IMI SENSORS
A PCB DIVISION

Model 640B72

Industrial vibration sensor, 4 to 20 mA output, 0 to 2.0 in/sec pk, 3 to 1k Hz, top exit, terminal block

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 640/641/645/646 B7 Series Industrial 4-20mA Sensor

Operating Guide with Enclosed Warranty Information

3425 Walden Avenue, Depew, New York 14043-2495

Phone (716) 684-0003

Fax (716) 684-3823

Toll Free Line 1-800-959-4IMI

MANUAL NUMBER: 28077
MANUAL REVISION: B
ECN NUMBER: 42851

Table of Contents

Introduction ..... *Page 3*

General Features

Dimension Drawing ..... *Page 4*

Operation and Wiring ..... *Page 5*

Standard Wiring
Taking Measurements
RV Option
TO Option
EP Option

ESD Sensitivity ..... *Page 10*

Warranty/Servicing

Warranty, Service & Return Procedure ..... *Page 11*

Customer Service ..... *Page 12*

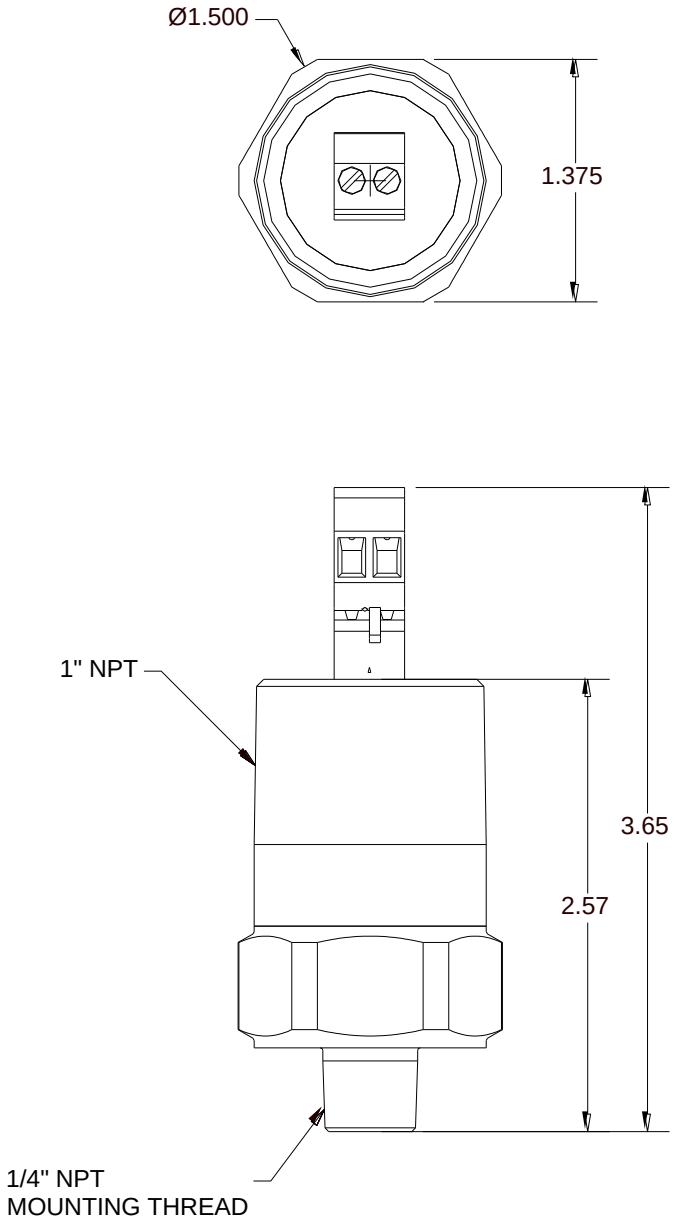
Introduction

The Model 640/641/645/646 B7 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.
- EP option includes an Explosion Proof capped elbow.
- 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.

Dimension Drawing



Inch (mm)

Operation and Wiring

Standard Wiring

The Model 640/641/645/646 B7 Series uses plug-in type screw terminal connectors for all input and output connections and operate from a standard 2-wire, 4-20mA loop. Attach the positive (+) input from the power supply to Pin 2 and the negative (-) input from the power supply to Pin 3.

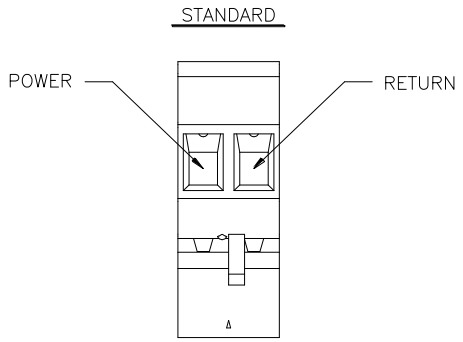


Figure 1 – wiring: standard connection

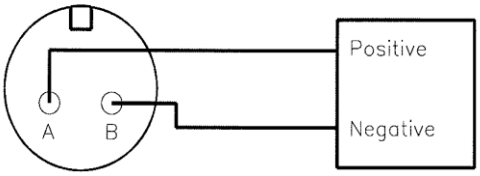


Figure 2 – wiring: loop powered

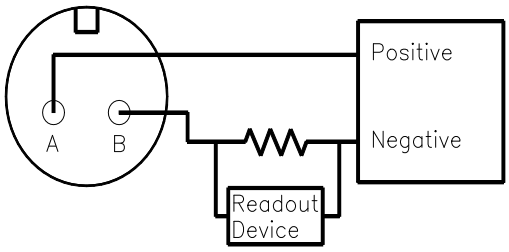


Figure 3 – wiring: loop powered/DC source

If using a standard DC power supply, install either an ammeter and/or load resistor in line with the return connection Pin 3.

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

$$V = IR$$

If $R = 500\Omega$ and $I = 6mA$, then $V = 3Vdc$

Note:

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

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	*640BX0*	*640BX1*	*640BX2*
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	*641BX0*	*641BX1*	*641BX2*
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	*645*	*646*
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-1 kHz, maximum amplitude of 15 g-pk. Data collectors or analyzers can use this vibration signal for further analysis.

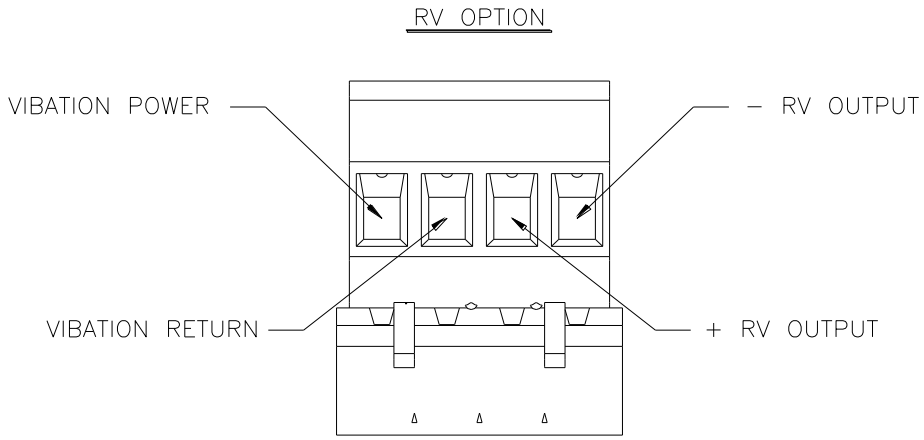


Figure 3 – RV wiring

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.

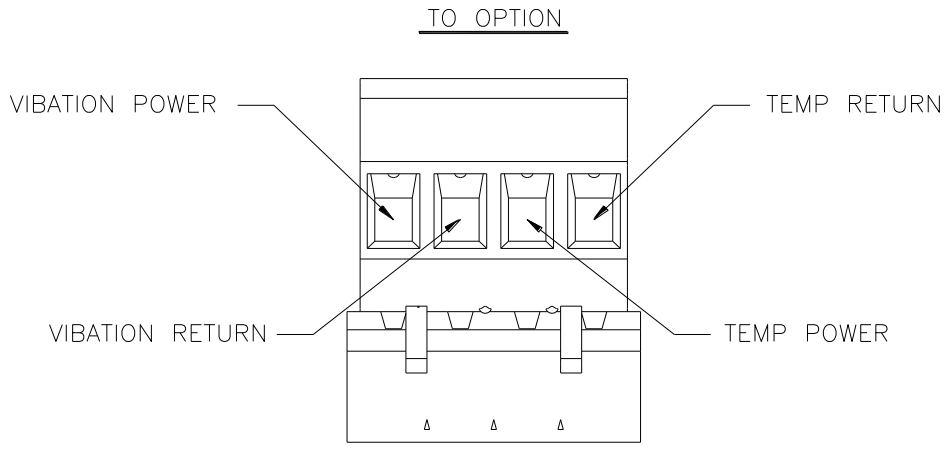


Figure 4 – TO wiring

Note:

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

EP Option

The EP option includes an Explosion Proof capped elbow for applications in rigid or IMC conduit systems where space is limited and access is needed for pulling conductors or maintenance. Standard conduit hub size is 1”NPT.

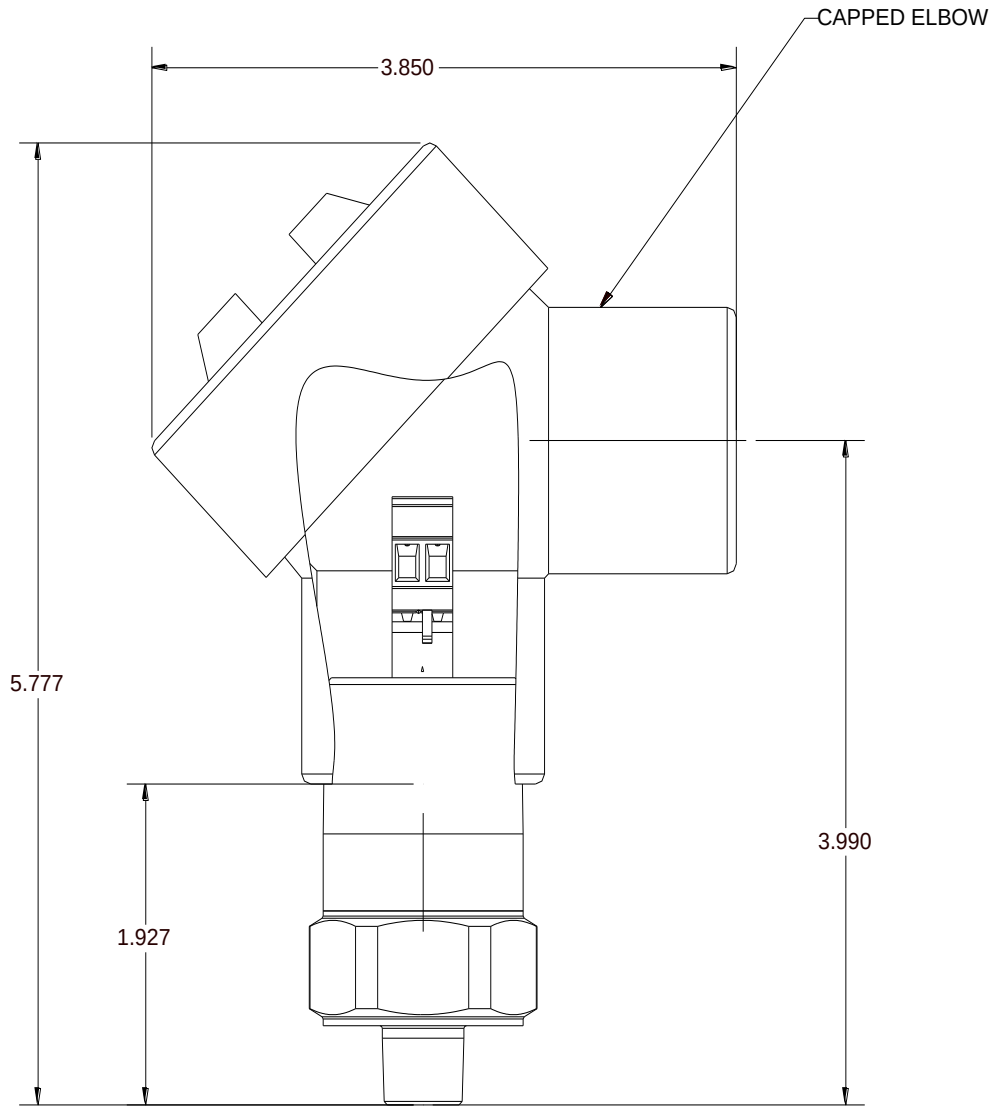


Figure 5 – EP option

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**.

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.

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

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

Model Number	4-20 MA OUTPUT VELOCITY SENSOR	Revision: C
640B72		ECN #: 33907

Performance	ENGLISH	SI	
Measurement Range	0.0 to 2 in/sec pk	0.0 to 50.8 mm/s pk	[1]
Output	4-20 mA	4-20 mA	
Frequency Range(± 3 dB)	180 to 60,000 cpm	3 to 1000 Hz	[2][3]
Broadband Resolution	0.01 in/sec pk	0.26 mm/s pk	[4]
Non-Linearity	± 1 %	± 1 %	
Environmental			
Temperature Range	-40 to 185 °F	-40 to 85 °C	
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)	1.5 in x 3.7 in	38.1 mm x 94 mm	
Weight	19.5 oz	553 gm	
Mounting Thread	1/4 NPT	No Metric Equivalent	
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Electrical Connector	Removable Screw Terminals	Removable Screw Terminals	
Electrical Connection Position	Top	Top	
Electrical Connections(Tab 1)	4-20 mA Pos (+)	4-20 mA Pos (+)	
Electrical Connections(Tab 2)	4-20 mA Neg (-)	4-20 mA Neg (-)	
Screw Terminal Wire Size	12-24 AWG	3.0 - .2mm²	

CE [5]

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 Group, 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.

EP - Explosion-proof certified conduit housing with 1" pipe thread

HT - High temperature, extends normal operation temperatures [6]

Temperature Range	-40 to 275 °F	-40 to 125 °C

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

Electrical Connector	Removable Screw Terminals	Removable Screw Terminals
Electrical Connections(Tab 1)	4-20 mA Pos (+)	4-20 mA Pos (+)
Electrical Connections(Tab 2)	4-20 mA Neg (-)	4-20 mA Neg (-)
Electrical Connections(Tab 3)	Signal Output Pos	Signal Output Pos
Electrical Connections(Tab 4)	Signal Output Neg	Signal Output Neg

TO - Temperature Output [7]

Temperature Output Range	-40 to +125 °C	-40 to +125 °C
Electrical Connector	Removable Screw Terminals	Removable Screw Terminals
Electrical Connections(Tab 1)	Vibration, 4-20 mA Pos.	Vibration, 4-20 mA Pos.
Electrical Connections(Tab 2)	Vibration, 4-20 mA Neg.	Vibration, 4-20 mA Neg.
Electrical Connections(Tab 3)	Temperature, 4-20 mA Pos.	Temperature, 4-20 mA Pos.
Electrical Connections(Tab 4)	Temperature, 4-20 mA Neg.	Temperature, 4-20 mA Neg.

VO - Buffered Analog Signal Output 100 mV/in/sec (±20%) [8]

Electrical Connections(Tab 1)	Vibration, 4-20 mA Pos.	Vibration, 4-20 mA Pos.
Electrical Connections(Tab 2)	Vibration, 4-20 mA Neg.	Vibration, 4-20 mA Neg.
Electrical Connections(Tab 3)	Signal Output Pos	Signal Output Pos
Electrical Connections(Tab 4)	Signal Output Neg	Signal Output Neg
Electrical Connector	Terminal Block	Terminal Block

NOTES:

[1] Conversion Factor 1 in/sec = 0.0254 m/sec.
[2] Current will fluctuate at frequencies below 5 Hz.
[3] 1Hz = 60 cpm (cycles per minute).
[4] Typical.
[5] See PCB Declaration of Conformance PS039 for details.
[6] Can not be combined with EX or VO options.
[7] Can not be combined with RV or VO options.
[8] Can not be combined with EX, HT, TO , RV options.

SUPPLIED ACCESSORIES:

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: tmw	Engineer: DQO	Sales: mm	Approved: DQO	Spec Number:
Date: 9/1/10	Date: 9/1/10	Date: 9/1/10	Date: 9/1/10	34414

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

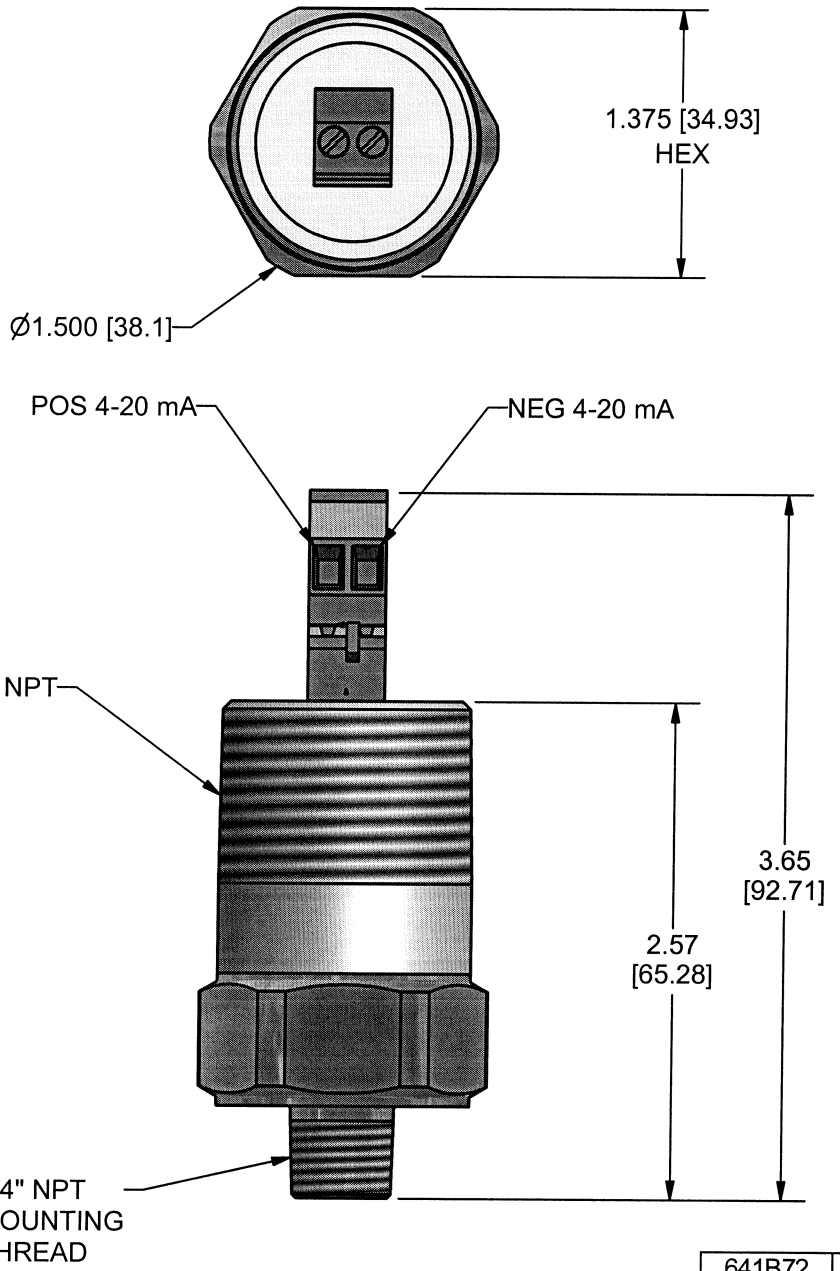
Phone: 800-959-4464
Fax: 716-684-3823
E-Mail: imi@pcb.com

APPLICATION		
NEXT ASS'Y	USED ON	VAR
	64XB7X	

REVISIONS			
REV	DESCRIPTION	ECN	APP'D
NR	RELEASED TO DRAFTING		
A	REVISED PER ECN	22197	DM 6/05

27394

PCB Piezotronics Inc. claims proprietary rights in the information disclosed hereon. Neither it nor any reproduction thereof will be disclosed to others without the written consent of PCB Piezotronics Inc.



MODEL	DESCRIPTION
641B72	0-2 IPS RMS, 10Hz-1kHz
641B71	0-1 IPS RMS, 10Hz-1kHz
641B70	0-0.5 IPS RMS, 10Hz-1kHz
640B72	0-2 IPS PK, 3Hz-1kHz
640B71	0-1 IPS PK, 3Hz-1kHz
640B70	0-0.5 IPS PK, 3Hz-1kHz

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

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

FILLETS AND RADII .003 - .005

FILLETS AND RADII [0.07 - 0.13]

DRAWN	RCE	6/16/05	MFG	[illegible]	6/17/05
CHK'D	DM	6/21/05	ENGR	JSD	6/17/05
APP'D	[illegible]	6/22/05	SALES	EGT	6/21/05

TITLE
OUTLINE DRAWING

MODEL 64XB7X
4-20 mA VELOCITY SENSOR

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

CODE IDENT. NO.	DWG. NO.
52681	27394

SCALE: FULL SHEET 1 OF 1

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).