

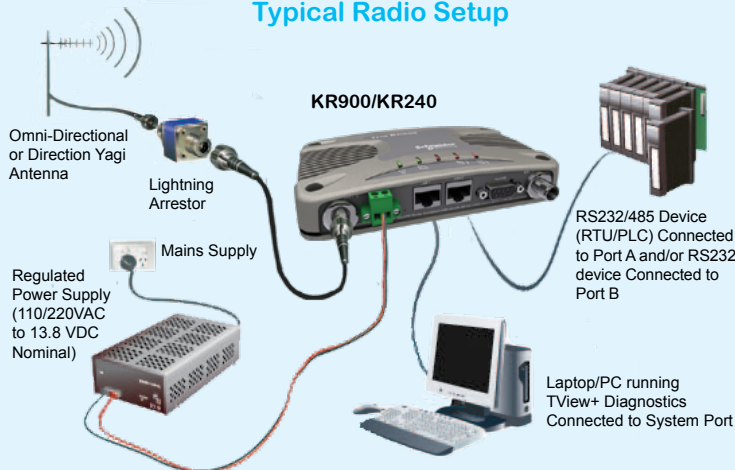
# Trio K-Series Quick Reference Guide

## KR900 & KR240 Data Radios

### Introduction

Welcome to the Quick Reference Guide AND Quick Start Guide for the Trio™ K-Series Data Radio. For a general overview of the K-Series operation, consult this Quick Reference Guide. Before proceeding, please ensure you have read the product warning sheet for safety information. For a step-by-step instruction on setting up a Point to Point radio link, turn this page over and consult the Quick Start Guide. For further information, please refer to the K-Series User Manual.

### Typical Radio Setup



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### Mounting and Environmental Considerations

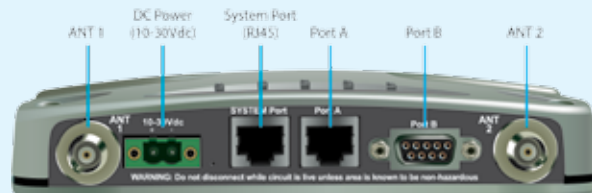
The radio should be mounted in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. In high power or high temperature applications, please allow sufficient passive or active ventilation. To best avoid moisture ingress mount the radio with the connectors facing downwards.

### Connecting Antennas and RF Feeders

The RF antenna system should be installed in accordance with the manufacturers notes. Antenna gain must be considered when setting Transmit Power. Refer to Compliance notices at the end of this document.

The RF connectors are TNC Type female connectors. Always use good quality low loss feeder cable, selected according to the length of the cable run. Ensure all external connections are waterproofed using amalgamating tape.

Preset directional antennas in the required direction using a compass, GPS, or visual alignment and ensure correct polarisation (vertical or horizontal). Note: Use ANT1 for Point to Point systems.



### Power Supply Requirements

Tx: Nominal 13.8 V @ 500 mA (Max 1A)  
Rx: Nominal 13.8V @ 120 mA  
Safe Operating Voltage 10- 30 V (24V @ 300 mA)

### Power Supply Protection and Precautions

The K-Series radio modem will operate from a 10 to 30 volt (filtered) DC supply. The radio is designed to self protect from permanent damage if the voltage exceeds 30V dc or if reverse polarity is applied. The replaceable internal fuse has a rating 3 Amp. Only use lead free solder and soldering equipment to replace the fuse. Fuse: Trio Part No. SM%FUSSQ3A

The current requirement is typically 200mA @ 13.8V in receive mode, and will vary in transmit mode according to RF output power level.

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Before connecting any wiring, ensure all components are earthed to a common ground point (please pay particular attention to 24V PLC power systems where converters are used).

Connect the antenna and RS 232 plugs BEFORE applying power to the unit. Lastly, before inserting the power plug, please re-check that the polarity and voltage on the DC power plug is correct using a multimeter.

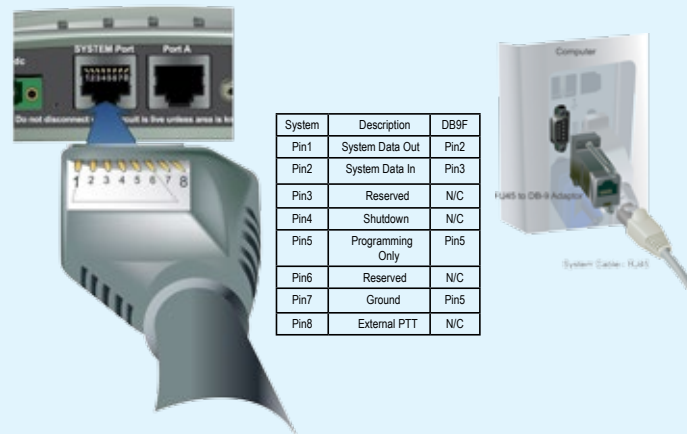
### Communications Ports

System Port - RJ45

The System Port is used for Programming / Configuration of the radio and can be used for Remote Diagnostics connections .

To access these functions use the Trio System Cable assembly TVIEW+™ E&K Cable. (RJ45 Cable and RJ45 to DB9 Adaptor)

All RJ45 connectors must utilize mating plugs that include an integral locking tab. You can make your own TVIEW+ E&K Cable using the pinouts shown below.



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### Communications Ports

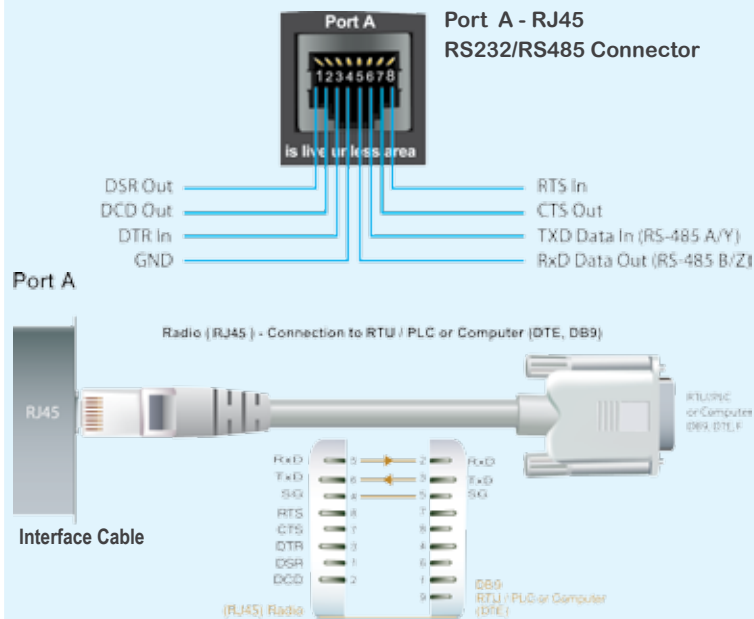
Port A - RJ45

User port A is configurable for RS-232 and RS-485 operation with no handshaking, or hardware flow control using RTS & CTS. RS-485 Operation is also possible but requires internal jumper links to be changed - consult the K-Series User Manual for more information on RS-485.

In most systems flow control is not required, in which case only 3 wires need to be connected between the radio and the application device.

3 Wire Connection:

- Pin 5 (Rx/D) - data output from the radio modem,
- Pin 6 (Tx/D) - data input to the radio modem,
- Pin 4 (SG) - signal ground.



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### Communications Ports

Port B - RS232

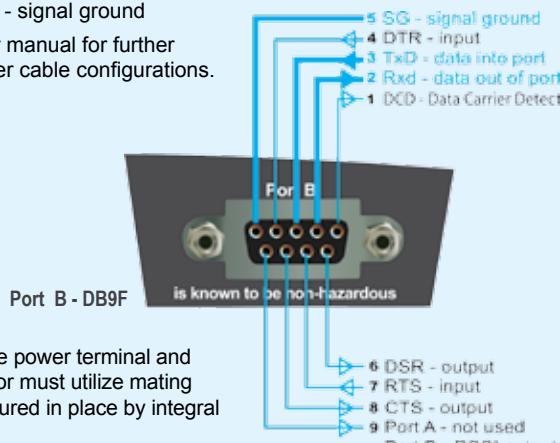
User port B is wired as a RS232 DCE, configurable for no handshaking (3-wire interface) , or hardware flow control using RTS, CTS.

In most systems flow control is not required, in which case only 3 wires need to be connected between the radio and the application device.

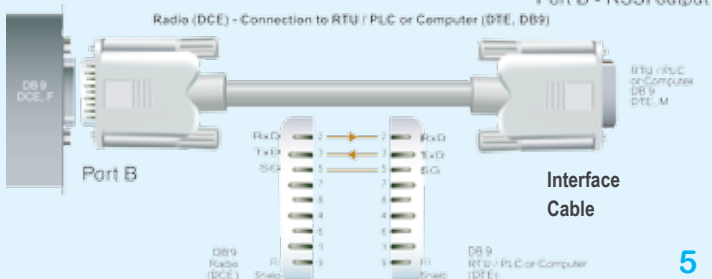
3 Wire Connection:

- Pin 2 (Rx/D) - data output from the radio modem
- Pin 3 (Tx/D) - data input to the radio modem
- Pin 5 (SG) - signal ground

Refer to User manual for further details of other cable configurations.



Connections to the power terminal and DB9 port connector must utilize mating plugs that are secured in place by integral screws.



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### TVIEW+ Management Suite

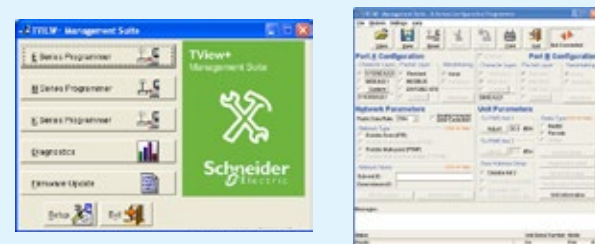
Radio Configuration

TVIEW+ offers a number of features including: Configuration (Local, or Remote - over-the-air), Remote Diagnostics Facilities and Firmware Upgrades.

Example: Local configuration session -

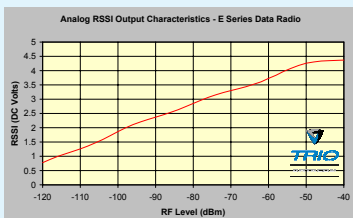
- 1/ Attach the programming cable from a PC RS232 Port to the System Port
- 2/ Launch TVIEW+ & Select "K-Series Programmer"
- 3/ Select Basic Mode or Advanced Mode (Some items not available in Basic)
- 4/ Click on the "Read" icon
- 5/ Change the configuration as required
- 6/ Click on "Write" to write the parameters back to the radio

Refer to K-Series User Manual for detailed operation of advanced features.



### Optimising the Antenna for Rx Signal

When using a directional antenna, it will be necessary to align the antenna for the best received signal. This can be done using TVIEW+ Diagnostics or by measuring the RSSI output on Pin 9 of Port B which indicates signal strength. This voltage can be converted to dBm using the chart below.



### LED Indicators



DC Power

If all the LEDs are off, no DC power is reaching the radio modem or the internal fuse is open. Successful power-up is indicated by the Pwr/Tx LED showing a continuous GREEN state for Remotes or an alternating Red/Green for Masters.

When the transmitter is active the Pwr/Tx LED is in a RED state.

Received Signal Indicator

A regular flashing GREEN LED indicates that the modem is synchronised to its Master. The GREEN LED will also flash when the modem is receiving data.

A regular flashing RED LED indicates the REMOTE is not synchronised to a MASTER or BRIDGE. Check the antenna, all RF connections, and the radio configuration as the Subnet ID may not match the Master or their may be insufficient RX signal or too much interference.

Port A and Port B Data Flow

The Rx/D/TxD LEDs indicate data flow into and out of the two user ports. Data being received at the port for transmission is indicated by a RED flash, and data being received over the air and then sent from the port is shown as a GREEN flash.

Error LED Indications

In some circumstances the radio will indicate an error state. This is shown as all LEDs flashing RED for 500ms and then a pattern of green LEDs for 500ms. The pattern of green LEDs indicate the type of error:

Pwr/Tx	Sync/NoRx	Port A	Port B	Error Type
Green	Off	Green	Off	High VSWR - Check antenna and RF connections
Green	Green	Green	Off	High Temperature - Cool the radio
Green	Green	Green	Green	External Voltage too high or too low - Out of spec



### Compliance Notices

#### FCC Part 15 Notice

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.

#### FCC Approved Antennas

This device can only be used with Antennas listed in the Appendix of the K-Series User Manual. Please Contact Trio Datacom if you need more information or would like to order an antenna.

#### RF Exposure

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 23 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

#### MAXIMUM EIRP

FCC Regulations allow up to 36 dBm effective isotropic radiated power (EIRP). Therefore, the sum of the transmitted power (in dBm), the cabling loss and the antenna gain (in dBi) cannot exceed 36 dBm.

#### AUSTRALIAN COMPLIANCE NOTICE: MAXIMUM EIRP

ACMA Regulations allow up to 30 dBm (1 Watt) of effective isotropic radiated power (EIRP) in the 915MHz license free band and 36 dBm (4 Watts) of EIRP in the 2.4GHz band. Therefore, the sum of the transmitted power (in dBm), the cabling loss and the antenna gain cannot exceed the above stated EIRP limits.

#### ETSI EN 300 328 v1.8.1 COMPLIANCE NOTICE for 2.4GHz installations in Europe:

In order to meet the directions of ETSI EN 300 328 v1.8.1 firmware versions 2.6.3 or earlier, EIRP must be limited to 10mW (10dBm). Later firmware versions can operate up to 500mW (27dBm) EIRP.

### 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@schneider-electric.com

Technical Support: Australia  
Inside Australia: 1300 369 233  
Email: au.help@schneider-electric.com

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# Trio K-Series Quick Start Guide

## KR900 & KR240 Data Radios

### Step-by-Step Point to Point Setup

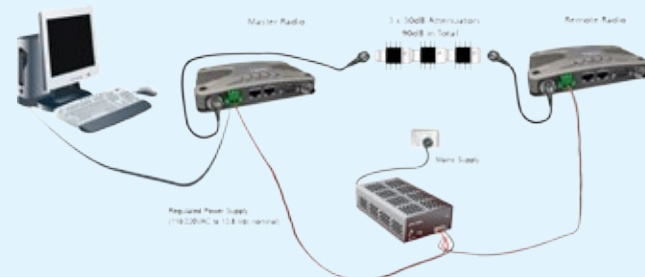
#### Introduction

This document describes the 10 key steps required for configuring the radio and demonstrating remote diagnostics on a pair of K-Series radios operating in Point to Point ( PTP ) mode. After successful diagnostics polling is achieved, subsequent testing can then be done on user equipment such as RTUs or PLCs.

For more information consult the following documents:

- K-Series User Manual
- TVIEW+ Diagnostics Quick Start Guide
- TVIEW+ Diagnostics User Manual

#### Typical Radio Setup



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#### Step 1 - RF and DC power connection

##### RF Connection

It is recommended that whip antennas are used to simulate a long distance RF link. RF attenuators are far superior to antennas for short-distance bench testing as the attenuation of the RF signals between both radios is consistent and is not subject to external interference. Alternatively 90dB of separation can be achieved with 50 ohm dummy loads or small whip antennas (minimum separation 5m/20ft).

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

2/ Small whip antennas should only be used if the test area is known to be free from interference and signal into the receiving radio are no greater than -30dBm and Tx power is set to 10dBm.

##### DC Power Connection

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

#### Step 2 - Power Up Radios

Nominal Power Supply Requirements 13.8V @500 mA



Apply DC power to the radios.

The "Pwr" LED should now be steady GREEN if the radio is configured as a Remote ( factory default ) or flash GREEN then RED if configured as a Master. If there is no LED indication, re-check the DC power cables and ensure the DC voltage is between 10V and 30V. The internal fuse may be open.

#### Step 3 - Setup for Radio Configuration

Connect the Master radio to the computer using the TView+ Programming and Diagnostics cable by inserting the DB-9 adapter in the PC serial port and the RJ-45 connector to the systems port as shown in the following figures.

Note: For more details on programmer & diagnostics connection, see over, or consult the K-Series User Manual and TView User Manual.

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TView+ E&K Cable



#### Step 4 - Start TView+ Management Suite on your PC



##### 4.1 Select K-Series

Click on the K-Series Programmer Button to start the K-Series specific configuration program. The following screen will then be shown.

##### 4.2 Read Radio Configuration

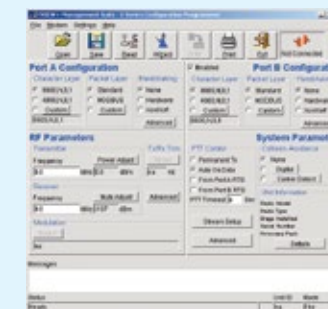
Click on the "Read" icon to read the configuration of the radio. The "connection" symbol in the top right hand corner of the screen will turn from Red to Green to indicate a successful configuration connection.



##### 4.3 Apply Wizard

The Wizard facility is the quickest way to configure the bulk of the radio configuration parameters. Click on the Wizard icon.

The Configuration Wizard Screen will appear



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#### 4.4 Select Point to Point

Click on (1) Point to Point Link ( PTP )

Select Master or Remote depending on the unit you are configuring. This will preconfigure the radio to a known working configuration.

The Wizard does not set the SubNet ID or Tx Power. This is done in step (5).

#### Step 5 - Select SubNet ID and Tx Power

##### 5.1 Set SubNet ID

Spread Spectrum radios use a Frequency Hopping Pattern which determines which frequencies are used and in what order.

Interference from other systems is minimized by selecting a unique Hopping Pattern not used by other radios in the area.

K-Series radios derive their hopping pattern from the SubNet ID.

The SubNet ID should be a descriptive name for the radio link.

It MUST be identical in both Master and Remote radios for correct operation to occur. For best performance do not leave at the factory default settings. Up to 20 printable characters can be used.

Example: "Murray Network1" will have a different Hopping Pattern to "Murray System1" and "Murray Network2"

##### 5.2 Set Tx Power

For this demonstration set Tx Power to 15 dBm

##### 5.3 Write Configuration

Click on the "Write" button to send this configuration to the radio

#### Step 6 - Configure Remote Radio

Repeat steps (3) to (6) for the Remote radio.

#### Step 7 - Verify Modem Operation

The radio modems are now ready for operation. Allow 15 seconds for the Remote radio to synchronise with the Master radio.

##### 7.1 Master Tx

Pwr/Tx LED will be Green but flash Red once per second.

##### 7.2 Remote Rx

Pwr/Tx LED will be Green and Sync/NoRX LED will flash Green once per second.

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#### 7.3 SCADA Application Check

Confirm correct operation of your application by directly connecting the PC to your RTU with a serial cable

#### 7.4 System Check using Port A

Confirm correct operation of the radio link by connecting the PC to Port A of one of the radios, and the RTU to Port A of the other radio.

At each radio, when data is received and sent at Port A, the Port A LED will flash GREEN for Rx, RED for Tx ( Orange when Tx and Rx together )

#### Step 8- Diagnostics Configuration & Testing

Exit the K-Series programmer software and start the Trio Diagnostics software by clicking on the "Diagnostics" button. This will launch TView+ Diagnostics. To utilise the diagnostics facilities, a database must be created which includes the individual serial numbers, alarm thresholds and various other parameters of each radio modem.



##### 8.1 Create Database

Create a New database using the menu option File -> New.

or

Open an existing database using menu option File->Open.

If a new database, the Individual Unit Database Setup window will open.

##### 8.2 Add Radios to Database

Add the two radios you wish to monitor with TView+ diagnostics software to the database using the File -> Add/Edit/Delete option.

To add a new radio, click on Add New button. Enter an appropriate Unit Name, Location, and the Unit Serial Number.

Select the Radio Model and Type as "K-Series" & "Master" for the Master Radio and "Remote" for the Remote radio.

The communications port should be set to Serial.

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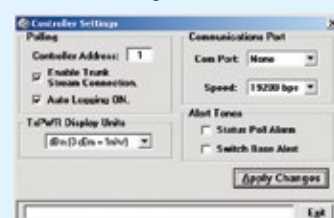
#### 8.3 Set Alarm Limits

Adjust the TxPwr alarm limits to High = 17dBm and Low = 13dBm since the radio TX power was set to 15 dBm in Step (5).

#### 8.4 - Controller Settings

The TView+ diagnostics controller has several settings which must be configured to be compatible with the radio which is connected to the computer running diagnostics.

Select Settings > Controller Settings from the File menu



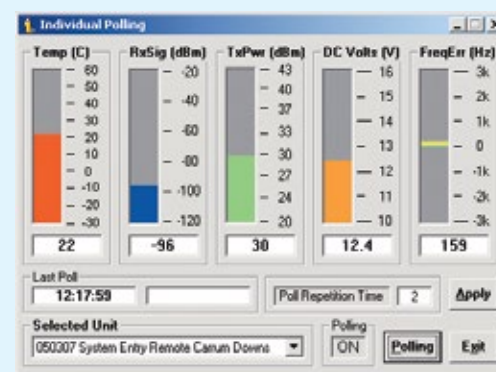
1/ Enable Trunk Stream Connection: This option should be ticked when connected to the "System Port" on an K-Series radio.

2/ Com Port: Select the serial port you have connected to the radio to on your PC.

3/ Speed: This should be set to 19200 bps.

#### Step 9 - Diagnostics Polling

To view the diagnostics parameters of each radio, open the Individual Polling screen by "Polling ->Individual Polling."



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Select the Master radio using the drop down "Selected Unit" entry box.

After the master unit has been selected, turn on polling by clicking on the "Polling" button. The Polling indicator should show "ON" as the status. The status bars should update with radio diagnostics information as shown in the following example .

This confirms the local diagnostics setup and configuration is correct.

Now select the remote unit using the "Selected Unit" drop down box. Turn polling on. The status bars should update as shown in the example above. This now confirms the remote diagnostics setup and configuration is correct.

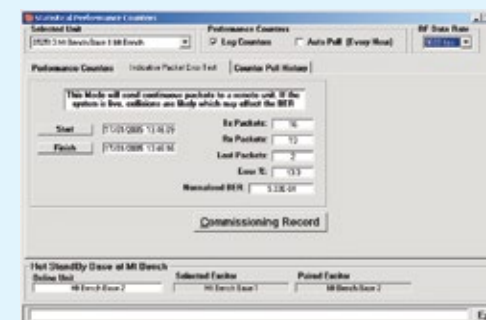
Note: Some diagnostics parameters (such as RxSig and TxPwr) will not display actual values until data has been sent or received via RF. RxSig, TxPwr and FreqErr are peak-held measurements (they show the last known readings).

#### Step 10 - Indicative Packet Error Testing

This tool provides a useful way to test a radio communications link by transmitting data packets between two units in a loop-backed mode.

To start the test select Tools -> Statistical Performance.

Choose the unit to test using the "Selected Unit" drop down box Start the test using "START" button



This completes the basic demonstration

The Point to Point Link is set up between the two Radio Modems.

Data can now be exchanged between Master Port A and Remote Port A.

Diagnostics Information can be read by both radios at either end of link.

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

#### Applies to models KR900-xxxx-xHx(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. Such locations are defined in Article 500 of the US National Fire Protection Association (NFPA) publication NFPA 70, otherwise known as the National Electrical Code and in Section 18 of the Canadian Standards Association C22.1 (Canadian Electrical Code).

The transceiver has been recognised for use in these hazardous locations by the Canadian Standards Association (CSA) International. CSA certification is in accordance with CSA Standard C22.2 No. 213-M1987 and UL Standard 1604 subject to the following conditions of approval:

1. The radio modem must be mounted in a suitable enclosure so that a tool is required to gain access for disconnection of antenna, power and communication cables.
2. The antenna, DC power and interface cables must be routed through conduit in accordance with the National Electrical Codes.
3. Installation, operation and maintenance of the radio modem should be in accordance with the radio modem's user manual and the National Electrical Codes.
4. Tampering or replacement with non-factory components may adversely affect the safe use of the radio modem in hazardous locations and may void the approval.
5. A power connector with locking screws as supplied by Trio Datacom MUST be used.

### 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.

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.**