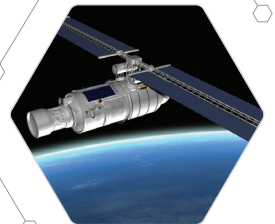
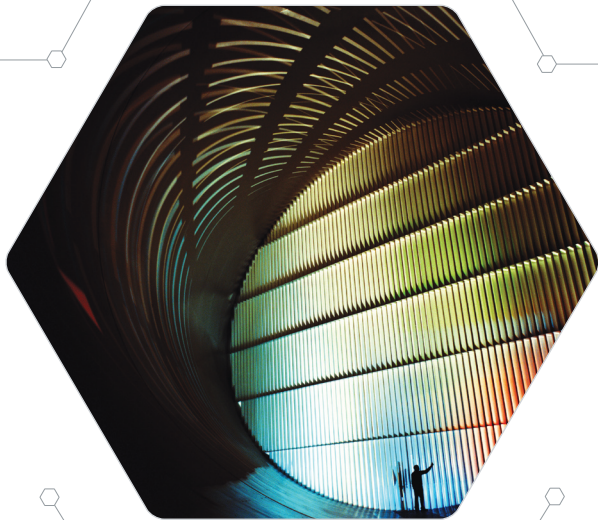




Series 6000

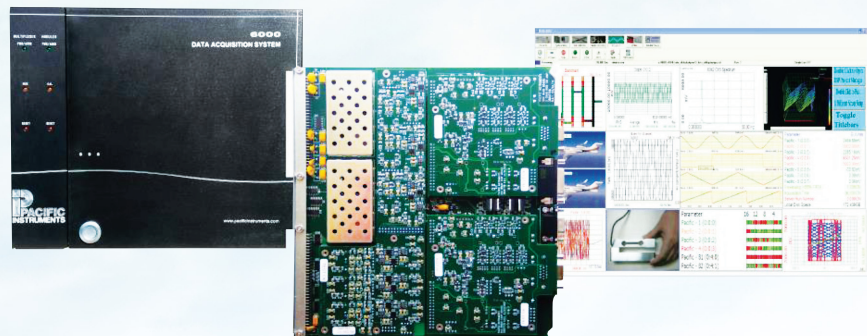
VPG(Micro-Measurements) 통합 DAQ SYSTEM



Overview

This system description describes a COTS Series 6000 integrated conditioning, acquisition and control system and is recommended for SEMES. Based on the requirements given the information below is a summary of the various components which meet the requirements.

An innovative and fully integrated modular transducer conditioning, acquisition and control system, the Series 6000 has unparalleled performance and accuracy. From two to many thousands of channels, high & low speed, analog & digital, Series 6000 acquires measurement data from virtually all types of sensors and is fully customizable to fit the needs of any test facility. Large & small, AC & DC powered enclosures are available for nearly any test environment. Analog and digital I/O modules condition, amplify, filter and digitize signals from transducers. Turnkey and/or API software is provided to help facilities get up and running quickly. Configuring the Series 6000 system begins with selecting Enclosures, I/O Modules & Software.



VPG(Micro-Measurements) 통합 DAQ SYSTEM Series 6000

검증된 데이터수집장치만 사용하는 NASA Marshall Flight Center와 나로우주센터에서 메인 장비로 사용해서 잘 알려진 Series 6000은 신뢰성 있는 데이터 측정을 보장합니다.



멀티채널 동시 측정가능

2 to 10,000 channel까지 멀티채널 동시 측정가능

모든 센서 측정 가능

Strain Gage, Load cell, LVDT, Thermocouple, ICP/IEPE

High sample rate

- up to 200kS/s(Module for ICP/IEPE)
- up to 10kS/s(Module for strain gage)

다양한 환경 측정 가능

AD & DC powered enclosures를 통해 다양한 환경 측정 가능

On-board storage for data redundancy

전용 Software PI660

CONNECT TO SENSORS IN SEVERAL EASY STEPS



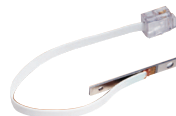
| Strain Gage |



| LVDT |



| Load Cell |



| Thermocouple |

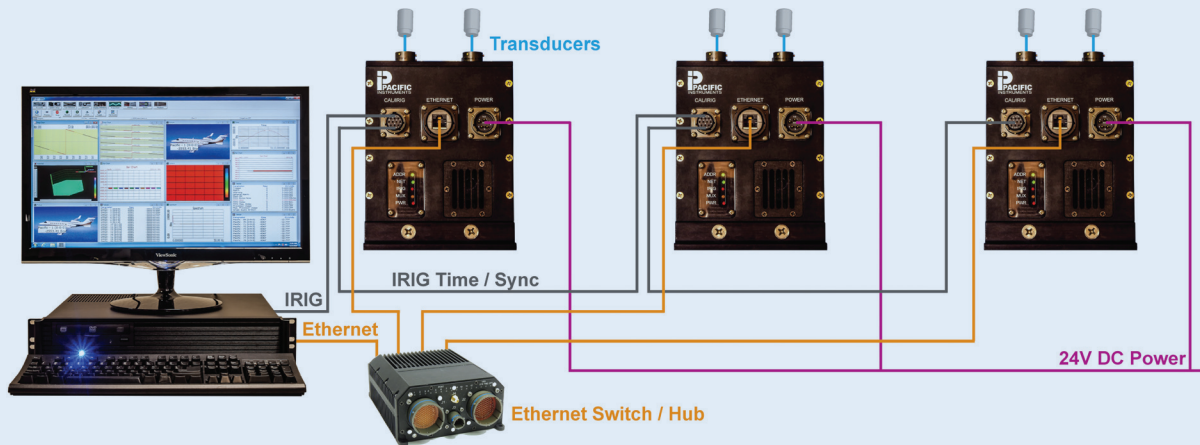


| Pressure sensor |



| Accelerometer |

Networking Diagram



Series 6000 Enclosures | 기본 구성품



Four enclosures are available as part of the Series 6000 System : Large, Small and two DC powered portables.

Common features include :

- Any number or combination of racks
- Over 20 MS/s, simultaneous sampling per system
- Multiple, distributed system support
- On-board storage for data redundancy
- Distributed Sample Clock, Alarm & Calibration Bus
- IRIG A, B or G
- Support any I/O module in any slot

The native interface for the enclosure is USB 2.0 and can be configured for Ethernet. There are many ways to configure a system. Multiple racks can be combined to provide a single larger system or used individually to create smaller, lower channel count

installations. The systems can be run locally (near a test cell) or remotely from a control room. This allows the test operators to setup, configure and calibrate the system locally near the test article and remotely while a test is in progress.

An Operator's Workstation is the primary control and data recording point for the Series 6000 System. Typically installed in the control room, the Operator's Workstation runs PI660 Data Acquisition Software for system setup, calibration, display, recording, distribution and export. Multiple, distributed systems are supported and controlled through a single Operator's Workstation.

A system can even be configured and used over wireless technology, allowing even greater control over the system. For example, a technician can change gain and filter settings on a touch screen tablet style PC while performing system checkouts and test readiness.

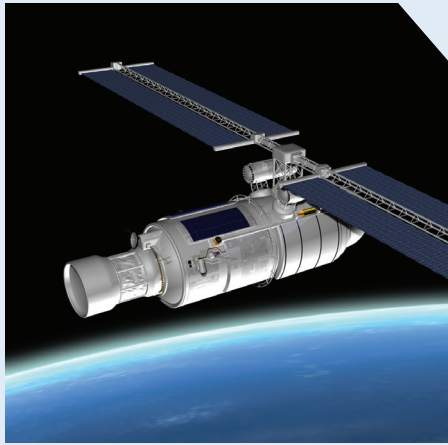
Data redundancy is optionally available and mounts on the controller board in each Series 6000 enclosure, creating a redundant recording point for the system. In the unlikely event the Operator's Workstation or application software fails, data will continue to record in each enclosure and can be recovered from the system post-test.

Recommended Enclosure | 추천 구성품

| Model 6005U - 10-Slot DC Powered USB Enclosure |

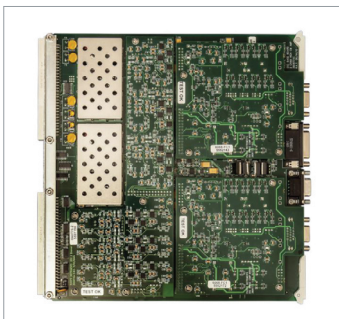
The 6005U enclosure has 10 slots for Series 6000 input/output modules and a USB interface for programming, control and data output to an Operator's Workstation. Power is 10 to 20 VDC for mobile applications. An included power adapter is provided for operation from 120/240 VAC. It has integral fans that supply cooling air to the modules and power supply and all front mounted controls and connectors allowing the 6005 to be located in the tightest of spaces. RJ45 connectors are typically used for strain gage measurements while BNC are used for Voltage/IEPE measurements.

Application | 응용분야



- DC Enclosure for 10 I/O Modules
- USB 2.0 Interface provides 5+ MS/s aggregate data rate
- Calibration voltage input
- Alarm busses for control external equipment
- Optional remote operation using gigabit Ethernet
- Optional on-board data storage
- Built-in fans and front mounted connections

| Series 6000 Input/Output Modules |



Many I/O modules are available as part of the 6000 product line. Series 6000 input/output modules condition, amplify, filter and digitize signals from analog and digital measurements for data display and recording. I/O modules are available for strain gage and bridge transducers, ICP/IEPE, temperature, displacement, position, digital measurements, etc. Many analog modules even provide a buffered analog output in addition to the digitized output, allowing easy access to analog systems for redundant recording.

All modules can be mixed and matched to meet test requirements and are easily changed as testing requirements change. Many of the Series 6000 I/O Modules can be used with more than one measurement type and are able to be reconfigured or custom designed to fit any application.

| Analog Input/Output modules |

Series 6000 analog I/O modules condition, amplify, filter and digitize signals from virtually any transducer. All modules have conditioning & amplifier per channel and nearly all modules allow for setting bridge completion, shunt calibration, transducer power, gain, etc. individually per channel. Following the conditioning/amplifier stage, multi-pole Bessel or Butterworth analog filters are provided on each channel and can be set or bypassed individually by program control. A number of the modules include a high level analog output providing a conditioned/filtered output to a redundant, external A/D system. A 16-Bit Successive Approximation A/D follows the analog filter stage. Some modules use a single A/D with sample and hold while others have an A/D per channel. Sample rates are programmable per channel to easily accommodate mixing high and low speed measurements into a single data stream. Programmable hardware based warnings and alarms are included in the channel-by-channel architecture and are detected by digital output modules in the system, providing an ultra-low latency control capability directly from the data acquisition system.



| Digital Input/Output modules |

Series 6000 digital I/O modules record signals from frequency counters, flow meters, encoders, discrete transducers, IRIG time, etc. which are often part of the test environment. These digital signals are time aligned and recorded alongside the system's analog measurements. High density digital inputs provide an opportunity to easily include facility controls like switches, valve positions, relays, lights, etc. along with the test data. Series 6000 digital I/O modules also provide outputs generated by user command or automatically by Sequence, Alarms or DSP. User generated outputs are accomplished in software while sequencers can be programmed prior to a test and initiated by program or hardware control. Alarm conditions preprogrammed on the analog side can automatically generate digital outputs which are typically connected to facility control systems or PLCs. A DSP adds powerful real-time processing and is appropriate for PID control loops, derived parameter calculations and a variety of other real-time operations.

Recommended Module for Thermocouple

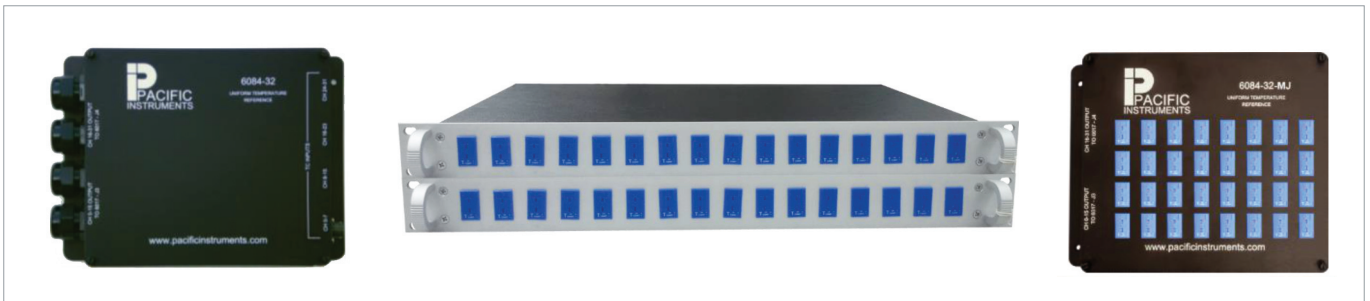
| Model 6017 - 32-Channel Multiplexed Thermocouple/Voltage Amplifier-Filter-Digitizer |



The 6017 input module has 32 channels divided into four multiplexed groups. Each 8-channel group has a differential instrumentation amplifier with programmable gain and digitizer. The input of each channel has a two-pole low-pass filter for noise reduction and the sample rate is programmable up to 2kS/s with 16-bit resolution. Due to its wide full scale signal range, ± 2 mV to ± 10 Volts, the 6017 is the ideal solution to digitize low and high-level analog signals. When used for Thermocouple applications, the 6017 has an additional input channel used for TC referencing from its companion 32-channel Uniform Temperature References.

- Voltage & thermocouple inputs
- Optional thermocouple reference junction box
- Gains 1 to 5,000 with 0.05% accuracy
- Automatic zero & gain calibration
- Low-pass filter
- Up to 2 kS/s per channel with 16-bit resolution
- Two alarms with programmable upper & lower limits

| Thermocouple References – Model 6084-32-RTD (Universal, Mini Jack) |

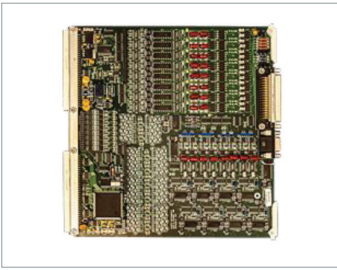


Recommended Module for ICP/IEPE

| Model 6029 - 8-Channel Voltage/IEPE Amplifier-Filter-Digitizer+Buffered Output |

The 6029 input module has 8 voltage input channels each with programmable AC or DC-coupled differential instrumentation amplifier, low-pass filter and analog to digital converter per channel. Analog Bandwidth is 1 Hz (AC coupled) or DC (DC coupled) to 100 kHz and sample rate is programmable up to 200 kS/s with 16-bit resolution. In addition to the digitized output, each channel has a buffered analog output that can be selected for wideband or filtered response. 4, 6 or 8-Pole filters with multiple cutoffs are available.

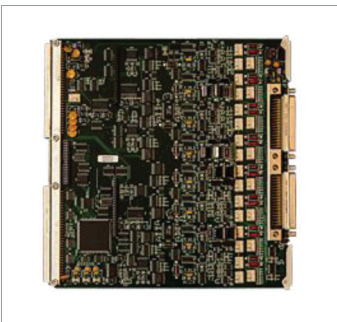
The 6029 is used to condition high or low level voltages or signals from piezoelectric transducers with built-in or in-line charge amplifiers having low-impedance outputs. It provides a current source, with 24-Volt compliance, which is adjustable from 2 mA to 20 mA for powering IEPE transducers. AC or DC input coupling is programmable enabling its use in static and dynamic applications. Input attenuation and current inputs, including 4-20 mA current loop, are available.



- AC or DC coupled inputs
- 2 to 20 mA current excitation
- Gains 1 to 5,000 with 0.05% accuracy
- 4, 6 or 8-pole, low-pass filter
- 100 kHz signal bandwidth
- Up to 200 kS/s per channel with 16-bit resolution
- Buffered ± 10 Volt analog

Recommended Module for Strain & Load Cell

Model 6039 - 8-Ch Strain/Bridge/Position Transducer Amplifier-Filter-Digitizer



The 6039 input module has 8-channels for strain gage, bridge and position type transducers like LVDT's each with amplifier, low-pass filter and analog to digital converter. Analog Bandwidth is 1 kHz and sample rate is programmable up to 10 kS/s with 16-bit resolution. The filter is available in 4, 6 or 8-pole configurations with multiple cutoff frequencies.

Model 6039 is the recommended module for facilities that make both strain/bridge transducer and position measurements. The 6039 has a 10-wire, shielded input accommodating all bridge and strain gage wiring techniques. Each channel has bridge completion for $\frac{1}{4}$, $\frac{1}{2}$, and full bridge transducers, individually programmable/regulated voltage excitation, automatic zero and balance and shunt calibration. Alternate pins provide transducer power (± 12 or 15V) for sensors like LVDT's or string pots.

- Programmable input configuration, $\frac{1}{4}$, $\frac{1}{2}$ & full bridge
- Programmable voltage excitation with remote sensing
- Additional 12 or 15 Volt transducer power
- Two-step shunt & voltage substitution calibration
- Gains 1 to 5,000 with 0.05% accuracy
- Programmable 4, 6 or 8 pole low-pass filter
- Up to 10kS/s per channel with 16-bit resolution
- Two alarms with programmable upper & lower limits

PI660: Professional Test & Measurement Software



Many facilities don't have the time, resources or interest in creating their own software applications. Save valuable time and money with PI660 Series 6000 Test and Measurement Software. PI660 is a turnkey application that runs on Microsoft Windows Operating Systems. Pre-test operations include: system setup, test definition & tracking, system & transducer calibration. Real-time features include: display, acquisition & data distribution to display clients. Post-test functions include: data replay, plotting and export to 3rd party formats for analysis. When facilities choose PI660, setup time is greatly reduced, allowing users to focus on what matters most: testing, not writing software.

Realizing that many facilities already have specific application software to use or may have the need to write their own, PI660 also has an application programmer's interface (API). The API encapsulates the real time core of PI660 and allows the user/programmer to integrate Series 6000 hardware into their own software without having to start from the low level. The PI660 API can be utilized by any software or development tools that can call a DLL. Using the DLL approach to custom software development allows the facility to easily stay up to date with any future hardware or software functionality added to the Series 6000 System.



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Technology

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