ASCII
REMOTE CONTROL

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ASCII REMOTE CONTROL

1. SCOPE

The RF-590A and R-2368B/URR family of receivers support two remote interface protocols. The standard Harris interface is available for use with the Harris RF-7405 and RF-777 remote control systems. The new ASCII interface has been provided for CRT and PC-based control systems. This manual specifies the ASCII protocol as well as the communications interface and installation details. Refer to subsection 4 for installations instructions.

2. HARDWARE INTERFACE

All communications between the receiver and the remote control unit (RCU) use an asynchronous serial interface with odd parity. Data words consist of seven data bits and one parity bit. The signal levels used in the interface, the baud rate, and unit address are described in the appropriate section of this manual.

3. MESSAGE PROTOCOL

3.1 Message Format

A message consists of a string of ASCII characters terminated by a carriage return character. The receiver translates lower case letters received into their upper case equivalent. The receiver always transmits letters as upper case. With the exception of the carriage return character, the receiver ignores the space character and all control characters. A message sent to the receiver is not processed until the terminating carriage return is received. In general, messages sent to a receiver from a remote controller are considered as commands, while messages sent from a receiver to a remote controller are considered as status reports.

3.2 Device Addressing

A receiver only responds to commands and issues status reports when the receiver has been addressed. A receiver's address is determined by hardware strapping in the receiver. Addresses range from 1 to 255, with address 0 being reserved for the future. A remote controller addresses a receiver by using the $ character followed by an address. This address command is recognized by a receiver only if it is located at the beginning of the command message. Multiple receivers may be addressed simultaneously by supplying a list of addresses after the $ character. These addresses should be separated by comma (,) characters.

Examples:

To address device 1 only, use the following command: **$1**

To address devices 1, 2, and 9, use the following command: **$1, 2, 9**

When multiple receivers are addressed, all addressed receivers follow the remote controller's commands. However, the receivers do not generate status reports, even if one is requested. A status report can only be generated by a uniquely addressed receiver. Once a receiver has been addressed it remains addressed until another $ character is received or primary power is removed from the receiver.

3.3 Command Types

The receiver accepts three basic command types: ADDRESS DEVICE, LETTER TYPE, and NUMBERED TYPE commands. All command types can usually be intermixed within the same command message.

3.3.1 ADDRESS DEVICE Command

The ADDRESS DEVICE command discussed in subsection 3.2 is used to address a specific receiver or a group of receivers. This command must appear at the beginning of command messages in which it is used.

3.3.2 LETTER TYPE Commands

The LETTER TYPE commands consist of one or two ASCII letters and are generally followed by additional parameters. For example, the command to change the receiver's frequency to 10.4 MHz is F10.4. All two-letter commands have a Z character as the first letter. This Z character is interpreted as a shift character. The shift only applies to the first character following the Z character. Some of the LETTER TYPE commands cause status reports to be generated. Table 1 lists the LETTER TYPE commands and gives a brief description of each. More detailed descriptions are given in subsections 3.3.2.1 – 3.3.2.25.

3.3.2.1 RF Attenuation Command

This command is used to select the RF ATTENUATION of the receiver when the AGC is OFF. The format of this command is as follows:

Ai

Where i is a positive integer in the range 0 – 150. A zero value will provide maximum gain and a value of 150 will provide minimum gain.

3.3.2.2 BFO Command

This command is used to control the BFO frequency used in the CW and Sideband modes.

The format of this command is as follows:

B [s] f

Where [s] is an optional sign character + or –, and f is a frequency value in the range 0 – 9.99 kHz. If no sign character is detected, the receiver will assume +.

3.3.2.3 Go To Channel Command

This command is used to select a programmed channel from the receiver's memory. The format of the command is as follows:

Cc

Where c is a channel number in the range 0 – 99.

Table 1. LETTER TYPE Commands

Command	Status Report Generated?	Description
Ai	No	RF Attenuation (Range 0 – 150)
B [s] f	No	BFO
Cc	No	Go to channel
Di	No	Mode
Ei	No	Auto stop scan threshold (Range 0 – 255)
Ff	No	Frequency (MHz)
G	Yes	Report complete status
Hc	Yes	Report channel
If	No	I.F. Filter bandwidth
Jc	No	Program channel
Kc OR Kg	No	Start scan at channel or group
Lc [, c [, c] . . .]	No	Lock out channel(s)
Mi	No	A.G.C.
Ni	No	Noise Blanker
Oon, ov [, on, ov . . .]	No	PRogram Option(S)
P1	No	Open/close input path (mute)
Qc [, c [, c] . . .]	No	Unlock channel(s)
R [s] f	No	FSK center frequency
Si		***SEe "S" commands***
T1 [1] [1] . . .	Yes	Request specific status
Uc, c	No	Channel scanning bounds
Vg, c [, c [, c] . . .]	No	Program group
Wg, c [, c [, c] . . .]	No	Unprogram group
Xg	Yes	Report group
Y [s] i	No	FSK Shift and polarity
zDf	No	Scan dwell

Notes:
- f — A floating point value; example 1.23.
- i — An unsigned integer; example 3.
- s — A sign character + or – (if not given then receiver defaults to +).
- c — A channel number; valid values are 0-99.
- g — A scan group number; valid values are 0-9.
- l — An ASCII letter. The T command parameters consists of letters specifying the desired status reports(s).
- on — Option number.
- ov — Option value.
- [ ] — Parameters shown in brackets are optional. In some cases a variable number of parameters may be specified and separated by (,) characters.

3.3.2.4 Mode Command

This command is used to change the receiver's detector mode. The format is as follows:

Di

Where i is a value corresponding to one of the following modes:

1 AM

2 FM

3 CW

4 NOT USED

5 2-ISB (if available)

6 LSB

7 USB

8 FSK (if available)

9 4-ISB (if available)

3.3.2.5 Auto Stop Scan Threshold Command

This command is used to set the auto stop-scan threshold. When scanning, the receiver compares each channel's AGC voltage to the stop-scan threshold. If a channel's AGC voltage is equal to or greater than the stop-scan threshold, the receiver will remain on that channel until the AGC voltage drops below the stop-scan threshold, or until the receiver is forced to a different channel by a command (e.g., resume scan, increment channel, etc). The format of this command is as follows:

Ei

Where i is an integer value in the range 0 – 255. A value of 255 will disable the auto stop-scan function. Also note, the AGC voltage used by the receiver is the same as that reported by the S19 command.

3.3.2.6 Frequency Command

This command is used to set the receiver's frequency. The format of the command is as follows:

Ff

Where f is a value in the range 0 – 29.999999 MHz. Although the frequency may be set to zero, the receiver's input circuitry will reject signals below a certain frequency. The R-2368 receiver will work down to 14 kHz.

3.3.2.7 Report Complete Status Command

This command is used to request a complete status report from the receiver. Refer to subsection 3.4 for a description of the returned values. The format of this command is as follows:

G

3.3.2.8 Report Channel Command

This command is used to request a status report on one of the receiver's preprogrammed channel memories. Refer to subsection 3.4 for a description of the returned values. The format of this command is as follows:

Hc

Where c is a channel number in the range 0 – 99.

3.3.2.9 I.F. Filter Command

This command is used to select a desired I.F. Filter. The format of this command is as follows:

If

Where f is a value in the range 0 – 99.9 kHz. The receiver will select the desired filter if it is present in the receiver. If the desired filter is not present, it will select a filter that is wider then the requested value, if available, or the widest available filter will be used.

3.3.2.10 Program Channel Command

This command is used to program one of the receiver's channel memories. The command acts as a context change, where all commands that follow within the message apply only to that channel's memory. The format of this command is as follows:

Jc

Where c is a channel number in the range 0 – 99. An example of a message used to program channel 11 to a frequency of 12 MHz and USB mode would be as follows:

J11F12D7

3.3.2.11 Start Scan at Channel or Group

This command is used to begin or resume scanning of a receiver that is currently in the channel or group scan state. The command has the following format:

K [i]

If the receiver is in the channel-scan state, [i] is a optional channel number in the range 0 – 99. If a channel number is specified, scanning will begin on that channel. If no channel is specified, scanning will begin on the channel that follows the last used channel.

If the receiver is in the group scan state, [i] is an optional group number in the range 0 – 9. If a group number is specified, scanning will begin at the first channel within that group. If no group number is specified, scanning will begin using the last group number that was scanned, using the channel following the last channel used in that group.

3.3.2.12 Lock Out Channel(s) Command

This command is used to temporarily block one or more channels from being scanned while in the channel-scan mode. If, for example, the receiver is scanning channels 10 through 20, and channel 12 is locked out, the receiver scans channel 13 after scanning channel 11. Channel 12 is skipped. The format of this command is as follows:

Lc, c, c, c . . .

Where c is a channel number in the range 0 to 99. One or more channels may be specified in the same command, as long as the channel numbers are separated by comma (,) characters.

3.3.2.13 AGC Command

This command is used to control the type of AGC used by the receiver. The format of this command is as follows:

Mi

Where i is one of the following values:

1 FAST

2 MEDIUM

3 SLOW

4 OFF

5 DATA

6 EXTERNAL

The value 6 or EXTERNAL AGC is not legal in FSK mode.

3.3.2.14 Noise Blanker Command

This command is used to turn a receiver's noise blanker ON or OFF if the receiver is so equipped. The format of the commands are as follows:

N0 NOISE BLANKER = OFF

N1 NOISE BLANKER = ON

3.3.2.15 Program Option(s) Command

This command is used to program any of the programmable options that are installed in the receiver. Refer to subsection 3.5 for format and usage information.

3.3.2.16 Open/Close Input Path Command (Mute/Unmute)

This command is used to open or close a relay that connects the receiver to an external antenna. When the antenna is disconnected, the receiver is muted. The command format is as follows:

P0 CLOSE RELAY (UNMUTE)

P1 OPEN RELAY (MUTE)

3.3.2.17 Unlock Channel(s) Command

This command is used to unlock one or more channels that were previously locked using the lock channel command. The format is as follows:

Qc, c, c, c . . .

Where c is a channel number in the range of 0 – 99. More than one channel may be specified in the same command as long as the channel numbers are separated by comma (,) characters.

3.3.2.18 FSK Center Frequency Command

This command is used to select the FSK center frequency to be used when in FSK mode.

The center frequency ranges from 0 – 3.999 kHz. A sign character + or – may also be included in the command. A positive center frequency causes the FSK demodulator to operate in the upper sideband, while a negative sign will allow operation in the lower sideband. For F1B FSK operation with no carrier offset, the positive center frequency should be used. If the command does not include a sign character, positive sign will be assumed. The format of this command is as follows:

R [s] f

Where [s] refers to the optional sign character, and f represents a value in the range 0 – 3.999 kHz.

3.3.2.19 Request Specific Status Command

This command is used to request specific status reports. The reports available are the same as those returned by the REPORT COMPLETE STATUS command, but only the requested reports are returned. The format of this command is as follows:

T1111 . . .

Where 1 is the letter of a desired status report. Refer to subsection 3.4.1 for a description of the available reports. One or more status reports may be obtained using a single command. Note that with this command no comma (,) characters are used between the letters. For example, to obtain only the frequency, mode, and AGC status the following command is used:

TFDM

3.3.2.20 Set Channel Scanning Bounds Command

This command is used to specify the lowest and highest channel numbers which will be scanned while in the channel scan mode. The format of this command is as follows:

Uc, c

Where each c is a channel number in the range 0 – 99. The first channel specified is the lower channel and the second channel specified is the upper channel. For example, to scan between channels 25 – 65 the following command is used:

U25, 65

3.3.2.21 Program Group Command

This command is used to add channel numbers to a scan group. Ten scan groups are available and are identified by the numbers 0 – 9. Each group can be programmed to hold up to 20 channel entries. The format of this command is as follows:

Vg, c, c, c, c, c . . .

Where g is a group number in the range 0 to 9, and c is a channel number in the range 0 – 99. One or more channel numbers may be specified in the same command as long as each channel number is separated by comma (,) characters. The channels are scanned in the order they are programmed. The same channel may appear more than once. For example, to cause the following sequence of channels 1, 3, 88, 1, 4, 89, 1, 5, 90 to be programmed into an empty group number 3, the following command is used:

V3, 1, 3, 88, 1, 4, 89, 1, 5, 90

NOTE

If this command is used to program a previously programmed group, the previous channels are not altered. The new channel numbers are instead added into the group.

3.3.2.22 Unprogram Group Command

This command is used to remove one or more channels from a previously programmed group. The format of the command is as follows:

Wg, c, c, c, c . . .

Where g is a group number in the range 0 – 9, and c is a channel number in the range 0 – 99. One or more channel numbers may be specified in the same command as long as each channel number is separated by comma (,) characters.

3.3.2.23 Report Group Command

This command is used to request a list of channels programmed into a specified channel scan group. The format of the command is as follows:

Xg

Where g is a group number in the range 0 – 9. Refer to subsection 3.4 for a description of the returned status.

3.3.2.24 FSK Shift and Polarity Command

This command is used to select the FSK shift range to be used when in the FSK mode. It is also used to select the sense of the received data. The format of the command is as follows:

Y [s] i

The [s] represents an optional sign character + or –. A + sign selects normal data sense, while a – sign selects inverted data sense. If no sign is given, the receiver defaults to normal data sense.

The i represents an integer in the range 0 – 3, which determines the shift range used. Following is a list of the available shifts:

0 VERY NARROW SHIFT (VN)

1 NARROW SHIFT (N)

2 MEDIUM SHIFT (M)

3 WIDE SHIFT (W)

3.3.2.25 Scan Dwell Command

This command is used to specify the time that a receiver remains at a single channel while scanning. The format of the command is as follows:

ZDf

Where f is a value in the range .1 – 10.0 seconds. If an invalid scan dwell is received, the receiver selects the closest longer standard dwell. The following is a list of the dwell times available:

0.1, 0.2, 0.4, 0.5, 0.8, 1.0, 2.0, 4.0, 5.0, 8.0, and 10.0 seconds

External dwell is also selectable and it may be commanded by sending a – character in place of the dwell value. Any dwell value following the – sign will be ignored.

3.3.3 NUMBERED TYPE (S) Commands

The NUMBERED TYPE or S commands consist of the S character followed by a command number only. Several of the S commands cause status reports to be returned. Table 2 lists the NUMBERED TYPE commands and gives a brief description of each. More detailed descriptions are given in subsections 3.3.3.1 through 3.3.3.14.

Table 2. NUMBER TYPE (S) Command

Command	Status Report Generated?	Description
S1	No	Ignored
S2	No	Ignored
S3	No	Begin BITE
S4	No	Go to normal state
S5	Yes	Report I.F. filter configuration
S6	Yes	Report BITE results
S7	No	Ignored
S8	No	Ignored
S9	No	Ignored
S10	No	Prepare for Channel Scan
S11	No	Prepare for Group Scan
S12	No	Halt Scan
S13	No	Resume Scan
S14	No	Increment Channel
S15	No	Decrement Channel
S16	Yes	Report who you are
S17	Yes	Report radio state
S18	Yes	Report programmable options
S19	Yes	Report AGC and audio levels

3.3.3.1 Begin Bite

This command causes the receiver to enter the TEST state and begin executing the internal self test programs. The format of this command is as follows:

S3

3.3.3.2 Go To Normal State

This command is used to return the receiver to the last normal RECEIVE state. The format of this command is as follows:

S4

NOTE

The receiver will not exit test while a test is in progress. To determine if a test is in progress, refer to subsection 3.4.2.4.

3.3.3.3 Report I.F. Filter Configuration

This command is used to request an I.F. FILTER CONFIGURATION report. Refer to subsection 3.4.2 for a description of the returned status. The format of this command is as follows:

S5

3.3.3.4 Report Bite Results

This command is used to request BITE self test results. Refer to subsection 3.4.2 for a description of the returned status. The format of this command is as follows:

S6

3.3.3.5 Prepare For Channel Scan

This command is used to cause a receiver to enter the CHANNEL SCAN state. The SCAN LED on the receiver's front panel lights but scanning does not begin until one of the start scan commands are received. The format of this command is as follows:

S10

3.3.3.6 Prepare For Group Scan

This command is used to cause a receiver to enter the GROUP SCAN state. The SCAN LED on the receiver's front panel lights but scanning does not begin until one of the start-scan commands are received. The format of this command is as follows:

S11

3.3.3.7 Halt Scan

This command is used to temporarily halt scanning while in the channel or group scan states. The receiver remains on the channel to which it was tuned when the halt scan command was received. The format of this command is as follows:

S12

3.3.3.8 Resume Scan

This command is used to cause a receiver to begin scanning in either channel or group scan mode. The channel used is the channel following the last used channel. The format of this command is as follows:

S13

3.3.3.9 Increment Channel

This command is used to advance the received channel by one. The command is only legal while the receiver is in one of the channelized modes. The format of this command is as follows:

S14

3.3.3.10 Decrement Channel

This command is used to decrement the received channel by one. The command is only legal while the receiver is in one of the channelized modes. The format of this command is as follows:

S15

3.3.3.11 Report WHO ARE YOU

This command is used to request a WHO ARE YOU value. This value identifies the type of receiver and installed options. Refer to subsection 3.4.2 for a description of the returned status. The format of this command is as follows:

S16

3.3.3.12 Report Radio State

This command is used to request a state report from a receiver. The state report gives detailed information about the receiver's current operating conditions. Refer to subsection 3.4.2 for a description of the returned status. The format of this command is as follows:

S17

3.3.3.13 Report Programmable Options

This command is used to request a report of any and all programmable options available on the receiver. Refer to subsection 3.4.2 and 3.5 for more information about the options and the format of the returned status. The format of this command is as follows:

S18

3.3.3.14 Report AGC And Audio Levels

This command is used to request an audio and AGC level report from a receiver. Refer to subsection 3.4.2 for a description of the returned status. The format of this command is as follows:

S19

3.4 Status Report Types

The receiver generates three basic status report types: LETTER TYPE, NUMBERED TYPE, and CURRENT STATUS TYPE reports.

3.4.1 LETTER TYPE Status Reports

The LETTER TYPE status report consists of one or two ASCII letter characters followed by additional data. The first letter in a two-letter status report is a Z character. This Z character should be interpreted as a shift character. The shift only applies to the letter immediately following the Z character.

Table 3 contains a list of the LETTER TYPE status reports returned by the G command.

The reports may also be requested individually or in groups by the T command. Refer to subsections 3.3.2.7 and 3.3.2.19 for a description of the G and T commands, respectively.

3.4.1.1 RF Attenuation Report

This status report returns the receiver's RF ATTENUATION value. The format of this report is as follows:

Ai

Where i is a value in the range 0 to 150 dB.

Table 3. LETTER TYPE Status Reports

Status Letter	Description
Ai	RF Attenuation (Range 0 – 150)
Bsf	BFO
Cc	Channel
Di	MODE
Ei	Auto Stop Scan Threshold (Range 0 – 255)
Ff	Frequency
Hc ,status reports>	Report Channel *see note 3*
If	I.F. Filter Bandwidth
Mi	A.G.C.
Ni	Noise Blanker
P1	Input Path (Mute) Status
Rsf	FSK Center Frequency
Uc, c	Channel Scanning Bounds

Table 3. LETTER TYPE Status Reports (Cont.)

Status Letter	Description
Xg, c, c, c . . .	Report Scan Group
Ysi	FSK Shift And Polarity
ZDf	Scan Dwell

Note 1: c – a channel number; valid values are 0-99.
f – a floating point value; example 1.23.
g – a scan group number; valid values are 0-9.
i – an unsigned integer; example 3.
s – a sign character + or -.

Note 2: The H (Report channel and X (Report scan group) LETTER TYPE status reports are only returned when specifically requested.

Note 3: The following status reports are returned as part of the REPORT CHANNEL status report: B,D,F,I,M,R, and Y. The reports are preceded by the Hc character string where C is the channel being reported.

3.4.1.2 3.4.1.2 BFO Report

This status report returns the receiver's BFO value. The format of this report is as follows:

Bsf

Where s is a sign character, either a + or –, and f is a value in the range 0 – 9.99 kHz.

3.4.1.3 3.4.1.3 Channel Report

This status report returns the channel number displayed on the receiver's front panel. The format of this report is as follows:

Cc

Where c is a channel number in the range 0 – 99. If no channel number is being displayed the following report is returned:

C-1

3.4.1.4 Mode Report

This status report returns the receiver's current detection mode. The format of this report is as follows:

Di

Where i is one of the following values:

1 AM

2 FM

3 CW

4 NOT USED

5 2-ISB

6 LSB

7 USB

8 FSK

9 4-ISB

3.4.1.5 Auto Stop Scan Threshold Report

This status report returns the receiver's auto stop scan threshold. The format of this report is as follows:

Ei

Where i is an integer in the range 0 – 255.

NOTE

If i is equal to 255, auto stop scan is disabled.

3.4.1.6 Frequency Report

This status report returns the receiver's current frequency. The format of this report is as follows:

Ff

Where f is a value in the range 0 – 29.999999 MHz.

3.4.1.7 I.F. Filter Report

This status report returns the bandwidth of the selected I.F. Filter. The format of this report is as follows:

If

Where f is a value in the range 0 – 99.9 kHz.

3.4.1.8 AGC Report

This status report returns the receiver's current AGC type. The format of this report is as follows:

Mi

Where i is one of the following values:

1 FAST

2 MEDIUM

3 SLOW

4 OFF

5 DATA

6 EXTERNAL

3.4.1.9 Noise Blanker Report

This status report returns the ON or OFF status of the receiver's noise blanker circuitry. The format of the report is as follows:

N0 NOISE BLANKER OFF

N1 NOISE BLANKER ON

3.4.1.10 Input Path Report

This status report returns the status of the receiver's internal antenna relay. The format of this report is as follows:

P0 RECEIVER UNMUTED

P1 RECEIVER MUTED

3.4.1.11 FSK Center Frequency Report

This report returns the current FSK CENTER FREQUENCY which is used when in FSK mode.

The center frequency ranges from –3.999 kHz to +3.999 kHz. The format of this status report is as follows:

Rsf

Where s refers to the sign character, and f represents a value between 0 – 3.999.

3.4.1.12 Channel Scanning Bounds Report

This status report returns the lowest and highest numbered channels that are scanned in the channel scan mode. The format of this report is as follows:

Uc, c

Where c is a channel number in the range 0 – 99. The first channel number is the lower channel bounds and the second channel is the upper bounds.

3.4.1.13 FSK Shift And Polarity Report

This report returns the FSK shift range and the data sense that is used while in FSK mode. The format of the status is as follows:

Ysi

Where s is a sign character, + or –. A + represents normal data sense, while a – represents inverted data sense.

The i represents an integer value from 0 to 3 that describes the shift range used. Below is a list of the available shifts.

0 VERY NARROW SHIFT (VN)

1 NARROW SHIFT (N)

2 MEDIUM SHIFT (M)

3 WIDE SHIFT (W)

3.4.1.14 Scan Dwell Time Report

This status report returns the DWELL time value that indicates how long the receiver remains on each channel while scanning. The format of this status report is as follows:

ZDf

Where f is a value in the range .1 – 10 seconds. External dwell is also available and is reported as follows:

ZD-1

3.4.1.15 Report Group Report

This status report returns a list of all channels programmed into a particular scan group. The format of this command is as follows:

Xg, c, c . . .

Where g is the group number being reported, and c is a list of channels programmed into the group. The channel numbers are separated by comma (,) characters. If no channels are programmed into the group, no channel numbers follow the group number.

3.4.2 NUMBERED TYPE Status Reports

The NUMBERED TYPE status reports consist of the # character followed by the status report type number, followed by the actual status data contained in brackets. The data is preceeded by the left bracket ([ ) character and is followed by the right bracket ( ]) character. The report type number corresponds to the command number that generated the report. For example, the S16 command, which is used to request the receiver's WHO ARE YOU report, generates a #16 [xxx] report where xxx is a numeric value. Table 4 lists the available NUMBERED TYPE status reports. subsections 3.4.2.1 – 3.4.2.6 contain descriptions of these reports.

Table 4. LETTER TYPE Status Reports

Report Number	Description
5	I.F. Filter Configuration report
6	BITE results report
16	Who Are You report
17	Radio State report
18	Programmable Options report
19	AGC And Audio Levels report

3.4.2.1 I.F. Filter Configuration Report

The I.F. Filter Configuration report is used by the remote controller to determine what I.F. Filters are present in a particular receiver. Only certain receiver modes are allowed for each of the filter selections and this information is also provided.

The basic format of this status report is as follows:

#5 [f11/f12/f13/f14/f15/f16/f17/f18]

The f11 – f18 positions contain a filter description for each of the eight I.F. Filter slots. The / characters are part of the message and serve as delimiters. An empty filter slot will be reported by a missing filter description. A message received from a receiver with empty filter slots 3, 4, and 7 has the following format:

#5 [f11/f12///f15/f16//f18]

Each of the filter slot descriptions has the following format:

bw, m, m

The description bw represents the filter bandwidth in kHz, and m is a mode that may use this filter. Refer to subsection 3.4.1.4 for possible values of m. For example, a filter description for a 2.7 kHz filter for use with USB and CW modes has the following format:

2.7,7,3

The number of modes available for each filter slot is determined only by the receiver's filter configuration and may vary according to filter and other options installed in the receiver. A non-empty slot always has at least one mode code in the filter description.

3.4.2.2 BITE Result Report

The BITE RESULTS REPORT contains three numeric values separated by comma (,) characters. The receiver never reports more than one failure after running BITE. The form of this report is as follows:

#6 [ma, sa, fc]

The three values returned are the MAJOR ASSEMBLY ma, the SUBASSEMBLY sa, and the FAULT CODE fc. If the BITE test does not detect any failure, then all three values are reported as zeros. At this time, a MAJOR ASSEMBLY of 1 refers to the receiver itself. Other values may be used in the future to show faults in equipment external to the receiver but under the receiver's control.

3.4.2.3 Who Are You Report

The Who Are You status is used by the remote controller to determine the type of equipment to which it is connected. This information is used to determine what options are installed in the equipment. The content of this report is as follows:

#15 [WHO ARE YOU value]

Following is a list of the current WHO ARE YOU values that might be returned by a receiver:

16 A standard RF-590A or R-2368/URR family receiver without any options

17 A receiver with only the 2-ISB option installed

144 A receiver with only the FSK option installed

145 A receiver with both 2-ISB and FSK options installed

3.4.2.4 Radio State Report

The RADIO STATE report is used by the remote controller to determine the operating STATE of the radio. The format of this report is as follows:

#17 [xxx]

Where xxx is a single integer value in the range of 0 – 255. The integer value must be converted to binary form to determine its meaning. When converted to binary form, this value is bit mapped as follows:

Bit 7: 1 if receiver is operating under remote control

(MSB): 0 if receiver is operating under local control

Bit 6: This bit is reserved for the future. It is reported as a zero bit.

Bits 4 – 5: These bits report the major state of the radio as shown in table 5.

Bits 0 – 3 have different meanings depending upon the major state. The major states are described in subsections 3.4.2.4.1 through 3.4.2.4.3.

Table 5. Major Radio States

Bit 5	Bit 4	State
0	0	Normal receive state
0	1	Scan state
1	0	Test state
1	1	reserved for future

3.4.2.4.1 Normal Receive State

Normal receive state refers to a receiver that is not in TEST or SCAN modes, and the RCV LED on the front panel is illuminated. In this STATE, bits 1 – 3 are not used and will be reported as zero bits. Refer to table 6.

Table 6. Receive States

Bit 3	Bit 2	Bit 1	Bit 0	Receive State
x	x	x	0	The receiver is not displaying a channel number.
x	x	x	1	The receiver is displaying a channel number.

3.4.2.4.2 Scan State

The receiver is in scan mode and the front panel SCAN LED is illuminated. Refer to table 7.

Table 7. Scan States

Bit 3	Bit 2	Bit 1	Bit 0	Scan State
x	x	x	0	The receiver is not displaying a channel number.
x	x	x	1	The receiver is displaying a channel number.
x	x	0	x	The receiver is in CHANNEL SCAN mode.
x	x	1	x	The receiver is in GROUP SCAN mode.
x	0	x	x	The receiver is actively scanning.
0	1	x	x	The receiver is not actively scanning.
1	1	x	x	The receiver has stopped scanning due to a received signal above the auto-stop scan threshold.

3.4.2.4.3 Test State

The receiver is in self-test mode. The BITE test is either running or has been completed. After a receiver has completed BITE, it will remain in TEST STATE until commanded into another STATE. In this STATE, bits 1 – 3 are not used and will be reported as zero bits. Refer to table 8.

Table 8. Test States

Bit 3	Bit 2	Bit 1	Bit 0	Test State
x	x	x	0	The receiver is currently running the BITE self test.
x	x	x	1	The receiver BITE test has been completed. BITE results are available.

3.4.2.5 Programmable Options Report

Refer to subsection 3.5 for a description of the programmable options.

3.4.2.6 AGC and Audio Level Report

A receiver is capable of reporting two or four signal levels that relate to the receiver's front panel meter. These signals are AGC LEVEL and AUDIO LINE LEVEL. In the case of a receiver with 2-ISB option which is in 2-ISB mode, four levels may be reported: USB AGC, USB LINE AUDIO, LSB AGC, and LSB LINE AUDIO. A receiver in any mode except 2-ISB sends the following report:

#19 [AGC level, audio line level]

A receiver in 2-ISB mode sends this report:

#19 [USB AGC, USB audio, LSB AGC, LSB audio]

In both these messages the comma (,) characters are part of the message, and the level values are unsigned integers in the range of 0 – 255.

3.4.3 CURRENT STATUS Report

The CURRENT STATUS report consists of the S character followed by a numeric value which represents the current status of the radio in brief form. The number value used for the current status report is a value that ranges from 0 – 127. When converted to binary form, this value is comprised of seven data bits, each having a different meaning. The meaning of each bit is described in table 9.

NOTE

This CURRENT STATUS report is appended to the end of all messages sent from the receiver.

Table 9. CURRENT STATUS Report

Bite #	Meaning
0	This bit is = 1 if the receiver is operating in REMOTE control mode, and this bit = 0 if under LOCAL control.
1	This bit is = 1 if one or more Phase Locked Loop (PLL) is unlocked.
2	This bit is not used at this time and is reported as a 0 bit.
3	This bit is = 1 if a communication error is detected in the remote control serial input stream. An example is a parity error.
4	This bit is = 1 if a syntax error is detected.
5	This bit is = 1 if the remote control serial input buffer overflows.
6	This bit is = 1 if an operational error is detected. This generally means that a received command is understood (proper syntax) but cannot be carried out. Commanding a receiver change while under local control, or commanding an illegal mode causes this error.

3.5 Programmable Options

At this time the receiver has have five options that may be programmed by a remote controller. The programmed values of these options may also be reported to the remote controller in a status message. When adding options or interpreting option status two values are used for each option. The first value is the option number which identifies the particular option. The second value is the option value which is the value that the particular option is programmed to be. At this time there are five different options (0 – 4) available, all five of the options deal with FSK operation. These options are not available unless the FSK option is installed.

These options are stored in battery backed up RAM and will be retained when primary power is removed from the receiver. Table 10 contains a list of the FSK options.

Table 10. FSK Options

Option Number	Available Option Values
#0 FSK VN SHIFT BAUD	#0 50 BAUD FILTER*
#1	100 BAUD FILTER
#2	200 BAUD FILTER

Table 10. FSK Options (Cont.)

Option Number	Available Option Values
#1 FSK N SHIFT BAUD	#0 50 BAUD FILTER*
#1	100 BAUD FILTER
#2	200 BAUD FILTER
#2 FSK M SHIFT BAUD	#0 50 BAUD FILTER
#1	100 BAUD FILTER*
#2	200 BAUD FILTER
#3 FSK W SHIFT BAUD	#0 50 BAUD FILTER
#1	100 BAUD FILTER
#2	200 BAUD FILTER*
#4 FSK AGC	#0 SLOW
#1	FAST*
#2	MEDIUM
#3	OFF
#4	DATA

Note 1: *Default

Note 2: The DEFAULT selections shown are the values that are initialized when a channel memory (battery backup up RAM) failure occurs.

3.5.1 Options Programming Command

The command to program one option has the following format:

Oon, ov

To program more than one option use:

Oon, ov, . . ., on, ov

Where on is the option's option number and ov is the option value to be programmed.

3.5.2 Options Status Report

The OPTIONS STATUS REPORT contains a list of all available options and the values to which they are programmed. This list will be empty if no options are available . The status report has the following format:

#18 [on, ov, . . .]

For each available option a pair of numbers is returned. The first number of the pair is the option number on, and the second is the option value ov.

3.5.3 FSK AGC

The AGC value used in FSK mode is global to the receiver. This includes channel memories. When entering FSK mode, the AGC value used is the value last used in FSK mode. The last-used value is the value programmed into the FSK AGC option. The FSK AGC option is also programmed automatically when an AGC command (m) is received while in FSK mode. The current AGC option is reported in the AGC status report (m) while in FSK mode. If a channel memory is programmed to FSK mode and the FSK AGC option is reprogrammed, the previously programmed channel's AGC is also altered.

4. INSTALLATION INSTRUCTIONS

Perform the following procedure for installation. Refer to the A14 Control Assembly tabsection for component locations.

a. Remove all primary power from the receiver.

b. Remove the receiver's top and bottom covers.

c. Loosen the four front-panel mounting screws so that the front panel may be tilted on its hinges.

4.1 Firmware Installation

Perform the following procedure for firmware installation. Refer to subsection 4.1.1 for handling procedures for static sensitive devices.

a. Integrated circuit U5 installed on the A14 Control Assembly must be revision 208C or above. If it is not, carefully remove and replace PROM U5, noting orientation, with the correct revision firmware.

b. Handle these devices carefully. Avoid contact with the leads of the device and verify that all of the device's pins are properly seated in the socket.

4.1.1 Protection of Static Sensitive Devices

Diode input protection is provided on all CMOS devices. This protection is designed to guard against adverse electrical conditions such as electrostatic discharge. Although most static sensitive devices contain some protective circuitry, several precautionary steps should be taken to avoid the application of potentially damaging voltages to the inputs of the device.

To protect static sensitive devices from damage, the following procedures should be followed:

a. Keep all static sensitive devices in their protective packaging until needed. This packaging is conductive and should provide adequate protection for the device. Storing or transporting static sensitive devices in conventional plastic containers could be destructive to the device.

b. Disconnect power prior to insertion or extraction of sensitive devices. This also applies to PWBs containing such devices.

c. Double check test equipment voltages and polarities prior to conducting any tests. Verify that no transients exist.

d. Use only soldering irons and tools that are properly grounded. Ungrounded soldering tips or tools can destroy these devices. SOLDERING GUNS MUST NEVER BE USED.

e. Avoid contact with the leads of the device. The component should always be handled very carefully by the ends or the side opposite the leads.

f. Avoid contact between PWB circuits or component leads and synthetic clothing.

4.2 ASCII Interface Enable

The receiver's firmware is capable of operation using either the Harris, or ASCII interface. A hardware connection is tested by the receiver's firmware to determine which interface to use. Depending upon the A14 Control Assembly's revision level one of two methods is used. Note the A14 Control Assembly revision level.

If revision is F or above:

> On A14 Control Assembly, jumper J20 pins 1 and 2 using supplied shunting bar to select the ASCII interface protocol. When J20 pins 2 and 3 are connected, the standard HARRIS interface is selected.

If revision is E or below:

> On A14 Control Assembly, solder a jumper wire between U26 pins 8 and 10 to select the ASCII interface protocol.

4.3 Ident/Baud Rate/Interface Selection

The IDENT, BAUD RATE, and INTERFACE selection is identical to the standard remote. Refer to tabsection A14 of the receiver manual for details.

5. EXAMPLES

5.1 Scanning

The following command string causes a receiver in receive mode (receiver number 1 in this case) to go into scan mode and scan channels 1 through 10, starting at channel 3, with a dwell time of 5.0 seconds:

$1 S10 U1, 10 ZD5.0 K3 <cr>

Where <cr> is a carriage return. The spaces in the example are optional and are included for ease of reading.

5.2 Channel Programming

The following command string programs channels 1 and 2 to 10 MHz and 15 MHz, respectively. Also, channel 1 is set to USB mode and channel 2 is set to LSB mode. Receivers 7, 8, and 9 are programmed.

$7, 8, 9 J1 F10.0 D7 J2 F15.0 D6 <cr>

Where <cr> is a carriage return. The spaces in the example are optional and are included for ease of reading.