Smart Pump Controller (SPC1000)

- ## 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 per Minute: 1 to 10 Cycles per Minute
  - On Time set range: 0.5 seconds to 5.5 seconds, in half second increments
  - Temperature Control mode: 30*F to 90*F
  - Modbus RS-485 connection by pluggable terminal block
  - Remote Input 4-20mA by pluggable terminal block

  - ## 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
    - Pump prime feature.
    - Four 0.250 spade Lug connectors for attaching battery and motor.
    - Battery voltage can be displayed.
    - On Off Temperatures can be displayed.
    - Probe temperature can be displayed.
    - Color Coded motor and battery connections

- ## Controls and Indicators

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

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 set point, Temperature OFF set point 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. 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.

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 NOT 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, at this point normal 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.

Setup

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 anytime. 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

A Plug-In Terminal Block is used for connection to Modbus and the Remote Inhibit input. The Modbus register map is a subset of the current TXAM Modbus register map. A dry contact connected to the Input will inhibit pump operation when closed and this is indicated by INH being displayed when pump operation is inhibited.

EncoderV1_20 Updates

Voltage cutback operation in Cycles per Minute mode has been changed to operate as previous timers.

Two new modes of operation have been added in version 1.2

cYc ncb Cycles per minute with no cutback and **cYc tru Cycles per minute true voltage**.

The default operation is CpM cycles per minute, but may be changed to On/Off timer, modbus control, ncb-no cutback cycles per minute or tru-true voltage cycles per minute operation.

ncb is a cycles per minute operation but there is no voltage cut back in operation as the voltage drops, but the low voltage (10.8 volts) will still stop operation. (ncb mode disables voltage cutback, but not low voltage inhibit)

tru is a cycles per minute operation, where the voltage that is displayed is the average voltage with and without a load (motor running and motor not running). The voltage used for voltage cutback uses this average voltage plus factors in the voltage drop in the wiring.

The alternating display of battery voltage and temperature is no longer displayed when there is no temperature probe connected. If no probe is connected, only battery voltage is displayed. When a temperature probe is connected the display alternates between battery voltage and probe temperature.

The temperature reading no longer stops at 99 degrees, it will now display temperatures over 100.

Power on reset will now display 1.20 at startup to indicate the version number.

SPC1000 Modbus Registers

Register		Example	Data Information	Comments
				0xnn indicates hex number, **nn** indicate decimal number(unsigned)
00000	Pump On/Off	**0xff00**	Turn Pump on = ff00 and off=0000 (hex)	coil 1 (controls pump ON and OFF)

Discrete Inputs - Function Code 02

Register		Example	Data Information	Comments
10000	Temerature 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 = temperture in operating range, 1 = outside temp setpoints
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 06 (03 for read)

Readback is in upper byte after set

Register		Example	Data Information	Comments
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 (ONtime 1/2 sec ecach count)
40001	On/Off Timer	0x1050	Pump is on for 5 seconds and off for 25 seconds	1/2 secs, On 60 sec, Off 60 sec

NOTE: Above register 0 timer type and register 1 for parameter if you write a timer type, you muct turn coil back on
parameter interpetered based on type of operation you can write new operating parameter and it will take effect
these number are a hex word , high byte, low byte on the next timing cycle

Register		Example	Data Information	Comments
40002	Not used	0		
40003	Temperature set point	60	Set Temperature set point Hi = 60°F (OFF temperature)	Range 30 to 90 F (if you read this register bytes are swapped)
40004	Temperature set point	30	Set Temperature set point Low = 30°F (ON Temperature)	Range 30 to 90 F (so read setpoints using Reg 30010 and 30011)
40005	Temperature Enable/Disable	1	Temperature Control Enable or Disable	0 = Disable, 1 = Enable Temperature Control (non zero = enable)

NOTE: For proper operation, high (OFF) temp.
must be 4 degrees higher than Low temp.

Input Registers - Function Code 04

Register		Example	Data Information	Comments
30000	Battery Voltage	0192	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	0609	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)
30002	Temperature Hi/Lo set points	0x6020	Temperature alarm set points Hi = 60°F and Lo = 20°f	Range +20 F to +70 F (Two hex numbers)
30003	External 4-20 mA #1	0195	User sensor input range 0 - 1024	FUTURE
30004	Operation Parameters	0000	Refer below for details *** (or read regs 30012-30015)	FUTURE set to 0000
30005	External 4-20 mA #2	0195	User sensor input range 0 - 1024	FUTURE set to 0000
30006	Temperature Sensor-INTERNAL	0087	Temperature value is 87 degrees F	Range 0 F to +158 F (Internal sensor)
30007	Software Version	0x0310	ver 1.0 (version number in low byte)(3 is a product ID code)	used for Internal Houskeeping functions
30008	Battery Voltage	126	Battery Voltage = 12.6 Volts {i.e. incoming value x 0.1}	Range 8 to 15 Volt
30009	Temperature sensor-External	0077	Temperature value is 77 degrees F	Range 0 to +158 F (Reads 166 if sensor is disconnected)
30010	Temperature High set point	0060	Temperature OFF set point Hi = 60°F	Range 30 to 90 F
30011	Temperature Low set point	0020	Temperature ON set point Lo = 20°F	Range 30 to 90 F
30012	Operation Parameters	0500	Plunger size 1/2 inch (incoming value x 0.001 inch)	FUTURE not used on CpM and On-Off timer
30013	Operation Parameters	0100	Stroke Length full (incoming value x 0.01)	FUTURE
30014	Operation Parameters	033	Motor RPM = 33	FUTURE
30015	Single head/Dual head Pump	1	Single head = 0, Dual head = 1	FUTURE