Interface Manual

SignalFire Counter -in-a-Stick

SignalFire Number: CTRS-CBBL

The SignalFire Counter -in-a-Stick has the following features:

- Wide range DC power input, 6 to 36VDC
- Configurable check -in period and network address
- 2 Digital I/O channels, can be used as digital/counter input or relay driver outputs
- Inputs support frequencies up to 2 kHz, open drain or pulse input supported
- Two 32Bit count totalizers
- Full time mesh node can forward messages from other SignalFire devices including sleeping nodes
- Sends data to a SignalFire Modbus Gateway
- Integrated 500mW FHSS 900MHz ISM band radio and high gain antenna

Connections

The Counter-in-a-Stick is supplied with a 6-conductor cable. The connections are as follows:

Wire Color	Connection
RED	Positive Power (6 to 36 VDC)
BLACK	Ground
GREEN	I/O Channel 1
BROWN	I/O Channel 2
ORANGE	RS-232 Debug/Programming TX, 2400 Baud
YELLOW	RS-232 Debug/Programming RX, 2400 Baud

The I/O lines may be used as either a digital input or a digital output. By default the relay driver is off which allows both channels to be used as inputs. If a relay is connected to an I/O channel and energized by issuing a write coil command, the line will be pulled low so that it cannot be used as an input, however the state can still be read to confirm that it is low.

The current state of the outputs is maintained through a power cycle of the device.

Relay Connections

The Counter-in-a-Stick provides an open drain relay driver capable of controlling a 12VDC relay coil, sinking up to 200mA for connection directly to a relay. The drawing below shows how to connect an external relay.
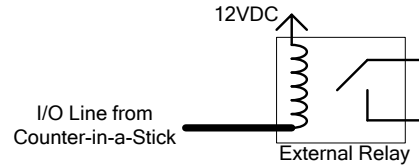
Status LED

The Counter-in-a-Stick has one LED available for field diagnostics.

LED	Description
Slow Flash (3 second pause)	System is running and in communication with radio network
Fast Flash (0.5 second pause)	System is running but no network found
Solid On	System Fault, needs service

Setup

The Counter-in-a-Stick requires initial configuration over the debug port. The SignalFire Toolkit PC application will be used to configure the device over the serial port.

The following items must be configured:
- Network Selection
- Check-in Period Selection
- Modbus Slave ID
- I/O Mode
- Failsafe Timers (optional)

The optional SignalFire Connector-Breakout-Board (CBB), pictured below, provides an easy means to connect the RS232 lines and power the device while configuring the system.

The **status** LED on the CBB will blink quickly (0.5 sec pause) if the node is not in radio communication with the gateway. It will blink slowly (3 sec pause) if the node is in radio communication with the gateway. In addition, one of the three **signal strength** LEDs will blink to indicate the wireless signal strength:

- Green = Excellent
- Yellow = Average
- Red = Weak

Network Setting

The network address can be used to create separate networks using multiple gateways (that are in close proximity with one another). The network is set using the SignalFire Toolkit. The Network Group setting is used when more than 8 networks are needed. Both the network and network group must match those of other nodes for nodes to communicate.

Radio Network 1 ▼ Set
Radio Network Group 0 ▼ Set

System Check-In Period

This setting controls how often the node will forward its register data to the gateway, and is configured using the SignalFire Toolkit.

Checkin Interval 10 seconds ▼ Set

Modbus Slave ID and Network Configuration

The SignalFire Counter-in-a-Stick must be configured to have a unique Modbus ID within a configured network. Configuration is done using the SignalFire Toolkit.

Slave ID 2 Set

I/O Mode

Each I/O can be configured as either an Output (relay control) or input using the SignalFire Toolkit.

Relay Failsafe

The Counter-in-a-Stick can be configured so that any outputs go to the non-energized safe state in the event of loss of communication. There are two options for the failsafe timer.

Relay Comm Failsafe Timer: If the Counter-in-a-Stick loses its wireless communications link to the gateway for greater than this time, the relay outputs will be put into a non-energized state. Note that the Counter-in-a-Stick will not know the wireless link has been lost until it performs its next scheduled check-in to the gateway. The relays will remain in this "safe" state until a Modbus command is sent to the gateway to energize the coil.

Relay Mesg Failsafe Timer: This is similar to the previous timer, but this indicates the time since a valid Modbus coil write message has been sent from the Modbus master through the SignalFire gateway. If used, this must be set higher than the Modbus coil write frequency of the Modbus master device.

Counter Inputs

Count Totalizers

The Counter-in-a-Stick totalizes count inputs whenever it is powered. The totalized count values are written to a non-volatile memory once every 2 hours to prevent against substantial count loss in the event of a power failure.

Frequency

The Counter-in-a-Stick reports three frequency values for each counter input. The first is the average frequency over the last check-in period. The second is the average frequency over the 2 seconds immediately before the check-in, and the last is the average counts per minute over the last check-in period.

Input State

In addition to counts and frequency, the state of the input at the time of the check-in (open or closed) is reported. This is useful for very low frequency inputs or a status input.

Modbus Write Register Instructions – Relay Control

The Modbus Master device will issue a standard Modbus protocol command in RTU format to the SignalFire Gateway. The register write command will be automatically forwarded over the air to the Counter-in-a-Stick.

The Counter-in-a-Stick supports single write coil and single write register Modbus commands:

0x05 MODBUS_WRITE_BOOLEAN (1-bit coil)
0x06 MODBUS_WRITE_REGISTER (16-bit value)

Remote Modbus Register Mapping

The client sends data to a SignalFire Telemetry buffered Modbus gateway. The data that is sent to the gateway shows up at the gateway in registers. 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 Counter-in-a-Stick registers are sent to the gateway. The gateway will save the data under the configured Modbus ID in 16-bit registers. The **register number** is the number commonly used by a Modbus RTU device. The **register address** is the actual Modbus register address sent over the RS485 wires.

Read-Only Register Map

Register Number	Register Address (Offset)	Description
41002	1001	Counter1 State (0 = Low, 1 = High)
41003	1002	Counter1 Count Value (upper 16-bits of 23-bit count)
41004	1003	Counter1 Count Value (lower 16-bits of 32-bit count)
41005	1004	Counter1 Frequency (Average over entire check-in period)
41006	1005	Counter1 Frequency (Average over 2 sec. at check-in time)
41007	1006	Counter2 State (0 = Low, 1 = High)
41008	1007	Counter2 Count Value (upper 16-bits of 32-bit count)
41009	1008	Counter2 Count Value (lower 16-bits of 32-bit count)
41010	1009	Counter2 Frequency (Average over entire check-in period)
41011	1010	Counter2 Frequency (Average 2 sec. at check-in time)
41012	1011	Counter1 Counts per minute (average over entire check-in)
41013	1012	Counter2 Counts per minute (average over entire check-in)
The registers below are common to all SignalFire Modbus products		
49988	9987 or 65524	Major revision number for the mainboard
49989	9988 or 65525	Minor revision number for the mainboard
49990	9989 or 65526	Major revision number for the radio
49991	9990 or 65527	Minor revision number for the radio
49992	9991 or 65528	High 16 bits of SFTS node address
49993	9992 or 65529	Low 16 bits of SFTS node address (the radio ID)
49994	9993 or 65530	Slave ID readback
49995	9994 or 65531	Received signal strength of last packet from the slave
49996	9995 or 65532	Battery voltage of the Modbus client, in millivolts
49997	9996 or 65533	Minutes until this slave will time out, unless new data is received
49998	9997 or 65534	Number of registers cached for this slave device
49999	9998 or 65535	Remote device type (22 for Counter Stick)

Coil Control Registers

Register Number	Register Address (Offset)	Description
00002	1	Output 1. 0x00FF = relay energized, 0x0000 = relay not-energized
00003	2	Output 2. 0x00FF = relay energized, 0x0000 = relay not-energized

Note: The status registers are only available from the 49988-49999 (9987-9998) address range if the Gateway is running firmware 7.52 or higher.