

LACO TECHNOLOGIES

USER MANUAL



LVC-200TC DIGITAL THERMOCOUPLE VACUUM GAUGE

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CONTENTS

1. SCOPE	1
2. GAUGE ACCURACY	1
3. TUBE INSTALLATION	2
4. CALIBRATION	2
5. RS232 OUTPUT	4
6. OPTIONAL SOFTWARE.....	5
7. ACCESSORIES AND SPARES	5
8. TROUBLESHOOTING	6

1. SCOPE

This manual contains operation, maintenance, and troubleshooting information for the LVG-200TC Vacuum Gauge. LACO vacuum gauges are designed to ensure safety when used properly. It is the responsibility of the user to follow safety-related warnings, cautions, notes, and other requirements described in this manual. Returned equipment will not be accepted without prior authorization. Prior to shipping please call for a returned material authorization (RMA) number.

LACO Technologies reserves the right to cancel the warranty if the gauge is disassembled without authorization.

2. GAUGE ACCURACY

The LVG-200TC uses a thermocouple gauge tube made for the range of 1 Torr (1000 microns) to 1 millitorr (1 micron). The gauge electronics can also provide general reference readings above 1 Torr to 760 Torr (1 atm).

NOTE The general reference readings from 1 Torr to atmosphere are less accurate than those below 1 Torr.

Readings Below 1 Torr (1000 microns)

0 to 9 microns +/- 1 micron

10 to 99 microns +/- 5% of reading +/- 1 micron

100 to 999 microns +/- 10% of reading +/- 5 micron

1000 to 1999 microns +/- 15% of reading +/- 50 micron

Readings Above 1 Torr to 760 Torr

1.0 to 9.9 Torr +/- 15% of reading +/- .1 Torr

10 to 99 Torr +/- 20% of reading +/- .2 Torr

100 to 760 Torr +/- 25% of reading +/- 10 Torr

NOTE Wide-range thermocouple and Pirani gauges rely on convection (a form of thermal conduction) to achieve their wide range with a thermal sensor. As such, they are sensitive to the gas species. For filling applications, transducer capacitance diaphragm type gauges are recommended.

3. TUBE INSTALLATION

The tube must be mounted in a stem down position within 10 degrees of vertical. The connection is one-eighth inch male pipe thread. Use Teflon thread tape for installation. Be careful not to twist the cable.

NOTE The tube should be installed in a clean part of the vacuum system. It is recommended that the tube is not mounted directly on vacuum pump suction as the tube life may be shortened by backstreaming of pump oil vapors. Inserting a loop of tubing or an optical baffle can be helpful in protecting the tube from backstreaming.

After energization, the unit will initialize and operate. The gauge reaches best thermocouple accuracy after a few minutes of warm-up.

The gauge has a switching power supply that can be connected to either 115 or 220 VAC, 50/60 Hz. They are powered by 115 to 230 Volts, AC or 5 volts DC.

At atmosphere, the unit will read 760 Torr. A visible decimal point indicates that the unit is reading in torr. As pressures are decreased, the readings will shift to 99.0, 9.99, .999, and finally to .001 Torr. A reading of .001 Torr is equal to one micron which is equal to one millitorr.

The reading of the gauge will be influenced by the composition of the gasses remaining. All wide range and Pirani vacuum gauges are subject to this phenomenon. For applications in which excellent accuracy is required in the low torr ranges, such as the filling of neon and laser tubes, we offer a transducer based gauge which gives precise readings regardless of gas composition. Transducer gauges are not able to read in the micron ranges.

4. CALIBRATION

If the tube is replaced, it is recommended that the unit be recalibrated. It is recommended that this be done at LACO Technologies but field calibration is available. If field calibration is done, the zero and span adjustments are available on two potentiometers which are accessible by removing the front panel of the instrument. The zero is on the left and the span is on the right. Make slight adjustments and wait a few seconds for the effects of the adjustments to be seen.

4.1 ATMOSPHERE

1. Energize the unit at atmospheric pressure. Remove the front panel.
2. Make sure that the gauge tube is in a vertical orientation, as it is position sensitive.

3. Connect a Voltmeter to the two pads available from the right side of the printed circuit board.
4. These are called Zero and Atm .420
5. Adjust the potentiometer labeled "Atm" (leftmost) until the voltage above equals .420

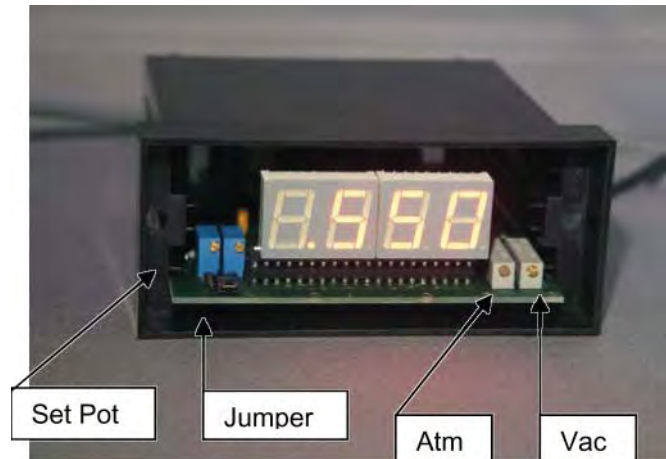
Figure 1



4.2 ZERO

1. Operate the unit at the lowest attainable pressure with at least a two stage pump capable of less than 10 microns. Ideally, use a turbo or diffusion pump to calibrate.
2. Connect Voltmeter leads to "Com" and "Vac" pins. The voltage should be approximately .16 Volts dc.
3. Make slight adjustments, if necessary, so the low end vacuum reading is correct.

If the above readings cannot be attained, the instrument, the gauge tube, or the cable is defective. Gauge tubes frequently become contaminated with oil. Cleaning the gauge tube with a strong solvent, such as a carburetor cleaner, can often improve or restore its calibration. For an Accredited NIST traceable calibration with data, (ref: P/N LSGC0003), call LACO for pricing.

Figure 2: LVG-200TC with red lens removed

For repair or recalibration, complete an RMA Form (located at www.lacotech.com) and return gauge to LACO.

5. RS232 OUTPUT

The LVG-200TC is supplied with an RS-232 output for external data logging. The output can be seen on any computer with a serial port, for example, a PC running Windows Terminal or Hyperterm will show the output.

5.1 PARAMETERS AND DETAILS FOR RS232

- The current value on the screen is sent out the RS232 port approximately once per second.
- The parameters are: 9600 baud, 8 data bits, 1 stop bit, no parity. No prompting or handshaking by the user is required.
- The data is presented as ASCII text for the numbers (with decimal points as required), followed by a carriage return and line feed.
- This data may be observed using Windows Terminal, Hyperterm, or any similar terminal program.
- Data may be saved using Terminal's "Transfers / Receive Text File" feature.
- The saved data files may be read with Microsoft Excel or any text editor. Microsoft Excel, or any spreadsheet program can also plot the data.
- The RS232 connections are made on the rear female 9 pin dsubminiature connector, and the data appears on pin 2, and the ground is on pin 5.

6. OPTIONAL SOFTWARE

For more convenient logging and plotting, we offer plotting software. The software program gives a visual presentation of the data which is coming out of the vacuum gauge. Update rate is approximately once per second. Logarithmic axes clearly show vacuum from atmosphere to 10^{-3} or 10^{-9} (ultra wide range version).

6.1 OPTIONAL RECORDER

We offer a special vacuum recorder which displays from atmosphere to hard vacuum. Both the plot and the numbers are displayed. This recorder is often used by rebuilders to document the performance of vacuum pumps, but there are many other uses. Contact LACO Technologies for further information.

6.2 CUSTOM FEATURES AND PROGRAMMING

The LVG-200TC gauges are microprocessor controlled, making it possible to provide custom control features at reasonable prices. The software is "burned" into the microprocessors, which are socketed and easily replaced by a user. Contact LACO to discuss your needs.

If the gauge is to be used in a neon sign processing facility, it must be installed with a stopcock or a solenoid valve to protect it from exposure to the system and possible damage during high voltage bombarding. Battery operated gauges are also offered and are particularly suited to neon applications.

7. ACCESSORIES AND SPARES

Table 1: Related Accessories and Spares

PART NUMBER	DESCRIPTION
VA0531	Spare gauge tube, 1/8" NPT
LVFAN25FP12S	Adaptor, NW25 1/8" FNPT, SS
LVFAN40FP12S	Adaptor, NW40 1/8" FNPT, SS
LVFAN16FP12S	Adaptor, NW16 1/8" FNPT, SS

8. TROUBLE-SHOOTING

1. **PROBLEM:** The gauge reads 760 Torr and does not respond to vacuum, it is possible the thermocouple voltage is not reaching the gauge.

Cause 1: Bad thermocouple

Remedy: Replace gauge tube

Cause 2: Bad cable connection

Remedy: Check red, black, green and white wires on 9 pin dsub connector and check soldered connections on octal connector

2. **PROBLEM:** The gauge reads 0

Cause 1: Bad thermocouple

Remedy: Replace gauge tube

Cause 2: Bad cable connections

Remedy: Check red, black, green and white wires on 9 pin dsub connector and check soldered connections on octal connector