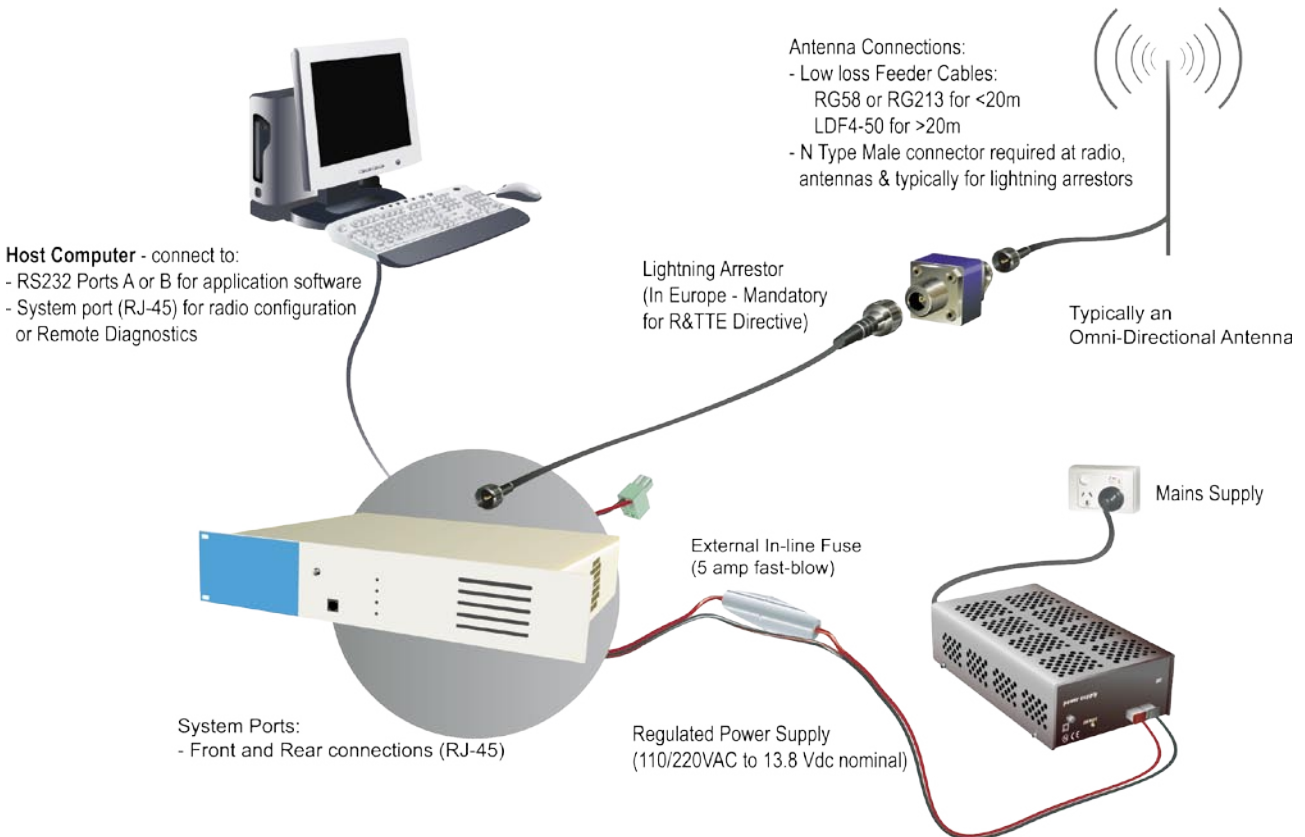## Typical Radio Setup

Digital Inputs and Outputs

The EB450 provides a facility for two channels of digital user inputs and outputs (Digital User I/O). Information on how to control and monitor this I/O using TVIEW+ Diagnostics can be found in Part J - TVIEW+ Management Suite - Remote Diagnostics & Network Controller.

All user I/O is optocoupled for isolation between the EB450 and uses equipment. When using the I/O facility the I/O electrical characteristics and ratings must be observed. Failure to observe these ratings may result in equipment damage.

Inputs

Two User Inputs are available. They have identical interface characteristics. Each input has an internal resistance of 470 Ohms. Some form of switching contact (ie: switch, relay) is normally used to change the state of the input. Both an isolated and non-isolated input configuration is possible.
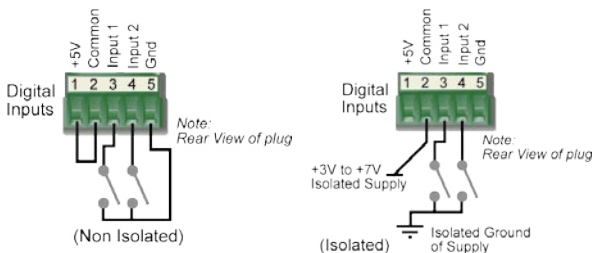
TVIEW+ Diagnostics will recognise an input as being ON when the switch is closed. If the switch is open (or not connected) TVIEW+ diagnostics will recognise the inputs as being OFF.
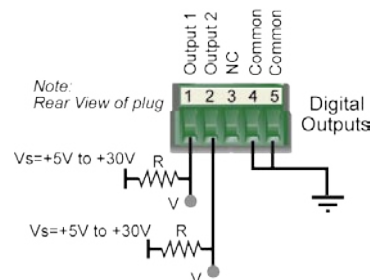
Outputs

Two User Outputs (Open Collector) are available. They have identical interface characteristics. The maximum current allowed through each output is 20ma. External resistors must be used keep the current below this value.

Each output has an internal resistance of 100 Ohms.Ohms law can be used to calculate the resistance required for a specific voltage (keeping the current below 20mA). Nominally 1k Ohm is used for a +13v8 supply and 330 Ohms for a +5v supply.

When the OUTPUT is OFF, V = Vs. No current will flow when output is off.

When the OUTPUT is ON, V = nominally 2.3 volts . Current is set by resistor.

LED Indicators & Test outputs

Radio is Powered

If all the LEDs are off, no power is reaching the radio modem.

Successful power-up is indicated by the **"PWR"** LED indicating a continuous (healthy) GREEN state. Note that this LED is turned RED when the transmitter is active.

LED Legend
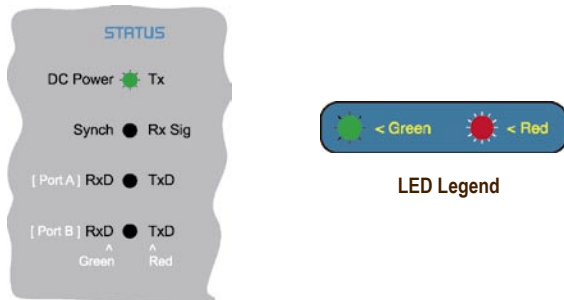
Hardware Error

A hardware error is indicated on the status LEDs by all LEDs flashing RED at a rate of 1Hz. This indicates internal communications to the exciter inside the basestation has been lost and the base station needs to be returned to repair.

Received Signal Indicator

The **"RX/SYNC"** LED indicates the state of the receiver.

If the LED is off, no signal is being received.

A RED indication shows that an RF carrier is being received, but no data stream can be decoded. This will briefly happen at the very start of every valid received transmission or may indicate the presence of interference, or another user on the channel.

A continuous GREEN indication shows that the modem is locked and synchronised to the incoming signal, and has excellent Bit Error Rate (BER). Any losses of synchronisation (BER errors) are shown as a visible RED flicker of the LED.

Note: This might only be apparent on a PTMP slave when only receiving.
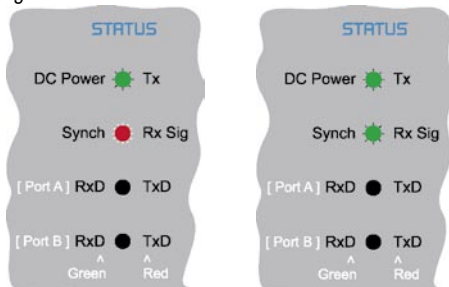
Data Flow "breakout" LEDs

There are also two LEDs to indicate data flow into and out of the two user ports.

Input data to be transmitted is shown as a RED flash, and received data to be output to the port is shown as a GREEN flash.

If data is alternately flowing in and out quickly, then the indicator appears Orange.

Bar Graph Indicators

The bar graph indicators on the front panel provide variable information regarding the performance of the Base Station. To enable / disable the bar graph display depress the Display ON / OFF button. The display will turn off automatically after 5 minutes.

DC Supply:

Indicates the supply input voltage at the exciter module. Typically 13.8Vdc.

Indication: <10Vdc no LED's on, 10-10.9Vdc LED's RED, 11-15.6Vdc All LED's GREEN, >=15.7Vdc last LED RED.

Tx Power:

Indicates forward RF power output as measured at the TX antenna port. Typically +37dBm.

Indication: <20dBm no LED's on, 20-40.6dBm (11.5W) LED's GREEN, >=40.7dBm last LED RED.

Tx Drive:

Indicates exciter drive level. Typically +20dBm.

Indication: <10dBm no LED's on, 10.0-25.9dBm LED's GREEN, >=26.0dBm last LED RED.

Rx Sig:

Indicates receive signal strength. Typically -85 to -65dBm.

Indication: <-120dBm no LED's on, -120 to -110.1dBm LED's RED, >=-110dBm LED's GREEN.

RxFreq. Offset:

Indicates offset of receiver AFC - useful in determining frequency drift. Typically 0kHz.

Indication: Single GREEN LED to indicate current value, <-3.6kHz or >+3.6kHz LED is RED. No signal, all LED's OFF.
Note: 5 second peak hold circuitry.

Test Mode

The Bar Graph indicators have a Test Mode, which cycles all LED's for correct operation (before returning to their normal operation). To activate this mode, simply depress the ON / OFF button while applying power to the unit.

EH450 Quick Start Guide

Introduction

Welcome to the *Quick Start Guide for the EH450 Hot Standby Base / Repeater Station*. This section provides additional step-by-step instructions to install, commission and operate the EH450 Hot Standby Base Station. This document should be read in conjunction with the EB450 Base Station Quick Start Guide.

The EH450 is a fully redundant, hot standby digital data radio base / repeater station providing automatic changeover facilities.

The EH450 is designed as a modular solution, comprising 2 identical EB450 base station units (standard) linked to a central, fail-safe monitoring and changeover controller (Hot Standby Controller). Either base station may be taken out for maintenance without the need for any system down time. The automatic changeover is triggered by out of tolerance (alarm) conditions based on either RF and/or user data throughput parameters.

Features and Benefits

- Individual and identical base stations with separate control logic changeover panel

- Modules are hot swapable without user downtime

- Flexible antenna options – single, separate Tx & Rx, two Tx and two Rx

- Both on-line and off-line units monitored regardless of active status

- Also refer to the common Features and Benefits list of the E Series Data Radio

Base / Repeater Unit

Base / Repeater Unit

Hot Standby Controller Unit

Rear View

Note: RF connectors not used on ETSI version

Operational Description

The Hot Standby Controller (HSC) unit is a 1RU rack mounted module that interfaces to two physically separate base stations (each 2RU rack mounted modules) via a number of RF and data cables.

Both base stations are operating simultaneously and both units are constantly receiving signals, however only data from one base station, the "online" base station is directed to the user equipment. The online base station is the only base station transmitting at any time. The Hot Standby Controller has the following functions:

• Diplex the transmit and receive paths (Assuming internal duplexer fitted), TX Only.

• Amplify and split the incoming signal two ways so both base stations receive at once.

• Monitor status reports from both base stations to identify faults and swap over the online base station if required.

• Switch the antenna via internal coaxial relay duplexer to the online base station transmitter and inhibit the offline base station from transmitting.

• Switch the User A and B data ports through to the online base station.

An optocoupler based switch in the base station controller directs data to and from ports A and B on the rear panel directly to ports A and B on the on-line base station without any involvement from the Hot Standby controller microcontrollers (apart from selecting the on-line base). This provides protection of the system from failure of the microcontroller.

As well as ports A and B, each base has a system port. The system port of each base station is interfaced to the microcontroller on the Hot Standby controller. This allows the microcontroller in charge of selecting the base station to receive diagnostic messages from each base station to decide their health.

The base station has it's own system port on the rear panel and this is interfaced to the Hot Standby Controller Module. The HSC will route diagnostics at the rear panel system port to and from the system ports of the base stations.

⚠ Warning

The base station front panel system port has priority over the rear panel port, which is used for communication between the base station and the Hot Standby Controller. This is to permit service personnel to reconfigure the base station module without disconnection from the Hot Standby Controller. It should be noted however, that when the front panel port is accessed, a changeover event will occur due to lost communications with the Hot Standby Controller.

Mounting and Environmental Considerations

The EH450 Hot Standby Base Station is housed as a 5RU 19" rack mounted set, encompassing 2 x 2RU Base Station units and 1 x 1RU Hot Standby Controller unit. The mounting holes on the front panels should be used to secure the units to the rack.

The unit should be mounted in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. Please allow sufficient passive or active ventilation to allow the radio modem's heatsink to operate efficiently.

All permanent connections are made at the rear of the unit. This includes: Power, Antenna, Communications Ports, Digital I/O and System Port. The front panel has an additional System Port connection point for easy access.

The Base Station front panel system ports must not be used while in this configuration.

Communications Ports

The A & B Data Ports and System Ports of each Base Station connect directly to the Hot Standby Controller units corresponding ports with the cables provided. Ensure all clamping screws on the Data Port cables are firmly secured and the System Port cables are clipped in correctly. See figure below for further details.

Note: Only the front or rear User System Port can be used at any one time on the Hot Standby Controller.

*Note: RF Connectors not used on ETSI version*

The Hot Standby Controller units A & B Data Ports connect directly to you application device and the System Port connects directly to your local PC. See ER450 Quick Start Guide Section for further
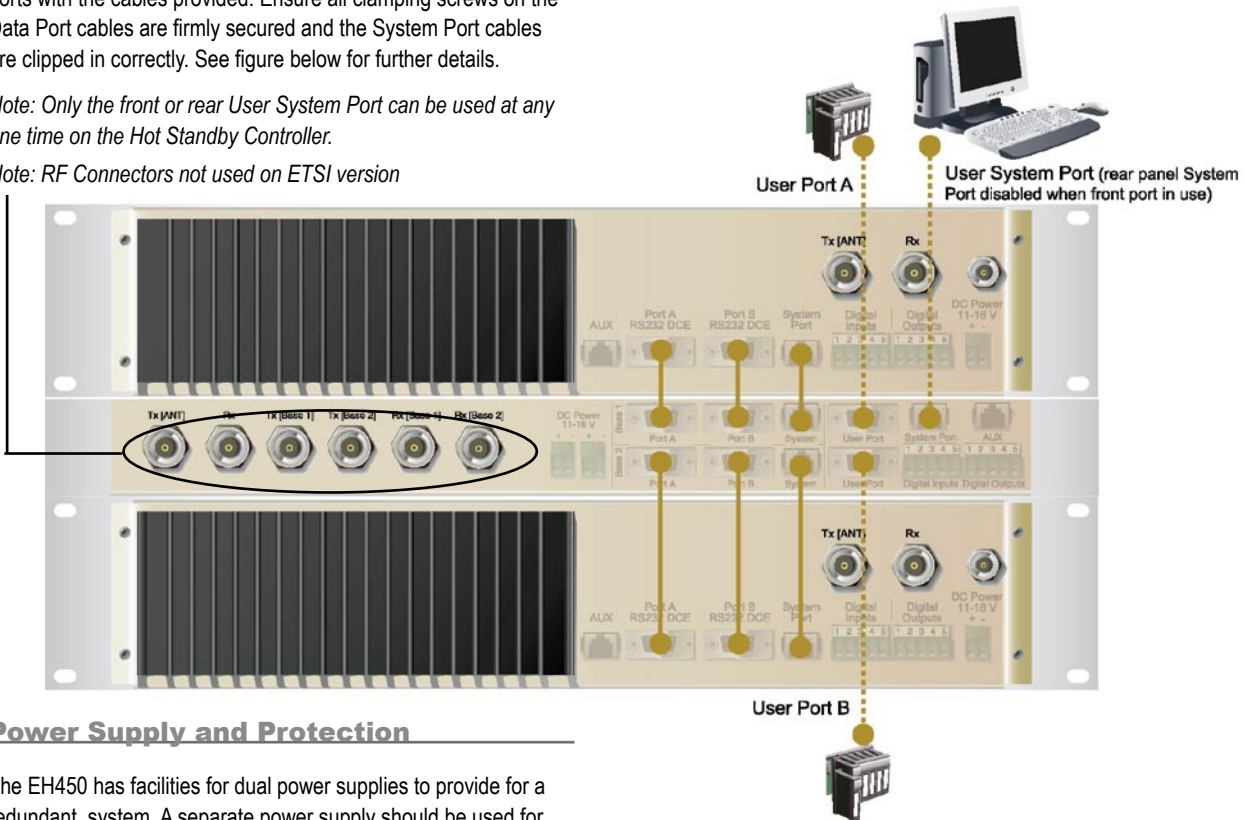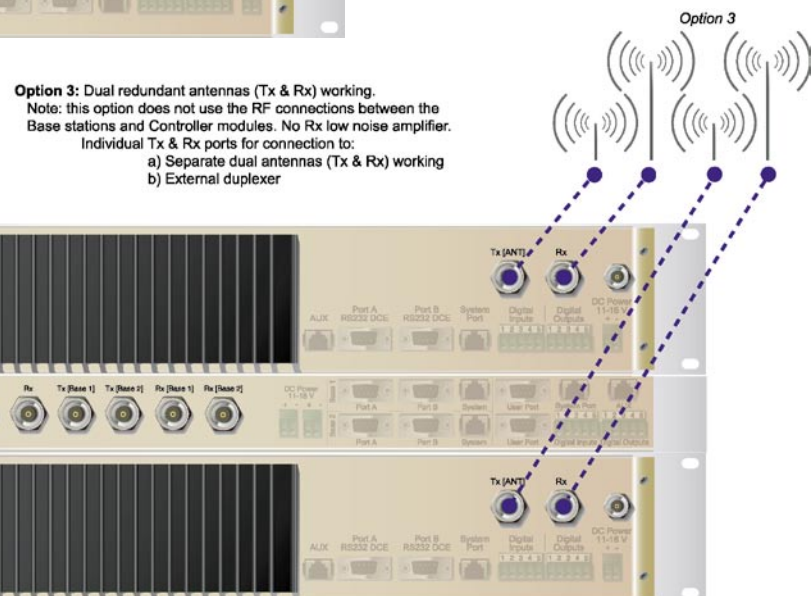

Power Supply and Protection

The EH450 has facilities for dual power supplies to provide for a redundant system. A separate power supply should be used for each of the Base Station units. The Hot Standby Controller unit has connections for dual power supplies and it is recommended that the power supplies from each of the Base Stations also be used to power the Hot Standby Controller unit. See Figure below for further details.

Note: RF Connectors not used on ETSI version
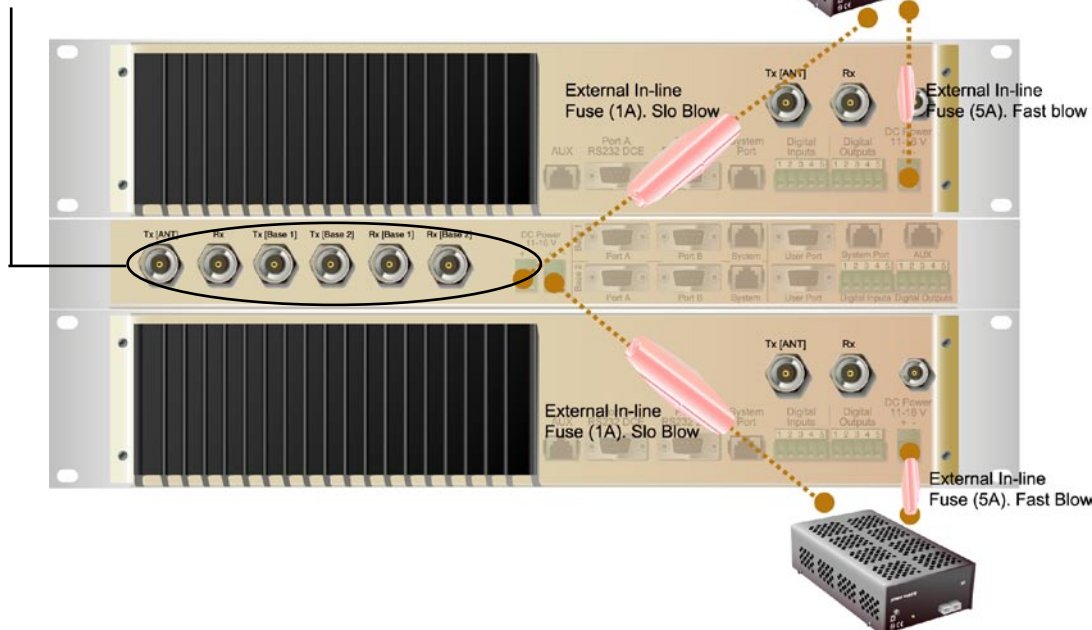
Connecting Antennas and RF Feeders

There are 3 primary antenna connection options. All connectors used are standard N Type sockets. See figures below for further details.

Option 1: Individual Tx & Rx ports for connection to:
a) Separate dual antennas (Tx & Rx) working
b) External duplexer

Opion 2: Single Antenna working (internal band reject duplexer).
Use Tx [ANT] connection of Controller module.

Option 3: Dual redundant antennas (Tx & Rx) working.
Note: this option does not use the RF connections between the Base stations and Controller modules. No Rx low noise amplifier.
Individual Tx & Rx ports for connection to:
a) Separate dual antennas (Tx & Rx) working
b) External duplexer

Omnidirectional or Directional Yagi Antenna

Lightning Arrestor
(In Europe - Mandatory for R&TTE Directive)

Front Panel Operation

Switches

Select Switch

The 3 position switch (1 / Auto / 2) on the front panel provides the following functionality:

• Position 1: base station 1 is forced into operation

• Position Auto: changeover hardware will select the online base station

• Position 2: base station 2 is forced into operation

The select switch is also used to identify the target base station for configuration programming.

Adjacent to the select switch are two LEDs: These LEDs indicate the current active base station.

Select LEDs

• Green - Auto Mode

• Red - Remote Force

• Amber - Local Force

2 Green Firmware Download

2 Amber Test Mode

2 Red Fatal Error - refer User Manual

Reset Switch

This is a momentary close switch which when depressed will reset all LED alarm indications.

System Port

There are two system port connection points, one on the rear panel and one on the front panel. Both have the same functionality and can be used for local diagnostics, firmware front panel downloads and hot standby controller testing. To access the system port use the diagnostic/programming cable supplied.

Note: When connection is made to front panel system rear system port is disabled.

Alarm Status LEDs

There are 10 alarm LEDs on the front panel, five for base 1 and five for base 2. These LEDs provide a general indication of base station status. More detailed base station status information is available by using the diagnostic utility software.

The indicated alarms for each base station are:

Freq.	=>	Frequency Error
RxSig	=>	Receive Signal (RF) Error
Data	=>	Receive Data Error
TxPower	=>	Transmit Power (RF) Error
Supply	=>	DC Voltage Error

The status of each alarm is represented as follows:

OFF	=>	Unknown
Green	=>	No Error
Red	=>	Current (active) Error condition
Amber	=>	Recovered Error condition

Any active or recovered error LEDs will turn to green after the reset

Part F - Operational Features

Multistream functionality (SID codes)

The E Series sends data messages in packets. A feature of the E Series is that an address can be embedded in each packet. This address is called the stream identifier code (SID).

By configuring a user serial port for a specific SID code, it is possible to steer messages to similarly configured ports between radio modems. In effect, it is possible to use the multiple serial ports available on the E Series, to enable multiple protocols to share the same RF channel. The SID codes also facilitate the use of other features such as TView diagnostics. Unique selective routing, repeating, and data splitting functions available in the radio modems configuration allow data steering and bandwidth management in complex systems.

See Part I - TView+ Management Suite - Programmer and Part J - TView Remote Diagnostics and Network Controller for details.

Collision Avoidance (digital and RFCD based)

Where multiple "unsynchronised" protocols coexist on a common "multiple access" radio channel, there is always a possibility that both "hosts" may poll different "remote" devices at the same time. If both devices attempt to answer back to the single master radio at the same time, it follows that a collision could occur on the radio channel.

To facilitate the operation of multiple protocol operation on the radio channel, a transparent collision management system has been implemented : See Part I - TView+ Management Suite - Programmer for details.

Digital Collision Avoidance System

If the "multiple access master" has been configured for full duplex operation, it is possible to use the inbuilt collision avoidance signalling system.

Once the master radio receives a valid incoming data stream from a remote, a flag within the "outbound" data stream is used to alert all other remote devices that the channel has become busy. Remote devices wishing to send data will buffer the message until the channel status flag indicates that the channel is clear. A pseudo-random timing value is added to the retry facility to ensure that waiting remotes do not retry at the same time.

RF Carrier Detect RSSI based Collision Avoidance

In half duplex systems, the receiver's RF carrier detect is used to inhibit the transmitter whilst a signal is being received.

Digipeater Operation

A feature of the E Series radio modems is the ability to internally repeat data packets to provide stand alone repeater facilities without the need for external intelligence.

This is done by programming "SID Codes" to "Repeat" a stream or range of streams. Wizard templates can be used to simplify setup of this and other features.

See Part I - TVIEW+ Management Suite for details.

TVIEW+ Diagnostics

The E Series has an inbuilt remote configuration and diagnostics utility.

This facility allows transparent remote access to the key configuration and operating parameters of the radio.

See the TView+ Diagnostics User Manual for more information.

Poor VSWR Sensing

To protect the transmitter, forward and reverse power are measured on each transmission.

If a VSWR of 3:1 or greater is measured, transmitter output power is reduced to +31 dBm.

Part G – Commissioning

Check DC power connector for correct voltage (10-16VDC) and polarity, BEFORE plugging in the power connector.

Power-up

Upon power up, the radio will self test and shortly after the green power LED will be displayed.

Failure of the power LED to light indicates no power, or failure of the fuse due to incorrect polarity or over-voltage.

Other failure such as fatal internal errors will initiate error modes as detailed in Part E - Getting Started: LED Indicators and Test Outputs.

LED Indicators

Will depend on the system architecture. If the device is a remote site receiving a base station with a constant carrier, then the RXSIG/SYNC LED should be green to indicate healthy reception of the wanted signal.

If the site has been configured as a constantly transmitting base station, then the PWR/TX LED should show red.

In other types of systems, TX and RX bursts would be indicated by the RX or TX LED's as above.

Data flow to and from the user ports is indicated by the TXD/RXD LEDs for each port.

(See Part E – Getting Started: LED Indicators and Test Outputs.)

Data Transfer Indications

Bi-colour LEDs are provided to indicate RS232 data being transmitted and received on each data port. A RED flash indicates a byte (or bytes) of incoming data from the serial line which will be transmitted to air, and a green flash indicates a byte of data received "off air" being released onto the serial line.

If data is being sent to the radio modem and the Data LED does not flash RED, this may indicate a wiring or configuration problem. Check that the TX and RX data lines are correctly wired (see Part E – Getting Started: LED Indicators and Test Outputs).

Also check that character set and parity settings (i.e. N,8,1 etc) are set identically at the terminal and the radio modem. Note that some incorrect settings of the character set parameter can still produce transmittable data, even though the data will not be understood by the application.
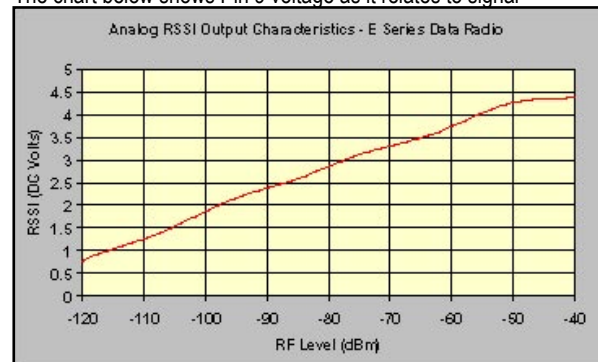
Antenna Alignment and RSSI Testing

Once the RXSIG LED is lit, it is possible to confirm RX signal strength and align a directional antenna by monitoring the RSSI output.

This DC voltage appears at Pin 9 of Port B.

A ground reference can be obtained from chassis ground or Pin 5 of Port A or B.

The chart below shows Pin 9 voltage as it relates to signal

strength.

Link Establishment and BER Testing

Once communications has been established, it is possible to confirm the packet error rate performance of the radio path, and thus estimate the BER figure.

There are a number of tools provided to do this. The easiest is to use the "indicative packet error test" provided within the TVIEW+ Diagnostics under "statistical performance tools". Alternatively, it is possible to use hyper terminal, or other packet test instruments or PC programs to run end to end or perform "loopback" testing.

Please note that when using a "loopback plug" some understanding of the packetising process is necessary, since each "test message' must be carried in a single packet for meaningful results to be obtained.

Note also that in PTMP systems, allowance must be made for collision potential if other data is being exchanged on the system.

VSWR Testing

VSWR testing is achieved using specialized VSWR testing equipment, or a "Thruline" power meter that measures forward and reverse power.

VSWR is the ratio between forward and reflected transmitter power, and indicates the health and tuning of the antenna and feeder system.

VSWR should be better than 3 to 1, or expressed as a power ratio, <6dB or no more than 25%. To activate the radio's transmitter for VSWR testing, use:

Part H – Maintenance

Routine Maintenance Considerations

The E Series hardware itself does not require routine maintenance. However all radio products contain crystal frequency references, and the stability of these crystals changes with time. The effect of this is that the product will slowly drift off frequency, and eventually it will require re-calibration. E Series radios are designed with high quality, low drift specification references, to ensure a long maintenance free lifespan. The length of this lifespan will depend on the severity of temperature extremes in the operating environment, but is normally 3–5 years. Extended frequency drift can be detected using TVIEW+ Diagnostics "Freq error" parameter.

Generally, re-calibration is achieved by replacing the radio in the field with a spare, and returning the radio to a service centre for re-calibration and specification testing at moderate cost.

Routine maintenance should be performed on external equipment subject to greater environmental stresses including antennas, RF feeder cables, backup batteries and cooling fans (if required). This maintenance should include testing of site commissioning figures such as received signal strength, VSWR, P/S voltage etc.

Part I – TVIEW+ Management Suite - Programmer

Introduction

This manual covers the installation and operation of the E Series TVIEW+ Management Suite which incorporates 3 utilities:

- Programmer for configuration of the radio RF parameters, system parameters and data ports

- Diagnostics* for real-time monitoring and logging of radio performance parameters

- Firmware Update for loading new firmware releases into the radio data modem

All utilities can be run on any IBM compatible computer running Windows 95® and above. This section describes use of the programmer and firmware Update utilities in detail. Users should refer to the separate Diagnostics section for information about this utility.

The programmer is used to set configuration parameters within the ER450 data radio modem and EB450 base station. The utility permits configuration of modems connected directly to the PC as well as over the air to a remote unit. Configuration parameters can be saved to a disk file for later retrieval, or used for clone programming of other modems.

All configuration parameters are held in non-volatile memory (NVRAM) on the Data Radio Modem. Configuration is fully programmable via the Systems Port using the programming adaptor and cable supplied. Disassembly of the unit is not required for any reason other than for servicing.

The diagnostics utility permits monitoring and logging of radio performance parameters for both E Series* as well as D Series* data radio modems and base stations. It supports homogeneous systems of radios as well as mixed systems of both E and D series radios.

The firmware update utility permits field upgrade of the firmware in an ER450 data radio modem, EB450 base station and EH450 hot standby unit connected directly to the PC. A special serial adaptor cable is required to be connected to Port B to load firmware into the unit.

Installation

Unit Connection

Programmer and Diagnostics Utilities

The unit is connected to the PC using the supplied DB9-RJ45 adaptor cable (part no. TVIEW+ Cable) for local configuration changes or diagnostic monitoring. The cable should be connected to the RJ45 System Port of the unit and a valid PC serial port (e.g. COM 1) DB9 connector.

(See Part E - Getting Started: Communications Ports)

Firmware Update Utility

The unit to be updated with firmware connects to the PC using the DB9-DB9 adaptor (part no. DRPROG). The cable should be connected to the DB9 Port B connector on the unit and a valid PC serial port (See Appendix C for details) DB9 connector.

Software

Please take a moment to read this important information before you install the software.

The installation of this Software Suite is a 2 step process.

Step 1 completes the typical installation of the TVIEW+ Management Suite and will install the Programming Software together with the E Series Documentation.

Step 2 installs the Diagnostic Software and is optional. This step is only required if your radios have Remote Diagnostics enabled.

STEP 1: Installation - TVIEW+ Management Suite

Note: If a previous version of the TVIEW+ Management Suite has been installed on your PC, you must uninstall it via Control Panel "Add/Remove Programs".

- Close down all other programs currently running.

- Place the CD-ROM in the drive on the PC.

- Using Windows Explorer locate the files on the CD-ROM.

- In Windows Explorer double click on the file called TVIEW+_(Version#)_install.exe

- After the installer starts follow directions.

STEP 2: Installation - TView Diagnostic Software (Optional)

Note: If a previous version of the "TView WinDiags" software has been installed on your PC, you must uninstall it via Control Panel "Add/Remove Programs".

•   Close down all other programs currently running.

•   Place the CD-ROM in the drive on the PC.

•   Using Windows Explorer open the "Diagnostics" directory on the CR-ROM.

•   Double click on the file called setup.exe

•   After the installer starts follow directions.

Other:

The current E Series Manuals are supplied and installed as part of the TVIEW+ Management Suite installation in Adobe Acrobat format.

Adobe Acrobat Reader is provided on the CD-ROM for installation if required.

TVIEW+ Front Panel

When started the TVIEW+ front panel appears. The larger buttons permit each of the three utilities to be started. The diagnostics button may be greyed out if this utility has not been installed or found in the correct file directory. Access to local help and an exit

Programmer

Main Window

When first started the programmer is in file mode as indicated by the mode field at the bottom right of the panel shown below. In this mode it is possible to open a previously saved configuration file, or configure various programming options and save the configuration to a file.

*Note: Modulation type is not available in this mode.*

To commence programming a unit (radio remote or base station) a session must first be established by using the "READ" function. This function reads the current configuration from the unit and displays it in the main window. The "mode" displays changes to local or remote depending on the type of session selected at the read function. Several options in the main window may be blanked out until a session has been established with a unit.

Note: Changing any item on the menu will in general not take effect until data is written back to the unit using the "WRITE" function.

The procedure to follow for normal programming of unit is:

•   Read unit

•   Configure parameters (or Open a previously saved configuration file)

•   Write unit

Several modems of the same radio type can be programmed with the same configuration using the clone facility described in Clone Mode. It is important to note that when using this facility the cloned
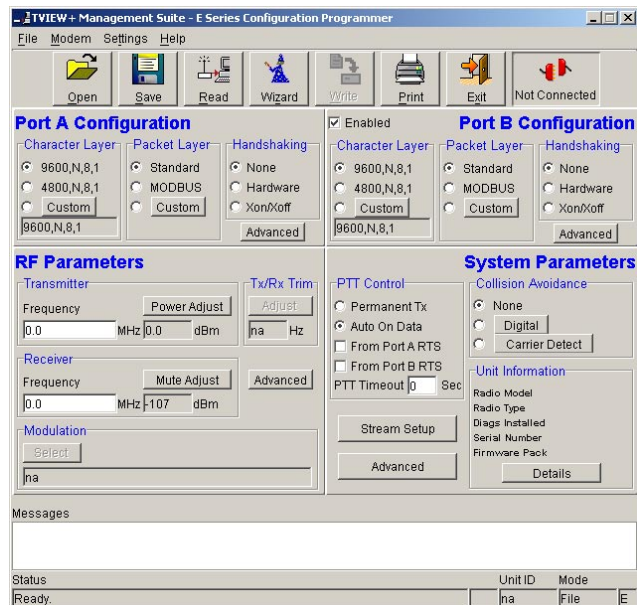
Pull Down Menus and Toolbar Buttons

The items on the pull-down menus can be selected either directly with a mouse or using the ALT key in combination with a HOT KEY (e.g. ALT-F to select the file menu). Several of the functions within each menu are also available on the toolbar (click once to select).

File Menu

The file menu allows the user to load (open) or save configuration data as well as to quit the program. The files are saved with an ".cfg" file extension

Open (also available on the toolbar)

This function is used to load an existing configuration file that can be used to directly program the radio or to use as a starting point to edit configuration parameters. Note that a session must be established with the unit by initially reading the configuration parameters from the unit prior to being written to a unit.

If in file mode the modulation type will not be displayed. If in local/remote mode and a file that was saved from local/remote mode is opened, then modulation type will be imported and used, but only if it is valid for the connected hardware. If not, then the unit's read modulation type will be used.

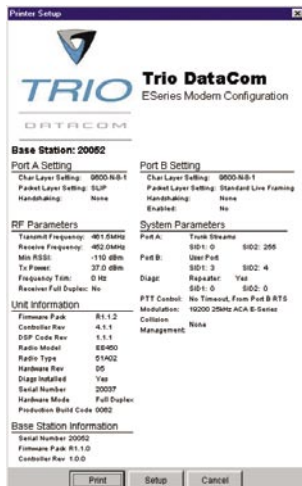**Save** (also available on the toolbar)

This function is used to save the current configuration parameters to a file for future recall.

If in "file mode" only basic RF, Port and System parameters are saved and re called. If in local/remote mode then modulation type is saved and re called.

Print (also available on the toolbar)

This function prints out the configuration data to the default printer in a standard format. There are no options for this item.

This should be used if a complete record is required for site/unit configuration. Firmware/Modulation/Diags/Hardware type are all printed.

Exit (also available on the toolbar)

This function terminates the program. The user is requested to confirm this selection before exiting the application.

Modem Menu

This radio menu allows configuration data to be read from and written to the unit (remote radio or base station) using the selected PC serial port connection (see Settings menu). The action of reading the configuration establishes a session with the unit. Communications is maintained with the unit to ensure that the session remains open. If the session has been lost due to data transmission errors or disconnection of the programming cable it will need to be re-established to ensure any updated configuration is written successfully to the unit.

Read (also available on the toolbar)

This function establishes a session with the unit, reads configuration data from the unit and displays it in the programmer main window. When selected a dialogue window appears prompting the user to choose whether the unit to read is local (connected directly to the serial port or remote (connected over the air to the unit connected to serial port). Unit no. (Serial no.) must be entered and the stream SID code is "on" (default =0)). After configuration data is read from the unit it is available for editing and writing back to the unit or saving to a file. The progress of data transfer to or from the unit is indicated by a message window as well as a rotating indicator in the bottom right hand corner of the main window.
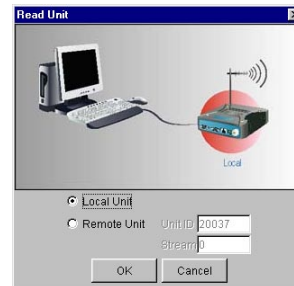
Write (also available on the toolbar)

This function writes configuration data displayed in the main window to the unit and reboots the unit. When selected a dialogue window appears prompting the user to confirm whether to proceed. A progress indicator in the bottom right hand corner of the main window is displayed while data is being read. This selection is only available if a session has been previously established and maintained with the unit.
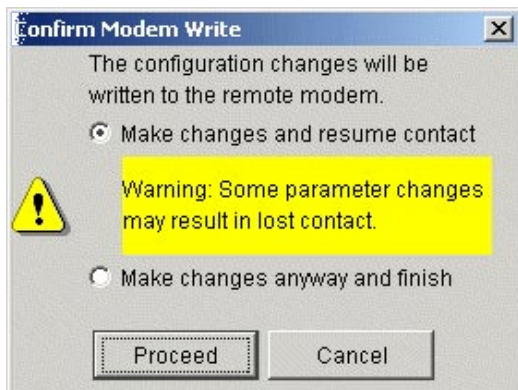
This dialog provides a facility for reversing any remote configuration changes that cause unexpected results resulting in the device reverting to previous configuration if contact is lost.

Choose "*Make changes and resume contact*" to safeguard changes. Some parameter changes (such as frequency change) will, by definition, automatically result in lost contact.

Choose "*Make changes anyway and finish*" to complete intentional changes which will result in lost contact.

After configuration data has been written, the session with the unit is closed and the programmer reverts to file mode.

Note: In general, any change made on the programmer screen must be written to the unit (using the write function) to become permanently stored. However, changes to Power adjust, Mute adjust and 7x/Rx trim take immediate effect to allow test and adjustment prior to permanent storage via the write function.

**Cancel Session** (also available on the toolbar)

This function closes the session with unit and puts the programmer back into file mode. All configuration changes are discarded including changes to Power Adjust, Mute Adjust and Tx/Rx Trim.

Wizard (also available on toolbar)

This function permits the user to select standard configurations after the configuration from a unit has been read or a file opened.
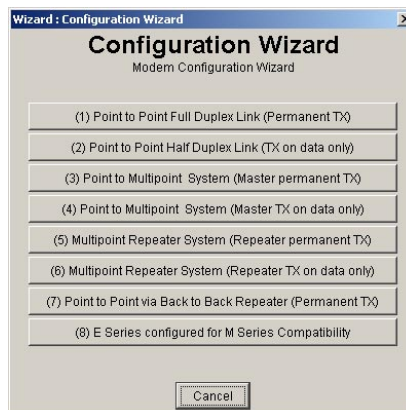
The user is prompted via a series of dialogue windows to select the desired configuration that can then be written to the unit (remote radio or base station).
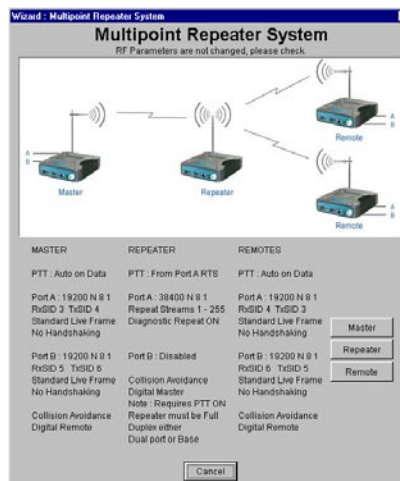
Clone Mode

This function permits writing of the same configuration data to several units. This feature is normally used for configuring data radio modems connected locally.

The procedure is:

• Read the configuration from the first unit.

• Configure the parameters (or open a previously saved configuration file).

• Select Clone Mode (Modem menu).

• Write the configuration to the first unit.

• The changes will take effect when unit is repowered.

• Connect the next unit.

• Write the next unit which establishes a session and recognises the unit serial number and type, which then configures the unit

• Repower the unit for changes to take effect

• Repeat the last 3 steps for the remaining units.

Settings

This menu permits selection of the PC serial port (COM1 to COM4) to be used for communications with the unit. COM1 is the default selection and if a different port is to be used it must be set before establishing a session by reading the configuration from a unit. Whilst a session is established with a unit this menu can not be accessed.

Help

This menu permits selection of help information using the Contents key. Warnings regarding use of the programmer software using the
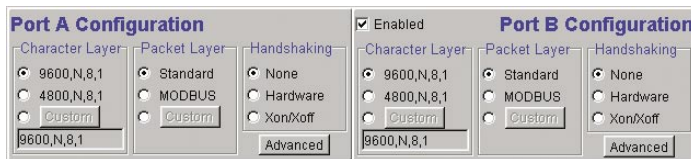
Warnings key and version detail using the About key.Port A and Port B Configuration

Data from these two user ports is multiplexed for transmission over the air. Each port can be configured separately for the Character layer (Data speed, number of data bits, number of stop bits, parity), Packet layer and Handshaking (flow control). Port B must be enabled if required by setting the check box at the top of its configuration section.

If Port B is off, the 16K memory is split equally between Port A Rx/Tx buffers (i.e. 8K & 8 K). If Port B is on, then the 16K is split equally across Port A & B Rx/Tx buffers (i.e. 4K, 4K, 4K & 4K).
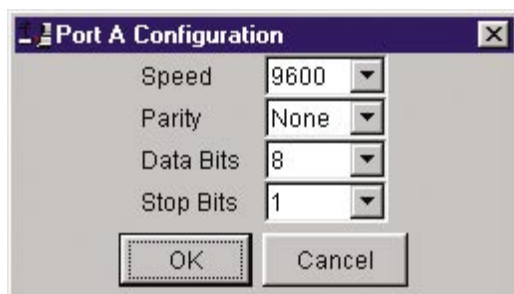
The following description is common to both ports.

Character Layer

There are two standard formats and a custom format that can be selected by checking the appropriate control button to the left of the description. The standard formats are:

• 9600,N,8,1 (data speed = 9600 bps, no parity, 8 data bits, 1 stop bit)

• 4800,N,8,1 (data speed = 4800 bps, no parity, 8 data bits, 1 stop bit)

A non-standard format can be selected via the Custom button that displays a dialogue box to permit selection of data speed, parity, number of data bits and stop bits. Once selected the OK button should be used to complete the selection. The custom selection is also displayed in the main window below the Custom button.

Packet Layer

There are two standard configurations and a custom configuration which can be selected by checking the appropriate control button to the left of the description. There are essentially two basic modes of operation for the packet assembler and disassembler (PAD).

The first is where the PAD operates in a standard mode with data received at the port being immediately sent over the radio channel.

The second is a store and forward or delayed mode where whole data packets are received from the port before being sent over the radio channel.

> In both cases data is sent over the radio channel in variable length frames and delineation of these frames is dependent on the configuration selected as well as the characteristics of the data stream received at the data port.

> The packet layer configuration options which can be selected are:

Standard (live framing)

With standard live framing data received from the host by the modem is immediately placed into a frame and transferred onto the radio channel.

This avoids placing "store and forward" delays in the data transmission.

If a stream of characters is received by the modem, then several characters at a time may be placed into the same frame. The number of characters in the frame depends mainly on the respective baud rates of the user port and the primary channel baud rate of the modem, as well as the level of overheads experienced on the radio channel and the user data stream.

For example a constant stream of 300 baud user data placed onto a 9600 baud channel will result in 1 character per frame being transmitted. If the user baud rate was lifted to 9600,N,8,1 with a continuous data stream, then the frame size would settle to about 16 characters plus 32 overhead bits. If collision avoidance is enabled as master the average frame size will increase to 32 characters plus overhead bits.

The number of data bits associated with the user data stream will also have an effect on the average size of a frame. For instance the number of stop bits, and number of data bits per character.

The system designer must choose the best compromise of all the above items to ensure the most efficient method of data transmission.

Note: The first character is always packetised and sent by itself regardless of all the above variables.
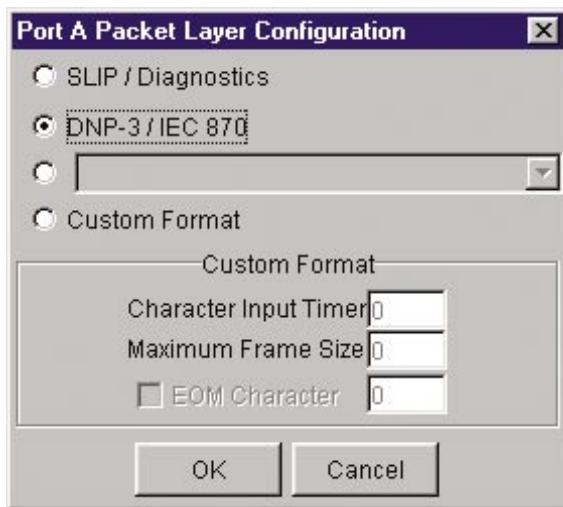
Modbus

This selection configures the PAD driver with options automatically set to implement the MODBUS protocol, e.g. 5 mSec timer.

Custom

Other configurations of the PAD driver can be selected via the Custom button which displays a dialogue box to permit selection of several configuration options as follows:

SLIP / DIAGNOSTICS

SLIP is a well known protocol for transferring binary data packets over a data link. Each data packet is delineated by <FEND> characters, and a substitution mechanism exists that allows these characters to be included in the data packet. Appendix B describes the SLIP protocol which is used extensively in UNIX™ based systems, and is closely associated with TCP/IP networks.

The diagnostics controller package uses the SLIP protocol to communicate between base station and remote modems.

DNP-3 / IEC870

This selection configures the PAD driver to implement the DNP-3 Protocol and IEC870 Protocol.

Pull Down Menu Selection

The PAD driver can be configured for a number of vendor specific protocols by selecting the desired option.

Custom Format

This selection permits PAD driver to be configured in a variety of ways and requires a greater understanding of the system design.

For the modem to successfully transmit its packets (or frames) of data over the radio channel, it must be told on what basis to delineate data packets received at the data port. Once the end of a data packet has been received at the port the data frame is closed and transmission over the radio channel commences. Delineation of data packets can be

configured to occur via any combination of:

- A pre-defined minimum time delay between packets received at the port. Typically the time delay would reflect the absence of a couple of characters in the data stream at the specified user port baud rate.

- Limiting the maximum number of characters which can be put in the data frame sent over the radio channel.

- Receipt of a selected end of message (EOM) character at the port. An ASCII carriage return (character 13) is often used for this purpose.

As each data frame to be transmitted over the radio channel has overhead data consisting of checksums and SID codes. The system designer must determine the best compromise between the ratio of overhead versus user data which depends on packet size and user data packet transmission latency.

The fields which can be configured are:

- Character Input timer: Set the input timer value in ms or enter zero to disable. Range 0 - 255.

- Maximum Frame Size: Set the maximum number of characters or enter zero to disable. Range 0 - 4095.

- EOM Character: Select the check box to the left of the

Handshaking

If the standard PAD is selected (i.e. any settings apart from SLIP/Diagnostics), then flow control can be either hardware handshaking, XON/XOFF protocol or none.

The XON/XOFF flow control is not possible when using either the SLIP/Diagnostics protocol.

The Handshaking section of the screen allows the selection of either of the handshaking methods as well as allowing handshaking to be disabled.

Details of the two handshaking methods are given below.

Hardware

The modem acts as Data Communications Equipment (DCE) and supplies to the host controller the following interface signals:

Data Set Ready	(DSR)
Data Carrier Detect	(DCD)
Clear To Send	(CTS)
Receive Data Output	(RXD)

The host controller must act as Data Terminal Equipment (DTE) and supplies to the modem the following interface signals :

Data Terminal Ready	(DTR)
Request To Send	(RTS)
Transmit Data Input	(TXD)

- DCD

DCD has several modes of operation. It is set to TRUE when data is being transferred from the modem to the host - RXD line active. The signal is asserted approximately 500ms before the start bit of the first character in the data stream and remains for approximately 1 character after the last bit in the data stream. The other modes of operation are dependent on the advanced settings.

• DSR

DSR is permanently set to TRUE.

• CTS

The CTS is a signal from the modem to the host informing the host that the modem is able to accept incoming data on the TXD line. It responds to the actions of the RTS line similar to the operation of a "standard" line modem.

The CTS is FALSE if the RTS line is FALSE. Once the RTS line is set to TRUE (signalling that the host wants to send some data to the modem on the TXD line), then the CTS will be set TRUE within 1ms, *if* the modem is capable of accepting more data.

The CTS line will be set to FALSE if the transmit buffer in the modem exceeds 4075 bytes, or the number of queued frames exceeds 29 to ensure that no overflow condition can occur.

• RTS

The RTS line is used for two reasons. The first is to assert the CTS line in response to RTS. The RTS line can also be used to key up the transmitter stage of the modem.

• DTR

The DTR line is used for flow control of data being sent from the modem to the host controller. When the host is able to accept data it sets this line to TRUE, and if data is available within the modem, it will be sent to the host. If the host cannot accept any more data, then it sets the DTR to FALSE, and the modem will stop all transmissions to the host.

• Xon/Xoff

If the flow control mechanism is XON/XOFF then the modem uses the standard ASCII control codes of DC1 {^Q=11(Hex)=17(Dec)} for XON and DC3 {^S=13(Hex)=19(Dec)} for XOFF. The DTR input line is totally ignored.

Note: There is no substitution mechanism employed in the XON/XOFF protocol, so care must be taken when transferring binary data to ensure that invalid flow control characters are not generated.

Advanced

This button provides access to the advanced features of the port configuration. When selected a dialogue box appears which
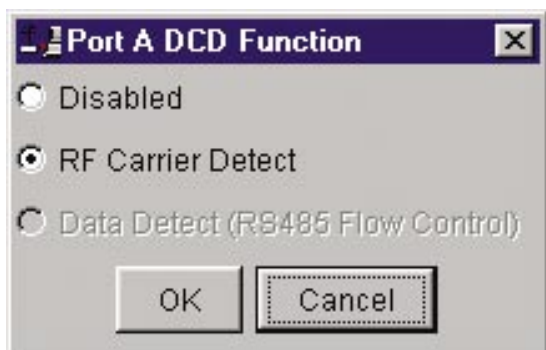
Disabled

This selection disables the DCD output on the port. This selection is not permissible if hardware based flow control has been selected.

RF Carrier Detect

This selection causes DCD to be asserted at the onset of a received RF signal being detected. This will generally occur several milliseconds before data is transmitted from the port.

Data Detect (RS485 Flow Control)

This selection causes DCD to be asserted when data is about to be transmitted from the port. This option is not available if handshaking is set to "None" or "Xon/Xoff".

RF Parameters

This section of the main window permits adjustment of transmitter and receiver, radio channel modulation scheme, frequency trim
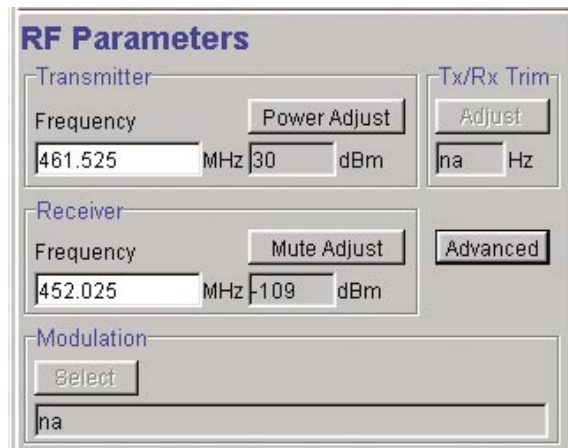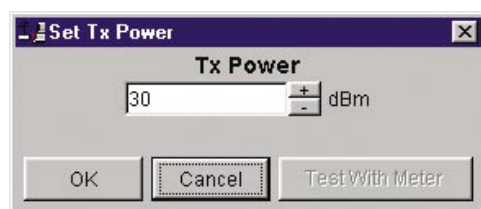

Transmitter

The transmitter can be configured for transmit frequency and power level.

Frequency

The required transmit frequency in MHz can be entered in the display field. The programmer checks that the selected frequency is in the range for the particular model of radio and provides warnings if not.

Power Adjust

The currently selected transmit power is displayed below the button in dBm. The power level can be adjusted by selecting this button which displays a dialogue box. The up/down keys, or a typed in value, can be used to select the required power level in dBm steps.

There are two methods for setting the power.

• Using Factory Calibration

To use the factory calibration of the radio the desired power is set immediately using the OK button in the dialogue box. This method permits the transmit power to be set without energising the transmitter. Note that although the transmit power has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after a power on reset.

• Using a Power Meter

To overcome manufacturing variations in the power setting a more accurate setting of power can be achieved by the selecting the "Test With Meter" button in the dialogue box. This displays another dialogue box warning the user that the transmitter is about to be energised and that the power meter used should be able to handle at least 10 Watts from the modem.

Selecting OK in this warning dialogue box will energise the transmitter which will also be indicated by the red transmit LED on the unit. The power is adjusted using the up/down keys until the required power level is obtained. Selecting OK will retain the power setting and turn the transmitter off.

Note: Although the transmit power has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after the modem is rebooted.

Selecting "stop test" will stop and leave you in power adjust box. "Cancel" will stop test and take you back to the main window.

Receiver

The receiver can be configured for receive frequency and mute level.

Frequency

The required receive frequency in MHz can be entered in the display field. The programmer checks that the selected frequency is in the range for the particular model of radio and provides warnings if not.

Mute Adjust

The currently selected mute level is displayed in the main window below the button in dBm. The mute level can be adjusted by selecting this button which displays a dialogue box. The up/down
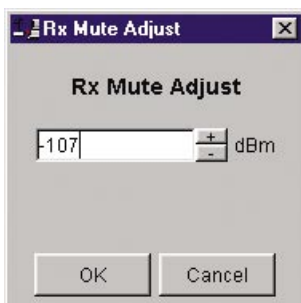
keys, or a typed in value, can be used to select the required mute level in dBm steps. Whilst a session is in progress with a unit the mute level adjustment is live. Selecting OK will retain the mute level setting. Note that although the mute level has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after the modem is rebooted.

Whilst the modem is capable of receiving extremely weak radio signals, and successfully extracting the data content from the waveforms the mute level should be set to assist the modem in filtering out unwanted signals. Unwanted signals can be the result of background noise or interference. The mute level should be set at a level above these unwanted signals and at a level low enough to detect the wanted signal. Detection of a received signal above the mute level is indicated by the "RxSig" LED on the unit.

Setting of a correct mute level at a base station is critical if collision avoidance is operational in a point to multipoint system. In this situation detection of "noise" instead of a valid transmission from the remote modems will effectively "lock out" all of the remote units from accessing and using the channel.

Due to normal manufacturing variations the actual mute level may vary by several dBm to that selected. If a more accurate adjustment is required an unmodulated signal of the correct frequency and desired threshold level can be applied to the radio modem's antenna connector.

Modulation

The radio modem utilises a DSP to control the modulation of transmit signals and de-modulation of received signals. This provides greater flexibility in the ability of the radio modem to support new modulation schemes whilst maintaining compatibility with existing modulation schemes.
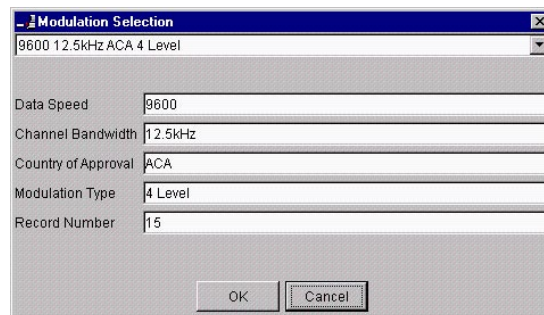
The currently selected modulation scheme is displayed in the main window below the select button. The modulation scheme can be adjusted by selecting this button which displays a dialogue box. The desired modulation scheme can then be selected from the pull-down menu in the dialogue box and retained using the OK button.

In the case of 12.5kHz channel radio modems the presently

In the case of 25kHz channel radio modems the presently supported modulation schemes include:

• 19200 25kHz ACA E Series. This is a new 19200bps modulation scheme available in E-Series products which supports a significantly reduced delay between detection of a valid RF carrier signal and demodulation of user data.

• 9600 25kHz ACA D Series. This is a current 9600bps modulation scheme used in the D Series products to provide backward compatibility.

Tx/Rx (Frequency) Trim

The currently selected frequency trim, which is common to both transmitter and receiver, is displayed in the main window below the button in Hz. The frequency trim can be adjusted live by selecting this button which displays a dialogue box. The up/down keys can be used to select the required frequency offset in steps pre-determined by the radio modem. Selecting OK will retain the frequency trim setting. Note that although the frequency trim has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after the modem is rebooted.
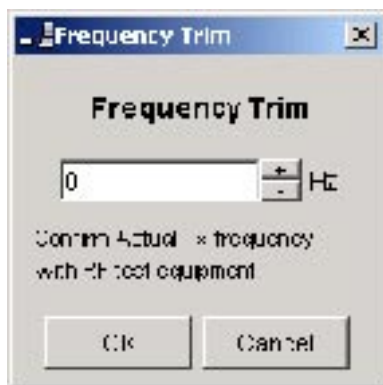
This facility permits correction for drifts in the frequency reference caused by component aging. For example, a standard crystal may vary in fundamental frequency operation over 1 year by one part per million. An adjustment range of ± 10ppm, displayed in Hz, has been allowed for and if this is insufficient the unit should be returned to the dealer/factory for re-calibration.

Advanced

This button permits setting of advanced features. When selected a dialogue box appears which permits configuration of the type of received data clock alignment method.
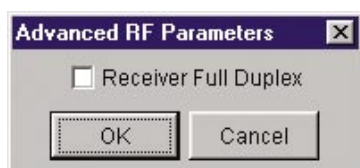
In the case of full duplex units the receiver is always active and is not interrupted by transmissions from the unit as would be the case for half duplex units. In this situation it is not necessary, or desirable in the case of a base station, for the recovered data clock alignment to be remembered between bursts of received signals. In this situation the "Receiver Full Duplex" check box to the left should be selected.

Note: For half duplex units the "Receiver Full Duplex" check box

System Parameters

This section of the main window configures the PTT control, collision avoidance, stream setup for routing of data, advanced features and provides unit information.

PTT (Press To Talk) Control

RF transmission can be configured to occur permanently, automatically on data received at Port A or Port B, or RTS being asserted on Port A or Port B. A PTT timeout facility can be configured to limit the period for which the transmitter is enabled. Each option is selected by setting the control to the left of the description on the main window. When PTT is active the "Tx" LED on the unit is illuminated and RF power is being fed to the antenna.

Permanent Tx

This will cause the transmitter to be permanently enabled (keyed) and displays another dialogue box warning the user that the transmitter will be energised immediately after the configuration is written to the unit. Selecting OK confirms this setting. The other PTT selections are disabled when this option is selected.

Note: This option is only available for full duplex units when being programmed locally.

Auto On Data

This will cause the transmitter to be enabled (keyed) automatically on data received at Port A or Port B and included in a complete frame for transmission over the radio channel. The maximum period for which the transmitter will be enabled is limited by the PTT timeout setting.

From Port A RTS

This will cause the transmitter to be enabled (keyed) on Port A RTS being asserted. The maximum period for which the transmitter will be enabled is limited by the PTT timeout setting. Applications which rely on establishing a link ahead of data being transferred require this method of activation.

From Port B RTS

This will cause the transmitter to be enabled (keyed) on Port B RTS being asserted. The maximum period for which the transmitter will be enabled is limited by the PTT timeout setting. Applications which rely on establishing a link ahead of data being transferred

require this method of activation.

PTT Timeout

The PTT timeout facility is used to disable the transmitter if it exceeds the designated time. The timeout value can range from 1 to 255 seconds and the facility is disabled by setting a zero value.

The timeout value chosen for this should be set according to system requirements which may include:

• Prevention of a remote unit remaining keyed up and locking out all other remote units in a point to multipoint system.

• Limiting the period a remote unit remains keyed up to prevent battery drain in a low power application.

Note: If a PTT timeout occurs before completion of a data transmission data will be lost.

Stream Setup

This button brings up a dialogue box to permit editing of Stream IDentifier (SID) codes which are used by the modem as the addressing mechanism for data stream routing. A SID code can be placed at the start of each data frame as it is sent over the radio channel. The receiving modems use this code to determine how to route the data message. The modem supports simultaneous operation of both Port "A" and Port "B" over the one radio link, along with the inclusion of a diagnostics data stream.

Each port is independent and supports multiple options which are described in the following sections.

The following diagram illustrates the structure of the stream routing function for each data port.

User Port

This option is selected by clicking on the User Port button and filling in the RXSID and TXSID fields to the right. The radio comes preconfigured with default values.

In User Port mode all SID code operations are performed transparently to the user data. Data placed into a user port which has been assigned a specified SID code, will only be received by a modem at the other end of the radio link that has a user port assigned with the same SID code. The SID code is added by the radio modem to the user data stream and removed by the radio modem when user data is outputted to a data port.

In this way, Port "A" and Port "B" can be assigned different SID codes, thereby separating the data streams.

Two SID codes values are available for each user port RXSID and TXSID. The RXSID codes apply to the data being received by the modem, and the TXSID codes apply to the data being transmitted by the modem. This allows for different transmit and receive codes if required, but generally they would be both the same.

A situation where Tx and Rx SID codes may be different is in a repeater configuration. In this type of application all data messages sent to the repeater will be "repeated". Thus by having different Tx and Rx codes, a control unit will not "hear" its own transmission, and remotes will not hear the reply from any other remote. For more information please consult the Trio E Series training material available as a power point slide from our website at www.trio.com.au

The diagnostics facility (when installed) also uses SID codes. The diagnostics data simply uses a different data stream to the user data, but is processed internally by the modem. If access to the diagnostics facility is required, similar to when the diagnostics utility is used with the modem, then the data port concerned and the diagnostics stream, must have the same SID codes assigned to them. Alternatively the System port can be used, which is 19.2K, Slip.

Trunk Streams

In the Trunk Streams mode, data that is inputted into the modem for transmission must have a SID code appended to the start of the data packet. This mode requires the use of a "SLIP" interface as configured using the packet layer.

Trunk Steam mode is normally used in conjunction with Trio Diagnostics software, when connection to a MSR Stream Router or when connecting radios together such as a back-to-back connections as used in multiple point to point links.

In Trunk Stream mode a range of SID codes can be transmitted and received via a data port. This range is specified when this mode is selected. In a typical application, such as a back to back connection as used in a multiple point to point links, where all data (including diagnostics) from one radio needs to be "trunked" through to the other radio, the range used is 0 to 255. Trunked mode allows a configurable selection of data streams to be "trunked" to other equipment yet the data remains separated as the SID codes are appended to each packet of data outputted.
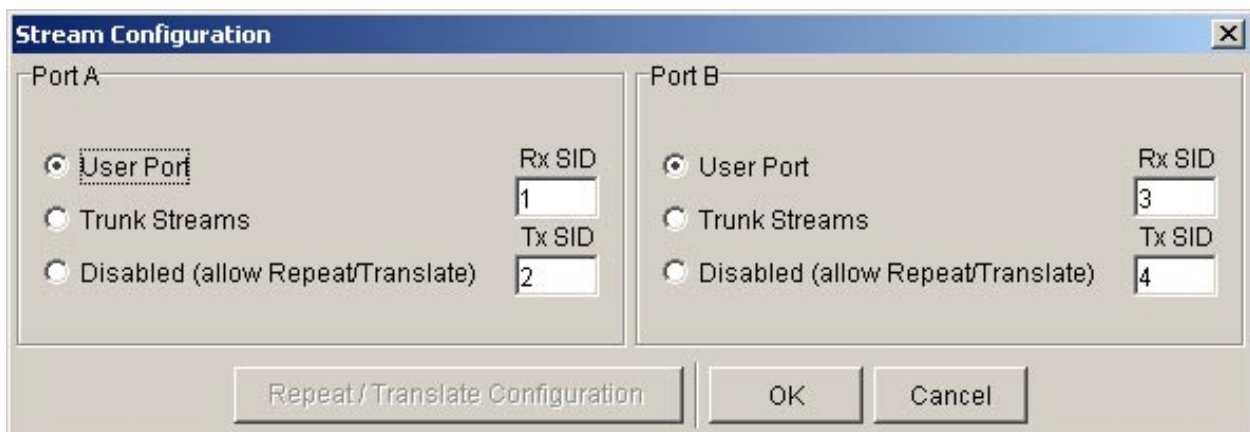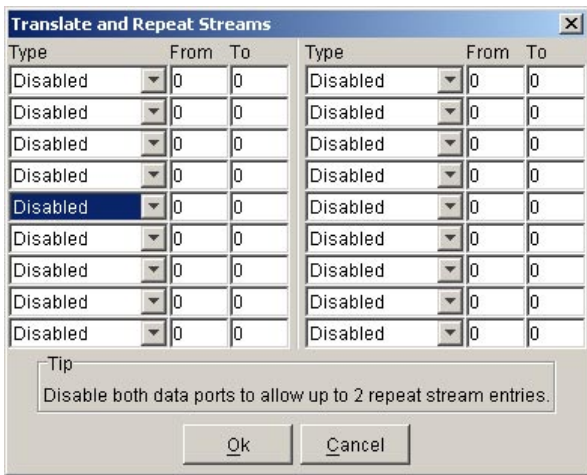
Repeat/Translate Configuration

The modem is capable of operating in a repeater mode. Each user port can be configured as a separate repeater. The associated user ports are effectively disconnected from the "outside world" when in repeater mode. Data received from the radio channel is passed directly to the transmitter, and placed back onto the radio channel. This feature requires a firmware revision of R2.12.1 or later.

The repeater must receive a complete frame of data before it is retransmitted. In some systems this store and forward delay may be significant, and careful selection of maximum frame sizes configured at the source unit must be considered to minimise the delay.

To enable the mode select "Repeat Range" in the Type field and specify the range of SID codes for which will be repeated.

Translate Streams

This function is similar to repeat streams however it also translates the SID code from one value to another as the repeating function occurs.

This mode can be used to uncontrolled data repeating in system where more than one repeater is required, such as store and forward systems or pipe-lines.
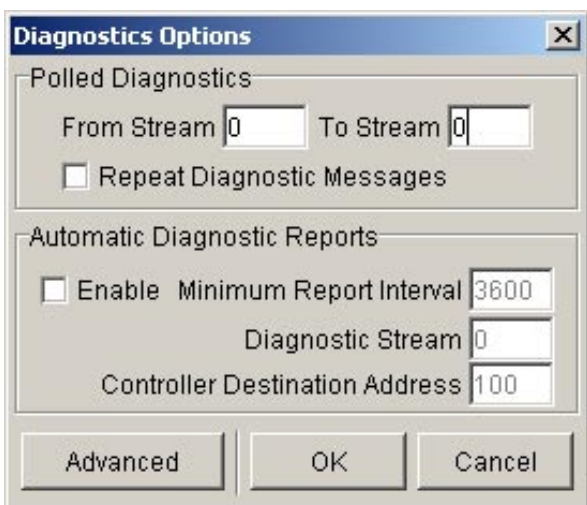
Diagnostics

Polled Diagnostics

The Diagnostics Processor can be configured to listen for diagnostics on a range of SID codes. The factory default is SID code 0 (From Stream 0 To Stream 0). The diagnostics responses are sent back over the same stream as the questions.

Diagnostics Repeat

This option can be toggled on and off by clicking the button. Some applications will require that a repeater unit in a point to multipoint system repeats diagnostics frames only.

This will be the case when the system diagnostics controller is connected to a remote unit in the system, and it polls the system population from this point. The master unit must retransmit any diagnostic frames that are not addressed to itself onto the remainder of the population.

Automatic Diagnostic Reports

This option allows the configuration of automatic diagnostics. This feature requires a firmware revision of R2.12.1 or later. This option automatically appends diagnostics messages when user data is transmitted. This option can be toggled on and off by clicking the "Enable" button.

Minimum Report Interval : Specifies the amount of time before a diagnostics message is appended to the next user data message.

Diagnostic Stream: Specifies the SID code used for the automatic diagnostics message.

Controller Destination Address: Specifies the address of the Diagnostics Controller Software that is receiving the automatic messages and displaying them. This value must match that specified in the TVIEW diagnostics software configuration.

Advanced

The Advanced button can be used to install diagnostics into the E Series radio if it was not purchased with the original order. Enter the 8 digit key-code supplied by Trio to enable diagnostics. If diagnostics is already installed this option will be "greyed out".

Collision Avoidance

In a point to multipoint system the master unit (usually a base station) can transmit at any time and the remotes will all receive the broadcast signal. However, if more than one remote unit transmits at a time, then a collision will occur during the multiple transmissions, resulting in a loss of data from one or more units.

Two collision avoidance mechanisms have been included in the modem. The standard (Digital) method utilises a signalling channel which is embedded in overhead data transmitted over the radio channel. The second method utilises detection of a carrier signal to
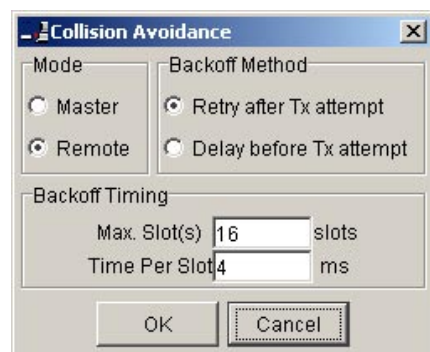
postpone transmission of data. Both methods require configuration of several options for successful operation.

The desired option for collision avoidance is selected by checking the control button to the left of the description on the main window.

None

When selected this turns off all collision avoidance mechanisms. This should only be used in point to point applications.

Digital

This is the standard method of collision avoidance and utilises a channel busy indication bit in the signalling channel transmitted to all remotes for control. When selected a dialogue box appears and several options must be configured:

- Mode – "Master" or "Remote". When the master unit receives a valid transmission from a remote unit it sets the channel busy indication bit. This busy bit is interpreted by the other remotes to not transmit. Once the transmission from the first remote ends the master unit resets the busy bit to indicate the channel is now clear to transmit on. The master unit, which is normally a base station, takes about 5ms to detect a transmission from a remote unit and set the channel busy indication bit on the radio channel. During this period collision of remote transmissions can still occur and is unavoidable.
  Note: The master must be permanently keyed.

- Backoff Method – "Retry after Tx Attempt" or "Delay before Tx Attempt". The method chosen is system dependent and can only be configured if the mode is "remote". The former is best used when data responses from remotes are largely asynchronous. The latter is best used when this is not the case.

- Backoff Timing – "Maximum Slots", "Time per Slot". This can only be configured if the mode is "remote". When a remote is ready to transmit data but it finds the busy bit from the master set it holds back its transmission for a random "backoff" time after which it tries to transmit data again. This ensures that modems waiting to be allowed to transmit do not re-attempt to do so at the same time. The "Maximum Slots" (1 to 16) and the "Time per Slot" (1 to 255ms) are used to calculate the backoff time by multiplying the slot time by a random number between 1 and the maximum slot number. For example if the time per slot is 30ms and the maximum slots is 4, the random backoff times can be 30, 60, 90 or 120ms.

As the channel busy indication bit is critical for reliable operation default interpretation of this bit is defined in the remote units. If the master modem stops transmission (or has not yet started) the remote will interpret that the channel is busy and will not transmit until the master comes on line.

Carrier Detect

This method of collision avoidance utilises a carrier transmitted to all remotes to indicate that the radio channel is busy. When selected a dialogue box appears and several options must be configured:

- Mode – "Master" or "Remote". When the master unit receives a valid transmission from a remote unit it transmits a carrier signal to indicate busy. Of course the master will also initiate a transmission if it has data to send. The transmitted carrier is interpreted by the other remotes to not transmit. Once the transmission from the first remote ends the master unit stops transmission to indicate the channel is now clear to transmit on. The master unit, which is normally a base station, takes about 5ms to detect a transmission from a remote unit and transmit a carrier signal. During this period collision of remote transmissions can still occur and is unavoidable.

  Note: The master can only be a full duplex unit and cannot be permanently transmitting. For half duplex and simplex systems all units should be set as "Remote" (no Master).

- Backoff Timing – "Maximum Slots", "Time per Slot". This can only be configured if the mode is "remote". When a remote is ready to transmit data but it detects a carrier signal from the master set it holds back its transmission for a random "backoff" time after which it tries to transmit data again. This ensures that modems waiting to be allowed to transmit do not re-attempt to do so at the same time. The "Maximum Slots" (1 to 16) and the "Time per Slot" (1 to 255ms) are used to calculate the backoff time by multiplying the slot time by a random number between 1 and the maximum slot number. For example if the time per slot is 30ms and the maximum slots is 4, the random backoff times can be 30, 60, 90 or 120ms.
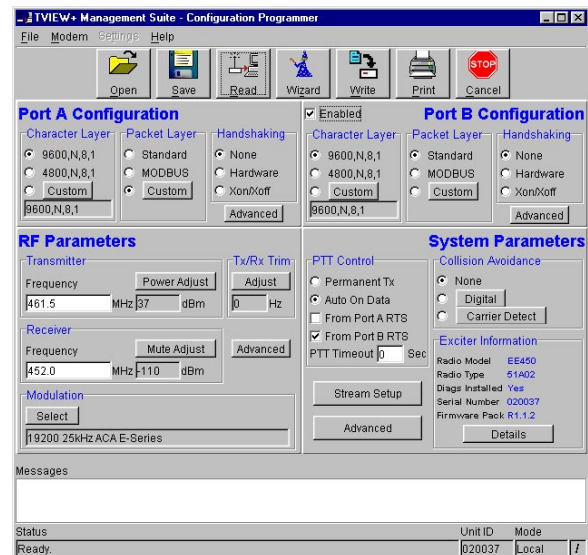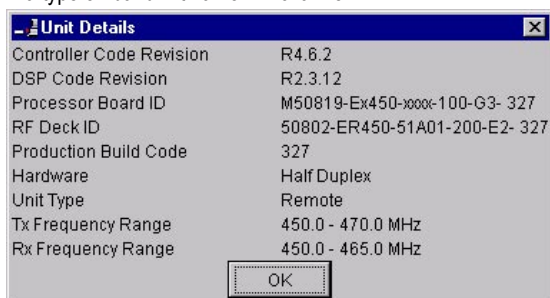
Unit Information

The information displayed is intended to assist the user to identify the radio modem as well as support should their services be needed.

> Radio Model refers to the type of unit. The ER450 is a remote unit and the EE450 is a exciter inside a base station unit.

> Radio Type refers to the frequency band supported by the radio as well as the channel bandwidth. For example 51A02 is a type 51 band with a 25kHz channel.

Unit Information - Details

More detailed information is also available to assist in identifying components installed in the unit (remote, base station or hot standby).

The additional information provided is:

• Controller Rev refers to the microcontroller firmware component version for the radio.

• DSP Code Rev refers to the DSP firmware component version for the radio.

• Processor Board ID refers to the processor board identification number and hardware revision information for the radio.

• RF Deck ID refers to the RF deck board identification number and hardware revision information inside the radio.

• Production Build Code refers to the automated production test and calibration sequence used during manufacture of the radio.

• Hardware indicates whether the radio is half or full duplex.

• Unit Type indicates whether the unit is recognised as a remote or base station.

• Tx and RX Frequency Range indicates the frequency range for which the radio is capable of being operated in.

In the case of a base station unit the following additional information is provided:

• Base Firmware Pack refers to the firmware package version installed in the base station (front panel) controller which is separate to the radio installed. There are several components associated with this firmware package and a

Messages

The message window provides a log of error messages occurring during use of the programmer utility. Several error messages may occur as a result of a selection.

Status Bar

The status bar is located at the bottom of the main window and provides information regarding communication actions occurring with the radio data modem.

Additional fields located on the status bar include:

• Unit ID refers to the identification label used by the diagnostics utility. This is currently the same as the unit's serial number.

• Mode refers to the type of session established. It can be a File, Local indicating a local port connection to the unit or Remote indicating communications is via a radio channel.

• Rotating bar progress indicator showing data is being transferred to or received from a unit.

Appendix A - Firmware Updates

Radio or Base Station Exciter Firmware Update

Firmware update is performed on a unit connected locally to the PC. It is recommended that all cabling to the unit be disconnected prior to commencing firmware update to minimise any interruption to the process or disturbances of signals on cables still connected. All other TVIEW+ Management Suite utilities should also be exited during the firmware update process. The steps to update the firmware as follows:

1. Start the firmware update utility from the TView+ front panel.

2. Disconnect power from the unit by turning off the power supply or removing the power connector to the unit.

3. Connect the serial cable from the PC to Port B on the unit

4. Select the unit type from the options on the top right of the firmware update main window. Please note that "Exciter" refers to the radio contained inside the base station.

    Note: Firmware update to base station exciter will result in fatal error display and fan on whilst in this mode.

5. Select the file containing the firmware update package using the "Select" button at the bottom of the main window. After opening the file the browse window will close and a description of the firmware package will appear in the main window.

6. Initiate the firmware update process using the "Write"
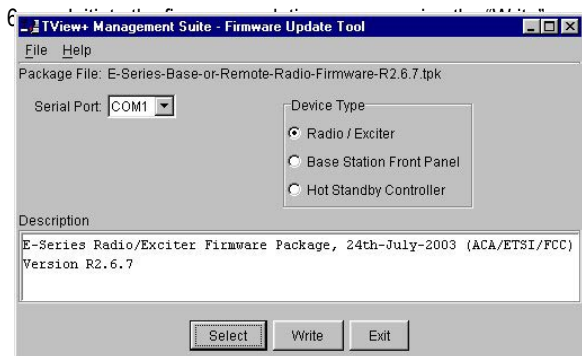
button at the bottom of the main window. Another logging window will appear.

7. Reconnect power to the unit when prompted in the logging window. The status LEDs on the unit including power should all be extinguished and the transfer of firmware should commence. If this does not occur steps 6 & 7 should be repeated.

    Note: Remote radio status LED's including power will all be off.

8. The logging window will display the progress of each firmware block transferred and when complete a success dialogue box appears. Type OK to close this dialogue box

Base Station Display Firmware Update

Installation Instructions:

1. Update of the front panel firmware uses the firmware update utility supplied with the TVIEW+ Management Suite.

2. Start the firmware update utility from the TVIEW+ front panel.

3. In the firmware update utility select device type as "Base Station Front Panel"

4. Select the file containing the firmware update package using the "select" button at the bottom of the main window. After opening the file the browse window will close and a
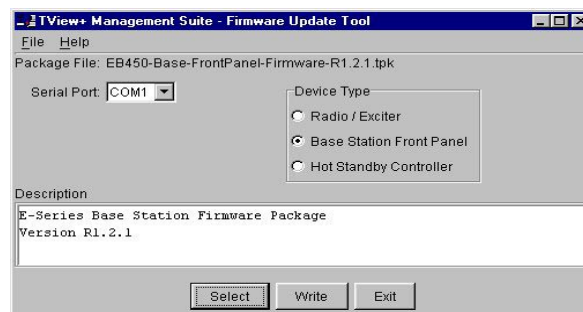

description of the firmware package will appear in the main window.

5. Ensure that the base station is powered.

6. Connect the "TVIEW+ cable" to the front or rear system port of the base station.

7. On the base station front panel depress and hold the "Display On/Off" button, then momentarily depress the firmware update switch using a suitable probe before releasing the "Display On/Off" button. The firmware update switch is located behind the small hole (not labelled) in the front panel below the "Display On/Off" button.

    Note: Display Status LEDs will be lit in this Mode.

8. Initiate the firmware update process using the "Write" button
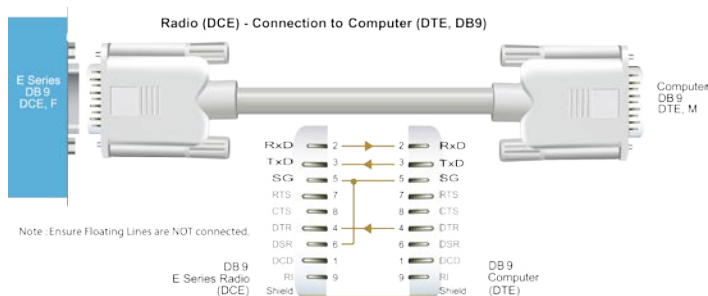
9.   The logging window will display the progress of each firmware block transferred and when complete a success dialogue box appears. Click OK to close this dialogue box and click "Exit" in the main window to exit the firmware update utility.

Note: If a mismatch occurs between selected file and device type, an error message will appear.

Hot Standby Controller Firmware Update

Installation Instructions:

1.   Update of the hot standby firmware uses the firmware update utility supplied with the TVIEW+ Management Suite.

2.   Start the firmware update utility from the TVIEW+ front panel.

3.   In the firmware update utility select device type as "Hot Standby Controller".

4.   Select the file containing the firmware update package using the "select" button at the bottom of the main window. After opening the file the browse window will close and a
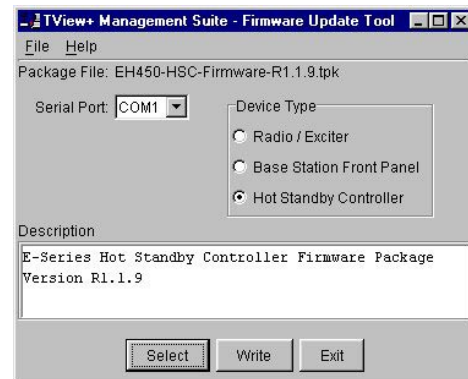
5.   Ensure that the hot standby controller is powered.

6.   Connect the "TVIEW+ cable" to the front or rear system port of the hot standby controller.

7.   On the hot standby controller front panel depress and hold the "Reset Alarms" button, then momentarily depress the firmware update switch using a suitable probe before releasing the "Display On/Off" button. The firmware update switch is located behind the small hole (not labelled) in the front panel to left of "Reset Alarm" button.

Note: The two LEDs either side of the "Select" switch will be lit green in this mode.

8.   Initiate the firmware update process using the "Write" button at the bottom of the main window. Another logging window will appear.

9.   The logging window will display the progress of each firmware block transferred and when complete a success dialogue box appears. Click OK to close this dialogue box and click "Exit" in the main window to exit the firmware update utility.

Note: If a mismatch occurs between selected file and device type, an error message will appear.

Part J – Specifications

Remote Data Radio - ER450
E Series

Radio

Frequency Range: 330-520 MHz (various sub-frequency bands available)

Frequency Splits: Various Tx/Rx frequency splits - programmable

Channel Selection: Dual synthesizer, 6.25 kHz channel step

Channel Spacing: 12.5 or 25 kHz

Frequency Accuracy: 1ppm (-30 to +60C) (-22 to 140F) ambient

Aging: <= 1ppm/annum

Operational Modes: Simplex, Half duplex or Full duplex*

Configuration: All configuration via Windows based software

Compliances:

ETSI	EN300113, EN301489, EN60950
FCC	PART 15, PART 90
IC	RS119, ICES-001
ACA	AS4295-1995 (Data)
CSA	Class I, Division II, Groups (A,B,C,D) for Hazardous Locations (ANSI/UL equivalent)

Transmitter

Tx Power: 0.05 - 5W (+37 dBm) 1 dB User configurable with over-temperature and reverse power protection

Modulation: User configurable narrow band digitally filtered binary GMSK or 4 level FSK

Tx Keyup Time: <1mS

Timeout Timer: Programmable 0-255 seconds

Tx Spurious: <= -37 dBm

PTT Control: Auto (Data) / RTS line (Port A or B) / System Port Override

Receiver

Sensitivity: -118 dBm for 12 dB SINAD

Selectivity: Better than 60 dB

Intermodulation: Better than 70 dB

Spurious Response: Better than 70 dB

AFC Tracking: Digital receiver frequency tracking

Mute: Programmable digital mute

Diagnostics (Optional)

Network wide operation from any remote terminal.

Non intrusive protocol - runs simultaneously with the application.

Over-the-air re-configuration of user parameters.

Storage of data error and channel occupancy statistics.

In-built Error Rate testing capabilities.

Connections

User Data Ports: 2 x DB9 female ports wired as DCE (modem)

System Port: RJ45 for diagnostic, configuration and re-programming

Antenna: N female bulkhead. Separate N (Tx) and SMA (Rx) connectors for full duplex.*

Power: 2 pin locking, mating connector supplied

LED Display: Multimode Indicators for Pwr, Tx, Rx, Sync, TxD and RxD data LEDs (for both port A and B)

Modem

Data Serial Port A: RS232, DCE, 600-76,800 bps asynchronous

Data Serial Port B: RS232, DCE, 300-38,400 bps asynchronous

System Port: RS232, 19,200 bps asynchronous

Flow Control: Selectable hardware / software / 3 wire interface

RF Channel Data Rate: 4800/9600/19,200 bps Half / Full duplex*

Data Buffer: 16 kbyte of on-board RAM

Bit Error Rate:
< 1x10^{-6} @ -110 dBm (4800 bps)
< 1x10^{-6} @ -108 dBm (9600 bps)
< 1x10^{-6} @ -106 dBm (19,200 bps)

Collision Avoidance: Trio DataCom's unique supervisory channel C/DSMA collision avoidance system

Multistream™: Trio DataCom unique simultaneous delivery of multiple data streams (protocols)

Data Turnaround Time: <10mS

Firmware: Field upgradeable Flash memory

General

Power Supply: 13.8 Vdc nominal (10-16 Vdc)

Transmit Current: 750 mA nom. @ 1 W 1600 mA nom. @5 W

Receive Current: <125 mA nom

Sleep Mode: External control, < 1 mA

Dimensions: Rugged Diecast Enclosure
170 x 150 x 42mm
6.7 x 5.9 x 1.65 inches
With Mounting Plate
190 x 150 x 47mm
7.5 x 5.9 x 1.85 inches

Mounting: Fitted Mounting Plate

Weight: 1.27 kg (2.8lbs.)

Options

ERFD450 Full Duplex Operation with separate N (Tx) and SMA (Rx) connectors

DUPLX450BR External Duplexer, Band Reject (for single antenna operation)

EDOVM Digital Order Wire Voice Module

NEMA 4/R Stainless Steel Enclosure (IP65, NEMA 4 rated)

TVIEW+™ Configuration, Network Management and Diagnostic Windows GUI Software

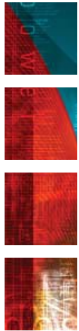**DIAGS/E** Network Management and Remote Diagnostics Facilities per Radio Modem

Related Products

EB450 Base Station

EH450 Hot Standby Base Station

95MSR 6 and 9 Port Stream Router Multiplexer

* With ERFD450 full duplex option plus external duplexer for single antenna operation

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sales@trio.com.au www.trio.com.au

Digital Data Base Station - EB450

E Series

Radio

Frequency Range: 330-520 MHz (various sub-frequency bands available)

Frequency Splits: Various Tx/Rx frequency splits - programmable

Channel Selection: Dual synthesizer, 6.25 kHz channel step

Channel Spacing: 12.5 or 25 kHz

Frequency Accuracy: ±1ppm (-30 to 60°C) (-22 to 140°F) ambient

Aging: <= 1ppm/annum

Operational Modes: Simplex, Full duplex, heading (Optional Internal or external duplexer available for single antenna operation)

Configuration: All configuration via Windows based software

Compliances:
ESTI   EN300 113, EN301 489, EN60950
FCC   PART 15, PART 90
IC   RS119, ICES-001
ACA   AS4295-1995

Transmitter

Tx Power: 5W (+37 dBm) ±1 dB User configurable with over-temperature and reverse power protection

Modulation: User configrable narrow band digitally filtered GMSK or 4 Level FSK

Tx Keyup Time: < 2 mS

Timeout Timer: Programmable 0-255 seconds

Tx Spurious: <= -37 dBm

PTT Control: Auto (on Data) / RTS line (Port A or B) / System Port Override

Receiver

Sensitivity: -118 dBm for 12 dB SINAD

Selectivity: Better than 60 dB

Intermodulation: Better than 70 dB

Spurious Response: Better than 70 dB

AFC Tracking: Digital receiver frequency tracking

Mute: Programmable digital mute

Diagnostics (Optional)

Network wide operation from any remote terminal.

Non intrusive protocol - runs simultaneously with the application.

Over-the-air re-configuration of user parameters.

Storage of data error and channel occupancy statistics.

In-built Error Rate testing capabilities.

Connections

User Data Ports: 2 x DB9 female ports wired as DCE (modem)

System Port: RJ45 (front and rear) for diagnostics, configuration and programming

Antenna:
2 x N female bulkhead (separate Tx and Rx ports)
1 x N female bulkhead (with optional internal duplexer)

Power: 2 pin locking, mating connector supplied

LED Display: Multimode Indicators for Pwr, Tx, Rx, Sync, TxD and RxD data LEDs (for both port A and B)

Modem

Data Serial Port A: RS232, DCE, 600-76,800 bps asynchronous

Data Serial Port B: RS232, DCE, 300-38,400 bps asynchronous

System Port: RS232, 19,200 bps asynchronous

Flow Control: Selectable hardware/software/3 wire interface

RF Channel Data Rate: 4800/9600/19,200 bps Full duplex

Data Buffer: 16 kbyte of on-board RAM

Bit Error Rate:
< 1×10^{-6} @ -110 dBm (4800 bps)
< 1×10^{-6} @ -108 dBm (9600 bps)
< 1×10^{-6} @ -106 dBm (19,200 bps)

Collision Avoidance: Trio DataCom's unique supervisory channel C/DSMA collision avoidance system

Multistream™: Trio DataCom's unique simultaneous delivery of multiple data streams (protocols)

Data Turnaround Time: <10mS

Firmware: Field upgradeable Flash memory

General

Power Supply: 13.8 Vdc nominal (11-16 Vdc)

Transmit Current:
1.3 A nominal @ 1 W
2.5 A nominal @ 5 W

Receive Current: < 350 mA

Dimensions: 19" 2 RU rack mount 485 x 90 x 420 mm (Including heatsink) 19 x 3.5 x 16.5 inches

Weight: 5kg (11 lbs) (excluding optional duplexer)

Digital I/O:
2 Inputs monitered by TVIEW+ Diagnostics Software
2 Outputs user configurable by TVIEW+ Diagnostics Software

Options

DUPLX450Bx Internal / External Duplexers, Band Reject and Band Pass

EDOVM Digital Order Wire Voice Module

TVIEW+™ Configuration, Network Management and Diagnostic Windows GUI Software

DIAGS/E Network Management and Remote Diagnostics Facilities per Radio Modem

Related Products

EH450 Hot Standby Base Station

ER450 Remote Data Radio

95MSR 6 and 9 Port Stream Router Multiplexer

Digital Hot Standby Base - EH450

E Series

Radio

Frequency Range: 330-520 MHz (various sub-frequency bands available)

Frequency Splits: Various Tx/Rx frequency splits - programmable

Channel Selection: Dual synthesizer, 6.25 kHz channel step

Channel Spacing: 12.5 or 25 kHz

Frequency Accuracy: ±1ppm (-30 to 60°C) (-22 to 140°F) ambient

Aging: <= 1ppm/annum

Operational Modes: Simplex, Full duplex (optional internal or external duplexer available for single antenna operation)

Configuration: All configuration via Windows based software

Compliances:

ETSI	EN300 113, EN301 489, EN60950
FCC	PART 15, PART 90
IC	RS119, ICES-001
ACA	AS4295-1995

Transmitter

Tx Power: 5W (+37 dBm) ±1 dB User configurable with over-temperature and reverse power protection

Modulation: User configurable narrow band digitally filtered GMSK or 4 Level FSK

Tx Keyup Time: < 2 mS

Timeout Timer: Programmable 0-255 seconds

Tx Spurious: <= -37 dBm

PTT Control: Auto (on Data) / RTS line (Port A or B) / System Port Override

Receiver

Sensitivity: -118 dBm for 12 dB SINAD

Selectivity: Better than 60 dB

Intermodulation: Better than 70 dB

Spurious Response: Better than 70 dB

AFC Tracking: Digital receiver frequency tracking

Mute: Programmable digital mute

Diagnostics (Optional)

Network wide operation from any remote terminal.

Non intrusive protocol - runs simultaneously with the application.

Over-the-air re-configuration of all parameters.

Storage of data error and channel occupancy statistics.

In-built Error Rate testing capabilities.

Connections

NOTE: Various duplicated configurations available.

User Data Ports: 2 x DB9 female ports wired as DCE (modem)

System Port: RJ45 (front and rear) for diagnostics, configuration and programming

Antenna:
2 x N female bulkhead (separate Tx and Rx ports)
1 x N female bulkhead (with optional internal duplexer)

Power: 2 pin locking, mating connector(s) supplied

LED Display: Multimode Indicators for Pwr, Tx, Rx, Sync, TxD and RxD data LEDs (for both port A and B)

Modem

Data Serial Port A: RS232, DCE, 600-76,800 bps asynchronous

Data Serial Port B: RS232, DCE, 300-38,400 bps asynchronous

System Port: RS232, 19,200 bps asynchronous

Flow Control: Selectable hardware/software/3 wire interface

RF Channel Data Rate: 4800/9600/19,200 bps Full duplex

Data Buffer: 16 kbyte of on-board RAM

Bit Error Rate:

$< 1 \times 10^{-6}$ @ -110 dBm (4800 bps)
$< 1 \times 10^{-6}$ @ -108 dBm (9600 bps)
$< 1 \times 10^{-6}$ @ -106 dBm (19,200 bps)

Collision Avoidance: Trio DataCom's unique supervisory channel C/DSMA collision avoidance system

Multistream™: Trio DataCom's unique simultaneous delivery of multiple data streams (protocols)

Data turnaround: <10mS

Firmware: Field upgradeable Flash memory

Hot Standby Controller (HSC)
Features: Alarm indications, manual / auto changeover control, continuous monitoring of Tx power, RSSI, frequency offset, recovered data, power supply, and diagnostic commands from each base.

General

Power Supply: 13.8 Vdc nominal (11-16 Vdc)

Transmit Current:
2.0 A nominal @ 1 W
3.2 A nominal @ 5 W

Receive Current: < 1000 mA

Dimensions: 19" 5 RU rack mount 485 x 225 x 420 mm (Including heatsink) 19 x 8.9 x 16.5 inches

Weight: 12.7 kg (28lbs) (excluding optional duplexer)

Digital I/O (HSC):
TVIEW+ Diagnostics Software to;
- Monitor 2 inputs
- Set 2 outputs

Options

DUPLX450Bx Internal / External Duplexers, Band Reject and Band Pass

EDOVM Digital Order Wire Voice Module

TVIEW+™ Configuration, Network Management and Diagnostic Software

DIAGS/EH Network Management and Remote Diagnostics Facilities

Local regulatory conditions may determine the performance and suitability of individual versions in different countries. It is the responsibility of the buyer to confirm these regulatory conditions. Performance data indicates typical values related to the described unit.

Part K – Support Options

Website Information

The Trio DataCom website support contains links to e-mail and telephone support, technical notes, manuals, software updates.

Please go to **www.trio.com.au/support.htm**.

E-mail Technical Support

E-mail your questions to **support@trio.com.au**.

When e-mailing questions to our support staff, make sure you tell us the exact model number (and serial number if possible) of the Trio equipment you are working with. Include as much detail as possible about the situation, and any tests that you have done which may help us to better understand the issue. If possible, please include your telephone contact information should we wish to further clarify any issues.

Telephone Technical Support

Telephone support is available at our head office telephone number Australia: (+61) 3 9775 0505 during Eastern Australian business hours (9am-5pm).

Contacting the Service Department

The Service department may be contacted by e-mail to **service@trio.com.au** , or by telephone during Eastern Australian business hours.
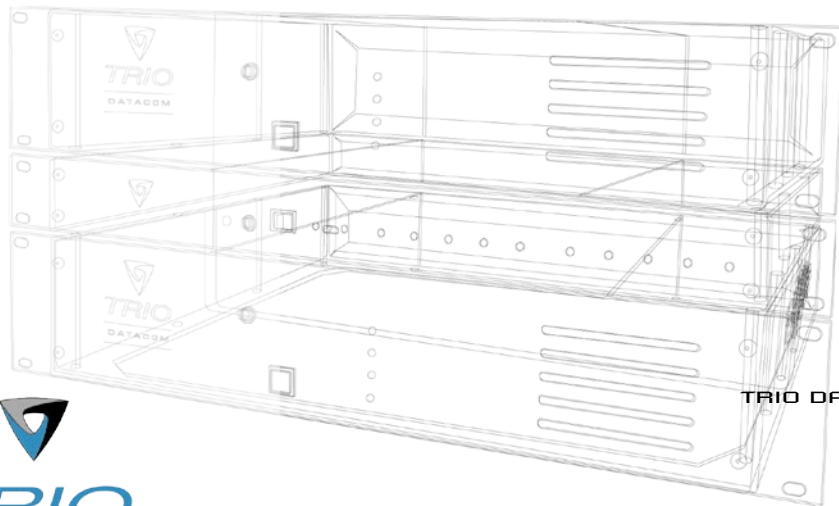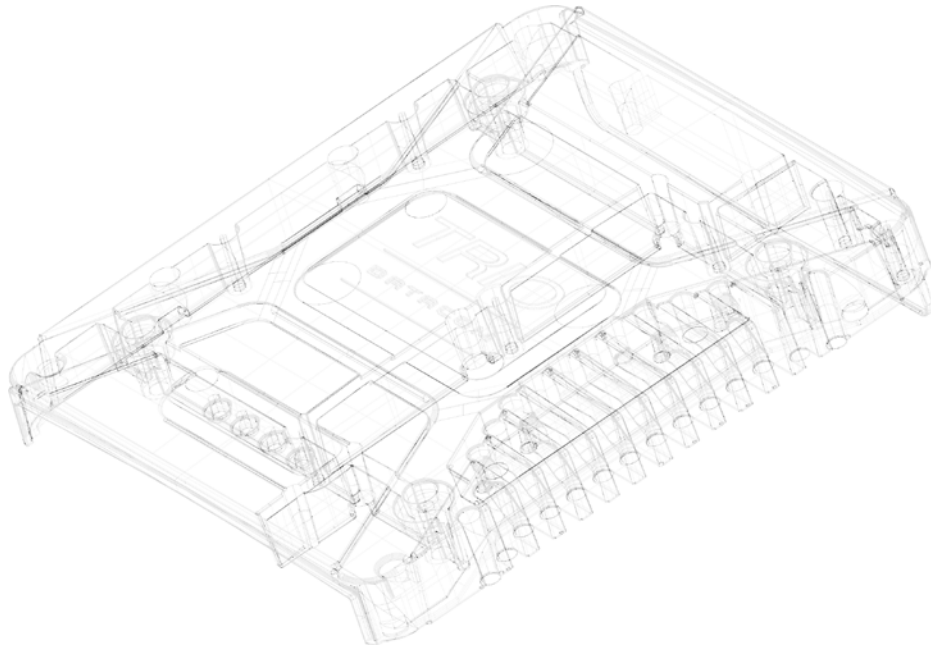
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TRIO
DATACOM

Innovative and sophisticated
digital communications
designs products and solutions