

**Instruction Manual**  
**Low Voltage**  
**DC-Operated**  
**LVDT**  
**Signal Conditioner**  
**Model LVC-2401**

**MACRO SENSORS™**  
*Division Of Howard A. Schaevitz Technologies, Inc.*  
***Innovators in Position Measurement Products***

**7300 Industrial Center, Bldg. 22**  
**U.S. Route 130 North**  
**Pennsauken, NJ 08110-1541**

**Phone: 856-662-8000**

**FAX: 856-317-1005**

## DESCRIPTION

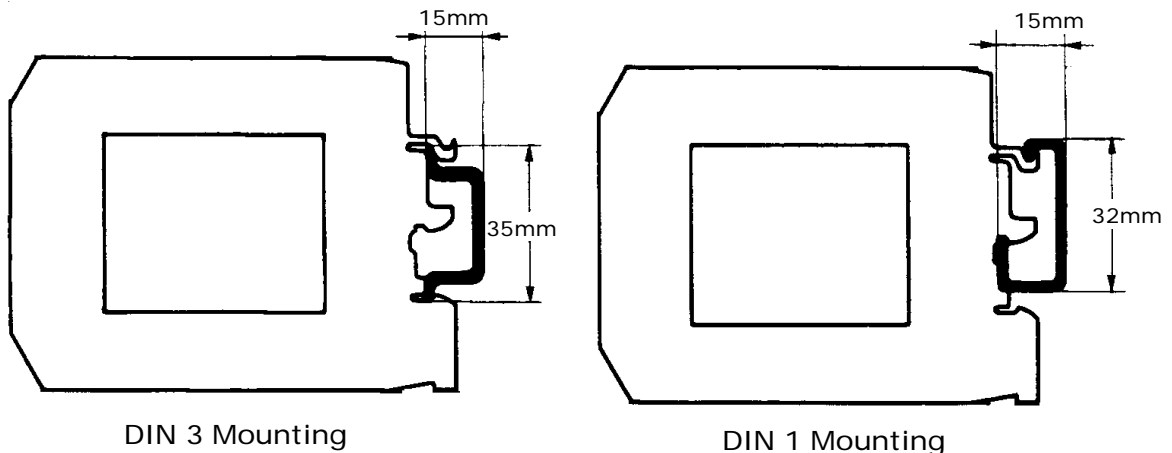
The LVC-2401 is a compact, single channel DC-operated signal conditioner capable of providing conditioning of most LVDTs and RVDTs. Operating from isolated 24 to 30V DC, the LVC-2401 provides all circuitry required to operate an LVDT position sensor and provide a high level, low noise analog DC output suitable for feeding analog or digital indicators, PLCs and other system indicating and control instrumentation or a 4-20 mA 4-wire current loop output. The LVC-2401 features user selectable excitation frequency and gain to function with sensors having widely different sensitivities. Connections are made via recessed screw terminals at the top and bottom of the case. The case mounts on DIN 1 or DIN 3 type rail.

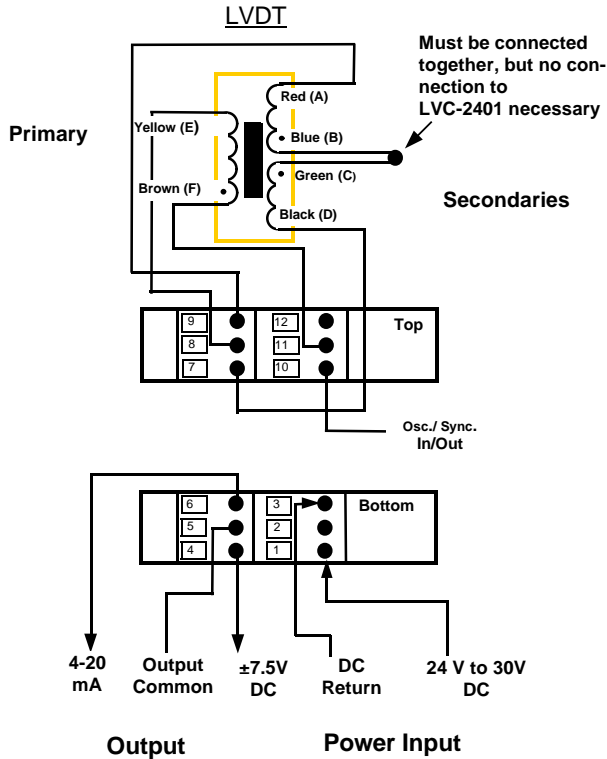
## SPECIFICATIONS

Power Input Voltage.....	24 to 30V DC, 50mA max.
LVDT Excitation Voltage.....	.3V rms (nom.)
LVDT Excitation Freq.....	3kHz, 5kHz or 10kHz
LVDT Input Impedance.....	200 Ohms (min.)
Output, Full Scale, Voltage Mode.....	$\pm 7.5V$ DC @ 5mA
Output, Current Mode.....	4-20 mA sourcing, 450 Ohms max
Frequency Response.....	-3db at 250Hz
Output Ripple.....	<10mV rms
Output Impedance.....	<10 Ohms
Nonlinearity.....	$\pm 0.01\%$ FSO
Operating Temp. Range.....	0°F to +160°F (-18°C to +70°C)
Temp. Coeff. of Sens.....	0.01% FSO/°F (0.018% FSO/°C)
Controls.....	Zero and Span
Weight.....	3.1 ounces (89 grams)

## MOUNTING

The LVC-2401 is designed to mount on the DIN rail mounting system, including DIN 1, 32mm X 15mm asymmetrical, or DIN 3, 35mm X 7.5mm or 15mm, symmetrical rails as illustrated below.



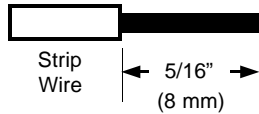


**Wiring Note:** The wire colors and/or letters shown in the connection diagram apply only to Macro Sensors' standard AC LVDTs with 6 lead wires or 6-pin connectors. For LVDTs with other terminations such as BB series gaging probes or SQ series heavy duty LVDTs, or for extension cables used with LVDTs, consult the data sheet accompanying the LVDT or cable for the correct color codes or terminal connections. Connect the LVDT's primary and secondaries to the signal conditioner according to the wiring diagram, observing the magnetic polarity dots on the LVDT winding schematic

**Warning: Do not connect output common to power supply return**

### CONNECTIONS

All wire connections to the LVC-2401 are through industry standard recessed screw clamp terminals that will accept wire sizes from #28AWG to #12 AWG, either solid or stranded. Wires should be stripped 5/16" which will provide the proper length of conductor without exposing any bare wire. DC power input wiring should utilize a minimum size of #22AWG.

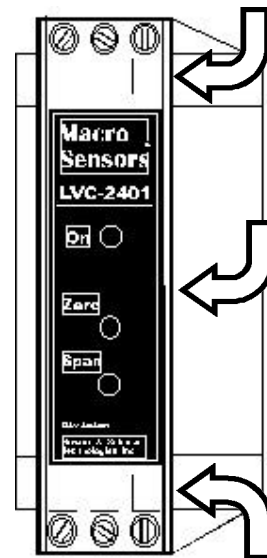


### INTERNAL ACCESS

It may be necessary to gain access to the inside of the LVC-2401 to adjust excitation frequency and/or gain jumpers.

**De-energize DC power.**

Using a knife blade, small screwdriver or similar tool, gently pry off the cover at points indicated in adjoining figure.



## EXCITATION FREQUENCY SELECTION

The LVC-2401 has three user-selectable LVDT excitation frequencies. The desired frequency is normally set to match the specifications and/or recommended operating frequency of the LVDT being used. As shipped from the factory, the unit is set at 3k Hz excitation frequency which is common to many LVDTs. Frequency is changed by jumpers (shorting bars) on S1, S2 and S3. (see Figure 1). As supplied, a jumper is positioned across S1 as shown in Figure 1. To obtain 5k Hz, move the jumper from S1 to S2. To obtain 10k Hz, move the jumper from S1 to S3. Unit should be de-energized when cover is removed.

## OUTPUT GAIN SELECTION

The LVC-2401 can operate with LVDTs having a wide range of sensitivities. Coarse gain selection is provided to permit operation with most LVDTs. To set coarse gain, the AC full scale output of the LVDT being used must be determined by performing the following calculation:

Sensitivity in Volts/.001" X Excitation Voltage X Full Stroke in thousandths of an inch = Full Scale Output (V AC rms)

**Example 1:** ±0.050" Stroke LVDT

Sensitivity:  $0.0065\text{V}/.001" \times 3\text{V rms} \times 50$  (1/2 range in .001") = 0.975V AC, rms Full Scale LVDT Output

**Example 2:** ±1.000" Stroke LVDT

Sensitivity:  $0.00065\text{V}/.001" \times 3\text{V rms} \times 1000$  (1/2 range in .001") = 1.95V AC, rms Full Scale LVDT Output

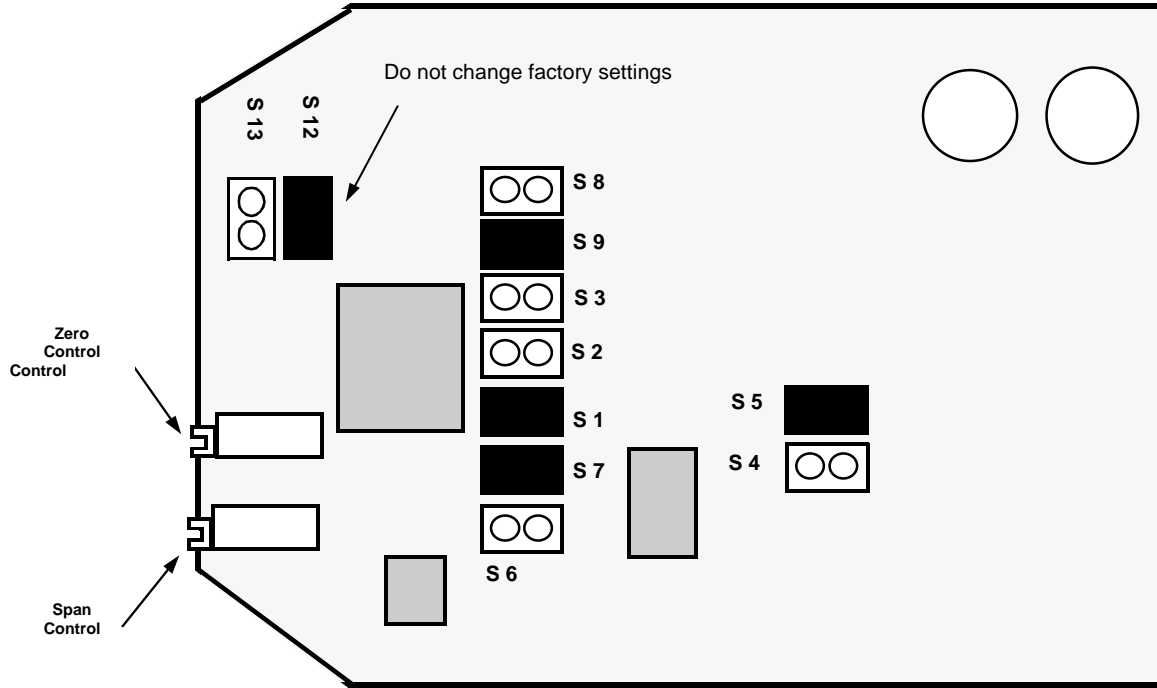
Gain may be adjusted by placing jumpers S4, S5, S6, and S7 (shorting bars) in positions shown in the table below.

Placing jumpers as instructed below will yield a ±7.5V DC full scale output.

GAIN SELECTION TABLE				
LVDT Full Scale Output AC Volts	S4	S5	S6	S7
0 - 0.3V	Open	Open	Open	Open
0.31V - 0.6V	Open	<b>Jumper</b>	Open	Open
0.61V - 2.5V	Open	<b>Jumper</b>	Open	<b>Jumper</b>
2.51V - 5.5V	<b>Jumper</b>	Open	<b>Jumper</b>	Open

See next page for jumper locations.

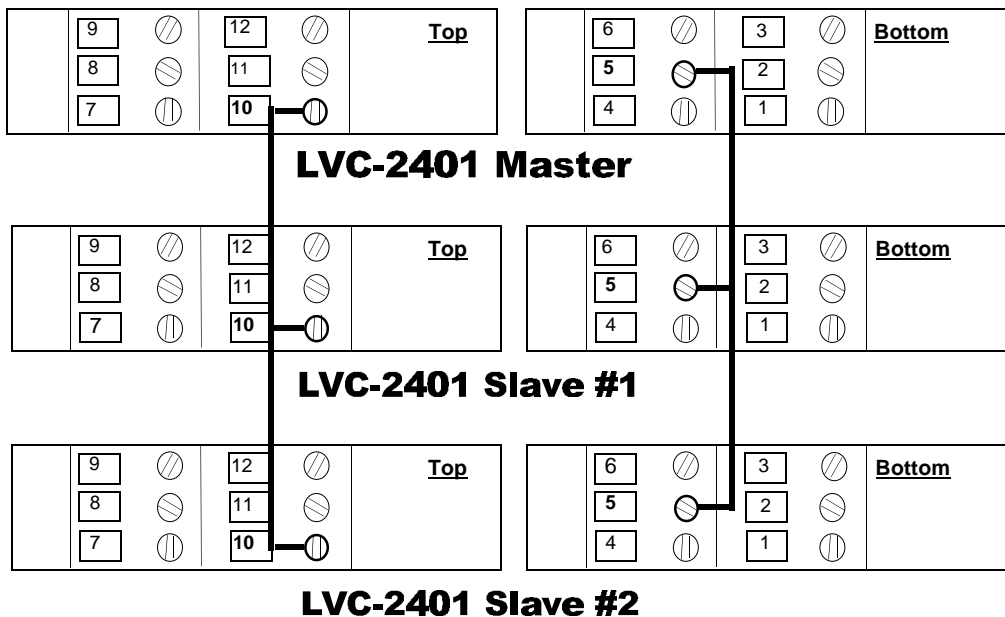
Indicates Jumper positions as shipped from factory



**Figure 1**

## MULTI-CHANNEL APPLICATIONS

A requirement may exist where multiple LVC-2401s are to be used and where units will be located in close proximity to each other. The LVC-2401 can synchronize the oscillators of multiple units to prevent crosstalk, beating and intermodulation between units. To synchronize the oscillators, connect together terminal 5 on all units and connect together terminal 10 on all units. These connections are in addition to the connections shown on page 4. One unit should be designated as the “Master” and the balance of the units designated as “Slaves”. The “Master” units excitation frequency must be set in accordance with the instructions given in the paragraph entitled “Excitation Frequency Selection”. On “Master” unit, move jumper from S8 to S9. The “Slave” units must have a jumper (shorting bar) on S8. On “Slave” units only, all jumpers (shorting bars) must be removed from S1, S2, S3 and S9.



Additional Connections For LVC-2401 Multi-channel “Master/Slave” Configuration

### **CALIBRATION PROCEDURE(Voltage Output)**

To calibrate, remove LVDT secondary wire, usually Red (A) from terminal 9. Insert temporary jumper between terminals 7 and 9 (this jumper will be removed after Zero adjustment). Apply DC power to unit and allow a 3-5 minute warm-up. Adjust the Zero control until an output of 0V DC is obtained between terminals 4 and 5. De-energize unit and remove temporary jumper from between terminals 7 and 9. Re-connect secondary wire Red (A) to terminal 9. Apply DC power to unit and move core or LVDT body until an output of 0V DC is obtained. This position is the true null of the sensor and the reference point from which subsequent measurements are made.

**NOTE:** If mechanical adjustment of the core or LVDT body is difficult or impossible, make this adjustment as close as possible and then adjust the Zero control to obtain 0V DC output. It is important that the LVDT be within 5% of its true null to insure that full displacement is within the LVDTs rated linear range. Offsets of more than 5% may result in non-linear results at or near full scale displacement.

Move the LVDT core to its full scale displacement and adjust the Span control to obtain a reading of 7.5V DC. Outputs of less than 7.5V DC may be obtained by adjustment of the Span control (e.g. 5V DC). If desired full scale output cannot be obtained by Span control adjustment, reset gain jumpers (shorting bars) to next higher or lower setting as shown in "GAIN SELECTION" table on page 7 and then re-adjust Span control to obtain desired output. Unit is now ready for normal operation.

### **CALIBRATION FOR 100% ZERO OFFSET (Voltage Output)**

100% zero offset allows the user to obtain a unipolar output over the full range of the LVDT.

Follow the instructions as described in the "CALIBRATION PROCEDURE" section for full scale use, but adjust the Span control for half the desired full scale output (e.g. 3.75V DC). Move the LVDT core to "minus" full scale displacement and adjust the Zero control to obtain zero output. Move the LVDT core to "plus" full scale displacement and adjust the Span control for desired full scale output. Repeat this procedure to insure proper calibration.

Unit is now ready for unipolar operation.

### **CALIBRATION FOR CURRENT(4-20mA) OUTPUT**

To calibrate unit for current output, make sure that output connections are made between Terminals 5 and 6. Remove LVDT secondary wire, usually Red (A) from Terminal 9. Insert temporary jumper between terminals 7 and 9 (this jumper will be removed after zero adjustment). Apply DC power to unit and allow a 3-5 minute warm-up. Adjust Zero control until a reading of 12mA is obtained. De-energize unit and remove jumper from between Terminals 7 and 9. Re-connect secondary wire Red (A) to Terminal 9. Apply DC power to unit. Move LVDT core or body until 12mA output is obtained. This position is the true null position of the sensor and the point from which subsequent measurements are made.

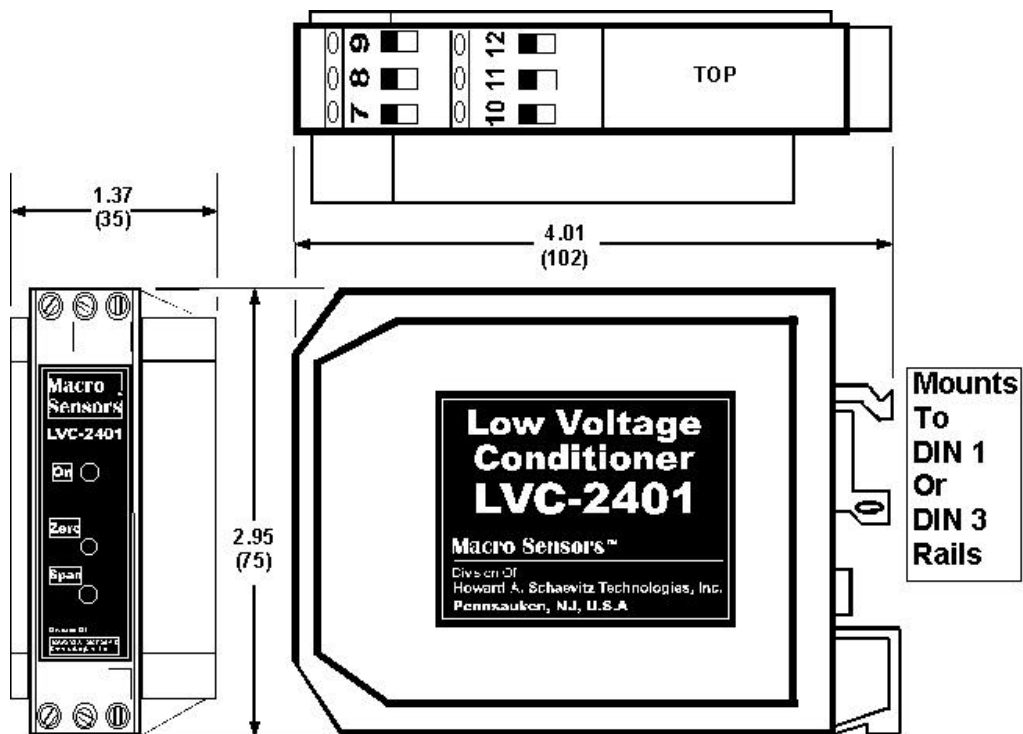
**NOTE:** If mechanical adjustment of the core or LVDT body is difficult or impossible, make this adjustment as close as possible and then adjust the Zero control to obtain 12mA output. It is important that the LVDT be within 5% of its true null or zero position to insure that full displacement is within the LVDT's rated linear range. Offsets of more than 5% may result in non-linear results at or near the full scale displacement.

Move the LVDT core to its "plus" full scale displacement and adjust the Span control to obtain a reading of 20mA. Return the core to "minus" full scale position and adjust the Zero control to obtain a reading of 4mA. Move the core to the "plus" full scale position and adjust the Span control to obtain a 20mA reading. Repeat above procedure to insure proper output at both extremes of the core travel.

Unit is now ready for current output operation.

## DIRECTIONAL SENSE

If the slope of the analog output is the reverse of the desired slope, i.e., if the output voltage or current increases or decreases opposite to the desired direction of core motion, reverse the LVDT connections to terminals 7 and 9.



## OUTLINE

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