TIGER FAMILY

- **6-digit, 0.56" (14.2 mm) Alphanumeric Display**
- **1/8 DIN Case**
- **3-button Front Panel Operation**
- **Intuitive Scrolling Text Configuration Menus**

LVDT-200

Dual LVDT Controllers Positioning & Displacement

Optimize performance and linearity. Select the correct frequency for your sensor

Introduction

The LVDT-200 Series are accurate, high performance, programmable dual channel controllers that deliver precise measurement and control for applications using LVDT (Linear Variable Differential Transformer) inputs.

The 6-digit alphanumeric LED display provides easy to follow setup prompts for all LVDT parameters using the following intuitive scrolling text configuration menus.

Input setup mode

- 50 or 60 Hz supply frequency.
- Excitation frequencies:

  50 Hz: 1.2, 1.6, 2.4, 3.2, 4.8, 6.4, 8.0, 9.6 kHz excitation.

  60 Hz: 1.44, 1.92, 2.88, 3.84, 5.76, 7.68, 9.60, 11.52 kHz excitation.
- Update rates: 1, 4, 10, or 20 readings per second.
- Independent decimal point position setting for each channel display with resolution to 0.00001 of any engineering unit.

Calibration mode

- Independent calibration for each channel:

  Auto Calibration: 2-point zero and span setting.

  Offset Trim: Independently trim the zero setting or enter an offset value.

  Span Trim: Independently trim the span setting.

Analog output mode

- Zero setting.
- Full scale setting.

Setpoints mode

- Four independently configured setpoints with above and below setpoint value actuation.
- **Relay**

  Standard : Four 4 amp relays.
- **Analog Output**

  Standard: Fully scalable from 0/4 to 20 mA (or reverse).

  Options: Single 0 to 10 V DC (or reverse) or dual 10–0–10 V DC.

Advanced Functions

A range of built-in measurement and control functions are available with the LVDT-200 Series controllers' resident operating system that can also be programmed from the front panel. These include:

- **Linearization**. Up to four 32-point flexible linearization tables or a single 125-point flexible table.
- **Serial Communications.** Optional single ASCII or Ethernet (TCP/IP) outputs.
- **Differential Measurement**. Differential measurement and cross channel maths available (A+B, A–B, AxB, A/B).

Specifications

General

Digital Display: 14-segment alphanumeric, 0.56" (14.2 mm) LEDs.

Display Color: Red (standard). Green or Super-bright Red (optional).

Display Range: -199999 to 999999.

Display Update Rate: 1, 4, 10, or 20 times per second.

Display Dimming: 8 brightness levels. Front panel selectable.

Scrolling Display Text Messaging: Full alphanumeric text characters supported.

Polarity: Assumed positive. Displays – negative.

Annunciators: 6 red LEDs on front panel; one per setpoint.

Overrange Indication: OVER

Underrange Indication: UNDER

Front Panel Controls: PROGRAM, UP and DOWN buttons.

Power Supplies. Standard high voltage AC / DC power supply 85-265 V AC / 95-300 V DC, 50-400Hz, 2W nominal. or optional low voltage AC / DC power supply 14-48 V AC / 10-72 V DC.

Environmental

Operating Temperature: 0 to 50 ˚C (32 ˚F to 122 ˚F).

Storage Temperature: -20 ˚C to 70 ˚C (-4 ˚F to 158 ˚F).

Relative Humidity: 95% (non-condensing) at 40 ˚C (104 ˚F).

Mechanical

Case Dimensions: 1/8 DIN, 96x48 mm (3.78" x 1.89").

Case Depth: 137 mm maximum (5.39").

Case Material: 94V-0 UL rated self-extinguishing polycarbonate.

Weight: 11.5 oz (0.79 lbs), 14 oz (0.96 lbs) when packed.

Approvals

UL: E469078

Input Module ISL1

Excitation Voltage: 3 V RMS sine wave, zero DC component THD <2% (1.2 kHz).

Excitation Frequency: x 16 selectable frequencies available (1.2 kHz to 11.5 kHz). Crystal locked, software driven.

Temperature Coefficient: ± 50 ppm/ ° C of full scale (typical).

Dual LVDT Inputs: 30 kΩ input impedance. Synchronous demodulation of excitation carrier. >130 db rejection of excitation carrier.

Frequency Response: 500 Hz (–3 db) low-pass filter.

Analog to Digital: Dual channel ΣΔ A/D convertor approaching 19-bit resolution. Ratiometric operation relative to excitation voltage magnitude.

Dual Output Rates: Rapid and average response outputs. 1 Hz, 2 Hz, 10 Hz, 20 Hz averaged.

Line Frequency Rejection: 50 / 60 Hz noise rejection.

Relay Output Modules

Please see Page 11.

Table of Contents

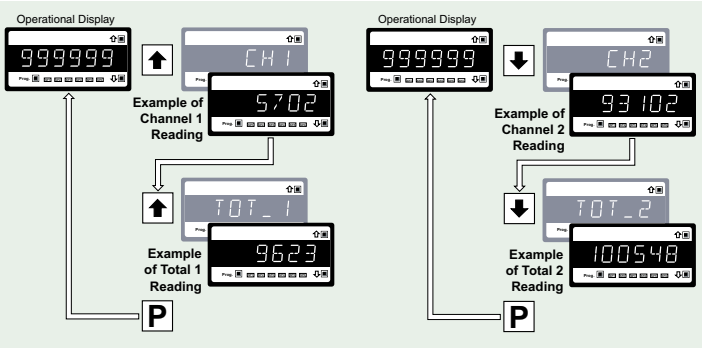
Intuitive Scrolling Text Menus

After the controller has been powered up, the display settles and indicates the input signal calibrated value. This is known as the operational mode and is generally referred to as the throughout this document.

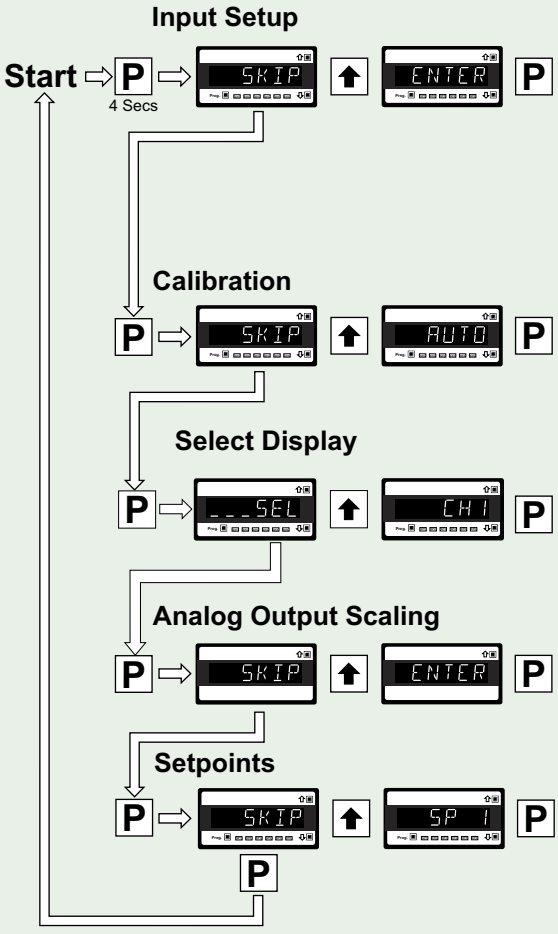
Intuitive scrolling text menus provide quick access to a range of configuration modes for easy LVDT sensor application setup. The below describes the configuration menus.

View Modes

The view modes allow easy viewing of the second channel reading plus total 1 and total 2 if required.



Configuration Menus Logic Tree



Takes you into Input Setup mode and provides selection for:
- Supply frequency: 50 or 60 Hz.
- One of eight excitation settings for either 50 or 60 Hz.
- One of four output rates.
- Independent decimal point position for channels 1 and 2.

See Page 3

Takes you into Calibration mode and provides selection for:
- Either channel 1 or channel 2 for calibration.
- 2-point auto calibration for zero and span.
- Manual trim for zero offset.
- Manual trim for span.

See Page 4

Allows you to change the displayed value:
- Select either CH1, CH2, CH1+CH2 or CH1-CH2.

See Page 4

Takes you into Analog Output Scaling mode and provides:
A menu that allows you to set zero and full scale analog output calibration settings.

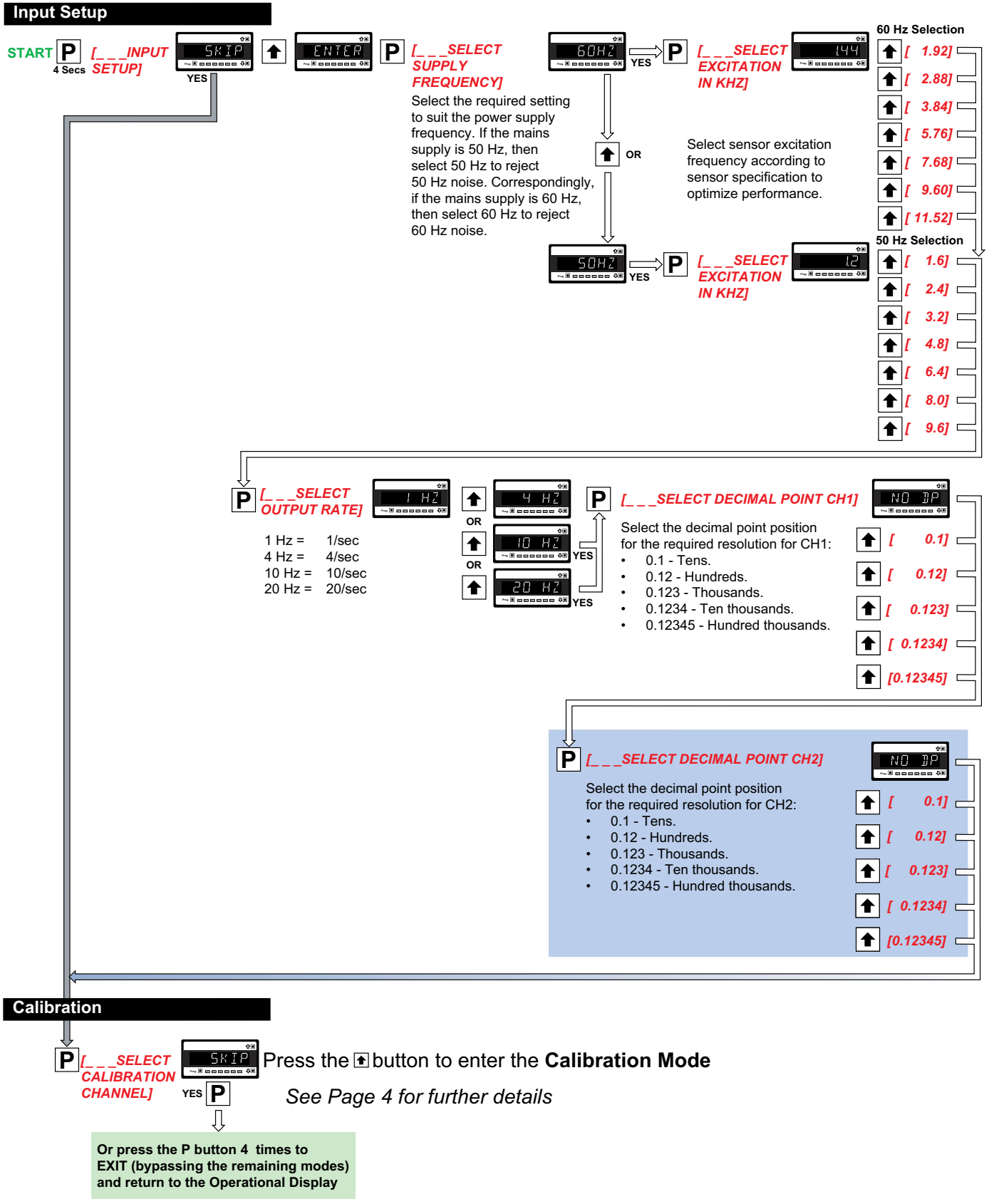
See Page 5

Takes you into Setpoint mode and provides:
- Selection of individual setpoints SP1 to SP4.
- Setting of individual setpoint source.
- Setting of individual setpoint activation value.
- Setting of individual setpoint activation ABOVE or BELOW.

See Page 6

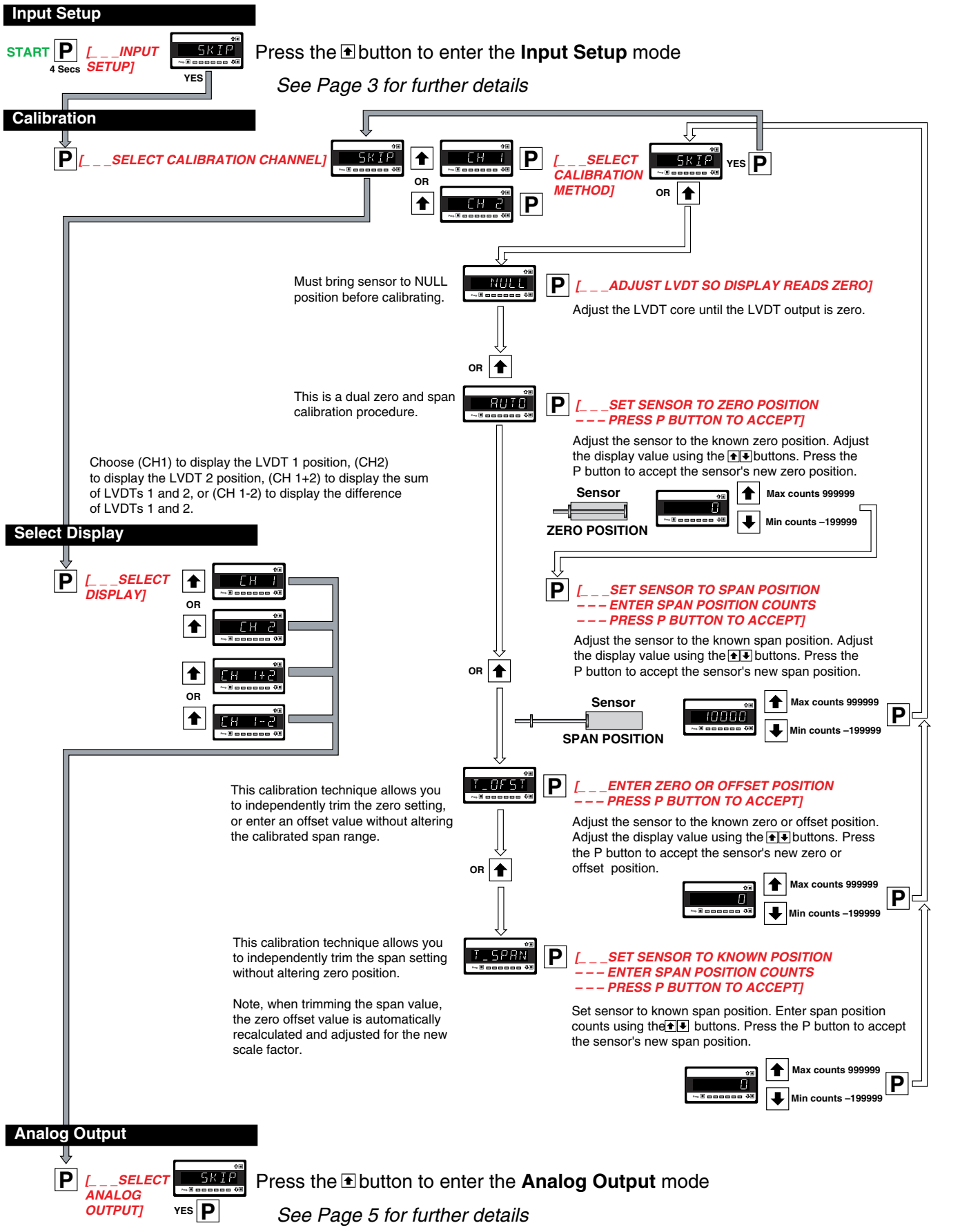
Input Setup

The **input setup** mode allows you to configure five input setup settings in linked menus.



Calibration

The **calibration** mode provides four individual calibration techniques.



Analog Output Scaling

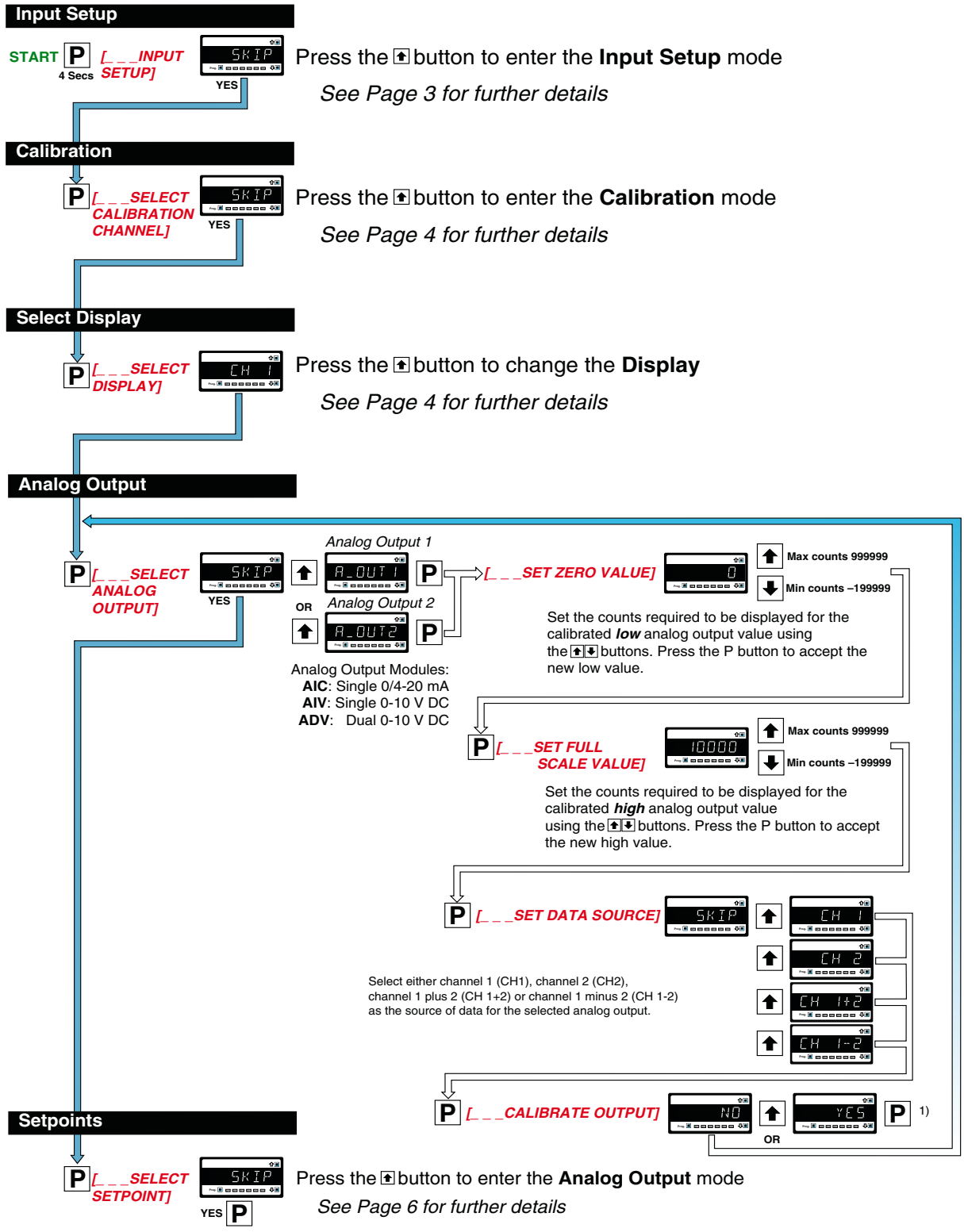
The analog output module is a standard single channel, programmable, isolated, 16-bit analog output that can be scaled to any desired span between –199999 to 999999 display counts using the .

Optional single channel 0-10 V DC and dual channel 10–0–10 V DC analog output modules are also available.

See **Analog Output Procedures** for an analog output scaling procedure.

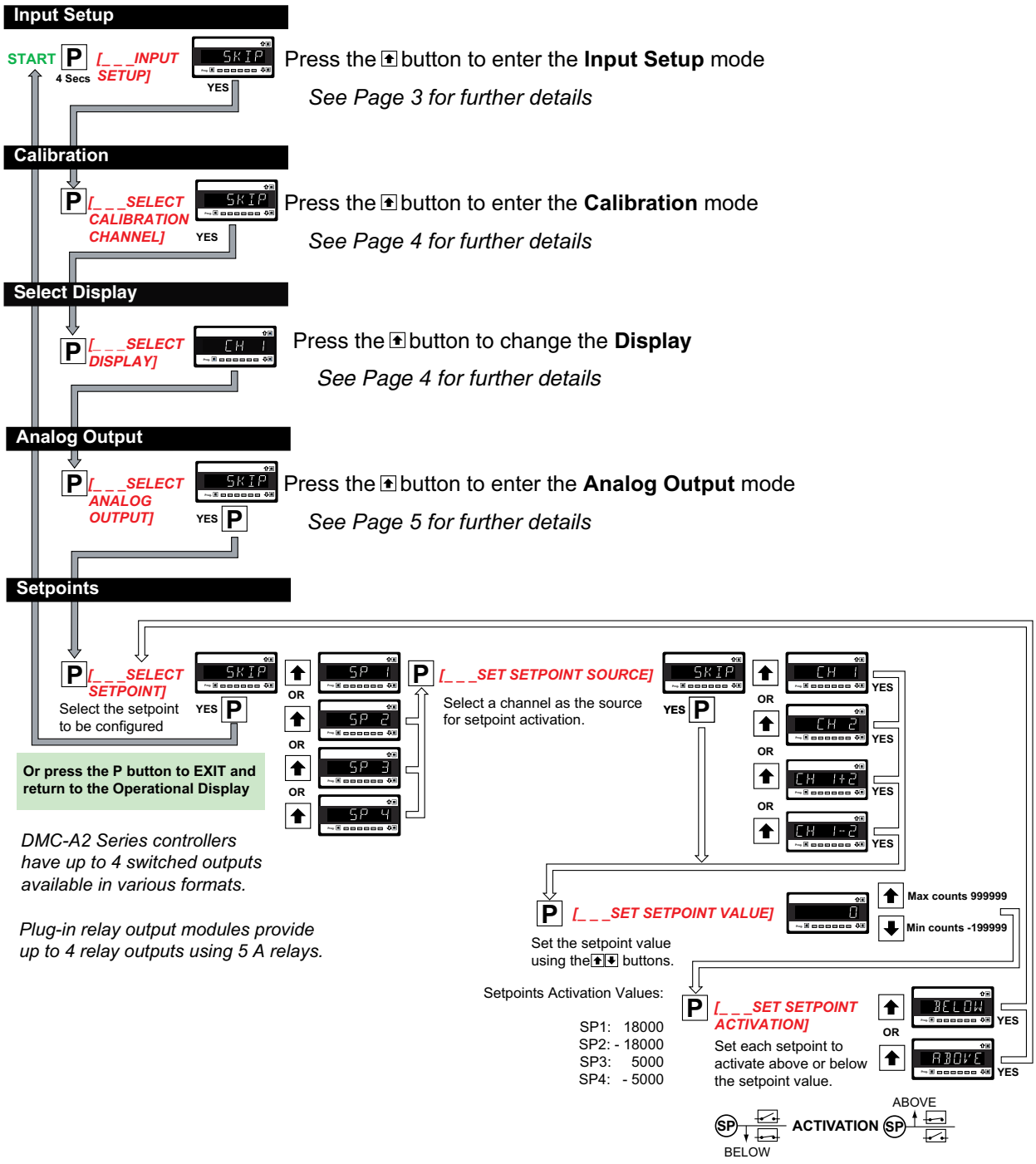
1) See **Analog Output Procedures** for an analog output signal calibration procedure.

See **Analog Output Procedures** for a current / voltage selection header positioning procedure.



Setpoints

The **setpoint** mode provides settings for six individual setpoints.



Calibration Mode Zero Options

NULL

The NULL position allows the user to adjust the LVDT core until the LVDT output is zero. The sensor must be brought to NULL position before calibrating.

The controller has been programmed with a and function that operates on the selected primary display reading only.

The function is used to zero the display. Display zero is initiated from a remote switch (not supplied) connected across the and pins at the rear of the controller (Terminal 2: Pin 4 Common, Pin 2 Hold).

The function is used to restore the true calibrated value on the display. Reset display value is initiated from a remote switch connected across the and pins at the rear of the controller (Terminal 2: Pin 4 Common, Pin 1 Lock).

The display zero value and reset display value are not retained during a power outage.

The display zero and reset display value functions are often used for cut, measure, and trim applications.

Analog Output Scaling and Calibration Example

In this example the analog output signal is scaled over a range of 50 to 30,000 counts. The analog output is then calibrated for a 0 to 10 V DC output.

Note:
*In **Steps 11** to **19,** the analog output may be calibrated to other ranges such as 0-20 mA or 4-20 mA. For current output the header on the analog output module has to be moved to the CURRENT position.*

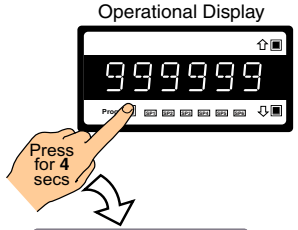
See the drawing on Page 8 on how to change the analog output from voltage (default) to a current output.

1) Connect a multimeter to the analog output connector at the rear of the meter (Terminal 4: Pin 3 positive, Pin 2 negative).
2) Make sure the multimeter is set to read the appropriate signal type: volts or milliamps.
3) Carry out the analog output scaling procedure to set zero and full scale settings.
4) If required, carry out the analog output calibration procedure to calibrate the milliamp (or voltage) output low and high settings.

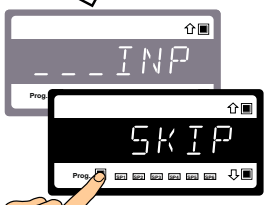
Scaling the Analog Output Signal

START HERE

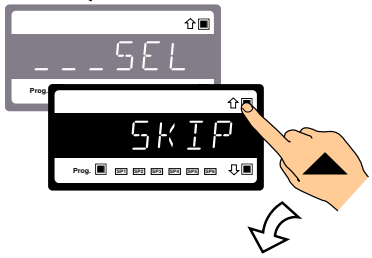
Operational Display



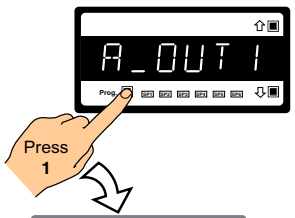
Step 1
Enter the Configuration Menus



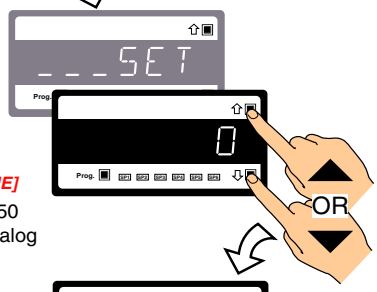
Step 2
Display scrolls
[_ _ _ INPUT SETUP]
Press the [P] button three times to skip the **Calibration** and **Display Select** modes enter the **Analog Output** mode



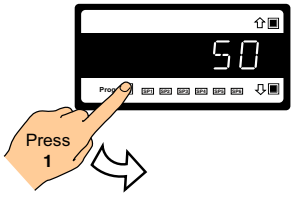
Step 3
Display scrolls
[_ _ _ SELECT ANALOG OUTPUT]
Press the [↑] button once to enter **Analog Output 1** or twice to enter **Analog Output 2**



Step 4
Confirm Analog Output Selection.



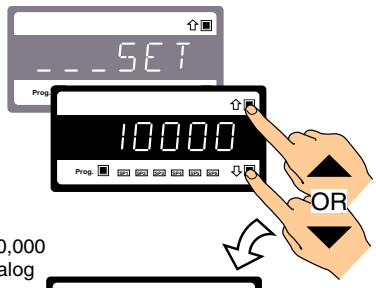
Step 5
Display scrolls
[_ _ _ SET ZERO VALUE]
Adjust the display to 50 counts for the **low** analog output scale setting



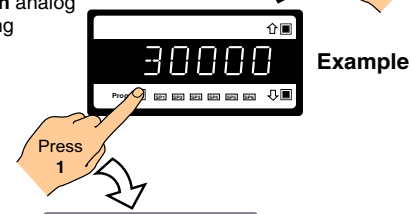
Step 6
Accept the new low value

To Step 7

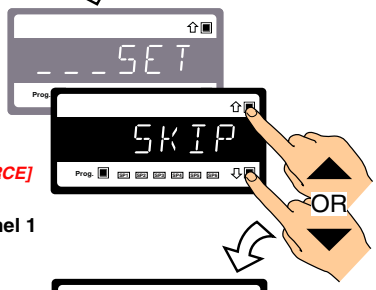
From Step 6



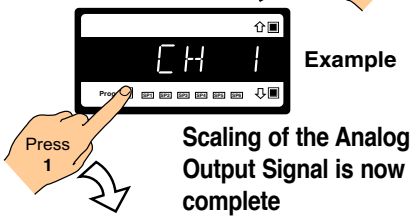
Step 7
Display scrolls
[_ _ _ SET FULL SCALE VALUE]
Adjust the display to 30,000 counts for the **high** analog output scale setting



Step 8
Accept the new high value

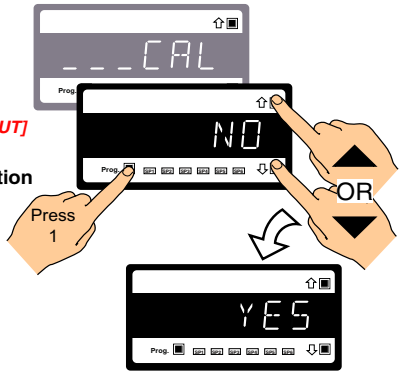


Step 9
Display scrolls
[_ _ _ SET DATA SOURCE]
Press the [↑] button once to select **Channel 1** or twice to select **Channel 2**



Step 10
Accept the new data source setting.

Scaling of the Analog Output Signal is now complete



Step 11
Display scrolls
[_ _ _ CALIBRATE OUTPUT]
Press the [P] button to skip **Output Calibration** and return to Step 3. Press the [P] button twice to return to the Operational Display

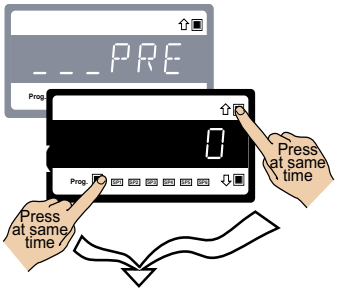
The calibration of the Analog Output is continued on page 8

From Step 16

Step 12

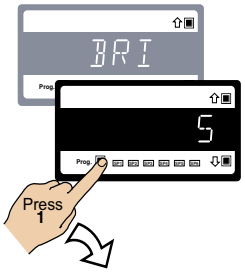
Display scrolls **[___PRESS P AND UP]**

Press [P] and [▲] buttons at the same time



Step 13

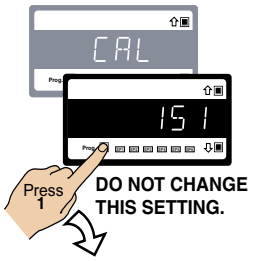
Press [P] to enter the Calibration menu



Step 14

With DMC-A2 Series connected to a multimeter, DMC-A2 Series displays [CAL] [151]. This is the setting for **analog output 1** ([CAL] [152] for analog output 2).

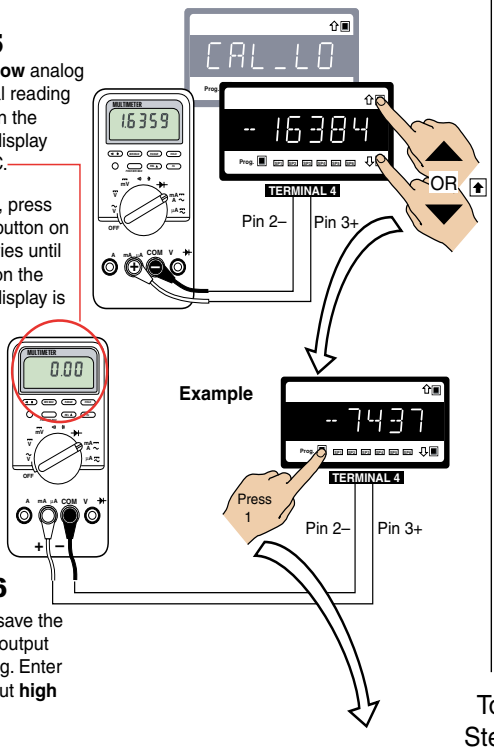
Press [P] to start the calibration procedure



Step 15

Ensure the **low** analog output signal reading [CAL_LO] on the multimeter display is 0.00 V DC.

If not correct, press the [▲] or [▼] button on DMC-A2 Series until the reading on the multi meter display is correct.



Step 16

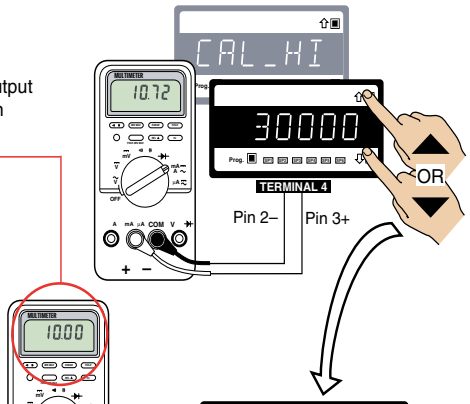
Press [P] to save the **low** analog output signal setting. Enter analog output **high**

To Step 17

Step 17

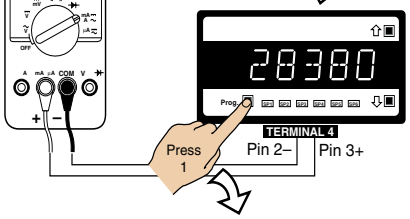
Ensure the **high** analog output signal reading [CAL_HI] on the multimeter display is 10.00 V DC.

If not 10.00 V DC, press the [▲] OR [▼] button on DMC-A2 Series until the reading on the multimeter display is correct.



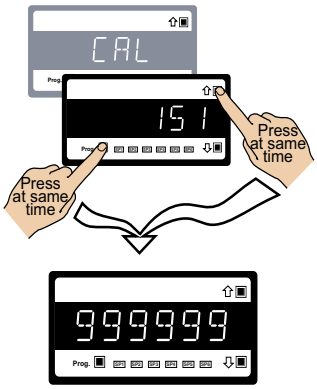
Step 18

Press [P] button to leave the CAL menu



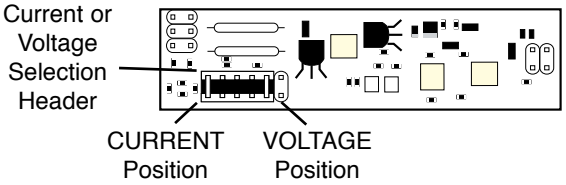
Step 19

Press [P] and [▲] buttons at the same time to return to the operational display



Operational Display

Analog Output Module PCB



Available in Single (0~4-20mA or 0-10V) or Dual (0-10V & 0-10V)

To change the analog output from voltage to current output, remove the PCB from the case.
Identify the Analog Output module which is soldered on to the top carrier board.
Move the V/I selection header on the analog output module from the voltage position (default) to the current position .

Technical Description

This input is a smart input module designed to drive and condition the signals from two LVDT transducers. The module contains two high-speed microcontrollers and a SD 16-bit dual channel A/D convertor. It communicates with the selected controller via the I²C data bus. One of the microcontrollers generates the sine wave for the LVDT excitation frequency. These frequencies are produced as multiples of the line frequency (either 50 Hz or 60 Hz). Up to 16 frequencies are available and are selected using the controller setup. The output to the primary coil of both LVDTs is a 3 V RMS sine wave. The received LVDT signals are synchronously demodulated and filtered to remove the carrier frequency. The Σ Δ 16-bit A/D convertor has over 130 dB noise rejection at the excitation frequencies and is capable of 40 Hz averaged output on 45 samples.

Two open collector NPN transistors are available as high-speed controlled outputs. The controller setpoint SP5 controls output CONTROL 1 and SP6 and controls output CONTROL 2.

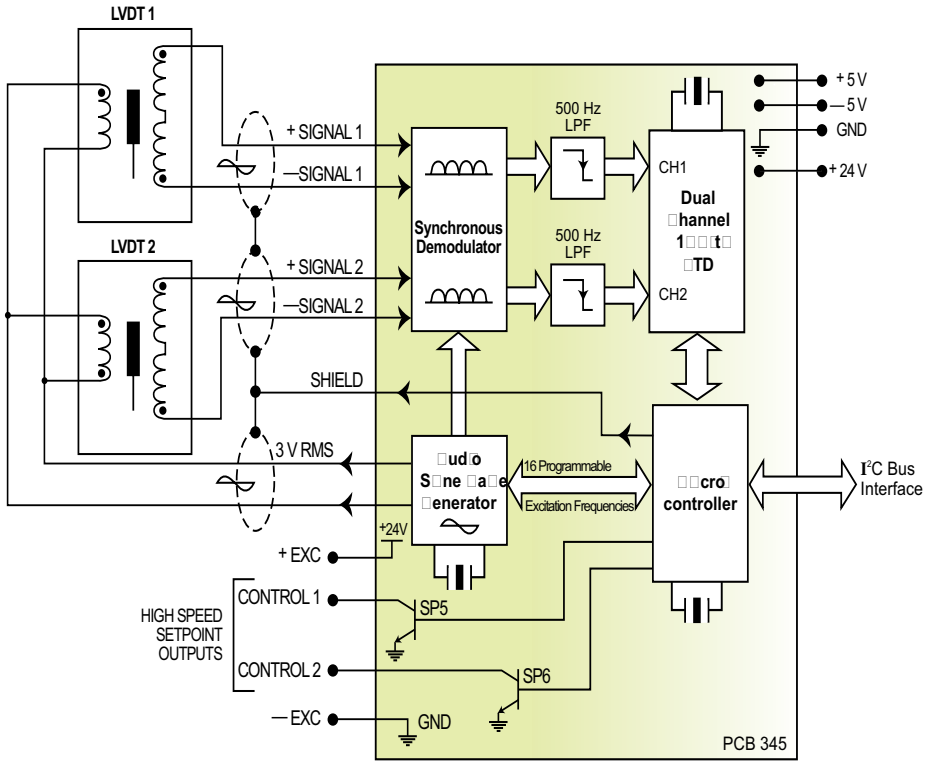
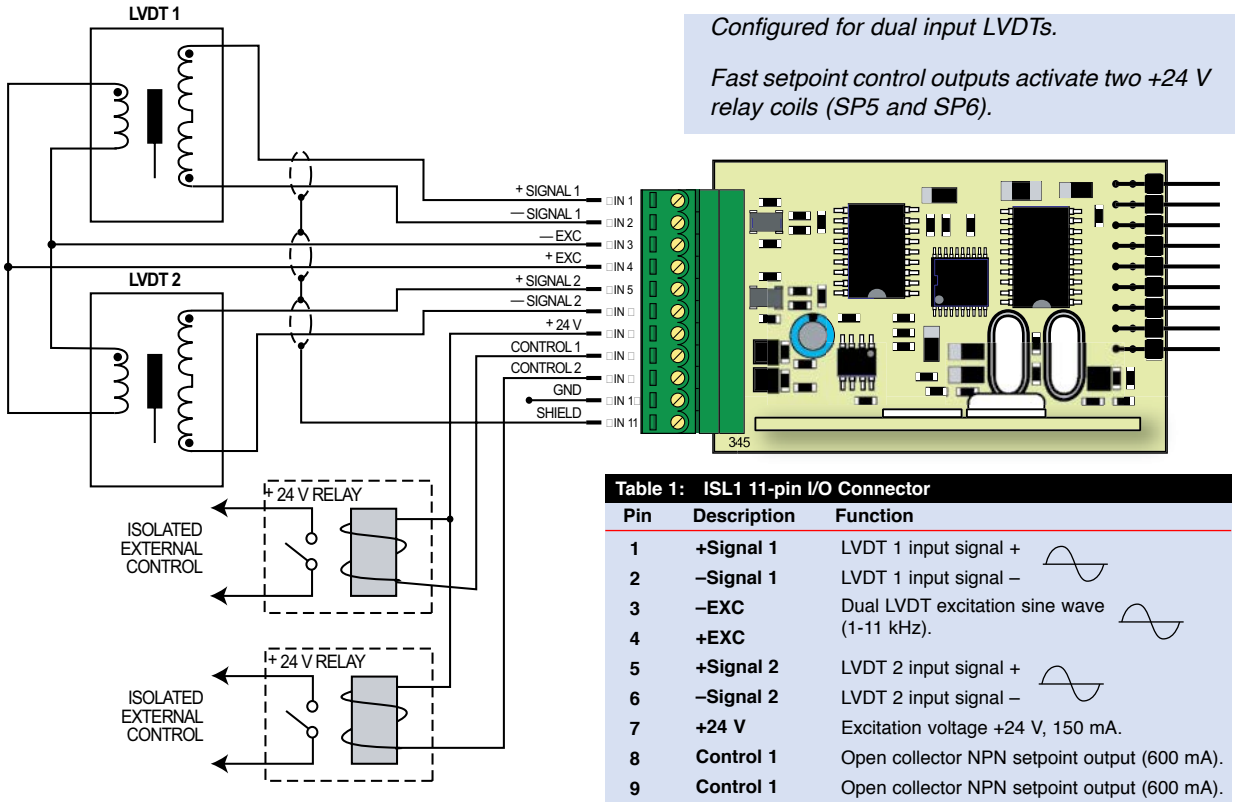


Figure 2 – ISL1 LVDT Functional Schematic

Example Connection Diagram



Configured for dual input LVDTs.

Fast setpoint control outputs activate two +24 V relay coils (SP5 and SP6).

Table 1: ISL1 11-pin I/O Connector

Pin	Description	Function
1	**+Signal 1**	LVDT 1 input signal +
2	**–Signal 1**	LVDT 1 input signal –
3	**–EXC**	Dual LVDT excitation sine wave (1-11 kHz).
4	**+EXC**	
5	**+Signal 2**	LVDT 2 input signal +
6	**–Signal 2**	LVDT 2 input signal –
7	**+24 V**	Excitation voltage +24 V, 150 mA.
8	**Control 1**	Open collector NPN setpoint output (600 mA).
9	**Control 1**	Open collector NPN setpoint output (600 mA).
10	**Ground**	0 V.
11	**Shield**	Cable shield, 3 V common mode.

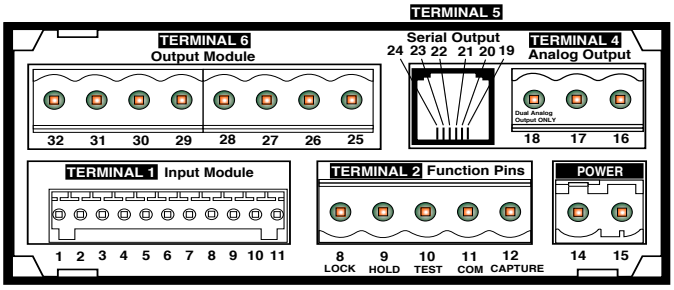
Figure 3 – Example Connection Configured for Dual LVDT Inputs and Two Relay Outputs

Connector Pinouts

All external connections to the LVDT-200 Series are via the following six connector terminal blocks located at the rear of the controller:

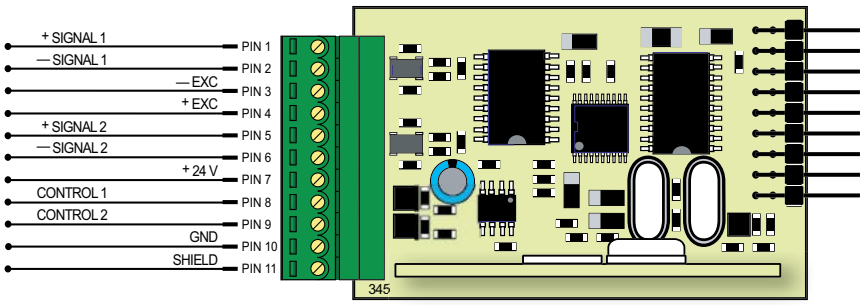
- Terminal 1: Input Signals.
- Terminal 2: Function Pins.
- Power: AC / DC Power Supply.
- Terminal 4: Analog Output.
- Terminal 5: Serial Output.
- Terminal 6: Relay Output or Multi-I/O Module.

LVDT-200 Series use plug-in type screw terminal connectors for most input and output connections, an RJ-11 phone connector for the RS-232 serial output and an RJ-45 phone connector for the optional Ethernet output.



WARNING: AC and DC input signals and power supply voltages can be hazardous. Do not connect live wires to screw terminal plugs, and do not insert, remove, or handle screw terminal plugs with live wires connected.

Figure 4 – Rear Panel Pinout Diagram

Connector	Pin	Name	Description
TERMINAL 1 **Input Signals** Pins 1 up to 11	1 2 3 4 5 6 7 8 9 10 11	+ Signal 1 – Signal 1 –Excitation +Excitation + Signal 2 – Signal 2 + 24 V Control 1 Control 2 Ground Shield	**Input Module ISL1** 
TERMINAL 2 **Function Pins** Pins 8 to 12	8	Reset Display Value (Lock)	By connecting Pin 1 (**lock**) to Pin 4 (**common**) with a remote spring-return switch restores the display to the true calibrated value.
	9	Display Zero (Hold)	By connecting Pin 2 (**hold**) to Pin 4 (**common**) with a remote spring-return switch zeroes the display.
	10	Display Test and Reset	Pin 3 (**display test** and **reset** pin) provides a test of the controller's display and resets the microprocessor when Pin 3 is connected to Pin 4.
	11	Common	To activate the **hold**, **test and reset**, or **lock** pins from the rear of the controller, the respective pins have to be connected to the **common** pin.
	12	Manual Zero (Capture)	By connecting Pin 5 (**capture**) to Pin 4 (**common**) with a remote spring-return switch manually resets the calibrated zero. **For further details on the function pins, contact Texmate.**
POWER **Auto Sensing AC / DC Power Supply** Pins 14 and 15	14 15	AC Neutral / DC – AC Line / DC +	The **power** connector supplies AC / DC power to the controller via a standard high voltage or optional low voltage auto-sensing power supply mounted on the main board. **PS1**: Standard High Voltage option. 85-265 V AC / 95-370 V DC. **PS2**: Optional Low Voltage option. 14-48 V AC / 10-72 V DC.

Connector	Pin	Name	Description
TERMINAL 4 **Analog Outputs** Pins 16 to 18	TERMINAL 4 connects the analog output module to external devices. A single 0~4 to 20 mA (standard) or (optional) 0 to 10 V DC or dual 10–0–10 V DC is supported on the standard, Ethernet, or DeviceNET carrier board.		
	18	Positive (+)	Positive for Analog Output 2 (**ADV** – Dual 10–0–10 V DC modules only).
	17	Negative (–)	Negative for Analog Output 1 and 2.
	16	Positive (+)	Positive for Analog Output 1.

TERMINAL 5

Serial Outputs

Pins 19 up to 24

TERMINAL 5 connects the serial output module to external devices.

The **standard** carrier board supports a single or dual RS-232 or RS-485 ASCII or Modbus serial card connected thru an RJ-11 socket.

Ethernet

Pin No.	RS-232	RS-485
19	Reserved for future use	Reserved for future use
20	RXD. Received Serial	B (Low)
21	TXD. Transmitted Serial	A (High)
22	+5 VDC to power external converters	+5 VDC to power external converters
23	Isolated Ground	Isolated Ground
24	Reserved for future use	Reserved for future use

Ethernet – The Ethernet carrier board has the same analog output pins, with 10/100Base-T Ethernet (RJ-45 Socket).

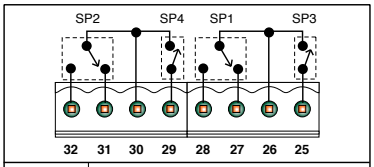
TERMINAL 6

Relay Outputs

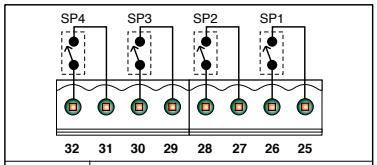
TERMINAL 6 connects electromechanical and solid state relays (SSRs) to external applications.

Depending on the number of relays, standard plug-in relay boards use up to 8 pins.

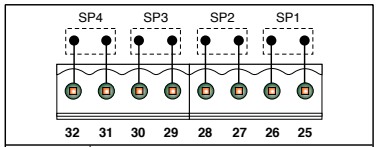
Relay Module



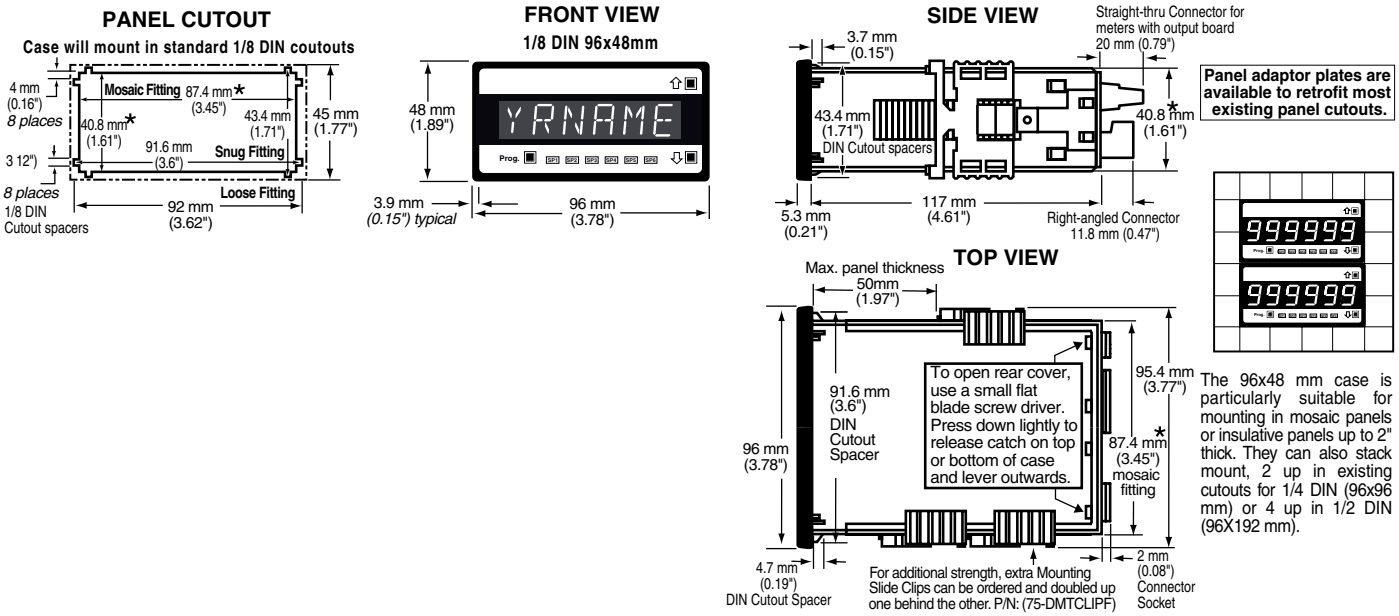
Order Code	Options			
	SP2	SP4	SP1	SP3
OR11	-	-	10A	-
OR12	9A	-	9A	-



Order Code	Options			
	SP4	SP3	SP2	SP1
OR32	-	-	5A	5A
OR34	5A	5A	5A	5A



Order Code	Options			
	SP4	SP3	SP2	SP1
OR54	210mA	210mA	210mA	210mA



Installation Procedure

WARNING

AC and DC power supply voltages are hazardous. Make sure the power supply is isolated before connecting to the meter.

STEP A Prepare the Panel

1) Cut a hole in the panel to suit the panel cutout. See panel cutout sizes above.

STEP B Install the Meter

1) Remove both mounting clips from the meter. ①
2) Push the meter into the panel cutout from the front of the panel. ②
3) Attach both mounting clips to the meter from the rear of the panel and push them towards the front of the panel until the meter is firmly held. ③

STEP C Connect the Cables

1) Connect all input and output signal cables to the connector pins (See *Connector Pinouts* for details).
2) Connect the power cables to the connector pins (See *Connector Pinouts* for details).

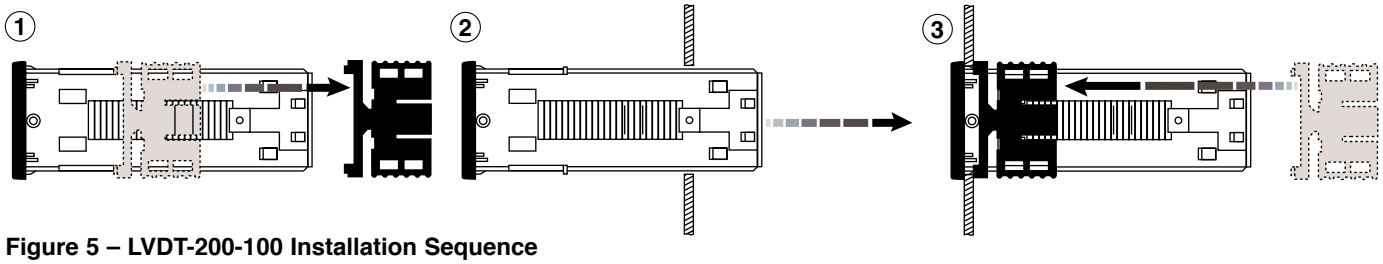


Figure 5 – LVDT-200-100 Installation Sequence

Installation Guidelines

Installation

1. Install and wire meter per local applicable codes/ regulations, the particular application, and good installation practices.

2. Install meter in a location that does not exceed the maximum operating temperature and that provides good air circulation.

3. Separate input/output leads from power lines to protect the meter from external noise. Input/output leads should be routed as far away as possible from contactors, control relays, transformers and other noisy components. Shielding cables for input/output leads is recommended with shield connection to earth ground near the meter preferred.

4. A circuit breaker or disconnect switch is required to disconnect power to the meter. The breaker/switch should be in close proximity to the meter and marked as the disconnecting device for the meter or meter circuit. The circuit breaker or wall switch must be rated for the applied voltage (e.g., 120VAC or 240VAC) and current appropriate for the electrical application (e.g., 15A or 20A).

5. See *Case Dimensions section* for panel cutout information.

6. See *Connector Pinouts section* for wiring.

7. Use 28-12 AWG wiring, minimum 90˚C (HH) temperature rating. Strip wire approximately 0.3 in. (7-8 mm).

8. Recommended torque on all terminal plug screws is 4.5 lb-in (0.51 N-m).

Application Examples

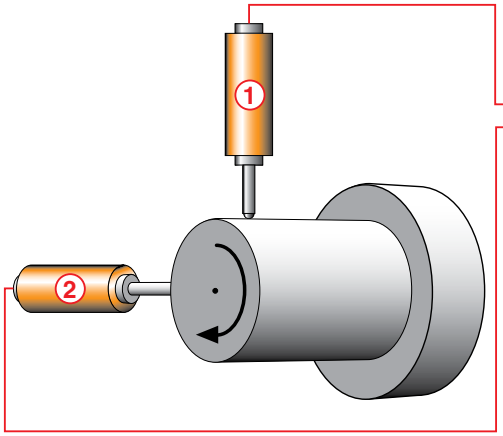
LVDT sensors can be applied in almost all engineering applications covering civil, mechanical, petrochemical, power generation, production, aerospace, defense, and much more.

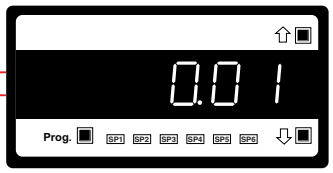
They can be used on production lines to automatically gauge products for quality control and product sorting.

In the power generation and petrochemical industries they can be used, for example, as servo position feedback on actuated equipment such as valves and dampers, or for measuring turbine casing expansion.

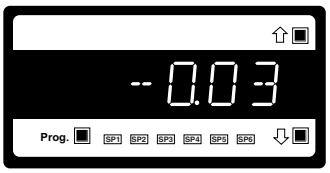
Submersible units can be used in marine and offshore mining applications, sensors that meet military environmental standards have been applied to defense and aerospace applications.

Following are applications that show the versatility of the LVDT-200 Series controller.





Operational Display (CH1)



CH2 View Mode

ALIGNMENT TOOL

Measured using two LVDT sensors at 90°

LVDT 1 to CH1 = Shown on Display

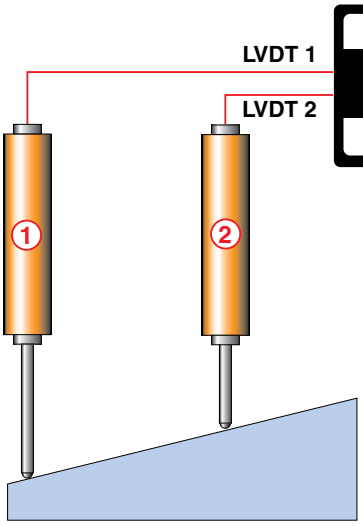
LVDT 2 to CH2 = Use View Mode to view CH2

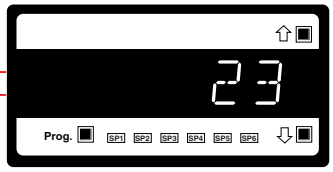
SLOPE INDEXING

Measured using two parallel LVDT sensors (1 – 2)

LVDT 1 minus LVDT 2 = Displayed Result

Note:
This is an advanced function and is configured in Code 1 of the main programming mode.





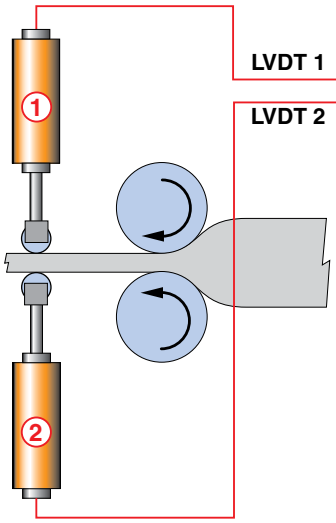
Operational Display
showing result of
signal 1 – signal 2

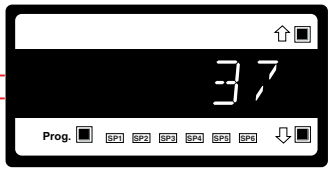
THICKNESS MONITORING

Measured using two opposed LVDT sensors (1 + 2)

LVDT 1 plus LVDT 2 = Displayed Result

Note:
This is an advanced function and is configured in Code 1 of the main programming mode.





Operational Display
showing result of
LVDT 1 + LVDT 2

Frequency Range:

Excitation Frequency:

LVDT Output Rate in kHz:

Decimal Point Position:

	CH 1	CH 2

Standard Display:

Input Signal

	CH 1	CH 2
Zero:		
Span:		

Analog Output Signal Calibration

	A_OUT1	A_OUT2
CAL_LO:		
CAL_HI:		

Scale Range

Zero:		
Full Scale:		

Setpoints

	Source	Value	Activation
SP1:			
SP2:			
SP3:			
SP4:			

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TEXMATE INC
450 State Place • Escondido, CA 92029
Tel: 1-760-598-9899 • USA 1-800-839-6283 • 1-800-TEXMATE
Fax: 1-760-598-9828 • Email: orders@texmate.com • Web: www.texmate.com

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