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MODEL LVDT-8A

USER MANUAL

FILE: MLVDT8A.A1c

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ALWAYS CONNECT AND DISCONNECT YOUR FIELD CABLING WITH THE COMPUTER POWER OFF. ALWAYS TURN COMPUTER POWER OFF BEFORE INSTALLING A CARD. CONNECTING AND DISCONNECTING CABLES, OR INSTALLING CARDS INTO A SYSTEM WITH THE COMPUTER OR FIELD POWER ON MAY CAUSE DAMAGE TO THE I/O CARD AND WILL VOID ALL WARRANTIES, IMPLIED OR EXPRESSED.

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Prior to shipment, ACCES equipment is thoroughly inspected and tested to applicable specifications. However, should equipment failure occur, ACCES assures its customers that prompt service and support will be available. All equipment originally manufactured by ACCES which is found to be defective will be repaired or replaced subject to the following considerations.

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If a unit is suspected of failure, contact ACCES' Customer Service department. Be prepared to give the unit model number, serial number, and a description of the failure symptom(s). We may suggest some simple tests to confirm the failure. We will assign a Return Material Authorization (RMA) number which must appear on the outer label of the return package. All units/components should be properly packed for handling and returned with freight prepaid to the ACCES designated Service Center, and will be returned to the customer's/user's site freight prepaid and invoiced.

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Following Years: Throughout your equipment's lifetime, ACCES stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry.

Equipment Not Manufactured by ACCES

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General

Under this Warranty, liability of ACCES is limited to replacing, repairing or issuing credit (at ACCES discretion) for any products which are proved to be defective during the warranty period. In no case is ACCES liable for consequential or special damage arriving from use or misuse of our product. The customer is responsible for all charges caused by modifications or additions to ACCES equipment not approved in writing by ACCES or, if in ACCES opinion the equipment has been subjected to abnormal use. "Abnormal use" for purposes of this warranty is defined as any use to which the equipment is exposed other than that use specified or intended as evidenced by purchase or sales representation. Other than the above, no other warranty, expressed or implied, shall apply to any and all such equipment furnished or sold by ACCES.

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Chapter 1: Introduction

Linear Variable Differential Transformers, LVDTs, are the most commonly used passive type displacement transducers. They operate under the principle of a mutual inductance change due to movement of a magnetic core. This movement produces an electrical output proportional to the displacement of the core.

An AC, 5KHz, 1.5 to 3.5VRMS excitation voltage, is applied to the primary winding (see the specification section for other frequency options). Two identical secondary windings, symmetrically spaced from the primary, are connected in a series-opposing circuit. Motion of the magnetic core varies the mutual inductance of each secondary to the primary, which in turn, determines the voltages induced from the primary to each of the secondaries.

If the core is centered between the secondary windings, the voltage induced in the secondaries is identical and 180 degrees out-of-phase, so there is no net output. This is the NULL point. If the core is moved off center, the mutual inductance of the primary with one secondary is greater than with the other, and an AC differential voltage appears across the secondaries in series. For displacements within the operating range of the transducer used, this voltage is a linear analog of the displacement.
Each LVDT-8A card supplies power, excitation, and signal conditioning for up to eight independent LVDT transducers..

Each LVDT Signal Processor Chip has an Oscillator that provides the Excitation voltage for the associated Channels (0 through 7). This Excitation, or primary, voltage, designated as B voltage, is supplied to the LVDT.

The Signal Processor Chip also receives the VAC secondary, or return, voltage FROM the LVDT. This voltage is designated as the A voltage.

The Signal Processor Chip now executes the following equation.

Vout = A/B x 500uA x R2.

Vout is the VDC analog output for the channel selected.

A/B is the ratio of the secondary, IN, return VAC divided by the, OUT, VAC excitation voltage.

R2 is a scaling resistor. Changing the value of this resistor allows the setting of +/- 10 VDC or +/- 5 VDC for full LVDT displacement, or desired displacement.

The use of LVDT ratios rather than voltage levels alone to determine the VDC channel outouts improves output stability especially against temperature changes.

ED Display Utility:

Six LEDs are used to display the VDC output of a Jumper Selected channel, (0 through 7). The LEDs are labeled +10V, +5V, ZERO, -5V, and -10V. Whenever the selected output voltage is within +/- 0.5 volts of a Marked LED, that LED will be illuminated.

This Utility is not intended for Calibration. It may be used to facilitate testing of channel(s) using On Card resources.

Do not install more than one jumper at a time, while the Card outputs are not affected, the LEDs see the average of two channels. One Jumper may be installed, if desired, when the Card is Under Use.

The LVDT-8A has no incoming Computer communications. It supplies the eight VDC outoputs as described above. If a channel is not used, no LVDT installed, that channel's output will be near zero volts.

Specifications

The LVDT-8 provides power, excitation, and signal conditioning for eight independent transducers.

- Transducers Served: LVDT, RVDT, LVRT with primary impedances of 150 Ohms or greater.

- Excitation Frequency: 5 KHz.
  The Frequencies may be anywhere in the range of 1 to 10 KHz.

This is a Factory installed option.

- Power Required: +24 (18 to 36) VDC at 350 mA maximum
  Call Factory for installed power options
  Options Include:
  + 12 (9 to 18) VDC at 700 mA maximum
  + 48 (36 to 75} VDC at 175 mA maximum
  External power supply: +/- 12 VDC or +/- 15 VDC at +/- 300 mA maximum. If external power supply option is ordered, connect +12VDC to terminal marked +24VDC, connect Ground as marked and connect -12VDC to non-marked terminal. (See Option Selection map.)

- Output Analog Voltage: +/- 10 VDC or +/-5 VDC.

Environmental

- Operating Temperature Range: 0 °C. to 65 °C.
- Storage Temperature Range: -40 °C. to +100 °C.
- Humidity: 0 to 90%, non-condensing.

- Size (LVDT-8 module): 8.0" long (203 mm) X 4.74" wide (120 mm) X 0.75" high(19 mm). Fits inside of T-BOX enclosure (included)
- Size (T-BOX): 8.5" long (216 mm) X 5.25" wide (133 mm) X 2.0" high (51 mm).

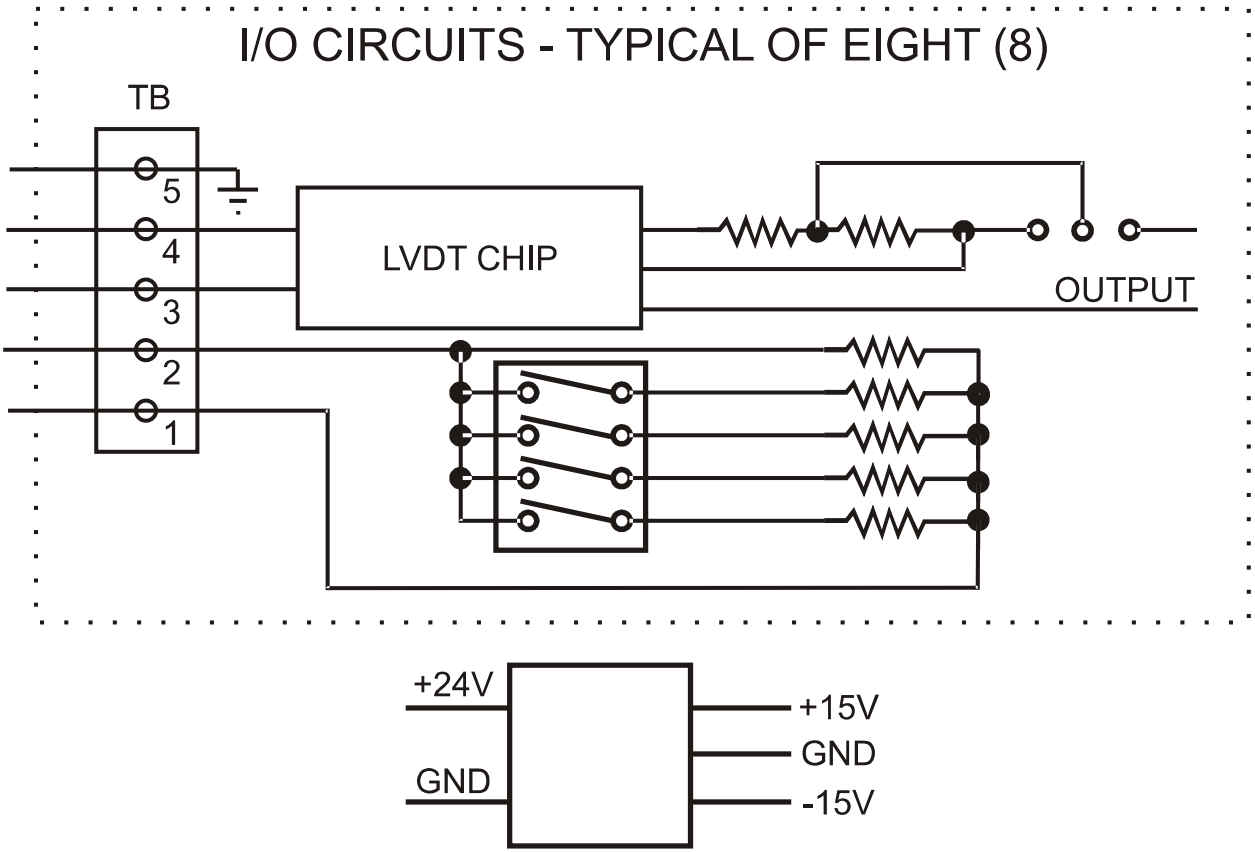

Figure 1-1: Block Diagram

Installing the Hardware

The LVDT-8A is installed in a steel enclosure (model T-BOX).

Signals from the transducers to the LVDT-8 module are connected via eight terminal blocks labeled TB1 through TB8. To ensure that there is minimum susceptibility to EMI, proper EMI cabling techniques (twisted-pair wiring and, in extreme cases, shielded wiring) should be used on input wiring. Each of the terminal blocks has five terminals:

1-2: Primary Winding
3-4: Secondary Winding
5: Chassis Ground

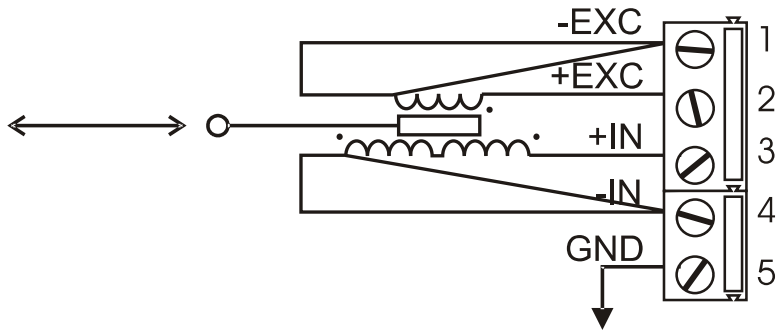

Figure 1-2: Terminal Schematic

The LVDT-8A board requires 350mA of +24VDC power. Connect the +24VDC from your power supply to terminal block TB9 Pin 3 (labeled +24V). Connect Power Ground to TB9 Pin 2 (labeled GND.) Under normal circumstances, do not make ANY connections to TB9 Pin 1.

Note

To minimize possibility of extraneous noise, short terminals 3 and 4 on any unused inputs. DO NOT ground the inputs or connect them to pin 5.

Chapter 2: Option Selection

Output Channels

All eight output channels are continuously available from output terminals labeled TB10 and TB11. These eight channels are also available from connector P1, pins 37 through 30.

External +24 VDC Power

A jumper block located between the ribbon cable connectors and terminal block TB1 are used to connect +/- 12V power to the LVDT-8. If computer power carried by the ribbon cable is used, the jumpers should be placed in the PS positions. If any external power supply is used, then these jumpers should be placed in the EX positions and the power supply connected to the adjacent screw terminals on TB1.

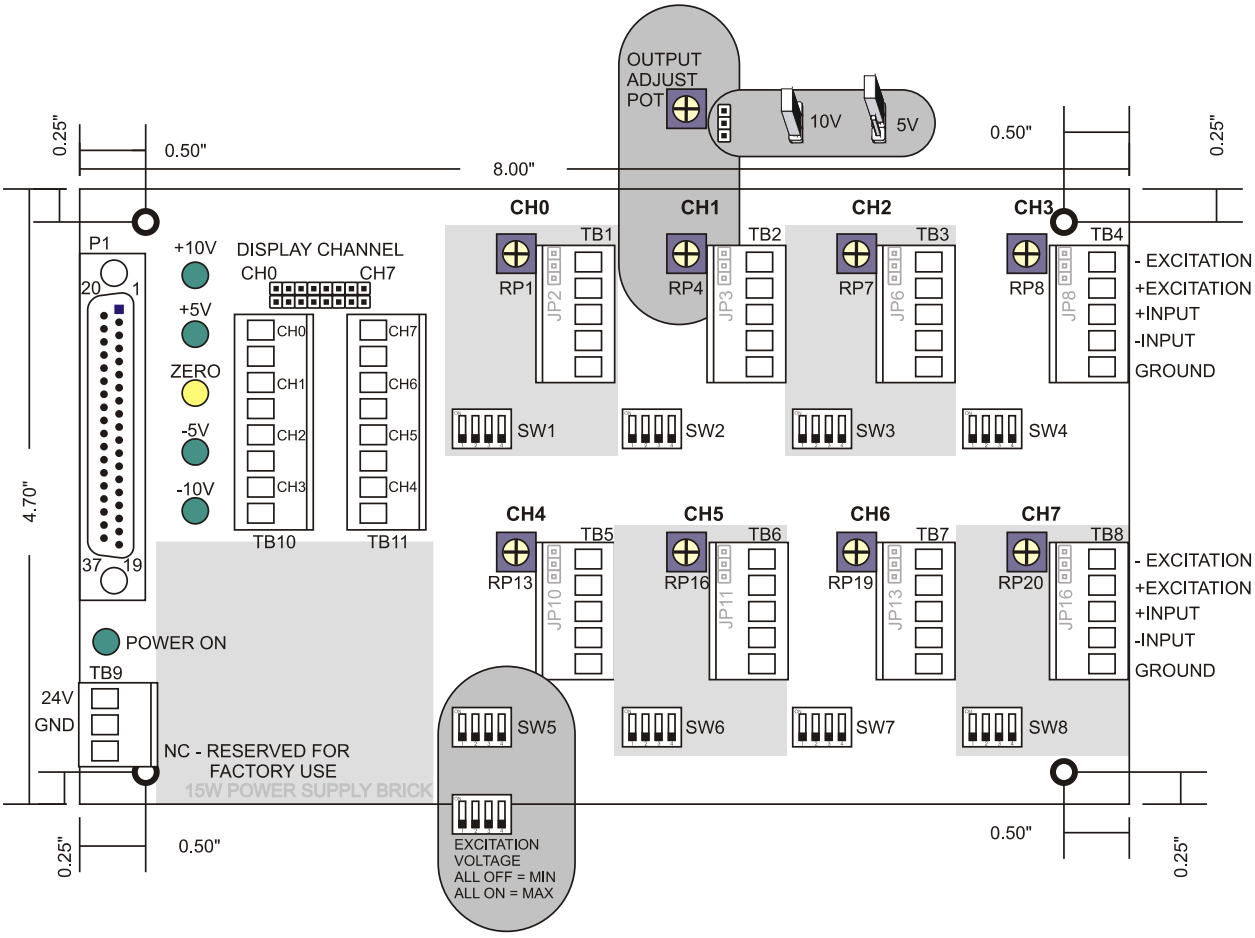

Figure 2-1: Option Selection Map

Chapter 3: Calibration

Refer to the Block Diagram and Option Selection Map presented earlier in the manual for guidance as you perform the calibration procedure.

Equipment Required

- A means of moving the LVDT sensor in precision increments across the desired range of movement (a micrometer jig).
- An oscilloscope may be used to observe the primary and/or LVDT waveforms.
- A 4 ½ digit DVM should be used for reading VDC and VAC voltages.

Calibration Procedure

1. Read LVDT Data Sheet. Note frequency Range, Input Voltage (Excitation), and Sensitivity (mV out per displacement unit). These elements should be compatible with the similar elements described below in step 2.

2. Calibrating Channel 0: Select Channel 0 by installing a LVDT at terminal block TB2, See Figure 3-1 for locations. See the LVDT installation at Installing the Hardware, page 1-6. Set all four positions of SW1 to OFF.. Set LVDT displacement to full mechanical scale or to desired mechanical scale using the micrometer jig. With power ON read excitation voltage, which should be 1.5 VRMS to 3.5 VRMS. Read return, secondary, voltage from LVDT at TB10, normal voltage should fall between 0.15 volts and 3.5 volts at full mechanical displacement. If the excitation voltage level is low turn on position 1 of SW1. The excitation voltage should increase by a nominal 7 to 9%. Both the excitation voltage and the return voltage should be sine waves with NO limiting at the top or bottom of the wave form.

3. Scaling Output: See Figure 3-1for positions. A multi turn potentiometer, RP1 and a jumper position JP2 are used to scale the VDC output, to either +/- 10 VDC or +/- 5VDC. For +/- 10VDC the jumper at JP2 is installed at the bottom position or not installed at all. Adjust the LVDT to the desired positive mechanical position, nominally full scale.. Turn the potentiometer at RP1 until the output reads + 10.00 volts. Adjust the LVDT to its null position. The output should be 0.0 volts. Adjust the LVDT to the desired negative position. The output should be - 10.00 volts. A slight adjustment of potentiometer RP1 may provide better accuracy across the full plus and minus scale.

4. Failure to calibrate: Not all LVDTs are alike. A LVDT may be mis connected, or defective. It is possible there is insufficient scale range for some LVDTs. You are invited to call the factory if you have a LVDT-8A with a problem.

5. After completing the calibration of Channel 0 the remaining seven channels may be installed and calibrated. It is suggested that this be done one channel at a time.

6. Chan 0 use TB1, RP1, JP2, and SW1; Chan 1 use TB2, RP4, JP3, and SW2; Chan 2 use TB3, RP7, JP6, and SW3: Chan 3 use TB4, RP8, JP8, and SW4; Chan 4 use TB5, RP13, JP10, and SW5: Chan 5 use TB6, RP16, JP11, and SW6: Chan 6 use TB7, RP19, JP13, and SW6: Chan 7 use TB8, RP20, JP16, and SW8.

7. The procedure for calibrating a channel other than Chan 0 is to use the same information from the above steps, but using the symbol positions for the selected channel listed in step 6, above.

8. When all channels, or all channels to be used, are calibrated, it is suggested that the calibration of all channels be reviewed. The LED Display Utility, see Introduction, can quickly locate a channel that needs recalibration.

Note

Reverse the connections to terminals 3 and 4 if the LVDT direction is backwards from what you desire.

Chapter 4: Connector Pin Assignments

Two parallel 37 pin D-Sub type connectors are provided on the LVDT-8A module. The mating connectors are AMP type 747304-1 or equivalent.

Pin#	Label	Used for
1		FACTORY
2	(UNUSED)	
3	(UNUSED)	
4	(UNUSED)	
5	(UNUSED)	
6	(UNUSED)	
7	(UNUSED)	
8	(UNUSED)	
9	(UNUSED)	
10	(UNUSED)	
11	GROUND	GROUND
12	(UNUSED)	
13	(UNUSED)	
14	(UNUSED)	
15	(UNUSED)	
16	(UNUSED)	
17	(UNUSED)	
18	GROUND	GROUND
19	(UNUSED)	
20		FACTORY
21	GROUND	GROUND
22	" "	
23	" "	
24	" "	
25	" "	
26	" "	
27	" "	
28	(UNUSED)	
29	(UNUSED)	
30	CH 7	OUTPUT TO A/D CHANNEL 7
31	CH 6	OUTPUT TO A/D CHANNEL 6
32	CH 5	OUTPUT TO A/D CHANNEL 5
33	CH 4	OUTPUT TO A/D CHANNEL 4
34	CH 3	OUTPUT TO A/D CHANNEL 3
35	CH 2	OUTPUT TO A/D CHANNEL 2
36	CH 1	OUTPUT TO A/D CHANNEL 1
37	CH 0	OUTPUT TO A/D CHANNEL 0

Table 4-1: Connector Pin Assignments, P1

Pin #	Label	Use
TB1		
1	- Excitation	Negative, B Channel, Excitation for Channel 0
2	+ Excitation	Positive, B Channel, Excitation for Channel 0
3	+ Input	Positive, A Channel, Return signal from Channel 0
4	- Input	Negative, A Channel, Return signal from Channel 0
5	GROUND	
TB2		
1	- Excitation	Negative, B Channel, Excitation for Channel 1
2	+ Excitation	Positive, B Channel, Excitation for Channel 1
3	+ Input	Positive, A Channel, Return signal from Channel 1
4	- Input	Negative, A Channel, Return signal from Channel 1
5	GROUND	
TB3		
1	- Excitation	Negative, B Channel, Excitation for Channel 2
2	+ Excitation	Positive, B Channel, Excitation for Channel 2
3	+ Input	Positive, A Channel, Return signal from Channel 2
4	- Input	Negative, A Channel, Return signal from Channel 2
5	GROUND	
TB4		
1	- Excitation	Negative, B Channel, Excitation for Channel 3
2	+ Excitation	Positive, B Channel, Excitation for Channel 3
3	+ Input	Positive, A Channel, Return signal from Channel 3
4	- Input	Negative, A Channel, Return signal from Channel 3
5	GROUND	
TB5		
1	- Excitation	Negative, B Channel, Excitation for Channel 4
2	+ Excitation	Positive, B Channel, Excitation for Channel 4
3	+ Input	Positive, A Channel, Return signal from Channel 4
4	- Input	Negative, A Channel, Return signal from Channel 4
5	GROUND	
TB6		
1	- Excitation	Negative, B Channel, Excitation for Channel 5
2	+ Excitation	Positive, B Channel, Excitation for Channel 5
3	+ Input	Positive, A Channel, Return signal from Channel 5
4	- Input	Negative, A Channel, Return signal from Channel 5
5	GROUND	
TB7		
1	- Excitation	Negative, B Channel, Excitation for Channel 6
2	+ Excitation	Positive, B Channel, Excitation for Channel 6
3	+ Input	Positive, A Channel, Return signal from Channel 6

4	- Input	Negative, A Channel, Return signal from Channel 6
5	GROUND	
TB8		
1	- Excitation	Negative, B Channel, Excitation for Channel 7
2	+ Excitation	Positive, B Channel, Excitation for Channel 7
3	+ Input	Positive, A Channel, Return signal from Channel 7
4	- Input	Negative, A Channel, Return signal from Channel 7
5	GROUND	

Table 4-2: LVDT Connections, Channel 0 through Channel 7

Pin #	Label	Use
Outputs/TB10		
1	CH 0	VDC Sigout-0 for Channel 0
2	GND	
3	CH 1	VDC Sigout-1 for Channel 1
4	GND	
5	CH 2	VDC Sigout-2 for Channel 2
6	GND	
7	CH 3	VDC Sigout-3 for Channel 3
8	GND	
Outputs/TB11		
1	CH 7	VDC Sigout-7 for Channel 7
2	GND	
3	CH 6	VDC Sigout-6 for Channel 6
4	GND	
5	CH 5	VDC Sigout-5 for Channel 5
6	GND	
7	CH 4	VDC Sigout-4 for Channel 4
8	GND	

Table 4-3: Output Pinouts

Pin #	Label	Use			
		24 VDC	12 VDC	48 VDC	+/- 12 VDC
1	+24V	+24 VDC Input	+12 VDC	+48 VDC	+12 VDC
2	GND	+24 VDC Ground Return	GND	GND	GND
3	TB9	MAKE NO CONNECTION	No Connection	No Connection	-12 VDC

Table 4-4: Power On Connections

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: *manuals@accesio.com*. Please detail any errors you find and include your mailing address so that we can send you any manual updates.

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