

Manual Pressure Scout

SignalFire Model: Scout-PSIx-y



The SignalFire Pressure Scout is an Intrinsically Safe wireless pressure sensor with the following features:

- Powers integrated pressure sensor and radio for years with an internal battery
- Rapid pressure sampling with configurable alarms and report by exception
- Available in standard pressure ranges
- Pushbutton or remote zeroing
- Optional solar battery system for routing nodes or rapid data collection
- Sends data to a SignalFire Buffered Modbus Gateway
- Compact and simple to install and maintain
- AES 128bit Encryption

Specifications

Enclosure Size	7.25" tall × 2.75" diameter
Power Source	Internal IS Lithium battery pack SignalFire Part Number: 810-0008-02 External Solar battery system SignalFire Part Number: SENTINEL-SOLAR-xxx Other external power supply meeting the power entity parameters from the control drawing.
Temperature Rating	-40°C to +60°C
Radio Frequency	902-928MHz Ism Band, FHSS radio, internal antenna FCC ID: W8V-PS IC: 8373A-PS
Compliance	Certified for use in Class I, Division 1 groups C and D. EXi [EXi] FCC/IC Certified.



WARNING: Use of this equipment in a manner not specified by the manufacturer may impair the protection provided by the equipment.



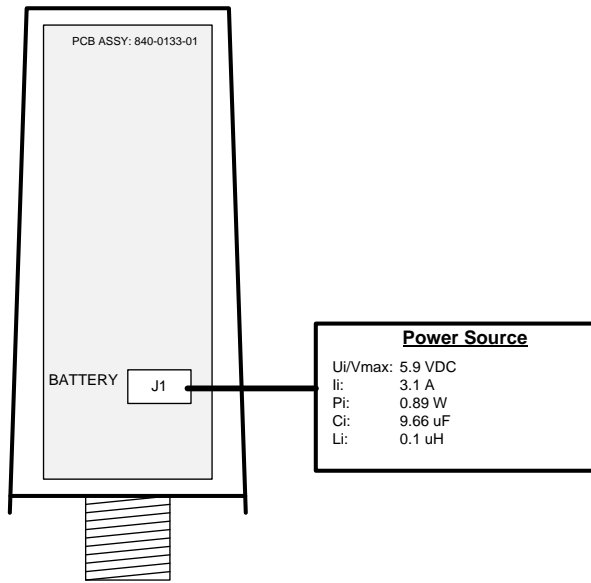
WARNING: The use of any parts not supplied by the manufacturer violates the safety rating of the equipment.

Refer to control drawing 960-0081-01 for requirements when used in a Class I Division 1 area.

SignalFire Pressure Scout

Models: Scout-PSix-y

x=pressure span, y=power source



<u>Class I, Division 1, Groups C and D</u>	<u>Ambient Temperature Limit: -40C to +60C</u> <u>Temperature Code: T3</u>
<ul style="list-style-type: none"> • WARNING: Substitution of components may impair intrinsic safety. • Choose peripheral devices and associated apparatuses such that the following conditions are met: $U_i/V_{max} \geq U_o/V_{oc}$ $I_i/I_{max} \geq I_o/I_{sc}$ $P_i \geq P_o$ $C_o/C_a \geq C_i + C_{cable}$ $L_o/L_a \geq L_i + L_{cable}$ • When replacing the internal battery, only use SignalFire lithium battery model number 810-0030-01 (1BIS) • See SignalFire Instruction manuals numbers 960-0082-01 for installation requirements • Install the internal battery pack only when external power is not used 	

<h2>SignalFire Telemetry</h2>	
Part Name	Control Drawing, Pressure Scout
Date	10/10/16
Part Number	960-0081-01
Rev	1.1
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Connections and Components

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Radio LEDs

- The Radio TX LED (**green**) flashes each time a radio packet is sent. This LED will blink rapidly while searching for the radio network and at boot up.
- The Radio RX LED (**red**) blinks on each received radio packet.

Status LEDs

- The STATUS LED (**green**) will blink on when the pressure sensor is sampled.
- The ERROR LED (**red**) will blink to indicate an error condition.

Checkin Button

- If this button is pressed the Scout will take a reading from the integrated pressure sensor and send the data to the gateway.

Zero Button

- Allows the pressure sensor to be zeroed. Hold the 'Zero' button down for 3 seconds to zero the pressure sensor. The status LED will come on and then blink twice to indicate that the sensor has been zeroed.

Setup

The Pressure Scout needs to be set up for correct operation before being fielded. The configurable items include:

- Network selection
- Check-in period selection
- Modbus Slave ID setting
- Optional alarm thresholds and scaling

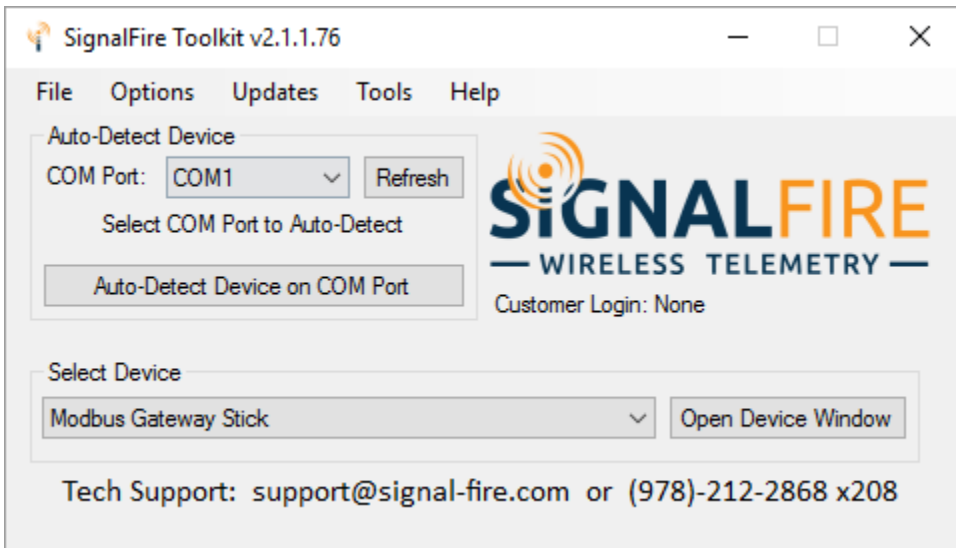
All settings are made using the SignalFire Toolkit PC application and a USB-serial programming cable available from SignalFire.



WARNING: Perform the steps in this section (Setup) in a safe location only.

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 Pressure Scout and click "Auto-Detect Device on COM Port." This will open the device configuration window, where all device settings can be configured.

The screenshot shows the Pressure Scout application window. At the top right, a status box displays a green 'Passed' message with a '4' in a black circle next to it. The interface is divided into several sections:

- 1**: Serial Port Settings (COM Port: COM19, Refresh, Open, Close, Offline buttons)
- 2**: Scout Information (Product: Pressure Scout, Slave ID: 41, Node Name: SCOUT, Radio Connectivity: Connected -46dBm, Mainboard Version: 0.54, Radio Version: 2.50 (sleeping), Radio Address: 25411, Corporate ID: <Encrypted>, Radio Mode: Sleeping, Radio Network: 3, Radio Network Group: 0, Radio Power (dBm): 14, Checkin Interval: 1 minute, Scale Low Value: 0, Scale High Value: 20.2, Scale Offset Value: 0, Alarm Value Low: 1.100000, Alarm Value High: 2.200000, Sampling Interval: 5 seconds)
- 3**: Set Corporate ID / Encryption Key (Enable Encryption checked, Key: signalfire)
- 4**: Status of Last Operation (Passed)
- 5**: Reported Sensor Values (Table with columns: Address, Description, Value)

Address	Description	Value
3000	Sensor Voltage (mV)	500
3001	Sensor PSI (int)	12800
3002	Sensor PSI x100 (int)	12800
3003	High Notification	0
3004	Low Notification	1
3005	Low Battery	0
3006	Sensor Span (PSI)	20
3007	Error Status	0
3008-3009	Sensor PSI (float)	0.00556
3010-3011	Sensor PSI Scaled (int)	0.00561
3012-3013	Alam HighThreshold	2.200000
3014-3015	Alam Low Threshold	1.100000
65532	Battery Voltage (mV)	3646
- 6**: Scout Settings (Slave ID: 41, Node Name: SCOUT, Radio Mode: Sleeping, Radio Network: 3, Radio Network Group: 0, Checkin Interval: 1 minute)
- 7**: Battery Life Estimate (Battery Life: 75%, Low Battery: 0, High Battery: 100%)
- 8**: Custom Sensor Scaling (Scaling: Enabled, Scale Low Value: 0, Scale High Value: 20.2, Scale Offset (+/-): 0)
- 9**: Pressure Alarm Settings (Low: 1.100000, High: 2.200000, Sample Interval: 5 seconds)

A note at the bottom right states: "When the device is in Alarm mode, it will ignore the Checkin Interval setting, and check in on every sample instead."

Success

- | | | | |
|---|-----------------------------------|---|--------------------------|
| 1 | Serial Port Settings | 2 | Scout Information |
| 3 | Set Corporate ID / Encryption Key | 4 | Status of Last Operation |
| 5 | Reported Sensor Values | 6 | Scout Settings |
| 7 | Battery Life Estimate | 8 | Custom Sensor Scaling |
| 9 | Pressure Alarm Settings | | |

Network Setting

The network is set using the SignalFire Toolkit. The network, network group, and corporate ID (replaced with Encryption) settings must match those of the gateway (and other nodes) in order for them to communicate

Radio Network	1	Set
Radio Network Group	0	Set

Encryption

Starting with firmware version 0.50, it is possible to encrypt over-the-air transmissions to prevent tampering. Encryption keys replace the Corporate ID system, so it is important that all devices connected to a Gateway have the same encryption key as well as network and network group number.

To set up a Pressure Scout to use encryption, click the checkbox labeled **Enable Encryption** inside the **Set Corporate ID** box:

The encryption key box. For more details, click the Help button.

The box will then change into a **Set Encryption Key** box, and it will prompt instead for the encryption key (6 to 16 characters) you would like to use. Note that keys may not contain spaces or angle brackets. Enter it and then press **Set**. This will cause the Scout to drop its network, and only attempt to join networks that use the same encryption key. If you are setting up a new network, you will need to set the encryption key on all of your devices. If you are adding a Scout to a legacy network, you can simply set the Corporate ID without clicking the Enable Encryption box, and it will remain compatible with the older system.

Setting the encryption key.

It is also possible to hide your encryption key so it cannot be read. This is the most secure option, but if you forget your key, there is no way to recover it – you have to reset the key on every device on its network. To enable this option, select **Set Encryption Key Unrecoverable** under the **Settings** menu.

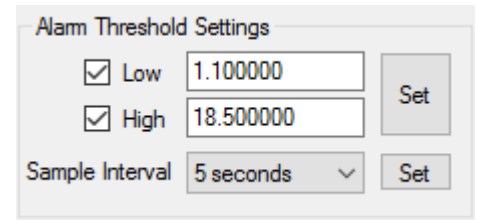
Setting the encryption key unrecoverable.

Modbus Slave ID

The Modbus Slave ID can be set with the SignalFire Toolkit. Each remote device connected to the gateway must have a unique Modbus Slave ID (1-240).

Alarm Threshold Settings

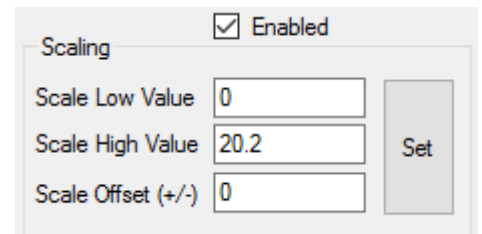
Optional alarm threshold settings are available which allow for rapid pressure sample interval (5 or 15 seconds) and will cause the Pressure Scout to check-in immediately if the threshold is crossed. While above the high alarm threshold (or below the low alarm threshold) the Scout will checkin at the configured sample interval. The Low and High alarm thresholds can be enabled individually.



The screenshot shows a window titled "Alarm Threshold Settings". It contains three rows of controls. The first row has a checked checkbox labeled "Low", a text input field containing "1.100000", and a "Set" button. The second row has a checked checkbox labeled "High", a text input field containing "18.500000", and a "Set" button. The third row has a label "Sample Interval", a dropdown menu showing "5 seconds", and a "Set" button.

Custom Scaling

The reported pressure can be optionally scaled to a custom range. This can be used to scale PSI to inches of H2O for example. If custom scaling is enabled, a Scale Low Value and Scale High Value must be configured. In addition, an optional Scale Offset can be set. The Scale Offset will be added (or subtracted) to the reported scaled value.



The screenshot shows a window titled "Scaling". At the top right, there is a checked checkbox labeled "Enabled". Below this, there are three rows of controls. The first row has a label "Scale Low Value", a text input field containing "0", and a "Set" button. The second row has a label "Scale High Value", a text input field containing "20.2", and a "Set" button. The third row has a label "Scale Offset (+/-)", a text input field containing "0", and a "Set" button.

Remote Modbus Register Mapping

The Scout 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 (Offset)	Description
43001	3000	Sensor Voltage (mV) (500mV to 2500mV is normal range)
43002	3001	Sensor PSI Reading (int)
43003	3002	Sensor PSI Reading x 100 (int) (only valid for pressures up to 650psi)
43004	3003	High Alarm Notification (0 = no alarm, 1 = high alarm active)
43005	3004	Low Alarm Notification (0 = no alarm, 1 = low alarm active)
43006	3005	Low Battery Alarm (0 = battery above 3.0V, 1 = battery below 3.0V)
43007	3006	Sensor Span (PSI)
43008	3007	Sensor Error Status (0=no errors, 1=sensor out of range low, 2=sensor out of range high)
43009-43010	3008-3009	Sensor PSI Reading (float)
43011-43012	3010-3011	Custom Scaled Sensor Reading (float)
43013-43014	3012-3013	Alarm High Threshold Setting (float)
43015-43016	3014-3015	Alarm Low Threshold Setting (float)
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. ?? for Pressure Scout

Mounting and Care

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The Pressure Scout unit comes with an integrated pressure sensor with a ½" MNPT process fitting. The Scout is mounted directly to the pressure source. It is important to mount the Scout so it is vertically orientated with the pressure fitting facing down.

Internal Lithium Battery Replacement

Battery Packs can be changed with the node in place.

- 1 Unscrew the cover from the base.
- 2 Unplug the battery from the PCB, by depressing the locking clip on the connector.
- 3 Remove/replace battery
- 4 Connect the battery to the main PCB battery connector.
- 5 Install the enclosure cover.



WARNING: Use of any battery other than the SignalFire part number 810-0030-01 (1BIS) will impair the protection provided by the equipment.

Cleaning Instructions

The outside of the enclosure may be cleaned with water, mild soap, and a damp cloth as needed. High pressure washing is not recommended.



WARNING: Electrostatic Discharge Hazard! Care must be taken to avoid the potential of creating a charge on the enclosure or antenna. Do not wipe with a dry cloth. Do not brush against the enclosure with clothing or gloves.



WARNING: Only connect to the debug port in a safe area!

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

SignalFire Telemetry
43 Broad St C-300
Hudson, MA 01752
(978) 212-2868
support@signal-fire.com

Revision	Date	Changes/Updates
1.0	10/1/16	Initial release
1.1	10/10/16	Updated control drawing, Edits to register map

APPENDIX - FCC and IC Statements

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Changes or modifications not expressly approved by SignalFire Telemetry, Inc could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING!

FCC and IC Radiation Exposure Statement:

This equipment complies with FCC's and IC's RF radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) & user's/nearby person's body at all times.
2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a maximum (or lesser) gain approved for this transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.r.i.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.