FD-11637 Specifications

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These specifications apply to the FD-11637.

Revision History

Version	Date changed	Description
377309B-01	June 2025	Added pinout.
377309A-01	March 2018	Initial release.

Looking For Something Else?

For information not found in the specifications for your product, such as operating instructions, browse ***Related Information***.

Related information:

- FD-11637 User Manual
- FD-11637 Calibration Procedure
- NI-DAQmx User Manual
- Software and Driver Downloads
- Release Notes
- License Setup and Activation
- Dimensional Drawings
- Product Certifications
- Letter of Volatility
- Discussion Forums
- NI Learning Center

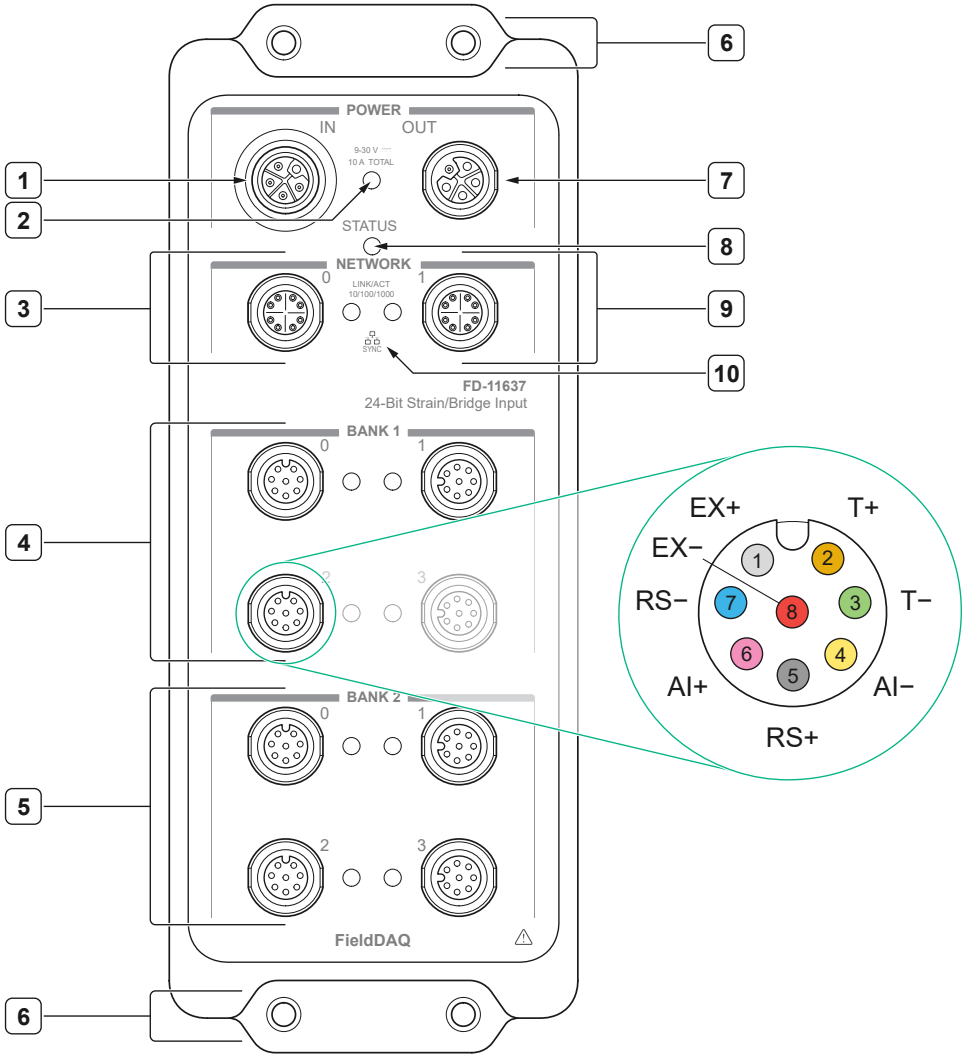
Conditions

Specifications are typical and valid from -40 °C to +85 °C unless otherwise noted.

FD-11637 Front Panel

Use the front panel to locate the connectors, LEDs, mounting holes on the FD-11637.

Figure 1. FD-11637 Front Panel



1. Power IN Connector
2. Power LED
3. Ethernet Port 0 and LED
4. Bank 1 Input Connectors 0 through 3 and LEDs
5. Bank 2 Input Connectors 0 through 3 and LEDs
6. Mounting Holes
7. Power OUT Connector
8. STATUS LED
9. Ethernet Port 1 and LED

10. SYNC Logo

Power Connector Pinout

The following figure shows the pinout of the Power IN connector.

Figure 2. Power Connector Pinout

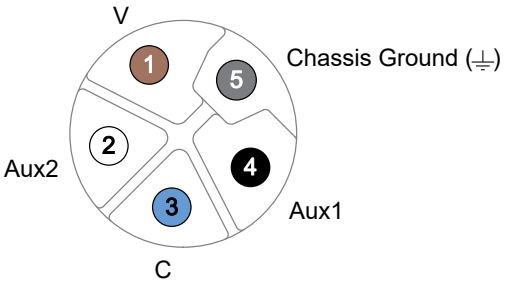


Table 1. Signal Descriptions

Pin Number	Wire Color*	Signal	Description
1	Brown	V	Positive voltage line
2	White	Aux2	Optional line for powering non-FieldDAQ devices
3	Blue	C	Common. Negative voltage line
4	Black	Aux1	Optional line for powering non-FieldDAQ devices
5	Gray	⏚	Chassis Ground. This terminal is internally connected to the C terminal.

* Wire color pertains to M125F power cables sold through NI. Other manufacturers' cable wire colors may vary.

Ethernet Ports

The FD-11637 has two 8-pin X-coded M12 Ethernet ports—0 and 1.

You can use a shielded straight-through Ethernet or an Ethernet crossover cable with either of the Ethernet ports to network your device to a computer host, NI Linux Real-Time controller, another FieldDAQ device, or any network connection on the same subnet. Refer to ***Topology Options*** for more information about using these ports in various topologies.

Figure 3. Ethernet Connector Pinout

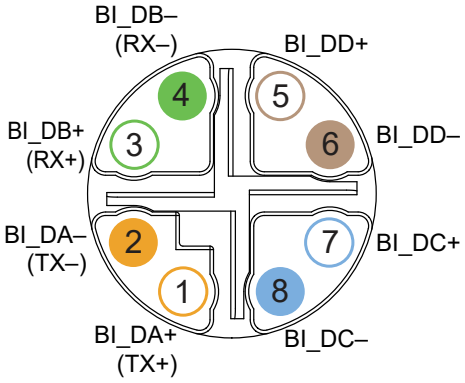


Table 2. Signal Descriptions

Pin Number	Wire Color	Gigabit Ethernet Signal	Fast Ethernet Signal
1	Orange/White	BI_DA+	TX+
2	Orange	BI_DA-	TX-
3	Green/White	BI_DB+	RX+
4	Green	BI_DB-	RX-
5	Brown/White	BI_DD+	No Connect
6	Brown	BI_DD-	No Connect
7	Blue/White	BI_DC+	No Connect
8	Blue	BI_DC-	No Connect

You can use the Ethernet ports to reset the FieldDAQ device to factory-default settings. Refer to ***Resetting the FieldDAQ to Factory-Default Settings*** for more information.

Cap the Ethernet ports when not in use.

Related information:

- Topology Options
- Resetting the FieldDAQ to Factory-Default Settings

Strain/Bridge Connectors

The FD-11637 features eight 8-pin A-coded M12 connectors.

The following figure shows the pinout of a strain/bridge input connector. The FD-11637 provides connections for eight quarter-, half- or full-bridge connections.

Figure 4. FD-11637 Pinout

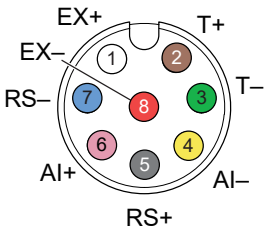


Table 3. Signal Descriptions

Pin Number	Wire Color*	Signal	Description
1	White	EX+	Positive sensor excitation
2	Brown	T+	TEDS data
3	Green	T-	TEDS return
4	Yellow	AI-	Negative analog input signal
5	Gray	RS+	Positive remote sense
6	Pink	AI+	Positive analog input signal
7	Blue	RS-	Negative remote sense
8	Red	EX-	Negative sensor excitation

* Wire color pertains to SHM128M I/O cables sold through NI. Other manufacturers' cable wire colors may vary.

Note M12 connectors must be mated to cables or have caps installed on

them to meet IP65/IP67 requirements. Cover the unused connectors with the included plastic caps whenever water, dust, or dirt are present.

Input Characteristics

Number of channels	8 analog input channels
Isolation	Galvanic isolation between channels and to chassis
Input range	±38 mV/V

Table 4. Bridge Completion

Half and Full	Internal
Quarter	Internal, 120 Ω and 350 Ω

ADC resolution	24 bits
Type of ADC	Delta-Sigma (with analog prefiltering)
Sample mode	Simultaneous
TEDS support	IEEE 1451.4 TEDS Class 2

Table 5. Timebases (f_M)

Frequency	13.1072 MHz, 12.8 MHz, 12.288 MHz, 10.24 MHz
Accuracy	±30 ppm maximum

Base clocks can be synchronized with other FieldDAQ devices using the network synchronization feature.

Table 6. Sampled Data Rate Range (f_S)

Minimum	500 Samples/s
Maximum	102.4 kSamples/s

Sampled data rates (f_S)	Refer to the following table for sample data rates supported for each timebase

Table 7. Timebases (f_M) and Supported Sampled Data Rates (f_S), (kSamples/s)

13.1072 MHz	12.8 MHz (Default)	12.288 MHz	10.24 MHz
102.4	100.0	96.0	80.0
51.2	50.0	48.0	40.0
34.133	33.333	32.0	26.667
25.6	25.0	24.0	20.0*
20.48	20.0	19.2	16.0
17.067	16.667	16.0*	13.333
12.8	12.5	12.0	10.0*
10.24	10.0	9.6	8.0
8.533	8.333	8.0*	6.667
6.4	6.25	6.0	5.0*
5.12	5.0	4.8	4.0
4.267	4.167	4.0*	3.333
3.2	3.125	3.0	2.5*
2.56	2.5	2.4	2.0
2.133	2.083	2.0*	1.667
1.6	1.563	1.5	1.25*
1.28	1.25	1.2	1.0
1.067	1.042	1.0*	0.833
0.8	0.781	0.75	0.625
0.64	0.625	0.6	0.5

For sample rates that can be obtained using two different timebases, the lowest noise (highest resolution) option is indicated with an asterisk (*).

Table 8. Measurement Noise

Sampled Data Rate	Timebase	Excitation		
		10 V	5 V	3 V
102.4 kSamples/s	13.1072 MHz	0.4 µV/V RMS	0.8 µV/V RMS	1.3 µV/V RMS
10 kSamples/s	10.24 MHz	0.12 µV/V RMS	0.25µV/V RMS	0.4 µV/V RMS
1 kSamples/s	12.288 MHz	0.04 µV/V RMS	0.08 µV/V RMS	0.14 µV/V RMS

Table 9. Gain Error (% of Reading)

Temperature	Full- or Half-Bridge Mode[1]	Quarter-Bridge Mode[2]	
		350 Ω	120 Ω
5 °C to 40 °C, typical	±0.05%	±0.15%	±0.3%
5 °C to 40 °C, maximum	±0.15%	±0.4%	±0.8%
-40 °C to 85 °C, maximum	±0.20%	±0.5%	±1.0%

Table 10. Offset Error, Full-Bridge Mode

Temperature	Excitation		
	10 V	5 V	3 V
5 °C to 40 °C, typical	±1.5 µV/V	±2 µV/V	±3 µV/V
5 °C to 40 °C, maximum	±6 µV/V	±8 µV/V	±12 µV/V
-40 °C to 85 °C, maximum	±10 µV/V	±13 µV/V	±20 µV/V

Half- and quarter-bridge sensors and strain gages should remove offset errors by offset nulling to eliminate offset effects of lead wire resistance and sensor impedance tolerances.

1. Calculated when using remote sense to remove gain errors caused by external lead wire resistances.
2. Calculated after using shunt calibration to remove gain errors caused by external lead wire resistances; these specifications include all errors caused by tolerances of the completion and shunt calibration resistors.

Table 11. Gain Drift

Full- and half-bridge mode	±5 ppm per °C
350 Ω quarter-bridge mode	±15 ppm per °C
120 Ω quarter-bridge mode	±40 ppm per °C

Table 12. Offset Drift, Full-Bridge Mode

10 V excitation	±0.02 µV/V per °C
5 V excitation	±0.04 µV/V per °C
3 V excitation	±0.06 µV/V per °C

Table 13. Offset Drift, Half-Bridge Mode

1 kΩ x2	±1 µV/V per °C
350 Ω x2	±2.5 µV/V per °C
120 Ω x2	±7 µV/V per °C

Table 14. Offset Drift, Quarter-Bridge Mode

350 Ω	±1 µV/V per °C
120 Ω	±2 µV/V per °C

Input delay	$36 / f\text{s} + 3.7$ µs
Input delay tolerance	±0.5 µs

Passband frequency	DC to $0.4 \cdot f\text{s}$

Table 15. Passband Flatness and Delay Variation with Input Frequency

0 kHz to 10 kHz	±0.04 dB, ±10 ns
0 kHz to 20 kHz	±0.08 dB, ±30 ns
0 kHz to 40 kHz	±0.30 dB, ±100 ns

Table 16. Stopband

Frequency	At and above 0.50 · f_S
Rejection	100 dB

Alias-free bandwidth	0.50 · f_S
Common-mode voltage, all signals to earth ground	±60 V DC, Refer to ***Safety Voltages*** for restrictions on working and fault voltages.
Full-bridge mode common-mode voltage range, with respect to EX-	Both inputs must be between 40% and 60% of the excitation voltage
Spurious Free Dynamic Range (SFDR)	130 dB
Total Harmonic Distortion (THD), up to 8 kHz and ±5 mV/V	-90 dB

Table 17. Crosstalk

f_{in} = 1 kHz	-120 dB
f_{in} = 10 kHz	-100 dB

Excitation voltage[3]	3 V, 5 V, 10 V

Table 18. Excitation, Allowable Load Resistance

10 V excitation	≥225 Ω
5 V or 3 V excitation	≥108 Ω

Table 19. Excitation, Resistance Threshold for Open Circuit Detection

Minimum	1.20 kΩ
Typical	1.75 kΩ
Maximum	2.60 kΩ

3. 10 V excitation is not supported for quarter-bridge mode.

Table 20. Shunt Calibration Resistance (Quarter-Bridge Mode Only)

350 Ω	49.90 kΩ
120 Ω	49.66 kΩ

Time-Based Triggers

Type	Start Trigger, Sync Pulse

Timing and Synchronization

Protocol	IEEE 802.1AS for network synchronization over 1000 Base-TX, full-duplex
Network synchronization accuracy[4]	<1 µs
Network synchronization accuracy with optimized configuration[5]	<100 ns

For information about network synchronization accuracy, refer to ***NI-DAQmx-Based TSN Synchronization Accuracy Explained***. For information about achieving high-accuracy synchronization, refer to ***How to Achieve High-Accuracy Measurements With NI-DAQmx-Based TSN Devices***.

Related information:

- NI-DAQmx-Based TSN Synchronization Accuracy Explained
- How to Achieve High-Accuracy Measurements With NI-DAQmx-Based TSN Devices

Network Interface

Network protocols	TCP/IP, UDP
Network ports used	HTTP:80 (configuration only), TCP:3580; UDP:5353 (configuration only), TCP:5353 (configuration only); TCP:31415; UDP:7865

4. I/O synchronization is system-dependent. Assumes the devices are connected in a line topology.
5. I/O synchronization is system-dependent. Assumes a system containing one hop.

	(configuration only), UDP:8473 (configuration only)
Network IP configuration	DHCP + Link-Local, DHCP, Static, Link-Local
Default MTU size	1,500 bytes

Ethernet

Number of ports	2 8-pin X-coded M12 ports, internally switched[6]
Network interface	1000 Base-TX, full-duplex; 1000 Base-TX, half-duplex; 100 Base-TX, full-duplex; 100 Base-TX, half-duplex; 10 Base-T, full-duplex; 10 Base-T, half-duplex
Communication rates	10/100/1,000 Mbps, auto-negotiated
Maximum cabling distance	100 m/segment
Maximum hops per line[7]	15

For information about creating reliable Ethernet-based systems, refer to ***Designing Distributed TSN Ethernet-Based Measurement Systems***.

Related information:

- Designing Distributed TSN Ethernet-Based Measurement Systems

Power Requirements

Caution The protection provided by the FD-11637 can be impaired if it is used in a manner not described in the ***FD-11637 User Manual***.

Table 21. Voltage Input Range

V_{in}	9 V DC to 30 V DC
V_{aux}	0 V DC to 30 V DC

6. This allows for line topologies or network redundancy.
7. With default software configuration.

Table 22. Device Power Consumption

Nominal	9 W
Maximum	15 W

- **Device power consumption**—The total amount of power drawn by the device from the power input connector, including power delivered to external sensors.

Table 23. Power Connectors

Power input connector	5-pin L-coded male M12 connector
Power output connector	5-pin L-coded female M12 connector

Current Limits

Notice Exceeding the current limits may cause damage to the device. Stay below a maximum of 10 A shared between both Input and Aux terminals.

Table 24. Power IN/OUT Terminals

V_{in}	10 A maximum
V_{aux}	10 A maximum total (combined with V_{in})

Recommended external overcurrent protection	16 A, slow blow fuse

Physical Characteristics

Table 25. Dimensions and Weight

Dimensions	198.5 mm × 77.4 mm × 47.1 mm (7.8 in. × 3.0 in. × 1.9 in.)
Weight	1.2 kg (2 lb 10 oz)

Table 26. Input Connection

Number	8
Type	8-pin A-coded M12 connectors

Torque for M12 connectors (power, Ethernet, input connections)	0.6 N · m (5.31 lb · in.)

Calibration

Calibration interval	1 year

Environmental

Refer to the ***FD-11637 User Manual*** for more information about meeting these specifications.

Operating temperature	-40 °C to 85 °C
Storage temperature	-40 °C to 100 °C

Note Failure to follow the mounting instructions in the ***FD-11637 User Manual*** can cause temperature derating.

Ingress protection	IP65/IP67
Operating humidity	Up to 100% relative humidity, condensing or noncondensing
Pollution Degree	4
Maximum altitude	5,000 m

Note M12 connectors must be mated to cables or have caps installed on them to meet IP65/IP67 requirements. Cover the unused connectors with the included plastic caps whenever water, dust, or dirt are present.

Note Avoid long periods of exposure to sunlight.

Shock and Vibration

To meet the following specifications, you must panel mount the system.

Table 27. Operating Vibration

Random	10 g RMS, 5 Hz to 2,000 Hz
Sinusoidal	10 g, 5 Hz to 2,000 Hz
Operating shock	100 g, 11 ms half sine, 3 shocks at 6 orientations, 18 total 40 g, 6 ms half sine, 4,000 shocks at 6 orientations, 24,000 total

Environmental Standards

This product meets the requirements of the following environmental standards for electrical equipment.

- IEC 60068-2-1 Cold
- IEC 60068-2-2 Dry heat
- IEC 60068-2-6 Sinusoidal vibration
- IEC 60068-2-27 Shock
- IEC 60068-2-30 Damp heat, cyclic (12 h + 12 h cycle)
- IEC 60068-2-64 Broadband random vibration

Safety Voltages

The FD-11637 is rated for use in DRY or WET LOCATIONS. Do not connect hazardous

voltages to the FD-11637. A ***hazardous voltage*** is a voltage greater than 30 V RMS, 42.4 V peak, or 60 V DC in DRY LOCATIONS and 22.6 V peak or 35 V DC in WET LOCATIONS.

Rated Voltages

Connect only voltages that are within the following limits:

Between any two pins	60 V DC (Dry Locations); 35 V DC (Wet Locations)

Temporary Overvoltage Protection

Product has been designed to withstand power frequency overvoltage of relatively long duration as specified below. Voltages beyond these levels may cause permanent damage.

Between any two pins on the connector	±30 V DC

Isolation Voltages

- **Working Voltage**—The highest RMS value of the AC or DC voltage across the insulation that can continuously occur when the equipment is supplied at rated voltage.
- **Transient Overvoltage (Vpk)**—An overvoltage condition of a relatively short duration, a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped.
- **Withstand**—The highest RMS value of AC or DC voltage to which the isolation barrier has been tested in order to verify the insulation can handle the working voltage electrical and mechanical stresses in normal use, verified with a 1 min. duration.

Table 28. Channel-to-Channel Isolation

Working Voltage	60 V DC (Dry Locations); 35 V DC (Wet Locations) Non-Mains
Withstand	1,000 V RMS, verified by 5 s withstand

Table 29. Channel-to-Earth Ground Isolation

Working Voltage	60 V DC (Dry Locations); 35 V DC (Wet Locations) Non-Mains
Withstand	1,000 V RMS, verified by 5 s withstand

These test and measurement circuits are not rated for measurements performed on circuits directly connected to the electrical distribution system referred to as MAINS.

MAINS is a hazardous live electrical supply system to which equipment is designed to be connected to for the purpose of powering equipment. This product is rated for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

Hazardous Voltage Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV, or for measurements on MAINs circuits or on circuits derived from Overvoltage Category II, III, or IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation. The product can only withstand transients up to the transient overvoltage rating without breakdown or damage to the insulation. An analysis of the working voltages, loop impedances, temporary overvoltages, and transient overvoltages in the system must be conducted prior to making measurements.

Tension dangereuse Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour des mesures dans ces catégories, ou des mesures sur secteur ou sur des circuits dérivés de surtensions de catégorie II, III ou IV pouvant présenter des surtensions transitoires supérieures à ce que le produit peut supporter. Le produit ne doit pas être raccordé à des circuits ayant une tension maximale supérieure à la tension de fonctionnement continu, par rapport à la terre ou à d'autres voies, sous peine d'endommager et de compromettre l'isolation. Le produit peut

tomber en panne et son isolation risque d'être endommagée si les tensions transitoires dépassent la surtension transitoire nominale. Une analyse des tensions de fonctionnement, des impédances de boucle, des surtensions temporaires et des surtensions transitoires dans le système doit être effectuée avant de procéder à des mesures.

Safety Compliance Standards

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1

Note For safety certifications, refer to the product label or the Product Certifications and Declarations section.

Electromagnetic Compatibility Standards

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Industrial immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- ICES-001: Class A emissions

Note Group 1 equipment is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note In Europe, Australia, New Zealand, and Canada (per CISPR 11) Class A equipment is intended for use in non-residential locations.

Note For EMC declarations and certifications, and additional information, refer to the ***Product Certifications and Declarations*** section.

Notice Operate this product only with shielded cables and accessories.

Notice To ensure the specified EMC performance, operate this product only with shielded Ethernet cables.

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.