IMI SENSORS
A PCB DIVISION

Model 642A00

Industrial vibration sensor, 4 to 20 mA output, 0 to 0.5 in/sec pk, 3 to 1k Hz, side exit, 2-pin conn.

Installation and Operating Manual

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

Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
Fax: 716-684-3823
E-mail: imi@pcb.com
Web: www.imi-sensors.com

IMI SENSORS
A PCB PIEZOTRONICS DIV.

SENSORS AND INSTRUMENTATION FOR MACHINE CONDITION MONITORING

Model 642/643/647/648 A Series Industrial 4-20mA Sensor

CE

Operating Guide with Enclosed Warranty Information

3425 Walden Avenue, Depew, New York 14043-2495

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MANUAL NUMBER: 25778
MANUAL REVISION: C
ECN NUMBER: xxxxx

IMI SENSORS
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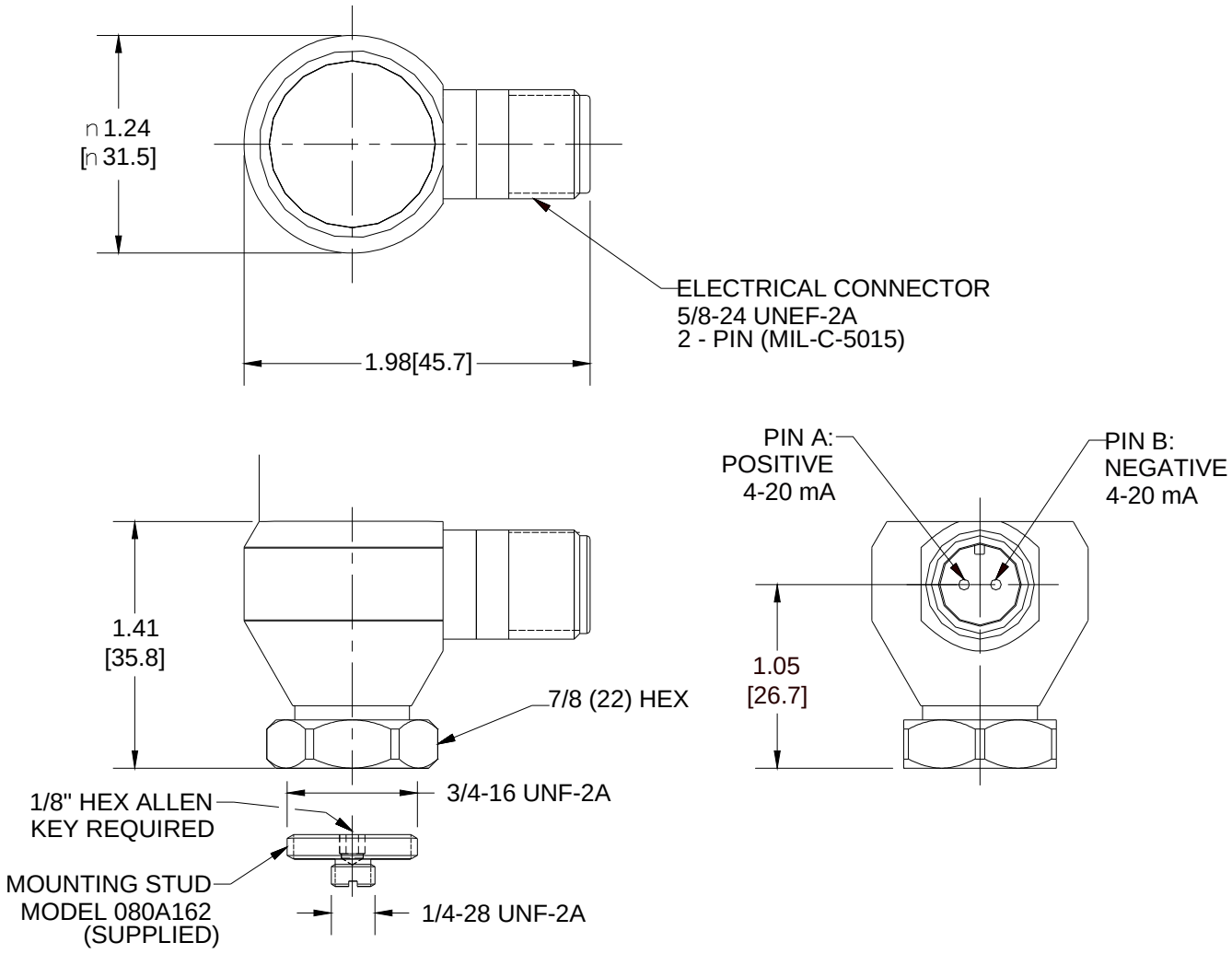
Introduction

The Model 642/643/647/648 A Series 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 or acceleration 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. There are many options in this series. Please refer to specific specification sheets for further details.

General Features

- Imbedded Piezoelectric Accelerometer for improved accuracy and frequency response.
- Vibration range can be in Acceleration or Velocity.
- Allows for continuous vibration monitoring of critical applications.
- Reduces sophisticated vibration analysis requirements.
- RV (Raw Vibration) option for conducting frequency analysis and machinery diagnostics.
- TO (Temperature Output) option via an independent 4-20mA loop.
- Readily interfaces to existing process control and predictive maintenance equipment.
- Rugged stainless steel construction for applications in harsh environments.
- Flexible design allows for various custom requirements.
- Swivel mount simplifies installation.
- Cable may be positioned in any direction.

Dimension Drawing



Inch (mm)

Operation and Wiring

Standard Wiring

The Model 642/643/647/648 A 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

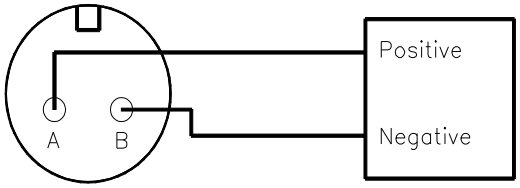
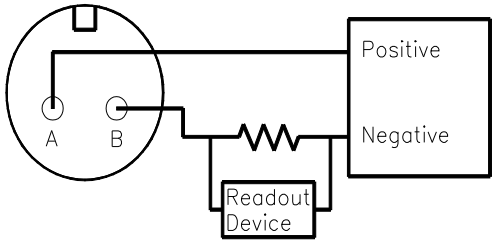


Figure 2 – wiring: loop powered/DC source



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.

Taking Measurements

When measuring the current output from the unit, use the following formula to calculate the vibration level:

Vibration Output = (Measured Output – 4mA) x (Full Scale Vibration Output /16mA)

Measured mA	*642AX0*	*642AX1*	*642AX2*
4.00	*0.0 ips, pk*	*0.0 ips, pk*	*0.0 ips, pk*
8.00	*0.125 ips, pk*	*0.25 ips, pk*	*0.5 ips, pk*
12.0	*0.25 ips, pk*	*0.5 ips, pk*	*1.0 ips, pk*
15.75	*0.37 ips, pk*	*0.73 ips, pk*	*1.47 ips, pk*
20	*0.5 ips, pk*	*1.0 ips, pk*	*2.0 ips, pk*

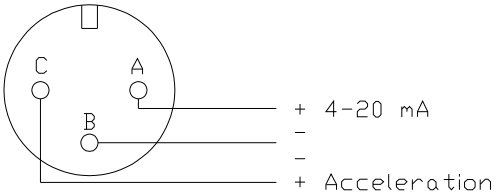
Measured mA	*643AX0*	*643AX1*	*643AX2*
4.00	*0.0 ips, rms*	*0.0 ips, rms*	*0.0 ips, rms*
8.00	*0.125 ips, rms*	*0.25 ips, rms*	*0.5 ips, rms*
12.0	*0.25 ips, rms*	*0.5 ips, rms*	*1.0 ips, rms*
15.75	*0.37 ips, rms*	*0.73 ips, rms*	*1.47 ips, rms*
20	*0.5 ips, rms*	*1.0 ips, rms*	*2.0 ips, rms*

Measured mA	*647*	*648*
4.00	*0.0 g rms*	*0.0 g rms*
8.00	*1.25 g rms*	*2.50 g rms*
12.0	*2.50 g rms*	*5.00 g rms*
15.75	*3.67 g rms*	*7.34 g rms*
20	*5.00 g rms*	*10.0 g rms*

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 Acceleration Negative*** *(same as black)*
WHITE	***+RV Acceleration Positive***

Note:

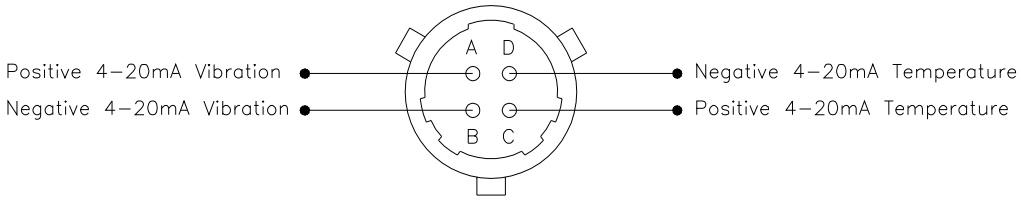
-The Acceleration Signal Negative has to be isolated from any grounding. If this terminal is grounded, the 4-20mA loop will short, causing no output.

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

TO Option

The TO (Temperature Output) option includes an additional independent 4-20mA output for temperature measurement. The temperature range is from -40°C to 125°C with an overall accuracy of ±5%FSO. The imbedded temperature sensor monitors the environment internal to the sensor housing and is situated at approximately mid level.

Figure 4 – TO wiring



For integral cable sensors:

RED	***4-20mA Vibration Positive***
BLACK	***4-20mA Vibration Negative***
GREEN	***4-20mA Temperature Negative***
WHITE	***4-20mA Temperature Positive***

Note:

- The same power supply can be used for both4-20mA loops. Connect the both positive terminals to directly to the power supply, then use the negative terminals for independent process loops.

Installation

Installation should be performed per the following detail drawing for best performance.

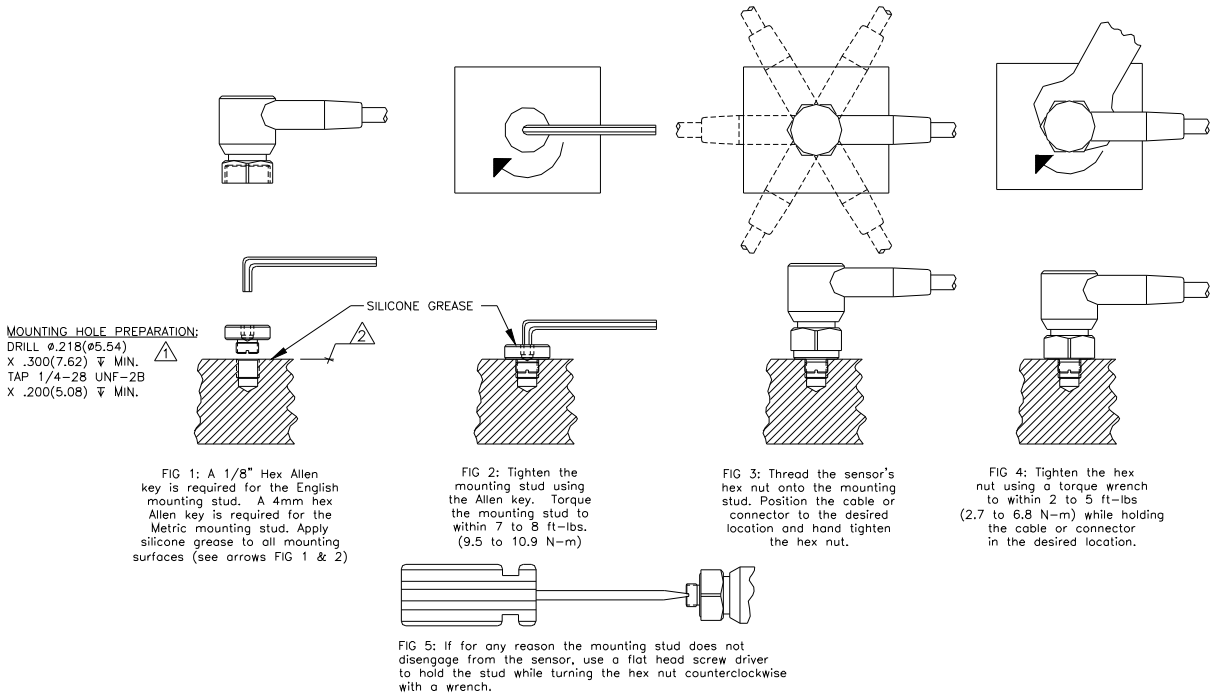


FIG 1: A 1/8" Hex Allen key is required for the English mounting stud. A 4mm hex Allen key is required for the Metric mounting stud. Apply silicone grease to all mounting surfaces (see arrows FIG 1 & 2)

FIG 2: Tighten the mounting stud using the Allen key. Torque the mounting stud to within 7 to 8 ft-lbs. (9.5 to 10.9 N-m)

FIG 3: Thread the sensor's hex nut onto the mounting stud. Position the cable or connector to the desired location and hand tighten the hex nut.

FIG 4: Tighten the hex nut using a torque wrench to within 2 to 5 ft-lbs (2.7 to 6.8 N-m) while holding the cable or connector in the desired location.

FIG 5: If for any reason the mounting stud does not disengage from the sensor, use a flat head screw driver to hold the stud while turning the hex nut counterclockwise with a wrench.

3.) FOR BEST RESULTS, PLACE A THIN LAYER OF SILICONE GREASE (DOW CORNING #4 OR EQUIVALENT) ON INTERFACE PRIOR TO MOUNTING.

2 MOUNTING SURFACE SHOULD BE FLAT TO WITHIN .001(0.03) TIR WITH A MINIMUM 63√(1.6√) FINISH FOR BEST RESULTS.

1 DRILL PERPENDICULAR TO MOUNTING SURFACE TO WITHIN ±1°

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 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**.

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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.

PCB PIEZOTRONICS INC. IMI DIVISION

3425 Walden Avenue, Depew, NY 14043-2495
Phone: (716) 684-0003 • USA Fax: (716) 684-3823 • INTL Fax: (716) 684-4703

Model Number 642A00	4-20 MA OUTPUT VELOCITY SENSOR	Revision: C ECN #: 50726

Performance	ENGLISH	SI	
Measurement Range	0.0 to 0.5 in/sec pk	0.0 to 12.7 mm/s pk	[1]
Output	4-20 mA	4-20 mA	
Frequency Range(± 10 %)	180 to 60 kcpm	3 to 1 kHz	[2][3]
Broadband Resolution	0.005 in/sec pk	0.13 mm/s pk	[4]
Non-Linearity	± 1 %	± 1 %	
Environmental			
Temperature Range	-40 to 185 °F	-40 to 85 °C	
Enclosure Rating	IP68	IP68	
Electrical			
Excitation Voltage	12 to 30 VDC	12 to 30 VDC	
Settling Time(within 2% of value)	< 15 sec	< 15 sec	
Electrical Isolation(Case)	> 10^8 Ohm	> 10^8 Ohm	
Physical			
Size (Hex x Height)	7/8 in x 1.41 in	22.2 mm x 35.8 mm	
Weight	3.8 oz	108 gm	
Mounting Thread	1/4-28 UNF	1/4-28 UNF	
Mounting Torque(Stud)	3 to 4 ft-lb	4.1 to 5.4 Nm	[5][6]
Mounting Torque(hex nut)	2 to 3 ft-lb	2.7 to 4.1 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	Side	Side	
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[7]

All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.
ICP® is a registered trademark of PCB Piezotronics, Inc.

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 M080A163A (1)

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 = 0.0254 m/sec.
[2]1Hz = 60 cpm (cycles per minute).
[3]Current will fluctuate at frequencies below 5 Hz.
[4]Typical value.
[5]1/8" hex Allen key required for English version, 3mm hex Allen key required for metric version.
[6]Stud torque must exceed sensor hex nut torque to ensure proper dismantling.
[7]See PCB Declaration of Conformance PS039 for details.

SUPPLIED ACCESSORIES:

Model 080A162 Mounting Stud (1)
Model ICS-4 NIST-traceable single-axis amplitude response calibration from 0 cpm (0 Hz) to upper 10% frequency for 4 - 20 mA output vibration sensor (1)

Entered: LK	Engineer: NJF	Sales: MC	Approved: NJF	Spec Number:
Date: 04/22/2020	Date: 04/22/2020	Date: 04/22/2020	Date: 04/22/2020	28682

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E-Mail: imi@pcb.com

18551

REVISIONS		
REV	DESCRIPTION	DIN
B	ADDED METRIC MOUNTING INFORMATION	43341

METRIC MOUNTING HOLE PREPARATION:

DRILL Ø.199[Ø5.05] ↧.300[7.62] MIN (1)

TAP M6 X 1-6g ↧.200[5.08] MIN

ENGLISH MOUNTING HOLE PREPARATION:

DRILL Ø.218[Ø5.54] ↧.300[7.62] MIN (1)

TAP 1/4-28 UNF-2B ↧.200[5.08] MIN

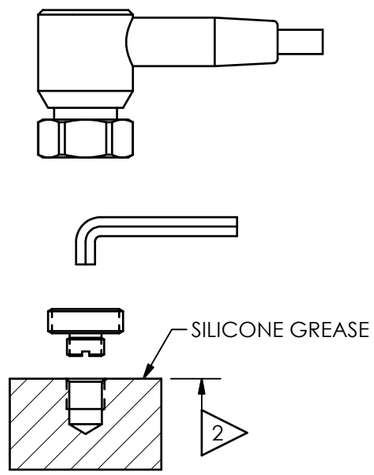


FIG 1: A 1/8" HEX ALLEN KEY IS REQUIRED FOR THE ENGLISH MOUNTING STUD. A 3MM HEX ALLEN KEY IS REQUIRED FOR THE METRIC MOUNTING STUD. APPLY SILICONE GREASE TO ALL MOUNTING SURFACES (SEE ARROWS FIG 1 & 2)

FIG 2: TIGHTEN THE MOUNTING STUD USING THE ALLEN KEY. TORQUE THE MOUNTING STUD TO WITHIN 3 TO 4 FT-LBS. (4.1 TO 5.4 Nm)

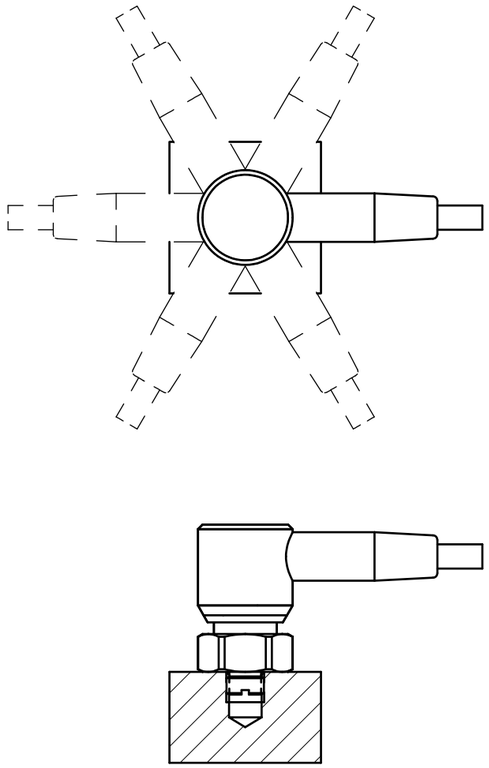


FIG 3: THREAD THE SENSOR'S HEX NUT ONTO THE MOUNTING STUD. POSITION THE CABLE OR CONNECTOR TO THE DESIRED LOCATION AND HAND TIGHTEN THE HEX NUT.

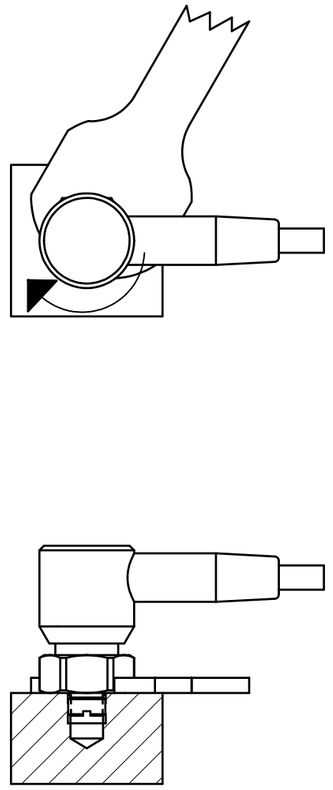


FIG 4: TIGHTEN THE HEX NUT USING A TORQUE WRENCH TO WITHIN 2 TO 3 FT-LBS (2.7 TO 4.1 Nm) WHILE HOLDING THE CABLE OR CONNECTOR IN THE DESIRED LOCATION.

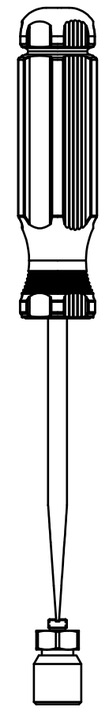


FIG 5: IF FOR ANY REASON THE MOUNTING STUD DOES NOT DISENGAGE FROM THE SENSOR, USE A FLAT HEAD SCREW DRIVER TO HOLD THE STUD WHILE TURNING THE HEX NUT COUNTERCLOCKWISE WITH A WRENCH.

3.) FOR BEST RESULTS, PLACE A THIN LAYER OF SILICONE GREASE (DOW CORNING #4 OR EQUIVALENT) ON INTERFACE PRIOR TO MOUNTING.

(2) MOUNTING SURFACE SHOULD BE FLAT TO WITHIN .001[0.03] TIR WITH A MINIMUM 63 [1.6] FINISH FOR BEST RESULTS.

(1) DRILL PERPENDICULAR TO MOUNTING SURFACE TO WITHIN ±1°

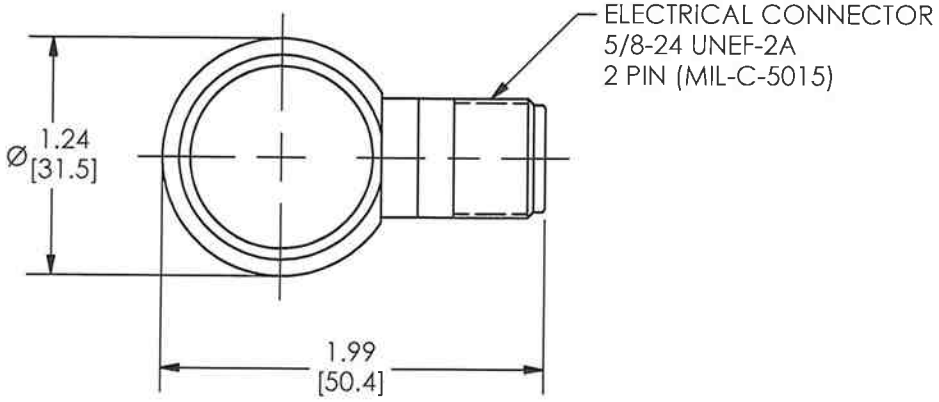
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER	
DIMENSIONS IN INCHES DECIMALS XX ±.01 XXX ±.005 ANGLES ± 2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ±0.3 XX ±0.13 ANGLES ± 2 DEGREES	JDM	10/9/14	ECB	10/9/14	DRK	10/9/14
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13	TITLE: INSTALLATION DRAWING MODEL 607 SERIES					

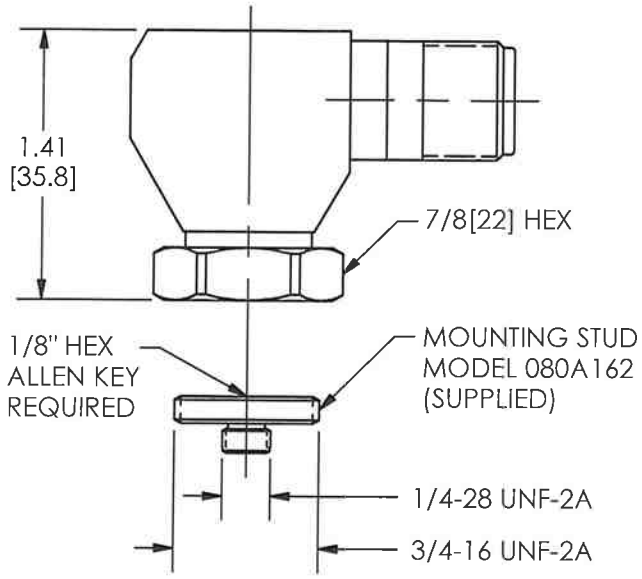
PCB PIEZOTRONICS
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 E-MAIL: sales@pcb.com

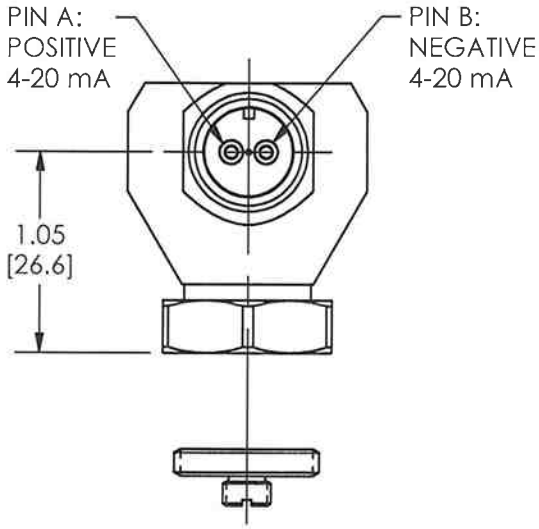
CODE IDENT. NO. 52681	DWG. NO. 18551
SCALE: FULL	SHEET 1 OF 1

21592

REVISIONS			
REV	DESCRIPTION	ECN	APP'D
B	REVISED PER ECR	21205	DM 12/04
C	CORRECT METRIC DIMENSION	29338	ECB 9/08







UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]
DECIMALS XX ± .03	DECIMALS X ± 0.8
XXX ± .010	XX ± 0.25
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]

DRAWN	ECB	9/9/08	MFG	LD	9/9/08
CHK'D	ECB	9/9/08	ENGR	DORT	9/9/08
APP'D	NF	9/9/08	SALES	JAJ	9/9/08

TITLE
OUTLINE DRAWING
MODEL 642A0X(M), 643A0X)M), 647A0X(M), 648A0X(M)
4-20 VIBRATION SENSING TRANSMITTER

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

CODE IDENT. NO.	DWG. NO.	
52681	21592	
SCALE: FULL	SHEET 1 OF 1	