Model 134A02

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

PCB PIEZOTRONICS

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

REVISIONS

1.0 INTRODUCTION

The Model 134A Tourmaline Pressure Bar is a high pressure, fast rise time supressed 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.

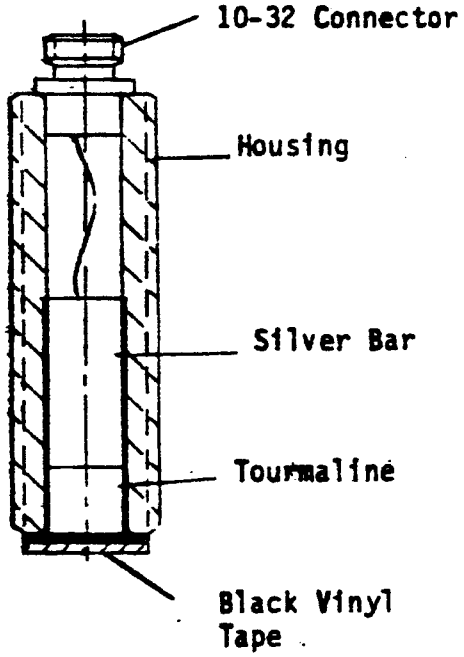


FIGURE 1 CROSS SECTION OF MODEL 134A

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.

Drawing Number: 21095
Revision: NR.

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:

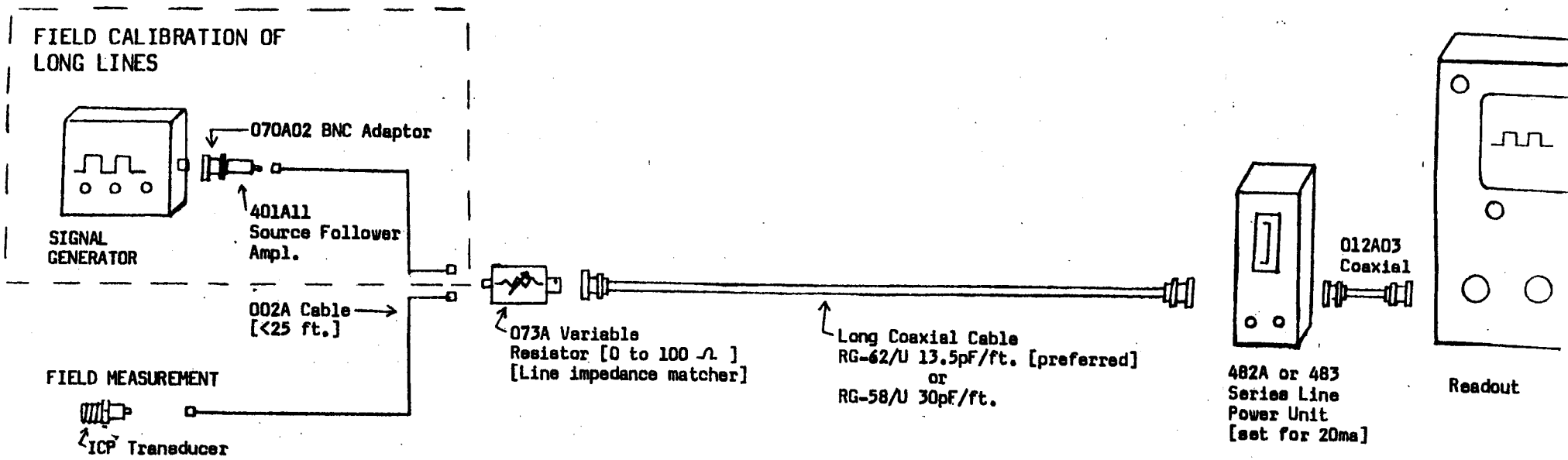
1. Do not exceed maximum load levels.

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.

Drawing Number: 21095
Revision: NR

Drawing Number: 21095
Revision: NR



SUGGESTIONS:

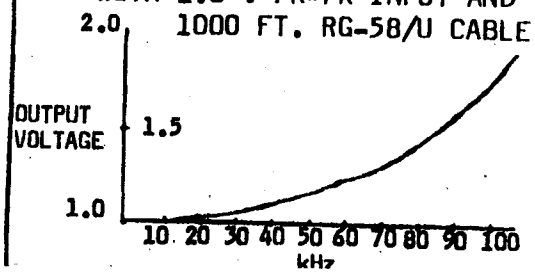
1. For best results thru long cables select transducer to operate around 1 volt F.S.
2. Use 20ma constant current
3. Use RG-62/U low capacitance cable whenever possible
4. Test long line systems with pk-pk voltage at expected frequency.

	Above system with 073A Impedance Matcher	Above system without 073A Impedance Matcher
PERFORMANCE CHARACTERISTICS with 500 ft. RG-58/U cable 20ma power	Flat to 100kHz with up to 3.5 V pk-pk input	Flat to 30kHz with up to 5 V pk-pk input
with 1000 ft. RG-58/U cable 20ma power	Flat to 100kHz with up to 2 V pk-pk input	Flat to 10kHz with up to 5 V pk-pk input

TYPICAL FIELD BLAST MEASUREMENT SYSTEM INVOLVING LONG LINES

PCB PIEZOTRONICS

TYPICAL OUTPUT vs. FREQ.
WITH 1.0 V PK-PK INPUT AND
1000 FT. RG-58/U CABLE



Model Number	CHARGE OUTPUT PRESSURE SENSOR	Revision: F
134A02		ECN #: 35509

Performance	ENGLISH	SI	
Sensitivity(± 15 %)	0.125 pC/psi	0.018 pC/kPa	
Measurement Range	20 kpsi	137,900 kPa	
Maximum Pressure(static)	40 kpsi	275,800 kPa	
Resolution	100 mpsi	0.69 kPa	[1]
Resonant Frequency	≥ 1500 kHz	≥ 1500 kHz	
Rise Time(Reflected)	≤ 0.2 µ sec	≤ 0.2 µ sec	
Non-Linearity	≤ 2.0 % FS	≤ 2.0 % FS	[2]
Environmental			
Temperature Range(Operating)	-32 to +120 °F	-36 to +49 °C	
Maximum Flash Temperature	5000 °F	2760 °C	
Electrical			
Output Polarity(Positive Pressure)	Positive	Positive	
Capacitance	10 pF	10 pF	
Insulation Resistance(at room temp)	≥ 10^{10} ohm	≥ 10^{10} ohm	
Physical			
Sensing Element	Tourmaline	Tourmaline	
Housing Material	Stainless Steel	Stainless Steel	
Sealing	Epoxy	Epoxy	
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	
Weight	0.98 oz	28 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 the standard model except where noted below. More than one option may be used.

M - Metric Mount

NOTES:

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

SUPPLIED ACCESSORIES:

Model 061A30 Spanner Wrench, 2 Pin (1)

Entered:	Engineer:	Sales:	Approved:	Spec Number:
Date: 4/27/11	Date: 4/27/11	Date: 4/27/11	Date: 4/27/11	28613

PCB PIEZOTRONICS
PRESSURE DIVISION
3425 Walden Avenue, Depew, NY 14043

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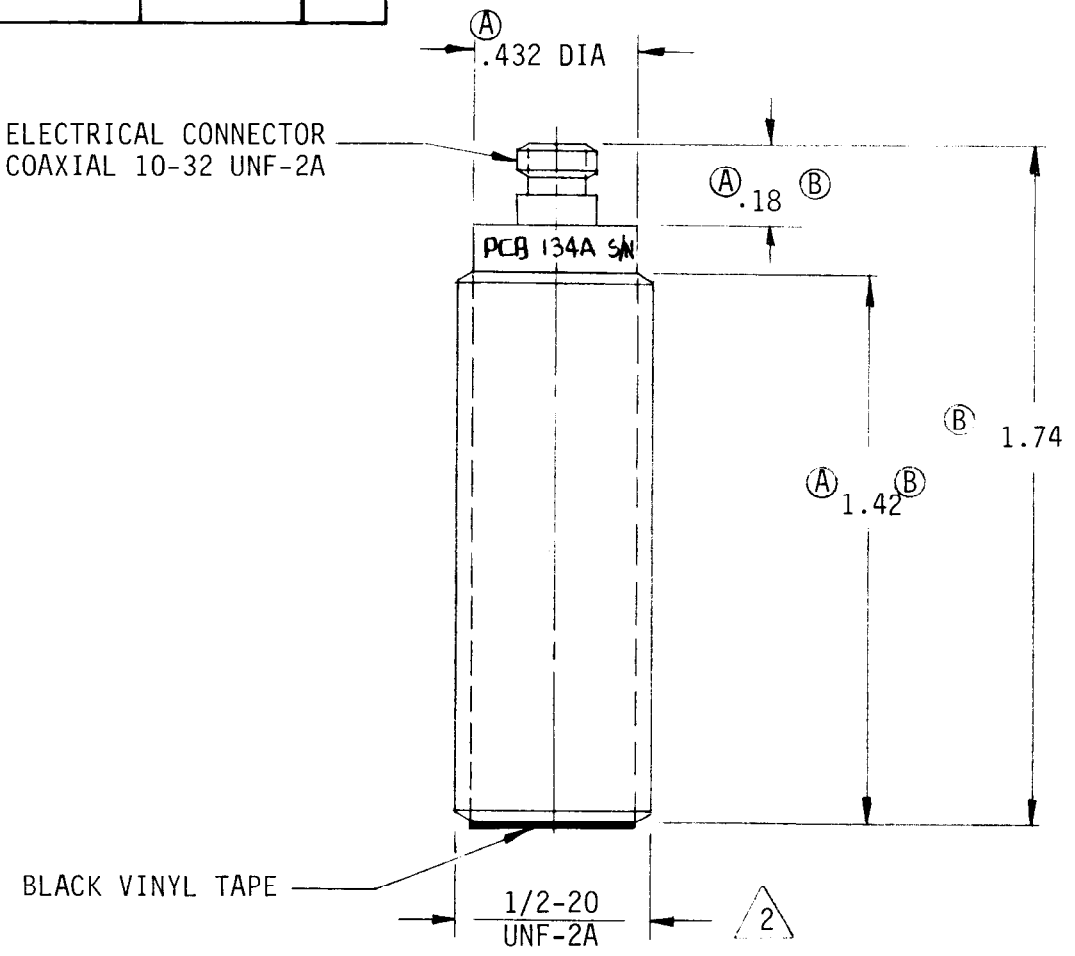
Fax: 716-686-9129
E-Mail: pressure@pcb.com

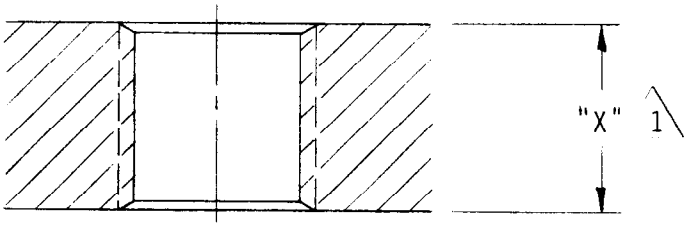
134-1010-90

APPLICATION			
QTY.	NEXT ASSY	USED ON	VAR

REVISIONS				
SYM.	DESCRIPTION	EO	DATE	APP'D
A	REVISED AS PER ECR #	1213 RG	6-28-83	EOR 6-28-83
B	REV PER ECR #	1374	2-2-84	EOR



MOUNTING HOLE PREPARATION:
DRILL "29/64" (.453 DIA)
THRU
TAP 1/2-20 UNF-2B
THRU



PREVIOUS SUSQUEHANNA INSTRUMENT MOD Nº $T4

2 TEFLON TAPE OR OTHER THREAD SEALANT IS RECOMMENDED.

1 "X" DIMENSION TO SUIT USER REQUIREMENTS.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES FRACTIONS ± 1/64 DECIMALS XX ± .01 XXX ± .005 ANGLES ± 1/2 DEG. BREAK SHARP EDGES .003 – .005	MATERIAL	DRAWN	RG	4/24/83	MFG.	J.T. 4/83
		CHECKED	AR	4/25/83	ENGR.	MT 4/25/83
	HEAT TREAT	APP'D			RELEASE NO.	
	EXCEPT AS NOTED FIN ✓	TITLE	INSTALLATION DRAWING MODELS 134A, A02 DYNAMIC PRESSURE TRANSDUCER			

pcb piezotronics, inc.
BUFFALO, NEW YORK 14225

CODE IDENT. NO.

DWG. NO. 134-1010-90

SCALE 2:1 SHEET 1 OF 1