



Specifications

- Nominal Battery Voltage: 12V
- Plastic enclosure with mounting tabs
- Fuse Type: 15 Amp mini automotive blade fuse
- Dimensions: 3.25" wide by 4.4" long by 1.7" deep
- Cycles set range: 1 to 10 Cycles per Minute
- On Time set range: 0.5 seconds to 5.5 seconds, in half second increments
- Temperature Control set range: 30°F to 90°F
- RS485 connection for Modbus remote control

Features

- Rotary knob control for quick change of parameter settings
- On Off Power Switch, with quick start up
- Three Digit Seven Segment display, readable in sunlight
- Reliable solid state protected circuitry.
- Replaceable Fuse for circuit/motor protection
- Temperature probe connection
- Display selection indicated by color LED indicators
- Pluggable terminal block for Modbus Connection and pump inhibit input
- Pump prime feature
- Four 0.250 spade Lug connectors for attaching battery and motor
- Battery voltage can be displayed
- Low Battery Voltage Shutdown
- Temperature ON and OFF set points can be displayed
- Probe temperature can be displayed
- Color Coded motor and battery connections
- Cycles per Minute Timer with Temperature and Remote Input inhibit

Controls and Indicators

- Five LEDs for Display indication
- Rotary knob for parameter setting
- Push rotary knob to save parameter
- Three digit seven segment display
- LEDs indicates the current display selection
- ON/OFF Power Switch



Figure 1 - SPC1000 Basic Pump Control Timer

Operation

When the Power Switch turns on a quick self test is performed and then the battery voltage display will be selected and displayed on the seven segment display.

Pressing down on the Rotary knob will select/cycle through different displays as indicated by the LEDs. The display parameters are Cycles per Minute, Duration (on time), Temperature ON setpoint, Temperature OFF setpoint and Battery Voltage / Temperature probe reading.

To set an operating parameter (such as duration), press the rotary knob down quickly (it will click) to cycle to the parameter you want to display or change. Each press goes to a different parameter that is displayed. When you have selected the parameter you want to change as indicated by the LEDs, you rotate the knob clockwise or counter clockwise to change this parameter setting up or down. When you have selected the new value you want Press and Hold the knob down for approximately three seconds, you will see SAV displayed indicating the new parameter set point has been saved. If you do not press and hold until SAV is indicated the setting is not saved. *Quit pressing down when SAV is displayed to save your setting.*

If you continue to hold down the knob for a couple of more seconds after SAV is display a pump prime cycle will occur (and the parameter will NOT be saved). The display will indicate a prime cycle by displaying PRI and then start a 30 second count down. During Prime the Pump will remain on until timed out, after time out normal pump operation will begin. Pressing the knob again during a prime cycle will extend the ON time another 30 seconds. *If you want to abort the prime cycle, you must turn off the power switch.*



Timer Setup



Always power off timer prior to any work on pump.

Connect the Battery to the POWER terminals, and connect the Pump to the MOTOR terminals.

If using a temperature probe, it may be connected at any time. If a probe is connected temperature control will be active. If no probe is connected, temperature control is not used.

Battery voltage must be above 10 volts for operation. The display will switch to the battery display when the battery gets too low for pump operation. *Lob will flash on the display along with the voltage and temperature, to indicate the voltage is too low for operation.*

A Plug-In Terminal Block is used for connection to Modbus and/or the Remote Inhibit input.

A dry contact connected to the Input will inhibit pump operation when closed and this will be indicated by INH being displayed when pump operation is inhibited.

Other Operation Features and Information

Plugging in the external temperature probe will activate temperature control in the CpM and On-Off modes. When in Modbus mode of operation you must have probe connected for Modbus to have the ability to enable/disable temperature operation. If Modbus enables temperature control, it will not be active or show the status of being active until a probe is connected. *If no external probe is connected (shutoff with temperature is disabled) the Temperature ON and Temperature OFF display selections will display a period (.) in the ones digit, no period is shown if the probe is connected.*

Voltage cut back is always enabled in the CpM mode of operation but is not enabled for Modbus or ON/Off control. *If the timer is in actual voltage cut back there will be a period under the c (cycles selection on the display) to indicate cutback due to low voltage. If the unit is operating normally the period will not be seen.*

Battery voltage is accurate to a couple of tenths. So use a voltage meter to verify when you need accuracy.

Some fuses maybe hard to remove or install, grabbing the fuse with pliers and slowly rocking the fuse back and forth will make it easier to remove and install.

While in Shutdown (Sdn on display) you may have to hold the switch down about 1 sec to get display back on for it to change to the next display selection.

The Duration (On) cycle is run first after Power On Reset.

The display will blank after a time out period, but one of the LEDs will be On. If the display is blank, press the rotary knob quickly and the display will come back on.



To change type of operation hold down the rotary encoder knob while powering up the timer. You will see the display change from CYC for cycles per minute operation, then ON OFF for On time Off time operation and bUS for Modbus control. When it displays the type of operation you desire release the encoder knob. Then you will momentary see SEL displayed followed by the mode you selected. By default it will go to Battery voltage display selection and begin to display the battery voltage for about three seconds and then follows by displaying temperature.

If you select Modbus operation (bUS) as soon as it says SEL, press the Knob down and hold it until it displays Adr and then Set, at this point release the knob and a number will be displayed. This is the Modbus address, rotate the knob until you have the Modbus address you want. Then press and release the knob, it will say rdY for ready. The timer is now ready to operate with the Modbus slave address you selected. Modbus operation is RTU mode, 8 data bits, no parity, 9600 bps. Address range is settable from 1 to 60, with a default of 20.

The first time the timer is powered up in the Modbus mode the timer will be in a halt mode. Once Modbus has requested the unit to turn on, future power ups will operate as per the last Modbus request.

Modbus (Remotely Control Mode, bUS Mode)

The Modbus mode requires that you connect the RS485 signal to the pluggable terminal block. A Modbus Master will control all pump operations via communication over the RS485 connection. This connection requires three wires, Data+, Data-, and Ground. The baud rate is 9600, Modbus Protocol Mode - RTU Slave, 1 stop bit, No parity. Modbus Address is selectable from 1 to 60. Modbus will control operation based on information written to the register map (See Appendix A). No termination is on the RS485 connection-user provides the required external 120 ohm resistor if needed.

During Modbus operation the rotary knob does not have any function (other than displaying of information) as all operation is controlled by the Modbus master. The push button switch will operate as follows. If you press the Push button on the bottom center the display selection LEDs will change what is being displayed.

During Modbus operation the Display will normally display bUS when running under Modbus control and will display hLt when Modbus commands the timer to stop.

When in Modbus mode after power up in the run mode they will be 4 short pump cycles, to indicate the timer is under Modbus control.

NOTE: In the event of a power fail (or when powering Off to On) the timer operation will be as last as commanded by Modbus. In other words, if the timer was in the halt mode, when power comes on it will be in the halt mode. If the timer was running when there was a power off, it would resume operation when power returns. Also, in Modbus mode you may use the input from an external contact to halt operation and it can be read it via a Modbus register.

If Modbus is inhibiting operation, the display will flicker when it should be blank. If the display is active you will see hLt flash and toggle with the actual display selection reading.



When you read the holding register setpoint temperature via Modbus, if it has not been changed from its initial condition data will be in the low byte, once changed the value is in the high byte during read back.

Timer Mode Setup – Cycles per Minute

With Timer in Modbus Mode, set the following registers as follow:

• Holding register 40000 as 0x00	Set timer mode to cycles per minute
• Holding register 40001 as 0x0205	1 st byte = 05 → 05 x .5 sec = 2.5 sec pump on time 2 nd byte = 02 → 2 cycles per minute
• Coil register 00000 as 0x1	Start operation

Timer Mode Setup – ON/OFF Timer

With Timer in Modbus Mode, set the following registers as follow:

• Holding register 40000 as 0x01	Set timer mode to On/Off timer
• Holding register 40001 as 0x1050	1 st byte = 0x50 → 80 x .5 sec = 40 sec pump off time 2 nd byte = 0x10 → 16 x .5 sec = 8 sec pump on time
• Coil register 00000 as 0x01	Start operation

APPENDIX A:

NOTE: 0xnn indicates hex number, nn indicate decimal number (unsigned)

Register	Example	Data Information	Comments
Coil Registers - Function Code 01			
00000	Operation Start/Stop	0 Operation is stopped	0 = stop all operation mode, 1 = start all operation mode
Discrete Inputs - Function Code 02			
10000	Temperature Sensor Fault	1 Temp sensor not connected	0 = probe working, 1 = no probe
10001	System is turned on --Running	0 System not requested to be on	0 = system halted, 1 = system running
10002	Initialization complete	1 System up and running	0 = not initialized, 1 = OK
10003	Battery voltage OK	1 Battery is above 10.8 Volts	0 = low battery, 1 = battery OK
10004	Temperature inhibit	0 Temperature not stopping operation- system within limits	0 = temperature in operating range, 1 = outside temp set points
10005	Voltage cutback operation	1 Voltage low, system cutting back on cycles to conserve power	0 = voltage OK, 1 = battery low system cutting back operation
10006	External Input	1 Status of input on Terminal Block - used as inhibit	0 = no inhibit request, 1 = inhibit active, pump stopped
10007	BAD mode	1 Modbus has sent an invalid operational mode	0 = Modbus data valid, 1 = Modbus set invalid operational mode
Holding Registers - Function Code 03 (06/16 to write)			
40000	Timer Mode--Type of operation	0x0000 Cycles per minute operation = 00	00 or 01 = operational mode, 00 = CpM, 01 = ON/OFF timer
40001	Cycles/minute & run time	0x0205 2 cycles per minute and each cycle is 2.5 seconds long	1-10 cycles, .5 to 5.5 sec on (ON time 1/2 sec each count)
	On/Off Timer	0x1050 Pump is on for 8 seconds and off for 40 seconds	1/2 secs, On 60 sec, Off 60 sec
<p>NOTE: For register 40000 (timer mode) and register 40001 (for parameters), if a timer mode is modified, the coil register 00000 (operation start/stop) must be restarted for the new parameters to take in effect on the next timing cycle.</p>			
Input Registers - Function Code 04			
30000	Battery Voltage	192 Battery Voltage = 192 x 0.06 = 11.52 i.e. incoming value x 0.06	8 to 15 voltage range (Value updated every 30 seconds)
30001	Temperature sensor	609 Temperature is 25°C {i.e. 409 + (25 x 8) = 25 degree C, 409 = 0 °C}	Range -40 C to +70 C (Value updated every 30 seconds)
30006	Temperature Sensor-INTERNAL	87 Temperature value is 87 degrees F	Range 0 F to +158 F (Internal sensor)
30007	Software Version	0x0310 Product Code ID 3, SW Ver. 1.0	Used for Internal Housekeeping functions
30008	Battery Voltage	126 Battery Voltage = 12.6 Volts (raw value x 0.1)	Range 8 to 15 Volt
30009	Temperature sensor-External	77 Temperature value is 77 degrees F	Range 0 to +158 F (Reads 166 if sensor is disconnected)
30010	Temperature High set point	60 Temperature OFF set point Hi = 60°F	Range 30 to 90 F
30011	Temperature Low set point	20 Temperature ON set point Lo = 20°F	Range 30 to 90 F



Revision History

Revision	Descriptions	Drawn	Checked	Approved	Date
0	Initial release – merged 2 existing documents into 1	AC	LG	SB	10/03/2019
1	Added Timer Mode example. Corrected register 40001 example on Modbus Map Table.	AC	LG	SB	11/06/2019
2	Removed 4-20 feature from specifications. Added pump inhibit input to features. Changed product picture.	JS	AC	AC	04/09/2020