3500/50 Tachometer Module

Bently Nevada™ Asset Condition Monitoring

Description

The 3500/50 Tachometer Module is a 2-channel module that accepts input from proximity probes or magnetic pickups (except as noted) to determine shaft rotative speed, rotor acceleration, or rotor direction, compares these measurements against user-programmable alarm setpoints, and generates alarms when these setpoints are violated. The 3500/50 Tachometer Module is programmed using the 3500 Rack Configuration Software and can be configured with four different options:

1. Speed Monitoring, Setpoint Alarming, and Speed Band Alarming.
2. Speed Monitoring, Setpoint Alarming, and Zero Speed Notification.
3. Speed Monitoring, Setpoint Alarming, and Rotor Acceleration Alarming.
4. Speed Monitoring, Setpoint Alarming, and Reverse Rotation Notification.

The 3500/50 can be configured to supply conditioned Keyphasor® signals to the backplane of the 3500 rack for use by other monitors, thus eliminating the need for a separate Keyphasor module in the rack. The 3500/50 also has a peak hold feature that stores the highest speed, highest reverse speed, or number of reverse rotations (depending on channel type selected) that the machine has reached. These peak values can be reset by the user.

Application Note

Bently Nevada™ Tachometer Modules are not designed for use independently as, or as a component of, a speed control or overspeed protection system.

Bently Nevada Tachometer Modules do not provide protective redundancy nor the response speed needed for reliable operation as a speed control or overspeed protection system.

Where provided, the analog proportional output is suitable for data logging, chart recording, or display purposes only. Also, where provided, speed alert setpoints are suitable for annunciation purposes only.

Magnetic pickups may not be used for the reverse rotation option because these transducers do not provide a clean edge for the detection circuit during low speeds. This could lead to false indications of rotation direction.

Magnetic pickups are not recommended for the zero speed option because these transducers do not provide a clean edge for the detection circuit during low speeds.

Failure to take the above items into account constitutes a misuse of the product and may result in property damage and/or bodily injury.

Note: The Bently Nevada product line does supply an Overspeed Protection System for the 3500 System. Consult Specification and Ordering Information part number 141539-01.

Specifications

Inputs

Signal:

Each Tachometer Module accepts up to 2 transducer signals from proximity probe transducers or magnetic pickups. The input signal range is +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 1-2 proximity transducer signals.

Note: Restrictions may apply to magnetic pickups. Refer to the Application Note (page 1).

Outputs

Front Panel LEDs

OK LED:

Indicates when the 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 □.

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 Tachometer will support 0.0039 - 255 events per revolution with 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/revolution) and 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. In addition, Alarm 2 setpoints can be set for any two of the values measured by the Tachometer. All 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:

Alarm delays can be programmed using software, and can be set as follows:

Alarm 1:

From 1 to 60 seconds in 1 second intervals.

Alarm 2:

From 1 to 60 seconds in 0.1 second intervals.

Proportional Values

Proportional values are speed measurements used to monitor a machine. The Tachometer Module returns the following proportional values:

Rotor Speed

Speed*,

Speed Band

Peak Speed**

Rotor Acceleration:

Rotor Acceleration*,

Speed,

Peak Speed**

Zero Speed:

Zero Speed*,

Speed, and

Peak Speed**

Reverse Rotation:

Reverse Speed*,

Reverse Peak Speed,

Speed (forward),

GAP**, and

Num Reverse Rotations

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

** This proportional value is for display and setup purposes only. No alarming is provided.

Environmental Limits

Operating Temperature:

When used with Internal/External Termination I/O Module:

-30 ºC to +65 ºC (-22 ºF to +150 ºF)

When used with Internal Barrier I/O Module (Internal Termination):

0 ºC to +65 ºC (32 ºF to +150 ºF)

Storage Temperature:

-40 ºC to +85 ºC (-40 ºF to +185 ºF).

Humidity:

95%, non-condensing.

CE Mark Directives

EMC Directives:

EN50081-2:

Radiated Emissions

EN 55011, Class A

Conducted Emissions

EN 55011, Class A

EN50082-2:

Electrostatic Discharge

EN 61000-4-2, Criteria B

Radiated Susceptibility

ENV 50140, Criteria A

Conducted Susceptibility

ENV 50141, Criteria A

Electrical Fast Transient

EN 61000-4-4, Criteria B

Surge Capability

EN 61000-4-5, Criteria B

Magnetic Field

EN 61000-4-8, Criteria A

Power Supply Dip

EN 61000-4-11, Criteria B

Radio Telephone

ENV 50204, Criteria B

Low Voltage Directives:

EN 61010-1

Safety Requirements

Hazardous Area Approvals

CSA/NRTL/C

Approval Option (01)

Class I, Div 2

Groups A, B, C, D

T4 @ Ta = -20 °C to +65 °C

(-4 °F to +150 °F)

Certification Number

CSA 150268-1002151 (LR 26744)

Approval Option (02)

When used with I/O module ordering options with internal barriers:

A/Ex nC[ia] IIC

Class I, Zone 2/(0)

Class I, Div I, Groups A,B,C,D

T4 @ Ta = -20 °C to +65 °C

(-4 °F to +150 °F)

Certification Number

CSA 1389797 (LR 26744-211)

ATEX

Approval Option (02)

For Selected Ordering Options with ATEX/CSA agency approvals:

 II 3/(3) G

EEx nCAL[L] IIC

T4 @ Ta = -20 °C to +65°C

(-4 °F to +150 °F)

Certification Number

LCIE 04 ATEX 6161X

Note: When used with Internal Barrier I/O Module, refer to specification sheet 141495-01 for approvals information.

Physical

Monitor Module (Main Board)

Dimensions(Height x Width x Depth):

241.3 mm x 24.4 mm 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.

Ordering Considerations

General

If the 3500/50 Module is added to an existing 3500 Monitoring System, the following (or later) firmware and software versions are required:

3500/20 Module Firmware – Revision G (1.07)

3500/01 Configuration Software

Version 3.50 or later for Reverse Rotation

Version 2.00 or later for other types

3500/02 Data Acquisition Software

Version 2.40 or later for Reverse Rotation

Version 2.00 or later for other types

3500/03 Display Software

Version 1.40 or later for Reverse Rotation

Version 1.10 or later for other types

3500/50 Firmware

Revision J (1.09) or later for Reverse Rotation

External Termination Blocks cannot be used with Internal Termination I/O modules.

When ordering I/O Modules with External Terminations, the External Termination Blocks and Cables must be ordered separately.

Bussed External Termination Blocks are to be used with TMR I/O modules only.

Internal Barrier I/O Module

The 3500 Internal Barrier specification sheet (part number 141495-01) should be consulted if the Internal Barrier Option is selected.

Ordering Information

Tachometer Module

3500/50-AXX-BXX-CXX

A: I/O Module Type

- **0 1** I/O Module with Internal Terminations
- **0 2** I/O Module with External Terminations
- **0 3** TMR I/O Module with External Terminations
- **0 4** I/O Module with Internal Barriers and Internal Terminations.

B: Agency Approval Option

- **0 0** None
- **0 1** CSA/NRTL/C
- **0 2** ATEX/CSA (Class 1, Zone 2)

C: Monitor Use

- **0 1** Speed Measurement
- **0 2** Reverse Rotation

Note: Agency Approval Option B 02 is only available with Ordering Option A 04.

External Termination (ET) Blocks

125808-05

Tachometer ET Block (Euro Style connectors)

128015-05

Tachometer ET Block (Terminal Strip connectors)

132242-03

Tachometer Bussed ET Block (Euro Style connectors)

132234-03

Tachometer Bussed 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-AXXXX-BXX

A: Cable Length

- **0 0 0 5** 5 feet (1.5 metres)
- **0 0 0 7** 7 feet (2.1 metres)
- **0 0 1 0** 10 feet (3 metres)
- **0 0 2 5** 25 feet (7.5 metres)
- **0 0 5 0** 50 feet (15 metres)
- **0 1 0 0** 100 feet (30.5 metres)

B: Assembly Instructions

- **0 1** Not Assembled
- **0 2** Assembled

3500 Recorder Output to External Termination (ET) Block Cable

129529-AXXXX-BXX

A: Cable Length

- **0 0 0 5** 5 feet (1.5 metres)
- **0 0 0 7** 7 feet (2.1 metres)
- **0 0 1 0** 10 feet (3 metres)
- **0 0 2 5** 25 feet (7.5 metres)
- **0 0 5 0** 50 feet (15 metres)
- **0 1 0 0** 100 feet (30.5 metres)

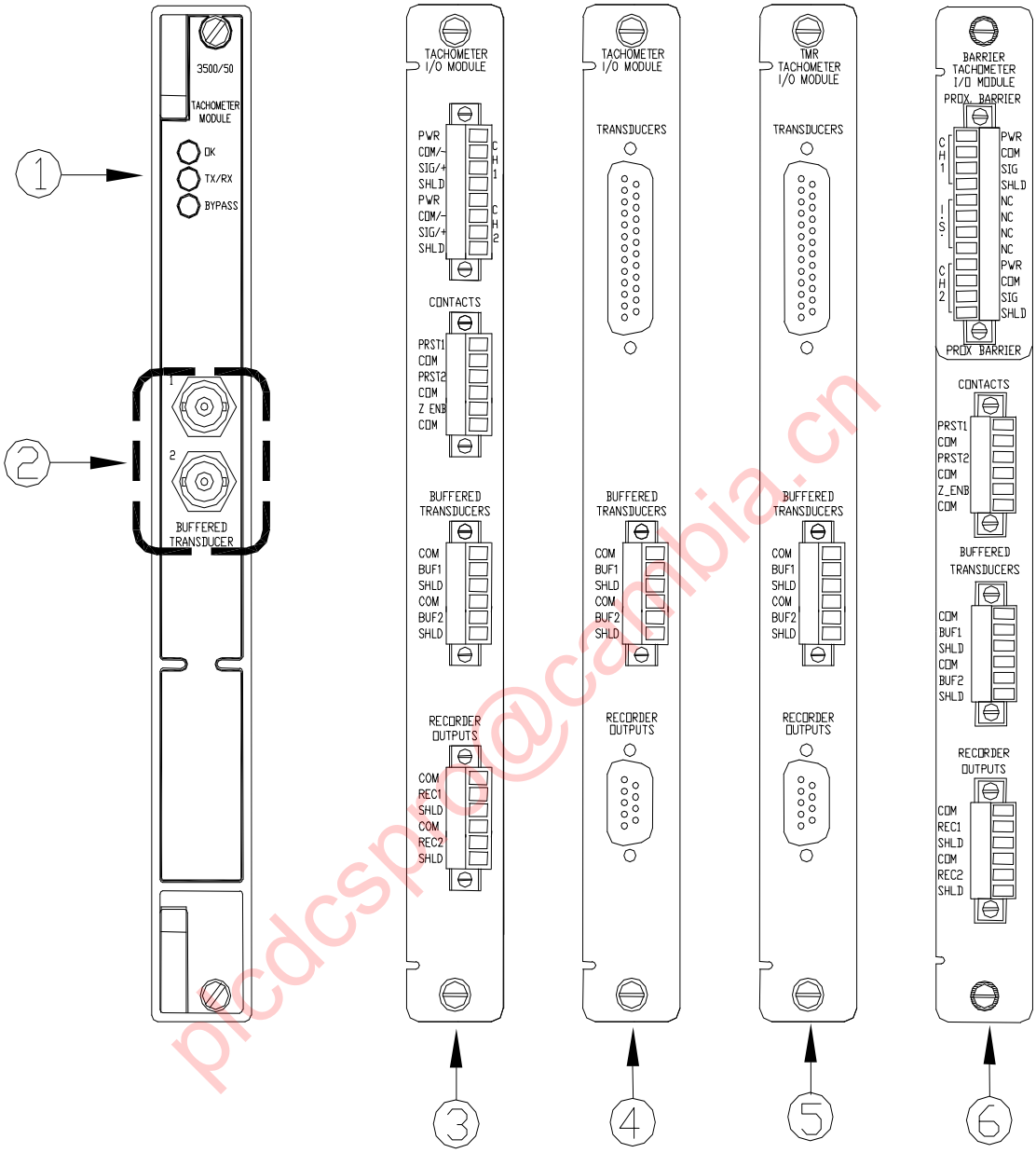
B: Assembly Instructions

- **0 1** Not Assembled
- **0 2** Assembled

Spares

133388-02	3500/50 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
134938-01	3500/50 Tachometer Manual
134130-01	3500/50 Firmware IC
04425545	Grounding Wrist Strap (single use only)
04400037	IC Removal Tool
00580434	Connector Header, Internal Termination, 8-position, Green
00580436	Connector Header, Internal Termination, 6-position, Green
00502133	Connector Header, Internal Termination, 12-position, Blue

Figures and Tables



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 Tachometer Module

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