Interface Manual
Cathodic Protection Node

SignalFire Model: A2-CP-3B

The SignalFire Cathodic Protection Monitoring Node has the following features:

- Monitors the DC rectifier voltage (0-75V) and the voltage across a high-side shunt resistor (0-100mV)
- Low power operation from a 3 "D" cell lithium battery pack (external power from 3.5 to 5.0VDC may be used in place of the battery)
- One counter/frequency input, up to 2kHz. Open drain or pulse input supported
- Reports state of dry contact inputs, open/closed, 32bit totalizer
- Sends data to a SignalFire Buffered Modbus Gateway
- Settable Modbus ID, check-in period, and network address

Specifications

Enclosure Size	6" tall × 4.25" wide × 3.0" deep (not including antenna)
Power Source	Internal Lithium battery pack *SignalFire Part Number: BAT-3XD (810-0008-01)*
Temperature Rating	-40°C to +85°C
Radio Frequency	902-928MHz Ism Band, 300mW FHSS radio, 300mW, 5dB external antenna
Wireless Range	Up to 3 Miles
DC Rectifier Voltage	Monitors 0-75VDC
Shunt Resistor Voltage	Monitors 0-100mV across shunt resistor (valid when rectifier voltage is above 5VDC)

Setup

The nodes need to be set up for correct operation before being fielded. The configurable items include:

- Network selection
- Check-in period selection
- Modbus Slave ID setting

The network and check-in period are set via a rotary switch. The Modbus slave ID is set using the DIP switch. The Modbus Slave ID can also be set using the SignalFire ToolKit if it is set to all 0's.

Check-In Period Rotary Switch

Network Address Rotary Switch

Slave ID DIP Switch
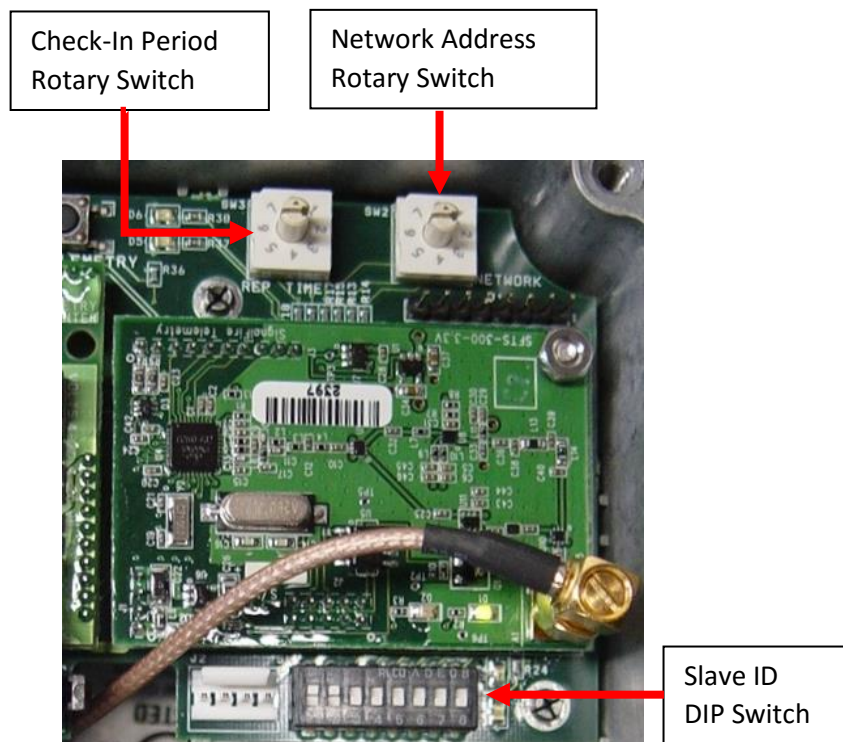
Network Setting

The network address can be used to create multiple networks using multiple gateways (that are in close proximity with one another). The network address can be selected using rotary switch SW2 in the lower right corner of the board.

The network setting must be the same on all units in the network including the gateway.

System Check-In Period

The check-in period is set using rotary switch SW1 in the upper right corner of the board. The switch settings are a shown in the following table:

Switch Setting	Check-In Period
0	1 min
1	2 min
2	4.5 min
3	10 min
4	30 min
5	1 hr
6	5 sec
7	15 sec

The default setting is 2 for a check-in period of 4.5 minutes.

Note: Settings 6 and 7 should only be used for testing or a non-battery pack powered node as they will have a high power draw.

Modbus Slave ID

The Modbus Slave ID can be set with the SignalFire Toolkit, or with the DIP switch located on the device. The DIP switch takes an 8-bit binary input which is converted into a slave ID from 1 to 240. In the picture below switch 1 and 2 are on, which is 00000011 and results in a slave ID of 3. The least significant bit (LSB) is on the left and is labeled 1 under the row of switches. The Node must be power cycled after setting the DIP switch. *Note: The DIP switch must be set to 0 (all switches off) in order to set the Slave ID with the SignalFire Toolkit*
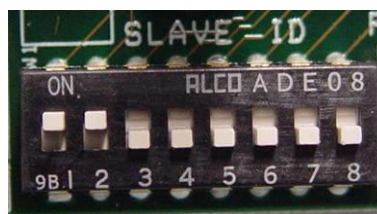
Using the SignalFire Toolkit

The SignalFire Toolkit application can be downloaded at www.signal-fire.com/customer. After installation, launch the software and the main toolkit window will open:
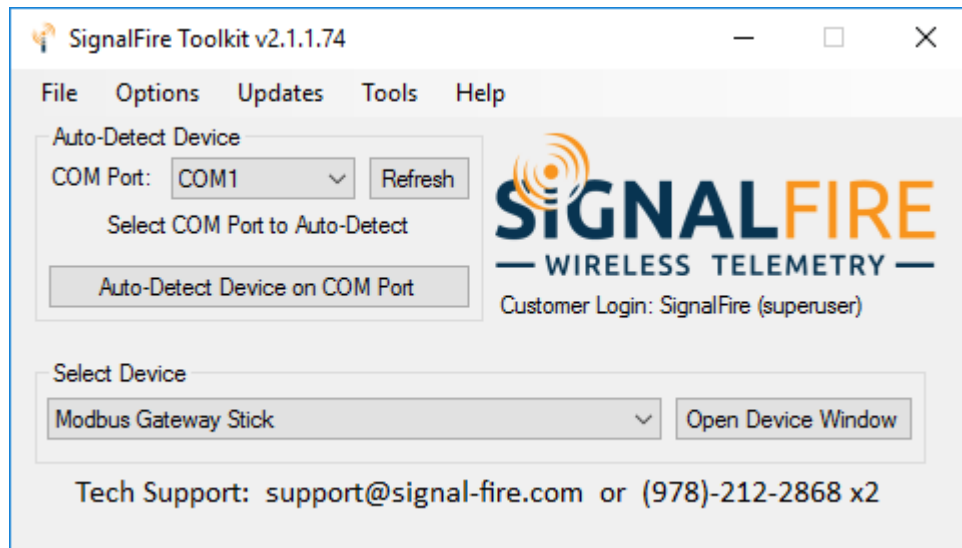
Select the COM port associated with the Sentinel Node and click "Auto-Detect Device on COM Port." This will open the device configuration window, where all device settings can be configured.

Optional Shunt Voltage to Current Conversion

The SignalFire ToolKit allows the shunt resistance to be configured. If the Shunt resistance is configured the calculated current through the shunt resistor will be available in the Modbus register map.

Connections

Rectifier Voltage

Connect the positive and negative terminals of the DC output voltage from the rectifier to the terminals on the daughter card as shown below.

Shunt Resistor Voltage

The shunt resistor must be on the high-side of the rectifier output (positive side). The measured voltage across the shunt resistor is valid as long as the rectifier voltage is above 5V.

Connect the SHUNT+ terminal to the positive (supply) side of the shunt resistor and the SHUNT- to the load side of the shunt resistor.
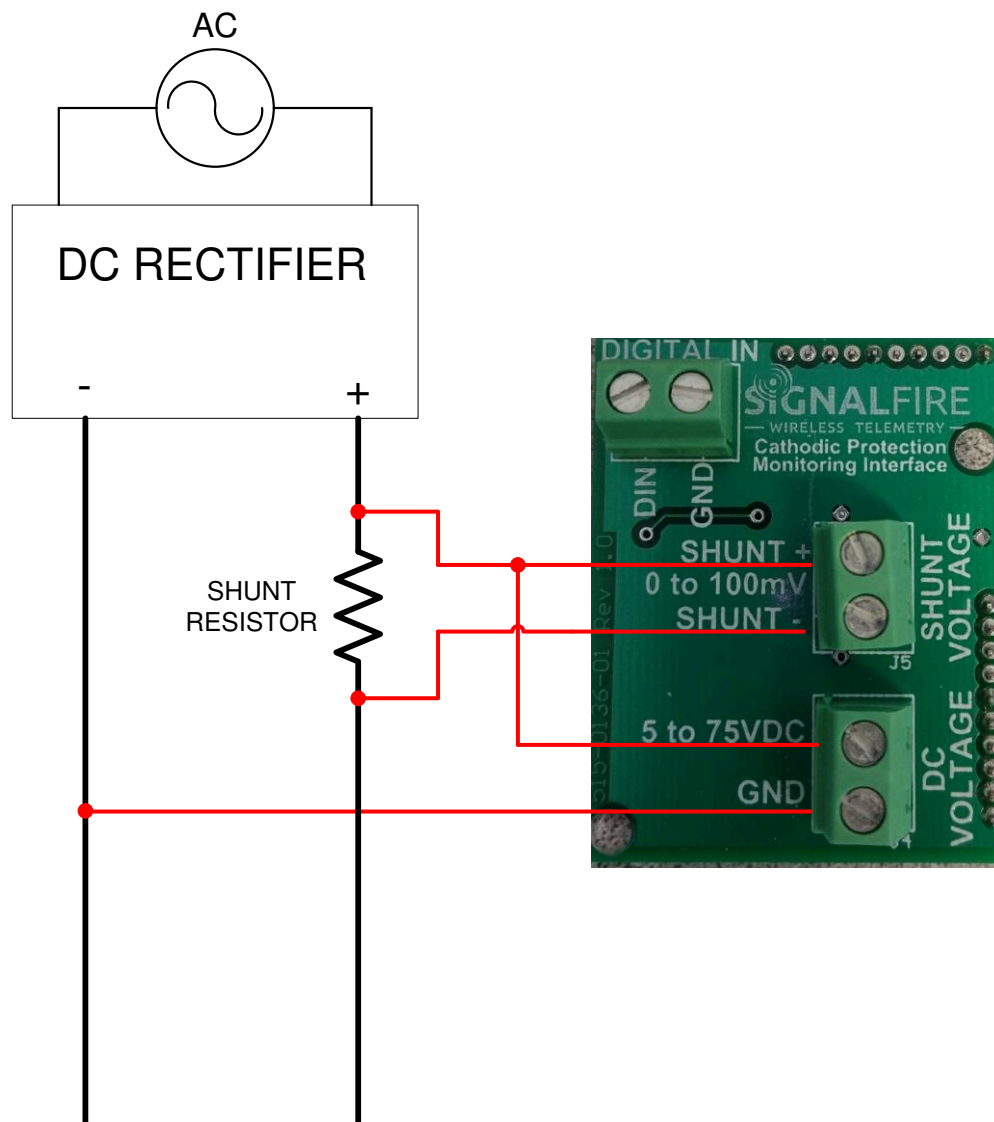
Wiring Diagram

Remote Modbus Register Mapping

The Sentinel Node sends data to a SignalFire Telemetry Modbus Gateway. The data that is sent to the gateway is available at the gateway in registers where it can then be read by a Modbus RTU. Consequently, the node needs to have a unique (to the network it is in) Modbus slave ID which the gateway will use to store its unique data.

Modbus Registers

Every check-in period, the sensors are read and data is sent to the gateway. The gateway will save the data under the set Modbus ID in 16-bit registers. The register map for this system is below.

Register Map

Register Number	Register Address	Description	Data Type
41001	1000	Rectifier Voltage (0-75VDC) (Volts x 10)	16Bit UINT
41002	1001	Shunt voltage (mV) (0-100)	16Bit UINT
41003	1002	Digital Input state (1=closed, 0=open)	16Bit UINT
41004	1003	Average frequency over the last check-in period times 10	16Bit UINT
41005	1004	Ave. counts per minute over the check-in period times 10	16Bit UINT
41006	1005	Frequency over 2 seconds at check-in time times 10	16Bit UINT
41007	1006	32-bit Hardware counter, High Byte	32Bit UINT
41008	1007	32-bit Hardware counter, Low Byte	32Bit UINT
41009	1008	Rectifier Voltage (V), High Byte	32Bit Float
41010	1009	Rectifier Voltage (V), Low Byte	32Bit Float
41011	1010	Shunt Voltage (mV), High Byte	32Bit Float
41012	1011	Shunt Voltage (mV), Low Byte	32Bit Float
41013	1012	Scaled Rectifier Current (Amps), High Byte	32Bit Float
41014	1013	Scaled Rectifier Current (Amps), Low Byte	32Bit Float
49988	9987 or 65524	Major revision number for the mainboard	16Bit UINT
49989	9988 or 65525	Minor revision number for the mainboard	16Bit UINT
49990	9989 or 65526	Major revision number for the radio	16Bit UINT
49991	9990 or 65527	Minor revision number for the radio	16Bit UINT
49992	9991 or 65528	High 16 bits of SFTS node address	16Bit UINT
49993	9992 or 65529	Low 16 bits of SFTS node address (the radio ID)	16Bit UINT
49994	9993 or 65530	Slave ID readback	16Bit UINT
49995	9994 or 65531	Received signal strength of last packet from the slave	16Bit INT
49996	9995 or 65532	Battery voltage of the Modbus client, in millivolts	16Bit UINT
49997	9996 or 65533	Minutes until this slave will time out, unless new data is received	16Bit UINT
49998	9997 or 65534	Number of registers cached for this slave device	16Bit UINT
49999	9998 or 65535	Remote device type (?? for Cathodic Protection Sensor Node)	16Bit UINT

Configuration / Debug

Debug and configuration information is available if a connection is made via the debug port on the main board. A USB converter cable (available from SignalFire) must be used for this interface.

Debug and advanced configuration may be done using the SignalFire Toolkit PC application.

Technical Support and Contact Information

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Revision	Date	Changes/Updates
1.0	6/7/16	Initial release