GE Industrial Systems

VRTD Processor Board

Board Specification

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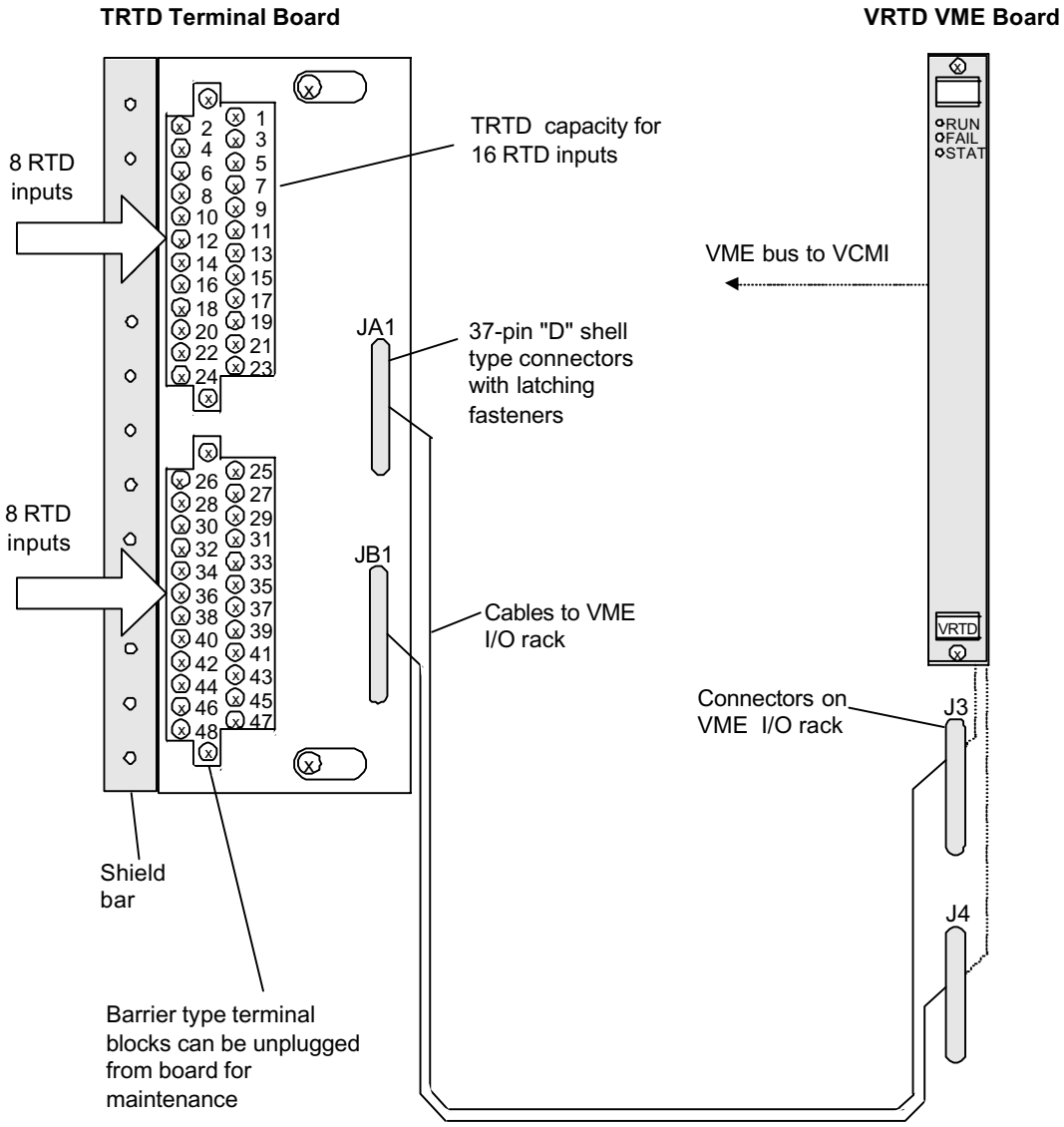
Functional Description

The Resistance Temperature Device (RTD) processor board (VRTD) accepts 16, three-wire RTD inputs. These inputs are wired to two barrier type blocks on the RTD terminal board (TRTD). Inputs to TRTD have noise suppression circuitry to protect against surge and high frequency noise. Cables with molded fittings connect the terminal board to the VME rack where the VRTD processor board is located.

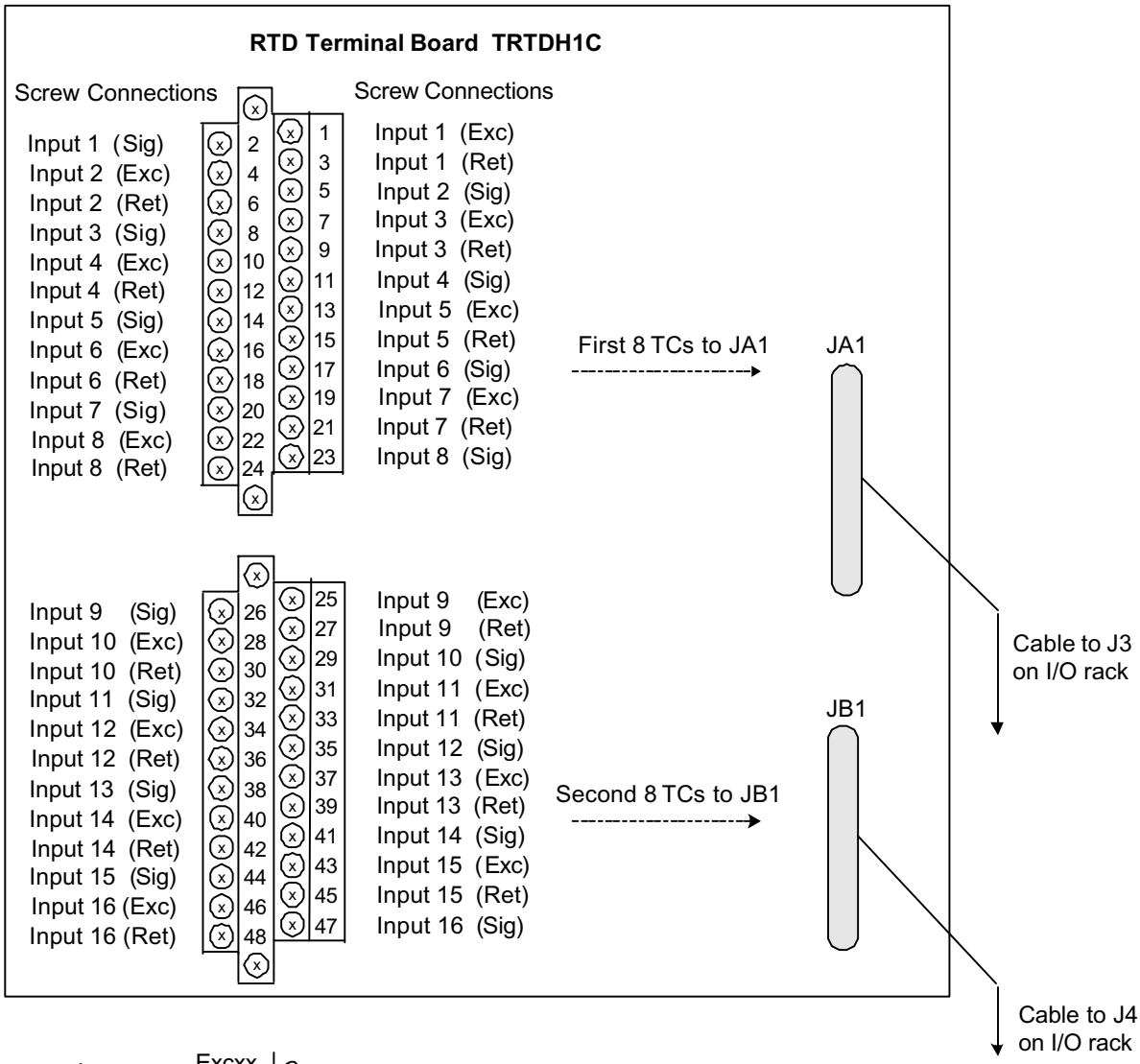
There are two versions of TRTD, simplex and a TMR version that fans out the signals to three VRTD boards. VRTD converts the inputs to digital temperature values and transfers them over the VME backplane to the VCMI, and then to the controller.



RTD Input Terminal Board, I/O Board, and Cabling

Installation

The sixteen RTDs are wired directly to two I/O terminal blocks mounted on the terminal board. Each block is held down with two screws and has 24 terminals accepting up to #12 AWG wires. A shield termination strip attached to chassis ground is located immediately to the left of each terminal block.



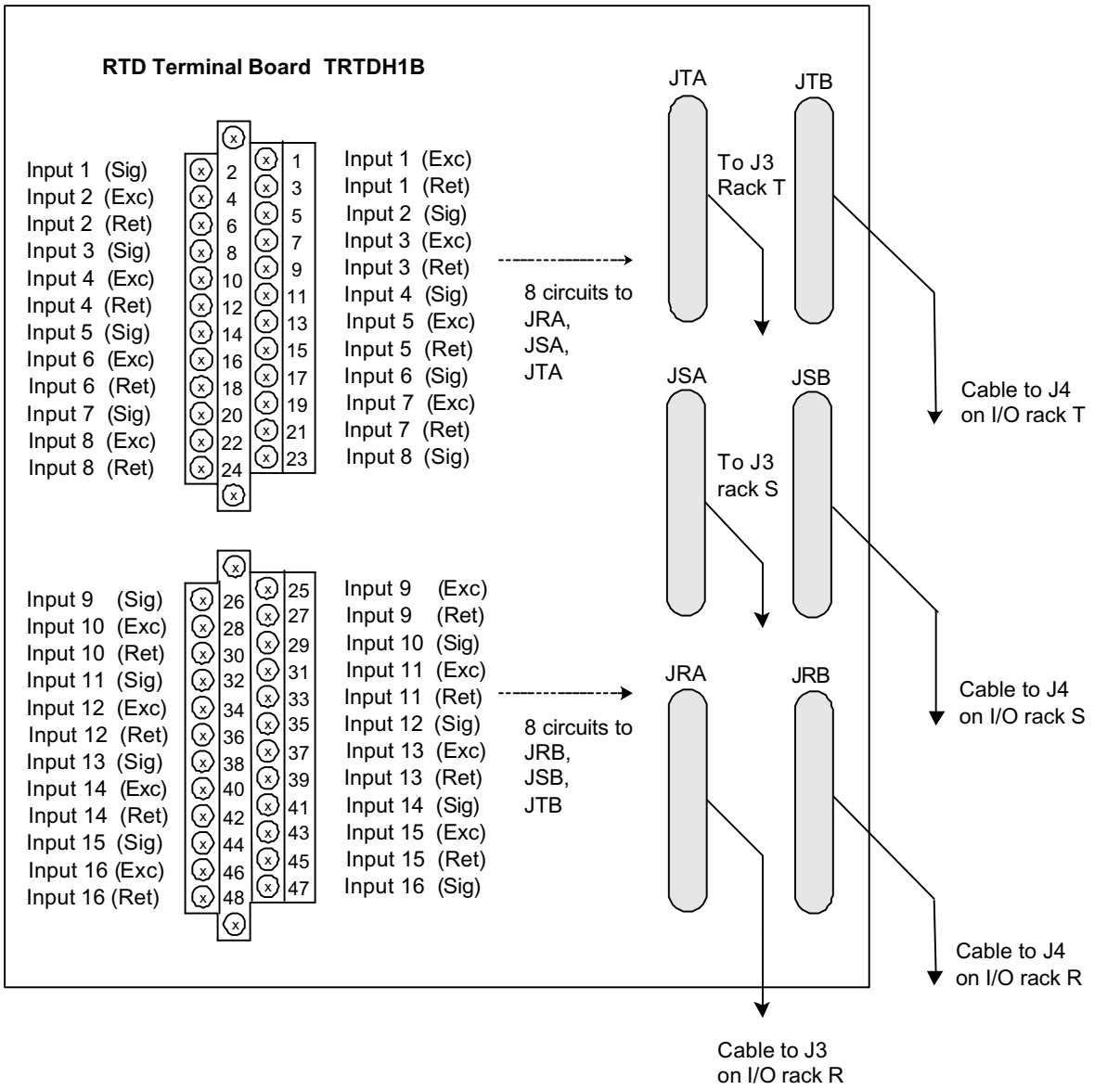
Application Note:

- Optional Ground: connnect the "B" wire to ground;
- RTD group wiring, that is sharing the "B" wire;
  tie the "B" wires together at the RTDs,
  tie the "Sigxx" signals together at the TRTD termination board, and interconnect with one wire.

TRTDH1C (Simplex) Board Wiring

TRTDH1B provides redundant RTD inputs by fanning the inputs out to VRTD boards in the R, S, and T. The inputs meet the same environmental, codes, resolution, suppression, and function requirements as with the TRTD terminal board, however, the fast scan is not available.

All RTD signals have high frequency decoupling to ground at signal entry. RTD multiplexing on the VRTD boards is coordinated by redundant pacemakers so that the loss of a single cable or loss of a single VRTD does not cause the loss of any RTD signals in the control database. VRTD boards in R, S, and T read RTDs simultaneously, but skewed by two RTDs, so that when R is reading RTD3, S is reading RTD5, and T is reading RTD7, and so on. This ensures that the same RTD is not excited by two VRTDs simultaneously, and hence produce bad readings.



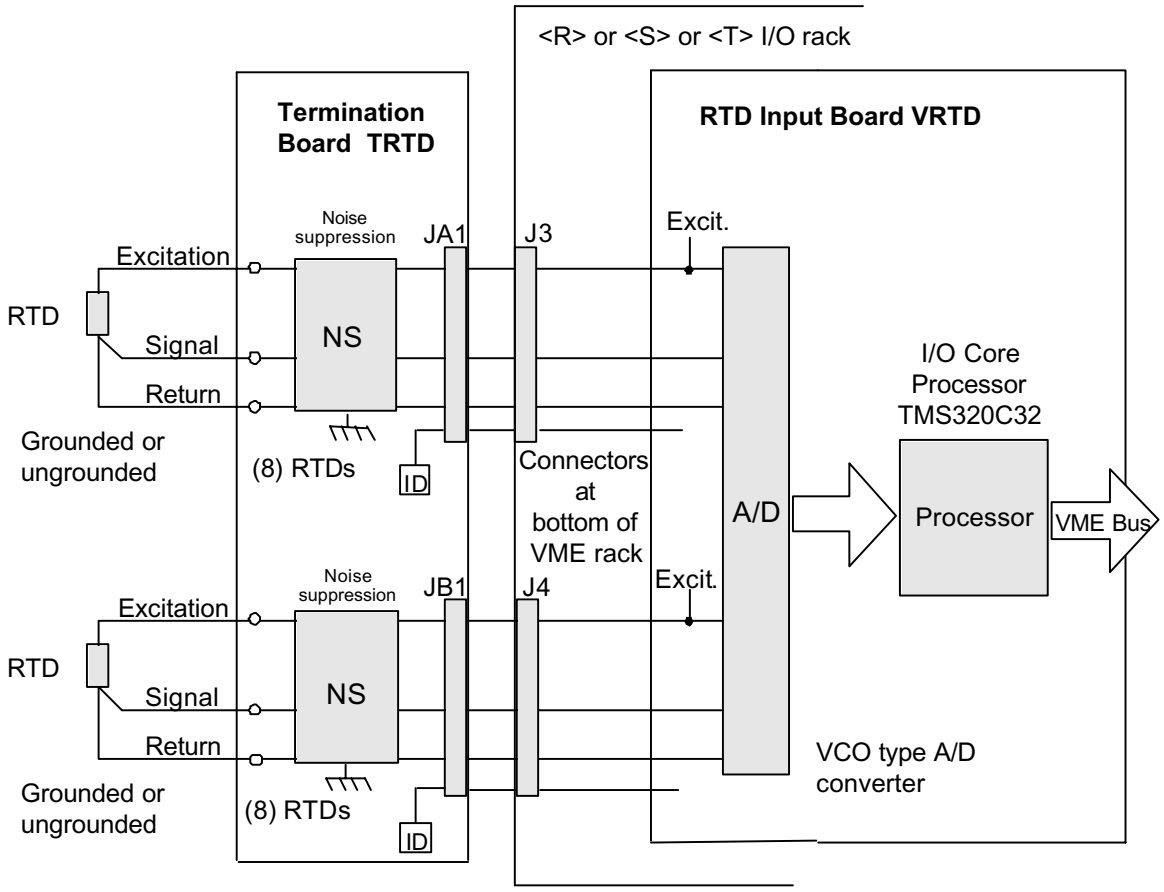
TRTDH1B (TMR) Board Wiring

Operation

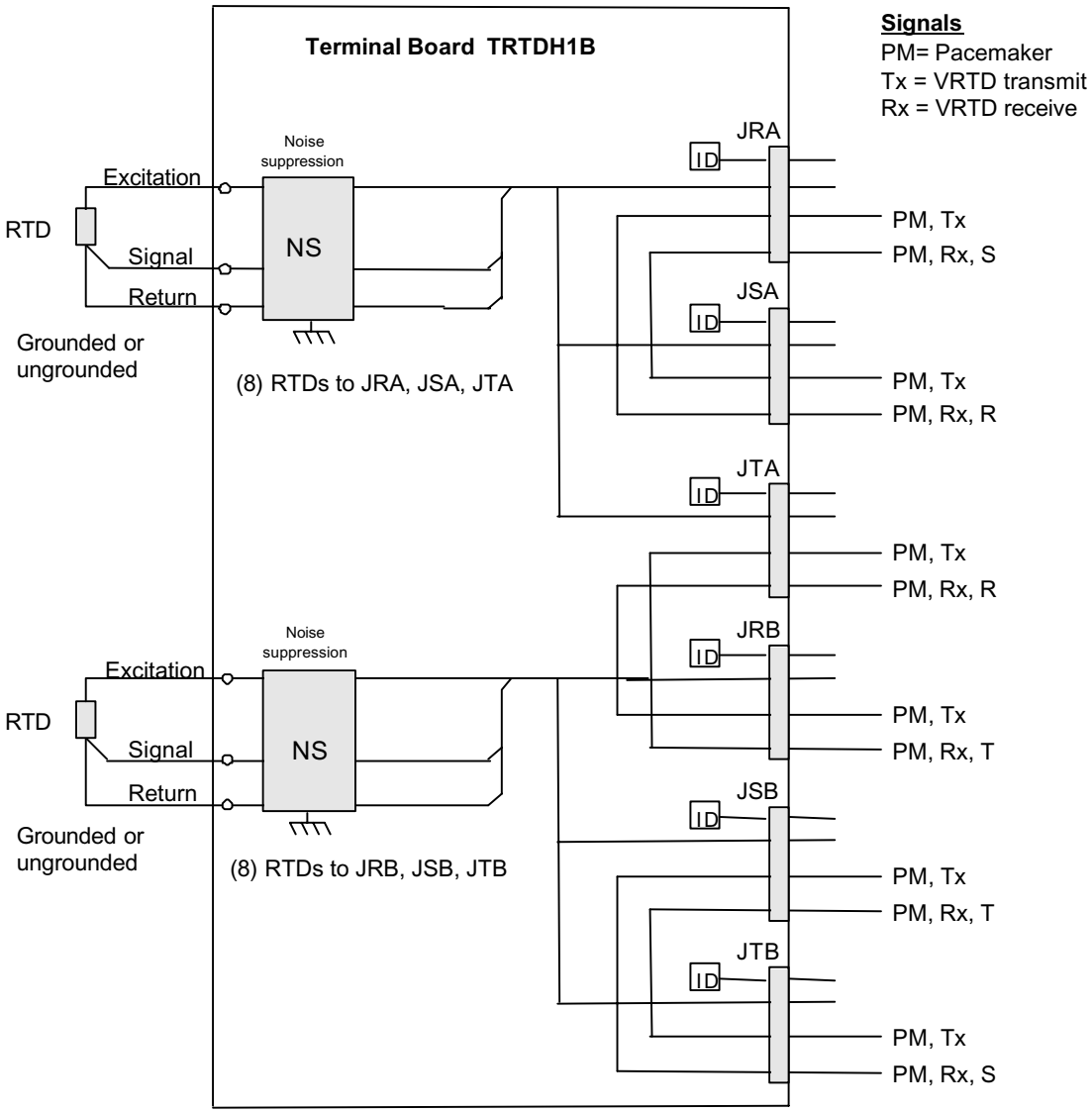
The terminal board supplies a 10 mA dc multiplexed (not continuous) excitation current to each RTD, which can be grounded or ungrounded. The 16 RTDs can be located up to 300 meters (984 feet) from the turbine control cabinet with a maximum two-way cable resistance of 15 ohms.

The VCO type A/D converter in the VRTD board uses voltage to frequency converters and sampling counters. The converter samples each signal and the excitation current four times per second for normal mode scanning, and 25 times per second for fast mode scanning, using a time sample interval related to the power system frequency. Linearization for the selection of 15 RTD types is performed in software by the digital signal processor.

RTD open and short circuits are detected by out of range values. An RTD that is determined to be out of hardware limits is removed from the scanned inputs in order to prevent adverse affects on other input channels. Repaired channels are reinstated automatically in 20 seconds, or can be manually reinstated.



TRTD (Simplex) Inputs and Signal Processing



TRTD (TMR) Inputs and Signal Processing

Specifications

RTD Specifications

Item	Specification
Number of channels	16 channels per terminal board 16 channels per VRTD board
RTD types	10, 100, and 200 ohm platinum 10 ohm copper 120 ohm nickel
Span	0.3532 to 4.054 volts
A/D converter resolution	14-bit resolution
Scan Time	Normal scan 250 ms (4 Hz) Fast scan 40 ms (25 Hz)
Power consumption	Less than 12 watts
Measurement accuracy	See Tables
Common mode rejection	Ac common mode rejection 60 dB @ 50/60 Hz Dc common mode rejection 80 dB
Common mode voltage range	± 5 V
Normal mode rejection	Rejection of up to 250 mV rms is 60 dB @ 50/60 Hz system frequency for normal scan
Maximum lead resistance	15 ohms maximum two way cable resistance
Fault detection	High/low (hardware) limit check High/low (software) system limit check

VRTD Accuracy

RTD Type	Group Gain	Accuracy at 400 °F
120 ohm nickel	Normal_ 1.0	2 °F
200 ohm platinum	Normal_ 1.0	2 °F
100 ohm platinum	Normal_ 1.0	4 °F
100 ohm platinum (–60 °F to 400 °F)	Gain_ 2.0	2 °F
10 ohm copper	10 ohm Cu_10	10 °F

VRTD Types and Ranges

RTD Type	Name/Standard	Range degree C	Range degree F
10 ohm copper	MINCO_CA GE 10 Ohm Copper	–51 to +260	–60 to +500
100 ohm platinum	SAMA 100	–51 to +593	–60 to +1100
100 ohm platinum	DIN 43760 IEC-751 MINCO_PD MINCO_PE PT100_DIN	–51 to +700	–60 to +1292
100 ohm platinum	MINCO_PA IPTS-68 PT100_PURE	–51 to +700	–60 to +1292
100 ohm platinum	MINCO_PB Rosemount 104 PT100_USIND	–51 to +700	–60 to +1292
120 ohm nickel	MINCO_NA N 120	–51 to +249	–60 to +480
200 ohm platinum	PT 200	–51 to +204	–60 to +400

Diagnostics

Three LEDs at the top of the VRTD front panel provide status information. The normal RUN condition is a flashing green and FAIL is a solid red. The third LED is normally off but shows a steady orange if a diagnostic alarm condition exists in the board.

Two types of diagnostic checking are applied to all inputs, hardware limit checking and system limit checking.

Each RTD type has hardware limit checking based on preset (non-configurable) high and low levels set near the ends of the operating range. If this limit is exceeded a logic signal is set and the input is no longer scanned. If any one of the 16 input's hardware limits is set it creates a composite diagnostic alarm, L3DIAG_VRTD, referring to the entire board. Details of the individual diagnostics are available from the toolbox. The diagnostic signals can be individually latched, and then reset with the RESET_DIA signal.

Each RTD input has system limit checking based on configurable high and low levels. These limits can be used to generate alarms, and can be configured for enable/disable, and as latching/nonlatching. RESET_SYS resets the out of limit signals. In TMR systems limit logic signals are voted and the resulting composite diagnostic is present in each controller.

Each connector has its own ID device, which is interrogated by the I/O board. The board ID is coded into a read-only chip containing the terminal board serial number, board type, revision number, and the JA1/JB1 connector location. The TMR board version has six ID chips, one for each connector.

Descriptions of the VRTD diagnostics are in GEH-6421D, Vol. I *Mark VI System Guide*, Chapter 8, *Troubleshooting and Diagnostics*.

Configuration

Like all I/O boards, the RTD board is configured using the toolbox. This software usually runs on a data highway connected CIMPLICITY station or workstation. For details refer to GEH-6403, *Control System Toolbox for Configuring the Mark VI Turbine Controller*.

Typical VRTD Configuration

Module Parameter	Description	Choices
Configuration		
System limits	Enable or disable all system limit checking	Enable, disable
Auto reset	Enable or disable restoring of RTDs removed from scan	Enable, disable
Group A rate	Sampling rate and system frequency filter for first group of 8 inputs	4 Hz, 50 Hz filter 4 Hz, 60 Hz filter 25 Hz
Group A gain	Gain 2.0 is for higher accuracy if ohms <190, first group of 8 inputs	Normal_1.0 Gain_2.0 10 ohm Cu_10.0
Group B rate	Sampling rate and system frequency filter for second group of 8 inputs	4 Hz, 50 Hz filter 4 Hz, 60 Hz filter 25 Hz
Group B gain	Gain 2.0 is for higher accuracy if ohms <190, second group of 8 inputs	Normal_1.0 Gain_2.0 10 ohm Cu_10.0
J3J4:IS200TRTDH1C	Terminal board	Connnected, not connected
RTD1	First of 16 RTDs - Board point signal	Point edit (input FLOAT)
RTD type	RTDs linearizations supported by VRTD; select RTD or Ohms Input (unused inputs are removed from scanning)	Unused CU10 MINCO_CA PT100_DIN MINCO_PD PT100_PURE MINCO_PA PT100_USIND MINCO_PB N120 MINCO_NA MINCO_PIA PT100_SAMA PT200 MINCO_PK Ohms
SysLim1 Enable	Enables or disables a temperature limit for each RTD, can be used to create an alarm	Enable, disable
SysLim1 Latch	Determines whether the limit condition will latch or unlatch for each RTD; reset used to unlatch.	Latch, unlatch
SysLim1 Type	Limit occurs when the temperature is greater than or equal (>=), or less than or equal to (<=) a preset value.	Greater than or equal Less than or equal
System Limit 1	Enter the desired value of the limit temperature, Deg F or Ohms	–60 to 1,300

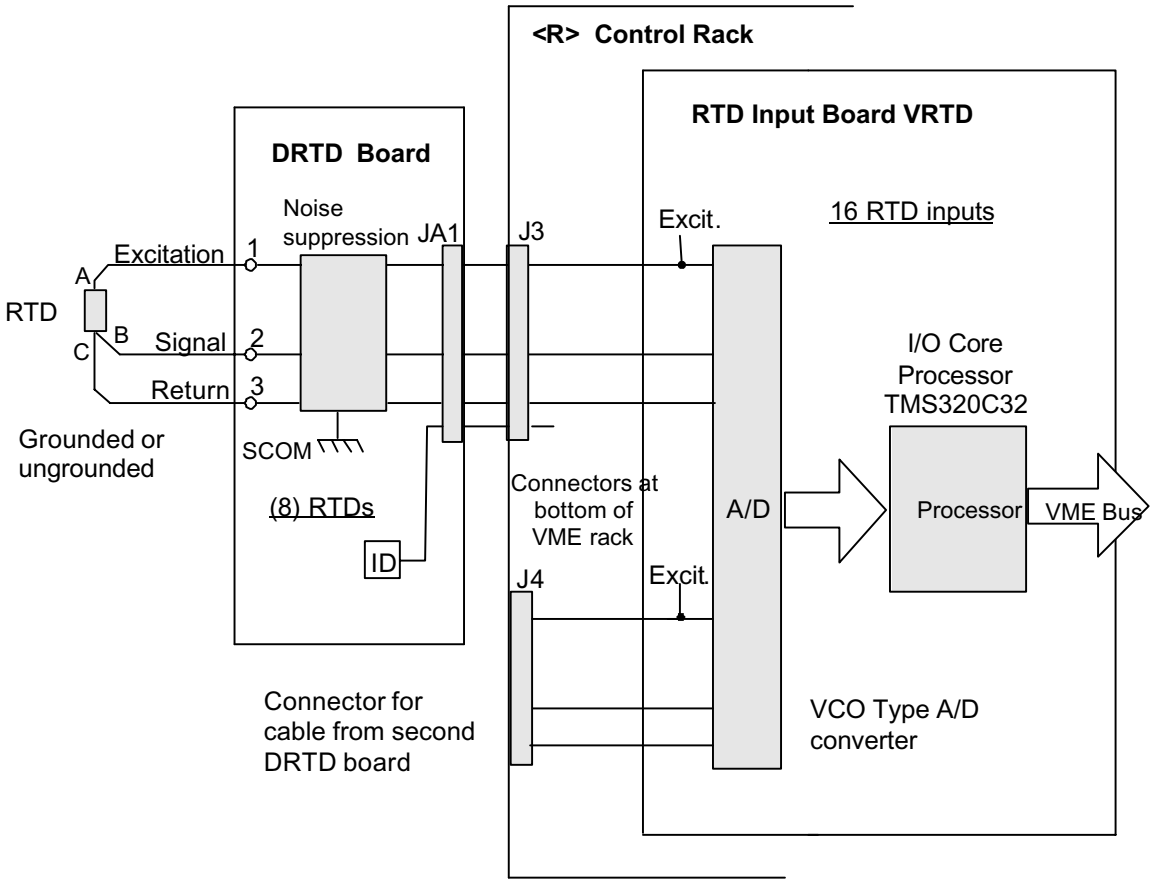
	SysLim2 Enable	Enables or disables a temperature limit which can be used to create an alarm	Enable, disable
	SysLim2 Latch	Determines whether the limit condition will latch or unlatch; reset used to unlatch.	Latch, unlatch
	SysLim2 Type	Limit occurs when the temperature is greater than or equal (>=), or less than or equal to (<=) a preset value.	Greater than or equal Less than or equal
Limit 2	System	Enter the desired value of the limit temperature, Deg F or Ohms	–60 to 1,300
Diff Limt	TMR	Limit condition occurs if 3 temperatures in R,S,T differ by more than a preset value; this creates a voting alarm condition.	–60 to 1,300

Signals	Board Point	Description-Point Edit (Enter Signal Connection)	Direction	Type
	L3DIAG_VRTD1	Board diagnostic	Input	BIT
	L3DIAG_VRTD2	Board diagnostic	Input	BIT
	L3DIAG_VRTD3	Board diagnostic	Input	BIT
	SysLim1RTD1	System limit 1	Input	BIT
	:	:	Input	BIT
	SysLim1RTD16	System limit 1	Input	BIT
	SysLim2RTD1	System limit 2	Input	BIT
	:	:	Input	BIT
	SysLim2RTD16	System limit 2	Input	BIT

DRTD Simplex Thermocouple Terminal Board

The DRTD board is a compact RTD terminal board, designed for DIN-rail mounting. The board has eight RTD inputs and connects to the VRTD processor board with a single 37-pin cable. This cable is identical to those used on the larger TRTD terminal board. The terminal boards can be stacked vertically on the DIN-rail to conserve cabinet space. Two DRTD boards can be connected to the VRTD for a total of 16 temperature inputs. Only a simplex version of the board is available.

The on-board noise suppression is similar to that on the TRTD. High density Euro-Block type terminal blocks are permanently mounted to the board, with two screw connections for the ground connection (SCOM). An on-board ID chip identifies the board to the VRTD for system diagnostic purposes.

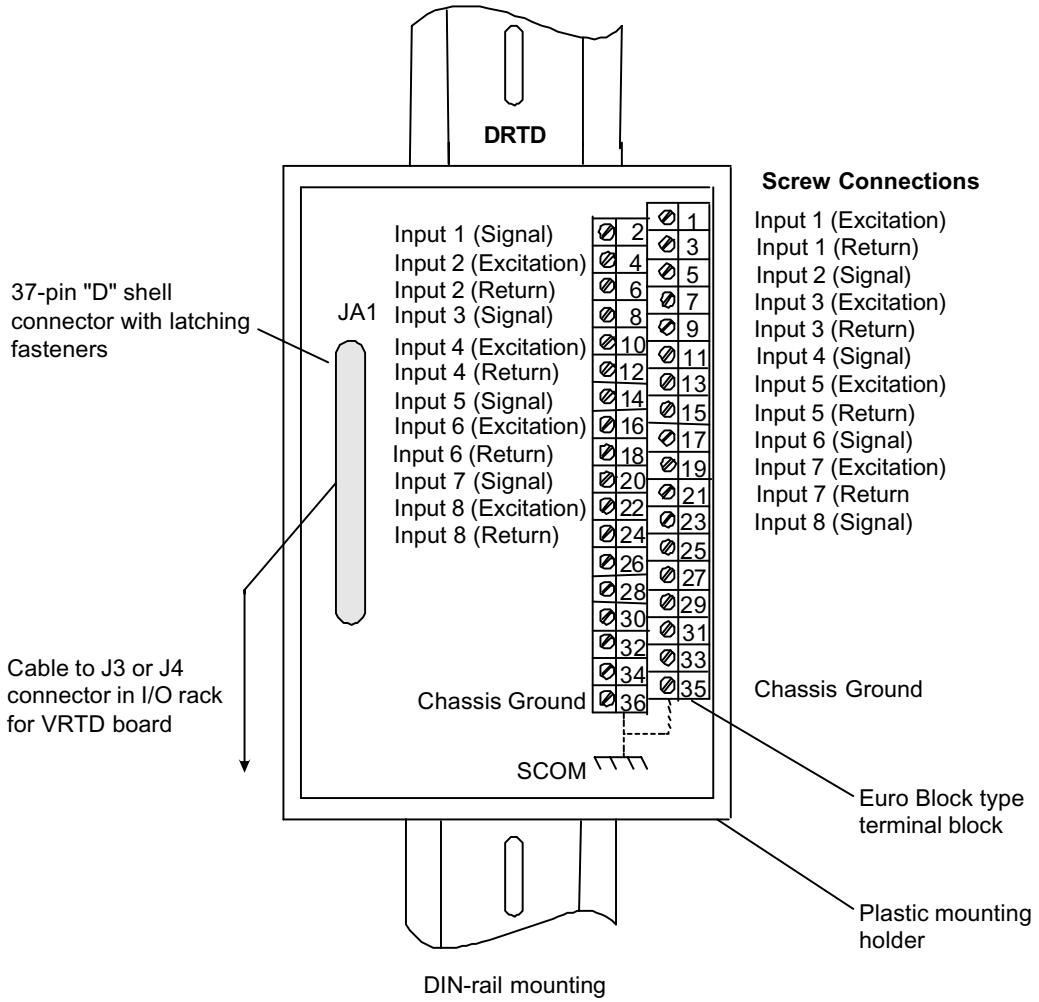


DRTD Board

Installation

There is no shield termination strip with this design.

The DRTD board slides into a plastic holder which mounts on the DIN-rail. The eight RTDs are wired directly to the terminal block. The Euro-Block type terminal block has 36 terminals and is permanently mounted on the terminal board. Typically #18 AWG wires (shielded twisted triplet) are used. Terminals 25 through 34 are spares. There are two screws for the SCOM (ground) connection, which should be as short a distance as possible. For wiring grounded RTDs, see the section, *Installation* for the TRTD board.



DRTD Board Wiring and Cabling

I/O Board Alarms

Diagnostic alarms for any I/O board can be displayed and reset from the toolbox. For troubleshooting and general diagnostic alarm information refer to GEG-6421 Volume I, Chapter 8.

I/O Board Diagnostic Alarms

Board	Fault	Fault Description	Possible Cause
VRTD	**2**	Flash Memory CRC Failure	Board firmware programming error (board will not go online)
	3	CRC failure override is Active	Board firmware programming error (board is allowed to go online)
	16	System Limit Checking is Disabled	System checking was disabled by configuration.
	17	Board ID Failure	Failed ID chip on the VME I/O board
	18	J3 ID Failure	Failed ID chip on connector J3, or cable problem
	19	J4 ID Failure	Failed ID chip on connector J4, or cable problem
	20	J5 ID Failure	Failed ID chip on connector J5, or cable problem
	21	J6 ID Failure	Failed ID chip on connector J6, or cable problem
	22	J3A ID Failure	Failed ID chip on connector J3A, or cable problem
	23	J4A ID Failure	Failed ID chip on connector J4A, or cable problem
	24	Firmware/Hardware Incompatibility	Invalid terminal board connected to VME I/O board
	30	ConfigCompatCode mismatch; Firmware: #; Tre: # The configuration compatibility code that the firmware is expecting is different than what is in the tre file for this board	A tre file has been installed that is incompatible with the firmware on the I/O board. Either the tre file or firmware must change. Contact the factory.
	31	IOCompatCode mismatch; Firmware: #; Tre: # The I/O compatibility code that the firmware is expecting is different than what is in the tre file for this board	A tre file has been installed that is incompatible with the firmware on the I/O board. Either the tre file or firmware must change. Contact the factory.
	32-47	RTD # high voltage reading, Counts are Y	An RTD wiring/cabling open, or an open on the VRTD board, or a VRTD hardware problem (such as multiplexer), or the RTD device has failed.
	48-63	RTD # low voltage reading, Counts are Y	An RTD wiring/cabling short, or a short on the VRTD board, or a VRTD hardware problem (such as multiplexer), or the RTD device has failed.

64-79	RTD # high current reading, Counts are Y	The current source on the VRTD is bad, or the measurement device has failed.
80-95	RTD # low current reading, Counts are Y.	An RTD wiring/cabling open, or an open on the VRTD board, or a VRTD hardware problem (such as multiplexer), or the RTD device has failed.
96-111	RTD # Resistance calc high, it is Y Ohms. RTD # has a higher value than the table and the value is Y	The wrong type of RTD has been configured or selected by default, or there are high resistance values created by faults 32 or 35, or both 32 and 35.
112-127	RTD # Resistance calc low, it is Y Ohms. TRD # has a lower value than the table and the value is Y	The wrong type of RTD has been configured or selected by default, or there are low resistance values created by faults 33 or 34, or both 33 and 34.
128-151	Voltage Circuits for RTDs, or Current Circuits for RTDs have Reference raw counts high or low, or Null raw counts high or low	Internal VRTD problems such as a damaged reference voltage circuit, or a bad current reference source, or the voltage/current null multiplexer is damaged.
152	Failed one Clock Validity Test, scanner still running. In TMR mode, the firmware tests whether the three TMR boards are synchronized and will stop scanning inputs under certain conditions	VME board, terminal board, or cable could be defective.
153	Failed one Phase Validity Test, scanner still running. In TMR mode, the firmware tests whether the three TMR boards are synchronized and will stop scanning inputs under certain conditions	VME board, terminal board, or cable could be defective.
154	Failed both Clock Validity Tests, scanner shutdown. In TMR mode, the firmware tests whether the three TMR boards are synchronized and will stop scanning inputs under certain conditions	VME board, terminal board, or cable could be defective.
155	Terminal Board connection(s) wrong. Cables crossed between <R>, <S>, and <T>	Check cable connections.
156	25 Hz Scan not Allowed in TMR Mode, please reconfigure	Configuration error. Choose scan of 4 Hz_50 Hz Fltr or 4 Hz_60 Hz Fltr.
160-255	Logic Signal # Voting mismatch. The identified signal from this board disagrees with the voted value.	A problem with the input. This could be the device, the wire to the terminal board, the terminal board, or the cable.
256-271	Input Signal # Voting mismatch, Local #, Voted #. The specified input signal varies from the voted value of the signal by more than the TMR Diff Limit	A problem with the input. This could be the device, the wire to the terminal board, the terminal board, or the cable.

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GE Industrial Systems

VAIC Analog Input Board

Board Specification

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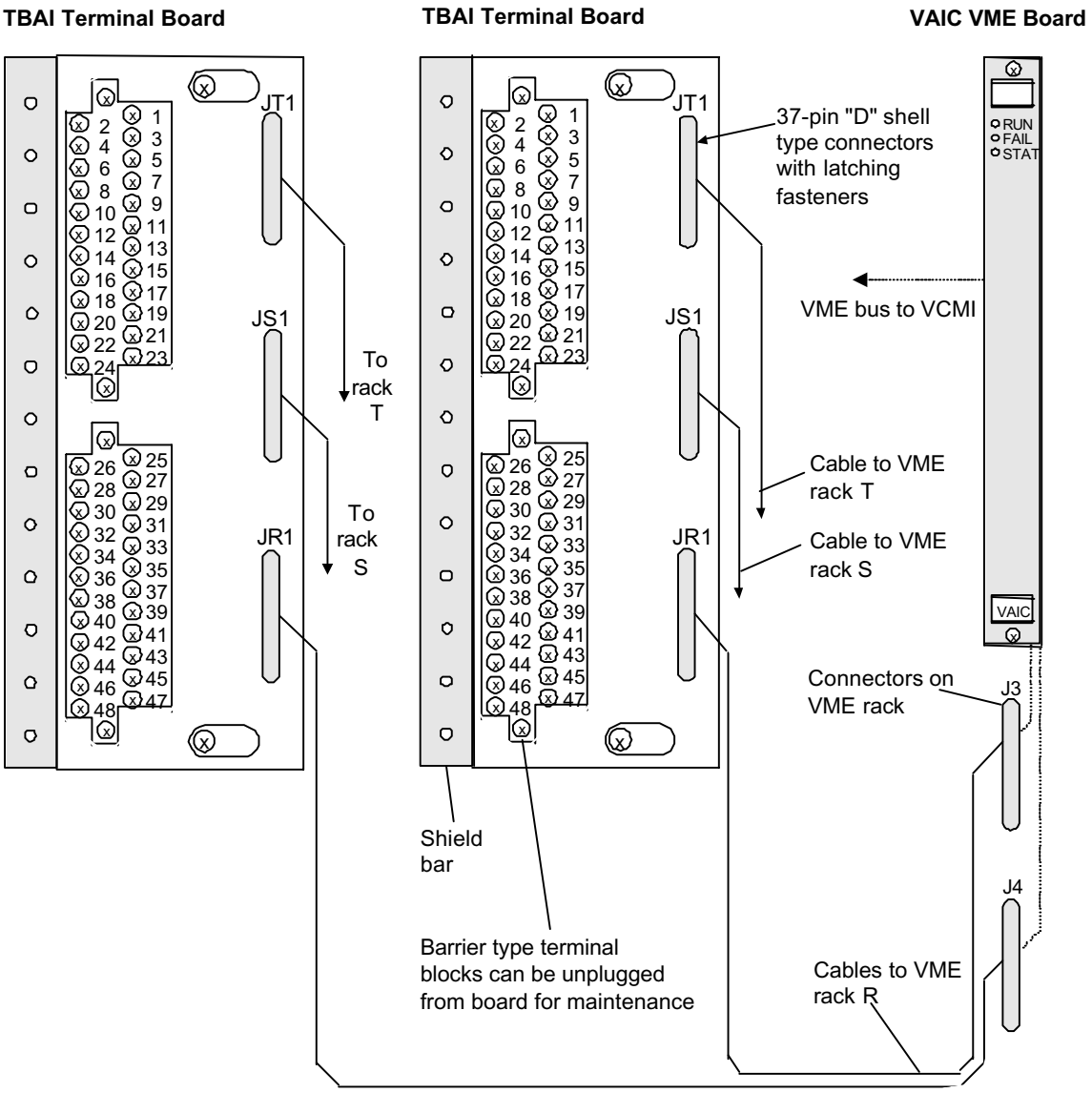
Functional Description

The Analog Input Board (VAIC) accepts 20 analog inputs and controls four analog outputs. Ten inputs and two outputs are wired to each Analog Input Terminal board (TBAI). Inputs and outputs have noise suppression circuitry to protect against surge and high frequency noise. Cables connect the terminal board to the VME rack where the VAIC processor board is located.

The VAIC converts the inputs to digital values and transfers these over the VME backplane to the VCMI, and then to the controller. Input signals are fanned out to three VME board racks R, S, and T for TMR applications. The VAIC requires two terminal boards to monitor 20 inputs.



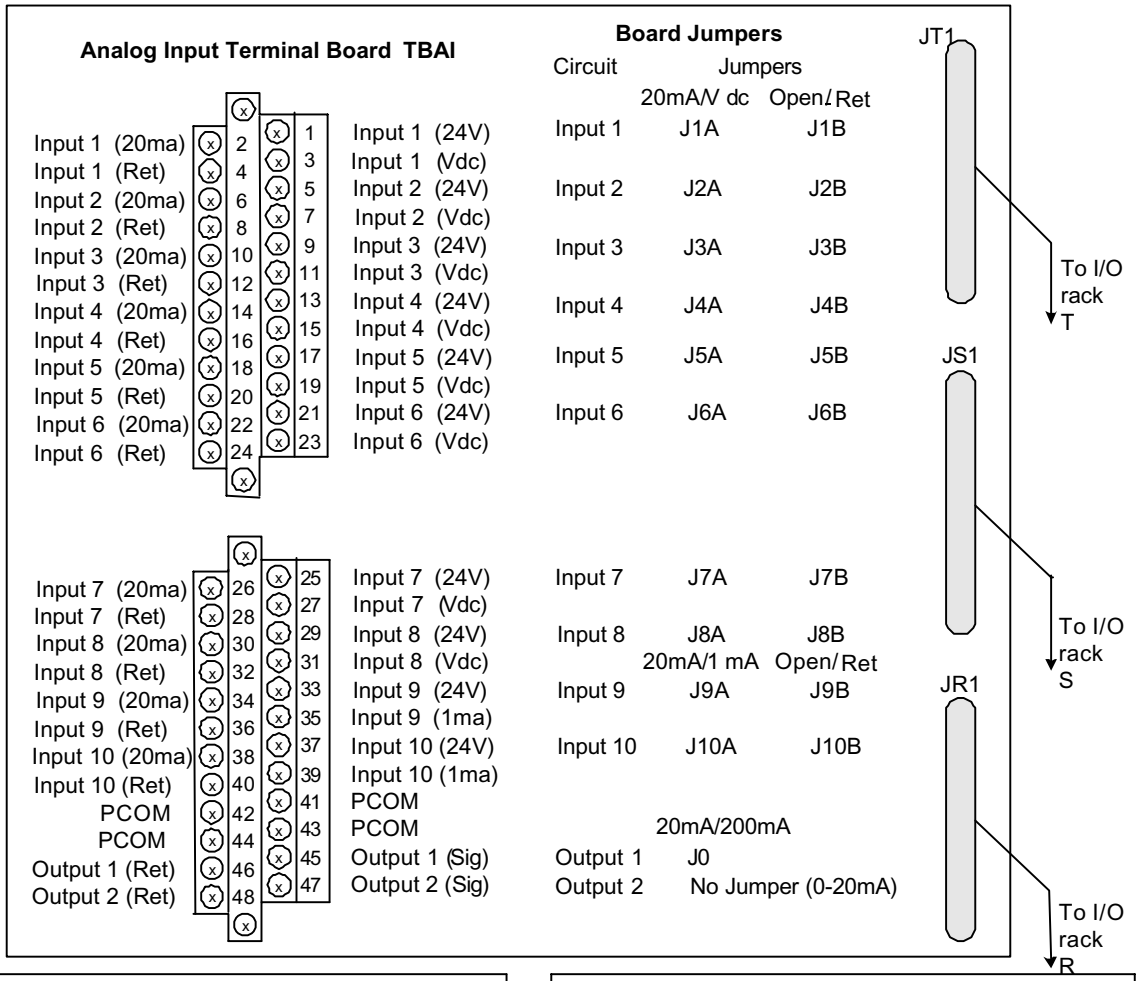
Analog Input Terminal boards, I/O Board, and Cabling (TMR System)

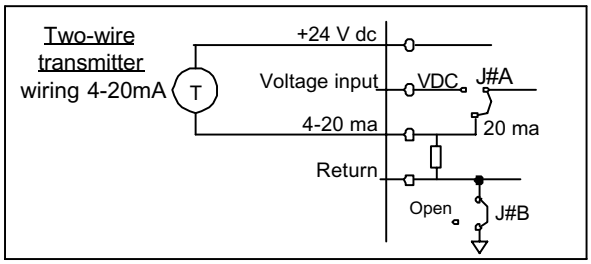
Installation

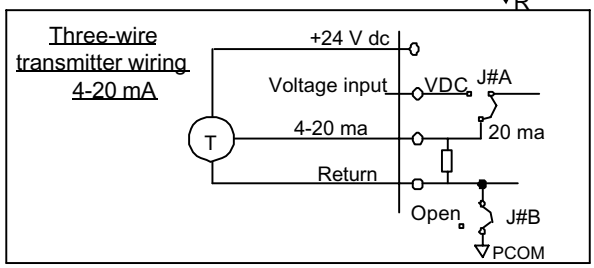
The 10 inputs and two outputs are wired directly to two I/O terminal blocks mounted on the terminal board. Each block is held down with two screws and has 24 terminals accepting up to #12 AWG wires. A shield termination strip attached to chassis ground is located immediately to the left of each terminal block.

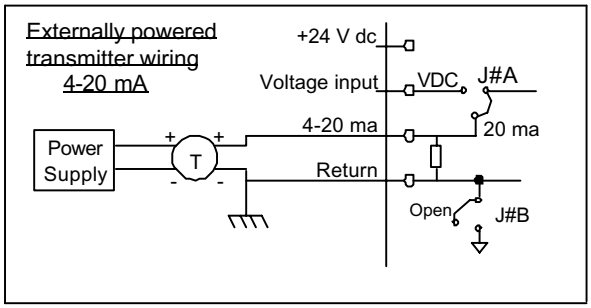
The types of analog inputs and outputs that can be accommodated are as follows:

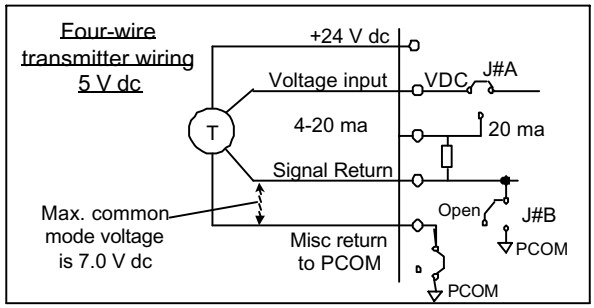
- Analog input, two-wire transmitter
- Analog input, three-wire transmitter
- Analog input, four-wire transmitter
- Analog input, externally powered transmitter
- Analog input, voltage ±5 V, 10 V dc
- Analog output, 20 mA
- Analog output, 200 mA









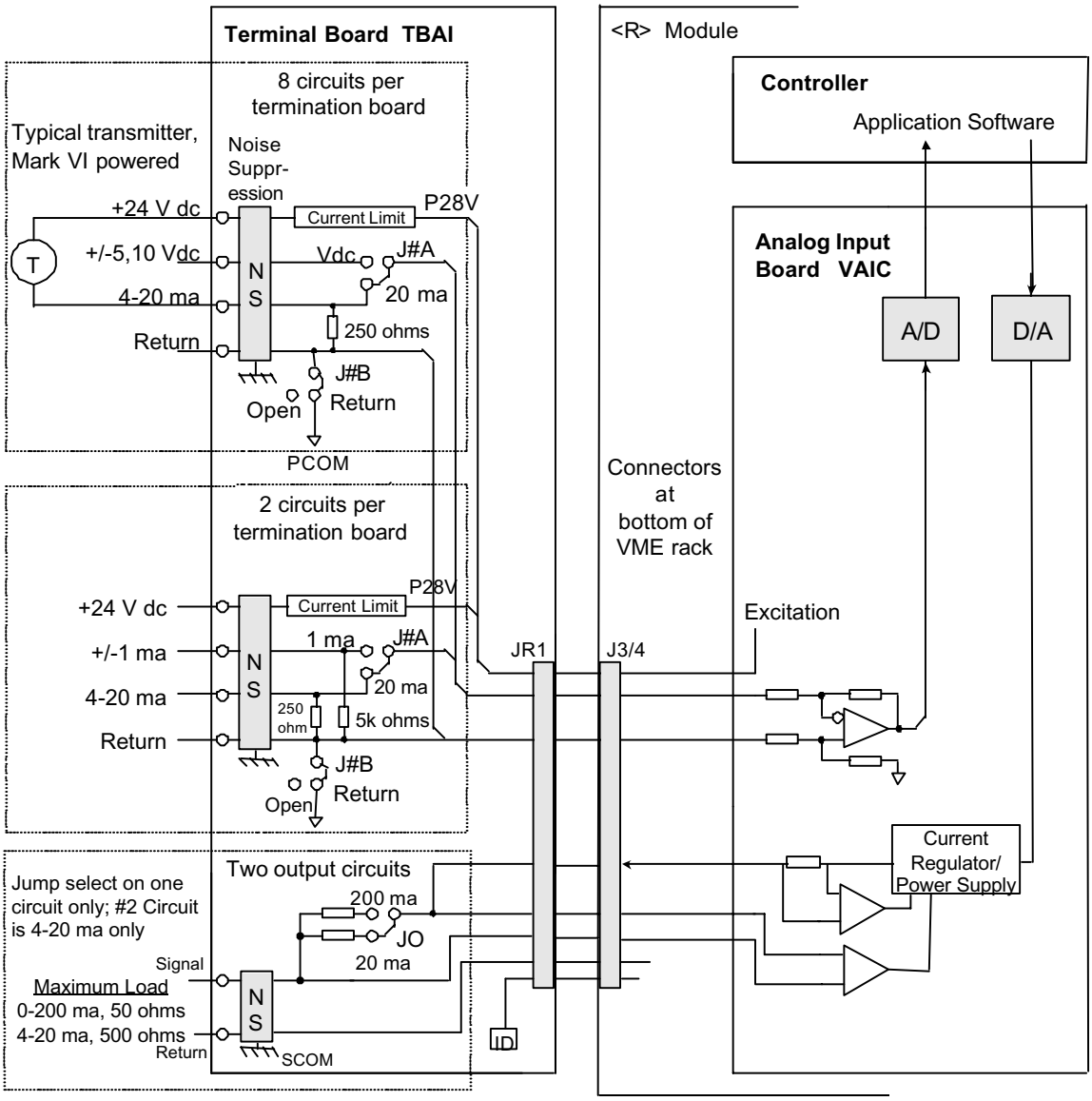


TBAI Terminal Board Wiring

Operation

24 V dc power is available on the terminal board for all the transducers and there is a choice of current or voltage inputs using jumpers. One of the two analog output circuits is 4–20 mA, and the other can be jumper configured for 4–20 mA or 0–200 mA. The same terminal board can be used for TMR applications.

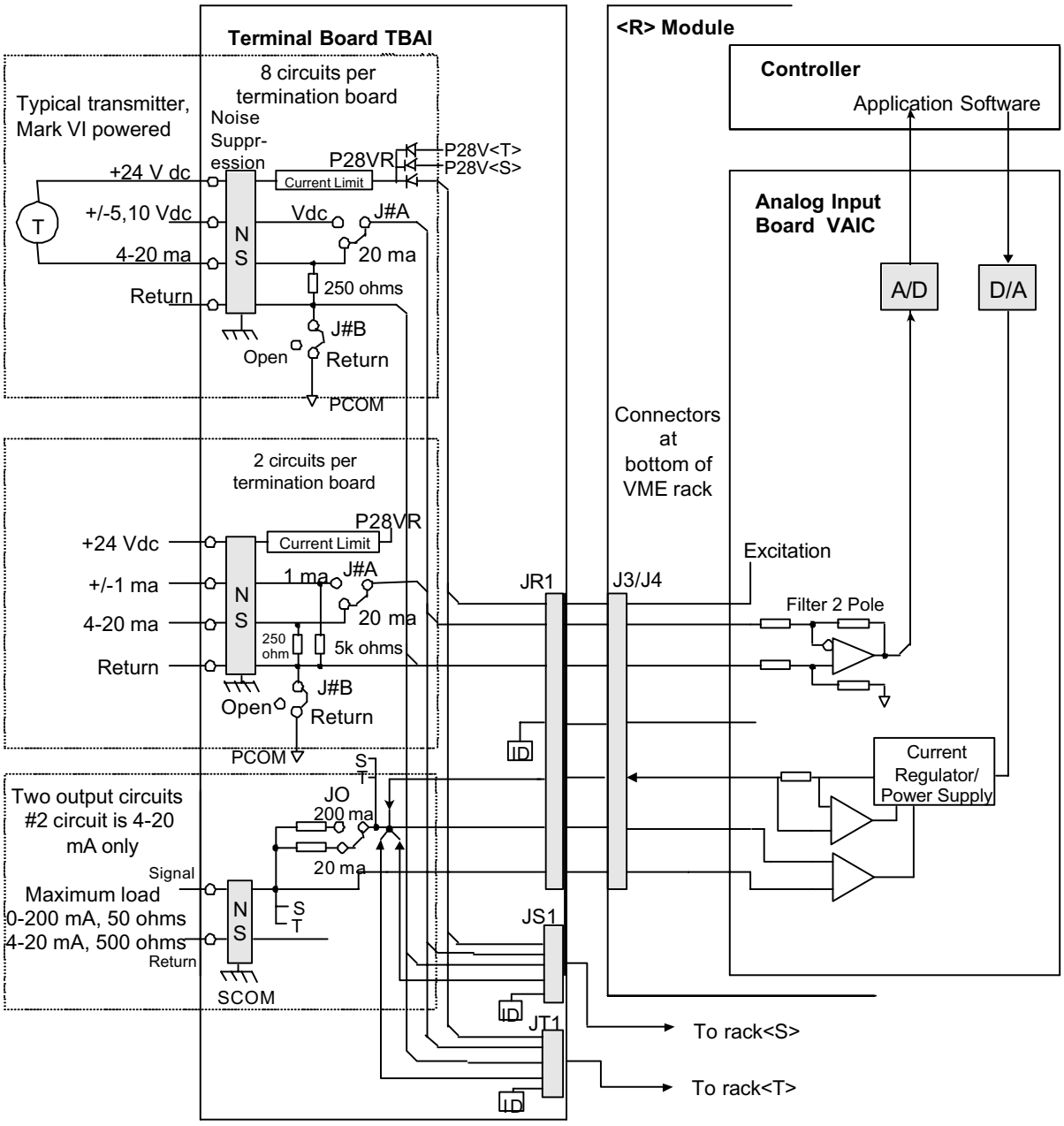
The VAIC board accepts 20 analog inputs, controls four analog outputs, and contains signal conditioning, an analog MUX, A/D converter, and D/A converter.



Simplex Analog Input Processing

In a TMR system, analog inputs fan out to the three control racks from JR1, JS1, and JT1. The 24 V dc power to the transducers comes from all three VAIC boards and is diode shared on the terminal board. Each analog current output is fed by currents from all three VAICs.

The actual output current is measured with a series resistor, which feeds a voltage back to each control rack. The resulting output is the voted middle value of the three currents.



TMR Analog Input Processing

The VAIC analog input/output capacity using two TBAI terminal boards, is shown in the following table.

VAIC Analog Inputs and Outputs

Qty	Analog Input Types	Qty	Analog Output Types
16	± 10 V dc, or ± 5 V dc, or 4–20 mA	2	0–20 mA, or 0–200 mA
4	4–20 mA, or ± 1 mA	2	0–20 mA

With the above noise suppression and filtering, the input ac common mode rejection (CMR) is 60 dB, and the dc CMR is 80 dB.

Transmitter/transducers can be powered by the 24 V dc source in the control system, or can be independently powered. Terminal board jumpers J#A, J#B, and JO set up the type of voltage and current inputs, and select the type of current output. Each output is monitored by diagnostics, and a suicide relay disconnects the corresponding output if a fault cannot be cleared by a command from the processor.

Hardware filters on the terminal board suppress high frequency noise. Additional software filters on VAIC provide configurable low pass filtering.

VAIC Board Specifications

Item	Specification
Number of channels	12 channels per terminal board (10 AI, 2 AO) 24 channels per VAIC board (20 AI, 4 AO)
Input span	1 – 5 V dc
Input converter resolution	16-bit A/D converter with 14-bit resolution
Scan time	Normal scan 10 ms (100 Hz) Inputs 1 through 4 available for scan at 200 Hz
Measurement accuracy	Better than 0.1% full scale
Noise suppression on inputs	The first ten circuits (J3) have a hardware filter with single pole down break at 500 radians/second. The second ten circuits (J4) have a hardware filter with a two pole down break at 72 and 500 rad/second. A software filter, using a two pole low pass filter, is configurable for 0, .75, 1.5 Hz, 3 Hz, 6 Hz, 12 Hz
Common mode rejection	Ac common mode rejection 60 dB @ 60 Hz, with up to ± 5 volt common mode voltage. Dc common mode rejection 80 dB with from –5 to +7 peak volt common mode voltage.

VAIC Board Specifications (continued)

Item	Specification
Common mode voltage range	± 5 V (± 2 V CMR for the ± 10 V inputs)
Maximum lead resistance	15 ohms maximum two-way cable resistance, cable length up to 300m (984 ft)
Output converter	12-bit D/A converter with 0.5% accuracy
Output load	500 ohms for 4–20 mA output 50 ohms for 200 mA output
Power consumption	Less than 31 watts
Compressor stall detection	Detection and relay operation within 30 seconds
Fault detection	Monitor D/A outputs, output currents, and total current Monitor suicide relays and 20/200 mA scaling relays

Diagnostics

Three LEDs at the top of the VAIC front panel provide status information. The normal RUN condition is a flashing green, and FAIL is a solid red. The third LED is normally off but displays a steady orange if a diagnostic alarm condition exists in the board.

Each analog input has hardware limit checking based on preset (non-configurable) high and low levels set near the ends of the operating range. If this limit is exceeded a logic signal is set and the input is no longer scanned. If any one of the input's hardware limits is set, it creates a composite diagnostic alarm, L3DIAG_VAIC, which refers to the entire board. Details of the individual diagnostics are available from the toolbox The diagnostic signals can be individually latched, and then reset with the RESET_DIA signal.

Each input has system limit checking based on configurable high and low levels. These limits can be used to generate alarms, and can be configured for enable/disable, and as latching/nonlatching. RESET_SYS resets the out of limits. Details of the diagnostics are in GEH-6421D, Vol. I *Mark VI System Guide*, Chapter 8, *Troubleshooting and Diagnostics*.

The TBAI terminal board has its own ID device, which is interrogated by the I/O board. The board ID is coded into a read-only chip containing the terminal board serial number, board type, revision number, and the JR, JS, JT connector location.

Configuration

The following table summarizes configuration choices and defaults. For details refer to GEH-6403, *Control System Toolbox for Configuring the Mark VI Turbine Controller*.

Typical VAIC Configuration

Parameter	Description	Choices
Configuration		
System limits	Enable or disable system limits	Enable, disable
Output voting	Select type of output voting	Simplex, TMR
Min_ *MA*_Input	Select minimum current for healthy 4–20 mA input	0 to 21 mA
Max_ *MA*_Input	Select maximum current for healthy 4–20 mA input	0 to 21 mA
CompStalType	Select compressor stall algorithm (# of transducers)	0, 2, or 3
InputForPS3A	Select analog input circuit for PS3A	Analog in 1, 2, 3, or 4
InputForPS3B	Select analog input circuit for PS3B	Analog in 1, 2, 3, or 4
InputForPS3C	Select analog input circuit for PS3C	Analog in 1, 2, 3, or 4
SelMode	Select mode for excessive difference pressure	Maximum, average
PressDelta	Excessive difference pressure threshold	5 to 500
TimeDelay	Time delay on stall detection, in milliseconds	10 to 40
KPS3_Drop_Min	Minimum pressure rate	10 to 2000
KPS3_Drop_I	Pressure rate intercept	10 to 100
KPS3_Drop_S	Pressure rate slope	0.05 to 10
KPS3_Delta_S	Pressure delta slope	0.05 to 10
KPS3_Delta_I	Pressure delta intercept	10 to 100
KPS3_Delta_Mx	Pressure delta maximum	10 to 100
KPS3_Drop_L	Threshold Pressure rate	10 to 2000
KPS3_Drop_Mx	Max pressure rate	10 to 2000
J3:IS200TBAIH1A	Terminal board connected to VAIC via J3	Connected, not connected
AnalogIn1	First of 10 analog inputs - board point	Point edit (input FLOAT)
Input type	Current or voltage input type	Unused, 4–20 mA, ± 5 V, ± 10 V
Low_Input	Value of current at the low end of scale	–10 to +20
Low_Value	Value of input in engineering units at low end of scale	–3.4082e+038 to 3.4028e+038
High_Input	Value of current at the high end of scale	–10 to +20
High_Value	Value of input in engineering units at high end of scale	–3.4082e+038 to 3.4028e+038
Input _Filter	Bandwidth of input signal filter	Unused, 0.75, 1.5 Hz, 3 Hz, 6 Hz, 12 Hz

TMR_Diff_Limit	Difference limit for voted inputs in % of high-low values	0 to 100
Sys_Lim_1_Enable	Input fault check	Enable, disable
Sys_Lim_1_Latch	Input fault latch	Latch, unlatch
Sys_Lim_1_Type	Input fault type	Greater than or equal Less than or equal
Sys_Lim_1	Input limit in engineering units	−3.4082e+038 to 3.4028e+038
Sys_Lim_2_Enable	Input fault check	Enable, disable
Sys_Lim_2_Latch	Input fault latch	Latch, unlatch
Sys_Lim_2_Type	Input fault type	Greater than or equal Less than or equal
Sys_Lim_2	Input limit in engineering units	−3.4082e+038 to 3.4028e+038
AnalogOut1	First of two analog outputs - board point	Point edit (output FLOAT)
Output_MA	Type of output current	Unused, 0−20 mA, 0−200 mA
Low_MA	Output mA at low value	0 to 200 mA
Low_Value	Output in engineering units at low mA	−3.4082e+038 to 3.4028e+038
High_MA	Output mA at high value	0 to 200 mA
High_Value	Output value in engineering units at high mA	−3.4082e+038 to 3.4028e+038
TMR Suicide	Suicide for faulty output current, TMR only	Enable, disable
Diff Limit	Current difference for suicide, TMR only	0 to 200 mA
D/A Err Limit	Difference between D/A reference and output, in % for suicide, TMR only	0 to 100 %
J4:IS200TBAIH1A	Terminal board connected to VAIC via J4	Connected, not connected
AnalogIn11	First of 10 analog inputs - board point	Point edit (input FLOAT)
AnalogOut3	First of two analog outputs - board point	Point edit (output FLOAT)

Board Points (Signals)	Description – Point Edit (Enter Signal Connection)	Direction	Type
L3DIAG_VAIC1	Board diagnostic	Input	BIT
L3DIAG_VAIC2	Board diagnostic	Input	BIT
L3DIAG_VAIC3	Board diagnostic	Input	BIT
SysLimit1_1	System limit 1	Input	BIT
:	:	Input	BIT
SysLimit1_20	System limit 1	Input	BIT
SysLimit2_1	System limit 2	Input	BIT
:	:	Input	BIT

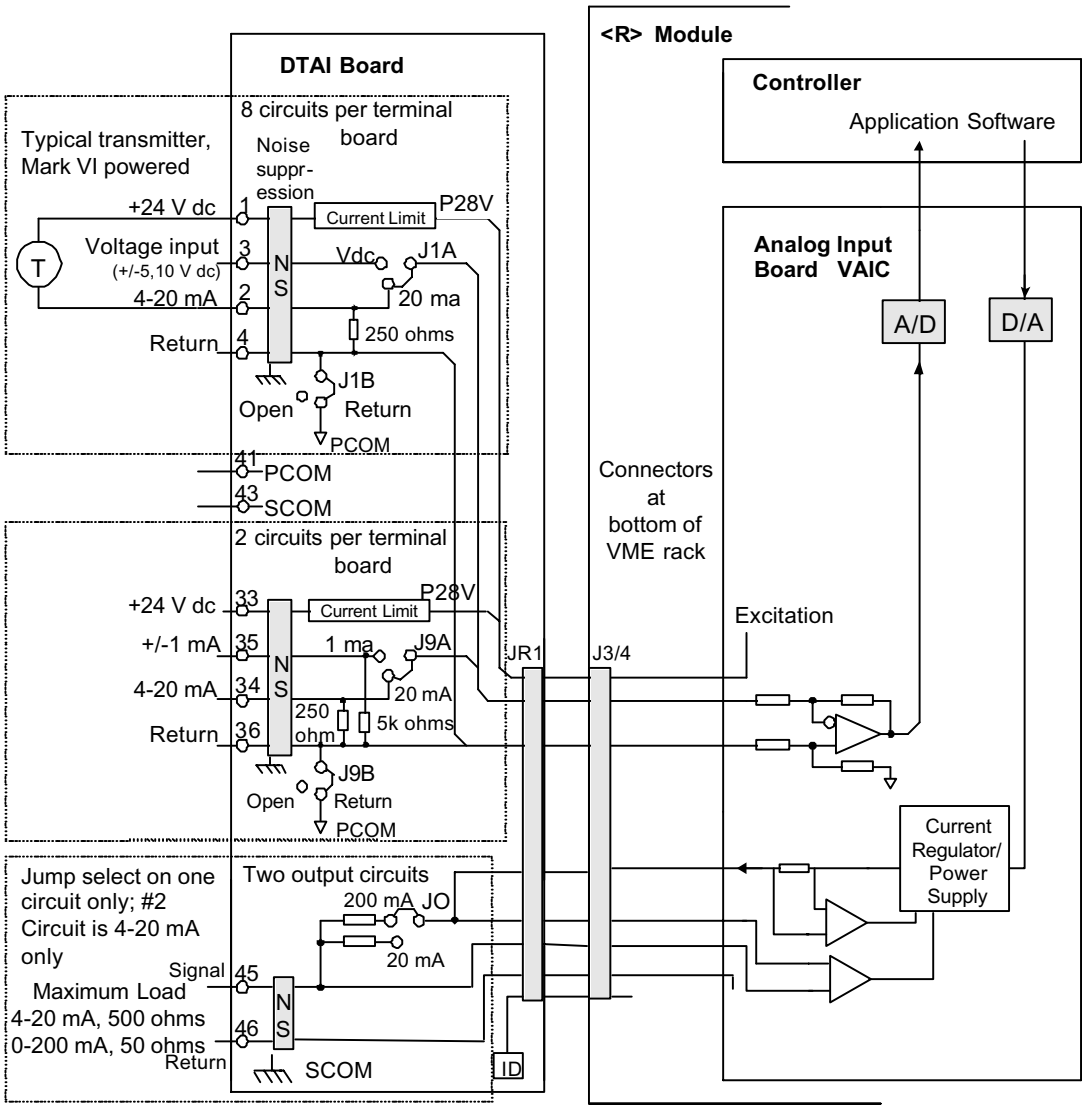
SysLimit2_20	System limit 2	Input	BIT
OutSuicide1	Status of suicide relay for output 1	Input	BIT
:	:	Input	BIT
OutSuicide4	Status of suicide relay for output 4	Input	BIT
DeltaFault	Excessive difference pressure	Input	BIT
CompStall	Compressor stall	Input	BIT
Out1MA	Feedback, total output current, mA	Input	FLOAT
:	:	Input	FLOAT
Out4MA	Feedback, total output current, mA	Input	FLOAT
CompPressSel	Selected compressor press, by stall Algo.	Input	FLOAT
PressRate Sel	Selected compressor press rate, by stall Algor.	Input	FLOAT
CompStallPerm	Compressor stall permissive	Output	BIT

DTAI Simplex Analog Input Terminal Board

The DTAI board is a compact analog input terminal board, designed for DIN-rail mounting. The board has 10 analog inputs and two analog outputs, and connects to the VAIC processor board with a single 37-pin. This cable is identical to those used on the larger TBAI terminal board. The terminal boards can be stacked vertically on the DIN-rail to conserve cabinet space.

Two DTAI boards can be connected to the VAIC for a total of 20 analog inputs and four analog outputs. Only a Simplexversion of the board is available.

The functions and on-board noise suppression are the same as those on the TBAI. High density Euro-Block type terminal blocks are permanently mounted to the board, with two screw connections for the ground connection (SCOM). An on-board ID chip identifies the board to the VAIC for system diagnostic purposes.

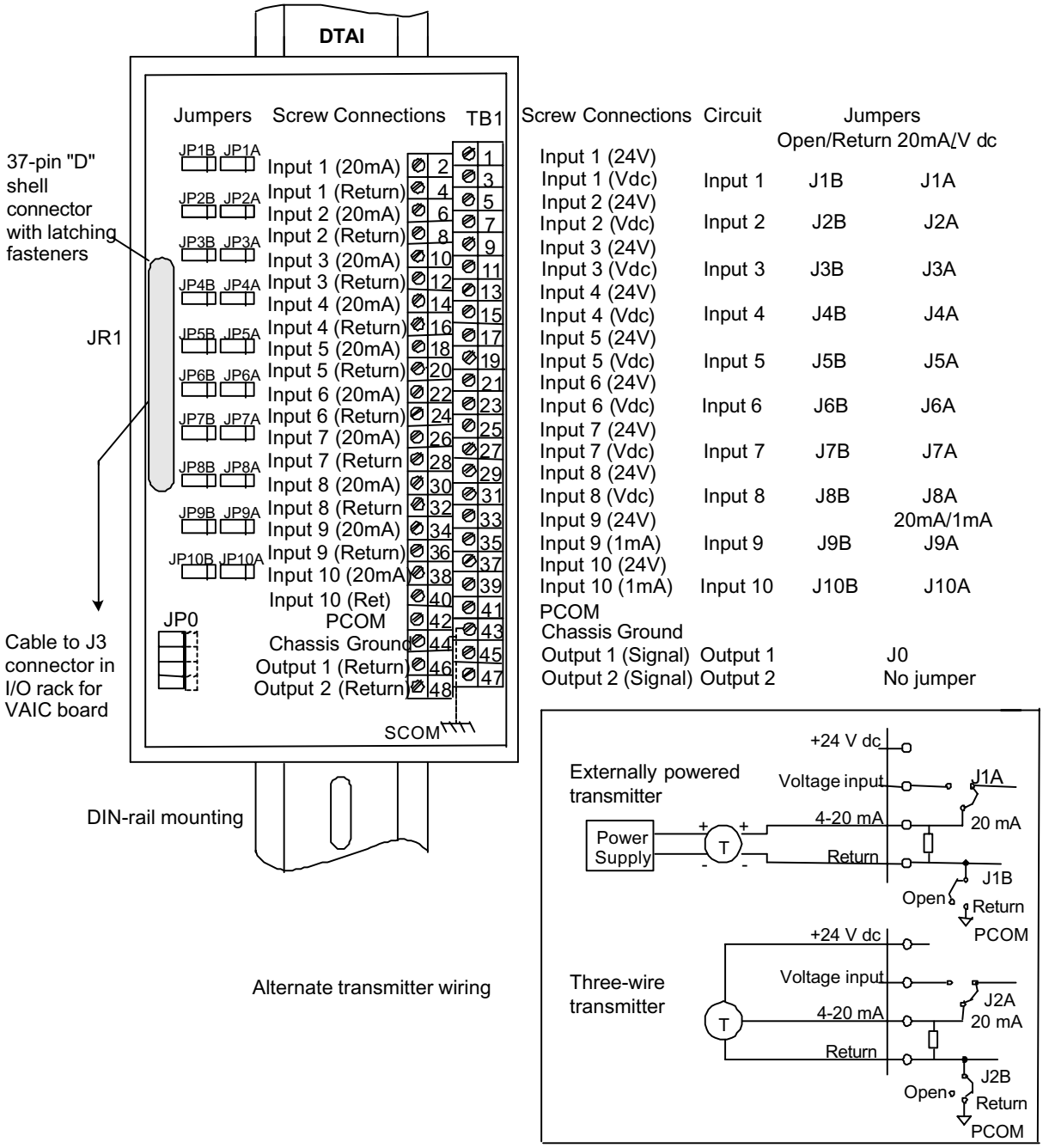


DTAI Board

Installation

There is no shield termination strip with this design.

The DTAI board slides into a plastic holder which mounts on the DIN-rail. The Euro-Block type terminal block has 48 terminals and is permanently mounted on the board. Typically #18 AWG wires (shielded twisted pair) are used. There are two screws for the SCOM (ground) connection, which should be as short a distance as possible.



DTAI Wiring, Cabling, and Jumper Positions

I/O Board Alarms

Diagnostic alarms for any I/O board can be displayed and reset from the toolbox. For troubleshooting and general diagnostic alarm information refer to GEH-6421 Volume I, Chapter 8.

Board	Fault	Fault Description	Possible Cause
VAIC	**2**	Flash Memory CRC Failure	Board firmware programming error (board will not go online)
	3	CRC failure override is Active	Board firmware programming error (board is allowed to go online)
	16	System Limit Checking is Disabled	System checking was disabled by configuration
	17	Board ID Failure	Failed ID chip on the VME I/O board
	18	J3 ID Failure	Failed ID chip on connector J3, or cable problem
	19	J4 ID Failure	Failed ID chip on connector J4, or cable problem
	20	J5 ID Failure	Failed ID chip on connector J5, or cable problem
	21	J6 ID Failure	Failed ID chip on connector J6, or cable problem
	22	J3A ID Failure	Failed ID chip on connector J3A, or cable problem
	23	J4A ID Failure	Failed ID chip on connector J4A, or cable problem
	24	Firmware/Hardware Incompatibility. The firmware on this board cannot handle the terminal board it is connected to	Invalid terminal board connected to VME I/O board- check the connectors and call the factory
	30	ConfigCompatCode mismatch. Firmware: #; Tre: # The configuration compatibility code that the firmware is expecting is different than what is in the tre file for this board	A tre file has been installed that is incompatible with the firmware on the I/O board. Either the tre file or firmware must change. Contact the factory.
	31	IOCompatCode mismatch. Firmware: #; Tre: # The I/O compatibility code that the firmware is expecting is different than what is in the tre file for this board	A tre file has been installed that is incompatible with the firmware on the I/O board. Either the tre file or firmware must change. Contact the factory.
	32-65	Analog Input # Unhealthy	Excitation to transducer, bad transducer, open or short-circuit
	66-69	Output # Individual Current Too High Relative to Total Current. An individual current is N mA more than half the total current, where N is the configurable TMR_Diff Limit	Board failure
	70-73	Output # total Current Varies from Reference Current. Total current is N mA different than the reference current, where N is the configurable TMR_Diff Limit	Board failure or open circuit

74-77	Output # Reference Current Error. The difference between the output reference and the input feedback of the output reference is greater than the configured DA_Err Limit measured in percent	Board failure (D/A converter)
78-81	Output # Individual Current Unhealthy. Simplex mode only alarm if current out of bounds	Board failure
82-85	Output # Suicide Relay Non-Functional. The shutdown relay is not responding to commands	Board failure (relay or driver)
86-89	Output # 20/200 mA Selection Non-Functional. Feedback from the relay indicates incorrect 20/200 mA relay selection (not berg jumper selection)	Configured output type does not match the jumper selection, or VAIC board failure (relay).
90-93	Output # 20/20 mA Suicide Active. One output of the three has suicided, the other two boards have picked up current	Board failure
128-223	Logic Signal # Voting mismatch. The identified signal from this board disagrees with the voted value	A problem with the input. This could be the device, the wire to the terminal board, the terminal board, or the cable.
224-249	Input Signal # Voting mismatch, Local #, Voted #. The specified input signal varies from the voted value of the signal by more than the TMR Diff Limit	A problem with the input. This could be the device, the wire to the terminal board, the terminal board, or the cable.

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