



***FireLine* Data Radio Modem System Protocol Manual**

*Version D3
August 2006*

Raveon Technologies Corporation

2780 La Mirada Dr. Suite C
Vista, CA 92081
760-727-8004
www.raveontech.com

Table of Contents

1. Overview.....	3
2. RF Test Related Commands	3
3. FireLine Configuration Commands	4
4. FireLine MODEM Statistics Provisions	4
4.1. Overview of Diagnostics	4
4.2. Reading the Diagnostic Information	5
4.3. Status and Statistics Command	5
4.4. AutoStatus	6
5. Remote Procedure Request (RPR)	7
5.1. RPR Overview	7
5.2. RPR Protocol	7
5.3. Remote Procedure Request Commands	8
5.4. RPR Error Responses	9

1. Overview

The *FireLine* modem (as well as the RV-M3 series of modules) operate in two modes, the “normal” data transmission/reception mode, and the COMMAND mode. By “normal” mode, this is the mode where two or more FireLine modems exchange data over-the-air. This is the mode the modem is in when it power on, and is normally used to send data.

When the modem is in the COMMAND mode (send **+++** to enter this mode), the user may:

1. **Issue RF Test commands useful for tuning and testing the FireLine.** Certain commands are provided to allow the user to key the transmitter and send various test patterns.
2. **Review the current configuration using various AT commands.** All MODEM settings may be reviewed using various AT commands. The **ATSH** command will cause the FireLine to output an overview of all of its major parameters.
3. **Modify the current configuration using various AT commands.** The user may change ID codes, packet length, data rates, etc... using the AT commands when the MODEM is in the COMMAND mode.
4. **Read MODEM statistics using certain AT commands.** These statistics are read using the ATST command, and are used to monitor the operation of the modem. The signal-strength history of previous receptions may also be displayed using the **ATHS** command.
5. **Issues Remote Procedure Requests (RPRs).** While the *FireLine* is in the COMMAND mode, certain RPR commands allow the user or user application to request other FireLine modems in the system (via an over-the-air request), to execute commands or provide information. Users may “Ping” other modems, request other modems statistics, history, RSSI, and configuration data. RPRs are issued in the “background”, and in most cases, the *FireLine* system and other modems are not aware of the RPR communications.

Note, that if no valid commands are received within 60 seconds, the modem will exit the COMMAND mode, and automatically return to the “normal” mode of operation.

The following 5 sections describe the features of the COMMAND mode.

2. Radio Test Related Commands

2.1. RF Test Commands

These command are for FireLine bench testing only. Not for use in the field.

The following commands may be entered when a FireLine is in the command mode. They allow a technician to measure various RF parameters such as power

output, deviation, and frequency. The modem must be in the COMMAND mode to execute these commands. (Enter +++ at the keyboard to put unit into COMMAND mode.)

ATTD x	Various transmit test routines. 0 = Go back to normal mode. Stops the test. 1 = Random data transmit. 2 = Hop up/down one channel 3 = Force PLL to fast lock mode 4 = Transmit all 0s 5 = Transmit all 1s 6 = Enable the test points on the PCB. 7 = Transmit CW on center of channel 8 = Transmit preamble (101010 pattern)
SHOW	Display an overview of the configuration.
ATST	Display statistics of how the modem is working.
AT\$5	Display RSSI DAC reading. A number will scroll the reading until another character comes in the serial port. The number displayed is the reading of the DAC level of the RSSI.
ATRQ	Display the current RF level of any signal on the receivers frequency. The value returned is in dBm.

2.2. Packet Counter

The packet counter mode will output packet count statistics once per minute. It will output the number of packets received in the last minute as well as the running total.

ATPE	Begin counting and displaying the packet counters every minute
ATPE 1	Reset the packet counters back to zero
ATPE 2	Stop counting and displaying packet counters

Upon power up, the packet counter feature is always disabled.

3. FireLine Configuration Commands

See the FireLine user manual for information regarding these commands.

4. FireLine MODEM Statistics Provisions

4.1. Overview of Diagnostics

Internal to the *FireLine* radio modem, is a powerful 32-bit microprocessor. Along with handling all aspects of radio modulation and demodulation, the microprocessor also maintains an extensive array of diagnostic information.

This section details the diagnostic information available, and describes how to use the information to optimize or troubleshoot a *FireLine* radio network.

4.2. Reading the Diagnostic Information

FireLine diagnostic information is read using AT commands, while the unit is in the Command Mode. Refer to the section “User Serial Port Commands” to learn how to put the *FireLine* modem into the Command Mode.

To see a general overview of how the modem has been operating, use the **ATST** command (status request command), without any parameter. The radio modem will respond with a list of certain operation statistics that it maintains. All statistics start counting at 0 when the unit is first powered on. The **ATST 9** command can be used to reset all statistics back to 0.

Other operation and configuration statistics are available using the **ATST x** command, with a parameter to specify the desired statistic. The following table describes the various statistics available.

4.3. Status and Statistics Command

AT Command	Command Description	Response
ATST	General Communication Statistics – This command will cause the <i>FireLine</i> to output a table of various operational statistics.	Statistics overview screen
ATST9	Reset Statistic Counters – All statistic counters will be reset to 0.	OK
ATST2	Low-level internal statistics – Returns various low-level statistics. These are subject to change in various firmware revisions.	Low-level statistics screen
ATST3	Compile date and time – Returns the data and the time that the firmware was compiled.	Date and time
ATST4	Run Time – Returns the amount of time that the modem has been powered up and running.	Time running

See the *FireLine* Technical Manual for detailed information on the Status and Statistics responses.

4.4. AutoStatus

The Auto-Status feature of the FireLine enables it to automatically transmit a packet of status information. By default, this feature is disabled. When enabled, the FireLine modem will send status reports to a pre-determined ID (it may be configured to be a different TOID address from the ID that normal modem data is sent to).

To enable the Auto Status feature, use the **ATAS xxx** command, where **xxx** is the status interval in minutes. The interval may be between 1 minute and 65000 minutes (45 days).

The general format of the message that the modem will send is:

```
[an ASCII STX character, 02]
<STATUS>
ATMY=1234
ATVR=D1
ATDT=1234
ATVB=12300
UPTIME=120
OSERR=0
PRX=1295
PTX=7933
</STATUS>
[an ASCII ETX character, 03]
```

When a station receives an AutoStatus message it will output the status text via its serial port. For systems where the AutoStatus messages are sent to the same modem ID as normal data, it may be challenging to detect the difference between the data traffic on the channel and the AutoStatus message.

To aid the user or system in detecting the reception of an AutoStatus message as opposed to a normal data transmission, the standard ASCII Start of Text and End of Text characters are used. The first character is a Start of Text character. This is followed by the phrase "<STATUS>". Each line in the status transmission is terminated with an ASCII carriage return (0D) and line feed (0A).

As new features are added to the *FireLine*, there may be new status parameters added. But all *FireLine* modems with Revision D or higher firmware support at a minimum, the above shown status parameters. The status transmission will end with an ASCII 03 character, the End of Text character.

The parameters passed in the status message are:

ATMY	The ID of the modem sending the status.
ATVR	The firmware version in the modem
ATDT	The ID the modem is programmed to send data to.
ATVB	DC voltage, in millivolts of the DC input to the modem.
UPTIME	Number of seconds since this modem has turned on.
OSERR	The number of Operation System Errors. Normally this is 0.
PRX	The number of packets this modem has received.
PTX	The number of packets this modem has transmitted.

The ID code that the status information will be sent to, is configured with the **ATMA xxxx** command. Whenever a status transmission is sent, the "TO ID" of the transmission is the address as set using the **ATMA** command. This allows the system to be configured in a way the normal modem communications take place between the modems, and the status information is delivered only to modem(s) that need to receive it.

5. Remote Procedure Request (RPR)

5.1. RPR Overview

Modems with firmware D3 and above have over-the-air diagnostics capability. When the modem is in the COMMAND mode, some commands may be issued that are intended for use on other modems in the system. The modem connected to the command user's device will send the command to the intended remote FireLine over-the-air on the currently selected channel.

The remote modem will process the requested command (whether or not it is in its COMMAND mode) and then transmit its response back to the requesting modem. Depending upon baud-rate, the command, and the system configuration, the response may take some time to execute. The requesting FireLine modem will time-out after 5 seconds if a response does not come back.

RPR commands are generally used to interrogate remote modems, and find out their internal statistics, operation parameters, and how they were configured.

If a <CR> is entered into the requesting FireLine while it is waiting for a remote response, it will then abort the request and not send the time-out message if the remote request does not come back. Even when a <CR> is entered, if the response is received from a remote modem, the FireLine that initiated the RPR will output the response.

5.2. RPR Protocol

All FireLine modems with Firmware version D2 and above have the ability to send a Remote Procedure Request to other FireLine modems. The requesting FireLine must be in the COMMAND mode. A FireLine modem is put into the command mode using the +++ sequence per the *FireLine Data Radio MODEM Technical Manual*. Section 5.3 describes the various RPR commands that are available.

When a FireLine modem receives an RPR response message back from the remote modem that executed the RPR, it will output the message in the following general format:

<REPLY>	The Phrase "<REPLY>" in ASCII characters, followed by a and ASCII <CR> and <LF>.
FROM=1234	The Phrase "FROM=" followed by the 4-digit ID of the modem that sent the RPR response, and then a <CR> <LF> sequence.
RSSI=-76	The RPR response text. This may be one parameter, a list of parameters, or other information. It is dependent upon the RPR command. See section 5.3 for a description of the RPR responses.
</REPLY>	The Phrase "</REPLY>" in ASCII characters, followed by a and ASCII <CR> and <LF>. This phrase may be used to determine the end of the RPR message.

All RPR responses end with a <CR><LF> sequence. So for example, the line <REPLY> is actually sent as: **< R E P L Y >** <CR> <LF>

5.3. Remote Procedure Request Commands

The following RPR commands are supported. All RPR commands, except the PING command must be preceded with the text **RPR**.

PING

RPR PING xxxx Send a "PING" to modem xxxx where xxxx is 0000 thru FFFE. A PING is a short request transmitted over the air to another modem that tells the remote modem to answer back with a short status packet.

Example: PINGs remote modem 1234.

PING 1234	<i>User enters request to PING station 1234</i>
<REPLY> FROM=1234 RSSI=-76 </REPLY>	<i>Response back from remote modem 1234 indicates that the RSSI of this modem, as received by modem 1234 was -76dBm.</i>

RPR ATVR

RPR ATVR xxxx Request the software version of remote modem xxxx where xxxx is 0000 thru FFFE.

Example: Request the software version from modem 1234.

RPR ATVR 1234	<i>User enters request to station 1234</i>
<RPR> FROM=1234 ATVR=D2 </RPR>	<i>Response back from remote modem 1234 indicates that the modem's firmware is verion "D2".</i>

RPR ATVB

RPR ATVR xxxx Request the DC input voltage of remote modem xxxx where xxxx is 0000 thru FFFE.

Example: Request the software version from modem 1234.

RPR 1234 ATVB	<i>User enters request to station 1234</i>
<RPR> FROM=1234 ATVB=12520 </RPR>	<i>Response back from remote modem 1234 indicates that the modem's dc input voltage is 12525mV (12.520 volts)</i>

RPR ATBD

RPR ATVR xxxx Request the serial port baud rate of remote modem xxxx where xxxx is 0000 thru FFFE.

Example: Request the software version from modem 1234.

RPR 1234 ATBD	User enters request to station 1234
<RPR> FROM=1234 ATBD=3 </RPR>	Response back from remote modem 1234 indicates that the modem's baud rate setting is 3 (9600 bps)

RPR ATAT, RPR ATBT, and RPR ATCT

RPR ATAT xxxx Request the serial port time-out parameters of remote modem xxxx where xxxx is 0000 thru FFFE.

Example: Request the software version from modem 1234.

RPR 1234 ATAT	User enters request to station 1234
<RPR> FROM=1234 ATAT=500 </RPR>	Response back from remote modem 1234 indicates that the modem's AT before-time period is set to 500mS.

RPR ATNB, and RPR ATNS

RPR ATAT xxxx Request the serial port parameters.

Example: Request the number of stop bits

RPR 1234 ATNS	User enters request to station 1234
<RPR> FROM=1234 ATNS=1 </RPR>	Response back from remote modem 1234 indicates that the modem's serial port uses one stop bit.

5.4. RPR Error Responses

If an invalid RPR request is transmitted, the *FireLine* will output an error message that can be used to determine the source of the error.

Wrong or invalid ID

If a *FireLine* sends an RPR request to a remote modem with an ID that does not exist in the network, is out of range, turned off, or has the RPR feature disabled, the *FireLine* will respond by outputting a TIMEOUT message from its serial port after about 5 seconds of not receiving a response from the remote modem.

For Example:

RPR 1234 ATVR	<i>User enters request to FireLine 1234 for its software version. FireLine 1234 does not exist in the system.</i>
TIMEOUT<CR><LF>	<i>Response back from remote modem 1234 indicates that the modem's serial port uses one stop bit. CR = ASCII 10, LF=ASCII 13.</i>

Invalid Request

If a *FireLine* sends and RPR request to a remote modem, and it is an invalid request, the remote modem will response with an RPR_ERROR_1 message. This is typically due to a “typo” or an invalid RPR command. It is formatted in the same way as a valid RPR message, except the parameter is the phrase RPR_ERROR_1.

For Example:

RPR 1234 ATXX	<i>User enters an invalid request to remote FireLine 1234. (ATXX is not a valid command)</i>
<RPR> FROM=1234 RPR_ERROR_1 </RPR>	<i>Response back from remote modem 1234 indicates that it received the request, and could not process it.</i>

Unable to Execute the Request

If a *FireLine* sends and RPR request to a remote modem, and the remote modem understood the command but could not execute it, the remote modem will response with an RPR_ERROR_2 message. This is typically due to an invalid parameter in the command. The response is formatted in the same way as a valid RPR message, except the parameter is the phrase RPR_ERROR_2.

For Example:

RPR 1234 ATNS 3	<i>User enters request to remote FireLine 1234 to change the number of stop bits to 3 (1 or 2 are the only valid parameters).</i>
<RPR> FROM=1234 RPR_ERROR_2 </RPR>	<i>Response back from remote modem 1234 indicates that it received the request, and could not process it.</i>

Raveon Technologies Corporation

2722 Loker Avenue West, Suite D
Carlsbad, CA 92010
www.raveontech.com