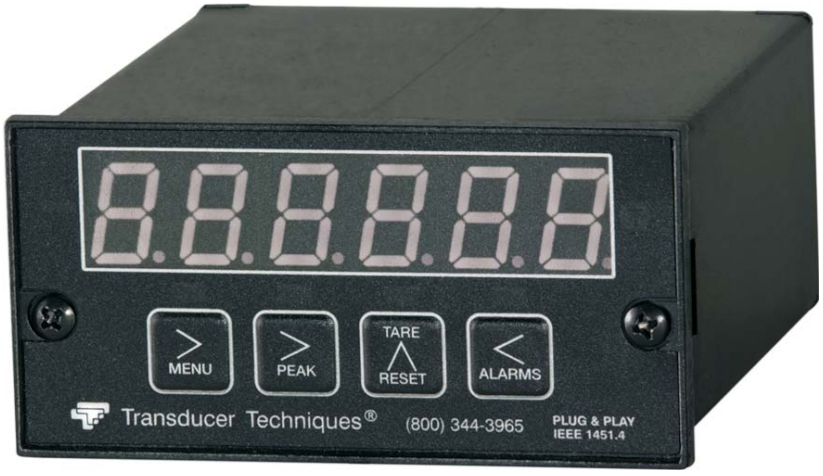
DPM-3

DIGITAL PANEL MOUNT METER

PLUG AND PLAY IEEE 1451.4 COMPLIANT

OPERATOR MANUAL

Intertek
4006497



Transducer
Techniques®

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REVISED 11/2013

1. TEDS IEEE 1451.4 INTRODUCTION

The DPM-3 is a TEDS IEEE 1451.4 Plug and Play Smart Load Cell Meter. TEDS, or Transducer Electronic Data Sheet, is a set of electronic data in a standardized format defined within the IEEE 1451.4 standard. Stored in an EEPROM, this data specifies what type of sensor is present, describes its interface, and gives technical information such as sensitivity, bridge type, excitation, etc.

The DPM-3 automatically detects when a TEDS IEEE 1451.4 compliant Load Cell / Torque Sensor has been connected to it by using a built-in EEPROM detector. Once such a sensor has been detected, the DPM-3 displays a front panel TEDS indicator light, reads the EEPROM, stores the information in memory, and performs an automatic configuration. The built-in, sensor-related EEPROM may be of any of the following types: DS1973/DS2433, DS2431 or DS1971/DS2430A. The automatic system configuration function performs all steps needed to calibrate the TEDS IEEE 1451.4 compliant Load Cell / Torque Sensor and DPM-3 as a system. This includes the configured precision of 32 bits, 19 bits or 11 bits and the configured excitation voltage. Using the DPM-3 with a TEDS IEEE 1451.4 compliant Load Cell / Torque Sensor is as easy as plugging a mouse into a computer, making it a true plug and play experience.

The DPM-3 is safety certified to UL 61010-1 and to CSA C22.2#61010-1. It carries the ETL certification mark for the USA and Canada.

2. GENERAL INTRODUCTION

DPM-3 digital panel meters are a versatile, cost-effective solution to a wide variety of monitoring and control applications. They are easily set up to produce an accurate display of weight, load or direct reading of microvolts. Setup can be via front panel pushbuttons or the meter's serial interface. Digital scaling of zero and span provides direct readout in engineering units. Digital calibration of all ranges eliminates drift associated with potentiometers found in non-microcomputer-based meters. Selective security lockout of the front panel keys protects against accidental changes to the meter setup.

A unique method of analog-to-digital conversion provides 60 conversions per second (50 for 50 Hz operation), while integrating the signal over a full line cycle for maximum noise rejection. Self-calibration cycles reduce the average reading rate to 56 per second (47 for 50 Hz). This fast read rate provides an accurate display of peak signal input and quick response in control applications.

An adaptive auto-filter automatically selects a time constant appropriate for the encountered signal noise level. This ensures stable displayed readings and outputs while responding rapidly to changes of the input signal that exceed a selected threshold value. Input signal polarity may be selected as normal or reverse.

The DPM-3 uses a lightweight, high-efficiency switching power supply that operates from either AC or DC voltages and complies with safety regulations. The meter can be powered worldwide without changes to the supply. An optional low voltage supply operates on 10 to 48 Vdc from batteries or 12 to 32 Vac from sources such as 400 Hz aircraft power. Both supplies have an isolated 10 Vdc excitation supply to power transducers.

The NEMA-4 (IP65) 1/8 DIN case is made of high impact 94V-0 UL-rated plastic. Mounting is from the front of the panel and requires less than 110 mm behind the panel. All wiring is by removable plugs conforming to UL61010C safety standards. All output options are isolated from meter and power ground by 250 Vac minimum.

Alarm or setpoint control is provided by an optional relay board with two or four Form C 8A mechanical relays or two or four Form A 120 mA solid state relays. The setpoints may be latching or non-latching, be energized above or below the setpoint, or operate in a fail-safe mode. The relays can operate from the filtered signal to reduce relay chatter or from the unfiltered signal for fastest response. Snubber circuits and a programmable relay switching time delay extend relay contact life.

An isolated analog output of 4-20 mA, 0-20 mA, 0-10V or -10 to +10V can be provided by an optional analog output board. The output is linearized to the display and can operate from the filtered or unfiltered signal input. It can be scaled via front panel pushbuttons or the meter's serial interface.

Optional RS232, RS485, or USB serial interfaces allow the DPM-3 to communicate bidirectionally with computers, PLC's or other digital devices. An optional USB-to-RS485 converter board allows a primary DPM-3 to be interfaced to a computer and to be the device server for a network of up to 31 other DPM-3's on an RS485 bus, while itself retaining all capabilities of a meter.

Windows-based software is available from Transducer Techniques to program our meter and transmitters via a PC using the serial interface. This software can be downloaded at no charge from http://www.transducertechniques.com. Please see Section 19 for details.

3. RECEIVING & UNPACKING

Your DPM-3 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 the unit to Transducer Techniques for repair or replacement. Please include a detailed description of the problem.

4. SAFETY CONSIDERATIONS

Visually inspect the instrument for signs of damage. If damaged, do not attempt to operate.

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 85-264 Vac with the high voltage power supply option, or 12-32 Vac (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 85-264 Vac mains connector (P1 Pins 1-3) is colored Green to differentiate it from other input and output connectors. The 12-32 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. Verify the panel cutout dimensions, and mount according to instructions.

Symbols applicable to this product:

ETL Mark. Indicates that product conforms to UL Std. 61010-1 and is certified to CAN/USA Std. C22.2 No. 61010-1

CE Mark. Indicates that product meets EU safety, health and environmental requirements.

Caution (refer to accompanying documents)

Caution, risk of electric shock.

Earth (ground) terminal.

Equipment protected throughout by double insulation or reinforced insulation.

Both direct and alternating current.

RoHS Symbol. Indicates that product is free from hazardous substances defined in EC directive 2002/95/EC.

WEEE Symbol. Indicates that product should be recycled and not disposed of as general waste.

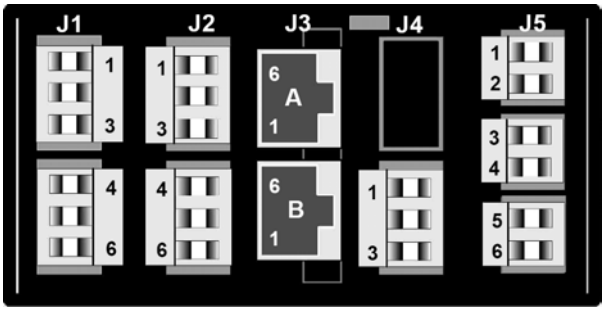
Operating environment:

The meter is Class II (double insulated) equipment designed for use in Pollution degree 2.

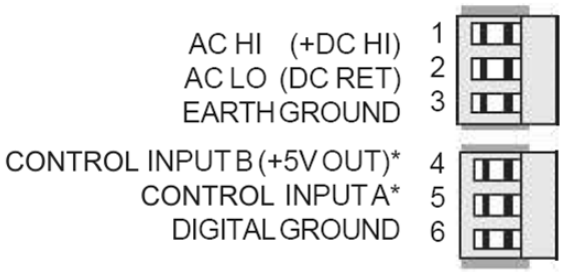
5. CONNECTOR WIRING INFORMATION

5.1 CONNECTOR LOCATION

Connectors for signal and power are UL-rated screw-clamp terminal blocks that plug into mating jacks on the printed circuit board. Communication connectors can be a USB jack, a single RJ11 jack for RS232, dual RJ11 jacks for RS485, or dual RJ45 jacks for RS485.



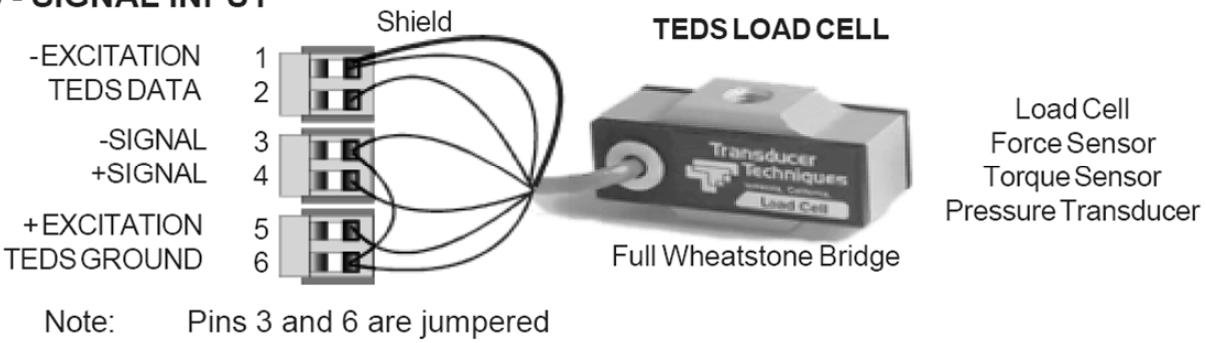
5.2 J1 - POWER AND DIGITAL CONTROLS



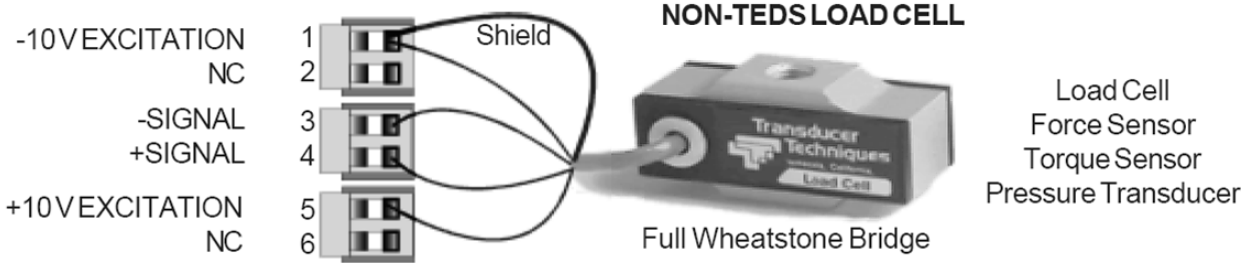
*Notes: 1) Non-isolated digital control inputs 1 and 2 are menu selectable.

2) +5V Output may be connected to J1-4 instead of digital input B, see page 40.

5.3 J5 - SIGNAL INPUT



Note: Pins 3 and 6 are jumpered

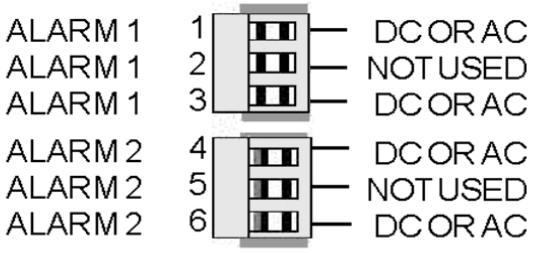


Note: For wiring color, refer to Load Cell Calibration Certificate or to www.transducertechniques.com/wiring-color-code.aspx

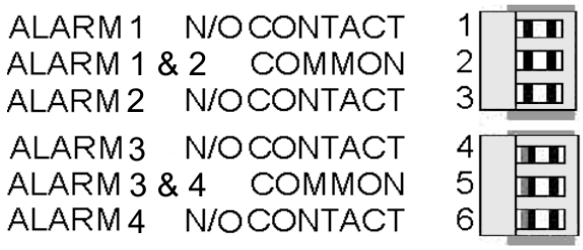
P2 - SETPOINT CONTROLLER

DUAL MECHANICAL RELAY OUTPUTS

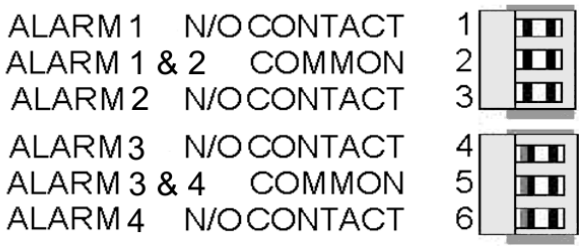
DUAL SOLID STATE RELAY OUTPUTS



QUAD MECHANICAL RELAY OUTPUTS

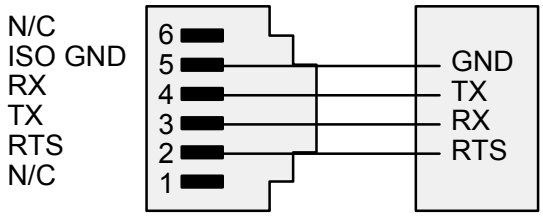


QUAD SOLID STATE RELAY OUTPUTS

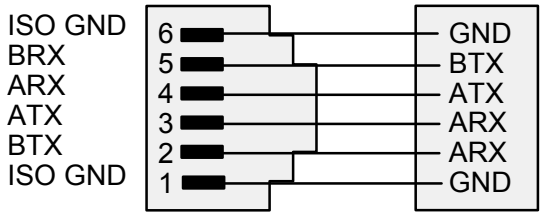


P3 - SERIAL COMMUNICATIONS

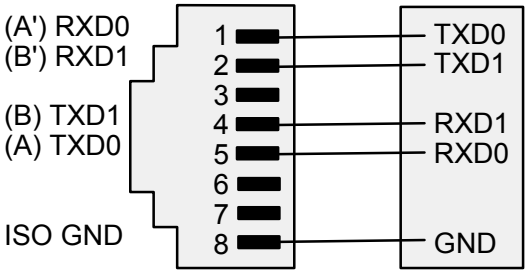
RS232 INTERFACE



RS485 INTERFACE - FULL DUPLEX

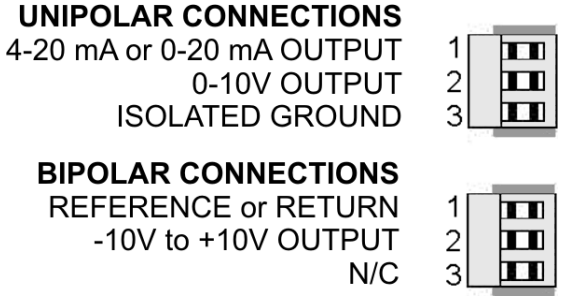


RS485-MODBUS - FULL DUPLEX



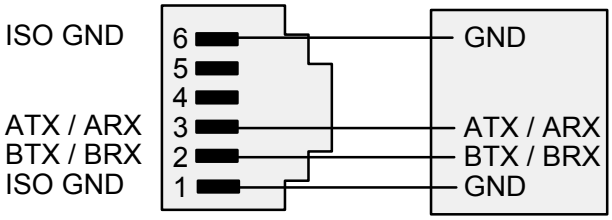
P4 - ANALOG OUTPUT

UNIPOLAR CONNECTIONS

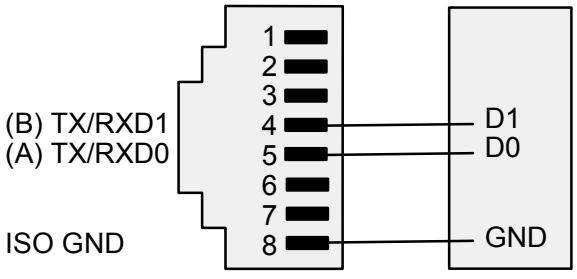


BIPOLAR CONNECTIONS

RS485 INTERFACE - HALF DUPLEX



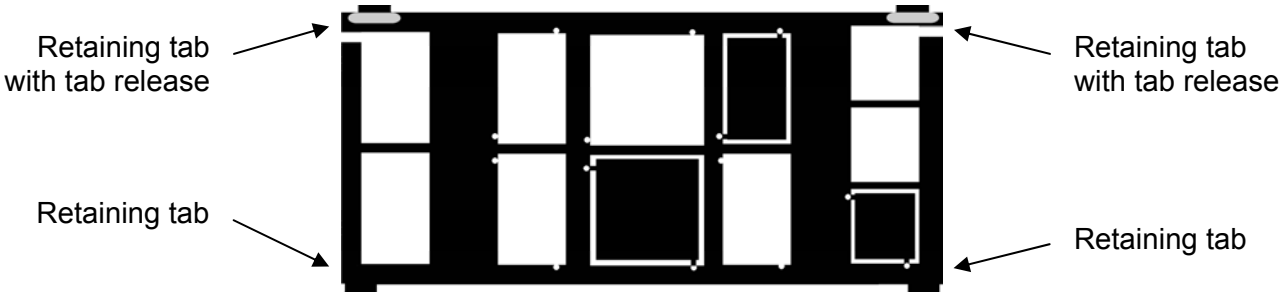
RS485-MODBUS - HALF DUPLEX



6. MECHANICAL ASSEMBLY

REMOVING THE REAR PANEL

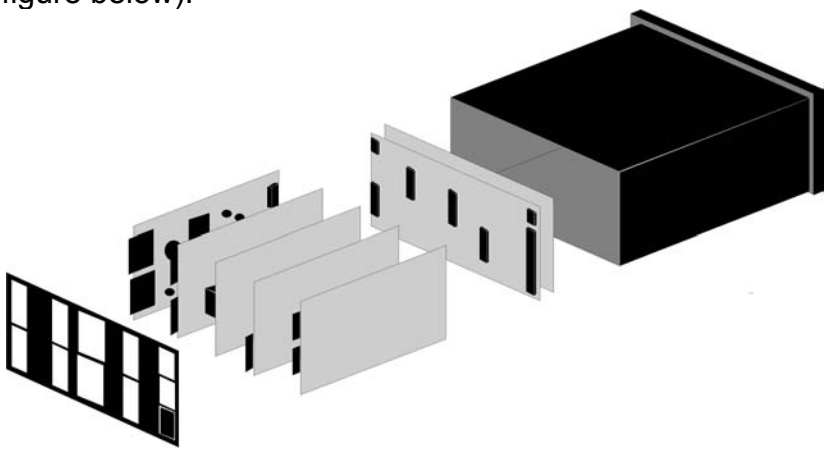
First remove any connectors. Use one hand to press in the two sides of the rear of the case, and the other hand to press down the two protruding tab releases at the top of the rear panel (see figure below). This will unhook the rear panel from the case.



Rear Panel

REMOVING THE ELECTRONICS

With the rear panel removed, grasp the power supply board to the left and signal conditioner board to the right, and carefully slide the electronic assembly out through the rear of the case (see figure below).



INSTALLING NEW OPTION BOARDS

Options boards plug into the main board at the front of the meter. These are plug-and-play and may installed in the field. They will be recognized by the software, which will provide access to the menu items associated with that board. If necessary, remove rear panel knockouts for new boards. Boards plug into connectors as follows:

Option Board	Main Board Jack	Rear Panel Jack
Power supply	P11	J1
Relay board	P12	J2
Serial interface board	P13	J3
Analog output board	P14	J4
Signal conditioner board	P15	J5

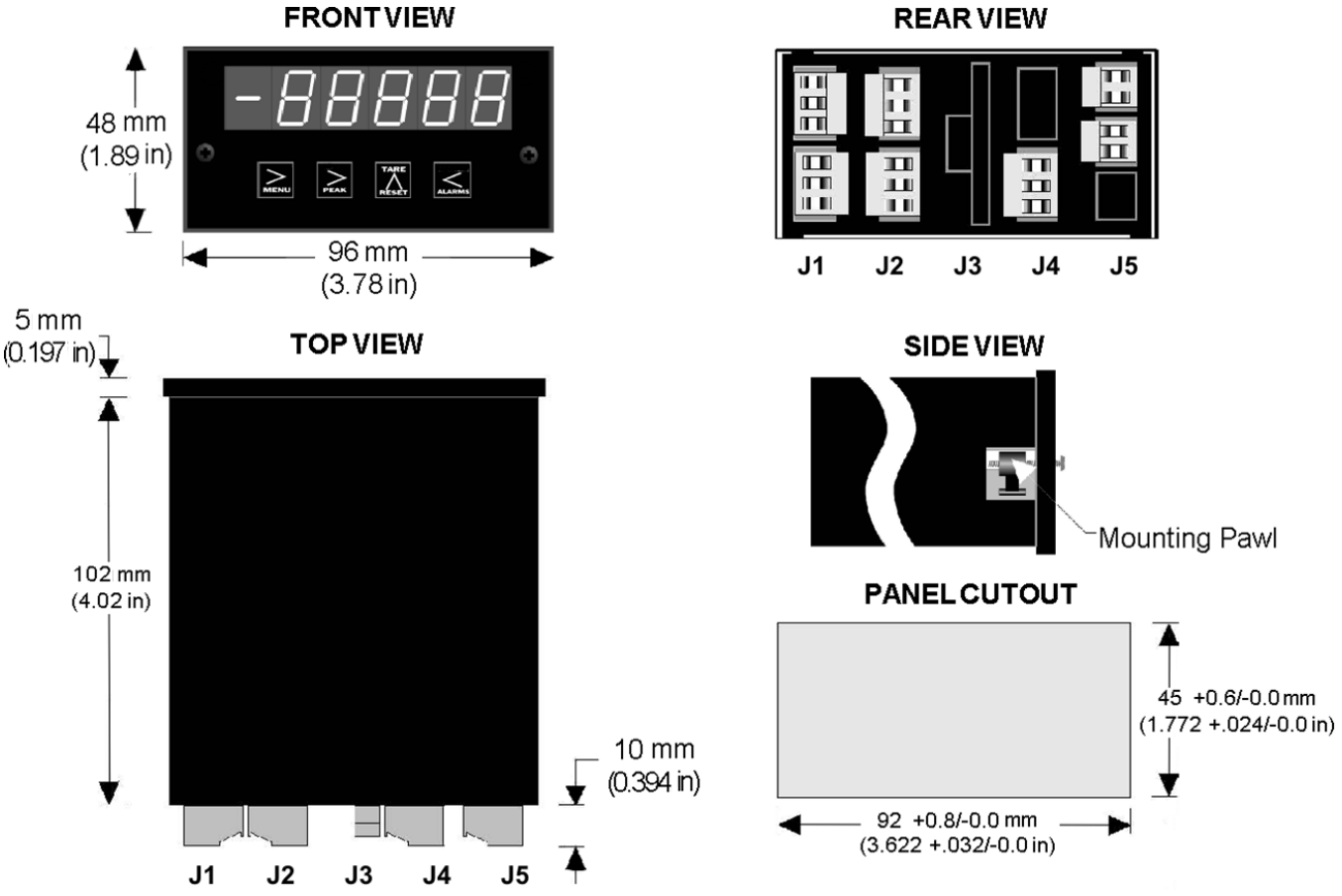
Note: Corresponding main board and option board connectors have the same number of electrical lines. When an option board is correctly installed, the top and bottom edges of the main board and option board are aligned.

REASSEMBLING YOUR METER

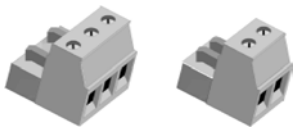
Slide the electronics assembly into the case until the display board is seated flush against the front overlay. Insert the bottom tabs of the rear panel into the case, then carefully align the board connectors with the openings in the rear panel. If necessary, remove any rear panel knockouts for new option boards that may have been installed. Ensure that all option boards are properly aligned with the molded board retaining pins on the inside of the rear panel. With the rear panel in place, reinstall the input/output screw clamp terminal plugs.

PANEL MOUNTING

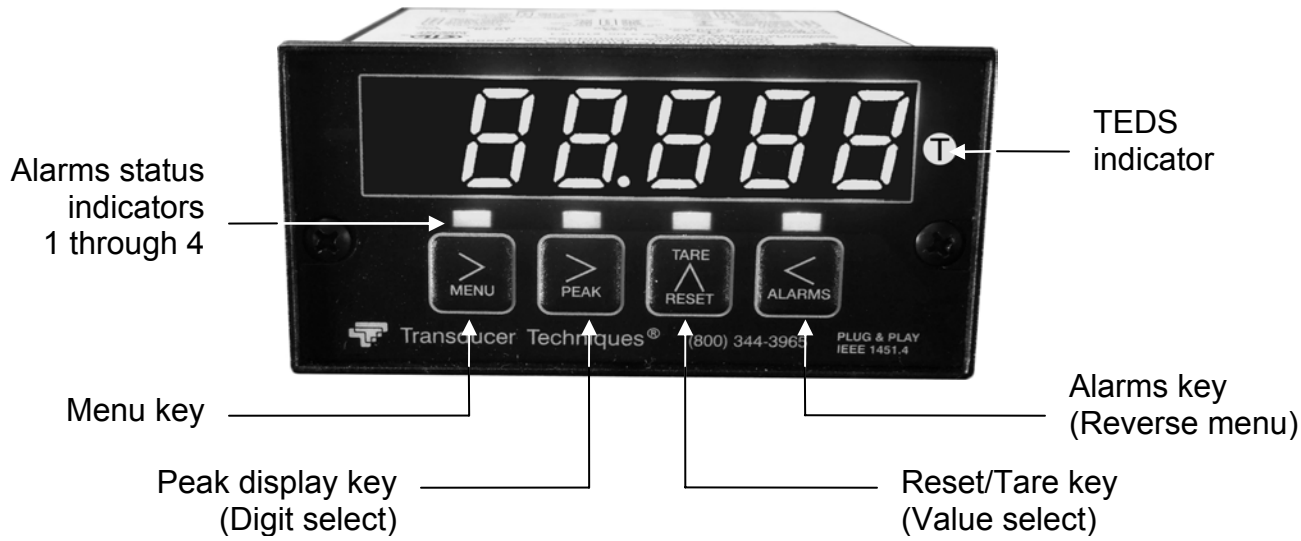
Ensure that the panel mounted gasket is in place against the back of the bezel. Turn the two mounting screws counterclockwise until the space between the mounting pawl and the rear of the gasket is greater than the panel thickness. Insert the meter in the panel cutout. Turn the mounting screws clockwise until the meter is securely mounted in the panel. Do not overtighten.



The DPM-3 uses UL / VDE rated detachable screw terminal connectors for signal and power.



7. 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 (> MENU Menu, > PEAK Digit select, TARE ^ RESET Value select, < ALARMS Reverse menu) for the Menu Mode.

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 returns the display to the present value. The *PEAK* key can also be programmed to display Valley, alternating Peak or Valley, or to Tare the reading to zero. When Peak or Valley is selected, periodic horizontal bars at the top of the display indicate Peak, and periodic horizontal bars at the bottom indicate Valley.

TARE ^ RESET **RESET/TARE Key.** Pressing *RESET* with *PEAK* resets peak and valley values. Pressing *RESET* with *ALARMS* resets latched alarms. Pressing *RESET* with *MENU* performs a meter reset (same as power on). Meter reset can also be applied via a rear panel connector. Pressing and releasing RESET/TARE tares the meter value to zero.

< 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

(Menu). Pressing MENU 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**, **Lo in**, **Lo rd**, **Hi in**, **Hi rd**, **tArE**, **Loc 1**, **Loc 2**, **Loc 3**, **Loc 4**. If a change has been made to a menu item, that change is saved to non-volatile memory when the MENU key is pressed next, and **StorE** is displayed briefly.

(Digit Select). Pressing **digit select** from the *InPut* menu brings up all meter functions available with the meter's signal conditioner. For the Load cell signal conditioner, these are, **Strn** and **dC u**.

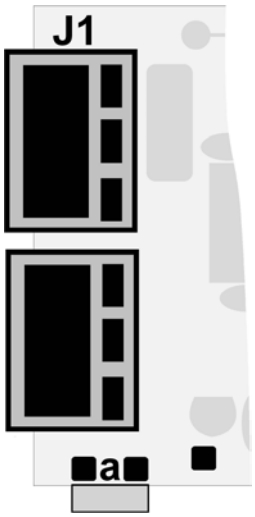
- Pressing **digit select** from the *SEtuP*, *ConfFG*, *FiLtr*, *Lo in, Lo rd*, Hi in, Hi rd, tArE, *Loc 1*, *Loc 2* or *Loc 3* menus items sequentially selects digit positions 1 - 5, as indicated by a flashing digit: **0**0000, 0**0**000, 00**0**00, 000**0**0, 0000**0**.

(Value Select). Pressing **value select** for a flashing item (digit position or decimal point position) will increment that item. Pressing *MENU* will save any changes.

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

8. 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, Loc 3* or *Loc 4*, and each function to be enabled is set to "0." The top menu items *Loc 1*, *Loc 2, Loc 3* and *Loc 4* can in turn be locked out by installing an internal hardware jumper. With the jumper installed, the operator only has access only to enabled menu items. With the jumper removed, the user also has access to menu items *Loc 1*, *Loc 2, Loc 3* and *Loc 4.*



SETTING HARDWARE LOCKOUT JUMPER

To access the lockout jumper, remove the rear panel per Section 6 and locate jumper "**a"** in the lower portion of the power supply board next to the input connectors (see figure at right).

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** **Loc 4**

Press the *MENU* key until *Loc 1, Loc 2 Loc 3* or *Loc 4* is displayed, as desired. **Note:** the hardware lockout jumper must be removed (see above).

11111

Press PEAK 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 RESET 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)

Loc 4 (TEDS only)

1 - Serial number
2 - Units of measure
3 - Calibration date
4 - Calibrator's initials & bridge ID
5 - Meter reset pushbutton

9. TEDS SIGNAL CONDITIONER IN TEDS MODE

9.1 INTRODUCTION

The DPM-3 is a TEDS IEEE 1451.4 Plug and Play Smart Load Cell Meter. TEDS, or Transducer Electronic Data Sheet, is a set of electronic data in a standardized format defined within the IEEE 1451.4 standard that is stored in an EEPROM. This data specifies what type of sensor is present, describes its interface, and gives technical information such as sensitivity, bridge type, excitation, etc. The DPM-3 will automatically detect when a TEDS IEEE 1451.4 compliant Load Cell/Torque Sensor is connected to it, each and every time, by a built in EEPROM detector. Once a TEDS Sensor has been detected, the DPM-3 displays a front panel TEDS indicator light, reads the EEPROM and stores the information in memory and performs an automatic configuration. The automatic system configuration function performs all steps needed to calibrate the TEDS IEEE 1451.4 compliant Load Cell /Torque Sensor and DPM-3 as a system, including selecting the correct sensor excitation. Using the DPM-3 with a TEDS IEEE 1451.4 compliant Load Cell / Torque Sensor is as easy as plugging a mouse into a computer, making it a true plug and play experience.

9.2 SCALING

When a DPM-3 connected to a TEDS transducer is powered on, the meter reads the data stored in the transducer. The excitation supply is automatically set to the correct value and the DPM-3 calculates the correct scaling to calibrate the meter and the transducer as a system. The jumper on the signal conditioner board must be set for the 50 mV range. See Section 13.1. If the Maximum Physical Value of the TEDS sensor exceeds 100,000, the calculated scale and offset are divided by 10 and the reading is in 10's of units.

If the full scale of the transducer is 50 pounds, the meter will display 50 at full scale output. If more resolution is desired, the meter decimal point can be set so that the meter will read 50.0, 50.00, or 50.000. In this example, if another unit of measure, such as kilograms, is desired, there are two alternatives.

If the meter has a serial communication board installed, **TEDS Reader_Editor** software can be used (see Section 24 "Accessories" for information). The electronic data sheet for your transducer can then be read electronically and be displayed on a computer screen. The values can be modified (e.g., to display kilograms instead of pounds), and then written back to the transducer.

The meter Menu item "Tare," digits 4 and 5, can be set to 1 to configure the meter as a non-TEDS transducer type.

9.3 Error Messages

If there is a problem with the TEDS connection between the meter and the TEDS transducer, one of the following error messages will be displayed at power on or when plugging in a TEDS transducer while the power is on:

Err 1 - TEDS data line shorted
Err 2 - No Presence pulse from TEDS
Err 3 - Improper Presence pulse width
Err 4 - TEDS family code in ROM in error
Err 5 - TEDS checksum error in the first or second 32 bytes

9.4 Software

TEDS Reader-Editor Software, **P/N DPM-3-TRES**, is available from Transducer Techniques. This software allows the user to read and edit information stored in the TEDS transducer. See Section 24 "Accessories" for ordering information.

9.5 Meter Setup

When setting up the meter, it may be necessary to enable some of the menu items. See Section 8 “Enabling and Locking Out Menu Items” for the procedure.

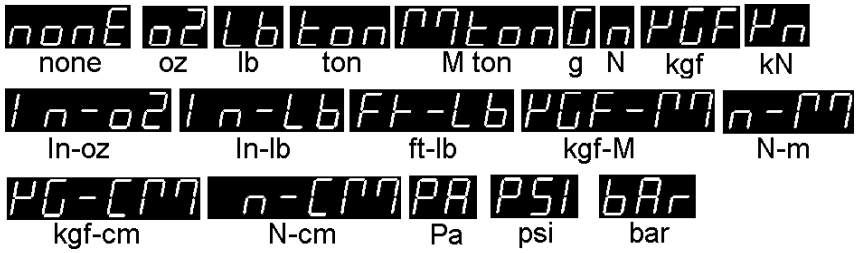
MENU KEY > MENU	**DIGIT SELECT KEY** > PEAK	**VALUE SELECT KEY** TARE ∧ RESET
SEtuP Meter Setup	**_0__0** Power line frequency	**0** Noise minimized for 60 Hz **1** Noise minimized for 50 Hz
	_0__0 Rear control inputs A & B **True** = logic 1 (0V or tied to digital ground) **False** = logic 0 (5V or open)	**0** A = Reset, B = Meter Hold **1** A = Function Reset B = Peak or Valley Displ. **2** A = Meter Hold B = Peak or Valley Displ. **3** A = Meter Hold B = Tare **4** A = Peak or Valley B = Tare **5** A = Tare B = Reset **6** A = 0, B = 0, decimal point 1= XXXXX A = 1, B = 0, decimal point 1 = XXXX.X A = 0, B = 1, decimal point 1 = XXX.XX A = 1, B = 1, decimal point 1 = XX.XXX **7** A = 0, B = 0, decimal point 2 = XXXX.X A = 1, B = 0, decimal point 2 = XXX.XX A = 0, B = 1, decimal point 2 = XX.XXX A = 1, B = 1, decimal point 2 = X.XXX.X **8** A = Function Reset B = Display Blank **9** A = Hold B = Display Blank **A** A = Peak or Valley B = Display Blank **B** A = Tare B = Display Blank **C** A = Valley Display B = Peak Display **D** A = Tare B = Tare Reset Both control inputs A and B set to logic 1 for selections **2**, **4**, **A**, **C** = Function Reset. Both control inputs A and B set to logic 1 for selections **0**, **1**, **3**, **5**, **8**, **9**, **B**, **D** = Meter Reset.
ConFG Meter Configuration	**_00_** Operation of front panel PEAK button	**0** Peak Display (max reading) **1** Valley Display (min reading) **2** Peak (1st push), Valley (2nd push)
	_00_ Signal polarity	**0** Normal Input Signal Polarity **1** Reverse Signal Polarity

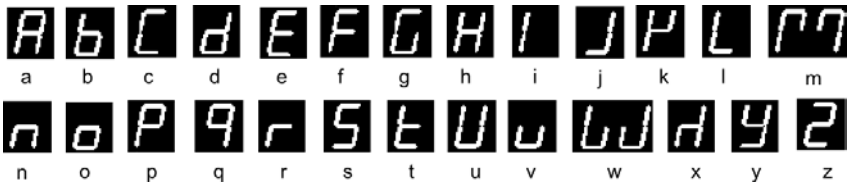
MENU KEY (> MENU)	DIGIT SELECT KEY (> PEAK)	VALUE SELECT KEY (TARE ^ RESET)
FiLtr Filtering	**00000** Alarm filtering	**0** Alarm unfiltered **1** Alarm filtered
	00000 Peak & Valley filtering	**0** Peak & Valley unfiltered **1** Peak & Valley filtered
	00000 Display filtering	**0** Display batch average 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 Decimal point selection.	**d.dddd** Determines decimal point position & reading resolution.	**d.dddd** **dd.ddd** **ddd.dd** **dddd.d** **ddddd.** **.ddddd** Press ^ key to shift decimal point. Decimal point is stored in TEDS memory. Display shows **TEds** instead of **StorE**.
Option board dependent menu items		
ALSEt **ALS34** **dEU1H** **dEU2H** **dEU1b** **dEU2b** **dEU3H** **DEU4H** **DEU3b** **DEU4b** Menu items related to **alarm setup** These will only appear if a relay board is detected. If so, please see Section14.		
AnSEt **An Lo** **An Hi** Menu items related to **analog output setup**. These will only appear if an analog output board is detected. If so, see Section 15.		
Tare Tare & TEDS selections.	**0000** Front panel pushbutton Tare.	**0** Front panel tare enabled **1** Front panel tare disabled
	0000 Auto-Tare.	**0** Tare after meter reset **1** No tare after meter reset
	0000 TEDS Plug and Play indicator.	**0** Plug and Play indicator enabled **1** Plug and Play Indicator disabled
	0000 TEDS Plug and Play.	**0** Plug and Play enabled **1** Plug and Play disabled

MENU KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)

Option board dependent menu items

SEr 1 **SEr 2** **SEr 3** **SEr 4** **Addr**
Menu items related to **serial communications**. These will only appear if an RS232, RS485, or USB I/O board is detected. If so, see Section 16.

SEr no Transducer Serial No.	If the serial number is 6 digits or less, press the Peak key once to display all digits **123456**. If the serial number is greater than 6 digits, press Peak once to display the first digits **12–**, and press the Peak key again to display the remaining digits **345678**. Read only.
UnitS Units of measure. Read only.	
CALdAt Cal date	**00.00.00** Transducer calibration date in mm.dd.yy format (month, day, year). Read only.

CALInL Cal initials	**A b C** Initials of the person who performed the transducer calibration. Read only. Characters used are: 
CALPEr Cal period	**365** Required transducer calibration interval in days. Read only.
M – Id Bridge ID	**brdg-A** or **brdg-b** or **brdg-C** Identifies whether meter is monitoring bridge A, bridge B or bridge C.

10. SETUP OF NON-TEDS TRANSDUCERS

10.1 SCALING METHODS

Three methods are selectable for scaling the meter, as follows:

Scale and Offset Method (using calculated scale and offset). This method requires that you calculate the required scale and offset values and enter them into memory when the meter displays **SCALE** and **OFFst**. No calibration signals need to be applied to the meter.

Coordinates of 2 Points Method (using values from sensor's calibration certificate). With this method, you enter the low input signal value, the display value for the low signal, the high input signal value, and the display value for the high input signal value. These values are entered when menu items **Lo In**, **Lo rd**, **HI In** and **HI rd** are displayed. No calibration signals need to be applied to the meter with this method, which is the most commonly used.

Reading Coordinates of 2 Points Method (applying a known weight or load). When using this method, the meter calculates the proper scaling and offset values, entering them into memory. The meter is connected to your sensor and looks at the values of the input signals to calibrate the meter and transducer as a system.

10.2 Implementing Scale and Offset Method (using calculated scale factor and offset)

Apply power and press the **MENU** key until **SEtuP** appears on the display.

Press the **PEAK** key, and four digits will appear on the display. Continue pressing the **PEAK** key until Digit 4 begins to flash **00_00**. Make this digit a **0** by pressing the **RESET** key until **0** appears. Store the change by pressing the left **MENU** key. Perform any other programming changes are required for your application.

10.3 Implementing Coordinates of 2 Points Input Method (using values from the sensor's calibration certificate)

Apply power and press the **MENU** key until **SEtuP** appears on the display.

Press the **PEAK** key, and four digits will appear on the display. Continue pressing the **PEAK** key until Digit 4 begins to flash **00_10**. Make this digit a **1** by pressing the **RESET** key until **1** appears. Store the change by pressing the **MENU** key. Reset the meter.

Press the **MENU** key until **Lo In** appears. Using the **PEAK** and **RESET** keys, enter the low input value. Push the **MENU** key until **Lo rd** appears. Using the **PEAK** and **RESET** keys, enter the low reading to be displayed. Repeat this procedure for **HI In** and **HI rd**. Perform any other programming changes that are required for your application.

10.4 Implementing Reading Coordinates of 2 Points Method (applying a known load)

Apply power and press the left **MENU** key until **SEtuP** appears on the display.

Press the **PEAK** key, and four digits will appear on the display. Continue pressing the **PEAK** key until the Digit 4 begins to flash **00_20**. Make this digit a **2** by pressing the **RESET** key until **2** appears. Store the change by pressing the left **MENU** key. Reset the meter.

Go to Section 11 and perform the procedure of applying known low and high loads. Perform any other programming changes that are required for your application.

11. METER SCALING BY APPLYING KNOWN LOADS

Apply power and press the left **MENU** key until **SEtuP** appears on the display. Press the **PEAK** key, and 4 digits will appear on the display. Continue pressing the **PEAK** key until the Digit 4 begins to flash **00_20**. Make this digit a **2** by pressing the **RESET** key until **2** appears. Store the change by pressing the left **MENU** key. Reset the meter. Connect the meter to your sensor or transducer. Use the procedure below to scale your meter by applying known loads.

MENU KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)
Lo In Press the MENU key. **Lo In** will appear on the meter display. Apply the low known load.	**0.021** Press the PEAK key. The meter will begin to take readings and display the low signal value.	**0.021** Press the TARE/RESET key to store the **Lo In** (low signal) value.
Hi In Press the MENU key. **Hi In** will appear on the meter display. Apply the high known load.	**20.094** Press the PEAK key. The meter will begin to take readings and display the high signal value.	**20.094** Press the TARE/RESET key to store the **Hi In** (high signal) value.
Lo rd Press the MENU key. **Lo Rd** will appear on the meter display. Enter the desired low load reading value.	**0001.5** Press the PEAK key to select a digit, which will flash. **0**.0000 0.**0**000 0.00**0**0 0.000**0** 0.0000	**0000.0** Press the TARE/RESET key to select a value from 0 to 9 for the flashing digit. The decimal is fixed by **dEC.Pt**.
Hi rd Press the MENU key. **Hi Rd** will appear on the meter display. Enter the desired high load reading value.	**1000.0** Press the PEAK key to select a digit, which will flash. **0**.0000 0.**0**000 0.00**0**0 0.000**0** 0.0000	**5000.0** Press the TARE/RESET key to select a value from 0 to 9 for the flashing digit. The decimal is fixed by **dEC.Pt**.

12. TEDS SIGNAL CONDITIONER WITH NON-TEDS TRANSDUCERS

MENU KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)
InPut Input signal type	**Strn** Load cells. Factory default scaling is 50 mV FS	**20.0** **50.0** **100.0** **250.0** **500.0** 20, 50, 100, 250, 500 mV full scale.
	dC u DC millivolts	
SEtuP Meter Setup	**00_00** Display type	**0** 4-1/2 digit meter, counts by 1 **1** 5-digit remote display (±99,999) **2** 4-1/2 digit meter, counts by 10 **3** 3-1/2 digit meter
	00_00 Power line frequency	**0** Noise minimized for 60 Hz **1** Noise minimized for 50 Hz
	_0_00 Meter scaling method	**0** Scale and offset method **1** Coordinates of 2 points method **2** Reading coordinates of 2 points method
	00_00 Rear connector 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 = Pk or Valley Disp. **2** 1 = Meter Hold 2 = Pk or Valley Disp. **3** 1 = Meter Hold 2 = Tare **4** 1 = Peak or Valley 2 = Tare **5** 1 = Tare 2 = Reset **6** 1 = 0, 2 = 0, decimal point 1= XXXXX 1 = 1, 2 = 0, decimal point 1 = XXXX.X 1 = 0, 2 = 1, decimal point 1 = XXX.XX 1 = 1, 2 = 1, decimal point 1 = XX.XXX **7** 1 = 0, 2 = 0, decimal point 2 = XXXX.X 1 = 1, 2 = 0, decimal point 2 = XXX.XX 1 = 0, 2 = 1, decimal point 2 = XX.XXX 1 = 1, 2 = 1, decimal point 2 = 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 = Tare Reset Both control inputs 1 & 2 set to 1 for selections **2**, **4**, **A**, **C** = Function Reset. Both control inputs 1 & 2 set to 1 for selections **0**, **1**, **3**, **5**, **8**, **9**, **B**, **D** = Meter Reset.

MENU KEY (> MENU)	DIGIT SELECT KEY (> PEAK)	VALUE SELECT KEY (TARE ∧ RESET)
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
	000_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)
	000_0 Signal polarity.	0 Normal signal polarity 1 Reverse signal polarity
	000_0 Nonlinear input scaling *Extended meter only.*.	0 Linear input 1 Custom curve linearization
FiLtr Filtering	00000 Alarm filtering	0 Alarm unfiltered 1 Alarm filtered
	00000 Peak & Valley filtering	0 Peak & Valley unfiltered 1 Peak & Valley filtered
	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

MENU KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)
Scaling method “Scale and Offset” if selected under **SEtuP**		
SCALE Scale factor	**0**.0000 **0.0**000 **0.0**0**0**0 **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**0**0 **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**0**0 **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.
Lo rd Desired reading at Lo In.	**0**.0000 **0.0**000 **0.0**0**0**0 **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 **dEC.Pt**.
Hi In High signal input.	**0**.0000 **0.0**000 **0.0**0**0**0 **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.
Hi rd Desired reading at Hi In.	**0**.0000 **0.0**000 **0.0**0**0**0 **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 **dEC.Pt**.
Scaling method “Reading coordinates of 2 points” if selected under **SEtuP**		
Lo In Low signal input.	**0.021** Apply a low reference signal to the meter.	**0.021** Press TARE/RESET to store the low signal input in the meter.
Hi In High signal input.	**20.094** Apply a high reference signal to the meter.	**20.094** Press TARE/RESET to store the high signal input in the meter.
Lo rd Desired reading at Lo In.	**0**.0000 **0.0**000 **0.0**0**0**0 **0.00**0**0** **0.000**0 Select digit to flash.	**0.0000** Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Decimal point is set by **dEC.Pt**.
Hi rd Desired reading at Hi In.	**0**.0000 **0.0**000 **0.0**0**0**0 **0.00**0**0** **0.000**0 Select digit to flash.	**6.7500** Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Decimal point is set by **dEC.Pt**.

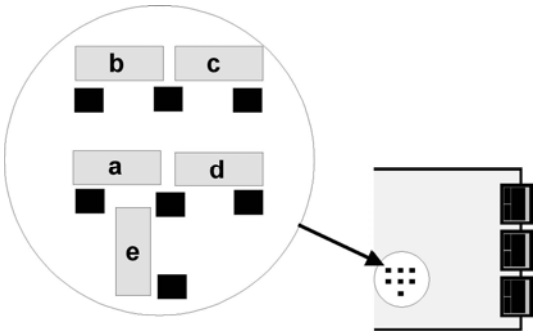
Option board dependent menu items		
ALSEt ALS34 dEU1H dEU2H dEU1b dEU2b dEU3H DEU4H DEU3b DEU4b Menu items related to **alarm setup** These will only appear if a relay board is detected. If so, please see Section14.		
AnSEt An Lo An Hi Menu items related to **analog output setup**. These will only appear if an analog output board is detected. If so, see Section 15.		
MENU KEY > MENU	**DIGIT SELECT KEY** > PEAK	**VALUE SELECT KEY** TARE ^ RESET
Tare Tare selections.	**0000** Front panel pushbutton Tare.	**0** Front panel tare enabled **1** Front panel tare disabled
	0000 Auto-Tare.	**0** Tare after meter reset **1** No tare after meter reset
Option board dependent menu items		
SEr 1 SEr 2 SEr 3 SEr 4 Addr Menu items related to **serial communications**. These will only appear if an RS232, RS485, or USB I/O board is detected. If so, see Section 16.		
Menu lockout items		
Loc 1 Loc 2 Loc 3 Menu items used to enable or lock out (hide) other menu items. **Loc** menu items may in turn be locked out by a hardware jumper. Please see Section 8.		

13. LOAD CELL & MICROVOLT SIGNAL CONDITIONER

This section provides setup instructions to set up the DPM-3 signal conditioner for use with load cells or strain gauges, or as a microvolt meter. The meter's built-in, isolated 10 Volt, 120 mA excitation supply will power up to four 350 ohm load cells in parallel.

13.1 RANGE SELECTION VIA JUMPERS

Input Range	Jumpers	Full Scale Display
± 20 mV	e	± 20000
± 50 mV	a	± 50000
± 100 mV	b	± 10000
± 250 mV	c	± 25000
± 500 mV	d	± 50000



Notes **1.** See Section 17 to select 10V excitation.
2. Jumpers are 2.5 mm (0.1").
3. If a TEDS sensor is connected, jumper for ± 50 mV.

13.2 MENU SELECTION

Display in engineering units can be programmed by either the Scale and Offset Method, Coordinates of 2 Points Method, or Reading Coordinates of 2 Points Methods.

With the Scale and Offset Method, scale and offset are calculated as follows, and are then entered manually. The example below is for 0 to 20 mV = 0 to 100.00.

Input span = Hi signal in – Lo signal in Input ratio =Input range / Input span	Input span = 20 mV – 0 mV = 20 mV Input ratio = 20 mV / 20 mV = 1.00
Display span = Hi display – Lo display Display ratio = FS Display / Display span	Display span = 10000 – 0000 = 10000 Display ratio = 20000 / 10000 = 2.00
Scale Factor = Input ratio / Display ratio	**Scale Factor** = 1.00 / 2.00 = 0.5000
Offset = – (Lo signal in / Input span) x Display span + Lo display	**Offset** = – (0 mV / 20 mV x 10000) + 0000 = 0000

With the Coordinates of 2 Points Method, values for low signal input, low display reading, high signal input and high display reading must be entered manually. For example, if the desired scaling is 0 to 30 mV = 0 to 500.0, the 50 mV full scale range would be selected and values would be entered as follows:

Lo in = 00.000 **Lo rd** = 0000.0
Hi in = 30.000 **Hi rd** = 0500.0

In the Coordinates of 2 Points example below, 0 to 20 mV = 00000 to 50000. During setup, it may be necessary to enable some menu items. See Section 8 for information.

MENU KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)
InPut Press MENU to display **InPut** (input type).	**Strn** Press PEAK key until **Strn** (ratiometric) is displayed.	**20.0** Press RESET to select 20.0, 50.0, 100.0, 250.0 or 500.0 mV.
SEtuP Press MENU to display **SEtuP** (basic setup). See Section 18 for description of digits 1 - 5.	**30_00** Press PEAK to select digit, which will flash.	**00_10** 12345 Press RESET key to select value.
ConFG Press MENU to display **ConFG** (configuration). See Section 18 for description of digits 1 - 5.	**00000** 12345 Press PEAK to select digit, which will flash.	**00000** 12345 Press RESET to select value.
dEc.Pt Press MENU to display **dEcPt** (decimal point).	**d.dddd** Press PEAK to display decimal point location.	**ddddd.** Press RESET to change decimal point location.
Lo in Press MENU to display **Lo in** (low signal input value).	**00.000** Press PEAK to select digit, which will flash. Decimal point is fixed by input range.	**00.000** Press RESET to set digit values. Set to 00.000 mV. Leftmost digit may be set to 0 thru 9 and -0 thru -9.
Lo rd Press MENU to display **Lo rd** (desired meter reading at low signal input).	**00000** Press PEAK to select digit, which will flash. Decimal point is fixed by **dEc.Pt**	**00000** Press RESET to set digit values. Set to 0.
Hi in Press MENU to display **Hi in** (high signal input value).	**00.000** Press PEAK to select digit, which will flash. Decimal point is fixed by input range.	**20.000** Press RESET to set digit values. Set to 20.000 mV.
Hi rd Press MENU to display **Hi rd** (desired meter reading at high signal input).	**00000** Press PEAK to select digit, which will flash. Decimal point is fixed by **dEc.Pt**.	**50000** Press RESET to set digit values. Set to 0.
rESEt Press MENU (or MENU and RESET simultaneously) until **rESEt** is displayed. The meter will go to the operating mode and display the value of the input signal.		

14. DUAL OR QUAD RELAY OUTPUT OPTION

An optional relay board may be installed in the meter main board at plug position P2, adjacent to the power supply board. Four board versions are available: 2 or 4 relays, mechanical or solid state. Once installed, the relay board is recognized by the meter software or PC-based Instrument Setup software, which will bring up the appropriate menu items for it. These menu items will not be brought up if a relay board is not detected. All relay boards offer a choice of operating modes: normally off or on, latched or non-latched, hysteresis band, deviation band, alarm based on the filtered or unfiltered signal, and selectable number of readings in alarm zone to cause an alarm.

KEYSTROKES FOR VIEWING & CHANGING SETPOINTS

The ALARMS (Alarms) key can be used to step through and view setpoints while the meter continues to make conversions and performs setpoint control. If the PEAK (Peak) key is pressed while a setpoint is displayed, conversion stops and the setpoint can be changed. After pressing ALARMS, you have 30 seconds, or the meter reverts to the normal display. To view setpoints, menu item Loc3, digit 2, must have been set to 0. To change setpoints, menu item Loc2, digit 2, must have been set to 0.

ALARMS KEY	DIGIT SELECT KEY	VALUE SELECT KEY
300.24 Press ALARMS, (Alarms) to display Alarm 1 setpoint.	200.00 Current setpoint 1 value blinks, and Alarm 1 LED indicator lights. Press PEAK to select a digit, which will blink.	295.00 To change setpoint 1 value, press TARE RESET to change selected blinking digits.
395.00 Press ALARMS, (Alarms) to display Alarm 2 setpoint.	395.00 Current setpoint 2 value blinks, and Alarm 2 LED indicator lights. Press PEAK to select a digit, which will blink.	305.00 To change setpoint 2 value, press TARE RESET to change selected blinking digits.
395.00 Press ALARMS, (Alarms) to display Alarm 3 setpoint.	395.00 Current setpoint 3 value blinks, and Alarm 3 LED indicator lights. Press PEAK to select a digit, which will blink.	305.00 To change setpoint 3 value, press TARE RESET to change selected blinking digits.
395.00 Press ALARMS, (Alarms) to display Alarm 4 setpoint.	395.00 Current setpoint 4 value blinks, and Alarm 4 LED indicator lights. Press PEAK to select a digit, which will blink.	305.00 To change setpoint 4 value, press TARE RESET to change selected blinking digits.
300.24 Press ALARMS, (Alarms) again. Meter will reset and display current reading.		

KEYSTROKES FOR SETPOINT SETUP

If the *MENU* [MENU] key does not work, see Section 8 “Enabling & Locking Out Menu Items.”

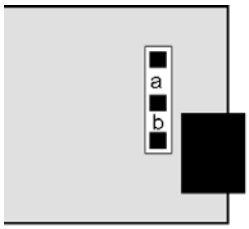
MENU KEY [MENU]	DIGIT SELECT KEY [PEAK]	VALUE SELECT KEY [TARE / RESET]	
ALSEt Alarm Setup for relays 1 & 2 if detected. Press [MENU] until *ALSEt* is displayed.	**_00000** Relay state when alarm is active.	**0** Relay 1 on **1** Relay 1 off **2** Relay 1 on **3** Relay 1 off	Relay 2 on Relay 2 on Relay 2 off Relay 2 off
	_00000 Alarm latching or non-latching (auto reset).	**0** Alarm 1 auto reset **1** Alarm 1 latching **2** Alarm 1 auto reset **3** Alarm 1 latching	Alarm 2 auto reset Alarm 2 auto reset Alarm 2 latching Alarm 2 latching
	_00000 Alarm operates at and above setpoint (active high) or at and below setpoint (active low).	**0** AL1 active high **1** AL1 active low **2** AL1 disabled **3** AL1 active high **4** AL1 active low **5** AL1 disabled **6** AL1 active high **7** AL1 active low **8** AL1 disabled	AL2 active high AL2 active high AL2 active high AL2 active low AL2 active low AL2 active low AL2 disabled AL2 disabled AL2 disabled
	_00000 Hysteresis mode or band deviation mode	**0** AL1 band deviation **1** AL1 hysteresis **2** AL1 band deviation **3** AL1 hysteresis **4** No deviation or hysteresis in menu.	AL2 band deviation AL2 band deviation AL2 hysteresis AL2 hysteresis
	_00000 Number of consecutive 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 reading
ALS34 Alarm Setup for relays 3 & 4 if detected.	**_00000** Relay state when alarm is active.	**0** Relay 3 on **1** Relay 3 off **2** Relay 3 on **3** Relay 3 off	Relay 4 on Relay 4 on Relay 4 off Relay 4 off
	_00000 Alarm latching or non-latching (auto reset).	**0** Alarm 3 auto reset **1** Alarm 3 latching **2** Alarm 3 auto reset **3** Alarm 3 latching	Alarm 4 auto reset Alarm 4 auto reset Alarm 4 latching Alarm 4 latching

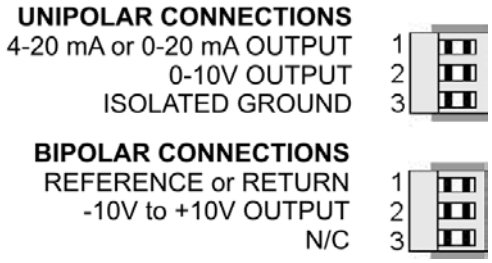
MENU KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)	
ALS34 Alarm Setup for relays 3 & 4 (continued)	00000 Alarm operates at and above setpoint (active high) or at and below setpoint (active low).	**0** AL3 active high	AL4 active high
		1 AL3 active low	AL4 active high
		2 AL3 disabled	AL4 active high
		3 AL3 active high	AL4 active low
		4 AL3 active low	AL4 active low
		5 AL3 disabled	AL4 active low
		6 AL3 active high	AL4 disabled
		7 AL3 active low	AL4 disabled
		8 AL3 disabled	AL4 disabled
	00000 Hysteresis mode or band deviation mode (see Glossary)	**0** AL3 band deviation	AL4 band deviation
		1 AL3 hysteresis	AL4 band deviation
		2 AL3 band deviation	AL4 hysteresis
		3 AL3 hysteresis	AL4 hysteresis
	00000 Number of consecutive readings in alarm zone to cause an alarm.	**0** After 1 reading	**4** After 16 readings
		1 After 2 readings	**5** After 32 readings
		2 After 4 readings	**6** After 64 readings
		3 After 8 readings	**7** After 128 reading
dEU1H Alarm 1 hysteresis **DEU2H** Alarm 2 hysteresis	0.0000 0.0000 0.0000 0.0000 0.0000 Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Alarms will activate above the setpoint by the value entered and deactivate below the setpoint by the value entered.	
DEU1b Alarm 1 band deviation **DEU2b** Alarm 2 band deviation	0.0000 0.0000 0.0000 0.0000 0.0000 Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Alarms will activate above and below the setpoint by the value entered and will deactivate in the middle of the band.	
dEU3H Alarm 3 hysteresis **DEU4H** Alarm 4 hysteresis	0.0000 0.0000 0.0000 0.0000 0.0000 Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Alarms will activate above the setpoint by the value entered and deactivate below the setpoint by the value entered.	
DEU3b Alarm 3 band deviation **DEU4b** Alarm 4 band deviation	0.0000 0.0000 0.0000 0.0000 0.0000 Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Alarms will activate above and below the setpoint by the value entered and will deactivate in the middle of the band.	

15. ANALOG OUTPUT OPTION

An optional analog board may be installed in the meter at rear panel jack position J4, adjacent to the signal conditioner board. Once installed, this board is recognized by the meter, which will bring up the appropriate menu items for it. These will not be brought up if an analog output board is not installed.

The analog output can be a 0-20 mA, 4-20 mA or 0-10V unipolar signal with respect to isolated ground, or a bipolar -10V to +10V voltage signal with respect to a reference return line. Unipolar or bipolar operation is selected by a jumper. A unipolar current or voltage output is selected at the connector. Unipolar 4-20 mA or 0-20 mA current is selected in software.





Unipolar current of voltage: Jumper **a**
Bipolar -10 to +10 voltage: Jumper **b**

The low analog output (0 mA, 4 mA, 0V, or -10V) may be set to correspond to any low displayed reading **An Lo**. The high analog output (20 mA, 0V or 10V) may be set to correspond to any high displayed reading **An Hi**. The meter will then apply a straight line fit between these two end points to provide an analog output scaled to the meter reading.

KEYSTROKES FOR SETUP

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

MENU KEY > MENU	DIGIT SELECT KEY > PEAK	VALUE SELECT KEY TARE ^ RESET
AnSEt Analog Output Setup. Press MENU until *AnSEt* is displayed (requires analog output board).	**00** Analog output signal selection.	**0** 0-20 mA current output **1** 0-10V voltage output **2** 4-20 mA current output **3** -10 to +10V voltage output
	00 Analog output filtering.	**0** Analog output unfiltered **1** Analog output filtered
An Lo Low displayed value for 0 mA, 4 mA, 0V, or -10V output	**0.0000** **0.0000** **0.0000** **0.0000** **0.0000** Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Decimal point location is fixed by ***dEC.Pt*** selection.
An Hi High displayed value for 20 mA or 10V output	**0.0000** **0.0000** **0.0000** **0.0000** **0.0000** Select digit to flash.	Select **-9** thru **9** for flashing first digit, **0** thru **9** for other flashing digits. Decimal point location is fixed by **dEC.Pt** selection.

16. SERIAL COMMUNICATION OPTIONS

A serial communications board may be connected to the DPM-3 meter main board at plug position P13 (middle position). Available boards are RS232, RS485 (with dual RJ11 connectors), RS485 Modbus (with dual RJ45 connectors), USB, and a USB-to-RS485 converter. The dual connectors of RS485 boards are wired in parallel to allow daisy chaining of addressable meters without the use of a hub. Three serial communication protocols are selectable for all serial boards: Custom ASCII, Modbus RTU, and Modbus ASCII.

A USB-to-RS485 converter board allows a DPM-3 meter to be interfaced to a computer and to be the device server for a network of up to 31 other meters on an RS485 bus, while itself retaining all capabilities of a meter. The remote meters need to be equipped with our RS485 digital interface board DPM-3-OPT-TRS485. This board has dual 6-pin RJ11 jacks, which are wired in parallel to allow multiple meters to be daisy-chained using readily-available 6-wire data cables with no need for hand-wiring or an RS485 hub. The outer two wires are used for ground.

Use 6-wire, straight-through data cables, not 4-wire telephone cables or crossover cables, all the way from the device server to the last device on the RS485 bus. Connect ATX to ATX, BTX to BTX, etc., with no crossover as you go from device to device.

To connect a meter with a USB board to a computer, use a USB cable with Type A and Type B connectors. The computer will display “Found new Hardware” followed by “Welcome to the Found new Hardware Wizard.” Follow the instructions for software installation from a CD. When the installation is complete, use Device Manager to determine the COM port. To get to Device Manger, go to the Windows Control Panel, click on System, click on the Hardware tab, then click on Device Manager. Go down the device list and click on Ports (COM & LPT) and USB serial port (COM #). Note the COM port # for use with communications to your meter, then exit Control Panel. If you later need to change the COM port, right-click on USB serial port (COM #), then on Properties, Port settings, and Advanced. Change port to the desired number, click OK, then exit Control Panel.

DOWNLOADABLE SOFTWARE AND MANUALS

Windows-based software is available from Transducer Techniques to program our meters and transmitters via a PC using the serial interface. This software can be downloaded at no charge from http://www.transducertechniques.com. Please see Section 19 for details.

Software manuals for the Custom ASCII and Modbus Protocols can also be downloaded from http://www.transducertechniques.com.

BOARD SETUP VIA JUMPERS

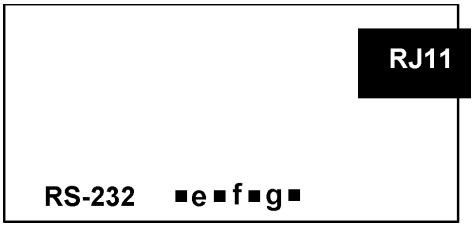
USB Board

No jumpers required.

RS232 Board

e - Normal operation.
f - Slave display to RS232 from another meter.
g - Pull-up resistor on RTS line.

Note: Board is shipped with jumpers **e** and **g** installed



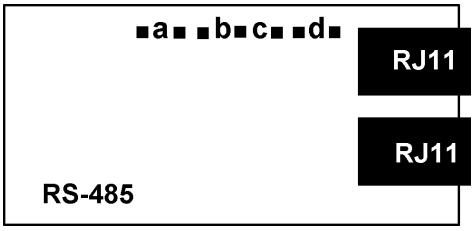
RS485 Board, Full Duplex Operation

b & d - Installed on last meter in long cable run.

RS485 Board, Half Duplex Operation

a & c - Installed for half duplex operation.
d - Installed on last meter in line with long cable runs.

Note: Board is shipped with no jumpers installed.



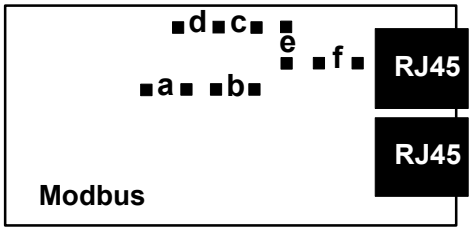
RS485-Modbus Board, Full Duplex Operation

b & e - Bias jumpers should be installed on 1 board.
a & d - Installed on last meter in long cable run.

RS485-Modbus Board, 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: Board is shipped with no jumpers installed.



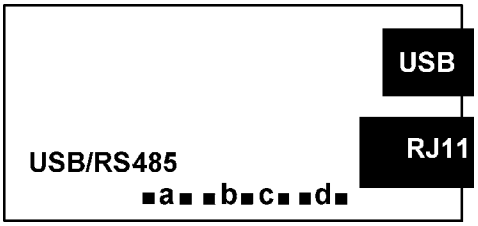
USB-to-RS485 Converter Board

Full Duplex Operation

No jumpers for short cable runs.
Add **b & d** for long cable runs.

Half Duplex Operation

a & c - Installed for half duplex operation.
d - Installed on last meter in line with long cable runs.



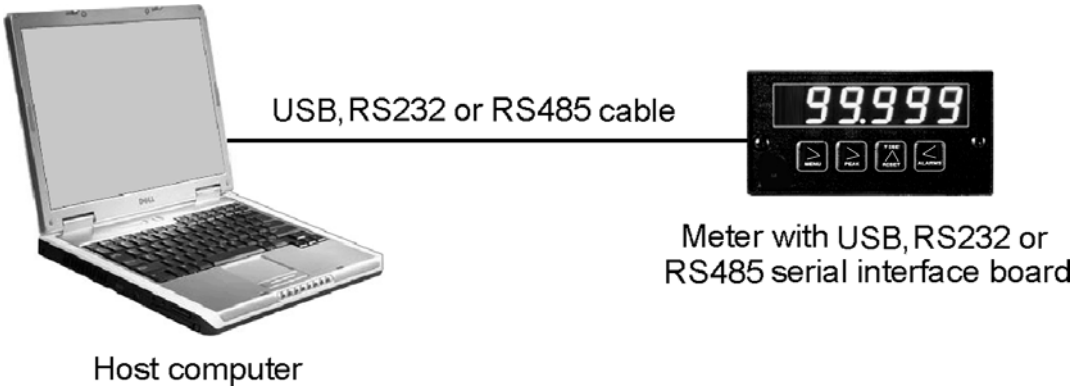
KEYSTROKES FOR SETUP

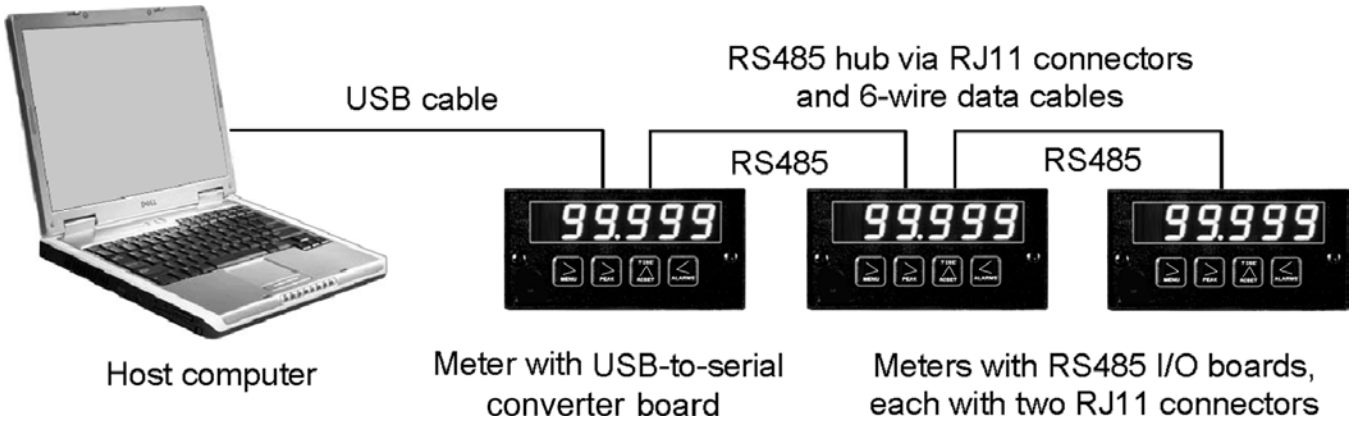
If the *MENU* [MENU] key does not work, see Section 8 "Enabling & Locking Out Menu Items."

MENU KEY [MENU]	DIGIT SELECT KEY [PEAK]	VALUE SELECT KEY [TARE / RESET]
SEr 1 Fixed Parameters: No parity 8 data bits 1 stop bit	**_000** Output filtering	**0** Send unfiltered signal **1** Send filtered signal
	_000 Baud rate	**0** 300 baud **1** 600 baud **2** 1200 baud **3** 2400 baud **4** 4800 baud **5** 9600 baud **6** 19200 baud
	_000 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	**_0000** Line feed	**0** No line feed after carriage return **1** Line feed after carriage return
	_0000 Alarm data with readings	**0** No alarm data **1** Alarm data with reading
	_0000 Control of data output	**0** Continuous data output **1** Data output on ASCII command only
	_0000 Meter address with Custom ASCII protocol	Select **1** thru **F** for addresses 1 thru 15. Select **0.** thru **F.** (with decimal point) for addresses 16 thru 31.
SEr 3 Serial Setup 3	**00000** Half or full duplex	**0** Full duplex **1** Half duplex
	00000 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 KEY (MENU)	DIGIT SELECT KEY (PEAK)	VALUE SELECT KEY (TARE / RESET)
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.	__000 Modbus ASCII gap timeout	0 1 sec 1 3 sec 2 5 sec 3 10 sec
	__000 Serial protocol	0 Custom ASCII 1 Modbus RTU 2 Modbus ASCII
	__000 Parity	0 None, 2 or more stop bits 1 Odd, 1 or more stop bits 2 Even, 1 or more stop bits
Addr Modbus Address. Appears only if the Modbus protocol is selected.	__000 __000 __000 Select digit to flash.	__247 Select 0 through 9 for flashing digit. Address range is 1 to 247.

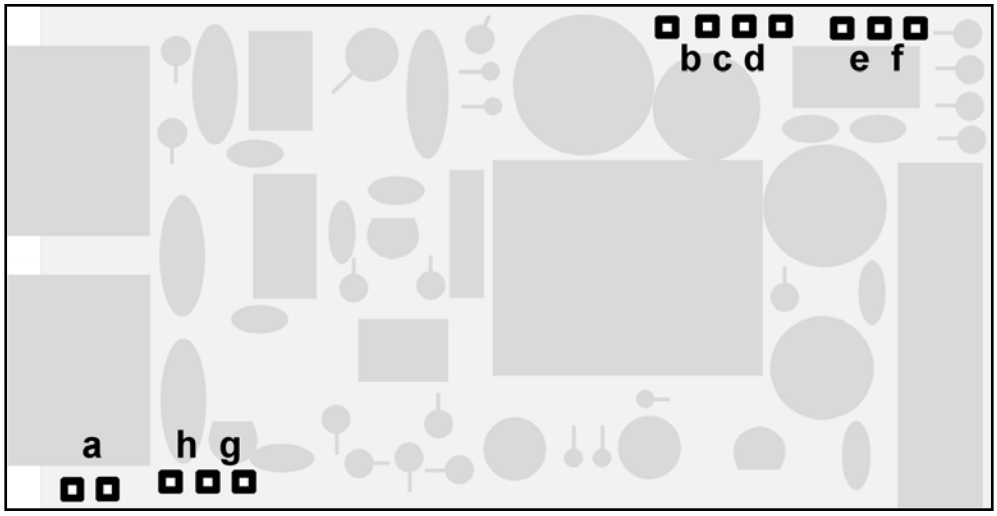
SERIAL CONNECTION EXAMPLES





17. 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 (85-264 Vac) and to the low voltage power supply (12-32 Vac or 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 Section 8)
Jumper g - Provides +5V power output at P1-4 when installed.
Jumper h - Connects "Control Input 2" to P1-4 when installed.

18. DIGITAL CONTROL INPUTS

18.1 FUNCTION OF DIGITAL INPUTS

$\overline{\text{Tare}}$	Logical **0**	Current display value is set to zero and is stored as offset value.
	Logical **1**	Displayed value equals signal input less tare value.
$\overline{\text{Peak Display}}$	Logical **0**	Peak or Valley value of input signal is displayed.
Valley Display	Logical **1**	Current value of input signal is displayed.
$\overline{\text{Hold}}$	Logical **0**	Meter display and outputs are held at last reading prior to hold going low.
	Logical **1**	Display and outputs are updated normally.
$\overline{\text{Meter Reset}}$	Logical **0**	Microcomputer reads and resets meter to values stored in non-volatile memory.
	Logical **1**	Meter display and outputs operate normally.
$\overline{\text{Function Reset}}$	Logical **0**	Microcomputer resets peak to current value, and resets alarms.
	Logical **1**	Meter display and outputs operate normally.

18.2 MENU SELECTIONS

MENU KEY (MENU)	**DIGIT SELECT KEY** (PEAK)	**VALUE SELECT KEY** (TARE / RESET)
SEtuP Press the MENU key until **SEtuP** (meter setup) is displayed.	0 **0** 12345 Press PEAK to select digit **5**, which will flash.	0 **0** 12345 Press TARE/RESET to set value for flashing digit. **0** A = Reset B = Meter Hold **1** A = Function Reset B = Peak or Valley Disp. **2** A = Meter Hold B = Peak or Valley Disp. **3** A = Meter Hold B = Tare **4** A = Peak Display B = Tare **5** A = Tare B = Reset **6** A = 1, B = 1, decimal point 1= XXXXX A = 0, B = 1, decimal point 1 = XXXX.X A = 1, B = 0, decimal point 1 = XXX.XX A = 0, B = 0, decimal point 1 = XX.XXX **7** A = 1, B = 1, decimal point 2 = XXXX.X A = 0, B = 1, decimal point 2 = XXX.XX A = 1, B = 0, decimal point 2 = XX.XXX A = 0, B = 0, decimal point 2 = X.XXX.X **8** A = Function Reset B = Display Blank **9** A = Hold B = Display Blank **A** A = Peak or Valley B = Display Blank **B** A = Tare B = Display Blank **C** A = Valley Display B = Peak Display **D** A = Tare B = Tare Reset
Both inputs A and B set to 1 for selections **2**, **4**, **A**, **C** = Function Reset Both inputs A and B set to 1 for selections **0**, **1**, **3**, **5**, **8**, **9**, **B**, **D** = Meter Reset External decimal DP1 & DP2 control the decimal point positions and override the decimal point selection in **SEtuP**.		

19. INSTRUMENT SETUP & DATA DISPLAY VIA PC

DPM-3 Instrument Setup software is a PC program which is much easier to learn than front panel programming. It is of benefit whether or not the meter is connected to a PC. With the meter connected to a PC, it allows uploading, editing and downloading of setup data, execution of commands under computer control, and the listing, plotting and graphing of data. With the meter unconnected to a PC, it provides quick selection of jumper locations and a printable display of menu selections for front panel setup.

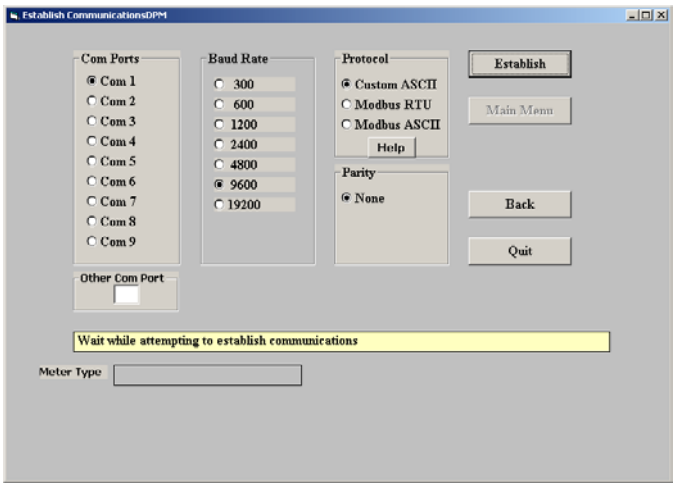
SOFTWARE INSTALLATION

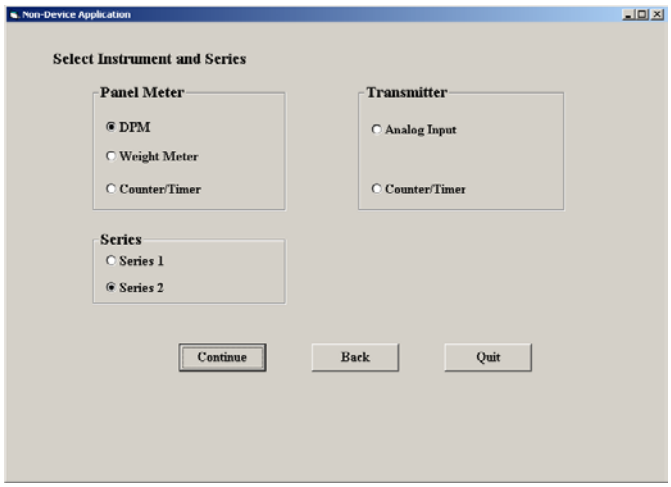
Download *DPM-3 Instrument Setup* from www.transducertechniques.com onto your PC. Double-click on the downloaded file to unzip it into a special directory, such as *c:\Program Files\DPM-3\IS*. Within that directory, double-click on *setup.exe*, which will install the software on your PC. Prerequisites for connected use are the following:

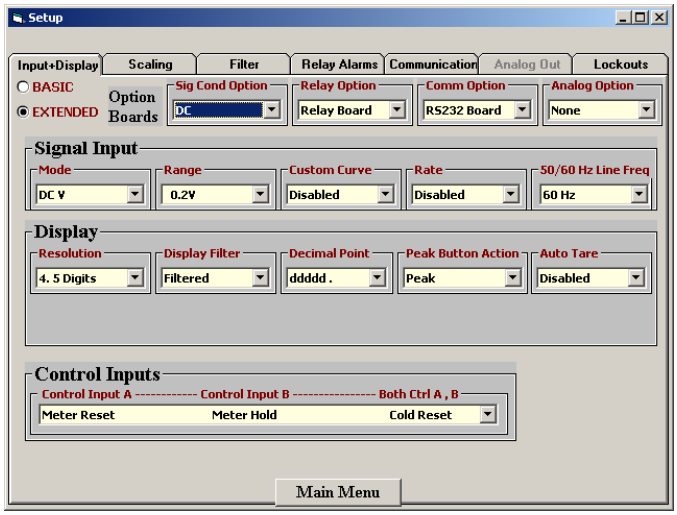
- DPM-3 meter with a DPM-3-OPT-T (RS232 option) or DPM-3-OPT-U (USB option).
- PC-compatible computer with an available RS232 or USB port.
- RJ11-to-DB9 RS232 cable (P/N DPM-3-RJ11AD9) or commercial USB cable to connect the meter to the PC.
- DPM-3 Instrument Setup software.

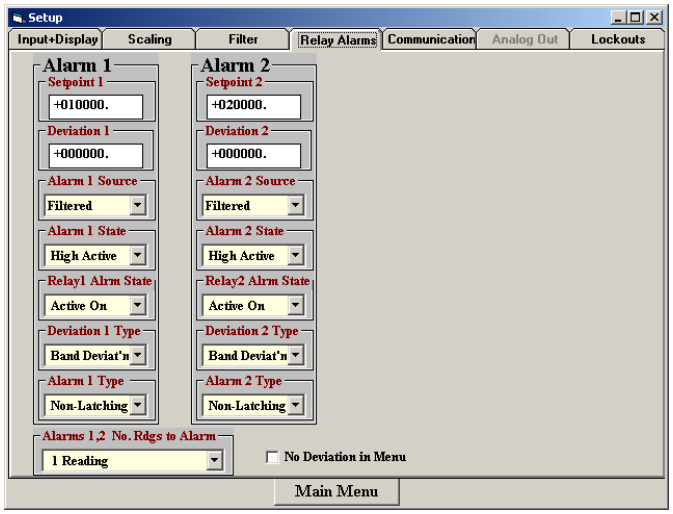
ESTABLISHING COMMUNICATIONS

Connect the meter to the PC. Apply power, and keep the meter in RUN Mode. To start the software from Windows, click on *Start > Programs > DPM-3 Digital Panel Meter > DPM-3 Instrument Setup*. Select the proper COM port and baud rate. Click on *RS232 > Establish*. The program will temporarily set the selected COM port to the required baud rate, parity, data bits and stop bit. Once communications have been established, click on *Main Menu*.









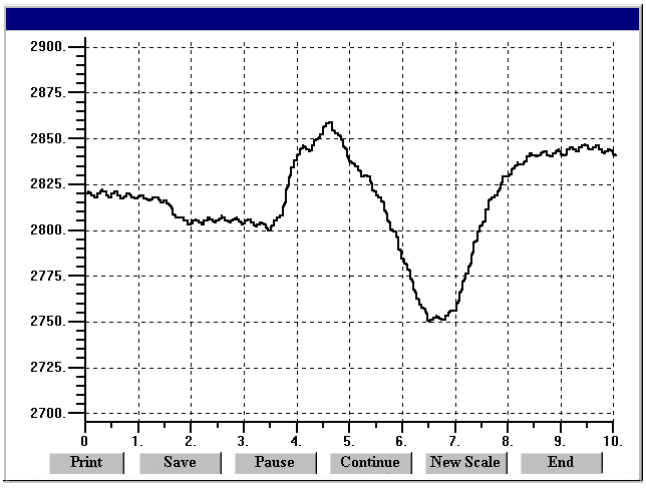
SETUP OF CONNECTED METER

A setup file can be retrieved from the meter (*DPM => Get Setup*), be edited (*View => Setup*), be saved to disk (*File => Save Setup*), be retrieved from disk (*File => Open Setup*), and be downloaded into one or multiple meters (*DPM => Put Setup*). Downloading of setup files from a PC can be a major time saving when multiple meters have to be set up in the same way.

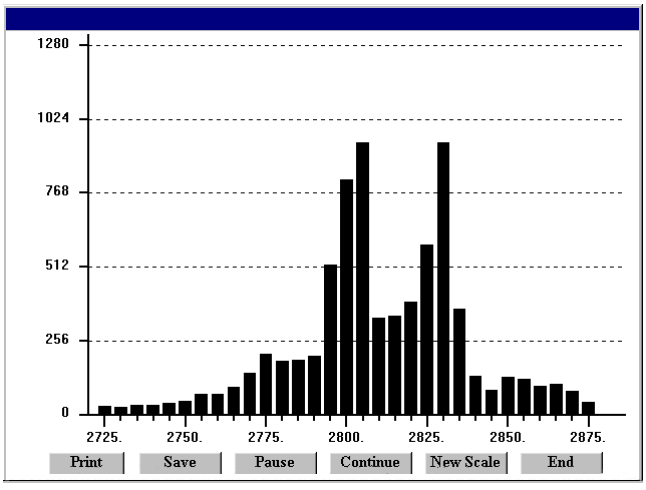
You will find that DPM-3 *Instrument Setup software* is very user friendly, with separate tab-selectable windows for *Input+Display*, *Scaling*, *Filter*, *Relay Alarms*, *Communications*, *Analog Out*, and *Lockouts*. If the required hardware, such as the analog output board, is not sensed, the corresponding tab will be grayed out.

ADDITIONAL FEATURES

- **The Commands pull-down menu** allows you to execute certain meter functions by using your computer mouse. You can reset individual meter functions, display current or peak readings, and enter numbers to be displayed remotely by the DPM. The first position of a transmitted number must be a blank, + sign or - sign. Five digits and a decimal point must be transmitted. Leading 0's serve as blanks. The *Commands* pull-down menu will be grayed out unless a *Get Setup* has been executed.

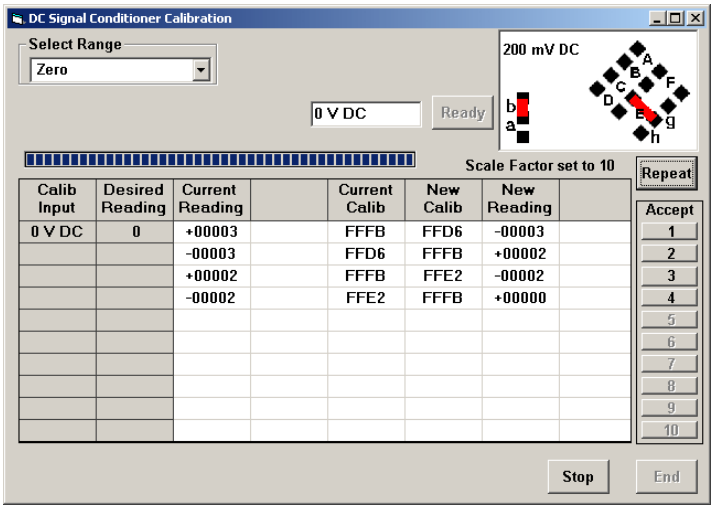


Plot



Graph

- **The Readings pull-down menu** provides three formats to display DPM data on the PC monitor. Use the *Pause* and *Continue* buttons to control the timing of data collection, then press **Print** for a hardcopy using your PC printer.
  - **List** presents the latest readings in a 20-row by 10-column table. Press *Pause* at any time to freeze the display. Press *Print* for a hardcopy. *List* can capture peak readings.
  - **Plot** generates a plot of readings vs. time in seconds. It effectively turns the DPM-PC combination into a printing digital oscilloscope.
  - **Graph** generates a histogram, where the horizontal axis is the reading and the vertical axis is the number of occurrences of readings. The display continually resizes itself as the number of readings increases.



Calib Input	Desired Reading	Current Reading		Current Calib	New Calib	New Reading
0 V DC	0	+00003		FFFB	FFD6	-00003
		-00003		FFD6	FFFB	+00002
		+00002		FFFB	FFE2	-00002
		-00002		FFE2	FFFB	+00000

- **The Jumpers pull-down menu** provides jumper positions for the various meter boards, duplicating information in this manual.

METER SETUP WITH AN UNCONNECTED PC

DPM-3 Instrument Setup software is also of benefit when the PC is not connected to a meter. Upon launching the software, click on *None* for *Communications*, then on *DPM-3* and *Continue*. Click on *File => Default Setup* to retrieve a default setup file from disk, or on *File => Open Setup* to retrieve a previously saved setup file from disk.

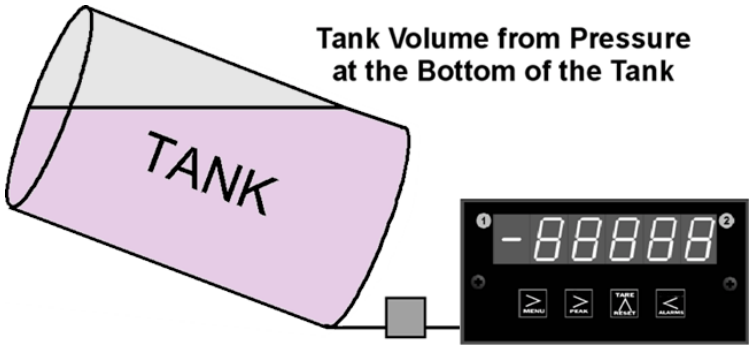
MENU KEY	S	1	2	3	4	5
InPut			d	C		V
SEtuP		0	0	0	0	0
ConFiG		0	0	0	0	0
FiLtEr		0	0	1	1	6
DecPt		d	d	d.	d	d
SCALE		0	0	0	1	0
OFFSt		0	0	0.	0	0
SEr 1				0	5	0
SEr 2			0	0	1	1
Loc 1		0	0	0	0	0
Loc 2			0	0	1	0
Loc 3			0	0	0	0

To enter new setup information, click on *View => Setup*, then make your screen selections as if you were connected to a meter. Tabs will be grayed out if you have not selected the required hardware under the *Input+Display* tab. When done, press on *Main Menu*, then on *View => Menu*. The selections made under *Setup* will now be shown in the form of the required front panel programming sequence, where each row corresponds to a menu item selected by the MENU key, and the seven data columns correspond to values entered via the PEAK and RESET keys.

Click on any step in the sequence to bring up a detailed help window. Click on *Print* for a hardcopy, which you can then use as an instruction sheet to program your meter via its front panel. Click on *Main Menu => File => Save Setup As* to save your setup to disk and have an electronic record.

20. CUSTOM CURVE LINEARIZATION

Curve.exe is a DOS-based, executable PC program used to set up an Extended meter so that the readings have a user-defined, non-linear relationship with the input signal. The calculated linearizing parameters are downloaded into non-volatile memory of the meter. For example, it allows a meter to correct for transducer nonlinearity or to display volume of an irregularly shaped tank based on pressure measured at the bottom of the tank. The curve-fitting algorithm uses quadratic segments of varying length and curvature, and provides diagnostics to estimate curve fitting errors. The program is self-prompting, avoiding the need for a detailed printed manual. This manual section is only intended as an introduction.



PREREQUISITES

1) PC-compatible computer with an available USB or RS232 communications port.
2) Extended DPM-3 meter.
3) A USB or RS232 board in the meter. This board can be used for meter setup only, then be removed.
4) USB cable, A to B, or RS232 cable, RJ11-to-DB9 (P/N DPM-3-RJ11AD9), to connect the meter and PC.
5) Curve.exe software, available from Transducer Techniques.

GETTING STARTED

Download *curve.exe* into the same directory that will contain your data files, such as c:\curves. Set the meter baud rate to 9600. To do so, press the ≥ key to get to **SEr 1**, then set the entry to **__050**. Set the meter address to 1. To do so, press the ≥ key to get to **SEr 2**, then set the entry to **_0011**. To execute the program from Windows, simply double-click on *curve.exe*, which is an executable file. Follow the steps on computer screens, which will prompt you and provide extensive information. Pressing **R** (Enter) returns to the main menu. You will be given the choice to enter your data in one of four modes:

1) **Text file entry mode,** with an X value in one column and a Y value in another. There can be additional columns, which are ignored. The file must have a DOS name of up to 8 characters and the extension .RAW. There can be from 5 to 180 rows. X is the input value and should be in the unit of measure for which the meter was set up, such as mV or V. Y is the desired corresponding reading, and can range from -99999 to 99999 with any decimal point.
2) **2-coordinate keyboard entry mode,** where an actual X input signal is applied, and the desired Y reading is entered from the keyboard.
3) **2-coordinate file entry mode,** where an actual X input signal is applied, and the desired Y reading is provided from a file.

4) **Equation entry mode,** where the coefficients of a polynomial Y = K1X^P1 + K2X^P2 + K3*X^P3 + … are entered. Up to 20 terms are allowed. An offset can be built into X.

You will be asked if your DPM has a revision of DPM4L or later. You will normally select **2** (yes), since revision DPM4L started to ship in August 2000.

You will be asked to supply the following:

LOW X-COORDINATE VALUE >
LOW INPUT MEASUREMENT VALUE >
HIGH X-COORDINATE VALUE >
HIGH INPUT MEASUREMENT VALUE >

This informs the computer of your signal conditioner jumper settings. Enter 0 and 0 for the two LOW values. For HIGH X, enter your signal conditioner jumper range in the same units of measure that you will be using in your *.RAW data input file. Enter **20** for 20 mV or 50mV. For HIGH INPUT MEASUREMENT VALUE, enter **20000**

Position of the decimal point from 6=X.XXXXX, 5= XX.XXX, 4=XXX.XXX, 3=XXXX.XX, 2=XXXXX.X, 1=XXXXXX (for DPMs, the leading X is a blank). Specify the same position that you specified in the **dEc.Pt** decimal point menu selection.

Follow the steps on the screens to finish generating the custom curve. When prompted to download the file to the meter, select **Y**. When prompted to set the meter to custom curve mode, also select **Y**.

KEYPAD CONTROL

You can take a meter in and out of custom curve linearization using the meter keypad. From the Menu mode, press the key to get to **ConFG**, then set the fifth digit to either **0** (normal linear operation) or to **1** (custom curve operation). This fifth digit will only be displayed with an Extended meter.

FILES USED OR CREATED BY CURVE.EXE

1) ***.RAW** is the raw input file generated by all four data entry methods.
2) ***.DVD** adds three columns from which the smoothness of the input data and obvious input errors can be judged. The more data points and the smoother the data, the better the curve fit.
3) ***.NUM** lists Y readings prior to custom curve linearization and addition of the decimal point.
4) ***.CCF** is an internal file used by the software.
5) ***.SIM** lists simulated linearized meter readings and calculated corresponding errors.
6) ***.PRM** contains the final hex data that is downloaded into the meter.

21. METER CALIBRATION

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.

Annual meter recalibration by the factory is recommended. Please contact Transducer Techniques for an RMA number.

22. SPECIFICATIONS

Display

Type .....5 LED, 7-segment, 14.2mm (.56") high digits & 3 LED indicators
Color..... Red
Range..... -99999 to +99999
TEDS Status Indicator..... Yellow LED lamp
TEDS Status..... With a TEDS transducer, lamp lights with TEDS enabled and in Plug and Play mode

A-TO-D Conversion

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 0 = tied to digital ground, logic 1 = open)

/ Hold input .....Logic 0 holds display and outputs
/ Peak or Valley input .....Logic 0 displays peak/valley value
/ Tare input ..... Logic 0 offsets input value to zero
/ Tare Reset .....Logic 0 resets Tare value to zero
/ Reset input ..... Logic 0 resets all meter functions
/ Function Reset input .....Logic 0 resets peak values and alarms
/ Decimal Point input .....Overrides internal DP selections and controls DP position
/ Display Blank input .....Logic 0 shuts off the display

Accuracy

Input Range	Resolution	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	-99,999 to +99,999	0 to ±99,999	0.01% of Full Scale ±2 counts

Span Tempco (load cell signal conditioner).....0.0015% of reading/°C
Zero Tempco ..... 0.2 µV/°C

Power Requirements

Input Voltage rating (standard).....85-264 Vac or 90-300 Vdc
Input Voltage rating (low voltage option) .....12-32 Vac or 10-48 Vdc
Power Line Frequency .....DC and 47-63 Hz
Power Consumption, Max ..... 5 Watts

Excitation Outputs

Voltage & Current Levels (jumper selectable) ..... 5 Vdc ±5%, 100 mA max
10 Vdc ±5%, 120 mA max
24 Vdc ± 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..... 50 Vdc

Dual & Quad Relay Options

Power to Relay Option .....Powered by meter
Setpoint Setup..... Via front panel pushbuttons or serial communication
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 or 4 red LED lamps
Status Indication Setup (selectable).....Lit when output is ON or OFF, or disabled

Form C, SPDT Relay Output:

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

Form A, SPST Solid State Relay Output:

AC Rating ..... 120 mA @ 140 Vac
DC Rating ..... 120 mA @ 180 Vdc
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

Analog Output Option

Power to Analog Output Option ..... Powered by meter
Output Levels ..... 0-20 mA, 4-20 mA, 0-10V, -10 to +10V
Voltage Compliance, 0-20 mA Output ..... 12V (0-600 Ohm load)
Current Compliance, 0-10V, -10 to +10V Output ..... 2 mA (5 kOhm or higher load)
Accuracy ..... Meter input accuracy ±0.02% of full scale analog output
Resolution ..... 16 bit (1 part in 65,536)
Response Time ..... 50/60Hz update rate
Scaling of Reading for Zero Output ..... -99,999 to +99,999
Scaling of Reading for Full Scale Output ..... -99,999 to +99,999
Isolation rating between signal common and analog output ..... 250V ac
Insulation dielectric strength between signal common and analog output .....
..... 3.5 kV ac for 5 sec, 2.3 kV ac for 1 min

Serial Interface Option (USB, RS232, RS485, RS485-Modbus boards)

Output Types ..... RS232, RS485, RS485-Modbus, USB, USB-to-RS485 converter
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, RS485, USB standards
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
Option Board Connectors:
- RS232 ..... Single RJ11 jack
- RS485 ..... Two RJ11 jacks (for daisy chaining with 6-wire data cables)
- RS485 (for Modbus std) ..... Two RJ45 jacks (for daisy chaining with 8-wire data cables)
- USB ..... USB type B plug
- USB-to-RS485 converter ..... USB type B plug plus RJ11 jack to RS485 bus

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 (IP65) from front when panel mounted (not verified for UL)
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.

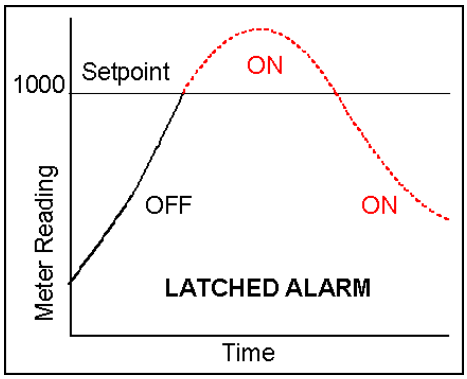
23. GLOSSARY OF TERMS

Adaptive Filter Threshold

A threshold which causes an adaptive moving average filter to be reset to the latest reading when the accumulated difference between individual readings and the filtered reading exceeds that threshold. Adaptive moving average filtering allows the meter to respond rapidly to actual changes in signal while filtering out normal noise. The accumulated difference is also reset to zero when the latest reading has a different polarity than the filtered reading. A low adaptive filter threshold is normally selected. A high filter threshold should be selected if the signal has large transients.

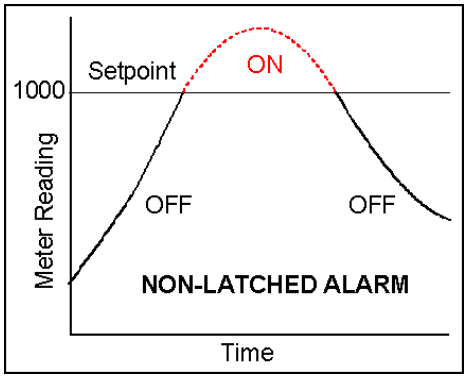
Alarm, Latched

An alarm which stays actuated until reset. Latched alarms can shut down machinery or a process when an operating limit has been exceeded, or maintain an alarm condition until acknowledged by an operator.



Alarm, Non-latched

An alarm which changes state automatically when the reading rises above a specified limit and changes back automatically when the reading falls below a limit.



Autofilter A selectable digital filter mode which automatically selects an appropriate moving average filter time constant from 0.08 sec to 9.6 sec for the encountered noise condition.

Auto-tare A selectable meter operating mode, where the first reading following power-on or meter reset is used to zero the display. Further readings are then relative to this new zero.

Batch Average Filter

A digital filter mode which averages 16 readings and then displays the average. Readings are taken at 60/sec with 60 Hz power and 50/sec with 50 Hz power.

Counts The reading displayed on the meter ignoring the decimal point.

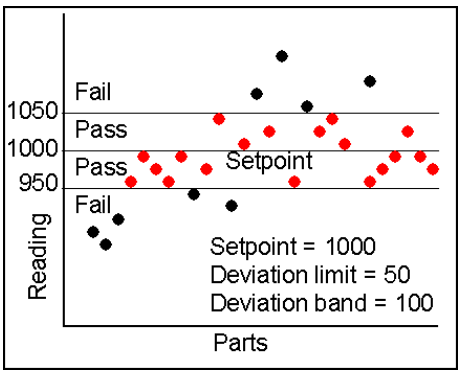
Custom ASCII Protocol

A simplified serial communications protocol which allows 31 digital addresses. Not an industry-standard protocol like the more complex Modbus protocol, which is also offered with the meter.

Deviation Band

A band in counts which controls relay action symmetrically around a setpoint. The relay actuates when the reading falls within the deviation band, and de-actuates when the reading falls outside. A limit (e.g., 50 counts) is set up around both sides of the setpoint to create a deviation band (e.g., 100 counts).

Setting up a passband around a setpoint is often used for component testing. Deviation limits are programmed by entering menu item dEU1b for Alarm 1 and dEU2b for Alarm 2. The deviation band will be equal to two limits.



Display Blank A rear panel input which blanks the display when the input is tied to logic ground by a switch or 0V is applied (logic level true). The meter display will light when the input is open or is held at +5V (logic level false).

Extended Meter

A meter with an enhanced microcomputer that provides added capabilities, such as linearization of nonlinear inputs and display of rate of change from successive readings.

Full Scale The maximum input signal range for which the meter has been configured. For example, the most sensitive full scale for the load cell meter is ±20 mV (signal range from -20 mV to +20 mV).

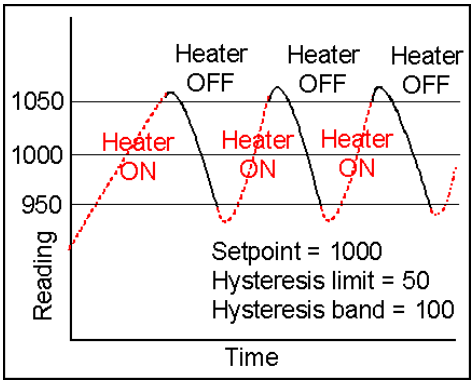
Function Reset

A rear panel control input which resets Peak, Valley and any latched alarms when the input is tied to logic ground by a switch or 0V is applied (logic level true). To reset the value again, the input must be open or 5V applied (logic level false) and then set low.

Ground Loop A closed conductive path in external ground wiring that allows stray currents to flow in ground wiring, creating ground noise. The meters in this manual minimize ground loop problems by mutually isolating the grounds associated with meter power, signal input, and all output and communication options.

Jumper A push-on component which provides a short between two adjacent posts on a circuit board. Jumpers are used to configure the load cell signal conditioner board for specific full scale ranges, and to configure power supply and communications boards for various modes of operation. Unused jumpers are stored by pushing one side over an unused post.

Hysteresis Band



A band which controls relay action symmetrically around a setpoint. The relay closes (or opens) when the reading goes above the setpoint plus one hysteresis limit, and opens (or closes) when the reading falls below the setpoint less one hysteresis limit. A narrow hysteresis band is often used to minimize relay chatter around a setpoint due to electrical noise or signal feedback caused by load switching. A wide hysteresis band can be used for control applications, such as turning on a fill pump when the tank level has reached a lower limit and shutting off the pump when the tank level has reached an upper limit. The hysteresis band will be equal to two hysteresis limits.

Menu Mode The meter programming mode used for input and range selection, meter setup, and meter configuration. Entered into from the Run mode by pressing the MENU key. The Menu mode can be locked out completely by a jumper.

Meter Hold A rear panel input which freezes the meter display and all meter outputs while that input is tied to logic ground by a switch or is held at 0V (logic level true). The meter will resume operation when the input is allowed to float or is held at +5V (logic level false).

Modbus An industry-standard serial communications protocol which allows devices by different manufacturers to be digitally addressed by a PC on the same communication line, with up to 247 digital addresses. More complex than the Custom ASCII protocol, which is also supported by the meter.

Moving Average Filter

A digital filter mode which displays a weighting moving average of readings. Readings are taken at 60/sec with 60 Hz power and 50/sec with 50 Hz power. Display update rates remain 3.5/sec with 60 Hz power and 3.0/sec with 50 Hz power. There are eight moving average modes:

Old average x 1/2 + new reading x 1/2 (equivalent to 0.08 sec RC time constant).
Old average x 3/4 + new reading x 1/4 (equivalent to 0.15 sec RC time constant).
Old average x 7/8 + new reading x 1/8 (equivalent to 0.3 sec RC time constant).
Old average x 15/16 + new reading x 1/16 (equivalent to 0.6 sec RC time constant).
Old average x 31/32 + new reading x 1/32 (equivalent to 1.2 sec RC time constant).
Old average x 63/64 + new reading x 1/64 (equivalent to 2.4 sec RC time constant).
Old avg. x 127/128 + new reading x 1/128 (equivalent to 4.8 sec RC time constant).
Old avg. x 255/256 + new reading x 1/256 (equivalent to 9.6 sec RC time constant).

Offset A constant adder used for the displayed reading. This is the term b in the straight line formula y = mx + b, where y is the displayed reading in counts, m is the scale factor, x is the measured reading in counts, and b is the offset. For direct readout in (milli)volts or (milli)amps, offset is 0.

Peak Display The maximum (or most positive) reading since that maximum was last reset. Reset can be via the meter front panel, an external input, or a software command. The displayed value can reflect the filtered or unfiltered readings.

Rate of Change Meter

A configuration mode of the *Extended meter* which allows the display of rate based on successive readings. The conversion to engineering units is achieved with the combination of a multiplier from 0.1 to 10,000 and a scale factor.

Reading The value displayed by the meter. “Taking a reading” is the action of the meter to make an analog-to-digital conversion. Readings are taken at 60/sec with 60 Hz power or 50/sec with 50 Hz power, and are displayed with an update rate of 3.5/sec with 60 Hz power or 3.0/sec with 50 Hz power.

Remote Display

A display mode which allows the meter to serve as a remote display to another meter when connected to it by a 4-wire phone cord. Also allows the meter to transmit raw measurement data to a computer and then display processed data from the computer. A serial communications option board is required in the meter. If such a board is not installed or no serial data is received, the meter displays rESEt.

Reset

There are three types of Reset:

- Peak and Valley Reset. Achieved by simultaneously pressing the RESET and PEAK keys.
- Latched Alarm Reset. Achieved by simultaneously pressing the RESET and ALARMS keys.
- Meter Reset. Causes the meter to reinitialize and take a tare reading when set up for auto-tare. Achieved by powering up the meter, simultaneously pressing the RESET and MENU keys, stepping through all top-level menu choices, grounding a rear panel connector, or supplying an ASCII command. rESEt is displayed briefly.

RS485 Half Duplex

Serial communications implemented with two wires, allowing data transmission in both directions, but not simultaneously.

RS485 Full Duplex

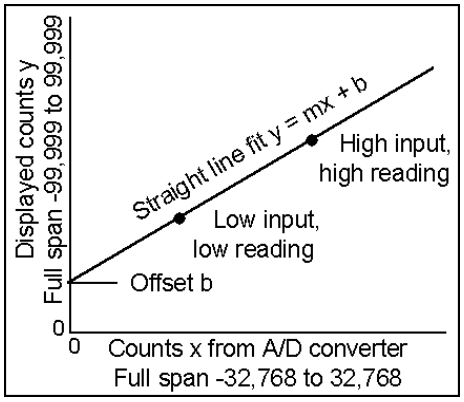
Serial communications implemented with four wires, allowing data transmission in two directions simultaneously.

Run Mode

The normal operating mode of the meter, where readings are taken, as opposed to the menu mode.

Scale

A constant multiplier used to go from A/D converter counts to displayed counts. This is the slope term m in the straight line formula y = mx + b, where y is the displayed reading in counts, m is the scale factor, x is the measured reading in counts, and b is the offset. For direct readout in mV or mA, scale is 1.



Scaling

The process of setting scale and offset so that the meter reads properly in engineering units, such as lbs.

Scaling, Coordinates of 2 Points Method

A scaling method where four numbers are entered manually: low input, desired reading at low input; high input, and desired reading at high input. The meter then applies a straight line fit. The decimal point is set by the separate dEC.Pt menu item. If the Maximum Physical Value of the sensor exceeds 100000, the calculated scale and offset are divided by 10 and the reading is in 10's of units.

Scaling, Scale and Offset Method

A scaling method where scale and offset are entered manually.

Scaling, Reading Coordinates of 2 Points Method

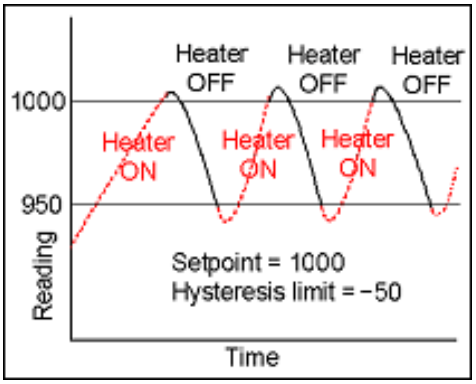
A scaling method, where the low and high input values are determined from actual signals. A known low signal is first applied to the meter, such as the output of a pressure transducer at zero pressure. That signal is captured as the low input value, and the desired low reading is entered. A known high signal is then applied, such the output of a transducer for a know weight or pressure. That signal is captured as the high input value, and the desired high reading is entered. The meter then applies straight line fit. 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 decimal point is set by the separate dEC.Pt menu item.

Setpoint A value compared to the reading to determine the state of a relay. Term often used interchangeably with "alarm setpoint." The relay action can by latching or non-latching, utilize a hysteresis band, or utilize a deviation band. Hysteresis bands and deviation bands are specified by two symmetrical limits around the setpoint.

Span The number of counts corresponding to a given signal range.

Split Hysteresis

A hysteresis mode where a setpoint and a single-side hysteresis limit are entered. That limit can be negative or positive. If the limit is negative, the relay will close below the hysteresis limit, for example to turn on a heater, and open when the setpoint is reached. If the limit is positive, the relay will close when that limit is reached, for example to turn on a cooler, and open when the setpoint is reached. Split hysteresis is an alternative to normal hysteresis, where the setpoint is at the center of a symmetrical hysteresis band.



Tare A rear panel input which causes the display to be set to zero when the input is momentarily tied to logic ground by a switch or is held at 0V (logic level true). When the input is allowed to float or is held at +5V (logic level false), the meter displays readings relative to this new zero. A common application is in weighing, where an external Tare button is pressed to read the weight of an empty scale (tare), and tare is then automatically subtracted as a constant from gross weight for display of net weight. Tare can also be used for other applications where a reading relative to starting point is desired.

TEDS 1451.4 TEDS, or Transducer Electronic Data Sheet, is a set of electronic data in a standardized format defined within the IEEE 1451.4 standard that is stored in EEPROM. This data specifies what type of sensor is present, describes its interface, and gives technical information such as sensitivity, bridge type, excitation, etc. With TEDS Plug and Play, the sensor and the meter are automatically scaled as a system at power on.

Valley Display

The minimum (or most negative) reading since that minimum was last reset. Reset can be via the meter front panel, an external input, or a software command. The displayed value can reflect the filtered or unfiltered readings.

Zero An adjustment so that a given low transducer output reads zero on the meter. Zero is adjusted by programming offset.

24. ACCESSORIES

DPM-3-AD9

Adapter Connector

INSTALLATION INSTRUCTIONS

1. Remove the three (3) connectors from the J5 location at the rear of the DPM-3 meter (See DPM-3 Operator Manual, Page 6, Section 5.1 for illustration of J5 location)

2. Install the **DPM-3-AD9** Adapter Connector at the J5 location

Wiring Diagram / Schematic

Figure 1 **NON-TEDS Load Cell / Torque Sensor**

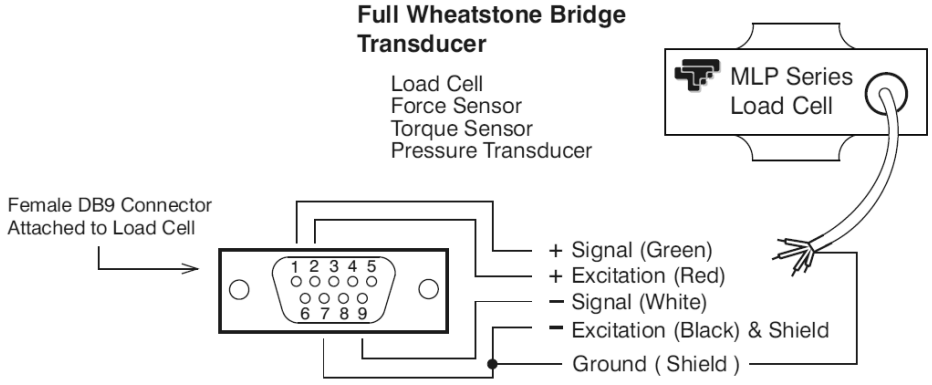
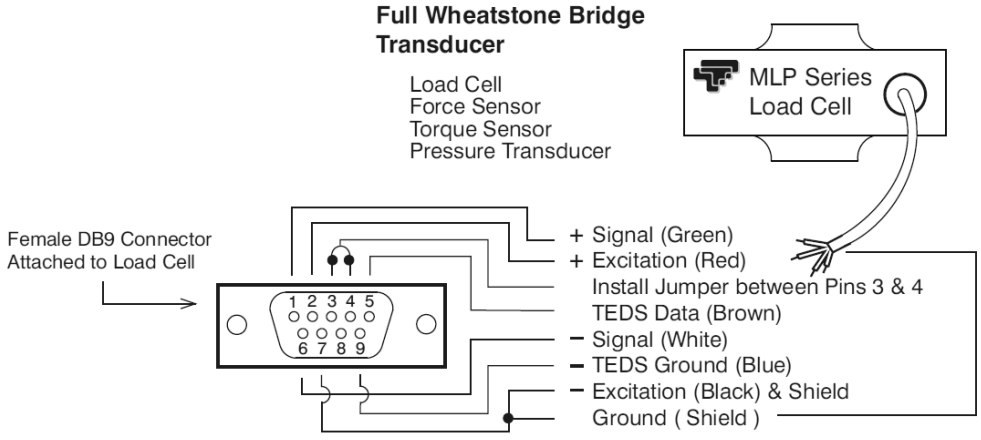


Figure 2* **TEDS IEEE 1451.4 Smart Load Cell / Torque Sensor**



*** Compatible for use with IEEE 1451.4 compliant National Instruments devices**

DPM-3-PC6 & DPM-3-PC12
Power Cable to Meter

DPM-3-RJ11AD9
RS232 Data Cable, PC to Meter

USB-2.0-A/B
USB Cable, Type A/B, 10 ft.

DPM-3-DLS
Data Logging Software

DPM-3-TRES
TEDS Reader_Editor Software

DPM-3-SFC
Splashproof Front Cover. Seals meter against instrument panel.

25. WARRANTY & REPAIR POLICY

Limited Warranty on Products

Any of our products which, under normal operating conditions, proves defective in material or in workmanship within one (1) year from the date of shipment by Transducer Techniques, will be repaired or replaced free of charge provided that you obtain a return material authorization from Transducer Techniques and send the defective product, transportation charges prepaid with notice of the defect, and establish that the product has been properly installed, maintained, and operated within the limits of rated and normal usage. Replacement product will be shipped F.O.B. our plant. The terms of this warranty do not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The replacement warranty detailed here is the Buyer's exclusive remedy, and will satisfy all obligations of Transducer Techniques, whether based on contract, negligence, or otherwise. Transducer Techniques is not responsible for any incidental or consequential loss or damage which might result from a failure of any Transducer Techniques' product. This express warranty is made in lieu of any and all other warranties, expressed or implied, including implied warranty of merchantability or fitness for particular purpose. Any unauthorized disassembly or attempt to repair voids this warranty.

Obtaining Service Under Warranty

Advance authorization is required prior to the return to Transducer Techniques. Before returning the item(s), either write to the Repair Department c/o Transducer Techniques, 42480 Rio Nedo, Temecula, CA 92590, or call (951) 719-3965 with: 1) a part number; 2) a serial number for the defective product; 3) a technical description of the defect; 4) a no-charge purchase order number (so products can be returned to you correctly); and, 5) ship to and bill to addresses. Shipment to Transducer Techniques shall be at Buyer's expense, and repaired or replacement items will be shipped F.O.B. our plant in Temecula CA. Non-verified problems or defects may be subject to a $75 evaluation charge. Please return the original calibration data with the unit.

Obtaining Non-Warranty Service

Advance authorization is required prior to the return to Transducer Techniques. Before returning the item(s), either write to the Repair Department c/o Transducer Techniques, 42480 Rio Nedo, Temecula, CA 92590, or call (951) 719-3965 with: 1) a model number; 2) a serial number for the defective product; 3) a technical description of the malfunction; 4) a purchase order number to cover Transducer Techniques' repair cost; and 5) ship to and bill to addresses. After the product is evaluated by Transducer Techniques, we will contact you to provide the estimated repair costs before proceeding. The minimum evaluation charge is $75. Shipment to Transducer Techniques shall be at Buyer's expense, and repaired items will be shipped to you F.O.B. our plant in Temecula, CA. Please return the original calibration data with the unit.

Repair Warranty

All repairs of Transducer Techniques' products are warranted for a period of 90 days from the date of shipment. This warranty applies only to those items which were found defective and repaired; it does not apply to products in which no defect was found and returned as is, or merely re-calibrated. Out of warranty products may not be capable of being returned to the exact original specifications or dimensions.

FOR TECHNICAL SUPPORT, CALL (800) 344-3965 OR FAX (951) 719-3900

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Sensors ™

(800) 344-3965

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