INSTALLATION, OPERATION, AND

INTERMEDIATE LEVEL MAINTENANCE MANUAL

FOR THE

WJ-8712P DIGITAL HF RECEIVER

P/N 181159-001, Revision J

BAE SYSTEMS
AEROSPACE ELECTRONICS, INC.
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

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WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

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WJ-8712P DIGITAL HF RECEIVER

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REVISION RECORD

Revision	Description	Date
A	Initial issue.	4/94
B	Incorporates changes and corrects errata. Effective Serial No. 67, the LINE A output of TB1 provides LSB audio in ISB mode and the LINE B output provides USB audio in ISB mode.	5/94
C	Reverses the changes made under Revision B for the LINE A and LINE B audio outputs to their original configuration. See above.	9/94
D	Provides information on Digital Control PC Assembly (A2) upgrade.	5/95
E	Updated manual to reflect 871Y Control Version 4.01.05. Added information about the use of the CI-V Level Converter when using the CSMA Interface.	12/95
F	Corrected errata. Bit 6 of the Event Summary Register is not used. It cannot be used to flag front panel parameter changes. Improved AGC attack time specification from 15 ms to 5 ms.	4/96
G	Deleted reference to WJ-871Y/PCSM2 Personal Computer Signal Monitor Option as an available option. Removed associated **Appendix G**. Added freeware control program to the list of equipment supplied. Revised specification for vibration and shock to agree with data sheet.	7/96
H	Added part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	6/98
J	Incorporated ECO 039883.	5/00

TECHNICAL NOTE

HANDLING OF LITHIUM BATTERIES

WARNING

This unit contains a lithium battery as back up power for memory retention. Extreme care should be used in storage, handling, and disposal of lithium batteries. Improper handling may present explosion hazard.

- Always wear eye protection when handling batteries.
- Do not puncture, compact, incinerate, short circuit, or expose to temperatures above 160°F (71°C).
- Do not expose batteries to charging currents.
- Do not store loose batteries in bins. Always store in original containers.
- Dispose of batteries properly. Discharged cells should be handled with care, as they retain significant energy. They should be electrically isolated and packaged for disposal. Dispose in accordance with local regulations for hazardous material disposal. DO NOT INCINERATE OR COMPACT.

WJ-8712P DIGITAL HF RECEIVER BATTERY REPLACEMENT FOR UNITS CONTAINING THE TYPE 797012 DIGITAL ASSEMBLY (A2)

The lithium battery contained in the WJ-8712P Receiver is mounted in a battery holder on the Type 797012 Digital Assembly (A2). If replacement is required, carefully insert a blunt, nonmetallic, tool between the bottom face of the battery and the holder at one of the five slots provided. Pry the battery up at a slight angle and remove with fingers. Take care to avoid shorting the positive (+) and negative (-) contacts during the removal process. Install the replacement battery with the positive contact face up. Insert battery under the battery clip at a slight angle and slide in place.

WJ-8712P DIGITAL HF RECEIVER BATTERY REPLACEMENT FOR UNITS CONTAINING THE TYPE 797214 DIGITAL ASSEMBLY (A2)

Refer to the instructions contained in **paragraph 7.8.5.**

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IF Output	
Center Frequency	455 kHz, nominal
Output Level	-20 dBm, nominal
Output Impedance	50 ohms, nominal
Connector Type	BNC female
Signal Monitor Output	
Center Frequency	455 kHz, nominal; inverted
Bandwidth	30 kHz (-6 dB) minimum
Output Level	30 dB above RF Input, nominal
Output Impedance	50 ohms, nominal
Connector Type	BNC female
Gain Control Modes	Manual, AGC Fast, Medium, and Slow
AGC Range	100 dB minimum
AGC Threshold	Variable. When enabled locally through SPECIAL FUNCTION key and AUXILIARY PARAMETER EDIT knob, operator controls with MANUAL GAIN. Remotely enabled by operator with AGT command and controlled with RFG command
AGC Attack Time	5 msec typical
AGC Decay Time	Fast: 10-100 msec variable in 10 ms steps Medium: 100-1000 msec variable in 100 ms steps Slow: 1-5 sec variable in 0.5 sec steps
Selectable Front End Gain/Attenuation	
Preamplifier Gain	10 dB (±2 dB)
Attenuation	15 dB (±2 dB)
Beat Frequency Oscillator (BFO)	
Tuning Range	±8000 Hz
Tuning Resolution	10 Hz
Image Rejection	90 dB minimum
IF Rejection	85 dB minimum, greater than 90 dB typical
Internal Spurious Responses	<-114 dBm
Local Oscillator Phase Noise	-110 dBc @ 1 kHz offset, typical
Reciprocal Mixing	With a desired signal of 25 mV in the 3.2 kHz IF bandwidth, the desired signal-to-noise ratio is greater than 20 dB, when an undesired signal 70 dB higher in amplitude and 35 kHz removed in frequency is present.
Cross Modulation	With a desired signal of 10 mV an undesired signal 86 dB higher, 30% AM modulated produces less than 10% cross modulation for frequency separation of greater than 50 kHz in the 1 kHz IF bandwidth.
Blocking	An unwanted signal of 1mV separated 20 kHz from a desired signal of 1mV will not cause the IF output to fall by more than 3 dB

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-8712P Digital HF Receiver is a microprocessor-controlled, synthesized receiver capable of continuous 1 Hz tuning resolution over the frequency range of 5 kHz to 30.0 MHz. Available detection modes are AM, FM, CW, ISB, USB, LSB, and Synchronous AM (SAM). Selectable IF bandwidths, including 66 digital IF bandwidth filters and a tunable (non-linear phase) IF notch filter, are standard. Manual or automatic gain control (AGC) modes are selectable. In CW detection mode, beat frequency oscillator (BFO) and passband tuning capabilities are available. The BFO is adjustable over a ±8000 Hz range. Passband tuning, which is an operator aid that facilitates simultaneous adjustments of tuned frequency and BFO, is adjustable over a ±2000 Hz range.

The receiver's squelch threshold can be set to any value from 0 to -135 dBm or can be turned off. For use with HF transmitters, audio signals can be muted via the presence of an external control signal input at the receiver's rear panel.

In addition to fixed frequency tuning, the WJ-8712P provides a flexible scanning capability. Three scan types are available: channel scan, frequency-to-frequency scan (F1 to F2), and frequency-to-frequency scan with lockouts. In channel scan mode, the receiver steps through a sequence of up to 100 user-programmable memory channels. Receiver parameters stored in each channel include frequency, IF bandwidth, detection mode, BFO, gain control mode, manual gain value, and squelch threshold. Prior to initiating the channel scan, the operator may select a specific range of channels to scan through. Individual channels within the range can be identified for the receiver to skip over during the scan. In both frequency-to-frequency scan modes, the receiver monitors frequencies between programmed start and stop frequencies according to a selected step size between 1 Hz and 25 kHz. For all scan modes, the receiver automatically stops when a signal is acquired that breaks the squelch threshold level. The duration of time the receiver holds on a signal before resuming scan (dwell time) is operator-selectable between 0.5 and 20 seconds. An infinite dwell time can also be selected. A built-in-test (BITE) function is available which can be used to verify equipment performance.

The WJ-8712P can be operated locally or remotely. Local operations can be performed using the controls, indicators and displays located on the receiver's front panel. The indication of the receiver's tuned frequency is provided on a dedicated 8-digit numeric display. A separate 32-character alphanumeric display is provided for monitoring general receiver parameter entries and memory/scan operations. A separate analog-type signal strength meter is also provided.

Remotely, the WJ-8712P can be controlled either via an RS-232C interface or via a Carrier Sense/Multiple Access (CSMA) interface bus. Both remote interfaces allow for parameters such as tuned frequency, detection mode, IF bandwidth, gain mode, manual gain, and RF input path to be controlled remotely. Additionally BITE can be initiated from the RS-232C interface as well as status reporting.

The WJ-8712P's internal power supply accepts 90-264 VAC, 47-440 Hz line power as its power source. The unit's internal power supply automatically adjusts to the input power, providing it is within the acceptable limits.

Refer to **Table 1-1** for a complete listing of WJ-8712P Digital HF Receiver specifications.

Table 1-1. WJ-8712P Digital HF Receiver Specifications

Frequency Range	5 kHz to 30 MHz (Tunable to 0 Hz, degraded performance below 500 kHz)
Tuning Resolution	1 Hz
Internal Reference Stability	Better than 0.7 PPM (0 to 50°C) Better than 0.2 PPM (0 to 50°C) with REF option
External Reference Frequency	Accepts 1, 2, 5 or 10 MHz (±1 PPM or better, 200 mV rms into high impedance load). Automatically switches to external reference upon application of signal
Synthesizer Lock Time	Greater than 10 msec typical
Antenna Input	
Impedance	50 ohms, nominal
VSWR	2:1 maximum at receiver's tuned frequency
Maximum Input Signal	+30 dBm
Connector	BNC female
Third Order Intercept Point	+30 dBm typical, +25 dBm minimum (for signals separated by 50 kHz minimum)
Second Order Intercept Point	+60 dBm typical
Noise Figure	14 dB maximum (11 dB maximum with preamplifier engaged)
Detection modes	AM, FM, CW, USB, LSB, ISB, and SAM (Consult factory for additional demodulation modes)

Sensitivity (500 kHz - 30 MHz)

Modulation	IF BW	S+N/N Min	Without Preamp dBm/mV
AM (50% mod. at 400 Hz)	6.0 kHz	10 dB	-103/(1.58)
FM (4.8 kHz dev. 400 Hz mod)	16.0 kHz	17 dB (SINAD)	-99/(2.50)
USB/LSB/ISB	3.2 kHz	10 dB	-112/(0.56)
CW	0.3 kHz	16 dB	-116/(0.35)

CW Sensitivity, 5 kHz - 500 kHz, without Preamp (0.3 kHz IF Bandwidth)

50 kHz - 500 kHz	-113 dBm (0.5 mV) typical for 16 dB S+N/N
20 kHz - 50 kHz	-105 dBm (1.27 mV) typical for 16 dB S+N/N
5 kHz - 20 kHz	-78 dBm (28 mV) typical for 16 dB S+N/N

Table 1-1. WJ-8712P Digital HF Receiver Specifications (Continued)

IF Bandwidths:	3 dB Bandwidths	Typical Shape Factor (3/60 dB)	3 dB Bandwidths	Typical Shape Factor (3/60 dB)
	.056 kHz	1.45:1	1.000 kHz	1.40:1
	.063 kHz	1.40:1	1.100 kHz	1.40:1
	.069 kHz	1.40:1	1.200 kHz	1.35:1
	.075 kHz	1.35:1	1.300 kHz	1.35:1
	.081 kHz	1.35:1	1.400 kHz	1.35:1
	.088 kHz	1.35:1	1.500 kHz	1.35:1
	.094 kHz	1.35:1	1.600 kHz	1.35:1
	.100 kHz	1.30:1	1.800 kHz	1.45:1
	.113 kHz	1.45:1	2.000 kHz	1.40:1
	.125 kHz	1.40:1	2.200 kHz	1.40:1
	.138 kHz	1.40:1	2.400 kHz	1.35:1
	.150 kHz	1.35:1	2.600 kHz	1.35:1
	.163 kHz	1.35:1	2.800 kHz	1.40:1
	.175 kHz	1.35:1	3.000 kHz	1.35:1
	.188 kHz	1.35:1	3.200 kHz	1.25:1
	.200 kHz	1.30:1	3.600 kHz	1.45:1
	.225 kHz	1.45:1	4.000 kHz	1.40:1
	.250 kHz	1.40:1	4.400 kHz	1.40:1
	.275 kHz	1.40:1	4.800 kHz	1.35:1
	.300 kHz	1.35:1	5.200 kHz	1.35:1
	.325 kHz	1.35:1	5.600 kHz	1.35:1
	.350 kHz	1.35:1	6.000 kHz	1.25:1
	.375 kHz	1.35:1	6.400 kHz	1.30:1
	.400 kHz	1.30:1	7.200 kHz	1.45:1
	.450 kHz	1.45:1	8.000 kHz	1.40:1
	.500 kHz	1.40:1	8.800 kHz	1.40:1
	.550 kHz	1.40:1	9.600 kHz	1.35:1
	.600 kHz	1.35:1	10.400 kHz	1.35:1
	.650 kHz	1.35:1	11.200 kHz	1.35:1
	.700 kHz	1.35:1	12.000 kHz	1.35:1
	.750 kHz	1.35:1	12.800 kHz	1.30:1
	.800 kHz	1.30:1	14.400 kHz	1.25:1
	.900 kHz	1.45:1	16.000 kHz	1.20:1

(Consult factory for alternate or additional IF bandwidths)

Table 1-1. WJ-8712P Digital HF Receiver Specifications (Continued)

IF Output	
Center Frequency	455 kHz, nominal
Output Level	-20 dBm, nominal
Output Impedance	50 ohms, nominal
Connector Type	BNC female
Signal Monitor Output	
Center Frequency	455 kHz, nominal; inverted
Bandwidth	30 kHz (-6 dB) minimum
Output Level	30 dB above RF Input, nominal
Output Impedance	50 ohms, nominal
Connector Type	BNC female
Gain Control Modes	Manual, AGC Fast, Medium, and Slow
AGC Range	100 dB minimum
AGC Threshold	Variable. When enabled locally through SPECIAL FUNCTION key and AUXILIARY PARAMETER EDIT knob, operator controls with MANUAL GAIN. Remotely enabled by operator with AGT command and controlled with RFG command
AGC Attack Time	5 msec typical
AGC Decay Time	Fast: 10-100 msec variable in 10 ms steps Medium: 100-1000 msec variable in 100 ms steps Slow: 1-5 sec variable in 0.5 sec steps
Selectable Front End Gain/Attenuation	
Preamplifier Gain	10 dB (±2 dB)
Attenuation	15 dB (±2 dB)
Beat Frequency Oscillator (BFO)	
Tuning Range	±8000 Hz
Tuning Resolution	10 Hz
Image Rejection	90 dB minimum
IF Rejection	85 dB minimum, greater than 90 dB typical
Internal Spurious Responses	<-114 dBm
Local Oscillator Phase Noise	-110 dBc @ 1 kHz offset, typical
Reciprocal Mixing	With a desired signal of 25 mV in the 3.2 kHz IF bandwidth, the desired signal-to-noise ratio is greater than 20 dB, when an undesired signal 70 dB higher in amplitude and 35 kHz removed in frequency is present.
Cross Modulation	With a desired signal of 10 mV an undesired signal 86 dB higher, 30% AM modulated produces less than 10% cross modulation for frequency separation of greater than 50 kHz in the 1 kHz IF bandwidth.
Blocking	An unwanted signal of 1mV separated 20 kHz from a desired signal of 1mV will not cause the IF output to fall by more than 3 dB

Table 1-1. WJ-8712P Digital HF Receiver Specifications (Continued)

Line Audio Outputs	
Number of Outputs	Two center-tapped, balanced outputs. For ISB mode, USB and LSB on separate outputs. For all other modes, audio signal is common to both outputs.
Output Level	0 dBm nominal into 600 ohm load
Connector Type	Screw Terminals
Speaker Output	
Number of Outputs	One output. For ISB mode, USB and LSB can be selected individually or combined. (Internal Speaker optional)
Bandwidth	100 Hz to 13 kHz
Output Level	Adjustable up to 2 Vrms into 8 ohm load
Total Harmonic Distortion	Less than 3%
Connector Type	Screw terminals
Headphone Output	
Number of Outputs	Two unbalanced outputs. For ISB mode, one output contains USB (right channel), the other contains LSB (left channel). In all other modes, the audio signal is common to both outputs
Output Level	Adjustable up to 10 mW into 600 ohm load
Connector Type	Standard 1/4" stereo jack
Remote Control	RS-232C
RS-232	Full duplex, 3-wire serial interface; rear panel 25-pin female D-shell connector
CSMA	Half duplex, rear panel miniature phone jack
Baud Rates	75, 150, 300, 600, 1200, 2400, 4800 and 9600; selectable by internal switches.
Operating Temperature	0°C to +50°C
Storage Temperature	-40°C to +70°C
Humidity	10 Cyclic days (240 Hrs.) Procedure III for Continuous Exposure to 95% RH.
Altitude	50,000 ft. (15, 240, meters) non-operating 24,000 ft. (7, 315 meters) operating

Table 1-1. WJ-8712P Digital HF Receiver Specifications (Continued)

Shock	Bench Handling (Field Service) 8 drops total onto a horizontal hard wooden surface - operating.
Power Requirements	97 to 253 VAC, 47 to 440 Hz
Power Consumption	35 watts typical with options
Dimensions	3.5 x 8.25 x 20.0 inches (excluding connectors and controls)
Weight	Less than 12 pounds

1.2 MECHANICAL CHARACTERISTICS

The WJ-8712P is designed in a half-rack enclosure (19-inch rack), occupying 3.5 inches of vertical rack space and extending 20 inches into the equipment rack. Either two units can be mounted side-by-side (standard configuration), or an optional blank rack (WJ-8712/BR) can be ordered to mount a single unit in the 19-inch rack. A #10 threaded grounding stud is located on the rear panel for grounding the receiver in the rack. See **paragraph 2.2.1** for rack mounting instructions.

All operation controls and indicators are located on the front panel. All input and output connectors (except for the PHONE jack) are located on the rear panel. Connector types used are BNC, multipin, mini-phones, 1/8-inch stereo headphones jack, and a 13 terminal audio terminal block.

The top and bottom covers and main chassis are constructed of aluminum. Removal of the covers provides access to all internal circuitry including the following four major assemblies: the Type 797214-1 Digital Assembly, the Type 797006-1 RF Assembly, the Type 766028-1 Power Supply Assembly, and the Type 797182-2 Front Panel Assembly.

1.3 OVERALL FUNCTIONAL DESCRIPTION

Functionally, the WJ-8712P can be divided into four subsystems: the RF Subsystem, the Digital Signal Processing (DSP) Subsystem, the IF/Audio Output Subsystem, and the Control Subsystem (see **Figure 1-2**).

The 5 kHz to 30.0 MHz RF antenna input signal is first applied to the RF subsystem. Here the RF signal is mixed with three local oscillator (LO) signals to produce an intermediate frequency (3rd IF) centered at 25 kHz. The 1st LO tunes from 40.455 to 70.455 MHz in 1 kHz steps to produce a 1st IF of 40.455 MHz. The 1st IF is mixed with the 2nd LO, which is fixed at 40 MHz, to produce a 2nd IF of 455 kHz. The 2nd LO is also routed to the DSP Subsystem for use as a system clock for the DSP processors.

The 2nd IF signal is then split. One path of the signal is routed to the rear panel SMO connector as the signal monitor output. The other path of the 2nd IF is routed to a mixer where it is mixed with the 3rd LO. The 3rd LO signal is fixed at 430 kHz to produce a 3rd IF of 25 kHz. The 3rd LO is also routed to the IF/Audio Output Subsystem to be used for final IF conversion.

The timing and synchronization of the LO's are driven by a 10 MHz reference signal. This reference can be generated by an internal 10 MHz clock or can be driven by an external reference input of 1, 2, 5, or 10 MHz.

The DSP Subsystem performs the majority of the signal processing functions within the receiver. This subsystem is comprised of a 16-bit analog-to-digital (A/D) converter, a 24-bit fixed point Digital Signal Processor (DSP), and associated static random-access memory (SRAM).

The 3rd IF signal, provided by the RF Subsystem, is sampled by the A/D converter to 16 bits of resolution at an output sampling rate of 100 kHz. This digitized output signal of the A/D is then applied to the DSP which performs the following functions to the sampled waveform:

- Fine tuning (in 1 Hz steps) in accordance with the operator selected tuned frequency,
- IF filtering in accordance with the operated-selected IF bandwidth,
- Gain control (AGC Fast, AGC Medium, AGC Slow or Manual),
- Determination of the received signal strength,
- Signal demodulation in accordance with the operator-selected detection mode, and BFO tuning resolution.
- Noise blanking, and
- Generation of a multiplexed digital serial data stream containing two demodulated audio channels and a post filtered IF signal for analog reconstruction by the IF/Audio Output Subsystem.

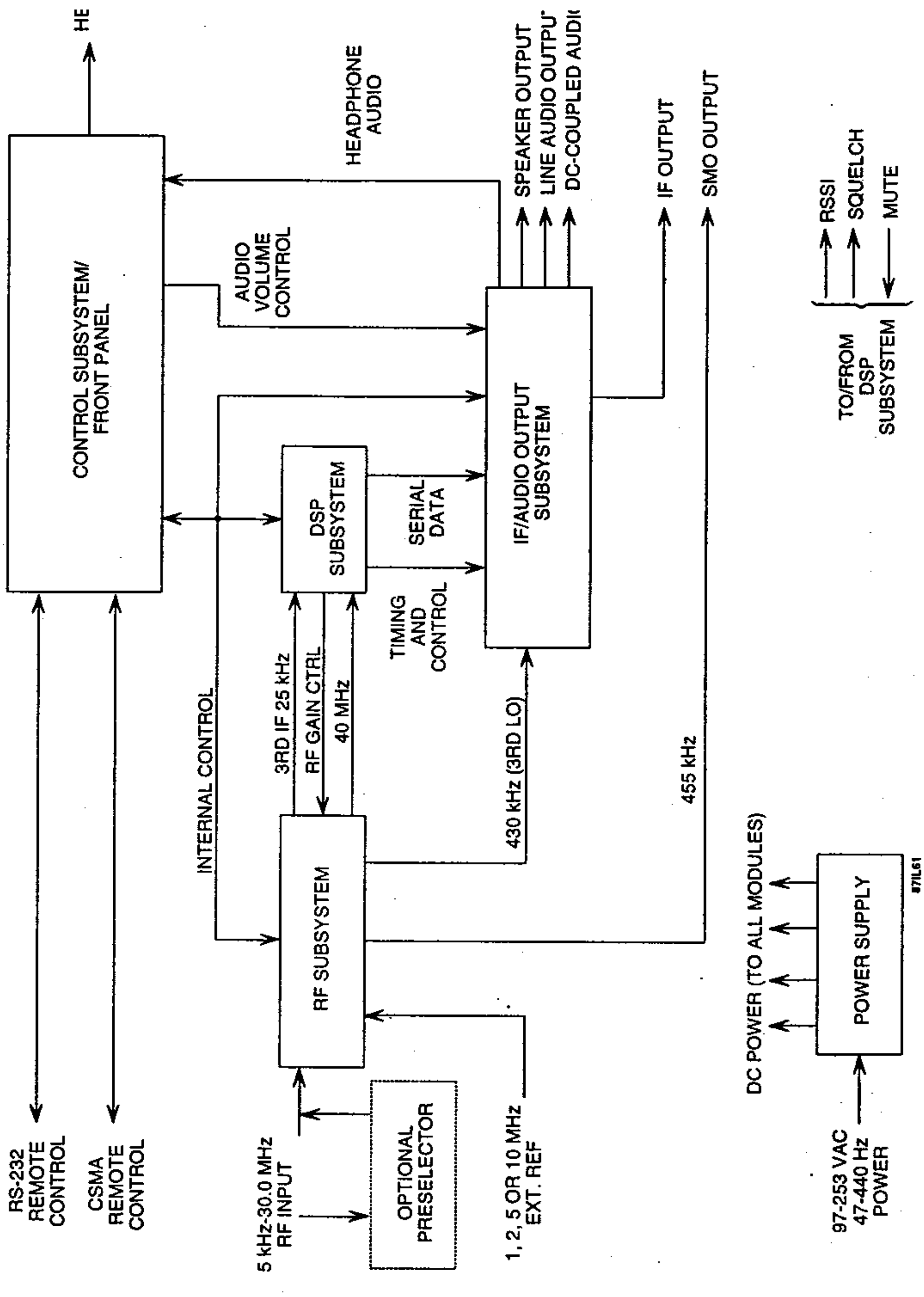

Figure 1-2. WJ-8712P Overall Functional Block Diagram

The IF/Audio Output Subsystem takes the multiplexed IF and audio serial data received from the DSP Subsystem and reconstructs it into two separate audio signals and one filtered IF signal. The two analog audio signals are processed in this subsystem to provide the following outputs:

- Two-channel (stereo) headphone outputs to the front panel PHONE jack,
- An 8-ohm speaker output that consists of one or both audio channels, and
- Two balanced line outputs with a fixed nominal output level of 0 dBm into 600 ohms.

Following analog reconstruction, the filtered IF signal is converted up to 455 kHz by a sample of the 430 kHz 3rd LO supplied by the RF Subsystem. The up-converted IF signal is passed through a bandpass roofing filter to remove unwanted mixer products, is buffered, and is then routed to the rear panel as the IF Output.

The Control Subsystem consists of the Front Panel Assembly which contains a control microprocessor and its associated memory, an RS-232 interface, a Carrier Sense/Multiple Access (CSMA) interface, and the front panel keypads and displays. The control microprocessor monitors front panel operations and remote commands (via the remote interfaces), processes the instructions, and sends internal control data to the other subsystems in the receiver to update hardware. The control microprocessor also monitors the action of the hardware and appropriately updates the front panel displays remote responses (when queried) over the remote interface.

The Power Supply section of the receiver generates the dc supply voltages required by the subsystems of the receiver. The power supply is powered by the 90-264 VAC 47-440 Hz input connected at the rear panel POWER connector.

1.4 EQUIPMENT SUPPLIED

Equipment supplied with the WJ-8712P consists of an Intermediate Level Maintenance Manual, and an accessory kit consisting of:

1	Each	Line Cord	17600
1	Each	Fuse, 1 Amp 3 AG Slow	MDL1
1	Each	Terminal	ELFP13210
1	Each	Support Bracket, Center	280505-3
1	Each	Support Bracket	280504-3
4	Each	Machine Screw PNH 8-32	MS51957-438
4	Each	Washer, Lock No. 8	MS35338-137B
4	Each	Washer, Flat No. 8	MS15796-807B
1	Each	Handle	13212-A-0832-2
2	Each	Machine Screw FLH 8-32	MS24693-C51
1	Each	Handle Assembly, Rear	383160-1
1	Each	Handle Assembly, Rear	383160-2
4	Each	Machine Screw FLH 6-32 X 1/4	MS24893-C24
1	Each	Machine Screw 8-32 x 3/8	MS51957-28
1	Each	Washer, Lock No. 8	MS35338-137
1	Each	Washer, Flat No. 8	MS15795-807
1	Each	1/4 to 1/8 Headphone Adapter	274-366
2	Each	Spacers	283304-1
1	Each	3 1/2" Disk containing Windows Based Control Program	WJ-871Y/PCSW

The WJ-871Y/PCSW is an undocumented freeware program that is suitable for demonstration purposes only.

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

To obtain full utilization of the receiver, the following equipment is required:

- HF Antenna, 50 ohm
- Headphones, 600 ohms
- Line audio monitoring equipment
- Signal Monitoring equipment
- Remote Controller, CSMA or RS-232C compatible

1.6 RECEIVER OPTIONS

1.6.1 WJ-871Y/REF REFERENCE GENERATOR OPTION

This factory-installed option improves the WJ-8712P internal reference generator stability from better than 0.7 ppm to better than 0.2 ppm over an operating range of 0°C to 50°C. Refer to **Appendix A** for further information on the WJ-871Y/REF option.

1.6.2 WJ-8712/PRE SUBOCTAVE PRESELECTOR OPTION

This option provides band filtering of the incoming RF spectrum between 0 and 30 MHz for improved second and third order intercept point performance. The WJ-8712/PRE option uses eleven separate filter bands, each covering a segment of the overall range. The appropriate filter is automatically selected as the receiver is tuned. Refer to **Appendix B** for further information on the WJ-8712/PRE option.

1.6.3 WJ-8712/DSO1 DIGITAL SIGNAL OUTPUT OPTION

This option provides digitized time samples (A/D output) for a wide range of data sources including the receivers pre-filtered and post-filtered third IF signal, and the demodulated audio signal. Refer to **Appendix D** for further information on the WJ-8712/DSO1 option.

1.6.4 WJ-8712/BR BLANK RACK OPTION

This option allows for mounting of a single WJ-8712P receiver in a standard 19-inch rack. Two side by side mounted WJ-8712P receivers in a standard 19-inch rack is the standard configuration.

1.6.5 WJ-871Y/485 485 INTERFACE OPTION

This option provides multidrop interface capability to the receiver via a rear panel connector. Refer to **Appendix H** for further information on the WJ-871Y/485 option.

1.6.6 WJ-8712/488 IEEE-488 INTERFACE OPTION

The WJ-8712/488 IEEE-488 Interface Option provides the communications link between a remote IEEE-488 interface-equipped controller and the receiver's host controller. The communication protocol incorporated into the IEEE-488 interface complies with the guidelines of the IEEE-488.2 Interface specification. Refer to **Appendix E** for further information on the WJ-8712/488 option.

1.6.7 WJ-871Y/8KRF 8 kHz ROOFING FILTER OPTION

The WJ-871Y/8KRF 8 kHz Roofing Filter Option improves the reception of weak signals which are in the presence of large signals at nearby adjacent frequencies. The receiver RF bandwidth is reduced to 8 kHz and the number of selectable IF bandwidths is reduced to 58 (extending from 58 Hz to 8 kHz). Refer to **Appendix F** for additional information on the WJ-871Y/8KRF option.

1.6.8 WJ-871Y/SEU SPEECH ENHANCEMENT UNIT

The WJ-871Y/SEU Speech Enhancement Uni option uses adaptive filtering techniques to provide enhancement of audio signals that are received from signals in the HF frequency band. The option utilizes these filter techniques to accomplish wideband noise reduction and automatic notch filtering of the audio signals. See **Appendix I.**

1.7 WJ-8712P SOFTWARE VERSION RELEASE HISTORY

To ensure efficient receiver operations, the WJ-8712P uses two microprocessors, each running its own software code. The digital microprocessor (A2U1) runs the internal control code, and the digital signal processor (A2U37) runs the digital signal processing (DSP) code.

1.7.1 WJ-8712P INTERNAL CONTROL SOFTWARE RELEASE HISTORY

The WJ-8712P internal control software is contained in EPROM A2U12. The original internal control software, version 1.00, was released May 23, 1991.

Version 1.10 was never released.

Version 1.20, released December 20, 1991, added the following RS-232C remote commands and queries: AGC, AGC?, BFO, BFO?, BWS, BWS?, CDE?, CTL, CTL?, DET, DET?, FRQ, FRQ?, LDE?, REF?, RFG, RFG?, RFP, RFP?, SGV?, SQL, SQL?, *CLS, *ESE, *ESE?, *ESR?, *RST, *SRE, *SRE?, *STB?, and *TST?. This release also allowed service request handling on the RS-232C interface. This release improved BITE by testing the following receiver areas: the DSP circuitry, the RF signal path, and the audio signal path. This release set the default AGC value to FAST AGC, and the IFBW default value to 6 kHz. This release also temporarily mutes the receiver audio when changing the RF input path. When changing detection modes from a non-SSB (AM, FM, CW) detection mode to a SSB detection mode (LSB, USB, ISB), this release stores the non-SSB IFBW value and selects the 3.2 kHz IFBW. When the detection mode is changed back to a non-SSB detection mode, the previously stored non-SSB IFBW returns. This release disallowed the preamplifier RF input path when tuned below 500 kHz. This release added the selected RF input path to the variables stored in a memory channel.

Version 1.21, released February 25, 1992, improved BITE and changed the default BFO value from 0 kHz to +1 kHz.

Version 1.30, released May 27, 1992, added the following RS-232C remote commands and queries: ADV, BLK, BLK?, CHA, CHA?, CHB, CHB?, CHI, CHS, CLM, ENA, EXE, FRA, FRA?, FRB, FRB?, IDN?, INC, INC?, LCK, LRN?, MUT?, OPC, OPC?, OPR?, PBT, PBT?, RCL?, RLK?, SCF, SCF?, SCS?, SDW, SDW?, SLM?, SPK, STO, SUS, and ULK.

Version 1.40, released June 25, 1992, supported the WJ-8712/PRE preselector option, allowed interrupts during BITE, and shortened the lockout stored message to one second.

Version 1.41, released July 23, 1992, added the receiver status register to the WJ-8712 status structure. This additional register allows the receiver to generate service requests (SRQ) for reporting signal found and end-of-scan. This release also added the following RS-232C remote commands: *RSE, *RSE?, and *RSR?.

Version 2.0.0, released December 7, 1992, added Fast Scan enhancements to provide the capability of scan speeds of up to 50 msec. per increments, with IF bandwidths of 3.2 kHz or greater. The initialization was also modified to correctly display the receiver type when the TF-30387 Front Panel Interface test fixture is connected to the receiver. The version 2.0.0 Internal Control software requires that the DSP software version be updated to version 2.0.0, or greater.

Version 3.00.00, released November 12, 1993, added various DSP enhancements to the receiver including the extended IF bandwidths and the tunable notch filter. This release also added the following remote commands: BWC, BWC?, BWN, BWN?, NFM, NFM? NFR, NFR?, *OPT?, VLA, and VLA?.

Version 4.01.00, released August 3, 1994, made the following changes. All IF bandwidths are included on cold start, each detection mode has been associated with an IF bandwidth. The default conditon for this association is OFF. An option was added that, when set to ON, causes the manual gain stored in a Memory Channel to be retrieved and stored into the Receiver Manual Gain. The default for this option is ON, *OPT? returns Bit 4 of Byte 2 set. A Speech Enhancement Option was added. The default for this option is OFF. *OPT? returns Bit 1 of Byte 2 set. In order to use the SEU option, the PCSM option must be set ON. The receiver now tunes to zero Hz in LSB, and supports IF bandwidths up to 4 kHz. The receiver now correctly mutes audio when changing detection mates or IF bandwidths. Multidrop RS-485 and RS-422 interfaces are supported. The default value for Tuned Carrier operations in now ON. The default value for Fast AGC decay time is now 40 milliseconds versus 20 milliseconds.

Version 4.01.02, released December 22, 1994 turns off the Speech Enhancement Unit during BITE or while using the ISB Detection Mode. It also fixed RS-485 so no remote commands were missed.

Version 4.01.03, corrected a lock-up problem that occurred when two *TST? queries were sent in close succession. Also the BFO is now retuned with each change of the detection mode, correcting a tuning problem associated with using passband tuning, changing to another detection mode, and returning to CW. Also now the notch filter works correctly in USB or LSB detection modes with 3.6 or 4.0 kHz IF bandwidths.

Version 4.01.04 involved not functional changes.

Version 4.01.05 corrected deficiencies in the CSMA Interface. Released on November 13, 1995, this version is to be used with RS-232 and CSMA only.

1.7.2 WJ-8712P DSP SOFTWARE RELEASE HISTORY

The WJ-8712P DSP software is stored in EPROM A2U56. The original version 1.00, released May 29, 1991.

Version 1.10 was never released.

Version 1.20, released December 17, 1991, increased the EPROM address space from 8000H-FFFFH to 4000H-FFFFH. This release runs properly on the type 797214-1 Digital Board and may not run properly on earlier digital boards.

Version 2.0.0, released December 7, 1992, modified the scan routine to increase the scan speed to up to 50 msec. per increment, with a selected IF bandwidth of 3.2 kHz or greater. This software version requires that the Internal Control software be updated to version 2.0.0, or greater.

Version 3.00.01, released November 12, 1993, is required for operation with Internal Control Software Version 3.00.00.

NOTES

SECTION II

INSTALLATION

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SECTION II

INSTALLATION

2.1 UNPACKING AND INSPECTION

BAE SYSTEMS ships the WJ-8712P and its accessories in a cardboard shipping container, designed specifically for its dimensions and weight. After unpacking the equipment, retain the shipping container and packing material until the equipment has been thoroughly inspected and it is ensured that reshipment is not necessary. Perform the following initial inspection:

1. Carefully inspect the outside of the shipping container for discoloring, stains, charring, or other signs of exposure to excessive heat, moisture, or liquid chemicals. Check for any signs of excessive shock or careless handling.

2. Remove all equipment and accessories from the shipping container. If any items are missing, contact the factory or your BAE SYSTEMS representative.

3. Remove and retain the white 5x6 inch PRODUCT DISCREPANCY REPORT card. This card should be used if reshipment of the equipment is required. It also contains important warranty adjustment information.

4. Carefully inspect the equipment for dents, scratches, damaged or loose pushbuttons or knobs, or any other signs of physical abuse or careless handling during shipment.

If damage is found, forward an immediate request to the delivering carrier to perform an inspection and prepare a concealed-damage report. Do not destroy any packing material until it has been examined by an agent of the carrier. Concurrently, report the nature and extent of damage to BAE SYSTEMS, giving equipment serial numbers, so that necessary action can be taken. Under U.S. shipping regulations, claims for damage must be collected by the consignee; do not return the equipment to BAE SYSTEMS until a claim for damages has been established.

2.2 INSTALLATION

2.2.1 RACK MOUNTING

The WJ-8712P Digital HF Receiver is packaged in a 3.5" x 8.25" x 20" half-rack enclosure, and can be mounted in a standard 19-inch equipment rack through the use of the WJ-8712/BR (Blank Rack) option. The standard configuration calls for the side-by-side mounting of two WJ-8712P receivers in a standard 19-inch equipment rack. The use of Jonathan Type 110QD-20-2 chassis slides are recommended for racking mounting the WJ-8712P.

Supporting loads up to 120 pounds, these slides mount easily into bracketed equipment racks using machined bar nuts. **Figure 2-1** illustrates installation of the chassis slides to an equipment rack, with special attention given to bracket hole spacing.

CAUTION

Do not use screws longer than 5/16 inch in slide mounting holes of the WJ-8712P. Damage may result to the unit.

Each of the Type 110QD-20-2 chassis slides are comprised of two functional pieces: a chassis section for mounting to the unit and a cabinet section for mounting to the equipment rack. Three 10-32 X 5/16 pan head screws are used to install each chassis section to a side panel of one WJ-8712P. After both chassis sections have been securely tightened to the WJ-8712P receiver, the cabinet sections are to be installed within the equipment rack. The WJ-8712P occupies 3.5 inches of vertical rack space. Four of the holes are used to secure the cabinet section of the slide to the equipment rack. Two outer holes are used to secure the unit's front panel to the equipment rack. Slide locks permit quick disconnect of the chassis section of the slides from the cabinet sections for equipment removal. A #10 threaded grounding stud is located on the rear panel for grounding the receiver in the equipment rack. See **paragraph 2.2.3.10**.

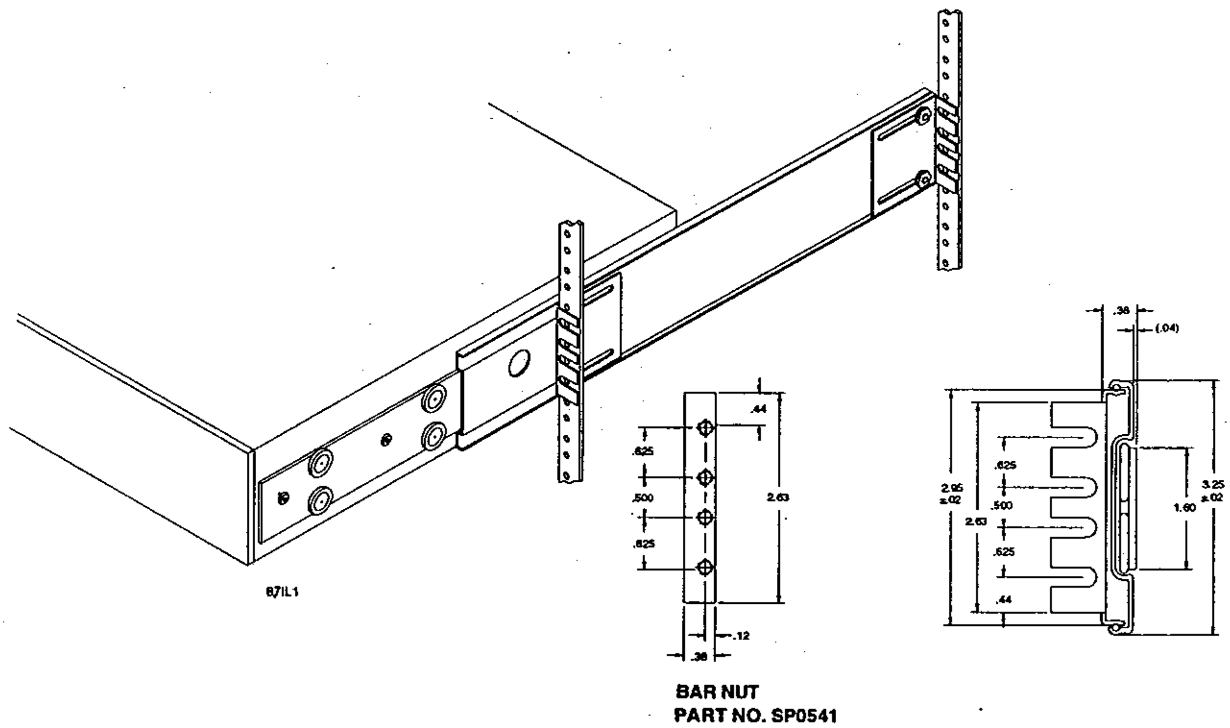


Figure 2-1. Installation of Jonathan Type 110QD-20-2 Slide Mounts

2.2.2 POWER REQUIREMENTS

The WJ-8712P requires an input voltage of 90-264 VAC at 47 to 440 Hz for operation. The receiver's internal power supply circuitry automatically adjusts to the power input applied (providing it is within the specified range). Therefore, no manual switching of power source voltage selection is required. The six-foot line power cord supplied with the receiver connects to the three-prong POWER connector (FL1J1) located on the rear panel. The WJ-8712P requires approximately 30 watts for operation.

A 1 amp, slo-blo fuse (F1) is provided and located in a fuse case on the rear panel of the receiver (see **Figure 2-2**). This type fuse is to be used for operation anywhere in the VAC range.

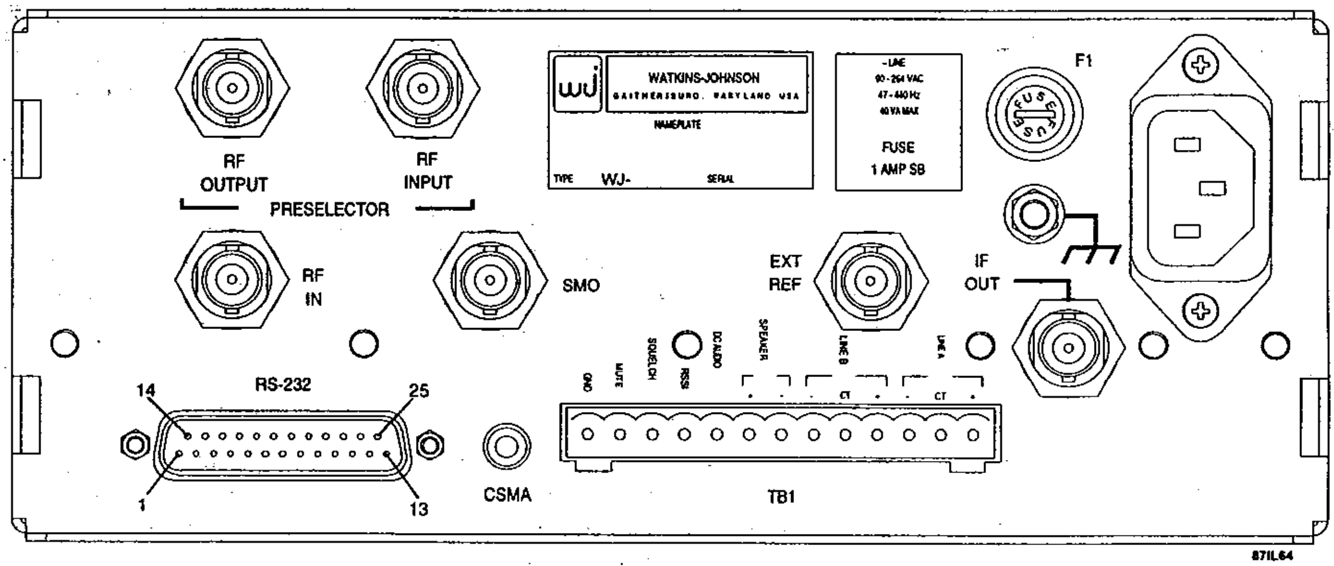


Figure 2-2. WJ-8712P Rear Panel

To replace the fuse, first turn off the receiver and disconnect the power cord from the rear panel. Grasp the fuse case and pull straight out of its compartment in FL1. Remove the fuse from the fuse case and replace with a 250 V, 1 amp, slo-blo fuse. Reinstall the fuse case in its compartment and press firmly until it "clicks" in place. Reconnect the power cord.

2.2.3 CONNECTOR SIGNALS

All external connectors of the WJ-8712P are located on the rear panel, with the exception of the PHONE jack which is located on the front panel. **Table 2-1** lists these connectors and provides a brief description and the reference designation for each. **Figure 2-2** shows the location of the rear panel connectors. The following paragraphs provide details of the signals resident at the connectors.

Table 2-1. List of Connectors

Connector	Reference Designation	Function
RF IN	A3J1	BNC female. RF input from an antenna (or from A4J2 Preselector Output, when configured with WJ-8712/PRE option).
SMO	A3J2	BNC female. Signal monitor output.
EXT REF	A3J3	BNC female. 1, 2, 5, or 10 MHz reference input.
IF OUT	A2J1	BNC female. Post-filtered IF output.
CSMA	A2J2	Mini-phone. Carrier Sense/Multiple Access (CSMA) remote interface port.
RS-232	A2J3	D-Type, 25-pin. RS-232C remote serial interface port.
TB1	TB1	Thirteen-terminal audio terminal block. Provides connection for two variable line audio outputs, DC-coupled audio output, speaker output, remote signal strength indication output, squelch output, and mute input.
POWER	FL1J1	Three-prong male receptacle, mates with line power cord. 90-264 VAC 47-440 Hz power input.
PHONES	A1J1	1/8-inch stereo headphones jack. Headphones audio.
PRESELECTOR RF INPUT	A4J3	BNC female. RF input to WJ-8712/PRE option (see **Appendix B** for details on WJ-8712/PRE option).
PRESELECTOR RF OUTPUT	A4J4	BNC female. Preselected RF output from WJ-8712/PRE option (see **Appendix B** for details on WJ-8712/PRE option).

2.2.3.1 **RF IN, Antenna Input (A3J1)** - This BNC female connector accepts the 5 kHz-30.0 MHz RF input from the antenna or the WJ-8712/PRE Preselector option (if installed). Input impedance is nominally 50 ohms.

2.2.3.2 **SMO, Signal Monitor Output (A3J2)** - The signal monitor output is a BNC female connector, which provides a sample of the 2nd intermediate frequency, centered at 455 kHz with a minimum bandwidth of 30 kHz at -6 dB and an inverted spectrum. The nominal output impedance is 50 ohms with approximately 25 dB of gain from the antenna input. This output may be used by a signal monitor or other ancillary equipment.

2.2.3.3 **EXT REF, External Reference Input (A3J3)** - This female BNC connector allows an external 1 MHz, 2 MHz, 5 MHz, or 10 MHz reference input, having a minimum level of 200 mV rms into a high impedance load, to be used as the time base for the receiver. The WJ-8712P automatically switches to external reference operation upon sensing the external reference input signal (providing it is within the specified limits).

2.2.3.4 **IF OUT, Post-Filtered IF Output (A2J1)** - This BNC female connector provides the post-filtered IF output. The output is centered at 455 kHz with a bandwidth equal to the operator-selected IF bandwidth. The minimum output level is -21 dBm (20 mV) into a 50 ohm load.

2.2.3.5 **CSMA, Carrier Sense/Multiple Access Port (A2J2)** - This mini-phone connector is used as the interface port for Carrier Sense/Multiple Access (CSMA) remote operations. The connector's center conductor carries the remote data while the sleeve is ground. See **Section V** of this manual for details on the CSMA remote interface and operations.

2.2.3.6 **RS-232C Serial Interface Port (A2J3)** - This D-type, 25-pin connector is used as the interface port for RS-232C remote operations. The RS-232C interface operates as a full duplex interface at a selectable baud rate of 75 to 9600 bps. Pin 2 of this connector is the transmit data line (TXD), pin 3 is the receive data line (RXD) and pin 7 is ground. See **Section IV** of this manual for details on the RS-232C remote interface and operations.

2.2.3.7 **TB1, Audio Terminal Block (TB1)** - This terminal block contains 13 terminals for connection of various inputs and outputs of the receiver such as line audio outputs, speaker outputs, DC-coupled audio output, remote signal strength indicator output, squelch output, and mute input. These input and outputs at the terminals of A2TB1 are further described in the following paragraphs.

2.2.3.7.1 **Line Audio Outputs (TB1 Terminals 1 thru 6)** - Terminals 1 thru 6 of TB1 provide two, center-tapped balanced line audio outputs. One of the line audio outputs (LINE A) is provided on the combination of terminals 1, 2, and 3. Terminal 1 is the positive output (LINE A (+)), terminal 3 is the negative output (LINE A (-)) and terminal 2 is the ungrounded center tap output (LINE A (CT)).

The other line audio output (LINE B) is provided on the combination of terminals 4, 5, and 6. Terminal 4 is the positive output (LINE B (+)), terminal 6 is the negative output (LINE B (-)), and terminal 5 is the ungrounded center tap output (LINE B (CT)).

When the independent sideband (ISB) detection mode is selected, the LINE A output provides upper sideband (USB) audio while the LINE B output provides lower sideband (LSB) audio. In all other detection modes, the LINE A and LINE B outputs provide identical signal content.

The output signal level for input signals above the AGC threshold is 0 dBm nominal (±3 dB). Output impedance for both line audio outputs is 600 ohms (±30 ohms). The bandwidth for both line audio outputs is 0.1 to 13.0 kHz at ±3 dB. Continuous short circuit protection is provided for both outputs.

2.2.3.7.2 **Speaker Output (TB1 Terminals 7 and 8)** - Terminals 7 and 8 of TB1 provide an audio output, sufficient to drive an external 8 ohm speaker. Terminal 7 is common (SPEAKER COM), and terminal eight is positive (SPEAKER (+)). The bandwidth of the output audio is 0.1 to 13.0 kHz at ±2 dB. Output level is 2 Vrms minimum with less than 3% total harmonic distortion.

Lower sideband (LSB) or upper sideband (USB) audio can be selected individually or combined, while in the ISB detection mode, and made available at the speaker output.

2.2.3.7.3 **DC-Coupled Audio Output (TB1 Terminal 9)** - Terminal 9 of TB1 provides a DC-coupled version of the audio provided at the speaker output (see **paragraph 2.2.3.7.2**).

2.2.3.7.4 **Remote Signal Strength Indicator Output (TB1 Terminal 10)** - Terminal 10 of TB1 provides an analog output representing the strength of the current detected signal which can be used to drive an external signal strength indicator. The output is a dc voltage which is a linear representation of the strength of the received signal. The output is 0 Vdc for a signal strength of -120 dBm and +5 Vdc for a signal strength of +10 dBm into a high impedance load.

2.2.3.7.5 **Squelch Output (TB1 Terminal 11)** - Terminal 11 of TB1 provides a low impedance to ground (capable of sinking 150 mA) when the receiver's signal squelch circuitry is activated (i.e., the detected signal is above the set squelch level). This output is provided for system integration of the WJ-8712P. This output appears as a +5 Vdc source through a 100 kΩ impedance when signal squelch is not active.

2.2.3.7.6 **Mute Input (TB1 Terminal 12)** - Terminal 12 of TB1 is provided to accept a logic level mute input from an external source. When the input at this terminal is grounded (or driven to a CMOS logic low), all audio outputs of the receiver are disabled.

2.2.3.8 **POWER, 90-264 VAC Line Power Input (FL1J1)** - This three-prong male receptacle mates with the six-foot line power cord that is supplied with the receiver to supply the line voltage for the unit's operation. Acceptable input power is 90-264 VAC at 47 to 440 Hz. The WJ-8712P requires approximately 30 watts for operation.

2.2.3.9 **PHONES, Front Panel Headphones Jack (A1J1)** - The PHONE connector located on the front panel is a 1/8-inch stereo headphones jack. Each channel of this output provides a minimum of 10 mW at less than 5% total harmonic distortion into a 600 ohm load, when the input signal is above the AGC threshold. Located above the PHONE jack on the front panel is the audio level control knob. A clockwise rotation of this knob results in an increase in headphones output signal level. When the independent sideband (ISB) detection mode is selected, the right channel provides upper sideband (USB) audio while the left channel provides lower sideband (LSB) audio. In all other detection modes, both channels provide identical signal content.

2.2.3.10 **Ground Stud** - A #10 threaded grounding stud is located on the rear panel for grounding the receiver in an equipment frame. See **Figure 2-2** for the location of this grounding stud.

2.2.4 CONFIGURING THE RECEIVER FOR REMOTE OPERATIONS

The WJ-8712P contains two DIP switches that can be used to configure the receiver for remote operation. These switches are mounted on the Digital PC Assembly (A2) and are accessed by removing the receiver's bottom cover (see **Figure 2-3**). The switches are designated A2S1 and A2S2. Each switch contains eight rocker-type switches. The rocker switches are on when they are in the down position and are off when in the up position.

The rocker switches in A2S1 are used to enable either the RS-232C or the CSMA interface for remote operations, and to set the baud rate for the selected interface. Setting switch 4 of A2S1 to off (up) enables the RS-232C interface. Conversely, setting switch 4 to on enables the CSMA interface.

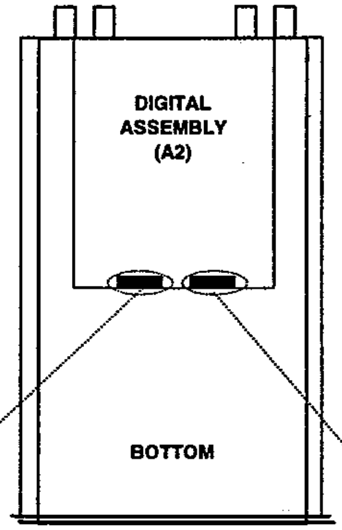
The positions of switches 1, 2, and 3 of A2S1 are used to set the baud rate for remote operations. Selectable baud rates are 75, 150, 300, 600, 1200, 2400, 4800, and 9600 bps. See **Figure 2-3** for the proper positions of switches 1, 2, and 3 of A2S1 to select the desired baud rate.

Switches 1 thru 6 of A2S2 are used to set the receiver's address on the CSMA bus during CSMA remote operations. Valid addresses are from 01 to 63 (address 00 is reserved). See **Figure 2-3** for the proper positions of switches 1 thru 6 of A2S2 to select the desired CSMA bus address. When it is desirable to have the WJ-8712P emulate the ICOM R71A HF Receiver, the CSMA address should be set to 26.

Switch 8 of A2S2 is used to set the tuned frequency command and response formats on the CSMA interface to four bytes or five bytes. Setting this switch to the on (down) position selects the five-byte format and setting it to the off (up) position selects the four-byte format. It is recommended that the WJ-8712P be set for four bytes.

When determining the switch settings to achieve a specific binary value, a switch in the off (up) position corresponds to a binary 0 while a switch in the on (down) position corresponds to a binary 1.

Figure 2-4 gives an example of switches A2S1 and A2S2 set to positions to provide particular configurations. In the example, switch A2S1 is set to select CSMA remote operation with a baud rate of 2400 bps. Switch A2S2 is set to provide a CSMA address of 26 and a four-byte tuned frequency format.



A2S1

** ROCKER SWITCH:	FUNCTION:
4	Remote Interface Selection
0	RS-232 Interface
1	CSMA Interface

3 2 1	BAUD RATE (bps)
0 0 0	9600
0 0 1	4800
0 1 0	2400
0 1 1	1200
1 0 0	600
1 0 1	300
1 1 0	150
1 1 1	75

Off (Up) = 0
On (Down) = 1

A2S2

** ROCKER SWITCH:	FUNCTION:
1 thru 6	CSMA Address Selection

6 5 4 3 2 1	Address	6 5 4 3 2 1	Address	6 5 4 3 2 1	Address
0 0 0 0 0 1	1	0 1 0 1 1 0	22	1 0 1 0 1 1	43
0 0 0 0 1 0	2	0 1 0 1 1 1	23	1 0 1 1 0 0	44
0 0 0 0 1 1	3	0 1 1 0 0 0	24	1 0 1 1 0 1	45
0 0 0 1 0 0	4	0 1 1 0 0 1	25	1 0 1 1 1 0	46
0 0 0 1 0 1	5	0 1 1 0 1 0	26	1 0 1 1 1 1	47
0 0 0 1 1 0	6	0 1 1 0 1 1	27	1 1 0 0 0 0	48
0 0 0 1 1 1	7	0 1 1 1 0 0	28	1 1 0 0 0 1	49
0 0 1 0 0 0	8	0 1 1 1 0 1	29	1 1 0 0 1 0	50
0 0 1 0 0 1	9	0 1 1 1 1 0	30	1 1 0 0 1 1	51
0 0 1 0 1 0	10	0 1 1 1 1 1	31	1 1 0 1 0 0	52
0 0 1 0 1 1	11	1 0 0 0 0 0	32	1 1 0 1 0 1	53
0 0 1 1 0 0	12	1 0 0 0 0 1	33	1 1 0 1 1 0	54
0 0 1 1 0 1	13	1 0 0 0 1 0	34	1 1 0 1 1 1	55
0 0 1 1 1 0	14	1 0 0 0 1 1	35	1 1 1 0 0 0	56
0 0 1 1 1 1	15	1 0 0 1 0 0	36	1 1 1 0 0 1	57
0 1 0 0 0 0	16	1 0 0 1 0 1	37	1 1 1 0 1 0	58
0 1 0 0 0 1	17	1 0 0 1 1 0	38	1 1 1 0 1 1	59
0 1 0 0 1 0	18	1 0 0 1 1 1	39	1 1 1 1 0 0	60
0 1 0 0 1 1	19	1 0 1 0 0 0	40	1 1 1 1 0 1	61
0 1 0 1 0 0	20	1 0 1 0 0 1	41	1 1 1 1 1 0	62
0 1 0 1 0 1	21	1 0 1 0 1 0	42	1 1 1 1 1 1	63

* All positions on both switches are shown in the On (down) position.

** Rocker switches not listed are not used.

87IL62

Figure 2-3. Locating and Setting Configuration DIP Switches A2S1 and A2S2

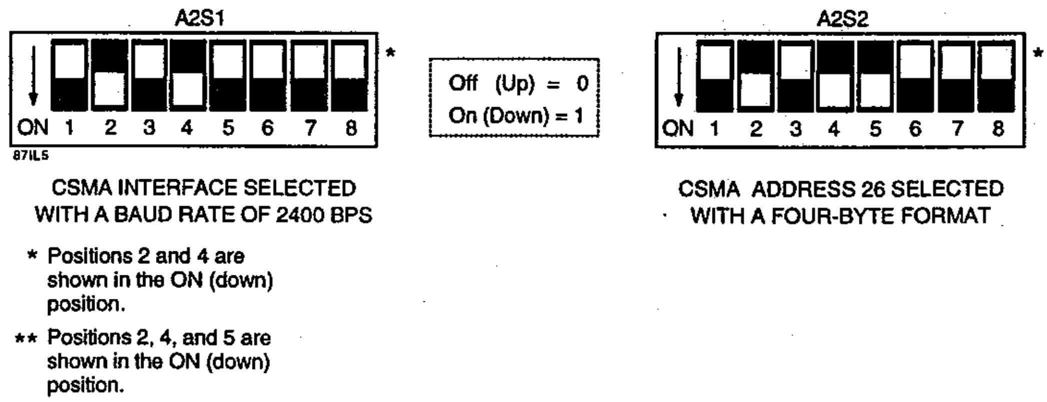


Figure 2-4. Examples of Set DIP Switches A2S1 and A2S2

2.3 EQUIPMENT MALFUNCTIONS

This unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. If an apparent malfunction is encountered after installation, verify that the correct input signals are present at the proper connectors. Prior to taking any corrective maintenance action or breaking any seals, contact your BAE SYSTEMS representative, or the BAE SYSTEMS Customer Service Department to prevent the possibility of voiding the terms of the warranty. Contact BAE SYSTEMS via mail, telephone, or wire at:

BAE SYSTEMS
Aerospace Electronics, Inc.
Customer Service Department
700 Quince Orchard Road
Gaithersburg, Maryland 20878-1794

Toll Free 1-800-954-3577
TELEX: 89-8402
TELEFAX: (301) 948-5666

If reshipment is necessary, follow the instructions in the following paragraph (Preparation for Reshipment or Storage). Do not return the equipment until a Return for Maintenance Authorization (RMA) number has been obtained from BAE SYSTEMS Customer Service Department. See Item 10 in the General Terms and Conditions of Sale paper (Form #WJ-151-X) for more information on equipment returns.

2.4 PREPARATION FOR RESHIPMENT OR STORAGE

If the equipment must be prepared for reshipment, the packaging method should follow the pattern established in the original shipment. Use the best packaging materials available to protect the equipment during reshipment or storage. When possible, use the original packing containers and cushioning material. If the original packing materials are not available, use the following procedure:

1. Wrap the equipment in sturdy paper or plastic.

2. Place the wrapped equipment in strong shipping containers and place a layer of shock-absorbing material (3/4-inch minimum thickness) around all sides of the equipment to provide a firm cushion and to prevent movement inside the container.

3. If shipping the equipment for service, fill out all information on the 5x6-inch PRODUCT DISCREPANCY REPORT card (Form # WJC-QA55-0) that was provided with the original shipment. Also ensure that the Return for Maintenance Authorization (RMA) number is recorded on the card. (See **paragraph 2.3** for details on obtaining this number.) If this card is not available, attach a tag to the equipment containing the following information:

   a. Return for Maintenance Authorization (RMA) number.

   b. The Type/Model number of the equipment.

   c. Serial number.

   d. Date received.

   e. Date placed in service.

   f. Date of failure.

   g. Warranty adjustment requested, yes or no.

   h. A brief description of the discrepant conditions

   i. Customer name and return address.

   j. Original Purchase Order/Contract number.

4. Thoroughly seal the shipping container and mark FRAGILE.

   When storing the equipment for extended periods, follow the above packing instructions to prevent damage to the equipment. The safe limits for storage environment are as follows:

   Temperature: -40 to +70°C
   Humidity: less than 95%

5. Ship to:

BAE SYSTEMS
Aerospace Electronics, Inc.
700 Quince Orchard Road
Gaithersburg, MD 20878-1794
U.S.A.

NOTES

SECTION III

LOCAL OPERATION

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SECTION III

LOCAL OPERATION

3.1 INTRODUCTION

This section provides information related to the local operation of the WJ-8712P Digital HF Receiver using its front panel controls, indicators, and displays.

The WJ-8712P Digital HF Receiver provides four basic modes of operation to be used for the search, acquisition, and analysis of signal activity in the RF spectrum. The four basic modes are manual, channel scan, frequency-to-frequency scan, and frequency-to-frequency scan with lockouts.

The manual mode is a fixed tuned operation that allows for optimizing the receiver parameters for further signal analysis. This mode can be entered initially or entered during any active or paused scan activity.

The channel scan mode is an automatic mode of operation that allows the receiver to step through selected frequencies in the RF spectrum. In the channel scan mode, the receiver is programmed to scan from a start channel to a stop channel. The channels are memory channels that contain receiver parameters. In this mode the receiver steps from channel to channel beginning with the start channel and ending with the stop channel. As the receiver steps to each channel, the receiver parameters are automatically changed to those of the current memory channel. If a signal is not received in the current channel, it moves to the next channel. When the stop channel is reached, the receiver steps to the start channel and continues scanning. Up to 100 memory channels are available and each can be included or skipped in a channel scan.

In the frequency-to-frequency scan mode, the receiver is programmed to scan all frequencies between and including a start and stop frequency. If a signal is found, the scan mode stops for a specified period of time and displays the current frequency. The amount of time the scan mode stops on a received signal is dependent on the setting of the receiver's signal dwell timer. When the stop frequency is reached the receiver tunes to the start frequency and continues scanning.

The frequency-to-frequency scan mode with lockout frequencies inserted operates identically to the frequency-to-frequency scan mode. However, in this mode the operator enters frequencies that are to be passed over during the scan sequence without a search for signal activity. These frequencies are referred to as lockout frequencies.

Front panel controls, indicators, and displays provide the local operator total control over the receiver's operation. The following paragraphs provide detailed information on WJ-8712P local operations. **Figure 3-1** shows the location of the front panel controls, indicators, and displays. **Table 3-1** lists the front panel controls and indicators and provides references for quick access to information concerning their role in implementing the receiver's local operation.

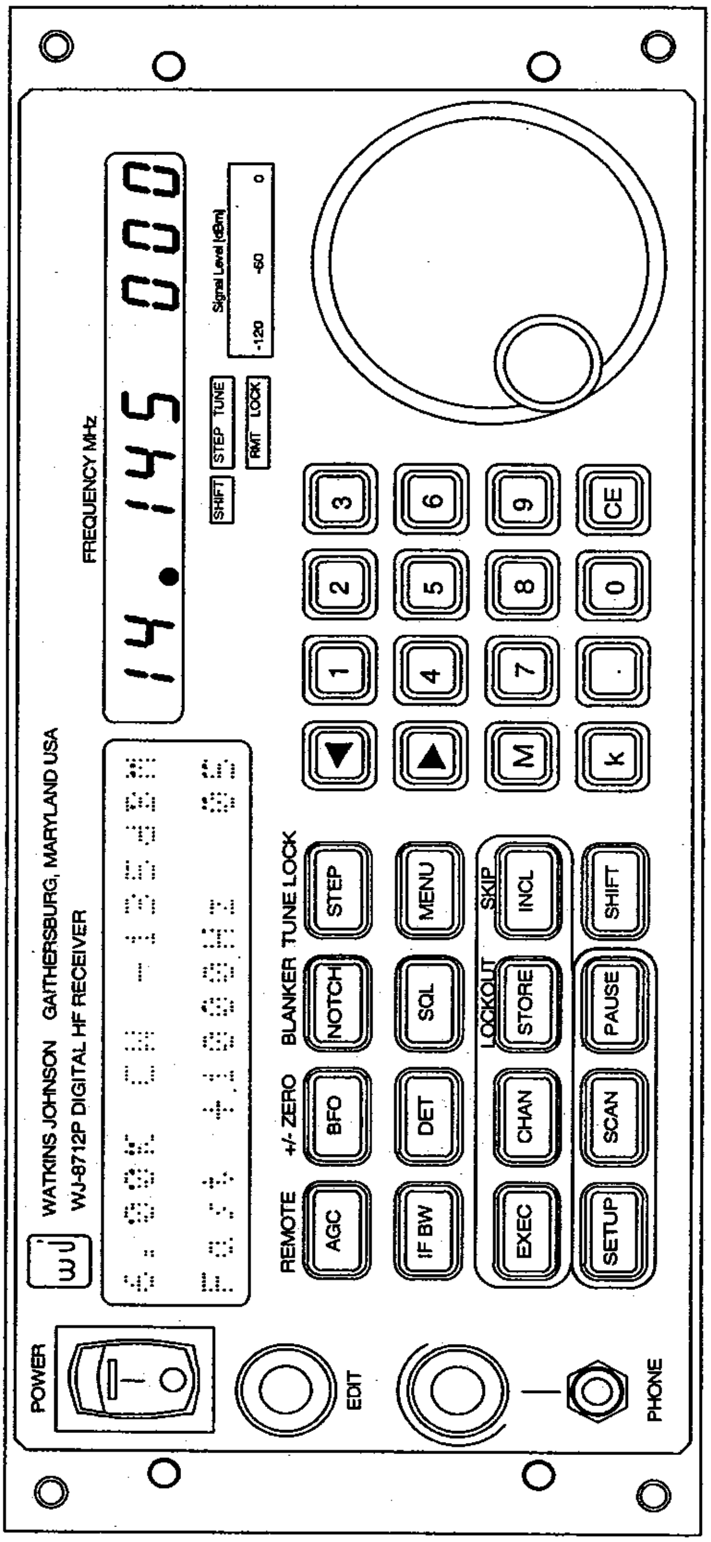

Figure 3-1. WJ-8712P Front Panel Controls, Indicators and Displays

Table 3-1. WJ-8712P Controls and Indicators

Controls and Indicators	Description	Ref. Para.
POWER	Power ON/OFF toggle switch.	3.1.1.1
EDIT	Control knob available in most front panel modes (except tuned frequency) for adjustment of selected parameters, identified by a blinking cursor.	3.1.3.6
PHONE	Headphone audio level control knob.	3.1.1.3
Tuning Wheel	Manual adjustment of the receiver's tuned frequency. Tuning resolution is identified by a blinking cursor or operator selected step size.	3.1.3.1
FREQUENCY MHz Display	8-digit display indicating the receiver's currently tuned frequency. The frequency is displayed in MHz with a 1.0 Hz resolution.	3.1.2.2
Auxiliary Parameters Display	32-character readout for monitoring of current receiver parameters (i.e., IF Bandwidth and Detection Mode).	3.1.2.1
SHIFT Indicator	Green LED illuminated when the front panel's SHIFT key is selected.	3.1.2.4
STEP TUNE Indicator	Green LED illuminated when the Step Tuning mode is enabled. Activated by pressing the STEP control key.	3.1.2.6
TUNE LOCK Indicator	Green LED illuminated when the Tuning Wheel operation is disabled. Activated by pressing the SHIFT/TUNE LOCK control keys.	3.1.2.7
RMT Indicator	Green LED illuminated when the receiver is placed under remote control. Activated by pressing the SHIFT/REMOTE control keys.	3.1.2.5
Signal Level [dBm] Indicator	Analog-type signal strength bargraph representing the receiver's RF input signal level.	3.1.2.3
Numeric Entry Keys	Digits "0" through "9" and a decimal point are available. Allows for the direct entry of data when permitted by the selected receiver parameter.	3.1.3.5
CE Key	Clear Entry key deletes an undesired numeric entry prior to pressing a valid termination key. Clears memory channels and/or lockout frequencies from memory. Clears the display and exits the currently active entry mode.	3.1.3.7
M Key	Enters the tuned frequency of the receiver in MHz, as defined by front panel numeric entry.	3.1.3.8
k Key	Enters the tuned frequency of the receiver in kHz, as defined by front panel numeric entry.	3.1.3.8

Table 3-1. WJ-8712P Controls and Indicators (Continued)

Controls and Indicators	Description	Ref. Para.
"◄" Key	The "◄" key moves the cursor in the frequency display to the left one position each time the "◄" key is pressed. The "◄" key functions as an up arrow (▲) key when the SHIFT LED is illuminated. Each press of the up arrow increments the tuned frequency by a value of one in accordance with the blinking cursor position, or increments the tuned frequency by the operator selected step size when the STEP TUNE LED is illuminated.	3.1.3.4
"►" Key	The "►" key moves the cursor in the frequency display to the right one position each time the "►" key is pressed. The "►" key functions as a down arrow (▼) key when the SHIFT LED is illuminated. Each press of the down arrow decreases the tuned frequency by a value of one in accordance with the blinking cursor position, or decreases the tuned frequency by the operator selected step size when the STEP TUNE LED is illuminated.	3.1.3.4
AGC Key	Used to toggle the receiver's gain mode. Available selections are AGC (Fast), AGC (Medium), AGC (Slow), and Manual. When Manual gain is selected, a numeric gain value of 000 to 127 can be entered.	3.1.4.1
REMOTE Key	Places the receiver in the remote control mode. The SHIFT key must be enabled.	3.1.1.2
BFO Key	Permits adjustment of the active BFO offset frequency when in the CW detection mode.	3.1.4.2
+/- ZERO KEY	Selects the position of the current BFO frequency either above (+) or below (-) the tuned carrier frequency, or off. The SHIFT key must be enabled. Note: BFO is only valid in the CW detection mode. Selects the position of the active Tunable Notch Filter setting either above (>) or below (<) the tuned carrier frequency, or off. The SHIFT key must be enabled. Note: The Tunable Notch Filter is not valid in the CW detection mode.	3.1.4.4
NOTCH Key	Enables the tunable notch filter when in the AM, FM, USB, LSB, ISB, or SAM detection modes.	3.1.4.3

Table 3-1. WJ-8712P Controls and Indicators (Continued)

Controls and Indicators	Description	Ref. Para.
BLANKER Key	Permits entry of a noise blanker setting from 1 to 10 or off. The SHIFT key must be enabled.	3.1.4.5
STEP Key	Permits tuning of the receiver according to the operated selected step size. The STEP TUNE LED illuminates.	3.1.4.9
TUNE LOCK Key	Disables tuning wheel operation. The SHIFT key must be enabled.	3.1.3.3
IF BW Key	Permits setting the receiver's active IF Bandwidth.	3.1.4.6
DET	Permits selection of the receiver's active detection mode.	3.1.4.7
SQL Key	Permits entry of the receiver's squelch setting. The squelch range is from 0 to -135 dBm or off.	3.1.4.8
MENU Key	The Menu key provides access to a subset of receiver special functions. Some of the available selections are the receiver's Built-in-Test (BITE), baud rate selection, and the RF Input signal path. See **paragraph 3.1.5** for a complete listing of the special functions available via the MENU key.	3.1.5
EXEC Key	Sets current receiver parameters to the selected memory channel settings.	3.1.7.5
CHAN Key	Permits access to a selected memory channel for review and editing of stored parameters.	3.1.7.1
STORE Key	Stores current receiver parameters to a memory channel.	3.1.7.2
LOCKOUT Key	Permits setting of lockout frequencies used during a frequency-to-frequency scan with lockouts. The SHIFT key must be enabled.	3.1.7.6
INCL Key	Includes the selected memory channel during an active channel scan as long as the memory channel number is within the start and stop channels.	3.1.7.3
SKIP Key	Permits the selected memory channel to be "skipped" during an active channel scan. The SHIFT key must be enabled.	3.1.7.4
SETUP Key	Used to set up a scan operation.	3.1.9.1
SCAN Key	Initiates the current scan setup and returns an active Scan to the Manual mode.	3.1.9.2
PAUSE Key	Suspends an active scan. Resumes a paused Scan.	3.1.9.3
SHIFT Key	The SHIFT key is required to activate the upper case function of dual function keys. The SHIFT LED will illuminate.	3.1.3.2

3.1.1 INITIATING LOCAL OPERATIONS

To operate the WJ-8712P locally using the front panel controls, indicators, and displays, the unit is first powered-up using the POWER toggle switch and then placed in the Local mode by pressing the SHIFT/REMOTE keys (if powered-up in the Remote mode). Local operation is enabled when the RMT LED is off. Additionally, the front panel headphones audio output level should be adjusted to a comfortable level using the PHONE volume control knob. **Paragraphs 3.1.1.1** through **3.1.1.3** provide more details on the POWER toggle switch, the REMOTE key, and the PHONE control knob, respectively.

3.1.1.1 **POWER Toggle Switch** - This ON/OFF toggle switch enables power to the WJ-8712P receiver. Upon power-up, three actions occur. First, all LED indicators on the front panel are illuminated verifying front panel operations. Second, "WJ-8712P" is displayed followed by the software release level. And third, the receiver front panel returns to the operating mode and parameters that were present prior to the last power interruption.

3.1.1.2 **REMOTE Key** - This key places the receiver in either the Local or Remote mode of operation. The receiver is set for Local operations whenever the RMT LED in off. To place the receiver in the Remote mode, first press the SHIFT key to activate the upper case REMOTE function, then press the REMOTE key. When placed in the Remote mode the RMT LED is illuminated. Pressing the SHIFT/REMOTE key again returns the receiver to the Local mode.

3.1.1.3 PHONE Output Volume Control Knob

The PHONE output volume control knob is located directly above the front panel headphone jack. The knob is used to increase or decrease the volume level of the audio output on both channels of the PHONE jack. A clockwise rotation increases the volume of a nominal audio signal up to approximately 10 milliwatts and a counterclockwise rotation decreases the volume to approximately 0 milliwatts. This control is also operational while the receiver is in the Remote mode.

3.1.1.4 Performing a Cold Start at Power-Up

NOTE

When a cold start is performed at power-up, all setups in memory are cleared. All scan setups, memory channel contents, and receiver parameters are reset to their default conditions.

The receiver can be cycled through a cold start at power-up. A cold start provides a means of clearing the receiver of all previous settings saved in memory and possible front panel errors. This is performed by pressing and holding the CE (clear entry) key while turning on the receiver, then releasing the CE key. At cold start power-up, the parameters display shows "COLD START" for approximately two seconds while clearing memory then goes through its normal initialization routine. When the power-up routine is completed, the parameter displays and the tuned frequency window displays their default settings.

3.1.2 FRONT PANEL INDICATORS AND ALPHANUMERIC DISPLAYS

The front panel indicators and alphanumeric displays of the WJ-8712P enable the local operator to monitor the status of the receiver's operation continuously. The status is recognized by observing the information on the 32-character auxiliary parameters display, the 8-digit frequency display, the analog signal level meter, and the LED's associated with the keys on the keypad. **Paragraphs 3.1.2.1** through **3.1.2.3** provide more details on the auxiliary parameters display, the frequency display, and the signal strength meter, respectively. **Paragraphs 3.1.2.4** through **3.1.2.7** provide details for the front panel keypad LED's.

3.1.2.1 Auxiliary Parameters Display

The auxiliary parameters display is a 32-character readout that provides the operator the capability to monitor the receiver's status and settings visually. For example, when the receiver is in the Manual mode the selected IF Bandwidth, detection mode, signal strength, gain mode, BFO/NOTCH frequency, and blanking setting are displayed. However, while in the Scan mode, the current memory channel number and the programmed memory channel frequency are displayed. In some displays a flashing cursor appears, indicating that the parameter displayed in that character position may be adjusted via the EDIT control knob or numeric entry. More details on the various types of information displayed are provided throughout the Local Operations section where applicable.

3.1.2.2 FREQUENCY MHz Display

The FREQUENCY MHz display is an 8-digit display the provides the current tuned frequency of the receiver with a 1 Hz resolution. A display cursor is also available, identifying the current tuning resolution used during front panel tuning wheel adjustment and up/down arrow adjustment.

3.1.2.3 Signal Level [dBm], Signal Strength Meter

The Signal Level [dBm] meter, located below the frequency display, provides the local operator a rapid means of determining the receiver's RF input signal strength. The Signal Level meter is comprised of 10 LED's that provide the local operator an analog indication of the received signal strength within the range of 0 to -120 dBm.

3.1.2.4 SHIFT Indicator

The SHIFT indicator, located below the frequency display, illuminates when the SHIFT key on the front panel keypad is active. The SHIFT key must be active to access the upper key functions of dual function keys on the receiver's keypad. Front panel keys that require an active SHIFT function include the REMOTE, +/- ZERO, BLANKER, TUNE LOCK, LOCKOUT, and SKIP keys. More details on the various keypad functions are provided throughout this section where applicable.

3.1.2.5 **RMT, Remote Indicator**

The RMT (Remote) indicator, located below the frequency display, is illuminated when the receiver is in the Remote mode of operation. The RMT indicator is off when the Local mode is selected.

3.1.2.6 **STEP TUNE Indicator**

The STEP TUNE LED, located below the frequency display, is lit when the Step Tune mode is selected via the front panel's STEP key. When the STEP TUNE LED is illuminated, adjusting the tuning wheel changes the receiver's tuned frequency according to the selected step size.

3.1.2.7 **TUNE LOCK Indicator**

The TUNE LOCK LED, located below the frequency display, is lit when the TUNE LOCK key on the front panel is selected. When this LED is lit, the tuning wheel operation is disabled.

3.1.3 **GENERAL ENTRY KEYS**

General Entry keys are used to adjust or enable various parameters and functions of the WJ-8712P receiver. Available General Entry keys include:

- the front panel tuning wheel,
- the SHIFT key,
- the TUNE LOCK key,
- the left and right arrow keys,
- the numeric entry keys,
- the EDIT control keys,
- the CE (clear entry) key,
- and the "M" and "k" termination keys.

Paragraphs 3.1.3.1 through **3.1.3.8** provide further details on the General Entry keys available for the WJ-8712P receiver and their individual functions.

3.1.3.1 **Tuning Wheel** - The tuning wheel is used to adjust the receiver's tuned frequency in accordance with the selected tuning rate and tuning resolution. Available tuning rates include FAST, SLOW, and ACCELERATED (see **paragraph 3.1.5.10** for further details). The current tuning resolution is indicated by a blinking cursor in the frequency display provided the STEP TUNE LED is not illuminated. The front panel's left and right arrow keys are used to position the blinking cursor in the frequency display for the desired tuning resolution. When the STEP TUNE LED is lit, the tuning increment corresponds to the operated selected step size. Refer to **paragraph 3.1.4.9** for further information on entering the desired Step size.

3.1.3.2 **SHIFT Key** - The SHIFT key is required to access upper case functions of dual function control keys. The SHIFT key must be selected prior to the control key in order to enable the upper case function (SHIFT LED on).

3.1.3.3 **TUNE LOCK Key** - To prevent inadvertent adjustment of the tuning wheel, and subsequent changing of the receiver's tuned frequency, the tuning wheel operation may be disabled by pressing the TUNE LOCK key. When Tune Lock is enabled, the TUNE LOCK LED is illuminated. The SHIFT key is required to access the TUNE LOCK function.

3.1.3.4 **Left (◀) and Right (▶) Arrow Keys** - During front panel operations where tuned frequency adjustment is permitted, the left (◀) and right (▶) arrow keys are used to position the blinking cursor in the tuned frequency display to the desired tuning resolution. When the STEP TUNE mode is selected (STEP TUNE LED on), the left or right arrow keys can also be used to extinguish the STEP TUNE LED, returning the cursor to the digit of the tuning display last selected as the tuning resolution.

When the front panel SHIFT LED is illuminated, the left and right arrow key functions are changed to the "up arrow" and "down arrow" keys, respectively. When the frequency display's cursor is active, the tuned frequency is increased or decreased by a value of one at the cursor position with each press of the "up arrow" or "down arrow" keys. When the STEP TUNE LED is illuminated, each press of the "up arrow" or "down arrow" keys changes the tuned frequency according to the operator selected step size. Pressing the SHIFT key causes the SHIFT LED to extinguish and returns the left and right arrow keys to their original functions.

3.1.3.5 **Numeric Entry Keys** - The numeric entry keys (0-9) allow direct entry of numeric values except during an active Scan operation. When keypad entry begins, the tuned frequency display is cleared and the entered digit is displayed at the far right side of the frequency display. Each additional entry appears to the right, causing the previous entry to shift one position to the left. The decimal point key (.) permits the entry of fractional values when permitted by the front panel parameter. The entry is completed when a valid terminator key is pressed. Valid terminator keys include:

M key	(enters tuned frequency in MHz)
k key	(enters tuned frequency in kHz)
SQL key	(enters squelch setting)
BFO key	(enters BFO offset frequency)
STEP key	(enters Step Tune size)
BLANK key	(enters noise blanking setting)
MENU key	(enters parameters requested by Menu key subfunctions)
CHAN key	(enters a selected memory channel in the channel view mode)
SETUP key	(enters scan setup parameters)
STORE key	(enters current receiver parameters into a selected memory channel)
INCL key	(enters selected memory channel for channel scan operations)
SKIP key	(enters selected memory channels for exclusion during channel scan operations)

If any other key is pressed while a non-terminated numeric entry is in progress, "INVALID TERM" is displayed in the lower portion of the parameters display. If a numeric entry is outside the specified limits of the associated parameter the term "OUT OF RANGE" is displayed in the lower portion of the parameters display. Either of these two messages is displayed for approximately 3 seconds before returning to their previous settings.

Undesired entries may be canceled by pressing the CE (clear entry) key, prior to pressing a valid termination key. This restores the front panel settings to values previously displayed.

3.1.3.6 The EDIT Control Knob

The EDIT control knob is located just below the POWER toggle switch of the front panel. This knob can be used to alter various auxiliary parameters of the receiver when certain conditions are met. The following are the functions provided by the EDIT control knob.

Gain Control: Scrolls up (clockwise) and down (counterclockwise) through gain control modes when the AGC key is selected (**paragraph 3.1.4.1**). The available gain control modes are FAST (AGC fast), MED (AGC medium), SLOW (AGC slow), and manual (numeric value), in that order.

BFO Frequency: Increases (clockwise) and decreases (counterclockwise) the BFO frequency value in steps corresponding to the highlighted digit of the BFO display when the BFO key LED is selected (**paragraph 3.1.4.2**). The range of the BFO value is -8000 to +8000 Hz. Attempts to tune beyond these limits are ignored. The BFO value does not go directly from +8000 to -8000 Hz with a clockwise rotation of the edit knob (i.e. no wrap-around).

Noise Blanker: Increases (clockwise) and decreases (counterclockwise) the Noise Blanker value when the BLANKER key LED is selected (**paragraph 3.1.4.5**). The range of the noise blanker value is 1 to 10 or " - - -" (off). Attempts to tune beyond these limits are ignored. Turning the edit knob counterclockwise while 01 is displayed causes " - - -" to be displayed. The noise blanker value does not go directly from 10 to " - - -" with a clockwise rotation of the edit knob (i.e., no wrap-around).

IF Bandwidth: Scrolls up (clockwise) or scrolls down (counterclockwise) through the available IF bandwidths when the IF BW key is selected (**paragraph 3.1.4.6**). The IF bandwidth selection does not go directly from the maximum to minimum bandwidth when the edit knob is turned clockwise, nor does it go directly from the minimum to maximum bandwidth when turned counterclockwise (i.e., no wrap-around).

Detection Mode: Scrolls up (clockwise) or scrolls down (counterclockwise) through the available detection modes when the DET key is selected (**paragraph 3.1.4.7**). The selectable detections modes are AM, SAM, FM, CW, LSB, USB, and ISB, in that order. The IF detection mode selection does not go directly from ISB to AM when the edit knob is turned clockwise, nor does it go directly from AM to ISB when turned counterclockwise (i.e., no wrap-around).

Squelch Level: Increases (clockwise) and decreases (counterclockwise) the squelch value in steps corresponding to the highlighted digit of the squelch parameter display when the SQUELCH key is selected (**paragraph 3.1.4.8**). The range of the squelch parameter is 0 to -135 dBm or "- - -" (off). Turning the edit knob counterclockwise while 135 is displayed causes "- - -" to be displayed. Turning the edit knob counterclockwise while "- - -" is displayed has no effect. Turning the edit knob clockwise while "- - -" is displayed causes 135 to be displayed with the 10-dBm digit ("3") highlighted. Turning the knob clockwise while the maximum squelch parameter is displayed (000) does not directly step the parameter to the minimum value (-135 dBm) or "- - -".

Passband Tuning: Increases (clockwise) or decreases (counterclockwise) the passband tuning parameter in 100-Hz steps when the Passband Tuning -100 Hz mode is enabled (**paragraph 3.1.5.1**). Increases (clockwise) or decreases (counterclockwise) the passband tuning parameter in 10-Hz steps when the Passband Tuning -10 Hz mode is selected (paragraph 3.1.5.2).

Tunable Notch Filter: Increases (clockwise) or decreases (counterclockwise) the position of the tunable notch filter. The range is ±9999 Hz in 1 Hz steps. This setting represents the position of the notch filter with respect to the tuned carrier frequency.

The EDIT control knob is also used during scan setup operations to cycle through the three available scan types. Once the SETUP key is pressed, rotating the EDIT control knob clockwise toggles through the scan types available, including CHANNEL (Channel scan), F1 -> F2 (frequency-to-frequency scan), and F1 -> F2 WLCK (frequency-to-frequency scan with lockouts). In addition, whenever the Channel View or Channel Execute modes are selected, the displayed channel number can be altered via the EDIT control knob. A clockwise rotation steps through the 100 available memory channels from 00 to 99. Once channel 99 is displayed, a further clockwise rotation will return to channel 00 (wraparound available). A counterclockwise rotation performs similarly, decreasing the displayed channel number (99 to 00 with wraparound).

3.1.3.7 CE (Clear Entry) Key

The CE key provides four functions. First, to clear an unwanted, in progress, numeric entry. Second, to exit an active entry mode. Third, to clear a displayed lockout frequency from memory. And fourth, to erase both Channel and Lockout memory.

When a numeric entry has already been started and a valid terminator key has not yet been pressed, pressing the CE key causes the entire numeric entry to be erased. When an entry mode is currently active (i.e. the BFO entry mode), and a numeric entry is not in process, pressing the CE key clears the parameters display and exits the active entry mode.

The CE key is also used to erase programmed memory Channel and/or Lockout frequency settings. When a lockout frequency is displayed during a scan setup, pressing the CE key clears the lockout frequency from memory. When a numeric entry is not in progress and an entry mode is not selected, the first press of the CE key has no effect. A second press of the CE key displays the message "NEXT=CLR MEM" on the parameters display. When the CE key is pressed the third time, all Channel and Lockout memory is erased.

3.1.3.8 The "M" and "k" Terminator Keys

The "M" and "k" keys are used to terminate an in-process numeric entry of the receiver's tuned frequency in MHz (M) or kHz (k), as required.

3.1.4 RECEIVER AUXILIARY PARAMETER CONTROLS

All auxiliary parameters of the WJ-8712P receiver can be set using the front panel controls and displays. Auxiliary parameters (such as the gain control mode, manual gain level, BFO and Tunable Notch settings, the noise blanker and squelch values, the detection mode and IF bandwidth, and the step tune size) are altered via the available auxiliary parameter keys. The following paragraphs provide further information on the front panel's auxiliary parameter keys including:

- the AGC key (**paragraph 3.1.4.1**)
- the BFO key (**paragraph 3.1.4.2**)
- the NOTCH key (**paragraph 3.1.4.3**)
- the +/-ZERO key (**paragraph 3.1.4.4**)
- the BLANKER key (**paragraph 3.1.4.5**)
- the IF BW key (**paragraph 3.1.4.6**)
- the DET key (**paragraph 3.1.4.7**)
- the SQL key (**paragraph 3.1.4.8**)
- the STEP key (**paragraph 3.1.4.9**)
- and the SCAN key (**paragraph 3.1.4.10**)

3.1.4.1 **AGC Key** - Pressing the AGC key enters the Automatic Gain Control (AGC) entry mode and highlights the AGC field in the parameters display. Each press of the AGC key toggles between the three available AGC types, the Manual gain mode, and the Manual gain edit mode.

The three available AGC types are FAST (AGC fast), MED (AGC medium), and SLOW (AGC slow), denoting the speed of the AGC attack. When manual gain control is selected, the receiver's manual gain setting is displayed with all digits being highlighted. The next press of the AGC key enters the manual gain edit mode, highlighting the least significant digit only. The manual gain range is from 0 to -127 dB in 1 dB increments, and is set using the EDIT control knob. A clockwise rotation of the EDIT control knob increases the manual gain setting in 1 dB steps, while a counterclockwise rotation decreases the manual gain setting. The currently selected AGC mode or the manual gain setting is displayed in the lower left portion of the parameters display. Pressing any auxiliary parameter key or the CE key exits the AGC entry mode.

3.1.4.2 **BFO Key** - The BFO key is used to set the frequency of the beat frequency oscillator (BFO) while in the CW detection mode. The BFO range is from +8000 Hz to -8000 Hz with a 1 Hz resolution and is set by adjustment of the EDIT control knob or numeric entry. The current BFO setting is displayed in the lower portion of the parameters display.

To adjust the BFO frequency via the EDIT control knob, press the BFO key once. The BFO entry mode becomes active with a cursor highlighting the 1 kHz digit. Each press of the BFO key moves the cursor one position to the right. Once the 1 Hz digit is selected, the next press of the BFO key returns the cursor to the 1 kHz position. Once the desired tuning resolution is identified by the cursor, the BFO frequency is adjusted by rotating the EDIT control knob. A clockwise rotation increases, while a counterclockwise rotation decreases the BFO frequency.

The BFO frequency can also be adjusted by front panel numeric entry. Simply press the BFO key to activate the BFO function. Using the front panel numeric keypad, enter the desired BFO frequency in Hz. Pressing the BFO key enters the new BFO setting. Pressing any auxiliary parameter key or the CE key exits the BFO entry mode.

3.1.4.3 NOTCH Key - The NOTCH key is used to access the receiver's Tunable Notch Filter while in the AM, SAM, FM, USB, LSB, and ISB detection modes, to aid in the reduction of unwanted signals outside the passband. Pressing the NOTCH key enters the tunable notch filter entry mode, highlighting the tunable notch filter field. The displayed relative position of the Tunable Notch Filter can be adjusted to +/-9999 Hz from the tuned carrier frequency; however, each available IF bandwidth filter has its own limits. **Table 3-2** lists the possible IF bandwidths available and their respective tunable notch filter range.

NOTE

The WJ-8712P software will allow tunable notch filter settings of ±9999 Hz in all IF bandwidths. However, settings outside the specified maximum limit for each bandwidth will automatically disable the tunable notch filter.

Table 3-2. Tunable Notch Filter Range

IF Bandwidth (kHz)	Maximum Relative Setting from the Tuned Carrier Frequency
.056, .063, .069 .075, .081, .088 .094, .100	±97 Hz
.113, .125, .138, .150, .163, .175, .188, .200	±195 Hz
.225, .250, .275 .300, .325, .350, .375, .400	±390 Hz
.450, .500, .550, .600, .650, .700, .750, .800	±781 Hz
.900, 1.000, 1.100, 1.200, 1.300, 1.400, 1.500, 1.600	±1562 Hz
1.800, 2.000, 2.200, 2.400, 2.600, 2.800, 3.000, 3.200	±3125 Hz
3.600, 4.000, 4.400, 4.800, 5.200, 5.600, 6.000, 6.400	±6250 Hz
7.200, 8.000, 8.800, 9.600, 10.400, 11.200, 12.000, 12.800, 14.400, 16.000	±12500 Hz

To adjust the Tunable Notch Filter setting using the EDIT control knob, press the NOTCH key once. The Tunable Notch Filter field becomes active and displays the current Tunable Notch Filter setting with an active cursor in the 1 kHz position. Each press of the NOTCH key moves the cursor one position to the right. Once the 1 Hz digit is selected, the next press of the NOTCH key returns the cursor to the 1 kHz position. Once the desired tuning resolution is identified by the cursor, the Tunable Notch Filter setting is adjusted by rotating the EDIT control knob. A clockwise rotation increases, while a counterclockwise rotation decreases the notch filter setting.

The Tunable Notch Filter can also be adjusted by front panel numeric entry. Simply press the NOTCH key to activate the Tunable Notch Filter function. Using the front panel numeric keypad, enter the desired notch filter setting in Hz. Pressing the NOTCH key enters the new Tunable Notch Filter setting.

Pressing any auxiliary parameter key or the CE key exits the Tunable Notch Filter entry mode.

3.1.4.4 **+/- ZERO Key** - The +/- ZERO key allows for entries of BFO and Tunable Notch Filter offsets. This key is an upper case function of a dual function key and requires the SHIFT mode to be entered first (SHIFT LED on).

The BFO offset is toggled between above (+) or below (-) the tuned carrier frequency, or set to off (____) with each press of the +/- ZERO key. This entry is only permitted in the CW detection mode. The currently selected offset (+,-, or ____) is displayed in the BFO field of the parameters display.

The Tunable Notch Filter position is toggled between above (>) or below (<) the tuned carrier frequency, or set to off (____) with each press of the +/- ZERO key. This entry is permitted in all detection modes except CW. The currently selected position (>, <, or ____) is displayed in the BFO field of the parameters display.

3.1.4.5 **BLANKER Key** - The BLANKER key permits setting the current noise blanker value from 1 to 10 or can be set to off (---). This key is an upper case function of a dual function key and requires the SHIFT mode to be entered first (SHIFT LED on). This function can be used to "blank" impulse interference at the tuned frequency. Common interference such as "popping" from ground radar waves can be blanked for a period of time, keeping them from being demodulated and heard at the audio outputs. The higher the noise blanker value, the more noise blanking is applied. The noise blanker can be adjusted while listening to the received audio, and setting the noise blanker to a value that is just long enough to blank the noise but no longer.

Pressing the BLANKER key selects the noise blanker entry mode and highlights the noise blanker field. The current noise blanker setting is displayed in the lower right portion of the parameters display. If the BLANKER key is pressed while a noise blanker setting of 1 to 10 is displayed, the noise blanker is set to off (---). If set to off, pressing the BLANKER key returns the noise blanker value to its previous setting.

The noise blanker value is adjusted by rotation of the EDIT control knob or by numeric entry. When numeric entry is used, the setting (0 to 10) is terminated (entered) by pressing the BLANKER key.

Pressing any auxiliary parameter key or the CE key exits the BLANKER entry mode.

3.1.4.6 **IF BW Key** - The IF BW key permits selection of the desired IF bandwidth filter installed in the WJ-8712P Receiver. Pressing the IF BW key selects the IF bandwidth entry mode and highlights the IF bandwidth field. Once the IF Bandwidth mode is selected, the EDIT control knob is used to cycle through a list of IF bandwidth filters included for selection. The IF bandwidth list may contain as many as 66 IF bandwidth filters, ranging in bandwidth from 56 Hz to 16 MHz. The IF bandwidth list is user configurable via the MENU key (refer to **paragraph 3.1.5.3** for further information).

NOTE

In USB or LSB detection modes, only IF bandwidths from .900 to 3.20 kHz are available for selection. For the ISB detection mode, only IF bandwidths from 1.80 to 3.20 kHz are available.

To select an IF bandwidth filter, simply rotate the EDIT control knob until the desired filter size is displayed. As an alternative method, each press of the IF BW key steps through the list of included IF bandwidth filters. Once the desired IF bandwidth filter is selected, pressing any other auxiliary parameter key or the CE key will exit the IF bandwidth entry mode.

3.1.4.7 **DET Key** - The DET control key is used to select the desired detection mode. Pressing the DET key selects detection mode entry and highlights the detection mode field. Available detection modes for the WJ-8712P receiver include AM, SAM, FM, CW, LSB, USB and ISB. Rotating the EDIT control knob clockwise steps through the available detection modes in the sequence listed above. Once ISB is selected, a continued clockwise rotation will have no effect (i.e., no wraparound). A counterclockwise rotation of the EDIT control knob will step back through the available detection modes. Additionally, pressing the DET key on the front panel steps through the list of available detection modes, with AM being selected after the ISB selection (i.e., wraparound available).

NOTE

Whenever LSB, USB, or ISB detection modes are selected, the IF bandwidth automatically changes to the last selected SSB bandwidth. Only IF bandwidths from .900 to 3.20 kHz are available in the LSB and USB detection modes. IF bandwidths from 1.80 to 3.20 kHz are available in the ISB detection mode. When changing from one of the SSB detection modes to AM, SAM, FM, or CW, the IF bandwidth returns to its original value.

3.1.4.8 **SQL Key** - The SQL key allows for the setting of the squelch threshold level. The squelch can be adjusted to a level, depending on the signals being received. If a signal is being received that is not quite strong enough for proper demodulation (i.e., audio is unclear), the squelch level can be adjusted to block it from being applied to the audio outputs. The squelch should be set to a level where it does not block clear signals but does block noisy unwanted signals. Several adjustments may have to be made to find the optimum level.

Pressing the SQL key selects the squelch entry mode and highlights the squelch field. Initially, a 10 dB adjustment resolution is enabled, as identified by a blinking cursor. Each subsequent press of the SQL key toggles the resolution between 10 dB and 1 dB. Once the desired adjustment resolution is identified, a squelch level between 0 and -135 dBm is entered by rotating the EDIT control knob. Additionally, the squelch level may be entered via the front panel's numeric keypad. Simply press the SQL key to select the squelch entry mode. Enter the desired squelch value within the range of 0 to (-)135 dB using the numeric keypad. Pressing the SQL key enters the new squelch value. Pressing any other auxiliary parameter key or the CE key exits the squelch entry mode.

3.1.4.9 **<u>STEP Key</u>** - The STEP key places the receiver in the Step Tune mode. While in the Step Tune mode, the receiver's tuning wheel and up/down arrow keys adjust the tuned frequency according to the operated selected step size. The step size limits are from 1 Hz to 25 kHz with a 1 Hz resolution.

Pressing the STEP key causes three immediate front panel actions to take place. First, the STEP TUNE LED illuminates identifying the receiver is in the Step Tune mode. This LED is located below the frequency display. Second, the frequency display's blinking cursor is disabled. And third, the parameters display is cleared, and the current step size is displayed as shown below, with a blinking cursor highlighting the 10 kHz digit.

```
BW                    SQL
STEP     10.000K


        BFO           BLANK
```

The step size is adjusted via the EDIT control knob or by numeric entry. When using the EDIT control knob, each press of the STEP key moves the blinking cursor in the step tune frequency one position to the right. Once the cursor is in the 1 Hz position, the next press of the STEP key exits the Step frequency entry mode and returns the parameters display to its previous settings. Once the required tuning resolution is selected, the step frequency is adjusted by rotating the EDIT control knob. A clockwise rotation increases, while a counterclockwise rotation decreases the step tune frequency.

For front panel numeric entry, simply press the STEP key to enter the Step Tune entry mode. Using the numeric keypad, enter the Step frequency desired between .001 and 25.0 kHz. Pressing the STEP key enters the new step tune size. Pressing any other auxiliary parameter function key or the CE key exits the Step Tune entry mode.

3.1.4.10 **<u>SCAN Key</u>** - The SCAN control key, when pressed, initiates a scan setup. If an active scan is currently in process, pressing the SCAN key stops the active scan and returns the receiver to the manual mode. For further information concerning Scan operations, refer to **paragraph 3.1.9.2.**

3.1.5 MENU CONTROL KEY

The MENU control key is used to access various special function parameters of the WJ-8712P receiver. Each press of the MENU key toggles through a list of 17 special function items, making them available for selection or adjustment. The special functions provided with the MENU key and a brief description of each item are listed in **Table 3-3.**

Table 3-3. Menu Key - Special Function Menu Items

Menu Item	Function
1. PB TUNING nnnn	Selects Passband tuning with a 100 Hz tuning resolution. Only available when the CW detection mode is selected.
2. PB TUNING nnnn	Selects Passband tuning with a 10 Hz tuning resolution. Only available when the CW detection mode is selected.
3. IF BW SELECT	Allows installed IF bandwidth filters to be "INCLUDED" or "SKIPPED" in the current IF bandwidth list.
4. BITE PENDING	Initiates the receiver's Built-In-Test (BITE) mode.
5. REMOTE xxxxxx	Selects the remote interface desired, RS-232 or CSMA.
6. BAUD RATE nnnn	Selects the remote baud rate. Available baud rates are from 75 to 9600.
7. ADDRESS nnn	Sets the receiver address from 001 to 063. Only available when the CSMA remote interface is selected.
8. SPEAKER xxxx	Selects the speaker output mode. Available selections are USB, BOTH, or LSB.
9. RF INPUT xxxxxx	Selects the RF input signal path. Available selections are PRE_AMP (preamplifier), NORM (normal), and ATTN (attenuation).
10. NOT AVAILABLE FOR THE WJ-8712P	
11. TUNE RATE xxxxxxxxxxx	Selects the current tuning rate for the front panel's tuning wheel. Available selections are FAST, SLOW, and ACCELERATED.
12. NOT AVAILABLE FOR THE WJ-8712P	
13. REF xxxxx	Displays the current reference frequency used by the receiver, where xxxxx represents INT (internal), EXT (external) 1MHz, EXT 2MHz, EXT 5MHz, or EXT 10 MHz.
14. AGC THRESHOLD xxx nnn	Sets the AGC Threshold function (xxx) to ON or OFF. The threshold gain level (nnn) is controlled by the EDIT control knob.

Table 3-3. Menu Key - Special Function Menu Items (Continued)

Menu Item	Function
15. FAST DECAY nnn	Adjustment of the AGC FAST decay time. Available settings are from 010 to 100 milliseconds in 10 millisecond increments.
16. MEDIUM DECAY nnnn	Adjustment of the AGC MEDIUM decay time. Available settings are from 0100 to 1000 milliseconds in 100 millisecond increments.
17. SLOW DECAY nnn	Adjustment of the AGC SLOW decay time. Available settings are from 1.0 to 5.0 seconds in 0.5 second increments.

Paragraphs 3.1.5.1 through **3.1.5.15** provide further details on the special function menu items available via the MENU key.

3.1.5.1 MENU Item 1, Passband Tuning, 100 Hz

The passband tuning function is available only while the receiver is in the CW detection mode. This function has the effect of shifting the IF bandwidth without changing the frequency of the audio output signals so that unwanted CW signals can be placed outside of the IF bandwidth while keeping the wanted CW signals inside the bandwidth. This is especially useful in FSK demodulation applications for monitoring mark and space frequencies while other CW signals close in frequency are present.

The passband tuning parameter can be any value from -2000 to +2000 Hz in 10-Hz steps. When the passband tuning function is used, the tuned frequency and BFO frequencies are adjusted in accordance to the entered passband tuning parameter. The BFO frequency counteracts the effect of the tuned frequency, which allows the output audio tones to remain at the previously adjusted frequencies. For example, entering a passband tuning parameter of +1000 shifts the tuned frequency up by 1000 Hz which also shifts the IF bandwidth. Any signals received within the IF bandwidth are applied with a BFO offset frequency of -1000 Hz which brings the demodulated tone back down to its original audio frequency.

The Passband Tuning - 100 Hz mode is entered by pressing the MENU key until the parameters display appears as follows:

```
      BW                        SQL
1.  PB TUNE                   100 Hz

    snnnn
           BFO                  BLANK
```

where "s" is the positive or negative sign and "nnnn" is the offset frequency in Hz.

The offset frequency is adjusted using the EDIT control knob. From this menu item, only a 100 Hz adjustment resolution is available from +2000 to -2000 Hz. Pressing the MENU key once more will display menu item number 2, Passband Tuning-10 Hz, permitting adjustments in 10 Hz steps. The selected passband tuning frequency is reset to zero whenever the CW detection mode is deselected or the receiver's tuned frequency is changed. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.2 MENU Item 2, Passband Tuning, 10 Hz

This menu item is used when further adjust of the passband tuning offset frequency is required. As in the previous menu item, this selection is only available when the receiver is in the CW detection mode. The Passband Tuning - 10 Hz mode is entered by pressing the MENU key until the parameters display appears as follows:

```
     BW                        SQL
2.  PB TUNE                   10 Hz

    snnnn
              BFO              BLANK
```

where "s" is the positive or negative sign and "nnnn" is the offset frequency in Hz.

The offset frequency is adjusted using the EDIT control knob. From this menu item, only a 10 Hz adjustment resolution is available from +2000 to -2000 Hz. Pressing the MENU key once more will display menu item number 3, IF BW SELECT. Pressing any other auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.3 MENU Item 3, IF BW SELECT

Any of the 66 available IF bandwidth filters can be included for selection by the receiver. The IF Bandwidth Select mode is used to "include" or "skip" the desired IF bandwidth in the list of available filters.

The IF Bandwidth Select mode is enabled by pressing the MENU key until the parameters display appears as follows.

```
     BW                        SQL
3.  IF BW SELECT

    nnnn   xxxxxxxx
              BFO              BLANK
```

Here, "nnnn" represents the currently selected IF bandwidth and "xxxxxxxx" represents the word "INCLUDED" or "SKIPPED". When "INCLUDED" is displayed, the identified bandwidth will be included in the available IF bandwidth list used for making IF bandwidth selections as described in **paragraph 3.1.4.6**. If "SKIPPED" is displayed, the identified bandwidth will not be available for selection.

Once in the IF Bandwidth Select mode, each of the 66 IF bandwidth filters can be set to "INCLUDED" or "SKIPPED" as desired. To set a filter for "INCLUDED", first select the desired IF bandwidth by rotating the EDIT Control knob until that bandwidth is displayed in the parameters display. Each press of the IF BW key toggles the status of the selected filter from "INCLUDED" to "SKIPPED". Pressing the MENU key once more will display menu item number 4, BITE PENDING. Pressing any other auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.4 MENU Item 4, BITE PENDING

The BITE (built-in-test) initialization mode can be enabled by pressing the MENU key until the parameters display appears as shown below.

```
    BW                        SQL
4.  BITE PENDING


          BFO                 BLANK
```

If the EDIT control knob is turned in either direction while the above message is displayed, all front panel LEDs are lit indicating that the receiver's built-in-test has been started. Refer to **paragraph 3.1.14** for more details on the BITE function. Pressing the MENU key once more displays menu item 5, REMOTE. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.5 MENU Item 5, REMOTE

The Remote Control Selection mode can be enabled by pressing the MENU key until the parameters display appears as follows:

```
    BW                        SQL
5.  REMOTE

    XXXXX
          BFO                 BLANK
```

Here, "xxxxx" is the current selected remote control mode, either "RS232" or "CSMA". The EDIT Control knob can be used to change the selection. The selection is recognized by the receiver only after power is cycled off and back on. Refer to **paragraph 3.1.17** for more details on selecting the remote control mode. Pressing the MENU key once more displays menu item number 6, BAUD RATE. Pressing any other auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.6 MENU Item 6, BAUD RATE

The Remote Baud Rate Entry mode can be enabled by pressing the MENU key until the parameters display appears as follows:

BW	SQL
6. BAUD RATE	
XXXX	
BFO	BLANK

Here, "nnnn" is the current selected baud rate. The EDIT Control knob can be used to select the baud rate. Available selections are 75, 150, 300, 600, 1200, 2400, 4800, and 9600 baud. The selection is recognized by the receiver only after power is cycled off and back on (see **paragraph 3.1.18** for further information).

If CSMA remote control is selected, pressing the MENU key again while the above message is displayed causes the CSMA Address Entry Mode (MENU Item 7) to be selected (**paragraph 3.1.5.7**). If RS-232 is selected, pressing the MENU key displays menu item 8, SPEAKER (**paragraph 3.1.5.8**). Pressing any other auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.7 MENU Item 7, ADDRESS

The CSMA Address Entry mode is enabled by first selecting the CSMA remote control mode (see **paragraph 3.1.5.5**) and then pressing the MENU key until the parameters display appears as follows:

BW	SQL
7. ADDRESS	
nnn	
BFO	BLANK

Here, "nnn" is the current setting of the CSMA address. The address can be entered with the EDIT control knob or by numeric entry terminated with the MENU key. The range of the address is 1 to 63 (0 is reserved). The selection is recognized by the receiver only after power is cycled off and back on. Pressing the MENU key once displays menu item 8, SPEAKER. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.8 MENU Item 8, SPEAKER

The Speaker select mode is entered by pressing the MENU key until the parameters display appears as shown below.

```
   BW                      SQL
8. SPEAKER

   XXXX
         BFO               BLANK
```

Here "xxxx" represents the selected audio signal (LSB, USB, or BOTH) assigned to the speaker outputs at pins 7 and 8 of the audio terminal block TB1, located on the rear panel. The EDIT control knob is used to select the speaker output. A clockwise rotation selects LSB, USB, or BOTH in that order. A further clockwise rotation will not return to LSB (i.e., no wraparound). When BOTH is currently displayed, the order is reversed for a counterclockwise rotation, with LSB being the final selection.

When LSB is selected, only lower sideband audio is provided at the speaker output. When USB is selected, only upper sideband audio is provided at the speaker output. When BOTH is selected, upper and lower sideband audio is provided at the speaker output. The SPEAKER setup has no effect on the speaker output when any detection mode other than ISB is selected.

Pressing the MENU key while the SPEAKER menu item is selected displays menu item number 9, RF INPUT. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.9 MENU Item 9, RF INPUT

The RF INPUT menu item is used to select the path of the RF input signal, prior to being applied to any IF conversions. The RF INPUT select mode is entered by pressing the MENU key until the parameters display appears as shown below.

```
   BW                      SQL
9. RF INPUT

   XXXXXXX
         BFO               BLANK
```

Here "xxxxxxx" represents the currently selected input path. Available input paths are PRE_AMP (preamplifier), NORM (normal), and ATTN (attenuation). The EDIT control knob is used to select the desired RF Input path. A clockwise rotation steps between PRE_AMP, NORM, and ATTN. Once ATTN is selected, a further clockwise rotation does not return to the PRE_AMP setting (i.e., no wraparound). Adjusting the EDIT control knob counterclockwise steps back through the available choices.

The preamplifier is selected when PRE-AMP is displayed. In this selection, the input RF signal is amplified approximately 10 dB. The attenuator is selected when ATTN is displayed. In this selection, the RF signal is attenuated approximately 15 dB. When the NORM is selected, the input signal is routed in its normal path to the other circuits of the receiver.

The PRE-AMP selection is disabled when the receiver is tuned at or below 500 kHz. If PRE-AMP is selected while tuned above 500 kHz and then the receiver is tuned below 500 kHz, the preamplifier path is automatically deselected and the normal input path is automatically selected. If the receiver is then tuned back above 500 kHz, the normal path is deselected and the preamplifier path is reselected.

Pressing the MENU key while the RF INPUT menu item is selected displays menu item number 11, TUNE RATE (menu item number 10 is not available in the WJ-8712P receiver). Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.10 MENU Item 11, TUNE RATE

The TUNE RATE entry mode is used to select the rate at which the tuned frequency changes with each revolution of the tuning wheel. The TUNE RATE entry mode is entered by pressing the MENU key until the parameters display appears as shown below.

```
      BW                  SQL
11. TUNE RATE

      XXXXXXXXXXXX
           BFO            BLANK
```

Here "xxxxxxxxxxx" represents the current tuning rate, either FAST, SLOW, or ACCELERATED.

The rate at which the tuning wheel changes the receiver's tuned frequency is dependent on the current tuning rate selected. If the TUNE RATE parameter is set to "FAST" the tuning wheel tunes at a rate of 128 Hz per revolution. When the SLOW tuning rate is selected, the tuning rate is reduced to 8 Hz per revolution. When the ACCELERATED tuning rate is selected, the receiver tunes at a linear variable rate based on the rotation rate of the tuning wheel.

Once the TUNE RATE entry mode is entered, the tuning rate is selected by adjustment of the EDIT control knob. A clockwise rotation steps between ACCELERATED, SLOW, and FAST. When FAST is displayed, a further clockwise rotation of the EDIT control knob will not return to the ACCELERATED setting (i.e., no wraparound). Adjusting the EDIT control knob counterclockwise will step back through the available choices. Pressing the MENU key while the TUNE RATE entry mode is selected displays menu item 13, REF (Reference). It should be noted that menu item 12 is not available with the WJ-8712P Receiver. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.11 MENU Item 13, REF (Reference)

The REF (Reference) menu item provides the local operator a rapid way to determine the type of reference frequency, either internal or external, currently used by the receiver. To select the REF (Reference) menu item, press the MENU key until the parameters display appears as shown below.

```
      BW                          SQL
13. REF nnxxx


           BFO                    BLANK
```

Here "REF nnxxx" represents the current reference frequency type. One of five possible responses are provided, including REF INT, REF 1MHZ, REF 2MHZ, REF 5MHZ, or REF 10MHZ.

The REF INT response indicates that the receiver's internal 10 MHz Voltage-Controlled Temperature-Controlled Oscillator (VCTCXO) is the source of the receiver's reference frequency. The REF 1MHZ, REF 2MHZ, REF 5MHZ, and REF 10MHZ responses indicate that an external reference signal, at the identified frequency (either 1, 2, 5 or 10 MHz), is the source of the receiver's reference frequency.

Pressing the MENU key while the REF menu item is selected displays menu item 14, AGC THRESHOLD. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.12 MENU Item 14, AGC THRESHOLD

The AGC THRESHOLD entry mode is selected by pressing the MENU key until the parameters display appears as shown below.

```
      BW                          SQL
14.  AGC THRESHOLD

      XXX  nnn
           BFO                    BLANK
```

Here "xxx" represents the current AGC Threshold status, either ON or OFF, while "nnn" provides the current AGC Threshold setting between 000 and 127 (-) dBm. Once the AGC Threshold mode is selected, the ON/OFF status is available for selection as identified by a blinking cursor. A clockwise turn of the EDIT control knob sets the AGC Threshold ON, while a counterclockwise turn sets the AGC Threshold OFF. Pressing the MENU key once while the ON/OFF field is active enters the AGC Threshold level entry mode ("nnn" is identified by a blinking cursor). A clockwise turn of the EDIT control knob adjusts the threshold level from 000 to 127 (-) dBm in 1 dB increments. A further clockwise rotation of the EDIT control knob while 127 is displayed does not return to 000 (i.e., no wraparound). A counterclockwise adjust of the EDIT control knob decreases the threshold value in the same manner.

The Variable AGC Threshold feature provides an adjustable threshold which allows the operator to force the receiver to stay in Manual Gain Control mode until the signal exceeding a preset AGC threshold level is detected. Once this strong signal is detected, the receiver forces itself into AGC to prevent overload and distortion.

The Variable AGC Threshold is most useful in single sideband (SSB) detection mode or in the presence of severely fading signals. With the AGC disabled and SSB signal inactive, RF noise is amplified to full scale of the audio channel. When AGC is enabled, all signals below the specified threshold are unaffected by AGC and are not brought up to full scale.

The operation of this feature can be verified by tuning to a SSB signal and slowly reducing the AGC threshold. While the strong SSB signal should sound the same, the noise between the SSB activity drops out since the receiver does not apply AGC.

Pressing the MENU key while the AGC Threshold Level entry mode is selected displays menu item 15, FAST DECAY. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.13 <u>MENU Item 15, FAST DECAY</u>

The FAST DECAY entry mode is entered by pressing the MENU key until the parameters display appears as shown below.

```
     BW                  SQL
15.  FAST DECAY

     nnn
         BFO             BLANK
```

Here "nnn" represents the current AGC Fast decay time setting in milliseconds.

As pertaining to AGC operations, the decay time is defined as the length of time that it takes for the audio outputs to return to a nominal level after a moderate instantaneous decrease in the input signal level has occurred. For the AGC Fast gain control mode, the decay time limit is from 10 to 100 msec. The EDIT control knob is used to adjust the decay time setting with a 10 msec resolution. Rotating the EDIT control knob clockwise steps the decay time from 10 to 100 msec in 10 msec increments. Once 100 msec is displayed, further rotation of the EDIT control knob does not return the setting to 10 msec (i.e., no wraparound). Similarly, a counterclockwise rotation decreases the decay time setting from 100 msec to 10 msec in 10 msec steps.

Pressing the MENU key while the FAST DECAY entry mode is selected displays menu item 16, MEDIUM DECAY. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.14 MENU Item 16, MEDIUM DECAY

The MEDIUM DECAY entry mode is entered by pressing the MENU key until the parameters display appears as shown below.

```
    BW                      SQL
16. MEDIUM DECAY

    nnnn
          BFO               BLANK
```

Here "nnnn" represents the current AGC Medium decay time setting in milliseconds.

The AGC Medium decay time limit is from 100 to 1000 msec. The EDIT control knob is used to adjust the decay time setting with a 100 msec resolution. Rotating the EDIT control knob clockwise steps the decay time from 100 to 1000 msec in 100 msec increments. Once 1000 msec is displayed, further rotation of the EDIT control knob does not return the setting to 100 msec (no wraparound). Similarly, a counterclockwise rotation decreases the decay time setting from 1000 msec to 100 msec in 100 msec steps.

Pressing the MENU key while the MEDIUM DECAY entry mode is selected displays menu item 17, SLOW DECAY. Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.5.15 MENU Item 17, SLOW DECAY

The SLOW DECAY entry mode is entered by pressing the MENU key until the parameters display appears as shown below.

```
    BW                      SQL
17. SLOW DECAY

    nn
          BFO               BLANK
```

Here "nn" represents the current AGC Slow decay time setting in seconds.

The AGC Slow decay time limit is from 1.0 to 5.0 seconds. The EDIT control knob is used to adjust the decay time setting with a 0.5 second resolution. Rotating the EDIT control knob clockwise steps the decay time from 1.0 to 5.0 seconds in 0.5 second increments. Once 5.0 seconds is displayed, further rotation of the EDIT control knob does not return the setting to 1.0 seconds (i.e., no wraparound). Similarly, a counterclockwise rotation decreases the decay time setting from 5.0 seconds to 1.0 seconds in 0.5 second steps.

Pressing the MENU key while the SLOW DECAY entry mode is selected causes one of two responses. First, menu item 1, PB TUNE - 100 HZ, is displayed when the receiver is set to the CW detection mode. Or two, menu item 3, IF BW SELECT, is displayed when the detection mode is set to other than CW (i.e., AM, FM, or SSB modes). Pressing any auxiliary parameter key or the CE key returns the parameters display to its original settings.

3.1.6 LOCAL OPERATION EXAMPLE - MANUAL MODE

When the receiver is in the Manual mode of operation (i.e., no scan operations), the front panel keys, the tuning wheel, and the EDIT control knob are used to set active receiver parameters. The following paragraphs provide examples that illustrate the setting of front panel parameters with typical values.

3.1.6.1 Placing the Receiver into Local Operating Mode

The following example illustrates the action of placing the receiver into local operation using the front panel controls. As shown, pressing the REMOTE key while the SHIFT LED is illuminated, takes the receiver out of remote control and into local. See **paragraph 3.1.1.2** for more details on the REMOTE key.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display						Frequency Display (MHz)	Entry Mode	Tuned Frequency
	IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK			
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	REMOTE	20.000000
SHIFT	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	REMOTE	20.000000
REMOTE	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	LOCAL	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.2 Adjusting the Tuned Frequency

While in the Manual mode, the active tuned frequency may be changed to another frequency as illustrated in the following example. In the example, the CE key is pressed to exit the IF bandwidth entry mode. The numeric entry keys and the decimal point are used to enter the new frequency, starting with the most significant digit. Pressing a valid termination key "M" enters the new tuned frequency. Notice that while the frequency display indicates the new tuned frequency that the frequency is not valid until the termination key is pressed. If the adjusted frequency is outside the tuning range of the receiver, the entry is not accepted and the prompt "OUT OF RANGE" appears in the parameters display. This then causes the last valid frequency entered to be displayed. Refer to **paragraph 3.1.3.5** for more details on adjusting the receiver's tuned frequency via the numeric keypad.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
CE	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
2	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	2	N/A	20.000000
8	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	28	N/A	20.000000
•	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	28.	N/A	20.000000
7	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	28.7	N/A	20.000000
M	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	28.700000	N/A	28.700000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.3 Selecting the IF Bandwidth

As illustrated in the following example, the IF bandwidth selection may be changed while in Manual mode by first pressing the IF BW key to enter the IF bandwidth entry mode. Each subsequent press of the IF BW key steps through the available IF bandwidth filters in ascending order. Once the maximum bandwidth is selected, the next press of the IF BW key selects the narrowest available IF bandwidth (i.e., wraparound available). Only those filters that are set to be "INCLUDED" are available for selection from the IF bandwidth list (see **paragraph 3.1.5.3** for further information on including an IF bandwidth filter in the IF bandwidth list). For the following illustration, the .600 kHz, 3.20 kHz, 6.00 kHz, 8.00 kHz, and 16.0 kHz IF bandwidth filters are set to "INCLUDED". All remaining filters will be "SKIPPED" during the selection process. See **paragraph 3.1.4.6** for more information on IF bandwidth selection.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK	Frequency Display (MHz)	Entry Mode	Tuned Frequency
IF BW	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
IF BW	8.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
IF BW	16.0K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
IF BW	.600K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
IF BW	3.20K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
IF BW	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.4 Setting the Detection Mode

The receiver's active detection mode may be changed at any time while in the Manual mode by pressing the DET key to enter the detection entry mode. As illustrated in the example below, the DET key is initially pressed twice. The first press exits the IF bandwidth entry mode, while the second press enters the detection entry mode. Each subsequent press of the DET key steps through the available detection modes in the following sequence: AM, SAM, FM, CW, LSB, USB, and ISB. Note that the IF bandwidth is automatically adjusted when entering or exiting a single sideband detection mode. Once ISB is selected, the next press of the DET key selects AM (i.e., wraparound available). See **paragraph 3.1.4.7** for more information on detection mode selection.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	IF BW	20.000000
DET	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
DET	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	DET	20.000000
DET	3.20K	LSB	-135 dBm	FAST	>4000Hz	05	20.000000	DET	20.000000
DET	3.20K	USB	-135 dBm	FAST	>4000Hz	05	20.000000	DET	20.000000
DET	3.20K	ISB	-135 dBm	FAST	>4000Hz	05	20.000000	DET	20.000000
DET	6.00K	AM	-135 dBm	FAST	>4000Hz	05	20.000000	DET	20.000000
DET	6.00K	SAM	-135 dBm	FAST	>4000Hz	05	20.000000	DET	20.000000
DET	6.00K	FM	-135 dBm	FAST	>4000Hz	05	20.000000	DET	20.000000
DET	6.00K	CW	-135 dBm	FAST	+1000Hz	05	20.000000	DET	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.5 Selecting the Gain Control Mode

The following example illustrates changing the receiver's Automatic Gain Control (AGC) type and selecting the Manual gain control mode. The three available AGC types include FAST (AGC fast), MED (AGC medium), and SLOW (AGC slow). When the Manual gain edit mode is selected, a gain setting from 000 to 127 can be entered. As illustrated below, pressing the AGC key twice exits the detection entry mode and enters the AGC entry mode. Each subsequent press of the AGC key steps through the available gain types in the following order: FAST, MED, SLOW, a numeric value representing the current manual gain setting, and the Manual gain edit mode. When the Manual gain edit mode is displayed, pressing the AGC key selects AGC fast (i.e., wraparound available). See **paragraph 3.1.4.1** for more information on AGC operation and setting the manual gain level via the EDIT control knob.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	DET	20.000000
AGC	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
AGC	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	AGC	20.000000
AGC	6.00K	CW	-135 dBm	MED	+1000 Hz	05	20.000000	AGC	20.000000
AGC	6.00K	CW	-135 dBm	SLOW	+1000 Hz	05	20.000000	AGC	20.000000
AGC	6.00K	CW	-135 dBm	127	+1000 Hz	05	20.000000	AGC	20.000000
AGC	6.00K	CW	-135 dBm	127	+1000 Hz	05	20.000000	MAN.EDIT	20.000000
AGC	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	AGC	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.6 Setting the BFO Frequency

The example below illustrates changing the BFO frequency while the receiver is in the CW detection mode. A BFO frequency between 0 and 8000 Hz can be entered using the EDIT control knob or by numeric entry. The example represents the numeric entry method.

As shown below, pressing the BFO key twice exits the AGC entry mode and then enters the BFO entry mode. The new BFO frequency is entered via the numeric keypad starting with the most significant digit first. The BFO frequency is always entered in Hz with a 1 Hz resolution. The new BFO frequency is entered by pressing the BFO key. Note that the new BFO frequency is not entered until the valid termination key (BFO) is pressed. See **paragraph 3.1.4.2** for further information on adjusting the BFO frequency.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display						Frequency Display (MHz)	Entry Mode	Tuned Frequency
	IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH				
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	AGC	20.000000
BFO	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
BFO	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	BFO	20.000000
2	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	2	BFO	20.000000
1	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	21	BFO	20.000000
5	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	215	BFO	20.000000
0	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	2150	BFO	20.000000
BFO	6.00K	CW	-135 dBm	FAST	+2150 Hz	05	20.000000	BFO	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.7 Changing the BFO Offset with the +/- ZERO Key

As illustrated in **paragraph 3.1.6.6**, the BFO is set to a frequency between 0 and 8000 Hz. The BFO position, either above (+) or below (-) the tuned frequency, or off, is selected via the +/- ZERO key. The following example shows the CE key is pressed to exit the BFO entry mode. Then, with the SHIFT LED illuminated, the BFO offset toggles between above (+), below (-), or off, each time the +/- ZERO key is pressed. Refer to **paragraph 3.1.4.4** for further information on changing the BFO offset and the +/- ZERO key.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display						Frequency Display (MHz)	Entry Mode	Tuned Frequency
	IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH				
	6.00K	CW	-135 dBm	FAST	+2150Hz	05	20.000000	BFO	20.000000
CE	6.00K	CW	-135 dBm	FAST	+2150Hz	05	20.000000	N/A	20.000000
SHIFT	6.00K	CW	-135 dBm	FAST	+2150Hz	05	20.000000	N/A	20.000000
+/-ZERO	6.00K	CW	-135 dBm	FAST	-2150Hz	05	20.000000	N/A	20.000000
+/-ZERO	6.00K	CW	-135 dBm	FAST	---- Hz	05	20.000000	N/A	20.000000
+/-ZERO	6.00K	CW	-135 dBm	FAST	+2150Hz	05	20.000000	N/A	20.000000
SHIFT	6.00K	CW	-135 dBm	FAST	+2150Hz	05	20.000000	N/A	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.8 Setting the Tunable Notch Filter Location

The example below illustrates changing the Tunable Notch Filter setting (available in all detection modes except CW). A notch filter setting, from 0 to 9999 Hz, is entered by rotation of the EDIT control knob or by numeric entry terminated with the NOTCH key. The example represents the numeric entry method. As shown below, pressing the NOTCH key once (no other entry modes are currently active) enters the Tunable Notch entry mode. The new Tunable Notch Filter setting is entered via the numeric keypad starting with the most significant digit first. This numeric entry is always entered in Hz with a 1 Hz resolution. The new notch filter setting is entered by pressing the NOTCH key. It should be noted that the new Tunable Notch Filter setting is not entered until the valid termination key (NOTCH) is pressed. See **paragraph 3.1.4.3** for further information on adjusting the Tunable Notch Filter.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display						Frequency Display (MHz)	Entry Mode	Tuned Frequency
	IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH				
	6.00K	AM	-135 dBm	FAST	>2000Hz	05	20.000000	N/A	20.000000
NOTCH	6.00K	AM	-135 dBm	FAST	>2000Hz	05	20.000000	TUN NOTCH	20.000000
1	6.00K	AM	-135 dBm	FAST	>2000Hz	05	1	TUN NOTCH	20.000000
2	6.00K	AM	-135 dBm	FAST	>2000Hz	05	12	TUN NOTCH	20.000000
3	6.00K	AM	-135 dBm	FAST	>2000Hz	05	123	TUN NOTCH	20.000000
4	6.00K	AM	-135 dBm	FAST	>2000Hz	05	1234	TUN NOTCH	20.000000
NOTCH	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	TUN NOTCH	20.000000
CE	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.9 Setting the Tunable Notch Filter Location with the +/- ZERO Key

As illustrated in **paragraph 3.1.6.8**, the Tunable Notch Filter is set from 0 and 9999 Hz. The notch location (either above (>) or below (<) the tuned frequency, or off) is selected via the +/- ZERO key (the SHIFT key must be active). In the following example the SHIFT key is pressed, illuminating the SHIFT LED. Each subsequent press if the +/-ZERO key toggles the notch filter's location between above (>) and below (<) the tuned carrier frequency, or off, in that order. Refer to **paragraph 3.1.4.4** for further information on changing the Tunable Notch Filter location and the +/- ZERO key.

Local Input: Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	WJ-8712P RESPONSE: Parameters Display: IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000
SHIFT	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000
+/-ZERO	6.00K	AM	-135 dBm	FAST	<1234Hz	05	20.000000	N/A	20.000000
+/-ZERO	6.00K	AM	-135 dBm	FAST	------------	05	20.000000	N/A	20.000000
+/-ZERO	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000
SHIFT	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.10 Setting the Squelch Threshold

As illustrated in the following example, the squelch setting can be set in the Manual mode by first pressing the SQL key to enter the squelch entry mode. A squelch level from 0 to 135 -dBm is selected by rotation of the EDIT control knob or by numeric entry. The example below represents the numeric entry method.

First, press the SQL key to enter the squelch entry mode. The numeric entry keys are then used to enter a new squelch value, starting with the most significant digit. Pressing the valid termination key (SQL) enters the new squelch value. For more information on setting the squelch threshold, see **paragraph 3.1.4.8**.

Local Input: Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	WJ-8712P RESPONSE: Parameters Display: IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000
SQL	6.00K	AM	-135 dBm	FAST	>1234Hz	05	20.000000	SQL	20.000000
9	6.00K	AM	-135 dBm	FAST	>1234Hz	05	9	SQL	20.000000
5	6.00K	AM	-135 dBm	FAST	>1234Hz	05	95	SQL	20.000000
SQL	6.00K	AM	-095 dBm	FAST	>1234Hz	05	20.000000	SQL	20.000000
CE	6.00K	AM	-095 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.11 Adjusting the Noise Blanker Setting

The noise blanker range is from 0 to 10, with 0 corresponding to off. This setting can be adjusted by rotation of the EDIT control knob or by numeric entry. The example that follows represents the numeric entry method.

First, the SHIFT key is pressed to access the uppercase function of the BLANKER key (SHIFT LED illuminates). With the SHIFT key active, the BLANKER key is pressed to enter the noise blanker entry mode. A new noise blanker value is entered using the numeric keypad, starting with the most significant digit. Pressing the valid termination key (BLANKER) enters the new noise blanker setting. See **paragraph 3.1.4.5** for further information on the BLANKER key.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	AM	-095 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000
SHIFT	6.00K	AM	-095 dBm	FAST	>1234Hz	05	20.000000	N/A	20.000000
BLANKER	6.00K	AM	-095 dBm	FAST	>1234Hz	05	20.000000	BLANKER	20.000000
8	6.00K	AM	-095 dBm	FAST	>1234Hz	05	8	BLANKER	20.000000
BLANKER	6.00K	AM	-095 dBm	FAST	>1234Hz	08	20.000000	BLANKER	20.000000
SHIFT	6.00K	AM	-095 dBm	FAST	>1234Hz	08	20.000000	N/A	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.12 Entering a Step Tune Size

The receiver's step tune size can be adjusted while the receiver is in the Manual mode. As the below example illustrates, pressing the STEP key enters the Step Tune mode, illuminating the STEP TUNE LED and disabling the cursor in the frequency display. When the STEP TUNE LED is illuminated, the tuning wheel adjusts the tuned frequency of the receiver in accordance with the operator selected step size. A new step size can be entered by numeric entry or by rotation of the EDIT control knob. The example below represents the numeric entry method.

Once the STEP key is initially pressed, the STEP TUNE LED illuminates and the current step size is displayed in the parameters display (see **paragraph 3.1.4.9** for further information). A new step tune size is entered in kHz using the numeric and decimal entry keys, starting with the most significant digit. The valid range is from .001 to 25.0 kHz. The new step size is entered after the proper termination key (STEP) is pressed. See **paragraph 3.1.4.9** for further STEP key information.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	AM	-095 dBm	FAST	>1234 Hz	08	20.000000	N/A	20.000000
STEP	STEP		10.000K				20.000000	STEP	20.000000
1	STEP		10.000K				1	STEP	20.000000
•	STEP		10.000K				1.	STEP	20.000000
5	STEP		10.000K				1.5	STEP	20.000000
STEP	STEP		1.500K				20.000000	STEP	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.6.13 Enabling the Tune Lock Function

While in the Manual mode, pressing the upper function TUNE LOCK key (while the SHIFT key is active) enters the Tune Lock mode (TUNE LOCK LED illuminates). While the TUNE LOCK LED is illuminated, the tuning wheel operation and the up/down arrow keys are disabled, insuring that the reception of a signal is not disrupted by inadvertent front panel manipulation.

As shown in the example below, the SHIFT key is pressed to allow access to the uppercase TUNE LOCK function. With the SHIFT LED on, pressing the TUNE LOCK key illuminates the TUNE LOCK LED and disables the cursor in the frequency display. The tune lock function is enabled. Refer to **paragraph 3.1.3.3** for further information on the TUNE LOCK key.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display						Frequency Display (MHz)	Entry Mode	Tuned Frequency
	IF BW	DET	SQL	AGC	BFO/ NOTCH	BLANK			
	6.00K	AM	-095 dBm	FAST	>1234Hz	08	20.000000	N/A	20.000000
SHIFT	6.00K	AM	-095 dBm	FAST	>1234Hz	08	20.000000	N/A	20.000000
TUNE LOCK	6.00K	AM	-095 dBm	FAST	>1234Hz	08	20.000000	N/A	20.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.7 WJ-8712P MEMORY FUNCTIONS

The WJ-8712P Receiver provides 100 memory channels for the storage of receiver parameters. These memory channels, when "executed", change the receiver parameters to those of the selected memory channel. Memory channels are also used during the receiver's Channel Scan operation. Each memory channel, up to 100, can be "included" or "skipped" during an active channel scan. In addition, 100 lockout frequencies can be stored into memory. When a lockout is stored, the receiver's tuned frequency and the selected IF bandwidth are programmed into a lockout memory location. During an active scan sequence, those frequencies entered into lockout memory are not visited by the receiver.

The front panel contains four function keys (two of which are dual function) used to monitor and edit the available memory channels, place a frequency into lockout memory, and to "include" or "skip" a memory channel during an active channel scan sequence. These keys are labeled CHAN, EXEC, STORE/LOCKOUT, and INCL/SKIP.

The CHAN (channel) key is used to monitor and edit memory channels without affecting the current operating parameters of the receiver.

The EXEC (execute) key sets the current receiver parameters to those of the selected memory channel.

The STORE key enters the current receiver parameters into the selected memory channel.

The LOCKOUT key enters the current tuned frequency and selected IF bandwidth into a lockout memory location.

The INCL (include) key is used to "include" a selected memory channel during an active Channel Scan operation.

The SKIP key is used to "skip" a selected memory channel from being visited during an active Channel Scan operation.

Paragraphs 3.1.7.1 through **3.1.7.6** provide more details on the CHAN, STORE, INCL, SKIP, EXEC, and LOCKOUT function keys, respectively.

3.1.7.1 The CHAN (Channel) Key

The CHAN key provides access to the 100 available memory channels for the review and editing of the stored parameters. Pressing the CHAN key enters the Channel View mode, displaying the channel number most recently viewed in the parameters display. The parameters display appears as follows:

```
     BW                 SQL
s01  10.000000          VW

         BFO            BLANK
```

In the example above, the "s01" identifies that memory channel number 01 is currently displayed and that it will be skipped (s) during Channel Scan operations. The memory channel's programmed frequency (10.000000) is displayed in MHz with a 1 Hz resolution, while the letters "VW" indicate the Channel View mode is currently active.

Pressing the CHAN key while in the Channel View mode steps through the 100 available memory channels, provided no numeric entries are in progress. Each subsequent press of the CHAN key increments the displayed channel number by one. Once channel number 99 is displayed, the next CHAN key press returns the display to memory channel 00.

The CHAN key is also used as the termination key when entering the desired channel number via the numeric keypad. Simply enter a numeric value from 0 to 99 (representing the desired memory channel for display) and enter the selection by pressing the CHAN key. When keypad entries are made, it is not necessary to enter leading zeros.

3.1.7.2 The STORE Key

The STORE key is used to store the current receiver settings into a memory channel provided the following conditions exist. One, the Channel View mode is active and a numeric entry is not in progress. And two, the receiver must be in the Manual or Pause mode (i.e., does not store in the scan mode). If the STORE key is pressed while the Channel View mode is not selected, the Channel View mode will automatically be entered to further assist the operator in the use of the STORE key.

Once the Channel View mode is enabled, pressing the STORE key enters the current receiver parameters to the displayed memory channel. The stored parameters include tuned frequency, gain mode, manual gain level, IF bandwidth, detection mode, BFO setting, and squelch level.

The STORE key also serves as the termination key for numeric entry of a desired channel number. While in the Channel View mode, enter the desired channel number that is to store the current receiver parameters with the numeric keypad and terminate the entry with the STORE key.

3.1.7.3 The INCL (Include) Key

Pressing the INCL key forces the receiver into the Channel View mode if not already entered. Pressing this key while in the Channel View mode places the displayed memory channel in the "include" (i) status. This means that when the receiver is scanning in the Channel Scan mode, the channel will be visited as long as it is within the start and stop channels. A channel set to "include" status is indicated by an "i" located to the left of the channel number in the parameters display. After setting the memory channel to the "include" status with the INCL key, the new prefix appears in the display for one second. The display then automatically increments to the next higher channel number.

A numeric entry may also be used to place a selected memory channel to the "include" (i) status. While in the Channel View mode, enter the desired channel number with the numeric keys, and terminate the entry with the INCL key. Additionally, groups of successive channel numbers can also be set to the "include" status. First, enter the lowest channel number of the group, a decimal point, the highest channel number of the group, and terminate the entry with the INCL key. This action causes the parameters display to show the highest channel number of the group prefixed with an "i" for one second, and then to increment automatically to the next higher memory channel number. All channels between and including the entered channel numbers are set to "include" (i) status.

3.1.7.4 The SKIP Key

The SKIP key is an upper case function of a dual function key and requires the SHIFT mode to be entered first (SHIFT LED on). Selecting the SKIP key forces the receiver into the Channel View mode if not already entered. Pressing this key while in the Channel View mode places the displayed memory channel in the "skip" (s) status. This means that when the receiver is scanning in the Channel Scan mode, the channel will not be visited regardless if it is within the start and stop channels. A channel set to the "skip" status is indicated by an "s" located to the left of the channel number in the parameters display. After setting the memory channel to "skip" status with the SKIP key, the new prefix appears in the display for one second. The display then automatically increments to the next higher channel number.

A numeric entry may also be used to place a selected memory channel to the "skip" (s) status. While in the Channel View mode, enter the desired channel number with the numeric keys, and terminate the entry with the SKIP key. Additionally, groups of successive channel numbers can also be set to the "skip" status. First, enter the lowest channel number of the group, a decimal point, the highest channel number of the group, and terminate the entry with the SKIP key. This action causes the parameters display to show the highest channel number of the group prefixed with an "s" for one second, and then to increment automatically to the next higher memory channel number. All channels between and including the entered channel numbers are set to "skip" (s) status.

3.1.7.5 The EXEC (Execute) Key

Pressing the EXEC key forces the receiver into the Channel View mode if not already entered. Pressing this key while in the Channel View mode enters the Channel Execute mode with the parameters display appearing as follows:

```
     BW                 SQL
s01  10.000000          EXE

         BFO            BLANK
```

Here the "s01" identifies that memory channel number 01 is currently displayed and that it is to be skipped (s) during Channel Scan operations. The memory channel's programmed frequency (10.000000) is displayed in MHz with a 1 Hz resolution, while the letters "EXE" indicate the Channel Execute mode is currently active.

Enabling the Channel Execute mode sets the receiver parameters to the values stored in the displayed channel number. The receiver parameters stored (including frequency, IF bandwidth, detection and gain modes, manual gain value, BFO setting, and squelch level) are immediately executed by the receiver. Since the Channel View mode is always selected when the Channel Execute mode is in effect, the displayed channel number can be altered by adjustment of the EDIT control knob, or via the CHAN key as described in **paragraph 3.1.7.1**. Each time the displayed channel is changed, the receiver parameters are adjusted according to the current memory channel settings.

3.1.7.6 The LOCKOUT Key

The LOCKOUT key is an upper case function of a dual function key and requires the SHIFT mode to be entered first (SHIFT LED on). The LOCKOUT key is used to store the current receiver tuned frequency and selected IF bandwidth in one of the lockout memory locations of the receiver, or serves as the termination key for numeric entry of a desired lockout frequency. When the numeric entry method is used, the stored IF bandwidth for the lockout frequency is the currently selected receiver IF bandwidth. Up to 100 lockout frequencies can be entered. When the LOCKOUT key is pressed, the message "LOCKOUT STORED" is displayed in the parameters display for a period of three seconds, and then returns to its previous settings. If an attempt is made to enter a new lockout frequency when 100 lockout frequencies are already entered, the message "MEMORY FULL" is displayed instead. This indicates that the lockout memory is full.

Lockout frequencies cannot be entered while an active scan is in process. An attempt to enter a lockout frequency during an active scan causes the message "PAUSE TO STORE" to appear for the three second period described above. This indicates that the scan must be paused before a lockout frequency can be entered.

3.1.8 EXAMPLES - ENTERING RECEIVER MEMORY SETTINGS

The following paragraphs and illustrations demonstrate the procedures necessary, and the front panel responses received, when entering receiver memory settings via the CHAN, STORE, INCL, EXEC, and LOCKOUT keys.

3.1.8.1 Changing the Displayed Memory Channel Number

While in the Channel View mode (see **paragraph 3.1.7.1**), the displayed channel number can be changed by the EDIT control knob, by pressing the CHAN key, or by entering the desired channel number via the numeric keypad. When a new memory channel is displayed, its tuned frequency and included (i) or skipped (s) status are updated in the parameters display along with the new channel number.

Rotating the EDIT control knob clockwise while in the Channel View mode increases the displayed channel number from 00 to 99. Once channel 99 is displayed, a further clockwise rotation returns to channel 00 (i.e., wraparound available). Rotating the EDIT control knob counterclockwise decreases the displayed channel number from 99 to 00 in the same manner with wraparound.

Similarly, the CHAN key steps through the 100 available memory channels when in the channel view mode, provided no numeric entries are in progress. Each subsequent press of the CHAN key increments the displayed channel number by one. Once channel number 99 is displayed, the next CHAN key press returns the display to memory channel 00.

As the example below illustrates, the memory channel number can also be changed by numeric entry while in the Channel View mode. In the example, the CHAN key is pressed to enter the Channel View mode. Then a numeric value of 30 (representing the desired memory channel for display) is entered using the numeric keypad. Pressing the CHAN key terminates the entry process, and memory channel 30 is now shown in the parameters display. Note that changing the displayed memory channel has no effect on the current receiver parameters.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display						Frequency Display (MHz)	Entry Mode	Tuned Frequency
	IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH				
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
CHAN	s01		10.000000		VW		20.000000	CHAN VIEW	20.000000
3	s01		10.000000		VW		3	CHAN VIEW	20.000000
0	s01		10.000000		VW		30	CHAN VIEW	20.000000
CHAN	s30		15.000000		VW		20.000000	CHAN VIEW	20.000000

NOTE: Underlined character indicates flashing cursor position.

Courtesy of http://BlackRadios.terryo.org

3.1.8.2 Storing Current Receiver Settings in Memory

The receiver parameters that are currently displayed can be stored in a memory channel of the receiver for later recall and use. The current tuned frequency and auxiliary parameters are stored (i.e,. detection mode and IF bandwidth). To store the current receiver parameters, first select the Channel View mode by pressing the CHAN key. Use the EDIT control knob or a numeric entry terminated with the CHAN key to display a memory channel that has old data that can be overwritten. Unstored memory channels have a default frequency value of 20.000000 MHz.

NOTE

Storing receiver parameters in a memory channel overwrites its previous contents. Ensure, before storing data, that the memory channel does not contain wanted data.

Once the desired memory channel is displayed, press the STORE key to enter the receiver parameters into the selected memory channel. This causes the new stored frequency to be displayed for three seconds in the parameters display and the channel number to be prefixed with an (i) (example: i01 12.000000 VW). After three seconds, the channel number automatically increments to the next memory channel.

The STORE key also serves as the termination key when selecting the desired memory channel via numeric entry. With the Channel View mode active, enter the memory channel number desired (0 to 99) with the numeric keypad. Press the STORE key to store the current receiver parameters to the selected memory channel. The new stored frequency is displayed for three seconds in the parameters display and the channel number is prefixed with an (i) (example: i01 12.000000 VW). After three seconds, the channel number automatically increments to the next memory channel.

The illustration below uses the numeric entry method to store the receiver parameters in a selected memory channel. First, the Channel View mode is entered by pressing the CHAN key. Second, memory channel two is selected to store the receiver settings by pressing the number 2 on the numeric keypad, followed by the STORE termination key. After the channel store is made, the new frequency value appears for three seconds, with an "i" prefix to the left of the channel number. After the three second period, the display automatically increments to the next memory channel number.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	25.000000	N/A	25.000000
CHAN	s01		10.000000		VW		25.000000	CHAN VIEW	25.000000
2	s01		10.000000		VW		2	CHAN VIEW	25.000000
STORE	i02		25.000000		VW		25.000000	CHAN VIEW	25.000000
	s03		20.000000		VW		25.000000	CHAN VIEW	25.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.8.3 Setting a Memory Channel to the Include Status

As described in **paragraph 3.1.7.3**, pressing the INCL key forces the receiver into the Channel View mode if not already entered. Pressing this key while in the Channel View mode places the displayed memory channel in the "include" (i) status. A desired memory channel or channels can also be set to the "include" status using the numeric keypad to enter the memory channel number(s), and terminating the selection with the INCL key as illustrated in the example below.

First, the Channel View mode is entered by pressing the CHAN key. Then memory channel 01 is set to the "include" status by pressing the numeric key "1" of the keypad, and terminating the entry with the INCL key. The new status of memory channel number 01 appears for three seconds, with an "i" prefix to the left of the channel number. After the three second period, the display automatically increments to the next memory channel number.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	25.000000	N/A	25.000000
CHAN	s01	10.000000			VW		25.000000	CHAN VIEW	25.000000
1	s01	10.000000			VW		1	CHAN VIEW	25.000000
INCL	i01	10.000000			VW		25.000000	CHAN VIEW	25.000000
	i02	25.000000			VW		25.000000	CHAN VIEW	25.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.8.4 Setting A Memory Channel to the Skip Status

As described in **paragraph 3.1.7.4**, pressing the SKIP key (while the SHIFT LED is illuminated) forces the receiver into the Channel View mode if not already entered. Pressing this key while in the Channel View mode places the displayed memory channel in the "skip" (s) status. A desired memory channel or channels can also be set to the "skip" status using the numeric keypad to enter the memory channel number(s), and terminating the selection with the SKIP key as illustrated in the example below.

First, the Channel View mode is entered by pressing the CHAN key. Then memory channel 01 is set to the "skip" status by pressing the numeric key "1" of the keypad, and terminating the entry with the SHIFT/SKIP keys. The new status of memory channel number 01 appears for three seconds, with an "s" prefix to the left of the channel number. After the three second period, the display automatically increments to the next memory channel number.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	25.000000	N/A	25.000000
CHAN	i01	10.000000			VW		25.000000	CHAN VIEW	25.000000
1	i01	10.000000			VW		1	CHAN VIEW	25.000000
SHIFT	i01	10.000000			VW		1	CHAN VIEW	25.000000
SKIP	s01	10.000000			VW		25.000000	CHAN VIEW	25.000000
	i02	25.000000			VW		25.000000	CHAN VIEW	25.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.8.5 Changing Receiver Parameters to Those Stored in Memory

The receiver parameters can automatically be updated with receiver parameters that are stored in one of the memory channels. As the example below illustrates, to perform this function, press the CHAN key to enter the Channel View mode. Then use the EDIT control knob, or perform a numeric entry terminated with the CHAN key, to display the memory channel that contains the desired parameters. Once the memory channel is displayed, pressing the EXEC key enters the Channel Execute mode, and updates the receiver with the parameters of the selected memory channel.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	25.000000	N/A	25.000000
CHAN	i02	25.000000			VW		25.000000	CHAN VIEW	25.000000
3	i02	25.000000			VW		3	CHAN VIEW	25.000000
CHAN	s03	20.000000			VW		25.000000	CHAN VIEW	25.000000
EXEC	s03	20.000000			EXE		20.000000	CHAN EXE	20.000000

NOTE: Underlined character indicates flashing cursor position.

While the Channel Execute mode is active, the displayed memory channel can be changed because the Channel View mode is still enabled. Changing the memory channel number while in the Channel Execute mode is enabled causes the receiver parameters to be automatically updated as each channel is selected and displayed. Note, in the example below, as the EDIT control knob steps through a series of memory channels for display, the receiver's tuned frequency is automatically updated.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
EDIT CONTROL KNOB (Clockwise Adjustment)	s03	20.000000			EXE		20.000000	CHAN EXE	20.000000
	i04	8.000000			EXE		8.000000	CHAN EXE	8.000000
	i05	29.125000			EXE		29.125000	CHAN EXE	29.125000
	s06	15.500000			EXE		15.500000	CHAN EXE	15.500000
	s07	10.000000			EXE		10.000000	CHAN EXE	10.000000

NOTE: Underlined character indicates flashing cursor position.

3.1.8.6 Entering a Tuned Frequency and IF Bandwidth into Lockout Memory

The WJ-8712P receiver provides 100 Lockout memory locations for the storage of receiver tuned frequencies and their coresponding IF bandwidth, for use during scan operations. Two methods are available for entering these parameters into lockout memory (anytime except during an active scan operation). The available methods are: direct entry of the current tuned frequency and IF bandwidth settings, and numeric entry of a desired lockout frequency.

The example below illustrates storing the receiver's currently tuned frequency and IF bandwidth selection into lockout memory. Since the LOCKOUT key is an upper case function of a dual function key, the SHIFT key must be entered first (SHIFT LED on). Once the SHIFT LED is illuminated, pressing the LOCKOUT key stores the receiver's current tuned frequency and selected IF bandwidth in one of the 100 available lockout memory locations. After a lockout frequency is successfully stored, the message "LOCKOUT STORED" is displayed in the parameters display for a period of three seconds, and then returns to its previous settings. If the frequency cannot be stored because the 100 lockout memory locations contain lockout data, the message "MEMORY FULL" is displayed instead. If the frequency cannot be stored because a scan operation is currently active, the message "PAUSE TO STORE" is displayed. This prompts the operator to pause the scan operation (PAUSE key) before attempting to enter a lockout frequency.

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	SQL BLANK	AGC	BFO/ NOTCH		Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	10.000000	N/A	10.000000
SHIFT LOCKOUT	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	10.000000	N/A	10.000000
	LOCKOUT STORED OR MEMORY FULL OR PAUSE TO STORE								
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	10.000000	N/A	10.000000

NOTE: Underlined character indicates flashing cursor position.

To enter a lockout frequency using a numeric entry, press the SHIFT key to access the upper case LOCKOUT function of the dual function key. Then, using the numeric keypad, enter the desired lockout frequency in MHz, with a 1 Hz resolution. Press the LOCKOUT key to terminate (enter) the selected frequency into lockout memory, along with the current receiver IF bandwidth selection. One of the available messages "LOCKOUT STORED", "MEMORY FULL", or "PAUSE TO STORE" appears in the parameters display as described in the previous paragraph.

3.1.8.7 Clearing Memory Channels and Lockout Memory Locations

The CE key is used to clear programmed memory channels and/or lockout frequency settings.

NOTE

Read the following paragraphs carefully to avoid accidental deletion of stored scan parameters.

- Pressing the CE key while a lockout frequency is displayed during a scan setup (see **paragraph 3.1.11.3**) causes the displayed lockout frequency to be cleared from the lockout memory.

- Pressing the CE key while a lockout frequency is not displayed and a numeric entry is not in progress exits the current Memory or Scan entry mode.

- Pressing the CE key twice while a lockout frequency is not displayed and a numeric entry is not in progress, causes the following message to be displayed on the parameters display.

```
BW                SQL
NEXT = CLR MEM


     BFO          BLANK
```

- Pressing the CE key once more, while the above message is displayed, clears the contents of all lockout and memory channels. The parameters display returns to its previous settings.

3.1.9 OPERATION IN THE SCAN MODE

The Scan mode is an automatic mode of operation, where the receiver can be preprogrammed to search a band of frequencies or step through individual frequencies for signal activity. Three types of scan operations are available in the Scan mode: channel scanning, frequency-to-frequency scanning, and frequency-to-frequency scanning with lockout frequencies inserted.

In the channel scan mode, the receiver is programmed to scan from a start channel to a stop channel. The channels are memory channels that contain receiver parameters, stored with the STORE key (**paragraph 3.1.7.2**). In this mode the receiver steps from channel to channel beginning with the start channel and ending with the stop channel. As the receiver steps to each channel, it automatically changes its parameters to those stored in the channel. If a signal is not received in the current channel, it moves to the next channel. When the stop channel is reached, the receiver steps to the start channel and continues scanning.

In the frequency-to-frequency scan mode, the receiver is programmed to scan all frequencies between and including a start frequency and a stop frequency. If a signal is found, the scan mode stops and displays the current frequency. The amount of time the scan mode stops on a received signal is dependent on the dwell timer entry (**paragraph 3.1.10**). When the stop frequency is reached the receiver steps to the start frequency and continues scanning.

The frequency-to-frequency scan mode with lockout frequencies inserted operates identically to the frequency-to-frequency scan mode. However, in this mode the operator can enter frequencies that are to be passed over during the scan sequence and not searched for signal activity. These frequencies are referred to as lockout frequencies.

Three function keys are provided on the receiver's front panel for entering scan setups, to initiate an active scan operation, to suspend or resume an active scan operation, and to return the receiver to the Manual mode while an active scan is in progress. These three keys are labeled SETUP, SCAN, and PAUSE.

The SETUP key is used to enter the Scan Setup mode. While in the Scan Setup mode, the desired scan type (either Channel Scan, Frequency-to Frequency Scan, or Frequency-to Frequency Scan with Lockouts) can be selected. Once selected, the EDIT control knob is used to scroll up or down through the available scan setup menu items. All scan setup parameters, for the selected scan type, are then entered using the front panel numeric keypad, terminating the entries with the SETUP key.

The SCAN key enables the Scan mode, initiating the selected Scan parameters. While the receiver is in the Scan mode (either "Scanning" or "Scan Paused"), the Scan key can be used to return the receiver to the Manual mode of operation.

The PAUSE key suspends an active scan operation or resumes a previously suspended scan operation. The PAUSE key can also be used to advance a scan operation regardless of the receivers dwell timer setting.

Paragraphs 3.1.9.1 through **3.1.9.3** provide further details on the SETUP, SCAN, and PAUSE keys, respectively. Refer to **Paragraphs 3.1.10** through **3.1.13** for further information on the use of the dwell timer, entering scan setups, starting scans, and stopping scans.

3.1.9.1 The SETUP Key

The SETUP key is used to set up a scan operation for the receiver. Pressing the SETUP key enters the Scan Setup mode. Once the Scan Setup mode is entered, the parameters display appears as shown below.

```
   BW                          SQL
SCAN SETUP

TYPE XXXXXXXXXX
        BFO      BLANK
```

Here, "xxxxxxxxxx" will be one of the following three selections, representing the last selected scan type.

- CHANNEL (Channel Scan)
- F1->F2 (Frequency-to-Frequency Scan)
- F1->F2 W/LK (Frequency-to-Frequency Scan with Lockout Frequencies)

Rotating the EDIT control knob clockwise will step through the three available scan types. Once the desired scan type in displayed, pressing the SETUP key will enter that scan types Scan Setup Menu. The parameters display will appear as shown below.

```
   BW                          SQL
SCAN SETUP

XXXXXXXXXXX
   BFO                       BLANK
```

Here, "xxxxxxxxxxx" represents the first scan setup menu item for the selected scan type. Each press of the SETUP key causes the next line in the scan type setup menu to be displayed. Pressing the SETUP key in succession while the Channel Scan type is selected causes the parameters display to scroll through the following menu items:

START CHAN xx (where xx is the current start channel)

STOP CHAN xx (where xx is the current stop channel)

DWELL xx.x sec (where xx.x is the current dwell timer setting)

or

DWELL INFINITE (when the dwell timer is set to infinite)

Pressing the SETUP key in succession while the F1->F2 (frequency-to-frequency) scan type is selected causes the parameters display to scroll through the following menu items:

F1 xx.xxxxxx (where xx.xxxxxx is the current start frequency in MHz)

F2 xx.xxxxxx (where xx.xxxxxx is the current stop frequency in MHz)

STEP xx.x kHz (where xx.x is the current step size in kHz)

DWELL xx.x sec (where xx.x is the current dwell timer setting)

or

DWELL INFINITE (when the dwell timer is set to infinite)

Pressing the SETUP key in succession while the F1->F2 W/LK (frequency-to-frequency with lockouts) scan type is selected causes the parameters display to scroll through the following menu items:

F1 xx.xxxxxx (where xx.xxxxxx is the current start frequency in MHz)

F2 xx.xxxxxx (where xx.xxxxxx is the current stop frequency in MHz)

STEP xx.x kHz (where xx.x is the current step size in kHz)

DWELL xx.x sec (where xx.x is the current dwell timer setting)

or

DWELL INFINITE (when the dwell timer is set to infinite)

LOCK xx.xxxxxx (where xx.xxxxxx is the lowest lockout frequency in MHz)

(each press of the SETUP key scrolls through the entered lockout frequencies in frequency-numeric order between F1 and F2)

LOCK xx.xxxxxx (where xx.xxxxxx is the highest lockout frequency in MHz)

After completely scrolling through the scan setup menu, pressing the SETUP key again exits the Scan Setup mode, returning the parameters display to its original settings. This key can also be used as numeric entry terminator when using the numeric entry keys to enter scan setup parameters. Using the key as a terminator causes the new value to appear in the parameters display for a period of three seconds, and then the display automatically increments to the next menu item.

3.1.9.2 The SCAN Key

The SCAN key is used to place the receiver in and out of the scan mode. When this key is initially pressed, the receiver automatically begins scanning and the parameters display appears as shown below.

BW	SQL
SCANNING	
BFO	BLANK

The parameters of the scan operation are dependent on the scan setup entered with the SETUP key (refer to **paragraph 3.1.9.1**). Pressing the SCAN key while the message "SCANNING" is displayed halts the scan operation, exits the scan mode, and returns the receiver to the Manual mode.

3.1.9.3 The PAUSE Key

The PAUSE key is used to pause (stop) an active scan operation. It is only functional while in the Scan mode. When the scan operation is paused, the parameters display appears as shown below.

BW	SQL
SCAN PAUSED	
BFO	BLANK

The main advantage of this function is to allow the operator to immediately monitor a signal that is acquired during the scan operation, without waiting for the scan to cycle through to its stop parameter. The scan can be continued by pressing the PAUSE key again. The scan resumes at the next point in the scan and the message "SCANNING" is once again displayed in the parameters display.

NOTE

Pressing the PAUSE key while the message "SCAN PAUSED" is displayed in the parameters display resumes the scan operation regardless of whether or not the dwell timer has stopped. As a result, the operator can restart a scan when the dwell timer is entered by pressing the PAUSE key twice (once to pause the scan and again to resume the scan). This allows the operator to advance the scan sequence when a signal of non-interest is acquired without waiting for the dwell timer settings to expire.

3.1.10 USING THE DWELL TIMER

The dwell timer provides the operator with a means of controlling the time the receiver remains tuned on a signal received in the Scan mode before moving to the next frequency or channel. The dwell timer is activated when a signal that has a power level above the set squelch level is received.

The dwell timer can be set to any value from 0.5 to 20.0 seconds or can be set to infinite. When the timer expires, the scan operation automatically resumes whether or not the signal is still above squelch. When the timer is set to infinite, the receiver continues to dwell on the signal until either it drops below the squelch level for a period of eight seconds or until the operator manually restarts the scan.

If the signal drops below the squelch level for a period of eight seconds while the timer is activated, the scan automatically resumes regardless of whether the timer has not yet expired.

The dwell timer value is entered during a scan setup in the scan setup menu (see **paragraph 3.1.11**).

A dwell timer value from 0.5 to 20 seconds can be entered with the numeric keypad, terminated with the SETUP key, or by rotation of the EDIT control knob. To set the dwell timer to infinite, first adjust the dwell timer setting to 20 seconds, then turn the EDIT control knob clockwise. The message "DWELL INFINITE" is displayed in the scan setup menu. The infinite setting cannot be entered using the numeric keypad.

3.1.11 SCAN SETUPS

Prior to initiating an active scan, a scan setup must be entered. To enter a scan setup, first press the SETUP key to enable the scan setup entry mode. This mode is enabled when the message "SCAN SETUP" is displayed in the upper portion of the parameters display. A line item of the current scan type setup menu is displayed in the lower portion of the parameters display. The scan type setup menu that is displayed is selected by rotation of the EDIT control knob.

Three scan type setup menus are available: channel (CHANNEL), frequency-to-frequency (F1 → F2), and frequency-to-frequency with lockout frequencies inserted (F1 → F2 W/LK). The following paragraphs provide details on these scan setups.

3.1.11.1 <u>CHANNEL Scan Setup</u>

Channel scan setups can be entered when the message "SCAN SETUP" and the CHANNEL Scan type appear in the parameters display. In this setup menu, three items can be entered: the start channel, the stop channel, and the dwell time.

Start Channel: The start channel entry signifies the lowest channel number of the setup. To enter the start channel, first press the SETUP key until "START CHAN xx" is displayed. The "xx" is replaced with the current start channel number. Use the numeric entry keys to enter the new start channel and terminate with the SETUP key.

Stop Channel: The stop channel entry signifies the highest channel number of the setup. To enter the stop channel, first press the SETUP key until "STOP CHAN xx" is displayed. The "xx" is replaced with the current stop channel number. Use the numeric entry keys to enter the new stop channel and terminate with the SETUP key.

Dwell Time: The dwell timer value (**paragraph 3.1.10**) can be set in the channel scan setup menu. To enter the dwell timer value, first use the EDIT control knob or press the SETUP key until the dwell timer menu item is displayed. The menu item appears as "DWELL INFINITE" or "DWELL xx.x sec" where xx.x is the current dwell timer value in seconds. Use the EDIT control knob or the numeric entry keys to enter the dwell timer value, terminating a numeric entry with the SETUP key. The dwell timer cannot be set to DWELL INFINITE with the numeric entry keys; use the EDIT control knob.

Each channel in the scan setup should be set to the "included" or "skipped" status. If all channels within the scan setup are to be scanned, they should be in the "included" status. The "included" status for a channel is indicated by the channel number being prefixed with "i". If a channel within the scan setup is not to be scanned, it should be set to the "skipped" status. The "skipped" status for a channel is indicated by the channel number being prefixed with an "s". Use the Channel View mode to review the status of each channel within the scan setup. Use the SKIP key or the INCL key to select the desired status when the channel is displayed.

Table 3-4 provides an example of setting up and executing a channel scan operation. In the example, the SETUP key is pressed to enter the Scan Setup mode and the EDIT control knob is used to select the "CHANNEL" scan type. Once the channel scan is selected ("CHANNEL" displayed in the parameters display) the SETUP key is pressed to obtain the first setup menu item, "START CHAN 10" (10 representing the current start channel). A new start channel number of "25" is entered using the numeric keypad and terminated with the SETUP key. The new start channel is displayed for three seconds, and then the display automatically increments to the next scan menu item, "STOP CHAN 33" (33 represents the current stop channel). A new stop channel of 55 is entered numerically and terminated with the SETUP key. After a three second period for display of the new stop channel setting, the display increments to the final menu item, "DWELL 10.0 sec". The current dwell timer setting of 10.0 seconds is changed by numeric entry (15), terminated with the SETUP key. Pressing the SETUP key while the "DWELL 15.0 sec" menu item is displayed exits the Scan Setup mode. Pressing the EXEC key starts the channel scan operation. The message "SCANNING" is displayed in the parameters display, and the frequency of the active channel number is provided in the frequency display.

Table 3-4. Example of a Channel Scan Operation

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	BFO/ BLANK	SQL	AGC	NOTCH	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
SETUP	SCAN SETUP CHANNEL						20.000000	SCAN SETUP	20.000000
SETUP	SCAN SETUP START CHAN 10						20.000000	SCAN SETUP	20.000000
2	SCAN SETUP START CHAN 10						2	SCAN SETUP	20.000000
5	SCAN SETUP START CHAN 10						25	SCAN SETUP	20.000000
SETUP	SCAN SETUP START CHAN 25						20.000000	SCAN SETUP	20.000000
	SCAN SETUP STOP CHAN 33						20.000000	SCAN SETUP	20.000000
5	SCAN SETUP STOP CHAN 33						5	SCAN SETUP	20.000000
5	SCAN SETUP STOP CHAN 33						55	SCAN SETUP	20.000000
SETUP	SCAN SETUP STOP CHAN 55						20.000000	SCAN SETUP	20.000000
	SCAN SETUP DWELL 10.0 SEC						20.000000	SCAN SETUP	20.000000
1	SCAN SETUP DWELL 10.0 SEC						1	SCAN SETUP	20.000000
5	SCAN SETUP DWELL 10.0 SEC						15	SCAN SETUP	20.000000
SETUP	SCAN SETUP DWELL 15.0 SEC						20.000000	SCAN SETUP	20.000000
SETUP	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
EXEC	SCANNING						12.250000	N/A	12.250000

3.1.11.2 Frequency-to-Frequency (F1 → F2) Scan Setup

Frequency-to-Frequency scan setups can be entered when the SCAN SETUP mode is active and the F1 → F2 Scan type is selected. In this setup menu, four items can be entered: the start frequency, the stop frequency, the step size, and the dwell time.

Start Frequency: The start frequency entry signifies the first frequency of the scan sequence. To enter the start frequency, first press the SETUP key until "F1 xx.xxxxxx" is displayed. The xx.xxxxxx is replaced with the current start frequency in MHz. Use the numeric entry keys to enter the new start frequency and terminate with the SETUP key.

Stop Frequency: The stop frequency entry signifies the last frequency of the scan sequence. To enter the stop frequency, first press the SETUP key until "F2 xx.xxxxxx" is displayed. The xx.xxxxxx is replaced with the current stop frequency in MHz. Use the numeric entry keys to enter the new stop frequency and terminate with the SETUP key.

Step Size: The step size entry determines the frequency steps in the scan. The step size can be any value from 0.001 to 25.0 kHz. To enter the step size, first press the SETUP key until "STEP xx.xxxk" is displayed. The xx.xxx is replaced with the current step size in kHz. Use the numeric entry keys to enter the new step size and terminate with the SETUP key.

Dwell Time: The dwell timer value (**paragraph 3.8.10**) can be set in the frequency-to-frequency scan setup menu. To enter the dwell timer value, first use the EDIT control knob or press the SETUP key until the dwell timer menu item is displayed. The menu item appears as "DWELL INFINITE" or "DWELL xx.x s" where xx.x is the current dwell timer value in seconds. Use the EDIT control knob or the numeric entry keys to enter the dwell timer value, terminating a numeric entry with the SETUP key. The dwell timer cannot be set to "DWELL INFINITE" with the numeric entry keys, use the EDIT control knob.

Table 3-5 provides an example of setting up and executing an F1 → F2 scan operation. In the example, the SETUP key is pressed to enter the Scan Setup mode and the EDIT control knob is used to select the "F1 -> F2" scan type. Once the frequency-to-frequency scan is selected ("F1 -> F2" appearing in the parameters display) the SETUP key is pressed to obtain the first setup menu item, "F1 2.000000" (2.000000 representing the current start frequency in MHz). A new start frequency of 1.5 MHz is entered using the numeric keypad and terminated with the SETUP key. The new start frequency is displayed for three seconds, and then the display automatically increments to the next scan menu item, "F2 18.000000" (18.000000 represents the current stop frequency in MHz). A new stop frequency of 26.8 MHz is entered numerically and terminated with the SETUP key. After a three second period for display of the new stop frequency setting, the display increments to the next menu item, "STEP 10.0kHz". The current step size setting of 10.0 kHz is changed by numeric entry (5) to 5.0 kHz and terminated with the SETUP key. The new step size is displayed for three seconds, and then the display automatically increments to the final menu item, "DWELL 10.0 sec". The current dwell timer setting of 10.0 seconds is changed by numeric entry (15), and terminated with the SETUP key. Pressing the SETUP key while the "DWELL 15.0 sec" menu item is displayed, exits the Scan Setup mode. Pressing the EXEC key starts the frequency-to-frequency scan operation. The message "SCANNING" is displayed in the parameters display, and the current tuned frequency is provided in the frequency display.

Table 3-5. Example of an F1 → F2 Scan

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display IF BW	DET	BFO/ BLANK	SQL	AGC	NOTCH	Frequency Display (MHz)	Entry Mode	Tuned Frequency
	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
SETUP	SCAN SETUP F1 → F2						20.000000	SCAN SETUP	20.000000
SETUP	SCAN SETUP F1 2.000000						20.000000	SCAN SETUP	20.000000
1	SCAN SETUP F1 2.000000						1	SCAN SETUP	20.000000
•	SCAN SETUP F1 2.000000						1.	SCAN SETUP	20.000000
5	SCAN SETUP F1 2.000000						1.5	SCAN SETUP	20.000000
SETUP	SCAN SETUP F1 1.500000						20.000000	SCAN SETUP	20.000000
	SCAN SETUP F2 18.000000						20.000000	SCAN SETUP	20.000000
2	SCAN SETUP F2 18.000000						2	SCAN SETUP	20.000000
6	SCAN SETUP F2 18.000000						2.6	SCAN SETUP	20.000000
•	SCAN SETUP F2 18.000000						26.	SCAN SETUP	20.000000
8	SCAN SETUP F2 18.000000						26.8	SCAN SETUP	20.000000
SETUP	SCAN SETUP F2 26.8000000						20.000000	SCAN SETUP	20.000000
	SCAN SETUP STEP 10.0 kHz						20.000000	SCAN SETUP	20.000000
5	SCAN SETUP STEP 10.0 kHz						5	SCAN SETUP	20.000000
SETUP	SCAN SETUP STEP 5.0 kHz						20.000000	SCAN SETUP	20.000000
	SCAN SETUP DWELL 10.0 Sec						20.000000	SCAN SETUP	20.000000
1	SCAN SETUP DWELL 10.0 Sec						1	SCAN SETUP	20.000000
5	SCAN SETUP DWELL 10.0 Sec						15	SCAN SETUP	20.000000
SETUP	SCAN SETUP DWELL 15.0 Sec						20.000000	SCAN SETUP	20.000000
SETUP	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
EXEC	SCANNING						2.005000	N/A	2.005000

3.1.11.3 Frequency-to-Frequency with Lockouts (F1 → F2 W/LK) Scan Setup

Frequency-to-frequency with lockouts scan setups can be entered when the SETUP mode is active and the F1 → F2 W/LK Scan type is selected. This setup menu is the same as the frequency-to-frequency setup menu (**paragraph 3.1.11.2**) except a list containing up to 100 lockout frequencies is available. When scanning in this mode, all frequencies entered in the list are passed over.

A lockout frequency can be added to the list during a paused scan by setting the tuned frequency display to the desired frequency and pressing the LOCKOUT key. The scan setup mode does not have to be entered to store a new lockout frequency. After the lockout frequency is stored, the message "LOCKOUT STORED" is displayed in the parameters display for a period of three seconds, after which time the display returns to the previous display. If no lockout channels are available (i.e., 100 lockouts are already entered), the message "MEMORY FULL" is temporarily displayed.

A lockout frequency can also be deleted from the list. To delete a lockout, scroll through the scan setup menu until the lockout frequency is displayed, then press the CE key.

Table 3-5 provides an example of setting up and executing an F1 → F2 scan operation. The process for setting up a frequency-to-frequency scan with lockouts (F1 -> F2 W/LK) is identical to the F1 -> F2 scan, up to the point where the new dwell timer setting is entered with the SETUP key. During a F1 -> F2 scan with lockouts, this is not the final menu item. As **Table 3-6** illustrates, once the new dwell timer value is entered, the new value is displayed in the parameters display for three seconds, and then the display increments to the next menu item "LOCK 1.600000". Here, 1.600000 represents the lowest frequency in MHz, currently entered in the lockout list. Each subsequent press of the SETUP key steps through the entered lockout frequencies in frequency-numeric order. Once the last lockout frequency is displayed, pressing the SETUP key exits the Scan Setup mode and returns the parameters display to its original settings. Pressing the EXEC key starts the frequency-to-frequency scan with lockouts operation. The message "SCANNING" is displayed in the parameters display, and the current tuned frequency is provided in the frequency display. In this scanning mode, none of the frequencies that are in the lockout frequency list are visited during the scan operation.

Table 3-6. Additional Menu Items for a F1 → F2 W/LK Scan Operation

Local Input	WJ-8712P RESPONSE								
Keypad Entry, Tuning Wheel/ EDIT Knob Adjustment	Parameters Display: IF BW	DET	BFO/ BLANK	SQL	AGC	NOTCH	Frequency Display (MHz)	Entry Mode	Tuned Frequency
SETUP	SCAN SETUP DWELL 15.0 Sec						20.000000	SCAN SETUP	20.000000
	SCAN SETUP LOCK 1.600000						20.000000	SCAN SETUP	20.000000
SETUP	SCAN SETUP LOCK 5.000000						20.000000	SCAN SETUP	20.000000
SETUP	SCAN SETUP LOCK 15.000000						20.000000	SCAN SETUP	20.000000
SETUP	6.00K	CW	-135 dBm	FAST	+1000 Hz	05	20.000000	N/A	20.000000
EXEC	SCANNING						2.005000	N/A	2.005000

3.1.12 PLACING THE RECEIVER IN SCAN MODE

Once a scan setup has been entered, the receiver can be placed into the scan mode. To start a scan, simply press the SCAN key. The scan is started when the message "SCANNING" is displayed in the parameters display.

3.1.13 PAUSING AND RESTARTING SCANS

An active scan operation can be paused by pressing the PAUSE key. When the scan is paused, the message "SCAN PAUSED" is displayed in the parameters display. The scan can be restarted by pressing the PAUSE key again, returning the message "SCANNING" to the parameters display. When a paused scan operation is restarted, the scan operation resumes at the next step in the scan sequence after which it was paused. For example, when a channel scan operation is paused, the channel to which the receiver is currently tuned is displayed. When the scan is restarted, the scan resumes at the next channel in the scan sequence.

When paused, the receiver acts as if it is in the Manual mode. Receiver parameters can be adjusted to look more closely at a received signal. When a scan is restarted, tuned frequency adjustments are ignored and the scan resumes according to the programmed scan setup. However, changes and adjustments to auxiliary parameters are maintained.

Also, when paused, scan setup parameters can be changed. Lockout frequencies can be added with the LOCKOUT key or can be deleted in the scan setup menu. The step size can also be changed with the STEP key or in the scan setup menu.

3.1.14 RUNNING THE BUILT-IN-TEST FUNCTION (BITE)

The built-in-test function (BITE) provides the operator the capability of testing the internal circuitry of the receiver. A passed BITE test provides confidence that the receiver is performing normally.

To start BITE, first press the MENU key until the menu item number 4 "BITE PENDING" is shown in the parameters display. Then turn the EDIT control knob in either direction; all LEDs are lit while BITE is being run.

The BITE result takes the form of a decimal number, equivalent to a 16-bit binary number. Sixteen tests are performed during the BITE routine. A failed test sets its corresponding bit in a 16-bit register table. The tests and their corresponding bits of the register table are listed in **Table 3-7**.

Table 3-7. BITE Error Codes

Bit	Decimal Value	Error Indication
0 (LSB)	1	**Transmit Error** - the control to DSP transmit pipeline is not empty.
1	2	**Host Download Unsuccessful** - the host microprocessor could not download the operating program.
2	4	**EPROM Download Unsuccessful** - the download to EPROM could not be completed.
3	8	**Host Command Not Acknowledged** - the DSP processor could not acknowledge the start-up command from the host microprocessor.
4	16	**No Response Back From the Host Processor** - the DSP processor did not receive a response back from the host microprocessor.
5	32	**DSP Memory Check Not Completed** - the check of the DSP processor's internal memory could not be completed.
6	64	**DSP EPROM Failure** - the DSP processor's internal EPROM could not be accessed.
7	128	**DSP SRAM Failure** - the DSP processor's internal static RAM could not be accessed.
8	257	**RF Test Failed** - the RF front end is not functioning properly.
9	512	**Host A/D Failure** - the host microprocessor's internal analog-to-digital converter is not functioning properly.
10	1024	**Non-SSB Audio Failure** - the AM, FM, CW demodulated audio path not functioning properly.
11	2048	**USB Audio Failure** - the upper sideband (USB) demodulated audio path not functioning properly.
12	4096	**USB Audio in LSB Path Failure** - the lower sideband (LSB) audio path not functioning properly with upper sideband (USB) audio.
13	8192	**LSB Audio Failure** - the lower sideband (LSB) demodulated audio path not functioning properly.
14	16384	**LSB Audio in USB Audio Path Failure** - the upper sideband (USB) audio path not functioning properly with lower sideband (LSB) audio.
15 (MSB)	32768	**DSP A/D Failure** - the DSP processor's analog-to-digital converter is not functioning properly.

The combination of set bits will determine the BITE result number. If all tests passed, the BITE result displayed is "BITE PASS". If BITE PASS is not displayed, an error has occurred. For example, if bits 0 and 3 were set because their corresponding tests failed, the BITE result displayed will be "BITE 009" (binary equivalent 00000000 00001001). If an error is encountered, the operator may attempt to turn the receiver's power off then back on from a cold start to rerun the BITE function. If an error persists, a hardware failure has been encountered.

3.1.15 DISPLAYING THE RECEIVER'S CURRENT INTERNAL CONTROL SOFTWARE VERSION

To display the receiver's current internal control software version turn the POWER switch off and then on. The receiver goes through its initialization routine and displays the unit's current internal control software version in the parameters display. The internal control software version is displayed for approximately one second. The Vxx.xx.xx indicates the current software version.

```
  BW                   SQL
RCVR  WJ-8712P

V  XX.XX.XX
  BFO                BLANK
```

This function is only available in units with internal control software version 1.40 and later.

3.1.16 SETTING REMOTE OPERATION CONFIGURATIONS FROM THE FRONT PANEL

From the front panel the local operator can select several remote operation configurations: RS-232 or CSMA remote operation selection, baud rate selection, and receiver address selection for CSMA remote operation. The following paragraphs provide details on performing these configurations. Details regarding optional interfaces are included in the appendix section of the manual.

NOTE

The receiver only recognizes remote configuration changes when power is cycled off and back on. After making any remote configuration changes, turn the receiver off then back on to set the new configuration in the receiver.

3.1.17 SELECTING THE RS-232 OR THE CSMA INTERFACE FOR REMOTE OPERATIONS

The interface to be used for receiver remote operation can be selected from the front panel by pressing the MENU key until menu item 5, "REMOTE xxxxx", is displayed in the parameters display. The xxxxx is replaced with the current selection, either "RS232" or "CSMA". Use the EDIT control knob to display the desired remote interface. This selection overrides the selection made with DIP switch A2S1 (see **paragraph 2.2.4**). Refer to **Section IV** of this manual for details on RS-232 remote operations or to **Section V** for details on CSMA remote operations.

3.1.18 SELECTING THE BAUD RATE FOR REMOTE OPERATIONS

The baud rate for RS-232 and CSMA remote operations can be selected from the front panel by pressing the MENU key until menu item 6, "BAUD RATE xxxx"," is displayed in the parameters display. The available baud rates are 75, 150, 300, 600, 1200, 2400, 4800, and 9600 bps. Use the EDIT control knob to display the desired baud rate. The baud rate selected applies to both RS-232 and CSMA remote operations (separate baud rate selections are not available). This selection overrides the selection made with DIP switch A2S1 (see **paragraph 2.2.4**).

3.1.19 SELECTING THE RECEIVER'S ADDRESS FOR CSMA REMOTE OPERATIONS

The address of the receiver for CSMA remote operations can be selected at the front panel by pressing the MENU key until menu item 7, "ADDRESS xx", is displayed in the parameters display. The "xx" is replaced with the current address selection. The CSMA address selection is available only while CSMA is selected for remote operations (refer to **paragraph 3.1.17**).

The CSMA address for the receiver can be any number from 1 to 63 (0 is reserved). Use the EDIT control knob to select and display the desired address number. This selection overrides the selection made with DIP switch A2S2 (see **paragraph 2.2.4**).

NOTES

SECTION IV

RS-232 REMOTE OPERATION

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SECTION IV

RS-232 REMOTE OPERATION

4.1 INTRODUCTION

The WJ-8712P Digital HF Receiver has the built-in capability of being controlled remotely by a computer or other controller device that is equipped with an RS-232 serial interface and capable of transmitting and receiving ASCII-standard encoded characters. Physically, the controller device needs only a transmit line (TXD), a receive line (RXD), and a ground line to communicate with the receiver.

The WJ-8712P can be set for RS-232 remote control by selecting "RS232" in the remote control entry mode via the front panel MENU key. The baud rate can also be selected in an entry mode entered with this key. Refer to **paragraph 3.1.5** for details on using the MENU key to configure the receiver for remote operation. Switch 4 of DIP switch A2S1 can be set to the off (up) position to activate the RS-232 remote control. A baud rate hardware default can also be selected. Refer to **paragraph 2.2.4** for details on configuring DIP switch A2S1.

Various receiver parameters can be controlled and/or monitored over the RS-232 interface. These parameters are:

- tuned frequency,
- BFO frequency,
- detection mode,
- squelch level,
- speaker type,
- IF bandwidth,
- gain mode,
- built-in-test (BITE) execution,
- error status (both current and latched),
- selection of local control, remote control, or remote control with local lockout,
- selection of F1-to-F2 scan start and stop frequencies,
- selection of channel scan start and stop channels,
- passband tuning offset frequency,
- recall stored parameters from
- tunable notch filter adjustment
- external reference,
- signal strength,
- squelch status,
- mute status,
- receiver identity,
- manual gain,
- signal dwell time,
- blanking,
- selection of channel scanning, F1-to-F2 scanning, or F1-to-F2 scanning with local lockouts, selection of F1-to-F2 scan increment,
- selection of frequency lockouts,
- store front panel parameters to selected memory channel, and
- current WJ-8712P operating parameters,
- current internal control software version

This section of the manual contains all the information necessary to enable an operator to control and monitor the above receiver parameters from an RS-232 controller. Details on how to properly format and transmit remote messages and how to read responses from the receiver are provided.

Before attempting to operate the receiver remotely, it is recommended that the operator become familiar with the operation and capabilities of the receiver by viewing the information provided in **Section III** of this manual. It is also recommended that the operator become familiar with the operation of the controller by viewing its literature.

4.2 INTERFACING WITH THE WJ-8712P

The RS-232 interface of the WJ-8712P is physically implemented on the RS-232 connector (A2J3), located on the rear panel. This interface has a full duplex operation, meaning that it can transmit and receive data simultaneously. The interface is set up as a "three-wire" RS-232 configuration, implemented on the transmit data line (TXD), the receive data line (RXD), and ground. These three wires are provided at the rear panel RS-232 connector on pins 2, 3, and 7, respectively.

This interface supports software handshaking only, including XON/XOFF (receiver protocol) and ACK/NAK (transmitter protocol). Hardware handshake signals such as RTS (request to send), CTS (clear to send), DTR (data terminal ready), or DSR (data set ready) are not supported.

RS-232 serial interfaces use a method of transmitting data one bit at a time over the TXD and RXD lines. For example, an eight-bit character takes eight sequential transmissions to complete the character. In RS-232 serial transmissions, data is sent in frames (or packets). Each bit within the frame is determined by a voltage level. The voltage levels used by this interface are -8 Vdc (nominal) for a logic "1" and +8 Vdc (nominal) for a logic "0". In the inactive or quiet state, the transmit line is held at a logic 1.

The baud rate (rate of data flow in bits per second) for the WJ-8712P is selectable (75, 150, 300, 600, 1200, 2400, 4800, or 9600 bps). Refer to **paragraph 3.1.5** for details on selecting the baud rate via the MENU key. Switches 1, 2, and 3 of DIP switch A2S1 can be set to appropriate positions to select the hardware default baud rate. Refer to **paragraph 2.2.4** in **Section II** of this manual for details on configuring DIP switch A2S1.

The WJ-8712P is set up with a fixed data word frame format consisting of ten bits, and comprised of the following:

- one start bit,
- an eight-bit character, and
- one stop bit.

It is important in serial data transmissions that the receiving device knows when data is being transferred and when data being transferred is about to stop. This information is conveyed by the above start and stop bits. The start bit synchronizes the receiving device so it reads the data properly. The stop bit notifies the receiving device that the data frame has ended. The WJ-8712P's fixed data word frame format does not contain a parity bit.

4.3 COMMAND MESSAGE FORMATTING

Command messages for the WJ-8712P are exclusively ASCII-encoded data, consisting of command headers and arguments. Command headers consist of three character mnemonics. All queries consist of a command header, followed by a question mark (?). All command arguments are in the "forgiving" numerical representation form (refer to **paragraph 4.3.3**).

Command messages are divided into two categories: receiver device messages and communication messages. Refer to **paragraphs 4.4** and **4.5** respectively.

Multiple commands may be sent to the receiver at once by transmitting them as a string. All commands in the string must be separated by a semicolon (;) (i.e., DET 1;BWS 4).

4.3.1 TERMINATORS FOR COMMANDS AND QUERIES

Terminators are used to signal the end of a command or string. When a properly formatted message is ready to be sent, a LF (line feed) character should be entered. The LF character instructs the receiver to process the preceding message(s).

The WJ-8712P also transmits a terminator when responding to queries. After the query response is transmitted the receiver issues a CR,LF (carriage return, line feed characters), indicating end of response.

4.3.2 FORMATS OF QUERY RESPONSES

The WJ-8712P transmits responses to queries in a fixed-field format. Query responses begin with the three-letter mnemonic of the query in upper-case characters, followed by a numeric argument. In all query responses, the mnemonic and argument are separated by a space. Numeric arguments are represented by the least number of digits possible, while still representing the entire range of the value. If a negative value is allowed for the argument, a positive or negative sign is always given. Responses due to multiple queries are linked together in a query string, with each query and its argument separated with a semicolon from other queries in the string. The WJ-8712P terminates all responses to single queries or query strings with the CR (carriage return) and LF (line feed) characters.

4.3.3 REPRESENTATION OF NUMERIC ARGUMENTS

Arguments for commands and queries in this manual are represented by an nrX (where X is either f, 1, or 2). The nrf representation is used for command numeric arguments. The nr1 and nr2 are used for the representation of query response arguments.

Numeric arguments that are used with commands are accepted in a forgiving numeric representation (nrf). This implies that the WJ-8712P is a forgiving listener. Specific details on numeric representation are given below.

- nrf - The nrf (forgiving numeric representation) data element for commands is composed of the sequential fields listed below. All fields (1-5) are optional with one restriction: at least one digit must be present with the active data element of the argument.

Field	Data
1	Plus (+) or minus (-) sign.
2	Any number of digits, up to eight.
3	A decimal point (.).
4	Any number of digits, up to eight.
5	An upper-case "E" or lower-case "e" followed by an optional sign and at least one digit but no more than two digits.

If the WJ-8712P receives an nrf of a precision greater than it can handle, it rounds the number rather than truncating it. When rounding, the unit ignores the sign of the number and rounds up on values greater than or equal to one half. It rounds down on values less than one half.

- nr1 - The nr1 is a numeric query response data format for integers, composed of an optional sign field, followed by any number of digits. The decimal point is implicitly defined to always follow the last digit and is therefore, not present in the response data element.

- nr2 - The nr2 numeric response data format is composed of an optional sign field, followed by any number of digits, a decimal point, and any number of digits. At least one digit is always present on both sides of the decimal point.

4.4 RECEIVER DEVICE MESSAGES

Receiver Device Messages are commands that affect the operational parameters of the receiver. These commands are listed in **Table 4-1**.

Table 4-1. Receiver Device Messages

Command	Response	Description
ADV		Advance to next scan frequency. Operates when WJ-8712P is in dwell mode during scan.
AGC nrf		Select gain control mode. Range: 0 - 3 Where: 0 - Manual 1 - Slow AGC 2 - Fast AGC 3 - Medium AGC
AGC?	AGC nr1	Request active gain control mode. Reset: AGC 2 Default: AGC 2 Example: AGC 0
AGD nrf nrf		Set decay time for gain control.
Field 1	Parameter Gain control mode	Range: 1 - Slow AGC 2 - Fast AGC 3 - Medium AGC
2	Time (milliseconds)	If Slow AGC - 1000 to 5000 (rounds up to next lower 500 millisecond step) Fast AGC - 10 to 100 (rounds to next lower 10 millisecond step) Medium AGC - 100 to 1000 (rounds to next lower 100 millisecond step)
AGD? nrf	AGD nr1,nr1	Recall the selected gain control mode and decay time. Range: 1 - 3 Reset: AGD 1, 2000 AGD 2, 40 AGD 3, 200 Default: AGD 1, 200 AGD 2, 200 AGD 3, 200 Example: AGD 1, 2000 AGD 2, 20 AGD 3, 200

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
AGT nrf		Select AGC threshold mode. Range: 0 - 1 Where: 0 - off
AGT?	AGC nr1	Request active AGC threshold mode. Reset: AGC 0 Default: AGC 0 Example: AGC 1
BFO nrf		Set frequency in Hz (10 Hz steps). Range: -8000 to +8000 Where: +0000 = BFO Off
BFO?	BFO nr1	Request current BFO frequency. Reset: BFO +0000 Default: BFO +1000 Example: BFO -7990
BLK nrf		Select blanking setting. Range: 0 to 10
BLK?	BLK nr1	Request active blanking setting. Example: BLK 5 Default: BLK 0
BWC nrf		Select an IF bandwidth size in Hz. Range: 0 to 16000 Note: If the value entered is not a standard IF bandwidth (see **Table 1-1**), the standard IF bandwidth that is greater in value and closest to the requested IF bandwidth will be selected. Note: Only IF bandwidths from .900 to 3.2 kHz are valid selections for the LSB, USB, and ISB detection modes. Selecting an IF bandwidth outside the specified limit results in an Execution Error being set in the Event Summary Status Register (see **paragraph 4.6.2**). As a result, when changing the IF bandwidth and the detection mode selections using a multiple command string, always enter the detection mode command prior to the IF bandwidth command to avoid an inadvertent Execution Error being set.
BWC?	BWC nr1	Request the current IF bandwidth in Hz. Reset: 06000 Default: 06000 Example: 03200

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
BWN nrf		Select one of the 66 available IF bandwidth filters. Where nrf represents the filter number. The narrowest bandwidth (.056 kHz) being number 1 and the widest bandwidth (16.0 kHz) being number 66. Range: 001 to 066 Where: 001 = .056 kHz 034 = 1.00 kHz 002 = .063 kHz 035 = 1.10 kHz 003 = .069 kHz 036 = 1.20 kHz 004 = .075 kHz 037 = 1.30 kHz 005 = .081 kHz 038 = 1.40 kHz 006 = .088 kHz 039 = 1.50 kHz 007 = .094 kHz 040 = 1.60 kHz 008 = .100 kHz 041 = 1.80 kHz 009 = .113 kHz 042 = 2.00 kHz 010 = .125 kHz 043 = 2.20 kHz 011 = .138 kHz 044 = 2.40 kHz 012 = .150 kHz 045 = 2.60 kHz 013 = .163 kHz 046 = 2.80 kHz 014 = .175 kHz 047 = 3.00 kHz 015 = .188 kHz 048 = 3.20 kHz 016 = .200 kHz 049 = 3.60 kHz 017 = .225 kHz 050 = 4.00 kHz 018 = .250 kHz 051 = 4.40 kHz 019 = .275 kHz 052 = 4.80 kHz 020 = .300 kHz 053 = 5.20 kHz 021 = .325 kHz 054 = 5.60 kHz 022 = .350 kHz 055 = 6.00 kHz 023 = .375 kHz 056 = 6.40 kHz 024 = .400 kHz 057 = 7.20 kHz 025 = .450 kHz 058 = 8.00 kHz 026 = .500 kHz 059 = 8.80 kHz 027 = .550 kHz 060 = 9.60 kHz 028 = .600 kHz 061 = 10.4 kHz 029 = .650 kHz 062 = 11.2 kHz 030 = .700 kHz 063 = 12.0 kHz 031 = .750 kHz 064 = 12.8 kHz 032 = .800 kHz 065 = 14.4 kHz 033 = .900 kHz 066 = 16.0 kHz Note: Only IF bandwidths from .900 to 3.2 kHz are valid selections for the LSB, USB, and ISB detection modes. Selecting an IF bandwidth outside the specified limit results in an Execution Error being set in the Event Summary Status Register (see **paragraph 4.6.2**). As a result, when changing the IF bandwidth and the detection mode selections using a multiple command string, always enter the detection mode command prior to the IF bandwidth command to avoid an inadvertent Execution Error being set.

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
BWN?	BWN nrl	Request active IF bandwidth number. Reset: BWN 055 Default: BWN 055 Example:BWN 028
BWS nrf	BWS nrl	Select an IF bandwidth. Range: 1-5 Where: 1 - 0.30 kHz 2 - 1.00 kHz 3 - 3.20 kHz 4 - 6.00 kHz 5 - 16.0 kHz Note: Only IF bandwidths from .900 to 3.2 kHz are valid selections for the LSB, USB, and ISB detection modes. Selecting an IF bandwidth outside the specified limit results in an Execution Error being set in the Event Summary Status Register (see **paragraph 4.6.2**). As a result, when changing the IF bandwidth and the detection mode selections using a multiple command string, always enter the detection mode command prior to the IF bandwidth command to avoid an inadvertent Execution Error being set.
BWS?	BWS nrl	Request the active IF bandwidth slot. Reset: BWS 4 Default: BWS 4 Example: BWS 1
CHA nrf		Select start channel for channel scan. Range: 00 to 98
CHA?	CHA nrl	Request currently selected channel for channel scan. Example: CHA 25 Default: CHA 0
CHB nrf		Select stop channel for channel scan. Range: 01 to 99
CHB?	CHB nrl	Request currently selected stop channel for channel scan. Example: CHB 26 Default: CHB 99
CHI nrf		Include channel when in channel scan. Range: 0 to 99
CHS nrf		Skip channel when in channel scan. Range: 0 to 99
CLM		Clear all memories.

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
CTL nrf		Set the device control mode. Range: 0 - 2 Where: 0 - Local 1 - Remote 2 - Remote w/Local Lockout
CTL?	CTL nr1	Request the device control mode. Default: CTL 0 Example: CTL 1
DET nrf		Set the detection mode. Range: 1 - 7 Where: 1 - AM 2 - FM 3 - CW 4 - USB 5 - LSB 6 - ISB 7 - SAM Note: Only IF bandwidths from .900 to 3.2 kHz are valid selections for the LSB, USB, and ISB detection modes. Selecting an IF bandwidth outside the specified limit results in an Execution Error being set in the Event Summary Status Register (see **paragraph 4.6.2**). As a result, when changing the IF bandwidth and the detection mode selections using a multiple command string, always enter the detection mode command prior to the IF bandwidth command to avoid an inadvertent Execution Error being set.
DET?	DET nr1	Request the active detection mode. Reset: DET 1 Default: DET 1 Example: DET 4
ENA		Continue suspended scan command.
EXE nrf		Recall and execute specified memory channel. Range: 0 to 99
FRA nrf		Select start frequency for Frequency-to-Frequency (F1-to-F2) scan in MHz. Range: 0.000000 to 29.999999
FRA?	FRA nr2	Request current Frequency-to-Frequency (F1-to-F2) scan start frequency in MHz. Example: FRA 23.123456 Default: FRA 00.000000

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
FRB nrf		Select stop frequency for Frequency-to-Frequency (F1-to-F2) scan in MHz. Range: 0.000001 to 30.000000
FRB?	FRB nr2	Request current Frequency-to-Frequency (F1-to-F2) scan stop frequency in MHz. Example: FRB 27.123456 Default: FRB 30.000000
FRQ nrf		Set the tuned frequency in MHz (1-Hz steps). Range: 00.000000 to 30.000000
FRQ?	FRQ nr1	Request the tuned frequency. Reset: FRQ 20.000000 Default: FRQ 20.000000 Example: FRQ 12.345678
INC nrf		Select Frequency-to-Frequency (F1-to-F2) scan increment in kHz. Range: 0.001 to 25.000
INC?	INC nr2	Request current Frequency-to-Frequency (F1-to-F2) scan increment in kHz. Example: INC 20.000 Default: INC 25.000
LCK nrf nrf		Enter a lockout to be used in the (F1-to-F2) scan w/Lock mode. The lockout is specified as a center frequency only. The lockout width is ± half of the current IF bandwidth selection. Once stored, the lockout width remains the same, regardless of future IF bandwidth changes. The channel number assigned with this command remains constant as channels are added or deleted. This lockout data overwrites any data previously stored in the selected lockout channel.

Field	Parameter	Range
1	Channel number	0 to 99
2	Lockout center frequency	0.000000 to 30.000000

Command	Response	Description
MUT?	MUT nr1	Request the current mute status. Range: 0,1 Where: 0 = Audio not muted 1 = Audio muted

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
NFM nrf		Set the tunable notch filter mode. Range: 0,1 Where: 0 = OFF 1 = Relative (ON) Request the current tunable notch filter mode. Range: 0 to 4 Where: 0 = OFF 1 = Relative (ON) 2 = Not Used 4 = Disabled Note: A disabled response occurs when the notch filter relative setting is outside the specified limits of the selected bandwidth. Refer to **paragraph 3.1.4.3**.
NRF nrf NRF?	 NFR nr1	Set the tunable notch filter setting. Refer to **paragraph 3.1.4.3** for a list of the maximum relative settings for each bandwidth. Range: -9999 to +9999 Hz Request the current tunable notch filter setting. Reset: 0000 Default: 0000 Example: -6200

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
OPR nrf		Select operation mode. Range: 0, 1 Where: 0 = Manual 1 = scan (type of scan is dependent on current scan type (SCF) selection.)
OPR?	OPR nr1	Request current operation mode. Example: OPR 1 Default: OPR 0 Reset: OPR 0 Default: OPR 0
PBT nrf		Selected passband tuning offset frequency. Only effective in CW detection mode. Range: -2000 to +2000 Hz (10 Hz steps)
PBT?	PBT nr1	Request current passband tuning offset frequency in Hz. Example: PBT 1250 Reset: PBT 0 Default: PBT 0
RCL? nrf	RCL nr1,nr1, nr2,nr1,nr1,nr1, nr1,nr1	Recall selected memory channel parameters. Range: 0 to 99

Field	Parameter	Range
1	Memory channel number	0 to 99
2	Skip/include channel	0 = skip, 1 = include
3	Tuned frequency (FQR)	0.000000 to 30.000000 MHz
4	AGC mode (AGC)	0 to 3
5	Detection mode (DET)	1 to 7
6	Bandwidth number (BWN)	001 to 066 (see BWN command)
7	Squelch threshold (SQL)	0 to 135 -dBm, 136 = no squelch
8	RF input (RFP)	1 to 3
9	BFO Frequency (BFO)	-8000 to +8000 Hz
10	Remote Manual Gain Level (RFG)	000 - 127

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
REF?	REF nr1	Request the status of the external reference. Range: 0 - 4 Where: 0 - Internal 1 - 10 MHz External 2 - 5 MHz External 3 - 2 MHz External 4 - 1 MHz External Example: REF 3
RFG nrf		Set the remote manual gain level. Range: 000 -127
RFG?	RFG nr1	Request the remote manual gain level. Reset: RFG 000 Default: RFG 000 Example: RFG 123
RFP nrf		Select the RF input path. Range: 1 - 3 Where: 1 - Normal 2 - Attenuated 3 - Preamplified
RFP?	RFP nr1	Request the selected RF input path. Reset: RFP 1 Default: RFP 1 Example: RFP 2
RLK? nrf	RLK nr1,nr2	Recall the selected lockout channel center frequency. When the lockout memory channel is vacant a frequency of 31.000000 MHz is returned. Range: 0 to 99 Example: RLK 12, 27.123456
SCF nrf		Select desired scan type. Range: 1 to 3 Where: 1 = Channel scan 2 = F1-to-F2 3 = F1-to-F2 w/Lock
SCF?	SCF nr1	Request the currently selected scan type. Example: SCF 1 Default: SCF 2

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
SCS?	SCS nr1	Request the current receiver scan status. Range: 0 to 3 Where: 0 = No scan 1 = Scan 2 = Scan dwell 3 = Scan paused
SDW nrf SDW?	 SDW nr1	Select the scan dwell time. Range: 0.5 to 20 seconds, 0 = infinite Request currently selected scan dwell time. Example: SDW 2 Default: SDW 0.5
SGV?	SGV nr1,nr1	Request the signal strength value (in dBm) and squelch status value. Range: +20 to -135,0-1 Where: nr1,0 - squelch on nr1,1 - squelch off Reset: No Change Example: SGV -123,0
SLM?	SLM nr1	Request number of unused lockout channels available. Range: 0 to 100 Example: SLM 75 Reset: SLM 100
SPK nrf SPK?	 SPK nr1	Select speaker type. Range: 1 to 3 Where: 1 = USB 2 = Both 3 = LSB Request currently selected speaker type. Example: SPK 2 Default: SPK 2

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
SQL nrf		Set squelch level in negative dBm. Range: 0 to 135, 136 = squelch off
SQL?	SQL nr1	Request the squelch level setting in -dBm (136 = squelch off). Example: SQL 90 Reset: SQL 136
STO nrf		Store front panel parameters to selected memory channel. Range: 0 to 99
STS?		Request current receiver parameters. Example: FRQ12.34567, AGC2, RFG123, BFO-1234, BLK10, BWS5, DET1, SLQ123, SPK1, RFP2, PBT1250.

Field	Parameter	Range
1	Tuned Frequency (FRQ)	00.000000 to 30.000000 MHz
2	AGC Mode (AGC)	0 to 3
3	Remote Manual Gain Level (RFG)	000 - 127
4	BFO Frequency in kHz (BFO)	-8000 to +8000 Hz
5	Blanking Setting (BLK)	0 to 10
6	Bandwidth Slot (BWS)	1 to 5
7	Detection Mode (DET)	1 to 6
8	Squelch Threshold (SQL)	0 to 135 -dBm 136 = no squelch
9	Speaker Type (SPK)	1 to 3
10	RF Input Path (RFP)	1 to 3
11	Passband Tuning Offset (PBT)	-2000 to +2000 Hz

Command	Response	Description
SUS		Suspend scan command. Suspends scan in the same manner as the front panel "PAUSE" key pauses scan. Scan may be continued using the ENA command.
ULK nrf		Unlock selected lockout memory channel. Range: 0 to 99

4.5 COMMUNICATION MESSAGES

Communication messages are always valid. These are commands which establish communications between the WJ-8712P and the controller. All WJ-8712P communication messages are listed in **Table 4-2**. Common communication messages are prefixed with an asterisk.

Table 4-2. Communication Messages

Command	Response	Description
CDE?	CDE nr1	Request the current Device-Dependent Error Register value. Example: CDE 00255 Range: 00000 - 65535 See **Table 4-6** for bit-mapped detail.
*CLS		Clears all communication status registers.
*ESE nrf		Set the Event Summary Enable Register. See discussion of the Event Summary Registers for bit-mapped details. Range: 0 - 255
*ESE?	*ESE nr1	Request the Event Summary Enable Register value. Reset: No change Default: *ESE 000 Example: *ESE 128
*ESR?	*ESR nr1	Request the Event Summary Status Register value. See **Table 4-4** for bit-mapped details. Example: *ESR 016 Range: 0 - 255 Bit 0 - OPC Operation Complete Bit 1 - Not Used Bit 2 - QYE Query Error Bit 3 - DDE Device-Dependent Error Bit 4 - EXE Execution Error Bit 5 - CME Command Error Bit 6 - Not Used Bit 7 - PON Power On
*IDN?	*IDN (see example)	Request receiver identity. The fields provide information in the following order: model number, space reserved for future expansion, and software version number. Example: *IDN WJ8712P,0,1.40
LDE?	LDE nr1	Request the latched Device-Dependent Error Register value. Example: LDE 00255 Range: 00000 - 65535 See **Table 4-6** for bit-mapped detail.

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*LRN?	*LRN nr2,nr1, nr1,nr1,nr1,nr1, nr1,nr1,	Request current WJ-8712P operating parameters. The data returned for this query is field dependent.

Field	Parameter	Range
1	Tuned Frequency (FRQ)	00.000000 to 30.000000 MHz
2	AGC Mode (AGC)	0 to 3
3	Detection Mode (DET)	1 to 7
4	Bandwidth number (BWN)	001 to 066
5	Squelch threshold (SQL)	0 to 135 -dBm, 136 = no squelch
6	RF input (RFP)	1 to 3
7	BFO frequency (BFO)	-8000 to +8000 Hz (in 10 Hz steps)
8	Blanking (BLK)	0 to 10
9	Speaker (SPK)	1 to 3

Command	Response	Description
*OPC		Operation complete switch. When this command is sent with a data string, the OPC bit in the Event Summary Status Register will be set upon completion of the operation(s) in the input buffer. An SRQ may be generated with corresponding bit enabled.
*OPC?	*OPC 1	An *OPC 1 string will be loaded into the output buffer (returned at the completion of the operation in the input buffer).
*OPT?	*OPT nr1,nr1	Request the options currently installed in the receiver. The returned response is a bit-mapped value of two 8 bit bytes. Range: 0 - 255, 0 - 255 Example: *OPT 016 1st nr1 bit-mapped response: Bit 0 - Preselector Option Bit 1 - Extended Bandwidths Bit 2 - Tuned Carrier Bit 3 - Variable Line Audio Bit 4 - Tunable Notch Filter Bit 5 - AGC/Detection Mode Matching Bit 6 - Zero Digit tuning Bit 7 - Synchronous AM 2nd nr1 bit-mapped response: Bit 0 - AGC Enhancement Bit 1 - Speech Enhancement Option Bit 2 to Bit 7 Reserved for future expansion

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*RSE nrf		This command allows writing to a register that enables interrupts to be passed from the RSR register to the *STB register via its RSB bit. BIT FUNCTION 0 Enable PRS, signal exceeded COR event to set the RSB bit. 1-3 Not Used 4 Enable ESN, end of single scan event to set the RSB bit. 5-7 Not used.
*RSE?	*RSE nr1	Request the contents of the Receiver Status Enable Register. Reset: no change Default: *RSE 000 Example: *RSE 016
*RSR?	*RSR nr1	Read the Receiver Status Register. The information included in this register is latched. It is cleared by the *CLS command or a read of the register. The information in the register discloses the reason for the RSB bit to be set in the Status Byte Register. BIT FUNCTION 0 PRS, signal exceeded COR threshold. This is an edge triggered event on the action of a signal going from below COR threshold to above COR threshold. 1-3 Not used. 4 ESN, end of single scan. This bit indicates the end of scan has been encountered. This bit is only set while in a scan mode. (F1→F2, F1→F2 w/Lock, Channel) 5-7 Not used
*RST		For all device parameters to their reset condition.

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*SRE nrf		Set the Service Request Enable Register. See discussion of the Status Byte Registers for bit-mapped details. Range: 0 - 255
*SRE?	*SRE nr1	Request the Service Request Enable Register value. Reset: No Change Default: *SRE 000 Example: *SRE 032
*STB?	*STB nr1	Request the Status Byte Register value. See **Table 4-3** for bit-mapped details. Range: 0 - 255 Example: *STB 064 Bit 0 - RSB Bit 1 - Not Used Bit 2 - Not Used Bit 3 - Not Used Bit 4 - Not Used Bit 5 - ESB Event Summary Bit Bit 6 - RQS Request Service Bit 7 - Not Used
STS?		Request current receiver parameters. Example: FRQ12.34567, AGC2, FRG123, BFO-1234, BLK10, BWS5, DET1, SLQ123, SPK1, RFP2, PBT1250

Field	Parameter	Range
1	Tuned Frequency (FRQ)	00.000000 to 30.000000 MHz
2	AGC Mode (AGC)	0 to 3
3	Remote Manual Gain Level (RFG)	000 - 127
4	BFO Frequency in kHz (BFO)	-8000 to +8000 Hz
5	Blanking Setting (BLK)	0 to 10
6	Bandwidth Slot (BWS)	1 to 5
7	Detection Mode (DET)	1 to 6
8	Squelch Threshold (SQL)	0 to 135 -dBm 136 - no squelch
9	Speaker Type (SPK)	1 to 3
10	RF Input Path (RFP)	1 to 3
11	Passband Tuning Offset (PBT)	-200 to +2000 Hz

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*TST?	*TST nr1	Execute built-in-test (BITE) and report outcome. The response is a bit-mapped value of 16 bits, representing the success or failure of each test. Any failed test will set the associated bit as listed below. Range: 0 - 65535 Example: *TST 00000 Bit Failure 0 Control to DSP transmit pipeline not empty. 1 Control to DSP download unsuccessful. 2 DSP EPROM download unsuccessful. 3 Control command no acknowledged. 4 No DSP response to control request. 5 DSP memory check did not complete. 6 DSP EPROM failure. 7 DSP SRAM failure. 8 RF test failed. 9 Control A/D failure. 10 Non-SSB audio failure. 11 USB audio failure. 12 USB audio in LSB path failure. 13 LSB audio failure. 14 LSB audio in USB path failure. 15 DSP A/D failure.

4.6 RECEIVER STATUS SUMMARY

Figure 4-1 illustrates the architecture of the receiver's status registers. It is composed of six eight-bit registers and one 16-bit register, whose logic gating allows the programmer great flexibility in remote operations. The eight bit registers can be split into three pairs. Each pair consists of a status register and an enable register.

One pair is composed of the Event Summary Status Register (whose functions are summarized in **paragraph 4.6.2**) and the Event Summary Status Enable Register. Each bit in the Event Summary Status Register is logically ANDed to a bit in the Event Summary Status Enable Register. The ANDed combination of these two registers are logically ORed to set the Event Summary Status Bit (ESB) of the Status Byte Register. The Device-Dependent Error Bit (DDE) of the Event Summary Status Register is the ORed combination of the 16-bit Device-Dependent Error Register (see **paragraph 4.6.4**).

The second pair is composed of the Status Byte Register and the Service Request Enable Register. The receiver uses only three bits of the Status Byte Register as described in **Table 4-3**. The ANDed combination of bits 0 and 5 of the Status Byte Register and the Service Request Enable Register are logically ORed to determine the setting of bit six (RQS) of the Status Byte Register. If the RQS bit is set high, a service request is asserted.

Table 4-3. Status Byte Register, Bit Evaluation

Bit Number	Mnemonic	Description
0	RSB	**Receiver Status Bit** - This bit, when set, indicates that an event has caused a bit or bits in the Receiver Status Register to be set (see **paragraph 4.6.3**). This bit is cleared by *CLS or by reading the contents of the Receiver Status Register using the RSR? query.
1-4	Not Used	
5	ESB	**Event Summary Bit** - This bit, when set, indicates that the Event Summary Status Register has set SRQ. By reading the Event Summary Status Register via the *ESR? mnemonic, the host controller may identify what status event has caused the SRQ. This bit is cleared by sending, *CLS or reading the contents of the Event Status Register.
6	RQS	**Request Service Bit** - This bit, when set, indicates that the unit has asserted SRQ.
7	Not Used	

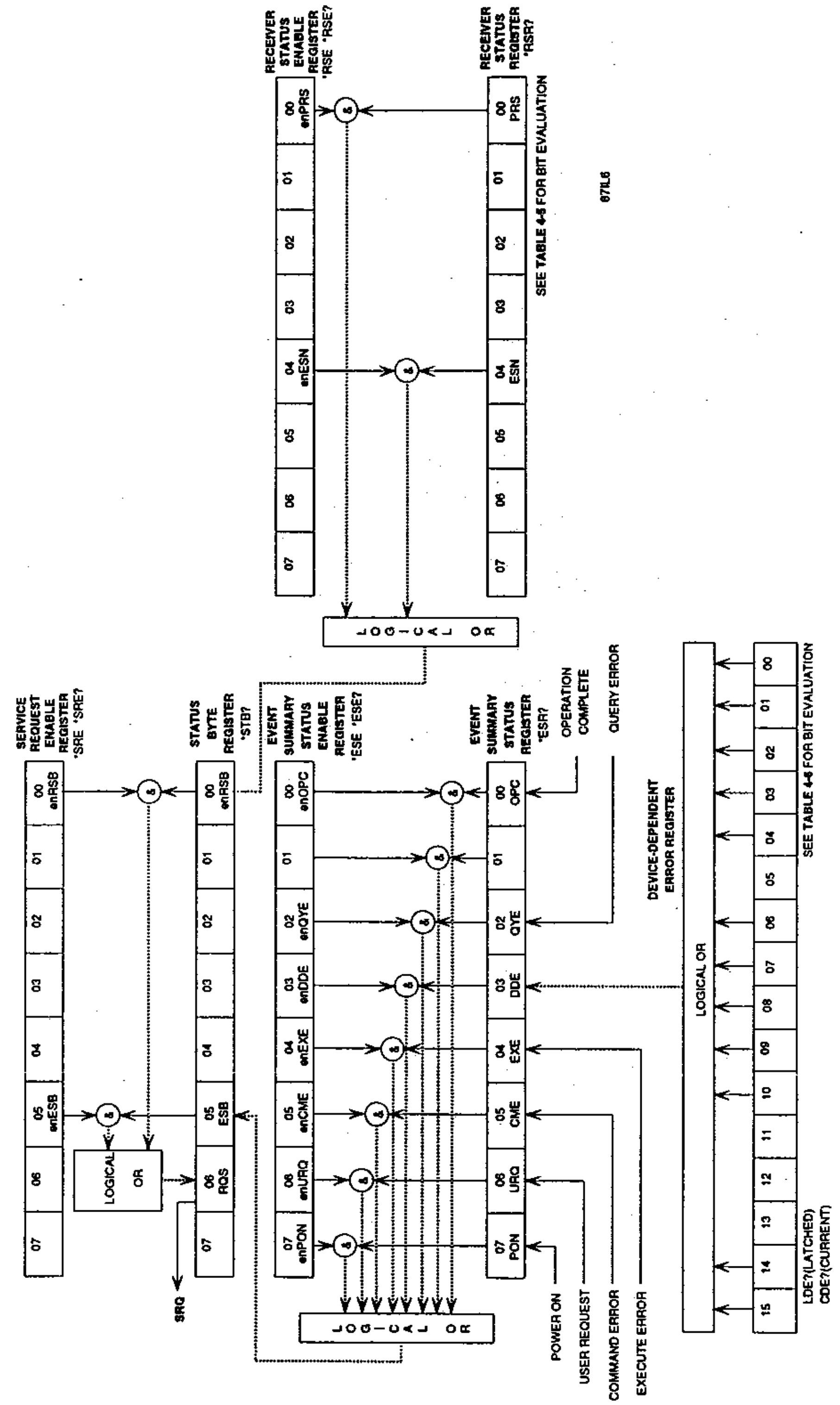

Figure 4-1. Receiver Status Data Structure

4.6.1 STATUS BYTES

The following information discusses the operation of the SRQ interrupt and the "*STB?" query. The operation of these is very similar. The SRQ interrupt allows the controller to establish which event has caused the receiver to set the SRQ. The "*STB?" query response includes similar information as detailed below.

SRQ - This is a one byte control character (ESC) indicating a service request. When SRQ is generated, it is immediately followed by the output of the Status Byte Register if enabled. This clears the SRQ and the Status Byte Register. The evaluation of each bit in this status byte is in **Table 4-3**.

***STB? Query** - The Status Byte Register can also be read using the *STB? query. Sending *STB? does not clear the SRQ status line or the Status Byte Register.

The Service Request Enable Register allows status bits to generate service requests. Setting a status bit will set service request if and only if the corresponding enable bit is set. Service Request Enable Register bit six is ignored and reported as zero. This bit would correspond to the RQS bit of the Status Byte Register which triggers service request.

4.6.2 EVENT SUMMARY STATUS REGISTER

The following discussion covers the Event Summary Status Register and the *ESR? query. See **Table 4-4** for the Event Summary Status Register bit numbers, mnemonics and descriptions.

The Event Summary Status Register is read destructively by the *ESR? query, which clears the register. The *CLS command also clears the register. The power on sequence automatically sets the Power On bit and initially resets the remaining bits.

The Event Summary Status Enable Register allows the event flags of the Event Summary Status Register to be reflected in the Event Summary Bit (ESB) of the Status Byte. The setting of an event status flag sets ESB high <u>only</u> if the corresponding bit in the Event Summary Status Enable Register is set high. The Event Summary Status Enable Register is written to with the *ESE command. The data following the mnemonic is the decimal equivalent of a binary number representing the register bits. The *ESE? query loads the output buffer with a decimal number, which can be converted to binary to determine the setting of the Event Summary Status Enable Register.

Table 4-4. Event Summary Status Register, Bit Evaluation

Bit Number	Mnemonic	Description
0	OPC	**Operation Complete** - This bit is set on completion of operation that has been designated by the *OPC command.
2	QYE	**Query Error** - Set on an attempt to read data from the output buffer with no data stored or pending, or the output buffer is dumped for any cause except device clear, such as an overflow.
3	DDE	**Device-Dependent Error** - Set when a hardware error occurs within the receiver.
4	EXE	**Execution Error** - Set when an out of range data element follows a known message header or when a valid message count not be executed due to some device condition.
5	CME	**Command Error** - Set when an unrecognized message header has bee received.
7	PON	**Power On** - Set during the power-up sequence. Also set when a Device or Select Device Clear is received.

4.6.3 RECEIVER STATUS REGISTER

The Receiver Status Register allows for interrupts to be generated when particular operational events occur. The information in this register discloses the reason for the RSB bit to be set in the Status Byte Register. The *RSR? query reads the latched contents of this register and clears it. It is also cleared by *CLS. See **Table 4-5** for the bit evaluation of the Receiver Status Register.

Table 4-5. Receiver Status Register, Bit Evaluation

Bit	Decimal Value	Function
0	1	PRS, signal exceeded COR threshold. This is an edge triggered event on the action of a signal going from below COR threshold to above COR threshold.
1	2	Not used
2	4	Not used
3	8	Not used
4	16	ESN, end of scan. This bit indicates the end of scan has been encountered. This bit is only set while in a scan mode (F1→F2, F1→F2 w/Lock, or Channel).
5	32	Not used
6	64	Not used
7	128	Not used

4.6.4 DEVICE-DEPENDENT ERROR REGISTER

The contents of the Device-Dependent Error Register can be read to determine what event has caused the DDE bit in the Event Status Register to be set. The CDE? and LDE? queries are used as further discussed below.

The LDE? query request the latched error status. The response is a bit-mapped 16-bit word indicating the error conditions that have occurred since the last read of the register. Reading the contents of the register also clears it. See **Table 4-6** for a bit evaluation of the Device-Dependent Error Register.

The CDE? query request the current device error. The response to this query is also a bit-mapped 16-bit word as detailed in **Table 4-6**. Reading this register has no effect on it.

Table 4-6. Device-Dependent Error Register, Bit Evaluation

Bit	Decimal Value	Mnemonic	Description
0	1	DSP ERR 1	Control to DSP transmit pipeline not empty.
1	2	DSP ERR 2	Control to DSP download unsuccessful.
2	4	DSP ERR 3	DSP EPROM download unsuccessful.
3	8	DSP ERR 4	Control command not acknowledged by DSP.
4	16	DSP ERR 5	No DSP response to Control request.
5	32	Not Used	
6	64	PS ERR 1	-12 Volt Supply Low.
7	128	PS ERR 2	+12 Volt Supply Low.
8	256	BATT ERR	Battery Voltage Low.
9	512	LO ERR	Local Oscillator Unlocked.
10	1024	REF ERR	Unknown External Reference.
11	2048	RAM FAIL	Control Processor RAM Failure.
12	4096	CHKSUM	EPROM Checksum Error.
13	8192	PRESEL OVRLD	Preselector Overload (when the WJ-8712/PRE option is installed).
14	16384	Not used	
15	32768	Not used	

4.7 MESSAGE PROCESSING

When the WJ-8712P receives a remote message, it stores it in an input buffer circuit until it receives a valid message terminator (LF). When the terminator is received, the message is parsed and executed.

The format of the received message is checked for validity as the message is parsed and executed. If the message fails to meet the restrictions of the command message format, it is ignored.

4.8 RS-232 COMMUNICATIONS PROTOCOL

The communications protocol for the WJ-8712P implements both ENQ/ACK (ENQuire/ACKnowledge) and XON/XOFF (ctl Q/ctl S) software handshakes. The ENQ/ACK format, typically referred to as "transmitter protocol", allows the operator to send an "ENQ" character to the WJ-8712P when an acknowledge is required. The receiver then responds with the ACK/NAK (ACKnowledge/Not AcKnowledge) character indicating the validity of the data received in the input buffer and the fact the unit has completed all current data through to the last received terminator. The XON/XOFF format supports both transmit and receive communications. This format, typically referred to as "receiver protocol", allows transmission based on the availability of buffer space (refer to **paragraph 4.8.3**).

Table 4-7 lists the supported communications control commands for RS-232 remote operation. The following paragraphs provide more details on the ENQ/ACK and XON/XOFF protocol, and buffer control.

Table 4-7. Supported RS-232C Communications Control Commands

HEX	ASCII	Receive	Transmit	Function
11	DC	x	x	XON, allow data transmission
13	DC3	x	x	XOFF, disallow data transmission
05	ENQ	x		Enquire, request acknowledge
06	ACK		x	Acknowledged, data received
15	NAK		x	Not acknowledged, data communications error
0A	LF	x	x	Line feed, start processing input buffer
0D	CR	x	x	Carriage return, no action

4.8.1 XON/XOFF PROTOCOL

The XON/XOFF communications protocol is always active in the WJ-8712P. In the event the buffer has room for less than 16 additional characters the unit will output an XOFF character. When the unit empties its input buffer, it issues an XON character. The user must stop sending data within 15 characters after receiving the XOFF character. On each character that is received while the buffer is full, the unit issues an XOFF character. The user may start sending data to the unit after receiving the XON character.

The WJ-8712P responds to the XON and XOFF commands while outputting data to the user. If the unit receives an XOFF while sending, it stops transmitting within two characters. The unit will not transmit any further data until an XON is received. The WJ-8712P assumes the XON condition at power-up.

4.8.2 ENQ/ACK PROTOCOL

When the ENQ character is sent to the WJ-8712P, it responds to a valid message with an ACK, or to an invalid message with a NAK. An invalid message is indicated on a data communications error such as framing, noise, or overrun. The transmission of a NAK indicates that one or more of the bytes received after the last ENQ has a communications error. The ACK/NAK response is only sent after the unit has completed processing any previous messages in the input buffer and has output any response necessary. See **Table 4-7**.

WJ-8712P internally maintains a communications error flag. The flag is cleared on power-up or the transmission of a NAK. The flag is set when a byte is received with a data communications error. Upon receiving an ENQ character, the unit responds with an ACK/NAK based on the condition of the communications flag, after any pending input and output operations are complete.

4.8.3 BUFFER HANDLING

4.8.3.1 Input Buffer

The input buffer is handled in circular fashion allowing simultaneous inputting and processing of data. The input buffer accepts up to 1024 bytes before overflowing. As data in the buffer is being processed, additional inputs can be accepted by the unit. Upon receiving a terminator character, the WJ-8712P processes any previous messages in the buffer. When the buffer has less than 16 unused bytes, XOFF is generated. XON is generated when the buffer has less than 16 bytes remaining to be processed.

The input buffer processing starts on the receipt of a terminator (LF). If the communications error flag is set, the buffer contents from the end of the last processed message thru the message terminator is discarded. In the event the buffer is overrun, its contents are discarded. Messages such as XON, XOFF, and ENQ have immediate actions. These commands are processed on receipt and are not buffered. All other incoming data is buffered and processed in the order in which it was received.

4.8.3.2 Output Buffer

The output buffer is handled in circular fashion allowing simultaneous additions and outputting. The transmission of XON/XOFF has priority over data in the output buffer that is awaiting transmission. The ACK/NAK transmission are buffered operations so they stay in time synchronization with query operations. The output buffer holds up to 1024 bytes of data.

SECTION V

CSMA REMOTE CONTROL

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SECTION V

CSMA REMOTE CONTROL

5.1 INTRODUCTION

This section provides information for controlling the WJ-8712P Digital HF Receiver via a CSMA/CD interface. The Carrier Sense Multiple Access with Collision Detection interface (hereafter referred to as a CSMA interface) is a media access method that allows up to 63 devices to be addressed on a common bus interface. To transmit, a controller waits for a quiet period on the medium (that is, no other device is transmitting) and then sends a message in byte-serial form. The controller waits for responses to queries or for Acknowledge (ACK) or Not Acknowledge (NAK) messages before proceeding with the next command or query. Message collisions can occur on a CSMA interface and are more likely when the system hardware limitations are pushed beyond recommendations. The CSMA interface detects these collisions and tries to overcome resulting communications loss. See **paragraph 5.9** for a full description of the behavior of the interface during collision detection.

5.2 CONTROLLING MULTIPLE RECEIVERS VIA THE CSMA INTERFACE

System hardware configuration will dictate the limitations regarding the number of units physically capable of being controlled. For best results, BAE SYSTEMS recommends the following:

Limit the number of bus controllers to one;

Send one command line at a time;

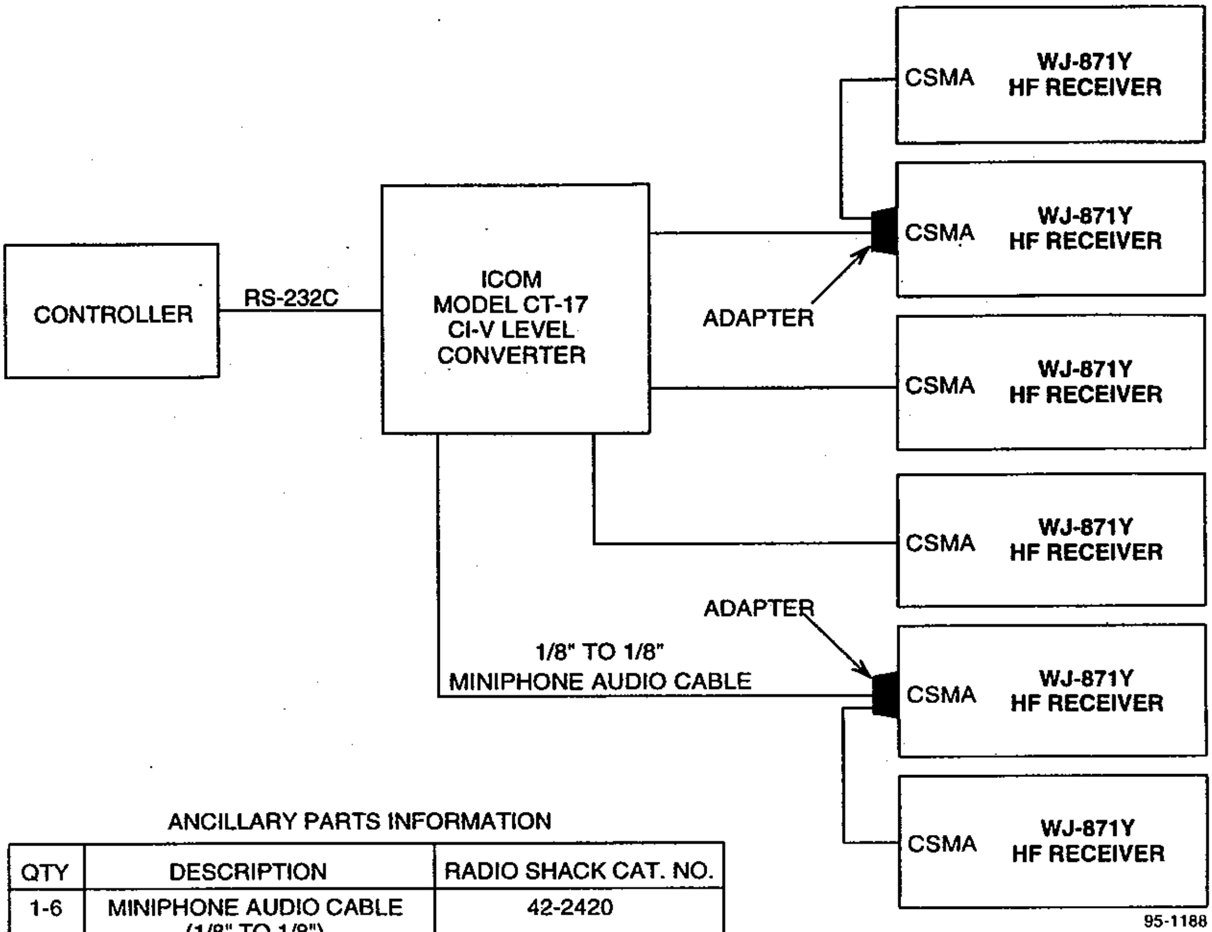
Wait for a response to a query or an Acknowledgment (ACK) or non-Acknowledgment (NAK) of a command before proceeding with the next step;

Do not string commands and queries together on a single command line;

Avoid commands that do not task the receiver to return an ACK/NAK or other response;

Limit the number of devices on the bus;

BAE SYSTEMS recommends the use of a ICOM CT-17 CI-V Level Converter to control multiple receivers via their CSMA interfaces when the controller is a PC equipped with an RS-232 serial interface. Refer to **Figure 5-1**. BAE SYSTEMS has successfully driven up to six receivers by adding audio adapter jacks to extend the four outputs provided by the ICOM CT-17.



ANCILLARY PARTS INFORMATION

QTY	DESCRIPTION	RADIO SHACK CAT. NO.
1-6	MINIPHONE AUDIO CABLE (1/8" TO 1/8")	42-2420
0-2	DUAL MINIPHONE ADAPTER	274-310

Figure 5-1. Recommended Controller Setup

5.3 SETTING UP THE RECEIVER FOR REMOTE CSMA INTERFACE

The WJ-8712P can be set for CSMA remote control by selecting "CSMA" in the remote control entry mode with the SPECIAL FUNCTION key. The baud rate and CSMA address can also be set in entry modes selected with this key. Refer to **paragraph 3.1.15** details on configuring the receiver for remote operation. Switch 4 of DIP switch A2S1 can be set to the on (down) position to activate the CSMA remote control. Baud rate hardware default can also be selected. The CSMA address hardware default can be selected with switch A2S2. The tuned frequency format can be set to four bytes or five bytes with A2S2. It is recommended that the WJ-8712P be set to four bytes. Refer to **paragraph 2.2.4** for details on configuring DIP switches A2S1 and A2S2.

The following receiver parameters are controllable via the CSMA interface:

- local control, remote control, or remote control with local lockout,
- tuned frequency,
- BFO frequency,
- detection mode,
- IF bandwidth,
- gain mode,
- manual gain, and
- RF input path.

This section of the manual contains information necessary to enable an operator to control and monitor the above receiver parameters from an external controller on the CSMA interface. Details on how to properly format and transmit remote messages and how to read responses from the receiver are provided.

Before attempting to operate the receiver remotely, it is recommended that the operator become familiar with the operation and capabilities of the receiver by viewing the information provided in **Section III** of this manual. It is also recommended that the operator become familiar with the operation of the controller by viewing its literature.

5.4 ELECTRICAL REQUIREMENTS OF THE INTERFACE

The CSMA interface is implemented on a mini-phones jack (A2J2) located on the rear panel, labeled CSMA. The sleeve of this connector is connected to chassis to ground. The center conductor carries the bidirectional serial data. For proper communications on the interface, a logic HIGH input should be +2 volts minimum. A logic LOW input should be +0.7 volts maximum. These logic levels are compatible with standard TTL and 5 volt CMOS logic drivers. With appropriate level shifting circuitry, any computer equipped with an RS-232C interface port can be used to control the WJ-8712P via its CSMA interface. To reduce the adverse effects of reflections on the line, resistive terminations are recommended on each end of the interface cable. The DC bias introduced by the terminations must exceed +2.5 volts. A single resistor at each end of the cable, connected between a clean +3 to +5 volt supply and the data line, is usually adequate. Be sure that all devices connected to the CSMA interface have sufficient drive capability to transmit data onto the line. The WJ-8712P CSMA port can sink up to 100 mA at a logic low output voltage of +0.7 volts.

5.5 SERIAL DATA TRANSMISSIONS

Data in serial transmissions is read from the transition of the change in state (i.e., high to low, or low to high). Data transmitters and data receivers connected on the interface exchange serial information using the NonReturn to Zero (NRZ) format. This means, in baseband transmissions, if a logic "1" is continuously sent, the signal does not return to logic "0" until a logic "0" is sent. The composition of one byte of data is shown in **Figure 5-2** with an example of the NRZ format.

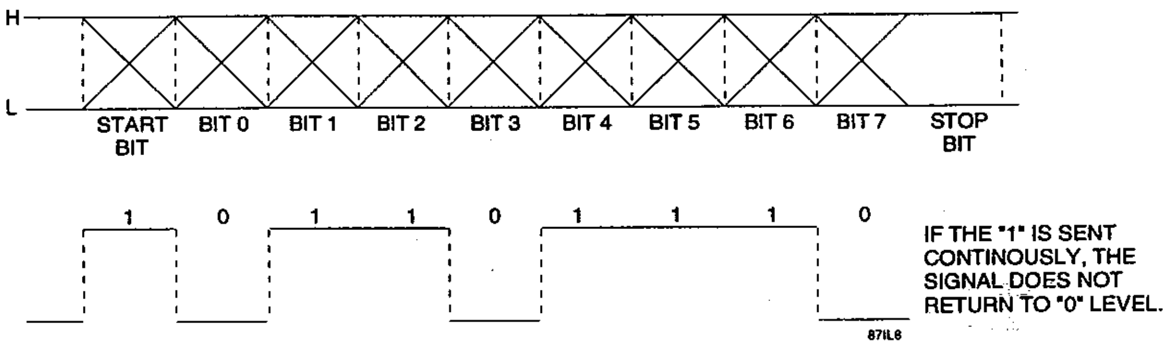


Figure 5-2. Composition of One Byte of Serial Data

5.6 COMMAND MESSAGE FORMATTING

The typical message format of a command packet used with this interface is provided in **Figure 5-3**. Each block in the packet contains one byte of data. As shown in the figure the packet consists of two preamble bytes, a receiving station address byte, a transmitting station address byte, a control code byte, a varying number of data bytes, and an end of message byte. All information contained in bytes is expressed in hexadecimal except for the data bytes which may vary in number and are expressed in packed binary coded decimal (BCD).

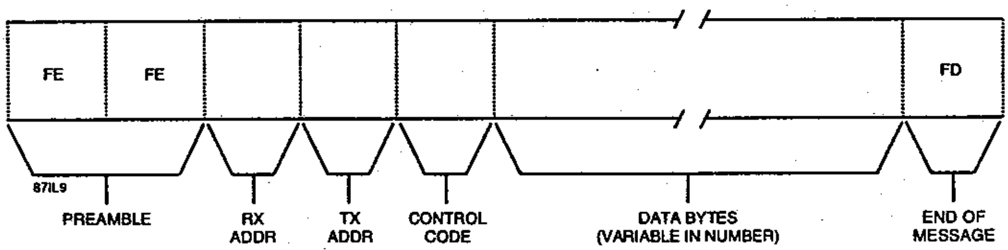


Figure 5-3. Format of Typical Command Message Packet

The preamble [FE|FE] identifies the start of a message. The receiver address (RX ADDR) identifies the address of the unit that is to receive the data. The WJ-8712P's address setting should be entered at this location. The transmitting station address identifies the address of the controller sending the data. The control code represents the WJ-8712P function that is to be controlled. This code should always be sent in hexadecimal format. The variable length data field contains data that accompanies the control code to set certain values of the function. This data field can contain any number of bytes required to send the data. Data in these bytes should always be sent in binary coded decimal format. The end of message byte [FD] identifies the end of the message being transmitted.

5.7 CONTROL CODES

Table 5-1 lists the control codes used for controlling the receiver functions. The control codes listed are shown in hexadecimal format. A description is provided for each control code. Data accompanying control codes is shown in decimal format unless otherwise noted.

Certain control codes require that an acknowledgment be sent to the host controller indicating that their format was valid and accepted. For all control codes that require an acknowledgment, hexadecimal FB (ACK) is returned to the controller when the control code is recognized and the accompanying data is within the specified range. Hexadecimal FA (NAK) is returned to the controller if either the control code sent is unsupported or if the accompanying data sent with a supported control code is out of range. Note that unless otherwise indicated the control code requires an acknowledge. **Figure 5-4** shows the format of ACK and NAK responses.

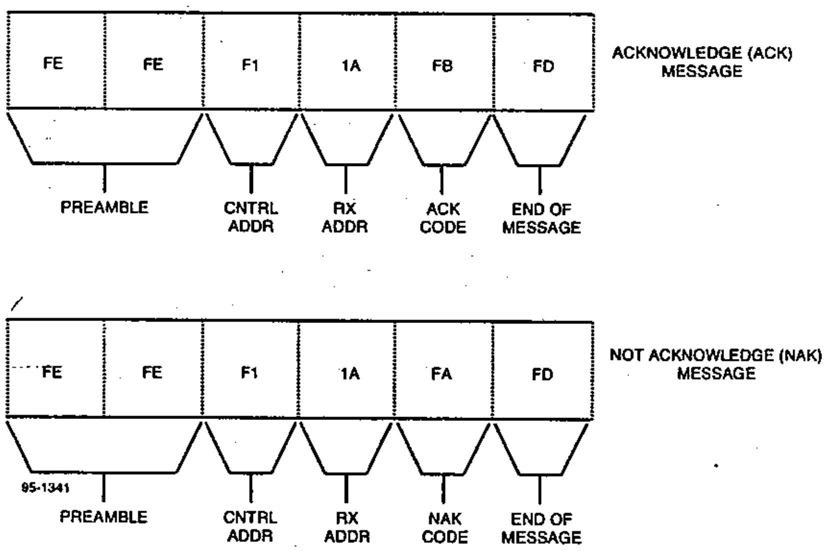


Figure 5-4. Format of ACK and NAK Messages

Table 5-1. CSMA Control Code

Control Code (Hexadecimal)	Description (Decimal)
00	Set the tuned frequency in Hz without acknowledge. Range: 00000000 - 30000000
01	Set the detection mode (first data byte) and IF bandwidth (second data byte) without acknowledge. Where: 00 - LSB 01 - USB 02 - AM 03 - CW 05 - FM 06 - ISB 07 - SAM And: 01 - 0.30 kHz 02 - 1.00 kHz 03 - 3.20 kHz 04 - 6.00 kHz 05 - 16.0 kHz
02	Request the tuned frequency range.
03	Request the tuned frequency.
04	Request the selected detection mode and IF bandwidth.
05	Set the tuned frequency in Hz with acknowledge. Range: 00000000 - 30000000
06	Set the detection mode (first data byte) and IF bandwidth (second data byte) with acknowledge. Where: 00 - LSB 01 - USB 02 - AM 03 - CW 05 - FM 06 - ISB 07 - SAM And: 01 - 0.30 kHz 02 - 1.00 kHz 03 - 3.20 kHz 04 - 6.00 kHz 05 - 16.0 kHz Note: The ISB, LSB, or USB detection modes will force the unit into the 3.20 kHz IF BW.

Table 5-1. CSMA Control Code (Continued)

Control Code (Hexadecimal)	Description (Decimal)
30	Request active gain control mode.
31	Select gain control mode with acknowledge. Where: 00 - Manual 01 - Slow AGC 02 - Fast AGC 03 - Medium AGC
32	Request the remote manual gain level.
33	Set the remote manual gain level with acknowledge. Range: 0000 - 0127
34	Request current BFO frequency.
35	Set BFO frequency in Hz (in 10 Hz steps) with acknowledge. The third data byte contains the sign in hexadecimal (0E for negative and 0A for positive). Range: -8000 to +7999 Where: +0000 = BFO Off
36	Request the device control mode.
37	Set the device control mode with acknowledge. Range: 00 - 02 Where: 00 - Local 01 - Remote 02 - Remote w/Local Lockout
38	Request the selected RF input path.
39	Select the RF input path with acknowledge. Range: 01 - 03 Where: 01 - Normal 02 - Attenuated 03 - Preamplified

5.8 DETAILS ON COMMAND AND RESPONSE FORMATS

The following paragraphs provide examples of command and response formats for each control code listed in **Table 5-1**. In the examples, the receiver's address is assumed to be hexadecimal 1A (decimal 26) and the controller's address is assumed to be hexadecimal F1 (decimal 241). It is also assumed that the tuned frequency format is set to four bytes with A2S2 (**paragraph 2.2.4**).

5.8.1 TUNED FREQUENCY COMMAND WITHOUT ACKNOWLEDGE [00]

Figure 5-5 shows an example of the typical format for setting the receiver's tuned frequency using control code [00]. This control code provides the same result as the [05] code described in **paragraph 5.8.2** except it does not require an acknowledgment. For this reason it is not the preferred method to tune a WJ-8712P.

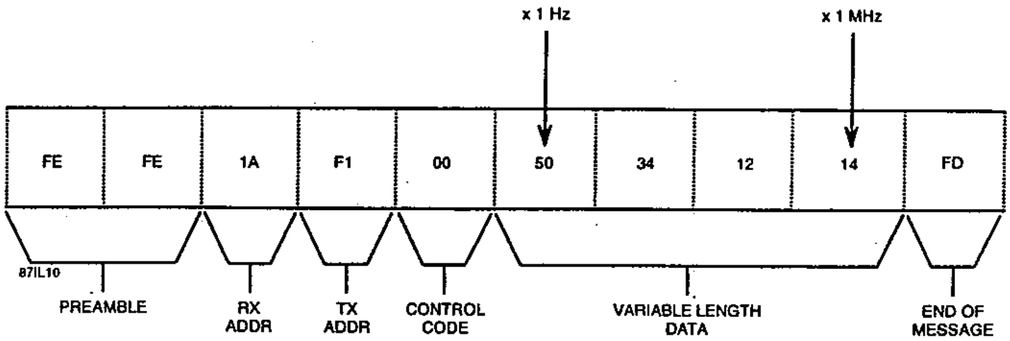


Figure 5-5. Tuned Frequency Command Format without Acknowledge

The frequency can be set to any value from 0 to 30.0 MHz at a resolution of 1 Hz. The frequency entered in the example is 14.123450 MHz. The first byte of the frequency data contains Hz data. The last (fourth) byte contains MHz data. If less than four bytes accompany the frequency control code, only those lower resolution value are changed and the higher resolution values (bytes not sent) remain the same.

5.8.2 TUNED FREQUENCY COMMAND WITH ACKNOWLEDGE [05]

Figure 5-6 shows an example of the typical format for setting the receiver's tuned frequency using control code [05]. This control code provides the same result as the [00] code described in **paragraph 5.8.1** except it requires an acknowledgment to the controller. For this reason it is the preferred method to tune a WJ-8712P.

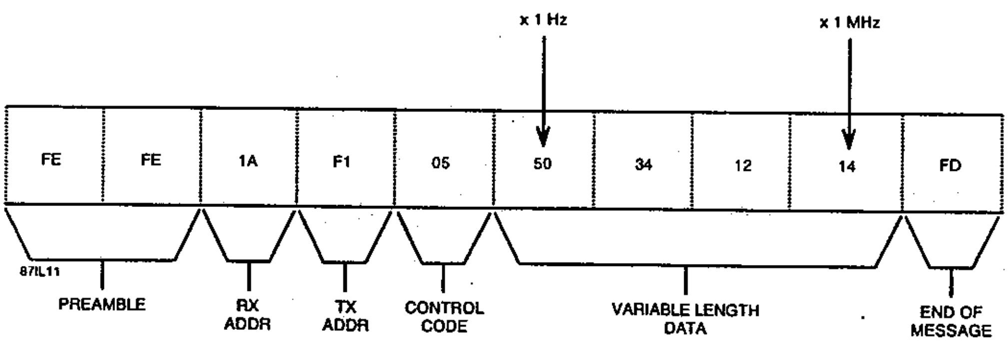


Figure 5-6. Tuned Frequency Command Format with Acknowledge

The frequency can be set to any value from 0 to 30.0 MHz at a resolution of 1 Hz. The frequency entered in the example is 14.123450 MHz. The first byte of the frequency data contains Hz data. The last (fourth) byte contains MHz data. If less than four bytes accompany the frequency control code, only those lower resolution value are changed and the higher resolution values (bytes not sent) remain the same.

5.8.3 RESPONSE TO TUNED FREQUENCY REQUESTS [03]

Figure 5-7 shows an example of the typical response format when requesting the tuned frequency with control code [03].

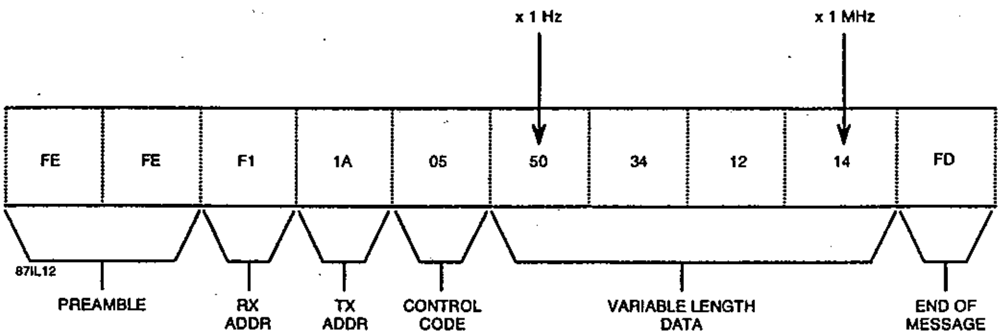


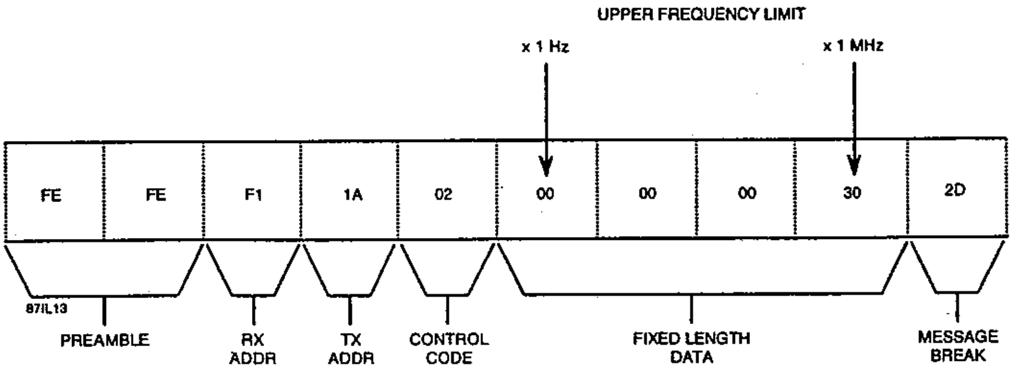
Figure 5-7. Tuned Frequency Request Response Format

The response in the example is 14.123450 MHz. The first byte of the frequency data contains Hz data. The last (fourth) byte contains MHz data. The response always contains all four bytes of the frequency data.

5.8.4 RESPONSE TO TUNED FREQUENCY RANGE REQUESTS [02]

Figure 5-8 shows an example of the typical response format when requesting the tuned frequency range of the receiver with control code [02].

In the response the upper frequency limit and the lower frequency limit are separated with 2D hex. The first byte of the frequency data in each limit of the response contains Hz data. The last (fourth) byte contains MHz data. The upper frequency limit response always contains data representing 30.000000 MHz [00|00|00|30]. The lower frequency limit response always contains data representing 0 Hz [00|00|00|00].



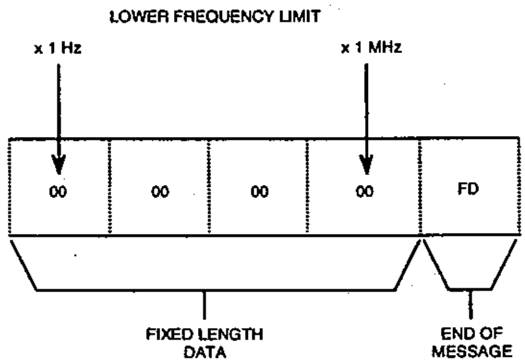


Figure 5-8. Tuned Frequency Range Request Response Format

5.8.5 DETECTION MODE/IF BANDWIDTH COMMAND WITHOUT ACKNOWLEDGE [01]

Figure 5-9 shows an example of the typical format for selecting the receiver's detection mode and IF bandwidth using control code [01]. This control code provides the same result as the [06] command described in **paragraph 5.8.6** except it does not require an acknowledgment. For this reason it is not the preferred method to change IF bandwidth or detection mode.

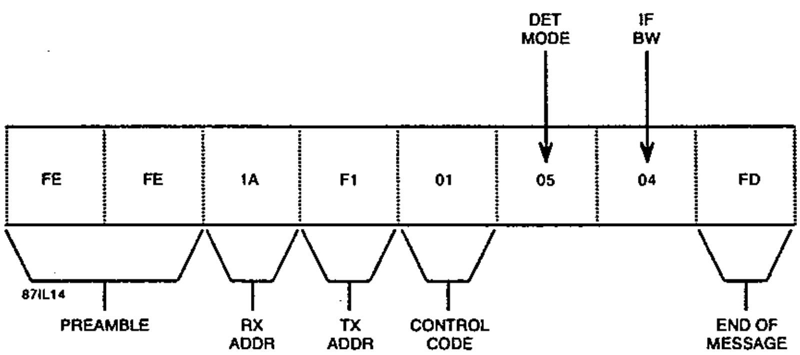


Figure 5-9. Detection Mode/IF Bandwidth Command Format Without Acknowledge

The first byte after the control code contains the detection mode code. The second byte contains the IF bandwidth code. See control code [01] in **Table 5-1** for the detection mode and IF bandwidth choices and their codes. In the example, the FM detection mode is selected with an IF bandwidth of 6.00 kHz. The IF bandwidth byte is ignored when the detection mode byte contains codes for LSB, USB, or ISB detection modes ([00], [01], or [06]). When these detection modes are selected, the IF bandwidth is automatically set to 3.2 kHz [03].

5.8.6 DETECTION MODE/IF BANDWIDTH COMMAND WITH ACKNOWLEDGE [06]

Figure 5-10 shows an example of the typical format for selecting the receiver's detection mode and IF bandwidth using control code [06]. This control code provides the same result as the [01] command described in **paragraph 5.8.5** except it requires an acknowledgment to the controller. For this reason it is the preferred method to change the IF bandwidth or detection mode.

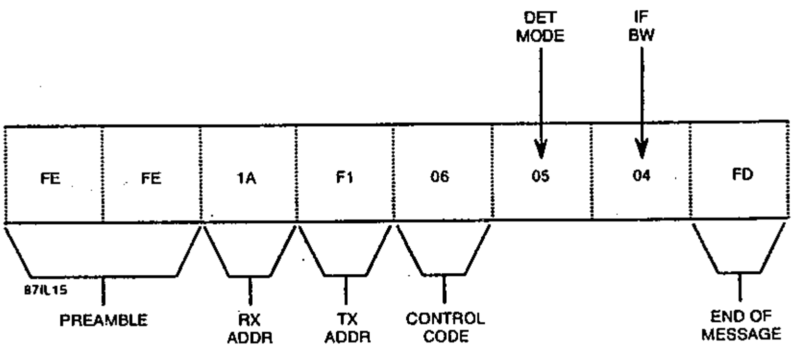


Figure 5-10. Detection Mode/IF Bandwidth Command Format With Acknowledge

The first byte after the control code contains the detection mode code. The second byte contains the IF bandwidth code. See control code [06] in **Table 5-1** for the detection mode and IF bandwidth choices and their codes. In the example, the FM detection mode is selected with an IF bandwidth of 6.00 kHz. The IF bandwidth byte is ignored when the detection mode byte contains codes for LSB, USB, or ISB detection modes ([00], [01], or [06]). When these detection modes are selected, the IF bandwidth is automatically set to 3.2 kHz [03].

5.8.7 RESPONSE TO DETECTION MODE/IF BANDWIDTH REQUESTS [04]

Figure 5-11 shows an example of the typical response format when requesting the receiver's detection mode and IF bandwidth with control code [04].

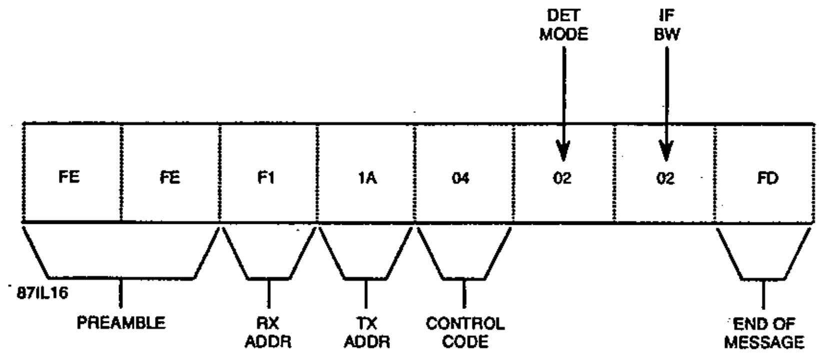


Figure 5-11. Detection Mode/IF Bandwidth Request Response Format

The first byte in the response contains the detection mode code and the second byte contains the IF bandwidth code. The response in the example is the AM detection mode with an IF bandwidth of 1.00 kHz. See control code [01] or [06] in **Table 5-1** for the possible responses for both bytes.

5.8.8 GAIN CONTROL MODE COMMAND WITH ACKNOWLEDGE [31]

Figure 5-12 shows an example of the typical format for selecting the receiver's gain control mode using control code [31]. This control code requires an acknowledgment to the controller.

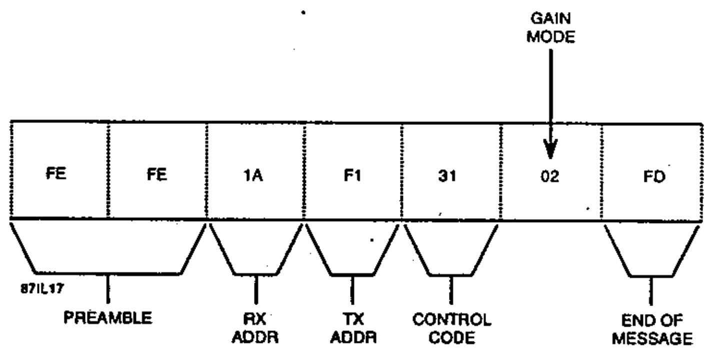


Figure 5-12. Gain Control Mode Command Format

One byte is sent with the control code. In the example, the fast AGC control mode is selected [02]. The selection can also be either slow AGC [01] or manual gain control [00].

5.8.9 RESPONSE TO GAIN CONTROL MODE REQUESTS [30]

Figure 5-13 shows an example of the typical response format when requesting the receiver's active gain control mode with control code [30].

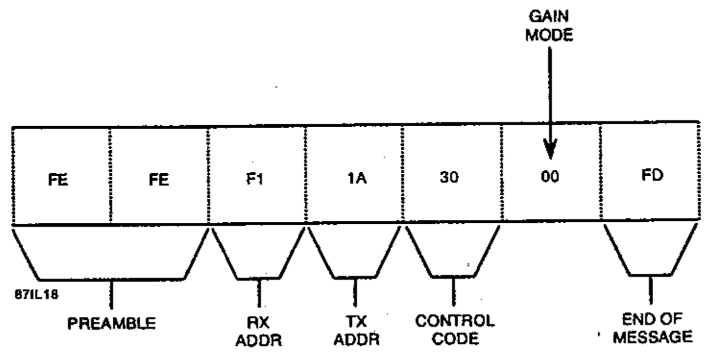


Figure 5-13. Gain Control Mode Request Format

The byte in the response after the control code contains the gain control code. The response in this byte is [00] for manual gain, [01] for slow AGC, or [02] for fast AGC. In the example, manual gain control is the response.

5.8.10 MANUAL GAIN LEVEL COMMAND WITH ACKNOWLEDGE [33]

Figure 5-14 shows an example of the typical format for selecting the receiver's manual gain level using control code [33]. This control code requires an acknowledgment to the controller.

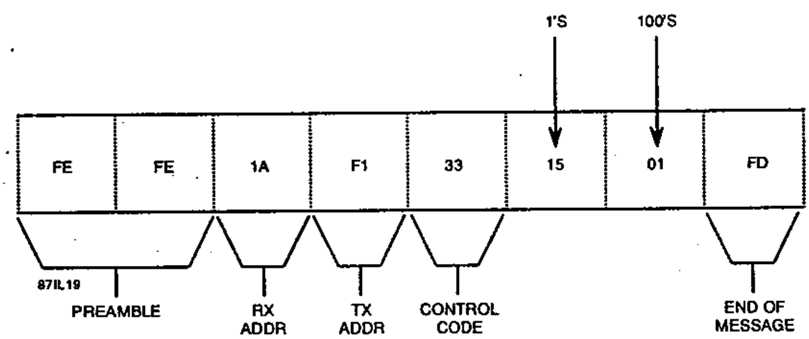


Figure 5-14. Manual Gain Level Command Format

Two bytes are sent with the control code, with the combination of both representing the value. The range is 0000 to 0127 (for 0 to 127 dB). In the example, a manual gain level of 115 dB is selected [15|01].

5.8.11 RESPONSE TO MANUAL GAIN LEVEL REQUESTS [32]

Figure 5-15 shows an example of the typical response format when requesting the receiver's manual gain level with control code [32].

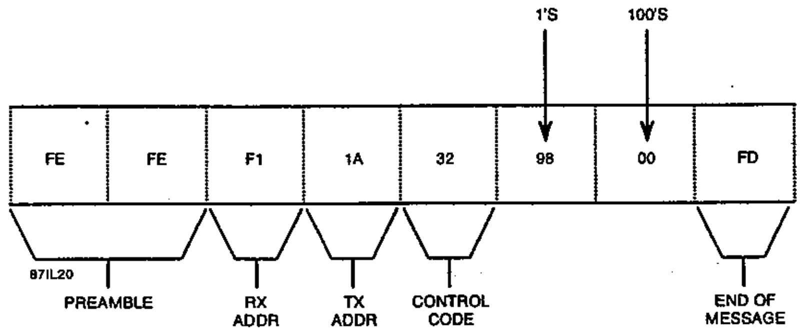


Figure 5-15. Manual Gain Level Request Format

Two bytes in the response following the control code contain the current manual gain level. The combination of the two bytes represent the value in binary coded decimal. The value can be from 0000 to 0127 (or 0 to 127 dB). In the example, the manual gain level response is 98 [98|00].

5.8.12 BFO FREQUENCY COMMAND WITH ACKNOWLEDGE [35]

Figure 5-16 shows an example of the typical format for sending the receiver's BFO frequency using control code [35]. This control code requires an acknowledgment to the controller.

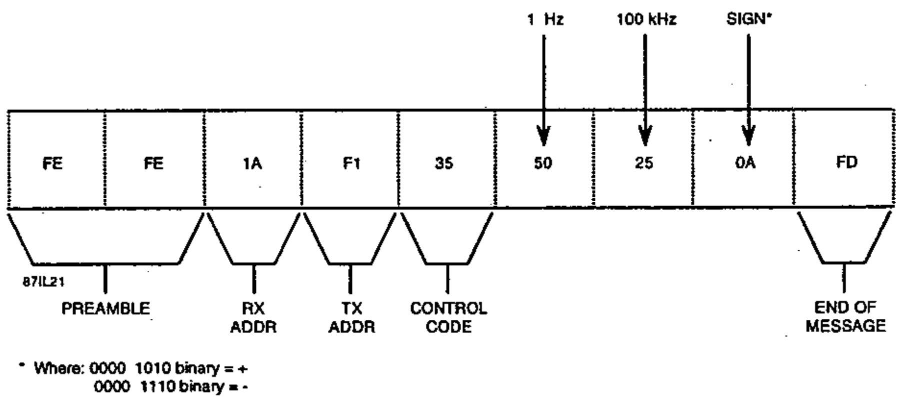


Figure 5-16. BFO Frequency Command Format

The frequency can be set to any value from +7999 to -8000 kHz at a resolution of 10 Hz. Sending +0000 sets the BFO to off. The frequency entered in the example is +2.550 kHz. The first byte of the frequency data contains Hz data. The second byte contains 100-Hz data. The third byte contains the sign, positive (+) or negative (-). For negative BFO frequencies, a hexadecimal value of [0E] should be sent in the third byte. For positive BFO frequencies, a hexadecimal value of [0A] should be sent in the third byte.

5.8.13 RESPONSE TO BFO FREQUENCY REQUESTS [34]

Figure 5-17 shows an example of the typical response format when requesting the BFO frequency with control code [34].

The response in the example is -855 Hz. The first byte of the frequency data contains Hz data. The second byte contains 100-Hz data. The third byte contains the sign, positive (+) or negative (-). A value of [0E] is returned in the third byte of the response when the frequency is a negative value. A value of [0A] is returned when the BFO frequency is positive.

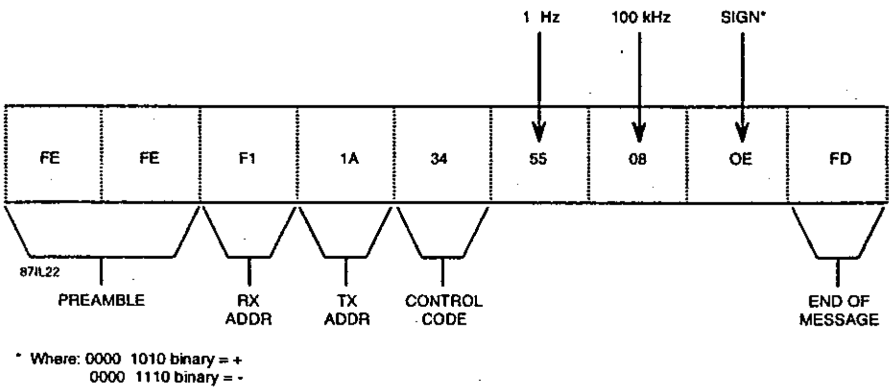


Figure 5-17. BFO Frequency Request Response Format

5.8.14 RF INPUT PATH COMMAND WITH ACKNOWLEDGE [39]

Figure 5-18 shows an example of the typical format for selecting the receiver's RF input path using control code [39]. This control code requires an acknowledgment to the controller.

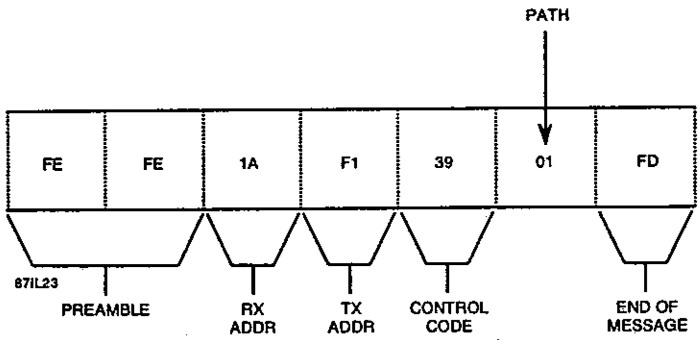


Figure 5-18. RF Input Path Command Format

One byte is sent with the control code. In the example, the normal RF input path is selected [01]. The selection can also be either attenuated [02] or preamplified [03]. The preamplifier is only allowed at tuned frequencies of 0.5 MHz and above.

5.8.15 RESPONSE TO RF INPUT PATH REQUESTS [38]

Figure 5-19 shows an example of the typical response format when requesting the receiver's current RF input path selection with control code [38].

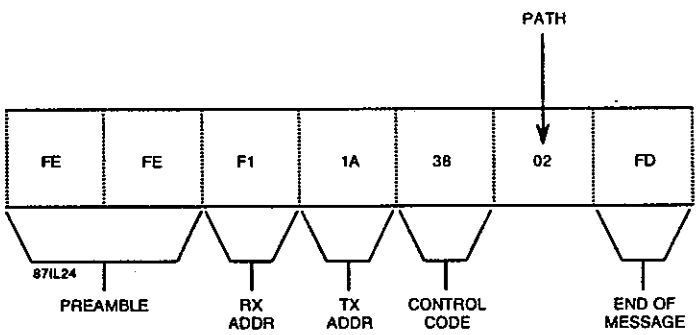


Figure 5-19. RF Input Path Request Response Format

The byte in the response after the control code contains the RF input path code. The response in this byte is [01] for normal, [02] for attenuated, or [03] for preamplified. In the example, the attenuated RF input path is selected.

5.8.16 DEVICE CONTROL MODE COMMAND WITH ACKNOWLEDGE [37]

Figure 5-20 shows an example of the typical format for selecting the receiver's control mode using control code [37]. This control code requires an acknowledgment to the controller.

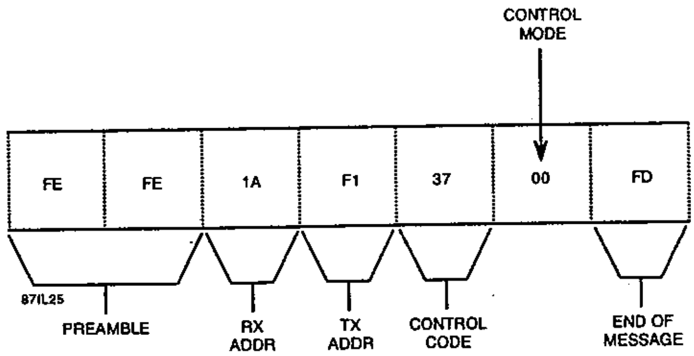


Figure 5-20. Device Control Mode Command Format

One byte is sent with the control code. In the example, the Local control mode is selected [00]. The selection can also be either Remote mode [01] or Remote with Local Lockout [02]. Sending [02] disables the WJ-8712P's front panel REMOTE key (i.e., a local operator cannot place the receiver out of Remote mode).

5.8.17 RESPONSE TO DEVICE CONTROL MODE REQUESTS [36]

Figure 5-21 shows an example of the typical response format when requesting the receiver's current control mode with control code [36].

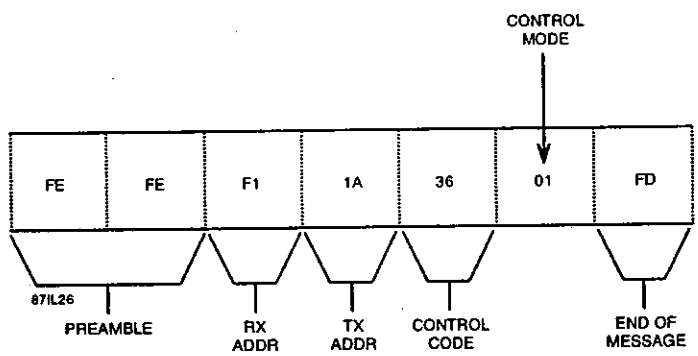


Figure 5-21. Device Control Mode Request Response Format

The byte in the response after the control code contains the device control mode code. The response in this byte is [00] for Local, [01] for Remote, or [02] for Remote with Local Lockout. In the example, the Remote control mode is selected.

5.9 COLLISION DETECTION

Many different data transmitting devices can be connected on the CSMA interface along with the WJ-8712P. Therefore, there is always the possibility that two or more units may want to talk at the same time, causing "data collisions" on the interface.

The WJ-8712P is designed so that it monitors all the messages that it transmits and then compares the monitored data to the transmitted data. If the transmitted data does not match the monitored data, it is assumed that a collision has occurred. The WJ-8712P immediately sends the jammer codes shown in **Figure 5-22**. The WJ-8712P waits for a period of time, checks for an idle interface, and then sends the original response. If another collision occurs, the process is repeated with an increased wait until the message goes through or until the fifth repetition. After five tries (each with an increased wait), the WJ-8712P discards the message. Only when the controller transmits a new message does the process start again. If any device detects the jammer codes, the data that it receives is disregarded.

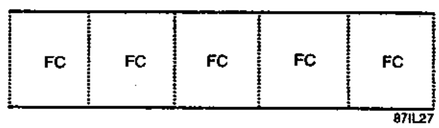


Figure 5-22. Jammer Code

SECTION VI

CIRCUIT DESCRIPTION

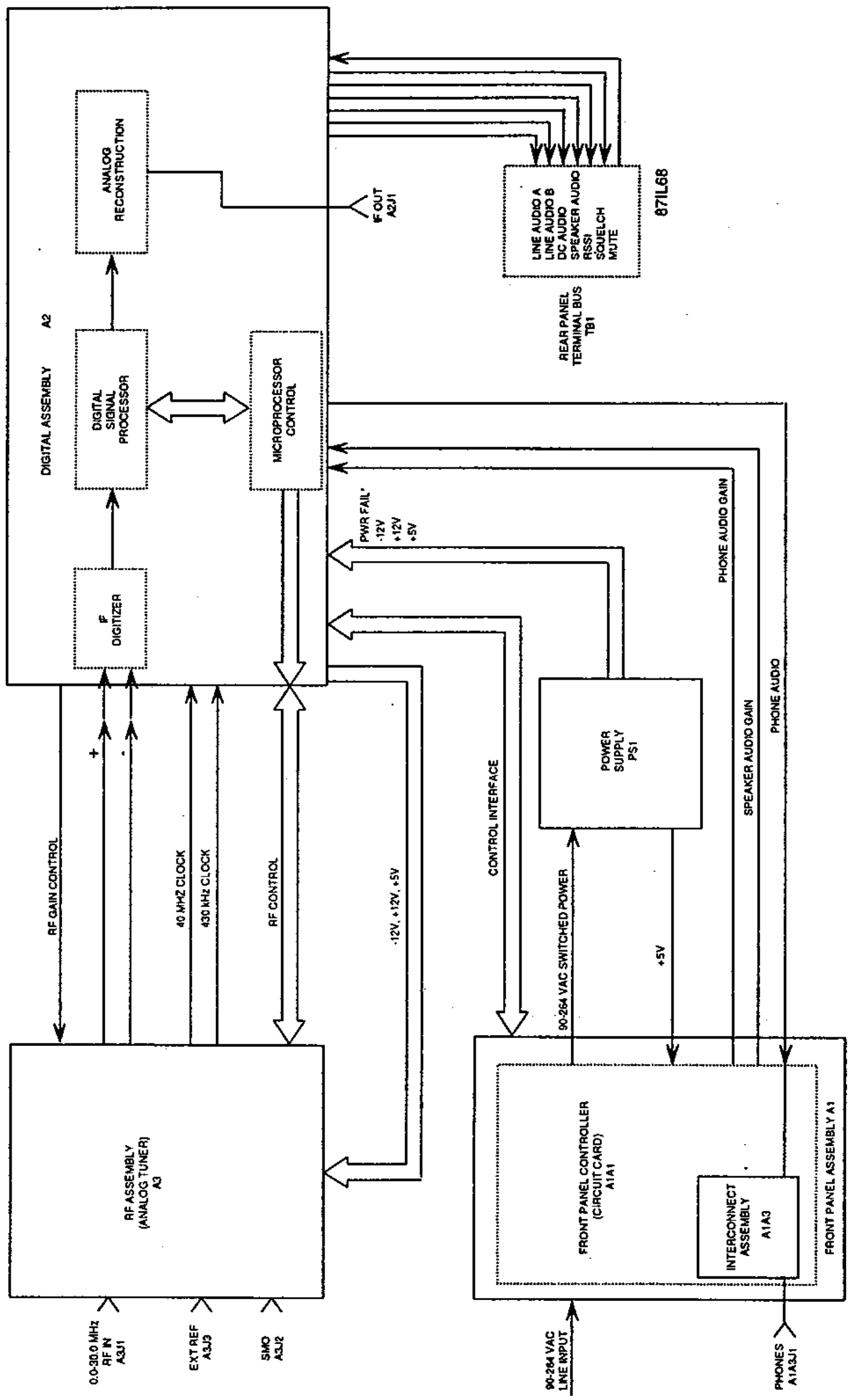


Figure 6-1. WJ-8712P Digital HF Receiver Functional Block Diagram

SECTION VI

CIRCUIT DESCRIPTION

6.1 WJ-8712P DIGITAL HF RECEIVER FUNCTIONAL DESCRIPTION

The WJ-8712P Digital HF Receiver is a Digital Signal Processing (DSP) based receiver, consisting of an analog tuner, an IF digitizer, digital signal processing and analog reconstruction circuitry, and front panel control logic. These operating components are contained on three printed circuit assemblies, consisting of the Type 797006-1 RF Assembly (A3), the Type 797214-1 Digital Assembly (A2), and the Type 797182-2 Front Panel Assembly (A1). These three assemblies and the Type 766028-1 Power Supply Assembly (PS1) comprise the complete DSP-based HF Receiver, as illustrated in **Figure 6-1**. Refer to the functional block diagram in **Figure 6-1** for the following description.

The Type 797006-1 RF Assembly (A3) functions as the analog tuner for the receiver. It performs coarse signal tuning and provides two wide band IF output signals. Three conversion stages contained in this assembly provide tuning throughout the 0 to 30.0000 MHz spectrum, with a coarse tuning resolution of 1 kHz. The RF input from the antenna enters the assembly at the rear panel RF IN connector (A3J1) and, after passing through two and three conversion stages, the tuned signal is translated into two IF outputs, respectively. The first output which is after the second conversion stage is a 455 kHz IF output, having a nominal 30 kHz bandwidth and 1-kHz resolution. It is routed directly to the rear panel Signal Monitor Output connector (SMO, A3J2). This is a 50 ohm wide band output suitable for connection of an external signal monitor. The second output which is after the third conversion stage is a 25 kHz IF output, also having a nominal 30 kHz bandwidth, that is routed to the Type 797214-1 Digital Assembly (A2) for digitizing and further processing. In addition to the 25 kHz IF signal, the RF Assembly provides two clock signals to the Digital Assembly. The 40 MHz and 430 kHz signals, derived from the receiver's local oscillators, are used for signal processing synchronization and analog reconstruction.

Timing and synchronization of the local oscillators in the RF Assembly are maintained by a precision 10 MHz reference oscillator contained on the assembly. In the standard receiver, the internal reference oscillator provides a reference stability of better than 0.7 ppm, which may be optionally upgraded to 0.2 ppm with the WJ-871Y/REF option installed. The RF Assembly reference may also be locked to an external frequency standard by connecting the external 1, 2, 5, or 10 MHz signal at the rear panel EXT REF connector (A3J3). The connection of the external reference is automatically sensed and locks the reference oscillator to the external source.

The Type 797214-1 Digital Assembly (A2) functions as the IF Digitizer, Digital Signal Processor, and Analog Reconstruction circuit for the receiver. It also contains the microcontroller circuitry that maintains control over all receiver operations. The Digital Assembly accepts the 25 kHz IF signal from the RF Assembly, digitizes the signal, and using Digital Signal Processing (DSP) techniques, performs the majority of the signal processing operations required to produce the final outputs. The DSP circuitry on this assembly converts the digitized IF signal from a continuous time domain signal into discrete time samples that can be stored in random access memory and processed digitally to perform a wide range of operations, normally associated with analog circuitry, such as:

- Receiver Fine Tuning to a 1 Hz resolution,
- IF Bandpass Filtering,

- Determination of Input Signal Strength,
- Receiver Gain Control,
- Signal Detection and Demodulation,
- Noise Blanking.

Upon completion of the signal processing, a serial data stream representing the receiver's bandpass filtered IF signal, and the demodulated audio extracted from the tuned signal are routed to the Analog Reconstruction circuitry. The Analog Reconstruction circuitry converts the digital data back to its analog form, separates the audio and IF signals, provides post filtering, and, after completion of the analog reconstruction, provides the final audio and post filtered IF outputs. The reconstructed IF signal is converted up to 455 kHz and is provided at the rear panel IF OUT connector (A2J1) for external use. This 50 ohm output provides the 455 kHz IF at a level of approximately -20 dBm (AGC active), with its bandwidth determined by the operator selected IF bandwidth.

The reconstructed audio is separated into left and right channels and is then directed to the various receiver audio outputs. The phone audio is routed to the front panel PHONE jack (A1A3J1) via the Front Panel circuit card assembly (A1A1) . The audio signal is also provided to the rear panel terminal bus (TB1). The LINE A and LINE B audio outputs are 600 ohm balanced audio outputs, and the SPEAKER output is an unbalanced 8 ohm output. The final audio output is the DC AUDIO, which is a DC coupled, unbalanced, 1 kohm output.

The Type 797214-1 Digital Assembly also contains a microcontroller that provides an interface between an external controlling device and the receiver circuitry. A serial control interface is provided at the rear panel to permit receiver control by an RS-232 compatible computer via A2J3.

Operating power is supplied to all of the assemblies in the WJ-8712P Receiver by the Type 766028-1 Power Supply Assembly (PS1). This assembly accepts the incoming line voltage and converts it to the DC voltages required for proper receiver operation. It accepts an AC input ranging between 90 and 264 VAC and provides the -12 V, +12 V, GND, and +5 V outputs to the operational assemblies.

6.2 CIRCUIT DESCRIPTIONS

6.2.1 TYPE 797006-1 RF ASSEMBLY, (A3)

The Type 797006-1 RF Assembly (A3) functions as the RF tuner for the WJ-8712P Digital HF Receiver. It receives a 0 to 30.0000 MHz input spectrum from the RF signal source and provides RF tuning to extract the signal of interest from the input spectrum. The signal of interest is converted to 455 kHz and 25 kHz IF signals that are provided as outputs for further processing. Refer to the Type 797006-1 RF Assembly Block Diagram in **Figure 6-2** as a reference for the following module description. For a more detailed illustration of the RF Assembly circuitry, refer to the Type 797006-1 RF Assembly schematic diagram, **Foldout FO-7**.

The RF Assembly consists of an RF Input circuit, three Mixing stages for signal conversion, a highly stable reference generator, and three local oscillators. These module sections interconnect as illustrated in **Figure 6-2** to produce the required outputs.

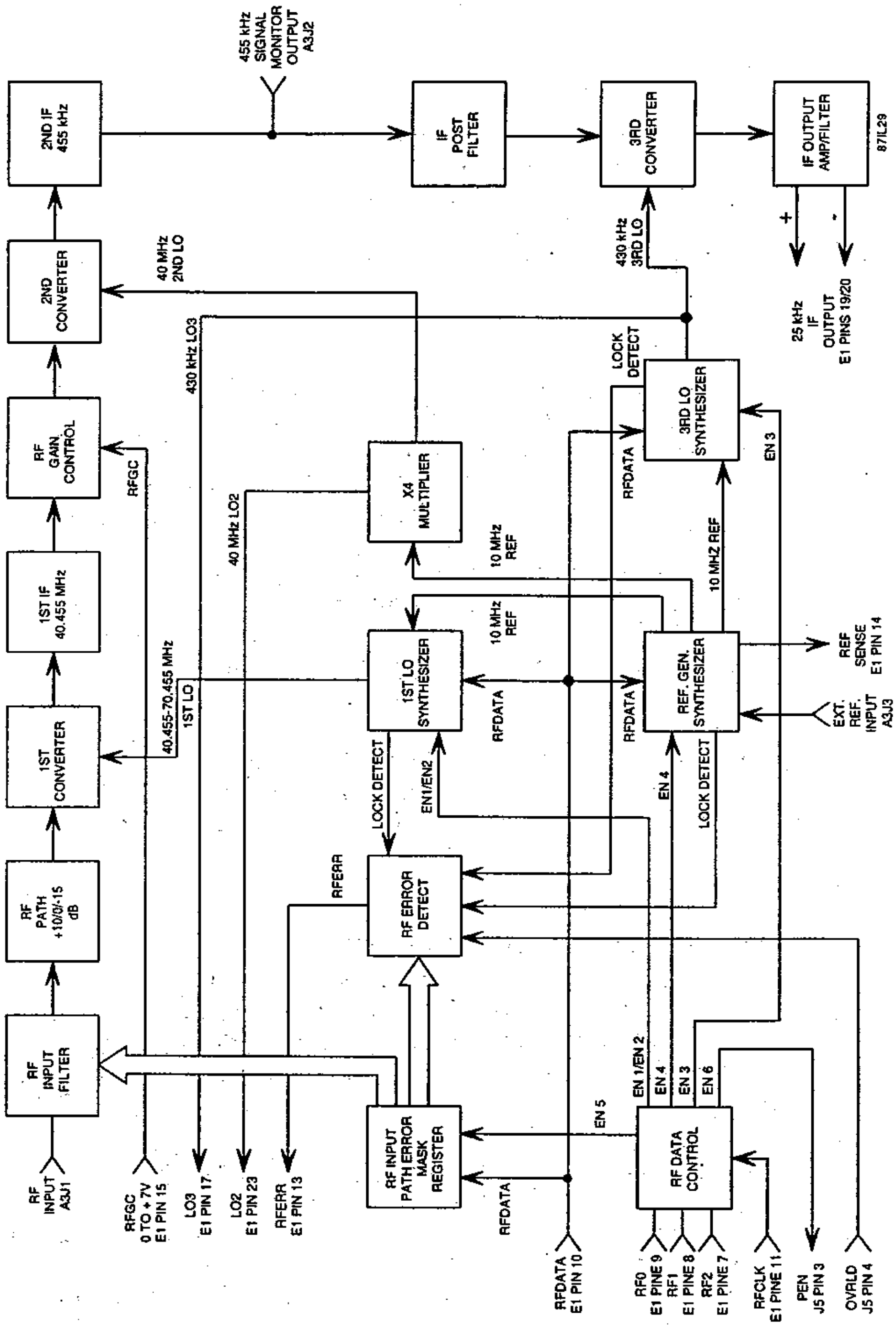


Figure 6-2. Type 797006 RF Assembly Block Diagram

The reference generator uses a phase-locked-loop synthesizer to control a temperature compensated, voltage controlled crystal oscillator, producing a highly stable 10 MHz reference signal that is used as the time base for the receiver. In the standard receiver, using the Type 797006-1 or 797006-3 RF Assembly, the stability of the reference is .7 ppm. Where greater stability is required, the optional Type 797006-2 and 797006-4 assemblies provide 0.2 PPM stability. Additionally, the reference generator may be locked to an external reference by connecting an external 1, 2, 5, or 10 MHz reference signal, at a level of 200 mV rms, at the rear panel EXT REF connector (A3J3). When an external input at one of the specified frequencies is present at this input, its presence is automatically sensed, and the internal 10 MHz reference generator phase-locks to the external signal. The phase-locked internal 10 MHz reference is then provided as the time base for the 1st, 2nd, and 3rd local oscillators.

The 1st LO circuit is a translation oscillator, comprised of the 1st LO VCO, a coarse tuning phase-locked-loop synthesizer, and a fine tuning phase-locked-loop synthesizer. The combined circuitry produces the variable 1st LO output, used to provide signal tuning. The output ranges from 40.455 MHz to 70.455 MHz for tuned frequencies ranging from 0.0000 to 30.0000 MHz, respectively. This output is provided to the first mixer (U28) to produce a 40.455 MHz 1st IF.

The 2nd LO circuit produces a fixed 40 MHz output. It is produced by multiplying the 10 MHz reference signal by a factor of four. The 40 MHz output is then provided to the 2nd mixing stage (U30) to produce 455 kHz 2nd IF. The 40 MHz 2nd LO is also provided to the Digital Assembly for use as the time-base for the control microprocessor and analog to digital conversion circuitry. This signal is output via pin 23 of connector A3E1 (LO2).

The 3rd LO circuit uses a phase-locked-loop synthesizer, locked to the 10 MHz reference, to produce the fixed 430 kHz 3rd LO signal. This 430 kHz signal is provided to the 3rd mixing stage (U31) to produce the 25 kHz 3rd IF. The 430 kHz 3rd LO signal is also directed via pin 17 of A3E1 to the Digital Assembly. It is used in the Digital Assembly for analog reconstruction of the IF signal for output to the rear panel IF OUT (A2J1).

The RF/IF signal path accepts the 0 to 30.0000 MHz input spectrum, provides input filtering, and using multiple conversion stages, produces the 455 kHz and 25 kHz IF outputs. The signal enters the assembly via the 50 ohm RF IN rear panel connector (A3J1). The signal passes through a lowpass input roofing filter, having a nominal 32 MHz cutoff frequency. This permits the 0.5000 to 30.0000 MHz HF spectrum to pass while attenuating signals above the receiver tuning range. The input filtering provides improved IF and image frequency rejection. Beyond the 32 MHz cutoff frequency, the filter response drops sharply, providing approximately 80 dB of ultimate attenuation. The filtered RF input is then directed through a selectable front end gain/attenuation control circuit, providing three operator selectable front end settings. It permits the operator to route the signal directly to the 1st conversion stage, or, depending on signal conditions, introduce front end gain or attenuation. In the NORMAL mode, the signal is passed directly through this circuit with no effect on signal amplitude. Under weak signal conditions, the +10 dB gain path provides 10 dB of signal amplification. The third signal path is for extremely strong signal conditions. The -15 dB selection passes the signal through a 15 dB resistive pad to reduce the signal entering the receiver front end. This attenuation pad is capable of dissipating up to 1 watt to provide protection at the receiver input.

The 1st stage of conversion consists of a high intercept mixer that mixes the RF spectrum with the 1st LO signal, ranging from 40.455 MHz (0.0000 MHz Tuned Frequency) to 70.455 MHz (30.0000 MHz Tuned Frequency). The mixer output is amplified and bandpass filtered to select the 40.455 MHz difference frequency. The 1st IF filter provides a 30 kHz bandpass, centered at 40.455 kHz.

After IF filtering and amplification, the 40.455 kHz IF signal is directed to the second conversion stage, via a voltage controlled attenuator. This circuit provides control over the amplitude of the signal to the proper output level, preventing overloading of the analog to digital converter stage in the Digital Assembly. The RF GAIN input at pin 15 of connector E1 is provided by the control processor in the Digital Assembly (A2). It is the result of the DSP microprocessor sampling the value of the signal level after digitization. This voltage ranges from 0 to +7 V, providing approximately 60 dB of gain control. This voltage is strictly dependent on the signal level and is independent of the receiver's AGC or manual gain setting.

The 2nd conversion stage mixes the signal with the fixed 40 MHz 2nd LO signal, producing the 455 kHz 2nd IF. After filtering to remove the undesired mixing products, the IF signal is split into two paths. The first path directs the 455 kHz IF out to the rear panel Signal Monitor Output (SMO) connector (A3J2). This provides a 50 ohm output at a level of approximately 30 dB greater than the RF Input at the RF IN connector (A3J1). The Signal Monitor Output bandwidth is approximately 30 kHz wide.

The second signal path for the 2nd IF signal is through the third stage of conversion. The signal is mixed with the 430 kHz 3rd LO signal, producing the 25 kHz 3rd IF signal. After filtering, the 25 kHz IF is output, via pins 19 and 20 of connector E1, to the Digital Assembly for digitization and further processing. It is a differential output, having a level approximately 53 dB greater than the RF input. The bandwidth is approximately 25 kHz.

All control over the operation of the Type 797006-1 RF Assembly is performed by the Digital Assembly via pins 7 through 15 of connector A3E1. Connector E1 pin 15 provides a 0 to +7 V level, controlling the gain of the RF signal path. It is the result of sampling of the IF signal level after digitization. The remaining pins are used for monitoring the RF Assembly operation and sending control data for tuning and setting RF front end Gain/Attenuation selection.

The PRE/OPT (pin 12), RF ERR (pin 13), and REF SENSE (pin 14) are all outputs from the RF assembly to the Digital Assembly. They provide the control microprocessor with the operating status. The PRE/OPT line (pin 12) indicates when the WJ-8712P/PRE optional Preselector is installed in the receiver. When the optional preselector assembly is present, it sets this line to logic "1", indicating to the control microprocessor that it must send preselector control data whenever the receiver is tuned. If the option is not installed, the PRE/OPT line is held at logic "0".

The REF SENSE line (pin 14) provides an indication when an external reference is connected at the rear panel EXT REF connector (A3J3). When an external reference is connected, it causes this line to assume a logic "0" condition. The control microprocessor then tunes the reference phase-locked-loop synthesizer to each of the allowable reference input frequencies, until the reference synthesizer locks on external input. If no external reference is present, the REF SENSE line remains at logic "1" and the internal reference provides the receiver time-base.

The RF ERR line (pin 13) provides the control microprocessor with an indication of the operating status of the phase-locked-loop synthesizers in the RF assembly. When the optional preselector is installed in the receiver, this line also monitors the overload protection circuitry in the preselector and activates this line during signal overload conditions. The synthesizer lock lines of the Reference, 1st LO and 3rd LO synthesizers are ORed together, along with the preselector overload line. Any synthesizer unlock or signal overload condition causes this line to assume a logic "0" condition. Once flagged by the RF ERR line, the microprocessor individually masks each of the RF ERR controlling inputs to determine the error source and reports the appropriate error condition.

Control of the RF assembly is provided via the RF0, RF1, RF2, RF DATA, and RF CLK lines (pins 7 through 11). The RF DATA line (pin 10) carries serial data from the control microprocessor to the various controlled circuits in the RF and optional Preselector Assemblies. The data is sent as a series of 8-bit data words synchronized with the data clock present on the RF CLK line (pin 11). The RF DATA line is shared by six controlled circuits each of which acts on the data only when instructed by the microprocessor via the RF0, RF1, and RF 2 control lines. These lines determine the destination of the data. **Table 6-1** lists the states of the data control lines and the associated data.

Table 6-1. RF Data Control

RF2	RF1	RF0	Strobe	Data Type
0	0	0	EN1	1st LO Fine Loop Tuning Data.
0	0	1	EN2	1st LO Coarse Loop Tuning Data.
0	1	0	EN3	3rd LO Tuning Data.
0	1	1	EN4	Reference Oscillator Tuning Data.
1	0	0	EN5	BITE/NORM/PREAMP/ATTEN Data.
1	0	1	EN6	Optional Preselector Band Select Data.

6.2.2 TYPE 797214-1 DIGITAL ASSEMBLY, (A2)

The Type 797214 Digital Assembly (A2) consists of three major operating sections: the Control and Interface section; the Digital Signal Processing section; and the Reconstructed Analog Section. These sections perform the IF digitization, Digital Signal Processing, Analog Reconstruction, and Receiver Control functions associated with the operation of the WJ-8712P Digital HF Receiver. The assembly also provides an interface with an external computer, or other external controlling devices, and performs the control and monitoring functions that direct the receiver operation. Refer to the Type 797214 Digital Assembly Block Diagram in **Figure 6-3** as a reference for the following assembly description. For a more detailed illustration of the Digital Assembly circuitry, refer to the Type 797214 Digital Assembly Schematic Diagram, **Foldout FO-6**.

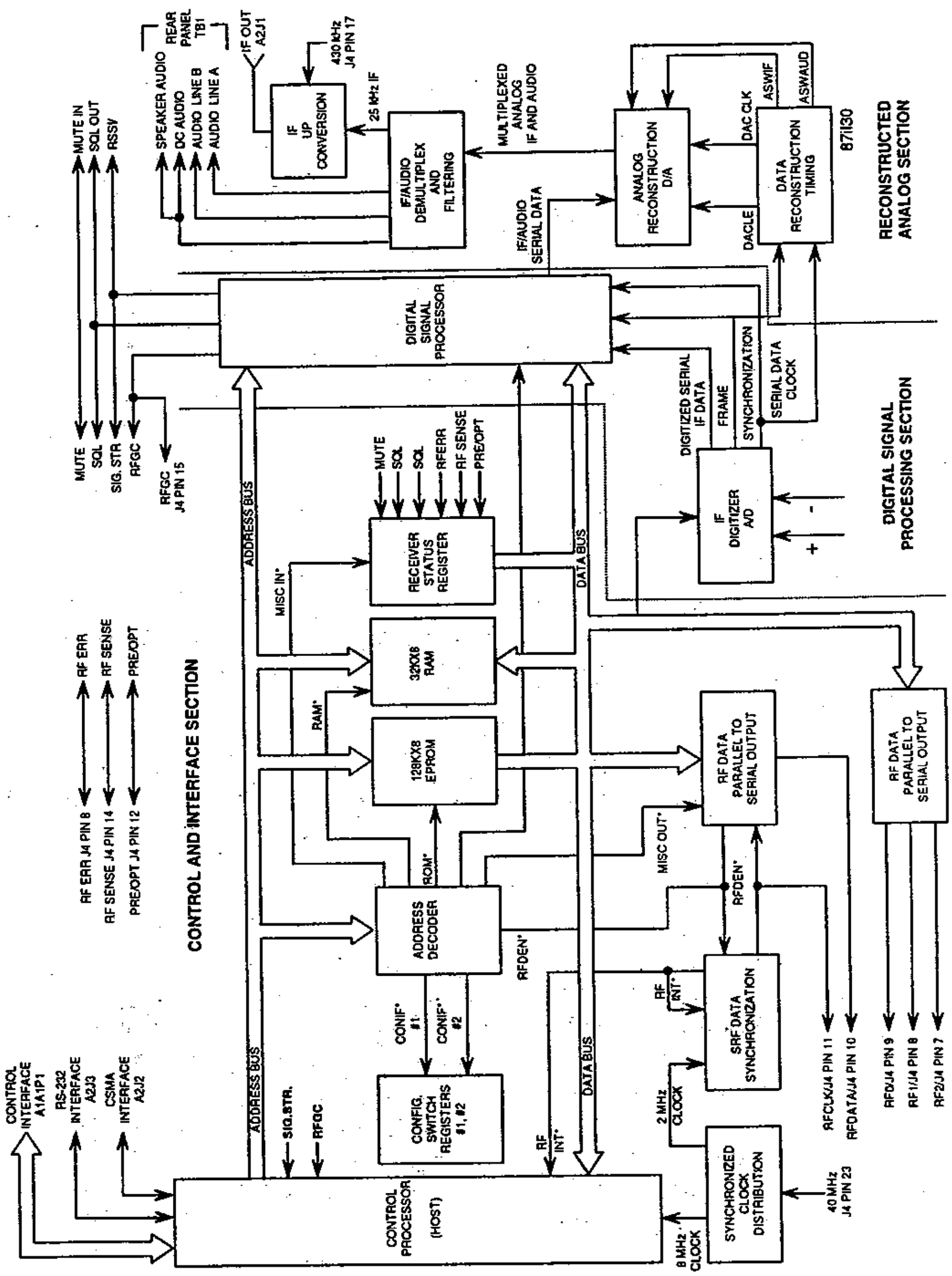


Figure 6-3. Type 797214 Digital Assembly Functional Block Diagram

Under the direction of the Control and Interface section, the Digital Signal Processing section takes the analog IF signal supplied by the RF Assembly, digitizes it, and processes the digitized signal data to extract the signal intelligence. Other than the signal tuning performed by the RF Assembly, the Digital Signal Processing section performs all of the receiver functions that ultimately produce the final outputs. The 25 kHz IF input enters the Digital Assembly at pins 19 and 20 of J4. This differential input has a 25 kHz bandwidth, and ranges in level from approximately .1 to .7 V peak-to-peak at each of the input pins. The signal is directed into the IF Digitizer where the analog signal is converted into digital data that can be read by the Digital Signal Processor. A 12.8 MHz clock, provided by synchronized clock distribution circuitry in the Control and Interface section provides the timing for the analog-to-digital conversion. It causes the signal to be sampled at a 100 kHz rate, producing a series of data frames, each representing one sample of the analog input. Each frame is made up of 32 data bits, 16 of which contain the digitized IF sample. The samples are provided to the DSP circuitry where the continuous time domain signal samples are converted into discrete time samples for continuous processing. Using this data, the Digital Signal Processor, digitally performs fine tuning to a 1 Hz resolution, IF bandwidth filtering, signal strength calculations, signal demodulation, noise blanking, and receiver gain control.

The outputs from the Digital Signal Processing section consists of serial data containing a digital representation of the receiver's IF (limited to the selected IF bandwidth), and detected audio, multiplexed into a single data stream. This data is routed to the Reconstructed Analog section where the signals are separated, converted back to analog signals, and output to the rear panel of the receiver. It also provides analog and digital outputs to the Control and Interface section, and to the rear panel terminal bus (TB1) for monitoring. The Squelch output line at the rear panel provides a logic level that indicates to external equipment if a tuned signal exceeds the programmed Squelch level. It is set to logic "0", whenever a tuned signal exceeds the programmed level. The signal strength output is provided at the rear panel terminal bus as the RSSI output line. It is an analog voltage ranging from 0 to +5V, representing the strength of the received signal. These outputs are also provided to the Control and Interface section for monitoring. Additionally the Digital Signal Processing section provides an RF gain control output to the Type 797006-1 RF Assembly (A3). This output is a result of the DSP sampling the signal level at the input to the IF Digitizer. It controls the gain of the RF section to prevent the signal from over driving the input of the IF Digitizer. The voltage ranges from approximately +7.0 V with no signal present to 0 V with strong signals present.

The Reconstructed Analog section receives the Digitized IF and audio data from the Digital Signal Processing section and converts the signals back to analog form for output. In addition to the serial data, the Digital Signal Processing section provides frame synchronization and serial data clock signals for timing of the data transfer. These timing signals permit the Reconstructed Analog section to demultiplex the signals into separate IF and audio signals. The reconstructed IF signal, converted back to a 25 kHz analog IF, is mixed with a 430 kHz local oscillator signal from the RF Assembly (A3), provided via pin 17 of J4. This mixing process up-converts the IF signal to 455 kHz. The signal is then provided to rear panel connector A2J1. This 50 ohm output provides a 455 kHz IF output, limited in bandwidth to the selected IF bandwidth. The level is approximately -20 dBm when loaded into 50 ohms.

The reconstructed audio is filtered and routed to the rear panel terminal bus as the Line A and Line B audio outputs. These are 600 ohm balanced outputs for use with external audio monitoring devices. A DC Audio output is also provided at the rear panel terminal bus. It is an unbalanced, DC coupled audio output. The final audio output is provided to the front panel PHONE jack, via the Type 797182-2 Front Panel Assembly (A1).

The Control and Interface Section directs the operation of the Type 797006-1 RF Assembly (A3) and it directs the operation of the functions performed by the Digital Signal Processing Section, contained on this assembly.

The heart of the Control and Interface Section is the 68HC11 microcontroller. It continuously monitors the receiver functions and provides control data to direct its operation. On receiver power up, the control processor enters into a power up routine that checks the two banks of configuration switches to properly configure the external control interfaces for communication with external controlling devices, and it performs a built-in-test (BITE) operation to verify proper operation of key receiver parameters. Once the configuration and testing have been completed, the microcontroller then directs control data to the RF Assembly and the Digital Signal Processing section to set the receiver parameters for operation. The communication with the Digital Signal Processing section is via the microcontroller's address and data buses. It consists of data that determines the parameters that the Digital Signal Processor uses in processing of the tuned signal.

The transfer of control data to the RF section is performed through a ribbon cable connected at J4. This data (RF DATA) is transferred serially as a sequence of 8-bit data words, via J4 pin 10, and provides the data to five control registers in the RF Assembly that: phase locks the receiver time base; tunes the RF Assembly to the desired frequency; and selects the NORMAL, PREAMPLIFIED, or ATTENUATED RF Input Path. Three control lines (RF0, RF1, and RF2) are set as each data word is transferred, determining the destination of the data after it reaches the RF Assembly. These control lines form a three bit address via pins 9, 8, and 7 of J4, respectively, which are decoded by the RF Assembly to properly direct the data transfer (refer to **Table 6-1**). The RF DATA, and the RF0, RF1, and RF2 Control lines are synchronized with the RF clock (RFCLK), J4 pin 11. This is a sequence of 8 bit clock bursts that provide timing for the data transfer.

Three status lines, provided via connector J4, are monitored by the Control Section to determine the operating status of the RF assembly. They are routed to a receiver status input register, and are checked periodically to verify proper operation and to determine if any control action is to be taken. The RFERR status line provides a logic level to notify the Control section if an error condition occurs. With an external reference connected to the receiver rear panel, and, with all of the phase-locked-loop synthesizers in the RF Assembly locked and operating normally, the RFERR line provides a constant logic "1". If any of the synthesizers fail, the unlocked synthesizer causes a logic "0". If no external reference is connected to the receiver rear panel, the internal reference is active, and logic "0" pulses occur at intervals of approximately 8 msec. Also, if the receiver is equipped with the RF Preselector option, a signal overload will result in a logic "0" on the RFERR line.

The Control and Interface section timing is synchronized with the receiver's time base by a 40 MHz signal, provided by the RF Assembly via J4 pin 23. This signal enters the synchronized clock distribution circuitry of the Control and Interface section, where it is used to generate an 8 MHz clock for the microcontroller, a 2 MHz clock to provide timing for transferring control data to the RF Assembly, and the 12.8 MHz clock for timing of the analog-to-digital conversion in the IF digitizer.

Two methods of control of the receiver operation are supported by the Control and Interface section. The RS-232 interface provides a communications link from the microcontroller to a 25 pin RS-232 connector at the receiver rear panel (A2J3). This is a three wire configuration that permits talk and listen capabilities, using RS-232 levels. The second form of receiver control is via the Control Interface output (A2J7). This interface is routed to the Front Panel Assembly (A1) via a 24 conductor ribbon cable attached to A1A1E1.

6.2.3 TYPE 797182-2 FRONT PANEL ASSEMBLY (A1)

The Front Panel Assembly (A1) provides the man/machine interface for the WJ-8712P Digital HF Receiver. The Type 797182-2 Front Panel Assembly (A1) consist of a power switch assembly (S1) with a power on indicator (DS1), a Frequency Encoder (U1), a Keypad (U2), a Front Panel Controller Assembly (A1A1), a Front Panel Display Assembly (A1A2), and an Interconnect Assembly (A1A3).

The Front Panel Controller Assembly (A1A1) contains a microcontroller and the associated decoding and driving circuits to act as an interface between the Front Panel Assembly and the Digital Control Assembly (A2), the Front Panel Display Assembly (A1A2), and the Interconnect Assembly (A1A3). The Front Panel Display Assembly (A1A2) contains four 5-by-5 dot matrix displays, eight 7-segment displays, and all receiver status LEDs for monitoring of receiver settings. The Interconnect Assembly contains an encoder (EDIT control knob), the front panel headphone jack, and the PHONE volume control knob.

The following paragraphs provide further details on the Front Panel Assembly including the Front Panel Controller (A1A1), the Front Panel Display (A1A2), and the Interconnect Assembly (A1A3). Refer to **Figure 6-4**, Front Panel Assembly Functional Block Diagram, during the following discussion. For a more detailed illustration of the Front Panel Assembly (A1) and the Interconnect Assembly (A1A3) see schematic diagram **Foldout FO-3**. For schematic diagrams of the Front Panel Controller Assembly (A1A1) and the Front Panel Display Assembly (A1A2), see **Foldout FO-4** and **Foldout FO-5**, respectively.

The Front Panel Controller Assembly's control processor (A1U1) is connected directly to the Digital Control Assembly (A2) via octal buffer A1U5. The two microcontrollers operate in a Master/Slave configuration, where the Master controller is on the Digital Assembly (A2). A full duplex serial data path is provided by the MOSI (Master-Out-Slave-In) and the MISO (Master-In-Slave-Out) lines, on connector A1E1 pins 6 and 7, respectively. Any operation performed on the front panel such as adjusting of one of the two encoders or pressing a front panel key, causes the front panel controller to assert the Front Panel interrupt (FPINT*) signal at A1E1 pin 9. The master control processor of the Digital Control Assembly (A2) responds by reading the registers of processor A1U1 and asserting the Front Panel Acknowledge (FPACK*) signal at A1E1 pin 8. Front panel keypad U2, when pressed, supplies the control processor (A1U1) the required instruction via the KEYROW bus [00:03], while the frequency tune encoder supplies the new tuning information via A1J3 through buffer A1U2 and latches A1U3 and A1U4. When the receiver is performing an operation under the control of the Digital Control Assembly's control processor such as sweeping or scanning, the frequency data is fed to the front panel slave processor via the MOSI data line.

EPROM A1U10 contains the front panel control software for the receiver. Once a front panel change is detected (FPINT* active low), the control processor supplies the new information via the Data bus to segment latches A1U14 and A1U15, and digit latch A1U16. The segment latch outputs are input to segment drivers A1Q1 through A1Q16, whose outputs are routed to the Front Panel Display Assembly connector A2J1 via A1J8. Similarly, the digit latch output from A1U16 is supplied to drivers A1U25 and A1U26, providing the digit select signals to the Front Panel Display Assembly (A2) at connector A2J1.

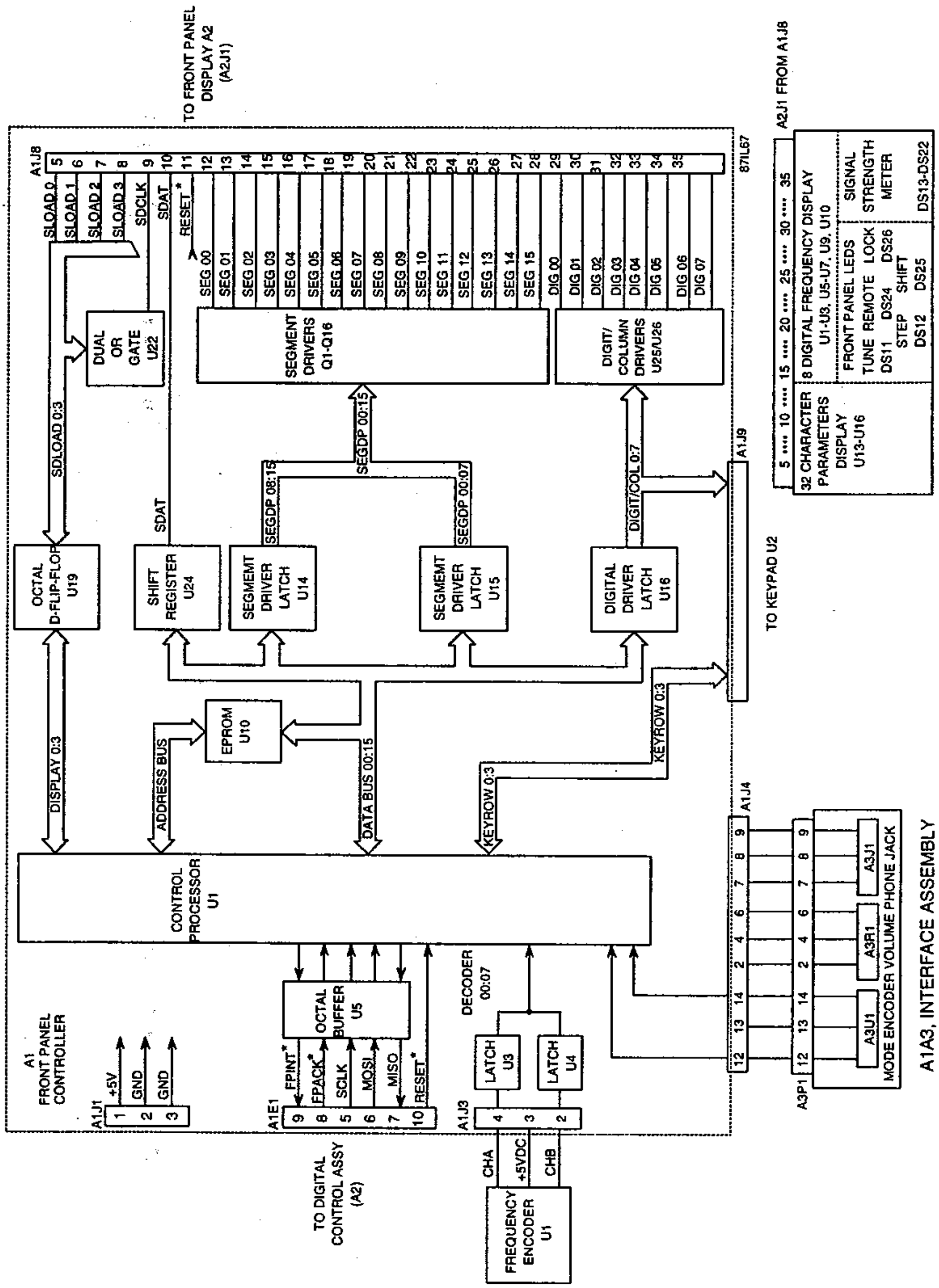


Figure 6-4. Type 797182-2 Front Panel Assembly Functional Block Diagram

The Front Panel Display Assembly (A1A2) contains all front panel displays and LED's for monitoring of receiver settings. Four 5-by-5 dot matrix displays (A2U13-A2U16) comprise the receiver's parameters display. Eight 7-segment displays (A2U1-A2U3, A2U5-A2U7, A2U9, and A2U10) provide the front panel's "FREQUENCY MHZ" display. Twenty-Six (26) LED's, A2DS11 through A2DS26, provide the receiver status indicators (i.e. REMOTE and SHIFT LEDs) and the frequency display's decimal point. The segment driver and digit driver outputs from A1J8 are supplied to A2U1-A2U3, A2U5-A2U7, A2U9, A2U10, and A2U13-A2U16 via A2J1. The combination of an active low digit driver input and an active high segment driver input, illuminates the required display segments and LEDs. Additionally, the segment data (A2J1 pin 10), the segment clock (A2J1 pin 9), and the segment load signals (A2J1 pins 5 through 8) required for proper illumination of the 32-character parameters display are input via A1J8.

The Interconnect Assembly (A1A3) contains the receiver's front panel PHONE jack A3J1, the mode encoder A3U1, and a 10 kohm potentiometer A3R1. Encoder A3U1 provides the EDIT control knob function for the WJ-8712P receiver. Encoder adjustments are input directly to microcontroller A1U1 of the Front Panel Controller Assembly via A1J4. Potentiometer A3R1 and connector A3J1 receive the front panel headphone audio signal from the Digital Control Assembly (A2) via Front Panel Controller connector A1J4. A3J1 is the 1/8-inch stereo PHONE jack and potentiometer A3R1 is the PHONE volume control knob available at the receiver's front panel.

6.2.4 TYPE 766028-1 POWER SUPPLY ASSEMBLY, (PS1)

The Type 766028-1 Power Supply Assembly (PS1), illustrated in the WJ-8712P Digital HF Receiver Main Chassis schematic diagram, **Foldout FO-8**, provides the voltages required for the proper operation of the WJ-8712P Receiver.

The Type 766028-1 Power Supply is capable of providing reliable outputs over a wide range of input line voltages and frequencies. It operates from 90 to 264 VAC, at line frequencies ranging from 47 to 440 Hz. The voltage outputs under load are as follows:

Voltage	Current (Max.)	Tolerance	Ripple (Max.)
+5 V	3.0 A	±2%	50 mV P-P
+12V	1.5 A	±4%	50 mV P-P
-12V	0.5 A	±4%	50 mV P-P

SECTION VII

MAINTENANCE

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SECTION VII

MAINTENANCE

7.1 GENERAL

The WJ-8712P Digital HF Receiver has been designed to operate for extended periods of time with a minimum of routine maintenance. Cleaning, inspection and performance tests should be performed at regular intervals, consistent with the facility's normal scheduling and after repairs have been made. The only alignment procedure required for the WJ-8712P is for the Reference Frequency Timebase Accuracy, and shall be performed on an as needed basis (see **paragraph 7.6.3**).

7.2 PREVENTIVE MAINTENANCE PROCEDURES

Preventive maintenance procedures for the receiver consist of both cleaning and scheduled preventive maintenance procedures.

7.2.1 CLEANING AND LUBRICATION

The receiver should be kept free of dust, moisture, grease and other foreign matter to ensure trouble-free operation. Use low pressure air, if available, to remove accumulated dust from the interior of the receiver. A clean, dry cloth or soft bristled brush may also be used for this purpose. No lubrication is required.

7.2.2 SCHEDULED PREVENTIVE MAINTENANCE PROCEDURES

Component A2U5 is a plug-in chip that furnishes battery power (V Batt) for the Digital Control PC Assembly (A2). U5 should be changed every eight years, or more frequently if local preventive maintenance procedures dictate. Refer to **paragraph 7.8.5** for RAM/Battery (A2U5) removal and replacement procedures.

7.3 INSPECTION FOR DAMAGE AND WEAR

Many existing or potential troubles can be detected by making a thorough visual inspection of the unit. For this reason, as a first step in troubleshooting, a complete visual inspection should be made whenever the unit is inoperative. Inspect mechanical parts such as pin connectors and interconnecting cables for looseness, wear and other signs of deterioration. The circuit card assemblies should be checked to assure that they are properly secured to the chassis and making good electrical contact. Electronic components that show signs of deterioration, such as overheating, should be inspected and a thorough investigation of the associated circuitry should be made to verify proper operation. Often, damage due to heat is a result of other, less apparent problems in the circuit.

7.4 TEST EQUIPMENT REQUIRED

Procedures for testing the WJ-8712P Receiver have been developed for performance using a minimum of common test equipment. The test equipment listed in **Table 7-1**, or equivalents, are required to perform the troubleshooting and alignment procedures, along with the performance tests described in this section.

7.5 TROUBLESHOOTING AND FAULT ISOLATION

The test procedures that are provided in this section verify proper receiver operation and assist in fault isolation to a malfunctioning assembly. They have been developed to set known laboratory conditions that eliminate external conditions as a possible cause of the malfunction. Use performance tests in **paragraph 7.6**, and the circuit descriptions in **Section VI** to assist in fault isolation. The loss of stored parameters between receiver power-ups may be the result of the failure of the RAM/Battery chip (A2U5). Refer to **paragraph 7.8.5** for RAM/Battery (A2U5) removal and replacement procedures.

7.6 WJ-8712P DIGITAL HF RECEIVER PERFORMANCE TESTS

The performance tests that follow are designed to verify proper operation of the WJ-8712P Receiver, and each of its operational modules. In performance of the tests, the receiver may be controlled by the front panel controls or by an external controlling computer, connected to the rear panel RS-232 connector. Each procedure provides sufficient set up information to accommodate either control method.

Table 7-1. Required Test Equipment

Equipment	Recommended Type	Requirement
Variable Frequency Power Source	Elgar 501A	Voltage Range - 90 to 264 VAC Frequency Range - 47 to 440 Hz
Volt-Amp-Power Meter	Clark-Hess 255	Power Measurement
Signal Generator (Qty 2)	Marconi 2031	Frequency Range to 30 MHz Internal Modulation Capability
Frequency Counter	Fluke 1953A	Frequency Range to 100 MHz
RF Millivoltmeter	Boonton 92B	dB Scale Referenced to 600 Ohm Load
RF Probe	Boonton 91-12F	
"T" Adapter	Boonton 91-14A	
50 Ohm Termination	Boonton 91-15A	
AC Voltmeter	HP-400EL	dB Scale Referenced to 600 Ohm Load
Distortion Analyzer	HP-334A	Harmonic Distortion Measurement
Digital Voltmeter	Fluke 8001A	AC/DC Voltage Measurement
Oscilloscope	Tektronix 2236	100 MHz Frequency Response
Control Computer	IBM PC Compatible	RS-232 Compatible
Headphones	TELEX PH-6	600 ohm, stereo (2-channel with 1/4" tip-ring jack)
Adapter	Radio Shack 274-366	1/4" to 1/8" headphone jack adapter

7.6.1 POWER CONSUMPTION

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-1**.

2. Set the Clark-Hess Volt-Amp-Wattmeter function to the power mode, with the 500 ma current range selected. Set the voltage range as required for the line voltage being tested.

3. Adjust the Variable Frequency Power Source to the line frequency and voltage at which the receiver is to be operated.

NOTE

Power requirements for the WJ-8712P Receiver may range from 90 to 264 VAC, with a line frequency ranging from 47 to 440 Hz.

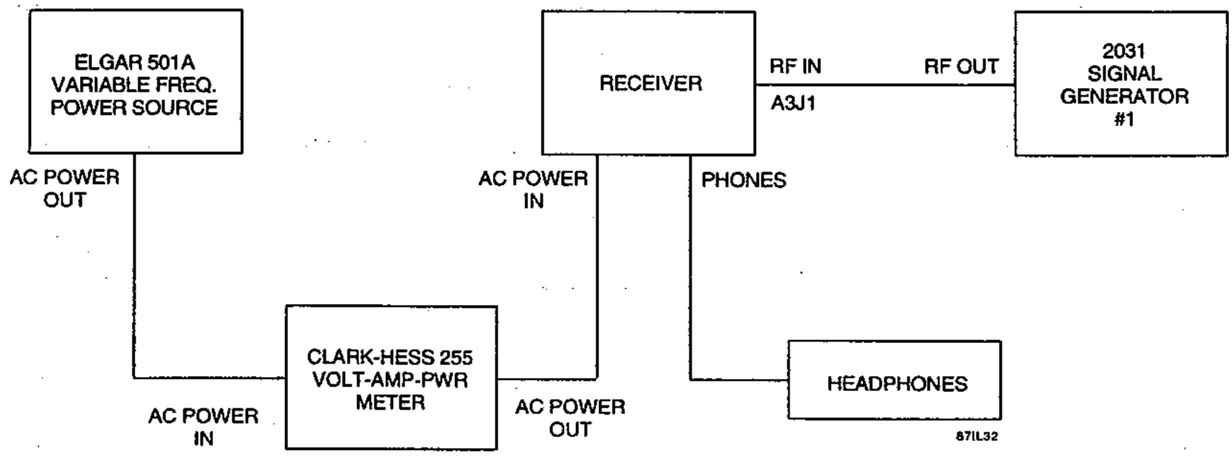

Figure 7-1. Power Consumption Performance Test Equipment Connection

4. Set the Signal Generator to produce a 1.0000 MHz output at a level of -90 dBm. Set the generator modulation for 400 Hz AM, 50% modulation.

5. Apply power to the receiver and set the receiver parameters as follows:

Tuned Frequency:	1.000000 MHz	FRQ 1 <Return>
Detection Mode:	AM	DET 1 <Return>
IF Bandwidth:	6.0 kHz	BWS 4 <Return>
Gain Control:	AGC Fast	AGC 2 <Return>
Squelch:	Off	SQL 136 <Return>

6. Adjust the PHONE level control for a clear 400 Hz audio tone in the headphones.

7. Verify that the power consumption level displayed on the Volt-Amp-Wattmeter does not exceed 40 Watts.

8. Slowly increase and decrease the Variable Frequency Power Source by 10% of the initially set value while observing the power consumption level on the Volt-Amp-Wattmeter. Verify that the power consumption throughout the ±10% range remains at 40 Watts or less and a clear audio tone remains present in the headphones.

9. Slowly decrease the Variable Frequency Power Source output voltage until the audio tone cuts off, indicating that the receiver has shut down. Verify that the line voltage at shut down is 90 VAC or less.

7.6.2 FRONT PANEL TESTS

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-2.**

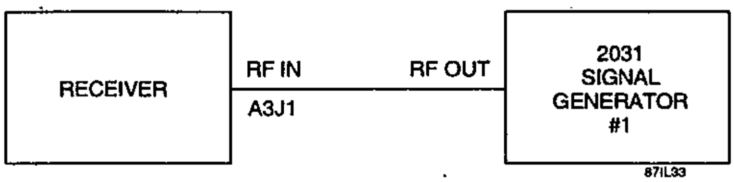

Figure 7-2. Front Panel Test Equipment Connections

2. Set up the signal generator as follows:

Frequency	1.000 MHz
Output Amplitude	-10 dBm
Modulation	None (CW)

3. Turn the WJ-8712P Receiver off.

4. While observing the front panel, turn the receiver on. Upon power up, verify that all LEDs (except for the Signal Level [dBm] meter) and seven segment displays will light and are of uniform brilliance. Also verify that the LED in the POWER switch is lit.

5. While viewing and FREQUENCY MHz display, rotate the Receiver tuning wheel clockwise (CW) and counterclockwise (CCW). Verify that the display indicates that CW tuning increments the display and CCW tuning decrements the display.

6. Depress the TUNE LOCK button. Verify that the TUNE LOCK LED illuminates, and that the tuning wheel is disabled.

7. Depress the TUNE LOCK button again. Verify that the TUNE LOCK LED is extinguished and the tuning wheel is functional.

8. With the fast automatic gain control mode (Fast AGC) selected, tune the receiver to 1.000 MHz (the detection mode and IF bandwidth are not important). Verify the Signal level [dBm] meter indicates between 0 and -20 dBm.

9. Referring the **Figure 3-1**, operate all of the pushbuttons and controls listed below. Verify that all of the controls function correctly. For keys that have associated function LEDs, ensure that the LED correctly indicates the status of the key. Refer to **Section III** for further information on the front panel controls and their individual function, as required.

   Numeric Keypad
   EDIT control knob
   Shift key
   AGC/REMOTE key
   BFO/ +/-ZERO key
   NOTCH BLANKER key
   STEP/TUNE LOCK key
   IF BW key
   DET key
   SQL key
   MENU key (and all menu item functions)
   EXEC key
   CHAN key
   STORE/LOCKOUT key
   INCL/SKIP key
   SETUP key
   SCAN key
   PAUSE key

7.6.3 REFERENCE FREQUENCY TIMEBASE ACCURACY

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-3**. Apply power to the receiver and test equipment and allow a warm-up period of at least 30 minutes before proceeding with the timebase testing.

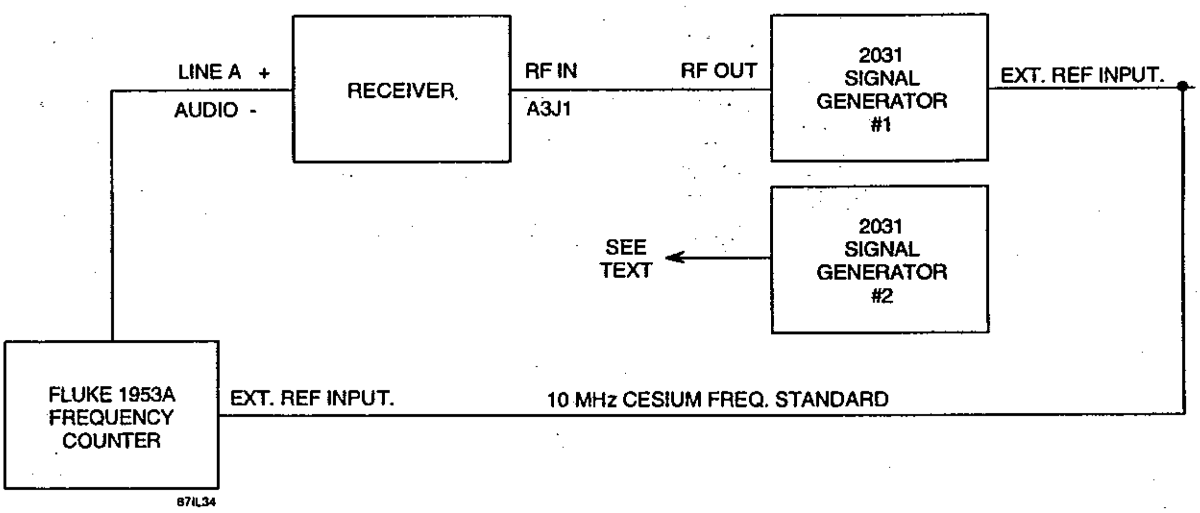

Figure 7-3. Reference Frequency Timebase Accuracy Performance Test Equipment Connection

2. Set Signal Generator #1 to produce a 30.0000 MHz CW signal at an output level of -80 dBm.

3. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	30.000000 MHz	FRQ 30 <Return>
Detection Mode:	CW	DET 3<Return>
BFO Offset:	+1.00 kHz	BFO 1000 <Return>
IF Bandwidth:	6.0 kHz	BWS 4 <Return>
Gain Control:	AGC Slow	AGC 1 <Return>
Squelch:	Off	SQL 136 <Return>

4. Set the Frequency Counter for 0.1 Hz resolution.

5. Note the frequency displayed on the Frequency Counter to determine the accuracy of the receiver timebase. The displayed frequency should fall in the range between 980.0 and 1020.0 Hz.

NOTE

If the frequency counter reading noted in step 5 is outside the specified limits, perform the Reference Frequency Timebase Accuracy alignment procedure found in **paragraph 7.7.1**.

6. Set Signal Generator #2 to produce a 10.0000 MHz CW signal at an output level of 0 dBm. Connect the Signal Generator output to the EXT. REF. connector at the receiver rear panel (A3J3).

7. Note the frequency displayed on the frequency counter. This frequency should be approximately 1000 Hz, depending on the accuracy of the frequency setting in step 2.

8. While observing the frequency counter display, slowly increase and decrease the frequency of generator #2. Verify that the frequency displayed on the frequency counter changes with changes in the generator frequency, indicating that the receiver timebase is locked to the external reference.

NOTE

The magnitude of change on the frequency counter does not match the generator changes due to frequency scaling within the receiver.

7.6.4 FINE TUNING ACCURACY

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-4.**

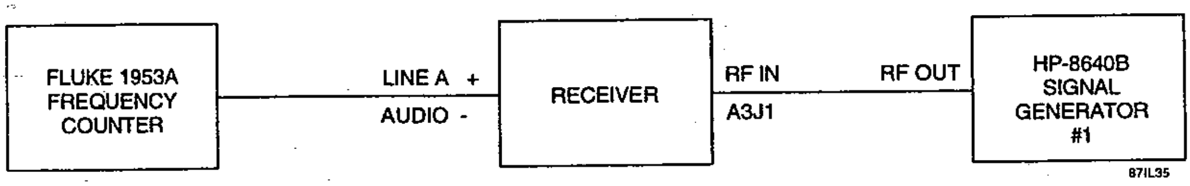

Figure 7-4. Fine Tuning Accuracy Performance Test Equipment Connection

2. Set the signal generator to produce a 10.000000 MHz CW signal at an output level of -40 dBm.

3. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	10.000000 MHz	FRQ 10 <Return>
Detection Mode:	CW	DET 3 <Return>
BFO Offset:	+1.00 kHz	BFO 1000 <Return>
IF Bandwidth:	16.0 kHz	BWS 5 <Return>
Gain Control:	AGC Slow	AGC 1 <Return>
Squelch:	Off	SQL 136 <Return>

4. Set the frequency counter for 1.0 Hz resolution.

5. Note the frequency displayed on the frequency counter as a reference for the tuning accuracy tests. The displayed frequency is the difference between the receiver and the signal generator frequencies, plus the 1000 Hz BFO offset.

6. While observing the frequency counter display, slowly increase the receiver tuned frequency in 1 Hz, 10 Hz, 100 Hz, and 1 kHz steps. Verify that the magnitude of change on the frequency counter display tracks with the receiver tuned frequency changes, maintaining a frequency that is 1 kHz greater than the difference between the signal generator and receiver frequencies.

NOTE

Maintain tuned frequencies between 10.000000 and 10.008000 MHz to avoid exceeding the 16.0 kHz IF bandwidth limitations.

7.6.5 SIGNAL STRENGTH ACCURACY

1. Connect the HP-8640B Signal Generator to the RF Input of the WJ-8712P Receiver (A3J1).

2. Set the signal generator to produce a 15.0000 MHz CW signal at an output level of -100 dBm.

3. Connect the digital voltmeter between the RSSI pin and ground on the rear panel terminal bus (TB1). Set the digital voltmeter function to DC Voltage, 10 V range.

4. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	15.000000 MHz	FRQ 15 <Return>
Detection Mode:	CW	DET 3 <Return>
BFO Offset:	+0.00 kHz	BFO 0 <Return>
IF Bandwidth:	6.0 kHz	BWS 4 <Return>
Gain Control:	AGC Slow	AGC 1 <Return>
Squelch:	Off	SQL 136 <Return>

5. Slowly increase the signal generator output level to 0 dBm, in 10 dB increments. At each increment, note the DC voltage displayed on the digital voltmeter and verify the receiver signal level using the "SGV?" query. On the Front Panel, observe the signal level on the signal strength meter.

6. Verify that the receiver signal strength indication remains within ±10 dB of the signal generator output level. The DC voltage present at the RSSI output should range from approximately +1.0 V (-100 dBm) to +4.6 V (0 dBm). For each 10 dB increase of input level, the RSSI level should increase by approximately +.35 V.

7.6.6 WJ-8712P SENSITIVITY PERFORMANCE TEST

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-5**.

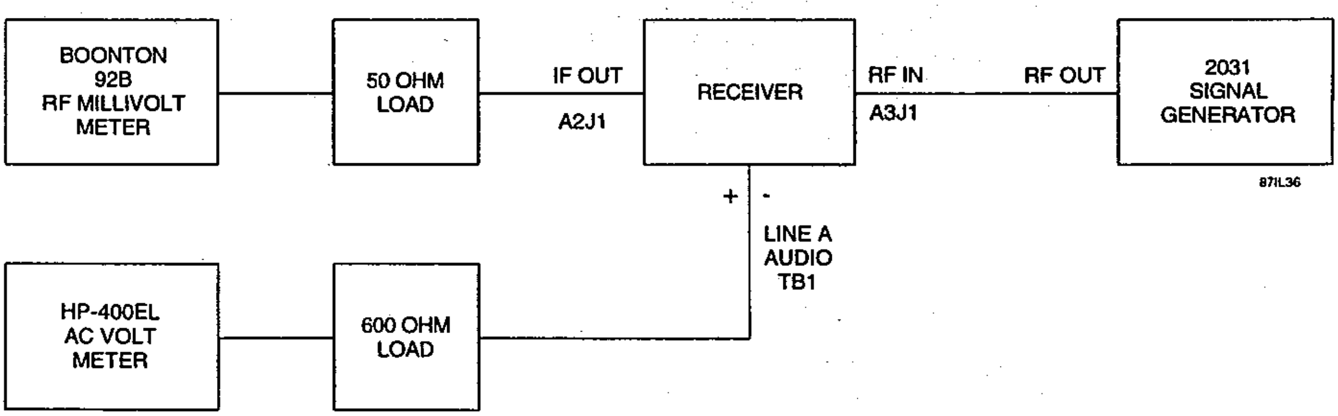

Figure 7-5. Receiver Sensitivity Performance Test Equipment Connection

2. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	0.500000 MHz	FRQ 5 <Return>
Detection Mode:	CW	DET 3 <Return>
BFO Offset:	+1000 Hz	BFO 1000 <Return>
IF Bandwidth:	**See Table 7-2**	
Gain Control:	Manual	AGC 0 <Return>
Gain Setting:	Mid-Range 060	RFG 60 <Return>
RF Input Path	Preamplified	RFP 3 <Return>
Squelch:	Off	SQL 136 <Return>

3. Set the receiver tuned frequency to 0.500000 MHz [FRQ .5 <Return>] and set the signal generator to produce a .5000 MHz CW output at a level of -116 dBm.

4. Set the receiver IF bandwidth and the corresponding signal generator output level to each of the settings listed in **Table 7-2.** For each of the listed settings, perform the test described in steps 5 through 8.

Table 7-2. Receiver Sensitivity Performance Test Equipment Connection

IF BW (kHz)	Command	Sig. Gen Output Level (dBm)	AM Modulation	FM Mod. Frq/Dev.
0.30	BWS 1 <Return>	-116	100 Hz / 50%	100 Hz / 90 Hz
1.00	BWS 2 <Return>	-111	400 Hz / 50%	400 Hz / 300 Hz
3.20	BWS 3 <Return>	-106	400 Hz / 50%	400 Hz / 960 Hz
6.00	BWS 4 <Return>	-103	400 Hz / 50%	400 Hz / 1800 Hz
16.0	BWS 5 <Return>	-99	400 Hz / 50%	400 Hz / 4800 Hz

5. Set the receiver RF Gain as required to produce a -20 dBm indication on the RF millivoltmeter.

6. Note the Line A audio level indicated on the AC voltmeter as the reference level for the following CW sensitivity performance test. The typical AC voltmeter indication is 0 ±3 dBm.

7. While observing the AC voltmeter indication, turn off the signal generator RF Output.

8. Note the AC voltmeter level with the RF signal removed. Calculate the signal-to-noise ratio by subtracting this level from the reference level noted in step 6. The difference between these two levels should be a minimum of 16 dB.

9. Tune the receiver and signal generator to 5.0000 MHz, 15.0000 MHz, and 29.9000 MHz. At each frequency, repeat the test described in steps 4 through 8.

10. Set the receiver for a .50000 MHz tuned frequency [FRQ .5 <Return>], AGC Fast [AGC 2 <Return>], and select the AM Detection Mode [DET 1 <Return>]. Set the signal generator to produce a .5000 MHz AM modulated signal.

11. Set the receiver IF bandwidth, the corresponding signal generator RF output level, and the AM modulation as listed in **Table 7-2**. For each of the listed settings, perform the test described in steps 12 through 15.

12. Note the Line A audio level indicated on the AC voltmeter as the reference level for the following AM sensitivity performance test. The typical AC voltmeter indication is +6 ±3 dBm.

13. While observing the AC voltmeter indication, turn the signal generator AM modulation off.

14. Note the AC voltmeter level with the AM modulation removed. Calculate the signal-to-noise ratio by subtracting this level from the reference level noted in step 12. The difference between these two levels should be a minimum of 10 dB.

15. Tune the receiver and signal generator to 5.0000 MHz, 15.0000 MHz, and 29.9000 MHz. At each frequency, repeat the test described in steps 11 through 14.

16. Set the receiver for a .50000 MHz tuned frequency [FRQ .5 <Return>], AGC Fast [AGC 2 <Return>], and select the FM Detection Mode [DET 2 <Return>]. Set the signal generator to produce a .5000 MHz FM modulated signal.

17. Set the receiver IF bandwidth, the corresponding signal generator RF output level, and the FM modulation as listed in **Table 7-2**. For each of the listed settings, perform the test described in steps 18 through 21.

18. Note the Line A audio level indicated on the AC voltmeter as the reference level for the following FM sensitivity performance test. The typical AC voltmeter indication is +0 ±3 dBm.

19. While observing the AC voltmeter indication, turn the signal generator FM modulation off.

20. Note the AC voltmeter level with the FM modulation removed. Calculate the signal-to-noise ratio by subtracting this level from the reference level noted in step 18. The difference between these two levels should be a minimum of 17 dB.

21. Tune the receiver and signal generator to 5.0000 MHz, 15.0000 MHz, and 29.9000 MHz. At each frequency, repeat the test described in steps 17 through 20.

22. Set the receiver for a .50000 MHz tuned frequency [FRQ .5 <Return>], Manual Gain [AGC 0 <Return>], select the ISB Detection Mode [DET 6 <Return>] and select the 3.2 kHz IF bandwidth [BWS 3 <Return>]. Set the signal generator to produce a .5010 MHz CW output signal, at a level of -13 dBm.

23. Set the receiver RF Gain as required to produce a -20 dBm indication on the RF millivoltmeter.

24. Note the Line A audio level indicated on the AC voltmeter as the reference level for the following SSB sensitivity performance test. The typical AC voltmeter indication is +0 ±3 dBm.

25. While observing the AC voltmeter indication, turn off the signal generator RF Output.

26. Note the AC voltmeter level with the RF signal removed. Calculate the signal-to-noise ratio by subtracting this level from the reference level noted in step 24. The difference between these two levels should be a minimum of 16 dB.

27. Temporarily remove the AC voltmeter and 600-ohm load from the Line A output of TB1 and connect them across the + and - terminals of the Line B output. Tune the signal generator to 1.0000 kHz below the receiver tuned frequency and repeat steps 23 through 26 to verify the lower sideband of the ISB outputs.

28. Reconnect the AC voltmeter and 600-ohm load across the Line A output terminals.

29. Tune the receiver and signal generator to 5.0000 MHz, 15.0000 MHz, and 29.9000 MHz. In each case, set the signal generator frequency for 1.000 kHz above the receiver tuned frequency. At each frequency, repeat the test described in steps 23 through 27.

7.6.7 AUDIO DISTORTION PERFORMANCE TEST

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-6**.

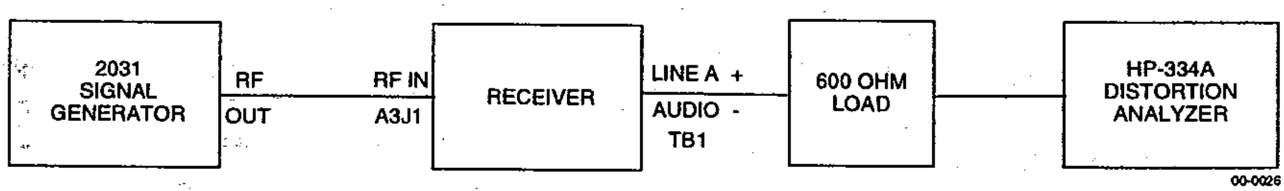

Figure 7-6. Audio Distortion Performance Test Equipment Connection

2. Set the signal generator to produce a 15.0000 MHz AM modulated signal at an output level of -50 dBm. Set the AM modulation to 400 Hz, at 30 %.

3. Preset the distortion analyzer as follows:

Mode:	Manual
Frequency Range:	X10
Function:	Voltmeter
Meter Range:	1 Volt

4. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	15.000000 MHz	FRQ 15 <Return>
Detection Mode:	AM	DET 1 <Return>
IF Bandwidth:	6.0 kHz	BWS 4 <Return>
Gain Mode:	AGC Slow	AGC 1 <Return>
Gain Setting:	Mid-Range 060	RFG 60 <Return>
RF Input Path	Normal	RFP 1 <Return>
Squelch:	Off	SQL 136 <Return>

5. Verify that the detected audio level is 0 ±3 dBm, as indicated on the analyzer voltmeter.

NOTE

Due to a +10 dB offset on the distortion analyzer voltmeter, the +10 dB scale is used for a 0 dBm reading.

6. Reset the distortion analyzer meter range to the 3 volt scale and increase the signal generator modulation level to 50%.

7. Set the distortion analyzer function control and meter range to the SET LEVEL positions. Adjust the distortion analyzer sensitivity control for a 100% indication on the meter (an indication of "1" on the 0-1 scale).

8. Set the distortion analyzer function control to the Distortion position. Slowly adjust the distortion analyzer Frequency control for a minimum indication on the meter. Reset the meter range as required for the best meter resolution. Verify that the total harmonic distortion measured does not exceed 5%.

9. Set the receiver detection mode to ISB [DET 6 <Return>] and the IF bandwidth to 3.2 kHz [BWS 3 <Return>].

10. Reset the distortion analyzer as follows:

Mode:	Manual
Frequency Range:	X100
Function:	Voltmeter
Meter Range:	3 Volt

11. Reset the signal generator to produce a 15.0010 MHz CW signal at a -50 dBm output level (modulation off, frequency 1.0 kHz greater than the receiver tuned frequency).

12. Verify that the detected audio level indicated on the distortion analyzer voltmeter is 0 ±3 dBm.

13. Set the distortion analyzer function control and meter range to the SET LEVEL positions. Adjust the distortion analyzer sensitivity control for a 100% indication on the meter.

14. Set the distortion analyzer function control to the Distortion position. Slowly adjust the distortion analyzer Frequency control for a minimum indication on the meter. Reset the meter range as required for the best meter resolution. Verify that the total harmonic distortion measured does not exceed 5%.

7.6.8 SQUELCH/MUTE PERFORMANCE TEST

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 1-1.**

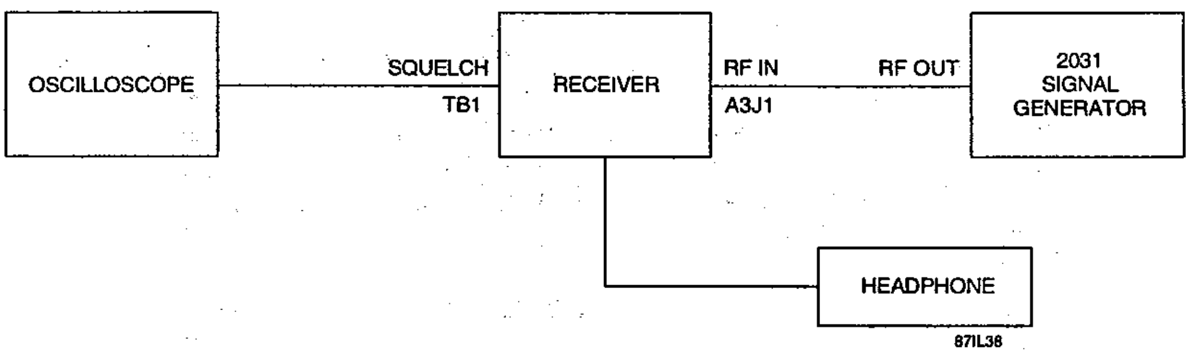

Figure 7-7. Squelch/Mute Performance Test Equipment Connection

2. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	15.000000 MHz	FRQ 15 <Return>
Detection Mode:	AM	DET 1 <Return>
IF Bandwidth:	6.0 kHz	BWS 4 <Return>
Gain Mode:	AGC Fast	AGC 2 <Return>
RF Input Path	Normal	RFP 1 <Return>
Squelch:	-120	SQL 120 <Return>

3. Set the signal generator to produce a 15.0000 MHz CW output at a level of -130 dBm.

4. Observe that a steady logic "1" level (+5V) is present at the Squelch terminal of the rear panel terminal bus (TB1), as indicated on the oscilloscope.

5. While observing the oscilloscope trace, slowly increase the signal generator output level until the trace indicates a logic "0" (0V) level. Note the signal generator output level at which the squelch output switches. Verify that the signal generator output level is within ±10 dB of the receiver squelch setting.

6. Increase the receiver squelch threshold in 10 dB increments, up to 0 dBm. At each increment, increase the signal generator output level until the oscilloscope displays a logic "0" level, indicating that the squelch has turned off. Note the signal generator output level at each switchpoint. Verify that at each level tested, the signal generator output level is within ±10 dB of the receiver squelch setting.

7. Set the squelch to -100 dBm [SQL 100 <Return>] and set the signal generator to produce a 15.0000 MHz AM modulated output, at a level of -40 dBm. Set the modulation to 400 Hz, 50%.

8. Observe that a clear 400 Hz tone is present in the headphones, and the oscilloscope indicates a logic "0" at the squelch output terminal.

9. While monitoring the headphone audio and the oscilloscope display, connect a short jumper between the MUTE terminal of TB1 and ground. Observe that the audio cuts off and after a slight delay, the squelch line switches to Logic "1".

10. Remove the jumper and verify that the audio, and the squelch logic level return to the state observed in step 8.

7.6.9 RECONSTRUCTED IF OUTPUT PERFORMANCE TEST

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-8.**

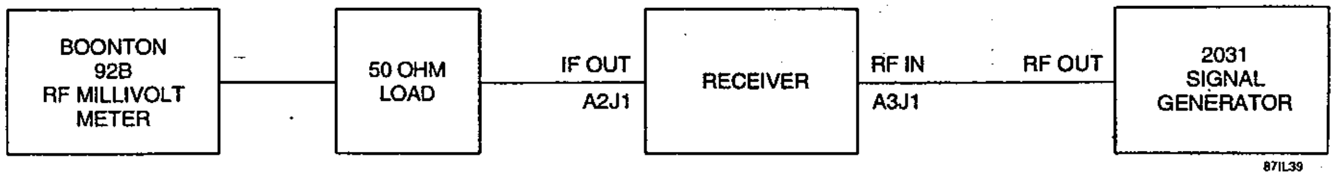

Figure 7-8. Reconstructed IF Output Performance Test Equipment Connection

2. Set the signal generator to produce a 15.0000 MHz CW output at a level of -100 dBm.

3. Set the RF millivoltmeter to the -20 dBm range.

4. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	15.000000 MHz	FRQ 15 <Return>
Detection Mode:	AM	DET 1 <Return>
IF Bandwidth:	16.0 kHz	BWS 5 <Return>
Gain Control:	AGC Slow	AGC 1 <Return>
RF Input Path	Normal	RFP 1 <Return>
Squelch:	Off	SQL 136 <Return>

5. Note the IF Output signal level, as indicated on the RF millivoltmeter. Verify that the output level is -20 ±3 dBm (-23 to -17 dBm).

6. While observing the signal level on the RF millivoltmeter, increase the signal generator output level, in 10 dB increments, to an output level of 0 dBm. Verify that throughout the 100 dB change in the RF input signal level, the IF output level -20 ±3 dBm is maintained.

7. Decrease the signal generator output level to -115 dBm.

8. Set the receiver to the Manual Gain mode [AGC 0 <Return>] and set the manual gain to maximum [RFG 127 <Return>].

9. Adjust the signal generator output level to produce a -20 dBm reference level, as displayed on the RF millivoltmeter (Typical signal generator output level of -112 dBm).

10. Set the receiver manual gain to minimum [RFG 0 <Return>].

11. Increase the signal generator output level to +12 dBm and note the signal level indicated on the RF millivoltmeter. Verify that the RF millivoltmeter indication is less than the -20 dBm reference set in step 9, indicating greater than 100 dB of manual gain control.

12. Adjust the signal generator output level to -55 dBm.

13. Set the receiver manual gain to approximately mid-range [RFG 60 <Return>].

14. Increase the signal generator output level until a -20 dBm signal level reference is indicated on the RF millivoltmeter. Typically a signal generator output level of approximately -50 dBm is required.

15. While observing the RF millivoltmeter, slowly increase the signal generator frequency until the RF millivoltmeter indication decreases by 3 dB from the reference set in step 14. Note the signal generator frequency at this point.

16. Slowly decrease the signal generator frequency past the 15.0000 MHz tuned frequency and continue until the RF millivoltmeter again displays a 3 dB decrease from the reference level set in step 14. Note the signal generator frequency at this point.

17. Determine the 3 dB bandwidth of the reconstructed IF output by subtracting the value obtained in step 16 from the value obtained in step 15. The calculated bandwidth should be within ±10% of the selected IF bandwidth, as indicated in **Table 7-3.**

Table 7-3. Selected IF Bandwidth Frequency Range

IF BW (kHz)	Control Command	BW Min. (kHz)	BW Max. (kHz)
0.30	BWS 1 <Return>	0.270	0.330
1.00	BWS 2 <Return>	0.900	1.100
3.20	BWS 3 >Return>	2.880	3.502
6.00	BWS 4 <Return>	5.400	6.600
16.0	BWS 5 <Return>	14.400	17.600

18. Set the WJ-8712P Receiver to each of the IF bandwidths listed in **Table 7-3**, and repeat steps 14 through 17 for each selection.

7.6.10 RF/IF SIGNAL PATH PERFORMANCE TEST

1. Connect the WJ-8712P Receiver and test equipment as illustrated in **Figure 7-9**.

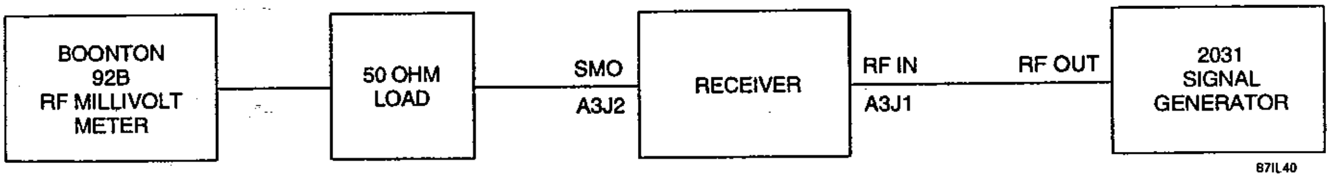

Figure 7-9. RF/IF Signal Path Performance Test Equipment Connection

2. Set the signal generator to produce a 10.000000 MHz CW output at a level of -70 dBm.

3. Set the RF millivoltmeter to the -30 dBm range.

4. Set the WJ-8712P Receiver as follows:

Tuned Frequency:	10.000000 MHz	FRQ 10 <Return>
Detection Mode:	AM	DET 1 <Return>
IF Bandwidth:	16.0 kHz	BWS 5 <Return>
Gain Control:	Manual Gain	AGC 0 <Return>
Gain Setting	Mid Range 060	RFG 60 <Return>
RF Input Path	Normal	RFP 1 <Return>
Squelch:	Off	SQL 136 <Return>

5. Adjust the signal generator output level as required to produce a -30 dBm reference level, as indicated on the RF millivoltmeter.

6. Determine the RF Assembly gain by comparing the signal generator output level with the SMO signal level indicated on the RF millivoltmeter. Typically, the signal gain ranges between 25 and 35 dB.

7. While observing the signal level on the RF millivoltmeter, slowly increase the signal generator frequency until a decrease of 3 dB, from the reference set in step 5, is observed. Note the signal generator output frequency at this point.

8. Slowly decrease the signal generator frequency past the 10.0000 MHz tuned frequency and continue until the RF millivoltmeter again displays a 3 dB decrease in signal level from the reference set in step 5. Note the signal generator output frequency at this point.

9. Determine the 3 dB bandwidth of the RF signal path by subtracting the frequency value obtained in step 8 from the value obtained in step 7. The calculated bandwidth should be at least 0.0300 MHz (30.0 kHz).

10. Return the signal generator output frequency to 10.000000 MHz and adjust the output level as required to obtain a -30 dBm reference level on the RF millivoltmeter.

11. Set the RF Input path of the receiver to the ATTENUATED selection. [RFP 2 <Return>]

12. Note the signal level indicated on the RF millivoltmeter. The signal level should decrease by 15 ±3 dB from the reference level set in step 10.

13. Set the RF millivoltmeter to the -20 dBm range and set the receiver RF Input path to the PRE_AMP selection. [RFP 3 <Return>]

14. Note the signal level indicated on the RF millivoltmeter. The signal level should increase by 10 ±3 dB from the reference set in setup 10.

7.7 ALIGNMENT PROCEDURES

The WJ-8712P has been designed to operate for extended periods without the need for module alignment. However, it may become necessary to adjust the unit's internal Temperature Controlled Voltage Controlled Oscillator (TCVCXO) should the Reference Frequency Timebase Accuracy performance test fall outside the specified limits (see **paragraph 7.6.3**).

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Whenever a problem is suspected, repair and maintenance of the equipment should be performed by qualified maintenance personnel only. This equipment contains no user serviceable parts.

7.7.1 REFERENCE FREQUENCY TIMEBASE ACCURACY ALIGNMENT PROCEDURE

The following steps provide the alignment procedure necessary for adjusting the unit's internal TCVCXO when an out-of-tolerance condition has been determined.

1. Connect the Receiver and test equipment as described in **paragraph 7.6.3**. Apply power to the receiver and test equipment and allow a warm-up period of at least 30 minutes before proceeding with the timebase alignment procedure.

2. Referring to **paragraph 7.6.3**, perform the Reference Frequency Timebase Accuracy performance procedure, step 1 through step 5 only.

3. With the receiver and test equipment power ON, remove the top cover of the receiver.

4. Referring to **Figure 8-1**, locate module A3, RF Tuner Assembly (Type 797006-1), and locate R59, a 10 kohm variable resistor.

5. While monitoring the Frequency Counter, adjust R59 until the displayed frequency is within the specified limits provided in **paragraph 7.6.3**, step 5.

6. Install the receiver's top cover, and repeat the timebase performance test **(paragraph 7.6.3)**.

7.8 SUBASSEMBLY REMOVAL AND REPLACEMENT

The procedures that follow provide a guide for the removal and replacement of the subassemblies contained in the WJ-8712P Digital HF Receiver. Always disconnect the receiver power cord from the AC power source before attempting to remove any assembly from the receiver.

7.8.1 FRONT PANEL REMOVAL AND REPLACEMENT

1. Remove the top and bottom covers from the receiver.

2. Detach the front panel from the WJ-8712P by removing the four phillips head screws.

3. Remove A1A1P1 from J7 on the Digital Control PC Assembly (A2).

4. Remove PS1P1 from J1 on the Controller PCB (A1A1).

5. Remove the ground strap from the rear plate of the front panel.

6. Carefully remove the Front Panel Assembly from the unit.

7. For installation of the replacement assembly, reverse the steps taken in the removal process.

8. Before reassembling the receiver carefully check for proper cable mounting, and check for pinched wires and shorted connections.

9. Replace the bottom cover and verify proper operation.

7.8.2 TYPE 797214 DIGITAL ASSEMBLY REMOVAL AND REPLACEMENT

If the unit contains a Digital Expansion Assembly (A2A1), remove the 4 screws and 1 connector from the Digital Expansion Assembly and carefully lift the Digital Expansion Assembly from the Digital Control Assembly.

The Type 797214 Digital Assembly contains a lithium battery. When removing this subassembly use extreme care to avoid shorting the battery to any conductive surface.

1. Remove the receiver bottom cover to gain access to the Digital Assembly (A2).

2. At the receiver rear panel, remove the terminal connector installed at the TB1 connector plug.

3. Remove the two hex-head mounting screws securing the A2J3 connector to the rear panel.

4. Remove the hex-nut and washer securing the IF Output BNC connector (A2J1) to the rear panel.

5. Disconnect the following connectors from the Digital Assembly (A2), as follows:

   A3P1 ....RF Assembly Interface Cable
   A1P1 ....Power Distribution Cable
   W3P1 ....Control Interface Cable

6. Remove the six phillips head screws and washers securing the Digital Assembly to the receiver deck.

7. Carefully raise the forward edge of the Digital Assembly slightly and slide the assembly toward the front of the receiver until the connectors are free of the rear panel. Lift the assembly free of the main chassis.

8. For installation of the replacement assembly, reverse the steps taken in the removal process.

9. Before reassembling the receiver carefully check for proper cable mounting, and check for pinched wires and shorted connections.

10. Reassemble the receiver and verify proper operation.

7.8.3 TYPE 797006 RF ASSEMBLY REMOVAL AND REPLACEMENT

1. Remove the top and bottom covers from the receiver.
2. At the rear panel of the receiver, remove the hex nuts and washers securing the RF IN (A3J1), SMO (A3J2), and the EXT REF (A3J3) BNC connectors to the receiver rear panel.
3. From the under side of the receiver, Remove the ribbon connector A3P1 from the J4 connector of the Digital Assembly (A2).
4. From the top of the receiver, remove the five phillips head screws and washers securing the RF Assembly to the stand-offs on the receiver deck.
5. Carefully lift the front edge of the assembly and slide toward the front of the receiver until the connectors are free of the rear panel.
6. Carefully guide the ribbon cable and connector A3P1 through the access hole in the receiver deck and remove the assembly from the receiver.
7. For installation of the replacement assembly, reverse the steps taken in the removal process.
8. Before reassembling the receiver carefully check for proper cable mounting, and check for pinched wires and shorted connections.
9. Reassemble the receiver and verify proper operation.

7.8.4 TYPE 766028-1 POWER SUPPLY REMOVAL AND REPLACEMENT

1. Remove the receiver top and bottom covers.
2. Detach the front panel from the WJ-8712P chassis by removing the four phillips head mounting screws. Carefully move the front panel aside to gain access to the PS1P2 cable connected to the Power Distribution Assembly (A1). Unplug the PS1P2 cable.
3. From the under side of the receiver, remove the four phillips head screws and washers securing the Power Supply assembly to the receiver deck.
4. From the top of the receiver, carefully lift the Power Supply out of the receiver. Carefully free the attached cables and wires while removing the assembly.
5. For installation of the replacement assembly, reverse the steps taken in the removal process.
6. Before reassembling the receiver carefully check for proper cable mounting, and check for pinched wires and shorted connections.
7. Reassemble the receiver and verify proper operation.

7.8.5 RAM/BATTERY (A2U5) REMOVAL/REPLACEMENT PROCEDURES

Component A2U5 is a plug-in chip that furnishes battery power (V Batt) for the Digital Control PC Assembly (A2). U5 may require replacement as a result of failure of the battery, failure of the other functions of the chip, or as a result of preventive maintenance activities designed to periodically replace the battery.

Remove the bottom cover from the receiver.

Refer to **Figure 7-10** for the approximate location of U5 on the Digital Control PC Assembly. If your receiver contains a Digital Expansion Assembly (Options) Board A2A1, the Digital Expansion Assembly (Options) A2A1 must be removed for access to the A2U5 component. (**Note**: Observe proper Electro Static Discharge (ESD) procedures when removing and replacing (A2U5.)

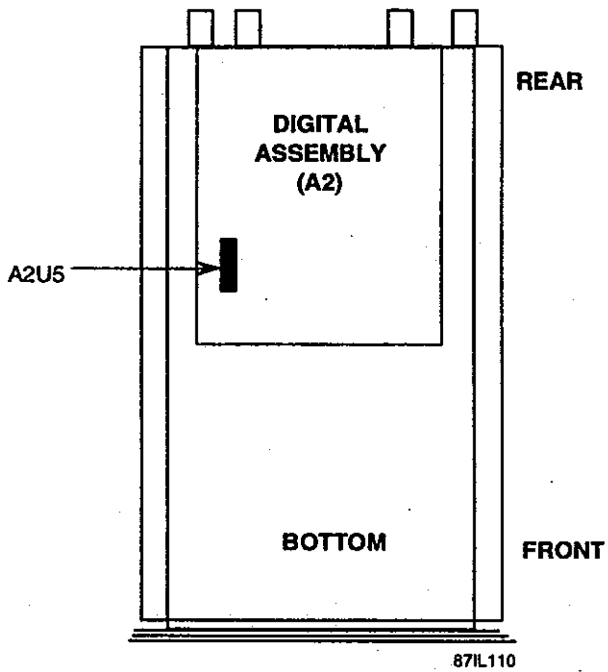

Figure 7-10. RAM/BATTERY Removal and Replacement Procedures

SECTION VIII

REPLACEMENT PARTS LIST

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SECTION VIII

REPLACEMENT PARTS LIST

8.1 UNIT NUMBERING METHOD

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly, and discrete components. An example of the unit numbering method used is as follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

8.2 REFERENCE DESIGNATION PREFIX

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

8.3 PROVISIONING NOTE - INCONSISTENCIES IN PART NUMBERING CONVENTIONS

The internal computer applications at BAE SYSTEMS AEROSPACE ELECTRONICS, INC. Gaithersburg Operations have undergone upgrades to better serve our customers. With this upgrade came alterations to the numbering scheme for parts reporting to an end item. Due to these alterations, minor inconsistencies may exist between identifying parts numbers found on drawings, piece parts, or other documentation. No form fit and function specifications have been altered due to this change in the numbering scheme.

The inconsistencies take two forms. New part number conventions mandate the use of three-digit suffixes for part numbers used within computer applications. Part numbers having single-digit suffixes have been altered by the addition of leading zeroes. Therefore, a piece part with an identifying number having a suffix of "-2" may be represented in a computer-generated document with a part number having a suffix of "-002". Also the new part numbering convention requires that the base portion of a part number be made up of six digits. Part numbers with base portions with less than six digits are expressed with leading zeroes to meet this requirement. Accordingly, a part number having a base of "34456" may appear as "034456". If you have questions or concerns regarding the configuration identification of piece parts, contact the plant for additional information at 1-800-954-3577.

8.4 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr Code	Name and Address
0B0A9	Dallas Semiconductor Corp. 4350 Beltwood Parkway S Dallas, TX 75244	15542	Mini-Circuits Laboratories 2625 E. 14th Street Brooklyn, NY 11235
0VUE0	Raltron Electronics Corp. 2315 N.W. 107th Avenue Miami, FL 33172	17856	Siliconix Incorporated 2201 Laurelwood Road Santa Clara, CA 95050
00779	AMP, Inc. P. O. Box 3608 Harrisburg, PA 17150	18324	Signetics Corporation 4130 So. Market Court Sacramento, CA 94834
01295	Texas Instruments, Inc. 13500 No. Central Express Way Dallas, TX 75231	20462	Prem Magnetics Incorporated 3521 No. Chapel Hill Road McHenry, IL 60050
03508	General Electric Company Semi-Conductor Products Dept. W. Genesee Street Auburn, NY 13021	22526	Dupont Electronics Department Route 83 New Cumberland, PA 17070
04713	Motorola, Inc. 5005 East McDowell Road Phoenix, AZ 85008	24355	Analog Devices Incorporated Route 1, Industrial Park P.O. Box 280 Norwood, MA 02062
05245	CORCOM, Inc. 1600 Winchester Road Libertyville, IL 60048-1267	24931	Specialty Connector Co., Inc. 2100 Earlywood Drive P.O. Box 547 Franklin, TN 46131
06665	Precision Monolithics, Inc. 1500 Space Park Drive Santa Clara, CA 95050	25088	Siemens America Incorporated 186 Wood Avenue So. Iselin, NJ 08830
12697	Clarostat Mfg. Co., Inc. 1 Washington P.O. Box 1507 Dover, NH 03820-1507	26742	Methode Electronics Inc. 7447 W. Wilson Avenue Chicago, IL 60658-4548
14632	BAE SYSTEMS Aerospace Electronics, Inc. 700 Quince Orchard Road Gaithersburg, MD 20878	27014	National Semi-Conductor Corp. 2950 San Ysidro Way Santa Clara, CA 95051
14778	Renco Electronics Incorporated 60 Jefryn Blvd., E. Deer Park, NY 11729	27264	Molex Incorporated 2222 Welington Court Lisle, IL 60532

Mfr. Code	Name and Address	Mfr Code	Name and Address
28480	Hewlett-Packard Company 1501 Page Mill Road Palo Alto, CA 94304	56289	Sprague Electric Co. World Hqs. 267 Lowell Road Hudson, NH 03051-4900
30149	Standard Crystal Corporation 9940 E. Baldwin Place El Monte, CA 91731	58982	Precision Connector Designs, Inc. Centennial Park 2 Technology Drive Peabody, MA 01960
34371	Harris Corp. Semiconductor Sector 200 Palm Bay Boulevard P.O. Box 883 Melbourne, FL 32902-0883	6E390	Powell Electronics, Inc. 2260 Lundy Avenue San Jose, Ca 95131-1816
4W716	Specialty Electric Inc. Airport Way Hailey, ID 83333	6Y440	Micron Semiconductor, Inc. 2805 E. Columbia Road Boise, ID 83706-9698
51406	Murata Erie North America, Inc. 1148 Franklin Road, S.E. Marietta, GA 30067	61271	Fujitsu Microelectronics, Inc. 2985 Kifer Road Santa Clara, CA 95051-0802
52648	Plessey Semiconductors 1641 Kaiser Avenue Irvine, CA 92714	61638	Advanced Interconnections Corp. 5 Division Street West Warwick, RI 02818-3842
53337	RDI/REED Devices, Inc. Subsidiary of AUGAT Inc. 525 Randy Road Carol Stream, IL 60188	62786	Hitachi America, LTD. 1800 Bering Drive San Jose, CA 95122
54473	Panasonic Industrial Company One Panasonic Way P.O. Box 1501 Secaucus, NJ 07094	7J069	TDK Corporation of America 4015 W Vincennes Road Indianapolis, IN 46268-3008
54483	Aircraft Systems Corporation West Caldwell, NJ	71400	Bussmann Div. Of Cooper Industries, Inc. 114 Old State Road Ellisville, MO 63021
54583	TDK Electronics Corporation 12 Harbor Park Drive Port Washington, NJ 11550	75915	Littlefuse Tracor, Inc. Subsidiary of Tracor, Inc. 800 E. Northwest Highway Des Plaines, IL 60016-3049
55322	Samtec Incorporated 810 Progress Boulevard P.O. Box 1147 New Albany, IN 47150	8J671	Crane Component, Co. 4000 Rane Centre Drive Streetsboro, OH 44240-5076

Mfr. Code	Name and Address	Mfr Code	Name and Address
8Z573	J S Terminal Corp. of America 1380 Brummel Avenue Elk Grove Village, IL 60007-2109	9AA37	JST Corporation 1200 Business Center Drive Mt. Prospect, IL 60056
80294	Bourns Incorporated 6135 Magnolia Avenue Riverside, CA 92506	9AA39	TOKO America, Inc. Eastern Regional Office 107 Mill Plain Road Danbury, CT 06811
81349	Military Specifications Promulgated by Military	95146	Alco Electronics Products, Inc. 1551 Osgood Street North Andover, MA 01845
81640	EATON Corporation Aerospace and Commercial 2250 Whitfield Avenue E. Sarasota, FL 34243-9703	95275	Vitramon, Inc. Box 544 Bridgeport, CT 06601-0544
86797	Rogan Corporation 3455 Woodhead Drive Northbrook, IL 60062-1812	99800	Delivan Electronics Division 270 Quaker Road East Aurora, NY 14052-2114

8.5 PARTS LIST

The following parts list contains all the electrical components used in the unit, along with mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts from BAE SYSTEMS, specify the unit type and the serial number, and the option configuration. Also include the reference designation and description for each item ordered. The list of manufacturers, provided in **paragraph 8.4**, and the manufacturer's part number, provided in **paragraph 8.6**, are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph 8.6** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacture provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are identified by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semiconductors become available, it is the policy of BAE SYSTEMS to incorporate them in proprietary products. For this reason some transistors, diodes and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

8.6 TYPE WJ-8712P DIGITAL HF RECEIVER — MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	REVISION H1				
A1	Front Panel Assembly	1	797182-2	14632	
A2	Digital Control PC Assembly	1	797214-1	14632	
A3	RF Tuner Assembly	1	797006-1	14632	
A4	See Customer Options				
B1	Blower, Fan Assembly	1	383178-3	14632	
F1	Fuse/Cartridge 1 AMP 3AG Slow	1	MDL1	71400	
FL1	Filter/Power Line	1	1EF1F	05245	
PS1	Power Supply, 5V @ 3A, +12V @ 1.5A and -12V @ .5A	1	766028-1	14632	
W2	Cable Assembly	1	383159-1	14632	
W2P1	Connector, Receptacle	1	1-480318-0	00779	
XF1	Fuseholder 3AG Size	1	3453LS8	75915	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

8.6.1.1 **Type 482554-1 Front Panel Control PC Assy** REF DESIG PREFIX A1A1

REVISION A

C1	Capacitor, Ceramic: .047µF, 10%, 50V	36	841415-023	14632	
C2	Capacitor, Ceramic: .01µF, 10%, 50V	6	841415-019	14632	
C3	Same As C2				
C4 Thru C6	Same as C1				
C7	Capacitor, Ceramic: .10µF, ± 10%, 100V	4	VJ1812Y104KXBMT	95275	
C8	Same as C7				
C9	Same as C7				
C10	Same as C1				
C11	Same as C1				
C12	Capacitor, Tantalum: 47µF, 20%, 16V	3	841293-30	14632	
C13	Same as C12				
C14	Same as C1				
C15	Capacitor, Tantalum: 4.7µF, 20%, 20V	6	841293-25	14632	
C16	Capacitor, Ceramic: 22PF, 5%, 50V	2	841415-003	14632	
C17	Same as C16				
C18 Thru C20	Same as C1				
C21	Same as C15				
C22 Thru C24	Same as C2				
C25	Same as C15				
C26	Same as C1				
C27	Same as C15				
C28	Same as C1				
C29	Same as C15				
C30 Thru C37	Same as C1				
C38	Same as C15				
C39	Capacitor, Ceramic: 100PF, 5%, 50V	36	841415-007	14632	
C40	Same as C1				
C41	Not Used				
C42	Same as C1				

REF DESIG PREFIX **A1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C43 Thru C50	Not Used				
C51 Thru C54	Same as C1				
C55	Same as C7				
C56 Thru C62	Same as C1				
C63	Same as C2				
C64	Same as C12				
C65	Not Used				
C66	Not Used				
C67	Same as C1				
C68	Same as C1				
C69 Thru C79	Same as C39				
C80 Thru C85	Not Used				
C86 Thru C101	Same as C39				
C102	Capacitor, Ceramic: 1000PF, 10%, 50V	17	841415-013	14632	
C103 Thru C117	Same as C102				
C118 Thru C125	Same as C39				
C126	Not Used				
C127	Same As C102				
C128	Same As C1				
CR1	Diode/Dual Switching Diode	8	MMBD7000LT1	04713	
CR2 Thru CR8	Same as CR1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A1A1

DS1	LED Red 5V=VR 12.5MA=1F	2	LSS260-DOE7502	25088	
DS2	Same as DS1				
E1	Cable Assembly 24 Position	1	IDMD-12-T-13-C	55322	
J1	Connector, Header 3 Pin	1	26-48-2035	27264	
J2	Connector, Plug 3 Pin	1	640456-3	00779	
J3	Connector, 4 Position Single Row	1	S4B-PH-K	8Z573	
J4	Connector, Header 18 Position	1	2MD09R30-37-30	24931	
J5 Thru J7	Not Used				
J8	Connector	1	PGM44DS-G40T30	8J671	
J9	Connector, 16 Pin Double Row	1	SSW-108-01-G-D	55322	
J10	Not Used				
J11	Not Used (10-PIN)				
L1	Inductor, Choke 1µH, .03 Ω MAX	3	NLC565050T-1R0K	54583	
L2	Same As L1				
L3	Same As L1				
Q1	Transistor	16	MMBT2907ALT1	04713	
Q2 Thru Q16	Same as Q1				
R1	Resistor, Fixed: 10KΩ, 5%, .1W	65	841414-097	14632	
R2 Thru R7	Same as R1				
R8	Jumper .05 Ω	8	841417	14632	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed: 56Ω, 5%, .1W	18	841414-043	14632	
R12	Same as R11				
R13	Same As R1				
R14	Same As R1				
R15	Resistor, Fixed: 1.0KΩ, 5%, .1W	6	841414-073	14632	
R16	Same as R1				
R17	Same As R8				
R18	Same As R15				
R19	Resistor, Fixed: 330KΩ, 5%, .1W	1	841414-133	14632	

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R20	Resistor, Fixed: 10MΩ, 5%, .1W	1	841414-169	14632	
R21	Resistor, Fixed: 4.7KΩ, 5%, .1W	12	841414-089	14632	
R22 Thru R29	Same as R21				
R30	Not Used				
R31 Thru R33	Same as R1				
R34	Same as R21				
R35	Same as R8				
R36 Thru R38	Same as R21				
R39 Thru R62	Same as R1				
R63	Same as R8				
R64	Not Used				
R65	Same as R1				
R66	Not Used				
R67	Resistor, Fixed: 2.2KΩ, 5%, .1W	16	841414-081	14632	
R68	Resistor, Fixed: 22.0Ω, 5%, .125W	16	841296-025	14632	
R69	Same as R67				
R70	Same as R68				
R71	Same as R67				
R72	Same as R68				
R73	Same as R67				
R74	Same as R68				
R75	Same as R67				
R76	Same as R68				
R77	Same as R67				
R78	Same as R68				
R79	Same as R67				
R80	Same as R68				
R81	Same as R67				

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R82	Same as R68				
R83	Same as R67				
R84	Same as R68				
R85	Same as R67				
R86	Same as R68				
R87	Same as R67				
R88	Same as R68				
R89	Same as R67				
R90	Same as R68				
R91	Same as R67				
R92	Same as R68				
R93	Same as R67				
R94	Same as R68				
R95	Same as R67				
R96	Same as R68				
R97	Same as R67				
R98	Same as R68				
R99	Resistor, Fixed: 100KΩ, 5%, .1W	3	841414-121	14632	
R100 Thru R102	Same as R1				
R103 Thru R106	Same as R15				
R107 Thru R110	Same as R1				
R111	Same as R99				
R112	Same as R99				
R113 Thru R116	Same as R1				
R117	Resistor, Fixed: 100Ω, 5%, .1W	5	841414-049	14632	
R118 Thru R121	Same as R117				
R122 Thru R134	Not Used				

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R135	Same as R8				
R136	Not Used				
R137 Thru R144	Same as R11				
R145 Thru R160	Same as R1				
R161 Thru R166	Same as R11				
R167	Not Used				
R168	Same as R11				
R169	Not Used				
R170	Resistor, Fixed: 22Ω, 5%, .1W	2	841414-033	14632	
R171	Same as R170				
R172	Same as R8				
U1	Integrated Circuit	1	MC68HC16Z1CFC16	04713	
U2	Integrated Circuit	1	8674HC14SO14U	14632	
U3	Integrated Circuit, CMOS	3	8674HC191SO16U	14632	
U4	Same as U3				
U5	Integrated Circuit	1	8674HC244SOL20U	14632	
U6	Integrated Circuit	1	MC34064D-5	04713	
U7	Integrated Circuit	2	8674HC74SO14U	14632	
U8	Same As U7				
U9	Not Used				
U10	Integrated Circuit	1	TMS27PC210A-12FNL	01295	
XU10	Socket	1	213-044-601	26742	
U11	Not Used				
XU11	Not Used				
U12	Not Used				
U13	Not Used				
U14	Integrated Circuit	4	8674HC273SOL20U	14632	
U15	Same As U14				
U16	Same As U14				
U17	Integrated Circuit, CMOS	1	8674HC123S016N	14632	
U18	Integrated Circuit	2	8674HC32SO14U	14632	
U19	Same As U14				
U20	Same As U18				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
8.6.1.3	**Type 383605-1 Interconnect PC Assembly**		REF DESIG PREFIX A1A3		
	REVISION A				
C1	Capacitor, Ceramic: .1µF, 10%, 100V	2	CK06BX104K	81349	
C2	Same As C1				
J1	Connector, 1/8 Stereo Phone Jack, PC Mount	1	SJ-500	53337	
P1	Connector, Multipin 18 Position	1	2320930-01	4W716	
R1	Resistor, Variable: 10K 1/2 W Linear ±10%	1	308N10KS	12697	
U1	Encoder	1	388EN6P	12697	

8.6.2 TYPE 797214-1 DIGITAL CONTROL PC ASSEMBLY REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
BT1	Not Used				
XBT1	Not Used				
BT2	Not Used				
XBT2	Not Used				
C1	Capacitor, Ceramic, .01µF, 10%	118	841415-019	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, .033µF, 10%	17	841415-022	14632	
C5	Same as C4				
C6	Same as C4				
C7	Same as C4				
C8	Same as C4				
C9	Same as C4				
C10	Same as C4				
C11	Same as C1				
C12	Capacitor, Ceramic, .1µF, 10%, >/=50VDC	8	841250-25	14632	
C13	Same as C1				
C14	Capacitor, Ceramic, 75pF, ~~2%	1	841416-046	14632	
C15	Capacitor, Tantalum, 3.3µF, 20%, 16V	10	841293-10	14632	
C16	Same as C12				
C17	Capacitor, Ceramic, 22pF, 5%	3	841415-003	14632	
C18	Same as C1				
C19	Same as C1				
C20	Capacitor, Ceramic, 100pF, 5%	9	841415-007	14632	
C21	Same as C20				
C22	Same as C20				
C23	Same as C20				
C24	Same as C1				
C25	Capacitor, Electrolytic, Aluminum, 470 F, 16V	1	ECE-A1CU471	54473	
C26	Same as C1				
C27	Capacitor, Ceramic, .047µF, 10%	9	841415-023	14632	
C28	Same as C27				
C29	Same as C1				
C30	Same as C4				
C31	Same as C4				
C32	Same as C1				
C33	Same as C4				
C34	Same as C1				
C35	Same as C15				
C36	Same as C1				
C37	Same as C1				
C38	Same as C12				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C39	Same as C1				
C40	Capacitor, Tantalum, 10µF, 20%, 16V	2	841293-16	14632	
C41	Same as C17				
C42	Same as C17				
C43	Same as C12				
C44	Same as C1				
C45	Same as C12				
C46	Same as C40				
C47	Same as C1				
C48	Same as C12				
C49	Capacitor, Ceramic, 470pF, 5%	8	841415-011	14632	
C50	Same as C49				
C51	Same as C49				
C52	Same as C49				
C53	Same as C49				
C54	Same as C1				
C55	Same as C1				
C56	Capacitor, Ceramic, 1000pF, 10%	4	841415-013	14632	
C57	Capacitor, Ceramic, 47pF, 2%	4	841416-041	14632	
C58	Same as C1				
C59	Same as C1				
C60	Same as C1				
C61	Same as C15				
C62	Same as C15				
C63	Same as C15				
C64	Same as C1				
C65	Same as C1				
C66	Same as C1				
C67	Same as C1				
C68	Same as C1				
C69	Same as C1				
C70	Same as C1				
C71	Same as C15				
C72	Same as C56				
C73	Same as C56				
C74	Same as C49				
C75	Same as C27				
C76	Same as C27				
C77	Capacitor, Ceramic, 1500pF, 10%,	3	841415-014	14632	
C78	Same as C27				
C79	Same as C77				
C80	Same as C77				
C81	Capacitor, Ceramic, 820pF, ±2%	3	841416-071	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C82	Same as C49				
C83	Same as C1				
C84	Same as C1				
C85	Same as C1				
C86	Same as C49				
C87	Same as C1				
C88	Same as C1				
C89	Same as C1				
C90	Same as C1				
C91	Same as C1				
C92	Same as C1				
C93	Same as C1				
C94	Same as C1				
C95	Same as C1				
C96	Capacitor, Ceramic, 2200pF, 10%	4	841415-015	14632	
C97	Same as C57				
C98	Same as C1				
C99	Same as C1				
C100	Same as C1				
C101	Same as C27				
C102	Same as C1				
C103	Same as C15				
C104	Same as C15				
C105	Same as C4				
C106	Capacitor, Ceramic, 220pF, 5%	1	841415-009	14632	
C107	Same as C1				
C108	Same as C27				
C109	Same as C1				
C110	Same as C1				
C111	Same as C1				
C112	Same as C15				
C113	Capacitor, Ceramic, 330pF, 5%	1	841415-010	14632	
C114	Same as C27				
C115	Same as C57				
C116	Same as C1				
C117	Same as C1				
C118	Same as C96				
C119	Same as C1				
C120	Same as C1				
C121	Same as C15				
C122	Same as C57				
C123	Same as C4				
C124	Same as C96				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
				REF DESIG PREFIX A2	
C125	Capacitor, Ceramic, 180pF, 2%	1	841416-055	14632	
C126	Capacitor, Ceramic, 470pF, 2%	1	841416-065	14632	
C127	Same as C27				
C128	Capacitor, Ceramic, 68pF, ±2%	1	841416-045	14632	
C129	Same as C1				
C130	Same as C1				
C131	Not Used				
C132	Same as C1				
C133	Same as C1				
C134	Same as C1				
C135	Not Used				
C136	Same as C1				
C137	Same as C1				
C138	Same as C81				
C139	Same as C1				
C140	Same as C1				
C141	Same as C1				
C142	Not Used				
C143	Same as C1				
C144	Same as C81				
C145	Same as C1				
C146	Same as C1				
C147	Same as C1				
C148	Capacitor, Ceramic, 100pF, 2%	4	841416-049	14632	
C149	Same as C148				
C150	Same as C148				
C151	Same as C148				
C152	Same as C1				
C153	Same as C1				
C154	Same as C1				
C155	Same as C1				
C156	Same as C1				
C157	Same as C1				
C158	Capacitor, Ceramic, 1000pF, 2%	1	841416-073	14632	
C159	Capacitor, Ceramic, 56pF, 2%	1	841416-043	14632	
C160	Same as C1				
C161	Same as C1				
C162	Capacitor, Ceramic, 1200pF, 2%	1	841416-075	14632	
C163	Capacitor, Tantalum, 68µF, 20%, 6.3V	1	841293-24	14632	
C164	Same as C1				
C165	Same as C1				
C166	Same as C1				
C167	Same as C1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C168	Same as C1				
C169	Same as C1				
C170	Same as C1				
C171	Same as C56				
C172	Same as C1				
C173	Same as C1				
C174	Same as C1				
C175	Capacitor, Tantalum, 33µF, 20%, 16V	9	841293-22	14632	
C176	Same as C175				
C177	Same as C96				
C178	Same as C1				
C179	Same as C175				
C180	Capacitor, Tantalum, 6.8µF, 20%, 6.3V	2	841293-14	14632	
C181	Same as C180				
C182	Same as C1				
C183	Not Used				
C184	Same as C1				
C185	Same as C12				
C186	Same as C12				
C187	Same as C1				
C188	Same as C1				
C189	Same as C1				
C190	Not Used				
C191	Same as C1				
C192	Same as C4				
C193	Same as C1				
C194	Same as C1				
C195	Same as C1				
C196	Same as C1				
C197	Same as C1				
C198	Not Used				
C199	Not Used				
C200	Same as C1				
C201	Same as C1				
C202	Same as C175				
C203	Same as C175				
C204	Same as C175				
C205	Same as C1				
C206	Same as C20				
C207	Same as C1				
C208	Same as C1				
C209	Same as C1				
C210	Same as C1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C211	Same as C1				
C212	Same as C1				
C213	Same as C1				
C214	Same as C20				
C215	Same as C20				
C216	Same as C1				
C217	Same as C20				
C218	Same as C1				
C219	Same as C175				
C220	Same as C175				
C221	Same as C175				
C222	Same as C1				
C223	Same as C20				
C224	Same as C1				
C225	Same as C1				
C226	Same as C1				
C227	Same as C1				
C228	Same as C1				
C229	Same as C4				
C230	Same as C1				
C231	Same as C1				
C232	Not Used				
C233	Same as C4				
C234	Not Used				
C235	Same as C1				
C236	Same as C4				
C237	Same as C4				
C238	Not Used				
C239	Not Used				
CR1	Not Used (SOT-23)				
CR2	Diode/Swpin Dual Swithcing Diode Reverse Volltage	2	MMBD7000LT1	04713	
CR3	Not Used				
CR4	Same as CR2				
CR5	Not Used				
FL1	Filter, 455 kHz Precision Ladder Type	1	CFS-455B	51406	
J1	Connector, Jack, BNC BNC Rt Ang , PCB/Panel MT W/SLDR Mt Posts	1	227677-1	00779	
J2	Phone Jack, 3.5 Dia Mini Phone Jack, RES=3OM	1	SJ360	53337	
J3	Connector, 25-Pin D-Sub RT Ang, PC MT	1	DMRSTR25RA05Cg	05574	
J4	CONN 24-Pin Term Strip Gold Flash .100CTRS	4	79223-624	22526	
J5	Connector, Header,6 Pos Pin Friction Lock .156 CTRS	1	26-48-2066	27264	
J6	Not Used				
J7	Same as J4				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
J8	Same as J4				
J9	Same as J4				
J10	Not Used				
J11	Connector, PC,BD 3 Pin SHRD HDR	1	3-102202-4	00779	
J12	Not Used				
J13	Not Used				
J14	Connector, Header,10 Pin HDR .025SQ X.230 X.10CTR SGLD PLTD	1	TSW105-07-G-D	55322	
J15	Not Used				
J16	Not Used				
JW1	Not Used				
L1	Inductor, 10µH, Surface MT	3	RL-1500-10	14778	
L2	Same as L1				
L3	Same as L1				
L4	Inductor, 1.0µH, ~-20%,@7.96MHZ QMIN-25 370MA Ferrite 1210	9	B82422-A1102-M	25088	
L5	Same as L4				
L6	Same as L4				
L7	Same as L4				
L8	Same as L4				
L9	Same as L4				
L10	Same as L4				
L11	Not Used				
L12	Inductor, 2.2µH	1	841444-009	14632	
L13	Inductor, 4.7µH	1	B82422-A1472-M	25088	
L14	Inductor, 150nH	1	841438-029	14632	
L15	Inductor, 68nH	1	841438-021	14632	
L16	Inductor, 2.7µH	1	841444-011	14632	
L17	Not Used				
L18	Inductor, 1000µH	2	NLF453232-102K	7J069	
L19	Same as L18				
L20	Same as L4				
L21	Same as L4				
L22	Not Used				
L23	Not Used				
Q1	Not Used				
Q2	Transistor	3	MMBT2222ALT1	04713	
Q3	Same as Q2				
Q4	Not Used				
Q5	Not Used				
Q6	Transistor	2	2N7002-LT1	17856	
Q7	Same as Q2				
Q8	Transistor	2	MMBT-3906	04713	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
Q9	Same as Q6				
Q10	Transistor	2	MMBT3904LT1	04713	
Q11	Same as Q8				
Q12	Same as Q10				
R1	Resistor, Fixed, 100kΩ, 5%	110	841414-121	14632	
R2	Resistor, Fixed, 47Ω, 5%	20	841414-041	14632	
R3	Resistor, Fixed, 47kΩ, 5%	7	841414-113	14632	
R4	Same as R3				
R5	Resistor, Fixed, 100Ω, 5%	16	841414-049	14632	
R6	Same as R3				
R7	Resistor, Fixed, 10kΩ, 5%	43	841414-097	14632	
R8	Resistor, Fixed, 4.7kΩ, 5%	7	841414-089	14632	
R9	Resistor, Fixed, 2.2kΩ, 5%	8	841414-081	14632	
R10	Same as R2				
R11	Resistor, Fixed, 820Ω, 5%	1	841414-071	14632	
R12	Resistor, Fixed, 680Ω, 5%	1	841414-069	14632	
R13	Same as R5				
R14	Same as R5				
R15	Not Used				
R16	Not Used				
R17	Not Used				
R18	Resistor, Fixed, 1.0kΩ, 5%	23	841414-073	14632	
R19	Jumper .05 Ω MAX 1A MIN@70C	26	841417	14632	
R20	Same as R19				
R21	Same as R18				
R22	Same as R19				
R23	Not Used				
R24	Same as R18				
R25	Same as R19				
R26	Resistor, Fixed, 1.5kΩ, 5%	5	841414-077	14632	
R27	Same as R19				
R28	Same as R18				
R29	Resistor, Fixed, 2.7Ω, 5%	4	841414-011	14632	
R30	Resistor, Fixed, 22kΩ, 5%	4	841414-105	14632	
R31	Same as R5				
R32	Same as R30				
R33	Same as R5				
R34	Same as R1				
R35	Same as R19				
R36	Resistor, Fixed, 2.7kΩ, 5%	2	841414-083	14632	
R37	Same as R18				
R38	Same as R19				
R39	Same as R7				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R40	Same as R7				
R41	Same as R18				
R42	Same as R7				
R43	Same as R19				
R44	Not Used				
R45	Same as R18				
R46	Same as R36				
R47	Same as R2				
R48	Same as R1				
R49	Same as R1				
R50	Resistor, Fixed, 470Ω, 5%	10	841414-065	14632	
R51	Not Used				
R52	Resistor, Fixed, 75kΩ, 5%	2	841414-118	14632	
R53	Same as R52				
R54	Same as R1				
R55	Resistor, Fixed, 33kΩ, 5%	5	841414-109	14632	
R56	Resistor, Fixed, 220kΩ, 5%	6	841414-129	14632	
R57	Same as R55				
R58	Same as R56				
R59	Resistor, Fixed, 68kΩ, 5%	4	841414-117	14632	
R60	Same as R18				
R61	Same as R1				
R62	Same as R1				
R63	Same as R50				
R64	Same as R1				
R65	Same as R1				
R66	Same as R1				
R67	Same as R2				
R68	Same as R56				
R69	Same as R56				
R70	Same as R2				
R71	Same as R56				
R72	Same as R56				
R73	Same as R2				
R74	Same as R59				
R75	Same as R18				
R76	Same as R1				
R77	Same as R1				
R78	Same as R9				
R79	Same as R1				
R80	Same as R1				
R81	Same as R18				
R82	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R83	Same as R1				
R84	Same as R1				
R85	Not Used				
R86	Same as R1				
R87	Same as R2				
R88	Same as R18				
R89	Same as R9				
R90	Same as R1				
R91	Same as R1				
R92	Same as R1				
R93	Same as R50				
R94	Resistor, Fixed, 18kΩ, 5 %	4	841414-103	14632	
R95	Same as R2				
R96	Same as R94				
R97	Same as R2				
R98	Same as R3				
R99	Same as R3				
R100	Same as R55				
R101	Same as R8				
R102	Same as R1				
R103	Same as R1				
R104	Same as R1				
R105	Not Used				
R106	Same as R9				
R107	Same as R94				
R108	Same as R9				
R109	Same as R94				
R110	Same as R18				
R111	Same as R7				
R112	Resistor, Fixed, 8.2kΩ, 5%	2	841414-095	14632	
R113	Same as R112				
R114	Same as R7				
R115	Same as R1				
R116	Not Used				
R117	Same as R7				
R118	Same as R7				
R119	Same as R7				
R120	Same as R1				
R121	Same as R1				
R122	Same as R1				
R123	Same as R1				
R124	Same as R2				
R125	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R126	Same as R18				
R127	Same as R59				
R128	Same as R7				
R129	Same as R2				
R130	Same as R1				
R131	Same as R1				
R132	Same as R1				
R133	Resistor, Fixed, 150kΩ, 5%	2	841414-125	14632	
R134	Same as R50				
R135	Same as R7				
R136	Same as R26				
R137	Same as R26				
R138	Same as R30				
R139	Same as R2				
R140	Same as R1				
R141	Same as R1				
R142	Same as R18				
R143	Same as R18				
R144	Same as R1				
R145	Same as R18				
R146	Same as R55				
R147	Resistor, Fixed, 150Ω, 5%	1	841414-053	14632	
R148	Resistor, Fixed, 3.3kΩ, 5%	9	841414-085	14632	
R149	Same as R1				
R150	Same as R1				
R151	Resistor, Fixed, 10Ω, 5%	5	841414-025	14632	
R152	Same as R18				
R153	Same as R18				
R154	Same as R133				
R155	Resistor, Fixed, 4.7Ω, 5%	1	841414-017	14632	
R156	Not Used				
R157	Same as R7				
R158	Same as R7				
R159	Same as R7				
R160	Same as R26				
R161	Same as R26				
R162	Same as R30				
R163	Same as R2				
R164	Same as R3				
R165	Same as R1				
R166	Same as R7				
R167	Same as R7				
R168	Same as R18				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R169	Resistor, Fixed, 220Ω, 5%	3	841414-057	14632	
R170	Same as R7				
R171	Same as R1				
R172	Same as R151				
R173	Same as R7				
R174	Same as R7				
R175	Not Used				
R176	Same as R29				
R177	Same as R1				
R178	Same as R7				
R179	Same as R1				
R180	Same as R2				
R181	Not Used				
R182	Not Used				
R183	Same as R2				
R184	Same as R29				
R185	Same as R7				
R186	Same as R19				
R187	Same as R2				
R188	Same as R151				
R189	Not Used				
R190	Same as R29				
R191	Same as R19				
R192	Not Used				
R193	Same as R1				
R194	Same as R1				
R195	Same as R7				
R196	Same as R7				
R197	Same as R148				
R198	Same as R148				
R199	Same as R151				
R200	Same as R18				
R201	Same as R19				
R202	Same as R148				
R203	Same as R148				
R204	Not Used				
R205	Same as R19				
R206	Same as R151				
R207	Same as R1				
R208	Same as R1				
R209	Same as R19				
R210	Same as R1				
R211	Same as R19				

REF DESIG PREFIX A2

REF DESIG	* DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R212	Same as R1				
R213	Not Used				
R214	Same as R19				
R215	Same as R1				
R216	Same as R19				
R217	Resistor, Fixed, 5.6kΩ, 5%	1	841414-091	14632	
R218	Same as R148				
R219	Same as R9				
R220	Same as R5				
R221	Same as R5				
R222	Same as R9				
R223	Same as R7				
R224	Same as R1				
R225	Not Used				
R226	Same as R8				
R227	Same as R3				
R228	Same as R8				
R229	Same as R1				
R230	Same as R1				
R231	Same as R19				
R232	Same as R1				
R233	Same as R1				
R234	Not Used				
R235	Same as R1				
R236	Not Used				
R237	Same as R1				
R238	Not Used				
R239	Same as R1				
R240	Same as R7				
R241	Same as R8				
R242	Same as R8				
R243	Same as R7				
R244	Same as R1				
R245	Same as R7				
R246	Same as R1				
R247	Resistor, Fixed, 1.0 MΩ 5%	4	841414-145	14632	
R248	Same as R2				
R249	Same as R1				
R250	Same as R7				
R251	Same as R7				
R252	Same as R2				
R253	Same as R1				
R254	Same as R1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R255	Same as R7				
R256	Same as R1				
R257	Same as R1				
R258	Same as R1				
R259	Same as R1				
R260	Same as R1				
R261	Same as R1				
R262	Not Used				
R263	Not Used				
R264	Not Used				
R265	Same as R5				
R266	Same as R1				
R267	Same as R1				
R268	Same as R1				
R269	Not Used				
R270	Same as R7				
R271	Same as R19				
R272	Same as R1				
R273	Same as R7				
R274	Same as R7				
R275	Same as R1				
R276	Same as R1				
R277	Same as R1				
R278	Same as R7				
R279	Not Used				
R280	Same as R19				
R281	Same as R1				
R282	Same as R1				
R283	Same as R7				
R284	Not Used				
R285	Not Used				
R286	Same as R247				
R287	Not Used				
R288	Same as R1				
R289	Same as R19				
R290	Same as R1				
R291	Not Used				
R292	Same as R1				
R293	Same as R19				
R294	Same as R19				
R295	Not Used				
R296	Same as R19				
R297	Same as R55				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R298	Same as R7				
R299	Not Used				
R300	Not Used				
R301	Same as R19				
R302	Same as R5				
R303	Same as R7				
R304	Same as R1				
R305	Same as R1				
R306	Same as R18				
R307	Same as R59				
R308	Same as R7				
R309	Not Used				
R310	Same as R7				
R311	Same as R7				
R312	Same as R1				
R313	Same as R1				
R314	Same as R5				
R315	Same as R7				
R316	Same as R5				
R317	Same as R1				
R318	Same as R5				
R319	Same as R1				
R320	Same as R50				
R321	Same as R1				
R322	Same as R1				
R323	Same as R18				
R324	Same as R5				
R325	Same as R1				
R326	Same as R1				
R327	Same as R18				
R328	Same as R7				
R329	Same as R1				
R330	Same as R9				
R331	Same as R1				
R332	Same as R1				
R333	Resistor, Fixed, 6.8 kΩ, 5%	2	841414-093	14632	
R334	Same as R8				
R335	Not Used				
R336	Same as R1				
R337	Same as R333				
R338	Same as R148				
R339	Same as R148				
R340	Resistor, Fixed, 68Ω, 5%	2	841414-045	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R341	Same as R247				
R342	Same as R247				
R343	Same as R2				
R344	Same as R1				
R345	Same as R1				
R346	Same as R1				
R347	Same as R1				
R348	Same as R1				
R349	Same as R1				
R350	Same as R1				
R351	Same as R1				
R352	Same as R1				
R353	Same as R1				
R354	Same as R1				
R355	Same as R1				
R356	Same as R1				
R357	Same as R1				
R358	Same as R1				
R359	Same as R1				
R360	Same as R7				
R361	Same as R340				
R362	Not Used				
R363	Same as R19				
R364	Not Used				
R365	Not Used				
R366	Same as R50				
R367	Same as R5				
R368	Same as R5				
R369	Same as R5				
R370	Same as R50				
R371	Same as R50				
R372	Same as R169				
R373	Same as R50				
R374	Same as R50				
R375	Same as R169				
R376	Same as R19				
R377	Same as R148				
R378	Same as R2				
R379	Not Used				
S1	Switch/Dip SPST Side Actuated Dip	2	ADP-08S	95146	
S2	Same as S1				
T1	Transformer CPLG Audio 600CT/500CT IMP=10%,	2	SPT-130	20462	
T2	Same as T1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U1	Integrated Circuit, Microcontroller,Microcontroller Unit 16-BIT Timer 8 Channel 8-BIT	1	MC68GC11A0FN	04713	
XU1	Socket 52-POS PLCC .050CTRS 1.050 X .20HT Polarized Surf	1	213-052-601	26742	
U2	Integrated Circuit,TRI-State Octal D-Type Latch SOL-20 Wide Pkg	1	74HC373SOL20	02735	
U3	Integrated Circuit,Octal TRI-State B!uffer, SOL-20 Wide Pkg	4	74HC244 SOL20	04713	
U4	Integrated Circuit,Quad 2-Input NAND Gate S0-14N	1	74HC00 SO14	02735	
U5	Integrated Circuit, RAM,8K X 8 Nonvolatile Time Keeping RAM 120NS=AT 28-Pin	1	DS1643-120	0B0A9	
XU5	Socket, IC 28 Pin .600 Row Spacing On .100 CTRS Gold Contact	2	O-628-SGT	S5322	
U6	Integrated Circuit, CMOS,Triple Three Input OR Gate SO-14 PLSTC PKG	1	74HC4075 SO14	02735	
U7	Integrated Circuit,TRIPLE 3-Input NOR Gates	1	74HC27 SO14	02735	
U8	Integrated Circuit,3-TO-8 Line Decoder	1	74HC138 SO16	02735	
U9	Integrated Circuit, CMOS,Quad Buffer/Line Driver	2	74HC125 SO14	34371	
U10	Integrated Circuit,Triple 3-Input AND Gate	1	74F11 SO14	04713	
U11	Integrated Circuit,1-OF-8 Decoder/Demultiplexer	1	74F138 SO16	04713	
U12	EPROMProgrammed	1	842032	14632	
XU12	socket, IC 32-PIN LOW PROFILE DIP Socket .600 Row Slpace Gold	1	O-632-SGT	S532	
U13	Integrated Circuit,16-BIT A/D Converter 20-Pin PLSTC DIP	1	DSP56ADC16S	04713	
U14	Same as U3				
U15	Integrated Circuit,Octal D Flip-Flops With Clear SOL-20 Wide Pkg	1	74HC273 SOL20		
U16	Same as U9				
U17	Same as U3				
U18	Not Used				
U19	Same as U3				
U20	Integrated Circuit,Line Driver and Receiver Monolithic 8 Pin PKS	2	SN75155D	01295	
U21	Integrated Circuit, CMOS,Hex Inverters Active Outputs	3	74AC04 SO14	04713	
U22	Amplifier Ultra-High Frequency Op. Amp Gain Bandwidth 1.	1	NE5539D	18324	
U23	Integrated Circuit,Dual D Flip-Flop With Preset and Clear	3	74HC74 SO14	04713	
U24	Integrated Circuit, CMOS,14-Stage Binary Ripple Counter	2	74HC4020 SO16	34371	
U25	Integrated Circuit, CMOS,Parallel-In/Serial-OUT 8-BIT Shift Register SO-1	1	74HC165 SO16	02735	
U26	Integrated Circuit, /INV Hex Inverter	1	74HC04 SO14	04713	
U27	Integrated Circuit,SYN Presettable Binary Counter	2	74AC161 SO16	34371	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U28	Same as U27				
U29	Same as U23				
U30	Integrated Circuit,Synchronous Binary Counter with Asynchronous Clear SO	1	74HC161 SO16	02735	
U31	Same as U23				
U32	Same as U21				
U33	Integrated Circuit, CMOS,Dual D Flip-Flop With PRESET AND CLEAR	1	74AC74CO14	02735	
U34	Voltage Regulator3 TERM NEG Volt Regulator -5V	1	MC79M05CDT	04713	
U35	Same as U24				
U36	Same as U21				
U37	Integrated Circuit,40 MHZ DSP Microprocessor with PLL 24-BIT 132-PIN PQF	1	DSP56002FC40	04713	
U38	Same as U20				
U39	Integrated Circuit, /SRAMCMOS,32K X 8 20NS Access Time 28PIN SOJ	6	MT5C2568DJ-20	6Y440	
U40	Same as U39				
U41	Same as U39				
U42	Integrated Circuit, /Sensing Undervoltage Sensing Rest Operation W/1V Input	1	MC34064D-5	04713	
U43	Not Used				
U44	Integrated Circuit, Differential Bus Transceiver	2	SN75176AD	01295	
U45	Same as U39				
U46	Same as U39				
U47	Same as U39				
U48	Integrated Circuit, Octal D Flip-Flop with RESET SOL-20 PKG	2	74HCT273 SOL20	02735	
U49	Integrated Circuit, Dual D Flip-Flop with SET and RESET	1	74HCT74 SO14	34371	
U50	Same as U48				
U51	Integrated Circuit, /CONV D/A Monolithic 8-BIT HS Current Output	2	DAC0800LCM	27014	
U52	Amplifier JFET-Input Dual OP AMP	7	MC34002D	04713	
U53	Integrated Circuit, Quad 2-Input AND Gate	1	74HC08 SO14	02735	
U54	Same as U52				
U55	Same as U51				
U56	EPROM Programmed	1	842033	14632	
XU56	Same as XU5				
U57	Same as U44				
U58	Integrated Circuit, Dual 1-OF-4 Decoder/Demultiplexer	1	74F139 SO16	04713	
U59	Integrated Circuit, /CONV D/A 16 Bit Audio D/A Converter	1	AD1851R	24355	
U60	Integrated Circuit, CMOS,Triple 2-Channel Analog Multiplexer/Demultiplexer	3	74HC4053 SO16	02735	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

U61	Same as U52				
U62	Same as U60				
U63	Same as U52				
U64	Same as U52				
U65	Amplifier Single Low Noise OP AMP SO 8 PIN	3	NE5534D	18324	
U66	Same as U65				
U67	Integrated Circuit, Dynamic Range Processor Dual VCA 16-Pin DIP	1	SSM-2122P	06665	
U68	Same as U60				
U69	Amplifier JFET-Input Operational Amplifier	2	MC34001D	04713	
U70	Same as U69				
U71	Same as U52				
U72	Integrated Circuit, /AMP 1.5W Audio Power AMP 14-PIN DIP	1	LM388N-1	27014	
U73	Not Used				
U74	Same as U52				
U75	Same as U65				
VR1	Not Used				
XTB1	Connector, Header,13-POS Shrouded PC MT	1	ELFH13210	58982	
Y1	Not Used				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

8.6.3 TYPE 797006-1/-2/-3/-4/-5 RF TUNER PC ASSEMBLY REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision D1				
	See Note*				
C1	Not Used				
C2	Not Used				
C3	Capacitor, Ceramic: .01 µF, 10%, 50 V	140	841415-019	14632	
C4	Same as C3				
C5	Same as C3				
C6	Not Used				
C7 Thru C10	Same as C3				
C11	Capacitor, Ceramic: 56 pF, 2%, 50 V NPO	4	841416-043	14632	
C12	Capacitor, Ceramic: .1 µF, 10% 50 VDC	80	841250-25	14632	
C13	Same as C12				
C14	Same as C12				
C15	Same as C3				
C16	Same as C12				
C17 Thru C22	Same as C3				
C23	Capacitor, Ceramic: 160 pF, 2%, 50 V NPO	2	841416-054	14632	
C24	Not Used				
C25	Capacitor, Ceramic: 8.2 pF,±.25 pF, 50 V	1	8414116-023	14632	
C26	Same as C23				
C27	Capacitor, Ceramic: 27 pF, 2%, 50 V NPO	3	841416-035	14632	
C28	Same as C11				
C29	Capacitor, Ceramic: 82 pF, ±2%, 50 V NPO	3	841416-047	14632	
C30	Not Used				
C31	Same as C3				
C32	Same as C3				
C33 Thru C37	Same as C12				
C38	Capacitor, Ceramic: 22 pF, 5%, 50 V NPO	6	841415-003	14632	
C39 Thru C41	Same as C3				
C42	Same as C38				
C43	Capacitor, Ceramic: 91 pF, ±2%, 50 V NPO	2	841416-048	14632	
C44	Capacitor, Ceramic: 33 pF, ±2%, 50 V NPO	1	841416-037	14632	
C45	Capacitor, Ceramic: 130 pF, 2%, 50 V NPO	1	841416-052	14632	

*Note: The differences between the RF Assembly versions are as follows:
Type 797006-1 Standard, .7 PPM Stability
Type 797006-2 8712/REF, .2 PPM Stability
Type 797006-3 Conformal Coated, .7 PPM Stability
Type 797006-4 Conformal Coated, .2 PPM Stability
Type 797006-5 Standard, with covers.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3

C46	Same as C43				
C47	Capacitor, Ceramic: 100 pF, 2%, 50 V NPO	9	841416-049	14632	
C48	Capacitor, Ceramic: 1500 pF, 10%, 50 V	3	841415-014	14632	
C49	Capacitor, Ceramic: 470 pF, 5%, 50 V NPO	3	841415-011	14632	
C50	Not Used				
C51	Same as C47				
C52	Same as C3				
C53	Same as C3				
C54	Same as C12				
C55	Same as C12				
C56	Same as C3				
C57	Same as C38				
C58	Same as C3				
C59	Same as C38				
C60	Same as C3				
C61	Capacitor, Tantalum: 2.2 µF, 20%, 20 V	4	841293-09	14632	
C62	Same as C3				
C63	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	13	841293-10	14632	
C64	Same as C3				
C65	Same as C3				
C66	Same as C61				
C67	Same as C3				
C68	Capacitor, Tantalum: 33 µF, 20%, 16 V	15	841293-22	14632	
C69 Thru C75	Same as C12				
C76	Same as C61				
C77	Same as C61				
C78	Capacitor, Ceramic: 1000 pF, 10%, 50 V	10	841415-013	14632	
C79	Same as C68				
C80 Thru C84	Same as C3				
C85	Capacitor, Tantalum: 4.7 µF, 20%, 25 V	2	841293-13	14632	
C86 Thru C89	Same as C12				
C90	Same as C68				
C91	Same as C12				
C92	Not Used				
C93	Same as C3				
C94	Capacitor, Ceramic: 2200 pF, 10%, 50 V	7	841415-015	14632	
C95	Same as C78				
C96	Same as C78				
C97	Same as C94				
C98	Same as C3				
C99	Same as C3				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	REF DESIG PREFIX A3				
C100	Not Used				
C101	Same as C3				
C102 Thru C110	Same as C12				
C111 Thru C113	Same as C3				
C114	Capacitor, Tantalum: 6.8 µF, 20%, 6.3 V	2	841293-14	14632	
C115 Thru C118	Same as C3				
C119	Capacitor, Ceramic: 68 pF, 5%, 50 V NPO	2	841415-006	14632	
C120	Same as C114				
C121	Same as C12				
C122	Same as C12				
C123	Same as C63				
C124 Thru C126	Same as C3				
C127 Thru C131	Same as C12				
C132	Same as C3				
C133	Same as C12				
C134	Same as C12				
C135	Same as C3				
C136	Same as C3				
C137	Same as C63				
C138	Same as C12				
C139	Same as C3				
C140	Same as C47				
C141	Same as C3				
C142	Same as C47				
C143	Same as C3				
C144	Capacitor, Ceramic: 47 pF, 5%, 50 V NPO	3	841415-005	14632	
C145	Same as C63				
C146	Same as C12				
C147 Thru C154	Same as C3				
C155	Same as C12				
C156	Same as C3				
C157	Same as C144				
C158	Same as C3				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C159	Same as C3				
C160	Same as C12				
C161	Same as C12				
C162	Not Used				
C163	Same as C3				
C164	Same as C3				
C165	Not Used				
C166	Same as C3				
C167	Same as C68				
C168	Same as C3				
C169	Same as C3				
C170	Same as C47				
C171 Thru C173	Same as C3				
C174	Not Used				
C175	Same as C49				
C176	Same as C78				
C177	Same as C63				
C178	Same as C78				
C179	Same as C119				
C180	Capacitor, Ceramic: 39 pF, 2%, 50 V NPO	1	841416-039	14632	
C181	Same as C12				
C182	Same as C12				
C183	Same as C3				
C184	Not Used				
C185	Same as C47				
c186	Same as C3				
C187	Same as C94				
C188	Same as C144				
C189	Same as C47				
C190 Thru C192	Same as C3				
C193	Not Used				
C194	Same as C78				
C195 Thru C197	Same as C3				
C198	Same as C85				
C199	Same as C3				
C200	Same as C68				
C201	Same as C49				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C202	Not Used				
C203	Same as C47				
C204	Same as C12				
C205	Capacitor, Tantalum: .33 µF, 20%, 35 V	8	841293-01	14632	
C206	Same as C12				
C207 Thru C211	Not Used				
C212	Same as C78				
C213	Same as C47				
C214	Same as C3				
C215	Same as C3				
C216	Capacitor, Ceramic: .033 µF, 10%, 50 V	8	841415-022	14632	
C217	Same as C63				
C218	Same as C38				
C219	Same as C216				
C220	Same as C3				
C221	Not Used				
C222	Same as C3				
C223	Same as C3				
C224	Not Used				
C225	Not Used				
C226	Same as C3				
C227	Same as C3				
C228	Same as C216				
C229	Same as C3				
C230	Same as C216				
C231	Same as C3				
C232	Not Used				
C233	Same as C3				
C234 Thru C240	Not Used				
C241 Thru C245	Same as C3				
C246 Thru C249	Same as C68				
C250	Same as C216				
C251	Same as C3				
C252	Same as C38				
C253 Thru C255	Same as C3				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C256	Capacitor, Tantalum: 68 µF, 20%, 6.3 V	2	841293-24	14632	
C257	Same as C68				
C258	Same as C216				
C259	Same as C78				
C260	Same as C78				
C261	Same as C3				
C262	Same as C3				
C263	Same as C94				
C264	Capacitor, Ceramic: 330 pF, 5%, 50 V NPO	2	841415-010	14632	
C265 Thru C267	Not Used				
C268	Same as C48				
C269	Same as C94				
C270	Same as C63				
C271	Same as C63				
C272	Same as C3				
C273	Same as C12				
C274	Same as C12				
C275	Same as C63				
C276	Same as C3				
C277	Same as C63				
C278	Same as C205				
C279	Same as C12				
C280	Same as C3				
C281	Same as C68				
C282	Same as C256				
C283	Same as C68				
C284	Same as C68				
C285	Same as C3				
C286	Same as C3				
C287	Same as C78				
C288	Same as C3				
C289	Same as C3				
C290	Same as C12				
C291	Same as C3				
C292	Capacitor, Ceramic: 2.2 pF, ±.1 pF, 50 V NPO	3	841416-009	14632	
C293	Same as C292				
C294	Same as C3				
C295	Same as C27				
C296 Thru C298	Same as C3				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C299	Same as C11				
C300	Same as C3				
C301	Same as C11				
C302 Thru C304	Same as C3				
C305	Same as C68				
C306	Same as C3				
C307	Same as C3				
C308	Not Used				
C309	Not Used				
C310 Thru C312	Same as C3				
C313	Same as C68				
C314	Not Used				
C315	Same as C27				
C316	Same as C292				
C317	Same as C12				
C318	Capacitor, Ceramic: 22 pF, 2%, 50 V NPO	2	841416-033	14632	
C319	Same as C318				
C320 Thru C325	Same as C3				
C326	Same as C12				
C327	Same as C12				
C328	Same as C48				
C329	Same as C264				
C330 Thru C334	Same as C3				
C335	Same as C29				
C336 Thru C338	Same as C3				
C339	Same as C12				
C340	Same as C29				
C341	Same as C12				
C342	Same as C63				
C343	Same as C12				
C344	Same as C63				
C345	Same as C12				
C346	Same as C205				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C347 Thru C350	Same as C12				
C351	Same as C205				
C352 Thru C354	Same as C12				
C355	Same as C205				
C356	Same as C12				
C357	Same as C3				
C358	Same as C205				
C359	Same as C3				
C360	Same as C94				
C361	Same as C216				
C362	Same as C94				
C363	Same as C3				
C364 Thru C366	Same as C12				
C367	Same as C63				
C368 Thru C370	Same as C12				
C371	Same as C205				
C372	Same as C12				
C373	Same as C12				
C374	Same as C205				
C375 Thru C377	Same as C12				
C378	Same as C216				
CR1	Dual Switching Diode	17	MMBD7000LT1	04713	
CR2	Diode	6	BB620(Q62702-B403)	25088	
CR3 Thru CR10	Same as CR1				
CR11	Same as CR2				
CR12	Same as CR2				
CR13	Same as CR1				
CR14	Same as CR1				
CR15	Same as CR2				
CR16	Same as CR2				
CR17	Same as CR1				
CR18	Diode	6	FDSO1503	27014	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
CR19 Thru CR23	Same as CR18				
CR24	Diode	6	HSMP-3800-T31	28480	
CR25 Thru CR29	Same as CR24				
CR30	Same as CR1				
CR31	Same as CR2				
CR32 Thru CR35	Same as CR1				
E1	Cable Assembly	1	IDMD-12-T-4-C	55322	
FB1	Ferrite Bead: 120Ω, ±25%	10	CB30-453215T	54583	
FB2 Thru FB10	Same as FB1				
FL1	Filter, BP: 40.455 MHz	1	92609	14632	
FL2	Filter: 455 kHz	1	CFS-455B	51406	
J1	Connector, Jack, BNC	3	227677-1	00779	
J2	Same as J1				
J3	Same as J1				
J4	Not Used				
J5	Connector	1	79223-610	22526	
L1	Inductor: 1000 μH, 10%	6	841699-037	14632	
L2	Inductor: 10 μH, 10%	2	841699-013	14632	
L3	Inductor: 22 nH, ±5%	1	841438-009	14632	
L4	Inductor: 15 nH, ±5%	1	841438-005	14632	
L5	Inductor: 4700 nH, 10%	12	841698-033	14632	
L6	Inductor: 47 μH, ±10%	2	NL322522-470K	54583	
L7	Inductor: 150 nH, ±5%	2	841438-029	14632	
L8	Inductor: 68 nH, ±5%	2	841438-021	14632	
L9	Inductor: 4.7 μH, ±20%	4	B82422-A1472-M	25088	
L10	Same as L6				
L11	Same as L7				
L12	Same as L8				
L13	Same as L9				
L14	Same as L9				
L15 Thru L17	Same as L5				
L18	Inductor: 270 μF, ±5%	2	841438-035	14632	
L19	Inductor: 330 nH, ±5%	1	841438-037	14632	
L20	Inductor: 220 nH, ±5%	4	841438-033	14632	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L21	Inductor: 160 nH, ±5%	1	841438-030	14632	
L22	Inductor: 180 nH, ±5%	1	841438-031	14632	
L23	Inductor: 240 nH, ±5%	1	841438-034	14632	
L24	Same as L1				
L25	Inductor: 150 μH, 10%	2	841699-027	14632	
L26	Same as L25				
L27	Same as L1				
L28	Same as L1				
L29	Inductor: 270 μH, 10%	13	841699-030	14632	
L30	Same as L29				
L31	Inductor: 47 μH, 10%	4	841699-021	14632	
L32	Same as L31				
L33	Same as L31				
L34	Same as L9				
L35	Same as L29				
L36	Same as L20				
L37	Inductor: 100 nH, ±5%	2	841438-025	14632	
L38	Same as L37				
L39	Inductor: 4700 nH, 10%	1	841698-033	14632	
L40	Same as L5				
L41	Same as L5				
L42	Same as L18				
L43 Thru L45	Same as L29				
L46 Thru L48	Same as L5				
L49 Thru L52	Same as L29				
L53	Not Used				
L54	Same as L29				
L55 Thru L57	Not Used				
L58	Same as L29				
L59	Same as L29				
L60	Inductor: 470 nH, ±5%	2	841438-041	14632	
L61	Same as L60				
L62	Same as L20				
L63	Same as L20				
L64	Same as L1				
L65	Same as L1				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L66	Same as L2				
L67	Same as L31				
L68	Same as L5				
L69	Same as L5				
L70	Not Used				
L71	Same s L5				
Q1	Transistor	1	MMBR2857	04713	
Q2	Transistor	15	MMBT3904LT1	04713	
Q3	Same as Q2				
Q4	Transistor	18	MMBT-3906	04713	
Q5	Same as Q4				
Q6	Transistor	3	OST310	17856	
Q7	Transistor	6	MMBTH69LT1	04713	
Q8	Same as Q7				
Q9 Thru Q12	Same as Q2				
Q13	Same as Q4				
Q14	Same as Q2				
Q15	Transistor	1	2N7002	17856	
Q16	Same as Q6				
Q17	Same as Q7				
Q18	Same as Q7				
Q19	Same as Q4				
Q20	Same as Q7				
Q21	Same as Q7				
Q22	Same as Q2				
Q23	Transistor	1	841381-2	14632	
Q24	Same as Q4				
Q25	Same as Q2				
Q26	Same as Q4				
Q27	Same as Q2				
Q28	Same as Q4				
Q29	Same as Q2				
Q30	Same as Q4				
Q31	Same as Q4				
Q32	Transistor	4	MRF5812	04713	
Q33 Thru Q35	Same as Q32				
Q36	Same as Q2				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3

Q37	Transistor	2	MMBT3960A	04713	
Q38	Same as Q37				
Q39	Same as Q6				
Q40	Same as Q4				
Q41	Transistor	2	MTD10N05E	04713	
Q42	Same as Q4				
Q43	Transistor	1	MTD4P05	04713	
Q44	Same as Q41				
Q45	Same as Q2				
Q46	Same as Q2				
Q47	Same as Q4				
Q48	Same as Q2				
Q49 Thru Q54	Same as Q4				
R1	Resistor, Fixed: 1.0 kΩ, 5%, 1/10 W	29	841414-073	14632	
R2	Resistor, Fixed: 680Ω, 5%, 1/10 W	22	841414-069	14632	
R3	Same as R1				
R4	Jumper	26	841417	14632	
R5	Same as R4				
R6	Same as R2				
R7	Same as R4				
R8	Resistor, Fixed: 100 kΩ, 5%, 1/10 W	14	841414-121	14632	
R9	Same as R2				
R10	Resistor, Fixed: 10Ω, 5%, 1/10 W	35	841414-025	14632	
R11	Resistor, Fixed: 10 kΩ, 5%, 1/10 W	19	841414-097	14632	
R12	Same as R11				
R13	Same as R1				
R14	Same as R8				
R15	Resistor, Fixed: 1.5 MΩ, 5%, 1/10 W	5	841414-149	14632	
R16	Same as R10				
R17	Resistor, Fixed: 680 kΩ, 5%, 1/10 W	5	841414-141	14632	
R18	Resistor, Fixed: 6.8 kΩ, 5%, 1/10 W	5	841414-093	146732	
R19	Resistor, Fixed: 120 kΩ, 5%, 1/10 W	2	841414-123	14632	
R20	Resistor, Fixed: 12 kΩ, 5%, 1/10 W	6	841414-099	14632	
R21	Resistor, Fixed: 4.7 kΩ, 5%, 1/10 W	16	841414-089	14632	
R22	Same as R10				
R23	Same as R20				
R24	Resistor, Fixed: 27 kΩ, 5%, 1/10 W	6	841414-107	14632	
R25	Same as R20				
R26	Same as R24				
R27	Same as R21				
R28	Same as R10				
R29	Resistor, Fixed: 68 kΩ, 5%, 1/10 W	2	841414-117	14632	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R30	Same as R15				
R31	Same as R29				
R32	Same as R15				
R33	Same as R10				
R34	Resistor, Fixed: 2.2 kΩ, 5%, 1/10 W	8	841414-081	14632	
R35	Same as R15				
R36	Same as R15				
R37	Same as R17				
R38	Not Used				
R39	Same as R11				
R40	Resistor, Fixed: 330Ω, 5%, 1/10 W	7	841414-061	14632	
R41	Same as R8				
R42	Resistor, Fixed: 3.3 kΩ, 1/10 W	10	841414-085	14632	
R43	Same as R1				
R44	Resistor, Fixed: 470Ω, 5%, 1/10 W	19	841414-065	14632	
R45	Same as R1				
R46	Resistor, Fixed: 15 kΩ, 5%, 1/10 W	5	841414-101	14632	
R47	Not Used				
R48	Same as R11				
R49	Same as R19				
R50	Same as R10				
R51	Same as R42				
R52	Resistor, Fixed: 100Ω, 5%, 1/10 W	17	841414-049	14632	
R53	Same as R52				
R54	Same as R10				
R55	Same as R8				
R56	Resistor, Fixed: 22 kΩ, 5%, 1/10 W	3	841414-105	14632	
R57	Same as R8				
R58	Same as R56				
R59	Resistor, Variable: 10 kΩ	1	3269X-1-103	80294	
R60	Same as R11				
R61	Same as R10				
R62	Same as R46				
R63	Same as R1				
R64	Same as R1				
R65	Not Used				
R66	Resistor, Fixed: 470 kΩ, 5%, 1/10 W	2	841414-137	14632	
R67	Same as R10				
R68	Same as R11				
R69	Same as R18				
R70	Same as R44				
R71	Same as R10				
R72	Same as R10				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R73	Same as R1				
R74	Same as R52				
R75	Same as R34				
R76	Same as R8				
R77	Same as R11				
R78	Same as R11				
R79	Same as R10				
R80	Resistor, Fixed: 1.5 kΩ, 5%, 1/10 W	12	841414-077	14632	
R81	Resistor, Fixed: 150Ω, 5%, 1/10 W	6	841414-053	14632	
R82	Resistor, Fixed: 470Ω, 5%, 1/8 W	3	841296-057	14632	
R83	Same as R44				
R84	Same as R82				
R85	Same as R82				
R86	Same as R24				
R87	Resistor, Fixed: 120Ω, 5%, 1/10 W	4	841414-051	14632	
R88	Resistor, Fixed: 270Ω, 5%, 1/10 W	2	841414-059	14632	
R89	Same as R24				
R90	Same as R21				
R91	Same as R66				
R92	Same as R44				
R93	Same as R2				
R94	Same as R81				
R95	Resistor, Fixed: 22Ω, 5%, 1/10 W	7	841414-033	14632	
R96	Same as R52				
R97	Same as R34				
R98	Same as R80				
R99	Resistor, Fixed: 120Ω, 5%, 1/8 W	5	841296-043	14632	
R100	Same as R99				
R101	Same as R99				
R102	Same as R81				
R103	Same as R99				
R104	Resistor, Fixed: 180Ω, 5%, 1/10 W	5	841414-055	14632	
R105	Same as R52				
R106	Same as R10				
R107	Same as R99				
R108	Same as R95				
R109	Same as R10				
R110	Same as R87				
R111	Same as R52				
R112	Same as R10				
R113	Same as R24				
R114	Resistor, Fixed: 220Ω, 5%, 1/10 W	10	841414-057	14632	
R115	Same as R114				
R116	Same as R2				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3

R117	Resistor, Fixed: 47Ω, 5%, 1/10 W	15	841414-041	14632	
R118	Same as R87				
R119	Same as R1				
R120	Same as R1				
R121	Same as R87				
R122	Same as R1				
R123	Resistor, Fixed: 68Ω, 5%, 1/10 W	5	841414-045	14632	
R124	Same as R123				
R125 Thru R127	Same as R44				
R128	Same as R123				
R129	Same as R80				
R130	Same as R1				
R131	Same as R44				
R132	Same as R21				
R133	Resistor, Fixed: 33 kΩ, 5%, 1/10 W	3	841414-109	14632	
R134	Same as R21				
R135	Same as R44				
R136	Same as R21				
R137	Same as R133				
R138	Same as R21				
R139	Same as R21				
R140	Same as R114				
R141	Same as R21				
R142	Same as R133				
R143	Same as R21				
R144	Same as R10				
R145 Thru R147	Same as R8				
R148	Same as R114				
R149	Resistor, Fixed: 2.7 kΩ, 5%, 1/10 W	8	841414-083	14632	
R150 Thru R152	Same as R21				
R153	Same as R24				
R154	Same as R20				
R155	Same as R8				
R156	Same as R10				
R157	Same as R11				
R158	Same as R149				
R159	Same as R11				
R160	Same as R21				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R161	Same as R21				
R162	Same as R52				
R163	Same as R42				
R164	Same as R44				
R165	Same as R10				
R166	Same as R88				
R167	Same as R149				
R168	Same as R42				
R169	Same as R10				
R170	Same as R1				
R171	Same as R149				
R172	Same as R42				
R173	Resistor, Fixed: 560Ω, 5%, 1/10 W	5	841414-067	14632	
R174	Same as R42				
R175	Not Used				
R176	Same as R4				
R177	Same as R114				
R178	Same as R149				
R179	Same as R10				
R180	Same as R2				
R181	Same as R117				
R182	Same as R80				
R183	Same as R2				
R184	Same as R10				
R185	Not Used				
R186	Same as R81				
R187	Same as R40				
R188	Same as R81				
R189	Same as R117				
R190	Same as R2				
R191	Resistor, Fixed: 3.3Ω, 5%, 1/10 W	2	841414-013	14632	
R192	Same as R191				
R193	Same as R4				
R194	Resistor, Fixed: 33Ω, 5%, 1/10 W	4	841414-037	14632	
R195	Same as R34				
R196	Same as R8				
R197	Same as R10				
R198	Same as R10				
R199	Same as R2				
R200	Same as R2				
R201	Same as R1				
R202	Same as R46				
R203	Same as R52				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R204	Same as R117				
R205	Same as R44				
R206	Same as R8				
R207	Same as R40				
R208	Same as R44				
R209	Same as R4				
R210	Same as R194				
R211	Same as R117				
R212	Same as R2				
R213	Same as R42				
R214	Same as R2				
R215	Same as R42				
R216 Thru R218	Same as R4				
R219	Same as R10				
R220	Same as R114				
R221	Same as R42				
R222	Same as R4				
R223	Same as R2				
R224	Same as R4				
R225	Same as R4				
R226	Same as R10				
R227	Same as R10				
R228	Same as R2				
R229	Same as R1				
R230	Same as R1				
R231	Same as R10				
R232	Same as R42				
R233	Same as R80				
R234	Same as R10				
R282	Same as R117				
R283	Same as R1				
R284	Same as R95				
R285	Same as R1				
R286	Same as R18				
R287	Same as R80				
R288	Same as R249				
R289	Same as R173				
R290	Resistor, Fixed: 2.7Ω, 5%, 1/10 W	2	841414-011	14632	
R291	Same as R11				
R292	Same as R11				
R293	Same as R10				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3

R294	Same as R4
R295	Same as R44
R296	Same as R4
R297	Same as R114
R298	Same as R11
R299	Same as R34
R300	Same as R52
R301	Same as R52
R302	Same as R123
R303	Same as R123
R304	Same as R104
R305	Same as R104
R306	Same as R40
R307	Same as R117
R308	Same as R1
R309	Same as R117
R310	Same as R40
R311	Same as R149
R312	Same as R95
R313	Same as R117
R314	Same as R80
R315	Same as R18
R316	Same as R117
R317	Same as R1
R318	Same as R117
R319	Same as R40
R320	Same as R117
R321	Same as R149
R322	Same as R4
R323	Same as R20
R324	Same as R52
R325	Same as R4
R326	Same as R20
R327	Same as R80
R328	Same as R52
R329	Same as R173
R330	Same as R173
R331	Same as R95
R332	Same as R52
R333	Same as R95
R334	Same as R249
R335	Same as R1
R336	Same as R173

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R337	Same as R52				
R338	Same as R104				
R339	Same as R114				
R340	Same as R44				
R341	Same as R117				
R342	Same as R290				
R343	Same as R44				
R344	Same as R44				
R345	Same as R18				
R346	Same as R80				
R347	Same as R1				
R348	Same as R149				
R349	Same as R44				
R350	Same as R52				
R351	Same as R34				
R352	Same as R2				
R353	Same as R44				
R355	Same as R52				
R355	Same as R11				
R356	Same as R1				
R357	Same as R1				
R358	Same as R80				
R359	Same as R80				
R360	Same as R114				
R361	Same as R117				
R362	Same as R81				
R363	Same as R249				
R364	Same as R104				
R365	Same as R46				
R366	Same as R194				
R367	Same as R10				
R368	Same as R249				
R369	Same as R194				
R370	Same as R40				
R371	Same as R10				
R372	Same as R95				
R373	Same as R2				
R374	Resistor, Fixed: 180Ω, 5%, 1/8 W	1	841296-047	14632	
T1	Transformer	1	841709-1	14632	
T2	Transformer	2	458DB-1011=P1	9AA39	
T3	Same as T2				
T4	Transformer	1	458PS-1007=T1	9AA39	
U1	Integrated Circuit	1	8674HC08SO14U	14632	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U2	Integrated Circuit	2	8674HC32SO14U	14632	
U3	Integrated Circuit	1	8674HC138SO16U	14632	
U4	Integrated Circuit/CMOS	1	8674HC4094SO16U	14632	
U5	Integrated Circuit	2	8674HC00SO14U	14632	
U6	Amplifier	1	86062SO8	14632	
U7	Integrated Circuit	3	MC145158DW-2	04713	
U8	Integrated Circuit	1	8674HC02SO14U	14632	
U9	OSC/TCVXO, ±0.6 PPM*	1	92658	14632	
U9	TCXO/XTAL 10.000 MHz**		92549	14632	
U10	Integrated Circuit/CMOS	3	8674AC00SO14U	14632	
U11	Integrated Circuit	1	TL431CD	04713	
U12	Same as U2				
U13	Integrated Circuit/CMOS	1	MB87086APF	61271	
U14	Amplifier	10	NE5534D	18324	
U15	Same as U7				
U16	Same as U14				
U17	Integrated Circuit	1	MB504PF	61271	
U18	Integrated Circuit	1	SP8792/MP	52648	
U19	Integrated Circuit/CMOS	1	8674AC74S014	14632	
U20	Same as U5				
U21 Thru U25	Same as U14				
U26	Mixer, Balanced	1	NE602D	18324	
U27	Same as U10				
U28	Integrated Circuit	1	SD5400CY	17856	
U29	Amplifier	1	LH2422AJ	27014	
U30	Mixer	1	LRMS-1-TR	15542	
U31	Integrated Circuit/CMOS	1	8674HC4053SO16U	14632	
U32	Same as U14				
U33	Integrated Circuit/CMOS	1	8674AC86S014	14632	
U34	Same as U10				
U35	Same as U7				
U36	Same as U14				
U37	Integrated Circuit	1	8674HC74SO14U	14632	
U38	Not Used				
U39	Amplifier	3	86061SO08	14632	
U40	Same as U39				
U41	Same as U39				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U42	Same as U14				
VR1	Diode, Zener	2	MMBZ5231BLT1	04713	
UR2	Same as VR1				
VR3	Diode, Zener	1	MMBZ5235BLT1	04713	

*Note: The difference between the RF Assembly version are as follows:

Type 797006-1 Standard, .7 PPM Stability

Type 797006-2 8712/RF, .2 PPM Stability

Type 797006-3 Conformal Coated, .7 PPM Stability

Type 797006-4 Conformal Coated, .2 PPM Stability

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	8.6.4 WJ-8712 HF RECEIVER ACCESSORY ITEMS			REF DESIG PREFIX AI	
AI-1	Cord, Line	1	17600	16428	
AI-2	Fuse, Cartridge	1	MDL1	71400	
AI-3	Terminal	1	ELFP13210	58982	
AI-4	Label, Decal	1	383162-1	14632	
AI-5	Center Support Bracket	1	280505-3	14632	
AI-6	Support Bracket	1	280504-3	14632	
AI-7	Handle	1	13212-A-0832-2	06540	
AI-8	Rear Handle Assembly	1	383160-1	14632	
AI-9	Rear Handle Assembly	1	383160-2	14632	

NOTES

SECTION IX

FOLDOUTS

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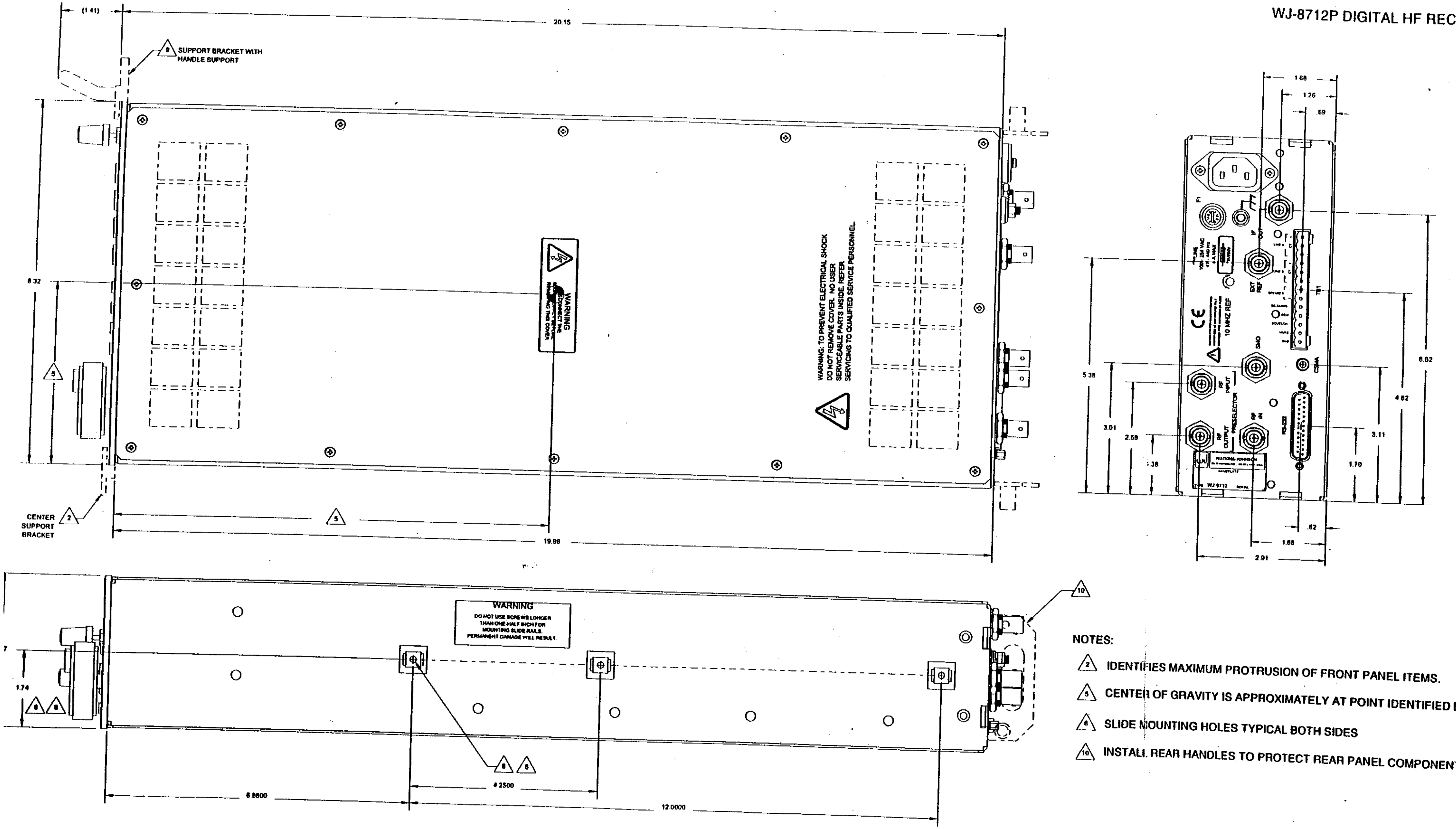
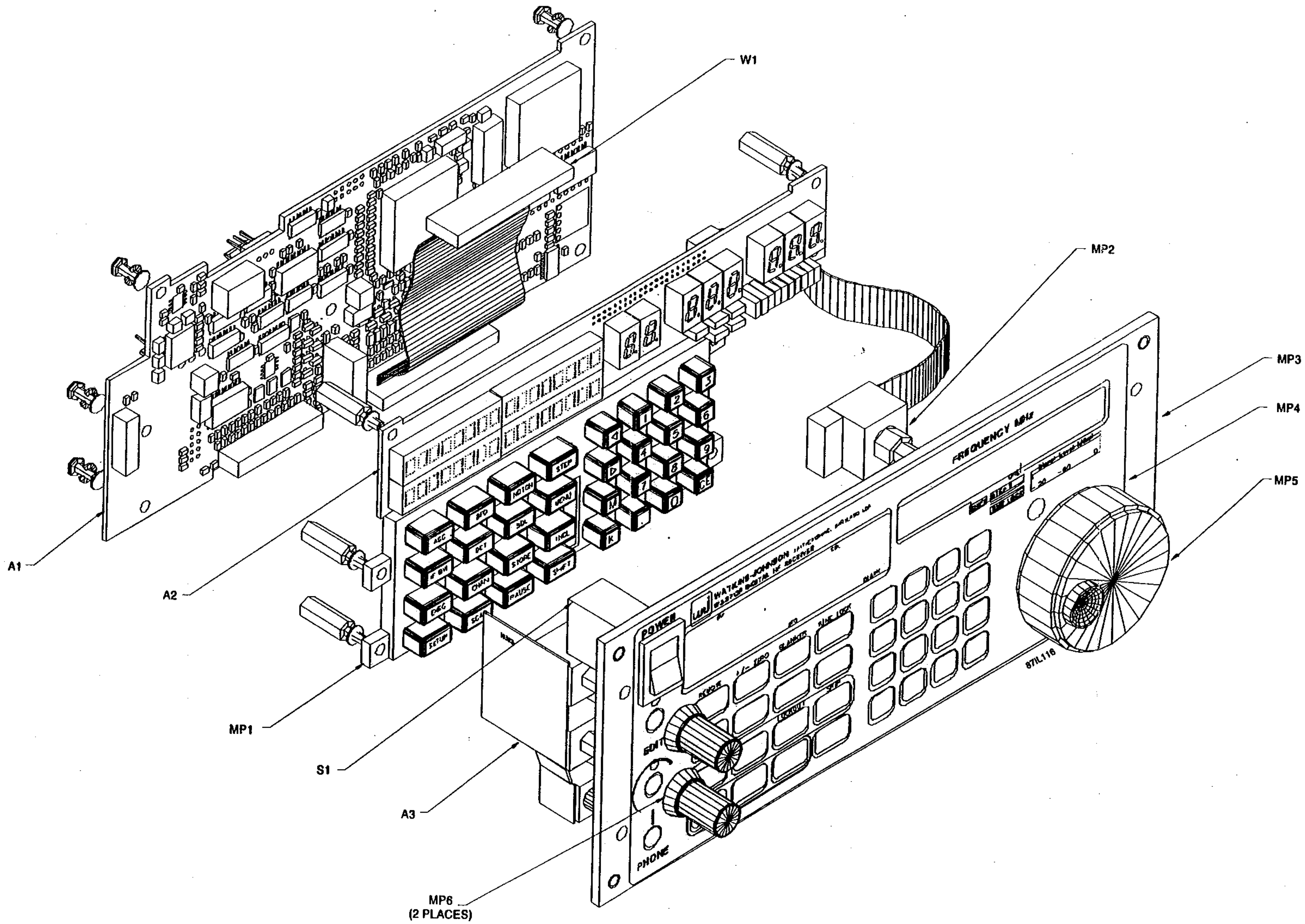


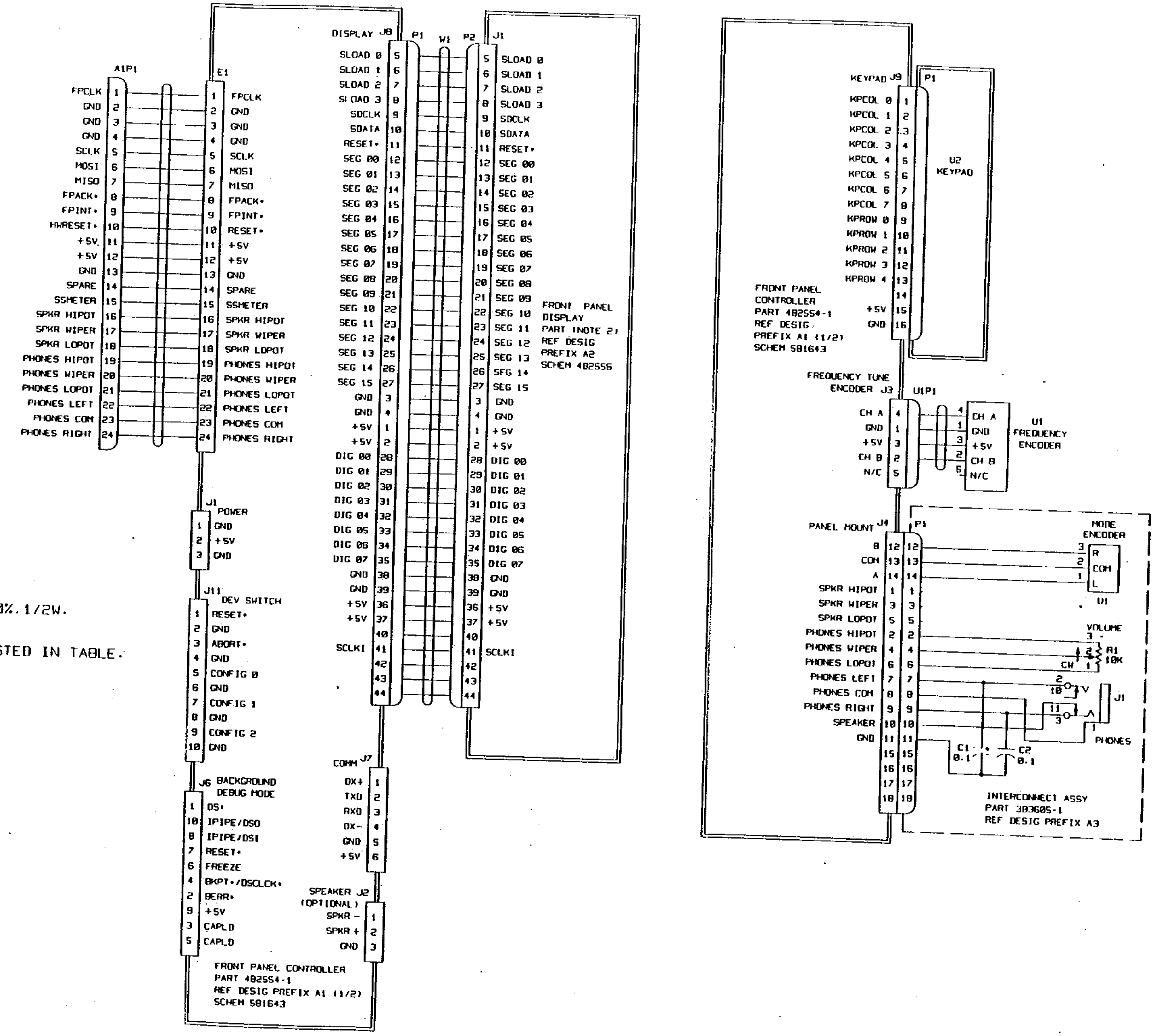
NOTES:

2. IDENTIFIES MAXIMUM PROTRUSION OF FRONT PANEL ITEMS.
5. CENTER OF GRAVITY IS APPROXIMATELY AT POINT IDENTIFIED BY
6. SLIDE MOUNTING HOLES TYPICAL BOTH SIDES
10. INSTALL REAR HANDLES TO PROTECT REAR PANEL COMPONENTS

FO-1. WJ-8712P Digital HF Receiver, Critical Dimensions Diagram



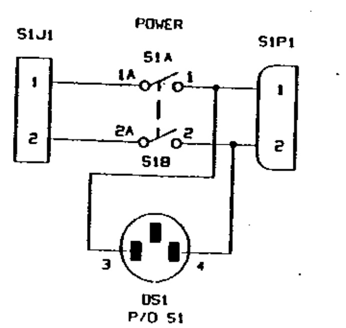
FO-2. Type 797182-2 Front Panel Assembly (A1)
Component Locations



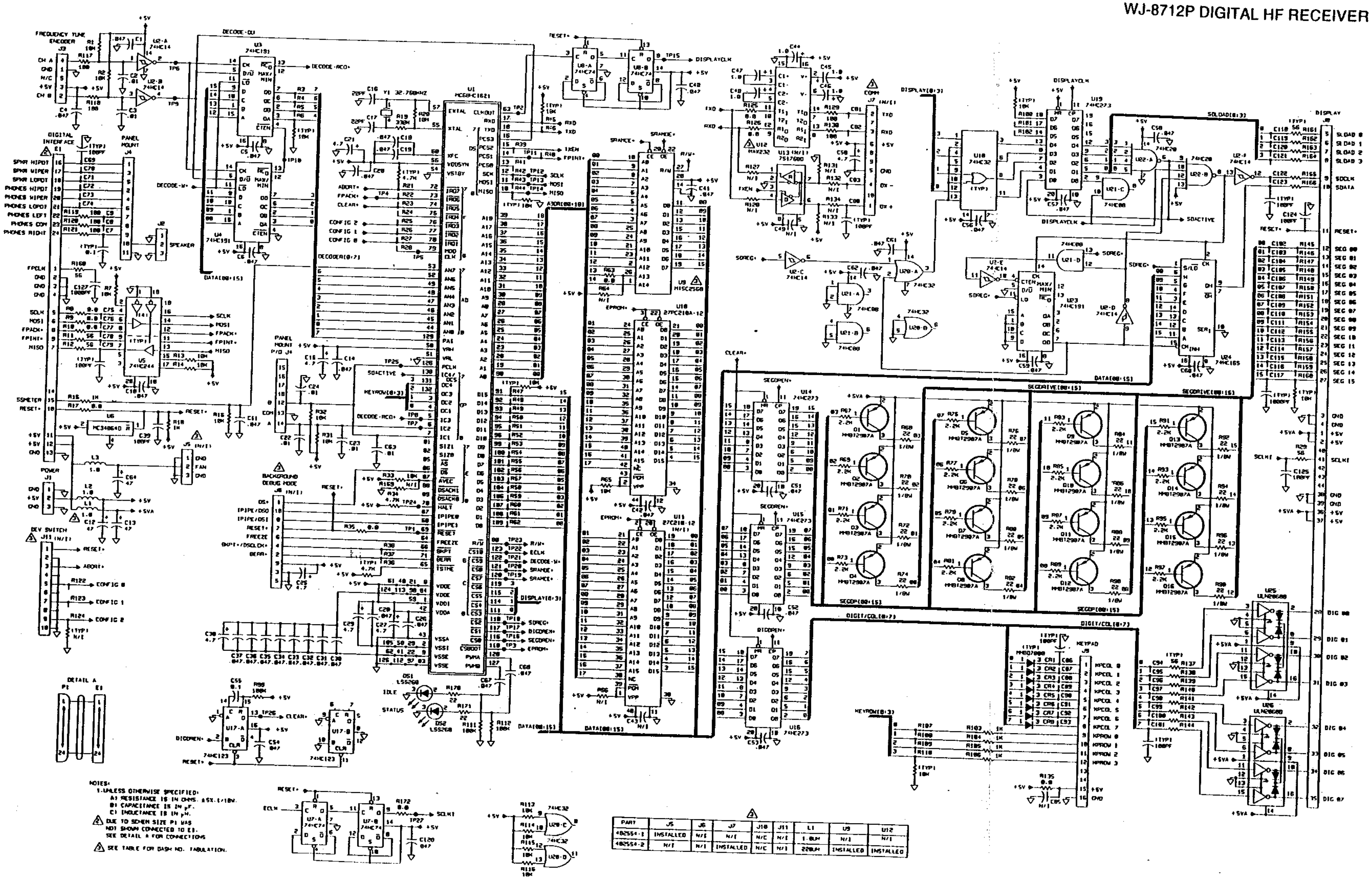
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±10%, 1/2W.
   B) CAPACITANCE IS IN μF.
2. DIFFERENCE BETWEEN TYPES IS LISTED IN TABLE.

TYPE	A2
797182-1	482555-1
797182-2	482555-2



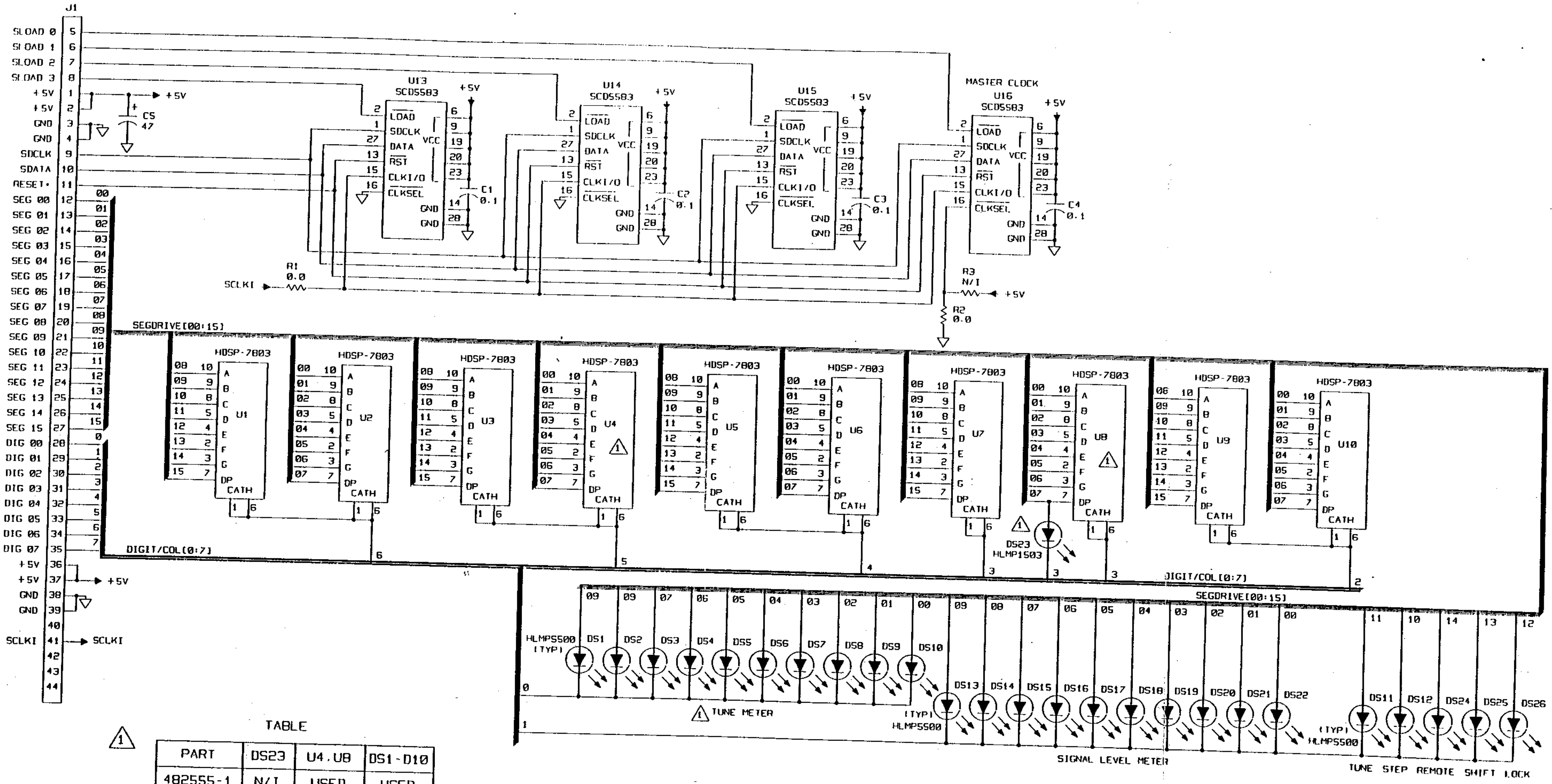
FO-3. Type 797182-2 Front Panel Assembly (A1)
Schematic Diagram 482583 (A)



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
B) CAPACITANCE IS IN μF.
C) INDUCTANCE IS IN μH.
2. DUE TO SCHEM SIZE P1 WAS NOT SHOWN CONNECTED TO E1. SEE DETAIL A FOR CONNECTIONS
3. SEE TABLE FOR DASH NO. TABULATION.

PART	J5	J6	J7	J10	J11	L1	U9	U12
482554-1	INSTALLED	N/I	N/I	N/C	N/I	1.0UH	N/I	N/I
482554-2	N/I	N/I	INSTALLED	N/C	N/I	220UH	INSTALLED	INSTALLED

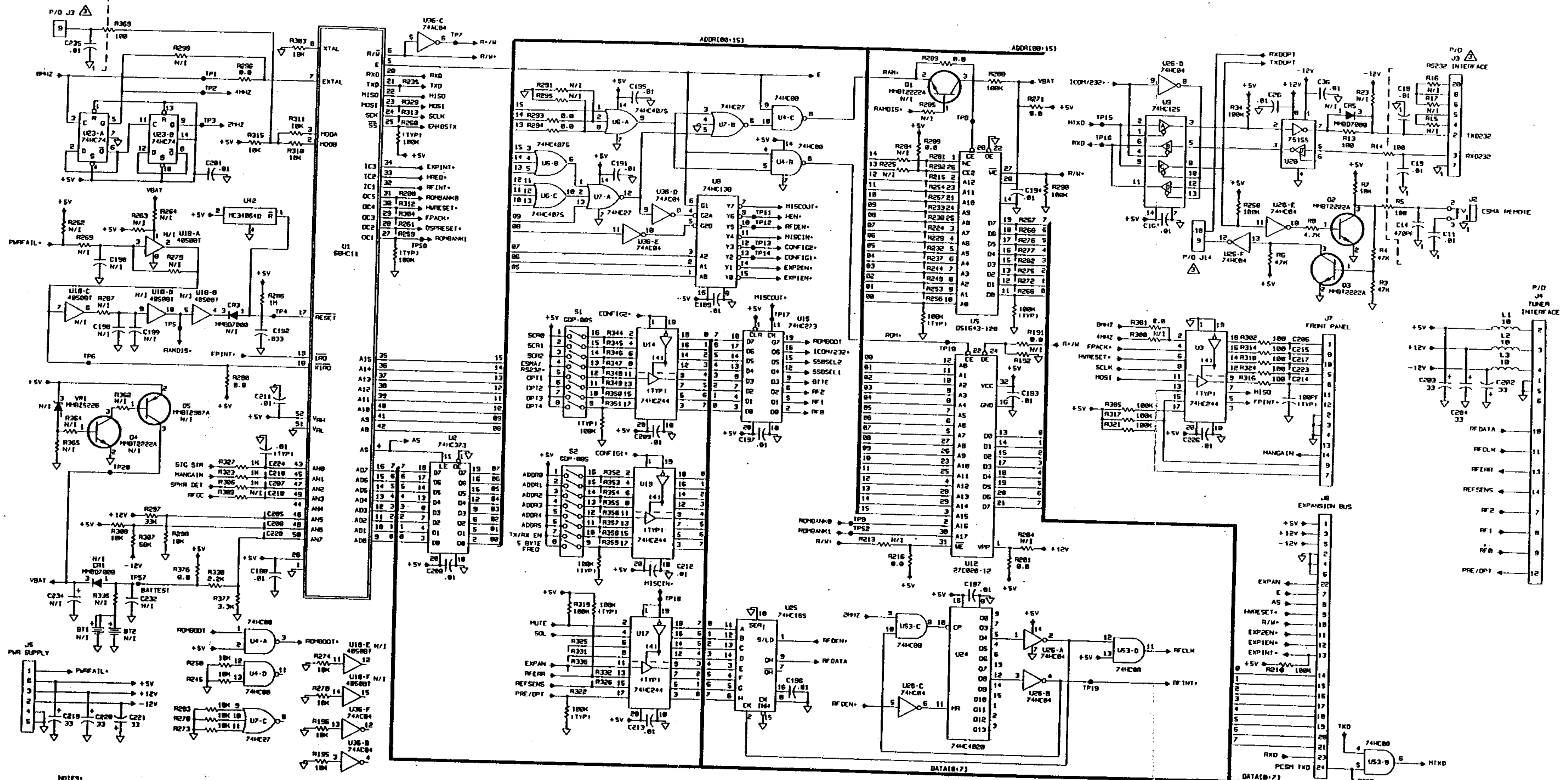
FO-4. Type 482554-1 Front Panel Controller (A1A1)
Schematic Diagram 581643 (D)



TABLE

PART	DS23	U4, U8	DS1 - D10
482555-1	N/I	USED	USED
482555-2	USED	N/I	N/I

FO-5. Type 482555-2 Front Panel Display (A1A2)
Schematic Diagram 482556 (B)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.
2. PIN/ADDRESS NUMBERS SHOWN ARE FOR MICRON SEMICONDUCTOR PARTS. ADDRESS NUMBERS MAY DIFFER ON ALTERNATE MFG. PARTS. HOWEVER THEY ARE FUNCTIONALLY EQUIVALENT.

△3 DIFFERENCE BETWEEN TYPES IS LISTED IN TABLE 1.

TABLE 1

TYPE	J3, J14	J2
797214-1	USED	USED
797214-2	N/I	USED
797214-3	USED	N/I
797214-4	△5	
797214-5	△6	
797214-6	△7	
797214-7	△8	
797214-8	△9	

NOTES: (CONTINUED)

4. IT IS POSSIBLE TO USE VARIOUS DENSITY MEMORY CHIPS FOR U39, U40, U41, U45, U46, U47 & U56. THE FOLLOWING TABLE 2 LISTS EACH ASSY DASH NO. (TYPE), IT'S MEMORY CONFIGURATION, AND WHICH 0-OHM RESISTORS MUST BE INSTALLED.

TABLE 2

TYPE	REF DES	DESCRIPTION	PART NO.	R43	R44	R30	R156
797214-1, -2	U56 U45, U46, U47 U39, U40, U41	64K X 8 EPROM 32K X 8 SRAM ** 32K X 8 SRAM ***	27C512 MT5C2568 MT5C2568	0.0	N/I	0.0	N/I

** A 28-PIN 32K X 8 SRAM IS SHOWN ON THE SCHEMATIC. WHEN A 28-PIN 8K X 8 SRAM IS INSTALLED, PIN 26 IS CE2 (VS. A13) AND PIN 1 IS NC (VS. 14).

*** A32-PIN 128K X 8 SRAM IS SHOWN ON THE SCHEMATIC. WHEN A 28-PIN 32K X 8 IS INSTALLED, PINS 1 THRU 28 CORRESPOND TO PINS 3 THRU 30 ON THE 32-PIN CHIP.

△5 -4 SAME AS -1, EXCEPT CONFORMAL COATED.

△6 CUSTOMER SPECIFIC ALTERATIONS MADE. SEE 797214-5 CPL

△7 -6 SAME AS -1, EXCEPT SHIELD (383085-1) IS NOT INSTALLED OVER TB1.

△8 -7 SAME AS -3, EXCEPT SHIELD (383085-1) IS NOT INSTALLED OVER TB1.

△9 -8 SAME AS -1, EXCEPT SHIELD (383085-1) IS NOT INSTALLED, (B) (644558) IS NOT INSTALLED, AND CONFORMAL COATED.

FO-6. Type 7987214-1 Digital Control Assembly (A2)
Schematic Diagram 581839 (Sheet 1 of 4) (J)

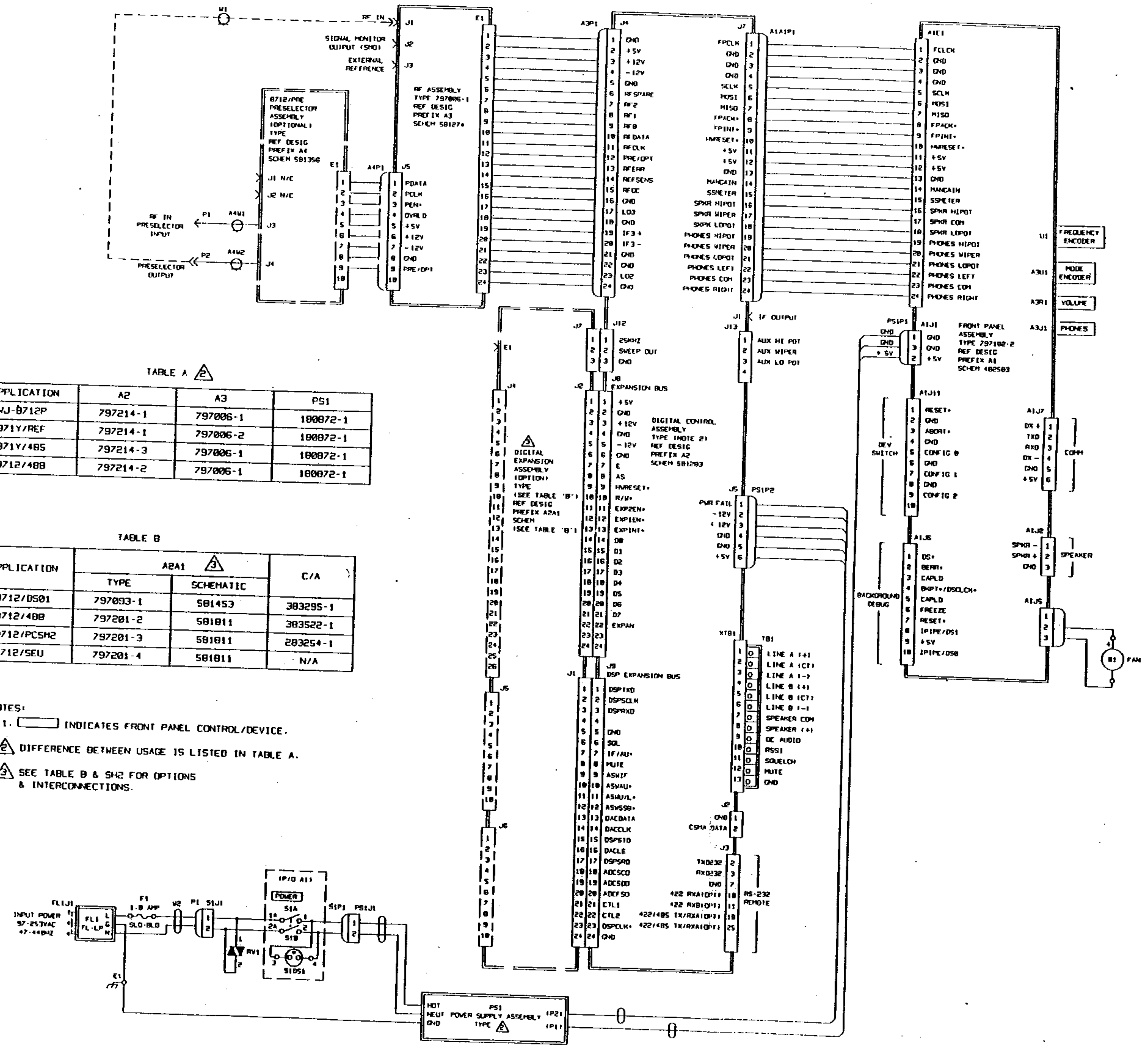


TABLE A ⚠2

APPLICATION	A2	A3	PS1
WJ-8712P	797214-1	797006-1	180872-1
871Y/REF	797214-1	797006-2	180872-1
871Y/485	797214-3	797006-1	180872-1
8712/488	797214-2	797006-1	180872-1

TABLE B

APPLICATION	A2A1 ⚠3		C/A
	TYPE	SCHEMATIC	
8712/DS01	797093-1	581453	383295-1
8712/488	797201-2	581811	383522-1
8712/PCSM2	797201-3	581811	283254-1
8712/SEU	797201-4	581811	N/A

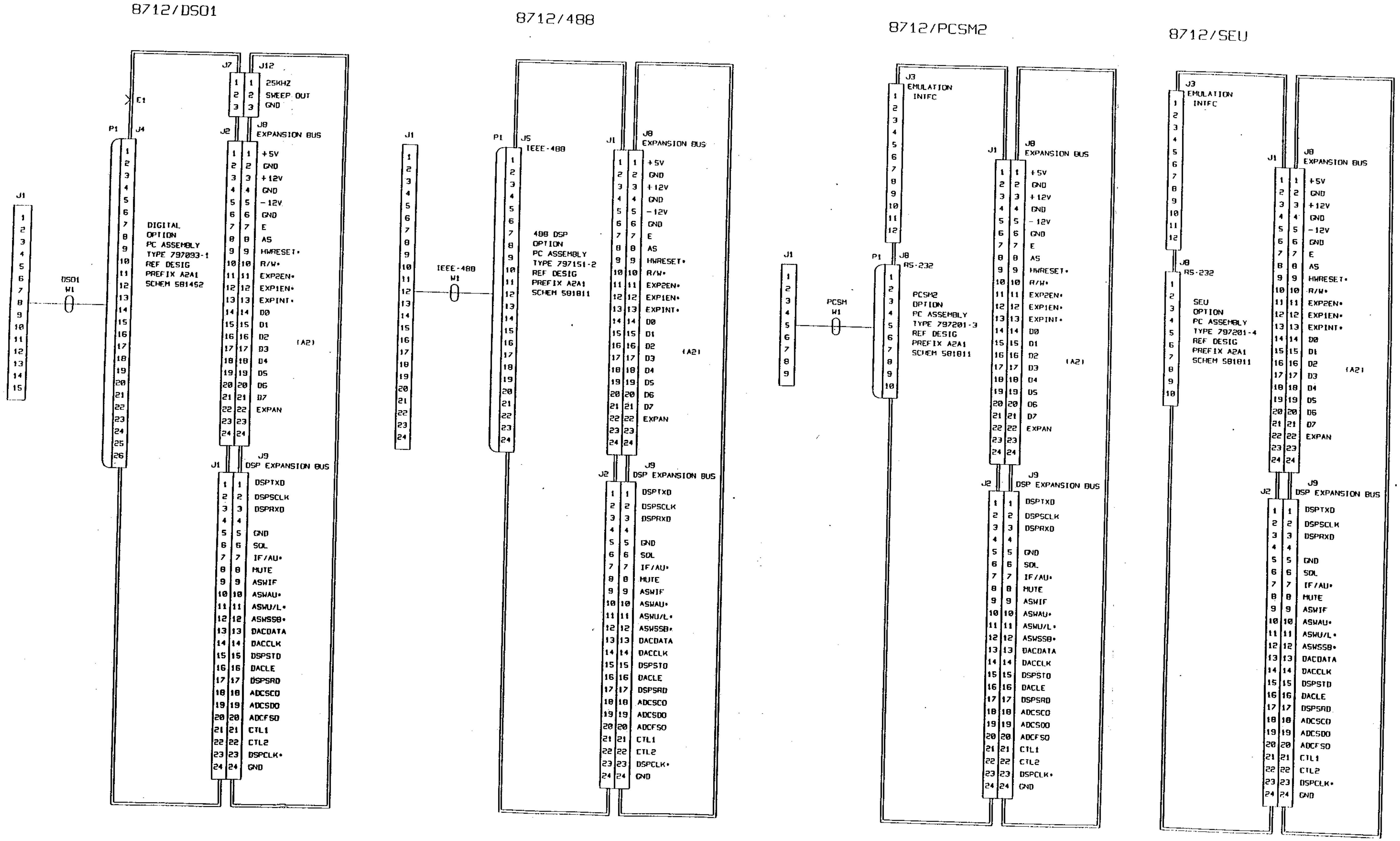
NOTES:

1. ▭ INDICATES FRONT PANEL CONTROL/DEVICE.

⚠2 DIFFERENCE BETWEEN USAGE IS LISTED IN TABLE A.

⚠3 SEE TABLE B & SH2 FOR OPTIONS & INTERCONNECTIONS.

FO-8. Type WJ-8712P Digital HF Receiver, Main Chassis Schematic Diagram 581731 (Sheet 1 of 2) (G)



FP-8. Type WJ-8712P Digital HF Receiver, Main Chassis Scheamtic Diagram 581731 (Sheet 2 of 2) (G)

APPENDIX A

TYPE WJ-871Y/REF REFERENCE GENERATOR OPTION

WJ P/N 181280-001, Revision C

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

September 1997

PROPRIETARY STATEMENT

LIST OF EFFECTIVE PAGES

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APPENDIX A

TYPE WJ-871Y/REFERENCE GENERATOR OPTION

A.1 ELECTRICAL CHARACTERISTICS

When installed in either the WJ-8711 Digital HF Receiver or the WJ-8712 Digital HF Receiver, the WJ-871Y/REF Reference Generator option provides improved frequency stability (better than 0.2 ppm) over the standard WJ-8711 or WJ-8712 internal reference generator (better than 0.7 ppm). As with all crystal oscillators, frequency output may drift over time particularly over the first 90 days. Check stability periodically and readjust if necessary. **Table A-1** lists the WJ-871Y/REF specifications.

Table A-1. WJ-871Y/REF Reference Generator Option Specifications

Internal Frequency Stability	Better than 0.2 ppm (0-50°C)

A.2 MECHANICAL CHARACTERISTICS

Receivers (either WJ-8711s or WJ-8712s) equipped with the WJ-871Y/REF Reference Generator option are mechanically identical to the standard receivers, with the exception of the RF assembly (A3). In receivers equipped with the WJ-871Y/REF option, the type 797006-2 RF assembly replaces the standard type 797006-1 RF assembly. The WJ-871Y/REF option RF assembly uses an improved 10 MHz temperature-compensated voltage-controlled crystal oscillator (TCVCXO), located at A3U9.

A.3 INSTALLATION

The WJ-871Y/REF Reference Generator option is installed in the Receiver (either WJ-8711 or WJ-8712) at the factory when ordered with the receiver.

A.4 OPERATION

Once installed, WJ-871Y/REF option operates automatically. The improved reference generator functions just as the standard reference generator functions, only with greater stability. Either the internal 10 MHz reference frequency, or a user-supplied external 1, 2, 5, or 10 MHz reference frequency may be used. Refer to the base manual for information on selecting reference frequencies.

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LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	B
ii	Proprietary Statement	B
iii	List of Effective Pages	B
iv	Intentionally Blank	B
v	Revision Record	B
vi	Intentionally Blank	B
vii thru viii	Table of Contents	B
B-1 thru B-18	Appendix B	B
FP-B-1/(FP-B-2 blank)	Figure	B

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TYPE WJ-8712/PRE SUBOCTAVE PRESELECTOR OPTION

REVISION RECORD

Revision	Description	Date
A	Initial Printing.	9/92
B	Added WJ part number to the title page. Incorporated a List of Effective Pages. Renumbered Figure B-1 to Figure FO-B-1.	7/98

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TABLE OF CONTENTS

APPENDIX B

TYPE WJ-8712/PRE SUBOCTAVE PRESELECTOR OPTION

LIST OF TABLES

LIST OF ILLUSTRATIONS

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APPENDIX B

TYPE WJ-8712/PRE SUBOCTAVE PRESELECTOR OPTION

B.1 ELECTRICAL CHARACTERISTICS

The WJ-8712/PRE Suboctave Preselector option filters unwanted out-of-band signal energy from the RF applied to the WJ-8712 Digital HF Receiver. The WJ-8712/PRE option uses eleven preselector bands to improve WJ-8712 second and third order intercept performance. The WJ-8712 digitally selects the appropriate preselector filter based on the receiver's tuned frequency. The WJ-8712/PRE also features two RF overvoltage protection circuits. **Table B-1** lists the WJ-8712/PRE specifications.

Table B-1. WJ-8712/PRE Suboctave Preselector Option Specifications

Input Impedance	50 ohms, nominal
Output Impedance	50 ohms, nominal
Control	Digital, via multipin connector to the WJ-8712 tuner board
Second Order Intercept	> +60 dBm, typical
Third Order Intercept	> +30 dBm, typical
Input VSWR	2:1
Input Protection	Spark gap, > 1 watt relay threshold
Dimensions	6-1/8" x 5-3/4" x 3/4"
Operating Temperature Range	0°to +50°C
Power Requirements	+5 Vdc @ 200mA -12 Vdc @ 2 mA +12 Vdc @ 3 mA

B.2 MECHANICAL CHARACTERISTICS

The WJ-8712/PRE Suboctave Preselector option consists of the Type 797033-2 preselector assembly, and mounting hardware. The preselector assembly is housed in an aluminum chassis, which is installed inside the WJ-8712 on its rear panel.

B.3 OVERALL FUNCTIONAL DESCRIPTION

RF enters the WJ-8712/PRE Suboctave Preselector option at A4J3 and is routed to one of the eleven digitally-selected filters. **Table B-2** lists the band, frequency range, insertion loss, 10 dB attenuation points, and type of each of the eleven filters. The RF is filtered and made available at A4J4 for use by the WJ-8712. Spark gap protection at the preselector RF input shunts any voltages of 50 V or greater to ground.

Power sensing at the preselector RF input protects the preselector from RF power levels greater than one watt.

Table B-2. WJ-8712/PRE Suboctave Preselector Option Filter Information

Band	Frequency Range (MHz)	Insertion Loss (dB Typ.)	10 dB Attenuation Points (MHz Typ.)	Type
A	25.001 to 30.000000	2.5	18.7 and 36.9	Bandpass
B	20.501 to 25.000999	2.5	15.6 and 30.9	Bandpass
C	14.301 to 20.500999	2.0	8.4 and 30.8	Bandpass
D	9.901 to 14.300999	2.0	5.3 and 21.5	Bandpass
E	6.901 to 9.900999	2.0	3.7 and 14.9	Bandpass
F	4.801 to 6.900999	2.0	2.7 and 10.6	Bandpass
G	3.301 to 4.800999	2.0	1.9 and 7.1	Bandpass
H	2.301 to 3.300999	1.5	1.4 and 5.2	Bandpass
I	1.601 to 2.300999	1.5	0.9 and 3.6	Bandpass
J	0.501 to 1.600999	1.5	2.6	Lowpass
K	0.000 to 0.500999	2.0	0.8	Lowpass

B.4 EQUIPMENT SUPPLIED

Equipment supplied with the WJ-8712/PRE Suboctave Preselector option consists of:

- 1 WJ-8712/PRE Suboctave Preselector Assembly (Type 797033-2)
- Mounting hardware consisting of:
  a. Four 4-40 x 1/4 Pan Head Machine screws.
  b. Four No. 4 Flat Washers.
  c. Four No. 4 Lock Washers.
  d. Four Standoffs (WJ P/N 20755-294)

B.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

A WJ-8712 Digital HF Receiver and a 50 ohm HF antenna are necessary to obtain full use of the WJ-8712/PRE Suboctave Preselector option.

B.6 INSTALLATION

The WJ-8712/PRE Suboctave Preselector option is installed in the WJ-8712 Digital HF Receiver at the factory when ordered with the receiver.

B.6.1 CONNECTOR SIGNALS

All WJ-8712/PRE option external connectors are located on the rear panel of the WJ-8712. **Table B-3** lists these connectors and provides a brief description of each.

Table B-3. List of WJ-8712/PRE Option External Connectors

Connector	Reference Designation	Function
Preselector RF Input	A4J3	BNC female. RF input from antenna.
Preselector RF Output	A4J4	BNC female. Preselected RF output for use by the WJ-8712 RF IN connector (A3J1).

Connector A4P1 contains all the power and control signals necessary for WJ-8712/PRE option operation. **Table B-4** lists the pins, signal names, signal functions, and the signal directions for connector A4P1.

Table B-4. List of WJ-8712/PRE Option A4P1 Connector Signals

Pin	Signal	Function	Direction
1	PDAT	Preselector Selection Data	Input
2	PCLK	Preselector Clock	Input
3	PEN-#	Preselector Enable Strobe	Input
4	OVRLD	RF Overload	Output
5	+5 Vdc	+5 Vdc Supply	Input
6	+12 Vdc	+12 Vdc Supply	Input
7	-12 Vdc	-12 Vdc Supply	Input
8	GND	Ground	Input
9	PRE/OPT	Preselector Identification	Output
10	NOT USED		

B.7 OPERATION

The WJ-8712 digital control automatically detects and operates the WJ-8712/PRE Suboctave Preselector option.

B.7.1 PRESELECTOR OVERLOAD

During operations, the preselector continually checks its input for an overload condition. An overload condition exists when the power at the preselector RF Input (A4J3) is greater than one watt.

During the overload, the overload-sensing circuit automatically protects the preselector by removing the applied RF signal from the preselector input. Accordingly, during the overload, the preselector significantly attenuates the RF signal to the receiver. A preselector overload condition also sets bit 13 of the Device Dependent Error register. Refer to the base manual for more information on the Device Dependent Error register. The set bit is utilized to request a reset via the remote controller.

B.8 REPLACEMENT PARTS LIST

B.8.1 UNIT NUMBERING METHOD

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly, and discrete components. An example of the unit numbering method used is as follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

B.8.2 REFERENCE DESIGNATION PREFIX

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

B.8.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
04713	Motorola Incorporated 5005 East McDowell Road Phoenix, AZ 85008	27014	National Semi-Conductor, Corp. 2950 San Ysidro Way Santa Clara, CA 95051
06090	Raychem Corporation 300 Constitution Drive Menlo Park, CA 94025-1111	55322	Samtec Incorporated 810 Progress Boulevard P.O. Box 1147 New Albany, IN 47150
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878	71482	C.P. Clare Company 3101 Pratt Boulevard Chicago, IL 60645
17540	Alpha Industries Incorporated 20 Sylvan Road Woburn, MA 01801	99800	Delevan Electronics 270 Quaker Road East Aurora, NY 14052-2114

REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C131	Same as C97				
C132	Same as C1				
C133	Capacitor, Ceramic: 680 pF, ±2%, 50 V NPO	4	841416-069	14632	
C134	Same as C79				
C135	Same as C78				
C136	Same as C79				
C137	Same as C133				
C138	Same as C79				
C139	Same as C97				
C140	Same as C33				
C141	Same as C96				
C142	Same as C22				
C143	Same as C94				
C144	Same as C1				
C145	Same as C78				
C146	Same as C58				
C147	Same as C1				
C148	Same as C114				
C149	Same as C13				
C150	Same as C1				
C151	Same as C1				
C152	Not Used				
C153	Not Used				
C154	Capacitor, Ceramic: 560 pF, 2%, 50 V NPO	1	841416-067	14632	
C155	Capacitor, Ceramic: 1000 pF, 2%, TOL, 50 V NPO	1	841416-073	14632	
C156	Same as C13				
C157	Same as C1				
C158	Same as C7				
C159	Same as C1				
C160	Capacitor, Ceramic: 820 pF, ±2%, 50 V NPO	4	841416-071	14632	
C161	Capacitor, Ceramic: 120 pF, 2%, 50 V NPO	2	841416-051	14632	
C162	Capacitor, Ceramic: 390 pF, 2%, 50 V NPO	1	841416-063	14632	
C163	Same as C40				
C164	Same as C33				
C165	Same as C160				
C166	Same as C161				
C167	Same as C13				
C168	Same as C114				
C169	Same as C58				
C170	Same as C78				
C171	Same as C1				
C172	Same as C40				
C173	Same as C114				
C174	Same as C1				

REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C175	Same as C109				
C176	Same as C133				
C177	Same as C109				
C178	Capacitor, Ceramic: 1200 pF, 2%, 50 V NPO	4	841416-075	14632	
C179	Same as C79				
C180	Same as C1				
C181	Same as C109				
C182	Same as C178				
C183	Same as C33				
C184	Same as C109				
C185	Same as C133				
C186	Same as C114				
C187	Same as C40				
C188	Same as C94				
C189	Same as C1				
C190	Capacitor, Ceramic: .15 μF, 10%, 50 V	1	841415-020	14632	
C191	Same as C160				
C192	Capacitor, Ceramic: 1500 pF, 2%, 50 V NPO	4	841416-077	14632	
C193	Same as C1				
C194	Same as C178				
C195	Same as C33				
C196	Same as C178				
C197	Same as C192				
C198	Same as C94				
C199	Same as C160				
C200	Same as C1				
C201	Capacitor, Ceramic: 2700 pF, 2%, ≥50 WVDC NPO	2	841314-083	14632	
C202	Same as C201				
C203	Not Used				
C204	Not Used				
C205	Same as C2				
C206	Same as C192				
C207	Capacitor, Ceramic: 4700 pF, 2%, ≥0 WVDC NPO	2	841314-089	14632	
C208	Same as C192				
C209	Same as C207				
C210	Not Used				
C211	Not Used				
C212	Same as C1				
C213	Same as C1				
C214	Not Used				
C215	Not Used				
C216	Same as C2				
C217 Thru C223	Not Used				

REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C224	Same as C217				
C225	Same as C1				
C226	Capacitor, Tantalum: 4.7 μF, 20%, 10 V	4	841293-12	14632	
C227	Same as C226				
C228	Same as C1				
C229	Same as C226				
C230	Same as C226				
C231	Same as C13				
C232	Same as C13				
C233	Same as C1				
C234 Thru C237	Not Used				
C238 Thru C240	Same as C1				
CR1	Not Used				
CR2	Diode, Dual Switching	2	MMBD7000LT1	04713	
CR3	Diode	2	MMBD1203-HIGH	27014	
CR4	Same as CR3				
CR5	Diode	20	SMP1300-99	17540	
CR6 Thru CR24	Same as CR5				
CR25	Not Used				
CR26	Same as CR2				
CR27	Not Used				
CR28	Not Used				
CR29	Diode, Pin	2	MA4P4001F	MAICO	
CR30	Same as CR29				
E1	Cable Assembly	1	IDMD-5-T-10-C-G	55322	
J1	Not Used				
J2	Not Used				
J3	Termination, Coaxial	2	D-607-10	06090	
J4	Same as J3				
JW1	Jumper: 1/2Ω	5	841417	14632	
JW2 Thru JW5	Same as JW1				
K1	Relay	1	SMJ1A05-S	14632	
L1	Not Used				
L2	Inductor: 220 nH, ±5%	2	841438-033	14632	
L3	Same as L2				
L4	Inductor: 680 nH, ±5%	9	841438-045	14632	

REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L5	Same as L4				
L6	Same as L4				
L7	Inductor: 330 μH, 5%	20	841444-061	14632	
L8	Same as L7				
L9	Same as L7				
L10 Thru L12	Same as L4				
L13	Same as L7				
L14	Same as L7				
L15	Inductor: 560 nH, ±5%	3	841438-043	14632	
L16	Same as L15				
L17	Same as L15				
L18	Same as L7				
L19	Same as L7				
L20 Thru L22	Same as L4				
L23	Same as L7				
L24	Same as L7				
L25	Inductor: 1.0 μH, 5%	3	841444-001	14632	
L26	Same as L25				
L27	Same as L25				
L28	Same as L7				
L29	Same as L7				
L30	Inductor: 1.5 μH, 5%	3	841444-05	14632	
L31	Same as L30				
L32	Same as L30				
L33	Same as L7				
L34	Same as L7				
L35	Inductor: 2.2 μH, 5%	3	841444-009	14632	
L36	Same as L35				
L37	Same as L35				
L38	Same as L7				
L39	Same as L7				
L40	Inductor: 3.3 μH, 5%	3	841444-013	14632	
L41	Same as L40				
L42	Same as L40				
L43	Same as L7				
L44	Same as L7				
L45	Inductor: 4.7 μH, 5%	3	841444-017	14632	
L46	Same as L45				
L47	Same as L45				
L48	Same as L7				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L49	Same as L7				
L50	Inductor: 5600 nH, ±5%	2	841438-067	14632	
L51	Inductor: 6800 nH, ±5%	1	841438-069	14632	
L52	Same as L50				
L53	Same as L7				
L54	Inductor: 680 µH, 5%	5	841444-069	14632	
L55	Same as L54				
L56	Inductor: 12 µH	2	1330-46	99800	
L57	Inductor	1	1330-54	99800	
L58	Same as L56				
L59	Same as L54				
L60	Same as L54				
L61	Inductor: 47 µH, 5%	1	841444-041	14632	
L62 Thru L65	Not Used				
L66	Same as L54				
Q1	Transistor	2	MMBT3904LT1	04713	
Q2	Same as Q1				
Q3	Transistor	11	MMBT2907ALT1	04713	
Q4 Thru Q13	Same as Q3				
Q14	Transistor	1	MTD10N05E	04713	
R1	Resistor, Fixed: 3.9 kΩ, 5%, 1/10 W	1	841414-087	14632	
R2	Resistor, Fixed: 1.0 kΩ, 5%, 1/10 W	8	841414-073	14632	
R3	Resistor, Fixed: 10Ω, 5%, 1/10 W	13	841414-097	14632	
R4	Same as R3				
R5	Resistor, Fixed: 10Ω, 5%, 1/10 W	23	841414-025	14632	
R6	Same as R5				
R7	Same as R3				
R8	Resistor, Fixed: 330Ω, 5%, 1/10 W	15	841414-061	14632	
R9	Same as R5				
R10	Same as R5				
R11	Same as R3				
R12	Same as R8				
R13	Same as R5				
R14	Same as R3				
R15	Same as R5				
R16	Same as R8				
R17	Same as R5				
R18	Same as R3				
R19	Same as R5				
R20	Same as R8				

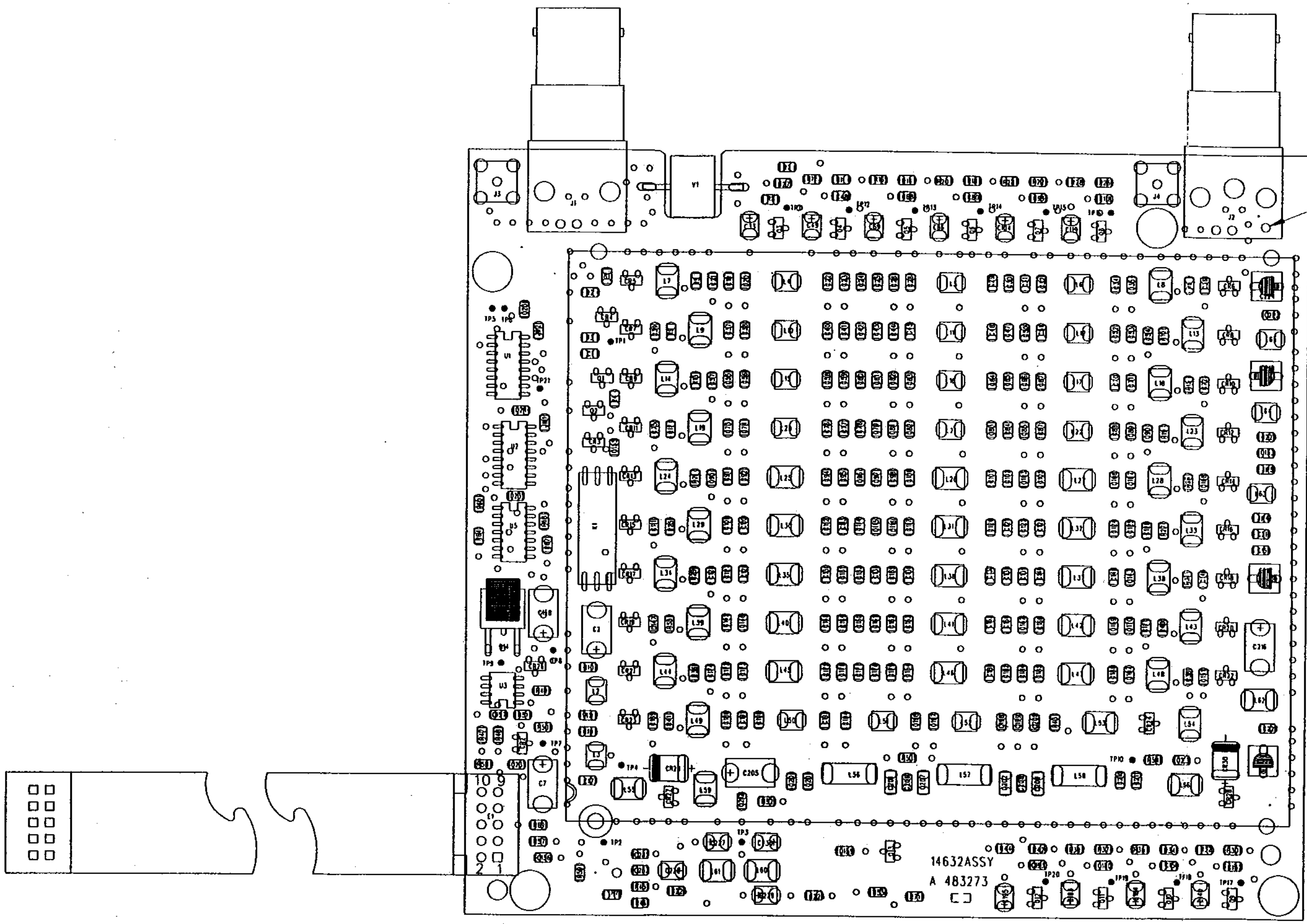
REF DESIG PREFIX A4A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R21	Same as R5				
R22	Same as R3				
R23	Same as R8				
R24	Same as R5				
R25	Same as R5				
R26	Same as R3				
R27	Same as R5				
R28	Same as R8				
R29	Same s R5				
R30	Same as R3				
R31	Same as R5				
R32	Same as R8				
R33	Same as R5				
R34	Same as R3				
R35	Same as R8				
R36	Same as R5				
R37	Same as R3				
R38	Same as R5				
R39	Same as R8				
R40	Same as R5				
R41	Same as R5				
R42	Same as R3				
R43	Same as R5				
R44	Same as R8				
R45	Not Used				
R46	Same as R2				
R47	Same as R2				
R48	Resistor, Fixed: 15 kΩ, 5%, 1/10 W	1	841414-101	14632	
R49	Resistor, Fixed: 680 kΩ, 5%, 1/10 W	1	841414-141	14632	
R50	Resistor, Fixed: 22 kΩ, 5%, 1/10 W	1	841414-105	14632	
R51	Resistor, Fixed: 4.7 kΩ, 5%, 1/10 W	1	841414-089	14632	
R52	Same as R5				
R53	Same as R3				
R54	Same as R5				
R55	Same as R8				
R56	Not Used				
R57 Thru R59	Same as R8				
R60	Same as R2				
R61 Thru R63	Not Used				
R64	Same as R2				
R65	Not Used				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A4A1A1

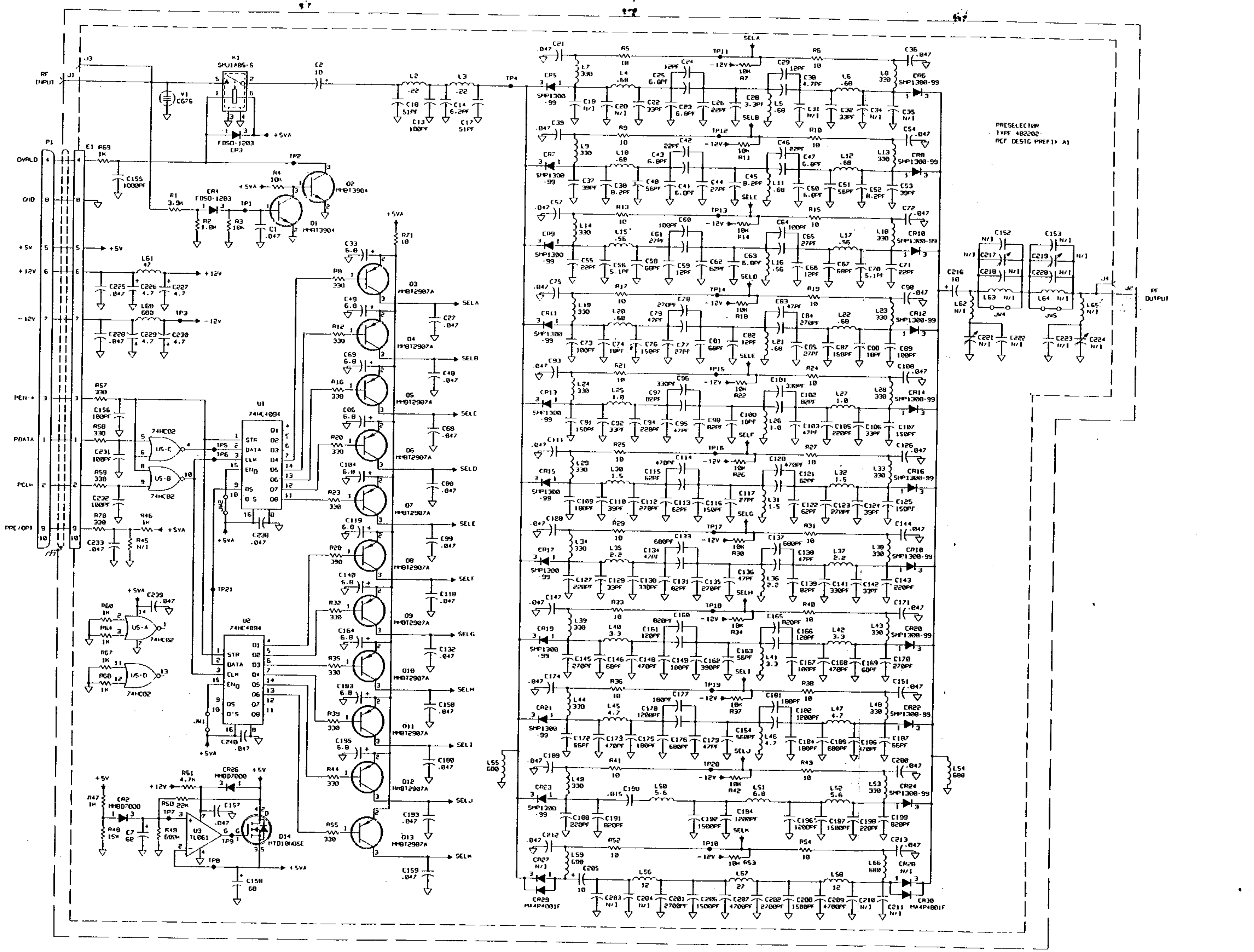
R66	Not Used				
R67					
Thru	Same as R2				
R69					
R70	Same as R8				
R71	Same s R5				
U1	Integrated circuit, CMOS	2	8674HC4094SO16U	14632	
U2	Same as U1				
U3	Amplifier	1	86061O08	14632	
U4	Not Used				
U5	Integrated Circuit	1	8674HC02SO14U	14632	
V1	Arrester	1	CG75L	71482	
W1	Cable Assembly	2	383168-1	14632	
W2	Same as W1				



FO-B-1. Type 797033-1 Preselector Assembly (A4)
Component Location Drawing

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/10W
   B) CAPACITANCE IS IN pF.
   C) INDUCTANCE IS IN μH.
2. A 14 PIN DIP SOCKET IS PROVIDED FOR INSTALLATION OF K2.



FO-B-2. Type 797033-1 Preselector Assembly (A4), Schematic Diagram 581356 (D)

APPENDIX C

RESERVED FOR A FUTURE OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

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APPENDIX D

TYPE WJ-8710/DSO1, WJ-8711/DSO1, AND WJ-8712/DSO1

DIGITAL SIGNAL OUTPUT OPTIONS

WJ P/N 181272-001, Revision E

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

September 1997

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LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	E
ii	Proprietary Statement	E
iii	List of Effective Pages	E
iv	Intentionally Blank	E
v	Revision Record	E
vi	Intentionally Blank	E
vii thru viii	Table of Contents	E
D-1 thru D-16	Appendix D	D
D-17 (D-18 blank)	Schematic	D

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WJ-8710/DSO1, WJ-8711/DSO1, AND WJ-8712/DSO1 OPTIONS

REVISION RECORD

Revision	Description	Date
A	Initial Issue.	9/93
B	Expand to detail various receiver models.	5/94
C	Add information about IF data spectrum inverstion.	6/94
D	Added table detailing DSO1 output functions versus mode.	12/94
E	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97

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APPENDIX D

TYPE WJ-8710/DSO1, WJ-8711/DSO1, AND WJ-8712/DSO1

DIGITAL SIGNAL OUTPUT OPTIONS

LIST OF TABLES

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LIST OF ILLUSTRATIONS

APPENDIX D

TYPE WJ-8710/DSO1, WJ-8711/DSO1, AND WJ-8712/DSO1

DIGITAL SIGNAL OUTPUT OPTIONS

D.1 INTRODUCTION

This document provides installation and configuration setup procedures for the Digital Signal Output options: WJ-8710/DSO1, WJ-8711/DSO1, and WJ-8712/DSO1. The WJ-8710/DSO1 is used on the WJ-8710 and WJ-8710A Digital HF Receivers. The WJ-8711/DSO1 is used on the WJ-8711 and WJ-8711A receivers. The WJ-8712/DSO1 is used on the WJ-8712, WJ-8712A and WJ-8712P receivers.

D.2 ELECTRICAL CHARACTERISTICS

The DSO1 Digital Signal Output (DSO) option provides digital data output from the Digital HF Receiver.

This digital data is intended for external digital signal processing, and is available via a 15-pin D-type subminiature connector. This connector is mounted on the front panel of the WJ-8710 and WJ-8710A receivers (refer to **Figure D-1(A)**). The connector is mounted on the rear panel of the WJ-8711 and WJ-8711A (refer to **Figure D-1 (B)**), and the WJ-8712, WJ-8712A and WJ-8712P (refer to **Figure D-1 (C)**).

The DSO1 option provides data samples of 16-bit resolution at 100 kHz, in twos complement format with the Most Significant Bit (MSB) first. A range of data sources can be represented by the digital output including representations of the prefiltered, not fine-tuned, third IF centered at 25 kHz (via the ADC); the post-filtered fine-tuned switched IF centered at 25 kHz; and the demodulated audio signal. However, this range varies depending on the selection of one of three modes. These modes, whose related outputs are depicted in **Figure D-2** and **Table D-1**, are:

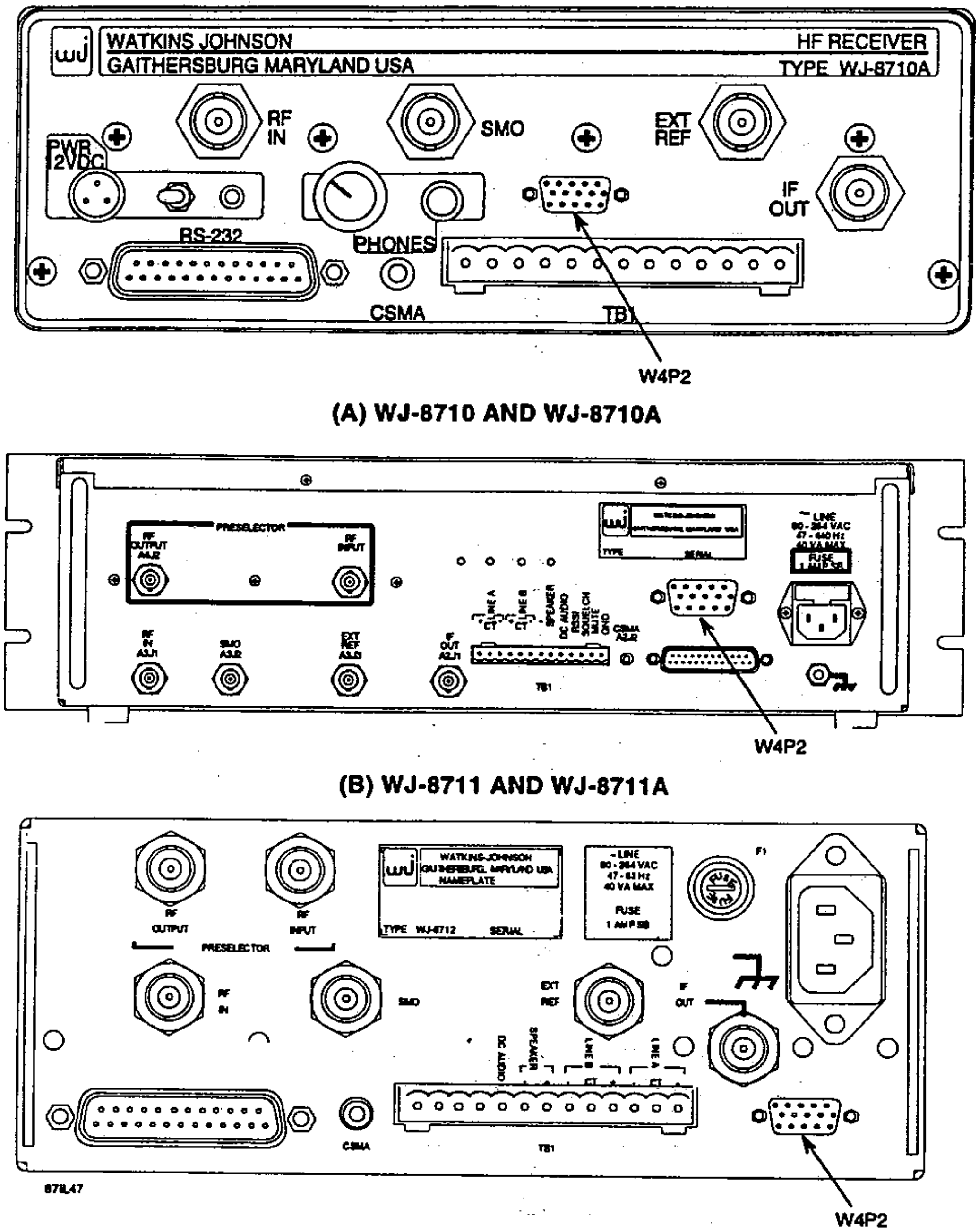
- Eight-bit TTL parallel mode,
- Serial TTL mode, or
- Serial Differential mode with constant current drivers.

In eight-bit TTL parallel mode, the data can be sourced from one of the following:

- Pre-filtered Third IF data (centered at 25 kHz) converted by an analog-to-digital converter (ADC) that has not been fine-tuned,
- Multiplexed Post-filtered fine-tuned IF data (centered at 25 kHz) /demodulated Audio,
- Post-filtered fine-tuned IF data (centered at 25 kHz), or
- Demodulated audio

In serial TTL mode, the data is simultaneously sourced from all of the following:

- Pre-filtered not fine-tuned Third IF data (via ADC),
- Multiplexed post-filtered fine-tuned IF/demodulated audio,
- Post-filtered fine-tuned IF centered at 25 kHz, or
- Demodulated audio

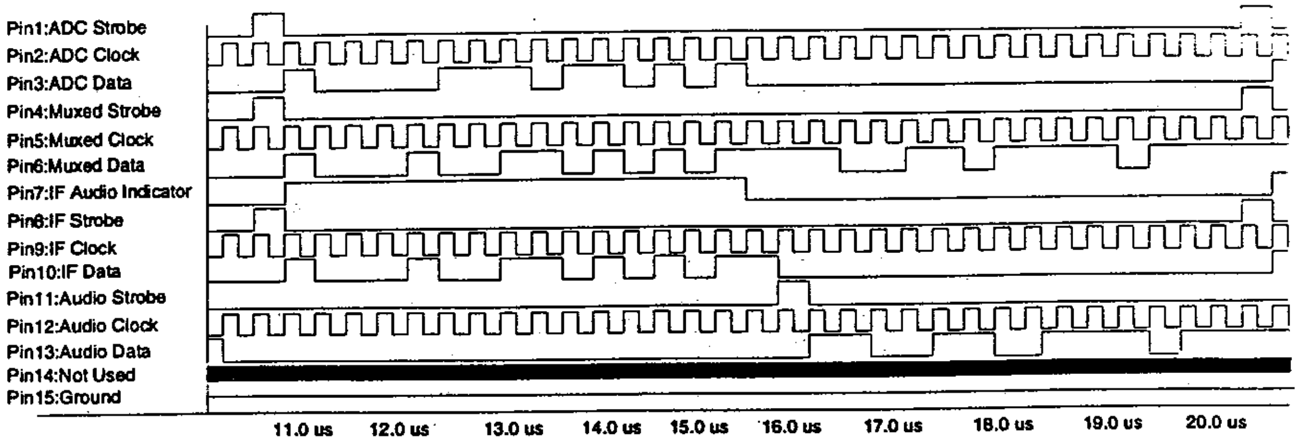


(A) WJ-8710 AND WJ-8710A

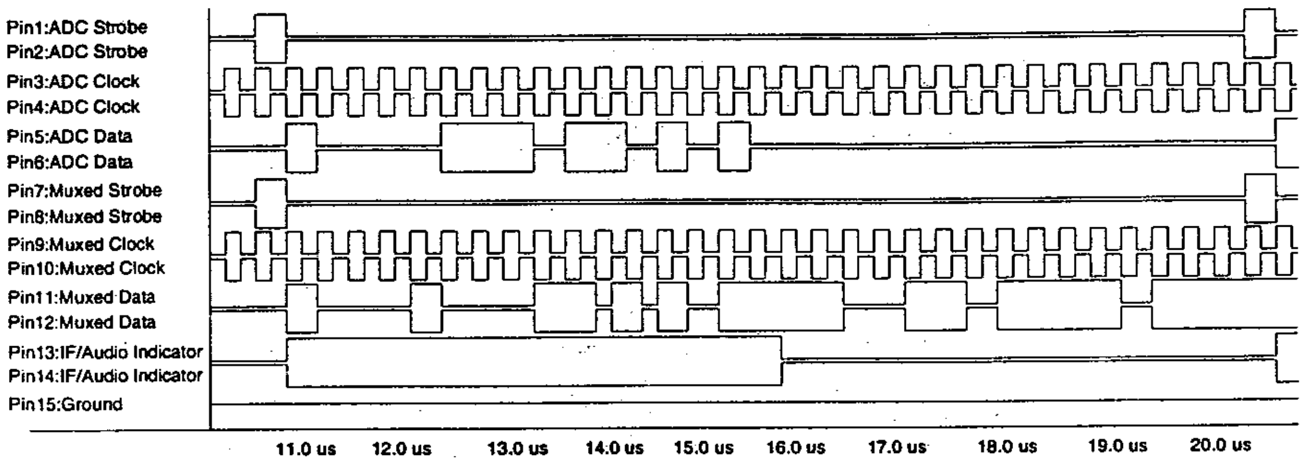
(B) WJ-8711 AND WJ-8711A

(C) WJ-8712, WJ-8712A AND WJ-8712P

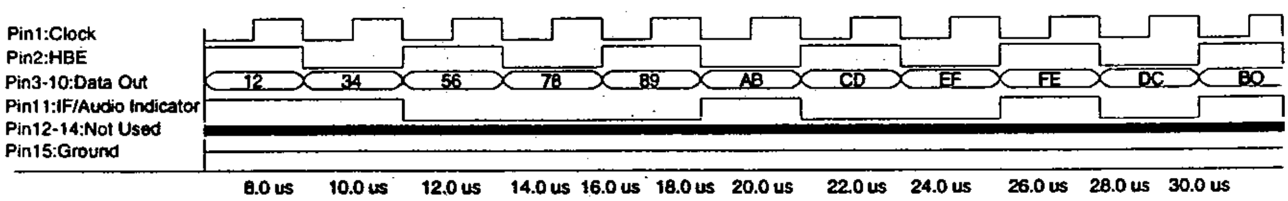
Figure D-1. Location of DSO1 Output Connector W4P2



(A) Serial TTL Level Output



(B) Serial Differential Output



(C) 8 Bit TTL Output

87IL134

Figure D-2. DSO1 Signal Outputs Versus Selected Mode

Table D-1. DSO1 Output Function Versus Mode

Mode	Pin No.	Signal Name	
Serial, TTL Level	1	ADC Strobe	
	2	ADC Clock	
	3	ADC Data	
	4	Muxed IF/Audio Strobe	
	5	Muxed IF/Audio Clock	
	6	Muxed IF/Audio Data	
	7	IF/Audio* Indicator	
	8	IF Strobe	
	9	IF Clock	
	10	IF Data	
	11	Audio Strobe	
	12	Audio Clock	
	13	Audio Data	
	14	Not Used	
	15	GND	
Serial, Differential		When S1SW3 is OFF	When S1SW3 is ON
	1	ADC Strobe +	IF Strobe +
	2	ADC Strobe -	IF Strobe -
	3	ADC Clock +	IF Clock +
	4	ADC Clock -	IF Clock -
	5	ADC Data +	IF Data +
	6	ADC Data -	IF Data -
	7	Muxed IF/Audio Strobe +	Audio Strobe +
	8	Muxed IF/Audio Strobe -	Audio Strobe -
	9	Muxed IF/Audio Clock +	Audio Clock +
	10	Muxed IF/Audio Clock -	Audio Clock -
	11	Muxed IF/Audio Data +	Audio Data +
	12	Muxed IF/Audio Data -	Audio Data -
	13	IF/Audio* Indicator +	Not Used
	14	IF/Audio Indicator -	Not Used
	15	GND	GND
8-Bit Parallel	1	Clock	
	2	High Byte Enable	
	3	Data out (0)	
	4	Data out (1)	
	5	Data out (2)	
	6	Data out (3)	
	7	Data out (4)	
	8	Data out (5)	
	9	Data out (6)	
	10	Data out (7)	
	11	IF/Audio* Indicator (only in muxed mode)	
	12	Not Used	
	13	Not Used	
	14	Not Used	
	15	GND	

In serial differential mode, the data can be sourced from one of the following:

- Pre-filtered Third IF centered at 25 kHz (via ADC) that is not fine-tuned and Multiplexed Post-Filtered IF centered at 25 kHz/Demodulated Audio, or

- Pre-filtered Third IF (via ADC) centered at 25 kHz that is not fine-tuned and demodulated Audio.

In each mode, the IF data taken direct from the A/D converter (not multiplexed), has an inverted spectrum relative to the input. The IF data in the multiplexed output signal has been re-inverted by DSP operations to a normal spectrum.

The bandpass of the post-filtered IF data is dependent on the current bandpass filter selection. The board's architecture is very flexible, and can be easily modified to support a variety of protocols through the use of a programmable gate array. Please contact your Watkins-Johnson representative for details.

D.3 MECHANICAL CHARACTERISTICS

The Digital Signal Output option consists of the Type 797093-1 Digital Signal Output PC Assembly (A2A1) and a Type 383295-1 Cable Assembly (W4) for routing signals to the rear or front panel of the receiver. Mounting hardware and mating connector hardware is provided to satisfy assembly and cabling requirements.

D.4 OVERALL FUNCTIONAL DESCRIPTION

Multiplexed post-filtered fine-tuned IF (IF), demodulated audio, or pre-filtered not fine-tuned Third IF signals (referred to as ADC because these analog signals have undergone ADC conversion) are applied to the Digital Signal Output option daughterboard for processing. Programmable logic reclocks the incoming signals; converts the input signals to parallel, if required; demultiplexes the IF/Audio multiplex line; and provides a separate IF or Audio line, if required. The output signals are then routed to the DSO output connector.

D.5 INSTALLATION

The Digital Signal Output option is installed in the receiver at the factory when ordered with the receiver.

D.5.1 CONNECTOR SIGNALS

All DSO1 output signals are accessed at the DSO connector (W4P2) located on the rear or front panel of the receiver (refer to **Figure D-1**). **Figure D-2** lists the signal name at each pin, for each mode, and provides a view of each.

D.6 DSO1 CONFIGURATION SETUP

The DSO1 Digital Signal Output option processes and outputs signals in accordance with the settings of DIP switch S1 located on the Digital Signal Output PC Assembly (A2A1). See **Figure D-3, D-4** and **D-5**. The switch must be set in accordance with **Table D-2.**

Table D-2. Switch Settings of DIP Switch A2A1S1

Position 5 (Interface):		
OFF = TTL Level Output	ON = Differential Output (Serial mode only)	
Position 6 (Clock Polarity):		
OFF = Data changes on falling edge	ON = Data changes on rising edge	
Position 7, 8 (Data Source):		
In parallel mode:		
Source	Pos. 8	Pos. 7
Pre-filtered Third IF (ADC)	ON	ON
Multiplexed Post-Filtered IF & Audio	OFF	ON
Post-filtered IF	ON	OFF
Demodulated Audio	OFF	OFF
In Serial Differential mode:		
Source	Pos. 8	Pos. 7
Pre-filtered Third IF (ADC) and Multiplexed Post-Filtered IF/Audio	ON	OFF
Pre-filtered Third IF, Audio	OFF	OFF
In Serial TTL mode:		
Source	Pos. 8	Pos. 7
Pre-filtered Third IF (ADC), Multiplexed Post-Filtered IF/Audio, Post-filtered fine-tuned IF and Demodulated Audio	OFF	OFF
Position 9, 10 (Data Format):		
Format	Pos. 10	Pos. 9
Serial Mode	OFF	OFF
8 bit TTL Parallel	OFF	ON

Note 1: Switch Positions 4, 3, 2, 1 = OFF (All Modes)
Note 2: As positioned on PC Assembly, ON is up; OFF is down.

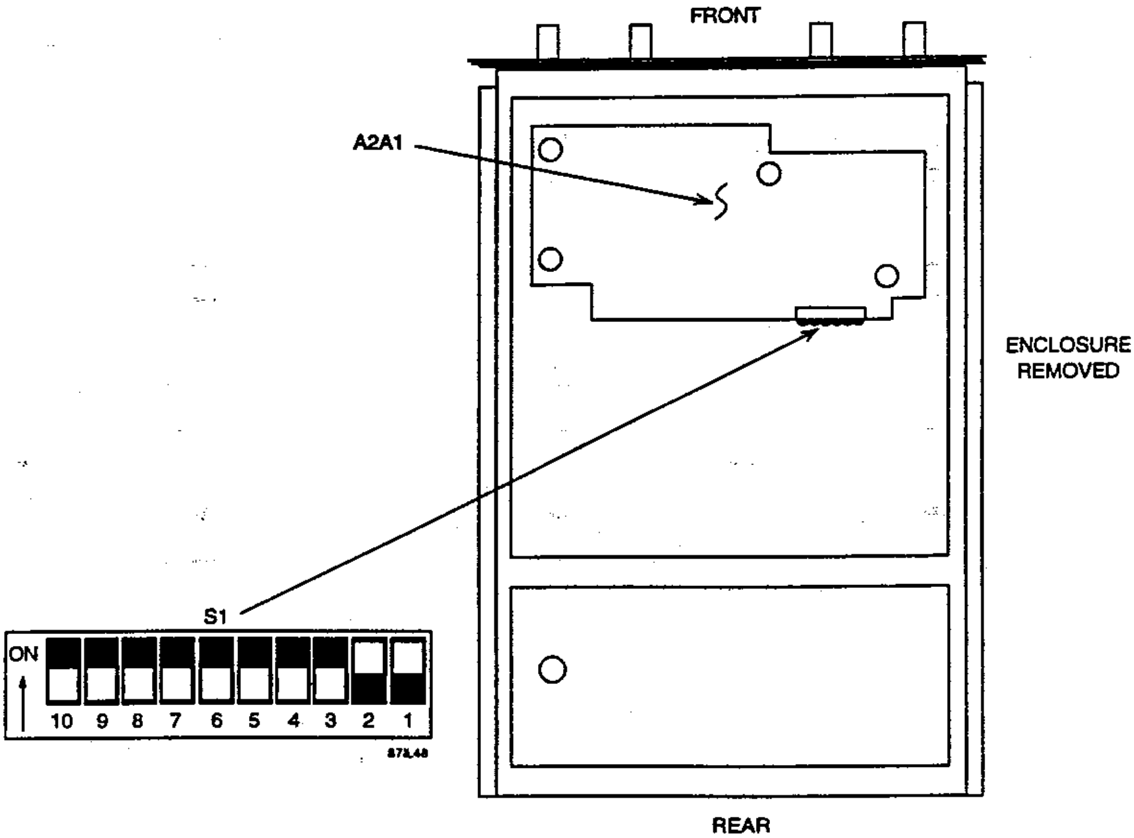


Figure D-3. Location of DSO1 DIP Switch S1 in the WJ-8710 and WJ-8710A

D.6.1 ACCESSING DIP SWITCH S1 ON THE DIGITAL SIGNAL OUTPUT PC ASSEMBLY

D.6.1.1 <u>WJ-8710 and WJ-8710A Digital HF Receiver</u>

Perform the following procedural steps to gain access to the DSO1 DIP switch S1:

a. Turn off the receiver and disconnect the power plug from the front panel PWR 12 VDC connector.

b. Remove two black pan-head screws from the lower left and right corners of the front panel.

c. Remove four flat-head screws and two pan-head screws from the rear panel.

d. Remove the rear panel and then slide the main chassis (complete with front panel) out of the enclosure.

e. Locate the RFI gasket (the long copper strip) on each side of the receiver's deck assembly (between the deck assembly and the bottom housing).

f. Insert the special installation tool (included with the accessory kit) between the RFI gasket fingers, and the bottom housing along the entire length of the deck assembly (in the left side of the deck as viewed from the rear of the receiver). Ensure that the tool is down against the flange on the deck and then slide the housing away from the front panel until it is free of the deck assembly.

g. Place the receiver on the bench, bottom side up, and locate S1 on the A2A1 assembly (refer to **Figure D-3**).

h. Set the switches for the desired configuration in accordance with **Table D-2**.

i. Install the bottom housing by laying the tool along the right side of the deck (as viewed from the rear of the unit). Position the tool so that the RFI gasket fingers are covered by the tool along the entire length of the deck. Align the bottom housing grooves with the deck flanges and slide the housing forward until it contacts the front panel. Lift the tool out of position so that the RFI fingers now contact the housing.

j. Slide the main chassis back into the enclosure, reinstall the rear panel and secure both panels in place with the screws that were removed in steps b and c, respectively.

k. Reconnect the power plug to the front panel PWR 12 VDC connector.

D.6.1.2 WJ-8711 and WJ-8711A Digital HF Receiver

Perform the following procedural steps to gain access to the DSO1 DIP switch S1:

a. Turn off the receiver and disconnect the power plug from the rear panel power connector.

b. Remove two pan-head screws from the rear edge of the top panel securing it to the chassis rear apron, and two flat-head screws on the forward edge of the top panel.

c. Carefully remove top panel and disconnect the speaker leads.

d. Locate S1 on the A2A1 assembly (refer to **Figure D-4**).

e. Set the switches for the desired configuration in accordance with **Table D-2**.

f. Reconnect the speaker leads to the top panel and replace the top panel on the receiver. Secure the top panel with the screws removed in step b.

g. Reconnect power cord to the rear panel power connector.

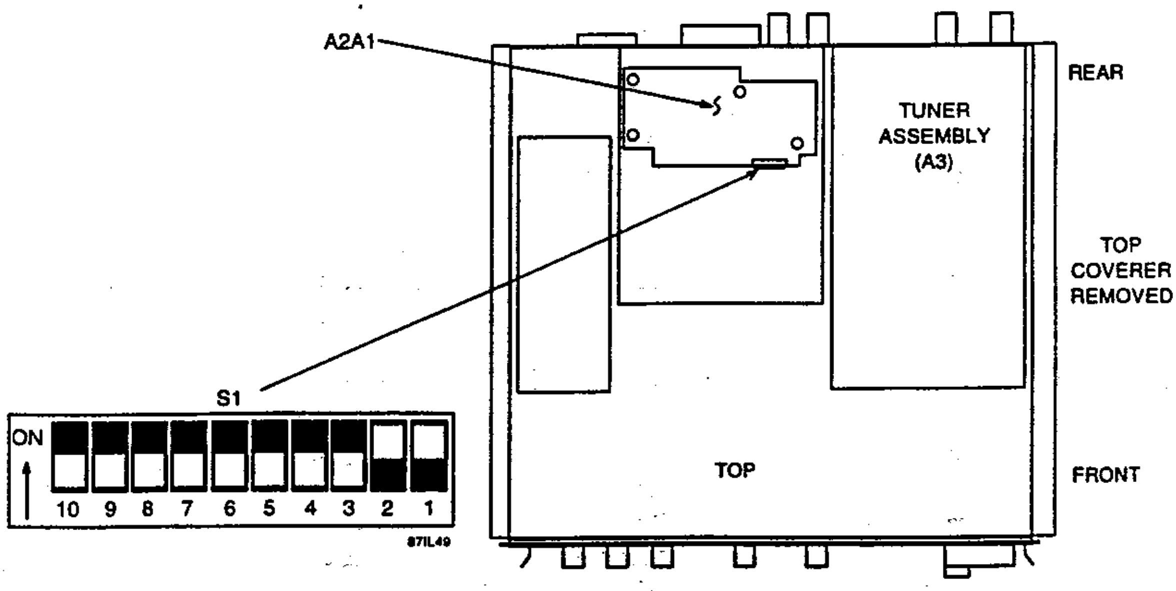


Figure D-4. Location of DSO1 DIP Switch S1 in the WJ-8711 and WJ-8711A

D.6.1.3 <u>WJ-8712, WJ-8712A and WJ-8712P Digital HF Receiver</u>

Perform the following procedural steps to gain access to the DSO1 DIP switch S1:

a. Turn off the receiver and disconnect the power plug from the rear panel power connector.

b. Remove twelve (12) flat-head screws from the bottom cover and remove the bottom cover.

c. Locate S1 on the A2A1 assembly (refer to **Figure D-5**).

d. Set the switches for the desired configuration in accordance with **Table D-2**.

e. Replace the bottom cover and secure in place with the twelve (12) screws removed in step b.

f. Reconnect power cord to the rear panel power connector.

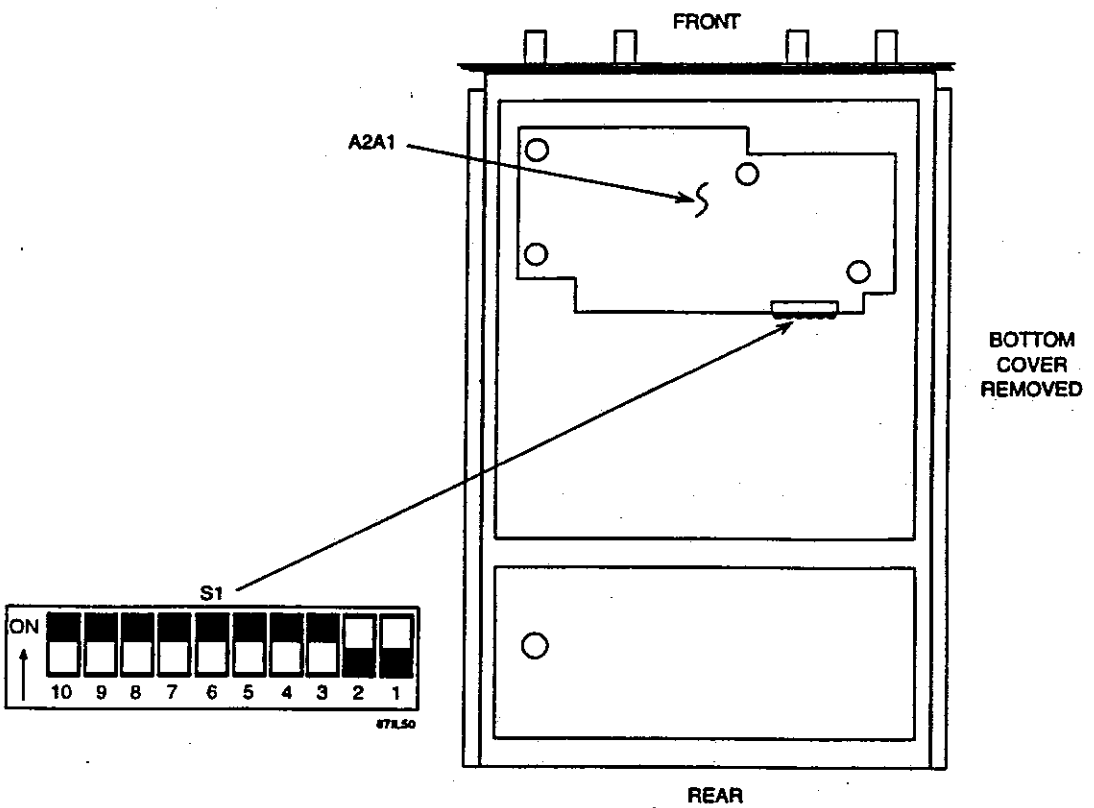


Figure D-5. Location of DSO1 DIP Switch S1 in the WJ-8712, WJ-8712A and WJ-8712P

D.7 UNIT NUMBERING METHOD

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly, and discrete components. An example of the unit numbering method used is as follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

D.8 REFERENCE DESIGNATION PREFIX

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

D.9 LIST OF MANUFACTURERS

The manufacturers listed below are supply sources used for obtaining certain parts in this option, and are not listed in the base manual. All other manufacturers not listed below can be found in the base manual.

Mfr. Code	Name and Address	Mfr. Code	Name and Address
05313	McCarty Sales Inc. 112 Rittenhouse Bayfield, WI 54814	9AA35	Mepcopal Company San Diego, CA 92121
07263	Fairchild Semiconductor Div. Cupertino, CA 95014	91506	Augat Incorporated 452 John Dietsch Blvd. P.O. Box 2510 Attleboro Falls, MA 02763
67183	Altera Corporation 2610 Orchard Parkway San Jose, CA 95134-2020		

D.10 PARTS LIST

The following parts lists contain all the electrical components used in the unit, along with mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts from the Watkins-Johnson Company, specify the unit type, the serial number, and the option configuration. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in **paragraph D.9**, and the manufacturer's part number, provided in **paragraph D.10.1**, are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph D.10.1** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semiconductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes and integrated circuits installed in the equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
D.10.1	**TYPE WJ-8710/DSO1, WJ-8711/DSO1, AND WJ-8712/DSO1 DIGITAL SIGNAL OUTPUT OPTION 1**				
	Revision X1				
A2A1	Digital Signal Output PC Assembly	1	797093-1	14632	
W4	Cable Assembly	1	383295-1	14632	
	Accessory Items				
AI-1	Connector, D-Sub 15 Pin	1	K86-EA-15P	05313	
AI-2	Shell, 15 pin Connector	1	207908-1	00779	

D.10.1.1 Type 797093-1 Digital Signal Output PC Assembly

REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision 01				
C1	Capacitor, Ceramic: .047 µF, 10%, 50 VDC	8	841415-023	14632	
C2 Thru C8	Same as C1				
C9	Capacitor, Ceramic: .01 µF, 10%, 50 V	18	841415-019	14632	
C10	Same as C9				
C11	Capacitor, Ceramic: 100 pF, 5%, 50 V NPO	66	841415-007	14632	
C12	Same as C11				
C13 Thru C15	Same as C9				
C16	Capacitor, Tantalum: 33 µF, 20%, 16 V	1	841293-22	14632	
C17	Capacitor, Tantalum: 15 µF, 20%, 25 V	2	841293-19	14632	
C18	Same as C17				
C19 Thru C54	Same as C11				
C55 Thru C63	Same as C9				
C64 Thru C91	Same as C11				
C92	Capacitor, Ceramic: 82 pF, ±2%, 50 V NPO	1	841416-047	14632	
C93	Capacitor, Ceramic: 39 pF, 2%, 50 V NPO	1	841416-039	14632	
C94	Capacitor, Ceramic: 560 pF, 2%, 50 V NPO	1	841416-067	14632	
C95	Same as C9				
C96	Same as C9				
C97	Capacitor, Ceramic: 470 pF, 2%, 50 V NPO	1	841416-065	14632	
C98	Capacitor, Ceramic: 2200 pF, 10%, 50 V	1	841415-015	14632	
C99	Capacitor, Ceramic: 270 pF, 2%, 50 V NPO	2	841416-059	14632	
C100	Capacitor, Ceramic: 150 pF, 2%, 50 V NPO	1	841416-053	14632	
C101	Capacitor, Ceramic: 330 pF, 2%, 50 V NPO	1	841416-061	14632	
C102	Capacitor, Ceramic: 1500 pF, 2%, 50 V NPO	1	841416-077	14632	
C103	Capacitor, Ceramic: 390 pF, 2%, 50 V NPO	1	841416-063	14632	
C104	Capacitor, Ceramic: 180 pF, 2%, 50 V NPO	1	841416-055	14632	
C105	Same as C99				
C106	Same as C9				
C107	Same as C9				
C108	Capacitor, Ceramic: 1200 pF, 2%, 50 V NPO	1	841416-075	14632	
C109	Capacitor, Ceramic: 1000 pF, 2%, TOL, 50 V NPO	1	841416-073	14632	
C110	Capacitor, Ceramic: .33 µF	1	841293-01	14632	
C111	Capacitor, Ceramic: 1.0 µF	1	841293-04	14632	
C112	Capacitor, Ceramic: .1 µF	2	841250-25	14632	

REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C113	Same as C112				
CR1	Diode	10	MBAV74	04713	
CR2 Thru CR10	Same as CR1				
E1	Not Installed				
J1	Connector, PC Board: 24-Pin Dbl Row Skt	2	SSW-112-01-T-G-D	55322	
J2	Same as J1				
J3	Not In Circuit				
J4	Connector, Receptacle: 20-POS DBL ROW MALE	1	M80-8662622		
J5	Not Installed				
J6	Not Installed				
J7	Connector, PC Board: 3 POS SGL ROW SKT	1	SSW-103-01-T-S	55322	
R1	Resistor, Fixed: 10 kΩ, 5%, 1/10 W	15	841414-097	14632	
R2 Thru R10	Same as R1				
R11 Thru R48	Not Installed				
R49	Jumper: .05Ω	24	841417	14632	
R50 Thru R72	Same as R49				
R73	Resistor, Fixed: 56Ω, 5%, 1/10 W	24	841414-043	14632	
R74 Thru R96	Same as R73				
R97	Resistor, Fixed: 9.1 kΩ, 5%, 1/10 W	3	841414-096	14632	
R98	Same as R97				
R99	Same as R97				
R100	Resistor, Fixed: 3.3 kΩ, 5%, 1/10 W	1	841414-085	14632	
R101	Resistor, Fixed: 6.8 kΩ, 5%, 1/10 W	2	841414-093	14632	
R102	Resistor, Fixed: 4.7 kΩ, 5%, 1/10 W	3	841414-089	14632	
R103	Resistor, Fixed: 220 kΩ, 5%, 1/10 W	1	841414-129	14632	
R104	Resistor, Fixed: 1.0 kΩ, 5%, 1/10 W	4	841414-073	14632	
R105	Same as R104				
R106	Same as R1				
R107	Resistor, Fixed: 330Ω, 5%, 1/10 W	1	841414-061	14632	
R108	Resistor, Fixed: 3.9 kΩ, 5%, 1/10 W	1	841414-087	14632	
R109	Resistor, Fixed: 8.2 kΩ, 5%, 1/10 W	2	841414-095	14632	
R110	Same as R1				
R111	Resistor, Fixed: 47 kΩ, 5%, 1/10 W	1	841414-113	14632	
R112	Same as R1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2A1

R113	Same as R109				
R114	Same as R102				
R115	Same as R1				
R116	Same as R101				
R117	Resistor, Fixed: 33 kΩ, 5%, 1/10 W	1	841414-109	14632	
R118	Same as R104				
R119	Same as R104				
R120	Same as R1				
R121	Same as R102				
R122	Resistor, Fixed: 100Ω, 5%, 1/10 W	1	841414-049	14632	
R123	Resistor, Fixed: 91Ω, 5%, 1/10 W	2	841414-048	14632	
R124	Resistor, Fixed: 82Ω, 5%, 1/10 W	1	841414-047	14632	
R125	Same as R123				
S1	Switch, Dip: 10 POS SPST Side-Actuated	1	GDP10S	95146	
S2	Switch: 8 POS Slide	1	CHS08A	9AA35	
S3	Switch, Dip: SPSt Side-Actuated	1	GDP-08S	95146	
U1	Integrated Circuit, EPLD	1	EPM7096LC84-3	67183	
U2	Integrated Circuit: Line Driver and Receiver Monolithic	1	SN75155D	01295	
U3	Integrated Circuit (OBS): Quadruple Line Drivers	3	SN75111D	01295	
U4	Same as U3				
U5	Same as U3				
U6	Integrated Circuit, CMOS: Octal Buffer/Line Driver	3	8674AC244S020U	07263	
U7	Same as U6				
U8	Same as U6				
U9	Amplifier	2	MC33182D	04713	
U10	Same as U9				
U11	Voltage Regulator: -5 V	1	MC79M05CDT	14632	
XU1	Socket, PLCC: 84-Pin LO Profile	1	PCS-084-SMU-11T	91506	

NOTES

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
B) CAPACITANCE IS IN μF.
C) INDUCTANCE IS IN μH.

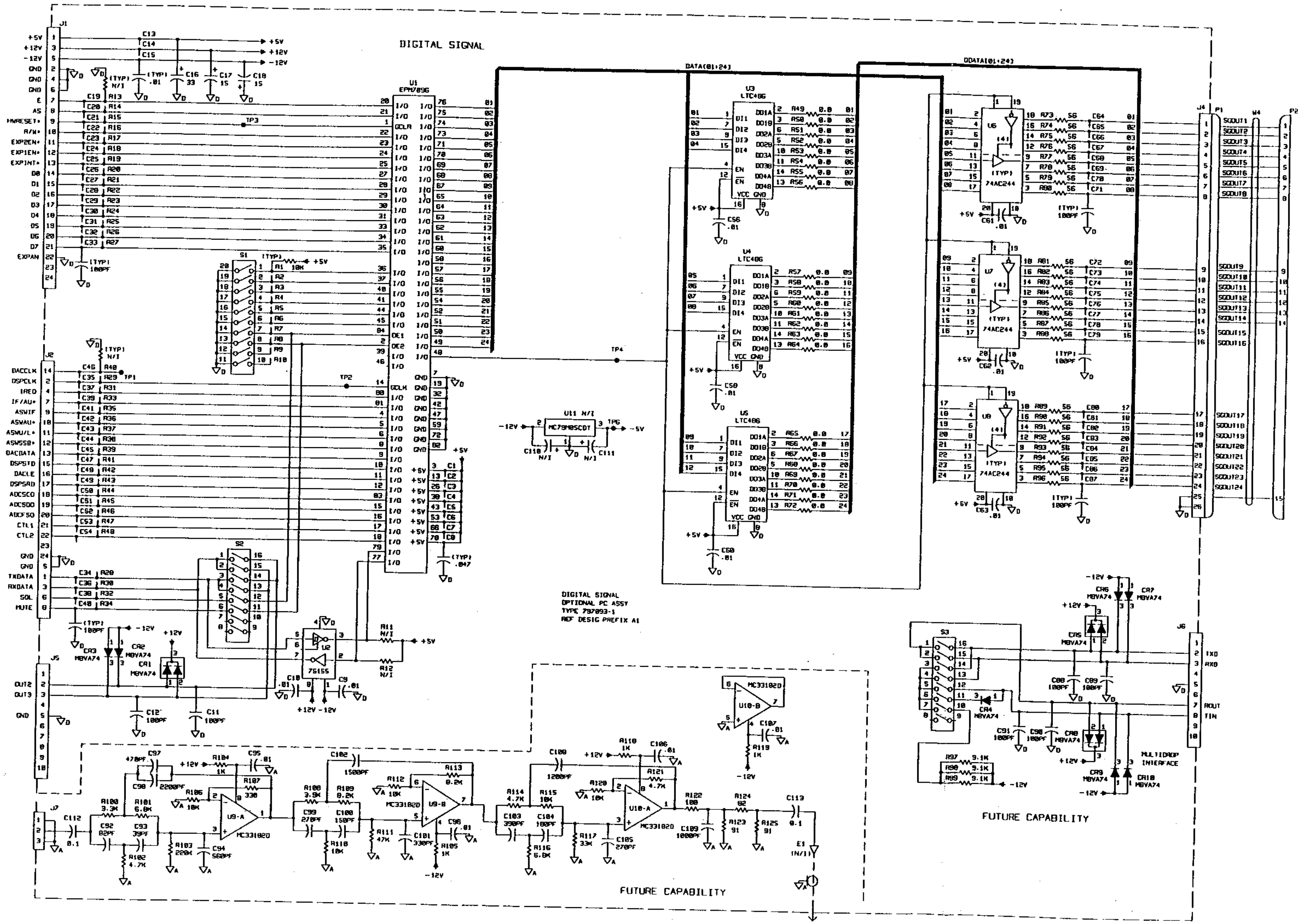


Figure D-6. Type 797093-1 Digital Signal Output PC Assembly (A2A1), Schematic Diagram 581452 (D)

APPENDIX E

WJ-8711/488 AND WJ-8712/488 IEEE-488 INTERFACE OPTIONS

P/N 181283-001, Revision D

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

September 1997

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LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	E
ii	Proprietary Statement	E
iii	List of Effective Pages	E
iv	Intentionally Blank	E
v	Revision Record	E
vi	Intentionally Blank	E
vii thru viii	Table of Contents	E
E-1 thru E-22	Appendix E	D
E-23 (E-24 blank)	Schematic	D
E-25 (E-26 blank)	Schematic	D

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WJ-8711/488 AND WJ-8712/488 IEEE-488 INTERFACE OPTIONS

REVISION RECORD

Revision	Description	Date
A	Initial Issue.	9/93
B	Expand to detail various receiver models.	5/94
C	Add information about IF data spectrum inverstion.	6/94
D	Added table detailing DSO1 output functions versus mode.	12/94
E	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97

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APPENDIX E

WJ-8711/488 AND WJ-8712/488 IEEE-488 INTERFACE OPTIONS

E.1 INTRODUCTION

This document describes the WJ-8711/488 and WJ-8712/488 IEEE Interface Options and includes the associated configuration setup procedures and remote operation instructions. This option is used on the WJ-8711A, WJ-8712A, and WJ-8712P Digital HF Receivers. When the IEEE-488 option is installed, standard remote operations via the CSMA interface are not available.

E.2 ELECTRICAL CHARACTERISTICS

The IEEE-488 Interface Option provides the communications link between a remote IEEE-488 interface-equipped controller and the receiver's host controller. The communications protocol incorporated into the IEEE-488 interface complies with the guidelines of the IEEE-488.2-1987 Interface specification. Operational details of this interface can be found in Section II of this manual.

The IEEE-488 interface is available via a standard 24-pin GPIB connector which is mounted on the rear panel of the receiver (refer to **Figure E-1(A) & (B)**).

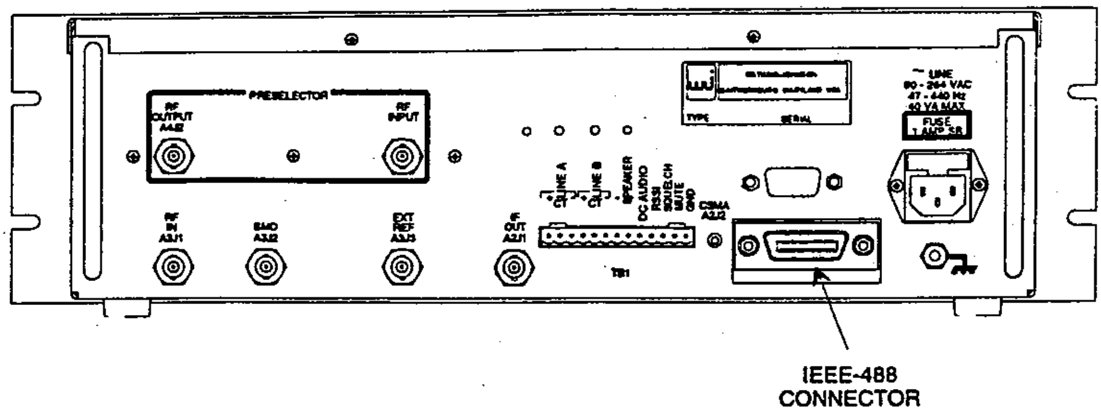
E.3 MECHANICAL CHARACTERISTICS

The IEEE-488 Interface Option consists of the Type 797201-2 488 Option PC Assembly (daughterboard) and a type 383522-1 Cable Assembly (W3) for routing signals to the rear panel of the receiver.

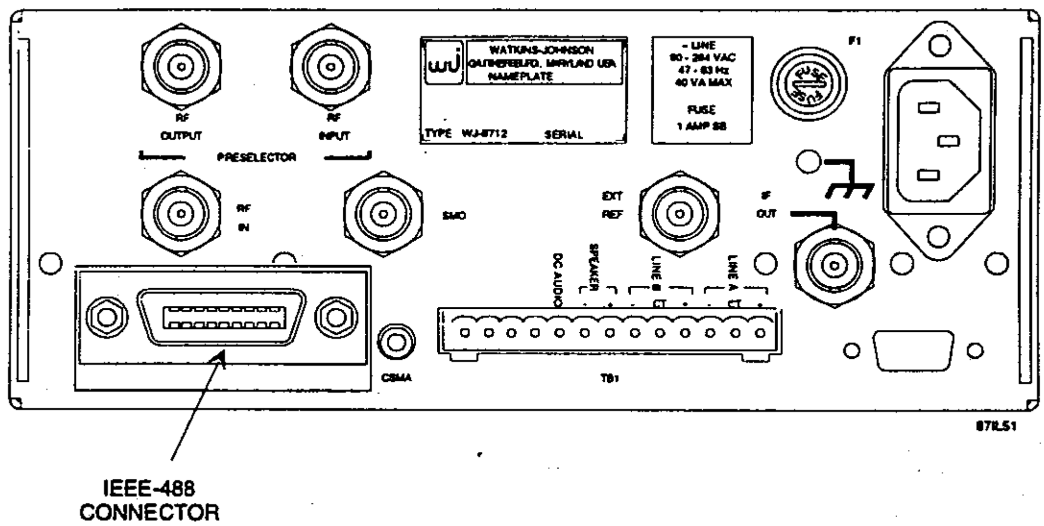
The IEEE-488 interface option daughterboard is piggyback mounted (via standoffs) to the receiver's Type 797214-2 Digital Control PC Assembly (a modified version of the 797214-1 PC Assembly which does not include connector J3). Two connectors (J1 and J2) on the daughterboard plug directly into mating connectors (J8 and J9) on the Digital Control PC Assembly. One end of the cable assembly attaches to the IEEE-488 connector mounted on the rear panel of the unit and the other end attaches to connector J5 on the daughterboard. Mounting hardware and mating connector hardware is provided to satisfy assembly and cabling requirements.

E.4 OVERALL FUNCTIONAL DESCRIPTION

The IEEE-488 Option allows a general purpose interface bus (GPIB) controller to handle data transfers to and from the host GPIB controller (via an eight-bit parallel data bus) in a bit-parallel, byte-serial format. Sixteen interconnecting lines plus eight ground and shield lines form the IEEE-488 interface.



(A) WJ-8711A



(B) WJ-8712A AND WJ-8712P

Figure E-1. Location of IEEE-488 Output Connector

The sixteen interconnecting lines consist of eight bi-directional bus lines, three data byte transfer lines, and five bus management lines. Data or address information is transferred between devices using the eight data bus lines (DI01 - DI08). The data byte transfer lines indicate the availability and validity of the information on the data bus (DAV), the readiness of the listening device to accept data (NRFD), and that the data has or has not been accepted (NDAC). The five bus management lines are ATN, EOI, SRQ, IFC, and REN. ATN is asserted by the controller to indicate that it is placing an address or control byte on data bus lines. The controller de-asserts ATN to allow a talker to place data on the bus. A talker may assert EOI simultaneously with the last byte of data to indicate end of data. SRQ may be asserted by any device to request the controller to take an action. The controller, in turn, conducts a serial poll to determine who is requesting service. IFC is asserted by the controller in order to initialize all bus devices to a known state. When the controller de-asserts IFC, it takes active control of the system. The REN line, which sets a device into remote local mode, has no effect on the unit in this implementation.

E.5 INSTALLATION

The IEEE-488 Interface Option is installed in the receiver at the factory when ordered with the receiver.

E.5.1 CONNECTOR SIGNALS

The IEEE-488 interface signals are available at the IEEE-488 connector located on the rear panel of the receiver (see **Figure E-1**). Refer **Figure E-2** for the pin configuration of the rear panel IEEE-488 interface connector.

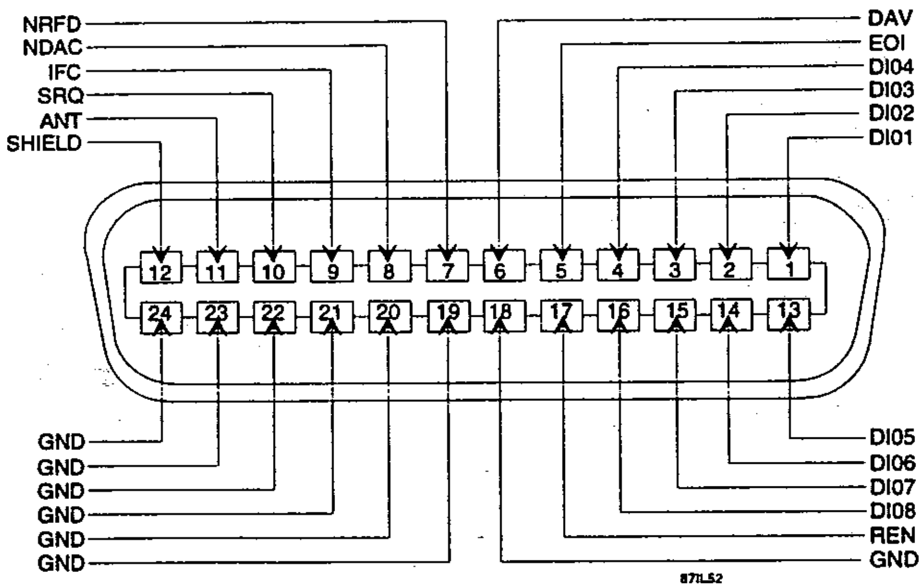


Figure E-2. IEEE-488 Interface Connector

E.6 IEEE-488 CONFIGURATION SETUP

The receiver contains a DIP switch that can be used to set the receiver's address on the IEEE-488 bus. This switch is designated S2 and is mounted on the Digital Control PC Assembly (A2). The DIP switch contains eight individual switches. Switches 1 through 5 of A2S2 are used to set the receiver's address (valid addresses are from 0 to 30). The individual switches within A2S2 are on when they are in the down position (toward front panel) and are off when in the up position (toward rear panel). Switch A2S2 must be on in accordance with **Table E-1** and may be accessed as explained in the following paragraphs.

NOTE

Receiver power must be cycled in order for switch settings to take effect.

E.6.1 ACCESSING DIP SWITCHES ON THE DIGITAL CONTROL PC ASSEMBLY

E.6.1.1 WJ-8711A Digital HF Receiver

Perform the following procedural steps to gain access to DIP switches A2S1 and A2S2:

a. Turn off the receiver and disconnect the power plug from the rear panel power connector.

b. Remove two pan-head screws from the rear edge of the top panel securing it to the chassis rear apron and two flat-head screws on the forward edge of the top panel.

c. Carefully remove top panel and disconnect the speaker leads.

d. Locate switches S1 and S2 on the A2 assembly (refer to **Figure E-3**).

e. Set the switches for the desired configuration in accordance with **Table E-1**.

f. Reconnect the speaker leads to the top panel and replace the top panel on the receiver. Secure the top panel with the screws removed in step b.

g. Reconnect power cord to the rear panel power connector.

Table E-1. Switch Settings of DIP Switch A2S2

A2S2, Positions 1 - 5 (IEEE-488 Address Selection)					
Address	Position 5	Position 4	Position 3	Position 2	Position 1
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
19	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF

Note 1: Switches not listed are not used.
Note 2: As positioned on PC Assembly, ON is down (toward front-panel); OFF is up (toward rear panel).

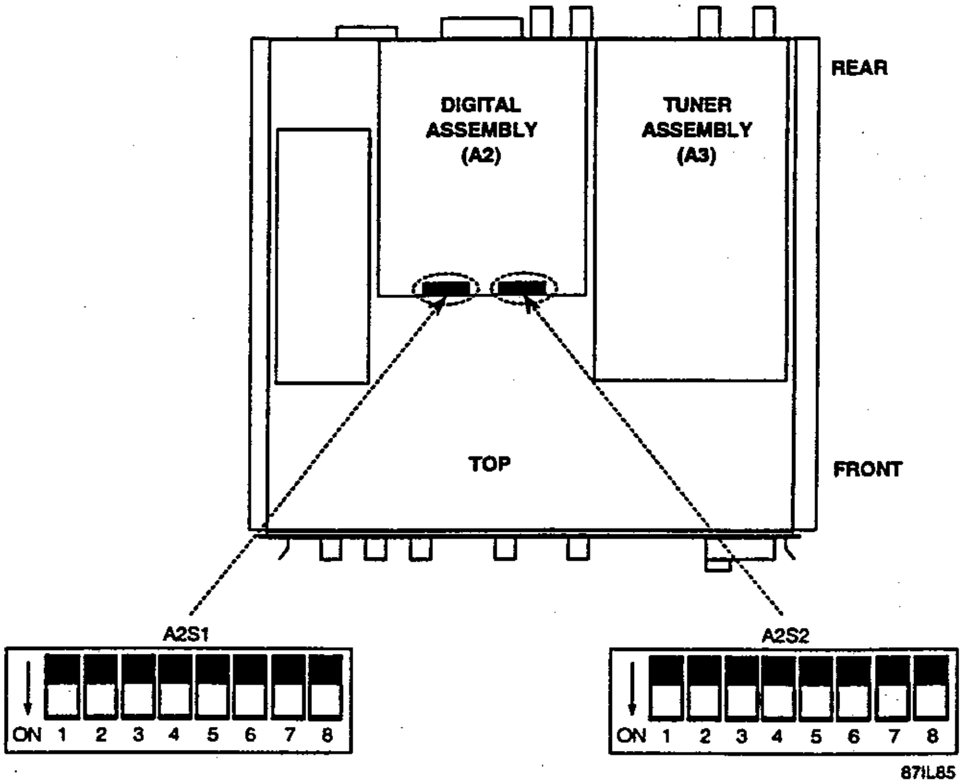


Figure E-3. Location of Switches A2S1 and A2S2 in the WJ-8711A

E.6.1.2 <u>**WJ-8712A and WJ-8712P Digital HF Receivers**</u>

Perform the following procedural steps to gain access to DIP switches A2S1 and A2S2:

a. Turn off the receiver and disconnect the power plug from the rear panel power connector.

b. Remove twelve (12) flat-head screws from the bottom cover and remove the bottom cover.

c. Locate switches S1 and S2 on the A2 assembly (refer to **Figure E-4**).

d. Set the switches for the desired configuration in accordance with **Table E-1**.

e. Replace the bottom cover and secure it in place with the twelve (12) screws removed in step b.

f. Reconnect power cord to the rear panel power connector.

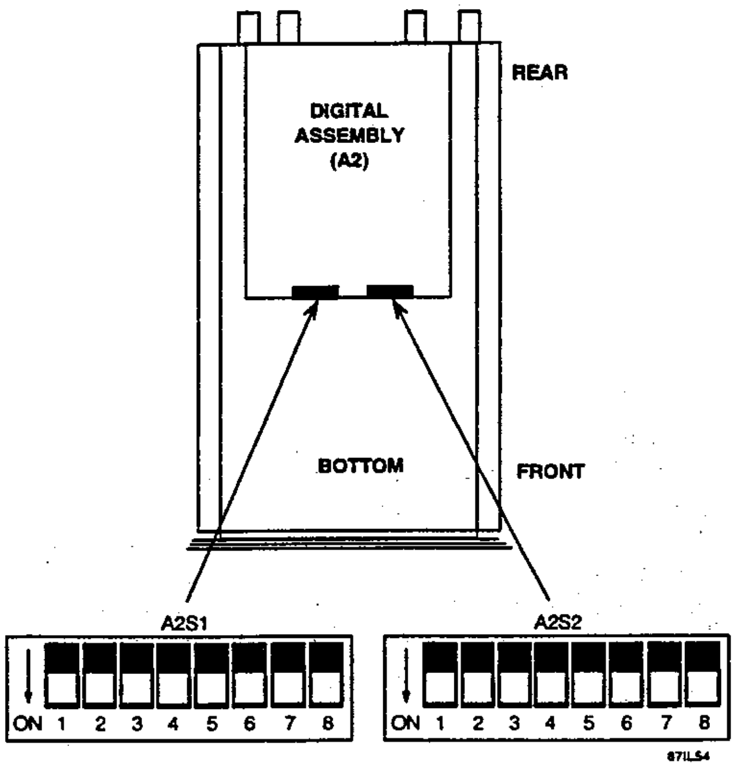


Figure E-4. Location of Switches A2S1 and A2S2 in the WJ-8712A and WJ-8712P

E.7 REMOTE OPERATION

With the IEEE-488 Interface Option installed, the WJ-8711A, WJ-8712A or WJ-8712P Digital HF Receiver may be controlled remotely by a computer or other controller device that is equipped with an IEEE-488 interface and capable of transmitting and receiving ASCII-standard encoded characters.

The WJ-8711A and WJ-8712P can be set for IEEE-488 remote control by selecting "GPIB" in the remote control entry mode with the front panel SPECIAL FUNCTION key (WJ-8711A) or the front panel MENU key (WJ-8712P), and then selecting the desired receiver address (0-30). Refer to Section III of the WJ-8711A or WJ-8712P Manual for details on using the SPECIAL FUNCTION key and MENU key, respectively. Also, the WJ-8711A, WJ-8712A, and WJ-8712P may be set for IEEE-488 remote operation by setting DIP switch A2S1 as explained in **paragraph E.6** above.

E.7.1 COMMUNICATIONS PROTOCOL

As implemented via the IEEE-488 Interface Option, the capabilities of the IEEE-488 interface include:

SH1	Source Handshake
AH1	Acceptor Handshake
T6	Basic Talker with Serial Poll
L4	Basic Listener
SR1	Service Request
DC1	Device Clear
RL2	No Remote Local Capability
PP0	No Parallel Poll
DT0	No Device Trigger
C0	No Controller Capability
E2	Tristate Drivers

This means that the unit can talk or listen when commanded by a controller. The unit can also request an SRQ from a controller and reply to controller's serial poll. The condition of the Remote Enable (REN) bus signal line has no effect on the unit. The unit is also capable of responding to SDC (selected device clear) and DCL (universal device clear).

E.7.2 COMMAND MESSAGE FORMAT

Command messages are exclusively ASCII-encoded data. Command headers consist of three-character mnemonics (refer to the command tables in **Section IV** of the main manual). "Common" commands are prefixed with the "*" character. All queries are suffixed with the "?" character. Also, all command arguments are in the "forgiving" numerical representation form. Multiple commands which are sent to the receiver must be separated with a semicolon (;) character. In addition, multiple arguments of a single command must be delimited with commas.

Messages may be terminated with any of the following combination of characters:

1. CR, LF
2. LF
3. CR, LF/EOI
4. CR/EOI
5. LF/EOI
6. EOI (on the last byte of the message)

Note that CR is essentially ignored and termination is confirmed on the receipt of a LF and/or EOI.

E.7.2.1 **Message Processing**

When the system receives a message, it is stored in the input buffer until a valid message termination is received. Then, the message is parsed and executed. Additional input data cannot be received until the execution of the message is finished.

The command message format is checked for validity as the message is parsed and executed. If the command message fails to meet the restrictions of the command message format, then an error is generated and the rest of the message is not processed.

E.7.2.2 **Query Response Format**

A fixed field format is used for query responses. Query responses begin with the mnemonic in upper case characters, followed by a numerical or string argument. Query responses separate the first argument from the mnemonic by a space. Numeric arguments are represented by the least number of digits possible, while still representing the entire range of the value. If a negative value is allowed for the argument, a sign is always given. Single queries that require multiple arguments are delimited by commas. Responses to multiple command queries are linked together in a series in the output buffer and delimited by semicolons. All output message terminations consist of a CR (carriage return) and a LF (line feed) with an EOI sequence.

E.7.2.3 **I/O Buffer Control**

The DCL (device clear) and SDC (selective device clear) bus commands and power-on are functionally similar in that all three clear both the input and output buffers. No other condition or action clears the input buffer. A query error is generated if the contents of the output buffer are discarded for any other reason.

Buffer sizing is based on the maximum reasonable message length, taking into consideration that the size of the input and output buffers are 1024 bytes each. If the input buffer becomes full, an execution error is set in the Event Status Register and the input buffer is cleared.

Detection of any invalid input command or data halts the execution of an input message, resets the input buffer and sets the appropriate error flag in the Event Status Register. Output buffer overflow causes the buffer to reset and the query flag to be set in the Event Status Register.

E.7.3 **REPRESENTATION OF NUMERIC ARGUMENTS**

Numeric arguments that are used with commands are accepted in a forgiving numeric representation. Refer to the **Section IV** of the main manual for details on numeric data representation.

E.7.4 MESSAGE CATEGORIES

The commands and queries used for remote operation of the receiver are contained in two main categories: Communication Messages and Device Messages. The applicable messages are identical to the RS-232 messages defined in **Section IV** of the main manual.

E.7.5 RECEIVER STATUS SUMMARY

With the addition of the IEEE-488 Interface Option, the architecture of the receiver's status registers (defined in Section IV of the main manual) reflect one additional parameter. With the IEEE-488 option installed, bit 4 of the Service Request Enable Register and bit 4 of the Status Byte Register (which were unused with the RS-232 interface) are used to represent the Message Available Bit. Bit 4 (enMAV) of the Service Request Enable Register and bit 4 (MAV) of the Status Byte Register are logically ANDed. The ANDed combination of these two bits (and the ANDed combination of bits 0 and 5 of these same two registers) are logically ORed to determine the setting of bit 6 (RQS) of the Status Byte Register.

The Message Available Bit (MAV), when set, indicates that data has been placed in the output buffer. This bit is cleared when the output buffer is empty.

E.8 IEEE-488 INTERFACE FUNCTIONAL DESCRIPTION

The IEEE-488 Interface Option basically consists of a General Purpose Interface Bus (GPIB) controller, address/data latches and transceivers as shown in **Figure E-5**. These circuits provide an interface between the receiver's host controller and the remote IEEE-488 interface equipped controller.

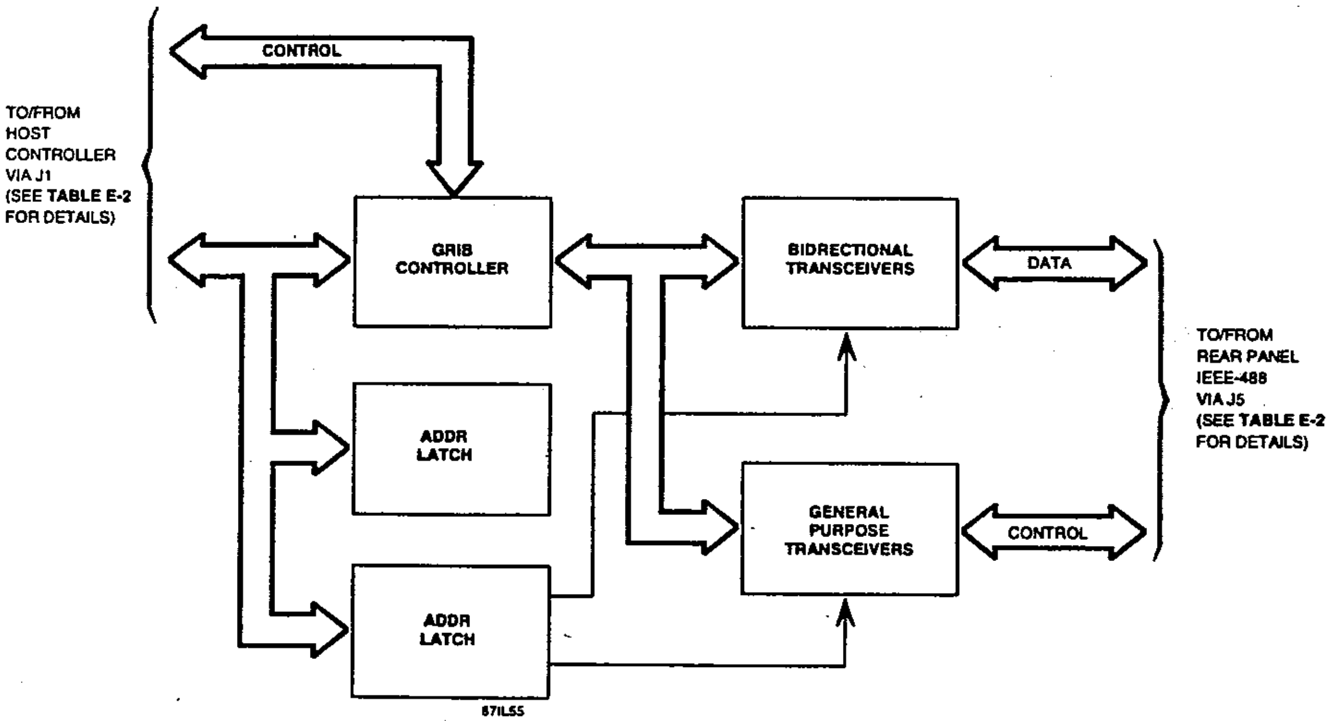


Figure E-5. IEEE-488 Interface Option Functional Block Diagram

The GPIB controller communicates directly with the receiver's host controller and essentially relieves the host controller of the task of providing the proper IEEE-488 protocol. Communication between the host controller and the GPIB controller is achieved via 8-bit memory mapped registers which are contained in the GPIB controller. These registers pass control data to and obtain status information from the device. All information is exchanged via a multiplexed data bus and is transferred in a bit-parallel, byte-serial format. Each memory mapped register is accessed when the appropriate address appears on the data bus and is stored in the address latch. This allows the appropriate register to be selected and accessed when the appropriate control (read or write) signal is sent from the host controller.

Communication between the GPIB controller and the remote IEEE-488 controller is achieved via the transceivers. Bidirectional transceivers are used to control the 8-line data bus. These transceivers allow all eight data lines to simultaneously transmit or receive data in a bit-parallel, byte-serial format (as determined by the GPIB controller). The bidirectional transceivers also provide totem-pole type outputs (allowing the fastest possible data rate). This type of output signal is selected by a control signal sent from the data latch (which stores the appropriate data bit sent from the host processor) during the receiver's initialization procedure.

The general purpose transceivers are used to control the 8-line control bus. These transceivers insure that the proper control line is enabled in the proper direction for exchange of bus management and handshaking signals (as determined by the GPIB controller). Three of the control lines (NDAC, NRFD and SRQ) have open-collector outputs and the remaining five control lines have totem-pole outputs as required by the IEEE-488 standard. Also, REN and IFC lines are configured so that the receiver may be used only as a slave device. This configuration is selected by a control signal sent from the data latch (which stores the appropriate data bit sent from the host processor) during the receiver's initialization.

The circuits which comprise the IEEE-488 Interface Option are located on the 488 Option PC Assembly (A1) which is mounted on the Digital Control PC Assembly (A2). The IEEE-488 interface circuits communicate with the receiver's host controller via connector J1 on the A1 assembly. The interface circuits are interfaced to the receiver's rear panel IEEE-488 connector via connector J5 (also located on the A1 assembly) and cable assembly W3. **Table E-2** provides details on the input and output signals which appear on connectors J1 and J5.

Table E-2. Pin Assignments for IEEE-488 Option PC Assembly (A1) Connectors J1 and J5

Connector/Pin	Function
J1 (pin 1)	+5 Vdc Power Input (+5 V)
J1 (pin 3)	+12 Vdc Power Input (+12 V)
J1 (pin 5)	-12 Vdc Power Input (-12 V)
J1 (pin 2)	Ground (GND)
J1 (pin 4)	Ground (GND)
J1 (pin 6)	Ground (GND)
J1 (pin 8)	Address Strobe from Host Controller (AS)
J1 (pin 9)	Hardware Reset from Host Controller (HW RESET)
J1 (pin 10)	Read/Write Control Signal from Host Controller (R/W*)
J1 (pin 12)	Expansion Bus Enable from Host Controller (EXP1EN)
J1 (pin 13)	Expansion Bus Interrupt to Host controller (EXPINT)

Table E-2. Pin Assignments for IEEE-488 Option PC Assembly (A1) Connectors J1 and J5 (Continued)

Connector/Pin	Function
J1 (pin 14)	Parallel Data Bit 0 (D0)
J1 (pin 15)	Parallel Data Bit 1 (D1)
J1 (pin 16)	Parallel Data Bit 2 (D2)
J1 (pin 17)	Parallel Data Bit 3 (D3)
J1 (pin 18)	Parallel Data Bit 4 (D4)
J1 (pin 19)	Parallel Data Bit 5 (D5)
J1 (pin 20)	Parallel Data Bit 6 (D6)
J1 (pin 21)	Parallel Data Bit 7 (D7)
J2 (pin 1)	IEEE 488 Data Line 1 (DI01)
J2 (pin 2)	IEEE 488 Data Line 2 (DI02)
J2 (pin 3)	IEEE 488 Data Line 3 (DI03)
J2 (pin 4)	IEEE 488 Data Line 4 (DI04)
J2 (pin 13)	IEEE 488 Data Line 5 (DI05)
J2 (pin 14)	IEEE 488 Data Line 6 (DI06)
J2 (pin 15)	IEEE 488 Data Line 7 (DI07)
J2 (pin 16)	IEEE 488 Data Line 8 (DI08)
J2 (pin 10)	Service Request (SRQ)
J2 (pin 11)	Attention (ATN)
J2 (pin 5)	End or Identify (EOI)
J2 (pin 6)	Data Valid (DAV)
J2 (pin 7)	Not Ready for Data (NRFD)
J2 (pin 8)	Not Data Accepted (NDAC)
J2 (pin 9)	Interface Clear (IFC)
J2 (pin 17)	Remote Enable (REN)
J2 (pin 12)	Shield
J2 (pin 18)	Ground
J2 (pin 19)	Ground
J2 (pin 20)	Ground
J2 (pin 21)	Ground
J2 (pin 22)	Ground
J2 (pin 23)	Ground
J2 (pin 24)	Ground

Note: Connector pins not shown are not used.

E.9 IEEE-488 INTERFACE PERFORMANCE TEST

The performance test that follows is designed to verify proper operation of the IEEE-488 interface. In performance of the test, the receiver must be controlled by an external controlling computer connected to the rear panel IEEE-488 interface connector.

Table E-3. Required Test Equipment

Equipment	Recommended Type	Requirement
Frequency Counter	Fluke 1953A	Frequency Range to 100 MHz
Signal Generator	Marconi 2031	Frequency Range to 30 MHz
Control Computer	IBM PC Compatible	IEEE-488 Compatible

E.9.1 IEEE-488 PERFORMANCE TEST

1. Connect the receiver and test equipment as illustrated in **Figure E-6**.

2. Set the signal generator to produce a 10.000000 MHz CW signal at an output level of -40 dBm.

3. Using the remote IEEE-488 controller, set the receiver as follows:

Tuned Frequency:	10.000000 MHz	FRQ 10 <CR> <LF>
Detection Mode:	CW	DET 3 <CR> <LF>
BFO Offset:	+1.00 kHz	BFO 1000 <CR> <LF>
IF Bandwidth:	16.0 kHz	BWS 5 <CR> <LF>
Gain Control:	AGC Slow	AGC 1 <CR> <LF>
Squelch:	Off	SQL 136 <CR> <LF>

4. Set the frequency counter for 1.0 Hz resolution.

5. Note the frequency displayed on the frequency counter. The displayed frequency should be equal to the difference between the receiver and the signal generator frequencies plus the 1000 Hz BFO offset.

6. Using the remote IEEE-488 controller, query each of the parameters specified in step 3 above and confirm that the receiver is configured as specified.

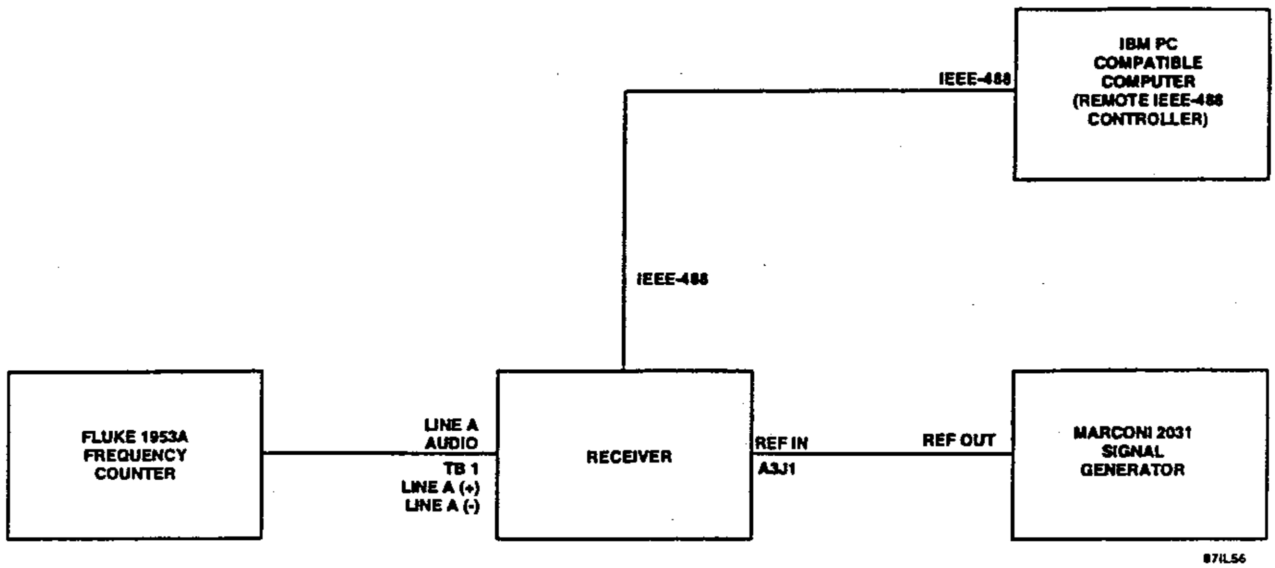


Figure E-6. IEEE-488 Performance Test Equipment Connections

E.10 UNIT NUMBERING METHOD

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly and discrete components. An example of the unit numbering method used is as follows:

Subassembly Designation A1	R1 Class and No. of item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

E.11 REFERENCE DESIGNATION PREFIX

Partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

E.12 LIST OF MANUFACTURERS

The manufacturers listed below are supply sources used for obtaining certain parts in the option, and are not listed in the base manual. All other manufacturers not listed below can be found in the base manual.

Mfr. Code	Name and Address
34371	Harris Corporation Semiconductor Sector 200 Palm Bay Blvd. Melbourne, FL 32902-0883

E.13 PARTS LIST

The following parts lists contain all the electrical components used in this option, along with mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts from the Watkins-Johnson Company, specify the unit type, the serial number, and the option configuration. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in **paragraph E.12**, and the manufacturer's part number, provided in **paragraph E.13.1**, are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph E.13.1** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improvements in semiconductors are made, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes and integrated circuits installed in the equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

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REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
E.13.1	**TYPE WJ-8711/488 AND WJ-8712/488 IEEE-488 REMOTE INTERFACE OPTIONS**				
	Revision A				
A2	Digital Control PC Assembly*	1	797214-2	14632	
A2A1	488/DSP Option PC Assembly	1	797201-2	14632	
W3	Cable Assembly	1	383522-1	14632	

*Note: The 488 Interface option is used only with receivers that are equipped with the type 797214-2 PC assembly (a modified version of the 797214-1 PC Assembly which does not include connector J3). Refer to the base manual for WJ-8711A Main Chassis Schematic information.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

E.13.1.1 **Type 797201-2 488 Option PC Assembly** REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic, .047µF ±10%, 50V 0805	10	841415-023	14632	
C2	Same as C1				
C3 Thru C9	Not Used				
C9	Same as C1				
C10 Thru C13	Not Used				
C14	Same as C1				
C15	Not Used				
C16	Same as C1				
C17	Same as C1				
C18 Thru C29	Note Used				
C30	Capacitor, Ceramic, 100pF ±5%, 50V 0805	33	841415-007	14632	
C31	Same as C30				
C32	Same as C30				
C33	Not Used				
C34	Not Used				
C35	Same as C30				
C36	Not Used				
C37 Thru C41	Same as C30				
C42 Thru C49	Not Used				
C50 Thru C52	Same as C30				
C53	Not Used				
C54 Thru C57	Same as C30				
C58	Not Used				
C59	Not Used				
C60	Same as C30				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2A1

C61	Same as C30				
C62					
Thru	Not Used				
C65					
C66	Capacitor, Tantalum, 15μF ±20%, 25V	2	841293-19	14632	
C67	Same as C66				
C68	Not Used				
C69	Same as C1				
C70	Not Used				
C71	Not Used				
C72	Same as C1				
C73	Same as C1				
C74	Not Used				
C75	Same as C1				
C76					
Thru	Same as C30				
C83					
C84					
Thru	Not Used				
C88					
C89	Capacitor, Tantalum, 33μF ±20%, 16V	1	841293-22	14632	
C90					
Thru	Same as C30				
C96					
C97					
Thru	Not Used				
C113					
CR1					
Thru	Not Used				
CR6					
DS1	Not Used				
DS2	LED SM LED RED 5V=VR 12.5MA=1F	1	LSS260-DOE7502	25088	
J1	Connector, PC, Bd 24-Pin Skt For Use				
	W/.025 Sq Pin .10 Ctr	2	SSW-112-01-T-G-D	55322	
J2	Same as J1				
J3	Not Used				
J4	Not Used				
J5	Connector, Receptacle, 24Pin RT. Angle				
	Header Double Row .1X.1	1	65624-124	22526	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2A1

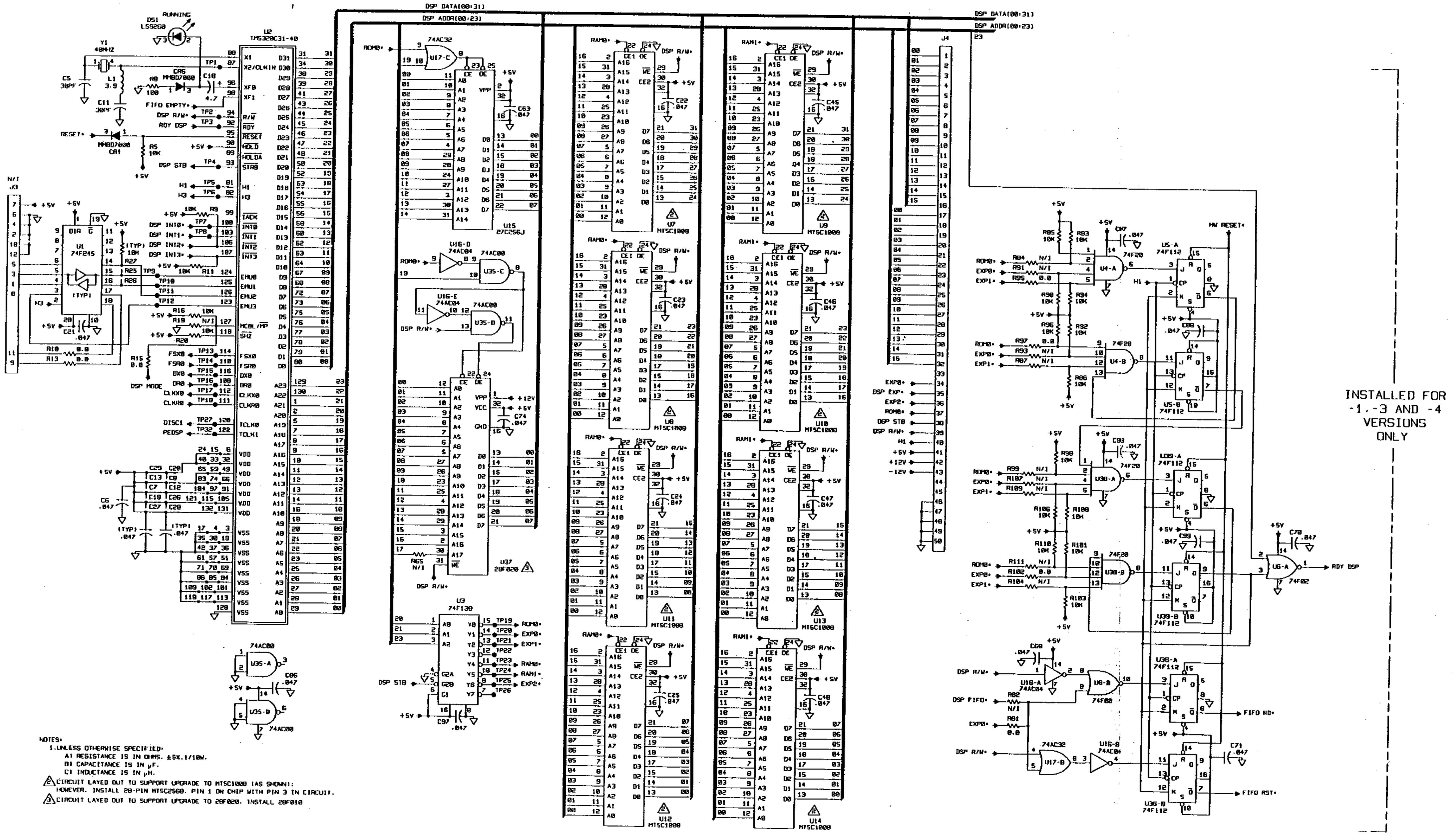
REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
J6 Thru J9	Not Used				
L1	Not Used				
Q1	Not Used				
R1	Not Used				
R2	Resistor, Fixed, 10kΩ ±5%, .1W 0805	1	841414-097	14632	
R3	Not Used				
R4	Resistor, Fixed, 1.0kΩ ±5%, .1W 0805	2	841414-073	14632	
R5	Not Used				
R6	Not Used				
R7	Jumper .05 Ω Max 1A Min@70C	2	841417	14632	
R8 Thru R13	Not Used				
R14	Same as R7				
R15+ Thru R79	Not Used.				
R80	Same as R4				
R81 Thru R152	Not Used				
U1	Integrated Circuit, /XCVR Octal Bus Transceiver W/3-St Outputs Sol-20 Wide	1	74F245 SOL20	01295	
U2	Not Used 132-PQFP				
U3	Not Used				
U4	Integrated Circuit, Dual 4-Input Positive NAND Gates	2	74F20 SO14	04713	
U5	Not Used				
U6	Integrated Circuit, /F-Logic Quad 2-Input NOR Gate	1	74F02 SO14	27014	
U7 Thru U15	Not Used				
XU15	Not Used				
U16	Integrated Circuit, CMOS, Hex Inverters Active Outputs	1	74AC04 SO14	04713	
U17	Integrated Circuit, CMOS, Quad 2-Input OR Gate	1	74AC32 SO14	34371	
U18	Integrated Circuit, /Latch Octal Transparent Latch W/3-ST Output 24MA SOL-	1	74ACT373 SOL20	04713	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2A1

U19	Integrated Circuit, /FF Octal D Flip-Flop W/CLOCKΩ Enable Sol-20 Wide Pkg	1	74ACT377 SOL20	04713	
U20	OBS; IC GPIB Intfc IEEE-488 44-Pin PLCC Pkg	1	TMS9914AFNL	01295	
U21	Integrated Circuit, /INTRFC 8 Channel Bidirectional Transceiver Mono HI-SP	1	SN75ALS160DW	01295	
U22	Integrated Circuit, /XCVR Octal General Purpose Interface Bus Transceiver	1	SN75ALS162DW	01295	
U23	Not Used				
XU23	Not Used				
U24	Not Used				
U25	Integrated Circuit, Dual 1-OF-4 Decoder/Demultiplexer	1	74F139 SO16	04713	
U26 Thru U37	Not Used				
U38	Same as U4				
U39	Not Used				
U40 Thru U42	Not Used				
Y1	Not Used				
Y2	Not Used				

NOTES



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
B) CAPACITANCE IS IN μF.
C) INDUCTANCE IS IN μH.

2 CIRCUIT LAYED OUT TO SUPPORT UPGRADE TO MTSC1000 (AS SHOWN); HOWEVER, INSTALL 28-PIN MTSC2560. PIN 1 ON CHIP WITH PIN 3 IN CIRCUIT.

3 CIRCUIT LAYED OUT TO SUPPORT UPGRADE TO 28F020. INSTALL 28F010

Figure E-7. Type 797201 -1, -2, -3, -4, 488/DSP Option PC Assembly (A2A1), Schematic Diagram 581811 (Sheet 1 of 2) (E)

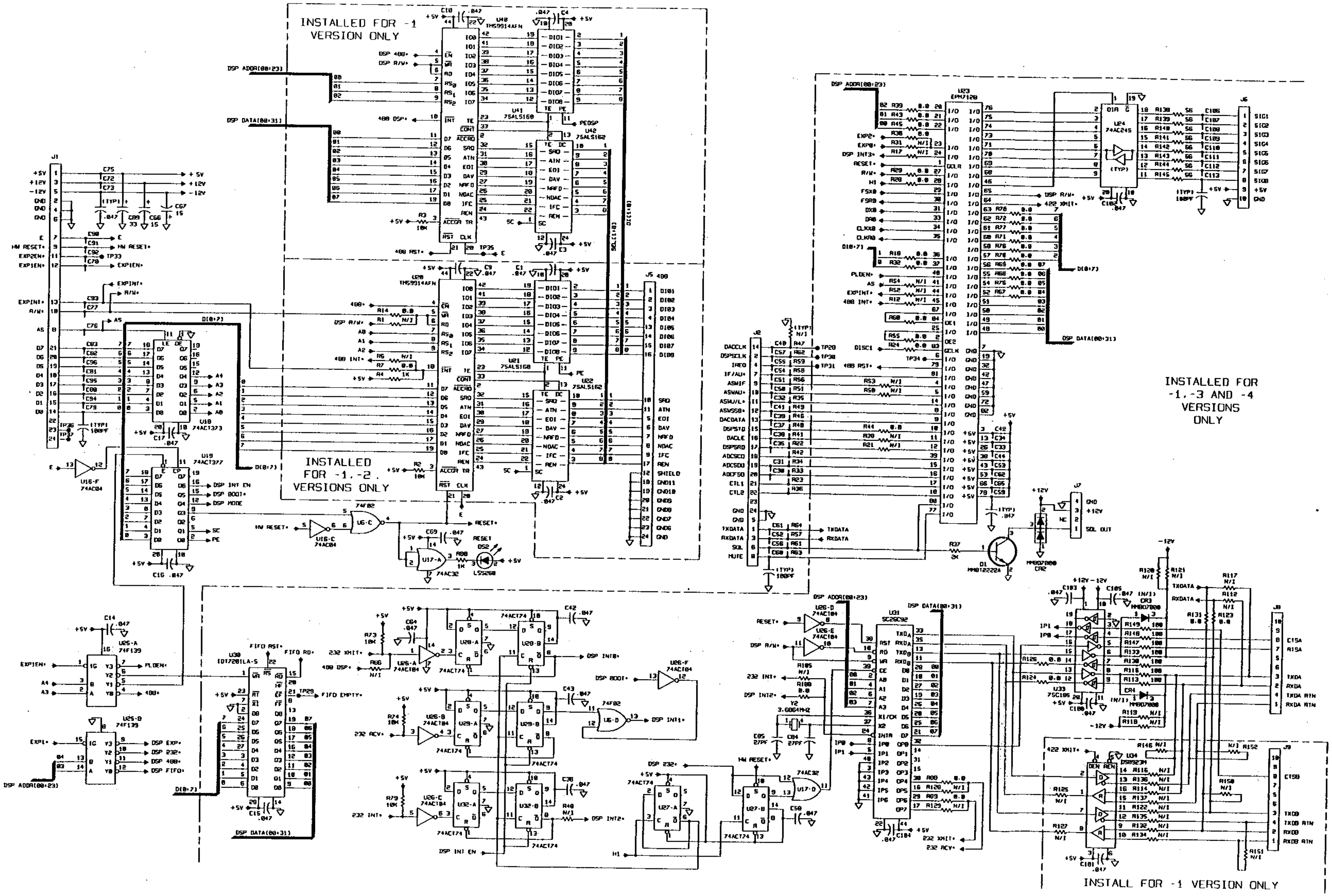


Figure E-7. Type 797201 -1, -2, -3, -4, 488/DSP Option PC Assembly (A2A1), Schematic Diagram 581811 (Sheet 2 of 2) (E)

WJ-871Y/8KRF 8 kHz ROOFING FILTER OPTION

APPENDIX F

WJ P/N 181284-001, Revision B

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

September 1997

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	B
ii	Proprietary Statement	B
iii	List of Effective Pages	B
iv	Intentionally Blank	B
v	Revision Record	B
vi	Intentionally Blank	B
vii thru viii	Table of Contents	B
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WJ-871Y/8KRF 8 kHz ROOFING FILTER OPTION

REVISION RECORD

Revision	Description	Date
A	Initial Issue.	12/93
B	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97

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APPENDIX F

LIST OF TABLES

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APPENDIX F

WJ-871Y/8KRF 8 kHz ROOFING FILTER OPTION

F.1 ELECTRICAL CHARACTERISTICS

The WJ-871Y/8KRF 8 kHz Roofing Filter Option improves the reception of weak signals which are in the presence of large signals at nearby adjacent frequencies. With this option installed, the receiver's RF bandwidth is reduced to 8 kHz and the number of selectable IF bandwidths is reduced to 58 (extending from 58 Hz to 8 kHz). This option also limits the bandwidth of the receiver's Signal Monitor Output to 8 kHz. **Table F-1** provides a list of specifications associated with this option.

F.2 INSTALLATION

F.2.1 SMO, SIGNAL MONITOR OUTPUT

With the WJ-871Y/8KRF Option installed, the signal monitor output connector continues to provide a sample of the 2nd intermediate frequency, centered at 455 kHz. However, the nominal (-6 dB) bandwidth of this signal is reduced from 30 kHz to 8 kHz. The nominal output impedance remains at 50 ohms with approximately 30 dB of gain from the antenna input.

F.3 LOCAL OPERATION OF THE WJ-8711AAND WJ-8712P

When the WJ-871Y/8KRF Option is installed in the WJ-8711A or WJ-8712P Digital HF Receiver, the number of available IF bandwidths (which may be selected via the front panel controls) is reduced to 58. **Table F-1** shows the IF bandwidths which are available. Refer to the base manual for details on selecting the desired IF bandwidth via the receiver's front panel controls.

F.4 REMOTE OPERATION OF THE WJ-8711A, WJ-8710A, WJ-8712P AND WJ-8712A

When the WJ-871Y/8KRF Option is installed in the WJ-8711A, WJ-8710A, WJ-8712P, or WJ-8712A Digital HF Receiver, the number of available IF bandwidths which may be remotely selected (via the RS-232 serial interface or other optional remote control interface) is reduced to 58. **Table F-1** shows the IF bandwidths which are available. Refer to the base manual for details on selecting the desired IF bandwidth via remote control.

Table F-1. WJ-871Y/8KRF 8 kHz Roofing Filter Option Specifications

IF Bandwidths

3dB Bandwidth	Typical Shape Factor (3/60 dB)	3 dB Bandwidths	Typical Shape Factor (3/60 dB)
.056 kHz	1.45:1	.700 kHz	1.35:1
.063 kHz	1.40:1	.750 kHz	1.35:1
.069 kHz	1.40:1	.800 kHz	1.30:1
.075 kHz	1.35:1	.900 kHz	1.45:1
.081 kHz	1.35:1	1.000 kHz	1.30:1
.088 kHz	1.35:1	1.100 kHz	1.40:1
.094 kHz	1.35:1	1.200 kHz	1.35:1
.100 kHz	1.30:1	1.300 kHz	1.35:1
.113 kHz	1.45:1	1.400 kHz	1.35:1
.125 kHz	1.40:1	1.500 kHz	1.35:1
.138 kHz	1.40:1	1.600 kHz	1.30:1
.150 kHz	1.35:1	1.800 kHz	1.45:1
.163 kHz	1.35:1	2.000 kHz	1.40:1
.175 kHz	1.35:1	2.200 kHz	1.40:1
.188 kHz	1.35:1	2.400 kHz	1.35:1
.200 kHz	1.30:1	2.600 kHz	1.35:1
.225 kHz	1.45:1	2.800 kHz	1.35:1
.250 kHz	1.40:1	3.000 kHz	1.35:1
.275 kHz	1.40:1	3.200 kHz	1.30:1
.300 kHz	1.35:1	3.600 kHz	1.45:1
.325 kHz	1.35:1	4.000 kHz	1.40:1
.350 kHz	1.35:1	4.400 kHz	1.40:1
.375 kHz	1.35:1	4.800 kHz	1.35:1
.400 kHz	1.30:1	5.200 kHz	1.35:1
.450 kHz	1.45:1	5.600 kHz	1.35:1
.500 kHz	1.40:1	6.000 kHz	1.35:1
.550 kHz	1.40:1	6.400 kHz	1.30:1
.600 kHz	1.35:1	7.200 kHz	1.25:1
.650 kHz	1.35:1	8.000 kHz	1.20:1

Signal Monitor Output

Center Frequency .... 455 kHz, nominal
Bandwidth .... 8kHz (-6 dB) minimum
Output Level .... 30 dB above RF Input, nominal
Output Impedance .... 50 ohms, nominal
Connector Type .... BNC female

APPENDIX G

[Reserved for Future Use]

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APPENDIX H

871Y/485 RS-485 INTERFACE OPTION

AND

871Y/MCU MULTI-DROP CONVERTER UNIT OPTION

WJ P/N 181273-001, Revision G

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

June 1999

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LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	G
ii	Proprietary Statement	G
iii	List of Effective Pages	G
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APPENDIX H

871Y/485 AND 871Y/MCU OPTIONS

REVISION RECORD

Revision	Description	Date
A	Initial Issue.	2/94
B	Changed Recommendation of RS-232-to-RS-485 Converter.	5/94
C	Corrected errata associated with DIP switch configuration.	5/95
D	Revised **Figure H-1** to show schematic representation of B&B RS-232-to-RS-485 I/O Converter Box hook-up.	12/94
E	Updated for 797214-1 (A2) Upgrade.	3/95
F	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97
G	Incorporated ECO 039697, adding details for the 871Y/MCU option.	6/99

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871Y/485 AND 871Y/MCU OPTIONS

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APPENDIX H

871Y/485 RS-485 INTERFACE OPTION
AND
871Y/MCU MULTI-DROP CONVERTER UNIT

H.1 INTRODUCTION

This document describes the 871Y/485 RS-485 Interface Option. Details on the 871Y/MCU Multi-Drop Converter Unit option are also provided herein due to its exclusive use with the 871Y/485 option. The associated configuration setup procedures and remote operation instructions are also provided. These options are used on the WJ-8710A, WJ-8711A, WJ-8712A, and WJ-8712P Digital HF Receivers. When the WJ-871Y/485 RS-485 Interface Option is installed, standard remote operations via the CSMA interface are not available.

H.2 ELECTRICAL CHARACTERISTICS

The 871Y/485 RS-485 Interface Option provides the capability of networking several WJ-871Y receivers over an RS-485 interface. It can be used in multipoint applications, where one central computer that is also equipped with the 871Y/MCU option controls many different devices. Up to 32 units can be interconnected over an RS-485 network in a multi-drop interface setup. A computer with a standard RS-232 interface will also require the 871Y/MCU Multi-Drop Converter unit which also acts as an RS-232 to RS-485 converter. This converter connects in-line with the interface cables and requires +12 Vdc for operation. A 120 Vac to 12 Vdc Power Supply Adaptor is provided with the option for this purpose.

H.3 MECHANICAL CHARACTERISTICS

The 871Y/485 RS-485 Interface Option consists of the Type 797214-007 Digital Assembly and associated software installed on EPROMs.

The 871Y/MCU Mutli-Drop Converter Unit option consists of a B&B Electronics Manufacturing Company (6J757) Model 485COR RS-232 to RS-485 Converter and a Model 485PS 120 Vac/12 Vdc Power Supply Adaptor module.

H.4 OVERALL FUNCTIONAL DESCRIPTION

The 871Y/485 RS-485 Interface Option provides the capability of networking several WJ-871Y receivers over a RS-485 interface when used with the 871Y/MCU Multi-Drop Converter unit. See **Figure H-1** for a typical network diagram of RS-485 equipped receivers. The RS-485 standard defines a balanced interface with tristatable drivers. It can be used in multipoint applications where one central computer controls many different devices. Up to 32 units can be interconnected over an RS-485 network. Transmissions can run long distances at speeds as high as 9600 baud. Distance is a function of cable design. For specific allowable distances, consult the RS-485 Standard.

The RS-485 interface is implemented on pins 18 (TX/RXA) and 25 (TX/RXB) of connector A2J3, located on the receiver's rear panel.

H.5 INSTALLATION

The 871Y/485 RS-485 Interface Option is installed in the receiver at the factory when ordered with the receiver.

The B&B Electronics Manufacturing Company (6J757) Model 485COR RS-232 to RS-485 Converter unit (included with the 871Y/MCU option) attaches to the controlling PC's 25-pin RS-232 control port. The DB-25 pin female connector of this converter is its RS-232 port, intended for connection to the PC. The DB-25 pin male connector is its RS-485 port, intended for connection to the receiver via an interface bus using the appropriate serial interface cable. When installing the converter module, tighten its retaining screws to both the PC and the interface cable to ensure a good connection. See **Figure H-1** for a typical network configuration including the converter module.

The RS-232 to RS-485 Converter unit requires +12 Vdc for operation. The 120 Vac/12 Vdc adaptor is provided with the 871Y/MCU option specifically for this purpose. This adaptor plugs into a standard US 2-prong, 120 Vac outlet. A cable with a 2.5 mm plug on one end is used to attach the adaptor to the Converter unit.

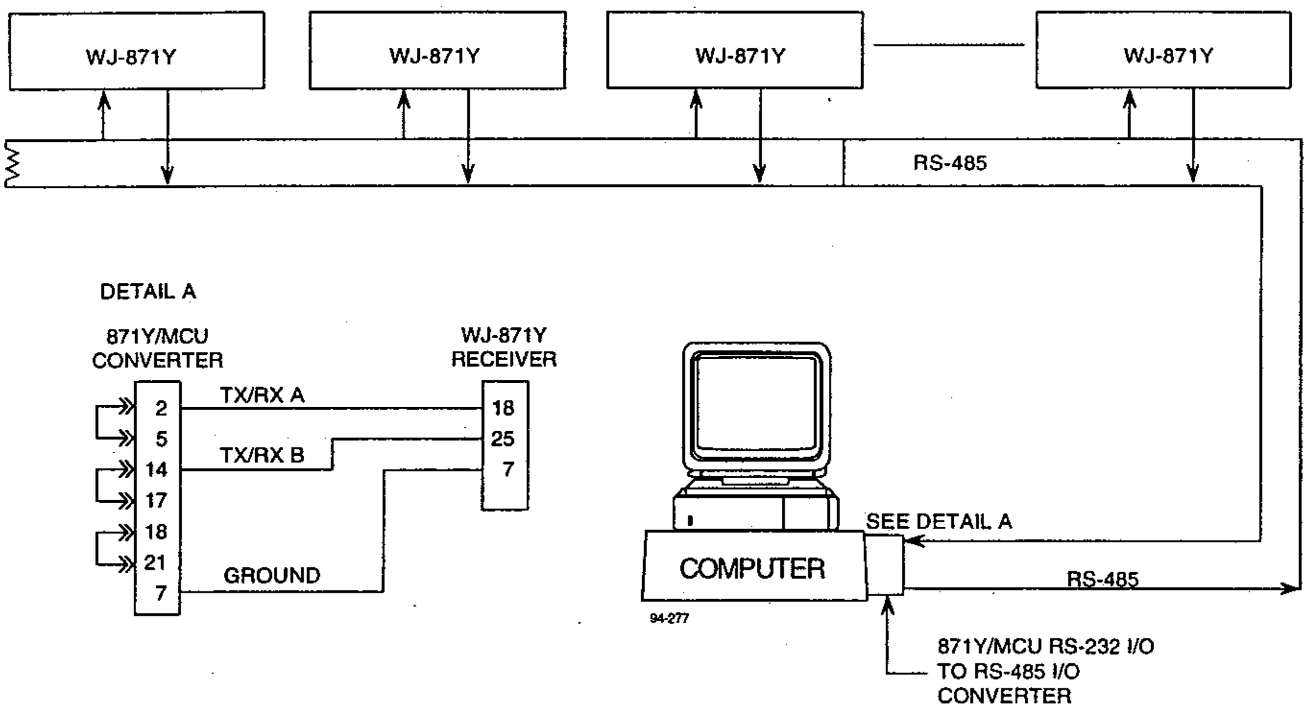


Figure H-1. Typical 871Y/485 Network Configuration

H.6 CONFIGURING THE RECEIVER FOR REMOTE OPERATION

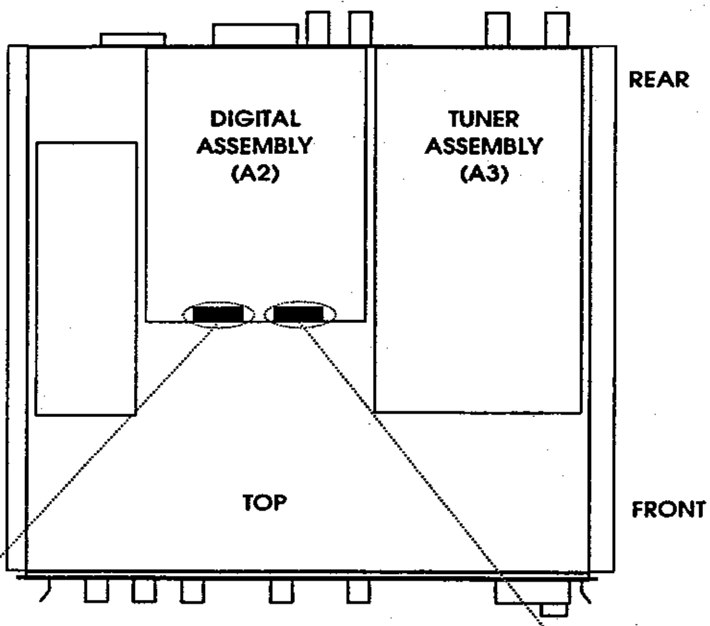
The receiver contains two DIP switches that are used to configure the receiver for remote operation. These switches are mounted on the Digital PC Assembly (A2) and are accessed as noted in **paragraph H.6.1**. The switches are designated A2S1 and A2S2. Each switch contains eight rocker-type switches. The rocker switches are on when they are in the down position and are off when in the up position.

The rocker switches in A2S1 are used to enable either the RS-232C or the RS-485 interface for remote operations, to set the baud rate for the selected interface, and to set the receiver's frame address. Setting switch 4 of A2S1 to off(up) enables the RS-232C interface. Conversely, setting switch 4 to on enables the RS-485 interface.

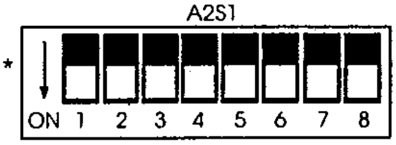
The positions of switches 1, 2, and 3 of A2S1 are used to set the baud rate for remote operations. Selectable baud rates are 75, 150, 300, 600, 1200, 2400, 4800, and 9600 bps. See **Figure H-2** for the proper positions of switches 1, 2, and 3 of A2S1 to select the desired baud rate.

Switches 5 of A2S1 is used to designate the receiver's frame address. When set to on, the frame address is 25 which is reserved for the WJ-8711A receivers. When reset, the frame address is 24, reserved for the WJ-8710A and WJ-8712A and WJ-8712P receiver.

Switches 1 thru 5 of A2S2 are used to set the receiver's address on the RS-485 Network during RS-485 remote operations. Valid addresses are from 00 to 31. See **Figure H-2** for the proper position of switches 1 thru 5 of A2S2 to select the desired RS-485 network receiver address.



A2S1

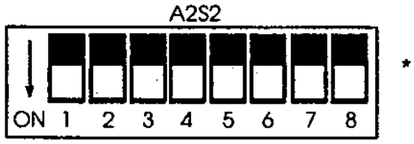


Off (Up) = 0
On (Down) = 1

ROCKER SWITCH:	FUNCTION:
8	Front Panel Select
0	WJ-8710X/WJ-8711X/WJ-8712/WJ-8712A
1	WJ-8712P
6 thru 7	Not Used
5	Frame Address
0	Address 24 (WJ-8710X & WJ-8712X)
1	Address 25 (WJ-8711X)
4	Remote interface Selection
0	RS-232 Interface
1	RS-485 Interface

3 2 1	BAUD RATE (bps)
0 0 0	9600
0 0 1	4800
0 1 0	2400
0 1 1	1200
1 0 0	600
1 0 1	300
1 1 0	150
1 1 1	75

A2S2



ROCKER SWITCH:	FUNCTION:
1 thru 5	RS-485 Address Selection
6 thru 8	Not Used

5 4 3 2 1	Address
0 0 0 0 0	0
0 0 0 0 1	1
0 0 0 1 0	2
0 0 0 1 1	3
0 0 1 0 0	4
0 0 1 0 1	5
0 0 1 1 0	6
0 0 1 1 1	7
0 1 0 0 0	8
0 1 0 0 1	9
0 1 0 1 0	10
0 1 0 1 1	11
0 1 1 0 0	12
0 1 1 0 1	13
0 1 1 1 0	14
0 1 1 1 1	15
1 0 0 0 0	16
1 0 0 0 1	17
1 0 0 1 0	18
1 0 0 1 1	19
1 0 1 0 0	20
1 0 1 0 1	21
1 0 1 1 0	22
1 0 1 1 1	23
1 1 0 0 0	24
1 1 0 0 1	25
1 1 0 1 0	26
1 1 0 1 1	27
1 1 1 0 0	28
1 1 1 0 1	29
1 1 1 1 0	30
1 1 1 1 1	31

* All positions on both switches are shown in the On (down) position.

Figure H-2. Locating and Setting Configuration DIP Switches A2S1 and A2S2 (WJ-8711A)

When determining the switch settings to achieve a specific binary value, a switch in the off (up) position corresponds to a binary 0 while a switch in the on (down) position corresponds to a binary 1.

Figure H-3 gives an example of switches A2S1 and A2S2 set to positions to provide particular configurations. In the example, switch A2S1 is set to provide a frame address of 24 (WJ-8710X and WJ-8712X) and to select RS-485 remote operation with a baud rate of 2400 bps. Switch A2S2 is set to a receiver address of 26.

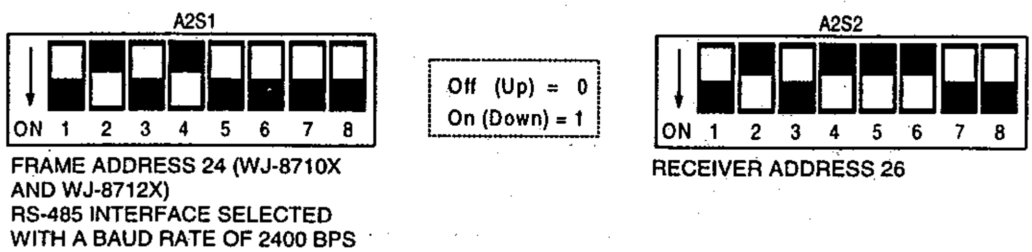


Figure H-3. Examples of Set DIP Switches A2S1 and A2S2

H.6.1 ACCESSING DIP SWITCHES ON THE DIGITAL CONTROL PC ASSEMBLY

H.6.1.1 WJ-8711A Digital HF Receiver

Perform the following procedural steps to gain access to DIP switches A2S1 and A2S2:

a. Turn off the receiver and disconnect the power plug from the rear panel power connector.

b. Remove two pan-head screws from the rear edge of the top panel securing it to the chassis rear apron and two flat-head screws on the forward edge of the top panel.

c. Carefully remove top panel and disconnect the speaker leads.

d. Locate switches S1 and S2 on the A2 assembly (refer to **Figure H-2**).

e. Set the switches for the desired configuration in accordance with **Figure H-2**.

f. Reconnect the speaker leads to the top panel and replace the top panel on the receiver. Secure the top panel with the screws removed in step b.

g. Reconnect power cord to the rear panel power connector.

H.6.1.2 **WJ-8712A and WJ-8712P Digital HF Receiver**

Perform the following procedural steps to gain access to DIP switches A2S1 and A2S2:

a. Turn off the receiver and disconnect the power plug from the rear panel power connector.

b. Remove twelve (12) flat-head screws from the bottom cover and remove the bottom cover.

c. Locate switches S1 and S2 on the A2 assembly (refer to **Figure H-4**).

d. Set the switches S1 and S2 on the A2 assembly (refer to **Figure H-4**).

e. Replace the bottom cover and secure it in place with the twelve (12) screws removed in step b.

f. Reconnect power cord to the rear panel power connector.

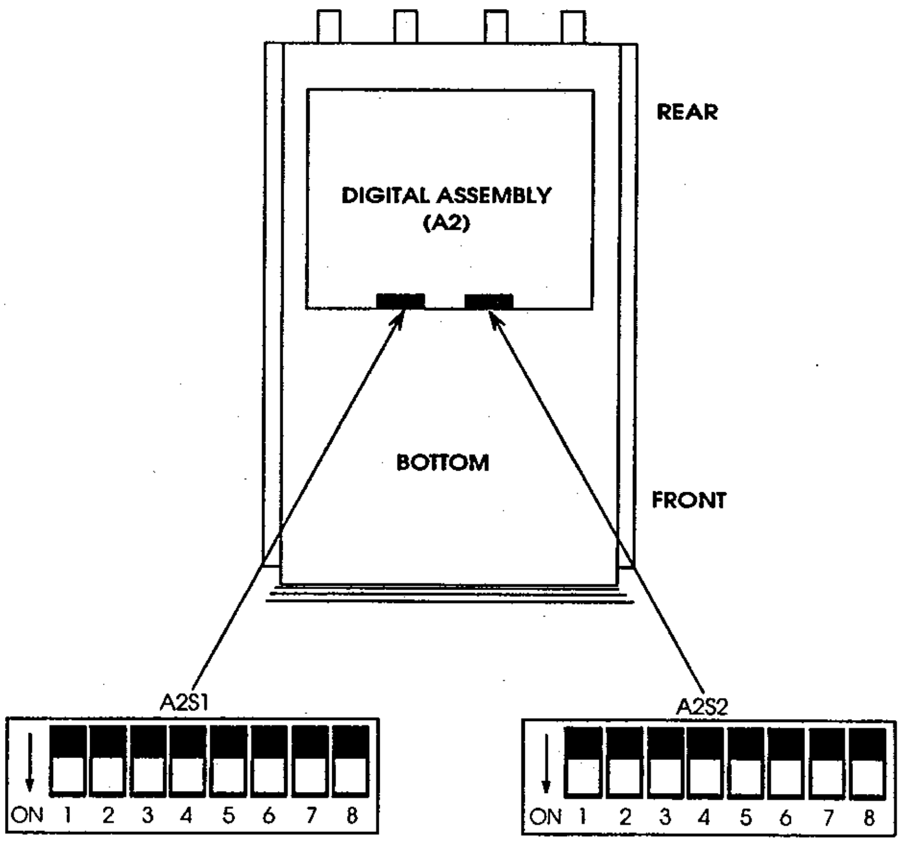


Figure H-4. Location of Switches A2S1 and A2S2 in the WJ-8712A and WJ-8712P

H.6.1.3 WJ-8710A Digital HF Receiver

Perform the following procedural steps to gain access to DIP switches A2S1 and A2S2:

a. Turn off the receiver and disconnect the power plug from the front panel PWR 12 Vdc connector.

b. Remove two black pan-head screws from the lower left and right corners of the front panel.

c. Remove four flat-head screws from the rear panel.

d. Slide the main chassis out of the enclosure.

e. Locate switches S1 and S2 and the A2 assembly (refer to **Figure H-5**).

f. Set the switches S1 and S2 on the A2 assembly (refer to **Figure H-5**).

g. Slide the main chassis back into the enclosure and reinstall the two pan-head screws and four flat-head screws that were removed in steps b and c, respectively.

h. Reconnect the power plug to the front panel PWR 12 Vdc connector.

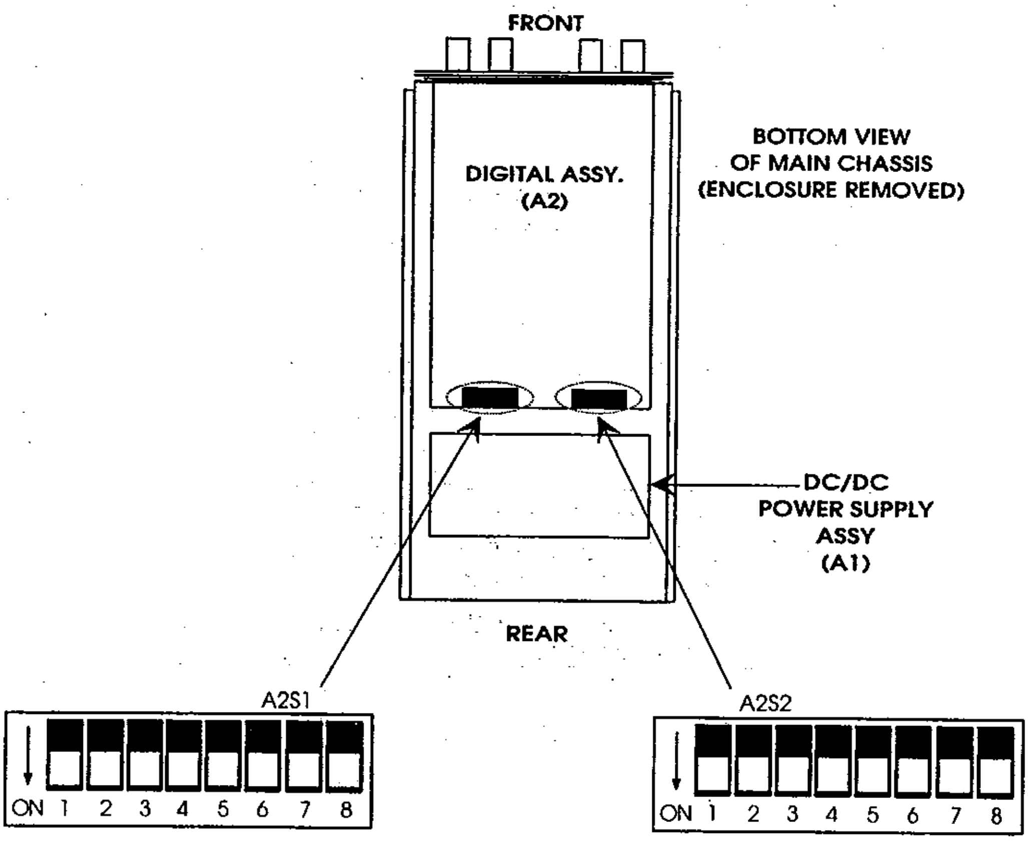


Figure H-5. Location of Switches A2S1 and A2S2 in the WJ-8710A

H.7 REMOTE OPERATION

With the RS-485 Interface Option installed, the WJ-8711A, WJ-8710A, WJ-8712P, or WJ-8712A Digital HF Receiver is controlled remotely by a computer or other controller device equipped with an RS-232C interface connected to the B&B Electronics Model 485COR RS-232 to RS-485 Converter, part of the 871Y/MCU option.

The WJ-8711A can be set for RS-485 remote control by selecting "RS-485" in the remote control entry mode with the front panel SPECIAL FUNCTION key and then selecting the desired receiver address (00-31). Refer to **Section III** of the WJ-8711A Manual for details on using the SPECIAL FUNCTION key. In addition, the WJ-8711A, WJ-8710A, WJ-8712P or WJ-8712A may be set for RS-485 remote operation by setting the DIP switches as described above.

Once the receiver is properly addressed, it continues to accept data until a new frame or receiver address is detected. If no new frame address is issued, the frame address need not be reissued, only the receiver address. **Figure H-6** shows the receiver addressing state transitions.

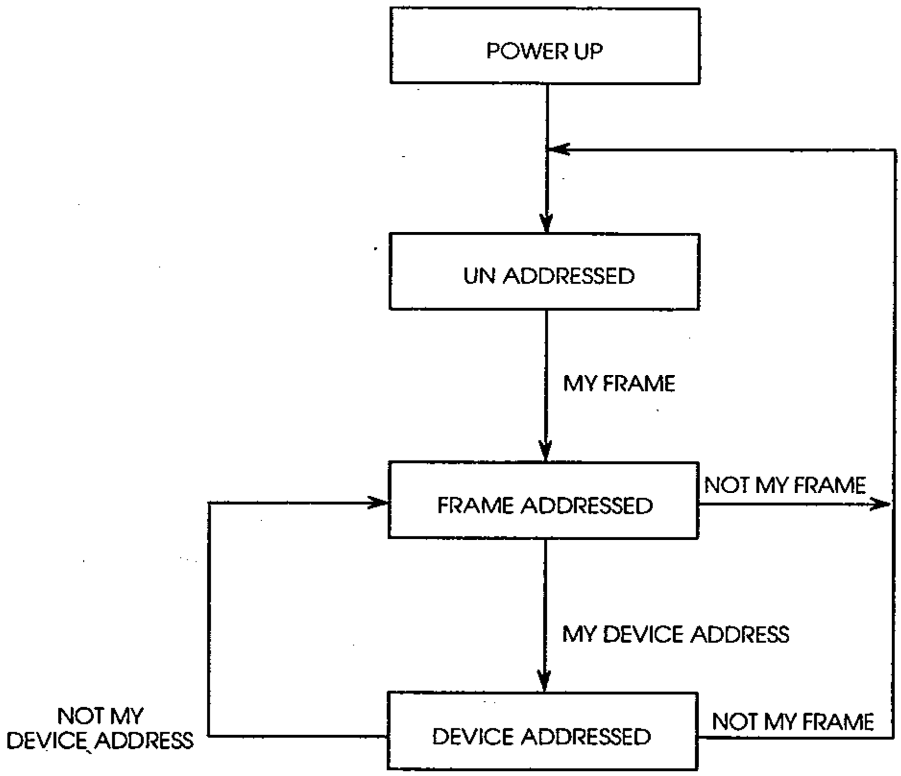


Figure H-6. Receiver Addressing State Transitions

H.7.1 COMMUNICATIONS PROTOCOL

When the LF character is sent to the receiver, it responds to a valid message with an ACK, or to an invalid message with a NAK. An invalid message is indicated on a communications error such as framing, noise, or overrun. The transmission of a NAK indicates that one or more of the bytes received after the last LF had an error. ACK/NAK response is sent only after the receiver has completed processing any previous messages in the input buffer and output any response necessary. **Table H-1** shows the data and command structure for the RS-485. **Table H-2** shows the supported multi-drop communications control commands.

The input buffer is processed on the receipt of a LF character or a CR,LF combination of characters.

Receipt of the DCL (device clear) command causes the receiver to clear both input and output buffers of any data. This command is acted upon as soon as it is received and is not buffered.

Table H-1. RS-485 Data and Command Structure

D0	D1	D2	D3	D4	D5	D6	D7	Command Type
x	x	x	x	x	x	x	0	Data
x	x	x	x	x	0	0	1	Bus Acquisition, Not used in this application
x	x	x	x	x	1	0	1	Not used
x	x	x	x	x	0	1	1	Frame Address
x	x	x	x	x	1	1	1	Receiver Address

Table H-2. Supported Multi-drop Communications Control Commands

HEX	ASCII	RX	TX	Function
06	ACK		x	Acknowledged, data received okay
15	NAK		x	Not Acknowledged, data communications error
0A	LF	x	x	Line Feed, start processing input buffer
0D	CR	x	x	Carriage Return, no action
14	DC4	x		DCL, clear input and output buffers
D9,D8		x		Frame Address group (24, 25)
E0-FF		x		Receiver Address group (00-31)

H.8 UNIT NUMBERING METHOD

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly and discrete components. An example of the unit numbering method used is as follows:

Subassembly Designation A1	R1 Class and No. of item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

H.9 REFERENCE DESIGNATION PREFIX

Partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles in parenthesis).

H.10 LIST OF MANUFACTURERS

The manufacturer listed below is a supply source used for obtaining parts used in the 871Y/MCU option. This manufacturer is not listed in the base manual. All other manufacturers of parts listed in this appendix can be found in the base manual.

Mfr. Code	Name and Address
6J757	B&B Electronics Manufacturing Co. 707 Dayton Road P.O. Box 1040 Ottawa, IL 61350

H.11 PARTS LIST

The following parts lists identify all of the major electrical and mechanical components used in the 871Y/485 RS-485 Interface Option and in the 871Y/MCU Multi-Drop Converter Unit Option. When ordering replacement parts from the Watkins-Johnson Company, specify the unit type, serial number, option configuration, and reference designation and description of the part being ordered. The manufacturer's part number provided in **paragraph H.11.1** and **paragraph H.11.2** are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph H.11.1** and **paragraph H.11.2**, if used, will provide satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In cases where components are defined by a military or industrial specification, a vendor who can provide the necessary component is suggested as a convenience to the user.

NOTE

As improvements in semiconductors are made, it is the policy of Watkins-Johnson to incorporate them in proprietary products. As a result, some transistors, diodes, and integrated circuits that are installed in the unit may not agree with the parts lists or schematic diagrams contained in this manual. Replacing these components with the devices listed in this manual, however, will produce satisfactory results.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
H.11.1	**TYPE 871Y/485 RS-485 INTERFACE OPTION**				
	Revision E				
A2	Digital Control PC Assembly	1	797214-007	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

H.11.1.1 **Type 797214-007 Digital Control PC Assembly** REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
BT1	Not Used				
XBT1	Not Used				
BT2	Not Used				
XBT2	Not Used				
C1	Capacitor, Ceramic, .01µF, 10%	118	841415-019	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, .033µF, 10%	17	841415-022	14632	
C5	Same as C4				
C6	Same as C4				
C7	Same as C4				
C8	Same as C4				
C9	Same as C4				
C10	Same as C4				
C11	Same as C1				
C12	Capacitor, Ceramic, .1µF, 10%, >/=50VDC	8	841250-25	14632	
C13	Same as C1				
C14	Capacitor, Ceramic, 75pF, ~~2%	1	841416-046	14632	
C15	Capacitor, Tantalum, 3.3µF, 20%, 16V	10	841293-10	14632	
C16	Same as C12				
C17	Capacitor, Ceramic, 22pF, 5%	3	841415-003	14632	
C18	Same as C1				
C19	Same as C1				
C20	Capacitor, Ceramic, 100pF, 5%	9	841415-007	14632	
C21	Same as C20				
C22	Same as C20				
C23	Same as C20				
C24	Same as C1				
C25	Capacitor, Electrolytic, Aluminum, 470 F, 16V	1	ECE-A1CU471	54473	
C26	Same as C1				
C27	Capacitor, Ceramic, .047µF, 10%	9	841415-023	14632	
C28	Same as C27				
C29	Same as C1				
C30	Same as C4				
C31	Same as C4				
C32	Same as C1				
C33	Same as C4				
C34	Same as C1				
C35	Same as C15				
C36	Same as C1				
C37	Same as C1				
C38	Same as C12				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C39	Same as C1				
C40	Capacitor, Tantalum, 10μF, 20%, 16V	2	841293-16	14632	
C41	Same as C17				
C42	Same as C17				
C43	Same as C12				
C44	Same as C1				
C45	Same as C12				
C46	Same as C40				
C47	Same as C1				
C48	Same as C12				
C49	Capacitor, Ceramic, 470pF, 5%	8	841415-011	14632	
C50	Same as C49				
C51	Same as C49				
C52	Same as C49				
C53	Same as C49				
C54	Same as C1				
C55	Same as C1				
C56	Capacitor, Ceramic, 1000pF, 10%	4	841415-013	14632	
C57	Capacitor, Ceramic, 47pF, 2%	4	841416-041	14632	
C58	Same as C1				
C59	Same as C1				
C60	Same as C1				
C61	Same as C15				
C62	Same as C15				
C63	Same as C15				
C64	Same as C1				
C65	Same as C1				
C66	Same as C1				
C67	Same as C1				
C68	Same as C1				
C69	Same as C1				
C70	Same as C1				
C71	Same as C15				
C72	Same as C56				
C73	Same as C56				
C74	Same as C49				
C75	Same as C27				
C76	Same as C27				
C77	Capacitor, Ceramic, 1500pF, 10%,	3	841415-014	14632	
C78	Same as C27				
C79	Same as C77				
C80	Same as C77				
C81	Capacitor, Ceramic, 820pF, ~~2%	3	841416-071	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C82	Same as C49				
C83	Same as C1				
C84	Same as C1				
C85	Same as C1				
C86	Same as C49				
C87	Same as C1				
C88	Same as C1				
C89	Same as C1				
C90	Same as C1				
C91	Same as C1				
C92	Same as C1				
C93	Same as C1				
C94	Same as C1				
C95	Same as C1				
C96	Capacitor, Ceramic, 2200pF, 10%	4	841415-015	14632	
C97	Same as C57				
C98	Same as C1				
C99	Same as C1				
C100	Same as C1				
C101	Same as C27				
C102	Same as C1				
C103	Same as C15				
C104	Same as C15				
C105	Same as C4				
C106	Capacitor, Ceramic, 220pF, 5%	1	841415-009	14632	
C107	Same as C1				
C108	Same as C27				
C109	Same as C1				
C110	Same as C1				
C111	Same as C1				
C112	Same as C15				
C113	Capacitor, Ceramic, 330pF, 5%	1	841415-010	14632	
C114	Same as C27				
C115	Same as C57				
C116	Same as C1				
C117	Same as C1				
C118	Same as C96				
C119	Same as C1				
C120	Same as C1				
C121	Same as C15				
C122	Same as C57				
C123	Same as C4				
C124	Same as C96				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C125	Capacitor, Ceramic, 180pF, 2%	1	841416-055	14632	
C126	Capacitor, Ceramic, 470pF, 2%	1	841416-065	14632	
C127	Same as C27				
C128	Capacitor, Ceramic, 68pF, ~~2%	1	841416-045	14632	
C129	Same as C1				
C130	Same as C1				
C131	Not Used				
C132	Same as C1				
C133	Same as C1				
C134	Same as C1				
C135	Not Used				
C136	Same as C1				
C137	Same as C1				
C138	Same as C81				
C139	Same as C1				
C140	Same as C1				
C141	Same as C1				
C142	Not Used				
C143	Same as C1				
C144	Same as C81				
C145	Same as C1				
C146	Same as C1				
C147	Same as C1				
C148	Capacitor, Ceramic, 100pF, 2%	4	841416-049	14632	
C149	Same as C148				
C150	Same as C148				
C151	Same as C148				
C152	Same as C1				
C153	Same as C1				
C154	Same as C1				
C155	Same as C1				
C156	Same as C1				
C157	Same as C1				
C158	Capacitor, Ceramic, 1000pF, 2%	1	841416-073	14632	
C159	Capacitor, Ceramic, 56pF, 2%	1	841416-043	14632	
C160	Same as C1				
C161	Same as C1				
C162	Capacitor, Ceramic, 1200pF, 2%	1	841416-075	14632	
C163	Capacitor, Tantalum, 68µF, 20%, 6.3V	1	841293-24	14632	
C164	Same as C1				
C165	Same as C1				
C166	Same as C1				
C167	Same as C1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C168	Same as C1				
C169	Same as C1				
C170	Same as C1				
C171	Same as C56				
C172	Same as C1				
C173	Same as C1				
C174	Same as C1				
C175	Capacitor, Tantalum, 33µF, 20%, 16V	9	841293-22	14632	
C176	Same as C175				
C177	Same as C96				
C178	Same as C1				
C179	Same as C175				
C180	Capacitor, Tantalum, 6.8µF, 20%, 6.3V	2	841293-14	14632	
C181	Same as C180				
C182	Same as C1				
C183	Not Used				
C184	Same as C1				
C185	Same as C12				
C186	Same as C12				
C187	Same as C1				
C188	Same as C1				
C189	Same as C1				
C190	Not Used				
C191	Same as C1				
C192	Same as C4				
C193	Same as C1				
C194	Same as C1				
C195	Same as C1				
C196	Same as C1				
C197	Same as C1				
C198	Not Used				
C199	Not Used				
C200	Same as C1				
C201	Same as C1				
C202	Same as C175				
C203	Same as C175				
C204	Same as C175				
C205	Same as C1				
C206	Same as C20				
C207	Same as C1				
C208	Same as C1				
C209	Same as C1				
C210	Same as C1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C211	Same as C1				
C212	Same as C1				
C213	Same as C1				
C214	Same as C20				
C215	Same as C20				
C216	Same as C1				
C217	Same as C20				
C218	Same as C1				
C219	Same as C175				
C220	Same as C175				
C221	Same as C175				
C222	Same as C1				
C223	Same as C20				
C224	Same as C1				
C225	Same as C1				
C226	Same as C1				
C227	Same as C1				
C228	Same as C1				
C229	Same as C4				
C230	Same as C1				
C231	Same as C1				
C232	Not Used				
C233	Same as C4				
C234	Not Used				
C235	Same as C1				
C236	Same as C4				
C237	Same as C4				
C238	Not Used				
C239	Not Used				
CR1	Not Used (SOT-23)				
CR2	Diode/Swpin Dual Swithcing Diode Reverse Volltage	2	MMBD7000LT1	04713	
CR3	Not Used				
CR4	Same as CR2				
CR5	Not Used				
FL1	Filter, 455 kHz Precision Ladder Type	1	CFS-455B	51406	
J1	Connector, Jack, BNC BNC Rt Ang , PCB/Panel MT W/SLDR Mt Posts	1	227677-1	00779	
J2	Phone Jack, 3.5 Dia Mini Phone Jack	1	SJ360	53337	
J3	Connector, 25-Pin, D-Sub, RT Ang, PC MT	1	DB25SQFA	05574	
J4	Connector, 24-Pin Term Strip Gold Flash .100CTRS	4	79223-624	22526	
J5	Connector, Header, 6 Pos Pin Friction Lock .156 CTRS	1	26-48-2066	27264	
J6	Not Used				
J7	Same as J4				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
J8	Same as J4				
J9	Same as J4				
J10	Not Used				
J11	Connector, PC,BD 3 Pin SHRD HDR	1	3-102202-4	00779	
J12	Not Used				
J13	Not Used				
J14	Connector, Header,10 Pin, Double Row	1	SLW-105-01-G-D	55322	
J15	Not Used				
J16	Not Used				
JW1	Not Used				
L1	Inductor, 10µH, Surface MT	3	RL-1500-10	14778	
L2	Same as L1				
L3	Same as L1				
L4	Inductor, 1.0µH, ~~20%,@7.96MHZ QMIN-25 370MA Ferrite 1210	9	B82422-A1102-M	25088	
L5	Same as L4				
L6	Same as L4				
L7	Same as L4				
L8	Same as L4				
L9	Same as L4				
L10	Same as L4				
L11	Not Used				
L12	Inductor, 2.2µH	1	841444-009	14632	
L13	Inductor, 4.7µH	1	B82422-A1472-M	25088	
L14	Inductor, 150nH	1	841438-029	14632	
L15	Inductor, 68nH	1	841438-021	14632	
L16	Inductor, 2.7µH	1	841444-011	14632	
L17	Not Used				
L18	Inductor, 1000µH	2	NLF453232-102K	7J069	
L19	Same as L18				
L20	Same as L4				
L21	Same as L4				
L22	Not Used				
L23	Not Used				
Q1	Not Used				
Q2	Transistor	3	MMBT2222ALT1	04713	
Q3	Same as Q2				
Q4	Not Used				
Q5	Not Used				
Q6	Transistor	2	2N7002-LT1	17856	
Q7	Same as Q2				
Q8	Transistor	2	MMBT-3906	04713	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
Q9	Same as Q6				
Q10	Transistor	2	MMBT3904LT1	04713	
Q11	Same as Q8				
Q12	Same as Q10				
R1	Resistor, Fixed, 100kΩ, 5%	110	841414-121	14632	
R2	Resistor, Fixed, 47Ω, 5%	20	841414-041	14632	
R3	Resistor, Fixed, 47kΩ, 5%	7	841414-113	14632	
R4	Same as R3				
R5	Resistor, Fixed, 100Ω, 5%	16	841414-049	14632	
R6	Same as R3				
R7	Resistor, Fixed, 10kΩ, 5%	43	841414-097	14632	
R8	Resistor, Fixed, 4.7kΩ, 5%	7	841414-089	14632	
R9	Resistor, Fixed, 2.2kΩ, 5%	8	841414-081	14632	
R10	Same as R2				
R11	Resistor, Fixed, 820Ω, 5%	1	841414-071	14632	
R12	Resistor, Fixed, 680Ω, 5%	1	841414-069	14632	
R13	Same as R5				
R14	Same as R5				
R15	Not Used				
R16	Not Used				
R17	Not Used				
R18	Resistor, Fixed, 1.0kΩ, 5%	23	841414-073	14632	
R19	Jumper .05 Ω MAX 1A MIN@70C	26	841417	14632	
R20	Same as R19				
R21	Same as R18				
R22	Same as R19				
R23	Not Used				
R24	Same as R18				
R25	Same as R19				
R26	Resistor, Fixed, 1.5kΩ, 5%	5	841414-077	14632	
R27	Same as R19				
R28	Same as R18				
R29	Resistor, Fixed, 2.7Ω, 5%	4	841414-011	14632	
R30	Resistor, Fixed, 22kΩ, 5%	4	841414-105	14632	
R31	Same as R5				
R32	Same as R30				
R33	Same as R5				
R34	Same as R1				
R35	Same as R19				
R36	Resistor, Fixed, 2.7kΩ, 5%	2	841414-083	14632	
R37	Same as R18				
R38	Same as R19				
R39	Same as R7				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R40	Same as R7				
R41	Same as R18				
R42	Same as R7				
R43	Same as R19				
R44	Not Used				
R45	Same as R18				
R46	Same as R36				
R47	Same as R2				
R48	Same as R1				
R49	Same as R1				
R50	Resistor, Fixed, 470Ω, 5%	10	841414-065	14632	
R51	Not Used				
R52	Resistor, Fixed, 75kΩ, 5%	2	841414-118	14632	
R53	Same as R52				
R54	Same as R1				
R55	Resistor, Fixed, 33kΩ, 5%	5	841414-109	14632	
R56	Resistor, Fixed, 220kΩ, 5%	6	841414-129	14632	
R57	Same as R55				
R58	Same as R56				
R59	Resistor, Fixed, 68kΩ, 5%	4	841414-117	14632	
R60	Same as R18				
R61	Same as R1				
R62	Same as R1				
R63	Same as R50				
R64	Same as R1				
R65	Same as R1				
R66	Same as R1				
R67	Same as R2				
R68	Same as R56				
R69	Same as R56				
R70	Same as R2				
R71	Same as R56				
R72	Same as R56				
R73	Same as R2				
R74	Same as R59				
R75	Same as R18				
R76	Same as R1				
R77	Same as R1				
R78	Same as R9				
R79	Same as R1				
R80	Same as R1				
R81	Same as R18				
R82	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R83	Same as R1				
R84	Same as R1				
R85	Not Used				
R86	Same as R1				
R87	Same as R2				
R88	Same as R18				
R89	Same as R9				
R90	Same as R1				
R91	Same as R1				
R92	Same as R1				
R93	Same as R50				
R94	Resistor, Fixed, 18kΩ, 5 %	4	841414-103	14632	
R95	Same as R2				
R96	Same as R94				
R97	Same as R2				
R98	Same as R3				
R99	Same as R3				
R100	Same as R55				
R101	Same as R8				
R102	Same as R1				
R103	Same as R1				
R104	Same as R1				
R105	Not Used				
R106	Same as R9				
R107	Same as R94				
R108	Same as R9				
R109	Same as R94				
R110	Same as R18				
R111	Same as R7				
R112	Resistor, Fixed, 8.2kΩ, 5%	2	841414-095	14632	
R113	Same as R112				
R114	Same as R7				
R115	Same as R1				
R116	Not Used				
R117	Same as R7				
R118	Same as R7				
R119	Same as R7				
R120	Same as R1				
R121	Same as R1				
R122	Same as R1				
R123	Same as R1				
R124	Same as R2				
R125	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R126	Same as R18				
R127	Same as R59				
R128	Same as R7				
R129	Same as R2				
R130	Same as R1				
R131	Same as R1				
R132	Same as R1				
R133	Resistor, Fixed, 150kΩ, 5%	2	841414-125	14632	
R134	Same as R50				
R135	Same as R7				
R136	Same as R26				
R137	Same as R26				
R138	Same as R30				
R139	Same as R2				
R140	Same as R1				
R141	Same as R1				
R142	Same as R18				
R143	Same as R18				
R144	Same as R1				
R145	Same as R18				
R146	Same as R55				
R147	Resistor, Fixed, 150Ω, 5%	1	841414-053	14632	
R148	Resistor, Fixed, 3.3kΩ, 5%	9	841414-085	14632	
R149	Same as R1				
R150	Same as R1				
R151	Resistor, Fixed, 10Ω, 5%	5	841414-025	14632	
R152	Same as R18				
R153	Same as R18				
R154	Same as R133				
R155	Resistor, Fixed, 4.7Ω, 5%	1	841414-017	14632	
R156	Not Used				
R157	Same as R7				
R158	Same as R7				
R159	Same as R7				
R160	Same as R26				
R161	Same as R26				
R162	Same as R30				
R163	Same as R2				
R164	Same as R3				
R165	Same as R1				
R166	Same as R7				
R167	Same as R7				
R168	Same as R18				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R169	Resistor, Fixed, 220Ω, 5%	3	841414-057	14632	
R170	Same as R7				
R171	Same as R1				
R172	Same as R151				
R173	Same as R7				
R174	Same as R7				
R175	Not Used				
R176	Same as R29				
R177	Same as R1				
R178	Same as R7				
R179	Same as R1				
R180	Same as R2				
R181	Not Used				
R182	Not Used				
R183	Same as R2				
R184	Same as R29				
R185	Same as R7				
R186	Same as R19				
R187	Same as R2				
R188	Same as R151				
R189	Not Used				
R190	Same as R29				
R191	Same as R19				
R192	Not Used				
R193	Same as R1				
R194	Same as R1				
R195	Same as R7				
R196	Same as R7				
R197	Same as R148				
R198	Same as R148				
R199	Same as R151				
R200	Same as R18				
R201	Same as R19				
R202	Same as R148				
R203	Same as R148				
R204	Not Used				
R205	Same as R19				
R206	Same as R151				
R207	Same as R1				
R208	Same as R1				
R209	Same as R19				
R210	Same as R1				
R211	Same as R19				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R212	Same as R1				
R213	Not Used				
R214	Same as R19				
R215	Same as R1				
R216	Same as R19				
R217	Resistor, Fixed, 5.6kΩ, 5%	1	841414-091	14632	
R218	Same as R148				
R219	Same as R9				
R220	Same as R5				
R221	Same as R5				
R222	Same as R9				
R223	Same as R7				
R224	Same as R1				
R225	Not Used				
R226	Same as R8				
R227	Same as R3				
R228	Same as R8				
R229	Same as R1				
R230	Same as R1				
R231	Same as R19				
R232	Same as R1				
R233	Same as R1				
R234	Not Used				
R235	Same as R1				
R236	Not Used				
R237	Same as R1				
R238	Not Used				
R239	Same as R1				
R240	Same as R7				
R241	Same as R8				
R242	Same as R8				
R243	Same as R7				
R244	Same as R1				
R245	Same as R7				
R246	Same as R1				
R247	Resistor, Fixed, 1.0 MΩ 5%	4	841414-145	14632	
R248	Same as R2				
R249	Same as R1				
R250	Same as R7				
R251	Same as R7				
R252	Same as R2				
R253	Same as R1				
R254	Same as R1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R255	Same as R7
R256	Same as R1
R257	Same as R1
R258	Same as R1
R259	Same as R1
R260	Same as R1
R261	Same as R1
R262	Not Used
R263	Not Used
R264	Not Used
R265	Same as R5
R266	Same as R1
R267	Same as R1
R268	Same as R1
R269	Not Used
R270	Same as R7
R271	Same as R19
R272	Same as R1
R273	Same as R7
R274	Same as R7
R275	Same as R1
R276	Same as R1
R277	Same as R1
R278	Same as R7
R279	Not Used
R280	Same as R19
R281	Same as R1
R282	Same as R1
R283	Same as R7
R284	Not Used
R285	Not Used
R286	Same as R247
R287	Not Used
R288	Same as R1
R289	Same as R19
R290	Same as R1
R291	Not Used
R292	Same as R1
R293	Same as R19
R294	Same as R19
R295	Not Used
R296	Same as R19
R297	Same as R55

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R298	Same as R7				
R299	Not Used				
R300	Not Used				
R301	Same as R19				
R302	Same as R5				
R303	Same as R7				
R304	Same as R1				
R305	Same as R1				
R306	Same as R18				
R307	Same as R59				
R308	Same as R7				
R309	Not Used				
R310	Same as R7				
R311	Same as R7				
R312	Same as R1				
R313	Same as R1				
R314	Same as R5				
R315	Same as R7				
R316	Same as R5				
R317	Same as R1				
R318	Same as R5				
R319	Same as R1				
R320	Same as R50				
R321	Same as R1				
R322	Same as R1				
R323	Same as R18				
R324	Same as R5				
R325	Same as R1				
R326	Same as R1				
R327	Same as R18				
R328	Same as R7				
R329	Same as R1				
R330	Same as R9				
R331	Same as R1				
R332	Same as R1				
R333	Resistor, Fixed, 6.8 kΩ, 5%	2	841414-093	14632	
R334	Same as R8				
R335	Not Used				
R336	Same as R1				
R337	Same as R333				
R338	Same as R148				
R339	Same as R148				
R340	Resistor, Fixed, 68Ω, 5%	2	841414-045	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R341	Same as R247				
R342	Same as R247				
R343	Same as R2				
R344	Same as R1				
R345	Same as R1				
R346	Same as R1				
R347	Same as R1				
R348	Same as R1				
R349	Same as R1				
R350	Same as R1				
R351	Same as R1				
R352	Same as R1				
R353	Same as R1				
R354	Same as R1				
R355	Same as R1				
R356	Same as R1				
R357	Same as R1				
R358	Same as R1				
R359	Same as R1				
R360	Same as R7				
R361	Same as R340				
R362	Not Used				
R363	Same as R19				
R364	Not Used				
R365	Not Used				
R366	Same as R50				
R367	Same as R5				
R368	Same as R5				
R369	Same as R5				
R370	Same as R50				
R371	Same as R50				
R372	Same as R169				
R373	Same as R50				
R374	Same as R50				
R375	Same as R169				
R376	Same as R19				
R377	Same as R148				
R378	Same as R2				
R379	Not Used				
S1	Switch/Dip SPST Side Actuated Dip	2	ADP-08S	95146	
S2	Same as S1				
T1	Transformer CPLG Audio 600CT/500CT IMP=10%,	2	SPT-130	20462	
T2	Same as T1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

U1	Integrated Circuit, Microcontroller,Microcontroller Unit 16-BIT Timer 8 Channel 8-BIT	1	MC68GC11A0FN	04713	
XU1	Socket 52-POS PLCC .050CTRS 1.050 X .20HT Polarized Surf	1	213-052-601	26742	
U2	Integrated Circuit,TRI-State Octal D-Type Latch SOL-20 Wide Pkg	1	74HC373SOL20	02735	
U3	Integrated Circuit,Octal TRI-State B!uffer, SOL-20 Wide Pkg	4	74HC244 SOL20	04713	
U4	Integrated Circuit,Quad 2-Input NAND Gate S0-14N	1	74HC00 SO14	02735	
U5	Integrated Circuit, RAM,8K X 8 Nonvolatile Time Keeping RAM 120NS=AT 28-Pin	1	DS1643-120	0B0A9	
XU5	Socket, IC 28 Pin .600 Row Spacing On .100 CTRS Gold Contact	2	O-628-SGT	S5322	
U6	Integrated Circuit, CMOS,Triple Three Input OR Gate SO-14 PLSTC PKG	1	74HC4075 SO14	02735	
U7	Integrated Circuit,TRIPLE 3-Input NOR Gates	1	74HC27 SO14	02735	
U8	Integrated Circuit,3-TO-8 Line Decoder	1	74HC138 SO16	02735	
U9	Integrated Circuit, CMOS,Quad Buffer/Line Driver	2	74HC125 SO14	34371	
U10	Integrated Circuit,Triple 3-Input AND Gate	1	74F11 SO14	04713	
U11	Integrated Circuit,1-OF-8 Decoder/Demultiplexer	1	74F138 SO16	04713	
U12	EPROMProgrammed	1	842032	14632	
XU12	socket, IC 32-PIN LOW PROFILE DIP Socket .600 Row Slpace Gold	1	O-632-SGT	S532	
U13	Integrated Circuit,16-BIT A/D Converter 20-Pin PLSTC DIP	1	DSP56ADC16S	04713	
U14	Same as U3				
U15	Integrated Circuit,Octal D Flip-Flops With Clear SOL-20 Wide Pkg	1	74HC273 SOL20		
U16	Same as U9				
U17	Same as U3				
U18	Not Used				
U19	Same as U3				
U20	Integrated Circuit,Line Driver and Receiver Monolithic 8 Pin PKS	2	SN75155D	01295	
U21	Integrated Circuit, CMOS,Hex Inverters Active Outputs	3	74AC04 SO14	04713	
U22	Amplifier Ultra-High Frequency Op. Amp Gain Bandwidth 1.	1	NE5539D	18324	
U23	Integrated Circuit,Dual D Flip-Flop With Preset and Clear	3	74HC74 SO14	04713	
U24	Integrated Circuit, CMOS,14-Stage Binary Ripple Counter	2	74HC4020 SO16	34371	
U25	Integrated Circuit, CMOS,Parallel-In/Serial-OUT 8-BIT Shift Register SO-1	1	74HC165 SO16	02735	
U26	Integrated Circuit, /INV Hex Inverter	1	74HC04 SO14	04713	
U27	Integrated Circuit,SYN Presettable Binary Counter	2	74AC161 SO16	34371	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U28	Same as U27				
U29	Same as U23				
U30	Integrated Circuit,Synchronous Binary Counter with Asynchronous Clear SO	1	74HC161 SO16	02735	
U31	Same as U23				
U32	Same as U21				
U33	Integrated Circuit, CMOS,Dual D Flip-Flop With PRESET AND CLEAR	1	74AC74CO14	02735	
U34	Voltage Regulator3 TERM NEG Volt Regulator -5V	1	MC79M05CDT	04713	
U35	Same as U24				
U36	Same as U21				
U37	Integrated Circuit,40 MHZ DSP Microprocessor with PLL 24-BIT 132-PIN PQF	1	DSP56002FC40	04713	
U38	Same as U20				
U39	Integrated Circuit, /SRAMCMOS,32K X 8 20NS Access Time 28PIN SOJ	6	MT5C2568DJ-20	6Y440	
U40	Same as U39				
U41	Same as U39				
U42	Integrated Circuit, /Sensing Undervoltage Sensing Rest Operation W/1V Input	1	MC34064D-5	04713	
U43	Not Used				
U44	Integrated Circuit, Differential Bus Transceiver	2	SN75176AD	01295	
U45	Same as U39				
U46	Same as U39				
U47	Same as U39				
U48	Integrated Circuit, Octal D Flip-Flop with RESET SOL-20 PKG	2	74HCT273 SOL20	02735	
U49	Integrated Circuit, Dual D Flip-Flop with SET and RESET	1	74HCT74 SO14	34371	
U50	Same as U48				
U51	Integrated Circuit, /CONV D/A Monolithic 8-BIT HS Current Output	2	DAC0800LCM	27014	
U52	Amplifier JFET-Input Dual OP AMP	7	MC34002D	04713	
U53	Integrated Circuit, Quad 2-Input AND Gate	1	74HC08 SO14	02735	
U54	Same as U52				
U55	Same as U51				
U56	EPROM Programmed	1	842033	14632	
XU56	Same as XU5				
U57	Same as U44				
U58	Integrated Circuit, Dual 1-OF-4 Decoder/Demultiplexer	1	74F139 SO16	04713	
U59	Integrated Circuit, /CONV D/A 16 Bit Audio D/A Converter	1	AD1851R	24355	
U60	Integrated Circuit, CMOS,Triple 2-Channel Analog Multiplexer/Demultiplexer	3	74HC4053 SO16	02735	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX **A2**

U61	Same as U52				
U62	Same as U60				
U63	Same as U52				
U64	Same as U52				
U65	Amplifier Single Low Noise OP AMP SO 8 PIN	3	NE5534D	18324	
U66	Same as U65				
U67	Integrated Circuit, Dynamic Range Processor Dual VCA 16-Pin DIP	1	SSM-2122P	06665	
U68	Same as U60				
U69	Amplifier JFET-Input Operational Amplifier	2	MC34001D	04713	
U70	Same as U69				
U71	Same as U52				
U72	Integrated Circuit, /AMP 1.5W Audio Power AMP 14-PIN DIP	1	LM388n-1	27014	
U73	Not Used				
U74	Same as U52				
U75	Same as U65				
VR1	Not Used				
XTB1	Connector, Header,13-POS Shrouded PC MT	1	ELFH13210	58982	
Y1	Not Used				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

H.11.2 TYPE 871Y/MCU MULTI-DROP CONVERTER UNIT OPTION

Revision B

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
1	Converter Unit, RS-232 to RS-485, 2-Channel	1	485COR	6J757	
2	Adaptor, Power Supply, 120 Vac/12 Vdc, 100 mA	1	485PS	6J757	

APPENDIX I

TYPE WJ-871Y/SEU SPEECH ENHANCEMENT UNIT

WJ P/N 181274-001, Revision D

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

September 1997

WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

PROPRIETARY STATEMENT

LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	D
ii	Proprietary Statement	D
iii	List of Effective Pages	D
iv	Intentionally Blank	D
v	Revision Record	D
vi	Intentionally Blank	D
vii thru viii	Table of Contents	D
I-1 thru I-8	Appendix I	C

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WJ-871Y/SEU SPEECH ENHANCEMENT UNIT

REVISION RECORD

Revision	Description	Date
A	Initial issue.	1/95
B	Updated for 797214-1 (A2) Upgrade.	4/95
C	Corrected edratta. Mnemonic for WBN added to **Table I-1**. Information about mutual exclusivity of options also updated.	3/95
D	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97

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WJ-871Y/SEU SPEECH ENHANCEMENT UNIT

LIST OF TABLES

LIST OF ILLUSTRATIONS

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APPENDIX I

WJ-871Y/SEU SPEECH ENHANCEMENT UNIT

I.1 GENERAL DESCRIPTION

The WJ-871Y/SEU Speech Enhancement Unit option uses adaptive filtering techniques to provide enhancement of audio signals that are received from signals in the HF frequency band. The option utilizes these filter techniques to accomplish wideband noise reduction and automatic notch filtering of the audio signals. The adaptive filters analyze the correlation, or constancy, of the signal and modify the audio response to attenuate highly correlated steady tone interference or uncorrelated broad band noise. Use of these features permits an operator to attenuate the effects of the interference, providing a more intelligible output. Selection and control of the Adaptive Notch Filter and Wideband Noise Reduction can be performed from the front panel or via the remote interface.

I.2 MECHANICAL DESCRIPTION

The WJ-871Y/SEU Speech Enhancement Unit option may be field installed in units equipped with software versions 4.01.02 or greater, having a Type 797012 Digital Control Assembly (A2) with a dash 3 or greater type number suffix. The option may also be installed in units that have a Type 797214-1 Digital Control Assembly (A2) installed. It functions with any option configuration except for configurations containing the WJ-871Y/PCSM, WJ-871Y/488, WJ-871Y/IFC125, or WJ-871Y/DSO1 options.

When used with the Type 797012 Digital Control Assembly the option consists of the Type 797201-4 Digital Expansion Assembly, five standoffs for mounting the assembly, a DSP EPROM and a Control EPROM containing the control and Digital Signal Processing software for the option. The Control and DSP EPROMs install in place of the existing Control (U12) and DSP (U56) EPROMs, located on the Type 797012 Digital Control Assembly. When used with the Type 797214 Digital Control Assembly the two EPROMS are not required as they are already installed in the Type 797214 Digital Controll Assembly.

The Type 797201-4 Digital Expansion Assembly is a daughterboard that mounts to either of the Digital Control Assemblies using the five mounting standoffs supplied with the option. Electrical interface between the Digital Control Assembly and the Digital Expansion Assembly is through two on-board multipin connectors that plug into the J8 and J9 connectors of the Digital Control Assembly. No additional cabling or hardware configuration is required.

I.3 FIELD INSTALLATION PROCEDURE WHEN USED WITH TYPE 797012 DIGITAL CONTROL ASSEMBLY

Installation of the WJ-871Y/SEU Speech Enhancement Unit consists of upgrading of the Type 797012 Control and DSP software, and installation of the Type 797201-4 Digital Expansion Assembly daughterboard onto the receiver's Digital assembly. All of the necessary installation hardware is included with the option. The installation procedure is detailed in the following steps.

1. Remove the top cover from the receiver to gain access to the receiver's Type 797012 Digital assembly.

2. Remove EPROMs U12 and U56 from their sockets on the Digital Assembly. Refer to **Figure I-1** for the locations of these components on the assembly.

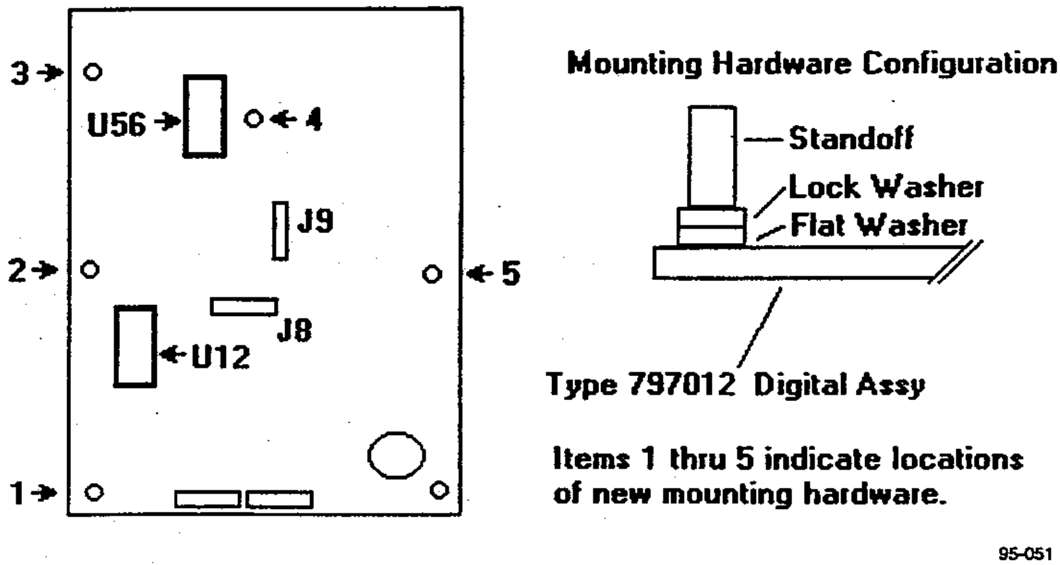

Figure I-1. Type 797012 Installation Component Illustration

3. From the components supplied, locate EPROMs U12 (842032) and U56 (842033) and install these components into their respective EPROM sockets.

4. Remove five of the six mounting screws and their associated washers from the Digital Assembly, identified as items 1 through 5 in **Figure I-1**.

5. At each mounting location install one standoff, one flat washer, and one lock washer. Refer to the Mounting Hardware Configuration in **Figure I-1** for the orientation of these parts.

6. Orient the SEU Digital Expansion Assembly as illustrated in **Figure I-2**, with the component side facing down and J5 pointing toward the rear of the receiver. Carefully connect sockets J1 and J2 with J8 and J9 on the Type 797012 Digital Assembly. Using slight pressure, seat the SEU Digital Expansion Assembly into place.

7. At each of the five mounting holes on the SEU Digital Expansion Assembly, install one mounting screw, one flat washer and one lock washer. Refer to the mounting hardware configuration in **Figure I-2** for the orientation of these parts.

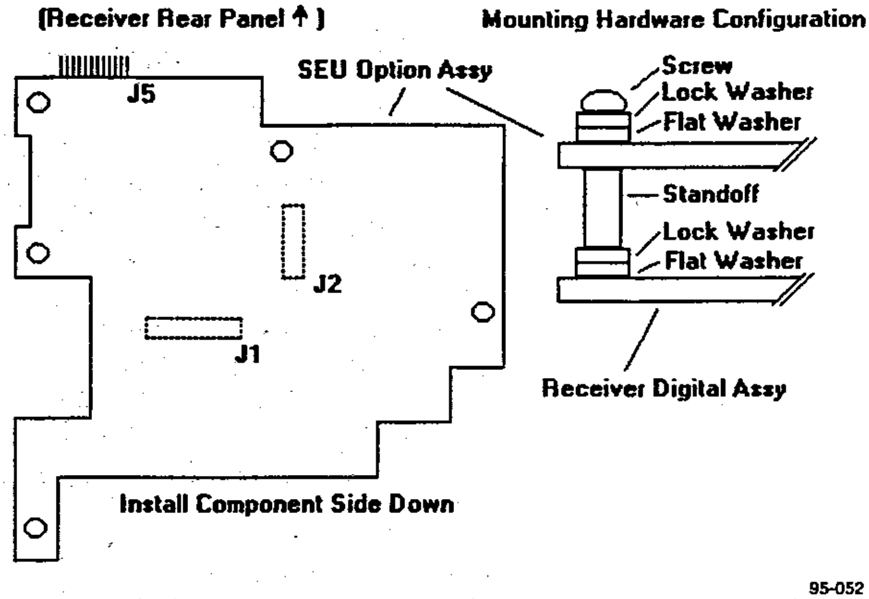

Figure I-2. SEU Digital Expansion Assembly Hardware Illustration

I.4 FIELD INSTALLATION PROCEDURES WHEN USED WITH TYPE 797214 DIGITAL CONTROL ASSEMBLY

The procedures for installtion of the WJ-871Y/SEU option when used with the Type 797214 Digital Control Assembly are identical to the instructions contained in **paragraph I.3** above except that the EPROMS are not required, as the correct EPROMS are already installed in the Type 797214 Digital Control Assembly.

I.5 OPERATION

The WJ-871Y/SEU option provides enhancement to the audio present at all audio outputs of the receiver. It may be activated with AM, FM, SAM, CW, SB, or USB demodulation. It is not recommended for use with CW signals and is inhibited in the ISB detection mode. Activation and control of the speech enhancement features may be performed locally at the front panel, or remotely via the remote interface.

I.5.1 LOCAL OPERATION

Local selection of the features of the WJ-871Y/SEU Speech Enhancement Option are made using the BLANKER key and the Auxiliary Parameter edit knob on the receiver front panel. When the option is installed, the BLANKER key becomes a three-function selection key, permitting control of the Noise Blanker, the Adaptive Notch Filter, and the Wideband Noise Reduction. The Auxiliary Parameter Edit knob sets the magnitude of control over the selected function. The control operation is illustrated in **Table I-1**.

Table I-1. WJ-871Y/SEU Speech Enhancement Unit Operating Modes

Blanker	Function	Auxiliary Parameter Edit Knob
1st Press	Noise Blanker	Edit knob rotation selects the degree of noise reduction. The display directly above the Blanker key displays a number from 1 to 10, or "--", indicating noise reduction setting. The higher the displayed number, the lower the blanking threshold. A setting of "--" indicates the blanker is disabled.
2nd Press	Adaptive Notch Filter	The Edit knob rotation activates and sets the amount of attenuation provided by the Adaptive Notch Filter. The display directly above the Blanker key displays the alpha-numeric characters A0 to A7, indicating the degree of attenuation provided by the notch filter to constant tone interfering signals. The higher the number, the greater the filter effect. A setting of A0 disables the adaptive filter.
3rd Press	Wideband Noise Reduction	The Edit knob activates and sets the magnitude of the effect provided by the Wideband Noise Reduction filter. The display directly above the Blanker key displays the alpha-numeric characters W0 to W3, indicating the degree of noise filtering provided. The higher the number, the greater the filter effect. A setting of W0 disables Wideband Noise Reduction.

The Adaptive Notch Filter and Wideband Noise Reduction can be used separately or simultaneously. Once activated, the function remains active until it is disabled by setting its parameter to 0 (A0/W0), or by cycling the receiver's power off and back on. The amount of filtering that is required is determined by listening to the audio, and adjusting the setting to obtain the best audio response. Use of the Adaptive Notch Filter with CW signals should be avoided as this highly correlated signal will be attenuated along with undesired tones.

I.5.2 REMOTE OPERATION

The commands listed in **Table I-2** are used for activating and setting of the Adaptive Notch Filter and Wideband Noise Reduction. In addition, the OPT? query has been modified to add the Speech Enhancements option to the list of available options.

Table I-2. WJ-871Y/SEU Speech Enhancement Unit Remote Commands

Command	Response	Description
ADN *nrf*		Selects the Adaptive Notch Filter and sets the degree of filtering provided. Range: 0-7, 0=Off
ADN?	ADN *nr1*	Requests the Adaptive Notch Filter setting. Range: 0-7, 0=Off Default: ADN 0, Off Reset: ADN 0, Off Example: ADN 1, Feature enabled with minimum filter effect.
WBN nr1		Selects Wideband Noise Reduction and sets the degree of noise filtering. Range: 0-3, 0=Off
WBN?	WBN *nr1*	Requests the Wideband Noise Reduction Setting. Range: 0-3, 0=Off Default: WBN 0, Off Reset: WBN 0, Off Example: WBN 3, Feature enabled with maximum filter effect.

Table I-2. WJ-871Y/SEU Speech Enhancement Unit Remote Commands (Continued)

Command	Response	Description
*OPT?	*OPT *nrf*, *nrf*	Requests a list of the options installed in the receiver. Two bytes are returned, with the bit setting reflecting available options. A bit set to logic "1" indicates that the option is installed. <u>Byte 1</u>: Bit 0 - Preselector Bit 1 - Extended IF BWs Bit 2 - Tuned Carrier Bit 3 - Variable Line Audio Bit 4 - Notch Filter Bit 5 - AGC/Detection Mode Match Bit 6 - Zero Digit Tuning Bit 7 - Synchronous AM <u>Byte 2</u>: Bit 0 - AGC Enhancements **Bit 1 - Speech Enhancement** Bit 2-7 - Reserved, set to 0

I.6 OPERATOR TIPS

This section contains a number of operator tips and suggestions that will provide the most effective performance of the WJ-871Y/SEU option. It is suggested that this section be reviewed before using the features of this option.

- When copying CW signals, the Adaptive Notch Filter should not be engaged, as it will attenuate the desired signal along with interfering tones. In this situation, it is recommended that the Passband Tuning and Tunable Notch Filter functions be used to block interfering tones. Refer to the Local Operation section of the receiver manual for details on these functions.

- In situations where multiple interfering tones are present, it is recommended that the Tunable Notch Filter feature be used first to attenuate the strongest interfering signal. The Adaptive Filter should then be activated to attenuate the remaining tones. This will provide better attenuation performance on the remaining tones.

- Due to limitations in the computational capabilities of this option, the effectiveness of the Adaptive Notch Filter and Wideband Noise Reduction is decreased when the features are used simultaneously. To obtain the highest level of performance it is recommended that only one of these features be activated at a time. For example, a signal with multiple interfering tones and static hiss would be best satisfied by selecting a narrower IF bandwidth and then activating the Adaptive Notch Filter. This provides more effective performance than enabling both the Adaptive Notch Filter and Wideband Noise Reduction with a wide IF bandwidth selected.

- Some signals may cause the Speech Enhancement Option performance to fail. This condition results in a sudden muting of the receiver audio. If this condition occurs, the setting of the enabled feature should be decreased until the audio is restored.

I.7 PARTS LIST

The following parts list contains all operational components used in the Speech Enhancement Option, along with mechanical parts and EPROMS that are required for installation.

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

I.7.1 WJ-871Y/SEU SPEECH ENHANCEMENT OPT — REF DESIG PREFIX SEU

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision X1				
A1	Digital Expansion Assy/SEU Option	1	797201-4	14632	
A2U12	EPROM, Programmed, Control*	1	842032	14632	
A2U56	EPROM, Programmed, DSP*	1	842033	14632	
	Spacer, .187 x .52, 4-40 Stud	5	283051-2	14632	
	Washer, Flat, No. 4	10	MS15795-803	96906	
	Washer, Lock, No. 4	10	MS35338-135	96906	
	Screw,Machine, 2-56 x 5/16	5	MS51957-4	96906	

*A2U12 and A2U56 are not required when the WJ-871Y-SEU Option is used with the Type 797214 Digital Control Assembly

WJ-871Y/IFC125 12.5 kHz IF OUTPUT OPTION

APPENDIX J

WJ P/N 181275-001, Revision B

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

September 1997

PROPRIETARY STATEMENT

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LIST OF EFFECTIVE PAGES

Page Number	Description	Revision
i	Cover	B
ii	Proprietary Statement	B
iii	List of Effective Pages	B
iv	Intentionally Blank	B
v	Revision Record	B
vi	Intentionally Blank	B
vii thru viii	Table of Contents	B
J-1 thru J-22	Appendix J	A
J-23 (J-24 blank)	Schematic	A
J-25 (J-26 blank)	Schematic	A
J-27 (J-28 blank)	Schematic	A
J-29 (J-30 blank)	Schematic	A

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WJ-8711A DIGITAL HF RECEIVER

REVISION RECORD

Revision	Description	Date
A	Initial issue.	12/95
B	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97

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WJ-871Y/IFC125 12.5 kHz IF OPTION

APPENDIX J

LIST OF ILLUSTRATIONS

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WJ-871Y/IFC125 12.5 kHz IF OPTION

APPENDIX J

J.1 ELECTRICAL CHARACTERISTICS

The WJ-871Y/IFC125 12.5 kHz IF Option provides a post-filtered IF output on the rear panel of the WJ-871Y receiver at A2J1. The output center frequency is 12.5 kHz with a bandwidth equal to the operator-selected IF Bandwidth. The minimum output level is -20 dBm (20mV) into a 50 ohm load. Note that when the WJ-871Y/IFC125 option is installed, the WJ-871Y/DSO1, /488, /SCU, /SEU, /PCSM, and PCSM2 options are not available.

J.2 INSTALLATION

The WJ-871Y/IFC 12.5 kHz IF Option requires the modification of the Type 797214-X Digital Control PC Assembly (A2). The modified version is a Type 797214-5 Digital Control PC Assembly(A2). The modified A2 assembly contains the following modifications:

- FL1 and C130 are removed.
- R11, C16, C106, C122, and C129 have new values.
- A new DSP EPROM is installed as U56.
- A jumper wire is installed instead of FL1.
- A jumper wire is installed from U32 pin 13 to U32 pin 14.
- The A2 assembly has "797214-5" stamped on the outer housing for identification.

Install the new WJ-871Y/IFC125 12.5 kHz IF Option according to the removal and installation procedures for the A2 assembly outlined in the base manual.

Affix the new label, "IF TAPE" over the "IF OUT" label on the rear panel and add the "12.5K Filter" marking to the nameplate.

J.3 FUNCTIONAL DESCRIPTION

Refer to **Figure J-1**. The Reconstructed Analog section receives the Digitized IF and audio data from the Digital Signal Processing section and converts the signals back to analog form for output. In addition to the serial data, the Digital Signal Processing section provides frame synchronization and serial data clock signals for timing of the data transfer. These timing signals permit the Reconstructed Analog section to demultiplex the signals into separate IF and audio signals. The multiplexed analog IF and audio signals pass to the IF/Audio Demultiplex and Filtering section where the reconstructed IF signal is converted to a 12.5 kHz IF signal and is passed through the IF Baseband Filter to rear panel connector A2J1.

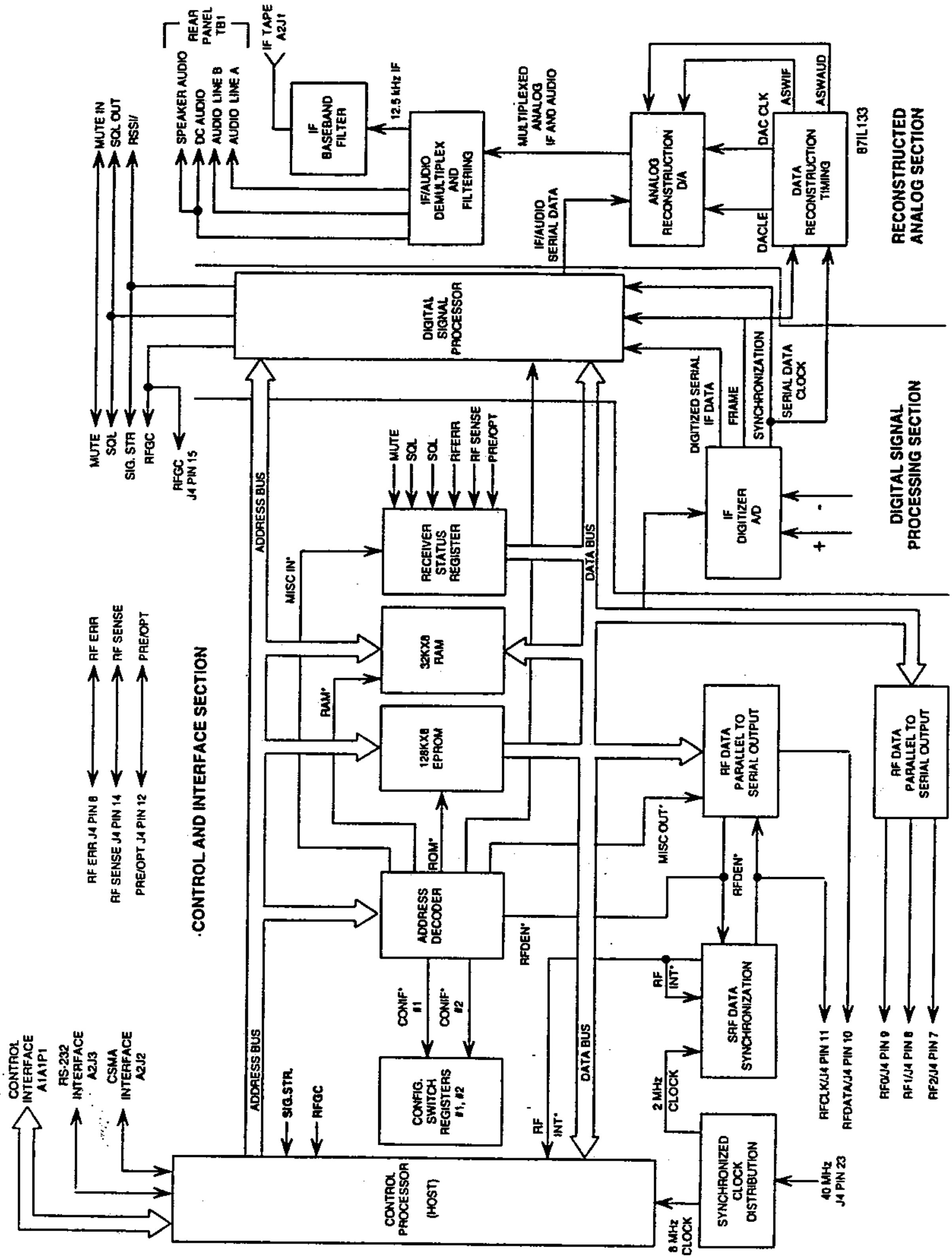


Figure J-1. Type 797214-5 Digital Assembly Functional Block Diagram

J.4 LIST OF MANUFACTURERS

The manufacturers listed below are supply sources used for obtaining certain parts in this option and may not be in the base manual. All other manufacturers not listed below are found in the base manual.

Mfr. Code	Name and Address	Mfr. Code	Name and Address
05574	Viking Electronics Inc. 21001 Nordhoff St. P.O. Box 2379 Chatsworth, CA 91311-5987	1Z447	RCA Corp. Solid State Div. 2872 Woodcock Blvd., Suite 304 Atlanta, GA 30341-4002
53337	RDI/REED Devices, Inc. 525 Randy Road Carol Stream, IL 60188		

J.5 PARTS LIST

The following parts list contains all the electrical components used in the unit, along with mechanical parts that may be subject to unusual wear or damage. When ordering replacement parts from the Watkins-Johnson Company, specify the unit type, the serial number, and the operation configuration. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in **paragraph J.4**, and the manufacturer's part numbers, provided in **paragraph J.5.1**, are supplied as a guide to aid the user of the equipment while in the field. The parts list may not necessarily be identical with the parts installed in the unit. The parts list in **paragraph J.5.1** will provide for satisfactory operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement are compatible with the original part. In the case where components are identified by a military or industrial specification, a vendor that can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semiconductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semiconductors designated in the manual substitute in every case with satisfactory results.

J.5.1 TYPE 797214-5 DIGITAL CONTROL PC ASSEMBLY REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
BT1	Not Used				
XBT1	Not Used				
BT2	Not Used				
XBT2	Not Used				
C1	Capacitor, Ceramic, .01µF, 10%	118	841415-019	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, .033µF, 10%	17	841415-022	14632	
C5	Same as C4				
C6	Same as C4				
C7	Same as C4				
C8	Same as C4				
C9	Same as C4				
C10	Same as C4				
C11	Same as C1				
C12	Capacitor, Ceramic, .1µF, 10%, >/=50VDC	8	841250-25	14632	
C13	Same as C1				
C14	Capacitor, Ceramic, 75pF, ±2%	1	841416-046	14632	
C15	Capacitor, Tantalum, 3.3µF, 20%, 16V	10	841293-10	14632	
C16	Capacitor, Tantalum, 6.8 pf, 20%, 10V	1	841293-37	14632	
C17	Capacitor, Ceramic, 22pF, 5%	3	841415-003	14632	
C18	Same as C1				
C19	Same as C1				
C20	Capacitor, Ceramic, 100pF, 5%	9	841415-007	14632	
C21	Same as C20				
C22	Same as C20				
C23	Same as C20				
C24	Same as C1				
C25	Capacitor, Electrolytic, Aluminum, 470 F, 16V	1	ECE-A1CU471	54473	
C26	Same as C1				
C27	Capacitor, Ceramic, .047µF, 10%	9	841415-023	14632	
C28	Same as C27				
C29	Same as C1				
C30	Same as C4				
C31	Same as C4				
C32	Same as C1				
C33	Same as C4				
C34	Same as C1				
C35	Same as C15				
C36	Same as C1				
C37	Same as C1				
C38	Same as C12				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

C39	Same as C1				
C40	Capacitor, Tantalum, 10µF, 20%, 16V	2	841293-16	14632	
C41	Same as C17				
C42	Same as C17				
C43	Same as C12				
C44	Same as C1				
C45	Same as C12				
C46	Same as C40				
C47	Same as C1				
C48	Same as C12				
C49	Capacitor, Ceramic, 470pF, 5%	8	841415-011	14632	
C50	Same as C49				
C51	Same as C49				
C52	Same as C49				
C53	Same as C49				
C54	Same as C1				
C55	Same as C1				
C56	Capacitor, Ceramic, 1000pF, 10%	4	841415-013	14632	
C57	Capacitor, Ceramic, 47pF, 2%	4	841416-041	14632	
C58	Same as C1				
C59	Same as C1				
C60	Same as C1				
C61	Same as C15				
C62	Same as C15				
C63	Same as C15				
C64	Same as C1				
C65	Same as C1				
C66	Same as C1				
C67	Same as C1				
C68	Same as C1				
C69	Same as C1				
C70	Same as C1				
C71	Same as C15				
C72	Same as C56				
C73	Same as C56				
C74	Same as C49				
C75	Same as C27				
C76	Same as C27				
C77	Capacitor, Ceramic, 1500pF, 10%,	3	841415-014	14632	
C78	Same as C27				
C79	Same as C77				
C80	Same as C77				
C81	Capacitor, Ceramic, 820pF, ±2%	3	841416-071	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C82	Same as C49				
C83	Same as C1				
C84	Same as C1				
C85	Same as C1				
C86	Same as C49				
C87	Same as C1				
C88	Same as C1				
C89	Same as C1				
C90	Same as C1				
C91	Same as C1				
C92	Same as C1				
C93	Same as C1				
C94	Same as C1				
C95	Same as C1				
C96	Capacitor, Ceramic, 2200pF, 10%	4	841415-015	14632	
C97	Same as C57				
C98	Same as C1				
C99	Same as C1				
C100	Same as C1				
C101	Same as C27				
C102	Same as C1				
C103	Same as C15				
C104	Same as C15				
C105	Same as C4				
C106	Capacitor, Ceramic, 820pF, ±2%, 50V	1	841416-071	14632	
C107	Same as C1				
C108	Same as C27				
C109	Same as C1				
C110	Same as C1				
C111	Same as C1				
C112	Same as C15				
C113	Capacitor, Ceramic, 330pF, 5%	1	841415-010	14632	
C114	Same as C27				
C115	Same as C57				
C116	Same as C1				
C117	Same as C1				
C118	Same as C96				
C119	Same as C1				
C120	Same as C1				
C121	Same as C15				
C122	Capacitor, Ceramic, 56 pf, ±2%, 50V	1	841416-043	14632	
C123	Same as C4				
C124	Same as C96				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

C125	Capacitor, Ceramic, 180pF, 2%	1	841416-055	14632	
C126	Capacitor, Ceramic, 470pF, 2%	1	841416-065	14632	
C127	Same as C27				
C128	Capacitor, Ceramic, 68pF, ±2%	1	841416-045	14632	
C129	Jumper, 0.0Ω	1	841417	14632	
C130	Not Used				
C131	Not Used				
C132	Same as C1				
C133	Same as C1				
C134	Same as C1				
C135	Not Used				
C136	Same as C1				
C137	Same as C1				
C138	Same as C81				
C139	Same as C1				
C140	Same as C1				
C141	Same as C1				
C142	Not Used				
C143	Same as C1				
C144	Same as C81				
C145	Same as C1				
C146	Same as C1				
C147	Same as C1				
C148	Capacitor, Ceramic, 100pF, 2%	4	841416-049	14632	
C149	Same as C148				
C150	Same as C148				
C151	Same as C148				
C152	Same as C1				
C153	Same as C1				
C154	Same as C1				
C155	Same as C1				
C156	Same as C1				
C157	Same as C1				
C158	Capacitor, Ceramic, 1000pF, 2%	1	841416-073	14632	
C159	Capacitor, Ceramic, 56pF, 2%	1	841416-043	14632	
C160	Same as C1				
C161	Same as C1				
C162	Capacitor, Ceramic, 1200pF, 2%	1	841416-075	14632	
C163	Capacitor, Tantalum, 68µF, 20%, 6.3V	1	841293-24	14632	
C164	Same as C1				
C165	Same as C1				
C166	Same as C1				
C167	Same as C1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	REF DESIG PREFIX A2				
C168	Same as C1				
C169	Same as C1				
C170	Same as C1				
C171	Same as C56				
C172	Same as C1				
C173	Same as C1				
C174	Same as C1				
C175	Capacitor, Tantalum, 33μF, 20%, 16V	9	841293-22	14632	
C176	Same as C175				
C177	Same as C96				
C178	Same as C1				
C179	Same as C175				
C180	Capacitor, Tantalum, 6.8μF, 20%, 6.3V	2	841293-14	14632	
C181	Same as C180				
C182	Same as C1				
C183	Not Used				
C184	Same as C1				
C185	Same as C12				
C186	Same as C12				
C187	Same as C1				
C188	Same as C1				
C189	Same as C1				
C190	Not Used				
C191	Same as C1				
C192	Same as C4				
C193	Same as C1				
C194	Same as C1				
C195	Same as C1				
C196	Same as C1				
C197	Same as C1				
C198	Not Used				
C199	Not Used				
C200	Same as C1				
C201	Same as C1				
C202	Same as C175				
C203	Same as C175				
C204	Same as C175				
C205	Same as C1				
C206	Same as C20				
C207	Same as C1				
C208	Same as C1				
C209	Same as C1				
C210	Same as C1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C211	Same as C1				
C212	Same as C1				
C213	Same as C1				
C214	Same as C20				
C215	Same as C20				
C216	Same as C1				
C217	Same as C20				
C218	Same as C1				
C219	Same as C175				
C220	Same as C175				
C221	Same as C175				
C222	Same as C1				
C223	Same as C20				
C224	Same as C1				
C225	Same as C1				
C226	Same as C1				
C227	Same as C1				
C228	Same as C1				
C229	Same as C4				
C230	Same as C1				
C231	Same as C1				
C232	Not Used				
C233	Same as C4				
C234	Not Used				
C235	Same as C1				
C236	Same as C4				
C237	Same as C4				
C238	Not Used				
C239	Not Used				
CR1	Not Used (SOT-23)				
CR2	Diode/Swpin Dual Swithcing Diode Reverse Volltage	2	MMBD7000LT1	04713	
CR3	Not Used				
CR4	Same as CR2				
CR5	Not Used				
FL1	Not Used				
J1	Connector, Jack, BNC BNC Rt Ang , PCB/Panel MT W/SLDR Mt Posts	1	227677-1	00779	
J2	Phone Jack, 3.5 Dia Mini Phone Jack, RES=3OM	1	SJ360	53337	
J3	Connector, 25-Pin D-Sub RT Ang, PC MT	1	DMRSTR25RA05Cg	05574	
J4	CONN 24-Pin Term Strip Gold Flash .100CTRS	4	79223-624	22526	
J5	Connector, Header,6 Pos Pin Friction Lock .156 CTRS	1	26-48-2066	27264	
J6	Not Used				
J7	Same as J4				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
J8	Same as J4				
J9	Same as J4				
J10	Not Used				
J11	Connector, PC.BD 3 Pin SHRD HDR	1	3-102202-4	00779	
J12	Not Used				
J13	Not Used				
J14	Connector, Header,10 Pin HDR .025SQ X.230 X.10CTR SGLD PLTD	1	TSW105-07-G-D	55322	
J15	Not Used				
J16	Not Used				
JW1	Not Used				
L1	Inductor, 10μH, Surface MT	3	RL-1500-10	14778	
L2	Same as L1				
L3	Same as L1				
L4	Inductor, 1.0μH, ±20%,@7.96MHZ QMIN-25 370MA Ferrite 1210	9	B82422-A1102-M	25088	
L5	Same as L4				
L6	Same as L4				
L7	Same as L4				
L8	Same as L4				
L9	Same as L4				
L10	Same as L4				
L11	Not Used				
L12	Inductor, 2.2μH	1	841444-009	14632	
L13	Inductor, 4.7μH	1	B82422-A1472-M	25088	
L14	Inductor, 150nH	1	841438-029	14632	
L15	Inductor, 68nH	1	841438-021	14632	
L16	Inductor, 2.7μH	1	841444-011	14632	
L17	Not Used				
L18	Inductor, 1000μH	2	NLF453232-102K	7J069	
L19	Same as L18				
L20	Same as L4				
L21	Same as L4				
L22	Not Used				
L23	Not Used				
Q1	Not Used				
Q2	Transistor	3	MMBT2222ALT1	04713	
Q3	Same as Q2				
Q4	Not Used				
Q5	Not Used				
Q6	Transistor	2	2N7002-LT1	17856	
Q7	Same as Q2				
Q8	Transistor	2	MMBT-3906	04713	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
Q9	Same as Q6				
Q10	Transistor	2	MMBT3904LT1	04713	
Q11	Same as Q8				
Q12	Same as Q10				
R1	Resistor, Fixed, 100kΩ, 5%	110	841414-121	14632	
R2	Resistor, Fixed, 47Ω, 5%	20	841414-041	14632	
R3	Resistor, Fixed, 47kΩ, 5%	7	841414-113	14632	
R4	Same as R3				
R5	Resistor, Fixed, 100Ω, 5%	16	841414-049	14632	
R6	Same as R3				
R7	Resistor, Fixed, 10kΩ, 5%	43	841414-097	14632	
R8	Resistor, Fixed, 4.7kΩ, 5%	7	841414-089	14632	
R9	Resistor, Fixed, 2.2kΩ, 5%	8	841414-081	14632	
R10	Same as R2				
R11	Resistor, Fixed, 15kΩ, 5%, .1 watt	1	841414-101	14632	
R12	Resistor, Fixed, 680Ω, 5%	1	841414-069	14632	
R13	Same as R5				
R14	Same as R5				
R15	Not Used				
R16	Not Used				
R17	Not Used				
R18	Resistor, Fixed, 1.0kΩ, 5%	23	841414-073	14632	
R19	Jumper .05 Ω MAX 1A MIN@70C	26	841417	14632	
R20	Same as R19				
R21	Same as R18				
R22	Same as R19				
R23	Not Used				
R24	Same as R18				
R25	Same as R19				
R26	Resistor, Fixed, 1.5kΩ, 5%	5	841414-077	14632	
R27	Same as R19				
R28	Same as R18				
R29	Resistor, Fixed, 2.7Ω, 5%	4	841414-011	14632	
R30	Resistor, Fixed, 22kΩ, 5%	4	841414-105	14632	
R31	Same as R5				
R32	Same as R30				
R33	Same as R5				
R34	Same as R1				
R35	Same as R19				
R36	Resistor, Fixed, 2.7kΩ, 5%	2	841414-083	14632	
R37	Same as R18				
R38	Same as R19				
R39	Same as R7				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R40	Same as R7				
R41	Same as R18				
R42	Same as R7				
R43	Same as R19				
R44	Not Used				
R45	Same as R18				
R46	Same as R36				
R47	Same as R2				
R48	Same as R1				
R49	Same as R1				
R50	Resistor, Fixed, 470Ω, 5%	10	841414-065	14632	
R51	Not Used				
R52	Resistor, Fixed, 75kΩ, 5%	2	841414-118	14632	
R53	Same as R52				
R54	Same as R1				
R55	Resistor, Fixed, 33kΩ, 5%	5	841414-109	14632	
R56	Resistor, Fixed, 220kΩ, 5%	6	841414-129	14632	
R57	Same as R55				
R58	Same as R56				
R59	Resistor, Fixed, 68kΩ, 5%	4	841414-117	14632	
R60	Same as R18				
R61	Same as R1				
R62	Same as R1				
R63	Same as R50				
R64	Same as R1				
R65	Same as R1				
R66	Same as R1				
R67	Same as R2				
R68	Same as R56				
R69	Same as R56				
R70	Same as R2				
R71	Same as R56				
R72	Same as R56				
R73	Same as R2				
R74	Same as R59				
R75	Same as R18				
R76	Same as R1				
R77	Same as R1				
R78	Same as R9				
R79	Same as R1				
R80	Same as R1				
R81	Same as R18				
R82	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R83	Same as R1				
R84	Same as R1				
R85	Not Used				
R86	Same as R1				
R87	Same as R2				
R88	Same as R18				
R89	Same as R9				
R90	Same as R1				
R91	Same as R1				
R92	Same as R1				
R93	Same as R50				
R94	Resistor, Fixed, 18kΩ, 5 %	4	841414-103	14632	
R95	Same as R2				
R96	Same as R94				
R97	Same as R2				
R98	Same as R3				
R99	Same as R3				
R100	Same as R55				
R101	Same as R8				
R102	Same as R1				
R103	Same as R1				
R104	Same as R1				
R105	Not Used				
R106	Same as R9				
R107	Same as R94				
R108	Same as R9				
R109	Same as R94				
R110	Same as R18				
R111	Same as R7				
R112	Resistor, Fixed, 8.2kΩ, 5%	2	841414-095	14632	
R113	Same as R112				
R114	Same as R7				
R115	Same as R1				
R116	Not Used				
R117	Same as R7				
R118	Same as R7				
R119	Same as R7				
R120	Same as R1				
R121	Same as R1				
R122	Same as R1				
R123	Same as R1				
R124	Same as R2				
R125	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R126	Same as R18				
R127	Same as R59				
R128	Same as R7				
R129	Same as R2				
R130	Same as R1				
R131	Same as R1				
R132	Same as R1				
R133	Resistor, Fixed, 150kΩ, 5%	2	841414-125	14632	
R134	Same as R50				
R135	Same as R7				
R136	Same as R26				
R137	Same as R26				
R138	Same as R30				
R139	Same as R2				
R140	Same as R1				
R141	Same as R1				
R142	Same as R18				
R143	Same as R18				
R144	Same as R1				
R145	Same as R18				
R146	Same as R55				
R147	Resistor, Fixed, 150Ω, 5%	1	841414-053	14632	
R148	Resistor, Fixed, 3.3kΩ, 5%	9	841414-085	14632	
R149	Same as R1				
R150	Same as R1				
R151	Resistor, Fixed, 10Ω, 5%	5	841414-025	14632	
R152	Same as R18				
R153	Same as R18				
R154	Same as R133				
R155	Resistor, Fixed, 4.7Ω, 5%	1	841414-017	14632	
R156	Not Used				
R157	Same as R7				
R158	Same as R7				
R159	Same as R7				
R160	Same as R26				
R161	Same as R26				
R162	Same as R30				
R163	Same as R2				
R164	Same as R3				
R165	Same as R1				
R166	Same as R7				
R167	Same as R7				
R168	Same as R18				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R169	Resistor, Fixed, 220Ω, 5%	3	841414-057	14632	
R170	Same as R7				
R171	Same as R1				
R172	Same as R151				
R173	Same as R7				
R174	Same as R7				
R175	Not Used				
R176	Same as R29				
R177	Same as R1				
R178	Same as R7				
R179	Same as R1				
R180	Same as R2				
R181	Not Used				
R182	Not Used				
R183	Same as R2				
R184	Same as R29				
R185	Same as R7				
R186	Same as R19				
R187	Same as R2				
R188	Same as R151				
R189	Not Used				
R190	Same as R29				
R191	Same as R19				
R192	Not Used				
R193	Same as R1				
R194	Same as R1				
R195	Same as R7				
R196	Same as R7				
R197	Same as R148				
R198	Same as R148				
R199	Same as R151				
R200	Same as R18				
R201	Same as R19				
R202	Same as R148				
R203	Same as R148				
R204	Not Used				
R205	Same as R19				
R206	Same as R151				
R207	Same as R1				
R208	Same as R1				
R209	Same as R19				
R210	Same as R1				
R211	Same as R19				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R212	Same as R1				
R213	Not Used				
R214	Same as R19				
R215	Same as R1				
R216	Same as R19				
R217	Resistor, Fixed, 5.6kΩ, 5%	1	841414-091	14632	
R218	Same as R148				
R219	Same as R9				
R220	Same as R5				
R221	Same as R5				
R222	Same as R9				
R223	Same as R7				
R224	Same as R1				
R225	Not Used				
R226	Same as R8				
R227	Same as R3				
R228	Same as R8				
R229	Same as R1				
R230	Same as R1				
R231	Same as R19				
R232	Same as R1				
R233	Same as R1				
R234	Not Used				
R235	Same as R1				
R236	Not Used				
R237	Same as R1				
R238	Not Used				
R239	Same as R1				
R240	Same as R7				
R241	Same as R8				
R242	Same as R8				
R243	Same as R7				
R244	Same as R1				
R245	Same as R7				
R246	Same as R1				
R247	Resistor, Fixed, 1.0 MΩ 5%	4	841414-145	14632	
R248	Same as R2				
R249	Same as R1				
R250	Same as R7				
R251	Same as R7				
R252	Same as R2				
R253	Same as R1				
R254	Same as R1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R255	Same as R7
R256	Same as R1
R257	Same as R1
R258	Same as R1
R259	Same as R1
R260	Same as R1
R261	Same as R1
R262	Not Used
R263	Not Used
R264	Not Used
R265	Same as R5
R266	Same as R1
R267	Same as R1
R268	Same as R1
R269	Not Used
R270	Same as R7
R271	Same as R19
R272	Same as R1
R273	Same as R7
R274	Same as R7
R275	Same as R1
R276	Same as R1
R277	Same as R1
R278	Same as R7
R279	Not Used
R280	Same as R19
R281	Same as R1
R282	Same as R1
R283	Same as R7
R284	Not Used
R285	Not Used
R286	Same as R247
R287	Not Used
R288	Same as R1
R289	Same as R19
R290	Same as R1
R291	Not Used
R292	Same as R1
R293	Same as R19
R294	Same as R19
R295	Not Used
R296	Same as R19
R297	Same as R55

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R298	Same as R7				
R299	Not Used				
R300	Not Used				
R301	Same as R19				
R302	Same as R5				
R303	Same as R7				
R304	Same as R1				
R305	Same as R1				
R306	Same as R18				
R307	Same as R59				
R308	Same as R7				
R309	Not Used				
R310	Same as R7				
R311	Same as R7				
R312	Same as R1				
R313	Same as R1				
R314	Same as R5				
R315	Same as R7				
R316	Same as R5				
R317	Same as R1				
R318	Same as R5				
R319	Same as R1				
R320	Same as R50				
R321	Same as R1				
R322	Same as R1				
R323	Same as R18				
R324	Same as R5				
R325	Same as R1				
R326	Same as R1				
R327	Same as R18				
R328	Same as R7				
R329	Same as R1				
R330	Same as R9				
R331	Same as R1				
R332	Same as R1				
R333	Resistor, Fixed, 6.8 kΩ, 5%	2	841414-093	14632	
R334	Same as R8				
R335	Not Used				
R336	Same as R1				
R337	Same as R333				
R338	Same as R148				
R339	Same as R148				
R340	Resistor, Fixed, 68Ω, 5%	2	841414-045	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R341	Same as R247				
R342	Same as R247				
R343	Same as R2				
R344	Same as R1				
R345	Same as R1				
R346	Same as R1				
R347	Same as R1				
R348	Same as R1				
R349	Same as R1				
R350	Same as R1				
R351	Same as R1				
R352	Same as R1				
R353	Same as R1				
R354	Same as R1				
R355	Same as R1				
R356	Same as R1				
R357	Same as R1				
R358	Same as R1				
R359	Same as R1				
R360	Same as R7				
R361	Same as R340				
R362	Not Used				
R363	Same as R19				
R364	Not Used				
R365	Not Used				
R366	Same as R50				
R367	Same as R5				
R368	Same as R5				
R369	Same as R5				
R370	Same as R50				
R371	Same as R50				
R372	Same as R169				
R373	Same as R50				
R374	Same as R50				
R375	Same as R169				
R376	Same as R19				
R377	Same as R148				
R378	Same as R2				
R379	Not Used				
S1	Switch/Dip SPST Side Actuated Dip	2	ADP-08S	95146	
S2	Same as S1				
T1	Transformer CPLG Audio 600CT/500CT IMP=10%,	2	SPT-130	20462	
T2	Same as T1				

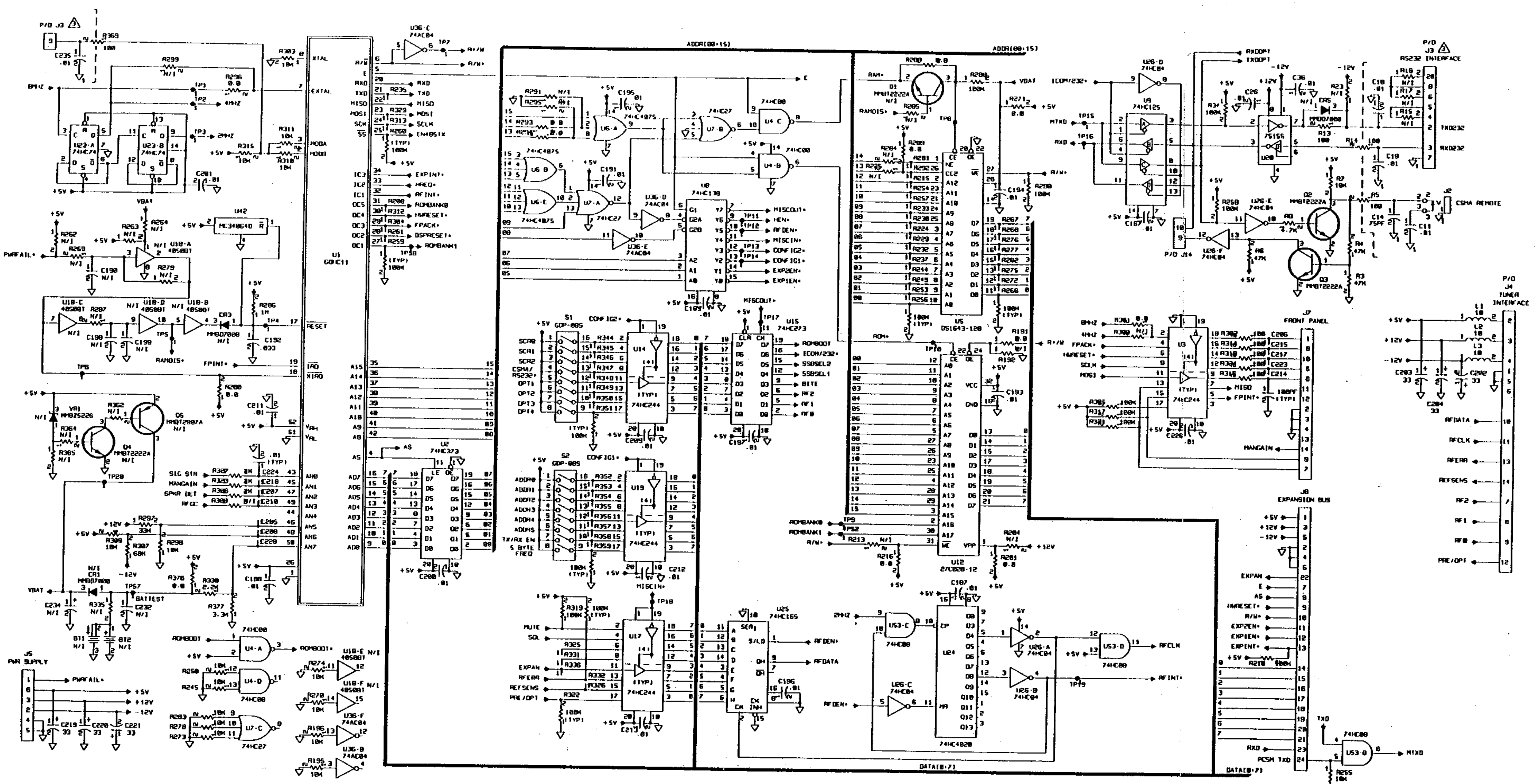
REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	REF DESIG PREFIX A2				
U1	Integrated Circuit, Microcontroller,Microcontroller Unit 16-BIT Timer 8 Channel 8-BIT	1	MC68GC11A0FN	04713	
XU1	Socket 52-POS PLCC .050CTRS 1.050 X .20HT Polarized Surf	1	213-052-601	26742	
U2	Integrated Circuit,TRI-State Octal D-Type Latch SOL-20 Wide Pkg	1	74HC373SOL20	02735	
U3	Integrated Circuit,Octal TRI-State B!uffer, SOL-20 Wide Pkg	4	74HC244 SOL20	04713	
U4	Integrated Circuit,Quad 2-Input NAND Gate S0-14N	1	74HC00 SO14	02735	
U5	Integrated Circuit, RAM,8K X 8 Nonvolatile Time Keeping RAM 120NS=AT 28-Pin	1	DS1643-120	0B0A9	
XU5	Socket, IC 28 Pin .600 Row Spacing On .100 CTRS Gold Contact	2	O-628-SGT	S5322	
U6	Integrated Circuit, CMOS,Triple Three Input OR Gate SO-14 PLSTC PKG	1	74HC4075 SO14	02735	
U7	Integrated Circuit,TRIPLE 3-Input NOR Gates	1	74HC27 SO14	02735	
U8	Integrated Circuit,3-TO-8 Line Decoder	1	74HC138 SO16	02735	
U9	Integrated Circuit, CMOS,Quad Buffer/Line Driver	2	74HC125 SO14	34371	
U10	Integrated Circuit,Triple 3-Input AND Gate	1	74F11 SO14	04713	
U11	Integrated Circuit,1-OF-8 Decoder/Demultiplexer	1	74F138 SO16	04713	
U12	EPROMProgrammed	1	842032	14632	
XU12	socket, IC 32-PIN LOW PROFILE DIP Socket .600 Row Slpace Gold	1	O-632-SGT	S532	
U13	Integrated Circuit,16-BIT A/D Converter 20-Pin PLSTC DIP	1	DSP56ADC16S	04713	
U14	Same as U3				
U15	Integrated Circuit,Octal D Flip-Flops With Clear SOL-20 Wide Pkg	1	74HC273 SOL20		
U16	Same as U9				
U17	Same as U3				
U18	Not Used				
U19	Same as U3				
U20	Integrated Circuit,Line Driver and Receiver Monolithic 8 Pin PKS	2	SN75155D	01295	
U21	Integrated Circuit, CMOS,Hex Inverters Active Outputs	3	74AC04 SO14	04713	
U22	Amplifier Ultra-High Frequency Op. Amp Gain Bandwidth 1.	1	NE5539D	18324	
U23	Integrated Circuit,Dual D Flip-Flop With Preset and Clear	3	74HC74 SO14	04713	
U24	Integrated Circuit, CMOS,14-Stage Binary Ripple Counter	2	74HC4020 SO16	34371	
U25	Integrated Circuit, CMOS,Parallel-In/Serial-OUT 8-BIT Shift Register SO-1	1	74HC165 SO16	02735	
U26	Integrated Circuit, /INV Hex Inverter	1	74HC04 SO14	04713	
U27	Integrated Circuit,SYN Presettable Binary Counter	2	74AC161 SO16	34371	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U28	Same as U27				
U29	Same as U23				
U30	Integrated Circuit,Synchronous Binary Counter with Asynchronous Clear SO	1	74HC161 SO16	02735	
U31	Same as U23				
U32	Same as U21				
U33	Integrated Circuit, CMOS,Dual D Flip-Flop With PRESET AND CLEAR	1	74AC74CO14	02735	
U34	Voltage Regulator3 TERM NEG Volt Regulator -5V	1	MC79M05CDT	04713	
U35	Same as U24				
U36	Same as U21				
U37	Integrated Circuit,40 MHZ DSP Microprocessor with PLL 24-BIT 132-PIN PQF	1	DSP56002FC40	04713	
U38	Same as U20				
U39	Integrated Circuit, /SRAMCMOS,32K X 8 20NS Access Time 28PIN SOJ	6	MT5C2568DJ-20	6Y440	
U40	Same as U39				
U41	Same as U39				
U42	Integrated Circuit, /Sensing Undervoltage Sensing Rest Operation W/1V Input	1	MC34064D-5	04713	
U43	Not Used				
U44	Integrated Circuit, Differential Bus Transceiver	2	SN75176AD	01295	
U45	Same as U39				
U46	Same as U39				
U47	Same as U39				
U48	Integrated Circuit, Octal D Flip-Flop with RESET SOL-20 PKG	2	74HCT273 SOL20	02735	
U49	Integrated Circuit, Dual D Flip-Flop with SET and RESET	1	74HCT74 SO14	34371	
U50	Same as U48				
U51	Integrated Circuit, /CONV D/A Monolithic 8-BIT HS Current Output	2	DAC0800LCM	27014	
U52	Amplifier JFET-Input Dual OP AMP	7	MC34002D	04713	
U53	Integrated Circuit, Quad 2-Input AND Gate	1	74HC08 SO14	02735	
U54	Same as U52				
U55	Same as U51				
U56	EPROM Programmed	1	841678	14632	
XU56	Same as XU5				
U57	Same as U44				
U58	Integrated Circuit, Dual 1-OF-4 Decoder/Demultiplexer.	1	74F139 SO16	04713	
U59	Integrated Circuit, /CONV D/A 16 Bit Audio D/A Converter	1	AD1851R	24355	
U60	Integrated Circuit, CMOS,Triple 2-Channel Analog Multiplexer/Demultiplexer	3	74HC4053 SO16	02735	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U61	Same as U52				
U62	Same as U60				
U63	Same as U52				
U64	Same as U52				
U65	Amplifier Single Low Noise OP AMP SO 8 PIN	3	NE5534D	18324	
U66	Same as U65				
U67	Integrated Circuit, Dynamic Range Processor Dual VCA 16-Pin DIP	1	SSM-2122P	06665	
U68	Same as U60				
U69	Amplifier JFET-Input Operational Amplifier	2	MC34001D	04713	
U70	Same as U69				
U71	Same as U52				
U72	Integrated Circuit, /AMP 1.5W Audio Power AMP 14-PIN DIP	1	LM388n-1	27014	
U73	Not Used				
U74	Same as U52				
U75	Same as U65				
VR1	Not Used				
XTB1	Connector, Header,13-POS Shrouded PC MT	1	ELFH13210	58982	
Y1	Not Used				



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.
2. PIN/ADDRESS NUMBERS SHOWN ARE FOR MICRON SEMICONDUCTOR PARTS. ADDRESS NUMBERS MAY DIFFER ON ALTERNATE MFG. PARTS. HOWEVER THEY ARE FUNCTIONALLY EQUIVALENT.

△3 DIFFERENCE BETWEEN TYPES IS LISTED IN TABLE 1.

TABLE 1

TYPE	J3	J2
797214-1	USED	USED
797214-2	N/I	USED
797214-3	USED	N/I
797214-4	△5	
797214-5	△6	

NOTES: (CONTINUED)

4. IT IS POSSIBLE TO USE VARIOUS DENSITY MEMORY CHIPS FOR U39, U40, U41, U45, U46, U47 & U56. THE FOLLOWING TABLE 2 LISTS EACH ASSY DASH NO. (TYPE), IT'S MEMORY CONFIGURATION, AND WHICH 0-OHM RESISTORS MUST BE INSTALLED.

TABLE 2

TYPE	REF DES	DESCRIPTION	PART NO.	R43	R44	R38	R156
797214-1, -2	U56 U45, U46, U47 U39, U40, U41	64K X 8 EPROM 32K X 8 SRAM ** 32K X 8 SRAM ***	27C512 MT5C2568 MT5C2568	0.0	N/I	0.0	N/I

** A 28-PIN 32K X 8 SRAM IS SHOWN ON THE SCHEMATIC. WHEN A 28-PIN 8K X 8 SRAM IS INSTALLED, PIN 26 IS CE2 (VS. A13) AND PIN 1 IS NC (VS. 14).

*** A 32-PIN 128K X 8 SRAM IS SHOWN ON THE SCHEMATIC. WHEN A 28-PIN 32K X 8 IS INSTALLED, PINS 1 THRU 28 CORRESPOND TO PINS 3 THRU 30 ON THE 32-PIN CHIP.

△5 -4 SAME AS -1, EXCEPT CONFORMAL COATED.

△6 CUSTOMER SPECIFIC ALTERATIONS MADE. SEE 797214-5 CPL.

Figure J-2. Type 797214-5 Digital Control Assembly (A2) Schematic Diagram 581839 (Sheet 1 of 4) (D)

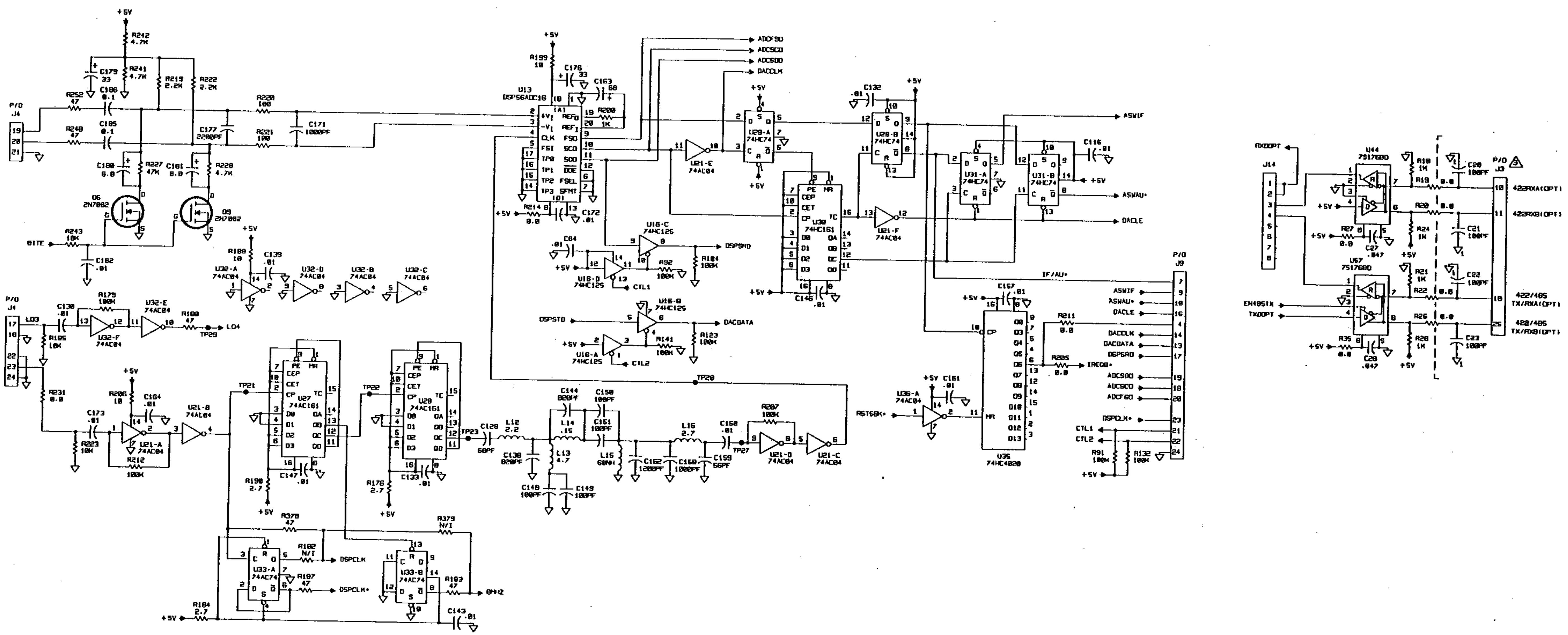


Figure J-2. Type 797214-5 Digital Control Assembly (A2)
Schematic Diagram 581839 (Sheet 2 of 4) (D)

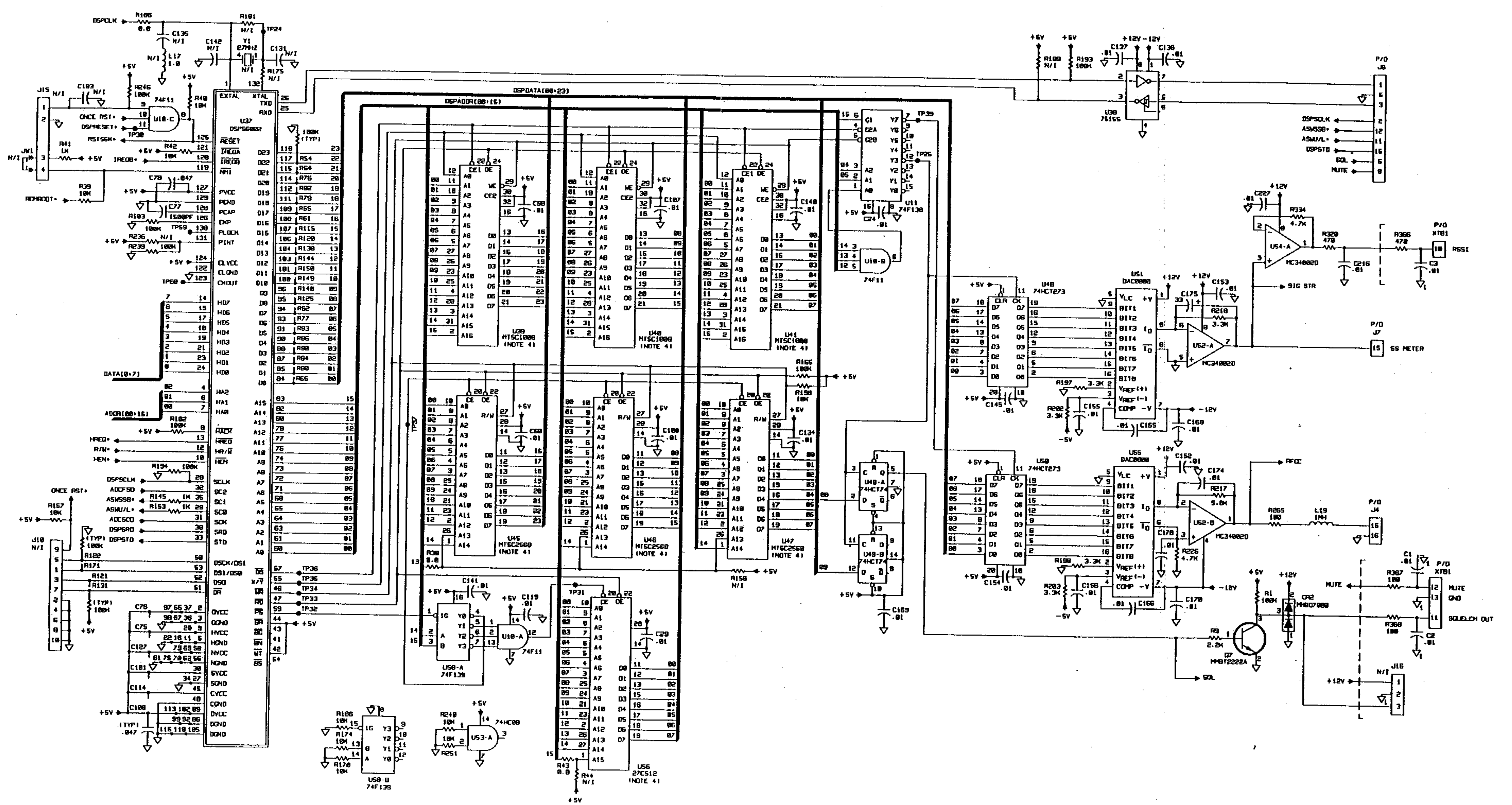


Figure J-2. Type 797214-5 Digital Control Assembly (A2)
Schematic Diagram 581839 (Sheet 3 of 4) (D)

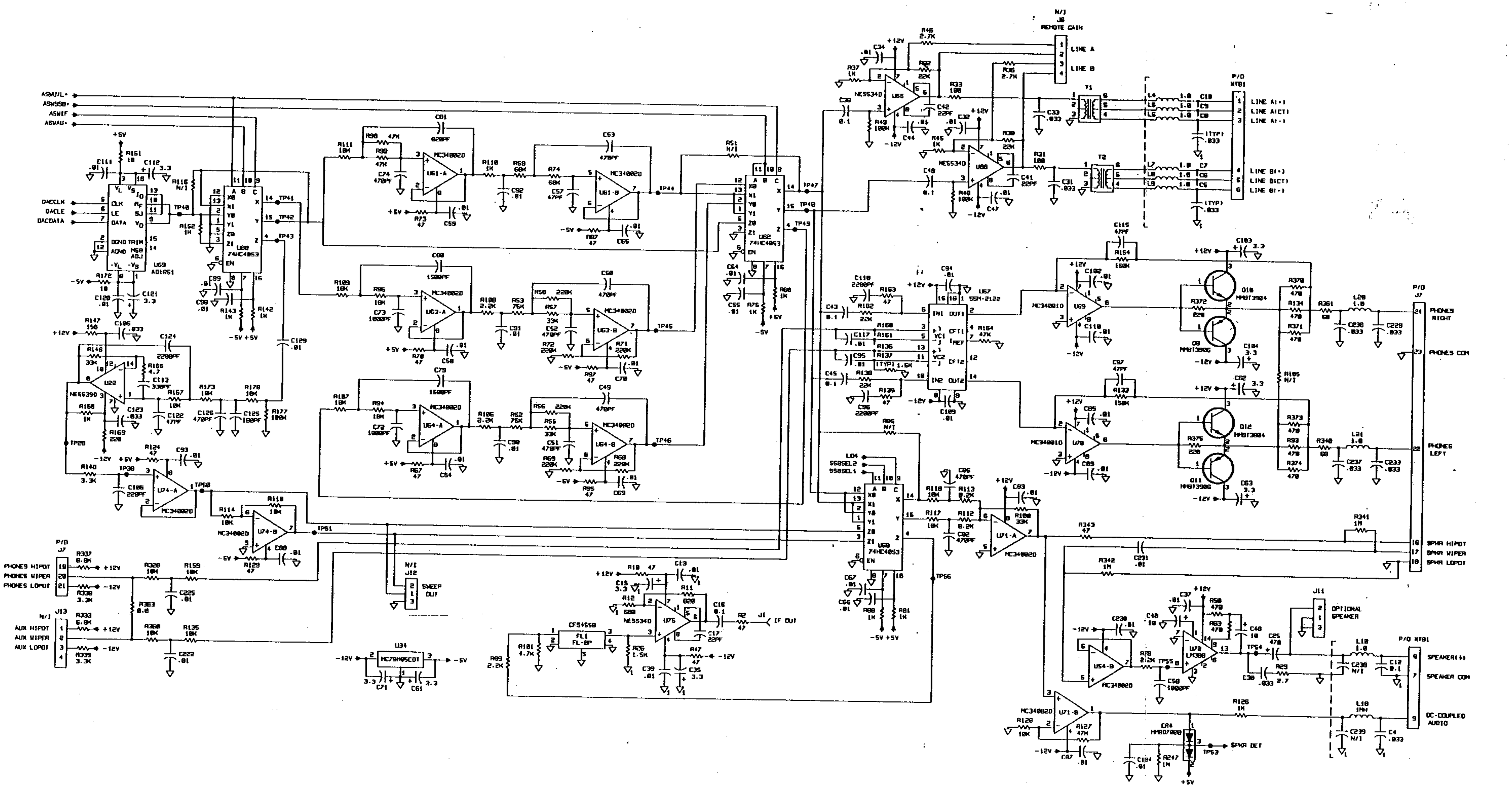


Figure J-2. Type 797214-5 Digital Control Assembly (A2)
Schematic Diagram 581839 (Sheet 4 of 4) (D)