

# ProSense® Universal Signal Conditioners

## Quick Start Guide

AUTOMATIONDIRECT

- Models:**  
**SCU-1400 - Universal Transmitter with Analog Output**  
**SCU-1600 - Universal Transmitter with Analog and (2) Relay Outputs**  
**SCU-3100 - Universal Transmitter with (2) Relay Outputs**  
**SCU-PDM1 or SCU-PDM2 - Display / Programming Module**

3505 HUTCHINSON ROAD  
 CUMMING, GA 30040-5860



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### Technical Specifications

Operating temperature ..... -20°C to +60°C (-4°F to 140°F)  
 Storage temperature ..... -20°C to +85°C (-4°F to 185°F)  
 Supply voltage..... 21.6...253 VAC or 19.2...300 VDC  
**Max. required power:**  
 SCU-1400, SCU-3100..... ≤ 2.0 W  
 SCU-1600..... ≤ 2.5 W  
**Max. power dissipation:**  
 SCU-1400, SCU-3100..... ≤ 2.0 W  
 SCU-1600..... ≤ 2.5 W  
 Fuse ..... 400mA SB / 250VAC  
 Isolation voltage, test / operation..... 2.3 kVAC / 250VAC (reinforced isolation)

EMC immunity influence..... < ±0.5% of span

Extended EMC immunity:

NAMUR NE 21, A criterion, burst..... < ±1% of span  
 Relative humidity..... < 95% RH (non-cond.)  
 Dimensions (HxWxD) ..... 109 x 23.5 x 104 mm  
 Dimensions (HxWxD) w/ SCU-PDM1..... 109 x 23.5 x 116 mm or  
 109 x 23.5 x 132 mm w/ SCU-PDM2

Protection degree ..... IP20

### Approvals

UL, Standard for Safety ..... UL 508/C22.2 No. 14  
 FM ..... 3600, 3611, 3810, ISA 61010-1  
 Class I, Div. 2, Group A-D, T5  
 Class I, Div. 2, Group IIC, T5  
 Zone 2 (when SCU-PDM2 is not attached).  
 The SCU-PDM2 is NOT approved for use in Hazardous Locations.

### Observed authority requirements:

EMC ..... 2014/30/EU  
 LVD ..... 2014/35/EU  
 RoHS 2..... 2011/65/EU

Model	SCU-1400	SCU-1600	SCU-3100
<b>Input</b>			
Input for RTD types	Pt10, Pt20, Pt50, Pt100, Pt200, Pt250, Pt300, Pt400, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000, Cu10, Cu20, Cu50, Cu100	Pt10, Pt20, Pt50, Pt100, Pt200, Pt250, Pt300, Pt400, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000, Cu10, Cu20, Cu50, Cu100	Pt10, Pt20, Pt50, Pt100, Pt200, Pt250, Pt300, Pt400, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000, Cu10, Cu20, Cu50, Cu100
Input for TC types	B, E, J, K, L, N, R, S, T, U, W3, W5, LR	B, E, J, K, L, N, R, S, T, U, W3, W5, LR	B, E, J, K, L, N, R, S, T, U, W3, W5, LR
Current input ranges	0...20, 4...20 mA	0...20, 4...20 mA	0...20, 4...20 mA
Current input resistance	Nom. 20 Ω + PTC 50 Ω	Nom. 20 Ω + PTC 50 Ω	Nom. 20 Ω + PTC 50 Ω
Input voltage drop, nom.	1.4 V @ 20 mA	1.4 V @ 20 mA	1.4 V @ 20 mA
Voltage input ranges	0/0.2...1, 0/0.5...2.5, 0/1...5, 0/2...10 VDC	0/0.2...1, 0/0.5...2.5, 0/1...5, 0/2...10 VDC	0/0.2...1, 0/0.5...2.5, 0/1...5, 0/2...10 VDC
Voltage input resistance	Nom. 10 MΩ	Nom. 10 MΩ	Nom. 10 MΩ
<b>Output</b>			
Current output	0/4...20 mA, 20...0/4 mA	0/4...20 mA, 20...0/4 mA	-----
Load (max.), current output	≤ 800 Ω	≤ 800 Ω	-----
Current limit	≤ 28 mA	≤ 28 mA	-----
Voltage output	0...1 / 0.2...1 / 0...10 / 0...5 / 1...5 / 2...10 / 1...0 / 1...0.2 / 5...0 / 5...1 / 10...0 / 10...2 V	0...1 / 0.2...1 / 0...10 / 0...5 / 1...5 / 2...10 / 1...0 / 1...0.2 / 5...0 / 5...1 / 10...0 / 10...2 V	-----
Load (min.), voltage output	≥ 500 kΩ	≥ 500 kΩ	-----
Relay output	-----	2 x SPST, AC: 500 VA	2 x SPST, AC: 500 VA

Note: Additional specifications available at [www.AutomationDirect.com](http://www.AutomationDirect.com)

### Installation:

This installation guide for technical personnel covers the following products:

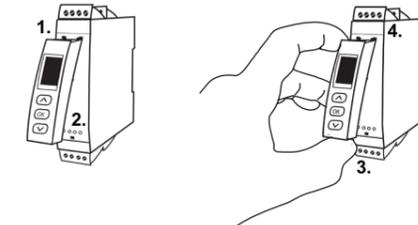
SCU-1400	SCU-1600	SCU-3100
SCU-PDM1	SCU-PDM2	SCU-CJC1

### Mounting SCU-PDM1 or SCU-PDM2:

1. Insert the tabs of the SCU-PDM1 or SCU-PDM2 into the holes at the top of the device.
2. Swing the SCU-PDM1 or SCU-PDM2 down until it snaps into place.

### Removing the SCU-PDM1 or SCU-PDM2:

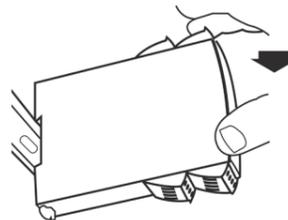
3. Push the release button on the bottom of the SCU-PDM1 or SCU-PDM2 and swing out and up.
4. With the SCU-PDM1 or SCU-PDM2 hinged up, remove it from the holes at the top of the device.



**Warning:** The SCU-PDM2 is NOT approved for use in Hazardous Locations.

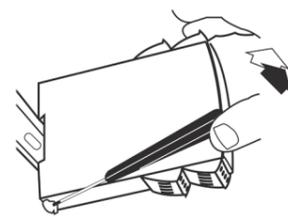
### Mounting on DIN rail:

Place top notch of module onto DIN rail and then press lower portion onto DIN rail until it snaps in place.



### Removing from DIN rail:

Remember to remove the connectors with hazardous voltages. Detach the device from DIN rail by lifting the bottom lock.



### Wiring:

Max. wire size 1 x 2.5 mm2 stranded wire. Screw terminal torque 0.5 Nm.

## WARNING

This device is designed for connection to hazardous electric voltages. Ignoring this warning can result in severe personal injury or mechanical damage. To avoid the risk of electric shock and fire, the safety instructions of this guide must be observed and the guidelines followed. The specifications must not be exceeded, and the device must only be applied as described in the following. Prior to the commissioning of the device, this installation guide must be examined carefully. Only qualified personnel (technicians) should install this device. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Until the device is mounted, do not connect hazardous voltages to the device. The following operations should only be carried out on a disconnected device and under ESD safe conditions: General mounting, connection and disconnection of wires.

Do not open the front plate of the device as this will cause damage to the connector for the display / programming front SCU-PDM1 or SCU-PDM2. This device contains no DIP-switches or jumpers. Units must be mounted on a DIN rail according to DIN 60715

The SCU-PDM2 is NOT approved for use in Hazardous Locations.

### SAFETY INSTRUCTIONS

#### Receipt and unpacking

Unpack the device without damaging it. The packing should always follow the device until it has been permanently mounted. Check at the receipt of the device to ensure the type corresponds to the one ordered.

#### Environment

Avoid direct sunlight, dust, high temperatures, mechanical vibrations and shock, as well as rain and heavy moisture. If necessary, heating in excess of the stated limits for ambient temperatures should be avoided by way of ventilation. All devices can be used for Measurement / Overvoltage Category II and Pollution Degree 2. The module is designed to operate safely at an altitude of 2000m or less.

#### Mounting

Mounting and connection of the device should comply with national legislation for mounting of electric materials, i.e. wire cross section, protective fuse, and location. Descriptions of input / output and supply connections are shown in this installation guide and on the side label. The following apply to hazardous voltage-connected devices:

The max. protective fuse is 10A. A power switch shall be easily accessible and close to the device. The power switch shall be marked as the disconnecting unit for the device.

#### UL installation requirements

Use 60/75°C copper conductors only.  
 For use only in pollution degree 2 or better.  
 Max. ambient temperature ..... 60°C (140°F)  
 Wire size ..... AWG 26-14  
 UL file number, SCU-1400, SCU-1600 & SCU-3100..... E191072

The device is an Open Type Listed Process Control Equipment. To prevent injury resulting from accessibility to live parts the equipment must be installed in an enclosure.

#### FM installation in Division 2 or Zone 2

FM19US0054X ..... Cl. I, Div. 2, Group A, B, C, D T5 or Cl. I, Div. 2, Zone 2, Group IIC T5 (when SCU-PDM2 is not attached). The SCU-PDM2 is NOT approved for use in Hazardous Locations.

#### Specific Conditions of Use:

1. The products may be used with the SCU-PDM1 or SCU-PDM2 Display/Programming front accessory. WARNING The SCU-PDM2 is NOT approved for use in Hazardous Locations.
2. The equipment shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application, including a tool removable cover.

In Class I, Div. 2 or Zone 2 installations, the subject equipment shall be mounted within a tool secured enclosure which is capable of accepting one or more of Class I, Div. 2 wiring methods specified in the National Electrical Code (ANSI/NFPA 70). The SCU Series transmitters must be connected to limited output NEC Class 2 circuits, as outlined in the National Electrical Code® (ANSI / NFPA 70), only. If the devices are connected to a redundant power supply (two separate power supplies), both must meet this requirement. Where installed in outdoor or potentially wet locations the enclosure shall at a minimum meet the requirements of IP54.

**Warning:** The SCU-PDM2 is NOT approved for use in Hazardous Locations.

**Warning:** Substitution of components may impair suitability for Zone 2 / Div. 2.

**Warning:** To prevent ignition of explosive atmospheres, disconnect power before servicing and do not separate connectors when energized and an explosive gas mixture is present.

#### Calibration and adjustment

During calibration and adjustment, the measuring and connection of external voltages must be carried out according to the specifications of this installation guide. The technician must use tools and instruments that are safe to use.

#### Cleaning

When disconnected, the device may be cleaned with a cloth moistened with distilled water.

### Side Label

SCU-1600

SN: 000000000

TAG: .....

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AutomationDirect, 3505 Hutchinson Road  
 Cumming, GA 30040, 800-633-0405  
[www.AutomationDirect.com](http://www.AutomationDirect.com)

-20°C ≤ Ta ≤ +60°C

21: output	RET N.O. 230VRMS / 2A / 680VA	31: supply	24-250VDC / 105-10mA
22: output	RET N.O. 24VDC / 1A	32: supply	24-230VAC / 50-60Hz / 2.5W
23: output	RET N.O. 230VRMS / 2A / 680VA		
24: output	RET N.O. 24VDC / 1A		

41: input	TC	V	1-3w / 4w	pot1	mA	11: output	V	1V
42: input	TC	V	2w / 3w / 4w	pot2	mA	12: output	V	1V
43: input	V	2w / 3w / 4w	pot3	mA	13: output	V	1V	10V
44: input	V	4w	pot2	mA	14: output	V	10V	

Attention! Read Manual before installation / operation. Life manual event installation / operation.

Suitable for installation in Class I, Div 2 Group A-D T5 or Class I, Zone 2, Group IIC T5

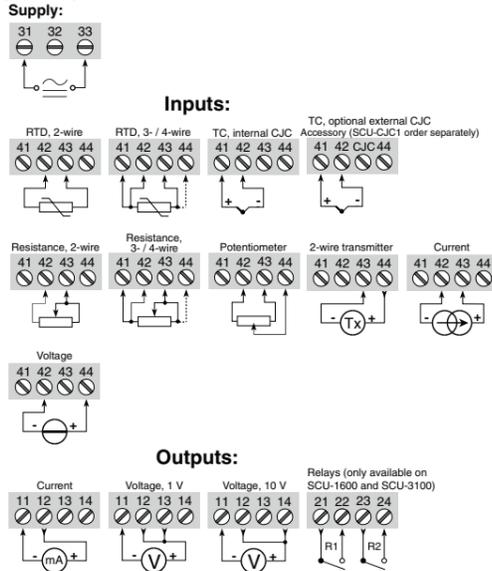
IP20

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SCU-1600S101

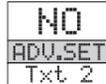
UNIVERSAL TRANSMITTER SCU-1600

## Wiring Diagrams



## Configuring a new unit

- Mount the unit on a 35mm DIN rail and connect supply, input and output wires to the appropriate terminals based on the connection diagrams in this Quick Start Guide.
- Snap the SCU-PDM1 or SCU-PDM2 Programming Module on the front of the unit.
- Power up the unit.
- The unit should display the configuration menu similar to the figure below. If not, press **OK** once.



**Note:** If no sensor is connected to the input terminals, SE.BR will flash in the display when the unit is powered up. Press **OK** once to acknowledge the error and then press **OK** again to display the first screen of the menu as shown above.

- Press **OK** to begin configuration. Press **▲** or **▼** to scroll through options on each step. Press **OK** to confirm an option and move to the next step.
- Press and hold **OK** to step backwards through the configuration menu.

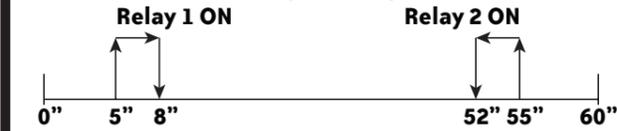
## Abbreviations used on the SCU-PDM1 or SCU-PDM2 display

FL.ER = flash memory error	DISP.HI = display range high
AO.ER = no load for current output (S4-20 mA only)	REL.UN = relays set in units or % range
NO.CO = connection error with SCU-PDM1 or SCU-PDM2	Rx.FUNC = relay 1 / 2 function
IN.ER = error levels on input	Rx.CONT = relay 1 / 2 contact type
TY.ER = configuration in SCU-PDM1 or SCU-PDM2 doesn't match this product	Rx.SETP = relay 1 / 2 setpoint
ADV.SET = advanced settings	Rx.HYST = relay 1 / 2 hysteresis
IN TYPE = input type	ERR.ACT = relay action on error
V.RANGE = voltage range	ON.DEL = relay on delay
I.RANGE = current range	OFF.DEL = relay off delay
CONNEC. = connecting wires	ANA.OUT = analog output
Pt. TYPE = Platinum RTD type	O.RANGE = output range
Ni TYPE = Nickel RTD type	OUT.ERR = output action on error
TC.TYPE = thermocouple type	OUT.LO = temp for low output
DEC.P = decimal place location	OUT.HI = temp for high output
SE.BR = a sensor wire is not connected	EN.PASS = enable password
DECR = decreasing	NEW.PAS = new password
ACT.DIR = action direction	CAL.LO = calibrate input low to process value?
DISP.LO = display range low	CAL.HI = calibrate input high to process value?
	USE.CAL = Use process calibration value?

**Note:** Help text for each abbreviation will scroll across the SCU-PDM1 or SCU-PDM2

## Application Example - Voltage Input to Current and/or Relay Output

A level sensor with 0-5 VDC output needs to be connected to a 4-20 mA and/or digital inputs on a PLC. The sensor measures fluid level between 0 and 60" in a tank. When using the SCU-1600 or SCU-3100, low and high alarms will be set at 5" and 55" respectively with a 3" hysteresis and 5 second on delay set for each alarm. In the event of a sensor error, both relays will hold in their current state when the error occurred. Relay switching will work as follows:



- In the configuration menu press **▲** or **▼** until VOLT is displayed on line 1. Press **OK**.
- Select input range. Press **▲** or **▼** until 0-5 is displayed for V.RANGE. Press **OK**.
- Select input units. Press **▲** or **▼** until in is displayed for UNIT. Press **OK**.
- Select decimal point location. Press **▲** or **▼** until 111.1 is displayed for DEC.P. Press **OK**.
- Set display value for minimum input. Press **▲** or **▼** until 0.0 is displayed for DISP.LO. Press **OK**.
- Set display value for maximum input. Press **▲** or **▼** until 60.0 is displayed for DISP.HI. Press **OK**.

### Relay Configuration (SCU-1600 and SCU-3100 only)

- Select the relay unit type. Press **▲** or **▼** until DISP is displayed for REL.UNI. Press **OK**.
- Select relay 1 function. Press **▲** or **▼** until SETP is displayed for R1.FUNC. Press **OK**.
- Select relay contact type. Press **▲** or **▼** until N.O. is displayed for R1.CONT. Press **OK**.
- Set relay setpoint. Press **▲** or **▼** until 5.0 is displayed for R1.SETP. Press **OK**.
- Select relay activation decreasing mode. Press **▲** or **▼** until DECR is displayed for ACT.DIR. Press **OK**.
- Set relay hysteresis. Press **▲** or **▼** until 3.0 is displayed for R1.HYST. Press **OK**.
- Set relay on delay in seconds. Press **▲** or **▼** until 5 is displayed for ON.DEL. Press **OK**.
- Set relay off delay in seconds. Press **▲** or **▼** until 0 is displayed for OFF.DEL. Press **OK**.
- Select relay 2 function. Press **▲** or **▼** until SETP is displayed for R2.FUNC. Press **OK**.
- Select contact type. Press **▲** or **▼** until N.O. is displayed for R2.CONT. Press **OK**.
- Set relay setpoint. Press **▲** or **▼** until 60.0 is displayed for R2.SETP. Press **OK**.
- Select relay activation increasing mode. Press **▲** or **▼** until INCR is displayed for ACT.DIR. Press **OK**.
- Set relay hysteresis. Press **▲** or **▼** until 3.0 is displayed for R2.HYST. Press **OK**.
- Set relay on delay in seconds. Press **▲** or **▼** until 5 is displayed for ON.DEL. Press **OK**.
- Set relay off delay in seconds. Press **▲** or **▼** until 0 is displayed for OFF.DEL. Press **OK**.
- SCU-1400 and SCU-1600 only Select output mode. Press **▲** or **▼** until CURR is displayed for ANA.OUT. Press **OK**.
- SCU-1400 and SCU-1600 only Select output range. Press **▲** or **▼** until 4-20 is displayed for O.RANGE. Press **OK**.
- Wait while the settings are stored and the unit switches to run mode.

Once the SCU-1600 or SCU-3100 has been configured, the relay setpoints can be adjusted very quickly. Press **▲** to adjust RELAY1 and **▼** to adjust RELAY2. Adjust the setpoint up or down and then press **OK** to save the setting and exit the menu. Pressing **▲** and **▼** simultaneously will change the relay's state.

## Application Example - Thermocouple Input

An oven's temperature is to be monitored using a type K thermocouple and a SCU-1400 or SCU-1600. The unit will output a 0-10 VDC signal for a temperature range of 100-400 °F

- In the configuration menu press **▲** or **▼** until TEMP is displayed on line 1. Press **OK**.
- Select sensor type. Press **▲** or **▼** until TC is displayed for SENSOR. Press **OK**.
- Select TC type. Press **▲** or **▼** until TC.K is displayed for TC.TYPE. Press **OK**.
- Select CJC type. Press **▲** or **▼** until INT is displayed for CJC. Press **OK**.
- Select temperature units. Press **▲** or **▼** until °F is displayed for UNIT. Press **OK**.
  - SCU-1600 only - select relay 1 function. Press **▲** or **▼** until OFF is displayed for R1.FUNC. Press **OK**.
  - SCU-1600 only - select relay 2 function. Press **▲** or **▼** until OFF is displayed for R2.FUNC. Press **OK**.
- Select output mode. Press **▲** or **▼** until VOLT is displayed for ANA.OUT. Press **OK**.
- Select output range. Press **▲** or **▼** until 0-10 is displayed for O.RANGE. Press **OK**.
- Set temperature for analog output low. Press **▲** or **▼** until 100.0 is displayed for OUT.LO. Press **OK**.
- Set temperature for analog output high. Press **▲** or **▼** until 400.0 is displayed for OUT.HI. Press **OK**.
- Wait while the settings are stored and the unit switches to run mode.

## Application Example - Voltage Input to Voltage Output with Custom Scaling

A flow sensor, connected to a SCU-1400 or SCU-1600, delivers a 3-7 VDC output over a range of 0-80 gallons per minute. The signal conditioner will convert the 3-7 VDC input signal to a 0-10 VDC output signal. The unit must first be configured to the voltage output range. The two-point calibration mode in Advanced Settings is then used to set the custom input range.

- In the configuration menu press **▲** or **▼** until VOLT is displayed on line 1. Press **OK**.
- Select input range. Press **▲** or **▼** until 0-10 is displayed for V.RANGE. Press **OK**.
- Select input units. Press **▲** or **▼** until gal/min is displayed for UNIT. Press **OK**.
- Select decimal point location. Press **▲** or **▼** until 111.1 is displayed for DEC.P. Press **OK**.
- Set display for minimum input. Press **▲** or **▼** until 0.0 is displayed for DISP.LO. Press **OK**.
- Set display for maximum input. Press **▲** or **▼** until 80.0 is displayed for DISP.HI. Press **OK**.
  - Select the relay unit type. Press **▲** or **▼** until DISP is displayed for REL.UNI. Press **OK**.
  - SCU-1600 only - select relay 1 function. Press **▲** or **▼** until OFF is displayed for R1.FUNC. Press **OK**.
  - SCU-1600 only - select relay 2 function. Press **▲** or **▼** until OFF is displayed for R2.FUNC. Press **OK**.
- Select output mode. Press **▲** or **▼** until VOLT is displayed for ANA.OUT. Press **OK**.
- Set output range. Press **▲** or **▼** until 0-10 is displayed for O.RANGE. Press **OK**.

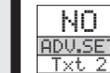
Application Example Continued above.

## Application Example - Voltage Input to Voltage Output with Custom Scaling - Cont'd

- Wait while these settings are stored and the unit switches to run mode.
- Press **OK** to return to the configuration menu.
- Enter Advanced Settings Mode. Press **▲** or **▼** until YES is displayed for ADV.SET. Press **OK**.
- Select custom scaling mode. Press **▲** or **▼** until CAL is displayed for SETUP. Press **OK**.
- Drive the input to a low value. The value does not have to be a minimum. In this example we will use 5.0 VDC (40 gallons per minute).
- Select lowpoint. Press **▲** or **▼** until YES is displayed for CAL.LO. Press **OK**.
- Set low point. Press **▲** or **▼** until 40.0 is displayed for gal/min. Press **OK**.
- Drive the input to a high value. The value does not have to be a maximum. In this example we will use 6.0 VDC (60 gallons per minute).
- Select high point. Press **▲** or **▼** until YES is displayed for CAL.HI. Press **OK**.
- Set high point. Press **▲** or **▼** until 60.0 is displayed for gal/min. Press **OK**.
- Confirm to use custom scaling. Press **▲** or **▼** until YES is displayed for USE.CAL. Press **OK**.
- Wait while the settings are stored and the unit switches to run mode.

## Advanced Operations

Several useful functions are in the Advanced Settings Menu. To get to the Advanced Settings Menu, Press **▲** or **▼** until YES is displayed for the first screen of the configuration menu that looks like this:



- The configuration of the SCU-1400, SCU-1600 or SCU-3100 can be saved into the SCU-PDM1 or SCU-PDM2. The SCU-PDM1 or SCU-PDM2 can then be moved to another unit (must be the same part number) and the configuration loaded into the new unit.
- Enter Advanced Settings menu and then press **▲** or **▼** until MEM is displayed for SETUP. Press **OK**.
- To save the configuration into the SCU-PDM1 or SCU-PDM2. Press **▲** or **▼** until SAVE is displayed for MEMORY. Press **OK**.
- To load the configuration from the SCU-PDM1 or SCU-PDM2 into the SCU-1400, SCU-1600 or SCU-3100. Press **▲** or **▼** until LOAD is displayed for MEMORY. Press **OK**.

Password Protection allows the user to create a 4-digit password (0000-9999) to prevent tampering with configuration settings if the SCU-PDM1 or SCU-PDM2 is left mounted to the front of the signal conditioner.

- Enter Advanced Settings menu and then press **▲** or **▼** until PASS is displayed for SETUP. Press **OK**.
- To enable password protection. Press **▲** or **▼** until YES is displayed for EN.PASS. Press **OK**.
- To set a password. Press **▲** or **▼** until the desired code is displayed for NEW.PAS. Press **OK**.

## Additional Help and Support

- For product support, specifications, installation and troubleshooting, a Hardware User Manual can be downloaded from the On-line Documentation area of the **AutomationDirect** web site.
- For additional technical support and questions, call our Technical Support team @ 1-800-633-0405 or 770-844-4200