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MODEL LVDT-8U

**EIGHT CHANNEL AC LVDT UNIVERSAL
SIGNAL CONDITIONER**

USER MANUAL

MLVDT8U.B2h

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WARNING!!

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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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.

Coverage

First Three Years: Returned unit/part will be repaired and/or replaced at ACCES option with no charge for labor or parts not excluded by warranty. Warranty commences with equipment shipment.

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.

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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

This eight channel LVDT signal conditioner has been designed to be as universal as possible. By “universal” we mean it can provide conditioning for many different kinds of AC LVDTs, from full-bridge to half bridge. Our goal was to design a board that would be useful to as wide of a market as possible without the need to customize each board for each customer’s unique needs. Significant enhancements and improvements have been made over our recent “8A” Signal Conditioner. For example:

- Addition of a 25 turn offset adjustment potentiometer per channel
- Synchronized excitation frequencies, Channel 0 serves as the Master while Channel’s 1 through 7 are slaves, following Channel 0’s frequency.
- Higher available gains for super-sensitive LVDTs and for half-bridge sensors.

At the core of the board are eight individual conditioner chips, the flexible and powerful Analog Devices AD698.

LED 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 card has no incoming computer communications. It supplies the eight VDC outputs as described above. If a channel is not used, no LVDT installed, that channel’s output will be near zero volts.

Specifications

The card 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: 10 kHz.
The Frequencies may be anywhere in the range of 1 to 20 kHz $\pm 10\%$. This is a Factory installed option which should be specified at the time of purchase. Frequencies may be the same or different for each LVDT channel.
- Excitation Voltage: 3Vrms standard.

- Power Required: + 12 (9 to 18) VDC at 700 mA maximum
Call Factory for installed power options. Should be specified at the time of purchase.
- Options Include:
 - On-board DC/DC converter + 24 (18 to 36) VDC at 350 mA maximum
 - + 48 (36 to 75) VDC at 175 mA maximum
 - External power supply (no on-board DC/DC converter)
+/- 12 VDC or +/- 15 VDC at +/- 300 mA maximum.
- Output Analog Voltage: +/- 10 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 (card module): 8.0" long (203 mm) X 4.74" wide (120 mm) X 0.75" high (19 mm). Fits inside of RT-BOX enclosure (Optional)
- Size (RT-BOX): 8.5" long (216 mm) X 5.25" wide (133 mm) X 2.0" high (51 mm).

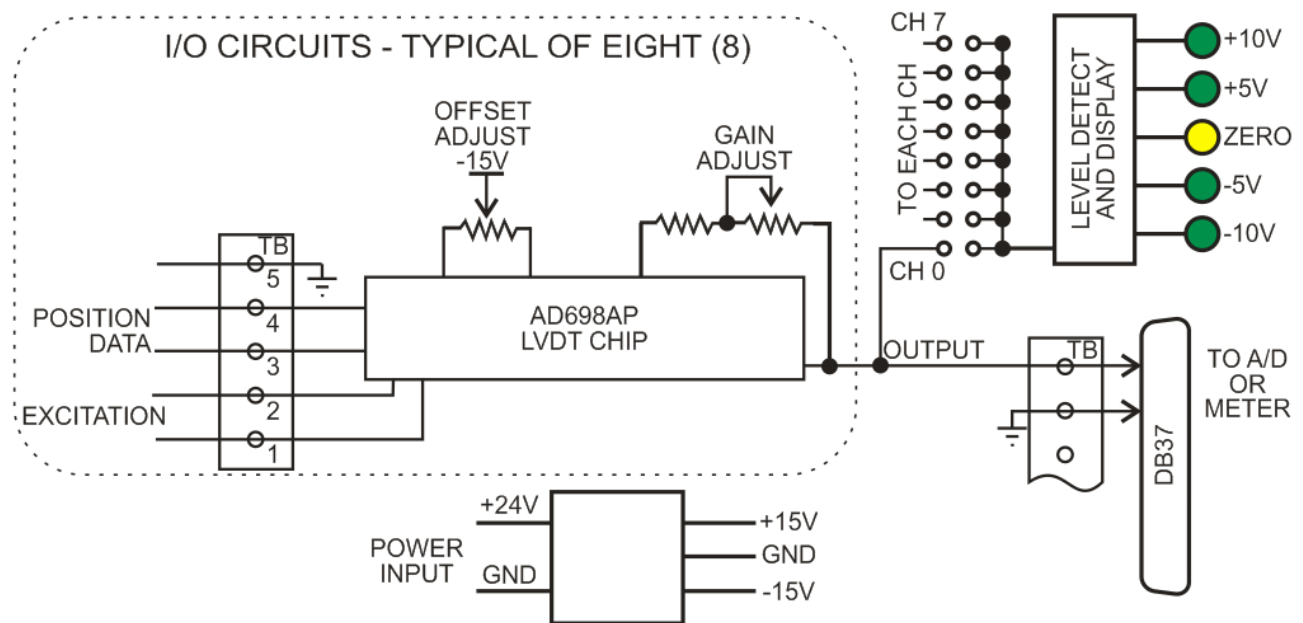


Figure 1-1: Block Diagram

Installing the Hardware

The card may be installed in an optional steel enclosure (model RT-BOX or T-BOX).

Sensors:

Signals from the transducers to the card module are connected via removable 5-pin 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.

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

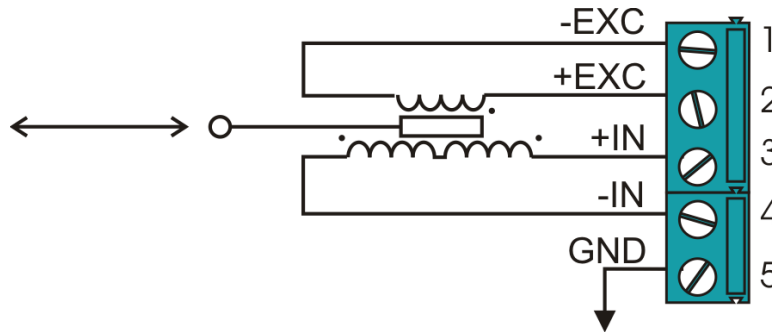


Figure 1-2: Full-Bridge LVDT Sensor Terminal Schematic

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.

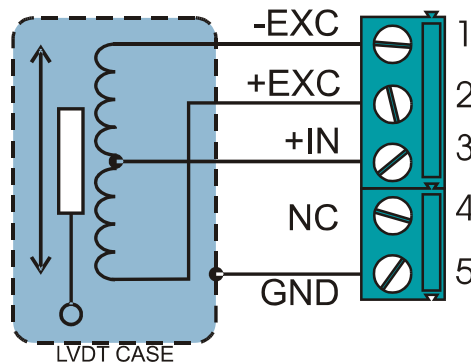


Figure 1-3: Half-Bridge LVDT Sensor Terminal Schematic

Power:

The board requires 700mA of +12VDC power. Connect the +12VDC from your power supply to terminal block TB9 Pin 1 (labeled +15V). Connect Power Ground to TB9 Pin 2 (labeled GND.) Under normal circumstances, do not make ANY connections to TB9 Pin 3.

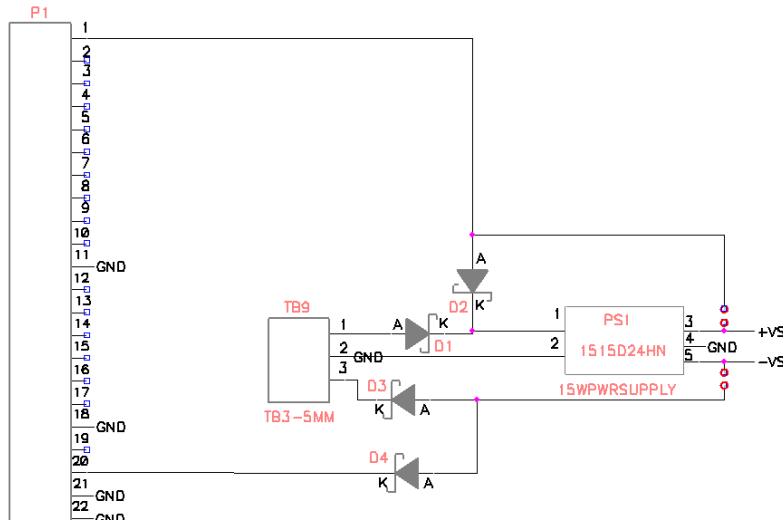


Figure 1-4: Input Power Circuit Schematic

Card Power Options

The card requires +15 VDC and -15 VDC for internal operating power. The preferred source of this power is from a Power Supply (DC/DC converter) installed on the card. This power supply provides a regulated +/- 15 Volts derived from an external source within one of the three available ranges.

- +12 (9 to 18) VDC at 700 mA maximum
- +24 (18 to 36) VDC at 350 mA maximum
- +48 (36 to 75) VDC at 175 mA maximum

In addition, full +/- 10 Volt Data Outputs and a correct LED display utility which is referenced to +/- 15 Volts will result.

An external +/- 15 Volt power supply may be used to power the Card's internal circuits with some reduction in performance. First, reverse voltage protective diodes are located in series with the +15 Volt and the - 15 Volt external power inputs. These diodes reduce the +/- 15 Volts to +/- 14.5 Volts approximately. This Voltage reduction should not affect the +/- Data Output. However, the LED display utility will have a half-Volt error. This error may be corrected at the factory. If the external power supply is used to power other external devices as well, noise generated by these devices may be added to the Card's DATA Output.

An external +/- 12 Volt power supply is NOT recommended. +/- 10 Volt Data output could not be supported, +/- 7.5 Volt Data would be the maximum. The LED display utility would be in error up to 5 Volts, too much for correction.

Chapter 2: Option Selection

While no software is required to use this signal conditioner, you may install a software package for this card off our master CD. This will install this user manual, some general utilities, and the card setup program, which is intended to be used in conjunction with this manual. All these items will be accessible from the start menu (windows users).

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.

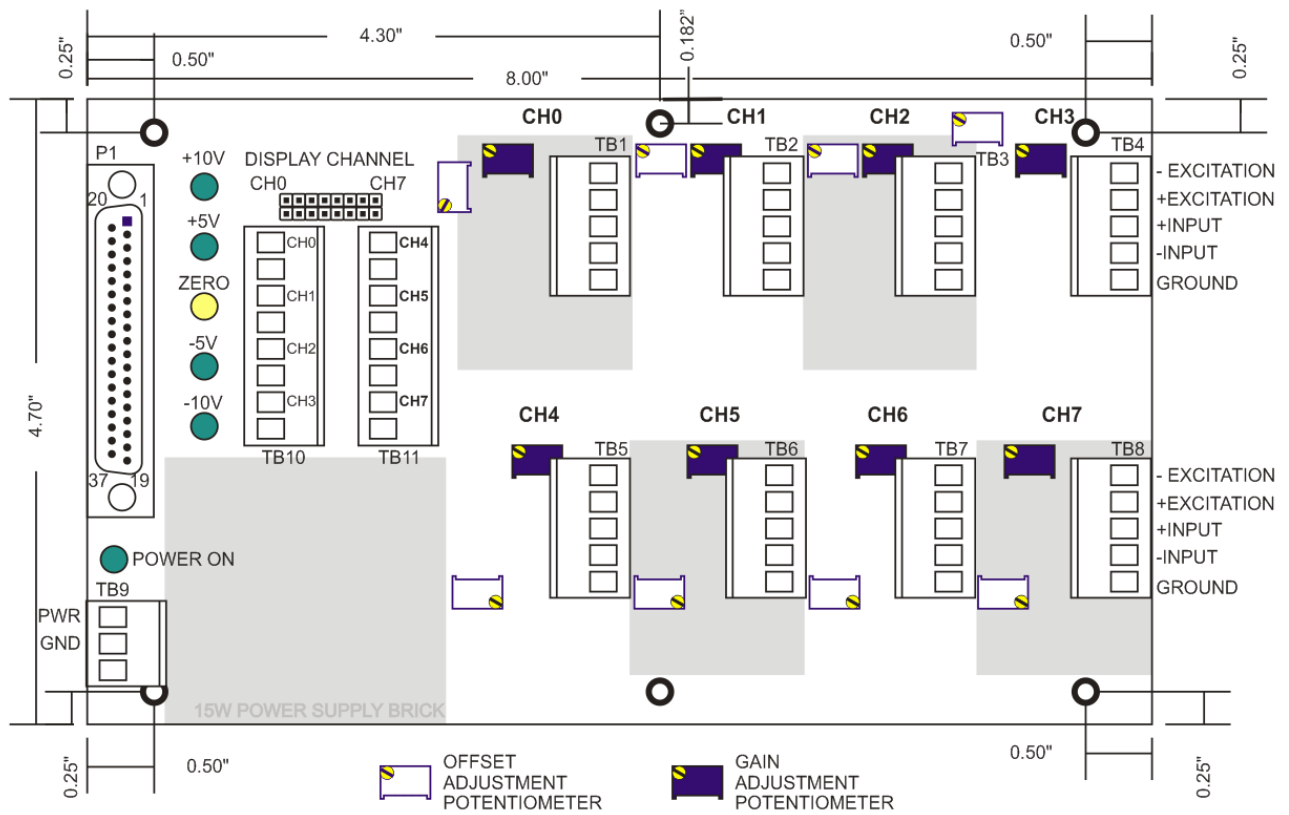


Figure 2-1: Option Selection Map

External Power

A terminal block labeled TB9, located on the corner of the board is used to connect power to the card. With any on-board DC/DC converter option, only make connections to TB9 on the PWR terminal and GND terminal for the return.

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

Note

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

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 Display Channel 0 by placing a jumper on the Display Channel jumper block for Channel 0. Set LVDT displacement to full mechanical scale or to desired mechanical scale using the micrometer jig.
3. Scaling Output: See Figure 2-1 for positions. Two 20-turn potentiometers are used per channel to scale the VDC output +/- 10 VDC and to adjust the offset. Adjust the LVDT to the desired positive mechanical position, nominally full scale. Turn the gain potentiometer until the output reads + 10.00 volts. Adjust the LVDT to its null position. The output should be 0.0 volts, adjust the offset potentiometer as required. Adjust the LVDT to the desired negative position. The output should be -10.00 volts. A slight adjustment of the gain and offset potentiometers may be necessary to provide the best accuracy across the full plus and minus scale.
4. Failure to calibrate: Not all LVDTs are alike. An LVDT may be mis-connected, or defective. It is possible there is insufficient scale range for some LVDTs. You can move your sensor connection to an unused channel to confirm sensor problems vs. board channel problems. You are invited to call the factory if you have a card with a problem.
5. After completing the calibration of Channel 0 the remaining seven channels may be installed and calibrated using the above procedure per channel.

Chapter 4: Connector Pin Assignments

One 37 pin D-Sub type connector is provided on the module with pin compatibility to one of our A/D cards. The mating connectors are AMP type 747304-1 or equivalent.

Pin#	Label	Used for
1	+VINEX	+ 15V INPUT
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	-VINEX	- 15V INPUT
21	GROUND	GROUND
22	GROUND	GROUND
23	GROUND	GROUND
24	GROUND	GROUND
25	GROUND	GROUND
26	GROUND	GROUND
27	GROUND	GROUND
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: DB37 Connector Pin Assignments, P1

Pin #	Label	Use
TB1 through TB8		
1	- Excitation	Negative, B Channel, Excitation for Channel 0 through Channel 7
2	+ Excitation	Positive, B Channel, Excitation for Channel 0 through Channel 7
3	+ Input	Positive, A Channel, Return signal from Channel 0 through Channel 7
4	- Input	Negative, A Channel, Return signal from Channel 0 through Channel 7
5	GROUND	

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

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

Table 4-3: Conditioned Outputs

Pin #	Label	Use			
		+12VDC, +15VDC, +24VDC, or +48VDC For ON-Card power supplies use pin 1 and 2 only	+12VDC For ON-Card power supplies use pin 1 and 2 only	+24VDC For ON-Card power supplies use pins 1 and 2 only	+48VDC For ON-Card power supplies use pins 1 and 2 only
1	+15V	All Positive Inputs	+12VDC	+24VDC	+48VDC
2	GND	All Ground Returns	RETURN	RETURN	RETURN
3	-15V	For OFF-Card power supplies. +/- 15V Only	No Connection	No Connection	No Connection

Table 4-4: TB9 Power Connections

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: manuals@accessio.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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