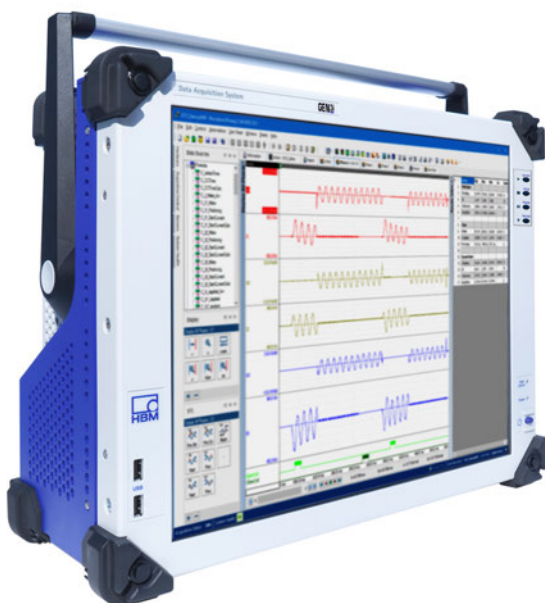# GEN series GEN3iA

Transient Recorder and Data Acquisition System

Special features

- **Built-in Windows 10 PC**
- **Robust and portable**
- **Up to 96 analog, 32 digital and 4 Timer/ Counter channels**
- **200 MB/s continuous streaming to SSD**
- **Remote use from external PC**
- **Perception Advanced software for review and analysis**
- **Power failure data security**
- **Wake-on-LAN**
- **PTP time synchronization**
- **Master/Sync connection (option)**
- **IRIG/GPS time synchronization (option)**
- **1 Gbit optical Ethernet (option)**
- **10 Gbit optical or electrical Ethernet with 400 MB/s continuous streaming (option)**

The GEN3iA is a versatile portable data recorder. In addition, it provides all the features expected from a transient recorder. The hardware combines a full-featured, low-power, Windows® PC with a large, high-resolution, touch screen and a robust three-slot acquisition unit. The GEN3iA power failure data security feature enables recording file integrity during continuous recording minimizing data loss upon sudden power loss. As soon as power restores, GEN3iA automatically reboots and resumes the recording with the setup used prior to power loss.

The GEN3iA includes the Perception Advanced for post-processing. With a single touch, the data recorder turns into a dedicated instrument for analysis and sophisticated reporting. If third party analysis is preferred, up to 20 export formats are available including MATLAB, DIAdem, MDF4/ASAM, UFF58 and more.
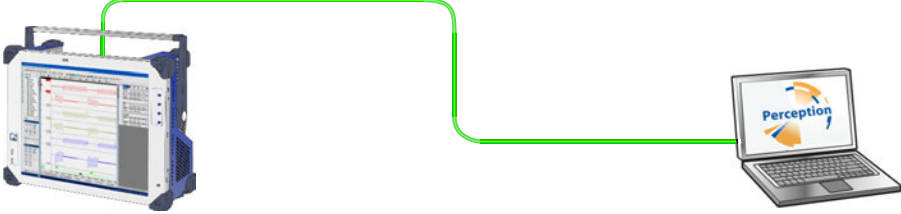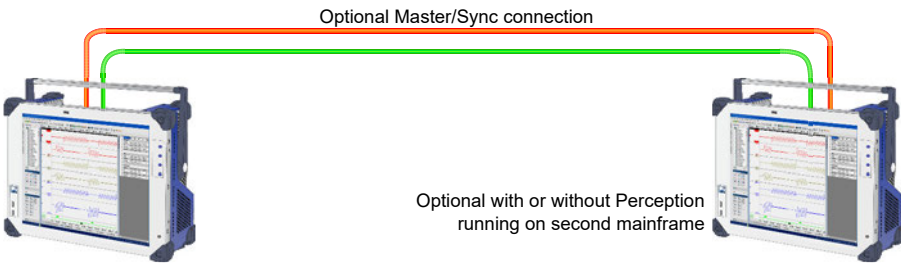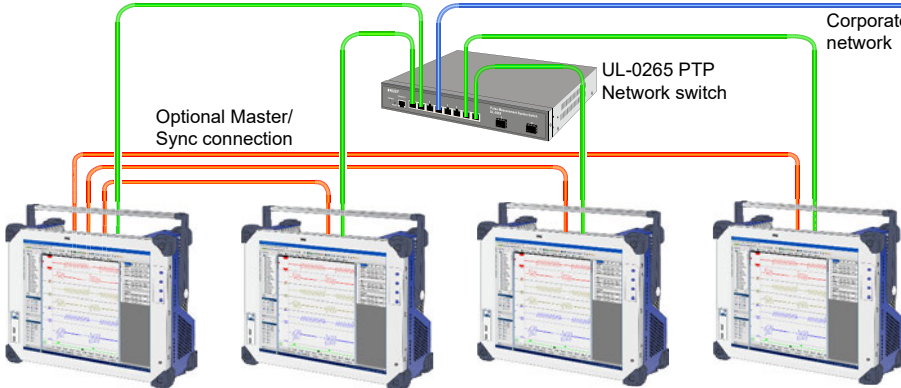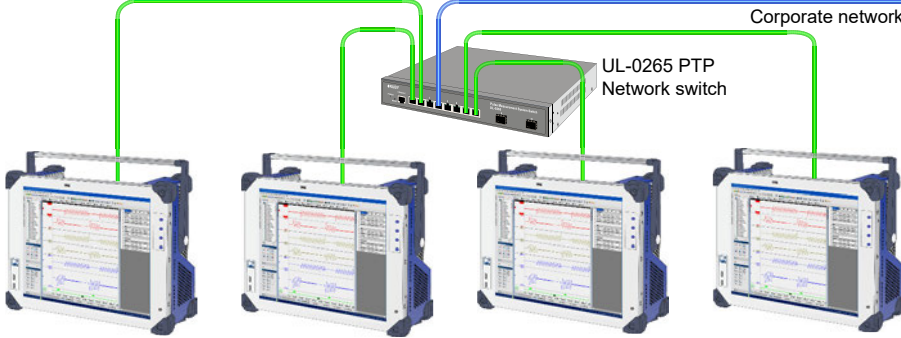
Using the Basic cards the GEN3iA can be used to record voltages, or vibrations using IEPE transducers, with up to 24 channels simultaneously at up to 2 MS/s.

Using the unique real-time math enabled 1.5 kV power cards turns GEN3iA into a powerful 9 channel power analyzer with real-time power computation and harmonic analysis.

The Universal card can be used in material testing with physical sensors like strain gauges, IEPE sensors or thermocouples using up to 500 kS/s sample rate.

The 250 MS/s cards can be used for ultra-fast voltage or strain gauge measurements or using the fiber optic digitizers in a real high voltage/ high power environment.

Data is stored on the inputs cards built-in memory and/or streamed with 200 MB/s aggregate to built-in solid state drive.

Supported Operation Mode

Supporting features	
Stand-alone • Perception Advanced software • 200 MB/s storage to SSD • Start/Stop/Trigger TTL inputs • Real-time formula database • Full Windows® 10 network support	 **Figure 1.1:** Stand-alone
Remote access • Tethered use • No feature loss • 200 MB/s storage to SSD • Real-time formula database • PTP (GPS/IRIG) time sync	 **Figure 1.2:** Tethered use
Dual mainframe • Perception on each mainframe • GEN3iA in tethered control • Single wire Master/Sync control • 400 MB/s storage to SSD • Real-time formula database • PTP (GPS/IRIG) time sync	 Optional Master/Sync connection Optional with or without Perception running on second mainframe **Figure 1.3:** Dual mainframe
Four mainframes (>2) • Perception on each mainframe • GEN3iA in tethered control • Master/Sync control & trigger • 800 MB/s storage to SSD • Real-time formula database • PTP (GPS/IRIG) time sync	 Corporate network UL-0265 PTP Network switch Optional Master/Sync connection **Figure 1.4:** Multi mainframe
Distributed mainframes (>2) • Perception on each mainframe • GEN3iA in tethered control • Optical network • Distributed data storage • 800 MB/s storage to SSD • Real-time formula database • PTP (GPS/IRIG) time sync	 Corporate network UL-0265 PTP Network switch **Figure 1.5:** Multi mainframe (distributed)

Mainframe to Mainframe Synchronization Options

Network setup	Number of (mixed) GEN DAQ mainframes used		
	1	2	> 2
Direct network to PC/Notebook	Not required	Use Master/Sync setup 1-G091 in both mainframes	Use Master/Sync setup 1-G083 in master mainframe 1-G091 in other mainframes
Standard switch (No PTP support)	Not required	Use Master/Sync setup 1-G091 in both mainframes	Use Master/Sync setup 1-G083 in master mainframe 1-G091 in other mainframes
PTP Network switch (e.g. HBK UL-0265)	Not required	Works for continuous recording No synchronized triggers for dual and sweep recording OR Use Master/Sync setup 1-G091 in both mainframe	Works for continuous recording No synchronized triggers for dual and sweep recording OR Use Master/Sync setup: 1-G083 in master mainframe 1-G091 in other mainframes

Maximizing Continuous Data Recording Speed

When using continuous data recording two elements in the setup typically impact the maximum speed: network and drive.
Both bottlenecks can be addressed by selecting the right setup. Either divide (multiple network cables or drives) the data load or increase the speed (10 Gbit ethernet and/or Solid State drives / RAID drives)

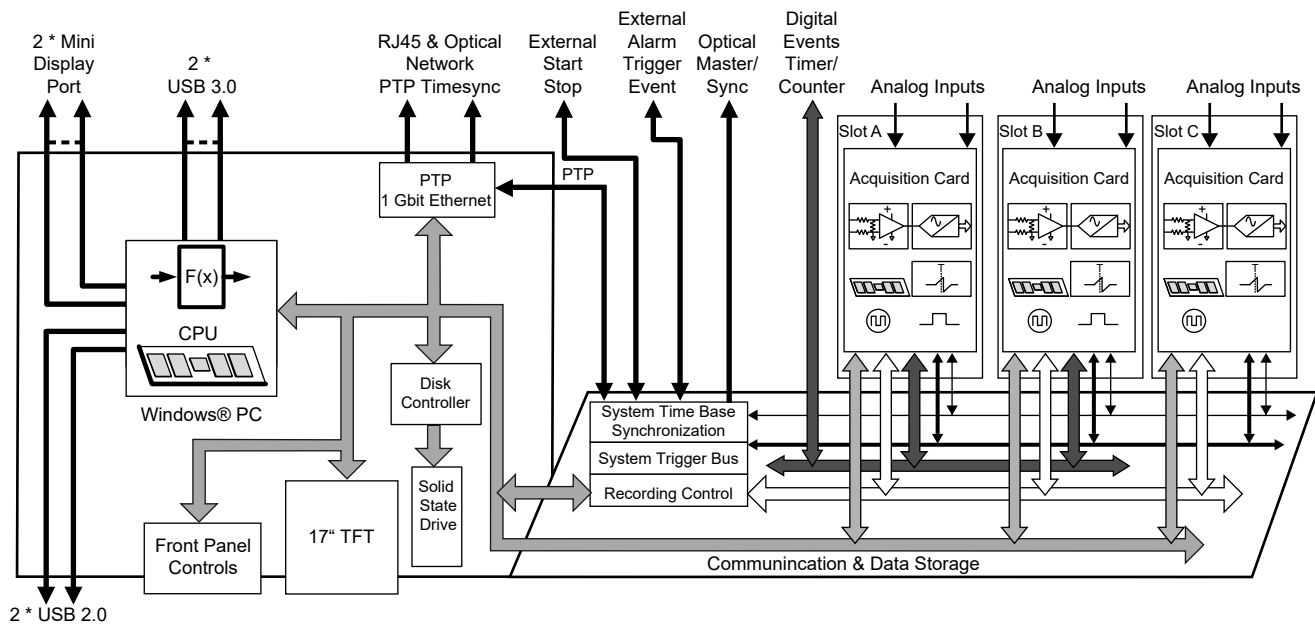| Network and/or drive setup	Number of (mixed) GEN DAQ mainframes used			
	1	2	>2	Notes
Direct 1 Gbit network to PC (no switch used) 100 MB/s per 1 Gbit network cable	100 MB/s	200 MB/s	3 MF: 300 MB/s 4 MF: 400 MB/s ... 10 MF: No support	• The PC drive might limit the speed • 4 network ports / PC will work • Notebooks usually have 1 network port
1 Gbit network switch with 1 Gbit to PC 100 MB/s per 1 Gbit network cable	100 MB/s	100 MB/s	3 MF: 100 MB/s 4 MF: 100 MB/s ... 10 MF: 100 MB/s	• A single 1 Gbit cable to PC limits the speed • Not preffered for continuous recording
1 Gbit network switch with 10 Gbit to PC 100 MB/s per 1 Gbit network cable ~700 MB/s per 10 Gbit network cable	100 MB/s	200 MB/s	3 MF: 300 MB/s 4 MF: 400 MB/s ... 10 MF: 700 MB/s	• The PC drive might limit the speed • 10 Gbit on PC's is not yet standard • Notebooks usually do not support 10 Gbit • A single 10 Gbit port reduces costs
10 Gbit network switch with 10 Gbit to PC ~700 MB/s per 10 Gbit network cable	400 MB/s	700 MB/s	3 MF: 700 MB/s 4 MF: 700 MB/s ... 10 MF: 700 MB/s	• The PC drive might limit the speed • 10 Gbit on PC's is not yet standard • Notebooks usually do not support 10 Gbit • Cost effective 10 Gbit switches exist
Mainframe local disk storage 200 MB/s per Mainframe drive 1 Gbit network switch with 1 Gbit to PC	200 MB/s	400 MB/s	3 MF: 600 MB/s 4 MF: 800 MB/s ... 10 MF: 2000 MB/s	• Worry free extreme reliable setup • Scales with every added mainframe • Low cost 1 Gbit switches can be used

Block Diagram

Figure 1.6: Block diagram

Windows® PC

Memory	4 GB; DDR4 RAM
Processor	Intel 6102E, Core™ i3 6th generation; 2 Core, 4 threads; 1.9 GHz
Ethernet	1 * RJ45 Ethernet connection with PTPv2 support; 1 Gbit/s 1 * SFP based optical Ethernet connection with PTPv2 support; 1 Gbit/s; supports 850 and 1310 nm SFP modules.
Wake-on-LAN	Supported on all Ethernet ports
USB connectors	USB 2.0, two in front USB 3.0, two in back[2]
Internal storage PC disk	Solid State Drive (SSD), unformatted size 480 GB, 200 MB/s continuous streaming[1]
Display	TFT SXGA touch screen, 17" / 1280x1024 resolution
Video connection	2 * Mini DisplayPort
Multiple monitors support	2; clone mode and extended mode
Speaker/Speaker Out	Internal speaker
Accessories	Protective carrying bag, USB keyboard and USB optical mouse
Front panel controls	4; direct recording control for Start/Stop/Pause/Trigger

(1) The size of SSDs increases almost every year. Contact support team or customs systems for availability.
Contact custom systems at: customsystems@hbm.com

(2) Using a performance USB 3.0 SSD over 100 MB/s continuous streaming is possible.

Software

DAQ software	Perception Advanced package. Includes real-time live and recorded data review using y/t and x/y displays. Y/t displays support vertical, horizontal and slope cursors, trace and display markers as well as an interactive waveform calculator. On top Perception allows synchronized video playback. For data analysis Perception supports interactive user keys with macro support, Formula Database with waveform and math calculators. To create a report of the recorded and analysis data Perception supports adding additional meta data describing your test details, quick report to Microsoft Word® and Excel®, an advanced built-in report engine. If analysis in third party software is preferred 20 export format (Including MATLAB, DIAdem, MDF4/ASAM, UFF58 and more) are supported. For automated analysis, reporting or data exports Perception supports extensive automation and result logging features.
DAQ software options	Basic FFT, Sensor Database, User Definer Mode and Multi Mainframe Control.
DAQ software languages	English, German, French, Chinese, Japanese, Korean, Portuguese (Brazilian)
Operating system	Microsoft Windows® 10 PRO
Languages installed in operating system	English, German, French, Chinese, Japanese Other languages can be downloaded and installed using "Windows® Update"

Acquisition System

System Time Base and Synchronization
Central time base for all acquisition cards

Accuracy	± 3.5 ppm; aging after 10 years ± 10 ppm
Base	Binary, Decimal or External
Synchronization sources	IEEE1588:2008 PTPv2 (Precision Time Protocol) using an End-to-End protocol Master/Sync; Sync or Master mode on built-in connector Master output card (G083): Option to synchronize up to 16 Sync mainframes
PTP synchronization accuracy	± 150 ns; no Ethernet switch used When network switches are required, use only PTP IPv4 aware switches that support End-to-End set-ups. Overall accuracy depends on PTP switch used. **Note:** PTP aware switches require PTP setup, refer to the operating manual of the switch for more details.

Acquisition Slots
Unused slots must be covered using the GEN DAQ blind panel. This closes the mainframe front panels for EMC/EMI and safety compliance and also regulates the internal airflow to cool the acquisition system correctly.

|	
Maximum slots	3
Acquisition cards	Any combination of GEN DAQ acquisition cards which support fast data streaming
Digital Event/Timer/Counter connector	1; Connected to slots A and B
Thermal control	Every acquisition card and the acquisition system monitors its own temperature and status. This is used to regulate fan speeds and reduce noise while optimizing airflow and power consumption.
Calibration	Any changes to the acquisition system configuration may change its internal thermal gradients. As accurate calibration relies on a steady and repeatable thermal environment, calibration is void if changes are made in the configuration. For information on calibration impact, please refer to the individual card specifications.

Connection Overview
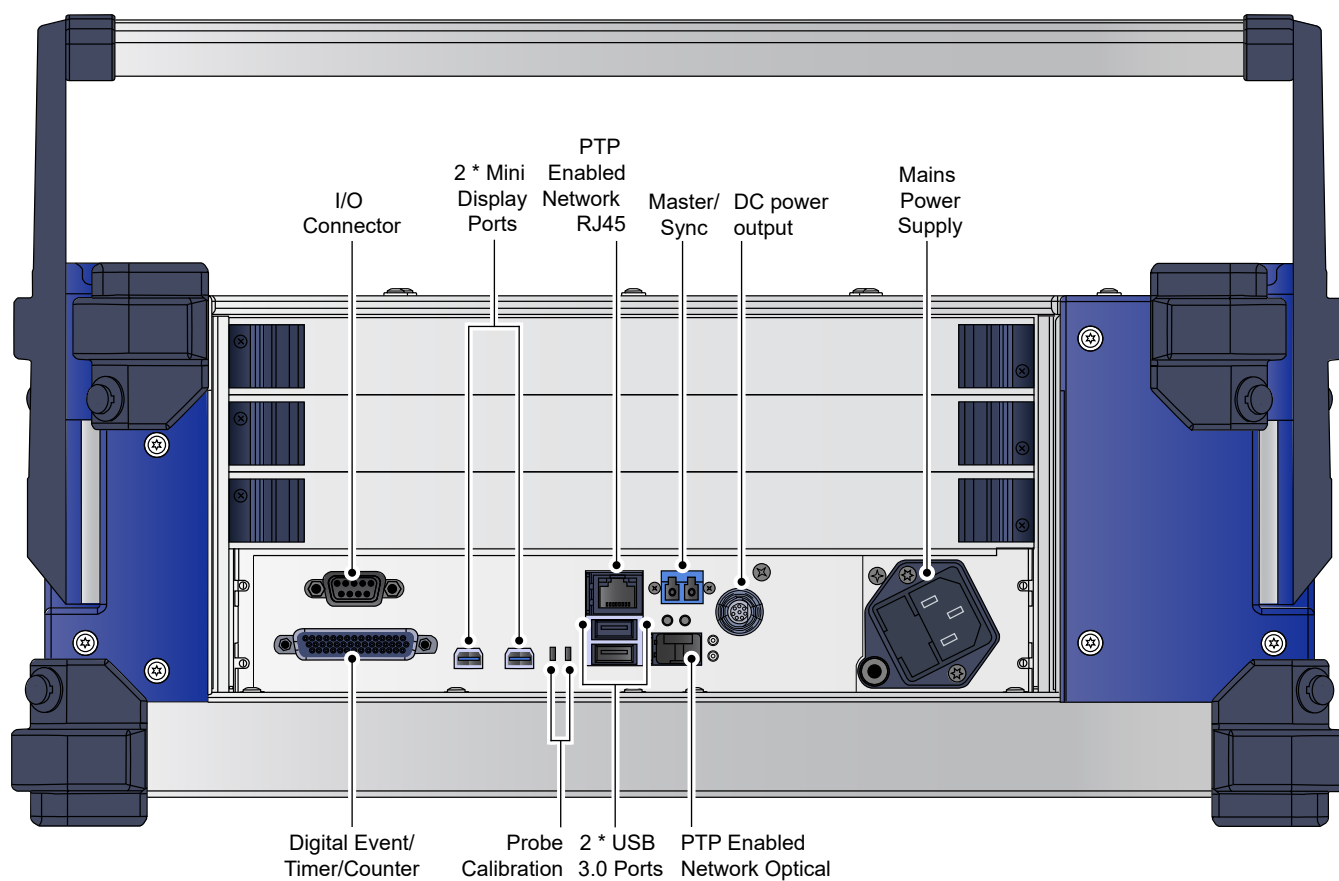
Figure 1.7: Connection overview

1 Gbit Network Interface

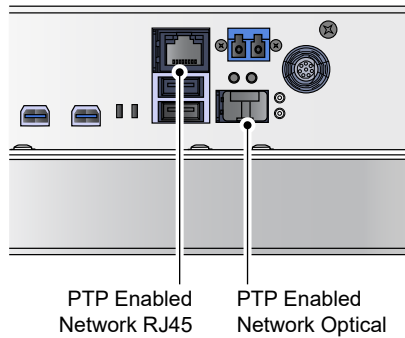GEN3iA supports an electrical and optional optical 1 Gbit Ethernet connector

PTP Enabled
Network RJ45

PTP Enabled
Network Optical

Figure 1.8: Electrical and optical 1 Gbit network interface

Standard Ethernet	1000BASE-T; 1 Gbit, CAT5e UTP or STP (RJ-45 connector)
Optical Ethernet	1000BASE-SX or 1000BASE-LX; 1 Gbit, Ethernet using optional SFP module
1000BASE-SX SFP (option G091)	850 nm, maximum 500 m Multi Mode 50/125 µm optical cable length, LC connector
1000BASE-LX SFP (option G063)	1310 nm, maximum 10 km Single Mode 9/125 µm optical cable length, LC connector
TCP/IP IPv4	
Address setup	DHCP/Auto IP or fixed IP
DHCP setup	When DHCP fails, APIPA (Automatic Private IP Addressing) is used similar to Windows® PCs
Gateway setup	Gateway setup supported for control using VPN and/or Internet
TCP/IP IPv6	Not supported
PTPv2 (IEEE1588:2008) synchronization	Supported on standard and optical 1 Gbit Ethernet interface (See table "Supported Acquisition Cards" for details)
Wake-on-LAN	Supported on standard and optical 1 Gbit Ethernet interface
Multiple Ethernet use cases	PTPv2 (IEEE1588:2008) can be used on separate (dedicated) Ethernet interface
Maximum Transfer Speed	
Continuous recording to a remote PC	100 MB/s[1] uncompressed, up to 175 MB/s with compression

(1)   Tested using circular recording for 48 hours. Test setup uses a Windows® PC with Intel i7 CPU and SSD with sustained write speeds exceeding 250 MB/s.

GEN3iA Stand-Alone Recorded Data Storage Overview

Using GEN3iA in stand-alone mode allows for several storage options. The built-in SSD is directly controlled by the Windows® PC inside the GEN3iA. As a result all storage options are Perception PC storage based. Continuous streaming throughput is tested by using 48 hours of circular recordings at specified data rates.
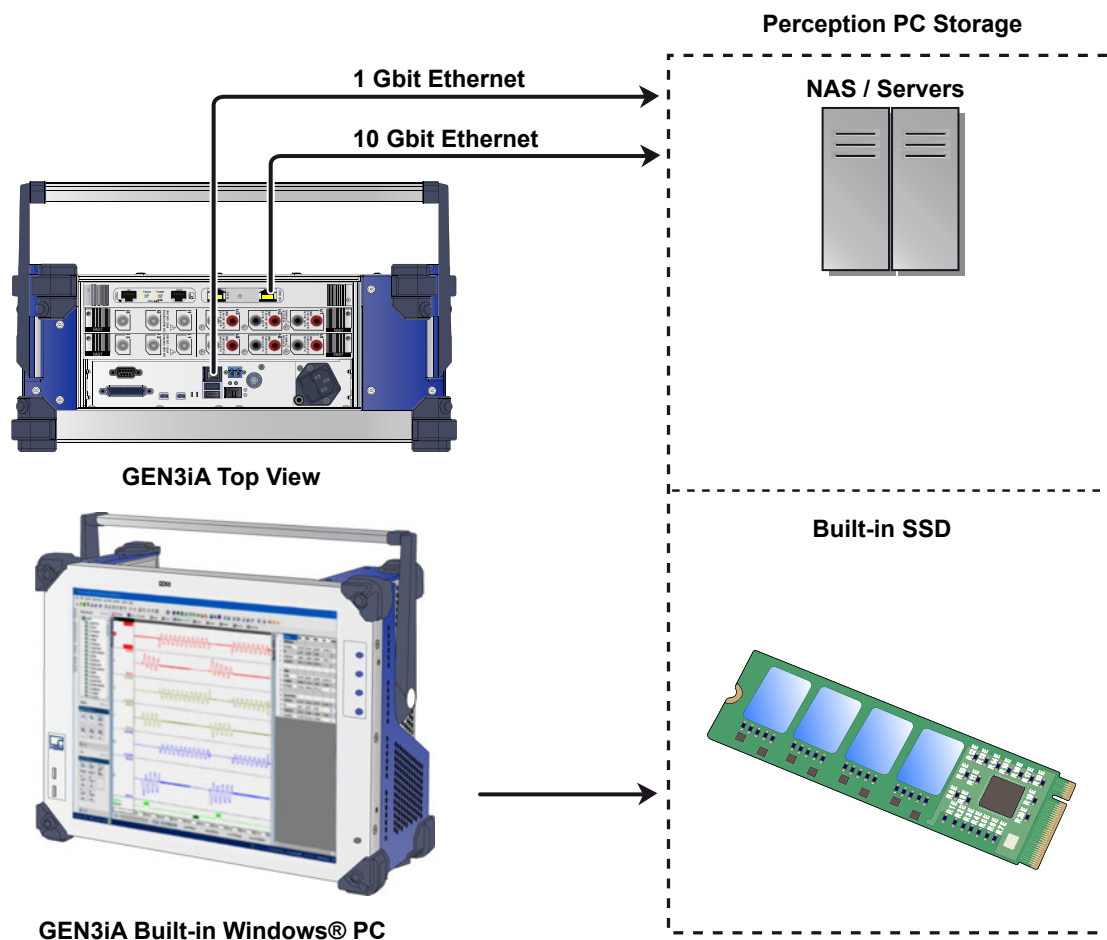

Figure 1.9: Data storage overview

Maximum continuous data storage rates	Perception PC storage (GEN3iA)
Built-in SSD	200 MB/s[2]
Server storage	
1 Gbit Ethernet (optical or electrical)	100 MB/s[3]
10 Gbit Ethernet (optical or electrical, option)	400 MB/s[1][4]
Power failure data security	
Continuous recording	When storing continuous recorded data on the built-in SSD Perception secures all recorded data is stored on the SSD on regular intervals. The interval time depends on the continuous data storage rate used. A sudden power loss at higher continuous data storage rates results in more recording time loss just before the moment the power disappeared.
Sweep and dual rate recording	When storing sweeps and/or dual rate recordings the data storage behavior is heavily depending on the triggers detected by the system. Sudden bursts of triggers mean a lot of data to be stored. A power loss during or right after this trigger burst will result in much more data loss compared to a moment in time the system is waiting for triggers.

(1)   Legacy cards do not support the enhanced fast streaming bus. The maximum aggregate storage rate for legacy cards is 200 MB/s.

(2)   Tested using circular recording for 48 hours.

(3)   Tested using circular recording for 48 hours. Test setup uses a Synology® DS212 configured with a two disk RAID 0 partition.

(4)   Tested using circular recording for 48 hours. Test setup uses a Synology® DS3412 configured with a eight disk RAID 0 partition and a 10 Gbit Ethernet link.

GEN3iA Remote Controlled Recorded Data Storage Overview

Using GEN3iA in remote mode allows for several storage options. While in remote control, Perception on the GEN3iA Windows® PC is closed. As a result all Solid State Drives (internal and removable) are not usable anymore.
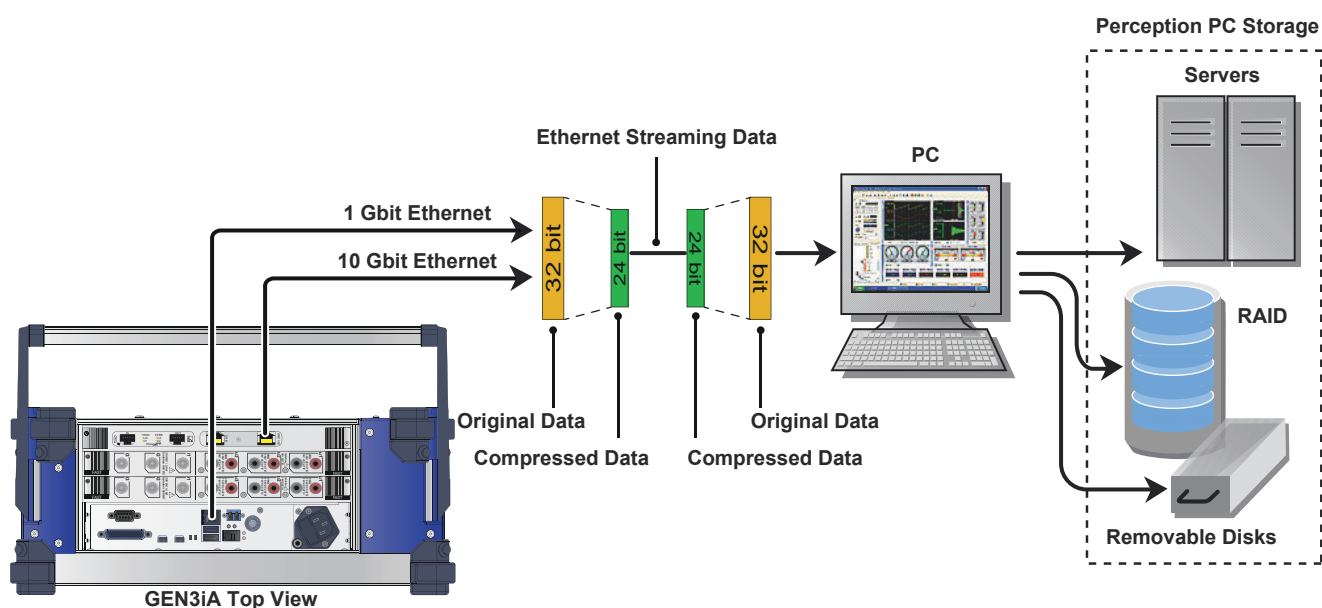

Figure 1.10: Remote data storage overview

Maximum continuous data storage rates (tested using full disk circular recording for 48 hours)	Perception PC storage	
	Uncompressed	Compressed
1 Gbit Ethernet (optical or electrical)	100 MB/s[1]	Up to 175 MB/s[1][2]
10 Gbit Ethernet (optical or electrical, option)	400 MB/s[3]	n/a
Built-in SSD	Not usable in this mode	Not usable in this mode

[1]   Test setup uses a Windows® PC with Intel i7 CPU and SSD with sustained write speeds exceeding 250 MB/s.

[2]   Compression ratio is defined by the ADC channel width. For details, please refer to the "Streaming Compression Ratio" table (below). Rate is valid before decompressing storage data to maintain backward PNRF compatibility.

[3]   Test setup uses a Windows® PC with Intel i7 CPU and SSD with sustained write speeds exceeding 700 MB/s and a 10 Gbit Ethernet link.

Analog Channel Streaming Compression Ratio

Acquisition cards	Sample width	Compression ratio	
		16 bit storage	32 bit storage
GN310B, GN311B	18 bits	1 : 1	1.75 : 1
GN610B, GN611B	18 bits	1 : 1	1.75 : 1
GN815, GN816	18 bits	1 : 1	1.75 : 1
GN840B, GN1640B	24 bits	1 : 1	1.33 : 1
GN1202B	14 bits	1 : 1	N/A
GN3210, GN3211	24 bits	1 : 1	1.33 : 1
GN8101B, GN8102B, GN8103B	14 bits	1 : 1	N/A

Master/Sync Connection

GEN series mainframes support a Master/Sync connector. The connector can be used as a single Master output or as a Sync input. The Master output function can be extended using the Master output card (G083).
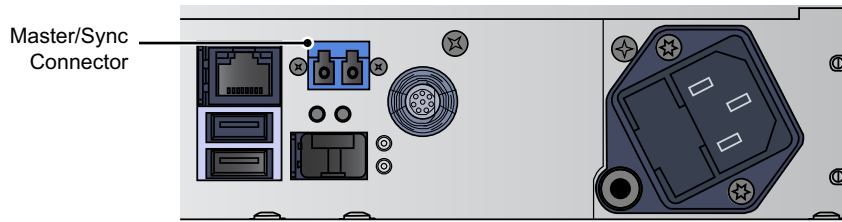

Figure 1.11: Master/Sync connector

Mainframe to mainframe phase shift	± 150 ns RMS
LED signaling	Optical link synchronized, not connected, function disabled
Master mode	Basic and extended synchronization supported; Supports one Sync mainframe. Multiple Sync mainframes support by using one or more optional Master output cards (G083)
Sync mode	Basic and extended synchronization supported
Maximum number of mainframes	2; more mainframes supported when using one or more optional Master output cards (G083)
Time required to full synchronization after Master/Sync signal detected	
No recording active	Typically 1 minute
Recording or pause active	1 minute and an additional 25 s per ms recording time deviation from Master time
User notifications while recording	Time marks on Master/Sync signal lost/restored and Master/Sync time synchronized
Basic synchronization	
Cable length propagation delay	Automatic cable length detection and propagation delay compensation
First sample	Synchronizes the first sample in a continuous recording for each mainframe. Cable length propagation delay not compensated at start of recording. First samples not recorded in the Sync mainframes, as defined by the propagation delays. Signal phase shifts are not introduced by this propagation delay.
Synchronized time base	Prevents frequency drift of the sample rates within each mainframe
Measured channel trigger exchange	Synchronously exchanges measured channel triggers connected to the Master/Sync trigger bus to/from each connected mainframe. Typically used for the sweep recording modes.
Compatibility	Basic synchronization features are backward compatible with GEN series Master/Sync card option for both Master and Sync modes
Extended synchronization	
Calculated channel trigger exchange	Additional trigger bus to synchronously exchange trigger conditions detected on real-time calculated (RTC) channels between mainframes. RTC channel triggers have a longer delay caused by the required calculation time prior to establishing a trigger.
Synchronous manual trigger	User action within Perception to trigger all mainframes synchronously
Synchronous recording actions	Start/Stop and Pause a recording across multiple mainframes, each of which is controlled by a separate instance of Perception. Stop recording is a non-synchronous action. Synchronously records distributed data with a mix of two GEN DAQ mainframes in Master/Sync setup while running Perception on each of the mainframes. A more typical Master/Sync setup would be to stop Perception on one system and use one instance of Perception application to control both systems.
Compatibility	Extended synchronization features are not supported by the legacy Master/Sync card option. A mixed system setup automatically works with basic synchronization.
Connection	
Optical wavelength	850 nm
Optical cable type	Multi Mode 50/125 µm
Optical data rate	2 Gbit/s
Maximum cable length	500 m
Connector type	Duplex LC

Synchronization Specification Overview
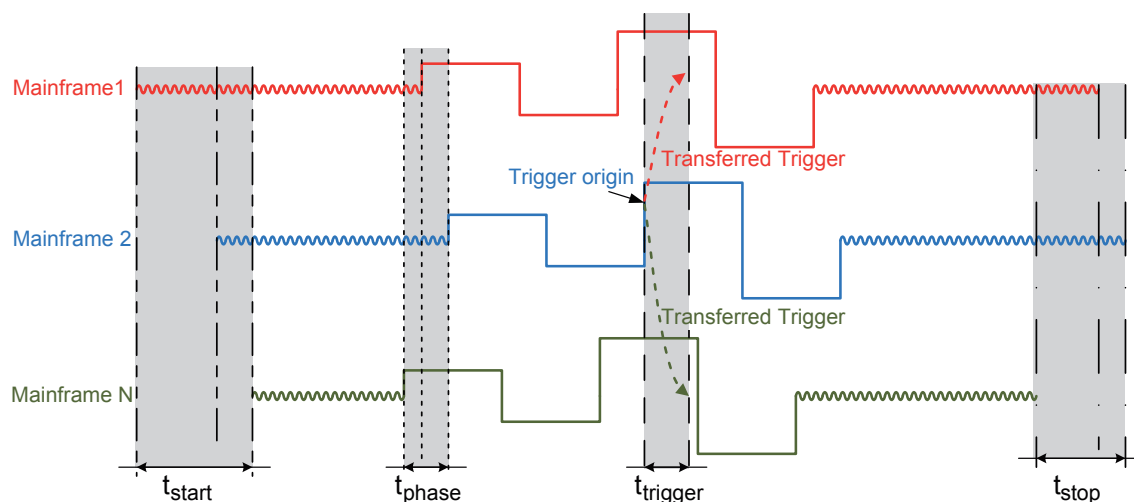
Figure 1.12: Synchronization specification overview

		t_{phase}[1]	t_{start}[2]	t_{stop}[3]	$t_{trigger}$[4][5]
Synchronization source					
	Master/Sync	≤ 150 ns	≤ cable delay	≤ 1 s	≤ 150 ns
	PTP	≤ 150 ns	≤ 1 s	≤ 1 s	≤ (516 µs + cable delays)
No synchronization source					
	Mainframes connected by Perception simultaneously	≤ 1 s	≤ 1 s	≤ 1 s	≤ 1 s
	Additional error after connection	≤ 0.5 s/hour	≤ 0.5 s/hour	≤ 0.5 s/hour	≤ 0.5 s/hour

[1]   **t_{phase}**   Maximum phase difference between signals. *(This specification is not affected by any of the other specifications).*

[2]   **t_{start}**   Maximum delay between the start of recording for each mainframe.

[3]   **t_{stop}**   Maximum delay between the stop of recording for each mainframe.

[4]   **$t_{trigger}$**   Maximum delay to transfer a trigger from one mainframe to all other mainframes.

[5]   **Note** on trigger exchange
        Trigger exchange is included in the Master/Sync cable. All other synchronization modes require that the mainframes are connected from each External Trigger Out to each External Trigger In on all the mainframes in order to exchange triggers.

I/O Connector

PIN   Signal
PIN 1 - External Event In
PIN 2 - External Event Out
PIN 3 - External Trigger In
PIN 4 - Ground
PIN 5 - Ground
PIN 6 - External Start In
PIN 7 - External Trigger Out
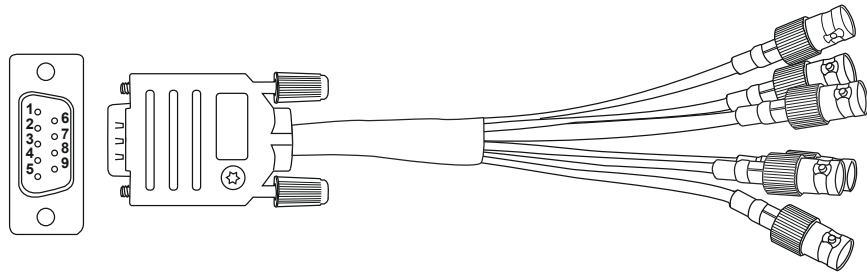PIN 8 - External Stop In
PIN 9 - +5V

Figure 1.13: Pin assignment breakout cable

Connector type	TE (Tyco Electronics) connectivity: 2-5747706-0 (D-sub, 9-pin female)
Mating connector type	TE (Tyco Electronics) connectivity: 5-747904-5
1-KAB2132-0_5: Breakout cable (Option, to be ordered separately)	
Cable type	Coax
Connector type	6; BNC female
Length	0.5 m (1.6 ft)
External input details (Trigger In / Event In / Start In / Stop In)	
Levels	TTL compatible, Low -30 V to 0.7 V, High 2 V to 30 V Input has an internal pull-up of 20 kΩ ± 1% to 5 V
Input overvoltage protection	± 25 V DC, ± 30 V peak <1 minute
Resolution	50 ns
Minimum pulse width filter	500 ns, 1 µs, 2 µs, 5 µs, 10 µs
Active edge	Rising or falling; software selectable
Delay	± 1 µs + up to one sample period
Start response time	Typically 1 s when system is completely idle
Stop response time	Typically 1 s when system is recording without automation
External output details (Trigger out / Event out)	
Levels	TTL compatible; 0 V < Low < 0.6 V; 2 V < High < 5 V
Active level	High/Low/Hold High; software selectable
Pulse width	High or Low selected: 12.5 to 12.8 µs Hold High selected: Active from first trigger to end of recording
Maximum output current	50 mA, short circuit protected
Output impedance	49.9 Ω ± 1%
Short circuit protected	Continuous
External Trigger Out delay	User selectable; minimum value may vary for each acquisition card. Default 516 ± 1 µs + up to one sample period; Filter set to wideband [1]
External Event Out delay	User selected external trigger output delay - 1 µs

(1)   If an analog and/or digital filter is used, extra delay will be added, depending on the type of filter and signal frequency.
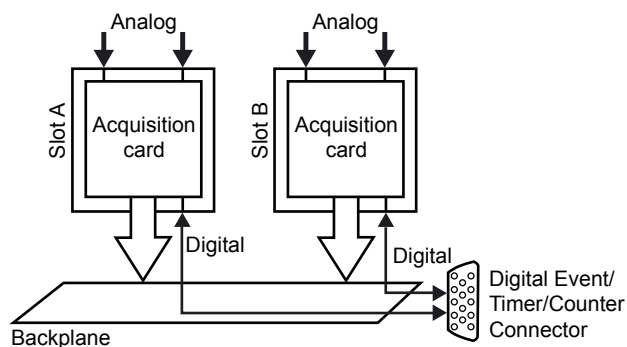
Digital Event/Timer/Counter

Figure 1.14: Digital Event/Timer/Counter block diagram

Number of connectors	
Connector type	44 pin, female D-type connector, AMP HD-22 series (Tyco/TE connectivity: 5748482-5)
Mating cable connector type	44 pin, male D-type connector, HDP-22 series (Tyco/TE connectivity: 1658680-1)
Output power	
Voltage	5 ± 0.5 V DC
Maximum current	0.5 A
Event Inputs	
Number of event inputs	16 per card, 2 cards per connector
Levels	TTL Compatible, Low -30 V to 0.7 V, High 2 V to 30 V
	Figure 1.15: Logic threshold voltage levels
Overvoltage protection	
Timer/Counter	
Number of channels	Two per card, two cards per connector
Functions	See specifications of the acquisition cards that support these inputs
Outputs	
Number of outputs	Two per card, two cards per connector
Functions	See specifications of acquisition cards that support these outputs
Output levels	TTL compatible; 0 V < Low < 0.6V; 2 V < High < 5 V
Output resistance	49.9 Ω ± 1%
Maximum output current	50 mA, short circuit protected

Digital Event/Timer/Counter Connector Pin Assignment
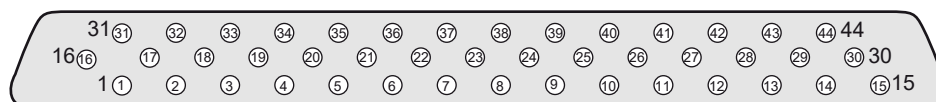
PIN 1 - Event Input A1 & Reset Timer/Counter A2
PIN 2 - Event Input A2 & Direction Timer/Counter A2
PIN 3 - Event Input A3 & Clock Timer/Counter A2
PIN 4 - Event Input A4
PIN 5 - Event Input A5
PIN 6 - Event Input A6
PIN 7 - Event Input A7
PIN 8 - Event Input A8
PIN 9 - Event Input A9
PIN 10 - Event Input A10 & Reset Timer/Counter A1
PIN 11 - Event Input A11 & Direction Timer/Counter A1
PIN 12 - Event Input A12 & Clock Timer/Counter A1
PIN 13 - Event Input B1 & Reset Timer/Counter B2
PIN 14 - Event Input B2 & Direction Timer/Counter B2
PIN 15 - Event Input B3 & Clock Timer/Counter B2

PIN 16 - Event Input B4
PIN 17 - Event Input B5
PIN 18 - Event Input B6
PIN 19 - Event Input B7
PIN 20 - Event Input B8
PIN 21 - Event Input B9
PIN 22 - Event Input B10 & Reset Timer/Counter B1
PIN 23 - Event Input B11 & Direction Timer/Counter B1
PIN 24 - Event Input B12 & Clock Timer/Counter B1
PIN 25 - Event Input B13
PIN 26 - Event Input B14
PIN 27 - Ground
PIN 28 - Ground
PIN 29 - Ground
PIN 30 - Ground

PIN 31 - Event Input B15
PIN 32 - Event Input B16
PIN 33 - Event Input A13
PIN 34 - Event Input A14
PIN 35 - Event Input A15
PIN 36 - Event Input A16
PIN 37 - Event Output B2
PIN 38 - Event Output B1
PIN 39 - Event Output A2
PIN 40 - Event Output A1
PIN 41 - Ground
PIN 42 - Ground
PIN 43 - +5 V Power
PIN 44 - +5 V Power

Figure 1.16: Pin diagram for Digital Event/Timer/Counter connectors

DC Power Output

Connector type	ODU, G81L0C-P08LFG0-0000
Mating connector type	ODU, SX1LOC−P08MFG0−0000
Connector pinning	QuantumX compatible; only GND and PWR signals connected
Output Power	15 Watt
Output Voltage	> 11 V; Typically 11.5 V to 12 V
Maximum Output Current	1.4 A; Limited current and short circuit protected

PIN   Signal
PIN 1 - Reserved/not connected
PIN 2 - Reserved/not connected
PIN 3 - GND
PIN 4 - Reserved/not connected
PIN 5 - Reserved/not connected
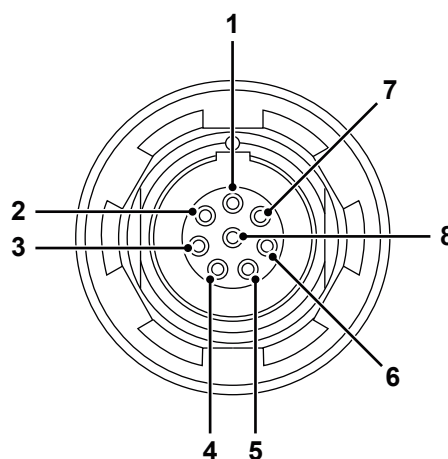PIN 6 - Reserved/not connected
PIN 7 - PWR
PIN 8 - Reserved/not connected

Figure 1.17: Connector power output

Probe Calibration

Pins	2; Signal and ground
Signal	~1 kHz square wave
Signal amplitude	0 V to 2 V using 1 MΩ load 0 V to 1 V using 50 Ω load

Power

Power Inlet	47-63 Hz, 100-240 V AC
Total Power of unit (maximum)	250 VA, 300 VA peak

Physical, Weight and Dimensions

| Weight		
	Mainframe	9 kg (20.9 lb), add ≈ 1 kg (2.2 lb) per acquisition card installed (2.2 lb) per acquisition card installed
Dimensions		
	Height/Height with handle	342 mm/392 mm (13.5"/15.4")
	Width	436 mm (17.2")
	Depth	186 mm (7.3")
Acoustic Noise		The total A-weighted SPL 55 dBA @ 0.6 m maximum
Temperature Sensors		For temperature monitoring and air flow control
Cooling Fans		2
Handle		One handle used for carrying and tilting the unit to higher tilt angles
Tilting Feet		Two retractable feet for small tilt angles
Grounding		4 mm Banana plug
Casing		Aluminum/Plastic cover
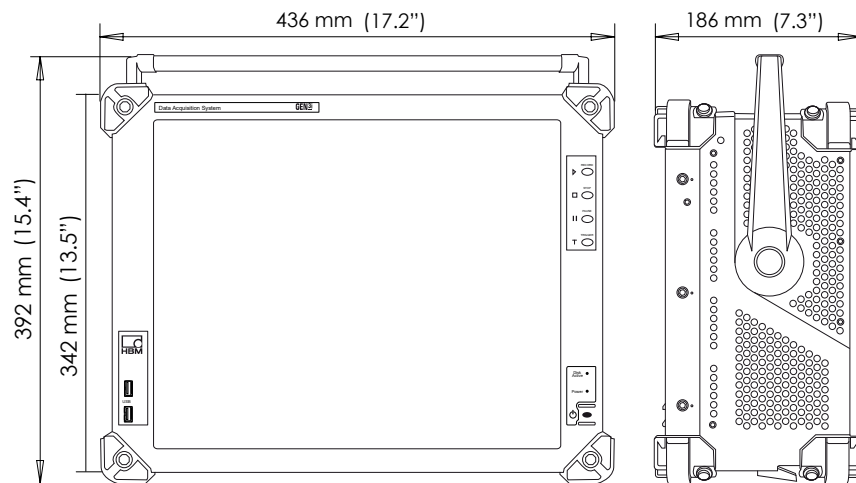
Figure 1.18: GEN3iA dimensions

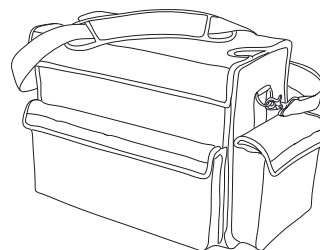| Accessories	Soft carry case with strap for transportation included. The case has a hardened front and back for protection and two storage pouches for a mouse and keyboard

Figure 1.19: Soft carry case

Environmental Specifications

Temperature Range	
Operational	0 °C to +40 °C (+32 °F to +104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)
Thermal protection	Automatic shutdown above +40 °C (+104 °F) with notifications starting at +35 °C (+95 °F)
Relative humidity	0% to 80%; non-condensing; operational
Protection class	IP20
Altitude	Maximum 2000 m (6562 ft) above sea level; operational[1]

Shock: IEC 60068-2-27	
Operational	Half-sine 10 g/11 ms; 3-axis, 1000 shocks in positive and negative direction
Non-operational	Half-sine 25 g/6 ms; 3-axis, 3 shocks in positive and negative direction

Vibration: IEC 60068-2-64	
Operational	1 g RMS, ½ h; 3-axis, random 5 to 500 Hz
Non-operational	2 g RMS, 1 h; 3-axis, random 5 to 500 Hz

Operational Environmental Tests	
Cold test IEC60068-2-1 Test Ad	-5 °C (+23 °F) for 2 hours
Dry heat test IEC-60068-2-2 Test Bd	+40 °C (+104 °F) for 2 hours
Damp heat test IEC60068-2-3 Test Ca	+40 °C (+104 °F), humidity > 93% RH for 4 days

Non-Operational (Storage) Environmental Tests	
Cold test IEC-60068-2-1 Test Ab	-25 °C (-13 °F) for 72 hours
Dry heat test IEC-60068-2-2 Test Bb	+70 °C (+158 °F) humidity < 50% RH for 96 hours
Change of temperature test IEC60068-2-14 Test Na	-25 °C to +70 °C (-13 °F to +158 °F) 5 cycles, rate 2 to 3 minutes, dwell time 3 hours
Damp heat cyclic test IEC60068-2-30 Test Db variant 1	+25 °C/+40 °C (+77 °F/+104 °F), humidity > 95/90% RH 6 cycles, cycle duration 24 hours

Harmonized Standards for CE Compliance, According to the Following Directives

Low Voltage Directive (LVD): 2014/35/EU
Electromagnetic Compatibility Directive (EMC): 2014/30/EU

Electrical Safety	
EN 61010-1 (2010)	Safety requirements for electrical equipment for measurement, control, and laboratory use - General requirements
EN 61010-2-030 (2010)	Particular requirements for testing and measuring circuits

Electromagnetic Compatibility	
EN 61326-1 (2013)	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Emission	
EN 55011	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics Conducted disturbance: class B; Radiated disturbance: class A
EN 61000-3-2	Limits for harmonic current emissions: class D
EN 61000-3-3	Limitation of voltage changes, voltage fluctuations and flicker in public low voltage supply systems

Immunity	
EN 61000-4-2	Electrostatic discharge immunity test (ESD); contact discharge ± 4 kV/air discharge ± 8 kV: performance criteria B
EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test; 80 MHz to 2.7 GHz using 10 V/m, 1000 Hz AM: performance criteria A
EN 61000-4-4	Electrical fast transient/burst immunity test Mains ± 2 kV using coupling network. Channel ± 2 kV using capacitive clamp: performance criteria B
EN 61000-4-5	Surge immunity test Mains ± 0.5 kV/± 1 kV Line-Line and ± 0.5 kV/± 1 kV/± 2 kV Line-earth Channel ± 0.5 kV/± 1 kV using coupling network: performance criteria B
EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields 150 kHz to 80 MHz, 1000 Hz AM; 10 V RMS @ mains, 3 V RMS @ channel, both using clamp: performance criteria A
EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests Dips: performance criteria A; Interruptions: performance criteria C

G063: 1 Gbit Optical SFP Module Single Mode 1310 nm (Option, to be ordered separately)

Small Form-factor Pluggable (SFP)
Optical transceiver used for:
–   Multi Mode 1310 nm 1 Gbit optical network support

> ⚠️ **WARNING**
> **Use HBM approved transceivers only.**

Data rate	1.0 Gbps
Wavelength	1310 nm
Input connector	LC
Form factor	SFP
Laser class	1
Original manufacturer's part number	Foxconn AFCT-5710PZ
Temperature Range	
Operational	-10 °C to +60 °C (-14 °F to +140 °F)
Non-operational (Storage)	-40 °C to +85 °C (-40 °F to +158 °F)

G091: 2 Gbit Optical SFP Module Multi Mode 850 nm (Option, to be ordered separately)

Small Form-factor Pluggable (SFP)
Optical transceiver used for:
–   Multi Mode 850 nm 1 Gbit optical network support
–   GN1202B optical front end connection
–   GEN DAQ optical Master/Sync connections

> ⚠️ **WARNING**
> **Use HBM approved transceivers only.**

Data rate	2.125 Gbps
Wavelength	850 nm
Input connector	LC
Form factor	SFP
Laser class	1
Original manufacturer's part number	Finisar FTLF8519P3BNL
Temperature Range	
Operational	-20 °C to +60 °C (-4 °F to +140 °F)
Non-operational (Storage)	-40 °C to +85 °C (-40 °F to +158 °F)

G081: Option Carrier Card (Option, to be ordered separately)

Used to enable optional synchronization and other interface cards. (See option card specifications for more details)
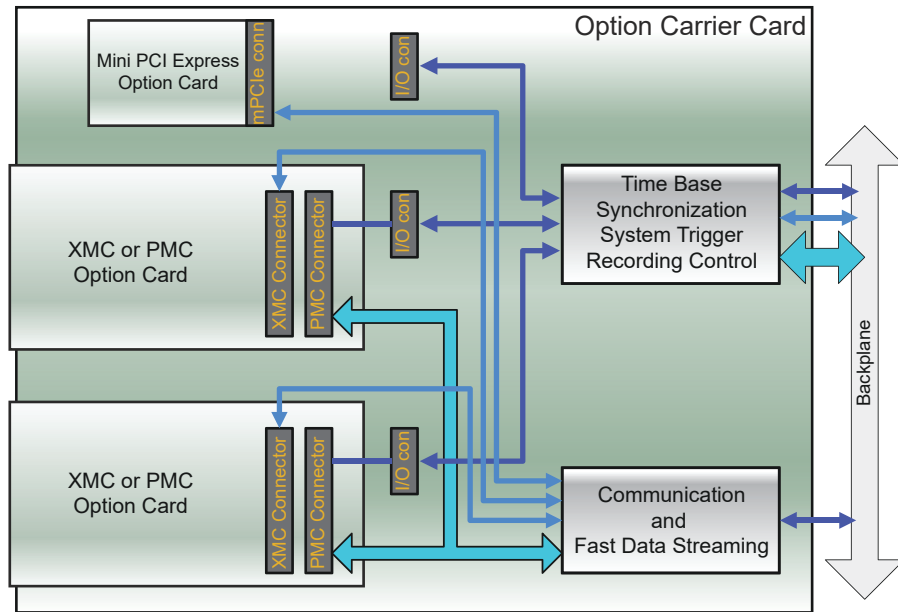

Figure 1.20: Block diagram option carrier card

Maximum option carrier cards	Mainframe number of slots - 1 Every mainframe needs at least one acquisition card.
Supported mainframes	GEN2tB, GEN3iA, GEN4tB, GEN7iA, GEN7tA and GEN17tA
Option card types	
PMC/XMC cards	Two per option carrier card
Mini PCI express cards	One per option carrier card
Supported PMC/XMC option cards	
Master output card	1-G083 Master output card to support four Sync mainframes per Master output card Two Master output cards per option carrier card, multiple option carrier cards per mainframe
10 Gbit Ethernet card, optical	1-G064 10 Gbit Ethernet card with SFP+ modules to support 850 nm and 1330 nm optical as well as RJ45 copper cable networks One Ethernet option card per mainframe, cannot be combined with 1-G084
EtherCAT® card	1-G082 EtherCAT® card with configurable SDO and PDO data output (no setup) One EtherCAT® option card per mainframe EtherCAT® card not supported in GEN3iA and GEN7iA
Supported mPCIe option cards	
2 Channel CAN/CAN FD card (No part number)	Custom special 2 channel CAN FD card, not supported in GEN3iA and GEN7iA Can only be ordered through custom systems at: customsystems@hbm.com
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

G083: Master Output Card (Option, to be ordered separately)

Supports up to four Sync mainframes, multiple Master output cards supported (G081 option carrier card required).
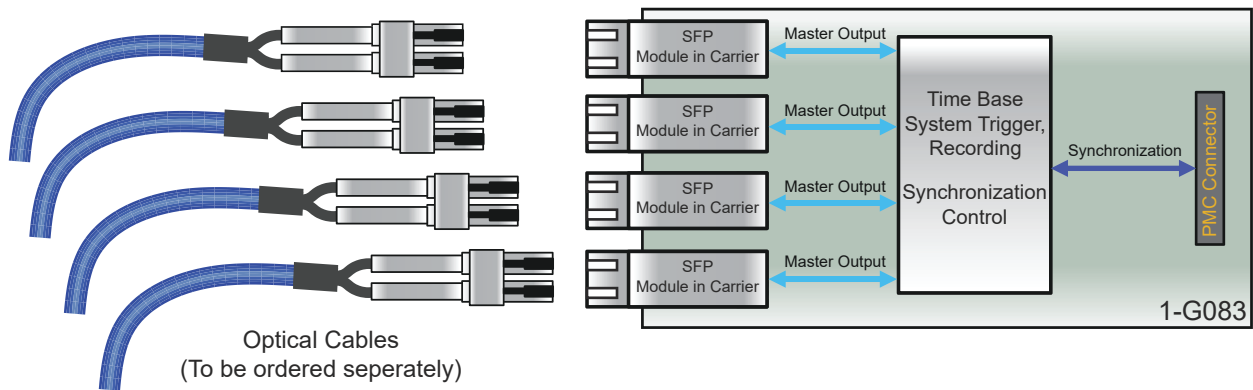Factory installed option.

Figure 1.21: Block diagram Master output card (G081 required)

Master outputs	Four per Master output card. Up to two Master output cards per option carrier card. All but the first mainframe slots can be filled with option carrier cards.
Mainframe to mainframe phase shift	± 150 ns RMS; measured on analog signals using identical acquisition modules, identical sample rates and filter settings in each mainframe
LED signaling	Optical link synchronized, not connected, function disabled
Master mode	Basic and extended synchronization supported; four Sync mainframes per Master output card Two Master output cards per option carrier card, multiple option carrier cards per mainframe
Sync mode	Not supported. Use Master/Sync synchronization connector of mainframe for Sync mode.
Maximum mainframes	GEN2tB: 9 Sync mainframes, 10 including Master mainframe GEN4tB: 25 Sync mainframes, 26 including Master mainframe GEN3i, GEN3iA and GEN3t: 17 Sync mainframes, 18 including Master mainframe GEN7i, GEN7iA and GEN7tA: 49 Sync mainframes, 50 including Master mainframe GEN17tA: 129 Sync mainframes, 130 including Master mainframe
Time required to full synchronization after Master/Sync signal detected	
No recording active	1 minute typical
Recording or pause active	1 minute plus 25 s per ms recording time deviation from Master time
User notifications while recording	Time marks on Master/Sync signal lost/restored and Master/Sync time synchronized
Basic synchronization (backward compatible with the legacy GEN series Master/Sync card option)	
Cable length propagation delay	±5 ns/m; Automatic cable length detection and propagation delay compensation
First sample	Synchronizes the first sample in a continuous recording for each mainframe. First samples are not recorded in the Sync mainframes defined by the cable length propagation delays. Signal phase shifts are not introduced by this propagation delay.
Synchronized time base	Prevents frequency drift of the sample rates within each mainframe
Measured channel trigger exchange	Synchronously exchanges measured channel triggers connected to the Master/Sync trigger bus between mainframes. Typically used for the sweep recording modes.
Extended synchronization (Not supported by the legacy GEN series Master/Sync card option)	
Calculated channel trigger exchange	Synchronously exchanges real-time calculated (RTC) channel triggers between mainframes. Separate exchange required due to the longer internal delays of RTC channel triggers that were caused by the mathematics prior to establishing a trigger.
Synchronous manual trigger	User action within Perception to trigger all mainframes synchronously
Synchronous recording actions	Start/Stop and Pause a recording across multiple mainframes, each controlled by a separate instance of Perception. Stop recording is a non-synchronous action. Synchronously records distributed data with a mix of GEN7iA/GEN3iA mainframes in Master/Sync setup while running Perception on each of the mainframes. A more typical Master/Sync setup would be to control both systems from one Perception application.
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

G064: 10Gbit Ethernet Card, Optical (Option, to be ordered separately)

Supports up to two 10Gbit Ethernet connections using SFP+ modules (G081 option carrier card required).
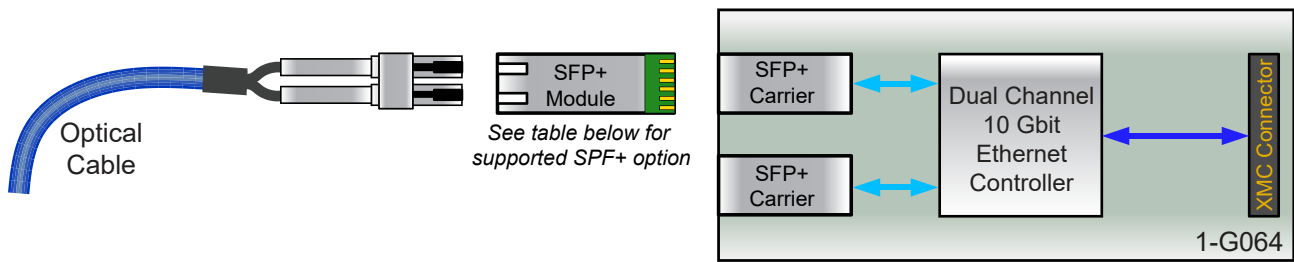Factory installed option, cannot be combined with 1-G084.

Figure 1.22: Block diagram 10Gbit Ethernet card, optical (G081 required)

Maximum number of Ethernet option cards	One Ethernet option card per mainframe, cannot be combined with 1-G084		
Network interface	Up to two interfaces each 10 Gbit/s optical using SFP+ modules with LC connectors		
Ethernet Speed	1 or 10 Gbit (auto detection)		
SFP+ Module selection	1-G065	1-G066	1-SFP-10GBIT-RJ45
10GBASE-SR (Optical)	Yes	No	No
10GBASE-SR (Optical)	No	Yes	No
10GBASE-T (Electrical)	No	No	Yes
Optical Wavelength	850 nm	1310 nm	-
Connector type	LC	LC	RJ45
Required cables			
Multi Mode OM3 cable	KAB280	-	-
Single Mode OS2 cable	-	KAB288 or KAB290	-
Electrical cable	-	-	CAT6A or higher
Maximum cable length	82 m (269 ft)	10 km (6.2 mi)	100 m (330 ft)
TCP/IP IPv4			
Address setup	DHCP/Auto IP or fixed IP		
DHCP setup	When DHCP fails, the APIPA (Automatic Private IP Addressing) setup is used similarly to Windows® PCs		
Gateway setup	Gateway setup supported for control through VPN and/or Internet		
TCP/IP IPv6	Not supported		
PTPv2 (IEEE1588:2008) synchronization	Not supported on Ethernet option cards		
Wake-on-LAN	Not supported on Ethernet option cards		
Multiple Ethernet use cases	PTPv2 (IEEE1588:2008) can be used on a separate 1 Gbit Ethernet interface A combination of 10 Gbit and 1 Gbit Ethernet interfaces is supported		
Maximum transfer speed			
Continuous recording to remote PC	400 MB/s[1]		
Temperature Range			
Operational	0 °C to 40 °C (32 °F to 104 °F)		
Non-operational (Storage)	-55 °C to +85 °C (-67 °F to +185 °F)		

[1]   Tested using circular recording for 48 hours. Test setup uses a Windows® 7 PC with Intel i7 CPU and SSD with sustained write speeds exceeding 700 MB/s and a 10 Gbit Ethernet link.

1-G065: 10 Gbit Optical Network SFP+ module 850 nm (Option, to be ordered separately)

GEN DAQ 10 Gbit Ethernet SFP+, 850 nm Multi Mode, up to 82 m optical cable length supported, LC connector support.
10 Gbit SFP+ modules are not compatible with the 1 Gbit SFP modules.

Figure 1.23: 10 Gbit Optical Network SFP+ module 850 nm

Multi Mode SFP+ module (10GBASE-SR)	
Ordering part number	1-G065
Ethernet Speed	1 or 10 Gbit (auto detection)
Optical wave length	850 nm
Maximum cable length	82 m (269 ft) using OM3 specified optical cable (KAB280)
Connector type	LC
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

1-G066: 10 Gbit Optical Network SFP+ module 1310 nm (Option, to be ordered separately)

GEN DAQ 10 Gbit Ethernet SFP+, 1310 nm Single Mode, up to 10 km optical cable length supported, LC connector support.
10 Gbit SFP+ modules are not compatible with the 1 Gbit SFP modules.

Figure 1.24: 10 Gbit Optical Network SFP+ module 1310 nm

Single Mode SFP+ module (10GBASE-LR)	
Ordering part number	1-G066
Ethernet Speed	1 or 10 Gbit (auto detection)
Optical wave length	1310 nm
Maximum cable length	10 km (6.2 mi) using OS2 specified optical cable (KAB288)
Connector type	LC
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

1-SFP-10GBIT-RJ45: 10Gbit Electric Network SFP+ module (Option, to be ordered separately)

GEN DAQ 10 Gbit electric Ethernet SFP+, module with RJ45 connector. Enables the mixed use of optical and electric 10Gbit Ethernet using the 1-G064 SFP+ based Ethernet card.

Note: 10 Gbit SFP+ modules are not compatible with the 1 Gbit SFP modules.

Figure 1.25: 10 Gbit Copper Network SFP module

RJ45 Electrical SFP+ module (10GBASE-T)	
Ordering part number	1-SFP-10GBIT-RJ45
Ethernet Speed	1 or 10 Gbit (auto detection)
Connector type	RJ45
Maximum cable length (10GBASE-T)	
CAT6A or higher	100 m (330 ft) at 1 and 10 Gbit/s
CAT6	55 m (180 ft) at 10 Gbit/s 100 m (330 ft) at 1 Gbit/s
CAT5e	100 m (330 ft) at 1 Gbit/s (not supported at 10 Gbit/s)
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

KAB280: Fiber Optic Cable MM 50/125 µm LC-LC (Option, to be ordered separately)

Standard zipcord fiber optic duplex Multi Mode patch cable
Used with 850 nm optical 1 Gbit or 10 Gbit Ethernet (1-G091 and 1-G065), Master/Sync and GN1202B cards. Typically used for fixed cable routing or LAB environments.
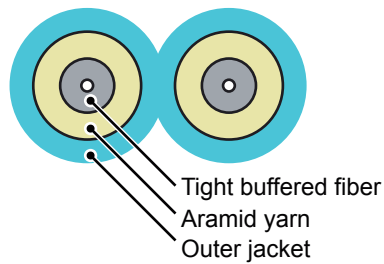

Tight buffered fiber
Aramid yarn
Outer jacket

Figure 1.26: Block diagram and image

Connector type	LC - LC
Cable rating	OM3; Multi Mode, 850 nm
Core/Cladding diameter	50/125 µm
Jacket size/diameter	Typically 2 mm (0.08") single core
Jacket rating	Low-smoke zero-halogen
Attenuation	≤ 2.7 dB/km @ 850 nm
Available lengths	3, 10, 20 and 50 m (10, 33, 66 and 164 ft). For other lengths contact custom systems[1].
Bend radius	30 mm (1.2")
Weight	Typically 14 kg/km (9 lb/1000 ft)
Operating temperature	-40 °C to +80 °C (-40 °F to 176 °F)

(1)   Contact custom systems at: customsystems@hbm.com

KAB288: Fiber Optic Cable SM 9/125 µm LC-LC (Option, to be ordered separately)

Standard zipcord fiber optic duplex Single Mode patch cable
Used with 1310 nm optical 1 Gbit or 10 Gbit Ethernet (1-G063 and 1-G066). Typically used for fixed cable routing or LAB environments.
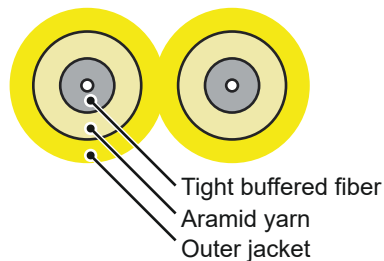

Tight buffered fiber
Aramid yarn
Outer jacket

Figure 1.27: Block diagram and image

Connector type	LC - LC
Cable rating	OS2; Single Mode, 1310 nm
Core/Cladding diameter	9/125 µm
Jacket size/diameter	Typically 2 mm (0.08") single core
Jacket rating	Low-smoke zero-halogen
Attenuation	≤ 0.5 dB/km @ 1310 nm
Available lengths	2, 10, 20, 50 and 100 m (6.6, 33, 66, 164 and 330 ft). For other lengths contact custom systems[1].
Bend radius	30 mm (1.2")
Weight	Typically 14 kg/km (9 lb/1000 ft)
Operating temperature	-40 °C to +70 °C (-40 °F to 158 °F)

(1)   Contact custom systems at: customsystems@hbm.com

KAB289: Robust Fiber Optic Cable SM 9/125 µm LC-LC (Option, to be ordered separately)

Heavy duty fiber optic duplex Single Mode cable
Used with 1310 nm optical 1 Gbit or 10 Gbit Ethernet (1-G063 and 1-G066). Typically used for test cell environments.
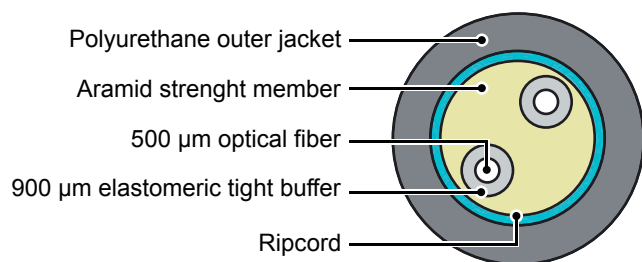
Polyurethane outer jacket
Aramid strenght member
500 µm optical fiber
900 µm elastomeric tight buffer
Ripcord

Figure 1.28: Block diagram and image

Connector type	LC - LC
Cable rating	OS2; Single Mode, 1310 nm
Core/Cladding diameter	9/125 µm
Jacket size/diameter	5.8 mm (0.23")
Jacket rating	Polyurethane, halogen free
Attenuation	≤ 0.5 dB/km @ 1310 nm
Available lengths	10, 20, 50, 100, 150 and 300 m (33, 66, 164, 328, 492 and 984 ft). For other lengths contact custom systems[1].
Bend radius	58 mm (2.3")
Crush resistance	2000 N/cm
Weight	Typcially 32 kg/km (21.5 lb/1000 ft)
Operating temperature	-40 °C to +85 °C (-40 °F to 185 °F)

(1)   Contact custom systems at: customsystems@hbm.com

G070A: Torque/RPM Adapter (Option, to be ordered separately)

An external connection box to connect HBM's T12, T40B or any other RS422-based torque/RPM transducer directly to the GEN series mainframe Digital Event/Timer/Counter connector. Mainframe connection cable included.
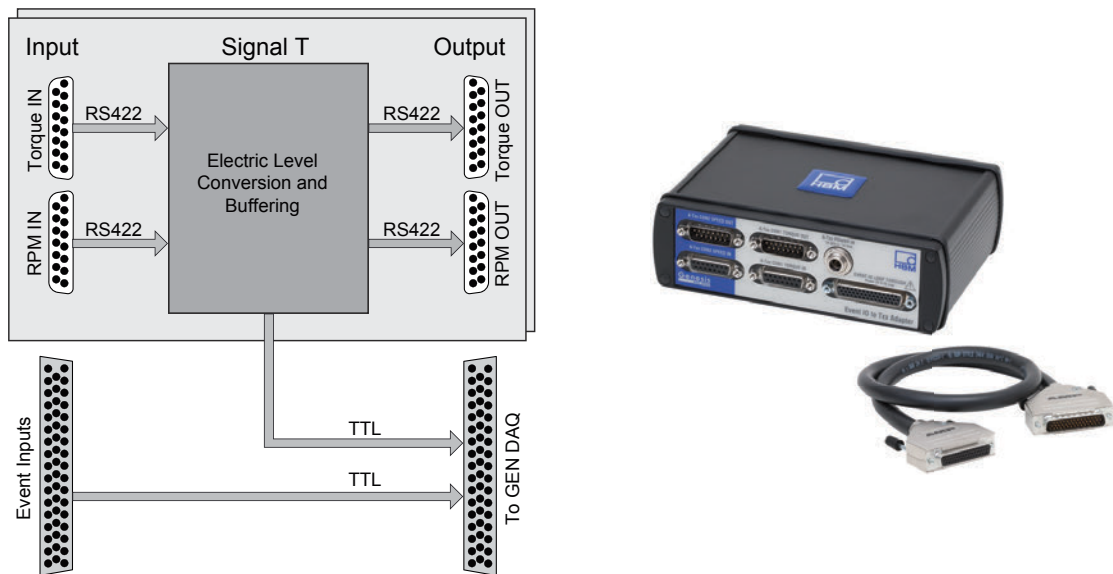

Figure 1.29: Block diagram and image

Torque sensor connection	
Number of torque sensors	2
Torque interface support	Torque and shunt (A-Txx CON1 Torque IN & B-Txx CON1 Torque IN)
Speed interface support	RPM, direction and reference (A-Txx CON2 Speed IN & B-Txx CON2 Speed IN)
Signal levels	Differential RS422
Signal termination	100 Ω

Torque sensor loop through	
Number of torque sensors	2
Torque interface output	Torque (A-Txx CON1 torque OUT & B-Txx CON1 torque OUT)
Speed interface output	RPM, direction and reference (A-Txx CON2 Speed OUT & B-Txx CON2 Speed OUT)
Output levels	Differential RS422, electronically retransmitted from input signals

Connectors	
Digital Event/Timer/Counter	HD22 sub-D 44 pin male (connection cable included)
Event I/O loop through connector	44 pin, female D-type connector, AMP HD-22 series (Tyco/TE Connectivity: 5748482-5)
Event I/O loop through cable connector	44 pin, male D-type connector, HDP-22 series (Tyco/TE Connectivity: 1658680-1), to be ordered separately
Torque, Speed/RPM interface IN	15 pin, female sub-D type connector (matches 1-KAB149-6 and 1-KAB163-6)
Torque, Speed/RPM interface OUT	15 pin, male sub-D type connector
Torque power input	Switchcraft L712A Matching cable connector Switchcraft 761KS17 (LD-024-1000911). Two cable connectors included

Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

Note *For more details, please refer to data sheet "B4229 en GEN series G070A Torque/RPM adapter".*

G072: Isolated Digital Event Adapter (Option, to be ordered separately)

An external connection box to isolate all input and output signals used on the GEN series mainframe Digital Event/Timer/Counter connector. Adapter input connector pin compatible with mainframe input connector. Mainframe connection cable included.
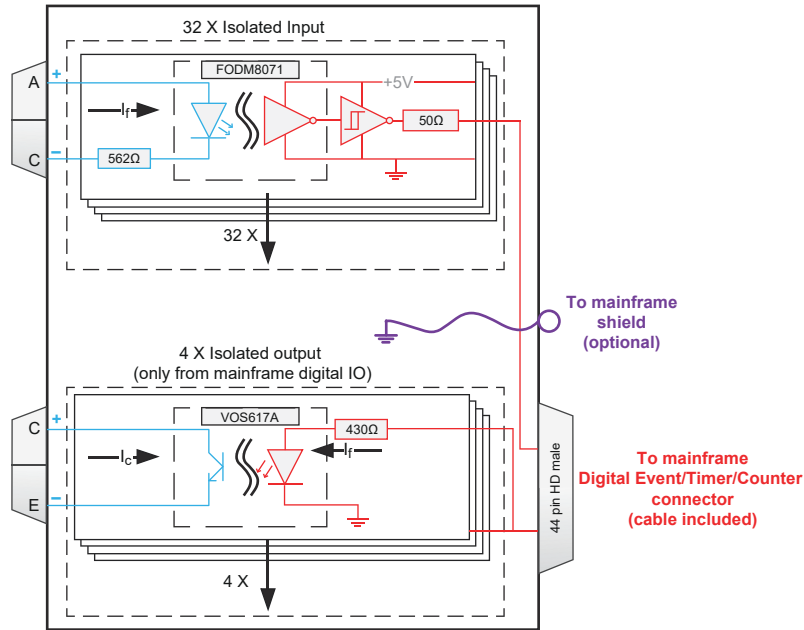

Figure 1.30: Block diagram and image

Event inputs	
Inputs	32 event channels (Anode, Cathode optocoupler with a 562 Ω series resistor)
Isolation voltage	230 V AC RMS or DC (channel to channel and channel to chassis/earth)
Isolation device	Fairchild FOD8071 optocoupler (or comparable)
Switching frequency	10 MHz input block signal tested. The highest frequency supported for the system is limited by the isolator box or acquisition system, whichever is the lowest.
Maximum propagation delay	55 ns
Common mode transient voltage	Typically 20 kV/µs

Input switching voltages	
Logic 0	< 1.0 V + 0.0015 A (562 Ω + R_{ext})
Logic 1	> 1.3 V + 0.0050 A (562 Ω + R_{ext}) (+100 V when R_{ext} = 20 kΩ)
Maximum nondestructive voltage	1.8 V + 0.0150 A (562 Ω + R_{ext}) (+300 V when R_{ext} = 20 kΩ)
Minimum nondestructive reverse voltage	-5.0 V

Event outputs	
Output channels	4 digital isolated output channels (open Collector, Emitter) Only supported by Digital Event/Timer/Counter connector
Isolation device	Vishay VOS617A optocoupler (or comparable)
Output frequency	170 kHz output signal tested. Maximum useable frequency for the system is limited by the Isolated Digital Event Adapter or acquisition system, whichever is the slowest.

Nondestructive control voltages	
Maximum voltage	0.007 * R_{ext} and < 80 V
Minimum voltage	-7.0 V

Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

Note   *For more details, please refer to data sheet "B4232 en GEN series G072 230 Volt RMS Isolated Digital Event adapter".*

G001B: IRIG Receiver with PTP Output (Option, to be ordered separately)

External IRIG to PTPv2 convertor in a compact housing. Using the PTPv2 time source output GEN DAQ then synchronizes to IRIG time source. The solution comes as a complete package including cables, 19" rack mount kit and CD with user manual and installation instructions.
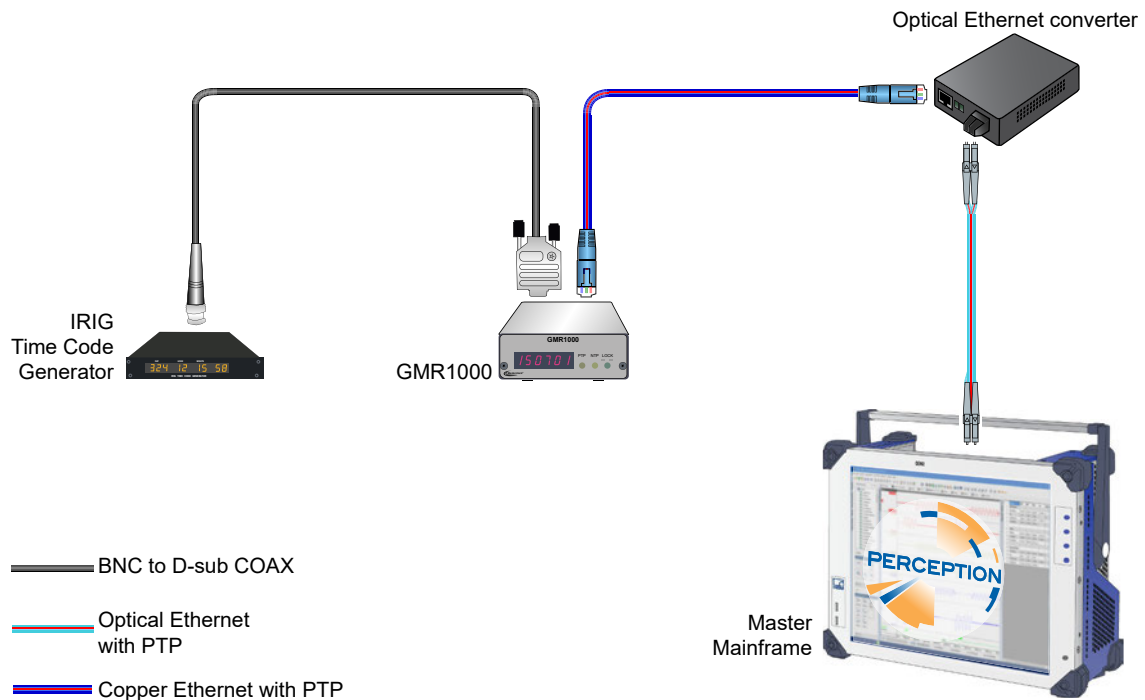

Figure 1.31: Example setup IRIG time synchronization

Included in G001B option	
IRIG receiver	GMR1000
IRIG input	2.5 m (8.2 ft) BNC to D-sub COAX
Ethernet cables	4.5 m (14.8 ft) CAT6 Ethernet cable to PoE adapter 20 m (65 ft) Fiber cable standard MM LC-LC 1-KAB280-20
Optical Ethernet converter	Converts the electrical Ethernet signal to an optical SFP Ethernet output signal.
Optical SFP	2 * G091 for optical Ethernet converter and GEN DAQ mainframe optical ethernet option
IRIG receiver GMR1000	
DC input	9-28 V DC
AC input	External wall mount power supply
Dimensions	164 mm (width) x 103 mm (height) x 36 mm (depth) (6.45" x 4.05" x 1.41")
Weight	0.45 kg (16 oz)
Rack mount	19", 1U height included
IRIG protocols supported	IRIG-B0 (DCLS), IRIG-B1 (AM), IRIG-A0 (DCLS), IRIG-A1 (AM), IRIG-E0 (DCLS), IRIG-E1 (AM)
Time synchronization accuracy	< 50 μs to IRIG time (Measured on GEN DAQ mainframe)
GEN DAQ series functions	Capture start of recording time Synchronize master time base oscillator frequency
Time required to full synchronization	
No recording active	< 1 min
Recording or pause active	< 1 min plus 25 s per ms recording time deviation from IRIG time source
Supported PTPv2 timing protocol	PTP according to IEEE1588-2008 (1 step, End-to-End, UDP, IPv4)
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F)
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

G002B: GPS Receiver with PTP Output (Option, to be ordered separately)

External GPS time synchronization using PTPv2 network communication.
The solution comes as a complete package, including a power over Ethernet (PoE) powered GPS antenna, all required RJ45 network cable, an outdoor RJ45 network surge protector, a PoE injector, two G091 SFPs and CD with user manual and installation instructions.
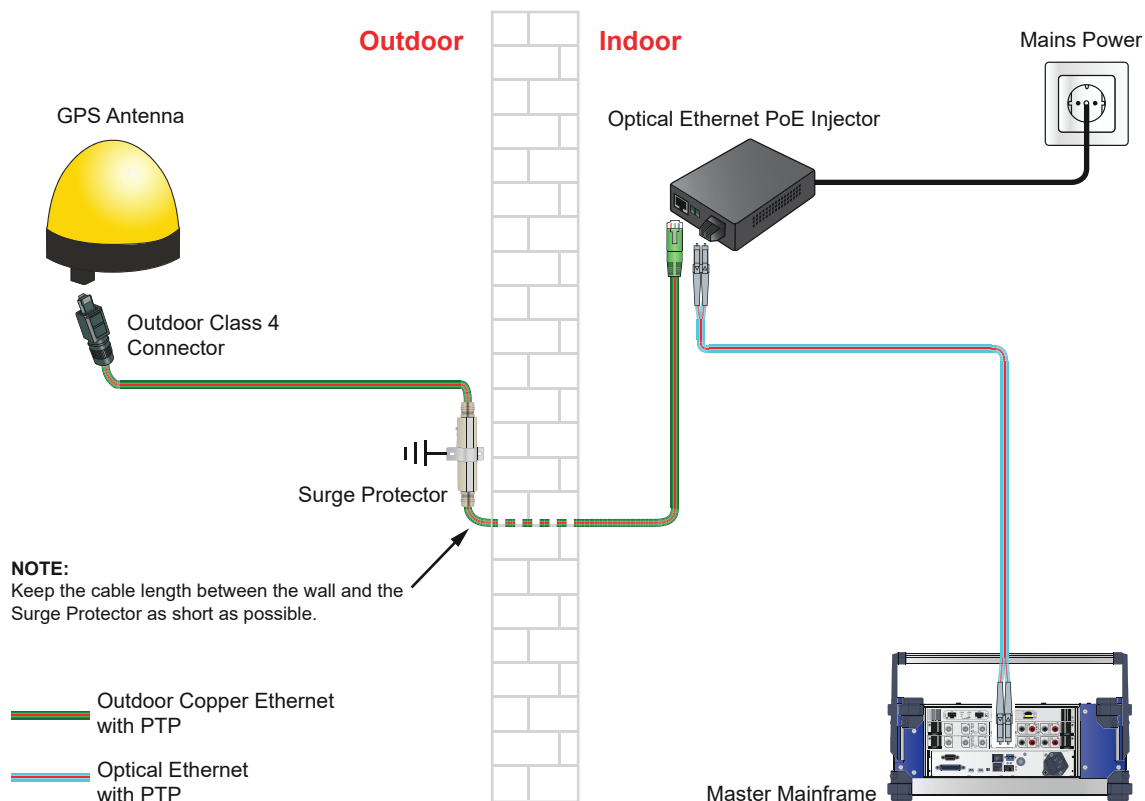

Figure 1.32: Example setup GPS time synchronization

Included in G002B option	
GPS antenna	OTMC 100
GPS antenna cables	50 m (164 ft) Outdoor CAT6 Ethernet cable to Surge Protector 20 m (65 ft) Outdoor CAT6 Ethernet cable to PoE adapter 20 m (65 ft) Fiber cable standard MM LC-LC 1-KAB280-20
Surge Protector	UL497B standard
Optical Ethernet PoE Injector	Power over Ethernet (PoE) injector. Supplies power to GPS antenna and converts the electrical Ethernet signal to an optical MM 50/125 um Ethernet output signal.
Optical SFP	2 * G091 for PoE injector and GEN DAQ mainframe optical ethernet option
GPS antenna safety	IEC60950-1:2005 2 Ed. +A1:2009 IEC60950-22:2005
GPS antenna connector	RJ45 waterproof connector according to IEC61076-3-106 (Variant 4)
Time synchronization accuracy	<150 ns to reference time (UTC) (Measured on GEN DAQ mainframe)
GEN DAQ series functions	Capture start of recording time Synchronize master time base oscillator frequency
GPS localization time	4 to 10 minutes after power on of antenna
Time required to full synchronization after GPS localization completed	
No recording active	<1 min
Recording or pause active	<1 min plus 25 s per ms recording time deviation from UTC time
User notifications while recording	Time marks on PTP time synchronization lost/restored, Mac Address of Master
Antenna Supported Timing Protocols PTPv2	PTP according to IEEE1588–2008 (1 step, End-to-End, UDP, IPv4)
Temperature Range	
Operational	0 °C to 40 °C (32 °F to 104 °F
Non-operational (Storage)	-25 °C to +70 °C (-13 °F to +158 °F)

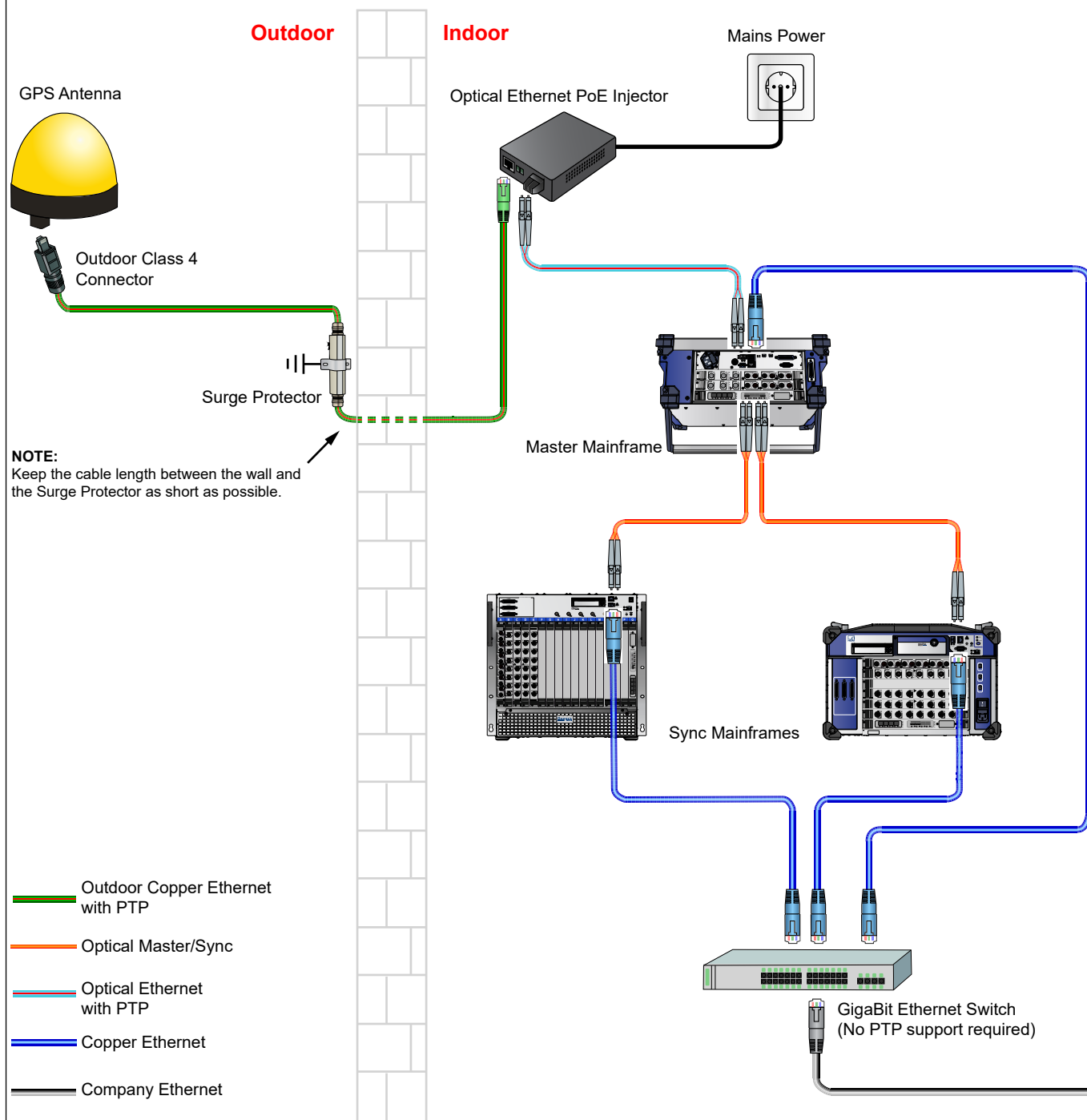**Example Setup: GPS Receiver with Master/Sync Connected Systems**

Outdoor | Indoor

Mains Power

GPS Antenna

Optical Ethernet PoE Injector

Outdoor Class 4 Connector

Surge Protector

Master Mainframe

NOTE:
Keep the cable length between the wall and the Surge Protector as short as possible.

Sync Mainframes

GigaBit Ethernet Switch (No PTP support required)

Outdoor Copper Ethernet with PTP

Optical Master/Sync

Optical Ethernet with PTP

Copper Ethernet

Company Ethernet

Figure 1.33: GPS setup for tethered mainframe with Master/Sync connected Sync mainframes

Example Setup: GPS Receiver with Tethered Mainframes and QuantumX

Outdoor

Indoor

Mains Power

GPS Antenna

Optical Ethernet PoE Injector

Outdoor Class 4
Connector

Surge Protector

Gigabit PTP switch
HBK: UL-0265

NOTE:
Keep the cable length between the wall and
the Surge Protector as short as possible.

Optical Ethernet
with PTP

Outdoor Copper Ethernet
with PTP

Copper Ethernet
with PTP

Company Ethernet

GEN series Mainframes

MX471B

MX1609KB
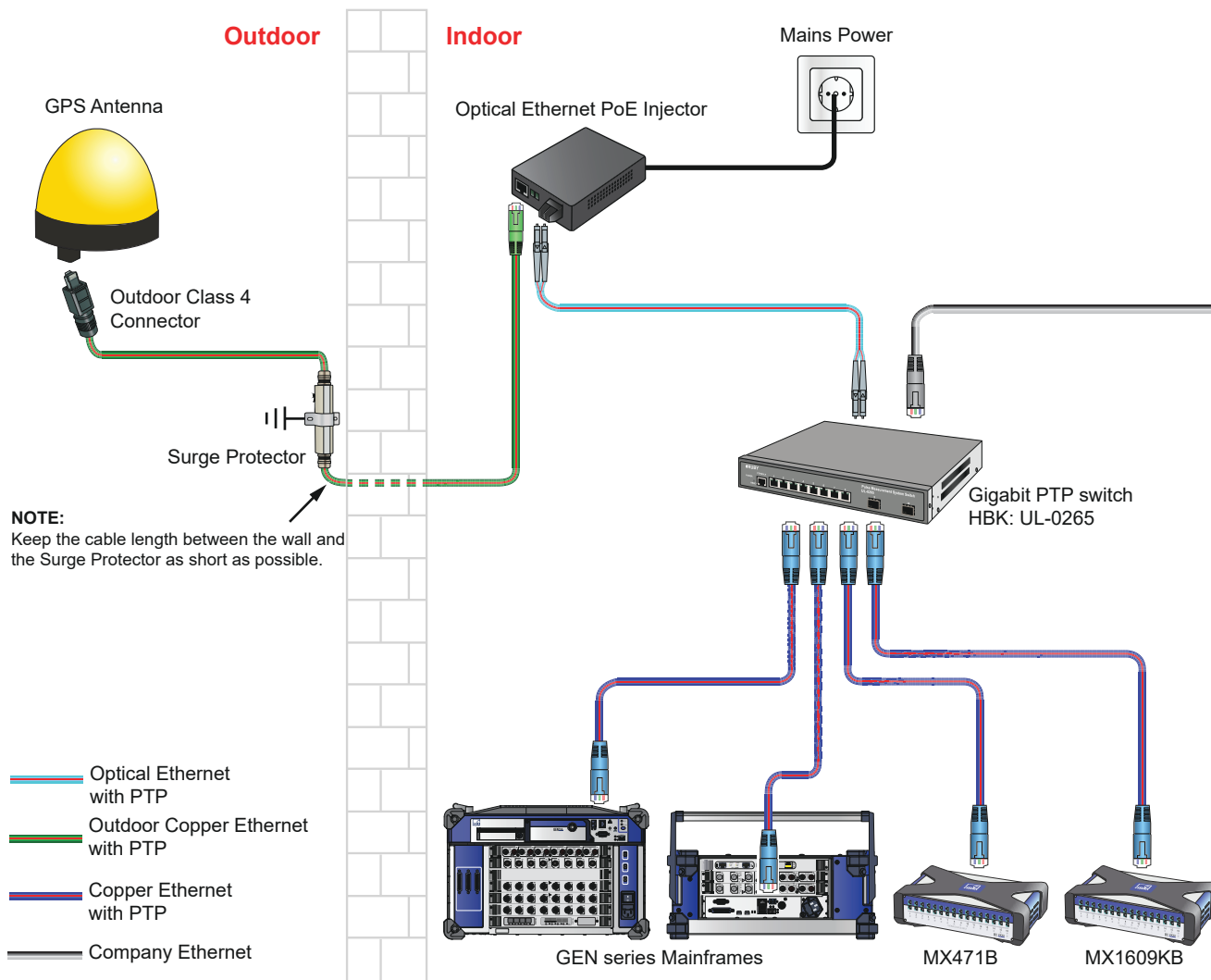
Figure 1.34: GPS setup for tethered mainframes and QuantumX

G054: Shipping Case (Option, to be ordered separately)
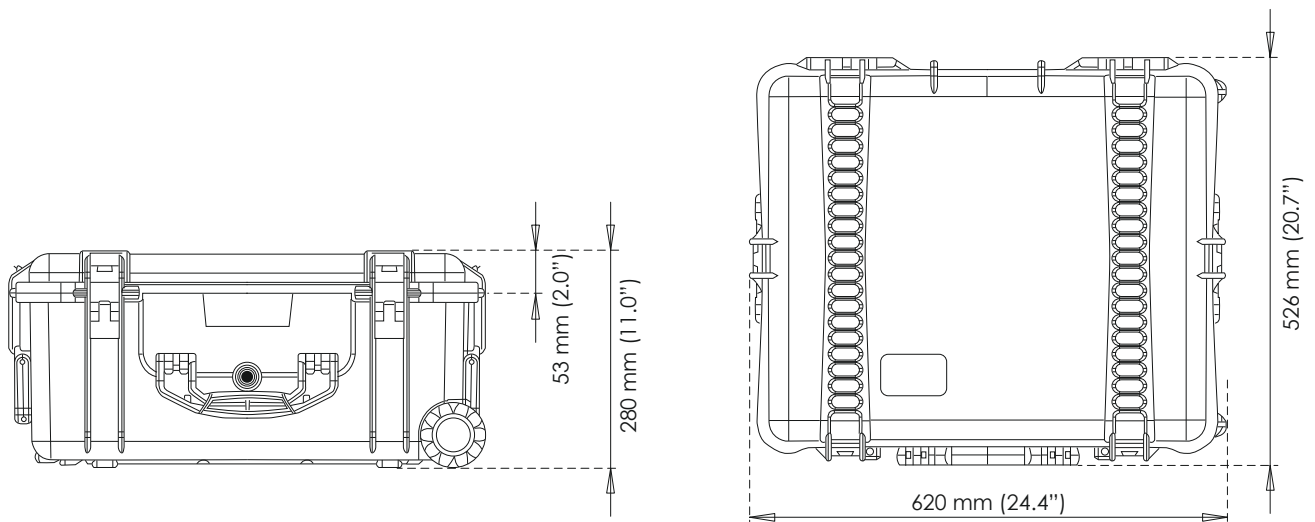
Figure 1.35: Reusable hardcover shipping case with wheels and transport handle

Outside Dimensions	526 mm (20.7") x 620 mm (24.4") x 280 mm (11.0") (HxWxD)
Weight Empty Case	9 kg (19.8 lb)
System Storage Area	Special area for system, slides in from the top for easy storage and easy removal from the shipment case. Protects the system from impact during drops, shocks and vibrations
Accessories Area	Separate area for keyboard and mouse
Reliable Case Transport	Wheels and extendable handle constructed for stable transportation with a low gravitation point to prevent the case from tumbling in any direction during roll transport
Case Extras	Two lift handles and locks on side of the case for easy transport

G071: Rack Mount Kit (Option, to be ordered separately)
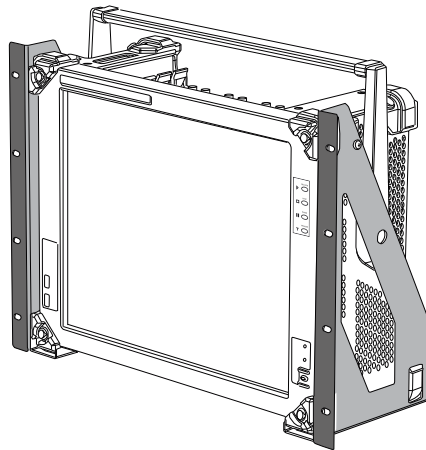
Figure 1.36: GEN3iA Rack Mount Kit

Rack Mount Kit	Mounting a GEN3iA mainframe in a standard 19" rack. Does not support the mouse and keyboard delivered with the GEN3iA. Requires no additional mounting materials. User installed option.

Supported Acquisition Cards

Model	Type	Isolation	Maximum sample rate/ (not multiplexed)	Resolution	Memory/card	Analog Channels	Digital events	Timer/Counter channels	Streaming support	Slot width
GN310B	Balanced Differential/ Current	yes	2 M	18 bit	2 GB	6	16	2	fast	1
GN311B	Balanced Differential/ Current	yes	200 k	18 bit	200 MB	6	16	2	fast	1
GN610B	Balanced Differential	yes	2 MS/s	18 bit	2 GB	6	16	2	fast	1
GN611B	Balanced Differential	yes	200 kS/s	18 bit	200 MB	6	16	2	fast	1
GN815	Unbalanced Differential/ IEPE	yes	2 MS/s	18 bit	2 GB	8	16	2	standard & fast	1
GN816	Unbalanced Differential/ IEPE	yes	200 kS/s	18 bit	200 MB	8	16	2	standard & fast	1
GN840B	Bridge/IEPE/Charge/ 4-20 mA/PT100/PT1000/ Thermocouples	yes	500 kS/s	24 bit	2 GB	8	16	2	fast	1
GN1202B	Multi Mode Optical Fiber	yes	100 MS/s	--[1]	8 GB	12	16	2	fast	1
GN1640B	Bridge/IEPE/Charge/ 4-20 mA/PT100/PT1000/ Thermocouples	yes	500 kS/s	24 bit	2 GB	16	16	2	fast	2
GN3210	Differential/IEPE/Charge	no	250 kS/s	24 bit	2 GB	32	16	2	standard	1
GN3211	Differential	no	20 kS/s	16 bit	200 MB	32	16	2	standard	1
GN8101B	Single-ended	no	250 MS/s	14 bit	8 GB	8	16	2	fast	1
GN8102B	Single-ended	no	100 MS/s	14 bit	8 GB	8	16	2	fast	1
GN8103B	Single-ended	no	25 MS/s	14 bit	8 GB	8	16	2	fast	1

(1)   This card supports up to 12 optical fiber transmitter channels.

Optical Fiber Transmitter Channels

Transmitter
Every transmitter is a single channel unit. Every unit has an unbalanced differential input, amplifier, analog anti-alias filter and ADC with an optical data and control link to the receiver card. The receiver card has the recording logic, sample rate selection and memory.

Model	Receiver card	Power	Sample rate	Resolution	Isolation
GN110	GN1202B	Battery	100 MS/s	14 bit	User application defined
GN111	GN1202B	Battery	25 MS/s	15 bit	User application defined
GN112	GN1202B	120/240 V AC	100 MS/s	14 bit	1800 V RMS
GN113	GN1202B	120/240 V AC	25 MS/s	15 bit	1800 V RMS

Mainframe Feature Overview

	Tethered models				Integrated models	
	GEN2tB	**GEN4tB**	**GEN7tA**	**GEN17tA**	**GEN3iA**	**GEN7iA**
Number of acquisition cards	2	4	7	17	3	7
Built-in TFT screen (resolution)	Not Supported				17" (1280x1024)	17" (1280x1024)
Built-in Windows® PC	Not Supported				Intel© i3, 8 GB RAM	Intel© i5, 16 GB RAM
Portable	ultra portable	portable	transporta-ble	Not Supported	portable	transporta-ble
Rack mount support (Option)	yes					
Built-in storage drive	option 500 GB	option 500 GB or 960 GB	Not Supported		480 GB	960 GB
Removable built-in storage drive	Not Supported		option 960 GB EXT4		Not Supported	option 960 GB NTFS
Built-in drive continuous streaming rate	200 MB/s	350 MB/s[2]			200 MB/s	350 MB/s
1 GB Ethernet Continuous streaming rate	100 MB/s					
10 GB Ethernet Continuous streaming rate	NS[1]	400 MB/s				
IEEE1588:2008 PTPv2 support	yes					
Digital events	up to 32	up to 64	up to 96	up to 96	up to 32	up to 96
USB ports	1	2	0		8	
1 GB Ethernet (RJ45)	1				4	
Master/Sync connector	SFP option		included			
DC power output (QuantumX compliant)	NS[1]	NS[1]	30 W	NS[1]	15 W	30 W
Mechanical	**GEN2tB**	**GEN4tB**	**GEN7tA**	**GEN17tA**	**GEN3iA**	**GEN7iA**
Air filter	yes				no	yes
Weight without acquisition cards (kg)	4.0	8.0	10.9	18.9	9	15.7
Dimensions (height / width / depth [mm])	96/375/320	133/441/345	293/448/343	450/446/517	342/436/186	350/446/386
19" Rack mount	option	included	option			
Shipping case	option			NS[1]	option	
Option overview	**GEN2tB**	**GEN4tB**	**GEN7tA**	**GEN17tA**	**GEN3iA**	**GEN7iA**
IRIG time synchronization (G001B)	option					
GPS time synchronization (G002B)	option					
Option carrier card support (G081)	option					
Master output card (G083)	option					
10 GB Ethernet (G064)	NS[1]	option				
EtherCAT® real-time output	NS[1]	option			Not Supported	
CAN FD semi real-time output	option				Not supported	
Software	**GEN2tB**	**GEN4tB**	**GEN7tA**	**GEN17tA**	**GEN3iA**	**GEN7iA**
Included Perception package	Standard				Advanced	Enterprise
GEN DAQ API remote control	Standard supported				NS[1]	NS[1]
Perception API remote control	Standard supported					
Perception CSI (custom special software)	option					

(1)   NS: Not supported

(2)   **Note**: Please check specific storage option for maximum continuous streaming rate.

Perception Versions

Features	Viewer (no copy protection)	Viewer Enterprise	Standard (no copy protection)	Advanced	Enterprise
True 64 bit support	✔	✔	✔	✔	✔
Basic review, y/t and x/y displays	✔	✔	✔	✔	✔
Horizontal, vertical and slope cursors	✔	✔	✔	✔	✔
Trace and display markers	✔	✔	✔	✔	✔
Interactive waveform calculator	✔	✔	✔	✔	✔
Interactive user keys	✔	✔	✔	✔	✔
Quick report to Microsoft® Word and Excel	✔	✔	✔	✔	✔
Automation and log-file	✔	✔	✔	✔	✔
Export to ASCII, Excel, imPression, RTPro, TEAM data	✔	✔	✔	✔	✔
Analysis functions/Formula Database	✖	✔	✖	✔	✔
Advanced Report	✖	✔	✖	✔	✔
Advanced Export adds 15 additional formats MATLAB, DIAdem, Flexpro, Famos, UFF58 etc.	✖	✔	✖	✔	✔
Synchronized Video Playback	✖	✔	✖	✔	✔
Multiple Workbooks (Monitors)	✖	✔	✖	✔	✔
Information sheet to add recording meta data	✖	✔	✖	✔	✔
Single mainframe control	✖	✖	✔	✔	✔
Multiple mainframe control[1]	✖	✖	✖	✖	✔
Macro editor for user keys and automation	✖	✔	✖	✖	✔
Basic FFT	✖	✔	✖	✖	✔
Sensor Database	✖	✔	✖	✖	✔
User/Definer Mode	✖	✔	✖	✖	✔
Application packages					
Custom Software Interface	✖	Cost option	✖	Cost option	Cost option
STL Analysis (Short-Circuit Testing Liaison methods)	✖	Cost option	✖	Cost option	Cost option
HV-IA Lightning, Switching and Current impulse analysis (IEC60060-1 and IEC61083-2)	✖	Cost option	✖	Cost option	Cost option
eDrive electrical motor/inverter/generator and drive analysis	✖	Cost option	✖	✖	Cost option

(1)   The maximum number of mainframes Perception can control is calculated by using 25% of PC memory divided by 50 MB FIFO required per mainframe. Minimum suggested configuration is a PC with 64 bit Windows® and 8 GB of memory.

Perception Remote Control (Free of Charge)

Perception remote control is based on DCE/RPC network communication standards (Distributed Computing Environment/Remote Procedure Calls, free of charge). The source code supplied by HBM can be compiled on many different operating systems. For ease of use in the Microsoft®.NET environment a COM interface is created on top of the basic DCE/RPC interface. An extensive help file is available to explain interface calls offered in this API.
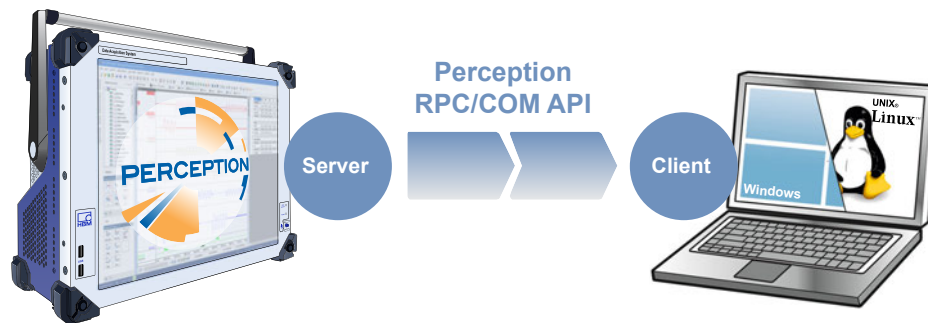
Figure 1.37: Functional diagram DCE/RPC

Functions	Control Perception software from an external computer/application on Windows®, Linux, Unix or Mac OS X
COM interface	All RPC commands have a COM wrapper for easier Windows® software integration
Available basic commands	Load and save Perception setup files, Setup Recording, set and review Hardware Settings, Start/Stop/Pause/Trigger, monitor Live data
Examples (free of charge)	C++ and C# getting started example programs supplied for Windows®, source code included. Unsupported Linux getting started example by request only.
LabVIEW™ integration (free of charge)	LabVIEW™ RPC/COM getting started examples available on www.hbm.com
DIAdem™ integration (free of charge)	DIAdem™ RPC/COM getting started examples available on www.hbm.com

PNRF Recording File Reader (Free of Charge)

HBM maintained file reader to read the proprietary PNRF format. (Perception Native Recording File) Integrated by several industry standard analysis package suppliers. Available for all 3rd party software developers.

Figure 1.38: Functional diagram PNRF Reader

Functions	Read PNRF, NRF and LRF recording files directly in your own application
COM interface	The PNRF reader comes as a COM interface and can be used from any application or programming language which supports COM automation
PNRF Software Development Kit (SDK)	Installs PNRF dll's and supplies Visual Basic, C# and C++ getting started examples
GlyphWorks® integration	PNRF SDK integrated and available directly from HBM nCode
MATLAB® integration	PNRF SDK installs both MATLAB® PNRF reader and getting started examples
LabVIEW™ integration	PNRF SDK integrated and available directly from National Instruments
DIAdem™ integration	PNRF SDK integrated and available directly from National Instruments
FlexPRO integration	PNRF SDK integrated and available directly from Weisang GmbH
jBEAM™ integration	PNRF SDK integrated and available directly from AMS
DynaWorks® integration	PNRF SDK integrated and available directly from Intespace

Perception CSI (Customer Software Interface)
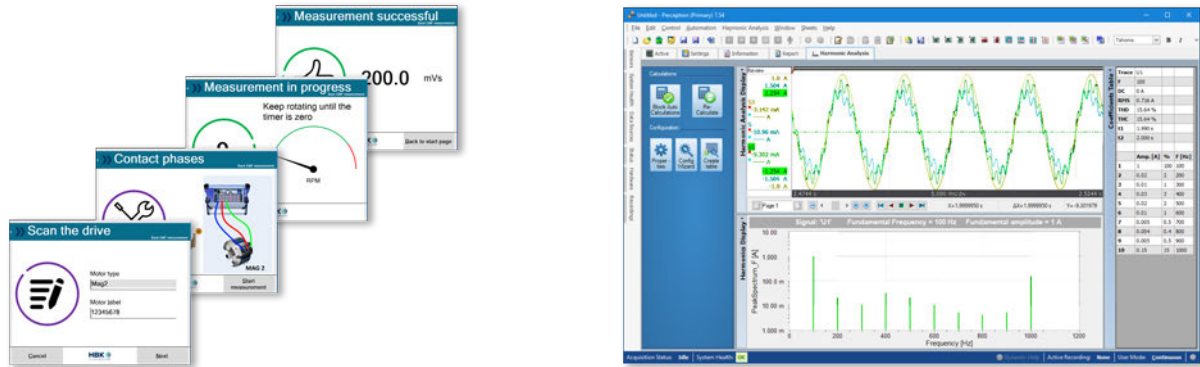
Figure 1.39: Perception CSI examples BackEMF (left) Harmonic analysis (right)

Functions	Create software extensions inside the Perception software by adding CSI user sheets, custom automation and extended analysis functions. Basic Windows C# sheet template included. Available for all languages that support Microsoft®.NET 4.
Available basic controls & commands	Access to every Perception part: Start/Stop/Pause and Trigger, Start Manager, Acquisition System, Hardware Settings, Displays, Meters, User Tables, Formulas, Calculations, Data Manager, Data Sources, User variables, Notifications, Logging, Conversion Functions, Automation Actions, Sheet Manager and more, to create a dedicated application GUI that hides the entire Perception standard GUI.
Examples (free of charge)	C# getting started example programs supplied, source code included
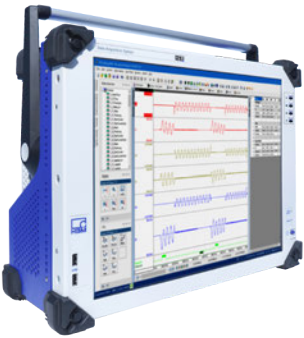
Perception and eDrive Training Program

Figure 1.40: Perception on-site training

HBM offers paid professional training and support programs on all API interfaces (PNRF reader, RPC and CSI). Training programs are based on C#, are on-site or are at a central HBM location. On-site training can be specific for each customer. Support can be the development of a fully customized software application or answering questions from software engineers.

S-TRAIN1-GEN_PERC	First day on-site basic training on GEN DAQ/PERCEPTION. Example content: Basic usage, hardware setup, acquisition. Training can be customized for specific training needs.
S-TRAIN2-GEN_PERC	Second day on-site enhanced training on GEN DAQ/PERCEPTION. Training can be customized for specific training needs.
S-TRAIN1-eDRIVE	First day on-site basic training on eDrive application specifics. Example content: Basic usage, hardware setup, acquisition. Training can be customized for specific training needs.
S-TRAIN2-eDRIVE	Second day on-site enhanced training on eDrive application specifics. Training can be customized for specific training needs.
1-PERC-CSI-TRAIN	Two day on-site Perception CSI training for software programmers During the training software programmers learn how to get started using the CSI template, make changes to the Perception user interface, to add new mathematical routines to the Formula Database or to add User Keys etc. The exact training details can be fully customized to the programmers needs including reviews and examples how to create the exact CSI changes of choice. Basic Microsoft® Visual Studio software C# programming skills are required before joining this training. More dedicated detailed training is available on request.
1-PERC-CSI-PROJ	One day eMail/Phone support for Perception CSI or RPC programmers. Get support from a HBM senior software engineer. Support can range anywhere from answering "how-to" question, assisting in analysing any kind of (performance) issue to generating basic getting started example code fragments.

Ordering Information

Article		Description	Order No.
GEN3iA		GEN3iA rugged, portable data recorder.[1] The integrated instrument has three acquisitions slots, a 200 MB/s streaming rate, one Master/ Sync connector, an integrated PC, the Windows® 10 PRO, 64 bit version. 17 inch touch screen TFT, 480 GB Solid State Drive, mouse, keyboard, carrying bag with integrated protective front cover. Includes Perception Advanced software package.	1-GEN3iA
GEN3iA plus one Iso1kV200k card		GEN3iA - 6 channel Iso1kV200k package. Same as GEN3iA plus one 1-GN611B; 6 channels, 1 kV isolated balanced differential inputs, 200 kS/s, 128 MB RAM cards.	1-GEN3i6
GEN3iA plus two Iso1kV200k cards		GEN3iA - 12 channel Iso1kV200k package. Same as GEN3iA plus two 1-GN611B; 6 channels, 1 kV isolated balanced differential inputs, 200 kS/s, 128 MB RAM cards. (12 channels altogether).	1-GEN3i12
GEN3iA plus three Iso1kV200k cards		GEN3iA - 18 channel Iso1kV200k package. Same as GEN3iA plus three 1-GN611B; 6 channels, 1 kV isolated balanced differential inputs, 200 kS/s, 128 MB RAM cards. (18 channels altogether).	1-GEN3i18

(1)   The layout of the keyboard delivered with GEN3iA can be in English, German, French, or US international. Specify when ordering.

GEN3iA Accessories (Options, to be ordered separately)

Article		Description	Order No.
GEN2i/GEN3i/ GEN3iA 19 inch rack mount kit		GEN2i/GEN3i/GEN3iA rack mount kit (does not include mouse and keyboard mounting kits). User installed option.	1-G053
GEN2i/GEN3i/ GEN3iA/GEN3t shipping case		GEN2i/GEN3i/GEN3iA/GEN3t shipping case with wheels and handle. IP67 with exterior dimensions (W x H x D) 620 x 526 x 280 mm (24.4 x 20.7 x 2.0"). Weight 9 kg (19.8 lb).	1-G054

Network SFP/SFP+ (Options, to be ordered separately)

Article		Description	Order No.
2 Gbit Optical SFP module MM 850 nm		GEN DAQ 2 Gbit Ethernet SFP, 850 nm Multi Mode, up to 600 m optical cable length supported, LC connector support. Not compatible with the 10 Gbit SFP+ modules. Operating temperature: -20 °C to +60 °C	1-G091
1 Gbit Optical Network SFP module 1310 nm		GEN DAQ 1 Gbit Ethernet SFP, 1310 nm Single Mode, up to 10 km optical cable length supported, LC connector support. Not compatible with the 10 Gbit SFP+ modules. Operating temperature: -10 °C to +60 °C	1-G063
10 Gbit Optical Network SFP+ module 850 nm		GEN DAQ 10 Gbit Ethernet SFP+, 850 nm Multi Mode, up to 82 m optical cable length supported, LC connector support. 10 Gbit SFP+ modules are not compatible with the 1 Gbit SFP modules. Operating temperature: 0 °C to +40 °C	1-G065
10 Gbit Optical Network SFP+ module 1310 nm		GEN DAQ 10 Gbit Ethernet SFP+, 1310 nm Single Mode, up to 10 km optical cable length supported, LC connector support. 10 Gbit SFP+ modules are not compatible with the 1 Gbit SFP modules. Operating temperature: 0 °C to +40 °C	1-G066
10 Gbit Copper Network SFP+ module		GEN DAQ 10 Gbit Ethernet SFP+, Copper, up to 30 m cable length supported, RJ45 connector support. **Note**: 10 Gbit SFP+ modules are not compatible with the 1 Gbit SFP modules. Operating temperature: 0 °C to +40 °C	1-SFP-10GBIT-RJ45

Fiber Optic Cables (Options, to be ordered separately)

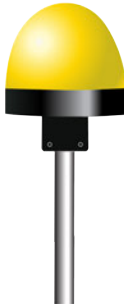| Article		Description	Order No.
Fiber cable MM LC-LC		GEN DAQ standard zipcord fiber optic duplex Multi Mode 50/125 µm cable, 3.0 dB/km loss, LC-LC connectors, aqua, ISO/IEC 11801 type OM3. Typically used for fixed cable routing or LAB environments. Lengths: 3, 10, 20 and 50 meters (10, 33, 66 and 164 ft) Used with 850 nm optical 1 Gbit or 10 Gbit Ethernet (1-G091 and 1-G065), Master/Sync and GN1202B cards.	1-KAB280-3 1-KAB280-10 1-KAB280-20 1-KAB280-50
Fiber cable SM LC-LC		GEN DAQ standard zipcord fiber optic duplex Single Mode 9/125 µm cable, 0.5 dB/km loss, LC-LC connectors, yellow, ISO/IEC 11801 type OS2. Typically used for fixed cable routing or LAB environments. Lengths: 2, 10, 20, 50 and 100 meters (6.5, 33, 66, 164 and 328 ft) Used with 1310 nm optical 1 Gbit or 10 Gbit Ethernet (1-G063 and 1-G066).	1-KAB288-2 1-KAB288-10 1-KAB288-20 1-KAB288-50 1-KAB288-100
Robust fiber cable SM LC-LC		GEN DAQ heavy duty fiber optic duplex Single Mode 9/125 µm cable, 0.5 dB/km loss, LC-LC connectors, black, ISO/IEC 11801 type OS2. Typically used for test cell environments. Lengths: 10, 20, 50, 100, 150 and 300 meters (33, 66, 164, 328, 492 and 984 ft) Used with 1310 nm optical 1 Gbit or 10 Gbit Ethernet (1-G063 and 1-G066).	1-KAB289-10 1-KAB289-20 1-KAB289-50 1-KAB289-100 1-KAB289-150 1-KAB289-300

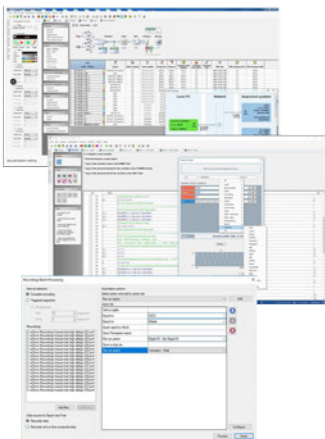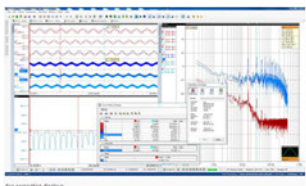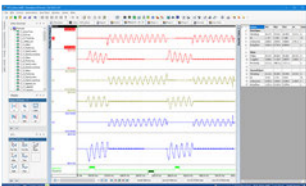**Note**   *Other fiber cable lengths can be ordered from custom systems at:* customsystems@hbm.com
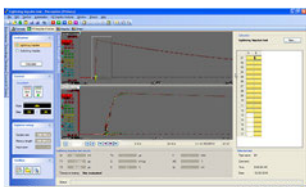
Option Carrier Card and Add-ons (Options, to be ordered separately)

Article		Description	Order No.
Option carrier card		The option carrier card enables the use of two option cards within the GEN2tB, GEN3iA, GEN4tB, GEN7iA, GEN7tA and GEN17tA mainframes. Multiple option carrier cards are supported. Option cards enable the use of synchronization, field busses and 10 Gbit Ethernet. Operating temperature: 0 °C to +40 °C	1-G081
Master output card		Factory installed, option carrier card (G081) required. The Master output card supports the use of four Sync mainframes. Up to two Master output cards are supported per option carrier card. Multiple option carrier cards supported per mainframe. Compatible with Master/Sync card (1-G040) and mainframe Master/Sync. Operating temperature: 0 °C to +40 °C	1-G083
10 Gbit Ethernet card, optical		Factory installed, option carrier card (G081) required. The optical 10 Gbit Ethernet card adds up to two extra 10 Gbit Ethernet network interfaces to a GEN DAQ series mainframe. Supports up to 400 MB/s continuous data transfer from the GEN DAQ mainframe to a suitable PC. Requires a 10 Gbit optical network SFP+ module. Requires one or two 10 Gbit network SFP+ module. Can not be used together with 1-G084. Operating temperature: 0 °C to +40 °C	1-G064

General Accessories (Options, to be ordered separately)

Article		Description	Order No.
I/O BNC Breakout cable		BNC breakout cable for direct BNC cable connection to the 9-pin D-sub I/O connector	1-KAB2132-0.5
Torque/RPM adapter		Converts the differential signaling used by HBM torque transducers to TTL signal levels used by the Timer/Counter A and B available on the Digital Event/Timer/Counter connector of GEN DAQ mainframes. Both Torque and Speed are interfaced separately for 2 torque sensors. Event output connected to Shunt control. All remaining event TTL signals available on output connector. Comes with 0.7 m (2.3 ft) cable to connect adapter to the mainframe. Torque transducer cables not included.	1-G070A
Isolated digital event adapter		230 V RMS Isolated Digital Event adapter. Supports 32 channel to channel isolated digital event inputs. The inputs can either be used to connect to the GEN series mainframes that support the Digital Event/Timer/Counter connector. Input connectors and cable to connect to the GEN series mainframe are included.	1-G072

Time Synchronization (Options, to be ordered separately)

Article		Description	Order No.
IRIG to PTPv2 convertor		External IRIG to PTPv2 convertor in a compact housing. Using the PTPv2 time source output GEN DAQ then synchronizes to IRIG time source. The solution comes as a complete package including cables, 19" rack mount kit and CD with user manual and installation instructions.	1-G001B
GPS to PTPv2 receiver		External GPS time synchronization using PTPv2 network communication. The solution comes as a complete package, including a power over Ethernet (PoE) powered GPS antenna (OTMC 100i), a 50 m (164 ft) IP67 CAT6 outdoor RJ45 network cable, an outdoor RJ45 network surge protector (PD-OUT/SP11), a 20 m (65 ft) CAT6 RJ45 network cable, a RJ45 to Optical SFP convertor with PoE injection on the RJ45 network, two G091 SFPs (For GEN DAQ SFP network and the SFP convertor), a KAB280-10 optical cable and CD with user manual and installation instructions.	1-G002B
Gbit PTP ethernet switch		UL-0265 is a 10/100/1000 Mbps network switch with IEEE1588:2008 PTPv2 time synchronization and PoE (Power over Ethernet) support. The switch is pre-configured for plug and play use on both IPv4 PTP used by GEN DAQ systems as well as PoE output for 8 devices. For systems using IPv6 PTP, the switch can be reprogrammed. UL-0265 has a built-in 100 to 240 V AC, 50 to 60 Hz mains power supply.	UL-0265

Software (Options, to be ordered separately[1])

Article		Description	Order No.
Perception Advanced		For setup and control of a single GEN series mainframe. Includes real-time live and recorded data review using y/t and x/y displays. Y/t displays support vertical, horizontal and slope cursors, trace and display markers as well as an interactive waveform calculator. On top Perception allows synchronized video playback. For data analysis Perception supports interactive user keys, Formula Database with waveform and math calculators. To create a report of the recorded and analysis data Perception supports adding additional meta data describing your test details, quick report to Microsoft Word® and Excel®, an advanced built-in report engine. If analysis in third party software is preferred 20 export format (Including MATLAB, DIAdem, MDF4/ASAM, UFF58 and more) are supported. For automated analysis, reporting or data exports Perception supports extensive automation and result logging features. Perception supports 64 bit versions of Windows® 10.	1-PERC-AD-01
Perception Enterprise		Perception Advanced with additionally: Macro editor, Basic FFT, Sensor Database, User Definer Mode and Multi Mainframe Control.	1-PERC-E64-01
Perception Viewer Enterprise		Same as Perception Enterprise without mainframe setup and control.	1-PERC-VA-01
CSI Interface		License extension to develop and use customer specific created user interface and/or mathematical / evaluation software extensions. HBM offers the service of custom made Perception extensions. An experienced software engineer will contact the end user and create a requirements document. A project quote will be made based on the agreed requirements.	1-PERC-OP-CSI-01
STL Analysis		Special analysis routines in accordance with the STL standard used in LV, MV and HV labs. Includes import of TDG data (Test Data Generator) for verification. Includes HighPower/HighVoltage automated analysis. Evaluates data from NoLoad, ShortCircuit, Capacitive and Synthetic tests of HV/MV switchgear devices.	1-PERC-OP-STL-01
HV-IA		High Voltage Impulse Analysis option; evaluates Lightning, Switching and Current impulses; designed in accordance with IEC60060-1 and IEC61083-2 requirements. Allows for evaluation with new k-factor method.	1-PERC-OP-HIA-01
eDrive		Allows for easy and application oriented setup and efficiency calculations of electrical inverter/drive tests with minimum interaction. Requires Perception Enterprise.	1-PERC-OP-EDR-01

(1)   Software options are also sold in a package with multiple single seat licenses and multiple seat network license.

measure and predict with confidence

HBM