



Model 480E09

1-Channel, battery-powered, ICP® sensor signal conditioner, gain x1, x10,

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**



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 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

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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1.0 INTRODUCTION

The Models 480E09/E06 are ICP® Battery Power Units with gain. The voltage gain switch offers amplification factors of 1, 10, and 100.

NOTE: The only difference between the models is that the 480E09 unit features BNC connectors while the 480E06 unit features microdot connectors.

2.0 DESCRIPTION

Refer to Drawings and Specifications in the front of this manual. Also see Figure 1 for Schematic Diagram, common for both Models 480E09 and 480E06.

The 480E09/E06 models operate from three self-contained 9-volt transistor radio batteries and supply constant-current power to the built-in transducer amplifier in ICP® transducers or in-line and adaptor amplifiers such as the 401 and 402 series. (See Guide G-0001 for a comprehensive coverage of the ICP® concept).

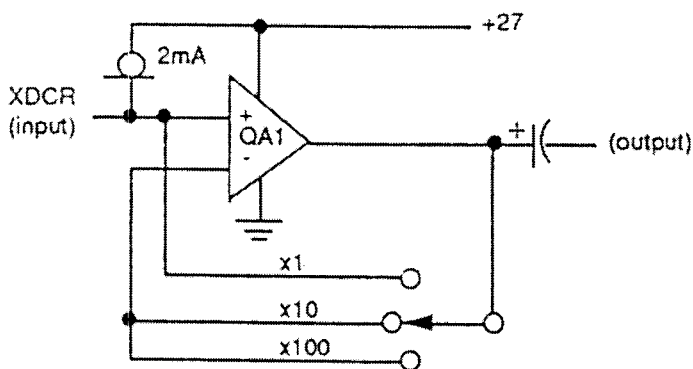


Figure 1

Schematic Diagram Model 480E09 or 480E06

A transducer ("XDCR") jack is located at the front panel as well as a signal output jack labeled "SCOPE". These jacks are both female BNC jacks (for the 480E09) which mate directly with the PCB Model 002C cable.

Both units use easy-to-change batteries (see Section 3.3) and are physically easy to operate.

The units are small enough to be easily carried in the field and, being battery operated, are especially noise-free and unaffected by ground loops. The low battery drain affords good battery life. An additional connector for battery charging permits use of rechargeable batteries.

Also, the gain amplifier is "unpowered" in the gain of "1" position for extended battery life.

A notable feature common to these units is the low-frequency response. (See Specification Sheets).

Another feature common to these units is a front panel meter which serves as fault monitor check for circuit connections and, when used in connection with a front panel momentary battery test rocker switch, can also check the condition of the batteries. Another refinement is a small phone jack on the front panel which can be used as an external DC power source with inputs up to 27 volts.

The front panel meter referred to above is color-coded to monitor circuit faults and to check battery conditions. Subsequent sections of this manual will describe these functions in detail.

3.0 OPERATION

With no transducer connected to the Models 480E09/E06, move the rotary switch to the desired gain position. The front panel voltmeter will read the battery voltage. (+27 volts for fresh batteries). The voltmeter is scaled to read 27-volts full scale without the transducer in the system. (see figure 2).

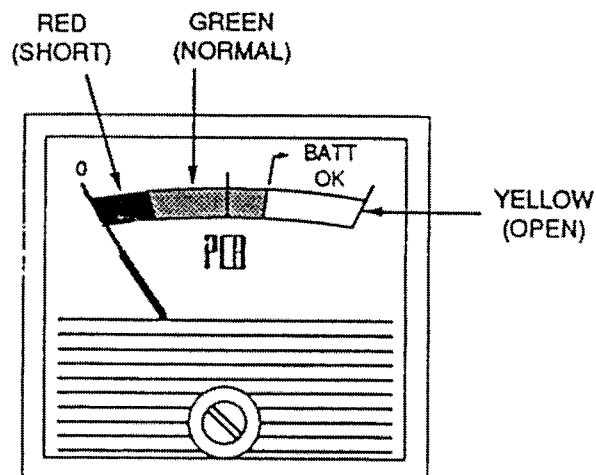


Figure 2

Fault Monitor Meter

When an ICP® transducer is connected to the input "transducer" jack, the meter will indicate approximately mid-scale (+11V nominal) if the transducer's built-in amplifier is functioning properly and cables are intact. (Certain special ICP® transducers such as low-noise or cryogenic units have lower turn-on voltage. Consult specification sheet).

In this manner, the meter can be used to continuously monitor the system for normal operation.

Immediately after connecting readout instrument (oscilloscope, meter, recorder, etc.) to the "output" jack, the 22 μ F coupling capacitor will begin charging through the input resistance of the readout instrument. This charging will cause an apparent "drifting" of the output signal until the capacitor is fully charged. Such drifting is perfectly normal.

3.1 OUTPUT VOLTAGE LIMITATIONS

Certain ICP® transducers are capable of a 10-volt output voltage swing. The Models 480E09/E06 with 27V supply will allow the positive-going side of the signal to go to ± 14 volts. The negative-going side of the signal is capable of -8 volts assuming a 10-volt turn-on for the transducer.

3.2 CURRENT DRIVE LIMITATIONS

In the interest of battery life, the current output of Models 480E09/E06 is fixed at 2mA. This current will adequately handle high-frequency signals in cables up to approximately 100 ft. long. Longer cables can be driven, but with sacrifice of high-frequency response.

3.3 CHANGING THE BATTERIES

Should the batteries require changing, as indicated by the front panel voltmeter, proceed as follows:

Remove the one screw at the rear panel of both the 480E09/E06 and remove the unit from its plastic case.

Unsnap battery from connectors and remove batteries. Connect new 9-volt batteries in place, replace rear cover and re-screw. Be sure the insulator between the PC board and the battery is in place.

In normal use, the life expectancy of the batteries is in excess of 40 hours of operation when gain is in the x10 or x100 position. When gain switch is in unity position, battery life is approximately 80 hours. Turn unit off when not in use to conserve battery life.

NOTE: Use Mallory Duracell Mn 1604 or equivalent NEDA 1604A battery.

3.4 BATTERY TEST

The Models 480E09/E06 Power Units incorporate a momentary battery test rocker switch as part of the ON/OFF switch.

Depressing this rocker switches the meter from the "XDCR" jack to the battery high side.

Normal circuit operation is not affected by this action and releasing the rocker returns the meter to the transducer bias monitor function.

Replace batteries if meter pointer does not move to "BATT OK" mark on the meter when power is "ON", and "BATT TEST" rocker is depressed.

3.5 BATTERY CHARGING

Plug 488A02 charger into front panel jack and with unit off, recharge for 14 hours. Full charge supplies 10 mA constant current to batteries. (With unit "ON" only a trickle charge of about 2mA is available for the batteries). The standard 488A02 operates on 110V; the prefix "F" indicates 220V operation (F488A02).

CAUTION

Do not use recharger unless unit has rechargeable batteries installed (Varta TR7/8 or Eveready N88).

3.6 EXTERNAL BATTERY CONNECTION

The external battery connector (which takes a #750 switchcraft phone plug) is intended for use when longer battery life is desired. Model 073A05 Long Life Battery Pack uses 6V lantern batteries connected in series to provide 24 volts to the unit.

4.0 MAINTENANCE AND REPAIR

Aside from battery replacement, no maintenance is required for these units. It is suggested, should trouble occur, that you contact the factory for assistance.

If the unit must be returned, please describe the problem in a brief note.

A quotation for repair of out-of-warranty equipment should be requested.

MANUAL NUMBER: 18782

MANUAL REVISION: NR

Model Number

480E09

BATTERY-POWERED SIGNAL CONDITIONER

Revision: R

ECN #: 38626

Performance	ENGLISH	SI	
Channels	1	1	
Frequency Range(-5 %)(x1, x10 Gain)	0.15 to 100,000 Hz	0.15 to 100,000 Hz	[5]
(-10 %)(x100 Gain)	0.15 to 50,000 Hz	0.15 to 50,000 Hz	[6]
Voltage Gain(± 2 %)	1:1	1:1	
(± 2 %)	1:10	1:10	
(± 2 %)	1:100	1:100	
Fault/Bias Monitor/Meter(± 1 V)(midscale)	13 VDC	13 VDC	
Environmental			
Temperature Range	32 to 120 °F	0 to 50 °C	
Electrical			
Excitation Voltage(To Sensor)	25 to 29 VDC	25 to 29 VDC	[1]
Constant Current Excitation(To Sensor)	2.0 to 3.2 mA	2.0 to 3.2 mA	[2]
Discharge Time Constant	>7 sec	>7 sec	[3]
DC Offset(Maximum)	<30 mV	<30 mV	[3]
Spectral Noise(1 Hz)(Gain 1)	.25 µV/√Hz	-132 dB	
(10 Hz)(Gain 1)	.07 µV/√Hz	-143 dB	
(100 Hz)(Gain 1)	.05 µV/√Hz	-146 dB	
(1 kHz)(Gain 1)	.04 µV/√Hz	-148 dB	
(10 kHz)(Gain 1)	.03 µV/√Hz	-150 dB	
Broadband Electrical Noise(1 to 10,000 Hz)(Gain x1)	3.25 µV rms	-110 dB/rms	
Spectral Noise(1 Hz)(Gain 10)	2.2 µV/√Hz	-113 dB	
(10 Hz)(Gain 10)	2.0 µV/√Hz	-114 dB	
(100 Hz)(Gain 10)	1.1 µV/√Hz	-119 dB	
(1 kHz)(Gain 10)	.55 µV/√Hz	-125 dB	
(10 kHz)(Gain 10)	.3 µV/√Hz	-130 dB	
Broadband Electrical Noise(1 to 10,000 Hz)(Gain x10)	49 µV/rms	-86 dB/rms	
Spectral Noise(1 Hz)(Gain 100)	20 µV/√Hz	-94 dB	
(10 Hz)(Gain 100)	19 µV/√Hz	-94 dB	
(100 Hz)(Gain 100)	12 µV/√Hz	-98 dB	
(1 kHz)(Gain 100)	5.5 µV/√Hz	-105 dB	
(10 kHz)(Gain 100)	2 µV/√Hz	-114 dB	
Broadband Electrical Noise(1 to 10,000 Hz)(Gain x100)	569 µV/rms	-65 dB/rms	
Power Required(Standard)	Internal Battery	Internal Battery	
Internal Battery(Type)	9V	9V	
Battery Life(Standard Alkaline)	50 hours	50 hours	
Power Required(Alternate)	DC power	DC power	
DC Power	15 mA	15 mA	[4]
Internal Battery(Quantity)	3	3	
DC Power	18 to 30 VDC	18 to 30 VDC	[4][1]
Physical			
Electrical Connector(Input, sensor)	BNC Jack	BNC Jack	
(Output, scope)	BNC Jack	BNC Jack	
(External Power, DC)	3.5 mm Diameter Miniature Jack	3.5 mm Diameter Miniature Jack	
(Battery Charger)	#722 Switchcraft Jack	#722 Switchcraft Jack	
Size (Depth x Height x Width)	2.4 in x 4.0 in x 2.9 in	6.1 cm x 10 cm x 7.4 cm	
Weight(Including Batteries)	0.7 lb	0.3 Kg	

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.

R - Rechargeable option, includes rechargeable batteries and charger.

Internal Battery(Quantity)	3	3
Internal Battery(Type)	9V	9V
Battery Life(Rechargeable Ni MH)	20 hours	20 hours

NOTES:

- [1] Excitation voltage to sensor limited by optional DC power voltage.
 [2] Through internal current limiting regulator.
 [3] With 1M ohm load.
 [4] Provided by optional external DC power supply.
 [5] Low frequency response specified into 1M ohm load.
 [6] After Serial Number 24699, previously HFR was 100kHz.
 [7] See PCB Declaration of Conformance PS024 for details.

OPTIONAL ACCESSORIES:

Model 400A81 (3) 9 V ultralife lithium batteries
 Model 488A02 Tabletop battery charger, selectable input voltage, 110 & 220 VAC (for Series 480 battery signal conditioners)
 Model 488A03 AC power source (for Series 480 battery signal conditioners - based on Model 488A02)

Entered: <i>Let</i>	Engineer: <i>AGP</i>	Sales: <i>JGM</i>	Approved: <i>BAM</i>	Spec Number:
Date: <i>5-15-12</i>	Date: <i>3-27-12</i>	Date: <i>3-29-12</i>	Date: <i>3-27-12</i>	480-5090-80



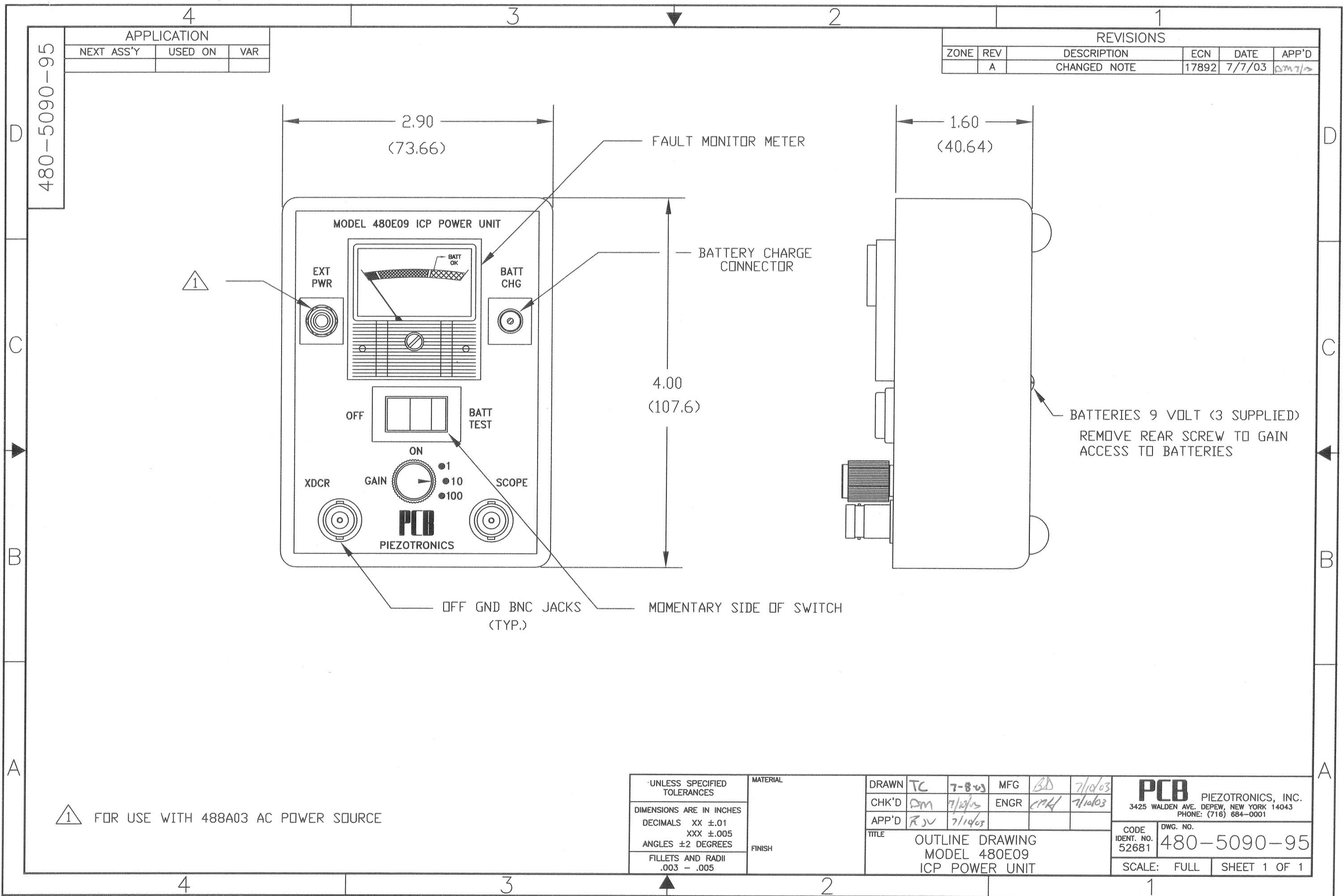
[7]

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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PCB PIEZOTRONICS
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APPLICATION		
NEXT ASS'Y	USED ON	VAR

REVISIONS					
ZONE	REV	DESCRIPTION	ECN	DATE	APP'D
	A	CHANGED NOTE	17892	7/7/03	<i>DM</i>

480-5090-95

① FOR USE WITH 488A03 AC POWER SOURCE

UNLESS SPECIFIED TOLERANCES DIMENSIONS ARE IN INCHES DECIMALS XX ±.01 XXX ±.005 ANGLES ±2 DEGREES FILLETS AND RADII .003 - .005	MATERIAL	DRAWN	<i>TC</i>	<i>7-8-03</i>	MFG	<i>BD</i>	<i>7/10/03</i>	PCB PIEZOTRONICS, INC. 3425 WALDEN AVE. DEPEW, NEW YORK 14043 PHONE: (716) 684-0001
	FINISH	CHK'D	<i>DM</i>	<i>7/14/03</i>	ENGR	<i>AK</i>	<i>7/10/03</i>	
		APP'D	<i>RJV</i>	<i>7/14/03</i>				
		TITLE	OUTLINE DRAWING MODEL 480E09 ICP POWER UNIT					
								SCALE: FULL SHEET 1 OF 1