Appendix J: Manual

Please refer to the following pages.

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RFI-148 & RFI-900 HIGH OUTPUT POWER PAGING TRANSMITTERS

USER MANUAL

RFI-148 & RFI-900 High Output Power Paging Transmitters

User Manual

DISCLAIMER

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Contents

1. Introduction

The RFI-148 and RFI-900 are high power output paging transmitters operating in the VHF and UHF band, respectively.

- RFI-148: VHF band operation (138 MHz – 174 MHz) with 2.5 MHz switching bandwidth
- RFI-900: UHF band operation (929 MHz – 932 MHz) with 3 MHz switching bandwidth
- Up to 250 W (54 dBm) maximum transmit power
- Compatible with:
  - POCSAG 512, 1200, 2400 bps (2-level FSK).
  - FLEX 1600 (2-level FSK), 3200 (2- or 4-level FSK), 6400 bps (4-level FSK).
- Windows GUI for configuration and diagnostics over serial or network (Cruise Control).
- SNMP diagnostics.
- TNPP and PET/TAP support (decoder) over serial or network.
- POCSAG encoder with in-built deployment test and modulation self-test feature.
- DSP precision modulation.
- Integrated isolator.
- RF diagnostics port for in-rack receiver.
- Remote firmware update capability.
- Software selectable frequency offset.
- Adjustable absolute delay correction.
- Hardware alarm outputs.
- Front panel indicators for power output and diagnostics.
- High frequency stability and external reference option.

2. Installation

2.1 General Considerations

There are a number of rules to observe when installing a paging transmitter.

Antenna selection is vital to a good RF link. Different antennas are required depending on the application. Please contact your antenna manufacturer or STI Engineering for correct antenna selection.

Antenna placement has a significant impact on RF link performance. In general, higher antenna placement results in a better communication link. A vantage point should be chosen to clear the propagation ellipsoid. An unobstructed, line-of-sight link will always perform better than a cluttered or obstructed link.

Obstructions, such as walls and poles, will distort the antenna radiation pattern and VSWR, resulting in less efficient transmission and reception.

Antennas in close proximity are potential sources of mutual interference. A transmitter can cause overload of a nearby receiver, if due precautions are not taken in antenna location. Moreover, transmitters in close proximity may cause intermodulation. Slight adjustments in antenna placement may help solving interference problems.

All items of radio equipment, such as antennas, are sources of RF radiation. They should thus be placed away from electrical equipment, such as computers, telephones or answering machines.

Serial cable runs between radio modem and attached terminal equipment (eg RTU or PC) should be kept as small as possible. A maximum cable capacitance of 2,400 pF is recommended for transfer rates up to 19.2 kbit/s. If a non-shielded, 30 pF / foot cable is used, the maximum length should be limited to 80 feet (approximately 24m). For higher interface speeds, the length of the serial cable should be shortened.

Long serial cables should also be avoided in areas with frequent lightning activity or static electricity build-up. Nearby lightning strikes or high levels of static electricity may lead to interface failure.

The Ethernet cable from the RFI-148/900250 to the Ethernet switch must be less than 10 metres long.

STI Engineering supplies a range of external data interface converters for applications requiring long cable runs.

2.2 External Antennas

Long antenna feed lines cause RF loss, both in transmission and reception levels, and degrade link performance. When long cable runs are required use a suitable low-loss cable.

As an example, RG58 (tinned-copper braid) will exhibit a loss of 7.1 dB / 30 m at 148 MHz – 174 MHz, whereas RG58 CellFoil will exhibit 3 dB less (4.2 dB / 30 m).

Antennas should not be located within close reach of people, due to radiation hazard. Exposure guidelines should be followed at all times.

Use extreme caution when installing antennas and follow all instructions provided. Because external antennas are subject lightning strikes, STI Engineering recommends protecting all antennas against lighting strike by using lightning surge arrestors.

2.3 Product Installation

The back panel of the AC model paging transmitter is shown below in Figure 1.

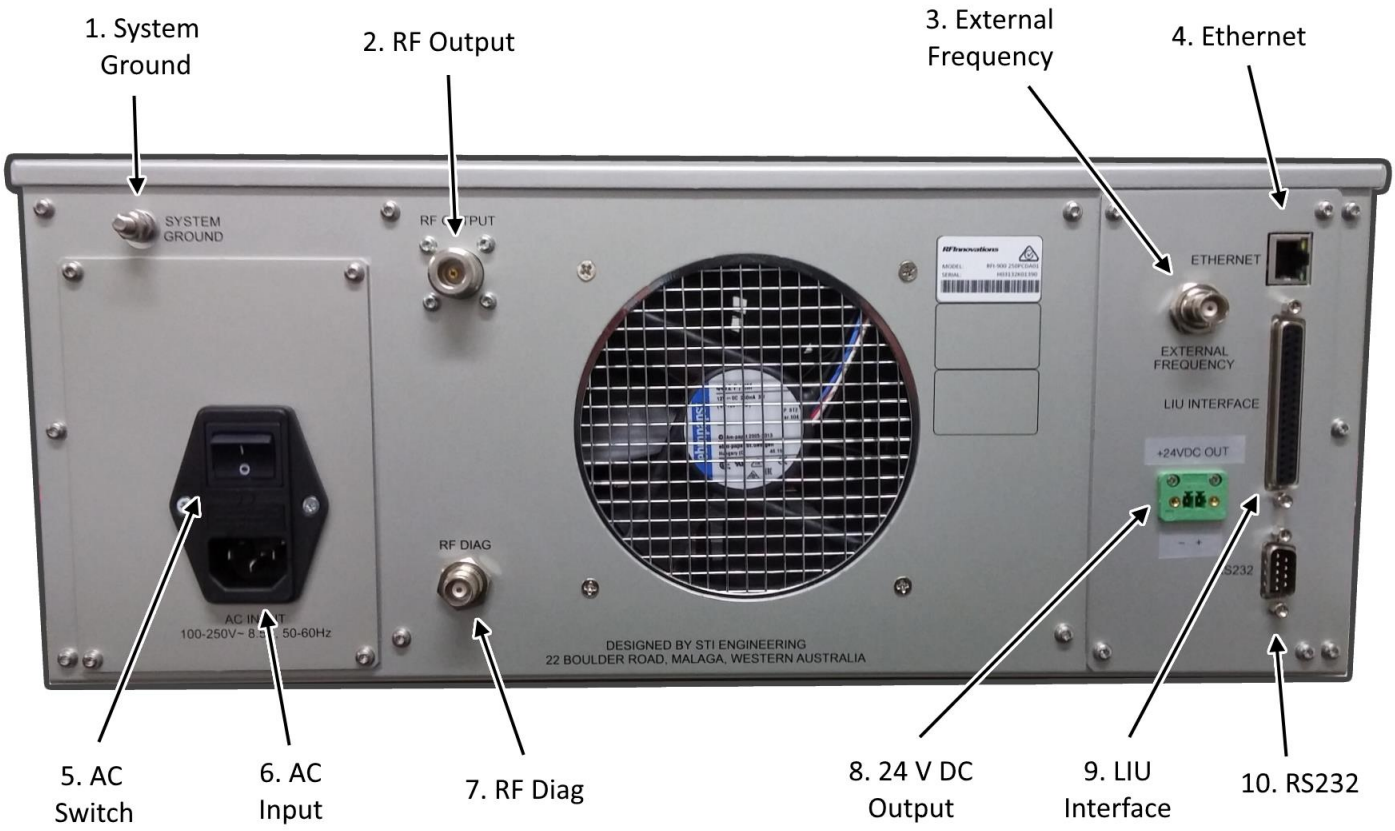

Figure 1: Paging Transmitter Back Panel (AC model shown)

1. ***System Ground:*** External connection for system ground. When connecting a 24 VDC supply the negative line is connected to the system ground. When connecting a -48 VDC supply the positive line is connected to the system ground

2. ***RF Output:*** Modulated RF output from the paging transmitter. N-type female connector.

3. ***External Frequency:*** External reference input for accurate channel synthesis. BNC female connector.

4. ***Ethernet:*** Ethernet connection for configuration and diagnostics over UDP. RJ45 connector. The Ethernet cable from the RFI-148/900250 to the Ethernet switch must be less than 10 metres long.

5. ***AC Switch:*** Power switch.

6. ***Power Supply Input:*** The power supply input is model-specific. The AC input connector is shown in Figure 1.

    a. 24VDC Model: 20 to 31.2 VDC input range for 24 V nominal. Phoenix terminal block connector.

    b. -48VDC Model: -40.5 to -57 VDC input range for -48 V nominal. Phoenix terminal block connector.

    c. 110/240VAC Model: 100 to 250 VAC, 50 to 60 Hz

7. ***RF Diag:*** Sniffer port for diagnostics. TNC female connector.

8. ***24V DC Output (RFI-900 only):*** Enabled via Cruise Control (*Encoder Interface → 24 V DC Output*), the RFI-900 can source up to 2A at 24V to an external load. Phoenix terminal block connector (plug supplied).

9. ***LIU Interface:*** Combined alarm and encoder interface. DC-37 female connector.

10. ***RS-232:*** Rear serial port.

    a. RFI-148: DE-9 male connector (DTE)

    b. RFI-900: DE-9 female connector (DCE).

2.3.1 Installation Guidelines to Ensure Safe Exposure Levels

The following installation guidelines ensure that safe exposure levels to radio frequency radiation are not exceeded:

1. Ensure the unit is switched off, and the mains power supply is unplugged.
2. Properly connect antennas, and RF cabling.
3. Connect other cabling, leaving power cables last.
4. Ensure that the safe distance limits in Table 1 are met before powering and operating the unit, using physical exclusion barriers if necessary.

2.3.2 Typical Installation

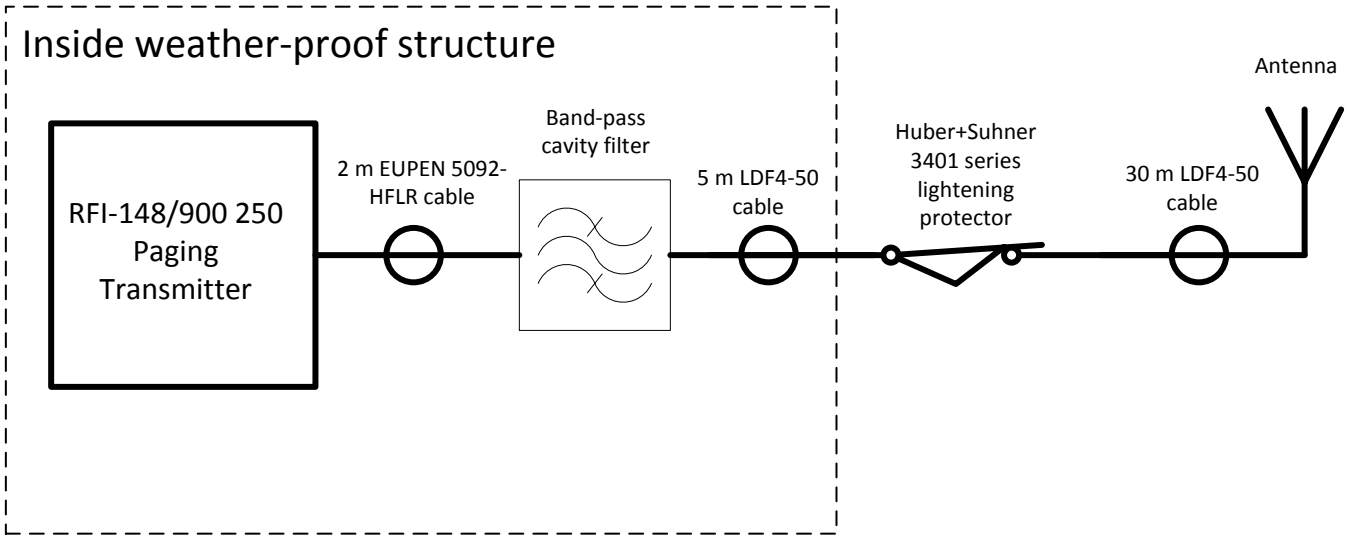

Figure 2: Typical installation components

In a typical installation the RFI-148/900 250 will be housed in a weather-proof structure. Inside the weather-proof structure a 2 m EUPEN 5092-HLFR cable will connect the antenna port of the RFI-148/900 250 to the input of a band-pass cavity filter (CV1417-0111-11 for RFI-148 or CV9296-0511-11 for RFI-900) . A 5 m run of LDF4-50 cable will connect to the output of the band-pass cavity filter, exit the weather-proof structure into the input of a Huber+Suhner 3401 series lightening protector mounted on the outside of the weather-proof structure. A 50 m run of LDF4-50 cable will connect to the output of the Huber+Suhner 3401 series lightening protector, run across to a 30 m antenna tower via a cable tray, then run up the tower to an antenna (COL54 for RFI148 or COL806 for RFI-900) mounted at the top. The installation is completely fenced off and secured with lock and key.

A clear installation will provide optimal radio signal propagation.

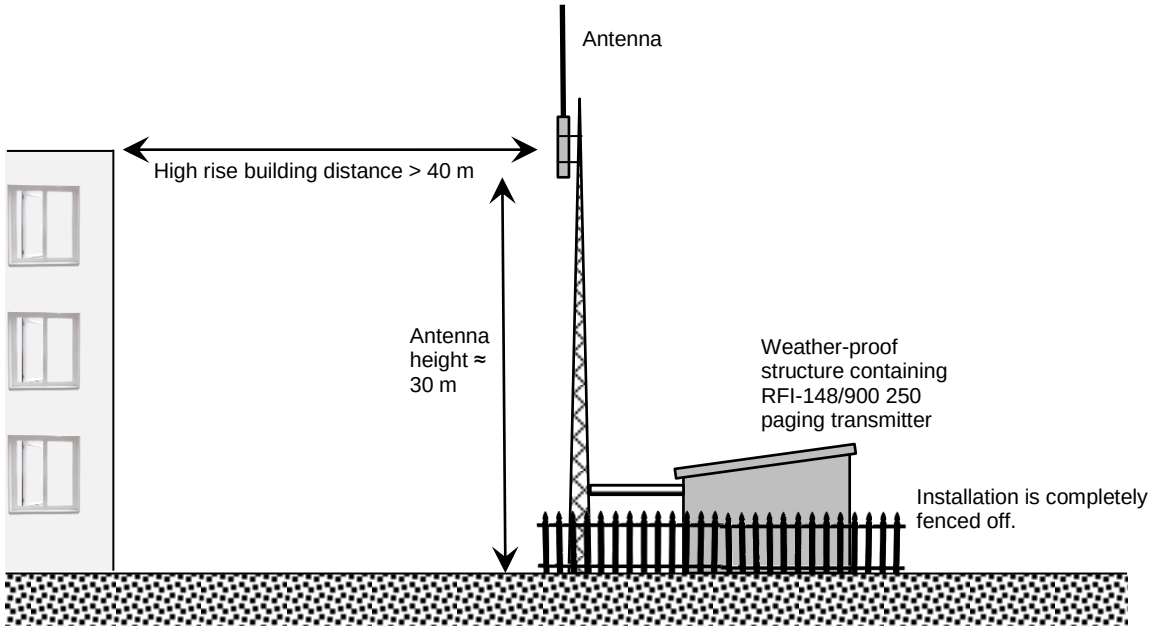

Figure 3: Typical installation site

2.4 Safety and Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.4.1 Human Exposure to Emissions, Safe Distances

RF radiation source	Safe distance	Notes
RFI-148/900 250 mechanical enclosure	> 15 cm	
Transmit signal RF cabling	> 15 cm	
Antenna < 6 dBi gain	> 7 m	These distances are used to determine the minimum antenna height and distance to nearest high-rise habitable structures
Antenna < 8 dBi gain	> 8 m	
Antenna < 10 dBi gain	> 10 m	
Antenna < 12 dBi gain	> 13 m	
Antenna < 14 dBi gain	> 16 m	

Table 1: Human exposure to emissions, safe distances

For further information on human RF exposure, contact your local health department. For example, Health Canada's Safety Code 6 provides a comprehensive set of Canadian guidelines.

2.4.2 Equipment Installation

Any devices that connect to the data ports must comply with clause 4.7 of EN 60950-1.

The installation should be in accordance with EN 50310:2010.

2.4.3 Modifications

CAUTION: Changes or modifications not expressly approved by STI Engineering will void the user's authority to operate the equipment legally, as well as any warranty provided.

3. Configuration

3.1 Overview

There are six interfaces available for configuration and diagnostic information to be monitored:

- ***Cruise Control management interface:*** All configuration and diagnostics parameters can be accessed using the Windows-based Cruise Control Graphical User Interface (GUI).
- ***SNMP interface:*** Support for diagnostics using SNMP through the RFI SNMP Proxy agent.
- ***Terminal menu interface:*** A navigable menu system is available that has all the configuration and diagnostics that Cruise Control provides.
- ***AT command interface:*** The AT command interface provides a subset of the configuration and diagnostic information available over Cruise Control with ASCII Hayes attention commands. For a list of AT commands see Appendix D Hayes AT Reference.
- ***Front panel interface:*** The front panel consists of six status LEDs and a transmit power gauge.
- ***LIU interface:*** The combined LIU interface has digital inputs and alarm outputs for limited configuration and diagnostic output.

3.2 Cruise Control

This section outlines how to use Cruise Control with the paging transmitter. For more information see the Cruise Control User Manual. Figure 4 below is a screenshot of Cruise Control running on Windows 10.

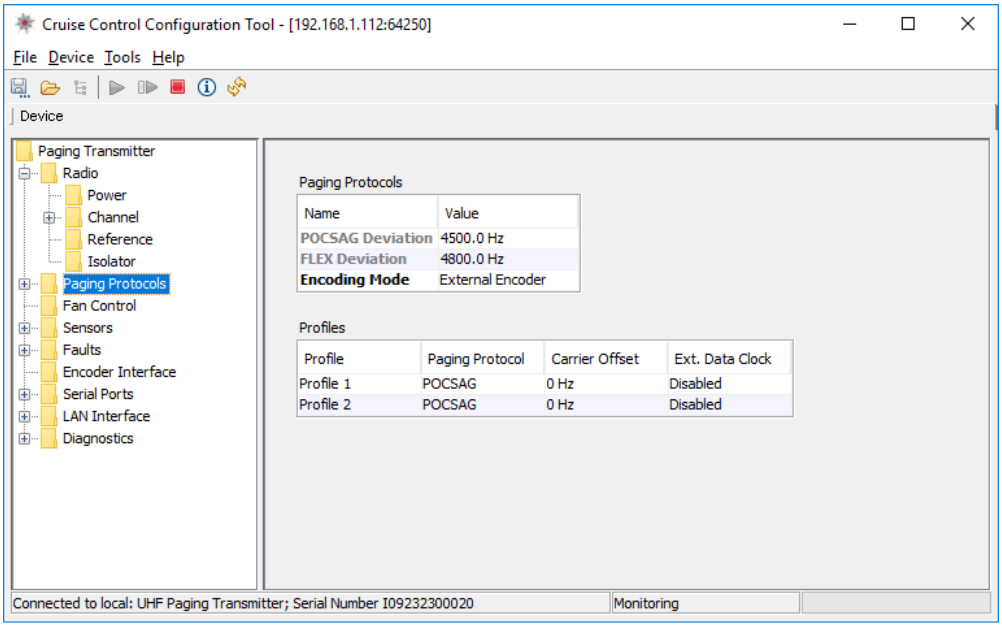

Figure 4: Cruise Control Interface

3.2.1 Installation

The requirements for using the Cruise Control application are:

- Pentium III+ Processor.
- Windows XP (x86) or Windows 7 (x86 and x64).
- At least 1 available serial port or a network connection to the device.

3.2.2 Connecting to the Paging Transmitter

SERIAL

To connect to a device with RS-232, attach the paging transmitter to the PC running Cruise Control via a serial port. Configure the Cruise Control communication settings using `Device -> Configure Communications`, ensure that `Serial` is selected from the dropdown box and enter in the serial settings (The front serial port is locked to 19200 8N1).

Use the `Device -> Connect to Local Device` menu item to connect to the local device.

ETHERNET

To connect to a device over a network, the device IP address must be known. Configure the Cruise Control communication settings using `Device -> Configure Communications`, ensure that `UDP` is selected from the dropdown box and enter the device IP address. For the UDP port, enter 64250, 64251 or 64252.

The paging transmitter listens on UDP ports 64250, 64251 and 64252 for data and will not allow more than one simultaneous session per port. If the paging transmitter does not respond to Cruise Control on a UDP port, try another port as a connection could already be active on that port.

Use the `Device -> Connect to Local Device` menu item to connect to the device.

3.2.3 Device Navigation

Once all the settings have been downloaded from the device, the available configuration groups are displayed in a tree on the left. Items that can be configured in each group are displayed in tables on the right. The names of editable items are displayed in black. Read only items have their names in grey.

3.2.4 Sensor Gauges

Cruise Control can provide real-time operational information for paging transmitters using the Sensor Gauges plugin. A screenshot of the Sensor Gauges plugin is shown below in Figure 5.

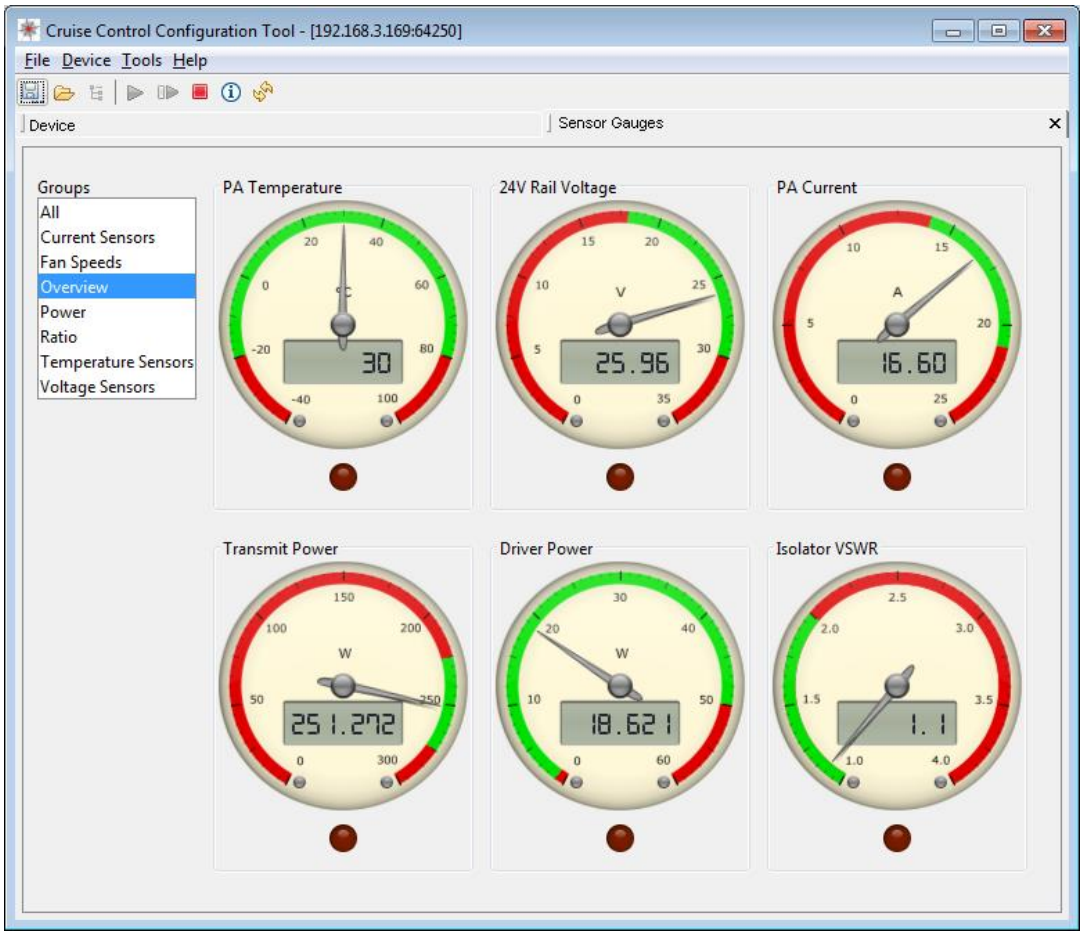

Figure 5: Cruise Control Sensor Gauges Plugin

To view Sensor Gauges for a paging transmitter, first connect to the paging transmitter using Cruise Control. Then use the `Tools -> Plugins -> Sensor Gauges` menu item to open the Sensor Gauges plugin.

The Sensor Gauges will automatically update, with the needles showing the current value of the gauge parameter. The green region indicates the expected normal operating value for the parameter. The upper and lower cut-off values for the sensor (see section 0) determine the range of the green region. There is a red indicator below each gauge which turns on when the parameter exceeds the upper or lower cut-off value.

The Groups option box on the left shows the different groups of gauges available, grouped by the unit of measurement of the sensor. There are also two additional groups, overview and all. The overview group provides a subset of the most informative gauges for quick diagnostic troubleshooting. The all group shows all of the gauges.

3.2.5 Firmware Update

Cruise Control supports the updating of device firmware. Cruise Control will only allow firmware images that are compatible with the paging transmitter to be uploaded. For more information, see section 0.

3.3 SNMP

RFI SNMP Proxy is an SNMP agent which allows configuration and diagnostics via SNMP. RFI SNMP Proxy can be installed on a Windows or Debian Linux system, including embedded devices capable of running Linux.

In smaller networks, RFI SNMP Proxy may be run on the same machine as an SNMP network monitoring application. SNMP communication may be done via IP loopback as shown in Figure 6. Alternatively, RFI SNMP Proxy may run on existing embedded devices connected to the transmitter by Ethernet, as shown in Figure 7.

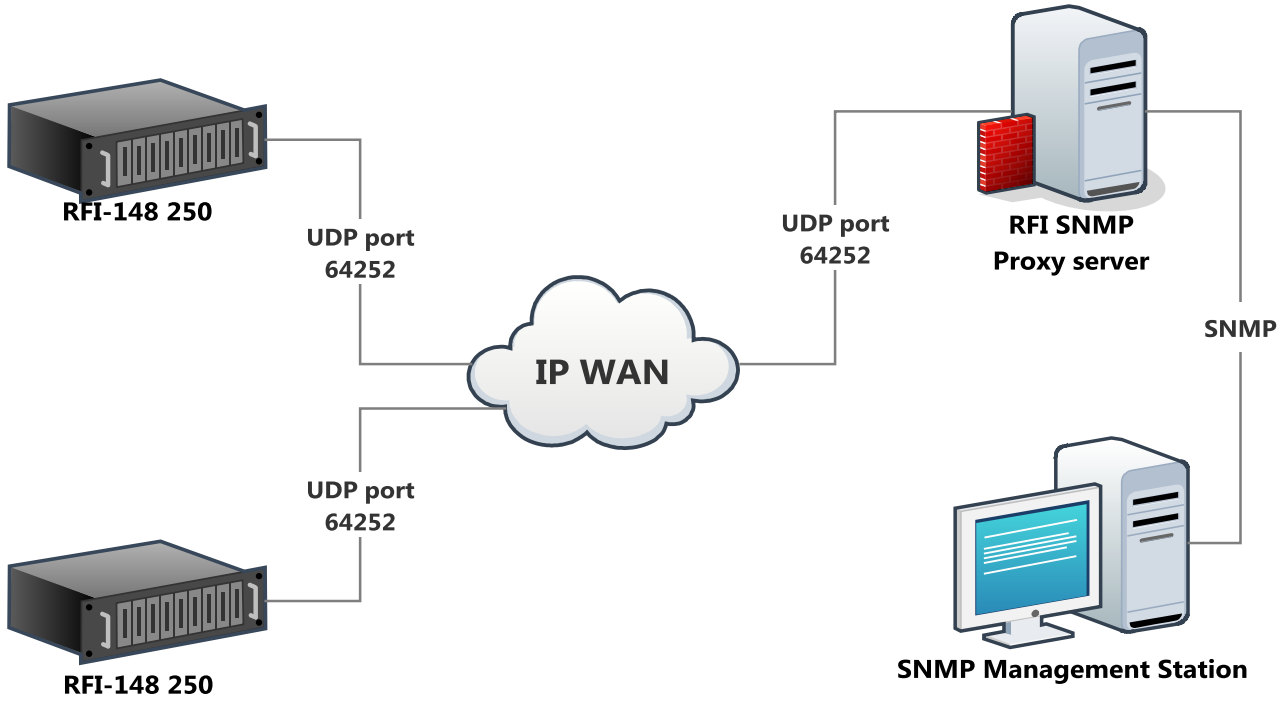

Figure 6: RFI SNMP Proxy running on a central server

SNMP versions 1 and 2c are supported. The community string 'public' should be used when issuing SNMP requests. RFI SNMP Proxy is compatible with standard SNMP managers and other SNMP client applications. An SMI MIB file defining OIDs for this product is available from STI Engineering.

RFI SNMP Proxy communicates with the paging transmitter via a proprietary protocol using UDP port 64252 through the Ethernet interface.

Not all configuration and diagnostic parameters may be accessed via SNMP. See Appendix C.2 for a list of values which may be accessed via SNMP.

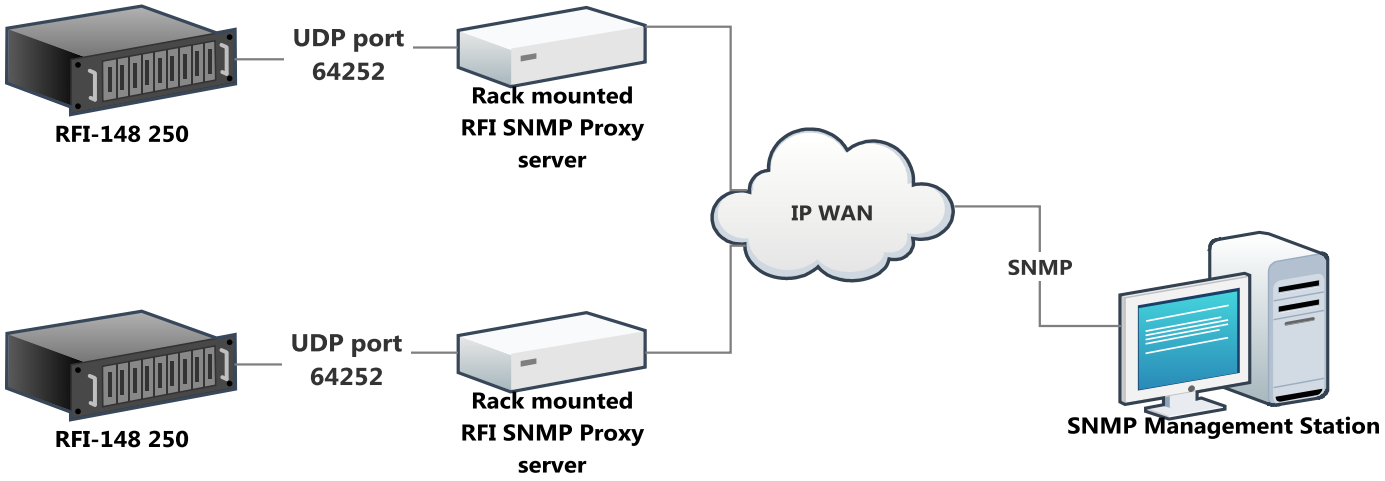

Figure 7: RFI SNMP Proxy running on embedded hardware on remote sites

3.4 Terminal Menu Interface

The terminal menu provides access to all configuration parameters in the radio.

To access the terminal menu execute the `AT?` command at the Hayes AT command interface. See section 3.5 on page 17 for information on executing AT commands. The terminal menu will not be started if it is open on another port, instead the `BUSY` response is returned.

The terminal menu is available over serial, UDP (ports 64250 and 64251) and TCP (port 23).

3.5 Hayes AT Command Interface

The paging transmitter supports Hayes ATtention commands. These are used to query and change device configuration and probe performance parameters. AT commands are available via serial port, and via TCP port 23 on the Ethernet interface.

The format for the query and configuration AT command is:

```
ATxxx<[I1, I2, … In]><=value><TERM>
```

Where:

- `AT` is the attention code. All AT commands must be prefixed with `AT`. This is case insensitive, so `At`, `aT`, or `at` can also be used.
- `xxx` is the actual command. The list of valid AT commands is given in Appendix D on page 54.
- `<[I1, I2, … In]>` is an optional section that allows the specification of an index. Indexes are used to access one of an array of similar items. For example, the paging transmitter has a list of sensor values which can be accessed using the `ATI90` indexer. The command `ATI90[0]` will read the PA temperature, while the command `ATI90[1]` will read the driver temperature.
- `<=value>` is an optional section that is used to set the value of a configuration parameter. If this section is omitted, then the value of the configuration parameter will be displayed.
- `<TERM>` is the terminator for the AT command. A terminator can consist of a carriage return (ASCII value $13_{Decimal}$) or a carriage return followed by a line feed (ASCII value $10_{Decimal}$).

A response is generated for each AT command issued. Responses to AT commands are shown in Table 2.

Response Code	Response Number	Description
OK	0	Returned whenever a command is entered that is executed correctly.
ERROR	4	Returned whenever a command is invalid or could not be executed.
BUSY	7	Returned when an attempt is made to enable the menu via AT? but the menu system is already enabled on the other serial port.

Table 2: AT command response codes

3.5.1 List Slicing Syntax

Multiple indexes of an indexer can be queried in a single AT command using the list slicing syntax. AT command sets cannot be used with the list slicing syntax. The list slice syntax uses the colon ':' operator to indicate a range of indexes to retrieve. Each value retrieved is printed on a new line.

For example, the AT command for retrieving a single sensor value is I90[*n*] where *n* is the index of the sensor. To retrieve the first four sensor values (PA, Driver, PA Ambient, and Isolator temperatures) the following syntax can be used:

```
ATI90[0:3]
45
42
39
30
OK
```

Figure 8: List slicing syntax on the current sensor value

Running the list slice operator ':' without specifying the range will return the length of the indexer:

```
ATI90[:]
27
OK
```

Figure 9: List slicing syntax for the length of an indexer

3.5.2 Sequenced AT Commands

A series of get AT commands can be concatenated into a single AT command, known as a sequenced AT command. AT command sets cannot be sequenced. A sequenced AT command begins with the attention code, AT, followed by a number of commands, followed by the terminator.

For example, the AT commands for the serial number, current channel, and main serial port baud rate are I6, S54 and S100[0], respectively. These commands can be run separately:

```
ATI6
F00012K01000
OK

ATS54
1
OK

ATS100[0]
8
OK
```

Figure 10: Separate AT commands

Alternatively, they can be concatenated and run as a sequenced command:

```
ATI6S54S100[0]
F00012K01000
1
8
OK
```

Figure 11: Sequenced AT command

3.6 Front Panel Interface

The front panel interface consists of six status LEDs and a transmit power gauge. The panel is illustrated in Figure 12 and the function of each LED is described in Table 3.

LED	Colour	Description
Transmit On	Green	Turns on when the transmitter is on.
Fault	Red	Turns on when any fault is active. Will flash in unison with the Serial/Ethernet LED if there are serial errors.
Low Power	Red	Turns on when the sensed transmit power is lower than the lower cut-off value as specified in the sensor parameters.
High VSWR	Red	Turns on when the isolator VSWR is higher than the higher cut-off value as specified in the sensor parameters.
Serial/Ethernet	Green	Flashes when serial or Ethernet data is transmitted or received.
Power	Green	Turns on/off at 1 Hz while power is supplied.
Power Gauge	Green/Red	A bar graph displaying current transmit power.

Table 3: Front panel LED descriptions

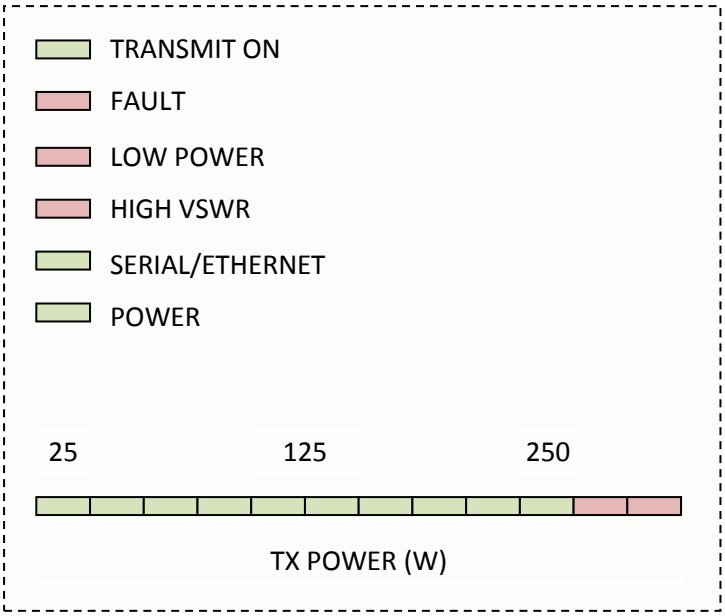

Figure 12: Front Panel Display

3.7 LIU Interface

The LIU interface is a DC-37 female connector at the rear of the paging transmitter. The pin-out for the LIU Interface can be found in Appendix A.4. The LIU interface has nine digital inputs[1] and fourteen alarm outputs. The alarm outputs are numbered 1 to 13 with an additional combined alarm and are configurable. The digital inputs are:

- Frequency Select 1
- Frequency Select 2
- Frequency Select 3
- Frequency Select 4
- Protocol Select
- Hardware PTT
- Tx Data L-bit
- Tx Data H-bit
- Transmit Clock
- Aux Input 1 (RFI-148 only)

Use of the hardware PTT, protocol select and frequency select inputs are all optional and may be disabled in software. The use of the transmit clock is optional for 2-level protocols, but required for 4-level protocols.

[1] RFi-148 has an extra, general purpose input "Aux Input 1," for a combined total of 10.

4. Operation

4.1 Serial Port Operation

`Serial Ports -> [Rear|Front] Settings`

4.1.1 Overview

The RFI-148/900250 has two RS-232 serial ports, providing support as shown in Table 1. The serial port pin-outs can be found in Appendix A.3 on page 45.

Serial Ports			
Front	**Connector Type**	Female DE9 (DCE)	
	Supported	TX, RX, GND.	
Rear	**Connector Type**	**RFI-148**	**RFI-900**
		Male DE9 (DTE)	Female DE9 (DCE)
	Supported	TX, RX, and GND, RTS and DTR outputs CTS and DCD inputs	

Table 4: Serial port availability.

4.1.2 Configuration

The rear serial port supports the following configuration options:

- Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200.
- Data bits: 7 or 8.
- Parity: None, odd, or even.
- Stop bits: 1 or 2.

The front serial port is locked into a specific configuration to ensure a fail-safe way to communicate with the paging transmitter:

- Baud rate: 19200.
- Data bits: 8.
- Parity: None.
- Stop bits: 1.

4.1.3 Statistics

Statistics are maintained for both serial ports. These statistics are listed in Table 21 in Appendix C.1. All statistics are reset if power is removed.

These statistics may be useful in troubleshooting. For example, Rx framing errors may indicate that the serial port configuration does not match the serial port configuration of the link partner.

4.2 Ethernet Operation

`LAN Interface`

4.2.1 Overview

The paging transmitter has one 10BASE-T/100BASE-TX Ethernet port. Auto-negotiation of link speed is supported, including duplex mode. There is also a software override for forcing the parameters of the link.

4.2.2 IP Addressing

The paging transmitter supports IPv4. The paging transmitter may have a statically assigned IP address or obtain an IP address as a DHCP client.

A static IP address may be configured with a single static address. A subnet mask and default gateway may be configured to allow communication across sub-networks.

The paging transmitter may act as a DHCP client. This allows a DHCP server to assign an IP address to the paging transmitter. By default, the DHCP client is enabled and the hostname of the paging transmitter is of the form "rfi-*serial_number*" where *serial_number* is the factory assigned serial number of the unit. If the unit does not receive an IP address from the DHCP server, the IP interface will not work.

4.2.3 Statistics

Both IP and Ethernet packet statistics are independently recorded and presented as combined figures for all active data streams since the transmitter was last powered-up. A power-cycle of the transmitter clears this data.

4.3 Transmitter Operation

4.3.1 Transmit Power

`Radio -> Power`

The RFI-148/900250 supports transmit power from 20 to 250 Watts in 1 Watt increments.

POWER FOLDBACK

The power foldback is a configurable percentage which calculates the power to foldback to when the scale transmit power fault action is latched. For example, for a transmit power of 250 W and a power foldback of 50%, the transmitter will transmit at 125 W when the scale transmit power fault action is latched. See section 5.2.1 for more information on fault actions.

4.3.2 Channel Selection

`Radio -> Channel`

The RFI-148/900250 has up to sixteen radio channels. Each channel represents a transmit frequency.

The channel frequencies can be set anywhere within the radio switching bandwidth, but must equal integer multiples of the raster frequency.

The channel to be used can be set by adjusting the current channel setting.

`Encoder Interface -> Encoder Channel Control`

ENCODER CHANNEL CONTROL

The active channel can be set by adjusting the current channel setting in software. Alternatively, "Encoder Channel Control" may be enabled and the channel set through the LIU interface as shown in Table 5 below. If encoder channel control is used, the channel cannot be changed in software.

Channel	CH4	CH3	CH2	CH1
1	N/C	N/C	N/C	N/C
2	N/C	N/C	N/C	Gnd
3	N/C	N/C	Gnd	N/C
4	N/C	N/C	Gnd	Gnd
5	N/C	Gnd	N/C	N/C
6	N/C	Gnd	N/C	Gnd
7	N/C	Gnd	Gnd	N/C
8	N/C	Gnd	Gnd	Gnd
9	Gnd	N/C	N/C	N/C
10	Gnd	N/C	N/C	Gnd
11	Gnd	N/C	Gnd	N/C
12	Gnd	N/C	Gnd	Gnd
13	Gnd	Gnd	N/C	N/C
14	Gnd	Gnd	N/C	Gnd
15	Gnd	Gnd	Gnd	N/C
16	Gnd	Gnd	Gnd	Gnd

Table 5: Channel selection via LIU Interface

4.3.3 Push-To-Talk (PTT)

There are three methods available to turn the transmitter on:

- ***Software PTT:*** Software PTT is available using Hayes AT commands, through the Cruise Control GUI, or through the terminal menu interface. It is also selected implicitly when enabling TNPP or PET/TAP on either a serial or Ethernet stream.

- ***Hardware PTT:*** Hardware PTT is available through the LIU connector. Hardware PTT can be configured to be active high or active low. The delay from hardware PTT to transmitter on and data ready is 10 ms.

- ***Auto PTT:*** Auto PTT is performed by detecting a change in the data bits on the LIU and turning on the transmitter. When using auto PTT some preamble will be lost; some encoders may need to increase preamble time.

Hardware PTT can be enabled using the "Encoder Hardware PTT" option and auto PTT can be enabled using the "Auto PTT" option in the "Encoder Interface" menu. Hardware PTT and auto PTT cannot both be enabled at the same time.

PTT TURN OFF DELAY

`Radio -> PTT Turn Off Delay`

The unit has the option to leave the transmitter on for a set duration after receiving a PTT off signal. This delay is driven by software and typically accurate to 100 ms.

TRANSMIT TIMEOUT

`Radio -> Transmit Timeout`

The unit can automatically raise a fault if the transmitter has been transmitting for too long. By default, the transmit timeout feature is disabled. If enabled, the transmit timeout fault causes the transmitter to key down and set the PTT system override to disable transmit. See section 5.2.1 for more information on fault actions.

`Radio -> PTT Override`

PTT OVERRIDE

Transmitter PTT can be completely disabled which stops the paging transmitter from transmitting. PTT override can be changed using the "PTT override" setting.

In some cases the paging transmitter will disable itself from transmitting. If PTT override is disabling transmit the "PTT Override Status" will describe what caused the override. There are five circumstances where the paging transmitter will override PTT:

- ***User:*** The PTT override has been configured to "Disable Transmit".

- ***Listening:*** The isolator mode is set for listening (for operation of the isolator see section 0).

- ***Fault:*** The disable transmit fault action is active (for more on fault actions see section 0).

- ***Loading Config:*** Cruise Control is loading a configuration file.

- ***In Standby:*** The unit is in Standby due to the Hot Standby operation (see section 7 Hot Standby Operation).

PTT is enabled once the source of the override is addressed.

HARDWARE PTT EDGE OR LEVEL DETECTION

The transmitter keys up due to the rising or falling edge of the hardware PTT signal – it is based on edge detection rather than sampling. However, there are three exceptions to this case where the hardware PTT signal is sampled to check for key up:

- When the unit powers up.
- When the hardware PTT configuration is changed from Disabled to Enabled.
- When the unit comes out of PTT Override.

4.3.4 External Reference

`Radio -> Reference`

The transmitter supports an external reference for channel frequency generation.

To use the external reference, a 5 or 10 MHz sine or square wave -20 dBm to +15 dBm signal must be applied to the "External Frequency" input BNC connector on the back panel. The "Reference Mode" must then be configured to "External With Failover". The paging transmitter will use the internal reference by default.

The external reference frequency must be configured correctly in order to lock to the external reference. By default the external reference is configured to 10 MHz.

AUTOMATIC REFERENCE SWITCHOVER

If the external reference is selected as the default reference, the transmitter will switch to the internal reference in the event of the external reference failing. There are two conditions which characterise an external reference failure:

- The external reference is not detected. The external reference won't be detected if it is less than the specified input power.
- Cannot lock to external reference. If the frequency difference between the internal and external reference drifts too far, the paging transmitter will not lock to the external reference.

NOTE: If the paging transmitter is transmitting when reference switchover occurs, there may be data loss.

`Radio -> Absolute Delay Adjustment`

4.3.5 Absolute Delay Adjustment

The paging transmitter can insert a small artificial delay on data presented on the LIU interface before it is passed to the digital synthesiser. The delay adjustment can be set from 0 to 40 ms in 5 µs steps. The additional net delay is accurate to ± 3 µs.

Absolute delay adjustment can be used for matching delay in:

- Simulcast networks where transmitters from different manufacturers are used.

- Radio and leased line simulcast systems.

4.3.6 RF Diagnostics

`Radio -> Isolator`

The paging transmitter provides an RF diagnostics port output on the back panel. The RF diagnostics port can be configured for two different modes using the "Isolator Mode" setting:

- ***Set for Transmitting:*** The RF diagnostics port will output a signal identical to that of RF out but at a much lower power level.

- ***Set for Listening:*** Insertion loss from RF out to RF diag is decreased to 12 dB. This is a special mode of operation used for network testing. **NOTE:** While in listening mode, PTT override is forced to disable transmit.

LISTEN MODE TIMEOUT

A timeout can be enabled for listening mode. When the listening mode timeout is enabled, the isolator mode will automatically revert to transmitting mode after the timeout expires. The timeout starts when the isolator mode is set to listening mode. By default, the listening mode timeout is disabled.

ISOLATOR FEEDBACK

The isolator feedback is a read-only field that indicates the isolator status when the isolator is in listening mode. When the isolator mode is set to listening, the feedback status will change to "Switching" for one second and then change to "Listening Mode". However, if the status changes to "Listening Failure" then there may be a hardware failure of the mechanical attenuation switch-out.

4.4 Data

The RFI-148/900250 supports the following modulation formats:

- ***POCSAG:*** Baud rates of 512, 1200 and 2400 bps (2-level FSK) are supported.

- ***FLEX:*** Baud rates of 1600 (2-level FSK), 3200 (2-level or 4-level FSK) and 6400 bps (4-level FSK) are supported.

- ***Custom:*** A customizable deviation and FSK level at baud rates up to 6400 bps. See section 0.

2-level FSK protocol data may optionally be clocked into the paging transmitter using the external data clock or may run asynchronously. 4-level FSK protocols must use the external data clock.

`Encoder Interface -> 4-Level Operation`

4.4.1 4-Level Deviation Mapping

When using 4-level FSK the deviation with respect to the H and L bits is outlined in Table 6 below. Note that two interpretations of the H-bit/L-bit are available, denoted as "Legacy" and "Normal" and configurable

via *Encoder Interface → 4-Level Operation*. The "Legacy/Normal" operation was introduced in firmware 4.0, firmware versions prior to this operate implicitly in "Legacy" mode.

H-Bit	L-bit	Deviation from Carrier (Hz)	
		Legacy	Normal
N/C	N/C	$+\frac{F_d}{3}$	$+\frac{F_d}{3}$
N/C	Gnd	$+F_d$	$-\frac{F_d}{3}$
Gnd	N/C	$-\frac{F_d}{3}$	$+F_d$
Gnd	Gnd	$-F_d$	$-F_d$

Table 6: Custom 4-level deviation frequency offsets

Where F_d is the deviation frequency in Hz.

`Paging Protocols -> Profile [1|2] -> Carrier Offset`

4.4.2 Carrier Offset

The carrier offset setting is provided for use in simulcast paging networks. The offset from the carrier frequency can be specified for each protocol. The carrier offset can be set from +5000 to -5000 Hz in increments of 1 Hz.

4.4.3 Custom Deviation

`Paging Protocols -> Advanced`

The transmitter supports generation of non-standard paging protocol settings. When the paging protocol custom is selected, the custom deviation and FSK level are used for that protocol. The custom deviation setting is useful for legacy paging systems with non-standard protocols and/or paging receivers.

`Fan Control`

4.5 Fan Control

The transmitter has two fans for cooling; the front fan is an intake and the rear fan is the exhaust. The fans turn on at the configured fan turn on temperature, and then turn off at the configured fan turn off temperature. The temperature reference is configurable to either individual sensors, the hottest of all sensors, or the hottest of all sensors on the PA and Isolator ('PA Group Sensors').

4.5.1 Fan Override

There is a fan override feature available to force the fans to turn on at full speed. When fan override is set to always on the fans will turn on and ignore the reference temperature.

4.5.2 Self-Test

The fan controller has a self-test feature which causes the fans to run at full speed for a minute so fan operation can be verified. The self-test feature runs once every 24 hours by default.

5. Diagnostics

5.1 Status Monitoring

`Sensors -> Sensor Configuration`

The paging transmitter has a number of sensors which are continuously monitored. The sensors are used to monitor:

- Internal voltage and current levels.
- Ambient and transmitter temperature.
- Fan operation.
- Transmitted and reflected power.

Each sensor has configurable upper and lower cut-offs that will cause a fault when exceeded. For example, if the driver temperature upper cut-off is exceeded, the high driver temperature fault will be set active.

A full list of sensors, units of measure, and range of values can be found in Appendix E.

5.1.1 Conditional Cut-off Checking

Some sensors are only compared against their upper and lower cut-offs under certain conditions, such as when the transmitter is on. The following sensors have conditional cut-off checking:

During transmission:

- Exciter current.
- PA current.
- Driver current.
- Reverse power.
- Transmit power.
- Driver power.
- Exciter power.
- Isolator VSWR.

While the fans are turned on to full speed:

- Front and rear fan current.
- Front and rear fan RPM.

A sensor that falls outside its cut-offs while its checking condition is met will cause the respective fault to become active. A non-latching fault will only be cleared once it has returned to within its cut-offs while its checking condition is met. A latching fault must be cleared in software.

5.1.2 Minimum and Maximum Sensor History

When a sensor exceeds a previous minimum or maximum value for that sensor, the new minimum or maximum value is saved to non-volatile storage. The minimum and maximum sensor values also use the conditional cut-off checking. For example, minimum and maximum transmit power values are only recorded during transmission. The sensor history can be cleared to aid in troubleshooting.

`Faults -> Fault Configuration`

5.2 Faults

Undesirable operating conditions are reported using the faults feature of the paging transmitter. In most circumstances the paging transmitter should not have any active faults. Active faults indicate incorrect setup, a hardware issue or misconfiguration of the paging transmitter.

Faults can be in one of four states:

- ***Inactive:*** The fault is inactive.
- ***Fleeting:*** The source of the fault is currently active; however it has not been active longer than the minimum fault duration setting.
- ***Active:*** The source of the fault is currently active.
- ***Latched:***
    - For Faults: The fault was previously active but the source of the fault is no longer present.
    - For Fault Actions: The fault action has been carried out.

A list of possible faults can be found in Appendix E.

5.2.1 Fault Actions

Each fault can be configured to perform an action when the fault transitions from the inactive (or fleeting) to the active or latched state. The actions that are taken due to a fault are called *Fault Actions.* There are five fault actions:

- ***Reference switchover:*** The paging transmitter switches to the internal reference.
- ***Disable transmission:*** Any current transmission is interrupted, the transmitter is keyed down and future transmissions are disabled.
- ***Scale transmit power:*** Transmit power is reduced to a configured percentage. See section 0.
- ***Enable PA current fold-back:*** The PA current fold-back is engaged.
- ***Enable reverse power fold-back:*** The reverse power fold-back is engaged.

Each fault action operates as a fault itself; therefore when a fault action is taken, it can be seen as latched in the faults menu and logged in the fault history. Fault actions are latch-only and can only be cleared through user intervention. Any actions performed are reverted once the fault action is cleared.

5.2.2 Fleeting Faults

The minimum fault duration parameter determines how long the source of a fault is active until it is reported to the fault interface. A fault that does not reach the minimum fault duration will not be logged, activate a hardware alarm or trigger a fault action.

5.2.3 Combined Fault

The combined fault is an optional fault that will become active if any fault within the combined fault set becomes active. Each fault can be configured to be part of the combined fault set. The combined fault will only become inactive when all of the faults in the combined fault set return to inactive. The combined fault has a dedicated alarm output.

5.2.4 Hardware Alarm Outputs

A hardware alarm output can be assigned to each fault (see Appendix A.4 for the LIU interface pin-outs). When the fault is in the active or latched state, the respective alarm will be set to active. Multiple faults can share the same alarm output. The alarm output will only be set inactive if all of the faults that use that alarm output are inactive.

A list of hardware alarms available can be found in section 3.7.

5.3 Remote Firmware Update and Snapshot

Diagnostics -> Firmware Update

5.3.1 Update

The remote firmware update feature is used to upload a firmware image to a paging transmitter for feature additions and/or bug fixes. Remote firmware update requires a Cruise Control connection to the paging transmitter and a valid RFI-148/900250 firmware image file.

The firmware update process has two stages: uploading the firmware image to the paging transmitter and applying the firmware image.

FIRMWARE IMAGE UPLOAD

To upload the firmware image to the paging transmitter first connect to the transmitter using Cruise Control. In the Cruise Control interface select `Device -> Load Firmware` from the toolbar. In the new window that appears, navigate to the directory where the firmware image file is located, select the file and click `Upload`. The upload process is displayed on the status bar in Cruise Control, near the bottom right. Once the upload is finished, the status will display “Monitoring”.

Note that at this point the firmware image has not been applied. The firmware image is kept in non-volatile storage until it is required.

Once the firmware image has been uploaded, at any later date the firmware image can be applied.

APPLYING FIRMWARE IMAGE

To apply an uploaded firmware image, run the "Update Firmware Now" routine. The paging transmitter will reset to apply the image and will be unresponsive for up to one minute. Note that while the paging transmitter is applying the firmware image, it will not transmit, respond to AT commands or connect with Cruise Control.

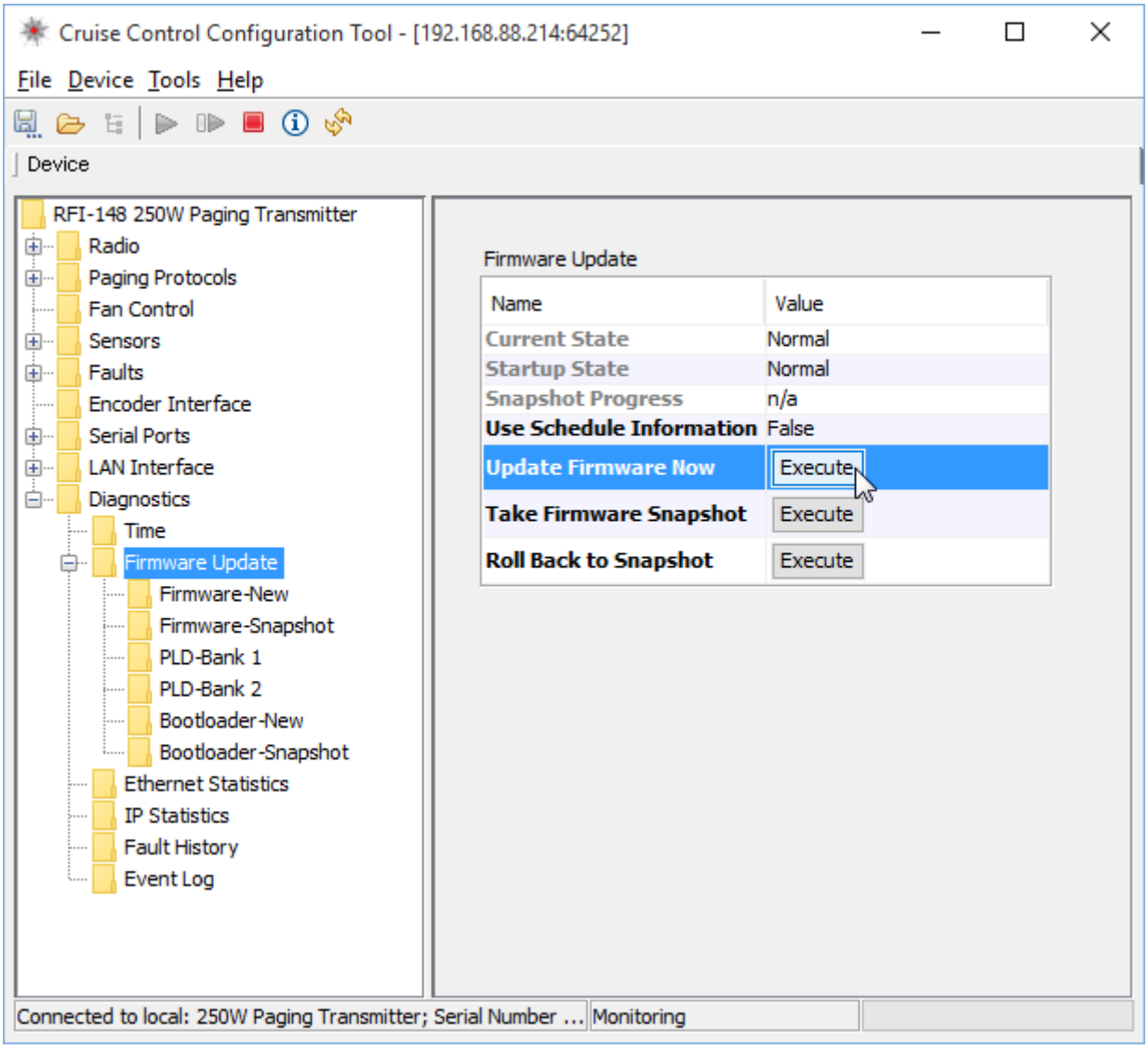

Figure 13: "Update Firmware Now" routine

When the firmware starts up after applying the new image the "Version String" can be inspected to ensure the new firmware image was loaded.

5.3.2 Snapshot

The paging transmitter has a firmware "Snapshot" used for recovering the paging transmitter to a previous state. The snapshot contains a backup of the current firmware and configuration.

To create a snapshot, run the "Take Firmware Snapshot" routine. The paging transmitter will continue operating normally during the snapshot process, which takes up to one minute to complete. The progress of the snapshot is displayed in the "Snapshot Progress" field.

The snapshot can be reverted to at any stage. This can be useful to revert back to a 'known good state' if the paging transmitter has been misconfigured or has been updated with an unwanted firmware update. To revert to the snapshot run the "Roll Back to Snapshot" routine. The paging transmitter will reset and take up to ninety seconds to revert back to the snapshot firmware and configuration. After reverting to a snapshot the paging transmitter will start up with the firmware update exception fault latched to notify that the snapshot was used.

By default, the paging transmitter has a factory snapshot that contains default factory firmware and configuration.

5.4 Time

5.4.1 Real Time Clock

`Diagnostics -> Time`

A battery-backed real time clock is used to track the passage of time. An accurate time is not essential for the operation of the transmitter, but aids diagnostics and troubleshooting. The time is used for:

- Generating time stamps for:
    - The transmitter fault history.
    - Firmware update images.
- Transmitter uptime since power-up.
- A short history of transmitter events (PTT on, off).

TIME ZONE

The time zone can be specified in hours and minutes as an offset from Coordinated Universal Time (UTC).

`LAN Interface -> SNTP`

5.4.2 SNTP Client

The transmitter supports time synchronisation using the Simple Network Time Protocol (SNTP) version 4. The SNTP client can be disabled or set to unicast mode. In unicast mode, the paging transmitter will query the configured time server for time updates at a configurable interval. By default the SNTP client is disabled.

6. Internal Encoding

6.1 Overview

The RFI PTX supports both internal and external page message encoding:

- ***External Encoding:*** The historical and most common way of interfacing to the RFI PTX is by clocking in pre-encoded paging data using the TTL inputs on the LIU. The RFI PTX will typically interface with a Base Station Controller (BSC) that provides the encoded data.

- ***Internal Encoding:*** The RFI PTX supports internal encoding of the POCSAG paging standard for generating messages when submitted through the serial or Ethernet ports. Messages can be submitted using the industry standard TNPP, TAP, or PET protocols. A custom protocol developed by STI Engineering also provides an additional simple datagram protocol for submitting pages: "Page Datagram".

This section provides an overview of the internal encoding functionality.

When internal encoding is in use, the Hardware PTT and Auto PTT functions are disabled.

Paging Protocols -> POCSAG

6.2 POCSAG Settings

The RFI PTX has several options for the POCSAG protocol in order to support differing networks:

- Preamble Length: The POCSAG preamble is used to wake up paging receivers and allow them to lock to the incoming signal. A default value of 576 bits is used which is the de facto standard for POCSAG.

- Function Override: Allows the function bits in a POCSAG address codeword to be overridden to this value. By default the function bits will follow the message encoding (00: Numeric, 01: Tone-only, 11: Alpha-numeric). The function bits have also been known as the "Group Code".

- Purge Timeout: The RFI PTX waits up until the purge timer in order to collate incoming page subsmissions into a single large transmission. This saves on overhead of having to repeat the preamble. Shorter Purge Timeouts will produce lower latency on page submission to transmission, at the possible expense of lower throughput when sending many page messages.

Paging Protocols -> POCSAG -> Page Repeat Rules

PAGE REPEATING

The RFI PTX supports a set of rules that trigger the repetition of a submitted page messages. When a rule is enabled any messages which match the cap code will be repeated *Count* number of times every *Delay* seconds.

6.3 Protocols Supported

Paging Protocols -> Encoding Mode

All protocols are accessible through either the rear serial port or the Ethernet port via TCP or UDP port 64250.

6.3.1 TNPP

Paging Protocols -> TNPP

The RFI PTX supports the ETE REQ and CAP PAGE block types. The TNPP station address is configurable.

6.3.2 PET

Paging Protocols -> TAP/PET

The RFI PTX supports the PG1 and PG3 page submission types. Note that the page "zone" for PG3 has no effect on the RFI PTX and it only accepts this value for backwards compatibility. Also accepted is a password up to length 6 characters. The password is not checked and also exists only for backwards compatibility.

There are several options available to allow for differences in PET implementations:

- Line Separator: The RFI PTX can print either a carriage return (<CR>) or a carriage return and line feed (<CR><LF>) for line separation. Note that the RFI PTX only accepts lines separated by <CR>.
- Timeout: The timeout while expecting the next command string is configurable. The RFI PTX starts a timer when it is expecting more data. If the timeout expires the RFI PTX PET parsing returns to either the *Idle* or *Logged In* state.
- Baud Rate: Due to PET not having a way to submit baud rate with page messages, the baud rate must be pre-configured. Standard POCSAG baud rates of 512, 1200, and 2400 are supported.
- Stay Logged In: This option allows the RFI PTX to remain in the *Logged In* state (ie, after the PG1 and password sequence) so messages can be submitted without having to handshake the connection each time. This option can be used in conjunction with Implied Login to skip handshaking altogether.
- Implied Login: If the <STX> character (the start of a message submission) is sent to the RFI PTX this option allows the RFI PTX to transition directly to message submission state and skip the login handshaking.
- Detect Numeric Pages: Encode a paging message as numeric if all characters within the message fit the numeric encoding scheme (ie, all characters are any of the following: `'0', '1', '2', '3', '4', '5', '6', '7', '8', '9', '!', 'U', ' ', '-', ']', '['`).

Paging Protocols -> TAP/PET

6.3.3 TAP

The TAP protocol is treated the same as PET, however with some extensions:

- Group Code: The RFI PTX can be configured to accept a group code that trails the pager ID during a message submission. The group code can be ‘A’, ‘B’, ‘C’, or ‘D’ when set for “Trailing Character”, or ‘1’, ‘2’, ‘3’, ‘4’ when set to “Trailing Digit”.

6.3.4 Page Datagram

`Paging Protocols -> Page Datagram`

The Page Datagram protocol is request-response. The maximum datagram length including the sync and CRC-32 fields is 265 bytes. Any datagrams larger than this will be dropped without response.

The general format of the protocol is (size in bytes of field shown in parenthesis):

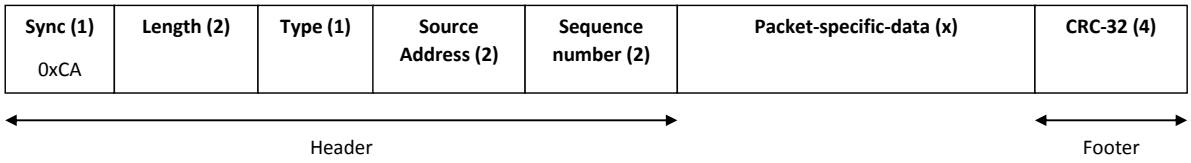

Figure 14: Page datagram generic format

The general fields are:

- Sync (1): The datagram sync byte, always 0xCA
- Length (2): The length of the datagram, minus the 3-byte header (sync, length)
- Type (1): The type of the page datagram, see below
- Source Address (2): The address of the RTU to which the reply (if any) should be sent. This can be set to 0xFFFF if unused
- Sequence number (2): An incrementing sequence number for confirming replies. This can be set to 0 if unused
- Packet-specific-data (x): Changes depending on the type field. Each type is shown in the following section
- CRC-32 (4): 32-bit CRC generated by the polynomial 0xEDB8832, with a starting value of 0xFFFFFFFF and the resulting value XOR’d with 0xFFFFFFFF. The CRC-32 is generated over the whole datagram excluding the Sync and CRC field.

PAGE SUBMIT

Submits a page message for transmission by the RFI PTX. The format of the page submit packet is shown in Figure 15.

<header>	Message length (2)	Baud rate (2)	Page class (1)	Cap code (4)	Function override (1)	Message (x)	<footer>

Figure 15: Page submission packet format

The fields are:

- <header>: The generic header shown in Figure 14 with the type field set to 0
- Message length (2): The length of the “Message (x)” field (the only variable length portion of this packet)

- Baud rate (2): The baud rate as an integer (ie, 512, 1200, 2400).
- Page class (1): Determines the encoding of the message, one of:
    - 0: Numerical encoding
    - 1: A tone-only message – no message codewords are sent, only an address codeword. The message field should be empty
    - 3: Alpha numeric encoding
- Cap code (4): Also known as pager ID, pager address, pager number, etc. The destination cap code for this message. For POCASG the valid cap codes are 1 to (2^21)-1
- Function override (1): When set to 0, does not override the "function" bits in the address codeword and instead uses the page class to determine the function bits. When set to 1 through 4 will encode the page as per the page class format, however it will override the function bits to this value.
- Message (x): 0 to 239 bytes long message
- <footer>: The generic footer shown in Figure 14

SUBMIT RESPONSE

A reply datagram generated by the RFI PTX. The format of the submit response is shown in Figure 16.

<header>	Response code (4)	<footer>

Figure 16: Submit response packet format

The fields are:

- <header>: The generic header shown in Figure 14 with the type field set to 1.
- Response code (4): A 32-bit response code:
    - 0x0: Page submission succeeded
    - 0x1: Page submission failed: too many pages in queue
    - 0x2: Unknown datagram type field
    - 0x3: Unexpected packet length
    - 0x4: Page submission failed: general error
    - 0x10: Nothing was performed – this is a link test reply
- <footer>: The generic footer shown in Figure 14.

LINK TEST

A link test is a query with no side effects that confirms the RFI PTX is “alive” and receiving datagrams. The reply to a link test query is a submit response but with the response code of 0x10.

The format of the link test query is shown in Figure 17.

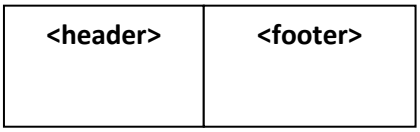

Figure 17: Link test query packet format

The fields are:

- <header>: The generic header shown in Figure 14 with the type field set to 2.
- <footer>: The generic footer shown in Figure 14.

6.4 Test Functions

`Paging Protocols -> Test`

When internal encoding is enabled the RFI PTX can generate test messages as a simple means to confirm site operation or perform extended site surveys.

7. Hot Standby Operation

7.1 Overview

`Encoder Interface -> Hot Standby`

Hot standby operation allows the transmitter to operate in sites with high uptime requirements. It features automatic fail-over to a secondary transmitter. Hot standby operation is an optional variant to the RFI-148 and RFI-900 that requires an additional external control unit ("RFI-PHSB": **P**aging transmitting **H**ot-**S**tandby **B**ox). The installation of such a system is illustrated in Figure 18.

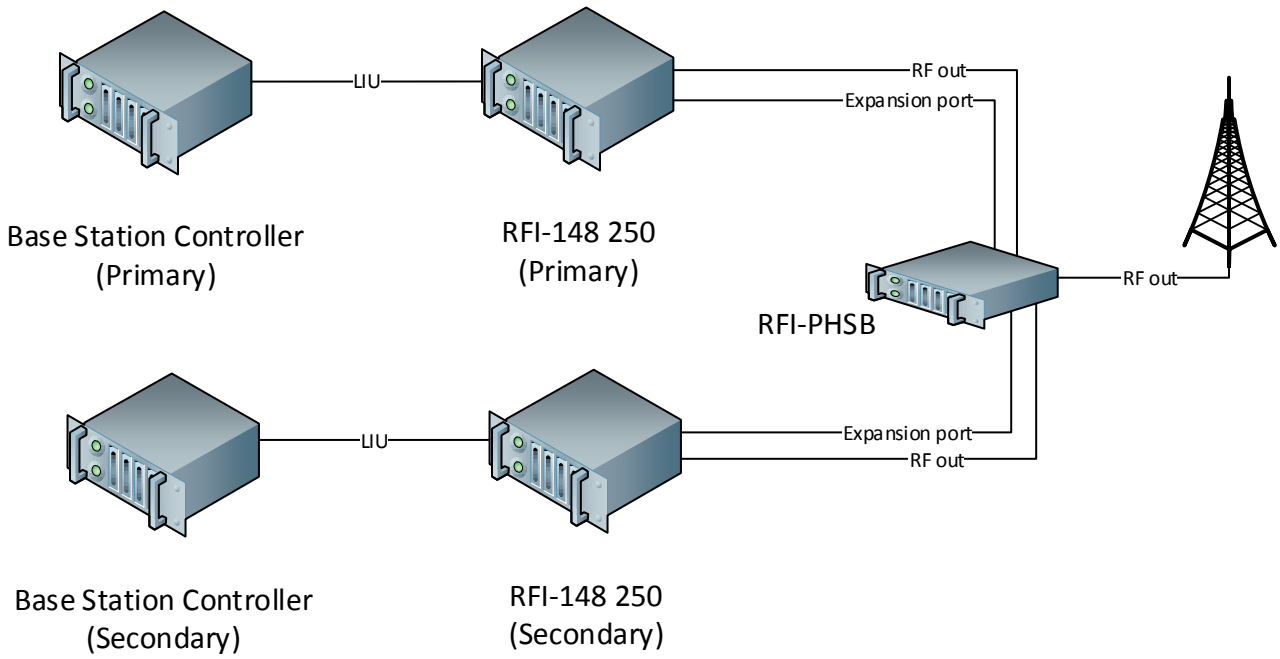

Figure 18: Hot standby system

The RFI-PHSB contains a high power RF switch to ensure minimal signal loss from the active RFI-148 250 to the antenna.

The pair of RFI-148 250 transmitters assume either a Primary or Secondary role. The role of the transmitter is determined by which port it is connected to the RFI-PHSB, there are two ports "Primary" and "Secondary". The typical behaviour is that the Primary RFI-148 250 is keying up and sending paging data.

7.2 Configuration

The hot standby operation is configured with the *Standby Mode* setting:

- Disabled (Default): The PTX is not operating in a hot standby environment and operates as normal
- Hardware: The *Can Go Active* signal is presented on pin 17 of the LIU. Active High.
- Software: The *Can Go Active* signal is controlled via Hayes AT command or Cruise Control.

Any changes to Standby Mode or installing the expansion port connector requires a power cycle to take effect.

7.3 Operation

The Primary RFI-148 250 has control of the RF switch position. The default switch position, when no Primary unit exists or the RFI-PHSB is unpowered, is for the Secondary unit. Upon power up the Primary unit will always favour itself for the RF switch position, but the power up default is to leave the switch in the Secondary unit position.

The Primary unit will change the RF switch to itself when all three signals satisfy the conditions:

- "Can Go Active" is True
    - For Hardware Standby Mode: Pin 17 is HIGH
    - For Software Standby Mode: "Can Go Active (SW)" is set to "True" (Hayes command: `ATM12=1`)"
- "TX Fault" is False (See section 7.4 below)
- "PTT" is Inactive

The Primary unit will change the RF switch to the Secondary unit if any two signals violate the conditions:

- "Can Go Active" is True
- "TX Fault" is False

Both the Primary and Second units know what position the switch is in. If the unit does not hold the switch position, transmission is disabled using the "PTT Override" feature. In this case "PTT Override Status" will read "DISABLED:In Standby". Because of this behaviour, the Base Station Controllers providing encoded paging data and PTT need not know of the RF switch position.

Faults -> Fault Configuration -> Go Standby

7.4 Switchover Faults

An additional option per fault is provided that is the source of the "TX Fault" signal. By default, any faults that would usually cause paging messages to fail to transmit will assert the "TX Fault" signal. This is configurable per-fault within the Faults menu as the "Go Standby" option.

Encoder Interface -> External I/O

7.5 Hardware Feedback

Two open-collector MOSFET outputs report a summary of the unit state:

- IN STANDBY (LIU pin 23): Active when the unit is in Standby mode (ie, PTT disabled)

- IS PRIMARY (LIU pin 24): Active if the unit is the Primary unit

Appendix A Technical Specifications

A.1 Type Approvals

RFI-148		
Australia / New Zealand	AS NZS 4769.1	Australian Supplier ID: N161
FCC	CFR 47 Part 15 and Part 90	FCC ID P5MRFI148
ETSI	ETSI EN 300 113, EN 301 489, EN 60950	N/A

Table 7: RFI-148 type approvals

RFI-900		
FCC	CFR 47 Part 15 and Part 90	FCC ID P5MRFI900

Table 8: RFI-900 type approvals

A.2 RFI-148/900250 Specifications

RF Operating Bandwidth	RFI-148	RFI-900
	138 MHz – 174 MHz	929 MHz – 932 MHz
RF Switching Bandwidth	RFI-148	RFI-900
	2.5 MHz	3MHz
RF Channel Spacing	12.5 kHz, 20 kHz, 25 kHz	
RF Channel Occupation POCSAG 512 POCSAG 1200 POCSAG 2400 FLEX-2 1600 FLEX-2 3200 FLEX-4 3200 FLEX-4 6400	 6.25 kHz (wide) 3.18 kHz (narrow) 6.30 kHz (wide) 3.20 kHz (narrow) 7.45 kHz (wide) 3.78 kHz (narrow) 6.90 kHz (wide) 3.50 kHz (narrow) 7.30 kHz (wide) 3.70 kHz (narrow) 7.00 kHz (wide) 3.55 kHz (narrow) 7.80 kHz (wide) 3.95 kHz (narrow)	
RF Frequency Raster	Selectable: 30kHz, 25 kHz, 20 kHz, 15kHz, 12.5 kHz, 10 kHz, 7.5kHz, 6.25 kHz, 5 kHz, 2.5kHz.	
RF Output	20 to 250 Watts +/- 0.5 dB	
RF Diag	Transmitting mode power level: -50 dBm Listening mode insertion loss: 12 dB +/- 2 dB	
Internal Reference	Frequency: 10 MHz Stability: +/- 1 ppm (-30 to +75 degrees C)	
External Reference	Frequency: 5 or 10 MHz Amplitude: -20 to 15 dBm	

<table>
<tr><td>Modulation</td><td>POCSAG 512, 1200, 2400 bps (2-level FSK).
FLEX 1600 (2-level FSK), 3200 (2- or 4-level FSK), 6400 bps (4-level FSK).</td></tr>
<tr><td>Real-time Clock</td><td>Time drift: 1 hour after 10 years
Battery life: 43 years (estimated)</td></tr>
<tr><td>Ethernet Port</td><td>10BASE-T/100BASE-TX, auto-negotiating.</td></tr>
<tr><td>Serial Ports</td><td>Dual asynchronous full-duplex RS-232
Baud rates (rear port only): 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Data bits (rear port only): 7 or 8
Parity (rear port only): None, odd, or even
Stop bits (rear port only): 1 or 2
Flow control (rear port only): None or hardware (RTS/CTS)
Control lines (rear port only): RTS, CTS, DTR, DCD
Front port configuration locked to 19200 8N1
Front port: DCE
<table><tr><td rowspan="2">Rear Port</td><td>RFI-148</td><td>RFI-900</td></tr><tr><td>DTE</td><td>DCE</td></tr></table></td></tr>
<tr><td>Digital Inputs</td><td>TTL Schmitt trigger with internal 100 KΩ pull-up.
Frequency Select 1
Frequency Select 2
Frequency Select 3
Frequency Select 4
Protocol Select
Hardware PTT
Tx Data L-bit
Tx Data H-bit
Transmit Clock
Aux Input 1 (General purpose, RFI-148 only)</td></tr>
<tr><td>Alarm Outputs</td><td>Open-collector Darlington with 500 mA sink current.</td></tr>
<tr><td>Input Voltage (Model specific)</td><td>24VDC Model: 20 V to 31.2 V for 24 V nominal
-48VDC Model: -40.5 V to -57 V for -48 V nominal
110/240V AC Model: 100 to 250 V AC, 50 to 60 Hz</td></tr>
<tr><td>Operating Temperature 24 V DC and -48 V DC</td><td>-30 to 55 ^{0}C</td></tr>
<tr><td>Operating Temperature 110/240VAC</td><td>-30 to 50 ^{0}C</td></tr>
<tr><td>Connectors (DC model)</td><td>DC Power: Terminal block Phoenix Contact 1703454 and cable mount plug Phoenix Contact 1967456.
Front Serial Port: DE-9 RS-232 Female (DCE)
LIU Interface: DC-37 Female
Ethernet: RJ45 socket</td></tr>
</table>

	RF Output: N-type female 50 Ω RF Diag: TNC female 50 Ω External Reference Input: BNC female		
	Rear Serial Port	RFI-900	RFI-148
		DE-9 RS-232 Female (DCE)	DE-9 RS-232 Male (DTE)
DC Output (RFI-900 only)	Voltage	24V	
	Max. Load	2A	

Table 9: RFI-148/900250 Specifications

RFI-148 current draw		
Typical Current Draw at 24 V DC.	AMCA, FCC	ETSI
	• Idle: 0.6 A • 20 W: 5.85 A • 100 W: 11.58 A • 250 W: 17.28 A	• Idle: 0.6 A • 20 W: 6.03 A • 100 W: 11.79 A • 250 W: 19.05 A
Typical Current Draw at -48 V DC.	AMCA, FCC	ETSI
	• Idle: 0.5 A • 20 W: 3.42 A • 100 W: 6.51 A • 250 W: 10.31 A	• Idle: 0.5 A • 20 W: 3.52 A • 100 W: 6.89 A • 250 W: 11.48 A
Typical Current Draw at 240 V AC	ACMA, FCC	ETSI
	• Idle: 0.10 A • 20 W: 0.79 A • 100 W: 1.43 A • 250 W: 2.14 A	• Idle: 0.10 A • 20 W: 0.82 A • 100 W: 1.46 A • 250 W: 2.36 A

Table 10: RFI-148 current draw

RFI-900 current draw	
Typical Current Draw at 120 V AC	Figures quoted are with fans on unless specified. • Idle (Fans off): 0.48 A • 20 W: 2.01 A • 50 W: 2.84 A • 100 W: 3.93 A • 200 W: 5.56 A • 250 W: 6.22 A

Table 11: RFI-900 current draw

A.3 Serial Connectors

A.3.1 Rear Serial Port

Pin	Function	Direction	
		RFI-148	RFI-900
1	DCD	Input	Output
2	RxD	Input	Output
3	TxD	Output	Input
4	DTR	Output	Input
5	GND		
6	N/A		
7	RTS	Output	Input
8	CTS	Input	Output
9	N/A		

Table 12: Back Panel Connector Pin OutRFI-900

A.3.2 Front Serial Port (DCE)

Pin	Function	Direction
1	N/A	
2	RxD	Output
3	TxD	Input
4	N/A	
5	GND	
6	N/A	
7	N/A	
8	N/A	
9	N/A	

Table 13: Front Connector Pin Out

A.4 LIU Interface

Pin	Function	Label	Direction
1	Protocol Select	PRO	Input
2	Alarm 3	ALM3	Output
3	Alarm 10	ALM10	Output
4	Alarm 11	ALM11	Output

5	Frequency Select 4	CH4	Input
6	Frequency Select 3	CH3	Input
7	Frequency Select 2	CH2	Input
8	Frequency Select 1	CH1	Input
9	GND	GND	
10	GND	GND	
11	Hardware PTT	PTT	Input
12	Combined Alarm	COMB	Output
13[2]	Auxiliary Input 1	Aux Input 1	Input
14	Alarm 1	ALM1	Output
15	Tx Data L-bit	LB	Input
16	Tx Data H-bit	HB	Input
17	LIU Detect OR Hot Standby "Can Go Active"	DET	Input
18	Tx Data Clock	CLK	Input
19	GND	GND	
20	Alarm 2	ALM2	Output
21	Alarm 7	ALM7	Output
22	Alarm 4	ALM4	Output
23	Alarm 12 OR Hot Standby "IN STANDBY"	ALM12	Output
24	Alarm 13 OR Hot Standby "IS PRIMARY"	ALM13	Output
25	N/A		
26	Alarm 9	ALM9	Output
27	N/A		
28	N/A		
29	Alarm 5	ALM5	Output
30	Alarm 6	ALM6	Output
31	Alarm 8	ALM8	Output
32	+5 V	5V	Output
33	+5 V	5V	Output
34	**RFI-148** +12 V	12V	Output
	RFI-900 +24V	24V	
35	**RFI-148** +12 V	12V	Output
	RFI-900 +24V	24V	
36	**RFI-148** +24 V nominal (Note: identical to DC input voltage for 24 VDC model)	24V	Output

[2] A general purpose input available on the RFI-148 only.

	RFI-900	+48 V nominal (Note: identical to DC input voltage)	48V	
37	**RFI-148**	+24 V nominal (Note: identical to DC input voltage for 24 VDC model)	24V	Output
	RFI-900	+48 V nominal (Note: identical to DC input voltage)	48V	

Table 14: LIU Interface Pin Out

	Non-exciter-based build	**Exciter-based build**
Interface standards	5 V CMOS 5 V TTL (with modification) 3.3 TTL (with modification) 3.3 CMOS (with modification)	5 V CMOS 5 V TTL 3.3 TTL 3.3 CMOS
Input resistance	Schmitt trigger with internal 33 KΩ pull-up.	Schmitt trigger with internal 100 KΩ pull-up (148P306-B), 33 KΩ pull-up (148P306-C).
Nominal logic high input voltage	3.3 V to 5 V	3.3 V to 5 V
Minimum logic high input voltage	3.5 V	2.5 V
Maximum logic high input voltage	12 V	12 V
Nominal logic low input voltage	0 V	0 V
Maximum logic low input voltage	1.5 V	0.5 V
Minimum logic low input voltage	-12 V	-12 V
Over voltage protection	±12 V	±12 V

Table 15: LIU Encoder Input Specifications

	Non-exciter-based build	**Exciter-based build**
Output transistor type	Open collector MOSFET	Open collector Darlington
Maximum sink current	500 mA	50 mA
Maximum output voltage	50 V	12 V

Table 16: LIU Alarm Output Specifications

Appendix B Controller Configurations

The following section provides example wiring between the transmitter and some common controllers.

B.1 Motorola NIU Controller / FLEX Mode

External NIU(TB3, TB4)	Transmitter (LIU, DC37)
TB3-2: Tx Clock	DC37-18: CLK
TB3-4: Tx key	DC37-11: PTT
TB3-8: GND	DC37-19: GND
TB4-2: Rx FQ1	DC37-15: LB
TB4-3: Rx FQ2	DC37-16: HB

Table 17: Motorola NIU Controller / FLEX Mode Connection

B.2 Glenayre C2000 Controller / FLEX Mode

C2000 (J4)	Transmitter (LIU, DC37)
J4-10: GND	DC37-19: GND
J4-26: TXKEY+	DC37-11: PTT
J4-3: TD0+, MSB	DC37-16: HB
J4-34: TD1+, LSB	DC37-15: LB
J4-18: Data Clock+	DC37-18: CLK
J4-7: Freq2	DC37-6: CH3
J4-6: Freq1	DC37-7: CH2
J4-36: Freq0	DC37-8: CH1

Table 18: Glenayre C2000 Controller / FLEX Mode Connection

B.3 Glenayre C2000 Controller / POCSAG Mode

Encoder	Transmitter (LIU, DC37)
Tx Data	DC37-15: LB
PTT	DC37-11: PTT
GND	DC37-19: GND

Table 19: Glenayre C2000 Controller / POCSAG Mode Connection

B.4 Zetron Model 66 Transmitter Controller / POCSAG Mode

Model 66	Transmitter (DC37)
DIG DATA (pin 10)	DC37-15: LB
DIG PTT (pin 7)	DC37-11: PTT
GND (pin 3)	DC37-19: GND

Table 20: Zetron Model 66 Controller / POCSAG Mode Connection

Appendix C Management Reference

C.1 Serial Port Diagnostics

Name	Description	AT
Rx Total	The size of the input buffer.	I20[*p*,0]
Rx Used	The number of bytes currently stored in the input buffer.	I20[*p*,1]
Rx Bytes	The total number of bytes received.	I20[*p*,2]
Rx Errors	The total number of receive errors that have occurred. Sum of Rx Overflows, Rx Overruns, Rx Framing, and Rx Parity errors.	I20[*p*,3]
Rx Overflows	The number of receive overflow errors that have occurred. An overflow occurs when data is received, but the buffer is full.	I20[*p*,4]
Rx Overruns	The number of overrun errors that have occurred. An overrun occurs when the device is overloaded and cannot handle the incoming data.	I20[*p*,5]
Rx Framing	The number of framing errors that have occurred. Framing errors usually occur due to mismatched serial port baud rates.	I20[*p*,6]
Rx Parity	The number of serial parity errors that have been detected.	I20[*p*,7]
Tx Total	The size of the output buffer.	I20[*p*,8]
Tx Used	The number of bytes currently stored in the output buffer.	I20[*p*,9]
Tx Bytes	The total number of bytes that have been transmitted.	I20[*p*,10]
Tx Errors	The total number of errors that have occurred while transmitting. This is equal to the Tx Overflows count.	I20[*p*,11]
Tx Overflows	The number of transmit overflow errors that have occurred. This occurs when there is data to transmit, but the buffer is full.	I20[*p*,12]

Table 21: Serial Port Statistics

C.2 SNMP Diagnostic Parameters

Table 22 outlines the parameters accessible by SNMP. An 'R' under the access column indicates the parameter is read-only; an 'R/W' indicates read-write.

SNMP Textual Name	Access	Description
Diagnostics		
rfiDiagTimeLcl	R	The current local time (in seconds since Jan 1 1970).
rfiDiagTimeLclstring	R	The current local time.
rfiDiagTimeUp	R	Seconds since the radio powered up.
rfiDiagTimeUtc	R/W	The current UTC (in seconds since Jan 1 1970).
Fan Control		
rfiFanCtrlForce	R/W	Manual fan override (allows fans to be forced on).
rfiFanCtrlSensor	R/W	Temperature sensor used for fan control.
rfiFanCtrlTempOff	R/W	Sensed temperature below which fans will be turned off.
rfiFanCtrlTempOn	R/W	Sensed temperature above which fans will be turned on.
rfiFanSensTemp	R	Current temperature at sensor used for fan control.
Faults		
rfiFaultHistTblFault	R	The fault that occurred.
rfiFaultHistTblTime	R	The time that the fault occurred.
rfiFaultTblAction	R/W	Configured action to be taken when this fault occurs.
rfiFaultTblActtime	R	Duration for which this fault has been active, or 0 if the fault is not active.
rfiFaultTblCount	R/W	The number of times this fault has occurred since the statistics were reset.
rfiFaultTblLatch	R/W	Configured latching mechanism for this fault.
rfiFaultTblName	R	Name of the fault in this row of the table.
rfiFaultTblStatus	R	Indicates whether or not this fault condition is currently active.
Identity		
rfiIdApproval	R	International type approval code which applies to this device.
rfiIdFwver	R	Version information for the firmware loaded in this device.
rfiIdMfdate	R	Date on which this device was manufactured.
rfiIdOphours	R	An approximation of the total number of hours that this device has been powered up.
rfiIdProdstr	R	The model name for this device.
rfiIdSerialno	R	Factory assigned serial number for this device.
Paging Protocols		

rfiPageProtSelect	R/W	Active protocol profile.
rfiPageProtTblOffset	R/W	Configured carrier frequency offset for this profile.
rfiPageProtTblProt	R/W	Configured paging protocol for this profile.
Radio Parameters		
rfiRadioFrqChSelect	R/W	Currently selected radio channel number.
rfiRadioFrqChTblNo	R	Radio channel number.
rfiRadioFrqChTblTxfrq	R/W	Radio channel transmit frequency.
rfiRadioFrqRefCur	R	The current reference being used to generate channel frequencies.
rfiRadioFrqRefExt	R	The state of the external reference.
rfiRadioFrqRefMode	R/W	The reference selection method.
rfiRadioIsolatorFeed	R	Hardware feedback from the isolator attentuation switchout mechanism.
rfiRadioIsolatorMode	R/W	Sets the isolator for normal transmission (high attenuation on RF diag port) or for listening to signal from antenna, for network testing (low attenuation on RF diag port, transmission disabled).
rfiRadioTxDelay	R/W	Applies an artificial transmission delay to all data. Can be used for matching delay in heterogeneous transmitter networks.
rfiRadioTxIdletime	R	Time since last transmission ended (if not transmitting), or zero if currently transmitting.
rfiRadioTxOntime	R	Time since current transmission started (if transmitting), or zero if not currently transmitting.
rfiRadioTxPttAuto	R/W	Setting to enable or disable the automatic Push-To-Talk on data feature.
rfiRadioTxPttAutoTmout	R/W	No-data timeout for the automatic PTT feature.
rfiRadioTxPttOverride	R/W	Master override allowing transmission to be completely disabled, regardless of PTT inputs.
rfiRadioTxPttStatus	R	If PTT is currently disabled, describes what is the source of the override.
rfiRadioTxPttTofftime	R/W	Delay before turning off the transmitter after PTT off is signalled.
rfiRadioTxPwrCtrlLvl	R/W	Transmitter output power setting.
rfiRadioTxStatus	R	Current transmission status. May be off, on, or waiting for PTT delay to expire before turning off.
rfiRadioTxTimeout	R/W	Continuous transmission time, in seconds, which will cause a Transmit Timeout fault to occur. By default this will disable further transmission until the fault is cleared.
rfiRadioTxTimeouten	R/W	Enable or disable the transmit timeout feature.
Sensors		

rfiSensTblCutoffHi	R/W	Upper cutoff value for this sensor. Measurements which exceed this cutoff cause a fault.
rfiSensTblCutoffLo	R/W	Lower cutoff value for this sensor. Measurements lower than this cutoff cause a fault.
rfiSensTblFault	R	Current fault status associated with this sensor.
rfiSensTblMax	R	Maximum recorded sensor value since the statistics were reset.
rfiSensTblMin	R	Minimum recorded sensor value since the statistics were reset.
rfiSensTblName	R	Name of the fault in this row of the table.
rfiSensTblVal	R	Current measured sensor value.

Table 22: SNMP Diagnostic Parameters

Appendix D Hayes AT Reference

AT-only commands

Print All Sensors
Legacy command for printing all sensor values as a comma separated list.
ATI100: Runs the Print All Sensors routine

Print Faults Mask
Prints a comma separated list of active faults, each fault represented by their index. Prints 'None.' if there are no faults active.
ATI101: Runs the Print Faults Mask routine

Print Upper Limits
Legacy command for printing all sensor upper cutoff values as a comma separated list.
ATI102: Runs the Print Upper Limits routine

Print Lower Limits
Legacy command for printing all sensor lower cutoff values as a comma separated list.
ATI103: Runs the Print Lower Limits routine

Print Sensor Minimums
Legacy command for printing all sensor minimum recorded values since last sensor history reset as a comma separated list.
ATI105: Runs the Print Sensor Minimums routine

Print Sensor Maximums
Legacy command for printing all sensor maximum recorded values since last sensor history reset as a comma separated list.
ATI106: Runs the Print Sensor Maximums routine

Read Faults Detailed
Print all active faults, in the format "<FaultNumber>:<ActiveDuration>:<Counter>, ..."
ATI180: Runs the Read Faults Detailed routine

Online
(Alias for ATO) Exit command parsing mode and go online
ATO0: Runs the Online routine.

Online
Exit command parsing mode and go online
ATO: Runs the Online routine.

Reset
Perform a software reset
AT&T9: Runs the Reset routine.

RUF Init
Initialise the length for a .ruf file transfer
ATU1=*n*: Runs the RUF Init routine where *n* is the length of the .ruf file in bytes.

RUF Block

Send a data block as part of a .ruf file transfer, the CRC over the data is returned
ATU2=*n*: Runs the RUF Block routine where *n* is the .ruf file data block.

RUF Status
Query the status of an in-progress .ruf file transfer
ATU4: Runs the RUF Status routine.

RUF Query
Query the most recently completed .ruf file transfer
ATU5: Runs the RUF Query routine.

RUF Update
Execute an update to the most recently transferred .ruf file
ATU6: Runs the RUF Update routine.

Save All
Write through all AT command sets since power-on-reset to EEPROM
AT&W: Runs the Save All routine.

Password
Set the device password
AT%23=*n*: Runs the Password routine where *n* is the new password.

Open Menu
Open the terminal menu on this stream
AT?: Runs the Open Menu routine.

Stream Index
Show the index number of this stream
AT&S0: Runs the Stream Index routine.

Cruise Control Menu

Product String
The model name for this device.
ATI0: Returns the current value of Product String.

Manufacture Date
Date on which this device was manufactured.
ATI5: Returns the current value of Manufacture Date.

Serial Number
Factory assigned serial number for this device.
ATI6: Returns the current value of Serial Number.

Radio Menu

Current Transmit Time
Time since current transmission started (if transmitting), or zero if not currently transmitting.
ATP119: Returns the current value of Current Transmit Time.

Transmitter Idle Time
Time since last transmission ended (if not transmitting), or zero if currently transmitting.
ATP116: Returns the current value of Transmitter Idle Time.

PTT Override Status
If PTT is currently disabled, describes what is the source of the override.
ATP6: Returns the current value of PTT Override Status.

PTT Override
Master override allowing transmission to be completely disabled, regardless of PTT inputs.
ATP7: Returns the current value of PTT Override.
ATP7=*n* sets PTT Override to *n*
Values accepted:
0 = Enable Transmit
1 = Disable Transmit

PTT Turn Off Delay
Delay before turning off the transmitter after PTT off is signalled.
ATP112: Returns the current value of PTT Turn Off Delay.
ATP112=*n[.m]*: Sets the value of PTT Turn Off Delay to *n* s, given that 0.000 <= *n* <= 65.535.

Enable Transmit Timeout
Enable or disable the transmit timeout feature.
ATP117: Returns the current value of Enable Transmit Timeout.
ATP117=*n* sets Enable Transmit Timeout to *n*
Values accepted:
0 = False
1 = True

Transmit Timeout
Continuous transmission time, in seconds, which will cause a Transmit Timeout fault to occur. By default this will disable further transmission until the fault is cleared.
ATP118: Returns the current value of Transmit Timeout.
ATP118=*n[.m]*: Sets the value of Transmit Timeout to *n* s, given that 0.000 <= *n* <= 4294967.295.

Absolute Delay Adjustment
Applies an artificial transmission delay to all data. Can be used for matching delay in heterogeneous transmitter networks.
ATI154: Returns the current value of Absolute Delay Adjustment.
ATI154=*n[.m]*: Sets the value of Absolute Delay Adjustment to *n* ms, given that 0.000 <= *n* <= 40.000.

Power Menu

Transmitter Status
Current transmission status. May be off, on, or waiting for PTT delay to expire before turning off.
ATP115: Returns the current value of Transmitter Status.

(Distributer) Max Tx Power
Override the maximum configurable transmit power to a sublevel of the radios capabilities.
ATS209: Returns the current value of Max Tx Power.
ATS209=*n*: Sets the value of Max Tx Power to *n* W, given that 20 <= *n* <= 250.

Tx Power

Transmitter output power setting.
ATS45: Returns the current value of Tx Power.
ATS45=*n*: Sets the value of Tx Power to *n* W, given that 20 <= *n* <= 250.

Power Foldback
The percent of transmit power in Watts to foldback to when the scale transmit power fault action goes active.
ATP120: Returns the current value of Power Foldback.
ATP120=*n*: Sets the value of Power Foldback to *n* %%, given that 0 <= *n* <= 100.

Transmit On
Software PTT method to key up the transmitter.
ATP3: Runs the Transmit On routine.

Transmit Off
Software PTT method to key down the transmitter.
ATP2: Runs the Transmit Off routine.

Channel Menu

Tx Range
ATS183: Returns the current value of Tx Range.

Current Tx Freq
ATS184: Returns the current value of Current Tx Freq.

Raster
Read-only node for viewing the raster frequency of the radio.
ATS185: Returns the current value of Raster.

Channel Width
Read-only node for viewing the channel width of the radio.
ATS186: Returns the current value of Channel Width.

Current Channel
Currently selected radio channel number.
ATS54: Returns the current value of Current Channel.
ATS54=*n*: Sets the value of Current Channel to *n* , given that 1 <= *n* <= 17.

(Distributer) Channel Count
Number of channels that can be switched between using the current channel setting.
ATS210: Returns the current value of Channel Count.
ATS210=*n*: Sets the value of Channel Count to *n* , given that 1 <= *n* <= 16.

Advanced Menu

(Distributer) Tx Base Freq
Minimum transmit frequency.
ATS211: Returns the current value of Tx Base Freq.
ATS211=*n[.m]*: Sets the value of Tx Base Freq to *n* MHz, given that 130.000000 <= *n* <= 1050.000000.

(Distributer) Bandwidth

The amount of usable frequncies available to the radio.
ATS212: Returns the current value of Bandwidth.
ATS212=*n[.m]*: Sets the value of Bandwidth to *n* MHz, given that 1.000000 <= *n* <= 100.000000.

(Distributer) Raster
Frequency raster. All channel frequencies must be divisible by the raster.
ATS57: Returns the current value of Raster.
ATS57=*n* sets Raster to *n*
Values accepted:
0 = 0.001 kHz
1 = 2.500 kHz
2 = 5.000 kHz
3 = 6.250 kHz
4 = 7.500 kHz
5 = 10.000 kHz
6 = 12.500 kHz
7 = 15.000 kHz
8 = 20.000 kHz
9 = 25.000 kHz
10 = 30.000 kHz

Channel Width
The radios channel width.
ATS66: Returns the current value of Channel Width.
ATS66=*n* sets Channel Width to *n*
Values accepted:
0 = 12.500 KHz
1 = 25.000 KHz

Channel Table

Tx Freq
Radio channel transmit frequency.
ATS55[a]: Returns the current value of Tx Freq.
ATS55[a]=*n[.m]*: Sets the value of Tx Freq to *n* MHz, given that 130.000000 <= *n* <= 1050.000000. Where:
a = Channel Table table index (starting from 1)

Reference Menu

Current Reference
The current reference being used to generate channel frequencies.
ATI122: Returns the current value of Current Reference.

External Reference
The state of the external reference.
ATI123: Returns the current value of External Reference.

Reference Mode
The reference selection method.
ATI120: Returns the current value of Reference Mode.
ATI120=*n* sets Reference Mode to *n*
Values accepted:

0 = Internal
1 = External With Failover

Ext. Ref. Frequency
Configures the frequency of the external reference.
ATI121: Returns the current value of Ext. Ref. Frequency.
ATI121=*n* sets Ext. Ref. Frequency to *n*
Values accepted:
0 = 5 MHz
1 = 10 MHz

Isolator Menu

Feedback
Hardware feedback from the isolator attentuation switchout mechanism.
ATP33: Returns the current value of Feedback.

Isolator Mode
Sets the isolator for normal transmission (high attenuation on RF diag port) or for listening to signal from antenna, for network testing (low attenuation on RF diag port, transmission disabled).
ATP31: Returns the current value of Isolator Mode.
ATP31=*n* sets Isolator Mode to *n*
Values accepted:
0 = Set for Transmitting
1 = Set for Listening

Listening Mode Timeout
A timeout in seconds that starts when the isolator is set to listening mode. When the timeout expires the isolator will automatically return to transmitting mode.
ATP35: Returns the current value of Listening Mode Timeout.
ATP35=*n[.m]*: Sets the value of Listening Mode Timeout to *n* s, given that 0.000 <= *n* <= 65.535.

Enable Listening Timeout
Enables or disables listening mode timeout.
ATP34: Returns the current value of Enable Listening Timeout.
ATP34=*n* sets Enable Listening Timeout to *n*
Values accepted:
0 = Disabled
1 = Enabled

Paging Protocols Menu

POCSAG Deviation
ATP105: Returns the current value of POCSAG Deviation.

FLEX Deviation
ATP106: Returns the current value of FLEX Deviation.

Encoding Mode
Configure the encoding source for paging transmitter data.
ATN10: Returns the current value of Encoding Mode.
ATN10=*n* sets Encoding Mode to *n*
Values accepted:

0 = External Encoder
1 = TNPP Serial
2 = TNPP TCP:64250
3 = TNPP UDP:64250
4 = PET/TAP Serial
5 = PET/TAP TCP:64250
6 = PET/TAP UDP:64250

PET/TAP Menu

Current State
ATN43: Returns the current value of Current State.

Line Separator
The line separator output between new lines. Configurable for compatibility across terminals.
ATN15: Returns the current value of Line Separator.
ATN15=*n* sets Line Separator to *n*
Values accepted:
0 =
1 =

Timeout
Intercharacter timeout before purging input buffer and reverting to idle state.
ATN16: Returns the current value of Timeout.
ATN16=*n[.m]*: Sets the value of Timeout to *n* s, given that 0.5 <= *n* <= 10.0.

Baud Rate
Baud rate at which encoded POSCAG pages are sent over the air.
ATN19: Returns the current value of Baud Rate.
ATN19=*n* sets Baud Rate to *n*
Values accepted:
0 = 512
1 = 1200
2 = 2400

Stay Logged In
Remains logged in indefinitely after receiving a valid login string.
ATN41: Returns the current value of Stay Logged In.
ATN41=*n* sets Stay Logged In to *n*
Values accepted:
0 = False
1 = True

Implied Login
Option to skip login sequence if a <STX> is read while waiting for wake up sequence.
ATN42: Returns the current value of Implied Login.
ATN42=*n* sets Implied Login to *n*
Values accepted:
0 = Disabled
1 = PG1
2 = PG3

Detect Numeric Pages
When enabled, will encode a POCSAG page in numeric format (rather than alpha-numeric) if the message is wholly formed by digits.
ATN14: Returns the current value of Detect Numeric Pages.
ATN14=*n* sets Detect Numeric Pages to *n*
Values accepted:
0 = False
1 = True

Group Code
Allows the use of the final character or digit in the Pager ID field of a message submission to determine the function bits of the paging message.
ATN13: Returns the current value of Group Code.
ATN13=*n* sets Group Code to *n*
Values accepted:
0 = None
1 = Trailing Character
2 = Trailing Digit

Reset Statistics
Reset the TAP/PET statistics accumulated since start-up.
ATN17: Runs the Reset Statistics routine.

Statistics Table

Name

Value
ATN18[a]: Returns the current value of Value.
Where: a = Statistics table index (starting from 0)

TNPP Menu

Address
The address of this TNPP node.
ATN23: Returns the current value of Address.
ATN23=*n*: Sets the value of Address to *n* , given that 0 <= *n* <= 65535.

Promiscuous Mode
When enabled, this node will accept packets destined for any address.
ATN24: Returns the current value of Promiscuous Mode.
ATN24=*n* sets Promiscuous Mode to *n*
Values accepted:
0 = False
1 = True

Transparent CRC support
ATN25: Returns the current value of Transparent CRC support.
ATN25=*n* sets Transparent CRC support to *n*
Values accepted:
0 = False
1 = True

Address Extension support
ATN26: Returns the current value of Address Extension support.
ATN26=*n* sets Address Extension support to *n*
Values accepted:
0 = False
1 = True

Multi-Block support
ATN27: Returns the current value of Multi-Block support.
ATN27=*n* sets Multi-Block support to *n*
Values accepted:
0 = False
1 = True

Large Packet support
ATN28: Returns the current value of Large Packet support.
ATN28=*n* sets Large Packet support to *n*
Values accepted:
0 = False
1 = True

Reset TNPP Statistics
ATN22: Runs the Reset TNPP Statistics routine.

TNPP Statistics Table

Name
ATN20[a]: Returns the current value of Name .
Where: a = TNPP Statistics table index (starting from 0)

Count
ATN21[a]: Returns the current value of Count.
Where: a = TNPP Statistics table index (starting from 0)

POCSAG Menu

Preamble Length
Length of the preamble sent prior to paging data.
ATN30: Returns the current value of Preamble Length.
ATN30=*n*: Sets the value of Preamble Length to *n* bit, given that 32 <= *n* <= 2304.

Function Override
Override the function bits in the address codeword. Default (`Message Encoding`) is to set the function bits based on message encoding: Numeric: 00, Tone: 01, Alpha-numeric: 11.
ATN11: Returns the current value of Function Override.
ATN11=*n* sets Function Override to *n*
Values accepted:
0 = Message Encoding
1 = Always 00
2 = Always 01
3 = Always 10
4 = Always 11

Purge Timeout
Duration to wait to collate paging messages for sending over the air.
ATN29: Returns the current value of Purge Timeout.
ATN29=*n*: Sets the value of Purge Timeout to *n* ms, given that 250 <= *n* <= 5000.

Reset Statistics
ATN40: Runs the Reset Statistics routine.

Page Repeat Rules Table

Enabled
Whether this rule is enabled.
ATN36[a]: Returns the current value of Enabled.
ATN36[a]=*n* sets Enabled to *n*
Values accepted:
0 = False
1 = True
Where: a = Page Repeat Rules table index (starting from 0)

Capcode
The Capcode to match for this rule. 0 matches any capcode, all other integers match the specific capcode.
ATN37[a]: Returns the current value of Capcode.
ATN37[a]=*n*: Sets the value of Capcode to *n* , given that 0 <= *n* <= 2097152. Where: a = Page Repeat Rules table index (starting from 0)

Delay
The delay to insert between page repetitions.
ATN38[a]: Returns the current value of Delay.
ATN38[a]=*n*: Sets the value of Delay to *n* s, given that 4 <= *n* <= 60. Where: a = Page Repeat Rules table index (starting from 0)

Count
The number of times to repeat pages.
ATN39[a]: Returns the current value of Count.
ATN39[a]=*n*: Sets the value of Count to *n* , given that 1 <= *n* <= 5. Where: a = Page Repeat Rules table index (starting from 0)

POCSAG MAC Statistics Table

Name
ATN34[a]: Returns the current value of Name.
Where: a = POCSAG MAC Statistics table index (starting from 0)

Count
ATN35[a]: Returns the current value of Count.
Where: a = POCSAG MAC Statistics table index (starting from 0)

Test Menu

Status
ATG171: Returns the current value of Status.

Message

ATG172: Returns the current value of Message.
ATG172=s: Sets the value of Message to s, given that 0 <= length(s) <= 30.

Encoding
ATG173: Returns the current value of Encoding.
ATG173=*n* sets Encoding to *n*
Values accepted:
0 = Alpha-numeric
1 = Numeric

Capcode
ATG174: Returns the current value of Capcode.
ATG174=*n*: Sets the value of Capcode to *n* , given that 1 <= *n* <= 2097152.

Baud Rate
ATG175: Returns the current value of Baud Rate.
ATG175=*n* sets Baud Rate to *n*
Values accepted:
0 = 512
1 = 1200
2 = 2400

Append
ATG176: Returns the current value of Append.
ATG176=*n* sets Append to *n*
Values accepted:
0 = Nothing
1 = Count
2 = Timestamp
3 = Count and Timestamp

Interval
ATG177: Returns the current value of Interval.
ATG177=*n*: Sets the value of Interval to *n* s, given that 1 <= *n* <= 120.

Duration
ATG178: Returns the current value of Duration.
ATG178=*n*: Sets the value of Duration to *n* mins, given that 0 <= *n* <= 720.

Begin Survey
ATG180: Runs the Begin Survey routine.

Stop Survey
ATG181: Runs the Stop Survey routine.

Send One Message
ATG182: Runs the Send One Message routine.

Advanced Menu

Custom Deviation

The deviation of the custom paging protocol.
ATP103: Returns the current value of Custom Deviation.
ATP103=*n[.m]*: Sets the value of Custom Deviation to *n* Hz, given that 0.0 <= *n* <= 4800.0.

Custom FSK level
The FSK-levels of the custom paging protocol.
ATP104: Returns the current value of Custom FSK level.
ATP104=*n* sets Custom FSK level to *n*
Values accepted:
0 = 2-level
1 = 4-level

Profiles Table

Paging Protocol
Configured paging protocol for this profile.
ATP91[a]: Returns the current value of Paging Protocol.
ATP91[a]=*n* sets Paging Protocol to *n*
Values accepted:
0 = POCSAG
1 = FLEX-2
2 = FLEX-4
3 = Custom
Where: a = Profiles table index (starting from 0)

Carrier Offset
Configured carrier frequency offset for this profile.
ATP92[a]: Returns the current value of Carrier Offset.
ATP92[a]=[+/-]*n*: Sets the value of Carrier Offset to *n* Hz, given that -4000 <= *n* <= 4000. Where: a = Profiles table index (starting from 0)

Ext. Data Clock
Configures whether to use an external clock to synchronise data. An external clock is mandatory for 4-level protocols.
ATP93[a]: Returns the current value of Ext. Data Clock.
ATP93[a]=*n* sets Ext. Data Clock to *n*
Values accepted:
0 = Disabled
1 = Enabled
Where: a = Profiles table index (starting from 0)

Fan Control Menu

Sensed Temp.
Current temperature at sensor used for fan control.
ATP109: Returns the current value of Sensed Temp..

Time Until Fan Test
ATP111: Returns the current value of Time Until Fan Test.

Fan Override
Manual fan override (allows fans to be forced on).
ATP22: Returns the current value of Fan Override.

ATP22=*n* sets Fan Override to *n*
Values accepted:
0 = Normal
1 = Always On

Sensor To Use
Temperature sensor used for fan control.
ATP108: Returns the current value of Sensor To Use.
ATP108=*n* sets Sensor To Use to *n*
Values accepted:
0 = Baseband Sensor
1 = PA Sensor
2 = Driver Sensor
3 = PA/Driver Ambient Sensor
4 = Isolator Sensor
5 = Baseband Thermistor
6 = PA Group Average
7 = Hottest Sensor
8 = PA Group Sensors

Turn On Temp.
Sensed temperature above which fans will be turned on.
ATP20: Returns the current value of Turn On Temp..
ATP20=[+/-]*n*: Sets the value of Turn On Temp. to *n* deg C, given that -128 <= *n* <= 127.

Turn Off Temp.
Sensed temperature below which fans will be turned off.
ATP21: Returns the current value of Turn Off Temp..
ATP21=[+/-]*n*: Sets the value of Turn Off Temp. to *n* deg C, given that -128 <= *n* <= 127.

Fan Test Interval
Interval in hours between fan self-tests.
ATP110: Returns the current value of Fan Test Interval.
ATP110=*n*: Sets the value of Fan Test Interval to *n* hrs, given that 12 <= *n* <= 48.

Sensors Menu

(Distributer) Fault Reporting
ATI203: Returns the current value of Fault Reporting.
ATI203=*n* sets Fault Reporting to *n*
Values accepted:
0 = Disabled
1 = Enabled

(Distributer) Fail-safes
ATI204: Returns the current value of Fail-safes.
ATI204=*n* sets Fail-safes to *n*
Values accepted:
0 = Disabled
1 = Enabled

Sensor Configuration Menu

Reset Cutoffs
ATI207: Runs the Reset Cutoffs routine.

Reset Min/Max
Reset the historical minimums and maximums of monitored sensor values.
ATI104: Runs the Reset Min/Max routine.

Status Parameters Table

Name
Name of the sensor and its unit in this row of the table.
ATI176[a]: Returns the current value of Name.
Where: a = Status Parameters table index (starting from 0)

Current
Current measured sensor value.
ATI90[a]: Returns the current value of Current.
Where: a = Status Parameters table index (starting from 0)

Relevant Value
The current measured sensor value if it is relevant. Otherwise -2000000
ATI99[a]: Returns the current value of Relevant Value.
Where: a = Status Parameters table index (starting from 0)

Maximum
Maximum recorded sensor value since the statistics were reset.
ATI91[a]: Returns the current value of Maximum.
Where: a = Status Parameters table index (starting from 0)

Minimum
Minimum recorded sensor value since the statistics were reset.
ATI92[a]: Returns the current value of Minimum.
Where: a = Status Parameters table index (starting from 0)

Current State
Current fault status associated with this sensor.
ATI177[a]: Returns the current value of Current State.
Where: a = Status Parameters table index (starting from 0)

Upper Cutoff
Upper cutoff value for this sensor. Measurements which exceed this cutoff cause a fault.
ATI93[a]: Returns the current value of Upper Cutoff.
Where: a = Status Parameters table index (starting from 0)

Hysteresis
Hysteresis value for this sensor. When a sensor is near the cutoff value this helps reduce excessive fault toggling.
ATI97[a]: Returns the current value of Hysteresis.
ATI97[a]=*n*: Sets the value of Hysteresis to *n* , given that 0 <= *n* <= 65535. Where: a = Status Parameters table index (starting from 0)

Lower Cutoff

Lower cutoff value for this sensor. Measurements lower than this cutoff cause a fault.
ATI96[a]: Returns the current value of Lower Cutoff.
Where: a = Status Parameters table index (starting from 0)

Reset Sensor Min/Max
Reset the historical minimum and maximum for this sensor.
ATI181[a]: Runs the Reset Sensor Min/Max routine.
Where: a = Status Parameters table index (starting from 0)

Sensor Interpolation Menu

Transmit Power Variation Table

Name
Name of the sensor and its unit in this row of the table.
ATG156[a]: Returns the current value of Name.
Where: a = Transmit Power Variation table index (starting from 0)

20W Lower Cutoff
ATG157[a]: Returns the current value of 20W Lower Cutoff.
ATG157[a]=[+/-]*n*: Sets the value of 20W Lower Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

20W Upper Cutoff
ATG158[a]: Returns the current value of 20W Upper Cutoff.
ATG158[a]=[+/-]*n*: Sets the value of 20W Upper Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647.
Where: a = Transmit Power Variation table index (starting from 0)

50W Lower Cutoff
ATG159[a]: Returns the current value of 50W Lower Cutoff.
ATG159[a]=[+/-]*n*: Sets the value of 50W Lower Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

50W Upper Cutoff
ATG160[a]: Returns the current value of 50W Upper Cutoff.
ATG160[a]=[+/-]*n*: Sets the value of 50W Upper Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647.
Where: a = Transmit Power Variation table index (starting from 0)

100W Lower Cutoff
ATG161[a]: Returns the current value of 100W Lower Cutoff.
ATG161[a]=[+/-]*n*: Sets the value of 100W Lower Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

100W Upper Cutoff
ATG162[a]: Returns the current value of 100W Upper Cutoff.
ATG162[a]=[+/-]*n*: Sets the value of 100W Upper Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

200W Lower Cutoff
ATG163[a]: Returns the current value of 200W Lower Cutoff.
ATG163[a]=[+/-]*n*: Sets the value of 200W Lower Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

200W Upper Cutoff
ATG164[a]: Returns the current value of 200W Upper Cutoff.
ATG164[a]=[+/-]*n*: Sets the value of 200W Upper Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

250W Lower Cutoff
ATG165[a]: Returns the current value of 250W Lower Cutoff.
ATG165[a]=[+/-]*n*: Sets the value of 250W Lower Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

250W Upper Cutoff
ATG166[a]: Returns the current value of 250W Upper Cutoff.
ATG166[a]=[+/-]*n*: Sets the value of 250W Upper Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647. Where: a = Transmit Power Variation table index (starting from 0)

Other Table

Name
Name of the sensor and its unit in this row of the table.
ATG167[a]: Returns the current value of Name.
Where: a = Other table index (starting from 0)

Lower Cutoff
ATG169[a]: Returns the current value of Lower Cutoff.
ATG169[a]=[+/-]*n*: Sets the value of Lower Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647.
Where: a = Other table index (starting from 0)

Upper Cutoff
ATG168[a]: Returns the current value of Upper Cutoff.
ATG168[a]=[+/-]*n*: Sets the value of Upper Cutoff to *n* , given that -2147483648 <= *n* <= 2147483647.
Where: a = Other table index (starting from 0)

Temperature Sensors Table
Voltage Sensors Table
Current Sensors Table
Fan Speeds Table
Power Table
Ratio Table
Faults Menu

Total Faults Counter
ATI156: Returns the current value of Total Faults Counter.

Active Faults
ATI157: Returns the current value of Active Faults.

Combined Fault Status
The status of the combined alarm.
ATI158: Returns the current value of Combined Fault Status.

Overview Filter

ATI155: Returns the current value of Overview Filter.
ATI155=*n* sets Overview Filter to *n*
Values accepted:
0 = Show All
1 = Show Active/Latched
2 = Show Counter > 0

Clear All Faults
Clears all active faults and reverts all fault actions that have been taken.
ATI151: Runs the Clear All Faults routine.

Fault Configuration Menu

Combined Fault Ext. Alarm
The hardware alarm associated with the combined alarm.
ATI173: Returns the current value of Combined Fault Ext. Alarm.
ATI173=*n* sets Combined Fault Ext. Alarm to *n*
Values accepted:
0 = ALM1
1 = ALM2
2 = ALM3
3 = ALM4
4 = ALM5
5 = ALM6
6 = ALM7
7 = ALM8
8 = ALM9
9 = COMB
10 = ALM10
11 = ALM11
12 = ALM12
13 = ALM13
14 = None

Min. Fault Duration
The minimum duration a parameter must be in its fault condition before it is reported.
ATI172: Returns the current value of Min. Fault Duration.
ATI172=*n[.m]*: Sets the value of Min. Fault Duration to *n* s, given that 0.000 <= *n* <= 65.535.

Fault Beeper
ATI174: Returns the current value of Fault Beeper.
ATI174=*n* sets Fault Beeper to *n*
Values accepted:
0 = Never
1 = Activity
2 = Heartbeat

Reset Counters
ATI163: Runs the Reset Counters routine.

Faults Table

Fault Name

Name of the fault in this row of the table.
ATI164[a]: Returns the current value of Fault Name.
Where: a = Faults table index (starting from 0)

Status
Indicates whether or not this fault condition is currently active.
ATI165[a]: Returns the current value of Status.
Where: a = Faults table index (starting from 0)

Active Duration
Duration for which this fault has been active, or 0 if the fault is not active.
ATI170[a]: Returns the current value of Active Duration.
Where: a = Faults table index (starting from 0)

Ext. Alarm
The hardware alarm that will be asserted when this fault is active.
ATI166[a]: Returns the current value of Ext. Alarm.
ATI166[a]=*n* sets Ext. Alarm to *n*
Values accepted:
0 = ALM1
1 = ALM2
2 = ALM3
3 = ALM4
4 = ALM5
5 = ALM6
6 = ALM7
7 = ALM8
8 = ALM9
9 = COMB
10 = ALM10
11 = ALM11
12 = ALM12
13 = ALM13
14 = None
Where: a = Faults table index (starting from 0)

Fault Action
Configured action to be taken when this fault occurs.
ATI167[a]: Returns the current value of Fault Action.
ATI167[a]=*n* sets Fault Action to *n*
Values accepted:
0 = None
1 = Reference Switchover
2 = Disable Transmit
3 = Scale Transmit Power
4 = Enable PA0 Current Foldback
5 = Enable PA90 Current Foldback
6 = Enable Reverse Power Foldback
Where: a = Faults table index (starting from 0)

Latching Mechanism

Configured latching mechanism for this fault.
ATI168[a]: Returns the current value of Latching Mechanism.
ATI168[a]=*n* sets Latching Mechanism to *n*
Values accepted:
0 = None
1 = SW Reset
Where: a = Faults table index (starting from 0)

Triggers Combined
Allows this fault to assert the combined alarm (COMB) in addition to it's configured alarm.
ATI169[a]: Returns the current value of Triggers Combined.
ATI169[a]=*n* sets Triggers Combined to *n*
Values accepted:
0 = False
1 = True
Where: a = Faults table index (starting from 0)

Go Standby
Configures this fault as a TX FAULT for the purposes of entering standby mode when Hot Standby operation is enabled
ATM17[a]: Returns the current value of Go Standby.
ATM17[a]=*n* sets Go Standby to *n*
Values accepted:
0 = False
1 = True
Where: a = Faults table index (starting from 0)

Counter
The number of times this fault has occurred since the statistics were reset.
ATI171[a]: Returns the current value of Counter.
ATI171[a]=*n*: Sets the value of Counter to *n* , given that 0 <= *n* <= 65535. Where: a = Faults table index (starting from 0)

Faults Overview Table

Fault
ATI159[a]: Returns the current value of Fault.
Where: a = Faults Overview table index (starting from 0)

Status
ATI160[a]: Returns the current value of Status.
Where: a = Faults Overview table index (starting from 0)

Active Duration
ATI161[a]: Returns the current value of Active Duration.
Where: a = Faults Overview table index (starting from 0)

Counter
ATI162[a]: Returns the current value of Counter.
Where: a = Faults Overview table index (starting from 0)

Encoder Interface Menu

Encoder Detected
ATP102: Returns the current value of Encoder Detected.

Data Idle Duration
ATP94: Returns the current value of Data Idle Duration.

24 V DC Current
ATP126: Returns the current value of 24 V DC Current.

Data Idle Timeout
Configurable timeout for detecting the encoder data inputs as idle, which will cause the encoder data idle fault to go active.
ATP95: Returns the current value of Data Idle Timeout.
ATP95=*n[.m]*: Sets the value of Data Idle Timeout to *n* s, given that 0.000 <= *n* <= 4294967.295.

Report Data Idle
Enable or disable reporting of idle encoder data fault.
ATP96: Returns the current value of Report Data Idle.
ATP96=*n* sets Report Data Idle to *n*
Values accepted:
0 = False
1 = True

4-Level Operation
Allows swapping of L-/H-bit.
ATP124: Returns the current value of 4-Level Operation.
ATP124=*n* sets 4-Level Operation to *n*
Values accepted:
0 = Normal
1 = Legacy

Encoder Protocol Control
Allows the active protocol profile to be toggled by hardware input.
ATP99: Returns the current value of Encoder Protocol Control.
ATP99=*n* sets Encoder Protocol Control to *n*
Values accepted:
0 = Disabled
1 = Enabled

Encoder Channel Control
Allows the active channel to be toggled by hardware input.
ATS180: Returns the current value of Encoder Channel Control.
ATS180=*n* sets Encoder Channel Control to *n*
Values accepted:
0 = Disabled
1 = Enabled

Encoder Hardware PTT
Allows transmitter PTT to be controlled by hardware input.
ATP97: Returns the current value of Encoder Hardware PTT.

ATP97=*n* sets Encoder Hardware PTT to *n*
Values accepted:
0 = Disabled
1 = Enabled

Tx On Active Level
Configures which state is considered to be active with hardware PTT.
ATP98: Returns the current value of Tx On Active Level.
ATP98=*n* sets Tx On Active Level to *n*
Values accepted:
0 = Active Low
1 = Active High

Auto PTT
Setting to enable or disable the automatic Push-To-Talk on data feature.
ATP100: Returns the current value of Auto PTT.
ATP100=*n* sets Auto PTT to *n*
Values accepted:
0 = Disabled
1 = Enabled

Auto PTT Timeout
No-data timeout for the automatic PTT feature.
ATP101: Returns the current value of Auto PTT Timeout.
ATP101=*n[.m]*: Sets the value of Auto PTT Timeout to *n* s, given that 0.000 <= *n* <= 65.535.

Active Profile
Active protocol profile.
ATP90: Returns the current value of Active Profile.
ATP90=*n* sets Active Profile to *n*
Values accepted:
0 = Profile 1
1 = Profile 2

Aux Input 1 Debounce
ATP121: Returns the current value of Aux Input 1 Debounce.
ATP121=*n[.m]*: Sets the value of Aux Input 1 Debounce to *n* s, given that 0.5 <= *n* <= 120.0.

Aux Input 1 Active Level
ATP122: Returns the current value of Aux Input 1 Active Level.
ATP122=*n* sets Aux Input 1 Active Level to *n*
Values accepted:
0 = Low
1 = High

Clock Edge
Configures the clock edge to use when using an external data clock.
ATI152: Returns the current value of Clock Edge.
ATI152=*n* sets Clock Edge to *n*
Values accepted:

0 = Rising-edge
1 = Falling-edge

Data Invert
Set to true to invert data internally before modulation.
ATI153: Returns the current value of Data Invert.
ATI153=*n* sets Data Invert to *n*
Values accepted:
0 = Normal
1 = Inverted

24 V DC Output
ATP125: Returns the current value of 24 V DC Output.
ATP125=*n* sets 24 V DC Output to *n*
Values accepted:
0 = Disabled
1 = Enabled

24 V DC Cycle
ATP127: Runs the 24 V DC Cycle routine.

External I/O Table

Name
ATR248[a]: Returns the current value of Name.
Where: a = External I/O table index (starting from 0)

Direction
ATR249[a]: Returns the current value of Direction.
Where: a = External I/O table index (starting from 0)

State
ATR250[a]: Returns the current value of State.
Where: a = External I/O table index (starting from 0)

Hot Standby Menu

Role
ATM13: Returns the current value of Role.

State
ATM14: Returns the current value of State.

RF Switch
ATM15: Returns the current value of RF Switch.

Can Go Active (HW)
ATM11: Returns the current value of Can Go Active (HW).

TX Fault
ATM16: Returns the current value of TX Fault.

Standby Mode

ATM10: Returns the current value of Standby Mode.
ATM10=*n* sets Standby Mode to *n*
Values accepted:
0 = Disabled
1 = Hardware
2 = Software

Can Go Active (SW)
ATM12: Returns the current value of Can Go Active (SW).
ATM12=*n* sets Can Go Active (SW) to *n*
Values accepted:
0 = False
1 = True

Serial Ports Menu

Main DTR State
The state of the DTR input on the main serial port.
ATS92: Returns the current value of Main DTR State.

Main RTS State
The state of the RTS input on the main serial port.
ATS93: Returns the current value of Main RTS State.

Main Flow Control
Configures flow control methods for the main serial port
ATS104: Returns the current value of Main Flow Control.
ATS104=*n* sets Main Flow Control to *n*
Values accepted:
0 = None
2 = Hardware (RTS / CTS)

Main DCD Mode
Configures the behaviour of the DCD output on the main serial port.
ATS90: Returns the current value of Main DCD Mode.
ATS90=*n* sets Main DCD Mode to *n*
Values accepted:
0 = Always High
1 = Always Low
2 = Mirrors DCD
3 = Mirrors CTS
4 = Follows TX

Main CTS Mode
Configures the behaviour of the CTS output on the main serial port.
ATS91: Returns the current value of Main CTS Mode.
ATS91=*n* sets Main CTS Mode to *n*
Values accepted:
0 = Always High
1 = Always Low
2 = Mirrors DCD

3 = Mirrors CTS
4 = Follows TX

Settings Table

Baud Rate
The baud rate configured for this serial port.
ATS100[a]: Returns the current value of Baud Rate.
ATS100[a]=*n* sets Baud Rate to *n*
Values accepted:
1 = 300
2 = 600
3 = 1200
4 = 2400
5 = 4800
6 = 9600
8 = 19200
9 = 38400
10 = 57600
11 = 115200
Where: a = Settings table index (starting from 0)

Data Bits
The number of data bits configured for this serial port.
ATS102[a]: Returns the current value of Data Bits.
ATS102[a]=*n* sets Data Bits to *n*
Values accepted:
0 = 7
1 = 8
Where: a = Settings table index (starting from 0)

Parity
The parity configuration for this serial port.
ATS101[a]: Returns the current value of Parity.
ATS101[a]=*n* sets Parity to *n*
Values accepted:
0 = None
1 = Even
2 = Odd
Where: a = Settings table index (starting from 0)

Stop Bits
The number of stop bits used on this serial port.
ATS103[a]: Returns the current value of Stop Bits.
ATS103[a]=*n* sets Stop Bits to *n*
Values accepted:
0 = 1
1 = 2
Where: a = Settings table index (starting from 0)

Reset Statistics

ATS189[a]: Runs the Reset Statistics routine.
Where: a = Settings table index (starting from 0)

Statistics Table

Name
ATS188[a,b]: Returns the current value of Name.
Where: a = Settings table index (starting from 0) b = Statistics table index (starting from 0)

Value
Shows statistics for serial port events.
ATI20[a,b]: Returns the current value of Value.
Where: a = Settings table index (starting from 0) b = Statistics table index (starting from 0)

LAN Interface Menu

Ethernet Menu

Local MAC Address
The factory-assigned Ethernet MAC address of the unit.
ATR46: Returns the current value of Local MAC Address.

Link Status
ATR255: Returns the current value of Link Status.

Auto Negotiation Status
ATR256: Returns the current value of Auto Negotiation Status.

Link Speed
ATR257: Returns the current value of Link Speed.

Link Duplex
ATR258: Returns the current value of Link Duplex.

Auto Negotiation
Configure whether the Ethernet interface will automatically detect link speed and duplex.
ATR259: Returns the current value of Auto Negotiation.
ATR259=*n* sets Auto Negotiation to *n*
Values accepted:
0 = Force
1 = Auto-negotiate

Forced Link Speed
Configures the speed to use when the link parameters are forced.
ATR260: Returns the current value of Forced Link Speed.
ATR260=*n* sets Forced Link Speed to *n*
Values accepted:
0 = 10 Mbps
1 = 100 Mbps

Forced Link Duplex
Configures duplex when the link parameters are forced.
ATR261: Returns the current value of Forced Link Duplex.

ATR261=*n* sets Forced Link Duplex to *n*
Values accepted:
0 = Half duplex
1 = Full duplex

TCP/IP Menu

IP Address

A read-only string that shows the current IP address of the unit. If DHCP is enabled this will be the IP address assigned by the DHCP server. If DHCP is disabled this will be the configured static IP address.
ATI70: Returns the current value of IP Address.

Subnet Mask

ATI201: Returns the current value of Subnet Mask.

Gateway

ATI202: Returns the current value of Gateway.

Bcast Addr

ATI205: Returns the current value of Bcast Addr.

TCP Idle Timeout

Idle time before a TCP connection times out.
ATG48: Returns the current value of TCP Idle Timeout.
ATG48=*n*: Sets the value of TCP Idle Timeout to *n* s, given that 0 <= *n* <= 65535.

UDP Idle Timeout

Idle time before a UDP connection times out.
ATG96: Returns the current value of UDP Idle Timeout.
ATG96=*n*: Sets the value of UDP Idle Timeout to *n* s, given that 20 <= *n* <= 600.

DHCP Client

Enables or disables the DHCP client of this unit. When disabled, the unit will use the configured static IP address.
ATI71: Returns the current value of DHCP Client.
ATI71=*n* sets DHCP Client to *n*
Values accepted:
0 = Disabled
1 = Enabled

Hostname

The hostname of the unit.
ATI72: Returns the current value of Hostname.
ATI72=s: Sets the value of Hostname to s, given that 0 <= length(s) <= 26.

Static IP Configuration Table

1st Octet

Get or set the 1st Octet of either IP address, subnet mask or gateway.
ATI80[a]: Returns the current value of 1st Octet.
ATI80[a]=*n*: Sets the value of 1st Octet to *n* , given that 0 <= *n* <= 255. Where: a = Static IP Configuration table index (starting from 0)

2nd Octet
Get or set the 2nd Octet of either IP address, subnet mask or gateway.
ATI81[a]: Returns the current value of 2nd Octet.
ATI81[a]=*n*: Sets the value of 2nd Octet to *n* , given that 0 <= *n* <= 255. Where: a = Static IP Configuration table index (starting from 0)

3rd Octet
Get or set the 3rd Octet of either IP address, subnet mask or gateway.
ATI82[a]: Returns the current value of 3rd Octet.
ATI82[a]=*n*: Sets the value of 3rd Octet to *n* , given that 0 <= *n* <= 255. Where: a = Static IP Configuration table index (starting from 0)

4th Octet
Get or set the 4th Octet of either IP address, subnet mask or gateway.
ATI83[a]: Returns the current value of 4th Octet.
ATI83[a]=*n*: Sets the value of 4th Octet to *n* , given that 0 <= *n* <= 255. Where: a = Static IP Configuration table index (starting from 0)

SNTP Menu

Status
ATG8: Returns the current value of Status.

Last Sync
ATG2: Returns the current value of Last Sync.

Last Query Latency
ATG5: Returns the current value of Last Query Latency.

Mode
ATG1: Returns the current value of Mode.
ATG1=*n* sets Mode to *n*
Values accepted:
0 = Disabled
1 = Unicast

Server IP
ATG3: Returns the current value of Server IP.
ATG3=s: Sets the value of Server IP to s, given that 0 <= length(s) <= 32.

Query Interval
ATG4: Returns the current value of Query Interval.
ATG4=*n*: Sets the value of Query Interval to *n* mins, given that 1 <= *n* <= 2880.

Request Timeout
ATG6: Returns the current value of Request Timeout.
ATG6=*n[.m]*: Sets the value of Request Timeout to *n* s, given that 0.000 <= *n* <= 65.535.

Send Request
ATG7: Runs the Send Request routine.

UDP Connections Table

Local Port
ATG49[a]: Returns the current value of Local Port.
Where: a = UDP Connections table index (starting from 0)

Remote IP
ATG50[a]: Returns the current value of Remote IP.
Where: a = UDP Connections table index (starting from 0)

Remote Port
ATG51[a]: Returns the current value of Remote Port.
Where: a = UDP Connections table index (starting from 0)

Diagnostics Menu

(Distributer) Estimated Life Uptime
An approximation of the total number of hours that this device has been powered up.
ATI206: Returns the current value of Estimated Life Uptime.

Total Tx Time
ATG155: Returns the current value of Total Tx Time.

Startup Reason
ATG9: Returns the current value of Startup Reason.

Startup Config
ATG154: Returns the current value of Startup Config.

Approval Code
International type approval code which applies to this device.
ATI175: Returns the current value of Approval Code.

EEPROM Status
Displays the EEPROM status at start-up. Blank or Invalid EEPROM could indicate a hardware fault.
ATR10: Returns the current value of EEPROM Status.

Build Date
The date the firmware was compiled.
ATR9: Returns the current value of Build Date.

Firmware Version
Version information for the firmware loaded in this device.
ATI4: Returns the current value of Firmware Version.

FPGA Version
Version information for the FPGA image loaded into this device.
ATI18: Returns the current value of FPGA Version.

Bootloader Version
ATI130: Returns the current value of Bootloader Version.

(Distributer) Assertion Messages

ATG170: Returns the current value of Assertion Messages.
ATG170=*n* sets Assertion Messages to *n*
Values accepted:
0 = Disabled
1 = Enabled

Software Reset
ATG10: Runs the Software Reset routine.

Time Menu

Uptime
Seconds since the radio powered up.
ATG16: Returns the current value of Uptime.

Local Time
The current local time (in seconds since Jan 1 1970).
ATG11: Returns the current value of Local Time.

Battery Status
ATG13: Returns the current value of Battery Status.

Local Time
The current local time.
ATG12: Returns the current value of Local Time.

Startup Date
ATG17: Returns the current value of Startup Date.

Power Off Date
ATG14: Returns the current value of Power Off Date.

UTC
The current UTC (in seconds since Jan 1 1970).
AT%63: Returns the current value of UTC.
AT%63=*n*: Sets the value of UTC to *n* s, given that 0 <= *n* <= -1.

Time String Format
ATG15: Returns the current value of Time String Format.
ATG15=*n* sets Time String Format to *n*
Values accepted:
0 = DoW MMM DD HH:MM:SS YYYY
1 = "DD/MM/YYYY"
2 = DD/MM/YYYY
3 = "DD/MM/YYYY HH:MM:SS"
4 = DD/MM/YYYY HH:MM:SS
5 = "YYYY/MM/DD HH:MM:SS"
6 = YYYY/MM/DD HH:MM:SS

Time Zone (UTC +/-) Table

Hours

The hours portion of the time zone.
ATG18[a]: Returns the current value of Hours.
ATG18[a]=[+/-]*n*: Sets the value of Hours to *n* hrs, given that -12 <= *n* <= 14. Where: a = Time Zone (UTC +/-) table index (starting from 0)

Minutes
The minutes portion of the time zone.
ATG19[a]: Returns the current value of Minutes.
ATG19[a]=*n*: Sets the value of Minutes to *n* mins, given that 0 <= *n* <= 59. Where: a = Time Zone (UTC +/-) table index (starting from 0)

Firmware Update Menu

Current State
ATU50: Returns the current value of Current State.

Startup State
ATU46: Returns the current value of Startup State.

Snapshot Progress
Displays the completion status of a firmware snapshot being created.
ATU11: Returns the current value of Snapshot Progress.

Use Schedule Information
Use the schedule information in the CCMP-FIRMWARE-SCHEDULE packet to determine when to update to the new firmware image.
ATU47: Returns the current value of Use Schedule Information.
ATU47=*n* sets Use Schedule Information to *n*
Values accepted:
0 = False
1 = True

Update Firmware Now
Update the firmware to the most recent uploaded firmware image. This operation cannot be reversed and can cause configuration loss.
ATU17: Runs the Update Firmware Now routine.

Take Firmware Snapshot
Trigger a firmware snapshot to be created. The progress of the snapshot creation can be tracked under the node 'Snapshot Progress'.
ATU10: Runs the Take Firmware Snapshot routine.

Roll Back to Snapshot
'Roll Back' to the most recent firmware snapshot. This will load the firmware and configuration saved on the most recent firmware snapshot. This operation cannot be reversed.
ATU15: Runs the Roll Back to Snapshot routine.

Firmware Update Table

ATU48[a]: Returns the current value of .
Where: a = table index (starting from 0)

Available

Displays availability of the firmware image saved into this memory bank. True means an image is available, false means there is no image.
ATU20[a]: Returns the current value of Available.
Where: a = table index (starting from 0)

Type
ATU49[a]: Returns the current value of Type.
Where: a = table index (starting from 0)

Version
The firmware version of the firmware image loaded into this memory bank.
ATU21[a]: Returns the current value of Version.
Where: a = table index (starting from 0)

Timestamp
The creation date or upload date of the firmware image loaded into this memory bank.
ATU22[a]: Returns the current value of Timestamp.
Where: a = table index (starting from 0)

(Distributer) Load Image
ATU51[a]: Runs the Load Image routine.
Where: a = table index (starting from 0)

Ethernet Statistics Menu

Ethernet Summary Statistics Table

Name
ATR251[a]: Returns the current value of Name.
Where: a = Ethernet Summary Statistics table index (starting from 0)

Value
ATR252[a]: Returns the current value of Value.
Where: a = Ethernet Summary Statistics table index (starting from 0)

Ethernet Error Statistics Table

Name
ATR253[a]: Returns the current value of Name.
Where: a = Ethernet Error Statistics table index (starting from 0)

Value
ATR254[a]: Returns the current value of Value.
Where: a = Ethernet Error Statistics table index (starting from 0)

Ethernet Data Statistics Table

Name

Value
ATR303[a]: Returns the current value of Value.
Where: a = Ethernet Data Statistics table index (starting from 0)

IP Statistics Menu

IP Statistics Table

Name
ATG34[a]: Returns the current value of Name.
Where: a = IP Statistics table index (starting from 0)

Value
ATG35[a]: Returns the current value of Value.
Where: a = IP Statistics table index (starting from 0)

Protocol Statistics Table

Protocol
ATG36[a]: Returns the current value of Protocol.
Where: a = Protocol Statistics table index (starting from 0)

Transmitted
ATG37[a]: Returns the current value of Transmitted.
Where: a = Protocol Statistics table index (starting from 0)

Re-Transmitted
ATG38[a]: Returns the current value of Re-Transmitted.
Where: a = Protocol Statistics table index (starting from 0)

Received
ATG39[a]: Returns the current value of Received.
Where: a = Protocol Statistics table index (starting from 0)

Forwarded
ATG40[a]: Returns the current value of Forwarded.
Where: a = Protocol Statistics table index (starting from 0)

Dropped
ATG41[a]: Returns the current value of Dropped.
Where: a = Protocol Statistics table index (starting from 0)

Checksum Error
ATG42[a]: Returns the current value of Checksum Error.
Where: a = Protocol Statistics table index (starting from 0)

Length Error
ATG43[a]: Returns the current value of Length Error.
Where: a = Protocol Statistics table index (starting from 0)

Memory Error
ATG44[a]: Returns the current value of Memory Error.
Where: a = Protocol Statistics table index (starting from 0)

Routing Error
ATG45[a]: Returns the current value of Routing Error.
Where: a = Protocol Statistics table index (starting from 0)

Protocol Error

ATG46[a]: Returns the current value of Protocol Error.
Where: a = Protocol Statistics table index (starting from 0)

Error
ATG47[a]: Returns the current value of Error.
Where: a = Protocol Statistics table index (starting from 0)

Fault History Menu

(Distributer) Reset Fault History
ATG179: Runs the Reset Fault History routine.

Fault History Table

Time
The time that the fault occurred.
ATG20[a]: Returns the current value of Time.
Where: a = Fault History table index (starting from 0)

Fault
The fault that occurred.
ATG21[a]: Returns the current value of Fault.
Where: a = Fault History table index (starting from 0)

Event Log Menu

Level
The granularity of information to write to the event log.
ATS60: Returns the current value of Level.
ATS60=*n* sets Level to *n*
Values accepted:
0 = Faults
1 = Warnings
2 = Status
3 = Information
4 = Debugging

Clear Event Log
Clears all entries in the event log.
ATS65: Runs the Clear Event Log routine.

Filters Table

Type
ATS181[a]: Returns the current value of Type.
Where: a = Filters table index (starting from 0)

Status
ATS182[a]: Returns the current value of Status.
ATS182[a]=*n* sets Status to *n*
Values accepted:
0 = Disabled
1 = Enabled
Where: a = Filters table index (starting from 0)

Transmission Log Table

Time

ATP113[a]: Returns the current value of Time.
Where: a = Transmission Log table index (starting from 0)

Event

ATP114[a]: Returns the current value of Event.
Where: a = Transmission Log table index (starting from 0)

Appendix E Sensor and Fault List Reference

Index	Sensor	Unit	Range	Default Upper Cut-off	Default Lower Cut-off
0	PA Temp	ºC	-40 to 126	75	-20
1	Driver Temp	ºC	-40 to 126	70	-20
2	PA Ambient Temp	ºC	-40 to 126	70	-20
3	Isolator Temp	ºC	-40 to 126	60	-20
4	Baseband Temp 1	ºC	-40 to 126	60	-20
5	Baseband Thermistor	ºC	-42 to 152	60	-20
6	Baseband Voltage	mV	0 to 32991	49000	46500
7	24V Voltage	mV	0 to 14833	25930	23040
8	5V Voltage	mV	0 to 6649	5380	4810
9	3.3V Voltage	mV	0 to 4347	3510	3170
10	Baseband Current	mA	0 to 3296	2490	40
11	24V Current	mA	0 to 3296	3110	200
12	5V Current	mA	0 to 2197	2640	800
13	3.3V Current	mA	0 to 3296	1130	670
14	PA0 Current[3]	mA	0 to 24951	7330	4500
15	PA90 Current[3]	mA	0 to 24951	7330	4500
16	Driver Current	mA	0 to 2495	390	90
17	Supply Current[3]	mA	0 to 30742	16170	40
18	Rear Fan Current	mA	0 to 1636	470	50
19	Front Fan Current	mA	0 to 1636	470	50
20	Rear Fan Speed	RPM	0 to 32767	4440	1320
21	Front Fan Speed	RPM	0 to 32767	4440	1320
22	Reverse Power[3]	mW	0 to 86000	1730	0
23	Transmit Power[3]	mW	0 to 650000 (typical)	281000	222000
24	Driver Power[3]	mW	0 to 1714000	2640	800
25	Exciter Power	mW	0 to 21977	680	220
26	Isolator VSWR	10^{-3}:1	0 to 9000	2500	0

Table 23: Sensor Reference

[3] Measurement varies according to Tx Power – these values apply to Tx Power = 250W.

Index	Fault	Latching	Default Fault Action	Default Alarm
0	High PA Temperature	Configurable	Disable Transmit	ALM7
1	High Driver Temperature	Configurable	Disable Transmit	ALM7
2	High PA Ambient Temperature	Configurable	None	ALM7
3	High Isolator Temperature	Configurable	Disable Transmit	ALM7
4	High Baseband 1 Temperature	Configurable	None	ALM7
5	High Baseband 2 Temperature	Configurable	None	ALM7
6	High Baseband Voltage	Configurable	None	ALM1
7	High 24V Voltage	Configurable	None	ALM1
8	High 5V Voltage	Configurable	None	ALM1
9	High 3.3V Voltage	Configurable	None	ALM1
10	High Baseband Current	Configurable	None	ALM1
11	High 24V Current	Configurable	None	ALM1
12	High 5V Current	Configurable	None	ALM1
13	High 3.3V Current	Configurable	None	ALM1
14	High PA0 Current	Configurable	Disable Transmit	ALM1
15	High PA90 Current	Configurable	Disable Transmit	ALM1
16	High Driver Current	Configurable	None	ALM1
17	High Supply Current	Configurable	None	ALM1
18	High Rear Fan Current	Configurable	None	ALM8
19	High Front Fan Current	Configurable	None	ALM8
20	High Rear Fan RPM	Configurable	None	ALM8
21	High Front Fan RPM	Configurable	None	ALM8
22	High Reverse Power	Configurable	Disable Transmit	None
23	High Transmit Power	Configurable	Disable Transmit	ALM4
24	High Driver Power	Configurable	None	None
25	High DDS Power	Configurable	None	ALM4
26	High Isolator VSWR	Configurable	Disable Transmit	ALM6
27	Low PA Temperature	Configurable	None	None
28	Low Driver Temperature	Configurable	None	None
29	Low PA Ambient Temperature	Configurable	None	None
30	Low Isolator Temperature	Configurable	None	None
31	Low Baseband 1 Temperature	Configurable	None	None

32	Low Baseband 2 Temperature	Configurable	None	None
33	Low Baseband Voltage	Configurable	None	ALM1
34	Low 24V Voltage	Configurable	None	ALM1
35	Low 5V Voltage	Configurable	None	ALM1
36	Low 3.3V Voltage	Configurable	None	ALM1
37	Low Baseband Current	Configurable	None	ALM1
38	Low 24V Current	Configurable	None	ALM1
39	Low 5V Current	Configurable	None	ALM1
40	Low 3.3V Current	Configurable	None	ALM1
41	Low PA0 Current	Configurable	None	ALM1
42	Low PA90 Current	Configurable	None	ALM1
43	Low Driver Current	Configurable	None	ALM1
44	Low Supply Current	Configurable	None	ALM1
45	Low Rear Fan Current	Configurable	None	ALM8
46	Low Front Fan Current	Configurable	None	ALM8
47	Low Rear Fan RPM	Configurable	None	ALM8
48	Low Rear Fan RPM	Configurable	None	ALM8
49	Low Reverse Power	Configurable	None	None
50	Low Transmit Power	Configurable	None	ALM5
51	Low Driver Power	Configurable	None	None
52	Low DDS Power	Configurable	None	None
53	Low Isolator VSWR	Configurable	None	None
54	External Reference Fail	Configurable	Reference Switchover	ALM2
55	Software Fault	Configurable	None	None
56	Exciter Out-of-Lock	Configurable	Disable Transmit	ALM9
57	Efficiency Warning	Configurable	None	None
58	Transmit Timeout	Latch-only	Disable Transmit	None
59	Encoder Data Idle	Configurable	None	None
60	PA Current Foldback	Configurable	None	None
61	Reverse Power Foldback	Configurable	Disable Transmit	None
62	Invalid Calibration	Latch-only	Disable Transmit	None
63	Watch Dog Reset	Latch-only	None	None
64	Assertion Reset	Latch-only	None	None
65	Firmware Update Exception	Latch-only	None	None

66	Mass Storage	Configurable	None	None
67	Module	Latch-only	Disable transmit	None
68	Reference Switchover	Latch-only	None	ALM3
69	Disable Transmission	Latch-only	None	None
70	Scale Transmit Power	Latch-only	None	None
71	Enable PA0 Current Foldback	Latch-only	None	None
72	Enable PA90 Current Foldback	Latch-only	None	None
73	Enable Reverse Power Foldback	Latch-only	None	None

Table 24: Fault Reference

Appendix F Product Identification Table

Table 25 shows the Paging Transmitter product identification. The green shaded items are the available configurations. This table should be used when ordering a Paging Transmitter.

FREQUENCY BAND		MAXIMUM TX POWER		POWER SUPPLY		INTEGRATED ISOLATOR		RELEASE		OTHER FEATURES	
148	VHF	250	250 W	E	24 VDC	ND	Not Fitted	A	Australia and US	H	Hot standby operation
900	UHF			T	-48 VDC	CD	Fitted	E	Europe		
				P	110/240 VAC						

Table 25: Paging Transmitter product identification table

For example, the product code for a 250 W Paging Transmitter supplied from -48 VDC, with an integrated isolator and released for Europe is RFI-148 250TCDE.

Appendix G Troubleshooting

This section outlines steps that can be taken in response to issues with the paging transmitter.

G.1 Configuring Sensor Cutoffs

Changing the paging transmitter transmit power should also include changing the sensor cutoffs. The factory default settings for the paging transmitter is for 20 W transmit power, including reasonable sensor cutoffs for this transmit power. If the transmit power is increased, then the sensor cutoffs also need to be similarly increased. Please contact STI Engineering for accessing Cruise Control configuration files with recommended sensor cutoffs for common transmit power settings.

G.2 Fault LED Active

The paging transmitter has several different indicators that a fault is currently active. The easiest method to determine fault status is to observe the front panel of the unit. If the red fault LED is on then the transmitter has an active fault. The fault status can also be interrogated using Cruise Control.

To determine the type of fault that is active, connect to the paging transmitter using Cruise Control (for information on using Cruise Control see section 3.2). The front serial port of the paging transmitter has a configuration locked to 19200 8N1 (19200 baud, 8 data bits, even parity, and 1 stop bit). Once connected with Cruise Control, navigate to the Faults group and Cruise Control will display a view similar to the one shown in Figure 19 below.

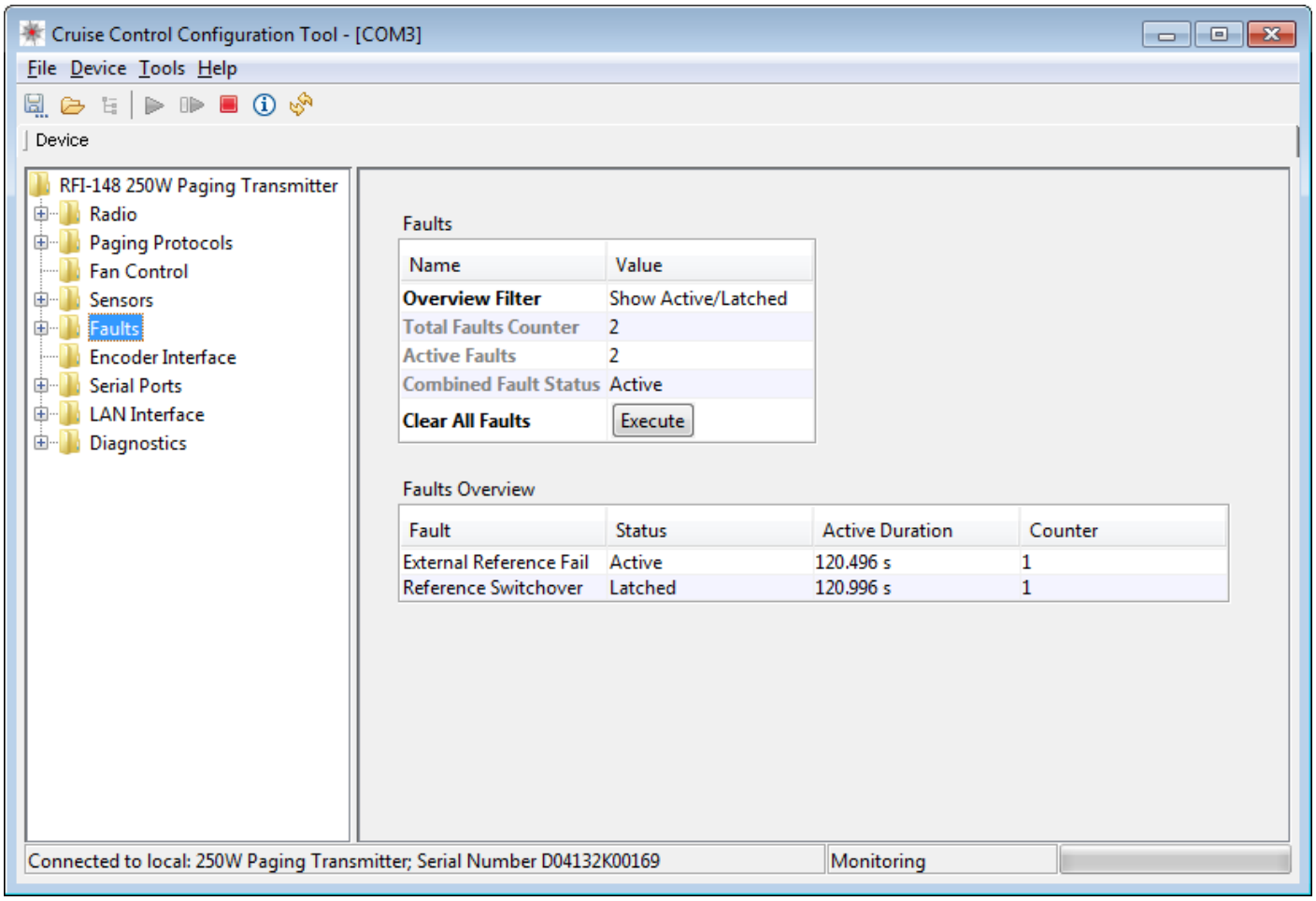

Figure 19: Cruise Control Faults Overview

In the case of Figure 19, the external reference fail and reference switchover faults are active. See the headings below to diagnose some common active faults.

G.2.1 External Reference Fail

The external reference fail fault goes active when the transmitter is configured to use the external reference, but it cannot be locked to.

If an external reference is not in use, change the reference mode to internal and then run the clear all faults routine to clear the fault LED.

If an external reference is required:

- Ensure the external reference is plugged in.
- Ensure the external reference is within specification (see Table 9).
- Ensure the external reference frequency is configured correctly.

G.2.2 High Transmit Power

A high transmit power fault could indicate a hardware issue, however it is usually due to incorrect configuration. The high transmit power fault will go active when the sensed transmit power exceeds the transmit power upper cutoff. A high transmit power fault is usually seen in tandem with high PA current and foldback faults.

If the transmit power setting has been increased without changing the sensor cutoff values then this is likely the cause of the fault. See appendix G.1 for troubleshooting sensor cutoffs. For information on sensor cutoffs see section 0.

G.2.3 High VSWR

The high VSWR fault goes active when there is too much power being reflected into the RF out connection. When diagnosing a VSWR fault ensure the guidelines on human exposure to RF emissions are followed in section 0. To diagnose a high VSWR fault:

- Ensure an antenna is attached to the RF out port.
- Ensure the paging transmitter is configured for the correct operating frequency and the correct channel number is selected.
- Ensure the antenna is tuned to the operating frequency.
    - Also ensure any in-line devices (such as a cavity filter) are tuned to the correct frequency.
- Ensure there are no open circuits in the cable run from the paging transmitter to the antenna.
- If possible, visually inspect the antenna for damage.

G.2.4 Disable Transmit

The disable transmit fault is a fault action automatically performed by the firmware due to other faults being active. The disable transmit fault action is caused by critical faults in the paging transmitter to stop hardware damage or transmitting off frequency. A list of faults that will cause disable transmit and how to troubleshoot them follows.

G.2.4.1 High PA or Driver Temperature

The temperature on the PA module has exceeded the sensor cutoff values (80 °C by default). To troubleshoot high PA temperature:

- Ensure the fans are configured to turn on at a reasonable temperature. The factory default is recommended and has the fans turn on at 40 °C.
- Check the ambient air temperature where the paging transmitter is installed. When transmitting at 250 W with an ambient temperature of 60 °C, the paging transmitter is expected to reach 80 °C. Ensure proper air circulation and/or air conditioning in the area the paging transmitter is installed.

- Ensure the fans are working. Check for blockages of the fan intake and exhaust.

G.2.4.2 High Reverse Power or Reverse Power Foldback

A high reverse power fault indicates a hardware failure of the circulator inside the paging transmitter. Failure of the circulator can cause RF spectrum splatter, so transmit is disabled. Return the unit to STI Engineering for repair.

G.2.4.3 Exciter Out-of-Lock

An exciter out-of-lock fault indicates that the channel frequencies can no longer be generated. There are two possible causes of an exciter out-of-lock:

- If an external reference is in use: the external reference frequency has drifted too far from the configured reference frequency. Check the accuracy of the external reference.
- A critical hardware failure in the paging transmitter. Return the unit to STI Engineering for repair.

G.2.4.4 Transmit Timeout

The transmit timeout fault goes active when the unit has been transmitting for longer than the transmit timeout duration. The transmit timeout fault can either be disabled, or the timeout can be increased.

G.3 Unit Won't Transmit

There could be several causes for the paging transmitting not transmitting, each is explained below.

G.3.1 PTT Override

The paging transmitter PTT override can disable the transmitter from transmitting. The status of PTT override is displayed in the PTT Override Status field under the radio settings:

- ***Enabled:*** Transmitting is enabled.
- ***DISABLED:User:*** Transmitting is disabled because the user-configurable option PTT Override is set to disable transmit. To enable transmit again, set PTT override to enable transmit.
- ***DISABLED:Fault:*** Transmitting is disabled because the disable transmit fault action is active. See section G.2.4 for troubleshooting a disable transmit fault action.
- ***DISABLED:Listening:*** Transmitting is disabled because the isolator mode is set for listening. To enable transmitting again, the isolator mode must be set for transmitting.
- ***DISABLED:Loading Config:*** Transmitting is disabled while Cruise Control is loading a configuration file.

G.3.2 Hardware or Auto PTT

When troubleshooting hardware or auto PTT, ensure the following:

- The paging transmitter can transmit with the "Transmit On" routine in Cruise Control.
- Hardware PTT or auto PTT is enabled.

For hardware PTT:

- The correct hardware PTT active level is configured, active low or active high.
- Toggling the hardware PTT state is reflected in the "Ext I/O" table in Cruise Control in the Encoder Interface group. If this does not work, it indicates a cabling issue with the hardware PTT input.

For auto PTT:

- Toggling the L-bit state is reflected in the "Ext I/O" table in Cruise Control in the Encoder Interface group. If this does not work, it indicates a cabling issue with the L-bit input.

G.3.3 Profile Definition

If the RFI-900 reports that it is transmitting (*Radio → Power → Transmitter Status*), yet LIU L-Bit activity does not produce modulated data, ensure that the selected modulation profile (*Encoder Interface → Active Profile*) is not configured to use an external data clock (via the LIU) unless you are providing one (*Paging Protocols → Profiles → Ext. Data Clock*).

G.4 Unit Transmits at Low Power

If the unit is transmitting at low power as indicated by the front panel power gauge or transmit power sensor there could be several causes. Ensure:

- The required transmit power is configured.
- There are no faults active. A unit configured to transmit at a high power level needs similarly higher sensor cutoffs, see appendix G.1.

Otherwise, low transmit power could indicate a hardware failure. If troubleshooting fails, return the unit to STI Engineering for repair.

Appendix H Glossary

BNC	Bayonet Neill-Concelman (Connector)
CTS	Clear To Send
DCD	Data Carrier Detect
DCE	Data Communications Equipment (radio modem)
DTE	Data Terminal Equipment (computer device)
DTR	Data Terminal Ready
EIRP	Effective Isotropic Radiated Power
GUI	Graphical User Interface
PA	Power Amplifier
POCSAG	Post Office Code Standardisation Advisory Group
PET	Motorola Page Entry (now TAP)
PTT	Push-To-Talk
RF	Radio Frequency
RSSI	Received Signal Strength Indicator
RTS	Request To Send
Rx	Received
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
TAP	Telelocator Alphanumeric Protocol (formerly PET)
TNC	Threaded Neill-Concelman (Connector)
TNPP	Telelocator Network Paging Protocol
Tx	Transmitted
UTC	Coordinated Universal Time
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

Table 26: Glossary

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