Schneider Electric

Trio QR450
Quick Reference Guide
Half Duplex - Q Data Radio

1.0 Introduction
Welcome to the Trio™ Quick Reference Guide for the QR450 half duplex data radio. This guide provides step-by-step instructions, with simple explanations to get you up-and-running. Before proceeding, please ensure that you have read the product warning sheet for safety information. For further information, please refer to the Q Data Radio user manual.

1.1 Typical Radio Setup

QR450

AC Power

Omni-directional or YAGI Antenna   Lightning Arrestor   Power Supply (Mains to 13.8VDC nominal)

Laptop/PC running TView+ Diagnostics (eDiags) Connected to ETH1

Ethernet Device (RTU/PLC) Connected to ETH 2
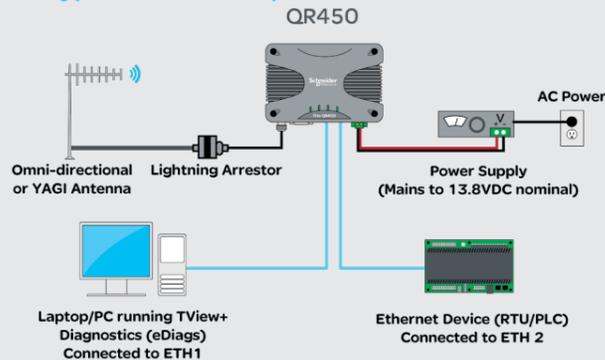
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2.0 Mounting Guidelines
Mount the radio in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. In high power or high temperature applications, provide sufficient passive or active ventilation. To help minimize moisture ingress it is suggested to mount the radio with the connectors facing downwards.

Din rail mounting kits are available (part no: TBUMDIN-KIT-TYPEA). For more information, refer to the user manual or the wireless accessories data sheet.

3.0 Physical Dimensions
Choose an enclosure that is suitable for the size of the radio. Dimensions: 115 x 34 x 164 mm (4.5 x 1.4 x 6.5 in.). The radio is rated for use in ambient environments from -40...70 °C (-40...158 °F).

4.0 Power Supply Requirements
Rated Operating Voltage: 10...30 Vdc
Nominal Operating Volage: 12 and 24 Vdc
Input Power (Rx typical): 5 Watts
Input Power (Tx typical): (See table below)

Tx Power (dBm)	Typical Input Power (Watts)
30	24
37	37
40	52

Typical receive/standby input power is 5 Watts. The input power will vary in transmit mode according to RF output power level.

The QR is supplied with a lock-in mating DC power connector (Schneider Electric Part Number TBUMPWR-PLUG-QR-A) which should be installed with the locking screws done up tightly (0.5 - 0.6 Nm / 4.42 - 5.31 ftin).

The radio is designed to limit damage if the voltage exceeds 30 Vdc or if reverse polarity is applied. The field-replaceable internal fuse has a 7 Amp rating. Fuse replacement instructions can be found in the Q Data Radio user manual. Fuses are available from Schneider Electric, part number TBUMPWR-FUSE-QR.

Before connecting any wiring, ensure that all components are earthed to a common ground point.

Connect and secure the Antenna, Ethernet and Serial connectors BEFORE applying power to the unit. Lastly, before inserting the power connector, re-check that the polarity and voltage are correct using a multimeter and check the power cable against the +/- label printed on the front panel of the radio.

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5.0 LED Indicators

Pwr/Tx LED	
No power, or ShutDown	
Power on	
Transmitter On	

Synch/RxSig LED	
No received signal	
Receiver in SYNC state	
RSSI over mute level and no sync	

COM1/2 LEDS	
No Activity	
RxD Data Output	
TxD Data Input	
RxD & TxD Data Active	

ETH1/2 LEDS	
Ethernet port inactive, no cable connected	
Ethernet port active @ 10Mbps	
Ethernet port active @ 100Mbps	

Alarm LED indications:
In some circumstances the radio will indicate an alarm state. This is shown by all LEDs illuminating red for 1 sec, followed by a pattern of green LEDs for 1 sec. The pattern of green LEDs indicate the type of alarm. Consult the user manual for further information. See the examples to the right for, high VSWR and supply voltage alarms.

High VSWR

Supply Voltage Alarm
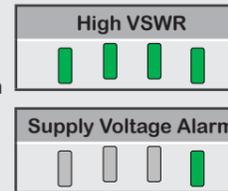
6.0 Connecting Antennas
The RF antenna system should be installed in accordance with the manufacture's' instructions and local regulatory requirements. The QR450 antenna connector is a TNC-type female connector. Always use good quality low-loss feeder cable, selected according to the length of the cable run. Also, use a flexible patch cable between the radio and lightning arrestor or flange mount of the radio cabinet/enclosure. Ensure that all external connections are waterproofed.

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7.0 Communication Ports

7.1 Ethernet Ports - ETH1/ETH2
The ETH ports are 10/100 Base-T compliant, using RJ-45 sockets. These sockets support both TIA/EIA-568-A & B wiring as they have Auto MDI/MDIX Auto Sensing. This means you can use both straight-through and cross-over type CAT-5 or better patch cables. All RJ45 connectors must utilize mating plugs that include an integral locking tab.

Note: If cable termination is required, refer to the Q Data radio user manual.

Note: Maximum differential voltage: 5 Vdc, 50 mA max through each differential pair.

Note: If 100-BaseT connection speed is required, CAT-6 Shielded cable should be used for installation to comply with ETSI EMC directives.

7.2 Serial Ports - COM1/COM2
The QR450 features a 9-pin miniature D-Shell (DE-9) Female connector that supports two individual serial port connections. Each serial port is associated with an embedded serial terminal server that provides Serial-to-TCP/UDP IP connectivity. Refer to the user manual for more information on the serial terminal servers.

Refer to the pin-out table for RS-232 pin allocations. For RS-485, please refer to the Q data radio user manual.

An RSSI output is available on pin 9 which is useful for antenna alignment. See following page for details.

RS-232 Mode		
Pin	Name	Input/Output
1	COM 1 DCD	Output
2	COM 1 RxD	Output
3	COM 1 TxD	Input
4	COM 2 TxD	Input
5	GND	-
6	COM 2 RxD	Output
7	COM 1 RTS	Input
8	COM 1 CTS	Output
9	RSSI	Output

Notes:
(1) Pin 1, 2, 6 & 8 are outputs rated at +/- 6 V, 65 mA max.
(2) Pin 3, 4 & 7 are inputs rated at +/- 15 V, 5 mA max.
(3) Pin 9 is an analog output pin (to indicate RSSI) with 5mA max output.
(4) Connecting wires should be #26 AWG (0.14 mm^2) or larger.

COM 1/2

WARNING: Do not disconnect while circuit is live unless area is known to be non-hazardous
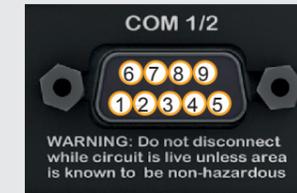
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8.0 Activating the Transmitter
Data sent to either of the radio's communication ports (Ethernet or Serial port) can cause the radio to activate its transmitter and send the data over the air. However, to test the transmitter with external test equipment (Tx power, VSWR or Frequency), or to test another radio's receiver, the Q data radio provides a tool to manually control the activation of the transmitter, which can be controlled via direct connection, or over the air.

Access to this tool is via the web user interface and browse to: Maintenance -> Transmit Test. This will display the transmit test tool page.

Transmitter State	Turn on
Transmit Carrier	Modulated ▼
Transmit Idle Time (s)	60
Power Level (dBm)	30
Frequency Trim (Hz)	0
	Save and apply

The transmitter can now be controlled via this page. To activate the transmitter, press the 'Turn ON' button. By default this will enable a Modulated Carrier for 60 seconds. During this time, the Tx LED should illuminate solid RED to indicate the transmitter is active.
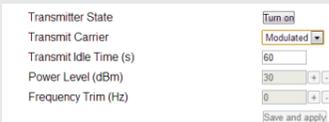
9.0 Antenna Azimuth Alignment for Rx Signal
When using a directional antenna, azimuth alignment may be required, to achieve optimum received signal. Receiver signal strength can be read from TVIEW+™ Diagnostics, which can provide the RSSI value after a poll/response, or, by measuring the DC voltage between pin 9 (RSSI) and pin 5 (GND) of the serial COM port which can output a live (2 second peak hold), RSSI to analog DC voltage, where, 2.5 Vdc represents approx. -90 dBm. Indicated signal strength is equal to ~20 dB/volt. As the RSSI-to-analog DC voltage output indicates 'live' receiver signal strength, the radio must be listening to a permanently active transmitter, otherwise, only low levels of background noise will be indicated. (see 8.0 for instructions on activating the transmitter).

RSSI to Analog DC Voltage Characteristics - Q Data Radios
Chart is approximate only.

DC Voltage output (Vdc)

Received Signal Level (dBm)

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10.0 Factory Default
The factory default IP address of the Q data radios is **192.168.2.15**. If you want to perform configuration changes on your Q data radio and do not know the IP address, you will need to activate a factory reset.

A factory reset will cause all configuration parameters to be returned to their factory default values. A factory reset can be initiated by applying DC power to the radio (allowing up to 3 minutes for the unit to fully boot up, indicated by a solid GREEN Power LED), pressing and holding the factory default switch, using a paper clip or similar object, for 6 seconds or until all four LEDs begin flashing GREEN, indicating the radio will return to the factory default settings. Wait for up to 4 minutes for the factory default reset process to complete.

ETH 1   ETH 2   USB   12-24 V   → Factory Default Switch
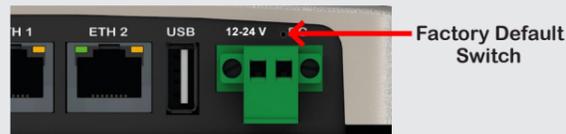
11.0 Connecting to the Web User Interface
The QR450 contains an embedded web server which provides access to the Web User Interface (WUI). The WUI can be used to perform configuration changes on the radio. To change a configuration parameter in a Q data radio, connect your PC to one of the Ethernet ports (ETH 1 or ETH 2) and direct your browser to the IP address of the Q data radio. It is strongly recommended that you follow these guidelines for successful connection to the radio:

(1) Ensure that the Q data radio is powered up and has fully booted. This is indicated by a solid GREEN power LED and will take approximately 2 minutes from the time power is applied to the Q data radio. Note that the radio may be in a fully booted state, but indicating a user alarm. For example, if the radio's antenna port is incorrectly terminated, the radio will indicate a high VSWR alarm. Regardless of this user alarm, the radio can still be browsed to.

(2) Disconnect your PC from any other Internet/LAN networks. Failure to do so may create a conflict in IP addresses or the Q data radio IP might not fall within the subnet mask specified by your network.

(3) Connect your PC's Ethernet port to one of the radio's Ethernet ports (ETH 1 or ETH 2) using an RJ-45 patch cable. Crossover cables will also work (Ethernet ports support MDI/MDIX). An active connection is indicated on the radio by solid green and amber illumination on the LEDs which are fixed to the physical Ethernet port you are connected to.

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(4) Ensure that your PC LAN port is configured for a suitable IP address. If you are using Windows 7, this can be done by configuring the LAN settings via the Control Panel. Navigate to your Windows "Start" button and open Control Panel -> Network and Sharing Center -> Change adapter setting -> Double click on the LAN port you are using -> Properties -> Double click 'TCP/IPv4'. You should see the window shown to the right.
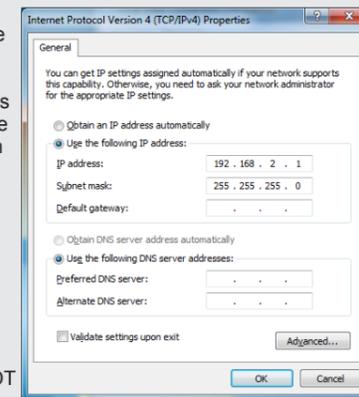
Ensure that "Obtain IP Address Automatically" is NOT selected. It is recommended that you manually specify a compatible IP Address. In this example, a factory default radio is being configured. The IP address of that radio is 192.168.2.15 and a compatible IP address for the PC would be 192.168.2.1. Click OK to accept the changes.

Note: Check with your Network Administrator before allocating IP addresses as each LAN/WAN network is different.

(5) Now open your web browser and enter the IP address of the Q data radio into the URL. In this case, we type "192.168.2.15", the browser should now display the home page of your radio. (Shown below).

Note: You may need to disable or modify a web proxy or firewall (if in use) to help ensure that the security rules allow access to the Q data radio's IP address.

Internet Protocol Version 4 (TCP/IPv4) Properties

IP address: 192 . 168 . 2 . 1
Subnet mask: 255 . 255 . 255 . 0

Trio QR450

Unit Information

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Resolving Ethernet Configuration Issues
Here are some basic tips to help you resolve any Ethernet configuration issues that you may encounter. The Windows operating system (and others) comes complete with many useful tools. First, you need to open a command window. This can be done by clicking on "Start" then "Run" and entering "CMD" and clicking OK.
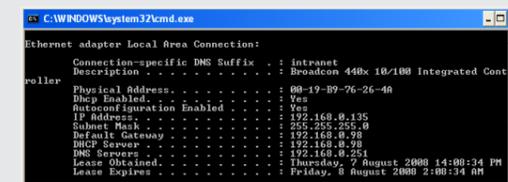
Obtaining IP information about your PC
If you need to find out more information about your computer's Ethernet IP configuration, network gateways and DNS servers, you can use a tool called "IPConfig". Simply type "IPconfig /all" into your command window.

Checking IP connectivity
The simplest way to check IP connectivity to a device is using the "Ping" utility. Type "ping x.x.x.x" where x.x.x.x is the complete IP address of the destination device you want to check. Ping will either respond with latency results (as shown) or display "timed out" if no connection was possible.
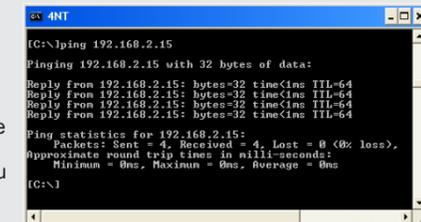
Repeated connections to multiple devices with same IP address
This is a common issue experienced when attempting to configure multiple radios with the same IP address (such as factory default radios) and is due to invalid MAC table entries. If you change your Ethernet connection between two devices with the same IP address quickly, you may need to reset the MAC look up table in your PC. You can do this by typing "arp -d 192.168.2.15" in the command window.

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Schneider Electric

Trio QR450
Quick Start Guide

Q Data Radios

Step-by-Step Bench Test Setup

Introduction

This document describes the ten key steps required for:

- Connecting and configuring a pair of QR450 half duplex radios.
- Performing basic diagnostics and health checks
- Connecting user equipment such as Host Software and/or RTUs

For more information consult the Q Data Radio User Manual.

Typical Bench Test Setup

Laptop/PC Connected to LAN1 — 80dB Attenuation — +10 to +30V DC — +10 to +30V DC — **Laptop/PC/ Ethernet Device Connected to LAN1**
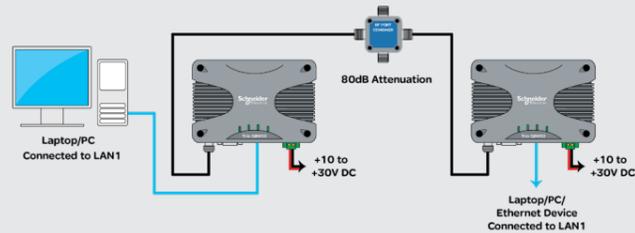
Step 1 - RF and DC power connection

RF Connection

Bench testing is typically performed over short distances, therefore RF signals must be significantly attenuated. Using dummy loads or whip antennas is not recommended.

A suitable method for attenuation of RF signals is to use a 4-Port RF Attenuator (Part Number TBUM4PORTATTEN). An attenuator accurately reduces RF signal level, simulating a real world, long distance RF link. Other types of RF attenuators can be used providing the total attenuation is approximately 90 dB. Power input limit ratings must be checked (depending on configured Tx power).

If the TX power of each radio is set to 20 dBm (100 mW) then, low power, low cost attenuators can be used.

DC Power Connection

Ensure that each radio is wired using the correct polarity and that the power supply is regulated and has adequate current-delivering capacity.

Step 2 - Power Up Radios

For power supply requirements, refer to section 4.0

Apply DC power to the radios. The radio will begin a boot up process. This process can take up to 2 minutes (during this time frame, the 'Pwr' LED will periodically flash GREEN, indicating that the boot up process is still in progress).

Once the boot up process has completed, the 'Pwr' LED should be solid GREEN. If there is no LED indication, re-check the DC polarity and ensure that the input power is between 10...30 Vdc.

Note: If these checks are not correct you may need to inspect the internal fuse. Consult the user manual for further information.

Step 3 - Setup for Radio Configuration

IP Address and Factory Default

The default IP address of the radio is **192.168.2.15**. To configure the radio, you must know the IP address. If you are uncertain of the current IP address programmed into the radio you will need to reset the radio configuration to factory default.

A factory reset can be initiated by applying DC power to the radio (allowing up to 3 minutes for the unit to fully boot up, indicated by a solid GREEN Power LED), pressing and holding the factory default switch, using a paper clip or similar object, for 6 seconds or until all four LEDs begin flashing GREEN, indicating the radio will return to the factory default settings. The LEDS will stop when the factory default reset process is complete.

Connection to Embedded Web User Interface (WUI) - HTTP

Connect your PC Ethernet port to one of the Ethernet ports (ETH1 or ETH2). To verify you can communicate with the QR450 you should first ping the radio.

Open up a command window on your PC by going to the "Start" -> Run and typing "CMD" then OK. Then type "ping 192.168.2.15" which is the default address of the radio. The radio should respond to the ping as shown below. If this is not the case, check you network settings as described within the Quick Reference Guide - Section 11.0.


```
[C:\]ping 192.168.2.15

Pinging 192.168.2.15 with 32 bytes of data:

Reply from 192.168.2.15: bytes=32 time<1ms TTL=64
Reply from 192.168.2.15: bytes=32 time<1ms TTL=64
Reply from 192.168.2.15: bytes=32 time<1ms TTL=64
Reply from 192.168.2.15: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.2.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

[C:\]
```

Q Data Radios can also be configured via a Text User Interface (TUI). Console protocols such as Telnet, SSH or a serial connection may be used. For further details on making configuration changes via the TUI, refer to the user manual.

Step 4 - Start Web Browser on your PC

Start your web browser and enter the IP address of the radio into the URL. In this case, type "192.168.2.15", press the <enter> key and the QR450 home page should be displayed in the browser.

Browse to the "Wizards" section of the WUI by clicking: -> Setup -> Wizards.

Step 5 - Activate Entry Point - PTP Wizard

You will now see a variety of wizards available for selection.

Within the 'Different Tx/Rx Frequencies' section, find:

- Half Duplex - Point to Point.
- Then select the 'Half Duplex Entry Point' button

The wizard will now prompt for important configuration items. For each configuration item, help text is provided on the HTML programmer interface. If you are manually specifying IP addresses, record them for future reference. You will need to know the IP address of each radio in future steps.

At the bottom of the wizard page, the pre-configured options are shown.

After user-specific configuration parameters are complete, activate the configuration by clicking on the "Activate Configuration" button in the top right corner of the page.

Step 6 - Activate Remote - PTP Wizard

Repeat steps (3) to (5) for the Remote radio. When at Step 5, select the 'Half Duplex Remote' button and follow the same configuration procedure.

Step 7 - Verify Modem Operation

The radio configuration & RF link can now be verified for correct operation. First, check that the remote radio can correctly decode a transmitted signal. This is done by energizing the transmitter (modulated carrier) of the entry point radio. Refer to the instruction about this in section 8.0 of the Quick Reference Guide.

With the transmitter energized, inspect the LED status on each radio. The entry point radio should have a solid RED 'Pwr/Tx' LED. The remote radio should display a solid GREEN 'Sync/RxSig' LED. If this LED is not SOLID green it may indicate incorrect configuration or inadequate signal strength and the setup should be re-checked. Repeat this test with the Remote radio transmitting.

Step 8 - Packet Error Testing

This tool provides a useful way to test a radio communication link by transmitting data packets between two units in a look-back mode.

You can find this tool in the "Diagnostics" tab, then click on the "Packet Transmission Test" sub-menu.

Enter the IP address of the target radio that you want to ping in the "Destination IP Address" field. Ensure that the "Number of Packets" is set to a reasonable sample size (i.e. x100). Now click on the "Start Packet Test" button. The radio will indicate the packet test has started and is currently running and both units will have flashing Tx LEDs indicating that data is being transmitted.

This test can be done from any radio to any radio in the same network.

When the test is complete, a message stating "Packet transmission test completed" will be shown and the test results summarized in the "Test Results" section. The test results show TX & RX Packets, Lost Packets and the Packet Error Rate.
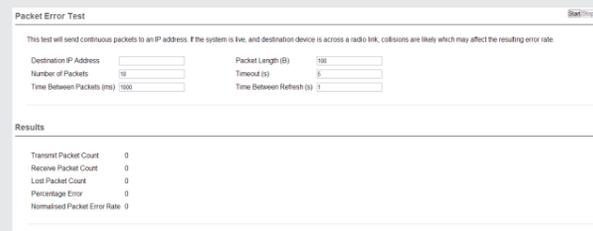
Step 9 - Embedded Diagnostics Testing
9.1 Review Diagnostics

Connect your web browser to the Entry Point radio using the IP address recorded in Step 5. Once loaded, click on the Monitoring tab, then select the Alarms and Events sub-menu. This will display the Alarms summary page. Review the diagnostics parameters checking for abnormal items such as high VSWR (high TX reverse power) and lower than expected radio RSSI (Received Signal Strength).

Follow this step again for the Remote radio.

Step 10 - Commissioning Record

After a packet transmission test has been performed, a Commissioning Record can be prepared. This facility is activated by clicking on the "Commissioning Record" button.

It is recommended that the radio is configured to obtain the current date / time from an NTP server, otherwise the date / time shown may not be correct.

The user can enter an appropriate Unit Name and Location for reference purposes. Additionally, a comment may be added noting the type of antenna in use. Once this information has been added, the web page can be printed (using the print facility in your web browser). It may be useful to print the commissioning record to PDF for future reference.

This now completes the requirements for setting up a half duplex, Point-to-Point Q Data Radio Link. The radios are now ready for application testing. The application can be connected to either ETH1 or ETH2 or both. For more information on testing, consult the Q Data Radio User Manual.

Contact Details

Technical Support: The Americas, Europe, Middle East, Asia

Available Monday to Friday 8:00am - 6:30pm Eastern Time
Toll free within North America: 1-888-226-6876
Direct Worldwide: +1-613-591-1943
Email: SupportTRSS@se.com

Technical Support: Australia/New Zealand (Pacific)

Available Monday to Friday 8:00am - 5:00pm Australian Eastern Standard Time
Inside Australia: 13 73 28 (13 SEAU)
Inside New Zealand: 0800 652 999
Email: techsupport.pz@se.com

Manufactured by
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415 Legget Drive, Suite 101,
Kanata, Ontario, K2K 3R1, Canada.
Printed in USA   Issue : 2020-11-05

⚠️ **Important Notices for Class I, Division 2 Groups A, B, C & D Hazardous Locations**

Applies to models TBURQR4xH-xxxxxxxx(CSA Marked)

This product is suitable for use in Class I, Division 2, Groups A, B, C & D hazardous locations or non hazardous locations only.

The transceiver has been recognized for use in these hazardous locations subject to the following conditions of approval:

1. This device is OPEN type equipment that must be used within a suitable end-use system enclosure, the interior of which is accessible only through the use of a tool. The suitability of the enclosure is subject to investigation by the local Authority Having Jurisdiction at the time of installation.

2. Wiring to or from this device, which enters or leaves the system enclosure, must utilize wiring methods suitable for Class I, Division 2 Hazardous Locations, as appropriate for the installation.

3. Installation, operation and maintenance of the radio modem should be in accordance with the radio modem's user manual.

4. A power connector with locking screws as supplied by Schneider Electric MUST be used.

Applied standards: CAN/CSA-C22.2 No. 0-10 (R2015), CAN/CSA-C22.2 No. 142-M1987 (R2014), CAN/CSA-C22.2 No. 213-2016, UL508:2013, ANSI/ISA - 12.12.01:2016, FM 3600:2011, FM 3611:2004.

⚠ WARNING

HAZARD OF EXPLOSION

- Do not connect or disconnect this equipment unless power has been removed or the area is known to be non-hazardous.
- Products with Part number TBURQR4LH-E0AE1L00 must not be used in Hazardous locations when operated between 450 and 453 MHz
- Tampering or substitution of components may adversely affect the safe use of the radio modem in hazardous locations and may void the approval.
- A power connector with locking screws as supplied by Schneider Electric MUST be used.

Failure to follow these instructions can result in death or serious injury, and equipment damage.