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GEN DAQ PRODUCTS

High speed, high channel count DAQ system

- Modular data acquisition system
- Combines transient recorder and streaming data acquisition capabilities
- True multi-channel, multi-mainframe synchronization
- Over 1000 high speed channels
- High-performance signal conditioning
- Isolation for safe and clean measurements
- Sample rates from 200 kS/s to 100 MS/s per channel
- Unlimited recording size and duration to embedded hard disk, network or PC's hard disk drive
- Unique "dual-rate" recording modes
- Transient RAM to 900 MS per card, 28.8 GigaByte per mainframe
- Direct to disc streaming with up to 50 MB/s
- Ethernet connectivity with 1000 MBit/s
- Optional IRIG or IRIG/GPS timing
- Decimal and binary sample rates, or external clock
- Complete software support with *Perception*

Perception

GEN DAQ - A NEW ERA IN DATA ACQUISITION

HBM is one of the world's largest providers of out-of-the-box, ready to use data acquisition systems for a variety of physical and electrical applications. The GEN series is our flagship system, providing a flexible, high accuracy and still cost-effective platform.

High Channel Count

GEN series input amplifiers provide signal conditioning for a variety of signals with the highest accuracy and lowest noise possible today. With sampling speeds ranging from 200 kS/s to 100 MS/s per channel the GEN series covers the complete spectrum of physical and electrical events - on up to 1080 channels simultaneously.

The Ideal Continuous and Transient Recorder

Combining continuous and transient recorder features, the GEN series allows you to capture and archive that 'once-in-a-lifetime' event as well as hours of recording, even at the same time.

Special Variant for High Power/High Voltage Industry

The GEN series Isolated Digitizer is a fiber-optically isolated digitizing subsystem with digital link, extra shielding and battery, designed to meet the demands of high power and high voltage measurements.

Complete System Without Compromise

Together with the *Perception* software, GEN DAQ products offer a high performance out-of-the-box solution, ready to run in minutes.



The *GEN7t* tower shown above allows seven input modules to be mixed to match your needs. Or select the 16-slot GEN16t 19" mainframe.

HBM Genesis HighSpeed products were previously sold under the Nicolet brand. The Nicolet brand is owned by Thermo Fisher Scientific Inc. Corporation.

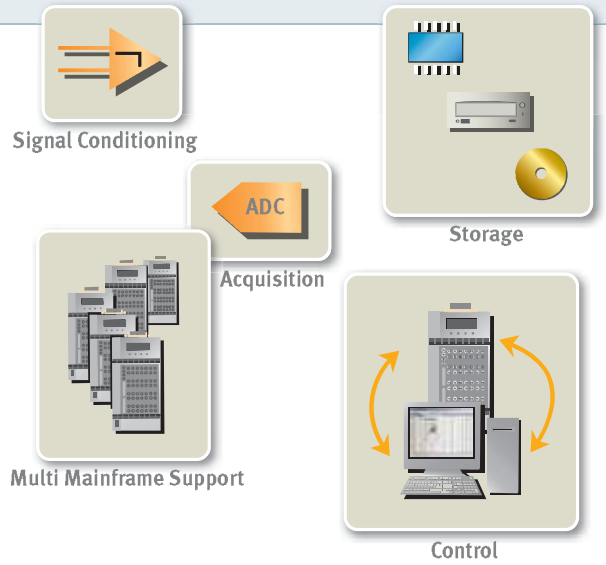
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All-in-one without concessions: transient recorder and streaming DAQ

STATE-OF-THE-ART SOLUTION

Based on the concept of a mainframe with plug-in modules, the GEN series offers a wealth of capabilities. Up to 128 channels can be installed in a single mainframe. Multiple mainframes can be used for large scale testing. Up to 900 MegaSamples of memory per board combined with fast sample rates allow for high definition transient capture. Built-in data transfer acceleration gives you an overview of MegaSamples of data within seconds. And with the world's best performance signal conditioning and up to 16-bit accuracy, GEN DAQ products are the right solution for your difficult measurement task.





FLEXIBILITY TO SUIT YOUR NEEDS

A wide range of cards and flavors allow the configuration of a completely tailored system that can be expanded in the future. Depending on your testing requirements, you can:

- Select between various maximum sample rates
- Choose memory length per channel
- Opt for basic voltage inputs or select one of the fully loaded sophisticated signal conditioners
- Mix and match input cards within a system
- Use digitally fiber-optic isolated digitizers for high voltage and high power applications
- Use digital channels and counter/timer inputs in addition to analog channels
- Create a really large system by combining multiple mainframes

ACQUISITION MODES

It's a Transient Recorder...

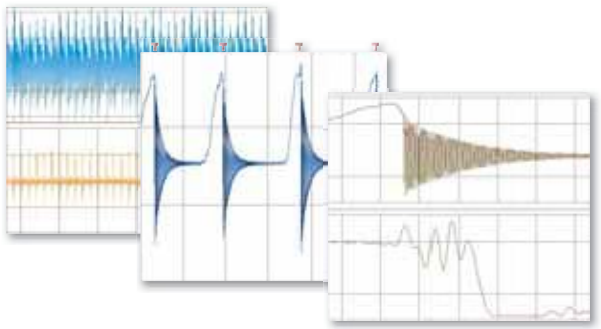
- Up to 100 MS/s per channel transient recording into RAM
- Hardware trigger on all channels with hysteresis, delay and advanced features
- Segmented sweeps with no dead time
- Fast scope display
- Pre-trigger recording

It's a Data Acquisition System...

- Up to 10 MS/s per channel streaming to hard disk
- Unlimited recording duration, pre-trigger and file size
- Internal and external sample clock support
- Real-time parameter extraction
- Streaming rate to controlling PC up to 50 MB/s
- Scalable total throughput using multiple local SCSI disks - up to 450 MB/s maximum

It's both...

- Combine both acquisition modes to see triggered events in full detail while still maintaining the global overview.



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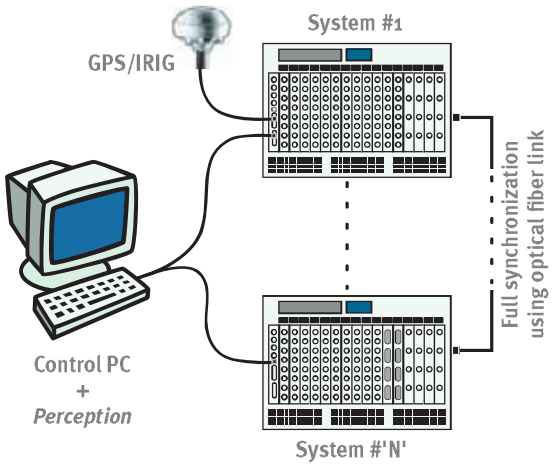
Scalable in number of channels, sample rate and data throughput

Increase number of channels ...

With the GEN series, you are not limited by the data acquisition infrastructure. After installing your first unit, you can expand any way you like.

Use the 7-slot tower model and start with a 4-channel, 200 kS/s card for limited experiments. Expand with more cards and even more mainframes as your testing requires more channels.

For true large-scale testing, you can expand with multiple synchronized 19" racks, each containing up to 128 channels digitizing at 1 MS/s, to create an arrangement that supports one thousand channels and beyond.



Using Ethernet for communication, physical placement of the GEN DAQ products is flexible and has no additional restrictions. And with the unique fiber optic based Master-Slave module, you can even synchronize mainframes that are hundreds of meters apart, down to the sample level, while the optical synching method used eliminates all ground loop issues.

Increase sample rate ...

Not all physical phenomena are the same order of magnitude or happen within the same time interval. There are slowly changing parameters, like room temperature; there are phenomena that change in the blink of an eye, like a lightning discharge.

For some of these events, relatively slow sampling will do the job; others require true high speed transient capture. Or maybe you want to do both at the same time.

GEN DAQ products can do the job with acquisition cards that provide maximum sample rates of 200 kS/s to 100 MS/s. You can mix these cards to meet your needs and stay truly synchronous. Or use dual-rate recording to benefit from both transient capture and continuous recording at the same time on one card.

For measurements with rotational devices like motors, transmissions or distance related measurements, the sample rate can be external, while a unique "ext clock divider" feature still allows different sample rates per recorder, all derived from the external "master" clock.



When you want to go below the 200 kS/s sample rate, e.g. when you want to include thermocouples, you can combine the GEN DAQ products with the HBM LIBERTY DAQ system and still control the complete system from a single *Perception* application.

Increase data throughput ...

Depending on your initial and future requirements, the GEN DAQ products have several mainframe options.



There is no limit on transfer of transient data into the **on-board RAM**. You can sample at 100 MS/s for several seconds per channel and store everything without a dropped sample. Or sample at 1 MS/s for a few minutes on thousands of channels.



Typical applications include real-time streaming of data to the **PC's internal hard disk**. GEN DAQ products support a typical transfer rate over the Ethernet connection of 12.8 MB/s, and with the high-speed option you can go up to a staggering 50 MB/s transfer rate - per mainframe. This is equivalent to as much as 100 channels at 200 kS/s each. More mainframes, more throughput - limited only by your PC's capabilities.



For even more bandwidth in multi-mainframe configurations, you can add **local hard disk** storage with the optional SCSI interface. This creates a 20 MB/s data stream per mainframe free from PC restrictions and OS irregularities. Using a fast SCSI attached RAID streaming rates of up to 50 MB/s per mainframe an be achieved, or up to 450 MB/s with multiple mainframes.

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Number one in signal fidelity

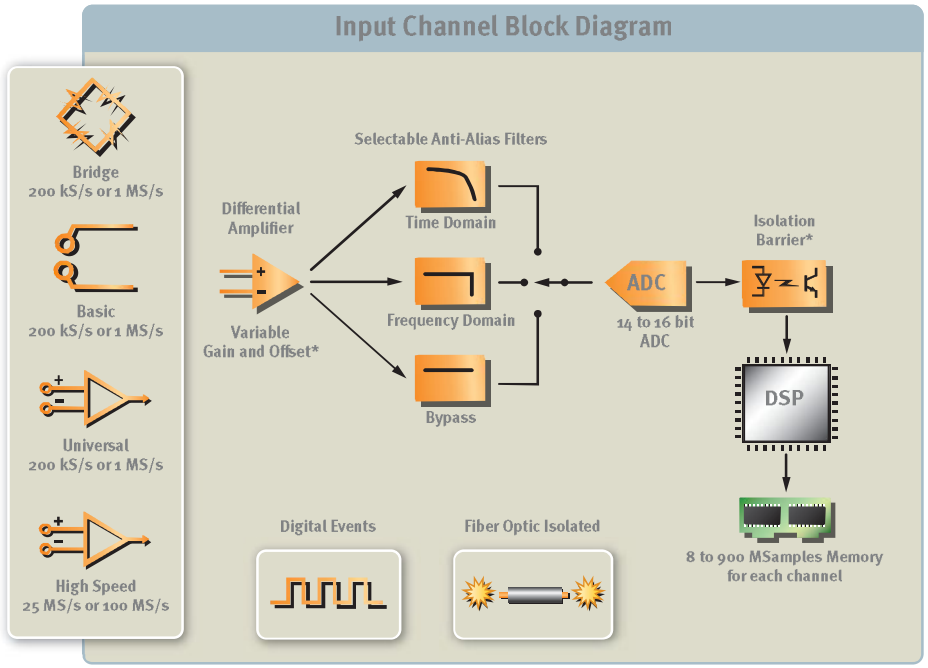
SIGNAL CONDITIONING

Your measurement is only as good as the signal path, so why compromise on signal conditioning? GEN series signal conditioners are mounted integrally (in the same slot) with the acquisition module. This concept allows for future plans and expansions while maintaining the standardized feature set without compromise. A good anti-aliasing filter is vital to recording the correct data. Therefore all GEN series input channels include selectable anti-aliasing filters for a best fit to your application.

The **basic amplifier** signal conditioners give you 8 channels with single-ended or unbalanced differential, isolated inputs on one board. With a maximum digitizing rate of 200 kS/s or 1 MS/s at 16 bit, they are ideally suited for high accuracy transient recording. The 200 kS/s and 1 MS/s fully isolated **bridge amplifiers** comprise everything that you would expect from HBM, including software selectable differential and DC sensor modes. Bridge support includes full, half and quarter bridge, all software selectable. Bridge completion, shunt calibration, and auto balance are also software selectable.

The unique 200 kS/s and 1 MS/s **universal amplifiers** serve a variety of needs: from differential and/or isolated measurements to ICP®-based vibration or shunt-based current measurements. By switching a menu selection, the amplifier supports any type of constant current vibration or acceleration sensor. In current mode, the built-in shunt can be used to measure up to 1 A. For really fast applications, the **25 MS/s and 100 MS/s digitizers** provide 14-bit resolution - more than enough to see even the finest details at high speed.

For binary or frequency signals, two **digital 1 MS/s boards** support event inputs and counter/timers.

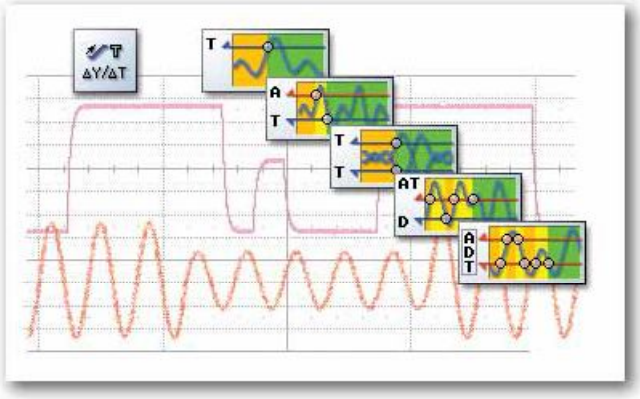


(*) Not available on all models

SOPHISTICATED TRIGGER MODES

All GEN series digitizers are equipped with advanced dual-level digital trigger logic on each channel. The trigger logic gets its trigger information from the digitized data to enable trigger accuracies of 0.1%. The logic includes a full range of sophisticated trigger modes, ranging from a simple basic trigger with hysteresis to advanced dual-window modes. A variety of trigger qualifiers allow for an even more precise determination of the event to capture.

Trigger modes include basic, dual, slope, sequential, window and dual-window. Qualifiers include glitch detect/reject, hold-off, interval, N-event, etc.



Perception software uses trigger icons to select specific trigger conditions without complicated terminology.

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Guaranteed to catch your data

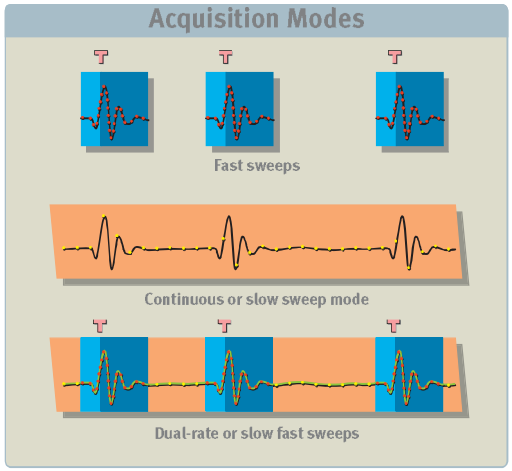
ACQUISITION

Synchronous split timebase

All recorders within the GEN series, or even within a mainframe "cluster" formed by Master/Slave board usage, derive their sample rate from a system-wide, stable, high frequency clock. Therefore multiple recorders, each with their own sample rate, can be used to create a single recording while maintaining true synchronisation between all samples of the various channels.

Dual-rate recording and Slow Fast Sweeps

Ever wonder what happens to your signals between transients? Dual-rate mode combines the power of high-speed transient capture and continuous recording. View and record continuous data at background speeds of up to 10 MS/s while simultaneously recording triggered sweeps at speeds up to 100 MS/s, including high-speed pre-trigger on each event! There is no limit to the number of triggers in a single recording.



DATA DISPLAY AND STORAGE

Review data

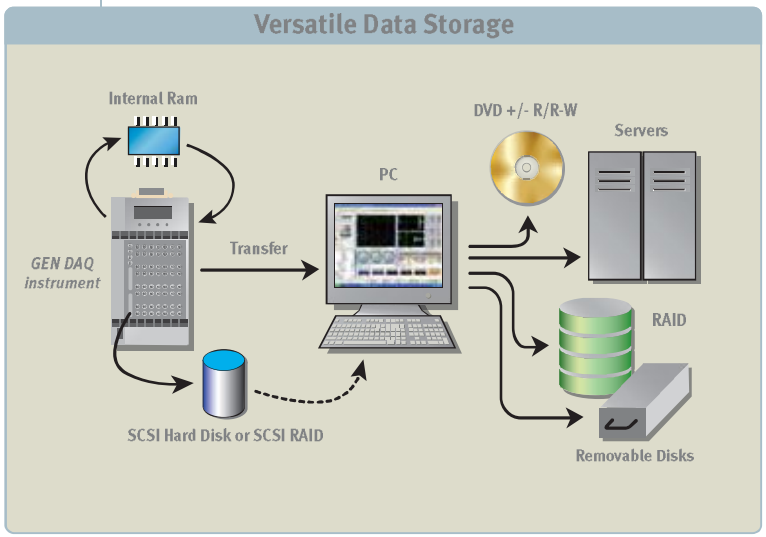
The GEN DAQ products allow for a variety of storage and display modes. Apart from the transient and scope display, data is also generated to provide a stutter-free scrolling display. You can even review data from a recording while still recording
- see the data before the test is complete!

Store data

GEN DAQ products break down the old barriers when it comes to data storage. In addition to the MegaSamples of on-board RAM, you can record directly to your PC hard drive, a removable disk or a network server over lightning-fast Gigabit Ethernet. Storage modes include "streaming-to-disk" as well as the innovative "continuous circular recording on disk".

SCSI Interface

With the optional SCSI interface board, you can add a hard disk drive to the mainframe for local storage of recordings, bypassing restrictions that your Operating System may impose. Disconnect from the GEN DAQ instrument and easily transfer a huge amount of data by simply connecting the drive directly to your PC. Using a SCSI RAID instead of a single disc also prevents data loss by failing hard drives or power supplies.



DATA STORAGE SPEEDS VS MEMORY LENGTH

Location	Throughput	Remarks
PC Hard Disk	6.4 MS/s standard 25 MS/s with Fast Streaming option	• Unlimited file size • Aggregate throughput might be increased using multiple mainframes, depending on PC performance
Mainframe Local SCSI Hard Disk	10 MS/s to disc, 25 MS/s to RAID, per mainframe	• Unlimited file size • Scalable throughput per mainframe, independent to PC
Channel RAM	Full channel sample rate up to 100 MS/s	• Recording size limited by RAM • No limit on aggregate sample rate

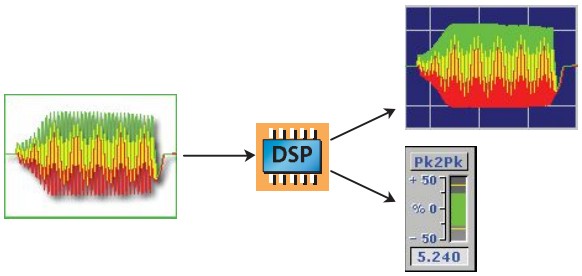
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Our technology gives you a head start

StatStream®1 DISPLAY TECHNOLOGY

Most PC-based DAQ systems can easily acquire megabytes of data. But even the most powerful PC is poorly equipped to display and process files that are megabytes or gigabytes. HBM´s exclusive *StatStream* display technology accelerates all aspects of your measurement task with dedicated hardware and firmware. While recording, *StatStream* preprocesses a display summary at the full resolution of your PC monitor. Even a single-point transient on any channel is accurately displayed. In addition, *StatStream* continuously calculates parameter values on blocks of data: you know the vital statistics of your waveform at every moment.

When reviewing your stored files, the embedded *StatStream* data enables an accurate, detailed overview of any size file in seconds. Unlike competitive systems, your PC has no need to inspect gigabytes of information just to display the last kilobyte. As you zoom in, more detail is displayed while always maintaining the highest visible resolution.



StatStream is a registered Trademark of HBM.
(1) Patented in Germany, patent pending in UK, US, France and PRC

ADDITIONAL POWER FOR YOUR MAINFRAME

Different interface options enable GEN DAQ products to be adapted to your application needs.

High speed streaming

Besides the standard Ethernet interface, a high speed streaming option allows extremely fast streaming to the control PC´s hard disk. With high-end PCs, streaming rates up to 50 MB/s are achievable for a single PC+mainframe combination.

Synchronization

Two different IRIG and IRIG/GPS timecode interfaces allow exact synchronization of multiple GEN series mainframes or of GEN DAQ products to other devices. Using this satellite-based timing information, each and every recording in each and every GEN product is time-stamped down to the microsecond - worldwide.



External drives

The SCSI interface connects a SCSI disk drive directly to the GEN series mainframe. Streaming speeds up to 50 MB/s per mainframe enable scalable acquisition rates.

Master/Slave

The unique Master/Slave board offers synchronization between mainframes down to the sample level. Using fiber optic communication links prevents grounding issues and allows distances of a few hundred meters.

ISOLATED MEASUREMENTS IN HOSTILE ENVIRONMENTS

With a long tradition of serving the High Power and High Voltage market, HBM has developed Isolated Digitizers for the GEN series: special ultra fast modules for these specific types of applications. The Isolated Digitizers are fiber optically isolated front-ends with maximum sample rates of 25 MS/s or 100 MS/s at 14/15-bit resolution. They feature a fully isolated power supply up to 10 kV or a long duration battery supply to work at virtually any off ground voltage. The enclosure offers extra shielding to ensure proper measurements in even the worst electrical or magnetic environments.



These isolated digitizers are tested and approved by KEMA in the Netherlands to be used in their *Current Zero Measurement* system.

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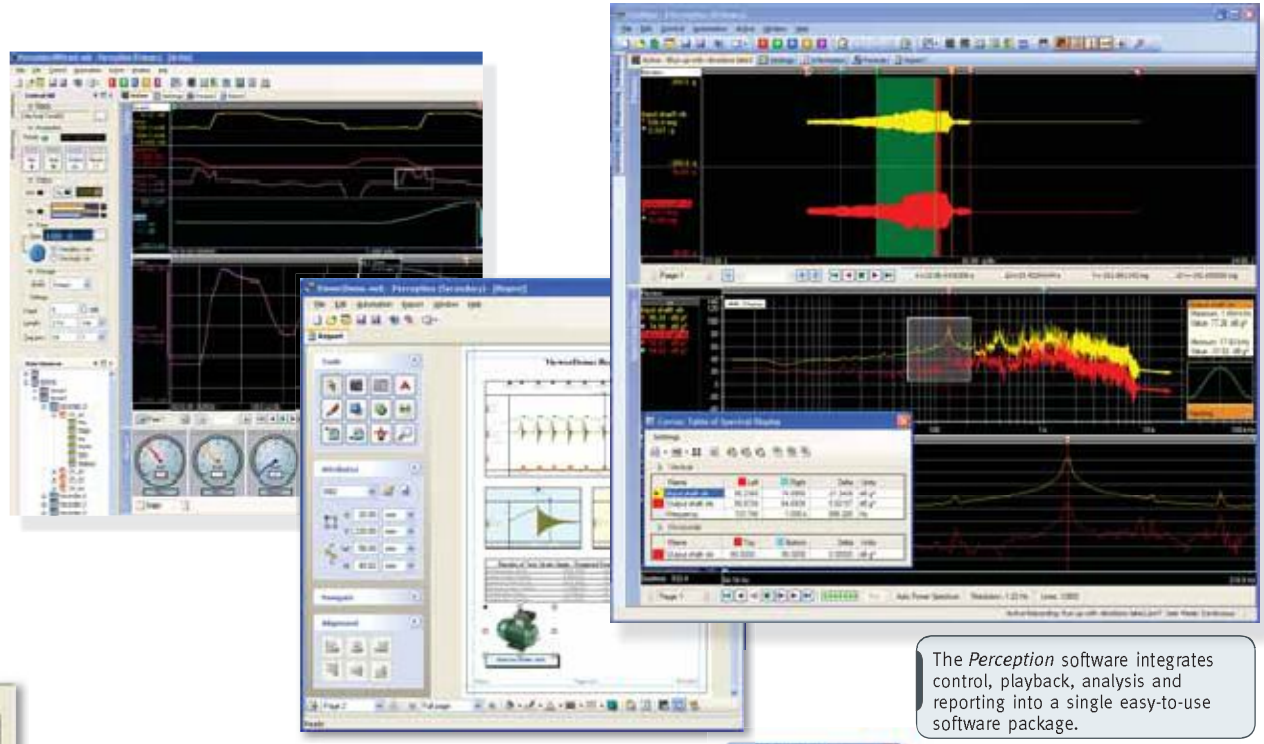
More than just hardware

SOFTWARE MAKES HARDWARE HAPPEN

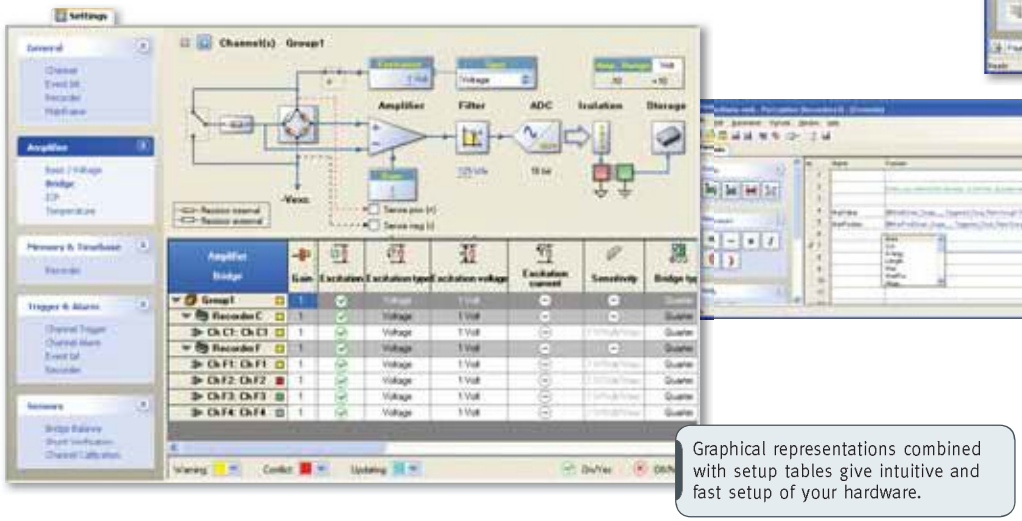
Nowadays, feature-rich hardware is only as good as the software that supports it. To take ultimate advantage of the hardware features of GEN DAQ products, the *Perception* software has been designed in parallel.

Tightly-coupled GEN series firmware and *Perception* control software allow for comfortable hardware control, easy software setup, swift data displays, interactive measurements and much, much more ...

No third-party software or programming is required to get up and running. Refer to the separate *Perception* brochure for an in-depth view of this sophisticated software package.



The *Perception* software integrates control, playback, analysis and reporting into a single easy-to-use software package.



Graphical representations combined with setup tables give intuitive and fast setup of your hardware.

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System overview

Options

Currently the following options are available:

- **Master-Slave interface board for true synchronization between mainframes**
- **IRIG and IRIG/GPS expansion boards for precise timing and synchronization**
- **SCSI interface board for connection of a hard disk for local storage**
- **External Hard Disk Drive for local storage. Can also be used in combination with a PC**
- **External SCSI attached RAID; various configurations, fail safe and redundant, hot swappable drives and power supplies if required**
- **High Speed Ethernet option that doubles the transfer speed to a PC for streaming mode acquisitions**
- **Counter/timer input channels**

ISO 9001
Cert No. FM 26616

All LDS equipment complies with current European and USA safety and EMC regulations

MAINFRAMES AND INPUT MODULES

The design of the GEN series mainframes delivers a substantial contribution to the measurement quality. The robust mechanical construction of the GEN series housing guarantees many years of trouble-free operation. The portable GEN7t tower model has a capacity of 7 acquisition cards; the GEN16t 19" version can accommodate 16 cards and is aimed for desktop as well as rack-mount usage. Separate datasheets are available that give full details on both mainframes and acquisition cards. Refer to the table below for available acquisition card models.



Model	Input Type	Isolation	Sample Rate	Resolution	Memory	Channels
Basic200	Single Ended	no	200 kS/s	16 bit	64 MS	8
Basic1M	Single Ended	no	1 MS/s	16 bit	128 MS	8
Basic1M iso	Unbalanced Diff(1)	yes	1 MS/s	16 bit	256 MS	8
Bridge200 iso	Bridge / Diff	yes	200 kS/s	16 bit	64 MS	4
Bridge1M iso	Bridge / Diff	yes	1 MS/s	16 bit	256 MS	4
Uni200 iso	Diff / ICP / Shunt	yes	200 kS/s	16 bit	64 MS	4
Uni1M iso	Diff / ICP / Shunt	yes	1 MS/s	16 bit	256 MS	4
HiSpeed25M	Differential	no	25 MS/s	15 bit	64 MS	4
HiSpeed100M	Differential	no	100 MS/s	14 bit	900 MS	4
IsoDig MV	Unbalanced Diff(1)	yes	25 or 100 MS/s	14/15 bit	100-900 MS	1/4(2)
IsoDig HV	Unbalanced Diff(1)	yes	25 or 100 MS/s	14/15 bit	100-900 MS	1/4(2)
Marker1M	Binary/Counter/Timer	no	1 MS/s	1 bit	512 MB	64
Marker1M HV	Binary/Counter/Timer	yes	1 MS/s	1 bit	512 MB	32 + 8



(1) An unbalanced differential input can be used to do differential, off ground, isolated measurements.
(2) Four single-channel Fiber Optic Isolated Digitizer front-ends can be connected to a single acquisition card.

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