



**Model 8162-055A**  
**Strain Gage Sensor Signal Conditioner**  
**Installation and Operating Manual**

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

**Toll-free: 800-828-8840**  
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<b>Service, Repair, and Return Policies and Instructions</b>
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**The information contained in this document supersedes all similar information that may be found elsewhere in this manual.**

**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 ensure 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 traceability to SI through 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 ensure 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 **Warranty, Service, Repair, and Return Policies and Instructions** 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.

**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](http://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](http://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:

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PCB工业监视和测量设备 - 中国RoHS2公布表  
 PCB Industrial Monitoring and Measuring Equipment - China RoHS 2 Disclosure Table

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
住房	○	○	○	○	○	○
PCB板	X	○	○	○	○	○
电气连接器	○	○	○	○	○	○
压电晶体	X	○	○	○	○	○
环氧	○	○	○	○	○	○
铁氟龙	○	○	○	○	○	○
电子	○	○	○	○	○	○
厚膜基板	○	○	X	○	○	○
电线	○	○	○	○	○	○
电缆	X	○	○	○	○	○
塑料	○	○	○	○	○	○
焊接	X	○	○	○	○	○
铜合金/黄铜	X	○	○	○	○	○
本表格依据 SJ/T 11364 的规定编制。						
○：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。						
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。						
铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。						

CHINA RoHS COMPLIANCE

Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	O	O	O
Teflon	O	O	O	O	O	O
Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
Cables	X	O	O	O	O	O
Plastic	O	O	O	O	O	O
Solder	X	O	O	O	O	O
Copper Alloy/Brass	X	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364.

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.

Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

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ECN: 46162

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**1.0 Description**

Series 8162 Strain Gage Signal Conditioners provide conditioned, amplified analog voltage and current output for strain gage based sensors such as load cells and reaction torque sensors. The units operate from 12 to 28 V<sub>DC</sub> power, and deliver ± 5 or ± 10 V and 4 to 20 mA output signals for recording, control, and analysis purposes.



**Figure 1 - Series 8162 Signal Conditioner**

The Series 8162 Signal Conditioners provide a wide strain gage input range from 0.5 to 11 mV/V, and are housed in fire resistant, waterproof NEMA 4X (IP66) enclosures. Standard features include an integral shunt calibration switch with an internal resistor, a two-pole active filter with 100 Hz cut-off, and watertight compression fittings for easy installation.

Typically, Series 8162 Signal Conditioners are configured to operate with a specific transducer during system calibration at the factory. Therefore, internal adjustments are not normally required prior to initial use. However, should adjustments be needed, the following sections outline instructions to configure the conditioner to other specific applications.

**2.0 Power Connection**

The Series 8162 Signal Conditioner is designed to operate on a customer supplied DC power source with a voltage range of 12 to 28 volts. To connect power to the conditioner,

- a. Loosen the four screws on top of the box and remove the lid to expose the internal circuit board.
- b. Insert a power cable through one of compression fittings located on the side of the unit.

- c. Prepare the wire leads of the cable, then insert the input voltage wire into the screw 1 position on terminal J1. Reference Figure 4 for the J1 terminal location. Tighten the screw to fasten the wire in place.
- d. Next, insert the Ground wire into the screw 2 position on terminal J1. Tighten the screw to fasten the wire.

**3.0 Transducer Cabling**

High quality twisted pair shielded cable with four conductors is recommended (such as Belden 8723) for transducer hook up. PCB can supply finished cables for transducers with either a PT02E-10-6P or PC04E-10-6P receptacle if desired.

To connect the transducer to the conditioner, insert the interconnect cable through a compression fitting, then screw attach to terminal J2 per the arrangement outlined in Table 1 below.

Table 1 – Transducer Cabling	
+Signal (Green)	Screw 1
-Signal (White)	Screw 2
-Excitation (Black)	Screw 3
+Excitation (Red)	Screw 4

**4.0 Analog Outputs**

Two analog outputs are available on the 8162 Series Signal Conditioner. The first is a voltage output that is jumper selectable to either ±5 or ±10 volts. The desired voltage output is set by the position of the P2 Jumper. Jumping pins 1 and 2 will set the conditioner to ±10 V<sub>OUT</sub>. Jumping pins 2 and 3 will set the conditioner to ±5 V<sub>OUT</sub>. Adjust Zero Balance and Span by using the R23, R29, and R22 potentiometers on the conditioner’s internal circuit board. Refer to Figure 4. Note that Zero Balance has both a coarse and fine adjustment.

A 4 to 20 mA current output is the second available output. The current output is adjusted using the R5 and R20 potentiometers. Reference Figure 4 for exact locations of the potentiometers.

Connecting output instrumentation to the signal conditioner is accomplished by attaching an interconnect cable to terminal J3 on the conditioner’s internal circuit board. Voltage output is fastened to screw 4; current output is attached to screw 1. Ground leads may be attached to either screw 2 or 3.

**5.0 Transducer Excitation**

Either 5-volt or 10-volt bridge excitation can be selected. In general, 5-volt excitation is used with 120 $\Omega$  transducers, and the 10-volt excitation is used with 350 $\Omega$  and 700 $\Omega$  transducers.

Excitation voltage is set by the position of the P1 Jumper. See Figure 4. Jumping pins 1 and 2 will set the conditioner to 10 V<sub>EXC</sub>. Jumping pins 2 and 3 will set the conditioner to 5 V<sub>EXC</sub>.

## 6.0 Calibration

The Series 8162 can be calibrated using (2) different methods. The first method uses actual or simulated Zero and Full Scale (FS) inputs. Actual inputs may come from a strain gage transducer loaded with calibrated weights. Simulated inputs may come from a strain gage bridge simulator.

The second method utilizes an R<sub>CAL</sub> resistor to simulate a load on a strain gage bridge. The R<sub>CAL</sub> resistor, located in the R12 position in Figure 4, is shunted across one arm of the strain gage bridge when the R<sub>CAL</sub> Switch (SW1) is depressed. The shunt produces an imbalance equivalent to that of a particular value of mechanical input. If this *Equivalent Input* value is accurately known, it can be used as a reference point for shunt calibration of the system. Upon completion of installation of the transducer and its associated cabling, the user can:

- a. Perform an overall deadweight calibration using a precisely known value of mechanical input. The calibration can then be transferred to the installed calibration resistor for convenience in checking later.
- b. Replace the installed calibration resistor with one supplied by the transducer manufacturer, or an equivalent resistance value, to achieve a precisely known equivalent input, allowing the instrument sensitivity to be adjusted correctly.
- c. A 30K ohm resistor is installed at the factory and is used during final checkout of the instrument. It is replaced with a more proper value resistor when calibrated with a specific transducer to produce a more accurate shunt value. The resistor is mounted internally on terminal R12 located on the printed circuit board in the instrument. See Figure 4. It can be reached by removing the cover.

*Note: Soldering is not required to remove or install the shunt calibration resistor. When an amplifier is purchased with a specific sensor as a system, PCB will install the proper value shunt resistor in the amplifier.*

### R<sub>CAL</sub> Polarity (+R<sub>CAL</sub> / -R<sub>CAL</sub>)

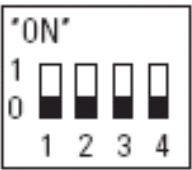
The default R<sub>CAL</sub> polarity setting of the Series 8162 Signal Conditioner is positive (+). Depending on the particular sensor being calibrated with the conditioner, +R<sub>CAL</sub> and/or -R<sub>CAL</sub> data is provided on the calibration certificate.

The polarity of the R<sub>CAL</sub> may be switched by changing the solder jumper position on the R<sub>CAL</sub> solder tabs located on the internal circuit board of the conditioner. See Figure 4 for the R<sub>CAL</sub> solder tab locations. Solder applied to jumper 1 will yield a +R<sub>CAL</sub>, solder applied to jumper 2 will yield a -R<sub>CAL</sub>.



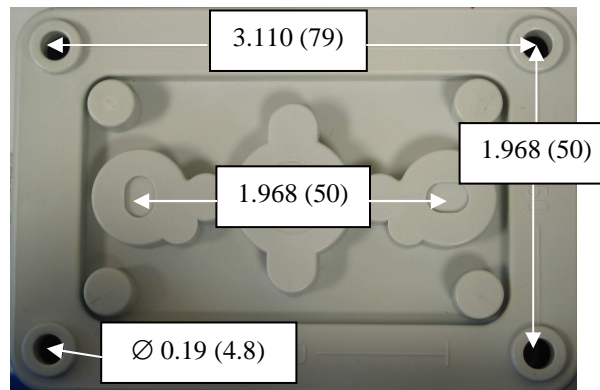
**7.0 Gain Switch**

Table 2 illustrates the proper Gain switch settings on switch block SW2 (shown in Figure 4) based on the input signal from the sensor with which it is used. Set each of the four switches to either 1 (ON) or 0 (OFF) according to the sensor’s excitation voltage and sensitivity.

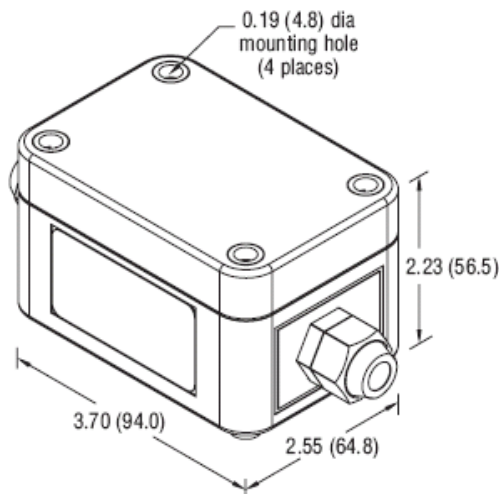
Table 2 – Switch Positions for Input Signal Range Adjustment						
Sensitivity (mV/V) Vexc = 5 VDC	Sensitivity (mV/V) Vexc = 10 VDC	SW2 Settings				SW2 1 = SW “ON”
		1	2	3	4	
7.0 to 11.0	3.5 to 5.5	0	0	0	1	
4.6 to 7.0	2.3 to 3.5	0	0	1	0	
3.0 to 4.6	1.5 to 2.3	0	1	0	0	
2.0 to 3.0	1.0 to 1.5	1	0	0	0	
1.5 to 2.0	0.75 to 1.0	1	0	1	0	
1.0 to 1.5	0.50 to 0.75	1	1	0	1	
0.9 to 1.0	0.45 to 0.50	1	1	1	1	

**8.0 Mounting**

To mount the Series 8162 signal conditioner, reference the hole patterns in Figure 2 for specific dimensions. Figure 3 illustrates the exterior dimensions of the conditioner. Dimensions are expressed in inches (millimeters).



**Figure 2**



**Figure 3**

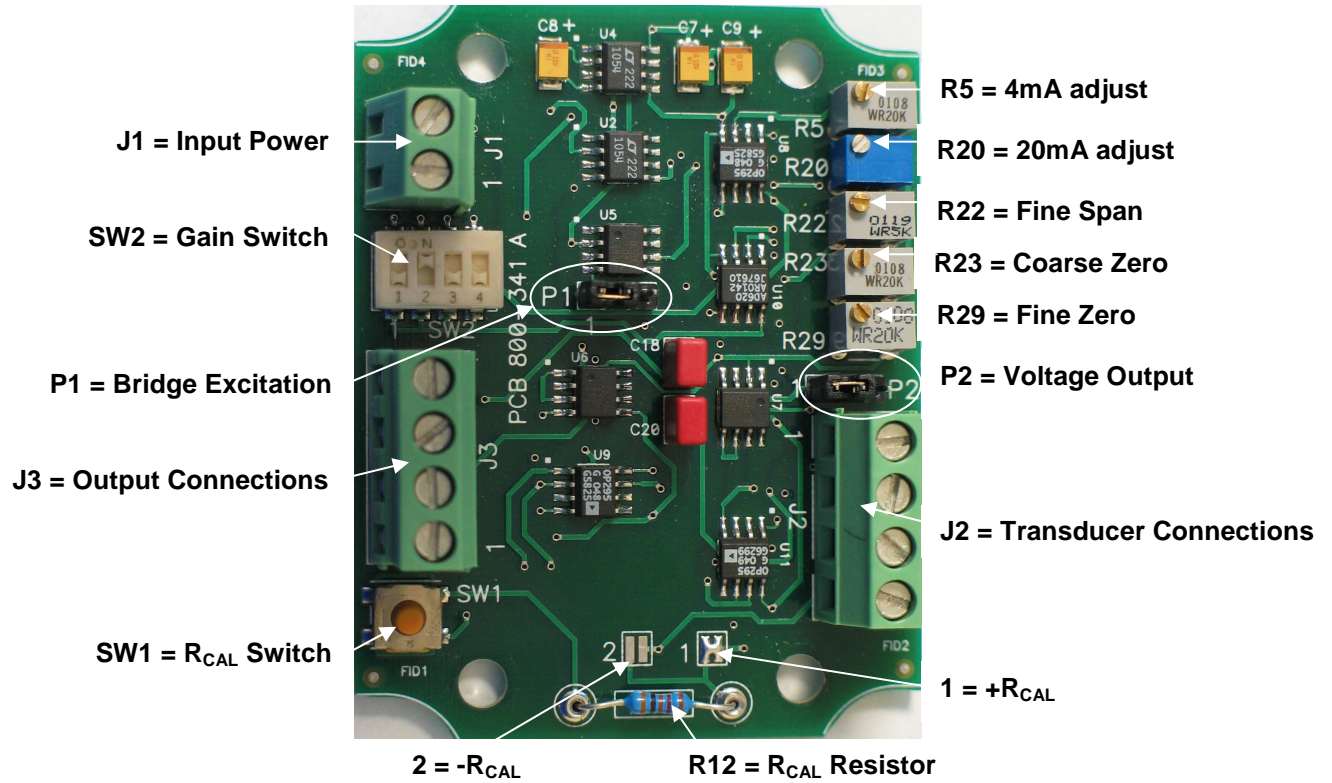



Figure 4 - Inside View

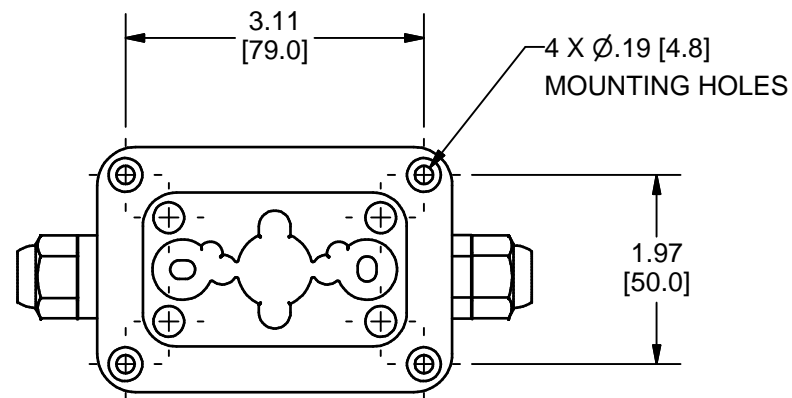
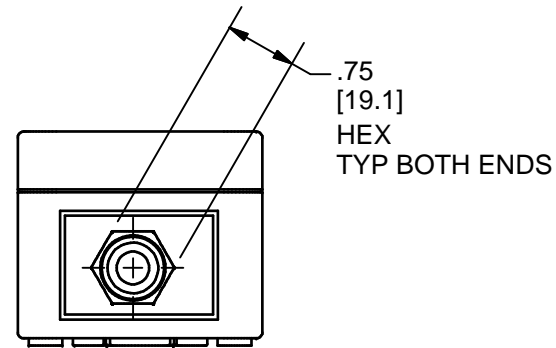
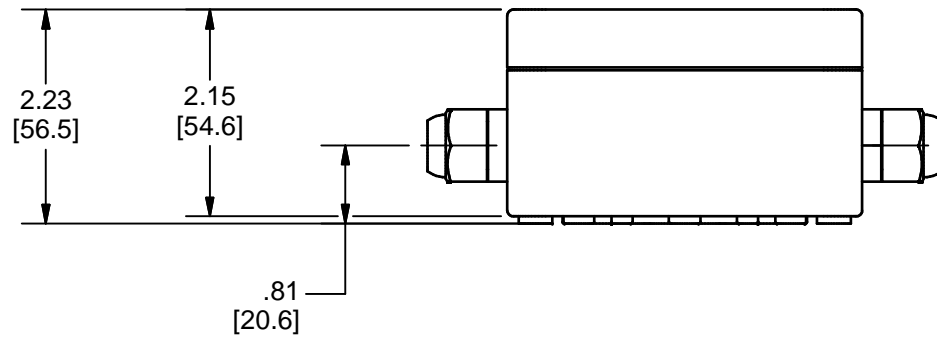
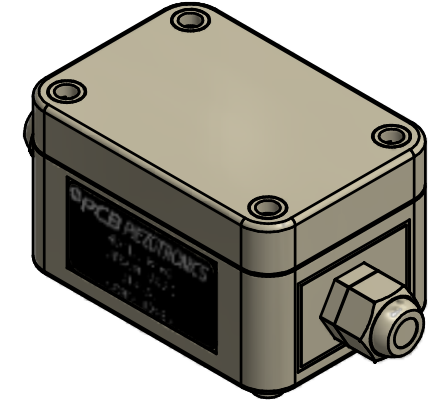
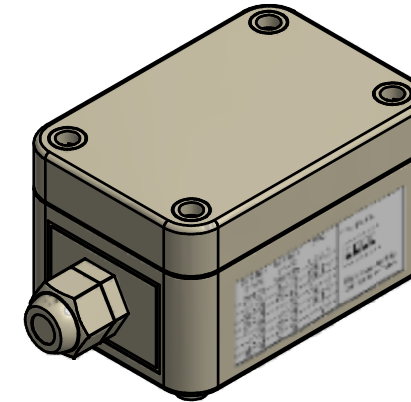
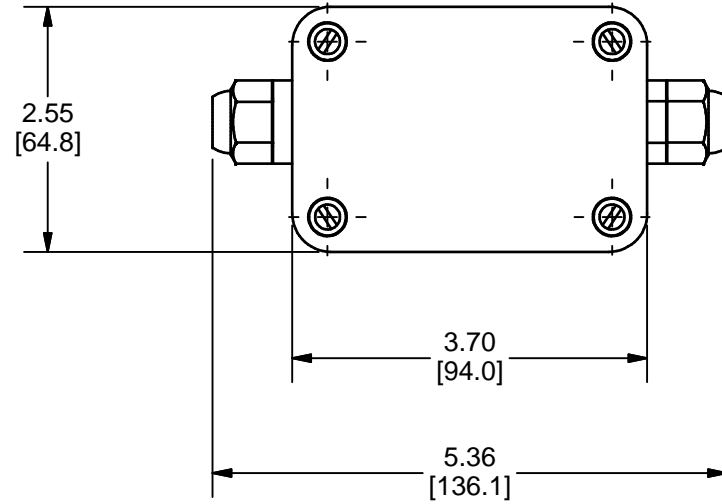
Model Number <b>8162-055A</b>	<b>STRAIN GAGE SENSOR SIGNAL CONDITIONER</b>			Revision: NR ECN #: 38072
<b>Performance</b> Electrical Filter Cutoff Frequency Frequency Range Input Signal(sensor sensitivity) <b>Environmental</b> Temperature Range Enclosure Rating Excitation Current <b>Electrical</b> Excitation Voltage Output Voltage Output Current Power Required Offset Voltage(@min. gain) Offset Voltage(@max.gain) <b>Physical</b> Electrical Connector(input/output) Size (Height x Width x Length)	<u>ENGLISH</u> 100 Hz 0 to 1000 Hz 0.5 to 11 mV/V +32 to +158 °F NEMA 4X 60 mA 10 VDC ± 5 VDC 4 to 20 mA 12 to 28 Vdc ± 50% of F.S. ± 70% of F.S. screw terminal 3.70 in x 2.55 in x 2.23 in	<u>SI</u> 100 Hz 0 to 1000 Hz 0.5 to 11 mV/V 0 to +70 °C IP66. 60 mA 10 VDC ± 5 VDC 4 to 20 mA 12 to 28 Vdc ± 50% of F.S. ± 70% of F.S. screw terminal 94.0 mm x 64.8 mm x 56.6 mm	[2] [3] [1] [1]	<b>OPTIONAL VERSIONS</b> Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.
<b>NOTES:</b> [1] Factory Adjustable [2] Filtered via 2-pole active filter. [3] User Adjustable.				
Entered: AP		Engineer: JSD		Sales: KWW
Date: 10/8/2013		Date: 10/8/2013		Date: 10/8/2013
			Approved: DA	Spec Number: <b>52276</b>
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.				<div style="text-align: center;">  <p> <b>PCB Load &amp; Torque, Inc.</b>            24350 Indoplex Circle            Farmington Hills, MI 48335            UNITED STATES            Phone: 866-684-7107            Fax: 716-684-0987            E-Mail: <a href="mailto:ltinfo@pcbloadtorque.com">ltinfo@pcbloadtorque.com</a>            Web site: <a href="http://www.pcbloadtorque.com">http://www.pcbloadtorque.com</a> </p> </div>


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27193

REVISIONS

REV	DESCRIPTION	ECO
A	UPDATED TO PCB L&T - 05.24.13, PTE	41446



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		 24350 Indoplex Circle, Farmington Hills, MI 48335 (716) 684-0001 E-MAIL: linfo@pcbloadtorque.com DWG. NO. <b>27193</b> SCALE: FULL SHEET 1 OF 1
DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]	PTE	05.24.13	SAC	05.24.13	SAC	05.24.13	
DECIMALS XX ±.01 XXX ±.005	DECIMALS X ± 0.3 XX ± 0.13	TITLE OUTLINE DRAWING MODEL 8162 SIGNAL CONDITIONER						
ANGLES ± .5 DEGREES	ANGLES ± .5 DEGREES							
FILLETS AND RADII .015 MAX	FILLETS AND RADII 0.38 MAX							