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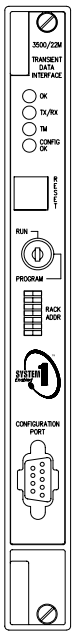
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# 3500/22M Transient Data Interface




## Description

The 3500 Transient Data Interface (TDI) is the interface between the 3500 monitoring system and Bently Nevada's System 1® machinery management software. The TDI combines the capability of a 3500/20 Rack Interface Module with the data collection capability of a communication processor such as TDXnet.

TDI operates in the RIM slot of a 3500 rack in conjunction with the M series monitors (3500/40M, 3500/42M, etc.) to continuously collect steady state and transient waveform data and pass this data through an Ethernet link to the host software. Static data capture is standard with the TDI, however using an optional Channel Enabling Disk will allow dynamic or transient data to be captured as well. TDI has made improvements in several areas over previous communication processors in addition to incorporating the Communication Processor function within the 3500 rack.

TDI provides certain functions common to the entire rack, however the TDI is not part of the critical monitoring path and has no effect on the proper, normal operation of the overall monitor system. One TDI or RIM is required per rack. The TDI occupies only a single slot in the rack and is always located in Slot 1 (next to the power supplies).

For Triple Modular Redundant (TMR) applications, the 3500 System requires a TMR version of the TDI. In addition to all the standard TDI functions, the TMR TDI also performs "monitor channel comparison". The 3500 TMR configuration executes monitoring voting using the setup specified in the monitor options. Using this method, the TMR TDI continually compares the outputs from three (3) redundant monitors. If the TMR detects that the information from one of those monitors is no longer equivalent (within a configured percent) to the remaining two, it will flag the monitor as being in error and place an event in the System Event List.



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# 3500/22M Specifications

## Inputs

**Power Consumption**

10.5 Watts

**Data**

*Front panel:*

115.2 kbaud maximum RS232 serial communications

*10 Base-T/100 Base-TX I/O:*

10 Base-T or 100 Base-TX Ethernet, autosensing

*100 Base-FX I/O:*

100 Base-FX Fiber-Optic Ethernet

## Outputs

**Front Panel LEDs**

*OK LED:*

Indicates when the 3500/22M is operating properly

*TX/RX LED:*

Indicates when the 3500/22M is communicating with the other modules in the rack.

*TM LED:*

Indicates when the 3500 rack is in Trip Multiply mode.

*CONFIG OK LED:*

Indicates that the 3500 rack has a valid configuration.

**I/O Module OK Relay:**

Relay to indicate when the 3500 rack is operating normally or when a fault has been detected within the rack. User can select either an "OPEN" or "CLOSED" contact to annunciate a NOT OK condition. This relay always operates as "Normally Energized".

*OK Relay:*

Rated to 5A @ 24 Vdc/120 Vac, 120 Watts/600 VA Switched Power.

*Normally closed contacts:*

Arc suppressors are provided.

## Controls

**Front Panel**

*Rack reset button:*

Clears latched alarms and Timed OK Channel Defeat in the rack.

Performs same function as "Rack Reset" contact on I/O module.

*Address switch:*

Used to set the rack address: 127 possible addresses.

*Configuration Keylock:*

Used to place 3500 rack in either "RUN" mode or "PROGRAM" mode. RUN mode allows for normal operation of the rack and locks out configuration changes. PROGAM mode allows for normal operation of the rack and also allows for local or remote rack configuration. The key can be removed from rack in either position, allowing switch to remain in either RUN or PROGRAM position. Locking switch in the RUN position allows you to restrict unauthorized rack reconfiguration. Locking switch in PROGRAM position allows remote reconfiguration of a rack at any time.

**I/O Module System Contacts**

*Trip Multiply:*

*Description:*

Used to place 3500 rack in Trip Multiply.

*Maximum Current:*

<1 mAdc, Dry Contact to Common

*Alarm Inhibit:*

*Description:*

Used to inhibit all alarms in the 3500 rack.

*Maximum Current:*

<1 mAdc, Dry Contact to Common

*Rack Reset:*

*Description:*

Used to clear latched alarms and Timed OK Channel Defeat.

*Maximum Current:*

<1 mAdc, Dry Contact to Common

## Data Collection

**Keyphasor® Inputs:**

- Supports the four 3500 system Keyphasor® signals. The speed range support is based on the



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number of dynamic channels enabled:

| Number of Channels | Minimum Speed | Maximum Speed |
|---|---|---|
| 1 to 16 | 1 rpm | 100,000 rpm |
| 17 to 24 | 1 rpm | 60,000 rpm |
| 25 to 48 | 1 rpm | 30,000 rpm |

- Supports multiple events per revolution speed inputs up to 20 kHz.

**Startup / Coastdown Data**

- Data collected from speed and time intervals.
- Increasing and decreasing speed interval independently programmable.
- Initiation of transient data collection based on detecting the machine speed within one of two programmable windows.
- The number of transient events that can be collected is only limited by the available memory in the module.

**Alarm Data Collection**

- Pre- and post-alarm data.
- 1 second static values collected for 10 minutes before the event and 1 minute after the event.
- 100 ms static values collected for 20 seconds before the event and 10 seconds after the event.
- 2.5 minutes of waveform data at 10-second intervals before the alarm and 1 minute collected at 10-second intervals after the alarm.

**Static Values Data**

- TDI will collect the static values including the values measured by the monitors.
- TDI provides four nX static values for each point. Amplitude and phase are returned for each of the values.

**Waveform Sampling**

- Collection of waveforms for 48 channels.
- DC-coupled waveforms.
- Simultaneous Synchronous and Asynchronous data sampled during all operational modes.
- User-configurable Synchronous waveform sampling rates:
  - 1024 samples/rev for 2 revolutions,
  - 720 samples/rev for 2 revolutions,
  - 512 samples/rev for 4 revolutions,
  - 360 samples/rev for 4 revolutions,
  - 256 samples/rev for 8 revolutions,
  - 128 samples/rev for 16 revolutions,
  - 64 samples/rev for 32 revolutions,
  - 32 samples/rev fro 64 revolutions, and
  - 16 samples/rev for 128 revolutions.
- Asynchronous data sampled to support an 800-line spectrum at the following frequency spans:
  - 10 Hz,
  - 20 Hz,
  - 50 Hz,
  - 100 Hz,
  - 200 Hz,
  - 500 Hz,
  - 1000 Hz,
  - 2000 Hz,
  - 5000 Hz,
  - 10 kHz,
  - 20 kHz, and
  - 30 kHz.
- Asynchronous data is anti-alias filtered.
- Channel Pairs for providing Orbit or synchronous full spectrum presentations can be split among multiple monitors. For asynchronous full spectrums the channels must be within a monitor channel pair (30 kHz frequency span data will not be phase correlated between channel pairs).



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## Communications

**Protocols**

*BN Host Protocol:*

Communication with 3500 Configuraton Software and 3500 Data Acquisition and Display Software.

*BN TDI Protocol:*

Communication with Bently Nevada System 1® Asset Management and Data Collection Software.

**Front Panel**

*Communications:*

RS232

*Protocol Supported:*

BN Host Protocol.

*Baud Rate:*

115.2 kbaud maximum (auto-baud capable)

*Cable Length:*

30 metres (100 feet) maximum

*Connector:*

9-pin DSUB

**10 Base-T/100 Base-TX Ethernet I/O**

*Communications:*

Ethernet, 10 Base-T and 100 Base-TX. Conforms to IEEE802.3.

*Protocol Supported:*

BN Host Protocol and BN TDI Protocol using Ethernet TCP/IP.

*Connection:*

RJ-45 (telephone jack style) for 10 Base-T/100 Base-TX Ethernet cabling.

*Cable Length:*

100 metres (328 feet) maximum.

**100 Base-FX Ethernet I/O**

*Communications:*

Ethernet, 100 Base-FX Fiber Optic, full duplex multimode. Conforms to IEEE802.3u.

*Protocol Supported:*

BN Host Protocol and BN TDI Protocol using Ethernet TCP/IP.

*Connection:*

MT-RJ Fiber Optic connector for 100 Base-FX cabling.

*Cable Length:*

2000 metres (6560 feet) maximum, multimode fiber optic cable.

## Environmental Limits

**TDI Module, 10 Base-T/100 Base-TX I/O, and 100 Base-FX I/O**

*Operating Temperature:*

-30 °C to +65 °C (-22 °F to +150 °F)

*Storage Temperature:*

-40 °C to +85 °C (-40 °F to +185 °F)

*Humidity:*

95%, non-condensing

**Battery Life**

*Powered TDI:*

38 years @ 50°C (122 °F)

*Un-powered TDI:*

12 years @ 50°C (122 °F)

## CE Mark Directives

**EMD Directive**

*Certificate of Conformity*

136669

*EN61000-6-4*

*Radiated Emissions*

EN 55011, Class A

*Conducted Emissions*

EN55011, Class A

*EN 61000-6-2*

*Electrostatic Discharge*

EN 61000-4-2, Criteria B

*Radiated Susceptibility*

EN 61000-4-3, Criteria A

*Conducted Susceptibility*

EN 61000-4-6, Criteria A

*Electrical Fast Transient*

EN 61000-4-4, Criteria B



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*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

**CE Mark Low Voltage Directives**
*Certificate of Conformity*

134036

*EN 61010-1*

Safety Requirements

## Hazardous Area Approvals

**CSA/NRTL/C:**

Ex nC[ia] IIC ZONE 2

Ex nC[L] IIC ZONE 2

Class I, Division 2, Groups A through D, T4 @ Ta=65°

**European ATEX:**

II 3(1) and (3)G

EEx nCAL[ia] IIC T4

EEx nCAL[L] IIC T4

@ -20 ºC ≤ Ta ≤ 60 ºC

## Physical

**TDI Module**
*Dimensions (Height x Width x Depth)*

243.1 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)*

243.1 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 lbs).

**Rack Space Requirements**
*TDI Module*

1 full-height front slot.

*I/O Modules*

1 full-height rear slot

# Ordering Information

## List of Options and Part Numbers

**3500/22M TDI Module and I/O**

**3500/22-AXX-BXX-CXX**

**A:** Transient Data Interface Type

| | |
|---|---|
| **0 1** | Standard (Use for standard monitoring applications) |
| **0 2** | TMR (Use only for applications that require a Triple Modular Redundant Configuration). |

**B:** I/O Module Type

| | |
|---|---|
| **0 1** | 10 Base-T/100 Base-TX Ethernet I/O module |
| **0 2** | 100 Base-FX (Fiber Optic) Ethernet I/O module |

**C:** Agency Approval Option

| | |
|---|---|
| **0 0** | None |
| **0 1** | CSA/NRTL/C |
| **0 2** | CSA/ATEX |

**3500/22M Dynamic Data Enabling Disk**

This disk is used to enable the number of channels of dynamic data that the TDI will support; dynamic data refers to the ability to collect waveforms. There are two levels of dynamic data: Steady-State points are channels that collect waveform data either due to a software command or due to an alarm event, and therefore support current values, scheduled waveform capture, and alarm data capture. Transient points provide all the function of a Steady-State point with the additional capabilities of waveform collection due to parameter variations such as machine speed.

**3500/09-AXXX-BXXX**

**A:** Steady-State Points:

0 to 672

**B:** Transient Points:

0 to 672

Note: The sum of the two fields must be equal to or less than 672. One disk can support multiple TDIs.

## Accessories

**Host Computer to 3500 Rack Cable**

**130118-AXXXX-BXX**

**A:** Cable Length:

| | |
|---|---|
| **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) |



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**B:** Assembly Instructions:

**0 0** Not assembled

**0 1** Assembled

**Ethernet Cables:**

**Standard 10 Base-T/100 Base-TX Shielded Category 5 Cable with RJ-45 connectors (solid conductor)**

**138131-AXXX**

**A:** Cable Length:

**0 0 6** 6 feet (1.8 m)

**0 1 0** 10 feet (3.0 m)

**0 2 5** 25 feet (7.6 m)

**0 4 0** 40 feet (12.2 m)

**0 5 0** 50 feet (15.2 m)

**0 7 5** 75 feet (22.9 m)

**0 8 5** 85 feet (25.9 m)

**1 0 0** 100 feet (30.5 m)

**1 2 0** 120 feet (36.6 m)

**1 5 0** 150 feet (45.7 m)

**2 0 0** 200 feet (61.0 m)

**2 5 0** 250 feet (76.2 m)

**3 2 0** 320 feet (97.5 m)

Note: Standard lengths for 10 Base-T/100 Base-TX cabling are shown above. Specific lengths can be ordered within the dimensions shown below. Contact your Bently Nevada solution specialist for assistance.

30 ft. – 100 ft. in 5 ft. increments only

100 ft. – 320 ft. in 10 ft. increments only

**100 Base-FX Fiber Optic Cable with MT-RJ connectors**

**161756-AXXX**

**A:** Length (in ft.) up to 1300 ft (400 m) in length:

10 ft. – 500 ft. in 10 ft. increments only

500 ft. – 1300 ft. in 100 ft. increments only

**Spares**

*138607-01*
Standard Transient Data Interface Module

*138607-02*
TMR Transient Data Interface Module

*146031-01*
10 Base-T/100 Base-TX I/O Module

*146032-01*
100 Base-FX (Fiber Optic) I/O Module

*147364-01*
3500 Buffered Signal Output Module

*161580-01*
3500/22M TDI Operation and Maintenance Manual

*164466-01*
Network Accessories Datasheet

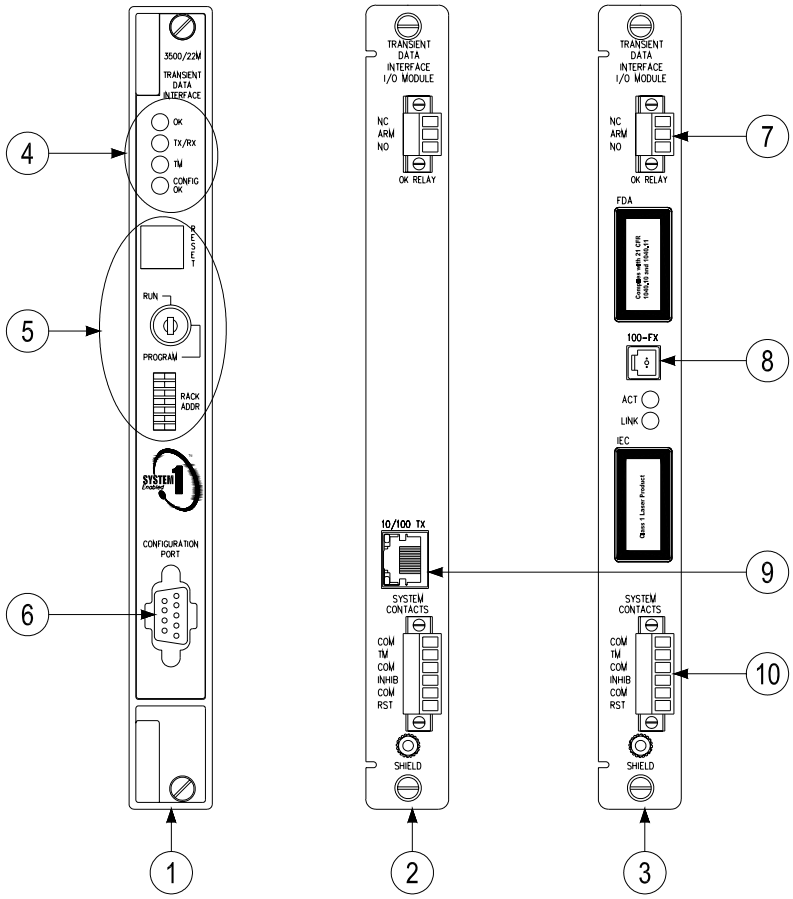
*00580441*
Connector header, internal termination, 3-position, green

*00580436*
Connector header, internal termination, 3-position, green



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## Figures




| | |
|---|---|
| 1 | Main module |
| 2 | 10 Base-T/100 Base-TX Ethernet I/O module |
| 3 | 100 Base-FX Ethernet I/O module |
| 4 | LEDs: Indicates the operating status of the module |
| 5 | Hardware switches |
| 6 | Configuration port: Configure or retrieve machinery data using RS-232 protocol |
| 7 | OK relay: Indicates the OK status of the rack |
| 8 | Fiber optic Ethernet port: For configuration and data collection |
| 9 | RJ-45 Ethernet port:: For configuration and data collection |
| 10 | System contacts |

**Figure 1: Front and rear view of the Transient Data Interface**

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