SECTION 3

OPERATION

3.1 INTRODUCTION

The RF-3466A is a versatile modem which has been designed to meet two basic operational needs:

- Manual operation giving complete control over all modem functions
- Preset operation allowing fast recall of complex equipment setups

This section describes all front panel controls and indicators, followed by descriptions of manual and preset modes of operation. Self test and remote control operation are described in detail. The section concludes with a detailed functional description of all modes, options, and settings.

3.2 CONTROLS AND INDICATORS

All operational controls and indicators are located on the front panel. Figure 3-1 and table 3-1 illustrate and describe the RF- 3466A controls. Note that some controls are located behind a closed door. In general, these controls are used for programming preset information and are not needed for routine operations.

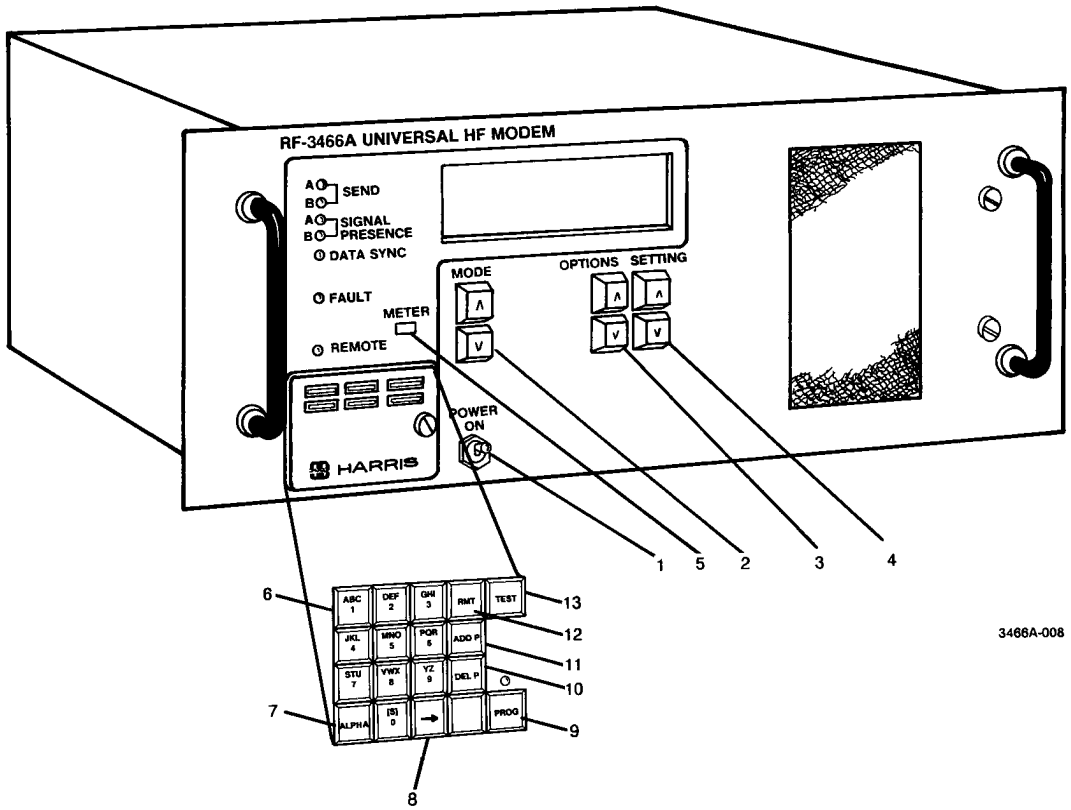


Figure 3-1. RF-3466A Front Panel Controls

Table 3-1. RF-3466A Front Panel Controls

Item No.	Control	Function
1	POWER ON	Main power switch.
2	MODE	Two arrow buttons that scroll through the available modes of operation.
3	OPTIONS	Two arrow buttons that scroll through the options that are available for the mode selected.
4	SETTING	Two arrow buttons used to select a setting for the option shown on the alphanumeric display.
5	METER	A toggle button used in FSK mode to display the mark and space signals. When the METER pushbutton is initially pressed, the display shows the mark and space signal levels for the FSK A channel using a bargraph. When pressed a second time the display shows the mark and space signal levels for the FSK B channel. When pressed a third time, the display reverts to the normal control display.
6	ALPHANUMERIC KEYPAD	Used for alphanumeric entry of settings or preset names.
7	ALPHA	During entry of preset names, this button allows the number at the right-most position in the field to be turned into a letter. Successive depressing of the ALPHA button causes the character to be rolled through all of the letters marked on the number button, and back to the original number.
8	------>	Active during entry of preset names. This pushbutton causes the characters in the display to be right-shifted. The right most letter is shifted out of the display and deleted by this edit feature.
9	PROG	A toggle button used to access the PROGRAM mode. This mode allows access to the Main Set Up Mode and all options for all modes.
10	DEL P	Functions only in PROG mode. Used to delete preset names from memory.
11	ADD P	Functions only in PROG mode. Used to add preset names to the memory.
12	RMT	Allows selection of remote or local control. Only the OPTIONS button is operational in the remote mode. This allows the user to view the settings of the modem in the displayed mode of operation.
13	TEST	Allows selection of self-test mode. When the TEST pushbutton is pressed, the operator is prompted to press ALPHA to run a self test.

Figure 3-2 and table 3-2 illustrate and describe the RF-3466A indicators. Note that a diagnostics connector located just above the PROG LED is used by service personnel to perform testing on the modem.

3.2.1 Send

The SEND Lamp is turned on when the modem modulator begins to transmit data.

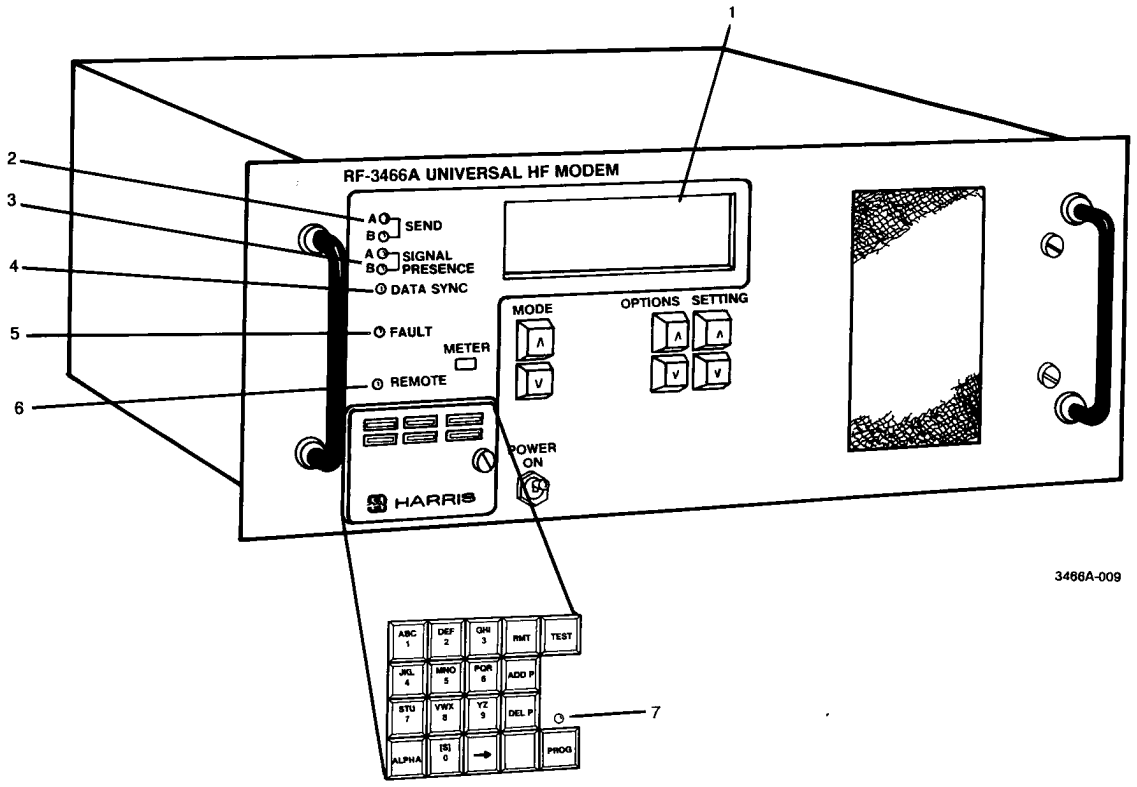


Figure 3-2. RF-3466A Front Panel Indicators

Table 3-2. RF-3466A Front Panel Indicators

Item No.	Control	Function
1	ALPHANUMERIC DISPLAY	The top line of the display shows the modem's current mode of operation. The second display line shows the options available and the selected setting for the option.
2	SEND A and B LED	Green LED lights to indicate that data is being sent.
3	SIGNAL PRESENCE A AND B LED	Green LED lights to indicate that acceptable signals are being received.
4	DATA SYNC LED	Green LED lights to indicate that modem is synchronized with a sending station, (39 tone and Robust Serial modes).
5	FAULT LED	Red LED lights to indicate the presence of a fault condition. See section 5 to evaluate fault messages.
6	REMOTE LED	Green LED lights to indicate modem is being remotely controlled.
7	PROG LED	Green LED flashed to indicate modem is being operated in PROGRAM mode.

3.2.2 Signal Presence A and B

These lamps indicate that the modem demodulator is receiving a signal in channel A or B, respectively, which meets an established signal-to-noise ratio threshold. A valid SIGNAL PRESENCE indication does not necessarily imply that the modem is synchronized with the received signal, nor does it imply that the bit error rate is meeting an established threshold criteria.

3.2.3 Data Sync

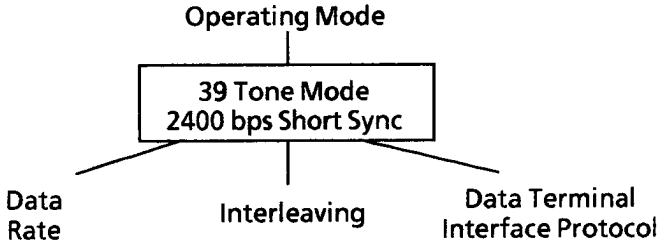
The DATA SYNC lamp indicates that the forward error correction decoder has synchronized on the incoming message, and is maintaining synchronization over the duration of the message. At the conclusion of a received message, or during a signal fade, the DATA SYNC condition is held for a time to ensure that it is really the end of the message. If another incoming message is received during this DATA SYNC hold time, the DATA SYNC is reset and synchronization is then established on the new message. The DATA SYNC hold time is a function of the modem baud rate and the interleaving delay. DATA SYNC is not used in FSK modes.

3.3 MANUAL OPERATION

Basic control of the RF-3466A is through the three pairs of arrow buttons directly below the alphanumeric display. These buttons control the following parameters:

- Operating mode
- Options available for each operating mode
- Settings for the available options

In both the manual and preset modes, the current mode of operation is displayed on the first line of the alphanumeric display. The second line contains status information for that mode of operation; i.e., the most important information for the mode. The following shows a typical alphanumeric display for 39 tone mode.



Dual modes of operation use two status lines: one for the primary mode of operation and the other for B channel FSK. The status lines are exactly the same as in the above example, except that the secondary status (B channel FSK) is accessed by pressing the OPTION up pushbutton.

A detailed list of options and settings available for each operating mode is found in paragraphs 3.8 and 3.9.

3.3.1 Selecting an Operating Mode

The list of operating modes, as they appear on the alphanumeric display, include:

- Main Set Up Mode (only shown in PROG mode)
- Fixed Preset Mode (see paragraph 3.4)

- Preset Mode (see paragraph 3.4)
- 39 Tone Mode
- Robust Serial Mode (only shown if the option is installed)
- FSK Mode
- 39 Tone/FSK Mode
- Rob Serial/FSK Mode (only shown if the option is installed)

The MODE pushbuttons are used to scroll through the list of modes of operation.

3.3.2 Selecting Operating Parameters.

Each operating mode has a set of operating parameters associated with it. By pressing the OPTIONS pushbutton, the modem scrolls through a frequently used list of operating parameters and their current settings. To access a complete list of operating parameters, the modem must be in PROGRAM mode.

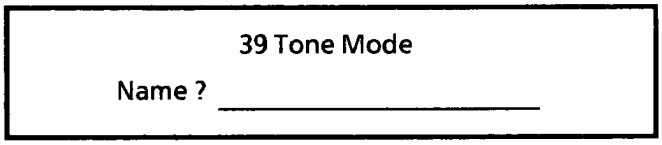
3.3.3 Changing Operating Parameters

To change an operating parameter, press either SETTING pushbutton with the option showing and the modem will scroll through the list of available settings for that option. The setting that appears on the alphanumeric display is the current setting for the modem.

3.3.4 Saving Selections as a Preset

After selecting the operating parameters for an operating mode, the operator may wish to store the selection in the modem's memory as a preset.

To do this, the operator can be in any mode (except Preset Mode). After selecting the options for the mode, press the PROG pushbutton and then the ADD P pushbutton. (Add Preset only functions in the program mode.) The display prompts for the name of the preset to be added. For example:



The user enters the name (up to 12 characters) by using the numerical keypad for number entries or by using the ALPHA button to change the number entries to letters. The ALPHA pushbutton allows the number at the right- most position in the field to be turned into a letter. Successive depressing of the ALPHA button causes the character to be rolled through all of the letters marked on the number button, and back to the original number.

The ------> pushbutton is an edit feature that causes the characters in the display to be right-shifted. The right most letter is shifted out of the display and deleted.

After entering the new preset press the PROG pushbutton to return to normal operation. If the user now scrolls over to Preset Mode, the new entry will be listed as the next available preset number.

3.4 PRESET OPERATION

The RF-3466A contains two operating modes that use preset information: the Fixed Preset Mode and the Preset Mode.

The Fixed Preset Mode contains presets that have been programmed before the modem is shipped and cannot be changed. When the Fixed Preset Mode is selected by the MODE pushbutton, the OPTIONS buttons are disabled; however, the SETTING buttons allow the operator to view the presets. Fixed Preset Mode can be used as an operating mode or as a baseline for creating custom presets.

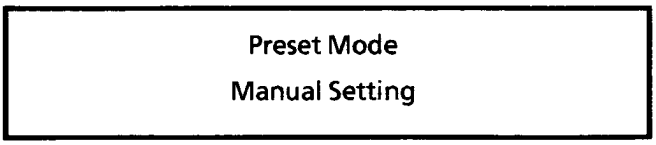
The Preset Mode contains presets that have been programmed by the user. When the Preset Mode is selected by the MODE pushbutton, the OPTIONS buttons are disabled; however the SETTING buttons allow the operator to view the presets.

Presets are listed in numerical order (01, 02, 03, etc).

A detailed list of options and settings available for each operating mode is found in paragraph 3.7.

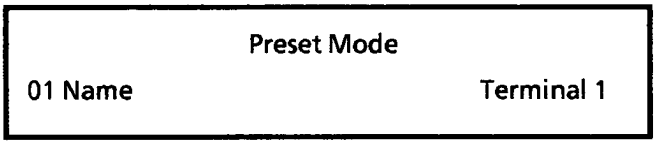
3.4.1 Entering the Preset Mode

The Preset Mode is entered by pressing the MODE buttons until the display shows Preset Mode. When in Preset Mode, each of the presets can be accessed by pressing the SETTING buttons. (The OPTIONS buttons are inactive.) The first entry in the preset list is the manual setting. The alphanumeric display shows:



3.4.2 Selecting a Preset

Pressing the SETTING buttons cause the modem to scroll through the selected presets until the selection comes back to the Manual Setting position. An example of a preset display would be:



3.4.3 Reviewing the Operating Parameters of a Preset

When a preset is selected, the operator can view the settings for that preset by pressing either of the MODE pushbuttons. The display will switch to the mode of the selected preset and display a P in the top left corner:

The user can then examine the parameters by using the OPTIONS buttons. Pressing the MODE buttons a second time will return the display to the preset mode.

3.4.4 Temporary Alteration of a Preset's Parameters

When the operator is reviewing the parameters for a preset described above, all of the buttons are functional and the options can be changed; however, this is a temporary change and the preset will revert to the original settings when a MODE pushbutton is pressed. This feature can be used to change data rates or other parameters of a temporary nature.

The changes can be saved by using the ADD P pushbutton to create a new preset, as described in paragraph 3.3.4 .

3.4.5 Deleting a Preset

To delete a preset, the user must be in the Preset menu and the PROG mode. Use the SETTING button to select the preset to be deleted. Then, press the DEL P (Delete Preset) pushbutton. The display will show:

Press ALPHA - delete
Press other - bypass

If the ALPHA pushbutton is pressed, the preset is deleted and the display shows the next preset on the list. If any other button is pressed, the display shows the currently selected preset. In either case, PROG mode is terminated and must be reselected in order to delete another preset.

When a preset is deleted, the number it was given when it was added is left blank. For example, if a modem has five presets stored in memory, they would occupy the numbers 01, 02, 03, 04, and 05. If the operator deletes the 03 preset, the list of presets would read: 01, 02, 04, and 05. The next added preset would become 03.

3.4.6 Exiting Preset Mode

Use the SETTING buttons to scroll through the list of presets until the manual setting appears on the display:

Preset Mode
Manual Setting

Now the MODE pushbuttons can be used to exit to another operating mode.

3.5 METERING

The METER button on the front panel is a toggle button that functions only when using one of the FSK modes. It allows the received signal to be fine-tuned for optimum performance. When using an FSK mode, pressing the METER button the first time causes the display to change to a bar graph. This bar graph shows the received mark and space tone signal levels for FSK channel A. Pressing the METER button a second time shows the received mark and space tone signal levels for FSK channel B. Pressing it a third time returns the display to its original form. In dual waveform modes pressing the METER button causes the display to show signal levels for FSK channel B. Pressing it again returns the display to its original form.

To fine-tune a received signal, the option to be tuned should be selected using the OPTIONS buttons. Next, the METER button is pressed to display the signal levels for the desired channel. By pressing the SETTINGS buttons the frequency of the option can be incremented or decremented in 1/2-hertz steps. If the SETTINGS buttons are held down the frequency will increment or decrement until the button is released. By watching the bar graph display the signal can be fine-tuned to achieve maximum signal strength. Note that the mark and space frequencies can be tuned independently, or the center frequency can be tuned which effectively tunes mark and space tones simultaneously.

3.6 SELF-TEST

The RF-3466A contains a built-in test (BIT) feature that is designed to test as much of the modem as possible without operator intervention. This modem self-test can be entered in two ways. There is also a short self-test of the front panel that can be used if the front panel controls are unresponsive.

If the FAULT LED lights or an error message is displayed during any of the above test procedures, consult the maintenance section of this manual.

3.6.1 Self-Test on Power Up

When the Power Up BIT option is turned on in the Main Set Up Mode, the self-test occurs automatically on power up. The alphanumeric display will say TEST IN PROGRESS while the following occurs at the front panel:

- The front panel LEDs will alternately turn on and off. This occurs for approximately 32 seconds during the modem's self test routine.
- When the self-test routine is complete, all the LEDs will turn on for one second and then turn off. The alphanumeric display will then show the last mode of operation for which the modem was set.
- If a fault was detected, the fault lamp will stay on and the display will identify failed modules.

3.6.2 Using the TEST Button for Self-Test

The self test can also be executed by pressing the TEST pushbutton after the modem is turned on. After pressing TEST the user is prompted to begin the test. The display will show:

Press ALPHA - test
Press 9 - bypass

When the self-test is done this way, TEST IN PROGRESS does not appear on the alphanumeric display. Instead, individual tests are listed on the alphanumeric display with the words PASS, FAIL, OR TIMEOUT after each test.

3.6.3 Testing the Front Panel Controls

To test only the front panel controls, press and hold the TEST pushbutton, then turn the power on. The TEST button must be held approximately one second after turning on the power. A brief test of the front panel controls will occur. To end the test, turn power off. (See paragraph 5.4.3 for a detailed explanation of the front panel controls test.)

3.7 REMOTE CONTROL OPERATION

The RF-3466A can be controlled from a remote location. The RMT pushbutton toggles between remote and local control. In remote control, the REMOTE LED lights on the front panel and all controls are non-functional except for the OPTIONS pushbuttons. If an operating parameter can be remotely controlled, it is noted in a special column in tables 3-3 through 3-16.

3.8 FUNCTIONAL DESCRIPTIONS

This paragraph describes in detail all MODE, OPTIONS, and SETTING selections that can be made for each selectable operating mode. It also notes which parameters can be remotely controlled. Manual Mode selections are separated from Program Mode selections. Program selections are also given for 39-tone and robust serial modes, when the data terminal interface is asynchronous.

It is important to note that any setting changes made to a given waveform will affect all modes which use that waveform. For example, changes made in 39 Tone mode will affect the 39 Tone/FSK mode. Similarly, changes made to the FSK portion of Robust Serial/FSK would affect both FSK mode and and 39 Tone/FSK mode.

Options and settings are described in paragraphs 3.9.1 through 3.9.37.

3.8.1 Main Set Up Mode

The Main Set Up Mode contains unit specific parameters which pertain to operation of the modem. It can only be entered when the modem is in Program mode. None of the operating parameters in the Main Set Up Mode can be remotely controlled. The parameters, as they appear on the alphanumeric display, are listed in table 3-3.

Table 3-3. Main Set Up Mode
(Available Only in Program Mode)

Option	Setting	Paragraph
01 Remote Ident	1 to 255	3.9.1
02 Remote Rate	75 150 300 600 1200 2400 4800 9600	3.9.2
03 Power Up Bit	Off On	3.9.3
04 Halt/Fault	Off On	3.9.4
05 Loopback	Off On	3.9.5
06 Clock	Internal Ext DTE Ext 1Mhz (if enabled)	3.9.6
07 Diag Rate*	75 150 300 600 1200 2400 4800 9600	N/A
08 Diag Parity*	Off Odd Even	N/A
09 Diag Char Size*	7 8	N/A
10 Diag Stop Bits*	1 2	N/A

*These options used by service personnel only.

3.8.2 39-Tone Mode

The selectable options are listed in tables 3-4 (manual mode), 3-5 (program mode), and 3-6 (if the data terminal equipment is asynchronous). It is also noted in the tables whether the option is remotely controllable.

Table 3-4. 39-Tone Mode (Manual Mode Selections)

Option		Setting	Remotely Controllable	Paragraph
01	Rate	75 bps 150 bps 300 bps 600 bps 1200 bps 2400 bps 2400 voice	X	3.9.37
02	Interleave	Short Long Alt S Alt L	X	3.9.7
03	DTE	Asynchronous Synchronous	X	3.9.8

Table 3-5. 39 Tone Mode (Program Mode Selections)

Option		Setting	Remotely Controllable	Paragraph
04	Chan	A only B only Diversity	X	3.9.9
05	Duplex	Half Full	X	3.9.10
06	Key Delay	45 ms 340 ms 630 ms 900 ms		3.9.11
07	Clipping	Off On		3.9.12
08	Time/F Div	Off On		3.9.13
09	Dopplr Track	Off On	X	3.9.14
10	Acquire	Normal Norm/Enh Enh/Norm Enhanced		3.9.15

Table 3-6. 39 Tone Mode
(Program Selections if DTE is Asynchronous)

Option	Setting	Paragraph
11 DTE Rate	75 150 300 600 1200 2400 Slaved	3.9.16
12 DTE Parity	Off Odd Even	N/A
13 DTE Char Size	5 6 7 8	N/A
14 DTE Stop Bits	1 2	N/A
15 DTE Echo	Off On	3.9.17
16 Async EOM	Off On	3.9.18
17 Flow	CTS Xon/Xoff	3.9.19

3.8.3 Robust Serial Mode (Option)

The selectable options are listed in tables 3-7 (manual mode), 3-8 (program mode), and 3-9 (if the data terminal equipment is asynchronous). It is also noted in the tables if an option is remotely controllable.

Table 3-7. Robust Serial Mode (Manual Mode Selections)

Option	Setting	Remotely Controllable	Paragraph
01 Interleave	0.0s 1.2s 4.8s 9.6s	X	3.9.20
02 DTE	Asynchronous Synchronous	X	3.9.8

Table 3-8. Robust Serial Mode (Program Mode Selections)

Option	Setting	Remotely Controllable	Paragraph
03 Chan	A only B only	X	3.9.9
04 Duplex	Half Full	X	3.9.10
05 Key Delay	45 ms 340 ms 630 ms 900 ms		3.9.11

Table 3-9. Robust Serial Mode
(Program Selections if DTE is Asynchronous)

Option	Setting	Paragraph
06 DTE Rate	75 150 300 600 1200 2400 Slaved	3.9.16
07 DTE Parity	Off Odd Even	N/A
08 DTE Char Size	5 6 7 8	N/A
09 DTE Stop Bits	1 2	N/A
10 DTE Echo	Off On	3.9.17
11 Flow	CTS Xon/Xoff	3.9.19

3.8.4 FSK Mode

There are two status lines in the FSK mode: one for Channel A and one for Channel B. The display initially shows the channel A status line; the other can be viewed by pressing the option up arrow. An example of the status lines would be:

FSK Mode Fc 1700 Fs ± 85	FSK Mode B Fc 2400 Fs ± 425

The numeric keypad may be used to enter data rate and mark and space frequencies. The setting buttons allow half-hertz selection of mark and space frequencies.

The selectable options are listed in tables 3-10 (manual mode) and 3-11 (program mode). It is also noted in the tables if an option is remotely controllable.

3.8.5 39 Tone/FSK Mode

The 39 Tone/FSK Mode is a dual mode of operation that provides both 39 Tone and FSK. The settings for 39 Tone appear on Channel A; FSK is always on Channel B.

A typical status display setting when the MODE pushbutton is used to enter this dual mode is:

39 Tone/FSK Mode		
2400 V	Short	Sync

By pressing the OPTIONS up arrow pushbutton, the second status display might be:

39 Tone/FSK Mode
B Fc 2400 Fs ± 425

All operating parameters are selected in the same way as in the single mode of operation.

The selectable options are listed in tables 3-12 (manual mode), 3- 13 (program mode), and 3-14 if the data terminal equipment is asynchronous. It is also noted in the tables if the option is remotely controllable.

Table 3-10. FSK Mode (Manual Mode Selections)

Option	Setting	Remotely Controllable	Paragraph
Channel A:			
A01 Rx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.21
A02 Tx Mark Tx Cent	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.22
A03 Tx Space Tx Shift	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.23
A04 Rx Mark Rx Cent	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.24
A05 Rx Space Rx Shift	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.25
Channel B:			
B01 Rx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.21
B02 Tx Mark Tx Cent	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.22
B03 Tx Space Tx Shift	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.23
B04 Rx Mark Rx Cent	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.24
B05 Rx Space Rx Shift	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.25

Table 3-11. FSK Mode (Program Mode Selections)

Option	Setting	Remotely Controllable	Paragraph
Channel A:			
A06 Chan	Independent Diversity	X	3.9.26
A07 Tx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.27
A08 Thresh Track	Off On	X	3.9.28

Table 3-11. FSK Mode (Program Mode Selections) (Cont.)

Option		Setting	Remotely Controllable	Paragraph
Channel A (Cont.):				
A09	Mod Out	Off On Switched	X	3.9.29
A10	Polarity	Tx- Rx- Tx- Rx + Tx + Rx- Tx + Rx +	X	3.9.30
A11	Mark Hold	Off On Auto	X	3.9.31
A12	Tune	Cent/Shift Mark/Space		3.9.32
A13	Track Tune	Off On		3.9.33
A14	Mod AB Sum	Off On		3.9.34
A15	DTE Rx Clock	A B		3.9.35
Channel B:				
B06	Tx Rate	45 to 1200 bps (steps of 1 Hz)	X	3.9.27
B07	Thresh Track	Off On	X	3.9.28
B08	Mod Out	Off On Switched		3.9.29
B09	Polarity	Tx- Rx- Tx- Rx + Tx + Rx- Tx + Rx +	X	3.9.30
B10	Mark Hold	Off On Auto	X	3.9.31
B11	Analog In	A B		3.9.36

Table 3-12. 39 Tone/FSK Mode (Manual Mode Selections)

Option		Setting	Remotely Controllable	Paragraph
A01	Rate	75 bps 150 bps 300 bps 600 bps 1200 bps 2400 bps 2400 voice	X	3.9.37
A02	Interleave	Short Long Alt S Alt L	X	3.9.7
A03	DTE	Asynchronous Synchronous	X	3.9.8
FSK Channel B selections:				
B01	Rx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.21
B02	Tx Mark Tx Cent	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.22
B03	Tx Space Tx Shift	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.23
B04	Rx Mark Rx Cent	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.24
B05	Rx Space Rx Shift	0 to 3400.0 (steps of 0.5 Hz)	X	3.9.25

Table 3-13. 39 Tone/FSK Mode (Program Mode Selections)

Option		Setting	Remotely Controllable	Paragraph
A04	Duplex	Half Full	X	3.9.10
A05	Key Delay	45 ms 340 ms 630 ms 900 ms		3.9.11

Table 3-13. 39 Tone/FSK Mode (Program Mode Selections) (Cont.)

Option		Setting	Remotely Controllable	Paragraph
A06	Clipping	Off On		3.9.12
A07	Time/F Div	Off On		3.9.13
A08	Dopplr Track	Off On	X	3.9.14
A09	Acquire	Normal Norm/Enh Enh/Norm Enhanced		3.9.15
FSK Channel B Selections:				
B06	Tx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.27
B07	Thresh Track	Off On	X	3.9.28
B08	Mod Out	Off On Switched	X	3.9.29
B09	Polarity	Tx- Rx- Tx- Rx + Tx + Rx- Tx + Rx +	X	3.9.30
B10	Mark Hold	Off On Auto	X	3.9.31

Table 3-14. 39 Tone/FSK Mode (Program Selections if DTE is Asynchronous)

Option		Setting	Paragraph
A10	DTE Rate	75 150 300 600 1200 2400 Slaved	3.9.16
A11	DTE Parity	Off Odd Even	N/A

Table 3-14. 39 Tone/FSK Mode (Program Selections if DTE is Asynchronous) (Cont.)

Option		Setting	Paragraph
A12	DTE Char Size	5 6 7 8	N/A
A13	DTE Stop Bits	1 2	N/A
A14	DTE Echo	Off On	3.9.17
A15	Async EOM	Off On	3.9.18
A16	Flow	CTS Xon/Xoff	3.9.19

3.8.6 Robust Serial/FSK Mode

The Robust Serial/FSK Mode is a dual mode of operation that provides both Robust Serial and FSK. The settings for Robust Serial appear on Channel A; FSK is always on Channel B.

A typical status display setting when the MODE pushbutton is used to enter this dual mode is:

Rob Ser/FSK Mode
75 bps Inter 1.2s

By pressing the OPTIONS pushbutton, the second status display might be:

Rob Ser/FSK Mode
B Fc 2400 Fs ± 425

All operating parameters are selected in the same way as in the single mode of operation.

The selectable options are listed in tables 3-15 (manual mode), 3- 16 (program mode), and 3-17 if the data terminal equipment is asynchronous. It is also noted in the tables if the option is remotely controllable.

Table 3-15. Robust Serial/FSK Mode (Manual Mode Selections)

Option		Setting	Remotely Controllable	Remotely Controllable
A01	Interleave	0.0s 1.2s 4.8s 9.6s	X	3.9.20
A02	DTE	Asynchronous Synchronous	X	3.9.8

Table 3-15. Robust Serial/FSK Mode (Manual Mode Selections) (Cont.)

Option		Setting	Remotely Controllable	Paragraph
FSK Channel B Selections:				
B01	Rx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.21
B02	Tx Mark Tx Cent	0 to 3400.0 (steps 0.5 Hz)	X	3.9.22
B03	Tx Space Tx Shift	0 to 3400.0 (steps 0.5 Hz)	X	3.9.23
B04	Rx Mark Rx Cent	0 to 3400.0 (steps 0.5 Hz)	X	3.9.24
B05	Rx Space Rx Shift	0 to 3400.0 (steps 0.5 Hz)	X	3.9.25

Table 3-16. Robust Serial/FSK Mode (Program Mode Selections)

Option		Setting	Remotely Controllable	Paragraph
A03	Duplex	Half Full	X	3.9.10
A04	Key Delay	45 ms 340 ms 630 ms 900 ms		3.9.11
FSK Channel B Selections:				
B06	Tx Rate	45 to 1200 bps (steps of 1 bps)	X	3.9.27
B07	Thresh Track	Off On	X	3.9.28
B08	Mod Out	Off On Switched	X	3.9.29

Table 3-16. Robust Serial/FSK Mode (Program Mode Selections) (Cont.)

Option	Setting	Remotely Controllable	Paragraph
FSK Channel B Selections (Cont.):			
B09 Polarity	Tx- Rx- Tx- Rx + Tx + Rx- Tx + Rx +	X	3.9.30
B10 Mark Hold	Off On Auto	X	3.9.31

Table 3-17. Robust Serial/FSK Mode (Program Selections if DTE is Asynchronous)

Option	Setting	Paragraph
A05 DTE Rate	75 150 300 600 1200 2400 Slaved	3.9.16
A06 DTE Parity	Off Odd Even	N/A
A07 DTE Char Size	5 6 7 8	N/A
A08 DTE Stop Bits	1 2	N/A
A09 DTE Echo	Off On	3.9.17
A10 Flow	CTS Xon/Xoff	3.9.19

3.9 PARAMETER DESCRIPTIONS

This section describes in detail all OPTION and SETTINGS parameters available in the various operating modes.

3.9.1 Remote Identification

The modem's remote control identification code is set from the Main Set Up Mode. The identification code is selected between 1 and 255.

3.9.2 Remote Rate

The modem will interface with a Harris remote control unit at baud rates from 75 to 9600 bits per second.

3.9.3 Power Up Bit

The Main Set Up Mode allows the user the option of disabling the power-up BIT that normally runs when power is applied or when the master reset is pressed. This should be left in the ON position to activate the built-in test feature of the RF-3466A.

3.9.4 Halt On Fault

When this feature is set to ON, and a fault occurs, a fault message will be displayed on both lines of the display. The first line will be overwritten after one second with the message "Hit any key to go on". During this time the modem is inactive and will not respond to DTE or remote control signals. This ensures that the operator will see the error message. When any front panel button is pressed the modem will be reinitialized with all LEDs off, and return to the standard display.

In some tactical situations this feature may be undesirable. In that case the MAIN SETUP MODE can be used to disable it. When it is set to OFF, and a fault occurs, the fault message will be displayed for three seconds. After that the modem will be reinitialized and return to the standard display. The FAULT LED will be illuminated to alert the operator that a fault has been detected.

3.9.5 Loopback

When set to ON, a continuous analog loopback test is run after the power up BIT is finished. This can be used as a troubleshooting aid. For normal operation Loopback should be set to OFF. To run the test, both Power Up BIT and Loopback must be set to ON. Turning the modem power off and back on will then cause both tests to run. To stop the loopback test set Loopback to OFF, then turn the modem power off and back on.

3.9.6 Clock

There are three choices available to set up the master oscillator for the modem. When set to Internal, the modem generates the 10.1376 MHz master clock via an internal free-running phase-locked loop circuit. When set to Ext DTE, the master clock is slaved to a transmit clock which must be provided by the data terminal equipment (DTE). The third option is Ext 1 MHz. In order to use this option S2-1 on the A8 Digital I/O assembly must be set to open, and an external 1 MHz frequency reference must be connected to J2 on the rear panel. An error condition will occur if Ext 1 MHz is selected when there is no external standard provided. S2-1 acts as a form of interlock to help prevent this fault condition from occurring.

3.9.7 39 Tone Mode Interleaving Factor

Time interleaving of the outgoing data is used to reduce bit errors caused by burst conditions on the radio channel. While not affecting the data rate, interleaving does introduce a time delay.

The interleaving factor is used to define the degree of interleaving. As the factor increases, the degree of interleaving becomes greater, time delay becomes longer, and the protection against burst errors increases. Some systems impose timing constraints because of end-to-end delay requirements such as digital voice transmissions. These constraints limit the interleaving delay to a specific maximum.

Multiple interleaving delays are provided for each data rate. This provides the best possible burst protection and, at the same time, satisfies the different timing constraints for the various systems.

There are four interleaving factors available: Short, Long, Alternate Short, and Alternate Long.

Tables 3-18 and 3-19 show the modem startup delay and modem throughput delay as a function of the data mode setting, interleaving factor (short/long), and whether Time/Frequency Diversity is enabled (paragraph 3.7.23). Note that SHORT implies no interleaving at all, for all rates except 2400 bps. (A no interleaving mode for 2400 is also available in the voice position, SHORT.)

The modem startup delay is defined as the elapsed time between the application of the RTS and CTS signals. The throughput delay is defined as the length of time expended between data entrance at the transmitting modem and the same data exiting from the receiving modem.

Table 3-18. Modem Startup and Throughput Delays (Short or Long Mode) in Seconds (Delays Assume a Keyline Delay Setting of 45 ms)

Data Mode	Short Interleaving			Long Interleaving		
	Startup**		Throughput	Startup**		Throughput
	Norm	Enh		Norm	Enh	
Voice	.450	N/A	.367	.315	N/A	.637
2400 Sync	.0225	.0225	5.07	.0225	.0225	9.88
2400 Async	.450	2.12	.341	.0225	.0225	10.13
1200	.450	2.12	.416	.0225	.0225	12.60
600	.450	2.12	.558	.0225	.0225	12.94
600*	.450	2.12	.738	.0225	.0225	13.12
300	.428	2.09	.821	.0225	.0225	13.39
300*	.428	2.09	1.09	.0225	.0225	13.66
150	.383	2.05	1.37	.0225	.0225	14.15
150*	.383	2.05	1.69	.0225	.0225	14.47
75	.293	1.96	2.42	.0225	.0225	13.49
75*	.293	1.96	2.76	.0225	.0225	13.83

*Time/Frequency Diversity Enabled
**Norm and Enh refer to acquisition mode (See paragraph 3.9.15)

Table 3-19. Modem Startup and Throughput Delays (ALTERNATE Short or Long Mode) in Seconds (Delays Assume a Keyline Delay Setting of 45 ms)

Data Mode	Short Interleaving			Long Interleaving		
	Startup**		Throughput	Startup**		Throughput
	Norm	Enh		Norm	Enh	
Voice	.160	N/A	0.974	.0225	N/A	1.29
2400	.0225	1.58	1.58	.0225	.945	2.75
1200	.0225	1.49	1.71	.0225	.225	4.24
600	.0225	1.46	2.0	.0225	.135	4.6
600*	.0225	1.46	2.13	.0225	.135	4.77
300	.0225	1.51	2.32	.0225	.315	4.65
300*	.0225	1.51	2.58	.0225	.315	4.92
150	.0225	1.40	3.1	.0225	.113	5.6
150*	.0225	1.40	3.35	.0225	.113	5.90
75	.0225	1.46	4.3	.0225	.360	6.7
75*	.0225	1.46	4.58	.0225	.360	7.01

*Time/Frequency Diversity Enabled
**Norm and Enh refer to acquisition mode (See paragraph 3.9.15)

3.9.8 Synchronous or Asynchronous DTE

When selecting asynchronous operation, set baud rate, parity, character length, number of stop bits, echo/no echo, XON/XOFF (CTS), and EOM. These must be set to match the data terminal's interface parameters.

3.9.9 Channel Diversity

The modem can be set for dual channel diversity reception, or it can receive audio independently on channel A or B.

3.9.10 Duplex

In the full-duplex mode, the RF-3466A can simultaneously transmit and receive a message. In the half-duplex mode, if the RTS input at the DTE interface is active, the modem will transmit a message but the receive path of the modem will be disabled. When the RTS is removed and the message transmission is completed, then the receive section of the modem will again be enabled and incoming messages will be recognized.

Half-duplex mode is often required if the modem is being used with an HF Transceiver which supplies a "side tone" back to the modem during a transmission (this happens when the modem is interfaced to the transceiver via the audio handset connector of the radio). In this case, the half-duplex mode prevents the modem from "echoing" back this "received" message to the DTE.

3.9.11 Key Delay

The modem can control the transmitter keyline function. The modem delays audio output to the transmitter after application of the keyline to allow for the transmitter startup delay. This delay can be set between 45 milliseconds and 900 milliseconds.

3.9.12 Clipping

Clipping limits the peak amplitude of the audio signal so the HF radio signal can be maintained at its maximum average power level. Clipping is part of the digital signal process and when on is normally set to achieve a baseband peak-to-average ratio of 10 dB which results in a transmitted PEP/P_{rms} ratio of 7 dB or less.

3.9.13 Time/Frequency Diversity

With data rates of 600, 300, 150, and 75 baud, a choice of signalling formats is available. Time/Frequency diversity will provide a performance advantage over in band frequency diversity for many types of HF channel conditions, although it will add some delay to the overall system throughput (360 ms or less).

3.9.14 Doppler Track

Normally the modem automatically corrects for frequency errors introduced by vehicle motion, shifts of ionosphere, or by frequency standard inaccuracies in the radio transmitter and receiver. Doppler track provides continuous correction as part of the demodulation routine. Doppler track can be disabled if frequency errors greater than ± 2 Hz are not expected.

3.9.15 Acquisition

The RF-3466A has an enhanced acquisition feature that, under low signal-to-noise ratio (SNR) conditions, provides improved probability of signal detection and acquisition. This mode can be selected independently for two data rate ranges: 75-300 bps and 600-2400 bps. When enhanced operation is selected, a longer preamble is used which adds delay to the system throughput. The frequency correction range is also reduced from ± 75 Hz to ± 20 Hz. The enhanced acquisition mode is particularly desirable in the low data rate range. This mode will permit reliable synchronization at SNRs as low as -3 dB. A performance advantage will be realized for high rate modes as well, although the high rate modes are generally used at SNRs where the normal synchronization is adequate. Voice mode defaults to normal acquisition.

The choices for this option are in the format "low range/high range". The Normal and Enhanced settings mean that both ranges are either normal or enhanced, while Norm/Enh means that the low range is set to normal and the high range is set to enhanced. Similarly, Enh/Norm means that the low range is set to enhanced and the high range is set to normal.

3.9.16 DTE Baud Rate

The asynchronous DTE baud rate can be set at 75, 150, 300, 600, 1200, or 2400.

For asynchronous DTEs supporting XON/XOFF handshake, or CTS signalling, the DTE baud rate setting can be equal to or greater than the modem baud rate. For example, if the DTE baud rate is set to 2400 bps, the modem baud rate can be varied from 2400 bps to 75 bps, depending upon HF channel conditions. As long as the DTE responds to XON/XOFF or CTS, the differences in modem and DTE baud rates can be regulated to maintain data integrity. If the DTE cannot respond to XON/XOFF or CTS, then the DTE baud rate must be set to match the modem baud rate. This must occur each time the modem baud rate is changed. A SLAVE mode is available that will eliminate the need for DTE rate manipulation. In the SLAVE mode, the DTE baud rate setting of the modem follows the data rate setting of the modem as the baud rate is changed.

3.9.17 DTE Echo/No Echo

The RF-3466A can supply an echo back to the DTE when DTE Echo operation is selected. The data received by the modem on the TX data line is sent back to the DTE via the RX data line when the option is enabled. This

type of echo back is usually referred to as a Host Echo. When echo is selected, the receive side of the modem is disabled.

3.9.18 Asynchronous EOM

When the modem is used with an asynchronous DTE and EOM is enabled, the sending modem will insert a string of 10 EOM characters in the outgoing data stream at the end of a message. This happens when RTS is removed by the sending DTE. The receiving modem uses the incoming EOM characters to detect the end-of-message. When this occurs, the modem mutes the RX data stream to the receiving DTE. This may be an undesirable feature to some DTEs. For instance, DTEs utilizing an ARQ-type half-duplex protocol will normally send their own turn-around character. In this case, the modem's EOM characters are not needed and only serve to delay the link turn-around time.

3.9.19 Flow

In asynchronous mode, with a DTE character length of 7 or 8 bits selected, a choice is available to regulate data transfer between the RF-3466A and DTE. When set to CTS, the Clear-To-Send signal at the DTE interface is removed and reissued to regulate data transfer from the sending DTE. When set to XON/XOFF, control characters are inserted into the data stream to regulate data transfer from the sending DTE. Note that some data terminals support XON/XOFF while others only support CTS. Check the data terminal before setting this option.

3.9.20 Interleaving Factor (Robust Serial Option)

Time interleaving of the outgoing data is used to reduce bit errors caused by burst conditions on the radio channel. While not affecting the data rate, interleaving does introduce a time delay.

The interleaving factor is used to define the degree of interleaving. As the factor increases, the degree of interleaving becomes greater, time delay becomes longer, and the protection against burst errors increases. Some systems impose timing constraints because of end-to-end delay requirements. The constraints limit the interleaving delay to a specific maximum.

3.9.21 FSK Rx Rate

This sets the FSK receive data rate, selectable in 1 bps increments over the range of 45 bps to 1200 bps. Because the FSK modem is asynchronous, the modem will function as long as the Rx rate is set higher than the actual channel rate; however for optimum performance it should be set equal to the channel rate.

3.9.22 Tx Mark, Tx Center

The FSK frequencies can be specified as either a mark/space frequency pair or as a center frequency and shift. The choice is made using the TUNE option, available in the FSK Program mode. When the Tx Mark/Cent option is selected the RF-3466A display will show either Tx Mark or Tx Cent depending on the TUNE setting. The Tx Mark or Tx Center frequency can then be altered using either the numeric keypad or the SETTING buttons.

If the frequencies are specified as a center frequency and shift, it is important to note that the sum of the center frequency plus the shift frequency must be less than 3400. Similarly, the center frequency minus the shift frequency must be greater than 0. If these limits are exceeded, even temporarily while a change is being made, the values will automatically be adjusted to fit within the limits.

3.9.23 Tx Space, Tx Shift

The FSK frequencies can be specified as either a mark/space frequency pair or as a center frequency and shift. The choice is made using the TUNE option, available in the FSK Program mode. When the Tx Space/Shift option is selected, the RF-3466A display will show either Tx Space or Tx Shift, depending on the TUNE setting. The Tx Space or Tx Shift frequency can then be altered using either the numeric keypad or the SETTING buttons.

If the frequencies are specified as a center frequency and shift, it is important to note that the sum of the center frequency plus the shift frequency must be less than 3400. Similarly, the center frequency minus the shift frequency must be greater than 0. If these limits are exceeded, even temporarily while a change is being made, the values will automatically be adjusted to fit within the limits.

3.9.24 Rx Mark, Rx Center

The FSK frequencies can be specified as either a mark/space frequency pair or as a center frequency and shift. The choice is made using the TUNE option, available in the FSK Program mode. When the Rx Mark/Cent option is selected, the RF-3466A display will show either Rx Mark or Rx Cent, depending on the TUNE setting. The Rx Mark or Rx Center frequency can then be altered using either the numeric keypad or the SETTING buttons.

If the frequencies are specified as a center frequency and shift, it is important to note that the sum of the center frequency plus the shift frequency must be less than 3400. Similarly, the center frequency minus the shift frequency must be greater than 0. If these limits are exceeded, even temporarily while a change is being made, the values will automatically be adjusted to fit within the limits.

3.9.25 Rx Space, Rx Shift

The FSK frequencies can be specified as either a mark/space frequency pair or as a center frequency and shift. The choice is made using the TUNE option, available in the FSK Program mode. When the Rx Space/Shift option is selected, the RF-3466A display will show either Rx Space or Rx Shift, depending on the TUNE setting. The Rx Space or Rx Shift frequency can then be altered using either the numeric keypad or the SETTING buttons.

If the frequencies are specified as a center frequency and shift, it is important to note that the sum of the center frequency plus the shift frequency must be less than 3400. Similarly, the center frequency minus the shift frequency must be greater than 0. If these limits are exceeded, even temporarily while a change is being made, the values will automatically be adjusted to fit within the limits.

3.9.26 FSK Channel

When set to INDEPENDENT, the channel A and channel B FSK signals operate as two separate independent modems. When set to DIVERSITY, the two receive channels are combined using an equal gain diversity technique for improved bit error rate performance.

3.9.27 FSK Tx Rate

This sets the Tx clock rate, and is selectable in 1 bps increments over the range of 45 bps to 1200 bps. Note that this has no effect on the speed at which normal asynchronous data can be sent.

3.9.28 Threshold Tracking

When set to ON, the threshold tracker attempts to track the center of the received FSK signal to optimize the data output under conditions of selective fades as encountered on HF channels. Threshold tracking works best at data rates of 600 bps and below and should be set to OFF for higher rates. It should also be set to OFF for Gaussian channels such as telephone networks.

3.9.29 Modulator Output

When set to OFF, the FSK modulator output is disabled and no audio will be present at the radio interface. When set to ON, the modulator will always produce an output. If no data is being sent, then a constant mark signal will be present at the radio interface. When set to SWITCHED, the transmit audio will only be present when data is being sent, one second after assertion of the RTS signal.

3.9.30 Polarity

This feature controls the polarity of the FSK transmit and receive data. Settings are available as follows:

Setting	Meaning
Tx- Rx-	Both transmit and receive data are inverted
Tx- Rx +	Transmit data is inverted, receive data is non-inverted
Tx + Rx-	Receive data is inverted, transmit data is non-inverted
Tx + Rx +	Both transmit and receive data are non-inverted

3.9.31 Mark Hold

When set to ON, the demodulator output will be a constant mark signal. When set to AUTO, the demodulator output will be set to a mark signal when the received signal level drops below a preset threshold. When set to OFF, the demodulator will operate continuously. In that case corrupted data may be presented to the data terminal under poor channel conditions.

3.9.32 Tune

When set to CENT/SHIFT, the FSK frequencies can be entered as a center frequency and shift. When set to MARK/SPACE, the FSK frequencies can be entered as a mark frequency and a space frequency.

3.9.33 Track Tune

When set to OFF, all FSK frequencies for both channels can be set and changed independent of each other. However, this means that if the operator wants to change both the transmit and receive frequencies it will require two operations.

When Track Tune is set to ON, any changes made to the channel A transmit frequencies will also occur on the channel A receive, channel B transmit, and channel B receive frequencies. In this case, if the operator wants to change both the transmit and receive frequencies it only requires one operation. Note that these frequencies will be changed to the same values as the channel A transmit settings. After setting the channel A transmit frequency, the others can be changed independently if desired.

3.9.34 Mod AB Sum

When set to ON, the channel A and channel B modulator outputs are mixed together and output on audio channel A. The combined signal has an output level equal to that of a single modulator output. Setting this parameter to OFF keeps the FSK channels separate.

3.9.35 DTE Rx Clock

The modem can provide a recovered receive clock to one of the FSK data terminal interface ports. The DTE Rx Clock option allows the user to assign the receive clock to either of the two ports. Setting it to A routes the clock recovered from FSK channel A data to the data terminal associated with FSK channel A. Setting it to B routes the clock recovered from FSK channel B data to the data terminal associated with FSK channel B.

3.9.36 B Analog In

When using channel B of the FSK mode, the source of the receive audio can be selected. When this option is set to B, the receive audio associated with FSK channel B will be demodulated. When it is set to A, the channel B demodulator will be demodulating the receive audio associated with FSK channel A.

3.9.37 39 Tone Modem Rate

The modem supports baud rates of 75, 150, 300, 600, 1200, and 2400 bps. When the modem is used with synchronous DTE equipment, the modem baud rate must match the baud rate of the DTE.

NOTE

When the modem is used with asynchronous DTE equipment, it is possible to operate the modem at a lower baud rate than the DTE (although this places certain requirements on the DTE for handshake characteristics, as discussed in section 1.5).

Voice mode is used when the modem's data terminal equipment is a voice digitizer. In voice operation, a baud rate of 2400 bps is established. In voice mode, the interleaving delay inserted by the Error Correction process of the modem is much shorter than that used for the 2400 bps data mode, resulting in less end-to-end delay for voice transmission. Voice mode supports both half and full-duplex operation. Note that selection of voice mode forces the modem to be in the synchronous state, regardless of front panel setting.