ProSense® Universal Signal Conditioners
Quick Start Guide

AUTOMATIONDIRECT

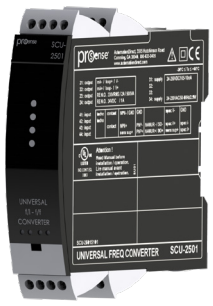
3505 HUTCHINSON ROAD
CUMMING, GA 30040-5860

Models:

SCU-2501 - Universal Frequency Transmitter with Analog and Relay Outputs

SCU-2502 - Universal Frequency Transmitter with (2) Relay Outputs

SCU-2503 - Universal Frequency Transmitter with Analog and Frequency Outputs



ProSense Universal Transmitter Signal Conditioner models SCU-2501, SCU-2502 and SCU-2503 are single input devices that accept PNP, NPN, TTL, NAMUR, and custom special trigger current or voltage level frequency. The SCU-2501 and SCU-2502 models support relay output with the SCU-2502 having two independently triggered relay outputs. The SCU-2501 and SCU-2503 provide a mA (sourcing or sinking) or voltage output. The SCU-2503 is the only unit with a frequency output allowing for frequency/frequency conversion. They feature a plastic slim-line housing, integral 35mm DIN rail mounting adapter, and removable screw terminals. The detachable SCU-PDM2 programming / display module (purchased separately) is required for unit configuration. The programming / display module may remain affixed for operational display of input and output values.

Note: Additional specifications available at www.AutomationDirect.com

⚠ 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-PDM2. This device contains no DIP-switches or jumpers. Units must be mounted on a DIN rail according to DIN 60715

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.

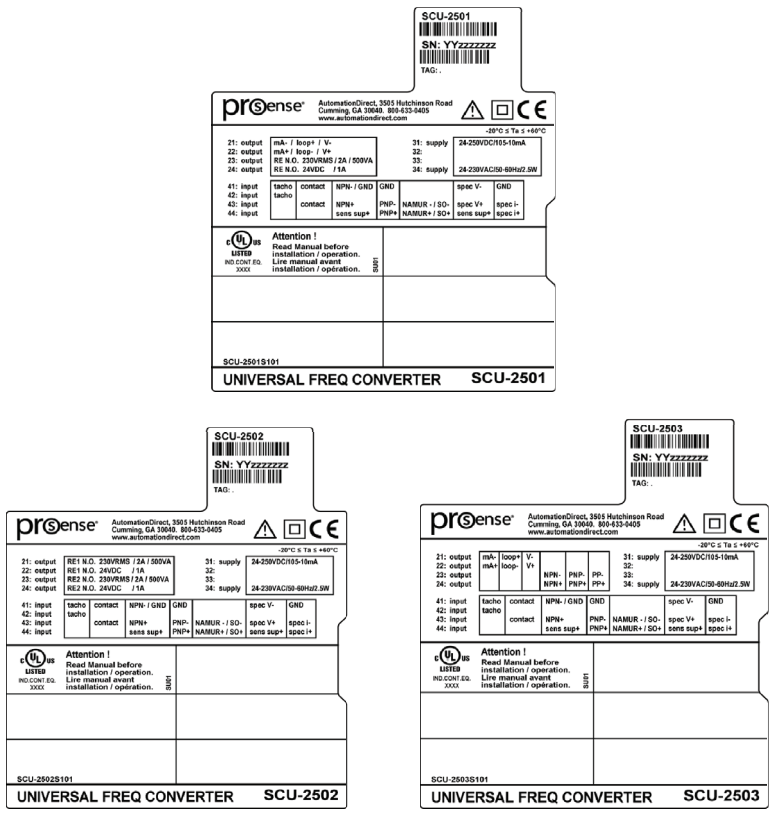
Mounting
Mounting and connection of the device should comply with national legislation for mounting of electric materials, i.e. wire cross section, protective fuse, and location. Descriptions of input / output and supply connections are shown in this installation guide and on the side label. The following 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-2501, SCU-2502 & SCU-2503..... E197592
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.

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



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-2501/2/3..... ≤ 2.6 W
Max. power dissipation:
SCU-2501/2/3..... ≤ 2.1 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-PDM2..... 109 x 23.5 x 116 mm
Protection degree IP20
Approvals
UL, Standard for Safety ..... UL 508/C22.2 No. 14
Observed authority requirements:
EMC 2014/30/EU
LVD 2014/35/EU
RoHS 2..... 2011/65/EU

Model		*SCU-2501*	*SCU-2502*	*SCU-2503*
Input				
Frequency input	Frequency Range	0.001 Hz to 100 kHz		
	Time range, time function	10 µs to 999.9 s		
	Max. frequency, with input filter ON	75Hz		
	Min. pulse width with input filter ON	8ms		
	Min. pulse width with input filter OFF	4µs		
	Response time (0...90%, 100...10%)	< 30ms		
NAMUR input	Trig-level LOW	≤ 1.2 mA		
	Trig-level HIGH	≥ 2.1 mA		
	Input impedance	1 kΩ || < 220pF		
	Breakage detection	≤ 0.1 mA		
	Short-circuit detection	≥ 6.9 mA		
	Sensor supply - pin 44, fixed	8.3 V		
Tacho input	Trig-level LOW	≤ -50 mV		
	Trig-level HIGH	≥ +50 mV		
	Input impedance	100 kΩ || < 220 pF		
	Max. input voltage	80VAC pp		
	Sensor supply - pin 44, programmable	5...17 V / 23mA		
NPN / PNP input	Trig-level LOW	≤ 4.0 V		
	Trig-level HIGH	≥ 7.0 V		
	Input impedance	3.48 kΩ || < 220 pF		
	Trigger edge	NPN = Neg. edge, PNP = Pos. edge.		
	Sensor supply - pin 44, programmable	5...17 V / 23mA		
TTL input	Trig-level LOW	≤ 0.8 V		
	Trig-level HIGH	≥ 2.0 V		
	Input impedance	≥ 100 kΩ || < 220 pF		
	Sensor supply - pin 44, programmable	5...17 V / 23mA		
S0 input	Trig-level LOW	≤ 2.2 mA		
	Trig-level HIGH	≥ 9.0 mA		
	Input impedance	758 Ω || < 220 pF		
	Sensor supply - pin 44, fixed.	17V		
Special voltage input	User-programmable trig-levels	-0.05...6.50 V		
	*Hysteresis, min	50 mV		
	Input impedance, programmable:	High Z: ≥100 kΩ || < 220 pF Pull up/down; 3.48 kΩ || < 220 pF		
	Programmable sensor supply - pin 44	5...17 V / 23 mA		
	Max. input voltage	17V		
Special current input	User-programmable trig-levels.	0.0...10.0 mA		
	*Hysteresis, min	0.2 mA		
	Input impedance	1 kΩ || < 220 pF		
	Sensor supply - pin 44, programmable	5...17 V / 23 mA		
	Max. input current	17mA		
Model		***SCU-2501***	***SCU-2502***	***SCU-2503***
Output				
Current output		0...20, 4...20, S4-20, ±10 mA, ±20 mA	----------	0...20, 4...20, S4-20, ±10 mA, ±20 mA
Load (max.), current output		≤ 600 Ω	----------	≤ 600 Ω
Current limit		≤ 28 mA	----------	≤ 28 mA
Voltage output		0…5, 1…5, 0...10, 2…10, ±5, ±10 VDC	----------	0…5, 1…5, 0...10, 2…10, ±5, ±10 VDC
Load (min.), voltage output		≥ 2 kΩ	----------	≥ 2 kΩ
Relay output		SPST, AC: 250 VAC/ VDC, 2A, 500VA	2 x SPST, AC: 250 VAC/VDC, 2A, 500VA	----------
Frequency output		----------	----------	0.001 Hz...100kHz
PNP output		----------	----------	24VDC at 30mA max
NPN output		----------	----------	30VDC at 130mA max
Push-Pull output		----------	----------	5...24VDC

*** For low signal levels with input trigger level hysteresis below 100 mV / 0.1 mA it is recommended to use shielded cables with correct grounding, to avoid false triggering due to induced EMC.**

Installation:

This installation guide for technical personnel covers the following products:

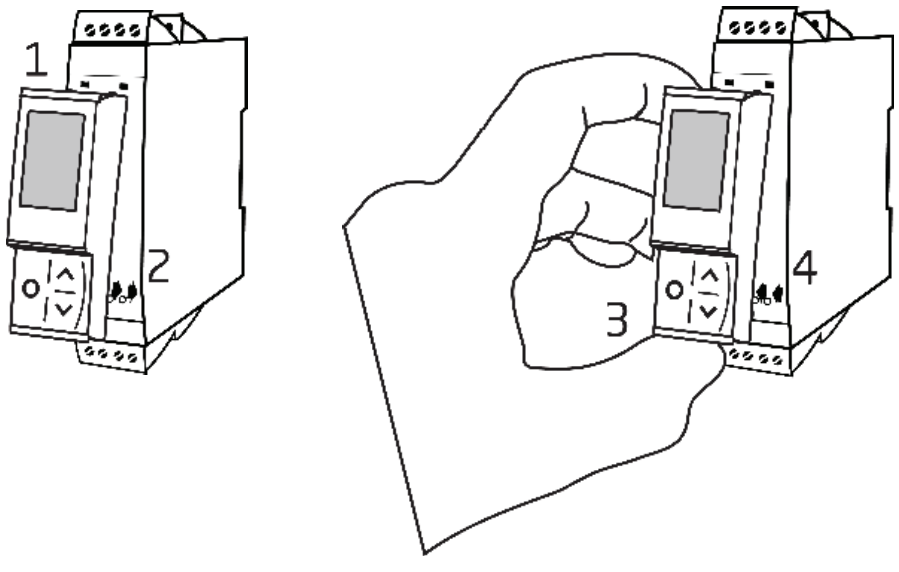
SCU-2501	SCU-2502	SCU-2503
SCU-PDM2		

Mounting SCU-PDM2:

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

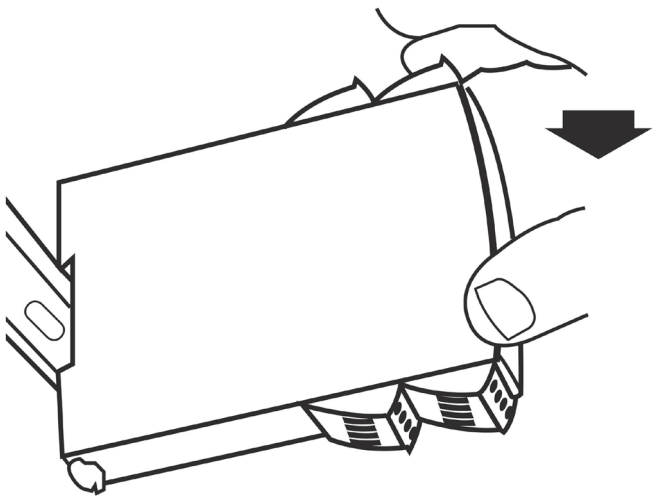
Removing the SCU-PDM2:

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



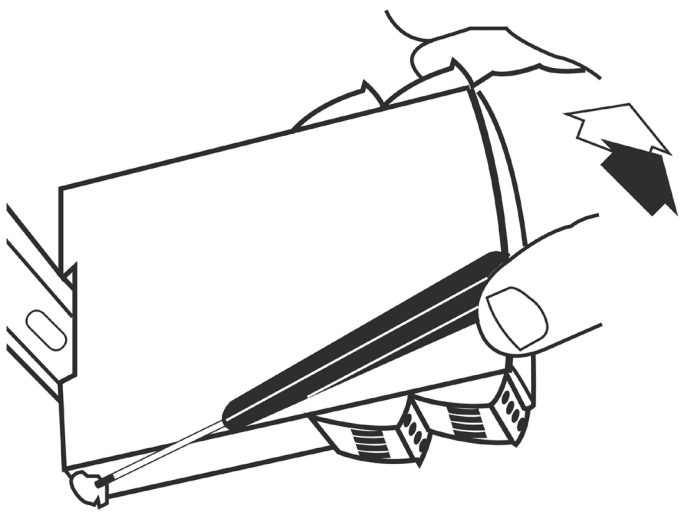
Mounting on DIN rail:

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 mm^2 stranded wire. Screw terminal torque 0.5 Nm.

Error Messages and Troubleshooting

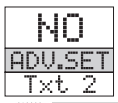
Scrolling Error Message	*Indication Text*	*Condition*	*Action*
Process and application errors			
Input error	IN.ER - flashing display	Input out of configured input limits	Check input signal value and configured input limits
Input underrange	IN.LO	Input below low cut-off	Check input signal source
Input overrange	IN.HI	Input above valid measurement range	Check input signal source
Display out of range	-1999 or 9999	Display saturation	Check configuration and input values
Analog output error	AO.ER	Error in analog output current (S4-20 mA output only)	Check wiring of analog output and recycle power *
Sensor supply overloaded	SE.OL	Sensor supply overload condition detected	Check sensor supply specifications
Sensor short circuit	SE.SH	Sensor short circuit condition	Check sensor for short circuit
Sensor wire break	SE.BR	Sensor open loop / broken wire condition	Check sensor for open loop / broken wire
Device errors			
No communication between device and the SCU-PDM2 communication interface	NO.CO	No communication (SCU-PDM2 <-> device)	Reattach the SCU-PDM2 communication interface to the product. If attached, disconnect and reattach
Configuration error	CO.ER	Invalid configuration downloaded to module	Step through menu to create valid configuration **
Invalid configuration type or version	TY.ER	Configuration read from the SCU-PDM2 has invalid type or rev. no.	Save correct device type and revision configuration to the SCU-PDM2 communication interface **
Analog output supply error	AO.SU	Analog output supply error	Verify output configuration and output connection *
RAM error	RA.ER	Internal RAM error	Contact AutomationDirect *
A/D converter error	AD.ER	Internal A/D converter error	Contact AutomationDirect *
Internal flash error	IF.ER	Internal flash error	Contact AutomationDirect *
Frequency input error	FI.ER	Internal frequency circuit error	Contact AutomationDirect *
EEPROM Error	EE.ER	Internal EEPROM error	Contact AutomationDirect *
Storing of configuration failed - previous configuration used	CO. WARN	Writing configuration to internal device memory failed.	Device configuration reverts to last known valid configuration. Cycle through menu to retry writing new configuration.

! All error indications in the display flash once per second. The help text explains the error. If the error is an input loop error, the display backlight flashes as well - this is acknowledged (stopped) by pushing the 3 button.
*** Error is acknowledged by either stepping through the basic setup, or by resetting the device power. Some types of errors can only be acknowledged by resetting the device power.**
**** Error is acknowledged by stepping through the basic setup.**

Notes

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-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.

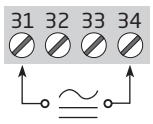


Note: If no sensor is connected to the input terminals, SE.BR will flash in the display when the unit is powered up. Press OK once to acknowledge the error and then press OK again to display the first screen of the menu as shown above.

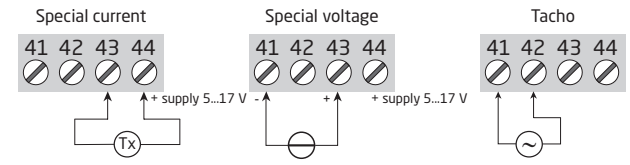
- Press OK to begin configuration. Press ^ or v to scroll through options on each step. Press OK to confirm an option and move to the next step.
- Press and hold OK to step backwards through the configuration menu.

Wiring Diagrams

Supply

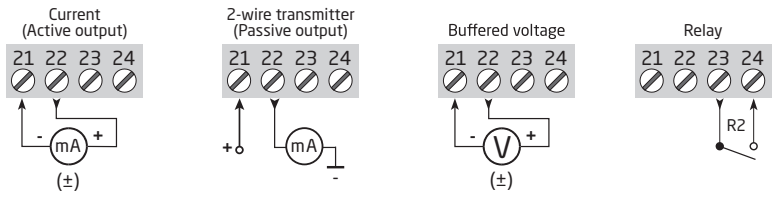


Inputs:

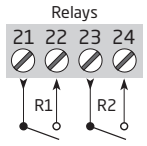


Outputs:

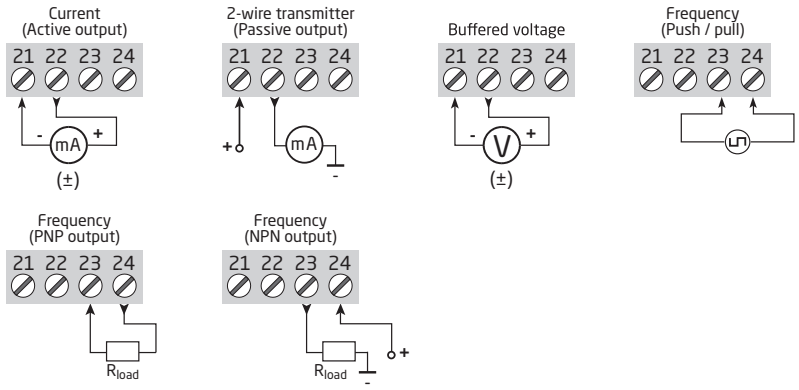
SCU-2501



SCU-2502

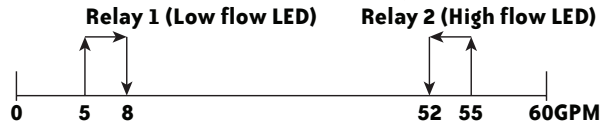


SCU-2503



Application Example - Frequency Input to Relay Output (SCU-2502)

A flow sensor with 12VDC NPN output needs to be connected to two LEDs as a low and high flow alarm indication in a panel. The sensor measures fluid flow in 0.1 gallons per pulse. When using the SCU-2502, low and high alarms will be set at 5GPM and 55GPM respectively with a 3GPM 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 occured. Relay switching will work as follows:



- In the configuration menu press ^ or v until NPN is displayed IN.TYPE. Press OK.
- *Set sensor supply voltage.* Press ^ or v until 12.0 is displayed for S.SUP. Press OK.
- *Select input units.* Press ^ or v until Hz is displayed for IN. Press OK.
- *Select input low value.* Press ^ or v until 0 is displayed for IN.LO. Press OK.
- *Select high value.* Press ^ or v until 10 is displayed for IN.HI. Press OK.
- *Select input filter to off.* Press ^ or v until NO is displayed for FILTER. Press OK.
- *Select scaled units.* Press ^ or v until GAL/MIN is displayed for UNIT. Press OK.
- *Select decimal point location.* Press ^ or v until 111.1 is displayed for DEC.P. Press OK.
- *Set display value for minimum input.* Press ^ or v until 0.0 is displayed for DISP.LO. Press OK.
- *Set display value for maximum input.* Press ^ or v until 60.0 is displayed for DISP.HI. Press OK.
- *Set display response time.* Press ^ or v until 0 is displayed for DISP.RP. Press OK.

Relay Configuration

- *Select the relay unit type.* Press ^ or v until DISP is displayed for REL.UNI. Press OK.
- *Select relay 1 function.* Press ^ or v until SETP is displayed for R1.FUNC. Press OK.
- *Select relay contact type.* Press ^ or v until N.O. is displayed for R1.CONT. Press OK.
- *Set relay setpoint.* Press ^ or v until 5.0 is displayed for R1.SETP. Press OK.
- *Select relay activation decreasing mode.* Press ^ or v until DECR is displayed for ACT.DIR. Press OK.
- *Set relay hysteresis.* Press ^ or v until 3.0 is displayed for R1.HYST. Press OK.
- *Set relay on delay in seconds.* Press ^ or v until 5 is displayed for ON.DEL. Press OK.
- *Set relay off delay in seconds.* Press ^ or v until 0 is displayed for OFF.DEL. Press OK.
- *Select relay 2 function.* Press ^ or v until SETP is displayed for R2.FUNC. Press OK.
- *Select contact type.* Press ^ or v until N.O. is displayed for R2.CONT. Press OK.
- *Set relay setpoint.* Press ^ or v until 55 is displayed for R2.SETP. Press OK.
- *Select relay activation increasing mode.* Press ^ or v until INCR is displayed for ACT.DIR. Press OK.
- *Set relay hysteresis.* Press ^ or v until 3.0 is displayed for R2.HYST. Press OK.
- *Set relay on delay in seconds.* Press ^ or v until 5 is displayed for ON.DEL. Press OK.
- *Set relay off delay in seconds.* Press ^ or v until 0 is displayed for OFF.DEL. Press OK.

- *Set input limit low to off.* Press ^ or v until NO is displayed for ILIM.L. Press OK.
- *Set input limit high to off.* Press ^ or v until NO is displayed for ILIM.H. Press OK.
- *Set power on delay time.* Press ^ or v until 0 is displayed for POW.DEL. Press OK.
- Wait while the settings are stored and the unit switches to run mode.

Once the unit has been configured, the relay setpoints can be adjusted very quickly. Press ^ to adjust RELAY1 and v to adjust RELAY2. Adjust the setpoint up or down and then press OK to save the setting and exit the menu. Pressing ^ and v simultaneously will change the active relay's state.

Application Example - Convert a PNP 24V Pulsed Signal to Analog 0-10VDC (SCU-2501)

A 24VDC pulsed signal from a senor is converted to a linear 0-10VDC analog output.

- In the configuration menu press ^ or v until PNP is displayed IN.TYPE. Press OK.
- *Select sensor supply voltage.* Press ^ or v until 10.0 is displayed for S.SUP. Press OK.
- *Select input units.* Press ^ or v until Hz is displayed for IN. Press OK.
- *Set input low value.* Press ^ or v until 0 is displayed for IN.LO. Press OK.

A 24VDC pulsed signal from a senor is converted to a linear 0-10VDC analog output.

- In the configuration menu press ^ or v until PNP is displayed IN.TYPE. Press OK.
- *Select sensor supply voltage.* Press ^ or v until 10.0 is displayed for S.SUP. Press OK.
- *Select input units.* Press ^ or v until Hz is displayed for IN. Press OK.
- *Set input low value.* Press ^ or v until 0 is displayed for IN.LO. Press OK.
- *Set input high value.* Press ^ or v until 25.00 kHz is displayed for IN.HI. Press OK.
- *Set scaled units.* Press ^ or v until % is displayed for UNIT. Press OK.
- *Select decimal point location.* Press ^ or v until 111.1 is displayed for DEC.P. Press OK.
- *Set display value for minimum input.* Press ^ or v until 0.0 is displayed for DISP.LO. Press OK.
- *Set display value for maximum input.* Press ^ or v until 100.0 is displayed for DISP.HI. Press OK.
- *Set display response time.* Press ^ or v until 0 is displayed for DISP.RP. Press OK.
- *Set output type.* Press ^ or v until VOLT is displayed for OUT.TY. Press OK.
- *Set output voltage range.* Press ^ or v until 0-10 is displayed for O.RANGE. Press OK.
- *Set relay units.* Press ^ or v until DISP is displayed for REL.UNI. Press OK.
- *Set relay to off.* Press ^ or v until OFF is displayed for R1.FUNC. Press OK.
- *Set input limit low to off.* Press ^ or v until NO is displayed for ILIM.L. Press OK.
- *Set input limit high to off.* Press ^ or v until NO is displayed for ILIM.H. Press OK.
- *Set output response time.* Press ^ or v until 0.0 is displayed for OUT.RSP. Press OK.
- *Set power on delay time.* Press ^ or v until 0 is displayed for POW.DEL. Press OK.
- Wait while the settings are stored and the unit switches to run mode.

Application Example - Convert a TTL Frequency Input to a PNP Output and Scaling the Frequency

A TTL output sensor, connected to a SCU-2503, delivers a 5VDC frequency output scaled up from 0-1kHz to 0-100kHz.

- *Set sensor supply voltage.* Press ^ or v until 5.0 is displayed for S.SUP. Press OK.
- *Select input units.* Press ^ or v until Hz is displayed for IN. Press OK.
- *Set input low value.* Press ^ or v until 0 is displayed for IN.LO. Press OK.
- *Set input high value.* Press ^ or v until 1.000 is displayed for IN.HI. Press OK.
- *Set scaled units.* Press ^ or v until kHz is displayed for UNIT. Press OK.
- *Select decimal point location.* Press ^ or v until 111.1 is displayed for DEC.P. Press OK.
- *Set display value for minimum input.* Press ^ or v until 0.0 is displayed for DISP.LO. Press OK.
- *Set display value for maximum input.* Press ^ or v until 100.0 is displayed for DISP.HI. Press OK.
- *Set display response time.* Press ^ or v until 0 is displayed for DISP.RP. Press OK.
- *Set output type.* Press ^ or v until FREQ is displayed for OUT.TY. Press OK.
- *Set output voltage range.* Press ^ or v until Hz is displayed for OU.UN. Press OK.
- *Set output low frequency.* Press ^ or v until 0 is displayed for OUT.LO. Press OK.
- *Set output low cut off frequency.* Press ^ or v until 0 is displayed for LO.CUT. Press OK.
- *Set output contact type.* Press ^ or v until 0 is displayed for CONT.TY. Press OK.
- *Set input limit low to off.* Press ^ or v until NO is displayed for ILIM.L. Press OK.
- *Set input limit high to off.* Press ^ or v until NO is displayed for ILIM.H. Press OK.
- *Set output response time.* Press ^ or v until 0.0 is displayed for OUT.RSP. Press OK.
- *Set power on delay time.* Press ^ or v until 0 is displayed for POW.DEL. 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 v until YES is displayed for the first screen of the configuration menu that looks like this:

The configuration of the SCU-250x can be saved into the SCU-PDM2. The 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 v until MEM is displayed for SETUP. Press OK.
- *To save the configuration into the SCU-PDM2.* Press ^ or v until SAVE is displayed for MEMORY. Press OK.
- *To load the configuration from the SCU-PDM2 into the SCU250x.* Press ^ or v 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-PDM2 is left mounted to the front of the signal conditioner.

- Enter Advanced Settings menu and then press ^ or v until PASS is displayed for SETUP. Press OK.
- *To enable password protection.* Press ^ or v until YES is displayed for EN.PASS. Press OK.
- *To set a password.* Press ^ or v 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 out Technical Support team @ 1-800-633-0405 or 770-844-4200

Notes