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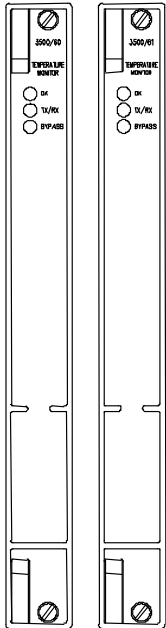
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3500/60 & /61 Temperature Monitors

Bently Nevada™ Asset Condition Monitoring



Description

The 3500/60 & 61 modules provide six channels of temperature monitoring and accept both Resistance Temperature Detector (RTD) and Thermocouple (TC) temperature inputs. The modules condition these inputs and compare them against user-programmable alarm setpoints. The 3500/60 and 3500/61 provide identical functionality except that the 3500/61 provides recorder outputs for each of its six channels while the 3500/60 does not.

The user programs the modules to perform either RTD or TC temperature measurements using the 3500 Rack Configuration Software. Different I/O modules are available in RTD/TC non-isolated or TC isolated versions. The user can configure the RTD/TC non-isolated version to accept either TC or RTD, or a mixture of TC and RTD inputs. The TC isolated version provides 250 Vdc of channel-to-channel isolation to protect against external interference.

When used in a Triple Modular Redundant (TMR) configuration, temperature monitors must be installed adjacent to each other in groups of three. When used in this configuration, the system employs two types of voting to ensure accurate operation and to avoid single-point failures.



Specifications and Ordering Information
Part Number 141540-01
Rev. C (03/07)

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Specifications

Inputs

Signal

Accepts from 1 to 6 RTD or TC transducer signals.

Input Impedance

Greater than 10 M Ω for each lead input.

Power Consumption

3500/60: Nominal consumption of 7 watts.

3500/61: Nominal consumption of 9 watts.

Transducers

TCs

Type E: -100 °C to +1000 °C,
(-148 °F to +1832 °F).

Type J: 0 °C to +760 °C,
(+32 °F to +1400 °F).

Type K: 0 °C to +1370 °C,
(+32 °F to +2498 °F).

Type T: -160 °C to +400 °C,
(-256 °F to +752 °F).

RTDs

100 Ω 3-wire & 4-wire platinum RTD (alpha = 0.00385):

*-200° C to +850° C
(-328 °F to +1562 °F).

With external barriers:
-50 °C to +850 °C
(-122 °F to +1562 °F).

100 Ω 3-wire & 4-wire platinum RTD (alpha = 0.00392):

* -200 °C to +700 °C
(-328 °F to +1292 °F).

With external barriers:
-50 °C to +850 °C
(-122 °F to +1562 °F).

120 Ω 3-wire & 4-wire nickel RTD:

-80 °C to +260 °C
(-112 °F to +500 °F).

10 Ω 3-wire & 4-wire copper RTD:

*-100 °C to +260 °C,
(-148 °F to +500 °F).

With external barriers:
-50 °C to +850 °C
(-122 °F to +1562 °F).

Note: Platinum RTD's with 0.00385 alphas are the worldwide industrial standard and are recommended for all applications.

* Lower OK limit with external barriers is -50°C.

I/O Modules

Isolated TC I/O modules have 250 Vdc of isolation between channels.

Outputs

Front Panel LEDs

OK LED

Indicates when the Temperature Monitor is operating properly.

TX/RX LED

Indicates when the Temperature Monitor is communicating with other modules in the 3500 rack.

Bypass LED

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	Indicates when the Temperature Monitor is in Bypass Mode.		Standard Rack: ± 3 °C at 25 °C (± 5.4 °F at 77 °F).
RTD Current Source Value	925 \pm 15 μ A @ 25° C per transducer (single supply for the 4-wire RTD and two supplies for the 3-wire).	<i>External Termination Non-Isolated:</i>	Bulkhead Rack: ± 3 °C at 25 °C (± 5.4 °F at 77 °F).
Recorder	+4 to +20 mA. Values are proportional to monitor full-scale. Individual recorder values are provided for each channel. Monitor operation is unaffected by short circuits on recorder outputs.	<i>Internal Termination Isolated:</i>	Standard Rack: ± 1 °C at 25 °C (± 1.8 °F at 77 °F). Bulkhead Rack: ± 2 °C at 25 °C (± 3.6 °F at 77 °F).
Voltage Compliance (current output)	0 to +12 Vdc range across load. Load resistance is 0 to 600 Ω .		Standard Rack: ± 3 °C at 25 °C (± 5.4 °F at 77 °F).
Resolution	0.3662 μ A per bit \pm 0.15% error at room temperature \pm 0.4% error over temperature range.	<i>External Termination Isolated:</i>	Bulkhead Rack: ± 1 °C at 25 °C (± 1.8 °F at 77 °F). Standard Rack: ± 1 °C at 25 °C (± 1.8 °F at 77 °F).
Signal Conditioning			
	Note: Specified at +25 °C (+77 °F) unless otherwise noted.		
	Full-scale range for each channel is set in the field via 3500 Configuration Software. No calibration is required.	10Ω Copper RTDs	
RTDs and TCs (except for 10Ω Copper RTDs)		Resolution	1°C or 1 °F
Resolution	1 °C or 1 °F	Accuracy	± 3 °C at 25 °C (± 5.4 °F at 77 °F).
Accuracy		Cold Junction Compensation Sensor (used for TC measurements)	
<i>Internal Termination Non-Isolated</i>	Bulkhead Rack ± 3 °C at 25 °C (± 5.4 °F at 77 °F).	Accuracy	± 1 °C at 25 °C

(±1.8 °F at 77 °F).

indicate the minimum alarm time delay based on the channel loading.

Alarms

Alarm Setpoints

The user can set Alert and Danger setpoints for the value measured by the monitor using software configuration. Alarms are adjustable from 0 to 100% of full-scale for each measured value. The exception is when the full-scale range exceeds the range of the sensor. In this case, the range of the sensor will limit the setpoint. Accuracy of alarms are to within 0.13% of the desired value. The Temperature Monitors have both under and over alarm setpoints.

Alarm Time Delays

The user can program alarm delays using software as follows:

Alert

From 1 to 60 seconds in 1 second intervals.

Danger

From 1 to 60 seconds in 0.5 second intervals or can be set to the minimum alarm delay.

Number of actual channel(s)	Minimum time delay (mS)
1	225
2	300
3	375
4	450
5	525
6	600

Note: 225 ms alarm time delays will not be available for all channels. As more channels are used the alarm time delay increases. The configuration software will

Proportional Values

Proportional values are temperature measurements used to monitor the machine. The Temperature Monitors return temperature proportional values.

Environmental Limits

Operating Temperature

-30 °C to +65 °C (-22 °F to +150 °F) when used with Internal/External Termination I/O Modules

0 °C to +65 °C (32 °F to +150 °F) when used with Internal Barrier I/O Modules (Internal Termination).

Storage Temperature

-40 °C to +85 °C (-40 °F to +185 °F).

CE Mark Directives

Declaration of Conformity

134036

EMC Directives

IEC/EN61000-6-4

Radiated Emissions
EN 55011, Class A

Conducted Emissions
EN 55011, Class A

IEC/EN61000-6-2

Electrostatic Discharge
EN 61000-4-2, Criteria B

Radiated Susceptibility
EN61000-4-3, Criteria A

Conducted Susceptibility
EN61000-4-6, Criteria A

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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

*Certification
 Number*

T4 @ Ta = -20 °C to +65 °C
 (-4 °F to +150 °F)

CSA 1389797 (LR 26744-211)

**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)

Low Voltage Directives

IEC/EN61010-1

Safety Requirements

Hazardous Area Approvals

CSA/NRTL/C

**Approval Option
 (01)**

Class I, Div 2
 Groups A, B, C, D
 T4 @ Ta = -30 °C to +65 °C
 (-22 °F to +150 °F)

*Certification
 number*

150268-1002151 (LR 26744)

**Approval Option
 (02)**

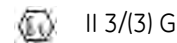
**When used with I/O module
 ordering options without
 internal barriers:**

A/Ex nC[L] IIC
 Class I, Zone 2
 Class I, Div 2, Groups A,B,C,D

ATEX

**Approval Option
 (02)**

**For Selected Ordering Options
 with ATEX/CSA agency
 approvals:**



Ex 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**

**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 lbs.).

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 lbs.).

**Internal Barrier
I/O Module**

**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 lbs.).

Rack Space Requirements

Monitor Module

1 full-height front slot.

I/O Modules

1 full-height rear slot.

Ordering Considerations

General

If the 3500/60 or 3500/61 is added to an existing 3500 System the following firmware and software versions (or later) are required:

3500/20 Module Firmware – Revision G

3500/01 Software – Version 2.00

3500/02 Software – Version 2.00

3500/03 Software – Version 1.10

Note: 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.

**Internal Barrier
I/O Module**

Consult the 3500 Internal Barrier specification sheet (part number 141495-01) if the Internal Barrier Option is selected.

Ordering Information

No Recorder Outputs

3500/60-AXX-BXX

A: I/O Module Type

- 01** RTD/TC Non-isolated with Internal Terminations
- 02** RTD/TC Non-isolated with External Terminations
- 03** TC Isolated with Internal Terminations
- 04** TC Isolated with External Terminations
- 05** RTD/TC Non-isolated with Internal Barriers and Internal Terminations

B: Agency Approval Option

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

Note: Agency Approval Option B 02 is only available with Ordering Option A 05.

Recorder Outputs

3500/61-AXX-BXX

A: I/O Module Type

- 01** RTD/TC Non-isolated with Internal Terminations
- 02** RTD/TC Non-isolated with External Terminations
- 03** TC Isolated with Internal Terminations

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- 04 TC Isolated with External Terminations
- 05 RTD/TC Non-isolated with Internal Barriers and Internal Terminations

B: Agency Approval Option

- 00 None
 - 01 CSA/NRTL/C (Class 1, Div 2)
 - 02 ATEX/CSA (Class 1, Zone 2)
- Note:** Agency Approval Option B 02 is only available with Ordering Options A 01, A 03, and A 05.

External Termination Blocks

133908-01

RTD/TC Non-Isolated External Termination Block (Terminal Strip connectors).

133916-01

RTD/TC Non-Isolated External Termination Block (Euro Style connectors).

133924-01

TC Isolated External Termination Block (Terminal Strip connectors).

133932-01

TC Isolated External Termination Block (Euro Style connectors).

133892-01

3300/61 Recorder Output External Termination Block (Terminal Strip connectors).

133900-01

3300/61 Recorder Output External Termination Block (Euro Style connectors).

Cables

3500/60 and 3500/61 Transducer (XDCR) Signal to External Termination (ET) Block Cable

134544-AXXXX-BXX

A: Cable Length

- 0005 5 feet (1.5 metres)
- 0007 7 feet (2.1 metres)
- 0010 10 feet (3.0 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

3500/61 Recorder Output to External Termination (ET) Block Cable

134543- AXX - BXX

A: Cable Length

- 0005 5 feet (1.5 metres)
- 0007 7 feet (2.1 metres)
- 0010 10 feet (3.0 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

Shared components

133908-01

RTD/TC Non-Isolated External Termination Block (Terminal Strip connectors).

133916-01

RTD/TC Non-Isolated External Termination Block (Euro Style connectors).

133924-01

TC Isolated External Termination Block (Terminal Strip connectors).

133932-01

TC Isolated External Termination Block (Euro Style connectors).

00580442

Connector Header, Internal Termination, 9-position, Green.

00580443

Connector Header, Internal Termination, 12-position, Green.

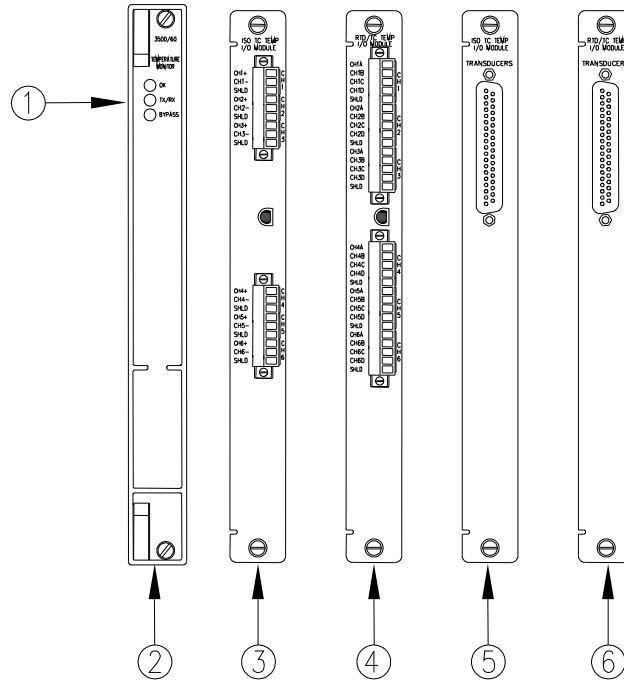
00502133

Connector Header, Internal Termination, 12-position, Blue.

00580444

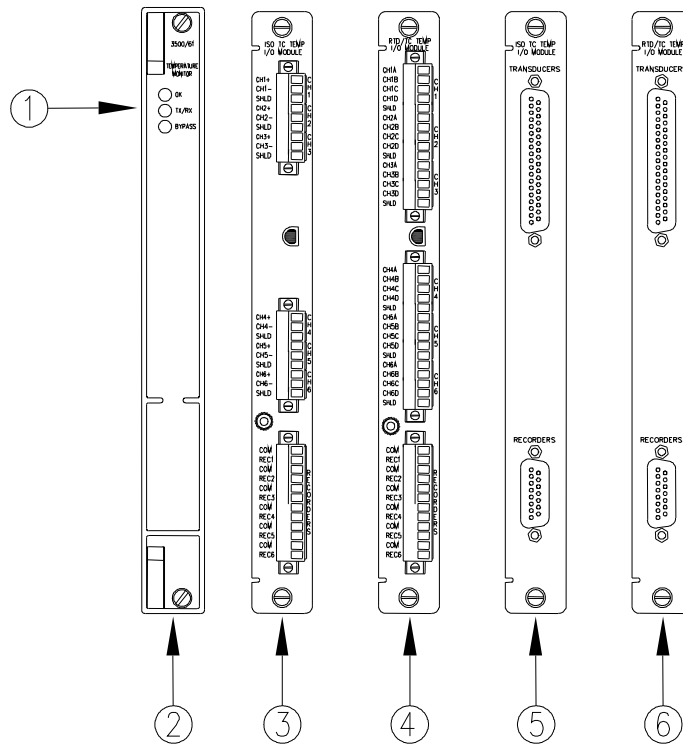
04425545	Connector Header, Internal Termination, 15-position, Green.	3500/61-Specific 133811-02	3500/61 Monitor (Replaced by PN 163179-02).
04400037	Grounding Wrist Strap (single use).	135343-01	Firmware IC
134542-01	IC Removal Tool.	133819-02	3500/61 RTD/TC Non-Isolated I/O Module Internal Terminations.
	3500/60 & 3500/61 Manual.	133827-02	3500/61 RTD/TC Non-Isolated I/O Module External Terminations.
3500/60-Specific 133811-01	3500/60 Monitor (Replaced by PN 163179-01).	133835-02	3500/61 TC Isolated I/O Module Internal Terminations.
135344-01	Firmware IC.	133843-02	3500/61 TC Isolated I/O Module External Terminations.
133819-01	3500/60 RTD/TC Non-Isolated I/O Module Internal Terminations.	133892-01	3500/61 Recorder Output External Termination Block (Terminal Strip connectors).
133827-01	3500/60 RTD/TC Non-Isolated I/O Module External Terminations.	133900-01	3500/61 Recorder Output External Termination Block (Euro Style connectors).
133835-01	3500/60 TC Isolated I/O Module Internal Terminations.	136711-02	3500/61 RTD/TC I/O Module with Internal Barriers and Internal Terminations. (Not-Isolated)
133843-01	3500/60 TC Isolated I/O Module External Terminations.		
136711-01	3500/60 RTD/TC I/O Module with Internal Barriers and Internal Terminations. (Not-Isolated)		

Figures and Tables



- 1) Status LEDs
 - 2) 3500/60 Main Module Front View
 - 3) ISO TC Temp I/O Module (Internal Terminations)
 - 4) RTD/TC Temp I/O Module (Internal Terminations)
 - 5) ISO TC Temp I/O Module (External Terminations)
 - 6) RTD/TC Temp I/O Module (External Terminations)
- (No Recorder Outputs)

Figure 1: Front and rear views of the 3500/60 Temperature Monitor



- 1) Status LEDs
 - 2) 3500/61 Main Module Front View
 - 3) ISO TC Temp I/O Module (Internal Terminations)
 - 4) RTD/TC Temp I/O Module (Internal Terminations)
 - 5) ISO TC Temp I/O Module (External Terminations)
 - 6) RTD/TC Temp I/O Module (External Terminations)
- (Recorder Outputs)

Figure 2: Front and rear views of the 3500/61 Temperature Monitor

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