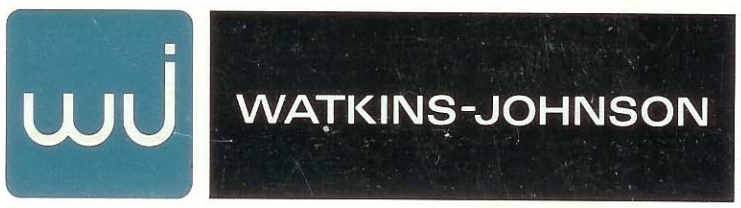
INFORMATION MANUAL

FOR

TYPE WJ-8617B(1) VHF/UHF RECEIVER



INFORMATION MANUAL

FOR

TYPE WJ-8617B(1) VHF/UHF RECEIVER

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MD 20878

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WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted. Exercise extreme caution in working with the equipment with any of the protective covers removed.

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SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-8617B(1) VHF/UHF Receiver is a fully synthesized, digitally controlled receiver, designed to operate in the VHF/UHF frequency range. It receives AM, FM, CW and PULSE emissions over a frequency range of 20 to 500 MHz. The standard receiver is capable of manual operation, utilizing the front panel controls and automatic operation, utilizing the built-in microprocessor and 96 channel memory. Remote control capabilities can also be incorporated, utilizing an optional IEEE-488 bus or RS-232 interface. During the manual operating mode, all receiver functions are controlled by the front panel controls. The operating parameters are selected by pressing the appropriate front panel push button. When pressed, a LED on the button illuminates indicating the selection.

A built-in memory provides 96 operator-programmable memory channels in the Manual and Step modes or 48 programmable frequency search bands in the Scan mode. The memory contains all receiver parameters including: Tuned Frequency, Antenna Selection, IF Bandwidth, Detection Mode, COR level, AGC ON/OFF and AFC ON/OFF. In the manual mode, the operator has full control of all receiver functions. In the Step mode, the built-in microprocessor directs the receiver to step to each discrete frequency stored in the memory channels in search of signal activity. In the Scan mode, the microprocessor directs the receiver to search the operator-programmed bands for signal activity.

Internal frequency tuning circuitry of the WJ-8617B(1) receiver includes the 1st and 2nd LO Synthesizers. The synthesizers determine the tuned frequency to a resolution of 100 Hz. A tuning knob on the front panel and three tuning rate push buttons provide tuning capability. Tuning is performed in 1 MHz, 10 kHz or 100 Hz steps by selecting the appropriate tuning rate button. Pressing the Disable button locks the receiver to the selected frequency and disables the tuning knob, preventing accidental frequency changes.

Ease of maintenance and flexibility is provided by the modular design concept. Nearly all functional modules plug directly into the motherboards and the connections are accessible from the bottom of the receiver, with the bottom panel removed.

1.2 MECHANICAL CHARACTERISTICS

The receiver mounts in a standard 19-inch equipment rack, occupies 5.25 inches of vertical space and extends 19.9 inches into the rack. The main chassis top, bottom, front, rear and internal compartment panels are constructed of aluminum. Except for the Line Audio control, which mounts on the rear panel, all operating controls are mounted on the front panel, while all input and output cables (except for the phones jack and optional tuning connector) connect to the rear panel.

A black bezel, etched with control markings, is mounted to the front panel. The push buttons, Display LEDs, dwell control and Optional Tuning connector all mount on a printed circuit board, positioned behind the front panel, and extend through cutouts in the front panel and bezel. All other controls (except for the ON/OFF Power Button) mount to the front panel.

The power ON/OFF button mounts to the chassis and extends through the front panel and bezel.

The rear panel mounts all input and output connectors, except for the phones jack and Optional Tuning connector, mentioned before. N-type connectors provide the ANT 1 and ANT 2 inputs. A TNC connector is provided for the switched IF OUTPUT. All other connectors are BNC type. The REF SEL switch for selecting an internal or external timebase is mounted immediately above the 1 MHz reference input/output connector. Line Audio control, R3, which controls the rear panel audio output is mounted on the rear panel alongside of the audio output connector. Two rear mounted fuse holders are provided. The rectangular fuse holder mounts the operational line fuse while the circular holder is utilized to house the alternate line voltage fuse. Also mounted on the rear panel are four heat sinked voltage regulators (for +15 V, -15 V and +5 V) and two rectifiers (for +9 V unregulated).

The top cover is held in place using quarter-turn fasteners. Loosening these fasteners permits removal of the top cover, exposing the five main compartments. The Power Distribution circuit, Signal Monitor assembly compartment, RF/IF modules, Digital I/O modules and Synthesizer modules are in separate compartments for mechanical support and shielding purposes. Removal of the top cover permits access to all plug-in modules.

Removal of the bottom cover, held in place by quarter-turn fasteners, exposes the Wideband IF Amplifier and the three motherboards that mount the plug-in modules. All connections to the motherboards are made with push-on plugs, thus replacement of a motherboard consists of removal of mounting screws and the plugs.

1.3 EQUIPMENT SUPPLIED

The equipment supplied consists of the receiver, detachable line cord, and subassembly extender cards.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

To obtain full use of the receiver, equipment from the following list should be selected.

1) Two antennas, 50-ohm

2) Audio monitoring equipment

   speaker panel, 600-ohm
   headphones set, 600-ohm
   tape recorder

3) HP-85 calculator, with IEEE-488 option, for remote control operation

4) Computer terminal and/or line printer, with RS-232 option, for remote control operation

Table 1-1. WJ-8617B(1) VHF/UHF Receiver, Specifications

Frequency Range	
WJ-8617B(1)	20 - 500 MHz
WJ-8617B(1) (with FE option)	20 - 1100 MHz
Detection Modes	AM, FM, CW and Pulse standard; Variable BFO and SSB optional (other modes are available on special order)
Tuning Scheme	Frequency synthesized local oscillators locked to internal reference
Reference Accuracy	1 part in 10^7 or external 1 MHz reference input
Tuning Resolution	100 Hz
Synthesizer Tuning Speed	3 msec typical, 10 msec maximum
Input Impedance	50 Ω
Input VSWR	2.5:1 Typical 3.0:1 Maximum
Noise Figure	9.5 dB typical, 11 dB maximum
Third Order Intercept Point	+8 dBm typical +3 dBm minimum (20-500 MHz) 0 dBm typical, -5 dBm minimum (500-1100 MHz)
Second Order Intercept Point	+50 dBm, minimum
Ultimate FM S+N/N	40 dBm minimum in 50 kHz BW
Oscillator Phase Noise (20 kHz from the carrier)	-105 dBc typical
Preselection	Automatically switched, suboctave (1.66:1) bandpass filters
LO Radiation	-100 dBm typical
Image Rejection	90 dB minimum
IF Rejection	90 dB minimum
Internal Spurious	Equivalent to -115 dBm maximum at the RF input
Reciprocal Mixing	With an input signal at a rated sensitivity level; an out-of-band signal removed 350 kHz in the 20 kHz IF bandwidth at a level of 70 dB above rated sensitivity will not degrade the desired output signal ratio (S+N)/N by more than 3 dB
IF Bandwidths	5 or 10 IF Bandwidths (To be selected from Table 1) Note: 5th IF BW position must be 500 kHz or greater
IF Shape Factor	See Table 1
Final IF	21.4 MHz, -30 dBm Nominal Output Level

Table 1-1. WJ-8617B(1) VHF/UHF Receiver, Specifications (Cont'd)

Table I. Available Bandwidths and Rated Sensitivity

Bandwidth (kHz)	Max Shape Factor 3:60 dB	Sensitivity (dBm)
3.2	3:1	-107
6.4	3:1	-105
10	3:1	-104
20	3:1	-101
50	3:1	-97
75	3:1	-95
100	3:1	-94
250	4:1	-90
300	4:1	-89
500	4:1	-87
1000	4:1	-84
2000	4:1	-81
4000	4:1	-78
8000	4:1	-75

6 kHz, 15 kHz, 30 kHz and 40 kHz also available on special order.

Sensitivity Conditions:

AM - Input AM modulated 50% by a 1 kHz tone, will produce a minimum video output (S + N)/N ratio of 10 dB.

FM - Input signal FM modulated at a 1 kHz rate with a peak deviation equal to 30% of the selected IF BW, will produce a minimum video output (S + N)/N ratio of 17 dB. (Note: A 400 Hz modulation rate is required for the 10 kHz IF BW.)

AM Stability	6 dB maximum from AGC threshold to a level 100 dB above AGC threshold (maximum input -5 dBm)
Switched Video Output	1 volt peak-to-peak; nominal, into 91 ohm load for FM with peak frequency deviation at 30% of the IF Bandwidth and AM with 50% modulation. DC coupled for FM and AM
FM Monitor	DC coupled FM output, 1 volt peak-to-peak minimum, into 91 ohm load
Video Amplifier Frequency Response	DC to 1/2 IF Bandwidth for FM Monitor; DC to 1/2 IF Bandwidth for AM/FM switched video output

Table 1-1. WJ-8617B(1) VHF/UHF Receiver, Specifications (Cont'd)

Line Audio Output	10 mW, minimum, into 600 ohms for 50% AM or FM peak frequency deviation equivalent to 30% of the IF bandwidth
Audio Amplifier Distortion	2.5% typical, 3% maximum
COR/Squelch	Adjustable threshold from noise level to approximately 40 dB above noise. COR provides 100 mA current "sink-to-ground" for switching; +24 Vdc maximum external voltage (external current limiting must be provided)
Signal Monitor (Optional)	
Sweep Width	0-4 MHz continuously adjustable
Resolution	10 kHz
Sweep Rate	Adjustable to 15 - 25 Hz
Marker	Center frequency (locked to receiver frequency standard)
Display	Lin/Log
CRT	1 x 3 inches nominal dimensions
PAN	Provides pan display during SCAN mode with optional digitally refreshed display (DRD)
Temperature Range:	
Operating	0°C to 50°C
Non-Operating	-20°C to 80°C
Power Requirement	110, 120/220, 240 Vac, 47 - 400 Hz, 100 watts nominal
Dimensions	19-inch rack mount, 18 inch depth, excluding connectors and handles, and 5.25 inch panel height
Weight	50 pounds, approximately

SECTION II

INSTALLATION AND OPERATION

SECTION II

INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

Examine the shipping carton for damage before the equipment is unpacked. If the carton's exterior appears to be damaged, try to have the carrier's agent present when the equipment is unpacked. If this is not possible, retain all packing material and shipping containers for the carrier's inspection if damage to the equipment is evident after it has been unpacked. Also, verify that the equipment is complete as listed on the packing slip. Contact the Watkins-Johnson Company or your Watkins-Johnson representative for any discrepancies or shortages.

2.2 INSTALLATION

The receiver is designed for mounting in a standard 19-inch equipment rack. It occupies 5.25 inches of vertical rack space and extends approximately 19.5 inches into the rack to the tips of the rear protective handles. Do not rely solely on front panel mountings to support the receiver. The use of Jonathan Type QD110 slides, mounted to the sides of the receiver, is preferred and acceptance mounting holes are provided. The rack environment should allow for a free flow of air through the top and bottom covers and the side panels, as well as around the outer surfaces of the receiver. A 1.75 inch space above and below the unit is recommended for rack mount configuration, along with forced air convection.

Prior to installing the receiver at its final location, DIP switch S1 on the Synthesizer Interface (A5A2) should be inspected for proper switch configuration. This switch is located at the upper edge of the Synthesizer Interface subassembly and is accessible by removing the top cover of the receiver. The switch settings listed in **Table 2-1** are used to configure the receiver software to automatically switch between the ANT1 and ANT2 inputs at specific frequencies and to recognize the installation of the FE Options (2 to 500 MHz or 500 to 1100 MHz). Refer to **Table 2-1** as a guide to setting this switch.

Access to the rear panel should be allowed so that input and output connections can be made or changed conveniently, if desired.

The front and rear panel connections are described in **Table 2-2.** As a reference for the panel connectors, refer to **Figure 2-1.**

NOTE

Before power is applied to the unit be sure the selected line voltage for the receiver matches the line voltage being used.

Table 2-1. Synthesizer Interface Switch Configurations

S1 switch settings are listed below:

Switch S1 on A5A2						Function Selected
6	5	4	3	2	1	
1	-	-	-	-	-	Selects Variable Tuning Resolution (from 100 Hz to 10 MHz)
0	-	-	-	-	-	Selects Normal Tuning Resolution (100 Hz, 10 kHz, 1 MHz only)
-	1	-	-	-	-	Selects Dual IF Amplifiers (up to 10 IF bandwidths)
-	0	-	-	-	-	Selects Single IF Amplifiers (up to 5 IF bandwidths)
-	-	*	-	-	-	Spare (for future expansion)
-	-	-	*	-	-	Spare (for future expansion)
-	-	-	-	1	-	Enables SSB Option
-	-	-	-	0	-	Disables SSB Option
-	-	-	-	-	1	Frequency Extender Option Installed
-	-	-	-	-	0	Frequency Extender Option Not Installed

S2 switch settings are listed below:

Switch S2 on A5A2								Function Selected
8	7	6	5	4	3	2	1	
*	-	-	-	-	-	-	-	Spare (for future expansion)
-	1	-	-	-	-	-	-	Pre-dwell Selected
-	0	-	-	-	-	-	-	Post-dwell Selected
-	-	1	-	-	-	-	-	NRT Disabled
-	-	0	-	-	-	-	-	NRT Enabled
-	-	-	*	-	-	-	-	Spare (for future expansion)
-	-	-	-	*	-	-	-	Spare (for future expansion)
-	-	-	-	-	1	-	-	LOG 40 dB LOG Scale Selected
-	-	-	-	-	0	-	-	LOG 60 dB LOG Scale Selected
-	-	-	-	-	-	*	-	Spare (for future expansion)
-	-	-	-	-	-	-	*	Spare (for future expansion)

NOTE: 1 = OPEN
0 = CLOSED
* = NOTE USED

Table 2-2. Table Of Connectors

Connector		Function
ANT 1	ANTENNA INPUT	(Type-N) RF Input From #1 Antenna
ANT 2	ANTENNA INPUT	(Type-N) RF Input From #2 Antenna
J1	SW IF OUT	(TNC) Selected Bandwidth IF Output (50 ohms)
J2	FM MON	(BNC) FM Monitor Output (91 ohms)
J3	AUDIO	(BNC) Audio Output (600 ohms)
J4	SW VIDEO OUT	(BNC) AM/FM Video Output (91 ohms)
J5	OPT OUT	(Multipin) Provides output signals from installed options.
J6	X OUT	(BNC) SM Display Output
J7	Y OUT	(BNC) SM Display Output
J22	Z OUT	(BNC) 8 µsec blanking pulse for external display
J8	1 MHz REF	(BNC) 1 MHz Reference In/Out (50 ohms)
J20	WB IF OUT	(BNC) Wideband IF Output (50 ohms)
J21	COR	(BNC) Carrier Operated Relay
	REMOTE CONTROL	Remote Control Input/Output (optional)
A7J1	PHONES	Phone Output (Front Panel)
A6J1	OPTIONAL TUNING	Optional Tuning Input (Front Panel)
FL1J1	Line Cord Receptacle and Voltage Selector	Power Input

2.2.1 CONNECTOR SIGNALS

2.2.1.1 **Line Cord Receptacle And Voltage Selector Fuse Block** - This multi-function assembly should always be inspected before installing the receiver in a new location. With the line cord unplugged, the clear plastic window can be slid to the left over the male power receptacle prongs, exposing the line fuse and a hinged plastic fuse pull lever.

Swinging the lever to the left ejects the fuse from the holder and frees a line-voltage-select pc wafer, at the bottom of the assembly. Looking down on the pc wafer, at a slight angle, the selected line voltage for the receiver shows on the left side (either 100, 120, 220, 240 Vac). If the voltage shown does not match the available line voltage, remove the pc wafer and install it so that the closest line voltage is visible with the pc wafer in position. The pc wafer should be set in the voltage position closest to the line voltage utilized. Then, install the fuse suitable for the line voltage: 1.5 ampere slow-blow for 100 Vac and 120 Vac or .75 ampere for 220 Vac and 240 Vac. Install the other fuse in the alternate fuse holder.

2.2.1.2 **Antenna #1 Input ANT 1** - This N-type connector provides the RF input signal from the #1 antenna. Nominal input impedance is 50 ohms.

2.2.1.3 **Antenna #2 Input ANT 2** - This N-type connector provides the RF input signal from the #2 antenna. Nominal input impedance is 50 ohms.

2.2.1.4 **SW IF OUT J1** - The switched IF output TNC connector supplies a -30 dBm IF signal into 50 ohms. The center frequency is 21.4 MHz with a bandwidth equal to the selected IF bandwidth.

2.2.1.5 **FM MON J2** - The FM Monitor BNC connector provides a DC coupled FM output. The level is 1 volt peak-to-peak minimum, into 91 ohms, for input signals with a peak deviation equal to 30% of the selected IF bandwidth.

2.2.1.6 **Audio J3** - This BNC connector provides a 600 ohms audio output. This output drives a 600 ohm load at a level adjustable to 10 mW minimum. The output level is controlled by the Line Audio Control (R3) located on the rear panel.

2.2.1.7 **SW Video Out J4** - This Switched Video Output BNC connector provides a 1 volt peak-to-peak, minimum, video signal into a 91 ohm load. The output is a DC coupled AM or FM video signal, determined by the operation mode chosen.

2.2.1.8 **OPT OUT J5** - The Option Output multipin connector provides output signals from the installed options as follows:

Pin	Signal	
1	ASO	Audio Scan Output
2	GND	
3	DFC	Direction Finder Control
4	GND	
5		
6	TX DATA	
7	GND	RS-232 Interface
8	RX DATA	
9		

2.2.1.9 **X OUT J6** - This BNC connector provides X axis signal monitor information to drive an external display.

2.2.1.10 **Y OUT J7** - This BNC connector provides Y axis signal monitor information to drive an external display.

2.2.1.11 **Z OUT J22** - This BNC connector provides an 8 µsec blanking pulse to an external display to blank the display on retrace. A negative blanking pulse is standard. (A positive pulse is optionally available.)

2.2.1.12 **1 MHz REF J8** - With the REF SEL switch in the internal position, this BNC connector provides a 1 MHz output with a level of 100 mV rms into 50 ohms. In the external position, a 1 MHz reference signal must be applied to J8 to provide a time base for the receiver. The level of the external TTL signal is between 3.5 V and 5.0 V.

2.2.1.13 **WB IF OUT J20** - The Wideband IF Output BNC connector provides a -30 dBm IF signal into 50 ohms. The center frequency is 21.4 MHz with a bandwidth of approximately 4 MHz, with Wideband IF Output option installed.

2.2.1.14 **COR J21** - The Carrier-Operated-Relay BNC connector provides a 100 mA current-sink to ground for control of external equipment. The maximum external voltage that can be applied is +24 VDC.

2.2.1.15 **Remote Control** (optional) - The Remote Control multipin connector allows the receiver to interface with other equipment via an optional interface bus. This permits the receiver to be controlled from an external source or it can be programmed to supply signals to other receivers.

2.2.1.16 **PHONES A7J1** - The PHONES connector, mounted on the front panel, provides an audio signal of 10 mW, minimum, into 600 ohms. This signal is capable of driving a standard 600 ohm headphone set.

2.2.1.17 **Optional Tuning A6J1** - The optional tuning multipin connector, permits receiver control using an optional external keyboard.

2.3 EQUIPMENT MALFUNCTIONS

This unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. If any malfunctions are encountered after following the recommended installation procedures, verify that the correct input signals are present at the proper jacks. Maintenance and troubleshooting of the unit can be aided by using the procedures described in Section IV of this manual. Contact your Watkins-Johnson representative or the Watkins-Johnson Company, SP Division, Gaithersburg, Maryland, to prevent the possible voiding of the warranty prior to taking any corrective maintenance action.

2.4 OPERATION

The WJ-8617B(1) Receiver is capable of manual, semi-automatic and automatic operation in its standard configuration. Local operation is exercised using the front panel controls and indicators described in paragraph 2.4.1. Depression of a front panel push button illuminates a LED on the button (refer to **Table 2-4**), indicating that particular function is active. Depressing any push button in a group deactivates any previously selected button in that group. The CLR push button activates a special three-step sequence, as described in paragraph 2.4.1.18.

In addition to the operating modes available in local operation, the WJ-8617B(1) Receiver is capable of remote operation when the IEEE-488 (488) or RS-232 (232) interface option is incorporated in the receiver. Via the remote interface, all receiver operations can be controlled by an external controlling device, with the exception of signal monitor operation. Remote operation is described in paragraph 2.5.

2.4.1 CONTROLS AND INDICATORS

2.4.1.1 Push ON/OFF Power - This push button applies power to the unit. When pushed, the button remains partially depressed indicating the switch is energized. Depressing the button again causes the button to return to its fully extended OFF position.

On power up, the receiver is set to the operating mode and parameters that were present prior to the last power interruption. However, if the Scan mode was active when the receiver was last turned off, it will return at the beginning of the Scan sequence, rather than at the point where power was interrupted. Also when the unit is powered down or power is interrupted, the upper case parameters are dumped and must be re-entered, if desired. The receiver is returned to the operating conditions that existed before an upper case function was selected.

2.4.1.2 FUNCTION (F↑) - This push button places the front panel push buttons into the upper case mode of operation. In this mode, selected push buttons are utilized to control receiver options associated with the upper case mode. Upper case functions are indicated in **Table 2-4** with an asterisk (*) following the primary push button function description. The primary function of the push buttons is unaffected when in the upper case mode. When the Function (F↑) push button is depressed, only the active upper case function of a particular function illuminates an LED on that push button.

With Type 796353-X Microprocessor (A5A3) installed, the receiver is able to be placed into a Test Mode. To place the receiver into the test mode, the FUNCTION push button must be pressed in when receiver power is turned on. Test Mode enables the receiver to:

- Tune from 0 to 1200 MHz
- Select an empty IF bandwidth slot (without generating an ERROR 814)
- Display the decimal equivalent of the selected IF bandwidth

2.4.1.2.1 Extended Tuning Range

In the Test Mode, the receiver tuning range is extended. Instead of tuning from 20 MHz to 500 MHz, the receiver is able to be tuned from 0 to 1200 MHz. This extended tuning range is provided requardless of the receiver tuning range. By tuning the receiver to 0 MHz, the receiver's 1st LO is able to: be fed through the receiver to determine whether the receiver can pass a signal; check the Signal Monitor and check the audio circuit.

Tuning the receiver to 0 MHz injects the receiver's 1st LO (552 MHz) frequency through the receiver. At 0 MHz, the 1st LO is passed through the receiver as a 21.4 MHz signal with a very high amplitude. This signal is displayed on the Signal Monitor as a frequency spike. By selecting the different IF bandwidths, and observing the front panel SIGNAL STRENGTH display (to observe a 3 dB decrease in the level) the bandwidth of each IF Amplifier can be estimated.

2.4.1.2.2 Troubleshooting

While in the Test Mode of operation, the operator can select an IF bandwidth slot that is empty without generating an ERROR 814 on the front panel. If the receiver is not in the Test Mode, and empty IF bandwidth slot is not able to be selected. The Test Mode allows an IF Amplifier module to be removed and then select the empty slot for the purpose of troubleshooting. This allows the logic levels and supply voltages to be checked without having the IF Amplifier installed.

2.4.1.2.3 Displayed Decimal Code

With the Test Mode enabled, the decimal code for the selected IF bandwidth is displayed on the receiver front panel to the right of the MEMORY SELECT window. The decimal code is a three digit number representing the analog-to-digital equivalent of the IF bandwidth code. Refer to **Table 2-3** for the IF bandwidth decimal codes. Using the decimal code, an external controller is able to determine which IF bandwidth is selected. If the IF bandwidth code is out of the limits listed in the table, the decimal code can be adjusted without using a voltmeter. To adjust the displayed decimal code, the receiver power must be turned off and then on again for the microprocessor to update the decimal code.

Table 2-3. IF Bandwidth Decimal Code

IF Bandwidth	DC Voltage	Decimal Code From	To
6.4 kHz	0.500	11	16
10 kHz	1.000	24	30
15 kHz	1.500	37	43
20 kHz	2.000	51	56
25 kHz	2.250	57	63
30 kHz	2.500	64	70
40 kHz	2.750	71	76
50 kHz	3.000	77	84
75 kHz	3.500	92	99
100 kHz	4.000	100	113
3.2 kHz	4.500	114	127
250 kHz	5.000	128	140
300 kHz	5.500	141	154
500 kHz	6.000	155	168
1000 kHz	7.000	182	195
800 kHz	7.500	196	208
2000 kHz	8.000	209	221
8000 kHz	8.500	222	235
4000 kHz	9.000	236	248
6000 kHz	9.500	249	255

Table 2-4. Table of Controls and Indicators

PUSH ON/OFF POWER	Applies power to the receiver.
DETECT MODE:	
AM	Selects AM detection mode.
*BITE	Enables the built-in test function.
FM	Selects FM detection mode.
CW	Selects CW detection mode.
*PLS	Selects PLS detection mode.
PAS	Enables Programmable Antenna Selection.
SSB (optional)	Selects SSB detection mode.
BANDWIDTH	Selects the IF bandwidth.
AFC	Activates automatic frequency control.
AGC	Activates automatic gain control to the RF and IF amplifiers.
COR LEVEL UP/DOWN	Selects the level at which the COR function activates.
*NRT LEVEL UP/DOWN	Selects the level at which the NRT function activates.
MEMORY SELECT UP/DOWN	Selects the desired memory channel.
*NRT	Selects Noise Riding Threshold operation.
BFO TUNE	Allows tuning of the beat-frequency-oscillator (BFO).
*PANSEC	Selects the Panoramic Sector operation mode.
TUNING RATE:	
1 MHz	Selects the 1 MHz tuning increment.
*HOUR	Allows tuning wheel to set correct hour.
10 kHz	Selects the 10 kHz tuning increment or increases the tuning rate, up to 10 MHz when Variable Tuning Resolution is enabled.
*MINUTE	Allows tuning wheel to set correct minutes.
100 Hz	Selects the 100 Hz tuning increment or decreases tuning resolution down to 100 Hz, when Variable Tuning Resolution is enabled.
TUNING KNOB	Controls the tuned frequency of the receiver or the Programmable Antenna Selection frequency (PAS) when enabled.
DISABLE	Locks receiver to the displayed frequency and disables tuning knob.
*TIME	Allows setting of internal 24-hour clock.
ANT 2	Selects RF input from Antenna 2.
*FBW SCAN	Provides full or half-bandwidth increments during Scan.
STO	Stores the selected receiver functions into the displayed memory channel.

*Indicates upper case function.

Table 2-4. Table of Controls and Indicators (Continued)

*AUTO LOG	Allows selection of automatic or manual logging.
MAN	Selects manual operation. Displays receiver type and software version when this push button is held pressed in during receiver power up. A typical display for the WJ-8617B-(1) Receiver would appear as: 8618B-(1) 3.0.0.
*MAN LOG	Provides signal data to a printer or external computer device.
REM	Selects either the local or remote mode of operation.
*488 ADDR	Allows selection of receiver's IEEE-488 address (0 to 30) and master/slave operation.
RCL	Recalls and displays information stored in active memory channel.
EXC	Sets receiver in accordance with active memory channel.
CLR	Resets the receiver front panel and clears the memory.
SCAN	Scans operator programmed bands for signal activity.
*CURSOR SCAN	Provides a digitally refreshed trace on the signal monitor and enables the tuning wheel to position a cursor, over the desired signal for tuning purposes.
STEP	Steps to each frequency stored in the memory channels in search of signal activity.
*PANSEC DECAY	Provides a delayed decrease in signal amplitude when signal activity stops.
FUNCTION (F↑)	Selects the upper case mode of the front panel push buttons. Enables the Test mode, when held in while turning receiver power on.
DWELL	Sets the period spent at each frequency or band in the Scan and Step modes.
*WIDTH	Controls the width of the frequency segment viewed from .01 to 9.999 MHz. Utilized only during PANSEC operation.
AUDIO GAIN	Controls the audio signal at the Phones Jack.
RF/IF GAIN	Manually controls the gain of the RF and IF amplifiers.
MSTR/SLAVE (Optional)	Permits receiver to be designated as a master to apply information to a designated slave receiver.
LOCK-OUT (Optional)	Excludes operator programmed signals from a scan.
INTENSITY (SM Option)	Controls the intensity of the Signal Monitor's CRT.

*Indicates upper case function.

Table 2-4. Table of Controls and Indicators (Continued)

FOCUS (SM Option)	Provides focus of the trace on the CRT.
SWEEP RATE (SM Option).....	Controls the rate at which the Signal Monitor sweeps the spectrum.
SWEEP WIDTH (SM Option).....	Controls the width of the spectrum being viewed.
CENTER FREQ (SM Option)	Controls the horizontal position of the IF band displayed.
GAIN (SM Option)	Controls the amplitude of the signal displayed on the CRT.
MARKER (SM Option)	Superimposes a 21.4 MHz reference marker on the IF signal displayed.
LIN/LOG (SM Option).....	Selects either a linear or logarithmic vertical display.
DIGITAL DISPLAY	Displays digitally the COR Level Selected, Relative Signal Strength, Memory Channel selected and the Receiver Tuned Frequency.

2.4.1.3 **DETECT MODE** - Depressing a button in the DETECT MODE group selects the desired receiver detection mode. An LED on the push button illuminates indicating the active mode. The operator may select standard AM, FM, CW or PULSE modes. SSB is an available option.

*BITE - Depressing the BITE push button (upper case AM) places the unit into a Built-In Test Enabled mode. With BITE (Option L) installed, the Power Supply, Synthesizer Tuning, RF Signal/Noise, Noise Quieting and COR/AGC are tested. This provides a thorough internal check of the receiver circuitry.

*PROGRAMMABLE ANTENNA SELECTION (PAS) - Programmable Antenna Selection allows the operator to select the tuned frequency where the selected antenna switches. PAS is enabled via pressing the FUNCTION push button and then pressing the PLS push button. Pressing the FUNCTION push button places the front panel in the upper case mode of operation. In the upper case mode of operation, the PLS button isused to select the Programmable Antenna Selection mode of operation. When in the upper case mode, the LED on the FUNCTION push button is illuminated. Pressing the PLS push button illuminates the LED on th key. Pressing the PLS push button illuminates the LED on the key. Pressing the PLS push button toggles the PAS mode between on and off. When the PAS mode is enabled, "On" is displayed to the left of the FREQUENCY display and the displayed frequency is the frequency at which the selected antenna switches. When the PAS mode is disabled, "OFF" is displayed to the left of the FREQUENCY display window and antenna selection must be performed manually by pressing the ANT 2 push button to select the desired antenna.

With PAS enabled (On), the tuning wheel is used to select the frequency (in 1 MHz steps) at which the selected antenna switches. Rotating the tuning wheel clockwise increases the antenna switching frequency, in 1 MHz increments. Counter clockwise rotation of the

*Indicates upper case function.

tuning wheel reduces the antenna switching frequency. After the PAS frequency has been set, pressing the FUNCTION push button again returns the front panel to the normal operating mode. With PAS enabled, rotating the tuning wheel to frequencies less than the selected PAS frequency antenna 1 is selected. When the receiver is tuned to frequencies equal to or greater than the set PAS frequency, antenna 2 is selected.

2.4.1.4 **BANDWIDTH** - This group of push buttons permits the operator to select the desired IF bandwidth. An LED illuminates on the active push button, indicating the IF bandwidth has been selected. Up to five IF Amplifiers and matched FM Demodulators can be installed in the receiver. Refer to paragraph 5.5.2, of the parts list, for a list of the available IF Amplifiers and FM Demodulators.

2.4.1.5 **AFC** - Depression of the AFC push button switches the Automatic Frequency Control circuitry on (AFC LED illuminated) or off (AFC LED extinguished). When this function is enabled, it corrects for any frequency drift keeping the receiver locked on to the desired signal, as long as the signal strength is sufficient to exceed the programmed COR level. The AFC circuitry has a tracking range of ±10 times the selected IF bandwidth. Selecting an IF bandwidth less than 10 kHz, AFC circuitry is automatically disabled by the receiver software. For receivers with software versions 2.2 and above, manually de-select AFC before selecting an IF bandwidth less than 10 kHz.

NOTE

1. If AFC is selected, the COR level should be set such that the COR LED is off when no signal is present. This prevents the AFC circuitry from hunting or attempting to correct the RF frequency, in the absence of a valid signal.

2. With two signals in close proximity, the AFC could lock onto the stronger signal. Therefore, when monitoring a low level signal, in the presence of stronger signals close in frequency to the desired signal, it is advisable to disable AFC.

2.4.1.6 **AGC** - Depressing the AGC push button alternates control of the RF/IF gain between Automatic Gain Control (AGC LED illuminated) and Manual Gain Control (AGC LED extinguished). When in the AGC mode, the RF/IF gain is automatically controlled by the internal AGC circuitry. In the Manual Gain Control mode, receiver RF/IF gain is set by rotating the front panel RF/IF Gain control. During a Scan, if AGC is selected as one of the programmed parameters, it is off during the Scan and the receiver will be set at maximum gain. When a signal is detected and the receiver is set to the "Scan Continue" mode, the AGC is then activated to control receiver gain.

2.4.1.7 **COR LEVEL** - Two push buttons are provided to set the level where the COR and squelch circuits activate. The COR Level is adjustable from noise level to approximately 40 dB above noise. When the COR Level is exceeded, both the COR and audio circuits are activated. A LED, on the down button, illuminates when the level is exceeded. With "00" displayed in the

COR window, the COR Level is set to minimum and the COR circuit is active at all times. A display of "--" indicates maximum level, keeping the COR circuit inactive at all signal levels. The COR Level also controls the activation of automatic frequency control when AFC is selected. This circuit prevents AFC from affecting the operation of the receiver until the signal level is above the set COR Level. When AFC is selected, the COR Level should be increased until the COR LED extinguishes, with no signal present.

*NRT LEVEL - With the Noise Riding Threshold (NRT) Option H installed, this push button allows the setting of a noise threshold level from 00-20. This establishes a level which must be exceeded. NRT operates in the 10, 20, 50 or 100 kHz bandwidths only. The higher the NRT number, the higher the signal level must be to operate and eliminate residual noise or occasional noise spikes.

2.4.1.8 **MEMORY SELECT** - Two push buttons are provided to select the desired memory channel (00-95). Pressing the up button counts up through the memory channels while the down button counts down. Each memory channel stores all receiver information (COR LEVEL, RF/IF GAIN, AFC and AGC STATUS, ANTENNA, DETECT MODE, BANDWIDTH and TUNED FREQUENCY).

2.4.1.9 **BFO TUNE** - This push button is utilized to allow tuning of the Beat Frequency Oscillator available only in CW and optional SSB modes. The LED on the push button illuminates indicating active BFO tuning. The tuning display indicates the offset frequency of ±8 kHz in 100 Hz steps in CW or ±1.5 kHz in 100 Hz steps for SSB.

*PANSEC - Selects PANSEC (Panoramic Sector) mode of operation. Requires PANSEC option. Produces two traces (Sector Scan and Pan Scan) and two markers (Frequency Pointer and Sector Position Indicator) on an external display.

2.4.1.10 **TUNING RATE** - Depressing one of the three tuning rate push buttons causes the tuned frequency to change in 1 MHz, 10 kHz or 100 Hz increments as the tuning knob is rotated.

*VARIABLE TUNING RESOLUTION - Setting position 6 of DIP switch S2 (located on Receive Interface module A5A2) to the OPEN position, Variable Tuning Resolution is selected. With Variable Tuning Resolution selected, the tuning resolution is operator selectable from 100 Hz to 10 MHz. When Variable Tuning Resolution is selected, a flashing digit is displayed in the front panel frequency window. The position of the flashing digit is controlled by the left shift "←" and right shift "→" arrows. Each time the left shift push button is (10 kHz key) is pressed, the flashing digit is shifted one place to the left (up to 10 MHz). Shifting the tuning resolution to the left increases the tuning rate while decreasing the tuning resolution. Pressing the right shift push button moves the flashing digit one place to the right (down to 100 Hz). Moving the tuning resolution to the right (100 Hz key) decreases the tuning rate and increases the tuning resolution.

*HOUR - Requires Extended Memory, Option M. Depressing this push button illuminates its LED enabling the tuning wheel to increment or decrement the displayed hour indication.

*Indicates upper case function.

*MINUTE - Requires Extended Memory, Option M. Depressing this push button illuminates its LED allowing the tuning wheel to control the minutes displayed.

NOTE

Rotating the tuning wheel to select minutes or hours resets the displayed seconds to 00.

2.4.1.11 **TUNING KNOB** - Rotation of this knob changes the receiver tuned frequency or the Programmable Antenna Selection Frequency. The frequency changes at a rate determined by the tuning rate push buttons.

2.4.1.12 **DISABLE** - Depressing this button removes control of the tuned frequency by the tuning knob. The receiver remains locked at the last selected frequency. Depressing any tuner related push button restores control to the tuning knob.

*TIME - Requires Extended Memory, Option M. Depressing the TIME push button illuminates the LED and converts the FREQUENCY display to a 24 hour clock. The clock digitally displays hours, minutes and seconds. Depressing the TIME key again returns the display to FREQUENCY.

2.4.1.13 **ANT 2** - This push button selects the RF input from either the ANT 1 or ANT 2 input connector. When the ANT 2 push button LED is illuminated, ANT 2 is selected. When the LED is extinguished, ANT 1 is selected.

*FBW SCAN - Requires PANSEC option. With the LED illuminated. Full Bandwidth (FBW) Scan is selected, providing full bandwidth steps. When the LED is extinguished in upper case operation, the Half Bandwidth Scan mode is selected. FBW SCAN mode provides the Sector Scan with a number of steps (dependent on the WIDTH setting) in full bandwidth increments. Half Bandwidth Scan allows the WIDTH control adjustments to be in one-half bandwidth steps.

2.4.1.14 **STO** - Depression of the STO push button transfers the selected receiver functions into the displayed memory channel. The TUNED FREQUENCY, AFC, AGC, RF/IF GAIN, COR LEVEL, BANDWIDTH, DETECT MODE, OPTIONAL BFO FREQUENCY and ANTENNA selections will be stored simultaneously into the channel displayed in the Memory Select window. After the data is stored, the Memory Select display is incremented to the next higher memory channel.

*AUTO LOG - Requires RLOG, Option J. Depressing this push button twice illuminates its LED, along with the MAN LOG push button LED, and is utilized with either the SCAN or STEP mode of operation. During these operation modes, if a signal level is encountered that is greater than the selected COR level, signal data is sent to the printer. AUTO LOG provides information to the printer of any signal above the COR level and then continues through the selected cycle repeatedly.

*Indicates upper case function.

2.4.1.15 **MAN** - The MAN push button permits the return to the Manual mode of operation from the Scan, Step, PANSEC or Memory Recall modes. When returning from Recall, a single depression of the MAN push button returns the receiver to the Manual mode. When returning from the Scan, Step, or PANSEC mode, a single depression places the receiver into the Scan, Step, or PANSEC Continue modes respectively. A second depression places the receiver into the Manual operating mode.

*MAN LOG - Requires RLOG, Option J. Only this push button LED is illuminated placing the receiver in the Manual Log mode. This mode provides data to the printer for a signal that exceeds the selected COR level and then stops until the SCAN or STEP push button is depressed again.

2.4.1.16 **REM** - Permits switching, at the receiver, between the local and remote modes of operation. The REM push button LED is illuminated when in the remote mode and extinguished when in the local mode. When switching between modes is performed by a remote controlling device, the REM push button LED indicates the operating mode.

*488 ADDR - Requires 488, Option D. Depressing this push button selects the IEEE-488 Address, illuminates the LED and displays ADR in the FREQUENCY display. Rotating the tuning wheel allows selection of an address from 00 to 30. Depressing any other front panel key (other than 488 ADDR) toggles an "S" or a blank for the least significant digit in the FREQUENCY display. "S" signifies master/slave operation and a blank signifies IEEE-488 interface bus operation. Depressing 488 ADDR again returns the front panel to normal operation.

2.4.1.17 **RCL** - The RCL push button recalls the receiver information stored in the active memory channel and displays the information on the front panel display and indicator lights. The display of the memory information does not affect the receiver operation. The receiver remains locked to the previously selected functions and frequency.

2.4.1.18 **EXC** - Depressing the EXC button sets the receiver in accordance with the frequency and function selection stored in the active memory.

2.4.1.19 **CLR** - The CLR push button activates a three step clear sequence that resets the receiver front panel and clears the memory. Depressing the CLR push button one time initiates the clear sequence. The CLR LED illuminates, indicating that the clear sequence has been initiated, but the front panel and memory are not affected. This sequence can be aborted by depressing any front panel push button, other than CLR. Depressing CLR a second time resets the front panel to: AGC ON, AFC OFF, BW #1, AM, MAN, COR-00, MEM-00, ANT 1, 20.0000 MHz with tuning disabled. The clear sequence can be aborted at this time without clearing the memory by depressing any front panel push button, other than CLR. Depressing the CLR push button a third time completes the clear sequence. The memory is cleared and the CLR LED is extinguished.

*Indicates upper case function.

2.4.1.20 SCAN - In the Scan mode the receiver searches up to 48 operator programmed bands for signal activity greater than the programmed COR level. When signal activity is present, the receiver stops until the signal falls below the COR level or the operator again depresses the SCAN button.

*CURSOR SCAN - Requires CURSOR, Option M. Depressing this push button illuminates its LED and causes the receiver to scan between two valid frequencies stored in memory. This scan displays a panoramic trace of the signal activity within the scanned sector. Rotating the tuning wheel moves the cursor across the signal monitor allowing the cursor to be centered above a signal and the frequency of that signal to be displayed in the FREQUENCY display. Depressing the CURSOR SCAN push button again disables Cursor Scan and returns the front panel to normal operation.

2.4.1.21 STEP - In the Step mode, the receiver steps to the frequency stored in each of the 96 memory channels. When signal activity greater than the programmed COR level is present, the receiver stops until the signal falls below the COR level or the operator again depresses the STEP button.

*PANSEC DECAY - Requires PANSEC option. Depressing this push button causes the displayed signal amplitude during PANSEC mode, to decrease by one-half when the displayed signal ceases. This allows a momentarily transmitted signal to be observed for several scans with decreasing amplitudes.

2.4.1.22 DWELL - The DWELL control is a dual function control that can be set to operate in either Pre-Dwell or Post-Dwell modes by changing the configuration of DIP switch S2 on the Synthesizer Interace subassembly (A5A2).

Pre-Dwell sets the time period the receiver spends at each Scan increment or Step frequency in the Scan or Step mode. It adjusts the time increment from approximately 0 (CCW) to 2 sec (CW).

Post-Dwell determines the time period the receiver remains locked onto a signal acquired in the Scan or Step mode. Full counter clockwise rotation of the DWELL control provides a minimum dwell period, with the dwell period increasing as the control is rotated clockwise. Full clockwise rotation causes the receiver to remain locked onto the signal as long as the signal level is greater than the programmed COR level. Regardless of the DWELL control setting, once signal transmission stops or the signal level falls below the set COR level, the Scan or Step sequence continues. Refer to paragraphs 2.4.2.3 and 2.4.2.4 for a description of Scan and Step modes.

The WJ-8617B(1) receiver is shipped with the Pre-Dwell mode selected. DIP switch S2 on the Synthesizer Interface subassemably (A5A2) switch #2 is in the OPEN position. Closing switch #2 selects the Post-Dwell mode.

*WIDTH - This control is utilized only in PANSEC operation mode. It controls the width of the frequency segment viewed on an external CRT. Control range is from 2 times the selected PAN bandwidth to the full width of the PAN display.

*Indicates upper case function.

2.4.1.23 **AUDIO GAIN** - The AUDIO GAIN control adjusts the level of the audio signal present at the phone jack. This level is adjustable to 10 mW.

2.4.1.24 **LINE AUDIO** - This rear panel control adjusts the level of the audio signal present at the rear panel audio output J3. The level of the signal is adjustable to 10 mW.

2.4.1.25 **RF/IF GAIN** - The RF/IF GAIN control provides manual control of the RF and IF amplifiers when AGC is not selected.

2.4.1.26 **LOCKOUT** (Optional) - This function permits the exclusion of selected signals from a Scan preventing the receiver from locking onto undesired signals. Pressing LOCKOUT, with the undesired frequency selected, places the frequency and bandwidth of the signal in the Lockout memory and the LOCKOUT LED illuminates for 1 second. All signals within 1/2 of the IF bandwidth of the Lockout frequency will be omitted from succeeding Scans. Lockout channels are sorted in order of ascending frequency regardless of the number displayed in the MEMORY SELECT window. The highest Lockout frequency occupies Channel 95. This button is blank if the Lockout option is not included.

2.4.1.27 **MSTR/SLAVE** (Optional) - The Master/Slave option permits the control of up to 14 additional master/slave equipped receivers, using the front panel controls of one of the receivers. Each receiver must be equipped with the IEEE Interface option. This button is blank if the master/slave option is not included.

2.4.1.28 **INTENSITY** (Optional) - The INTENSITY control varies the brightness of the trace on the CRT of the signal monitor.

2.4.1.29 **FOCUS** (Optional) - The FOCUS control provides a means of obtaining a sharp trace on the CRT.

2.4.1.30 **SWEEP RATE** (Optional) - The SWEEP RATE control is utilized to obtain optimum resolution at the sweep width being used and to prevent loss of sensitivity by sweeping too fast. The sweep rate is adjustable to 25 Hz.

2.4.1.31 **SWEEP WIDTH** (Optional) - The SWEEP WIDTH control varies the width of the frequency spectrum being viewed. In a fully clockwise position, the maximum bandwidth is displayed. The sweep width is adjustable from 0-4 MHz.

2.4.1.32 **CENTER FREQ** (Optional) - The CENTER FREQ control varies the horizontal position of the vertical pips on the CRT. Use this control to center the frequency spectrum under the center mark of the CRT.

2.4.1.33 **GAIN** (Optional) - The GAIN control varies the height of the vertical pips displayed on the CRT. This control is adjusted to maintain the desired height of the display.

2.4.1.34 **MARKER** (Optional) - In the ON position a 21.4 MHz marker is superimposed on the display as a reference marker. The marker frequency is locked to the receiver synthesizer.

2.4.1.35 **LIN/LOG** (Optional) - The LIN/LOG switch provides a linear or logarithmic vertical deflection. The LIN position provides a display with a vertical deflection proportional to the signal strength. In the LOG position, the vertical deflection is proportional to the LOG of the signal strength. This provides greater resolution of weaker signals.

2.4.1.36 **DIGITAL DISPLAY** - The DIGITAL DISPLAY is composed of seven-segment LED's. The display provides a digital read out, displaying the tuned frequency, COR Level selected, relative signal strength and active memory channel. With the DAV option installed, the audio or video output levels will be displayed in the COR window when the uppercase mode is selected.

2.4.2 LOCAL OPERATION

2.4.2.1 Manual Control

The Manual mode of operation permits total control of the receiver utilizing the front panel push buttons and control knobs. All operating parameters are selected utilizing the controls described in paragraph 2.4.1.

In addition to manually operating the receiver, the Manual mode also permits the operator to program the receiver's 96 channel memory and to enter into the Scan, Step or PANSEC modes of operation.

2.4.2.2 Memory Programming

The receiver's memory permits storage of receiver parameters such as COR Level, RF/IF Gain, AFC and AGC status, ANTENNA, DETECTION MODE, IF BANDWIDTH and TUNED FREQUENCY. This stored data can be utilized to provide the desired receiver parameters during the Scan or Step mode of operation, or it can function as a scratch-pad memory in the Manual mode to retain particular receiver settings. Programming of the memory is performed as follows:

Depress Memory Select Up/Down	Depress the Up or Down Memory Select push button until the number corresponding to the desired memory channel is displayed in the Memory Select window and then release the push button.

Depress COR Up/Down	Depress the Up or Down COR LEVEL push button until the number corresponding to the desired COR Level is displayed in the COR window (00-40 or --) and then release the push button.
Depress AFC	Changes status of AFC. AFC on - LED illuminated AFC off - LED extinguished
Depress AGC	Changes AGC status. Automatic Gain Control - LED illuminated Manual Gain Control - LED extinguished
Depress BW	Depress Bandwidth push button corresponding to the desired IF bandwidth. LED on the selected bandwidth push button illuminates.
Depress DETECT	Depress push button corresponding to the desired Detection mode. AM, FM or Pulse detection standard (LOG, CW and SSB optional). LED on selected Detection mode push button illuminates.
Rotate Tuning Knob	Rotate the tuning knob CW or CCW until the desired frequency is displayed by the frequency display above the tuning knob. The tuning increments are determined by the 1 MHz, 10 kHz and 100 Hz Tuning Rate push buttons or by the left and right shift push buttons with variable tuning resolutions of: 10 MHz, 1 MHz, 100 kHz, 10 kHz, 1 kHz and 100 Hz.

Depress ANT 2	Selects RF input from the standard Antenna 1 or Auxiliary Antenna 2. LED illuminated - Antenna 2 selected LED extinguished - Antenna 1 selected
Depress STO	Stores the selected receiver parameters into the memory channel displayed in the memory select window. Once the information is stored, the memory channel display is automatically incremented to the next higher channel.

Data stored in each memory channel can be recalled by depressing the RCL push button. When RCL is depressed, the receiver parameters stored in the channel displayed in the memory select window will be displayed on the front panel indicators of the receiver. The receiver remains at the parameters set prior to the selection of RCL. Depression of the MAN push button returns the indicators to that of the receiver setting or depression of EXC (EXECUTE) sets the receiver to the recalled data on the front panel.

2.4.2.3 SCAN Mode

In the Scan Mode, the receiver scans up to 48 operator programmed frequency bands utilizing the standard receiver memory. All receiver parameters and the start frequency of each Scan are stored in the EVEN numbered memory channels and the stop frequency is stored in the ODD channels. Upon initiation of the Scan, the receiver begins the Scan at the frequency stored in the EVEN numbered memory channel, setting the receiver to the parameters stored in that channel, and continues to the next higher ODD numbered memory channel, containing the stop frequency. The Scan is performed in discrete frequency increments equal to approximately one-half the programmed IF bandwidth. Scan increments for the various IF bandwidths are listed in the Table of Scan Increments (**Table 2-5**). A maximum of 65536 incremental steps can be made in each Scan, limiting the width of each Scan band to the Scan increment times 65536. If the maximum width is exceeded, an ERROR 812 appears on the front panel display.

Table 2-5. Table of Scan Increments

SELECTED IF BANDWIDTH	SCAN INCREMENT	SELECTED IF BANDWIDTH	SCAN INCREMENT
10 kHz	5 kHz	300 kHz	150 kHz
20 kHz	10 kHz	500 kHz	250 kHz
50 kHz	20 kHz	1 MHz	500 kHz
75 kHz	30 kHz	2 MHz	1 MHz
100 kHz	50 kHz	4 MHz	2 MHz
250 kHz	120 kHz		

If the COR LED is illuminated when the Scan is initiated, the receiver waits 50 msec. before stepping to the next frequency increment, permitting the COR circuits to deactivate. After stepping to the new frequency, if the COR LED extinguishes and comes back on, the receiver locks on to the signal. Otherwise, the Scan continues. When programming the COR level as one of the Scan parameters, a level should be set that permits the LED to extinguish in the absence of signals, but causes the LED to illuminate when signal activity is present. Otherwise, the COR LED remains on at all times and the receiver will not stop on a signal during the Scan.

During the Scan, if AFC is selected, the AFC LED remains illuminated. When a signal is detected, and the COR LED illuminates, the AFC adjusts the receiver to center the signal within the IF bandwidth. If AGC is selected, the AGC LED extinguishes and the receiver operates at maximum gain during the Scan. AGC remains inactive until the operator selects the Scan Continue mode.

The type Scan sequence is determined by the channel number displayed in the memory select window at the time the SCAN button is depressed. When an EVEN number is displayed, the receiver begins the Scan at that EVEN channel and continues to the next ODD number in sequence. This single band continues to be scanned until signal activity greater than the programmed COR level is detected or until the MAN push button is depressed. If an ODD number is displayed when the Scan is initiated, the Scan begins scanning at channel 00 and scans each band until it reaches the ODD number memory channel that was displayed when the SCAN button was depressed. This multiple Scan sequence continues until signal activity greater than the programmed COR level is detected or the MAN push button is depressed.

Prior to initiating the Scan function, the memory must be programmed, using the procedures described in paragraph 2.4.2.2. Using this procedure, enter the operating parameters and start frequency into the EVEN channel and then step the memory select to the next higher ODD channel. Enter the stop frequency (stop frequency must be greater than start frequency). Upon completion of memory programming, the Scan function can be initiated as follows:

Depress Memory Select Up/Down	Hold the Up or Down push button depressed until the desired memory channel is displayed in the memory select window (n). This step determines the type of Scan sequence that is selected.
	if n = ODD number - Receiver will first Scan from channels 00 to 01. Each succeeding band is sequentially scanned up to and including the band comprised of channels n - 1 to n.
	if n = EVEN number - Receiver scans a single band from channel n to n + 1.

Depress SCAN	Initiates the selected Scan sequence. Scan push button LED illuminates and the front panel indicators reflect the programmed parameters for the active band. The frequency display indicates the frequency of each increment of the Scan. If AGC has been selected as one of the programmed parameters, the AGC LED is extinguished and the receiver operates at maximum gain, during the Scan.
Rotate DWELL Knob	Controls the Scan rate by controlling the time that the receiver dwells at each increment of the Scan. Fully counterclockwise rotation selects minimum Dwell time with the time increasing as the knob is rotated clockwise.

When a signal greater than the programmed COR level is encountered, the Scan stops and the COR push button LED illuminates. The receiver remains at this frequency as long as the signal is present or until the SCAN button is again depressed to resume the Scan sequence.

2.4.2.3.1 SCAN Continue

The Scan Continue function permits the interruption of the Scan sequence to allow manual control of the receiver. This mode permits an operator to manually optimize the detected signal and to re-enter the Scan sequence at the point where the interruption took place. Entering into the Scan Continue mode from the Scan mode is performed as follows:

Depress MAN	Initiates the Scan Continue mode of operation. SCAN push button LED remains on and the MAN push button LED illuminates. If AFC was on during the Scan, it is turned off and the AFC LED extinguishes. If AFC is still desired, it must be selected again by depressing the AFC push button.

If AGC was selected as a Scan parameter, it is activated and the AGC LED illuminates. The receiver gain is then controlled by the AGC circuitry.

Operate Manual Controls — All front panel controls function as if in the Manual mode of operation. Use controls to optimize response of detected signal. From this mode: **a)** the Scan can be re-entered at the point where the Scan was interrupted, or **b)** the receiver can be placed into the Manual mode of operation.

a) Re-enter the Scan mode:

Depress SCAN — Returns the receiver to the Scan mode of operation. The MAN LED is extinguished and the SCAN LED remains illuminated. Scan is restarted at the point where it was interrupted by the Scan Continue function.

b) Enter Manual mode:

Depress MAN — Places the receiver into the Manual mode of operation from the Scan Continue mode. The MAN LED remains illuminated and the SCAN LED is extinguished.

2.4.2.3.2 **Scan Lockout** (Optional)

Scan Lockout is an optional function that is available when the Type 796185 Extended Memory option (EM) is incorporated in the receiver. This function permits the exclusion of selected signals from the Scan to prevent the receiver from locking onto undesired signals. Lockout data is stored in the higher order memory channels, in ascending order, according to frequency (channel 95 will store the highest Lockout frequency). The Scan mode, utilizing the Lockout function, is described as follows:

Depress SCAN — Activates the Scan mode of operation. The SCAN LED is illuminated. The receiver Scans

	the programmed frequency bands until signal activity is encountered. When signal activity greater than the programmed COR level is encountered, the receiver locks onto the signal.
Depress MAN	Places the receiver into the Scan Continue mode of operation. The SCAN and MAN LEDs are both illuminated. The receiver can now be operated manually to optimize the detected signal and the bandwidth can be changed to determine the bandwidth of the Lockout channel.
Depress LOCKOUT	The frequency and bandwidth of the undesired signal is stored in the Lockout memory. LOCKOUT LED illuminates for 1 second. All signals within 1/2 of the IF bandwidth of the Lockout frequency are omitted from succeeding Scans. If AFC has been selected, Lockout occurs after the signal is centered.

2.4.2.3.3 Lockout Channel Recall and Deletion

This mode permits the Recall and display of the information stored in the Lockout channels. It also permits revision of Lockout memory by permitting the deletion of channels where Lockout is no longer desired. To activate the Recall mode, the receiver must be in either the Scan Continue or Manual mode of operation. This operating mode is activated as follows:

Depress RCL	Initializes the Recall mode of operation. The RCL push button LED is illuminated and the front panel display reflects the information stored in the channel whose number is displayed in the MEMORY SELECT window.
Depress MEMORY SELECT Up/Down	Hold the MEMORY SELECT Up or Down push button in until the number corresponding to the desired memory channel is displayed in the MEMORY SELECT

	window. When the displayed channel is a Lockout channel, the letters "LL" will be displayed in the COR window.
Depress LOCKOUT	Deletes the information stored in the Lockout channel that is displayed in the MEMORY SELECT window. The LOCKOUT LED illuminates for 1 second. When a channel is deleted, all Lock-out channels below the deleted one move up one location.
Depress MAN	De-activates the Recall mode and activates the previously selected operating mode (Manual or Scan Continue).

2.4.2.4 **STEP Mode**

In the Step mode, the receiver steps through up to 96 operator programmed memory channels in search of signal activity, utilizing the standard receiver memory. Each memory channel is programmed with a complete set of receiver parameters using the memory programming procedure described in paragraph 2.4.2.2. RF frequencies need not be in ascending order as in the Scan mode.

The number displayed in the memory select window (n) determines the highest channel used in the Step sequence. When the STEP push button is depressed, the receiver begins stepping all channels containing valid memory data, starting at channel 00 and continuing to channel n. This stepping sequence continues until a signal greater than the programmed COR level is detected or until the MAN push button is depressed.

If the COR LED is illuminated when the Step mode is initiated, the receiver waits 50 msec. before stepping to the next memory channel to permit the COR circuits to deactivate. After 50 msec, if the COR LED is still on, the receiver locks onto the signal. Otherwise, the receiver Steps to the next memory channel.

Prior to initiating the Step mode, program the memory utilizing the procedure outlined in paragraph 2.4.2.2. The Step mode can then be initiated as follows:

Depress Memory Select Up/Down	Hold the Up or Down push button depressed until the number corresponding to the highest desired memory channel is displayed in the MEMORY SELECT window. NOTE: The displayed number must be greater than 00.

Depress STEP	Initiates the Step mode of operation. The STEP push button LED illuminates and the front panel indicators reflect the programmed parameters in each memory channel as it is selected. The Step sequence begins at channel 00 and sequentially Steps to each channel.
Rotate DWELL Knob	Controls the time the receiver dwells at each channel in the Step sequence. Fully counterclockwise rotation selects minimum dwell time with the time increasing as the knob is rotated clockwise.

When a signal greater than the COR level is encountered, the Step sequence stops and the COR push button LED illuminates. The receiver remains at this frequency as long as the signal is present or until the STEP push button is again depressed to resume the Step sequence.

2.4.2.4.1 **STEP Continue**

The Step Continue function permits the interruption of the Step sequence to allow manual control of the receiver. This function permits an operator to manually optimize the detected signal and re-enter the Step sequence at the point where the interrupt took place. It also allows the operator to reprogram that memory channel if the signal is of no further interest. Entering into the Step Continue mode from the Step mode is performed as follows:

Depress MAN	Initiates the Step Continue mode of operation. The STEP push button LED remains on and the MAN LED illuminates. The front panel indicators reflect the data stored in the memory channel displayed in the MEMORY SELECT window.
Operate MANUAL Controls	All front panel controls function as in the Manual mode of operation. Use the controls to optimize the detected signal or to change parameters if the detected signal is of no interest.

Depress STO	Updates the displayed memory channel with the new or revised data. The STO push button LED illuminates for 1 second when depressed.

From the Step Continue mode, the Step mode can be re-entered at the point where the Step sequence was interrupted or the receiver can be placed into the Manual mode of operation.

a) Re-enter the Step mode:

Depress STEP	Returns the receiver to the Step mode of operation. The MAN push button LED is extinguished and the STEP LED remains illuminated. The Step sequence is restarted at the point where the interrupt took place.

b) Enter the Manual Mode:

Depress MAN	Places the receiver into the Manual mode of operation. The MAN push button remains illuminated and the STEP push button LED extinguished.

2.4.2.5 **Master/Slave Operation** (Optional)

The Master/Slave function permits the control of up to 14 additional Master/Slave equipped receivers, utilizing the front panel controls of one of the receivers. Each receiver must be equipped with an IEEE-488 Interface. With the master and slave receiver(s) connected to the same interface bus, set the IEEE-488 address of the receivers. Available addressses are from 00 to 30. The address may be set via hardware (DIP switch S1 on the IEE-488 option module) or software. DIP switch S1 (positions 1-5) is used to set the receiver hardware address.

The receiver address may also be set via the front panel. Depressing the FUNCTION push button and the 488 ADDR push button causes Adr XX to be displayed on the front panel. XX is the receiver address. Rotate the tuning wheel to select the desired address (00-30). Depressing the FUNCTION push button again enters the displayed address into memory.

NOTE

The hardware address (S1 switch setting) is displayed at power up only if RAM memory is lost or if the S1 switch setting has changed since the last receiver power up.

Depress FUNCTION push button	Placing the receiver front panel in the upper case mode.
Depress the REM (upper case IEEE-488 push button)	The front panel displays adr XX (XX=00-30)
Rotate the tuning wheel	Rotating the tuning wheel selects the receiver remote address.
Depress the MSTR/SLAVE push button	An S is displayed in the FREQUENCY window. The S must be displayed in the master and slave receivers for Master/Slave to function.
Depress the FUNCTION push button	Receiver front panel is in normal mode.
Depress the MEMORY SELECT button	Press the Up to Down push button until the desired slave receiver address is displayed in the MEMORY SELECT WINDOW.

NOTE

If the Clear push button (CLR) is pressed the master and slave receivers should be turned off and on again. Otherwise uncertain Master/Slave operation may occur.

Depress MSTR/SLAVE	Activates the Master/Slave mode of operation and places the addressed receiver(s) in the Slave mode. The LED on the MSTR/SLAVE push button illuminates on the master unit and the remote push button LED illuminates on the addressed slave unit(s). All front panel controls on the slave unit(s) are disabled except for the remote* push button. All master unit controls function normally and control both the master and addressed slave units.

* At the slave unit, depression of the REM push button removes the unit from control by the master and restores local control.

Depress MSTR/SLAVE	When in the Master/Slave mode, depression of the MSTR/SLAVE push button deactivates the Master/Slave mode. The MSTR/SLAVE push button LED is extinguished.

2.4.2.6 **CURSOR** (Optional)

Cursor is an optional mode of operation that is available when the Digital Refreshed Display Option is installed and an active Function (F↑) push button. In this mode, a portion of the RF spectrum can be scanned with a signal strength vs. frequency display of the scanned frequencies displayed on the signal monitor of the receiver. The tuning knob can then be rotated to position a cursor over any of the signal pips displayed on the signal monitor. When the cursor is positioned over the signal pip, the frequency of that signal is displayed in the FREQUENCY WINDOW of the digital display.

Prior to entering into the Cursor mode, the memory must be programmed, using the procedure described in paragraph 2.4.2.2. Store the start frequency and operating parameters into the EVEN numbered channels and the stop frequency in the ODD channels. Upon completion of the memory programming, the Cursor mode may be entered into, as follows:

Depress F↑	Selects the upper case function. All push button LED's, except for active uppercase functions, extinguish.
Depress Cursor (SCAN push button)	Selects the Cursor mode of operation and activates the Cursor Scan. The push button LEDs on the front panel illuminate and the receiver performs a single Scan of the programmed band. Upon completion of the Scan, the receiver enters into the Cursor/Manual mode of operation.

Operate the Tuning Rate push button	Select the desired tuning rate by depressing the 1 MHz, 10 kHz or 100 Hz push button and rotate the tuning knob until the Cursor is positioned over the desired signal pip on the signal monitor. The frequency display on the digital display indicates the frequency at which the Cursor is positioned. Note: The Cursor travel is not limited to the frequency band displayed on the signal monitor. Therefore, if the Cursor does not appear on the signal monitor, rotate the tuning knob until the displayed frequency is within the scanned frequency band.

To disable the Cursor mode, and return the receiver to normal operation, proceed as follows:

Depress F↑	The Cursor (SCAN) push button LED illuminates and all other LED's extinguish.
Depress Cursor (SCAN)	The Cursor (SCAN) LED extinguishes and the selected push button LED's illuminate. The receiver is then restored to normal operation.

2.4.2.7 **Digital Audio/Video Gain** (Optional)

Digital Audio/Video Gain (DAV) is an option permiting digital control of the audio and video outputs of the receiver. With the Digital Audio/Video Gain subassembly installed in option slot 6 of the Digital Motherboard (A5), the audio and video outputs can be controlled over a 30 dB range, using the front panel push buttons. In the DAV mode, the COR window displays a number from 00 to 99 representing the output level of either the audio or video outputs, depending on which of the functions are selected.

Selection of DAV and the setting of the output levels are performed as follows:

Depress F↑	Selects the upper case function. All push button LED's, except for active upper case functions extinguish. The F↑ LED illuminates, indicating that the front panel is in the upper case mode.

Depress Audio (AFC Push button)	Selects Audio Gain Control. The LED on the Audio (AFC) push button illuminates and the COR window displays the audio output level.
Depress COR Up/Down	Depress and hold the COR Up or Down push button until the desired audio output level is displayed in the COR window. 99 - Maximum output level. (Clipping level at 100% modulation.) 00 - Minimum output level. (Noise level when no modulation is present.)
Depress Video (AGC Push button)	Selects Video Gain Control. The LED on the Video (AGC) push button illuminates and the Audio LED (if previously selected) extinguishes. The COR window displays the video output level.
Depress COR Up/Down	Depress and hold the COR Up or Down push button until the desired video output level is displayed in the COR window. 99 - Maximum output level. (Clipping level at 100% modulation.) 00 - Minimum output level. (Noise level when no modulation is present.)

2.4.2.8 **Single Sideband Operation** (Optional)

The capability of detecting Upper Sideband (USB) and Lower Sideband (LSB) signals is incorporated in the WJ-8617B(1) receiver when the SSB Demodulator (A3A14) and the VBFO (A4A5) are installed. With Single Sideband capabilities added, an IF Amplifier and FM Demodulator with a bandwidth of 20 kHz or less should be installed in the bandwidth #1 slot. A 6 kHz IF bandwidth is preferred for SSB operation.

Selection of SSB operation is accomplished by depressing the SSB push button. When selected, the SSB push button illuminates and the #1 bandwidth is automatically selected. A "U" or an "L" illuminates on the digital display indicates whether the Upper Sideband (U) or Lower Sideband (L) is active. Switching between Upper and Lower Sideband operation is performed by again depressing the SSB push button.

2.4.2.9 ERROR CODES

If an error condition should occur, the word "Error" along with a three digit error code is momentarily displayed in place of the frequency display. The error codes associated with the various operating modes are as follows:

Error 551	This code is displayed when all Lockout channels are in use and the creation of an additional one is attempted. To increase Lockout memory space, depress RCL and step to a channel number below the lowest existing Lockout channel. Depress LOCKOUT. The displayed channel and all higher channel numbers are now available for Lockout.
Error 552	This code is displayed when an attempt is made to store data, other than Lockout data into a channel designated for Lockout.
Error 810	This code is displayed when an attempt is made to initiate the Step or Scan mode and no valid data is stored in the memory locations to be scanned or stepped. The memory must be programmed as described in paragraph 2.4.2.2.
Error 811	This code is displayed when an attempt is made to initiate the Step mode when 00 is displayed in the MEMORY SELECT window. Depress the Memory Select Up push button to select a channel greater than 00.
Error 812	This code is displayed when an attempt is made to initiate a Scan and the number of Scan increments required is greater than 65536. The maximum width of a Scan band is equal to the Scan increment times 65536.

Error 813	This code is displayed when Scan is initiated and the memory is programmed with the start frequency greater than the stop frequency. The memory must be programmed with the EVEN numbered channel containing the lower frequency with the frequencies in ascending order. Or when the frequency step is less than the selected bandwidth.
Error 814	This code is displayed when an attempt is made to utilize a non-existing IF bandwidth.
Error 815	This code is displayed when the stop frequency BANDWIDTH is greater than or equal to the start frequency BANDWIDTH.

When the receiver is equipped for Remote operation, an additional set of error codes is utilized to inform the operator of an error condition, associated with the Remote mode. If an error condition should occur, the work "Error" along with a three digit error code will be momentarily displayed in place of the frequency display. In addition, a service request will be initiated to flag the controller. When queried by the controller, the two least significant digits of the error code are placed on the bus. The error codes associated with the remote mode of operation are as follows:

Error 401	Buffer full (message too long).
Error 402	Less than two characters in the message.
Error 403	Framing, parity or overrun error (RS-232)
Error 404	Invalid number
Error 406	"/" or "?" not valid for this mnemonic.
Error 407	Invalid message.

2.5 REMOTE OPERATION

2.5.1 GENERAL

Remote operation of the WJ-8617B(1) Receiver requires the installation of the IEEE-488 or RS-232 Remote Interface. These interfaces provide the electrical and mechanical compatibility to permit the exchange of messages between the receiver and a compatible controlling device. Both the IEEE-488 and the RS-232 Interfaces recognize the same set of messages and each can operate in ASCII or Binary formats. The Table of Mnemonics and Binary Codes (**Table 2-6**) lists the usable message codes, as mnemonics for ASCII operation and hexadecimal codes for binary operation, along with a description of their function.

In the ASCII format, the message consists of a series of data bytes that form one of the mnemonics listed in **Table 2-6.** Each byte is one ASCII character of the mnemonic. When the mnemonic contains a variable value (n or f) the mnemonic is followed by a number representing that value. Each digit of the number is sent as a separate ASCII character. In the binary format, the mnemonic is sent as one 8-bit byte containing the hexadecimal code corresponding to the mnemonic. When a variable value is to be included in the message, it is sent as one or more data bytes, representing the binary or hexadecimal value.

Table 2-6. Mnemonics and Binary Codes

NOTE: The following table lists mnemonics for the standard receiver. Mnemonics used with the optional assemblies are preceeded by an asterisk (*).

WJ-861X SERIES MNEMONICS LIST

COMMAND			RESPONSE			DESCRIPTION
ASCII	HEX	DEC	ASCII	HEX	DEC	
AFC	42	66				Turn on AFC
AFC/	43	67				Turn off AFC
AFC?	44	68				Request AFC status
			AFC/	43	67	AFC not on
			AFC	42	66	AFC on
AGC	45	69				Turn AGC on
AGC/	46	71				Turn AGC off
AGC?	47	71				Request AGC status
			AGC	45	69	AGC on
			AGC/	46	70	AGC not on
AM	48	72				Select AM Mode
AM?	4A	74				Request AM Modulation (%)
			AM(n)	48	72	AM Modulation value sent

Table 2-6. Mnemonics and Binary Codes (Continued)

ASCII	COMMAND HEX	COMMAND DEC	RESPONSE ASCII	RESPONSE HEX	RESPONSE DEC	DESCRIPTION
ANT(n)	4B	75				Selects antenna (1) or (2)
ANT?	4D	77				Requests selected antenna
			ANT(n)	4B	75	Returns selected antenna
*AUD	9F	159				Sets audio level (0-255)
*AUD?	A1	161				Requests set audio level
			AUD(n)	9F	159	Returns set audio level
*AUL(n)	F3	243				Sets Audio Output level
*AUL?	F5	245				Requests Audio Output level
			AULn)	F3	243	Returns Audio Output level
*BFO(n)	39	57				Sets BFO Freq. ±7.9 9kHz
*BFO?	3B	59				Requests set BFO Frequency
*BIC?	AA	170				Request BITE test Param #
			BIC(n)	A8	168	Returns BITE test Param #
BIN	n/a	n/a				Sets Binary Mode
BIN/	55	85				Sets ASCII Mode (Default)
*BIT(n)	A5	165				Start/Continue BITE
*BIT?	A7	167				Requests BITE Error #
			BIT(n)	A5	165	Returns BITE Error #
BW(n)	4E	78				Selects BW slot 1-4 or 1-5
BW?	50	80				Request selected BW slot
			BW(n)	4E	78	Returns selected BW slot
BWC?	9E	158				Requests BW size
			BWC(n)	9C	156	Returns selected BW size
CLM	6C	108				Clear Receiver and Memory
CLR	51	81	3F	40	42	Clear & initialize Receiver
COR(n)	57	87				Set COR level (0-40)
COR?	59	89				Request COR level
			COR(n)	57	87	Returns set COR level
CST?	9B	155				Request COR status
			CST/	9A	155	COR status off
			CST	99	153	COR status on
CW	5A	90				Select CW detection mode
DET?	5F	95				Requests detection mode
			FM	69	105	FM detection mdoe selected
			USB	93	147	USB detection mode selected
			LOG	96	150	LOG mode selected
			LSB	72	114	LSB detection mode selected
			AM	48	72	AM detection mdoe selected
			CW	5A	90	CW detection mode selected
			PLS	78	120	PLS detection mode selected
DWL(n)	60	96				Sets dwell time
DWL?	62	98				Requests dwell time
			DWL(n)	60	96	Returns set dwell time

Table 2-6. Mnemonics and Binary Codes (Continued)

COMMAND ASCII	COMMAND HEX	COMMAND DEC	RESPONSE ASCII	RESPONSE HEX	RESPONSE DEC	DESCRIPTION
ERR?	65	101				Requests Error number
			ERR(n)	63	99	Returns Error number
EXC	66	102				Executes selected RCL #
FBW	D8	216				Full bandwidth steps (SCAN)
FBW/	D9	217				Half bandwidth steps (SCAN)
FBW?	Da	218				Request bandwidth step size
			FBW	D8	216	Returns Full BW step size
			FBW/	D9	217	Returns Half BW step size
FM	69	105				Selects FM detection mode
FM?	6B	107				Requests FM detection mode
			FM(n)	AB	107	Returns FM detection value
FMO?	AD	173				Requests FM offset value
			FMO(n)	AB	171	Returns FM offset value
FRQ(n)	3C	60				Set tuned frequency (in MHz)
FRQ?	3E	62				Requests tuned frequency
			FRQ(n)	3C	60	Returns tuned frequency
*GEN	F1	225				Turns BITE generator on
*GEN/	E2	226				Turns BITE generator off
*EN?	E3	227				Requests BITE gen. status
			GEN	E1	225	BITE generator on
			GEN/	E2	226	BITE generator off
*IND?	D2	210				Requests LO Mode
LCK	94	148				Locks out current parameter
LCK	96	150				Checks for Lock out
			LCK	94	148	Lock out selected (on)
			LCK/	95	149	Lock out not selected (off)
LGV?	71	113				Requests Log Video value
			LGV(n)	6F	111	Returns Log Video value
LLO	F9	249				Local Lockout enabled
LLO/	FA	250				Local Lockout disabled
LLO?	FB	251				Requests Lockout status
			LLO	FA	249	Local Lockout enabled
			LLO/	FB	250	Local Lockout disabled
*LOG	96	150				Selects Log Detection Mode
*LSB	72	114				Selects LSB Detection Mode
*MAN	75	117				Selects MAN Detection Mode
*MAS	CC	204				Selects Master LO Mode
*NRT	B4	180				Selects NRT Mode
*NRT/	B5	181				Turns NRT Mode off
*NRT?	B6	182				Requests NRT Mode
			NRT	B4	180	NRT Mode is on
			NRT/	B5	181	NRT Mode is off
OPT?	DD	221				Requests installed options
			OPT(n)	(NO BINARY)		Returns options installed
PLS	78	120				Selects Pulse Det. Mode
RCL(a)	7B	123				Selects Recall Mode

Table 2-6. Mnemonics and Binary Codes (Continued)

ASCII	COMMAND HEX	COMMAND DEC	RESPONSE ASCII	RESPONSE HEX	RESPONSE DEC	DESCRIPTION
RCL?	7D	125				Requests current Channel
			RCL(n)	7B	123	Returns selected Channel
RFG(n)	7E	126				Sets RF Gain (0-255)
RFG?	80	128				Requests RF Gain setting
*RLG	FC	252				Enables RLOG mode
*RLG/	FD	253				Disables RLOG mode
*RLG?	FE	254				Requests RLOG status
			RLG	(NO BINARY)		RLOG mode enabled
			RLG/	(NO BINARY)		RLOG mode disabled
			RFG(n)	7E	126	Returns RF Gain setting
RMT	81	129				Selects Remote Mode
RMT/	82	130				Sets receiver to Local
RMT?	83	131				Requests Control status
			RMT	81	129	Returns Remote selected
			RMT/	82	130	Returns Local selected
SCN(n)	84	132				Selects Scan Mode
*SLA	CF	207				Selects Slave LO Mode
SS?	89	137				Requests Signal Strength
			SS(n)	87	135	Returns Signal Strength
STO(n)	8A	138				Store data in Mem. CH "n"
STP(n)	8D	141				Selects Step Mode
STS(n)	90	144				Sets status register for conditional SRW
STS?	92	146				Requests Status byte
			STS(n)	90	144	Returns Status byte
*TIM(n)	AE	174				Sets Time Function
*TIM?	B0	176				Requests Set Time
			TIM(n)	AE	174	Returns Set Time
			AM	(NO BINARY)		Returns AM Modulation
			FM	(NO BINARY)		Returns AM Modulation
			CW	(NO BINARY)		Returns AM Modulation
*USB	93	147				Selects USB Detection Mode
VER?	E0	224				Requests Software Version
			VER(n)	(NO BINARY)		Returns Software Version #
*VID(n)	A2	162				Sets Video Level (0-255)
*VID?	A4	162				Requests Video Set Level
			VID(n)	A2	162	Returns Set Video Level
*VIL?	F8	248				Requests Video Level
			VIL(n)	F6	246	Returns Video Level

2.5.1.1 **Variable Values**

In **Table 2-5** (n) represents a decimal number ranging from 0 to 255. When the ASCII format is used, each digit is represented by a separate ASCII character. In the binary format, this value is sent as a single byte containing the binary number representing the value.

The example below illustrates, in simplified form, the differences in the data when the ASCII and Binary formats are used to send a DWL (n) message ((n) = 125). In actual practice, additional data is required to address the bus and to indicate the end of the message.

ASCII FORMAT	
D	0 1 0 0 0 1 0 0
W	0 1 0 1 0 1 1 1
L	0 1 0 0 1 1 0 0
1	0 0 1 1 0 0 0 1
2	0 0 1 1 0 0 1 0
5	0 0 1 1 0 1 0 1

BINARY FORMAT	
DWL	0 1 1 0 0 0 0 0
125	0 1 1 1 1 1 0 1

When an FRQ (n) message is sent, (n) represents the frequency in MHz. Using the ASCII format, each digit and the decimal point are represented by a separate ASCII character. Leading and trailing zeros may be omitted. Using the Binary format, the value of (n) is sent as eight BCD digits packed into four bytes. The example below illustrates the differences in the ASCII and Binary formats when an FRQ (n) message is sent (n = 20.5 MHz). In actual practice, additional data bytes are required to address the interface and to indicate the end of a message.

ASCII FORMAT	
F	0 1 0 0 0 1 1 0
R	0 1 0 1 0 0 1 0
Q	0 1 0 1 0 0 0 1
2	0 0 1 1 0 0 1 0
0	0 0 1 1 0 0 0 0
.	0 0 1 0 1 1 1 0
5	0 0 1 1 0 1 0 1

BINARY FORMAT	
FRQ	0 0 1 1 1 1 0 0
00	0 0 0 0 0 0 0 0
20	0 0 1 0 0 0 0 0
50	0 1 0 1 0 0 0 0
00	0 0 0 0 0 0 0 0

The BFO (n) message is used to set the Beat-Frequency-Oscillator frequency when the VBFO option is installed in the receiver. In this message, (n) represents an offset frequency of ±7.99 kHz. When sending a positive offset frequency, using the ASCII format, a separate ASCII character is used for each digit and the decimal point. A minus sign indicates a negative offset. In the Binary format, (n) is sent in the same manner as the FRQ (n) message, with negative offset frequencies sent by setting Bit 3 of the kHz byte.

When a DWL (n) message is sent, (n) represents a number from 0 to 255, which is used by the receiver to determine the time that it will Dwell at each frequency increment, during the Scan and Step modes of operation. A value of (n) = 0 represents a zero Dwell time, while a value of (n) = 255 represents the maximum Dwell time (approximately 2 seconds). To determine the Dwell time (in milliseconds) for the various values of (n), the following formula is used:

$$(2^{Y} \times 8) - 8 = \text{Dwell time}$$

where: $Y = a \div 32$

When the RFG (n) message is sent, (n) represents a gain control number from 0 to 255. This message provides a minimum of 90 dB of control over the gain of the receiver. Each of the 255 increments represents approximately .35 dB of change, with 0 representing minimum gain and 255 representing maximum gain.

The response to an AM? mnemonic is a number from 000 to 068 which represents the level of AM Video present at the output of the receiver. Each digit represents approximately 13 mVrms of AM video. For FM?, the response is a number ranging from 000 to 100, which represents the precentage of FM modulation. Each digit represents a 1 percent increment with 100 being equal to 100% modulation and 000 equal to no modulation.

LGV? provides a number from 000 to 085, which represents the Log video level of the receiver. This number represents the signal level above the noise floor, of the receiver, with each number representing a .47 dB change. The noise floor is represented by 000, with 085 representing 40 dB above noise.

To set the COR Level, a COR (n) function would be used. With this function, (n) represents a decimal number from 0 to 40. This number corresponds to a threshold setting from noise level (0) to approximately 40 dB above noise level (40). Each interim step is equivalent to approximately a 1 dB change.

As a response to an STS? instruction or a serial poll, a status byte is returned indicating the receiver status. This response is a three-digit decimal number that corresponds to the binary number contained in the returned byte (000 = 00000000; 127 = 01111111). The significance of each bit of the status byte is as follows:

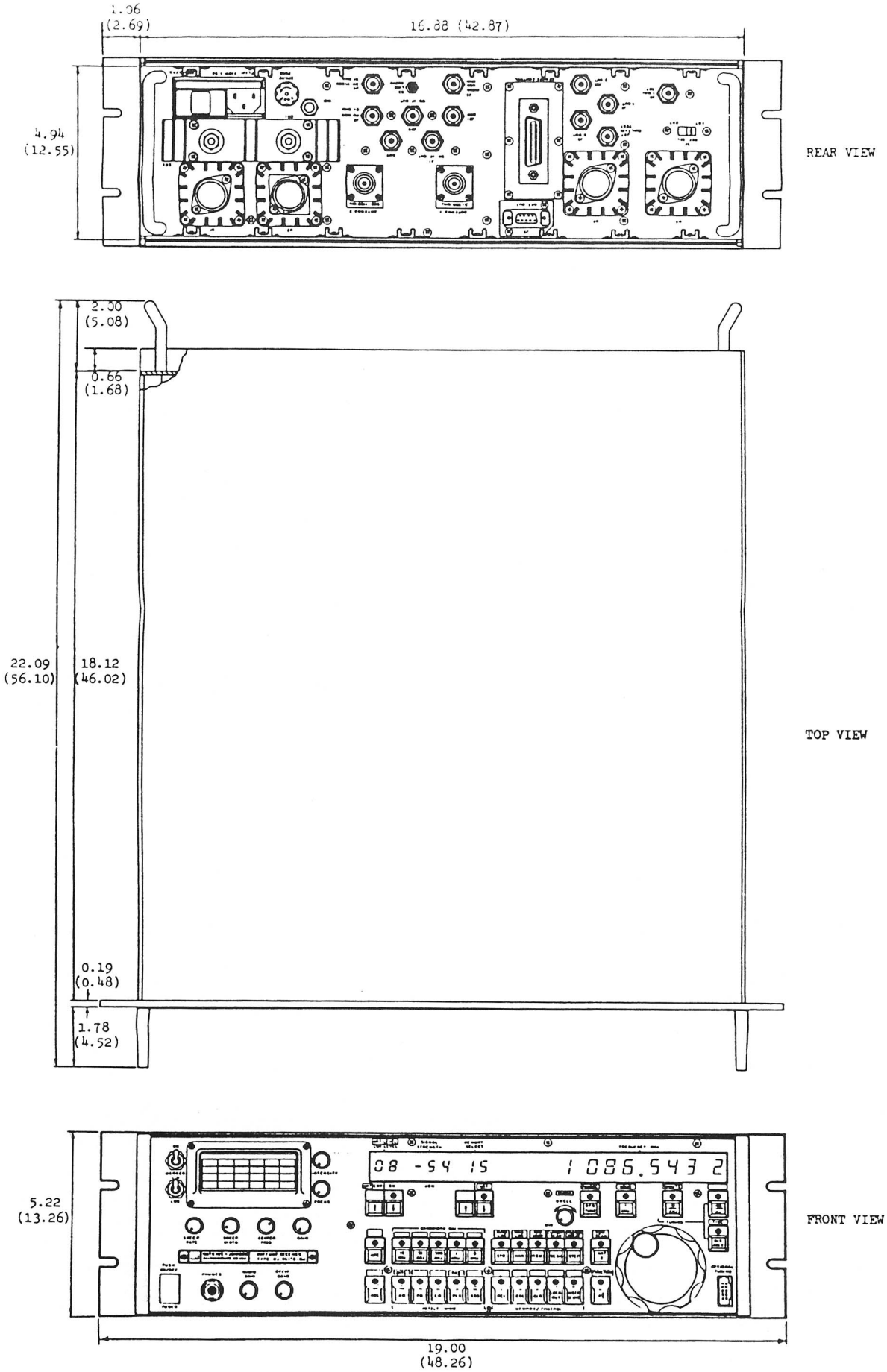
Bit	Value	Description
0	0	Indicates a signal is present.
1	2	Set on power up. Cleared by STS?
2	4	Set if BITE completed or error found by BITE. Cleared by BIT?
3	8	Not Used
4	16	Set to 1 when processing or responding to a message.
5	32	Set to 1 of an error exists. Cleared by "ERR?".
6	64	Set to 1 if a service request was sent.
7	128	Not Used

2.6 PREPARATION FOR RESHIPMENT

If the unit must be prepared for reshipment, the packaging methods should follow the pattern established in the original shipment. If retained, the original materials can be reused to a large extent or at least provide guidance for the repackaging effort.

(NOTES)

Figure 2-1. WJ-8617B(1) VHF/UHF
Receiver Outline Drawing



SECTION III

OPTIONS FOR THE WJ-861X RECEIVER

This section describes the options available for the WJ-8617B Receiver. A cross reference guide to the compatibility of the options is provided in Figure 3-1. The locations of the option slots in the receiver are shown in Figure 3-2. The location of all receiver modules is shown in Figure 3-3. The WJ-8617B functional block diagram is presented in Figure 3-4.

MS — Master/Slave (WJ-861X/MS)

The Master/Slave function permits the control of up to 29 additional Master/Slave equipped receivers, utilizing the front panel controls of one of the receivers. Each receiver must be equipped with an IEEE-488 Interface. Switch #6 of the DIP switch on the IEEE-488 must be in the open position on each receiver and the remaining 5 switches are set to a binary number between 0 and 30 to designate the receiver address. Only one receiver can function as the master unit at a given time and the remaining receivers function as slave units when addressed.

RLOG — Logging (WJ-861X/RLOG)

The RLOG option extends the capabilities of the Scan and Step modes of operation by permitting all signals, in excess of the programmed COR level, to be automatically classified and logged. Whenever the Scan or Step mode is initiated, the logging function is automatically activated to provide signal data to an external logging device (CRT or printer). When first activated, the receiver will output data, giving the receiver parameters stored in each of the memory channels, programmed for the Scan or Step operation. In the Step mode, one line is printed for each programmed memory channel and in the Scan mode, one line is printed for each pair of memory channels. When in operation, each time a signal greater than the programmed COR level is detected, a line will be printed giving the signal frequency, cycle, signal strength, time of day, and the percent of AM and FM modulation present on the signal. The cycle number corresponds to the number of times that the receiver has gone through the scan or step sequence. Channels which have previously been locked-out are not output.

BITE — Built-In Test (WJ-861XB/BITE)

The Built-In Test option (BITE) performs a sequence of operational tests on the receiver and compares the test results with limits contained in the BITE memory. If the results of any of the tests are outside of the specified limits, the test sequence will stop and an "E" will be displayed on the front panel of the receiver. The number of the failed test will be displayed in the MEMORY SELECT window and, where relevant, a relative number, representing the results obtained from the test, will be displayed in the SIGNAL STRENGTH window. When applicable, the frequency and bandwidth where the failure occurred will also be displayed. If all the tests are within the specified limits, the word END will appear in the FREQUENCY window, indicating that the receiver is fully operational. BITE is fully remote controllable.

VBFO — Variable Beat-Frequency-Oscillator (WJ-861X/VBFO)

This option installs in place of the standard BFO subassembly, (A4A5) and provides an operator controllable BFO frequency, during CW operation. The frequency can be varied by ±7.99 kHz about a 21.4 MHz center, in 10 Hz steps. In addition to the BFO output, 32.1 MHz and 10.7 MHz outputs are provided for use when the Signal-Sideband option (SSB) is incorporated.

PKC — Plug-In Keyboard Control (WJ-861XB/PKC)

The Plug-In Keyboard option (PKC) provides a means of rapidly inputting frequency information into the receiver. The keyboard plugs into the existing optional tuning connector on the receiver front panel and permits receiver tuning, memory programming and the initiation of lock-out channels.

DRD — Digitally Refreshed Display (WJ-861X/DRD)

With this option incorporated, the receiver's microprocessor is capable of providing a signal strength versus frequency plot on the signal monitor or an external display. The horizontal and vertical information is made available to the external equipment via the X OUT and Y OUT BNC connectors on the receiver rear panel.

CUR — Cursor (WJ-861X/CUR)

Cursor is an optional mode of operation that is available when the Extended Memory (equipped with software to support cursor), the Digitally Refreshed Display option and an active Function (F↑) pushbutton are installed. In this mode, a portion of the RF spectrum can be scanned, with a signal strength vs. frequency display of the scanned frequencies displayed on the signal monitor of the receiver. The tuning knob can then be rotated to position a cursor over any of the signal pips displayed on the signal monitor. When the cursor is positioned over the signal pip, the frequency of that signal is displayed in the frequency window of the digital display.

488 — IEEE-488 Interface (WJ-861X/488)

The IEEE-488 Interface option (488) is available for all receivers in the WJ-8617A or B series. This interface provides remote capabilities for the receiver by interfacing with a large array of compatible instruments. The 488 option provides talk and listen capabilities between receiver and external equipment such as calculators, microcomputers, or other IEEE-488 equipped devices. The data is transferred between units in bit-parallel, byte serial form, permitting rapid data transfer.

232 — RS-232 Async Interface (WJ-861X/232)

The RS-232 Asynchronous Interface bus is a standardized interface used to interface with computer peripheral equipment, such as computer terminals and line printers. It is available as an option for all of the receivers in the WJ-861X series. The 232 option provides remote capabilities for the WJ-8617A or B series receivers and permits the receiver to be operated remotely by providing TALK/LISTEN capabilities.

RTC — Real Time Clock (WJ-861X/RTC)

The Real Time Clock option (RTC) provides the time of day in hours, minutes and seconds, using a 24 hour format. It permits the time to be accessed via the receiver front panel, the remote interface (with 232 or 488 option installed) and permits the time to be printed on the RLOG printout (with RLOG installed).

WBO — Wideband IF Output (WJ-861X/WBO)

The WBO option is available for the WJ-8617B Receivers. This module mounts to the underside of the receiver and provides an output to the WBO connector (J20) mounted on the receiver rear panel. With this option incorporated, a sample of the receiver's 21.4 MHz IF signal is provided to the rear panel for use by external equipment. The WBO module contains its own AGC circuitry which provides a constant -30 dBm signal level (into 50 ohms) with a 4 MHz bandwidth. Without the WBO option the normal WB IF output level is 15 dB above the RF input. This option is necessary if the receiver is to be used with any compatible Watkins-Johnson direction finder when signal levels greater than the normal WB IF are required. The WBO option is also available in a 6 MHz bandwidth version (WJ-861X/WBO-1).

ASO — Audio Scan Output (WJ-861X/ASO)

The Audio Scan Output option (ASO) provides an audio frequency output that is representative of the tuned frequency of the WJ-8617A or B Series receiver. The output frequency varies linearly from 200 Hz (when start is tuned) to 11 kHz (when stop is tuned). This provides an audible tone equal to one hundred thousandth of the tuned RF Frequency. A DC level scan is also provided via an internal switch.

FE — Frequency Extender (WJ-861XB/FE)

The UHF Frequency Extender option (FE) will extend the frequency range from 500 to 1100 MHz. This option consists of a UHF preselector, a UHF preamp/mixer, and a 4 band LO module.

SSB — Single Sideband (WJ-861XB/SSB)

This module provides both upper sideband and lower sideband detection along with special AGC characteristics. Selection of the narrowest bandwidth is automatic and a 6.4 kHz IF bandwidth is preferred. Lower or upper sideband selection is shown in the display window when the SSB Key is depressed.

MFS — Main Frame Spares Kit (WJ-861XB/MFS)

The Main Frame Spares Kit (MFS) contains all the plug in modules of the WJ-861XB, less options, and includes power supply spare parts. Option spares must be ordered separately.

SM — Signal Monitor (WJ-861X/SM)

The Signal Monitor (SM) allows the operator to see spectrum activity out to ±2 MHz around the tuned frequency. A marker locked to the reference frequency is provided for center tuning. The sweep rate is adjustable and the resolution is 10 kHz. The display is 1 by 3 inches and has a 40 dB log range or linear mode. During receiver Scan mode the SM is in a PAN display if the DRD option is installed.

FAN — Fan Attachment (WJ-861X/FAN)

The FAN option provides cabling for the receiver in installations where a rack blower is not possible. It contains two quiet fans which blow air directly onto the receiver rear panel. This unit attaches to the rear handles of the receiver and adds three inches to its overall length.

IFBW — IF Bandwidth (WJ-861X/IFBW)

IF Bandwidths with matching discriminators available are: 3.2 kHz, 6.4 kHz, 10 kHz, 15 kHz, 20 kHz, 25 kHz, 30 kHz, 50 kHz, 75 kHz, 100 kHz, 250 kHz, 300 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, 6 MHz and 8 MHz. Up to 5 bandwidths can be selected if one bandwidth is 500 kHz or greater. Special group delay equalized filters of 400 kHz, 600 kHz, 800 kHz, and 1 MHz are also available for noise power ratios of greater than 40 dB.

NRT — Noise Riding Threshold (WJ-861XB/NRT)

Noise-Riding-Threshold (NRT) measures the ratio of a signal carrier level with the RF background noise and activates the audio and COR outputs when the operator selected threshold is exceeded. This circuitry has a threshold adjustment range of 20 dB that is set using the COR Up/Down pushbuttons on the receiver front panel.

DFC — Direction Finding Control (WJ-861X/DFC)

Direction Finding Control (DFC) provides a control line to alert the WJ-8971 series Direction Finders that the receiver has switched phase sense due to a tuned frequency greater than 500 MHz band change.

LOGV — Log Video (WJ-861X/LOGV)

A zero to plus eight volt into 1000 ohm load is present at the rear panel as the input signal rises above the noise floor by 60 dB.

RCS — Rotating Chassis Slides (WJ-861X/RCS)

Attaches to sides of receiver to allow unit to slide out from equipment rack and be tilted up or down.

SCS — Straight Chassis Slides (WJ-861X/SCS)

Attaches to sides of receiver to allow unit to slide straight out from equipment rack.

HF — 2 to 500 MHz Frequency Extension (WJ-861XB/HF)

The HF Frequency Extension extends the low frequency tuning limit of the receiver down to 2 MHz. It consists of software changes to extend the tuning range of the 1st local oscillator and a preselector capable of passing signals down to 2 MHz. Noise figure is typically 15 dBm at 2 MHz and 3IP is 0 dBm.

ISB — Independent Sideband (WJ-861XB/ISB)

The Independent Sideband option (ISB) provides upper and lower sideband detection and also provides an independent sideband output on the receiver rear panel. The lower or upper sideband selection will be shown in the display window when the SSB pushbutton is depressed and the ISB output will be activated. It is recommended that a 6.4 kHz IF bandwidth be installed in the receiver when this option is incorporated to provide the best sideband operation.

PANSEC — Panoramic Sector Display (WJ-861XB/PANSEC)

The PANSEC option provides X and Y outputs at the receiver rear panel to produce a display of wideband and narrow band signal strength vs. frequency traces simultaneously on an external display. During a scan, an overview of the entire spectrum is displayed on the wideband trace, while the narrow band trace provides a more detailed display of any portion of the display that is of interest. The portion of the wideband spectrum that is presented on the narrow band trace is underlined and the center frequency of the narrow band trace is displayed on the receiver front panel. Rotation of the receiver frequency knob changes the center frequency, allowing the operator to view a more detailed display of any portion of the wideband trace.

Chosen Option	LOC	MS	CUR	RLOG	BITE	VBFO	PKC	DRD	EM	488	232	WBO	ASO	FE	SSB	SM		NRT	DFC	SM	IFBW	LOGV	ISB	RTC	HF
	Cross Reference Option																								
LOC	X								I																
MS		X								R															
CUR			X					R																	
RLOG				X	C						R		E						C						
BITE				C	X								C						C						
VBFO						X																			
PKC							X																		
DRD								X												R					
EM									X																
488										X	E														
232										E	X														
WBO												X													
ASO				E	C								X						C						
FE														X											
SSB															X						S				
SM																X									
																	X								
NRT																		X							
DFC				C	C								C	R					X						
SM																				X					
IFBW															S						X				
LOGV																						X			
ISB															E							S	X		
RTC																								X	
HF																									X

C = Consult factory to use cross reference option
E = Chosen option excludes cross reference option
I = Chosen option includes cross reference option
R = Chosen option requires cross reference option
S = Chosen option suggests minimum IFBW of 6.4 kHz

Option Slot Requirements
(Refer to Module Location)

1 EM
2 DRD
3 BITE
4 488 or 232
5 ASO or RLOG
6 NRT

Figure 3-1. WJ-8617B Option Reference

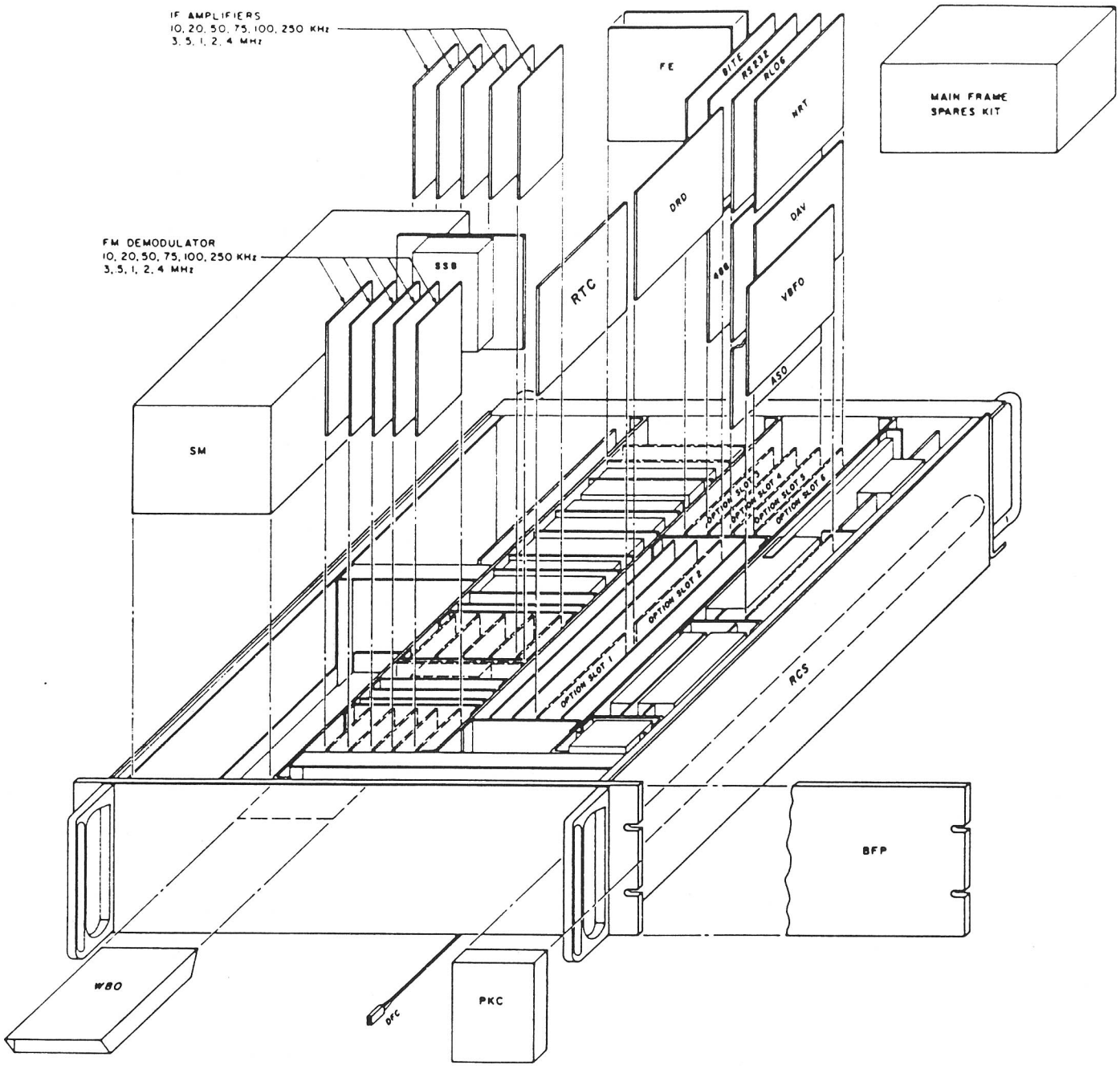
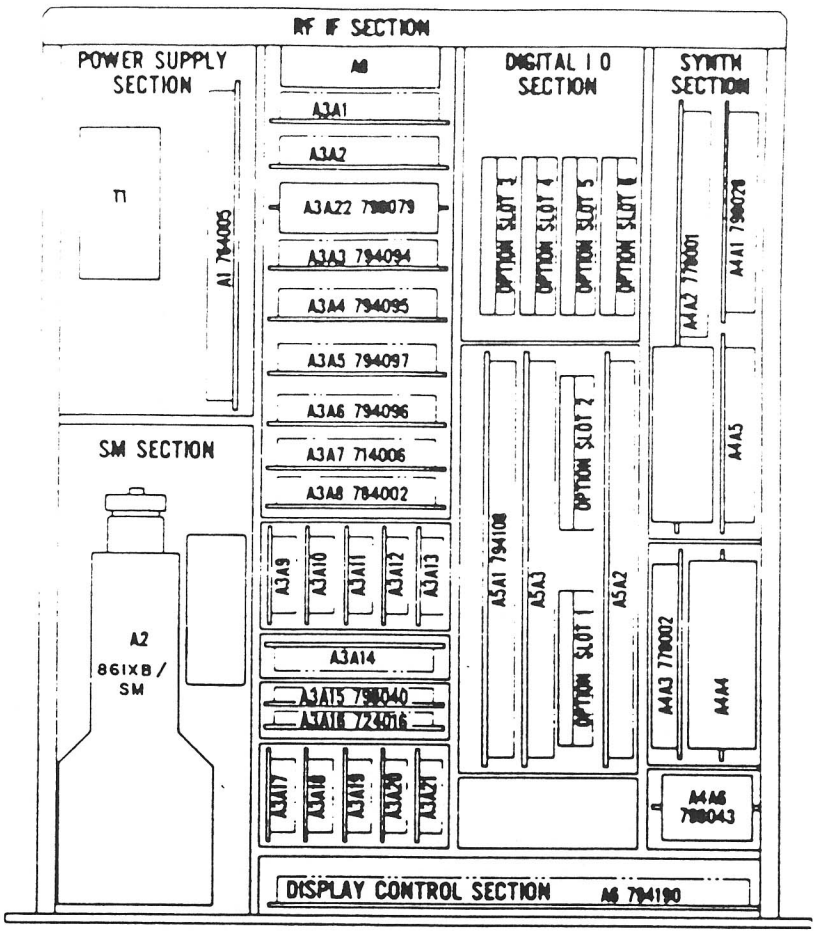


Figure 3-2. Location of WJ-8617B Options



Ref Desig	Type No.	Title	Ref Desig	Type No.	Title
A1	764005-1	Power Distribution	A4A3	778002-1	Translation Osc.
A2 Opt	861X/SM	Signal Monitor	A4A4	776002-1	4.4-5.4 MHz Syn.
A3	794189-2	RF/IF Mother Board	A4A5	794195-1	SSB BFO
A3A1	796414-1	UHF Preselector	A4A6	798043-1	535 MHz Generator
A3A2	796415-1	UHF Preampl/Mixer	A5	798039-9	Digital Mother Bd
A3A3	794094-1	High Band Preselector	A5A1	794108-6	Receiver Interface
A3A4	794095-1	Low Band Preselector	A5A2	796321-1	Syn. Interface
A3A5	794097-1	Preamplifier	A5A3	796353-1	Microprocessor
A3A6	794096-2	1st Converter	A5 Opt 1	796185-1	Extended Memory
A3A7	716003-1	2nd Converter	A5 Opt 2	796217-1	DRD
A3A8	784002-1	AGC Ampl	A5 Opt 3	794151-1	BITE
A3A9-A3A13	(Select.)	IF Bandwidths	A5 Opt 4	798044-1	IEEE Interface
A3A14	794188-1	SSB Demod	A5 Opt 4	796261-1	RS-232 Interface
A3A15	796233-1	Audio/Video/COR	A5 Opt 5	794150-1	Audio Scan Output
A3A16	724016-1	IF Output/AM Demod	A5 Opt 5	796261-1	RLOG
A3A17-A3A21	(Select.)	FM Demod	A5 Opt 6	798069-1	NRT
A3A22	798079-1	UHF LO Synthesizer	A6	794190-1	Display & Control
A4	798071-1	Synthesizer Mother Bd.	A7	794141-1	Phone Jack
A4A1	798028-1	Reference Generator	A8	794128-1	Antenna Switch
A4A2	778001-1	1st LO Synthesizer	A9 Opt	861X/WBO-1	Wideband IF Out Ampl.

Figure 3-3. WJ-8617B Module Location

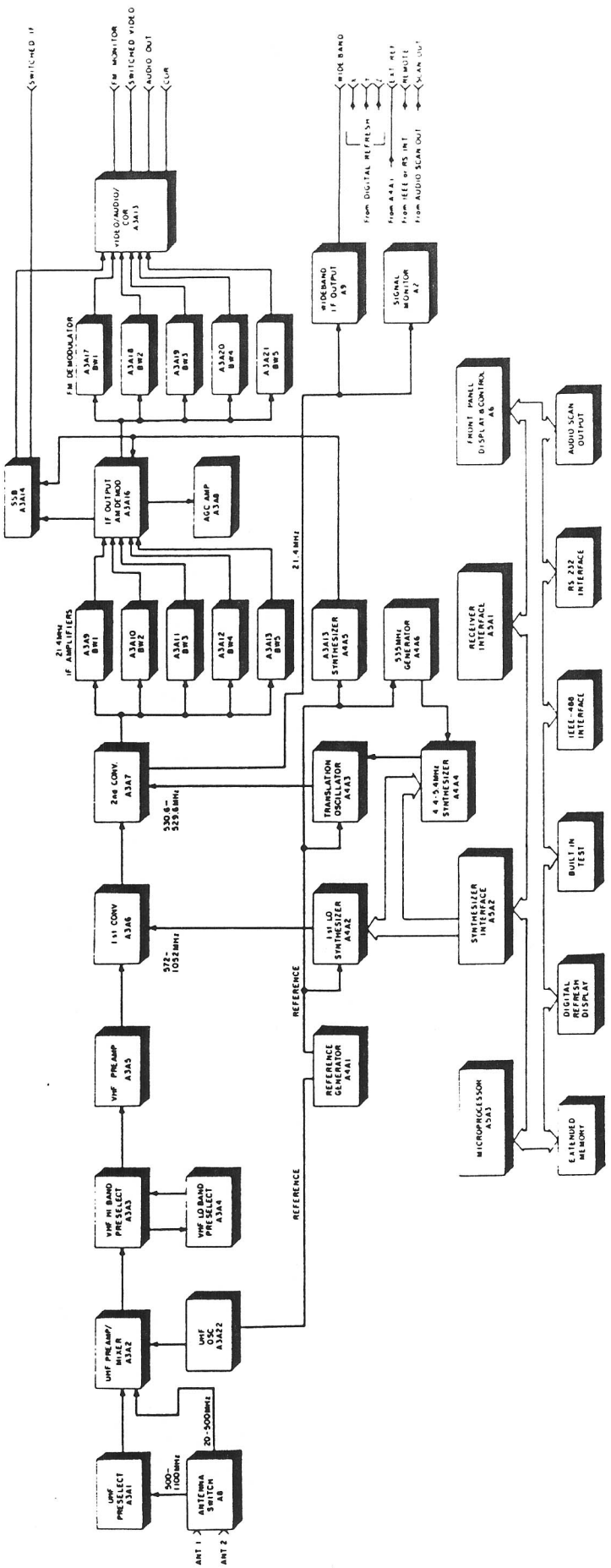


Figure 3-4. WJ-8617B Functional Block Diagram

(EXAMPLES)

Minimum Option Receiver

Type/Model	Description	(See current price list) Price (1-3)
WJ-8617B-3	Receiver with Blank Front Panel	_____
WJ-861X/488	Remote Interface	_____
WJ-861X/4 MHz	4 MHz IF Bandwidth	_____
	TOTAL	=====

Typical Receiver With 2 Option Slots Open

Type/Model	Description	Price (1-3)
WJ-8617B	General Purpose Receiver	
WJ-861X/SM	Signal Monitor	_____
WJ-861XB/FE	Frequency Extender	_____
WJ-861X/10k	10 kHz IF Bandwidth	_____
WJ-861X/50k	50 kHz IF Bandwidth	_____
WJ-861X/300k	300 kHz IF Bandwidth	_____
WJ-861X/1M	1 MHz IF Bandwidth	_____
WJ-861X/4M	4 MHz IF Bandwidth	_____
WJ-861XB/SSB	Single Sideband	_____
WJ-861X/488	IEEE-488 Interface Bus	_____
WJ-861X/DRD	Digital Refreshed Display	_____
WJ-861X/LOC	Frequency Memory Lockout	_____
WJ-861XB/PKC	Plug-in Keyboard Control	_____
WJ-861X/WBO	Wideband IF Output	_____
	TOTAL	=====