

149744 Trendmaster® Dynamic Scanning Module

Bently Nevada™ Asset Condition Monitoring



Description

The 149744 Trendmaster Dynamic Scanning Module (DSM) is a compact rack-based data acquisition system that is fully integrated with System 1® software. The DSM rack has a total of 5 card slots. The first slot is dedicated for communications and will accept either the copper or fiber Ethernet card. The other 4 slots are general-purpose card slots that can accept any combination of the available DSM input cards.

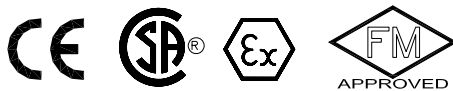
The DSM supports both Direct Input cards and a TIM Input card. Direct Input cards connect directly to sensors and are available for a variety of sensors as well as 4–20 mA transmitters. Direct Input cards support up to 8 channels and provide very rapid scanning. The TIM input card connects to Bently Nevada™ TIM, flexiTIM, and proTIM® modules. Each TIM input card provides 2 TIM lines, and each TIM line supports up to 255 TIMs and transducers. All input card types offer high-resolution sampling with onboard real-time processing. Onboard processing is the key to the powerful and efficient features available with the DSM platform. Because each input card can process data locally, the DSM can return post-processed variables to the host computer and reduce the required network bandwidth. If the host computer requires raw data, the DSM can also return waveforms and spectrums.

Modbus® Communications Capability

The introduction of a Modbus digital interface now permits DSMs to communicate directly with process control and automation systems without the need for additional hardware. This capability provides a low-cost entry-level alternative to System 1 that uses the basic trending and alarming functionality that is integral to existing process control systems. All DSMs now include Modbus over TCP/IP capability and require only the DSM Modbus Exporter software to configure all the DSM inputs and define the Modbus interface. The DSM requires the Modbus Serial to Ethernet Bridge for RS232/485 Modbus communication. See the accessory section of this datasheet for the Modbus Exporter software and Serial to Ethernet Bridge part numbers.

DSM Features

- Fully integrated with System 1 and Decision SupportSM
- Ethernet Modbus server with or without System 1
- Up to 150 DSMs per single data acquisition computer
- Small package, 21cm x 13 cm x 11cm (8.3 in x 5.1 in x 4.3 in)
- Choice of copper or fiber Ethernet
- Synchronous and asynchronous processing
- Automatic self-checking for DSM and Input cards, and transducers
- Up to 24 kHz high bandwidth inputs



- Up to 16-bit high resolution sampling
- Up to 16x auto gain
- Direct inputs for:
 - 2- and 3-wire acceleration sensors
 - 2- and 3-wire velocity sensors
 - Proximity, speed, and Keyphasor® signals
 - 4-20 mA transmitters buffered outputs
- TIM (Transducer Interface Module) support for:
 - Acceleration, velocity, and proximity sensors
 - 4-20 mA, 1-5 V, and 0-10 V transmitters
 - J and K thermocouples and platinum RTD
 - Up to 510 channels per card
- Onboard processing for:
 - True RMS and peak-peak
 - 1X, 2X, and not 1X variable
 - User configurable high-pass and band-pass filters
 - Integrated variables and waveforms
 - Configurable spectrums up to 3200 lines
 - Spectrum windowing, averaging, and overlap
 - Standard and enhanced high-frequency enveloping

Specifications

DSM Rack (149744)

Input Voltage

Power connector located on communications card.

20 to 30 Vdc

Input Power

18 watts maximum

Fuse Rating

1 amp slow-blow

10/100 TX Copper Ethernet Card (149776-01)

Status LED

Tri-color LED indicates status of DSM and input modules with combinations of colors and flash rates

Link/Activity LED

Tri-color LED indicates network link status

Connector Type

RJ45

Communications

DSM to System 1

TCP/IP

UDP for initialization

Modbus

Operates with or without System 1

Modbus over TCP/IP

Up to 6 clients

0.5 sec response time

Baud Rate

10 Base T or 100 Base TX, auto-negotiating

Cable Length

100 meters (328 feet)

Category 5, twisted pair

100 FX Fiber Ethernet Card (149776-02)

Status LED

Tri-color LED indicates status of DSM and input modules with combinations of colors and flash rates

Link/ACT LED

Tri-color LED indicates network link status

Connector type

MT-RJ

Communications

DSM to System 1

TCP/IP

UDP for initialization

Modbus

Operates with or without System 1

MODBUS over TCP/IP

Up to 6 clients

0.5 sec response time

Operation Protocol

TCP/IP, BN protocol

UDP for initialization only

Baud Rate

100 base FX only

Cable Length

400 meters (1312 feet) multimode fiber optic cable (half duplex)

2000 meters (6562 feet) multimode fiber optic cable (full duplex)

TIM Input Card (149787-01)**Input Lines**

Both lines sampled simultaneously

2 per card

255 TIMs per line

Supported TIMs

All proTIM, flexiTIM, and TIM modules

1900/15

1900/25

1900/55

TIM Cable Length

1200 meters (4000 feet)

A/D Resolution

14 bits

Accuracy

±2% of full-scale range

Short Circuit Current Limit

48 mA maximum

Hardware Frequency Response (3 dB corners)

1/3 Hz and 20 kHz

Refer to TIM and transducer specifications for more information

Direct Filter

2-pole high-pass, 1 Hz to 12.8 kHz

Prime Spike Filter

4-pole high-pass, 1 Hz to 12.8 kHz

2-pole low-pass, 10 Hz to 12.8 kHz

Rotor Region Filter

2-pole high-pass, 1 Hz to 12.8 kHz

2-pole low-pass, 10 Hz to 12.8 kHz

High Frequency Filter

4-pole high-pass, 1 Hz to 12.8 kHz

Synchronous Waveforms (Software configurable)**Frequency Span**

32, 64, and 128 samples per revolution

20 to 36,000 CPM

Waveform Size

8192 samples maximum

Filter

No anti-alias filter on synchronous path

Asynchronous Waveforms (Software configurable)**Frequency Spans**

20 Hz

50 Hz

100 Hz

200 Hz

500 Hz

1000 Hz

2000Hz

Sample Rates

51.2 Hz

128 Hz

256 Hz

512Hz

1280 Hz

2560 Hz

5120 Hz

12800 Hz

25600 Hz

Spectral Lines

100

200

400

800
1600
3200

Spectrum averages

Up to 8

Windowing

None, flat-top, or hanning

Process Variable Direct Input Card (149799-01)

Inputs

Both blocks sampled
simultaneously
2 blocks per card
4 inputs per block

Transmitter Type

4-20 mA, passive
Process variable card provides
transmitter power.

**Configurable Process
Types**

Current
Flow
Force
Frequency
Load
Mass
VAR
Position
Power
Power factor
Pressure
Process speed
Temperature
Torque
Valve position
Voltage
Weight

**Transmitter Supply
Voltage**

19.5 V to 30 V
(0.5 volts max < DSM input supply)

Input Impedance

211 $\Omega \pm 2 \Omega$

Accuracy

$\pm 2\%$ of FSR

A/D Resolution

14 bits

Full-Scale Range

4-20 mA, 22.5 mA maximum

**Short Circuit Current
Limit**

37 mA maximum

**24 Volt Transducer Direct Input Card
(149811-01)**

Inputs

Both blocks sampled
simultaneously. Any input can be
used for speed or KPH.
2 blocks per card
4 inputs per block
(X, Y, and KHP on a single card)

Transducer Type

3-wire voltage mode sensors

**Compatible Bently
Nevada™ Transducers**

3300
3300XL
3300 REBAM
7200
330400
330425

**Transducer Power
Supply Voltage**

-24 \pm 5% Vdc

| | |
|--|--|
| Maximum Transducer Current | 15 mA (per channel) |
| Maximum Transducer Cable Length | 305 m (1000 ft) |
| Amplitude Accuracy | 1% |
| Phase Accuracy | ±1° |
| A/D Resolution | 14 bits |
| Input Impedance | 10 kΩ |
| Keyphasor Input Signals | Keyphasor speed 6 to 36,000 cpm Duty cycle greater than 1% or 50 us Full scale gap range -24 volts Amplitude minimum 2.0 volts peak to peak |
| Hardware Frequency Response | 1/3 Hz and 24 kHz (3 dB corners) |
| Direct Filter | 2-pole high-pass, 1 Hz to 12.8 kHz |
| Prime Spike Filter: | 4-pole high-pass, 1 Hz to 12.8 kHz 2-pole low-pass, 10 Hz to 12.8 kHz |
| Rotor Region Filter | 2-pole high-pass, 1 Hz to 12.8 kHz 2-pole low-pass, 10 Hz to 12.8 kHz |
| High Frequency Filter | 4-pole high-pass, 1 Hz to 12.8 kHz |

| | |
|--|--|
| Synchronous Waveforms (Software Configurable) | |
| Frequency Span | 32, 64, and 128 samples per revolution 20 to 36,000 CPM |
| Waveform Size | 8192 samples maximum |
| Filter | No anti-alias filter on synchronous path |

| | |
|---|--|
| Asynchronous Waveforms (Software Configurable) | |
| Frequency Spans | 20 Hz 50 Hz 100 Hz 200 Hz 500 Hz 1000 Hz 2000 Hz 5000 Hz 10000 Hz 20000 Hz |
| Sample Rates | 51.2 Hz 128 Hz 256 Hz 512 Hz 1280 Hz 2560 Hz 5120 Hz 12800 Hz 25600 Hz 51200 Hz |
| Spectral Lines | 100 200 |

400
800
1600
3200

Spectrum Averages

Up to 8

Windowing

None, flat-top, or hanning

Constant Current Direct Input Card (149811-02)

Inputs

Both blocks sampled
simultaneously
2 blocks per card
4 inputs per block

Transducer Type

2-wire current mode sensors

**Compatible Bently
Nevada Transducers**

200350
330500
330525
190501

**Transducer Power
Supply Voltage**

-24 ± 5% Vdc

Bias Current Supply:

3.3 mA

Accuracy

1%

A/D Resolution

14 bits

**Transducer Cable
Length**

305 m (1000 ft) maximum for
compatible Bently Nevada
transducers

**Hardware Frequency
Response (3 dB corners)**

1/3 Hz and 24 kHz

Direct Filter

2-pole high-pass, 1 Hz to 12.8 kHz

Prime Spike Filter

4-pole high-pass, 1 Hz to 12.8 kHz
2-pole low-pass, 10 Hz to 12.8
kHz

Rotor Region Filter

2-pole high-pass, 1 Hz to 12.8 kHz
2-pole low-pass, 10 Hz to 12.8
kHz

High Frequency Filter

4-pole high-pass, 1 Hz to 12.8 kHz

Synchronous Waveforms (Software Configurable)

Frequency Span

32, 64, and 128 samples per
revolution
20 to 36,000 CPM

Waveform Size

8192 samples maximum

Filter

No anti-alias filter on
synchronous path

Asynchronous Waveforms (Software Configurable)

Frequency Spans

20 Hz
50 Hz
100 Hz
200 Hz
500 Hz
1000 Hz
2000 Hz
5000 Hz
10000 Hz
20000 Hz

Sample Rates

51.2 Hz
 128 Hz
 256 Hz
 512 Hz
 1280 Hz
 2560 Hz
 5120 Hz
 12800 Hz
 25600 Hz
 51200 Hz

Spectral Lines

100
 200
 400
 800
 1600
 3200

Spectrum Averages

Up to 8

Windowing

None, flat-top, or hanning

Seismic Direct Input Card (164746-01)**Inputs**

1 block of 8

Transducer Type

2-wire current mode sensors

Compatible Bently Nevada Transducers

200350
 330500
 330525
 190501

Transducer Power Supply Voltage

+24 ± 5% Vdc

Transducer Maximum Cable Length

See specific transducer datasheet.

Bias Current Supply

3.3 mA

Accuracy

1%

A/D Resolution

16 bits

Input Gain Stage (Manual or Auto)

1X, 4X, 8X, 16X

Hardware Frequency Response (3 dB corners)

1/3 Hz and 24 KHz

Direct Filter

2-pole high-pass, 1 Hz to 12.8 kHz

Prime Spike Filter

4-pole high-pass, 1 Hz to 12.8 kHz
 2-pole low-pass, 10 Hz to 12.8 kHz

Rotor Region Filter

2-pole high-pass, 1 Hz to 12.8 kHz
 2-pole low-pass, 10 Hz to 12.8 kHz

High Frequency Filter

4-pole high-pass, 1 Hz to 12.8 kHz

Enveloping Filter

4-pole high-pass, 2-pole low-pass
 25 – 125 Hz
 50 – 250 Hz
 100 – 500 Hz
 200 – 1000 Hz
 400 – 2000 Hz
 800 – 4000 Hz

1600 – 8000 Hz
3200 – 16000 Hz
6400 – 24000 Hz

25600 Hz
51200 Hz

Synchronous Waveforms (Software configurable)**Frequency span**

32, 64, 128, 256, 512, or 1024
samples per revolution
20 to 36,000 CPM at up to 25.6 k
samples/second
8192 samples maximum
waveform size

Filter

Tracking anti-alias filter

Waveform Averages

Up to 255

Asynchronous Waveforms (Software configurable)**Frequency Spans**

20 Hz
50 Hz
100 Hz
200 Hz
500Hz
1000 Hz
2000 Hz
5000 Hz
10000 Hz
20000 Hz

Sample Rates

51.2 Hz
128 Hz
256 Hz
512 Hz
1280 Hz
2560 Hz
5120 Hz
12800 Hz

Spectral Lines

100
200
400
800
1600
3200

Spectrum Averages

Up to 255

Windowing

None, flat-top, or hanning

General**Dimensions (Length x
Width x Height)**

21.6 cm x 13.3 cm x 11.4 cm (8.51
in x 5.24 in x 4.5 in)

Weight***DSM with no
input cards***

0.76 kg (1.7 lbm)

Input card

0.2 kg (0.44 lbm)

Power supply

0.5 kg (1.1 lb)

Mounting***DIN rail option***

35mm DIN rail. Requires 26.7 cm
(10.5 in) rail length.

***Weatherproof
housing***

35mm DIN rail. Requires 26.7 cm
(10.5in.) rail length.

Bulkhead option

Requires 4 #8 screws required.

Environmental Limits

Operating Temperature

-20 °C to +70 °C (-4 °F to +158° F)

Storage Temperature

-40 °C to +85 °C (-40 °F to +185 °F)

Operating or Storage Humidity

95%, non-condensing
100% condensing when installed in weatherproof housing with power applied.

Vibration

2 g's (10 to 55 Hz)
10 g's (55 to 500 Hz)

Shock

6-inch drop to plywood surface (installed in terminal base)

Compliance and Certifications

EMC

Standards:
EN61000-6-2 Immunity for Industrial Environments
EN61000-6-4 Emissions for Industrial Environments

Electrical Safety

Standards:
2006/95/EC Low Voltage

Hazardous Area Approvals

North American Approval Option (05)

AEx nA IIC T4; Class 1 Zone 2
Class 1 Division 2 Groups A,B,C,D T4
Vn = 20 to 30Vdc@Imax=750ma
T4@ -20 °C ≤ Ta ≤ 70 °C
When installed per DWG 163796

North American Approval Option (05)

Ex nA [nL] IIC T4
T4@ -20 °C ≤ Ta ≤ 70 °C
When installed per DWG 163796

European Approval Option (05)

⊕ II 3(1)G EEx nA [nL] IIC T4
Zone 2 Ex op is IIC
[ZONE 0][Ex op is] IIC
NEMKO 05 ATEX1090X
T4@ -20 °C ≤ Ta ≤ 70 °C
When installed per DWG 163796

Brazil

Approval Option (05)

Br-Ex nA [nL] IIC T4
MC, AEX-8295-X
T4@ -20 °C ≤ Ta ≤ 70 °C
When installed per DWG 163796

Ordering Information

149744 - AXX - BXX - CXX - DXX - EXX - FXX - GXX - HXX

A: Power Input

01 110/220 V 50-60 Hz
02 +24 Vdc

B: Communication

01 10/100baseT Ethernet
02 Fiber Optic Ethernet

C: Input Board 1

00 None
01 TIM input card
02 PV direct input card
03 24V transducer direct input card
04 Constant current direct input card
05 Seismic direct input card

| | | | |
|--|---|------------------------------------|---|
| D: Input Board 2 | | 149811-01 | |
| | 00 | None | |
| | 01 | TIM input card | Spare -24V Transducer Input Card. |
| | 02 | PV direct input card | |
| | 03 | 24V transducer direct input card | 149811-02 |
| | 04 | Constant current direct input card | Spare Constant Current Transducer Input Card. |
| | 05 | Seismic direct input card | 149799-01 |
| E: Input Board 3 | | | |
| | 00 | None | Spare Process Variable Input Card. |
| | 01 | TIM input card | |
| | 02 | PV direct input card | |
| | 03 | 24V transducer direct input card | 164746-01 |
| | 04 | Constant current direct input card | 149833-01 |
| | 05 | Seismic direct input card | Blank Slot Cover. |
| F: Input Board 4 | | 02200794 | |
| | 00 | None | +24V Power Supply. |
| | 01 | TIM input card | |
| | 02 | PV direct input card | |
| | 03 | 24V transducer direct input card | 162003 |
| | 04 | Constant current direct input card | Power Supply to DSM Wiring Harness. |
| | 05 | Seismic direct input card | 162222-01 |
| G: Mounting | | | Weatherproof Housing. |
| | 01 | Bulkhead mount | |
| | 02 | DIN Rail mount | 161692 |
| | 03 | Weatherproof enclosure | TIM Line Surge Protector Plug. Also requires Part 161693. |
| H: Approvals | | | |
| | 00 | No approvals | |
| | 05 | Multiple approvals | 161693 |
| <hr/> | | | |
| Accessories | | | |
| Use the part numbers listed in this section to order spare parts or additional components for your Trendmaster DSM system. | | | |
| 3010/56 | | 03839240 | |
| | DSM Modbus Exporter Software. | 02245020 | |
| 149776-01 | | | Signal Path Barrier MTL 764 (AC). |
| | Spare 10/100 Base T Ethernet Communication Card. | 02245021 | |
| 149776-01 | | 162261 | Signal Path Barrier MTL 765 (AC). |
| | Spare Fiber Optic Ethernet Communication Card. | | Trendmaster DSM SPA Cable. Mates with 162560. |
| 149787-01 | | 162560 | |
| | Spare TIM Line Input Card. | | SPA 5-position DIN Rail Terminal Block. Mates with 162261. |

162262

Trendmaster DSM PV/Direct Cable. Mates with 162559.

162559

PV/Direct 16-position DIN Rail Terminal Block. Mates with 162262.

43501

Low Pressure Cable Seal.

163723

EMI Ferrite Suppressor. For round cable.

164466-01

Ethernet Component Specification.

172555

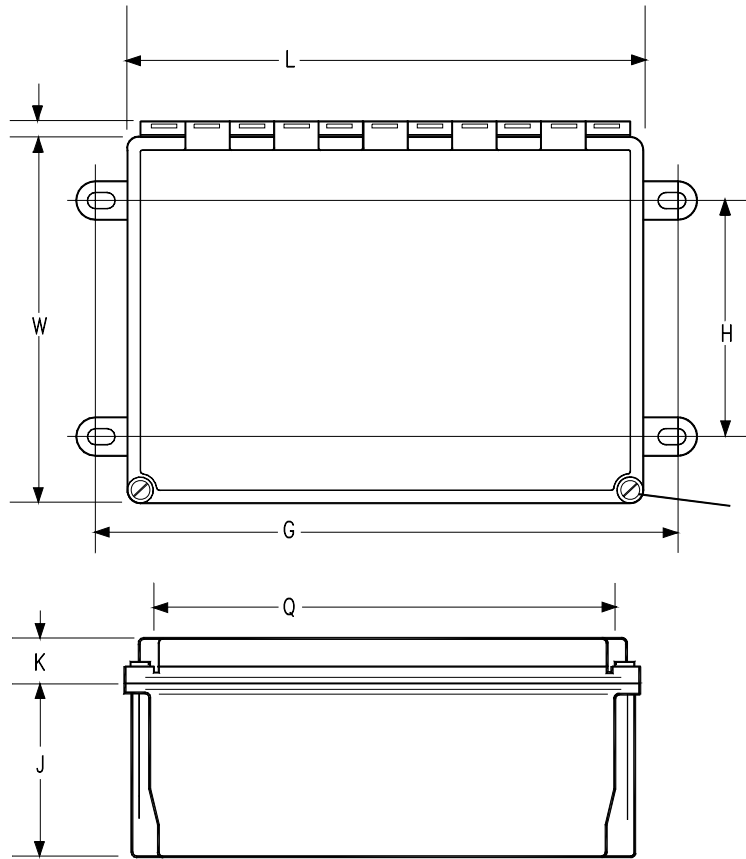
Modbus Serial to Ethernet Bridge.

162459-01

Trendmaster Galvanic Isolator.

Graphs and Figures

Note: All dimensions shown in millimetres (inches) except as noted.



L = 370 mm (14.55 in)

H = 274 mm (10.00 in)

W = 319 mm (12.55 in)

G = 379 mm (14.94 in)

J = 165 mm (6.5 in)

K = 46 mm (1.61 in)

Q = 260 mm (10.25 in)

Figure 1: Weatherproof Housing Dimensions

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