3500/22M Transient Data Interface Module

Datasheet

Bently Nevada Machinery Condition Monitoring

161581 Rev. AB

Description

The 3500/22M Transient Data Interface (TDI) is the interface between the 3500 monitoring system and compatible software (System 1 Condition Monitoring and Diagnostic software and 3500 System Configuration software). The TDI combines the function of a 3500/20 Rack Interface Module (RIM) with the data collection capability of a communication processor such as TDXnet.

The TDI resides in the slot adjacent to the power supplies of a 3500 rack. It interfaces with M series monitors (3500/40M, 3500/42M, etc.) to continuously collect steady state and transient dynamic (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 for more information.

Static data capture capability is standard with the TDI. However, using an optional Channel Enabling Disk will allow the TDI to capture dynamic and high-resolution transient data as well. The TDI 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 for automatic machinery protection. Every 3500 rack requires one TDI or RIM, which always occupies Slot 1 (next to the power supplies).

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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	
Function	Indicates 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".
Ratings	Standard OK Relay is rated to 5A @ 24 Vdc/120 Vac, 120 Watts/600 VA Switched Power (maximum) OK Relay with gold-plated contacts is rated down to 1 mA @ 1 Vdc (minimum)
Arc Protection	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

I/O Module Signal Common Terminal

Both versions of the TDI I/O Module now include a 2-pin connector for connecting Signal Common to a single point Instrument Ground for the rack. When this is done, the selector switch on the side of the Power Input Module (PIM) must be slid in the direction of the arrow marked "HP" to isolate Signal Common from chassis (safety) ground.

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 at selected increments of speed and time
- Increasing and decreasing speed intervals are 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
- Static values collected at one second intervals for 10 minutes before the event and 1 minute after the event
- Static values collected at 100 ms intervals for 20 seconds before the event and 10 seconds after the event
- 2.5 minutes of waveform data collected at 10-second intervals before the alarm and 1 minute of waveform data 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 System 1 Condition Monitoring and Diagnostic 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)
Unpowered TDI	12 years @ 50°C (122°F)

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

Compliance and Certifications

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

EMC

European Community Directive:

EMC Directive 2014/30/EU

Standards:

EN 61000-6-2; Immunity for Industrial Environments
EN 61000-6-4; Emissions for Industrial Environments

Electrical Safety

European Community Directive:

LV Directive 2014/35/EU

Standards:

EN 61010-1

RoHS

European Community Directive:

RoHS Directive 2011/65/EU

Maritime

DNV GL rules for classification – Ships, offshore units, and high speed and light craft

ABS Rules for Condition of Classification, Part 1

- Steel Vessels Rules
- Offshore Units and Structures

India-Battery EPR Marking

GE Oil & Gas India Private Limited

EPR Certificate No.: 1.1595372902047E+20

Hazardous Area Approvals

For the detailed listing of country and product-specific approvals, refer to the *Approvals Quick Reference Guide (108M1756)*.

For additional technical documentation, please log in to bntechsupport.com and access the Bently Nevada Media Library.

cNRTLus

Class I, Zone 2: AEx/Ex nA nC ic IIC T4 Gc;
Class I, Zone 2: AEx/Ex ec nC ic IIC T4 Gc;
Class I, Division 2, Groups A, B, C, and D;

T4 @ Ta= -20˚C to +65˚C (-4˚F to +149˚F)
When installed per drawing 149243 or 149244.

ATEX/IECEx

Ex II 3 G

Ex nA nC ic IIC T4 Gc
Ex ec nC ic IIC T4 Gc

T4 @ Ta= -20˚C to +65˚C
(-4˚F to +149˚F)
When installed per drawing 149243 or 149244.

Ordering Considerations

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.com** for additional details.

CAUTION

Upgrade advisory.

If the RIM I/O is left in the rack when installing a new TDI, it will damage the TDI.

Please perform the upgrade in this order:
1)Remove RIM
2)Remove RIM I/O
3) Insert TDI I/O
4) Insert TDI.

Network Requirements

For complete information on network requirements, refer to the *3500 Hardening Guide* [document 106M9733]. This document can be requested at **BNTechsupport.com**.

Ordering Information

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3500/22M TDI Module and I/O

3500/22-AA-BB-CC

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
03	10Base-T/100Base-TX Ethernet with gold-plated OK Relay contacts
04	100Base-FX (fiber optic) Ethernet with gold-plated OK Relay contacts
C: Agency Approval	
00	None
01	CSA/NRTL/C (Class 1, Division 2)
02	Multi (CSA, ATEX, IECEx)

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-AAA-BBB

A: Steady-State Points	
000 to 672	Steady-State Points
B: Transient Points	
002 to 672	Transient Points

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

Ethernet Cables

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

138131-AAA

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 (97.5 m)

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

Fiber Optic Cable

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

175M0075-AAAA

A: Cable Length in feet up to 1000 ft (300 m)	
0010	10 feet (3.0 m)
0100	100 feet (30.5 m)
0150	150 feet (45.7 m)
0330	330 feet (100.6 m)
0500	500 feet (152.4 m)
1000	1000 feet (304.8 m)

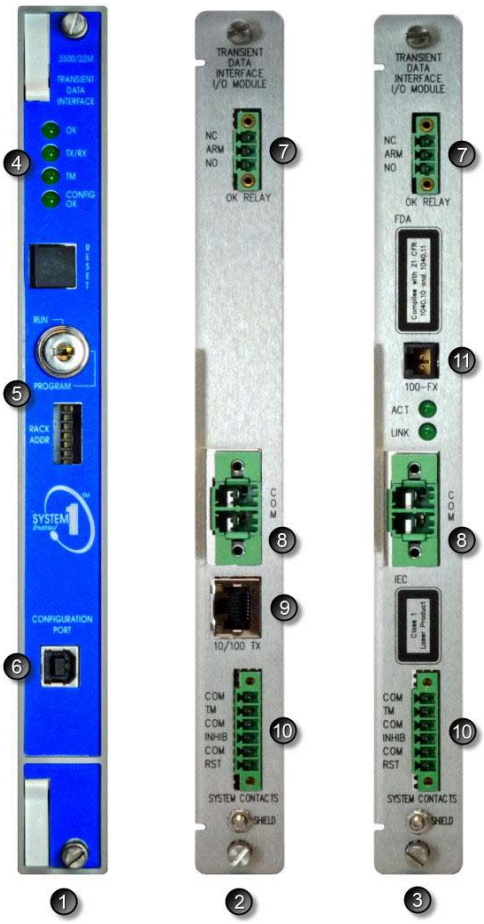
Spares

288055-01	Standard Transient Data Interface Module with USB cable
123M4610*	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
161580	3500/22M TDI Operation and Maintenance User Guide
164466	Network Accessories Datasheet
00580441	Connector header, internal termination, 3-position, green
00580436	Connector header, internal termination, 6-position, green
111M5777	Connector header, internal termination, 2-position, green
166M2390	Connector header, push-in-spring type (alternative for PN 00580436)
166M4363	Connector header, push-in-spring type (alternative for PN 00580441)
146031-03	10Base-T/100Base-TX I/O Module GLD Plated

146031-04	100Base-FX (Fiber Optic) I/O Module GLD Plated

* The USB cable part number is 123M4610. This specific cable is required to maintain isolation between chassis and ground. It is also important that the computer being attached to the USB needs to be operating from batteries (i.e. NOT connected to ground) to avoid creating a ground loop.

Graphs and Figures



1. Main Module
2. 10 Base-T/100 Base TX (copper) Ethernet I/O Module
3. 100 Base-FX (fiber optic) Ethernet I/O Module
4. LEDs indicate operating status of the module
5. Hardware Switches
6. USB Configuration Port for configuring or retrieving machinery data
7. OK Relay indicates the OK status of the overall rack
8. Signal Common external grounding terminal
9. RJ-45 Ethernet Port for configuration and data collection
10. System Contacts
11. Fiber Optic Ethernet Port for configuration and data collection

Figure 1: Front and Rear View of the Transient Data Interface

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