SENSOR SIGNAL CONDITIONERS

CAUTION!
For your safety and to insure long product life, please read all precautions before using this product.

Models 480E06, 480E09 2000

Battery Powered Signal Conditioner

for use with ICP® sensors

Installation and Operating Manual

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

GEP toll-free 800-828-8840
24-hour SensorLine™ 716-684-0001
Fax 716-684-0987
E-mail gep@pcb.com

PCB PIEZOTRONICS INC.
GEP DIVISION

GENERAL ELECTRONIC PRODUCTS DIVISION

WARNING

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 (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: 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.

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).

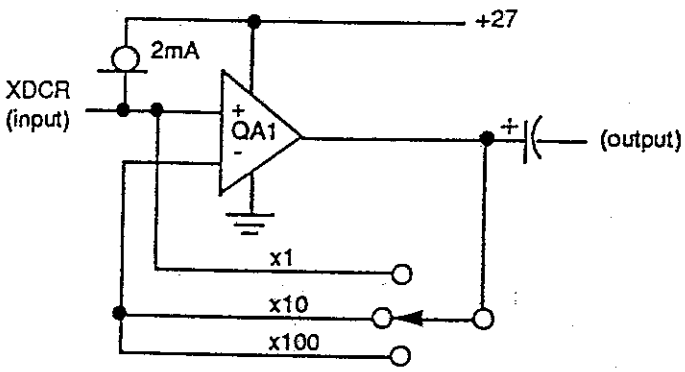

Figure 1
Schematic Diagram Model 480E09 or 480E06

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).

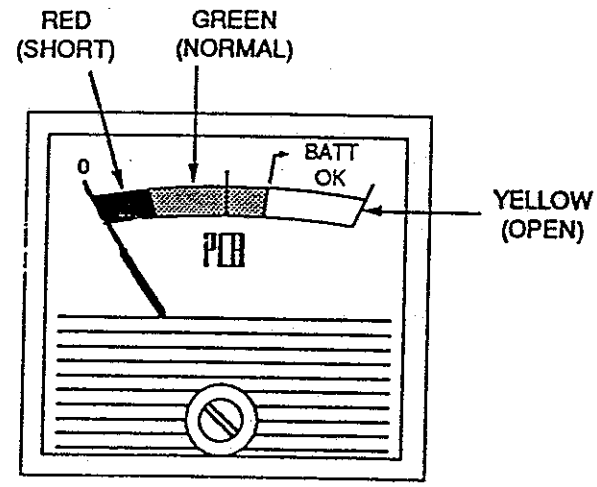

Figure 2
Fault Monitor Meter

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 22µF 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.

PCB® PIEZOTRONICS

SPECIFICATIONS

Battery-Powered Signal Conditioning For Use With ICP Sensors

Model No. 480E06

Revisions -B- Rev # 7498 DM 1/23/97

ELECTRICAL				
Supply Voltage		+V	27	
Supply Current (thru internal current limiting diode)		mA	2 (±0.6)	
Current Avail to Drive Readout		mA	1	
Time Constant (w/1M Ω load at "scope" output)		sec	11	(±10%)
DC Offset (maximum) (w/1M Ω load at "scope" output)		mV	±30	
Battery Life		hours	40, 12 (±10%)	[2] [3]
Battery (3 supplied) (Alkaline)		V	9, NEDA 1604A	[4]
Voltage Gain:			1 : 1 (±2%)	
			1 : 10 (±2%)	
			1 : 100 (±2%)	
Frequency Response (±5% voltage all gain)		Hz/kHz	0.15/100	[1]
Noise, Electrical -- Gain 1 Spectral:	1 Hz	nV/√Hz	23	
	10 Hz	nV/√Hz	8.9	
	100 Hz	nV/√Hz	3.5	
	1 kHz	nV/√Hz	3.2	
	RMS	nV	360	[5]
Noise, Electrical -- Gain 10 Spectral:	1 Hz	µV/√Hz	1.1	
	10 Hz	nV/√Hz	5.4	
	100 Hz	nV/√Hz	460	
	1 kHz	nV/√Hz	450	
	RMS	µV	44	[5]
Noise, Electrical -- Gain 100 Spectral:	1 Hz	µV/√Hz	10	
	10 Hz	µV/√Hz	5.1	
	100 Hz	µV/√Hz	4.5	
	1 kHz	µV/√Hz	4.6	
	RMS	µV	430	[5]
Fault Monitor Meter (1 mA movement)		V/FS	27	
External Power, Input		V/mA	18-28/8	
PHYSICAL				
Connectors:	Input (transducer) (micro)	jack	10-32	
	Output (scope) (micro)	jack	10-32	
	External Power, Input	jack	1/8 Diameter Miniature	
	Charge Connector	jack	#722 Switchcraft	
Size: H x W x D		inch	4.0 x 2.9 x 1.5	
		[mm]	[101,6 x 73,7 x 38,1]	
Weight (including batteries)		oz [grams]	12 [340,2]	

Options for 480E06 Power Unit:
488A02 Charger with 3 NiCad Batteries
073A05 External Long Life Battery Pack (for external power input)

NOTES:
[1] Low frequency response specified into 1M Ω load.
[2] Alkaline Batteries (typical or compatible).
[3] Rechargeable Batteries (typical or compatible).
[4] Varta TR7/8 (or Eveready N88) for rechargeable version.
[5] Specified over a range of 1 Hz to 10 kHz.

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

SUPPLIED ACCESSORIES:
None

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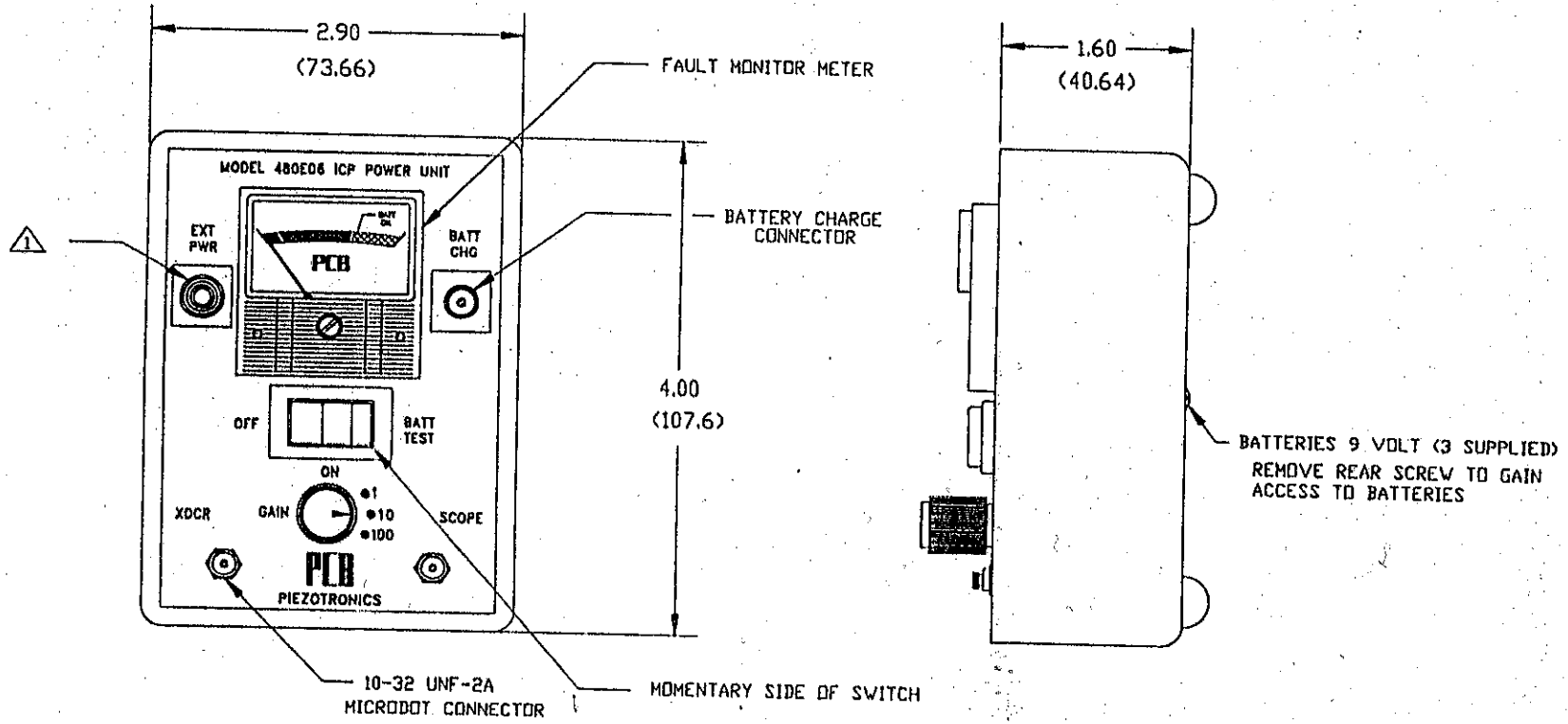
Engineer	[illegible]	1/23/97	
Sales	EJR	1/23/97	
Approved	RJV	1/23/97	Sheet 1 of 1

480-5060-95

APPLICATION		
NEXT ASS'Y	USED ON	VAR

REVISIONS					
ZONE	REV	DESCRIPTION	ECN	DATE	APP'D



⚠1 FOR USE WITH 073A05 EXTERNAL LONG LIFE PACK (24V)

UNLESS SPECIFIED TOLERANCES	MATERIAL
DIMENSIONS ARE IN INCHES DECIMALS XX ±.01 XXX ±.005 ANGLES ±2 DEGREES	FINISH
FILLETS AND RADII .003 – .005	

DRAWN	KEN L.	6/8/92	MFG			
CHK'D			ENGR			
APP'D		6/92				

TITLE: OUTLINE DRAWING MODEL 480E06 ICP POWER UNIT

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

CODE IDENT. NO.	DWG. NO.
52681	480-5060-95

SCALE: FULL | SHEET 1 OF 1

Model Number 480E09	BATTERY-POWERED SIGNAL CONDITIONING FOR USE WITH ICP ® SENSORS	Revision: C ECN #: 11560

ELECTRICAL

Supply Voltage (internal batteries)		+V	28 ±1V	
Supply Current (thru internal current limiting diode)		mA	2.5 (±0.6)	
Time Constant (w/1M Ω load at "scope" output)		sec	>10	
DC Offset (maximum) (w/1M Ω load at "scope" output)		mV	<30	
Battery Life		hours	40, 12 (±10%)	[2] [3]
Battery (3 supplied) (Alkaline)		V	9, NEDA 1604A	[4]
Voltage Gain:			1 : 1 (±2%)	
			1 : 10 (±2%)	
			1 : 100 (±2%)	
Frequency Response (±5% voltage all gains)		Hz/kHz	0.15/100	[1]
Noise, Electrical -- Gain 1 Spectral:	1 Hz	µV/√Hz [dB]	0.25 [-132]	
	10 Hz	µV/√Hz [dB]	0.07 [-143]	
	100 Hz	µV/√Hz [dB]	0.05 [-146]	
	1 kHz	µV/√Hz [dB]	0.04 [-148]	
	10 kHz	µV/√Hz [dB]	0.03 [-150]	
Broadband Noise 1 Hz-10 kHz:	RMS	µV/√Hz [dB]	3.25 [-110]	[5]
Noise, Electrical -- Gain 10 Spectral:	1 Hz	µV/√Hz [dB]	1.80 [-115]	
	10 Hz	µV/√Hz [dB]	0.80 [-122]	
	100 Hz	µV/√Hz [dB]	0.75 [-122]	
	1 kHz	µV/√Hz [dB]	0.55 [-125]	
	10 kHz	µV/√Hz [dB]	0.30 [-130]	
Broadband Noise 1 Hz-10 kHz:	RMS	µV/√Hz [dB]	40 [-88]	[5]
Noise, Electrical -- Gain 100 Spectral:	1 Hz	µV/√Hz [dB]	14.0 [-97]	
	10 Hz	µV/√Hz [dB]	8.5 [-101]	
	100 Hz	µV/√Hz [dB]	8.0 [-102]	
	1 kHz	µV/√Hz [dB]	5.5 [-105]	
	10 kHz	µV/√Hz [dB]	2.0 [-114]	
Broadband Noise 1 Hz-10 kHz:	RMS	µV/√Hz [dB]	350 [-69]	[5]
Bias Monitor Meter (midscale)		VDC	13 ±1V	
External Power, Input		V/mA	18-30/8	

PHYSICAL

Connectors:	Input (transducer)	type	BNC Jack
	Output (scope)	type	BNC Jack
	External Power, Input	type	3.5 mm Diameter Miniature Jack
	Charge Connector	type	#722 Switchcraft Jack
Size: H x W x D		in	4.0 x 2.9 x 1.5
		[mm]	[101,6 x 73,7 x 38,1]
Weight (including batteries)		oz [gm]	12 [340,2]

Options for 480E09 Power Unit:
Model 488A03 AC Power Supply
Model 488A02 Dual Mode Battery Charger with 3 NiCad Batteries
3 Ultralife U9VL Lithium Batteries (>200 hours operation)

NOTES:
[1] Low frequency response specified into 1M Ω load.
[2] Alkaline batteries (typical or compatible).
[3] Rechargeable Batteries (typical or compatible).
[4] Varta TR7/8 (or Eveready N88) for rechargeable version.
[5] Specified over a range of 1 Hz to 10 kHz.

SUPPLIED ACCESSORIES:
None

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 GEP DIVISION

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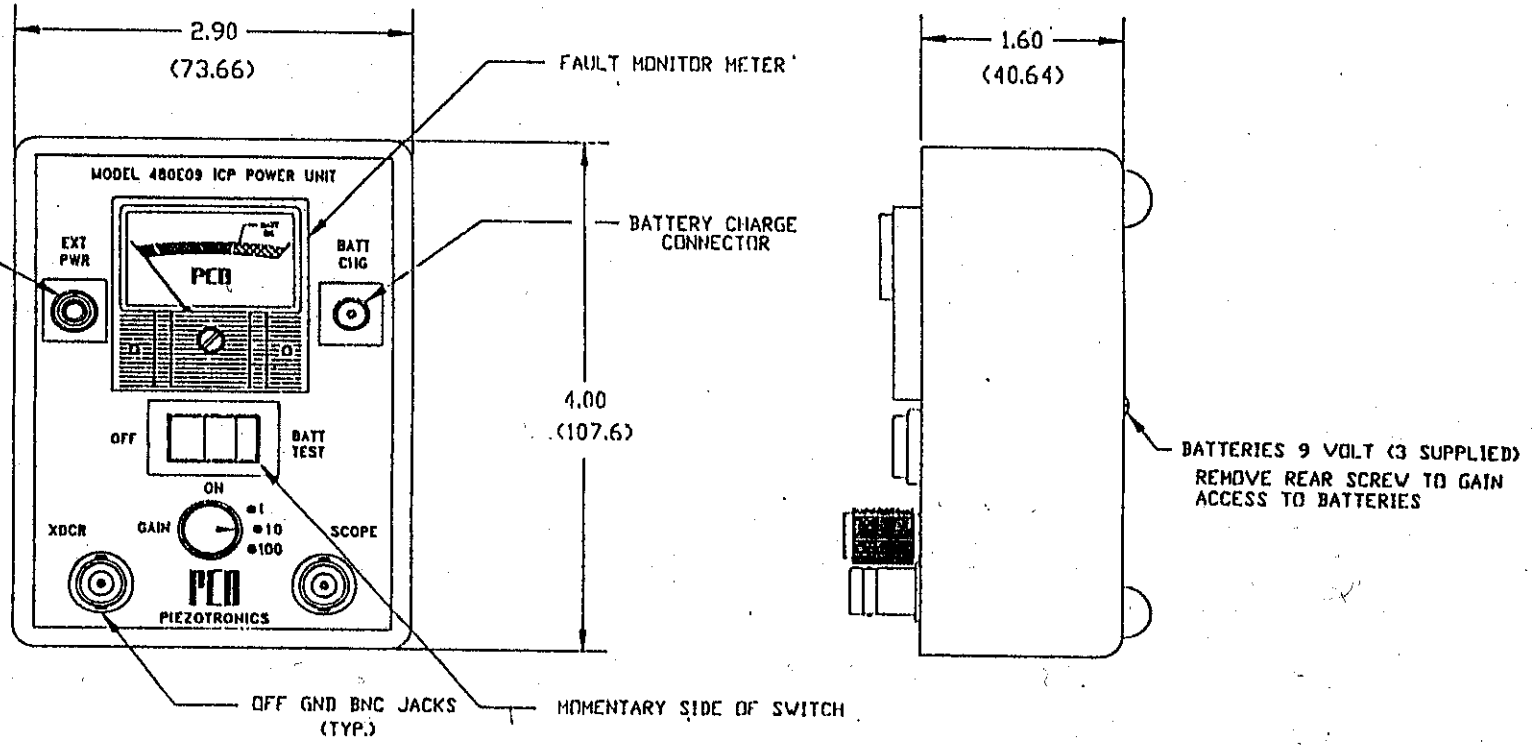
Engineer	[illegible]	3/9/00	480-5090-80
Sales	EJR	3/9/00	
Approved	EJV	3/10/00	Sheet 1 of 1

480-5090-95

APPLICATION		
NEXT ASS'Y	USED ON	VAR

REVISIONS					
ZONE	REV	DESCRIPTION	ECN	DATE	APP'D



⚠1 FOR USE WITH 073A05 EXTERNAL LONG LIFE PACK (24V)

UNLESS SPECIFIED TOLERANCES	MATERIAL
DIMENSIONS ARE IN INCHES DECIMALS XX ±.01 XXX ±.005 ANGLES ±2 DEGREES FILLETS AND RADII .003 – .005	FINISH

DRAWN	KEN L	6/4/92	MFG	[illegible]	6/9/92
CHK'D	DM	6/9/92	ENGR	[illegible]	6/9/92
APP'D	LZ	6/9/92			

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PHONE: (716) 684-0001

OUTLINE DRAWING
MODEL 480E09
ICP POWER UNIT

CAGE CODE	DWG. NO.
52681	480-5090-95
SCALE: FULL	SHEET 1 OF 1