

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 and Ordering Information
Part Number 141538-01
Rev. C (01/08)

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 Ω .

Resolution:

0.3662 μ A per bit \pm 0.25% error at room temperature \pm 0.7% error over temperature range. Update rate approximately 100 ms.

Signal Conditioning

Specified at +25 $^{\circ}$ C (+77 $^{\circ}$ 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.

From 1 to 60 seconds in 0.1 second intervals.

RPM Accuracy:

Less than 100 rpm = ± 0.1 rpm,
100 to 10,000 rpm = ± 1 rpm,
10,000 to 99,999 rpm = $\pm 0.01\%$ 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:

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 °C to +65 °C (-22 °F to +150 °F)

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

0 °C to +65 °C (32 °F to +150 °F)

Storage Temperature:

-40 °C to +85 °C (-40 °F to +185 °F).

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.

Recorder ET Block (Euro Style connectors)

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.

128710-01

Recorder ET Block (Terminal Strip connectors)

Ordering Information

Tachometer Module

3500/50-AXX-BXX-CXX

A: I/O Module Type

- 01 I/O Module with Internal Terminations
- 02 I/O Module with External Terminations
- 03 TMR I/O Module with External Terminations
- 04 I/O Module with Internal Barriers and Internal Terminations.

B: Agency Approval Option

- 00 None
- 01 CSA/NRTL/C
- 02 ATEX/CSA (Class 1, Zone 2)

C: Monitor Use

- 01 Speed Measurement
- 02 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

Cables

3500 Tachometer Signal to ET Block Cable

135101-AXXX-BXX

A: Cable Length

0005	5 feet (1.5 metres)
0007	7 feet (2.1 metres)
0010	10 feet (3 metres)
0025	25 feet (7.5 metres)
0050	50 feet (15 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-AXXX-BXX

A: Cable Length

0005	5 feet (1.5 metres)
0007	7 feet (2.1 metres)
0010	10 feet (3 metres)
0025	25 feet (7.5 metres)
0050	50 feet (15 metres)
0100	100 feet (30.5 metres)

B: Assembly Instructions

01	Not Assembled
02	Assembled

Spares**133388-02**

3500/50 Tachometer Module

134130-01

3500/50 Firmware IC

133442-01I/O Module with Internal
Terminations**04425545**Grounding Wrist Strap (single use
only)**136703-01**Discrete Internal Barrier I/O
Module with Internal Terminations**04400037**

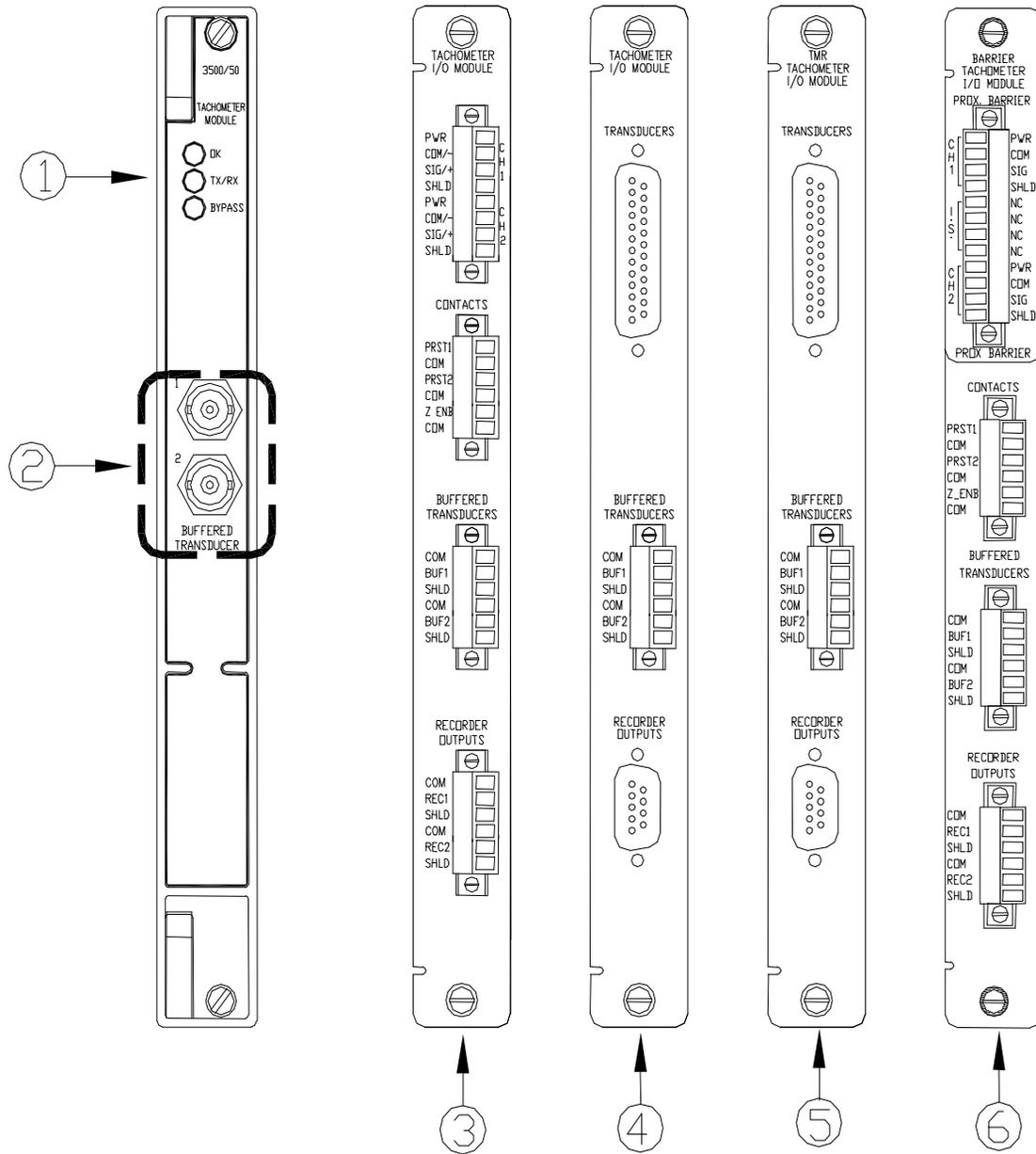
IC Removal Tool

133434-01I/O Module with External
Terminations**00580434**Connector Header, Internal
Termination, 8-position, Green**133450-01**TMR I/O Module with External
Terminations**00580436**Connector Header, Internal
Termination, 6-position, Green**134938-01**

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00502133Connector 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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