Model 112B11

Charge Output 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

PCB PIEZOTRONICS INC.
A PCB GROUP COMPANY

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 traceablility 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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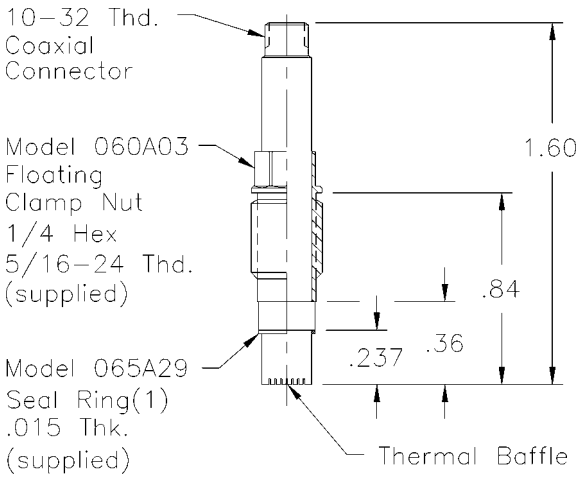
DOCUMENT NUMBER: 21354
DOCUMENT REVISION: B
ECN: 17900

OPERATION MANUAL FOR
ENGINE COMBUSTION SENSORS
Modes 112B10 & 112B11
Model 175A01

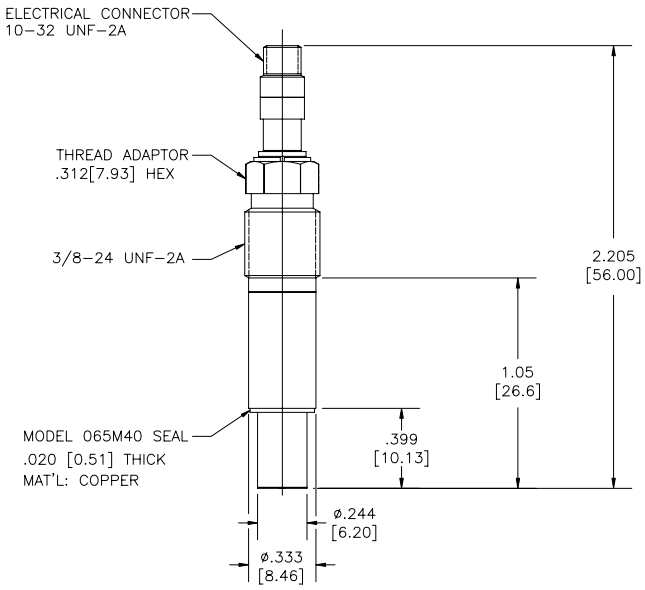
1.0 INTRODUCTION

Self-generating piezoelectric sensors, because of their extreme rigidity and wide dynamic range, excel in the measurement of repetitive and transient phenomena. In most applications, the instruments do not significantly alter the process or structure being tested. Also, they measure accurately over any partial or incremental portion of their full-scale range. But they cannot measure static inputs or absolute levels over extended time periods because of excessive drift when operating electrostatically.

Piezoelectric sensors generate an electrical voltage in response to pressure, force, or vibratory motion at high impedance levels. This voltage is conditioned by means of an isolation amplifier for display on a readout instrument.



Series 112B10: Engine Combustion Sensors



Series 175A: Engine Combustion Sensor

2.0 INSTALLATION

Carefully install the sensor according to instructions detailed on the enclosed installation drawing.

3.0 OPERATION

Using low-noise cable, connect the charge mode sensor to the charge or source-follower amplifier with short or medium decay time constants. The input or feedback circuits in these amplifiers eliminate DC signal components causing the output signal to decay exponentially following static or step function inputs. This action distorts transient measurements if the event lasts longer than a small percent of the decay time constant. The action also shifts to zero the average level or repetitive signals with DC components similar to an oscilloscope operating in an AC mode.

Switch power on and proceed with measurements.

Manual Number: 21069
Manual Revision: A
ECR Number: 22421

4.0 CALIBRATION

Charge mode sensors are usually calibrated by static or comparison methods according to NIST methods. The comparison method involves reference standards and the application of quasi-static step function or repetitive inputs. For highest accuracy, use the calibration certificate supplied or calibrate the sensor over the range of anticipated use. Factory calibration service is available at a nominal charge.

4.1 POLARITY

Standard models have a negative output for use with inverting-type charge amplifiers. Special positive-output sensors are available for use with source-follower amplifiers. The signal polarity can be reversed in most systems at the readout input to allow interchangeability of both designs.

5.0 SERVICING THE SENSOR

Keep the sensor clean at all times. In dirty environments, the cable connector can be protected with heat shrink tubing.

Model Number **112B11**	**CHARGE OUTPUT PRESSURE SENSOR**	Revision G ECN #: 40791

Performance	**ENGLISH**	**SI**	
Sensitivity (-10 to +25 %)	1.0 pC/psi	0.145 pC/kPa	
Measurement Range	3 kpsi	20685 kPa	
Maximum Pressure (static)	5 kpsi	34475 kPa	
Resolution	10 mpsi	0.069 kPa	[2]
Resonant Frequency	≥200 kHz	≥200 kHz	
Rise Time (Reflected)	≤3.0 µ sec	≤3.0 µ sec	
Non-Linearity	≤2.0 % FS	≤2.0 % FS	[3]
Environmental			
Acceleration Sensitivity	≤0.003 psi/g	≤0.0021 kPa/(m/s²)	
Temperature Range (Operating)	-100 to +600 °F	-73 to +316 °C	
Temperature Coefficient of Sensitivity	≤0.03 %/°F	≤0.054 %/°C	
Maximum Flash Temperature	4500 °F	2482 °C	
Maximum Shock	10000 g pk	98100 m/s² pk	
Electrical			
Output Polarity (Positive Pressure)	Negative	Negative	
Capacitance	20 pF	20 pF	[1]
Insulation Resistance (600°F(316°C))	$\geq 10^9$ Ohm	$\geq 10^9$ Ohm	
Insulation Resistance (at room temp)	$\geq 10^{12}$ Ohm	$\geq 10^{12}$ Ohm	
Physical			
Sensing Element	Quartz	Quartz	
Housing Material	Invar	Invar	
Diaphragm	Invar	Invar	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	
Weight (with clamp nut)	0.35 oz	10.9 gm	

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 standard model except where noted below. More than one option maybe used.)

M - Metric Mount
Supplied Accessory: Model 060A05 Clamp nut, M7 x 0.75-6G thd (for Series M111, M112 and M113) replaces Model 060A03

P - Positive Output Polarity

Notes

[1] Typical.
[2] Resolution dependent on range setting and cable length used in charge system.
[3] Zero-based, least-squares, straight line method.

Supplied Accessories

060A03 Clamp nut, 5/16-24-2A thd, 1/4" hex, stainless steel (1)
065A05 Seal sleeve sensor recess mount 0.248" OD x 0.221" ID x 0.240" thk 17-4 (1)
065A29 Seal, .250" OD x .218" ID x .015", 316L (3)
069A83 Sleeve Spacer, .248" OD x .221" ID x .25 thk, 17-4PH (1)
069A93 Sleeve Spacer, .248" OD x .221" ID, 17-4PH (1)
069A94 Sleeve Spacer, .248" OD x .221" ID, ST STL (1)

Entered: AP	Engineer: MJK	Sales: KWW	Approved: BAM	Spec Number:
Date: 03/19/2013	Date: 03/19/2013	Date: 03/19/2013	Date: 03/19/2013	**112-2110-80**

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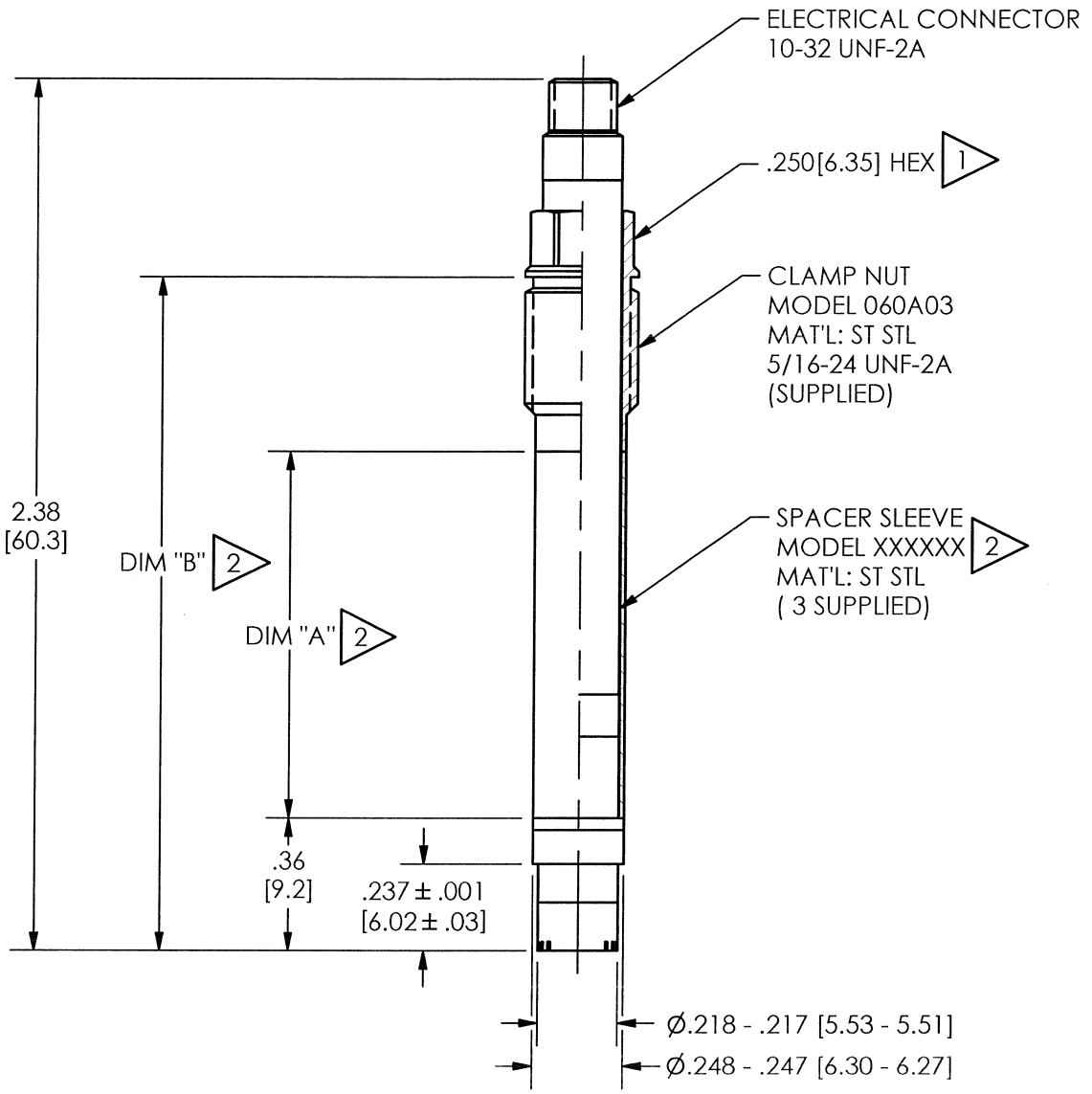
APPLICATION		
NEXT ASS'Y	USED ON	VAR

REVISIONS			
REV	DESCRIPTION	ECN	APP'D
D	REVISED PER ECR	6721	DM 5/96
E	ADD TOLERANCES TO SHEET 2	25015	DM 9/06

112-2110-90



3.) SEE SHEET 2 FOR MOUNTING INSTRUCTIONS.

2 SEE SHEET 2 FOR THIS INFORMATION.

1 RECOMMENDED MOUNTING TORQUE ON A .250[6.35] HEX: 25-35 IN LBS [285-395 NEWTON CENTIMETERS]

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:							
DIMENSIONS IN INCHES DECIMALS XX ± .01 XXX ± .005 ANGLES ± 2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ± 0.3 XX ± 0.13 ANGLES ± 2 DEGREES	DRAWN	ECB	9/21/06	MFG	R.R.R	9-25-06
		CHK'D	DM	9/21/06	ENGR	MEM	9/27/06
		APP'D	RF	10/3/06	SALES	JMM	10/4/06
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]	TITLE: INSTALLATION DRAWING MODEL 112B11 PRESSURE SENSOR					

PCB PIEZOTRONICS INC.
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CODE IDENT. NO.	DWG. NO.	
52681	112-2110-90	
SCALE: 2X	SHEET 1 OF 2	

112-2110-90

APPLICATION		
NEXT ASS'Y	USED ON	VAR

REVISIONS			
REV	DESCRIPTION	ECN	APP'D
	- SEE SHEET ONE -		

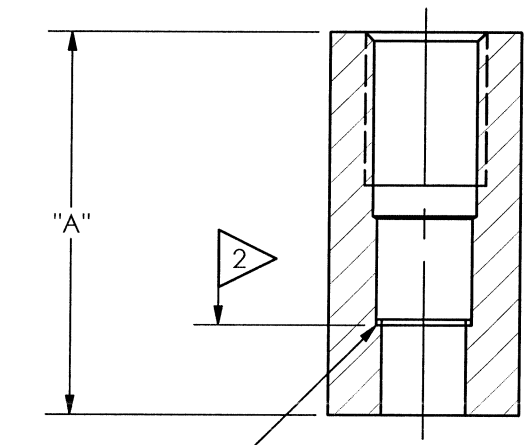
"X" (MOUNTING WALL)	"A" (SLEEVE SHEET ONE)	SLEEVE MOD NO (SHEET ONE)	"B" (SHEET ONE)
.620-.800[15.75-20.32]	.0000	NONE	.80[20.3]
.800-.980[20.32-24.89]	.180[4.57]	069A93	.98[24.9]
.980-1.160[24.89-29.46]	.360[9.14]	069A83	1.16[29.5]
1.160-1.340[29.46-34.04]	.540[13.72]	069A94	1.34[34.0]
1.340-1.520[34.04-38.61]	.720[18.29]	069A93 &069A94	1.52[38.61]
1.520-1.700[38.61-43.18]	.900[22.86]	069A83 & 069A94	1.70[43.2]

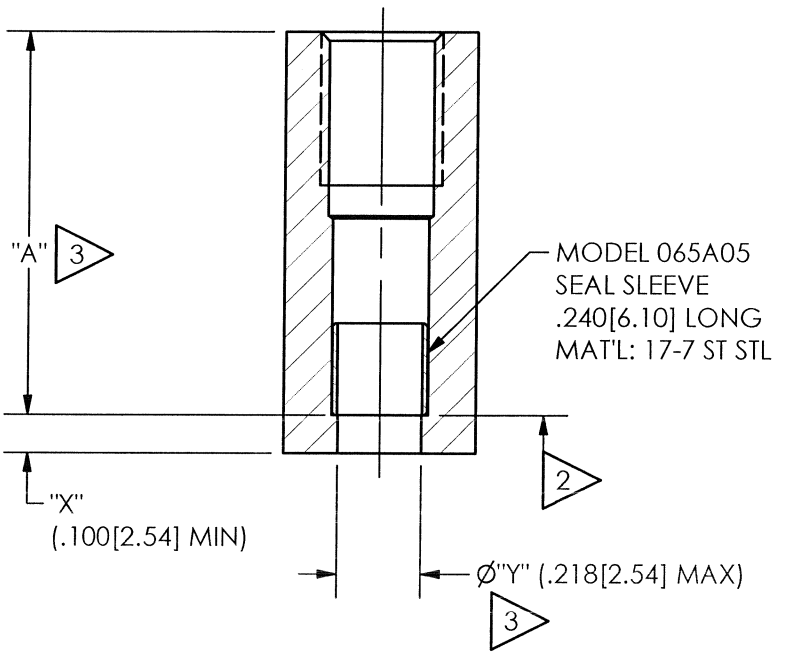
FLUSH INSTALLATION

1 DRILL AND REAM Ø.221± .002[Ø5.61± .05] THRU
1 ⌴Ø.250$^{+.003}_{-.000}$[Ø6.35$^{+.08}_{-.00}$]
X "A" MINUS .235["A" MINUS 5.97]
1 Ø.272[Ø6.91]
X .480[12.19] ↧
5/16-24 UNF-2B
X .400[10.16] ↧
MIN PERFECT THREAD

RECESSED INSTALLATION

1 DRILL AND F.B. REAM Ø.250$^{+.003}_{-.000}$[Ø6.35$^{+.08}_{-.00}$]
X "A" ↧
1 Ø.272[Ø6.91]
X .480[12.20] ↧
5/16-24 UNF-2B
X .400[10.16] ↧
MIN PERFECT THREAD





3 DIMENSION "X" AND DIAMETER "Y" TO SUIT USER REQUIREMENTS.

2 SEAL SURFACE SHOULD BE FLAT AND FREE OF TOOL MARKS WITH A MIN 63 FINISH[1.6] FOR PROPER SEALING.

1 THESE DIAMETERS TO BE CONCENTRIC TO WITHIN .001[.03] TIR.

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

DRAWN	ECB	9/21/06	MFG	P.R.R	9-25-06
CHK'D	DM	9/21/06	ENGR	NEM	9/27/06
APP'D	RF	10/3/06	SALES	Jmm	10/4/06

TITLE

INSTALLATION DRAWING
MODEL 112B11
PRESSURE SENSOR

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CODE IDENT. NO.	DWG. NO.
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