IMI SENSORS
A PCB DIVISION

Model 672A01

EchoPlus® Wireless Junction Box (8-channels), 916 MHz

Installation and Operating Manual

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

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EchoPlus® Wireless Junction Box
User's Manual

Model: 672A01 (916 MHz) / 672A02 (868 MHz)

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FCC NOTICE – 672A01

FCC ID: ZOC-IMI672A01

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 672A01

IC: 9732A-IMI672A01

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.

Introduction

The EchoPlus® Wireless Junction Box, Model 672A01, is an 8-channel junction box that allows standard wired industrial accelerometers to operate wirelessly transmitting measurements with 916 MHz RF transmitter. Model 672A02 is an identical unit but with an 868 MHz RF transmitter. These units provide a raw vibration output, via a BNC connector, that can be used with a portable data collector for full data collection and analysis. It also includes power circuits, signal processing electronics, and a transmitter for automatic wireless operation.

Standard ICP® industrial accelerometers are connected to the EchoPlus® Wireless Junction Box via cables, the same as with a standard junction box. However, the EchoPlus® Wireless Junction Box periodically powers the sensors and transmits overall vibration measurements wirelessly (the time interval between transmissions is user programmable). The transmitted measurements are optimized to be sensitive to most common machinery faults such as: unbalance, misalignment, looseness, bearing faults and gear faults. When a potential fault is identified, an analyst can use a portable vibration data collector, plug into the junction box BNC connector, and do detailed TWF and FFT analysis. The wireless measurements provided are: rms velocity, rms acceleration, true peak acceleration, and crest factor. The acceleration signals are passed through a 2 kHz high pass filter to provide more sensitivity for high frequency energy as found in certain bearing, gear, and other high frequency faults.

EchoPlus® "wakes up" at pre-determined intervals (8 hours by default) and for each active channel (8-channels maximum) powers the sensor, measures overall vibration levels, and transmits the results. A bank of LED's in the unit provides visual feedback on the state of the box, see page 6.

The transmitted data is received by an Echo® Receiver, (673B01 for 916 MHz systems and 673B02 for 868 MHz systems) decoded, and sent via Ethernet (TCP/IP) 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.

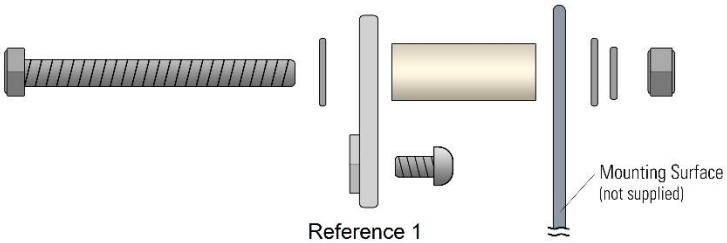
Proper Handling

Proper handling of the EchoPlus® Wireless Vibration Junction Box is critical to preventing damage. The box is rated at NEMA 4x (IP 66) and while it can be used in areas where there is incidental contact with water and the elements, it is not recommended that it be placed in an area where it will be subjected to heavy sprays or harsh weather. The box has a useable temperature range of -4° to +158° F (-20° to +70° C). Exposure to temperatures outside of this range may result in damage to the electronic circuits.

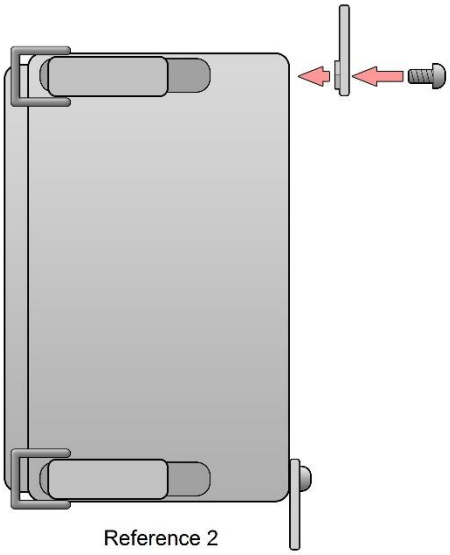
Physical Installation

The junction box is provided with four (4), 1.25 inch long nylon spacers. The box should be mounted with the spacers placed between the box mounts and the mounting surface. This will ensure the ceramic chip antenna on the circuit board in the junction box is far enough away from the mounting surface to avoid “Antenna Loading” that can degrade RF performance. This is particularly true if the mounting surface is metal or contains some metal.

Attach four (4) supplied mounting brackets to the back of the junction box as shown in the Figure 2 below using four (4) supplied #14 x ½” self tapping screws. Note: The brackets and box indents are “keyed” and can only be installed vertically. Next, attach the box to the mounting surface using the following supplied hardware: four (4) 5/16” x 18 x 2.5” hex bolts, eight (8) flat washers, four (4) lock washers, and four (4) 5/16” x 18 hex nuts in conjunction with the nylon spacers as shown in References 1, 3, and 4 below.



Reference 1



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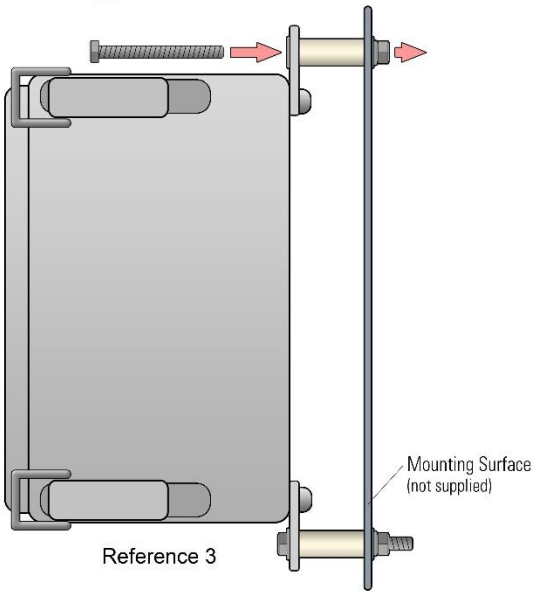

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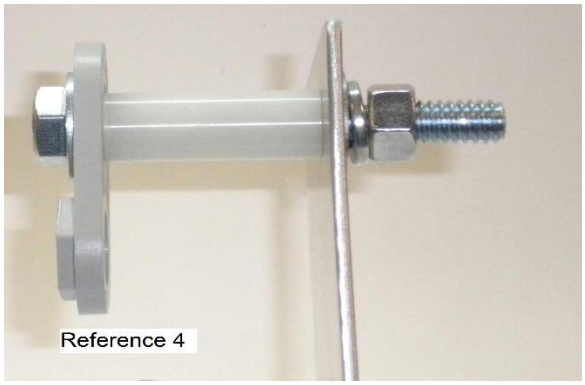


Reference 4

Powering the Box

The Junction Box can be powered by either 24 VDC that is readily available in many industrial plants or by any battery (or battery pack) with a voltage between 6 and 13 VDC. A battery can also be hooked up simultaneously with 24 V power and be used as a backup to 24 VDC power. Power cords should be routed through the cord grips in the bottom of the box (see photo below). There are 10 cord grips, 8 for the sensor cables, 1 for 24 VDC power, and 1 for battery power. Any cord grip can be used for any input; however, the diagram below the photo shows the recommended configuration that conforms to the channel layout in the box. Turn the cord grips counter clockwise to open them, insert the required amount of cord, then turn the cord grips clockwise to tighten them and hold the cords in place.

Recommended Cord Grip Layout

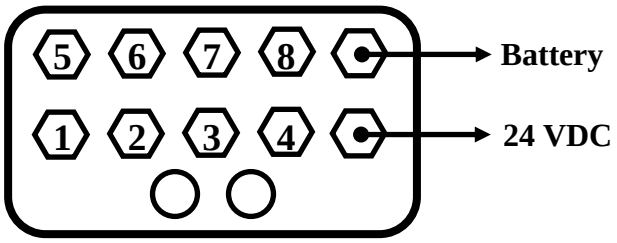


Figure 1

Caution: While there is reverse polarity and some overvoltage protection in the circuits, be careful to hook the power to the correct terminal or damage to the board could occur. **Warning**: Under no circumstances should 120 or 220 VAC power be connected directly to the power terminals. Damage to the board will occur.

Power Supply

It is recommended that a single 24 VDC power supply having a minimum 100 mA output current be used to power each junction box Figure 2 shows an optional IMI Model 682A01, 24 VDC power supply. Figure 3 shows and optional Model 682A00 DIN Rail Enclosure. If multiple junction boxes must be powered from a single power supply, install a DC-DC Converter between the power supply and each junction box to isolate the grounds, and then ground each box as described below. If multiple boxes are powered from they same power supply and the boxes are grounded without using DC-DC Converters, ground loops may be created that can contaminate the data. The EchoPlus® Wireless Junction Box may also be powered by a 6 to 13 VDC battery or battery pack. When powered by a battery, it should still be grounded as described below.

Figure 2 - IMI Model 682A01 Din Rail Mount 24 VDC Power Supply

Figure 3 - Model 682A00 Din Rail Enclosure with Optional DIN Rail Modules

Grounding

The power return, sensor shields, and earth ground (green wire in Figure 4) must be connected together to reduce electrical noise that can adversely affect the measurements. The Terminal Lug in the junction box is common to the sensor shields. Run a 12 or 14 gauge wire from the RETURN (-) contact on the terminal block, to the terminal lug, and a second wire from the terminal lug to earth ground. For best performance, the earth ground must be on the same ground plane as the machinery being monitored. The cable shields should be floating on the sensor end and grounded in the box. Note: if you are using standard IMI cables, they follow this convention.

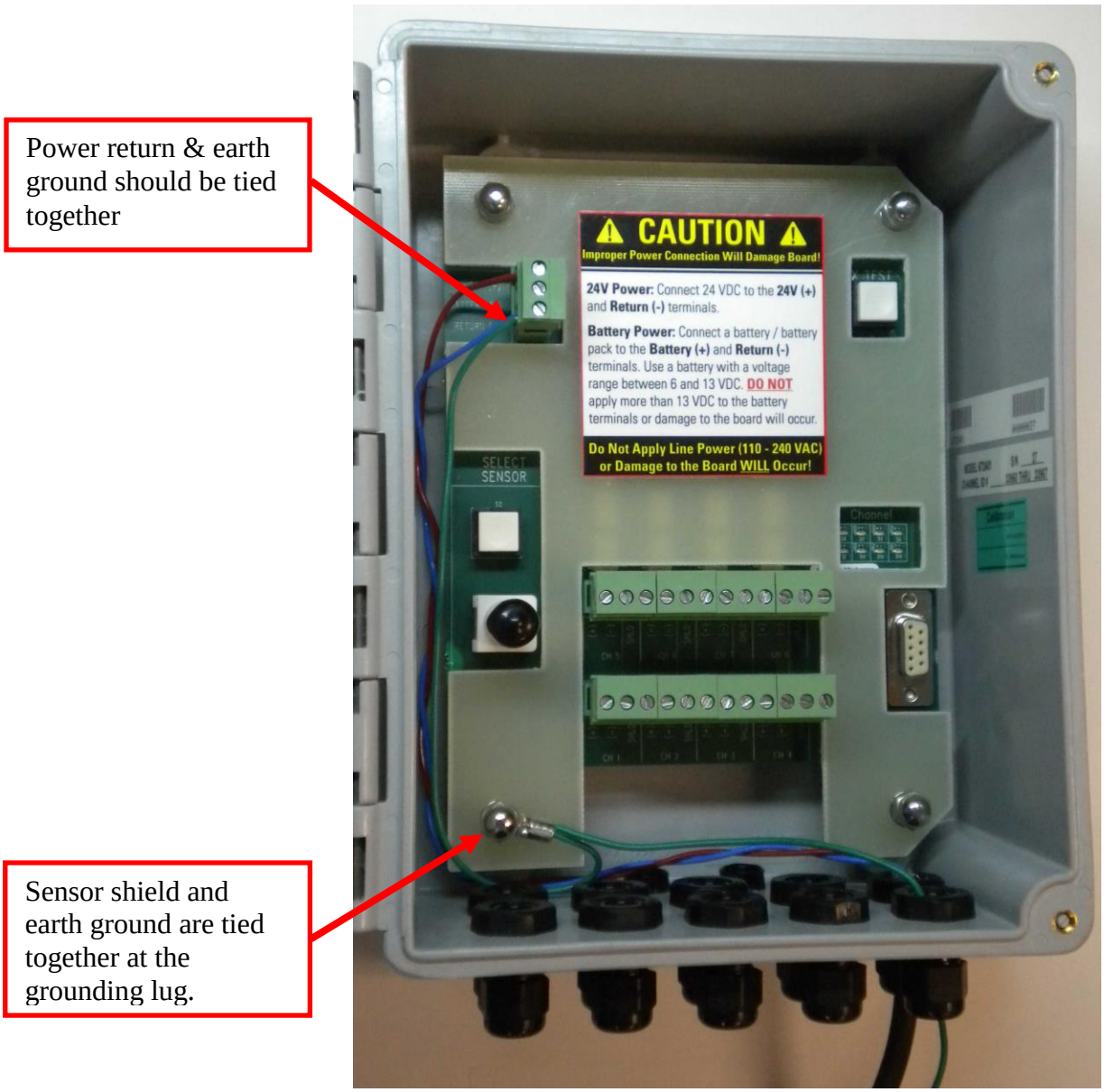


Figure 4 - Connect Ground Wires in Box as Shown

LED Status Messages

When power is applied to the box, the LED bank (see photo below) will illuminate briefly and a measurement cycle will start. For each active channel, the corresponding LED will illuminate while measurements are being made on that channel. After all measurements are made and for each active channel, the corresponding LED will blink while measurement are be transmitted to the receiver. When the measurement cycle is complete, the LED bank will blink once every 4 seconds until the next scheduled measurement time. See the LED summary below.

Channel			
5	6	7	8
1	2	3	4

The diagram to the right of the LED bank photo above shows the order of the channels.

Blue LED Message	Sensor Status
4 second intermittent blink of all LEDs	The box is waiting for the next measurement period.
Bright illuminated single LED	Vibration levels are being measured on the illuminated channel.
Fast blinking LED	Measurements for that channel are being transmitted to the receiver.
Bright illuminated single LED	Power is being supplied to the sensor on that channel and the Raw Vibration output is available at the BNC connector. This occurs only when manually initiated by the user at the box.
All LEDs illuminated	The box is connected to the computer via the serial connection.

Connecting Accelerometers to EchoPlus®

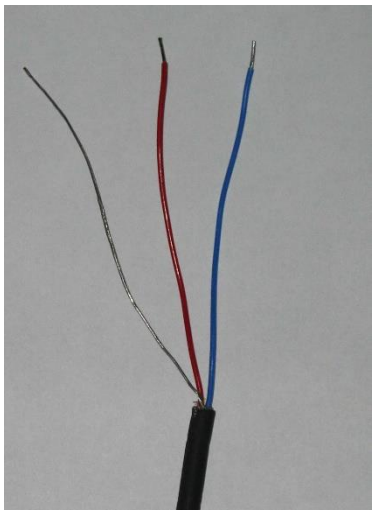
Accelerometers can be connected to the EchoPlus® Wireless Junction Box two ways.

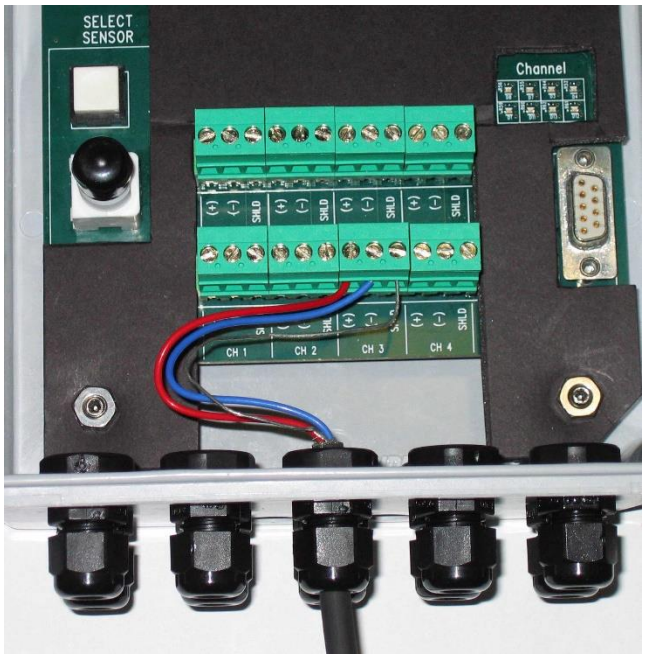
1. Sensor wires can be connected directly to EchoPlus®. This will allow both wireless operation and use of a portable data collector.
2. If the sensors are already connected to a traditional junction box and you want to use it for portable data collector measurements, wires can be jumped between the boxes. If it is hooked up in this manner, a portable data collector can be used with either the traditional junction box or EchoPlus®.

A good quality, twisted pair shielded cable like the IMI Model 052, should be used to connect the accelerometers. Refer to the photos on the next page.

1. Strip back the outer insulation of the cable to expose the appropriate length of wires needed.
2. Strip about ¼" of insulation off the end of the wire and tin it if possible.
3. Loosen the locking nut on the appropriate cord grip. It may be easier to remove the locking nut and slide it onto the cable before attempting to insert it. This will make inserting the cable through the body of the cord grip easier.
4. Insert the cable into the cord grip until the outer insulation just reaches inside the box.
5. Tighten the locking nut to secure and seal the cable.
6. Insert the appropriate cable into the (+), (-), and SHLD (shield) terminals on the appropriate 3-socket terminal strip and secure the cable using the screw. Be sure to check polarity.
7. The cable is now ready for use.

Alternately, a similar cable can be run from an existing junction box to EchoPlus® making both boxes functional. It is likely easier to discard the old box and run the sensor cables directly into EchoPlus®.





Programming the EchoPlus® Wireless Junction Box

The EchoPlus® Wireless Junction Box can be programmed with a computer running the Echo® Monitoring Software using a serial port on the computer. See the *Echo® Monitoring Software User's Manual* for complete details.

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.

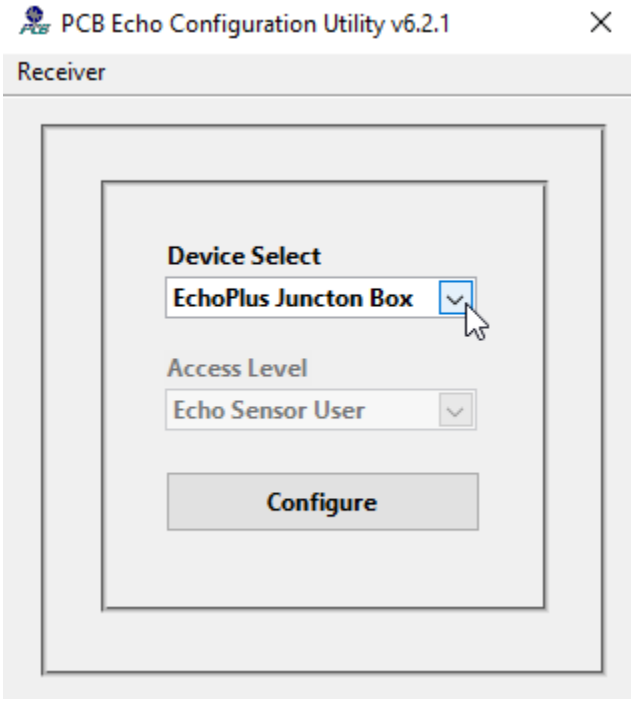
Connect the Serial Cable

If a serial cable is connected to the unit when a measurement cycle is in progress, the unit will refuse the connection until the cycle is complete. For this reason, the following procedure is recommended.

Connect the serial cable the computer's serial port (use a USB to RS232 adaptor if necessary). Connect the other end of the cable to the serial port in the junction box as shown below. Apply power to the box. The junction box will not go into a measurement cycle but will connect to the computer. All LED's will illuminate and stay on as long at the serial cable is attached.

EchoPlus Configuration using the Echo® Configuration Utility or Echo® Data Presentation Software

Open the PCB Echo® Device Configuration Utility Software. You should see a screen similar to the one below.



Select **EchoPlus Junction Box** as the device and click the **Configure** button to access the EchoPlus® Configuration screen shown in Figure 5.

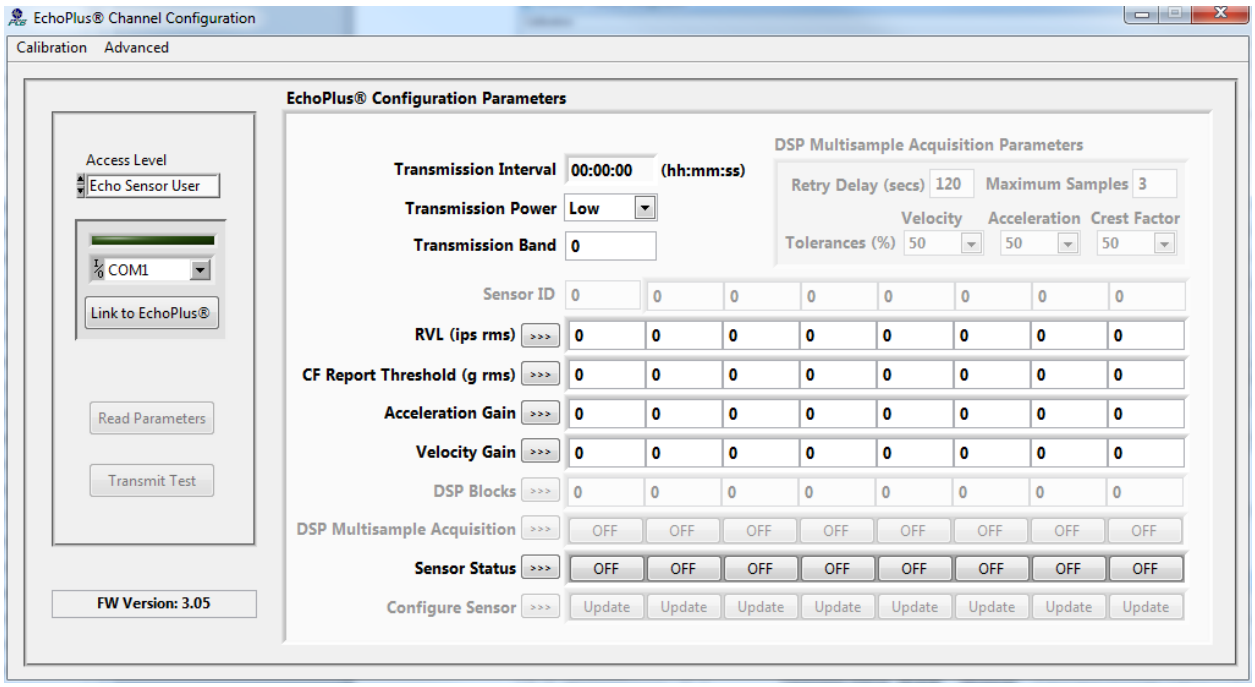


Figure 5 – EchoPlus® Configuration Screen

Alternatively, the EchoPlus® Configuration utility can be accessed from the Echo® Data Presentation Software using the **Configuration | Add Echo or EchoPlus sensors…** menu item (Figure 6). Or, right clicking on any EchoPlus channel already present in the system (channel Id >32767) and selecting **View/Edit Channel Settings…** Next, from the Echo® Sensor Parameters Editor screen select Echo Devices | Connect (Figure 7).

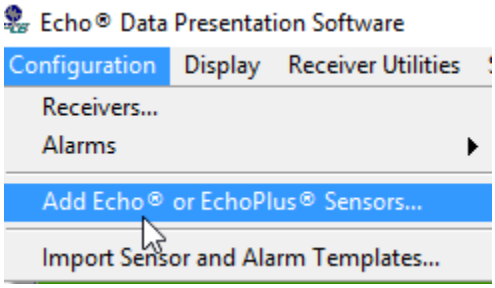


Figure 6 – Echo SW Main Menu

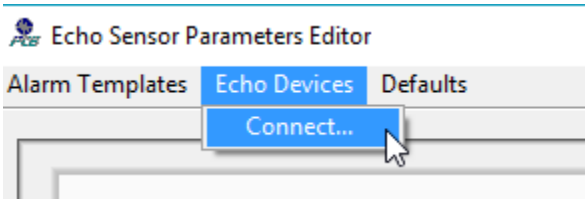


Figure 7 – EchoPlus® Configuration Screen

The EchoPlus® Device Configuration Utility provides a mechanism to read and write the sensor parameters for all 8 channels in an EchoPlus® junction box. These values are stored in, and used by, the EchoPlus® device. Typically, the only parameters that require modification are the Transmission Interval, the Residual Vibration Level (RVL) and the Crest Factor Threshold. The Sensor ID is set at the factory and must not be changed.

A Calibration utility, accessible from the Configuration screen menu bar, may be used to fine tune the data transmitted for sensors connected to it that have a sensitivity other than 100 mV/g.

To connect, select the appropriate COM port and click the 'Link to EchoPlus®' button shown in Figure 5 **when the junction box is not in an acquisition/transmit mode (i.e. all LEDs are off).** The serial port connection will cause all 8 blue LEDS in the box to light and stay lit until the cable is disconnected. When in this state the unit will not transmit data.

Once connected, the software will read the settings from the junction box and display them on the screen. An example of this is shown in Figure 9.

Note: If you are setting up your Echo database, it is highly recommended that you configure the EchoPlus® Junction Box and add channels to 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 these settings. See the *Echo® Monitoring Software User's Manual* for setup details.

If you get an error message similar to Figure 8 after clicking on Link to Echo®, click Continue on the error message, and then check that the COM port selection is correct and the unit is not in an acquisition/transmission cycle and then click the **Read Parameters** or **Link to EchoPlus** button.

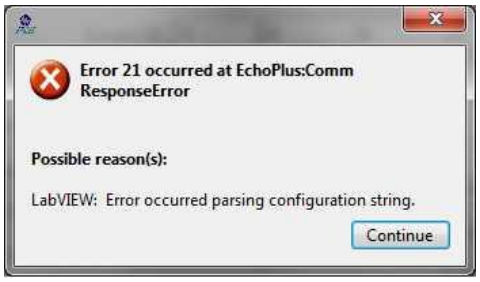


Figure 8 – EchoPlus® Configuration Error Message

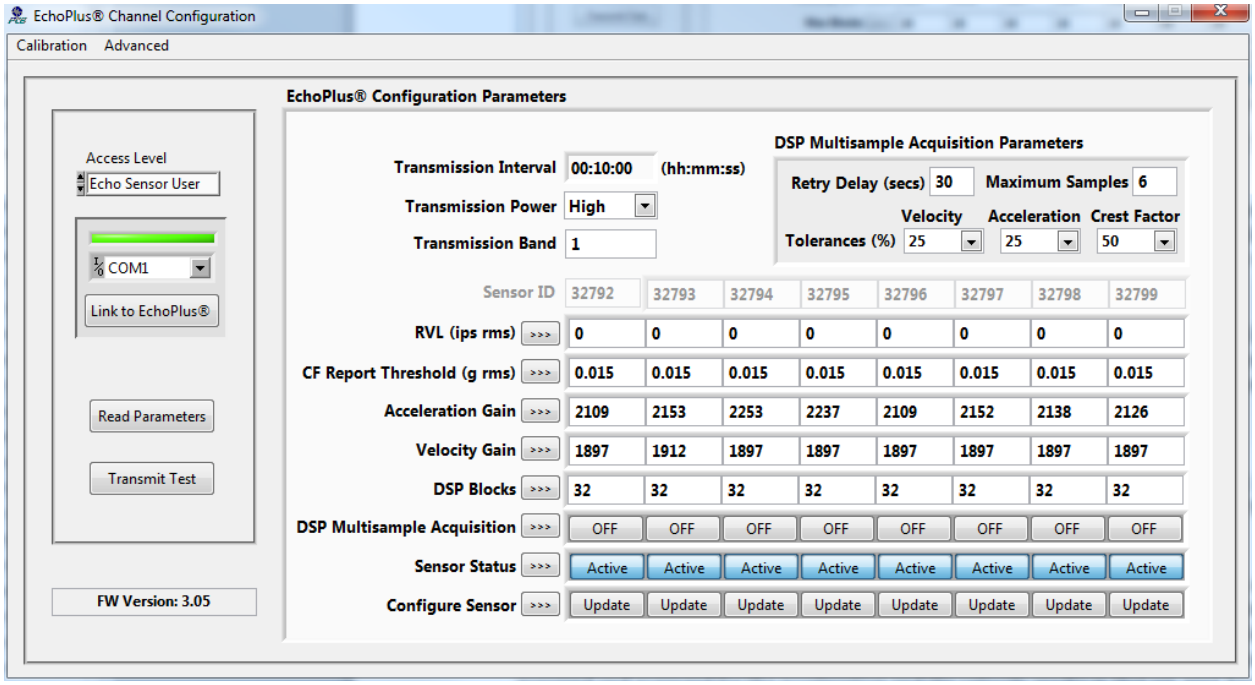


Figure 9 – EchoPlus® Configuration Utility Connected

The parameters are listed from top to bottom on the left with each column representing a channel's settings. Most channel parameters can be set individually except for Transmission Interval, Band, Power and the Multi Sample Acquisition Parameters. These are unit parameters. All enabled channels will transmit data at this interval, power level and band if they meet the RVL criteria. The Multi Sample Acquisition Parameters are active for a channel ONLY if that channel has Multi Sample Acquisition set to Active. Otherwise, the normal data acquisition algorithm is used.

Note the column of buttons on the left with the '>>>' designation. These facilitate setting all channels to the same value as channel 1 for the associated parameter. To accomplish this task set a value in channel 1 for the parameter of interest and then click on its '>>>' button to set that parameter for all channels.

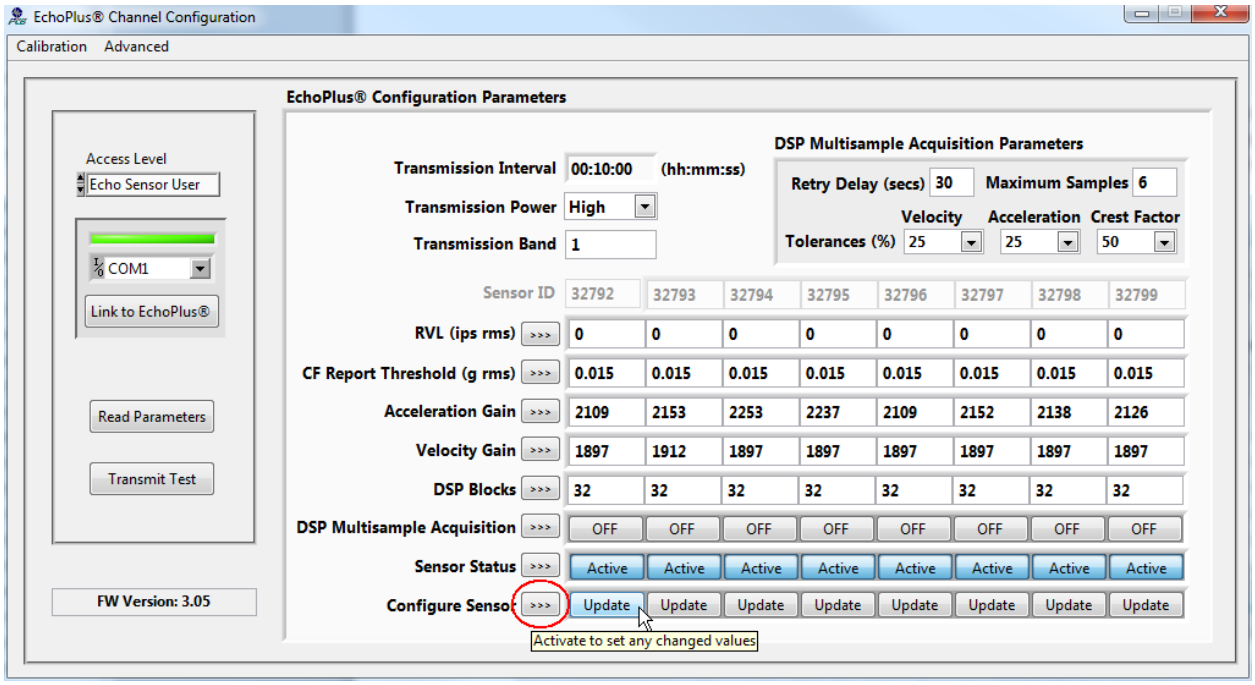


Figure 10 – EchoPlus® Configuration Utility Update

When all parameters for a channel are set, click on the **Update** button for that channel and the parameters will be sent to the channel. If a channel is not connected or the data is not to be collected for that channel then set the **Sensor Status** setting for that channel to the **OFF** setting and **Update** it. This will disable the channel. Note the red circled button above, activation of it will update all enabled channels rather than activating the individual channel **Update** buttons.

Clicking any update button will update the unit level settings.

To verify programming, click the **Read Parameters** button.

EchoPlus® channel numbers are always assigned at the factory and should never be changed. Additionally the ID numbers are always greater than or equal to 32768 and channel 1 will always be a multiple of 8 (examples of channel 1 IDs are 32768, 32776, 32784 etc..).

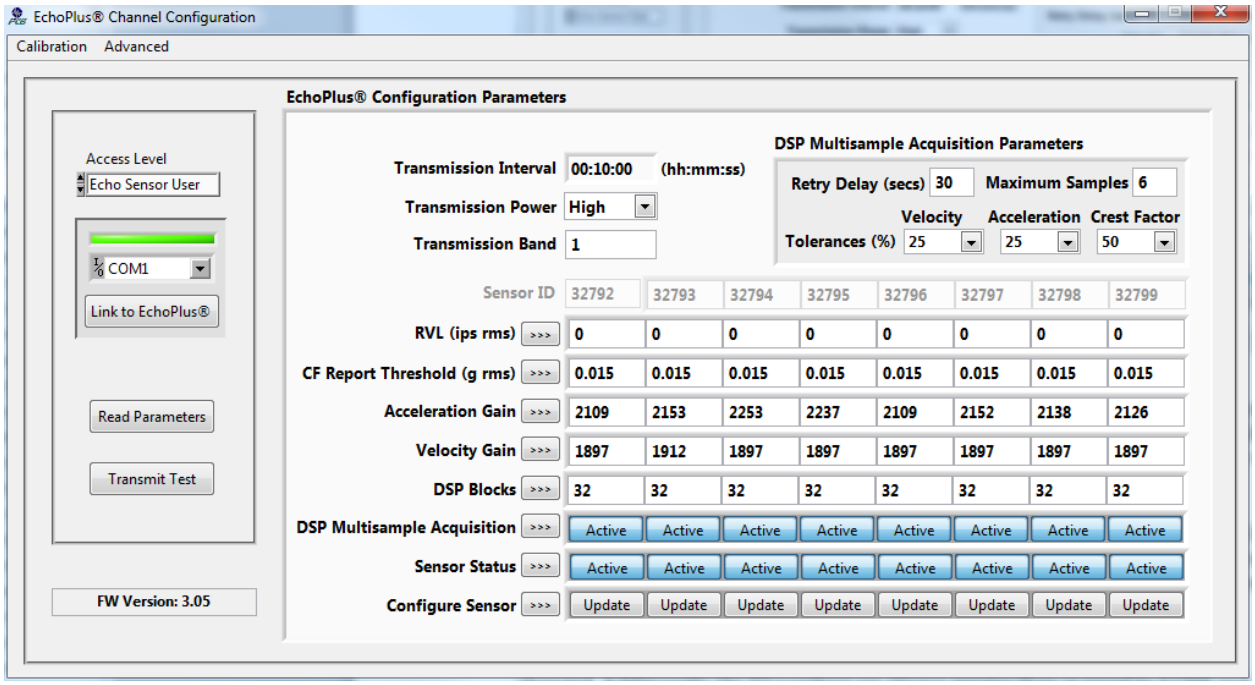


Figure 11 – EchoPlus® Configuration Utility with Multi-Sample Acquisition Active

EchoPlus® Wireless Junction Box Parameters

Sensor ID

The Sensor ID is a unique ID programmed for each channel of the junction box and set at the factory. This number **cannot** be changed.

Transmission Interval

The Transmission Interval is the time between transmissions. The factory default level is 8 hours. The junction box will "wake up" and make a measurement on each active channel every 8 hours (3 times per day). This parameter is programmable in 4 second increments.

Note: Decreasing the transmission interval (i.e., increasing the number of measurements per day) will not only reduce battery life (when running off battery power) 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.

Minimum Transmission Interval

672A01 916 MHz Systems – No minimum transmission interval

672A02 868 MHz Systems (EU) – 1% duty cycle. Each transmission requires 4.5 seconds to complete. Therefore, each channel must be inactive for 450 seconds after a transmission.

The following table defines the minimum transmission intervals for Model 672A02 EchoPlus® junction boxes based on the number of channels in the unit that are active (enabled).

Active Channels	Minimum Transmission Schedule hr:min:sec (s)
1	0:07:30 (450)
2	0:15:00 (900)
3	0:22:30 (1350)
4	0:30:00 (1800)
5	0:37:30 (2250)
6	0:45:00 (2700)
7	0:52:30 (3150)
8	1:00:00 (3600)

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 ≥ 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

Crest Factor (CF) is the ratio of true peak acceleration divided by rms acceleration. For a sine wave, this value is 1.414. EchoPlus® high pass filters 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.

Sensor Status

The sensor status displays if the specific accelerometer channel is Active or Off. If no sensor is attached to a channel, it is recommended to set the channel to Off. During a measurement cycle, a channel set to Off is skipped. When using the manual Sensor Select switch for measurements with a data collector, a channel will be selected regardless of its status. In that case, simply toggle past the ones of no interest.

Acceleration Gain

The Acceleration Gain value is used to normalize and calibrate acceleration measurements. These are factory set for a nominal 100 mV/g accelerometer. If you have

the actual calibration sensitivity for your sensor or have a different sensitivity accelerometer, this gain can be adjusted using the calibration feature. If you have a full calibration for you accelerometer, use the sensitivity at 5000 Hz for acceleration. If not, use the sensitivity at 100 Hz. See the *Echo® Monitoring Software User's Manual* for details.

Velocity Gain

The Velocity Gain value is used to normalize and calibrate velocity measurements. These are factory set for a nominal 100 mV/g accelerometer. If you have the actual calibration sensitivity for your sensor or have a different sensitivity accelerometer, this gain can be adjusted using the calibration feature. Use factory provided sensitivity at 100 Hz for velocity. See the *Echo® Monitoring Software User's Manual* for details.

DSP Blocks

The Digital Signal Block (DSP) size parameter is unique to the junction box and can be set on a per channel basis. The Echo® Multichannel system acquires acceleration and velocity data in sample blocks over 0.328 seconds, consisting of 2048 samples of velocity data and 18432 samples of acceleration data. The DSP Blocks variable controls the number 0.328 second blocks that are acquired and averaged for the acceleration and the velocity readings that are sent back to the receiver. For any given reading, the first 7 blocks are used to set the analog gains for the sensor inputs; thus a setting of 16 results in an acquisition times of (16-7)*0. 328 s= 2.952 s, while a setting of 128 results in an acquisition time of (121)*0.3 s=39.688 s. This variable can be set individually for each channel so that a specific sensor can be sampled for a longer time period. Following is a table of total acquisition time required for several DSP Block size assignments. Note that there is some overhead time required for each channel so the total time is greater the acquisition time described above.

DSP Block	Time(s)
128	55
80	37
80	36
72	34
64	31
40	23
32	20
20	15.5
16	14

Figure 12 – EchoPlus® Total Acquisition Time per Channel Table

EchoPlus® Multi-Sample Acquisition Parameters

The Multi Sample Acquisition Parameters are used to implement a sophisticated data acquisition algorithm for industrial situations where transient noise may be present which could be picked up by a sensor or the cabling and interfere with the normal data acquisition that generates the velocity and acceleration readings. If the **Multi-sample Acquisition setting** is turned on, the following process is followed in the junction box

firmware. First, 3 initial readings are acquired by the microcontroller from the DSP and if the 3 readings are within the specified **Tolerance ranges** for velocity, acceleration and crest factor, then the last reading (reading number 3) is transmitted back to the receiver. If the first 3 readings are not within the tolerance range, then an additional (fourth) reading is acquired from the DSP and the most recent 3 readings (2, 3 & 4) are evaluated to be within the tolerance range. If so then the fourth reading is transmitted to the receiver. If not, then the process is repeated, up to the number of sample readings specified in the **Maximum Samples** setting (up to 10), looking for 3 successive readings within the specified tolerances. If 3 successive readings are not within the specified tolerances, then the system "sleeps" for the time specified in the **Retry Delay** setting and then repeats the process. The parameter definitions are as follows:

- **Multi-sample Acquisition Enable** (ON/OFF) – Turns the multi-sample acquisition on or off for the specified channel. If multi-sample acquisition is OFF then a single reading is taken based on the DSP block size and transmitted without checking multiple samples for tolerance levels.
- **Maximum Samples** (3-10) – Number of samples to take while looking for 3 consecutive readings that are within tolerance.
- **Retry Delay** (5-255 seconds) – time to wait until the next acquisition attempt if the first pass of finding 3 consecutive readings within tolerance fails. This delay stops processing until it expires resulting in increased data collection time for the active transmission interval. Care should be taken to ensure the maximum possible time to acquire all enabled channels in the junction box does not exceed the **Transmission Interval** itself.
- **Tolerance Percent's** (50, 25, 12.5, 6.25, 3.125) – These are the available selections, in percent, for determining if the 3 consecutive samples are close enough to declare a good reading has been acquired and can be transmitted to the receiver. They are individually set for Velocity, Acceleration and Crest Factor. **Note**: Crest Factor only allows selections of 50, 25 and 12.5.
- **Multi-sample processing results –** the results of the multi-sample acquisition is provided by the **DSP Status** value transmitted with each channels data. The DSP Status can be viewed in the channels **History** table accessible from the **Echo Data Presentation Software** main screen. The values are as follows
    - **0 –** No error, the 1st 3 consecutive samples were found to be in tolerance (or Multi sample is turned off for the channel).
    - **1 –** The transmitted data was out of tolerance in the 1st three sample comparison but was valid with subsequent sampling before the need to delay and retry.
    - **2 –** 3 consecutive samples were found to be in tolerance on the 2nd pass after the retry delay.
    - **3 -** 3 consecutive samples were not found to be in tolerance.

Factory Defaults

- Sensor ID is a unique factory set number for each sensor and **cannot** be changed.
- Transmission Interval = 08:00:00 (8 Hours)
- Transmission Power = High
- Transmission Band = 1
- RVL = 0 (off)
- CF Report Threshold = 0.15
- Velocity Gain = varies
- Acceleration Gain = varies
- DSP Blocks = 64
- Multi Sample Acquisition = OFF
- Sensor Status = ACTIVE

EchoPlus® Sensor Calibration Utility

The calibration utility is included to improve the accuracy of the readings that are transmitted by the junction box. The initial gain settings of each channel assume that the attached sensor has a sensitivity of 100mV/g. If the actual calibrated sensitivity is known or the sensor sensitivity has a different general rating such as 10, 50, or 500 mV/g then that can be adjusted for here by calculating new Velocity and Acceleration Gain values.

From the EchoPlus® Channel Configuration screen, click, on **Calibration** in the upper left had corner of the screen, then select the appropriate signal type; Velocity (low band) or Acceleration (high band).

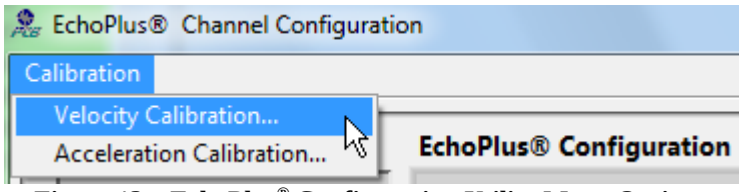


Figure 13 – EchoPlus® Configuration Utility Menu Options

These screen layouts have 6 columns and 8 rows. Each row represents a channel. The Columns are as follows

- Current Cal column - shows the current value for the channel.
- Nominal Sensitivities column – select the appropriate nominal sensitivity for the attached sensor
- Actual Sensitivity – enter the sensors actual sensitivity from the calibration certificate here if it is known. If not make this the same as the nominal value.
- Calculate – click on this button when the sensitivities are entered.
- New Cal – this shows the new calculated calibration factor.
- Accept – click to accept the value.

When all channel values are entered, close the window. The accepted values will be written to the junction box channel.

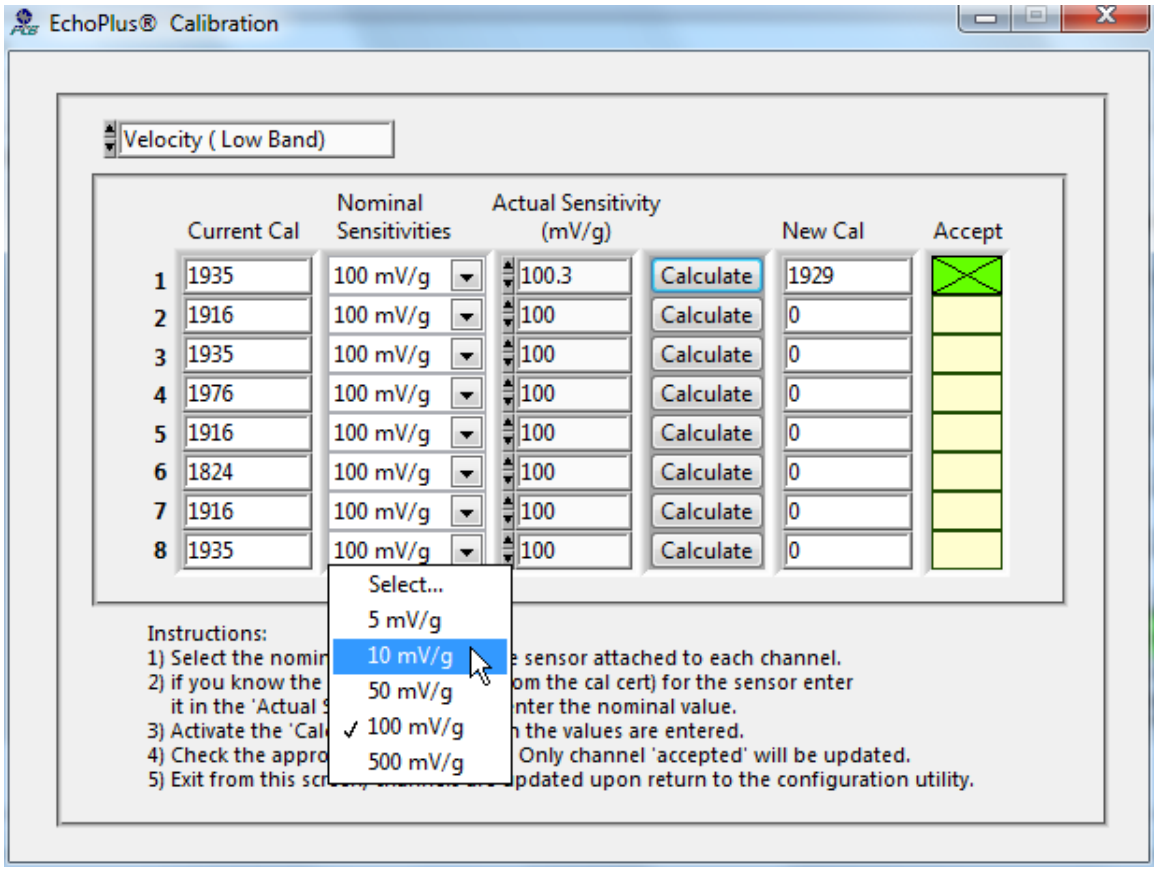


Figure 14 – EchoPlus® Configuration Utility Calibration Factor Calculator

In the EchoPlus® Calibration screen, select the **Nominal Sensitivities** of each accelerometer from the pull down menu. The default value is 100 mV/g. If the sensitivity of your accelerometer is not listed, it is not supported. If you don't have factory provided calibrations, set the **Actual Sensitivity** equal to the Nominal Sensitivities. If you have factory provided or other calibrated sensitivity values, enter them into the Actual Sensitivity boxes. For Velocity, use the sensitivity at 100 Hz which is the typical calibration frequency for a single point calibrated sensor. Click the **Calculate** button to compute the **New Cal** (Velocity Gain) needed for the sensitivity.

Close the window and the software will automatically import the new values to the EchoPlus® Channel Configuration window and program the box.

Model Number 672A01	ECHOPLUS®	Revision: C ECN #: 50243

Performance	ENGLISH	SI	
RMS Velocity Frequency Range(± 3 dB)	4 to 2,300 Hz	4 to 2,300 Hz	
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	0.001 ips	
Velocity Range	4.096 ips	4.096 ips	
RMS Acceleration Frequency Range(± 3 dB)	2,300 to 15,000 Hz	2,300 to 15,000 Hz	
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	0.005 g	0.005 g	[1]
Acceleration Range	40.48 g	40.48 g	[1]
Amplitude Linearity	1%	1%	[2]
Environmental			
Temperature Range(electronics)	-4 to +158 °F	-20 to +70 °C	
Enclosure Rating	NEMA 4X	IP66	
Transmission Range	250 ft to>1 mile radius, installation dependent	250 ft to>1 mile radius, installation dependent	[3]
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	916 MHz ISM Band	916 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	
External Battery Power	6 to 13 VDC	6 to 13 VDC	
External DC Power(± 1 V)	24 VDC	24 VDC	
Current Consumption	< 150 mA	< 150 mA	
Sensor Power Supplied	24 VDC @ 2.2 mA	24 VDC @ 2.2 mA	
Physical			
Size (Height x Width x Depth)	8.00 in x 6.00 in x 4.00 in	203 mm x 152 mm x 102 mm	
Weight	2.85 lb	1.29 kg	
Buffered Sensor Analog Output	BNC	BNC	
Sensor Select timeout	15 min	15 min	
Channels per Board	8	8	
Input Connector	Terminal Strip	Terminal Strip	

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

Hazardous Area Approval	Cl 1, Div 2, Groups A, B, C, D, T4	Cl 1, Div 2, Groups A, B, C, D, T4
Size - Depth	10.24 in	260 mm
Size - Height	3.54 in	90 mm
Size - Width	6.30 in	160 mm
Weight	5.2 lb	2.4 kg

NOTES:

[1]Conversion Factor 1g = 9.81 m/s^2.
[2]Zero-based, least-squares, straight line method.
[3]Typical.

Entered: LK	Engineer: KL	Sales: MC	Approved: JWH	Spec Number:
Date: 02/19/2020	Date: 02/19/2020	Date: 02/19/2020	Date: 02/19/2020	48612

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.

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

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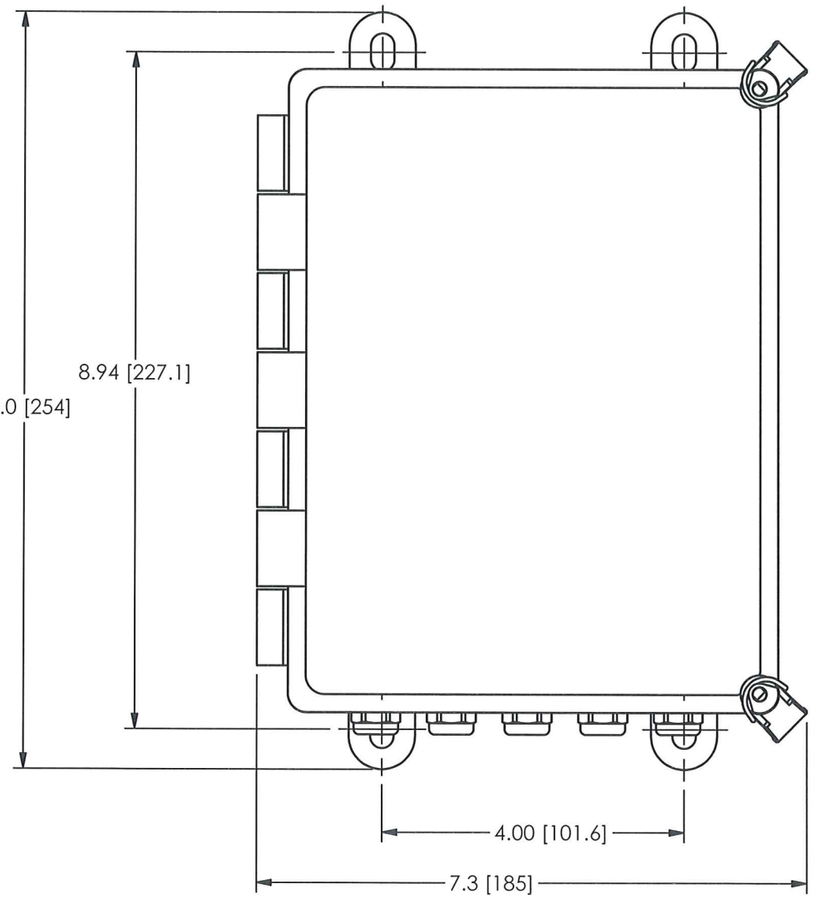
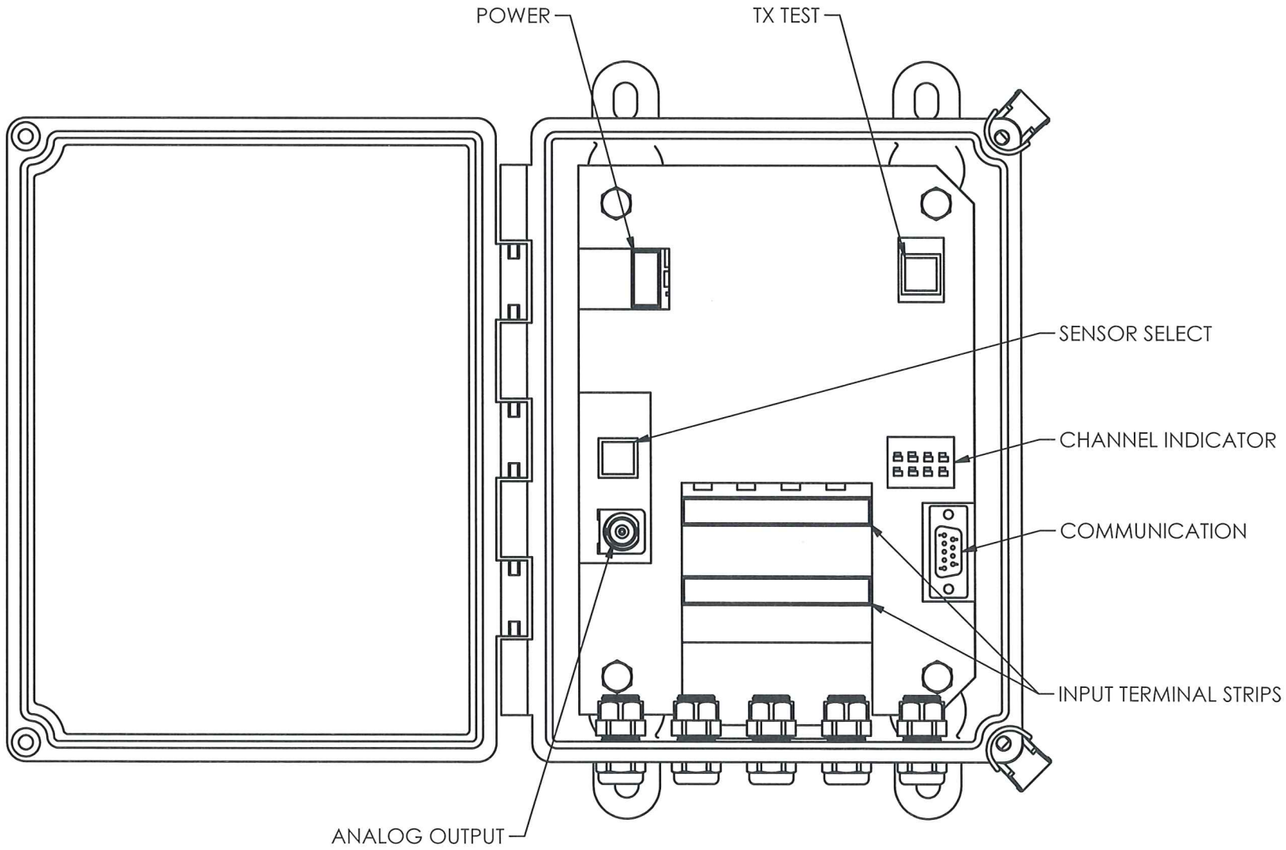
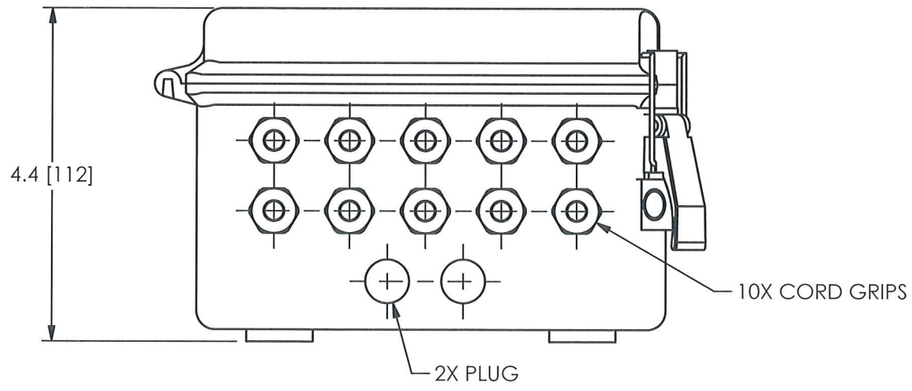
48611

REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	37728







UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER	
DIMENSIONS IN INCHES DECIMALS XX ±.03 XXX ±.010 ANGLES ± 2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ± 0.8 XX ± 0.25 ANGLES ± 2 DEGREES	SMB	1/6/12		1/6/12	NF	1/6/12
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13	TITLE: OUTLINE DRAWING MODEL 672A01 JUNCTION BOX					

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

CODE IDENT. NO.	DWG. NO.
52681	48611
SCALE: .25X	SHEET 1 OF 1

República Federativa do Brasil
Agência Nacional de Telecomunicações

Certificado de Homologação

(Intransferível)

Nº **05031-17-08750**

Validade: **Indeterminada**

Emissão: **28/07/2023**

Requerente:
CNPJ: 00.512.528/0001-40
MTS SISTEMAS DO BRASIL LTDA

Fabricante:
PCB PIEZOTRONICS, INC.
3425 WALDEN AVENUE, DEPEW
Nº

140432495

ESTADOS UNIDOS DA AMÉRICA

Este documento homologa, nos termos da regulamentação de telecomunicações vigente, o Certificado de Conformidade nº MT-6543/2023, emitido pelo **MASTER ASSOCIACAO DE AVALIACAO DE CONFORMIDADE TELECOM**. Esta homologação é expedida em nome do solicitante aqui identificado e é válida somente para o produto a seguir discriminado, cuja utilização deve observar as condições estabelecidas na regulamentação de telecomunicações.

Tipo - Categoria:
Equipamento de Radiocomunicação de Radiação Restrita - II

Modelo - Nome Comercial (s):
672A01 - (The Echo Wireless Junction Box)

Características técnicas básicas:

Tipo de Modulação	Intensidade de Campo (µV/m)	Distância da Medida (m)	Faixa de Frequências Tx (MHz)
BFSK	46025,65	3	915,0 a 928,0

Ensaio de SAR não aplicável.

Observações

Este produto destina-se ao uso profissional, manuseado por pessoal devidamente qualificado, não sendo destinado ao uso do público em geral para acesso a serviço de telecomunicações de interesse coletivo.

Na instalação do produto devem ser observadas as condições de uso conforme estabelecido no Regulamento sobre Equipamentos de Radiocomunicação de Radiação Restrita.

Este certificado substitui o de mesmo número emitido em 01/11/2017

Constitui obrigação do fabricante do produto no Brasil providenciar a identificação do produto homologado, nos termos da regulamentação de telecomunicações, em todas as unidades comercializadas, antes de sua efetiva distribuição ao mercado, assim como observar e manter as características técnicas que fundamentaram a certificação original.

As informações constantes deste certificado de homologação podem ser confirmadas no SCH - Sistema de Gestão de Certificação e Homologação, disponível no portal da Anatel. (www.anatel.gov.br).

Davison Gonzaga da Silva
Gerente de Certificação e Numeração

Repair and Maintenance

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

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

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

Calibration

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

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

Returning Equipment

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

Contact Information

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

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

Safety Considerations

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

Discontinue use and contact our 24-Hour Sensorline if:

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

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

Definition of Terms and Symbols

The following symbols may be used in this manual:

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

CAUTION
Refers to hazards that could damage the instrument.

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

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

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

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

This symbol indicates safety, earth ground.

PCB- PCB工业监测和测量设备 - 中国RoHS 公布表

PCB Industrial Monitoring and Measuring Equipment - China RoHS Disclosure Table

部件名称 Part Name	有毒和危险品 Toxic and Hazardous Substances or Elements									
Part	铅 (Pb)	水银 (Hg)	镉 (Cd)	六价 铬 (Cr(VI)	多溴化 苯 (PBB)	多溴化二苯 醚 (PBDE)	邻苯二甲酸 二(2-乙基) 己酯 (DEHP)	邻苯二甲丁 基苄酯 (BBP)	邻苯二甲酸 二酸正丁酯 (DBP)	邻苯二甲酸 二异丁酯 (DIBP)
电气外壳 (Electrical Enclosures)	X	O	O	O	O	O	O	O	O	O
紧固件和弹簧 (Fasteners)	X	O	O	O	O	O	O	O	O	O
电缆组件 (Cable Assembly)	X	O	O	O	O	O	O	O	O	O
印刷电路板组装 (PCBAs)	X	O	O	O	O	O	O	O	O	O
机械零件(Mechanical Parts)	O	O	O	O	O	O	O	O	O	O
塑料和橡胶零件 (Plastic & Rubber Parts)	O	O	O	O	O	O	O	O	O	O
金属零件 (Metal Parts)	X	O	O	O	O	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制

O =表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下 (indicates that the content of the toxic and hazardous substance in all the Homogeneous Materials of the part is below the concentration limit requirement as described in GB/T 26572).

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 (indicates that the content of the toxic and hazardous substance in at least one Homogeneous Material of the part exceeds the concentration limit requirement as described in GB/T 26572).