3500/44M Aeroderivitive GT Vibration Monitor

Datasheet

Cordant™

143441 Rev. W

Description

The Bently Nevada™ 3500/44M Aeroderivitive GT Vibration Monitor is a four-channel instrument designed for aeroderivative gas turbine applications. It:

- Continuously monitors machinery by comparing monitored parameters against configured alarm setpoints to drive alarms
- Communicates essential machine information for both operations and maintenance personnel

The 3500/44M 's Aero GT I/O modules interface to Velomitor sensors and accelerometers through Bently Nevada interface modules. The monitor uses the Prox/Velom I/O to interface to our .

Using the 3500 Rack Configuration Software, you can configure the 3500/44M Aeroderivitive GT Vibration Monitor for the following filter options:

- Signal Integration
- 1X vibration tracking
- Band-pass vibration

The 3500/44M Aeroderivitive GT Vibration Monitor accepts input from two separate Keyphasor signals, allowing each channel pair to use a different tracking filter.

You can configure multimode channels to have up to eight sets of alarm parameters including alert and danger setpoints and alarm time delays. Each set may be configured for a specific machine mode.

As the machine changes modes, the monitor can switch to a specific set using contacts on multimode I/O modules or software commands through a communications gateway.

Baker Hughes

Specifications

Inputs

Signal	Accepts 1 to 4 signals from interface modules (part numbers 86517 and 86497), velomitors and accelerometers
Power consumption	7.7 Watts, typical
Input Impedance	
Aero GT I/O	Greater than 95 kΩ (Proximitor and acceleration inputs)
Prox/Velom I/O and Multimode Prox/Velom I/O	10 kΩ for Prox/Accel 3.5 MΩ for Velomitor

Sensitivity

Aeroderivative	3.94 mV/(mm/s) (100mV/(in/s)) or 5.71 mV/(mm/s) (145mV/(in/s))
Aeroderivative2 and Multimode Aeroderivative	3.94 mV/(mm/s) (100mV/(in/s)), 5.71 mV/(mm/s) (145mV/(in/s)), 10.19 mV/(m/s2) (100 mV/g), 2.55 mV/(m/s2) (25 mV/g) **or** 1.02 mV/(m/s2) (10 mV/g)

Outputs

Front Panel LEDs	
OK LED	Indicates when the 3500/44M Aeroderivitive GT Vibration Monitor is operating properly.
TX/RX LED	Indicates when the 3500/44M Aeroderivitive GT Vibration Monitor is communicating with other modules in the 3500 Rack.
Bypass LED	Indicates when the 3500/44M Aeroderivitive GT Vibration Monitor is in Bypass Mode.
Buffered Transducer Outputs	The front of each monitor has one coaxial connector for each channel. Each connector is short-circuit protected.
Output Impedance	550 Ω
Transducer Power Supply	23 Vdc nominal at 43 mA max
Recorder	+4 to +20 mA Output is proportional to monitor full-scale. One output is provided for each channel. Monitor operation is unaffected by short circuits on recorder outputs.
Voltage Compliance (current output)	0 to +12 Vdc range across load Load resistance is 0 to 600 Ω.
Resolution	0.3662 µA per bit ±0.25% error at room temperature ±0.7% error over temperature range Update rate 100 ms or less

Signal Conditioning

Specified at +25°C (+77°F) unless otherwise noted.

Aeroderivative

Accuracy	Within ±0.33% of full-scale typical ±1% maximum Exclusive of filters
Frequency Response	
Direct signal	4 Hz to 30 kHz, -3 dB
Direct Signal - Bandpass Filter	
Low-pass corner	200 Hz (-3 dB)
Low-pass rolloff	10-pole 200 dB per decade 60 dB per octave
High-pass corner	25, 75 or 100 Hz (-3 dB)
High-pass rolloff	10-pole 200 dB per decade 60 dB per octave
Direct Signal - Tracking Filter	
Tracking filter	Valid for machine speeds of 60 to 240,000 cpm
Constant Q	User-configurable by selecting one of 22 normal operating speeds from 2,400 to 18,000 RPM and by bandwidth of 3 or 5Hz
Rolloff	6-pole 120 dB per decade 36 dB per octave

Aeroderivative 2 and Multimode Aeroderivative

Accuracy	Within ±0.33% of full-scale typical ±1% maximum Exclusive of filters
Frequency Response **Direct Signal - Bandpass Filter**	
Non-integrated velocity	4 Hz to 5500 Hz (-3 dB)
Integrated velocity	18 Hz to 5500 Hz (-3 dB)
Non-integrated acceleration	4 Hz to 30,000 Hz (-3 dB)
Integrated acceleration	18 Hz to 14,500 Hz (-3 dB)
Bias low-pass filter	0.01 Hz (-3 dB)
Bandpass Filter	
Low-pass cutoff frequency	Configurable between 100 Hz and 5500 Hz (-3 db)
Low-pass rolloff	8-pole 160 dB per decade 48 dB per octave
High-pass cutoff frequency	Configurable between 10 Hz and 1000 Hz (-3 dB)
High-pass rolloff	8-pole 160 dB per decade 48 dB per octave

Tracking Filter	
Constant Q	User configurable You can select one of 35 normal operating speeds from 2,400 to 30,000 RPM and bandwidth of 3 or 5 Hz.
Rolloff	6-pole 120 dB per decade 36 dB per octave

Alarms

Alarm setpoints	You can set Alert levels for various values measured by the monitor and Danger setpoints for up to two of the values measured by the monitor using configuration software. Alarms are adjustable from 0 to 100% of full-scale for each measured value except when the full-scale range exceeds the range of the transducer. In this case, the range of the transducer will limit the setpoint.
Alarm accuracy	Within 0.13% of the desired value
Aeroderivative	Direct 1X Amplitude Bandpass
Aeroderivative2	Direct Bandpass 1X Amplitude 1X Phase Lag
Multimode Aeroderivative	Direct Direct-B Bandpass Bandpass-B 1X Ampl 1X Ampl-B 1X Phase Lag
Alarm Time Delays	For Aeroderivative channels, you can set one alert and one danger delay for each channel. For Aeroderivative2 and Multimode Aeroderivative channels, you can set delays for each measured value having alarm setpoints.
Alert	From 1 to 60 seconds in 1 second intervals
Danger	0.1 seconds or from 1 to 60 seconds in 1 second intervals

Measured Values

Measured values are measurements used to monitor the machine. The 3500/44M Aeroderivitive GT Vibration Monitor provides the following measured values.

Aeroderivative	Direct 1X Amplitude Bandpass
Aeroderivative2	Direct Bandpass Bias 1X Amplitude 1X Phase Lag
Multimode Aeroderivative	Direct Direct-B Bandpass Bandpass-B 1X Ampl 1X Ampl-B 1X Phase Lag Mode

Physical

Monitor Module (Main Board)	
Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 241.8 mm (9.50 in x 0.96 in x 9.52 in)
Weight	0.91 kg (2.0 lb)
I/O Modules	
Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 99.1 mm (9.50 in x 0.96 in x 3.90 in)
Weight	0.45 kg (1.0 lb)

Rack Space Requirements

Monitor Module	1 full-height front slot
I/O Modules	1 full-height rear slot

Compliance and Certifications

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

EMC

European Community Directive:

EMC Directive 2014/30/EU

Standards:

EN 61000-6-2; Immunity for Industrial Environments
EN 61000-6-4; Emissions for Industrial Environments

Electrical Safety

European Community Directive:

LV Directive 2014/35/EU

Standards:

EN 61010-1

RoHS

European Community Directive:

RoHS Directive 2011/65/EU

China RoHS

Cables associated with the product(s) mentioned in this datasheet have an EFUP designation of 15 years, in accordance with SJ/T 11364-2024.

Maritime

DNV GL rules for classification – Ships, offshore units, and high speed and light craft

ABS Rules for Condition of Classification, Part 1

- Steel Vessels Rules
- Offshore Units and Structures

Hazardous Area Approvals

For the detailed listing of country and product-specific approvals, refer to the *Approvals Quick Reference Guide (108M1756)*.

For additional technical documentation, please log in to bntechsupport.com and access the Bently Nevada Media Library.

cNRTLus

When used with I/O module ordering options without internal barriers	Class I, Zone 2: AEx/Ex nA nC ic IIC T4 Gc; Class I, Zone 2: AEx/Ex ec nC ic IIC T4 Gc; Class I, Division 2, Groups A, B, C, and D; T4 @ Ta= -20˚C to +65˚C (-4˚F to +149˚F) When installed per drawing 149243 or 149244.
When used with I/O module ordering options with internal barriers	Class I, Zone 2: AEx/Ex nA nC ic [ia Ga] IIC T4 Gc; Class I, Zone 2: AEx/Ex ec nC ic [ia Ga] IIC T4 Gc; Class I, Division 2, Groups A, B, C, and D (W/ IS Output for Division 1) T4 @ Ta= -20˚C to +65˚C (-4˚F to +149˚F) When installed per drawing 138547.

ATEX/IECEx

When used with I/O module ordering options without internal barriers	II 3 G Ex nA nC ic IIC T4 Gc; Ex ec nC ic IIC T4 Gc; T4 @ Ta= -20˚C to +65˚C (-4˚F to +149˚F) When installed per drawing 149243 or 149244.
When used with I/O module ordering options with internal barriers	II 3(1) G Ex nA nC ic [ia Ga] IIC T4 Gc; Ex ec nC ic [ia Ga] IIC T4 Gc; T4 @ Ta= -20˚C to +65˚C (-4˚F to +149˚F) When installed per drawing 138547.

Ordering Information

For the detailed listing of country and product-specific approvals, refer to the *Approvals Quick Reference Guide (108M1756)*.

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Aeroderivative Monitor 3500/44 - AA - BB

A: I/O Module Type	
01	Aero GT I/O Module with Internal Terminations
02	Aero GT I/O Module with External Terminations
05	Prox/Velom I/O Module with Internal Terminations
06	Prox/Velom I/O Module with External Terminations
07	Multimode Prox/Velom I/O Module with Internal Terminations
08	Multimode Prox/Velom I/O Module with External Terminations
B: Hazardous Area Approval Option	
00	None
01	cNRTLus (Class 1, Division 2)
02	ATEX/IECEx/CSA (Class 1, Zone 2)

External Termination Blocks

125808-03	Aeroderivative ET Block Euro Style Connectors
125808-08	Prox/Velom External Termination Block Euro Style connectors
125808-11	Multimode Prox/Velom External Termination Block Euro Style connectors
125808-13	Multimode Recorder Output and Mode Input External Termination Block Euro Style connectors
128702-01	Recorder External Termination Block Euro Style connectors
128015-03	Aeroderivative External Termination Block Terminal Strip Connectors
128015-08	Prox/Velom External Termination Block Terminal Strip Connectors
128015-11	Multimode Prox/Velom External Termination Block Terminal Strip connectors
128015-13	Multimode Recorder Output and Mode Input External Termination Block Terminal Strip connectors
128710-01	Recorder External ET Block Terminal Strip connectors

Cables

3500 Transducer (XDCR) to External Termination (ET) Block Cable 129525 - AAAA - BB

A: I/O Cable Length	
0005	5 feet (1.5 metres)
0007	7 feet (2.1 metres)
0010	10 feet (3.0 metres)
0025	25 feet (7.6 metres)
0050	50 feet (15.2 metres)
0100	100 feet (30.5 metres)
B: Assembly Instructions	
01	Not Assembled
02	Assembled

3500 Recorder Output to External Termination (ET) Block Cable 129529 - AAAA - BB

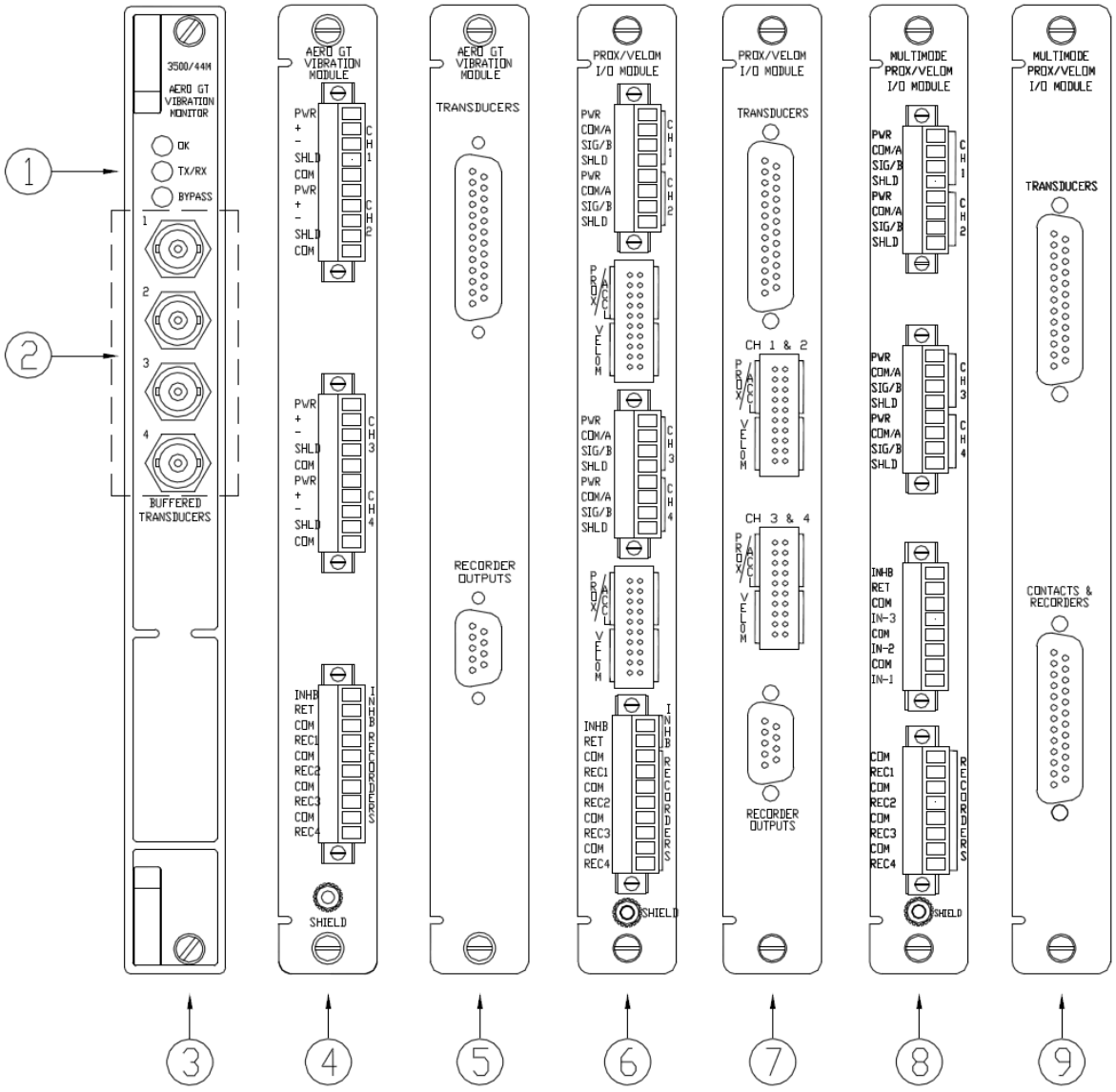
A: I/O Cable Length	
0005	5 feet (1.5 metres)
0007	7 feet (2.1 metres)
0010	10 feet (3.0 metres)
0025	25 feet (7.6 metres)
0050	50 feet (15.2 metres)
0100	100 feet (30.5 metres)
B: Assembly Instructions	
01	Not Assembled
02	Assembled

Spares

176449-03	3500/44M Aeroderivitive GT Vibration Monitor
143490-01	3500/44M Aeroderivitive GT Vibration MonitorUser Guide
126599-01	Aero GT I/O Module Internal Terminations
140471-01	Prox/Velom I/O Module with Internal Terminations
140482-01	Prox/Velom I/O Module with External Terminations
169459-01	Multimode Prox/Velom I/O Module with Internal Terminations
169459-02	Multimode Prox/Velom I/O Module with External Terminations
00580434	Euro Style connector header 8 pin Green For use on I/O modules with internal terminations
00580432	Euro Style connector header 10 pin Green For use on I/O modules with internal terminations
00561941	Prox/Velom and Multimode Prox/Velom I/O Module ten-pin connector shunt

166M2389	Connector Header Push-in-Spring Type (Alternative for PN 00580434)
166M2388	Connector Header Push-in-Spring Type (Alternative for PN 00580432)

Graphs and Figures



1. Status LEDs
2. Buffered Transducer Outputs
3. 3500/44M Aeroderivitive GT Vibration Monitor Main Module
4. Aero GT I/O Module with Internal Terminations
5. Aero GT I/O Module with External Terminations
6. Prox/Velom I/O, Internal Terminations
7. Prox/Velom I/O, External Terminations
8. Multimode Prox/Velom I/O, Internal Terminations
9. Multimode Prox/Velom I/O, External Terminations

Figure 1: Front and Rear Views of the 3500/44M Monitor

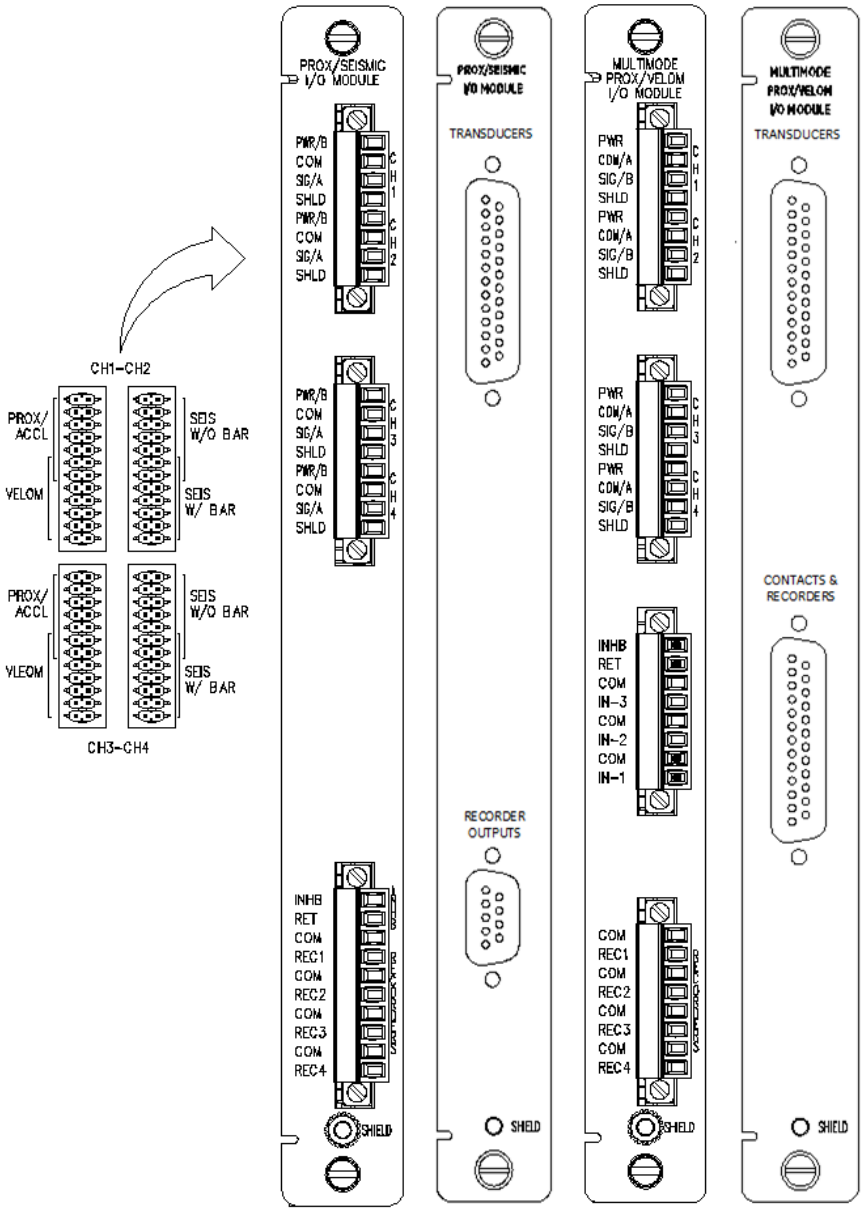


Figure 2: Side View of I/O Modules

Prox/Velom I/O modules and Multimode Prox/Velom I/O modules with internal and external terminations have the same jumpers.

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