



**Model TO670A02**

**Echo® Wireless Vibration Sensor, 868 MHz, with temperature out**

**Installation and Operating Manual**

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

**Toll-free: 800-959-4464**

**24-hour SensorLine: 716-684-0001**

**Fax: 716-684-3823**

**E-mail: [imi@pcb.com](mailto:imi@pcb.com)**

**Web: [www.imi-sensors.com](http://www.imi-sensors.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](mailto:info@pcb.com)  
Repair inquiries: [rma@pcb.com](mailto:rma@pcb.com)

For a complete list of distributors, global offices and sales representatives, visit our website, [www.pcb.com](http://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   | 0      | 0      | 0      | 0            | 0          | 0            |
| PCB板   | X      | 0      | 0      | 0            | 0          | 0            |
| 电气连接器  | 0      | 0      | 0      | 0            | 0          | 0            |
| 压电晶体   | X      | 0      | 0      | 0            | 0          | 0            |
| 环氧   | 0      | 0      | 0      | 0            | 0          | 0            |
| 铁氟龙  | 0      | 0      | 0      | 0            | 0          | 0            |
| 电子   | 0      | 0      | 0      | 0            | 0          | 0            |
| 厚膜基板   | 0      | 0      | X      | 0            | 0          | 0            |
| 电线   | 0      | 0      | 0      | 0            | 0          | 0            |
| 电缆   | X      | 0      | 0      | 0            | 0          | 0            |
| 塑料   | 0      | 0      | 0      | 0            | 0          | 0            |
| 焊接   | X      | 0      | 0      | 0            | 0          | 0            |
| 铜合金/黄铜   | X      | 0      | 0      | 0            | 0          | 0            |
| 本表格依据 SJ/T 11364 的规定编制。                          |        |        |        |              |            |              |
| 0：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.

# Echo<sup>®</sup> Wireless Vibration Sensor User's Manual



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## **FCC NOTICE**

FCC ID: ZOC-IMI670A01

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## **INDUSTRY CANADA (IC) NOTICE**

IC: 9732A-IMI670A01

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

## ***ANATEL NOTICE (Applies to Model 670A01 only)***

ANATEL: 05484-17-08750

Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.



## ***HAZARDOUS AREA USE***

Warning- Explosion Hazard- Do Not Disconnect or connect while circuit is live unless area is known to be non-hazardous. Batteries must not be changed unless area is known to be Non-Hazardous. Do not open when an explosive atmosphere may be present. Substitution of components may impair suitability for Class I, Div 2.

Avertissement- Risque D'explosion – Ne pas debrancher ou brancher tant que le circuit est sous tension. A moins qu'il ne s'agisse d'un emplacement non dangereux. Les piles ne doivent pas être remplacées à moins qu'il ne s'agisse d'un emplacement non dangereux. N'ouvrez pas lorsqu'une atmosphère explosive peut être présente. Remplacement de composants peut nuire à la conformité de Classe I Div 2.

## Introduction

The Echo<sup>®</sup> Wireless Vibration Sensor, Model CS670A01, is a standalone, battery powered, wireless, industrial vibration sensor. Its primary function is to monitor the vibration of machinery in condition monitoring and predictive maintenance applications. The sensor's measurements are optimized to be sensitive to most common machinery faults such as unbalance, misalignment, looseness, bearing faults and gear faults.

Echo<sup>®</sup> contains a one-way wireless transmitter that is designed to “wake up” at preprogrammed intervals, make a series of overall vibration measurements, transmit them to a receiver for processing, and go back to sleep to conserve battery power. The sensor is activated or deactivated using a magnet to operate a magnetic switch in the unit. When activated, the sensor immediately makes and transmits a measurement set and then goes to sleep until its next transmission time. The default transmission interval is 8-hours (3 times per day). An LED in the unit provides visual feedback on the state of the sensor: off, on but in sleep mode, measuring, transmitting and changing states.

The transmitted data is received by an Echo<sup>®</sup> Receiver, decoded, and sent via Ethernet to a computer or server running the Echo<sup>®</sup> Monitoring Software. For additional information on the Echo<sup>®</sup> Receiver and the Echo<sup>®</sup> Monitoring Software, please refer to their respective manuals.

## ***Proper Handling***

Proper handling of the Echo<sup>®</sup> Wireless Vibration Sensor is critical to preventing damage. The following should be avoided:

- Dropping the unit.
- Submersing the units in fluids of any kind.
- Mounting the sensor by twisting the housing.
- Exposing the unit to temperatures above 158° F.
- Exposing the cap to any reactive chemicals.

**Caution** - The sensor cap is easily cross-threaded. To avoid cross threading, press down lightly on the cap to compress the battery securing foam. Turn the cap counter-clockwise until a click is heard to line up the threads. Turn the cap slowly and carefully clockwise until the cap contacts the housing. If the cap does not thread easily, do not force it.

## Cap Material and Chemical Compatibility

The sensor cap is made from a translucent polycarbonate material. This material was chosen because it is tough, allows the transmitted RF signal to radiate out of the sensor, permits visual feedback provided by the imbedded blue status LED, and reduces the passage of ultraviolet (UV) rays. However, like any “plastic” material, it is compatible with some chemicals but not others.

Included here is a general chemical compatibility chart for polycarbonate material taken from information on the Internet. This data is not guaranteed but is offered as a general guide to chemical compatibility. It is highly recommended that you look up the compatibility of you specific chemical with polycarbonate material. If polycarbonate is not compatible with the processes in your plant, contact IMI for potential options.

| Will Damage Polycarbonate                   | Require Caution              | Considered Safe                 |
|---|------------------------------|---------------------------------|
| Alkali bleaches such as sodium hypochlorite | Cyclohexanone                | Acetic acid                     |
| Acetone                                     | Diesel oil                   | Ammonium chloride               |
| Acrylonitrile                               | Formic acid                  | Antimony trichloride            |
| Ammonia                                     | Gasoline                     | Borax in H <sub>2</sub> O       |
| Amyl acetate                                | Glycerine                    | Butane                          |
| Benzene                                     | Heating oil                  | Calcium chloride                |
| Bromine                                     | Jet fuel                     | Calcium hypochlorite            |
| Butyl acetate                               | Concentrated perchloric acid | Carbon dioxide                  |
| Sodium hydroxide                            | Sulfur dioxide               | Carbon monoxide                 |
| Chloroform                                  | Turpentine                   | Citric acid 10%                 |
| Dimethylformamide                           |                              | Copper(II) sulfate              |
| Concentrated hydrochloric acid              |                              | Ethyl alcohol, i.e. ethanol 95% |
| Concentrated hydrofluoric acid              |                              | Ethylene glycol                 |
| Iodine                                      |                              | Formaldehyde 10%                |
| Methanol                                    |                              | Hydrochloric acid 20%           |
| Methyl ethyl ketone                         |                              | Hydrofluoric acid 5%            |
| Styrene                                     |                              | Isopropyl alcohol               |
| Tetrachloroethylene                         |                              | Mercury                         |
| Toluene                                     |                              | Methane                         |
| Concentrated sulfuric acid                  |                              | Oxygen                          |
| Xylene                                      |                              | Ozone                           |
| Cyanoacrylate monomers                      |                              | Sulfur                          |
|   |                              | Urea                            |
|   |                              | Water                           |

## **Magnet Switch and LED Status Indicator**

The Echo<sup>®</sup> Wireless Vibration Sensor has a magnetic switch located inside the sensor that is used to activate and deactivate the sensor. Hold a strong magnet next to the sensor housing at the location indicated on the housing, see figure below, to operate the switch. The blue LED light should begin blinking quickly within about 4 seconds. When it starts blinking, remove the magnet from the sensor. If the sensor was previously deactivated, it will become active and immediately take a measurement. If the sensor was previously active, it will deactivate and no longer take measurements. The blue LED light allows the user to quickly determine the status of the unit by the time interval between blinks. An active sensor will blink every 4 seconds while a deactivated sensor will blink every 8 seconds. Note: If the LED does not blink after holding the magnet next to the housing for 5 seconds, remove the magnet and try again.



## **LED Status Messages**

| <b>Blue LED Message</b>     | <b>Sensor Status</b>                                       |
|-----------------------------|--|
| Fast continuous blinking    | Magnet switch is currently being activated.                |
| 4 second intermittent blink | Sensor is turned on and waiting for the next transmission. |
| 8 second intermittent blink | Sensor is turned off and will not make measurements.       |
| Dim illuminated LED         | Sensor is currently measuring vibration levels.            |
| Bright illuminated LED      | Sensor is currently transmitting information to receiver.  |

## Programming the Echo® Wireless Vibration Sensor

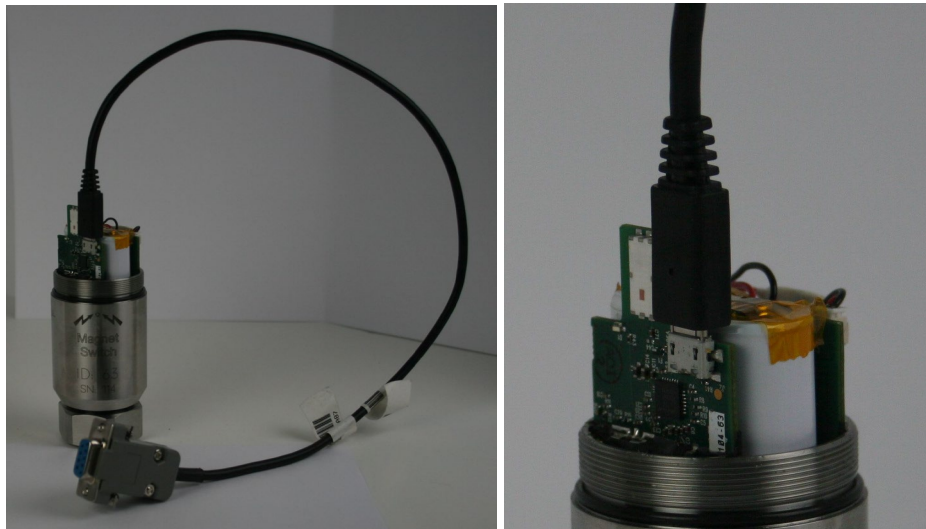
### ***Programming***

The Echo® Wireless Vibration Sensor can be programmed with a computer running the Echo® Monitoring Software through a serial port. While this is a serial port in the sensor, a micro USB connector is used in order to fit into the small space. A special (optional) Echo® Programming Cable, Model 070A87, is required.

**Note:** If your computer is not equipped with a serial port, a USB to RS232 adaptor can be used. These are readily available from computer electronics vendors.

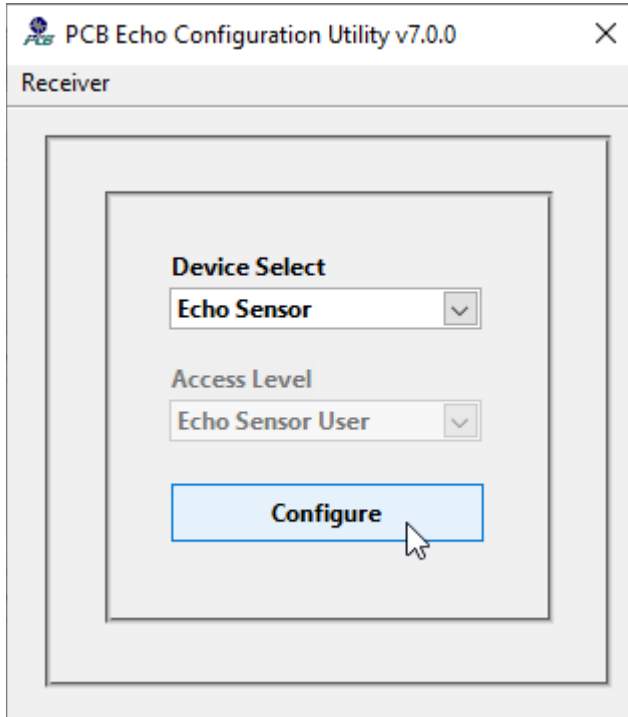
### ***Connect the Echo® Programming Cable***

In general, the Echo® Programming Cable should be connected to the computer's serial port prior to connecting it to the sensor. When prompted by the Echo® Monitoring Software to connect to the Echo® device (instructions below) use the following procedure. Unscrew and remove the cap to expose the micro USB port inside the sensor, see photos below. Carefully attach the programming cable to the sensor port (use a USB to RS232 adaptor if necessary). If the Programming Cable is connected to the computer's serial port, the LED will blink 5 times indicating that it is connected and ready to communicate.



## Connect to the Sensor with the Echo® Monitoring Software

Launch the PCB Echo® Configuration Utility Software. You should see a screen similar to the one below. Select Echo Sensor as the device and click the Configure button.



Alternatively, you can use the PCB Echo® Presentation Software to program the device. Select the channel to configure and right click on it. Select 'View edit Channel Settings'. On the subsequent 'Echo Sensors Parameters Editor' screen click on the Echo Device Menu item and select Connect...

To add a sensor to the Echo database see the *Echo® Monitoring Software User's Manual*.

Configuration Display Receiver Utilities System View Tools Administration Help

**33 Sensors In Alarm ( 828 Sensors Total )**

| Plant | Area       | Machine         | Location            | Sensor ID | Receiver | Reporting | A | ^ |
|-------|------------|-----------------|---------------------|-----------|----------|-----------|---|---|
| [-]   | West Coast |                 |                     |           |          |           |   |   |
|       | [-]        | Office          |                     |           |          |           |   |   |
|       |            |                 | Desk 1              | 21        |          | Late      |   |   |
|       |            |                 | Desk 3              | 34        |          |           |   |   |
|       |            |                 | Desk-2              | 274       |          |           |   |   |
|       | [-]        | Dust Collection |                     |           |          |           |   |   |
|       |            | [-]             | Bamboo Dust Collect |           |          |           |   |   |
|       |            |                 | [-]                 |           |          |           |   |   |
|       |            |                 | Bamboo DC D201      |           |          |           |   |   |
|       |            |                 | Motor OB Brg. 1H    | 34928     |          |           |   |   |
|       |            |                 | Motor OB Brg. 1V    | 34929     |          |           |   |   |
|       |            |                 | Motor IB Brg. 2H    | 34930     |          |           |   |   |
|       |            |                 | Motor IB Brg. 2V    | 34931     |          |           |   |   |
|       |            | [-]             | Bamboo DC D205 (A)  |           |          |           |   |   |
|       |            |                 | Motor OB Brg. 1H    | 33000     |          |           |   |   |
|       |            |                 | Motor OB Brg. 1V    | 33001     |          |           |   |   |
|       |            |                 | Motor IB Brg. 2H    | 33002     |          |           |   |   |
|       |            |                 | Motor IB Brg. 2V    | 33003     |          |           |   |   |
|       |            |                 | Blower IB Brg. 3H   | 33004     |          |           |   |   |
|       |            |                 | Blower IB Brg. 3V   | 33005     |          |           |   |   |
|       |            |                 | Blower OB Brg. 4H   | 33006     |          |           |   |   |
|       |            |                 | Blower OB Brg. 4V   | 33007     |          |           |   |   |

- Refresh Sensor List
- Open All Items
- Close All Items
- Sort Ascending
- Sort Descending
- Alarms
- View History...
- Advanced Plot...
- View/Edit Channel Notes...
- View/Edit Channel Settings...**
- Determine Alarm Levels...
- Check Transmission Reliability...
- Delete this Channel...

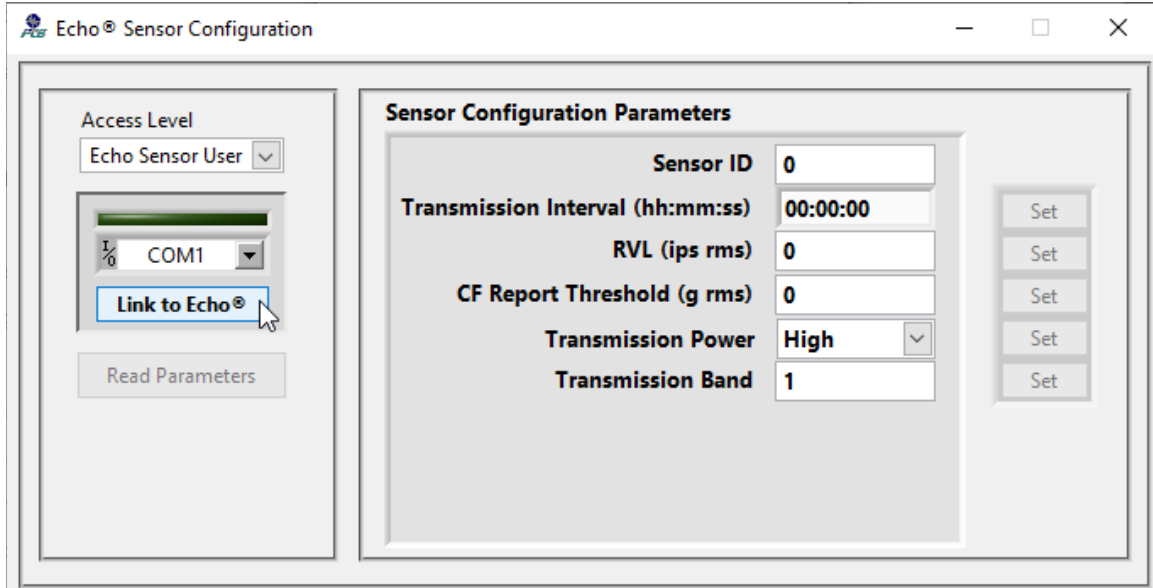
Alarm Templates Echo Devices Defaults

Connect...

Plant 1\_PCB

The following configuration screen will appear.  
Select the appropriate COM port and click on **Link to Echo®**.

**Note:** The Access Level is factory set and is not user selectable.



The green bar above the COM port selection should illuminate indicating the connection has been made. The fields to the right of the window will populate with the current programmed parameters.

## Factory Defaults

The factory defaults are defined below unless otherwise specified. See the explanation of the parameters below.

- Sensor ID is a unique factory set number for each sensor and cannot be changed.
- Transmission Interval = 8 hours
- RVL = 0 (off)
- CF Report Threshold = 0.02
- Transmission Power = High
- Transmission Band = 1

## Explanation of Echo® Wireless Sensor Parameters

Parameters can be changed by using the up and down arrows or by typing the values in the appropriate box. Click on the Set button by the parameter to actually program the sensor.

- **Sensor ID:** The Sensor ID is a unique ID programmed into and etched onto each sensor at the factory. This number cannot be changed.



- **Transmission Interval:** The Transmission Interval is the time between transmissions of measured data. The factory default is 8 hours. That means the sensor will “wake up” and make a measurement every 8 hours (3 times per day). At the default 8-hour transmission interval, the primary lithium-thionyl chloride (Li-SOCl<sub>2</sub>) batteries are expected to last in excess of 5 years.  
**Note:** Decreasing the transmission interval (i.e., increasing the number of measurements per day) will not only reduce battery life but will also use more receiver bandwidth. Thus, fewer sensors can be used with a receiver. See the *Echo<sup>®</sup> Receiver User’s Manual* for guidelines regarding the number of sensors that can be used per receiver.
- **RVL (Residual Vibration Level):** The RVL is an rms velocity level in ips (inches/second). If it is set to 0 (zero), the feature is off and the sensor will wake up at the programmed interval, make measurements, and transmit them. If a value is set, the sensor will wake up at the programmed interval and start a measurement. If the rms velocity is  $\geq$  the RVL, the measurement and transmission will proceed as normal. If the rms velocity is  $<$  the RVL, the machine is assumed to be off and the measurement is terminated. This both conserves battery power and minimizes the transmission of “bad data”.
- **CF Report Threshold:** CF (crest factor) is the ratio of true peak acceleration divided by rms acceleration. For a sine wave, this value is 1.414. Echo<sup>®</sup> sensors high pass filter both the true peak and rms acceleration measurements for better HFE (high frequency energy) response. This type of filtered measurement generally provides an earlier warning of bearing, gear, and other high frequency faults. It can also result in very low rms acceleration readings (sometimes in the noise) for healthy machines, particularly if they operate at slow speeds. The CF Report Threshold value is a minimum rms acceleration level at which CF will be computed. If the rms acceleration is below this value, CF is returned as zero.
- **Transmission Power:** The Echo<sup>®</sup> Wireless Vibration Sensor transmits at 0.75 mW ERP (Effective Radiated Power). In some cases, the sensor may be so close to the antenna and the signal strength so strong, that the receiver will see “reflections” of the transmitted signal. While this does not affect data accuracy, it can use unnecessary receiver bandwidth to deal with the reflections. If the received signal from a sensor is  $>$  65 dB, the Transmission Power should be changed from High to Low to eliminate this problem. This will cause the transmitted power to be reduced by about 45 dB.
- **Transmission Band:** The Echo<sup>®</sup> System can operate on 12 independent user selectable RF bands. Sensors will only communicate with receivers that are set to the same band that they are set to. This allows for large installations requiring hundreds or thousands of sensors and in cases where distances are too far to be picked up by a single antenna location.

## **Saving Changes to the Echo<sup>®</sup> Sensor**

Click the Set button next to each field to be updated to program the value in the Echo<sup>®</sup> Sensor. To verify the programming when all changes have been made, click the Read Parameters button. When sensor programming is completed, click the X in the upper right hand corner of the window.

## ***Mounting***

The Echo<sup>®</sup> Wireless Vibration Sensor should be stud mounted on a clean, flat surface. It is not recommended to mount the sensor with a magnet due to the size and mass of the sensor. The correct mounting torque for the sensor is 3 to 5 ft-lb (4 to 7 N-m). It is also a good idea to put a small amount of silicon grease on the bottom of the sensor before mounting.

**WARNING** – Do NOT tighten the sensor by twisting on the housing. Damage to the sensor WILL occur. Tighten to the correct torque using a wrench on the hex base.

*Outline Drawing – See enclosed drawing*

## **Preparing the Surface**

If a clean, flat spot is not available on the machine, it is recommended to prepare a flat, machined surface using an optional IMI Model 080A127 1” spot face tool, shown below. This tool will prepare a flat surface and drill the appropriate pilot hole for a ¼-28 UNF thread. A ¼-28 tap is NOT included with the spot face tool.

If you are unable to use a spot face tool on the machine, optional Model 080A118 Mounting Pad can be epoxied on to the machine. Optional Model 075A05 Small Epoxy Kit or Model 075A06 Large Epoxy Kit can be used to attach them to the machine.



## Battery Pack

### WARNING

- Do NOT attempt to recharge batteries
- Do NOT heat batteries above 212 °F (100 °C)
- Do NOT attempt to replace with standard AA size batteries. They will not work.

**Note:** The Echo<sup>®</sup> Sensor uses two 3.6 V, A-size (not AA) primary lithium-thionyl chloride (Li-SOCl<sub>2</sub>) high energy density, bobbin cell batteries in series that are NOT rechargeable. Please contact IMI for replacements.

The Echo<sup>®</sup> Wireless Vibration Sensor accurately measures battery voltage during each measurement cycle and transmits the battery status. The battery status is available for display in the Echo<sup>®</sup> Monitoring Software. See the *Echo<sup>®</sup> Monitoring Software User's Manual* for details on monitoring the battery status. The following are recommended actions based on battery status.

**Note:** The battery decline is not linear; it will be at a 3 level longer than a 2 level and at a 0 level the shortest amount of time.

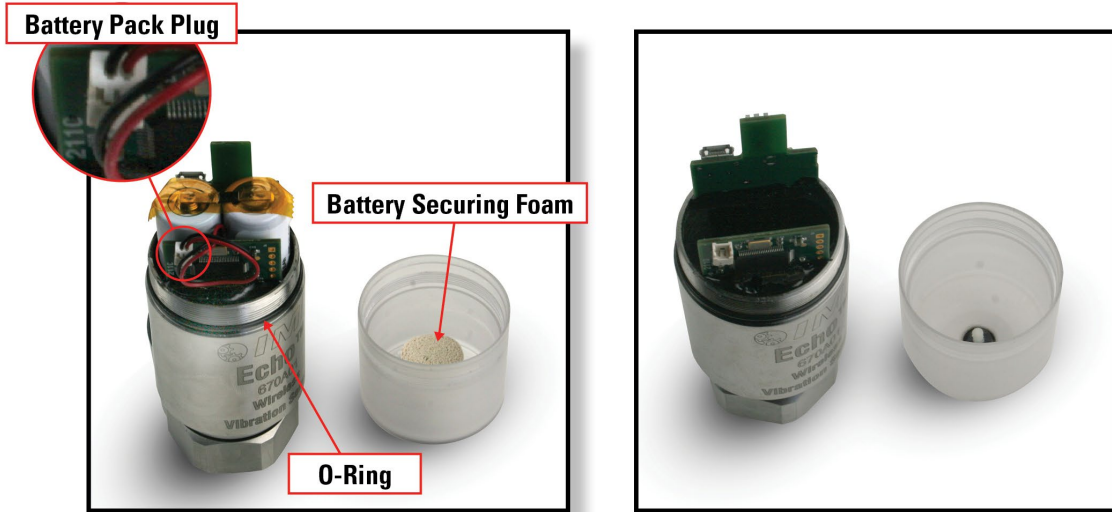
- 3 = Battery is good
- 2 = Battery good but order replacement
- 1 = Replace the battery
- 0 = Battery bad, stop taking measurements with it until replaced

When a battery is required, it is recommended you order a Model 073A20 Echo<sup>®</sup> Replacement Battery Kit, shown below. The kit includes a battery pack, 0-ring, silicon grease, battery securing foam, and instructions.

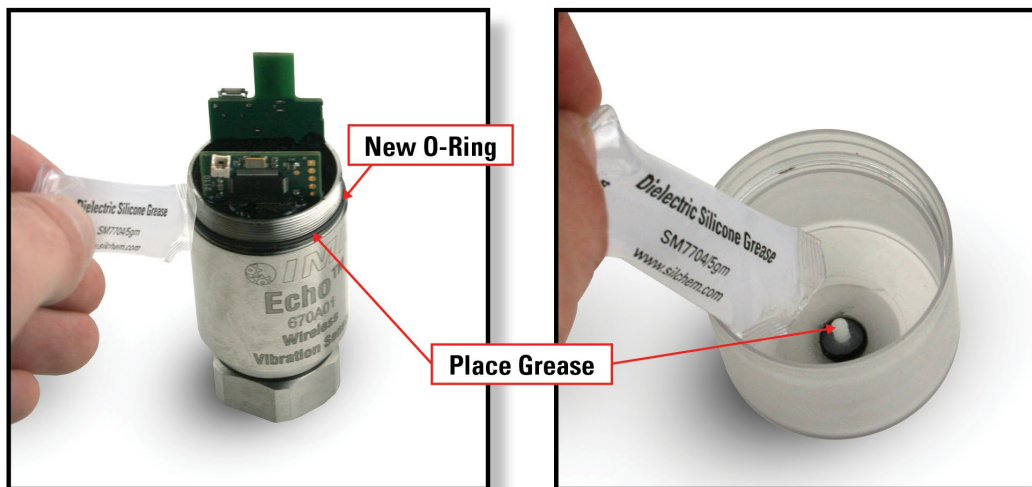


## Battery Replacement Instructions

1. Remove cap
2. Unplug and remove battery pack
3. Remove O-ring and battery securing foam



4. Place the new O-ring on the housing
5. Place grease completely around the O-ring
6. Place grease on and around the barb on the inside of the cap



7. Place the battery securing foam on the barb in the cap

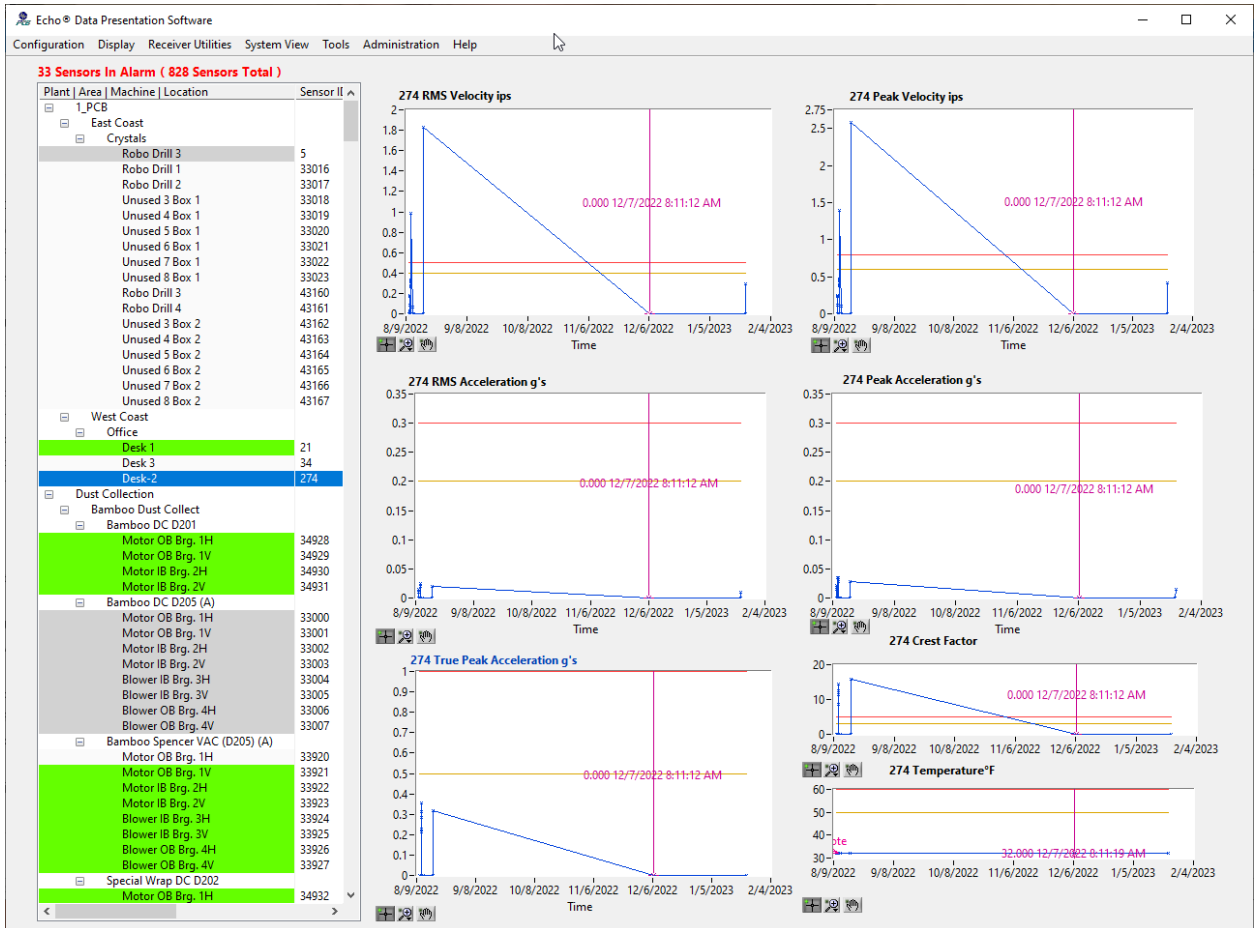


8. Plug in the new battery cap and place the battery pack in the housing
9. Screw cap onto the housing
  - a. Make sure that the foam is centered on top of the batteries.
  - b. Compress foam and hold so the threads of the cap and housing are touching.
  - c. Turn the cap counter clock wise unit you hear two clicks (This will prevent cross threading)
  - d. Thread the cap on to the housing until it bottoms out.



## Temperature Output option sensor TO670Axx

For Echo® Wireless Vibration Sensor Temperature Output option sensor model(s) TO670Axx. The Temperature Measurement is sent 3 seconds after the scheduled normal vibration data transmission. If the sensor has temperature data, it will be displayed on the main screen graphs and on a separate history screen.



Historical Data found in: EchoDataSQL.udl

Sensor Data Channel Notes

| Date and Time           | Sensor ID | Average SNR (dB) | Temperature (°F) | Battery Status |  |
|-------------------------|-----------|------------------|------------------|----------------|--|
| 1/23/2023 10:34:24 AM   | 274       | 64               | 32.00            | 3              |  |
| 1/23/2023 10:29:28 AM   | 274       | 57               | 32.00            | 3              |  |
| 1/23/2023 10:24:31 AM   | 274       | 51               | 32.00            | 3              |  |
| 1/23/2023 10:19:34 AM   | 274       | 53               | 32.00            | 3              |  |
| 12/7/2022 8:16:16 AM *  | 274       | 69               | 32.00            | 3              |  |
| 12/7/2022 8:11:19 AM    | 274       | 70               | 32.00            | 3              |  |
| 8/17/2022 10:32:41 AM * | 274       | 65               | 32.00            | 3              |  |
| 8/17/2022 10:31:20 AM   | 274       | 67               | 32.00            | 3              |  |
| 8/12/2022 2:14:10 PM *  | 274       | 66               | 32.00            | 3              |  |
| 8/12/2022 2:09:13 PM    | 274       | 61               | 32.00            | 3              |  |
| 8/12/2022 2:04:16 PM    | 274       | 60               | 32.00            | 3              |  |
| 8/12/2022 1:59:20 PM    | 274       | 60               | 32.00            | 3              |  |
| 8/12/2022 11:52:41 AM * | 274       | 60               | 32.00            | 3              |  |
| 8/12/2022 11:47:44 AM   | 274       | 47               | 32.00            | 3              |  |
| 8/12/2022 11:42:47 AM   | 274       | 69               | 32.00            | 3              |  |
| 8/12/2022 11:37:51 AM   | 274       | 54               | 32.00            | 3              |  |
| 8/12/2022 10:07:38 AM * | 274       | 63               | 32.00            | 3              |  |
| 8/12/2022 10:02:41 AM   | 274       | 68               | 32.00            | 3              |  |
| 8/12/2022 9:57:44 AM    | 274       | 65               | 32.00            | 3              |  |
| 8/12/2022 9:52:48 AM    | 274       | 63               | 32.00            | 3              |  |
| 8/12/2022 9:47:51 AM    | 274       | 65               | 32.00            | 3              |  |
| 8/11/2022 2:53:08 PM *  | 274       | 66               | 32.00            | 3              |  |
| 8/11/2022 2:48:11 PM    | 274       | 52               | 32.00            | 3              |  |
| 8/11/2022 2:38:17 PM *  | 274       | 62               | 32.00            | 3              |  |
| 8/11/2022 2:33:21 PM    | 274       | 54               | 32.00            | 3              |  |
| 8/11/2022 2:28:24 PM    | 274       | 57               | 32.00            | 3              |  |
| 8/11/2022 2:23:27 PM    | 274       | 26               | 32.00            | 3              |  |



Sensor Select

Trend Plot...

View Vibration Data

274 | Office | Desk-2







**Model 070A87**

**Echo® Programming Cable with RS232 to mini USB connector for  
Installation and Operating Manual**

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

**Toll-free: 800-959-4464  
24-hour SensorLine: 716-684-0001  
Fax: 716-684-3823  
E-mail: [imi@pcb.com](mailto:imi@pcb.com)  
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## 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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3425 Walden Ave.  
Depew, NY14043 USA  
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General inquiries: [info@pcb.com](mailto:info@pcb.com)  
Repair inquiries: [rma@pcb.com](mailto:rma@pcb.com)

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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.

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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   | 0      | 0      | 0      | 0            | 0          | 0            |
| PCB板   | X      | 0      | 0      | 0            | 0          | 0            |
| 电气连接器  | 0      | 0      | 0      | 0            | 0          | 0            |
| 压电晶体   | X      | 0      | 0      | 0            | 0          | 0            |
| 环氧   | 0      | 0      | 0      | 0            | 0          | 0            |
| 铁氟龙  | 0      | 0      | 0      | 0            | 0          | 0            |
| 电子   | 0      | 0      | 0      | 0            | 0          | 0            |
| 厚膜基板   | 0      | 0      | X      | 0            | 0          | 0            |
| 电线   | 0      | 0      | 0      | 0            | 0          | 0            |
| 电缆   | X      | 0      | 0      | 0            | 0          | 0            |
| 塑料   | 0      | 0      | 0      | 0            | 0          | 0            |
| 焊接   | X      | 0      | 0      | 0            | 0          | 0            |
| 铜合金/黄铜   | X      | 0      | 0      | 0            | 0          | 0            |
| 本表格依据 SJ/T 11364 的规定编制。                          |        |        |        |              |            |              |
| 0：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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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.

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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<br><b>070A87</b> | <b>ECHO RS232 PROGRAMMING CABLE</b> | Revision: NR<br>ECN #: 47345 |
|-------------------------------|-------------------------------------|------------------------------|

| <b>Performance</b>             | <u><b>ENGLISH</b></u>       | <u><b>SI</b></u>            |
|--------------------------------|-----------------------------|-----------------------------|
| Cable Style                    | Multi Conductor             | Multi Conductor             |
| Number of Conductors           | 5                           | 5                           |
| Connector Style(sensor side)   | Male                        | Male                        |
| Connection Type(sensor side)   | Micro USB (Micro B/USB 2.0) | Micro USB (Micro B/USB 2.0) |
| Connector Style(Receiver side) | Male                        | Male                        |
| Connection Type(Receiver side) | DB9                         | DB9                         |
| Connection Type(sensor side)   | Push-on                     | Push-on                     |
| Connection Type(Receiver side) | Push-on with thumb screws   | Push-on with thumb screws   |

**OPTIONAL VERSIONS**

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

| <b>Physical</b>       | <u><b>ENGLISH</b></u> | <u><b>SI</b></u> |
|-----------------------|-----------------------|------------------|
| Cable Jacket Diameter | 0.149 in              | 3.8 mm           |
| Cable Jacket Material | PVC                   | PVC              |
| Cable Jacket Color    | Black                 | Black            |
| ROHS Compliant        | Yes                   | Yes              |

|                  |                  |                  |                  |              |
|------------------|------------------|------------------|------------------|--------------|
| Entered: LK      | Engineer: gs     | Sales: MC        | Approved: BAM    | Spec Number: |
| Date: 11/13/2017 | Date: 11/13/2017 | Date: 11/13/2017 | Date: 11/13/2017 | <b>68146</b> |

*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.*



3425 Walden Avenue, Depew, NY 14043

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



**Model TO670A02**

**Echo® Wireless Vibration Sensor, 868 MHz, with temperature out**

**Installation and Operating Manual**

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

**Toll-free: 800-959-4464**

**24-hour SensorLine: 716-684-0001**

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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   |        |        |              |            |              |
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| 住房   | 0      | 0      | 0      | 0            | 0          | 0            |
| PCB板   | X      | 0      | 0      | 0            | 0          | 0            |
| 电气连接器  | 0      | 0      | 0      | 0            | 0          | 0            |
| 压电晶体   | X      | 0      | 0      | 0            | 0          | 0            |
| 环氧   | 0      | 0      | 0      | 0            | 0          | 0            |
| 铁氟龙  | 0      | 0      | 0      | 0            | 0          | 0            |
| 电子   | 0      | 0      | 0      | 0            | 0          | 0            |
| 厚膜基板   | 0      | 0      | X      | 0            | 0          | 0            |
| 电线   | 0      | 0      | 0      | 0            | 0          | 0            |
| 电缆   | X      | 0      | 0      | 0            | 0          | 0            |
| 塑料   | 0      | 0      | 0      | 0            | 0          | 0            |
| 焊接   | X      | 0      | 0      | 0            | 0          | 0            |
| 铜合金/黄铜   | X      | 0      | 0      | 0            | 0          | 0            |
| 本表格依据 SJ/T 11364 的规定编制。                          |        |        |        |              |            |              |
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CHINA RoHS COMPLIANCE

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| 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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2

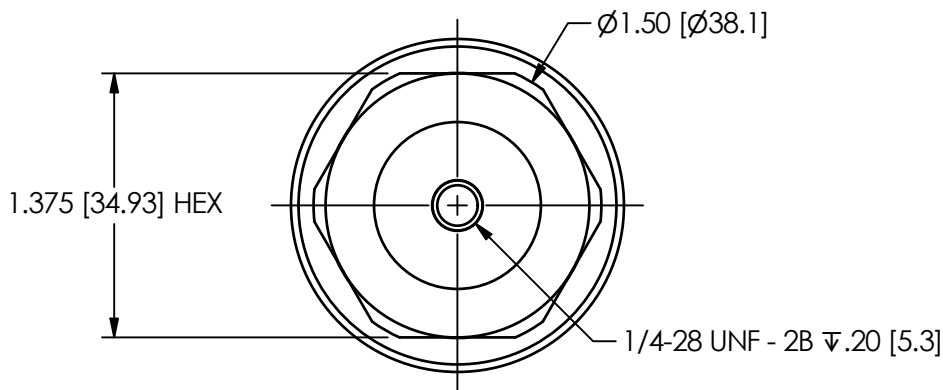
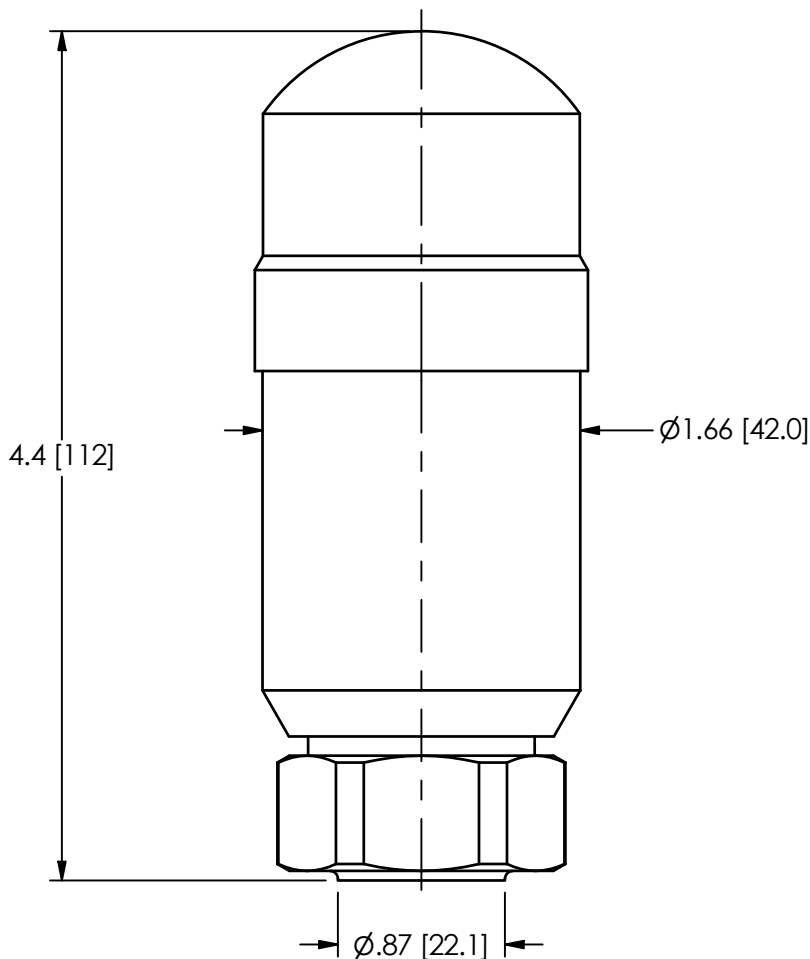
1

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REVISIONS

| REV | DESCRIPTION   | DIN   |
|-----|---------------|-------|
| B   | UPDATED TITLE | 50473 |

41966



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

| DRAWN |         | CHECKED |         | ENGINEER |         |
|-------|---------|---------|---------|----------|---------|
| JJF   | 2/26/20 | JJF     | 2/26/20 | YHK      | 2/26/20 |



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

DIMENSIONS IN INCHES

DIMENSIONS IN MILLIMETERS  
[ IN BRACKETS ]

DECIMALS XX ±.03  
XXX ±.010

DECIMALS X ± 0.8  
XX ± 0.25

ANGLES ± 2 DEGREES

ANGLES ± 2 DEGREES

FILLETS AND RADII  
.003 - .005

FILLETS AND RADII  
0.07 - 0.13

TITLE  
OUTLINE DRAWING  
(M)670A SERIES  
WIRELESS

CODE  
IDENT. NO.  
52681

DWG. NO.

41966

SCALE: FULL

SHEET 1 OF 1

2

1



**Model 070A87**

**Echo® Programming Cable with RS232 to mini USB connector for  
Installation and Operating Manual**

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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](mailto:info@pcb.com)  
Repair inquiries: [rma@pcb.com](mailto:rma@pcb.com)

For a complete list of distributors, global offices and sales representatives, visit our website, [www.pcb.com](http://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   | 0      | 0      | 0      | 0            | 0          | 0            |
| PCB板   | X      | 0      | 0      | 0            | 0          | 0            |
| 电气连接器  | 0      | 0      | 0      | 0            | 0          | 0            |
| 压电晶体   | X      | 0      | 0      | 0            | 0          | 0            |
| 环氧   | 0      | 0      | 0      | 0            | 0          | 0            |
| 铁氟龙  | 0      | 0      | 0      | 0            | 0          | 0            |
| 电子   | 0      | 0      | 0      | 0            | 0          | 0            |
| 厚膜基板   | 0      | 0      | X      | 0            | 0          | 0            |
| 电线   | 0      | 0      | 0      | 0            | 0          | 0            |
| 电缆   | X      | 0      | 0      | 0            | 0          | 0            |
| 塑料   | 0      | 0      | 0      | 0            | 0          | 0            |
| 焊接   | X      | 0      | 0      | 0            | 0          | 0            |
| 铜合金/黄铜   | X      | 0      | 0      | 0            | 0          | 0            |
| 本表格依据 SJ/T 11364 的规定编制。                          |        |        |        |              |            |              |
| 0：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.

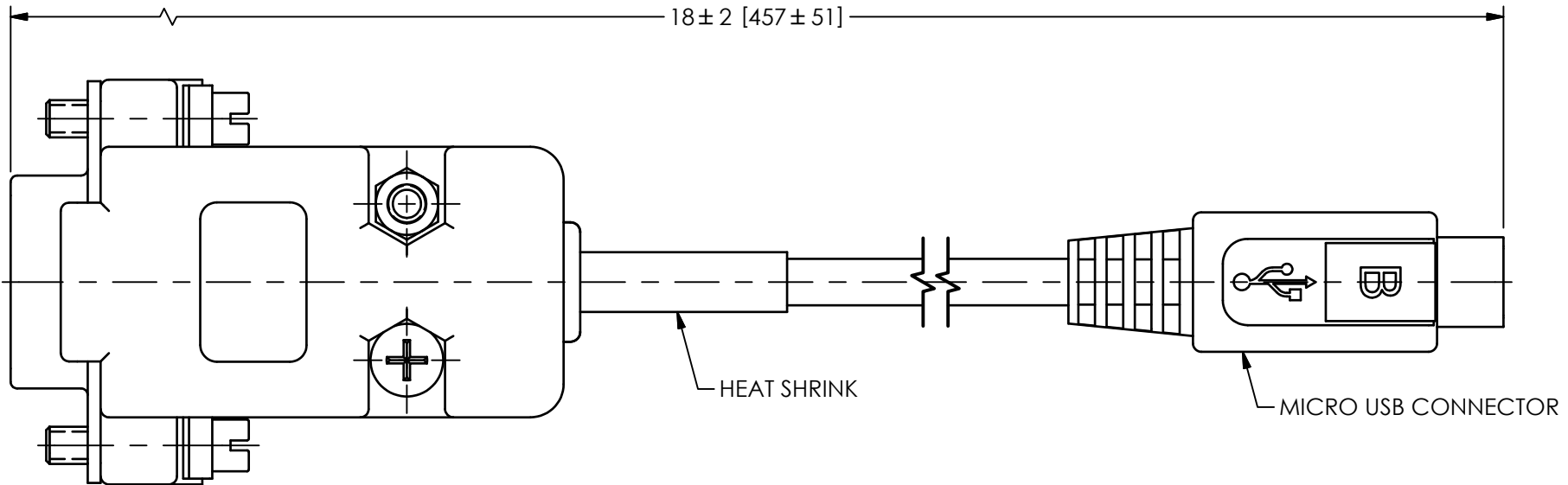
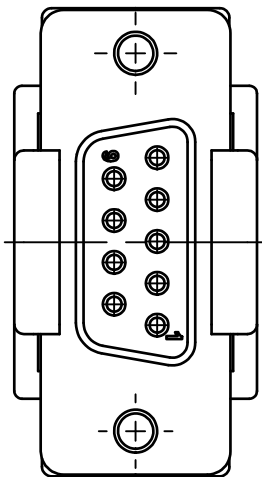
X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.

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

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45715

| REVISIONS |                      |       |
|-----------|----------------------|-------|
| REV       | DESCRIPTION          | DIN   |
| NR        | RELEASED TO DRAFTING | 53391 |



| UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:   |  | DRAWN  |  | CHECKED                                   |         | ENGINEER          |         |                        |         |
|--|--|--|--|---|---------|-------------------|---------|------------------------|---------|
| DIMENSIONS IN INCHES<br>DECIMALS XX ±.03<br>XXX ±.010<br>ANGLES ± 2 DEGREES  |  | DIMENSIONS IN MILLIMETERS<br>[ IN BRACKETS ]<br>DECIMALS X ± 0.8<br>XX ± 0.25<br>ANGLES ± 2 DEGREES  |  | JJF                                       | 2/20/23 | JJF               | 2/20/23 | HWK                    | 2/20/23 |
| CABLE TOLERANCES IN ENGLISH<br>1' ≤ LENGTH < 1' = +1' / - 0<br>1' ≤ LENGTH < 5' = +2' / - 0<br>5' ≤ LENGTH < 100' = +6' / - 0<br>100' ≤ LENGTH = +1' / - 0 |  | CABLE TOLERANCES IN METRIC<br>2.54cm ≤ LENGTH < 30.5cm = +2.54cm / - 0<br>30.5cm ≤ LENGTH < 1.5m = +5.1cm / - 0<br>1.5m ≤ LENGTH < 30.5m = +15.2cm / - 0<br>30.5m ≤ LENGTH = +30.5cm / - 0 |  | TITLE<br>OUTLINE DRAWING<br>070A87 SERIES |         |                   |         |                        |         |
| FILLETS AND RADII<br>.003 - .005   |  | FILLETS AND RADII<br>0.07 - 0.13   |  |   |         |                   |         |                        |         |
|  |  |  |  | CODE IDENT. NO.<br>52681                  |         | DWG. NO.<br>45715 |         | SCALE: 2X SHEET 1 OF 1 |         |

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