



Model 117B66

CONFORMAL BALLISTICS 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**





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

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 SensorLineSM: (716) 684-0001
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	○	○	○	○	○	○
PCB板	X	○	○	○	○	○
电气连接器	○	○	○	○	○	○
压电晶体	X	○	○	○	○	○
环氧	○	○	○	○	○	○
铁氟龙	○	○	○	○	○	○
电子	○	○	○	○	○	○
厚膜基板	○	○	X	○	○	○
电线	○	○	○	○	○	○
电缆	X	○	○	○	○	○
塑料	○	○	○	○	○	○
焊接	X	○	○	○	○	○
铜合金/黄铜	X	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。						
○：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

**OPERATION MANUAL FOR
CONFORMAL BALLISTICS PRESSURE SENSOR
Series 117B**

1.0 INTRODUCTION

The Model 117B Conformal Sensor measures pressure inside metallic cartridges and paper or plastic shotshell, during firing of the round, without drilled holes in the round.

The sensor is mounted flush with the chamber walls, matching the curvature exactly. The expanded cartridge or shotshell transmits forces through the thin wall to the sensor.

The Model 117B is a conventional charge output type sensor using synthetic quartz as the piezoelectric sensing material.

An alignment guide now standard on all 117B Models, simplifies installation by automatically controlling rotational alignment of the sensor, leaving only the depth adjustment consideration.

2.0 DESCRIPTION

Refer to enclosed installation drawing for outline dimensions and physical description.

The basic sensor is a probe design with captivated hollow clamp nut. The clamp nut rotates independently of the probe body and serves to lift the sensor out of the mounting port as it is unscrewed.

The alignment device consists of a pin and slotted clamp assembly which fits tightly over the collar of the sensor.

The hardened steel pin is accurately aligned with the axis of the diaphragm curvature and when assembled into a precisely drilled mating hole in the barrel or calibration chamber, achieves near perfect rotational alignment of sensor diaphragm.

The slotted clamp arrangement allows for tolerance in the location of the guide pin hole in an axial direction on the test barrel or calibration adaptor.

The precise depth adjustment is obtained by the use of the correct thickness spacer selected from a set of 9 spacers of various thicknesses supplied with each sensor.

Once the proper thickness spacer is found, removal and re-installation now becomes a routine matter.

3.0 INSTALLATION

3.1 PORT PREPARATION

Prepare mounting port in accordance with installation drawing 117-20 (XX)-90 supplied as part of this manual.

NOTE: The installation port for the 117B is identical to that for the 117A.

Drill guide pin hole as shown in installation drawing, paying particular attention to locating C/L of hole exactly on C/L of barrel.

Do not use a drill that is worn, as this may cause the hole to be slightly undersized and the guide pin may bind as it is drawn into the hole.

It is extremely important that the guide pin hole be drilled parallel to the sensor mounting port to permit the guide pin to move freely into the hole.

NOTE: Each model variation of the 117B is designed to fit in a specific location (measured from the bolt face) on a specific ammunition caliber. Changing location and/or caliber will cause a mismatch of diaphragm curvature with cartridge case diameter since most cartridge cases are tapered.

3.2 INSTALLING THE SENSOR

After mounting holes have been prepared, proceed with installation as follows:

1. On most models of 117B, it is not important which side of the sensor is mounted toward the muzzle.

However, on certain types of ammunition (such as 20 mm cannon) which have a severe taper, the diaphragm has a matching taper in

**OPERATION MANUAL FOR
CONFORMAL BALLISTICS PRESSURE SENSOR
Series 117B**

the curvature. In these latter cases, the sensor forward side is identified with the legend "FWD" etched on the guide collar to which the slotted clamp is attached. The clamp must be removed to find this legend. If it does not appear, the sensor may be mounted with either side toward the muzzle.

2. Loosen slotted clamp, but do not remove clamp.
3. Select the middle thickness (.014) spacer from the set of nine (065A19) supplied and place it around sensor barrel.
4. Begin threading the sensor clamp nut into the threaded mounting port, sliding slotted clamp fore and aft as needed to allow guide pin to fully enter hole.

Continue to turn clamp nut into hole by hand or using 5/16 open end wrench.

Do not tighten when sensor bottoms.

5. Now tighten the screw closing slotted clamp.
6. Using open end wrench, tighten sensor clamp nut.

NOTE: It is not necessary to put large amounts of torque on this nut since a pressure seal is not necessary. Approximately 5 to 10 ft. lbs. is sufficient.

7. Now inspect flushness of diaphragm with inside surface of chamber. This can be accomplished visually in most cases.

If the diaphragm extends too deeply into the chamber, select a thicker spacer and repeat mounting procedure.

If the diaphragm is too deeply recessed, select a thinner spacer and remount.

Once the proper thickness is found for perfect flushness, the sensor may be removed and reinstalled using this same spacer and the proper depth will be achieved each time.

NOTE: For best accuracy of results, use same charge amplifier for calibration and for actual operation. Use long TC for calibration, medium or short TC for best drift free operation.

4.0 POLARITY

Polarity of the Model 117B is negative i.e., the charge output is negative for increasing pressure input, making it compatible with inverting type charge amplifiers.

5.0 CALIBRATION

Calibration of the Models 117B is facilitated by a calibration adaptor which exactly matches the chamber dimensions of the cartridge under test. An actual cartridge case is hydraulically pressurized with reference pressure to obtain a point-by-point sensor calibration.

These calibration adaptors can be fabricated by the user or can be purchased from PCB as our Model 090B calibration adaptor. Simply specify caliber and longitudinal location of sensor.

For most rimfire applications, the sensor is located .25 inches forward of the boltface.

For center fire cartridges a location .175 inches back from the cartridge shoulder is preferred. Consult PCB for recommendations on sensor locations if questions arise.

Since most cartridge cases are tapered and diameter is dependent upon longitudinal location, this location may not be changed after the sensor is fabricated since it is essential for proper operation that the sensor curvature exactly match chamber curvature.

**OPERATION MANUAL FOR
CONFORMAL BALLISTICS PRESSURE SENSOR
Series 117B**

5.1 LOW-END NONLINEARITY

It will be noticed during calibration, especially with metallic cartridges, that a certain amount of pressure is necessary before linear output is attained from the conformal sensor.

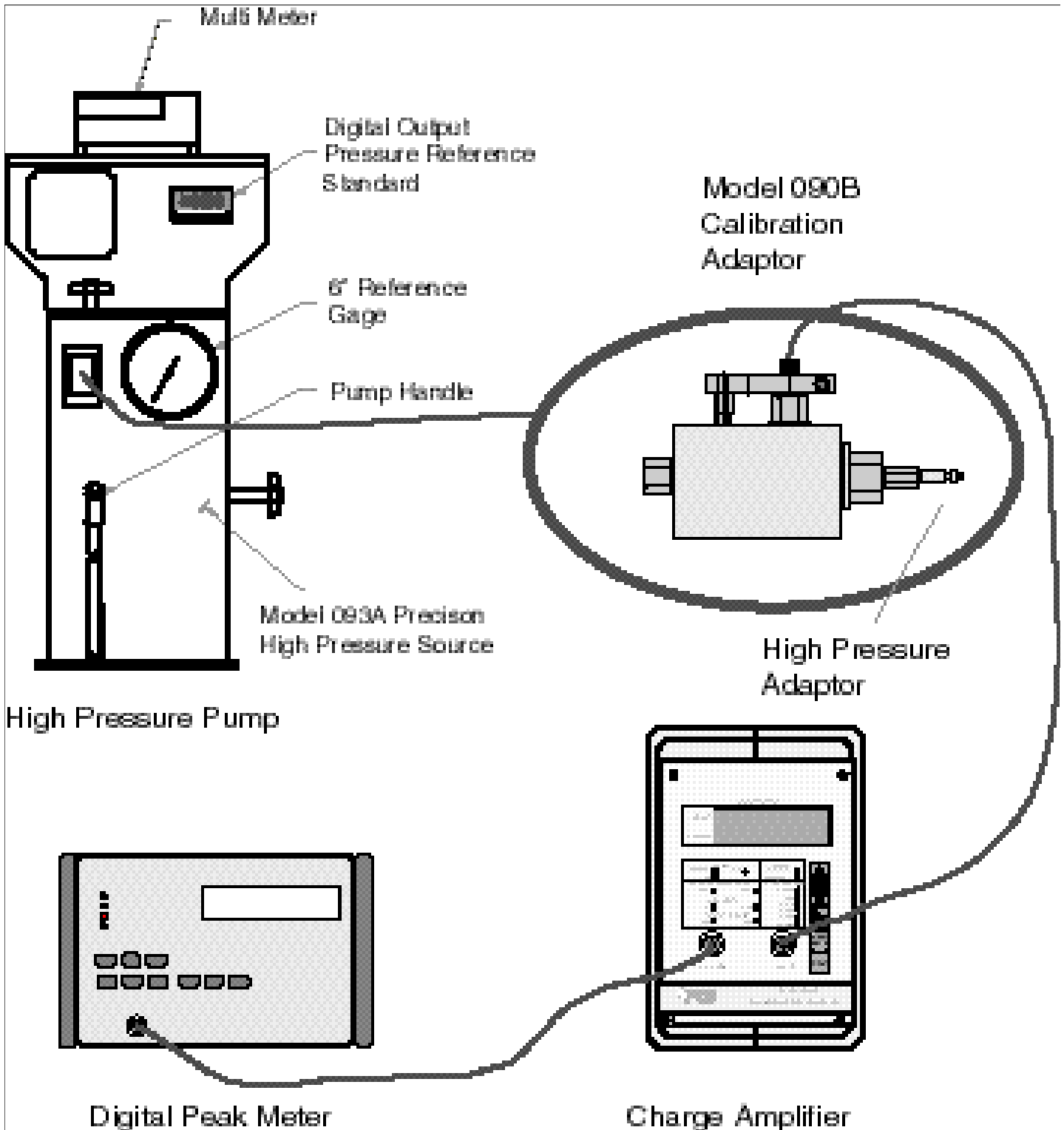
This is due to the fact that since the cartridge cases are made nominally smaller in diameter than the chamber to allow easy insertion and extraction, the case must be expanded slightly by the internal pressure before force can be transmitted to the sensor.

See the enclosed guide "An Improved Technique for Utilization of Conformal Ballistics Sensor Calibration Data" for methods of dealing with this topic.

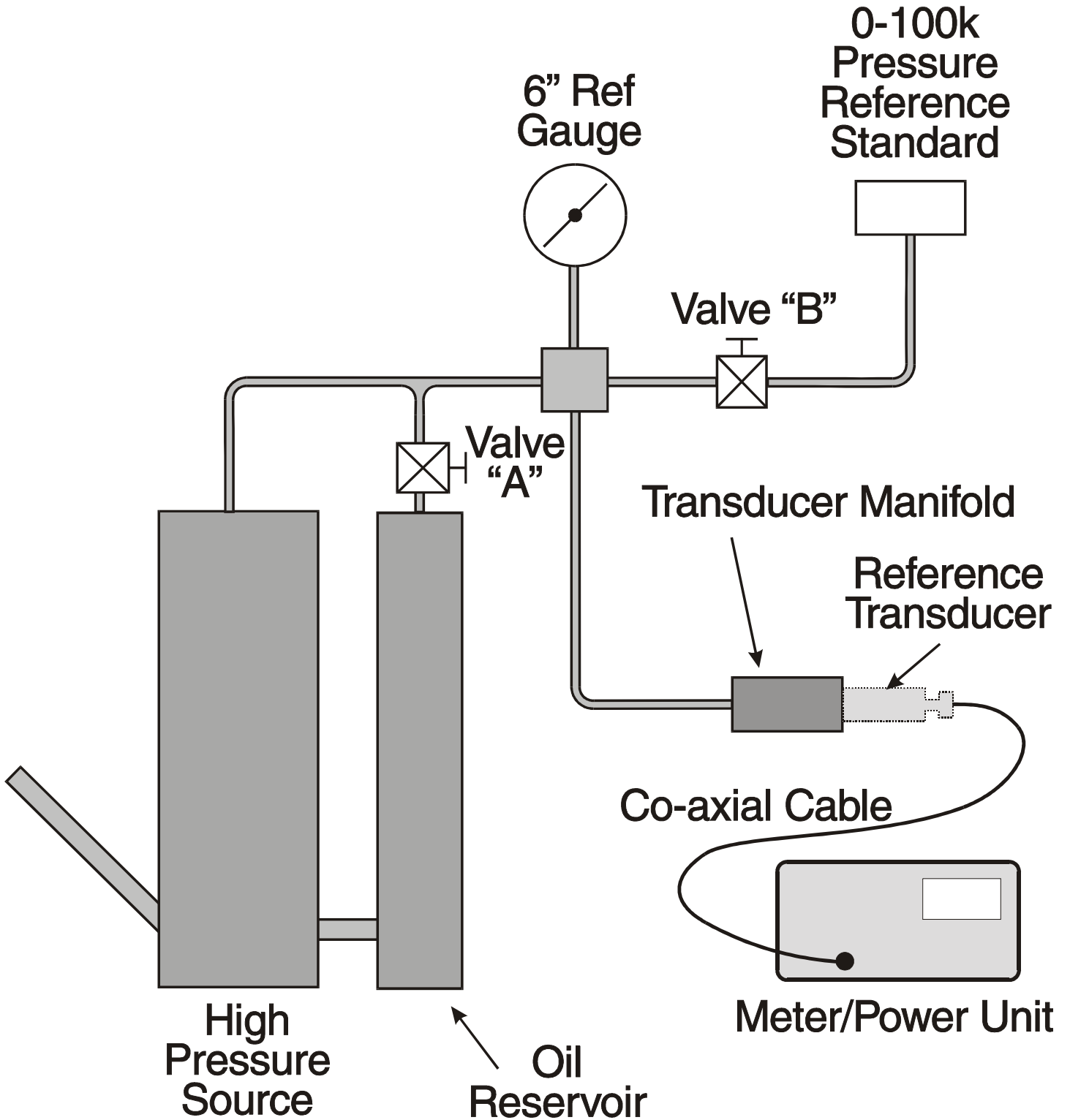
6.0 MAINTENANCE

It is essential for normal operation of the Model 117B that the insulation resistance be maintained above 10^{12} ohms. If insulation resistance should deteriorate, wipe connector with clean cloth or paper wipe dipped in a solvent compatible with Teflon[®] such as isopropyl alcohol, then bake in oven at 250°F for ½ hour.

OPERATION MANUAL FOR
CONFORMAL BALLISTICS PRESSURE SENSOR
Series 117B



OPERATION MANUAL FOR
CONFORMAL BALLISTICS PRESSURE SENSOR
Series 117B



Model Number 117B-40K	CHARGE OUTPUT PRESSURE SENSOR	Revision: R ECN #: 46956
---------------------------------	--------------------------------------	-----------------------------

	<u>ENGLISH</u>	<u>SI</u>	
Performance			
Sensitivity(± 20 %)(for straight oil)	0.110 pC/psi	0.016 pC/kPa	[2][3]
Measurement Range	10 to 35 kpsi	68,950 to 241,300 kPa	[4]
Maximum Pressure(static)	40 kpsi	275,800 kPa	
Resolution	2 psi	13.79 kPa	[5]
Resonant Frequency	≥ 300 kHz	≥ 300 kHz	
Rise Time(Reflected)	≤ 2 μ sec	≤ 2 μ sec	
Non-Linearity	≤ 2 % FS	≤ 2 % FS	
Environmental			
Acceleration Sensitivity	≤ .02 psi/g	≤ .014 kPa/(m/s ²)	
Temperature Range(Operating)	-100 to +400 °F	-73 to +204 °C	
Temperature Coefficient of Sensitivity	≤ .03 %/°F	≤ .054 %/°C	
Maximum Flash Temperature	3000 °F	1650 °C	
Maximum Shock	5000 g pk	49,050 m/s ² pk	
Maximum Vibration	1000 g pk	9810 m/s ² pk	
Electrical			
Output Polarity(Positive Pressure)	Negative	Negative	
Capacitance	5 pF	5 pF	[1]
Insulation Resistance(at room temp)	≥ 10 ¹² Ohm	≥ 10 ¹² Ohm	
Physical			
Housing Material	17-4 Stainless Steel	17-4 Stainless Steel	
Diaphragm	17-4 Stainless Steel	17-4 Stainless Steel	
Sealing	Epoxy	Epoxy	
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	
Weight	.35 oz	10 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.

M - Metric Mount

NOTES:

[1] Typical.
 [2] Actual slope is dependent upon material properties of cartridge case.
 [3] For conformal cal. sensitivity will be ±40%.
 [4] Calibrated range to 35,000 psi.
 [5] Resolution dependent on range setting and cable length used in charge system.
 [6] See PCB Declaration of Conformance PS158 for details.

SUPPLIED ACCESSORIES:
 Model 045B Alignment Guide
 Model 065A27 Spacer set 0.196" ID

Entered: LK	Engineer: BAM	Sales: WDC	Approved: BAM	Spec Number:
Date: 8/8/2017	Date: 8/8/2017	Date: 8/8/2017	Date: 8/8/2017	117-2660-80



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

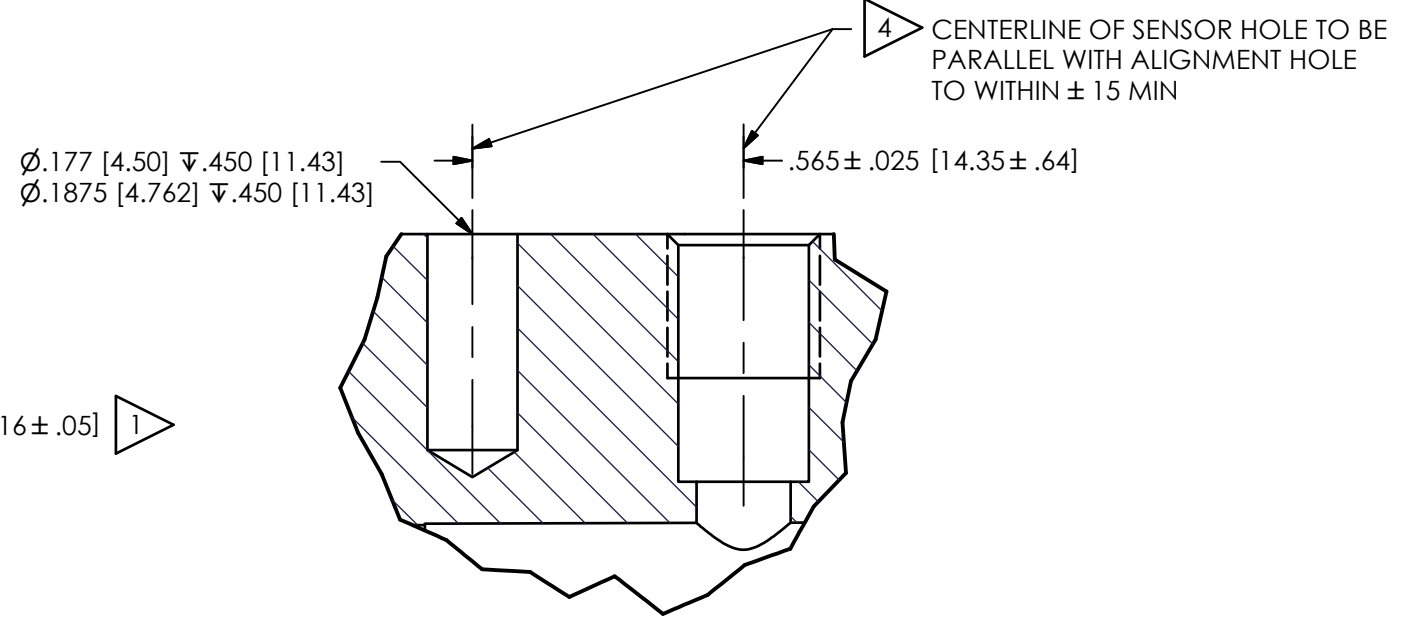
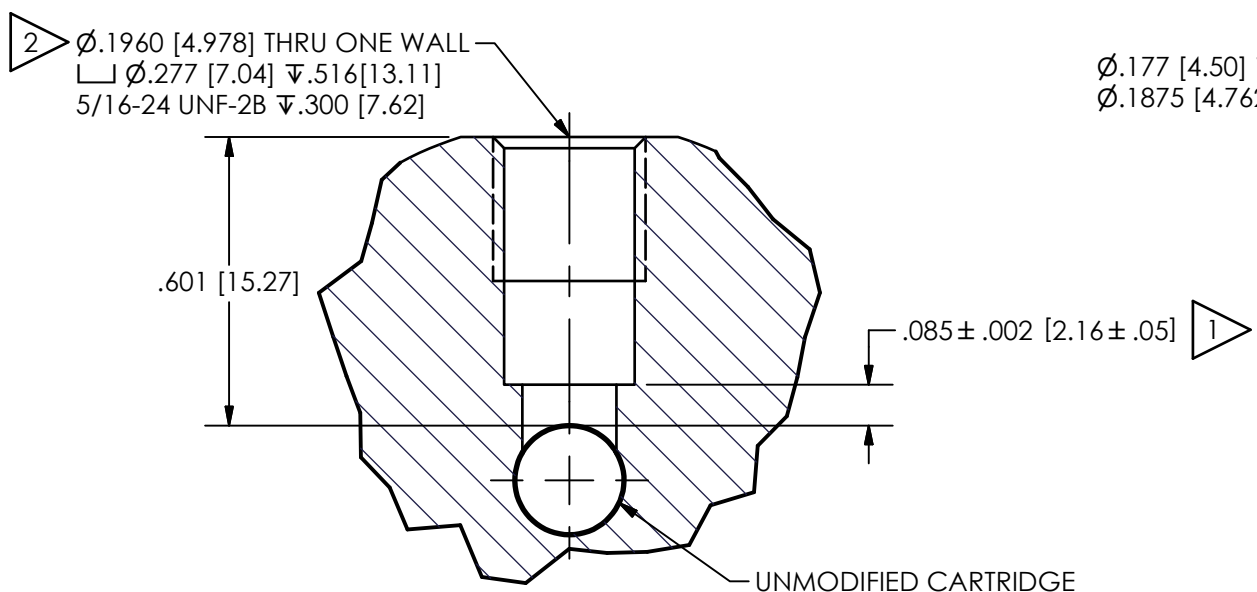
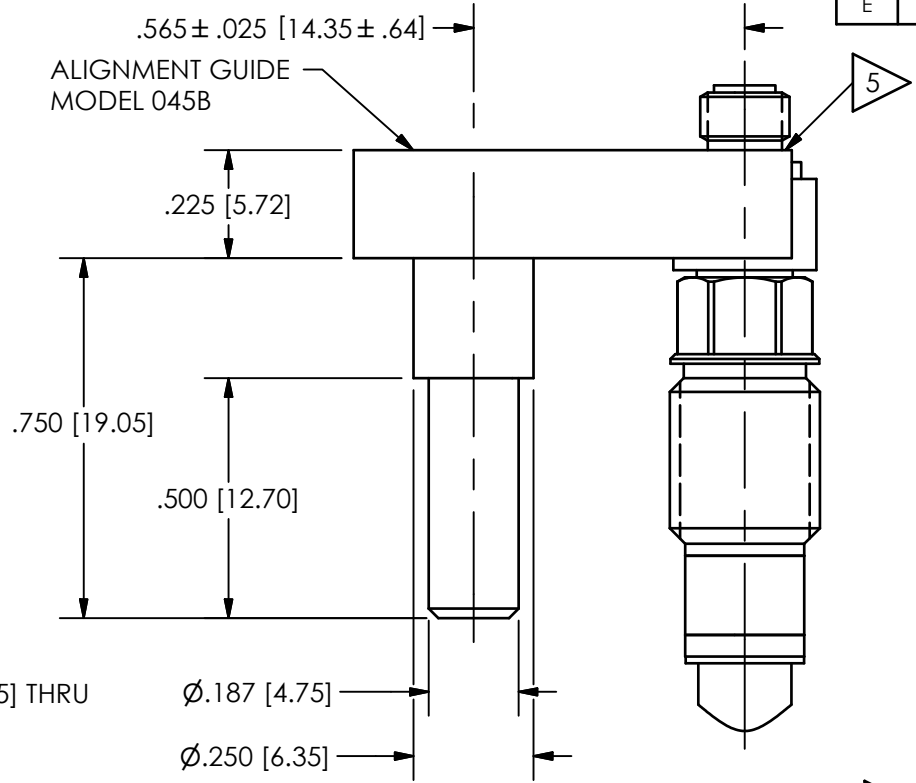
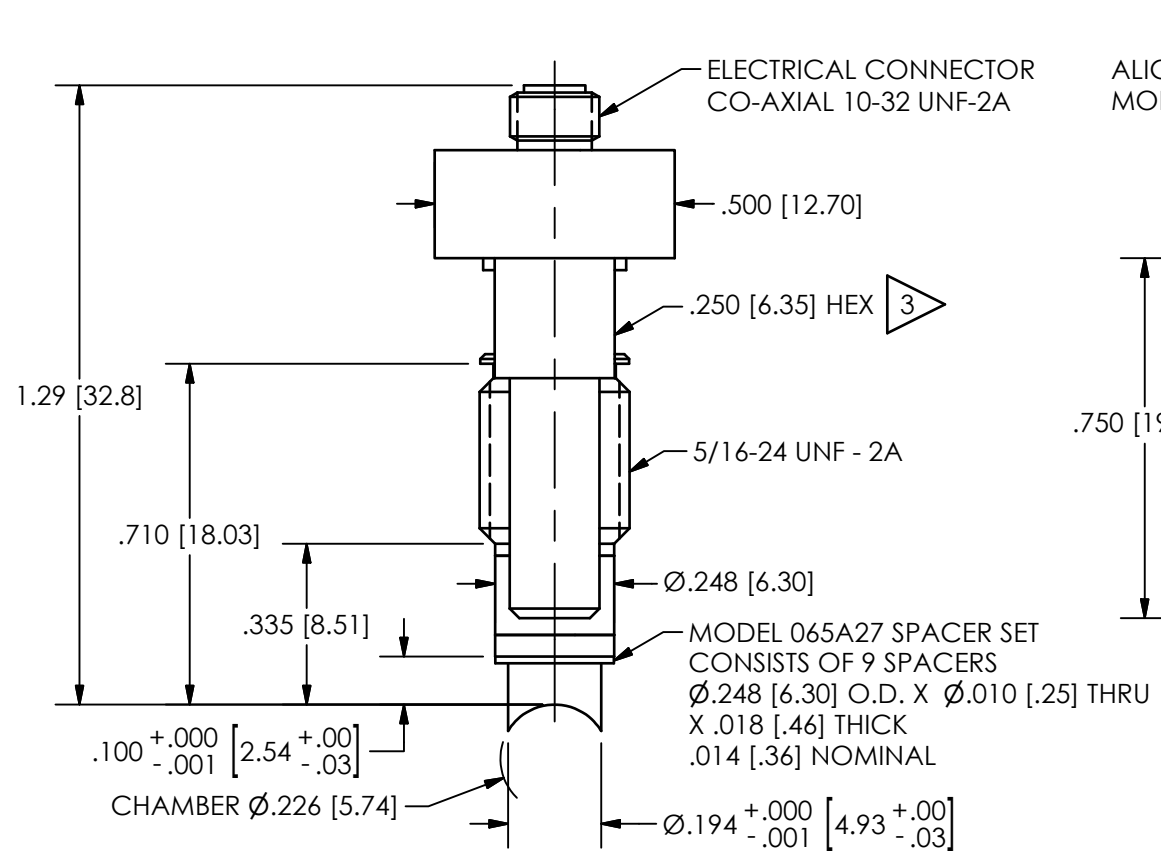


Phone: 716-684-0001
Fax: 716-684-0987
E-Mail: info@pcb.com

117-2660-90

PCB Piezotronics Inc. claims proprietary rights in the information disclosed hereon. Neither it nor any reproduction thereof will be disclosed to others without the written consent of PCB Piezotronics Inc.

REVISIONS		
REV	DESCRIPTION	DIN
E	UPDATED ALIGNMENT GUIDE	39992



- ∇ 5 LOCATE YELLOW DOT TOWARD CASE MOUTH.
- ∇ 4 ALIGNMENT HOLE MY BE LOCATED EITHER FOR OR AFT OF SENSOR MOUNTING HOLE.
- ∇ 3 MOUNTING TORQUE ON .250 [6.35] HEX: 2-5 FT LBS [2.7-6.8 NEWTON METERS].
- ∇ 2 CENTERLINE OF \varnothing .1960 [4.98] HOLE MUST INTERSECT CENTERLINE OF CHAMBER BORE WITHIN .001 [.23].
- ∇ 1 HOLD THIS DIMENSION TO OBTAIN FLUSH MOUNT.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	JDM	11/17/14	JDM	11/17/14	SMB	11/17/14
DECIMALS XX \pm .01 XXX \pm .005	DECIMALS X \pm .03 XX \pm .013	TITLE INSTALLATION DRAWING MODEL 117B66 CONFORMAL BALLISTICS SENSOR					
ANGLES \pm 2 DEGREES	ANGLES \pm 2 DEGREES						
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13	CODE IDENT. NO. 52681		DWG. NO. 117-2660-90		3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com	
		SCALE: 2.5X		SHEET 1 OF 1			

