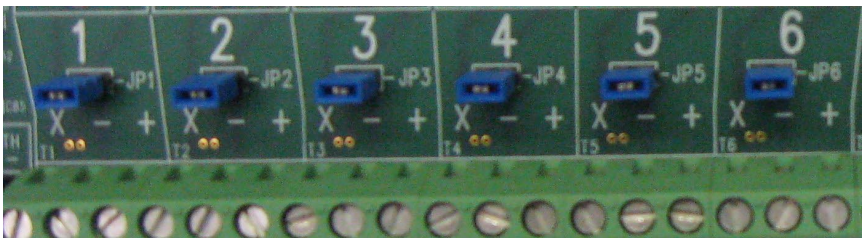

Figure 2   CJC Selection Jumpers

Installation

The FTA-544 is intended to be DIN-rail mounted. Access to the front and bottom is required. Refer to Figure 3 for assembly dimensions. Refer to *Vanguard Duplex System Installation* manual [UM5105] for information on CE installation.
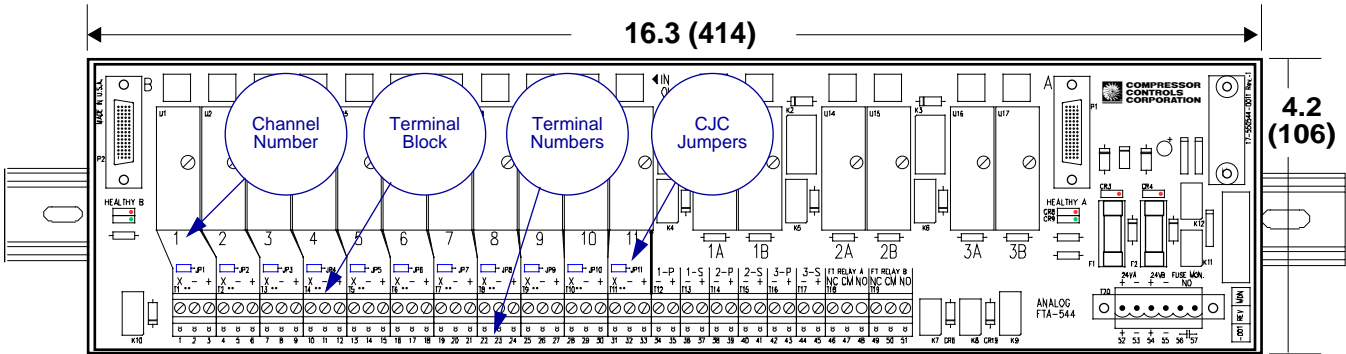

Figure 3   FTA-544 Dimensions

Connections   Terminal blocks are identified by using an alternating color scheme and a label above each conditioning module. See Table 2 for I/O signal terminal block assignments. Power input terminal (T20) assignments are shown in Table 3. T20 is a removable terminal block.

Refer to *Vanguard Local FTA Cable Assembly* [DS5207] for information on connecting local FTAs to an IOC.

Table 2   I/O Signal and FT Relay Terminal Assignments

Channel Numbers		Module Location	Terminal Block	Terminal Numbers
FTA1	**FTA2**			
AI 1	AI 12	1	T1	1 X 2 – 3 +
AI 2	AI 13	2	T2	4 X 5 – 6 +
AI 3	AI 14	3	T3	7 X 8 – 9 +
AI 4	AI 15	4	T4	10 X 11 – 12 +
AI 5	AI 16	5	T5	13 X 14 – 15 +
AI 6	AI 17	6	T6	16 X 17 – 18 +
AI 7	AI 18	7	T7	19 X 20 – 21 +
AI 8	AI 19	8	T8	22 X 23 – 24 +
AI 9	AI 20	9	T9	25 X 26 – 27 +
AI 10	AI 21	10	T10	28 X 29 – 30 +
AI 11	AI 22	11	T11	31 X 32 – 33 +

Channel Numbers		Module Location	Terminal Block	Terminal Numbers
FTA1	**FTA2**			
AO 1	AO 4	1A	T12	34 – 35 +
		1B	T13	36 – 37 +
AO 2	AO 5	2A	T14	38 – 39 +
		2B	T15	40 – 41 +
AO 3	AO 6	3A	T16	42 – 43 +
		3B	T17	44 – 45 +
FT Relay A	FT Relay A	--------	T18	46 – NC 47 – CM 48 – NO
FT Relay B	FT Relay B	--------	T19	49 – NC 50 – CM 51 – NO

Table 3   Power Input Terminal Assignments

Terminal Block	Terminal Numbers
T20	52 – 24VA + 53 – 24VA –
	54 – 24VB + 55 – 24VB –
	56 – FUSE MON NO 57 – FUSE MON CM

Power Circuits

Terminal block T20 (see Table 3 on page 4) provides four power terminals for connecting dual power supplies to the conditioning modules. Diode isolation for the dual supplies is provided by the FTA.

Note:

Power and Ground must be installed according to the requirements described in *Vanguard Duplex System Installation* manual [UM5105].

Fuse Monitoring

A Normally-Open (NO) contact terminal on T20 provides fuse (and input power) monitoring of the 24VA and 24VB power. The NO terminal is tied in series to the normally-open contacts of the two power relays. The power fault relays are energized for normal operation and de-energized for faulted condition.

Healthy Relays

The healthy state of the local FTA is reported to the IOC card. When IOC A is Healthy, it is in control of the outputs and IOC B is disconnected. When IOC A is not Healthy and IOC B is Healthy, IOC B is in control of the outputs and IOC A is disconnected. If both IOCs are not Healthy, both are disconnected and the outputs are de-energized (NO). The healthy relays for the analog outputs on the local FTA are shown in Figure 4.
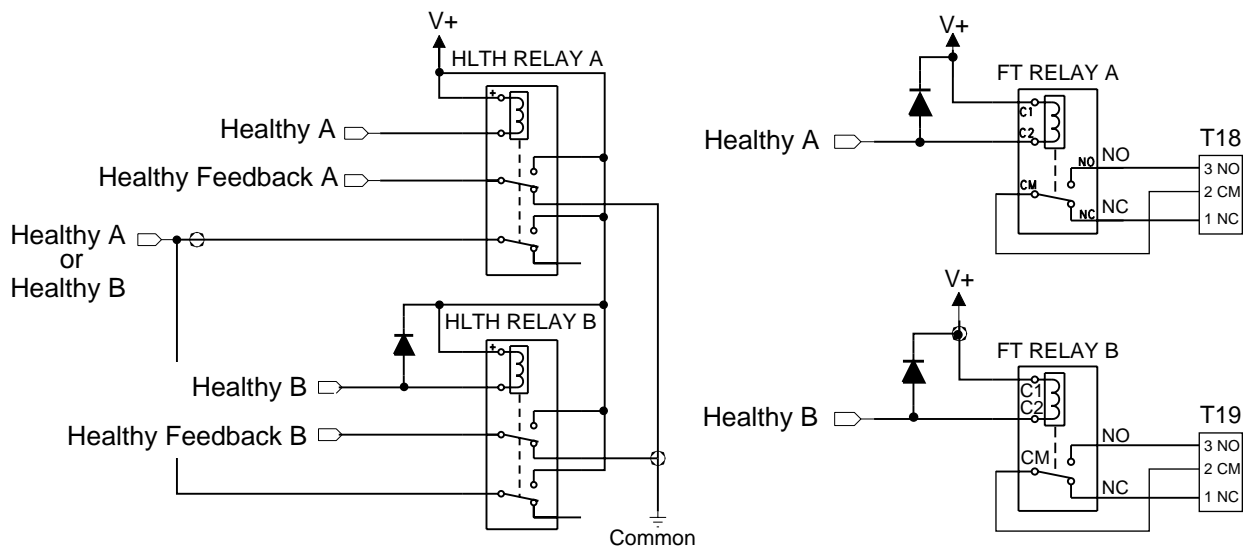
Figure 4   FTA-544 Healthy Relays for Analog Outputs and System Fault Relays

System Fault Relays

To satisfy fault relay requirements, duplex systems require each IOC set to have at least one local FTA of any type (analog or discrete). All FTA Fault relay contacts in the chassis will track each other. Terminal blocks T18 and T19 provide two screw terminals identified as a NO contact for the Fault relay. The NC terminals are not used. The system Fault relays are shown in Figure 4.

These fault relays will provide a system fault signal indicating a complete failure of the Vanguard controller with outputs in the fail-safe mode. To indicate a complete failure of the Vanguard controller, the NO contacts for FT Relay A and FT Relay B from one of the duplex FTAs must be connected in parallel.

See System Fault Relay Wiring Connections in Chapter 13 of UM5105 for wiring instructions. See System Switchover and Recovery in Chapter 5 of UM5106 for information on failure causes, indications, and alarms.

Note: The Fault relay follows the IOC Healthy relay and Healthy indicator LED. When the Healthy LED is green the System Fault and Healthy relays will be energized. When the Healthy LED is red they will be de-energized.

Note: The system-fault contact signal for the associated Vanguard controller must be connected to the DCS or PLC safety system.

I/O Circuits   Various I/O circuit types (conditioning modules) can be installed on the local FTA-544. Their functions differ slightly depending on the conditioning module type. Refer to *Local Conditioning Modules* [DS5210] for references to all of the local conditioning module data sheets.

Analog Inputs   Each analog input (T1-T11) on the FTA has three terminal connections: T1 (X-sense), T2 (–), and T3 (+), as shown in Figure 5.

Use terminals T2 (–) and T3 (+) on the conditioning module (CM) when the ANI signal is NOT powered externally, but instead is powered from the CM-1-335 (see DS5213).

Use terminals T1 (X) and T2 (–) on the CM when the ANI signal is powered externally (DCS). See Figure 5 for the polarity of the connection.

Note: Do not connect externally powered ANI signals to CM terminals T2 & T3. Doing so will result in a power conflict and intermittent operation.
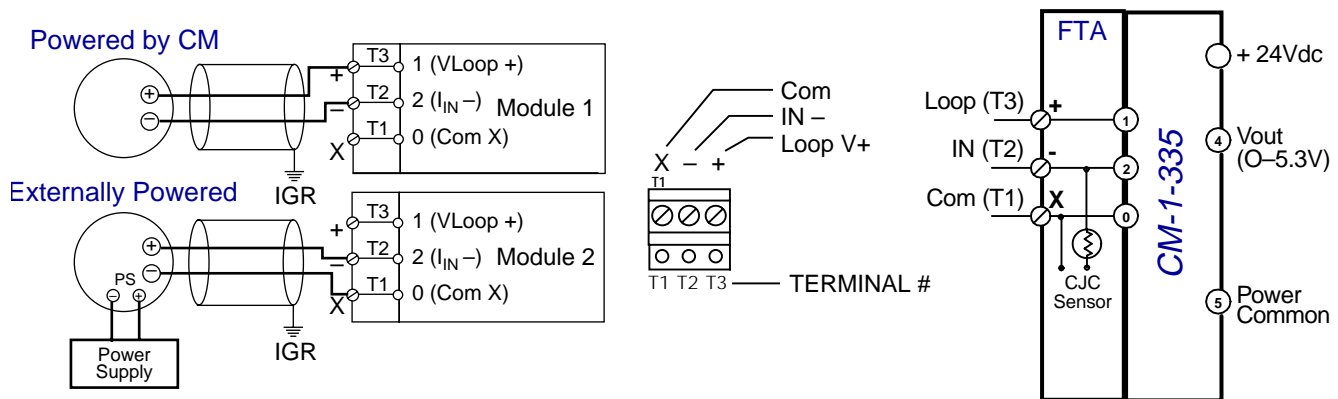

Figure 5   Analog Current Input Terminal Connections

Analog Outputs   Each analog output (T12-T17) on the FTA has two terminal connections: T1 (–), and T2 (+). The negative field device lead must be connected to the negative terminal; and the positive lead to must be connected to the positive terminal. Conditioning module (CM-1-439), see DS5217, must be used for analog out applications.

Note: The analog outputs are normally configured for 4 to 20 mA current loops. They can be converted to 1 to 5 Vdc signals by installing 250-ohm resistors on the output terminals.

Note: When analog output A (primary) channel is connected, analog output B (secondary) channel must be loaded by a resistor to match the impedance of the primary output or by a 250 Ω resistor (see Figure 6). This is required to prevent an error being reported for an open wire and to prevent short duration disturbances in the output during switching.
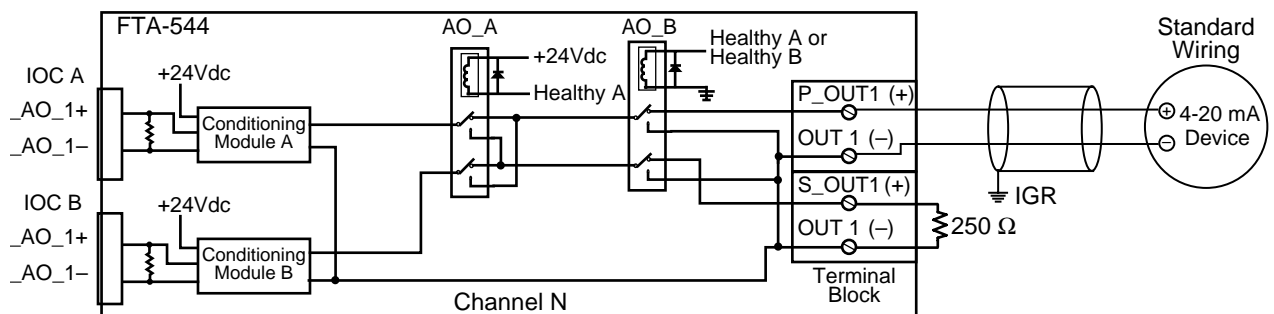
Figure 6   Simplified Schematics of a Duplex Analog Output

Specifications

Table 4 provides the FTA-544 specifications. Additional specifications relating to FTA-544 are located in:

- *Vanguard Control System Hardware Specifications* [DS5001]
- *Vanguard Environmental Specifications* [DS5002]
- *Vanguard Control System Parts List* [DS5003]

Table 4   Duplex FTA-544 Specifications

Part Number	FTA-544
Product Revision	C3
24VA/24VB Power	Voltage: 24 Vdc Max Current: 2 A Typ Current: varies by number of installed conditioning modules
I/O Channels	11 analog inputs, 3 duplex analog outputs
Analog Modules	Analog Input modules must output 1 to 5 Vdc to the IOC
Power Fuses	2.0A 250V Type F 5X20 mm Glass P#20-401820-020
Mounting	DIN 1 (EN 50 035) or DIN 3 (EN 50 022)
I/O Signal Cables	AWG 22 (0.3 mm^2) to AWG 14 (2.1 mm^2)
Power Cable	AWG 12 (3.3 mm^2) max
Fault Relays	1.0 A @ 30 V max
Dimensions with case:	4.2" high x 16.3" wide x 4.0" deep (106 x 414 x 102 mm)