

# 3500/22M Transient Data Interface

## Product Datasheet

Bently Nevada\* Asset Condition Monitoring

### Description



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

The 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. (Refer to the Compatibility section at the end of this document.) Static data capture is standard with the TDI, however using an optional Channel Enabling Disk will allow the TDI to capture dynamic or transient data as well. The TDI features improvements in several areas over previous communication processors and incorporates the Communication Processor function within the 3500 rack.

Although the TDI provides certain functions common to the entire rack it is not part of the critical monitoring path and has no effect on the proper, normal operation of the overall monitor system. Every 3500 rack requires one TDI or RIM, which always occupies 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 monitor 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 TDI detects that the information from one of those monitors is no longer equivalent (within a configured percent) to that of the other two monitors, it will flag the monitor as being in error and place an event in the System Event List.



## Specifications

### Inputs

Power	
Consumption	10.5 Watts
Data	
Front Panel	USB-B
10Base-T/ 100Base-TX I/O	10Base-T or 100Base-TX Ethernet, autosensing
100Base-FX I/O	100Base-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. PROGRAM mode allows for normal operation of the rack and also allows for local or remote rack configuration. The key can be removed from the rack in either position, allowing the switch to remain in either the RUN or PROGRAM position. Locking the switch in the RUN position allows you to restrict unauthorized rack reconfiguration. Locking the 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 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 of 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 for 64 revolutions
  - 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
  - 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)

## Communications

Protocols	
BN Host Protocol	Communication with 3500 Configuration Software, 3500 Data Acquisition Software, and 3500 Display Software
BN TDI Protocol	Communication with GE's System 1* Asset Management and Data Collection Software
Front Panel	
Communications	USB-B
Protocol Supported	BN Host Protocol
Baud Rate	115.2 kbaud maximum (auto-baud capable)
Cable Length	USB Cable Length: 5 meters (16.4 ft)

	maximum. A 3 meter (9.8 ft) cable is included with the 3500 rack
Connector	USB-B
10Base-T / 100Base-TX Ethernet I/O	
Communications	Ethernet, 10Base-T and 100Base 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 10Base-T/100Base-TX Ethernet cabling
Cable Length	100 metres (328 feet) maximum

100 Base-FX Ethernet I/O	
Communications	Ethernet, 100Base-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 Male Fiber Optic connector for 100 Base-FX cabling
Cable Length	2000 metres (6560 feet) maximum, multimode fiber optic cable

 The 3500/22M has a MT-RJ Male connector on the unit for Fiber Optic 100 Base-FX cabling therefore you MUST use a MT-RJ Female connector on the fiber optic cable to ensure proper connectivity.

## Environmental Limits

TDI Module, 10Base-T/ 100Base-TX I/O, and 100Base-FX I/O	
Operating Temperature	-30 °C to +65 °C (-22 °F to +149 °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)

Part Number: 161581-01  
Rev. M



## Compliance and Certifications


EMC	
Standards	EN 61000-6-2 Immunity for Industrial Environments EN 55011/CISPR 11 ISM Equipment EN 61000-6-4 Emissions for Industrial Environments
European Community Directives	EMC Directive 2014/30/EU
Electrical Safety	
Standards	EN 61010-1
European Community Directives	LV Directive 2014/35/EU

## Hazardous Area Approvals

 For the detailed listing of country and product specific approvals, refer to the **Approvals Quick Reference Guide**, document 108M1756, at [www.GEmeasurement.com](http://www.GEmeasurement.com).

CSA/NRTL/C (Approval Option -01)	
With Barriers	Ex nC [ia] IIC T4 Gc: Class I, Division 1, Groups A B C D  AEx nC [ia] IIC T4 Gc: Class I, Division 2/0, Groups A B C D  T4 @-20°C ≤Ta ≤65°C (-4°F to 149°F)  per drawing 138547
Without Barriers	Ex nC [L] IIC T4 Gc: Class I, Division 2, Groups A B C D  AEx nC IIC T4 Gc: Class I, Division 2, Groups A B C D  T4 @-20°C ≤Ta ≤65°C (-4°F to 149°F)  per drawing 149244

ATEX/IECEx (Approval Option -02)	
With Barriers	 II 3 (1) G Ex nA nC [ia Ga] IIC T4 Gc  T4 @-20°C ≤Ta ≤65°C (-4°F to 149°F) per drawing 138547
Without Barriers	 II 3 G Ex nA nC IIC T4 Gc  T4 @-20°C ≤Ta ≤65°C (-4°F to 149°F) per drawing 149244

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

## Physical

TDI 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	0.20 kg (0.44 lbs)
Rack Space Requirements	
TDI Module	1 full-height front slot
I/O Modules	1 full-height rear slot

## Ordering Information

 For the detailed listing of country and product specific approvals, refer to the **Approvals Quick Reference Guide**, document 108M1756, at [www.GEmeasurement.com](http://www.GEmeasurement.com).

### Product Options and Part Numbers

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

##### 3500/22-AXX - BXX - CXX

- A:** Transient Data Interface Type
- 01** Standard  
(Use for standard monitoring applications)
- B:** I/O Module Type
- 01** 10Base-T/100Base-TX Ethernet
  - 02** 100Base-FX (Fiber Optic) Ethernet
- C:** Agency Approval Option
- 00** None
  - 01** CSA/NRTL/C (Class 1 Div 2)
  - 02** Multi (CSA, ATEX, IECEx)

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#### 3500 22M Dynamic Data Enabling Disk

This disk enables the number of channels of dynamic data (i.e., the ability to collect waveforms) that the TDI will support. There are two levels of dynamic data. Steady-State points are channels that collect waveform data due either to a software command or 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 capability 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:  
2 to 672

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


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## Ethernet Cables

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

##### 138131-AXXX

- A:** Cable Length:
- 006 - 6 feet (1.8 m)
  - 010 - 10 feet (3.0 m)
  - 025 - 25 feet (12.2 m)
  - 040 - 40 feet (12.2 m)
  - 050 - 50 feet (15.2 m)
  - 075 - 75 feet (22.9 m)
  - 085 - 85 feet (25.9 m)
  - 100 - 100 feet (30.5 m)
  - 120 - 120 feet (36.6 m)
  - 150 - 150 feet (45.7 m)
  - 200 - 200 feet (61.0 m)
  - 250 - 250 feet (76.2 m)
  - 320 - 320 feet (97. m)

 Standard lengths for 10Base-T/100Base-TX cabling are shown above.

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## Fiber Option Cable

100 Base-FX fiber optic cable with MT-RJ female connectors.

##### 161756-AXXX

- A:** Cable Length (in feet) up to 1300 ft (400 m)
- 10 ft. - 500 ft. (in 10 ft. increments only)
  - 500 ft. - 1300 ft. (in 100 ft. increments only)

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## Spares

### 288055-01

Standard Transient Data Interface Module  
with USB cable

### 100M2833

10 foot A to B USB cable

### 146031-01

10Base-T/100Base-TX I/O Module

### 146031-02

100Base-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, 6-  
position, green

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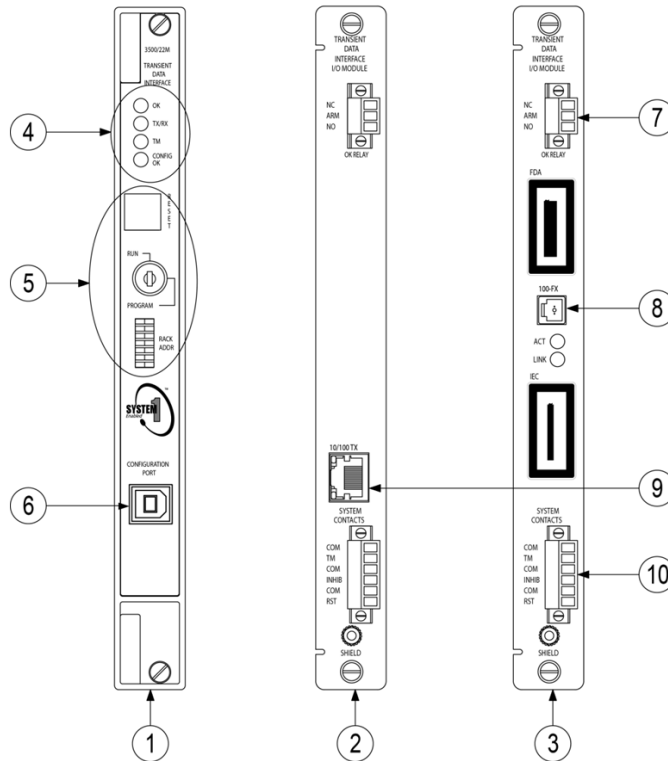
## Compatibility

When upgrading your 3500 rack from a 3500/20 RIM to a 3500/22 TDI, there may be 3500 M modules (e.g. 3500/40M) that are not compatible with the 3500/22. Please check with [bntechsupport@ge.com](mailto:bntechsupport@ge.com) for additional details.

## Network Requirements

For complete information on network requirements, refer to the *3500 Hardening Guide* [106M9733]. This document can be requested at [bntechsupport.com](http://bntechsupport.com).

# Graphs and Figures



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

<p>1: Main module</p> <p>2: 10 Base-T/100 Base-TX Ethernet I/O module</p> <p>3: 100 Base-FX Ethernet I/O module</p> <p>4: LEDs: Indicates the operating status of the module</p> <p>5: Hardware switches</p>	<p>6: Configuration port: Configure or retrieve machinery data using USB</p> <p>7: OK relay: Indicates the OK status of the rack</p> <p>8: Fiber optic Ethernet port: For configuration and data collection</p> <p>9: RJ-45 Ethernet port: For configuration and data collection</p> <p>10: System contacts</p>
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Printed in USA. Uncontrolled when transmitted electronically.

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