# IMI SENSORS
## A PCB PIEZOTRONICS DIV.

**Model CS670A01**

**Echo® Wireless Vibration Sensor, Intrinsically Safe**

**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
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Web: www.imi-sensors.com

Total Customer Satisfaction
IMI SENSORS
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**The information contained in this document supersedes all similar information that may be found elsewhere in this manual.**

**Total Customer Satisfaction** – PCB Piezotronics guarantees Total Customer Satisfaction. If, at any time, for any reason, you are not completely satisfied with any PCB product, PCB will repair, replace, or exchange it at no charge. You may also choose to have your purchase price refunded in lieu of the repair, replacement, or exchange of the product.

**Service** – Due to the sophisticated nature of the sensors and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. Caution should be observed to insure that liquids are not permitted to migrate into devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth and never submerged or have liquids poured upon them.

**Repair** – In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty.

**Calibration** – Routine calibration of sensors and associated instrumentation is

recommended as this helps build confidence in measurement accuracy and acquired data. Equipment calibration cycles are typically established by the users own quality regimen. When in doubt about a calibration cycle, a good "rule of thumb" is to recalibrate on an annual basis. It is also good practice to recalibrate after exposure to any severe temperature extreme, shock, load, or other environmental influence, or prior to any critical test.

PCB Piezotronics maintains an ISO-9001 certified metrology laboratory and offers calibration services, which are accredited by A2LA to ISO/IEC 17025, with full traceablility to N.I.S.T. In addition to the normally supplied calibration, special testing is also available, such as: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For information on standard recalibration services or special testing, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

**Returning Equipment** – *Following these procedures will insure that your returned materials are handled in the most expedient manner.* Before returning any equipment to PCB Piezotronics, contact your local distributor, sales representative, or factory customer service representative to obtain a Return

Materials Authorization (RMA) Number. This RMA number should be clearly marked on the outside of all package(s) and on the packing list(s) accompanying the shipment. A detailed account of the nature of the problem(s) being experienced with the equipment should also be included inside the package(s) containing any returned materials.

A Purchase Order, included with the returned materials, will expedite the turn-around of serviced equipment. It is recommended to include authorization on the Purchase Order for PCB to proceed with any repairs, as long as they do not exceed 50% of the replacement cost of the returned item(s). PCB will provide a price quotation or replacement recommendation for any item whose repair costs would exceed 50% of replacement cost, or any item that is not economically feasible to repair. For routine calibration services, the Purchase Order should include authorization to proceed and return at current pricing, which can be obtained from a factory customer service representative.

**Warranty** – All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a limited warranty against defective material and workmanship for a period of one year from date of original purchase. Contact PCB for a complete statement of our warranty. Expendable items, such as batteries and mounting hardware, are not covered by warranty. Mechanical damage to equipment due to improper use is not covered by warranty. Electronic circuitry failure caused by the introduction of unregulated or improper excitation power or electrostatic discharge is not covered by warranty.

**Contact Information** – International customers should direct all inquiries to their local distributor or sales office. A complete list of distributors and offices can be found at www.pcb.com. Customers within the United States may contact their local sales representative or a factory customer service representative. A complete list of sales representatives can be found at www.pcb.com. Toll-free telephone numbers for a factory customer service representative, in the division responsible for this product, can be found on the title page at the front of this manual. Our ship to address and general contact numbers are:

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY 14043 USA
Toll-free: (800) 828-8840
24-hour SensorLine$^{SM}$: (716) 684-0001
Website: www.pcb.com
E-mail: info@pcb.com

# Echo® Wireless Vibration Sensor
## User's Manual

## Models: 670A01, RV670A01 and CS670A01

# Table of Contents

**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.

**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.

Advertissment- Risque D'explosion – Ne pas debrancher ou brancher tant que le circuitest sous tension. A moins qu'il ne s'agisse d'un emplacement non dangereux. Les piles ne doivent pas etre remplacees a 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® Wireless Vibration Sensor, Model 670A01, is a stand alone, 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® 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® Receiver, decoded, and sent via Ethernet to a computer or server running the Echo® Monitoring Software. For additional information on the Echo® Receiver and the Echo® Monitoring Software, please refer to their respective manuals.

The Model RV670A01 Echo® Wireless Vibration Sensor with RV (Raw Vibration) Output operates identically to the standard model and additionally, provides the raw vibration signal for detailed diagnostic analysis. The unit has a connector on the side and can be used with an optional Model 070A86 Echo® RV Output Cable for analysis. See the "RV (Raw Vibration) Option" section of this manual for additional information.


**Proper Handling**

Proper handling of the Echo® 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 $H_2O$ |
| 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® 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**

| Blue LED Message | Sensor Status |
|---|---|
| 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.
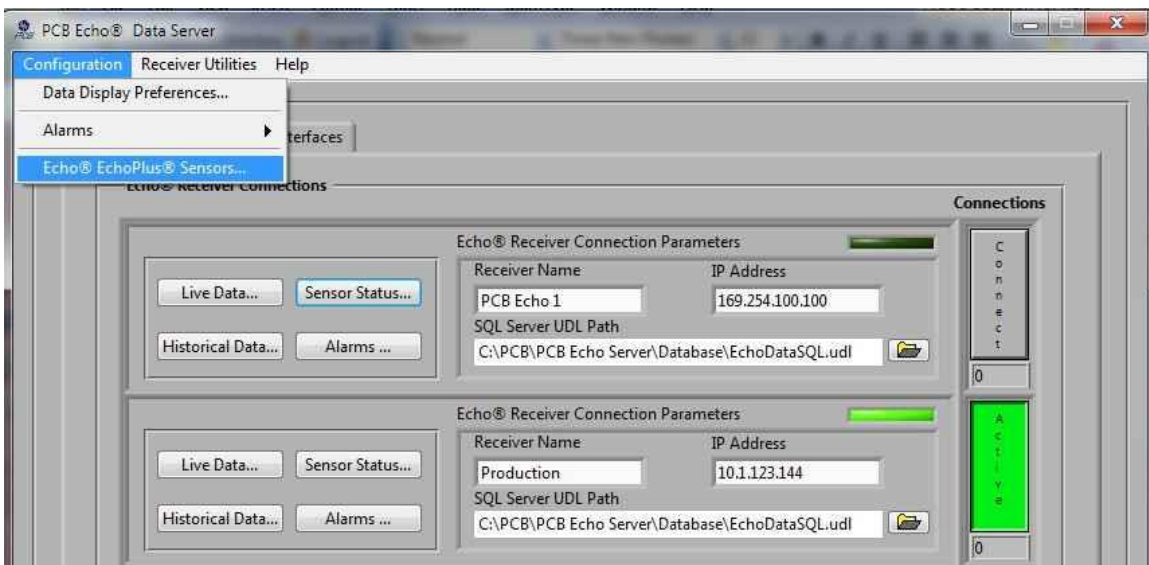
**Connect to the Sensor with the Echo® Monitoring Software**

Launch the Echo® Monitoring Software. You should see a screen similar to the one below.
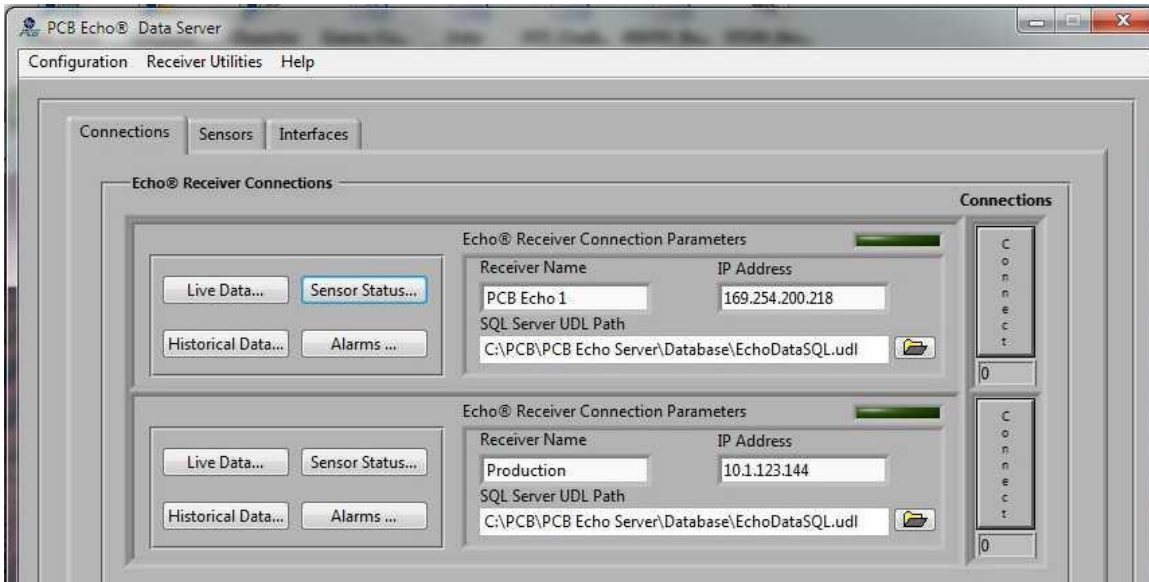


Click on **Configuration** on the menu bar. You should see a screen similar to the following, and then click on **Echo® EchoPlus® Sensors**.

You should see the following selections on the next screen. Click on **'I want to add |
update | view and Echo® Sensors parameters**', then click on **Next >** at the bottom of
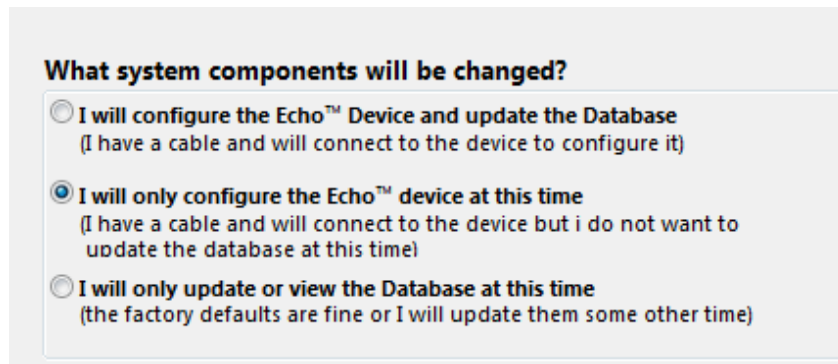the screen.



Select the receiver where data from this specific sensor should be sent. This also, by
default, specifies the database where data from this sensor will be stored. The default
setting for a single receiver installation is shown below. After the receiver is selected,
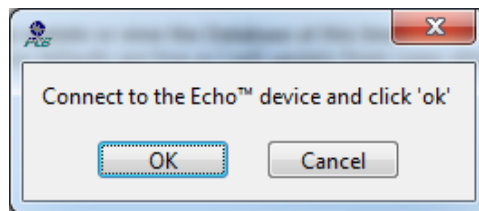click on **Next >.**
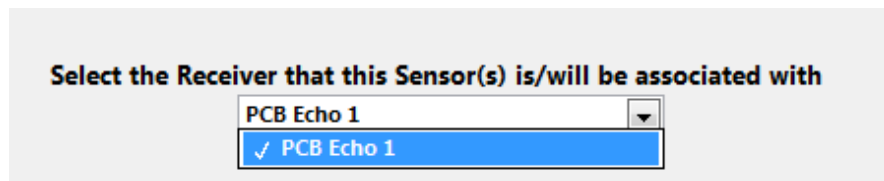
The software will then prompt for what system components will be changed as shown below.

**Note**: If you are setting up your actual database, it is highly recommended that you configure the Echo® Sensor and update the database together. By doing this, you are guaranteed that the sensor and database parameters will be set to the same values. Some important program information and alarms are based on theses settings. See the *Echo® Monitoring Software User's Manual* for setup details.

At this time, we will focus on programming the Echo® Sensor only. Select '**I will only configure the Echo® device at this time**' and click **Next >**.



When the following screen is displayed, make sure the Echo® Programming Cable is connected to the computer, then; connect the micro USB connector to the sensor. After the blue LED blinks 5 times, click **OK**.

The following connection window 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.
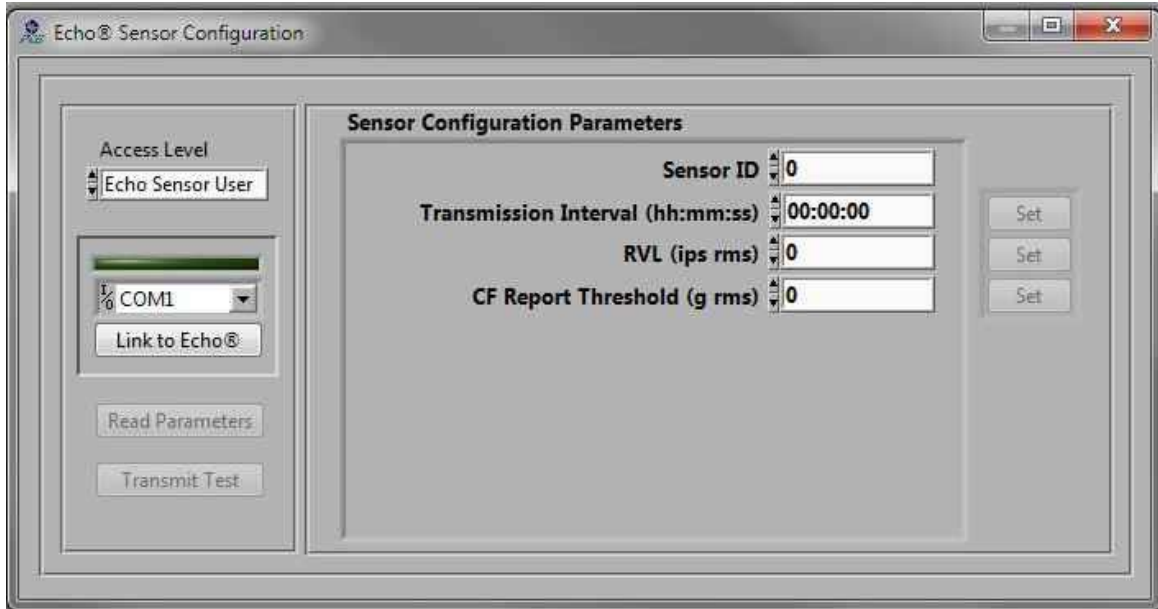


The green bar should illuminate indicating the connection has been made.  The fields to the right of the window will populate with the current programmed parameters.

**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 **<u>cannot</u>** be changed.
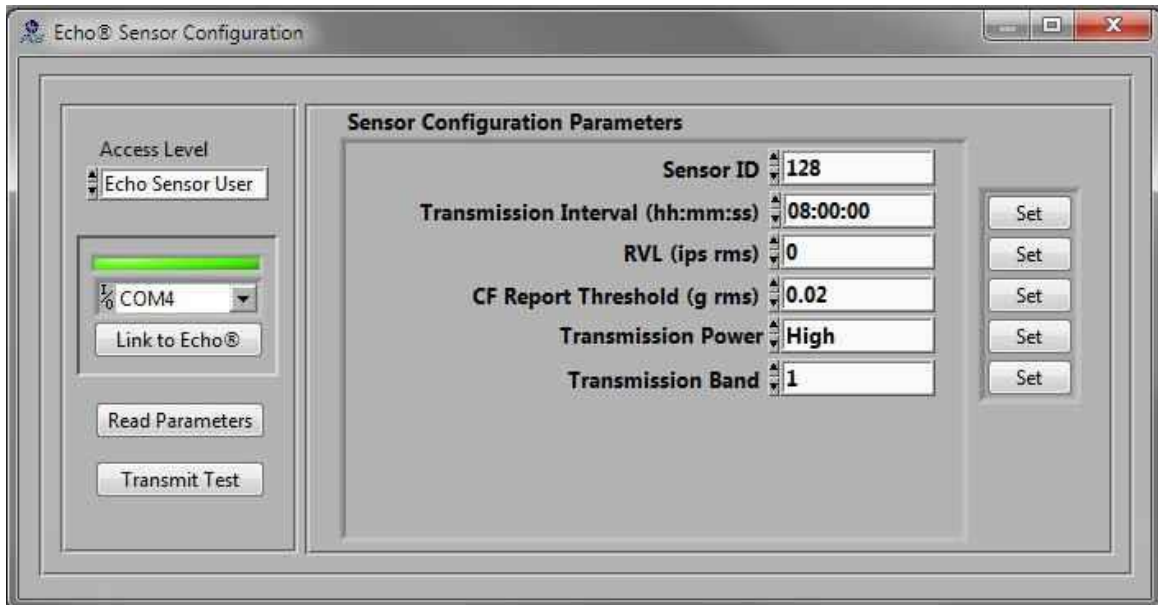- Transmission Interval = 8 hours
- RVL = 0 (off)
- CF Repot Threshold = 0.02
- Transmission Power = High
- Transmission Band = 1

**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$_2$) 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® 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 wale 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® 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® 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® 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.
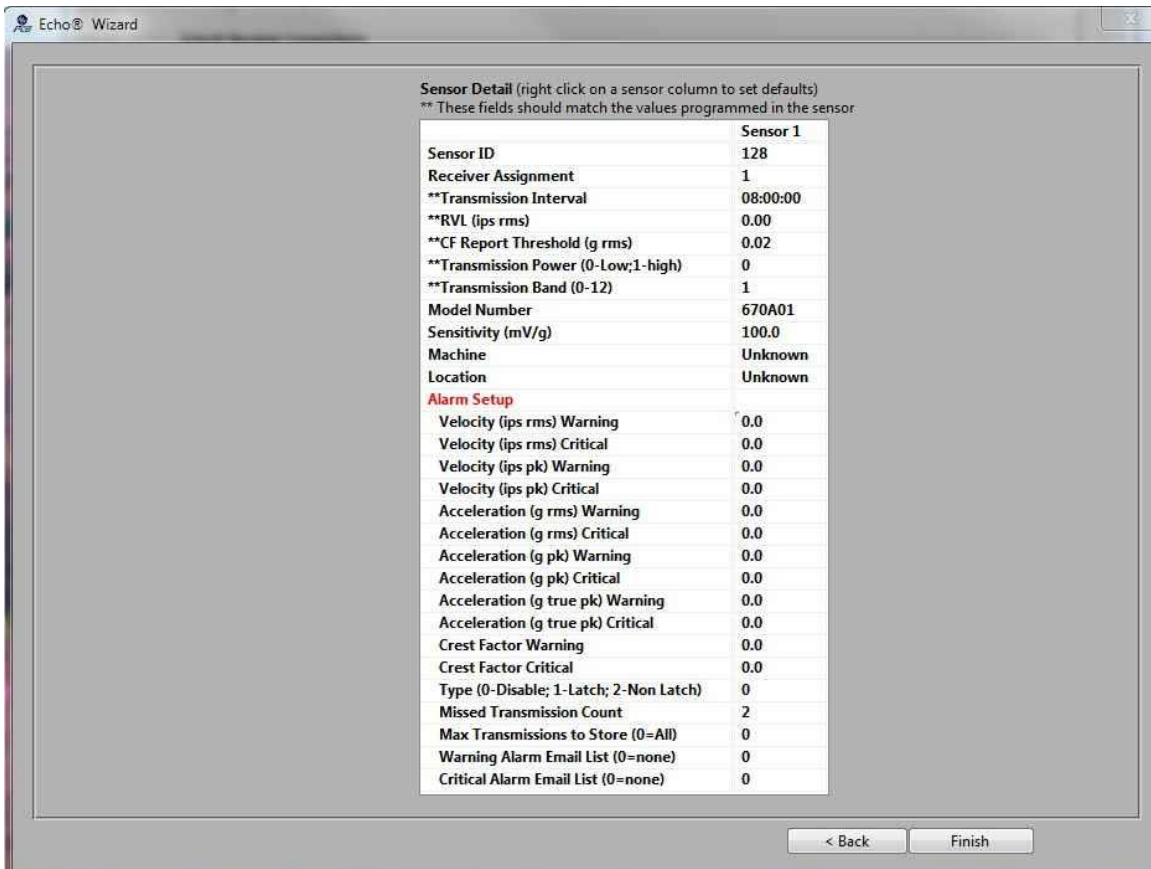
**Saving Changes to the Echo® Sensor**

Click the **Set** button next to each field to be updated to program the value in the Echo® 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.

**Updating the Database to Match Sensor Programming**

If the sensor has not been previously entered into the database, a message similar to the following will be displayed. Click **OK**. For details on setting up the database, see the *Echo® Monitoring Software User's Manual*.



A screen similar to the following will be displayed. Ignore the screen and click **Finish**. This will be used when you set up the actual database.



| Sensor Detail (right click on a sensor column to set defaults) | |
|---|---|
| ** These fields should match the values programmed in the sensor | |
| | Sensor 1 |
| Sensor ID | 128 |
| Receiver Assignment | 1 |
| **Transmission Interval | 08:00:00 |
| **RVL (ips rms) | 0.00 |
| **CF Report Threshold (g rms) | 0.02 |
| **Transmission Power (0-Low;1-high) | 0 |
| **Transmission Band (0-12) | 1 |
| Model Number | 670A01 |
| Sensitivity (mV/g) | 100.0 |
| Machine | Unknown |
| Location | Unknown |
| **Alarm Setup** | |
| Velocity (ips rms) Warning | 0.0 |
| Velocity (ips rms) Critical | 0.0 |
| Velocity (ips pk) Warning | 0.0 |
| Velocity (ips pk) Critical | 0.0 |
| Acceleration (g rms) Warning | 0.0 |
| Acceleration (g rms) Critical | 0.0 |
| Acceleration (g pk) Warning | 0.0 |
| Acceleration (g pk) Critical | 0.0 |
| Acceleration (g true pk) Warning | 0.0 |
| Acceleration (g true pk) Critical | 0.0 |
| Crest Factor Warning | 0.0 |
| Crest Factor Critical | 0.0 |
| Type (0-Disable; 1-Latch; 2-Non Latch) | 0 |
| Missed Transmission Count | 2 |
| Max Transmissions to Store (0=All) | 0 |
| Warning Alarm Email List (0=none) | 0 |
| Critical Alarm Email List (0=none) | 0 |

For complete programming options, see the *Echo® Monitoring Software User's Manual*.

**RV (Raw Vibration) Option**

The Model RV670A01 Echo® Wireless Vibration Sensor with RV (Raw Vibration) Output operates identically to the standard model, plus, it provides a raw vibration output signal for detailed diagnostic analysis. The unit has a connector on the side of the housing that can be used with an optional Model 070A86 Echo® RV Output Cable that provides the analog acceleration signal directly from the embedded accelerometer.



The cable converts the standard constant current sensor power provided by most data collectors to the low voltage supply required by the Echo® Sensor. To make raw vibration measurements, remove the shorting cap on the RV output connector. Attach the 4-pin connector on the cable to the RV output connector. Connect the BNC end to a data collector and set sensor power to on in the data collector. The nominal sensitivity of the raw signal is 100 mV/g and there is a ± 20 g range.

**Note**: Replace the shorting cap after raw vibration data is collected. Wireless operation of the sensor will not work with it removed.

**Mounting**

The Echo® 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® Sensor uses two 3.6 V, A-size (not AA) primary lithium-thionyl chloride (Li-SOCl$_2$) high energy density, bobbin cell batteries in series that are NOT rechargeable. Please contact IMI for replacements.

The Echo® 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® Monitoring Software. See the *Echo® 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® Replacement Battery Kit, shown below. The kit includes a battery pack, 0-ring, silicon grease, battery securing foam, and instructions.
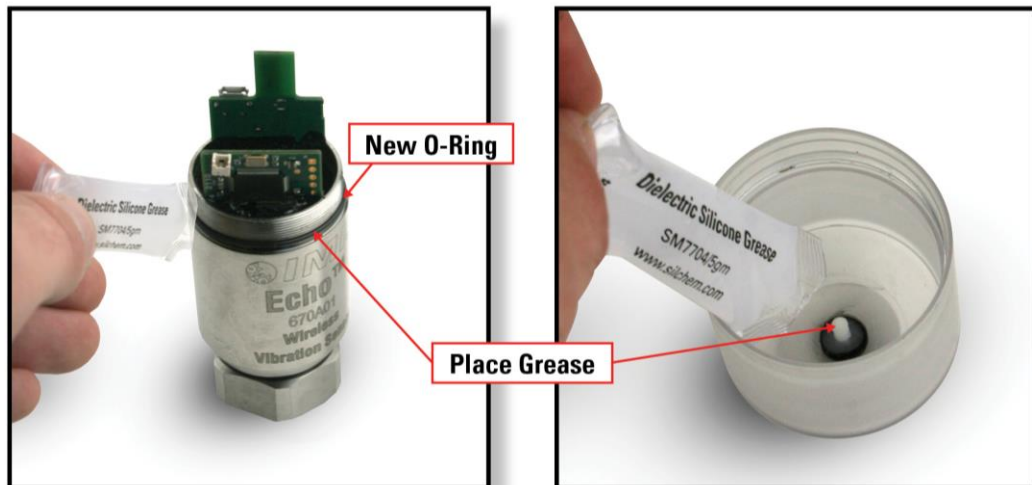
**Battery Replacement Instructions**

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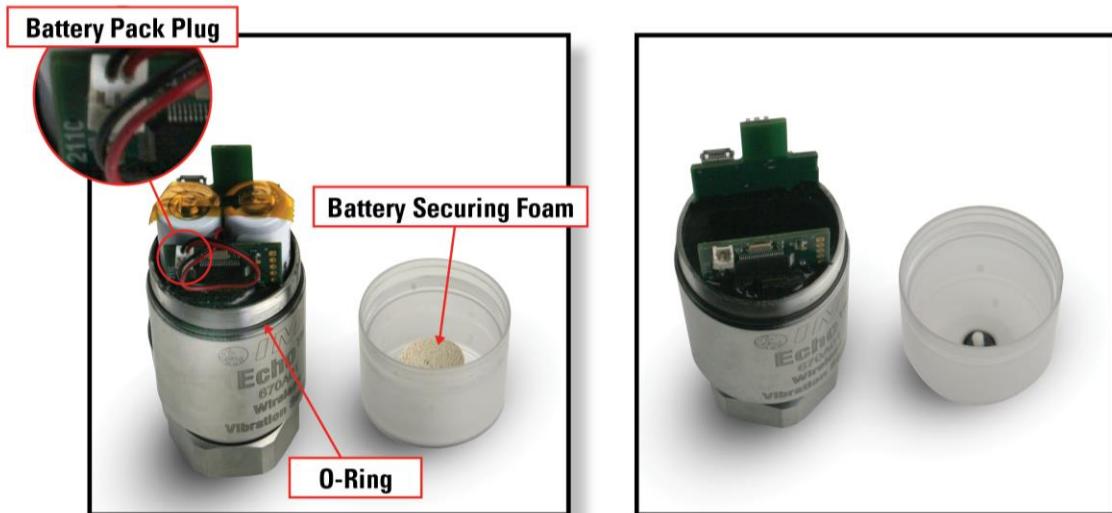


4. Place the new O-ring on the housing
5. Place grease completely around the O-ring
6. Place grease on and around the barb on the inside of the cap

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.

## Performance

| | ENGLISH | SI | |
|---|---|---|---|
| RMS Velocity Frequency Range(± 3 dB) | 4 to 2300 Hz | 4 to 2300 Hz | [2] |
| Velocity HP Filter | 2 Hz, 1-pole RC | 2 Hz, 1-pole RC | |
| Velocity LP Filter | 2400 Hz,3-pole Chebyshev | 2400 Hz,3-pole Chebyshev | |
| Velocity Resolution | 0.001 ips rms | 0.025 mm/s rms | |
| Velocity Range | 4 ips rms | 101.6 mm/s rms | |
| RMS Acceleration Frequency Range(± 3 dB) | 2200 to 15,000 Hz | 2200 to 15,000 Hz | [2] |
| Acceleration HP Filter | 2000 Hz,4-pole Chebyshev | 2000 Hz,4-pole Chebyshev | |
| Acceleration LP Filter | 15k Hz, 3-pole Chebyshev + 1-pole RC | 15k Hz, 3-pole Chebyshev + 1-pole RC | |
| Acceleration Resolution | 0.007 g pk | 0.069 m/s² pk | [3] |
| Acceleration Range | 20 g pk | 196.2 m/s² pk | [3] |
| Transverse Sensitivity | ≤ 7 % | ≤ 7 % | |
| Velocity Linearity(0-1 ips rms) | <1 % | <1 % | [4] |
| Velocity Linearity(0-4 ips rms) | <8.5 % | <8.5 % | [4] |
| Acceleration Linearity | <1 % | <1 % | [4] |

## Environmental

| | | | |
|---|---|---|---|
| Overload Limit(shock) | 1000 g pk | 9810 m/s² pk | |
| Temperature Range(electronics) | -4 to +158 °F | -20 to +70 °C | |
| Temperature Range(base) | -40 to +250 °F | -40 to +121 °C | |
| Temperature Range(battery) | -76 to +185 °F | -60 to +85 °C | |
| Enclosure Rating | IP66 | IP66 | |
| Transmission Range | 250 ft to>1 mile radius, installation dependent | 250 ft to>1 mile radius, installation dependent | [1] |

## Electrical

| | | | |
|---|---|---|---|
| RMS Velocity | Analog Integration, FFT Sum | Analog Integration, FFT Sum | |
| RMS Acceleration | 3.7 Sec time sample @ 61.4 kHz sample rate | 3.7 Sec time sample @ 61.4 kHz sample rate | |
| Filtered Crest Factor(max) | 16 | 16 | |
| Frequency Band | 900 MHz ISM Band | 900 MHz ISM Band | |
| Number of RF Bands | 12 | 12 | |
| Maximum Power(ERP) | 0.75 mW | 0.75 mW | |
| RF Data Rate | 20 bps | 20 bps | |
| ADC/dynamic range | 16 bit/>90db | 16 bit/>90db | |
| Battery Life(room temperature) | >5 years @ 3-measurements per day | >5 years @ 3-measurements per day | |
| Electrical Isolation | >10$^8$ Ohm | >10$^8$ Ohm | |

## Physical

| | | | |
|---|---|---|---|
| Power | 7.2V Lithium Battery Pack | 7.2V Lithium Battery Pack | |
| Size (Hex x Height) | 1.375 in x 4.40 in | 34.93 mm x 111.8 mm | |
| Sensing Element | Ceramic | Ceramic | |
| Weight | 1 lb | 454 g | |
| Sensing Geometry | Shear | Shear | |
| Housing Material | Stainless Steel | Stainless Steel | |
| Housing Diameter | 1.66 in | 42.0 mm | |
| Mounting | 1/4" - 28 | 1/4" - 28 | [5] |
| Mounting Torque | 3 to 5 ft-lb | 4 to 7 Nm | |
| Sealing | O-Ring | O-Ring | |
| Sensor Activation/Deactivation | Magnet Switch | Magnet Switch | |

*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.*

## 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.

**CS** - Canadian Standards Association Approved Intrinsically Safe [6]

**M** - Metric Mount
Supplied Accessory : Model M081A61 Mounting Stud 1/4-28 to M6 X 1 (1)

**RV** - Buffered Analog Signal Output - 100 mV/g (±20%)

| | | |
|---|---|---|
| Electrical Connector | 1/4-28 4-Pin | 1/4-28 4-Pin |
| Frequency Range(± 3 dB) | 1 to 15,000 Hz | 1 to 15,000 Hz |
| Settling Time(1%) | ≤ 4 sec | ≤ 4 sec |

Optional Accessory : Model 070A86
Supplied Accessory : Model 070A88 (1)
Supplied Accessory : Model ICS-2 NIST-traceable single-axis single-point amplitude response calibration at 6000 cpm (100 Hz) (1)

### NOTES:
[1] Typical.
[2] Upper frequency tolerance is ± 10% of the specified value.
[3] Conversion Factor 1g = 9.81 m/s².
[4] Zero-based, least-squares, straight line method.
[5] 1/4-28 has no equivalent in S.I. units.
[6] CL 1, Div 2, Groups A, B, C, D, T5

### SUPPLIED ACCESSORIES:
Model 081A40 Mounting Stud (1)

| Entered: AP | Engineer: gs | Sales: SA | Approved: BAM | Spec Number: |
|---|---|---|---|---|
| Date: 4/8/2014 | Date: 4/8/2014 | Date: 4/8/2014 | Date: 4/8/2014 | **42657** |

**IMI SENSORS**
A PCB PIEZOTRONICS DIV.
3425 Walden Avenue, Depew, NY 14043

**Phone: 800-959-4464**
**Fax: 716-684-3823**
**E-Mail: imi@pcb.com**

41966

4.4 [112]

Ø1.66 [42.0]

1/4-28 UNF-2B ▽ .20 [5.3]

Ø.87 [22.1]

Ø1.50 [38.1] ACROSS CORNERS

1.375 [34.9] HEX

1/4-28 UNF - 2B ▽ .20 [5.3]
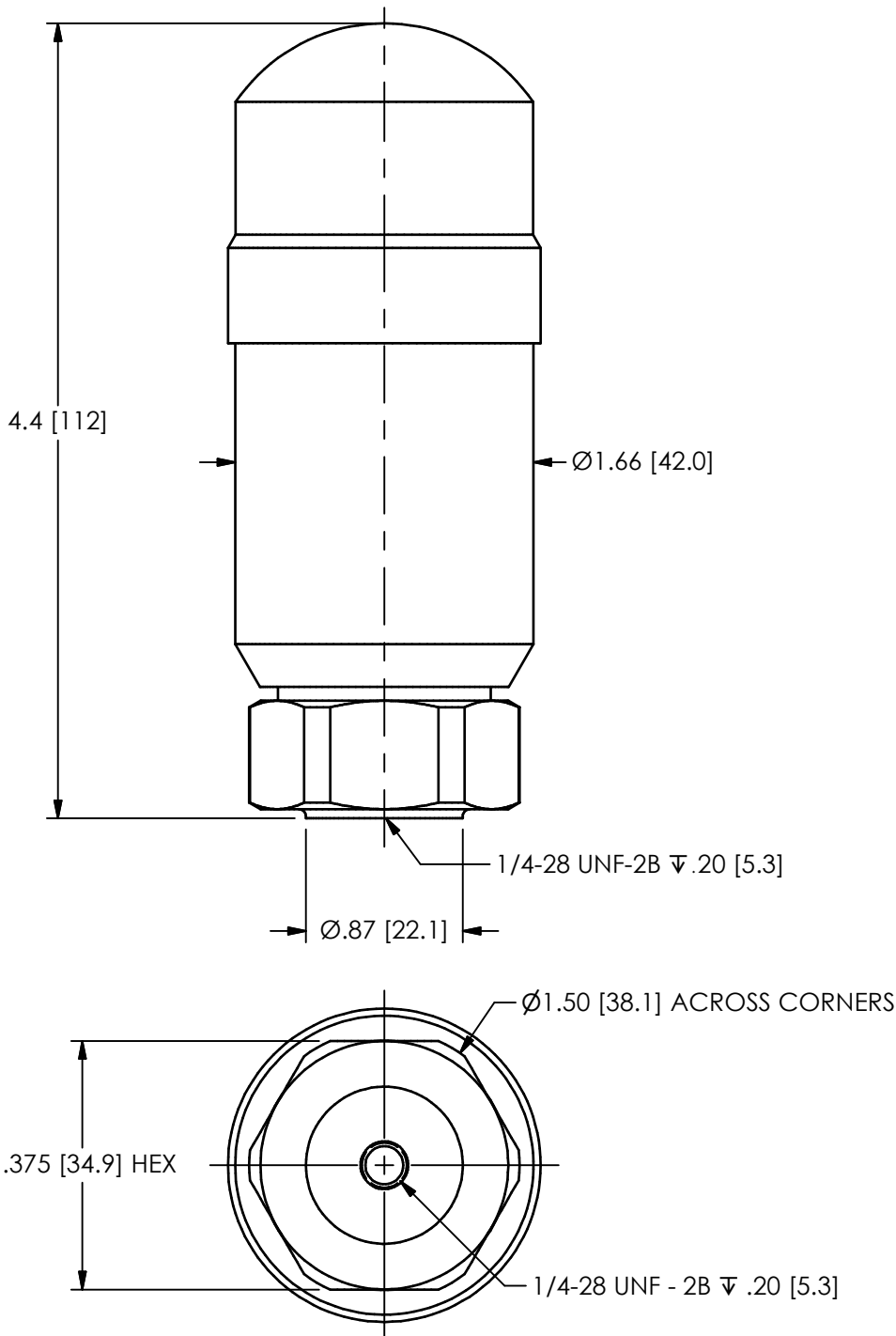


| UNLESS OTHERWISE SPECIFIED TOLERANCES ARE: | | DRAWN | | CHECKED | | ENGINEER | | PCB PIEZOTRONICS™ | |
|---|---|---|---|---|---|---|---|---|---|
| DIMENSIONS IN INCHES | DIMENSIONS IN MILLIMETERS [ IN BRACKETS ] | BB | 01/23/15 | ECB | 01/23/15 | BAM | 01/23/15 | 3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com | |
| DECIMALS   XX  ±.03           XXX  ±.010 | DECIMALS   X  ± 0.8            XX  ± 0.25 | TITLE  OUTLINE DRAWING 670A01 WIRELESS | | | | | | | |
| ANGLES ± 2 DEGREES | ANGLES ± 2 DEGREES | | | | | | | CODE IDENT. NO. 52681 | DWG. NO. 41966 |
| FILLETS AND RADII .003 - .005 | FILLETS AND RADII 0.07 - 0.13 | | | | | | | SCALE:   FULL    SHEET   1 OF 1 | |

# Certificate of Compliance

| | | | |
|---|---|---|---|
| **Certificate:** | 2646140 | **Master Contract:** | 184981 |
| **Project:** | 2646140 | **Date Issued:** | February 21, 2014 |

**Issued to:** **Industrial Monitoring Instr. (IMI)**

**A Div. of PCB Piezotronics, Inc.**
**3425 Walden Ave**
**Depew, NY 14043**
**USA**
**Attention: Gordon Singh**

*The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.*



**Issued by:** Jack Chin
*Jack Chin*

## PRODUCTS

**CLASS 2258 82**    - PROCESS CONTROL EQUIPMENT - For Hazardous Locations - Certified to US Standards

**CLASS 2258 02**    - PROCESS CONTROL EQUIPMENT - For Hazardous Locations

**Class I, Division 2, Groups A, B, C, D:**

Model **##670RXX Vibration Sensor, battery operated 7.2 V Saft Lithium battery pack, Temperature Code T5 at ambient temperature range: − 20°C to + 70°C.

where

** represents the certification type. ** = CS (CSA version), EX (ATEX and CSA version)

## represents the order features. ## = Blank, A,M,..

R represents family code. R=A,B,C,………to Z.

XX represents different mounting, cabling, and accessories variations. XX=01,02 to 99.

Notes:

DOC # 58443
REV: NR
ECO: 41674

1.    For Canadian Installations, the sensor metallic housing must be bonded to ground according to Section 18-074 of the CEC Part 1-2012.

2.    For US Installations, the sensor metallic housing must be bonded to ground according to Article 501.30 of the NEC-2011.

**APPLICABLE REQUIREMENTS**

CAN/CSA-C22.2 No. 0-M91        -        General Requirements – Canadian Electrical Code, Part II

C22.2 No. 142-M1987    -        Process Control Equipment

C22.2 No. 213-M1987    -        Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Location

ANSI/ISA 12.12.01-2007 -        Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations

**MARKINGS**

-        CSA Monogram with C/US indicator.

-        Submittor Identification

-        Model Number

-        Serial Number, Date Code or Month and Year of Manufacture

-        Hazardous Location Designation: Class I, Div. 2, Groups A, B, C and D

-        Warning: See manual/Voir manuel

-        Warning in French and English: 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.

-        See Manual for additional markings in French and English:

    - Warning: Explosion hazard- Do not open when an explosive atmosphere may be present.

    - Warning: Explosion hazard- Substitution of components may impair suitability for Class I, Division 2.