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Leaders in Wireless Data

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# RFI-148 250W VHF PAGING TRANSMITTER


USER MANUAL

STI-GLOBAL GROUP
Offices: ★ Sydney ★ Perth ★ Madrid

# RFI-148 250W VHF Paging Transmitter

User Manual

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# Contents

# 1. Introduction

The RFI-148 250 is a high power output paging transmitter operating in the VHF band.

- VHF band operation (138 MHz – 174 MHz) with 2 MHz switching bandwidth.
- 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.
- 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 RF Innovations 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.

RF Innovations 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, RF Innovations recommends protecting all antennas against lighting strike by using lightning surge arrestors.

## 2.3 Product Installation

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

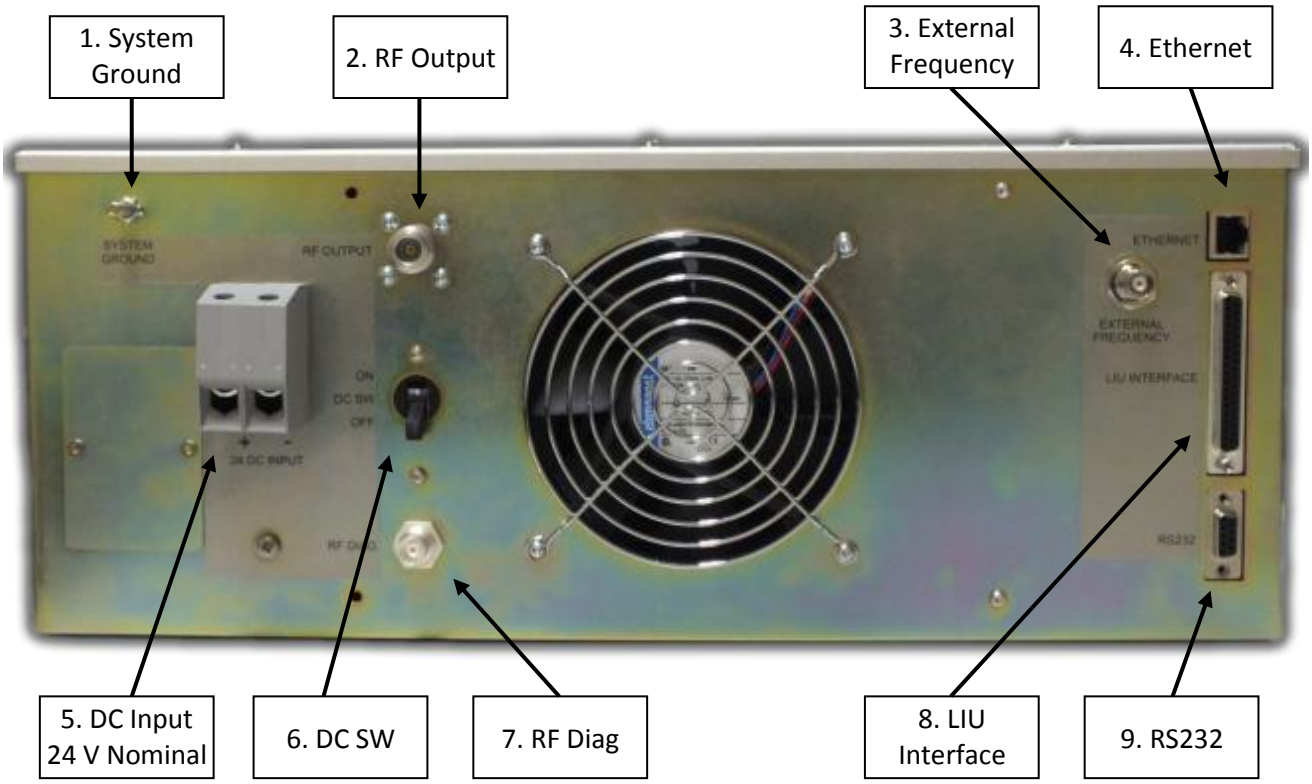


*Figure 1: Paging Transmitter Back Panel*

1. ***System Ground:*** External connection for 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.
5. ***DC Input 24 V Nominal:*** 20-31.2 V DC Input voltage. Terminal block connector.
6. ***RF Diag:*** Sniffer port for diagnostics. BNC female connector.
7. ***DC SW:*** Power switch.
8. ***LIU Interface:*** Combined alarm and encoder interface. DC-37 female connector.
9. ***RS-232:*** Main serial port. DE-9 female connector.

## 2.4 Safety and Compliance

### *2.4.1 Human Exposure to Emissions*

To limit human exposure, the following guidelines need to be observed:

1. Take reasonable precautions in any installation to maintain a clearance from the antenna of no less than 4 m (four metres) to the general public and 2 m (two metres) to service and maintenance personnel.

2. Do not apply power to the device unless the clearance described in 1 above has been allowed.

The guidelines above apply when transmitting at maximum power, with an antenna gain of up to 13 dB.

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 guidelines.

### *2.4.2 Modifications*

**CAUTION:** Changes or modifications not expressly approved by RF Innovations may void the user's authority to operate the equipment legally, as well as any warranty provided.

# 3. Configuration

## 3.1 Overview

The RFI-148 250 provides six interfaces that allow the transmitter to be configured 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.
- ***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.
- ***Front panel interface:*** The front panel consists of five 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

The following sections briefly outline how to use Cruise Control with the paging transmitter. For more information see the Cruise Control User Manual. Figure 2 below is a typical screenshot of the Cruise Control interface running on Windows 7.

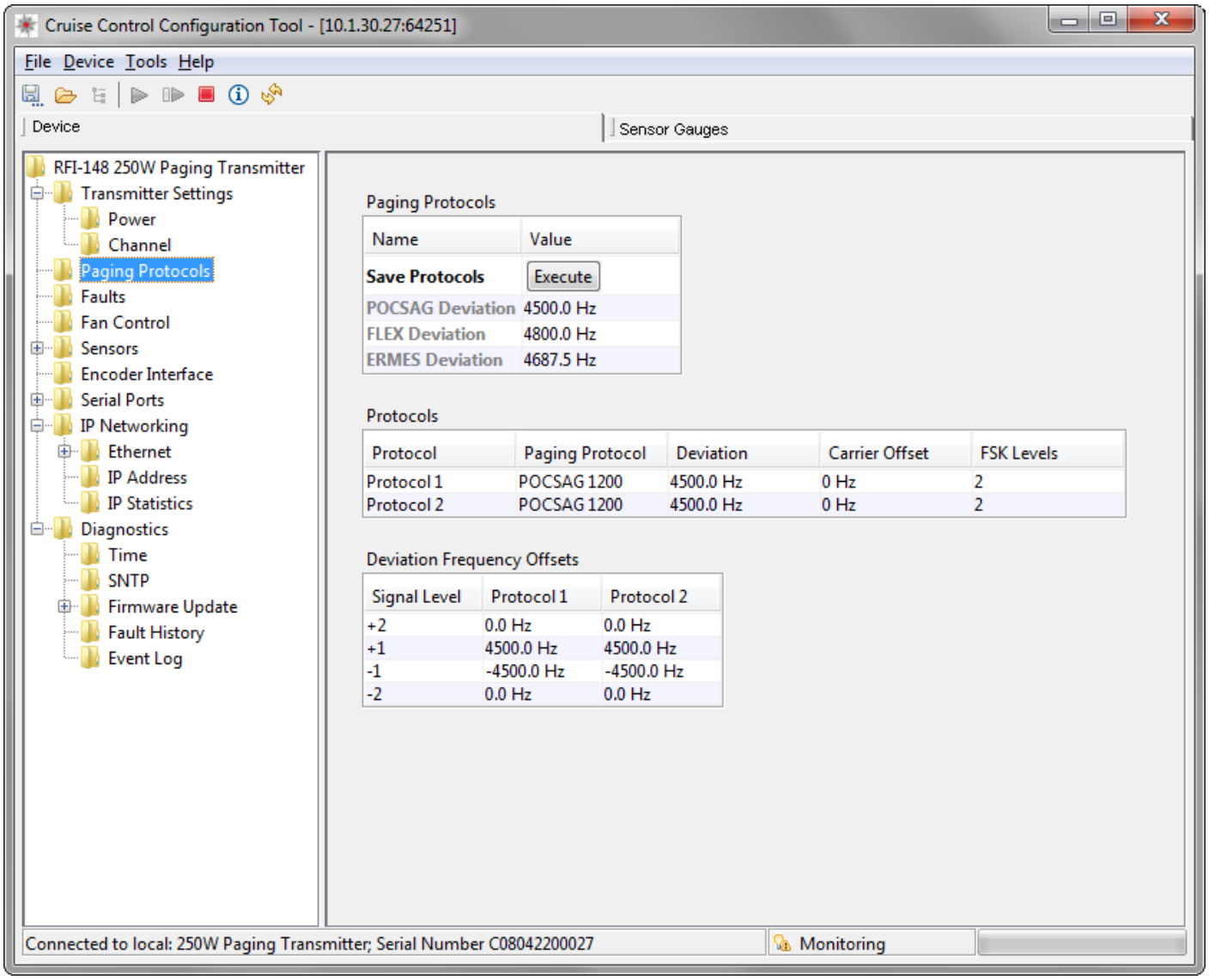


*Figure 2: Cruise Control Interface*

### 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 (19200 8N1 by default).

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. The 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. An example of diagnostic information provided by the Sensor Gauges plugin is shown below in Figure 3.

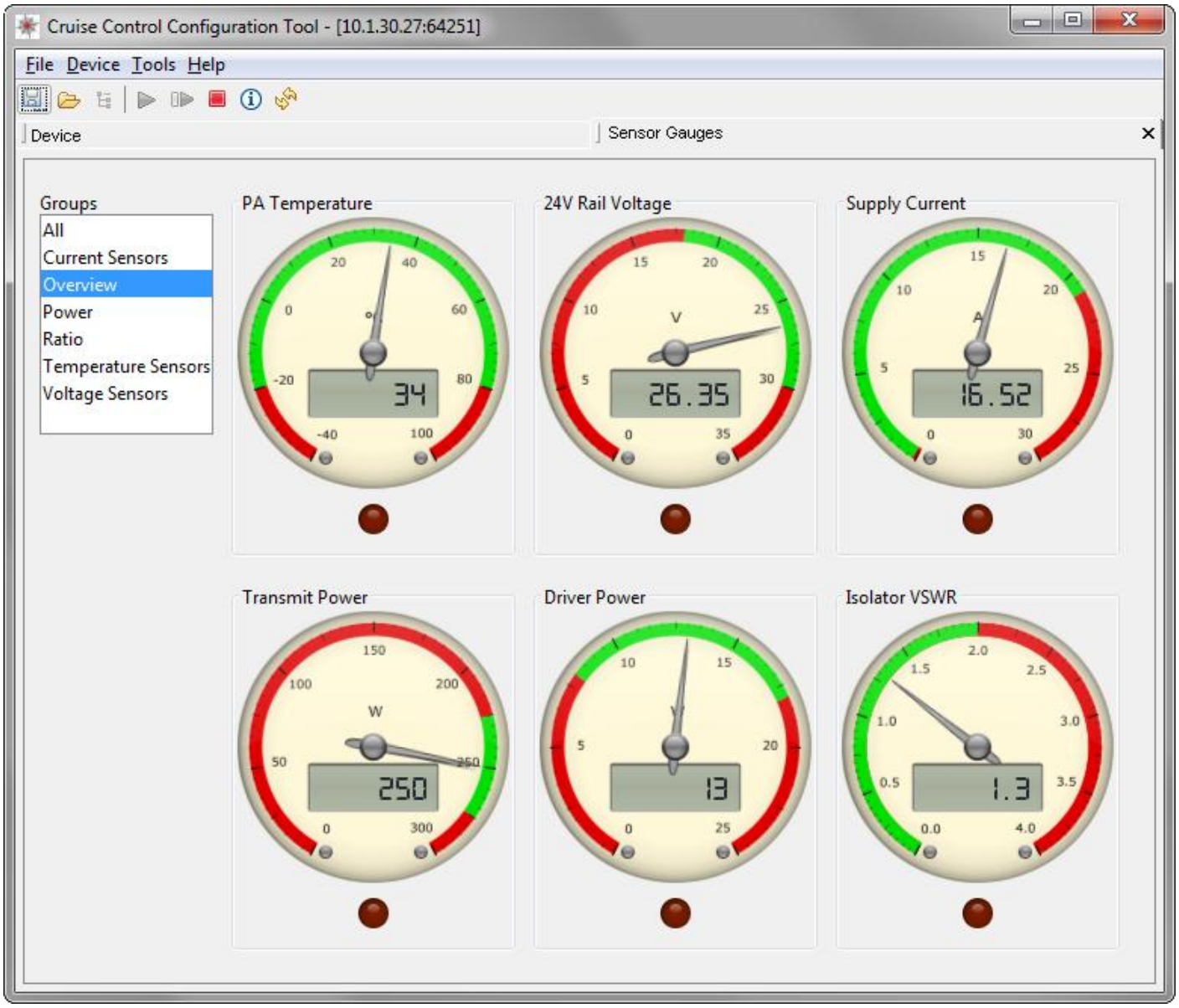


*Figure 3: Cruise Control Sensor Gauges Plugin*

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 5.1) 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 from Motorola S-Record image files (*.mot). Cruise Control will only allow firmware images that are compatible with the paging transmitter to be uploaded.

To upload a firmware image use the `Device -> Load Firmware` menu item. A windows explorer dialog will open, navigate to where the firmware image is on the computer, select the image and click upload. The progress bar at the bottom right will show the progress of the firmware update.

Once the upload has finished the paging transmitter will reset to apply the update. While updating the paging transmitter cannot key up or respond to queries. Cruise Control will automatically reconnect once the update is complete.

For information on this feature as related to the paging transmitter firmware, which includes the firmware recovery mechanism, see section 5.3.

## 3.3 SNMP

The paging transmitter includes a built-in SNMP agent. Not all configuration and diagnostic parameters may be queried via SNMP. See Appendix C.2 for a list of values which may be queried via SNMP.

SNMP versions 1 and 2c are supported. The community string ‘public’ should be used when issuing SNMP requests. The agent responds on UDP port 161 is compatible with standard SNMP managers and other SNMP client applications.

An SMI MIB file defining OIDs for this product is available.

## 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 13 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, 64251 and 64252) 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 33.
- `<[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 Crescendo radio has two serial ports which can both have different configurations. The command `ATS52[0]=1004` set the point-to-point destination on the main port, while the command `ATS52[1]=1004` will set the point-to-point destination on the auxiliary port.
- `<=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 $10_{Decimal}$).

For each AT command that is issued a response is generated. The list of responses to AT commands is shown in Table 1.

| 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 1: AT command response codes*

## 3.6 Front Panel Interface

The front panel interface consists of 6 status LEDs and a transmit power gauge. The panel is illustrated in Figure 4 and the function of each LED is described in Table 2.

| LED | Colour | Description |
|---|---|---|
| Transmit On | Green | Turns on when the transmitter is on. |
| Fault | Red | Turns on when any fault is active. |
| 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 2: Front panel LED descriptions*

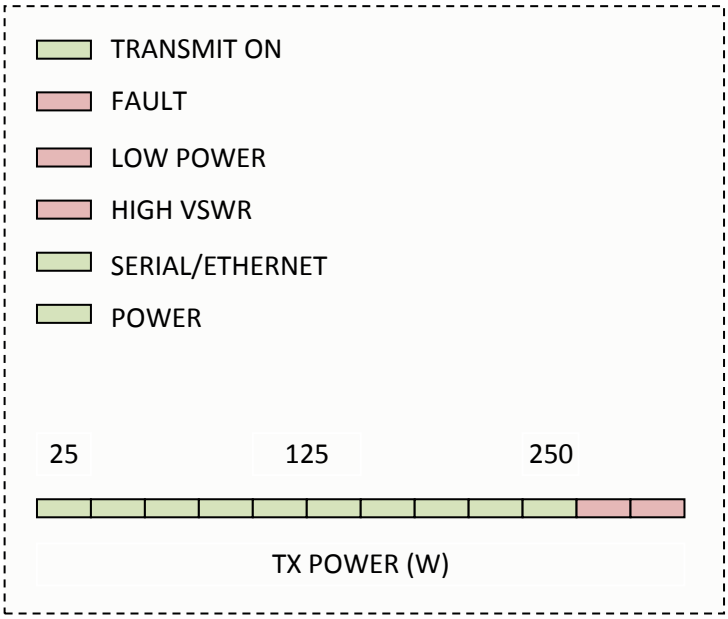


*Figure 4: Front panel display*

## 3.7 LIU Interface

The LIU interface is a DC-37 female connector at the rear of the paging transmitter. The LIU interface has the following connections:

Nine digital inputs:

- 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

Fourteen alarm outputs:

- Power Supply Alarm
- Reference Out-of-Lock Alarm
- Reference Switchover Alarm
- High Output Power Alarm
- Low Output Power Alarm
- High VSWR Alarm
- High Temperature Alarm
- Fan Failure Alarm
- Exciter Out-of-Lock Alarm
- Combined Alarm

- Spare Alarm 1
- Spare Alarm 2
- Spare Alarm 3
- Spare Alarm 4

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.

The pin-out for the LIU Interface can be found in Appendix A.4

# 4. Operation

## 4.1 Serial Port Operation

### *4.1.1 Overview*

The RFI-148 250 has two DCE RS-232 serial ports. The front serial port has a female DE9 connector (DCE) and the rear serial port has a male DE9 connector (DTE). The serial port pin outs can be found in Appendix A.3 on page 26.

The main port (at the back of the transmitter) supports:

- TX, RX, and GND.
- RTS and DTR inputs.
- CTS and DCD outputs.

The auxiliary (at the front of the transmitter) port supports:

- TX, RX, and GND.

### *4.1.2 Configuration*

Both main and auxiliary serial ports support 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

### *4.1.3 Statistics*

Statistics are maintained for both serial ports. These statistics are listed in Table 12 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 DTE.

## 4.2 Ethernet Operation

### *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 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.

## 4.3 Transmitter Operation

### 4.3.1 Transmit Power

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

### 4.3.2 Channel Selection

The transmitter supports four channel rasters: 5 kHz; 6.25 kHz; 10 kHz; and 12.5 kHz, and has up to sixteen configurable channels. The transmit frequency of each channel can be configured using the Cruise Control GUI. The current operating channel can be selected using the Cruise Control GUI, Hayes AT commands, a terminal interface or the 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.
- ***Hardware PTT:*** Hardware PTT is available through the LIU connector. Hardware PTT can be configured to be active high or active low.
- ***Auto PTT:*** Auto PTT is performed by detecting a change in the data bits on the LIU and turning on the transmitter.

#### 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

The unit can automatically raise a fault if the transmitter has been left on for too long. By default a transmit timeout fault is raised if the transmitter is on for greater than 600 seconds (10 minutes). The default action configured for the transmit timeout fault is to turn off the transmitter (see section 5.2). The ‘Enable transmit timeout’ option must be set for this to occur. By default, this option is disabled.

#### PTT SYSTEM OVERRIDE

Transmitter PTT can be completely disabled using the PTT system override setting. By default it is set to Enable Transmit.

### 4.3.4 External Reference

The transmitter supports an external reference for channel frequency generation. To use the external reference, a 10 MHz sine or square wave -10 dBm to 0 dBm signal must be applied to the "External Frequency" input BNC connector on the back panel. The paging transmitter will attempt to use an external reference by default.

#### AUTOMATIC REFERENCE SWITCHOVER

If the external reference is selected as the default reference, the transmitter will failover to the internal reference in the event of the external reference failing.

The external reference is considered to have failed when there is no signal transition on the external reference for at least two consecutive falling edges of the internal reference.

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

### 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.

### 4.3.6 Carrier Offset

A carrier offset from the channel frequency can be specified from -5000 to +5000 Hz in increments of 1 Hz.

### 4.3.7 RF Diagnostics

The paging transmitter provides an RF diagnostics port output on the back panel. The RF diagnostics port can be configured for two modes:

- ***Transmission:*** The sniffer port will output a signal identical to that of RF out, attenuated by approximately 105 dB. This is the normal mode of operation.
- ***Listening:*** Attenuation from the antenna port to the sniffer port is reduced to less than 15 dB. This is a special mode of operation used for network testing. **NOTE:** While the sniffer port is configured for listening, transmission is disabled.

## 4.4 Data

The RFI-148 250 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.

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.

Once the desired paging protocol, deviation and carrier offset settings have been selected, the `Save Protocols` routine must be executed to apply the selected settings.

## 4.5 Fan Control

The transmitter has two fans for cooling; the front fan is an intake and the rear fan is the exhaust.

### *4.5.1 Current Fan Speed*

The current fan speed displays the target fan speed by the fan controller as a percentage of total possible fan speed. This value is set by the paging transmitter and depends on the fan control type, current temperature, whether fan override is enabled or a fan test is in progress.

### *4.5.2 Control Types*

The fans have two control types:

- ***On/off:*** The fans will turn on and off at a specified temperature. The fans turn on at the speed specified by the fan speed setting parameter.

- ***Linear scaling:*** The fans will increase in speed as the transmitter heats up. The fan turn on and fan turn off temperatures determine the how quickly the fans respond to increases in temperature. Once the temperature exceeds the fan turn on temperature, the fans will then be set to full speed.

The fan control types act from a configurable temperature sensor. By default the fan controller will use the highest temperature of all the temperature sensors.

### *4.5.3 Fan Override*

There is a fan override feature available to force the fans to turn on at full speed. When fan override is enabled the fans will ramp up to full speed and ignore the configured control type. Otherwise, the fans turn off and on as specified by the control type.

### *4.5.4 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

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.

For a full list of sensors monitored by the transmitter and their tracked units and value range see 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:

- Fan 1 and 2 current.
- Fan 1 and 2 RPM.

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

### 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.

## 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.
- ***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.

To protect the paging transmitter hardware fault actions can only be changed by users with the distributer password.

### 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 a selected 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 configured set return to inactive. The combined fault can have a hardware alarm output configured.

### 5.2.4 Hardware Alarm Outputs

Each fault may have a hardware alarm output associated with its state (see Appendix A.4 for the LIU interface pin-outs). When the fault is in the active or latched state, it will set its respective alarm 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 or fleeting.

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

## 5.3 Remote Firmware Update and Recovery

### 5.3.1 Update

The remote firmware update feature can be used to upload a firmware update to a paging transmitter for feature additions and bug fixes. Remote firmware update requires a Cruise Control connection to the paging transmitter and a valid RFI-148 250 firmware image in the Motorola S-Record format (*.mot).

Cruise Control sends the firmware image to the paging transmitter and the paging transmitter stores it in non-volatile storage. Once the image has been fully received the paging transmitter verifies the integrity of the image. If the image is valid the paging transmitter can then load the new firmware image.

The paging transmitter will not update to a new firmware image downloaded using the remote update feature unless it has a valid recovery image (see section 5.3.2).

### 5.3.2 Recovery

The paging transmitter can save the current firmware and configuration to non-volatile storage. The recovery image can be reverted to in case of configuration loss, or a new firmware image loaded has undesired behaviour.

After a firmware recovery the paging transmitter will latch a firmware update exception fault.

## 5.4 Time

### 5.4.1 Real Time Clock

A real time clock is used to track the passage of time. The clock is used for:

- Keeping a time-stamped history of faults.
- A short history of transmitter events (PTT on, off).

### 5.4.2 SNTP Client

The transmitter supports time synchronisation using the Simple Network Time Protocol (SNTP) version 4.

#### MODES OF OPERATION

The SNTP client has three modes of operation:

- ***Disabled:*** The paging transmitter will not perform any time synchronisation.
- ***Unicast:*** The paging transmitter will query a time server for time updates.
- ***Broadcast:*** The paging transmitter will listen for time server updates.

In unicast mode the IP address of the time server must be specified. By default, the paging transmitter will query the time server at start-up and once per hour and wait a maximum of 10 seconds for a response.

#### TIME ZONE

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

# Appendix A Technical Specifications

## A.1 Type Approvals

| | | |
|---|---|---|
| Australia / New Zealand | AS NZS 4769.1 | Australian Supplier ID: N161 |
| FCC | CFR 47 Part 15 and Part 90 | FCC ID PSM RFI148 |
| ETSI (Planned) | ETS 300 113 | N/A |

*Table 3: Type approvals*

## A.2 RFI-148 250 Specifications

| | |
|---|---|
| RF Operating Bandwidth | 138 MHZ – 174 MHz |
| RF Switching Bandwidth | 2 MHz |
| RF Channel Bandwidth | 12.5 kHz, 25 kHz |
| RF Frequency Raster | Selectable: 25 kHz, 12.5 kHz, 6.25 kHz, 5 kHz |
| RF Output | 20 to 250 Watts |
| Internal Reference | Frequency: 10 MHz<br>Stability: +/- 1 ppm (-30 to +75 degrees C) |
| Modulation | • POCSAG 512, 1200, 2400 bps (2-level FSK).<br>• FLEX 1600 (2-level FSK), 3200 (2- or 4-level FSK), 6400 bps (4-level FSK). |
| Ethernet Port | 10BASE-T/100BASE-TX, auto-negotiating. |
| Serial Ports | Dual asynchronous full-duplex RS-232 (DTE)<br>Baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps<br>Data bits: 7 or 8<br>Parity: None, odd, or even<br>Stop bits: 1 or 2<br>Flow control (main port only): None or hardware (RTS/CTS)<br>Control lines (main port only): RTS, CTS, DTR, DCD |
| Digital Inputs | TTL Schmitt trigger with internal 100 KΩ pull-up.<br>• Frequency Select 1<br>• Frequency Select 2<br>• Frequency Select 3<br>• Frequency Select 4<br>• Protocol Select<br>• Hardware PTT<br>• Tx Data L-bit<br>• Tx Data H-bit<br>• Transmit Clock |
| Alarm Outputs | Open-collector Darlington with 500 mA sink current. |

| | |
|---|---|
| | • Power Supply Alarm<br>• Reference Out-of-Lock Alarm<br>• Reference Switchover Alarm<br>• High Output Power Alarm<br>• Low Output Power Alarm<br>• High VSWR Alarm<br>• High Temperature Alarm<br>• Fan Failure Alarm<br>• Exciter Out-of-Lock Alarm<br>• Combined Alarm<br>• Spare Alarm 1<br>• Spare Alarm 2<br>• Spare Alarm 3<br>• Spare Alarm 4 |
| Input Voltage | DC: 20 V to 31.2 V |
| Typical Current Draw at 24 V DC. | Fans off:<br>• Idle: 0.3 A<br>• 25 W: 7.0 A<br>• 100 W: 12.5 A<br>• 250 W: 20.3 A<br>Fans on:<br>• Idle: 0.6 A<br>• 25 W: 7.4 A<br>• 100 W: 13.1 A<br>• 250 W: 20.9 A |
| Connectors | Power: Terminal Block<br>Main Serial Port (Rear): DE-9 RS-232 Male (DTE)<br>Auxiliary Serial Port (Front): DE-9 RS-232 Female (DCE)<br>LIU Interface: DC-37 Female<br>Ethernet: RJ45<br>RF Output: N-type female 50 Ω<br>Sniffer Port Output: BNC female 50 Ω<br>External Reference Input: BNC female |

*Table 4: RFI-148 250 Specifications*

## A.3 Serial Connectors

### *A.3.1 Main Serial Port (Rear)*

| Pin | Function | Direction |
|---|---|---|
| 1 | DCD | Input |
| 2 | RxD | Input |

| | | |
|---|---|---|
| 3 | TxD | Output |
| 4 | DTR | Output |
| 5 | GND | |
| 6 | N/A | |
| 7 | RTS | Output |
| 8 | CTS | Input |
| 9 | N/A | |

*Table 5: Back Panel Connector Pin Out*

### A.3.2 Auxiliary Serial Port (Front)

| 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 6: Front Connector Pin Out*

## A.4 LIU Interface

| Pin | Function | Direction |
|---|---|---|
| 1 | Protocol Select | Input |
| 2 | Reference Switchover Alarm | Output |
| 3 | Spare Alarm 1 | Output |
| 4 | Spare Alarm 2 | Output |
| 5 | Frequency Select 4 | Input |
| 6 | Frequency Select 3 | Input |
| 7 | Frequency Select 2 | Input |
| 8 | Frequency Select 1 | Input |
| 9 | GND | |
| 10 | GND | |
| 11 | Hardware PTT | Input |

| | | |
|---|---|---|
| 12 | Combined Alarm | Output |
| 13 | N/A | |
| 14 | Power Supply Alarm | Output |
| 15 | Tx Data L-bit | Input |
| 16 | Tx Data H-bit | Input |
| 17 | LIU Detect | Input |
| 18 | Tx Data Clock | Input |
| 19 | GND | |
| 20 | Reference Out-of-Lock Alarm | Output |
| 21 | High Temperature Alarm | Output |
| 22 | High Output Power Alarm | Output |
| 23 | Spare Alarm 3 | Output |
| 24 | Spare Alarm 4 | Output |
| 25 | N/A | |
| 26 | Exciter Out-of-Lock Alarm | Output |
| 27 | N/A | |
| 28 | N/A | |
| 29 | Low Output Power Alarm | Output |
| 30 | High VSWR Alarm | Output |
| 31 | Fan Failure Alarm | Output |
| 32 | +5 V | Output |
| 33 | +5 V | Output |
| 34 | +12 V | Output |
| 35 | +12 V | Output |
| 36 | +24 V (Note: identical to DC input voltage) | Output |
| 37 | +24 V (Note: identical to DC input voltage) | Output |

*Table 7: LIU Interface Pin Out*

# 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, DB37) |
|---|---|
| TB3-2: Tx Clock | DB37-18: TX SYNC CLK |
| TB3-4: Tx key | DB37-11: TX ON EXT |
| TB3-8: GND | DB37-19: GND |
| TB4-2: Rx FQ1 | DB37-16: TX DATA H-BIT |
| TB4-3: Rx FQ2 | DB37-15: TX DATA L-BIT |

*Table 8: Motorola NIU controller / FLEX mode connection*

## B.2 Glenayre C2000 Controller / FLEX Mode

| C2000 (J4) | Transmitter (LIU, DB37) |
|---|---|
| J4-10: GND | DB37-19: GND |
| J4-26: TXKEY+ | DB37-11: TX ON EXT |
| J4-3: TD0+, MSB | DB37-15: TX DATA L-BIT |
| J4-34: TD1+, LSB | DB37-16: TX DATA H-BIT |
| J4-18: Data Clock+ | DB37-18: TX SYNC CLK |
| J4-7: Freq2 | DB37-6: FREQ SEL LINE 3 |
| J4-6: Freq1 | DB37-7: FREQ SEL LINE 2 |
| J4-36: Freq0 | DB37-8: FREQ SEL LINE 1 |

*Table 9: Glenayre C2000 controller / FLEX Mode connection*

## B.3 Glenayre C2000 Controller / POCSAG Mode

| Encoder | Transmitter (LIU, DB37) |
|---|---|
| Tx Data | DB37-15: TX DATA L-BIT |
| PTT | DB37-11: TX ON EXT |
| GND | DB37-19: GND |

*Table 10: Glenayre C2000 controller / POCSAG mode connection*

## B.4 Zetron Model 66 Transmitter Controller / POCSAG Mode

| Model 66 | Transmitter (DB37) |
|---|---|
| DIG DATA (pin 10) | DB37-15: TX DATA L-BIT |
| DIG PTT (pin 7) | DB37-11: TX ON EXT |
| GND (pin 3) | DB37-19: GND |

*Table 11: 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 12: Serial Port Statistics*

## C.2 SNMP Diagnostic Parameters

| SNMP Textual Name | Description |
|---|---|
| **Radio parameters** | |
| rfiChnChnCtrlChnnlsTable<br>rfiChnChnCtrlChnnlsEntry<br>rfiChnChnCtrlChnnlsIndex | Table of frequencies for all radio channels. |
| rfiChnChnCtrlChnnlNmbr | Radio channel number. |
| rfiChnChnCtrlTxFrq | Radio channel transmit frequency. |
| **Faults** | |

| | |
|---|---|
| rfiCrFltsFltIdxTable<br>rfiCrFltsFltIdxEntry<br>rfiCrFltsFltIdxIndex | Table containing configuration and status of all fault conditions. |
| rfiCrFltsFltNm | Name of the fault in this row of the table. |
| rfiCrFltsFltStts | Indicates whether or not this fault condition is currently active. |
| rfiCrFltsActvDrtn | Duration for which this fault has been active, or 0 if the fault is not active. |
| rfiCrFltsFltActn | Configured action to be taken when this fault occurs. |
| rfiCrFltsCntr | The number of times this fault has occurred since the statistics were reset. |
| **Sensors** | |
| rfiCrSnsMnSttsPrmTable<br>rfiCrSnsMnSttsPrmEntry<br>rfiCrSnsMnSttsPrmIndex | Table of parameters associated with sensors. |
| rfiCrSnsMnCrrVl | Current measured sensor value. |
| rfiCrSnsMnMxVl | Maximum possible sensor value. |
| rfiCrSnsMnMnVl | Minimum possible sensor value. |
| rfiCrSnsMnCrrStt | Current fault status associated with this sensor. |
| rfiCrSnsMnUppCtff | Upper cutoff value for this sensor. Measurements which exceed this cutoff cause a fault. |
| rfiCrSnsMnLwCtff | Lower cutoff value for this sensor. Measurements lower than this cutoff cause a fault. |
| **Identity** | |
| rfiCrIdntGtSrlNmbr | Factory assigned serial number for this device. |
| rfiCrIdntGtMnfctrDt | Date on which this device was manufactured. |
| rfiCrIdntApprvlCd | International type approval code which applies to this device. |
| rfiCrIdntUptmHrs | An approximation of the total number of hours that this device has been powered up. |
| rfiCrIdntGtFrmwrVrStr | Version information for the firmware loaded in this device. |

*Table 13: SNMP Diagnostic Parameters*

# Appendix D Hayes References

## D.1 General Commands

| Command | Name | Notes |
|---|---|---|
| ATI100 | Read All Sensors | Returns a list of the current value of all sensors, separated by commas and ended by a period, carriage return and line feed. See Appendix E for the sensor reference. |
| ATI101 | Read Active Faults | Returns either: a variable list of active fault indexes separated by commas; or "None", followed by a period, line feed and carriage return. See Appendix E for the fault reference. |
| ATI102 | Read Upper Sensor Limits | Returns a list of the current upper sensor cut-offs for all sensors, separated by commas and ended by a period, carriage return and line feed. See Appendix E for the sensor reference. |
| ATI103 | Read Lower Sensor Limits | Returns a list of the current lower sensor cut-offs for all sensors, separated by commas and ended by a period, carriage return and line feed. See Appendix E for the sensor reference. |
| AT&F1 | Factory Reset | Resets all settings to factory defaults. |
| AT&T9 | Reset | Causes the device to reboot. |
| AT? | Enable Menu | Starts the terminal menu this port. |
| AT%30 | Enable Cruise Control | Enables Cruise Control on this port. Waits for 10 seconds after executing with no further data input to return to normal Hayes mode. |

*Table 14: Hayes General Commands*

## D.2 I-Registers

| Command | Name | Notes |
|---|---|---|
| ATI0 | Product String | Returns the product string. |
| ATI4 | Version String | Returns the version string. |
| ATI5 | Manufacture Date | Returns the manufacture date. |
| ATI6 | Serial Number | Returns the device serial number. |
| ATI20[*p*, *s*] | Serial Port Statistics | Returns a serial port statistic where *p* selects port (0: main, 1: auxiliary) and *s* selects statistic (0 to 12, in the order listed in Table 12). |

| | | |
|---|---|---|
| ATI90[*p*] | Current status parameter | Returns the current value of a status parameter where *p* selects a parameter. See Appendix E for the sensor reference.* |
| ATI91[*p*] | Maximum status parameter | Returns the maximum recorded value of a status parameter. See Appendix E for the sensor reference.* |
| ATI92[*p*] | Minimum status parameter | Returns the minimum recorded value of a status parameter. See Appendix E for the sensor reference.* |
| ATI93[*p*] | Status parameter upper cut-off | Returns the upper cut-off value of a status parameter where *p* selects a parameter. See Appendix E for the sensor reference.* |
| ATI96[*p*] | Status parameter lower cut-off | Returns the lower cut-off value of a status parameter where *p* selects a parameter. See Appendix E for the sensor reference.* |
| ATI151 | Clear All Latched Faults | Clears all faults in the latched state. |

*Table 15: Hayes I-Register Commands*

* The parameter *p* is an integer index, as shown in the Index column of Table 17

| Command | Name | Notes |
|---|---|---|
| ATS45 | Transmit Power | Get or set transmit power in Watts. |
| ATS54 | Current Channel | Get or set the current channel. |
| ATS100[*p*] | Baud | Get or set the baud rate for serial port *p*.<br>1: 300<br>2: 600<br>3: 1200<br>4: 2400<br>5: 4800<br>6: 9600<br>8: 19200<br>9: 38400<br>10: 57600<br>11: 115200 |
| ATS101[*p*] | Parity | Get or set the parity for serial port *p*.<br>0: None<br>1: Even<br>2: Odd |
| ATS102[*p*] | Data Bits | Get or set the data bits for serial port *p*.<br>0: 7<br>1: 8 |
| ATS103[*p*] | Stop Bits | Get or set the stop bits for serial port *p*. |

| Command | Name | Notes |
|---|---|---|
| | | 0: 1<br>1: 2 |
| ATS104 | Main Port Flow Control | Note that this command cannot have a [p] port specifier.<br><br>0: None<br>2: Hardware (RTS / CTS) |
| ATS180 | Enable Hardware Frequency Select | 0: Disabled<br>1: Enabled |

*Table 16: Hayes S-Register Commands*

# Appendix E Sensor and Fault List Reference

| Index | Sensor | Unit | Range | Default Upper Cut-off | Default Lower Cut-off |
|---|---|---|---|---|---|
| 0 | PA Temp | ºC | -128 to 126 | 80 | -20 |
| 1 | Driver Temp | ºC | -128 to 126 | 80 | -20 |
| 2 | PA Ambient Temp | ºC | -128 to 126 | 80 | -20 |
| 3 | Isolator Temp | ºC | -128 to 126 | 80 | -20 |
| 4 | Baseband Temp 1 | ºC | -128 to 126 | 60 | -20 |
| 5 | Baseband Temp 2 | ºC | -42 to 152 | 60 | -20 |
| 6 | 24V Voltage | mV | 0 to 32767 | 30000 | 18000 |
| 7 | 12V Voltage | mV | 0 to 14833 | 15000 | 10000 |
| 8 | 5V Voltage | mV | 0 to 6649 | 6000 | 4000 |
| 9 | 3.3V Voltage | mV | 0 to 4347 | 4000 | 2500 |
| 10 | 24V Current | mA | 0 to 3296 | 1500 | 200 |
| 11 | 12V Current | mA | 0 to 3296 | 2500 | 300 |
| 12 | 5V Current | mA | 0 to 2197 | 1200 | 350 |
| 13 | 3.3V Current | mA | 0 to 3296 | 900 | 400 |
| 14 | Exciter Current | mA | 0 to 999 | 700 | 200 |
| 15 | PA Current | mA | 0 to 24951 | 20000 | 14000 |
| 16 | Driver Current | mA | 0 to 2495 | 800 | 300 |
| 17 | Supply Current | mA | 0 to 30742 | 21000 | 200 |
| 18 | Fan 1 Current | mA | 0 to 1636 | 450 | 100 |
| 19 | Fan 2 Current | mA | 0 to 1636 | 450 | 100 |
| 20 | Fan 1 Speed | RPM | 0 to 32767 | 2700 | 1900 |
| 21 | Fan 2 Speed | RPM | 0 to 32767 | 2700 | 1900 |
| 22 | Reverse Power | W | 0 to 86 | 16 | 0 |
| 23 | Transmit Power | W | 0 to 650 (typical) | 275 | 225 |
| 24 | Driver Power | W | 0 to 1714 | 18 | 8 |
| 25 | Exciter Power | mW | 0 to 21977 | 700 | 200 |
| 26 | Isolator VSWR | $10^{-3}$:1 | 0 to 32767 | 2000 | 0 |

*Table 17: Sensor Reference*

| Index | Fault | Latching | Default Fault Action | Default Alarm |
|---|---|---|---|---|
| 0 | High PA Temperature | Configurable | Disable Transmission | High Temperature |
| 1 | High Driver Temperature | Configurable | Disable Transmission | High Temperature |
| 2 | High PA Ambient Temperature | Configurable | Disable Transmission | High Temperature |
| 3 | High Isolator Temperature | Configurable | Disable Transmission | High Temperature |
| 4 | High Baseband 1 Temperature | Configurable | None | High Temperature |
| 5 | High Baseband 2 Temperature | Configurable | None | High Temperature |
| 6 | High 24V Voltage | Configurable | None | Power Supply |
| 7 | High 12V Voltage | Configurable | None | Power Supply |
| 8 | High 5V Voltage | Configurable | None | Power Supply |
| 9 | High 3.3V Voltage | Configurable | None | Power Supply |
| 10 | High 24V Current | Configurable | None | Power Supply |
| 11 | High 12V Current | Configurable | None | Power Supply |
| 12 | High 5V Current | Configurable | None | Power Supply |
| 13 | High 3.3V Current | Configurable | None | Power Supply |
| 14 | High Exciter Current | Configurable | None | Power Supply |
| 15 | High PA Current | Configurable | Enable Current Foldback | Power Supply |
| 16 | High Driver Current | Configurable | None | Power Supply |
| 17 | High Supply Current | Configurable | None | Power Supply |
| 18 | High Fan 1 Current | Configurable | None | Fan Failure |
| 19 | High Fan 2 Current | Configurable | None | Fan Failure |
| 20 | High Fan 1 RPM | Configurable | None | Fan Failure |
| 21 | High Fan 2 RPM | Configurable | None | Fan Failure |
| 22 | High Reverse Power | Configurable | Enable Reverse Power Foldback | None |
| 23 | High Transmit Power | Configurable | Scale Transmit Power | High Power |
| 24 | High Driver Power | Configurable | None | None |
| 25 | High Exciter Power | Configurable | None | High Power |
| 26 | High Isolator VSWR | Configurable | None | High VSWR |
| 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 24V Voltage | Configurable | None | Power Supply |
| 34 | Low 12V Voltage | Configurable | None | Power Supply |
| 35 | Low 5V Voltage | Configurable | None | Power Supply |
| 36 | Low 3.3V Voltage | Configurable | None | Power Supply |
| 37 | Low 24V Current | Configurable | None | Power Supply |
| 38 | Low 12V Current | Configurable | None | Power Supply |
| 39 | Low 5V Current | Configurable | None | Power Supply |
| 40 | Low 3.3V Current | Configurable | None | Power Supply |
| 41 | Low Exciter Current | Configurable | None | Power Supply |
| 42 | Low PA Current | Configurable | None | Power Supply |
| 43 | Low Driver Current | Configurable | None | Power Supply |
| 44 | Low Supply Current | Configurable | None | Power Supply |
| 45 | Low Fan 1 Current | Configurable | None | Fan Failure |
| 46 | Low Fan 2 Current | Configurable | None | Fan Failure |
| 47 | Low Fan 1 RPM | Configurable | None | Fan Failure |
| 48 | Low Fan 2 RPM | Configurable | None | Fan Failure |
| 49 | Low Reverse Power | Configurable | None | None |
| 50 | Low Transmit Power | Configurable | None | Low Power |
| 51 | Low Driver Power | Configurable | None | None |
| 52 | Low Exciter Power | Configurable | None | None |
| 53 | Low Isolator VSWR | Configurable | None | None |
| 54 | External Reference Fail | Configurable | Reference Switchover | Reference Out-of-Lock |
| 55 | Internal Reference Fail | Configurable | None | None |
| 56 | Exciter Out-of-Lock | Configurable | Disable Transmission | Exciter Out-of-Lock |
| 57 | Transmit Timeout | Latch-only | Disable Transmission | None |
| 58 | PA Current Foldback | Configurable | None | None |
| 59 | Reverse Power Foldback | Configurable | None | None |
| 60 | Invalid Calibration | Latch-only | Disable Transmission | None |

| | | | | |
|---|---|---|---|---|
| 61 | Watch Dog Reset | Latch-only | None | None |
| 62 | Assertion Reset | Latch-only | None | None |
| 63 | Firmware Update Exception | Latch-only | None | None |
| 64 | Reference Switchover | Latch-only | None | Reference Switchover |
| 65 | Disable Transmission | Latch-only | None | None |
| 66 | Scale Transmit Power | Latch-only | None | None |
| 67 | Enable PA Current Foldback | Latch-only | None | None |
| 68 | Enable Reverse Power Foldback | Latch-only | None | None |

*Table 18: Fault Reference*

# Appendix F Factory Defaults

If a setting is not specified in the factory defaults table then it is not changed during a factory reset.

| Group | Parameter | Default Value |
|---|---|---|
| Transmitter Settings | Enable Transmit Timeout | True |
| | Transmit Timeout | 600 s |
| | Default Reference | External |
| | Delay Correction | 0 ms |
| | Auto PTT | Disabled |
| | Auto PTT Timeout | 5 s |
| | PTT System Override | Enable Transmit |
| | PTT Turn Off Delay | 0 s |
| | Isolator Mode | Set for Transmitting |
| | Fault Scaling Factor | 50 % |
| | Raster | 12.5 kHz |
| Paging Protocols | Protocol 2 Protocol | POCSAG 1200 |
| | Protocol 2 Deviation | 4500.0 Hz |
| | Protocol 2 Carrier Offset | 0 Hz |
| Faults | Alarm and Fault Actions | See Table 18. |
| Fan Control | Fan Turn On Temperature | 55 ºC |
| | Fan Turn Off Temperature | 40 ºC |
| | Sensor To Use | Hottest Sensor |
| | Fan Speed Setting | 100 % |
| | Control Method | On/off |
| Sensor Configuration | Upper and Lower Cut-off | See Table 17 |
| Encoder Interface | Encoder Protocol Control | Disabled |
| | Encoder Frequency Control | Disabled |
| | Encoder Hardware PTT | Enabled |
| | Active Protocol | Protocol 1 |
| | Clock Invert | Normal |
| | Data Invert | Normal |
| IP Networking | IP Address | 192.168.1.80 |
| | Subnet Mask | 255.255.255.0 |
| | Gateway | 192.168.1.1 |
| Serial Port | Main Flow Control | None |
| | Main DTR Mode | Always High |

| | | |
|---|---|---|
| | Main RTS Mode | Always High |
| | Main Port Baud Rate | 19200 |
| | Main Port Data Bits | 8 |
| | Main Port Parity | None |
| | Main Port Stop Bits | 1 |
| | Auxiliary Port Baud Rate | 19200 |
| | Auxiliary Port Data Bits | 8 |
| | Auxiliary Port Parity | None |
| | Auxiliary Port Stop Bits | 1 |
| Diagnostics | SNTP Server | 0.0.0.0 (Disabled) |
| | SNTP Query Interval | 60 min |
| | Time Zone | + 8:00 |

*Table 19: Factory Defaults*

# Appendix G Glossary

| | |
|---|---|
| BNC | British Naval 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 |
| 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 |
| Tx | Transmitted |
| UTC | Coordinated Universal Time |
| VHF | Very High Frequency |
| VSWR | Voltage Standing Wave Ratio |

*Table 20: Glossary*

# Index