LCA

LOAD CELL AMPLIFIER
SIGNAL CONDITIONER

Modules LCA-9PC & LCA-RTC

OPERATOR MANUAL

Model LCA-9PC
(DB9 connectors)

Model LCA-RTC
(removable terminal connectors)

Transducer
Techniques®

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Revised August 2023

LCA PRODUCT DESCRIPTION

The LCA-9PC and LCA-RTC Modules provide low-cost, dedicated signal conditioning for a single bridge type load cell or torque sensor. Model LCA-9PC comes with DB9 male and female connectors, which require soldering to user-furnished mating female or male cable connectors. Model LCA-RTC comes with removable screw-clamp terminal connectors, which accept wires without soldering.

On- board jumper selections include sensitivities from 0.5 mV/V to 10 mV/V, bandwidths from 0-100 Hz to 0-30 kHz, and amplified outputs of 0 to ±5V, 0 to ±10V, 0-16 mA, 0-20 mA or 4-20 mA. Zero and span adjustments are via precision 25-turn low-tempco metal film potentiometers.

The units can be operated next to the sensor with 4-wire hookup or at distances up to 1 km (3300 feet) with 6-wire hookup. An onboard 87.325 kΩ shunt calibration resistor allows easy calibration at the push of a button. Provision is also made for a user furnished shunt calibration resistor. Power requirements are 11.8 to 26V DC with load currents from 10 to 60 mA. The upper current draw applies when the unit provides 10V DC excitation to a 350 ohm load cell while delivering a 20 mA analog output.

MOUNTING PROVISIONS

1. **DIN Rail Mounting of Cased LCA Units** can be via the 35 mm DIN Rail Mounting Kit (P/N ADR-KIT), as described in the Accessories section on page 17 of this manual. The mount is attached to the bottom of the case by means of four plastic push-in rivets that come with the kit.

2. **Bulkhead Mounting of Cased LCA Units** can be via four 0.156” (4.0 mm) holes in the bottom of the case. Please see the Case Dimensions section on page 15 of this manual. Note that any screw head inside the case can have a maximum height of only 0.10” (2.5 mm) so as to avoid contact with conductors on the back of the circuit board. Make sure that the adjustment holes in the top of the case remain accessible.

3. **Bulkhead Mounting of LCA Circuit Board** can be via user-furnished standoffs and two 9/64” (3.5 mm) mounting holes on the circuit board. Please see the Board Dimensions section on page 16 of this manual. To avoid electrical contact between the standoffs and live conductors, the circuit board should be sandwiched between two insulating nylon washers. Since spacing is tight, the diameter of the washers and mounting nuts at their widest dimension cannot exceed 1/4" (6 mm).

SETUP USING JUMPERS & POTENTIOMETERS

LCA operating parameters are selectable with combinations of push-on jumpers on the circuit board, as shown on the next two pages of this manual. Please review the default jumper settings to see if you need to move jumpers.

To move jumpers from their default settings, first open the case. As shown in Figure 1, use a screwdriver to pry apart the two clamshell halves, which snap together. With the case open, locate the pin forest headers on the circuit board, which are highlighted in gray in Figure 2 and are labeled **E1** thru **E8**.

Figure 1. *Opening clamshell case.*

After resetting jumpers and with the case still open, apply signal and power, and use a multimeter to measure the signal output. Use a small flat-blade screwdriver to rotate the 25-turn zero and span potentiometers. Verify that the unit can be calibrated as expected, thereby confirming that your jumper settings are correct.

When done, align the lid of the clamshell case so that the zero and span potentiometers can be adjusted through holes in the top of the lid, then snap the case shut again.

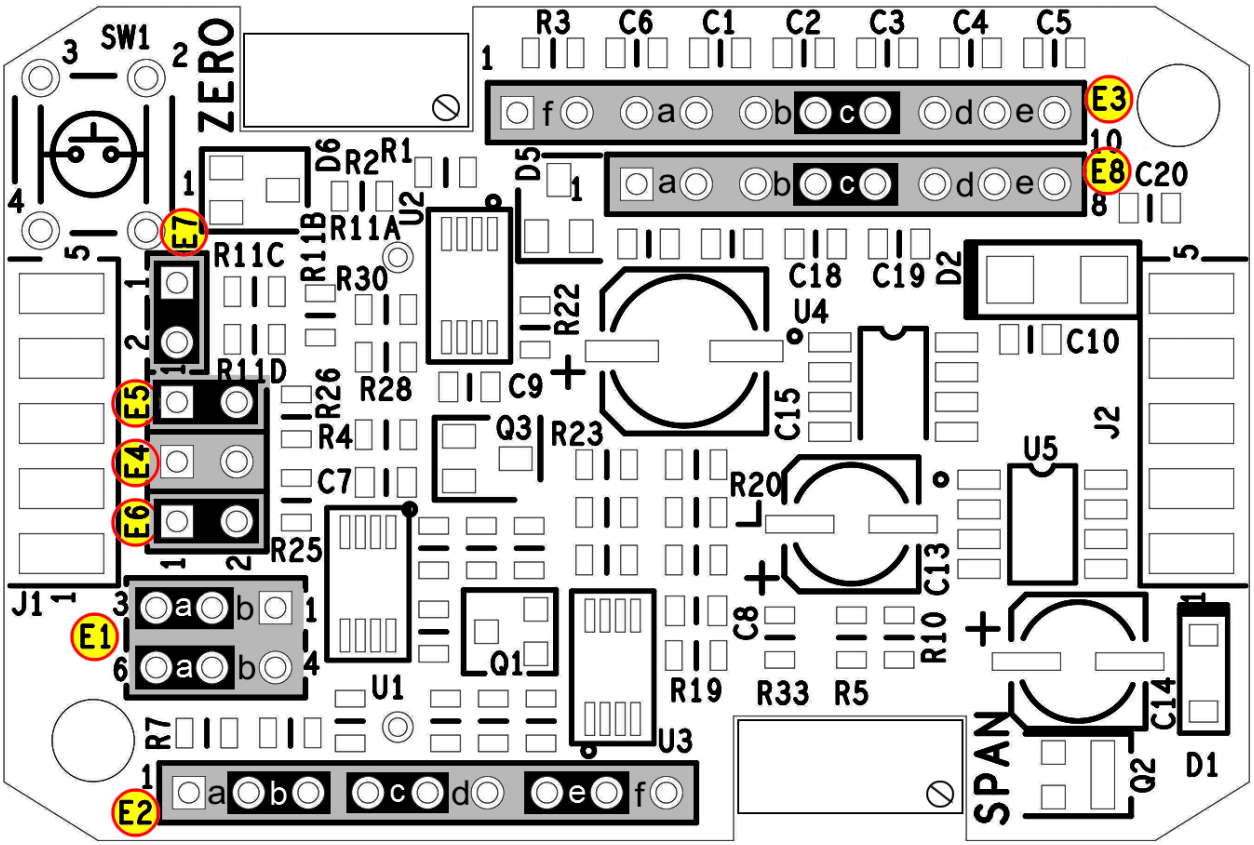


Figure 2. *Circuit board showing potentiometers, jumper locations, and factory default jumpers.*

Set E4 jumper to select 5V excitation output. Leave out for 10V excitation output.

Excitation Voltage	5V	10V
E4 jumper	install	none*

* Factory default setting.

Set twin E1 jumpers to select normal or reversed input polarity for a positive voltage output.

Signal polarity	Normal	Reversed
E1 jumper	a + a*	b + b

* Factory default setting.

Set the E3 jumper position f to select a 4-20 mA output. Do not set that jumper for other output ranges.

Signal output	0 to ±5V	0 to ±10V	0-16 mA	0-20 mA	4-20 mA
E3 jumper	no f*				f

* Factory default setting

Set E2 gain jumpers for combinations of excitation voltage (5V or 10V), load cell sensitivity (0.5 to 10.0 mV/V), and signal output (0-5V, 0-10V, 0-16 mA, 0-20 mA or 4-20 mA).

Exc.	Output		Load cell sensitivity in mV/V							
	V_o	I_o	0.5	1.0	1.5	2.0	2.5	3.0	4.0	10.0
5V	1-5V	4-20 mA	f	a, e	b, d	b, c, e*	c, e	c	b, e	e
	0- ±5V	0-20 mA	f	a, e	b, d	b, c, e*	c, e	c	b, e	e
	0- ±10V	NA	a, d, f	f	a, c, e	a, e	b, d, e	b, d	b, c, e	b
10V	1-5V	4-20 mA	a, e	b, c, e	c	b, e	b	b	e	none
	0- ±5V	0-20 mA	a, e	b, c, e	c	b, e	b	b	e	none
	0- ±10V	NA	f	a, e	b, d	b, c, e*	c, e	c	b, e	e

* Factory default setting

Set E3 and E8 jumpers to set low-pass filter action, which applies to both voltage and current outputs. At the upper frequencies shown (0.1 to 30 kHz), signal and noise amplitudes will be down by -6 dB (or a factor of 2).

-6 dB point in kHz	0.1	0.3	1.0	3.0	10	30
E3 jumper	a	b	c*	d	e	none
E8 jumper	a	b	c*	d	e	none

* Factory default setting

Set E5 and E6 jumpers to set up the unit for 4-wire or 6-wire connection. With a 4-wire connection, 2 wires are used for signal and 2 wires for excitation. With a 6-wire connection, an additional 2 wires are used to sense the excitation voltage at the sensor, thereby eliminating errors due to voltage drop in the excitation leads.

Excitation Connection	4-wire	6-wire
E5 jumper	install*	none
E6 jumper	install*	none

* Factory default setting

Set the E7 jumper for use of the unit's on-board standard 87.325 kΩ shunt calibration resistor. Do not set the E7 jumper for use of a user-furnished custom shunt calibration resistor.

Calibration Resistor	Standard	Custom
E7 jumper	install*	none

* Factory default setting

A custom shunt calibration resistor, if used, is inserted into two single-pin sockets on the circuit board, as shown in Figure 3. Cut and bend the leads so that the resistor will fit into the case when closed.

The selected resistor (standard or custom) is connected to the circuit by pressing the pushbutton switch at SW1, which is accessible through a hole in the top of the case.

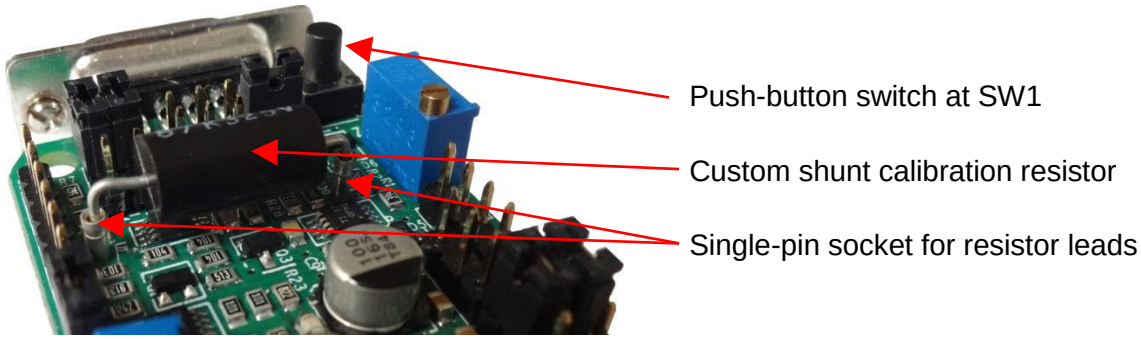


Figure 3. *Custom shunt calibration resistor*

ELECTRICAL CONNECTIONS

Model LCA-RTC (with removable terminal connectors)

Revisions G and later:

Terminal Connector J1
(bottom of product label, sensor side)

Terminal Connector J2
(top of label, signal output & power side)

WARNING: If input power (green connector) is plugged into the black terminal (jacks 1, 2, 3), damage will occur to the device.

Revision G was implemented in July 2017 for the LCA-RTC to change the green power connector from 3 pins to 2 pins, and to increase the pitch (or spacing) between the power connecter pins. In combination, these two changes minimize the chance of applying power to the wrong terminals, thereby damaging the unit. LCA-RTC cable assemblies built for Revision F or earlier units cannot be used with Revision G or later units.

Revisions earlier than G:

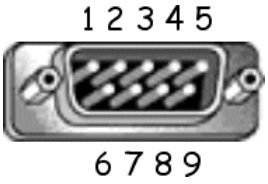
Terminal Connector J1
(bottom of product label, sensor side)

Terminal Connector J2
(top of label, signal output & power side)

WARNING: If input power (green connector) is plugged into the black terminal (jacks 1, 2, 3), damage will occur to the device.

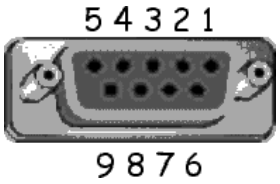
Model LCA-9PC (with DB9 connectors)

Pin numbers 1 through 9 of DB9 connectors are molded into the plastic adjacent to the pins and can be read with a magnifying glass.



DB9 Male Connector J1
(bottom of product label, sensor side)

Pin 1	+ SIG	+ Signal input
Pin 2	+ EXC	+ Excitation output
Pin 3	NC	Not connected
Pin 4	NC	Not connected
Pin 5	+ SEN	+ Sense
Pin 6	- SIG	- Signal input
Pin 7	- EXC & GND	
Pin 8	- SEN	- Sense
Pin 9	- SIG	- Signal input



DB9 Female Connector J2
(top of label, signal output & power side)

Pin 1	I_o	Current output
Pin 2	GND	Electrical ground
Pin 3	V_o	Voltage output
Pin 4	GND	Electrical ground
Pin 5	V_{pwr}	Power input, 11.8-26V
Pin 6	GND	Electrical ground
Pin 7	GND	Electrical ground
Pin 8	GND	Electrical ground
Pin 9	GND	Electrical ground

Sensor Connections

- **For operation with a 4-wire sensor,** connect +SEN to +EXC and -SEN to -EXC. This can be achieved by installed jumpers at E5 and E6 on the circuit board, or by making the connections externally at the J1 connector.
- **For operation with a 6-wire sensor,** connect +SEN to +EXC and -SEN to –EXC at the sensor. 6-wire operation allows the distance between the sensor and the signal conditioner to be up to 1 km (3300 ft).

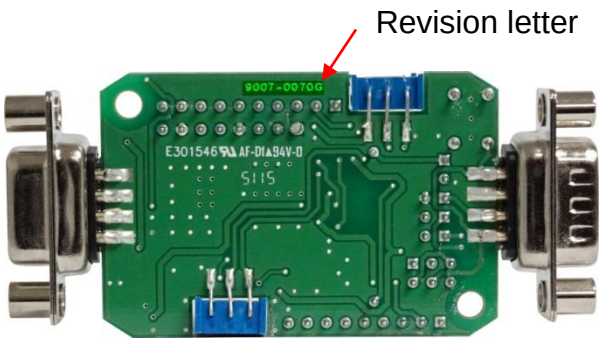
Revisions G or later:

Revision G was implemented in January 2016 for the LCA-9PC to change the J1 connector to from female to male, and the J2 connector to from male to female. DB9 cables built for earlier revisions cannot be used with Revision G or later units.

To determine the LCA-9PC revision:

Revisions G and later:

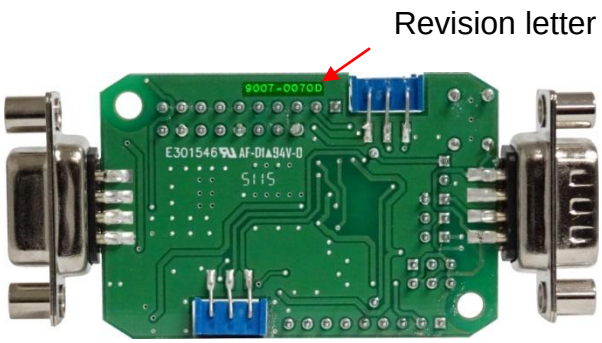
J1-Male: Requires female DB9 cable connector to sensor.
J2-Female: Requires male DB9 cable connector to input power/signal output.



J1- Male DB9

Revisions earlier than G:

J1-Female: Requires Male DB9 to be installed to sensor.
J2-Male: Requires Female DB9 to be connected to input power/signal output.



J1- Female DB9

CALIBRATION

Method 1: Shunt calibration with Transducer Techniques sensors.

1) With the LCA-9PC module, insert the mating DB9 connectors, as shown under Electrical Connections.

2) With the LCA-RTC module, insert the mating screw clamp plug connectors, as shown under Electrical Connections.

3) For adjustment of output voltage, measure voltage with a calibrated 4-1/2 digit (19,999 count) DC digital voltmeter across Pin 3 of J2 (voltage output) and Pin 2 of J2 (electrical ground).

4) For calibration of current output, measure current from Pin 1 of J2 (current output) to Pin 2 of J2 (electrical ground). Use a calibrated 4-1/2 digit (19,999 count) DC digital voltmeter to measure the voltage across a precision load resistor, and divide this voltage by the precision resistance value to obtain current. The precision resistor can be a 500 Ω precision resistor or a 100 Ω precision resistor in series with a non-precision 400 Ω resistor.

5) Apply power by connecting 11.8 to 26V DC across Pin 4 of J2 (power input) and Pin 5 of J2 (electrical ground).

6) Allow 30 minutes for warmup to achieve maximum stability and accuracy.

7) With zero load applied to the transducer, adjust the zero potentiometer to obtain a zero reading on the voltmeter.

8) Refer to the sample calibration certificate Figure 4 (typical of the certificates supplied with TTI transducers). Multiply the percent of load value (PCT LOAD) simulated by an 87.325 kΩ resistor, such as 50.34% in the sample, by the desired full-scale voltage output, such as ±10V DC. Example: 10V x 50.34% = 5.034V.

9) Press and hold the shunt calibration button (calibration button to remain depressed throughout this step). Adjust the span potentiometer until the voltmeter displays the value calculated in step 8, for example 5.034V. Release the shunt calibration button when adjustment is complete.

10) Repeat steps 7 through 9 if necessary.

Method 2: Using a known load (dead weight calibration).

1) Follow Method 1, steps 1 thru 7.

2) Apply a known load (dead weight) to the transducer.

3) Adjust the span potentiometer to so that the multimeter displays the known load (dead weight) correctly in engineering units.

4) Remove the known load (dead weight).

5) Readjust the zero potentiometer if necessary so that the multimeter displays zero.

6) Repeat steps 2 through 5 until the zero and dead weight readings are correct.

The Cert below is an example only. Please use the Cert supplied with your sensor when calibrating your LCA unit.

Figure 4: *Typical Certificate of Calibration (Cert)*

CERTIFICATE OF CALIBRATION

SERIAL NUMBER:	SAMPLE	DATE OF CALIBRATION:	12/5/2014
SENSOR MODEL:	HSW-30K	DATE OF RECALIBRATION	12/5/2015
JOB NUMBER:	0		
TECHNICIAN:	GM		

COMPRESSION LOAD LBS.	MV/V INC	MV/V DEC
0	0.0000	0.0000
15000	-1.0020	-1.0017
30000	-2.0038	

NON-LINEARITY	0.00	PCT FS
NON-REPEATABILITY	0.00	PCT FS
HYSTERESIS	-0.01	PCT FS

SHUNT CALIBRATION

PCT LOAD	LOAD LBS.	SIGNAL MV/V	SHUNT K OHMS	SHUNT PINS
50.34	15101.81	1.0087	87.325	(-E,-S)
100.68	30203.62	2.0174	43.575	(-E,-S)

DPM-2 SCALE FACTOR 0.4491

CALIBRATION COMPUTED FROM THREE (3) RUNS INCREASING AND DECREASING
TRACEABLE TO NIST TEST # 58183
CALIBRATION PERFORMED AT 10 VDC
MAXIMUM BRIDGE EXCITATION 12 VDC

WIRING

PIN	COLOR	CODE
N/A	RED	+EXCITATION
N/A	RED/BLK	–EXCITATION
N/A	GRN	+SIGNAL
N/A	RED/WHT	–SIGNAL
N/A	RED/YEL	NOT USED
N/A	RED/BLU	NOT USED
N/A	SHD	GROUND

OPERATING RECOMMENDATIONS

Noise Reduction

- **Use twisted pair #16 to #22 AWG wire** for power to the LCA unit to minimize EMI (electromagnetic interference) pickup.
- **Use twisted pair #18 to #22 AWG wire** for the voltage or current outputs of the LCA unit to minimize EMI pickup and generation.
- **Use shielded twisted pair wire** for the excitation leads, sense leads, and signal leads for cable lengths above 3 m (10 ft). Suitable cables with an outer shield for multiple inner twisted pairs are available from cable manufacturers and can be used for distances up to 1 km (3,300 ft). Tie the shield to the -EXC terminal of the LCA unit (Pin 7 of J1). For cable lengths less than 3 m (10 ft), shielded cable may not be required, but twisted pairs are advised.
- **Do not place signal and sense cables** in the same conduit or cable tray that holds power cables or cables to motors and solenoids, as these are known EMI generators.

Thermal Stability

- **Minimize ambient temperature variations** since low-level signal measurements can be corrupted by thermal emf's generated by the electronics and signal input connections. Minimize changing air flows around the LCA unit.
- **Allow the LCA to warm up before taking measurements.** Allow 15 minutes if the LCA does not provide sensor excitation, is powered by 12V, and a voltage output is used. Under these conditions, power dissipation inside the LCA unit is minimized and is only around 120 mW. Otherwise allow 30 minutes of warmup time.
- **Apply a maximum 500Ω load** when a current output is used so that up to 200 mW is dissipated in the external load, not inside the LCA unit. If a precision 100 Ω resistor is used to monitor the output current, a 400 Ω max non-precision resistor should be placed in series with it.

Potentiometer Operation

- **Precision 25-turn potentiometers** are used to make zero and span adjustments following the warmup period. These are electromechanical devices subject to stiction (or static friction) between the wiper and resistive surface. Stiction causes hysteresis, or slightly different outcomes if the rotation is clockwise or counter-clockwise.
- **To minimize stiction and hysteresis,** rotate the potentiometer screw in one direction and then back off in the opposite direction by a fraction of a degree. Then gently tap the potentiometer body with the adjustment screwdriver. Both actions will decrease the angular tension between the wiper and resistive surface.

SPECIFICATIONS

SIGNAL INPUT

Voltage Range	±2.5 mV min to 100 mV max
Voltage Sensitivity	0 to 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 or 10 mV/V (jumper selectable)
Polarity Reversal	Jumper selectable
Offset Voltage	±10 µV typ, ±30 µV max
Offset Voltage Tempco	±0.04 µV/°C typ, ±1.2 µV/°C max
Power Supply Rejection	±0.1 µV/V typ, ±0.3 µV/V max
Offset Voltage Aging	±2 µV/1000h typ, ±6 µV/1000h max
Bias Current	±0.3 nA typ, ±2.8 nA max
Voltage Noise at 0.1 to 10 Hz	350 nVpp or 56 nVrms typ
Voltage Noise Density	12.4 nV/√Hz typ at 1kHz
Differential Resistance	1 GΩ min
Common Mode Resistance	100 GΩ typ
Common Mode Voltage	-5.5V to +5.5V DC

SIGNAL OUTPUT

Amplifier Type	Differential, bipolar
Voltage Ranges	0 to ±5V, 0 to ±10V (jumper selectable)
Voltage Load	5 kΩ min
Span Range	50 to 4000
Noise and Ripple	See chart on page 14.
Current Source	0-16 mA, 0-20 mA or 4-20 mA (jumper selectable)
Current Load	0-500Ω (10V compliance)
Nonlinearity	±0.005% of FS max
Zero Adjust	±10% of FS min
Zero Stability	±0.05% of FS max for 8 hours
Zero Tempco	±0.003%/°C of FS max
Span Adjust	±24% of FS min
Span Accuracy	±0.05% of FS max
Span Stability	±0.01% of FS max for 8 hours
Span Tempco	±0.003%/°C of FS max
Filter Configuration	Two-pole low-pass (jumper selectable)
Selectable Frequency Response	DC to 0.1, 0.3, 1.0, 3.0, 10, 30 kHz (-6 dB points)

EXCITATION OUTPUT

Voltage Output	5 or 10V DC ±2%
Load Current	0-30 mA
Load Resistance	350Ω min
Voltage Tempco	±0.005%/°C max
Load Cell Connection	4 or 6 wires (jumper selectable)
Compensation for changes in lead resistance	0.0025% of span max / 1Ω (sum of + and - excitation lead resistance changes with 6-wire connection to 350Ω load cell)

POWER REQUIREMENT

Module Voltage	11.8V to 26V DC
Protection for Reverse Polarity	-40V DC
Current	40 mA with 350Ω LC at 10V exc and no load on V_o 60 mA with 350Ω LC at 10V exc and 20 mA out on I_o
AC Adapter Ratings	120V AC, 60 Hz input; 12V DC, 200 mA output
AC Adapter Safety	UL and CSA safety certifications

CALIBRATION

Standard Shunt Cal Resistor	87.325 kΩ ±0.025% selectable via push-button switch
Custom Shunt Cal Resistor	Sockets for leads of user furnished cal resistor

GENERAL

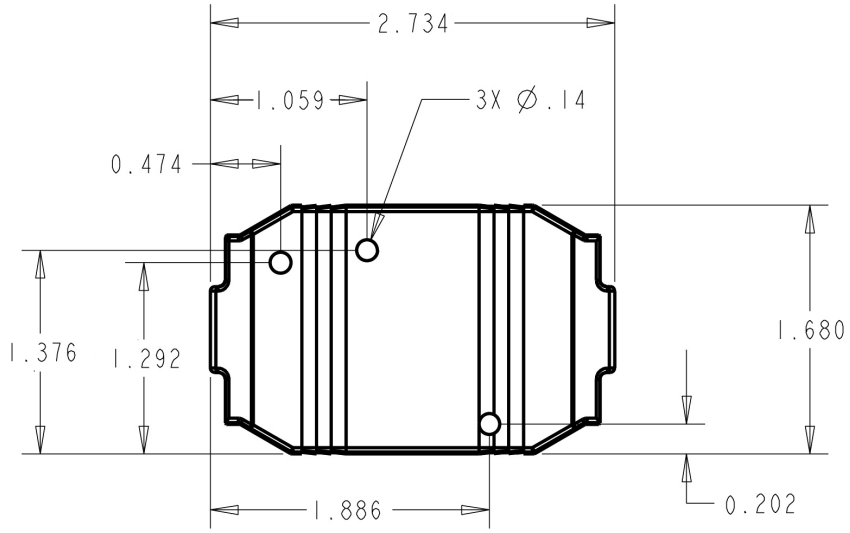
Operating Temperature	0 to 55°C for full specs, -40 to +70°C, non-condensing, with derated specs
Case Material	ABS 94HB thermoplastic polymer
Dimensions, Plastic Case	2.7” x 1.7” x 0.8”, 70 x 43 x 20 mm, L x W x H
Dimensions with DB9	3.1” x 1.7” x 0.8”, 78 x 43 x 20 mm, L x W x H For length, make allowance for user furnished DB9 mating connectors.
Dimensions with Plugs	3.5” x 1.7” x 0.8”, 90 x 43 x 20 mm, L x W x H For length, add 10 mm (0.4”) on each side for furnished cable connectors.
Weight	1.4 oz (40g) for LCA-9PC, 1.6 oz (45g) for LCA-RTC
Provision for DIN rail mounting	Accessory DIN rail mount, P/N ADR-KIT

VOLTAGE & CURRENT NOISE OUTPUT, PEAK TO PEAK, TYPICAL

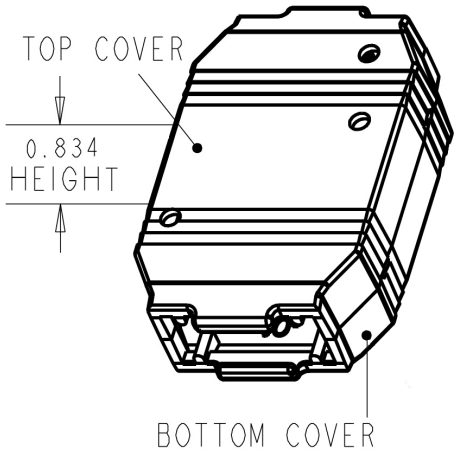
mV/V	Gain*	Noise in mV or µA at stated bandwidth (-6 db)											
		0.1 kHz		0.3 kHz		1.0 kHz		3.0 kHz		10 kHz		30 kHz	
		mV	µA	mV	µA	mV	µA	mV	µA	mV	µA	mV	µA
0.5	2000	8	70	10	70	12	70	15	80	20	80	50	90
1.0	1000	6	70	7	70	8	70	10	70	12	70	50	80
1.5	667	6	70	7	70	8	70	10	70	12	70	40	70
2.0	500	6	70	7	70	8	70	10	70	12	70	40	70
2.5	400	6	70	7	70	8	70	10	70	12	70	40	70
3.0	333	6	70	7	70	8	70	10	70	12	70	40	70
4.0	250	6	70	7	70	8	70	10	70	12	70	40	70
10	100	6	70	7	70	8	70	10	70	12	70	40	70

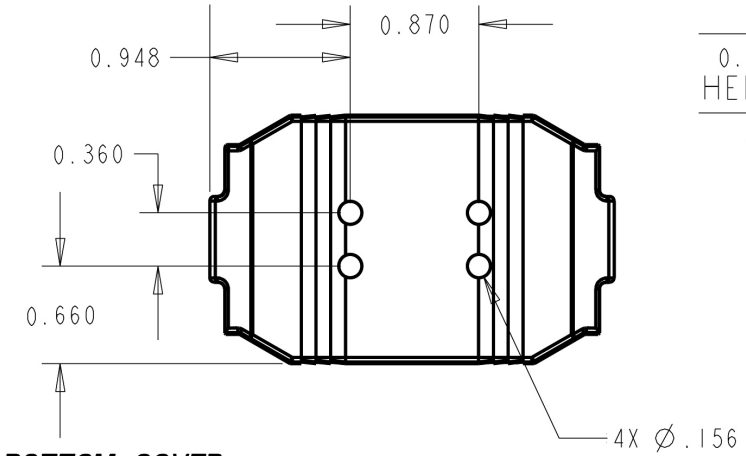
* Gain is for 10V excitation and 0-10V voltage output. Noise is in mV for 10V output or µA for 4-20 mA output. 0-30 kHz is obtained when no filter jumper is installed at E3 and E8.

CASE DIMENSIONS (inches)



TOP COVER





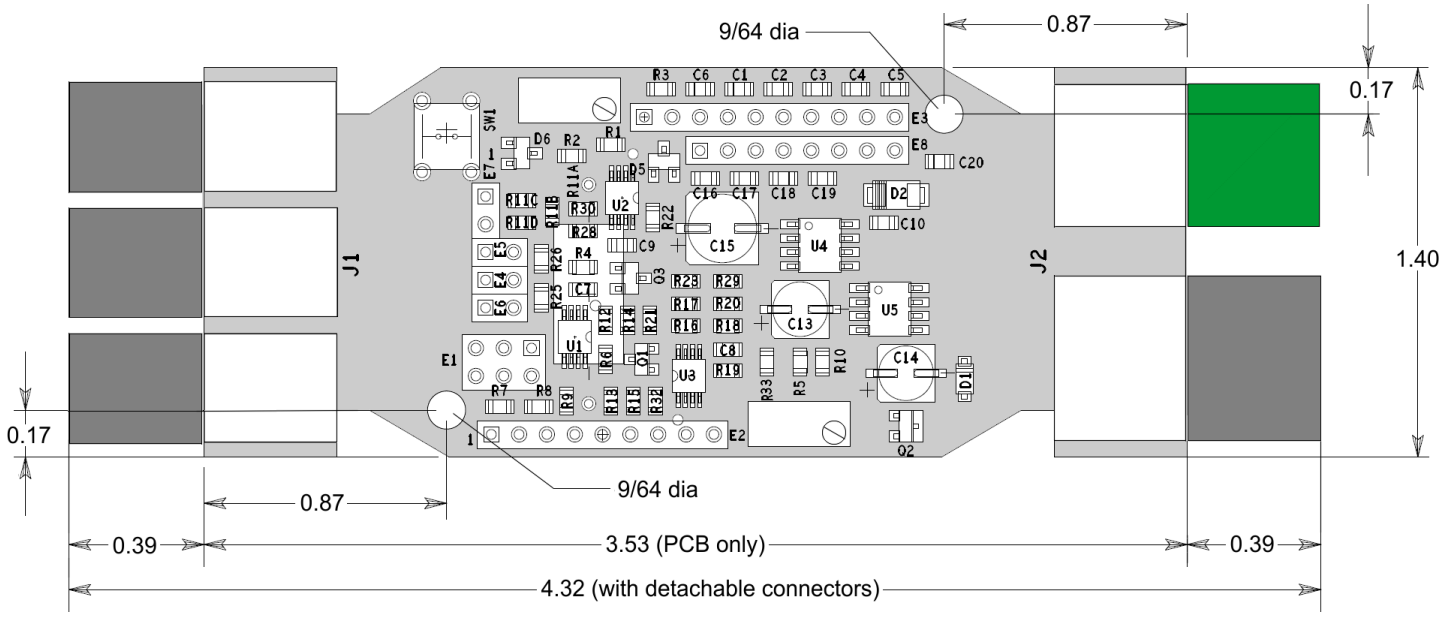
BOTTOM COVER

TROUBLESHOOTING

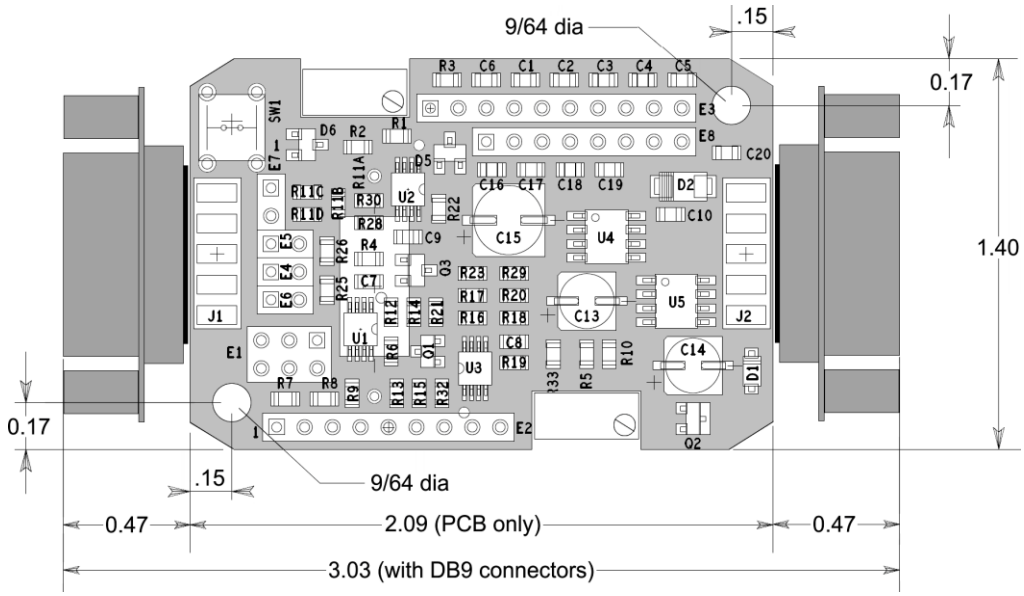
Symptom or Problem	Action
Negative output voltage.	Switch signal wire positions on J1 connector or move the two jumpers on header E1 from positions a, a to b, b.
Analog output is saturated.	Recheck jumper positions on header E2 to ensure that proper voltage gain has been selected.
	Verify that transducers wires are connected properly to the pins of the J1 connector.

CIRCUIT BOARD DIMENSIONS (inches)

LCA-RTC Board Dimensions



LCA-9PC Board Dimensions



ACCESSSORIES

APD-12VDC **AC Power Adapter for LCA** 120V AC, 60 Hz input, 12V DC, 200 mA output.	
ATB-1 **Replacement Terminal Block Kit** Connects field wires to mating connectors of LCA-RTC. Includes 2-pin green power connector for Rev G or later, and 3-pin green power connector for earlier Revs.	
ATP-T **Trim Pot Tool** Used to adjust zero and span.	
ADR-KIT **DIN Rail Clip with Fasteners** Attaches LCA unit to a 35 mm DIN rail.	

To install the DIN rail clip, open the clamshell case and lift out the circuit board from the case bottom. Place the case bottom over the DIN rail clip, align the four sets of holes, and push in the provided four plastic rivet fasteners all the way from the top. This will secure the DIN rail clip to the case bottom with the round rivet heads inside the case. Reinstall the circuit board in the case bottom, orienting it so that the shunt calibration pushbutton is adjacent to the spring element of the DIN rail clip. This will ensure that the label is right-side-up when the case top is reattached to the case bottom, and the LCA unit is DIN rail mounted.

WARRANTY / REPAIR POLICY

Limited Warranty on Products

Any of our products which, under normal operating conditions, proves defective in material or in workmanship within one (1) year from the date of shipment by Transducer Techniques, will be repaired or replaced free of charge provided that you obtain a return material authorization from Transducer Techniques and send the defective product, transportation charges prepaid with notice of the defect, and establish that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement product will be shipped FOB our plant. The terms of this warranty do not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the Buyer's exclusive remedy, and will satisfy all obligations of Transducer Techniques, whether based on contract, negligence, or otherwise. Transducer Techniques is not responsible for any incidental or consequential loss or damage which might result from a failure of any Transducer Techniques' product. This express warranty is made in lieu of any and all other warranties, express or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

Warranty Service

Advance authorization is required prior to the return to Transducer Techniques. Before returning the items either write to the Repair Department c/o Transducer Techniques, 42480 Rio Nedo, Temecula, CA 92590, or call (951) 719-3965 with: 1) a part number; 2) a serial number for the defective product; 3) a technical description of the defect; 4) a no-charge purchase order number (so products can be returned to you correctly); and 5) ship-to and bill-to addresses. Shipment to Transducer Techniques shall be at Buyer's expense. Repaired or replacement items will be shipped F.O.B. our plant in Temecula, CA. Non-verified problems or defects may be subject to a $75 evaluation charge. Please return the original calibration data with the unit.

Non-Warranty Service

Advance authorization is required prior to the return to Transducer Techniques. Before returning the items, either write to the Repair Department c/o Transducer Techniques, 42480 Rio Nedo, Temecula, CA 92590, or call (951) 719-3965 with: 1) a model number; 2) a serial number for the defective product; 3) a technical description of the malfunction; 4) a purchase order number to cover Transducer Techniques' repair cost; and, 5) ship-to and bill-to addresses. After the product is evaluated by Transducer Techniques, we will contact you to provide the estimated repair costs before proceeding. The minimum evaluation charge is $75. Shipment to Transducer Techniques shall be at Buyer's expense and repaired items will be shipped to you F.O.B. our plant in Temecula, CA. Please return the original calibration data with the unit.

Repair Warranty

All repairs of Transducer Techniques' products are warranted for a period of 90 days from the date of shipment. This warranty applies only to those items which were found defective and repaired; it does not apply to products in which no defect was found and returned as is, or merely recalibrated. Out-of-warranty products may not be capable of being returned to the exact original specifications or dimensions.

FOR TECHNICAL SUPPORT, CALL (800) 344-3965
FAX (951) 719-3900

Printed in U.S.A.