



Model 378B02

1/2" prepolarized free-field condenser microphone, 50 mV/Pa (+/-1.5 dB), 3.15 Hz - 20 kHz (+/-2 dB) with 1/2" ICP® preamplifier (426E01) and TEDS

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.

PRODUCT GUIDE **377 SERIES MICROPHONES** **426 SERIES PREAMPLIFIERS**



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1.0 Introduction

Thank you for your purchase of a PCB high quality microphone. These microphones offer highly accurate and reliable acoustic measurements and are typically used in research and design applications. They are accurate enough for laboratory usage, yet rugged enough for field-testing.

Sound within the typical 20 to 20,000 Hz audible range of a healthy human ear can either be pleasing to the ear, as in music, or unpleasant (or harmful), as in noise. As a result, many applications, from the development of consumer products to research in acoustics, measure sound, even sound outside the range of human hearing. The instrument typically used to measure sound is the microphone, which is designed, like the human ear, to transform pressure oscillations into a corresponding voltage oscillation.

2.0 Standards

Before selecting an acoustical instrument, it is important to identify which acoustical standards are appropriate for the application in which the instrument will be used. Whether for legal purposes or for quality assurance programs, these standards will help determine the required quality, accuracy and consistency of the instrument. Standards that correspond to the performance requirements, dimensions and characteristics of acoustical components are established for microphones, sound level meters, calibrators, or other related components. The most common organizations producing these standards are the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC). IEC 1094-4 establishes specifications for the mechanical dimensions and certain electroacoustic characteristics for standard industrial microphones. The performance specification sheet supplied with each PCB microphone identifies the standards to which the microphone is compliant.

3.0 Setting up a Microphone Measurement System

After the proper microphone has been selected, the corresponding preamplifier, cabling, power supplies, signal conditioning and data acquisition selections are ready to be installed. Not all of these components are required for all test set-ups. The figures below show typical set-ups for externally polarized and prepolarized microphone systems.

A prepolarized microphone can be used with a standard Microphone Power Supply designed for externally polarized microphones, and its preamplifier, provided the supply voltage is set to zero.

Phantom powered microphone systems use a 3 pin XLR connector. A phantom powered microphone system should use a 48V phantom power supply or signal conditioner for optimum performance; however these microphone systems may be powered with a 24V or a 12V phantom power supply, but this will limit the maximum output voltage.



Externally Polarized Microphone System

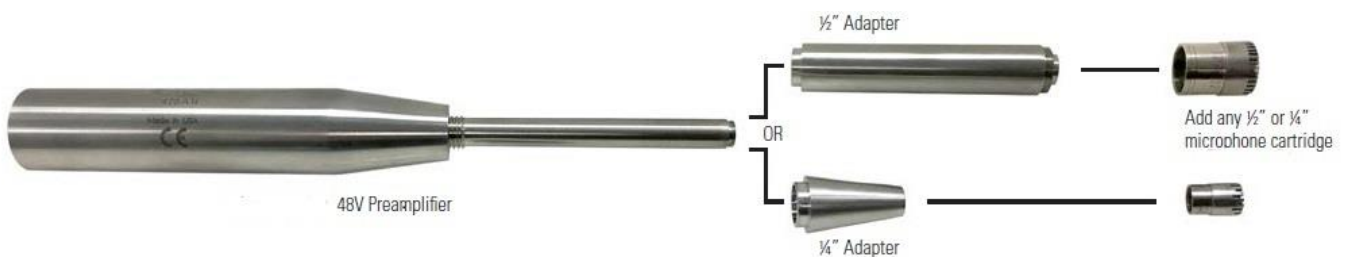


Prepolarized Microphone System



Phantom Powered Microphone System

The phantom powered preamp may be used with either a 1/4" or a 1/2" microphone cartridge by using the adapter provided. All IEC 61094-4 compliant microphones can be used with the phantom powered preamp.



Adapters for Phantom Powered Preamp

4.0 Taking Measurements

The following formula is used to calculate the pressure measured by the microphone from the output voltage signal. The sensitivity of a microphone is typically measured at 250 Hz.

$$\text{Pressure (Pa)} = \text{Voltage (mV)} / \text{Sensitivity (mV/Pa)}.$$

The lowest amplitude a healthy human ear can detect is 20 millionths of a Pascal (20μPa). Another scale more commonly used to describe sound pressure level is the decibel (dB). To convert the output voltage signal (measured in V_{rms}) to sound pressure level (measured in decibels), use the following formula:

$$SPL = \left(20 \text{ Log} \left(\frac{V_{rms}}{S P_{ref}} \right) \right) dB$$

where S is the sensitivity of the microphone in mV/Pa, and P_{ref} is the reference pressure in air, which is 20×10^{-6} Pa. The decibel scale is logarithmic and more closely matches the response reactions of the human ear to the pressure fluctuations. Some examples of typical sound pressure levels are shown in the table below.

dB	Pressure	Example
0	0.00002 Pa	Threshold of Hearing
60	0.02 Pa	Business Office
80	0.2 Pa	Shop Noise
94	1 Pa	Large Truck
100	2 Pa	Jackhammer
120	20 Pa	Airplane Take-Off
140	200 Pa	Threshold of Pain

At very high-pressure amplitudes, the microphone's diaphragm will start to distort the measured sound pressure. The maximum rated sound pressure level of a microphone is expressed as the amplitude at which the Total Harmonic Distortion (THD) reaches a specified amount, typically 3% THD. It is important to note that the highest sound pressure level that can be measured with a microphone system may be limited by other parts of the system, such as the preamplifier, signal conditioner, or instrumentation. Conversely, the Cartridge Thermal Noise (CTN) specification provides the lowest measurable sound pressure level that can be detected above the electrical noise inherent within the microphone.

Temperature and pressure will affect the sensitivity of a microphone but these effects can be accounted for by adjusting the recorded microphone values using the coefficients specified for each microphone model. Simply calculate the difference in temperature and ambient pressure from those recorded during calibration and multiply this value by the proper coefficient to determine the sensitivity offset. In most cases, the offset will be very small and is therefore unnecessary.

5.0 Accessories & Miscellaneous

Transducer Electronics Data Sheet (TEDS)

Preamplifiers can incorporate TEDS devices, which have a built in read/write memory that contains relevant information about the sensor and its use. Information includes manufacturer name, model number, serial number, sensitivity, etc. The operation of TEDS devices is defined by IEEE P1451.4. A TEDS microphone system includes a microphone mated with a preamplifier that contains the TEDS memory programmed with both the microphone and preamplifier information. This is particularly helpful when using large channel count systems and array set-up.

A-Weight Inline Filter

The inline filter is used in conjunction with an ICP® preamplifier to provide A-weighting for acoustical measurements. The filter's frequency response is weighted according to the A-weighting filter portion of both ANSI S1.4 and IEC 60651 Type 1 Sound Level Meter Standards. ICP® signal conditioners of 4 mA or greater are recommended when using inline filters.

Windscreens and Nose cones

Wind induced noise can be reduced by using a windscreen. This can offer some protection against dust particles and mechanical damage. In the presence of high-speed airflow from a well-defined direction, such as wind tunnels, a nose cone is recommended. When using windscreens and noise cones, the frequency response of the microphone will be attenuated at higher frequencies.

Clamps and stands

When holding a microphone in place, it is important to minimize the influence of the stand on the sound being measured. This can be accomplished by using low profile stands and clamps available from PCB.

Cables and Electronics

PCB carries LEMO® cables as well as coaxial cables with BNC and 10-32 connectors. Traditional externally polarized microphone power supplies along with a variety of ICP® signal conditioners are available that will fit almost any need.

6.0 Maintenance

Microphones are very stable over long periods of time, provided they are handled and stored properly. The microphone contains fragile components that can be damaged by misuse, in particular the diaphragm, which is made up of a very thin proprietary material and should be kept clean of dust, dirt, moisture and free any type of imperfection (scratch, dent, etc.).

The microphone's grid cap is designed to let the true sound pressure level through to the diaphragm while preventing items from coming in contact with it. We do not recommend that you ever remove the grid cap or clean the microphone. If you take the precautionary measures to keep the microphone clean and dry, it should not be necessary. Should you need to remove the grid cap to replace it with PCB's enhanced rugged grid cap (shown below, and as an independent part of a rugged kit) to extend the lifespan of the precision measuring device, caution should be taken to ensure the delicate diaphragm sensing element remains untouched and safe.



Use of accessories, like windscreens, and desiccants will help keep moisture off the microphone and maintain the specified sensitivity level. Nose cones will help keep turbulence off the microphone diaphragm and allow the sound pressure to be measured with greater accuracy.

Keep the microphone and preamplifier assembled while preparing for testing. Keep the rubber maintenance caps on the preamplifier's electrical connector only. Do not place these rubber caps over the microphone. This will create a vacuum and undo pressure on the microphone diaphragm, which can stretch the diaphragm and cause a change in sensitivity. Store the microphones and preamplifiers in their protective cases when not in use.

Dust, rain, oil, moisture or exposure to extreme temperatures may adversely affect the microphone and preamplifier's performance. If the microphone or the inside of the connection area of the preamplifier becomes contaminated, use a light pressure rubber bulb to gently blow clean, dry air onto the unit in order to remove the dust. In the event that you absolutely must take off the grid cap and clean the microphone diaphragm, we recommend using a blow bulb or a light pressure, clean and dry air hose to gently blow contamination off the diaphragm. The direction of the air should be parallel with the diaphragm, not directly (0 degree incidence) pointed at the diaphragm. Do not touch the microphone's diaphragm with your fingers or let it come in contact with any sharp or pointed object. Please note that any contact to the microphone's diaphragm can negatively impact the sensitivity and long term stability of the microphone.

If the microphone is ever dropped (the effects of this can be minimized by PCB's rugged grid cap or utilizing rugged microphone kits), or comes into contact with any contamination, or is exposed to extreme temperatures, immediate recalibration of the microphone should be performed. When using a rugged grid cap, a handheld calibrator with a 1" diameter (example CAL250, or pistonphone) is required for recalibration, along with the larger (079A59) calibration adapter. Please note that heat from your hands can affect the calibration results. It is always good practice to wait a minimum of 30 seconds after placing the microphone on a test system before taking a calibration reading in order to minimize the effect that heat from your hands has on the calibration. Changes in the environmental conditions: temperature, humidity or atmospheric pressure, may cause a change in your microphones sensitivity and thus, changes in your output accuracy. It is always recommended to calibrate both before and after your test, within the test environment. Performing a single point handheld calibrator check, both before and after your test, ensures reliability of the test data. With proper maintenance, the microphone and preamplifier should provide stable and accurate results for years to come.

7.0 Calibration

PCB offers recalibration services for our precision microphones, as well as units produced by other A2LA manufacturers. Our internal metrology laboratory is certified to ISO 9001, accredited by A2LA to ANSI/IEC 17025 and ANSI/NCSL Z540-1, complies with ISO 10012-1 (and former MIL-STD-45662A), and uses equipment directly traceable to one or more of the following National Labs (NIST, PTB or DFM). Our investment in equipment, traceability and conformance to industry standards ensures accurate calibration against relevant specifications. We also carry a line of acoustic calibrators that can be used to calibrate microphone sensitivity on site as needed.

Hand calibration of sensitivity for most prepolarized microphones may be performed with a Larson Davis CAL250 or CAL200 (or equivalent). The CAL250 produces 114 dB SPL at 251.2 Hz. The CAL 200 produces either 94 dB or 114 dB (user selectable) at 1000 Hz. Note that both the CAL250 and CAL 200 are compliant with ANSI S1.40-2006, Specifications and Verification Procedures for Sound Calibrators, Class1 and IEC 60942-2003, Class 1, Sound Calibrators.

8.0 Warranty and Service

All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a warranty against defective material and workmanship under a **Total Customer Satisfaction** policy. 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. See the supplemental sheet, contained with this manual, for information on our service, repair and return policies, procedures and instructions. When unexpected problems arise, call our 24-Hour SensorLineSM (716-684-0001) to speak with an Application Engineer. Visit www.pcb.com for a complete statement of our warranty.

3425 Walden Avenue, Depew, NY 14043-2495

E-Mail: info@pcb.com

Website: www.pcb.com

24-hour SensorLineSM: 716-684-0001

U.S.A. Fax: 716-684-0987

Toll-free (in the U.S.A.): 800-828-8840

A PCB GROUP COMPANY

ISO 9001 CERTIFIED

A2LA ACCREDITED to ISO 17025

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Manual Number: 27042

Manual Revision: F

ECO 51020



Printed in the U.S.A.



Model 130F20

ICP® Electret Array Microphone

Installation and Operating Manual

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Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
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OPERATING GUIDE FOR 130 SERIES MICROPHONES

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Figure 1

1.0 Introduction

PCB[®] 130 series ICP[®] array microphones provide an extremely cost-effective method for large channel count sound pressure measurements. Multiple array microphones with their excellent phase characteristics can be combined with the appropriate software to perform measurements that are not possible with a single microphone. Typical applications include sound pressure mapping, beamforming, acoustic mode analysis, near-field acoustic holography, or sound intensity measurements. To ensure the best performance from your 130 series microphone follow the installation and operating procedures in this guide. If you have additional questions concerning the microphone system or applications, call a factory Application Engineer at 716-684-0001, or your nearest PCB[®] Field Application Engineer.

2.0 Product Description

PCB[®]'s 130 series ICP[®] Array are integrated systems that include a built-in preamplifier. Models 130F20, 130F21, and 130F22 are all ¼-inch microphones that provide a 45 mV/Pa output over an extended 120dB dynamic range. They are ideal for use at frequencies from 20 Hz to 10 kHz (± 2 dB) or 20 kHz (± 5 dB). All models are of rugged, stainless steel construction .

These microphones all have the same performance specifications but are fitted with different electrical connectors to make them suitable for differing applications. Model 130F20 features a BNC connector while Model 130F21 uses a 10-32 coaxial jack connector. Model 130F22 terminates in a SMB connector. These models are shown in Figure 1.

The 130A23 and 130A24 are designed for high amplitude applications with an upper dynamic range of 150 dB. Model 130A23 terminates in a SMB electrical connector. The 130A24 is an enhanced, rugged, water and dust resistant design, and terminates in a BNC electrical connector. Model 130A24 has a lower sensitivity (10 mV/Pa) than the 130A23 (14 mV/Pa), but otherwise the performance specifications are the same.

All 130 Series array microphones include TEDS capable digital memory and communication electronics compliant with IEEE 1451.4. These microphones are easy to operate and interface with many PCB® ICP® constant current signal conditioners and other data acquisition and recording instruments available on the market today. In a complete microphone system, low-impedance cables couple the microphone and signal conditioner to customer supplied read-out instruments. The use of low impedance cables enables signals to be driven long distances with negligible signal loss.

3.0 Powering

All ICP® powered microphones require constant-current excitation for proper operation. For this reason, use only PCB constant-current signal conditioners or other approved constant-current sources. The signal conditioner provides an AC-coupled output signal that is compatible with most standard readout devices. Signal conditioners consist of a regulated 2-20mA, 18-30 VDC source. They are available in single or multi channel, battery or line powered configurations. Battery powered devices offer versatility for portable low noise measurements, whereas line powered units provide the capability for continuous monitoring. A typical system schematic is shown in Figure 2.

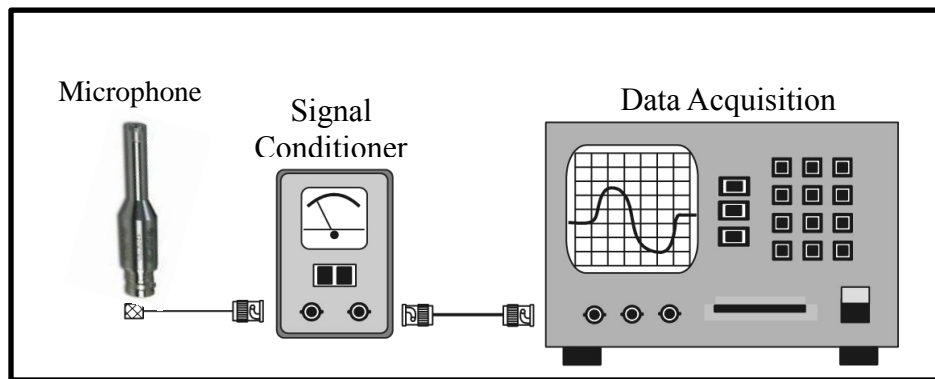


Figure 2

Signal conditioners have meters or LEDs, which enable users to monitor the bias voltage output signal, check microphone operation, and detect cable faults. Typically yellow denotes an open circuit; green indicates normal operation and red indicates a short circuit. Many FFT analyzers, data acquisition modules, and data collectors have the proper constant-current excitation built-in for direct use with ICP® microphones. Before using this feature, care should be taken to assure the proper supply voltage and constant current excitation are provided. Check the enclosed specification sheet to make sure the supply voltage and current are within acceptable limits for your particular microphone.

4.0 Installation

There are many ways to mount the microphone, from simply placing the microphone in a clip to using a two-dimensional array stand. A diagram of an array configuration is provided in Figure 3. For installation of this type, remove the microphone from its package, connect the appropriate cable between the signal conditioner and the microphone, and connect a second cable between the signal conditioner and the data acquisition device. Cabling may consist of standard low-impedance coax cables. Desired electrical connectors would be dependent on the 130 series microphone used and the input of the signal conditioner and read-out instrument. PCB® offers these cables in a variety of standard or customer specified lengths.

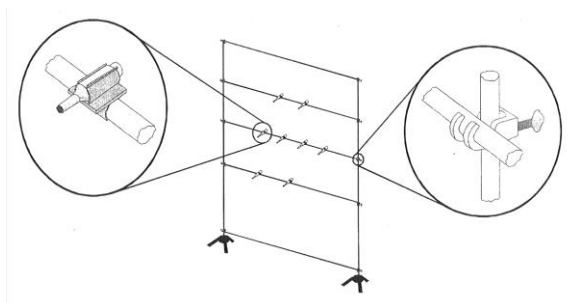


Figure 3

The 130A24 microphone features a removable grid cap and replaceable protective cover. This allows the 130A24 to withstand harsh environments while extending the lifespan of critical sensitive components. If the water and dust resistant cover is damaged, having a removable grid cap allows the user to replace this protective cover quickly and easily.

To replace a grid cap, first unthread the grid cap from the housing. Next, peel off the existing cover from the end of the housing. Sharp edged tools can be used to aid in cover removal, but it is important to keep the tool at a shallow angle. DO NOT make contact with the microphone's delicate diaphragm (right hand side of Figure 4). To ensure a proper seal, gently wipe the top of the microphone housing to remove any moisture or debris. Do not use solvent when removing debris from the housing because solvents have the potential to damage the microphone. Apply the replacement water resistant patch to the end of the housing (left hand side of Figure 4) while keeping it centered. Finally, assemble the grid cap back onto the housing. Additional 079A46 five-pack replacement water resistant pads can be ordered separately.



Figure 4

5.0 Calibration

All microphones are supplied with calibration documentation showing the free field frequency response and the conditions under which the calibration was performed. Calibrations are performed with reference microphones traceable to national laboratories specializing in acoustic measurements (NIST, PTB, or DFM). PCB is ISO 10012-1 and ISO 9001-2008 certified. Calibration methods used by PCB for acoustic pressure have been audited for proficiency and accredited for compliance with ISO/IEC 17025:2005; ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3. Sample calibration certificates are provided in Figure 5, Figure 6, and Figure 7 for the 130F series, 130A23, and 130A24, respectively.

~ Calibration Certificate ~

Model Number: 130F20

Serial Number: 43998

Description: ICP® Microphone

Manufacturer: PCB

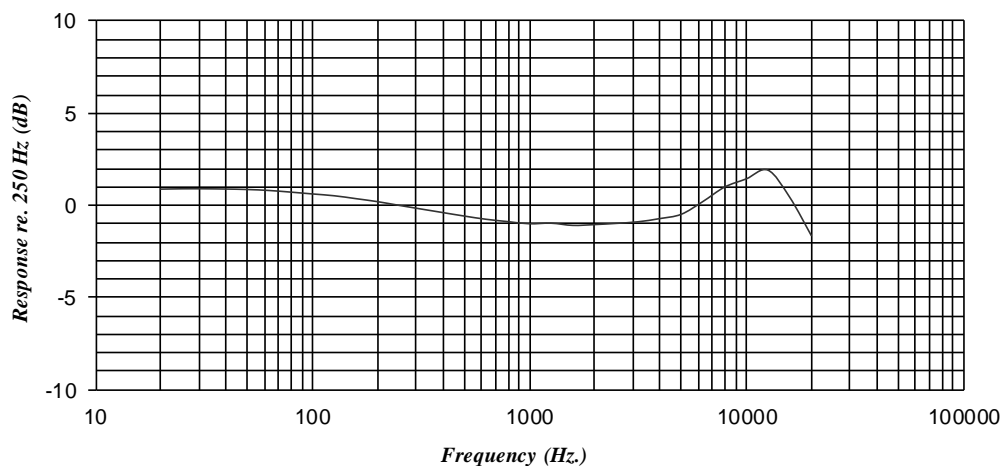
Calibration Data

Sensitivity: 44.2 mV/Pa
-27.1 dB re 1V/Pa

Reference Freq.: 250 Hz
Output Bias: 9.8 VDC

Temperature: 73 °F 23 °C Relative Humidity: 60 %

Response Plot



Condition of Unit

As Found: n/a
As Left: New Unit, In Tolerance

Notes

1. Frequency response determined by IEC 61094-5: Methods for pressure calibration of working standard microphones by comparison.
2. Calibration of reference equipment is traceable to one or more of the following National Labs: NIST, PTB or DFM.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1 and ANSI/NCSL Z540.3.
4. Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.
5. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
6. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc
7. Calibrated per ACS-21.

Technician: Isaac Miller

Date: May 16, 2016



Headquarters: 3425 Walden Avenue, Depew, NY 14043

Calibration performed at: 10869 Highway 903, Halifax, NC 27839

Figure 5

~ Calibration Certificate ~

Model Number: 130A23

Serial Number: 45002

Description: ICP® Microphone

Manufacturer: PCB

Method ¹: Back-to-Back Reference

Calibration Data

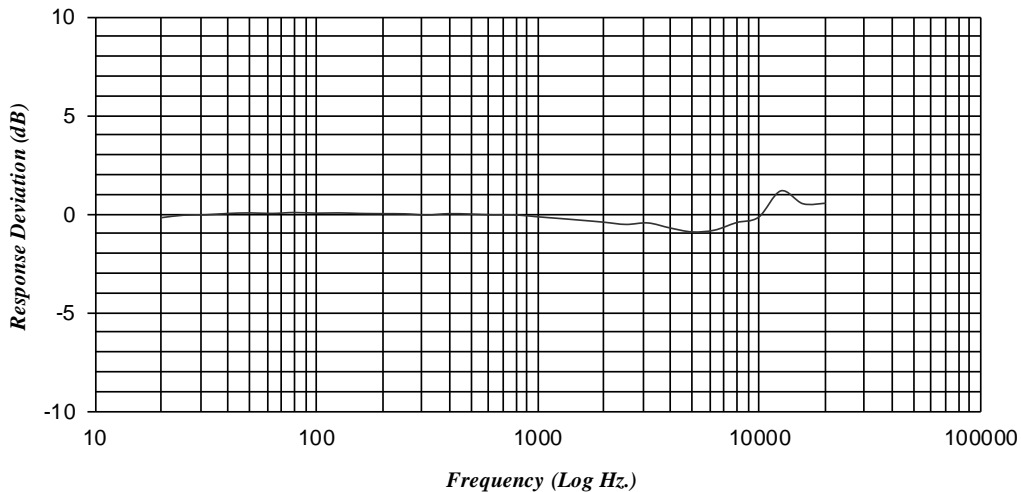
Sensitivity: 12.2 mV/Pa
-38.3 dB re 1V/Pa

Reference Freq.: 250 Hz.
Output Bias: 11.8 VDC

Temperature: 72 °F 22 °C

Relative Humidity: 44 %

Response Plot



Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. This method involves comparing the test unit with a reference microphone in a GRAS 51AB calibrator.
2. Calibration of reference equipment is traceable to one or more of the following National Labs; NIST, PTB or DFM.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1 and ANSI/NC SL Z540.3.
4. Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.
5. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
6. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc
7. Calibrated per ACS-21.

Technician: Scott Skibniewski

Date: June 10, 2016



Headquarters: 3425 Walden Avenue, Depew, NY 14043

Calibration performed at: 10869 Highway 903, Halifax, NC 27839

Figure 6

~ Calibration Certificate ~

Model Number: 130A24

Serial Number: 41270

Description: ICP® Microphone

Manufacturer: PCB

Method ¹: Back-to-Back Reference

Calibration Data

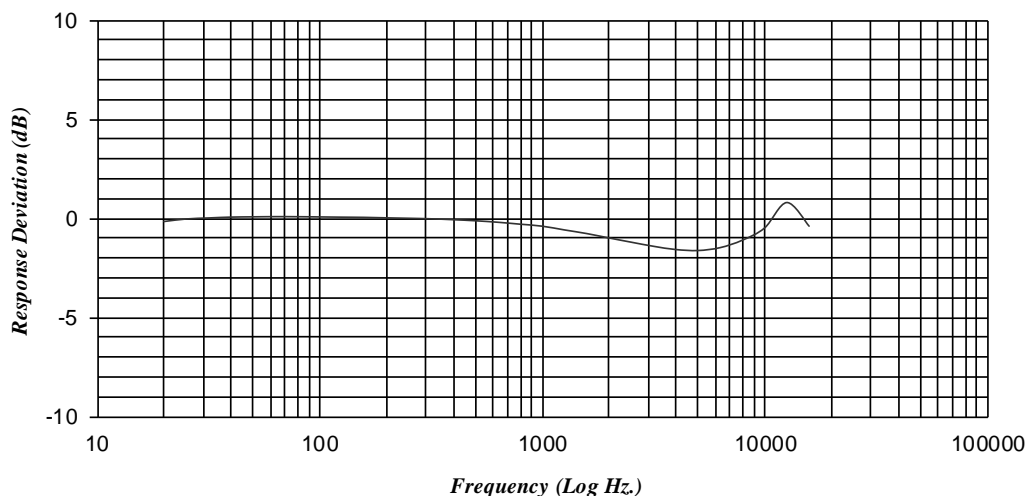
Sensitivity: 10.4 mV/Pa
-39.7 dB re 1V/Pa

Reference Freq.: 250 Hz
Output Bias: 11.8 VDC

Temperature: 71 °F 22 °C

Relative Humidity: 39 %

Response Plot



Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. This method involves comparing the test unit with a reference microphone in a GRAS 51AB calibrator.
2. Calibration of reference equipment is traceable to one or more of the following National Labs; NIST, PTB or DFM.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1 and ANSI/NC SL Z540.3.
4. Due to state-of-the-art limitations, 4:1 calibration ratios are not possible on pressure measurement standards, microphones and acoustic calibrators. Calibration ratios for these types of devices are limited to 1:1.
5. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
6. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc
7. Calibrated per ACS-21.

Technician: William M. Urbanek

Date: April 13, 2015



3425 Walden Avenue
Depew, New York 14043

Figure 7

All 130 series array microphones are designed for use in a free field environment. A free field environment is one without reflections. Anechoic rooms and outdoor spaces without structures are good examples of a free field environment. The free field response is the voltage response with respect to the pressure when exposed to a plane progressive sound wave. A free field microphone has a flat frequency response with respect to any source whose primary direction is collinear with the axis of the microphone.

Calibration of free field microphone occurs at a zero degree angle of incidence. This means that the frequency response reported on the calibration certificate is valid when the microphone is directed straight at the sound source. If the microphone is directed at an angle with respect to the source the response may vary depending on the angle and the frequency of operation.

After completing the system set-up, turn on the the signal conditioner and allow 1 to 2 minutes for the system to stabilize. If the system doesn't appear to be functioning correctly check all system connections and try to isolate and individually check functionality of all system components, or consider replacing system components one at a time. If the system still does not operate properly, consult a PCB Application Engineer.

Under normal conditions, microphones offer a very stable response. However, the microphone output may be affected by harsh environments, such as moisture, dirt, mechanical shock, or other unusual conditions. This may manifest itself in a number of ways, ranging from a loss in frequency range to failure of the built-in microelectronic circuits. To assure sensors characteristics are known PCB® recommends that a recalibration cycle be established for each microphone. Customers should determine a calibration cycle best suited for their needs as the cycle is based upon a variety of factors, such as frequency of use, exposure to harsh environments, accuracy requirements, trend information obtained from previous calibration records, contractual regulations, and risk associated with incorrect readings. PCB® recommends 12 to 24 month calibration intervals but as stated, this interval is at the discretion of the customer and is based on customer needs. It is also best practice to perform verification both before and after each test. PCB's CAL 250 acoustic calibrator (sold separately) is a handheld calibration instrument ideal for field or quick sensor operational evaluation purposes.

6.0 Service

See the supplemental sheet for information on our service, repair and return policies, procedures and instructions. If an unexpected problem arises, call our 24-Hour SensorLineSM (716-684-0001) to discuss your dynamic instrumentation needs with a PCB® Application Engineer.

7.0 Warranty

PCB's 130 Series Microphones are covered by a limited warranty against defective material and workmanship. Visit http://www.pcb.com/terms_conditions for a complete statement of our warranty.



3425 Walden Avenue, Depew, NY 14043-2495

E-Mail: info@pcb.com

Website: www.pcb.com

24-hour SensorLineSM: 716-684-0001

Fax: 716-684-0987

Toll-free: 800-828-8840

ISO 9001 CERTIFIED • AS9100 CERTIFIED

In the interest of constant product improvement, specifications are subject to change without notice.

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Manual Number: 64548

Manual Revision: NR

ECO# 45478

Printed in the U.S.A.



Model 300A32

ICP® Electret Array Microphone

Installation and Operating Manual

This manual contains the 130F20, 378A14, 378B02 installation and operating manuals that comprise a Model 300A32 ICP® Electret Array Microphone kit.

**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
<p>This table is prepared in accordance with the provisions of SJ/T 11364.</p> <p>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.</p> <p>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.</p> <p>Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.</p>						



Model 378A14
ICP Microphone System
Installation and Operating Manual

**This manual contains the 377A14, 426A05 installation and operating manuals that
comprise a Model 378A14 ICP Microphone System kit.**

**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**



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.**

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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.

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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

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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
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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

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Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

PRODUCT GUIDE **377 SERIES MICROPHONES** **426 SERIES PREAMPLIFIERS**



Contents:

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3.0	Setting up a Microphone Measurement System	1
4.0	Taking Measurements	3
5.0	Accessories and Miscellaneous	3
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1.0 Introduction

Thank you for your purchase of a PCB high quality microphone. These microphones offer highly accurate and reliable acoustic measurements and are typically used in research and design applications. They are accurate enough for laboratory usage, yet rugged enough for field-testing.

Sound within the typical 20 to 20,000 Hz audible range of a healthy human ear can either be pleasing to the ear, as in music, or unpleasant (or harmful), as in noise. As a result, many applications, from the development of consumer products to research in acoustics, measure sound, even sound outside the range of human hearing. The instrument typically used to measure sound is the microphone, which is designed, like the human ear, to transform pressure oscillations into a corresponding voltage oscillation.

2.0 Standards

Before selecting an acoustical instrument, it is important to identify which acoustical standards are appropriate for the application in which the instrument will be used. Whether for legal purposes or for quality assurance programs, these standards will help determine the required quality, accuracy and consistency of the instrument. Standards that correspond to the performance requirements, dimensions and characteristics of acoustical components are established for microphones, sound level meters, calibrators, or other related components. The most common organizations producing these standards are the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC). IEC 1094-4 establishes specifications for the mechanical dimensions and certain electroacoustic characteristics for standard industrial microphones. The performance specification sheet supplied with each PCB microphone identifies the standards to which the microphone is compliant.

3.0 Setting up a Microphone Measurement System

After the proper microphone has been selected, the corresponding preamplifier, cabling, power supplies, signal conditioning and data acquisition selections are ready to be installed. Not all of these components are required for all test set-ups. The figures below show typical set-ups for externally polarized and prepolarized microphone systems.

A prepolarized microphone can be used with a standard Microphone Power Supply designed for externally polarized microphones, and its preamplifier, provided the supply voltage is set to zero.

Phantom powered microphone systems use a 3 pin XLR connector. A phantom powered microphone system should use a 48V phantom power supply or signal conditioner for optimum performance; however these microphone systems may be powered with a 24V or a 12V phantom power supply, but this will limit the maximum output voltage.



Externally Polarized Microphone System

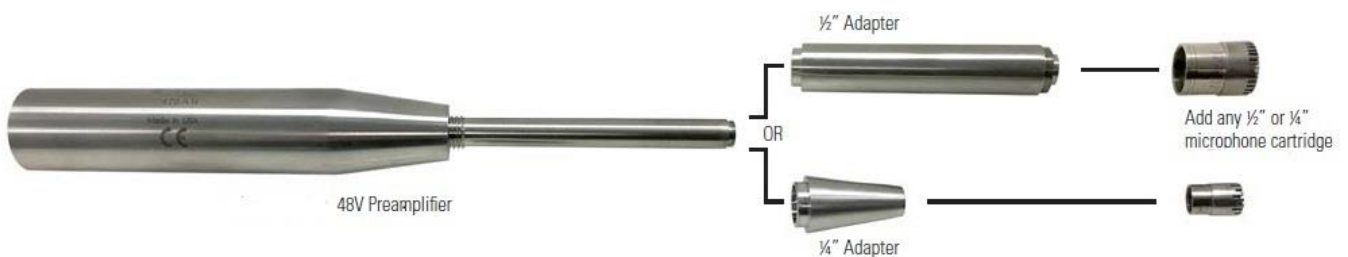


Prepolarized Microphone System



Phantom Powered Microphone System

The phantom powered preamp may be used with either a 1/4" or a 1/2" microphone cartridge by using the adapter provided. All IEC 61094-4 compliant microphones can be used with the phantom powered preamp.



Adapters for Phantom Powered Preamp

4.0 Taking Measurements

The following formula is used to calculate the pressure measured by the microphone from the output voltage signal. The sensitivity of a microphone is typically measured at 250 Hz.

$$\text{Pressure (Pa)} = \text{Voltage (mV)} / \text{Sensitivity (mV/Pa)}.$$

The lowest amplitude a healthy human ear can detect is 20 millionths of a Pascal (20μPa). Another scale more commonly used to describe sound pressure level is the decibel (dB). To convert the output voltage signal (measured in V_{rms}) to sound pressure level (measured in decibels), use the following formula:

$$SPL = \left(20 \text{ Log} \left(\frac{V_{rms}}{S P_{ref}} \right) \right) dB$$

where S is the sensitivity of the microphone in mV/Pa, and P_{ref} is the reference pressure in air, which is 20×10^{-6} Pa. The decibel scale is logarithmic and more closely matches the response reactions of the human ear to the pressure fluctuations. Some examples of typical sound pressure levels are shown in the table below.

dB	Pressure	Example
0	0.00002 Pa	Threshold of Hearing
60	0.02 Pa	Business Office
80	0.2 Pa	Shop Noise
94	1 Pa	Large Truck
100	2 Pa	Jackhammer
120	20 Pa	Airplane Take-Off
140	200 Pa	Threshold of Pain

At very high-pressure amplitudes, the microphone's diaphragm will start to distort the measured sound pressure. The maximum rated sound pressure level of a microphone is expressed as the amplitude at which the Total Harmonic Distortion (THD) reaches a specified amount, typically 3% THD. It is important to note that the highest sound pressure level that can be measured with a microphone system may be limited by other parts of the system, such as the preamplifier, signal conditioner, or instrumentation. Conversely, the Cartridge Thermal Noise (CTN) specification provides the lowest measurable sound pressure level that can be detected above the electrical noise inherent within the microphone.

Temperature and pressure will affect the sensitivity of a microphone but these effects can be accounted for by adjusting the recorded microphone values using the coefficients specified for each microphone model. Simply calculate the difference in temperature and ambient pressure from those recorded during calibration and multiply this value by the proper coefficient to determine the sensitivity offset. In most cases, the offset will be very small and is therefore unnecessary.

5.0 Accessories & Miscellaneous

Transducer Electronics Data Sheet (TEDS)

Preamplifiers can incorporate TEDS devices, which have a built in read/write memory that contains relevant information about the sensor and its use. Information includes manufacturer name, model number, serial number, sensitivity, etc. The operation of TEDS devices is defined by IEEE P1451.4. A TEDS microphone system includes a microphone mated with a preamplifier that contains the TEDS memory programmed with both the microphone and preamplifier information. This is particularly helpful when using large channel count systems and array set-up.

A-Weight Inline Filter

The inline filter is used in conjunction with an ICP® preamplifier to provide A-weighting for acoustical measurements. The filter's frequency response is weighted according to the A-weighting filter portion of both ANSI S1.4 and IEC 60651 Type 1 Sound Level Meter Standards. ICP® signal conditioners of 4 mA or greater are recommended when using inline filters.

Windscreens and Nose cones

Wind induced noise can be reduced by using a windscreen. This can offer some protection against dust particles and mechanical damage. In the presence of high-speed airflow from a well-defined direction, such as wind tunnels, a nose cone is recommended. When using windscreens and noise cones, the frequency response of the microphone will be attenuated at higher frequencies.

Clamps and stands

When holding a microphone in place, it is important to minimize the influence of the stand on the sound being measured. This can be accomplished by using low profile stands and clamps available from PCB.

Cables and Electronics

PCB carries LEMO® cables as well as coaxial cables with BNC and 10-32 connectors. Traditional externally polarized microphone power supplies along with a variety of ICP® signal conditioners are available that will fit almost any need.

6.0 Maintenance

Microphones are very stable over long periods of time, provided they are handled and stored properly. The microphone contains fragile components that can be damaged by misuse, in particular the diaphragm, which is made up of a very thin proprietary material and should be kept clean of dust, dirt, moisture and free any type of imperfection (scratch, dent, etc.).

The microphone's grid cap is designed to let the true sound pressure level through to the diaphragm while preventing items from coming in contact with it. We do not recommend that you ever remove the grid cap or clean the microphone. If you take the precautionary measures to keep the microphone clean and dry, it should not be necessary. Should you need to remove the grid cap to replace it with PCB's enhanced rugged grid cap (shown below, and as an independent part of a rugged kit) to extend the lifespan of the precision measuring device, caution should be taken to ensure the delicate diaphragm sensing element remains untouched and safe.



Use of accessories, like windscreens, and desiccants will help keep moisture off the microphone and maintain the specified sensitivity level. Nose cones will help keep turbulence off the microphone diaphragm and allow the sound pressure to be measured with greater accuracy.

Keep the microphone and preamplifier assembled while preparing for testing. Keep the rubber maintenance caps on the preamplifier's electrical connector only. Do not place these rubber caps over the microphone. This will create a vacuum and undo pressure on the microphone diaphragm, which can stretch the diaphragm and cause a change in sensitivity. Store the microphones and preamplifiers in their protective cases when not in use.

Dust, rain, oil, moisture or exposure to extreme temperatures may adversely affect the microphone and preamplifier's performance. If the microphone or the inside of the connection area of the preamplifier becomes contaminated, use a light pressure rubber bulb to gently blow clean, dry air onto the unit in order to remove the dust. In the event that you absolutely must take off the grid cap and clean the microphone diaphragm, we recommend using a blow bulb or a light pressure, clean and dry air hose to gently blow contamination off the diaphragm. The direction of the air should be parallel with the diaphragm, not directly (0 degree incidence) pointed at the diaphragm. Do not touch the microphone's diaphragm with your fingers or let it come in contact with any sharp or pointed object. Please note that any contact to the microphone's diaphragm can negatively impact the sensitivity and long term stability of the microphone.

If the microphone is ever dropped (the effects of this can be minimized by PCB's rugged grid cap or utilizing rugged microphone kits), or comes into contact with any contamination, or is exposed to extreme temperatures, immediate recalibration of the microphone should be performed. When using a rugged grid cap, a handheld calibrator with a 1" diameter (example CAL250, or pistonphone) is required for recalibration, along with the larger (079A59) calibration adapter. Please note that heat from your hands can affect the calibration results. It is always good practice to wait a minimum of 30 seconds after placing the microphone on a test system before taking a calibration reading in order to minimize the effect that heat from your hands has on the calibration. Changes in the environmental conditions: temperature, humidity or atmospheric pressure, may cause a change in your microphones sensitivity and thus, changes in your output accuracy. It is always recommended to calibrate both before and after your test, within the test environment. Performing a single point handheld calibrator check, both before and after your test, ensures reliability of the test data. With proper maintenance, the microphone and preamplifier should provide stable and accurate results for years to come.

7.0 Calibration

PCB offers recalibration services for our precision microphones, as well as units produced by other A2LA manufacturers. Our internal metrology laboratory is certified to ISO 9001, accredited by A2LA to ANSI/IEC 17025 and ANSI/NCSL Z540-1, complies with ISO 10012-1 (and former MIL-STD-45662A), and uses equipment directly traceable to one or more of the following National Labs (NIST, PTB or DFM). Our investment in equipment, traceability and conformance to industry standards ensures accurate calibration against relevant specifications. We also carry a line of acoustic calibrators that can be used to calibrate microphone sensitivity on site as needed.

Hand calibration of sensitivity for most prepolarized microphones may be performed with a Larson Davis CAL250 or CAL200 (or equivalent). The CAL250 produces 114 dB SPL at 251.2 Hz. The CAL 200 produces either 94 dB or 114 dB (user selectable) at 1000 Hz. Note that both the CAL250 and CAL 200 are compliant with ANSI S1.40-2006, Specifications and Verification Procedures for Sound Calibrators, Class1 and IEC 60942-2003, Class 1, Sound Calibrators.

8.0 Warranty and Service

All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a warranty against defective material and workmanship under a **Total Customer Satisfaction** policy. 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. See the supplemental sheet, contained with this manual, for information on our service, repair and return policies, procedures and instructions. When unexpected problems arise, call our 24-Hour SensorLineSM (716-684-0001) to speak with an Application Engineer. Visit www.pcb.com for a complete statement of our warranty.

3425 Walden Avenue, Depew, NY 14043-2495

E-Mail: info@pcb.com

Website: www.pcb.com

24-hour SensorLineSM: 716-684-0001

U.S.A. Fax: 716-684-0987

Toll-free (in the U.S.A.): 800-828-8840

A PCB GROUP COMPANY

ISO 9001 CERTIFIED

A2LA ACCREDITED to ISO 17025

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Manual Number: 27042

Manual Revision: F

ECO 51020



Printed in the U.S.A.



Model 130F20

ICP® Electret Array Microphone

Installation and Operating Manual

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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

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**CAUTION**

Refers to hazards that could damage the instrument.

**NOTE**

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



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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 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.

[illegible]



Model 378B02

1/2" prepolarized free-field condenser microphone, 50 mV/Pa (+/-1.5 dB), 3.15 Hz - 20 kHz (+/-2 dB) with 1/2" ICP® preamplifier (426E01) and TEDS

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

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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:



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**NOTE**

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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
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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

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	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
<p>This table is prepared in accordance with the provisions of SJ/T 11364.</p> <p>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.</p> <p>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.</p> <p>Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.</p>						

Model Number 378B02		ICP MICROPHONE SYSTEM			Revision: F ECN #: 47338			
Performance		ENGLISH	SI	OPTIONAL VERSIONS				
Nominal Microphone Diameter		1/2"	1/2"	Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.				
Frequency Response Characteristic(at 0° incidence)		Free-Field	Free-Field					
Sensitivity		50 mV/Pa	50 mV/Pa				[3]	
Sensitivity(± 1.5 dB)		-26 dB re 1 V/Pa	-26 dB re 1 V/Pa				[3]	
Frequency Range(± 2 dB)		3.75 to 20,000 Hz	3.75 to 20,000 Hz					
Frequency Range(± 1 dB)		7 to 10,000 Hz	7 to 10,000 Hz					
Lower Limiting Frequency(-3 dB)		1.0 to 3.0 Hz	1.0 to 3.0 Hz					
Inherent Noise		15.5 dB(A) re 20 µPa	15.5 dB(A) re 20 µPa				[2]	
Dynamic Range(3% Distortion Limit)		137 dB re 20 µPa	137 dB re 20 µPa				[2]	
TEDS Compliant		Yes	Yes				[4]	
Environmental				NOTES: [1] Prepolarized [2] Typical. [3] re 250 Hz [4] TEDS Capable Digital Communication, compliant with IEEE 1451.4 [5] Venting through Preamp. [6] See PCB Declaration of Conformance PS064 for details.				
Temperature Range(Operating)		-40 to +176 °F	-40 to +80 °C					
Temperature Coefficient of Sensitivity(+14 to +158°F (-10 to +70°C))		0.005 dB/°F	0.009 dB/°C				[2][3]	
Static Pressure Coefficient		-0.013 dB/kPa	-0.013 dB/kPa				[2][3]	
Humidity Coefficient of Sensitivity(0 to 100%, non-condensing)		± 0.001 dB/%RH	± 0.001 dB/%RH				[3]	
Influence of Axial Vibration(0.1g (1 m/s²))		63 dB re 20 µPa	63 dB re 20 µPa				[2]	
Electrical								
Polarization Voltage		0 V	0 V				[1]	
Excitation Voltage		20 to 30 VDC	20 to 30 VDC					
Constant Current Excitation		2 to 20 mA	2 to 20 mA					
Output Bias Voltage		10 to 14 VDC	10 to 14 VDC					
Maximum Output Voltage		± 7 Vpk	± 7 Vpk					
Output Impedance		<50 Ohm	<50 Ohm					
Physical				SUPPLIED ACCESSORIES: Model ACS-63 Calibration (with TEDS) of Precision Condenser Microphones and Preamplifiers together (mated pair). (1)				
Housing Material		Stainless Alloy	Stainless Alloy					
Venting		Rear	Rear				[5]	
Electrical Connector		BNC Jack	BNC Jack					
Mounting Thread(Grid)		0.5 - 60 UNS	0.5 - 60 UNS					
Size (Diameter x Height)(with grid)		0.52 in x 3.62 in	13.2 mm x 91.9 mm					
Size (Diameter x Height)(without grid)		0.50 in x 3.58 in	12.7 mm x 90.9 mm					
Weight		1.63 oz	45.8 gm				[2]	
CE		[6]						
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.								
Entered: LK			Engineer: MT		Sales: MV	Approved: MT	Spec Number:	
Date: 10/17/2017			Date: 10/17/2017		Date: 10/17/2017	Date: 10/17/2017	57824	
PCB PIEZOTRONICS 3425 Walden Avenue, Depew, NY 14043						Phone: 716-684-0001 Fax: 716-684-0987 E-Mail: info@pcb.com		



Model 378A14
ICP Microphone System
Installation and Operating Manual

**This manual contains the 377A14, 426A05 installation and operating manuals that
comprise a Model 378A14 ICP Microphone System kit.**

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

**Toll-free: 800-828-8840
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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 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。						
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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

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Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

Model Number 378A14		ICP MICROPHONE SYSTEM			Revision: F ECN #: 49377																					
Performance		ENGLISH	SI	OPTIONAL VERSIONS																						
Nominal Microphone Diameter		1/4"	1/4"	Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.																						
Frequency Response Characteristic		Pressure	Pressure																							
Sensitivity		1.0 mV/Pa	1.0 mV/Pa																							
Sensitivity(± 3 dB)		-60 dB re 1 V/Pa	-60 dB re 1 V/Pa																							
Frequency Range(± 2 dB)		4.0 to 70,000 Hz	4.0 to 70,000 Hz																							
Lower Limiting Frequency(-3 dB)		0.75 to 4.0 Hz	0.75 to 4.0 Hz	NOTES: [1] Prepolarized [2] Typical. [3] re 250 Hz [4] A-Weighted inherent noise is specified from 20 Hz - 20 kHz. [5] TEDS Capable Digital Communication, compliant with IEEE 1451.4 [6] See PCB Declaration of Conformance PS076 for details.																						
Inherent Noise		50 dB(A) re 20 µPa	50 dB(A) re 20 µPa																							
Dynamic Range(3% Distortion Limit)		173 dB re 20 µPa	173 dB re 20 µPa																							
TEDS Compliant		Yes	Yes																							
Environmental																										
Temperature Range(Operating)		-40 to +158 °F	-40 to +70 °C	SUPPLIED ACCESSORIES: Model ACS-63 Calibration (with TEDS) of Precision Condenser Microphones and Preamplifiers together (mated pair). (1)																						
Temperature Coefficient of Sensitivity(+14 to +158°F (-10 to +70°C))		0.004 dB/°F	0.007 dB/°C																							
Static Pressure Coefficient		-0.003 dB/kPa	-0.003 dB/kPa																							
Humidity Coefficient of Sensitivity(0 to 100%, non-condensing)		± 0.0014 dB/%RH	± 0.0014 dB/%RH																							
Influence of Axial Vibration(0.1g (1 m/s²))		66 dB re 20 µPa	66 dB re 20 µPa																							
Electrical				<table><tr><td>Entered: LK</td><td>Engineer: MJN</td><td>Sales: MV</td><td>Approved: NJF</td><td>Spec Number:</td></tr><tr><td>Date: 4/9/2019</td><td>Date: 4/9/2019</td><td>Date: 4/9/2019</td><td>Date: 4/9/2019</td><td>57858</td></tr></table>			Entered: LK	Engineer: MJN	Sales: MV	Approved: NJF	Spec Number:	Date: 4/9/2019	Date: 4/9/2019	Date: 4/9/2019	Date: 4/9/2019	57858										
Entered: LK	Engineer: MJN	Sales: MV	Approved: NJF				Spec Number:																			
Date: 4/9/2019	Date: 4/9/2019	Date: 4/9/2019	Date: 4/9/2019				57858																			
Polarization Voltage		0 V	0 V																							
Excitation Voltage		20 to 32 VDC	20 to 32 VDC																							
Constant Current Excitation		2 to 20 mA	2 to 20 mA																							
Output Bias Voltage		10 to 14 VDC	10 to 14 VDC	<table><tr><td colspan="2">Entered: LK</td><td colspan="2">Engineer: MJN</td><td colspan="2">Sales: MV</td><td colspan="2">Approved: NJF</td><td colspan="2">Spec Number:</td></tr><tr><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">57858</td></tr></table>			Entered: LK		Engineer: MJN		Sales: MV		Approved: NJF		Spec Number:		Date: 4/9/2019		Date: 4/9/2019		Date: 4/9/2019		Date: 4/9/2019		57858	
Entered: LK		Engineer: MJN					Sales: MV		Approved: NJF		Spec Number:															
Date: 4/9/2019		Date: 4/9/2019					Date: 4/9/2019		Date: 4/9/2019		57858															
Maximum Output Voltage		± 8 Vpk	± 8 Vpk																							
Output Impedance		<50 Ohm	<50 Ohm																							
Physical																										
Housing Material		Stainless Alloy	Stainless Alloy	<table><tr><td colspan="2">Entered: LK</td><td colspan="2">Engineer: MJN</td><td colspan="2">Sales: MV</td><td colspan="2">Approved: NJF</td><td colspan="2">Spec Number:</td></tr><tr><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">57858</td></tr></table>			Entered: LK		Engineer: MJN		Sales: MV		Approved: NJF		Spec Number:		Date: 4/9/2019		Date: 4/9/2019		Date: 4/9/2019		Date: 4/9/2019		57858	
Entered: LK		Engineer: MJN					Sales: MV		Approved: NJF		Spec Number:															
Date: 4/9/2019		Date: 4/9/2019					Date: 4/9/2019		Date: 4/9/2019		57858															
Venting		Side	Side																							
Electrical Connector		10-32 Jack	10-32 Jack																							
Mounting Thread(Preamplifier)		0.25 - 60 UNS	0.25 - 60 UNS																							
Size (Diameter x Height)(with grid)		0.28 in x 2.07 in	7.1 mm x 52.6 mm	<table><tr><td colspan="2">Entered: LK</td><td colspan="2">Engineer: MJN</td><td colspan="2">Sales: MV</td><td colspan="2">Approved: NJF</td><td colspan="2">Spec Number:</td></tr><tr><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">Date: 4/9/2019</td><td colspan="2">57858</td></tr></table>			Entered: LK		Engineer: MJN		Sales: MV		Approved: NJF		Spec Number:		Date: 4/9/2019		Date: 4/9/2019		Date: 4/9/2019		Date: 4/9/2019		57858	
Entered: LK		Engineer: MJN					Sales: MV		Approved: NJF		Spec Number:															
Date: 4/9/2019		Date: 4/9/2019					Date: 4/9/2019		Date: 4/9/2019		57858															
Size (Diameter x Height)(without grid)		0.25 x 2.02 in	6.35 mm x 51.3 mm																							
Weight		0.27 oz	7.8 gm																							
																										
<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.</p> <p>ICP® is a registered trademark of PCB Group, Inc.</p>				<div><p>3425 Walden Avenue, Depew, NY 14043</p></div> <div><p>Phone: 716-684-0001 Fax: 716-684-0987 E-Mail: info@pcb.com</p></div>																						



Model 378B02

1/2" prepolarized free-field condenser microphone, 50 mV/Pa (+/-1.5 dB), 3.15 Hz - 20 kHz (+/-2 dB) with 1/2" ICP® preamplifier (426E01) and TEDS

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:



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电缆	X	O	O	O	O	O
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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

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Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

2

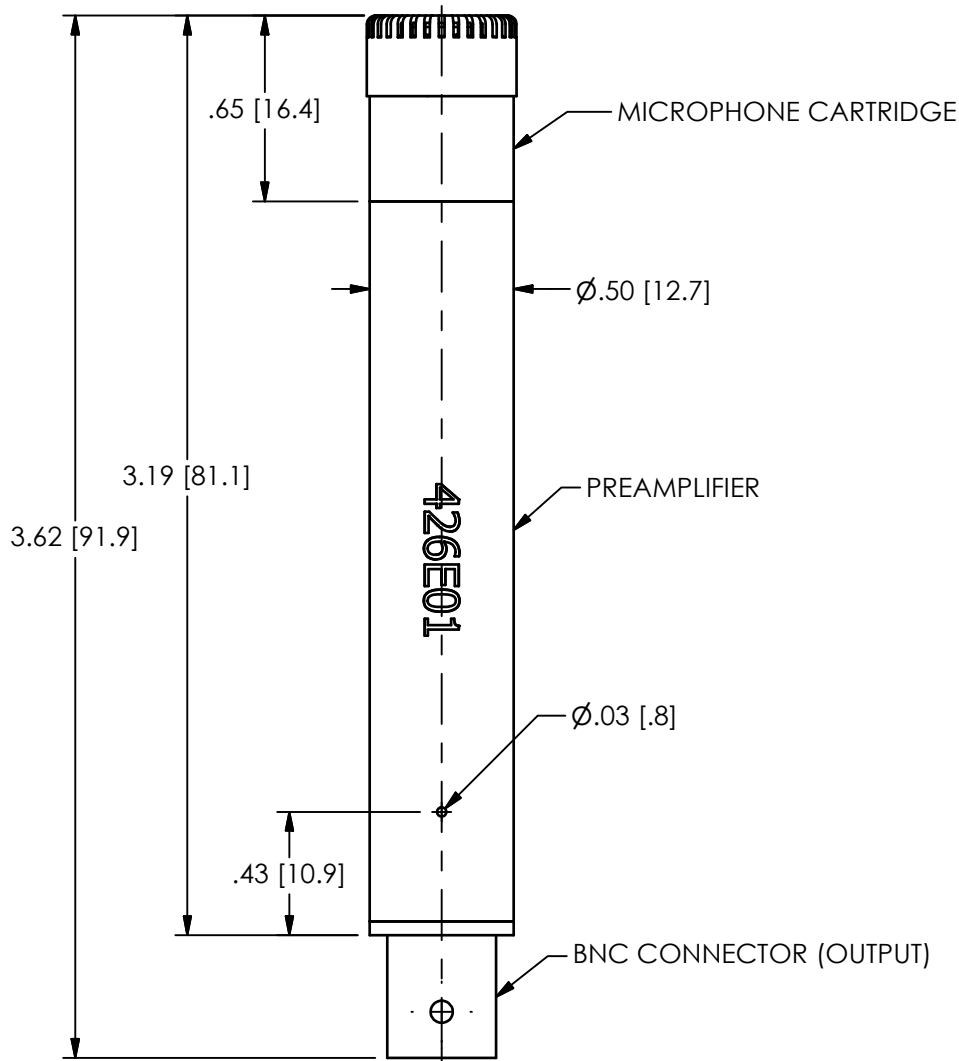
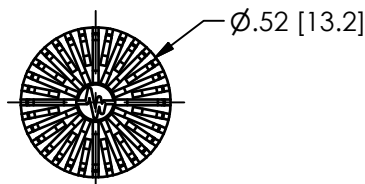
1

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REVISIONS

REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	42362

57746



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

DIMENSIONS IN INCHES

DECIMALS XX ±.03
XXX ±.010

ANGLES ± 2 DEGREES

FILLETS AND RADII
.003 - .005

DIMENSIONS IN MILLIMETERS
[IN BRACKETS]

DECIMALS X ± 0.8
XX ± 0.25

ANGLES ± 2 DEGREES

FILLETS AND RADII
0.07 - 0.13

DRAWN

JDM 12/20/13

CHECKED

JDM 12/20/13

ENGINEER

MT 12/20/13

TITLE

OUTLINE DRAWING
1/2" ICP MICROPHONE SYSTEM

PCB PIEZOTRONICS

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

CODE
IDENT. NO.
52681

DWG. NO.

57746

SCALE: 1.5X

SHEET 1 OF 1

2

1

ebreeze 15:38 4/29/2015

Repair and Maintenance

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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
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焊接	X	O	O	O	O	O
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CHINA RoHS COMPLIANCE

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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

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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.

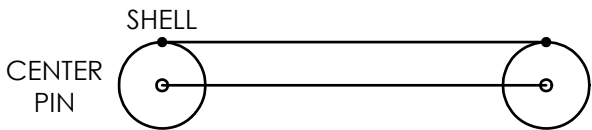
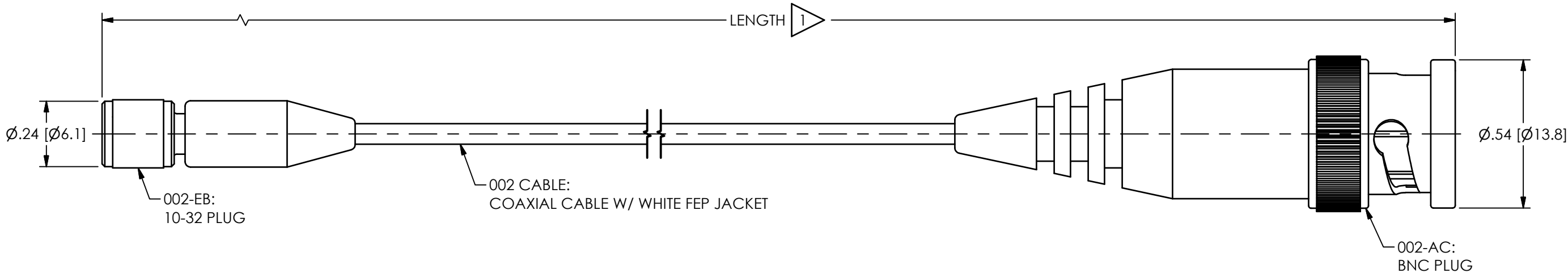
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72524


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REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	50133



SCHEMATIC DIAGRAM

CABLE LENGTH TOLERANCE	
LENGTH	TOLERANCE
1'-11"	+1"/-0"
1'-4'	+4"/-0"
5'-99'	+6"/-0"
99'+	+1'/-0"

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	JES	1/3/20	JES	1/3/20	BAM	1/3/20	
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ± 0.8 XX ± 0.25	TITLE OUTLINE DRAWING 002CXX SERIES & 002EBXXXAC SERIES COAXIAL CABLE W/ 10-32 & BNC PLUGS						
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES							
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13							CODE IDENT. NO. 52681
								DWG. NO. 72524
								SCALE: 2.5X
								SHEET 1 OF 1

1 LENGTH WILL VARY IN FEET OR METERS DEPENDING ON THE MODEL

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.

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Returning Equipment

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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.

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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.

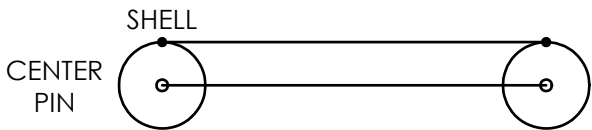
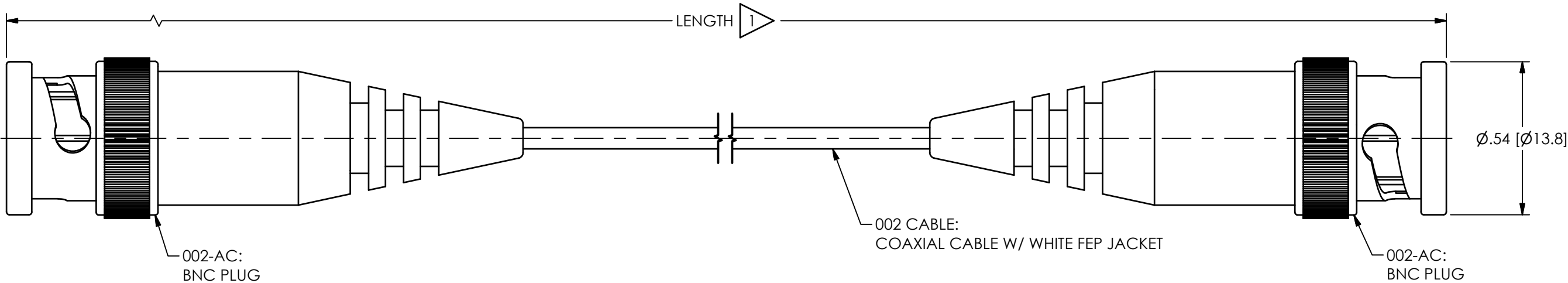
X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.

Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

72528

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REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	50133



SCHEMATIC DIAGRAM

1 LENGTH WILL VARY IN FEET OR METERS DEPENDING ON THE MODEL

CABLE LENGTH TOLERANCE	
LENGTH	TOLERANCE
1'-11"	+1"/-0"
1'-4'	+4"/-0"
5'-99'	+6"/-0"
99'+	+1'/-0"

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		<div> PCB PIEZOTRONICS™</div> <div>3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com</div>	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	JES	1/3/20	JES	1/3/20	BAM	1/3/20		
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ± 0.8 XX ± 0.25	TITLE OUTLINE DRAWING 002TXX SERIES & 002ACXXXAC SERIES COAXIAL CABLE W/ BNC PLUGS						CODE IDENT. NO. 52681	DWG. NO. 72528
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES								
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13								
								SCALE: 2.5X	SHEET 1 OF 1



Model 378A14
ICP Microphone System
Installation and Operating Manual

**This manual contains the 377A14, 426A05 installation and operating manuals that
comprise a Model 378A14 ICP Microphone System kit.**

**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**



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.**

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Safety Considerations

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Definition of Terms and Symbols

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**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.

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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
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压电晶体	X	O	O	O	O	O
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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。						
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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
<p>This table is prepared in accordance with the provisions of SJ/T 11364.</p> <p>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.</p> <p>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.</p> <p>Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.</p>						

2

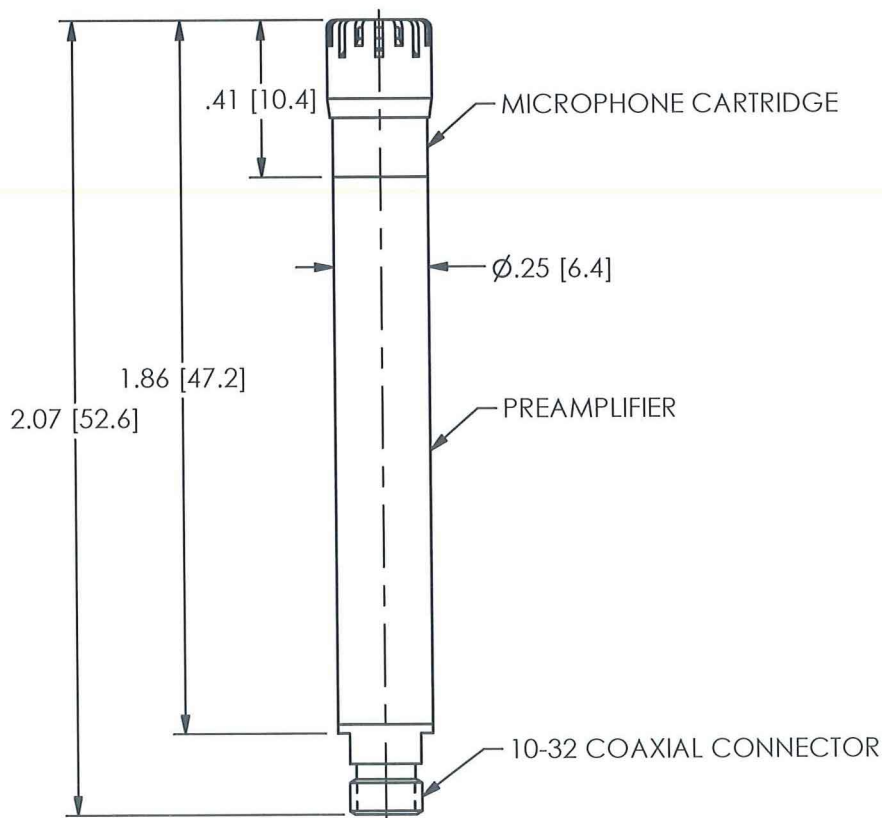
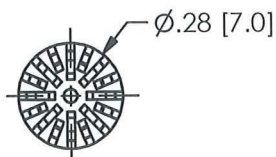
1

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REVISIONS

REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	42375

57748



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

DIMENSIONS IN INCHES

DECIMALS XX ± 0.03
XXX ± 0.010

ANGLES ± 2 DEGREES

FILLETS AND RADII
.003 - .005

DIMENSIONS IN MILLIMETERS
[IN BRACKETS]

DECIMALS X ± 0.8
XX ± 0.25

ANGLES ± 2 DEGREES

FILLETS AND RADII
0.07 - 0.13

DRAWN

JDM 1/3/14

CHECKED

Jm 1/6/14

ENGINEER

MT 1/3/14

TITLE

OUTLINE DRAWING
1/4" ICP MICROPHONE SYSTEM
SIDE VENT



PCB PIEZOTRONICS™

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

CODE
IDENT. NO.
52681

DWG. NO.

57748

SCALE:

2X

SHEET

1 OF 1

2

1

jmorawski 09:54 1/3/2014



Model 130F20

ICP® Electret Array Microphone

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



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电气连接器	O	O	O	O	O	O
压电晶体	X	O	O	O	O	O
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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
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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

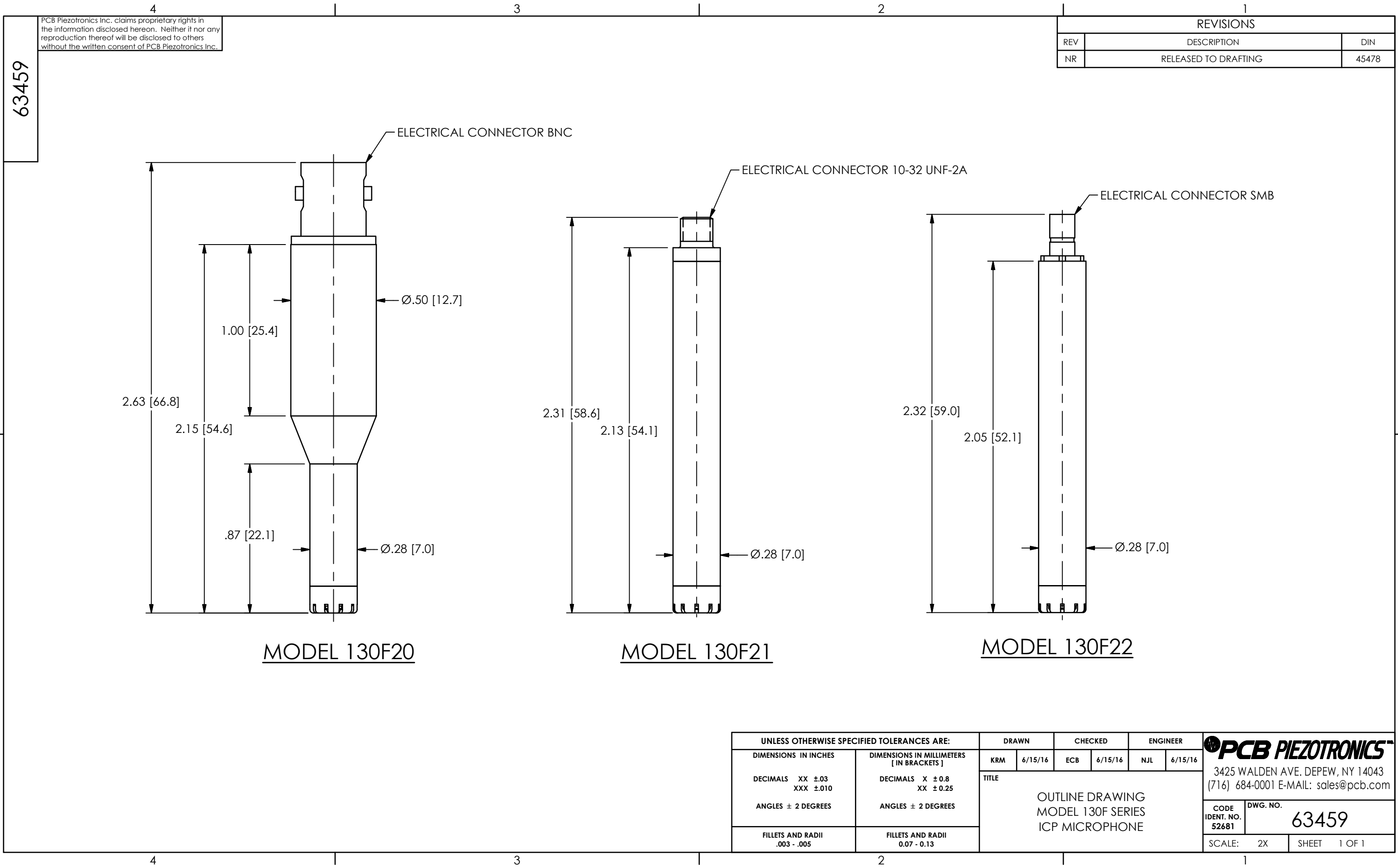
Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	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.

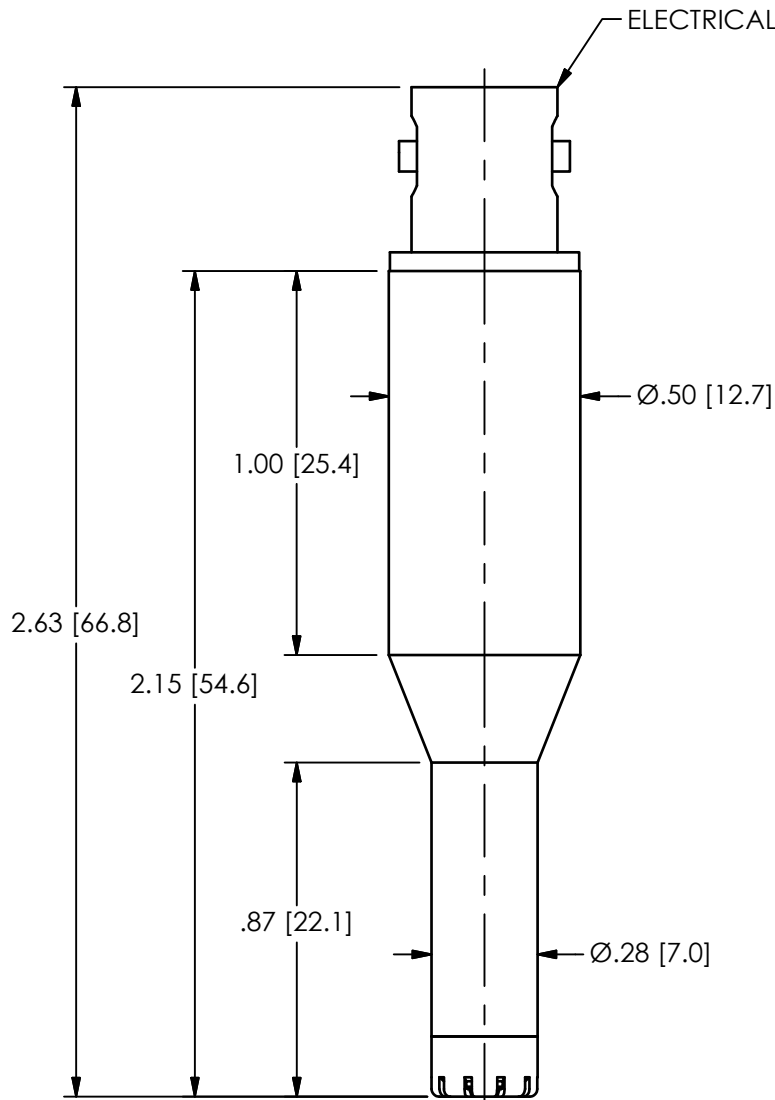
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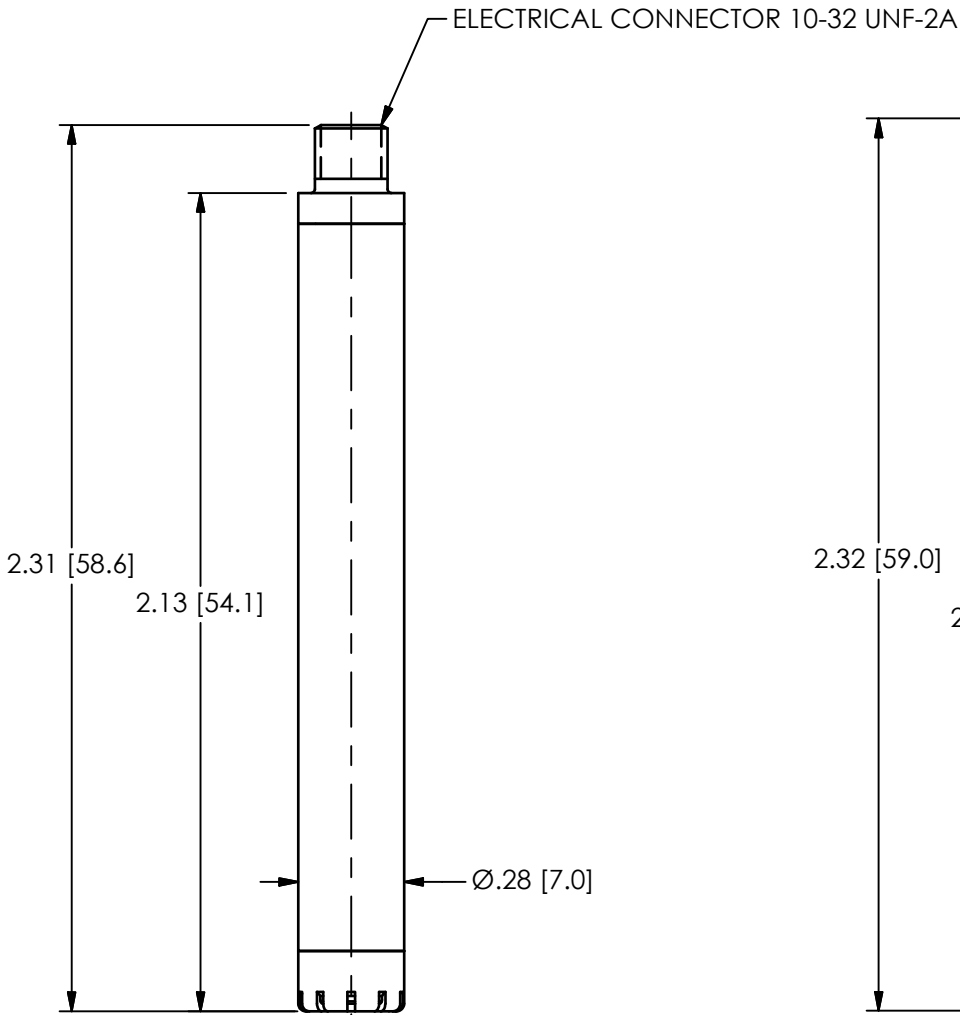


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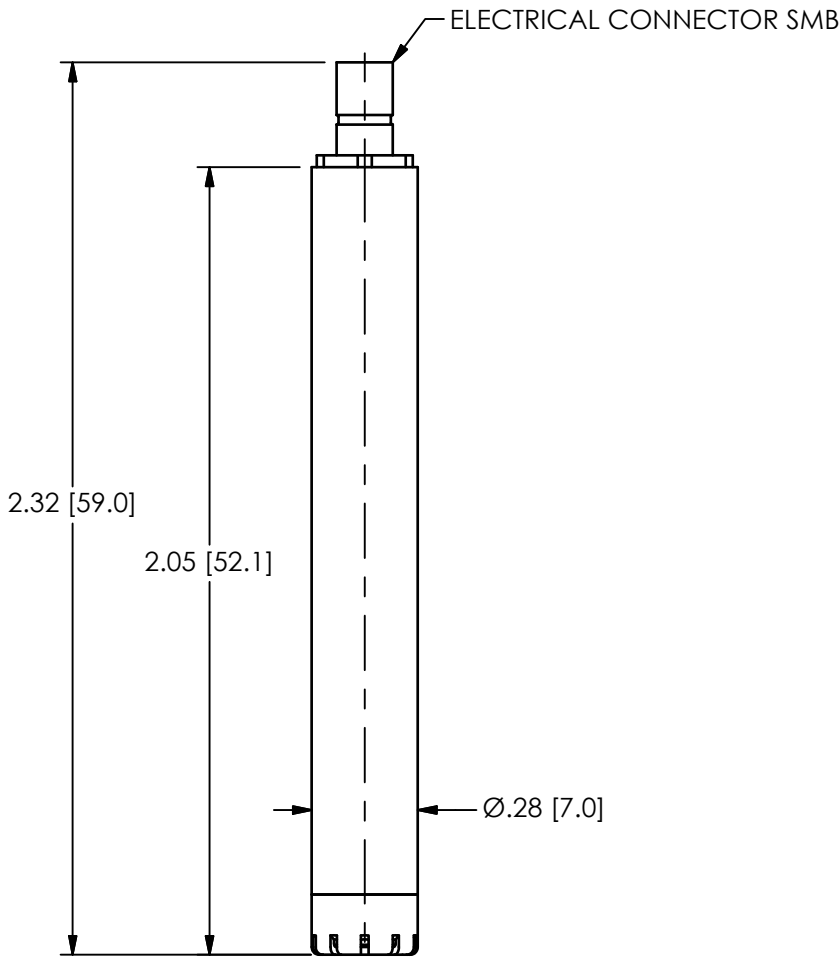
REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	45478




MODEL 130F20



MODEL 130F21



MODEL 130F22

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	KRM	6/15/16	ECB	6/15/16	NJL	6/15/16	
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ± 0.8 XX ± 0.25	TITLE OUTLINE DRAWING MODEL 130F SERIES ICP MICROPHONE						
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES							
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13							CODE IDENT. NO. 52681
								DWG. NO. 63459
								SCALE: 2X
								SHEET 1 OF 1