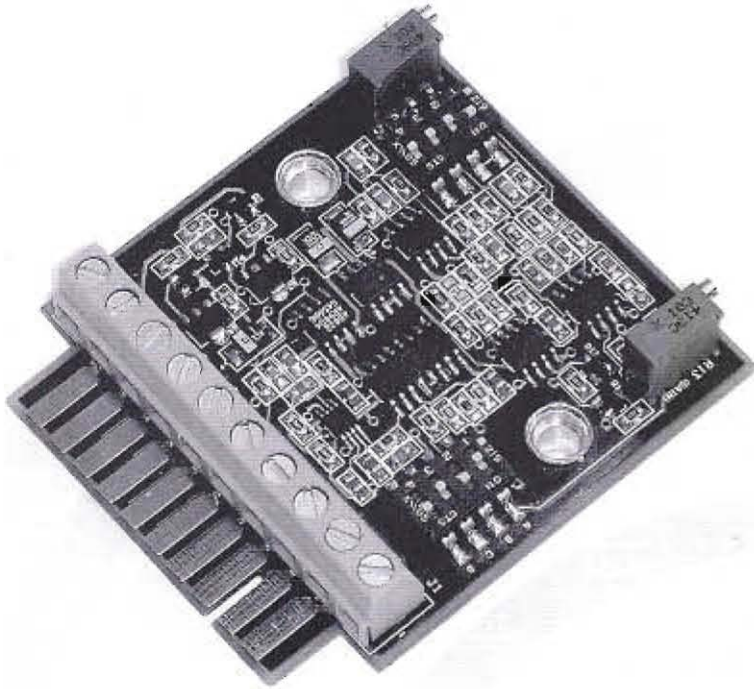




LVM-110
LVDT Signal Conditioning
Module



Specifications • Operating Instructions • Installation

measurement
SPECIALTIES



Warranty

Schaevitz instruments are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer, at his expense, during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right to final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warrant is in lieu of any other warranty, expressed, implied, or statutory, and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

Receiving Inspection

Every Schaevitz instrument is carefully inspected and is in perfect working order at the time of shipment. Each instrument should be checked as soon as received. If the unit is damaged in any way, or fails to operate, a claim should immediately be filed with the transportation company.

Service Concerns

If a Schaevitz instrument requires service, first contact the nearest Schaevitz Representative. He may be able to solve the problem without returning the unit to the factory. If it is determined that factory service is required, call the Repair Department for an RMA number before return.

Returns

All units being returned to the factory require an RMA (Return Material Authorization) number before they will be accepted. This number may be obtained by calling the Repair Department at 1-800-745-8008 with the following information: model number, quantity, serial number, and symptoms of the problem, if being returned for service. You must include the original P.O. number or Schaevitz sales number if under warranty.

Inquiries

Address all inquiries on operation or applications to your nearest Sales Representative, or to Sales Manager, Schaevitz Sensors, 1000 Lucas Way, Hampton, VA 23666, USA.

LVM-110 Specifications:

Power Supply Requirements:

| | | |
|--------------|---------------------------|-----------------------------|
| Voltage | ± 15 V dc. $\pm 10\%$ | (for ± 10 V dc. output) |
| | ± 12 V dc. $\pm 10\%$ | (for ± 5 V dc. output) |
| Current Draw | 30mA. (max) | |

Transducer Excitation:

| | |
|-----------|--|
| Voltage | 3.0 V-rms. $\pm 10\%$ |
| Current | ≤ 20 mA (min LVDT Input impedance 150 Ω) |
| Frequency | 2.5, 5, 8 & 10 kHz |

Position Signal: ± 10 , ± 5 , 0 to 10 and 0 to 5 V dc.
(5 mA. max current)

Required Signal for ± 10 Vdc Output:

| | |
|---------|--------------|
| Minimum | 100 mV. rms. |
| Maximum | 5.6 V. rms. |

(In six DIP-switch selectable gains)

Frequency Response 250 Hz. (-3db, 3-pole Butterworth)

Linearity $\leq .05\%$

Operating Temperature Range
-13F° to 160°F (-25°C to +70°C)

Tempco $< .02\%/^{\circ}$ F

Zero Suppression ± 4 V dc. (fixed offset)
 ± 2 V dc. (adjustable)

Output Impedance $< 1\Omega$

Noise and Ripple ≤ 15 mV rms
Stability .05% of FSO
(after 15 min. warm-up)

Product Description:

The LVM-110 is a low-cost LVDT / RVDT signal conditioning board, primarily designed for OEM process automation applications.

The design has been optimized to provide maximum versatility while offering good performance at a moderate cost.

This device is compatible with most, but NOT all, 5 and 6 wire LVDTs and RVDTs. Please consult the product specification page to ensure compatibility with your particular sensor.

DIP switches are provided to allow selection of four sensor excitation frequencies, from 2.5 to 10.0 kHz.

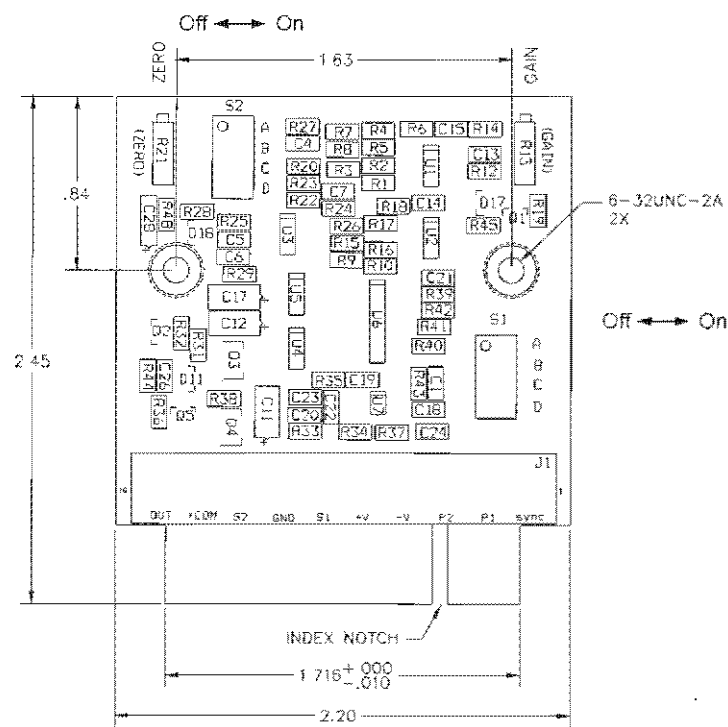
Switches are also provided to select six course gain ranges, two zero offsets, and master / slave or stand alone operation.

Installation may be accomplished by use of the card-edge connector or threaded stand-offs and screw-lock barrier strip connections.

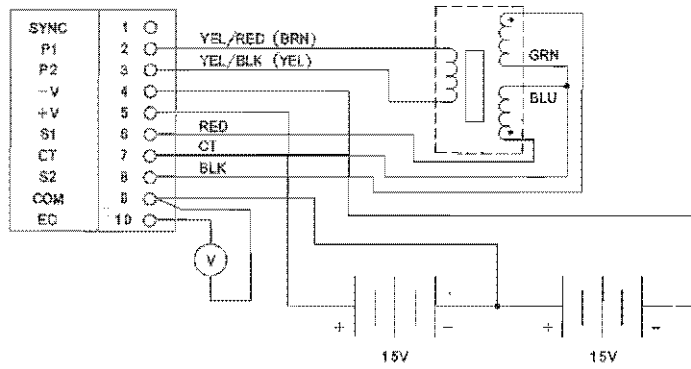
The next few pages will take you, step by step, through the simple set-up and calibration process. This device may be set-up for several different full scale analog outputs, some of the potential configurations are listed below.

The set-up configurations to be discussed will be:

- ± 10 V dc. out
- ± 5 V dc. out
- 0 to 10 V dc. out
- stand alone operation
- master / slave operation



LVM-110 Top View



LVM-110 Connection Diagram

Initial Set-Up Procedure:

In order to begin this process, you must first know a few basic things about the LVDT or RVDT you intend to use with the LVM-110 conditioning board. This is the minimum information required to perform a successful calibration. This information may be obtained from the sensor calibration sheet, catalog literature or on the Schaevitz web site at www.meas-spec.com

- Recommended operating frequency
- Sensitivity at that frequency
- Primary (input) impedance at that frequency
- The \pm full scale stroke you intend to calibrate over
- Analog output signal required by your application

Oscillator Frequency:

Once you have established the proper excitation frequency for your sensor, refer to the table below and the DIP switch locations on the page 4 diagram, to set the LVM-110 oscillator frequency.

| OSCILLATOR FREQUENCY | S1-C | S1-D |
|----------------------|------|------|
| 2.5 KHZ | OFF | OFF |
| 5.0 KHZ | ON | OFF |
| 8 KHZ | OFF | ON |
| 10 KHZ | ON | ON |

Oscillator Frequency Table

Oscillator Mode:

The Oscillator mode setting will depend on the number of LVM-110s and LVDT or RVDTs in your system.

For a single LVDT system you will be running the LVM card in the stand alone (master) mode. For multi sensor systems, it is best to master and slave the LVM oscillators, to prevent beat frequencies and cross talk between amplifiers and LVDTs.

You will be selecting one LVM to serve as the master oscillator, and the balance will be set-up in the slave mode.

CAUTION: Attempting to synchronize two LVMs set as masters may damage one or both units.

Connecting pin-1 of the barrier strip, from unit to unit, will complete the sync bus circuit. The power common serves as the return line. Use the table below to configure you oscillator mode.

| S1-B | MODE |
|------|--------|
| OFF | SLAVE |
| ON | MASTER |

Oscillator Mode Table

Oscillator drive capability:

To insure LVDT compatibility with the LVM-110 you must know the sensor current draw. The new LVM is designed with a more robust oscillator than its predecessor, however it is rated for a maximum drive current of 20 mA rms. To insure compatibility you will need to know the LVDT input impedance, at the frequency you intend to operate at. The minimum sensor input impedance **must** be equal to or greater than 150Ω, which will result in maximum current draw of 20 mA. Or less. The input impedance information will be available on the Schaevitz LVDT data sheet.

Setting Amplifier Gain:

You will need to calculate the LVDT full scale output, using the simple formula below.

LVDT sensitivity (in $mV/V/.001''$) (at the selected frequency)

Times

The LVDT excitation voltage, (3.0 V rms. for the LVM-110)

Times

The full scale displacement of the LVDT in .001''

(i.e. a 1000 HR full scale is $\pm 1,000$ thousandths of an inch).

As an example, the calculation for a 1000-HR, with a sensitivity of $0.39mV/V/.001''$, would be done as follows:

$0.39(mV) \times 3.0(V \text{ rms}) \times 1,000(\text{thousandths}) = 1,170 \text{ mV full scale output, or } 1.17 \text{ Volts at } \pm 1 \text{ inch.}$

Using the gain table below, select the gain setting that appears to the left of the V rms range your full scale output falls into. In our example, you would select gain x 0.2, HIGH, or x 0.5, LOW, either will work, due to range overlap.

This table assumes you want to calibrate the LVM-110 for a $\pm 10 \text{ V dc}$, full scale output.

| 1ST STAGE | | 2ND STAGE | | SENSITIVITY RANGE FOR 10 VDC OUTPUT CHANGE (VRMS INPUT) | |
|-----------|----------|-----------|------|---|--------------|
| GAIN | SWITCHES | | GAIN | | SWITCH |
| | S2-A | S2-B | | S1-A | |
| X0.2 | OFF | OFF | LOW | ON | 2.10 TO 5.55 |
| X0.2 | OFF | OFF | HIGH | OFF | 1.00 TO 2.64 |
| X0.5 | ON | OFF | LOW | ON | 0.84 TO 2.22 |
| X0.5 | ON | OFF | HIGH | OFF | 0.40 TO 1.00 |
| X2 | OFF | ON | LOW | ON | 0.21 TO .55 |
| X2 | OFF | ON | HIGH | OFF | 0.10 TO 0.26 |

LVM-110 Gain Selection Table

Calibration Procedure (for ± 10 V dc output):

Using the connection diagram in the front of this manual, connect the LVDT, a dc volt meter and bi-polar power supply to the LVM-110.

Note: To calibrate your LVDT for a ± 5 V dc output, double the result of your full scale output calculation, prior to consulting the gain table. This will result in you selecting half the normal gain, therefore resulting in half the normal output.

Note: The 0 to 10 volt calibration process is at the end of this section.

Note: Changing course gain settings after step 6 may result in a zero shift. Should you find it necessary to change gain, you should repeat steps 1 through 6.

1. Disconnect the S-2 connection from terminal 8, (black LVDT lead)
2. Place a temporary shorting jumper across terminals 6 and 8.
3. Adjust the zero potentiometer for zero volts output, between terminals 9 and 10.
4. Remove shorting jumper and re-install black wire to terminal 8.
5. Move the core to the approximate center of the LVDT coil, using the volt meter to find the sensor null, (zero).
6. Using the zero potentiometer, adjust out any remaining output signal, due to positioning difficulty.
7. Using a gage block micrometer or other precision positioning device, move the LVDT core in a positive direction, (toward the leads or connector), to the full scale displacement used in your calculation, (+1.0 inches in our example).
8. Adjust the GAIN potentiometer for the required positive full scale dc output, between pins 9 and 10.
9. Return to the original zero position to re-check your null voltage, then displace the core to minus full scale position, (the end opposite the lead exit or connector).

You should have approximately the same minus full scale output voltage, at this location.

Zero Suppression Calibration:

To perform a 0 to 10 Volt calibration, follow the instructions for the ± 5 Volt calibration, then displace the core to the minus full scale position, (- 5V dc).

Using the table below, select a +4 Volt offset. After you have set the zero switches for the offset, your output should have increased to about -1V dc.

| S2-C | S2-D | OFFSET |
|------|------|------------------|
| OFF | OFF | NO FIXED OFFSET |
| ON | OFF | NEG (-4V) OFFSET |
| OFF | ON | POS (+4V) OFFSET |

LVM-110 Zero Offset Table

Using the ZERO potentiometer, adjust the -1 V reading until the output signal is zero volts.

Return to your original zero position, you should now read a +5 Volts.

Continue in the same direction to your original + full scale position, you should now read +10 Volts output.

Your calibration is now complete.

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