

 Hi-Techniques



echelon-XE

A NEW ERA IN RUGGED PERFORMANCE

Redefining Expectations in Ruggedized Data Acquisition

Powerful enough for the Lab - Rugged enough for the Field



The Hi-Techniques Echelon series of Data Acquisition Systems combines lab quality input amplifiers and signal conditioning with unparalleled connectivity in a rugged, portable package. Why be forced to compromise performance just to get a ruggedized data acquisition system? Echelon offers unrivaled capability.



Low power design, multiple internal and remote power options provide a go anywhere solution



Compact, modular design can be expanded for virtually any channel count



Up to 1MS/s per channel long term recording to rugged, removable storage media and to a remote PC via Ethernet



Internal signal conditioning supports virtually any sensor type



View analog and digital inputs, video, vehicle data, GPS, and frequency signals



Real-time LiveCalc™ DSP based data analysis, filtering and data reduction



Designed for extreme environmental conditions including water, dust, shock vibration and extreme temperature



Distributed acquisition and scalability even across long distances



Remote setup and real-time display of data

Echelink™ Interface

Connectivity

Time Synchronization

Key capabilities include:

Full system control and display of live streaming data in realtime to local SSD data storage and/or to a remote PC via Gigabit Ethernet. Preview mode allows data to be viewed in realtime with single button recording operation. Acquired data can be rapidly transferred from local media post-acquisition.

Synchronization of multiple Echelon systems provides for virtually limitless channel counts. Simply connect a single Ethernet cable to start/stop acquisition from any Echelon system, external PC or mobile wireless device. Time synchronicity is maintained even across long distances through built-in GPS/IRIG realtime clock or using Echelon's integrated IEEE1588 Precision Time Protocol Capability.

Extreme Environmental Performance

From its inception, the Echelon was designed to withstand extreme environmental conditions in harsh and mobile environments. **Key capabilities include:**



IP 67 Environmental rating protects against dust and water

Echelon modules are gasketed to guard against exposure to dust and water. Sealed front panel connectors can be further protected by water resistant covers when not in use



-40° to +85° C operating temperature

Design features low power/low heat architecture, specifically selected industrial temperature grade components and thermal mitigation techniques to provide high performance even in the harshest temperature conditions



Shock protection up to 100g on 3 axes

Design features low mass components, minimal internal interconnects, and small cards to withstand up to 100g shock



Low power architecture

Echelon capitalizes on advancements in mobile computing technology to provide maximum performance with minimal power use



Small physical size

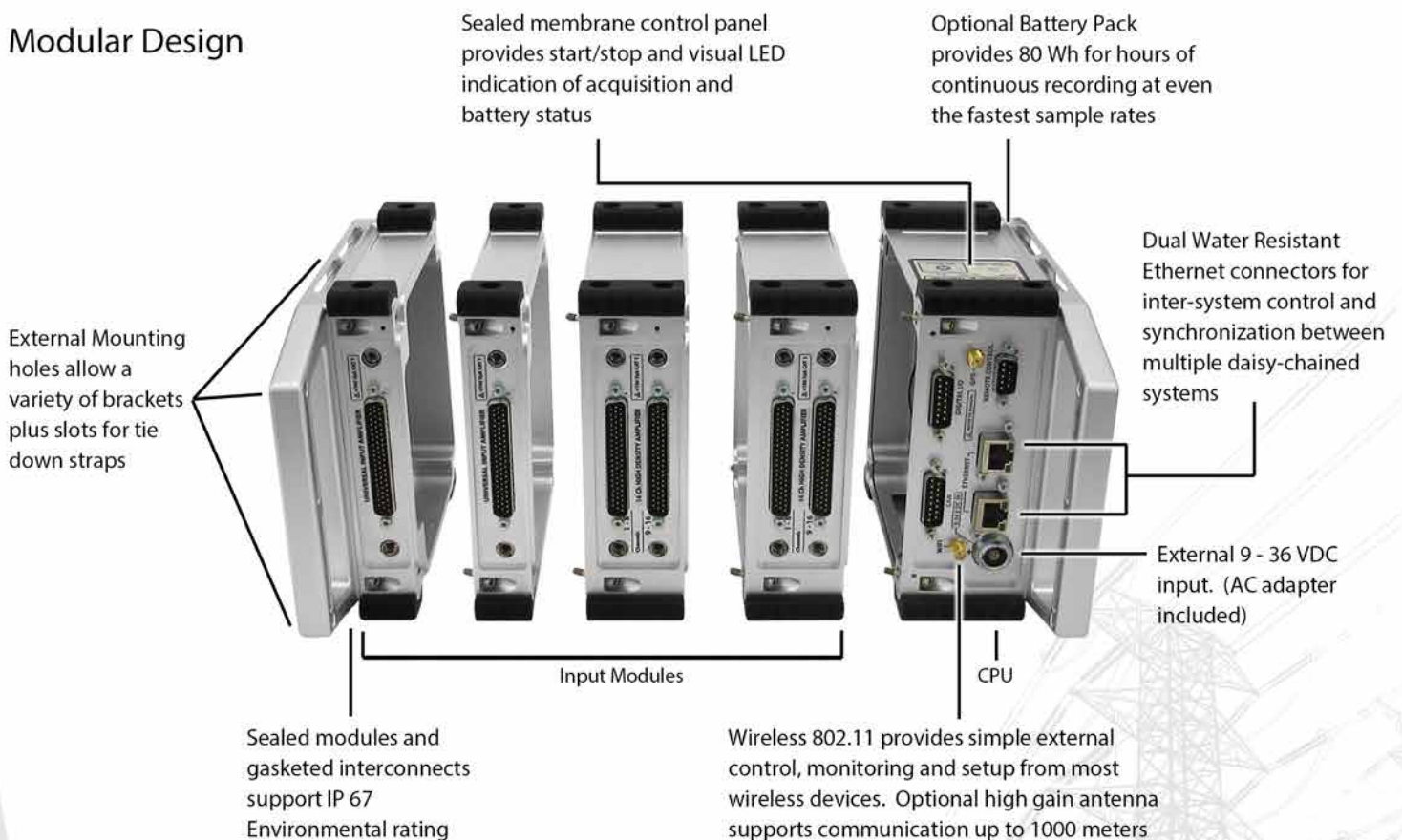
Offering best in class laboratory grade performance in the smallest possible package



Mounting options

Echelon offers a variety of mounting holes and accessories enabling secure physical attachment in any orientation

Modular Design



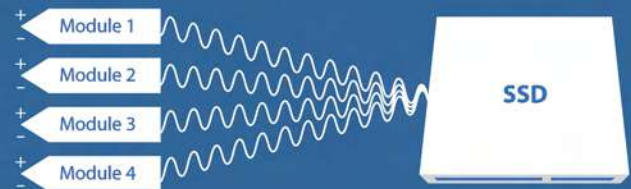
Small Package... Big Performance

The Processor/Control Module is the heart of the Echelon system offering laboratory performance in a ruggedized, power-efficient package. Utilizing advancements in mobile computing and mobile communications technology, Echelon was designed from the ground up to offer best-in-class performance.

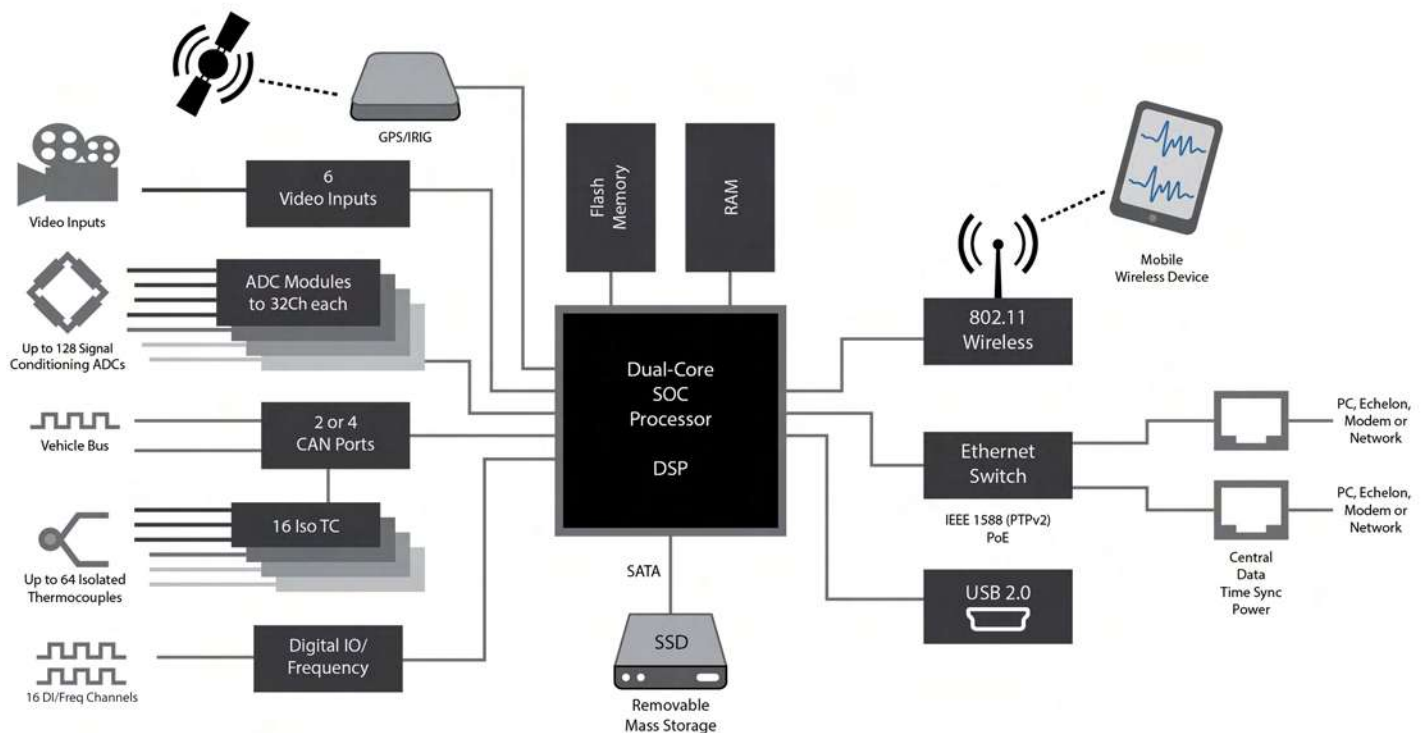
Key capabilities include:

Streaming and disk management - Each Processor Module supports up to 4 input modules and a battery module. Need more channels? Simply add another Processor Module. The distributed processor architecture allows streaming at full sample rates to removable ruggedized media....regardless of channel count!

- Data is stored to removable, PC-readable storage with industrial temperature rated SSD and/or external host PC. Easily transferable post-acquisition via standard Ethernet or by simply removing the SSD
- Remote monitoring and control by PC, tablet or cell phone
- Integrated membrane keypad provides start/stop as well as indicators for acquisition, storage, and power status
- Capture and visualize data from a number of different sources including analog signals, vehicle bus, digital I/O, GPS time and position, and video



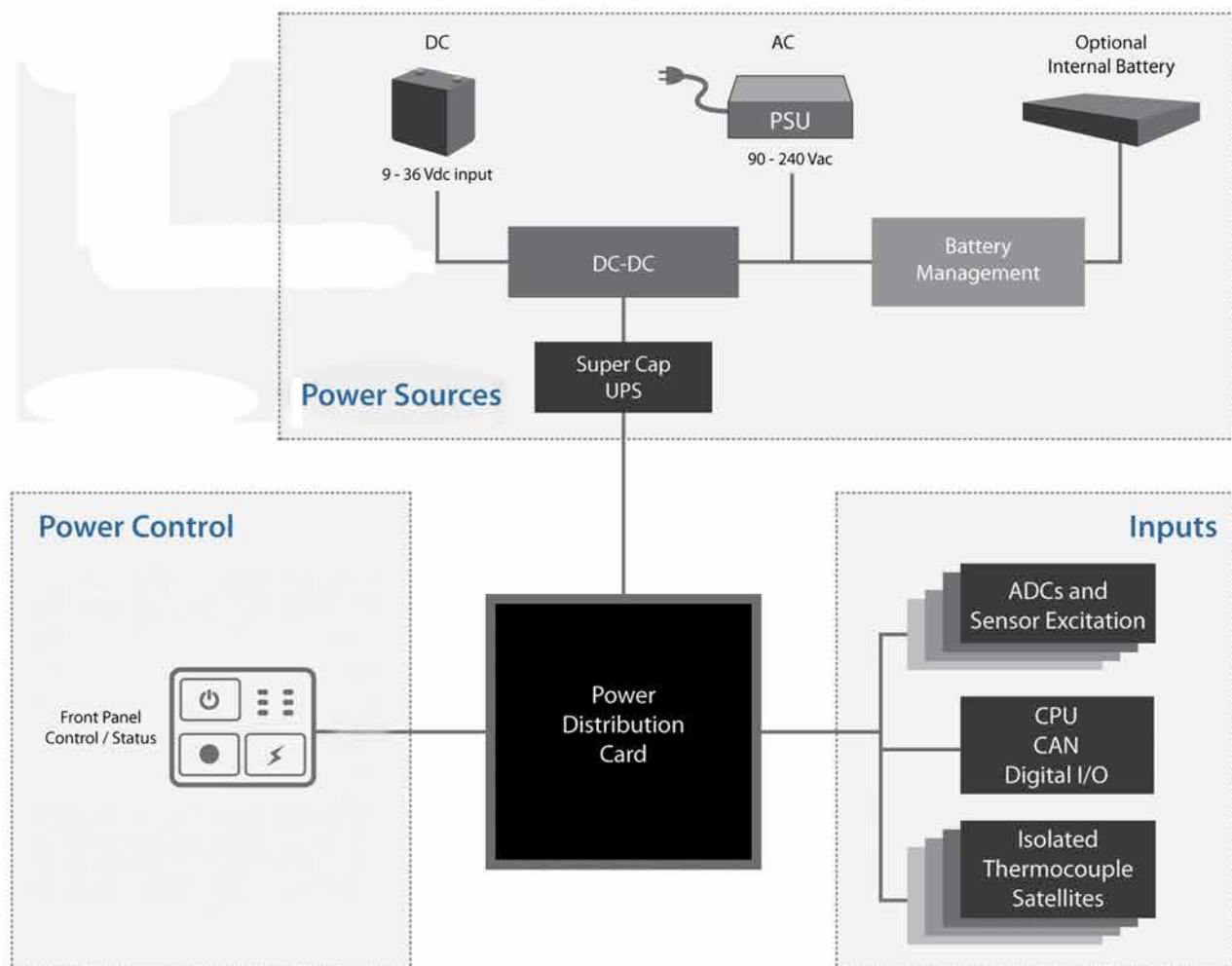
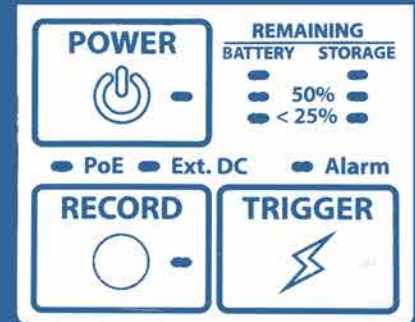
System Architecture



Power Management

Echelon's low power architecture is designed to be powered in a variety of ways:

- External DC input supports 9 - 36 Vdc. External AC/DC adaptor supports 90-240 Vac
- Optional battery module supports 80 Wh of continuous acquisition
- Built-in UPS protects against momentary power dips or vehicle starting loss
- Start recording upon key on ignition, wired or wireless ethernet, or wired remote
- Front panel indicators provide battery status, charge status, and power source
- Remote indication of battery status via wireless interface



Echelon Input Modules

A data acquisition system is only as good as its input capabilities. Echelon amplifiers are designed to the highest accuracy available. Differential zero drift amplifiers ensure stability of measurement across even the most extreme temperature range.

A range of input modules are configured for virtually any sensor or input type to allow for the ultimate in configuration flexibility. The modular design allows modules to be easily added or removed as test requirements change.



High Density Input Module

8 or 16-Ch | EM-HD (O)

High Level Input Module

8 or 16-Ch | EM-HL (O)

The High Density Input Module offers 16 channels of 100kS/s, 24-bit software selectable bridge, thermocouple, IEPE, or voltage inputs in a single module. Supports ¼, ½, and full bridge devices with a zero drift amplifier. 1-10 V bipolar excitation per channel at up to 30 mA supports all bridge type sensors with 100 mA available on channel 1 and 9 of each module to support high current sensors such as LVDTs. Optional breakout cables support ICP/IEPE sensors with 20 V, 4 mA excitation and voltage inputs up to ±200 V. 8-channel input and analog out variants available.

The High Level variant supports up to 15V unipolar excitation per channel and up to ±100 V direct input range.



Ultra High Density Input Module

32-Ch | EM-UHD

The Ultra High Density Input Module offers 32 channels of 20kS/s, 24-bit software selectable bridge, thermocouple, IEPE, or voltage inputs in a single module. Supports ¼, ½, and full bridge devices with a zero drift amplifier. 5 or 10 V unipolar excitation per 8 channel group at up to 250mA per 16 channels. Optional breakout cable interfaces with

HD/HL breakouts.



High Speed Module

4-Ch | EM-HS

The High Speed Universal Input Module offers best in class performance including 4 individual 1 MS/s 16-bit digitizers and internal support for virtually any sensor or signal type. Connect your strain gages, load cells, force, pressure and piezo-resistive sensors with support for ¼, ½, and full bridge. Directly connect bridge, thermocouple, ICP/IEPE, and MEMS devices.



Video Input Module

6-Ch | EM-VM

The Video Input Module directly accepts up to 6 USB camera inputs for synchronized, realtime video display and storage. Video is stored directly to high speed media and can be viewed in Aspire software. High speed video cameras can also be synchronized and displayed using IEEE 1588 (PTPv2) or IRIG/GPS.



Internal Battery Module

80 Wh | EP-BAT

The Battery Module provides 80 Wh of power to support hours of running time. The compact battery is also a UPS to ensure worry free operation should input power be temporarily unavailable. Battery modules can be recharged externally or charged in system.



Isolated Thermocouple CAN Device

16-Ch | HT-TCS

The 16-channel Isolated Thermocouple Module provides low cost ruggedized 100 S/s thermocouple support and links to Echelon via a dedicated CAN connection. Up to 4 Thermocouple modules can be daisy chained to a single CAN port for up to 64 distributed temperature channels. Operates with Echelon, Hi-Techniques Synergy or may be used stand-alone via CAN.

Collect Data From A Number of Sources

Store and analyze sensor data, vehicle data, GPS, and video simultaneously in a single integrated solution.

	High Density Input Module	High Level Input Module	Ultra High Density Input Module	High Speed Input Module	Video Input Module
					
Model	EM-HD (O)	EM-HL (O)	EM-UHD	EM-HS	EM-VM
Channels	8 or 16	8 or 16	32	4	6
Sample Rate/Ch	100 kS/s (10 μ sec)	100 kS/s (10 μ sec)	20 kS/s (50 μ sec)	1 MS/s (1 μ sec)	up to 30 frames/sec
Resolution	24-bit SAR	24-bit SAR	24-bit SAR	16-bit SAR	up to 1080p
Ranges	± 10 mV to ± 10 V, Up to ± 250 V*	± 200 mV to ± 100 V	± 20 mV to ± 5 V	± 10 mV to ± 100 V	N/A
Sensor Power	1 to 10 V bipolar	3 to 15 V unipolar	5 or 10 V unipolar	1 to 10 V bipolar, 3 to 15 V unipolar	5 V
Sensor Support	Voltage, Bridge, IEPE*, TC*	Voltage, IEPE*, Amplified	Voltage, Bridge, IEPE*, TC*	Voltage, Bridge, TC*, IEPE*, Amplified	USB Cameras
Cable Adapters	IEPE, AC, 20x, 50x, SLT	IEPE, AC, SLT	IEPE, AC, 20x, 50x, SLT	BNC, SLT	USB
Analog Out Option	Software Selectable ± 5 V or 0-10V Output	Software Selectable ± 5 V or 0-10V Output	N/A	N/A	N/A

*Requires external breakout



XE CPU Module

DIO, CAN/CAN-FD, GPS/IRIG, WiFi | EM-CPU-XE

The CPU is the heart of the Echelon system providing real time analysis, control, power management, SSD storage, and communication capabilities. Any mix of 1 - 4 analog input modules are supported (offering up to 128 analog channels) as well as an additional 4 daisy-chained ruggedized Thermocouple modules (offering up to 64 more TC channels, for a total of 192 analog channels). Sixteen Digital Inputs are provided for Boolean, Frequency, RPM, Period, Pulse Width, Duty Cycle, Encoder Count and Mag Pickup RPM inputs. Two built-in CAN ports (optionally four) include autosensing automatic bitrate configuration for easy setup. Dual GigE Ethernet ports provide IEEE-1588 PTP2 time synchronization between distributed systems and connection to an optional host PC. Powerful on-board DSP analysis provide realtime on-the-fly calculations, filtering and triggering. Sealed membrane keypad provides standalone start/stop with LED indicators for power, battery and storage. Direct streaming of all data channels regardless of sample rate to included 64GB industrial-grade SSD or up to 1TB optional SSDs.

Available CPU options include:

Video input module, providing hardware synchronization with up to six USB webcams

Internal GPS receiver adds 20 Hz recording of location, speed, heading and distance

Two additional CAN ports for a total of four, including two CAN-FD ports

Optional XCP-over-Ethernet vehicle protocol

Built-in WiFi for simple remote control and status on any phone, tablet or PC

Multi-Box networks with time synchronization and data merging across 2 - 8 distributed Echelon chassis

Analysis and Display Software

The reason for using any Data Acquisition system is to get meaningful results as quickly as possible. For many competitive Data Acquisition systems, the software is the weakest link. The Echelon series offers a variety of dedicated software to help you get the most from your investment.

Aspire™ Software

The full featured Aspire™ software provides real-time setup, display and analysis from any remote PC or tablet. Combine and view analog data, vehicle bus data, video, GPS mapping and realtime calculations in a single, easy to use workspace. Integrated Calibration Wizard and Sensor Database simplifies sensor configuration. Aspire Software exports to most popular third party analysis software packages including drag and drop support to Excel.

Time and Frequency Domain Displays

Stacked and Overlaid Displays

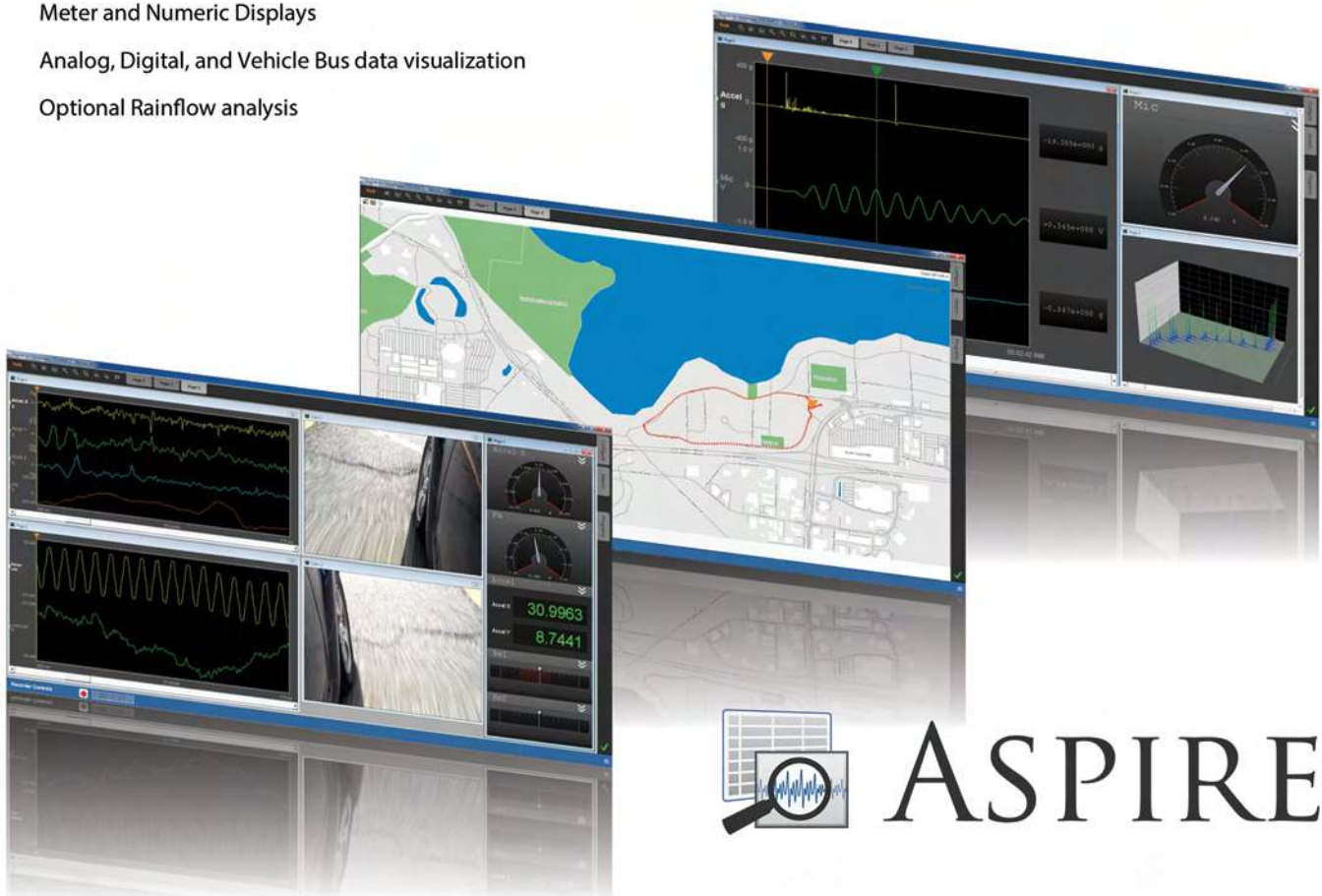
Video and GPS Mapping

Fatigue Displays including Rainflow and Peak Valley

Meter and Numeric Displays

Analog, Digital, and Vehicle Bus data visualization

Optional Rainflow analysis



Each Echelon system features a powerful Digital Signal Processor directly in the data stream to perform sophisticated data reduction and analysis on-the-fly.

Echelon offers time and frequency domain filtering with selectable characteristics

Conditional triggering, event detection, burst data collection, rainflow, mean, max, min, frequency, RMS and limit comparison	Description: ICP8 Accelerometer
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Live FFT calculations, including spectral displays

Calibration Data

Sensitivity @ 100 Hz: 101.4 mV/g Output Bias: 11.0 VDC
0.6 %
57.7 Hz

Source Type	Serial #	Manufacturer	Model	Description	Sampling Rate	Range	Offset	Multiplier	Bridge Type	Design Function	Units	Linearity Data	Sensitivity	Full Scale	Last Cal Date
ICP1	1001	ICP	1001	ICP Accelerometer	1000	1000	0.0000	1.0000	1000	1000	g	0.0000	101.4	101.4	10/10/10
ICP2	1002	ICP	1002	ICP Accelerometer	1000	1000	0.0000	1.0000	1000	1000	g	0.0000	101.4	101.4	10/10/10
ICP3	1003	ICP	1003	ICP Accelerometer	1000	1000	0.0000	1.0000	1000	1000	g	0.0000	101.4	101.4	10/10/10

Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
10	1.8	300	-1.1	7000	-1.7
15	1.1	500	-1.6	10000	-0.3
30	0.7	1000	-2.1		
50	0.3	3000	-2.7		
REF. FREQ.	0.0	5000	-2.5		

The powerful Sensor Database provides an easy way to maintain and edit sensor information including calibration data.

Supports all sensor types with drag-and-drop setup

Maintains calibration information and monitors calibration intervals

Easily synchronizes with virtually all corporate sensor databases

Simplifies setup in Aspire by maintaining individual sensor setup and calibration information

Add user information on a sensor by sensor basis

The spreadsheet setup allows for quick and easy setup of large channel tests. Exports and Imports Microsoft Excel spreadsheets for simple offline test preparation.

The CAN Configuration Tool simplifies integration of CAN, CCP and XCP messages into the Aspire Software. CAN messages can be correlated to other inputs, used as a trigger source or used in calculations.

Developed especially for the Echelon family of Data Acquisition systems, E-Connect™ software allows 802.11 WiFi control from almost any mobile PC or communications device. Use your mobile phone or tablet PC to change channel settings, view battery and memory status, or even view channel data on-the-fly from your favorite web browser.

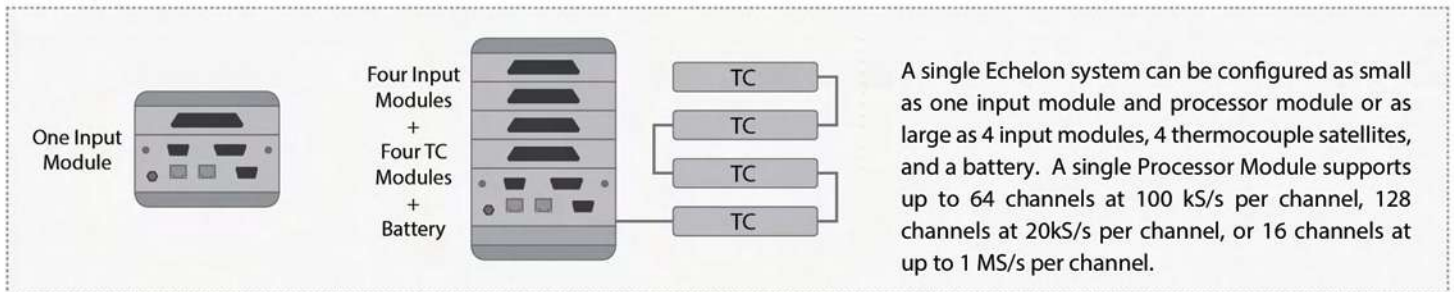


Configurations

Each Echelon Processor Module supports any mix of up to 4 input modules. The distributed architecture ensures full-speed streaming and real-time analysis regardless of channel count. Systems and modules can be easily re-configured in a variety of different ways.

Mount several complete Echelon systems together for virtually limitless channel counts. Simply use standard Ethernet cable to synchronize systems at distances up to 100 meters. Synchronized start/stop and data capture of hundreds of channels at the touch of a single button.

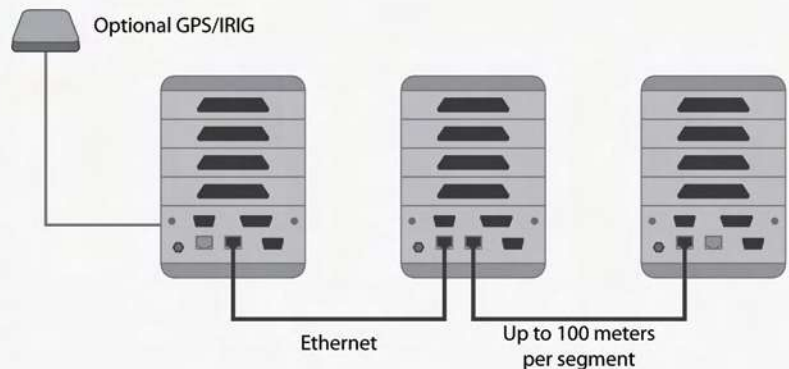
Single



Distributed

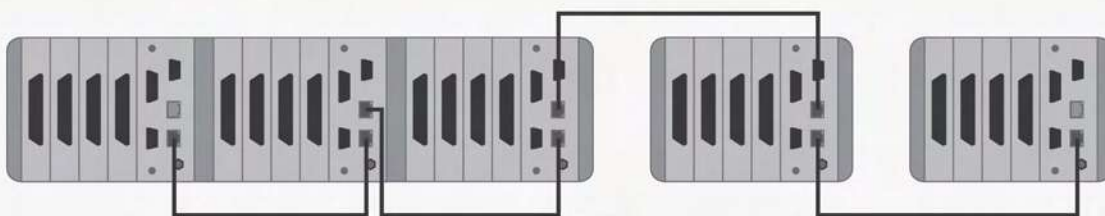
Distribute and synchronize multiple systems up to 100 meters apart using a single lightweight Ethernet cable. The Echelon can be positioned closer to the measurement source for the best noise performance with reduced time and cabling costs. A single GPS or IRIG time input can be installed in the master system to allow synchronization to Absolute time.

In addition, distributed systems store data to local ruggedized media with acquisition synchronized by GPS/IRIG. Optional high gain WiFi antenna allows communication up to 1000 meters.



Docked/Distributed

Increase stability and portability by quickly mounting multiple systems together. The dovetail end cap design of the Echelon supports system mounting in just seconds. Mount or link together an unlimited number of systems as the architecture allows for synchronization regardless of channel count.



Mobile Testing

Echelon's compact size and extreme environmental packaging make it ideal for a variety of mobile markets, including:

Marine Vehicles	Aerospace Vehicles
Offroad and Heavy Machinery	Agriculture, Lawn and Garden Equipment
Recreational and Sport Vehicles	Automotive Road Load
Military Vehicles	Aircraft
	Motorcycles and Bicycle



Typical Uses:

Materials Testing and Fatigue	Engine Analysis
Noise, Vibration and Harshness	Electrical and Battery Systems
Component and Subsystem Testing	Safety and Reliability
Road Load	Braking Systems



Monitoring

Echelon's low power design, distributed wireless and wired Ethernet architecture, and flexible signal conditioning support a range of monitoring applications:

Test Cells	Machinery Monitoring
Civil Engineering and Bridge Monitoring	Motor Drive Monitoring
Material Degradation	Power Fault Monitoring



Ballistics and Explosives

Echelon's high performance digitizers and rugged packaging support a variety of ballistics applications:

IED Mitigation	Body Armor
Arena Testing	Slow Cook Off Testing
Near-field Ballistics	Gun Testing



Specifications

Physical / Environmental

Power Input:

9-36 Vdc input via front panel connector, Opt. 80 Wh Battery Pack
90-240 Vac External AC/DC adaptor provided

Power over Ethernet input: up to 20 W

Standby mode supports start on remote or start on ignition

Typical Power Consumption: 10 - 30 W excluding sensor excitation

Enclosure: 1065 aluminum (approx. dimensions excluding bumpers)

Minimum Size: 6.95" L x 6.15" W x 4.75" H (156 x 177 x 120 mm)

Maximum Size: 6.95" L x 6.15" W x 13.3" H (156 x 177 x 337 mm)

Environmental: Sealed IP67 enclosure

Operating Temperature: -40° to +85° C (-20° to +70° C with Battery Module)

Shock: 100 g, 11 ms half-sine, Mil-Std-810F Procedure 1

Vibration: 20 g, 25-500 Hz, Mil-Std-810F, Procedure 1

Mounting: Handles accommodate 1.5" tie-down straps, opt. flange mount
end caps for additional mounting

EMI: CE Certified

Communications

Dual water resistant Ethernet connectors

Multiple systems can be daisy chained via IEEE1588 PTPv2 synchronization

Wireless 802.11 b/g up to 100 meters

Optional high gain antenna provides up to 1000 m range

USB 2.0 connects as storage device to PC

Front panel membrane keypad enables start/stop and LED indicators for
battery and memory status (25%, 50%, 100%) as well as LED alarm indicator

Storage

All channels stream directly to local, ruggedized media at full acquisition
speeds to a removable 64 GB or larger industrial-rated Solid State Drive.

Contact Hi-Techniques for additional storage options

Storage Modes: Continuous, Segmented Triggered Sweep

Input Capabilities

Clock Accuracy: <50 ppm standalone

Multibox synchronization: < 2 microseconds

GPS: Optional, precision time and 20 Hz location

IRIG: Optional IRIG-B timecode input

CAN: Up to 4 CAN inputs, version 2.0 part A+B, Baud rates to 1 Mbps

Up to 4 32-bit quadrature encoder inputs, 16 digital/frequency inputs,

External Trigger In/Out, Manual Trigger

XE CPU adds 4 magnetic pickup RPM channels.

Isolated Thermocouple CAN Module HT-TCS | 16-ch

CAN: Compatible with Echelon CAN ports. Up to 4 modules can be
connected in series

Connector Type: Miniature blade type T/C

Environmental: IP67 compliant, -40° to +85° C operating temperature

Channels: Sigma-delta ADC per channel at 10 or 100 S/sec with CJC

Isolation: 500 V pk channel-to-channel, channel-to-ground

Thermocouple Types: J, K or T type

Video Input Module EM-VM | 6-ch

Inputs: Supports 6 simultaneous UVC compliant USB 2.0 cameras

Connector: Inputs: 4-pin waterproof M8

On-module storage: 500 GB non-volatile, upgradeable

High Density Input Module EM-HD | 8 or 16-ch

Amplifier Type: Zero-drift, autozeroing at 800 kHz, fully differential

Shunt Calibration: Fixed 100 K Ω 0.05%, A- to V-

Input range: ± 10 mV to ± 5 V, external 20x or 50x attenuator available

Input Impedance: Single Ended 10 M Ω to ground, Diff 20 M Ω (+) to (-)

Coupling: DC, DC Differential, Ground, Bridge, IEPE*, Thermocouple*

Bridge Support: Full, $\frac{1}{2}$, $\frac{1}{4}$ bridge software selectable, internal ultra-precision
350 Ω completion at 0.2 ppm/°C per channel (120 Ω optional)

Excitation: Bipolar 1-10 Vdc excitation, up to 30 mA per ch. (Ch1, 9: 100 mA),
Independent variable and fixed 10 V sources per module, selectable per ch

Connector Type: One or two sealed IP67 compliant 62-pin male connectors

Channels: 8 or 16 independent 24-bit, 100 kS/s oversampling SAR digitizers

Sample Rates: Decimal rates in 1, 2, 5 steps from 0.5 S/s to 100 kS/s, Binary
rates from 0.512 S/s to 102.4 kS/s

Analog Out Option: Software selectable 0-10 V or ± 5 V output per channel

High Level Input Module EM-HL | 8 or 16-ch

Amplifier Type: Zero-drift, autozeroing at 800 kHz, fully differential

Input range: ± 200 mV to ± 100 V

Input Impedance: Single Ended 1 M Ω to ground, Diff 2 M Ω (+) to (-)

Coupling: DC, DC Differential, Ground, Full Bridge, IEPE*

Excitation: Unipolar 3-15 Vdc excitation, 30 mA per channel (Ch1, 9: 100 mA)

Connector Type: One or two sealed IP67 compliant 62-pin male connectors

Channels: 8 or 16 independent 24-bit, 100 kS/s oversampling SAR digitizers

Sample Rates: Decimal rates in 1, 2, 5 steps from 0.5 S/s to 100 kS/s, Binary
rates from 0.512 S/s to 102.4 kS/s

Analog Out Option: Software selectable 0-10 V or ± 5 V output per channel

Ultra High Density Input Module EM-UHD | 32-ch

Amplifier Type: Zero-drift, autozeroing at 800 kHz, fully differential

Shunt Calibration: Fixed 100 K Ω 0.1%, Between Ch- and Ex+ or Ex-

Input range: ± 20 mV to ± 5 V

Input Impedance: Single Ended 10 M Ω to ground, Diff 20 M Ω (+) to (-)

Coupling: DC, DC Differential, Ground, Bridge, IEPE*

Bridge Support: Full, $\frac{1}{2}$, $\frac{1}{4}$ bridge software selectable per channel
350 Ω completion at 0.2 ppm/°C per channel (120 Ω optional)

Excitation: 5 or 10V unipolar, selectable by 8-channel groups

Connector Type: Two sealed IP67 compliant 104-pin male connectors

Channels: 32 independent 24-bit, 20 kS/s oversampling SAR digitizers

Sample Rates: Decimal rates from 0.5 S/s to 20 kS/s, Binary
rates from 0.512 S/s to 20.48 kS/s

High Speed Input Module EM-HS | 4-ch

Connector Type: Sealed IP67 compliant 78-pin male connector

Channels: Four independent 16-bit, 1 MS/s SAR type digitizers

Sample Rates: Decimal rates in 1, 2, 5 steps from 0.5 S/s to 1 MS/s, Binary
rates from 0.512 S/s to 1.024 MS/s

Input Range: ± 10 mV to ± 100 V

Coupling: DC, DC Differential, Ground, AC, Bridge, IEPE*, Thermocouple*

Bridge Support: Full, $\frac{1}{2}$, $\frac{1}{4}$ bridge software selectable per channel

Excitation: Two independent sources: 0.5-10.0V variable bipolar and
3.0-15.0V variable unipolar, selectable by channel.

Please see individual input module data sheets for more complete information

Specifications subject to change. Please contact Hi-Techniques for more
complete specifications.

*Requires external breakout