Model 484B02

Line Powered ICP 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
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 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 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:

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY14043 USA
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Website: www.pcb.com
E-mail: 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	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

PCB Model 484B02 ICP® Sensor Signal Conditioners feature four operating configurations:

- AC-Coupled Mode
- AC-Coupled Mode with Active Clamp
- AC-Coupled Mode with Relay Clamp
- DC-Coupled Mode

The unit supplies 2mA to 20mA of constant current to ICP® transducers or amplifiers, as well as deliver up to 10mA of low impedance (50 ohms) output current via a unity gain buffer amplifier.

See Guide G0001 (General Guide to ICP® Instrumentation) for a complete coverage of the low impedance concept.

2.0 DESCRIPTION

AC-Coupled Mode (no clamp)

The AC-Coupled Mode is used for most normal measurements since long term thermal drifting of long time constant transducers is nullified by the internal AC coupling. In this configuration, the signal information (AC voltage) is decoupled from the transducer bias level (DC voltage) and fed through a unity gain buffer amplifier. The coupling time constant is approximately 1,000 seconds and is independent of output load.

Since the output signal is not clamped, a repetitive pulse train will gradually drift downward and stabilize in time with equal areas above and below signal ground. (**Figure 1**)

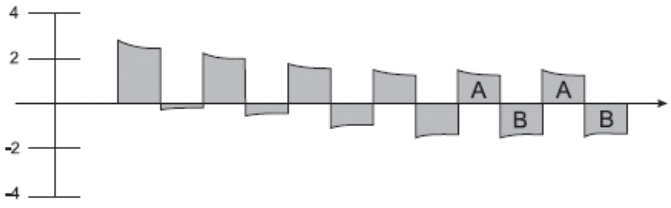


Figure 1 - Repetitive Pulse Train, AC Signal

To operate in this mode, set the MODE switch to AC, and the CLAMP switch to the OUT position.

Note: The front panel ZERO ADJUST knob has no effect in any of the AC mode configurations.

AC-Coupled Mode with Active Clamp

In this configuration, the conditioner is internally set to automatically keep pulsating output signals ground based (within 20mV negative undershoot) and positive polarity. (**Figure 2**) This clamp is useful in stabilizing output signals when interfacing with instrumentation that requires repetitive pulse train signals be ground based and of one polarity (usually positive).

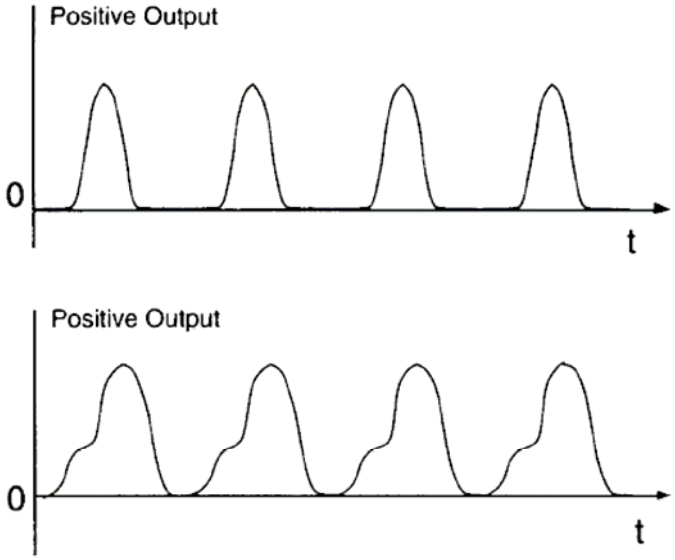


Figure 2 - Positive Polarity, Zero-based AC Output

To operate this mode, set the MODE switch to AC, and the CLAMP switch to the IN position.

AC-Coupled Mode with Relay Clamp

The Relay Clamp is essentially a perfect clamp with no negative undershoot. Grounding one wire of the relay coil externally actuates the Relay Clamp. This grounding operation can be a manual switch, automatic by machine operation or otherwise. The Relay Clamp may also be activated by pressing the front panel CAL/OP/GND switch to the GND position.

To operate this mode, set the MODE switch to AC. The CLAMP switch position does not affect this function.

DC-Coupled Mode

In the DC-Coupled Mode, the output signal is directly coupled from the transducer, through a level shifting circuit, to the unity gain buffer amplifier. In this setting, the low frequency response is determined solely by the transducer. The system discharge time constant is not compromised by the signal conditioner, so long time constant transducers may be used for calibration purposes, or for special situations where extra long duration events must be measured. In the latter situation, a thermally stable environment is usually required.

To operate this mode, set the MODE switch to DC. The CLAMP switch has no effect in this mode.

3.0 OPERATION

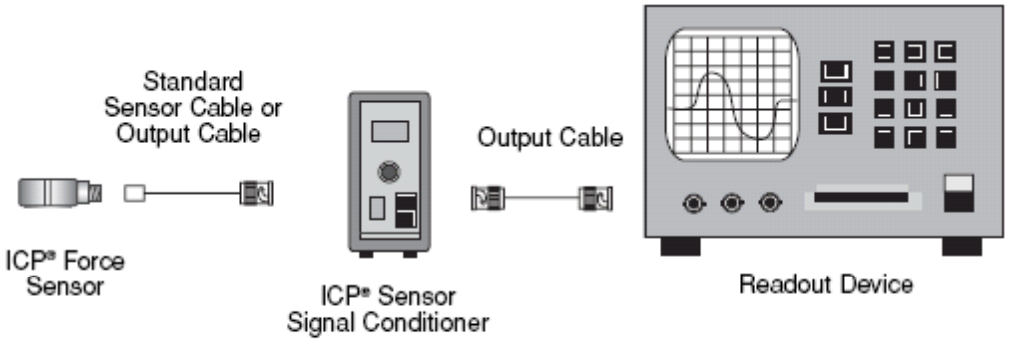


Figure 3 - Typical ICP® Sensor System

Operating in any AC-Coupled Mode

1. Connect the transducer or amplifier to the INPUT jack located on the back of the conditioner.

   Note: Since ICP® transducers operate at a low impedance level, it is not necessary to use low noise or other shielded cable. In some cases, it is desirable to use twisted pair and other types of 2-wire cable.

2. Connect readout device to the OUTPUT jack located on the back of the conditioner.

3. Set the MODE switch to AC.

4. Plug the supplied 3-wire line cord (PCB Model 017) into the 120V 60Hz receptacle, then press the red POWER button on. Activating the power button supplies an adjustable constant current source at a regulated DC power supply (+24V) and to the single transducer or ICP® amplifier.

5. Verify the transducer circuit is operating properly by observing the Fault Monitor Meter located on the front panel. A normal operating transducer will display in the green range, approximately mid-scale of the meter indicator. A reading in the red (zero volts) range indicates a short in the cabling and/or the ICP® amplifier. A reading in the yellow (full-scale) range indicates an open in the cabling or a faulty ICP® amplifier.

6. Activate the GND Switch (Relay Clamp) to quickly stabilize the output to zero. This will immediately charge the capacitor in the AC coupling circuit to the transducer bias.

7. Set the CLAMP Switch to the desired position.

8. Allow the unit to warm up for 10 or 15 minutes prior to use to thermally stabilize system components.

9. To conduct a system calibration, press the CAL/OP/GND switch to the CAL position to introduce a +1.0 volt DC calibration voltage to the input of the unity gain output amplifier. A BNC CAL input jack is available on the back panel of the unit for external calibration purposes.

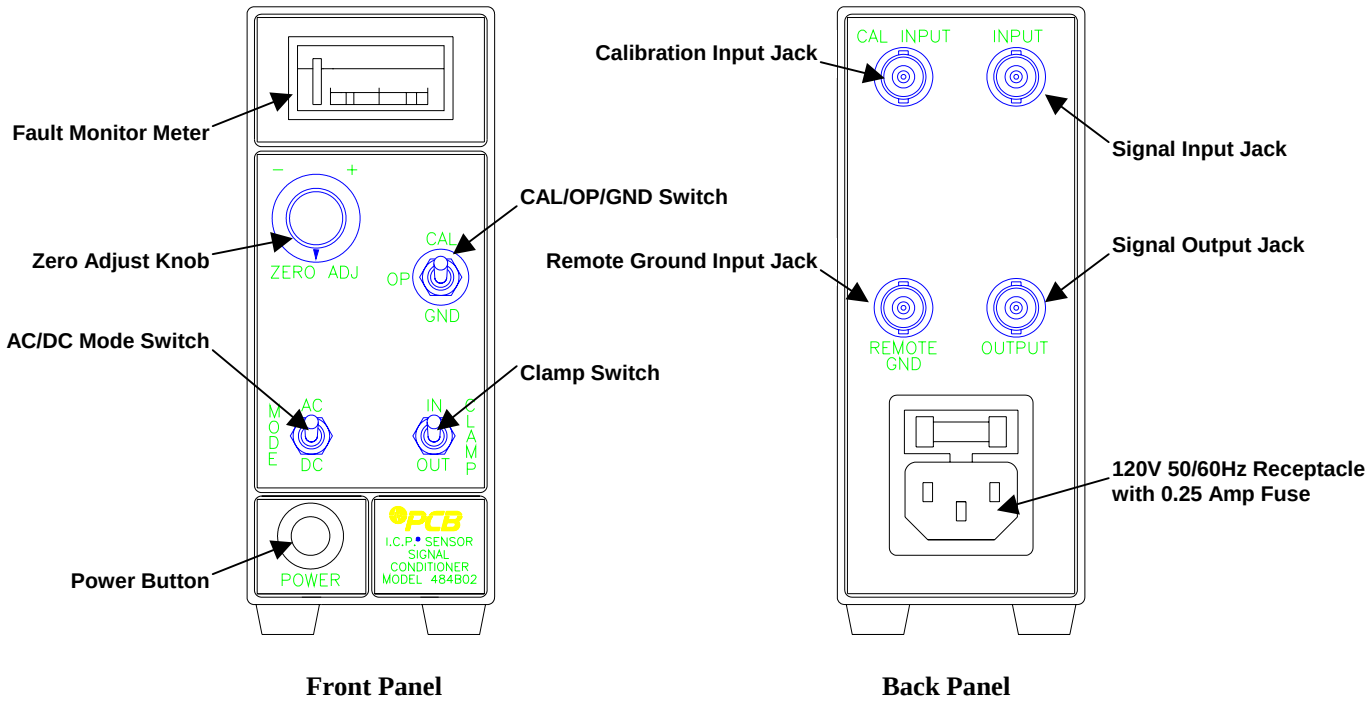


Figure 4 – Panel Descriptions

Operating in DC-Coupled Mode

1. Connect the transducer or amplifier to the INPUT jack located on the back of the conditioner.
   Note: Since ICP® transducers operate at a low impedance level, it is not necessary to use low noise or other shielded cable. In some cases, it is desirable to use twisted pair and other types of 2-wire cable.

2. Connect readout device, if used, to the OUTPUT jack located on the back of the conditioner.

3. Set the MODE switch to DC.

4. Plug the supplied 3-wire line cord (PCB Model 017) into the 120V 60Hz receptacle, then press the red POWER button on. Activating the power button supplies a regulated DC power supply (+24V) and adjustable constant current source to the single transducer or ICP® amplifier.

5. Verify the transducer circuit is operating properly by observing the Fault Monitor Meter located on the front panel. A normal operating transducer will display in the green range, approximately mid-scale of the meter indicator. A reading in the red (zero volts) range indicates a short in the cabling and/or the ICP® amplifier. A reading in the yellow (full-scale) range indicates an open in the cabling or a faulty ICP® amplifier.

6. Allow unit to warm up for 10 or 15 minutes prior to use to thermally stabilize system components.

7. Zero the output voltage. After the system has adequately warmed up, turn the ZERO ADJUST control knob to zero the output voltage. Clockwise rotation shifts the voltage positive and counterclockwise moves it negative. After long periods of operation, it may be necessary to reset the zero slightly. This is normal.

8. To conduct a system calibration, press the CAL/OP/GND switch to the CAL position to introduce a +1.0 volt DC calibration voltage to the input of the unity gain output amplifier. A BNC CAL input jack is available on the back panel of the unit for external calibration purposes.

3.0 SETTING THE CONSTANT CURRENT

System performance may be adversely affected by the physical parameters of the transducer, pulse rise time, cable length and terminations. Optimizing the current setting may help correct this condition.

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

Note: Unit is factory set to 4 ±0.6 mA. This current setting is sufficient for most applications.

To set the constant current,

1. Remove the four rubber feet from the bottom of the conditioner by unscrewing the pan head screws with a small Phillips head screwdriver.
2. Pull the protective inner case out of the blue outer shell.
3. Remove the small flat head screw from the center of the protective inner case, near the edge.
4. Remove the cover from the protective case to expose the internal circuit board.
5. Locate the current adjust potentiometer. (Refer to **Figure 5**).
6. Connect a 0-30mA DC meter (or multimeter) to the center conductor of the INPUT jack.
7. Return the negative probe to chassis ground. The constant current value is read directly on the milliammeter.
8. Adjust the current adjust potentiometer to set current to a new level. Use care to avoid shorting components with metal screwdriver blades.
9. Replace and fasten the protective case, outer shell, and rubber feet.

Caution: Operating an ICP® transducer or amplifier above 20mA may result in equipment damage.

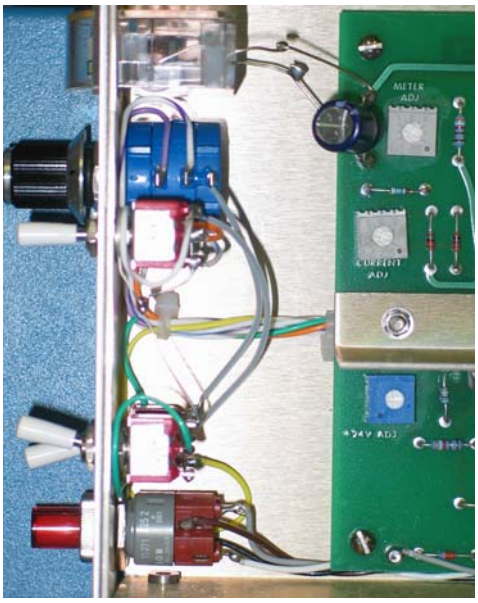


Figure 5 - Constant Current Potentiometer Location

4.0 MAINTENANCE AND REPAIR

Aside from the transducer current adjustment as described in Section 3.0, there are no other adjustments to perform on the Model 484B02. No maintenance is required for these units. In the unlikely event the unit does not perform properly, please contact the factory for assistance.

MANUAL NUMBER: 20141
MANUAL REVISION: A
ECN NUMBER: 22378

Model Number		Revision: C
484B02	**LINE POWERED ICP® SENSOR SIGNAL CONDITIONER**	ECN #: 9948

ELECTRICAL

Supply Voltage Regulated		VDC	+24 ±1.0	
ICP® Sensor Excitation Current (Constant Current Source)		mA	2-20	[1]
Time Constant		sec	1,000	[3]
Transducer Bias Voltage Accommodation Range		VDC	7.5 to 14.5	
Low Frequency Response (-5%) AC, DC		Hz	0.0005, 0	[4]
High Frequency Response (±5V, -5%)		kHz	200	
DC Offset		mV	<30	[3]
Noise Broadband, RMS (1 Hz-10 kHz)		µV [dB]	28.8 [-90,8]	
Typical Spectral Noise:	at 1 Hz	µV/√Hz [dB]	4.50 [-107]	
	at 10 Hz	µV/√Hz [dB]	1.10 [-119]	
	at 100 Hz	µV/√Hz [dB]	0.40 [-129]	
	at 1 kHz	µV/√Hz [dB]	0.20 [-135]	
	at 10 kHz	µV/√Hz [dB]	0.06 [-144]	
Gain			1 ±1%	
Maximum Voltage Output		volts (pk)	±10	
Output Impedance		ohms	<10	
Fault Monitor Meter (1 mA movement)		V/FS	24 ±1.0	
Power (50 to 400 Hz)		V/A	115 ±10%/0.25 (maximum)	[2]

PHYSICAL

Connectors:	Input (transducer)	type	BNC Jack	
	Output (scope)	type	BNC Jack	
	Calibration Input	type	BNC Jack	
	Remote Ground	type	BNC Jack	
	AC (power) Input	type	IEC 320	
Size (H x W x D):		in	2 x 5 x 10.5	
		[mm]	[50,8 x 127 x 266,7]	
Weight		lb [gm]	2 [907,2]	

NOTES:

[1] Unit supplied with current set at 4 ±0.6 mA.
[2] Unit set to 230 VAC when ordered as "F484B02."
[3] In AC mode.
[4] System response determined by sensor's discharge time constant.

SUPPLIED ACCESSORIES:

Model 017 AC Line Cord

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

ICP® is a registered trademark of PCB Piezotronics, Inc.

PCB PIEZOTRONICS INC.

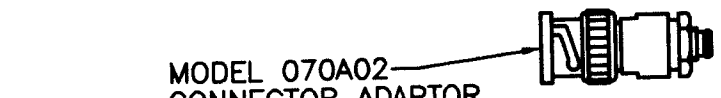
Drawn	[illegible]	JAN 11, '99	Spec No. 484-2020-80
Engineer	[illegible]	1/11/99	
Sales	EJR	1/11/99	
Approved	KJS	1/11/99	Sheet 1 of 1

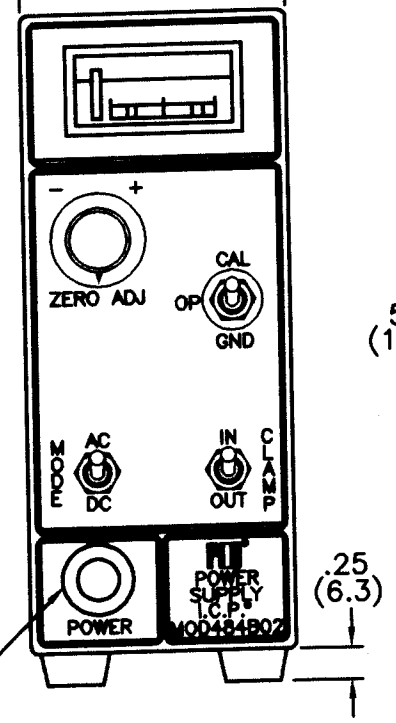
APPLICATION		
NEXT ASS'Y	USED ON	VAR

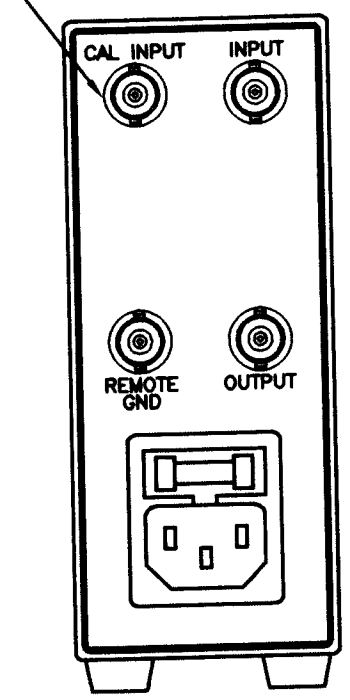
484-2020-95

REVISIONS					
ZONE	REV	DESCRIPTION	ECN	DATE	APP'D
	A	REVISED PER ECR	7684	6/12/97	

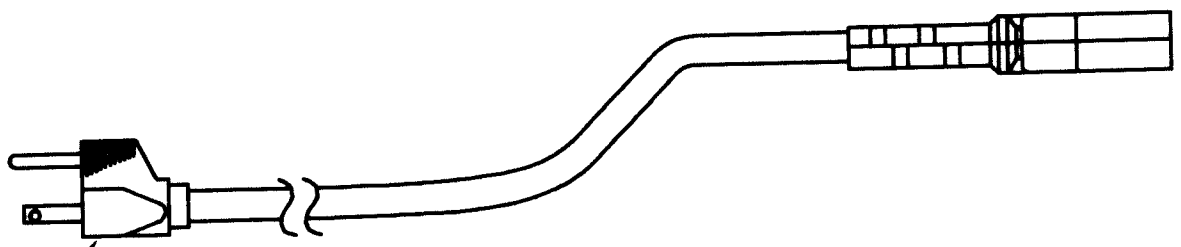
MODEL 070A02
CONNECTOR ADAPTOR
BNC PLUG TO
MICRODOT 10-32 (SUPPLIED)







POWER ON-OFF SWITCH
(INCLUDES PILOT LIGHT)



DETACHABLE 3 WIRE AC CORD
8 FEET(2.44 METERS) LINE CORD

UNLESS SPECIFIED TOLERANCES	
DIMENSIONS IN INCHES DECIMALS XX ±.01 XXX ±.005 ANGLES ±2 DEGREES	DIMENSIONS IN MILLIMETERS (IN PARENTHESIS) DECIMALS XX ±0.3 XXX ±0.13 ANGLES ±2 DEGREES
FILLETS AND RADII .003 - .005	FILLETS AND RADII (0.07 - 0.13)
DD012 REV. A 05/26/95	

DRAWN		7/3/97	MFG	R Grim	7-3-97
CHK'D		7/3/97	ENGR		7/3/97
APP'D					

TITLE: OUTLINE DRAWING
MODEL 484B02
DUAL MODE POWER SUPPLY

PCB PIEZOTRONICS, INC.
3425 WALDEN AVE. DEPEW, NEW YORK 14043
PHONE: (716) 684-0001

CODE IDENT. NO.	DWG. NO.
52681	484-2020-95
SCALE: .66=1	SHEET 1 OF 1