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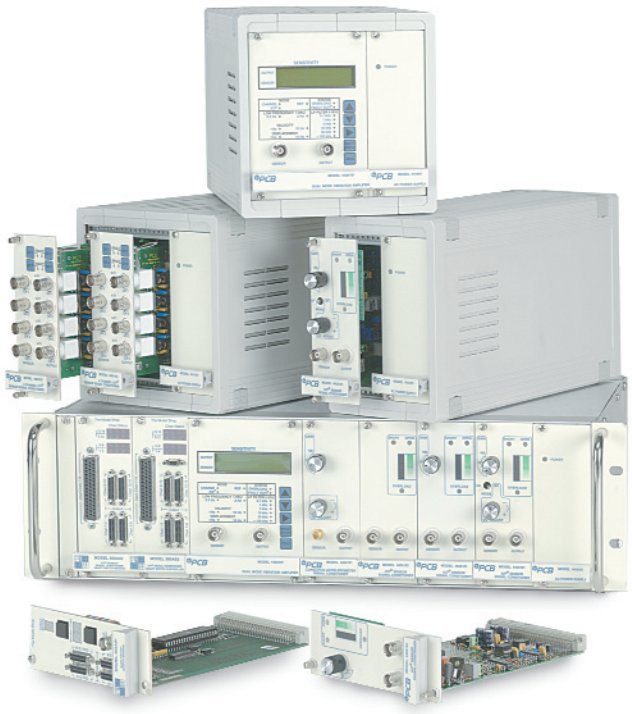
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Find the *PCB Piezotronics 440* at our website: *Click HERE*

Modular Signal Conditioning System

For Conditioning ICP®, Charge, TEDS, and PCB Capacitive Sensors

- Powers ICP®, Charge, and PCB Capacitive Sensors
- Reconfigures Quickly with Flexible Modular Design
- Expands Economically as Needs Grow
- Simplifies Multi-Channel Testing with VXI Compatibility
- Supports TEDS Sensors with Mixed Mode Operation



The PCB **Series 440** Modular System is a versatile sensor signal conditioning and channel management system. With 20 plug-in modules currently available, the Modular System can be configured to meet the signal conditioning requirements of most sensors. The system is compatible with piezoelectric charge, ICP®, TEDS, and PCB capacitive sensors. It can be configured into a single signal conditioner such as a charge amplifier or it can be expanded into a multi-channel signal conditioning and channel management system. Since all signal conditioner modules are compatible, adding new modules is easy and economical.

PCB PIEZOTRONICS INC.
ELECTRONICS DIVISION

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PCB Modular 440 System Description

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System Flexibility

The Modular System consists of a series of chassis, power supplies, and plug-in sensor signal conditioning modules. These modules can be mixed and matched as necessary to construct signal-conditioning systems that meet the diversified needs of most tests. The Modular System supports all types of piezoelectric sensors, including TEDS, and PCB capacitive (DC) sensors. Supported sensors include all types of charge, Integrated Electronics Piezoelectric (IEPE) and PCB capacitive accelerometers, force sensors, pressure sensors, microphones, and PCB ICP® strain sensors.

Multi-channel signal conditioner modules are also available to power large arrays of sensors from a very compact unit. This system is particularly beneficial in modal analysis testing, vehicle testing, and acoustic array testing. Cable management is greatly simplified using multi-pin connectors, rather than individual cables. This reduces the potential for cable routing errors and other cable problems. Bank switching makes possible the selection of large groups of sensor signals to route them to a multi-channel analyzer as needed. This greatly simplifies and expedites multi-channel testing.

Whether an application calls for a single channel of signal conditioning or many, the PCB Modular System will meet your needs today and grow to meet tomorrow's needs as well.

Sensors Supported

The Modular System includes signal conditioning for the following piezoelectric, capacitive, and smart sensors.

ICP® Sensors

- Accelerometers
- Force Sensors
- Pressure Sensors
- Microphones
- Strain Sensor

PCB Capacitive

- Accelerometers

Smart Sensors

- IEEE P1451.4 TEDS -Compliant

Charge Mode Sensors

- Accelerometers
- Force Sensors
- Pressure Sensors

Expand The Possibilities

Specifying a configuration for the Modular System is as basic as selecting a preconfigured signal conditioner or as detailed as specifying a completely customized signal conditioning system. Enter the Modular System at the level that meets current needs, then expand as test requirements grow.

Specifying a modular system is easy; it can be thought of as a multi-layer process. Review the system levels described on page 3 and select the one that most closely defines your desired system. Level 1 consists of preconfigured signal conditioners; Level 2, customized signal conditioners; Level 3, multi-channel signal conditioners; or Level 4, a combined multi-channel customized system. After selecting the level of features needed, follow the appropriate step-by-step procedures on pages 5, 7, or 9 to define the desired system. If you require a Level 4 system, contact a PCB technical representative for assistance.

Modules Available

- Single-channel ICP sensor signal conditioners
- Multi-channel ICP sensor signal conditioners
- Charge amplifiers
- PCB capacitive sensor signal conditioners
- Bank switching for ICP sensors and voltage signals
- AC and DC power supplies
- Smart sensor signal conditioners
- Computational signal conditioner
- Charge summing panel

Features such as gain, coupling, and time constant vary between modules. *See the signal conditioner module descriptions on pages 10 to 15 in this brochure for specifications.*

PCB specializes in custom product development. Should you encounter an application that requires signal conditioning capabilities not found in current modules, please contact PCB to discuss a custom module tailored to suit your needs.

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Level 1 — Preconfigured Signal Conditioners

PCB offers various preconfigured signal conditioners to meet many typical applications. For low channel-count applications involving charge amplifiers, ICP® sensor signal conditioners, or PCB capacitive sensor signal conditioners, simply select the preconfigured signal conditioner that meets testing needs. *See the step-by-step configuration guide for specifying preconfigured signal conditioners on page 5 of this brochure.*



Preconfigured Dual-Mode Vibration Amplifier and ICP Sensor Signal Conditioner

Level 2 — Customized Signal Conditioners

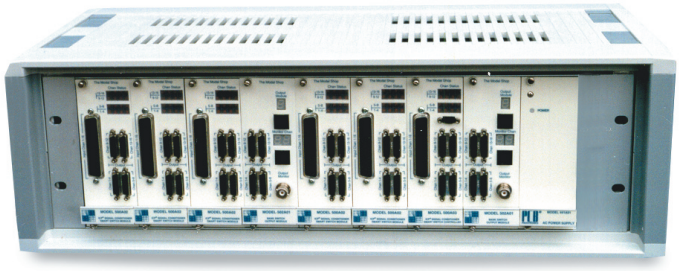
The modular nature of the system allows the user to select the required signal conditioner modules and configure them into a single system. If desired, a single system can be furnished to support ICP, charge, and PCB capacitive sensors in any quantity. *See the step-by-step configuration guide for specifying customized signal conditioners on page 7 of this brochure.*



Customized Signal Conditioning Systems

Level 3 — Multi-Channel Signal Conditioners

The Modular System has several special signal conditioner modules specifically designed for simplifying power and cable management for multi-channel testing. Additionally, bank switching is available to simplify the switching of large numbers of channels into a multi-channel data acquisition system. *See the step-by-step configuration guide for specifying multi-channel signal conditioning systems on page 9 of this brochure.*



Multi-Channel Signal Conditioner

Level 4 — Combined Multi-Channel Customized Systems

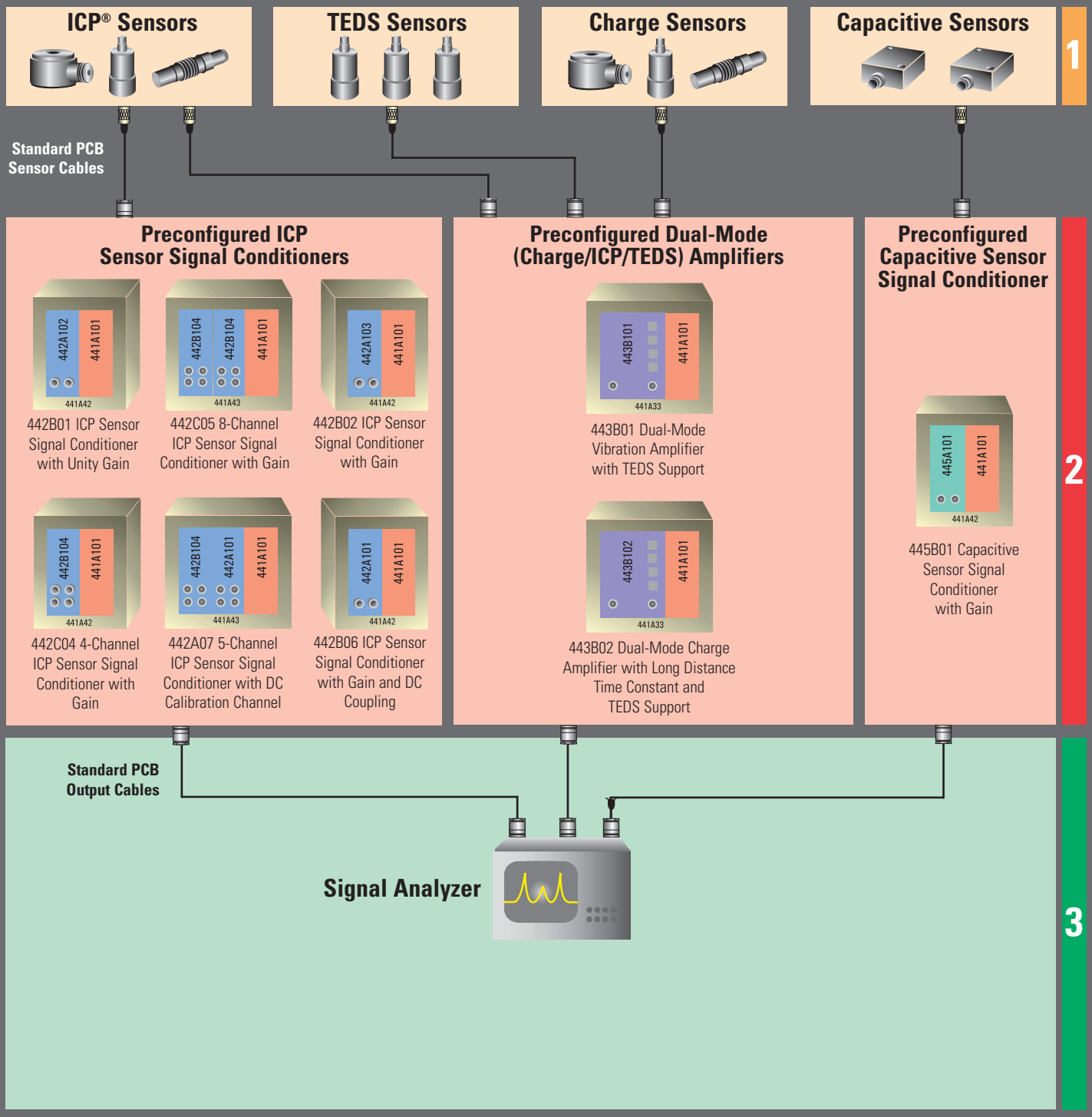
When tests call for a mixture of signal conditioning solutions, the Modular System meets the challenge. Modules from the customized signal conditioners and multi-channel signal conditioning systems can be mixed and matched as needed to meet most test requirements. Due to the wide range of possibilities available for these types of systems, please contact a PCB sales representative for assistance in configuring combined systems.



Combined System

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PRECONFIGURED SIGNAL CONDITIONERS



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Level 1 — Preconfigured Signal Conditioner Configuration Guide

STEP 1 Select the sensor required for the test.

STEP 2 Select the preconfigured signal conditioner that supports the sensor specified in step 1. *See the signal conditioner module descriptions on pages 10 to 12 for specifications on the modules.* Also select the appropriate standard PCB sensor cable to connect the sensor to the signal conditioner.

STEP 3 Select the standard PCB output cable to connect the signal conditioner to the readout device.



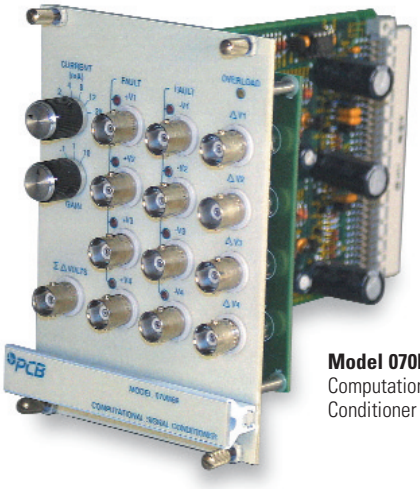
***Note**: Other signal conditioner modules can easily be interchanged with the modules supplied in the preconfigured signal conditioners. For example, the 443B101 dual-mode vibration amplifier module can easily be replaced with two 442B104 four-channel ICP® sensor signal conditioner modules, converting the instrument into an eight-channel ICP sensor signal conditioner (See photo). When a charge amplifier is again required, the dual-mode vibration amplifier module may be reinstalled. If a rack-mount chassis is selected, several signal conditioners are available in a single rack as shown in the photo on page 7.*

Computational Modules

PCB offers two specialized computational modules that can be used independently or as part of the Force-Limited Vibration Testing System (page 7).

Computational Signal Conditioner

The Model 070M69 Computational Signal Conditioner computes the difference and outputs up to four pairs of signals and provides the summation of the differences. The unit can be used with voltage signals or supplies constant current excitation for ICP® sensors.



Model 070M69
Computational Signal Conditioner

Charge Summing Panel

The Model 070M70 Charge Summing Panel outputs the sum of up to eight charge signals.

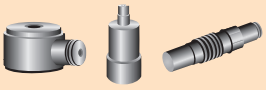


Model 070M70
Charge Summing Panel

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CUSTOMIZED SIGNAL CONDITIONERS

ICP® Sensors



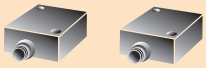
TEDS Sensors



Charge Sensors



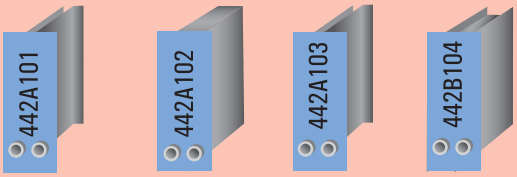
Capacitive Sensors



1

Standard PCB Sensor Cables

ICP Sensor Signal Conditioner Modules



Single Channel with Gain and AC/DC Coupling

Single Channel with Unity Gain

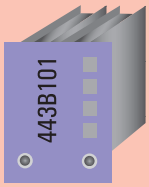
Single Channel with Gain

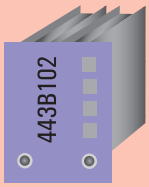
Four Channel with Gain

Dual-Mode Amplifier Modules

(Operates as both a Charge Amplifier and ICP Sensor Signal Conditioner)

Dual Mode Vibration Amplifier





Dual Mode Charge Amplifier

PCB Capacitive Sensor Signal Conditioner Module



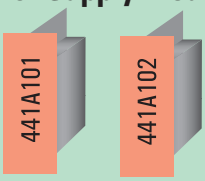
Capacitive Module with Gain

2

Power Supply Modules

Insert Modules into Slots in Chassis; Power Module must be in the Right Most Slot of a Chassis

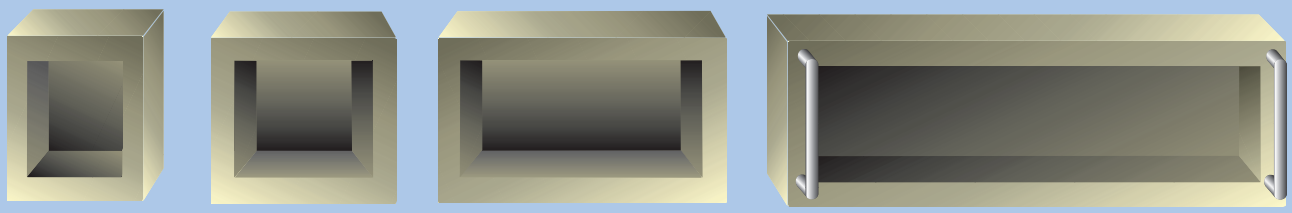
AC Power Supply 45 W



DC Power Supply 30 W

3

Chassis



2-Slot Chassis
441A42 Standard

3-Slot Chassis
441A33 Master
441A43 Standard

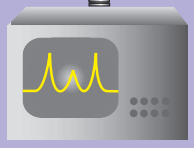
5-Slot Chassis
441A35 Master
441A45 Slave

9-Slot Chassis
441A38 Master with 100W Power Supply
441A39 Master
441A49 Slave

4

Standard PCB Output Cable

Signal Analyzer



5

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Level 2 — Customized Signal Conditioner Configuration Guide

STEP 1 Select the sensors required for a test.

STEP 2 Select the signal conditioner modules required for use with the sensors specified in step 1. *See the signal conditioner module descriptions on pages 10 to 12 for specifications on the modules.* Also, select the appropriate standard PCB sensor cables to connect the sensors with the signal conditioner modules.

STEP 3 One power supply module is required for each chassis. Calculate the total power consumption in watts for the modules selected in step 2. If the power required is 30 watts or less, either the AC or DC power supply can be used. If the power required is between 30 and 45 watts, then the AC power supply must be used. *Refer to the signal conditioner module specifications on pages 10 to 12 for the power consumption of each module.*

***Note**: For CE compliance, the total power consumption in any chassis cannot exceed 30 watts.*

STEP 4 Calculate the total number of slots required to house the signal conditioner modules. *Refer to the signal conditioner module specifications on pages 10 to 12 for the information required.* To this number, add one slot for each power supply module used. Based on the total number of slots required, select an appropriate number of chassis. *See note below.*

STEP 5 Select standard PCB output cables with connectors that are compatible with both the signal conditioner modules selected in step 2 and the signal analyzer.

***Note**: The number of slots available for signal conditioner modules in any chassis is one less than the total number of slots in the chassis. For example, a standard 9-slot, 19-inch rack-mount chassis has eight slots available for signal conditioner modules. The slot on the right is reserved for the power supply module.*

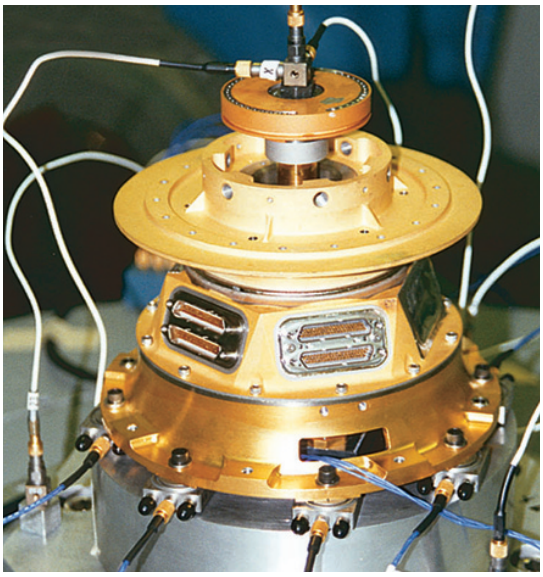
Customized Signal Conditioner



Force-Limited Vibration Testing



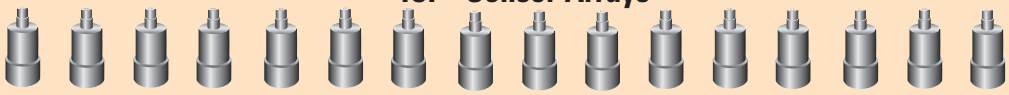
Force-limited vibration testing minimizes over-testing and reduces the risk of damage to critical structures. The PCB® Model 200M184 Force-Limited Vibration Testing System includes 3-component force sensors and the conditioning electronics necessary to meet most agencies' requirements for limiting the reaction force between the shaker and unit under test in random vibration testing. The use of PCB piezoelectric, 3-component force sensors facilitates easy and accurate measurement of the input force.



Vibration Measurements on an Atmospheric Infrared Sounder (used on Earth Observing System)

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1 ICP® Sensor Arrays

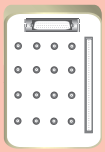


Standard PCB Sensor Cables

2 Multi-Channel Patch Panels



Model 070C21 Patch Panel



Model 070C29 Patch Panel



Model 070A33 Rack Mount Patch Panel

Multi-Pin Input Cables — 009FXX or 009HXX (shielded) DB50 to DB50 (XX specify length)

3 16-Channel ICP Sensor Signal Conditioner and Bank Switch Modules



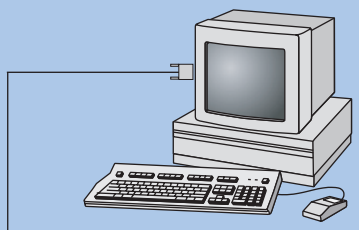
Bank Switch



16-Channel ICP Sensor Signal Conditioner Basic

16-Channel Modules
442B116 — Basic
442B117 — Smart
442B119 — Smart, TEDS
442A121 — Smart, Gain
442A122 — Smart, Gain, TEDS
442A123 — Smart, Filters
442A124 — Smart, Filters, Gain
442A125 — Smart, Filters, TEDS
442A126 — Smart, Filters, TEDS, Gain

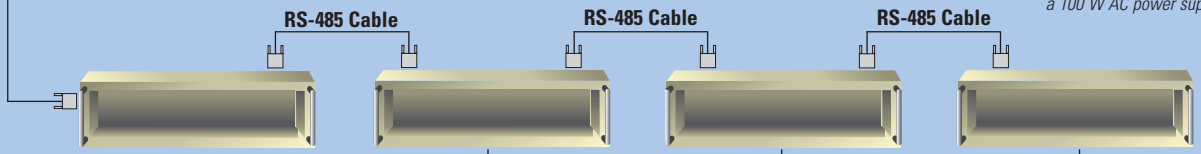
Host Computer with System Control Software



RS-232 Cable

4 Rack-Mount Chassis

***Note**: The 441A38 chassis includes a 100 W AC power supply.*



Connects to Signal Conditioner or Bank Switch Module (see step 3)

Multi-Pin Output Cables
009L05 VXI to 4 BNC (4-channel)
009P05 2 VXI to DB50 (8-channel)
009S08 VXI to VXI (4-channel)

5 Power Supply Modules

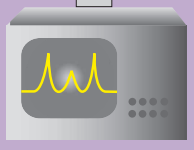
AC Power Supply 45 W





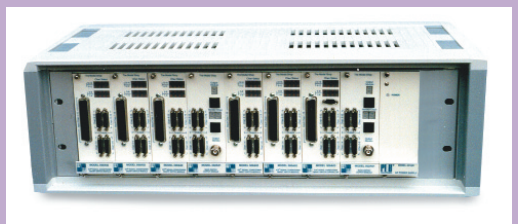
DC Power Supply 30 W

Multi-Pin Output Cable



Signal Analyzer

6



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Level 3 — Multi-Channel Signal Conditioner Configuration Guide

STEP 1 Select the sensors required for a test.

STEP 2 Select the patch panel(s) and standard PCB sensor cables required to connect the sensors to the patch panel(s).

Note: *Patch Panels provide the interface to switch from individual cables to multi-pin cables.*

STEP 3 Select the multi-channel signal conditioner and bank switching modules required to power and switch the sensors specified in step 1. *See the signal conditioner module descriptions on page 14 for specifications on the modules.* Also, select one multi-pin input cable for each multi-channel module used. This cable connects the patch panel output (DB50) connector to the multi-channel module input (DB50) connector.

Note: *Either the 009FXX or 009HXX DB50 to DB50 cable can be used. The 16-channel signal conditioner modules have a DB50 input connector and 4 VXI output connectors. The bank switch has 4-VXI output connectors.*

STEP 4 Each signal conditioner and bank switch module requires one slot in the chassis. Determine the number of master and slave chassis needed based on the total number of modules selected. *See page 10 for a description of chassis.*

Note: *Eight slots are available for signal conditioning modules in each 9-slot,19-inch rack-mount chassis.*

STEP 5 Include one power supply module for each 19-inch chassis selected, except the 441A38 which comes with a 100 W power supply. The 100 W power supply cannot be used with other chassis.

Note: *The power supply module occupies the right-most slot in the chassis. For CE compliance, the total power usage in any chassis cannot exceed 30 watts.*

STEP 6 Select multi-pin output cables with VXI to either VXI, DB50, or BNC connectors that are compatible with the multi-channel analyzer being used.

Note: *For smaller channel count systems requiring only ICP® Sensor Signal Conditioner modules, the 2- and 3-slot chassis can be used. Bank switching can only be used with the 5 and 9-slot chassis.*

Multi-Channel Accessories

Patch panels and multi-conductor cables are key to organizing a test containing large numbers of channels. Rather then running dozens of long cables that often get confused, tangled, and are hard to trace, sensor cables are terminated at a patch panel. From there, multi-conductor cables, typically 009F or 009H shown below, are routed to the input connector of the signal conditioner modules. Four Agilent VXI E1432 connectors provide sensor output signals from the 16-channel signal conditioners. Cable models 009L, 009P, and 009S are available for output to the signal analyzer. In cases where a patch panel is not desired, cable model 009M81 or 009M82 (BNC jack to DB50) can be supplied. **Note:** *The suffix XX on cable models designates they are available in various lengths.*

Patch Panels



Model 070C21
16-Channel Patch Panel
IDC in, DB50 out



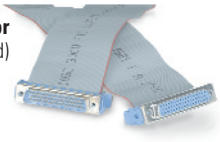
Model 070C29
16-Channel Patch Panel
IDC and BNC in, DB50 out



Model 070A33 32-Channel Rack Mount Patch Panel
IDC and BNC in, DB50 out

Multi-Pin Input Cable

Model 009FXX or 009HXX (shielded)
DB50 to DB50



Model 009M81 (3') or 009M82 (6') BNC Jack to DB50 (not shown)

Multi-Pin Output Cable



Model 009LXX
VXI to 4-BNC



Model 009SXX
VXI to VXI



Model 009PXX
2-VXI to DB50

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Modular System Components

Modular System

The system is composed of three primary interchangeable components: chassis, plug-in power supplies, and plug-in signal conditioner modules. This interchangeability allows the system to be easily customized to meet the signal conditioning needs of most sensors.

Chassis



A chassis is the enclosure into which modules are inserted. It consists of a housing, mechanical brackets that physically hold modules, and a backplane into which the modules plug. Each chassis has a series of slots. A slot is defined as a position in a chassis where a module can be inserted and plugged into the backplane. The backplane is a circuit board assembly in the rear of the chassis that distributes power to the modules and provides the means by which modules communicate with each other, the rest of the system, and a personal computer. A module is a board assembly with its associated mechanical parts, including front panel, shields, and connector that can be plugged into a chassis. A module can occupy one or more slots in the chassis, depending on its width.

System chassis for the Modular System are available in 2-, 3-, 5-, and 9-slot sizes. The 9-slot chassis are standard 19-inch rack mount size. There are three types of chassis available based on their digital communication capability. All three reserve the right-most slot for a power supply module. The Model 441A38 chassis is supplied with a 100 watt power supply. It is the only chassis that includes a power supply and the only chassis that can be used with the 100 watt supply. All other chassis can be used with either the Model 441A101 AC Power Supply or the Model 441A102 DC Power Supply. All chassis come equipped with blank panels (model number 400A17) to cover any unused slots in the chassis.

Chassis are offered with three different levels of digital communication capability. Master chassis include RS-232 and RS-485 interfaces, slave chassis include an RS-485 interface, and standard chassis include no interfaces. The RS-232 interface is used for communication with a host computer. The RS-485 interface is used for communications between up to four daisy-chained chassis.

					Power Supply Compatibility			
					441A101	441A102	Includes	19" Rack
Model	Type	Slots	RS-232	RS-485	AC 45 W	DC 30 W	AC 100 W	Mount
441A42	Standard	2	No	No	x	x		
441A33	Master	3	Yes	Yes	x	x		
441A43	Standard	3	No	No	x	x		
441A35	Master	5	Yes	Yes	x	x		
441A45	Slave	5	No	Yes	x	x		
441A38	Master	9	Yes	Yes			x	x
441A39	Master	9	Yes	Yes	x	x		x
441A49	Slave	9	No	Yes	x	x		x

Power Supply Modules

One power supply is required for each chassis used in a system. Both an AC and a DC power supply module are available. *Note: For CE compliance, the total power consumption in any chassis cannot exceed 30 watts.* The Model 441A101 AC Power Supply module is a 45-watt supply with a universal power input that automatically senses and adjusts to input voltages from 100 to 240 VAC and frequencies from 50 to 60 Hz.

The Model 441A102 DC Power Supply module is a 30-watt supply that can be operated from either an internal rechargeable battery (included) or a 12 VDC source, such as the cigarette lighter in a car, using the included Model 017A22 DC Power Cord. Use of this power supply affords portability and field testing capability to the system. The module comes with a Model 488A08 Battery Charger that plugs into the front panel of the unit. It can be line powered when used in conjunction with optional Model 488A09 Universal AC Power Adapter.



Model 441A101
AC Power Supply



Model 441A102
DC Power Supply

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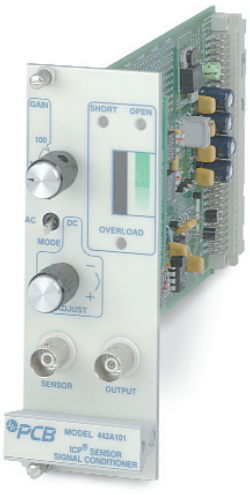
ICP® Sensor Signal Conditioner Modules

All ICP sensor signal conditioners supply a 24 VDC excitation voltage and up to 20 mA (factory set at 4 mA) constant current excitation to power all types of ICP sensors, including accelerometers, force sensors, microphones, pressure sensors, and dynamic strain sensors. All models are low noise and are CE marked when installed in a PCB chassis. Modules are available in single or four-channel configurations, have AC and/or DC coupling, and have a wide frequency response. *Refer to the* ICP *Sensor Signal Conditioner Module Specifications Table (below) for a comparison of module specifications.*

ICP® Sensor Signal Conditioner Module Specifications

Model Number	442A101	442A102	442A103	442B104
Channels	1	1	1	4
Excitation Voltage	24 VDC	24 VDC	24 VDC	25.5 VDC
Constant Current Excitation (preset to 4)	1 to 20 mA	1 to 20 mA	1 to 20 mA	0.5 to 20 mA
Voltage Gain	x1, x10, x100	Unity	x1, x10, x100	x1, x10, x100
Coupling	AC/DC	AC	AC	AC
Time Constant	>10 sec	>10 sec	>10 sec	>10 sec
Frequency Response (-5%)	DC to 100k Hz	0.05 to 100k Hz	0.05 to 100k Hz	0.05 to 100k Hz
Broadband Noise[1] (1 Hz to 10 kHz)	9.11 µV	7.2 µV	8.91 µV	8.5 µV
Output Range	±10 V	±10 V	±10 V	±10 V
Power Consumption	2.0 W	1.25 W	1.5 W	5.5 W
Chassis Slots	1	1	1	1
Input Connectors	BNC	BNC	BNC	BNC
Output Connectors	BNC	BNC	BNC	BNC

[1] AC coupled, gain x 1



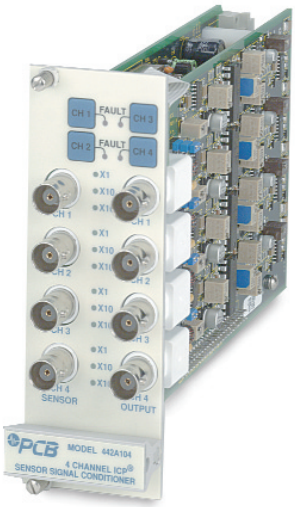
Model 442A101
Single-Channel ICP® Sensor Signal Conditioner with AC/DC coupling and x1, x10, x100 Gain



Model 442A102
Single-Channel ICP® Sensor Signal Conditioner with unity Gain



Model 442A103
Single-Channel ICP® Sensor Signal Conditioner with x1, x10, x100 Gain



Model 442B104
Four-Channel ICP® Sensor Signal Conditioner with x1,x10, x100 Gain

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Dual-Mode Amplifier Modules

The Dual-Mode amplifiers are multiple-purpose signal conditioners and amplifiers that can be used as an ICP® sensor signal conditioner, charge amplifier, or general-purpose instrumentation (voltage) amplifier. Additionally, these units support digital communication with TEDS Sensors. TEDS (Transducer Electronic Data Sheet) are smart transducers that conform to IEEE P1451.4. The dual-mode amplifiers are microprocessor based, menu driven, have a digital display, and set all parameters to four-digit accuracy. Additionally, they have low pass filters, single and double integration, continuous gain, and can normalize sensor sensitivities. The amplifiers also provide sensor fault detection, sensor and amplifier overload detection, and operate in both English and Metric units. The dual-mode amplifiers have a very low noise floor and are CE marked when installed in a PCB chassis. ***Note:*** *The Model* 443B101 *(shown) is the standard vibration amplifier. Also available is the Model* 443B102*, long discharge time constant unit, for quasi-static measurements and calibration.*



Model 443B101 Dual Mode Amplifier

Dual-Mode Amplifier Module Specifications

Model Number	443B101	443B102
Channels	1	1
Input Sensor Type (selectable)	ICP, charge, voltage,TEDS	ICP, charge, voltage,TEDS
Input Sensitivity Adjustment	0.001 to 9999 pC or mV/unit	0.001 to 9999 pC or mV/unit
Excitation Supplied (ICP mode)	24 VDC @ 0-20 mA	24VDC @ 0-20 mA
Voltage Gain (ICP, voltage, and TEDS modes)	0.1 to 1000	0.1 to 1000
Charge Converter (charge mode)	0.1 to 10,000 mV/pC	0.1 to 10,000 mV/pC
Charge Input Limit	100,000 pC	100,000 pC
Accuracy	±1%	±1%
Output Range	±10 V	±10 V
Discharge Time Constant (selectable)	0.18, 1.8 sec	0.18, 1.8, 10, 100, 1000, >100k sec
Low Frequency Response (-10%)	2, 0.2 Hz	2, 0.2, 0.03, 0.003, ~0 Hz
High Frequency Response (-10%)	100, 1k, 3k, 10k, >100k Hz	100, 1k, 3k, 10k, 100k, >200k Hz
Integration (selectable)	Velocity or Displacement	Velocity or Displacement
Low Frequency Response (Vel. or Displ., -10%)	1, 10 Hz (selectable)	1, 10 Hz (selectable)
Broadband Noise (ICP mode) (2 to 22.4k Hz)	<3 µV (-110.5 dB)	<3 µV (-110.5 dB)
Broadband Noise (charge mode) (2 to 22.4k Hz)	<5 fC	<5 fC
Serial Interface	RS-232/RS-485	RS-232/RS-485
Power Consumption	6.25 watts	6.25 watts
Input Connectors	BNC / 10-32[1]	BNC / 10-32[1]
Output Connector	BNC	BNC
External Zero	N/A	SMB
Chassis Slots Required	2	2

[1] Panel connection is BNC. 10-32 achieved with supplied adaptor.

Capacitive Sensor Signal Conditioner Modules

The capacitive sensor signal conditioner provides a regulated 18 VDC power for operating PCB and IMI capacitive (response to DC) sensors. The DC voltage adjustment feature allows the user to remove the bias offset from the signal up to ±1.15 volts. The capacitive sensor signal conditioner has a very low noise floor and is CE marked when installed in a PCB chassis.

Capacitive Sensor Signal Conditioner Module Specifications

Model Number	445A101
Channels	1
Excitation Voltage	18 VDC
Gain	x1, x10, x100
Coupling	DC
DC Adjustment Range	±1.15 V
Frequency Response (-5%)	DC to 25k Hz
Broadband Noise (0.1Hz to 10 kHz)	14 µV
Output Range	±10 V
Power Consumption	1 W
Chassis Slots	1
Input Connectors	PCB 4-Pin
Output Connectors	BNC



Model 445A101
Capacitive Sensor Signal Conditioner with Gain

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Multi-Channel Signal Conditioning Systems



The 16-channel signal conditioner modules can be used to power large arrays of ICP® accelerometers, force sensors, pressure sensors, and microphones. These modules are an excellent choice for multi-channel NVH testing, acoustic array measurement, modal analysis, and GVT testing.

The system greatly reduces large, confusing, and often tangled cable bundles. Using multi-conductor cables, cabling is simplified, more organized, and less error-prone. The 16-channel ICP sensor signal conditioner modules display a separate LED for each channel. The LEDs can be used to identify which sensor is connected to which channel without having to trace confusing cable runs. The LEDs also verify correct operation of the sensors. The signal outputs on the multi-channel modules are provided via Agilent VXI compatible connectors. Both VXI-to-VXI and VXI-to-BNC cables are available.

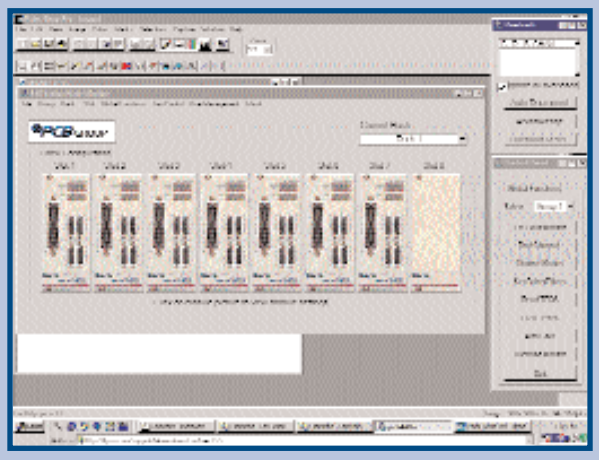
Bank switching (i.e., switching large numbers of channels simultaneously) can help manage signal routing to multi-channel data acquisition systems. Each bank switch can switch up to 16 channels at a time. Multiple bank switches can be used in a single chassis or in a daisy-chained set of chassis. For example, if a 32-channel data acquisition system is used with 64 sensors, 32 channels would be measured initially. Then using two bank switches, the next 32 channels would be switched (routed) to the analyzer without the need of changing any cables. This makes testing faster, more accurate, and less prone to cable routing errors.

Multi-channel systems can be as simple as a single, stand-alone 16-channel module or as expansive as many 16-channel modules and bank switches in up to four computer controlled, daisy-chained 9-slot chassis. Computer control of the system is accomplished via RS-232 using the Windows based System Control Software (supplied with master chassis). In order to use computer control, at least one master chassis must be used in the system. Up to 4 chassis can be daisy-chained together using the RS-485 interface on master and slave chassis. Standard chassis cannot be daisy-chained. Typically, in a daisy-chained system, the first chassis would be a master chassis and the rest slaves.

The modular architecture of the system allows the user to add or reconfigure the modules as necessary to meet the needs of the test. The multi-channel modules, together with the standard signal conditioner modules, make the Modular System highly versatile, powerful, and a must for any test lab.

System Control Software

The system control software for the modular system is a Windows-based program that controls all functionality of the 16-channel signal conditioners and sensor routing through bank switch modules. The program also displays channel status of all channels in a 19-inch chassis simultaneously, identifies the modules that are installed in up to four interconnected chassis, and logs changes that occur in the system configuration (e.g., a sensor was connected or disconnected). The software also controls the order in which signal conditioner modules are selected for output and automatically switches to the appropriate modules. The monitored signal output on the bank switch panel can also be specified in the program, and front panel operation of the system modules can be locked out. The software also supports the use of IEEE P1451.4 TEDS Compliant Smart Sensors. For modules that are so equipped, it controls gain and filter setting. The program requires a minimum 486 PC with 16MB RAM, Windows 95, 98, NT, 2000 and a display with at least 800 x 600 resolution.



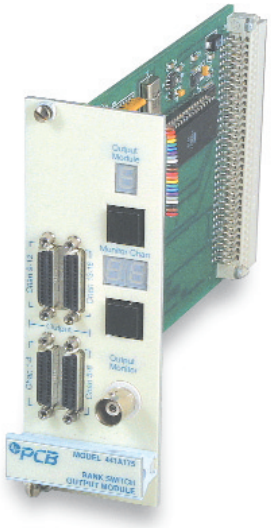
System Control Software main screen showing the status of multi-channel modules.

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Multi-Channel Signal Conditioner Modules

Model 441A175 Bank Switch Output Module

The Model 441A175 Bank Switch Output module transfers sensor signals from a selected 16-channel ICP® sensor signal conditioner to the output connectors on the Model 441A175. The bank switch can select the signals (via the chassis backplane) from up to seven 16-channel ICP sensor signal conditioners. Multiple bank switch modules can be used in a single chassis or in multiple chassis to switch more than 16 channels at a time. Switching is controlled either manually by push button or via computer using the System Control Software. The Model 441A175 also provides a user-selectable buffered signal output from any channel of any module controlled by the bank switch to a BNC connector on the front panel.



Model 441A175 Bank Switch

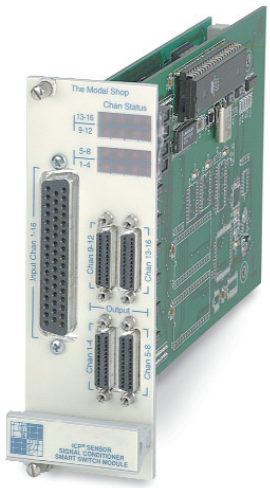
16-Channel ICP® Sensor Signal Conditioner Module Specifications		
Model Number	**442B116 to 442A126**	**441A175**
Channels	16	16
Excitation Voltage	22 VDC	N/A
Constant Current Excitation[1]	2-10 mA	N/A
Coupling	AC	N/A
Time Constant	>10 sec	N/A
Frequency Response (±5%)	0.125 Hz to 30k Hz	N/A
Broadband Noise (0.3 Hz to 30k Hz)	100 µV	N/A
Output Range	±10 V	N/A
Power Required	See options table	1 W
Chassis Slots Required	1	1
Input Connector	DB50 Female	N/A
Output Connector (4)	Agilent E1432A[2]	Agilent E1432A[2]

[1] Factory preset at 4 mA
[2] Direct connection compatibility with Agilent VXI Model E1432A
N/A= Not applicable

16-Channel ICP Sensor Signal Conditioner

All 16-channel ICP sensor signal conditioner modules supply a 22 VDC, user adjustable 2 to 10 mA (factory set at 4 mA) constant current excitation to all channels simultaneously. The constant current can be disabled on a channel-by-channel basis via on-board selection switches. This allows the use of voltage mode sensors such as tachometers.

Sixteen front panel LEDs indicate the channel's sensor status (short, open, or good). Signal input is made through a 50-pin front panel connection, typically using a standard PCB ribbon cable with a DB50 connector. Signal output is also provided at the front panel from 4 Agilent VXI E1432A connectors. Additionally, the output can be directed to a Bank Switch Module that also has 4 VXI output connectors. For special connection requirements, please contact PCB.



Series 442 16 Channel ICP® Input Module

Smart modules are compatible with bank switching and are software controllable. Gain, pre-filters, and TEDS are only accessible through software control and cannot be accessed through the front panel. Smart modules are available with any combination of the following options

- Unity or selectable gain (x1, x10, and x100).
- Unfiltered or selectable pre-filter (2-pole Butterworth LP with 100 Hz, 500 Hz, 5000 Hz, and 30k Hz cutoff frequencies). Custom filters are also available.
- With or without TEDS (Transducer Electronic Data Sheet) support.

Note: *Due to the power requirements of the pre-filters, systems using modules with the pre-filter option must use the 441A38 chassis with the 100 watt power supply.*

16-Channel ICP® Sensor Signal Conditioner Module Options					
Model	**Smart**	**TEDS**	**Gain**	**Pre-Filter**	**Power Consumption[1]**
442B116	No	No	x1	No	5.7 W
442B117	Yes	No	x1	No	5.7 W
442B119	Yes	Yes	x1	No	5.7 W
442A121	Yes	No	x1, x10, x100	No	5.7 W
442A122	Yes	Yes	x1, x10, x100	No	5.7 W
442A123	Yes	No	x1	Yes	9.2 W
442A124	Yes	No	x1, x10, x100	Yes	9.2 W
442A125	Yes	Yes	x1	Yes	9.2 W
442A126	Yes	Yes	x1, x10, x100	Yes	9.2 W

[1] Power consumption at factory set 4mA constant current excitation.

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Modular System Ordering Information

Modular System Ordering information

Individual Modules (A complete instrument requires a chassis, power supply, and at least one signal conditioner module.)

Function	Model Number	Description
Chassis	441A42	2-slot standard chassis
Chassis	441A33	3-slot master chassis
Chassis	441A43	3-slot standard chassis
Chassis	441A35	5-slot master chassis
Chassis	441A45	5-slot slave chassis
Chassis	441A38	9-slot master chassis with 100 W power supply
Chassis	441A39	9-slot master chassis
Chassis	441A49	9-slot slave chassis
Blank Panel	400A17	Blank panel
AC Power Supply	441A101	45 watt AC power supply[1]
DC Power Supply	441A102	30 watt DC power supply
ICP Sensor Signal Conditioner	442A101	1-channel, AC/DC coupling, x1, x10, x100 gain
ICP Sensor Signal Conditioner	442A102	1-channel, AC coupling, x1gain
ICP Sensor Signal Conditioner	442A103	1-channel, AC coupling, x1, x10, x100 gain
4-Channel ICP® Sensor Signal Conditioner	442B104	4-channel, AC coupling, x1, x10, x100 gain
Dual-Mode Vibration Amplifier	443B101	Charge/ICP, normalization, TEDS support
Dual-Mode Amplifier	443B102	Charge/ICP, LDTC, normalization, TEDS support
Capacitive Sensor Signal Conditioner	445A101	1-channel, DC coupling, x1, x10, x100 gain
16-Channel ICP Sensor Signal Conditioner	442B116	x1 gain
16-Channel ICP Sensor Signal Conditioner	442B117	Smart, x1 gain
16-Channel ICP Sensor Signal Conditioner	442B119	Smart, TEDS, x1 gain
16-Channel ICP Sensor Signal Conditioner	442A121	Smart, x1, x10, x100 gain
16-Channel ICP Sensor Signal Conditioner	442A122	Smart, TEDS, x1, x10, x100 gain
16-Channel ICP Sensor Signal Conditioner	442A123	Smart, Pre-filter, x1 gain
16-Channel ICP Sensor Signal Conditioner	442A124	Smart, x1, x10, x100 gain, pre-filter
16-Channel ICP Sensor Signal Conditioner	442A125	Smart, TEDS, x1 gain, pre-filter
16-Channel ICP Sensor Signal Conditioner	442A126	Smart, TEDS, x1, x10, x100 gain, pre-filter
Bank Switch	441A175	16-channel bank switch

Preconfigured Instruments (Preconfigured instruments include chassis and power supply.)

Function	Model Number	Description
ICP Sensor Signal Conditioner	442B01	1-channel, AC coupling, x1gain
ICP Sensor Signal Conditioner	442B02	1-channel, AC coupling, x1, x10, x100 gain
4-Channel ICP Sensor Signal Conditioner	442C04	4-channel, AC coupling, x1, x10, x100 gain
8-Channel ICP Sensor Signal Conditioner	442C05	8-channel, AC coupling, x1, x10, x100 gain
ICP Sensor Signal Conditioner	442B06	1-channel, AC/DC coupling, x1, x10, x100 gain
5-Channel ICP Sensor Signal Conditioner	442A07	5-channel, AC coupling, x1, x10, x100 gain plus 1-channel AC/DC coupling
Dual-Mode Vibration Amplifier	443B01	Charge/ICP, normalization, TEDS support
Dual-Mode Amplifier	443B02	Charge/ICP, LDTC, normalization, TEDS support
Capacitive Sensor Signal Conditioner	445B01	1-channel, DC coupling, x1, x10, x100 gain

[1] Power consumption cannot exceed 30 watts in any chassis for CE Marking compliance.

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