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Model 482A21

1-channel, line-powered, ICP® sensor signal cond., unity gain, BNC

Installation and Operating Manual

**For assistance with the operation of this product,
contact PCB Piezotronics, Inc.**

Toll-free: 800-828-8840
24-hour SensorLine: 716-684-0001
Fax: 716-684-0987
E-mail: info@pcb.com
Web: www.pcb.com





Warranty, Service, Repair, and Return Policies and Instructions

The information contained in this document supersedes all similar information that may be found elsewhere in this manual.

Total Customer Satisfaction – PCB Piezotronics guarantees Total Customer Satisfaction. If, at any time, for any reason, you are not completely satisfied with any PCB product, PCB will repair, replace, or exchange it at no charge. You may also choose to have your purchase price refunded in lieu of the repair, replacement, or exchange of the product.

Service – Due to the sophisticated nature of the sensors and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. Caution should be observed to insure that liquids are not permitted to migrate into devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth and never submerged or have liquids poured upon them.

Repair – In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty.

Calibration – Routine calibration of sensors and associated instrumentation is recommended as this helps build confidence in measurement accuracy and acquired data. Equipment calibration cycles are typically established by the users own quality regimen. When in doubt about a calibration cycle, a good “rule of thumb” is to recalibrate on an annual basis. It is also good practice to recalibrate after exposure to any severe temperature extreme, shock, load, or other environmental influence, or prior to any critical test.

PCB Piezotronics maintains an ISO 9001:2015 QMS Certified by DQS, Inc. metrology laboratory and offers calibration services, which are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to the normally supplied calibration, special testing is also available, such as: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For information on standard recalibration services or special testing, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

Returning Equipment – *Following these procedures will insure that your returned materials are handled in the most expedient manner*. Before

returning any equipment to PCB Piezotronics, contact your local distributor, sales representative, or factory customer service representative to obtain a Return **Warranty, Service, Repair, and Return Policies and Instructions** Materials Authorization (RMA) Number. This RMA number should be clearly marked on the outside of all package(s) and on the packing list(s) accompanying the shipment. A detailed account of the nature of the problem(s) being experienced with the equipment should also be included inside the package(s) containing any returned materials.

A Purchase Order, included with the returned materials, will expedite the turn-around of serviced equipment. It is recommended to include authorization on the Purchase Order for PCB to proceed with any repairs, as long as they do not exceed 50% of the replacement cost of the returned item(s). PCB will provide a price quotation or replacement recommendation for any item whose repair costs would exceed 50% of replacement cost, or any item that is not economically feasible to repair. For routine calibration services, the Purchase Order should include authorization to proceed and return at current pricing, which can be obtained from a factory customer service representative.

Warranty – All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a limited warranty against defective material and workmanship for a period of one year from date of original purchase. Contact PCB for a complete statement of our warranty. Expendable items, such as batteries and mounting hardware, are not covered by warranty. Mechanical damage to equipment due to improper use is not covered by warranty. Electronic circuitry failure caused by the introduction of unregulated or improper excitation power or electrostatic discharge is not covered by warranty.

Contact Information – International customers should direct all inquiries to their local distributor or sales office. A complete list of distributors and offices can be found at www.pcb.com. Customers within the United States may contact their local sales representative or a factory customer service representative. A complete list of sales representatives can be found at www.pcb.com. Toll-free telephone numbers for a factory customer service representative, in the division responsible for this product, can be found on the title page at the front of this manual. Our ship to address and general contact numbers are:

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PCB工业监视和测量设备 - 中国RoHS2公布表

PCB Industrial Monitoring and Measuring Equipment - China RoHS 2 Disclosure Table

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
住房	O	O	O	O	O	O
PCB板	X	O	O	O	O	O
电气连接器	O	O	O	O	O	O
压电晶体	X	O	O	O	O	O
环氧	O	O	O	O	O	O
铁氟龙	O	O	O	O	O	O
电子	O	O	O	O	O	O
厚膜基板	O	O	X	O	O	O
电线	O	O	O	O	O	O
电缆	X	O	O	O	O	O
塑料	O	O	O	O	O	O
焊接	X	O	O	O	O	O
铜合金/黄铜	X	O	O	O	O	O
本表格依据 SJ/T 11364 的规定编制。						
O： 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。						
X： 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。 铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。						

CHINA RoHS COMPLIANCE

Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	O	O	O
Teflon	O	O	O	O	O	O
Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
Cables	X	O	O	O	O	O
Plastic	O	O	O	O	O	O
Solder	X	O	O	O	O	O
Copper Alloy/Brass	X	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364.

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.
Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

DOCUMENT NUMBER: 21354
*DOCUMENT REVISION: **C***
ECN: 45605

1.0 Introduction and Specifications

A specification sheet and outline drawing are located in the rear of this manual.

1.1 Introduction: Safety Considerations

WARNING 1: *The power supply/signal conditioner should not be opened by anyone other than qualified service personnel.* This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

WARNING 2: This equipment is designed with user safety in mind; however, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by PCB Piezotronics, Inc.

Caution 1: *Cables can kill your equipment.* High voltage electrostatic discharge can damage electrical devices. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, such as that which occurs in the following:

- Laying on and moving across a rug.
- Any movement through air.
- The action of rolling out a cable.
- Contact with a non-grounded person.

The solution for product safety: 1) Connect the cables only with the AC power off. 2) Temporarily "short" the end of the cable before attaching it to any signal input or output.

Caution 2: *ESD considerations should be made prior to performing any internal adjustments on the equipment.* Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should therefore be done ONLY at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.

WARNING SYMBOLS AND TERMS

The following symbols and terms may be found on the equipment described in this manual.

 This symbol on the unit indicates that the user should refer to the operating instructions located in the manual.

 This symbol on the unit indicates that high voltage may be present. Use standard safety precautions to avoid personal contact with this voltage.

 This symbol indicates safety, earth ground.

The **WARNING** heading used in this manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **Caution** heading used in this manual explains hazards that could damage the instrument.

1.2 Introduction

Model 482A21 is a single-channel, line-operated signal conditioner for ICP® transducer systems. This unit provides constant current excitation to the built-in transducer amplifier and decouples the signal from the DC bias voltage.

The unit also contains provision for fault monitoring the channel, as well as provision for externally varying the constant current output over a 2 to 20 mA range. This model is factory set at 4 mA.

2.0 Description

Model 482A21 is powered externally by universal power supply model 488B04. The rear panel contains a BNC jack for transducer signal INPUT and a BNC jack for signal OUTPUT connections.

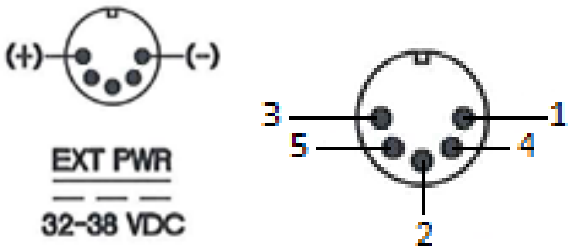
The AC signal information is decoupled from the sensor bias by a coupling capacitor and brought out to the OUTPUT jack.

The bias monitor located on the front panel consists of a color-coded panel meter that permanently monitors the sensor bias level. See sensor specification for correct sensor bias level.

3.0 Installation

See the included outline drawing for dimensions, as well as jack and control locations. Plug the five-pin DIN output connector on 488B04 into the DC INPUT located on the rear panel of 482A21.

Plug the three-wire line cord of the 488B04 into a source of 85 to 264 VAC, 47 to 440 Hz power and switch the power on for 482A21.



Pins 3 and 5 are (+)
Pins 1, 2 and 4 are (-)
Outside shell is earth/chassis ground

Figure 1: External Power Connector and Pin Numbers

Note: For battery operation use model 488B07 in place of model 488B04.

With no transducer connected to the INPUT connector, the front panel bias indicator meter indicates full scale (yellow), which corresponds to open circuit power supply voltage. See Figure 2.

Meter Reading	Yellow	Green	Red
Condition	Open	Ok	Short

Figure 2: Fault Monitor Table

When an ICP® transducer (or in-line amplifier) is connected to the INPUT jack, the front monitor meter indicates approximately midscale (green) if the transducer or amplifier is functioning properly. It does not read midscale if the transducer bias is 3 to 5 volts.

If a cable is faulty (open), or the sensor's built-in amplifier is open, the meter indicates a yellow (full scale) reading. When a cable or transducer is shorted, the meter indicates zero volts (red).

Immediately after connecting a readout instrument (oscilloscope, meter, or recorder) to the OUTPUT jack, the coupling capacitor begins charging through the input resistance of the readout instrument. This charging causes an apparent "drifting" of the output signal until the capacitor is fully charged. The normal amount of leakage through the coupling capacitor usually results in a <20 mV maximum DC offset.

4.0 Coupling Time Constant, AC Coupled

The coupling time constant (TC) is the product of the coupling capacitor (47 µF) and the input resistance of the readout instrument, in parallel with the 274 kilohm shunt resistor. Typically, this is ten seconds, assuming the input resistance of the readout measurement is one megohm.

In most cases, it is desirable to keep the coupling TC long, with respect to the transducer discharge TC, to minimize the effect of the coupling TC on low frequency response.

4.1 Driving Long Cables

When driving long cables, it may be necessary to increase the constant current drive to the transducers. 482A21 is normally supplied with the constant current output to the transducer set at 4 mA nominal. This is adequate for most laboratory and field applications. Special situations, such as driving long cables (beyond 100 ft) with high frequency or fast rise time pulses, may require increasing the transducer drive current up to 20 mA.

When driving fast rise time pulses over long lines, system performance may be optimized by "tuning" the drive current to the line; i.e., by finding the best current setting for the particular set of physical parameters established by the transducer, line length, line termination, pulse rise time, etc.

The optimum current setting is best determined by experimentation with your particular test setup. A good rule of thumb is to use the lowest current consistent with satisfactory results to minimize transducer self-heating and noise.

Another technique requires the use of impedance matching resistor model 073A connected immediately after the transducer. This variable resistor is then used to "tune" the current to the line.

One of the best approaches is to test the long line with a signal generator set at a frequency of interest.

4.2 Setting the Constant Current

To set the constant current, locate the current adjust potentiometer on the rear panel. Connect a 0 to 30 mA DC ammeter (or multimeter) to the INPUT jack (as shown in Figure 3). The constant current value is read directly on the ammeter. Using a small regular screwdriver, vary the setting of the current adjust pot to set the current at a new level.

CAUTION: It may be possible to exceed 20 mA slightly. Do not do so; to operate an ICP® transducer or amplifier above 20 mA may damage the equipment.

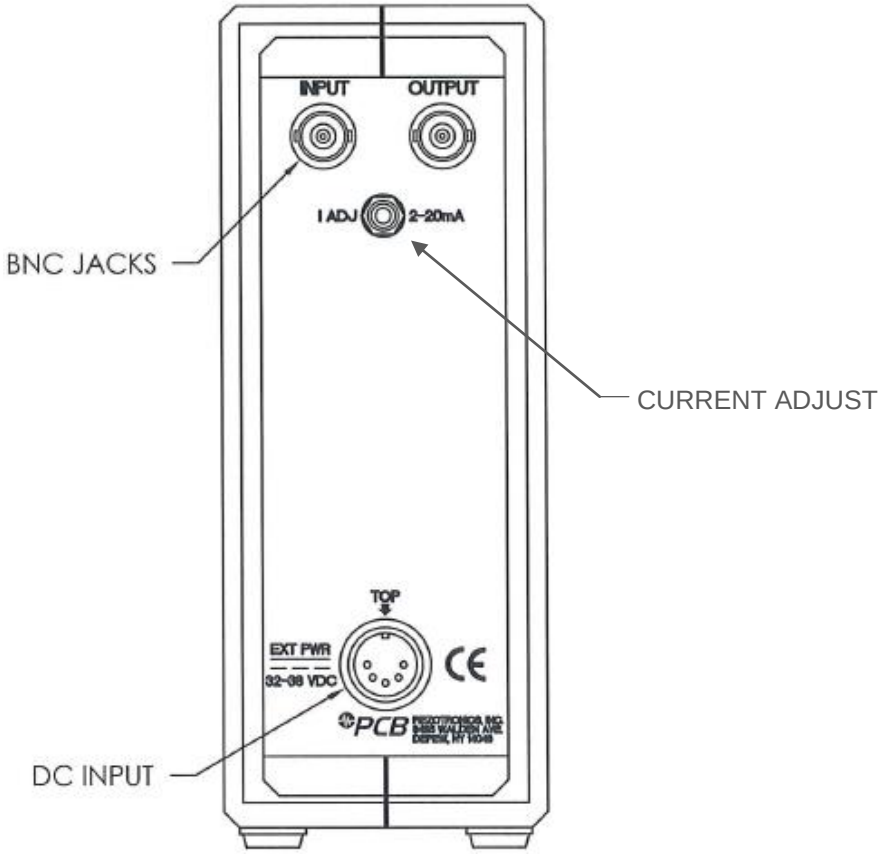


Figure 3: Constant Current Adjust

5.0 Maintenance and Repair

Because of the sophisticated nature of PCB instrumentation, field repair of the equipment is not recommended. Most PCB signal conditioners are of modular construction and are factory repairable. A repair or replacement quotation is available at no charge. Before returning equipment for repair, it is advisable that the user confers with a factory application engineer (or international representative) concerning the difficulty to ascertain if an on-site procedure rectifies the problem.

If repair is indicated, contact PCB to request a Return Materials Authorization (RMA) number from the factory. An advanced authorization to proceed with the repair, permitting charges of up to 50% of a new item, greatly expedites repair.

For the most efficient service, please provide a detailed, written description of the malfunction encountered with the equipment you are returning, together with your specific application and setup procedures. International customers should return PCB equipment to their representative. For exceptions, please contact the International Sales department at PCB to request shipping instructions and an RMA.

482A21 and 482A22 Troubleshooting Guide

Problem	**Test/Solution**
Unit does not appear to be powered up/ No meter movement.	- Power switch in the on position. - Test 'sensor' excitation current. Measure the current on the 'sensor' input BNC from the center conductor to the shell. Adjust 'Iadj' (rear panel) with screwdriver turning both clockwise and counterclockwise. Reference section 'Setting the Constant Current.' - Make sure the bias monitor channel select matches the channel of interest.
Output signal seems to drift.	- Make sure the input impedance of the readout device, scope or data acquisition system is approximately 1 MΩ.
Low frequency response not meeting specification or amplitude is attenuated.	- The input impedance of the readout device may be too low. May need to use a buffered signal conditioner, for example 482C16.
Meter does not seem to show sensor bias voltage.	- Match the channel select with channel of interest. - Measure the sensor bias while the sensor is attached to the unit. This requires a 'T' connector to allow both the sensor and the measuring device to be attached. If problem persists, return for repair.

MANUAL NUMBER: 19179
MANUAL REVISION:
ECO NUMBER:

Model Number **482A21**	**SENSOR SIGNAL CONDITIONER**	Revision: K ECN #: 43617

Performance	**ENGLISH**	**SI**	
Channels	1	1	
Voltage Gain(± 1 %)	1:1	1:1	
Low Frequency Response(-5 %)	<0.1 Hz	<0.1 Hz	[3][4]
High Frequency Response(-5 %)	>1000 kHz	>1000 kHz	
Fault/Bias Monitor/Meter	26 V FS	26 V FS	
Environmental			
Temperature Range	32 to 120 °F	0 to 50 °C	
Electrical			
Power Required(Standard)	DC power	DC power	
Excitation Voltage(To Sensor)	25 to 27 VDC	25 to 27 VDC	
DC Offset(Maximum)	<20 mV	<20 mV	
DC Power	+32 to 38 VDC	+32 to 38 VDC	[1]
DC Power	0.12 Amps	0.12 Amps	[1]
Constant Current Excitation(To Sensor)	2 to 20 mA	2 to 20 mA	[2]
Discharge Time Constant(0 to +50%)	10 sec	10 sec	[3][4]
Spectral Noise(1 Hz)	0.71 µV/√Hz	-123 dB	[5]
Spectral Noise(10 Hz)	0.09 µV/√Hz	-142 dB	[5]
Spectral Noise(100 Hz)	0.05 µV/√Hz	-147 dB	[5]
Spectral Noise(1 kHz)	0.04 µV/√Hz	-149 dB	[5]
Spectral Noise(10 kHz)	0.03 µV/√Hz	-150 dB	[5]
Broadband Electrical Noise(1 to 10,000 Hz)	3.25 µV	-110 dB	[5]
Physical			
Electrical Connector(Input, sensor)	BNC Jack	BNC Jack	
Electrical Connector(Output)	BNC Jack	BNC Jack	
Electrical Connector(DC Power Input)	DIN Jack	DIN Jack	
Size (Height x Width x Length)	6.3 in x 2.4 in x 11 in	16 cm x 6.1 cm x 28 cm	
Weight	1.51 lb	685 gm	

CE[6]

All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.
ICP® is a registered trademark of PCB Group, Inc.

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

NOTES:

[1]Provided by supplied external DC power supply.
[2]User adjustable, factory set at 4 mA (± 0.5 mA). One control adjusts all channels.
[3]With ≥ 1M ohm input impedance of readout device.
[4]Un-buffered output, read out device input impedance affects discharge time constant and low frequency response of unit.
[5]Typical.
[6]See PCB Declaration of Conformance PS024 for details.

SUPPLIED ACCESSORIES:

Model 017AXX Power Cord
Model 488B04/NC Power Convertor

Entered: AP	Engineer: CPH	Sales: ML	Approved: JWH	Spec Number:
Date: 1/28/2015	Date: 1/28/2015	Date: 1/28/2015	Date: 1/28/2015	**6528**

PCB PIEZOTRONICS
3425 Walden Avenue, Depew, NY 14043
Phone: 716-684-0001
Fax: 716-684-0987
E-Mail: info@pcb.com

Model Number	POWER SUPPLY	Revision: A
488B04		ECN #: 32528

Environmental	ENGLISH	SI
Temperature Range(Operating)	32 to 104 °F	0 to 40 °C
Humidity Range(Non-Condensing)	0 to 95 %	0 to 95 %
Electrical		
Output Voltage	32 - 38 VDC	32 - 38 VDC
Output Current	0.54 amps	0.54 amps
AC Power(50 to 60 Hz)	100 to 240 VAC	100 to 240 VAC
(50 to 60 Hz)	0.6 amps	0.6 amps
AC Ripple(Peak to Peak)	<350 mV	<350 mV
Physical		
Electrical Connector(AC Power Input)	IEC 320	IEC 320
(Output DC)	DIN 5 Pin (Male)	DIN 5 Pin (Male)
Size (Height x Width x Depth)	1.3 in x 2.13 in x 3.76 in	33 mm x 54.1 mm x 955 mm
Weight	1.25 lb	0.57 kg

CE [1]

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In the interest of constant product improvement, we reserve the right to change specifications without notice.

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OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

488B04/NC - Does not incluce a 017AXX Power Cord

NOTES:

[1] See PCB Declaration of Conformance PS024 for details.

SUPPLIED ACCESSORIES:

Model 017AXX Power Cord (1)

Entered:	Engineer:	Sales:	Approved:	Spec Number:
Date: 3-5-10	Date: 3-3-10	Date: 2-26-10	Date: 3-9-10	45177

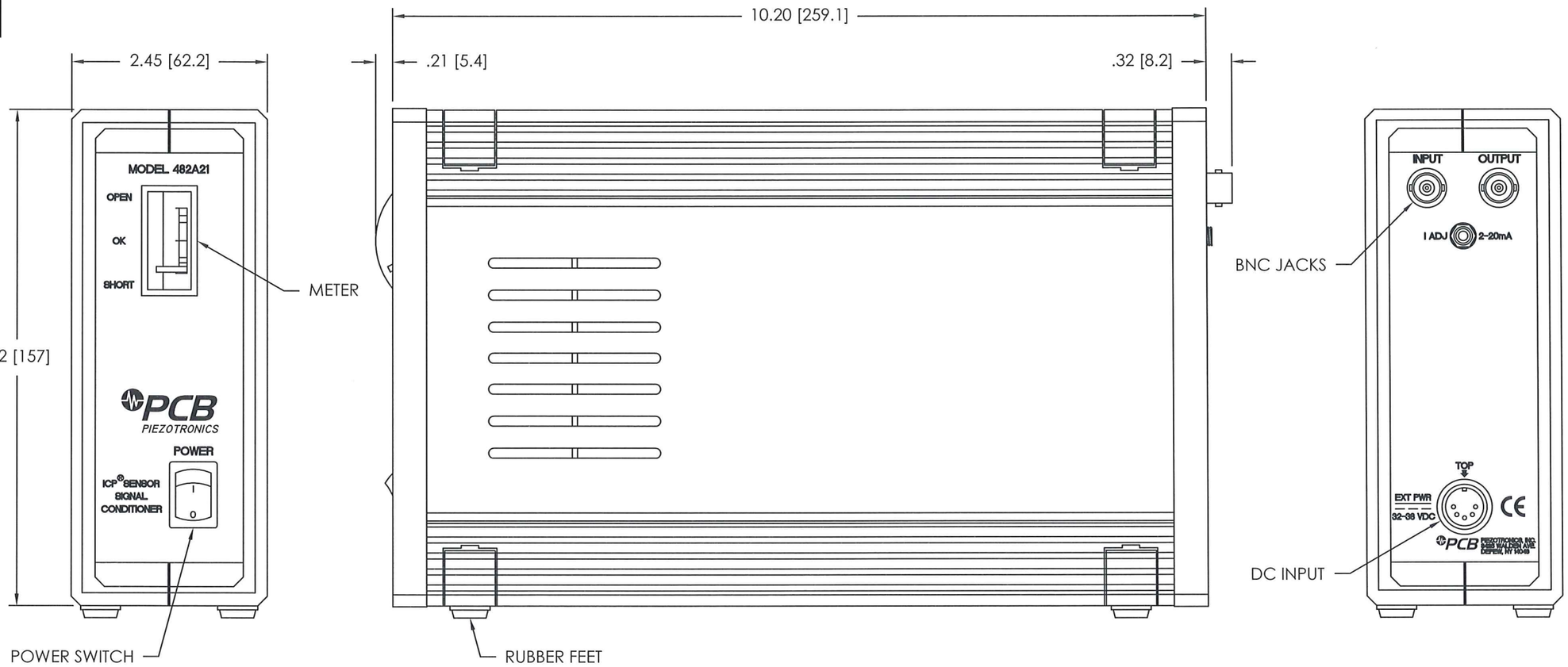
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REVISIONS		
REV	DESCRIPTION	DIN
A	CHANGED ARTWORK	37737

6498



UNLESS SPECIFIED TOLERANCES	
DIMENSIONS IN INCHES DECIMALS XX ±.03 XXX ±.010 ANGLES ±2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ±0.8 XX ±0.25 ANGLES ±2 DEGREES
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]

DRAWN		CHECKED		ENGINEER	
SMB	12/15/11	ECR	12/16/11	KEN L	12/15/11

TITLE
OUTLINE DRAWING
MODEL 482A21
ICP® SENSOR SIGNAL CONDITIONER

PCB PIEZOTRONICS INC
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 EMAIL: SALES@PCB.COM

CODE IDENT. NO.	DWG. NO.
52681	6498
SCALE: 1.5X	SHEET 1 OF 1

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