Hummingbird$^{48\text{-}1418}$

48 Channel Rugged Data Acquisition System

Connect | Condition | Acquire

Key Features

- 48 Fully Conditioned Channels in 3U Form Factor
- 16/24-bit ADC, >114dB SNR, 5-256kHz Sample Rates
- Gigabit Ethernet Connectivity
- Conduction Cooled, Milled Unibody Chassis
- Modular Architecture, Scalable to >1000 Channels
- Multi-unit Synchronisation (GPS, IRIG, LVDS, IEEE-1588)
- 9-36V dc & PoE++ Power Options

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Introduction

Hummingbird is a series of rugged 16, 24, 32 and 48 channel data acquisition modules designed to provide a world class, highly flexible solution for dynamic data measurement.

The Hummingbird series 5 features gigabit Ethernet connections, allowing control from remote laptops or PCs, as well as data streaming for monitoring / archiving.

Hummingbird V5 is designed to operate in extreme environments, operating at altitudes to 60,000ft (20,000m), in temperatures from –55 to 80°C, and humidity to 100% RH at measurement uncertainties of < +/-0.2%.of reading.

Hummingbird V5 has proven itself worldwide in numerous applications such as aero– and industrial engine development test cells, flight tests, outdoor test cells, outdoor icing test cells and in-tunnel high-altitude / high temperature wind tunnels.

The Hummingbird$^{48\text{-}1418}$ supports Voltage, IEPE (with TEDS support), Charge (Single Ended & Differential), Bridge (1/4, 1/2 and full for 120, 350 and 1000Ω) and Dynamic Strain (constant current single gauge) inputs directly and can support other sensors types with external adaptors.

The Hummingbird$^{48\text{-}1418}$ is supplied as standard with both IEEE-1588 and IRIG A/B support for synchronising the unit with external devices to +/-20ns accuracy. A GPS receiver can be specified as an optional addition.

Multiple power options are provided as standard, including Power over Ethernet (PoE++) to the latest IEEE802.3bt standard (HGL can also supply matching Power Injector units), 9-36V dc and wide range mains via external adaptors (100-250V ac 50/60Hz unit supplied).

All communications with the unit is achieved via Ethernet, either through the front LEMO ports or the rear RJ454 ports. HGL can supply software support from an API through to fully featured measurement systems.

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HGL Dynamics

Hardware Overview

Unibody Chassis

Rugged, milled aluminium housing for use in close proximity to the test article. External cooling fins are milled into the body to aid in heat dissipation. All internal PCBs mounted to thermal pads integrated into the chassis,

Connector Compatibility

Standard options available are BNC, Fischer LEMO, or 15-way D-Type. HGL can also provide customer specific connectors on request.

Independent Inputs

48CH

Equipped with 48 individual channels
One Sigma-delta ADC per channel.
Multiple Conditioning Options.
Simultaneous Sampling.
>114 dB SNR.

PoE++, IEEE-1588, Ethernet

Single connector interface for Power over Ethernet (IEE 802.3bt), IEEE-1588 (PTP) synchronisation, and gigabit Control / Data interface.

No Moving Parts

All components are securely mounted internally directly to the unibody chassis. No fans. No rotating storage. Solid State electronics.

Buffered Analogue Outputs

Buffered outputs from the FE-1418 conditioning cards (one connector per conditioning card)

DC Power

- 9-36V d.c.
- Slave output connectors for additional units

Networking

- Command & Control Interface
- Gigabit data streaming
- IEEE-1588 Synchronisation

LVDS Synchronisation

- LVDS (Low Voltage Differential Signalling) Synchronisation Interface
- <10nS Unit to Unit
- 0-200m Unit to Unit cable lengths
- Daisy-Chain, Star or mixed

Calibration

Hummingbird facilitates quick on-board correction with the use of standard bench signal generators/multi-meters.

IRIG (GPS Option) Synchronisation

Dedicated IRIG-A/B input for synchronization with external systems.

Optional GPS input for high precision syncronisation

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Specification

General

Dimensions (W x H x D):	400 x 110 x 223 mm
With handles:	490 x 110 x 307 mm
Weight:	17.5 kg (typical)
Supply Voltage:	9-36V V DC PoE++ (IEEE 802.3bt)
Power:	50 W (typical)

Environmental

Operating Temp.:	-55 to +80 °C
Operating Pressure:	Above 4.8 kPa (limit 24 hrs)
Storage Temp:	-55 to 100°C
Relative Humidity:	0-100% RH (IP68)

Input Configuration (with standard 1418 signal conditioning card)

Input Channels:	48
ADC Type:	Sigma-Delta
Quantization:	24-bit / 16-bit*
Input Ranges:	±10mV to ±10V in 1, 2, 5 steps*
DC Offset:	±0.15 mV
Input Coupling:	AC, DC *
Input Impedance:	>1MΩ
SNR:	>114 dB
Anti-aliasing:	<-110 dB
Sample Rate:	5 - 256 kHz *
Frequency Response:	DC to >100 kHz ± 0.01 dB
Dynamic Range:	140 dBFS / √Hz, 114 dB (broadband)
Inter-Channel Δ Phase:	< 20 nS (< 0.36° @ 10 kHz output signal)
Crosstalk:	< 100 dB @ 5 kHz, < 95 dB @ 10 kHz, < 87 dB @ 20 kHz, < 82 dB @ 40 kHz, < 70 dB @ 100 kHz
Distortion:	< -80 dB, 0 to 80 kHz
DC Linearity:	< 0.01%
Drift:	< 25 ppm/°C (with no correction applied)

Accuracy (%full scale)

Standard (5kHz 1V rms)

Voltage.:	±0.1%
IEPE:	±0.2%
Charge (SE/DF):	±0.2%
Bridge (all modes):	±0.5%
Dynamic Strain:	±0.5%

Frequency Response (0-100kHz)

V, IEPE, Bridge, Dyn:	±0.01dB
Charge (SE/DF):	±0.05dB

Temperature Response (Calibrated)

All Types (-30 to +80°C):	±0.1%

Altitude Response

All Types (0 to 20,000m):	±0.1%

*Software configurable parameter

Synchronisation

LVDS:	±50 ns
LVDS (max distance)	200 m # (node to node)
IRIG A/B:	±100 ns
IEEE-1588:	±20 ns
GPS (optional)	±50 ns

#If longer distances are require please contact HGL

Other Inputs (using any standard input)

IRIG-A and IRIG-B
Tachometer / Flow meter

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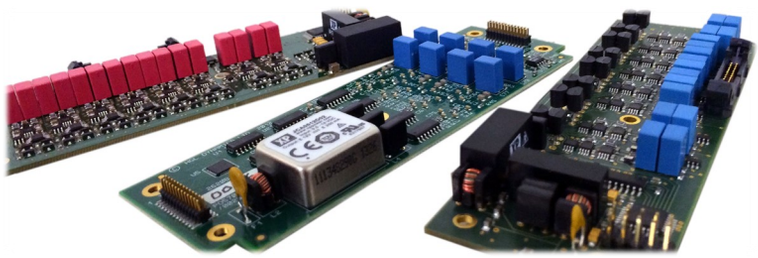
Condition

Signal Conditioning



The Hummingbord[48] module can be fitted with a wide range of internal signal conditioning cards which further extend the Hummingbird's capabilities. Single or multiple conditioning functions are possible depending on card choice.

HGL has designed a set of conditioning cards that fulfil most industry standard requirements. However more cards are developed as clients' requirements change. The signal conditioning options currently available for the Hummingbird[48] module are:

- HGL-HiZ: AC/DC voltage only conditioning with gain.
- FE-1418 All-purpose conditioning card including Voltage, IEPE, Bridge, Dynamic Strain,, SE/DF Charge and a built-in integrator.. On-board sensor health check and buffered analogue outputs.
- FE-1419: Voltage and IEPE (ICP) multi-range conditioning card. On board sensor health check and buffered analogue outputs. SE/DF Charge inputs can be supported as an option.
- FE-1420-BRG / DYN Voltage & Bridge Only and IEPE & Dynamic Strain only variants of FE-1418-APC card.
- FE-1421-MIC Voltage, IEPE & 200V Excited Microphone Conditioning.
- FE-1422 Voltage, IEPE, and Proximeter Probe conditioning card.

	Voltage		IEPE	Bridge	Dynamic	Charge	Temperature	Proximeter Probe	Speed
Cond. Card	AC	DC	Accel / Mic	Strain (¼, ½, full)	Strain (SG, Press)	Accel	Therm. & PT100		
HGL-HiZ	✓	✓							✓
FE-1418	✓	✓	✓	✓	✓	✓	✓#		✓
FE-1419	✓	✓	✓						✓
FE-1420-BRG	✓	✓		✓		✓	✓#		✓
FE-1420-DYN	✓		✓		✓	✓			✓
FE-1421-MIC	✓	✓	✓			✓			✓
FE-1422	✓	✓	✓					✓	✓

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Software Options

HGL Dynamics provides multiple software platforms for Hummingbird Acquisition systems; these range from low level Network APIs, Windows® DLL, Single Instrument Applications (Apps), and full Measurement System software. This flexibility allows users to choose the best platform for their particular applications and / or increases the utilisation of the hardware for multiple uses.

External Integration Protocols

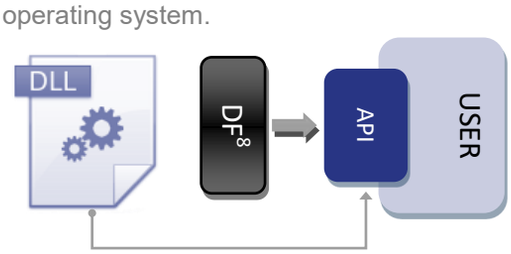
Integrating HGL's software into a third party system has never been easier. HGL Dynamics offers multiple ways to communicate with the Acquisition Software suites. Communication options include DDS subscriber / publisher, OPC client / server and Modbus (over ethernet) client / server.

Network API

All HGL Dynamics hardware modules are Ethernet connected to each other and their host PC(s); a fully documented Programmer's API is available for integrators / customers who wish to access the modules at this level or need to integrate the modules with a non-Windows operating system.

Microsoft Windows DLL

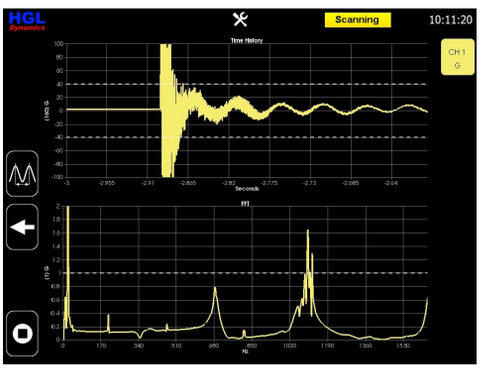
HGL provides (as standard) a Windows DLL with every Hummingbird Acquisition System; for Microsoft Windows users this provides a simpler method to access all the functions of the hardware.



Single Instrument Apps

HGL has developed a number of Single Instrument Apps, primarily for its Firefly system. These apps can be operated on a Hummingbird and Laptop / PC system equally well. The Apps are intended to provide a family of simple, easy to use applications which turn the Hummingbird into a single instrument, examples include:

- FFT Analyser
- Oscilloscope
- Chart Recorder
- Rotating Machinery Analyser
- Trim Balance
- Power Dip & Rise
  (requires isolation amplifier hardware)



Full Measurement System Software

For the past 15 years, HGL has providing a fully integrated, modular, network distributed Dynamics Measurement System; this software is intended for wide variety of applications and for systems ranging from small portable units to large multi-site systems with hundreds or thousands of channels.

The System comprises four main parts, Acquisition, Monitoring, Analysis and Data Management, and is focused on providing robust, flexible, fixed or mobile operation with ease of use as a primary consideration.

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Software Suites

Data Acquisition - Hawk

HGL's Hawk acquisition software provides everything a user needs to configure, calibrate and acquire data from the acquisition hardware. Full control and feedback of the system is provided by the Hawk GUI Client application; this provides an intuitive instrument-like interface that allows even novice users to operate large channel count systems, even from remote locations.

Real-Time Monitoring - Hawkeye

Hawkeye allows one or more users to monitor the signals being acquired in real-time (<0.1s latency).
Fully customisable displays such as FFTs, Waterfalls, Oscilloscopes, Numerical, Speed and Tracked-orders, Phase, Bode, Orbit, n^{th} Octave etc, provide a rich monitoring environment.
Hawkeye also provides Time, Frequency, Order and Phase domain alarming facilities for all channels simultaneously, with support for many different alarms types per channel. Hawkeye is also client / server based with the 'thin' Hawkeye Client allowing local or remote monitoring (performance dependent on network infrastructure).

Analysis - Aurora

Aurora provides an in-depth analysis tool for acquired data; this is usually required post-test, but can be operated simultaneously with testing if useful. Post-test analysis can pinpoint areas of interest / problems to be further investigated, and for this purpose Aurora provides a range of client / server based tools to analyse, investigate, mine, summarise and report on acquired data.
Multiple users can use Aurora simultaneously, and in common with HGL software portfolio access is via a network connected thin-client (Aurora Client) application, thus allowing both local and (potentially widely) remote users to access data simply and efficiently.

Data Storage & Archiving - Hercules

Prolonged or large-scale data acquisition generates a lot of data, 10's and 100's of TBytes are not unusual for large enterprises. Data is expensive to collect and the functionality to efficiently store and retrieve legacy data is essential for in-service investigations, product development etc.

HGL's Hercules software provides an integrated, low-cost, yet highly scalable and safe data management solution for any sized data acquisition operation. The key to the system's success is support for virtually any common media type (SD cards, HDD/SSDs, LTO tapes etc.) combined with a unique database architecture providing simple, yet highly efficient data storage information, and a client/server architecture which allows data to be managed across multiple remote sites from a single intuitive Graphical User Interface.

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Training

Training

HGL Dynamics offers a wide variety of training workshops and courses. Workshops are conducted at one of our global offices or at the client's site by our training team, all of whom have many years' of industry experience and knowledge.

Typical training courses include: Vibration Fundamentals, Signal Processing, Rotating Machinery, Advanced use of HGL Software and Analysing Large Datasets.

Information

About HGL Dynamics

HGL Dynamics is a world-leading supplier of services and high specification equipment for the integrated capture, monitoring, analysis, storage and management of high bandwidth data.

Purchasing & Availability

The HGL Dynamics Hummingbird Data Acquisition Module is now available for purchase or lease. Please contact one of our HGL Dynamics offices below for further information or to request a quote.

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