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DP130 Series Digital Pressure Test Systems



12/06

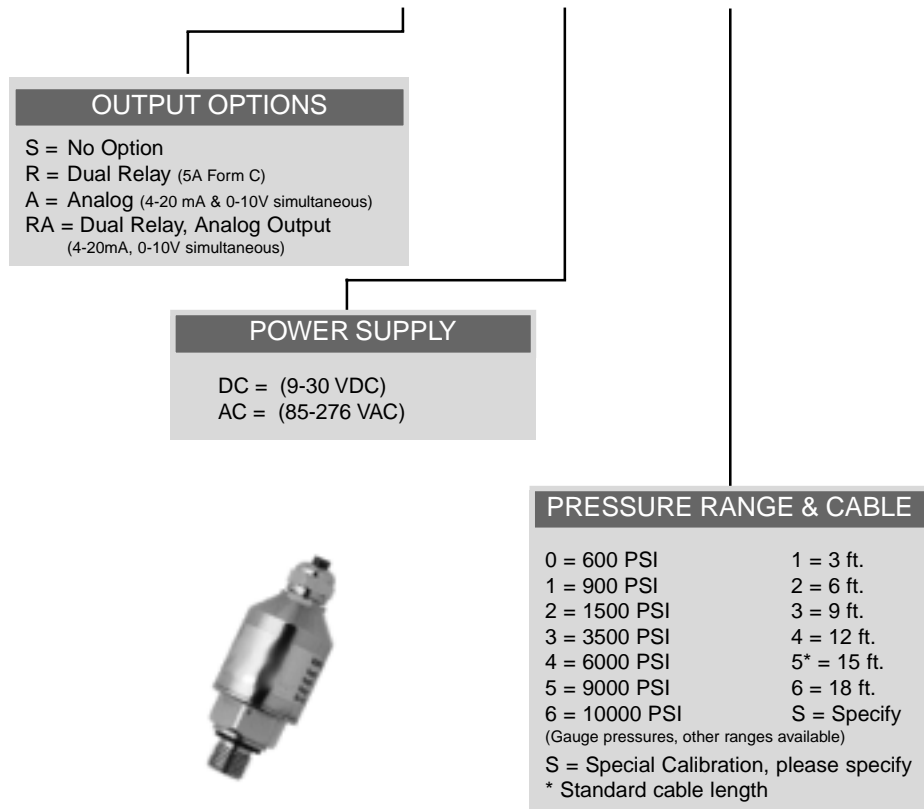
DP130-MA-ENG-1237.pdf

Designed and produced by Webtec Graphics.

www.webtec.co.uk

Installation and Operation

MODEL NUMBERS & PRESSURE TRANSDUCER SPECIFICATIONS



Pressure Transducer Features

- ASIC Optimized Temperature Performance
- RFI / EMC Protection 30V/m
- Accuracy +/- 0.15% span
- Vibration Tolerance 35g peak, 5 - 5000 Hz.
- Fatigue Life 100 Million FS Cycles
- Stainless Steel Wetted Parts
- Supplied with Integral Cable
- 1/4" NPT Port Connection (other available)
- Output 4-20 mA 2 wire (other available)

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Some equipment listed in our catalog is capable of generating radio frequency energy. If not installed and used in accordance with the instructions, these units may interfere with radio communications.

INTRODUCTION/ DESCRIPTION

This manual describes the installation of Webster DP130 series digital panel meters (DPM's). This manual steps through the installation of the DP130 in a logical order. First is a brief description of the base unit and the plug-in option boards. Next comes mounting information, wiring diagrams (including DIP switch settings), and programming instructions. Finally, this manual contains diagnostic test and calibration information and specifications. Once properly installed, there are no operator functions for the DPM.

DESCRIPTION

Base Unit

The DP130 converts a linear, 4-20 mA current input or 0-10 V signal from a pressure transducer into a digital readout in pressure engineering units, normally PSI. The display can be scaled to read out in units other than PSI. For instance, a pressure sensor may be used to monitor the pressure in a hydraulic cylinder with a known bore diameter. In this case, the DP130 could be calibrated to read pounds force exerted by the cylinder. The base unit contains slots for mounting optional, plug-in circuit boards for relay output, analog retransmission, and serial communication capabilities.

Relay Output Option Board

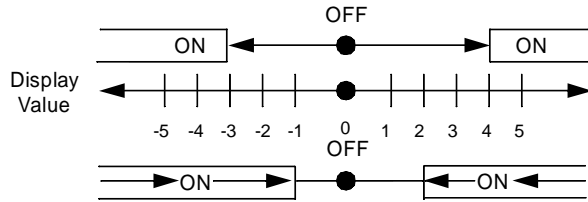
The optional relay board contains two form C (normally open and normally closed contacts) relays. Each relay has an adjustable high and low setpoint. The relays act as alarms by turning on when the value on the display is greater than the high setpoint OR is less than the low setpoint. If the low setpoint is greater than the high setpoint, the relay turns on when the value on the display meets both conditions; less than the low setpoint AND greater than the high setpoint. See specifications page 20 for details on the factory calibration of this particular unit.

Once a relay turns on, it stays on until the displayed value returns back across the setpoint "and then some". The "and then some" is called hysteresis. Hysteresis is a programmable value that is common to both setpoints and both relays. This means that a relay turns off when the display is less than or equal to the high setpoint minus the hysteresis value, or when the display is greater than or equal to the low setpoint plus the hysteresis value. Should an overlap occur between on and off conditions, the on condition overrides the off condition.

DESCRIPTION cont.

Example: Relay Output Operation

High Setpoint = 4 Relay ON above 4
 Low Setpoint = 3 Relay ON below -3
 Hysteresis = 2 Relay OFF below 2 and above -1



Analog Retransmission Option Board

The optional analog output board provides linear 0-10 V and 4-20 mA signals. When the displayed value is equal to the programmed output offset value, the output voltage is zero and the output current is 4 mA. When the displayed value is equal to the programmed output full scale value, the output voltage is 10 V and the output current is 20 mA.

When the displayed value is between the output offset and output full scale value:

1. The output voltage = $10 \frac{(\text{displayed value} - \text{output offset})}{(\text{output full scale} - \text{output offset})}$ V,
2. The output current = $16 \frac{(\text{displayed value} - \text{output offset})}{(\text{output full scale} - \text{output offset})}$ mA + 4 mA

RS 485 Serial Communications Option Board

The optional serial communication board allows a host device to download and read programming parameters and to read status information from the DP130, such as display value, relay status, etc.

This manual does not contain information on the serial communication protocol or the serial command list. That information is contained in the DP130 serial specification and is obtainable by contacting the Webster Literature Department at 800-932-8378 (U.S. and Canada), or 414-769-6400 or by FAX at 414-769-6591.

System Calibration

Customer: _____ WI Control #: _____
 Customer Order #: _____ Calibration Date: _____
 Order Date: _____ Calibration By: _____

Voltage: AC DC (strike one) Fluid: DTE 24, 150 SUS, 30 cST @ 100 °F

Readout Model #: DP130- _____ Serial #: _____

Pressure Transducer Model #: _____ Serial #: _____

Transducer Range: _____ psi Output: (mA, V) _____ @0, _____ @ FS

OPTIONAL OUTPUT SETTINGS

Analog Output Settings:

Low: _____ = _____
 High: _____ = _____

Relay / Alarm Settings:

Hysteresis: _____

Relay #1 Low: _____ = _____
 High: _____ = _____

Relay #2 Low: _____ = _____
 High: _____ = _____

RS485 Settings

Address: _____ (00-99)
 Baud Rate: 1200, 2400, 4800, 9600, 19200
 Parity: Even, Odd, None

SPECIFICATIONS cont.

OPTIONAL OUTPUTS

Relay Board

Number of relays:	2
Contact type:	1 set form C per relay
Contact rating:	5A, 250 VAC or 30 VDC
Isolation dielectric strength:	2300 VAC

Analog Retransmission

Output signals:	4-20 mA (<750 W) and 0-10 V (>2500 W)
Accuracy:	0.13% full scale and 100 PPM /°C (and 0.07% full scale change over 4-20 mA load ranges)
Isolation dielectric strength:	2300 VAC to signal inputs, relays, & AC power input, 500 VAC to RS 485 and DC power inputs

RS 485 Serial Communications

Baud Rate:	1200, 2400, 4800, 9600, or 19,200, programmable
Parity:	Even, odd, or no parity
Address Range:	00 to 99 decimal
Protocol:	Opto 22® compatible
Isolation Dielectric Strength:	2300 VAC to signal inputs, relays, & AC power input, 500 VAC to analog outputs and DC power inputs

ENVIRONMENTAL

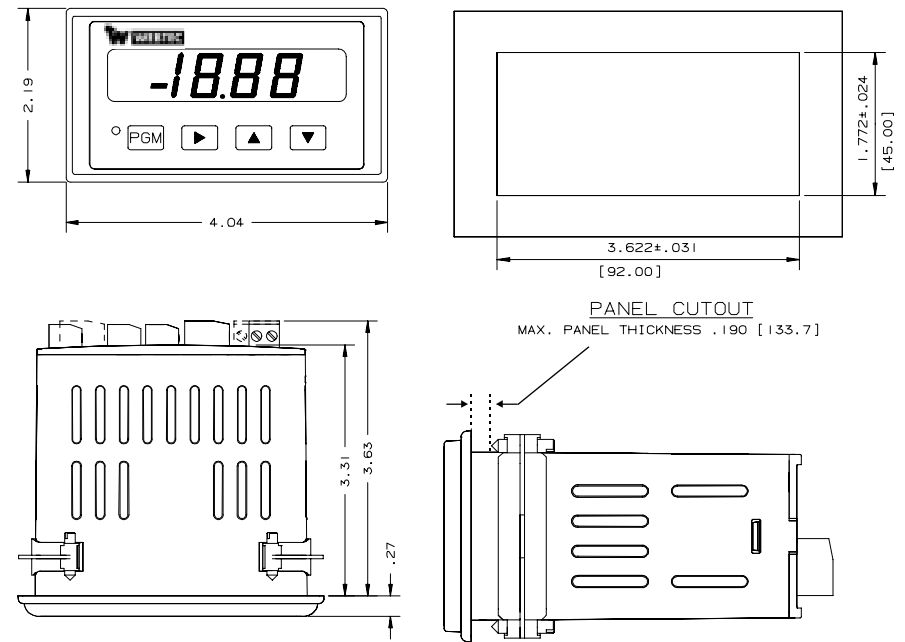
Operating Environment:	Indoor use to 2000 meters
Temperature:	Operating: 0 to 50°C Storage: -20 to 70°C
Humidity:	0 to 85% RH, non-condensing
Vibration:	2.5 g's, 30 to 200 Hz
Shock:	30 g's, 11 msec half sinewave
EMC:	Immunity to EN 50082-2 (Heavy Industrial) Emissions to EN 50081-2 (Heavy Industrial)
Front Panel:	NEMA 4X when mounted with gasket provided
Agency Approval:	UL, cUL listed, CE compliant CE EMC immunity and emissions requirements were met using shielded wiring on the RS-485, analog output, and signal input lines. The shields were connected to earth ground at the Eclipse end of the shields.

Conducted emissions requirements were met assuming that the AC signal input would not be connected directly to the AC Mains.

The measurement error during RF immunity testing was less than +/-5% of full scale. In addition, models with an AC signal input had measurement error of less than +25% of full scale during RF im-

MOUNTING

Mounting



Mounting clips and screws shown in installed positions.

Mounting Instructions

1. Slide mounting gasket (not shown) over unit body until adhesive surface makes contact with the front bezel.
2. Slide unit into cutout in panel.
3. Attach mounting clips and screws.
4. Tighten screws until unit is firmly in place. **DO NOT OVERTIGHTEN** screws to the point of squeezing the gasket out from behind the bezel.

WIRING

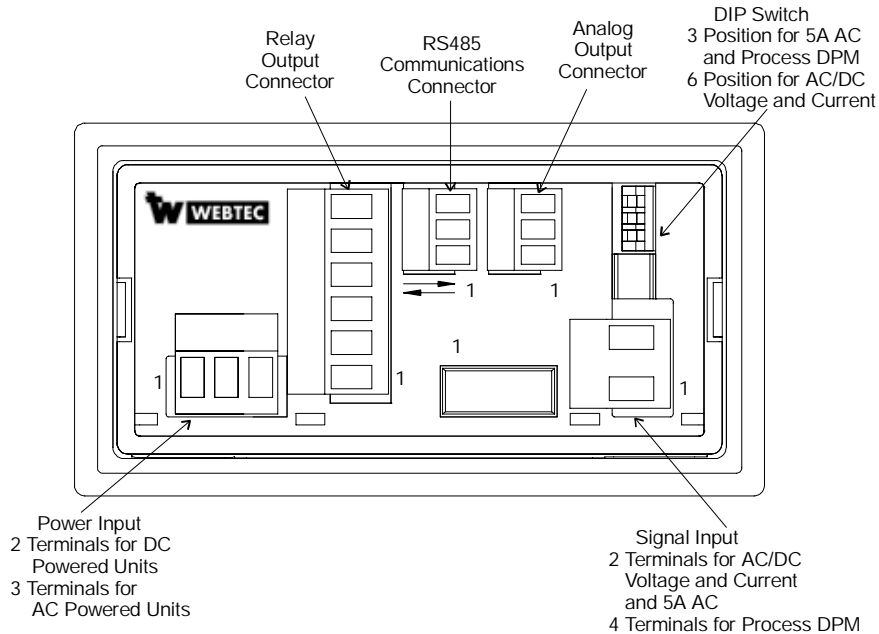
WIRING AND DIP SWITCHES

All wiring to the DP130 is done via rear terminal, de-pluggable connectors. Up to five headers accept the wired connectors on the DP130. All units have at least two headers, power input and signal input. Any combination of three additional circuit boards with headers may be installed. These option boards are relay output, RS 485 serial communications, and analog retransmission. The option boards occupy specific locations in the DPM and are not interchangeable. All boards are keyed to prevent installation in the wrong location.



Disconnect all power before wiring terminals. **A safety hazard exists if this precaution is not observed. Treat all control and count inputs as hazardous since they may carry line voltage.**

Rear Terminal Layout



Terminal Connector Ratings:

AC or DC Power Input / Relay Output / Signal (2-Terminal): 10A, 250VAC;
 Wire size: 12-24AWG (3.1mm² - 0.24mm²), 600V.
 RS485 / Analog Output / Signal (4-Terminal): 8A, 125VAC;
 Wire size: 16-28AWG (1.3mm² - 0.1mm²), 300V.

SPECIFICATIONS cont

Process Models (Standard DP130 unit)

Range: 4-20 mADC and 0-10 VDC; separate input terminals for voltage and current signals
 Impedance: 49.9 W (current input) and 1.13 M W (voltage input)
 Overrange: 50 mA maximum (current input) and 100 V maximum (voltage input)
 Power Output: 24 VDC +/- 10%, 90 mA max, short circuit protected
 Accuracy: +/- 0.05% of reading, +/- 1 digit, and +/- 80 PPM/°C

AC Voltage Models

Range: 199.9 mVAC, 1.999 VAC, 19.99 VAC, 199.9 VAC, DIP Switch Selectable
 Frequency: 40 to 1000 Hz
 Impedance: 1 M W (capacity coupled)
 Overrange: 750 VDC/530 VAC except 220 VDC/AC on 199.9 mV range
 Accuracy: +/- 0.5% of reading, +/- 3 digits, and +/- 180 PPM/°C (crest factor = 1), plus +/- 0.7% for crest factor = 1-3 and +/- 2.5% for crest factor = 5

DC Current Models

Range: +/- 199.9 mADC, +/- 1.999 mADC, +/- 19.99 mADC, +/- 199.9 mADC, DIP Switch Selectable
 Impedance: 199.9 mV/selected range
 Overrange: 30 mA (199.9mA range), 100 mA (1.999 mA range), 300 mA (19.99 mA range), 1A (199.9 mA range)
 Accuracy: +/- 0.1% of reading, +/- 1 digit, and +/- 120 PPM/°C

AC Current Models

Range: 199.9 mAAC, 1.999 mAAC, 19.99 mAAC, 199.9 mAAC, DIP Switch Selectable, all ranges true RMS
 Frequency: 40 to 1000 Hz
 Impedance: 199.9 mV/selected range (shunt output capacitively coupled)
 Overrange: 30 mA (199.9mA range), 100 mA (1.999 mA range), 300 mA (19.99 mA range), 1A (199.9 mA range)
 Accuracy: +/- 0.5% of reading, +/- 3 digits, and +/- 200 PPM/°C (crest factor = 1), plus +/- 0.7% for crest factor = 1-3, and +/- 2.5% for crest factor = 5

5A AC Models

Range: 5A AC, true RMS
 Frequency: 40 to 1000 Hz
 Impedance: 0.02 ohms (shunt output capacitively coupled)
 Overrange: 10A Maximum
 Accuracy: +/- 0.4% of reading, +/- 3 digits, and +/- 200 PPM/°C (crest factor = 1), plus +/- 0.7% for crest factor = 1-3, and +/- 2.5% for crest factor = 5

SPECIFICATIONS

MECHANICAL

Cutout Dimensions: 3.62" W x 1.77" H (92mm x 45mm) DIN standard
 Outline Dimensions: 4.04" W x 2.19" H x 3.87" D (103mm x 56mm x 98mm)
 3.60" (92mm) maximum depth in panel
 Enclosure: Plastic with polyester front label
 Connectors: Up to five de-pluggable terminal blocks

INPUT POWER

AC Powered Models (DP130-xx-AC)

Input Power: 85-265 VAC, 47-63 Hz, 20 VA
 External Fuse: 0.2A, 250 VAC, Time Delay (T200mA, 250V)
 Isolation Dielectric Strength: 2300 VAC

DC Powered Models (DP130-xx-DC)

Input Power: 9-30 VDC, 12 VA
 External Fuse: 2.0A, 50 VDC, Time Delay (T2A, 50V)
 Reverse Voltage Protection: Yes
 Isolation Dielectric Strength: 2300 VAC to signal inputs and relays, 500 VAC to RS485 and analog outputs

HUMAN INTERFACE

Display: +/- 4 full digits
 Type: .56" high, seven segment, red LED
 Indicator: One red LED program/calibration indicator
 Max./min. hold
 Update Time: 0.4 seconds
 Alarm: Flashing display

DATA RETENTION

Memory Type: EEPROM, no batteries required
 Duration: 100 years

SIGNAL INPUT

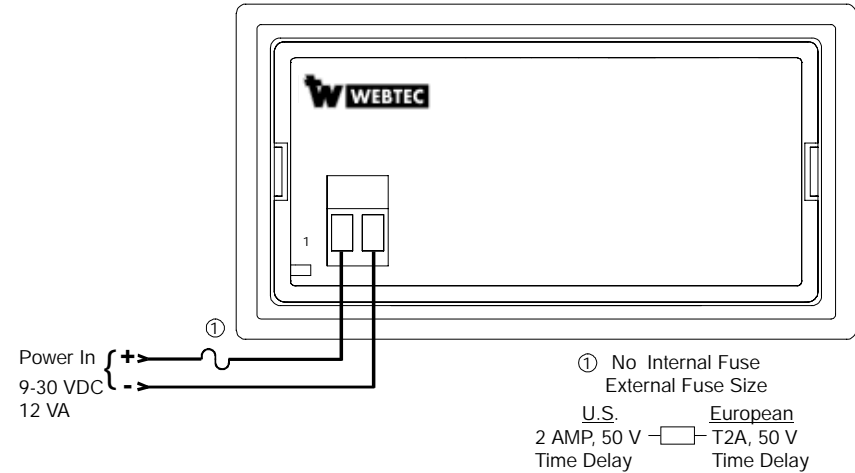
DC Voltage Models

Range: +/- 199.9 mVDC, +/- 1.999 VDC, +/- 19.99 VDC, +/- 199.9 VDC,
 DIP Switch Selectable
 Impedance: 1 M Ω (ohms)
 Overrange: 750 VDC/530 VAC except 220 VDC/AC on 199.9 mV range
 Accuracy: +/- 0.1% of reading, +/- 1 digit, and +/- 80 PPM/ $^{\circ}$ C

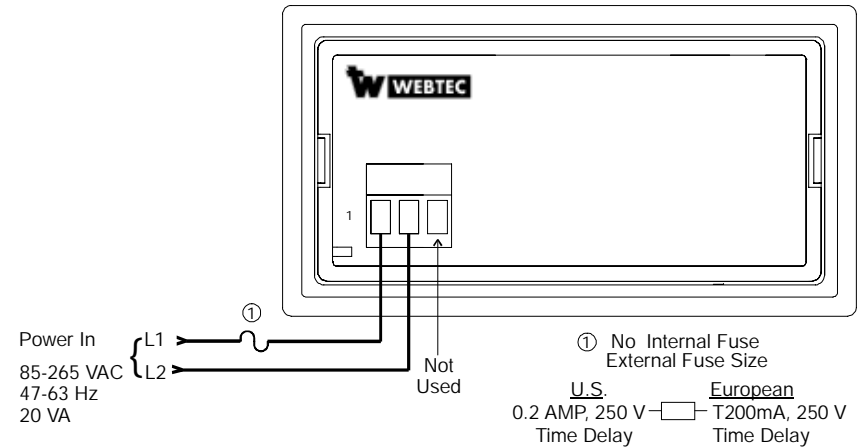
WIRING cont.

Wiring and DIP Switches

DC Power Input (for DC powered models DP130-XX-DC)



AC Power Input (for AC powered models DP130-XX-AC)

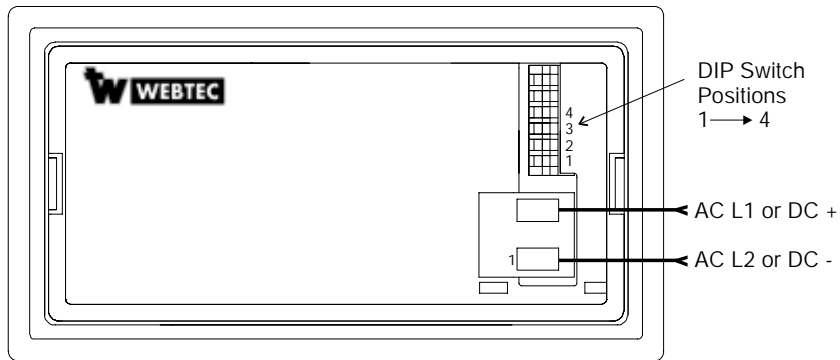


A power switch shall be included in the building installation:

- It shall be in close proximity to the equipment and within easy reach of the operator.
- It shall be marked as the disconnecting device for the equipment.
- Switches and circuit breakers in Europe must comply with IEC 947.

WIRING cont.

Signal Input for optional AC/DC Voltage and Current and 5A AC



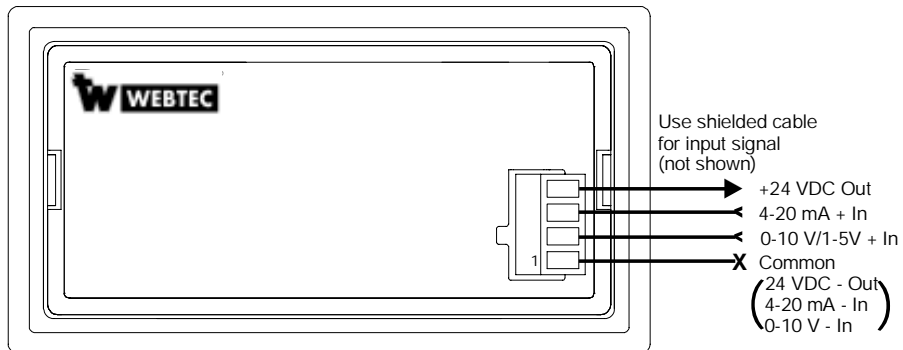
AC/DC Voltage and Current DIP switch selectable ranges:

Switch 4 ON - 200 V / 200 mA
Switch 3 ON - 20 V / 20 mA

Switch 2 ON - 2.0 V / 2.0 mA
Switch 1 ON - 0.2 V / 0.2 mA

See Specifications (pages 17-19) for Input Impedances and Overrange

Signal Input for Standard DP130



24 VDC Transducer Output Power Ratings:

24 VDC +/- 10%, 90 mA maximum, short circuit protected

See Specifications (pages 17-19) for Input Impedances and Overrange

DIAGNOSTICS cont.



Test Key

Unit Response

Program

PGM

Display shows software part number

Right Arrow



All display segments and the program LED turn OFF and the analog output goes to maximum value (20 mA and 10V).

Up Arrow



Each display digit will turn ON, one at a time, and relay 2 will turn ON.

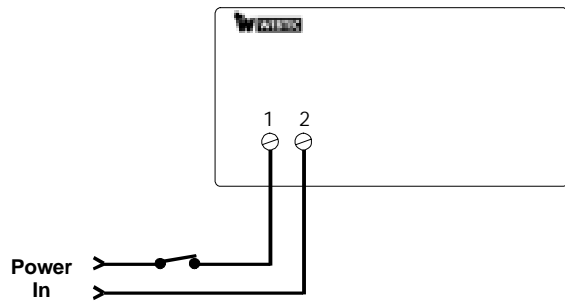
Down Arrow



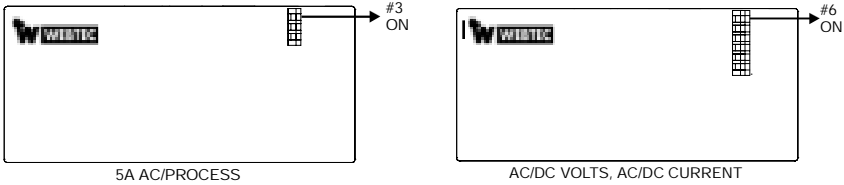
Each display segment of all displays will turn ON, one segment at a time, and relay 1 will turn ON.

To exit the diagnostic mode, turn unit power OFF.

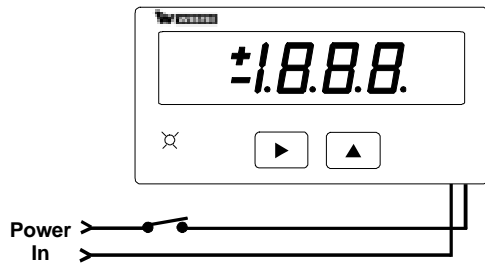
PROGRAMMING cont. / DIAGNOSTICS



2. Flip the rear terminal program enable DIP switch ON.



3. While holding both the right arrow key (▶) and the up arrow key (▲), turn unit power ON.



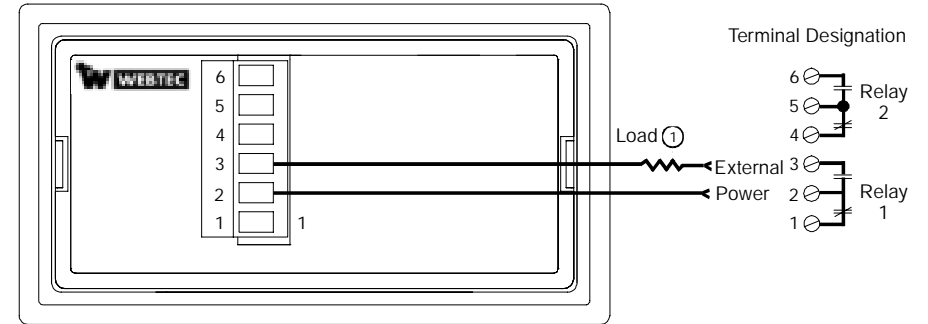
The program LED and all display segments will be ON. If present, both relays will be OFF (coils de-energized) and the analog output will be at minimum value (4 mA and 0V).

There are four keyboard diagnostic tests, one for each key. The tests are performed by pressing each key. The unit's response is maintained as long as the key is held.

WIRING cont.

Relay Output Option Board

Typical Wiring

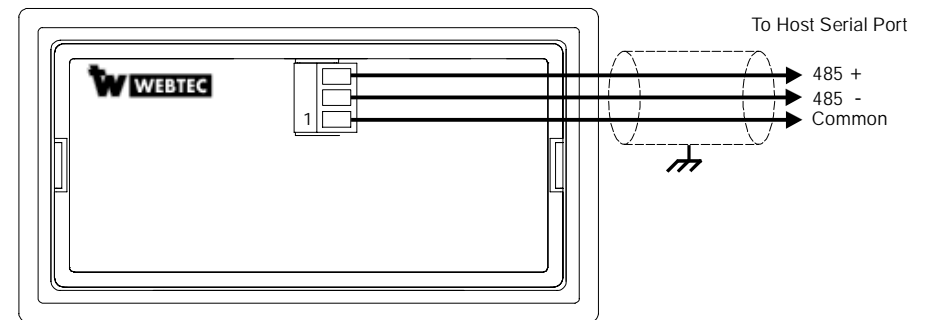


Contact Ratings

5 A @250 VAC or 30 VDC maximum

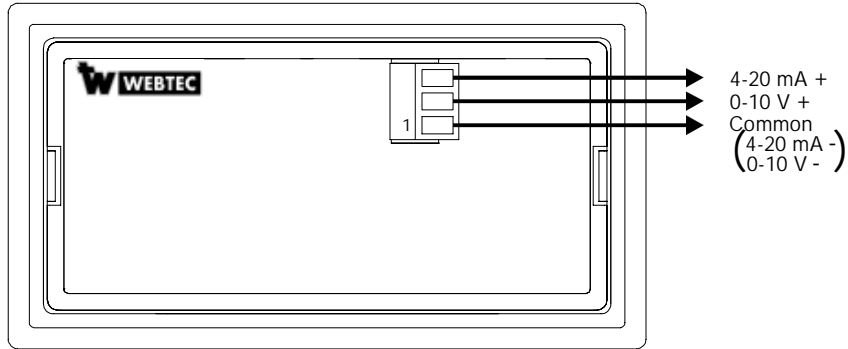
① An RC surge suppressor is recommended across all inductive loads.

RS 485 Communication Option Board



WIRING cont.

Analog Output Option Board



Output Ratings

4-20 mA into 750 W (Ohms) maximum

0-10 V into 2500 W (Ohms) minimum

DIAGNOSTICS

Self Diagnostics and Error Messages

Each time power is applied to the DP130, it performs a series of internal diagnostic tests. A lamp test (all display segments ON) is conducted while these tests are in progress. If a failure occurs, an error message will appear on the display. Additionally, once the unit is up and running, an out of range message (flashing **DL** or **-DL**) may occur, indicating that the scaled input signal (display reading) is greater than 1999 or less than -1999 respectively (disregard the decimal point place).

The diagnostic tests are checksum calculations of internal memory, to verify that data stored in memory at power down is still there at power up. The first tests are performed on internal ROM and RAM. Failure results in an error message **Err**. This error is non-recoverable, and the unit should be returned to the factory for repair.

Programming and calibration data is stored in non-volatile memory (NOVRAM). A failure in the programming section of NOVRAM results in the displayed error message **PrG**, which remains on the display until power is cycled OFF, then ON, to the unit, or until a key is pressed. When a **PrG** errors occur, the unit loads default values into all programming parameters. This error is recoverable by re-programming the DPM. An error message **CAL** indicates that the calibration section of NOVRAM, or both sections, has been corrupted, or that the calibration data does not match the input board type. **THERE IS NO DIAGNOSTIC TEST TO DETERMINE THAT THE DP130 IS CALIBRATED!** In this case, the unit loads default values into all programming and calibration parameters. This error is recoverable by re-programming and recalibrating the unit. If subsequent **PrG** or **CAL** errors occur, the NOVRAM itself may have failed and the unit should be returned to the factory for repair.

Keyboard Diagnostic Mode

The keyboard diagnostics allows the user to test each of the front panel keys, the display, and the analog retransmission and relay outputs if those optional boards are installed.

Caution: performing the diagnostic tests will turn on the analog transmission and relay outputs if those options are installed. Remove power from the DP130 and disconnect the outputs from any loads that should not be turned on before entering the keyboard diagnostic mode. If the optional RS485 communication board is installed, the DP130 will respond with the scaled input value to the QST command.

To enter the keyboard diagnostic mode:

1. Turn power to the unit OFF.

PROGRAMMING cont.

oOF *000

Analog Output Offset Value. Enter the displayed value that corresponds to the minimum analog output (0V and 4 mA).
Range: -1999 to 1999.

oFS *1000

Analog Output Full Scale Value. Enter the displayed value that corresponds to the maximum analog output (10V and 20 mA).
Range: -1999 to 1999.

1H, *1999

Relay 1 High Alarm Setpoint. Enter the displayed value at which relay 1 will turn ON if the display goes above this value.
Range: -1999 to 1999.

1Lo -1999

Relay 1 Low Alarm Setpoint. Enter the displayed value at which relay 1 will turn ON if the display goes below this value.
Range: -1999 to 1999.

2H, *1999

Relay 2 High Alarm Setpoint. Enter the displayed value at which relay 2 will turn ON if the display goes above this value.
Range: -1999 to 1999.

2Lo -1999

Relay 2 Low Alarm Setpoint. Enter the displayed value at which relay 2 will turn ON if the display goes below this value.
Range: -1999 to 1999.

HYS *000

Relay Hysteresis. Enter the value in display units between the relay turn ON values and relay turn OFF values.
Range: 0 to 999.

PROGRAMMING

PROGRAMMING

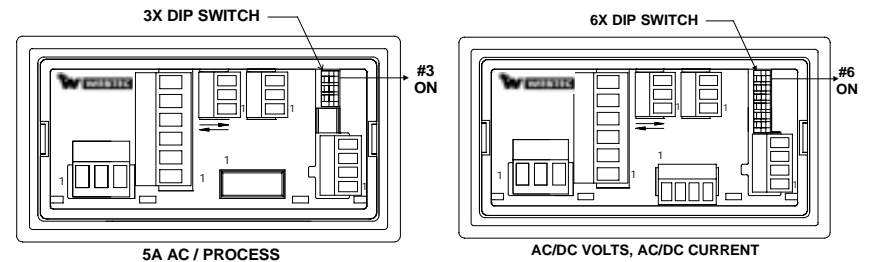


Entering the Program Mode (unit is supplied factory calibrated)

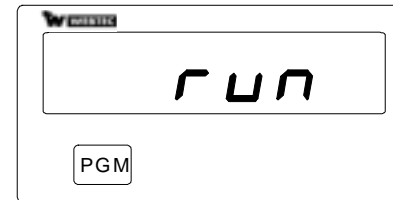
Note: If the optional relay output and/or analog output board(s) are installed in the DPM, entering the program mode will cause both relays to turn off and the analog output to go to its minimum values (0V and 4 mA) regardless of the input signal value.

To enter the program mode:

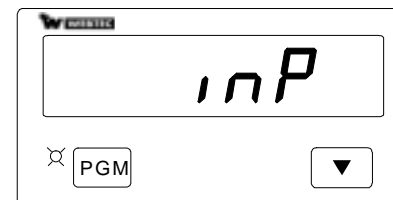
1. Flip the rear terminal program enable DIP Switch ON.



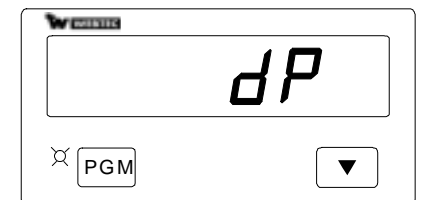
2. Press and hold the front panel program key (PGM); the display will say run:



3. Continue to press the (PGM) key and press the up arrow key (▲) one time; the program LED will turn ON and the display will show a parameter name.



In Process



All Others




PROGRAMMING cont.

If you need to default unit, while pressing the (PGM) key and the (▶) key simultaneously, the unit will display dFL, then the default value will appear.

Default (how to) Unit

Go into Program to Default. Press (PGM) (unit will say RUN).

The following list shows all programming parameter names, the default value for each, and the selection range for each. A programmed unit may be returned to the default state by pressing both the program (PGM) and right arrow (▶) keys at the same time for one second. The display will show dFL while the keys are pressed and blink OFF momentarily when the default is done.

Parameter Name	Default Value	Description/Range						
1. 	4.20	Input Selection - Select the type of process signal being applied. (Punch right arrow key to change input - (▶)).						
2. Hold (PGM) Press (▲)		<table border="0"> <tr> <td>4.20</td> <td>4-20 mA</td> </tr> <tr> <td>0.10</td> <td>0-10 V</td> </tr> <tr> <td>1.5</td> <td>1-5 V</td> </tr> </table>	4.20	4-20 mA	0.10	0-10 V	1.5	1-5 V
4.20	4-20 mA							
0.10	0-10 V							
1.5	1-5 V							
3. 	1000	Decimal Point. Choose the location for the display's decimal point. This location follows through to the offset, full scale, setpoint, and hysteresis programming screens as well as the operator's display. To change decimal position, press right (▶) arrow key.						
4. Hold (PGM) Press (▲) up arrow key		Offset. Enter the value for the display when the input signal is at its minimum value. Range: -1999 to 1999.						
	+.000							

PROGRAMMING cont.

5. Press (▲)

To change value of the display that is flashing, press the up (▲) or down (▼) arrow keys. To choose next digit, press right (▶) arrow key and use up (▲) or down (▼) arrow keys to change its value. Repeat for the remaining digits.

6. Hold (PGM)

Press (▲) up arrow key

7. 

Full Scale Value. Enter the value that the display should read if the input signal was at the maximum value of the selected input range.
Range: -1999 to 1999.

8. Hold (PGM)

Press (▲) up arrow key

9. 

Serial Address. Enter the serial address for the DPM. All communications to the DPM must contain this address. If two or more DPM's are connected in a network, each must have a unique address.
Range: 00-99.


10. Hold (PGM)

Press (▲) up arrow key

11. 

Baud Rate. Select the rate in kBaud at which to receive and transmit serial information.

1.20
2.40
4.80
9.60
19.2



Parity. Select the type of parity used for serial communications.

no none
Eun even
odd odd