Model 649A04

Programmable Loop Powered, Current Output, Industrial Vibration Sensor

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
Web: www.imi-sensors.com

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
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IMI SENSORS
A PCB PIEZOTRONICS DIV.

649AX4 Series Programmable Industrial 4-20mA Sensor

CE

Operating Guide with Enclosed Warranty Information

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Introduction

The Model 649A04 Programmable Industrial 4-20mA Sensors combine the capabilities of a piezoelectric vibration sensor and a 4-20mA vibration transmitter. The sensor outputs a 4-20mA signal that is proportional to the overall velocity, acceleration or displacement of the machinery. Ideal for monitoring the vibration of process equipment such as fans, motors and pumps, the output of the sensor is used for process control or predictive maintenance. The sensor can be configured many different ways in the field using the USB Programming interface.

General Features

- Embedded Piezoelectric Accelerometer for improved accuracy and frequency response.

- Field programmable vibration range for acceleration, velocity or displacement.

- Allows for continuous vibration monitoring of critical applications.

- Reduces the need for sophisticated vibration analysis requirements.

- RV (Raw Vibration) 100mV/g option for conducting frequency analysis and machinery diagnostics.

- Easily interfaces with existing process control and predictive maintenance equipment.

- Rugged stainless steel, hermetically sealed construction for applications in harsh environments.

- Flexible design allows for various custom requirements.

Operation and Wiring

Standard Wiring

The Model 649A04 Series operates from a standard 2-wire, 4-20mA loop. If using a loop powered unit, attach the positive (+) input from the power supply to Pin A or **Red** wire on the sensor and the negative (-) input from the power supply to Pin B or **Blue** wire of the sensor.
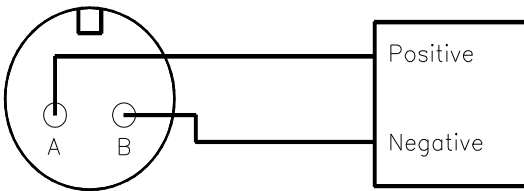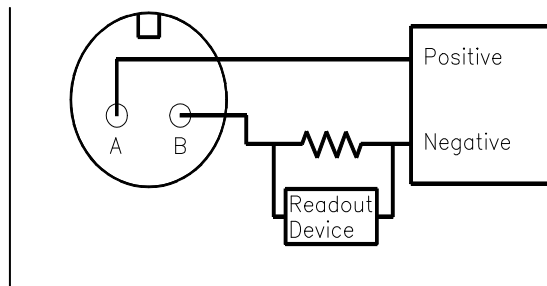
Figure 1 – wiring: loop powered

Figure 2 – wiring: loop powered/DC source

If using a standard DC power supply, install either an ammeter and/or load resistor in line with the output, Pin B or **Blue** wire.

The resistor will generate a DC voltage that is proportional to current by:

$$V = IR$$

$$If\ R = 500\ ohms\ and\ I = 6\ mA, then\ V = 3\ VDC$$

Note:

- Resistor value must be less than: (Vsupply – 12) x 50.

- For integral cable sensors: RED wire is positive, BLUE wire is negative.

RV Option

The RV (raw vibration) option includes a 100mV/g ±20% additional output. The accelerometer frequency range is 1 Hz-10 kHz, maximum amplitude of 15 g-pk. Data collectors or analyzers can use this vibration signal for further analysis.

Figure 3 – RV wiring
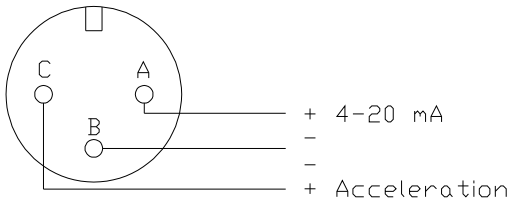
For integral cable sensors:

RED	**4-20mA Positive**
BLACK	**4-20mA Negative** (same as green)
GREEN	**-RV** (same as black)
WHITE	**+RV**

Note:

-The RV Signal Negative has to be isolated from any grounding. If this terminal is grounded, the 4-20mA loop will short, causing no output.

-The RV output signal is ideally suited for use with portable battery powered data collectors or analyzers.

649A04 USB Programming

The 649A04 may be programmed by the user by using the 600A21 programming kit for the 2-pin Mil Style connector. The kit contains the 070A89 programmer cable as well as the software on a CD. The 600A21 kit also contains an extra cable adapter (model 042M17) for use with integral cable models as well as the terminal block style connector used in conjunction with a 90 ° conduit elbow for hazardous areas. The latest copy of this software is also available as a free download via the IMI Website (www.imi-sensors.com). The software must be installed on the computer before connecting the programming cable to sensor.

Program Installation

Installing the Software and USB Driver: Insert the software CD provided into the CD drive. The Software will start the installation automatically if your PC is set to auto-install applications. If not, browse the CD and click on Setup.exe, this will start the installation process. The default installation directory is C:\PCB\600A21 it is recommended to use the default setting.

The Installer will first install the PCB 600A21 Programmer Kit application and then the Silicon Labs USBXpress device driver. This device driver is required for the programmer software to communicate with the 070A89 USB dongle included in the programmer kit.

The following screens will be displayed when the installer starts. Click the Next button to proceed from step to step.
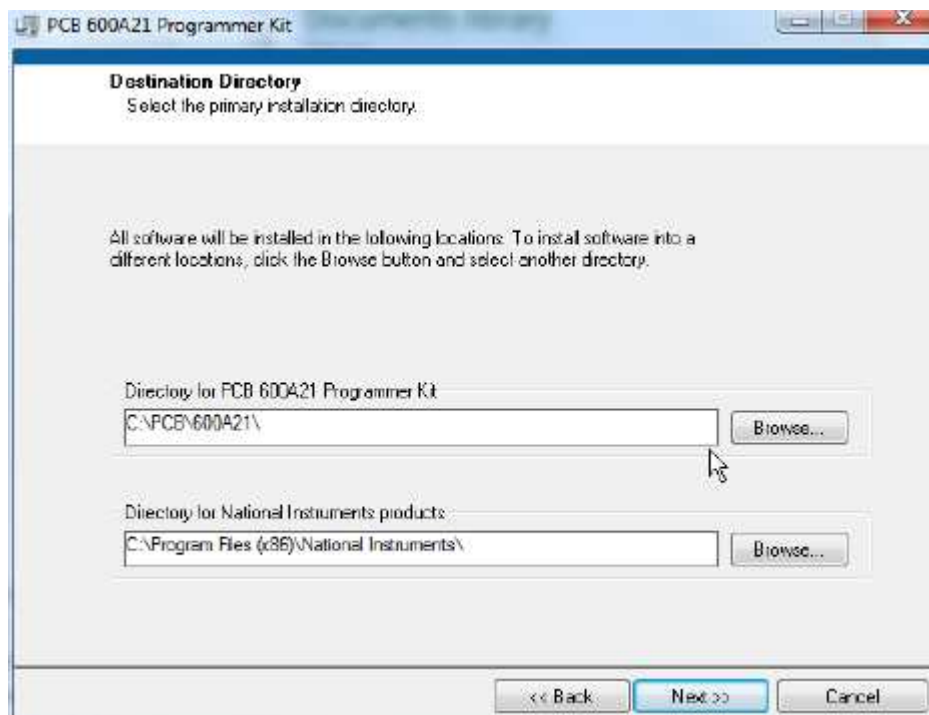
Figure 1 – 600A21 Install location screen

The following screen should appear, select "Install from a list or specific location" and click [Next >]
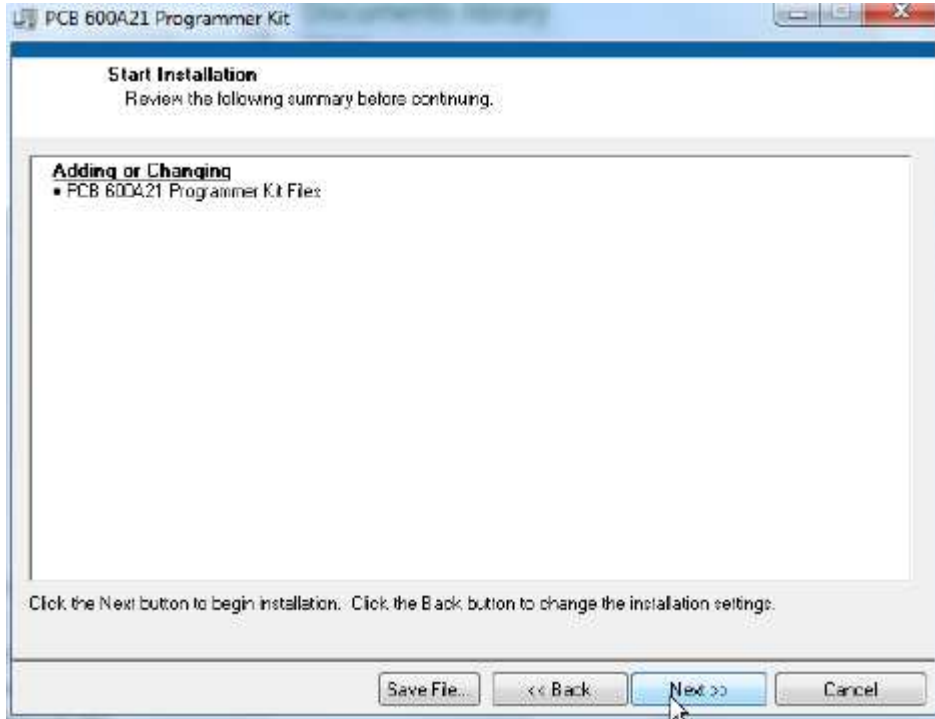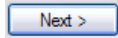

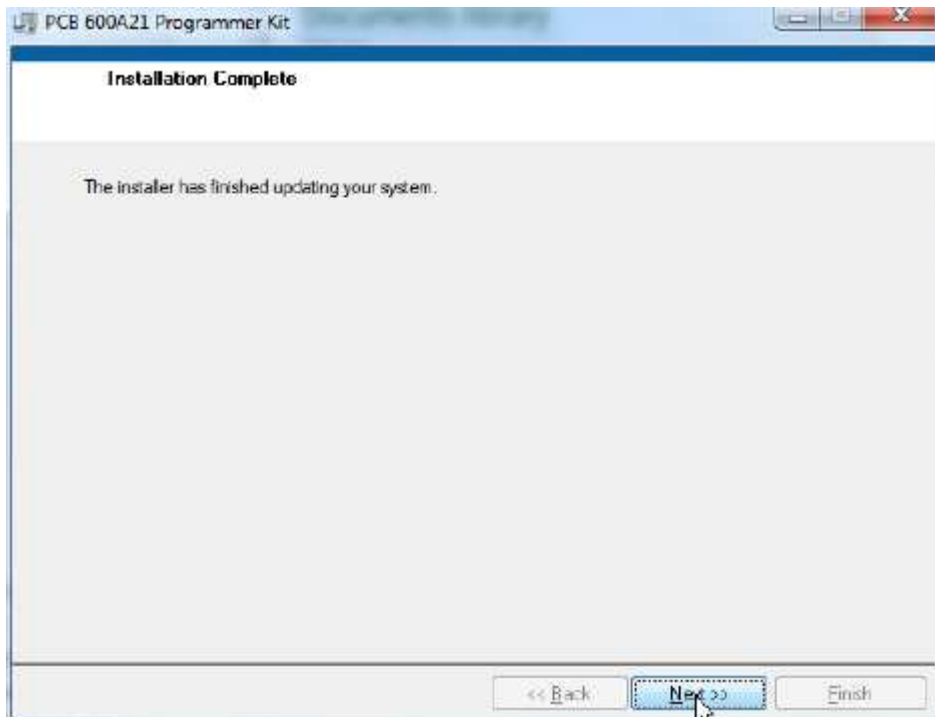**Figure 2 – 600A21 Installation verification screen**

Figure 3 – 600A21 Installation complete screen

After the 600A21 Programmer application installation completes the USB driver installer will start automatically. The initial USB installer will look similar to the one below.

Figure 4 – USBXpress driver installation screen

The drivers will now be properly installed and you should get the following screen. Click "Finish". The software is now ready to use.

When the USB driver installation completes the following screen will be displayed.
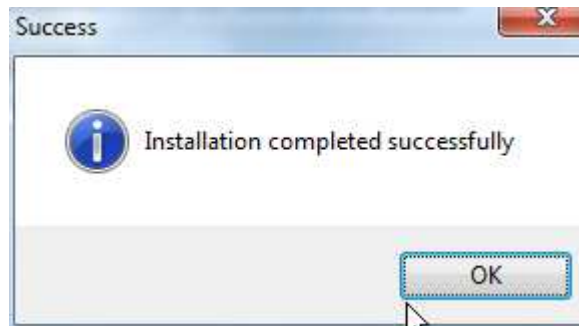

Figure 5 – USBXpress driver installation complete screen

Running the 600A21 Software

Connect the 070A89 Dongle to a USB port on the PC and then run the 600A21 Programmer application from the **Start | All Programs | PCB 600A21** menu item

Initially the screen will appear as in **Error! Reference source not found.** with a yellow bar and status indicating 'Initializing…' followed by the message: "Connecting to USB Dongle…".
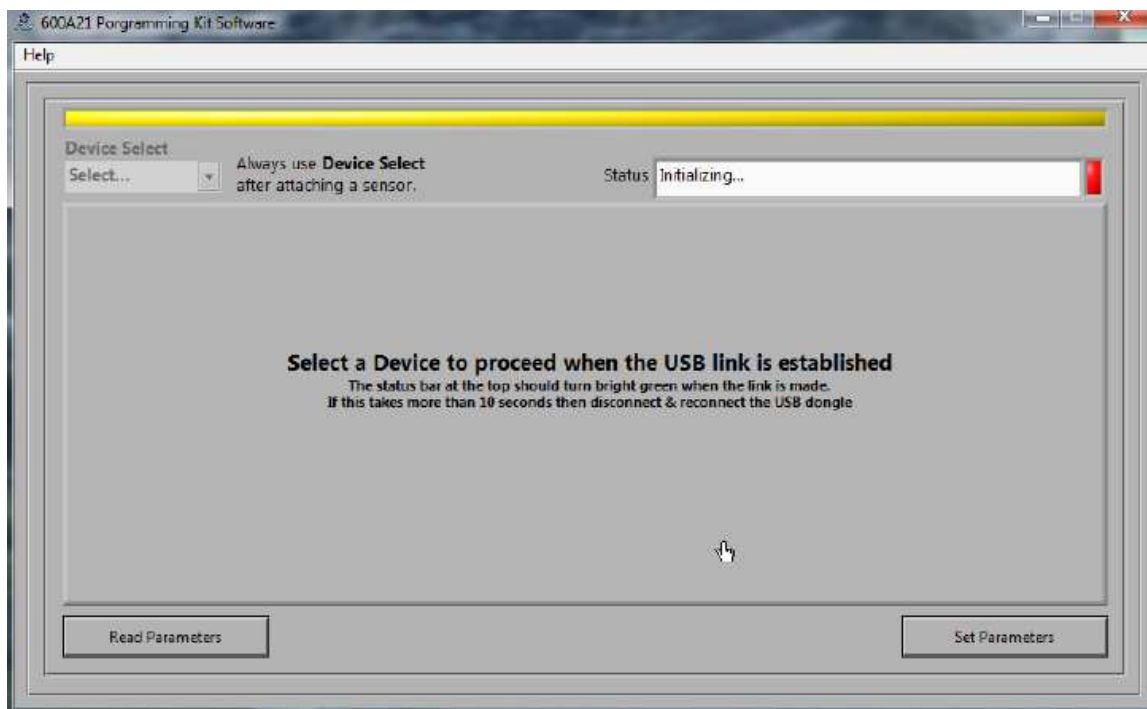

Figure 6 – 600A21 software without 070A89 USB dongle connection

Once the connection is made the bar at the top of the screen will turn green and the status will indicate "USB Connection Success - Select a device" (Figure 7). If the software and dongle fail to connect, remove and reinsert the USB dongle.
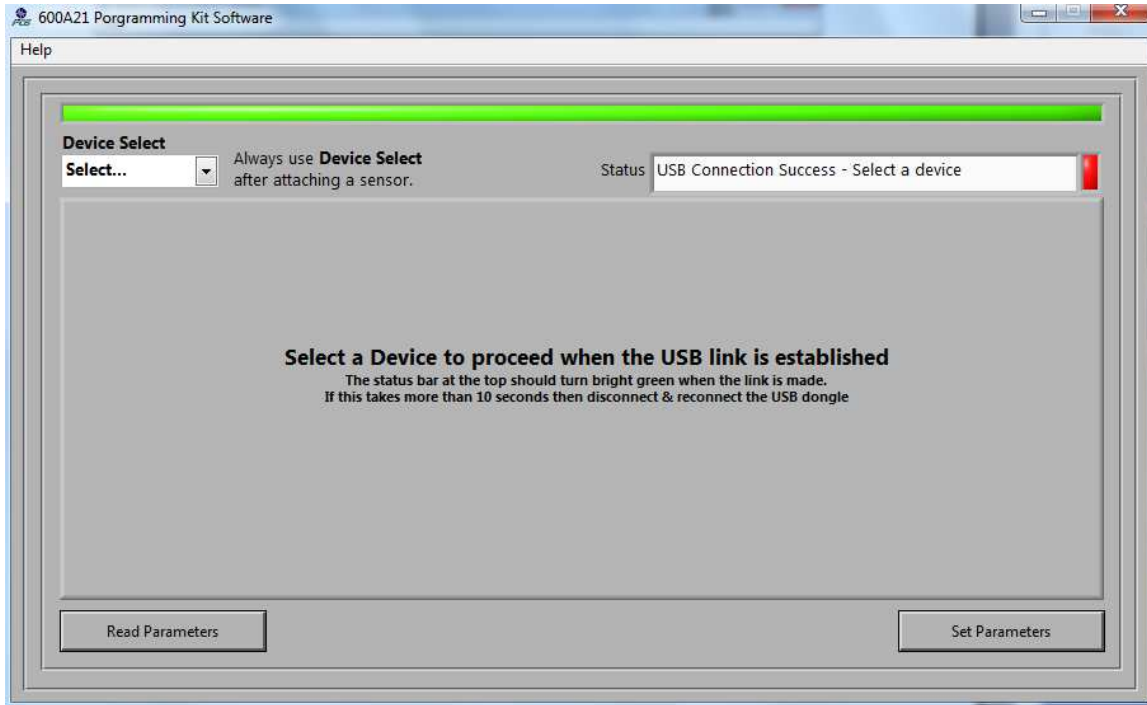

Figure 7 – 600A21 software with 070A89 USB dongle connection

To select a device click on the Device Select pull down menu (Figure 8) and select the device you'd like to program, in this case, 649A04.
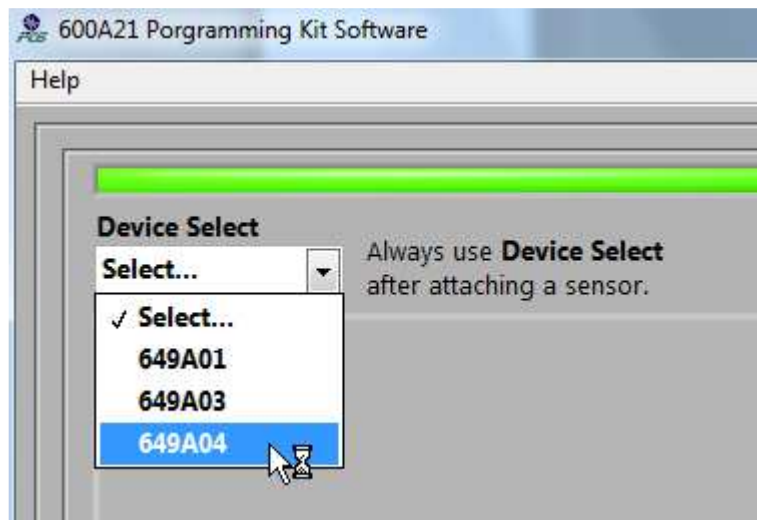

Figure 8 – 600A21 Device Selection

Once selected the software prompt you to connect the cable to the selected device. When the sensor is connected click OK to proceed. While the software is establishing communication with the sensor the

status will display 'Checking Status…' and the colored indicator box next to the status will alternate between red and yellow, this will take ~15 seconds. Once communication is established the indicator box will turn green and the software will read the sensors current settings and data (**Error! Reference source not found.**). The fields presented in the main body of the screen will be specific to the selected sensor.

649A04 Setting & Data fields

The 649A04 screen has 3 sections;
- **649A04 Unit Selection & Vibration Data** – This section, located on the left of the screen, displays the measured vibration data and current level. It also has a control to select the units (English or Metric) that the data is displayed in.
- **Actual 649A04 Settings** – this section, in the middle of the screen, shows the settings currently programed in the sensor.
- **649A04 Settings to Write** – this section, on the right, presents the options for programming the sensor.
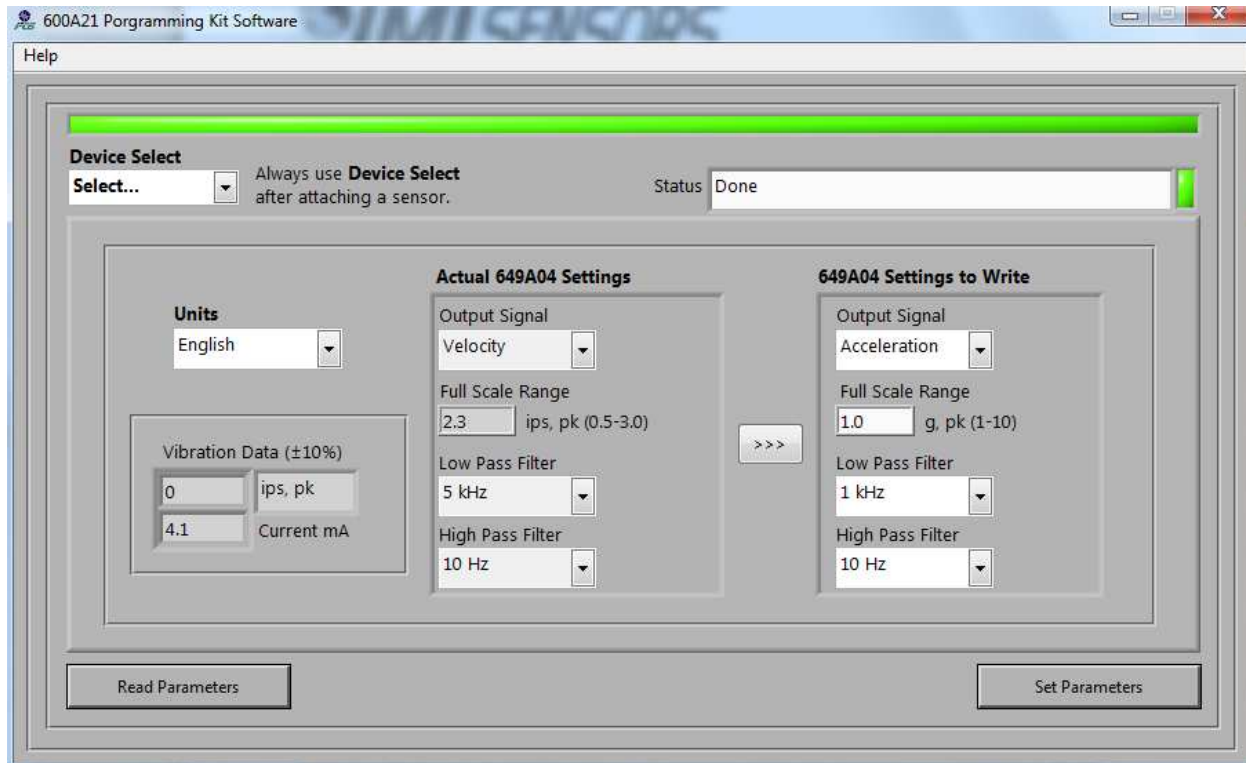

Figure 9 – 600A21 649A04 Successful Parameter Read

Figure 10 displays the programming options for the output signal, full scale and the filters.

- Output Signal options are: Acceleration, Velocity and Displacement
- Full Scale setting (units & range depend on the output signal selection)
- Low Pass options are: 1 kHz, 5 kHz and 10 kHz.
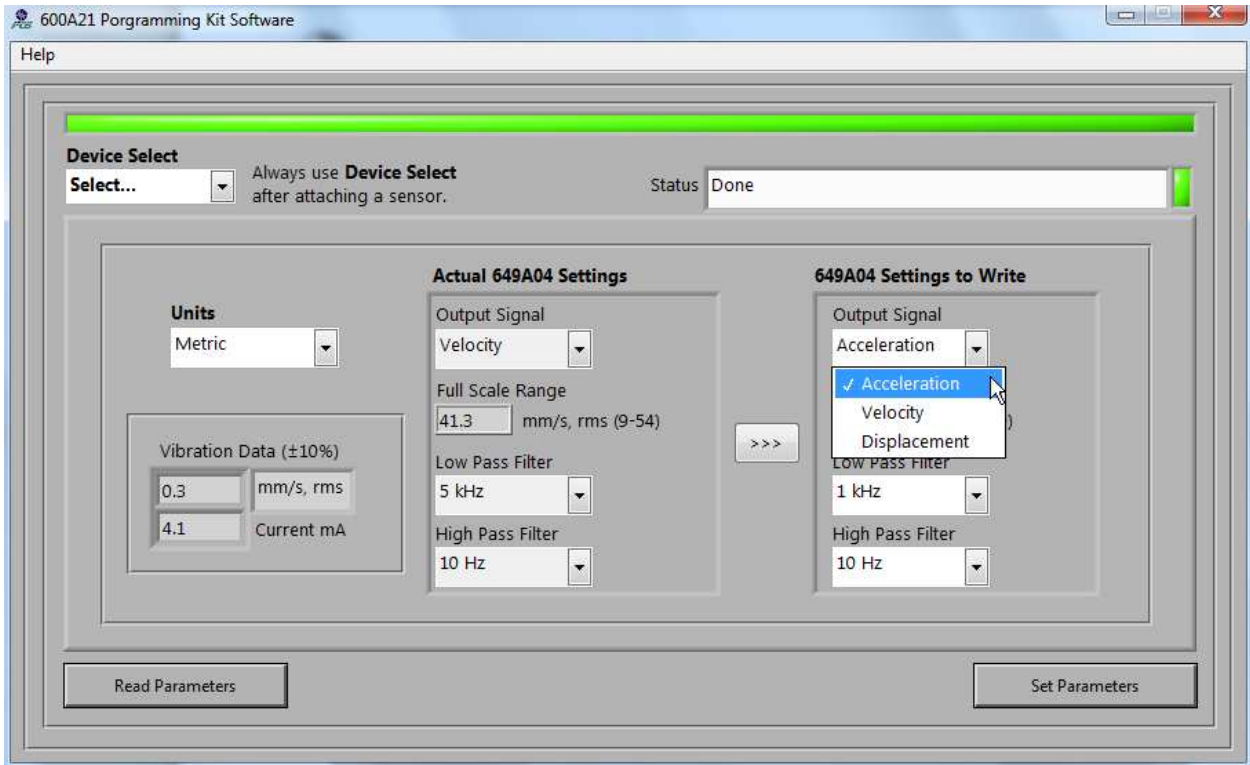- High Pass Filter options are 3Hz and 10Hz.

Figure 10 –649A04 Output Signal Selection

Menu Bar Items

The menu bar has 1 item, **Help**, which has 2 sub-items;

- **Log Communication** – selecting this option creates the text file **600A21 Comms.txt** in the same directory where the application is located. This file will be helpful to PCB technical support if communication problems occur.
- **About**… Selection this option causes a dialog box to appear with the software application version information.

Setting and Reading Settings

To set the sensor settings do the following in the '**649A04 Settings to Write'** fields:

- Select the Output Signal (Figure 10)
- Set the Full Scale value. The full scale units and range will be displayed next to the control.
- Select the Low Pass Filter Setting
- Select the High Pass Filter Setting

Next, click on the Set Parameters button to transmit the new settings to the sensor.

Note: use the '**>>>**' button to transfer all Actual Settings to the Settings to Write fields.

To Read the current sensor setting and data click the **Read Parameters** button

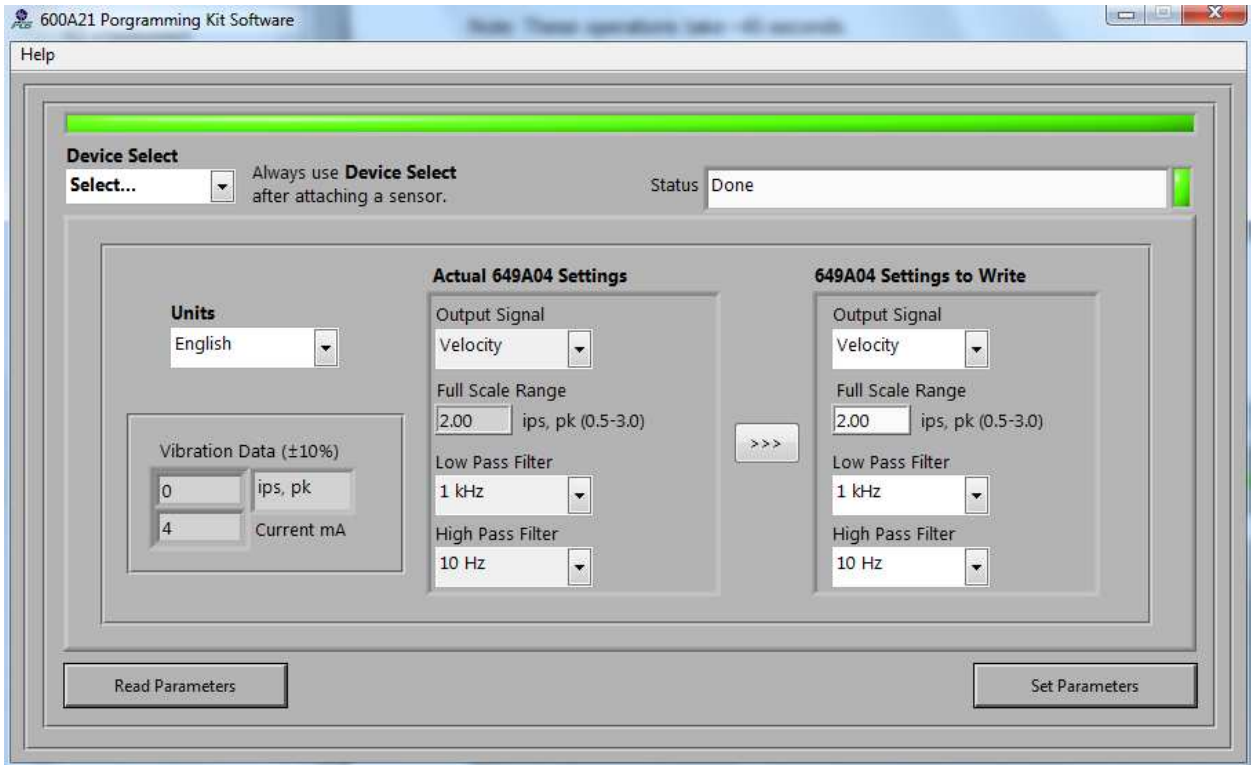Note: These operations take ~45 seconds.
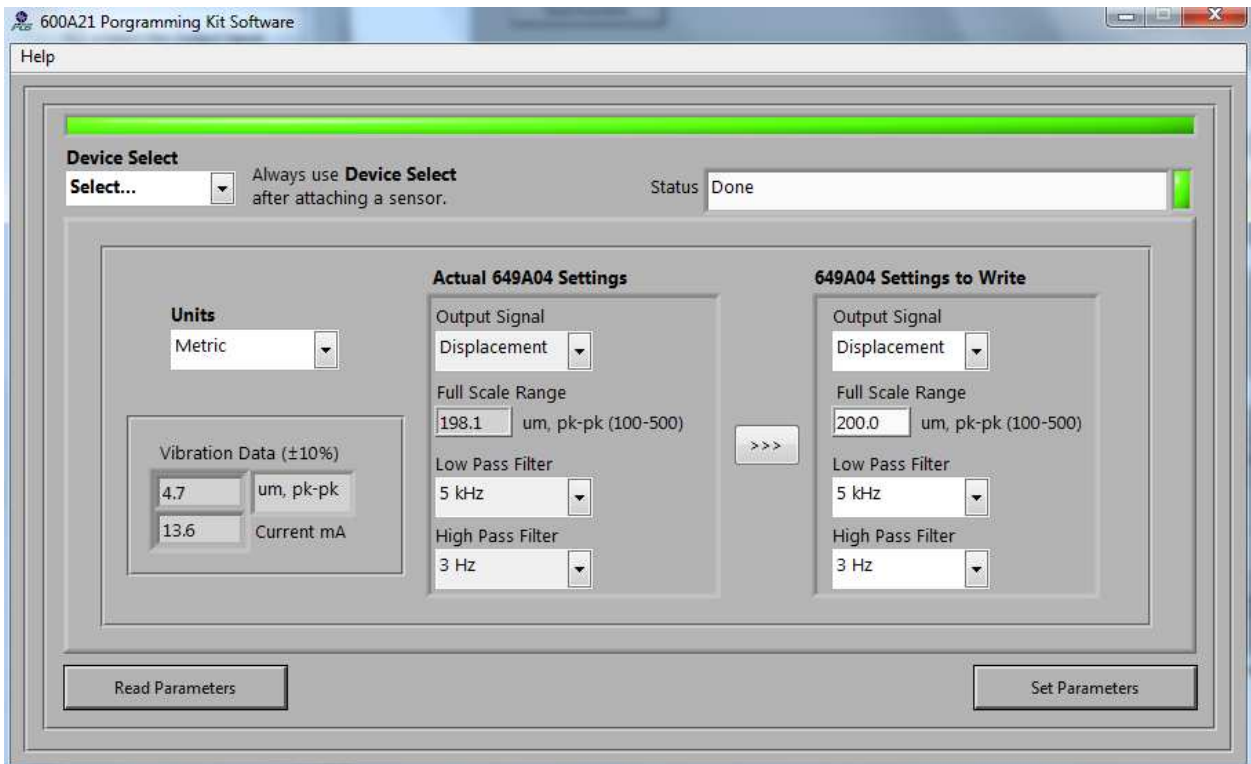
Figure 11 –649A04 Velocity with English Units selected

Figure 12 –649A04 Displacement with Metric Units selected

Installation

When choosing a mounting method, consider closely the advantages and disadvantages of each technique. Typical mounting types are stud, direct adhesive, adhesive mounting base and magnetic mounting base. Since the frequency response is limited for the displacement and velocity output, any of the four methods can be used without seriously affecting the data values. Stud mounting is highly recommended when using the acceleration output to monitor vibration due to its higher frequency response.

Note: For a complete list of product specifications, see the"Specification Sheet" and "Outline Drawing" at the end of this Manual

Direct Adhesive Mount Procedure

For restrictions of space or for convenience, most sensors (with the exception of integral stud models) can be adhesive-mounted directly to the machine surface.

STEP 1 Prepare a smooth, flat mounting surface. A minimum surface finish of 63 µin [0,00016 mm] generally works best.

STEP 2 Place a small portion of adhesive on the underside of the sensor. Firmly press down on the top of the assembly to displace any adhesive. Be aware that excessive amounts of adhesive can make sensor removal difficult.

Figure 1 – direct adhesive mounting

Firmly Press Down

Typical Accelerometer

Adhesive
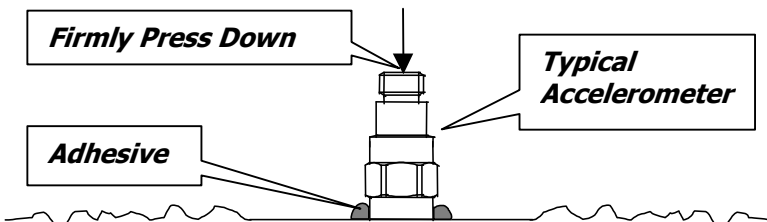
Standard Stud Mount Procedure

This mounting technique requires smooth, flat contact surfaces for proper operation and is recommended for permanent and/or secure installations. Stud mounting is also recommended when testing at high frequencies.

Note: DO NOT attempt mounting on curved, rough or uneven surfaces, as the potential for misalignment and limited contact surface may significantly reduce the sensor's upper operating frequency range.

Figure 2 – mounting surface preparation

1/4-28 Stud		1/4-28 Captive Screw
A (in)	*0.250*	*0.250*
B (in)	*0.350*	*0.350*
Torque (ft-lb)	*2 to 5*	*2 to 5*

1.1 Times Sensor Diameter
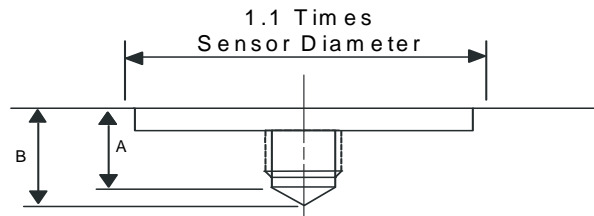
STEP 1 First, prepare a smooth, flat mounting surface, and then drill and tap a mounting hole in the center of this area as shown in Figure 2. A precision-machined mounting surface with a minimum finish of 63 μin [0,00016 mm] is recommended. (If it is not possible to properly prepare the machine surface, consider using an adhesive mounting pad as a possible alternative.) Inspect the area, checking that there are no burrs or other foreign particles interfering with the contact surface.

STEP 2 Wipe clean the mounting surface and spread on a light film of grease, oil or similar coupling fluid prior to installation.

Figure 3 – mounting surface lubrication
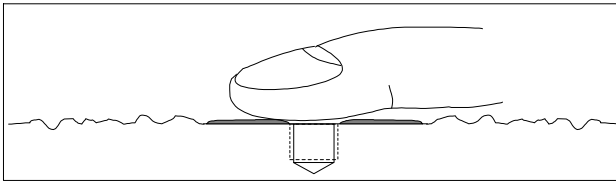
Adding a coupling fluid improves vibration transmissibility by filling small voids in the mounting surface and increasing the mounting stiffness. For semi-permanent mounting, substitute epoxy or another type of adhesive.

STEP 3 HAND-tighten the sensor/mounting stud to the machine, then secure the sensor with a torque wrench to the mounting surface by applying the recommended mounting torque (see enclosed specification data sheet for proper mounting torque). It is important to use a torque wrench during this step. **Under-torquing the sensor**

may not adequately couple the device; over-torquing may result in stud failure and possibly permanent damage.

Adhesive Stud Mount Procedure

Adhesive mounting is often used for temporary installation or when the machine surface cannot be adequately prepared for stud mounting. Adhesives like hot glue or wax work well for temporary mounts; two-part epoxies and quick-bonding gels provide a more permanent mount.

Note: Adhesively mounted sensors often exhibit a reduction in high-frequency range. Generally, smooth surfaces and stiff adhesives provide the best frequency response. Contact the factory for recommended epoxies.

This method involves attaching a base to the machine surface, then securing the sensor to the base. This allows for easy removal of the accelerometer.

STEP 1 Prepare a smooth, flat mounting surface. A minimum surface finish of 63 μin [0,00016 mm] generally works best.

STEP 2 Stud-mount the sensor to the appropriate adhesive mounting base according to the guidelines set forth in Steps 2 and 3 of the _Standard Stud Mount Procedure_.

STEP 3 Place a small portion of adhesive on the underside of the mounting base. Firmly press down on the assembly to displace any extra adhesive remaining under the base.

Figure 4 – mounting base: adhesive installation
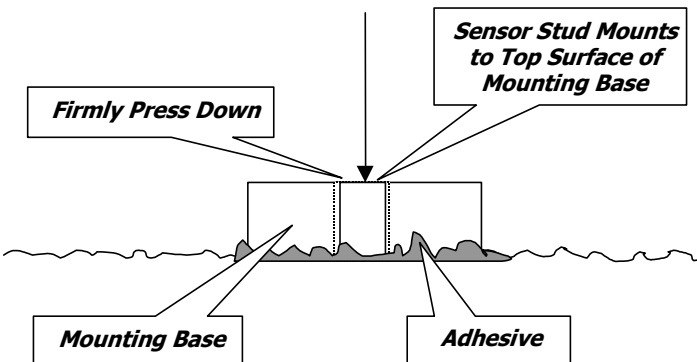
Magnetic Mount Procedure

Magnetic mounting provides a convenient means for making portable measurements and is commonly used for machinery monitoring and other portable or trending applications.

Note: The correct magnet choice and an adequately prepared mounting surface is critical for obtaining reliable measurements, especially at high frequencies. Poor installations can cause as much as a 50% drop in the sensor frequency range.

Not every magnet is suitable for all applications. For example, rare earth magnets are commonly used because of their high strength. Flat magnets work well on smooth, flat surfaces, while dual-rail magnets are required for curved surfaces. In the case of non-magnetic or rough surfaces, it is recommended that the user first weld, epoxy or otherwise adhere a steel mounting pad to the test surface. This provides a smooth and repeatable location for mounting.

Figure 5 – magnet types

Sensor Stud Mounts to Top Surface of Magnet

Flat Magnet   Dual-Rail Magnet   Mounting Pad with Magnet
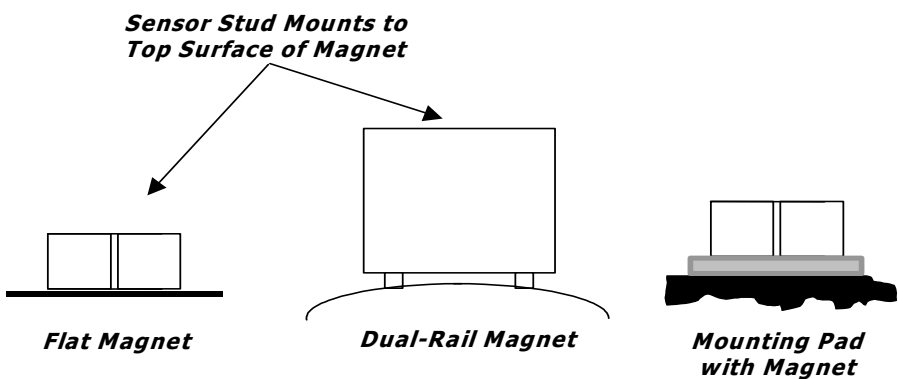
ALL SURFACES SHOULD BE FLAT AND SMOOTH

STEP 1 After choosing the correct magnet type, inspect the unit, verifying that the mounting surfaces are flat and smooth.

STEP 2 Stud-mount the accelerometer to the appropriate magnet according to the guidelines set forth in Steps 2 and 3 of the Standard Stud Mount Procedure.

STEP 3 Prepare a smooth, flat mounting surface. A minimum surface finish of 63 μin [0,00016 mm] generally works best. After cleaning the surface and checking for burrs, wipe on a light film of silicone grease, machine oil or similar-type coupling fluid.

STEP 4 Mount the magnet/sensor assembly to the prepared test surface by gently "rocking" or "sliding" it into place.

Note: Magnetically mounting accelerometers carelessly has the potential to generate very high (and very damaging) g levels. To prevent damage, install the assembly gently. If unsure, please contact the factory for assistance.

Warning 1 – ESD sensitivity

The power supply/signal conditioner should not be opened by anyone other than qualified service personnel. This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

Warning 2 – ESD sensitivity

This equipment is designed with user safety in mind; however, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by PCB Piezotronics, Inc.
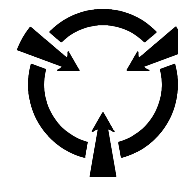
Caution 1 – ESD sensitivity

Cables can kill your equipment. High voltage electrostatic discharge (ESD) can damage electrical devices. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, such as that which occurs in the following:

- *Laying on and moving across a rug,*
- *Any movement through air,*
- *The action of rolling out a cable, and/or*
- *Contact with a non-grounded person.*

The PCB solution for product safety:

- *Connect the cables only with the AC power off.*
- *Temporarily "short" the end of the cable before attaching it to any signal input or output.*

CAUTION
ELECTROSTATIC
DISCHARGE SENSITIVE

Caution 2 – ESD sensitivity

ESD considerations should be made prior to performing any internal adjustments on the equipment. Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should therefore be done ONLY at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.

Warranty

IMI instrumentation is warranted against defective material and workmanship for 1 year unless otherwise expressly specified. Damage to instruments caused by incorrect power or misapplication, is not covered by warranty. *If there are any questions regarding power, intended application, or general usage, please consult with your local sales contact or distributor.* Batteries and other expendable hardware items are not covered by warranty.

Service

Because of the sophisticated nature of IMI instrumentation, field repair is typically **NOT** recommended and may void any warranty. If factory service is required, return the instrumentation according to the "Return Procedure" stated below. *A repair and/or replacement quotation will be provided prior to servicing at no charge.* Before returning the unit, please consult a factory IMI applications engineer concerning the situation as certain problems can often be corrected with simple on-site procedures.

Return procedure

To expedite returned instrumentation, contact a factory IMI applications engineer for a RETURN MATERIAL AUTHORIZATION (RMA) NUMBER. Please have information available such as model and serial number. Also, to insure efficient service, *provide a written description of the symptoms and problems with the equipment to a local sales representative or distributor, or contact IMI if none are located in your area.*

Customers outside the U.S. should consult their local IMI distributor for information on returning equipment. For exceptions, please contact the International Sales department at IMI to request shipping instructions and an RMA. For assistance, please call (716) 684-0003, or fax us at (716) 684-3823. You may also receive assistance via e-mail at **imi@pcb.com** or visit our web site at **www.pcb.com**.

Customer Service

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

IMI offers to all customers, at no charge, 24-hour phone support. This service makes product or application support available to our customers, day or night, seven days a week. When unforeseen problems or emergency situations arise, call the **IMI Hot Line at (716) 684-0003**, and an application specialist will assist you.

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ICP® *is a registered trademark of PCB Group, Incorporated,*
which uniquely identifies PCB sensors that incorporate built-in microelectronics.

Performance	ENGLISH	SI	
Measurement Range(Velocity)	0.5 to 3 in/sec pk	12.7 to 76.2 mm/s pk	[1][2][3][4]
Measurement Range(Acceleration)	1 to 10 g pk	9.8 to 98.1 m/s² pk	[5][2][4]
Measurement Range(Displacement)	4 to 20 mil pk - pk	0.1 to 0.5 mm pk - pk	[6][2][4]
Output(± 5 %)	4 mA	4 mA	
Output(± 10 %)	20 mA	20 mA	
Frequency Range(-6 dB)	180 to 60,000 cpm	3 to 1000 Hz	[7][8][4][9]
Frequency Range	180 to 300,000 cpm	3 to 5000 Hz	[7][8][4]
Frequency Range	180 to 600,000 cpm	3 to 10,000 Hz	[7][8][4]
Frequency Range	600 to 60,000 cpm	10 to 1000 Hz	[4][7][8]
Frequency Range	600 to 300,000 cpm	10 to 5000 Hz	[7][8][4]
Frequency Range	600 to 600,000 cpm	10 to 10,000 Hz	[7][8][4]
Environmental			
Temperature Range	-40 to +185 °F	-40 to +85 °C	
Electrical			
Excitation Voltage	15 to 30 VDC	15 to 30 VDC	
Settling Time(within 2% of value)	<30 sec	<30 sec	
Electrical Isolation(Case)	>10^8 Ohm	>10^8 Ohm	
Physical			
Size (Hex x Height)	1.0 in x 2.6 in	25.4 mm x 66 mm	
Weight	4.6 oz	129 gm	[10]
Mounting Thread	1/4-28 UNF	No Metric Equivalent	
Mounting Torque	3 to 5 ft-lb	4 to 7 Nm	
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	2-Pin MIL-C-5015	2-Pin MIL-C-5015	
Electrical Connection Position	Top	Top	
Electrical Connections(Pin A)	4-20 mA Pos (+)	4-20 mA Pos (+)	
Electrical Connections(Pin B)	4-20 mA Neg (-)	4-20 mA Neg (-)	

CE [11]

All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.

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OPTIONAL VERSIONS

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

M - Metric Mount
Supplied Accessory : Model M081A61 Mounting Stud 1/4-28 to M6 X 1 (1) replaces Model 081A40

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

Electrical Connector	3-Pin MIL-C-5015	3-Pin MIL-C-5015
Electrical Connections(Pin A)	4-20 mA Pos (+)	4-20 mA Pos (+)
Electrical Connections(Pin B)	4-20 mA Neg/Signal Output Neg	4-20 mA Neg/Signal Output Neg
Electrical Connections(Pin C)	Signal Output Pos	Signal Output Pos

NOTES:
[1] Conversion Factor 1 in/sec = 25.4 mm/sec.
[2] FS - Full Scale.
[3] Factory set, 1 in/sec peak.
[4] USB Programmable with 600A21 kit.
[5] Conversion Factor 1g = 9.81 m/s².
[6] Conversion Factor 1 mil = 0.0254 mm
[7] Current will fluctuate at frequencies below 5 Hz.
[8] 1Hz = 60 cpm (cycles per minute).
[9] Factory Set
[10] Typical.
[11] See PCB Declaration of Conformance PS124 for details.

SUPPLIED ACCESSORIES:
Model 081A40 Mounting Stud (1)

Entered: AP	Engineer: LAB	Sales: SA	Approved: NJF	Spec Number:
Date: 1/14/2014	Date: 1/14/2014	Date: 1/14/2014	Date: 1/14/2014	**45987**

IMI SENSORS
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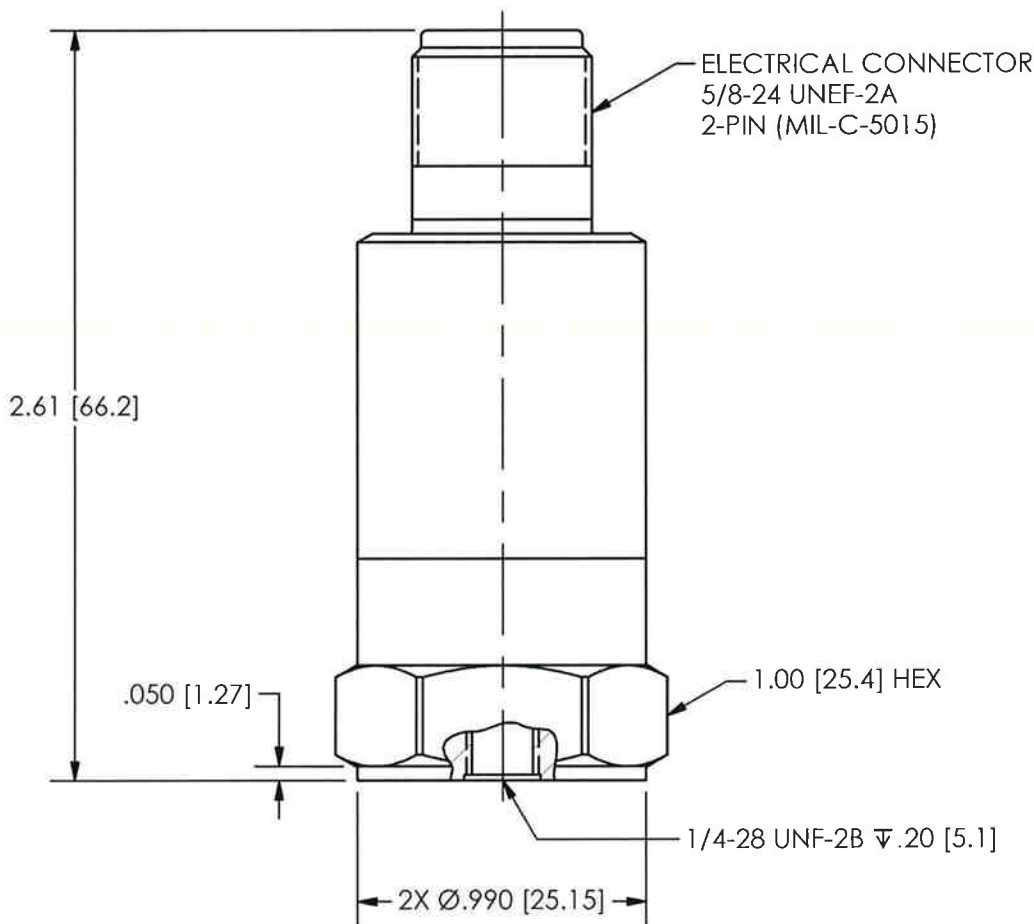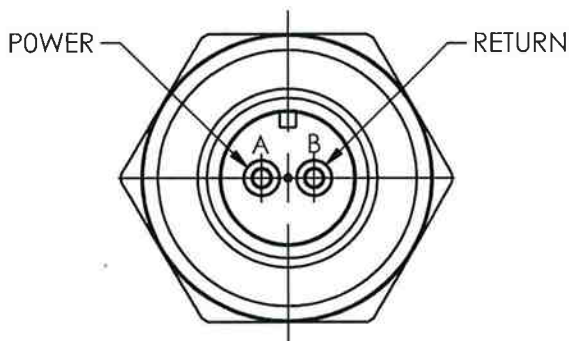45988

REVISIONS

REV	DESCRIPTION	ECO
NR	RELEASED TO DRAFTING	
A	UPDATE MODEL NUMBER	33220

POWER — RETURN

A B

ELECTRICAL CONNECTOR
5/8-24 UNEF-2A
2-PIN (MIL-C-5015)

2.61 [66.2]

1.00 [25.4] HEX

.050 [1.27]

1/4-28 UNF-2B ▼.20 [5.1]

2X Ø.990 [25.15]

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN	CHECKED	ENGINEER	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	MDL 6/25/10	SMB 6/25/10	LAB 6/25/10	
DECIMALS XX ±.03 XXX ±.010	DECIMALS X ±0.8 XX ±0.25		TITLE		
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES				
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13				

PCB PIEZOTRONICS
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TITLE
OUTLINE DRAWING
MODEL 649A04, M
USB PROGRAMMABLE
4-20 mA TRANSMITTER

CODE IDENT. NO. 52681	DWG. NO. 45988	
SCALE: 1.5 X	SHEET 1 OF 1	