



**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)**



## Repair and Maintenance

PCB guarantees Total Customer Satisfaction through its “Lifetime Warranty Plus” on all Platinum Stock Products sold by PCB and through its limited warranties on all other PCB Stock, Standard and Special products. Due to the sophisticated nature of our sensors and associated instrumentation, **field servicing and repair is not recommended and, if attempted, will void the factory warranty.**

Beyond routine calibration and battery replacements where applicable, our products require no user maintenance. Clean electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the material of construction. Observe caution when using liquids near devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth—never saturated or submerged.

In the event that equipment becomes damaged or ceases to operate, our Application Engineers are here to support your troubleshooting efforts 24 hours a day, 7 days a week. Call or email with model and serial number as well as a brief description of the problem.

## Calibration

Routine calibration of sensors and associated instrumentation is necessary to maintain measurement accuracy. We recommend calibrating on an annual basis, after exposure to any extreme environmental influence, or prior to any critical test.

PCB Piezotronics is an ISO-9001 certified company whose calibration services are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to our standard calibration services, we also offer specialized tests, including: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For more information, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

## Returning Equipment

If factory repair is required, our representatives will provide you with a Return Material Authorization (RMA) number, which we use to reference any information you have already provided and expedite the repair process. This number should be clearly marked on the outside of all returned package(s) and on any packing list(s) accompanying the shipment.

## Contact Information

PCB Piezotronics, Inc.  
3425 Walden Ave.  
Depew, NY14043 USA  
Toll-free: (800) 828-8840  
24-hour SensorLine: (716) 684-0001  
General inquiries: [info@pcb.com](mailto:info@pcb.com)  
Repair inquiries: [rma@pcb.com](mailto:rma@pcb.com)

For a complete list of distributors, global offices and sales representatives, visit our website, [www.pcb.com](http://www.pcb.com).

## Safety Considerations

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions required to avoid injury. While our equipment is designed with user safety in mind, the protection provided by the equipment may be impaired if equipment is used in a manner not specified by this manual.

Discontinue use and contact our 24-Hour Sensorline if:

- Assistance is needed to safely operate equipment
- Damage is visible or suspected
- Equipment fails or malfunctions

For complete equipment ratings, refer to the enclosed specification sheet for your product.

## Definition of Terms and Symbols

The following symbols may be used in this manual:



### **DANGER**

Indicates an immediate hazardous situation, which, if not avoided, may result in death or serious injury.

**CAUTION**

Refers to hazards that could damage the instrument.

**NOTE**

Indicates tips, recommendations and important information. The notes simplify processes and contain additional information on particular operating steps.

**The following symbols may be found on the equipment described in this 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 on the unit indicates that the user should refer to the operating instructions located in the manual.



This symbol indicates safety, earth ground.



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	0	0	0	0	0	0
PCB板	X	0	0	0	0	0
电气连接器	0	0	0	0	0	0
压电晶体	X	0	0	0	0	0
环氧	0	0	0	0	0	0
铁氟龙	0	0	0	0	0	0
电子	0	0	0	0	0	0
厚膜基板	0	0	X	0	0	0
电线	0	0	0	0	0	0
电缆	X	0	0	0	0	0
塑料	0	0	0	0	0	0
焊接	X	0	0	0	0	0
铜合金/黄铜	X	0	0	0	0	0
本表格依据 SJ/T 11364 的规定编制。						
0：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.

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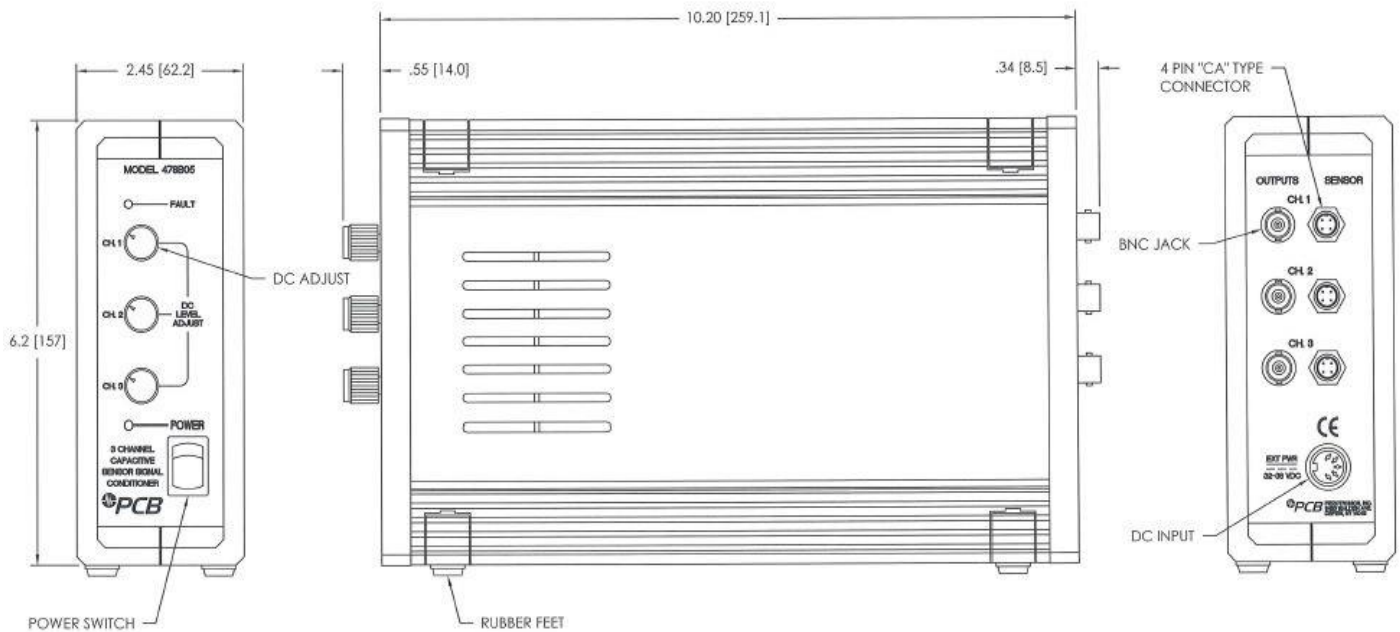
**OPERATING INSTRUCTIONS FOR  
MODEL 478B05  
SIGNAL CONDITIONER AND POWER SUPPLY  
FOR CAPACITIVE ACCELEROMETERS**

**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**



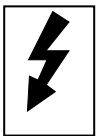
**OPERATING INSTRUCTIONS FOR  
MODEL 478B05  
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### 3.0 WARNING SYMBOLS & TERMS

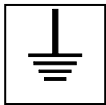
The following symbols and terms may be found on the equipment described in this manual.



*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.*

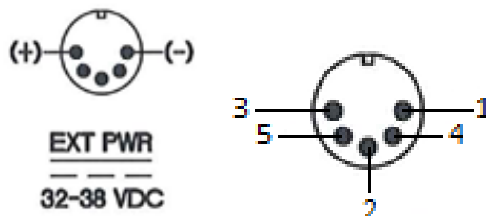


*This symbol indicates safety, earth ground.*

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

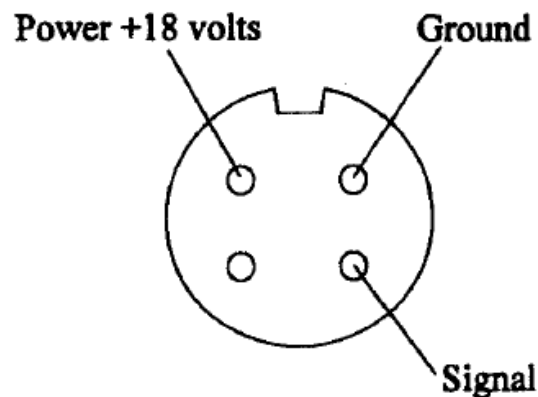
**OPERATING INSTRUCTIONS FOR  
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The input connections are made through three 4-pin connectors on the rear panel. Three single axis capacitive sensors can be connected to the input connectors via cable model 010D, 034D or 078D. One triaxial capacitive 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  
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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:

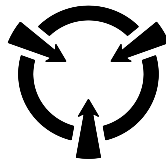
- Laying on and moving across a rug
- Any movement through air
- The action of rolling out a cable
- Contact with a non-grounded person

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>	<b>POWER SUPPLY</b>			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>	
Output Voltage	32 - 38 VDC	32 - 38 VDC	[1] See PCB Declaration of Conformance PS024 for details.	
Output Current	0.54 amps	0.54 amps	<b>SUPPLIED ACCESSORIES:</b>	
AC Power(50 to 60 Hz)	100 to 240 VAC	100 to 240 VAC	Model 017AXX Power Cord (1)	
(50 to 60 Hz)	0.6 amps	0.6 amps	Entered: <i>JH</i> Engineer: <i>PH</i> Sales: <i>gjm</i> Approved: <i>EB</i> Spec Number:	
AC Ripple(Peak to Peak)	<350 mV	<350 mV	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>	
<b>Physical</b>			<b>PCB PIEZOTRONICS</b> ELECTRONICS DIVISION 3425 Walden Avenue, Depew, NY 14043 Phone: 716-684-0001 Fax: 716-684-0987 E-Mail: electronics@pcb.com	
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		



[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.

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<b>Performance</b>	<u>ENGLISH</u>	<u>SI</u>	
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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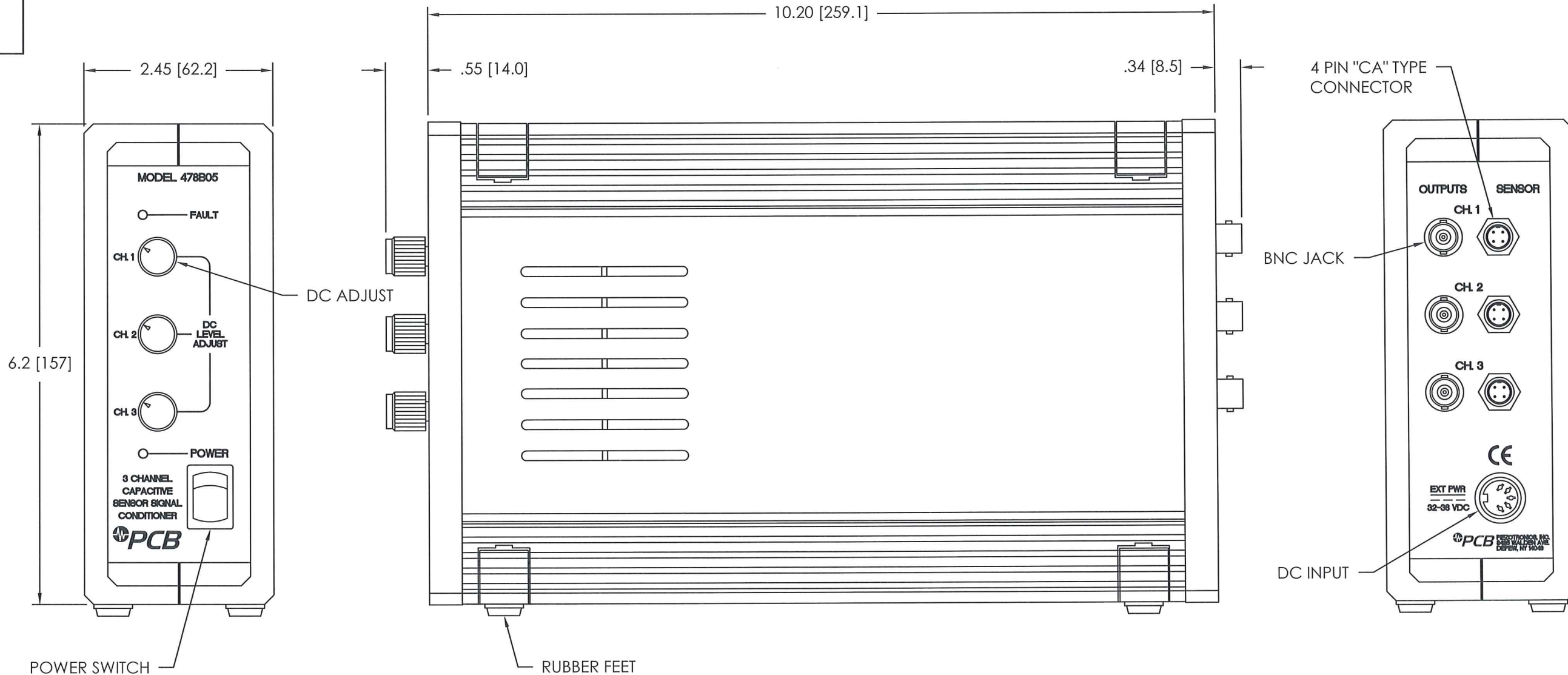


**Phone: 716-684-0001**  
**Fax: 716-684-0987**  
**E-Mail: info@pcb.com**

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REVISIONS		
REV	DESCRIPTION	DIN
B	CHANGED ARTWORK	37737

28812



UNLESS SPECIFIED TOLERANCES		DRAWN	CHECKED	ENGINEER	 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 EMAIL: SALES@PCB.COM
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]				