



Model 134A

**Tourmaline pressure bar, 10k psi, 0.12 pC/psi, charge output, 0.2 microsecond rise time
(reflected shock wave)**

Installation and Operating Manual

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

**Toll-free: 716-684-0001
24-hour SensorLine: 716-684-0001
Fax: 716-684-0987
E-mail: info@pcb.com
Web: www.pcb.com**



Repair and Maintenance

PCB guarantees Total Customer Satisfaction through its “Lifetime Warranty Plus” on all Platinum Stock Products sold by PCB and through its limited warranties on all other PCB Stock, Standard and Special products. Due to the sophisticated nature of our sensors and associated instrumentation, **field servicing and repair is not recommended and, if attempted, will void the factory warranty.**

Beyond routine calibration and battery replacements where applicable, our products require no user maintenance. Clean electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the material of construction. Observe caution when using liquids near devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth—never saturated or submerged.

In the event that equipment becomes damaged or ceases to operate, our Application Engineers are here to support your troubleshooting efforts 24 hours a day, 7 days a week. Call or email with model and serial number as well as a brief description of the problem.

Calibration

Routine calibration of sensors and associated instrumentation is necessary to maintain measurement accuracy. We recommend calibrating on an annual basis, after exposure to any extreme environmental influence, or prior to any critical test.

PCB Piezotronics is an ISO-9001 certified company whose calibration services are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to our standard calibration services, we also offer specialized tests, including: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For more information, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

Returning Equipment

If factory repair is required, our representatives will provide you with a Return Material Authorization (RMA) number, which we use to reference any information you have already provided and expedite the repair process. This number should be clearly marked on the outside of all returned package(s) and on any packing list(s) accompanying the shipment.

Contact Information

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY14043 USA
Toll-free: (800) 828-8840
24-hour SensorLine: (716) 684-0001
General inquiries: info@pcb.com
Repair inquiries: rma@pcb.com

For a complete list of distributors, global offices and sales representatives, visit our website, www.pcb.com.

Safety Considerations

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions required to avoid injury. While our equipment is designed with user safety in mind, the protection provided by the equipment may be impaired if equipment is used in a manner not specified by this manual.

Discontinue use and contact our 24-Hour Sensorline if:

- Assistance is needed to safely operate equipment
- Damage is visible or suspected
- Equipment fails or malfunctions

For complete equipment ratings, refer to the enclosed specification sheet for your product.

Definition of Terms and Symbols

The following symbols may be used in this manual:



DANGER

Indicates an immediate hazardous situation, which, if not avoided, may result in death or serious injury.

**CAUTION**

Refers to hazards that could damage the instrument.

**NOTE**

Indicates tips, recommendations and important information. The notes simplify processes and contain additional information on particular operating steps.

The following symbols may be found on the equipment described in this manual:



This symbol on the unit indicates that high voltage may be present. Use standard safety precautions to avoid personal contact with this voltage.



This symbol on the unit indicates that the user should refer to the operating instructions located in the manual.



This symbol indicates safety, earth ground.



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 SJ/T 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.

1.0 INTRODUCTION

The Model 134A Tourmaline Pressure Bar is a high pressure, fast rise time suppressed resonance blast transducer ideal for single shot high frequency measurements of incident or reflected pressures and end-on shock waves found in studies of plasma physics and hypersonics. Ranges are available up to 30,000 psi.

2.0 INSTALLATION

See Installation Drawing at the front of this manual for a graphic description of the transducer. Install in a gas medium where measurement is to be taken. The sensor cannot be used in a fluid medium.

Tie the low noise cable to rigid structures to prevent excessive motion and noise. Allow for strain relief.

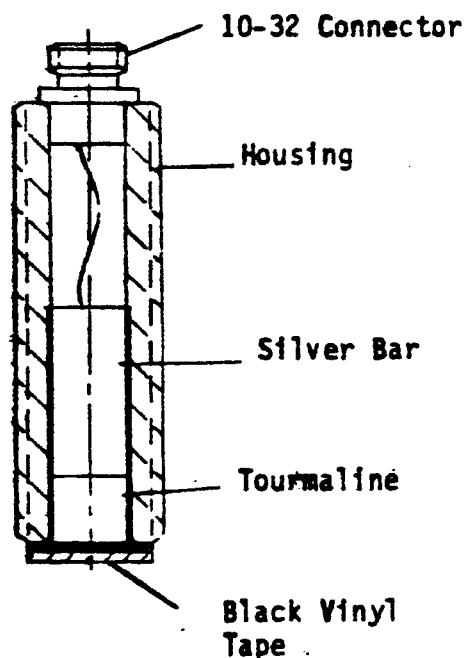


FIGURE 1 CROSS SECTION OF MODEL 134A

3.0 OPERATION

Connect the 134A to a laboratory type

charge amplifier such as the PCB Model 462A, 463A or 464A. Use only low noise cable such as the PCB Model 003A or equivalent. Protect the high impedance connection against moisture contamination with shrink tubing. Support transducer cables by tying them to rigid structures to prevent excessive motion which can generate noise. Allow strain relief in the cable.

Select the appropriate transducer sensitivity and range on the charge amplifier in accordance with the instructions supplied with the charge amplifier.

NOTE: Keep the input cable to the charge amplifier as short as practical because noise at the output of the charge amplifier is related to cable length. If necessary, depress the ground button of the charge amplifier and adjust electrical zero.

Connect the output of the charge amplifier to a readout instrument such as a storage scope or high speed recorder.

NOTE: The Model 134A can also be used with an in-line amplifier or by connecting it directly into a readout instrument. If used with an in-line amplifier, connect into a Model 480 Series Power Supply.

4.0 POLARITY

When subjected to pressure, the 134A will have a positive-going charge output. Because PCB charge amplifiers are signal inverting, the resultant output will be negative.

5.0 CALIBRATION

The Model 134A Tourmaline Pressure Bar must be calibrated dynamically. There are two methods used in dynamic calibration: the shock tube and drop tester methods.

These two methods are used to compare the similarity of the shock tube readings to the drop tester results, and to find the error band for each calibration.



134A TOURMALINE PRESSURE BAR
CHARGE MODE PRESSURE TRANSDUCER
SUSQUEHANNA ST-4

MODEL OPERATING GUIDE

REVISIONS

SHEET 2 OF 2

5.0 CALIBRATION (con't)

Employing the 2-inch dia. shock tube and a high-speed digital storage scope, the Mach number of the shock wave can be determined and the sensitivity mathematically calculated.

The sensitivity, using the drop tester method, is generally determined by taking five data points across the range in the drop tester and then finding the sensitivity by using linear regression mathematics.

The shape of the wave form and the rise time that we see on the scope provide valuable information about the quality of the transducer. (The transducer is exposed to shock waves traveling at a high Mach number).

The Model 134A Tourmaline Pressure bar cannot be calibrated statically because the structure cannot handle the load.

Should the pressure transducer require recalibration, the customer is urged to return the sensor to the factory with an explanatory note.

6.0 MAINTENANCE AND REPAIR

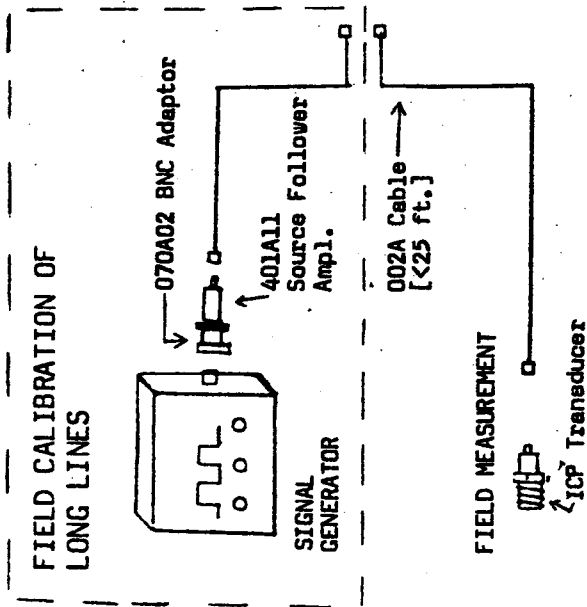
The transducer connector must be kept clean especially if operating in a dusty and/or wet environment.

It is well to observe the following precautions in using the Model 134A:

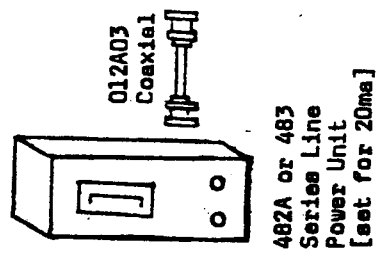
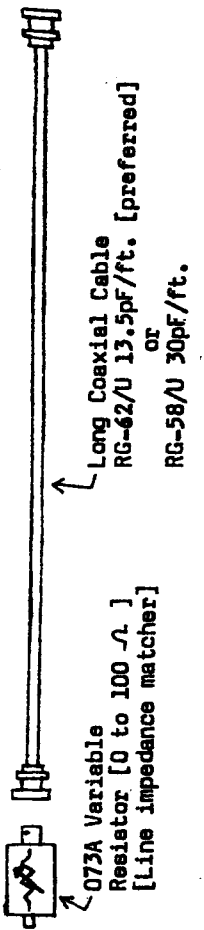
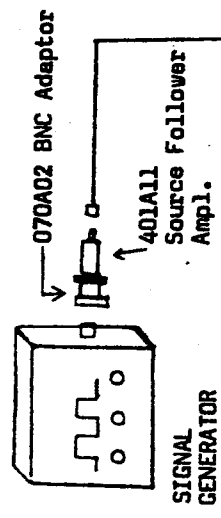
1. Do not exceed maximum load levels.
2. Constant temperatures around the transducer should be limited to 150°F. Short term exposure to higher temperatures as in a blast wave will not cause problems.

CAUTIONARY NOTE: If sensors are left

outside overnight, they should be coated with silicone oil and covered. The protective silicone oil or grease coating should also be applied when the sensors are operated in a humid or rainy environment.



FIELD CALIBRATION OF LONG LINES



Long Coaxial Cable
RG-62/U 13.5pF/ft. [preferred]
or
RG-58/U 30pF/ft.

073A Variable Resistor [0 to 100 Ω]
[Line impedance match]

FIELD MEASUREMENT

ICP Transducer

Readout

482A or 483 Series Line Power Unit
[set for 20ma]

012A03 Coaxial

SUGGESTIONS:

1. For best results thru long cables select transducer to operate around 1 volt F.S.
2. Use 20ma constant current
3. Use RG-62/U low capacitance cable whenever possible
4. Test long line systems with pk-pk voltage at expected frequency.



PERFORMANCE CHARACTERISTICS

with 500 ft. RG-58/U cable	20ma power
with 1000 ft. RG-58/U cable	20ma power

Above system with 073A Impedance Matcher	Above system without 073A Impedance Matcher
Flat to 100kHz with up to 3.5 V pk-pk input	Flat to 30kHz with up to 5 V pk-pk input
Flat to 100kHz with up to 2 V pk-pk input	Flat to 10kHz with up to 5 V pk-pk input
<p>TYPICAL OUTPUT vs. FREQ. WITH 1.0 V PK-PK INPUT AND 1000 FT. RG-58/U CABLE</p>	

TYPICAL FIELD BLAST MEASUREMENT SYSTEM INVOLVING LONG LINES

PIB
PIEZOTRONICS

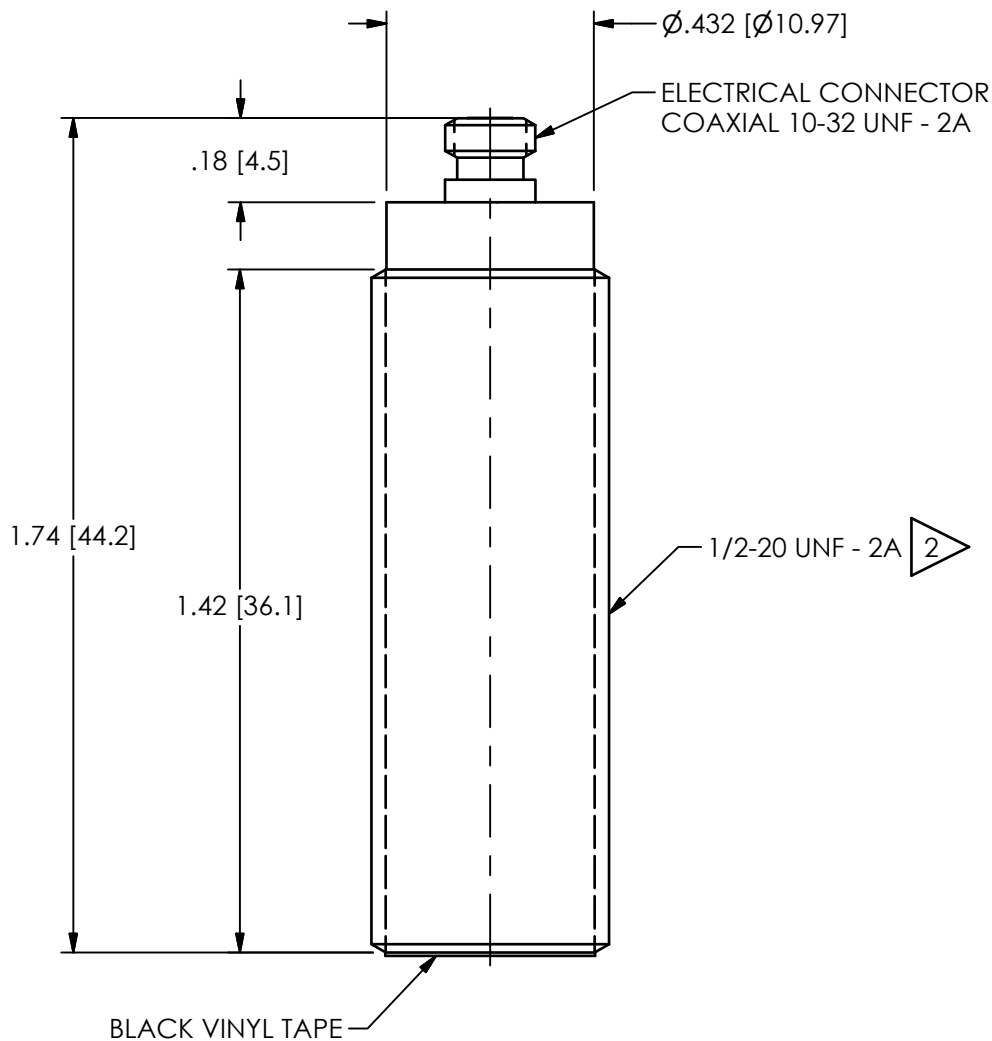
Model Number 134A	CHARGE OUTPUT PRESSURE SENSOR			Revision: G ECN #: 52882										
Performance Sensitivity(± 15 %) Measurement Range Maximum Pressure(static) Resolution Resonant Frequency Rise Time(Reflected) Non-Linearity Environmental Temperature Range(Operating) Maximum Flash Temperature Electrical Capacitance Insulation Resistance(at room temp) Physical Sensing Element Housing Material Sealing Electrical Connector Weight	ENGLISH 0.125 pC/psi 10,000 psi 15,000 psi 0.1 psi ≥ 1,500 kHz ≤ 0.2 μ sec ≤ 2.0 % FS -32 to +120 °F 5,000 °F 10 pF ≥ 10 ¹⁰ Ohm Tourmaline Stainless Steel Epoxy 10-32 Coaxial Jack 0.98 oz	SI 0.018 pC/kPa 68,950 kPa 103,420 kPa 0.69 kPa ≥ 1,500 kHz ≤ 0.2 μ sec ≤ 2.0 % FS -36 to +49 °C 2,760 °C 10 pF ≥ 10 ¹⁰ Ohm Tourmaline Stainless Steel Epoxy 10-32 Coaxial Jack 28 gm	<div> 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 </div> <div> NOTES: [1]Resolution dependent on range setting and cable length used in charge system. [2]Zero-based, least-squares, straight line method. [3]See PCB Declaration of Conformance PS158 for details. </div> <div> SUPPLIED ACCESSORIES: Model 061A30 Spanner Wrench, 2 Pin (1) </div>	<table> <tr> <td>Entered: ND</td><td>Engineer: RPF</td><td>Sales: MV</td><td>Approved: BAM</td><td>Spec Number:</td></tr> <tr> <td>Date: 06/03/2022</td><td>Date: 06/03/2022</td><td>Date: 06/03/2022</td><td>Date: 06/03/2022</td><td>134-1010-80</td></tr> </table>	Entered: ND	Engineer: RPF	Sales: MV	Approved: BAM	Spec Number:	Date: 06/03/2022	Date: 06/03/2022	Date: 06/03/2022	Date: 06/03/2022	134-1010-80
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Date: 06/03/2022	Date: 06/03/2022	Date: 06/03/2022	Date: 06/03/2022	134-1010-80										
<div>  </div> <div> <p>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 Piezotronics, Inc.</p> </div>				<div>  <div> Phone: 716-684-0001 Fax: 716-684-0987 E-Mail: info@pcb.com </div> <p>3425 Walden Avenue, Depew, NY 14043</p> </div>										

134-1010-90

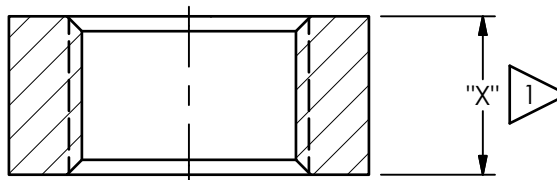
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REVISIONS

REV	DESCRIPTION	DIN
C	UPDATED DRAWING	49422




MOUNTING HOLE PREPARATION:
Ø.453 [11.51] THRU
1/2-20 UNF - 2B THRU



2 TEFLON TAPE OR OTHER THREAD SEALANT IS RECOMMENDED

1 "X" DIMENSION TO SUIT USER REQUIREMENTS

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

DIMENSIONS IN INCHES		DIMENSIONS IN MILLIMETERS [IN BRACKETS]		JES	5/16/19	JDM	5/16/19	MJK	5/16/19	<div><p>3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com</p></div>
DECIMALS XX ±.01 XXX ±.005	DECIMALS X ± 0.3 XX ± 0.13	TITLE INSTALLATION DRAWING MODELS 134A & A02 DYNAMIC PRESSURE TRANSDUCER								
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES									
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13									
										<div><div>CODE IDENT. NO. 52681</div><div>DWG. NO. 134-1010-90</div></div>
										<div>SCALE: 2X</div> <div>SHEET 1 OF 1</div>