# Interface Manual
# Sentinel Node RTD

*SignalFire Model: Sentinel-RTD-DC*



The SignalFire Sentinel Node is a device with the following features:

- Standard SignalFire Sentinel RS485-Modbus Node
- RS485 connection to internal RTD Interface Board
- 2, 3 and 4 wire PT100 RTD supported (other types on request)
- Low power operation from an onboard DC-DC power supply
- Sends data to a SignalFire Buffered Modbus Gateway
- AES 128bit Encryption

## *Specifications*

| | |
|---|---|
| Enclosure | 3.5" tall × 5.0" wide × 5.0" deep |
| Ingress | Type 3 |
| Power Source | DC-DC converter |
| Supply Voltage Range | 9-36V DC |
| Compliance | Certified for use in Class I, Division 2 groups A,B,C and D. T4 FCC/IC Certified. |
| Location | Indoor and Outdoor use, Wet location |
| Temperature Rating | -40°C to +85°C |
| Relative Humidity | Operating and storage humidity 0-100% |
| Altitude | 2000m Max |
| Pollution Degree | Pollution Degree II |
| Radio Frequency | 902-928MHz ISM Band, FHSS radio, internal antenna |

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

**L'utilisation du produit d'une manière différente telle que décrite par la manufacturier compromettra la protection intrinsèque de l'équipement.**

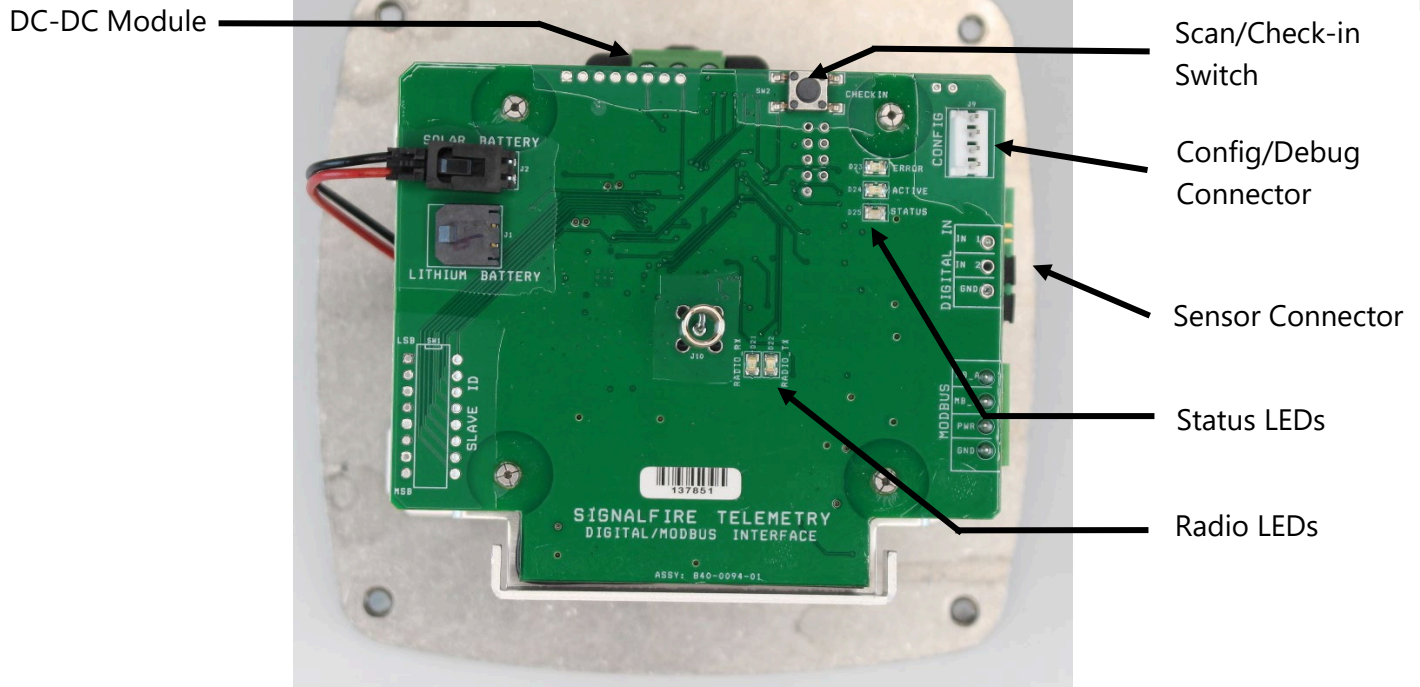**WARNING: The use of any parts not supplied by the manufacturer violates the safety rating of the equipment.**

**L'utilisation de toute composantes différentes du manufacturier élimine la sécurité intrinsèque du produit**

Device Label



SIGNALFIRE
— WIRELESS TELEMETRY —

Marlborough, MA USA
www.signal-fire.com
**Class I, Division 2**
**Groups A,B,C,D T4**

Conforms to UL STDs 121201 and 61010-1
Certified to CSA C22.2 Nos. 213 and 61010-1

c ETL us
LISTED
Intertek
4003827

**WARNING – EXPLOSION HAZARD**
Substitution of components may impair suitability for Class I, Division 2

AVERTISSEMENT - RISQUE D'EXPLOSION. Le remplacement de toutes composantes peut affecter la sécurité intrinsèque de l'appareil et son utilisation dans une zone classifié Classe I Division 2

S/N:  SRD001000

S/N BARCODE

Model: Sentinel-RTD-DC

| Input: | 9 – 36 VDC, 200mA |
| Output: | 2.0V Max |
| | 10mA Max |
| Ambient Temp: | –40°C to +85°C |

FCC ID: W8V-SENTINEL
IC:  8373A-SENTINEL

Install per manual (Installer par manuel): 960-0033-11

**WARNING – EXPLOSION HAZARD**
Do not open enclosure unless area is known to be nonhazardous

AVERTISSEMENT - RISQUE D'EXPLOSION. Ne pas ouvrir le boitier à moins que la zone n'est identifiée comme étant non-dangereuse

DC Converter



SIGNALFIRE
— WIRELESS TELEMETRY —

| NC | 3.3V OUT- |
| VIN- | NC |
| VIN+ | 3.3V OUT+ |

**9-36VDC**

## Connections and Components

DC-DC Module

Scan/Check-in Switch

Config/Debug Connector

Sensor Connector

Status LEDs

Radio LEDs

- 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.
- The Radio RX LED (red) blinks on each received radio packet.

Status LEDs
- The Active LED (green) will blink at boot up and will blink rapidly when the sensor is being powered and read.
- The ERROR LED (red) will blink to indicate an error condition.

Scan/Checkin Button
- If this button is pressed the Sentinel will take a reading from the RTD and send those values to the gateway.

# *Setup*

The nodes need to be set up for correct operation before being fielded. The configurable items include:
- Network selection
- Check-in period selection
- RTD mode enable

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

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

## 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.
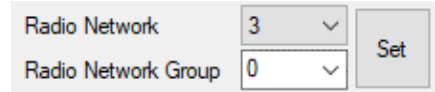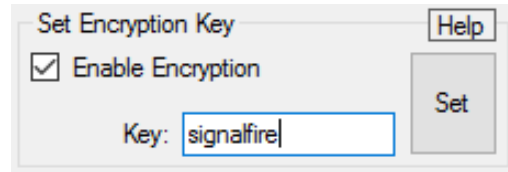
## Encryption

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 legacy Sentinel to use encryption, click the checkbox labeled **Enable Encryption** inside the **Set Corporate ID** box. All newer Sentinels come with this option enabled with "signalfire" as the default encryption key.
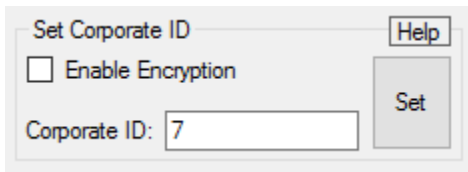
*Corporate ID*  *Encryption Enabled*

The box will then change into a **Set Encryption Key** box, and it will prompt instead for the encryption key you would like to use. Note that keys may not contain spaces or angle brackets. Enter it and then press **Set**. 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 Sentinel 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.

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.
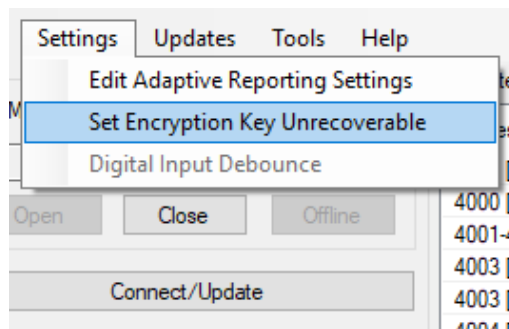
*Setting the encryption key to be unrecoverable.*

## System Check-In Period

This setting controls how often the node will read the Modbus device and forward the register data to the gateway.

Checkin Interval    10 seconds ▼    Set

## Configuration

Since the Sentinel RTD uses a standard Sentinel Modbus Node with the RTD interface card it is necessary to set the Sentinel type for RTD operation if it is the default Modbus mode. To do this, select **RTD** in the **Set Sentinel Type** option under the **Settings** pull down menu.
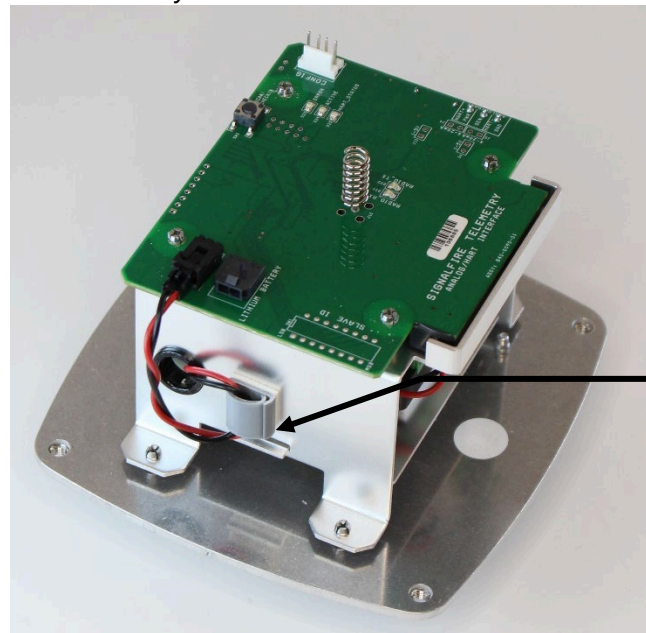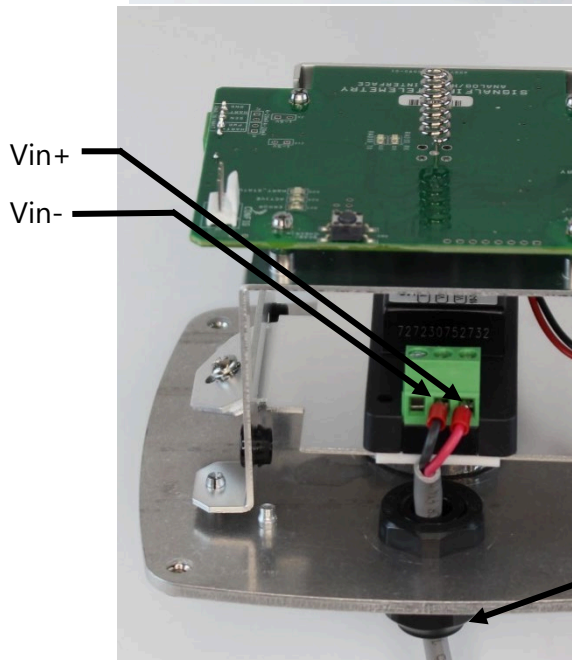
# *Sensor Connections*

## Wiring Requirements

Follow these guidelines when connecting sensors to the SignalFire node. See pictures for proper wire routing examples.

- Cables entering the enclosure must be run as pictured.
- DC power cable should be run through the cable gland and gland should be tightened.
- The DC-DC adapter wire must be routed through the cable hold-down clamp.
- Strip all wires so that there is minimal exposed un-insulated wire when inserted into the screw terminal.
- All field wiring must have a 18-16 AWG, with a minimum rating of 36VDC, 85°C.
- All wiring should be neat and orderly.



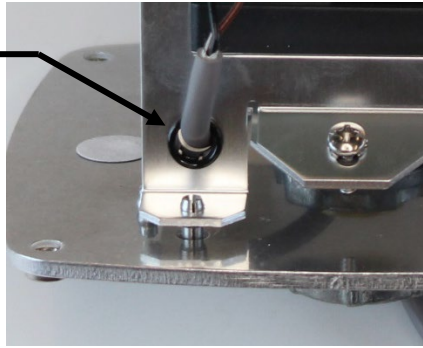DC-DC cable must run through clamp



Vin+
Vin-
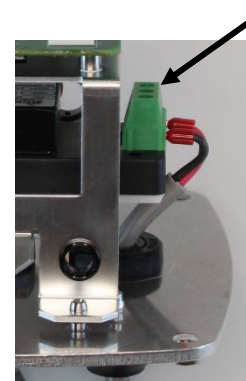
Tightening torque: max 0.4 N*m

Tighten Gland, Follow terminal markings on module

Sensor cable should
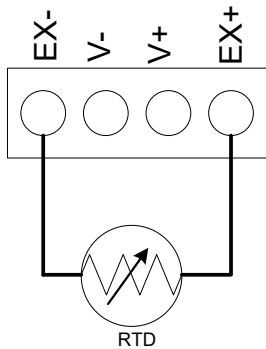be routed as shown



## RTD Connection

The RTD interface board has three jumpers, they must be configured for the type of RTD to be connected as follows:
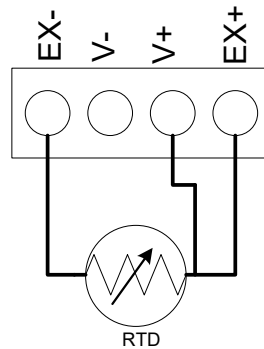2-WIRE:  Install Jumpers J2 & J3
3-WIRE:  Install Jumpers J1 & J2
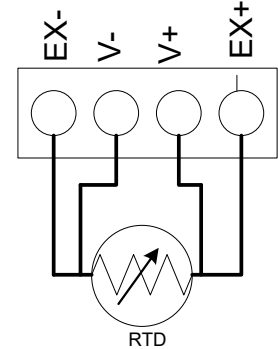4-Wire:  No Jumpers Installed

After configuring the jumpers for the RTD, connect the RTD wires to the interface board per the diagrams below.



2-Wire RTD Connection



3-Wire RTD Connection



4-Wire RTD Connection

Any error with the RTD or interface board will be shown in the Status register. See table on Page 10 for details.

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.

The following data is sent to the Gateway:

| Register Number | Register Address (offset) | Description |
|---|---|---|
| 41001 | 1000 | RTD Sensor Type (2=2/4wire, 3=3wire) |
| 41002 | 1001 | RTD Sensor Resistance at 0°C (Ω) (100, 1000, etc) |
| 41003 | 1002 | RTD Temperature (0.1 °C) |
| 41004 | 1003 | Fault – RTD Interface board not detected |
| 41005 | 1004 | Fault – RTD Low Threshold |
| 41006 | 1005 | Fault – RTD High Threshold |
| 41007 | 1006 | Fault – RTD Over/Under Voltage |
| 41008-41009 | 1007-1008 | RTD Temperature °C (32-bit float) |
| 41010 | 1009 | RTD Temperature (0.1 °F) |
| 41011-41012 | 1010-1011 | RTD Temperature °F (32-bit float) |
| 49987 | 9986 or 65523 | Status (0=no errors, 1=low power, 2=failed sensor read, 3=low power and failed sensor read) |
| 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 | Modbus ID readback |
| 49995 | 9994 or 65531 | Received signal strength of last packet from the Sentinel |
| 49996 | 9995 or 65532 | supply voltage of the Sentinel-RTD, in millivolts |
| 49997 | 9996 or 65533 | Minutes until this device will time out, unless new data is received |
| 49998 | 9997 or 65534 | Number of registers cached for this device |
| 49999 | 9998 or 65535 | Remote device type. 51 (0x33) for Sentinel RTD |

If any of the RTD system faults are detected all RTD register values will fail high. The 16bit integer registers will fail to 32768 and the float registers will fail to +infinity.

Note: The status registers are only available from the 49987-49999 (9986-9998) address range if the gateway is running firmware 7.52 or higher.

# Mounting and Care

The unit comes with a watertight ½" NPT conduit fitting on the bottom mounting plate. The Sentinel is then directly mounted to the sensor with a short section of conduit.
Tighten cover screws to 8 in-lbs. Do not use power tools. Anti-seize recommended.

## Direct Mount to Sensor with Short Conduit

This mounting method uses a short conduit run from the sensor and the unit is held in place by the conduit.
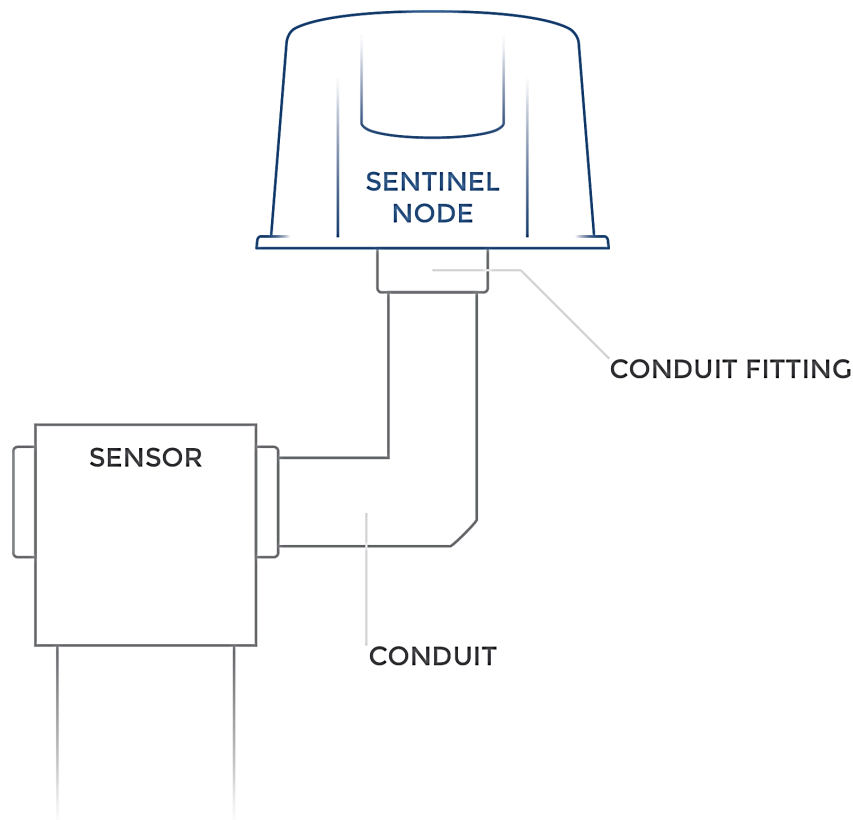


⚠️ **WARNING: The Sentinel must be mounted in a location free of high vibrations. Over time vibrations can damage the Sentinel, which could impair its safety ratings.  Do not mount directly to continuous vibrating equipment such as pumps or compressors.**

**ATTENTION: Le produit Sentinel doit être installé dans un endroit libre de hautes vibrations. Sans quoi avec le temps, des possibles dommages pourraient compromettre la sécurité intrinsèque du produit.  Les installations sur équipement en vibration constante (pompes, compresseurs) doit à tout prix être éviter.**

## 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 or antenna. Do not wipe with a dry cloth. Do not brush against the enclosure with clothing or gloves.**

**ATTENTION : Décharge électrostatique ! Il faut prendre soin d'éviter l'accumulation de charge électrostatique sur le boitier ou l'antenne du produit. Ne pas essuyer le produit avec un chiffon sec.  Ne pas frotter le boitier avec des vêtements ou des gants**

## Configuration / Debug

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

**ATTENTION : La connexion sur le port de déboggage doit être faite que dans un endroit classifier non-dangereux**

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
140 Locke Dr, Suite B
Marlborough, MA 01752
(978) 212-2868
support@signal-fire.com

To ensure environmental safety and compliance, please follow these disposal instructions for the product and its components:

## Electronic Components:
This product contains electronics that must be recycled through approved e-waste recycling programs. Electronics can contain harmful materials and should be prevented from entering landfills. Do not place electronics in regular trash.

## Metal Parts:
Any metal components can be separated and recycled through your local metal recycling facility.

## Packaging Materials:
Recycle or reuse packaging materials such as cardboard or plastics, following local recycling guidelines.

## For local disposal sites refer to:

- Call2Recycle (USA, Canada)
- Earth911 (USA, Canada)
- SERI (International)

In the USA or more information, visit:

- EPA's battery disposal guide
- EPA's electronics recycling page

By following these guidelines, you help reduce waste and support environmental sustainability.

*Revision History*

| Revision | Date | Changes/Updates |
|----------|------|-----------------|
| 1.4 | 5/1/23 | Initial release – forked from Sentinel-RTD manual |
| 1.5 | 11/1/2024 | Add disposal information |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

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.

Only the supplied coil antenna (Part number 810-0012-01) which is permanently soldered to the PCB may be used. This antenna has a maximum gain of 3dB.

**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.*