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Find the *GE / Bently Nevada 149787-01* at our website: *Click HERE*

# 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 Support*
- 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



imagination at work

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- 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



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# 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



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**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



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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 Ω ± 2 Ω

**Accuracy**

±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[1] or KPH.

2 blocks per card

4 inputs per block

(X, Y, and KHP on a single card)

[1] Direct Input Card does not support multi-event wheels

**Transducer Type**

3-wire voltage mode sensors

**Compatible Bently Nevada Transducers**

3300

3300XL

3300 REBAM

7200

330400

330425

**Transducer Power Supply Voltage**

-24 ± 5% Vdc

**Maximum Transducer Current**

15 mA (per channel)



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**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



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**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



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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



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**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

25600 Hz

51200 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)



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**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)

## CE Approvals

**EMC Directives**

DSM has the CE mark and is approved for installation within the European Union and EEA regions. DSM has been designed and tested to meet the listed directives.

**EMC Standards**

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the listed standards, in whole or in part, documented in a technical construction file.

***EN55011***

1998 Generic emission standard, Part 2, Industrial environment.

***EN61000-6-2***

EMC Generic immunity standard, Part 2, Industrial environment.

**Low Voltage Directive**

DSM meets Council Directive 73/23/EEC Low Voltage when the 24 Vdc power source is approved to the Low Voltage Directive. Power Supply part number 02200794 meets this requirement.

## Hazardous Area Approvals

**North American:**

FM APPROVED

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

Ex nA [nL] IIC T4

T4@ -20 °C ≤ Ta ≤ +70 °C

When installed per DWG 163796

**European**

II 3G Ex nA [ic] IIC T4 Gc

II 3(3)G Ex nA op is [op is T4 Gc] IIC T4 Gc

II 3(3)G [Ex op is T4 Gc] IIC

SIRA13ATEX4317X

T4@ -20 °C ≤ Ta ≤ +70 °C

When installed per DWG 163796

**Brazil**

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Ex nA [ic Gc] IIC T4 Gc

DNV 12.0029X

T4@ -20 °C ≤ Ta ≤ +70 °C

When installed per DWG 163796



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## Ordering Information

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

**A:** Power Input

| | |
|---|---|
| **0 1** | 110/220 V 50-60 Hz |
| **0 2** | +24 Vdc |

**B**: Communication

| | |
|---|---|
| **0 1** | 10/100baseT Ethernet |
| **0 2** | Fiber Optic Ethernet |

**C**: Input Board 1

| | |
|---|---|
| **0 0** | None |
| **0 1** | TIM input card |
| **0 2** | PV direct input card |
| **0 3** | 24V transducer direct input card |
| **0 4** | Constant current direct input card |
| **0 5** | Seismic direct input card |

**D:** Input Board 2

| | |
|---|---|
| **0 0** | None |
| **0 1** | TIM input card |
| **0 2** | PV direct input card |
| **0 3** | 24V transducer direct input card |
| **0 4** | Constant current direct input card |
| **0 5** | Seismic direct input card |

**E**: Input Board 3

| | |
|---|---|
| **0 0** | None |
| **0 1** | TIM input card |
| **0 2** | PV direct input card |
| **0 3** | 24V transducer direct input card |
| **0 4** | Constant current direct input card |
| **0 5** | Seismic direct input card |

**F**: Input Board 4

| | |
|---|---|
| **0 0** | None |
| **0 1** | TIM input card |
| **0 2** | PV direct input card |
| **0 3** | 24V transducer direct input card |
| **0 4** | Constant current direct input card |
| **0 5** | Seismic direct input card |

**G**: Mounting

| | |
|---|---|
| **0 1** | Bulkhead mount |
| **0 2** | DIN Rail mount |
| **0 3** | Weatherproof enclosure |

**H**: Approvals

| | |
|---|---|
| **0 0** | No approvals |
| **0 5** | Multiple approvals |

## Accessories

Use the part numbers listed in this section to order spare parts or additional components for your Trendmaster DSM system.

**3010/56**

**DSM Modbus Exporter Software.**

**149776-01**

**Spare 10/100 Base T Ethernet Communication Card.**

**149776-01**

**Spare Fiber Optic Ethernet Communication Card.**

**149787-01**

**Spare TIM Line Input Card.**

**149811-01**

**Spare –24V Transducer Input Card.**

**149811-02**

**Spare Constant Current Transducer Input Card.**

**149799-01**

**Spare Process Variable Input Card.**

**164746-01**

**Spare Seismic Input Card**.

**149833-01**

**Blank Slot Cover**.

**02200794**

**+24V Power Supply.**

**162003**

**Power Supply to DSM Wiring Harness.**

**162222-01**

**Weatherproof Housing.**

**161692**

**TIM Line Surge Protector Plug.**
Also requires Part 161693.



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**161693**

**TIM Line Surge Protector Base.** Also requires Part 161692.

**03839240**

**TIM Line Cable Seal.** 5.1 mm to 6.7 mm (0.20 in to 0.27 in).

**02245020**

**Signal Path Barrier MTL 764 (AC).**

**02245021**

**Signal Path Barrier MTL 765 (AC).**

**162261**

**Trendmaster DSM SPA Cable.** Mates with 162560.

**162560**

**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**

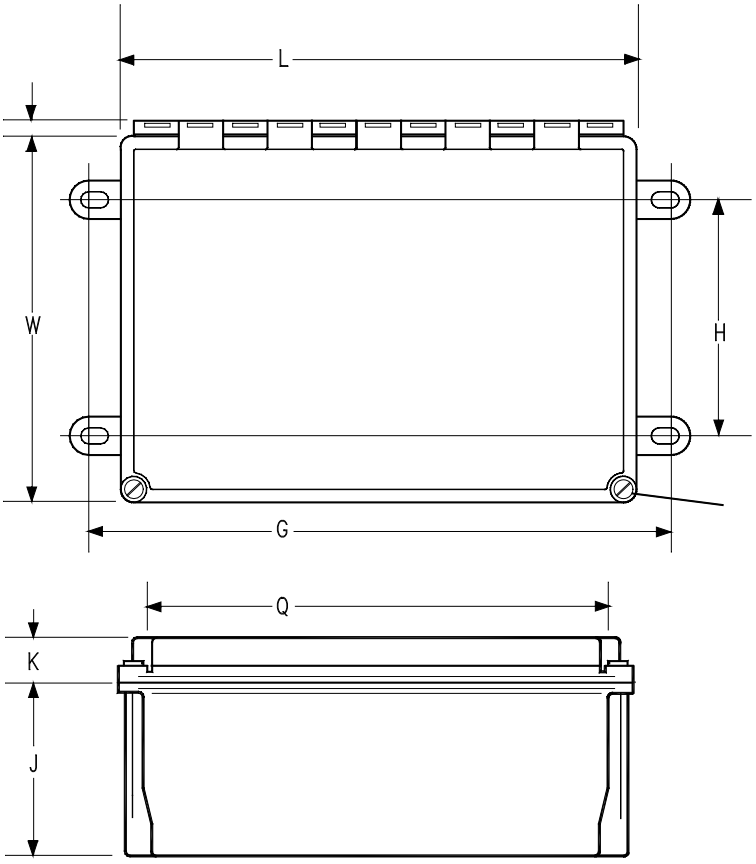
**Trendmaster Galvanic Isolator.**



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## 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**

* Denotes a trademark of Bently Nevada, Inc., a wholly owned subsidiary of General Electric Company.
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1631 Bently Parkway South, Minden, Nevada USA 89423
Phone: 775.782.3611 Fax: 775.215.2873
www.ge-mcs.com/bently



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