SECTION II

INSTALLATION AND OPERATION

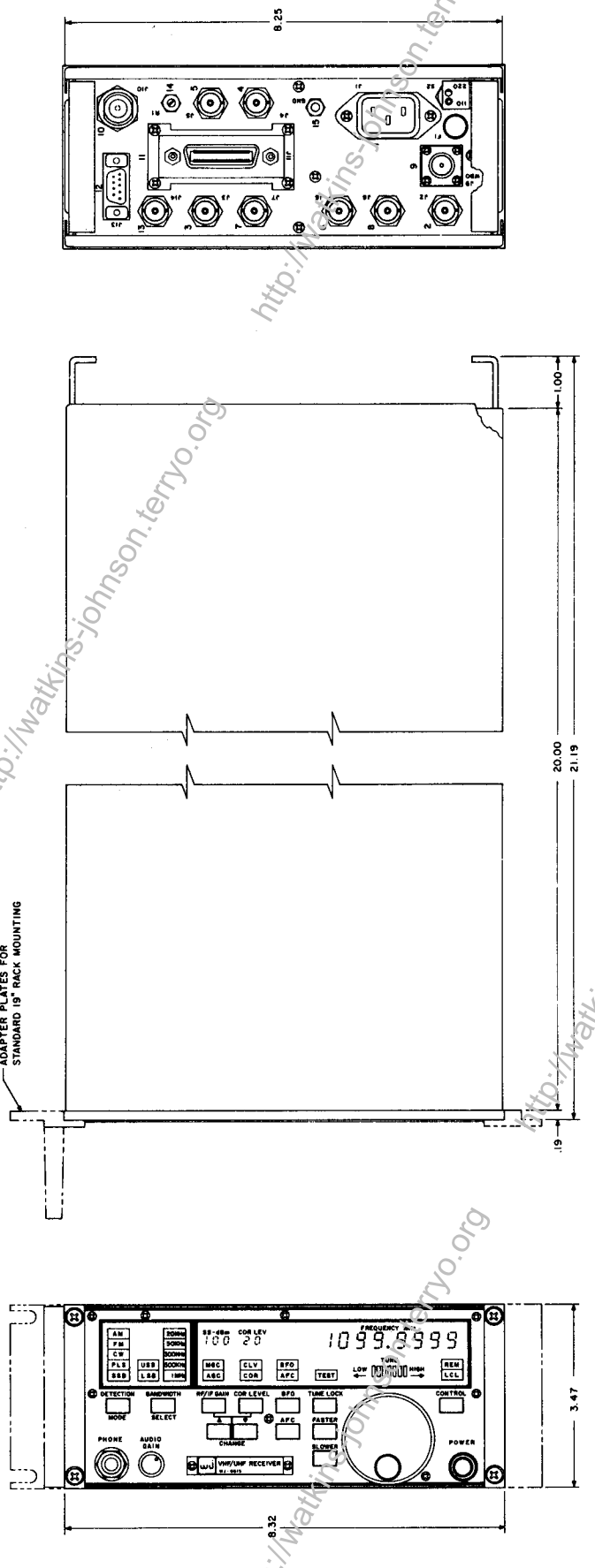

Figure 2-1. WJ-8615D Compact Receiver, Critical Dimensions

SECTION II

INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

Examine the shipping carton for damage before unpacking the equipment. If the carton's exterior appears to be damaged, try to have the carrier's agent present when unpacking the equipment. 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 unpacking. Also, verify 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 WJ-8615D Compact Receiver is designed for mounting in a half-rack configuration. Two units side-by-side occupy the full 19 inch requirement for a standard equipment rack. The receiver occupies 3.5 inches of vertical rack space and extends approximately 22 inches into the rack to the tips of the rear protective handles. Do not rely solely on front panel mountings to support the receiver. Utilize Jonathan Type QD110 slides, mounted to the sides of the receiver for support. A 1.75 inch space above and below the unit is recommended for rack mounting configuration along with forced air convection. Refer to **Figure 2-2** for racking equipment utilizing furnished mounting hardware.

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

Figure 2-1 depicts the WJ-8615D Compact Receiver Critical Dimensions. The front and rear panel connections are outlined in **Table 2-2**. As a reference for the location of the connectors, refer to **Figure 2-3**.

2.2.1 RECEIVER OPERATING CONFIGURATION

Operating configuration of the WJ-8615D Receiver is controlled by DIP switches S1 and S2 located on the IEEE-488/Interrupt subassembly (A1A2). Prior to installing the receiver, these switches should be inspected and configured to reflect the desired operating conditions. Refer to **Table 2-1** for configuring S1 and S2.

2.2.1.1 Receiver Option Configuration

On DIP switch S1, position 1 indicates to the software that the 500 to 1100 MHz Frequency Extender is installed. Position 2 indicates the presence of the Sideband Option and position 5 indicates the presence of the 2 to 500 MHz HF Extender. On DIP switch S2, position 8 indicates the presence of the optional internal Tracking Preselector to the software. These switches must be placed into the OPEN position, indicating to the control circuitry that these options are installed.

PART NO.	NOMENCLATURE
280504-1	Support Bracket
280505-1	Center Support
320306-5	Handle Assembly
280507-1	Rear Handle
280507-2	Rear Handle
480508-1	Blank Panel Assembly

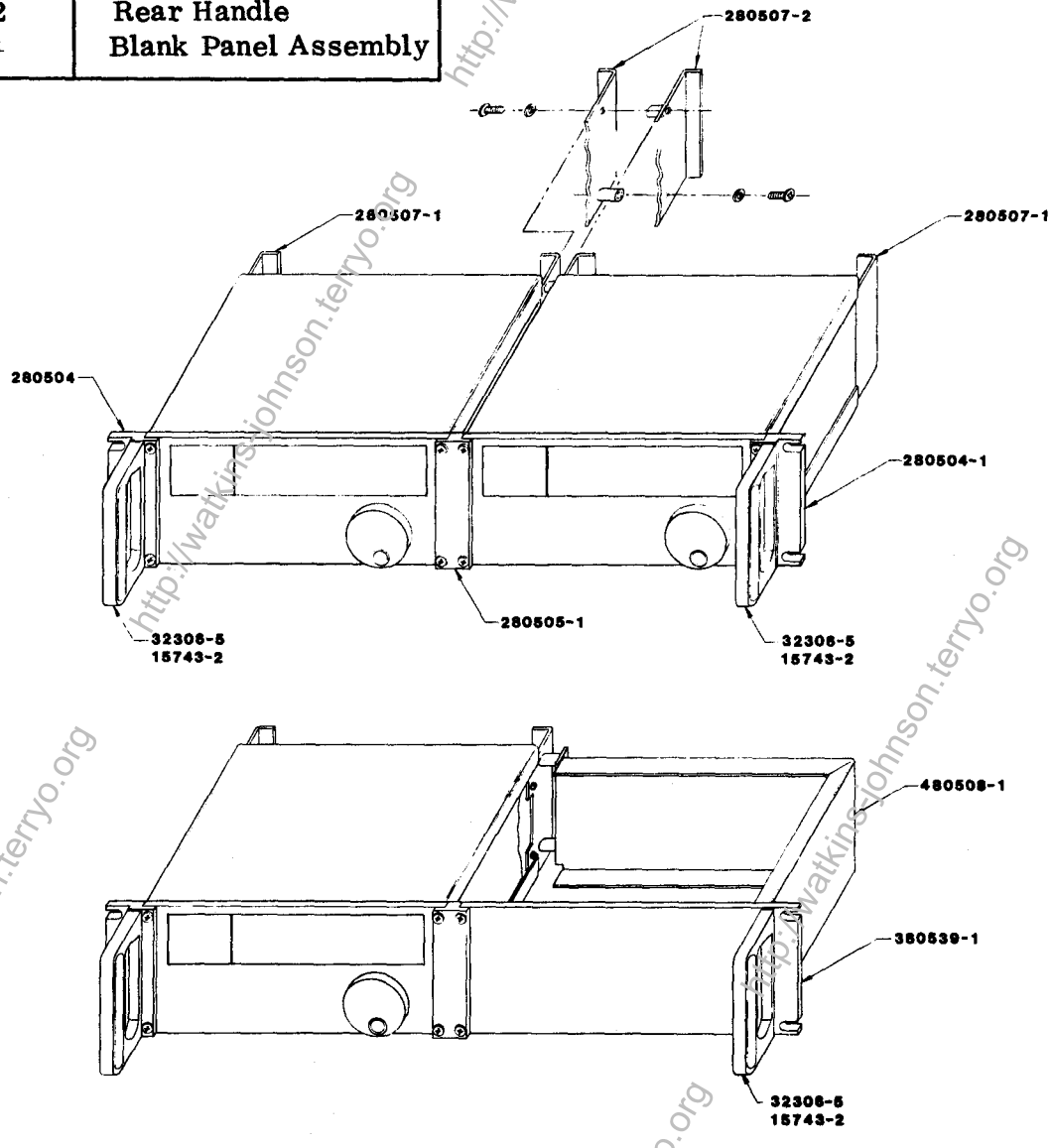

Figure 2-2. WJ-8615D Configuration of Rack Mounting Accessories

Table 2-1. IEEE-488/Interrupt Switch Configurations

Switch S1 on A1A2

Position	Front Panel Definition
1	FE (Frequency Extender)*, enabled by closing switch position 1.
2	SSb (allows selection of sideband operation)*, enabled by closing switch position 2.
5	HF (allows tuning to 2 MHz; requires HF Input Filter subassembly)*, enabled by closing switch position 5.
7	dEF (front panel definitions)*, with switch position 7 closed, the definitions may be modified by the front panel, otherwise, definitions may only be examined.
8	d1AG (diagnostics, refer to **paragraph 4.5.1**) This switch is an override for test purposes. This function is enabled by closing switch position 8.

Switch S2 on A1A2

Position	Front Panel Definition
1 thru 5	488 (selection of 488 address 0 to 30). Refer to **paragraph 2.2.1.2** for switch setting. Least significant digit is position 5 and the most significant digit is position 1.
6	SLA (slave operation, allows receiver to be controlled by WJ-861X family of receiver). This function is enabled by closing switch position 6.
8	PrES (optional internal Tracking Preselector).* This function is enabled by closing switch position 8.

Switch position 1 of DIP switch S1 allows front panel selection via the tuning wheel.

* If position 1 of DIP switch S1 is closed, this function can be disabled via the tuning wheel. If position 1 is open, this function cannot be enabled via the tuning wheel.

If the front panel definitions are not enabled, this function is controlled by its DIP switch position. Otherwise, this function is controlled via the tuning wheel.

2.2.1.2 IEEE-488 Interface Configuration

Switch positions 1 through 5 of DIP switch S2 are utilized to set the address of the receiver. Switch positions 1 through 5 allow address setting of from 0 (00000) to 30 (11110). Address 31 (11111) is not valid and should not be utilized. When selecting an address, an open switch indicates a logic "1" and a closed switch indicates a logic "0". The WJ-8615D Receiver also accepts "handoff" commands from the WJ-861XB family receivers in the Master/Slave mode utilizing the address configuration of DIP switch S2.

2.2.1.3 Front Panel Definitions

Receiver definitions allow an operator to examine or change the DIP switch settings from the front panel. Receiver front panel definitions can be examined by depressing the POWER on/off switch and holding the CONTROL pushbutton in until the display indicates "dEF XXX". The definition on/off function is controlled by rotating the tuning wheel until the desired argument is displayed. Functions can be selected for examination or modification depending on position 7 of DIP switch S1 on the IEEE-488/Interrupt subassembly and the argument (off/on) of the definition function (dEF).

The front panel CHANGE ↑/↓ pushbuttons are utilized to step through the available functions in a repeating fashion:

d1AG- Diagnostics, receiver test mode; refer to **pargraph 4.5.1.**

488 - 488 address, selectable from 0 to 30.

SLA - Slave function, when enabled, receiver is controlled via WJ-861XB family of "master" receivers. With function off, the receiver is configured for remote operation via an external controlling device.

SSb - Allows selection of sideband operation.

FE - Frequency extender, extends frequency coverage of receiver to 1100 MHz. (Requires the 500 to 1100 MHz FE option)

HF - HF frequency extenstion, extends frequency coverage of receiver to 2 MHz. (Requires HF Input Filter)

The display indicates the current condition of each function which may be modified from the front panel if position 7 of DIP switch S1 is closed and the "dEF" function is enabled (on). If position 7 of DIP switch S1 is open, receiver functions can only be examined from the front panel.

NOTE

1) Definition mode of the front panel must be exited by depressing the CONTROL pushbutton. If exited by depressing POWER on/off, an error 230 (loss of front panel configurations) is displayed.

NOTE (Cont'd)

2) "dEF" must be on in order for front panel changes to remain in memory.

Table 2-2. Table of Connectors

Connector		Function
J1	Line Cord Receptacle	Power Input
J2	10 MHz REF	(BNC) 10 MHz Reference In (10 k ohms)
J3	COR	(BNC) Carrier Operated Relay
J4	FM MONITOR	(BNC) FM Monitor Output (91 ohms)
J5	SELECTED VIDEO	(BNC) Selected Video Output (91 ohms)
J6	AUDIO	(BNC) Audio Output (600 ohms)(USB/Line Audio)*
J7	AUDIO	(BNC) Audio Output (600 ohms)(LSB/Line Audio)*
J8	SW IF OUT	(BNC) Selected Bandwidth IF Output (50 ohms)
J9	SM/IF OUT	(BNC) IF Output (50 ohms)
J9	WB IF OUT (optional)	(BNC) Wideband IF Output (50 ohms) (optional)
J10	ANTENNA	(N-Type) RF Input from Antenna (50 ohms)
J11	REMOTE CONTROL IEEE-488	(Multipin) Remote Control Input/Output
J12	PHONES	Phone Output (Front Panel)
J13	AUX	(Multipin) Auxiliary Input/Output

* These connectors provide the same signals in all detection modes except ISB.

NOTE

Before applying power to the unit, verify the selected line voltage for the receiver matches the utilized line voltage. Refer to **paragraph 2.2.2.1.**

A two receiver rack mounting configuration is shown in **Figure 2-2.** The illustrated accessory items except for the 8615/BP are furnished with each receiver. Requirements of receiver installation determines which accessory item is utilized.

2.2.2 CONNECTOR SIGNALS

2.2.2.1 **Line Cord Receptacle (J1)** - Before making the power connection, check the rear panel line voltage selector switch (S2) corresponds to the line voltage utilized. Plug the power cord into a 3-pin power source receptacle providing 115 V or 220 V at 48 to 62 Hz. The third pin of the receptacle must be a ground connection.

2.2.2.2 **10 MHz REF (J2)** - An external 10 MHz reference signal at a level of from 0 to +20 dB provides the time base for the receiver at this BNC connector. Switching from internal reference to external reference is automatically transferred when the external signal level reaches 0 dB. Connector impedance is 10 kohms, nominal.

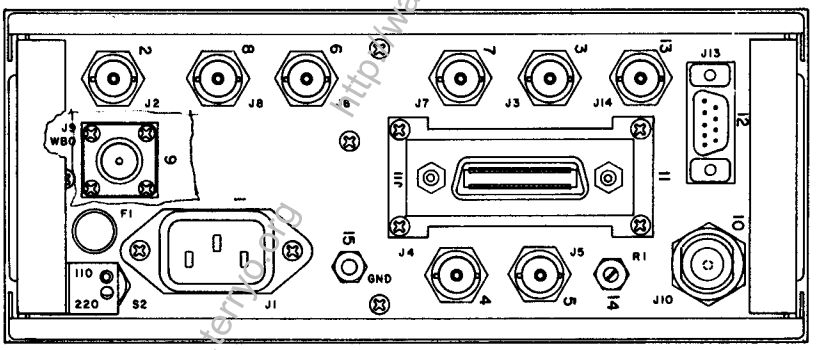

Figure 2-3. WJ-8615D Compact Receiver, Rear Panel Connectors

2.2.2.3 **COR (J3)** - The Carrier-Operated-Relay BNC connector provides a 100 mA current-sink to ground when COR level is exceeded for controlling external equipment. This output has a 5 sec. delay on release after signal drops below COR threshold. Maximum applied voltage is +24 Vdc.

2.2.2.4 **FM MON (J4)** - 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.

2.2.2.5 **SELECTED VIDEO (J5)** - This selected Video Output BNC connector provides a 1 Volt peak-to-peak, nominal, video signal into a 91 ohm load. The output is a DC coupled AM or FM video signal, determined by the chosen detection mode at sensitivity with 30% modulation.

2.2.2.6 **AUDIO (J6)(J7)** - The BNC connectors provide a 600 ohm audio output at a level adjustable to 10 mW, minimum via the Line Audio Control R1. Under normal operating conditions, the signal at these connectors is identical. During optional Single Sideband (SSB) operation, the USB signal appears at J6 and the LSB signal appears at J7.

2.2.2.7 **SW IF OUT (J8)** - The Switched IF Output BNC connector supplies a -40 dBm IF signal into 50 ohms during AGC operation. The center frequency is 21.4 MHz with a bandwidth equal to the selected IF Bandwidth.

2.2.2.8 **IF OUT (J9)** - The IF Output BNC connector provides a signal 15 dB greater than the relative signal strength, into 50 ohms up to the Preamplifier/Converter subassembly (A1A13). The center frequency is 21.4 MHz.

WB IF OUT (J9) - This optional BNC connector provides a -30 dBm IF signal into 50 ohms. The center frequency is 21.4 MHz.

2.2.2.9 **ANTENNA (J10)** - This N-Type connector accepts the RF input signal from the antenna. Nominal input impedance is 50 ohms.

2.2.2.10 **REMOTE CONTROL IEEE-488 (J11)** - This Remote Control multipin connector allows the receiver to interface with other equipment via the IEEE-488 interface bus. This permits the receiver to be controlled or monitored from an external source. Refer to **paragraph 2.5.**

2.2.2.11 **PHONES (J12)** - The Phones Jack, mounted on the front panel is a Tip-Ring-Sleeve type connector. A proper Tip-Ring-Sleeve type mating plug is recommended for headset monitoring. Under normal operation, audio levels adjustable to 10 mW minimum, with a 600 ohm impedance are available at both the "Tip" and "Ring". During optional ISB operation, USB signals are present at the "Tip" and LSB signals are present at the "Ring". The "Sleeve" portion of this connector is a common ground.

2.2.2.12 **AUX (J13)** - This Auxiliary Output multipin connector provides output signals from the receiver circuitry as follows:

Pin	Signal	Characteristics	Description
1	SPR IN	TTL level	Spare Interrupt
2	GND		Chassis Ground
3	+5 V		Regulated +5 Vdc out
4	DAC OUT	Analog, 0 to +12 V	Digital-to-Analog Converter Output
5	A/D IN	Analog, 0 to +15 V	Analog-to-Digital Converter Input
6	DFC	Logic "0" 500 MHz, Logic "1" 500 MHz	Direction Finder Control
7	PRINTER	RS-232, 300 baud rate	Printer Output
8	SPR DRV	TTL level	Spare Driver, Similar to COR
9	LOG VID	0-5 Vdc representing 55 dB log range	DC representation of 55 dB log range
11	+15 V		Regulated +15 Vdc out
12	-15 V		Regulated -15 Vdc out

2.3 EQUIPMENT MALFUNCTIONS

This unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. If malfunctions are encountered after following the recommended installation procedures, **paragraph 2.2,** verify the correct input signals are present at the proper jacks. Maintenance and troubleshooting of the unit can be aided utilizing the procedures outlined in Section IV of this manual. Contact your Watkins-Johnson representative or the Watkins-Johnson Company, SP Division, Gaithersburg, Maryland, to prevent possible warranty voiding prior to undertaking any corrective maintenance action.

2.4 OPERATION

The WJ-8615D Compact Receiver is capable of local and remote operation in its standard configuration. Local operation is a two part function which includes standard receiver operation and a test mode. Standard operation utilizing the front panel controls and indicators is described in **paragraph 2.4.1.** Receiver configuration operation utilizing the front panel controls and indicators is described in **paragraph 2.2.1** and Diagnostic operation is described in **paragraph 4.5.1.** Depressing a front panel pushbutton illuminates an LED within the display indicating that particular function is active. Refer to **Table 2-3** for the controls and indicators, and to **Figure 2-4** for their location. Remote operation is described in **paragraph 2.5** and Master/Slave operation is described in **paragraph 2.6.**

In addition to local operation, the WJ-8615D Compact Receiver is capable of remote operation via the IEEE-488 interface bus. When this interface is utilized, all receiver operations are controlled by an external controlling device. Remote operation is described in **paragraph 2.5.**

2.4.1 CONTROLS AND INDICATORS (STANDARD LOCAL OPERATION)

2.4.1.1 **POWER (S1)** - This pushbutton switch applies power to the unit. When depressed, the button clicks indicating the unit is energized. Depressing the button again causes it to click to the OFF position.

On power up, three functions occur. First, all LED indicators on the front panel are illuminated verifying front panel operation. Second, "8615", followed by the software revision level illuminates in the display showing present software revision level. And third, the receiver is set to the operating mode and parameters that were present prior to the last power interruption.

Receiver defined functions can be configured by holding the CONTROL pushbutton in while depressing the POWER switch. The defined functions include: definitions on/off, diagnostics on/off (refer to **paragraph 4.5.1**), 488 unit address, master/slave, preselector on/off, SSB on/off and frequency extender on/off.

2.4.1.2 **DETECTION MODE (S1)** - Depressing this pushbutton selects the desired receiver detection mode. Each time this pushbutton is depressed causes the LED's in the display to change indicating the active detection mode. The operator may select AM, FM, CW, PULSE and optional SSB modes. During SSB, the BW button selects USB or LSB. When these indicators are illuminated at the same time, ISB is selected.

Table 2-3. Table of Controls and Indicators

POWER	Applies power to the receiver.
DETECTION MODE (AM, FM, CW, PLS, ISB, USB, LSB)	Selects the mode of operation.
SELECT BANDWIDTH	Selects the IF Bandwidth.
RF/IF GAIN	Selects automatic gain control (AGC) or manual gain control (MGC).
COR LEVEL	Selects the level at which the COR function activates.
TUNING METER	Indicates relative frequency position of receiver with reference to frequency of received signal.
CHANGE	Controls the RF/IF gain or COR level.
BFO TUNE	Allows tuning of the beat frequency oscillator (BFO).
AFC	Activates automatic frequency control (AFC).
TUNING KNOB	Controls the tuned frequency of the receiver.
TUNE LOCK	Disables tuning knob.
FASTER	Causes tuning increment to increase to next digit (10 MHz increment, maximum).
SLOWER	Causes tuning increment to decrease to next digit (100 Hz increment, minimum).
CONTROL	Selects local or remote operating mode.
AUDIO GAIN	Controls the audio signal at the Phones Jack.

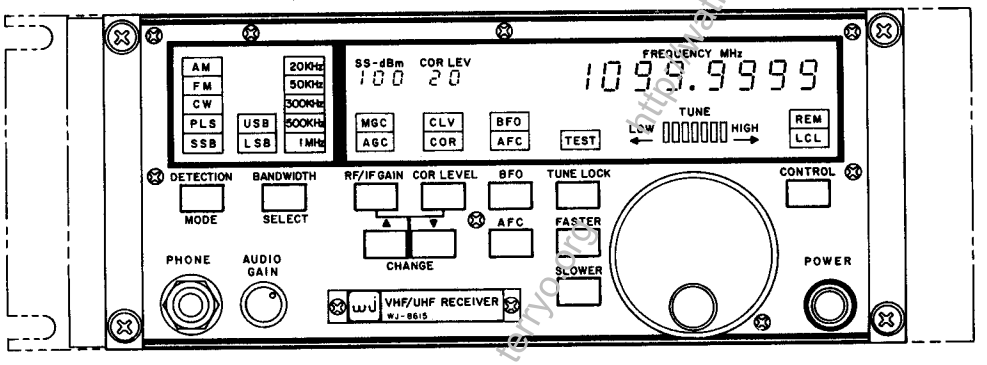

Figure 2-4. WJ-8615D Compact Receiver, Front Panel Controls and Indicators

2.4.1.3 **SELECT BANDWIDTH (S2)** - Depressing this pushbutton permits the operator to select the desired IF bandwidth. Depressing this pushbutton decrements the active bandwidth size allowing the operator to optimize the signal response. An LED on the active bandwidth in the display indicates that bandwidth has been selected. Up to five IF Filters and matched Video Filters can be installed in the receiver. Refer to the receiver specifications, **Table 1-1.**

2.4.1.4 **RF/IF GAIN (S3)** - Depressing this pushbutton permits the operator to choose between manual gain control or automatic gain control (AGC). In the manual gain control mode, the MGC LED is illuminated and the receiver RF/IF gain is set by the CHANGE pushbuttons on the front panel. While in manual gain, utilization of the AM Detector from 0 to 100% is indicated in the display window. An optimum setting for MGC operation is 50, indicated in the display. In the AGC mode, signal strength is displayed in -dBm within the window. The WJ-8615D Receiver features an "end-stop" indicator in the manual gain control mode. If "- - -" flashes in the display during a gain change, the "end-stop" has been reached and the operator must choose a different gain level. Depressing the RF/IF GAIN pushbutton again selects AGC and disables the CHANGE pushbuttons. When in the AGC mode, the RF/IF gain is automatically controlled by the internal AGC circuitry.

2.4.1.5 **COR LEVEL (S6)** - When COR level is selected, utilize the two CHANGE pushbuttons to set the level at which the COR and squelch circuits activate. The COR level is adjustable from theoretical noise level to approximately 80 dB above theoretical noise level of selected bandwidth. An "80" displayed in the display window is the "end-stop". When the COR level is exceeded, both COR and AUDIO circuits activate. An LED in the display marked COR illuminates when the level is exceeded. With "00" displayed in the COR LEV window, the COR level is set to minimum and the COR circuitry is active at all times. There is a delay on de-activation of the COR output which holds COR on for approximately 5 sec. after COR level is no longer exceeded. A display of "- - -" indicates inactive COR circuitry at all signal levels. If the CHANGE pushbutton is released at the "end-stop" and depressed again, the "end-stop" can be overridden. 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, without any signal present.

2.4.1.6 **CHANGE (↑S4, ↓S5)** - This pushbutton bank allows the operator to increase or decrease the RF/IF gain and the COR level. To change the RF/IF gain, depress the RF/IF GAIN pushbutton. The MGC LED in the display illuminates. Located above the MGC LED is the -dBm window. Utilize the CHANGE pushbuttons to increment the RF/IF gain to the desired AM detector level. In order to change the COR level, depress the COR LEVEL pushbutton. The COR level is located within the display window above the COR pushbutton.

2.4.1.7 **BFO TUNE (S7)** - This pushbutton is utilized to allow tuning of the Beat Frequency Oscillator available only in CW and ISB modes. An LED in the display window illuminates indicating active BFO tuning. The tuning display indicates the offset frequency of ±4 kHz in 40 Hz steps in CW or ±2 kHz in 20 Hz steps for SSB.

2.4.1.8 **AFC (S8)** - Depression of the AFC pushbutton switches the Automatic Frequency Control on (AFC LED illuminated) or off (AFC LED extinguished). When this function is enabled, it corrects for any frequency drift keeping the receiver locked onto 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. AFC is disabled for 1 second when a bandwidth change or a rotation of the tuning knob occurs.

NOTE

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.

2.4.1.9 **TUNING KNOB (U1)** - Rotation of this knob changes the receiver tuned frequency. The frequency changes at an increment established by the tuning rate pushbuttons. The tuning encoder has 64 counts per rotation. The frequency display does not rollover when it reaches the upper or lower frequency limit.

2.4.1.10 **TUNE LOCK (S9)** - Depressing this pushbutton disables control of the tuned frequency by the tuning knob. The receiver remains at the last selected frequency. Depressing any tuner related pushbutton restores control to the tuning knob. Depressing FASTER selects the 10 MHz digit. Depressing SLOWER from the TUNE LOCK position selects the 100 Hz digit.

2.4.1.11 **TUNING RATE (FASTER S10, SLOWER S11)** - Depressing one of these pushbuttons causes the tuned increments to change from 10 MHz (FASTER) to 100 Hz (SLOWER) steps in multiples of ten as the pushbutton is depressed. Tuning increment is indicated by a flashing digit. The flashing digit moves to the right or to the left indicating tuning increment.

2.4.1.12 **CONTROL (S12)** - This pushbutton allows the receiver to be controlled (REM) from an external source. In the local (LCL) mode, the operator controls the receiver via the front panel controls. Refer to **paragraph 4.5.** for additional functions of the CONTROL pushbutton in the function configuration mode of operation.

2.4.1.13 **AUDIO GAIN (R1)** - This control adjusts the level of the audio signal present at the phones jack. This level is adjustable to 10 mW.

2.5 REMOTE OPERATION

The IEEE-488 Remote Interface provides talk and listen capabilities between the receiver and external equipment, such as calculators, minicomputers or other IEEE-488 equipped controlling devices. The data is transferred between units in a bit-parallel, byte serial form, utilizing sixteen interconnection lines. These lines consist of eight bi-directional data

bus lines, three data byte transfer lines and five management lines. Data or address information is transferred between devices, utilizing the data bus lines. Refer to **Figure 2-5.**

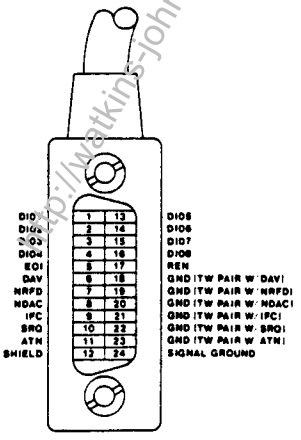

Figure 2-5. Configuration of IEEE-488 Data Bus.

The data byte transfer lines indicate: the availability and validity of the information on the data bus lines; if the devices are ready to accept data; and if the data has been accepted. The interface management lines: specify whether the data bus lines are carrying data or address information; request service; clear the interface; and indicate the end of a transfer sequence. The capabilities of the IEEE-488 Interface include:

Function Description	IEEE-488-1978 Subsets
● Source handshake	(SH1)
● Acceptor handshake	(AH1)
● Basic talker with serial poll	(T6)
● Basic listener with serial poll	(L4)
● Service request	(SR1)
● Device clear	(DC1)

Essentially, this means that the receiver can talk or listen when commanded by the controller. It can also issue a service request notifying the controller when it needs service.

Two types of data transfer are supported on the WJ-8615D Compact Receiver. One type of data transfer on the IEEE-488 interface bus is ASCII. This type of transfer utilizes ASCII mnemonics to control the receiver. The termination may be CR, LF (Carriage Return, Line Feed) or LF (Line Feed) or EOI (End or Identify) set on the last character of the transfer. These mnemonics may be strung together utilizing a semicolon. Another type of data transfer supported by the WJ-8615D Compact Receiver is binary. This type of data transfer allows single information bytes to control the receiver. In the binary operation, a command or group of commands must end with EOI (End or Identify) set on the last byte of the command. Commands may not be strung with a semicolon or terminated with CR (Carriage Return) or LF (Line Feed). The ASCII operation format tends to be self-documenting and easy to understand. Binary, on the other hand lessens the number of bytes that must be transferred and has a faster execution speed. In the ASCII format, the message consists of a series of data bytes that form one of the mnemonics listed in **Table 2-4.** Each byte is one ASCII character of the mnemonic. When the mnemonic contains a variable value, the mnemonic is followed by a number

representing that value. Each digit of the number is applied as a separate ASCII character. In the binary format, the mnemonic is 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 additional data bytes, representing the binary or hexadecimal value. During ASCII operation, only ASCII commands are valid and only ASCII responses are returned. In binary operation, only binary commands are valid and only binary responses are returned.

2.5.1 GENERAL

The command columns depict messages that can be sent to the WJ-8615D Remote Receiver as an active listener. Responses returned are messages returned when the receiver is an active talker. ASCII messages may be sent with embedded spaces or any combination of upper and lower case characters.

In addition to the mnemonics, the receiver responds to the 488 defined commands of SDC (selected device clear) and DCL (device clear). These commands set SRQ and cause the input and output buffers to be emptied. Any message in progress is aborted.

The response to an AM? mnemonic is a number from 000 to 068 representing the level of AM Video present at the output of the receiver. For FM?, the response is a number ranging from 000 to 100, representing the percentage of FM modulation. This percentage is related to the selected bandwidth size. For FMO?, the response is a number from 0-255, representing the FM Discriminator offset. The number 127 represents a signal at tuned frequency, >127 means the signal is > tuned frequency, <127 means the signal is < tuned frequency.

LGV? provides a number from 000 to 120 representing the Log video level of the receiver. This number represents the signal level above the theoretical noise floor of the receiver, with each number representing a 0.5 dB change. 000 represents the theoretical noise floor and 120 represents 60 dB above that level.

The response to SS? provides a signal strength number in dBm from -125 to 0. The "-" sign is assumed, not sent. In manual gain this number represents the level of the AM detector. While in Manual gain, the number returned by SS? is the utilization of the AM Detector, 0-100%.

The WJ-8615D Compact Receiver is capable of activating the SRQ line indicating controller service is required. Four different stimuli cause the receiver to set the SRQ line indicating the reasons for this assertion. These include: errors, power-up, clear and signal activity. If an error occurs during operation of the receiver, it sets the SRQ line and bits 5 and 6 of the status byte. When the receiver is powered-up or sent SDC or DCL commands, it sets SRQ and bits 1 and 6 of the status byte.

The remaining stimuli that cause the SRQ line to become active is the acquisition or loss of a signal (signal level above or below COR level). This sets bit 6 of the status byte. Signal activity SRQ must be enabled by sending STS 1 to enable this interrupt.

Table 2-4. Mnemonics and Binary Codes

Mnemonic	Hex	Dec	Description	Refer to Table
AFC	42	66	Turn AFC on	2-7
AFC/	43	67	Turn AFC Off	2-7
AFC?	44	68	Request AFC mode	2-7
AGC	45	69	Turn AGC on	2-7
AGC/	46	70	Turn AGC off	2-7
AGC?	47	71	Request AGC mode	2-7
AM	48	72	Select AM detection mode	2-6
AM?	4A	74	Request AM modulation 0-68	2-8
BFO(a)	39(p)	57(p)	Set BFO frequency ±4 kHz CW, ±2 kHz SSB	2-14
BFO?	3B	59	Request BFO frequency	2-14
BIN		84	Causes all future comands to be in binary.	2-4
	55	85	Causes all future commands to be in ASCII	2-4
BW(a)	4E(b)	78(b)	Select BW slot 1-5	2-5
BW?	50	80	Request which BW slot	2-5
BWC?	9E	158	Request BW size	2-5
BYP	3F	63	Select bypass of preselector	2-8
BYP/	40	64	De-select bypass of preselector	2-8
BYP?	41	65	Request present status of pre-selector (Bypass on/off)	2-8
CLM	6C	108	Clear receiver and memory	2-8
CLR	51	81	Clear receiver	2-8
COR(a)	57(b)	87(b)	Set COR level 0-80	2-7
COR?	59	89	Request COR level	2-7
CST?	9B	155	Request COR status	2-7
CW	5A	90	Select CW detection mode	2-6
DET?	5F	95	Request detection mode selected	2-6
ERR?	65	101	Request error number	2-4
FM	69	105	Select FM detection mode	2-6
FM?	6B	107	Request FM modulation 0-100	2-8
FMO?	AD	173	Request reading of FM offset 0-255	2-8
FPL	CF	207	Turn front panel displays on	2-5
FPL/	D0	208	Turn front panel displays off	2-5
FPL?	D1	209	Request front panel display status	2-5
FRQ(a)	3C(p)	60(p)	Set tuned frequency in MHz	2-7
FRQ?	3E	62	Request tuned frequency	2-7
ISB	B2	178	Select ISB detection mode	2-6
LGV?	71	113	Request reading of Log Video	2-8
LSB	72	114	Select LSB detection mode	2-6
MAN	75	117	Select Manual operation	2-8
MOD?	B3	179	Request operation mode	2-8
OPT?	-	-	Request option configuration	2-5
PLS	78	120	Select Pulse detection mode	2-6
RFG(a)	7E(b)	126(b)	Enter RF Gain (0-255)	2-7
RFG?	80	128	Request RF Gain	2-7
RMT	81	129	Select Remote operation	2-4
RMT/	82	130	De-select Remote	2-4
RMT?	83	131	Request control mode	2-4

Table 2-4. Mnemonics and Binary Codes (Cont'd)

Mnemonic	Hex	Dec	Description	Refer to Table
SS?	89	137	Request Signal Strength in dBm	2-8
STS(a)	90(b)	144(b)	Sets status byte	2-4
STS?	92	146	Request device status command	2-4
USB	93	147	Select USB detection mode	2-6
VER?	-	-	Request receiver type and software revision	2-5

(a) - Utilized in a command as an ASCII number or a group of numbers.
(b) - A single byte of binary information.
(p) - Eight packed BCD digits in four bytes of information.
(__) - Represents the default mode.

A serial poll clears the SRQ line as defined by the IEEE-488 specification. The status byte read by the computer while doing the serial poll is defined as follows:

Bit	Set Indicates	Cleared Indicates	Cleared By
Ø	Signal above COR	No signal above COR	Non-latched indicator
1	Unit Power-up SRQ		Requesting receiver status (device dependent command)
2	Not Used		
3	Not Used		
4	Responding to request for data		Non-latched indicator
5	Error condition occurred	Error condition cleared	Requesting Error status (device dependent command)
6	SRQ has occurred	SRQ not active from this device	Requesting RCVR status or Error status (device dependent command)
7	LO unlocked	LO locked	Non-latched indicator

As a response to an STS? instruction or serial poll, a status byte is returned to indicate the receiver status. This response is a three-digit decimal number that corresponds to the binary number contained in the returned byte (Ø = ØØØØØØØØ; 127 = Ø1111111).

Table 2-5. WJ-8615D Configuration Commands and Responses

The following table **(Table 2-5)** cites examples of commands and responses in ASCII, Hexadecimal and Decimal equivalents. These commands and responses are utilized to configure the receiver to the proper format.

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BIN		84				Causes all future expected commands to be in binary.
	55	85				Causes all future expected commands to be in ASCII. (default)
ERR?	65	101				Request error number. Returns 2 right hand digits of error code.
FPL	CF	207				Turns front panel display on
FPW	D0	208				Turns all display LED's off except "REM".
FPL?	D1	209				Request current front panel display status (on/off).
OPT?	-	-	OPT(a)(a)	-	-	Returns two groups of ASCII characters representing numbers from 0 to 255: Bit Group 1 Group 2 0 Not Utilized 1 HF 2 Not Utilized 3 FE 4 SSB 5 BFO 6 Not Utilized 7 Test Enabled
RMT	81	129	FPL	CF	207	Select remote operation. (Included to allow interface software capability with other WJ-861X Receivers.)
			FPL/	D0	208	
RMT/	82	130				De-select remote. (Remote Control remains unchanged).
RMT?	83	131	RMT	81	129	Requests control mode (Remote/ Local).
			RMT/	82	130	
STS(a)	90(b)	144(b)				Sets status byte. b = 0 - No SRQ sent on signal activity. a = 1 - SRQ sent on signal activity.

Table 2-5. WJ-8615D Configuration Commands and Responses (Cont'd)

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
STS?	92	146	STS(a)	90(b)	144(b)	Request device status command. Bit — Function 0 — Signal above COR level. 1 — Unit power-up or IEEE-488 DCL or SDC activated SRQ. 2 — Not Utilized 3 — Not Utilized 4 — Receiver responding to query. 5 — Unit error activated SRQ. (Cleared by ERR?) 6 — SRQ activated by this unit. (Cleared by serial poll followed by STS?)
VER			VER(a)			Request receiver model and software revision level. Returns in the form: VER 8615 X00000Y.Z.1 where X = letter designation of receiver Y = dash number of receiver Z = software designation 1 = software number

(a) - Utilized in a command as an ASCII number or a group of numbers.
Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.
(b) - A single byte of binary information.
(__) - Represents the default mode.

Table 2-6. WJ-8615D Bandwidth Commands and Responses

Bandwidths for the receiver are applied utilizing the following commands and responses.

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
BW(a)	4E(b)	78(b)				Select BW slot 1-5. Display is numbered top to bottom starting with slot 1. (WJ-8615D does not allow selection of empty BW slot).
BW?	50	80	BW(a)	4E(b)	78(b)	Request which slot is selected. (BW 1 is default)
BWC?	9E	158	BWC(c)	9E(b)(b)	15E(b)(b)	Request size of selected BW. (number returned in ASCII is in kHz). (Number returned in binary is a 2 byte binary number representing kHz).

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.
(b) - A single byte of binary information.
(c) - Utilized in a response as 4 bytes of ASCII data representing a number.

Table 2-7. WJ-8615D Detection Commands and Responses.

Detection modes for the receiver are applied utilizing the following commands and responses.

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM	48	72				Select AM detection mode.
CW	5A	90				Select CW detection mode.
FM	69	105				Select FM detection mode.
ISB	B2	178				Select ISB detection mode.
PLS	78	120				Select PULSE detection mode.
LSB	72	114				Select LSB detection mode.
USB	93	147				Select USB detection mode.
DET?	5F	95	AM	48	72	Request mode of detection selected.
			CW	5A	90	
			FM	69	105	
			ISB	B2	178	
			LSB	72	114	
			PLS	78	120	
			USB	93	147	

(_) - Represents the default mode.

Table 2-8. WJ-8615D Miscellaneous Control Commands and Responses

Miscellaneous control of the receiver is applied utilizing the following commands and responses.

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AFC	42	66				Turn AFC on.
AFC/	43	67				Turn AFC off.
AFC?	44	68	AFC/ AFC	42 43	66 67	Request AFC mode.
AGC	45	69				Turn AGC on.
AGC/	46	70				Turn AGC off.
AGC?	47	71	AGC AGC/	45 46	69 70	Request AGC mode.
BFO(f)	39(f)	57(f)				
BFO?	3B	59	BFO(f)	39(f)	57(f)	First ASCII character after space in (f) field is sign, (0 = + or -). In binary, frequency is sent in kHz with a decimal point assumed between 2nd and 3rd byte. Sign is bit 3 of 2nd byte.
BYP	3F	63				Select bypass of preselector.
BYP/	40	64				De-select bypass of preselector.
BYP?	41	65	BYP BYP/	3F 40	63 64	Request present status of preselector (bypass on/off).
COR(a)	57(b)	87(b)				Set COR level (0-80 = on, 80 = off). Level is 1 dB steps starting at noise floor threshold of selected BW.
COR?	59	89	COR(a)	57(b)	87(b)	Request the COR level; —indicates off.
CST?	9B	155				What is COR status?
			CST CST/	99 9A	153 155	Signal is above COR. Signal is below COR.
FRQ(f)	3C(p)	60(p)				Set the tuned frequency in MHz. (20-1100 in .0001 MHz steps.) (Binary mode is packed BCD always 4 bytes.) (Upper limit 500 MHz without FE option.)
FRQ?	3E	62	FRQ(f)	3C(p)	60	Request tuned frequency. (20 MHz is default.)

Table 2-8. WJ-8615D Miscellaneous Control Commands and Responses

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
RFG(a)	7E(b)	126(b)				Enter RF Gain number (0-255.) 0 = minimum gain, 255 = maximum gain.
RFG?	80	128	RFG(a)	7E(b)	126(b)	Request RF Gain number. (The RF Gain 0 is default.)

(a) - Utilized in a command as an ASCII number or a group of numbers.
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

(f) - Utilized in a command as a group of ASCII numbers representing a frequency. - Utilized in a response as a space followed by 4 bytes of ASCII data representig a frequency.
This should not exceed 10 characters, including sign and decimal. Leading and trailing zeros need not be sent.

(p) - Eight packed BCD digits in four bytes of information.

(_) - Represents the default mode.

Table 2-9. WJ-8615D Signal Information Commands and Responses.

Signal information for the receiver is applied utilizing the following commands and responses.

Commands			Responses			Description
ASCII	Hex	Dec	ASCII	Hex	Dec	
AM?	4A	74	AM(a)	48(b)	72(b)	Request reading from AM modulation. 000-068 Range
FM?	6B	107	FM(a)	69(b)	105	Request reading from FM modulation. 000-100 Range
FMO?	AD	173	FMO(a)	AB(b)	171(b)	Request reading of FM offset. 000-255 range.
LGV?	71	113	LGV(a)	6F(b)	111	Request reading of Log Video. 000-080 Range
SS?	89	137	SS(a)	87(b)	135(b)	Request reading of Signal Strength in dBm. (In manual, gain represents AM Detector 0-100%).

(a) - Utilized in a command as an ASCII number or a group of numbers
- Utilized in a response as a space followed by 3 bytes of ASCII data representing a number.

(b) - A single byte of binary information.

Table 2-10. Sending a Tuned Frequency of 25 MHz to the WJ-8615D Using an HP-85 (WJ-8615D Device #6)

Message: Send tuned frequency of 25.0000 MHz

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "FRQ25"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP-85 TALK
ASCII message may have leading zeros.	3	1	0	26		8615D LISTEN
Total none blank character count ≥15,	4	0	0	46	F	
for single commands, exponential	5	0	0	52	R	DATA TO
format not supported. IE: "FRQ	6	0	0	51	Q	WJ-8615D
0025.0000 is valid message.	7	0	0	32	2	
EOI may be the terminator.	8	0	0	35	5	
	9	0	0	0D	(CR)	
	10	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 60, 0, 37, 0, 0	1	1	0	3F		UNLISTEN
	2	1	0	55		HP-85 TALK
All bytes must be sent with no spaces	3	1	0	26		8615D LISTEN
or terminator characters.	4	0	0	3C	60	FREQ CODE
	5	0	0	00	0	BYTE 1
	6	0	0	25	37	BYTE 2
	7	0	0	00	0	BYTE 3
	8	0	1	00	0	BYTE 4

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-11. Sending an AFC "ON" Command

Message: turn AFC on

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "AFC"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	41	A	
	5	0	0	46	F	DATA TO
	6	0	0	43	C	WJ-8615D
	7	0	0	0D	(CR)	
	8	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 66	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	1	26		8615D LISTEN
	4	0	1	42	66	AFC/ON CODE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-12. Sending an AFC "OFF" Command

Message: turn AFC off

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "AFC/"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	41	A	
	5	0	0	46	F	DATA TO
	6	0	0	43	C	WJ-8615D
	7	0	0	2F	/	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 67	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	1	43	67	AFC/OFF CODE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages)
Printer is 706 (directs print statements to WJ-8615D)

Table 2-13. Sending an AM Detection Command

Message: send AM detection mode

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "AM"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	41	A	DATA TO
	5	0	0	4D	M	WJ-8615D
	6	0	0	0D	(CR)	
	7	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 72	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	1	48	72	AM CODE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages)
Printer is 706 (directs print statements to WJ-8615)

Table 2-14. Sending a COR "OFF" Command

Message: send COR off

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "COR 81"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	43	C	
	5	0	0	4F	O	DATA TO
	6	0	0	52	R	WJ-8615D
	7	0	0	34	8	
	8	0	0	31	1	
	9	0	0	0D	(CR)	
	10	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 87, 81	1	1	0	3F		UNLISTEN
	2	1	0	55		HP 85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	57	87	COR CODE
	5	0	1	29	81	VALUE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D).

Table 2-15. Sending a Command To Set BFO To -3.99 kHz

Message: set BFO to -3.99 kHz

(Message valid only if VBFO option is installed)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "BFO -3.99"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	42	B	
	5	0	0	46	F	DATA TO
	6	0	0	4F	O	WJ-8615D
	7	0	0	2D	-	
	8	0	0	33	3	
	9	0	0	2E	.	
	10	0	0	39	9	
	11	0	0	39	9	
	12	0	0	0D	(CR)	
	13	0	0	0A	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 57, 0, 15, 153, 0	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	20		8615D LISTEN
Bit 3 of byte 6 is the sign bit	4	0	0	39	57	BFO CODE
0 = +, 1 = - ,	5	0	0	00	00	BYTE 1
The remaining 3 bits are BCD 1's of kHz digit.	6	0	0	0F	15	BYTE 2
i.e. byte 6 for +3 kHz = 03 Hex.	7	0	0	99	153	BYTE 3
byte 6 for -3 kHz = 0B Hex.	8	0	1	00	0	BYTE 4

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D).

Table 2-16. Sending a Frequency Request

Message: request frequency (assume 25 MHz last sent)

ASCII Mode	#	ATN	EOI	HEX	ASCII	Comment
	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
Instruct WJ-8615D to prepare to output	3	1	Ø	26		8615D LISTEN
frequency information when made	4	Ø	Ø	46	F	
a talker	5	Ø	Ø	52	R	DATA TO
	6	Ø	Ø	51	Q	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	CR	
	9	Ø	Ø	ØA	LF	TERMINATOR
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
	13	Ø	Ø	46	F	
	14	Ø	Ø	52	R	
	15	Ø	Ø	51	Q	DATA FROM
A$ will contain "FRQ ØØ25.ØØØØ".	16	Ø	Ø	2Ø		WJ-8615D
	17	Ø	Ø	3Ø	Ø	
	18	Ø	Ø	3Ø	Ø	
	19	Ø	Ø	32	2	
Frequency response is always 15	2Ø	Ø	Ø	35	5	
characters.	21	Ø	Ø	2E		
	22	Ø	Ø	3Ø	Ø	
	23	Ø	Ø	3Ø	Ø	
	24	Ø	Ø	3Ø	Ø	
	25	Ø	Ø	3Ø	Ø	
	26	Ø	Ø	ØD	CR	
	27	Ø	Ø	ØA	LF	TERMINATOR

Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 62	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	3E		REQUEST FREQUENCY
Enter 7Ø6 using "#%, #%K"; A$	1	1	Ø	3F		UNLISTEN
	2	1	Ø	35		HP85 LISTEN
Image causes enter to terminate on EOI	3	1	Ø	46		8615D TALK
only.	4	Ø	Ø	3C	6Ø	FREQ CODE
	5	Ø	Ø	ØØ	Ø	BYTE 1
A$ will contain frequency data in packed	6	Ø	Ø	25	37	BYTE 2
BCD.	7	Ø	Ø	ØØ	Ø	BYTE 3
	8	Ø	1	ØØ	Ø	BYTE 4

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages)
Printer is 7Ø6 (directs print statements to WJ-8615D).

Table 2-17. Sending an AFC Condition Request

Message: request AFC condition (assume AFC off)

ASCII Mode	#	ATN	EOI	HEX	ASCII	Comment
		Actual Bus Transfer				
Output 706 using "K"; "AFC?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
Instruct WJ-8615D to prepare to output AFC status when made a talker.	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	41	A	
	5	Ø	Ø	46	F	DATA TO
	6	Ø	Ø	43	C	WJ-8615D
	7	Ø	Ø	3F	?	
	Ø	Ø	ØD	ØD	CR	
	Ø	Ø	ØA	ØA	LF	TERMINATOR
Enter 706; A$	8	1	Ø	3F		UNLISTEN
	9	1	Ø	35		HP85 LISTEN
	1Ø	1	Ø	46		8615D TALK
A$ will contain "AFC/".	11	Ø	Ø	41	A	
	12	Ø	Ø	46	F	DATA FROM
	13	Ø	Ø	43	C	WJ-8615D
	14	Ø	Ø	2F	/	
	15	Ø	Ø	ØD	(CR)	
	16	Ø	Ø	ØA	(LF)	TERMINATOR
				(Response in AFC On)		
Enter 706; A$	8	1	Ø	3F		UNLISTEN
	9	1	Ø	35		HP85 LISTEN
	1Ø	1	Ø	46		8615D TALK
A$ will contain "AFC".	11	Ø	Ø	41	A	
	12	Ø	Ø	46	F	DATA FROM
	13	Ø	Ø	43	C	WJ-8615D
	14	Ø	Ø	ØD	(CR)	
	15	Ø	1	ØA	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEC	DEC	Comment
*Print using "B"; 68	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	44	68	REQUEST AFC
Enter 706 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
	7	1	Ø	46		8615D TALK
A$ will contain 1 byte binary data.	8	Ø	1	43	67	AFC ON

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-18. Sending a Bandwidth Size Request

Message: request size of currently selected bandwidth (assume 10 kHz)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "BWC?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
Instruct 8615D to output size of	3	1	0	26		8615D LISTEN
selected BW in kHz when made an	4	0	0	42	B	
active talker.	5	0	0	57	W	DATA TO
	6	0	0	43	C	WJ-8615D
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contain "BWC 10".	12	1	0	46		8615D TALK
	13	0	0	42	B	
	14	0	0	57	W	DATA FROM
	15	0	0	43	C	WJ-8615D
	16	0	0	20		
	17	0	0	20		
	18	0	0	31	1	
	19	0	0	30	0	
	20	0	0	0D	CR	
	21	0	1	0A	LF	TERMINATOR
				(assume 4 MHz)		
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
A$ will contain "BWC 4000".	12	1	0	46		8615D TALK
	13	0	0	42	B	
	14	0	0	57	W	DATA FROM
	15	0	0	43	C	WJ-8615D
	16	0	0	34	4	
	17	0	0	30	0	
	18	0	0	30	0	
	19	0	0	30	0	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 158	1	1	0	3F		UNLISTEN
	2	1	0	55		HP TALK
	3	1	0	26		8615D LISTEN
	4	0	1	9E	158	BW SIZE REQUEST
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	B5		HP85 LISTEN
	7	1	0	46		8615D TALK
A$ will contain binary BW size	8	0	0	9C	156	BW CODE
information.	9	0	0	00	0	BINARY CODED
	10	0	1	0A	10	BANDWIDTH IN kHz
				(Assume 4 MHz)		
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 LISTEN
Byte 1, Byte 2	7	1	0	46		8615D TALK
	8	0	0	9C	156	BW CODE
A$ will contain binary BW size	9	0	0	0F	15	BINARY CODED
information.	10	0	1	A0	160	BANDWIDTH IN kHz

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-19. Sending a Detection Mode Request

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "DET?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP 85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	44	D	
	5	Ø	Ø	45	E	DATA TO
	6	Ø	Ø	54	T	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	(CR)	
	9	Ø	Ø	ØA	(LF)	TERMINATOR
Enter 706; A$	10	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
	13	Ø	Ø	41	A	
A$ will contain "AM".	14	Ø	Ø	4D	M	DATA FROM
	15	Ø	Ø	2Ø		WJ-8615D
	16	Ø	Ø	ØD	(CR)	
	17	Ø	1	ØA	(LF)	TERMINATOR
				(Assume PLS)		
Enter 706; A$	10	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
A$ will contain "PLS".	13	Ø	Ø	5Ø	P	
	14	Ø	Ø	4C	L	DATA FROM
	15	Ø	Ø	53	S	WJ-8615D
	16	Ø	Ø	ØD	(CR)	
	17	Ø	1	ØA	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 95	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 LISTEN
	3	1	Ø	26		8615D TALK
	4	Ø	1	5F	95	REQUEST DETECTION MODE
Enter 706 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
A$ will contain 1 byte binary	7	1	Ø	46		8615D TALK
information.	8	Ø	1	48	72	AM CODE
				(Assume PLS)		
Enter 706 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
A$ will contain 1 byte binary	7	1	Ø	46		8615D TALK
information.	8	Ø	1	78	120	PLS CODE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-20. Sending a COR Level Request

Message: request COR level, (assume off)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "COR?"	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	43	C	
	5	0	0	4F	O	DATA TO
	6	0	0	52	R	WJ-8615D
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
	12	1	0	46		8615D TALK
	13	0	0	43	C	
A$ will contain "COR 081"	14	0	0	4F	O	DATA FROM
	15	0	0	52	R	WJ-8615D
	16	0	0	20		
	17	0	0	30	0	
	18	0	0	34	8	
	19	0	0	31	1	
	20	0	0	0D	(CR)	
	21	0	1	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
		1	0	3F		UNLISTEN
*Print using "B"; 89		1	0	55		HP85 TALK
		1	0	28		8615D LISTEN
		0	1	59	89	REQUEST COR
Enter 706 using "#%, #%K"; A$	1	1	0	3F		UNLISTEN
	2	1	0	35		HP85 LISTEN
A$ will contain 2 bytes binary information.	3	1	0	46		8615D TALK
	4	0	0	57	87	COR CODE
	5	0	1	29	81	VALUE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-21. Sending a BFO Frequency Request

Message: request frequency (assume -3.60 kHz)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "BFO?"	1	1	0	3F		UNLISTED
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	42	B	
	5	0	0	46	F	DATA TO
	6	0	0	4F	O	WJ-8615D
	7	0	0	3F	?	
	8	0	0	0D	(CR)	
	9	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	10	1	0	3F		UNLISTEN
	11	1	0	35		HP85 LISTEN
	12	1	0	46		8615D TALK
A$ will contain "BFO -003.6000".	13	0	0	42	B	
	14	0	0	46	F	DATA FROM
	15	0	0	4F	0	WJ-8615D
	16	0	0	20		
	17	0	0	2D	-	
	18	0	0	30	0	
	19	0	0	30	0	
	20	0	0	33	3	
	21	0	0	2E	.	
	22	0	0	36	6	
	23	0	0	30	0	
	24	0	0	30	0	
	25	0	0	30	0	
	26	0	0	0D	(CR)	
	27	0	1	0A	(LF)	TERMINATOR
*Binary Mode	#	ATN	EOI	HEX	DEC	Comment
Print using "B"; 59	1	1	0	3F		UNLISTED
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	1	3B	59	REQUEST BFO
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 LISTEN
A$ will contain 5 bytes BFO	7	1	0	46		8615D TALK
information.	8	0	0	39	57	BFO CODE
	9	0	0	00	0	BYTE 1
	10	0	0	0B	11	BYTE 2
	11	0	0	60	96	BYTE 3
	12	0	1	00	00	BYTE 4
				(Assume 3.60 kHz)		
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 LISTEN
A$ will contain 5 bytes BFO	7	1	0	46		8615D TALK
information.	8	0	0	39	57	BFO CODE
	9	0	0	00	0	BYTE 1
	10	0	0	03	03	BYTE 2
	11	0	0	60	96	BYTE 3
	12	0	1	00	00	BYTE 4

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

Table 2-22. Sending a Signal Strength Level Request

Message: read signal strength (assume SS=95)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 706 using "K"; "SS?"	1	0	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	0	26		8615D LISTEN
	4	0	0	53	S	
	5	0	0	53	S	DATA TO
	6	0	0	3F	?	WJ-8615D
	7	0	0	0D	(CR)	
	8	0	0	0A	(LF)	TERMINATOR
Enter 706; A$	9	1	0	3F		UNLISTEN
	10	1	0	35		HP85 LISTEN
	11	1	0	46		8615D TALK
	12	0	0	53	S	
	13	0	0	53	S	DATA FROM
A$ will contain "SS 095".	14	0	0	20		WJ-8615D
	15	0	0	20		
	16	0	0	30	0	
	17	0	0	39	9	
	18	0	0	35	5	
	19	0	0	0D	(CR)	
	20	0	0	0A	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 137	1	1	0	3F		UNLISTEN
	2	1	0	55		HP85 TALK
	3	1	9	26		8615D LISTEN
	4	0	1	89	137	REQUEST SS
Enter 706 using "#%, #%K"; A$	5	1	0	3F		UNLISTEN
	6	1	0	35		HP85 LISTEN
Signal strength is returned in binary format.	7	1	0	46		8615D TALK
	8	0	0	87	135	SS CODE
	9	0	1	5F	95	SS BYTE

*Control Statement: Control 7, 16; 128 (sets HP85 to EOI terminator for printer messages).
Printer is 706 (directs print statements to WJ-8615D)

2.6 ERRORS

Error codes of the WJ-8615D Compact Receiver are divided into two categories: fatal and non-fatal. Fatal errors detect faults which are not predictable and will not allow receiver operation. The first of the fatal errors encountered is displayed as "Err XXX" and no other operation continues.

Non-fatal errors cause the error to be displayed for 5 seconds after it is detected. These errors set SRQ on the remote bus along with bit 5 of the status byte. The error number is determined by requesting error status from the receiver. This returns the two least significant digits of the error. Non-fatal errors indicate remote errors or receiver errors. Any non-fatal error code clears after 5 seconds or clears on front panel activity.

Fatal Error Code	Description
Err ---	Hardware failure of RAM, microprocessor or data bus.
Err 100	Hardware failure of RAM or data bus: bit 0
Err 101	bit 1
Err 102	bit 2
Err 103	bit 3
Err 104	bit 4
Err 105	bit 5
Err 106	bit 6
Err 107	bit 7
Err 110	RAM checksum cannot be calculated properly.
Err 120	3.33 msec. interrupt non-functional or not properly timed.
Err 121	.833 msec. interrupt non-functional or not properly timed.

Non-Fatal Error Code	Description
Err 130	A/D end of conversion not active, or improper A/D operation.
Err 131	-15 V supply not functional. +15 V supply okay.
Err 132	+15 V supply not functional. Not capable of testing -15 V supply.
Err 140	Illegal key code detected from keyboard encoder.
Err 160	EPROM checksum failure.
Err 220	Unlock condition detected for ~75 msec. on 1st, 2nd LO's and 3rd Synthesizer. This error is only reported on initial failure. If unlock continues, it is displayed by decimal points on all MHz digits indicating 1st LO unlocked or decimal points on all kHz digits indicating 2nd LO or 3rd Synthesizer unlocked. On remote, the unlock indication is monitored on bit 7 of the status byte.

Non-Fatal Error Code	Description
Err 230	RAM checksum failed. The receiver uses internal switches for configuration and returns to default parameters. A second failure after recalculation causes an Err 110. (This error occurs if the microprocessor card is unplugged.)
Err 240	BFO counter timer not functional or out of time specification. BFO will not function properly.

Remote Error Code	Description
Err 401	Input data buffer is full (message is too long).
Err 402	Less than 2 characters in message.
Err 404	Number is out of range for command.
Err 406	"/" or "?" not valid for this command.
Err 407	Invalid mnemonic or binary code received.
Err 416	This type mnemonic or binary code is not executed on the WJ-8615D.
Err 814	An attempt was made to select a non-occupied bandwidth slot.

2.7 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 utilized or at least provide guidance for the repackaging effort.