



SFTS Radio Board Interface Manual

Rev 4.1 8/3/11

This document describes how to integrate the SignalFire radio into a system.

The interface to/from the SFTS radio board (SFTS-10) consists of three connectors:

- Power
- Signal
- Programming/Aux

Power

The power interface is a four pin, 2mm center-to-center connector. The pinout is as follows:

1. Digital Power – Unregulated power that provides the CC1110 power through a 3.3V regulator. Voltage range is 3.5-12VDC at 50mA max.
2. PA Power – Unregulated power that provides the PA power through a 3.3V regulator. Max current draw is approximately 350mA. 5% duty cycle max. Not used on 10mW boards (connected to pin 1 on radio board)
3. GND
4. GND

Signal Interface

The signal interface connector is a ten pin, 2mm center-to-center connector. The pinout is as follows:

1. P0.1 – Analog input 1, Digital I/O. Buffered by 20K/0.1uF
2. P0.0 – Analog input 0, Digital I/O. Buffered by 20K/0.1uF
3. P1.2 – Digital I/O. Unbuffered I/O line from CC1110
4. P1.1 – Green LED – Digital I/O. Unbuffered I/O line from CC1110
5. P1.3 – Digital I/O. Unbuffered I/O line from CC1110
6. P1.5/TX – Digital I/O, UART TX. Unbuffered I/O line from CC1110
7. P1.7 – Digital I/O. Unbuffered I/O line from CC1110
8. P1.4/RX – Digital I/O, UART RX. Unbuffered I/O line from CC1110
9. Regulated 3.3V from radio digital supply
10. P1.6 – Digital I/O. Unbuffered I/O line from CC1110 (GDO1)

Communication Interfaces

USART0-UART, Alt 2	P1.4, P1.5
USART1-SPI, Alt 1	P0.3, P0.4, P0.5

Programming/AUX

This is a ten pin connector with 2mm center-to-center spacing. It is arranged in a 5x2 pattern. The pinout is as follows:

1. P2.1/Debug 1 – Programming interface and External Watchdog Reset. Toggled every time SW goes through the main loop for external watchdog reset. Needs to be cycled at least every ½ second.
2. P0.7 – LNA power on SFTS-300. Analog input 7, Digital I/O. Unbuffered I/O line to/from CC1110 on the SFTS-10.
3. P2.2/Debug 2 – Programming interface – may be used as digital I/O if necessary. If pulled high during the entire startup sequence (blinking LEDs), the configuration will be reset. Should be pulled down on motherboard if not used.
4. P0.6 – Analog input 6, Digital I/O. Unbuffered I/O line from CC1110
5. RESET/n – CC1110 Reset Line – Should be pulled high on motherboard.
6. P2.0 – Power Amp Control – HW line from PA and switch control. Low when PA is on and High when PA is off. Not connected on 10mA boards.
7. P0.4 – SPI MOSI
8. P0.5 – SPI MISO
9. P0.3 – SPI CLK
10. P1.0 – Red LED

EEPROM

The radio boards support a single serial (SPI) EEPROM. The following EEPROMs are supported:

Manufacturer	Part Number	Description
Atmel	AT25640AN-10SU-2.7	64 Kbit (8 Kbyte)
Microchip	25LC1024I/SM	1 Mbit (128 Kbyte)

The footprint is a standard 8 pin SOIC with the following pinout:

1. CS/n
2. SO
3. WP/n (tied high)
4. GND
5. SI
6. SCK
7. HOLD/n (tied high)
8. VCC (2.7-5.5V)

SPI Interface

The radio module is often used as a SPI slave to another application processor. In this case, the following connections must be made from the radio to the AP:

Signal Interface Connector

Pin 3 (P1.2 SPI1_SS) – SPI slave select aka Chip Select. Input to radio. CS must be asserted before each packet, and must be negated between packets.

Pin 5 (P1.3 SPI1_SPCK) – SPI clock. Input to radio.

Pin 6 (P1.5 SPI1_MOSI) – SPI Master out, slave in. Input to radio.

Pin 7 (P1.7) – Radio Attention. Output from radio. Set when the radio has a packet waiting for the host, and will be set after the host asserts CS to indicate the radio is ready for the transfer to begin.

Pin 8 (P1.4 SPI1_MISO) – SPI Master In, slave out. Output from radio.

AUX Connector

Pin 4 (P0.6) – Radio Wakeup. Input to radio. Must be set at least xxms before CS is asserted. Radio will not go to sleep when this is asserted low. Only for sleeping nodes.

APPENDIX - FCC and IC Statements

This module may only be used in SignalFire Telemetry end products or products designed by SignalFire for a 3rd party. Changes or modifications not expressly approved by SignalFire Telemetry, Inc could void the user's authority to operate the equipment.

SignalFire Telemetry Inc, Model SFTS-10 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.

The final end product must be labeled in a visible area with the following:

“Contains FCC ID: W8V-SFTS10
IC: 8373A-SFTS10”

This device has been designed to operate with the antennas listed below, and having a maximum gain of 5 dB. Antennas not included in this list or having a gain greater than 5 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. 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. i. r. p.) is not more than that permitted for successful communication.

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

The radio transmitter, Model SFTS-10, has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antennas:

Linx	Model ANT-916-JJB-ST	50 ohm, ¼ wave, 1dBi
Nearson	Model S161AM-915	50 ohm, ½ wave, 2.5dBi
SignalFire	Model 9-4-ANT	50ohm, ½ wave, 5dBi

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.

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.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Antennas:

Linx	Model ANT-916-JJB-ST	50 ohm, ¼ wave, 1dBi
Nearson	Model S161AM-915	50 ohm, ½ wave, 2.5dBi
SignalFire	Model 9-4-ANT	50ohm, ½ wave, 5dBi

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.

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.i.r.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.

Revision List

Date	Rev	Author	Change
3/14/08	1.0	Scott K.	Initial Release
5/22/08	2.0	Scott K.	Added support for additional I/O
9/2/08	3.0	Scott K.	Added support for SPI interface
12/4/08	3.1	Scott K.	Fixed doc on SPI
3/15/09	4.0	Scott K.	Added verbiage for FCC certification
8/3/11	4.1	Josh S.	Updated FCC/IC section