

Sciometric EDGE 421

125 kS/s 24-bit Analog In, 16-bit Analog Out Module



Product Specifications

Simplify data acquisition with this universal sensor I/O module

The Sciometric EDGE 421 is a compact data acquisition module that can power and record data from many analog sensor types. When paired with an EDGE carrier its modular design allows scaling from 1 to many channels. The module contains its own processor, ensuring scalability, and can synchronize with other modules with up to six high speed digital I/O.

Highlights

- 32-bit processor with real-time operating system
- Stand-alone operation for measurement, control, analysis and data storage
- Galvanically isolated analog front end

Analog Input

- 24-bit A/D with 125 kS/s sampling
- Differential/Single ended
- Built-in anti-aliasing filter
- ± 1 V, ± 5 V, ± 12 V, ± 60 V input ranges
- 250 Ω resistor for current loop measurements
- 12-bit analog comparator with programmable hysteresis
- AC/DC coupling (BNC option only)

Analog Output

- 16-bit 0-24 V, 0-100 mA Power Supply
- Constant current or constant voltage output
- Function generator (sine, square, ramp, etc.) or arbitrary waveform generation

Sensor Compatibility

- Amplified voltage output
- Bridge Sensors
- IEPE (ICP™)* constant current source
- RTD (4-wire resistance)
- Resistance (2-wire resistance)
- 0-20 mA or 4-20 mA with internal 250 Ω or external shunt resistor

* ICP is a registered trademark of PCB Piezotronics



Figure 1 - M12 connector option 3D view



Figure 2 - BNC connector option 3D view

Applications:

- Discrete Manufacturing
- Process Monitoring
- Condition and machine monitoring
- Data acquisition and Measurement

EDGE 421 Overview

The Sciometric EDGE 421 combines a galvanically isolated analog front end with a high-speed digital back end. The analog isolation allows low-noise measurements on signals with common mode voltages, while the back end provides handshaking, triggering, data analysis and communication when combined with other EDGE modules in an EDGE carrier.

The 24-bit analog input supports 4 voltage ranges on using the high voltage (HV) and low voltage (LV) channels of the input multiplexer (MUX), combined with a switchable gain from 1x to 5x. The input impedance of the HV range is set by a voltage divider, which is 2156 k Ω in differential mode and 1078 k Ω when single-ended (SE). A fixed 34 kHz anti-aliasing filter is in front the ADC. Software decimation and filtering can provide anti-aliasing at lower frequencies. A 250 Ω current shunt (CS) is available for current loop measurements and a shunt calibration (SCAL) relay is provided for bridge sensors.

The 16-bit analog output can provide controlled voltage (CV) from 0 ... 24 V or controlled current (CC) from 0 ... 100 mA to the analog output (AO) pin. The analog output filter (AOF) relay can be used to add 10 μ F to the AO pin for filtering. The controlled current internal relay (CCINT) can be used to apply a configurable pull-up to the analog input positive (AI+) pin.

The BNC option provides single-ended measurements for 2-wire sensors. The input is AC coupled through 1 μ F and can be DC coupled using the SCAL / DC relay. When used with an IEPE or (ICP™) sensor the analog output can be used to power the sensor and readback through the AC coupling. The input impedance is controlled by the 227 k Ω analog output voltage monitor (VMON) combined with the HV voltage divider.

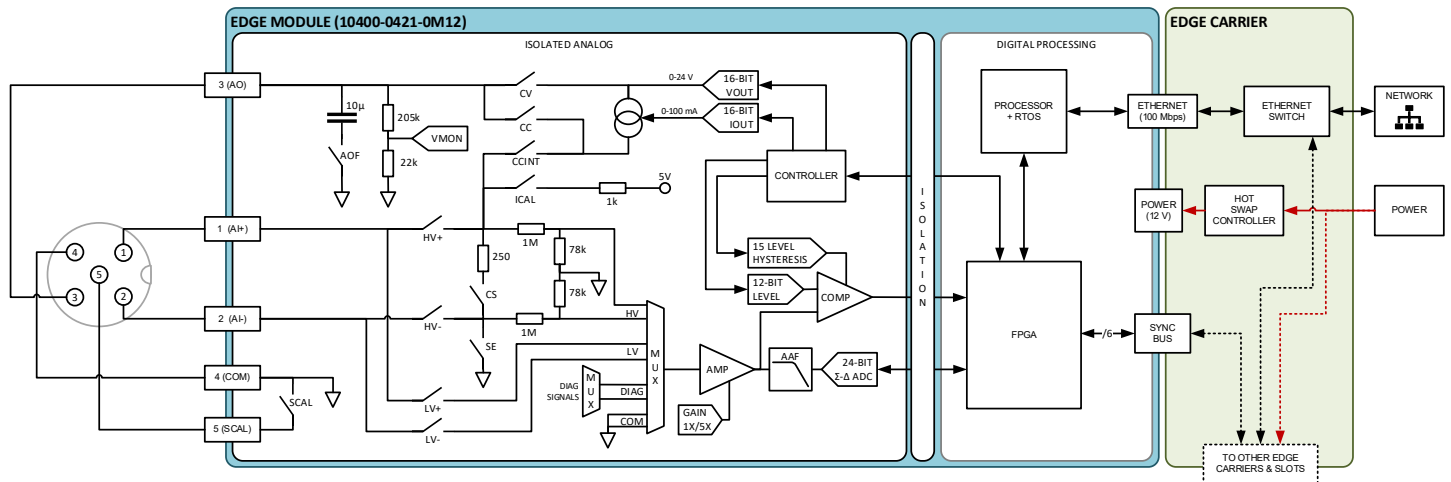


Figure 3 - Block Diagram of 10400-0421-0M12

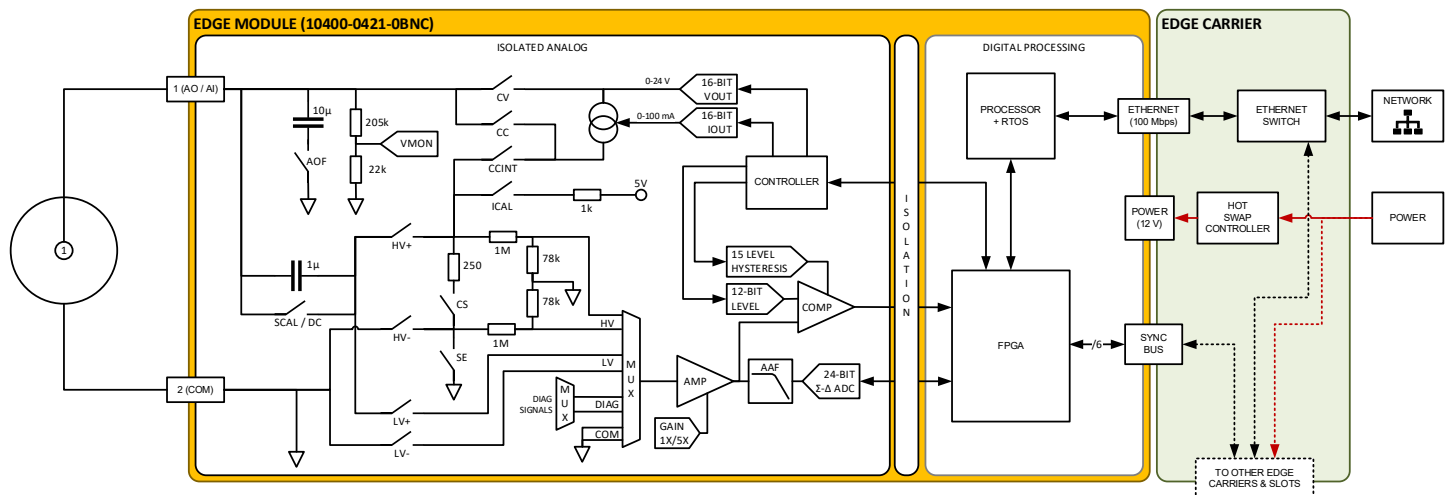


Figure 4 - Block Diagram of 10400-0421-0BNC

Sciometric EDGE Platform

Sciometric EDGE is a universal industrial analytics platform to help you perfect your process in record time. This distributed data analytics system removes barriers to collecting data, driving productivity improvements and cost savings. Select from a variety of modules to meet your data collection needs and use the expandable carriers to build out your measurement system to the desired number of channels.

Each EDGE module features its own processing and scripting, while the carriers provide communication and real-time synchronization. With processing at the channel level, the platform can scale to meet multi-channel synchronous and asynchronous tests.

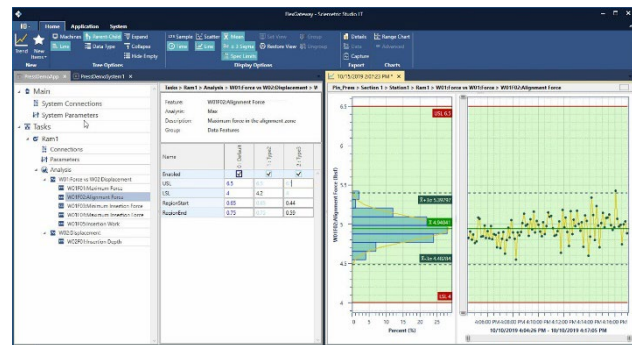
The platform performs digital signal processing and signature analysis to offer in-depth insight into the performance, reliability, and repeatability of a broad range of applications. Processing, analytics, and control functions are remotely configurable, giving you a centralized management of your distributed operations. It provides industrial operations with a sophisticated, exciting, new way to monitor a process, perform real-time pass/fail control, and gain the visibility needed to optimize and control the overall process.



Sciometric Studio Software

One Tool for Management, Setup and Analysis

Sciometric Studio offers comprehensive capabilities for monitoring and control of industrial applications. Manage Sciometric EDGE Systems through discovery, sensor calibration, application deployment, and software updates. Manage applications through configuration of tasks, features, parameters and variants. Leverage continuous improvement through data-driven insight with analytics such as feature, waveform and image trending, correlations and statistical reports.



Technical Specifications

General

- Dimensions: 32 mm x 32 mm x 128 mm
- Weight: 126 g
- Front Connector
 - OM12: 5-pin A-code receptacle
 - OBNC: 2-pin coaxial BNC jack
- Rear Connector
 - Samtec LSHM 40-pin, only for use in Sciometric EDGE carriers
 - Voltage: 12 V
 - Current: 750 mA max
 - Power: 2.5 W (typical usage, does not include AO load or dissipation)
 - Ethernet: 100 Mbps
 - Sync lines: 6 bi-directional lines at up to 10 MHz
- LED status indicator: RGB
- Internal Temperature: 0 °C to 70 °C
- Operating temperature: see carrier datasheet
- Humidity: 10 to 90% RH, non-condensing (IEC 60068-2-56)
- Shock: 150 m/s² (IEC 60068-2-27 table A.2)
- Vibration: IEC 60068-2-65 spectrum A.1 Category 3
- Ingress protection: IP65 when installed, IP20 otherwise
- Fastener screw torque: 2-4 in-lbs
- Pollution degree: 2 max
- Maximum altitude: 2000 m
- Approvals: CE, cNEMKOus

Processor

- CPU: 32 bit, 533 MHz
- Operating System: QNX™
- Storage: 512 MB SSD
- Memory: 512 MB DRAM
- Handshaking: EtherNet/IP
- Functions: Any Sciometric EDGE application, measurement, control, signature analysis and data storage

Analog Input

- Channels: 1
- ADC resolution: 24-bit ($\pm 8,388,608$ counts)
- Max sample rate: 125 kS/s
- Common mode rejection ratio (DC to 60 Hz): 80 dB
- Isolation voltage: 60 V
- Over voltage protection (TYP): ± 75 V
- Internal current shunt: 251.3 ± 0.5 Ω
- Input ranges

Range ID	0	1	2	3
Mux Setting	HV	HV	LV	LV
Gain Setting	1x	5x	1x	5x
Range	± 70 V	± 14 V	± 5 V	± 1 V
Full Scale (FS)	60 V	12 V	5 V	1 V
Accuracy	$\pm 0.1\%$ FS		$\pm 0.05\%$ FS	
Input Impedance (OM12 model)	2.15 M Ω (DIFF) 1.08 M Ω (SE)		>100 M Ω	
Input Impedance (OBNC model)	187 k Ω (DC) 227 k Ω (AC)		227 k Ω	
Small signal bandwidth (-3 dB)	34 kHz		40 kHz	
Dynamic Range (OM12 model)	105 dB	100 dB	105 dB	100 dB
Dynamic Range (OBNC model)			100 dB	90 dB

- Analog Comparator (before anti-aliasing filter)
 - Resolution: 12-bit
 - Accuracy: $\pm 0.5\%$ FS
 - Hysteresis: 15 levels, between -16% ... +16% of Range
 - Can be routed to any sync line for triggering
- software decoding: Manchester data stream with zero data value synchronization pulse

Analog Output

- Channels: 1
- DAC resolution: 16-bit (65535 counts)
- Max output power: 1 W
- Slew rate: ± 1.15 V/ μ s minimum
- Isolation: 60 V
- Output

Type	Voltage	Current
Min Output	0 ± 0.024 V	0 ± 0.04 mA
Max Output (FS)	24 V	100 mA
Accuracy	± 0.036 V	± 0.500 mA

- Default State:
 - Off
 - DACs revert to 0 V and 0 mA on power cycle or disconnect
- Protection
 - CV mode: max power can be limited
 - CC mode: max voltage and power can be limited
 - Continuous (always active)
 - 100 ms retry interval for up to 1 s before faulting
- Output functions:
 - OPCUA control
 - Application control
 - Synchronization bus input value from other modules
 - Function generator (sine, triangle, ramp, square, duty cycle, number of pulses, offset, peak to peak voltage) with 62.5 kS/s update rate

Shunt Cal Relay Function

- OM12: Shorts pin 5 (SCAL) to pin 4 (COM) with resistance < 3 Ω
- OBNC: Provides DC coupling for the analog input

Triggering

- Triggering is performed in software based on collected data in FIFO
- FIFO depth: 10M samples
- Trigger Support:
 - Start & Stop triggering
 - Sources: immediate¹, sync bus line², analog input level
 - Edges: rising, falling, rise/fall
 - Deadband³
 - Hold-off⁴
 - Pre-trigger and post trigger sampling offset
 - Multi-buffer collection
 - Automatic re-arming (no missed samples in multi-buffer collection)

¹ Immediate collection begins with the first valid sample after the collection is initialized.

² Comparator can be used to trigger by routing it to any sync line.

³ Deadband is below the trigger on rising edges and above the trigger on fall edges. Deadband boundaries must be within the range of the ADC.

⁴ Hold-off is the duration the trigger must stay true before a trigger is issued. The trigger will occur when the hold-off period has completed.

Internal Calibration and Diagnostics

- Internal measurements:
 - Module input power supply voltage and current
 - Processor supply voltage and current
 - Analog supply voltages
 - Faceplate temperature
- Internal input sources:
 - Ground
 - Precision voltage source

Mounting Information

The Sciometric EDGE 421 must be installed in an EDGE 421 Dual Carrier (10400-0412-0M12) or an EDGE 414 Quad Carrier (10400-0414-0000). Please see the EDGE Carrier datasheets for additional information and specifications. Users must provision for cable connector dimensions and cable bend radii.

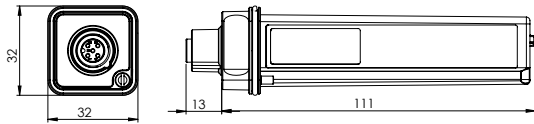


Figure 5 - 10400-0421-0M12 Dimensions

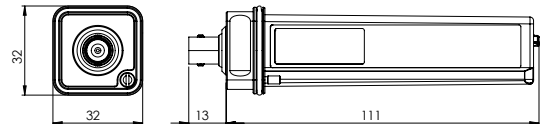



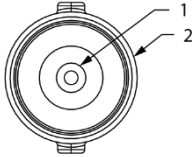








Figure 6 - 10400-0421-0BNC Dimensions

Pinout




Faceplate	Connector	Pin	Signal	Max Voltage	Mating Product
	M12 5-pin A-code receptacle 	1. 2. 3. 4. 5. SHELL	AI+ AI- AO COM SCAL SHLD	60 VDC	10400-AC0B-0002 10400-AC0B-0005 10400-AC0B-0010 10400-AX0A-MA05
	50 Ω BNC Jack 	1. 2.	AO/AI+ COM	75 VDC	N/A

Ordering Information






Sciometric EDGE family products

Description	Connections	Part Number	Image
EDGE 421 125 kS Analog Input/Output module	(1x) 5-pin A-Code M12 socket	10400-0421-0M12	
	(1x) BNC jack	10400-0421-0BNC	
EDGE 422 125 MS Analog Input module	(1x) 5-pin A-Code M12 socket	10400-0422-0M12	
EDGE 431 5 V 4x Digital Input/Output module	(1x) 8-pin A-Code M12 socket	10400-0431-0M12	
EDGE 412 Dual Carrier	(1x) 8-pin X-code M12 socket (POE) (2x) EDGE module slots	10400-0412-0M12	
EDGE 403 Interface	5-pin L-code M12 plug 8-pin X-code M12 socket	10400-0403-0000	
EDGE 414 Quad Carrier	(4x) EDGE module slots (1x) EDGE fan slot	10400-0414-0000	









Connectors

Description	Part Number	Image
M12 5-pin L code socket field wire-able connector (screw terminal)	10400-APC1-0001	
M12 5-pin A-code plug field wire-able connector, shielded (screw terminal)	10400-AX0A-MA05	
M12 8-pin A-code plug field wire-able connector, shielded (screw terminal)	10400-AX0A-MA08	

Cables and Cord Sets

Description	Length	Part Number	Image
Sensor Cable - M12 5-pin A-code plug to Pigtail leads	2 m	10400-AC0B-0002	
	5 m	10400-AC0B-0005	
	10 m	10400-AC0B-0010	
Sensor Cable - M12 8-pin A-code plug to Pigtail leads	2 m	10400-AC0C-0002	
	5 m	10400-AC0C-0005	
	10 m	10400-AC0C-0010	
Ethernet Cable - M12 8-pin X-code plug to RJ45 plug	1 m	10400-AC0X-0001	
	5 m	10400-AC0X-0005	
Adaptor - M12 X-code plug to M12 D-code socket for use with 10400-0412-0M12 when upgrading from 10400-0412-000A. Not compatible with 10400-0403-0000.	0.3 m	10400-ACXD-0012	
Adaptor Cable – M12 5-pin A-code to (2x) BNC jack, Analog In and Digital In for use with EDGE 422 Module	0.15 m	10400-AXDI-MA05	

Other Accessories

Description	Part Number	Image
EDGE 412 DIN Mounting Plate	10400-AM0A-000A	
EDGE 412 backwards compatibility machine mount bracket to match pitch of 10400-0412-000A	10400-AM0A-0M12	
EDGE 414 Wall Mount kit (mounts to 414 for use with 403/414 systems)	10400-AM01-0001	
EDGE 414 Replacement Fan module	10400-AFAN-0000	
EDGE 403 AC/DC 24 V 65 W power supply	10400-APSU-0065	
EDGE Fieldbus Conversion Interface (DIN mount)	10400-AFPN-0001	
Antaira 5-port industrial POE network switch, 12-36 VDC supply required	10400-AS0A-0005	
Antaira 8-port industrial POE network switch, 12-36 VDC supply required	10400-AS0A-0008	

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