Radar Scout Manual



Specifications

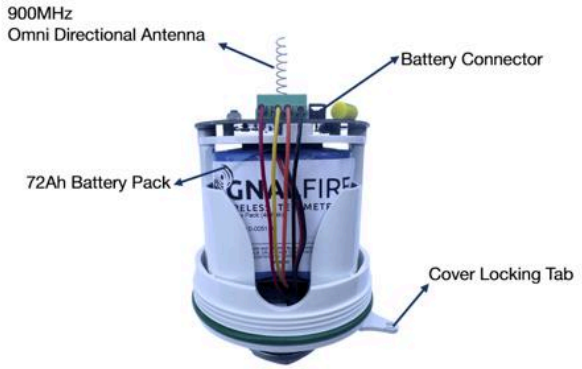
Overall Size	7.1” x 4.6” (19.55cm x 11.68cm)
Housing Material	IP67, UV-rated industrial polycarbonate
Process Connection	1½” male NPT; PEEK material
Power Source	Internal (4) D cell 72Ah Battery Pack. Field replaceable.
Temperature Rating	-40°C ≤ T_{amb} ≤ +85°C (-40°F to 185°F)
Radio Frequency	902-928MHz ISM Band, FHSS radio, internal antenna FCC ID: Pending IC: Pending
Radar Sensor	**Sensor Range:** 7 centimeters (2.8 inches) to 8 meters (26.2 feet) **Sensor Technology:** 60GHz Pulsed Coherent Radar **Dielectric Constant Range**: 10 – 100 **Measurement Accuracy:** ±7mm (±0.28 in) at 25°C (77°F) **Blocking Distance:** User Configurable; Minimum: 0cm, Maximum: 7cm (2.75”) **Resolution:** 2.5mm (0.10 in) **Beam Angle:** 12° **Reported Values:** Distance, level, percent full, radar echo strength, signal strength
Compliance & Hazardous Area Approvals	Class 1 Division 1, Temp Code T4, Groups C&D. - ***pending***
Estimated Battery Life	2 Years at 1-Minute Reporting/Sampling 5 Years at 5-Minute Reporting/Sampling
Radio Power	40mW, Receive Sensitivity: -109dB
Range	0.5 Miles (800 meters)

Data Integration	SignalFire Gateway Stick, PATRIoT Gateway, RANGER 900
Reporting Interval	Configurable; 5 seconds to 2 hours
Sampling Interval	Configurable; as fast as 5 seconds
Report on Exception	Configurable measurement threshold
Local Configuration	4-pin serial port; SignalFire part number "USB-4PIN" required Download SignalFire Toolkit for Configuration *Radar Scout can be configured remotely through a connected SignalFire gateway*

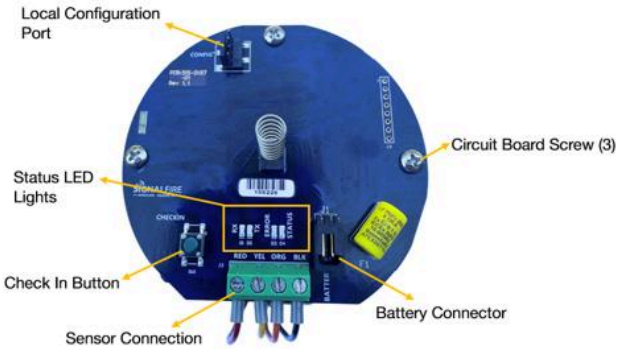
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Connections and Components



Radar Scout Exterior



Radar Scout Internal

Radio LEDs

- The Radio TX LED (green) blinks 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 Radar Scout sends a message to the Gateway.
- The ERROR LED (red) will blink to indicate an error condition.

Scan/Check-in Button

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

Operation

The SignalFire Radar Scout combines a non-contact pulsed coherent radar level sensor and wireless transmitter in one battery-powered device. Its integrated design simplifies installation by eliminating the connection between a separate level sensor and transmitter. The 60GHz radar sensor supports water, wastewater, chemical tank and river or lake level monitoring applications.

The Radar Scout transmits measurements over a 900MHz wireless link to a SignalFire gateway or RANGER 900. Gateway interfaces connect measurements to a supervisory system while the RANGER 900 or PATRIoT Gateway can forward measurements to SignalFire Cloud over a cellular or Ethernet connection

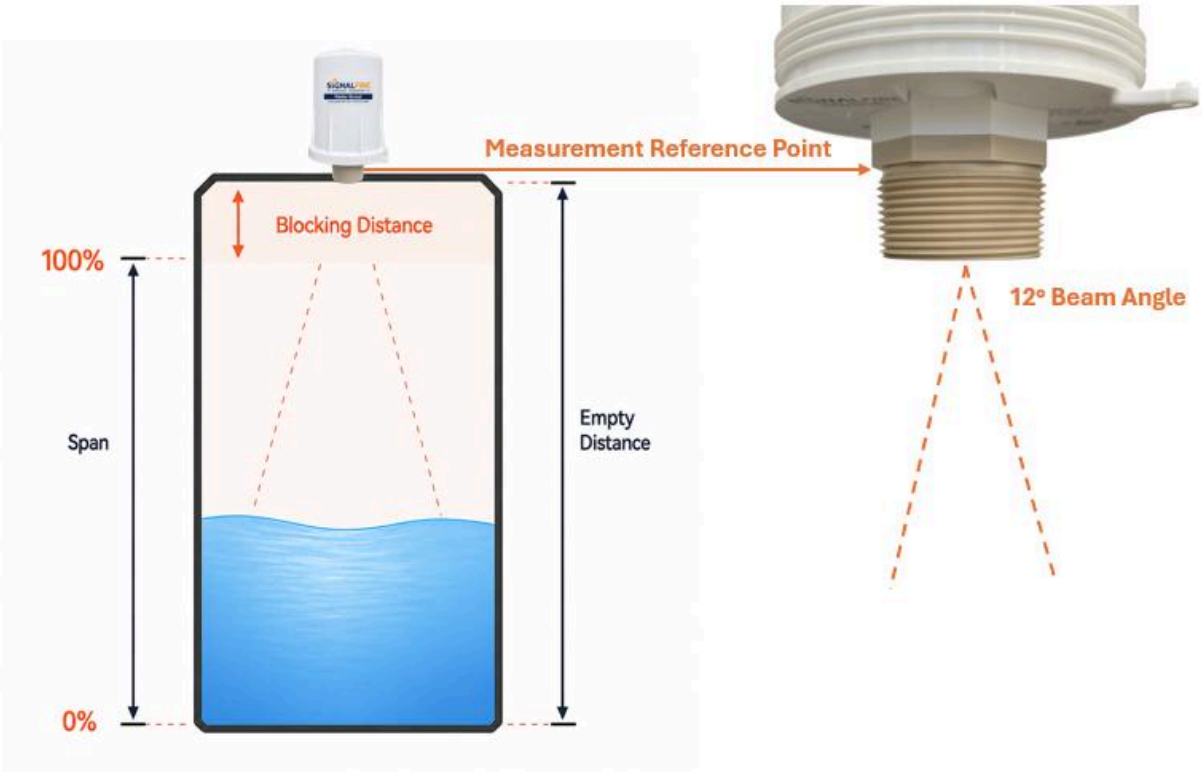
Digital Radar Sensor

The Radar Scout utilizes an integrated non-contact 60GHz pulsed coherent radar sensor designed for industrial level monitoring applications. Conceptualized with remote installations in mind, the sensor is extremely power efficient without sacrificing accuracy or repeatability.

The sensor operates as a fully digital device and communicates measurement data directly to the Radar Scout electronics with a digital interface for ensured stability

Sensor Benefits

- 60GHz frequency for improved penetration
- Pulsed coherent radar technology greatly improves reading stability
- Reports distance, level, percent full, and radar echo strength
- Configurable blocking distance
- Configurable span
- Configurable empty distance
- Narrow 12° beam angle



💡 Helpful Tip:

The "Measurement Reference Point" is where all distance settings originate and is physically located at the bottom of the hex fitting on the PEEK process connection

Setup

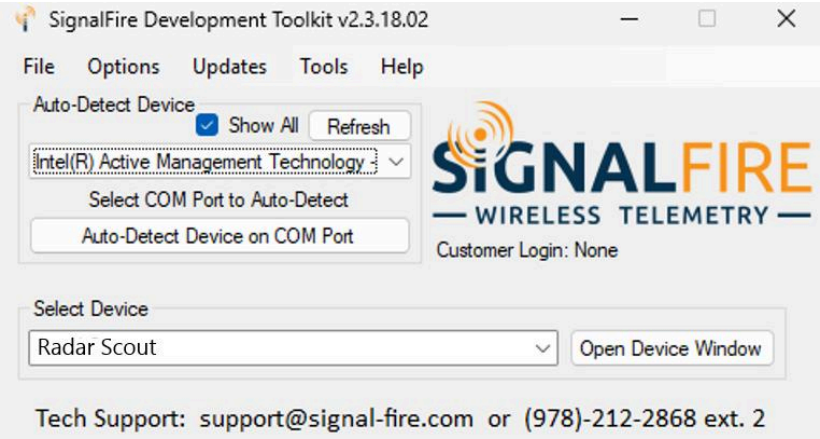
The Radar Scout needs to be set up for correct operation before being installed. The configurable items include:

- Network Settings
- Encryption
- Modbus ID

All settings are made using the SignalFire Toolkit PC application and a 4-pin serial cable

Using the SignalFire Toolkit

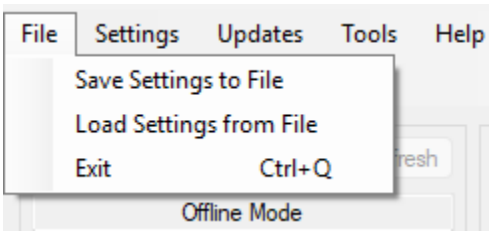
Download SignalFire Toolkit to configure the Radar Scout locally



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

Helpful Tip:

For repeat installations, SignalFire Toolkit configuration files can be saved to a local PC for simple and consistent configuration of additional Radar Scouts added to the network

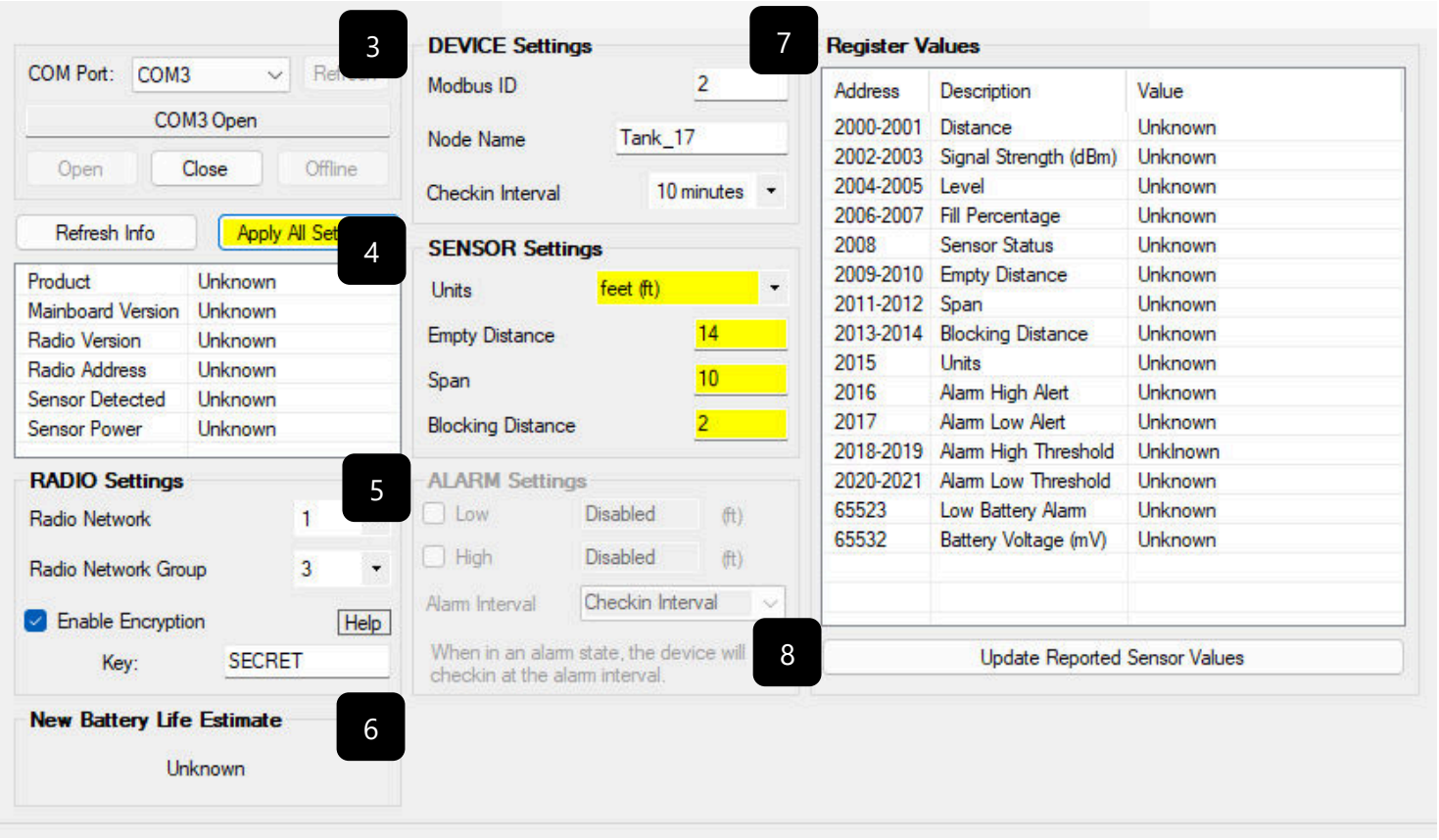


Save and Load Configuration Files

Radar Scout Configuration Settings

To get the Radar Scout connected to its target SignalFire Gateway, the "Radio Network", "Radio Network Group", and "Encryption Key" **must match** the gateway's configuration

To avoid any potential network connection issues, the **"Modbus ID" of the Radar Scout must be unique from every other node connected to the gateway**



1.	Select COM Port	2.	Radio Settings
3.	Device / Node Settings	4.	Sensor Settings
5.	Alarm Settings	6.	Battery Life Estimate
7.	Modbus Register Values	8.	Update Sensor Values

Helpful Tip:

Node Name: *Labeling the Radar Scout with a meaningful "Node Name" makes identifying the unit through the connected gateway much simpler*

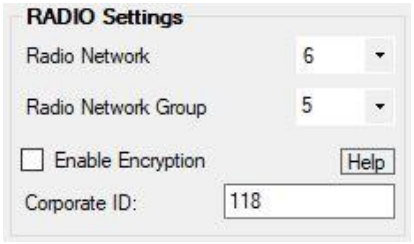
Network Settings

The network is set using the SignalFire Toolkit. The "Radio Network", "Radio Network Group", and corporate ID/encryption key **settings must match those of the gateway for proper connection**. 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.

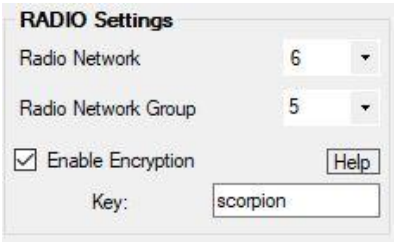
Encryption

To protect your over-the-air data and prevent tampering, SignalFire networks come with encryption.

To set up a Radar Scout to use encryption, click the checkbox labeled **Enable Encryption** inside the **Set Corporate ID** box. All new Radar Scout units come with this option enabled with "signalfire" as the default encryption key.



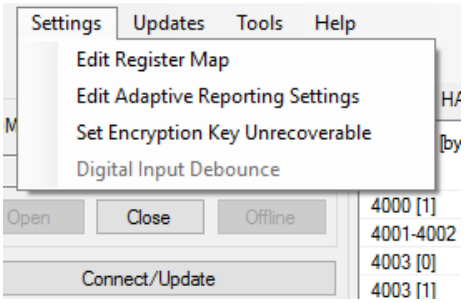
Corporate ID



Encryption Enabled

Note that 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. If you are adding a Radar 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.

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 the network. To enable this option, select **Set Encryption Key Unrecoverable** under the **Settings** menu.



Setting the encryption key to be unrecoverable.

Modbus ID

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

Sensor Settings

To ensure the Radar Scout is reporting the correct level measurement, there are (4) main sensor settings that must be adjusted accordingly.

- **Units:** The Radar Scout measures level in meters (m) by default, but units are selectable:
  - **Meters (m)**
  - **Centimeters (cm)**
  - **Millimeters (mm)**
  - **Feet (ft)**
- **Empty Distance:** The total distance from the "Measurement Reference Point" to the bottom of the tank when it is considered empty
- **Blocking Distance:** The distance from the "Measurement Reference Point" to the top of the process fluid when the tank is considered full. All measurements above this point are ignored
- **Span:** The total distance the user would like to measure; level measurement is "Empty Span" minus the "Blocking Distance"

Alarm Settings

The Radar Scout provides users the ability to configure a high level and a low level alarm which will be triggered based on the scaled value of your level reading. The Radar Scout defaults to reading level in meters (m), but if "feet (ft)" is chosen as the "Units", then the alarm threshold will be in feet.

Remote Modbus Register Mapping

The Radar Scout sends data to a SignalFire Telemetry 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 ID which the gateway will use to store its unique data.

Modbus Registers

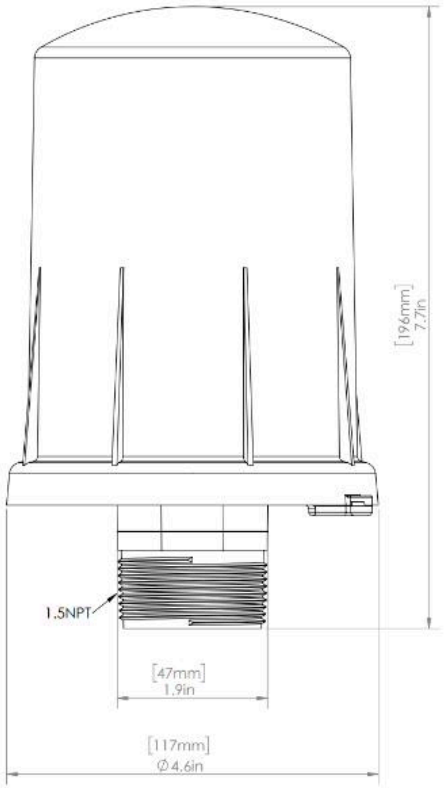
Every check-in period, the sensors are read and data is sent to the gateway. The gateway will save the data under the set Modbus ID in 16-bit registers. The register map for this system is below.

Register Map

Register Number	Register Address (Offset)	Description	Datatype
42001-42002	2000-20001	Distance	FLOAT
42003-42004	2002-2003	Signal Strength (dBm)	FLOAT
42005-42006	2004-2005	Level	FLOAT
42007	2006-2007	Fill Percentage	FLOAT
42008	2008	Sensor Status	INT16
42009	2009-2010	Empty Distance	FLOAT
42010	2011-2012	Span	FLOAT
42011	2013-2014	Blocking Distance	FLOAT
42012	2015	Units	UINT16
42013	2016	Alarm High Alert	INT16
42014	2017	Alarm Low Alert	INT16
42015	2018-2019	Alarm High Threshold	FLOAT
42016	2020-2021	Alarm Low Threshold	FLOAT
49987	65523	Low Battery Alarm. 1=Low battery	UINT16
49996	65532	Battery Voltage (mV)	UINT16

Mounting and Care

The Radar Scout should be mounted so there are no obstructions in measurement path and installed between 1/4 and 1/6 the tank's diameter from any wall to avoid false or interrupted readings



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

Internal Lithium Battery Replacement

Battery Packs can be changed without removing the Radar Scout from the process.

1. Turn the cover of the Radar Scout counterclockwise to remove
2. Unplug the battery from the PCB, by depressing the locking clip on the connector.
3. Remove the two screws holding the battery strap to the battery bracket
4. Remove/Replace the battery.
5. Connect the battery to the main PCB battery connector
6. Fasten the enclosure cover, use care to ensure that the wires are not pinched by the cover.

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.

Configuration / Debug

Debug and configuration information is available if a connection is made via the debug port on the main board. A SignalFire 4-pin serial cable (not included) must be used for this interface.

Debug and advanced configurations may be done using the SignalFire Toolkit PC application.

Disposal

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

Lithium Primary Battery:

This product contains lithium primary batteries, which must be removed before disposal. Lithium batteries must be recycled through specialized facilities due to their fire risk. Do not place batteries in regular trash.

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
1.0	11/10/26	Initial release

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.

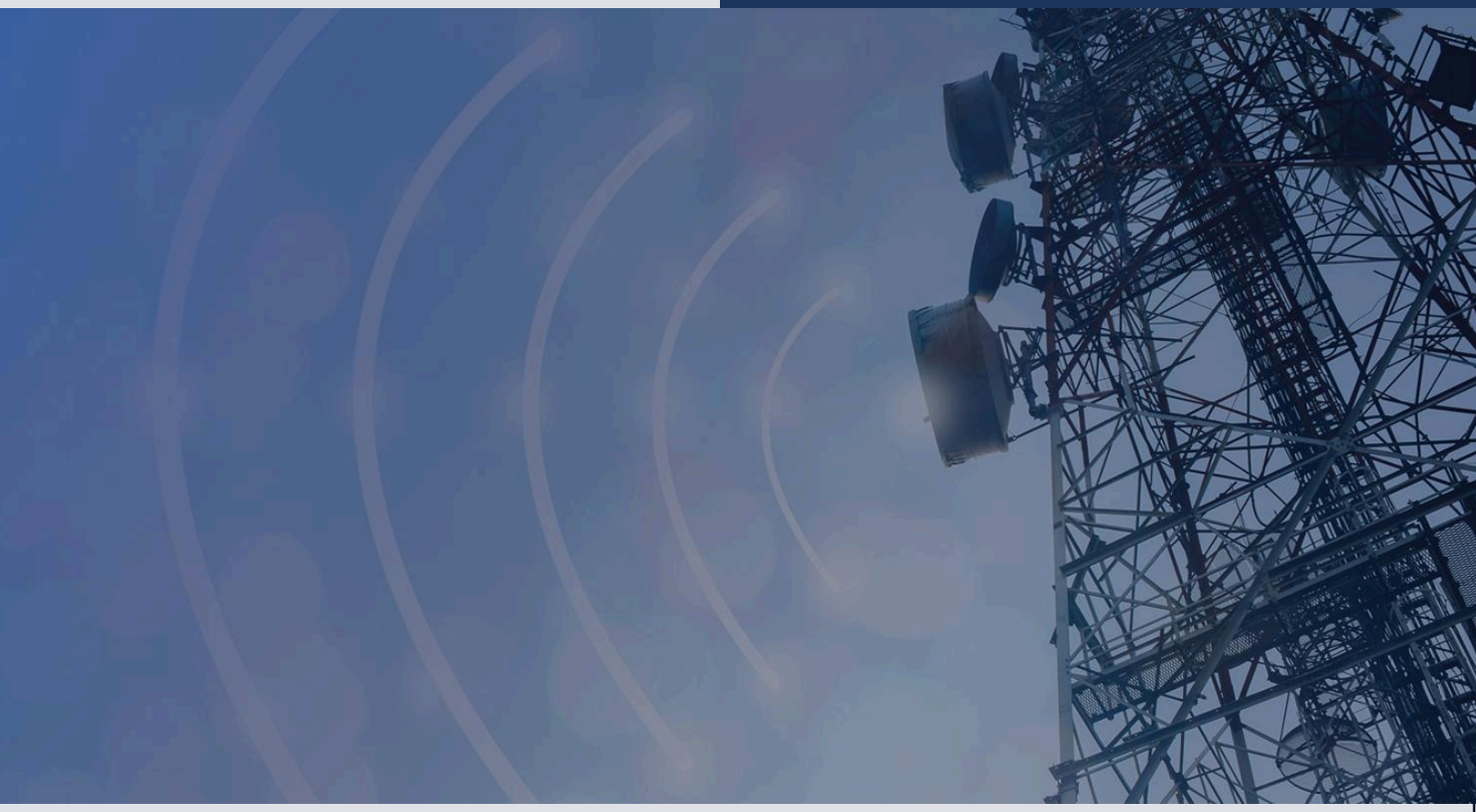
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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.

Technical Support And Contact Information

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WIRELESS TELEMETRY