PRODUCT DATA

LAN-XI Data Acquisition Hardware for PULSE™ and Test for I-deas™

From 2 to 1000+ channels in the same system
LAN-XI Data Acquisition Hardware is a versatile system of modular hardware that can be used as a stand-alone, single-module front-end, as part of a distributed module setup, or collected in 11-module frames. The hardware is fully compatible with IDA^e hardware for PULSE and works with both PULSE and Test for I-deas.

The individual modules have a very rugged industrial design, perfect for use in the field, and at the same time are plug and play modules that you can easily reconfigure in different setups. Running on AC, DC or Power over Ethernet (PoE) and with interchangeable front-panel connectors, LAN-XI hardware provides an extremely flexible system: scalable from 2 to more than 1000 channels with a frequency range of 51.2 kHz and an unlimited data transfer capacity.

USES AND FEATURES

USES

- Real-time, multichannel sound and vibration data acquisition system scalable from 2 to 1000+ measurement channels, all phase- and sampling-synchronous (IEEE 1588 Precision Time Protocol):
  - Stand-alone single-module front-end for small setups – up to 6 channels and 2 generator outputs
  - Distributed multichannel system setups with multiple single-module front-ends located close to each measurement point
  - Multichannel systems consisting of any number of front-end frames in combination with any number of single-module front-ends
- Laboratory and field measurements with the same AC, DC, battery or PoE powered system

FEATURES

- Multi-purpose conditioning of transducers: same input channel can condition all S & V transducers
- Standard frequency range of 0 to 51.2 kHz
- Generator output from 0 to 51.2 kHz
- Dyn-X technology input channels with single, 160 dB input range
- Interchangeable front panels (BNC or LEMO) – use your preferred transducer cabling
- Display on each module's front panel:
  - Simplifies system configuration and reduces the time for setting up a measurement system
  - Provides module status information on self-test and error conditions
- Full overload detection including out-of-band overload and generator overload
- Indication of incorrect/defective conditioning on each channel connector
- LAN interface allows the front-end to be close to the test object and reduces the number of signal cables and transducer cable length
- Power: Mains, DC, battery and, for stand-alone modules, PoE (IEEE 802.3af)
- Rugged and light modules cast in magnesium
- Silent operation
- Fully compatible with PULSE IDA^e hardware
- Fully compatible with all PULSE applications:
  - Automatic detection of hardware and transducers
  - Supports IEEE 1451.4-capable TEDS transducers

Brüel & Kjær

System Overview

LAN-XI Data Acquisition Hardware Type 3660 covers a range of input/output modules that can be used stand-alone, in a distributed network or in frames holding up to 11-modules. Fully compatible with PULSE IDA^e hardware, LAN-XI hardware is extremely flexible and can be easily reconfigured as requirements demand into systems from 2 channels to more than 1000.

Fig. 1 shows an overview of system setups and available hardware, and Table 1 gives details of the modules' variants. Further information on frames, modules and details of the input and output channels are described separately below and in Specifications.

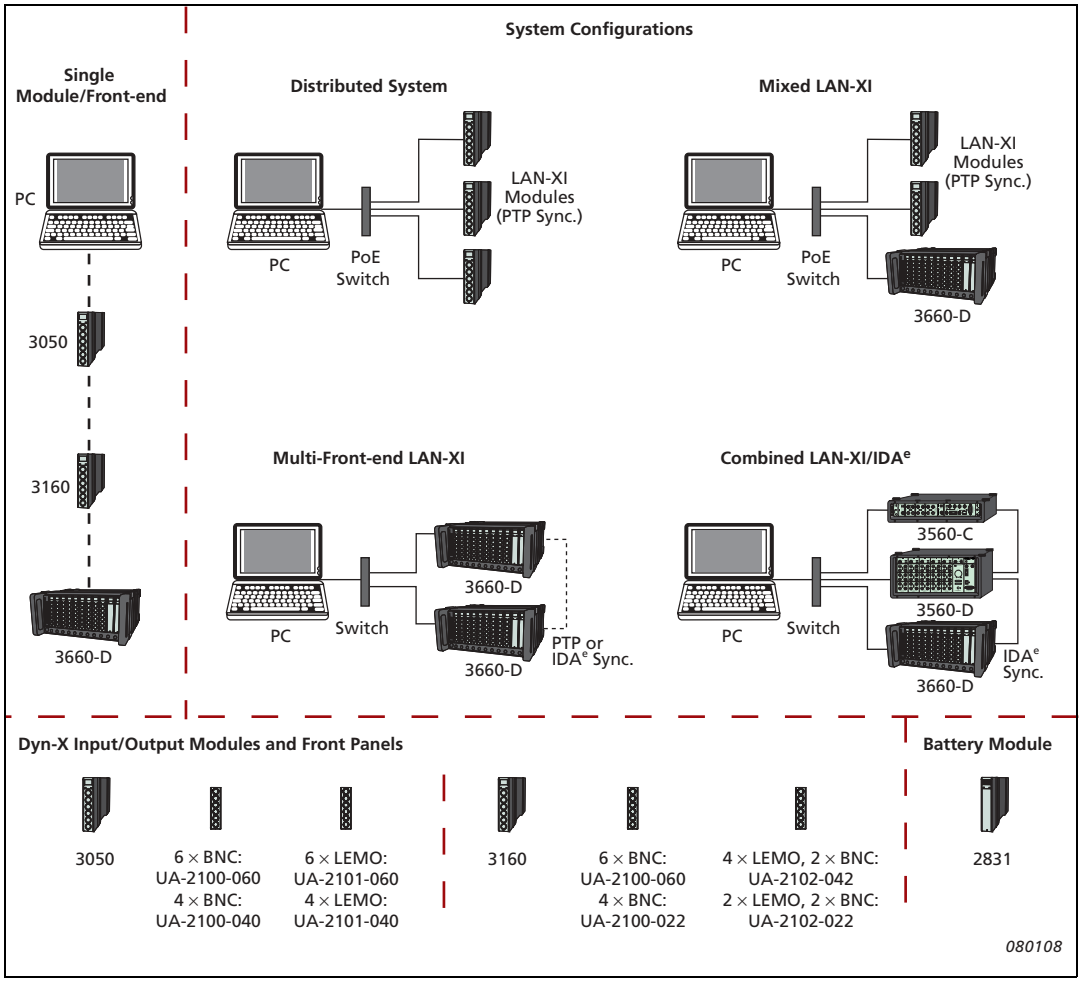


Fig. 1
Overview of the components available for use in a LAN-XI system and in combination with PULSE IDA^e hardware

The ability to use any module as stand alone, in a frame or in a distributed system means that you can place your modules close to the measurement object – the Precision Time Protocol (PTP) makes it possible to synchronise the clocks in the system components with sub-microsecond accuracy. With PoE, all you need between the modules and the PC are shielded CAT6 LAN cables and a PoE switch. This minimises the number of cables required and results in lower cost, less downtime, easier maintenance and greater flexibility and speed of installation (compare Fig. 2 and Fig. 3).

Table 1 *Modules comprising LAN-XI front-ends*

Input Type[a]	Product Name	Type No.	Input Channels	Generator Output Channels	Frequency Range	Front-panel Connectors	
						Included	Optional[b]
Multipurpose Input/Output Modules with Microphone Polarization Voltage (A-versions)							
Direct CCLD[c] Mic. Preamp. (0 or 200 V polarization voltage) Charge[d]	6-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)	3050-A-060	6	–	0 to 51.2 kHz	BNC: UA-2100-060	LEMO: UA-2101-060
	4-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)	3050-A-040	4	–		BNC: UA-2100-040	LEMO: UA-2101-040
	Generator, 4/2-ch. Input/Output Module LAN-XI 51.2 kHz (Mic, CCLD, V)	3160-A-042	4	2		BNC: UA-2100-060	LEMO/BNC: UA-2102-042
	Generator, 2/2-ch. Input/Output Module LAN-XI 51.2 kHz (Mic, CCLD, V)	3160-A-022	2	2		BNC: UA-2100-022	LEMO/BNC: UA-2102-022
DeltaTron® Only Input/Output Modules (B-versions)							
Direct CCLD[c]	6-ch. Input Module LAN-XI 51.2 kHz (CCLD, V)	3050-B-060	6	–	0 to 51.2 kHz	BNC: UA-2100-060	–
	4-ch. Input Module LAN-XI 51.2 kHz (CCLD, V)	3050-B-040	4	–		BNC: UA-2100-040	–
	Generator, 4/2-ch. Input/Output Module LAN-XI 51.2 kHz (CCLD, V)	3160-B-042	4	2		BNC: UA-2100-060	–
	Generator, 2/2-ch. Input/Output Module LAN-XI 51.2 kHz (CCLD, V)	3160-B-022	2	2		BNC: UA-2100-022	–
Battery Module							
–	Battery Module	2831	–	–	–	–	–

a. Supply for tachometers not available. RS–232 connector for remote control not available.
b. See also Ordering Information
c. Constant Current Line Drive for DeltaTron® and ICP® Accelerometers or Microphone Preamplifier
d. Via DeltaTron Converter Type 2646 or the range of Charge to DeltaTron Converters Type 2647

Fig. 2
Traditional measurement systems require extensive transducer cabling

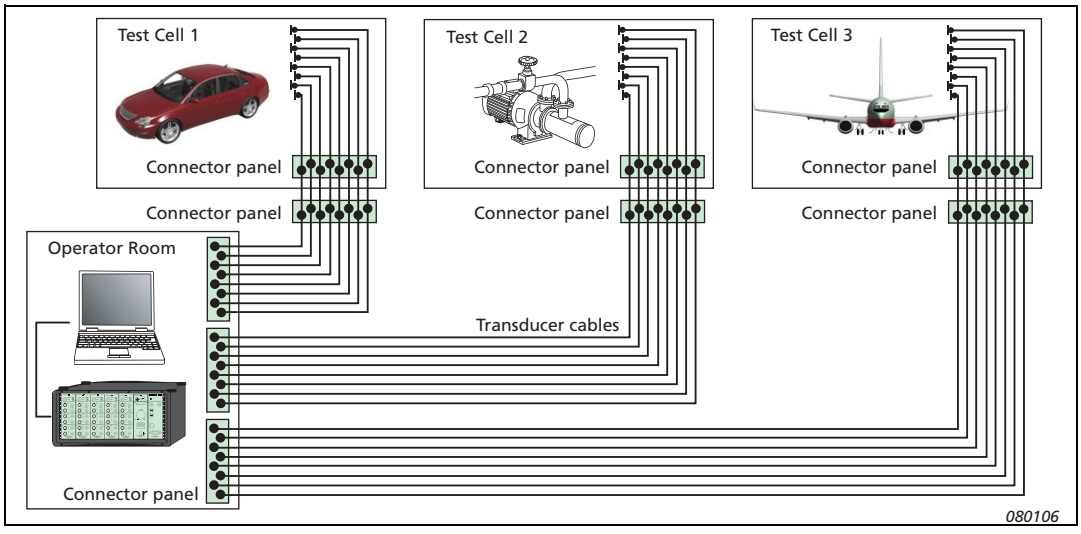
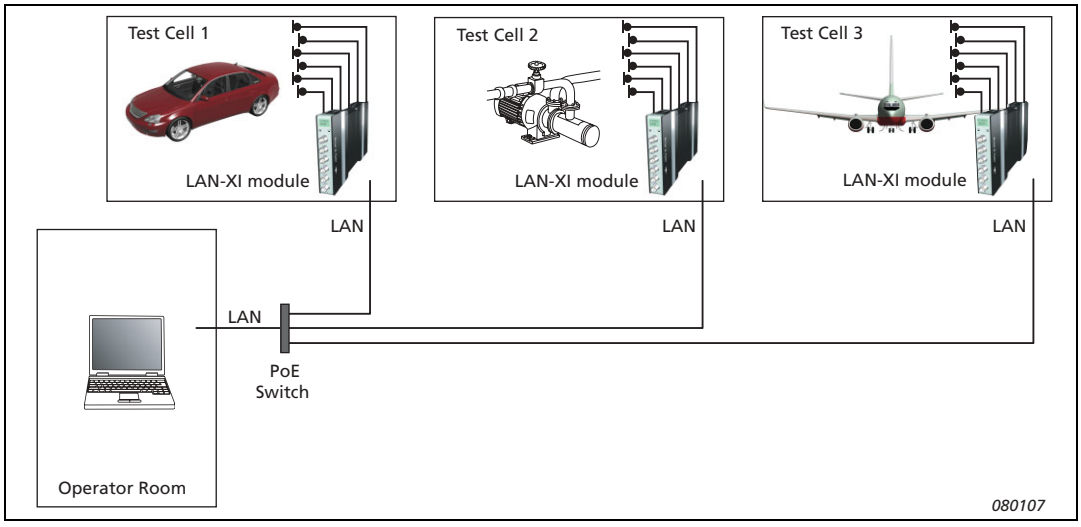


Fig. 3
Using LAN-XI, cabling between test cells and operator room is drastically reduced to only a few LAN cables



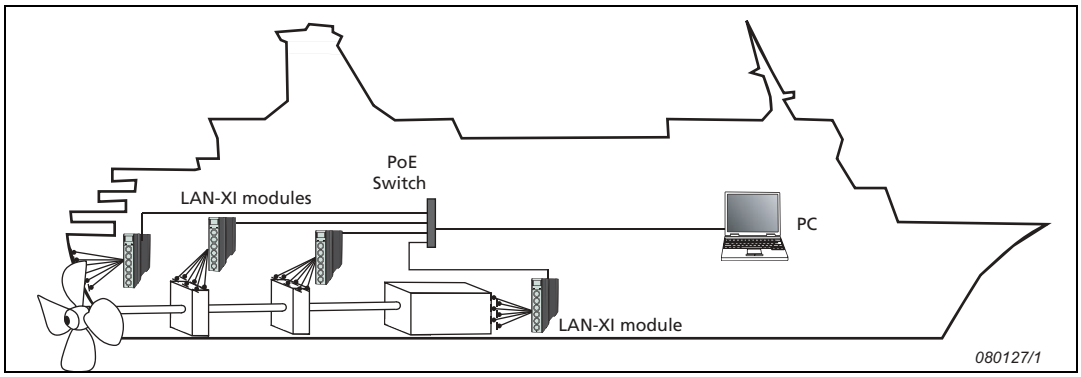


Fig. 4
With a distributed system where modules are situated close to the measurement object, transducer cabling is also drastically reduced for measurements on large structures

System Configuration

Building a Configuration

Configurations of one or more LAN-XI modules and frames are easily managed using a front-end browser via the PULSE Front-end Setup program. You can select modules and frames, access the modules' homepages, change IP addresses, flash the modules' LEDs, update firmware, etc.

IP Addresses

Each module has its own built-in network interface. This can be configured to use dynamic or static IP addressing, via the module's display or its homepage:

- If dynamic IP addresses are selected (default), the modules automatically receive their IP addresses from a DHCP server on the network. If this is not found, as in the case where a module is connected directly to a PC, the module will use "link-local" ("auto-IP"). This basically means that an address in the 169.254.xxx.xxx range is selected. A Windows® XP/ Windows Vista® PC will by default do the same, which means that the two can communicate
- If static addresses are selected, they can be changed later by using the front-end browser

Technologies

Sample Synchronisation Technique: Precision Time Protocol

For most sound and vibration applications, sample-synchronous and phase-matched measurements are a must. If no synchronisation method is used, two or more sampling systems will drift apart over time. Even the best clock systems available will, in less than 10 seconds, drift so far apart that the sample correlation will drop to an unacceptable level for high-quality sound and vibration measurements. Traditional measurement systems have a common sample clock ensuring synchronisation between measurement channels located in the same front-end frame. Newer systems have offered various cable-based synchronisation techniques between different front-ends – all with the significant disadvantage of requiring extra cabling.

With LAN-XI, Brüel & Kjær introduces a new technique to ensure sample-synchronous measurements over the same LAN connection used for transferring the measurement data. This simplifies the measurement system's cabling and makes it possible to perform sample-synchronous measurements over long distances, eliminating the effect of delays over the cable and interconnected switches.

PTP synchronisation provides a whole new set of possibilities for combining measurement systems located different places: closer to the actual measurement point, in different rooms/test cells, with long distances between. The only thing that is required is a LAN connection.

PTP Status
PTP synchronisation is shown in the module display:
PTP Locked: <100 ns
PTP Locking: <250 ns
PTP Settling: >250 ns

In practice:

- Less cabling is required so less time used for setting up a measurement system
- Less cable infrastructure is needed when defining and setting up new test cell facilities
- Much easier reconfiguration of existing test setups
- Highly accurate measurements are possible over long distances with only a LAN connection

The IEEE 1588 Precision Time Protocol

PTP synchronisation measures the delays between individual PTP components using a special algorithm (see the IEEE 1588 standard[a]). By doing this, all delays can be accurately measured, and the individual clocks can be set to exactly the same time. On top of this, the phase drift of the "slave" clocks is continuously measured and counter-adjusted by a control loop, which adjusts the slave clocks' speed. All Brüel & Kjær Sound & Vibration applications will work with either an ordinary high-performance 1 gigabit switch or a dedicated PTP switch[b].

Power over Ethernet

PoE is implemented according to IEEE 802.3af. PoE is wired Ethernet LAN technology that, with a suitable PoE LAN switch, allows the power needed for each module to be carried by shielded CAT6 LAN cables rather than by separate power cables. This minimises the number of cables required and results in lower cost, less downtime, easier maintenance and greater installation flexibility. PoE switches, such as the Linksys® SRW2008MP, 8-port Gigabit Switch, and PoE Injectors such as ZyXEL PoE-12 Power over Ethernet (a single-port PoE injector) can be used.

Dyn-X Technology – Single Range from 0 to 160 dB

Dyn-X is an innovative range of state-of-the-art input modules with a single input range from 0 to 10 V_p and a useful analysis range exceeding 160 dB.

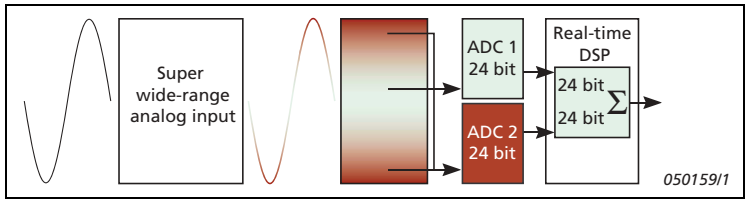


Fig. 5
Simplified block diagram of Dyn-X principle

To date, high-quality transducers and preamplifiers have outperformed measuring equipment with regard to linearity and dynamic performance, being able to deliver a noise- and distortion-free signal over a dynamic signal range of 120 to 130 dB broadband and 160 dB narrow-band.

Now, with Dyn-X technology, the entire measurement and analysis chain, for the first time, matches or outperforms the transducer used for measurement. This eliminates the need for an input attenuator for ranging the analysis-system input to the transducer output. All you need to do to get excellent results is choose the right transducer.

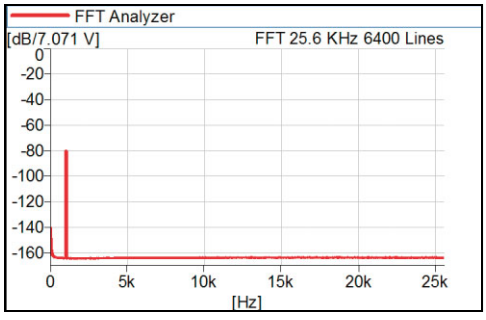


Fig. 6
160 dB analysis in one range. An FFT measuring a 1 KHz signal 80 dB below full-scale (7 V_{rms}). Note that noise and all spurious components measure 160 dB below full scale input

Transducer Overload

Transducer maximum output level can be entered in the PULSE Transducer Database. If the input exceeds this level, Dyn-X modules will give an overload warning on the front-end (and in the PULSE Level Meter).

Accuracy, Safety and Efficiency

Covering everything in one input range, you no longer have to worry about overloads, underranged measurements or discussions about the validation and verification of measurement

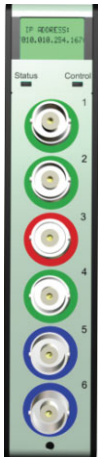
a. IEC 61588/IEEE 1588-2002, "Precision Clock Synchronization Protocol for Networked Measurement and Control Systems".
b. Dedicated IEEE 1588 PTP switches are not commercially available at time of printing. Using a standard high-performance 1 gigabit switch, measurements will be sample- and time-synchronous.

results. And with no need for trial runs in order to ensure that the input range is correct, you have a far greater certainty of getting measurements right first time.

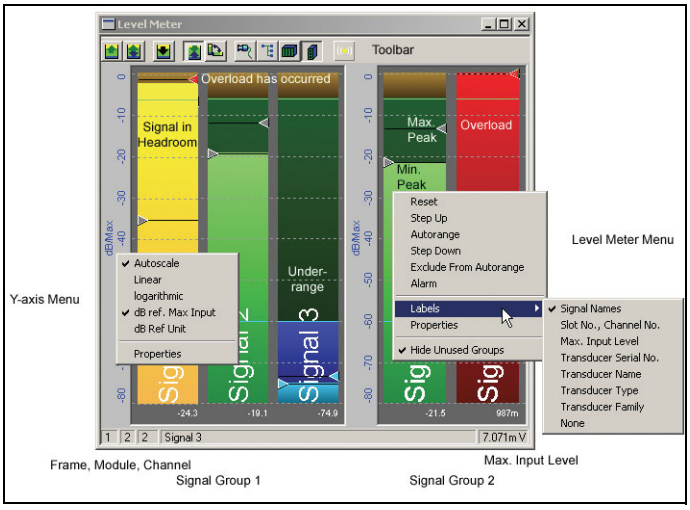
The measurement situations and applications below are examples of where Dyn-X technology can be usefully employed:

When you need to get the measurement right first time	• Crash testing • Destructive testing • Heavy machinery – run up/ coast down	*When signal levels are unknown*	• Run up/down • Field testing
Where there is minimal user interaction	• Road testing • Field testing	*When an overview of the whole measurement scenario is difficult*	• When measuring many channels • When combining more signal types: vibration, sound, temperature, pressure, RPM, etc. • Test cells • In-car testing • Sound, vibration and other parameters involved
When time is limited	• Test cells • Wind tunnels • Road testing • Flight testing		
When testing is unattended	• Production line • Noise monitoring	*High-dynamic applications*	• Impulsive testing, room acoustics • Run up/down • Electroacoustics • Structural measurements

Assistance and Feedback



All LAN-XI input/output modules provide assistance in setting up your system and monitoring its status. Combined with the use of PULSE's Level Meter on the PC, you can easily see whether your system is working as intended and, if not, where any attention is needed for correcting transducer mounting or cabling.



Each module has a display and each channel, a circular LED. These help you to locate a specific module or channel and to determine whether the system is functional and configured correctly with the transducers in good working order. You can toggle the display between module ID, IP address, PTP status and any error indications, including self-test and overload, but the display automatically changes if an error arises. In addition, each module has its own homepage containing information about the module, including frame configuration, calibration history, self-test, log file, etc. The home page can be accessed directly from an Internet browser without the need for a PULSE license.

The circular LEDs on each connector display status colours to indicate the following conditions:

- Green – active input channel
- Red – input overload; cable, transducer or conditioning fault
- Yellow – transferring TEDS data
- Blue – generator output
- Blue/Red (alternating at 0.5 s) – error on generator output, overload or cable short-circuit
- Flashing – the channel selected in the PULSE hardware setup or listened to using PULSE Data Recorder – very useful for checking and validating the transducer setup

The clear indication of the selected channel, combined with the use of IEEE 1451.4-capable transducers with standardised TEDS, greatly simplifies system setup.

FEATURES

- Multipurpose transducer support (see Input Channels)
- Designed for field use: rugged and light – cast in magnesium
- Interchangeable LEMO/BNC front panels – handle microphones with polarization voltage as well as DeltaTron transducers and let you use your preferred cabling
- Front-panel display of ID/IP address/status/error conditions
- Silent operation (no fan)
- Single LAN cable operation for data transfer, power supply (PoE) and synchronisation (PTP) in distributed measurement systems
- Mains Power Adaptor ZG-0426 included with each module

Power Supply

Each module can be powered by:

- Mains adaptor, 90 – 264 VAC, 47 – 63 Hz
- 10 – 32 V DC
- PoE according to IEEE 802.3af

Each module can be used, for example, in the field with a DC supply or as part of a distributed measurement system using PoE. Use in a distributed system minimises the requirements for transducer cables – all you need between the modules and the PC are LAN cables and an Ethernet switch (compare Fig. 2 and Fig. 3). In addition, modules can be easily plugged into the Type 3660-D frame (described below), or two or more modules can be attached to each other using integrated screws.

Silent Operation

Operation is silent as the modules have no cooling fan – the ribbed design provides enough cooling when used stand-alone.

Interchangeable Front Panels

The modules allow free interchange of front panels with LEMO or BNC connectors. This results in fewer patch panels, less cable “spaghetti”, fewer cable adaptors and faster system setup. In principle, any connector panel can be used on any module. However, if an illegal combination is used, for example, if the front panel has LEMO (multipurpose) connectors while the module only supports DeltaTron and voltage (B-versions), the module will stop during power-up and display an error message.

FEATURES

- Houses up to 11 input/output modules (up to 66 channels)
- Robust casing for industrial and hard everyday use
- Mains (90 – 264 VAC, 47 – 63 Hz) or DC powered (10 – 32 V)
- Silent operation (cooling fans turn on only at maximum safe temperature)
- Phase- and sample-synchronous measurement with other front-ends including IDA^e
- Plug and play modules can be removed for field measurements using a single module or swapped for calibration or repair
- Modules can be locked or screwed in place

Type 3660-D is a data acquisition system comprising a frame that contains up to 11 modules that can be freely chosen from the available I/O modules (see Fig. 1 and Table 1). With a 1 gigabit LAN backbone, the frame provides full throughput of all channels. With synchronisation cables, the frame is fully compatible with IDA^e hardware, maintaining phase- and sample-synchronous measurements.

Power Supply

Type 3660-D has an integral transformer for connection of a 90 – 264 VAC, 47 – 63 Hz mains power supply or can be powered from a 10 – 32 V DC supply. In addition, each frame can house up to two Battery Modules Type 2831, which are capable of powering nine input/output modules for up to 40 minutes. Batteries can be hot-swapped to extend operation time. The frame cannot be powered by PoE.

DC Output

To provide power for accessories such as a LAN switch or wireless LAN for interconnecting more front-ends, Type 3660-D has a 12 V DC, 1 A output (EIAJ-05 connector) with current protection. Cables for these accessories must be purchased separately.

Silent Operation, Cooling

Operation is silent as long as the temperature of the unit is within safety limits. If the maximum safe operating temperature is reached, cooling fans activate. The SPL is <30 dB at 1 m.

USES
- Input channels for multichannel sound and vibration measurements

FEATURES
- All input channels are Dyn-X
- Frequency range 0 to 51.2 kHz[a]
- Input voltage up to 10 V_{peak} and extended range up to 31.6 V_{peak}
- Absolute maximum input 60 V_{peak} without damage
- Support IEEE 1451.4 capable transducers with TEDS
- Automatic DC offset compensation
- Extremely low noise floor
- Selectable floating or grounded outputs
- Low out-of-band spurious noise
- Overload indicator indicates overload, incorrect conditioning and cable breaks on connected transducers
- Overload detection including out-of-band frequencies
- Full phase match among all inputs in a system, including IDA[e] hardware

These multipurpose, Dyn-X input channels can be used in combination with the modules' interchangeable front panels to connect and condition all relevant sound and vibration transducers including:
- Microphone preamplifier with 0 or 200 V microphone polarization voltage[b]
- DeltaTron microphones
- Proximity probes
- Accelerometers
- DeltaTron Accelerometers
- DC accelerometers (diff. input)
- Charge transducers (via DeltaTron converter)
- AC/DC
- Tachometers (power supply not available)

Independent Channels
The input channels on a module can be set up independently. You can set up the high-pass filters and input gain separately and attach different types of transducers to different channels. The microphone polarization voltage can be switched on for individual channels.

IEEE 1451.4 Transducers
Input modules support TEDS transducers. This allows automatic front-end and analyzer setup based on information stored in the transducer. TEDS information includes, for example, sensitivity, serial number, manufacturer and calibration date.

Overload
Input modules use two methods to detect transducer cable breaks or whether the wrong conditioning has been chosen. For microphones, their supply current is monitored. For DeltaTron accelerometers (or microphones using DeltaTron preamplifiers), the supply voltage is monitored. If conditioning errors, such as a broken cable, are detected, an error is indicated as an overload on the specific channel.

Overload indications for input channels include (see Specifications for details):
- Signal overload with adjustable detection level

a. Measurement frequency range can be selected in software.
b. Types 3050-A-xx and 3160-A-xx only (see Table 1)

- CCLD overload: detection of cable break, short-circuit or CCLD transducer working point fault
- Microphone preamplifier overload: detection of microphone preamplifier current consumption too high or too low
- Common mode voltage overload – relevant when input coupling is floating

Ground-loop Noise Suppression

The modules' floating/grounded, differential input design and the fact that all external connections (LAN, power supply) are galvanically isolated in the module provide optimal ground-loop noise suppression.

Protection

If the signal input level to a module significantly exceeds the measuring range, the input will go into protection mode for at least 0.5 s until the signal falls again. While protected, the input is partly switched off and the input impedance is greatly increased. (The measured value will be strongly attenuated but still detectable.)

Output Channels

USES

- Generator output channels for system excitation for sound and vibration measurements

FEATURES

- Two output channels: full generator functionality from 0 to 51.2 kHz
- Output voltage up to 10 V_{peak} and output current up to 40 mA_{peak} in two output ranges only
- Waveforms determined by software (see below)
- High amplitude and frequency linearity
- Extremely low noise floor
- Selectable floating or grounded outputs
- Capable of heavy complex loading without instability
- Low out-of-band spurious noise
- Overload detection on both channels individually (voltage and current) indicated by alternating red/blue LEDs on front panel
- Generator channel indicated by blue LED on front panel (active or not)
- Automatic shutdown (muting) of both channels simultaneously at failure (for example, lost connection to LAN) or excessive output loading
- Full output phase control among modules
- Power down mode (mutes signal and shuts off power to output channels) if the PoE supply is too low (to prevent functional failure on input channels)

The two output channels on Type 3160 can be used as high-quality signal generators with a frequency range from 0 to 51.2 kHz and can supply the signals necessary for performing system analysis.

Type 3160 is designed around a powerful digital signal processor and a low-noise, 24-bit, D/A converter. Type 3160 has exceptional flexibility, stability and accuracy. Output levels are adjustable in hardware (two ranges) with maximum outputs of 316 mV_{peak} and 10 V_{peak}. High-quality levels from 1 µV to 316 mV or 10 V are obtained. The output signal is provided by a BNC connector and can be referred to ground or floating. It is possible to add a DC offset, but any unwanted DC offset is automatically removed.

Waveforms

The waveform types supported by PULSE are:

- Single fixed sine (continuous or burst)
- Single swept sine
- Dual fixed sine
- Dual swept sine
- Fixed sine plus swept sine
- Stepped sine (with Steady State Response Analyzer)
- Random (continuous or burst)
- Pseudo-random
- Periodic random
- User-defined, arbitrary waveforms can be downloaded

Ranges

The fact that there are only two hardware ranges allows amplitude sweeping over a larger range without the presence of disturbing transients from range-shifting attenuators. To avoid these transients, the range of interest can be locked.

Due to the large dynamic range, it is possible to generate very accurate low-level signals.

Linearity

Frequency linearity is better than ±0.1 dB over the whole frequency range, and amplitude linearity is better than 0.1 dB over at least 100 dB amplitude range referred to full scale.

Overload

Output voltages above 11 V_{peak} or output currents above 40 mA_{peak} are indicated as overloads by the circular LEDs on the output channels.

Security

Automatic shutdown of both outputs is initiated in cases of heavy overload (shorted output) that could affect module functionality by drawing more current than available. The signal ramps up again when the overload is removed.

Output shutdown is also initiated after less than one second if LAN connection is lost.

Battery Module Type 2831

The battery module is a rechargeable Li-Ion battery with an output voltage of 14.8 V and a capacity of 6400 mAh. On the front panel, five LED status indicator shows the remaining capacity.

The battery module can be charged in a LAN-XI frame, or using a dedicated external charger.

The battery module is the same size as a standard LAN-XI input/output module.

Software and Applications

LAN-XI hardware works with all PULSE applications as well as with Test for I-deas software[a]. For information on the applications available, go to www.bksv.com.

a. Support available from Test for I-deas 6 in the fourth quarter of 2008.

Technical Support

With a Software Maintenance and Support Agreement you get technical support via telephone, e-mail or web conference[a]. You get direct contact with a knowledgeable and dedicated engineer to help you with:

- Configuration, setup and preparation of projects
- Immediate questions during installation or measurements
- Advice and assistance on post-processing tasks

Accredited Calibration

We recommend you have your system calibrated regularly, annually or every second year in order to:

- Know if values have shifted in one of the channels
- Prove measurement traceability
- Prove calibration of the entire measurement chain

Your certificate contains measurement results as well associated uncertainties.

With accredited calibration from Brüel & Kjær you have proof that calibration has been performed according to quality requirements in ISO 17025. To start the measurement history from day one, we recommend that you order accredited calibration with the new instruments.

Hardware Maintenance

Local Brüel & Kjær staff and skilled technicians at the manufacturing site can help to maximise the uptime of your instruments, performing to specifications.

- Conformance Test if you need manufacturer's proof that your hardware performs according to specifications
- Repair or replacement of components in your hardware

Service Agreement

With a Service Agreement you can save both time and money. The value of a Service Agreement lies in a combination of the following:

- Assurance that the time your instrument is away for service is minimised
- Attractive total service price

You can combine a range of services in one agreement over several years. You get priority at the time you need service and predictable maintenance budget. With planned service your instrument is available at the time you set up for measurements and you have proof of correct data.

Should the technician during calibration detect the need for repair or replacement, this will be performed while your instrument is in our hands, if covered by the service agreement. You don't have to be without your instrument several times. There is no delay in communication to decide what should happen with the instrument – and no large surprises to your budget.

Examples of what a Service Agreement can contain:

- With Brüel & Kjær your instrument can be calibrated and maintained at the same time
- Multiple calibrations – to give the most favourable price
- Priority calibration
- Priority repair – or replacement
- Extension of manufacturer's warranty

a. Check with your local Brüel & Kjær office to hear whether this service is available in your area

Compliance with Standards

(For environmental specifications and compliance with standards for PCs, see the specifications given by their respective manufacturers)

11-MODULE LAN-XI FRONT-END FRAME TYPE 3660-D, INPUT/OUTPUT MODULES TYPES 3050, 3160, BATTERY MODULE TYPE 2831

CE, C-Tick	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.
Safety	EN/IEC 61010–1 and ANSI/UL 61010–1: Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission	EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments. EN/IEC 61000–6–4: Generic emission standard for industrial environments. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device.
EMC Immunity	EN/IEC 61000–6–1: Generic standards – Immunity for residential, commercial and light industrial environments. EN/IEC 61000–6–2: Generic standards – Immunity for industrial environments. EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements. **Note:** The above is only guaranteed using accessories listed in this Product Data.
Temperature	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: –10 to +55°C (14 to 131°F) Storage Temperature: –25 to +70°C (–13 to +158°F)
Humidity	IEC 60068–2–78: Damp Heat: 93% RH (non-condensing at 40°C (104°F))
Mechanical	Operating (peak values) MIL–STD – 810C: Vibration: 12.7 mm, 15 ms^{-2}, 5 – 500 Hz Non-operating: IEC 60068–2–6: Vibration: 0.3 mm, 20 ms^{-2}, 10 – 500 Hz IEC 60068–2–27: Shock: 1000 ms^{-2} IEC 60068–2–29: Bump: 1000 bumps at: 250 ms^{-2}
Enclosure	IEC 60529: Protection provided by enclosures: **3660-D:** IP 20; **3050:** IP 31; **3160:** IP 31; **2831:** IP 31
RoHS	All LAN-XI products are RoHS compliant

EFFECT OF RADIATED AND CONDUCTED RF, MAGNETIC FIELD AND VIBRATION
Radiated RF: 80 – 1000 MHz, 80% AM 1 kHz, 10 V/m
Conducted RF: 0.15 – 80 MHz, 80% AM 1 kHz, 10 V
Magnetic Field: 30 A/m, 50 Hz
Vibration: 5 – 500 Hz, 12.7 mm, 15 m/s^2
Input measured with shorted input. All values are RMS. Conducted RF immunity on all channels is only guaranteed using an external connection from measuring ground to chassis terminal

Input/Output	Radiated RF	Conducted RF	Magnetic Field	Vibration
Direct/CCLD	<250 μV	<300 μV	<4 μV	<80 μV
Preamplifier[a]	<250 μV	<50 μV	<8 μV	<80 μV
Generator	<100 μV	<50 μV	<4 μV	<5 μV

a.Types 3050-A-xx and 3160-A-xx only (see Table 1)

Specifications – Type 3660-D

POWER REQUIREMENTS
Mains: Wide-range input 90 – 264 VAC, 47 – 63 Hz
External Mains Power Connector: Connector type C14 according to IEC/EN 60320–1
DC Input: 10 – 32 V DC
Connector: 4-pole XLR plug
Power Consumption:
Starts with 25 W if equipped with 1 LAN-XI module
Rises to 150 W if equipped with 11 LAN-XI modules
Maximum power consumption: 200 W

DC OUTPUT
+12 V ± 1.0 V; max. 1 A (with current protection)
Connector: EIAJ-05 (pin ø1.4, outer ø6.5)

LAN
Connector type RJ45 8/8, optionally Neutrik® EtherCon NE8MC1

ACOUSTIC NOISE EMISSION (at 1 m)

	dB SPL, A-weighted at 1 m	dB Lw, A-weighted
Fan Off	0	0
Normal (22°C)	25	30
Maximum	40	48

DIMENSIONS
Height: 177.8 mm (7.0″)
Width: 388.5 mm (15.3″)
Depth: 420.4 mm (16.5″)
Weight: 7 kg (15.4 lb.) frame with mains power supply, etc.

Specifications – Types 3050, 3160

POWER REQUIREMENTS
DC Input: 10 – 32 V DC
Connector: LEMO coax., FFA.00.113, ground on shield
Power Consumption:
DC Input: <15 W
Supply via PoE: According to IEEE 802.3af. Max. cable length 50 m

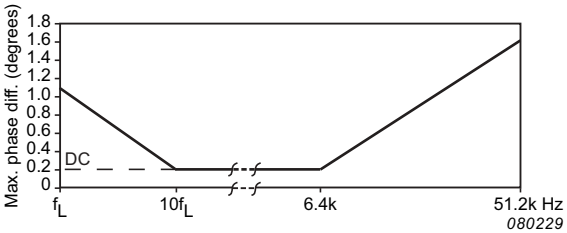
LAN
Connector type RJ45

DIMENSIONS AND WEIGHT
Height: 132.6 mm (5.22″)
Width: 27.5 mm (1.08″)
Depth: 250 mm (9.84″)
Weight: 750 g (1.65 lb.)

Specifications – Input Channels

		Dyn-X: 3050, 3160			
Frequency Range		DC to 51.2 kHz Lower frequency range can be set in PULSE software			
A/D Conversion		2 × 24 bit			
Data Transfer		24 bit			
Input Voltage Range		10 V_{peak} Extended range: 31.6 V_{peak}			
Input Signal Coupling	**Differential**	Signal ground is “floating” (1 MΩ re chassis)			
	Single-Ended	Signal ground is connected to chassis (“Grounded”)			
Input Impedance		Direct, Microphone: 1 MΩ || <300 pF			
		CCLD: >100 kΩ || <300 pF			
Absolute Maximum Input		±60 V_{peak} without damage			
High-pass Filters * Defined as the lower frequency, f_L, for guaranteed fulfilment of –0.1 dB accuracy in 10 V_{peak} range ** Defined as the nominal –10%/3 dB filter frequency		**– 0.1 dB ***	**–10% @ ****	**–3 dB @ ****	**Slope**
	0.1 Hz –10% analog high-pass filter 0.7 Hz –0.1 dB digital high-pass filter	0.5 Hz 0.7 Hz	0.1 Hz 0.15 Hz	0.05 Hz 0.073 Hz	–20 dB/dec.
	1 Hz –10% digital high-pass filter 7 Hz –0.1 dB digital high-pass filter	5 Hz 7 Hz	1.0 Hz 1.45 Hz	0.5 Hz 0.707 Hz	–20 dB/dec.
	22.4 Hz –0.1 dB analog high-pass filter	22.4 Hz	15.8 Hz	12.5 Hz	–60 dB/dec.
	Intensity filter (analog)	115Hz	23.00 Hz	11.5 Hz	–20 dB/dec.
Absolute Amplitude Precision, 1 kHz, 1 V_{input}		±0.05 dB, typ. ±0.01 dB			
Amplitude Linearity (linearity in one range)	0 to 80 dB below full scale	±0.05 dB, typ. ±0.01 dB			
	80 to 100 dB below full scale	±0.2 dB, typ. ±0.02 dB			
	100 to 120 dB below full scale	typ. ±0.02 dB			
	120 to 140 dB below full scale	typ. ±0.02 dB			
	140 to 160 dB below full scale	typ. ±1 dB			
Overall Frequency Response re 1 kHz, from lower limit f_L to upper limit f_U f_L is defined as the lower frequency for guaranteed fulfilment of –0.1 dB accuracy in 10 V_{peak} range (see under High-pass Filters) f_u is defined as the chosen frequency span. DC (f_L = 0)		±0.1 dB ±0.3 dB in 31.6 V range			
Noise * Measured lin. 10 Hz to 25.6 kHz or lin. 10 Hz to 51.2 kHz: (Input terminated by 50 Ω or less)		**Input Range**	**Guaranteed**		**Typical**	
			Lin*	**1 kHz**	**Lin***	**1 kHz**
	Signal level <316 mV$_{peak}$ 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz	10 V_{peak}	<4 µV$_{rms}$ <13 µV$_{rms}$	<25 nV$_{rms}$/√Hz	<3 µV$_{rms}$ <10 µV$_{rms}$	<19 nV$_{rms}$/√Hz
	Signal level >316 mV$_{peak}$ 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz	10 V_{peak}	<60 µV$_{rms}$ <350 µV$_{rms}$	<375 nV$_{rms}$/√Hz	<50 µV$_{rms}$ <250 µV$_{rms}$	<313 nV$_{rms}$/√Hz
	Signal level <1 V$_{peak}$ 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz	31.6 V_{peak}	<20 µV$_{rms}$ <45 µV$_{rms}$	<125 nV$_{rms}$/√Hz	<15 µV$_{rms}$ <35 µV$_{rms}$	<95 nV$_{rms}$/√Hz
	Signal level >1V$_{peak}$ 10 Hz to 25.6 kHz 10 Hz to 51.2 kHz	31.6 V_{peak}	<200 µV$_{rms}$ <1200 µV$_{rms}$	<1250 nV$_{rms}$/√Hz	<150 µV$_{rms}$ <800 µV$_{rms}$	<950 nV$_{rms}$/√Hz
Spurious-free Dynamic Range re full-scale input (Input terminated by 50 Ω or less) Spurious-free Dynamic Range is defined as the ratio of the rms full-scale amplitude to the rms value of the largest spurious spectral component (non-harmonic)		**Input Range**	**Typical**			
		10 V_{peak}	160 dB			
		31.6 V_{peak}	140 dB			

Specifications – Input Channels (continued)

		Dyn-X: 3050, 3160		
DC Offset re full scale		**Guaranteed**		**Typical**
		<–90 dB		–100 dB
Harmonic Distortion (all harmonics)		**Guaranteed**		**Typical**
		–80 dB (–60 dB in 31.6 V range)		–100 dB @ 1 kHz (–80 dB @ 1 kHz in 31.6 V range)
Crosstalk: Between any two channels of a module or between any two channels in different modules		**Frequency Range**	**Guaranteed**	**Typical**
		0 – 51.2 kHz	–100 dB	–140 dB
Channel-to-Channel Match		**Guaranteed**		**Typical**
(10 V_{peak} input range)	Maximum Gain Difference f_L is defined as the –0.1 dB frequency of the high-pass filter	0.2 dB from lower frequency limit, f_L, to 51.2 kHz (0.4 dB at –10% filter frequency)		±0.05 dB
	Maximum Phase Difference (within one frame) f_L is defined as the –0.1 dB frequency of the high-pass filter			
	Additional PTP sync. error (phase difference) between modules/frames (using a single standard gigabit switch)	**Typical:** <200 ns (approx. ±0.07° @ 1 kHz, ±2° @ 25.6 kHz)		
Channel-to-Channel Match (31.6 V_{peak} input range)	Maximum Gain Difference	0.6 dB from lower frequency limit, f_L, to 51.2 kHz (1 dB at –10% filter frequency)		
	Maximum Phase Difference (within one frame)	4° from lower frequency limit, f_L, to 51.2 kHz		
Sound Intensity Phase Match (only for using intensity filter and in 10 V_{peak} input range) All channels matched	**Frequency Range**	**Guaranteed Phase Match**		**Typical Phase Match**
	50 – 250 Hz	±0.017°		±0.005°
	250 Hz – 2.5 kHz	0.017° × (f/250)		±0.005°
	2.5 – 6.4 kHz	±0.17°		±0.08°
Common Mode Rejection in 10 V_{peak} input range Values for 31.6 V_{peak} range are 10 dB lower.		**Guaranteed**		**Typical**
	0 – 120 Hz	70 dB		80 dB
	120 Hz – 1 kHz	55 dB		60 dB
	1 – 51.2 kHz	30 dB		40 dB
Absolute Max. Common Mode Voltage		±5 V_{peak} without damage		
		±4 V_{peak} without clipping		
		If common mode voltage exceeds the max. value, care must be taken to limit the signal ground current in order to prevent damage. Max. is 100 mA. The instrument will limit the voltage to the stated max. "without damage" common mode value		
Anti-aliasing Filter At least 90 dB attenuation of those frequencies which can cause aliasing	Filter Type	3rd order Butterworth		
	–0.1 dB @	51.2 kHz		
	–3 dB @	128 kHz		
	Slope	–18 dB/octave		
Supply for Microphone Preamplifiers (Types 3050-A-xx, 3160-A-xx only)		±14.0 V, max. 100 mA per channel (max. 100 mA total/module)		
Supply for Microphone Polarization (Types 3050-A-xx, 3160-A-xx only)		200 V ±1 V, or 0 V		
Supply for DeltaTron/ICP®/CCLD		4 to 5 mA from 24 V source		
Tacho Supply		Not available		
Analog Special Functions		**Microphone Charge Injection Calibration:** All modules with 7-pin LEMO support CIC via dedicated application software and OLE interface **Analog Self-test:** Functional check **Transducers:** Supports IEEE 1451.4-capable transducers with standardised TEDS (up to 100 m cable length)		

Specifications – Input Channels (continued)

	Dyn-X: 3050, 3160
Overload Detection	**Signal Overload:** Adjustable detection level ±1 V_{peak} to ±10 V_{peak}. Default level ±10 V_{peak} (CCLD mode ±7 V_{peak}) (31.6 V range: ±31.6 V) Can be set in PULSE Transducer Database **CCLD Overload:** Detection of cable break or short-circuit + detection of CCLD transducer working point fault. Detection level: +2 V/20 V **Microphone Preamplifier Overload:** Detection of microphone preamplifier current consumption too high or too low. Detection level default 10 mA/1 mA Adjustable detection level 1 to 20 mA or 100 mA if disabled **Common Mode Voltage Overload:** Detection level: ±3.3 V
Protection	If signal input level exceeds the measuring range significantly, the input will go into protection mode until the signal goes below the detection level again – for at least 0.5 s. While in protection mode, the input is partly switched off and the input impedance is greatly increased. (The measured value will be strongly attenuated but still detectable) In DC mode –10 V_{peak} range, the detection limit is ±12 V. In all other measuring modes (except CCLD) the limit is ±50 V_{peak} including DC component or ±12 V_{peak} AC (In CCLD mode the limit is +50/–2 V_{peak} including DC component or ±12 V_{peak} AC) In the 31.6 V range, the limit is ±50 V_{peak}

Specifications – Output Channels

		Dyn-X: 3160	
Output Connector		2 × BNC	
Output Coupling		DC	
Signal Ground Coupling		Floating or grounded to chassis	
D/A Conversion		24 bit	
DC Offset		≤1 mV auto-adjusted by loopback (<–80 dB re FS)	
Output Voltage Range		1 μV_{RMS} – 10 V_{peak} in two ranges	
Output Impedance		50 Ω	
Output Load		Max. 40 mA_{peak}	
Frequency Range		0 – 51.2 kHz	
Frequency Response re 1 kHz		±0.1 dB, 1 mHz to 51.2 kHz	
Frequency Accuracy		0.00025%	
Frequency Resolution		1 mHz (defined in PULSE software)	
Phase Resolution		100 mdegrees (defined in PULSE software)	
Phase Deviation Between Channels		<20 mdegrees for frequencies below 1 kHz	
Waveform		Software determined arbitrary waveforms up to 2 Msamples Waveforms available in PULSE: Single fixed sine (continuous or burst), single swept sine, dual fixed sine, dual swept sine, fixed sine plus swept sine, stepped sine (with SSR Analyzer), random (continuous or burst), pseudo-random, periodic random User-defined, arbitrary waveforms can be downloaded	
Amplitude Linearity @ 1 kHz	±0.1 dB	**Guaranteed** 0 – 100 dB below 7 V_{rms}	**Typical** 0 – 110 dB below 7 V_{rms}
Noise μV_{rms} (nV/√Hz) in 50 kHz bandwidth	**Range**	**Guaranteed**	**Typical**
	316 mV_{peak}	1 μV_{rms} (4.4 nV/√Hz)	0.5 μV_{rms} (2.2 nV/√Hz)
	10 V_{peak}	10 μV_{rms} (44 nV/√Hz)	5 μV_{rms} (22 nV/√Hz)
Harmonic Distortion Products	0 – 51.2 kHz	<–80 dB re full range output	
Spurious In Band (non-harmonic)	0 – 51.2 kHz	<–100 dB re full range output or 1 µV, whichever is greater	
Spurious Out of Band (non-harmonic)	Up to 1 MHz	<–80 dB re full range output	
Absolute Amplitude Precision	@ 23°C, 1 kHz, 1 V_{rms}	**Guaranteed** ±0.05 dB	
Crosstalk Between output channels and between any output channel and any input channel terminated by less than 50 Ω (unloaded generator output)	0 – 51.2 kHz	**Guaranteed** –120 dB	**Typical** –130 dB

Specifications – Output Channels (continued)

	Dyn-X: 3160
Common Mode Rejection	**Guaranteed**
1 Hz – 1 kHz	60 dB
Maximum Common Mode Voltage	5 V_{peak}, DC – 80 MHz If common mode voltage exceeds the max. value, care must be taken to limit the signal ground current in order to prevent damage. Max. is 100 mA. The instrument will limit the voltage to the stated max. “without damage” common mode value
Reconstruction Filter	Sixth order Butterworth (–3 dB frequency = 120 kHz typically)
Attenuation of Mirror Frequencies	>80 dB
Overload Detection	Reported to PULSE and indicated by light rings on output connectors for output voltage above 11 V_{peak} and output current above 40 mA_{peak}

Specifications – Battery Module Type 2831

Rechargeable Li-Ion Battery
Output Voltage: 14.8 V
Capacity: 6400 mAh
A 5 LED status indicator shows the remaining capacity

DIMENSIONS AND WEIGHT
Height: 132.6 mm (5.22″)
Width: 27.5 mm (1.08″)
Depth: 250 mm (9.84″)
Weight: 1.0 kg (2.2 lb.)

Specifications – LAN Interface

CONNECTOR
RJ 45 (10baseT/100baseTX) connector complying with IEEE–802.3 100baseX
Type 3660-D permits the use of a ruggedized RJ45 data connector (Neutrik NE8MC-1) to screw the cable onto the frame

Type 3050 and 3160 communicate at 100 Mbits/s, while Type 3660-D also supports 1000 Mbits/s. For this speed, shielded cables of type “CAT 5e” or better should be used

All LAN-connectors support MDIX, which means that cables may be “crossed” or not

For stand-alone modules, PoE is also supported (IEEE 802.3af)

PROTOCOL
The following standard protocols are used:
- TCP
- UDP
- DHCP (incl. Auto-IP)
- DNS
- IEEE 1588 – 2002
- IP
- Ethernet

ACQUISITION PERFORMANCE
Each Type 3050 module generates data at almost 20 Mbit/s when measuring six channels at 51.2 kHz bandwidth and 24-bit Dyn-X samples. The modules are all capable of handling their own maximum traffic while the built-in switch in the frame’s backplane has more than sufficient capacity. This means that bottlenecks can only occur outside these, for example in:
- External switches
- PC

For convenience, it is possible to daisy-chain LAN-XI frames. However, It is not recommended to daisy-chain more traffic than corresponds to 32 Type 3050s

PTP PERFORMANCE
PTP Synchronisation (with 1 Gigabit LAN Switch): Typical sample synchronisation better that 200 ns (approx. ±0.07° @ 1 kHz, ±2° @ 25.6 kHz)
Tested with:
- Linksys® SRW2008MP, 8-port Gigabit Switch (PoE)
- Netgear® 5-port Gigabit Switch GS105

Better performance can be expected with a dedicated PTP switch

Ordering Information

Type No.[a]	Name	Accessories Included	Optional Accessories
3050-A-060	6-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)	UA-2100-060 Detachable front panel with 6 BNC input connectors	UA-2101-060 Detachable front panel with 6 LEMO input connectors
3050-A-040	4-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)	UA-2100-040 Detachable front panel with 4 BNC input connectors	UA-2101-040 Detachable front panel with 4 LEMO input connectors
3050-B-060	6-ch. Input Module LAN-XI 51.2 kHz (CCLD, V)	UA-2100-060 Detachable front panel with 6 BNC input connectors	
3050-B-040	4-ch. Input Module LAN-XI 51.2 kHz (CCLD, V)	UA-2100-040 Detachable front panel with 4 BNC input connectors	
3160-A-042	Generator, 4/2-ch. Input/Output Module LAN-XI 51.2 kHz (Mic, CCLD, V)	UA-2100-060 Detachable front panel with 6 BNC input/output connectors	UA-2102-042 Detachable front panel with 4 LEMO input and 2 BNC output connectors
3160-A-022	Generator, 2/2-ch. Input/Output Module LAN-XI 51.2 kHz (Mic, CCLD, V)	UA-2100-022 Detachable front panel with 4 BNC input/output connectors	UA-2102-022 Detachable front panel with 2 LEMO input and 2 BNC output connectors
3160-B-042	Generator, 4/2-ch. Input/Output Module LAN-XI 51.2 kHz (CCLD, V)	UA-2100-060 Detachable front panel with 6 BNC input/output connectors	
3160-B-022	Generator, 2/2-ch. Input/Output Module LAN-XI 51.2 kHz (CCLD, V)	UA-2100-022 Detachable front panel with 4 BNC input/output connectors	
3660-D	11-module LAN-XI Front-end Frame	Built-in mains power transformer Ruggedized RJ45 data connector (Neutrik NE8MC-1)	AQ-1776 3660-D Frame DC Power Cable AQ-1777 3660-D Frame DC Power to Car Utility Connector AO-0087-D-xxx BNC Cable for synchronisation of combined LAN-XI and IDA^e systems xxx = length in decimetres
All Input/Output Modules		ZG-0426 Mains Adaptor (100 – 240 V) AO-1450 Shielded CAT 6 LAN Cable with RJ45 (2 m)	

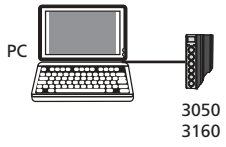
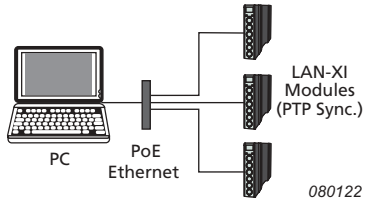
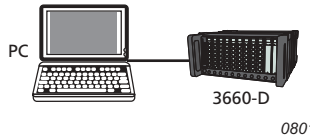
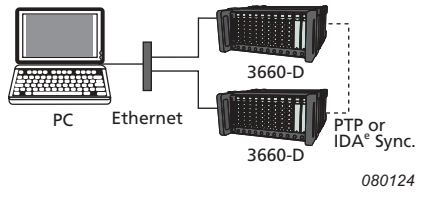
a. -A- versions are multipurpose input/output modules capable of providing microphone polarization voltage. -B- versions are “DeltaTron Only” input/output modules

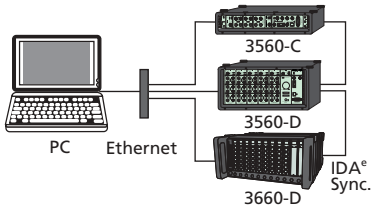
System Configurations

The table below gives ordering information for different system setups – from single-module to mixed multi-frame systems

Note: Any LAN switch can be used; however, if PoE is required, we recommend:

- UL-0252 PoE LAN Switch: Linksys SRW2008MP, 8-port Gigabit Switch

	**SINGLE-MODULE SYSTEM** • Select the preferred variant of Type 3050 or Type 3160 (see Table 1 for details) • Add an optional front panel if required (see Fig. 1 and Table 1)
	**DISTRIBUTED SYSTEM** • Select any number of the variants of Type 3050 and Type 3160 (see Table 1 for details) • For operation using PoE, add a PoE switch and appropriate LAN cabling • Add optional front panels as required (see Fig. 1 and Table 1)
	**SINGLE LAN-XI FRONT-END SYSTEM** • Select 11-module LAN-XI Front-end Frame Type 3660-D • Add up to 11 modules of Type 3050 and/or Type 3160 (see Table 1 for details) • Add Battery Modules Type 2831 as required (can be used in a frame two at a time) • Add optional front panels as required (see Fig. 1 and Table 1)
	**MULTIPLE LAN-XI FRONT-END SYSTEM** • Select the required number of 11-module LAN-XI Front-end Frames Type 3660-D • For each Type 3660-D, add up to 11 modules Type 3050 and/or Type 3160 (see Table 1 for details) • Add Battery Modules Type 2831 as required (can be used in a frame two at a time) • Add optional front panels as required (see Fig. 1 and Table 1) • If using a cable for IDA^e synchronisation, add one BNC Cable for each frame after the first



COMBINED LAN-XI AND IDA^e SYSTEM

- Select the required number of 11-module LAN-XI Front-end Frames Type 3660-D
- For each Type 3660-D, add up to 11 modules of Type 3050 and/or Type 3160 (see Table 1 for details)
- Add Battery Modules Type 2831 as required (can be used in a frame two at a time)
- Add optional front panels as required (see Fig. 1 and Table 1)
- For IDA^e synchronisation, add one BNC Cable for each frame after the first

OPTIONAL ACCESSORIES

AO-0090	7-pin LEMO to BNC male (1.2 m) for floating ground
AO-0091	7-pin LEMO to BNC female (1.2 m) for floating ground
AO-0526	4-pin Microtech to 3 × BNC Cable
AO-0546	DC Power Cable, Car Utility Socket to 1 module
AO-0548	DC Power Cable, Source to 4 modules
AO-1450	Shielded CAT 6 LAN Cable with RJ45 (2 m)
JJ-0081	BNC Adaptor, female to female
JJ-0152	BNC T-connector
JP-0145	BNC to 10–32 UNF Plug Adaptor
UA-1713	10 × 2 mm Allen Key (QX-1315) for front panel exchange
UL-0252	Linksys SRW2008MP, 8-port Gigabit Switch (PoE)
WB-1497	20 dB Attenuator

SOFTWARE

Please refer to the System Data for PULSE Software (BU 0229)

NOTEBOOK PCs[a]

7200-D-xxy[b, c] Dell® Standard Notebook
7201-D-xxy[b, c] Dell® High-end Notebook
7204-A-xx[b] Crete ROCKY II Plus EX Ruggedized Notebook

TOWER PCs[a]

7202-D–xxy[b, c] Dell® Optiplex GX280 Standard Desktop
7203-B-xxy[b, c] Dell® Precision 690 High-end Tower PC

PC ACCESSORIES

UL-0200	Vehicle Adaptor (12 – 32 V) for 7204-A-xx[b]
UL-0213	Dell® 17″ Flat Panel Display TFT
UL-0217	Dell® 19″ Flat Panel Display TFT

a. PCs are constantly updated. Contact your local dealer for latest information.
b. xx specifies country: DE, DK, ES, FR, GB, IT, RU, SE, US
c. y specifies inclusion of Microsoft® Office Pro: 1 – not included; 2 – included

Service Products

ACCREDITED CALIBRATION

3050-CAI: 3050 Initial Accredited Calibration
3160-CAI: 3160 Initial Accredited Calibration
3050-CAF: 3050 Accredited Calibration
3160-CAF: 3160 Accredited Calibration

TRACEABLE CALIBRATION

3050-CTF: 3050 Traceable Calibration
3160-CTF: 3160 Traceable Calibration

CONFORMANCE TEST

3050-TCF: 3050 LAN-XI Conformance Test with Certificate
3160-TCF: 3160 LAN-XI Conformance Test with Certificate

A wide range of Brüel & Kjær Accelerometers, Microphones, Preamplifiers and Sound Intensity Probes is available for use with a Type 3660 system. The system supports IEEE 1451.4-capable transducers with standardised TEDS

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