Model 8161-011A

DIN Rail Strain Gage Conditioner

Installation and Operating Manual

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

Toll-free: 800-828-8840
24-hour SensorLine: 716-684-0001
Fax: 716-684-0987
E-mail: info@pcb.com
Web: www.pcb.com

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
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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	O	O	O	O	O	O
PCB板	X	O	O	O	O	O
电气连接器	O	O	O	O	O	O
压电晶体	X	O	O	O	O	O
环氧	O	O	O	O	O	O
铁氟龙	O	O	O	O	O	O
电子	O	O	O	O	O	O
厚膜基板	O	O	X	O	O	O
电线	O	O	O	O	O	O
电缆	X	O	O	O	O	O
塑料	O	O	O	O	O	O
焊接	X	O	O	O	O	O
铜合金/黄铜	X	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。

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.

Table of Contents

Figures

MANUAL NUMBER: 23708
MANUAL REVISION: E
ECN NUMBER: 50103 (10/28/19)

1.0 Description

Series 8161 Signal Conditioner/Amplifier is designed for use with strain gage transducers that can operate with a DC excitation-amplification source. The 8161 series supplies either a 5 volt or a 10 volt transducer excitation, which can be selected through an internal jumper (see Figure 1). The 8161 series contains all necessary balancing, gain, and calibration controls and conditions/amplifies the applied input to a standard +/-5 or +/- 10 volt (jumper selectable, see Figure 1), and 4-20 mA analog output. Calibration of the instrument to the transducer is made through conventional a shunt technique using an internal calibration resistor. A front panel push button provides for calibration in the positive direction.

2.0 Power connection

The 8161 series is designed to operate on a customer supplied DC power source with a voltage range of 10 to 28 volts. Screw terminals 1 and 2 are provided for power connections. Reference Figure 3.

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 receptacles if desired. Reference Figure 3 for transducer hook up.

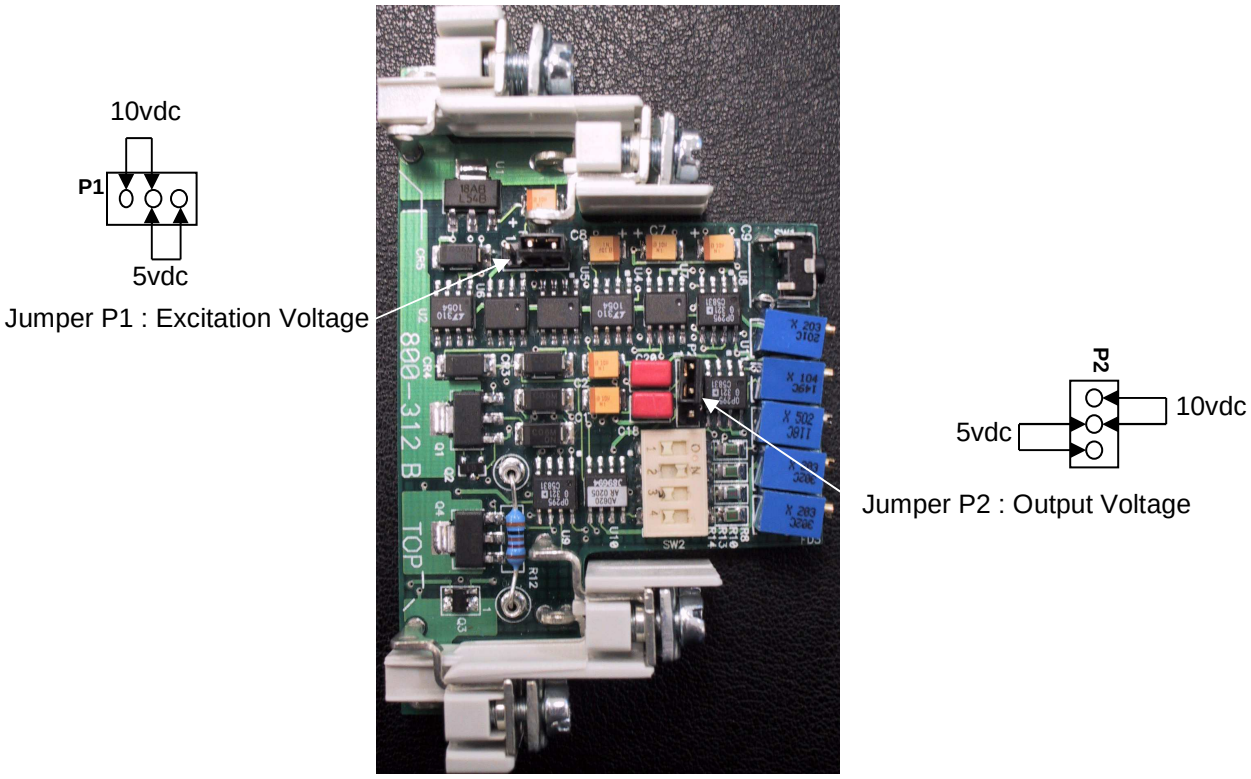


Figure 1 - Jumper Locations

4.0 Transducer excitation

Either 5 volt or 10 volt bridge excitation can be selected (see Figure 1). In general, 5-volt excitation is used with 120Ω transducers, and the 10-volt excitation is used with 350Ω and 700Ω transducers.

5.0 Calibration Resistor

If a fixed resistor is shunted across one arm of a strain gage bridge, it 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:

1. 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.

2. 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.

A 30K ohm resistor is installed at the factory and is used during final checkout of the instrument. It should be replaced with the proper value and accuracy for the transducer that it will be used with. The resistor is mounted internally on terminals located on the printed circuit board in the instrument. It can be reached by removing the cover.

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

6.0 Analog Outputs

Two different analog outputs are available at the instrument terminal connections. Each output has a 1,000 Hz cutoff frequency. The voltage output of ± 5 volts or ± 10 volt @ 5 mA (jumper selectable) is available between terminals 4 and 1. The current output of 4 to 20 mA is available between terminals 3 and 1.

7.0 Calibration

This section contains the instructions for calibrating the Model 8161 series. To perform calibration, proceed as follows:

1. Set SW2 switches to appropriate mV/V setting. See location in Figure 2.

"0" = Switch OFF, "1" = Switch ON

Sensitivity (mV/V) for $5V_{exc}$	Sensitivity (mV/V) for $10V_{exc}$	SW2- 1	2	3	4
7.0 - 11.0	3.5 – 5.5	0	0	0	1
4.6 – 7.0	2.3 – 3.5	0	0	1	0
3.0 – 4.6	1.5 – 2.3	0	1	0	0
2.0 – 3.0	1.0 – 1.5	1	0	0	0
1.5 – 2.0	.75 – 1.0	1	0	1	0
1.0 – 1.5	.50 - .75	1	1	0	1
.90 – 1.0	.45 - .50	1	1	1	1

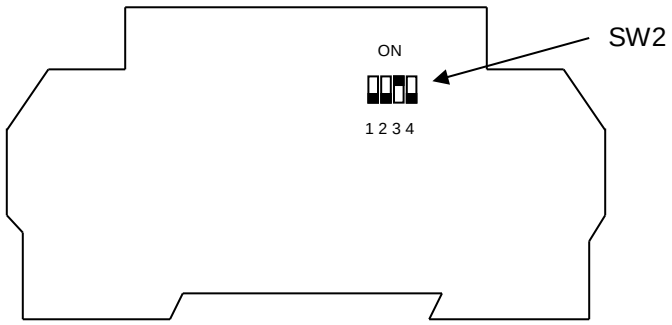


Figure 2 – SW2 Switch Settings

Example: *2.5 mV/V transducer*
V_{EXC} = 10 volts

Set: *SW2-1 (Off)*
SW2-2 (Off)
SW2-3 (On)
SW2-4 (Off)

2. Hookup transducer as shown in Figure 3, then connect power supply.

3. Apply DC power (10 to 28 volts) to terminals 1 and 2 (see Figure 3). Allow 30 minutes of warm-up time for stabilization of transducer characteristics.

4. With the transducer unloaded, set the voltage output to ZERO using the coarse and fine zero controls. If the current output is to be used, set ZERO to 4 mA using the 4 mA adjust.

5. Load the transducer to a convenient up-scale value, which is greater than one half of full scale. Adjust the fine span control until the voltage output signal reading is equal to the *dead weight* value. Remove the *dead weight*, then press the RCAL switch and note the voltage reading obtained. This reading can now be used in future calibrations since it is related to a value obtained thru *dead weight* calibration. To calibrate the instrument in the future, simply press the CAL button and adjust the fine span control to obtain the

reading previously recorded after *dead weight* calibration. If the current output is to be used, repeat the above step using the 20 mA adjust.

6. If *dead weight* calibration is not practical and the transducer manufacturer has supplied a calibration resistor (or resistor value), install the recommended calibration resistor. Now press the RCAL switch and adjust the voltage and/or current controls until the module output is equal to the *Equivalent Input* value simulated by the installed calibration resistor.

7. If *dead weight* calibration is not practical and the transducer-calibration data is unknown, the *Equivalent Input* value for the factory-installed calibration resistor can be approximated as follows, if the mV/V sensitivity rating of the transducer and the bridge resistance are known.

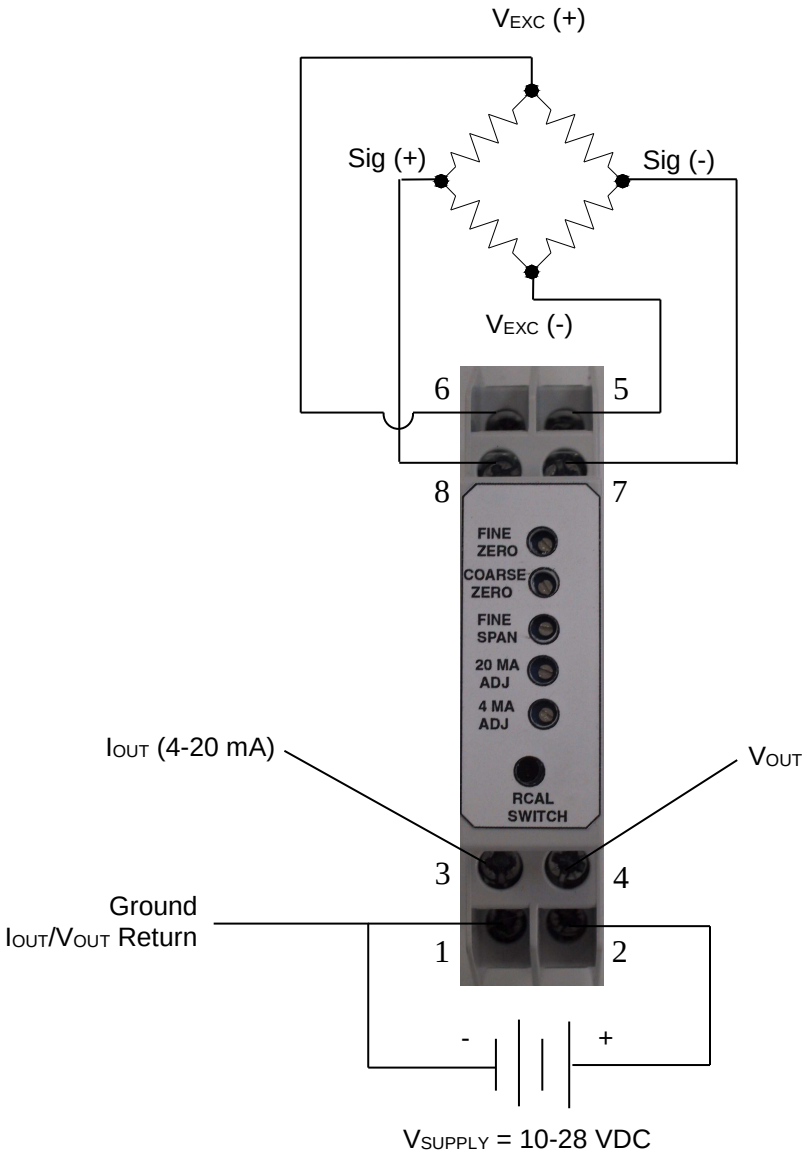
$$X = ((25000 \times Rb) / (K \times Rc))$$

Where X = Equivalent Input (% of full scale)
Rb = Bridge Resistance (ohms)
K = Transducer sensitivity (mV/V, full scale)
Rc = Calibration Resistance (ohms, 30k installed or proper value supplied with sensor)

Sample Calculation:

Assume that K = 3.000 mV/V for a 10,000 pound capacity load cell (F.S.) with a bridge resistance of 350 ohms.

$$X = ((25{,}000 \times 350) / (3.000 \times 30{,}000)) = 97.22\% \text{ F.S.} = 9{,}722 \text{ lbs.}$$



1	-	Ground
2	-	V_{supply} (10-28 VDC)
3	-	I_{out} (4-20 mA)
4	-	V_{out} (±5 or ±10 V)
5	-	- Excitation
6	-	+ Excitation
7	-	- Signal
8	-	+Signal

Figure 3– Transducer Hook-up

Model Number	DIN RAIL STRAIN GAGE CONDITIONER	Revision: B
8161-011A		ECN #: 41443

Performance	**ENGLISH**	**SI**	
Frequency Range	1 kHz	1 kHz	
Non-Linearity	± 0.01 % FS	± 0.01 % FS	
Zero Adjust Range(Output 1)(course)	± 60 %	± 60 %	
Zero Adjust Range(fine)	± 10 %	± 10 %	
Span Adjust Range(Output 1)(course)	± 0.05 to 5 mV/V	± 0.05 to 5 mV/V	
Span Adjust Range(fine)	± 20 %	± 20 %	
20 mA Adjust Range(Output 2)	± 20 %	± 20 %	
4 mA Adjust Range(Output 2)	± 10 %	± 10 %	
Environmental			
Temperature Range	+32 to +158 °F	0 to +70 °C	
Electrical			
Excitation(Max Current)	30 mA	30 mA	
Excitation Voltage(± .05 %)(Sensor)	10 VDC	10 VDC	[1]
Output 1(Voltage)	± 10 VDC	± 10 VDC	[1]
Output 2(Current)	4 to 20 mA	4 to 20 mA	
Power Required(Voltage)	12 to 28 Vdc	12 to 28 Vdc	
Power Required(Current)	60 mA	60 mA	[2]
Physical			
Size (Height x Width x Length)	3.35 in x 0.69 in x 2.27 in	89 mm x 18 mm x 58 mm	
Mounting	35 mm DIN Rail	35 mm DIN Rail	

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.

NOTES:
[1] Jumper selectable.
[2] At full sensor load.

Entered: AP	Engineer: JSD	Sales: KWW	Approved: DA	Spec Number:
Date: 6/14/2013	Date: 6/14/2013	Date: 6/14/2013	Date: 6/14/2013	**30528**

PCB LOAD & TORQUE
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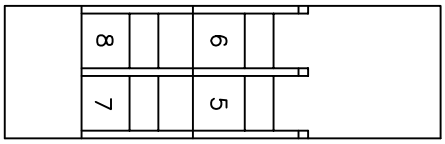
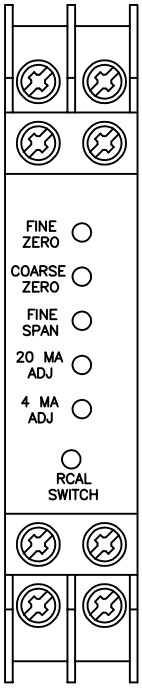
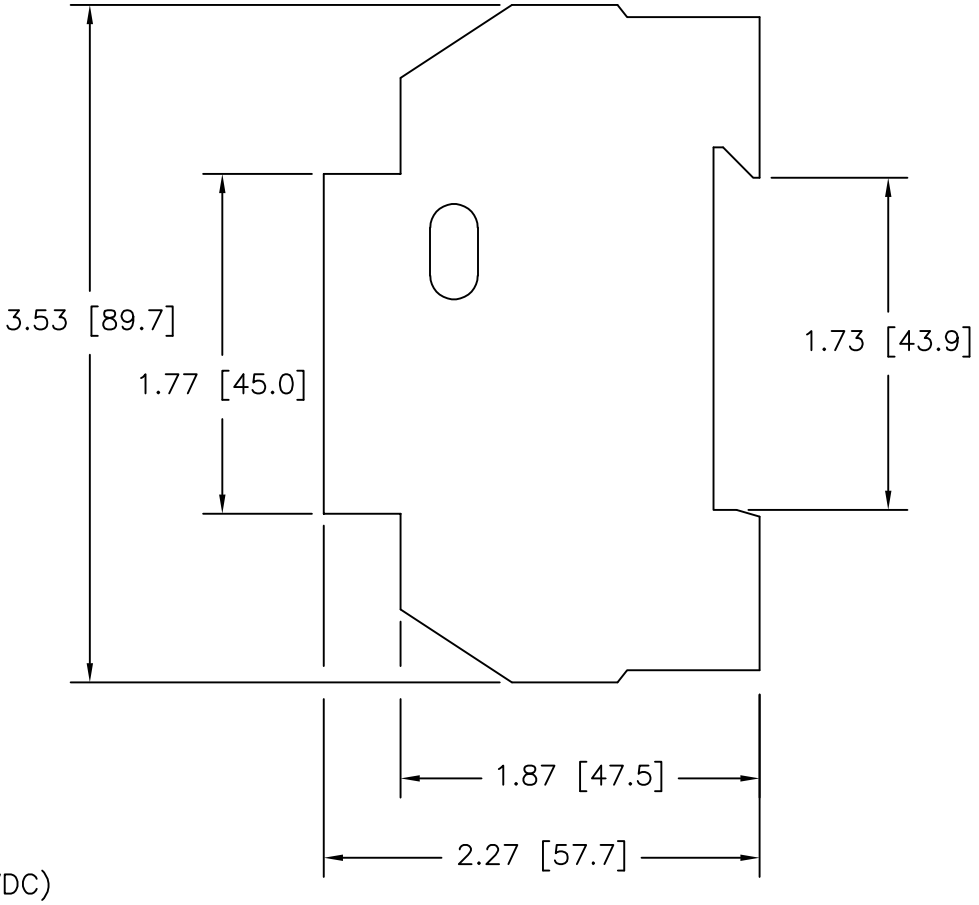
APPLICATION		
NEXT ASS'Y	USED ON	VAR

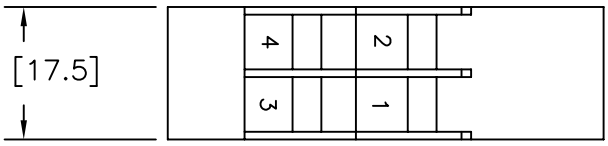
REVISIONS				
REV	DESCRIPTION	ECN	DATE	APP'D
C	UPDATED TERMINAL CONNECTIONS	50103	10/28/19	PTE

23570









TERMINAL CONNECTIONS

1 GROUND
2 V SUPPLY (10–28 VDC)
3 I OUT (4–20mA)
4 V OUT (±5 OR ±10 V)
5 – EXCITATION
6 + EXCITATION
7 – SIGNAL
8 + SIGNAL

UNLESS SPECIFIED TOLERANCES	
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
FILLETS AND RADII .003 – .005	FILLETS AND RADII [0.07 – 0.13]
DD011 REV. C 01/21/03	

DRAWN	JM	5.2.05	MFG	JS	6.14.05
CHK'D	DM	6.6.05	ENGR	MJK	6.9.05
APP'D	DMB	5.13.05	SALES	JJM	6.10.05

TITLE
OUTLINE DRAWING
MODEL 8161 SERIES
DIN RAIL MOUNT AMPLIFIER

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CODE IDENT. NO.	DWG. NO.
52681	23570
SCALE: FULL	SHEET 1 OF 1