3500/50M Tachometer Module

Datasheet

Bently Nevada Machinery Condition Monitoring

141538 Rev. T



Description

The 3500/50M Tachometer Module is a 2-channel module that accepts input from proximity probes or magnetic pickups to determine shaft rotative speed, rotor acceleration, or rotor direction. The module compares these measurements against user-programmable alarm setpoints and generates alarms when the setpoints are violated.

The Tachometer Module is programmed using the 3500 Rack Configuration software. The following configuration options are available:

- Speed Monitoring, Setpoint Alarming and Speed Band Alarming
- Speed Monitoring, Setpoint Alarming and Zero Speed Notification
- Speed Monitoring, Setpoint Alarming and Rotor Acceleration Alarming
- Speed Monitoring, Setpoint Alarming and Reverse Rotation Notification

The 3500/50M Tachometer Module can be configured to supply conditioned Keyphasor signals to the backplane of the 3500 rack for use by other monitors. Therefore, you don't need a separate Keyphasor module in the rack.

The 3500/50M Tachometer Module has a peak hold feature that stores the highest speed, the highest reverse speed, or the number of reverse rotations that the machine has reached. You can reset the peak values.

Bently Nevada offers an **Overspeed Protection System** (Product 3701/55).

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Warning

	WARNING
	PRODUCT MISUSE Risk of personal injury or equipment damage. Do **not** use the 3500/50M Tachometer Module independently or as a component of a speed control or an overspeed protection system because it does **not** provide protective redundancy or the response speed needed for reliable operation as a speed control or overspeed protection system. The analog proportional output is suitable for data logging, chart recording, or display purposes only. Speed alert setpoints are suitable for annunciation purposes only. **Magnetic Pickups:** Do not use magnetic pickups for the reverse rotation option or zero speed option. Otherwise, false indications of rotation direction may occur. The transducers do not provide a clean edge for the detection circuit during low speeds.

Specifications

Inputs

Signal	Each 3500/50M Tachometer Module accepts up to two transducer signals from proximity probe transducers or magnetic pickups.
Input signal range	+10.0 V to -24.0 V Signals exceeding this range are limited internally by the module.
Input impedance	20 k Ω (standard) 40 k Ω (TMR) 7.15 k Ω (Internal Barrier)
Power consumption	5.8 Watts, typical
Transducers	Accepts 1 to 2 proximity transducer signals Restrictions may apply to magnetic pickups (see Warning on page 2).

Outputs

Front Panel LEDs	
OK LED	Indicates when the 3500/50M Tachometer Module is operating properly.
TX/RX LED	Indicates when the Tachometer Module is communicating with other modules in the 3500 rack.
Bypass LED	Indicates when the Tachometer Module is in Bypass Mode.

Buffered Transducer	
Outputs	The front of each module has one coaxial connector for each channel. Each connector is short circuit and ESD protected. Buffered outputs are available at the I/O module via Euro style connectors.
Output Impedance	550 Ω
Transducer Power Supply	24 Vdc, 40 mA maximum per channel
Recorder	+4 to +20 mA Values are proportional to module full-scale range (rpm or rpm/min). Individual recorder values are 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 approximately 100 ms

Signal Conditioning

Specified at +25°C (+77°F)

Speed Input	The 3500/50M Tachometer Module supports 1 to 255 events per revolution for Rotor Acceleration and Zero Speed channel types. All other channel types support 0.0039 to 255 events per revolution. All channel types support a maximum full scale range of 99,999 rpm and a maximum input frequency of 20 kHz. Minimum input frequency for proximity transducers is 0.0167 Hz (1 rpm for 1 event per revolution). Minimum input frequency for passive magnetic pickups is 3.3 Hz.
RPM Accuracy	Less than 100 rpm = ± 0.1 rpm 100 to 10,000 rpm = ±1 rpm 10,000 to 99,999 rpm = ± 0.01% of true shaft speed
RPM/Min Accuracy	± 20 rpm/min

Transducer Conditioning

Auto Threshold	Use for any input above 0.0167 Hz (1 rpm for 1 event/revolution) Minimum signal amplitude for triggering is 1 volt peak-to-peak.
Manual Threshold	User selectable from +9.5 Vdc to -23.5 Vdc Minimum signal amplitude for triggering is 500 millivolts peak-to-peak
Hysteresis	User selectable from 0.2 to 2.5 volts

Alarms

Alarm Setpoints	Alarm 1 levels (setpoints) can be set for each value measured by the Tachometer. Alarm 2 setpoints can be set for any two of the values measured by the Tachometer. Alarm setpoints are set using software configuration. Alarms are adjustable and can normally be set from 0 to 100% of full scale for each measured value.
Alarm Time Delays	Programmable alarm delays for Alarm 1 and Alarm 2
Alarm 1 Time Delay	From 1 to 60 seconds in 1 second intervals
Alarm 2 Time Delay	From 1 to 60 seconds in 0.1 second intervals

Measured Values

Measured values are speed measurements used to monitor a machine. The 3500/50M Tachometer Module returns the following measured values:

Rotor Speed	Speed[1] Speed Band Peak Speed[2]
Rotor Speed 2	Speed[1] Gap[2] Speed Band Peak Speed[2]
Rotor Acceleration	Rotor Acceleration[1] Speed Peak Speed[2]

Rotor Acceleration 2	Rotor Acceleration[1] Gap[2] Speed Peak Speed[2]
Zero Speed	Zero Speed[1] Speed Peak Speed[2]
Zero Speed 2	Zero Speed[1] Gap[2] Speed Peak Speed[2]
Reverse Rotation	Reverse Speed[1] Reverse Peak Speed Speed (forward) Gap[2] Num Reverse Rotations

1 The primary value for the channel. This value can be included in contiguous registers in the Communications Gateway Module.

2 This measured value is for display and setup purposes only. No alarms are provided.

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	0.82 kg (1.8 lb)
I/O Modules (non-barrier)	
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	0.20 kg (0.44 lb)
I/O Modules (internal barrier)	
Dimensions (Height x Width x Depth)	241.3 mm x 24.4 mm x 163.1 mm (9.50 in x 0.96 in x 6.42 in)
Weight	0.46 kg (1.01 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

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 Considerations

To add the 3500/50M Tachometer Module to an existing 3500 Monitoring System, you must have the following versions of firmware and software:

Firmware and Software	Version
3500/22M Module Firmware	Revision (1.70)
3500/01 Configuration Software	Version 4.20 or later
3500/02 Data Acquisition Software	Version 2.52 or later
3500/03 Display Software	Version 1.52 or later
3500/50M Firmware	Revision 5.30 or later
3500/50M	**Not** compatible with any version of 3500/20

Consider the following guidelines and restrictions before placing an order:

- External Termination Blocks cannot be used with Internal Termination I/O modules.
- When ordering I/O Modules with External Terminations, you must order External Termination Blocks and cables separately.
- Use Bussed External Termination Blocks with TMR I/O modules only.
- Before selecting the Internal Barrier option, see 3500 Internal Barriers product datasheet (document **141495**).

Ordering Information

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

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3500/50M Tachometer Module 3500/50-AA-BB

A: I/O Module Type	
01	I/O Module with Internal Terminations
02	I/O Module with External Terminations
04	I/O Module with Internal Barriers and Internal Terminations
B: Hazardous Area Approval Option	
00	None
01	cNRTLus (Class 1, Division 2)
02	ATEX/IECEx/CSA (Class 1, Zone 2)

External Termination (ET) Blocks

Part Number	Description
125808-05	Tachometer ET Block Euro Style connectors
128015-05	Tachometer ET Block Terminal Strip connectors
128702-01	Recorder ET Block Euro Style connectors
128710-01	Recorder ET Block Terminal Strip connectors

Cables

3500 Tachometer Signal to ET Block Cable 135101-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

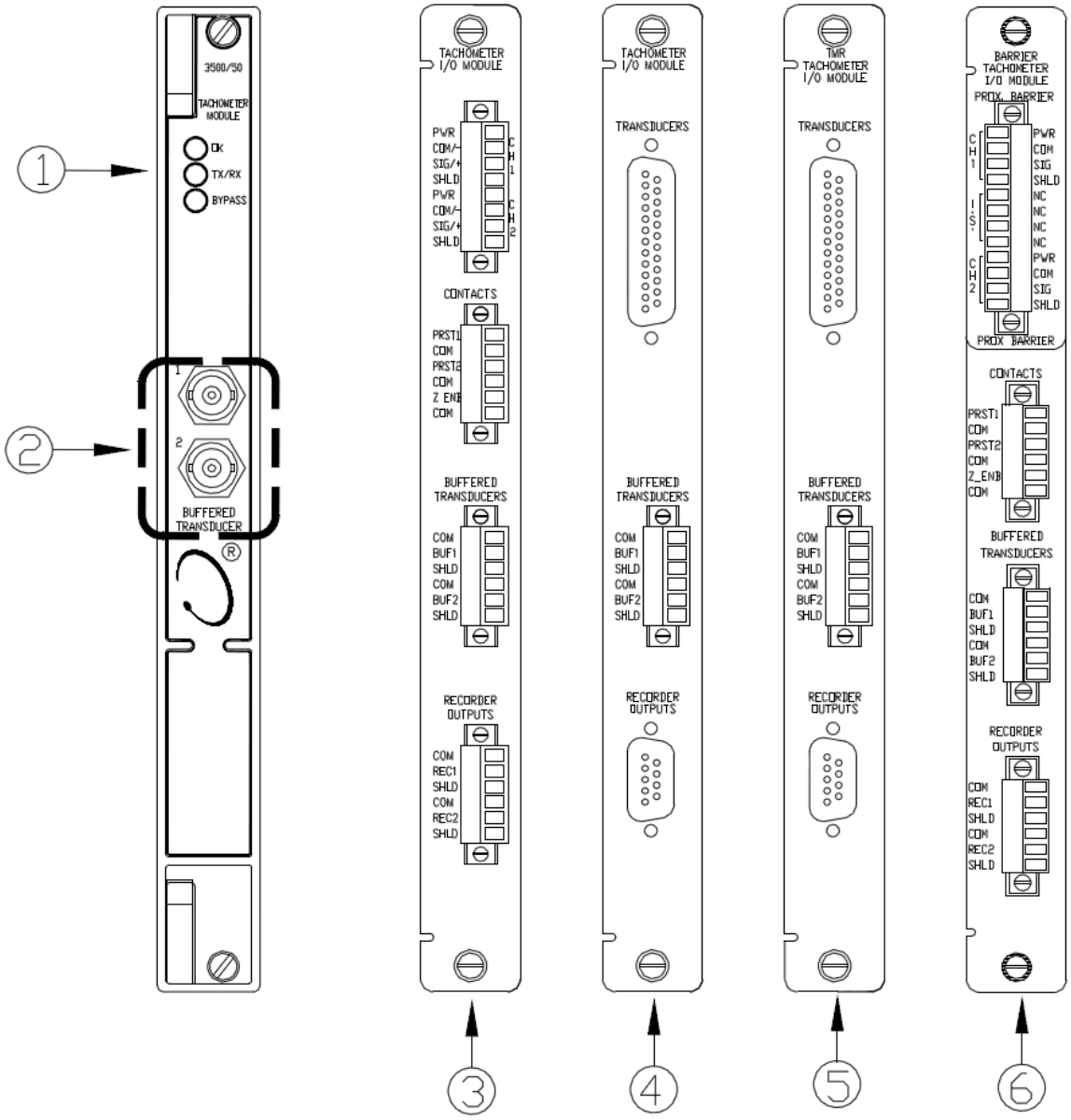
3500 Recorder Output to ET Block Cable 129529-AAAA-BB

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

Part Number	Description
288062-02	3500/50M Tachometer Module
133442-01	I/O Module with Internal Terminations
136703-01	Discrete Internal Barrier I/O Module with Internal Terminations
133434-01	I/O Module with External Terminations
133450-01	TMR I/O Module with External Terminations
134938	3500/50M Tachometer User Guide
04425545	Grounding Wrist Strap Single use only
00580434	Connector Header Internal Termination 8-position Green
00580436	Connector Header Internal Termination 6-position Green
00502133	Connector Header Internal Termination 12-position Blue
166M2390	Connector Header Push-in-Spring Type (Alternative for PN 00580436)
166M2389	Connector Header Push-in-Spring Type (Alternative for PN 00580434)

Graphs and Figures



1. Status LEDs
2. Buffered transducer outputs
3. I/O Module, Internal Terminations
4. I/O Module, External Terminations
5. I/O Module, TMR, External Terminations
6. I/O Module, Internal Barrier, Internal Terminations

Figure 1: Front and Rear Views of the 3500/50M Tachometer Module