FD-11637

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Contents

FD-11637 Specifications

Conditions

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

Input Characteristics

Number of channels	8 analog input channels
Isolation	Galvanic isolation between channels and to chassis
Input range	±38 mV/V
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
Timebases (f_M)[1]	
Frequency	13.1072 MHz, 12.8 MHz, 12.288 MHz, 10.24 MHz
Accuracy	±30 ppm maximum
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 1. 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

13.1072 MHz	12.8 MHz (Default)	12.288 MHz	10.24 MHz
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

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

Table 2. Measurement Noise

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

Table 3. Gain Error (% of Reading)

Temperature	Full- or Half-Bridge Mode[2]	Quarter-Bridge Mode[3]	
		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 4. 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
Note: 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.			

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
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
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
Quarter-bridge mode	
350 Ω	±1 µV/V per °C
120 Ω	±2 µV/V per °C
Input delay	36 / f_S + 3.7 µs
Input delay tolerance	±0.5 µs
Passband	
Frequency	DC to 0.4 · f_S
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
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
Crosstalk	
f_{in} = 1 kHz	-120 dB
f_{in} = 10 kHz	-100 dB
Excitation	
Voltage[4]	3 V, 5 V, 10 V
Allowable load resistance	
10 V excitation	≥225 Ω

5 V or 3 V excitation	≥108 Ω
Resistance threshold for open circuit detection	
Minimum	1.20 kΩ
Typical	1.75 kΩ
Maximum	2.60 kΩ
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[5]	<1 µs

Network synchronization accuracy with optimized configuration[6]	<100 ns

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 (configuration only), UDP:8473 (configuration only)
Network IP configuration	DHCP + Link-Local, DHCP, Static, Link-Local
Default MTU size	1500 bytes

Ethernet

Number of ports	2 8-pin X-coded M12 ports, internally switched[7]
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	10/100/1000 Mbps, auto-negotiated

Maximum cabling distance	100 m/segment
Maximum hops per line[8]	15

Power Requirements

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

Voltage input range	
V_{in}	9 V DC to 30 V DC
V_{aux}	Up to 30 V DC

Maximum device power consumption[9]	15 W
Maximum device heat dissipation[10]	11 W
Power input connector	5-pin L-coded male M12 connector
Power output connector	5-pin L-coded female M12 connector

Current Limits

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

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

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)
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.)

To clean the device, wipe it with a dry towel.

Calibration

Calibration interval	1 year

Environmental

Refer to the ***FD-11637 User Guide*** 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 Guide*** 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.

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

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 model meets the requirements of the following electrical equipment environmental standards for measurement, control, and laboratory use:

- IEC 60068-2-1
- IEC 60068-2-2
- IEC 60068-2-6
- IEC 60068-2-27
- IEC 60068-2-30
- IEC 60068-2-64

Safety Voltages

Connect only voltages that are within the following limits:

Channel-to-channel isolation	
Continuous working voltage[11]	60 V DC (Dry Locations); 35 V DC (Wet Locations)
Transient overvoltage[12]	1,000 V RMS, verified by 5 s withstand
Channel-to-earth ground isolation	
Continuous working voltage	60 V DC (Dry Locations); 35 VDC (Wet Locations)
Transient overvoltage	1,000 V RMS, verified by 5 s withstand
Overvoltage protection[13]	±30 V between any two pins on the connector

These test and measurement circuits are rated for measurements performed on circuits not 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.

Warning Do not connect the FD-11637 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.

Safety

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 UL and other safety certifications, refer to the product label or the Online Product Certification section.

Electromagnetic Compatibility

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
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) 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 For EMC declarations and certifications, and additional information, refer to the Online Product Certification section.

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

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the ***Minimize Our Environmental Impact*** web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all NI products must be

disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国RoHS）

中国客户 National Instruments符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于National Instruments中国RoHS合规性信息，请登录 ni.com/environment/rohs_china。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)