

INTERNATIONAL HEADQUARTERS

20 Willow Springs Circle, York, Pa. 17402, (717) 767-6511 FAX: (717) 764-0839
Web site- <http://www.redlion-controls.com> E-mail- sales@redlion-controls.com
EUROPEAN HEADQUARTERS

892 Plymouth Road, Slough, Berkshire SL1 4LP
ENGLAND +44 1753 696888 FAX: +44 1753 696339

MODEL SC2 - 2-LEVEL, 10 KHz PRESETTABLE COUNTERS WITH 0.43" (11 mm) LED DISPLAY, 4 & 6-DIGIT VERSIONS



- AVAILABLE IN TWO TYPES
 1. SC2DU - "UP" Counter, Reset-to-Zero (RTZ) Action
 2. SC2DD - "DOWN" Counter, Reset-to-Preset (RTP) Action
- COUNT INPUT PROGRAMMABLE FOR ALL STANDARD SENSORS & COUNT SWITCHES
- RESET ON POWER-UP
- TWO COMPLEMENTARY LATCHABLE OR MOMENTARY SOLID-STATE OUTPUTS FOR EACH PRESET LEVEL
- FOUR BASIC RESET CYCLE MODES WITH ADDITIONAL RESET TERMINATION CONDITIONS FOR UP TO 12 DISTINCT CYCLE PROGRAMS
- CONTROL INPUTS FOR REMOTE RESET, INHIBIT, UP/DOWN COUNT CONTROL & DISPLAY BLANKING FOR BATTERY BACKUP CURRENT CONSERVATION

DESCRIPTION

The SC2DU and SC2DD counters are ideal for more sophisticated applications where 2 preset levels are required. Combining a high degree of flexibility with field-proven technology allow these units to match the exact needs of practically all 2-level preset applications with the reliability and dependability so important for more complex operations.

The SC2DU resets to zero and counts "UP" through the two preset levels, activating the appropriate outputs as it reaches each preset level. This version is particularly useful where the first preset level is normally a fixed number of counts from the beginning of a count cycle.

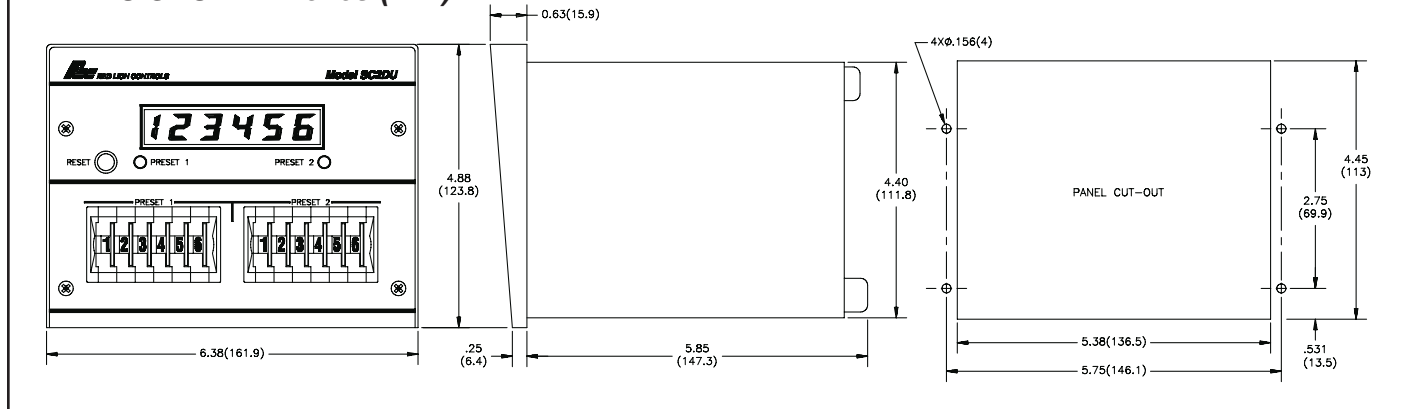
The SC2DD resets to a "Start-Count" level (Reset-to-Preset action) and counts "DOWN" through the first preset level to zero, the second preset level. Since the first preset level defines the number of counts from zero (cycle conclusion) this unit is ideal for "early warning" applications. The SC2DD version is also useful in "boundary-zone" applications where the Start Count value can be less than the Preset value, and zero and Preset define the boundary levels. Both SC2DU and SC2DD versions provide a wide range of other operating modes that can be obtained by set-up switch programming on the back of the unit.

SPECIFICATIONS

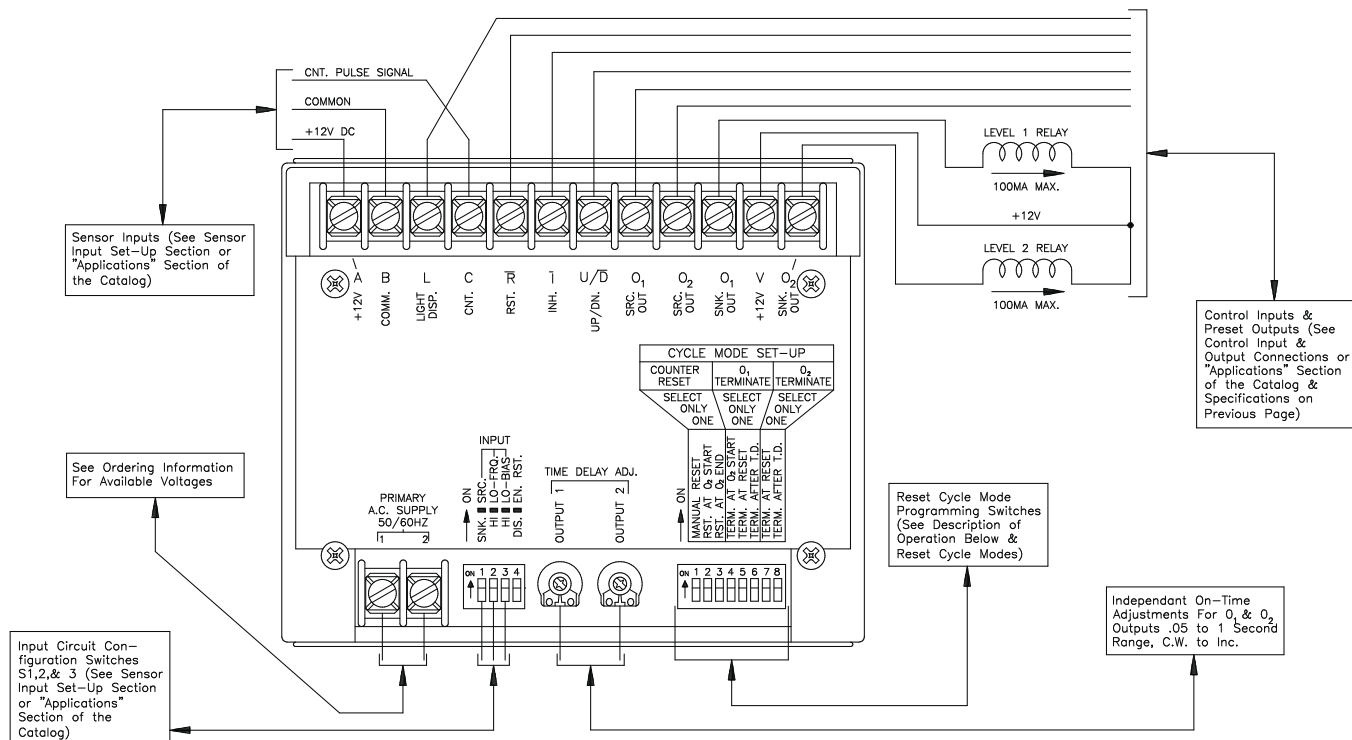
1. **PRIMARY SUPPLY VOLTAGE:** Available in four voltage ranges, 50/60 Hz (See Ordering Information). Allowable voltage variation $\pm 10\%$. Input power 12 VA. Also operates from +12 VDC Supply (See Application Notes).
2. ***SENSOR OUTPUT POWER (TERM."A"):** +12 VDC $\pm 15\%$ @ 100 mA.
3. **RESET & PRESET TIMING PARAMETERS:**
(See Description of Operation)
4. **OUTPUTS:** (2 sets, complementary outputs, one set for each preset level)
SNK OUT - Primary output (current sinking) to drive control relay, 100 mA max. This output goes low when preset level is reached.
SRC OUT - Aux. Output (inverted) operates synchronously with "SNK OUT" to deliver +12 VDC @ 10 mA.
5. **CURRENT DRAIN FROM BATTERY BACKUP:** 60 mA with displays blanked and without sensor or output loads. 350 mA (6-digit), 260 mA (4-digit) with full display on (all 8's) but less sensor and output load.
6. **OPERATING TEMPERATURE RANGE:** -20° to +50°C
7. **CONSTRUCTION:** Steel Case, Aluminum Bezel, Aluminum Front Panel with Polycarbonate Overlay, Black Epoxy Paint Finish. Wiring connections via Pressure Clamp Terminal strips on rear (U/L Recognized, CSA Certified terminals) that accept #12 stripped wires.
8. **WEIGHT:** 3.1 lbs (1.4 Kg).

* - See SC Series Sensor Input Connections & Input Configuration Switch Set-up, Note 1 or "Applications" Section of the Catalog.

DIMENSIONS "In inches (mm)"



MODEL SC2 INPUT/OUTPUT CONNECTIONS & PROGRAMMING SWITCHES



DESCRIPTION OF OPERATION

COUNTER RESETS

Both the SC2DU and SC2DD have three Counter Reset conditions that can be selected by programming switches. The three reset conditions are: MANUAL-RESET (via the front panel button, if enabled, or Terminal R); RESET at the instant the O_2 outputs activate (*automatic*); and RESET at the conclusion of O_2 output time-out period (*automatic*). The last two counter reset modes are used with the O_2 outputs set to "Terminate after T.D." and are used in Automatic Cycle - Reset and Run applications. Manual Reset via front panel button or control Terminal R is always active and takes precedence over either automatic reset modes in resetting the counter.

OUTPUTS & OUTPUT TERMINATION

Both the SC2DU and SC2DD have two preset levels, each level having one pair of complementary outputs (SNK & SRC). Each output pair is designed O_1 and O_2 corresponding to its respective preset level and in the order of its normal activation sequence. These outputs are activated at the time the accumulated count equals the preset value, or zero in the case of the second preset level on the SC2DD. Termination (*turn-off*) of these output pairs, after they have been activated by the count condition, is determined by program switches which can be set to cause output termination after an adjustable time delay or when a count-reset occurs. The O_1 outputs can also be set up to terminate at the instant the second preset level is reached and the O_2 outputs activate.

COUNTER RESETS & EFFECT ON OUTPUT TERMINATION

Output termination in the "Terminate after T.D." mode is not affected by a counter reset. If a pair of outputs have been activated in this mode and a counter reset occurs prior to the time-out, the counter will reset, but the outputs will remain active and terminate at the conclusion of the normal time-out period. O_1 outputs set to "Terminate at O_2 Start" will be terminated by a manual counter reset, and O_1 outputs set to "Terminate at Reset" will instantly terminate on either manual or automatic reset. O_2 outputs set to "Terminate at Reset" also terminate instantly on a manual reset, (O_2 outputs set to "Terminate at Reset" is not a valid condition in automatic reset cycles.)

COMPLEMENTARY COUNTING FOR NEGATIVE NUMBERS

Both SC2DU and SC2DD counters display complementary numbers when counting "DOWN" through zero into the negative number region. For a 6-digit counter the down-count sequence would be... 3, 2, 1, 0, 999999, 999998, etc. A 4-digit unit would display a similar sequence except the complementary number is limited to four decimal places.

With 6-digit counters, complementary numbers are valid numbers, and can be used for preset entry as will be illustrated later. However, with 4-digit counters

complementary preset numbers cannot be used since the basic internal counter comparator register has 6-digit capacity and only the first four significant figures would be loaded via the thumbwheels.

The above output-termination, counter-reset, and complementary counting modes apply to both SC2DU and SC2DD counters. However, the operating sequence of the two are substantially different as described below:

SC2DU OPERATING SEQUENCE

The SC2DU is normally used as an "UP" counter. A reset initializes the counter to zero, the count increments to the PRESET 1 level where O_1 outputs are activated and then on up to the PRESET 2 level where O_2 outputs activate. During the reset function, the counter is set to zero and the number entered into the PRESET 1 thumbwheel switches is loaded into an internal comparator register. This reset and loading operation requires 1 msec to complete and new counts can not be accepted during this period. (*Manual reset must be applied for a minimum of 1 msec, in automatic modes the reset period is automatically timed to 1 msec.*)

When the count equals the PRESET 1 value the O_1 outputs are activated. Simultaneously the number entered in the PRESET 2 thumbwheels is loaded into the internal comparator register, replacing the PRESET 1 value. This loading again requires 1 msec but in this case normal counting can continue through the loading period. The counter then continues accumulating counts and when the count equals the value of PRESET 2, the O_2 outputs activate. Unless reset, the counter can continue to accumulate and display counts beyond the PRESET 2 level.

This operating sequence imposes the following three restrictions.

1. The occurrence of PRESET 1 must always precede the occurrence of PRESET 2.
2. PRESETS 1 and 2 must be at least 1 msec apart in time.
3. Once PRESET 1 level has been activated it is lost and cannot be retriggered if the count reversed back to the PRESET 1 value. PRESET 2 however remains in the comparator register and can be retriggered any number of times (in "Terminate after T.D." mode) until reset.

With 6-digit SC2DU counters, entry of complementary preset numbers is valid. For example, PRESET 1 could be loaded with 999000 (1000 counts "DOWN" from zero) and PRESET 2 could be loaded with 998000 (2000 counts "DOWN"). The operation sequence then would be, reset-to-zero, and count "DOWN" (by connecting U/D to B) to the complementary preset values. Both real and complementary numbers can also be used together such as, count "UP" from zero to PRESET 1 = 100 (real), then count down to PRESET 2 = 999900 (complementary for "-100") or vice-versa. When setting up these operating sequences the three restrictions above must be kept in mind.

SC2DD OPERATING SEQUENCE

The SC2DD is normally used as a "DOWN" counter. (U/\bar{D} must be pulled low to B, to count "DOWN"). Reset initializes the counter by loading the value entered in the START COUNT thumbwheels into the counter, and simultaneously the PRESET value is loaded into the internal comparator register. The reset and load function requires 1 msec to complete and during this time new counts will not be accepted. The second level preset on the SC2DD is fixed at zero by a separate internal zero-detection circuit. The usual operating sequence then is: Reset the counter to the START COUNT value (RTP action), count "DOWN" to the PRESET value where O_1 outputs activate, and continue counting down to zero when O_2 outputs activate.

Unlike the operating sequence of the SC2DU, the SC2DD retains the PRESET value in its internal comparator register until the unit is reset. This removes the three operating restrictions imposed on the SC2DU unit. The two preset levels (PRESET and zero) may occur in any order in manual reset mode, and both levels are retriggerable (in the "Terminate after T.D." mode) when the count direction is reversed back through the preset levels any number of times.

Note: "Terminate O_1 at O_2 Start" mode, and automatic reset cycle modes will operate only when O_1 occurs before O_2 . The SC2DD does have one restriction in that the START COUNT value cannot be zero, (a paradoxical situation).

The 6-digit version of the SC2DD will also accept complementary numbers for START COUNT and PRESET entry as already described for the SC2DU version.

NORMAL RESET CYCLE MODES

The operating modes are set-up by a bank of eight set-up switches on the rear which are divided into 3 functional groups. The Reset cycle modes are determined by the combination of S1, 2 and 3 which determine how the counter is reset, and S7 and 8 which determine the termination of the second preset. The four "normal" modes described below cover the more frequent operating modes where the count is uni-directional. Many other individual modes can be set-up involving bi-directional count situations. See Description of Operation for more information.

MODE 1 LATCH AT 2ND PRESET, MANUAL RESET

Counts through first level preset and activates O_1 outputs*, then to second level preset (Preset 2 or zero) and activates O_2 outputs which latch ON. Front panel reset (if enabled) or remote reset (Term. "R") resets counter and turns off O_2 outputs (also turns off O_1 outputs if S5 has been set-on). Reset takes 1 msec minimum and new counts cannot be accepted during Reset time.



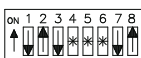
MODE 2 MOMENTARY OUTPUT AT 2ND PRESET, MANUAL RESET

Same operation as MODE 1 above, except O_2 output comes ON momentarily for a period determined by the O_2 T.D. Adjustment (0.05 to 1 sec). O_2 outputs can be re-triggered on second pass through PRESET 2 level. (See "Description of Operation")



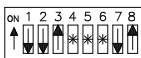
MODE 3 AUTOMATIC CYCLE - RESET & RUN AT 2ND PRESET

Counts through first level preset and activates O_1 outputs*, then at the second level preset (Preset 2 or Zero) O_2 outputs are activated and simultaneously counter resets back to its initial state (zero or start count) ready for the next count cycle. New counts can be accepted for the next cycle 1 msec after automatic reset was initiated. O_2 outputs return to the OFF state after normal time-out (0.05 to 1 sec adjustable).



MODE 4 AUTO. CYCLE, RESET & RUN AFTER 2ND PRESET TIME-OUT

Same operation as MODE 3 above, except counter resets at the conclusion of time-out of the O_2 outputs. New counts for next cycle can be accepted 1 msec after initiation of reset.



* Switches S4, 5 & 6 control turn-off of the first level preset and any one of the three switches may be turned "ON" for the above RESET CYCLE MODES. The O_1 turn-off (terminate) conditions are:

S4 ON - TERMINATE AT O_2 START - First level (O_1) outputs turn-off at the instant the second level count is reached and O_2 outputs come ON. (A manual reset will also terminate O_1 outputs if reset occurs prior to O_2 turn-on). This termination mode can be used only when preset levels 1 and 2 occur in the proper order.

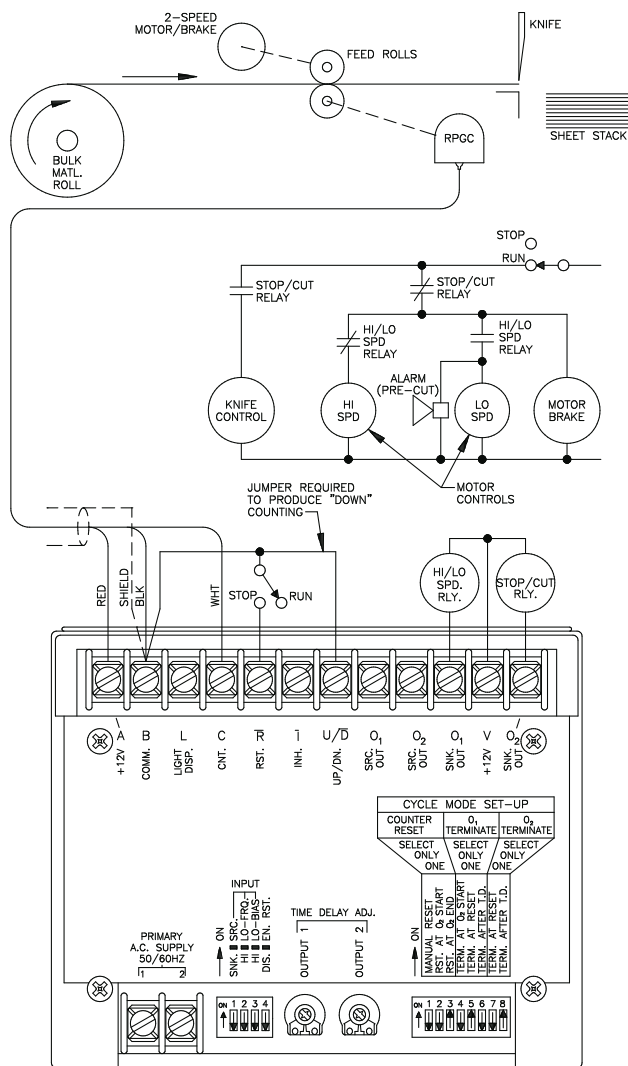
S5 ON - TERMINATE AT RESET - First level (O_1) outputs turn-off when counter is reset by manual or an automatic cycle reset.

S6 ON - TERMINATE AFTER T.D. - First level (O_1) outputs turn-off at completion of time-out period (0.05 to 1 sec) as determined by O_1 T.D. Adjustment.

Note: For more information on output termination see "Description of Operation" section.

TYPICAL APPLICATION

SC2DD Used For "early Warning" Cut-off Control

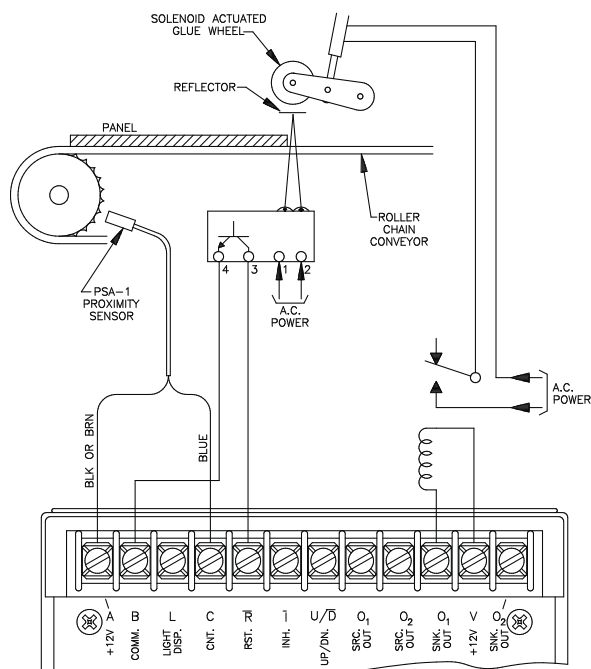


This illustration shows a simplified application for the SC2DD "DOWN" counter used as an automatic cycle cut-off control. An RPGC (Rotary Pulse Generator) coupled to the feed rolls provides count pulses scaled to the desired cut-off measuring units. For example, if cut-off is to be controlled to the nearest 1/10th inch, then the RPGC must produce 10 pulses/inch. The length of the sheets to be cut is entered in on the START COUNT thumbwheel switch in inches and tenths. The PRESET thumbwheels are set at a value of inches and tenths required just prior to cut-off (zero), to slow the feed down to creep speed for accurate stopping and cut-off.

At the beginning of a cycle the counter has just been reset and the number entered on the START COUNT thumbwheels is loaded and displayed on the counter. Since both HI/LO SPD and STOP/CUT relays are de-energized at the start of a cycle, power is applied to the motor brake solenoid, releasing the brake, and the high speed windings of the motor are energized, providing a fast feed of stock through the knife. The counter subtracts the amount of material being fed from the START COUNT amount, and just prior to zero, the PRESET count is reached. At this instant the motor slows to creep speed and an alarm sounds to indicate that cut-off is imminent. The count down continues at the slow speed and when it reaches zero, the STOP/CUT relay energizes momentarily, interrupts motor power, sets the brake and energizes the knife to cut a sheet at the proper length. With S3 set at "RESET AT O_2 END", the counter resets at the end of the momentary STOP/CUT relay closure, and the cycle is repeated. Manual Reset is provided by a second pole of the STOP/RUN switch which interrupts the automatic cycle operation.

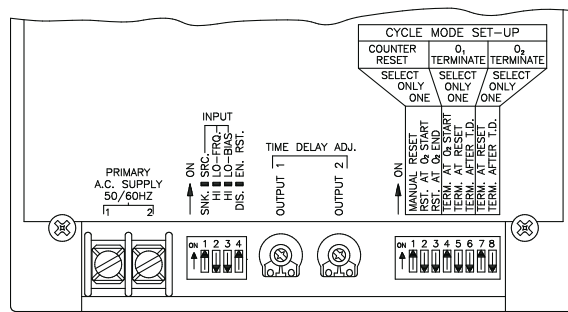
TYPICAL APPLICATION

SC2DU "UP" Counter



In this application an SC2DU "UP" counter is used to control glue application on structural panels. The glue is applied in a band that starts a fixed distance (*PRESET 1*) from the leading end of the panel and runs for a predetermined length along the panel (*PRESET 2*). The panels are moved past the gluing station on a 1" pitch roller chain conveyor. Since the preset settings are to be made in inches with a tolerance of ± 1 ", the count pulses can be generated directly by sensing sprocket teeth with a proximity sensor.

A photo-electric sensor keeps the counter reset to zero as long as it senses reflected light through a clear track in the chain conveyor. When the leading edge of a panel enters the glue application point, the light beam is broken, the reset condition is removed, and the counter then begins accumulating counts. When the count reaches PRESET 1, the O_1 output activates starting the glue strip. At PRESET 2, O_2 is activated terminating O_1 . In this application O_2 has no function other than to terminate O_1 and only one control relay is required. When the trailing end of the panel leaves the field of view of the photo-scanner, the counter is reset back to zero until the arrival of the next panel.



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	NO. OF DIGITS	PART NUMBERS FOR AVAILABLE SUPPLY VOLTAGE	
			230 VAC	115 VAC
SC2DU	2-Preset "Up" Counter	4	SC2DU410	SC2DU400
		6	SC2DU610	SC2DU600
SC2DD	2-Preset "Down" Counter	4	SC2DD410	SC2DD400
		6	SC2DD610	SC2DD600

For more information on Pricing, Enclosures & Panel Mount Kits refer to the RLC Catalog or contact your local RLC distributor.

Note: All SC Counters may be powered directly from +12 VDC supply. See Application Notes.