

# PD691 Strain Gauge, Load Cell & mV Meter Instruction Manual



- 0-30 mV, 0-200 mV,  $\pm 15$  mV,  $\pm 100$  mV Field Selectable Inputs
- Field Selectable 5, 10, or 24 VDC Excitation Power Supply
- 4½ Digits + Extra Zero Display
- Steady, Accurate Display to  $\pm 199,990$
- Max Display or Peak Hold Feature
- NEMA 4X, IP65 Front Panel
- Capture or Programmable Tare Feature
- Ratiometric Operation
- Lockout Feature
- 11-Point Linearization for Non-Linear Inputs
- Isolated Sensor Supply 5 VDC, 10 VDC, or 24 VDC
- 115 VAC or 230 VAC Power Options
- 4 Visual Alarm Points with Front Panel LED Status Indication
- 2 or 4 Relays + 4-20 mA Output Options

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**ORDERING INFORMATION**

<b>115 VAC Model</b>	<b>230 VAC Model</b>	<b>Options Installed</b>	<b>Option Card*</b>
PD691-3-N	PD691-4-N	No Options	
PD691-3-14	PD691-4-14	2 Relays	PD174
PD691-3-15	PD691-4-15	4-20 mA Out	PD175
PD691-3-16	PD691-4-16	2 Relays + 4-20 mA Out	PD176
PD691-3-17	PD691-4-17	4 Relays	PD177
PD691-3-18	PD691-4-18	4 Relays + 4-20 mA Out	PD178

Ordering example: PD691-3-14, strain gauge meter powered from 115 VAC (-3) with 2 relays (-14).

\* Part numbers for option cards when purchased separately.

**DEFINITIONS**

Display	Parameter	Description
<b>19999</b>	Overrange	Indicates overrange condition
<b>- 19999</b>	Underrange	Indicates underrange condition
<b>ALAR5</b>	Alarm and relay points	Sets alarm and relay set and reset points.
<b>b or U</b>	Bi-polar or uni-polar	Programs meter for bi-polar or uni-polar operation.
<b>CAL 1b</b>	Calibrate	To calibrate meter using a calibrated signal source.
<b>DEC Pt</b>	Decimal point	To program decimal point or light up extra "0".
<b>dSPY P</b>	Display peak	Displays the highest rate value captured.
<b>Error</b>	Error	Calibration not successful.
<b>FAULT</b>	Fault	Input signal out of range or open signal connection
<b>no. PtS</b>	Number of points	Programs meter for 2 to 11 calibration points.
<b>outPut</b>	Output	Programs optional 4-20 mA output values.
<b>r or n</b>	Ratiometric or non-ratiometric	Programs meter for ratiometric operation.
<b>TARE</b>	Tare	Programs meter for capture or programmable tare operation.

**Safety Notice**

**CAUTION:** Read complete instructions prior to installation and operation of the meter.



**WARNING:** Risk of electric shock.

**WARNING**

Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

**AVERTISSEMENT**

Les pièces à l'intérieur du boîtier portent des tensions dangereuses. Seules des personnes qualifiées et bien entraînées devraient entreprendre l'otalonnage et la maintenance.

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**SPECIFICATIONS**

Except where noted all specifications apply to operation at +25°C.

<b>INPUTS</b>	Field selectable: 0-30 mV, 0-200 mV, $\pm 15$ mV, $\pm 100$ mV
<b>DISPLAY</b>	0.56" (14.2 mm) red LED, 4½ digits + extra zero may be switched on to display $\pm 19,999(0)$ . Leading zeros blanked.
<b>ACCURACY</b>	0.05% FS $\pm 1$ count
<b>RATIOMETRIC OPERATION</b>	Deviation less than 0.1% FS $\pm 1$ count, with $\pm 10\%$ variation in excitation voltage.
<b>ZERO STABILITY</b>	0.5 $\mu$ V/°C
<b>SPAN STABILITY</b>	0.005% of full scale /°C
<b>SENSITIVITY</b>	Maximum 0.6 $\mu$ V
<b>FRONT PANEL</b>	Type 4X, NEMA 4X, IP65; panel gasket provided.
<b>CALIBRATION RANGE</b>	0 mV input may be set anywhere in range of the meter. 200 mV may be set anywhere above or below 0 mV input.
<b>INPUT IMPEDANCE</b>	20 k $\Omega$
<b>SENSOR POWER SUPPLY</b>	Isolated, selectable: 5 VDC or 10 VDC $\pm 5\%$ @ 50 mA, 24 VDC $\pm 5\%$ @ 20 mA. Available for either strain gauge or 4-20 mA output option, but not both. Maximum load resistance of 1200 $\Omega$ ).
<b>PEAK HOLD (MAX DISPLAY)</b>	Captures the peak reading and displays it via the front panel ENTER button. Stored until reset by the user or meter is turned off.
<b>PEAK HOLD INDICATION</b>	Front panel LED
<b>TARE</b>	Captures/sets current display to zero via front panel TARE button. Programmable tare: sets tare to a preset value.
<b>TARE INDICATION</b>	Front panel LED
<b>LOCKOUT</b>	Switch 8 restricts modification of programmed settings.
<b>POWER OPTIONS</b>	115 VAC or 230 VAC $\pm 10\%$ , 50/60 Hz, 10 VA
<b>ISOLATION</b>	AC powered: 1500 VAC; DC powered: 500 VDC
<b>NORMAL MODE REJECTION</b>	60 dB @ 50/60 Hz
<b>OVERLOAD PROTECTION</b>	230 VDC or VAC across inputs or input to ground
<b>ENVIRONMENTAL</b>	Operating temperature range: 0 to 60°C Storage temperature range: -40 to 85°C Relative humidity: 0 to 90% non-condensing
<b>ENCLOSURE</b>	1/8 DIN, high impact plastic, UL 94V-0, color: black
<b>WEIGHT</b>	19.7 oz (559 g) (including options)
<b>CONNECTIONS</b>	Removable screw terminal blocks, accept 22 to 12 AWG.
<b>ALARM POINTS</b>	4, any combination of high or low alarms
<b>ALARM STATUS INDICATION</b>	Front panel LED
<b>ALARM DEADBAND</b>	0-100% of full scale, user selectable
<b>WARRANTY</b>	2 years parts & labor
<b>EXTENDED WARRANTY</b>	1 or 2 years, refer to the Price List for details.
<b>UL FILE NUMBER</b>	E160849; 508 Industrial Control Equipment

## Options

### Relays

<b>RATING</b>	2 or 4 SPDT (Form C); rated 2 A @ 30 VDC or 2 A @ 250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive load.
<b>RESET</b>	User selectable: <ol style="list-style-type: none"> <li>Automatically when the input passes the reset point.</li> <li>Automatically + manually (via user supplied switch).</li> </ol> Note: Manual reset resets all manually resettable relays.
<b>FAIL-SAFE OPERATION</b>	Relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state. Fail-safe operation may be disabled, by removing jumper J2 located on the Options Board.
<b>AUTO INITIALIZATION</b>	When power is applied to the meter, the relays will always reflect the state of the input to the meter.
<b>DEADBAND</b>	0-100%, user selectable

### Isolated 4-20 mA Transmitter Output

<b>CALIBRATION RANGE</b>	The transmitter output can be calibrated so that a 4 mA output is produced for any number displayed on the meter. The 20 mA output may correspond to any number displayed on the meter that is at least 501 counts greater or smaller than the 4 mA output display. (Ex. 4 mA = 0, 20 mA = 501) If the span between 4 and 20 mA is less than 501 counts, an error message will appear.		
<b>OUTPUT LOOP RESISTANCE</b>	1000 $\Omega$ max using a 35V external power supply. 600 $\Omega$ max using the built-in power supply. Built-in power supply available for either 4-20 mA output @ 24 VDC or signal input, 5 or 10 VDC @ 50 mA, but not both.		
<b>ACCURACY</b>	$\pm 0.1\%$ FS $\pm .004$ mA		
<b>ISOLATION</b>	500 VDC or peak AC, input-to-output or input/output-to-24 VDC supply		
<b>EXTERNAL LOOP POWER SUPPLY</b>	35 V maximum		
<b>OUTPUT LOOP RESISTANCE</b>	<b>Power supply</b>	<b>Min loop resistance</b>	<b>Max loop resistance</b>
	24 VDC	10 $\Omega$	600 $\Omega$
	35 VDC (external)	600 $\Omega$	1000 $\Omega$

## Terminals Designation

Terminal	Description
L, L	AC input power
P+, P-	24, 10, or 5 VDC Excitation
S+, S-	Input signal
Ex	Ratiometric ext. excitation sense

Terminal	Description
AK	External relay acknowledge
CM	Common (return) for S+, AK, and R
+, -	4-20 mA output
1-6	Relay 1-4

## DESCRIPTION

All meters, regardless of configuration, have the same front panel. The front panel consists of a single button for programming and calibrating labeled **ENTER** and another button for setting Tare, labeled **TARE**.

In addition, the meter front panel includes LEDs that illuminate to assist in 4-20 mA output and alarm programming. LEDs are also provided to indicate Alarm, Peak Hold and Tare status.

## SETUP AND PROGRAMMING

Set the Configuration Switch (SW1) for desired input and excitation per chart below. The Configuration Switch is located at the rear of the instrument next to the screw terminal block. To disable lockout feature, set switch 8 to the off position.

FUNCTION	CONFIGURATION SWITCH (SW1)							
	8	7	6	5	4	3	2	1
Switch Number								
Ratiometric with Internal excitation		On	On					
Ratiometric with External excitation		Off	Off					
0-30 mV input				On	Off			
0-200 mV input				Off	Off			
± 15 mV input				On	On			
± 100 mV input				Off	On			
24 VDC Excitation						Off	Off	On
10 VDC Excitation						On	Off	Off
5 VDC Excitation						Off	On	Off
Lockout Feature	On							

## Power and Signal Connections

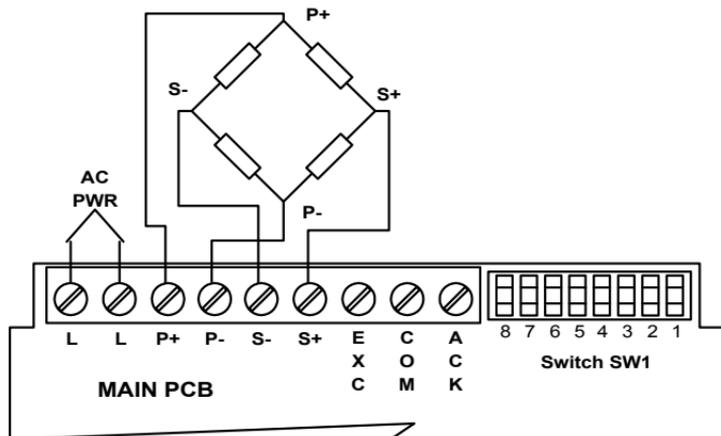


Figure 1. Strain gauge powered from internal power supply

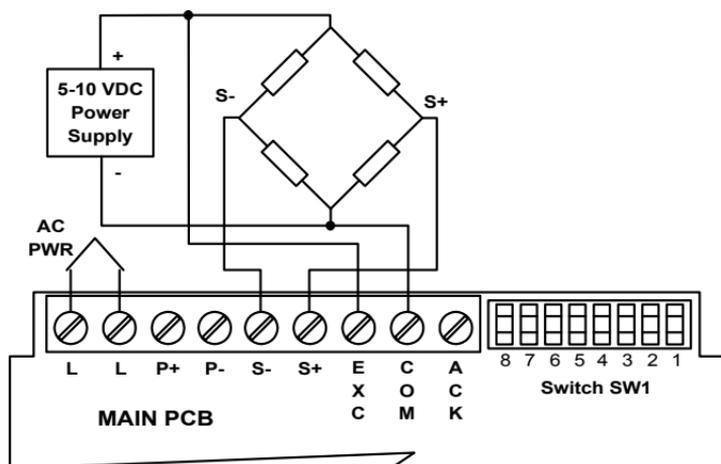


Figure 2. Strain gauge powered from external power supply

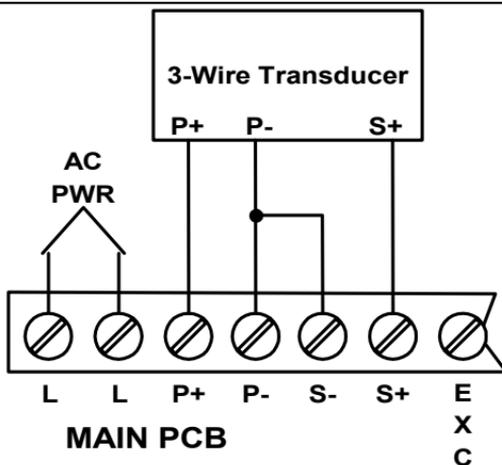


Figure 3. Three-wire transducer powered from internal power supply

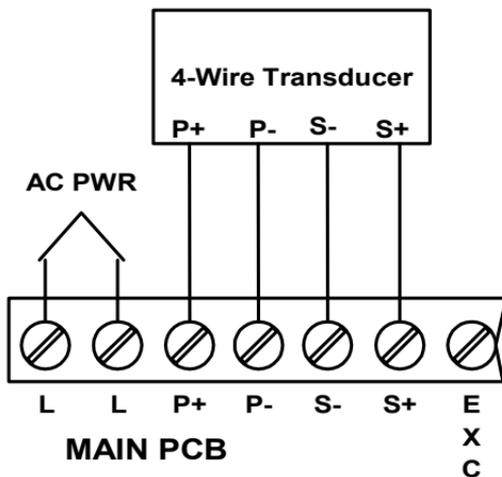


Figure 4. Four-wire transducer powered from internal power supply

**Note:** For two-wire mV signals connect positive lead to S+ and negative to S-.

## Wiring Instructions

1. All field connections to be made with insulated copper wire, either solid or stranded. Tighten all screw terminals to 4.5 lb-in (0.5 Nm). Strip length =  $\frac{1}{4}$  in (7 mm). **DO NOT** pre-treat wire with solder.
2. Terminals L and L: Use AWG #12-18 wire, 600 volt, 60°C. Only one wire to each terminal.
3. Terminals P+, P-, S-, S+, EXC, COM, and ACK: Use AWG #12-22 wire, 150 volt, 60°C. If using AWG #20 or smaller wire, up to 2 wires may be connected to each terminal. If using AWG #18 or larger wire, only 1 wire may be connected to each terminal.

## Programming the Meter

The meter's **Single Button Scaling** allows it to be programmed using only the **ENTER** button. The general procedure is to press the **ENTER** button to accept a flashing display or to wait for the display to scroll and press **ENTER** when the desired display appears.

For instance the first time the **ENTER** button is pressed, the meter scrolls through the standard programming routine titles as shown in the following table. It will also scroll the **outPut** programming routine if the meter contains an isolated 4-20 mA output option. To enter a programming routine, press **ENTER** when the meter displays the desired programming routine title.

Display	Parameter	Description
<b>dSPY P</b>	Display peak	Displays the highest rate value captured.
<b>tArE</b>	Tare	Programs meter for capture or programmable tare operation.
<b>CAL Ib</b>	Calibrate	Calibrates meter using a calibrated signal source.
<b>dECPt</b>	Decimal point	To program decimal point or light up extra "0".
<b>no. PtS</b>	Number of points	Programs meter for 2 to 11 calibration points.
<b>r or n</b>	Ratiometric or non-ratiometric	Programs meter for ratiometric operation.
<b>b or U</b>	Bi-polar or uni-polar	Programs meter for bi-polar or uni-polar operation if ratiometric operation is selected.
<b>ALAR5</b>	Alarm and relay points	Sets alarm and relay set and reset points.
<b>outPut</b>	Output	Programs optional 4-20 mA output values. Function is displayed only when 4-20 mA output option is installed.

## Calibration of the Meter

Calibration is performed from the front panel using the **ENTER** button. It does not require any tools or disassembly of the meter. The only equipment needed is a calibrated signal source.

**For best results, allow the meter to warm up for at least 30 minutes.**

The calibration input signals may be any value within the range of the meter, except Input 2 must be greater than Input 1. (However, the display for Input 2 does not have to be greater than the desired display for Input 1.)

An **Error** message will appear if input 1 signal and input 2 signal are too close together:

Input Range	Minimum Difference Between Input 1 and Input 2:
0-30 mV	1 mV / (# of points-1)
0-200 mV	5 mV / (# of points-1)
± 15 mV	1 mV / (# of points-1)
± 100 mV	5 mV / (# of points-1)
<b>Example:</b>	Minimum span for 11-point, 0-30 mV range is 0.1 mV between points.

## Single Button Scaling

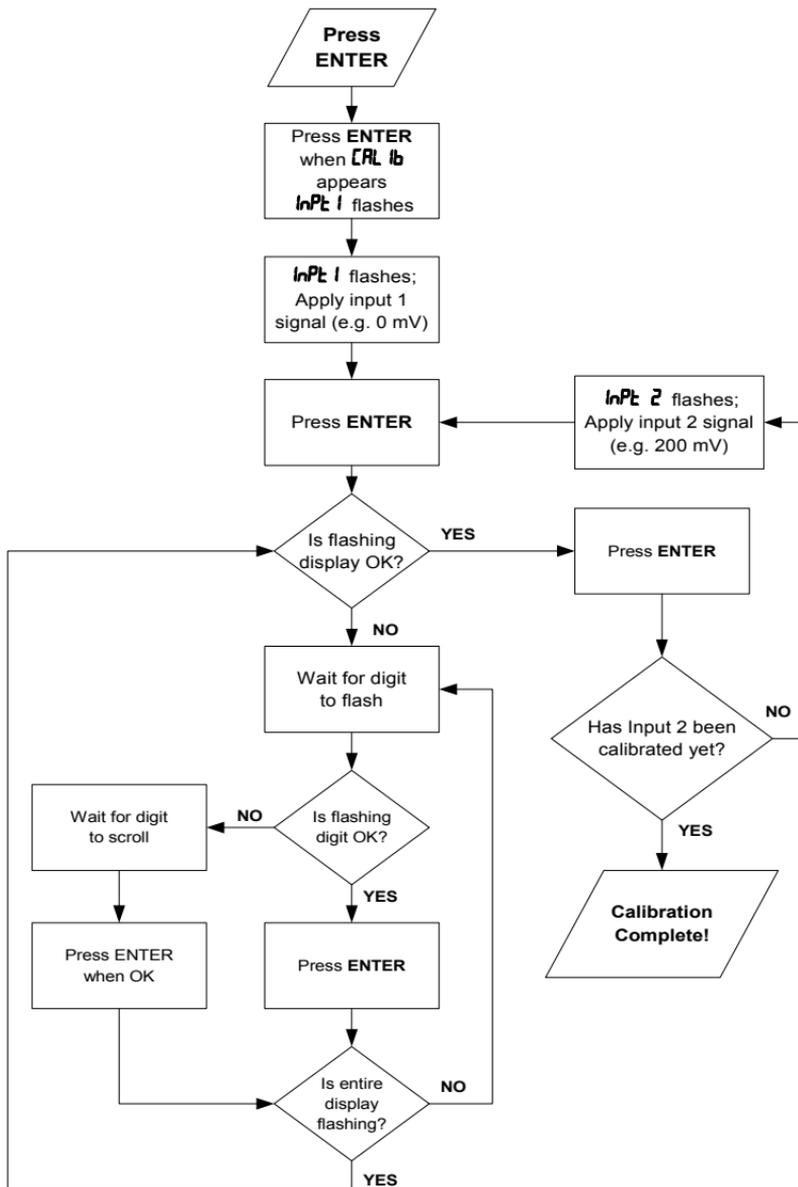
The **Single Button Scaling** technique is used to program many of the meter's functions, which include: Calibration, Tare, Alarm Set and Reset points and the 4 mA and 20 mA output values.

### Five basic calibration instructions

1. If the flashing display is OK, press **ENTER** before it stops flashing to accept it.
2. If the flashing display is not OK, (or if **ENTER** was not pressed in time to accept it), wait for the first digit to flash.
3. If a flashing digit is OK press **ENTER** before it starts to scroll to accept it.
4. If a flashing digit is not OK, (or if **ENTER** was not pressed in time to accept it), wait for the digit to scroll, and press **ENTER** when OK.
5. Digits will scroll until **ENTER** is pressed. When a digit is accepted by pressing **ENTER**, the next digit flashes.

The following flowchart illustrates a 2-point calibration using **Single Button Scaling**. The same general procedure is used for 11-point user calibrations, alarm set and reset point programming, and 4-20 mA output programming.

**Calibration Flowchart**



**Decimal Point (dEC Pt)**

To program the decimal point or light up the extra "0", press **ENTER**. Press **ENTER** again when **dEC Pt** appears. The meter then reads 199990 with the decimal point changing locations and the extra "0" illuminating. Press **ENTER** when the decimal point is in the desired position; or if the extra "0" is desired; when the extra "0" is displayed.

**Number of Calibration Points (no. Pt5)**

The user may input up to 11 calibration points and corresponding displays.

**To program the number of calibration points:**

1. Press **ENTER**, when **no. Pt5** appears, press **ENTER** again. The meter displays a number from 2 to 11 that represents the number of calibration points.
2. Press **ENTER** when the number equals the desired number of calibration points.

As soon as the number of points is programmed, the meter flashes **lnPt 1**. Refer to **Calibration Procedure (CAL lb)** on page 16, to calibrate each point.

**Calibration Procedure (CAL 1b)**

1. Press **ENTER**, when **CAL 1b** appears press **ENTER** again.
2. Meter flashes **INPt 1**. Apply input 1 signal THEN press **ENTER**, (e.g. 0 mV, -15 mV, etc.)
3. All digits flash for 3 seconds  
If this is the desired display for input 1, press **ENTER** before entire display stops flashing (meter will then flash **INPt 2**). Go to step 9 below.

If this is not the desired display, (or if **ENTER** was not pressed in time to accept the display) wait for the first digit to flash.

First digit flashes for 3 seconds before it scrolls.

4. When digit is OK, press **ENTER**, next digit will flash for 3 seconds before it scrolls.
5. When flashing digit is OK, press **ENTER**, next digit will flash for 3 seconds before it scrolls.
6. Repeat step 4 for each remaining digits.
7. When last digit is OK, press **ENTER**.
8. Entire display will flash for 3 seconds. Press **ENTER** within the 3 seconds if OK to complete input 1 calibration. If not OK, wait for first digit to flash and go to step 3 above.
9. Meter flashes **INPt 2**. Apply input 2 signal THEN press **ENTER**, (e.g. 30 mV, 200 mV, etc.)
10. GO TO STEP 3 ABOVE.

**Calibration Error**

A meter display of **Error** during calibration indicates that the calibration process was not successful. The meter should be recalibrated.

The **Error** message will appear if input 1 signal and input 2 signal are too close together, see chart on page 13.

The **Error** message will appear if input 1 signal is inadvertently also applied for input 2 calibration, or **ENTER** is pressed before applying input 2.

**Programming Confirmation**

The values that have been programmed can be quickly checked to make sure they are the desired values. To do this, apply the desired signal for each point and check the display.

---

### Selecting Ratiometric or Normal Operation

Selecting Ratiometric (**r**) allows the meter to compensate for small fluctuations in the excitation power supply. A voltage drift of  $\pm 10\%$  will not affect the display value of the meter when in Ratiometric mode.

Selecting normal (**n**) results in the meter not compensating for voltage fluctuations. The display value will shift as voltage change.

1. Press **ENTER**. When **r or n** appears, press **ENTER** again.
2. The meter will alternately flash **r or n**. Press **ENTER** when desired character is flashing. Meter will then revert back to indication mode.

### Selecting Bi-Polar or Uni-Polar Operation

When using Ratiometric (**r**) operation the meter must be programmed according to the input switch selections. If a uni-polar input is selected (0-30 mV or 0-200 mV), then uni-polar operation **U** must be selected. If a bi-polar input is selected ( $\pm 15$  mV or  $\pm 100$  mV), then bi-polar operation (**b**) must be selected. If Normal operation (**n**) is selected meter is able to read bi-polar signals.

This feature can only be accessed if Ratiometric Operation has been selected, see above.

1. Press **ENTER**. When **b or U** appears, press **ENTER** again.
2. The meter will alternately flash **b or U**. Press **ENTER** when desired character is flashing. Meter will then revert back to indication mode.

## Selecting Tare Function

The meter can be set for either Capture or Programmable Tare. Capture Tare sets a currently displayed reading to zero via front panel TARE button. The operator may reset Capture Tare at any time in the field. Programmable Tare will automatically subtract a set tare value from the actual reading.

**Example of Capture Tare:** a current display of some random number, say 13.0, is set to 0 when the TARE button is pressed.

**Example of Programmable Tare:** if tare is set to 10.0, then an input of 100.0 will always be displayed as 90.0 in the Programmable Tare mode.

1. Press **ENTER**. When **tArE** appears, press **ENTER** again.
2. The meter displays **tArE** and starts to scroll through the choices, (0-2). Press **ENTER** when desired digit appears (see chart below).

Tare	Choice Number
Off	0
Capture Tare	1
Programmable Tare	2

### Capture Tare

After Capture Tare (1) is selected the meter will revert back to indication mode displaying current reading. Pressing the TARE button resets the display to zero and a green LED labeled "T" illuminates indicating the display is showing a tare value. A new tare value may be set at any time by pressing the TARE button.

To clear the tare value simply press **ENTER**, when **tArE** appears press **ENTER** again. When the meter displays **tArE**, Press **ENTER** again.

### Programmable Tare

When Programmable Tare (2) is selected, the desired tare value must be set. The display will flash for 3 seconds. If this is the desired display for the tare value, press **ENTER** before the entire display stops flashing. If this is not the desired value then the Programmable Tare value needs to be programmed using the **Single Button Scaling** technique (see **Five basic calibration instructions**, page 13).

## Displaying Maximum or Peak Value

The meter captures the highest displayed value and stores it in memory for later viewing. The peak value is stored in memory until reset by the user or until power to the meter is turned off.

1. Press **ENTER**. When **dSPY P** appears, press **ENTER** again. A green LED labeled "P" illuminates indicating the display is showing the peak value.
2. Press **ENTER**, when **rSEt P** appears, press **ENTER** again. Last stored peak value is erased from memory and a new peak value will be captured. The meter will return to normal indication mode and the green LED will turn off.

## 4 ALARM POINTS

The meter is equipped with 4 alarm points as a standard feature. Each alarm may be programmed for either a high or low alarm and for 0-100% deadband. Front panel LEDs indicate alarm status.

### Options for 2 and 4 relays are available.

To program a high alarm, program the set point above the reset point. To program a low alarm, program the set point below the reset point.

To program the alarm deadband, set the reset point above or below the set point by an amount equal to the desired deadband value.

**Example:** Alarm 2 is a high alarm that trips at 1500 and has a deadband of 100. Alarm 2 set point is set at 1500 and its reset point at 1400.

### Alarm Set and Reset Point Programming (*ALArS*)

Alarm set and reset point programming is performed in the *ALArS* routine.

1. To enter the *ALArS* routine, press **ENTER** and when *ALArS* appears, press **ENTER** again. This starts a scan of the 4 alarm set and reset points. The scan sequence begins with a flashing display of alarm #1 set point. The "1" LED and "S" LED are illuminated to indicate the meter is flashing alarm #1 set point value.
2. All digits flash for 3 seconds. If this is the desired display for this alarm point, press **ENTER**. Pressing **ENTER** completes this alarm point programming. Proceed to step 8 for next alarm point programming.  
  
If this is not the desired display, wait for the first digit to flash. It will flash for 3 seconds before it starts to scroll.
3. If the first flashing digit is OK, press **ENTER** before it starts to scroll to accept it, the second digit flashes- go to step 6. If not OK, wait for first digit to scroll.
4. When the first digit is OK, press **ENTER**, the next digit flashes for 3 seconds before it starts to scroll.
5. If the flashing digit is OK, press **ENTER** before it scrolls. If not OK, wait for digit to scroll.
6. When digit is OK, press **ENTER**. Program remaining digits in the same fashion.

7. When the last digit is OK, press **ENTER**. The entire display flashes for 3 seconds. Press **ENTER** if OK to complete alarm point programming and proceed to step 8. If not OK, wait, first digit flashes. Repeat steps 3-7.
8. When an alarm set and reset point have been programmed the scan moves to the next alarm set and reset point. To program the remaining alarm set and reset points, repeat steps 2-7.

To determine which alarm set or reset point is being programmed, note which LEDs are illuminated. For instance, if the "3" LED and the "R" LED are illuminated, the meter is displaying alarm #3 reset point. When alarm programming is complete the meter will display the process input signal and the front panel LEDs will indicate alarm status.

### Programming Confirmation

To verify that the alarm set and reset points have been programmed as desired, press **ENTER**, and press **ENTER** again when **ALAr-S** appears. Before the display stops flashing #1 set point value, press **ENTER** again to advance the display to #1 reset point. Continue skipping through the remaining alarm set and reset points. To alter an alarm point value, wait for the first digit to flash and follow steps 3-8 above.

### Alarm Operation

When the meter detects an alarm, a front panel LED illuminates to indicate which alarm point has been tripped. This LED will stay illuminated until the meter display passes through the reset point.

### Relay Acknowledgment

Connect a N.O. contact push-button switch to the ACK and COM terminals. Closing the switch contacts will reset the optional relays only and has no effect on the alarm status LEDs.

## Optional Relays and 4-20 mA Output Terminals

Options may contain 2 or 4 relays and an isolated 4-20 mA output transmitter. Connections are made to removable screw terminal connectors located on the Options Board.

Function	Connector	Pin Number
Transmitter +	J1	1
Transmitter -	J1	2
Relay 1 Common	J2	1
Relay 1 NC	J2	2
Relay 1 NO	J2	3
Relay 2 Common	J2	4
Relay 2 NC	J2	5
Relay 2 NO	J2	6
Relay 3 Common	J3	1
Relay 3 NC	J3	2
Relay 3 NO	J3	3
Relay 4 Common	J3	4
Relay 4 NC	J3	5
Relay 4 NO	J3	6

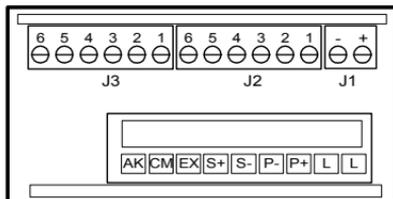


Figure 5. Rear View of Meter, Connectors Location

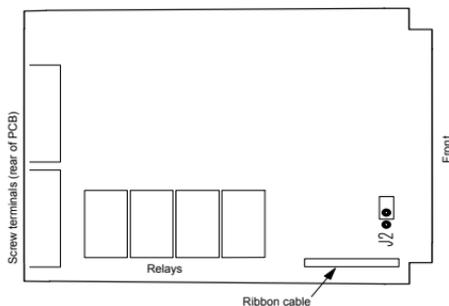


Figure 6. Fail-Safe Jumper Location

To disable the fail-safe operation, remove jumper J2, located at the front of the relay option card (see figure to left).

Refer to page 27 for option card removal instructions.

## RELAYS (Optional)

The meter is available with 2 and 4 relays. The SPDT relays can be programmed for automatic or automatic + manual reset. The relays can also be programmed for 0-100% deadband.

### Set and Reset Point Programming

Refer to page 19 to program the alarm (relay) set and reset points.

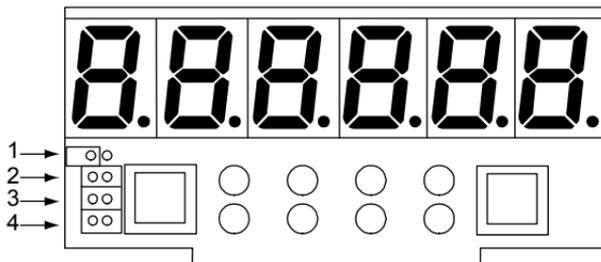
### Automatic and Manual Reset

There are two ways to reset the relays:

1. Automatically when the signal passes through the reset point.
2. Automatically + manually, via a user supplied momentary N.O. push-button connected across terminals ACK and COM at the rear of the instrument. That is, a relay may be manually reset prior to the signal passing through the reset point or it will automatically reset when the signal passes through the reset point.

A manual reset will reset all relays that are programmed for automatic + manual reset.

An array of jumpers located behind the front panel on the Display Board is used to program each relay for either automatic or automatic + manual reset. Refer to page 27 for front panel removal instructions. The top jumper is used for relay 1, the next for relay 2, etc. A relay will automatically reset if no jumper is installed. A relay will automatically reset, plus can be manually reset, if a jumper is installed over its respective pins.



**Figure 7. Relay Acknowledge Enable Jumpers**

Relay 1 is programmed for automatic reset.

Relays 2, 3, and 4 are programmed for automatic + manual reset.

## Switching Inductive Loads

The meter has the ability to suppress electrical noise generated by switching inductive loads. However, installing suppressors improves this performance even more and prolongs the life of the meter's relay contacts.

This suppression can be obtained with RC networks assembled by the user or purchased as a complete assembly. Refer to the following circuits for RC network assembly and installation.

### AC and DC Loads

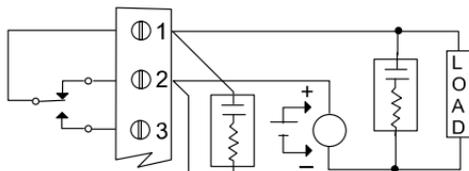


Figure 8. AC and DC Loads Protection

#### Choose R and C as follows:

R: 0.5 to 1  $\Omega$  for each volt across the contacts

C: 0.5 to 1  $\mu\text{F}$  for each amp through closed contacts

#### Notes:

1. Use capacitors rated for 240 VAC.
2. Snubbers may affect load release time of solenoid loads, check to confirm proper operation.
3. Install the RC network right at the meter's relay screw terminals. An RC network may also be installed across the load.

### Low Voltage Dc Loads

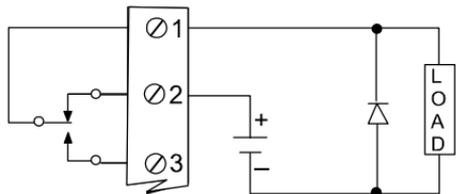


Figure 9. Low Voltage DC Loads Protection

Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

### RC Networks

Suppressors are available from Precision Digital and should be applied to each relay that switches an inductive load. Part number: PDX6901.

## ISOLATED 4-20 mA OUTPUT OPTION

The meter can be equipped with an isolated 4-20 mA output option that can be programmed to produce a 4-20 mA output for virtually any input.

### Connections

The following drawings illustrate the 4-20 mA output signal being powered from the meter's internal 24 V power supply and by an external power supply.

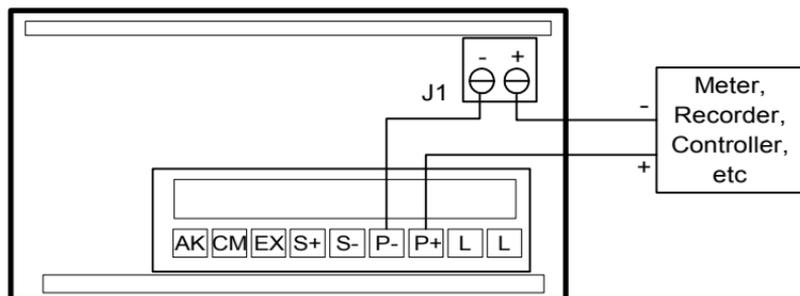


Figure 10. Output Loop Powered by Meter

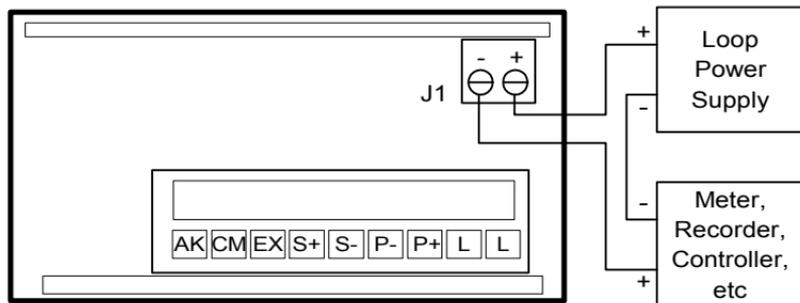


Figure 11. Output Loop Powered from External Supply



If the output loop is powered by an external supply, the loop power supply must be turned on before the meter is turned on. Otherwise, the output loop signal may be incorrect.

## Isolated 4-20 mA Output Calibration

The isolated 4-20 mA output signal is calibrated using the front panel **ENTER** button and uses the same **Single Button Scaling** technique that is used to calibrate the signal input and the alarm set and reset points. A current meter may be connected to the output terminals to verify calibration, but it is not required as part of the calibration process.

### 4 mA Output Calibration

1. Press **ENTER**, when **outPut** appears press **ENTER** again.
2. All digits flash for 3 seconds, a green LED labeled "4" illuminates indicating the flashing display is the value at which the meter will produce a 4 mA output.

If this is the desired display at which the meter will produce a 4 mA output, press **ENTER** before entire display stops flashing. The meter indicates that the 4 mA Output Calibration is now complete by illuminating the green "20" LED. Go to 20 mA Output Calibration below.

If this is not the desired display, (or if **ENTER** was not pressed in time to accept the display) wait for the first digit to flash.

3. First digit flashes for 3 seconds before it scrolls.
4. When first digit is OK, press **ENTER**, next digit will flash for 3 seconds before it scrolls.
5. When flashing digit is OK, press **ENTER**, next digit will flash for 3 seconds before it scrolls.
6. Repeat step 5 for each remaining digits.
7. When last digit is OK, press **ENTER**.
8. Entire display will flash for 3 seconds. Press **ENTER** within the 3 seconds if OK to complete 4 mA Output Calibration. If NOT OK, wait for first digit to flash and go to step 5 above.

### 20 mA Output Calibration

Note: The 20 mA output calibrates in the same fashion as 4 mA output so the 4 mA Calibration Instructions will be referenced for most of the 20 mA Calibration Instructions.

1. When **ENTER** is pressed to complete the calibration for 4 mA output, the green LED labeled "20" illuminates indicating the flashing display is the value at which the meter will produce a 20 mA output.
2. Repeat steps 2-8 in 4 mA Output Calibration above.
3. Upon acceptance of the display corresponding to the 20 mA output, the meter exits the **outPut** routine and returns to indication mode.

**Note: An Error message will be displayed if the 4-20 mA output span is smaller than 501 counts.**

## Programming Confirmation

The values that have been programmed to produce the 4 and 20 mA outputs can be quickly checked to make sure they are the desired values. To do this, enter the **outPut** routine by pressing **ENTER** and then pressing **ENTER** again when **outPut** appears.

The green "4" LED illuminates indicating the meter is displaying the value at which it will produce a 4 mA output. Confirm that this is the desired value. Press **ENTER** (within 3 seconds) before the entire display stops flashing and the green "20" LED illuminates indicating the meter is displaying the value at which it will produce a 20 mA output. Confirm that this is the desired value. Press **ENTER** (within 3 seconds), before the entire display stops flashing and the meter returns to indication mode.

## LOCKOUT

Set switch 8 to the **ON** position to restrict modification of programmed values. When **ENTER** is pressed with switch 8 **ON**, only **dSPY P**, **tArE**, **ALArS**, and **outPut** routines are displayed. **dSPY P** can still be entered to activate the Peak Hold feature. **ALArS** and **outPut** routines may be entered to view their settings, but the settings may not be altered. If Capture Tare is in operation, the captured value can be cleared.

## OPTIONS CARD REMOVAL & INSTALLATION

Meter options are installed at the factory. To disable relays' fail-safe operation, it is necessary to remove the Boards from the case. Refer to the following instructions and illustrations.

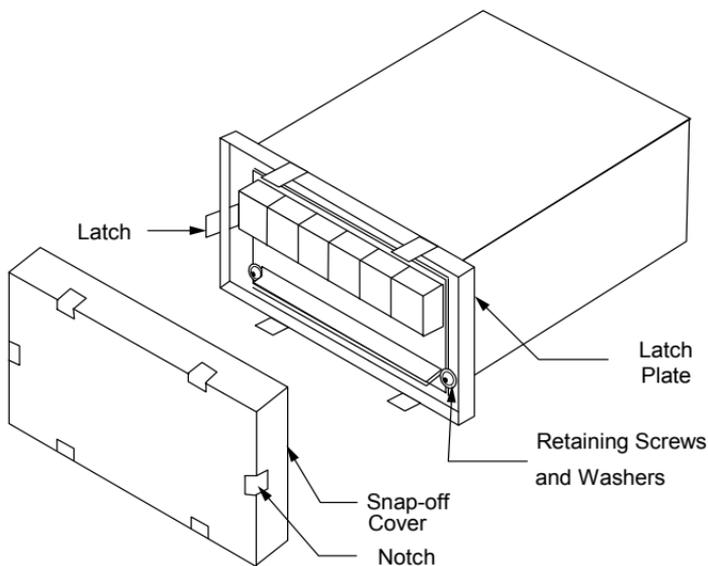


**Disconnect power prior to performing the following operations.**

The meter's snap-off cover is held in place by 6 latches that snap into notches on the snap-off cover. To remove the snap-off cover from the meter, grasp it firmly on its top and bottom edges and pull it forward. The latch plate remains around the meter's case.

To remove the circuit boards from the case:

1. Unscrew the retaining screws holding the circuit boards to the case.
2. Remove the screw terminal connectors at the rear of the meter.
3. Push the boards through the case by applying pressure to the circuit boards at the rear of the meter. Apply pressure evenly to both boards.
4. Do not apply pressure to the vertical display board.



**Figure 12. Front Cover Removal**

5. Configure fail-safe jumper on Options Board as required. Disconnect J2 jumper to disable fail-safe operation.
6. To avoid electric shock, re-install the circuit boards in the case prior to applying power.

All programming and calibrating can be performed with the circuit boards installed in the case.

To re-install the meter in its case:

1. Fold the Options Board over the Main Board, grasp both boards so the Main Board is on the bottom and the two Boards are separated by about an inch.
2. Insert the two boards together into the case. Be sure both the top and bottom boards engage the rails, which hold them in place.
3. Do not press on the Display Board when seating the assembly in the case.
4. Install washers and retaining screws in 4 corners of meter and install front cover.

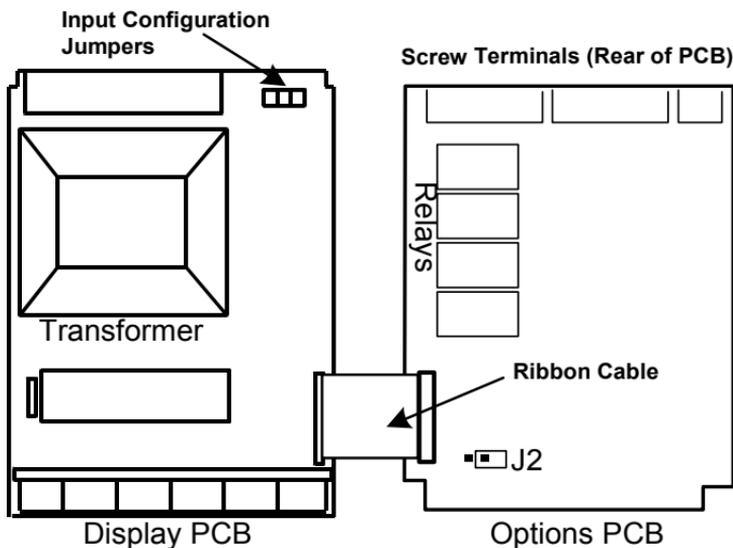


Figure 13. Options Card Installation

## User Programmed Parameters

Number of calibration points \_\_\_\_\_

### Calibration Point Values

input 1	_____	display 1	_____
input 2	_____	display 2	_____
input 3	_____	display 3	_____
input 4	_____	display 4	_____
input 5	_____	display 5	_____
input 6	_____	display 6	_____
input 7	_____	display 7	_____
input 8	_____	display 8	_____
input 9	_____	display 9	_____
input 10	_____	display 10	_____
input 11	_____	display 11	_____

Ratiometric operation or

Bi-polar operation or

Normal operation

Uni-polar operation

### Alarms

relay 1 set point	_____	reset point	_____
relay 2 set point	_____	reset point	_____
relay 3 set point	_____	reset point	_____
relay 4 set point	_____	reset point	_____

### 4-20 mA Output Option

4 mA display value \_\_\_\_\_

20 mA display value \_\_\_\_\_

Model Number: PD691 - \_\_\_\_\_ - \_\_\_\_\_

Serial Number: \_\_\_\_\_

## MOUNTING DIMENSIONS

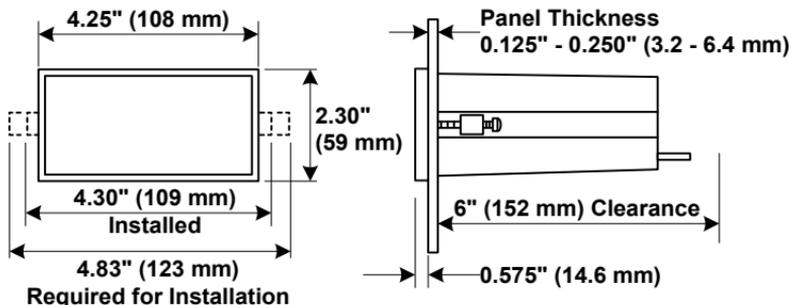
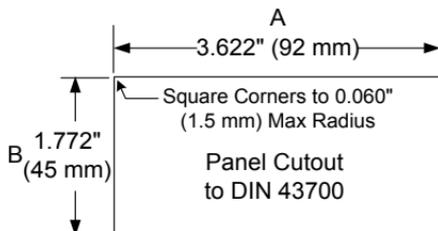


Figure 14. Mounting Dimensions



Tolerances:

A: +0.032 (+0.8 mm)

-0.000 (-0.0 mm)

B: +0.024 (+0.6 mm)

-0.000 (-0.0 mm)

Figure 15. Panel Cutout Dimensions

### Notes:

1. Panel cutout required: 1.772" x 3.622" (45 mm x 92 mm) 1/8 DIN
2. Panel thickness: 0.125" - 0.250" (3.17 mm - 6.34 mm)
3. Clearance: Allow 6 inches (152 mm) behind the panel

**OTHER PRECISION DIGITAL PRODUCTS**

<b>Model</b>	<b>Description</b>
PD118	MINIMUX® 8 Point Scanner
PD154	Vigilante® II 4-Point Annunciator (UL Listed)
PD158	Vigilante® II 8-Point Annunciator (UL Listed)
PD202	General Purpose Digital Pressure Gauge
PD213-224	Industrial Digital Pressure Gauges (FM & CSA)
PD233-253	Precision Digital Test Pressure Gauges (FM & CSA)
PD603	Sabre P Low-Cost Process Meter (UL Listed)
PD644	Javelin D High-Voltage DC Panel Meter (UL Listed)
PD655	1.0" LED NEMA 4X Large Display Process Meter
PD656	0.8" LED Exp-Proof Large Display Process Meter
PD660	Low-Cost NEMA 4X Loop-Powered Meter
PD661	Low-Cost Exp-Proof Loop-Powered Meter (FM & CSA)
PD683	Loop-Powered Meter
PD684	Loop-Powered Rate/Totalizer
PD685	3½ Digit Loop Powered NEMA 4X Meter (General Purpose)
PD686	3½ Digit Loop Powered NEMA 4X Meter (FM & CSA)
PD687	3½ Digit Loop Powered Exp-Proof Meter (FM & CSA)
PD688	Loop-Powered Meter (FM & CSA)
PD689	Loop-Powered Rate/Totalizer (FM & CSA)
PD690	1/8 DIN Analog Input Process Meter (UL Listed)
PD691	1/8 DIN Strain Gauge & mV Input Meter (UL Listed)
PD692	1/8 DIN Analog Input Flow Rate/Totalizer (UL Listed)
PD693	1/8 DIN Freq/Pulse Input Flow Totalizer (UL Listed)
PD743	Sabre T Low-Cost Temperature Meter (UL Listed)
PD750	TC & RTD Temperature Meter (UL Listed)
PD751	10 Ω Cu RTD Temperature Meters (UL Listed)
PD752	120 Ω Ni RTD Temperature Meters (UL Listed)
PD765	Trident Process & Temperature Meter (UL Listed)
PD865	Snooper Modbus Serial Input Meter (UL Listed)
PD940 & 941	ConsoliDator® 4 Multi-Channel Controllers (UL Listed)
PD980 & 981	ConsoliDator® 8 Multi-Channel Controllers (UL Listed)
PD6000	ProVu Process Meter (UL Listed)
PD6200	ProVu Analog Rate/Totalizer (UL Listed)
PD6300	ProVu Pulse Rate/Totalizer (UL Listed)

# How to Contact Precision Digital

- For Technical Support please

Call: (800) 610-5239 or (508) 655-7300

Fax: (508) 655-8990

Email: [support@predig.com](mailto:support@predig.com)

- For Sales Support or to place an order please

Call: (800) 343-1001 or (508) 655-7300

Fax: (508) 655-8990

Email: [sales@predig.com](mailto:sales@predig.com)

- For the latest version of this manual please visit

**[www.predig.com](http://www.predig.com)**

