DGSI
DURHAM GEO SLOPE INDICATOR

E-405
Smart Digital Indicator

User Manual

Version 1.0

Durham Geo Slope Indicator
2175 West Park Court
Stone Mountain, GA 30087
USA

Phone: 800-837-0864 or +1.770.465.7557
Fax: 770.465.7447
e-mail: solutions@durhamgeo.com
www.DurhamGeo.com

DURHAM GEO SLOPE INDICATOR

Disclaimer

Durham Geo-Enterprises, Inc. (including all affiliates to include its trade name of DGSI) makes no representations or warranties with respect to the contents hereof and specifically disclaim any implied warranties of merchantability or fitness for any particular purpose. Durham Geo Slope Indicator reserves the right to revise this publication and to make changes from time to time in its content without obligations to notify any person or organization of such revision or changes.

IMPORTANT
Before beginning installation procedures, these Installation and Operating Instructions should be studied carefully. The installation and operation should also be in accordance with local regulations and accepted codes of good practice.

Information Record

Model #: _E-405_____

Serial #: _____

Sold By: _____

Date Purchased: _____

The serial number for the unit is listed on the side of the pump head. You will need this number if you call DGSI for service or support.

Table of Contents

RECEIVING & UNPACKING

Your meter was carefully tested and inspected prior to shipment. Should the meter be damaged in shipment, notify the freight carrier immediately. In the event the meter is not configured as ordered or the unit is inoperable, return it to the place of purchase for repair or replacement. Please include a detailed description of the problem.

SAFETY CONSIDERATIONS

 **Warning**: Use of this equipment in a manner other than specified may impair the protection of the device and subject the user to a hazard. Visually inspect the unit for signs of damage. If the unit is damaged, do not attempt to operate.

Caution:

- This unit must be powered with AC (mains) from 95-240 Vac ±10% (90-300 Vdc) with the high voltage power supply option, or 10-34 Vac ±10% (10-48 Vdc) with the low voltage power supply option. Verify that the proper power option is installed for the power to be used. This meter has no AC (mains) switch. It will be in operation as soon as power is connected.
- The 95-240 Vac (95-300 Vdc) mains connector (P1 Pins 1-3) is colored Green to differentiate it from other input and output connectors. The 10-34 Vac (10-48 Vdc) mains connector is colored Black.
- Do not make signal wiring changes or connections when power is applied to the instrument. Make signal connections before power is applied. If reconnection is required, disconnect the AC (mains) power before such wiring is attempted.
- To prevent electrical or fire hazard, do not expose the instrument to excessive moisture.
- Do not operate the instrument in the presence of flammable gases or fumes; such an environment constitutes a definite safety hazard. This meter is designed to be mounted in a metal panel.

Symbols used

 Caution (refer to accompanying documents)

 Caution, risk of electric shock.

 Equipment protected throughout by double insulation or reinforced insulation.

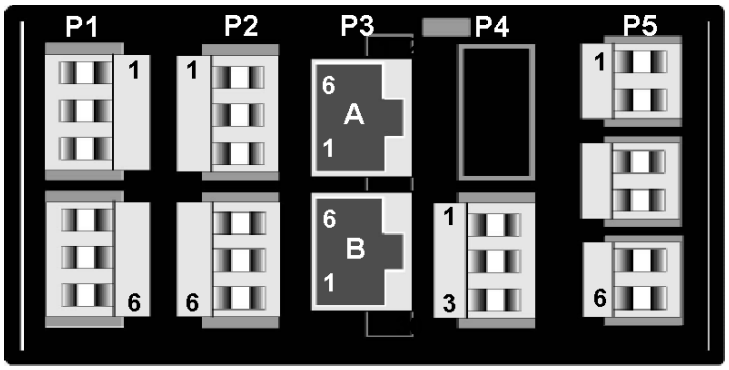
 Earth (ground) terminal.

 Both direct and alternating current.

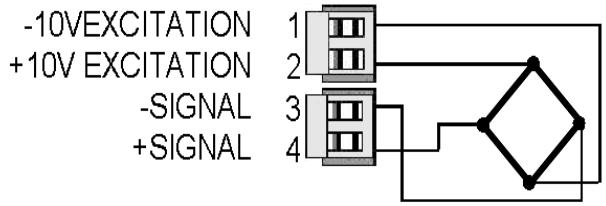
CONNECTOR WIRING INFORMATION

CONNECTORS

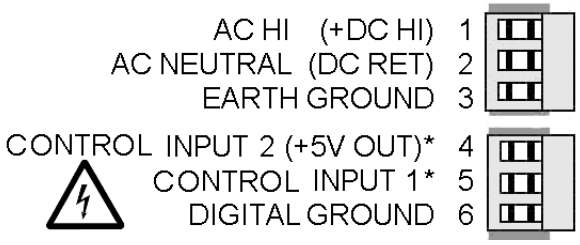
Connectors for signal and power are U/L rated screw-clamp terminal blocks that plug into mating jacks on the printed circuit board. Communication connectors are a single RJ11 plug for RS232, dual RJ11 plugs for RS485, dual RJ45 plugs for RS485 Modbus.



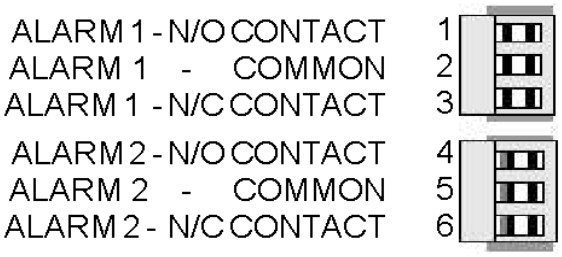
P5 - STRAIN GAUGE



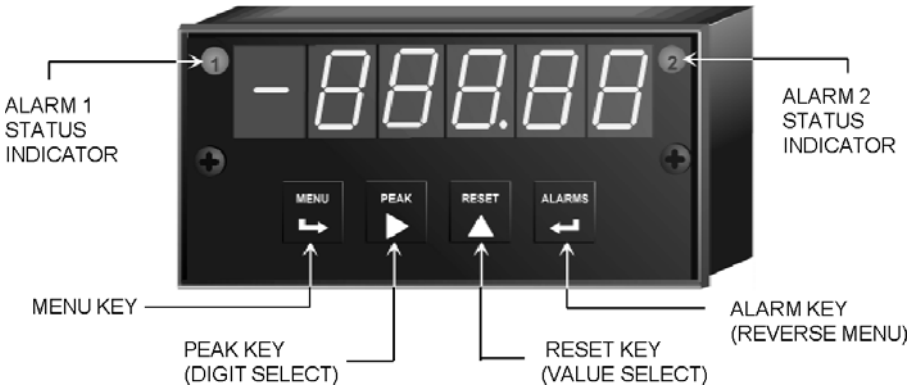
P1 - POWER AND DIGITAL CONTROLS



P2 - RELAY OUTPUTS (Rev K and later)



FRONT PANEL SETUP KEYS



Meter Front Panel

There are four front panel keys, which change function for the **Run Mode** and **Menu Mode**, effectively becoming eight keys. The keys are labeled with alphanumeric captions (MENU, PEAK, RESET, ALARMS) for the Run Mode and with symbols (↵ right arrow, ▶ right triangle, ▲ up triangle, ↵ left arrow) for the Menu Mode.

FRONT PANEL LOCKOUT

The Menu Mode will not work with most meters as received from the factory, since all menu items have been disabled in the software. Items under *Loc 1*, *Loc 2* and *Loc 3* then need to be set to "0" via the front panel for these menu items to be unlocked See page 8. The paragraphs below assume that all menu items have been unlocked.

MENU MODE KEY ACTION

In the Menu Mode, pressing a key momentarily advances to the next menu item. Holding down a key automatically advances through multiple menu items for fast menu navigation**.**

KEYS IN RUN MODE

MENU ↵ **MENU Key.** Pressing *MENU* from the Run Mode enters the Menu Mode. Pressing *MENU* repeatedly will step the meter through the various menu items (if these have not been locked out) and then back to the Run Mode.

PEAK ▶ **PEAK Key.** Pressing *PEAK* normally causes the peak value of the input signal to be displayed. The peak display then blinks to differentiate it from the normal present value display. Pressing *PEAK* again will return the display to the present value.

RESET ▲ **RESET Key.** Pressing *RESET* with *PEAK* resets peak values. Pressing *RESET* with *ALARMS* resets latched alarms. Pressing *RESET* with *MENU* performs a meter reset (same as power on).

ALARMS ↵ **ALARMS Key.** Pressing *ALARMS* once displays the setpoint for Alarm 1. Pressing it again displays the setpoint for Alarm 2. Pressing it again returns to the present value.

KEYS IN MENU MODE

Right Arrow Key (MENU). Pressing ↵ steps the meter through all menu items that have been enabled and then back to the Run Mode. With the DC signal conditioner board and no option boards, available menu items are **InPut**, **SEtuP**, **ConFG**, **FiLtr**, **dEc.Pt**, **SCALE**, **OFFSt**, **Loc 1**, **Loc 2**, **Loc 3**. If a change has been made to a menu item, that change is saved to non-volatile memory when the ↵ key is pressed next, and **StoreE** is displayed briefly.

Right Triangle Key (Digit Select).

- Pressing ▶ from the *InPut* menu brings up all meter functions available with the meter's signal conditioner. For the DC signal conditioner, these are **dC U**, **dC A** and **rAtio**.
- Pressing ▶ from the *SEtuP*, *ConfFG*, *FiLtr*, *SCALE, OFFSt*, *Loc 1*, *Loc 2* or *Loc 3* menus items sequentially selects digit positions 1 - 5, as indicated by a flashing digit: 00000, 00000, 00000, 00000, 00000.
- Pressing ▶ from the *dEC.Pt* menu item sequentially selects decimal point positions, which will flash: d.dddd dd.ddd ddd.dd dddd.d ddddd. .ddddd.

Up Triangle Key (Value Select). Pressing ▲ for a flashing item (digit position or decimal point position) will increment that item. Pressing *MENU* will save any changes.

Left Arrow Key (Reverse Menu). Pressing ↵ has the same effect as the *MENU* key, except that menu items are brought up in reverse order.

ENABLING & LOCKING OUT MENU ITEMS

For security reasons and ease of meter operation, any and all menu items may be disabled or "locked out" so that they are no longer directly accessible from the front panel. Each function to be disabled is set to "1" in menu items *Loc 1*, *Loc 2* or *Loc 3*, and each function to be enabled is set to "0."

SETTING SOFTWARE LOCKOUTS

When setting up the meter, it may be necessary to enable specific menu items by setting the corresponding lockout digit to 0. Be sure to reset the lockout digit to "1" if you do not want the menu item to be changed by an operator.

Loc 1 **Loc 2** **Loc 3**

Press the ↵ *MENU* key until *Loc 1, Loc 2* or *Loc 3* is displayed, as desired.

11111

Press ▶ to display the lockout status, consisting of 1's and 0's. The left digit will flash. Press ▶ again to step to the next digit, which will flash.

00000
12345

Press ▲ to set the flashing digit to "0" to enable the menu item or to "1" to disable. Press *MENU* to enter. See the table to the right for list of menu items that can be enabled or disabled.

Enabled or Disabled Menu Items

Loc 1

1 - Input type selection.
2 - Meter setup, configuration & decimal pt.
3 - Filter selection.
4 - Scale or Lo, Hi input.
5 - Offset or Lo, Hi reading

Loc 2

2 - Alarm setup.
3 - Alarm setpoint value programming.
4 - Analog output scaling.
5 - Serial interface setup.

Loc 3

2 - View peak value
3 - View alarm setpoints
4 - Reset (peak & latched alarms)
5 - Reset (meter reset)

READING COORDINATES OF 2 POINTS SCALING METHOD

When the *reading coordinates of 2 points** scaling method has been selected under **SEtuP**, (see page 12) the four menu items below will appear ahead of all other menu items when the *MENU* or ↵ key is first pressed from the run mode.

This scaling method applies a straight line fit between two points, which are determined from actual transducer signals and the desired corresponding meter readings. A low signal, such as the output of a pressure transducer at zero pressure, and high signal, such as the output of the same transducer at a known high pressure, are applied to the meter. The desired corresponding low and high readings are then entered from the front panel. The meter then applies straight line fit between the high and low calibration points. This scaling method has the advantage of calibrating the transducer and meter as a system. The actual voltage or current at either point does not need to be known.

The programming example below is for a process meter used with a 4-20 mA pressure transducer for 0 to 100 psi. Decimal points are set separately using the *dEC.Pt* menu.

MENU ***Press Menu Select Key***	PEAK ***Press Digit Select Key***	RESET ***Press Value Select Key***
Lo In Apply low signal input (e.g., transducer output for 0 psi).	**40.21** Press ▶ to display reading at low signal input (e.g., 4.021 mA).	**40.21** Press ▲ to store low reading.
Hi In Apply high signal input (e.g., transducer output for known 100.00 psi source).	**200.94** Press ▶ to display reading at high signal input (e.g., 20.094 mA).	**200.94** Press ▲ to store high reading.
Lo rd Mode to enter desired low reading (e.g., 0.00).	**000.00** **000.00** **000.00** **000.00** **000.00** Select digit to flash.	**0.00** Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits.
Hi rd Mode to enter desired high reading (e.g., 100.00).	**000.00** **000.00** **000.00** **000.00** **000.00** Select digit to flash.	**100.00** Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits.

Scaling method "Scale and Offset" if selected under **SEtuP** (see page 12)		
SCALE Scale factor*	**0**.0000 **0**.**0**000 **0**.0**0**00 **0**.00**0**0 **0**.000**0** **0**.0000 Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Select decimal point location when decimal point is flashing.
OFFst Offset value*	**0**.0000 **0**.**0**000 **0**.0**0**00 **0**.00**0**0 **0**.000**0** SELECT DIGIT TO FLASH.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Decimal point location is selected by **dEC.Pt**.
Scaling method "Coordinates of 2 points" if selected under **SEtuP**		
Lo In Low signal input.	**0**.0000 **0**.**0**000 **0**.0**0**00 **0**.00**0**0 **0**.000**0** Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Decimal point is set by input range chosen.

DC VOLTS, AMPS, PROCESS, STRAIN

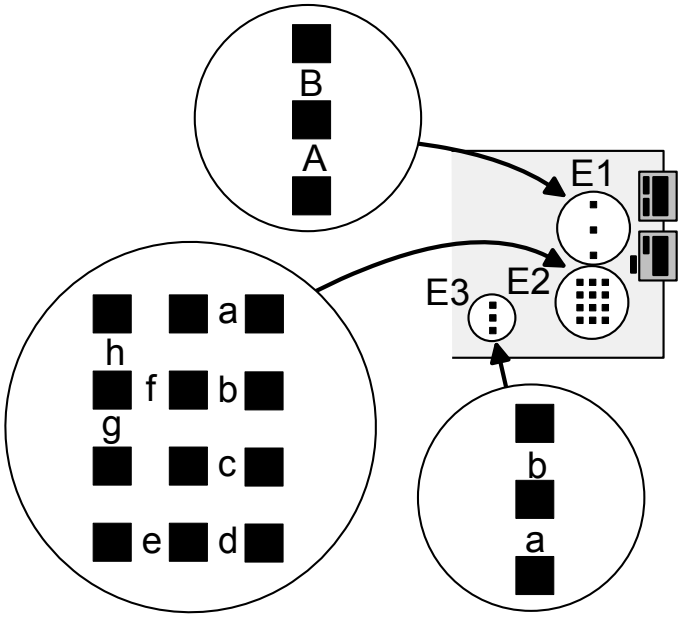
The DC Volts, Amps, Process and Strain meters utilize the DC signal conditioner board, which needs to be configured via jumpers for the desired voltage or current range. All signal ranges are factory calibrated with calibration factors stored in EEPROM. The meter software recognizes the board and will bring up the appropriate menu items for it; however, it does not recognize the jumper settings. Please see further manual sections for setup of the following: relay output (15), analog output (16), communication I/O (17), parallel BCD output (18), and transducer excitation output (19).

Voltage Ranges

FS Input	E1	E2	E3
±200.00 mV	A	f	b
±2.0000 V	A	f	a
±20.000 V	B	h	b
±200.00 V	B	h	a
±300V (UL)	B	g	a
±600V (not UL)	B	g	a

Current Ranges

FS Input	E1	E2	E3
±2.0000 mA	A	e, g	b
±20.000 mA	A	d, g	b
±200.00 mA	A	c, g	b
±5.000 A	A	a, b, g	b



1. Use 5 mm (0.2") jumpers for locations designated by a capital letter.
2. Use 2.5 mm (0.1") jumpers for locations designated by a lower case letter.
3. Store spare jumpers on an unused jumper post not associated a capital letter.

SCALE & OFFSET SETUP

For DC voltmeters & ammeters, a scale factor of 1 and an offset of 0 are used for direct readings in (milli)volts or (milli)amperes. Decimal point selection does not affect the displayed digits. For example, 0-20V or 0-20 mA signals can both be displayed as 0-20000. A full scale of 20000 may be displayed as 20.000 mA or 20000 µA. Use with a current shunt will require a scale factor to be set. For example, for a 500-100 (500A, 100 mV) shunt, divide 5000 (the desired full scale display with 0.1A resolution) by 10000 (displayed value with 100 mV when the scale factor is 1.0) for a scale factor of 0.5.

For process & strain meters, scaling is normally set up from the front panel using the ▶ and ▲ keys, but can also be set up via RS232/485 using special PC-compatible setup software (available at no charge). The meter allows three scaling methods to be selected: 1) S*cale and offset**, 2) *Coordinates of 2 points**, and 3) *Reading coordinates of 2 points**. Only menu items applicable to the selected method will be presented. Please see the Glossary for an explanation of items marked by an *.

KEYSTOKES FOR SETUP

If the *MENU* ↵ key does not work, see page 8 "Enabling & Locking Out Menu Items."

MENU ↵ *Press Menu Select Key*	PEAK ▶ *Press Digit Select Key*	RESET ▲ *Press Value Select Key*
InPut Selection of signal input type & range	**dC U** DC Volts	**0.2U 2.0U 20.0U 200.0U 660.0U** 0.2, 2, 20, 200, 660V FS
	dC A DC Amps	**2.0a 20.0a 200.0a 5.0a** 0.2, 20, 200 mA, 5A FS.
	rAtio Strain gauge & ratio	**0.2U 2.0U 20.0U** 0.2, 2, 20V FS.
SEtuP Meter Setup	**00_00** Display selection with scale factor of 1.	**0** 4-1/2 digits (±20,000) **1** Remote display* (±99,999) **2** 4-1/2 digits, counts by 10 (±20,000) **3** 3-1/2 digits (±2,000)
	00_00 Power line frequency	**0** Noise minimized for 60 Hz **1** Noise minimized for 50 Hz
	00_00 Scaling method	**0** Scale and offset method* **1** Coordinates of 2 points method* **2** Reading coordinates of 2 points method*

	00_00 Operation of control inputs 1 & 2: **True** = logic 1 (0V or tied to digital ground) **False** = 0 (5V or open)	0 1 = Reset*, 2 = Meter Hold* 1 1 = Function Reset*, 2 = Peak*or Valley* 2 1 = Hold*, 2 = Peak or Valley Display 3 1 = Hold*, 2 = Tare* 4 1 = Peak or Valley Display, 2 = Tare* 5 1 = Tare*, 2 = Reset* 6 1 = 1, 2 = 1, decimal point = XXXXX 1 = 0, 2 = 1, decimal point = XXXX.X 1 = 1, 2 = 0, decimal point = XXX.XX 1 = 0, 2 = 0, decimal point = XX.XXX 7 1 = 1, 2 = 1, decimal point = XXXX.X 1 = 0, 2 = 1, decimal point = XXX.XX 1 = 1, 2 = 0, decimal point = XX.XXX A = 0, 2 = 0, decimal point = X.XXX.X 8 1 = Function Reset*, 2 = Display Blank* 9 1 = Hold*, 2 = Display Blank A 1 = Peak or Valley, 2 = Display Blank* B 1 = Tare*, 2 = Display Blank* C 1 = Valley Display, 2 = Peak Display D 1 = Tare*, 2 = Reset Tare to Zero Both inputs 1 and 2 set to 1 for selections 2, 4, A, C = Function Reset* Both inputs 1 and 2 set to 1 for selections 0, 1, 3, 5, 8, 9, B, D = Meter Reset*
MENU ***Press Menu Select Key***	PEAK ***Press Digit Select Key***	RESET ***Press Value Select Key***
ConFG Meter Configuration	000_0 Operation as a rate of change meter*. *Extended meter* only.*	0 Not rate of change 1 Rate x 0.1 2 Rate x 1 3 Rate x 10 4 Rate x 100 5 Rate x 1000 6 Rate x 10000
	_0_ _0 Operation of front panel *PEAK* button and rear connector for Peak or Valley Display	0 Peak Display*. Also selects “Peak” in “Peak or Valley” at connector above. 1 Valley Display*. Also selects “Valley” in “Peak or Valley” at connector above. 2 Peak* (1st push), Valley* (2nd push) 3 Front panel Tare*
	000_ 0 Auto-tare	0 Meter comes up in normal run mode. 1 Meter comes up in auto-tare* mode
	000 _0 Nonlinear input scaling *Extended meter* only.*	0 Linear input 1 Custom curve linearization

FiLtr Filtering	00000 Alarm filtering	0 Unfiltered output 1 Filtered output
	00000 Peak & Valley filtering	0 Unfiltered Peak* & Valley* 1 Filtered Peak* & Valley*
	00000 Display filtering	0 Display batch average every 16 readings 1 Display filtered signal
	00000 Adaptive filter threshold	0 Low adaptive filter threshold level 1 High adaptive filter threshold level
	00000 Input signal filtering. *Can be applied to display, setpoint, analog output, data output.*	0 Autofilter* 1 Batch average, 16 readings 2 Moving average*, 0.08 sec. 3 Moving average*, 0.15 sec. 4 Moving average*, 0.3 sec. 5 Moving average*, 0.6 sec. 6 Moving average*, 1.2 sec. 7 Moving average*, 2.4 sec. 8 Moving average*, 4.8 sec. 9 Moving average*, 9.6 sec. A Unfiltered
dEc.Pt Dec. point selection	d.dddd Decimal point flashes.	d.dddd dd.ddd ddd.dd dddd.d ddddd. .ddddd Press ▲ to shift the decimal point.
Option board dependent menu items		
ALSEt dEU1H dEU2H dEU1b dEU2b Menu items related to **alarm setup** These will only appear if a relay board is detected. If so, please see page 16.		
SEr 1 SEr 2 SEr 3 SEr 4 MENU ITEMS RELATED TO **SERIAL COMMUNICATIONS**. THESE WILL ONLY APPEAR IF AN RS232 OR RS485 I/O BOARD IS DETECTED. IF SO, SEE PAGE 19.		

* *See Glossary for explanation of item.*

DUAL RELAY OUTPUT OPTION

An optional dual contact relay board or dual solid state relay board may be may be installed in the meter main board at plug position P12, adjacent to the power supply board. Once installed, the relay board is recognized by the software, which will bring up the appropriate menu items. These menu items will not be brought up if a relay board is not installed. Both relay boards offer a choice of operating modes: latched* or non-latched*, hysteresis band*, deviation band*, actuation based on the filtered or unfiltered signal, and selectable number of readings in alarm zone to cause an alarm. Please see the Glossary at the end of this manual for an explanation of terms marked by an *.

KEYSTROKES FOR VIEWING & CHANGING SETPOINTS

It is not necessary to enter the setup menu to view or change setpoints. This allows the meter to continue conversions and provide outputs when setpoints are displayed. After pressing ↵ (Alarms), you have 30 seconds to enter a change, or the meter reverts to normal display.

ALARMS ↵ ***Press Alarms Key***	PEAK ▶ ***Press Digit Select Key***	RESET ▲ ***Press Value Select Key***
300.24 PRESS ↵ (ALARMS) TO DISPLAY ALARM 1 SETPOINT.	200.00 Current setpoint 1 value blinks, and Alarm 1 LED indicator lights. Press ▶ to select a digit, which will blink.	295.00 To change setpoint 1 value, press ▲ to change selected blinking digits.
395.00 PRESS ↵ (ALARMS) TO DISPLAY ALARM 2 SETPOINT.	395.00 Current setpoint 2 value blinks, and Alarm 2 LED indicator lights. Press ▶ to select a digit, which will blink.	305.00 To change setpoint 2 value, press ▲ to change selected blinking digits.
300.24 Press ↵ (Alarms) again. The meter will reset and display the current reading.		

KEYSTROKES FOR SETUP

If the *MENU* ↵ key does not work, see page 8 "Enabling & Locking Out Menu Items."

MENU ↵ *Press Menu Select Key*	PEAK ▶ *Press Digit Select Key*	RESET ▲ *Press Value Select Key*
ALSEt ALARM SETUP. PRESS ↵ UNTIL *ALSET* IS DISPLAYED (WITH RELAY BOARD).	**00000** Relay state when alarm is active.	**0** Relay 1 on Relay 2 on **1** Relay 1 off Relay 2 on **2** Relay 1 on Relay 2 off **3** Relay 1 off Relay 2 off
	00000 Alarm latching* or non-latching* (auto reset).	**0** Alarm 1 auto reset Alarm 2 auto reset **1** Alarm 1 latching Alarm 2 auto reset **2** Alarm 1 auto reset Alarm 2 latching **3** Alarm 1 latching Alarm 2 latching
MENU ↵ *Press Menu Select Key*	PEAK ▶ *Press Digit Select Key*	RESET ▲ *Press Value Select Key*
ALSEt ALARM SETUP. (continued)	**00000** ALARM OPERATES AT AND ABOVE SETPOINT (ACTIVE HIGH) OR AT AND BELOW SETPOINT (ACTIVE LOW).	**0** AL1 active high AL2 active high **1** AL1 active low AL2 active high **2** AL1 disabled AL2 active high **3** AL1 active high AL2 active low **4** AL1 active low AL2 active low **5** AL1 disabled AL2 active low **6** AL1 active high AL2 disabled **7** AL1 active low AL2 disabled **8** AL1 disabled AL2 disabled
	00000 Hysteresis mode* or band deviation mode*	**0** AL1 band deviation AL2 band deviation **1** AL1 hysteresis AL2 band deviation **2** AL1 band deviation AL2 hysteresis **3** AL1 hysteresis AL2 hysteresis **4** No deviation or hysteresis in menu.
	00000 Number of readings in alarm zone to cause an alarm.	**0** After 1 reading **1** After 2 readings **2** After 4 readings **3** After 8 readings **4** After 16 readings **5** After 32 readings **6** After 64 readings **7** After 128 readings

** See Glossary for explanation of item.*

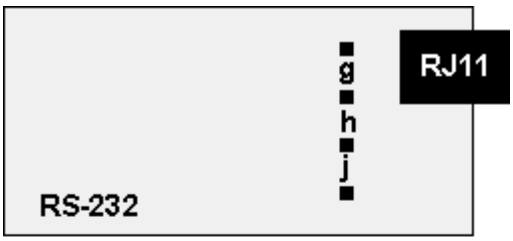
SERIAL COMMUNICATIONS OPTIONS

An optional serial communications board (RS232, RS485 or RS485-Modbus) may be connected to the meter main board at plug position P13 (middle position). Once installed, this board is recognized by the meter, which will bring up the appropriate serial communication menu items. These items will not be brought up if a communication board is not installed.

The RS485 and RS485-Modbus boards are electrically equivalent, but have a slightly different physical layout. The RS485 version uses two RJ11 connectors, while the RS485-Modbus version uses two RJ45 connectors for compliance with the Modbus standard. Both boards feature dual connectors, which are wired in parallel to allow daisy chaining of addressable meters with no need for a communications hub. All three boards are compatible with the same serial three communication protocols, which are selectable under meter setup: Custom ASCII*, Modbus* RTU, and Modbus* ASCII. Digital addressing of multiple meters on the same serial communication line requires RS485 or RS485-Modbus boards.

BOARD SETUP VIA JUMPERS

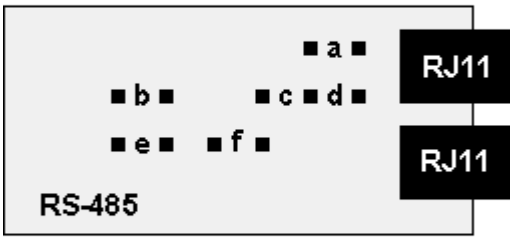
RS232 Board



g - Normal operation.
h - Slave display operation to RS232 output of another meter.
J - Pull-up resistor on RTS line.

Note: The board is shipped standard with jumpers **g** and **j** installed.

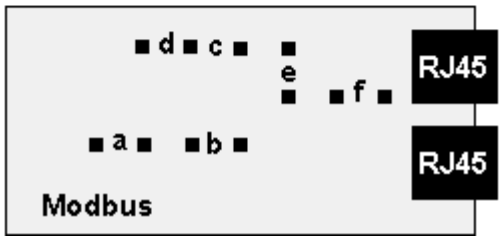
RS485 and RS485-Modbus Boards



Full Duplex Operation

b & e - These bias jumpers should be installed on 1 (and only 1) meter.
a & d - installed on last meter in line with long cable runs.

Half Duplex Operation



b & e - bias jumpers installed on 1 board.
c & f - installed for half duplex operation.

a - installed on last meter in line with long cable runs.

Note: The boards are shipped standard with no jumpers installed.

KEYSTROKES FOR SETUP

If the *MENU* ↵ key does not work, see page 8 "Enabling & Locking Out Menu Items."

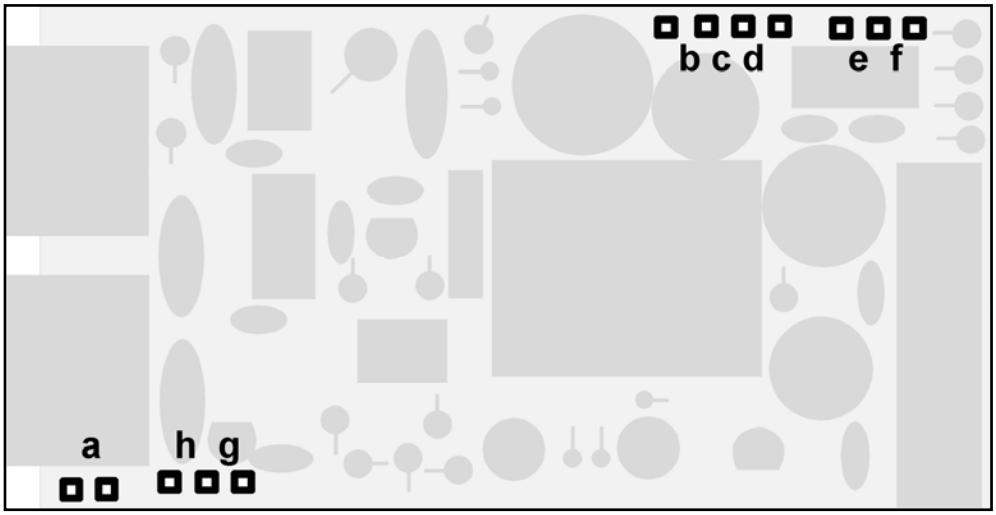
MENU ↵ *Press Menu Select Key*	PEAK ▶ *Press Digit Select Key*	RESET ▲ *Press Value Select Key*
SEr 1 FIXED PARAMETERS: NO PARITY 8 DATA BITS 1 STOP BIT	__0̲00 OUTPUT FILTERING	0 Send unfiltered signal 1 Send filtered signal
	__0̲00 Baud rate	0 300 baud 1 600 baud 2 1200 baud 3 2400 baud 4 4800 baud 5 9600 baud 6 19200 baud
	__0̲00 OUTPUT UPDATE RATE	60 Hz / 50 Hz 0 Line frequency / Line frequency 1 0.28 sec / 0.34 sec 2 0.57 sec / 0.68 sec 3 1.1 sec / 1.4 sec 4 2.3 sec / 2.7 sec 5 4.5 sec / 5.4 sec 6 9.1 sec / 10.9 sec 7 18.1 sec / 21.8 sec 8 36.6 sec / 43.5 sec 9 72.5 sec / 97 sec
SEr 2 Serial Setup 2	_0̲000 Line feed	0 No line feed after carriage return 1 **Line feed after carriage return**
	_0̲000 Alarm data with readings	0 No alarm data 1 Alarm data with reading
	_00̲00 Control of data output	0 Continuous data output 1 Data output on ASCII command only
	_000̲0 Meter address with Custom ASCII protocol*	Select 0 thru F for addresses 1 thru 15. Select 0. thru F. (with decimal point) for addresses 16 thru 31.
SEr 3 Serial Setup 3	0̲0000 Half or full duplex	0 Full duplex 1 Half duplex
	0̲0000 Special start & stop char.	0 Standard continuous mode 1 Special start & stop characters

	00000 RTS mode	0 Normal RTS 1 Single transmission
	00000 Termination characters	0 Only at end of all items 1 At end of each item
MENU ***Press Menu Select Key***	PEAK ***Press Digit Select Key***	RESET ***Press Value Select Key***
SEr 3 Serial Setup 3 (continued)	00000 DATA SENT IN CONTINUOUS MODE	0 Reading 1 Peak 2 Valley 3 Reading + peak 4 Reading + valley 5 Reading + peak + valley
SEr 4 Serial Setup 4	0000 Modbus* ASCII gap timeout	0 1 sec 1 3 sec 2 5 sec 3 10 sec
	0000 Serial protocol	0 Custom ASCII* 1 Modbus* RTU 2 Modbus* ASCII
	0000 PARITY	0 None 1 Odd 2 Even
Addr Modbus Address	0000 0000 0000 Select digit to flash.	158 Select 0 through 9 for flashing digit. Address range is 1 to 247.

** See Glossary for explanation of item.*

EXCITATION OUTPUTS & POWER SUPPLY

Three isolated transducer excitation output levels are available from the power supply board. These are selectable via jumpers b, c, d, e, f in the upper right of the board, as illustrated. In addition, the board provides three jumper positions for special features. The same jumper locations apply to the universal power supply (95-240 Vac ±10% and 95-300 Vdc ±10%) and to the low voltage power supply (10-34 Vac & 10-48 Vdc).



Excitation output	Jumper locations	
5 Vdc ±5%, 100 mA max	**b, d, e**	
10 Vdc ±5%, 120 mA max	**b, d, f**	
24 Vdc ±5%, 50 mA max	**c**	

SELECTION OF OTHER JUMPERS

Jumper a - Front panel menu lockout, locked when installed. See page 8)
Jumper g - Provides +5V power output at P1-4 when installed.
Jumper h - Connects "Control Input 2" to P1-4 when installed.

METER CALIBRATION & SPECIFICATIONS

All analog input and analog output ranges of the meter have been digitally calibrated at the factory prior to shipment using calibration equipment certified to NIST standards. Calibration constants are stored digitally in non-volatile memory in EEPROM on the signal conditioner board and analog output board. As a result, these boards may be mixed and interchanged without requiring meter recalibration. Digital calibration eliminates much of circuitry that would be associated with analog calibration, providing superior long term accuracy and stability.

If recalibration is required, the meter may be returned to the factory or to any authorized distributor.

BASIC METER

Display

Type..... 5 LED, 7-segment, 14.2mm (.56") high digits & 3 LED indicators
Color.....Red or green
Range..... -99999 to +99999 and -99990 to +99990

A to D Conversion

Technique (Pat.5,262,780).....Concurrent Slope™
Read Rate .....60/s for 60 Hz NMR, 50/s for 50 Hz NMR
Output Update Rate..... 56/s at 60 Hz, 47/s at 50 Hz
Display Update Rate..... 3.5/s at 60 Hz, 3/s at 50 Hz

Noise Rejection

CMV from DC to 60 Hz.....Withstand 250Vac
Dielectric strength.....3.5 kV ac for 5 sec, 2.3 kV ac for 1 min
CMR from DC to 60 Hz..... 130 dB
NMR at 50/60 Hz..... 90 dB with minimum digital filtering

Control Inputs (CMOS/TTL levels, logic 1 = tied to digital ground, logic 0 = open)

/ Hold input .....Logic 1 holds display and outputs
/ Peak input.....Logic 1 displays peak value
/ Tare input ..... Logic 1 offsets input value to zero
/ Reset input ..... Logic 1 resets all meter functions
/ Function Reset input..... Logic 1 resets peak values and alarms
/ Decimal Point input..... Overrides internal DP selections and controls DP position

Accuracy

Load Cell Input

Input Range	Reso-lution	Output Zero Range	Output Span Range	Error at 25°C
20.000 mV 50.000 mV 100.00 mV 250.00 mV 500.00 mV	1 µV 2.5 µV 5 µV 12.5 µV 25 µV	-99999 to 99999	0 to ±99,999	0.01% of FS ±1 Ct

Ratio

Current Range	Resolution	Input Ohms	Error at 25°C
200.00 mV 2.0000 V 20.000 V	10 µV 100 µV 1 mV	1 GΩ 1 GΩ 1 MΩ	0.01% of FS ±2 Cts

Span Tempco .....0.003% of reading/°C
0.0015% of reading/°C for load cell meter
Zero Tempco ..... 0.2 µV/°C
Reference Junction Accuracy .....1°C, 10°C to 40°C

POWER REQUIREMENTS

Input Voltage rating (standard)..... 95-240V ac ±10% or 90-300V dc ±10%
Input Voltage rating (low voltage option) .....10-34V ac or 10-48V dc
Power Line Frequency.....DC and 47-63 Hz
Power Consumption, Max .....5 Watts

EXCITATION OUTPUTS

Voltage & Current Levels (jumper selectable)..... 5V dc ±5%, 100 mA max
10V dc ±5%, 120 mA max
24V dc ± 5%, 40 mA max
Excitation Output Ripple.....100 mVp max
Isolation from power and outputs .....250 Vac
Insulation dielectric strength to power and outputs ..... 3.5 kV ac for 5 sec, 2.3 kV ac for 1 min
Isolation to signal common.....50V dc

DUAL RELAY OPTION

Power to Relay Option.....Powered by meter
Setpoint Setup.....Via front panel pushbuttons or RS232/485
Update Rate ..... 56/s at 60 Hz, 47/s at 50 Hz
Response to input signal (min).....Display update rate
Input Signal (selectable).....Filtered or unfiltered input signal
Actuation Modes (selectable) .....Above or below setpoint, latching or non-latching, disabled
Output Time Delay (selectable).....1 to 128 readings
Front Panel Enable / Lockout Modes (selectable).....1) Display and change setpoints
2) Display but do not change setpoints
3) Neither display nor change setpoints
Alarm Status Indication.....2 red LED lamps
Status Indication Setup (selectable)..... Lit when output is ON or OFF, or disabled

Contact Relay Output:

AC Rating .....8A @ 240V ac
DC Rating .....8A @ 24V dc
Isolation rating between signal common and contacts .....250V ac
Insulation dielectric strength between signal common and contacts.....
.....3.5 kV ac for 5 sec, 2.3 kV ac for 1 min

Solid State Relay Output:

AC Rating .....120 mA @ 125V ac, 24 ohms series resistance
DC Rating .....240 mA @ 150V dc, 6 ohms series resistance
Isolation rating between signal common and contacts .....250V ac
Insulation dielectric strength between signal common and contacts.....
.....3.5 kV ac for 5 sec, 2.3 kV ac for 1 min

SERIAL INTERFACE OPTION (RS232, RS485, RS485-Modbus boards)

Power to Interface Option.....Powered by meter
RS485 Wiring .....Half or full duplex
Baud Rates.....300, 600, 1200, 2400, 4800, 9600, 19200
Serial Protocols .....Custom ASCII*, Modbus* RTU, Modbus* ASCII (selectable)
Signal Levels .....Meet RS232 and RS485 standards
Connectors ..... Single RJ11 (RS232), two RJ11 (RS485), two RJ45 (RS485-Modbus)
Isolation rating between signal common and serial I/O .....250V ac
Insulation dielectric strength between signal common and serial I/O.....
.....3.5 kV ac for 5 sec, 2.3 kV ac for 1 min

ENVIRONMENTAL

Operating Temperature .....0°C to 55°C
Storage Temperature ..... -40°C to 85°C
Relative Humidity.....95% from 0°C to 40°C, non-condensing
Case .....NEMA-4X from front when panel mounted
Shock.....10 G at 1 kHz, applied in X, Y, Z axes
Vibration .....15 Hz to 150 Hz, 1 mm to 2 mm amplitude, 20 G max.