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TECHNOLOGY GROUP

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along with credit for buybacks and trade-ins.

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Expert team | Trust guarantee | 100% satisfaction

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Find the *PCB Piezotronics 113B24* at our website: *Click HERE*

Model 113B24

ICP® Pressure Sensor

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





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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.

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

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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. 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
Toll-free: (800) 828-8840
24-hour SensorLine[SM]: (716) 684-0001
Website: www.pcb.com
E-mail: info@pcb.com

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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 SJT 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: **D***
ECN: 46162

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OPERATION MANUAL FOR
QUARTZ PRESSURE SENSORS
SERIES 102
SERIES 113

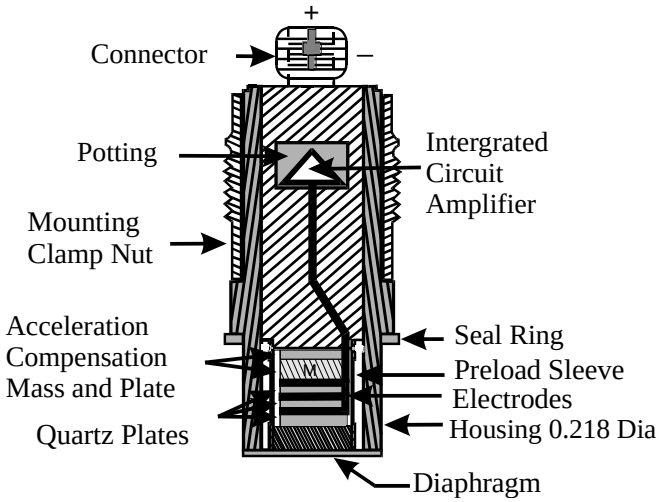
1.0 INTRODUCTION

This series of miniature dynamic pressure sensors is specifically designed for shock tube and blast wave measurements and for other applications requiring very high frequency, near non-resonant response.

The term used to describe the transient response of this model series is "Frequency Tailoring" and it encompasses several mechanical and electrical design features coupled with stringent in-process fabrication/test procedures with heavy emphasis on the shock tube as a tool.

2.0 DESCRIPTION

Although this series consists of sensors with three basic mechanical configurations and six different sensitivities, each model is basically similar in internal design.



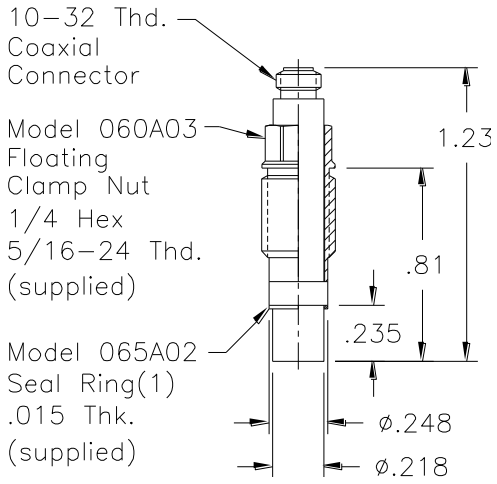
Typical ICP® Probe Style Sensor

Each utilizes the acceleration-compensated Series 113 quartz piezoelectric element coupled to a source follower type miniature electronics. (See "General Guide to ICP® Instrumentation," G-0001B, for a detailed description of the ICP® concept.)

The figure above shows the components of the basic ICP® probe, i.e. the piezoelectric element and the ICP® source follower amplifier. These components are joined together as an inseparable sealed assembly at the factory. Disassembly should not be attempted in the field.

Series 113B2x are in a probe configuration and are installed with a hollow clamp nut with 5/16-24 external threads. The housing of these models is at electrical ground potential.

Series 113B3x are similar to the B2x Series with an additional feature; all Invar construction. The all Invar sensors are designed to have minimal susceptibility to thermal transient events and are specifically suited for high-temperature shock and blast measurements.



Series 113: Probe Style Sensor

Series 102 consist of the basic 113 Series probe, as in the above mentioned series, mounted in a 3/8-24 threaded mounting adaptor. The probe is installed at the factory in an "off ground" configuration, i.e. the probe body is insulated from the external mounting adaptor body.

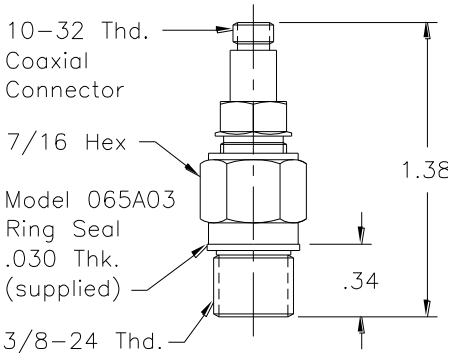
The Model 102A12 utilizes the same inner probe design as the above two designs but in a 3/8-24

Drawing Number: 21075
Revision: C
ECN Number: 47023

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threaded adaptor with floating clamp nut to allow adjustment of diaphragm mounting depth where it is necessary to adapt to various wall thicknesses. These models are supplied only as low-pressure (250 psi and 100 psi) sensors and are also "off ground".

Models 102A21 and 102A22 are high-temperature ICP® versions to 400 °F (204 °C), with a 3/8-24 straight threads adaptor and 1/8-27 NPT adaptor, respectively.



Series 102: Thread Mount Design, Ground-Isolated Sensor

3.0 INSTALLATION

This manual contains outline and installation information for your specific model.

Prepare mounting ports in accordance with instructions given in specific installation drawings, paying particular attention to sealing surfaces. These surfaces must be smooth and free from chatter marks, nicks and other irregularities which could preclude a pressure tight seal.

To fully realize the high-frequency response capabilities of this sensor series, flush mounting of the diaphragm must be used.

In some cases, where flash temperatures such as those generated by blasts and shock fronts are present, it may be necessary to thermally insulate the diaphragm to minimize signals generated by these effects. Common black vinyl electrical tape has been found to be an effective insulating material in many cases. One or more layers may be used across the end of diaphragm and adaptor.

A silicone rubber coating approximately .010" thick has also been proven effective in many applications. General Electric RTV type 106 is recommended. Apply the rubber coating to the surface of the diaphragm and allow it to cure in accordance with the manufacturer's instructions. (If you have ordered the CA option, ablative coated models, further protection will not be necessary.)

Although ICP® sensors have low-output impedance and in general are not affected by moisture, in extreme environments it is good practice to protect cable connections with shrink tubing.

It is not necessary to use low-noise cable with this sensor series. In fact, an optional Model 070B09 Solder Connector Adaptor allows the use of ordinary two-wire cable if desired.

4.0 OPERATION

It is only necessary to supply the sensor with a 2 to 20 mA constant current at +20 to +30 VDC through a current-regulating diode or equivalent circuit. (See guide G-0001B for powering and signal utilization information pertaining to all ICP® instrumentation).

Most of the signal conditioners manufactured by PCB have an adjustable current feature allowing a choice of input currents from 2 to 20 mA. In general, for lowest noise (best resolution), choose the lower current ranges. For driving long cables (to several thousand feet), use higher current, up to 20 mA maximum.

To operate system using a PCB signal conditioner:

1. Switch power on.

2. Wait several minutes for the IC amplifier to turn on and stabilize.

3. Proceed with measurements.

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5.0 POLARITY

The sensors in this series produce a positive-going output voltage for increasing pressure input.

6.0 LOW-FREQUENCY RESPONSE

The low-frequency response of an ICP® system is determined by:

1. The discharge T.C. of the sensor
2. If AC-coupled at power unit, the coupling time constant.

Consult Section 7.0 in guide G-0001B detailed explanation of low-frequency characteristics of ICP® instruments.

7.0 HIGH-FREQUENCY RESPONSE

Frequency tailoring and the very high-natural frequency of the sensor give an extremely wide usable frequency range (beyond 100 kHz). Exceptionally fast response time (1 µsec) and clean, virtually non-resonant response to rapid step functions are also features of these sensors. As mentioned previously, the diaphragm must be flush-mounted to fully realize the high-frequency response capabilities of this series.

8.0 CALIBRATION

Piezoelectric sensors are dynamic devices, but static calibration means can be employed if discharge time constants are sufficiently long. Generally, static methods are not employed below several hundred seconds time constant.

To employ static means, direct couple the sensor to the DVM readout using a T-Connector from the sensor jack or use the Model 484B in the calibrate mode. Apply pressure with dead weight tester and take readings quickly. Release pressure after each calibration point.

For the shorter time constant, rapid step functions of pressure are generated by a pneumatic pressure pulse calibrator or dead weight tester and readout is by recorder or storage oscilloscope.

PCB offers a complete calibration service. Consult factory for details.

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Model Number	ICP® PRESSURE SENSOR	Revision: C
113B24		ECN #: 40791

Performance	**ENGLISH**	**SI**	
Measurement Range(for ±5V output)	1 kpsi	6895 kPa	
Useful Overrange(for ± 10V output)	2 kpsi	13,790 kPa	[2]
Sensitivity(± 10 %)	5.0 mV/psi	0.725 mV/kPa	
Maximum Pressure	10 kpsi	68,950 kPa	
Resolution	5 mpsi	0.035 kPa	[1]
Resonant Frequency	≥ 500 kHz	≥ 500 kHz	
Rise Time	≤ 1.0 µ sec	≤ 1.0 µ sec	
Low Frequency Response(-5 %)	0.005 Hz	0.005 Hz	
Non-Linearity	≤ 1.0 % FS	≤ 1.0 % FS	[3]
Environmental			
Acceleration Sensitivity	≤ 0.002 psi/g	≤ 0.0014 kPa/(m/s²)	
Temperature Range(Operating)	-100 to +275 °F	-73 to +135 °C	
Temperature Coefficient of Sensitivity	≤ 0.03 %/°F	≤ 0.054 %/°C	[1]
Maximum Flash Temperature	3000 °F	1649 °C	
Maximum Vibration	2000 g pk	19,614 m/s² pk	
Maximum Shock	20,000 g pk	196,140 m/s² pk	
Electrical			
Output Polarity(Positive Pressure)	Positive	Positive	
Discharge Time Constant(at room temp)	≥ 100 sec	≥ 100 sec	
Excitation Voltage	20 to 30 VDC	20 to 30 VDC	
Constant Current Excitation	2 to 20 mA	2 to 20 mA	
Output Impedance	<100 Ohm	<100 Ohm	
Output Bias Voltage	8 to 14 VDC	8 to 14 VDC	
Physical			
Sensing Geometry	Compression	Compression	
Sensing Element	Quartz	Quartz	
Housing Material	17-4 Stainless Steel	17-4 Stainless Steel	
Diaphragm	Invar	Invar	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	
Weight(with clamp nut)	0.21 oz	6.0 gm	

CE[4]

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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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.

E - Emralon coating [5][6]

Coating	Emralon	Emralon
Electrical Isolation	10^8 Ohm	10^8 Ohm

Supplied Accessory : Model 065A08 Isolation ring 0.250"OD x 0.218" ID x 0.027" thk anodized aluminum (3)
Supplied Accessory : Model 065A22 Isolation Seal, .250" OD x .218" ID x .015", Torlon or Vespel (3)

H - Hermetic Seal [6]

Sealing	Welded Hermetic	Welded Hermetic

J - Ground Isolated [6][7]

N - Negative Output Polarity [6]

S - Stainless Steel Diaphragm [6]

Diaphragm	316L Stainless Steel	316L Stainless Steel

W - Water Resistant Cable [5][6]
Supplied Accessory : Model 060A03 Clamp nut, 5/16-24-2A thd, 1/4" hex, stainless steel (1)

WM - Water Resistant Cable [5][6]
Supplied Accessory : Model 060A05 Clamp nut M7 x 0.75-6g thd (1)

NOTES:

[1] Typical.
[2] For +10 volt output, minimum 24 VDC supply voltage required. Negative 10 volt output may be limited by output bias.
[3] Zero-based, least-squares, straight line method.
[4] See PCB Declaration of Conformance PS023 for details.
[5] Clamp nut installed prior to cable attachment
[6] For sensor mounted in thread adaptor, see adaptor installation drawing for supplied accessories.
[7] Used with optional mounting adaptor.

SUPPLIED ACCESSORIES:

Model 060A03 Clamp nut, 5/16-24-2A thd, 1/4" hex, stainless steel (1)
Model 060A05 Clamp nut M7 x 0.75-6g thd (1)
Model 065A02 Seal ring, sensor flush mount, 0.248" OD x 0.219" ID x 0.015" thk, brass (3)
Model 065A05 Seal sleeve sensor recess mount 0.248" OD x 0.221" ID x 0.240" thk 17-4 (1)

Entered: AP	Engineer: MJK	Sales: KWW	Approved: BAM	Spec Number:
Date: 3/19/2013	Date: 3/19/2013	Date: 3/19/2013	Date: 3/19/2013	**40647**

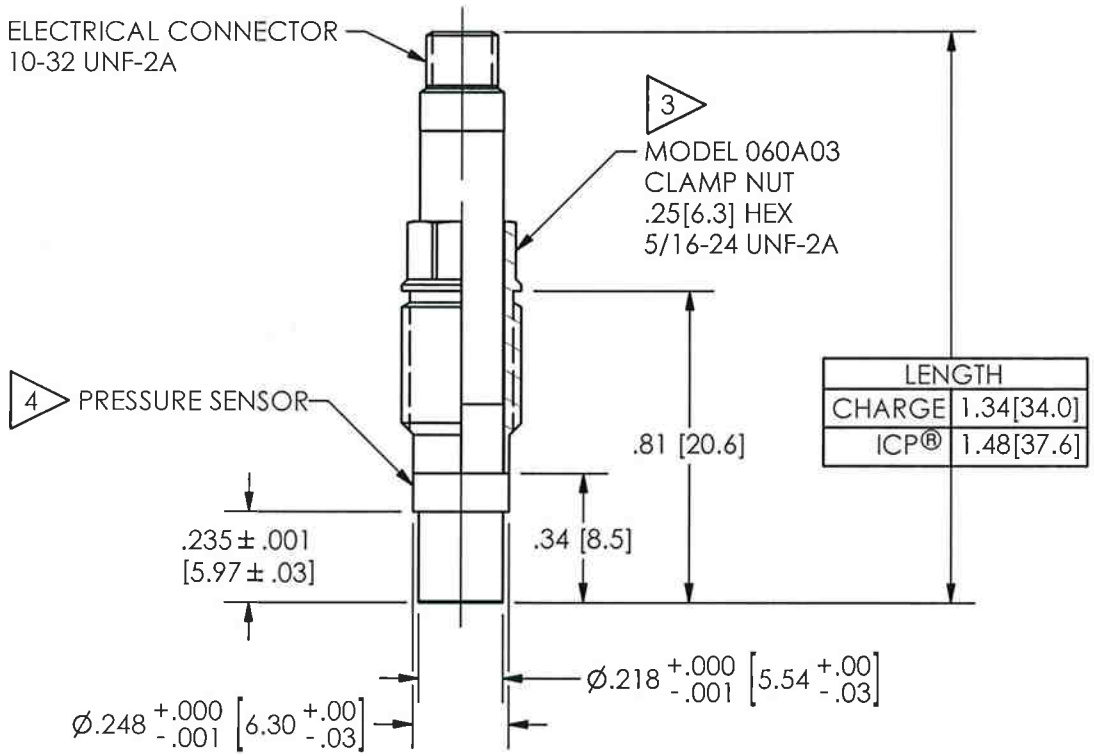
PCB PIEZOTRONICS
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REVISIONS			
REV	DESCRIPTION	ECN	APP'D
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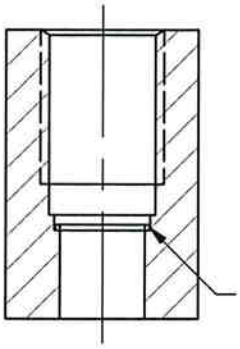


LENGTH	
CHARGE	1.34[34.0]
ICP®	1.48[37.6]

MOUNTING HOLE PREPARATION

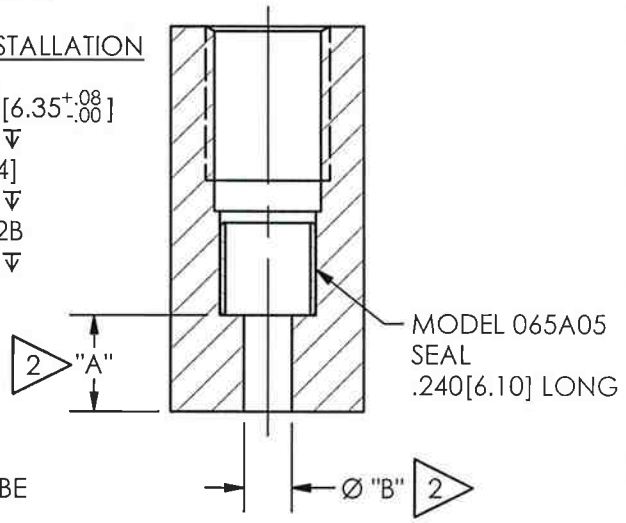
1 FLUSH INSTALLATION

Ø.221± .002[5.61± .05]
THRU
⌴Ø.250 +.003 -.000 [6.35 +.08 -.00]
X .520[13.20] ↧
⌴Ø.277[7.04]
X .480[12.19] ↧
5/16-24 UNF-2B
X .400[10.16] ↧



RECESSED INSTALLATION

⌴Ø.250 +.003 -.000 [6.35 +.08 -.00]
X .750[19.05] ↧
⌴Ø.277[7.04]
X .480[12.19] ↧
5/16-24 UNF-2B
X .400[10.16] ↧



4 IC AMP AND SENSOR ARE SEALED ASSEMBLIES AND SHOULD BE RETURNED TO THE FACTORY FOR SERVICE AND/OR REPAIR.

3 RECOMMENDED TORQUE ON .25[6.3] HEX: 25-35 IN. LBS. [2.8-3.9 Nm]

2 DIMENSIONS "A" AND "B" TO SUIT USER REQUIREMENTS.

1 THESE DIMENSIONS FOR .750[19.05] THICK WALL. COUNTERBORE FOR THICKER WALLS.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]
DECIMALS XX ± .01 XXX ± .005 ANGLES ± 2 DEGREES	DECIMALS X ± 0.3 XX ± 0.13 ANGLES ± 2 DEGREES
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]

DRAWN	MDF	9/6/08	MFG	P.RR.	8-7-08
CHK'D	MDF	9/6/08	ENGR	RF	8/8/08
APP'D	[signature]	8/7/08	SALES	KMW	8/7/08

TITLE
INSTALLATION DRAWING
ENGLISH MOUNT
MODELS 113B SERIES
PRESSURE SENSOR

PCB PIEZOTRONICS INC
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 E-MAIL: sales@pcb.com

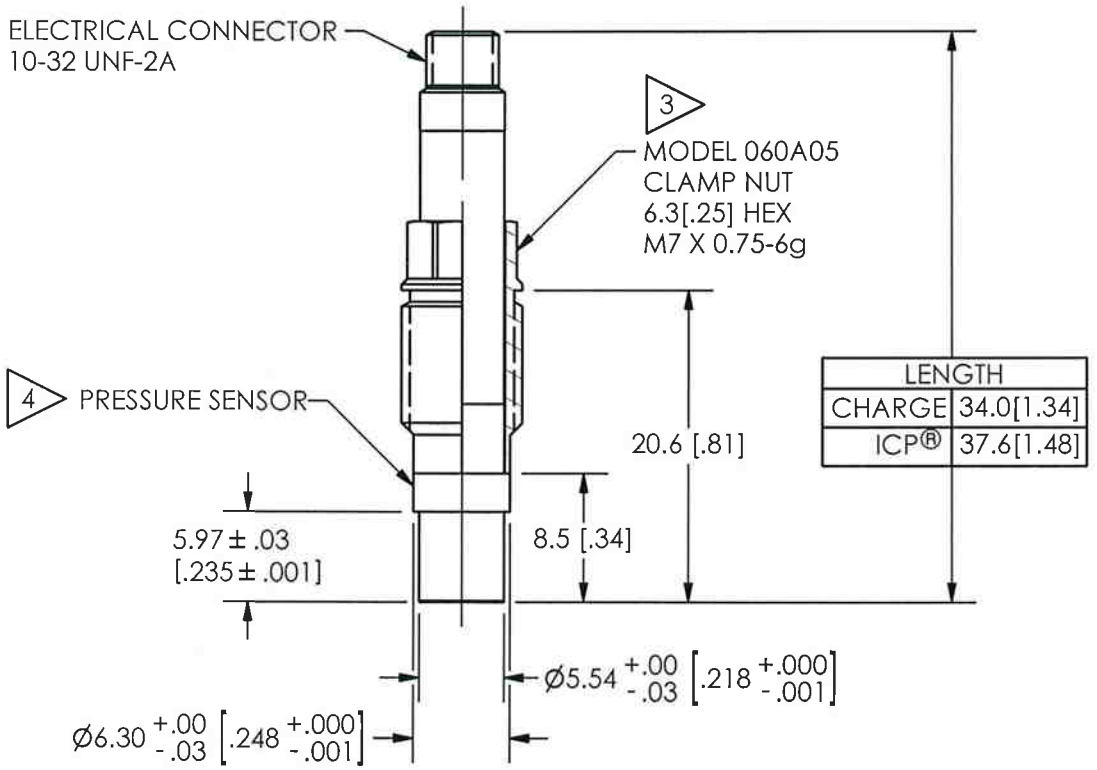
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SCALE: 2 X	SHEET 1 OF 2

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REVISIONS			
REV	DESCRIPTION	ECN	APP'D
	- SEE SHEET ONE -		mDF 8/6/08

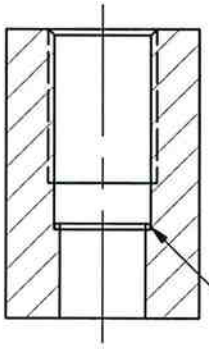


LENGTH	
CHARGE	34.0[1.34]
ICP®	37.6[1.48]

MOUNTING HOLE PREPARATION

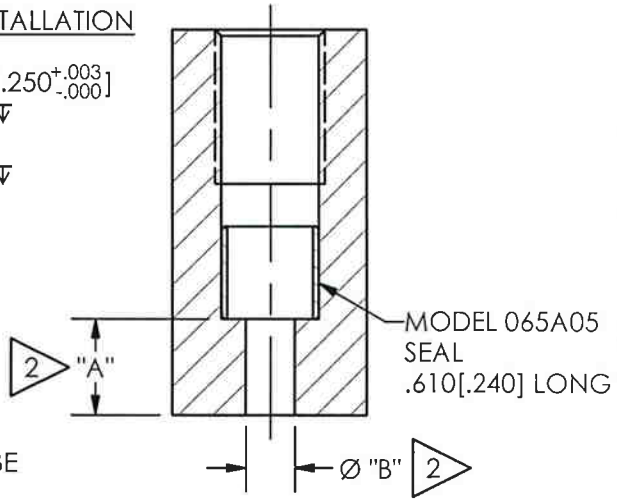
1 FLUSH INSTALLATION

Ø5.61± .05[.221±.002]
THRU
⌴Ø6.35 +.08 -.00 [.250 +.003 -.000]
X 13.20[.520] ↧
M7 X 0.75-6H
X 10.16[.400] ↧



RECESSED INSTALLATION

⌴Ø.635 +.08 -.00 [.250 +.003 -.000]
X 19.05[.750] ↧
M7 X 0.75-6H
X 10.16[.400] ↧



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FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]

DRAWN	mDF	8/6/08	MFG	P.R.R	8-7-08
CHK'D	mDF	8/6/08	ENGR	RF	8/8/08
APP'D	[illegible]	8/11/08	SALES	KW	08/08/08

TITLE
INSTALLATION DRAWING
METRIC MOUNT
MODELS 113B SERIES
PRESSURE SENSOR

PCB PIEZOTRONICS INC
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 E-MAIL: sales@pcb.com

CODE IDENT. NO. 52681	DWG. NO. 40623
SCALE: 2 X	SHEET 2 OF 2

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