Manual
Link Scout

SignalFire Model: LinkScout-HART-1BIS

The SignalFire Link Scout is an Intrinsically Safe wireless device with a HART sensor interface

- Powers HART interface and radio for years with an internal battery
- Wireless access to HART devices via PACTware or Radar Master
- Can monitor HART devices operating in 4-20mA mode without affecting the process loop
- Clips on to existing current loops in parallel, does not require loop to be broken
- Reads up to 4 HART devices
- Supports HART version 5, 6 and 7
- Sends data to a SignalFire 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: 1BIS
Temperature Rating	-40°C to +60°C
Enclosure	IP64 rated. Polycarbonate cover, 316SS base and NPT fitting, Aluminum nameplate
Radio Frequency	902-928MHz ISM Band, FHSS radio, internal antenna FCC ID: W8V-PS IC: 8373A-PS
Compliance	Class I, Div 1, Groups C-D, T3 Class II, Div 1, Groups E-G, T160°C, Class III Ex ia IIB T3 Ga IP64

WARNING: Use of this equipment in a manner not specified by the manufacturer may impair the protection provided by the equipment.
AVERTISSEMENT: L'utilisation de cet équipement d'une manière non spécifiée par le fabricant peut nuire à la protection fournie par l'équipement.

WARNING: The use of any parts not supplied by the manufacturer violates the safety rating of the equipment.
AVERTISSEMENT: L'utilisation de pièces non fournies par le fabricant est contraire à la cote de sécurité de l'équipement.

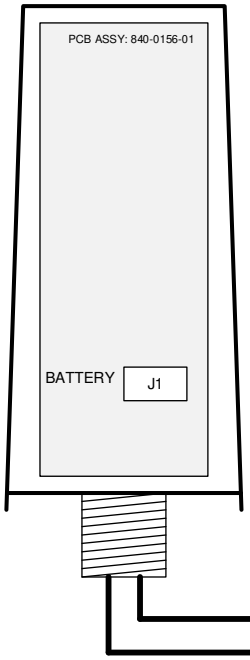
Refer to control drawing 960-0095-01 for requirements when used in a Class I Division 1 area.

Reportez-vous à l'illustration de contrôle 960-0095-01 pour connaître les exigences lorsqu'elle est utilisée dans une zone de classe I division 1.

Control Drawing

SignalFire Link Scout

Model: LinkScout-HART-1BIS



Power Source (J1)

SignalFire 1BIS Battery pack Only

HART Loop Entity Parameters

Ci and Li values are the capacitance and inductance that is added to the external connection via Hart output when the LinkScout is connected:
Ci = 6800pF
Li = 0H

The output parameters from the LinkScout to the external device will be as follows:
Uo = 5.73VDC
Io = 0A
Po = 0W
Co = 0.553µF
Lo = 0.08mH

The input parameters from the external device to LinkScout will be as follows:
Ui = 30VDC
Ii = 130mA
Pi = 1W

SignalFire Telemetry			
Part Name	Control Drawing, Link Scout	Date	4/18/19
Part Number	960-0095-01	Rev	1.3
Page 1 of 1			

Class I, Division 1, Groups C and D	Ambient Temperature Limit: -40C to +60C Temperature Code: T3

• WARNING: Substitution of components may impair intrinsic safety.

- Note: The LinkScout add only 6800pF and no inductance to the fixed system

• Choose peripheral devices and associated apparatuses such that the following conditions are met:
Ui/Vmax ≥ Uo/Voc
Ii/Imax ≥ Io/Isc
Pi ≥ Po
Co/Ca ≥ Ci + Ccable
Lo/La ≥ Li + Lcable
• When replacing the internal battery, only use SignalFire lithium battery model number 810-0030-01 (1BIS)
• See SignalFire Instruction manual number 960-0094-01 for installation requirements

Connections and Components

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

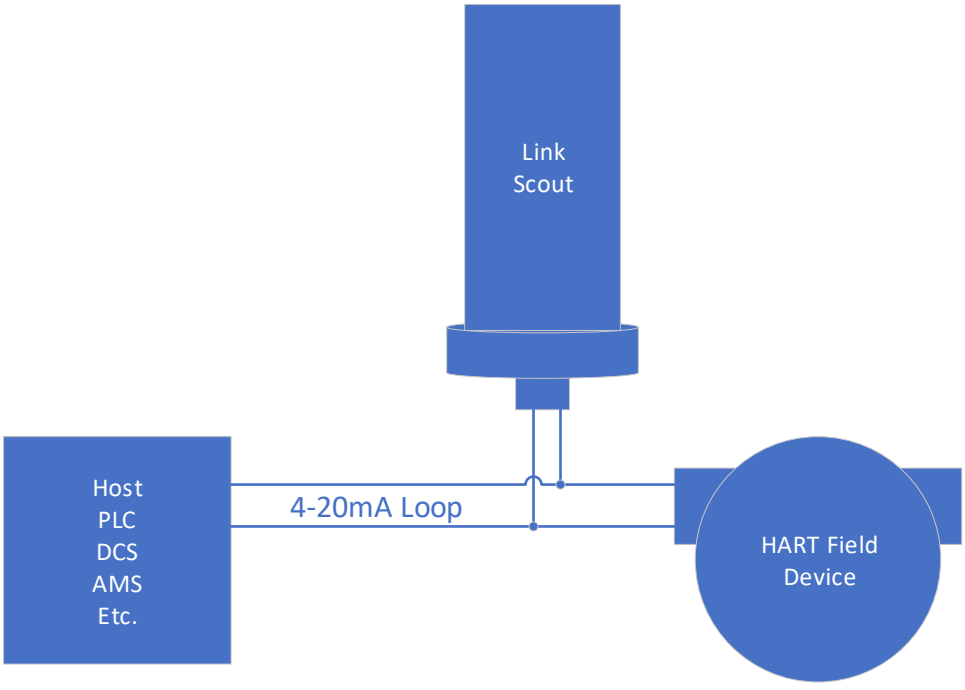
- The STATUS LED (green) will blink once for each HART device detected when the check-in button is pressed on the device on in the ToolKit.
- The ERROR LED (red) will blink to indicate an error condition.

Checkin Button

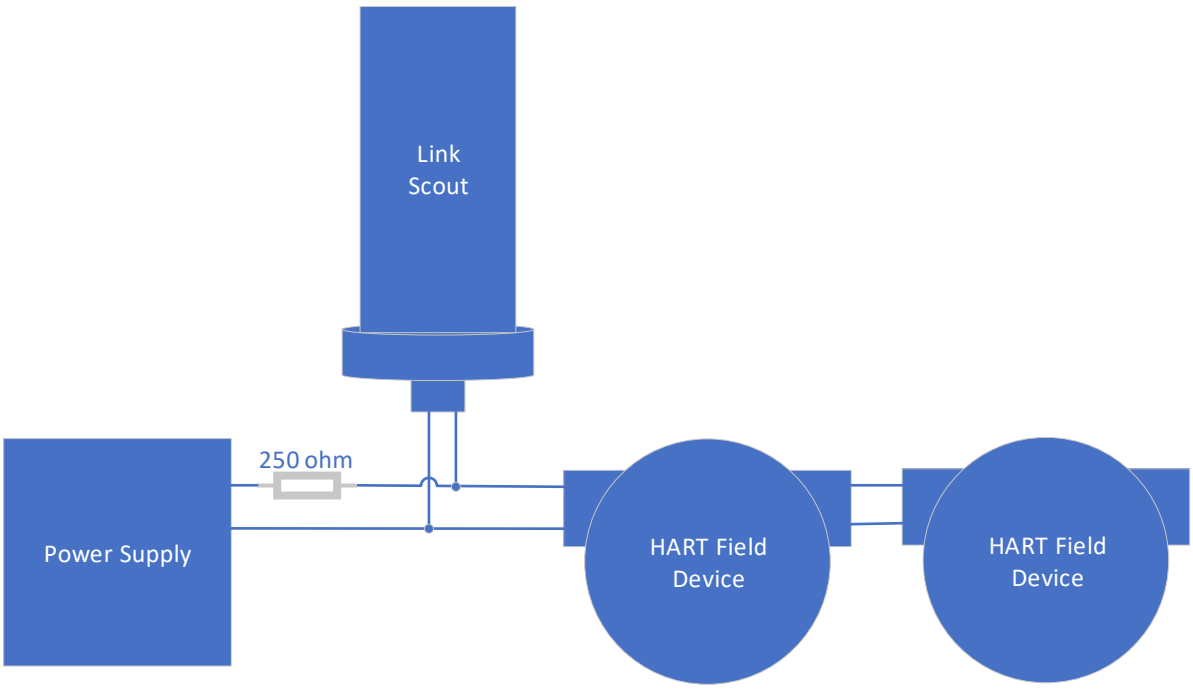
- If this button is pressed the Scout will take a reading from the HART loop and send the data to the Gateway.

Wiring Diagrams

In a system where an existing HART field device is being monitored or controlled by a host such as a PLC or DCS, the Link Scout can be attached to the existing 4-20mA current loop and collect the HART data.



The Link Scout can also be connected to up to 4 HART devices configured as HART Multi-Drop mode. In this configuration, a power supply will power the HART loop through the required 250 ohm resistor. The Link Scout will then read the HART data from the attached sensor(s).



Setup

6

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

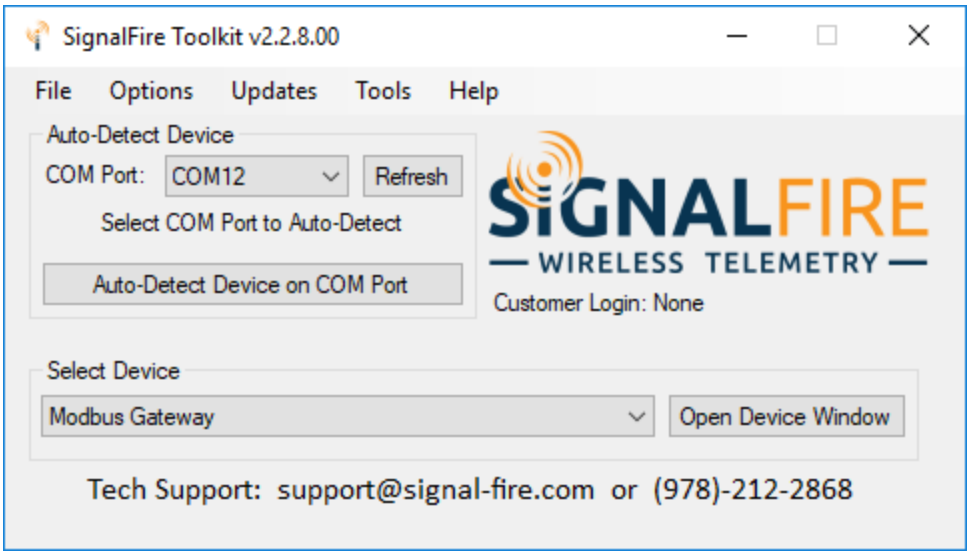
- Network selection
- Check-in period selection
- Modbus Slave ID setting
- HART sensor selection

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

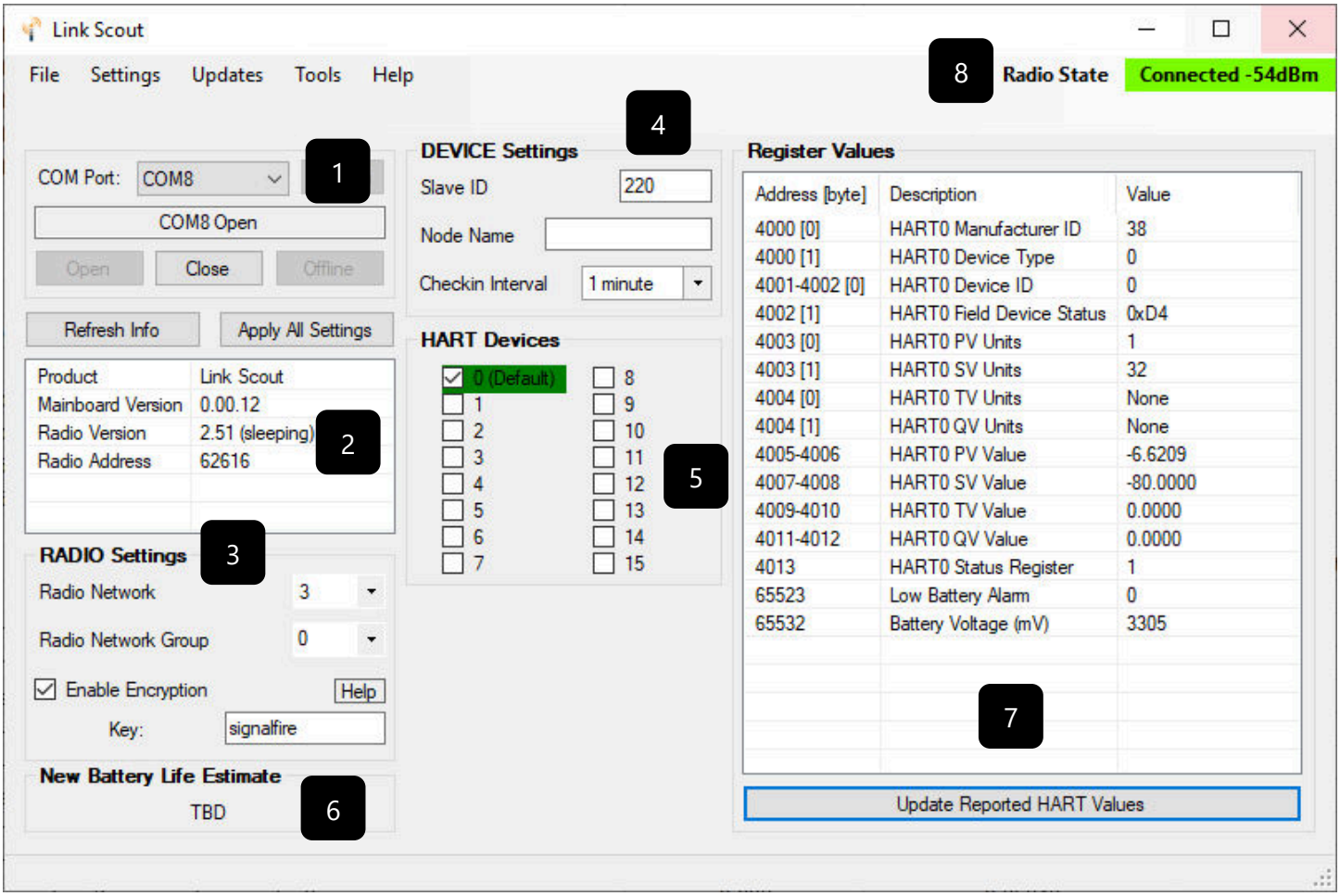
WARNING: Perform the steps in this section (Setup) in a safe location only.
AVERTISSEMENT: Suivez les étapes de cette section (Configuration) dans un endroit sûr uniquement.

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



1	Serial Port Settings	2	Scout Information
3	Radio Settings	4	Node Device Settings
5	HART ID Settings	6	Battery Life Estimate
7	Modbus Register Values	8	Radio connection Status

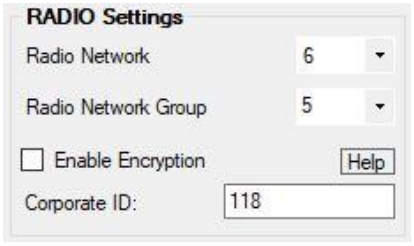
Network Setting

The network is set using the SignalFire Toolkit. **The network, network group, and corporate ID/encryption key settings must match those of the Gateway for them to communicate**. When any setting is changed, it will be highlighted yellow, indicating it has not actually been written to memory. To apply the desired settings, click the **Apply All Settings** button in the upper left-hand corner.

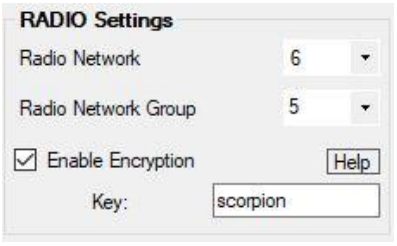
Encryption

To protect your over-the-air data and prevent tampering, SignalFire networks come with encryption. Legacy products use a Corporate ID, but can be switched over to use an encryption key if the firmware and ToolKit are up to date.

To set up a Link Scout to use the legacy corporate ID, uncheck the checkbox labeled **Enable Encryption** inside the **Radio Settings** box. The **Key** field will then change into a **Corporate ID** entry box, enter the CID you would like to use.



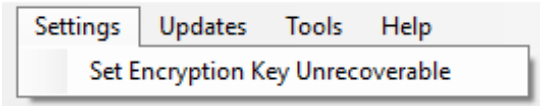
Corporate ID



Encryption Enabled

Note that encryption keys may not contain spaces or angle brackets. If you are setting up a new network, you will need to set the encryption key on all your devices.

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 must 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 to be 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). Every SignalFire device must have a unique slave ID to prevent conflicts.

HART Device Selection

By default, the Link Scout will attempt to read an attached HART device at ID 0 (4-20mA mode). If the Link Scout is connected to more than one HART device configured in multi-drop mode, the HART IDs connected can be selected (up to 4). Only select the HART IDs that are connected to the Link Scout that are to be read. HART IDs that are read successfully will indicate green in the ToolKit, and HART IDs that can not be read will be marked with red.

HART Sensor Configuration

The Link Scout also supports scanning the HART loop for attached HART IDs and allows the HART IDs to be changed. From the Tools menu select **HART Sensor Configuration.** Clicking Scan will display a list of the discovered IDs. The ID in the attached instrument(s) may also be changed using this window.

Remote Modbus Register Mapping

10

The Link 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.

Note that only registers from selected HART IDs are sent to the Gateway. **The registers from each HART ID are offset by 100 from the start of the pervious block.**

Register Map

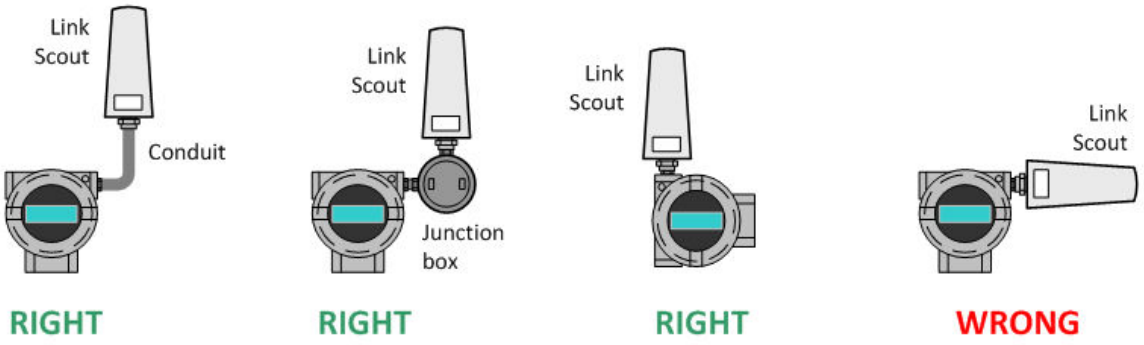
Register Number	Register Address (Offset)	Description	Data Type	Function Codes	Reg. Type
HART Loop Current					
43002	3001	Loop Current (uA) reported by HART sensor(s)	UINT	03, 04	read only
HART ID 0					
44001	4000	HART ID 0: Manufacturer's ID Code/Device Type (ID=MSB, Device=LSB)	UINT	03, 04	read only
44002	4001	HART ID 0: Device ID Number (ID high bite = MSB, ID mid byte = LSB)	UINT	03, 04	read only
44003	4002	HART ID 0: Device ID Number, HART Status (ID low byte = MSB, Status = LSB)	UINT	03, 04	read only
44004	4003	HART ID 0: PV & SV Units Code (PV=MSB, SV=LSB)	UINT	03, 04	read only
44005	4004	HART ID 0: TV & QV Units Code (TV=MSB, QV=LSB)	UINT	03, 04	read only
44006-44007	4005-4006	HART ID 0: Primary Variable (PV) (two registers) (float)	Float	03, 04	read only
44008-44009	4007-4008	HART ID 0: Secondary Variable (SV) (two registers) (float)	Float	03, 04	read only
44010-44011	4009-4010	HART ID 0: Tertiary Variable (TV) (two registers) (float)	Float	03, 04	read only
44012-44013	4011-4012	HART ID 0: Quaternary Variable (QV) (two registers) (float)	Float	03, 04	read only
44014	4013	HART ID 0: Sensor communication status. 1=comms OK, 0=no comms	UINT	03, 04	read only
		HART ID 1			
44101	4100	HART ID 1: Manufacturer's ID Code/Device Type (ID=MSB, Device=LSB)	UINT	03, 04	read only
44102	4101	HART ID 1: Device ID Number (ID high bite = MSB, ID mid byte = LSB)	UINT	03, 04	read only
44103	4102	HART ID 1: Device ID Number, HART Status (ID low byte = MSB, Status = LSB)	UINT	03, 04	read only
44104	4103	HART ID 1: PV & SV Units Code (PV=MSB, SV=LSB)	UINT	03, 04	read only
44105	4104	HART ID 1: TV & QV Units Code (TV=MSB, QV=LSB)	UINT	03, 04	read only
44106-44107	4105-4106	HART ID 1: Primary Variable (PV) (two registers) (float)	Float	03, 04	read only
44108-44109	4107-4108	HART ID 1: Secondary Variable (SV) (two registers) (float)	Float	03, 04	read only
44110-44111	4109-4110	HART ID 1: Tertiary Variable (TV) (two registers) (float)	Float	03, 04	read only
44112-44113	4111-4112	HART ID 1: Quaternary Variable (QV) (two registers) (float)	Float	03, 04	read only
44114	4113	HART ID 1: Sensor communication status. 1=comms OK, 0=no comms	UINT	03, 04	read only

...	...	...	...	...	...
		HART ID 15			
45501	5500	HART ID 15: Manufacturer's ID Code/Device Type (ID=MSB, Device=LSB)	UINT	03, 04	read only
45502	5501	HART ID 15: Device ID Number (ID high bite = MSB, ID mid byte = LSB)	UINT	03, 04	read only
45503	5502	HART ID 15: Device ID Number, HART Status (ID low byte = MSB, Status = LSB)	UINT	03, 04	read only
45504	5503	HART ID 15: PV & SV Units Code (PV=MSB, SV=LSB)	UINT	03, 04	read only
45505	5504	HART ID 15: TV & QV Units Code (TV=MSB, QV=LSB)	UINT	03, 04	read only
45506-45507	5505-5506	HART ID 15: Primary Variable (PV) (two registers) (float)	Float	03, 04	read only
45508-45509	5507-5508	HART ID 15: Secondary Variable (SV) (two registers) (float)	Float	03, 04	read only
45510-45511	5509-5510	HART ID 15: Tertiary Variable (TV) (two registers) (float)	Float	03, 04	read only
45512-45513	5511-5512	HART ID 15: Quaternary Variable (QV) (two registers) (float)	Float	03, 04	read only
45514	5513	HART ID 15: Sensor communication status. 1=comms OK, 0=no comms	UINT	03, 04	read only
		Status Registers			
49987	9986 or 65523	Low Battery Alarm (0 = battery above 3.0V, 1 = battery below 3.0V)	UINT	03, 04	read only
49988	9987 or 65524	Major revision number for the mainboard	UINT	03, 04	read only
49989	9988 or 65525	Minor revision number for the mainboard	UINT	03, 04	read only
49990	9989 or 65526	Major revision number for the radio	UINT	03, 04	read only
49991	9990 or 65527	Minor revision number for the radio	UINT	03, 04	read only
49992	9991 or 65528	High 16 bits of SFTS node address	UINT	03, 04	read only
49993	9992 or 65529	Low 16 bits of SFTS node address (the radio ID)	UINT	03, 04	read only
49994	9993 or 65530	Slave ID readback	UINT	03, 04	read only
49995	9994 or 65531	Received signal strength of last packet from the slave	INT	03, 04	read only
49996	9995 or 65532	Battery voltage of the Link Scout, in millivolts	UINT	03, 04	read only
49997	9996 or 65533	Minutes until this slave will time out, unless new data is received	UINT	03, 04	read only
49998	9997 or 65534	Number of registers cached for this slave device	UINT	03, 04	read only
49999	9998 or 65535	Remote device type. 62 for Link Scout	UINT	03, 04	read only

Mounting and Care

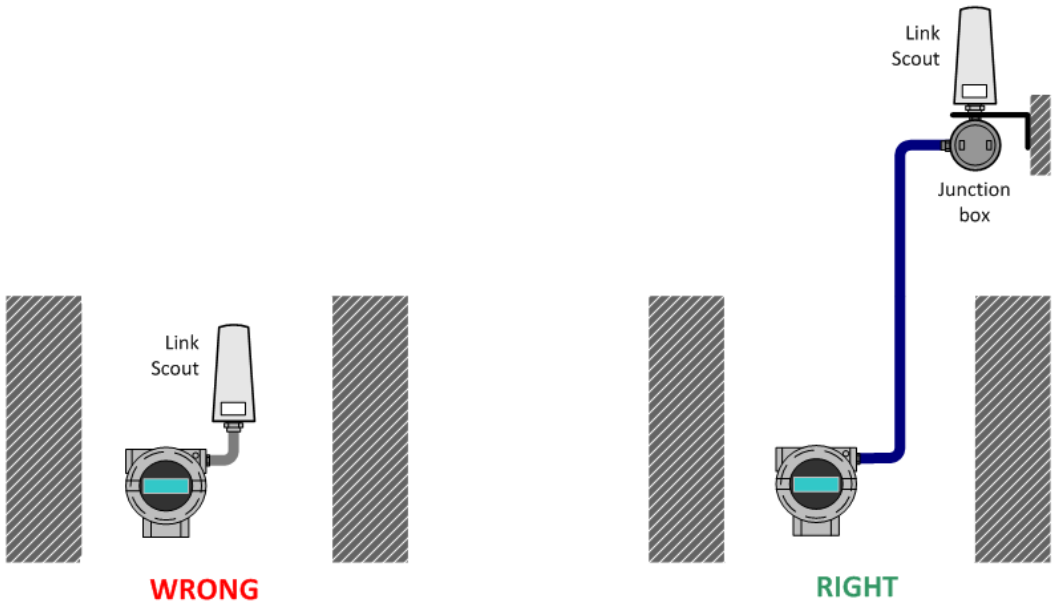
The Link Scout unit comes with an integrated ½" MNPT fitting with leads for connection to the HART loop. It is important to mount the Link Scout so it is vertically orientated with the NPT fitting facing down.

WARNING: The Link Scout must be mounted in a location free of high vibrations. Over time vibrations can damage the Link Scout or battery pack, which could impair its safety ratings. Do not mount directly to continuous vibrating equipment such as pumps or compressors.



Keep the Link Scout mounted vertically

Make sure the Link Scout is also free from obstructions that may interfere with its communication. It may be necessary to install conduit extension to raise the Link Scout to get line-of-sight with the Gateway.



Raise the Link Scout over any immediate obstructions for best reception

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.
AVERTISSEMENT: L'utilisation d'une pile autre que la référence SignalFire 810-0030-01 (1BIS) compromettra la protection fournie par l'équipement.

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 change on the enclosure. Do not wipe with a dry cloth. Do not brush against the enclosure with clothing or gloves.
AVERTISSEMENT: Risque de décharge électrostatique! Il faut veiller à éviter tout risque de changement de l'enceinte. Ne pas essuyer avec un chiffon sec. Ne pas brosser contre l'enceinte avec des vêtements ou des gants.

WARNING: The following metal parts have a capacitance in excess of 3pF, are isolated from ground and may pose a potential electrostatic charging hazard.

NPT Threads	13.26 pF
NPT Nut:	13.2 pF
Baseplate:	13.13 pF

Refer to the manufacturers' instruction manual for details on the mitigation of electrical discharge

AVERTISSEMENT: Les pièces de métal suivantes ont une capacitance qui excède 3pF et sont isolées de la mise à la terre et ainsi peuvent créer une décharge électrostatique dangereuse.

Filets NPT :	*13.26 pF*
Écrou de NPT:	*13.2pF*
Plaque de base:	*13.13pF*

WARNING: Only connect to the debug port in a safe area!
AVERTISSEMENT: Se connecter uniquement au port de débogage dans une zone sûre!

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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Marlborough, MA 01749
(978) 212-2868
support@signal-fire.com

Revision History

Revision	Date	Changes/Updates
1.0	1/2/19	Initial release
1.2	3/5/19	Added additional configuration details
1.4	4/9/19	Updated certification details
1.5	4/18/19	Updated control drawing
1.6	5/7/19	Updated Register map, added wiring diagrams
1.7	5/19/20	Added graphics for mounting instructions

APPENDIX - FCC and IC Statements

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.