



**Model 478B05**  
**3 Channel DC Sensor Signal Conditioner**  
**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](mailto:info@pcb.com)**  
**Web: [www.pcb.com](http://www.pcb.com)**





<b>Service, Repair, and Return Policies and Instructions</b>
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**The information contained in this document supersedes all similar information that may be found elsewhere in this manual.**

**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 ensure 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 certified 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 ensure 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.

**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](http://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](http://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:

PCB Piezotronics, Inc.  
3425 Walden Ave.  
Depew, NY14043 USA  
Toll-free: (800) 828-8840  
24-hour SensorLine<sup>SM</sup>: (716) 684-0001  
Website: [www.pcb.com](http://www.pcb.com)  
E-mail: [info@pcb.com](mailto:info@pcb.com)



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	○	○	○	○	○	○
PCB板	X	○	○	○	○	○
电气连接器	○	○	○	○	○	○
压电晶体	X	○	○	○	○	○
环氧	○	○	○	○	○	○
铁氟龙	○	○	○	○	○	○
电子	○	○	○	○	○	○
厚膜基板	○	○	X	○	○	○
电线	○	○	○	○	○	○
电缆	X	○	○	○	○	○
塑料	○	○	○	○	○	○
焊接	X	○	○	○	○	○
铜合金/黄铜	X	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。						
○：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: **D**

ECN: 46162

# **Three-Channel Capacitive Sensor Signal Conditioner**

**Model 478B05**

## **OPERATING MANUAL**



DOC #: 60168  
REV: A  
ECO #: 43785

**OPERATING INSTRUCTIONS FOR  
MODEL 478B05  
SIGNAL CONDITONER AND POWER SUPPLY  
FOR CAPACITIVE ACCELEROMETERS**

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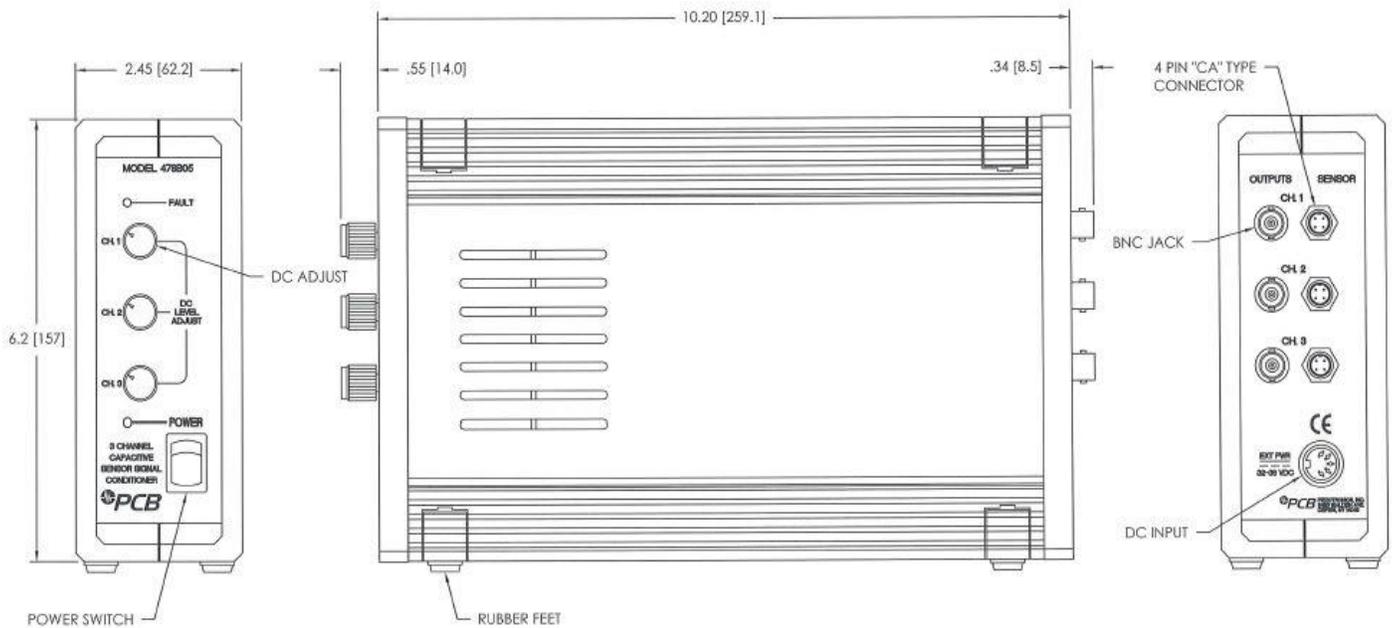
**OPERATING INSTRUCTIONS FOR  
MODEL 478B05  
SIGNAL CONDITIONER AND POWER SUPPLY  
FOR CAPACITIVE ACCELEROMETERS**

**1.0 INTRODUCTION**

Congratulations on the purchase of a quality PCB signal conditioner. In order to ensure the highest level of performance for this product, please familiarize yourself with the safety and operation procedures before attempting to operate this device. If you have any additional questions concerning this unit or its application, feel free to call a factory application engineer at (716) 684-0001. A product specification sheet is included in this manual.

**2.0 DESCRIPTION**

Model 478B05 is a three channel signal conditioner and power supply for PCB Series 371x capacitive sensors. It is primarily intended for the 3713 series triaxial accelerometer, but will function for three single-axis series 3711 sensors as well. The unit is powered by an external 36V DC supply. It comes standard with PCB model 488B04 power supply, but will also work with PCB model 488B07 battery pack.



**Figure 1: Model 478B05**

**OPERATING INSTRUCTIONS FOR  
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FOR CAPACITIVE ACCELEROMETERS**

### 3.0 WARNING SYMBOLS & TERMS

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



*This symbol 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.*

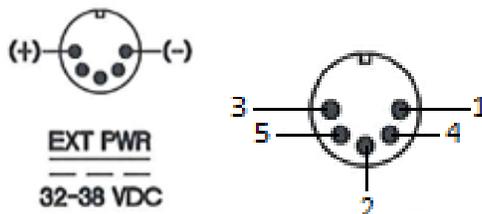


*This symbol indicates safety, earth ground.*

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.

### 4.0 OPERATION

To turn on the model 478B05, connect the 488B04 power supply to the DIN connector (see Figure 2 for pin information) on the back of the unit and press the black switch on the front panel to the 1 position. A green power indicator light will illuminate. A red fault light is provided on the front panel to indicate a problem with the power supply to the sensor. The light illuminates whenever the sensor supply voltage drops below 15.5V DC. Such an occurrence could be the result of the sensor being connected improperly, low batteries in the case where the unit is used with the 488B07, or the unlikely event of a sensor malfunction.



Pins 3 and 5 are (+)

Pins 1, 2 and 4 are (-)

Outside shell is earth/chassis ground

**Figure 2:** External Power Connector and Pin Numbers

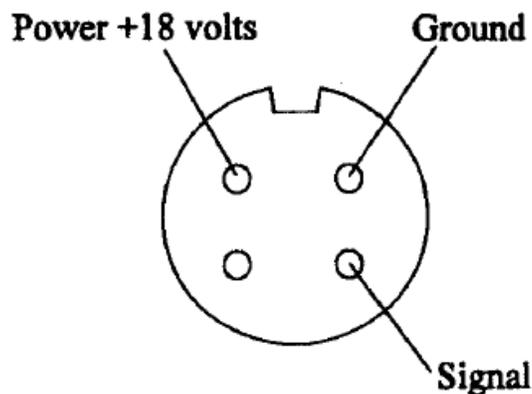
**OPERATING INSTRUCTIONS FOR  
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The input connections are made through three 4-pin connectors on the rear panel. Three single axis capacitive sensors can be connected to the input connectors via cable model 010D, 034D or 078D. One triaxial capacitive sensor can be connected to the input connectors via cable model 037A. Output is routed to the readout device from the three BNC connectors through a model 002 or 012 output cable.

PCB series 371x capacitive accelerometers can have up to 40 mV of DC offset at zero g's. Model 478B05 is equipped with an offset adjust feature on each channel to zero the DC offset and/or the effect of gravity prior to making measurements. The full DC adjustment range is  $\pm 2.25$  volts over a span of ten turns on the adjustment control.

### 5.0 Sensor Excitation

Model 478B05 is connected to capacitive sensors via a three-wire system that uses a multi-conductor cable. The three wires used in the connection are defined as power, sensed signal and ground. 478B05 provides +18 volts DC (current limited to 20 mA maximum) to the capacitive sensor. The current limit is set to allow for proper operation of the sensor and for protection against damage to other sensors that may be mistakenly connected to the signal conditioner. The sensed signal line is the output of the sensor. The ground connection to the sensor is provided. The signal ground of the sensor/signal conditioner is isolated from chassis ground by a 1.0  $\mu\text{F}$  capacitor.



**Figure 3:** Input Connector Pin Diagram

### 6.0 Warnings & Cautions

#### **WARNING 1 – ESD sensitivity**

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.

**OPERATING INSTRUCTIONS FOR  
MODEL 478B05  
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**WARNING 2 – ESD sensitivity**

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 – ESD sensitivity**

Cables can kill your equipment. High voltage electrostatic discharge (ESD) 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:

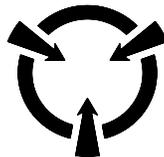
- Laying on and moving across a rug
- Any movement through air
- The action of rolling out a cable
- Contact with a non-grounded person

The PCB solution for product safety:

- Connect the cables only with the AC power off
- Temporarily “short” the end of the cable before attaching it to any signal input or output

**CAUTION 2 – ESD sensitivity**

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.



**CAUTION**  
ELECTROSTATIC  
DISCHARGE SENSITIVE

**7.0 Customer Service / Warranty**

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, within the warranty period, to have your purchase price refunded.

**OPERATING INSTRUCTIONS FOR  
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Instrumentation provided by PCB is covered by a limited warranty against defective material and workmanship for a period of one year. Contact PCB for a complete statement of our warranty.

PCB offers to all customers, at no charge, 24-hour emergency phone support. This service makes product or application support available to our customers, day or night, seven days per week. To reach a PCB SensorLine<sup>SM</sup> customer service representative, call 716-684-0001.

## **8.0 Warranty**

PCB offers an unconditional guarantee for customer satisfaction. PCB strives to provide superior, unmatched customer service. Should you at any time find yourself dissatisfied with any PCB product for any reason, consult a PCB application engineer to discuss repair, refund, or exchange procedures. PCB instrumentation is warranted against defective material and workmanship for one year unless otherwise expressly specified. Damage to instruments caused by incorrect power or misapplication is not covered by warranty. If there are any questions regarding power, intended application, or general usage, please contact a PCB application engineer (or your local sales contact). Batteries and other expendable hardware items are not covered by warranty.

## **9.0 Maintenance & 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 strongly suggested that the user confer with a factory application engineer (or local sales contact) concerning the difficulty, to ascertain if an on-site procedure may rectify 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. Please provide a detailed written description of the malfunction encountered with the returned item, together with your information and setup procedures. Customers outside the U.S. should consult their local PCB sales contact for information on returning equipment. For exceptions, please contact the International Sales department at PCB to request shipping instructions and an RMA. For assistance, please call (716) 684-0001, or fax us at (716) 684-0987. You may also receive assistance via e-mail at [info@pcb.com](mailto:info@pcb.com) or our web site at [www.pcb.com](http://www.pcb.com).

Manual Number: 60168  
Manual Revision:  
ECN Number:

Model Number <b>488B04</b>	<h1>POWER SUPPLY</h1>			Revision: A ECN #: 32528										
<b>Environmental</b>	<b>ENGLISH</b>	<b>SI</b>	<b>OPTIONAL VERSIONS</b>											
Temperature Range(Operating)	32 to 104 °F	0 to 40 °C	Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.											
Humidity Range(Non-Condensing)	0 to 95 %	0 to 95 %	<b>488B04/NC</b> - Does not include a 017AXX Power Cord											
<b>Electrical</b>			<b>NOTES:</b> [1] See PCB Declaration of Conformance PS024 for details.											
Output Voltage	32 - 38 VDC	32 - 38 VDC	<b>SUPPLIED ACCESSORIES:</b> Model 017AXX Power Cord (1)											
Output Current	0.54 amps	0.54 amps	<table border="1"> <tr> <td data-bbox="1018 462 1186 511">Entered: <i>JH</i></td> <td data-bbox="1186 462 1354 511">Engineer: <i>PH</i></td> <td data-bbox="1354 462 1501 511">Sales: <i>gjm</i></td> <td data-bbox="1501 462 1669 511">Approved: <i>EB</i></td> <td data-bbox="1669 462 1837 511">Spec Number:</td> </tr> <tr> <td data-bbox="1018 511 1186 560">Date: <i>3-15-10</i></td> <td data-bbox="1186 511 1354 560">Date: <i>3-3-10</i></td> <td data-bbox="1354 511 1501 560">Date: <i>2-26-10</i></td> <td data-bbox="1501 511 1669 560">Date: <i>3-9-10</i></td> <td data-bbox="1669 511 1837 560" style="text-align: center;"><b>45177</b></td> </tr> </table>		Entered: <i>JH</i>	Engineer: <i>PH</i>	Sales: <i>gjm</i>	Approved: <i>EB</i>	Spec Number:	Date: <i>3-15-10</i>	Date: <i>3-3-10</i>	Date: <i>2-26-10</i>	Date: <i>3-9-10</i>	<b>45177</b>
Entered: <i>JH</i>	Engineer: <i>PH</i>	Sales: <i>gjm</i>	Approved: <i>EB</i>	Spec Number:										
Date: <i>3-15-10</i>	Date: <i>3-3-10</i>	Date: <i>2-26-10</i>	Date: <i>3-9-10</i>	<b>45177</b>										
AC Power(50 to 60 Hz)	100 to 240 VAC	100 to 240 VAC	<div data-bbox="44 511 199 609" data-label="Image"> </div> <p data-bbox="44 609 1018 711">           [1]            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.         </p>											
(50 to 60 Hz)	0.6 amps	0.6 amps	<div data-bbox="1018 609 1501 711" data-label="Image"> </div>											
AC Ripple(Peak to Peak)	<350 mV	<350 mV	Phone: 716-684-0001 Fax: 716-684-0987 E-Mail: electronics@pcb.com											
<b>Physical</b>														
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 95.5 mm												
Weight	1.25 lb	0.57 kg												

Model Number <b>478B05</b>	<b>3 CHANNEL DC SENSOR SIGNAL CONDITIONER</b>	Revision: D ECN #: 45773
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	<u>ENGLISH</u>	<u>SI</u>	
<b>Performance</b>			
Channels	3	3	
Frequency Response(± 5 %)	DC Hz	DC Hz	
Frequency Response(± 5 %)	≥ 2000 Hz	≥ 2000 Hz	
Voltage Gain(± 1 %)	1:1	1:1	
<b>Electrical</b>			
Excitation Voltage(± 10 %)(To Sensor)	17.3 V	17.3 V	
DC Offset	± 2.25 V	± 2.25 V	
Spectral Noise(1 Hz)	0.50 μV/√Hz	-126 dB	[1]
Spectral Noise(10 Hz)	0.60 μV/√Hz	-124 dB	[1]
Spectral Noise(100 Hz)	0.35 μV/√Hz	-129 dB	[1]
Spectral Noise(1000 Hz)	0.35 μV/√Hz	-129 dB	[1]
Spectral Noise(10,000 Hz)	0.075 μV/√Hz	-142 dB	[1]
Broadband Electrical Noise(1 to 10,000 Hz)(Gain x1)	30 μV	-90 dB	[1]
Power Required	DC power	DC power	
DC Power	+32 to 38 VDC	+32 to 38 VDC	[2]
Current Consumption	0.12 Amps	0.12 Amps	
<b>Physical</b>			
Electrical Connector(Input, sensor)	4-Pin Jack	4-Pin Jack	
Electrical Connector(Output, scope)	BNC Jack	BNC Jack	
Electrical Connector(DC Power Input)	DIN Jack	DIN Jack	
Size (Depth x Height x Width)	11 in x 6.3 in x 2.4 in	28 cm x 16 cm x 6.1 cm	
Weight	2.0 lb	908 gm	

**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] Typical.  
 [2] Provided by supplied external DC power supply.  
 [3] See PCB Declaration of Conformance PS024 for details.

**SUPPLIED ACCESSORIES:**

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

**OPTIONAL ACCESSORIES:**

Model 488B07 External battery pack

Entered: LK      Engineer: CPH      Sales: ML      Approved: JWH      Spec Number:  
 Date: 9/6/2016      Date: 9/6/2016      Date: 9/6/2016      Date: 9/6/2016      **28813**



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.  
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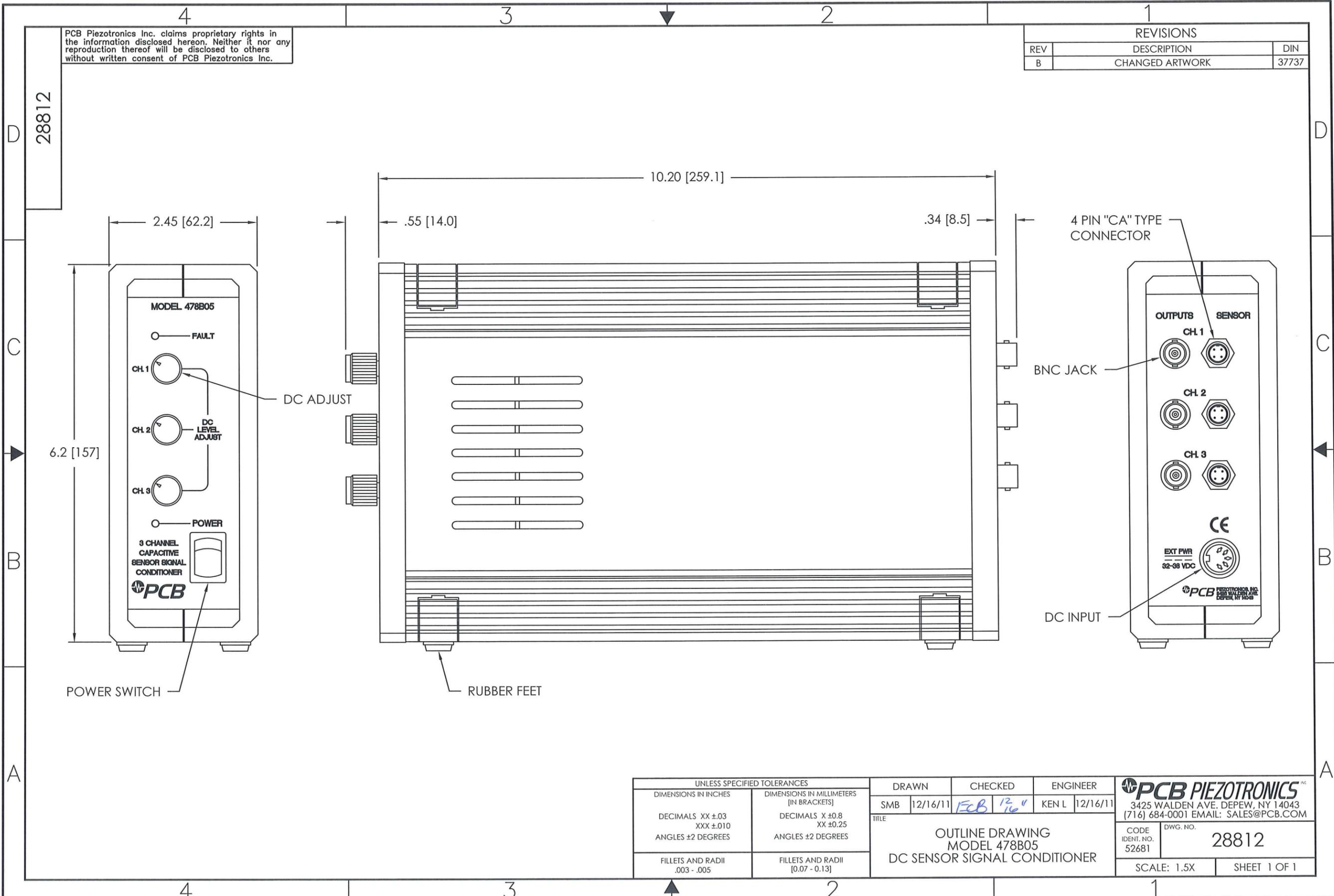


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**E-Mail: info@pcb.com**

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REVISIONS		
REV	DESCRIPTION	DIN
B	CHANGED ARTWORK	37737

28812



UNLESS SPECIFIED TOLERANCES		DRAWN	CHECKED	ENGINEER	 <b>PCB PIEZOTRONICS</b> <small>3425 WALDEN AVE. DEPEW, NY 14043</small> <small>(716) 684-0001 EMAIL: SALES@PCB.COM</small>
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	SMB	12/16/11	KEN L	
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ±0.8 XX ±0.25	TITLE		CODE IDENT. NO. 52681 DWG. NO. 28812	
ANGLES ±2 DEGREES	ANGLES ±2 DEGREES	OUTLINE DRAWING MODEL 478B05 DC SENSOR SIGNAL CONDITIONER		SCALE: 1.5X SHEET 1 OF 1	
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]				