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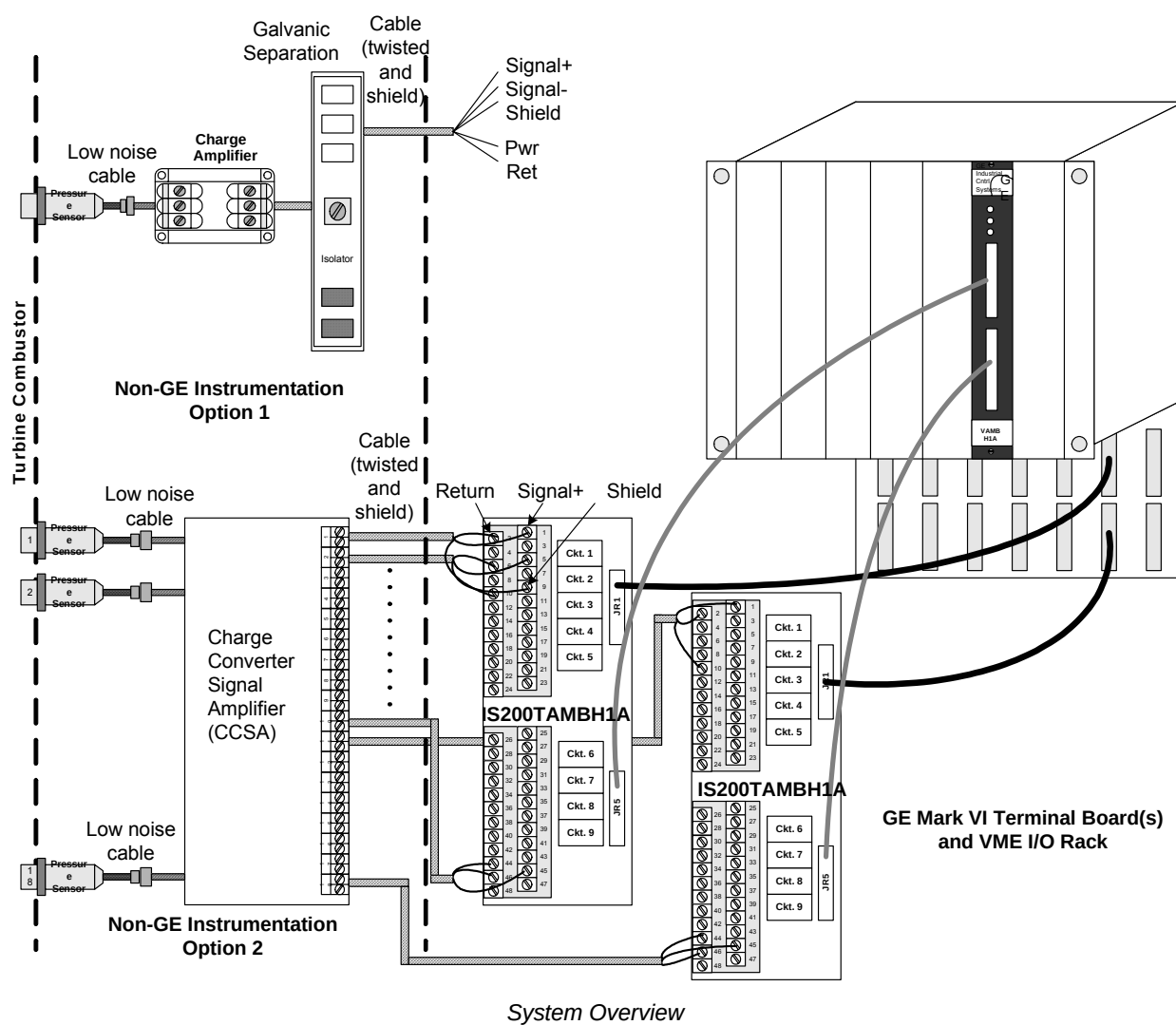


VAMB Acoustic Monitoring Input

VAMB Acoustic Monitoring

Functional Description

The Acoustic Monitoring (VAMB) board provides 18 channels of signal conditioning through two nine channel acoustic monitoring terminal boards IS200TAMB (TAMB) and one 18 channel I/O acoustic monitoring sub-assembly IS215VAMB (VAMB). The TAMB supports third party vendors such as, Bentley-Nevada[®], Vibro-meter[®], GE/Reuter-Stokes[®], and others.



The selected product combination determines the system requirements as follows:

- 18 channels of signal conditioning for sensing dynamic pressure output from third party charge amplifiers
 - Bentley-Nevada, Vibro-meter, PCB Piezotronics®, GE PS CCSA and GE/Reuter-Stokes vendors are supported
 - Differential inputs and adjustable gains
 - Fast synchronous-sampled analog/digital with 8x over-sampling capability to minimize analog filtering
 - Field Programmable Gate Array (FPGA) pre-processor with Finite Impulse Response (FIR) filters
 - Open wire detection
- Analysis capability per channel
 - Proprietary functions
 - RMS value for the ac input signal
 - Alarm detection if peak amplitude exceeds configurable level
 - List captures capability for all 18-channels if an alarm is detected

The acoustic monitoring function for the frame 6, 7, or 9 size gas turbines is supported by the VAMB and either one or two TAMB terminal boards. The TAMB receives an mV output from the CCSA or a third party charge amplifier. Power for the charge amplifier is supplied by the TAMB using a current limited +24V or -24V supply or from an external source. Other than electro-magnetic transient suppression, the differential input signal is routed directly to the VAMB through a cable with 18 twisted-pairs to the Versa Module Eurocard (VME) card front edge.

Gas Turbine Frame Size	No. of Combustors	No. of Flame Detectors	No. of VAMB I/O	No. of TAMB	Max. No. of channels supported
6FA	6	4	1	1	9
7EA	10	8	1	2	18
7FA, 7FB	14	4	1	2	18
9FA	18	4	1	2	18

Installation

Note A GE field service technician should install the VAMB. Technicians should refer to *GII-100014, VAMB Acoustic Monitoring Module*, for complete installation instructions.

The figure TAMB Acoustic Monitoring Terminal Board shows the functionality of one of the nine channels supported on the TAMB. Each channel provides current limited +24 V dc and +24 V dc power supply outputs. A constant current source is connected to the SIGx line for the PCB sensors. The input signal, CCSELx, is False when the signal is a logic-level low through an output on the VAMB. At power-up, the output must be False (logic-level low), leaving the constant current output deselected until the configuration parameters are loaded.

Each channel provides a hardware jumper, JPx, where x equals an even number, which selects a current input, I_IN, or a voltage input, V_IN. The current input provides a 250 W burden resistor for any 4-20 mA circuits connected to that channel.

Each channel has a jumper, JP_x, where x equals an odd number, which checks whether the return line, RET_x, is tied to the terminal board's power common, PCOM. If JP_x= PCOM, then the RET_x line is tied to PCOM. If JP_x= OPEN, then the RET_x line is not tied to PCOM.

A high impedance dc bias allows the VAMB to detect an open connection between the charge amplifier or sensor and the TAMB. The dc bias control provides three options:

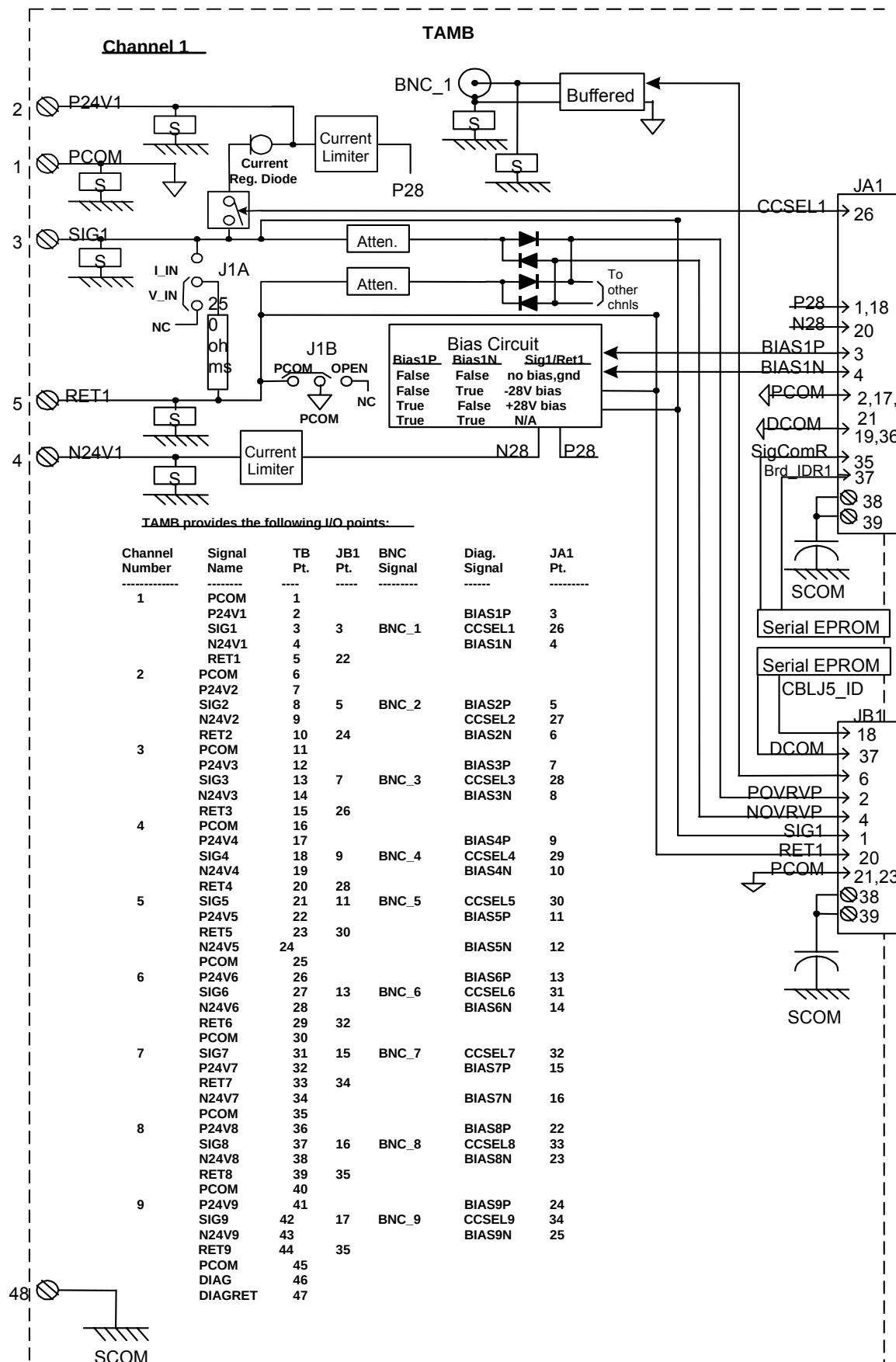
- 28 V bias or ground applied to the signal line
- SIG_x and return line
- RET_x

These inputs are activated or the signal select is True if the Mark* VI I/O board outputs a logic-level low signal from the TTL output. The table shows the selections:

BIAS _x P	BIAS _x N	SIG _x /RET _x Biased to
True	True	Illegal combination. Bias circuit protects power supplies from shorting
True	False	+28 V bias selected
False	True	-28 V bias selected
False	False	No bias selected, but both SIG _x and RET _x are pulled to ground to keep the unused input electrically quiet.

The sensor or charge amplifier signal output is connected to the terminal board point, SIG_x, and the Kelvin or low-current return is connected to RET_x. The terminal board provides signal suppression and EMI protection and passes the signal on to the VAMB through a 37-pin connector.

Each channel provides a buffered BNC output. The buffered signal is the input signal minus the dc bias.



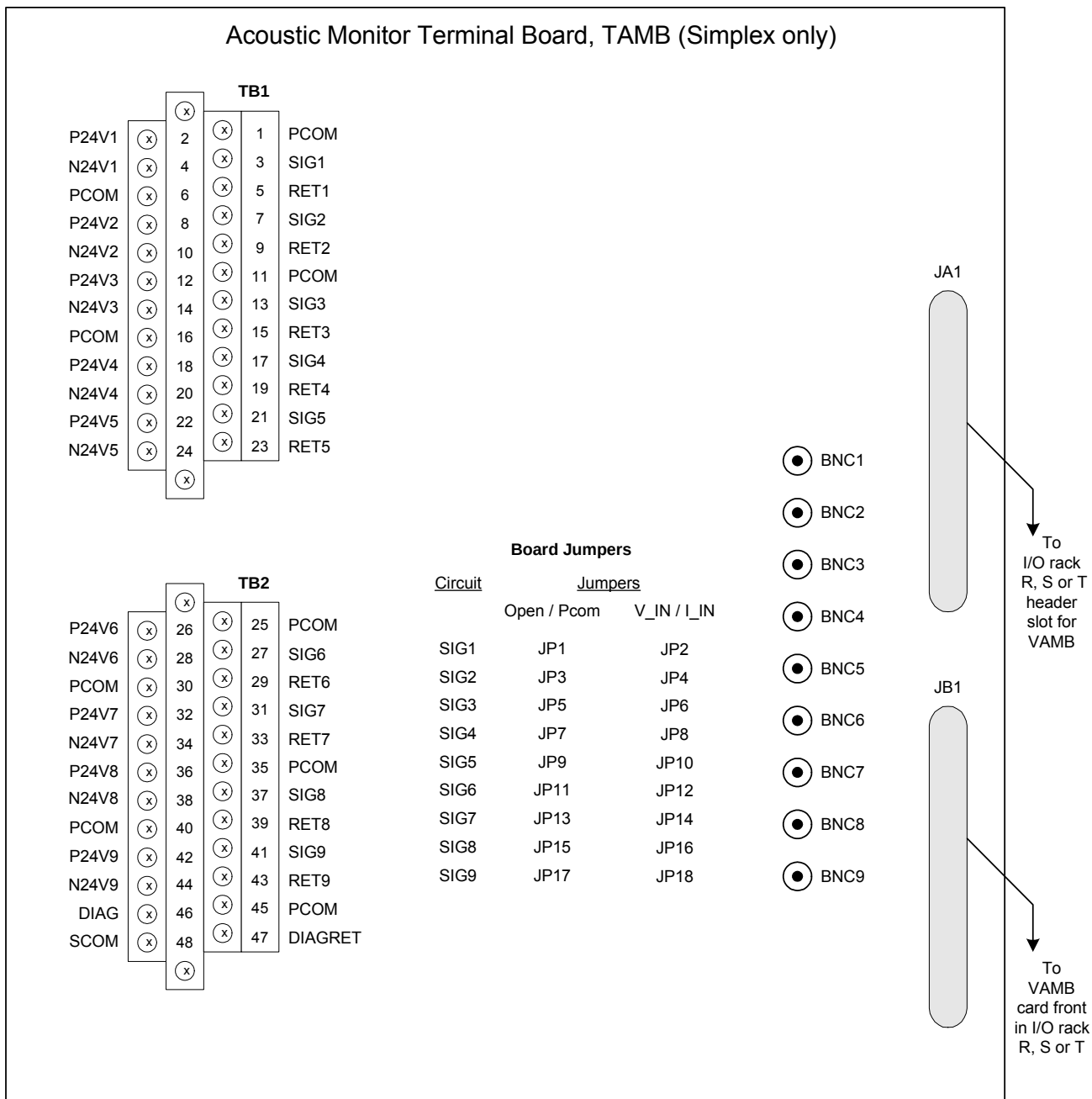
TAMB Acoustic Monitoring Terminal Board

Terminal Point Definitions

Signal Name	Pin #	Description of 48-pin Customer Terminal Points
PCOM	1	Power supply returns for either the P24 V or N24 V supply
P24V1	2	+24 V output feed for input #1's charge amplifier (used with Vibro-meter equipment)
SIG1	3	Dynamic pressure differential voltage input #1 signal side
N24V1	4	-24 V output feed for input #1's charge amplifier (used with Bently-Nevada equipment).
RET1	5	Dynamic pressure differential voltage input #1 return
PCOM	6	Power supply returns for either the P24 V or N24 V supply
P24V2	7	+24 V output feed for input #2's charge amplifier (used with Vibro-meter equipment)
SIG2	8	Dynamic pressure differential voltage input #2 signal side.
N24V2	9	-24 V output feed for input #2's charge amplifier. (used with Bently-Nevada equipment)
RET2	10	Dynamic pressure differential voltage input #2 return
PCOM	11	Power supply returns for either the P24 V or N24 V supply.
P24V3	12	+24 V output feed for input #3's charge amplifier (used with Vibro-meter equipment)
SIG3	13	Dynamic pressure differential voltage input #3 signal side.
N24V3	14	-24 V output feed for input #3's charge amplifier. (used with Bently-Nevada equipment)
RET3	15	Dynamic pressure differential voltage input #3 return
PCOM	16	Power supply returns for either the P24 V or N24 V supply
P24V4	17	+24 V output feed for input #4's charge amplifier (used with Vibro-meter equipment)
SIG4	18	Dynamic pressure differential voltage input #4 signal side
N24V4	19	-24 V output feed for input #4's charge amplifier (used with Bently-Nevada equipment)
RET4	20	Dynamic pressure differential voltage input #4 return
SIG5	21	Dynamic pressure differential voltage input #5 signal side
P24V5	22	+24 V output feed for input #5's charge amplifier (used with Vibro-meter equipment)
RET5	23	Dynamic pressure differential voltage input #5 return
N24V5	24	-24 V output feed for input #5's charge amplifier. (used with Bently-Nevada equipment)
PCOM	25	Power supply returns for either the P24 V or N24 V supply
P24V6	26	+24 V output feed for input #6's charge amplifier (used with Vibro-meter equipment)
SIG6	27	Dynamic pressure differential voltage input #6 signal side
N24V6	28	-24 V output feed for input #6's charge amplifier (used with Bently-Nevada equipment)
RET6	29	Dynamic pressure differential voltage input #6 return
PCOM	30	Power supply returns for either the P24 V or N24 V supply
SIG7	31	Dynamic pressure differential voltage input #7 signal side
P24V7	32	+24 V output feed for input #7's charge amplifier (used with Vibro-meter equipment)
RET7	33	Dynamic pressure differential voltage input #7 return
N24V7	34	-24 V output feed for input #7's charge amplifier (used with Bently-Nevada equipment)
PCOM	35	Power supply returns for either the P24 V or N24 V supply
P24V8	36	+24 V output feed for input #8's charge amplifier (used with Vibro-meter equipment)
SIG8	37	Dynamic pressure differential voltage input #8 signal side
N24V8	38	-24 V output feed for input #8's charge amplifier (used with Bently-Nevada equipment)
RET8	39	Dynamic pressure differential voltage input #8 return
PCOM	40	Power supply returns for either the P24 V or N24 V supply
P24V9	41	+24 V output feed for input #9's charge amplifier (used with Vibro-meter equipment)
SIG9	42	Dynamic Pressure differential voltage input #9 signal side
N24V9	43	-24 V output feed for input #9's charge amplifier (used with Bently-Nevada equipment)
RET9	44	Dynamic pressure differential voltage input #9 return

Signal Name Pin # Description of 48-pin Customer Terminal Points

PCOM	45	Power supply returns for either the P24 V or N24 V supply
DIAG	46	Diagnostic DAC output
DIAGRET	47	Return for diagnostic DAC output
SCOM	48	Shield ground

*Acoustic Monitor Terminal Board, TAMB*

TAMB Jumper Settings

Vendor	Vendor Model	Vendor I/O Conn.	TAMB Terminal Point (x=1 to 9)	TAMB Jpn (n=even number) Position	TAMB Jpn (n=odd number) Position
Bently-Nevada	350500 3-wire method	NC	P24Vx	V_IN	PCOM
		OUT	SIGx		
		COM	RETx		
		VT	N24Vx		
		NC	PCOM		
Bently-Nevada	350500 4-wire method (better than 3-wire)	NC	P24Vx	V_IN	Open
		OUT	SIGx		
		COM	RETx		
		VT	N24Vx		
		COM	PCOM		
Vibro-meter	IPC 620 or IPC 704 with GSI 122 or 130 3-wire method	+24V	P24Vx	V_IN	PCOM
		VOUT	SIGx		
		0V	RETx		
		NC	N24Vx		
		NC	PCOM		
Vibro-meter	IPC 620 or IPC 704 with GSI 122 or 130 4-wire method	+24V	P24Vx	V_IN	Open
		VOUT	SIGx		
		0V	RETx		
		NC	N24Vx		
		0V	PCOM		
GE Power System's Charge Converter Signal Amp (CCSA)	CCSA	NC	P24Vx	V_IN	Open
		OUT+	SIGx		
		OUT-	RETx		
		NC	N24Vx		
		NC	PCOM		
PCB Piezotronics	111A21, 102A05, 102M43, 102M158, 102M170, 102M174	NC	P24Vx	V_IN	PCOM
		Signal	SIGx		
		Ground	RETx		
		NC	N24Vx		
		NC	PCOM		
GE / Reuter-Stokes	Flame Tracker RS-FS -9001 & -9002 -9004, -9005 & -9006	+ conn.	P24Vx	I_IN	PCOM
		- conn.	SIGx		
		NC	RETx		
		NC	N24Vx		
		NC	PCOM		

Operation

The VAMB software features include:

- 18 channels of acoustic monitoring with
 - Synchronous sampling of all 18 channels of data
 - Configuration of TAMB terminal board controlling open circuit test voltage and constant current mode
 - A/D gain and offset adjustment
 - Dc bias removal from dynamic pressure signal to maximize SNR
 - Proprietary firmware functions
 - RMS calculation of the sampled AC signal data.

Milli-volt to engineering unit's conversion of RMS value

- Configuration constants can be changed through Mark VI toolbox
- 40 ms frame rate updates for signal space variables used by the application software
- Offline and online diagnostics to check the hardware

A/D Compensation

The A/D compensation function nulls any gain or offset error due to initial component variances. The firmware has an auto-calibration function built in for the A/Ds it controls. The auto-calibration function compares each of the 18 analog channels against a gold standard A/D channel. The gold standard A/D channel is calibrated using a standard high-precision voltage reference and the A/D common.

Note Refer to the figure, *Channel x Acoustic Monitoring Block Diagram*, where x equals 1-18.

Input Units to Engineering Value Conversion

The Acoustic Monitoring function provides a conversion from the hardware input units to the engineering units needed for the system calculation. For the mV to psi conversion, the range is 20 to 600 mV per psi. The firmware will be given four configuration parameters per channel to define the equation for the transfer function.

Value (engineering units in counts) = GUnitConversion * Input (milli-volts in counts) + Offset

where

$$GUnitConversion = (High_Value - Low_Value) / (High_Input - Low_Input)$$

$$Offset = High_Value - GUnitConversion * High_Input$$

where High_Value, Low_Value, High_Input + Low Input are the configuration parameters.

A/D Gain Adjust

The configuration parameter, Gain defined for each channel controls the channel gain in the hardware. This allows for the amplification of low level signals to provide better resolution in the analog to digital conversion hardware. The gain options are 1, 2, 4 and 8. The channel control writes the gain set up to the FPGA VSPA input amplifier 4x and 2x gain control registers. The signal level calculated by the VAMB firmware will not change with a change in the Gain parameter because the signal is divided by the Gain factor in the firmware to result in a net gain of 1 for the signal regardless of the gain factor used. The maximum expected signal level should not exceed 10 V (saturation) after the gain is applied as indicated in the following table.

Rules for selecting proper value for Gain

Gainx	Maximum magnitude of input signal after dc bias is removed (volts)
1	10
2	5
4	2.5
8	1.25

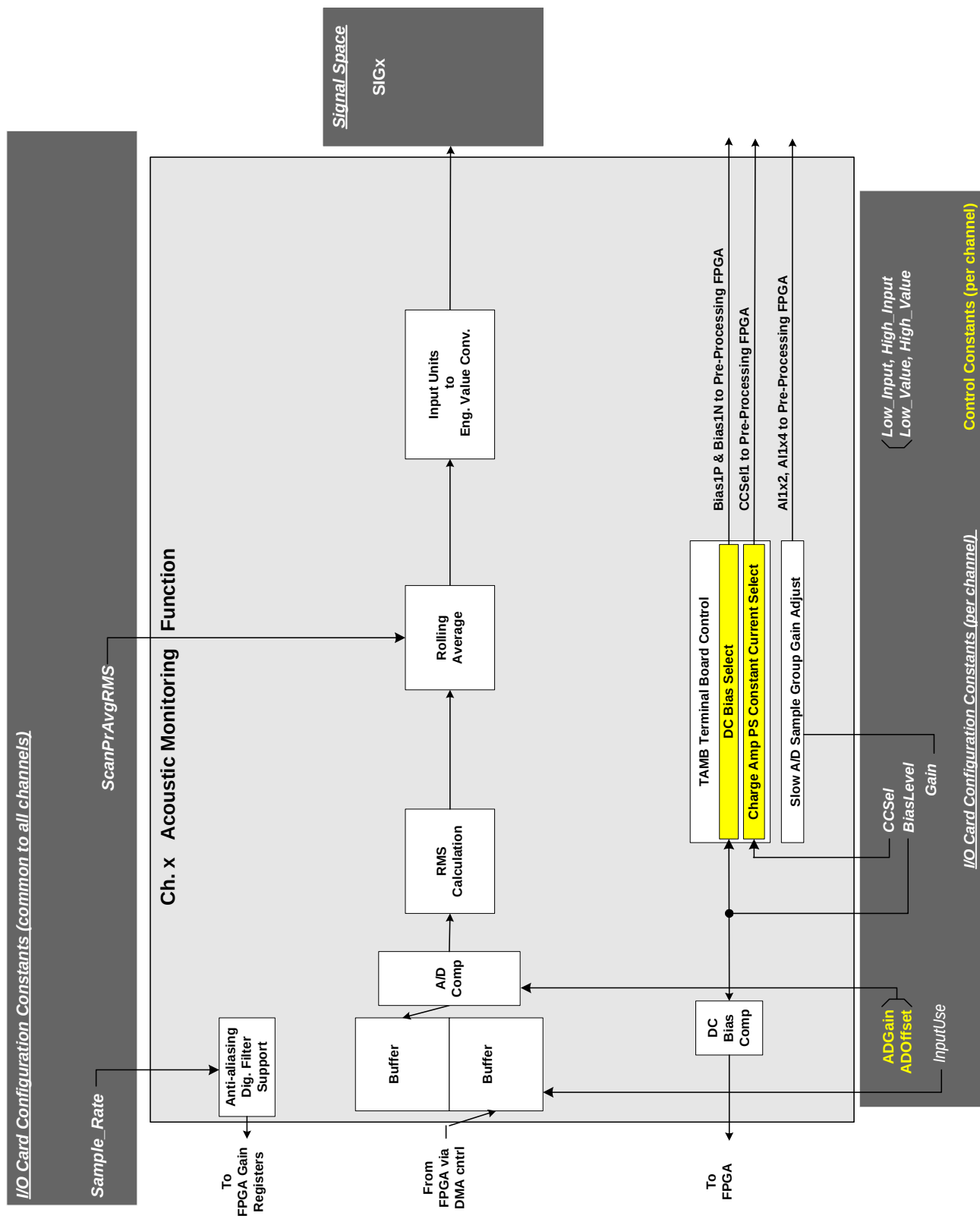
Rms Calculation and Rolling Average

The root-mean-square (rms) calculation performs an rms calculation on the ac acoustic information sampled for a given scan. The rms is defined as follows:

$$\text{rms_Chx} = \text{SQRT} \left((\text{AC_Input}(0)**2 + \text{AC_Input}(1)**2 + \dots + \text{AC_Input}(\text{Buffer_Length})**2) / \text{Buffer_Length} \right)$$

Where x is the channel number.

The rolling average provides a smoothing function to reduce the vibration in the signal.



Specifications

Signal Input Accuracy

Requirement	Limits
RMS Calculation Accuracy for Gain = 1, 2, 4 or 8 volts / volt	±2.0% full scale
Peak-to-Peak FFT Calculation Accuracy for Gains = 1, 2, 4 or 8 volts / volt	±0.5% full scale from 0 to 1600 Hz ±1.5% full scale from 1601 to 3200 Hz

Power Supply

Requirement	Limits
Number of P24 dual-mode outputs (one current-limit output, P24 Vx and one constant current output tied to SIGx selectable through CCSELx)	9 (one per channel)
P24 V (current-limit mode selected)	+22.8 to +25.2 V dc
P24 nominal current (current-limit mode selected) (due to standing current of IPC 704 on GSI 122/130)	44 mA ±10%
P24 minimum/maximum peak current range (current-limit mode selected) (due to ±5 mA ac signal component plus some over range riding on top of standing current of IPC 704 connected to GSI 122/130 from Vibro-meter)	20 – 60 mA
P24 V (constant current mode selected with supply tied to SIGx)	+20 to +30 V dc
P24 nominal current (constant current mode selected)	3.5 mA ±10%
Constant current input type	TTL
Constant current selection logic level for TRUE state. (TAMB ckt. provides a pull-up for the input.)	High
Number of N24 current-limited outputs	9 (one per channel)
N24 V	-18.85 to -26 V dc
N24 nominal current	20 mA
N24 maximum load current	30 mA

Jumper Selections

Requirement	Limits
Number of JPx (even) 3-pin jumpers with one side tied to the signal line, SIGx and the opposite side left open with the center pin tied to the 250 W burden resistor.	9 (one per channel)
Silk screen label for connection from signal line, SIGx to the 250 W burden resistor.	I_IN
Silk screen label for connection from the 250 Ω burden resistor to no-connect pin (open).	V_IN
Number of JPx (odd) 3-pin jumpers with one side tied to the return signal, RETx , and the opposite side left open with the center pin tied to PCOM.	9 (one per channel)
Silk screen label for connection from signal return, RETx to PCOM	PCOM
Silk screen label for connection from PCOM to no connect pin.	OPEN

Bias Control

Requirement	Limits
Number of TAMB channels with bias control.	9 (one per channel)
Control input signal type	TTL
Bias control input true state	Logic high
Dc error to dynamic signal channel produced by the bias control.	< 0.5 %

Constant Current Select for P24

Requirement	Limits
Number of constant current control inputs	9 (one per channel)
Control input signal type	TTL

Buffered BNC Outputs

Requirement	Limits
Number of buffered BNC outputs	9 (one per channel)
Dc gain (Dc bias is removed from signal)	1 $\pm$ 0.5 %
Allowable offset	30 mV $\pm$ 10%
Output impedance	40 Ω $\pm$ 50%
J6 connector type for QC	25-pin D shell

Diagnostics

Three LEDs at the top of the VAMB 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 exists in the board.

Each input has system limit checking based on two configurable levels. These limits can be configured for enable/disable, $\geq$ or $\leq$, and as latching/nonlatching. RESET_SYS resets the out of limits. If this limit is exceeded a system limit logic signal is set.

Each input has sensor limit checking, open circuit detection, and dc bias autonulling and excessive dc bias detection. Alarms will be generated for these diagnostics. Refer to *I/O Board Alarms and Point Configuration*. RESET_SYS resets these alarms.

The TAMB terminal board has its own ID device, which is interrogated by the I/O board. The board is coded into a read-only chip containing the terminal board serial number, board type, revision number, and the JR, JS, JT connector location. This ID is checked as part of the power-up diagnostics.

Configuration

Note The following information is extracted from the ToolboxST application and represents a sample of the configuration information for this board. Refer to the actual configuration file within the ToolboxST application for specific information.

Module Parameter	Description	Choices
BinReject	Defines the number of side bins that will be rejected when the search function is applied to the FFT results for channels 1 through 18. 0 = no bins rejected	0 to 6
Config_Mode	Defines the source of the currently active configuration. The Toolbox allows only mode Toolbox as a selection. The remote gateway configurator forces mode to tuning configurator without user control.	Toolbox only
FFT_Length	Defines the number of samples that will be used in the FFT calculation. Selections are: 1024, 2048, 4096, 8192, 16382, and 32768..	1024 to 32768
FFT_TF_SelA	Boolean that selects the internal test file as the input to all the acoustic monitoring channels instead of the actual analog input signals.	HW_Input to File
EventLstSel	Defines the sample site for the event capture list. Disable: list not used FFT_Out; fft output scaled in volts TC_Out: fft output after transducer compensation PSI_Out: fft outputs scaled in PSI Avg_Out: PSI_Out after averaging filter	Disable to Avg_Out
HiB_Limit	Defines the limit level for the maximum peak-peak amplitude signal in the high frequency band.	0 to 50 Psi
HiScrChBrkPt	Defines the frequency boundary between the high and screech frequency bands.	0 to 3200 Hz
LoLoB_Limit	Defines the limit level for the maximum amplitude signal in the low-low frequency band.	0 to 50 Psi
LowB_Limit	Defines the limit level for the maximum amplitude signal in the low frequency band.	0 to 50 Psi
LowLow_EndPt	Defines the ending frequency of the low-low frequency band.	0 to 3200 Hz
LowLowStrtPt	Defines the starting frequency of the low-low frequency band.	0 to 3200 Hz
LowMid_BrkPt	Defines the frequency boundary between the low and mid frequency bands.	0 to 3200 Hz
Low_StrtPt	Defines the starting frequency of the low band.	0 to 3200 Hz
MidB_Limit	Defines the limit level for the maximum amplitude signal in the mid frequency band	0 to 50 Psi
MidHi_BrkPt	Defines the frequency boundary between the mid and high frequency bands.	0 to 3200 Hz
NumEventScns	Defines the number of scans an event buffer will contain. *note if the sample location is set to Raw_Input the maximum scan allowed is 1.	1 to 32 Scans
OpLstSel	Defines the sample site for the spectrum on demand capture or diagnostic list. Selections are: Disable: list not used Raw_Input: input time domain data FFT_Out; fft output scaled in volts TC_Out: fft output after transducer compensation PSI_Out: fft outputs scaled in PSI Avg_Out: PSI_Out after averaging filter	Disable to Avg_Out Bool

Module Parameter	Description	Choices
PL_Fil_Freq	Defines the power line frequency that the notch filter will remove from the spectral content of the FFT output. Selections are 50 or 60 Hz.	50_Hz to 60_Hz
PL_Fil_Tol	Tolerance for power line filter signature calculated vs theoretical. Ten percent tolerance is 0.1.	0 to 1.0
PL_Fil_Width	Defines the bandwidth of the power line notch filter. The bandwidth will be $\pm$ value entered centered about the configured power line frequency.	0 to 100 Hz
SampleRate	Sample rate defines the FFT sample rate for all the acoustic monitoring channels 1–18. Selections are: 12,877 Hz only.	12,877 Hz only
ScanPrAvgFFT	Number of scans per average in the acoustic monitoring filtered FFT output. Selections are: integers 1–32	1 to 32 scans
ScanPrAvgRMS	Number of scans per average in the RMS calculation. Selections are: integers 1–32	1 to 32 scans
SearchInAvg(1) SearchInAvg(6)	Selects whether the sort function for the pk-pk amplitudes uses the present scan only or uses an averaged value	No average, Average
Session_Time	Scheduled time for temporary configuration mode. This time is forced to zero in the Toolbox. This value shall be set to the user-selected time in the temporary gateway remote configurator.	0 to 480 minutes
ScrchB_Limit	Defines the limit level for the maximum amplitude signal in the screech frequency band.	0 to 50 Psi
Scrch_EndPt	Defines the ending frequency of the screech frequency band.	0 to 3200 Hz
SysLimitDis	Enable all system limit checking.	Disable, Enable
T_FilWidth	Width ($\pm$ Hz) of the filter that excludes the transverse frequency fft coefficients and all fft coefficients designated by this filter from the screech band search.	0 to 100 Hz
TMC_Gain(1) – TMC_Gain(30)	Transducer mounting compensation gain values for 30 points to characterize the gain response.	0 to 10
TMC_Freq(1) – TMC_Freq(30)	Frequency corresponding to the gain value entered. Each of the 30 gain points has a corresponding frequency value.	0 to 3200 Hz
TrnsB_Limit	Defines the limit level for the maximum amplitude signal in the transverse frequency band.	0 to 50 Psi
Trns_Bnd_Enb	Enable calculations associated with the transverse band and excludes its FFT coefficients from the screech band.	Disable, Enable
Trns_EndPt	Defines the ending frequency of the transverse frequency band.	0 to 3200 Hz
Trns_StrtPt	Defines the starting frequency of the transverse frequency band.	0 to 3200 Hz
WindowSelect	Selects the windowing function to be used on the sampled data for both Channel A and B. Rectangular Hamming Hanning Triangular Blackman Blackman-Har(ris) Flat Top	Rectangular to Flat Top
ZoomCanSel	Selects one of the 18 acoustic monitoring cans to zoom in on. Selections are: None Can_1 through Can_18	0 to 18
ZoomFFTLngth	Defines the Zoom FFT Length of the input buffer.	1024, 2048, 4096, 8192, 16384, 32768

Module Parameter	Description	Choices
ZmEvtLstSel	Defines the sample site for the zoom event capture list. Selections are: Disable, FFT_Out, TC_Out, PSI_OUT, and Avg_Out	Disable to Avg_Out
ZmOpLstSel	Defines the sample site for the zoom operator capture list. Selections are: Disable: list not used Raw_Input: input time domain data FFT_Out: fft output scaled in volts TC_Out: fft output after transducer compensation PSI_Out: fft outputs scaled in PSI Avg_Out: PSI_Out after averaging filter	Disable to Avg_Out

Terminal Point Configuration

Module Parameter	Sig1	Description First of 9 analog inputs - board point	Choices Point volts RMS
Gain		Analog Input resolution adjustment used to amplify signal before digital conversion. Gain factor * (maximum signal peak voltage) must be less than 10 volts to prevent saturation. Selections: 1, 2, 4, and 8	1,2,4, 8 Volts / Volt
BiasLevel		BiasLevel is a dc bias voltage subtracted from the analog signal inputted for the dc bias compensation and used by the TAMB dc bias select. Only used when InputUse is either custom or file.	-11.6 to + 11.6 V dc
Can_Id		Combustor can be wired to this terminal board signal. This normally corresponds to the signal number to avoid confusion; wire terminal board signal 1 to can 1.	1 to 18
CCSel		If constant current select is equal to 1 then the P24 voltage supply is configured as a constant current supply providing a 4 mA output. Only used when InputUse is set to custom.	False, True .
High_Input		Defines point 2 x-axis value in milli-volts for TAMB terminal point that is used in calculating the gain and offset for the conversion to engineering units.	0 to 9998.8 mV
High_Value		Defines point 2 Y-axis value in engineering units for TAMB terminal point that is used in calculating the gain and offset for the conversion from milli-volts to engineering units.	0 to 99999 PSI
InputUse		Selects the sensor type used on the signal. Selections are: Unused, Bently-Nevada, Vibro-meter, Vibro-mA(current), 4 CCSA, PCB, GE/RS (Reuter Stokes), Custom,– File(test data stored in VAMB)	Unused To File
Low_Input		Defines point 1 x-axis value in milli-volts for TAMB terminal point that is used in calculating the gain and offset for the conversion to engineering units.	0 to 9998.8 mV
Low_Value		Defines point 1 Y-axis value in engineering units for TAMB terminal point that is used in calculating the gain and offset for the conversion from milli-volts to engineering units.	0 to 99999 PSI
PL_Fil_En		Enables the power line notch filter.	Disable, Enable
DiagHighEnab		Enables high input sensor limit diagnostics.	Disable, Enable
DiagLowEnab		Enables low input sensor limit diagnostics.	Disable, Enable
OcBiasEnab		Enables bias for open circuits.	Disable, Enable
BiasNullEnab		Enables automatic dc bias nulling.	Disable, Enable
DiagOCChk		Enables open sensor error diagnostic test.	Disable, Enable
DiagBiasNull		Enables excessive dc bias diagnostic test.	Disable, Enable
DiagSigSat		Enables signal saturation diagnostic test.	Disable, Enable
SysLim1Enabl		Enables system limit 1 fault check.	Disable, Enable
SysLim1Latch		Selects whether a fault is latching.	NotLatch, Latch
SysLim1Type		Selects how the test values are compared.	<=, >=
SysLimit1		Value to use for system limit comparison.	-1000 to 1000 Psi

Module	Parameter Sig1	Description First of 9 analog inputs - board point	Choices Point volts RMS
SysLim2Enabl		Enables system limit 2 fault check.	Disable, Enable
SysLim2Latch		Selects whether a fault is latching.	Not Latch, Latch
SysLim2Type		Selects how the test values are compared.	<=, >=
SysLimit2		Value to use for system limit comparison.	-1000 to 1000 Psi

VAMB Board Points

Board Points (Signals)	Description – Point Edit(Enter Signal Connection)	Direction	Type
L3DIAG_VAMB1	Board Diagnostic	Input	BIT
L3DIAG_VAMB2	Board Diagnostic	Input	BIT
L3DIAG_VAMB3	Board Diagnostic	Input	BIT
Can1_Health	Combustor can 1 signal health	Input	BIT
:	:		
Can18_Health	Combustor can 18 signal health	Input	BIT
Sig1_SysLim1	Terminal board signal 1 outside of system limits 1	Input	BIT
:	:		
Sig18_SysLim1	Terminal board signal 18 outside of system limits 1	Input	BIT
Sig1_SysLim2	Terminal board signal 1 outside of system limits 2	Input	BIT
:	:		
Sig18_SysLim2	Terminal board signal 18 outside of system limits 2	Input	BIT
Test_Config	Card is temporarily remotely configured	Input	BIT
Test_Mode	Signals are from internal test sources, not from terminal board	Input	BIT
TripCapList	A capture list triggered by TripCapReq is available	Input	BIT
UserCapList	A capture list manually requested by a user is available	Input	BIT
VambBool_1	General Electric Proprietary Information	Input	BIT
:	:		
VambBool_6	General Electric Proprietary Information	Input	BIT
VambPt_0	General Electric Proprietary Information	Input	INTEGER
:	:		
VambPt_263	General Electric Proprietary Information	Input	INTEGER
Num_Of_Scans	Scan (block of FFT data) number of this data (1-32)	Input	INTEGER
Num_Avg_Scns	Number of scans (block of FFT data) averaged (1-32)	Input	INTEGER
Session_Tmr	Time remaining for remote tuning session	Input	INTEGER
Trip_Cap_Req	Request for trip capture buffer collection	Input	BIT

Alarms

I/O Board Diagnostic Alarms

Fault	Fault Description	Possible Cause
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 will not go online)
16	System Limit Checking is Disabled	System limit checking was disabled by configuration
18	Incorrect J3 Terminal Board ID	Cable to J3 connector not properly connected to a TAMB terminal board or terminal board defective.
19	Incorrect J4 Terminal Board ID	Cable to J4 connector not properly connected to a TAMB terminal board or terminal board defective.
20	Incorrect J6 Terminal Board ID	Cable to J6 connector not properly connected to a TAMB terminal board or terminal board defective.

Fault	Fault Description	Possible Cause
21	Incorrect J7 Terminal Board ID	Cable to J7 connector not properly connected to a TAMB terminal board or terminal board defective.
30	ConfigCompatCode Mismatch;Firmware:#.Tre:#.	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:#	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.
38	Flashdisk error: Unable to revert to flash configuration after remote access	Permanent configuration data on card is corrupted. Download firmware to card or replace card.
39	JA1-JB1 TB IDs do no match: Check for cross-cabling	Terminal board cables are not properly connected. Check for cross-cabling.
40	VAMB A/Ds not calibrated, Run Self Test	Contact factory for instructions to run self test.
41-58	Sig x: Open Ckt Test Failed. Check Wires and Sensor.	Open circuit detected for terminal board signal Sig x, where x is the identified point. Check wiring and sensor.
61-78	Sig x: Bias Nulling Error. Check InputUse Config.	Dc bias designated for sensor type is outside of range detected for sensor. Check sensor type in configuration parameter InputUse, or check dc bias voltage on signal.
81-98	Sig x: Input Signal Saturated Check Gain Config	Peak input voltage is saturating input. Decrease configuration parameter Gain for designated signal, or check for sensor problem.
101- 118	Sig x: Sensor Limit Exceeded	Peak input voltage exceeds limit for selected sensor type. Check sensor type in configuration parameter InputUse, or check for sensor problem.