INSTRUCTION MANUAL

FOR

TYPE WJ-8607 VHF/UHF SURVEILLANCE RECEIVER

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

October 1989

PROPRIETARY STATEMENT

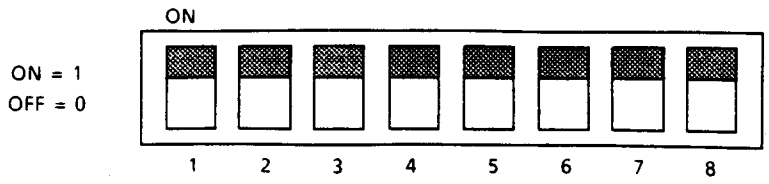
WJ-8607 VHF/UHF SURVEILLANCE RECEIVER INSTRUCTION MANUAL

REVISION RECORD

Revision	Description	Date
A	Initial issue.	3/89
B	Incorporates Revision A Change 1 consisting of corrected Figure 2-2 showing proper wiring for the HPIL connectors.	10/89

WJ-8607 VHF/UHF SURVEILLANCE RECEIVER
REVISION B CHANGE 1

TITLE:	INSTRUCTION MANUAL FOR THE WJ-8607 VHF/UHF SURVEILLANCE RECEIVER
MANUAL DATE:	October 1989
CHANGE 1 DATE:	February 1990
APPLICABILITY:	All units.
CHANGES/ERRATA INFORMATION:	Changes refer to updates of the manual to cover design modifications. Errata refer to corrections and clarifications of information in the manual.
CHANGE SUMMARY:	This change reflects information pertinent to Software Version 0.10. Remote interface options WJ-860X/HPIL and WJ-860X/RS-232C are provided as standard remote interfaces in the WJ-8607 Receiver when Software Version 0.10 is installed. The user has the capability to select either interface for operation via a DIP switch (A1S2).
ERRATA:	None
CHANGES:	Delete all references to WJ-860X/HPIL and WJ-860X/RS-232C as optional remote interfaces. These interfaces are now considered standard items provided with the receiver.
Page 2-7	In **paragraph 2.2.3.1** add the following: "Switch position 8 of DIP switch A1S2 is used to select either HPIL or RS-232C/RS-422A for remote operations. Setting position 8 to on (1) selects the RS-232C interface (or RS-422A interface when the WJ-860X/RS-422A Interface Option is installed). Setting position 8 to off (0) selects the HPIL interface."
Page 2-8	Replace **Figure 2-5** with attached **Figure 2-5.**
Page 2-9	**Paragraph 2.2.3.1.1,** last sentence; change "positions 7 and 8" to "position 7". **Paragraph 2.2.3.1.2,** second sentence; change "positions 7 and 8" to " position 7".



HPIL VERSION

DIP SW POSITION:	FUNCTION:
8	**Remote Interface Selection:**
0	HPIL Interface
1	RS-232C/RS-422A Interface
7	**Reference Selection:**
0	Internal
1	External 10 MHz
6	**Configuration Mode Selection:**
0	OFF
1	ON *

5 4 3 2 1	Address Selection:
0 0 0 0 0	00
0 0 0 0 1	01
0 0 0 1 0	02
0 0 0 1 1	03
0 0 1 0 0	04
0 0 1 0 1	05
0 0 1 1 0	06
0 0 1 1 1	07
0 1 0 0 0	08
0 1 0 0 1	09
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	not defined

RS-232C/RS-422A VERSION

DIP SW POSITION:	FUNCTION:
8	**Remote Interface Selection:**
0	HPIL Interface
1	RS-232C/RS-422A Interface
7	**Reference Selection:**
0	Internal
1	External 10 MHz
6	**Configuration Mode Selection:**
0	OFF
1	ON *
5	**Baud Rate Selection:**
0	User specified
1	9600

4 3 2 1	Address Selection:
0 0 0 0	N/U
0 0 0 1	N/U
0 0 1 0	N/U
0 0 1 1	N/U
0 1 0 0	N/U
0 1 0 1	N/U
0 1 1 0	N/U
0 1 1 1	N/U
1 0 0 0	N/U
1 0 0 1	N/U
1 0 1 0	N/U
1 0 1 1	N/U
1 1 0 0	N/U
1 1 0 1	N/U
1 1 1 0	N/U
1 1 1 1	RS-232C/RS-422A

* CAUTION

Vital EEPROM calibration data is unguarded while the Miniceptor is in the Configuration mode (position 6 set to ON, 1). Do Not set the Miniceptor to this mode unless absolutely necessary.

Figure 2-5. DIP Switch A1S2 Configurations

110 10010

TABLE OF CONTENTS

SECTION I

GENERAL DESCRIPTION

SECTION II

INSTALLATION AND OPERATION

TABLE OF CONTENTS (Continued)

SECTION II

INSTALLATION AND OPERATION (Continued)

TABLE OF CONTENTS (Continued)

SECTION II

INSTALLATION AND OPERATION (Continued)

SECTION III

REPLACEMENT PARTS LIST

TABLE OF CONTENTS (Continued)

LIST OF TABLES

SECTION I

SECTION II

LIST OF ILLUSTRATIONS

SECTION I

SECTION II

TABLE OF CONTENTS (Continued)

SECTION IV

SCHEMATICS

SECTION I

GENERAL DESCRIPTION

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-8607 VHF/UHF Surveillance Receiver "Miniceptor" is a compact, lightweight, receiver for use in limited space applications. The Miniceptor detects AM, FM, CW and Pulse signals over the frequency range of 20 to 512 MHz. Single Side Band (SSB) demodulation is available when the WJ-860X/SSB Option is installed. The tuning range is extended to 2000 MHz when the WJ-860X/FE Option is installed. Although the Miniceptor is not specified for operation below 20 MHz, tuning to 2 MHz is allowed for applications where modest HF performance is acceptable. Accurate tuning is provided by fully synthesized, low phase noise local oscillators. Up to five IF bandwidths may be installed in the Miniceptor ranging from 6.4 kHz to 8 MHz (dependent on customer requirements). These IF filters may also be bypassed entirely, yielding a bandwidth of approximately 10 MHz. The Miniceptor achieves a third order intercept point of +8 dBm while maintaining a typical noise figure of 8 dB. A built-in tracking preselector with a nominal bandwidth of 10 percent reduces out-of-band signals.

Three basic modes of operation are available: Manual (fixed frequency), Sweep (contiguous coverage from start to stop frequency), and Step (preprogrammed discrete frequencies). The Miniceptor is interactive in all of its operational modes. When signal activity is detected, the host controller can be alerted. In Sweep mode, a Lockout function is available for locking out portions of the RF spectrum. The Miniceptor contains non-volatile memory for storage of up to 100 Sweep or Step setups and 200 Lockout bands. A Motorola 68HC11 Microcontroller is employed and is responsible for controlling and monitoring receiver functions such as AGC, AFC, synthesizer tuning and I/O control functions.

All Miniceptor operations are implemented and controlled remotely by an external controlling device. Two input/output interface ports are provided for control and analysis operations. The use of these I/O ports is dependent on the interface option installed. An HPIL interface port (Hewlett-Packard Interface Loop) is available when the WJ-860X/HPIL Interface Option is installed. The other I/O port provides an asynchronous serial interface. When the HPIL interface is installed, this serial interface can be used as a dedicated handoff bus. In this configuration the Miniceptor can accept manual handoff commands from a WJ-8615P Receiver. Up to thirty Miniceptors and WJ-8615P receivers can be operated on a single handoff network. The serial interface I/O port can also be configured as a full duplex RS-232 interface (WJ-860X/RS-232C Interface Option) or as an RS-422 interface (WJ-860X/RS-422 Interface Option). The receiver can only be configured with one type of remote interface at a time.

Two IF outputs are provided. A signal monitor output provides nominally 14 dB of gain above the RF input with 12 MHz of bandwidth. When the WJ-860X/WBO Wideband Output Option is installed, a constant -30 dBm output level at 21.4 MHz with a minimum bandwidth of 12 MHz is provided in place of the signal monitor output. A selected IF bandwidth output provides a sample of the predetected 21.4 MHz IF at a level of -30 dBm. Other outputs include FM monitor, switched audio, switched video, line audio, and phones. In addition, a direct baseband output may be enabled which allows the operator to translate the 21.4 MHz down to a baseband output with a variable center frequency. When enabled, the baseband output is routed to the video output jack in lieu of the normal detected video.

See **Table 1-1** for WJ-8607 VHF/UHF Surveillance Receiver specifications.

1.2 MECHANICAL CHARACTERISTICS

The standard configured Miniceptor contains four modules: RF Converter, Synthesizer, Demodulator and Digital Controller. Each module is a multilayer PC board with surface mounted components on one side and plug-in metal cased components on the other side. The modules are attached to two milled-out aluminum housings that make up the main chassis.

A power switch and all connectors and indicators of the Miniceptor are located on the front panel. Five LEDs are provided for monitoring of the Miniceptor operating status. Connector types used are multipin, SMA and SMB with the exception of the phone jack which is a subminiature stereo headphones jack.

1.3 OVERALL FUNCTIONAL DESCRIPTION

Refer to **Figure 1-1.** The operating circuitry of the Miniceptor is contained in four functional sections. These are: Frequency Converter section, Synthesizer section, IF Amplifier/Demodulators section, and Digital Control section. Signal connection between the functional groups is via internal cabling.

The received RF first enters the Frequency Converter section. The RF is filtered and mixed with two LO frequencies from the Synthesizer section producing an IF with a center frequency of 21.4 MHz. A tracking preselector is used to reject out-of-band signals. A sample of the IF is provided at the Signal Monitor Output connector. A wideband output is provided at this connector in lieu of the signal monitor output when the WJ-860X/WBO Wideband Output option is installed. Up to five IF bandwidth filters, ranging from 6.4 kHz to 8 MHz, are used in this section (resident filters are dependent on customer requirements). Electrically, these filters are selected by control signals from the Digital Control section. The IF is then input to the IF Amplifier/Demodulator section.

The Synthesizer section provides three tunable LO signals. Two of these LOs, as mentioned before, are used in the Frequency Converter section. The first LO is tunable from 694 MHz to 1204 MHz in 2-MHz steps. The second LO is tunable from 669.6 MHz to 671.6 MHz in 100-Hz steps. A third LO and a 10 MHz internal reference is provided by the Synthesizer section to the IF Amplifier/Demodulator section. This third LO is tunable either from 19.4 MHz to 23.4 MHz in 1 kHz steps, or from 21.396 MHz to 21.404 MHz in .250 kHz steps.

Amplification and demodulation of the IF from the Frequency Converter section is accomplished in the IF Amplifier/Demodulator section. The IF signal from the Frequency Converter section is first filtered in a selected IF filter (NB, MB, WB) then passes through several stages of IF amplification and gain control. A sample of the bandlimited IF is provided at -30 dBm. The signal is then demodulated and input to a video filter. Switching of the demodulated signal to the input of the video filter is via microprocessor control from the Digital Control section. After the video filter, the resultant switched video output is available at the front panel. Microprocessor switching makes available audio and switched audio outputs (dependent on COR level, etc.).

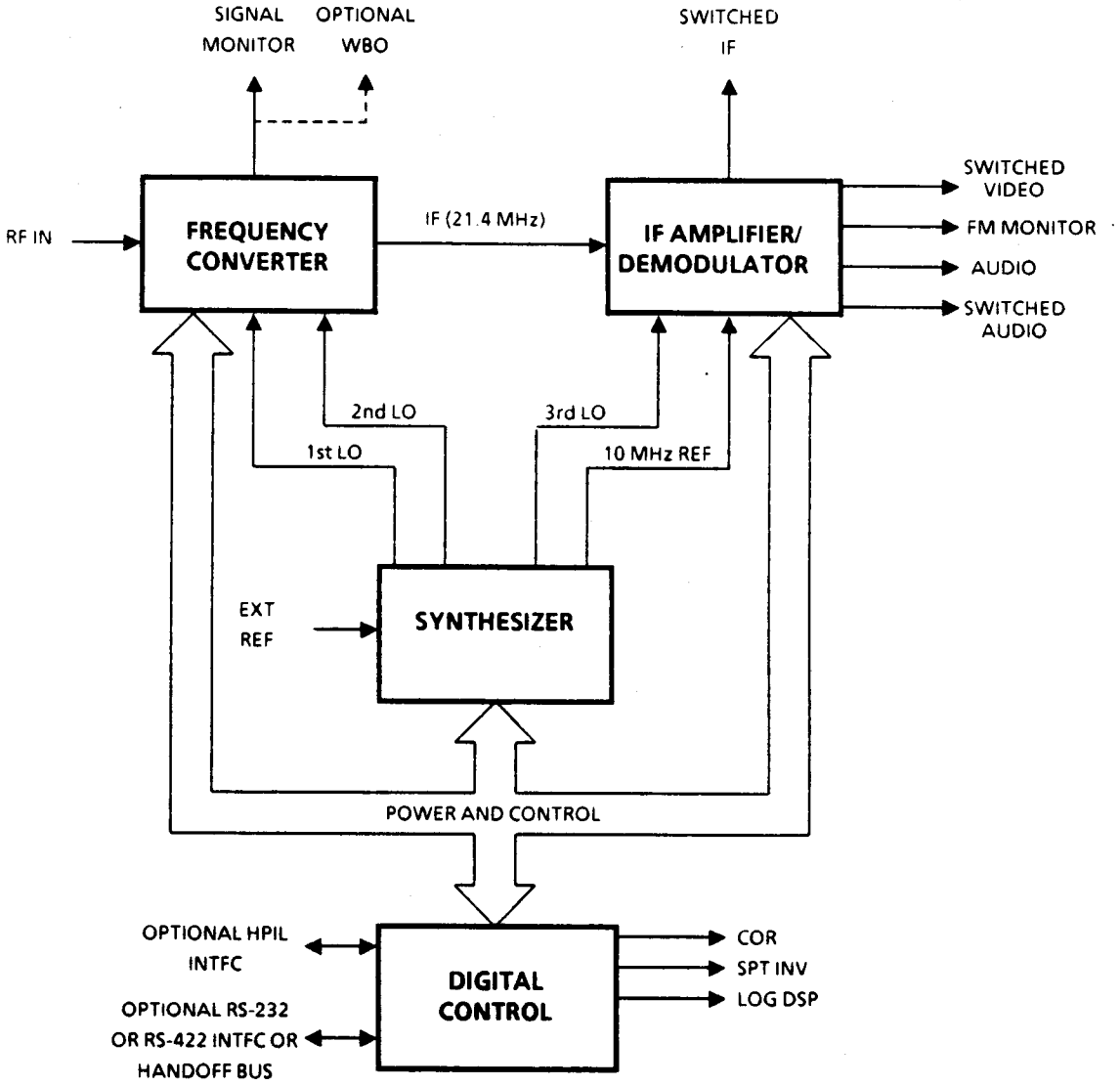


Figure 1-1. Miniceptor Overall Functional Block Diagram

The Digital Control section provides control of all receiver operations. A Motorola 68HC11 microcontroller and its peripherals are employed to perform this function. The microcontroller contains on-board EEPROM which stores the configuration parameters of the receiver, such as; the unit serial number, installed options data, RS-232 baud rate, bandwidth parameters, and preselector data. This section also contains the HPIL and serial interfaces. These interfaces are responsible for transferring data between the Miniceptor and an external controlling device. The serial interface can be used as a handoff interface or as an RS-232 or RS-422 interface. Incoming commands are processed and control signals are generated to control circuitry in other parts of the receiver. DC power distribution to the Frequency Converter, IF Amplifier/Demodulator and Synthesizer sections is controlled by circuitry in this section. This section also provides CMOS logic level outputs for COR, spectrum inversion, and log display.

1.4 EQUIPMENT SUPPLIED

Equipment supplied consists of the receiver (including the ordered options) and an accessory kit.

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

To obtain full utilization of the Miniceptor, equipment from the following list should be selected.

1) Antenna, 50 ohm

2) Audio monitoring equipment:

- Speaker Panel
- Headphones, 8 ohms to 600 ohms

3) Controller device, interface compatibility depends on interface option installed.

Table 1-1. WJ-8607 VHF/UHF Surveillance Receiver, Specifications

Frequency Range	20 to 512 MHz (2000 MHz with FE option). Tuning allowed to 2 MHz
Tuning Resolution	100 Hz, synthesized
Internal Reference Accuracy	±1 part in 10E $^{-6}$ (0 to 50°C)
External Reference Frequency	Selectable, 1, 5 or 10 MHz. 0 dBm nominal input level
Detection Modes	AM, FM, CW, and Pulse standard (SSB optional)
RF Input Impedance	50 ohms nominal
Preselection	Tracking Preselector, 20 to 512 MHz. 10 percent nominal bandwidth with bypass mode. (Five suboctave filters 512 to 2000 MHz)
Input VSWR	2.0:1 typical, 3.0:1 maximum at the tuned frequency
Noise Figure	11 dB maximum, 20 to 512 MHz (Preselector on). 8 dB typical, 5 to 512 MHz (Preselector off). 15 dB maximum, 512 to 2000 MHz with FE option
Intermodulation:	
2nd Order Intercept Point	+45 dBm, 20 to 512 MHz (Preselector on) +35 dBm, 512 to 2000 MHz
3rd Order Intercept Point	+8 dBm, 20 to 512 MHz (Preselector on) 0 dBm, 512 to 2000 MHz +5 dBm typical, 2 to 20 MHz
Image Rejection	90 dB minimum, 20 to 512 MHz 80 dB minimum, 512 to 2000 MHz

Table 1-1. WJ-8607 VHF/UHF Surveillance Receiver, Specifications (Continued)

IF Rejection:	
21.4 MHz	90 dB minimum
691 MHz	90 dB minimum (Preselector on)
FE IF Rejection (Variable)	80 dB minimum (with FE option)
LO Phase Noise at 20 kHz Offset	-100 dBc/Hz, 20 to 512 MHz -98 dBc/Hz, 512 to 2000 MHz
Synthesizer Tuning Speed	12 mSec maximum (from receipt of the last data byte to within 10 kHz of the final frequency)
Signal Monitor Output	Nominally 14 dB above RF input (WBO option provides -30 dBm leveled)
Gain Control Modes	Manual, automatic, 100 dB minimum range
AM Stability	6 dB maximum change from AGC threshold to 100 dB above AGC threshold (-5 dBm maximum input)
Internally Generated Spurious	Less than -110 dBm equivalent input 20 to 2000 MHz)
LO Level at RF Input	-100 dBm typical, -90 dBm maximum
Switched Video Output	0.5 volts peak-to-peak into 50 ohms (30 percent deviation in FM or 50 percent AM modulation)
Video Frequency Response	DC to 1/2 the IF bandwidth, -3 dB
Line Audio Output	10 mW minimum into 32 ohms
Switched Video Output	10 mW minimum into 32 ohms (can be used with other similar audio outputs)
Audio Frequency Response	200 Hz to 15 kHz minimum
FM Monitor Output	0.5 volts peak-to-peak with 30 percent FM deviation. DC coupled, 100 kHz maximum bandwidth
Ultimate FM S + N/N	40 dB minimum in a 50 kHz bandwidth
Reciprocal Mixing	With an input at rated sensitivity level in a 20 kHz bandwidth, an out-of-band signal 350 kHz removed and 70 dB higher in level will not degrade the S + N/N of the desired signal by more than 3 dB
Selected IF Output	Centered at 21.4 MHz, -30 dBm nominal output level
IF Bandwidths	Five plus bypass mode (three supplied and two optional). See **Table I** for selection
IF Shape Factor	See **Table I**
Baseband Output	2 MHz maximum center frequency. Output on the selected video jack
COR/Squelch	Adjustable from 0 to 55 dB above the noise floor of the selected bandwidth
Weight	5 pounds nominal
Dimensions	1.5" x 6.5" x 10.5" (FE option adds 2.85" to length)
Power Requirements	12 Volts DC (+9 to 16 VDC)
Power Consumption	16 watts nominal (20 to 512 MHz) (Add 4 watts for FE option)

Table 1-1. WJ-8607 VHF/UHF Surveillance Receiver, Specifications (Continued)

Remote Interface	Optional HPIL, RS-232C, or RS-422A interface option (supports only one at a time)
Handoff Interface	Supplied with HPIL interface option, compatible with WJ-8615P Receiver
Maximum RF Input without damage	+20 dBm
Temperature*	
Maximum Operating Temperature Range	-25 to +55°C
Non-Operating	-40 to +70°C
Shock	Meets the environmental conditions of MIL-E-5400T, paragraph 3.2.24.6.1 pertaining to equipment shock
Vibration	Meets environmental conditions of MIL-STD-810D, method 514.3, section I-3.2.4, category 4-propeller aircraft. Figure 514.3-25(a) defines the power spectral density with Li = 0.3 (g^2/Hz), and Fi = 68 Hz

* All Specifications herein apply over an operating temperature range of +20 to +30 degrees centigrade.

Table I. Available Bandwidths and Rated Sensitivity

Bandwidth (kHz)	Shape Factor 60:3 dB	Sensitivity (dBm)* 20 to 512 MHz
6.4**	3:1	-105
10**	3:1	-104
20**	3:1	-101
50**	3:1	-97
75**	3:1	-95
100**	3:1	-94
250	4:1	-90
300	4:1	-89
500	4:1	-87
1000	4:1	-84
2000	4:1	-81
4000	4:1	-78
8000	4:1	-75

* Sensitivity Conditions: Based on 20 to 512 MHz receiver. Add 4 dB for FE option

AM--An input signal AM modulated 50 percent by a 1-kHz tone will produce a minimum video output S + N/N ratio of 10 dB.

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

** This IF filter cannot be used in the 5th bandwidth position.

SECTION II

INSTALLATION AND OPERATION

SECTION II

INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

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

2.2 INSTALLATION

2.2.1 MOUNTING CONSIDERATIONS

The WJ-8607 VHF/UHF Surveillance Receiver "Miniceptor" is designed to be operated on a bench, table top, or any other secure surface. The Miniceptor may also be mounted if desired. The structure used for mounting should be secure and sturdy enough to withstand the Miniceptor's weight. Also, when mounting, allow sufficient space around the unit (approximately two inches) for air circulation.

CAUTION

Damage will occur to the Miniceptor if the mounting screws penetrate further than 1/8-inch into the mounting holes. When mounting, make certain that the mounting screws used are of a length that does not penetrate further than 1/8-inch into the mounting holes of the Miniceptor.

Holes for mounting the unit are made available by removing four screws and rubber feet from the bottom of the unit, see **Figure 2-1.** Hardware used for mounting should be four Type 6-32-UNC-2A screws. The length of these screws are determined by the thickness of the mounting surface plus 1/8-inch--the **maximum** penetration into the Miniceptor's mounting holes.

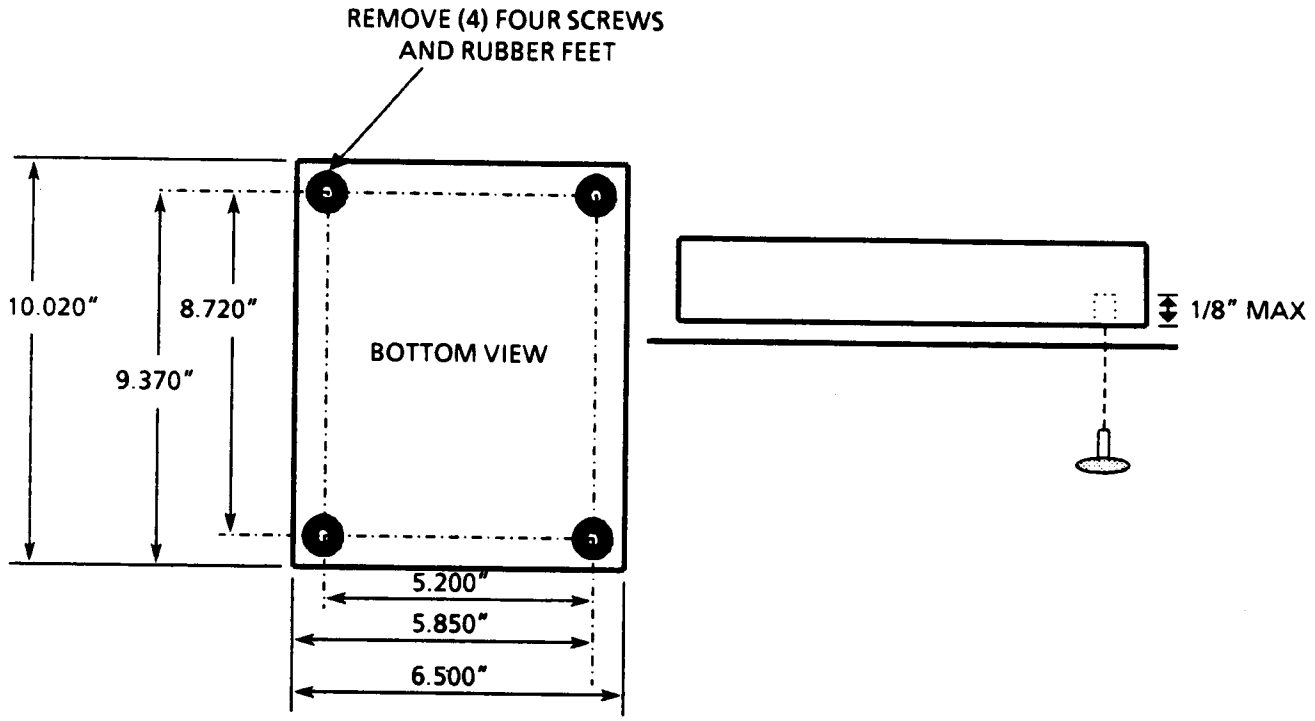


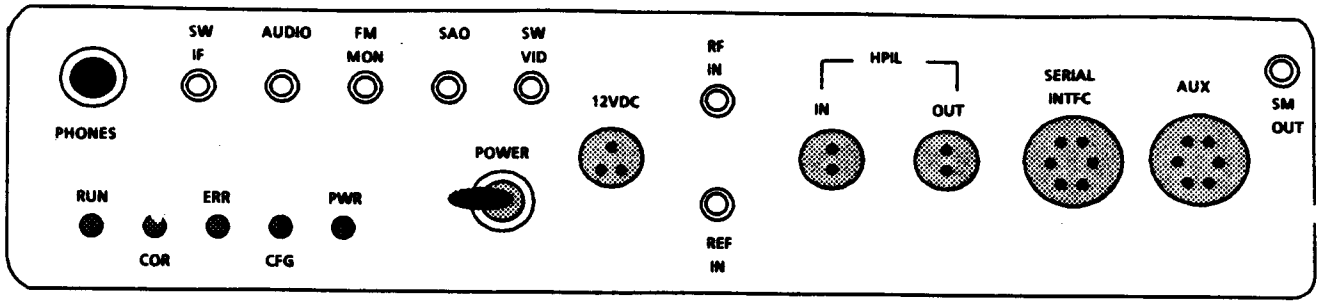
Figure 2-1. Mounting the Miniceptor

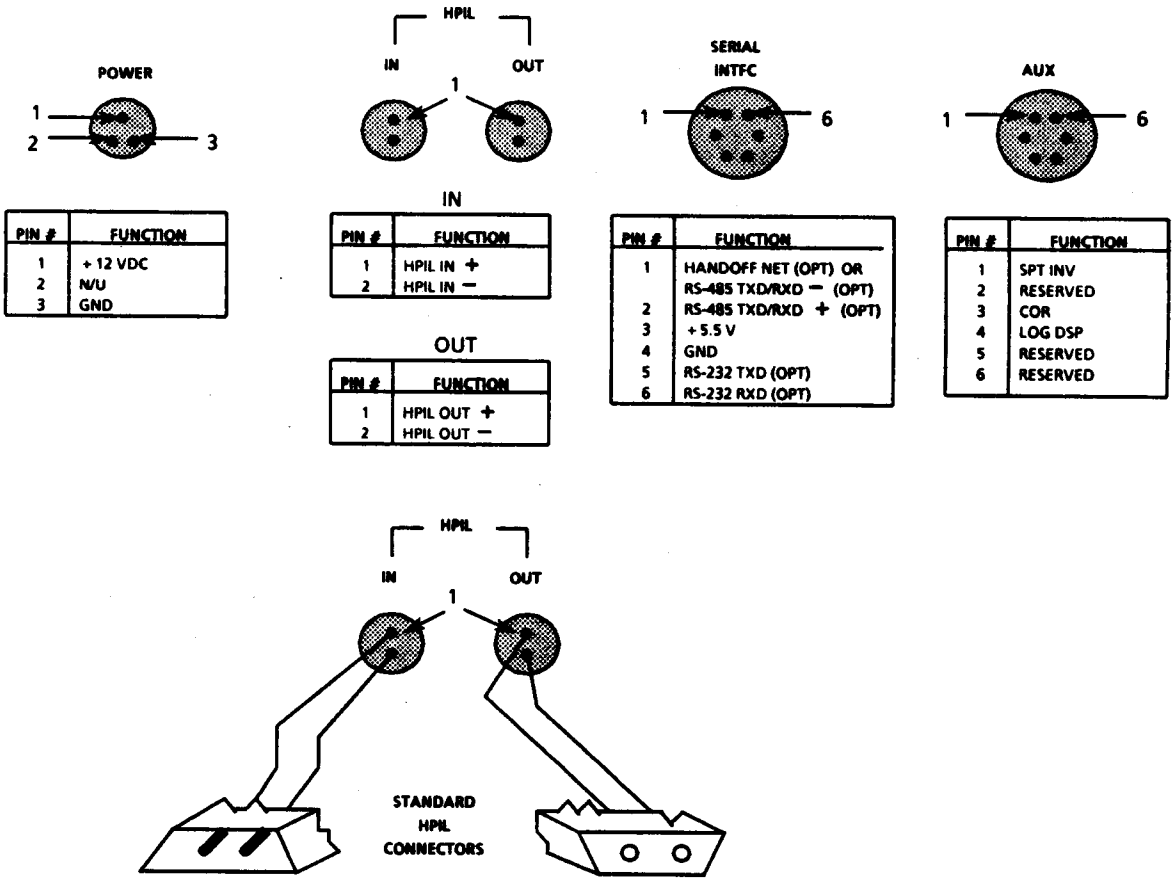
2.2.2 CONNECTOR SIGNALS

The following paragraphs provide an explanation of the input and output signals provided at the Miniceptor front panel connectors. **Table 2-1** lists the connectors, their reference designation, and the function for each. **Figure 2-2** shows the location of the connectors.

Table 2-1. List of Connectors

Connector	Ref Des	Function
SW IF	A4J2	(SMB) Switched 21.4 MHz IF Output
AUDIO	A4J3	(SMB) Line Audio Output
PHONE	A4J1	Phone Output 1/8-inch Miniature Stereo
FM MON	A4J4	(SMB) FM Monitor Output
SAO	A4J5	(SMB) Selected Audio Output
SW VID	A4J6	(SMB) Switched Video Output
REF IN	A2J5	(SMB) External Reference Input
RF IN	A3J10	(SMA) Antenna Input
POWER	A1FLIJ1	(Multipin) DC Power Input
HPIL IN	A1J5	(Multipin) HPIL Input
HPIL OUT	A1J6	(Multipin) HPIL Output
SERIAL INTFC	A1J7	(Multipin) Serial Interface I/O
AUX	A1J8	(Multipin) Auxiliary for COR, Spectrum Inversion, and Log Display
SM OUT	A3J9	(SMB) Signal Monitor Output





PIN #	FUNCTION
1	+ 12 VDC
2	N/U
3	GND

IN

PIN #	FUNCTION
1	HPIL IN +
2	HPIL IN −

OUT

PIN #	FUNCTION
1	HPIL OUT +
2	HPIL OUT −

PIN #	FUNCTION
1	HANDOFF NET (OPT) OR RS-485 TXD/RXD − (OPT)
2	RS-485 TXD/RXD + (OPT)
3	+ 5.5 V
4	GND
5	RS-232 TXD (OPT)
6	RS-232 RXD (OPT)

PIN #	FUNCTION
1	SPT INV
2	RESERVED
3	COR
4	LOG DSP
5	RESERVED
6	RESERVED

Figure 2-2. Miniceptor Front Panel Connectors

2.2.2.1 **SW IF, Switched IF Output (A4J2)** - The switched IF output connector supplies a nominal -30 dBm IF signal into 50 ohms. The center frequency is 21.4 MHz with a bandwidth equal to the selected IF bandwidth.

2.2.2.2 **AUDIO, Line Audio Output (A4J3)** - The line audio output SMB connector provides a limited bandwidth audio signal of approximately 3 Vp-p from a 68 ohm source. This output may be used with any load between 4 ohms and an open circuit. This output is switched based on the absence or presence of a signal above the COR threshold.

2.2.2.3 **PHONES, Headphones Jack (A4J1)** - The output signal at the headphones jack is the same signal as provided at the AUDIO connector. The PHONES jack is a 1/8-inch diameter miniature stereo headphones jack. This output is intended for use with 32 ohm mono or stereo headsets but may be used with other load impedances. This output is switched based on the absence or presence of a signal above the COR threshold.

2.2.2.4 **FM MON, FM Monitor Output (A4J4)** - The output at this SMB connector is a signal from the FM demodulator that has a limited bandwidth of 100 kHz or half of the selected IF bandwidth filter whichever is less. This output is present in AM, FM, and Pulse detection modes and is always an FM demodulated signal regardless of the selected detection mode. This signal may be used for signal analysis or by other ancillary equipment.

2.2.2.5 **SAO, Switched Audio Output (A4J5)** - The output at this SMB connector is a "Tri-State" audio bus with a 470 ohm output impedance. A system of Miniceptors may be configured with all of the SAO outputs tied in parallel. In this configuration, any receiver may be selected, by remote command, to be the audio source routed to the system audio monitoring devices. This output is derived from the Line Audio Output.

2.2.2.6 **SW VID, Switched Video Output (A4J6)** - The switched video output SMB connector provides a full bandwidth demodulated signal. When in FM detection mode, the nominal level of the signal is ±.5 Vp-p for ± half bandwidth frequency deviation. When in AM, CW, or SSB detection modes the nominal level of this signal is .5 Vp-p. The impedance of this output is 50 ohms.

2.2.2.7 **REF IN, External Reference Input (A2J5)** - This SMB connector allows an external 1 MHz, 5 MHz, or 10 MHz reference, having a level of 0 dBm, to be used as the time base for the unit. The Miniceptor must be configured to match the external reference being used. See **paragraph 2.2.3** for information concerning configuring the Miniceptor for operation.

2.2.2.8 **RF IN, Antenna Input (A3J10)** - This SMA connector accepts the RF input from the antenna. Nominal input impedance is 50 ohms. When the WJ-860X/FE option is installed, the IF signal from the FE module is input to this connector via external cabling.

2.2.2.9 **POWER, DC Power Input (A1FL1J1)** - This three pin connector accepts +12 Vdc power. The Miniceptor requires 16 watts. When the WJ-860X/FE option is installed, 19 watts are required.

2.2.2.10 **HPIL IN, HPIL Interface Input (A1J5)** - When the WJ-860X/HPIL Interface option is installed, this two pin connector accepts data in from a Hewlett-Packard Interface Loop (HPIL) bus.

2.2.2.11 **HPIL OUT, HPIL Interface Output (A1J6)** - When the WJ-860X/HPIL Interface option is installed, this two pin connector outputs data onto a Hewlett-Packard Interface Loop (HPIL) bus.

2.2.2.12 **SERIAL INTFC, Serial Interface I/O (A1J7)** - The function of this connector is dependent on the interface option installed. The following paragraphs provide the function of this connector with the applicable interface option.

WJ-8615P Handoff Net - When the WJ-860X/HPIL Interface option is installed, this connector (pin 1 and ground) can be used as a serial interface enabling the Miniceptor to accept manual handoff parameters from a WJ-8615P VHF/UHF Receiver. Up to thirty Miniceptors and WJ-8615P Receivers can be operated on a single handoff network.

RS-232C Serial Interface - When the Miniceptor is configured with the WJ-860X/RS-232C Interface option, this connector is used as the RS-232C serial interface port. In this configuration, the serial interface operates in full duplex at a data rate of up to 9600 baud. An adapter cable is provided with the interface option for mating the serial interface connector to a standard 25-pin D-type connector. See **Figure 2-3** for an illustration of this cable and its connector pin assignments.

RS-422 Serial Interface - When the WJ-860X/RS-422 Interface option is installed, this connector is used as an RS-422 serial interface port. An adapter cable is provided with the interface option for mating the serial interface connector to an RS-422 interface cable.

2.2.2.13 **AUX, Auxilliary for COR, Spectrum Inversion, and Log Display (A1J8)** - This multipin connector provides COR, Spectrum Inversion, and Log Display outputs as described below.

COR (Pin 3) - This signal is a CMOS logic output indicating the presence of energy over the programmed COR level. It's operation is controlled by COR, CLT, and COD commands (see **paragraph 2.4.3.2.1** for Miniceptor general device messages).

Spectrum Inversion (Pin 1) - This signal is a CMOS logic output indicating spectrum sense of the IF output. In nonextended tuning range this line is true (high). In the extended tuning range, this line is false (low) from 500 to 1230 and goes true (high) at approximately 1230.

Log Display (Pin 4) - This output of .1 V to 4.57 V is a linear representation of the amplitude of the signal in the selected IF bandwidth from 0 to 60 dB.

2.2.2.14 **SM OUT, Signal Monitor Output (A3J9)** - The signal monitor output SMB connector provides a sample of the 21.4 MHz IF signal with a 12 MHz bandwidth. Nominal impedance is 50 ohms with approximately 14 dB of gain from antenna input. This output may be used by a signal monitor or other ancillary equipment.

Wideband Output (Optional) - When the WJ-860X/WBO Wideband Output option is installed, connector A3J9 provides a constant -30 dBm output level at 21.4 MHz with a minimum bandwidth of 12 MHz.

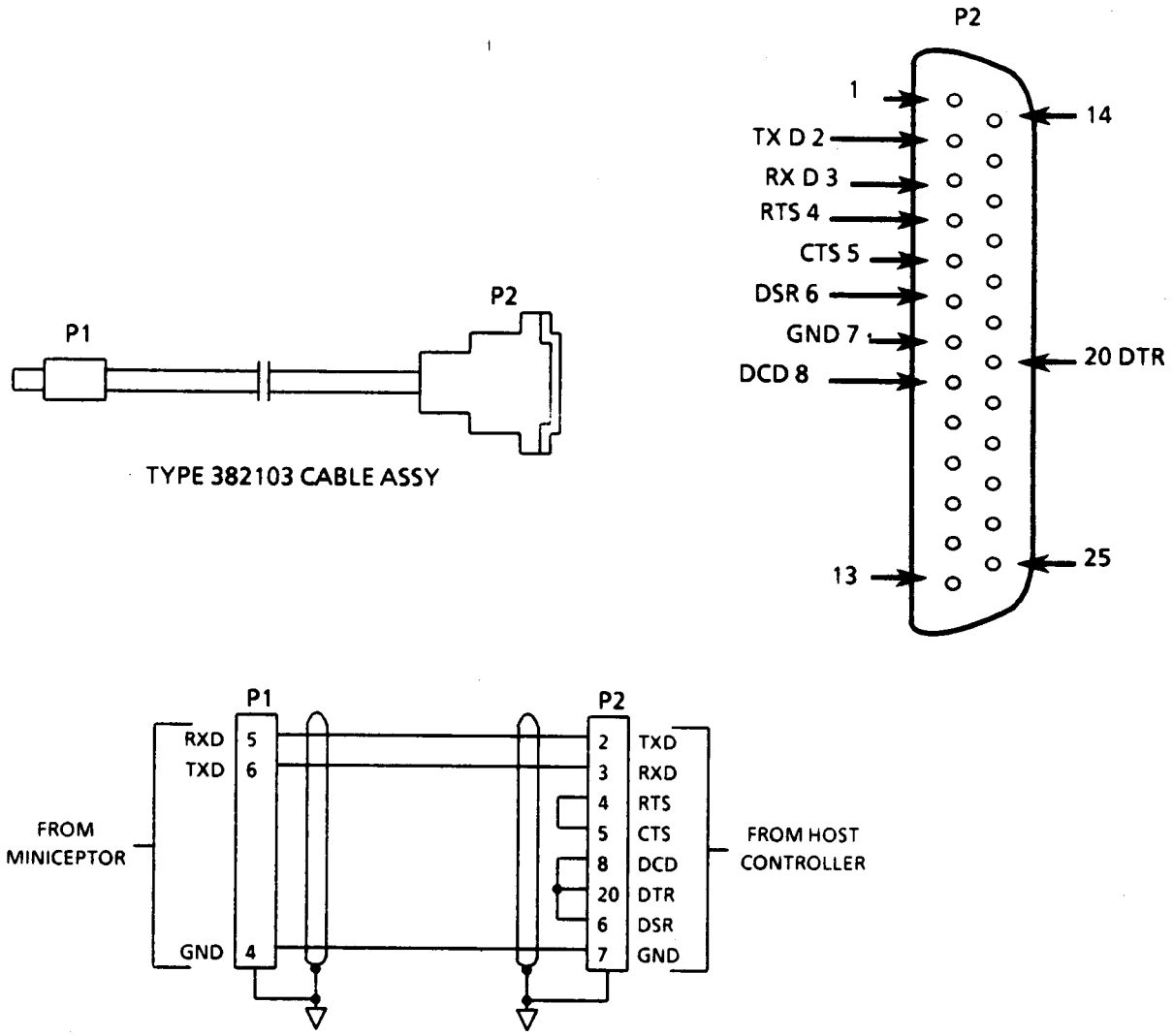


Figure 2-3. Optional RS-232 Adapter Cable, Type 382103

2.2.3 CONFIGURING THE MINICEPTOR FOR OPERATION

An eight position DIP switch, located on the Digital Control Module (A1), is used to configure the Miniceptor for operation. The Miniceptor reads this switch only at power-up. After any changes are made to the switch, the unit must be turned off and back on. This DIP switch, A1S2, is accessed by removing two screws and a switch plate from the bottom panel of the unit (see **Figure 2-4**). Switch positions are available for selecting the preferred external reference (1 MHz, 5 MHz, or 10 MHz) or internal reference (10 MHz), HPIL address (if configured with HPIL interface), RS-232 or RS-422 baud rate (if configured with RS-232 or RS-422 interfaces), and setting the receiver to Configuration mode.

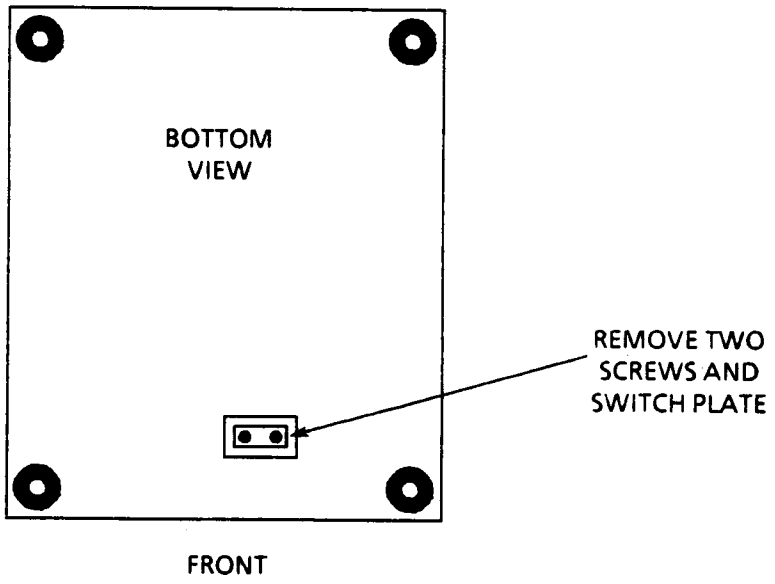


Figure 2-4. Accessing DIP Switch A1S2

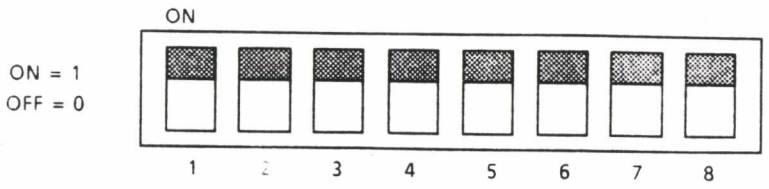
CAUTION

Vital receiver EEPROM calibration data is unguarded while the Miniceptor is in the Configuration mode. Do not set the Miniceptor for this mode unless absolutely necessary.

The Configuration mode allows hardware configuration parameters to be loaded into EEPROM. Typically, the Miniceptor should never have to be placed into this mode of operation. The only exception arises when there is a need to change the RS-232 or RS-422 baud rate to a value other than 300 or 9600 (default settings). To do this, the Miniceptor is required to be in the Configuration mode. Refer to **paragraph 2.4.3.6.3** for further information on changing the RS-232 or RS-422 baud rate. An LED, labeled CFG on the front panel, is illuminated when the Miniceptor is powered up and A1S2 is set for Configuration mode. Otherwise, this LED should remain extinguished.

2.2.3.1 DIP Switch A1S2 Settings

The positions of the switches in DIP switch A1S2 in some cases have different functions depending on whether the Miniceptor is configured for RS-232, RS-422, or HPIL interface. **Figure 2-5** illustrates the function of each switch position for HPIL, RS-232 and RS-422 versions.



HPIL VERSION

DIP SW POSITION:	FUNCTION:
8 7	**Reference Selection:**
0 0	Internal
0 1	External #1 (default = 1 MHz)
1 0	External #2 (default = 5 MHz)
1 1	External #3 (default = 10 MHz)
6	**Configuration Mode Selection:**
0	OFF
1	ON *

5 4 3 2 1	Address Selection:
0 0 0 0 0	00
0 0 0 0 1	01
0 0 0 1 0	02
0 0 0 1 1	03
0 0 1 0 0	04
0 0 1 0 1	05
0 0 1 1 0	06
0 0 1 1 1	07
0 1 0 0 0	08
0 1 0 0 1	09
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	not defined

RS-232C/RS-422A VERSION

DIP SW POSITION:	FUNCTION:
8 7	**Reference Selection:**
0 0	Internal
0 1	External #1 (default = 1 MHz)
1 0	External #2 (default = 5 MHz)
1 1	External #3 (default = 10 MHz)
6	**Configuration Mode Selection:**
0	OFF
1	ON *
5	**Baud Rate Selection:**
0	User specified
1	9600

4 3 2 1	Address Selection:
0 0 0 0	N/U
0 0 0 1	N/U
0 0 1 0	N/U
0 0 1 1	N/U
0 1 0 0	N/U
0 1 0 1	N/U
0 1 1 0	N/U
0 1 1 1	N/U
1 0 0 0	N/U
1 0 0 1	N/U
1 0 1 0	N/U
1 0 1 1	N/U
1 1 0 0	N/U
1 1 0 1	N/U
1 1 1 0	N/U
1 1 1 1	RS-232/RS-422

* CAUTION

Vital EEPROM calibration data is unguarded while the MIniceptor is in the Configuration mode (position 6 set to ON, 1). Do Not set the Miniceptor to this mode unless absolutely necessary.

Figure 2-5. DIP Switch A1S2 Configurations

2.2.3.1.1 Dip Switch A1S2 Settings (HPIL Version)

DIP switch settings for the HPIL interface selects the receiver reference, Configuration mode, and the HPIL address (see **Figure 2-5**). Addresses available are from 00 to 30. Positions 1-5 are used for address selection, position 6 for Configuration mode selection, and positions 7 and 8 for reference selection.

2.2.3.1.2 Dip Switch A1S2 Settings (RS-232 and RS-422 Versions)

DIP switch settings for both RS-232 and RS-422 interfaces select the receiver reference, Configuration mode, baud rate, and the RS-232 or RS-422 address (see **Figure 2-5**). Positions 1-4 are reserved for future use, position 5 for baud rate selection, position 6 for Configuration mode selection, and positions 7 and 8 for reference selection. Position 5 selects either 9600 (on) or user specified (off). The user specified default baud rate is 300. When a change to the user specified baud rate is desired, refer to **paragraph 2.4.3.6.3** for changing the defaulted RS-232 and RS-422 baud rates.

2.3 EQUIPMENT MALFUNCTIONS

The Miniceptor has been factory checked and adjusted for optimum performance prior to shipment. If malfunctions are encountered, verify the correct input signals are present at the proper jacks.

Avoid any corrective maintenance which would break an inspection seal and void the written warranty. Instead, contact your Watkins-Johnson representative or the Watkins-Johnson Company, CET Division, Gaithersburg, Maryland, USA.

2.4 OPERATION

2.4.1 CONTROLS AND INDICATORS

All Miniceptor controls and indicators are located on the front panel, see **Figure 2-4.** A power switch is provided for turning the unit on and off. Five LEDs are provided for monitoring the operating status of the unit. The following paragraphs further explain the function of each LED and the power switch.

2.4.1.1 **Power Switch (A1FL1S1)** - When set to the on (right) position, this two position toggle switch supplies +12 Vdc power, available at the front panel POWER connector, to the internal power supply.

2.4.1.2 **POWER Indicator (A1DS1)** - When the POWER switch is set to the on position, this LED illuminates indicating that +12 Vdc is available to the unit. In the event that the line power fuse (A1FL1F1) is blown or +12 Vdc is not present at the POWER connector, this LED will not illuminate.

2.4.1.3 **RUN Indicator (A1DS2)** - This LED illuminates approximately one second after the POWER LED indicating that the microcontroller is active and running properly.

2.4.1.4 **COR Indicator (A1DS3)** - This LED illuminates when the signal strength of a detected signal exceeds the selected COR threshold.

2.4.1.5 **ERR Indicator (A1DS4)** - In the event that a receiver error occurs, such as the LO's unlock or an internal power supply fails to meet specification, this LED illuminates.

2.4.1.6 **CFG Indicator (A1DS5)** - This LED illuminates when the receiver is powered up and configured for Configuration mode operation via DIP switch A1S2.

2.4.2 MODES OF OPERATION

The Miniceptor provides three modes of operation for acquiring RF signals. These are: Manual, Sweep, and Step. Manual mode is a fixed-tuned operation. Sweep mode provides contiguous coverage from a start frequency to a stop frequency. A Lockout function is available in the Sweep mode for locking out any unwanted frequencies. Step mode is for sequencing through specific points in the RF spectrum by use of preprogrammed memory channels. Both Sweep and Step are automatic modes of operation.

The selection of the Miniceptor mode of operation is controlled by messages sent to an operational mode control register. Changing the value in this register changes the mode of operation. When a mode of operation is changed, the Miniceptor moves to the active state of the new mode. Anytime a new mode of operation is entered, the Miniceptor will initialize that mode.

In the Sweep and Step modes the Miniceptor searches specified areas of the RF spectrum for signal activity. The action taken when a signal is acquired is based on the settings of internal dwell timers and two control registers: the Report Action Control register (RAC) and the Suspend Action Control register (SAC). These control registers allow for defining how a signal will be handled after it is received. Various types of Sweep and Step operations may be specified by messages sent to these control registers, such as; hold on signal, queue signals, only new signals, suspend on end of sweep, etc.

The following paragraphs provide more information on the three Miniceptor modes of operation, and the use of the RAC and SAC registers and dwell timers. References are made to the various remote commands for implementing the modes of operation. The Remote Operation section of this manual **(paragraph 2.4.3)** provides more details of the remote commands used for controlling the Miniceptor.

2.4.2.1 Manual (Fixed Tuned) Mode

This operational mode is not automatic. It allows the Miniceptor to be set to a specified fixed set of parameters. The parameters may be entered singularly or as a group or be executed from a memory channel. While in this operational mode the receiver is capable of generating an interrupt to the controller indicating signal acquisition, signal loss or both.

In the Manual mode of operation parameters such as frequency, detection mode, AGC, COR threshold, AFC, IF bandwidth, video bandwidth and others can be controlled. The Manual mode allows use of the receiver for signal analysis. The receiver while in this mode of operation may signal strength, COR status, and signal frequency offset values.

2.4.2.1.1 Setting the Tuned Frequency

The frequency command (FRQ) allows the tuned frequency of the Miniceptor to be set. This command controls all hardware parts of the receiver necessary to convert the desired input frequency to a detectable signal at the second IF of 21.4 MHz. If AFC operation is enabled, the receiver automatically adjusts this parameter to fine tune the signal. A host may query the Miniceptor for the current tuned frequency.

The frequency range is from 2.0000 to 513.9999 MHz in the standard receiver. When the WJ-860X/FE option is installed, the upper limit is extended to 2031.9999 MHz. The receiver firmware allows operation as low as 0 MHz for test purposes though receiver performance is only specified to 2 MHz.

The resolution of the frequency command is to 100 Hz. The actual tunning resolution is based on the tuning speed command (TSP). When the receiver is in slow tuning speed (TSP 1) the receiver resolution is 100 Hz. When the receiver is in fast tunning speed (TSP 2), the receiver resolution is 500 Hz. Regardless of the tuning speed the communications format includes 100 Hz resolution. While in fast tuning speed, the 100 Hz digit is internally truncated to 500 Hz resolution.

2.4.2.1.2 Selecting the Detection Mode

The detection mode selection allows the operator to decide by which of the detectors the IF information is to be processed. The basic receiver supports AM, FM, CW, PULSE and IFT (IF translation) detection modes. The WJ-860X/SSB option adds LSB and USB detection modes. This command causes the receiver firmware to connect the desired detector to the audio and video outputs, as well as to select AGC scheme and AFC disable operations. The receiver firmware maintains three different gate timers used for AGC operations as detailed below. The receiver firmware does not allow AFC operations in CW, IFT, LSB and USB detection modes.

Detection Mode	AGC Timer	AFC Disable	Video and Audio from:
AM	GTA	off	AM detector
FM	GTA	off	FM discriminator
CW	GTC	on	CW product detector
PULSE	GTP	off	AM detector
IFT	GTC	on	CW product detector
LSB	GTC	on	SSB detector
USB	GTC	on	SSB detector

2.4.2.1.3 Gain Control

The receiver supports AGC or manual attenuation operations for output level control. The operator may select AGC operation on or AGC operation off. When AGC operation is off, gain control of the receiver is via the ATN command. The ATN command allows the reduction of gain from maximum (ATN 0) in approximately 1 dB increments to gain minimum (ATN 111). The manual ATN value may be loaded from the current AGC value with the Load Gain (LDG) command.

When the AGC operation is on, the receiver firmware automatically adjusts the receiver attenuation to maintain a constant signal level output at the audio, video and switched IF outputs. The operation of the AGC firmware is automatically modified by the detection mode. In AM and FM detection modes, the AGC firmware adjusts the outputs based on the average AM detector value. In CW, IFT, LSB and USB, the AGC firmware adjusts the outputs based on the peak output level evaluated. In PULSE the output levels are adjusted to the peak value seen on the AM detector.

In AM, FM, CW, PULSE, and IFT detection modes the AGC fast attack is fixed at 5 dB/ms, the decay is based on the gate timer in use for that particular detection mode (see **paragraph 2.4.2.1.2**). The gate timer establishes how long the receiver must see a signal below AGC threshold before it will start increasing the gain. The gate timers are user programmable in msec.

The ATN value may be dumped in AGC by sending the Attenuator Dump (ATD) command to the receiver. This command causes the receiver to reset its gain to maximum and reattack the signal.

2.4.2.1.4 COR Operation

The Miniceptor provides outputs on the AUX connector and the remote interface indicating the absence or presence of a signal. The AUDIO output is also muted based on this operation. These outputs are based on the level of the signal and the programmed COR level. When a signal is over the programmed COR level, the outputs indicate signal presence. After the signal falls below the programmed COR level for a specified length of time, the signal absence is indicated via the remote interface. The COR output on the AUX connector is then delayed by another user-specified timer before indicating signal absence. COR operation is derived from the LOG display signal on the Demodulator assembly.

The COR level is set with the COR command. It is specified in dB above the theoretical noise floor for the selected IF bandwidth. The range of the COR level is from 0 to 55 dB. Zero causes the COR to continually indicate signal presence.

A COR Loss Timer (CLT) determines how long a signal must be absent before the COR indicates its loss. This timer is programmable in 20 ms increments from 0 to 2000 ms.

A COR Output Delay Timer (COD) determines how long the COR must indicate signal loss before indicating loss on the COR output on the AUX connector. This timer is programmable in 1 second steps from 0 to 5 seconds.

2.4.2.1.5 AFC Operation

The Miniceptor has built-in AFC firmware that tunes the receiver based on the DC level at the FM discriminator. The AFC operation may be turned on or off with the AFC command. AFC is only operational in AM, FM, and PULSE detection modes. When the AFC operation is enabled it becomes active and retunes the receiver when a signal exceeds the COR level, the LOG detector detects energy, and the FM discriminator indicates that the signal is more than 10% of the selected IF bandwidth off center frequency. As long as the signal is off frequency, the receiver continues to retune it. When the signal drops below COR threshold, the AFC process stops. The receiver remains at the last automatically tuned frequency.

2.4.2.1.6 IF Bandwidth Selection

The IF bandwidth commands allow selection of one of the five possible IF filters in the receiver or the IF bypass position. The IF filter may be selected by either the BWS (bandwidth slot) or BWC (bandwidth size) commands. Selection of an IF bandwidth causes the receiver firmware to automatically select the necessary gain, post IF filtering, and discriminator paths for the desired filter. If video filter mode is automatic, the receiver automatically selects the correct video filter for the current IF filter. In LSB and USB detection modes, the receiver automatically selects the narrowest IF that is greater than 6.4 kHz as a roofing filter. If a bandwidth command is sent at this time, it does not take effect until the SSB detection mode is exited. A BWA (bandwidth active) command allows a controlling device to interrogate which IF slot is currently active regardless of detection mode.

2.4.2.1.7 Video Bandwidth Selection

The video bandwidth may be selected automatically when the IF bandwidth is selected, bypassed or manually selected. The Video Bandwidth Mode (VBM) command allows the choice of video bandwidth operation. Video bandwidth is selected manually via the Video Bandwidth Slot (VBS) or Video Bandwidth Size (VBC) commands. In automatic video bandwidth selection, the video bandwidth is selected when the IF bandwidth is selected. While in automatic mode the manual VBS and VBC commands may override the automatic selection.

2.4.2.1.8 BFO and IFO Tuning

The receiver allows tuning of a variable oscillator mixing the final IF to baseband. For CW detection mode, the BFO command is used. Its range is ±4.00 kHz in 0.25 kHz steps. For IFT detection mode, the oscillator is controlled by the IFO command. The IFO command allows the oscillator to be tuned in 1 kHz steps ±2.000 MHz. In either case, the frequency specified is an offset from 21.4 MHz.

2.4.2.2 Sweep Mode

The Sweep mode is an automatic mode of operation that provides the capability to search preferred portions of the RF spectrum for signal activity. The Miniceptor uses specified start and stop frequencies and specified sweep increments for sweeping. The sweep can be incrementing from start frequency to stop frequency or decrementing from stop frequency to start frequency. The direction of the sweep is based on the selection of a sweep direction flag (up = start to stop, down = stop to start). The sweep is ended when the next tuned frequency is greater than the stop frequency if incrementing, or less than the start frequency if decrementing. Generally, the start frequency should be less than the stop frequency. If, however, the start frequency is greater than the stop frequency the sweep will consist of one point, either the start frequency or the stop frequency depending on the selected sweep direction flag. Sweep setups are entered and initialized by selecting one of two sweep operations: Sweep Immediate or Sweep Memory. These sweep operations are described below.

Sweep Immediate - When the Sweep mode of operation is selected, sweep parameters for a single sweep sector may be entered such as start frequency, stop frequency, sweep direction, etc. At this point selecting the Sweep Immediate operation causes the Miniceptor to use these entered parameters for the sweep.

Sweep Memory - This operation allows for selecting up to ten sweep sectors using parameters contained in preprogrammed memory channels. When this operation is selected, a sector list is used for entering memory channel(s) which contain the desired sweep sector parameters. Up to ten out of 100 Miniceptor memory channels may be entered on the sector list. When initiated the first memory channel on the sector list is swept, then the second channel is fetched and swept. When the last sweep of the sector list has been completed, the process starts over.

Sweep parameters may be entered and/or changed while the Miniceptor is actively sweeping either by single parameter inputs or by loading the sweep buffer from memory. This allows for optimizing the sweep without stopping, storing memory, and restarting. The parameter changes remain in the active sweep until the sweep buffer is reloaded. If the active sweep is using parameters from a memory channel, any parameter changes must be made and stored in the memory channel for the changes to be permanent.

The decision as to what action the Miniceptor will take when a signal is found is based on the Report Action Control register (RAC) (**paragraph 2.4.2.2.2**), the Suspend Action Control register (SAC) (**paragraph 2.4.2.4**), and the dwell timers (**paragraph 2.4.2.5**).

2.4.2.2.1 Sweep Lockout

Parts of the RF spectrum may be locked out from the sweep operation by use of the Sweep Lockout function. The area to be locked out is defined with a start-of-lockout frequency, a stop-of-lockout frequency, and a lockout channel number. The start-of-lockout frequency must be less than the stop-of-lockout frequency for the lockout to be accepted. The lockout information is stored in a selected lockout memory channel. The operator may then reference this data by the channel number under which it was stored. The Miniceptor must be in the Manual mode or in the Suspend state of Sweep or Step modes before lockout data can be entered. The Miniceptor's memory can contain up to 200 lockout bands.

2.4.2.2.2 Sweep Report Action Control (Sweep RAC)

A register called Report Action Control (RAC) determines what action is taken when a signal is found in Sweep or Step modes of operation. The Miniceptor allows a delta sweep function for reporting new signals and lost old signals while in the Sweep mode of operation. The delta sweep function is enabled by making requests for these reports to the Report Action Control register (RAC). The delta sweep covers a maximum of 8,192 points. While in this sweep operation, the Miniceptor keeps a COR status flag for each sweep frequency increment. During the first sweep, it assumes it had no previous signals. As it sweeps, it stops and reports on all signals it sees as new signals. On each successive sweep, the Miniceptor only stops on and reports the changes requested by the RAC register. Accordingly, a signal that is always up will only be reported on the first pass of the sweep. Every time the sweep is restarted the Miniceptor assumes a "no signal" condition for all points of the sweep. The delta sweep is only valid for buffer sweeps less than 8,192 points. In the event the sweep exceeds 8,192 points, all points with a signal past the 8,192nd point are reported as a new signal on each pass.

Another function controlled by the RAC register is the Ignore Lockout. When enabled, this function will cause the Miniceptor to ignore the data in its lockout memory and

report signals that are present in the lockout area. The RAC register also allows for enabling the "Don't Report or Stop on Adjacent Points" function. In normal operation, anytime a signal is over COR it is reported as well as multiple adjacent signal active points are stopped on and reported. When the "Don't Report or Stop on Adjacent Points" function is enabled, only the first point over COR is reported as a single signal at that frequency.

2.4.2.3 Step Mode

The Step mode is an automatic mode of operation that allows the Miniceptor to step through selected frequencies of the RF spectrum by use of preprogrammed memory channels. Each memory channel contains all of the parameters required for a complete receiver setup. A step channel list is used to enter up to twenty entries into the step operation. The entries may be discrete channel numbers or sets, each including a start and stop step channel number. Changes may be made to the parameters of a stored memory channel while the Step mode is active. After the changes are made and stored the new parameters will be used on the next pass of the modified memory channel. A memory channel can also be removed entirely from the step channel list while the Step mode is active. This is done by setting an idle flag parameter active in the memory channel, causing it to be ignored. The memory channel may be reinstalled at any time by resetting the idle flag to the inactive state.

As with the Sweep mode, the decision as to what action the Miniceptor will take when a signal is found in the Step mode is based on the Report Action Control register (RAC) (**paragraph 2.4.2.3.1**), the Suspend Action Control register (SAC) (**paragraph 2.4.2.4**), and the dwell timers (**paragraph 2.4.2.5**).

2.4.2.3.1 Step Report Action Control (Step RAC)

The Miniceptor allows a delta step function for reporting new signals or lost old signals while in the Step mode. The delta step function is enabled using a Report Action Control register (RAC). When either report new signals or report old lost signals are requested, the delta step function becomes active. When the delta step function is active, the Miniceptor reports all signals that it receives on the first pass of the step sequence as new signals. On all successive step sequences, only changes will be reported.

2.4.2.4 Suspend Function

The Sweep and Step modes of operation may be placed in a suspended state. When the operation is suspended the Miniceptor moves to a Sweep/Manual or Step/Manual type of operation. From the suspended operation, manual commands may be issued allowing a signal that was found in the automatic mode to be analyzed. The Miniceptor enters the suspended state by either of two methods; manually by remote command or automatically by control of the Suspend Action Control register (SAC). Five different automatic suspend actions may be set in the SAC register. These are: suspend on end of sweep, suspend on end of sweep sequence, suspend on end of step sequence, suspend on full queue, and suspend on reported signal acquisition. Once the Miniceptor has entered the suspended state, it can only be exited by enabling the operation (ENA command) or by changing the mode of operation. Returning to the active mode of operation from the suspended state causes the operation (Sweep or Step) to continue with the next successive point as though the suspend state had never taken place.

2.4.2.5 Dwell Timers

The Miniceptor provides three dwell timers that can be used to further control Sweep and Step operations. The dwell timers are: Pre Dwell, Signal Dwell, and Post Loss Dwell. The use of these dwell timers makes available operations such as queue, signal hold, synchronous search, and wait for response. The dwell timers, which are active in both Sweep and Step modes, are further explained in the following paragraphs.

2.4.2.5.1 Pre Dwell Timer

The Pre Dwell Timer defines how long the Miniceptor initially waits on a sweep or step frequency for signal activity. The Pre Dwell Timer can be set for up to 996 ms, in 4 ms increments, or can be set to infinity. A pre dwell of 0 implies that the Miniceptor will perform a minimum dwell before moving to the next frequency. Any time greater than 0 indicates the time in ms that the Miniceptor will wait on that frequency for a signal. With infinity selected the Miniceptor will dwell on a frequency until a signal is encountered or an advance command is issued. This type of operation allows control to be synchronous by use of remote commands. As soon as a signal over the COR level is encountered, the Miniceptor moves to Signal Dwell operation.

2.4.2.5.2 Signal Dwell Timer

The Signal Dwell Timer defines how long the Miniceptor stays tuned to an active frequency. The range of the timer can be set from 0 to 600 seconds, in 1 second intervals, or it can be set to infinity. The Signal Dwell Timer is initialized upon entry from Pre Dwell. The Miniceptor exits Signal Dwell when either the timer expires or the encountered signal drops below COR level. If the timer expires, the Miniceptor tunes to the next frequency. If the signal is lost, the Miniceptor moves to Post Loss Dwell operation. The timer continues on entry from Post Loss Dwell. With the Signal Dwell Timer set to infinity, the Miniceptor will stay in Signal Dwell until the signal is lost. This timer is cumulative for each frequency point in the sweep or step.

2.4.2.5.3 Post Loss Dwell Timer

Post Loss Dwell operation is entered from Signal Dwell upon loss of a signal. The Post Loss Dwell Timer specifies how long the Miniceptor waits for the return of a lost signal before tuning to a new frequency. The timer can be set to a range from 0 to 60 seconds or can be set to infinity. When this timer expires, the Miniceptor automatically tunes to the next frequency. If a signal is reacquired while in Post Loss Dwell, the Miniceptor returns to Signal Dwell operation. With the Signal Dwell and Post Loss Dwell timers set to infinity, the Miniceptor goes to a new frequency only by remote command. This timer is reinitialized each time Post Loss Dwell is entered.

2.4.3 REMOTE OPERATION

2.4.3.1 General

All Miniceptor operations are controlled by remote commands transferred over an interface bus. Three interface options available for controlling the operation of the Miniceptor

are the WJ-860X/HPIL Interface option, the WJ-860X/RS-232C Interface option, and the WJ-860X/RS-422 Interface option. The ASCII mnemonic structure for controlling the operation of the Miniceptor is the same when using any of these three interfaces. The protocol for all three interfaces is modeled after the IEEE-488.2 interface protocol standard. Because of the nature of these interfaces, there are some differences in the way data is handled over the respective interfaces. See **paragraph 2.4.3.5** for specific details on HPIL I/O operations if the WJ-860X/HPIL Interface option is employed. **Paragraph 2.4.3.6** provides details on RS-232C and RS-422 I/O operations if the WJ-860X/RS-232C or WJ-860X/RS-422 interface options are installed.

The Miniceptor implements a "speak when spoken to" ASCII mnemonic structure on all interfaces. The unit will only provide a response to query messages. Commands are assumed accepted unless an error is generated. On all interfaces the unit supports user selection of the asynchronous generation of service requests (SRQ). The actual implementation of the service request is based on the interface.

The following paragraphs provide general information for controlling the operation of the Miniceptor and apply to all interfaces.

2.4.3.1.1 Command Message Format

Command messages are exclusively ASCII-encoded data. Command headers consist of three-character mnemonics. "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 Miniceptor must be separated with a semicolon (;) character. In addition, multiple arguments of a single command must be delimited with commas.

Message may be terminated by the use of 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. The EOI is only valid for the HPIL interface.

2.4.3.1.1.1 Message Processing

When the Miniceptor receives a message, is 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 with the HPIL interface.

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 in the event status register and the rest of the message is not processed.

2.4.3.1.1.2 **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 numeric 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 which are multiple command queries are linked together in a series in the output buffer and delimited by a semicolon. All output message terminations consist of a CR (carriage return) and a LF (line feed) with an EOI sequence. The EOI sequence is only present on the HPIL interface.

2.4.3.1.2 **Details on Numeric Data Representation**

Numeric arguments that are used with commands are accepted in a forgiving numeric representation. This implies that the unit is a forgiving listener. All data output from the unit is in a fixed field, precise format.

Specific details on numeric representation used in this document are given below.

nrf - forgiving numeric representation

The nrf data element is composed of the sequential fields listed below. All fields are optional with one restriction: at least one digit must be present within the active data element.

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

This data structure defines all of the numeric data input. If the unit receives a nrf of a precision greater than it can handle, it will round 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 than one half. It rounds down on values less than one half.

nr1 - numeric response data - integers

Numeric response data format is composed of an optional sign, followed by any number of digits. The decimal point is implicitly defined to follow the last digit and is not present in the data element.

nr2 - nr2 numeric response data is composed of an optional sign field, followed by any number of digits, a decimal point, and any number of digits. As implied, there must be at least one digit on either side of the decimal point.

2.4.3.1.3 Handling of Communications Errors

The Miniceptor implements three types of communications errors: command errors, execution errors, and query errors. A command error indicates that the unit could not interpret the mnemonic in the input buffer. An execution error indicates when the data sent with the mnemonic is outside the range or acceptable format. A query error is generated when the output buffer overflows or its contents discarded. The contents of the output buffer are discarded when a terminated query is sent to the unit before the data from the previous query has been returned. Any command or execution error detected in the input buffer stops further processing of data in the input buffer and causes any remaining data to be ignored.

Any of these types of errors generates an SRQ if enabled. The actual cause of the error may be determined by reading the contents of the Status Bit Register. See **paragraph 2.4.3.4** for details on Miniceptor status reporting and reading the contents of status registers.

2.4.3.2 Miniceptor Device Messages

Device messages are commands that affect the operational parameters of the Miniceptor. These commands can be divided into the following operational subcategories:

- General Device Messages
- Signal Readings Messages
- Sweep and Step Modes Setup Parameters Messages
- Operational Control Messages
- Memory Operation Messages
- Sweep Lockout Messages
- Queue Messages
- Attenuator Test Operations Messages

The following paragraphs provide further details on the Miniceptor device messages in the above categories.

2.4.3.2.1 General Device Messages

The Miniceptor general device messages listed in **Table 2-2** are valid when the unit is in Manual, Sweep, or Step Suspended modes of operation.

Table 2-2. General Device Messages

Command	Response	Description
IDM nrf		Set receiver manual idle mode. 0 = Idle off; this is normal operation. 1 = Idle on; upon being placed in this state normal receiver operations halt without change and the IDM flag is set. The following processes are aborted: AFC, AGC, COR. The cor status output line and status bit become inactive. The unit no longer reacts to RF signal stimuli. While in step or sweep mode, if a memory channel is encountered with the IDM flag set, the memory channel is skipped.
IDM?	IDM nr1	Request idle mode status. Reset: IDM 0 Default: IDM 0 Example: IDM 1
FRQ nrf		Set frequency of receiver in MHz. Standard receiver (0002.0000-0513.9999) With FE option (0002.0000-2031.9999) Resolution is dependent on the tuning speed (TSP) selection. While in fast tuning speed the hundreds of Hz digit is truncated to either 0 or 5. The frequency data is unaltered.
FRQ?	FRQ nr2	Request current frequency of operation. Reset: FRQ 0002.0000 Default: FRQ 0002.0000 Example: FRQ 0511.9999
FRG?	FRG nr2,nr2	Request the lower and upper frequency limits of the unit in MHz. Example: FRG 0002.0000,0513.9999
TSP nrf		Select manual tuning speed choices. This allows selection of manual resolution tuning speed. This command has no affect on sweep or step operation. The unit uses fast tuning when in Sweep or Step operation. 1 = Slow tuning speed, 100 Hz resolution. 2 = Fast tuning speed, 500 Hz resolution.
TSP?	TSP nr1	Request current tuning speed choice. Reset: TSP 1 Default: TSP 1 Example: TSP 2

Table 2-2. General Device Messages (Continued)

Command	Response	Description
DET nrf		Select detection mode. 1 = AM 2 = FM 3 = CW 4 = AM PLS 5 = USB * 6 = LSB * 7 = not used 8 = IFT * Available with WJ-860X/SSB Option. Causes automatic roofing filter selection of the smallest IFBW (greater than 6.4 kHz). After deselecting USB or LSB, the previously specified IFBW (BWS) will be reselected.
DET?	DET nr1	Request current detection mode. Reset: DET 1 Default: DET 1 Example: DET 3
AGC nrf		Select status of gain control. 0 = Manual gain control 1 = Normal AGC on
AGC?	AGC nr1	Request current gain control status. Reset: AGC 1 Default: AGC 1 Example: AGC 0
ATN nrf		Set receiver input attenuation 0-111 dB.
ATN?	ATN nr1	Request current receiver input attenuation value. Reset: ATN 000 Default: ATN 000 Example: ATN 111
GTC nrf		Set gate timer for CW, SSB, and IFT AGC schemes. The timer establishes how long the receiver waits for signal energy before decaying the gain. The range is 4 ms to 252 ms in 4 ms increments.
GTC?	GTC nr1	Request current CW, SSB, and IFT AGC gate timer. Reset: GTC 252 Default: GTC 252 Example: GTC 004

Table 2-2. General Device Messages (Continued)

Command	Response	Description
GTA nrf		Set gate timer for AM and FM AGC schemes. The timer establishes how long the receiver waits for signal energy before decaying the gain. The range is 4 ms to 100 ms in 4 ms increments.
GTA?	GTA nr1	Request current AM and FM AGC gate timer. Reset: GTA 028 Default: GTA 028 Example: GTA 004
GTP nrf		Set gate timer for AM PLS schemes. The timer establishes how long the receiver waits for signal energy before decaying the gain. The range is for 4 ms to 252 ms in 4 ms increments.
GTP?	GTP nr1	Request current AM PLS gate timer. Reset: GTP 252 Default: GTP 252 Example: GTP 004
LDG		Load receiver attenuation (ATN) from current AGC attenuation value.
ATD		Attenuation dump. Causes the current attenuation value used by AGC to be set to zero. This command simulates an AGC dump operation. It has no affect on the manual (ATN) value.
AFC nrf		Select status of AFC operation. AFC operation is inhibited while in CW, IFT, USB, or LSB detection modes. 0 = AFC off 1 = AFC on
AFC?	AFC nr1	Request current AFC status. A query while in CW, IFT, USB, or LSB yields the actual condition and not the inhibited condition. Reset: AFC 0 Default: AFC 0 Example: AFC 1
BWS nrf		Select IF bandwidth slot 1-6. Selection of invalid slots causes an execution error. BWS 6 is IF bypass operation.
BWS?	BWS nr1	Request selected IF bandwidth slot. Reset: BWS 1 Default: BWS 1 Example: BWS 5

Table 2-2. General Device Messages (Continued)

Command	Response	Description
BWA?	BWA nr1	Request active IF bandwidth slot. In all detection modes other than USB and LSB the response of BWA and BWS are the same slot. Differences occur from automatic roofing filter selection in USB and LSB.
BWC nrf BWC?	 BWC nr2	Select IF bandwidth size in MHz. If requested size is not present, an error is generated. Range is from 0000.0000 to 0019.9999 MHz. Request active IF bandwidth size. Example: BWC 0000.0064
BWL?	BWL nr2,nr2, nr2,nr2,nr2, nr2	Request list of IF bandwidths (in MHz) installed in the receiver. The list is slot ordered. A zero in a field indicates the absence of a filter in that slot. Sixth slot is bypass. Example: BWL 0000.0100,0000.0200,0000.0500,0000.3000, 0002.0000,0012.0000
VBS nrf VBS?	 VBS nr1	Select video bandwidth slot 1-5. Request active video bandwidth slot. Reset: Based on video bandwidth configured for BWS 1. Default: Based on video bandwidth configured for BWS 1. Example: VBS 2
VBC nrf VBC?	 VBC nr2	Select video bandwidth size in MHz. If requested size is not present an error is generated. Request active video bandwidth size in MHz. Example: VBC 0000.3000
VBL?	VBL nr2,nr2, nr2,nr2,nr2	Request list of Video bandwidth sizes in MHz installed in the receiver. The list is slot ordered. A zero in a field indicates the absence of a filter in that slot. Example: VBL 0000.0100,0000.0200,0000.0500, 0000.3000,0002.0000

Table 2-2. General Device Messages (Continued)

Command	Response	Description
VBM nrf		Set type of video bandwidth selection. 0 = Manual: allows selection by use of VBS or VBC commands. 1 = Automatic: video bandwidth is chosen based on the IF bandwidth. This relationship is established in Configuration mode. The automatic selection is only made when the IF bandwidth is selected. 2 = Bypass the video filters. 3 = Mute the video output.
VBM?	VBM nr1	Request current video bandwidth mode. Reset: VBM 1 Default: VBM 1 Example: VBM 0
BFO nrf		Set BFO frequency in kHz from +4.00 to -4.00 in .25 kHz steps. This is used for CW detection.
BFO?	BFO nr2	Request current BFO frequency. Reset: BFO +0.00 Default: BFO +0.00 Example: BFO -3.75
IFO nrf		Set IF downconverter oscillator frequency in MHz from +2.000 to -2.000 MHz in 0.001 MHz steps. This oscillator is only used in IFT detection mode.
IFO?	IFO nr2	Request current IFO frequency. Reset: IFO +0000.0000 Default: IFO +0000.0000 Example: IFO +0002.0000
COR nrf		Set COR level from 0 to 55 dB above theoretical noise floor. A number of -1 sets COR to the off condition.
COR?	COR nr1	Return current COR value. The number -01 is returned for COR off. Reset: COR +00 Default: COR +00 Example: COR -01

Table 2-2. General Device Messages (Continued)

Command	Response	Description
CLT nrf		Set COR loss timer in msec. This timer specifies the amount of time the signal must be below COR threshold after detection before a signal loss is reported. Range is from 0 to 2000 ms in 20 ms increments. The COR status is driven as a result of this timer.
CLT?	CLT nr1	Request the value of the COR loss timer. Reset: CLT 0000 Default: CLT 0000 Example: CLT 0020
COD nrf		COR output delay timer. This timer establishes how long the COR output signal is held active after the COR status changes from signal to no signal. This timer starts after COR loss timer (CLT) expires. The range of this timer is from 0 to 5 seconds in 1 second steps.
COD?	COD nr1	Request the current COR output delay timer value. Reset: COD 0 Default: COD 0 Example: COD 4
BYP nrf		Set bypass status on the preselector. 0 = bypass off 1 = bypass on
BYP?	BYP nr1	Request the current bypass condition. Reset: BYP 0 Default: BYP 0 Example: BYP 1
SAO nrf		Set the selected audio output on or off. 0 = selected audio off 1 = selected audio on
SAO?	SAO nr1	Return the current SAO condition. Reset: SAO 0 Default: SAO 0 Example: SAO 1

2.4.3.2.2 Signal Readings Messages

The mnemonics in this message category are valid in Sweep, Step, or Manual modes of operation. The numeric response field for any of these numbers is replaced with asterisks (*) if the response is invalid at the time of the reading. Causes for an an invalid reading may be an active sweep or step. The commands in this message category are listed in **Table 2-3.**

Table 2-3. Signal Readings Messages

Command	Response	Description
CST?	CST nr1	Request the current COR status. 0 = COR is not exceeded 1 = COR is exceeded Example: CST 0
FMO?	FMO nr1	Request the FM Offset percentage of the selected IF bandwidth. The range is from +100 to -100. A positive number indicates the signal is greater than tuned frequency. Example: FMO +050 Example: FMO ****
AMD?	AMD nr1	Request current AM detector value in +/- dB. This number will be of little value while AGC is active. When AGC is inactive this number is used to establish the amount of attenuation required to place the signal in a linear portion of the detector. The range is from -22 dB to +14 dB. The zero point represents the typical gain set position. Example: AMD +10 Example: AMD ***
AMP?	AMP nr1	Request the current AM peak detector value in +/- dB. This number is of little value while AGC is active. The range is from -22 dB to +14 dB. The zero point represents the typical gain set point for CW, LSB, USB and PLS detection modes. Example: AMP +05
LGD?	LGD nr1	Request the current log display detector value in dB above the theoretical noise floor. The range is from 0 to 60 dB. Example: LGD 25 Example: LGD **
SPI?	SPI nr1	Request the status of the IF spectrum. 0 = spectrum is upright 1 = spectrum is inverted Example: SPI 1

Table 2-3. Signal Readings Messages (Continued)

Command	Response	Description
SGS?	SGS nr1	Return the current signal strength in dBm. This number is a result of the AGC operation. If the receiver is in manual gain, an invalid indication may be returned. Range of this number is 0 to -127. Example: SGS -100 Example: SGS<<<< (insufficient manual gain) Example: SGS >>>> (overload) Example: SGS **** (no valid reading)
SGV?	SGV nr1,nr1, nr1,nr1	Request the current list of signal values; SPI, CST, SGS, FMO. If any of this fields are invalid an asterisk will be returned in that field. Example: SGV 0,0,-100,+050 (indicates upright spectrum, COR level not exceeded, signal strength is -100 dBm, and FM offset is 50% of the selected bandwidth.)

2.4.3.2.3 **Sweep and Step Modes Setup Parameters Messages**

The mnemonics in this message category are valid in Sweep, Step, and Manual modes of operation. These commands are used to set up the Miniceptor for Sweep and Step operations such as start and stop frequencies, RAC and SAC registers parameters, dwell timer parameters, etc. The commands in this message category are listed in **Table 2-4.**

Table 2-4. Sweep and Step Setup Parameters Messages

Command	Response	Description
FRA nrf		Set start frequency for sweep in MHz. The same limits that apply to the FRQ command apply here.
FRA?	FRA nr2	Request start frequency for sweep. Reset: FRA 0002.0000 Default: FRA 0002.0000 Example: FRA 0111.9999
FRB nrf		Set stop frequency for sweep in MHz. The same limits that apply to the FRQ command apply here.
FRB?	FRB nr2	Request stop frequency for sweep. Default: FRB 0512.0000 Example: FRB 0111.9999

Table 2-4. Sweep and Step Setup Parameters Messages (Continued)

Command	Response	Description
INC nrf		Set sweep increment frequency in MHz. This is the frequency increment that will be used in sweep mode. The range is from 0000.0001 MHz to 513.9999 MHz with 0000.0001 MHz resolution.
INC?	INC nr2	Request sweep increment. Reset: INC 0000.1000 Default: INC 0000.1000 Example: INC 0011.9995
PDW nrf		Set pre dwell time for sweep or step. This is the time the receiver waits on a frequency for signal activity. The range is from 0000 to 996 ms with 4 ms increments. Entries of other than 4 ms increments will be rounded to the nearest 4 ms increment. (2 ms is rounded to 4 ms, 1 ms is rounded to 0 ms). Selection of -1 ms yields pre dwell until advance command. A selection of zero causes minimum signal sample time.
PDW?	PDW nr1	Request the current pre dwell number. Reset: PDW +000 Default: PDW +000 Example: PDW -001
SDW nrf		Set the signal dwell time for sweep or step. This is the cumulative time the receiver spends listening to a single frequency during a sweep or scan pass. The range is from 0 to 600 seconds, in one second increments. A selection of -1 seconds causes the timer to be infinity; this causes the receiver to stay on the signal as long as it is active. A selection of 0 represents a queue operation.
SDW?	SDW nr1	Request the current signal dwell time. Reset: SDW -001 Default: SDW -001 Example: SDW +000
LDW nrf		Set the post signal lost dwell timer for sweep or step. This is the time the receiver waits after the signal is lost before continuing the sweep or step. The range of the entry is from 0 to 60 seconds. A setting of -1 seconds will cause the receiver to hold on a frequency until advanced or signal dwell timer expires.
LDW?	LDW nr1	Request current post signal lost timer. Reset: LDW +000 Default: LDW +000 Example: LDW +010

Table 2-4. Sweep and Step Setup Parameters Messages (Continued)

Command	Response	Description
RAC nrf		Set the report action control register. This register allows the report action to be controlled for sweep or step modes of operation by setting the associated register bit high. BIT DESCRIPTION 0 Report new signals only. This is only active in sweep or step. This option is only valid for the first 8,192 points of a sweep. 1 Report old lost signals only. This action is only effective in buffer sweep or step with queue operations. Lost signals may be placed in the signal queue. This option is only valid for the first 8,192 points of a sweep. 2 Ignore the lockout list. This causes the receiver to ignore its lockout memory. 3 Don't report or stop on adjacent points while in sweep or manual. The signal must drop below COR before a new signal is stopped on or reported. The assumed COR status each time the sweep restarts is 0. This means a sweep with all points over COR stops at and reports the first point and only the first point with this option enabled. In step mode, this option has no affect. 4-7 Not used
RAC?	RAC nr1	Request the entry currently in the report action control register. Reset: RAC 000 Default: RAC 000 Example: RAC 003
SAC nrf		Set the suspend action control register. This register allows sweep or step actions to suspend the current sweep or step. The task can only be restarted by receiving an enable or an operational mode change. BIT DESCRIPTION 0 Suspend on end of sweep. 1 Suspend on end of sweep sequence. 2 Suspend on end of step sequence. 3 Suspend on full queue. 4 Suspend on reported signal acquisition. 5-7 Not used
SAC?	SAC nr1	Return the current suspend action control register value. Reset: SAC 0 Default: SAC 0 Example: SAC 1

Table 2-4. Sweep and Step Setup Parameters Messages (Continued)

Command	Response	Description
SWD nrf		Sweep direction. 0 = Sweep from FRB down to FRA. 1 = Sweep from FRA up to FRB.
SWD?	SWD nr1	Request current sweep direction. Reset: SWD 1 Default: SWD 1 Example: SWD 0
SWO nrf		Select the type of sweep operation. 0 = Sweep immediate, this causes the sweep to use the entered parameters for the sweep. (FRA, FRB, INC) 1 = Sweep memory, this operation causes the sector list to be used to identify the sweep area. Each channel in the list is swept then the next channel is fetched. When the end of the list has been swept the process starts over. A single channel may be entered in the sector list to load a single sweep set from memory.
SWO?	SWO nr1	Request the current sweep operation. Reset: SWO 0 Default: SWO 0 Example: SWO 1
SWL nrf,nrf, nrf,nrf,nrf, nrf,nrf,nrf, nrf,nrf		This is the list of 1 to 10 memory channel numbers that are to be used for sector sweep sequences. This list is only used when sector sweep is on.
SWL?	SWL nr1, nr1...,nr1	This command returns the current sector sweep list. The length of the list is based on the number of entries. Reset: SWL Default: SWL Example: SWL 001,002,003,019
STL nrf,nrf, nrf,nrf,nrf, nrf,...nrf or (nrf:nrf), (nrf:nrf),nrf, ...(nrf:nrf)		This command allows entry of a step channel list. The list may have a maximum of 20 numeric entries. Single numeric entries separated by commas indicate single step channels. Numbers in parentheses indicate ascending, inclusive, groups to be stepped. Each group represents two numeric entries for establishing the start channel and stop channel of a step list.

Table 2-4. Sweep and Step Setup Parameters Messages (Continued)

Command	Response	Description
STL?	STL nr1,nr1, nr1,nr1,nr1, nr1,...nr1 or (nr1:nr1), (nr1:nr1), nrf,...(nr1:nr1)	This query returns the step channel list. Reset: STL Default: STL Example: STL 001,002,003,019 Example: STL (001:005),007,(009:011)

2.4.3.2.4 Operation Control Messages

The mnemonics in this message category are valid in Manual, Sweep, and Step modes of operation. These commands are used for selecting and enabling the Miniceptor modes of operation. The commands in this message category are listed in **Table 2-5.**

Table 2-5. Operation Control Messages

Command	Response	Description
*RST		This command causes all receiver device messages to be set to the reset values.
OPR nrf		Set the receiver operating mode. 1 = Manual operation 2 = Sweep operation 3 = Step operation
OPR?	OPR nr1	Request the current operational mode. Reset: OPR 1 Default: OPR 1 Example: OPR 2
SWS?	SWS nr1	Request Sweep operation status. 0 = Sweep off 1 = Sweep active 2 = Sweep suspended Reset: SWS 0 Default: SWS 0 Example: SWS 2
MST?	MST nr1	Request Manual operation status. 0 = Manual off 1 = Manual active Reset: MST 1 Default: MST 1 Example: MST 0

Table 2-5. Operation Control Messages (Continued)

Command	Response	Description
SST?	SST nr1	Request Step operation status. 0 = Step off 1 = Step active 2 = Step suspended Reset: SST 0 Default: SST 0 Example: SST 1
DWS?	DWS nr1	Request current dwell state. This command returns the current state of the dwell. 0 = None of the dwell states are active. 1 = Pre-dwell active 2 = Signal dwell active 3 = Post loss dwell active Reset: DWS 0 Default: DWS 0 Example: DWS 1
ADV		The advance command causes Sweep or Step to advance to the next frequency if the current state is active.
ENA		The enable command causes a suspended operation to be restored to active. This command has no effect if the operation is not currently suspended. The command only has an effect in Sweep or Step operational modes. When the operation is continued it starts from the original suspended frequency. Any frequency tuning done during the suspend has no affect when the operation is continued.
SUS		Suspend the operation. This command causes the sweep or step to be placed in the suspend state. While in the suspend state, Manual operations may be performed.
RES		Restart the operation. This command causes an active or suspended sweep or step to be restarted from the beginning.

2.4.3.2.5 Memory Operation Messages

The mnemonics in this message category are valid in Manual, Sweep, or Step modes of operation. These commands, listed in **Table 2-6** are used to setup memory channels for operation.

Table 2-6. Memory Operation Messages

Command	Response	Description
STO nrf		Store current parameters to memory channel specified. Range is from 1 to 100.
RCE nrf		Recall and execute memory channel specified. Range is from 1 to 100.
SMD nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf		Store directly to the specified memory channel the following data list. The data of this command is field dependent. Each comma causes the next field to be selected. Any blank data fields will cause the specified parameter to remain unchanged in memory. The command may be terminated after any complete field. The remaining data is unchanged.

Field	Parameter	Range
1	Memory channel number	1 to 100
2	Idle mode status (IDM)	0,1
3	Tuned frequency (FRQ)	see (FRG?)
4	Bandwidth slot (BWS)	1 to 6
5	Cor threshold (COR)	-1 to 55
6	Detection mode (DET)	1 to 7
7	AGC mode (AGC)	0,1
8	Attenuation setting (ATN)	0 to 111
9	AFC mode (AFC)	0,1
10	Pre-signal dwell (PDW)	-1 to 999
11	Signal dwell (SDW)	-1 to 600
12	Post signal lost dwell (LDW)	-1 to 60
13	Sweep start frequency (FRA)	see (FRG?)
14	Sweep stop frequency (FRB)	see (FRG?)
15	Sweep increment frequency (INC)	.0005 to 20 MHz
16	Sweep direction (SWD)	0,1
17	BFO frequency (BFO)	-4.00 to +4.00 kHz
18	IFO frequency (IFO)	-2.000 to +2.000 MHz

Command	Response	Description
RMD nrf?	SMD nr1,nr1, nr2,nr1,nr1, nr1,nr1,nr1, nr1,nr1,nr1, nr1,nr2,nr2, nr2,nr1,nr2,nr2	Recall directly from memory the specified memory channel. See (SMD) for field definitions of the response. Reset: no change Default: SMD ###,0,0020.0000,1,+00,1,1,000,0,+000, -001,+000,0020.0000,0512.0000,0000.0200,1,+0.00, +0000.0000 (Note: ### indicates channel number. This is the default for all storage memory channels. This is also the memory cleared condition.) Example: SMD 001,0,0025.9999,2,+10,3,1,000,1,+000, -001,+010,0110.0000,0121.1000,0000.0200,1,+0.00, +0000.0000

Table 2-6. Memory Operation Messages (Continued)

Command	Response	Description
CLM nrf		Clear specified memory area. The argument is bit mapped to indicate the area to be cleared. BIT DESCRIPTION 0 Clear channel storage memory. 1 Clear lockout memory.

2.4.3.2.6 **Sweep Lockout Messages**

The mnemonics in this message category are valid in Manual, Sweep, and Step modes of operation. These commands, listed in **Table 2-7**, are used for controlling parameters pertaining to Sweep mode lockout channels.

Table 2-7. Sweep Lockout Messages

Command	Response	Description
LCK nrf,nrf, nrf		Enter a lockout channel to be used in Sweep operation. The lockout is specified as a start and stop frequency in ascending order. The channel number assigned with this command remains constant as channels are added or deleted. This lockout data will overwrite any previous data at the specified channel. Field Parameter 1 Channel number from 1 to 200. 2 Start frequency of the lockout from 0002.0000 to (high limit of receiver). 3 Stop frequency of the lockout from 0002.0000 to (high limit of the receiver). Note: The stop must be greater than the start or else an Execution error is generated.
ULC nrf		Unlock channel specified. Causes the specified channel to be cleared. This returns it to the default condition.
RLK nrf?	LCK nr1,nr2, nr2	Recall the specified lockout channel. The returned values are in the form of the LCK command. They are channel, start frequency and stop frequency. Reset: no change Default: All lockout channels contain start and stop frequencies of 0000.0000. Example: LCK 001,0025.0000,0026.0000
SLM?	SLM nr1	Request the available space in lockout memory in unused channels.

2.4.3.2.7 Signal Queue Messages

The mnemonics in this message category are valid in Manual, Sweep, and Step modes of operation. These commands relate to signal queue operations and are listed in **Table 2-8.**

Table 2-8. Signal Queue Messages

Command	Response	Description
QUE?	QUE nr2:nr1: nr1,nr2:nr1: nr1,nr2:nr1: nr1	Return the signal queue. The queue consists of up to 50 of the most recently reported entries. Each entry consists of a frequency, memory channel (0 if sweep immediate mode) and an activity indicator (0=inactive, 1=active). Reading of the queue causes it to be cleared. After 50 entries are collected the next entry causes the first entry to be lost. Information is only loaded to the queue from active step or sweep. Reset: QUE Default: QUE Example: QUE 0025.0100:000:1,0025.0100:000:0
CQU		Clear the signal queue.

2.4.3.2.8 Attenuator Test Operations

The mnemonics in this message category are valid in Manual mode only. These commands only work in manual gain control. When an operation such as BWS or ATN is sent, the gain is set according to that command. These commands may be sent to control the Miniceptor's attenuators directly. They work on a "last one there wins" control basis. The query responds with the last data base entry, not the current condition. See **Table 2-9** for a list of the commands in this message category. Note: <u>These commands are intended for maintenance operations only</u>.

Table 2-9. Attenuator Test Operations Messages

Command	Response	Description
ATR nrf ATR?	ATR nr1	Set RF attenuator 0-23 dB. Request RF attenuator.
ATI nrf ATI?	ATI nr1	Set 1st IF attenuator 0-23 dB. Request 1st IF attenuator.
ATS nrf ATS?	ATS nr1	Set 2nd IF attenuator 0-23 dB. Request 2nd IF attenuator.
ATF nrf ATF?	ATF nr1	Set final IF attenuator 0-23 dB. Request final IF attenuator.
Default for all above queries: ATx 00		

2.4.3.3 Miniceptor Communication Messages

The commands in this message category are always valid. These are commands which establish communications between the Miniceptor and the controller. The mnemonics associated with this message category are listed in **Table 2-10.**

Table 2-10. Communication Messages

Command	Response	Description
CFG?	CFG nr1	Request status of configuration mode switch (switch 6 in DIP switch A1S2). 0 = the unit is set to operation mode. 1 = the unit is set to configuration mode. Default: Position of DIP switch Example: CFG 0
*OPC		Operation complete switch. When this command is sent with a data string, the OPC bit in the Event 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	This command returns a bit mapped value of 16 bits indicating the options installed in the unit. BIT OPTION 0 WJ-860X/FE - 2.0 GHz Frequency Extender 1 WJ-860X/SSB - Single Sideband Filter 2 WJ-860X/WBO - Wideband IF Output 3-15 Not used. Default: *OPT 00000 Example: *OPT 00001 (Indicates FE option installed)
*CLS		This command causes all the communication status registers to be cleared.
*STB?	*STB nr1	This command returns the Status Byte Register. This is a summary level status byte indicating the general cause of interrupts. The Status Byte Register is cleared by power up. The *CLS command clears all bits of this command but bit 6. BIT FUNCTION 0 Receiver Status Bit (RSB) 1 Not used 2 Not used 3 Not used 4 Message Available (MAV) bit 5 Event Summary Bit (*ESB) 6 Request Service (RQS) bit 7 Not used Example: *STB 000

Table 2-10. Communication Messages (Continued)

Command	Response	Description
*SRE nrf		This command allows the writing to the Service Request Enable Register. The appropriate bit must be set to generate an interrupt via the Status Byte Register indicated event. BIT FUNCTION 0 Enable RSB interrupt 1 Not used 2 Not used 3 Not used 4 Enable MAV interrupt 5 Enable ESB event interrupt 6 Not used 7 Not used
*SRE?	*SRE nr1	This command allows the reading of the Service Request Enable Register. Reset: No change Default: *SRE 000 Example: *SRE 255 (Indicates all bits set high)
*ESR?	*ESR nr1	This command responds with the current setting of the Event Status Register. BIT FUNCTION 0 OPC operation complete 1 Not used 2 QYE query error 3 DDE device dependent error 4 EXE execution error 5 CME command error 6 Not used 7 PON power on Cleared by: *ESR?, power up, *CLS Example: *ESR 000
*ESE nrf		This command allows writing to the Event Status Enable Register. This register allows events that set a flag in the Event Status Register to be passed on to the Event Status Bit (bit 5) of the Status Byte Register. BIT FUNCTION 0 Enable OPC (operation complete) 1 Not used 2 Enable QYE (query error) 3 Enable DDE (device dependent error) 4 Enable EXE (execution error) 5 Enable CME (command error) 6 Not used 7 Enable PON (power on)

Table 2-10. Communication Messages (Continued)

Command	Response	Description
*ESE?	*ESE nr1	Read the current value of the Event Status Enable Register. Reset: no change Default: *ESE 000 Example: *ESE 255
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 ABS, signal fell below COR threshold. This is an edge triggered event on the action of a signal going from above COR threshold to below COR threshold. 2 NEW, new signal found. This bit indicates that a signal has been found that was not active on the previous pass of the sweep or step sequence. This bit is only set while the report new signals flag is set. 3 OLD, old signal no longer present. This bit indicates that a signal that was previously present is not present and was placed in the queue. This bit is only set while the report old lost signals flag is set. 4 ESW, end of single sweep. This bit indicates the end of sweep has been encountered. This bit is only set while in sweep mode. 5 ESS, end of single sweep sequence. This bit indicates the end of a sweep sequence has been encountered. The bit is only set while in the sweep memory mode. 6 ESP, end of single step sequence. This bit indicates that the single step sequence has been completed. The bit is only set while in the step mode. 7 FQE, full queue encountered. This bit indicates that the signal queue is full and any further entries causes the oldest entries to be lost. 8-15 Not used

Table 2-10. 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 Enable ABS, signal below COR event to set the RSB bit. 2 Enable NEW, new signal event to set the RSB bit. 3 Enable OLD, old lost signal event to set the RSB bit. 4 Enable ESW, end of single sweep event to set the RSB bit. 5 Enable ESS, end of sweep sequence event to set the RSB bit. 6 Enable ESP, end of step sequence to set the RSB bit. 7 Enable FQE, full queue event to set the RSB bit. 8-15 Not used
RSE?	RSE nr1	Request the contents of the Receiver Status Enable Register. Reset: no change Default: *RSE 00000 Example: *RSE 00001
CDE?	CDE nr1	Request the current Device Dependent Error Register contents. The response is a bit mapped 16 bit word indicating current error conditions. Reading the register has no effect on it. BIT FUNCTION 0 Supply fault - This bit is set to indicate a supply fault. One or more of the bits may be set below if a concise failure mode can be determined. 1 +12 Vdc fault 2 +7-7.5 Vdc fault 3 -7.5 Vdc fault 4 +30 Vdc fault 5 1st LO unlocked-greater than allowed lockup timer. 6 2nd LO unlocked - greater than allowed lockup timer. 7 2nd LO translation loop unlocked - greater than allowed lockup timer.

Table 2-10. Communication Messages (Continued)

Command	Response	Description
CDE? (Cont'd)	CDE nr1	BIT FUNCTION 8 A/D error 9 Reserved 10 Reserved 11 Freq extender LO unlocked 12 EPROM failure to be written 13-15 Not used Example: CDE 00000
DDE?	DDE nr1	Request the latched error status. The response is a bit mapped 16 bit word indicating the error conditions that have occurred since the last reading of the Device Dependent Error Register. Reading the register clears it until the error condition is corrected and reappears, or upon a new power up. An event causing this register to be loaded with an error event sets the DDE bit in the Event Status Register. BIT FUNCTION 0 Supply fault - this bit is set to indicate a supply fault. One or more of the bits may be set below if a concise failure mode can be determined. 1 +12 Vdc fault 2 +7.5 Vdc fault 3 -7.5 Vdc fault 4 +30 Vdc fault 5 1st LO unlocked 6 2nd LO unlocked 7 2nd LO translation loop unlocked 8 A/D error 9 EEPROM has been defaulted 10 RAM has been defaulted 11 Frequency extender LO unlocked 12 EEPROM failure to be written 13-15 Not used Example: DDE 00000
*IDN?	*IDN (see example)	This command returns the Miniceptor identity. The fields provide the following order of information: manufacture, model number, serial number, and software version number. Reset: no change Default: *IDN_WJ,860X_-_ _,99999,0.00 Example: *IDN_WJ,860X_-_ _,00001,0.00

Table 2-10. Communication Messages (Continued)

Command	Response	Description
HAD nrf		Specify the handoff address for the handoff net. This command is only valid for the WJ-860X/HPIL Interface option. The range is from 1 to 99. A -1 indicates the receiver ignores all data on the handoff net. This parameter is defaulted to the address specified on the HPIL address switch on defaulted memory.
HAD?	HAD nr1	Request the current handoff address. Reset: no change Default: address on HPIL switch Example: HND +99
RTK nrf?	RTK nr1	Request token from the receiver. If token is granted response will match request. If token is held by another controller response will be number of the other controllers token request. Token can be any number from 0 to 99.
RTK		Return token to receiver. It may now be requested by another controller. Power up: RTK 00 Default : RTK 00 Example : RTK 09

2.4.3.4 **Miniceptor Status Summary**

Figure 2-6 illustrates the architecture of the Miniceptor's status register. It is composed of four eight-bit registers and three 16-bit registers, whose logic gating allows the programmer great flexibility in remote operations. The four eight-bit registers and two of the 16-bit registers can be split into three pairs. Each pair consist of a status register and an enable register.

One pair is composed of the Event Status Register (whose functions are summarized in **Table 2-12**) and the Event Status Enable Register. Each bit in the Event Status Register is logically ANDed to a bit in the Event Status Enable Register. The ANDed combination of these two registers are logically ORed to set the Event Status Bit (ESB) of the Status Byte Register. The Device Dependent Error Bit (DDE) of the Event Status Register is the ORed combination of the 16-bit Device-Dependent Error Register (see **paragraph 2.4.3.4.3**).

The second pair is composed of the Status Byte Register and the Service Request Enable Register. The Miniceptor uses only four bits of the Status Byte Register as described in **Table 2-11**. The ANDed combination of the Status Byte Register and the Service Request Enable Register are logically ORed to determine the setting of bit 6 (RQS) of the Status Byte Register. If the RQS bit is set high, a service request is asserted.

The third pair is composed of the Receiver Status Register (whose functions are summarized in **Table 2-14**) and the Receiver Status Enable Register. The ANDed combination of these two registers are logically ORed to set the Receiver Status Bit (RSB) of the Status Byte Register.

2.4.3.4.1 Status Bytes

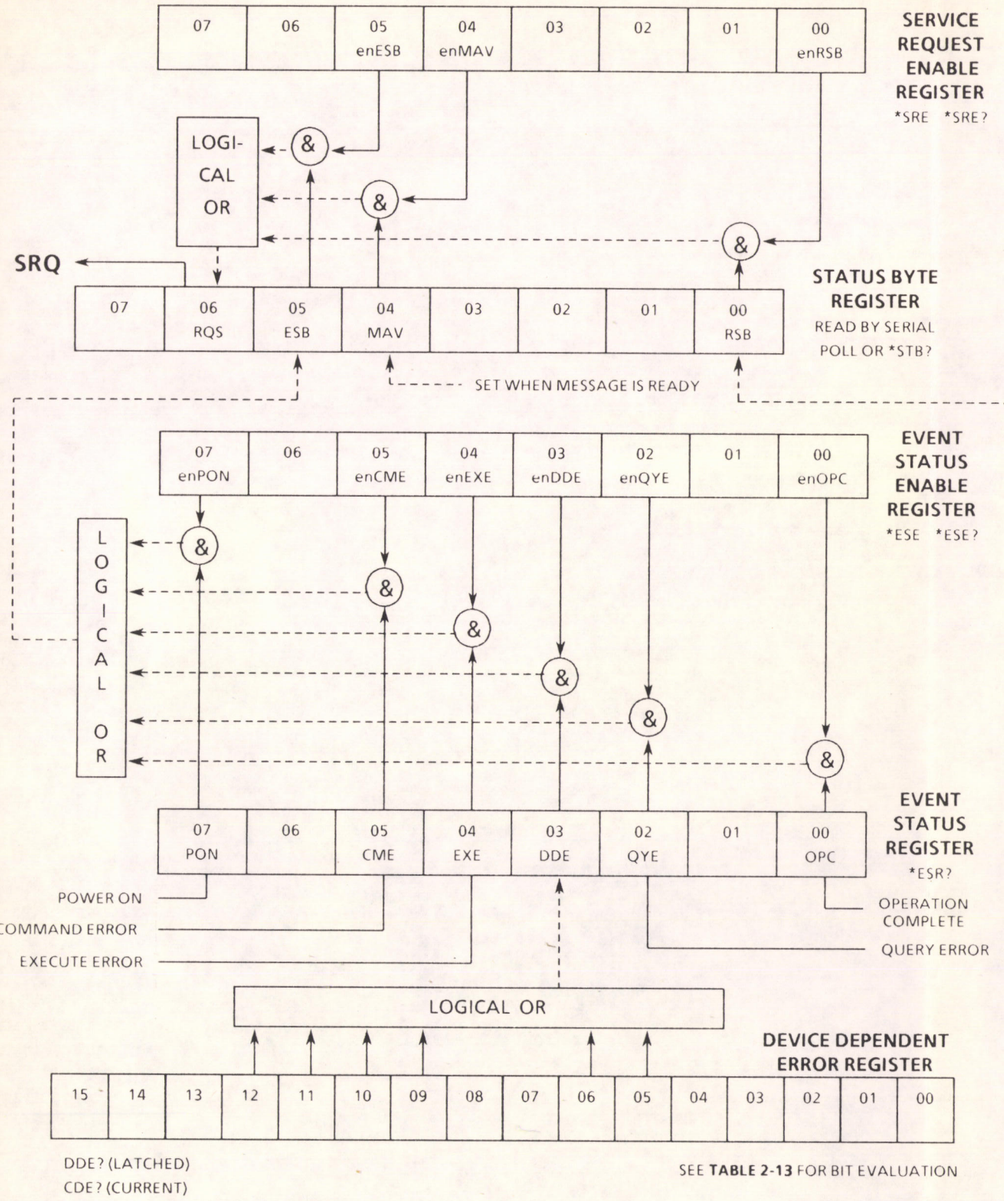
The following information discusses the operation of the serial poll and the "*STB?" query. The operation of these two is very similar. The serial poll status byte allows the controller to establish which event has caused the Miniceptor to set the SRQ. The "*STB?" query response includes similar information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

Serial Poll - When the Miniceptor services a serial poll, the unit outputs the decimal equivalent of the Status Byte Register and clears the SRQ and the Status Byte Register. The evaluation of each bit in this status byte is listed in **Table 2-11.**

***STB? Query** - The Status Byte Register can also be read using the *STB? query. The primary difference between a serial poll and the *STB? query operation is that the *STB? query does not clear the SRQ status line.

Table 2-11. 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 2.4.3.4.4**). This bit is cleared by *CLS or by reading the contents of the Receiver Status Register.
1	N/U	
2	N/U	
3	N/U	
4	MAV	**Message Available Bit** - This bit, when set, indicates that the Miniceptor has placed data in its output buffer and is ready to output this data. The bit is cleared by performing a serial poll or emptying the output buffer.
5	ESB	**Event Summary Bit** - This bit, when set, indicates that the Event Status Register has set SRQ. By reading the Event Status Register via the ESR? mnemonic, the host controller may identify what status event has caused the SRQ. This bit is cleared by performing a serial poll, *CLS, or reading contents of the Event Status Register.
6	RQS	**Request Service** - This bit, when set, indicates that the unit has asserted SRQ. This bit is cleared by performing a serial poll.
7	N/U	



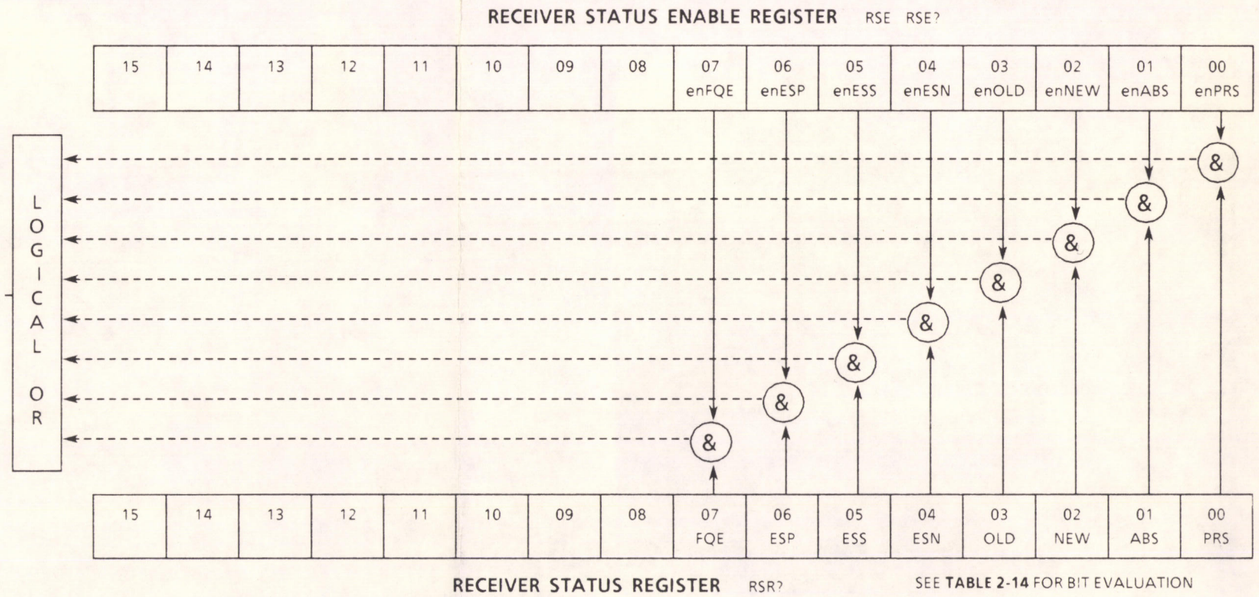


Figure 2-6. Miniceptor Status Data Structure

2.4.3.4.2 Event Status Register

The following discussion covers the Event Status Register and the *ESR? query. See Table 2-12 for the Event Status Register bit numbers, mnemonics, and descriptions.

The Event 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 Status Enable Register allows the event flags of the Event Status register to be reflected in the Event Summary Bit (ESB) of the status byte. The setting of an event status flag sets the event summary bit only if the corresponding bit in the Event Status Enable Register is set high. The Event 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 Status Enable Register.

Table 2-12. Event 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.
1	N/U	
2	QYE	**Query Error** - Set on an attempt to read data from the output buffer with no data stored or pending, or on output buffer overflow.
3	DDE	**Device Dependent Error** - Set when a device dependent error occurs (see **paragraph 2.4.3.4.3**).
4	EXE	**Execution Error** - Set by a data element out of range, or by a valid message which could not be processed due to some device condition.
5	CME	**Command Error** - Set by an unrecognized remote error message header.
6	N/U	
7	PON	**Power On** - Sets at power up of the Miniceptor.

2.4.3.4.3 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 raised (see **Figure 2-5**). The DDE? and CDE? queries are used and are further discussed below.

The DDE? query requests 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 clears it. See **Table 2-13** for the bit evaluation of the Device Dependent Error Register.

The CDE? query requests the current device error. The response to this query is also a bit mapped 16 bit word as detailed in **Table 2-13.** Reading this register has no effect on it.

Table 2-13. Device Dependent Error Register, Bit Evaluation

Bit	Decimal Value	Function
0	1	Power supply fault. This bit is set to indicate a power supply fault. One or more of the bits 1-4 below may be set if a concise failure mode can be determined.
1	2	+12 Vdc fault.
2	4	+7.5 Vdc fault.
3	8	-7.5 Vdc fault.
4	16	+30 Vdc fault.
5	32	1st LO unlocked.
6	64	2nd LO unlocked.
7	128	3rd LO unlocked.
8	256	A/D error.
9	512	EEPROM has been defaulted.
10	1024	RAM has been defaulted.
11	2048	Freq. Extender LO unlocked (not applicable when FE option is not installed).
12	4096	EEPROM failure to be written.
13	8192	Not used.
14	16384	Not used.
15	32768	Not used.

2.4.3.4.4 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 the 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 2-14** for the bit evaluation of the Receiver Status Register.

Table 2-14. 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	ABS, signal fell below COR threshold. This is an edge triggered event on the action of a signal going from above COR threshold to below COR threshold.
2	4	NEW, new signal found. This bit indicates that a signal has been found that was not active on the previous pass of the sweep or step sequence. This bit is set only while the Report New Signals flag is set in the Report Action Control Register. See "RAC" command in **Table 2-4.**
3	8	OLD, old signal no longer present. This bit indicates that a signal that was previously present is no longer present and was placed in the queue. This bit is set only while the Report Old Lost Signals flag is set in the Report Action Control Register. See "RAC" command in **Table 2-4.**
4	16	ESW, end of single sweep. This bit indicates the end of sweep has been encountered. This bit is only set while in sweep mode.
5	32	ESS, end of single sweep sequence. This bit indicates the end of a sweep sequence has been encountered. This bit is only set while in the sweep memory mode.
6	64	ESP, end of single step sequence. This bit indicates that the single step sequence has been completed. This bit is set only while in step mode.
7	128	FQE, full queue encountered. This bit indicates that the signal queue is full and any further entries causes the oldest entries to be lost.

Table 2-14 Receiver Status Register, Bit Evaluation (Continued)

Bit	Decimal Value	Function
8	256	Not used.
9	512	Not used.
10	1024	Not used.
11	2048	Not used.
12	4096	Not used.
13	8192	Not used.
14	16384	Not used.
15	32768	Not used.

2.4.3.5 WJ-860X/HPIL Interface Option I/O Operation Details

The following paragraphs provide further details of Miniceptor remote operations when the WJ-860X/HPIL Interface option is installed and apply only to HPIL I/O operations. For additional information on the HPIL interface, see the HPIL Interface Specification.

2.4.3.5.1 HPIL Interface

The HPIL (Hewlett-Packard Interface Loop) interface is a medium speed, medium distance, low power serial interface loop. This interface offers an addressing scheme that allows multiple receivers to share a single bus. A service request capability is also included as part of HPIL. An application level communication format similar to that of IEEE-488 is provided. HPIL is supported with commercial interface translators, controllers, and PC interfaces.

The HPIL interface supports operation of up to 31 devices on the loop. The distance between devices may be as much as 100 meters using twisted shielded pair cables. The interface data transfer rate may be as high as 20 k bytes per second. The Miniceptor outputs data at approximately 3 k bytes per second. The Miniceptor supports the following functions of the HPIL interface standard.

R	Receiver interface
D	Device interface
AH1	Acceptor handshake
SH1	Source handshake
CO	No controller capability
T1	Talker, send data
T2	Talker, send status
T3	Talker, send accessory ID
L1	Basic listener
SR2	Service request, basic and asynchronous

RLO	No local operation
AA1	Basic auto address
PDO	No power down
PPO	No parallel poll capability
DC2	Device clear, universal and addressed
DTO	No device trigger capability
DD0	No device dependent commands

This states that the device supports basic talker functions including data, status and accessory ID. The device supports the addressed listener operation, and can generate SRQ both asynchronously and synchronously. Auto addressing operation is also supported.

The Miniceptor connects to the HPIL via two 2-pin connectors located on the front panel labeled HPIL IN and HPIL OUT.

2.4.3.5.2 HPIL Communications Protocol

2.4.3.5.2.1 Terminator

The input buffer is processed on the receipt of a LF character. The Miniceptor outputs messages terminated with CR, LF.

2.4.3.5.2.2 Device Clear

Receipt of the Device Clear (DCL) or Selected Device Clear (SDC) HPIL commands causes the Miniceptor to clear both input and output buffers of any data.

2.4.3.5.2.3 Service Request (SRQ)

The Miniceptor may set the SRQ condition based on an enabled requesting condition. The serial poll operation clears the SRQ. The SRQ is sent synchronously or can be sent asynchronously if enabled by the Enable Asynchronous Request (EAR) HPIL command. The data byte returned from the serial poll action defines the cause of the SRQ. This byte is bit mapped the same as the response to the *STB? query. The transmitting of SRQ is enabled via the *SRE, *ESE, and RSE commands.

2.4.3.5.2.4 Buffer Handling

The HPIL buffers are handled in a linear fashion. When a terminator has been received, the Miniceptor will accept no further data until all data in the input buffer has been processed. Data in the output buffer is made available upon the completion of processing of all queries in the input buffer. Upon reading the data from the output buffer, it becomes empty. The unit flushes the output buffer of any remaining unread data upon processing of a new query. In response to either SDC or DCL commands, the Miniceptor empties both the input and output buffers. The HPIL input buffer holds up to 512 bytes of data. The HPIL output buffer holds up to 1024 bytes of data.

2.4.3.6 WJ-860X/RS-232C and WJ-860X/RS-422 Interface Options I/O Operation Details

The following paragraphs provide further details of Miniceptor remote operations when the WJ-860X/RS-232C or WJ-860X/RS-422 Interface options are installed. The information in these paragraphs apply to both interfaces but, for simplicity, only refer to RS-232C interface operation. See the applicable specification for additional information on these interfaces.

2.4.3.6.1 RS-232C Interface

The RS-232C interface is implemented on the six-pin serial I/O port labeled SERIAL INTFC on the front panel of the Miniceptor. A cable is supplied with the WJ-860X/RS-232C Interface option that adapts this connector to a standard 25-pin D-type connector. The RS-232C interface has a full duplex operation implemented on the TXD (transmit data) and RXD (receive data) lines. This interface supports a single drop environment.

The Miniceptor supports software communications protocol only. Hardware handshake signals such as RTS, CTS, DTR or DSR are not supported. Data word format is fixed and comprised of the following:

- One start bit
- An 8 bit character
- No parity
- One stop bit

Baud rate is remotely selectable from 150 to 9600 baud. See **paragraph 2.4.3.6.2** for information on selecting the baud rate.

2.4.3.6.2 RS-232C Communications Protocol

The communications protocol implements both ENQ/ACK (ENQuire/ACKnowledge) and XON, XOFF (ctl Q,ctl S). The ENQ/ACK format allows allows the user to send an ENQ character to the Miniceptor when an acknowledge is required. The receiver then responds with the ACK/NAK character indicating the validity of the data received in the input buffer and the fact that the receiver has completed processing all current data thru the last received terminator. The XON, XOFF format is supported both transmitting and receiving. This allows transmission based on the availability of buffer space.

2.4.3.6.2.1 XON/XOFF Protocol

The XON/XOFF communications protocol is always active in the receiver. In the event the input buffer has room for less than 16 additional characters the receiver will output an XOFF command. When the receiver empties its input buffer, it issues an XON. 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 receiver issues an XOFF. The user may start sending data to the receiver after receiving the XON character.

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

2.4.3.6.2.2 ENQ/ACK Protocol

When the ENQ character is sent to the Miniceptor, 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 ENQ had a communications error. The ACK/NAK response is only sent after the receiver has completed processing any previous messages in the input buffer and output any response necessary.

The receiver 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 communications error. Upon receiving an ENQ character, the receiver responds with an ACK/NAK based on the condition of the communications flag, after any pending input and output operations are complete.

2.4.3.6.2.3 Terminator

The input buffer is processed on the receipt of a LF character. The Miniceptor outputs messages terminated with CR,LF.

2.4.3.6.2.4 Device Clear

Receipt of the DCL (Device Clear) command causes the Miniceptor to clear both input and output buffers of any data. This command is not buffered and is acted upon as soon as it is received.

2.4.3.6.2.5 Service Request (SRQ)

The Miniceptor may send a one byte control character (ESC) indicating a service request, followed by an 8 bit binary encoded status byte if enabled. This SRQ byte (ESC) indicates to the user that a requesting event has occurred. The receiver status byte immediately follows the SRQ byte (ESC). This byte identifies the reason for requesting service. The encoding of this byte matches that of the *STB response.

The SRQ sequence either proceeds or follows the output of a data string being transmitted from the output buffer. It does not interrupt the data string. The SRQ sequence may be enabled or disabled with the *SRE command.

2.4.3.6.2.6 Buffer Handling

The Miniceptor RS-232 handles buffers in circular fashion to allow full duplex operation of the serial I/O.

2.4.3.6.2.6.1 Input Buffer

The input buffer is handled in circular fashion allowing the 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 may come into the receiver. Upon receiving a terminator character, the receiver 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 is no longer full (two messages removed or empty).

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

2.4.3.6.2.6.2 Output Buffer

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

2.4.3.6.2.7 Supported Communications Control Commands

Table 2-15 lists the supported communications control commands for RS-232C operation.

Table 2-15. Supported RS-232C Communications Control Commands

HEX	ASCII	Rx	Tx	Function
11	DC1	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 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
1B	ESC		x	Service Request character, always directly followed by status byte.

2.4.3.6.3 Changing the User-Specified RS-232C Baud Rate

The user-specified RS-232C baud rate value is stored in the Miniceptor's EEPROM. The baud rate value may be changed, via remote command, to another value other than the default user specified value of 300. The baud rates available are 150, 300, 600, 1200, 2400, 4800, and 9600.

Before changing the user specified baud rate, applicable switches in DIP switch A1S2 must be set to select Configuration Mode. See **paragraph 2.2.3** for information pertaining to setting DIP switch A1S2.

The mnemonics used for user-specified baud rate selection are #CBR and #CBR? as detailed in **Table 2-16** below. The "#" character indicates that these are Configuration Mode device messages.

Table 2-16. User-Specified Baud Rate Commands

Command	Response	Description
#CBR nrf		Configure the user position baud rate. This command is not valid with HPIL. This is the baud rate used when switch 5 in DIP switch A1S2 is in User-Specified position. The parameter is stored in EEPROM and only changeable in the Configuration mode of operation.
#CBR?	CBR nr1	Request the current user-specified baud rate. Example: #CBR 9600 Default: #CBR 0300

SECTION III

REPLACEMENT PARTS LIST

SECTION III

REPLACEMENT PARTS LIST

3.1 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.

3.2 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).

3.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
00681	Catalyst Research Corp. 1421Clarkview Rd. Baltimore, MD 21209	01295	Texas Instruments, Inc. Semiconductor-Components Div. 13500 North Central Expressway Dallas TX 75231
00779	AMP, Inc. P.O. Box 3608 Harrisburg, PA 17150	02113	Coilcraft Inc. 1102 Silver Lake Road Cary, IL 60013
01037	Pyroferric New York Inc. 621 E. 216th Street Bronx, NY 10467	04713	Motorola Incorporated Semiconductor Products Div. 5005 East McDowell Road Phoenix, AZ 85008

Mfr. Code	Name and Address
11532	Teledyne Relays 3155 W. El Segundo Blvd. Hawthorne, CA 90250
14482	Watkins-Johnson Company 3333 Hillview Avenue Palo Alto, CA 94304
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878
14674	Corning Glass Works Houghton, Park Corning, NY 14830
15542	Mini-Circuits Laboratories Division of Scientific Components Corp. 2625 E. 14th Street Brooklyn, NY 11235
17856	Siliconix, Incorporated 2201 Laurelwood Road Santa Clara, CA 95054
17858	Zeks Air Drier Corporation P.O. Box 396 Malvern, PA 19355
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, CA 94086
19505	Applied Eng. Products, Co. Division of Samarious, Inc. 300 Seymour Avenue Derby, CT 06418
22526	Berg Electronics Inc. Rt. 83 New Cumberland, PA 17070
24539	Avantek, Inc. 3175 Bowers Avenue Santa Clara, CA 95051
25088	Siemens America, Inc. 186 Wood Avenue S. Iselin, NJ 08830
26629	Frequency Sources Inc. 16 Maple Road Chelmsford, MA 01824
27014	National Semi-Conductor Corp. 2950 San Ysidro Way Santa Clara, CA 95051
27956	Relcom 3333 Hillview Avenue Palo Alto, CA 94304
28480	Hewlett-Packard Company Corporate Headquarters 1501 Page Mill Road Palo Alto, CA 94304
29990	American Technical Ceramics One Norden Lane Huntington Station, NY 11746
2P953	Lemousa, Inc. Santa Rosa, CA 95406
2X491	Rockwell International Corp. Filter Products 2990 Airway Avenue Costa Mesa, CA 92626
34899	Fair-Rite Products Corporation 1 Commercial Row Wallkill, NY 12589
50101	Frequency Sources Inc. 16 Maple Road Chelmsford, Ma 01824-3737
50140	K and L Microwave, Inc. 203 Newton Street Salisbury, MD 21801

Mfr. Code	Name and Address
51406	Murata Erie North America Inc. 1148 Franklin Rd. S.E. Marietta, GA 30067
51642	Centre Engineering Inc. 2820 E. College Avenue State College, Pa 16801-7515
52648	Plessey Semiconductors 1641 Kaiser Avenue Irvine, CA 92714
54583	TDK Electronics Corp. 755 Eastgate Blvd. Garden City, NY 11530
55027	Q-Bit Corp. 311 Pacific Ave., N.E. Palm Bay, FL 32905
55224	SMK Electronics Corp. Carson, CA
55322	Samtec, Inc. 810 Progress Blvd. P.O. Box 1147 New Albany, IN 47150
61271	Fujitsu Microelectronics, Inc. 2985 Kifer Road Santa Clara, CA 95051
61429	Fox Electronics P.O. Box 1078 Cape Coral, FL 33910
64762	Elantec, Inc. 1996 Tarob Court Milpitas, CA 95035
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, MA 02138
72982	Erie Technological Products 644 West 12th Street Erie, PA 16512
75915	Littlefuse Tracor, Inc. 800 E. Northwest Highway Des Plaines, Il 60016-3049
7W259	Tel Cal Corp. 9108 Mayflower Avenue El Paso, TX 79925
91637	Dale Electronics, Inc. P.O. Box 609 Columbus, NE 68601
91802	Industrial Devices, Incorporated 982 River Road Edgewater, NJ 92705
94902	Coilcraft, Inc. Otis Division 222 Avenue, East Hawarden, IA 51023
95146	Alco Electronics Products, Inc. 1551 Osgood Street Woodside, NY 11377
9AA16	SAI 407 Whooping Loop Altamonte Springs, FL 32701

3.4 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 3.3**, and the manufacturer's part number, provided in **paragraph 3.5**, are supplied as a guide to aid the user of the equiment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph 3.5** 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. As a result, some transistors, diodes and integrated circuits which are installed in the unit may not agree with the parts lists or schematic diagrams of this manual. However, substitution of the semiconductor devices listed in this manual may be substituted with satisfactory results.

3.5 WJ-8607 VHF/UHF SURVEILLANCE RECEIVER

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 05				
A1	Digital Controller	1	796777-1	14632	
A2	Synthesizer	1	796778-1	14632	
A3	RF Converter	1	796779-1	14632	
A4	Demodulator	1	796780-1	14632	
AI-1	Fuse, Plug-In	1	273003	75915	
AI-2	Plug, 3 COND	1	FGG.0B.303.C.N.AD52	2P953	
AI-3	Plug, 6 COND	1	FGG.01.306.C.N.AD52	2P953	
W5	Cable Assembly	1	17300-442-5	14632	
W6	Cable Assembly	1	382106-1	14632	
W7	Cable Assembly	1	17300-442-7	14632	
W8	Cable Assembly	1	17300-442-8	14632	

3.5.1 TYPE 796777-1 DIGITAL CONTROLLER

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 07				
A1	Line Filter Assembly	1	381961-1	14632	
BT1	Battery	1	1935-DE	00681	
C1	Capacitor, Tantalum: 68 µF, 20%, 6.3 V	6	841293-24	14632	
C2	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	47	841250-24	14632	
C3	Capacitor, Ceramic: 22 pF, 5%, 50 Vdc	2	841250-03	14632	
C4 Thru C6	Same as C2				
C7	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	7	841250-19	14632	
C8	Same as C2				
C9	Same as C2				
C10	Same as C3				
C11	Capacitor, Tantalum: 33 µF, 20%, 16 V	8	841293-22	14632	
C12	Capacitor, Tantalum: 1.0 µF, 20%, 35 V	1	841293-05	14632	
C13	Same as C2				
C14	Same as C2				
C15	Same as C7				
C16	Same as C2				
C17	Same as C2				
C18	Same as C11				
C19	Same as C2				
C20	Same as C1				
C21	Same as C7				
C22	Same as C2				
C23	Same as C2				
C24	Same as C11				
C25	Same as C2				
C26	Same as C1				
C27	Same as C1				
C28	Same as C2				
C29	Same as C2				
C30	Capacitor, Ceramic: 330 pF, 5%, 50 Vdc	2	841250-10	14632	
C31	Same as C30				
C32 Thru C35	Same as C2				
C36	Same as C1				
C37	Same as C11				
C38	Same as C7				
C39	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	2	841293-10	14632	
C40	Same as C1				
C41	Same as C11				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C42 Thru C47	Same as C2				
C48	Same as C39				
C49	Same as C11				
C50 Thru C52	Same as C2				
C53	Same as C11				
C54	Same as C2				
C55	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	6	841250-07	14632	
C56 Thru C59	Same as C2				
C60	Same as C7				
C61	Capacitor, Tantalum: 15 µF, 20%, 25 V	1	841293-19	14632	
C62	Same as C2				
C63	Same as C2				
C64	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	1	841250-11	14632	
C65	Same as C55				
C66	Same as C7				
C67	Same as C2				
C68	Same as C11				
C69	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	6	841250-13	14632	
C70 Thru C74	Same as C69				
C75	Same as C55				
C76	Same as C2				
C77	Same as C7				
C78	Same as C2				
C79	Same as C2				
C80	Same as C55				
C81	Same as C2				
C82	Same as C55				
C83	Same as C55				
C84 Thru C88	Same as C2				
C89	Not Used				
C90	Capacitor, Ceramic: 100 pF, 5%, 50 V	61	841415-007	14632	
C91 Thru C114	Same as C90				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C115 Thru C117	Not Used				
C118	Same as C90				
C119	Same as C90				
C120	Not Used				
C121 Thru C135	Same as C90				
C136	Same as C40				
C137 Thru C154	Same as C90				
C155	Same as C7				
CR1	Diode	16	HSMS-2802	28480	
CR2 Thru CR16	Same as CR1				
DS1	Lamp Assembly, LED Red	3	5600F1	91802	
DS2	Lamp Assembly, LED Green	1	5600F5	91802	
DS3	Lamp Assembly, LED Yellow	1	5600F7	91802	
DS4	Same as DS1				
DS5	Same as DS1				
FB1	Not Used				
FB2	Not Used				
FB3	Ferrite, Bead: 31Ω, ±25%, 100 MHz	1	CB70-322513B	54583	
J1	Socket	67	645952-2	00779	
J2 Thru J4	Same as J1				
J5	Connector, Receptacle	2	EPG.0B.302.HRD	2P953	
J6	Same as J5				
J7	Connector, Receptacle	2	EPG.1B.306.HRD	2P953	
J8	Same as J7				
K1	Relay	1	722-5	11532	
PS1	DC/DC Converter	1	766019-1	14632	
Q1	Transistor	4	MMBT2222A	04713	
Q2 Thru Q4	Same as Q1				
R1	Resistor, Fixed: 100 kΩ, 5%, 1/8 W	49	841296-113	14632	
R2	Resistor, Fixed: 220 kΩ, 5%, 1/8 W	1	841296-121	14632	
R3	Resistor, Fixed: 1.0 kΩ, 5%, 1/8 W	15	841296-65	14632	
R4	Same as R1				
R5	Same as R3				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R6	Resistor, Fixed: 2.2MΩ, 5%, 1/8 W	4	841296-145	14632	
R7	Not Used				
R8	Resistor, Fixed: 6.8MΩ, 5%, 1/8 W	1	841296-157	14632	
R9	Same as R1				
R10	Resistor, Fixed: 6.8Ω, 5%, 1/8 W	27	841296-13	14632	
R11	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	3	841296-81	14632	
R12	Same as R11				
R13	Same as R3				
R14	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	25	841296-89	14632	
R15	Same as R14				
R16	Same as R10				
R17	Same as R8				
R18 Thru R20	Same as R10				
R21	Same as R1				
R22	Same as R1				
R23	Same as R10				
R24	Same as R10				
R25 Thru R38	Same as R1				
R39	Same as R3				
R40	Same as R1				
R41	Same as R6				
R42	Same as R14				
R43	Same as R14				
R44	Same as R1				
R45 Thru R48	Same as R10				
R49	Same as R1				
R50	Same as R10				
R51 Thru R59	Same as R1				
R60	Not Used				
R61	Not Used				
R62	Same as R10				
R63	Same as R10				
R64	Resistor, Fixed: 330Ω, 5%, 1/8 W	3	841296-53	14632	
R65	Same as R64				
R66	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	4	841296-93	14632	
R67	Same as R66				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R68	Same as R10				
R69	Same as R3				
R70	Resistor, Fixed: 27.4 kΩ, 1%, 1/8 W	3	841311-008	14632	
R71	Same as R70				
R72	Resistor, Fixed: 10 kΩ, 1%, 1/8 W	2	841311-003	14632	
R73	Resistor, Fixed: 3.01 kΩ, 1%, 1/8 W	1	841311-001	14632	
R74	Resistor, Fixed: 51.1 kΩ, 1%, 1/8 W	1	841311-010	14632	
R75	Same as R1				
R76	Same as R1				
R77	Same as R10				
R78	Same as R1				
R79	Resistor, Fixed: 33 kΩ, 5%, 1/8 W	1	841296-101	14632	
R80	Same as R11				
R81	Same as R14				
R82 Thru R84	Same as R1				
R85	Resistor, Fixed: 47 kΩ, 5%, 1/8 W	1	841296-105	14632	
R86	Same as R1				
R87	Same as R10				
R88	Not Used				
R89	Not Used				
R90	Same as R10				
R91 Thru R98	Same as R1				
R99	Same as R14				
R100	Same as R10				
R101	Resistor, Fixed: 33.2 kΩ, 1%, 1/8 W	1	841311-009	14632	
R102	Resistor, Fixed: 56.2 kΩ, 1%, 1/8 W	3	841311-011	14632	
R103	Same as R102				
R104	Same as R72				
R105	Resistor, Fixed: 6.81 kΩ, 1%, 1/8 W	1	841311-002	14632	
R106	Same as R64				
R107	Resistor, Fixed: 15 kΩ, 1%, 1/8 W	1	841311-005	14632	
R108	Same as R3				
R109	Resistor, Fixed: 13.3 kΩ, 1%, 1/8 W	2	841311-004	14632	
R110	Resistor, Fixed: 22.1 kΩ, 1%, 1/8 W	1	841311-007	14632	
R111	Same as R14				
R112	Same as R17				
R113	Resistor, Fixed: 221 kΩ, 1%, 1/8 W	1	841311-012	14632	
R114	Resistor, Fixed: 20 kΩ, 1%, 1/8 W	1	841311-006	14632	
R115	Same as R3				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R116	Same as R14				
R117	Same as R14				
R118	Resistor, Fixed: 22 kΩ, 5%, 1/8 W	7	841296-97	14632	
R119	Same as R118				
R120	Same as R14				
R121	Same as R14				
R122	Same as R118				
R123 Thru R125	Same as R14				
R126	Same as R102				
R127	Same as R10				
R128	Same as R14				
R129	Resistor, Fixed: 2.2 kΩ, 5%, 1/8 W	1	841296-73	14632	
R130 Thru R133	Same as R3				
R134	Same as R10				
R135	Same as R17				
R136	Same as R14				
R137	Same as R14				
R138	Same as R17				
R139	Same as R14				
R140	Same as R10				
R141	Same as R66				
R142	Same as R3				
R143	Same as R14				
R144	Same as R14				
R145	Same as R10				
R146 Thru R148	Same as R118				
R149	Same as R10				
R150	Same as R1				
R151	Same as R14				
R152	Same as R6				
R153	Same as R118				
R154	Same as R70				
R155	Same as R109				
R156	Resistor, Fixed: 100Ω, 5%, 1/8 W	4	841296-41	14632	
R157	Not Used				
R158	Same as R14				
R159	Not Used				
R160	Same as R66				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R161	Same as R3				
R162	Same as R156				
R163	Same as R156				
R164	Same as R3				
R165	Same as R156				
R166	Same as R14				
R167	Same as R6				
R168	Same as R3				
R169	Same as R1				
R170	Same as R14				
R171	Same as R14				
R172 Thru R174	Same as R10				
S1	Not Used				
S2	Dip Switch	1	ADF-085	95146	
T1	Transformer	1	9100-4226	28480	
U1	Integrated Circuit	1	MC68HC11A1FN	04713	
U2	Integrated Circuit, EPROM	2	8627C512-151.1	14632	
U3	Integrated Circuit	2	864050S016N	14632	
U4	Integrated Circuit	1	864514S024W	14632	
U5	Integrated Circuit	1	8674HC08S014	14632	
U6	Integrated Circuit	2	8674HC02S014N	14632	
U7	Integrated Circuit	1	8674HC14S014N	14632	
U8	Integrated Circuit	2	8674HC20S014N	14632	
U9	Integrated Circuit	4	8674HC00S014N	14632	
U10	Same as U9				
U11	Integrated Circuit	6	8674HC74S014N	14632	
U12	Integrated Circuit	7	8674HC244S020W	14632	
U13	Same as U9				
U14	Integrated Circuit	5	8674HC373S020W	14632	
U15	Same as U12				
U16	Integrated Circuit	1	8674HC273S020W	14632	
U17	Integrated Circuit	3	867226D120	14632	
U18	Integrated Circuit, RAM	1	8662256LFP-12SL	14632	
U19	Same as U12				
U20	Integrated Circuit	1	ILB3-0003	28480	
U21	Same as U14				
U22	Same as U14				
U23	Same as U12				
U24	Same as U17				
U25	Same as U12				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U26	Same as U11				
U27	Same as U14				
U28	Integrated Circuit	3	8674HC138S016N	14632	
U29	Same as U28				
U30	Same as U17				
U31	Integrated Circuit, CMOS	1	8674HC165S016	14632	
U32	Integrated Circuit	1	8674HC245S020W	14632	
U33	Same as U12				
U34	Integrated Circuit	1	8674HC682S020W	14632	
U35	Integrated Circuit	2	8674HC273S020W	14632	
U36	Same as U11				
U37	Same as U11				
U38	Amplifier	1	TL064C	01295	
U39	Integrated Circuit	1	TL431CD	04713	
U40	Same as U14				
U41	Same as U28				
U42	Same as U12				
U43	Integrated Circuit	1	LM339M	27014	
U44	Amplifier	1	MC33171D	04713	
U45	Integrated Circuit	1	864555S016N	14632	
U46	Same as U3				
U47	Same as U8				
U48	Same as U9				
U49	Integrated Circuit	2	8674HC161S016N	14632	
U50	Same as U11				
U51	Integrated Circuit, Inverter	1	8674HC04S014N	14632	
U52	Same as U11				
U53	Same as U35				
U54	Same as U6				
U55	Same as U49				
U56	Integrated Circuit	1	8675176S08N	14632	
U57	Integrated Circuit	1	8674HC02S014N	14632	
U58	Same as U2				
VR1	Diode, Zener	1	MMBZ5232	04713	
VR2	Diode, Zener	4	MMBZ5236	04713	
VR3 Thru VR5	Same as VR2				
XU1	Socket, Integrated Circuit	1	821550-1	00779	
XU2	Socket	2	IC61-0324-017	00000	
XU58	Socket	1	IC61-0324-017	00000	
Y1	Digital, Quartz	1	FPX-SM-8MHz	61429	

3.5.1.1 Type 381961-1 Input Filter Assembly

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 04				
C1	Capacitor, Tantalum: 15 µF, 20%, 25 V	4	841293-19	14632	
C2 Thru C4	Same as C1				
C5	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	2	841250-24	14632	
C6	Same as C5				
E1	Pin, Connector	3	460-2620-02-03-00	71279	
E2	Same as E1				
E3	Same as E1				
F1	Fuse, Plug-In	1	273003	75915	
FB1	Ferrite, Bead	1	2743021446	34899	
J1	Connector, Receptacle	1	EPG.0B.303.HRN	2P953	
L1	Coil	1	282058-1	14632	
L2	Coil, Toroidal	2	20681-306	14632	
L3	Same as L2				
S1	Switch	1	SMT11D2SRA	95146	
XF1	Connector	1	SMH-103-01-G-SJ	55322	

3.5.2 TYPE 796778-1 SYNTHESIZER

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 08				
A3J4	Connector, Plug	3	2105-7521-005	19505	
A3J7	Same as A3J4				
A4J7	Connector, Plug, SMB	1	2002-7571-005	19505	
A4J8	Same as A3J4				
C1	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	40	841250-24	14632	
C2	Capacitor, Ceramic: 1.8 pF, ±.1 pF, 500 V	4	ATC100B1R8BP500X	29990	
C3	Capacitor, Ceramic: .5 pF, ±.1 pF, 500 V	2	ATC100B0R5BP500X	29990	
C4	Capacitor, Ceramic: 6.8 pF, ±.1 pF, 500 V	3	ATC100B6R8BP500X	29990	
C5	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	9	841250-13	14632	
C6	Capacitor, Ceramic: 10 pF, 2%, 50 W Vdc	4	841314-25	14632	
C7	Same as C1				
C8	Capacitor, Ceramic: .7 pF, ±10%, 500 V	1	ATC100B0R7BP500X	29990	
C9	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	83	841250-19	14632	
C10	Same as C1				
C11	Capacitor, Ceramic: 3 pF, ±.25%, 500 V	2	ATC100B3R0CP500X	29990	
C12	Same as C3				
C13	Capacitor, Ceramic: 5.6 pF, ±.1 pF, 500 V	3	ATC100B5R6BP500X	29990	
C14	Same as C1				
C15	Same as C2				
C16	Capacitor, Ceramic: 3.3 pF, ±.1 pF, 500 V	4	ATC100B3R3BP500X	29990	
C17	Same as C9				
C18	Capacitor, Tantalum: 68 µF, 20%, 6.3 V	9	841293-24	14632	
C19	Same as C1				
C20	Same as C11				
C21	Capacitor, Ceramic: .3 pF, ±.1 pF, 500 V	1	ATC100B0R3BCA500X	29990	
C22	Same as C4				
C23	Capacitor, Ceramic: 4.3 pF, ±.1 pF, 500 V	2	ATC100B4R3BP500X	29990	
C24	Same as C1				
C25	Same as C2				
C26	Same as C9				
C27	Same as C16				
C28	Same as C1				
C29	Same as C13				
C30	Same as C2				
C31	Capacitor, Ceramic: 18 pF, 2%, 500 V	2	ATC100B180GP500X	29990	
C32	Capacitor, Ceramic, Variable: 1.5-6. pF, ±300, 25 Vdc	2	DVS3A6A	51406	
C33	Same as C1				
C34	Capacitor, Ceramic: 2.4 pF, ±.1 pF, 500 V	3	ATC100B2R4BP500X	29990	
C35	Same as C16				
C36	Same as C9				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C37	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	14	841293-10	14632	
C38	Capacitor, Ceramic: 47 pF, 5%, 50 Vdc	3	841250-05	14632	
C39	Same as C38				
C40 Thru C42	Same as C9				
C43	Same as C1				
C44	Same as C9				
C45	Same as C1				
C46	Same as C1				
C47 Thru C50	Same as C9				
C51	Same as C1				
C52	Same as C1				
C53	Same as C18				
C54	Same as C9				
C55	Capacitor, Ceramic: 100 pF, 2%, 50 W Vdc	24	841314-49	14632	
C56	Same as C9				
C57	Same as C9				
C58	Same as C37				
C59	Capacitor, Ceramic: 2200 pF, +10%, 50 Vdc	5	841250-15	14632	
C60	Same as C5				
C61	Same as C18				
C62	Same as C5				
C63	Same as C55				
C64	Capacitor, Ceramic: 6800 pF, 10%, 50 Vdc	2	841250-18	14632	
C65	Same as C1				
C66	Same as C18				
C67	Same as C1				
C68	Capacitor, Tantalum: 1.0 µF, 20%, 35 V	2	841293-05	14632	
C69	Same as C1				
C70	Same as C18				
C71	Same as C18				
C72	Same as C1				
C73	Capacitor, Ceramic: 4700 pF, 2%, 50 W Vdc	5	841314-89	14632	
C74	Same as C5				
C75	Same as C55				
C76	Same as C37				
C77	Same as C18				
C78	Same as C1				
C79	Same as C1				
C80	Same as C68				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C81	Same as C9				
C82	Same as C37				
C83	Same as C9				
C84	Same as C37				
C85	Same as C55				
C86	Same as C1				
C87 Thru C89	Same as C55				
C90	Not Used				
C91	Same as C55				
C92	Same as C9				
C93	Capacitor, Ceramic: 5.1 pF, ±.25 pF, 50 W Vdc	2	841314-18	14632	
C94 Thru C96	Same as C9				
C97	Same as C55				
C98	Capacitor, Ceramic, Disc: 6.89 pF, ±.25 pF, 100 V	2	200-100-N470-689C	51642	
C99	Same as C55				
C100 Thru C102	Same as C9				
C103	Capacitor, Ceramic: 3.9 pF, ±.1 pF, 50 W Vdc	2	841314-15	14632	
C104	Same as C93				
C105	Same as C9				
C106	Same as C34				
C107	Same as C9				
C108	Same as C37				
C109	Same as C9				
C110	Capacitor, Electrolytic, Tantalum: 100 µF, 10 Vdc, 20%	8	MMJ-010-107R-20	14674	
C111 Thru C114	Same as C9				
C115	Capacitor, Ceramic: 10 pF, 2%, 500 V	1	ATC100B100GP500X	29990	
C116	Same as C9				
C117	Same as C9				
C118	Same as C73				
C119	Same as C13				
C120	Capacitor, Ceramic: .047 µF, 10%, 50 Vdc	3	841250-23	14632	
C121	Same as C9				
C122	Capacitor, Ceramic: 2.2 pF, ±.1 pF, 500 V	1	ATC100B2R2BP500X	29990	
C123	Same as C98				
C124	Same as C9				
C125	Same as C37				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C126	Same as C37				
C127	Same as C9				
C128	Same as C37				
C129	Same as C9				
C130	Capacitor, Ceramic: 7.5 pF, ±.1 pF, 500 V	1	ATC700B7R5BP500X	29990	
C131	Same as C9				
C132	Same as C9				
C133	Same as C1				
C134	Same as C9				
C135	Same as C32				
C136	Capacitor, Ceramic: 4.7 pF, .1 pF, 500 V	2	ATC100B4R7BP500X	29990	
C137	Same as C23				
C138	Same as C9				
C139	Same as C1				
C140	Same as C1				
C141	Same as C55				
C142 Thru C144	Same as C1				
C145	Same as C55				
C146	Capacitor, Ceramic: 220 pF, 5%, 50 Vdc	1	841250-09	14632	
C147 Thru C152	Same as C9				
C153	Same as C6				
C154	Same as C1				
C155 Thru C159	Same as C9				
C160	Capacitor, Ceramic: 33 pF, 5%, 50 Vdc	1	841250-04	14632	
C161	Same as C110				
C162	Same as C9				
C163	Same as C110				
C164 Thru C166	Same as C9				
C167	Same as C1				
C168	Same as C9				
C169	Same as C5				
C170	Same as C9				
C171	Same as C9				
C172	Same as C1				
C173	Same as C9				
C174	Same as C1				

REF DESIG PREFIX **A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C175	Same as C1				
C176	Same as C110				
C177 Thru C179	Same as C9				
C180	Same as C18				
C181	Same as C37				
C182	Same as C37				
C183	Capacitor, Tantalum: 6.8 µF, 20%, 6.3 V	3	841293-14	14632	
C184	Same as C1				
C185	Same as C1				
C186 Thru C189	Same as C55				
C190	Same as C9				
C191	Same as C55				
C192	Same as C1				
C193	Same as C55				
C194	Not Used				
C195	Same as C37				
C196	Same as C37				
C197	Same as C16				
C198	Same as C5				
C199	Same as C64				
C200	Capacitor, Ceramic: .022 µF, 10%, 50 Vdc	1	841250-21	14632	
C201	Same as C103				
C202	Same as C9				
C203	Same as C4				
C204	Capacitor, Ceramic, Monolithic: 22 pF, 5%, 100 V	1	200-100-N470-220C	51642	
C205	Same as C73				
C206	Capacitor, Ceramic: 1500 pF, 10%, 50 Vdc	1	841250-14	14632	
C207	Same as C55				
C208	Same as C73				
C209	Same as C9				
C210	Capacitor, Ceramic: 2.7 pF, ±.1 pF, 500 V	1	ATC100B2R7BP500X	29990	
C211	Same as C6				
C212	Same as C1				
C213	Capacitor, Ceramic: 3300 pF, 10%, 50 Vdc	2	841250-16	14632	
C214	Same as C73				
C215	Same as C213				
C216	Same as C9				
C217	Same as C38				
C218	Capacitor, Ceramic: .015 µF, 10%, 50 Vdc	1	841250-20	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C219	Same as C37				
C220	Same as C9				
C221	Same as C5				
C222	Same as C9				
C223	Same as C9				
C224	Same as C5				
C225 Thru C228	Same as C9				
C229	Same as C5				
C230	Same as C9				
C231	Same as C9				
C232	Same as C31				
C233	Same as C1				
C234	Same as C183				
C235	Same as C34				
C236	Same as C120				
C237	Same as C183				
C238	Same as C18				
C239	Same as C55				
C240	Same as C9				
C241	Same as C6				
C242	Not Used				
C243	Same as C1				
C244	Same as C1				
C245	Same as C9				
C246	Same as C9				
C247 Thru C249	Same as C55				
C250	Same as C120				
C251	Same as C1				
C252	Same as C9				
C253	Capacitor, Ceramic: .033 µF, 10%, 50 Vdc	1	841250-22	14632	
C254	Same as C55				
C255	Capacitor, Ceramic: 12 pF, 2%, 100 V	1	ATC100A120GP100X	29990	
C256	Capacitor, Ceramic: 270 pF, 2%, 50 W Vdc	1	841314-59	14632	
C257	Capacitor, Ceramic: 33 pF, 1%, 150 V	1	ATC100A330FP150X	29990	
C258 Thru C261	Same as C59				
C262	Same as C9				
C263	Not Used				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C264	Same as C9				
C265	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	4	841250-11	14632	
C266	Same as C9				
C267	Same as C265				
C268 Thru C270	Same as C110				
C271	Same as C265				
C272	Same as C265				
C273	Same as C1				
C274	Same as C136				
C275	Same as C110				
CR1	Diode	8	KV31S1	26629	
CR2	Dual Switching Diode	3	MMBD7000T1	04713	
CR3 Thru CR6	Same as CR1				
CR7	Diode	2	HSMS-2802	28480	
CR8	Same as CR7				
CR9	Same as CR1				
CR10	Diode	1	KV38S2	26629	
CR11	Same as CR2				
CR12	Same as CR2				
CR13	Same as CR1				
CR14	Same as CR1				
CR15	Diode, Zener	1	MMBZ5232	04713	
DS1	Diode	3	HLMP-6620	28480	
DS2	Same as DS1				
DS3	Not Used				
DS4	Same as DS1				
E1	Connector, Receptacle, SMB	4	8145-7521-005	19505	
E2 Thru E4	Same as E1				
FB1	Ferrite, Bead: 520Ω, ±25%, 100 MHz	10	CB30-322513B	00000	
FB2 Thru FB4	Same as FB1				
FB5	Not Used				
FB6 Thru FB8	Same as FB1				
FB9	Ferrite, Bead: 31Ω, ±25%, 100 MHz	8	CB70-322513B	54583	
FB10	Same as FB9				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
FB11	Same as FB1				
FB12 Thru FB16	Same as FB9				
FB17	Same as FB1				
FB18	Same as FB1				
FB19	Same as FB9				
J1	Socket	24	645952-2	00779	
J2	Not Used				
J3	Connector, Receptacle, SMB	1	2010-1511-000	19505	
J4	Connector, Receptacle	1	2009-7511-000	19505	
L1 Thru L3	Not Used				
L4	Inductor: 4.7 µH, ±20%, 7.96 MHz	15	B82422-A1472-M	25088	
L5 Thru L8	Not Used				
L9	Same as L4				
L10 Thru L12	Not Used				
L13	Same as L4				
L14 Thru L16	Not Used				
L17	Same as L4				
L18	Inductor: .15 µH, ±20%, 50 MHz	1	B82422-A3151-M	25088	
L19 Thru L22	Same as L4				
L23	Not Used				
L24	Inductor: 820 µH, ±10%, 1 kHz	1	LQN4N821K-TA	72982	
L25	Inductor: 47 µH, ±20%, 2.52 MHz	2	B82422-A1473-M	25088	
L26	Inductor: 10 nH, ±20%, 100 MHz	4	LQN2A10NM	72982	
L27	Inductor: 0.47 nH, ±20%	1	B82422-A3471-M	25088	
L28	Same as L26				
L29	Not Used				
L30	Same as L26				
L31	Same as L4				
L32 Thru L34	Not Used				
L35	Same as L25				
L36	Same as L4				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L37	Not Used				
L38	Same as L4				
L39	Not Used				
L40	Not Used				
L41	Same as L26				
L42	Same as L4				
L43	Inductor: 220 nH, ±10%, 25 MHz	1	LQN2AR22K	72982	
L44	Inductor: 1.8 µH, ±20%, 1 MHz	1	LQN3N1R8M	72982	
L45	Not Used				
L46 Thru L48	Same as L4				
Q1	Transistor	6	841381	14632	
Q2 Thru Q4	Same as Q1				
Q5	Transistor	6	MMBT2907A	04713	
Q6 Thru Q8	Same as Q5				
Q9	Not Used				
Q10	Transistor	6	MMBT2222A	04713	
Q11	Same as Q5				
Q12	Same as Q10				
Q13	Same as Q10				
Q14	Not Used				
Q15	Not Used				
Q16	Same as Q1				
Q17	Transistor	3	MMBR2857	04713	
Q18	Same as Q1				
Q19	Same as Q17				
Q20	Same as Q17				
Q21 Thru Q23	Same as Q10				
Q24	Transistor	2	MMBR911	04713	
Q25	Same as Q5				
Q26	Same as Q24				
Q27	Not Used				
R1	Resistor, Fixed: 1.0 kΩ, 5%, 1/8 W	26	841296-65	14632	
R2	Resistor, Fixed: 1.5 kΩ, 5%, 1/8 W	8	841296-69	14632	
R3	Resistor, Fixed: 220Ω, 5%, 1/8 W	1	841296-49	14632	
R4	Resistor, Fixed: 22.0Ω, 5%, 1/8 W	21	841296-25	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R5	Resistor, Fixed: 100Ω, 5%, 1/8 W	26	841296-41	14632	
R6	Resistor, Fixed: 10.0Ω, 5%, 1/8 W	13	841296-17	14632	
R7	Same as R4				
R8	Same as R1				
R9	Same as R2				
R10	Resistor, Fixed: 330Ω, 5%, 1/8 W	8	841296-53	14632	
R11	Same as R6				
R12	Not Used				
R13	Same as R5				
R14	Same as R1				
R15	Same as R2				
R16	Same as R10				
R17	Not Used				
R18	Same as R5				
R19	Same as R4				
R20	Same as R4				
R21	Same as R1				
R22	Same as R2				
R23	Same as R10				
R24	Same as R1				
R25	Same as R6				
R26	Same as R4				
R27	Same as R5				
R28	Same as R4				
R29	Resistor, Fixed: 68.0Ω, 5%, 1/8 W	4	841296-37	14632	
R30	Same as R29				
R31	Same as R5				
R32	Same as R5				
R33	Same as R4				
R34	Same as R5				
R35	Same as R29				
R36 Thru R40	Same as R5				
R41	Same as R29				
R42	Resistor, Fixed: 2.2 kΩ, 5%, 1/8 W	9	841296-73	14632	
R43	Same as R4				
R44	Same as R4				
R45	Resistor, Fixed: 150Ω, 5%, 1/8 W	4	841296-45	14632	
R46	Same as R42				
R47	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	28	841296-89	14632	
R48	Same as R6				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R49	Resistor, Fixed: 47.0Ω, 5%, 1/8 W	22	841296-33	14632	
R50 Thru R53	Same as R47				
R54	Resistor, Fixed: 3.3 kΩ, 5%, 1/8 W	8	841296-77	14632	
R55	Same as R42				
R56	Resistor, Fixed: 680Ω, 5%, 1/8 W	3	841296-61	14632	
R57	Resistor, Fixed: 470Ω, 5%, 1/8 W	25	841296-57	14632	
R58	Resistor, Fixed: 220Ω, 5%, 1/8 W	13	841296-49	14632	
R59	Not Used				
R60	Same as R58				
R61	Resistor, Fixed: 6.80Ω, 5%, 1/8 W	4	841296-13	14632	
R62	Same as R61				
R63	Same as R1				
R64	Same as R1				
R65	Same as R61				
R66	Same as R5				
R67	Not Used				
R68	Same as R4				
R69	Same as R2				
R70 Thru R76	Same as R1				
R77	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	14	841296-81	14632	
R78	Same as R1				
R79	Same as R1				
R80	Same as R2				
R81 Thru R84	Same as R57				
R85	Same as R77				
R86	Same as R58				
R87	Same as R5				
R88	Same as R57				
R89	Same as R49				
R90	Same as R4				
R91	Same as R10				
R92	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	3	841296-93	14632	
R93	Same as R5				
R94	Same as R5				
R95	Same as R10				
R96	Same as R77				
R97	Same as R45				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R98	Same as R5				
R99	Resistor, Fixed: 33.0Ω, 5%, 1/8 W	2	841296-29	14632	
R100	Same as R57				
R101	Same as R45				
R102	Same as R4				
R103	Same as R1				
R104	Same as R47				
R105	Same as R4				
R106	Same as R49				
R107	Same as R42				
R108	Same as R49				
R109	Same as R6				
R110	Same as R49				
R111	Same as R5				
R112	Same as R49				
R113	Same as R49				
R114	Same as R1				
R115	Same as R54				
R116	Same as R42				
R117	Same as R5				
R118	Same as R47				
R119	Same as R49				
R120	Same as R57				
R121	Same as R1				
R122	Same as R49				
R123	Same as R57				
R124	Same as R1				
R125	Same as R6				
R126	Same as R47				
R127	Resistor, Fixed: 22 kΩ, 5%, 1/8 W	4	841296-97	14632	
R128	Same as R4				
R129	Same as R54				
R130	Same as R42				
R131 Thru R133	Same as R57				
R134	Same as R6				
R135	Same as R6				
R136	Resistor, Fixed: 47 kΩ, 5%, 1/8 W	3	841296-105	14632	
R137	Same as R127				
R138	Resistor, Fixed: 270Ω, 5%, 1/8 W	2	841296-51	14632	
R139	Same as R138				

REF DESIG PREFIX **A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R140	Same as R6				
R141	Same as R127				
R142	Same as R1				
R143	Same as R136				
R144	Same as R6				
R145	Same as R6				
R146	Same as R5				
R147	Same as R58				
R148	Same as R57				
R149	Same as R10				
R150	Same as R77				
R151	Same as R4				
R152	Same as R58				
R153	Same as R56				
R154	Same as R49				
R155	Same as R4				
R156	Same as R6				
R157	Same as R4				
R158	Same as R57				
R159	Same as R57				
R160	Same as R58				
R161	Same as R58				
R162 Thru R164	Same as R49				
R165	Same as R4				
R166	Same as R58				
R167	Same as R127				
R168	Same as R58				
R169	Same as R49				
R170	Resistor, Fixed: 100 kΩ, 5%, 1/8 W	4	841296-113	14632	
R171	Same as R170				
R172	Same as R49				
R173	Same as R5				
R174	Same as R58				
R175	Same as R47				
R176	Same as R77				
R177	Same as R47				
R178	Resistor, Fixed: 33 kΩ, 5%, 1/8 W	1	841296-101	14632	
R179	Same as R47				
R180 Thru R182	Same as R77				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R183*	Same as R92				
R184*	Same as R57				
R185	Same as R5				
R186	Same as R4				
R187	Same as R61				
R188	Same as R47				
R189	Varistor: 1 kΩ, 30%, 100 Vdc	1	ST-23-A-102-C-W	91637	
R190 Thru R193	Same as R47				
R194	Same as R54				
R195	Resistor, Fixed: 220 kΩ, 5%, 1/8 W	1	841296-121	14632	
R196	Resistor, Fixed: 6.8 kΩ, 5%, 1/8 W	3	841296-85	14632	
R197	Resistor, Fixed: 56 kΩ, 5%, 1/8 W	1	841296-107	14632	
R198	Same as R54				
R199	Not Used				
R200	Same as R57				
R201	Same as R57				
R202	Same as R47				
R203	Same as R170				
R204	Same as R47				
R205	Same as R47				
R206	Same as R1				
R207	Same as R47				
R208	Same as R4				
R209	Same as R5				
R210	Same as R49				
R211	Same as R196				
R212	Same as R47				
R213	Same as R170				
R214	Same as R47				
R215	Same as R196				
R216	Same as R58				
R217	Same as R5				
R218	Same as R54				
R219	Same as R49				
R220	Same as R5				
R221 Thru R223	Same as R57				
R224	Same as R49				
R225	Same as R42				
R226	Same as R57				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R227	Same as R58				
R228	Not Used				
R229	Same as R49				
R230	Same as R47				
R231	Not Used				
R232	Same as R6				
R233	Same as R77				
R234	Same as R47				
R235	Same as R2				
R236	Same as R1				
R237	Same as R136				
R238 Thru R240	Same as R77				
R241	Same as R10				
R242	Same as R5				
R243	Same as R49				
R244	Same as R1				
R245	Same as R42				
R246	Same as R42				
R247	Same as R92				
R248	Same as R54				
R249	Same as R49				
R250	Same as R45				
R251	Same as R49				
R252	Same as R99				
R253	Same as R54				
R254	Same as R1				
R255	Not Used				
R256 Thru R258	Same as R57				
R259	Same as R77				
R260	Same as R58				
R261	Same as R4				
R262	Same as R1				
R263	Same as R47				
R264	Same as R77				
R265	Resistor, Fixed: 9.1 kΩ, 5%, 1/8 W	2	841296-88	14632	
R266	Same as R265				
R267	Same as R2				
R268	Same as R47				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R269	Same as R47				
R270	Same as R56				
R271	Same as R10				
R272	Same as R47				
T1	Transformer	6	281926-1	14632	
T2 Thru T6	Same as T1				
U1	Amplifier	8	MSA-0686	24539	
U2	Same as U1				
U3	Same as U1				
U4	Integrated Circuit	1	U822BS	9AA16	
U5	Same as U1				
U6	Integrated Circuit	1	U824BS	9AA16	
U7	Integrated Circuit, Divider	1	SP8799/MP	52648	
U8	Integrated Circuit	1	864094S016	14632	
U9	Voltage, Regulator	3	LM2931AD-5	27014	
U10	Voltage, Regulator	2	LM79L05ACM	27014	
U11	Not Used				
U12	Integrated Circuit	4	MC145158FN-1	04713	
U13	Mixer, Balanced	1	RMS-2	15542	
U14 Thru U16	Same as U1				
U17	Integrated Circuit	3	MB501LP	61271	
U18	Same as U12				
U19	Integrated Circuit	1	8674HC02S014N	14632	
U20	Amplifier	1	NE5534D	18324	
U21	Same as U9				
U22	Same as U9				
U23	Integrated Circuit	1	MC145157FN-1	04713	
U24	Integrated Circuit	2	DG403DY	17858	
U25	Same as U10				
U26	Integrated Circuit	4	TL062CD	01295	
U27	Same as U26				
U28	Same as U24				
U29	Same as U26				
U30	Integrated Circuit	1	8674HC74S014N	14632	
U31	Same as U12				
U32	Integrated Circuit, Divider	2	SP8719/MP	52648	
U33	Same as U32				

REF DESIG PREFIX **A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U34	Same as U26				
U35	Same as U1				
U36	Same as U12				
U37	Same as U17				
U38	Same as U17				
U39	TCXO	1	K1518AF	04713	
VR1	Diode, Zener	1	MMBZ5232	04713	
W1	Cable Assembly	1	17300-442-1	14632	
W2	Cable Assembly	1	17300-442-2	14632	
W3	Cable Assembly	1	17300-442-3	14632	
W4	Cable Assembly	1	17300-442-4	14632	

***Nominal Value, Final Value Factory Selected**

3.5.3 TYPE 796779-1 RF CONVERTER

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 06				
A1	Wideband Output Assembly	1	796784-1 (Option See Appendix B)	14632	
C1	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	34	841250-13	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	60	841250-19	14632	
C5	Capacitor, Ceramic: 1.5 pF, ±.1 pF, 500 V	2	ATC100B1R5BP500X	29990	
C6	Same as C5				
C7 Thru C10	Same as C1				
C11	Capacitor, Ceramic: 4.7 pF, .1 pF, 500 V	2	ATC100B4R7BP500X	29990	
C12	Same as C11				
C13	Same as C4				
C14	Same as C4				
C15	Same as C1				
C16 Thru C18	Same as C4				
C19	Same as C1				
C20	Capacitor, Ceramic: 1.8 pF, .1 pF, 150 V	4	ATC100A1R8BP150X	29990	
C21	Same as C4				
C22	Same as C4				
C23	Same as C1				
C24	Same as C20				
C25	Capacitor, Ceramic: 1.3 pF, ±.1 pF, 500 V	1	ATC100B1R3BP500X	29990	
C26	Capacitor, Ceramic: 1 pF, ±.1 pF, 500 V	1	ATC100B1R0BP500X	29990	
C27	Same as C4				
C28	Same as C4				
C29 Thru C31	Same as C1				
C32	Capactior, Ceramic: 47 pF, 5%, 50 Vdc	7	841250-05	14632	
C33	Same as C4				
C34	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	6	841293-10	14632	
C35 Thru C37	Same as C34				
C38 Thru C44	Same as C1				
C45	Same as C4				
C46	Same as C4				
C47	Capacitor, Ceramic: 24 pF, 5%, 500 V	2	ATC100B240JP500X	29990	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C48	Not Used				
C49	Capacitor, Ceramic: 15 pF, 2%, 500 V	1	ATC100B150GP500X	29990	
C50	Same as C4				
C51	Same as C34				
C52	Same as C1				
C53	Same as C4				
C54	Same as C34				
C55 Thru C57	Same as C4				
C58	Same as C32				
C59	Same as C4				
C60	Capacitor, Ceramic: 16 pF, 2%, 500 V	1	ATC100B160GP500X	29990	
C61	Capacitor, Ceramic: 33 pF, 2%, 500 V	2	ATC100B330GP500X	29990	
C62	Capacitor, Ceramic: 27 pF, 2%, 500 V	2	ATC100B270GP500X	29990	
C63	Capacitor, Ceramic, Variable: 5.0-20 pF, NPO, ±300, 25 Vdc	3	DVS3A20A	51406	
C64	Same as C63				
C65	Same as C63				
C66	Same as C47				
C67	Same as C62				
C68	Capacitor, Ceramic: 5.1 pF, ±.25 pF, 50 W Vdc	1	841314-18	14632	
C69	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	4	841250-07	14632	
C70	Same as C69				
C71 Thru C73	Same as C4				
C74	Not Used				
C75	Same as C4				
C76	Same as C4				
C77	Same as C32				
C78	Same as C4				
C79	Same as C69				
C80	Same as C4				
C81	Same as C69				
C82	Same as C4				
C83	Not Used				
C84 Thru C87	Same as C4				
C88	Same as C32				
C89 Thru C91	Same as C4				
C92	Capacitor, Ceramic: 3.5 pF, .1 pF, 150 V	2	ATC100A3R5BP150X	29990	

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C93 Thru C96	Same as C4				
C97	Same as C32				
C98 Thru C100	Same as C4				
C101	Same as C61				
C102 Thru C114	Same as C4				
C115 Thru C119	Same as C1				
C120	Same as C4				
C121 Thru C124	Same as C1				
C125	Same as C4				
C126	Capacitor, Ceramic: 5.1 pF, .1 pF, 150 V	4	ATC100A5R1BP150X	29990	
C127	Capacitor, Ceramic: 1 pF, 1%, 150 V	3	ATC100A1R0BP150X	29990	
C128	Same as C126				
C129	Same as C127				
C130 Thru C133	Same as C1				
C134	Same as C92				
C135	Same as C20				
C136	Same as C20				
C137 Thru C139	Same as C4				
C140	Not Used				
C141	Same as C32				
C142	Same as C32				
C143	Same as C126				
C144	Capacitor, Ceramic: 3.3 pF, .1 pF, 150 V	2	ATC100A3R3BP150X	29990	
C145	Same as C144				
C146	Same as C127				
C147	Same as C126				
CR1	Diode Tuning VHF & UHF Assembly	14	281991-2	14632	
CR2 Thru CR4	Same as CR1				
CR5	Diode	12	841320	14632	
CR6	Diode Tuning VHF & UHF Assembly	4	282034-2	14632	

REF DESIG PREFIX **A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR7	Not Used				
CR8	Not Used				
CR9	Same as CR6				
CR10	Same as CR5				
CR11	Same as CR6				
CR12	Not Used				
CR13	Diode Tuning VHF & UHF Assembly	2	282034-1	14632	
CR14	Same as CR13				
CR15	Not Used				
CR16	Same as CR6				
CR17 Thru CR22	Same as CR1				
CR23	Diode	8	KS35A2	50101	
CR24	Same as CR23				
CR25	Same as CR5				
CR26	Same as CR5				
CR27	Same as CR23				
CR28 Thru CR31	Same as CR5				
CR32	Same as CR23				
CR33 Thru CR36	Same as CR5				
CR37	Same as CR23				
CR38	Same as CR1				
CR39	Not Used				
CR40	Diode Tuning VHF & UHF Assembly	2	281991-1	14632	
CR41	Same as CR40				
CR42	Not Used				
CR43	Same as CR1				
CR44	Same as CR23				
CR45	Diode Tuning VHF & UHF Assembly	10	281991-3	14632	
CR46 Thru CR50	Same as CR45				
CR51	Same as CR23				
CR52	Same as CR23				
CR53	Same as CR1				
CR54	Not Used				
CR55	Not Used				
CR56	Same as CR1				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR57 Thru CR60	Same as CR45				
CR61	Diode	12	HSMP-3822-T	28480	
CR62 Thru CR72	Same as CR61				
FB1	Ferrite, Bead: 31Ω, ±25%, 100 MHz	8	CB70-322513B	54583	
FB2	Not Used				
FB3	Same as FB1				
FB4	Not Used				
FB5 Thru FB7	Same as FB1				
FB8	Ferrite, Bead: 52Ω, ±25%, 100 MHz	4	CB30-322513B	00000	
FB9	Ferrite, Bead Assembly	3	282044-1	14632	
FB10	Same as FB1				
FB11	Same as FB1				
FB12	Same as FB8				
FB13	Same as FB9				
FB14	Same as FB8				
FB15	Same as FB8				
FB16	Ferrite, Bead	6	P5-1288	01037	
FB17	Same as FB16				
FB18	Same as FB9				
FB19	Same as FB16				
FB20	Same as FB16				
FB21	Not Used				
FB22	Same as FB1				
FB23	Same as FB16				
FB24	Same as FB16				
FL1	Filter: 512 MHz	1	7LIB20-575-P/P	50140	
FL2	Filter, Bandpass	1	92523	14632	
FL3	Filter, Bandpass (Customer Selected Option)				
FL4 Thru FL7	Same as FL3				
J1	Connector, Receptacle	1	9650-7113-000	19505	
J2	Socket	28	645952-2	00779	
J3	Connector, Receptacle	1	65532-203	22526	
J4	Connector, Receptacle	3	2009-7511-000	19505	
J5	Same as J2				
J6	Same as J2				
J7	Same as J4				

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
J8	Same as J4				
L1	Coil Assembly	2	282038-1	14632	
L2	Same as L1				
L3	Inductor: 120 nH, ±10%, 25 MHz	3	1008CS-121	02113	
L4	Inductor: 4.7 µH, ±20%, 7.96 MHz	10	B82422-A1472-M	25088	
L5	Same as L4				
L6	Same as L3				
L7	Coil	1	180712-1	14632	
L8	Coil	1	180707-2	14632	
L9	Coil	1	180707-1	14632	
L10	Coil	1	180343-1	14632	
L11	Inductor: 47 µH, ±10%, 2.5 MHz	2	1611LS-473	02113	
L12	Same as L4				
L13	Inductor: 10 nH, ±20%, 50 MHz	3	1008CT-100	94902	
L14	Same as L4				
L15	Same as L4				
L16	Coil, Fixed, Generator: .040 µH, ±1%	2	L8-0R-040	7W259	
L17	Same as L16				
L18	Same as L4				
L19	Inductor: 270 nH, ±10%, 25 MHz	2	1008CS-271	02113	
L20	Same as L4				
L21	Coil	1	180341-2	14632	
L22	Coil	1	180341-1	14632	
L23	Same as L19				
L24	Same as L4				
L25	Coil Assembly	2	282037-1	14632	
L26	Same as L25				
L27	Same as L11				
L28	Inductor: .15 µH, ±20%, 50 MHz	4	B82422-A3151-M	25088	
L29	Same as L28				
L30	Inductor: 8 nH, ±20%, 50 MHz	2	1008CT-080	94902	
L31	Same as L30				
L32	Inductor: 1.0 µH	3	20681-304	14632	
L33	Inductor Assembly	3	282045-1	14632	
L34	Same as L13				
L35	Same as L4				
L36	Same as L3				
L37	Same as L32				
L38	Same as L33				
L39	Same as L32				
L40	Same as L28				

REF DESIG PREFIX **A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L41	Same as L28				
L42	Same as L4				
L43	Same as L13				
L44	Inductor: 3.3 µH, ±20%, 7.9 MHz	1	B82422-A1332	25088	
L45	Same as L33				
R1	Resistor, Fixed: 100Ω, 5%, 1/8 W	3	841296-41	14632	
R2	Resistor, Fixed: 1.0 kΩ, 5%, 1/8 W	26	841296-65	14632	
R3	Same as R2				
R4	Same as R2				
R5	Resistor, Fixed: 27 kΩ, 5%, 1/8 W	8	841296-99	14632	
R6 Thru R8	Same as R5				
R9	Same as R2				
R10	Resistor, Fixed: 680Ω, 5%, 1/8 W	4	841296-61	14632	
R11	Same as R2				
R12	Same as R2				
R13	Resistor, Fixed: 24 kΩ, 5%, 1/8 W	4	841296-98	14632	
R14	Same as R13				
R15	Same as R2				
R16	Same as R13				
R17	Same as R13				
R18 Thru R22	Same as R2				
R23 Thru R26	Same as R5				
R27	Same as R2				
R28	Same as R2				
R29	Same as R10				
R30	Same as R2				
R31	Resistor, Fixed: 47.0Ω, 5%, 1/8 W	6	841296-33	14632	
R32	Same as R1				
R33	Same as R2				
R34	Same as R31				
R35	Same as R31				
R36	Same as R2				
R37	Same as R31				
R38	Resistor, Fixed: 470Ω, 5%, 1/8 W	6	841296-57	14632	
R39	Same as R38				
R40	Same as R10				
R41	Same as R38				

REF DESIG PREFIX **A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R42 Thru R44	Same as R2				
R45	Resistor, Fixed: 150Ω, 5%, 1/8 W	2	841296-45	14632	
R46	Resistor, Fixed: 33.0Ω, 5%, 1/8 W	1	841296-29	14632	
R47	Same as R45				
R48	Same as R1				
R49	Same as R31				
R50	Same as R31				
R51	Same as R2				
R52	Same as R2				
R53	Same as R38				
R54	Same as R2				
R55	Same as R38				
R56	Same as R2				
R57	Same as R10				
R58	Same as R38				
R59	Same as R2				
R60	Same as R2				
U1	Amplifier, RF	1	QBH-126	55027	
U2	Attenuator	3	G1	27956	
U3	Mixer, Balanced	1	WJ-M2B	14482	
U4	Integrated Circuit	2	864094S016	14632	
U5	Amplifier	1	MSA-0486	24539	
U6	Same as U2				
U7	Amplifier	2	GPD-430	24539	
U8	Amplifier	1	A32	14482	
U9	Mixer, Balanced	1	M8T	14632	
U10	Amplifier, RF	1	QBH-138	55027	
U11	Integrated Circuit, Divider	1	SPD-C1	00000	
U12	Same as U7				
U13	Integrated Circuit	1	MWA320	04713	
U14	Same as U4				
U15	Same as U2				
U16	Amplifier, RF	1	QBH-179	55027	

3.5.4 TYPE 796780-1 DEMODULATOR

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 10				
A1	Video Filter Assembly	1	382XXX-X	14632	
C1	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	9	841250-24	14632	
C2	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	104	841250-19	14632	
C3	Capacitor, Ceramic: 2200 pF, ±10%, 50 Vdc	2	841250-15	14632	
C4	Same as C1				
C5	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	21	841293-10	14632	
C6	Same as C5				
C7	Same as C2				
C8	Same as C2				
C9 Thru C11	Same as C1				
C12	Same as C5				
C13 Thru C16	Same as C2				
C17	Capacitor, Ceramic: 47 pF, 5%, 50 Vdc	4	841250-05	14632	
C18	Capacitor, Ceramic: 6.8 pF, ±.25 pF, 50 W Vdc	2	841314-21	14632	
C19 Thru C23	Same as C2				
C24	Same as C2				
C25	Capacitor, Ceramic, Variable: 5.0-20 pF, ±300, 25 Vdc	3	DVS3A20A	51406	
C26	Same as C17				
C27	Capacitor, Ceramic: 150 pF, ±2%, 50 W Vdc	1	841314-53	14632	
C28	Same as C2				
C29	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	16	841250-13	14632	
C30	Capacitor, Ceramic: 110 pF, 2%, 50 W Vdc	1	841314-50	14632	
C31 Thru C35	Same as C2				
C36	Same as C5				
C37	Same as C2				
C38	Same as C2				
C39	Capacitor, Ceramic: .047 µF, 10%, 50 Vdc	4	841250-23	14632	
C40	Same as C2				
C41	Same as C5				
C42	Same as C1				
C43	Same as C5				
C44	Same as C2				
C45	Same as C2				
C46	Capacitor, Ceramic: 680 pF, 5%, 50 Vdc	2	841250-12	14632	
C47	Same as C2				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C48	Same as C39				
C49	Same as C2				
C50	Same as C5				
C51	Capacitor, Tantalum: 33 µF, 20%, 16 V	3	841293-22	14632	
C52	Same as C2				
C53	Same as C23				
C54	Same as C46				
C55	Same as C5				
C56	Same as C2				
C57	Same as C2				
C58	Capacitor, Ceramic: 15 pF, 5%, 50 Vdc	4	841250-02	14632	
C59	Same as C2				
C60	Same as C5				
C61	Same as C2				
C62	Capacitor, Ceramic: 3.3 pF, ±.1 pF, 50 W Vdc	2	841314-13	14632	
C63	Same as C2				
C64	Same as C39				
C65	Same as C2				
C66	Same as C5				
C67	Same as C51				
C68	Same as C51				
C69	Same as C2				
C70	Same as C2				
C71	Same as C58				
C72	Same as C2				
C73	Same as C2				
C74	Capacitor, Ceramic: 68 pF, 5%, 50 Vdc	2	841250-06	14632	
C75	Same as C2				
C76	Same as C2				
C77	Same as C58				
C78	Same as C5				
C79	Same as C2				
C80	Capacitor, Ceramic: 4.7 pF, ±.1 pF, 50 W Vdc	1	841314-17	14632	
C81	Same as C2				
C82	Same as C18				
C83	Capacitor, Ceramic: .5 pF, ±.1 pF, 500 V	2	ATC100B0R5BP500X	29990	
C84	Same as C5				
C85	Same as C2				
C86	Same as C2				
C87	Same as C5				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C88 Thru C91	Same as C2				
C92	Same as C5				
C93	Same as C2				
C94	Same as C5				
C95	Same a C5				
C96	Same as C23				
C97	Capacitor, Ceramic: 82 pF, 2%, 50 W Vdc	1	841314-47	14632	
C98	Same as C5				
C99	Same as C2				
C100	Same as C39				
C101	Same as C5				
C102	Same as C2				
C103	Same as C29				
C104	Same as C5				
C105	Same as C23				
C106	Same as C29				
C107 Thru C109	Same as C2				
C110	Same as C5				
C111	Same as C2				
C112	Same as C29				
C113	Same as C2				
C114	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	2	841250-07	14632	
C115 Thru C117	Same as C29				
C118	Same as C2				
C119	Same as C2				
C120	Same as C5				
C121	Same as C2				
C122	Same as C29				
C123	Same as C1				
C124	Same as C29				
C125	Same as C2				
C126	Same as C2				
C127	Same as C29				
C128	Same as C83				
C129	Same as C29				
C130 Thru C140	Same as C2				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C141	Capacitor, Ceramic: 220 pF, 5%, 50 Vdc	2	841250-09	14632	
C142 Thru C150	Same as C2				
C151	Same as C74				
C152 Thru C155	Same as C29				
C156	Same as C141				
C157 Thru C159	Same as C2				
C160	Same as C5				
C161	Same as C2				
C162	Same as C58				
C163	Same as C2				
C164	Same as C17				
C165	Same as C25				
C166	Same as C2				
C167	Same as C17				
C168	Same as C2				
C169	Same as C2				
C170	Same as C23				
C171	Capacitor, Ceramic: 22 pF, 2%, 50 W Vdc	2	841314-33	14632	
C172	Same as C25				
C173	Same as C62				
C174	Same as C2				
C175	Same as C2				
C176	Same as C23				
C177	Same as C2				
C178	Same as C171				
C179 Thru C185	Same as C2				
C186	Same as C1				
C187 Thru C190	Same as C2				
C191	Same as C1				
C192 Thru C195	Same as C2				
C196	Same as C29				
C197	Same as C114				
CR1	Diode	5	HSMS-2802	28480	

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR2	Same as CR1				
CR3	Diode	10	HSMP-3822-T	28480	
CR4	Same as CR3				
CR5	Same as CR3				
CR6	Diode	3	MBAV74	04713	
CR7	Same as CR6				
CR8	Same as CR6				
CR9	Same as CR3				
CR10 Thru CR12	Same as CR1				
CR13	Diode	8	HSMP-3800	50101	
CR14 Thru CR20	Same as CR13				
CR21 Thru CR26	Same as CR3				
FB1	Ferrite, Bead: 31Ω, ±25%, 100 MHz	7	CB70-322513B	54583	
FB2 Thru FB7	Same as FB1				
*FL1	Filter, Single Sideband	1	526-8551-010	2X491	
FL2	Filter, Bandpass	1	92493	14632	
J1	Phone Jack	1	S-G8042-01	55224	
J2	Connector, Receptacle, SMB	5	2110-7511-000	19505	
J3 Thru J6	Same as J2				
J7	Connector, Receptacle, SMB	1	2010-1511-000	19505	
J8	Connector, Receptacle	2	2009-7511-000	19505	
J9	Socket	27	645952-2	00779	
J10	Same as J8				
J11	Same as J9				
L1	Inductor: 60 nH, ±10%, 50 MHz	1	1008CT-600	02113	
L2	Inductor: 2.2 µH, ±10%, 7.9 MHz	1	1008FS-222	02113	
L3	Inductor: 470 nH, ±10%, 25 MHz	1	1008CS-471	02113	
L4	Inductor: 120 nH, ±10%, 25 MHz	1	1008CS-121	02113	
L5	Inductor: 180 nH, ±10%, 25 MHz	1	1008CS-181	02113	
L6	Inductor: 1.5 µH, ±20%, 7.96 MHz	2	B82422-A1152-M	25088	
L7	Inductor: 100 nH, ±10%, 50 MHz	1	1008CT-101	02113	
L8	Inductor: 330 nH, ±10%, 25 MHz	2	1008CS-331	02113	
L9	Inductor: 1.0 µH, ±20%, 7.96 MHz	3	B82422-A1102-M	25088	
L10	Inductor: 47 µH, ±20%, 2.52 MHz	11	B82422-A1473-M	25088	

*WJ-860X/SSB Option

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R62	Same as R13				
R63	Resistor, Fixed: 5.6 kΩ, 5%, 1/8 W	2	841296-83	14632	
R64	Same as R2				
R65	Same as R17				
R66	Same as R2				
R67	Resistor, Fixed: 1.5 kΩ, 5%, 1/8 W	4	841296-69	14632	
R68	Same as R2				
R69	Same as R67				
R70	Same as R67				
R71	Same as R11				
R72	Same as R57				
R73	Resistor, Fixed: 150Ω, 5%, 1/8 W	5	841296-45	14632	
R74	Same as R4				
R75	Same as R2				
R76	Same as R11				
R77	Same as R17				
R78	Same as R4				
R79	Same as R2				
R80	Same as R17				
R81	Same as R13				
R82	Same as R42				
R83	Same as R1				
R84	Same as R1				
R85	Same as R11				
R86	Same as R11				
R87	Resistor, Fixed: 680Ω, 5%, 1/8 W	2	841296-61	14632	
R88	Same as R1				
R89	Same as R1				
R90	Same as R87				
R91	Same as R1				
R92	Same as R2				
R93	Resistor, Fixed: 220Ω, 5%, 1/8 W	3	841296-49	14632	
R94	Same as R93				
R95	Same as R1				
R96	Same as R1				
R97	Same as R2				
R98	Same as R4				
R99	Same as R4				
R100	Same as R7				
R101	Resistor, Fixed: 27 kΩ, 5%, 1/8 W	1	841296-99	14632	
R102	Resistor, Fixed: 22 kΩ, 5%, 1/8 W	1	841296-97	14632	

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R103	Resistor, Fixed: 11 kΩ, 5%, 1/8 W	1	841296-90	14632	
R104	Resistor, Fixed: 120Ω, 5%, 1/8 W	1	841296-43	14632	
R105	Same as R11				
R106	Same as R11				
R107	Same as R17				
R108	Same as R11				
R109	Same as R4				
R110	Same as R11				
R111	Same as R11				
R112	Same as R93				
R113	Same as R17				
R114	Same as R8				
R115	Same as R11				
R116	Same as R11				
R117	Same as R12				
R118	Same as R12				
R119	Same as R11				
R120	Same as R7				
R121	Same as R12				
R122	Same as R2				
R123	Same as R42				
R124	Same as R2				
R125	Same as R56				
R126	Varistor: 10 kΩ, 30%, 100 Vdc	2	ST-23-A-103-C-W	91637	
R127	Same as R18				
R128	Same as R18				
R129	Same as R2				
R130	Same as R126				
R131	Same as R1				
R132	Same as R12				
R133	Same as R35				
R134	Same as R11				
R135	Same as R11				
R136	Resistor, Fixed: 68 kΩ, 5%, 1/8 W	1	841296-109	14632	
R137	Same as R1				
R138	Same as R42				
R139	Same as R56				
R140	Same as R11				
R141	Resistor, Fixed: 100 kΩ, 5%, 1/8 W	1	841296-113	14632	
R142	Same as R4				
R143	Same as R73				
R144	Resistor, Fixed: 180Ω, 5%, 1/8 W	1	841296-47	14632	

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R145	Same as R8				
R146	Same as R5				
R147	Same as R8				
R148	Same as R12				
R149	Same as R1				
R150	Same as R12				
R151	Same as R11				
R152	Same as R12				
R153	Same as R12				
R154	Same as R1				
R155	Same as R1				
R156	Same as R12				
R157	Same as R12				
R158	Same as R11				
R159	Same as R11				
R160	Same as R12				
R161	Same as R11				
R162	Same as R16				
R163	Same as R4				
R164	Same as R7				
R165	Resistor, Fixed: 1.0 MΩ, 5%, 1/8 W	1	841296-137	14632	
R166	Same as R2				
R167	Same as R12				
R168	Same as R11				
R169	Same as R2				
R170	Same as R18				
R171	Same as R12				
R172	Same as R11				
R173	Same as R1				
R174	Same as R37				
R175	Same as R63				
R176	Same as R12				
R177	Same as R2				
R178	Same as R18				
R179	Resistor, Fixed: 270Ω, 5%, 1/8 W	1	841296-51	14632	
R180	Same as R18				
R181	Same as R12				
R182	Same as R12				
R183	Same as R4				
R184	Same as R12				
R185	Same as R4				
R186	Same as R12				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R187	Same as R4				
R188	Same as R12				
R189	Same as R61				
R190	Same as R2				
R191	Same as R1				
R192	Same as R2				
R193	Same as R4				
R194	Same as R17				
R195	Same as R1				
R196	Same as R4				
R197	Same as R1				
R198	Same as R4				
R199	Same as R1				
R200	Same as R4				
R201	Same as R58				
R202	Same as R57				
R203	Same as R2				
R204	Same as R2				
R205 Thru R208	Same as R4				
R209	Same as R1				
R210	Same as R12				
R211	Same as R12				
R212	Same as R8				
R213	Same as R1				
R214	Same as R12				
R215	Same as R12				
R216	Same as R1				
R217	Same as R12				
R218	Same as R1				
R219	Same as R12				
R220	Same as R12				
R221	Same as R2				
R222	Same as R12				
R223	Same as R37				
R224	Same as R1				
R225	Same as R12				
R226	Same as R11				
R227	Same as R73				
R228	Same as R1				
R229	Same as R11				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R230	Same as R12				
R231	Same as R73				
R232	Resistor, Fixed: 33.0Ω, 5%, 1/8 W	1	841296-29	14632	
R233	Same as R73				
R234					
Thru	Same as R4				
R236					
R237	Same as R12				
R238	Same as R12				
R239	Same as R2				
R240	Same as R11				
R241	Same as R1				
R242	Same as R12				
R243	Same as R12				
R244	Same as R1				
R245	Same as R37				
R246	Same as R11				
R247	Same as R4				
R248	Same as R4				
R249	Same as R42				
R250	Resistor, Fixed: 15.0Ω, 5%, 1/8 W	1	841296-21	14632	
R251	Same as R42				
R252	Same as R16				
R253	Same as R67				
R254	Same as R17				
R255	Same as R5				
U1	Amplifier	6	8634002S08	14632	
U2	Same as U1				
U3	Integrated Circuit	1	8610116PLCC20	14632	
U4	Integrated Circuit	3	864016S014	14632	
U5	Same as U1				
U6	Amplifier	3	8634080S08	14632	
U7	Integrated Circuit	2	864051S016N	14632	
U8	Amplifier	3	EL2020CPL	64762	
U9	Integrated Circuit	3	864094S016	14632	
U10	Same as U7				
U11	Mixer, Balanced	2	NE602D	18324	
U12	Same as U6				
U13	Amplifier	2	865539S014	14632	
U14	Integrated Circuit	1	8674HC390S016	14632	
U15	Same as U8				
U16	Same as U1				

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U17	Integrated Circuit	1	861496S014	14632	
U18	Same as U13				
U19	Integrated Circuit	2	TL431CD	04713	
U20	DIS, Crystal	1	841221-2	14632	
U21	Same as U8				
U22	Same as U4				
U23	Same as U4				
U24	Same as U6				
U25	Same as U9				
U26	Same as U1				
U27	Same as U11				
U28	Coupler, Direct	1	TDC-10-1	15542	
U29	Same as U19				
U30	Splitter, Power	1	TSC-2-1	15542	
U31	Amplifier	6	MSA-0286	24539	
U32	Same as U31				
U33	Same as U31				
U34	Amplifier	2	MSA-0186	24539	
U35	Integrated Circuit	1	863356PLCC20	14632	
U36	Same as U1				
U37	Same as U31				
U38	Same as U34				
U39	Same as U31				
U40	Same as U9				
U41	Same as U31				

3.5.5 TYPE 766019-1 DC/DC POWER SUPPLY

REF DESIG PREFIX **PS1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 04				
A1	DC/DC Power Supply PC Assembly	1	381987-1	14632	
A2	DC/DC Controller PC Assembly	1	381988-1	14632	

3.5.5.1 Type 381987-1 DC/DC Converter Power Supply Assembly

REF DESIG PREFIX **PS1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 03				
C1	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	7	841250-24	14632	
C2	Capacitor, Tantalum: 15 µF, 20%, 25 V	1	841293-19	14632	
C3	Same as C1				
C4	Capacitor, Electrolytic, Aluminum: 100 µF, 20%, 16 V	2	ECE-A1CFS101	54473	
C5	Same as C4				
C6	Same as C2				
C7	Capacitor, Tantalum: 1.0 µF, 20%, 35 V	3	841293-05	14632	
C8	Same as C7				
C9	Same as C1				
C10	Same as C7				
C11	Same as C2				
C12	Same as C2				
C13	Same as C1				
C14	Same as C2				
C15	Same as C2				
C16	Same as C1				
C17	Same as C2				
C18	Same as C2				
C19	Same as C1				
C20	Same as C2				
C21	Same as C2				
C22	Same as C1				
CR1	Rectifier	6	MURD610CT	04713	
CR2	Diode, Zener	2	MLL4755A	04713	
CR3	Same as CR2				
CR4	Rectifier	1	MURD620CT	04713	
CR5 Thru CR9	Same as CR1				
CR10	Diode, Zener	1	MLL4752A	04713	
CR11	Diode, Zener	1	MLL4736A	04713	
CR12	Same as CR4				
E1	Pin, Connector	8	460-2620-01-03-00	71279	
E2 Thru E8	Same as E1				
FB1	Ferrite, Bead	4	2743021446	34899	
FB2 Thru FB4	Same as FB1				
J1	Connector	1	SMH-106-01-G-SW-00	55322	
L1	Inductor	1	382059-1	14632	

REF DESIG PREFIX **PS1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L2	Inductor	1	382061-1	14632	
L3	Inductor	1	20681-308	14632	
L4	Inductor: 47 µH, ±10%	1	NL322522-470K	54583	
L5	Inductor	4	20681-309	14632	
L6 Thru L8	Same as L5				
Q1	Transistor	2	MTD10N05E	04713	
Q2	Same as Q1				
R1	Resistor, Fixed: 10.0Ω, 5%, 1/8 W	1	841296-17	14632	
R2	Resistor, Fixed: 100 kΩ, 5%, 1/8 W	2	841296-113	14632	
R3	Same as R2				
T1	Transformer	1	382060-1	14632	

3.5.5.2 Type 381988-1 DC/DC Converter Controller Assembly

REF DESIG PREFIX **PS1A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 02				
C1	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	4	841293-10	14632	
C2	Capactior, Tantalum: .47 µF, 20%, 35 V	1	841293-02	14632	
C3	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	1	841250-24	14632	
C4	Same as C1				
C5	Same as C1				
C6	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	1	841250-11	14632	
C7	Same as C1				
CR1	Diode	1	MBAV74	04713	
P1	Terminal, Strip	1	65500-106	22526	
R1	Resistor, Fixed: 150 kΩ, 5%, 1/8 W	1	841296-117	14632	
R2	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	8	841296-89	14632	
R3	Resistor, Fixed: 10.0Ω, 5%, 1/8 W	1	841296-17	14632	
R4	Resistor, Fixed: 1.0 kΩ, 5%, 1/8 W	1	841296-65	14632	
R5	Same as R2				
R6	Resistor, Fixed: 100 kΩ, 5%, 1/8 W	2	841296-113	14632	
R7	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	1	841296-93	14632	
R8	Resistor, Fixed: 6.8 kΩ, 5%, 1/8 W	3	841296-85	14632	
R9	Resistor, Fixed: 47 kΩ, 5%, 1/8 W	1	841296-105	14632	
R10	Same as R2				
R11	Same as R2				
R12	Resistor, Fixed: 470Ω, 5%, 1/8 W	1	841296-57	14632	
R13	Not Used				
R14	Resistor, Fixed: 2.7 kΩ, 5%, 1/8 W	1	841296-75	14632	
R15	Resistor, Fixed: 2.2 kΩ, 5%, 1/8 W	1	841296-73	14632	
R16	Same as R8				
R17	Same as R8				
R18	Resistor, Fixed: 470 kΩ, 5%, 1/8 W	1	841296-129	14632	
R19 Thru R22	Same as R2				
R23	Resistor, Fixed: 22 kΩ, 5%, 1/8 W	1	841296-97	14632	
R24	Same as R6				
U1	Integrated Circuit	1	TSC170C0E	15818	
U2	Integrated Circuit, CMOS	1	864001S01H	14632	
U3	Integrated Circuit	1	LM339M	27014	

SECTION IV

SCHEMATICS

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN μF.
2. SEE TABLE A FOR VALUES SELECTED AT FACTORY TESTING.

TABLE A

	R16	R18	R60	R61	R62	R63	R87	R90
-1	6.8	6.8	N/U	N/U	6.8	6.8	6.8	6.8

Figure 4-1. Type 796777-1, Digital Controller (A1), Schematic Diagram 580895 (Sheet 1 of 3) (05)

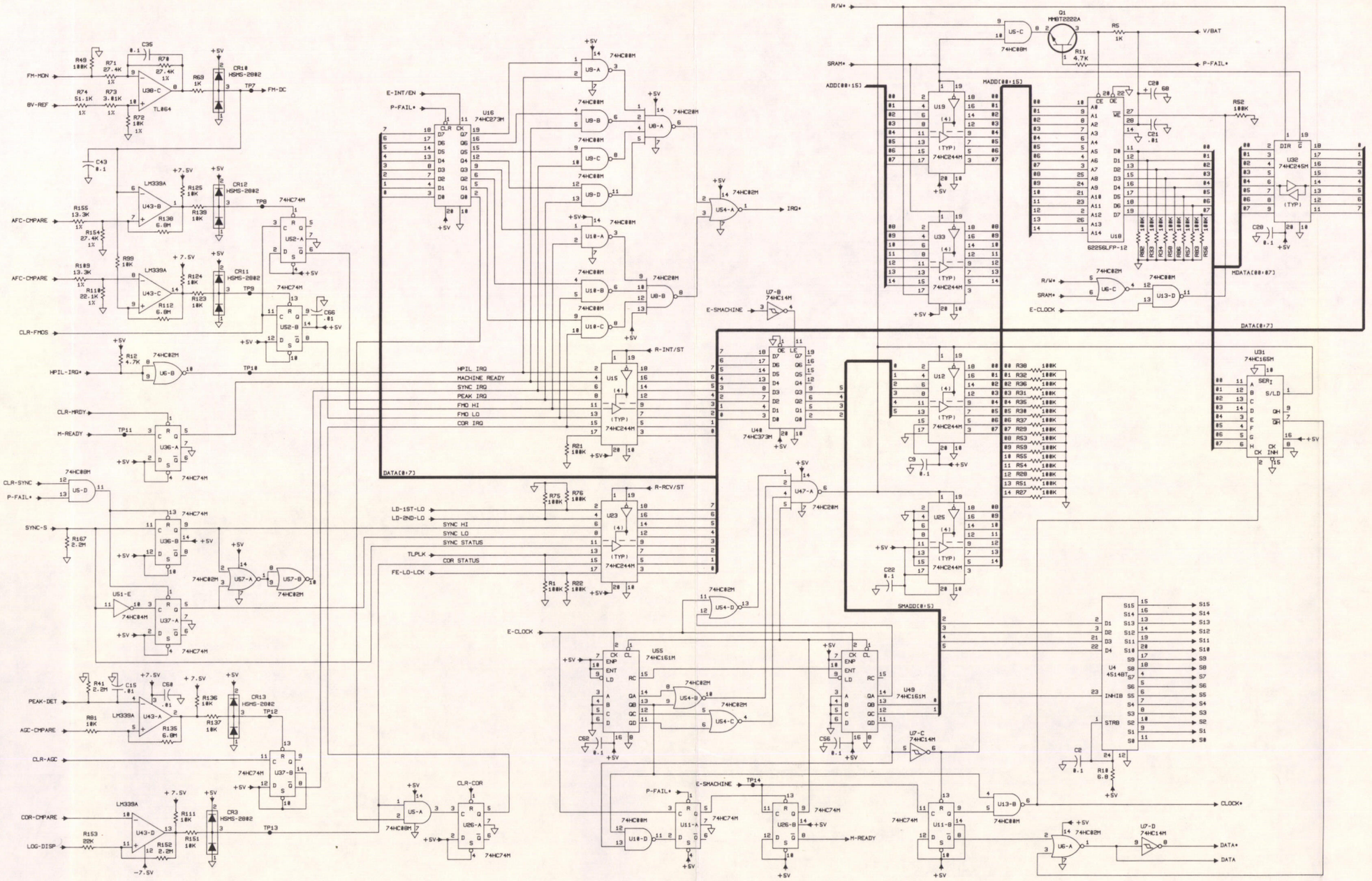


Figure 4-1. Type 796777-1, Digital Controller (A1), Schematic Diagram 580895 (Sheet 2 of 3) (05)

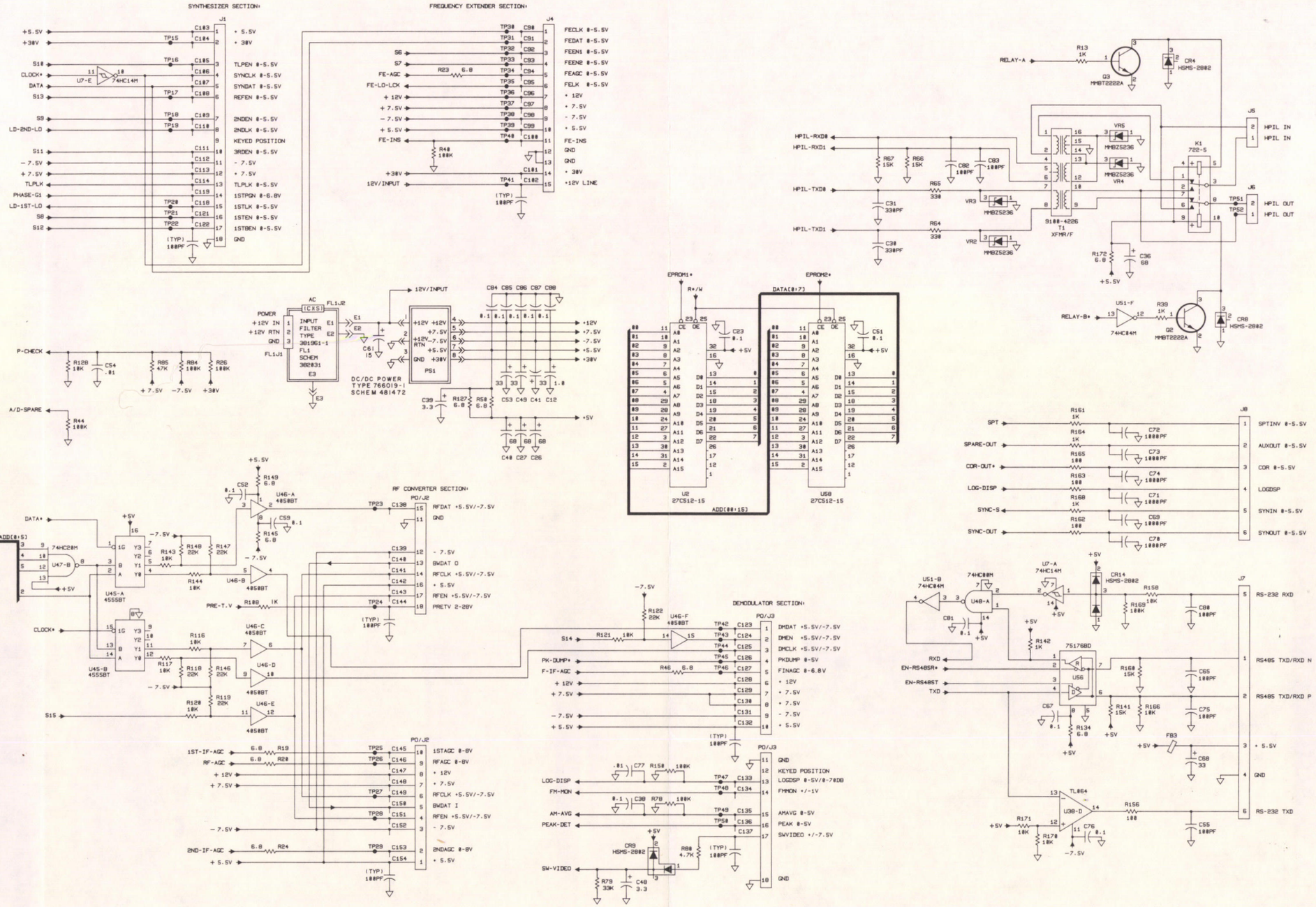


Figure 4-1. Type 796777-1, Digital Controller (A1), Schematic Diagram 580895 (Sheet 3 of 3) (05)

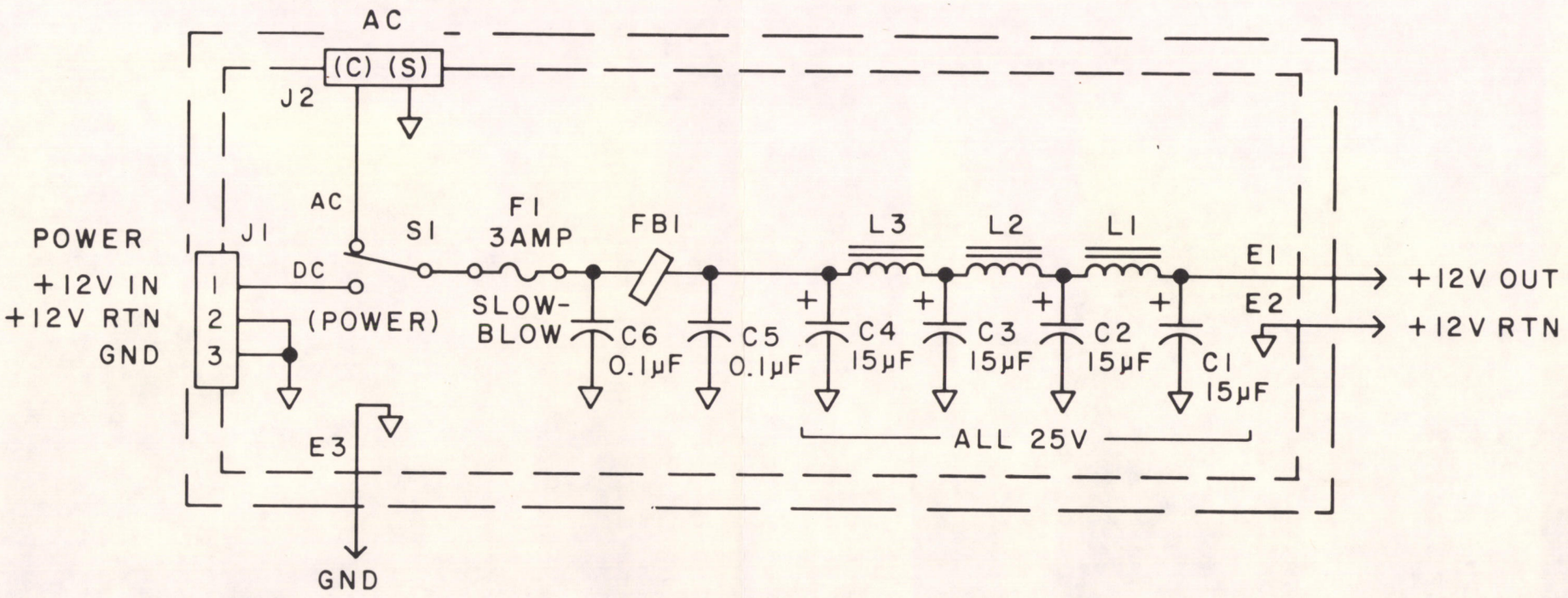


Figure 4-2. Part 381961-1, Input Filter (A1A1), Schematic Diagram 382031 (01)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.
2. NOMINAL VALUE; FINAL VALUE FACTORY SELECTED.

Figure 4-3. Type 796778-1, Synthesizer (A2), Schematic Diagram 580896 (Sheet 1 of 2) (A)

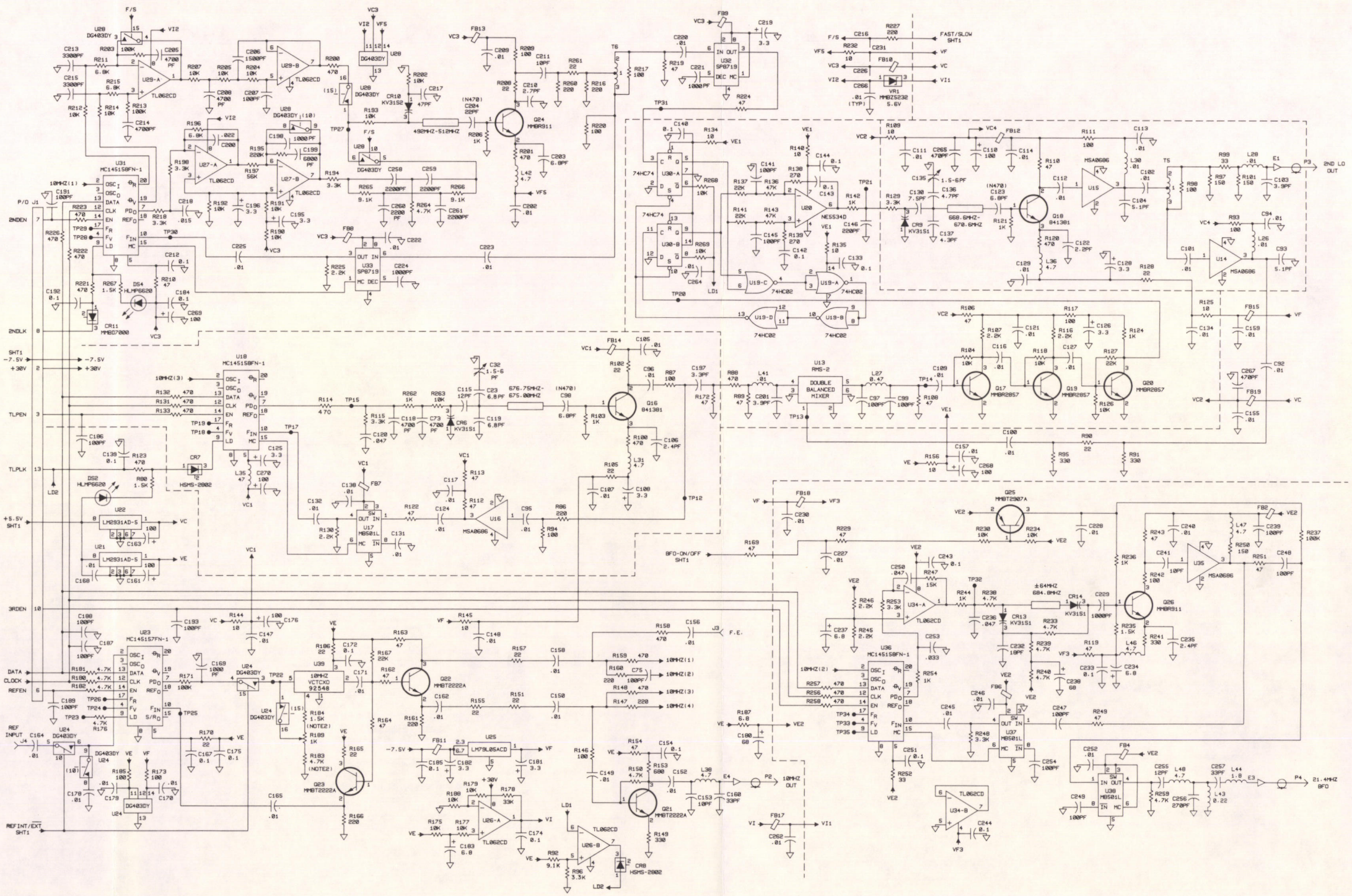


Figure 4-3. Type 796778-1, Synthesizer (A2), Schematic Diagram 580896 (Sheet 2 of 2) (A)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.

IF BANDWIDTH FILTER OPTIONS (FL3-FL7)

PART NO.	DESCRIPTION	USED ON TYPE NO.
92535	BW = 6.4 KHZ	860X/6.4
92503	BW = 10 KHZ	960X/10
92504	BW = 20 KHZ	860X/20
92501	BW = 50 KHZ	860X/50
92536	BW = 75 KHZ	860X/75
92502	BW = 100 KHZ	860X/100
92505	BW = 250 KHZ	860X/250
92529	BW = 300 KHZ	860X/300
92508	BW = 500 KHZ	860X/500
92499	BW = 1 MHZ	860X/1M
92498	BW = 2 MHZ	860X/2M
92497	BW = 4 MHZ	860X/4M
92531	BW = 8 MHZ	860X/8M
92504	BW = 25 KHZ	860X/25

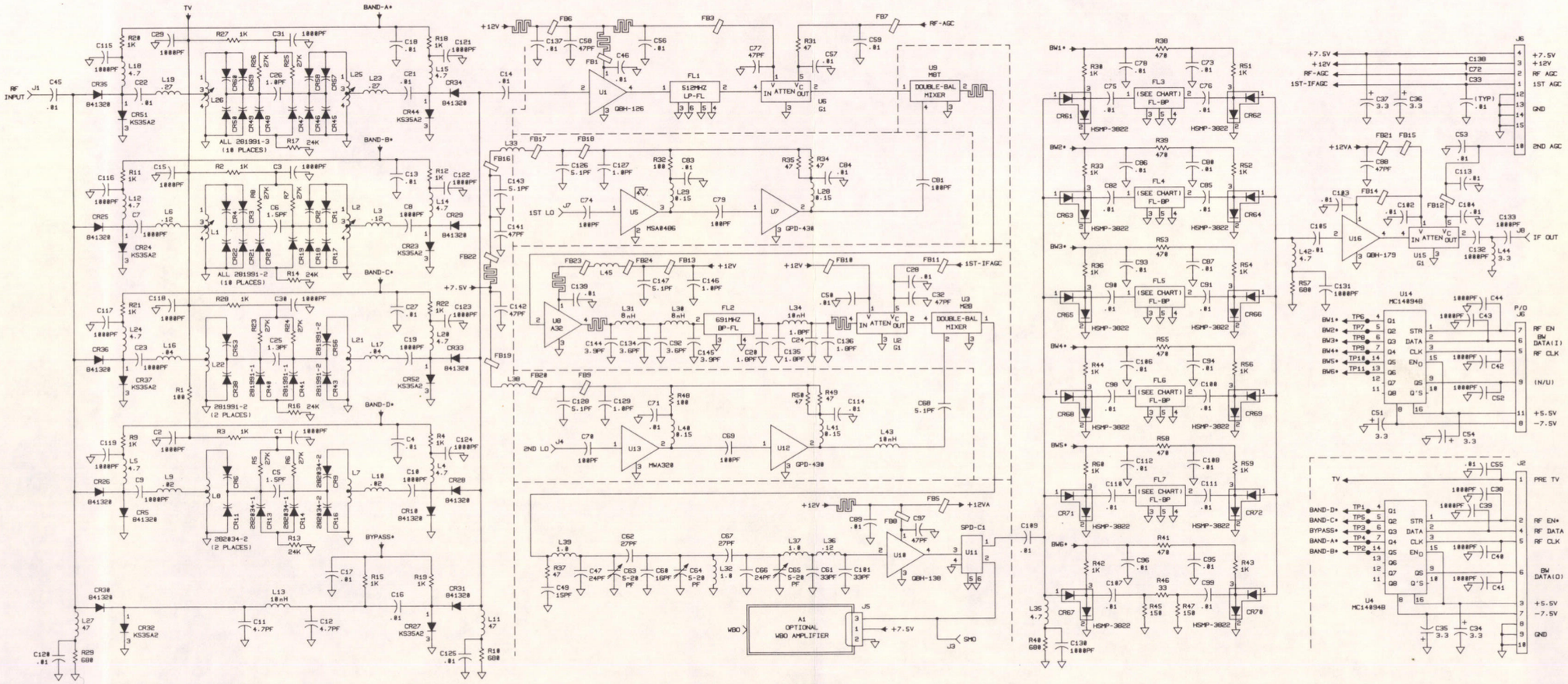


Figure 4-4. Type 796779-1, RF Converter (A3), Schematic Diagram 580897 (B)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ± 5%, 1/8W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.
2. DIFFERENCE BETWEEN TYPES (-1,-2) IS LISTED IN TABLE A.

TABLE A

TYPE	R74	R78
796780-1	USED	N/U
796780-2	N/U	USED

Figure 4-5. Type 796780-1, Demodulator (A4), Schematic Diagram 580898 (Sheet 1 of 2) (07)

Figure 4-5. Type 796780-1, Demodulator (A4), Schematic Diagram 580898 (Sheet 2 of 2) (07)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN µF.
   c) INDUCTANCE IS IN µH.

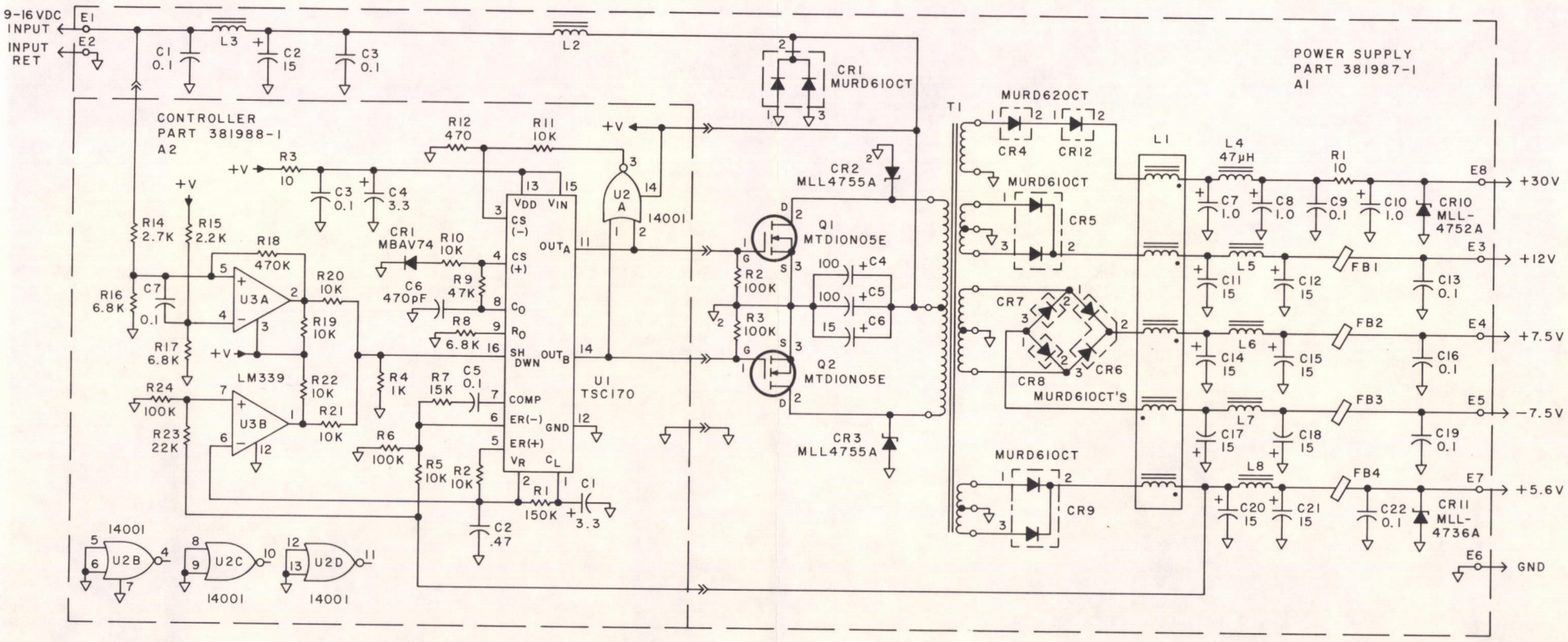


Figure 4-6. Type 766019-1, DC/DC Power Supply (PS1), Schematic Diagram 481472 (05)

NOTES:

1. WHEN WBO OPTION, SCHEM 481446, IS INSTALLED, A3A1 IS INSTALLED, JW1 IS CONNECTED TO A3A1 INSTEAD OF A3.
2. FOR A4A1 VIDEO FILTER USAGE (CUSTOMER/FACTORY), SEE TABLE.
3. WHEN FE-OPTION IS INSTALLED A3W6 IS NOT USED, FE-W1, FE-W2, FE-W3, AND FE-P1 ARE USED.

TYPE	SCHEM	DESCRIPTION
381999	382004	VIDEO FILTER, 4 ACTIVE, 1 PASSIVE
382000	382005	VIDEO FILTER, 3 ACTIVE, 2 PASSIVE
382001	382006	VIDEO FILTER, 2 ACTIVE, 3 PASSIVE
382002	382007	VIDEO FILTER, 1 ACTIVE, 4 PASSIVE
382003	382008	VIDEO FILTER, 0 ACTIVE, 5 PASSIVE

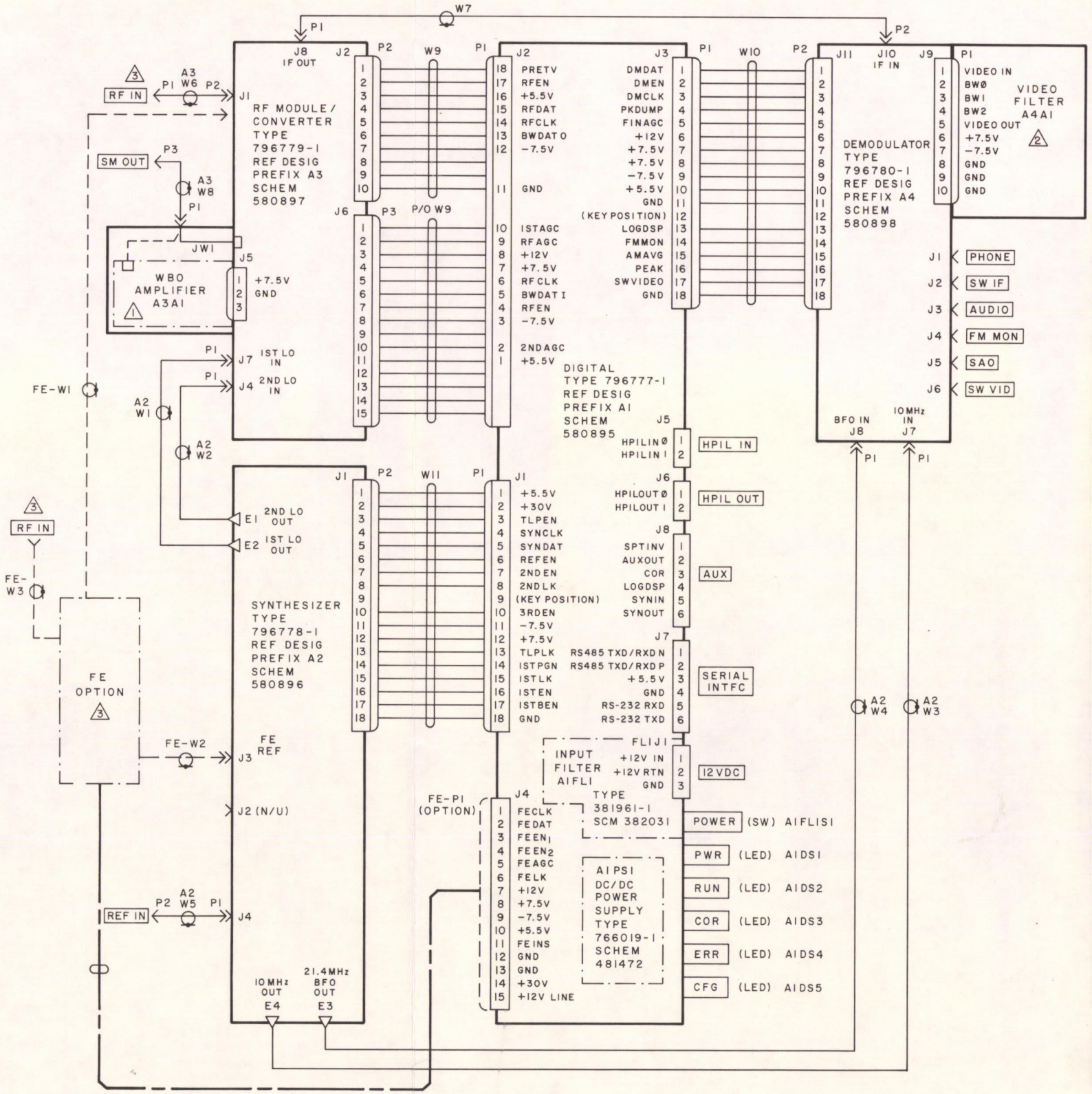


Figure 4-7. Type WJ-8607 Miniceptor Receiver, Main Chassis Schematic Diagram 481391 (04)

APPENDIX A

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

April 1990

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

TABLE OF CONTENTS

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

APPENDIX A

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX A

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

April 1990

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

APPENDIX A

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

TABLE OF CONTENTS

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

APPENDIX A

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX A

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

APPENDIX A

WJ-860X VHF/UHF RECEIVER IF BANDWIDTHS

A.1 GENERAL DESCRIPTION

The WJ-860X VHF/UHF Receiver may contain up to five user selectable IF bandwidths which are normally factory configured prior to delivery. **Table A-1** provides a list of the available IF Bandwidths for the WJ-860X VHF/UHF Receiver and the part numbers of the components associated with each selection. The IF filters and Video filter assembly components for each receiver are unique to the bandwidth configuration of that receiver. The actual IF bandwidth is determined by plug-in filters contained on the Type 796779-1 RF Converter Assembly. Video bandwidth is determined by the appropriate Video Filter Assembly, mounted on the Type 796780-X Demodulator Assembly. Once the bandwidth components are properly installed, the receiver firmware is configured to store parameters associated with the selected bandwidths into memory for use during normal receiver operation.

This appendix provides the component values associated with each of the available bandwidth selections to assist in troubleshooting, repair, and modification of the bandwidth configuration should a change in the installed bandwidths be required. Following the bandwidth description, the configuration procedure is described.

Table A-1. IF Bandwidth and Video Response Components

IF Bandwidth kHz	IF Filter Part Number	Bandwidth Group	Video Response Parts List	Video Response kHz
6.4	92535	A	860X/6.4	4.0
10.0	92503	A	860X/10	6.5
20.0	92504	A	860X/20	13.0
25.0	92504	A	860X/25	13.0
50.0	92501	A	860X/50	30.0
75.0	92536	A	860X/75	45.0
100.0	92502	A	860X/100	60.0
250.0	92505	P	860X/250	175.0
300.0	92529	P	860X/300	200.0
500.0	92500	P	860X/500	325.0
1000.0	92499	P	860X/1M	650.0
2000.0	92498	P	860X/2M	1300.0
4000.0	92497	P	860X/4M	2600.0
5000.0	92570	P	860X/5M	3250.0
8000.0	92531	P	860X/8M	5500.0

A.2 IF BANDWIDTH CONFIGURATION

For each of the bandwidth selections listed in **Table A-1**, the IF Filter part number is provided along with the designated parts list containing the component values installed on the Video Filter for that bandwidth location. Also included in the table is an IF Bandwidth Group code that signifies the type filter that is used on the Video Filter Assembly for each of the bandwidth selections. Bandwidth selections ranging from 6.4 kHz to 100 kHz are coded to signify that an active (A) video filter is used. Bandwidths of 250 kHz and greater are coded to signify that a passive (P) video filter is used. The combination of active and passive filters that are installed determines the type video filter card that is used to contain the video filter components. In order to provide the proper receiver operation, the Video Filter Assembly must contain the appropriate video response filters that match with the bandwidth filters installed in the receiver (as listed in **Table A-1**).

A.2.1 IF BANDWIDTH FILTER SELECTION

Selection of the desired IF bandwidth consists of choosing the appropriate IF filter from the available choices listed in **Table A-1.** Each IF filter is a sealed circuit that plugs directly into the Type 796779-1 RF Converter Assembly. It is recommended that the bandwidths be installed in ascending order, with the narrowest bandwidth filter installed in slot #1. Additionally, if a filter is installed in bandwidth slot #5, its value must be 250 kHz or greater.

A.2.2 VIDEO FILTER ASSEMBLY SELECTION

The Video Filter Assembly is factory assembled to match the bandwidth configuration of the receiver. The finished assembly is unique to a specific bandwidth configuration and may only be installed in receivers containing those bandwidths. Should a replacement Video Filter be required, it is ordered by specifying the bandwidth values that are contained in the receiver, in the order that they are installed.

There are five Video Filter Assemblies available for installation into the WJ-860X VHF/UHF Receiver. Each is designed to accept various combinations of active and passive type video filters. The assembly supplied depends on bandwidth groups into which the selected IF bandwidths fall. **Figures A-3 through A-7** contain the schematic diagrams for each of the five Video Filter Assemblies. **Figure A-8** provides a tabular listing of the component values used for each IF bandwidth selection.

A.2.2.1 Type 382003-1 Video Filter

The Type 382003-1 Video filter is used for receivers that contain bandwidths from Bandwidth Group P only. This Video Filter Assembly is used with configurations that contain only bandwidths of 250 kHz and greater. It contains no provisions for the installation of active filters that are used by filters from bandwidth group A.

A.2.2.2 Type 382002-1 Video Filter

The Type 382002-1 Video Filter is used in bandwidth configurations that contain one bandwidth from group A and up to four filters from group P. On this Video Assembly, filter location #1 contains a video filter that matches with an IF filter from group A (100 kHz and less).

Locations #2 through #5 contain filters that match with IF filters from group P (250 kHz and greater).

A.2.2.3 Type 382001-1 Video Filter

The Type 382000-1 Video Filter is used in bandwidth configurations that contain two bandwidths from group A and three from group P. The video filters that match with the group A IF filters (100 kHz and less) are installed in locations #1 and #2, and those that match with the group P IF filters (250 kHz and greater) are installed in locations #3, #4, and #5.

A.2.2.4 Type 382000-1 Video Filter

The Type 382000-1 Video Filter is used in bandwidth configurations that contain three IF bandwidths from group A and two from group P. The video filters that match with the group A filters (100 kHz and less) are installed in locations #1, #2, and #3, and those that match with the group P IF filters (250 kHz and greater) are installed in locations #4, and #5.

A.2.2.5 Type 381999-1 Video Filter

The Type 381999-1 Video Filter is used in bandwidth configurations that contain four IF bandwidths from group A and one from group P. The video filters that match with the group A IF filters (100 kHz and less) are installed in locations #1, through #4, and location #5 contains the one that matches with the group P IF filters (250 kHz and greater).

A.2.3 IF BANDWIDTH AND VIDEO FILTER REMOVAL AND REPLACEMENT

The procedure used for replacement of components associated with the IF bandwidth and Video Filter is divided into three groups to accommodate the various degrees of maintenance that may be performed. If either an IF Bandwidth Filter or Video Filter is to be replaced with a component of like value, and no change in bandwidth configuration results, only the IF Filter or Video Filter replacement procedure need be performed. However, if a new value IF bandwidth filter is installed, resulting in a configuration change, the procedures associated with the IF Filter replacement, Video Filter replacement, and Receiver Configuration must all be performed.

A.2.3.1 IF Bandwidth Filter Replacement

The procedure that follows is used to replace one or more of the IF filters installed in the WJ-860X VHF/UHF Receiver. Prior to performing this procedure, verify the current receiver configuration to determine if the Video Filter replacement and receiver firmware configuration is necessary. The label on the Video Filter Assembly contains a listing of the current bandwidth configuration.

1. Disconnect power from the unit.

2. Remove the three phillips head screws from the top edge of the front and rear panels of the unit. Carefully lift the top cover and unfold the receiver body to expose the internal circuitry.

3. Remove the three phillips head screws from the filter bracket (**Item "A" in Figure A-1**) and remove the bracket.

4. Locate the filter to be replaced and unplug it from its socket on the Type 796779-1 RF Converter Assembly (Refer to **Figure A-1** for identification of the filter location).

5. Install the replacement filter at the appropriate location and reinstall the filter bracket, using the hardware removed in step 3.

6. If the same filter value is installed in the same location on the RF Converter Assembly, no further action is required. The receiver may be closed and returned to service. Otherwise, continue with the Video Filter Replacement and Receiver Firmware Configuration procedures that follow.

A.2.3.2 Video Filter Replacement

Prior to attempting replacement of the Video Filter, verify that the replacement is configured to match the intended bandwidth configuration of the receiver. The label on the Video Filter Assembly defines configuration of the assembly and must match with the IF bandwidth filters installed on the Type 796779-1 RF Converter Assembly.

1. If not done previously, disconnect power and remove the three phillips head screws from the top edge of the front and rear panels of the unit. Carefully lift the top cover and unfold the receiver body to expose the internal circuitry.

2. Remove the two phillips head screws that secure the Video Filter to the Type 796780-1 Demodulator Assembly (**Item "B" in Figure A-1**).

3. Carefully unplug the Video Filter by pulling straight up.

4. Install the replacement Video Filter Assembly and secure in place, using the hardware removed in step 2.

5. If the replacement Video Filter configuration is identical to the one previously installed, no further action is required. The receiver may be closed and returned to service. Otherwise,verify that the proper IF bandwidth filters are installed on the Type 796779-1 RF Converter Assembly, close the receiver case, and continue with the Receiver Firmware Configuration procedure that follows.

A.2.4 RECEIVER FIRMWARE CONFIGURATION

Any modification to the originally installed bandwidth values requires that the firmware in the receiver be reconfigured with the parameters associated with the newly installed components. The procedure that follows provides the steps necessary to configure each IF Bandwidth and Video Filter slot to provide proper receiver operation for the new configuration.

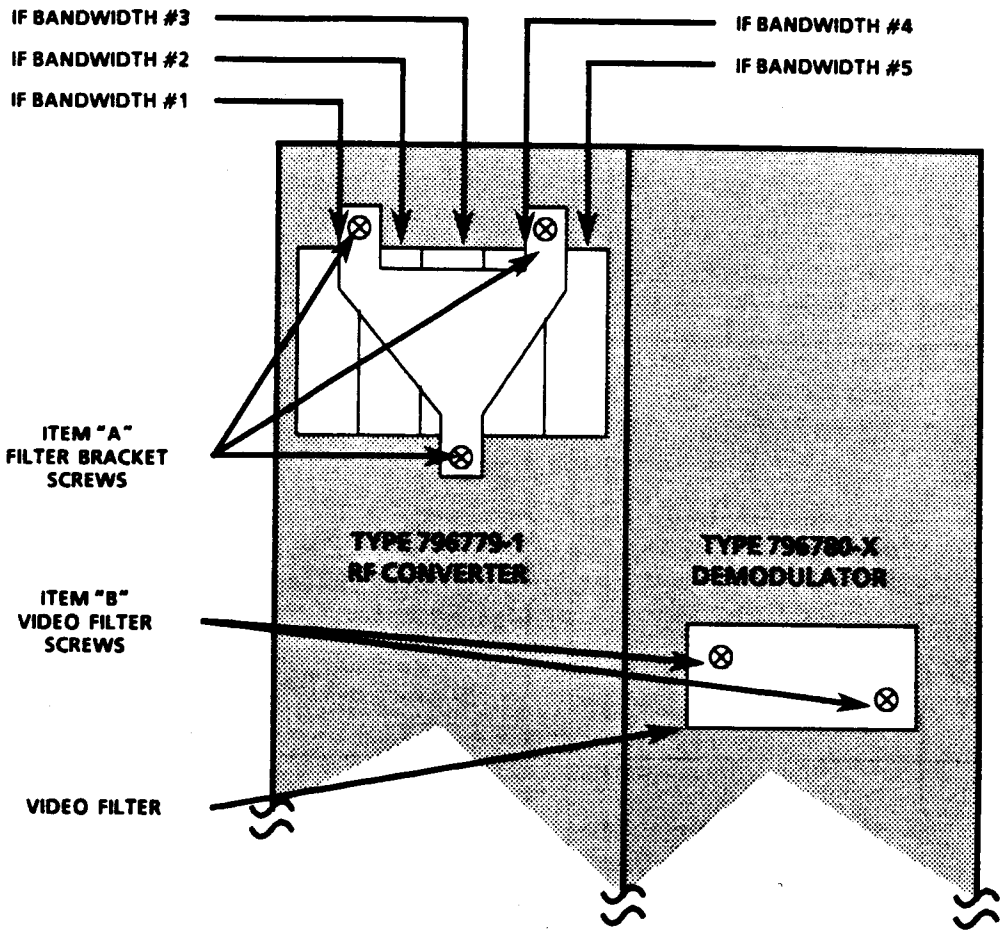


Figure A-1. IF Bandwidth and Video Filter Component Locations

Before any attempt is made at reconfiguring the receiver firmware, carefully review the procedure and commands associated with this process. When the receiver is placed into the CONFIGURATION mode, essential calibration data is unguarded and extreme caution must be observed to avoid disturbing vital data.

A.2.4.1 IF Bandwidth and Video Filter Configuration Mnemonics

The mnemonics describe below are valid only when the receiver is placed into the CONFIGURATION mode. They are used to set and verify the IF Bandwidth and Video Filter configuration when a change has been made to the original values. The command must be sent separately for each bandwidth slot that has been modified.

The Commands and queries described below are shown in a generic form to illustrate the mnemonic and data structure of the message. The actual method of initiation and termination of the message is determined by the type computer used. Refer to the user's manual for the computer for details on sending messages via its remote interface.

#CBW nrf,nrf,nrf,nrf,nrf,nrf,nrf,nrf,nrf

This command is used to enter IF Bandwidth configuration data into the receiver firmware. It consists of the #CBW mnemonic, followed by nine data fields, each containing one of the of the parameters needed for the configuration. Each field accepts ASCII data in a forgiving numeric representation (nrf). In this forgiving format, at least one ASCII digit must be present in the data element. Leading zeros to the left of the decimal point and trailing zeros to the right of the decimal point may be omitted. If a polarity sign is omitted in fields that require a polarity indication, it is assumed to be positive. Negative polarities must have the "-" sign preceding the digits.

The nine data fields following the command are strung together using a comma to separate fields. The range of the ASCII data in each field is as follows:

Field #1- The first data field contains a number ranging from 1 to 6, indicating which bandwidth slot is to be configured. Numbers 1 through 5 specify their respective bandwidth slot. Number 6 indicates the bypass position.

Field #2- The second data field specifies the IF bandwidth size (in MHz) that is installed in the slot indicated in field #1. This field contains a value ranging from 0.0000 to 20.0000, with 0.0 indicating that no bandwidth filter is installed in the slot. Refer to the IF BW SIZE column in the Bandwidth Configuration Table (Table A-2) for a list of the entries available for use in field #2.

Field #3- The third field specifies which Video Filter slot is activated with the bandwidth selection. This field contains a value ranging from 1 to 5. Except for IF bandwidth slot #6 (Bypass), the number in this field is normally the same as the number specified in field #1. Bandwidth slot 6 normally uses the widest Video Filter slot available, Typically slot 5.

Field #4- The fourth field determines which FM discriminator is to be used with the installed bandwidth. This field contains a value of 1, 2, or 3, to select the narrowband (1), medium band (2) or wide band (3) discriminator. Refer to the FM DISC. column in Table A-2 for a list of the required discriminator selections for each IF Bandwidth.

Field #5- The fifth field is used to specify the FM scaling factor that is to be used to provide the proper detected FM signal levels. Values in this field may range from 0 to 7. The FM SCALE column of Table A-2 lists the recommended scaling factor to use for each IF bandwidth selection.

Field #6- The sixth field selects the proper IF Post Filter. This field contains a value of 1, 2, or 3 to select the narrowband (1), medium band (2) or wide band (3) Post Filter. The POST FILTER column of **Table A-2** lists the required Post Filter to use for each IF bandwidth selection.

Field #7- The seventh field contains the IF normalization factor which adjusts the overall receiver gain to accommodate the various IF bandwidth sizes. This field contains values ranging from 00 to 25, specifying the gain normalization in dB. The IF NORM column of **Table A-2** lists the required IF normalization to use for each IF bandwidth selection.

Field #8- The eighth field contains a filter equalization value which is used to adjust for insertion loss in the different filters that may be selected. This field contains a value ranging from -3 to +3, to adjust for the design characteristics of the filters currently in use. The IF EQUAL column of **Table A-2** lists the current values of filter equalization to be used with each IF bandwidth selection.

Field #9- The last field indicates the Signal Strength Noise Floor for the IF bandwidth installed in the IF bandwidth slot. This field contains a value ranging from -50 to -140, specifying the noise floor in dBm. The NOISE FLOOR column of **Table A-2** lists the required Noise Floor value to be used with each IF bandwidth selection.

#CVB nrf,nrf

This command is used to enter Video Filter configuration data into the receiver firmware. It consists of the #CVB mnemonic, followed by two data fields, each containing one of the of the parameters needed for the configuration. Each field accepts ASCII data in a forgiving numeric representation (nrf). In this forgiving format, at least one ASCII digit must be present in the data element. Leading zeros to the left of the decimal point and trailing zeros to the right of the decimal point may be omitted.

The two data fields following the command are strung together using a comma to separate fields. The range of the ASCII data in each field is as follows:

Field #1- The first data field contains a number ranging from 1 to 5, indicating which Video Filter slot is to be configured.

Field #2- The second data field specifies the Video bandwidth size (in MHz) that matches with the IF filter installed in the corresponding IF Bandwidth slot. This field contains a value ranging from 0.0000 to 20.0000, with 0.0000 indicating that no bandwidth filter is installed in the corresponding IF Bandwidth slot. The VIDEO RESP. column of **Table A-2** lists the values to be used with each IF bandwidth selection.

#RCB nr1?

This query is used to verify the IF Bandwidth configuration data for the bandwidth slot specified by the nr1 data field. It consists of the #RCB mnemonic, followed by one data field and a question mark. In response to this query, the receiver returns the #CBW mnemonic followed by the nine data fields containing the current configuration data.

A typical response for bandwidth slot #1 when a 10 kHz IF bandwidth is installed is:

#CBW 1,0000.0100,1,1,7,1,02,+0,-124

Table A-2. Bandwidth Configuration Table

IF Bandwidth MHz	Video Resp. MHz	FM Disc.	FM Scale	Post Filter	IF Norm.	IF Equal	Noise Floor
0000.0064	0000.0040	1	7	1	00	-2	-126
0000.0100	0000.0065	1	7	1	02	-2	-124
0000.0200	0000.0130	1	4	1	05	-2	-121
0000.0250	0000.0130	1	4	1	05	-2	-121
0000.0500	0000.0300	1	2	1	09	-2	-117
0000.0750	0000.0450	1	2	2	00	+0	-115
0000.1000	0000.0600	1	2	2	01	+0	-114
0000.2500	0000.1750	2	3	2	05	+0	-110
0000.3000	0000.2000	2	3	2	06	+1	-109
0000.5000	0000.3250	2	2	2	08	+0	-107
0001.0000	0000.6500	2	1	3	01	+0	-104
0002.0000	0001.3000	3	3	3	04	+0	-101
0004.0000	0002.6000	3	2	3	07	+0	-098
0005.0000	0003.2500	3	1	3	08	+0	-097
0008.0000	0005.5000	3	1	3	10	+0	-095
▸0012.0000	▸Widest VBW	3	1	3	12	+0	-093

▸ This selection is used for IF Bandwidth slot #6 To indicate the BYPASS mode. The Video Filter selection for this position the slot number containing the widest bandwidth.

#RVB nr1?

This query is used to verify the Video Filter configuration data for the bandwidth slot specified by the nr1 data field. It consists of the #RVB mnemonic, followed by one data field and a question mark. In response to this query, the receiver returns the #CVB mnemonic followed by the two data fields containing the current configuration data.

A typical response for Video Bandwidth slot #1 when a 10 kHz IF bandwidth is installed is:

#CVB 1,0000.0065

A.2.4.2 **IF Bandwidth and Video Filter Firmware Configuration**

Any time an IF Bandwidth filter change results in a change in the receiver bandwidth configuration, the receiver must be reconfigured to store the parameters associated with the new configuration into the receiver firmware. The procedure that follows provides instructions to perform this task.

1. Place the receiver power switch in the OFF position.
2. Remove the two phillips head screws from the access cover on the underside of the receiver chassis.
3. Activate the Configuration Mode by placing switch #6 of the exposed DIP switch into the ON position (Refer to **Figure A-2**).

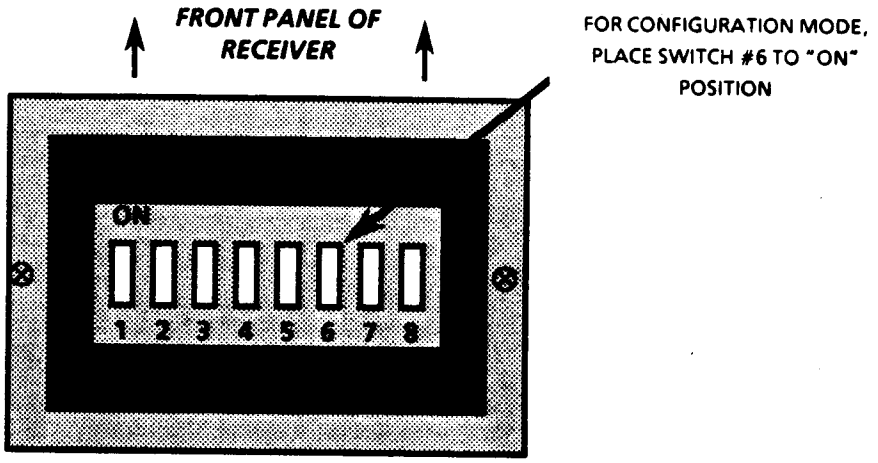


Figure A-2. Receiver Configuration Switch Location

4. Place the receiver into the ON position. The front panel Configuration LED will illuminate, indicating that the receiver is in the Configuration Mode.
5. From the controller keyboard, enter the #CBW command followed by the associated data fields to reconfigure the Bandwidth slots. Refer to the #CBW command description and **Table A-2** for the required data for each of the IF bandwidth selections. A separate #CBW command must be sent for each bandwidth slot that is to be reconfigured.

6. Enter #RCB command followed by the associated data fields to reconfigure the Video Filter. Refer to the #RCB command description and **Table A-2** for the required data for each of the selections. A separate #RCB command must be sent for each Video Filter slot that is to be reconfigured.

7. Verify the configuration of each IF Bandwidth slot, using the #CBW nr1? query. The nr1 variable indicates the IF Bandwidth slot number (1 through 6).

8. Verify the configuration of each Video Filter slot, using the #RVB nr1? query. The nr1 variable indicates the Video Filter slot number (1 through 5).

9. When the firmware reconfiguration and verification is complete, return the receiver to normal operation by placing the receiver Power switch into the OFF position and returning DIP switch #6 to the OFF position.

10. Replace the access cover. When the receiver is powered on, the CONFIGURATION LED will be extinguished, indicating the Configuration Mode is disabled.

A.3 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.

A.4 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).

A.5 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
01295	Texas Instruments, Inc. Semiconductor-Components, Div. 13500 North Central Expressway Dallas, TX 75231	55322	Samtec, Inc. 801 Progress Blvd. P.O. Box 1147 New Albany, IN 47150
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878	72982	Erie Tech. Products, Inc. 644 West 12th Street Erie, PA 16512

A.6 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 A.5**, and the manufacturer's part number, provided in **paragraph A.6.1**, 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 A.6.1** 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. As a result, some transistors, diodes and integrated circuits which are installed in the unit may not agree with the parts lists or schematic diagrams of this manual. However, substitution of the semiconductor devices listed in this manual may be substituted with satisfactory results.

A.6.1 TYPE 381999-1 VIDEO FILTER ASSEMBLY (4 ACTIVE, 1 PASSIVE)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	See IF Bandwidth Kit Parts List				
C2	See IF Bandwidth Kit Parts List				
C3	See IF Bandwidth Kit Parts List				
C4	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	2	841250-19	14632	
C5	Same as C1				
P1	Connector, Terminal	1	TD-105-G-A-1	55322	
R1	See IF Bandwidth Kit Parts List				
R2	See IF Bandwidth Kit Parts List				
R3	See IF Bandwidth Kit Parts List				
R4	See IF Bandwidth Kit Parts List				
R5	Resistor, Fixed: 220Ω, 5%, 1/8 W	2	841296-049	14632	
R6	Same as R5				
U1	Amplifier	1	86064SO14U	14632	
U2	Integrated Circuit	1	864051SO16N	14632	

A.6.2 TYPE 382000-1 VIDEO FILTER ASSEMBLY (3 ACTIVE, 2 PASSIVE)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	See IF Bandwidth Kit Parts List				
C2	See IF Bandwidth Kit Parts List				
C3	See IF Bandwidth Kit Parts List				
C4	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	2	841250-19	14632	
C5	Same as C1				
P1	Connector, Terminal	1	TD-105-G-A-1	55322	
R1	See IF Bandwidth Kit Parts List				
R2	See IF Bandwidth Kit Parts List				
R3	See IF Bandwidth Kit Parts List				
R4	See IF Bandwidth Kit Parts List				
R5	Resistor, Fixed: 200Ω, 5%, 1/8 W	2	841296-49	14632	
R6	Same as R5				
U1	Amplifier	1	86064SO14U	14632	
U2	Integrated Circuit	1	864051SO16N	14632	

A.6.3 TYPE 382001-1 VIDEO FILTER ASSEMBLY (2 ACTIVE, 3 PASSIVE)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	See IF Bandwidth Kit Parts List				
C2	See IF Bandwidth Kit Parts List				
C3	See IF Bandwidth Kit Parts List				
C4	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	2	851250-19	14632	
C5	Same as C1				
P1	Connector, Terminal	1	TD-105-G-A-1	55322	
R1	See IF Bandwidth Kit Parts List				
R2	See IF Bandwidth Kit Parts List				
R3	See IF Bandwidth Kit Parts List				
R4	See IF Bandwidth Kit Parts List				
R5	Resistor, Fixed: 220Ω, 5%, 1/8 W	2	841296-049	14632	
R6	Same as R5				
U1	Amplifier	1	86062SO8	14632	
U2	Amplifier	1	864051SO16N	14632	

A.6.4 TYPE 382002-1 VIDEO FILTER ASSEMBLY (1 ACTIVE, 4 PASSIVE)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	See IF Bandwidth Kit Parts List				
C2	See IF Bandwidth Kit Parts List				
C3	See IF Bandwidth Kit Parts List				
C4	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	2	841250-19	14632	
C5	Same as C1				
P1	Connector, Terminal	1	TD-105-G-A-1	55322	
R1	See IF Bandwidth Kit Parts List				
R2	See IF Bandwidth Kit Parts List				
R3	See IF Bandwidth Kit Parts List				
R4	See IF Bandwidth Kit Parts List				
R5	Resistor, Fixed: 220Ω, 5%, 1/8 W	2	841296-049	14632	
R6	Same as R5				
U1	Amplifier	1	86062SO8	14632	
U2	Integrated Circuit	1	864051SO16N	14632	

A.6.5 TYPE 382003-1 VIDEO FILTER ASSEMBLY (0 ACTIVE, 5 PASSIVE)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	See IF Bandwidth Kit Parts List				
C2	See IF Bandwidth Kit Parts List				
C3	Not Used				
C4	Capacitor, Ceramic: .01 µF, 10%, 50 VDC	2	841250-19	14632	
C5	Same as C1				
P1	Connector, Terminal	1	TD-105-G-A-1	55322	
R1	See IF Bandwidth Kit Parts List				
R2	See IF Bandwidth Kit Parts List				
R3	Not Used				
R4	Not Used				
R5	Resistor, Fixed: 220 Ω, 5%, 1/8 W	2	841296-049	14632	
R6	Same as R5				
U1	Not Used				
U2	Integrated Circuit	1	864051SO16N	14632	

A.6.6 TYPE 860X/6.4 IF BANDWIDTH KIT, 6.4 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 4700 pF, 10%, 50 Vdc	2	841250-17	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	1	841250-11	14632	
R1	Resistor, Fixed: 18 kΩ, 5%, 1/8 W	2	841296-095	14632	
R2	Same as R1				
R3	Resistor, Fixed: 68 kΩ, 5%, 1/8 W	1	841296-109	14632	
R4	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	1	841296-089	14632	

A.6.7 TYPE 860X/10 IF BANDWIDTH KIT, 10 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 4700 pF, 10%, 50 Vdc	2	841250-17	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	1	841250-11	14632	
R1	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	2	841296-089	14632	
R2	Same as R1				
R3	Resistor, Fixed: 33 kΩ, 5%, 1/8 W	1	841296-101	14632	
R4	Resistor, Fixed: 6.2 kΩ, 5%, 1/8 W	1	841296-084	14632	

A.6.8 TYPE 860X/20 IF BANDWIDTH KIT, 20 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 4700 pF, 10%, 50 Vdc	2	841250-17	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	1	841250-11	14632	
R1	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	2	841296-081	14632	
R2	Same as R1				
R3	Resistor, Fixed: 18 kΩ, 5%, 1/8 W	1	841296-095	14632	
R4	Resistor, Fixed: 3.3 kΩ, 5%, 1/8 W	1	841296-077	14632	

A.6.9 TYPE 860X/25 IF BANDWIDTH KIT, 25 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 01				
C1	Capacitor, Ceramic: 4700 pF, 10%, 50 Vdc	2	841250-17	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	1	841250-11	14632	
R1	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	2	841296-081	14632	
R2	Same as R1				
R3	Resistor, Fixed: 18 kΩ, 5%, 1/8 W	1	841296-095	14632	
R4	Resistor, Fixed: 3.3 kΩ, 5%, 1/8 W	1	841296-077	14632	

A.6.10 TYPE 860X/50 IF BANDWIDTH KIT, 50 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 2700 pF, 2%, 50 W Vdc	2	841314-083	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 270 pF, 2%, 50 W Vdc	1	841314-059	14632	
R1	Resistor, Fixed: 3.9 kΩ, 5%, 1/8 W	2	841296-079	14632	
R2	Same as R1				
R3	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	1	841296-093	14632	
R4	Resistor, Fixed: 2.4 kΩ, 5%, 1/8 W	1	841296-074	14632	

A.6.11 TYPE 860X/75 IF BANDWIDTH KIT, 75 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	2	841250-13	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	1	841250-07	14632	
R1	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	2	841296-093	14632	
R2	Same as R1				
R3	Resistor, Fixed: 27 kΩ, 5%, 1/8 W	1	841296-099	14632	
R4	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	1	841296-081	14632	

A.6.12 TYPE 860X/100 IF BANDWIDTH KIT, 100 kHz (ACTIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	2	841250-13	14632	
C2	Same as C1				
C3	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	1	841250-07	14632	
R1	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	2	841296-081	14632	
R2	Same as R1				
R3	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	1	841296-093	14632	
R4	Resistor, Fixed: 2.7 kΩ, 5%, 1/8 W	1	841296-075	14632	

A.6.13 TYPE 860X/250 IF BANDWIDTH KIT, 250 kHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 2200 pF, +10%, 50 Vdc	2	841250-15	14632	
C2	Same as C1				
L1	Inductor: 680 µH	1	841444-069	14632	
R1	Resistor, Fixed: 470Ω, 5%, 1/8 W	2	841296-057	14632	
R2	Same as R1				

A.6.14 TYPE 860X/300 IF BANDWIDTH KIT, 300 kHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 1800 pF, 2%, 50 W Vdc	2	841314-079	14632	
C2	Same as C1				
L1	Inductor: 680 µH	1	841444-069	14632	
R1	Resistor, Fixed: 470Ω, 5%, 1/8 W	2	841296-057	14632	
R2	Same as R1				

A.6.15 TYPE 860X/500 IF BANDWIDTH KIT, 500 kHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	2	841250-13	14632	
C2	Same as C1				
L1	Inductor: 47 µH, ±10% 1 MHz	1	LQN4N470K	72982	
R1	Resistor, Fixed: 470Ω, 5%, 1/8 W	2	841296-057	14632	
R2	Same as R1				

A.6.16 TYPE 860X/1M IF BANDWIDTH KIT, 1 kHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	2	841250-13	14632	
C2	Same as C1				
L1	Inductor: 100 µH, ±10%, 1 MHz	1	LQN4N101K-TA	72982	
R1	Resistor, Fixed: 270Ω, 5%, 1/8 W	2	841296-051	14632	
R2	Same as R1				

A.6.17 TYPE 860X/2M IF BANDWIDTH KIT, 2 MHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 470 pF, 5%, 50 Vdc	2	841250-11	14632	
C2	Same as C1				
L1	Inductor: 68 µF, ±10%, 1 MHz	1	LQN4N680K	72982	
R1	Resistor, Fixed: 270Ω, 5%, 1/8 W	2	841296-051	14632	
R2	Same as R1				

A.6.18 TYPE 860X/4M IF BANDWIDTH KIT, 4 MHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 270 pF, 2%, 50 W Vdc	2	841314-059	14632	
C2	Same as C1				
L1	Inductor: 22μH	1	841444-033	14632	
R1	Resistor, Fixed: 200Ω, 5%, 1/8 W	2	841296-048	14632	
R2	Same as R1				

A.6.19 TYPE 860X/5M IF BANDWIDTH KIT, 5 MHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 01				
C1	Capacitor, Ceramic: 220 pF, 2%, 50 W Vdc	2	841314-057	14632	
C2	Same as C1				
L1	Inductor: 18 µH	1	841444-031	14632	
R1	Resistor, Fixed: 200Ω, 5%, 1/8 W	2	841296-048	14632	
R2	Same as R1				

A.6.20 TYPE 860X/8M IF BANDWIDTH KIT, 8 MHz (PASSIVE FILTER)

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
C1	Capacitor, Ceramic: 120 pF, ±2%, 50 W Vdc	2	841314-051	14632	
C2	Same as C1				
L1	Inductor: 10 µH	1	841444-025	14632	
R1	Resistor, Fixed: 200Ω, 5%, 1/8 W	2	841296-048	14632	
R2	Same as R1				

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN µF.
   C) INDUCTANCE IS IN µH.
2) * DENOTES FACTORY/CUSTOMER OPTIONS.
3 REFER TO 382090 FOR DETAILED TABLE OF COMPONENT VALUES IN CIRCUITS A-E.

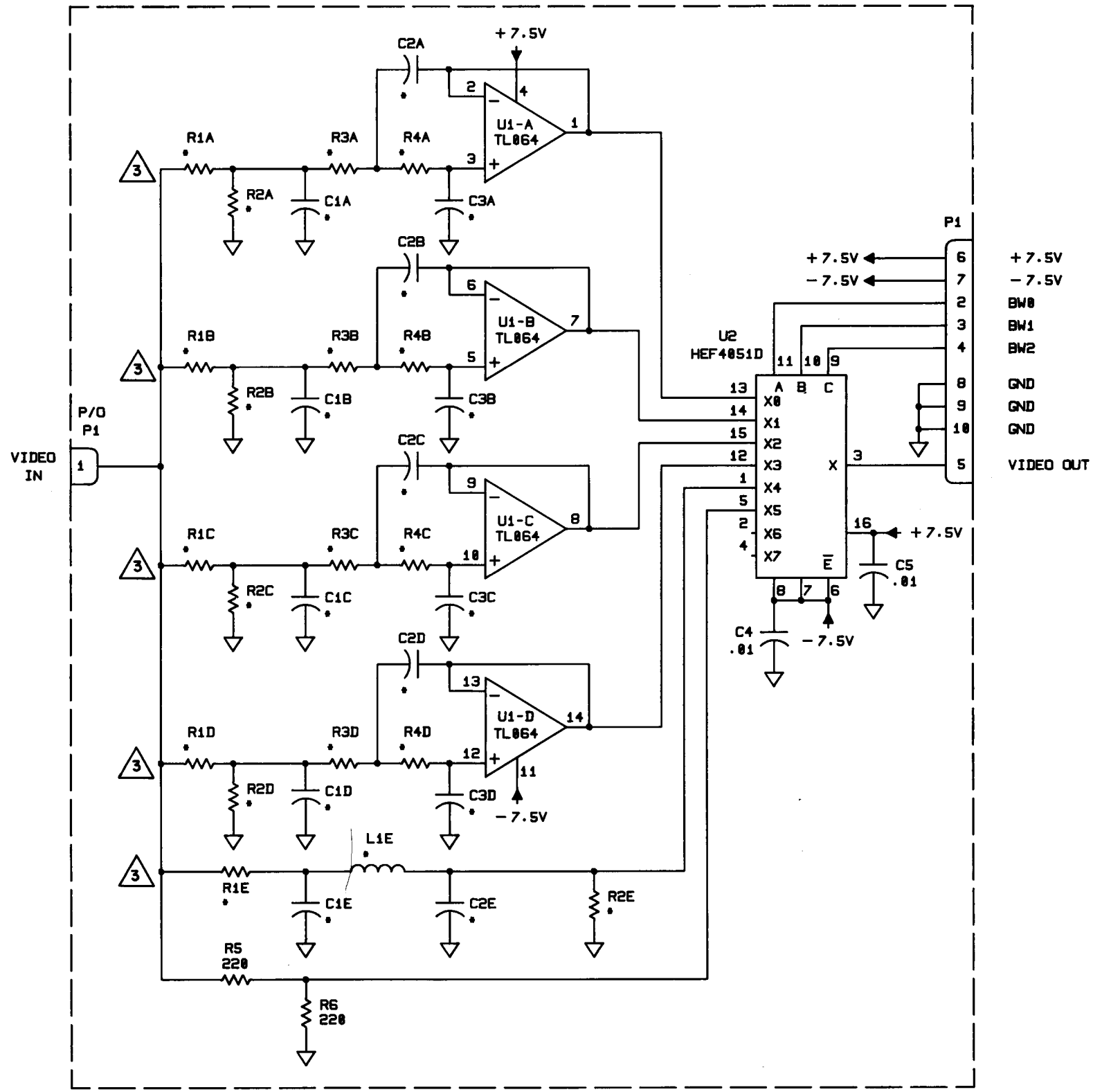


Figure A-3. Type 381999-1, Video Filter 4 Active/1 Passive, Schematic Diagram 382004 (A)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.
2) * DENOTES FACTORY/CUSTOMER OPTIONS.

(3) REFER TO 382090 FOR DETAILED TABLE OF COMPONENT VALUES IN CIRCUITS A-E.

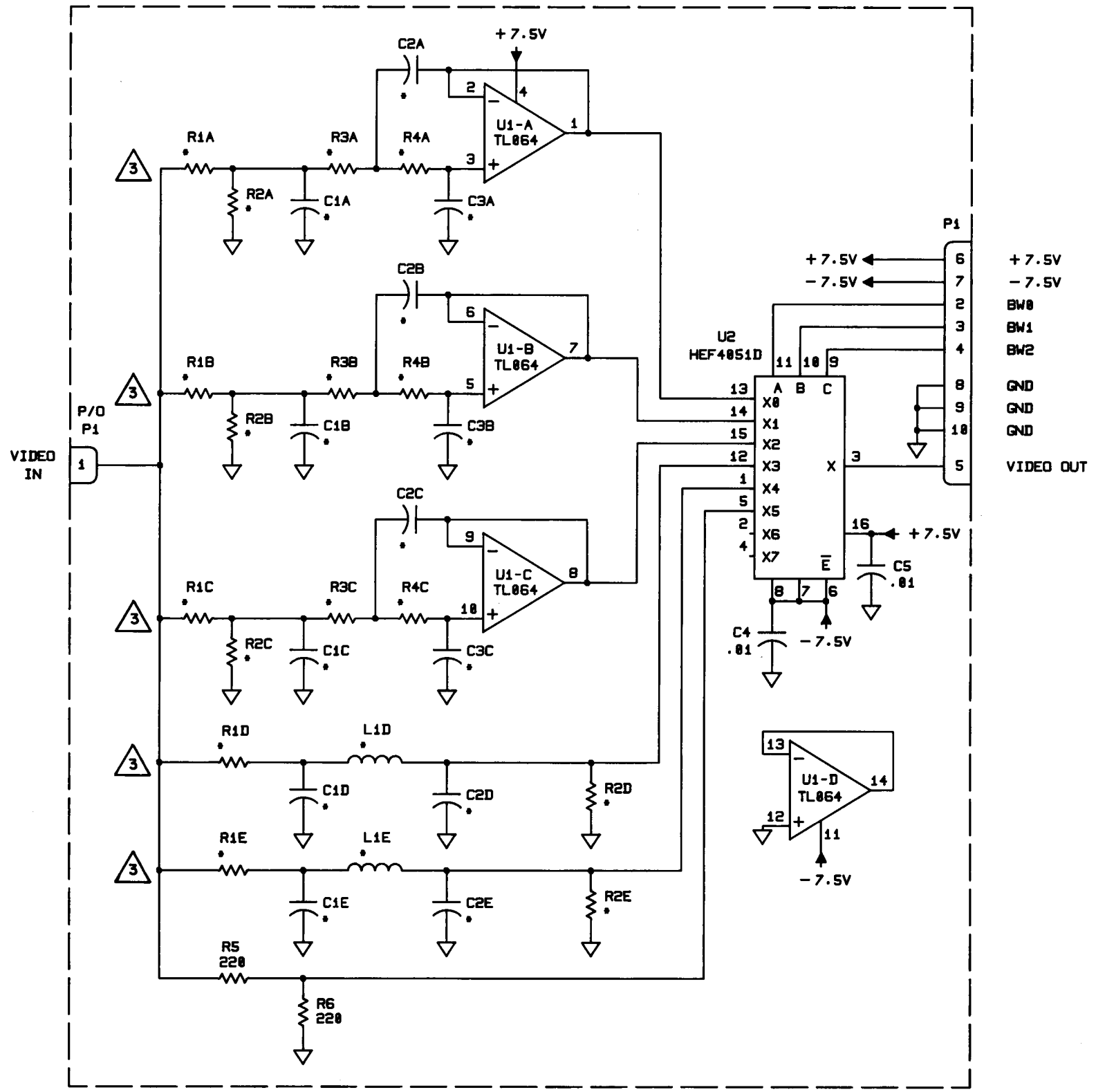


Figure A-4. Type 382000-1, Video Filter 3 Active/2 Passive, Schematic Diagram 382005 (A)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%,1/8W.
   B) CAPACITANCE IS IN µF.
   C) INDUCTANCE IS IN µH.
2) * DENOTES FACTORY/CUSTOMER OPTIONS.

△3 REFER TO 382090 FOR DETAILED TABLE OF COMPONENT VALUES IN CIRCUITS A-E.

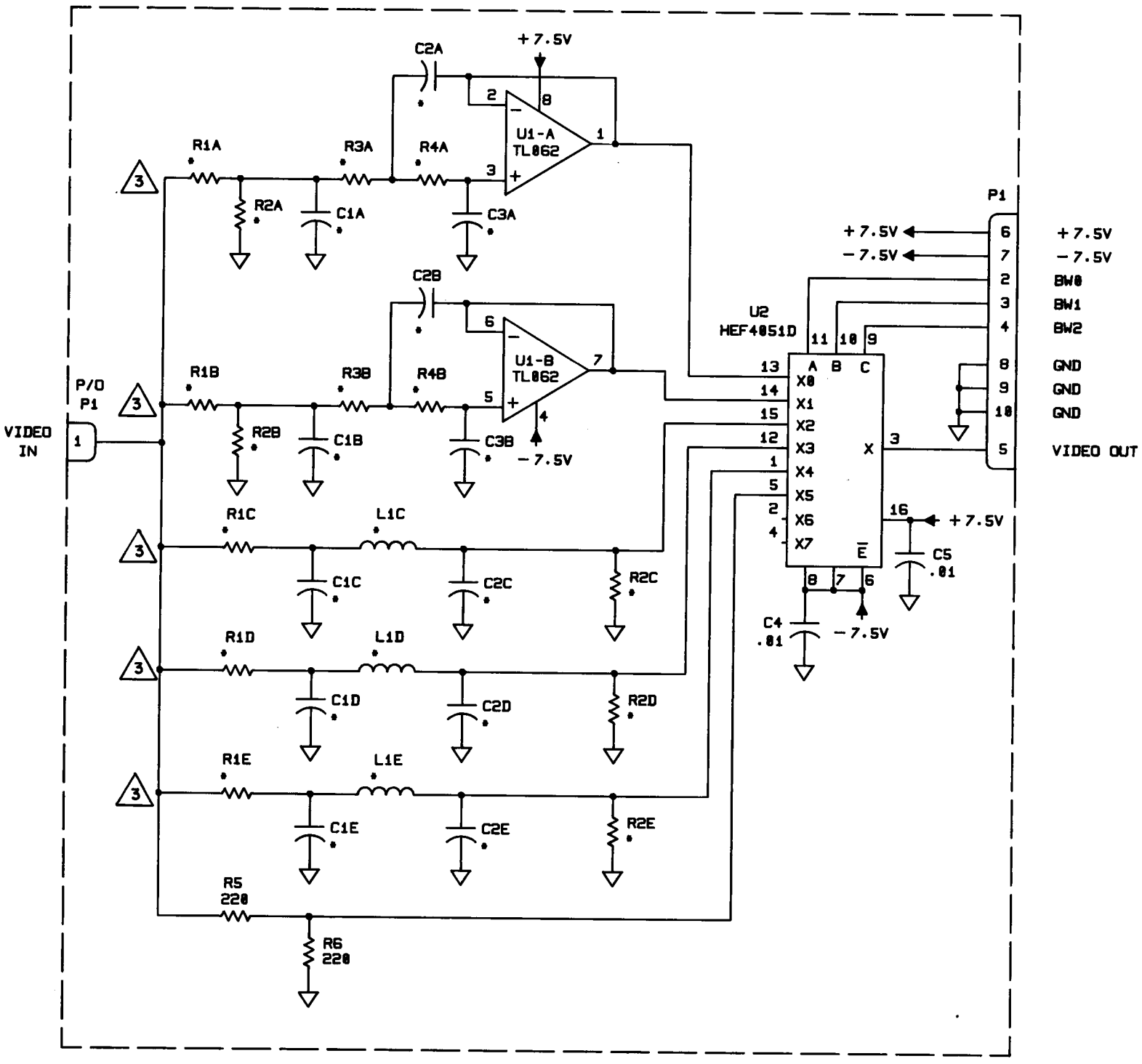


Figure A-5. Type 382001-1, Video Filter 2 Active/3 Passive, Schematic Diagram 382006 (A)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.
2) • DENOTES FACTORY/CUSTOMER OPTIONS.

△3 REFER TO 382090 FOR DETAILED TABLE OF COMPONENT VALUES IN CIRCUITS A-E.

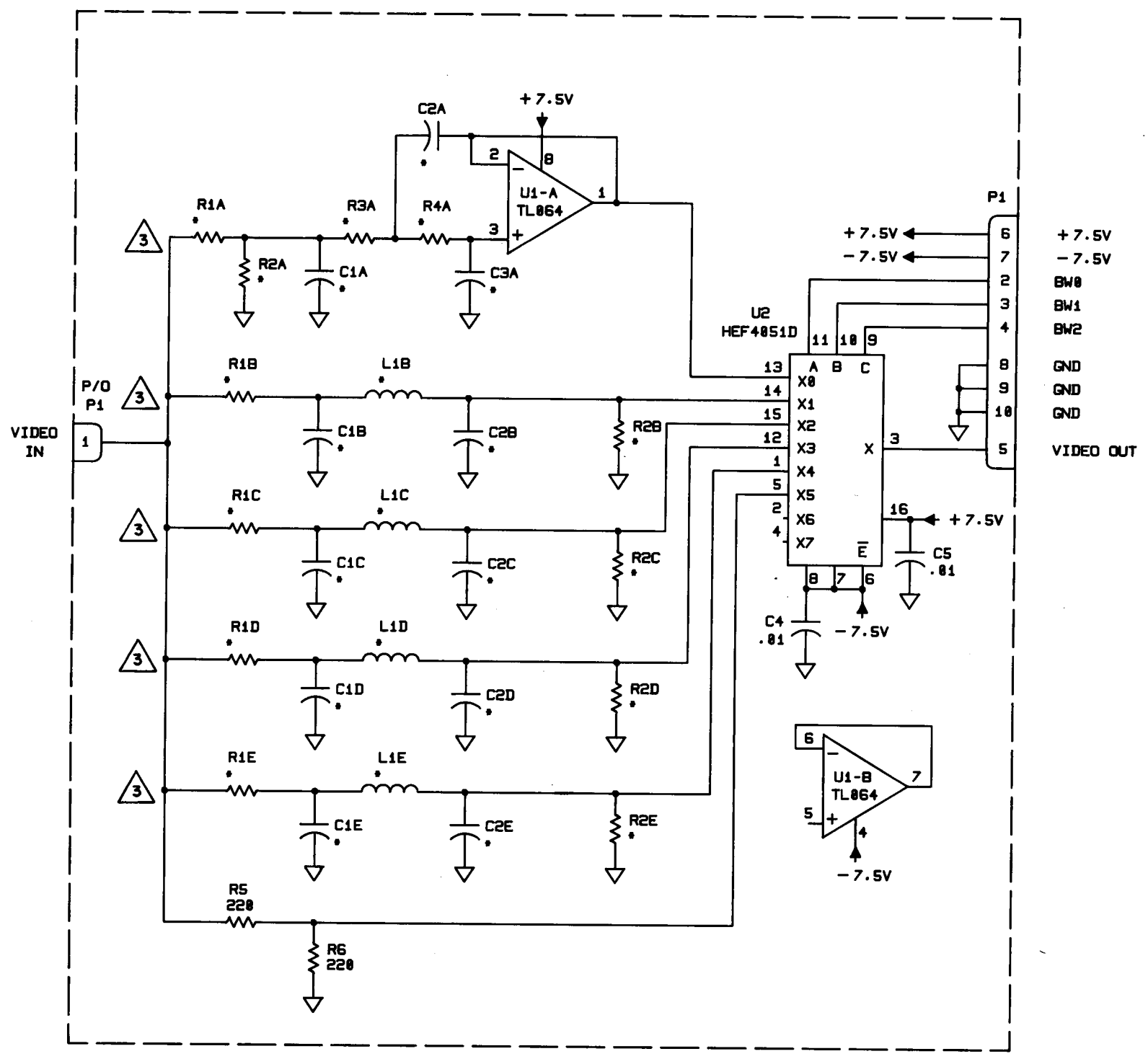


Figure A-6. Type 382002-1, Video Filter 1 Active/4 Passive, Schematic Diagram 382007 (A)

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN µF.
   C) INDUCTANCE IS IN µH.
2) * DENOTES FACTORY/CUSTOMER OPTIONS.

(3) REFER TO 382090 FOR DETAILED TABLE OF COMPONENT VALUES IN CIRCUITS A-E.

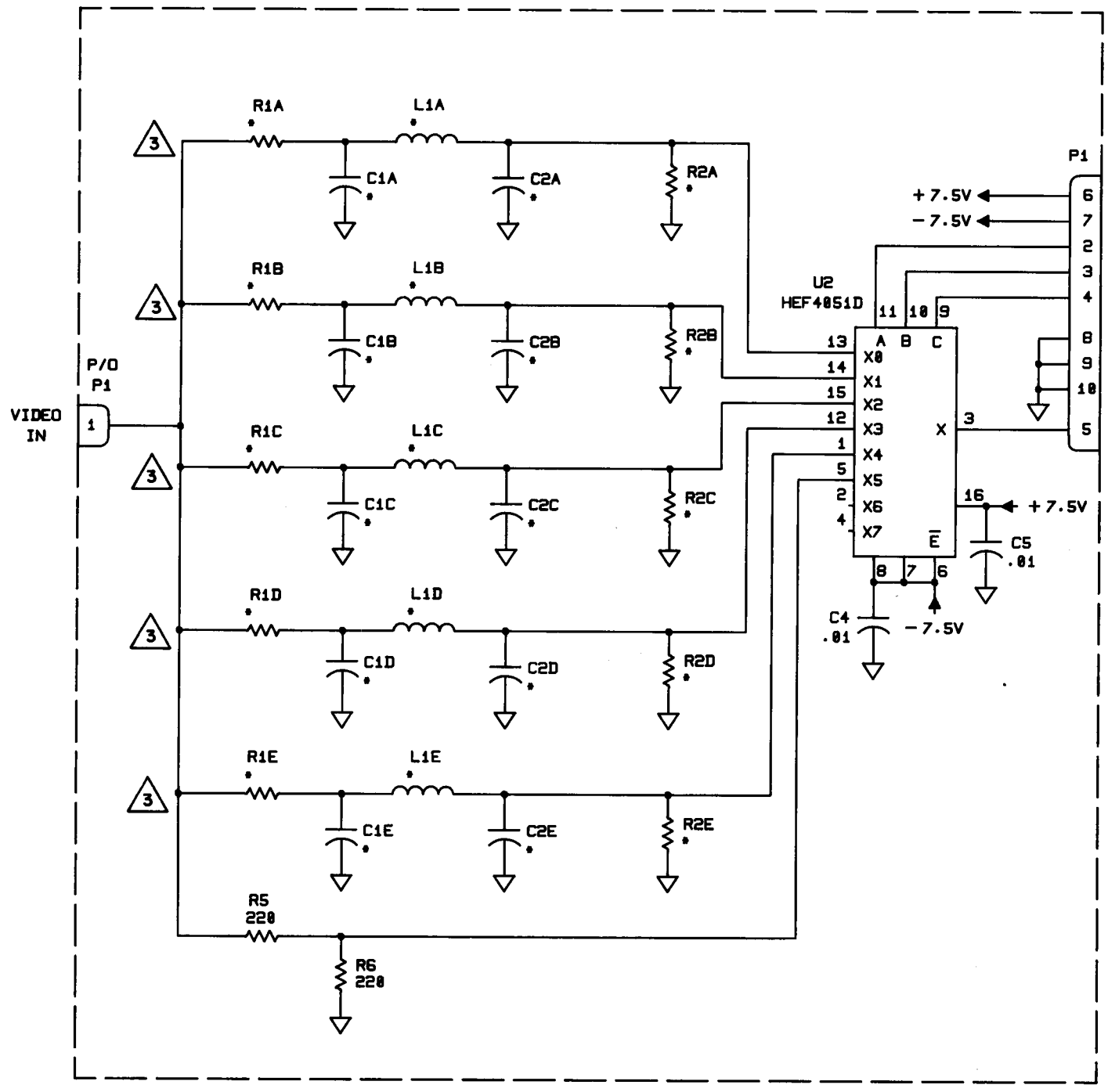
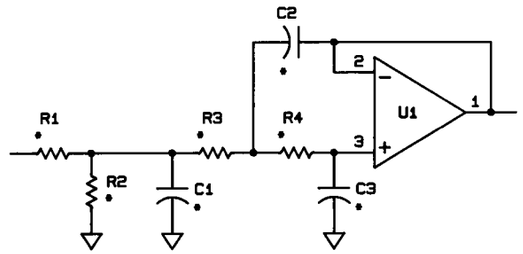


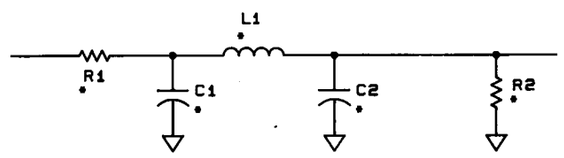
Figure A- . Type 382003-1, Video Filter 0 Active/5 Passive, Schematic Diagram 382008 (A)

NOTE: CHECK FACTORY/CUSTOMER OPTIONS
IN ORDER TO SELECT APPROPRIATE FILTER SECTION.



(ACTIVE FILTER)

IF BW	CIRCUIT VIDEO BW	R1	R2	R3	R4	C1	C2	C3	CPL NO.
6.4KHZ	4KHZ	18K	18K	68K	10K	4700PF	4700PF	470PF	860X/6.4
10KHZ	6.5KHZ	10K	10K	33K	6.2K	4700PF	4700PF	470PF	860X/10
20KHZ	13KHZ	4.7K	4.7K	18K	3.3K	4700PF	4700PF	470PF	860X/20
25KHZ	13KHZ	4.7K	4.7K	18K	3.3K	4700PF	4700PF	470PF	860X/25
50KHZ	30KHZ	3.9K	3.9K	15K	2.4K	2700PF	2700PF	270PF	860X/50
75KHZ	45KHZ	15K	15K	27K	4.7K	1000PF	1000PF	100PF	860X/75
100KHZ	60KHZ	4.7K	4.7K	15K	2.7K	1000PF	1000PF	100PF	860X/100



(PASSIVE FILTER)

IF BW	CIRCUIT VIDEO BW	R1/R2	C1/C2	L1	CPL NO.
250KHZ	175KHZ	470	2200PF	680	860X/250
300KHZ	200KHZ	470	1800PF	680	860X/300
500KHZ	325KHZ	470	1000PF	470	860X/500
1MHZ	650KHZ	270	1000PF	100	860X/1M
2MHZ	1.3MHZ	270	470PF	68	860X/2M
4MHZ	2.6MHZ	200	270PF	22	860X/4M
8MHZ	5.5MHZ	200	120PF	10	860X/8M
5MHZ	3.25MHZ	200	220PF	18	860X/5M

Figure A-8. Type 382090 Value Selection
Schematic Diagram 382090 (B)

APPENDIX B

TYPE WJ-860X/WBO WIDEBAND OUTPUT OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

March 1989

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

TABLE OF CONTENTS

APPENDIX B

TYPE WJ-860X/WBO WIDEBAND OUTPUT OPTION

LIST OF ILLUSTRATIONS

APPENDIX B

TYPE WJ-860X/WBO WIDEBAND OUTPUT OPTION

APPENDIX B

TYPE WJ-860X/WBO WIDEBAND OUTPUT OPTION

B.1 GENERAL DESCRIPTION

When the WJ-860X/WBO Wideband Output Option is installed, a wideband 21.4 MHz IF output signal is made available at the front panel SM OUT connector. This wideband signal, which is levelled by an independent AGC circuit, has a bandwidth of 12 MHz. The nominal power output level of this signal is -30 dBm.

B.2 MECHANICAL DESCRIPTION

The WJ-860X/WBO Option consists of the Type 796784-1 WBO 21.4 MHz Amplifier Assembly (A3A1). It is installed on the Type 796779-1 RF Converter Assembly (A3).

B.3 INSTALLATION

The WJ-860X/WBO option is installed at the factory.

B.3.1 CONNECTORS

B.3.1.1 SM OUT Connector

The wideband 21.4 MHz IF signal is output from the SM OUT connector, which is located on the extreme right of the WJ-860X front panel. See **Figure B-1.** This SMB connector has an output impedance of 50 ohms. The reference designation for this connector is A3J9.

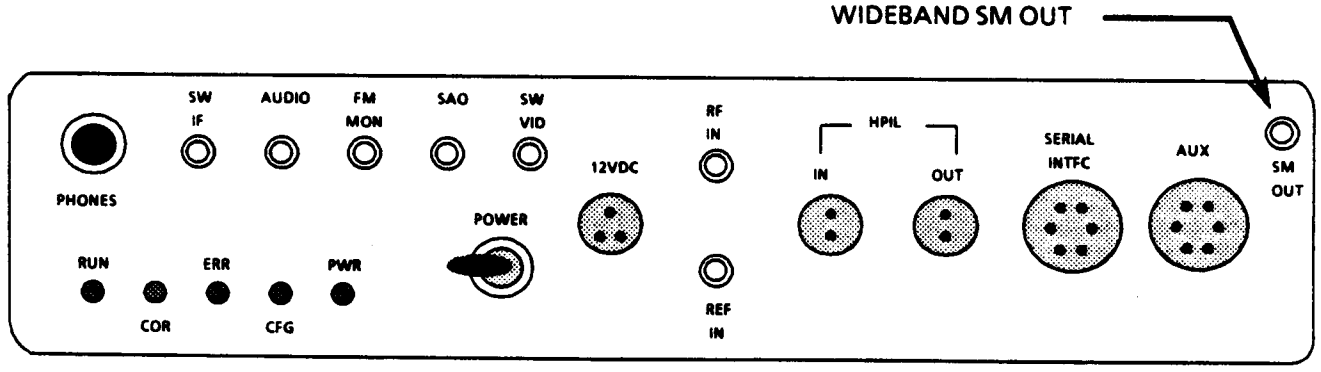


Figure B-1. Location of Wideband SM OUT Connector

B.4 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.5 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.6 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
14632	Watkins-Johnson Co. 700 Quince Orchard Road Gaithersburg, MD 0878	71279	Midland-Ross Corp. 445 Concord Avenue Cambridge, MA 02140
52648	Plessy Semiconductors 1674 McGraw Aenue Irvine, CA 92714	81349	Military Specifications
55322	Santec Inc. 810 Progress Blvd. P.O. Box 1147 New Albany, IN 47150	94375	Automatic Connector Inc. 400 Moreland Road Commack, NY 11725

B.7 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 B.6**, and the manufacturer's part number, provided in **paragraph B.8**, 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 B.8** 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.

B.8 TYPE 796784-1 WIDEBAND OUTPUT ASSEMBLY — MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 03				
A1	WBO 21.4 MHz Amplifier PC Assembly	1	381892-1	14632	

B.8.1 WBO 21.4 MHz AMPLIFIER ASSEMBLY

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 04				
C1	Capacitor, Ceramic: 4700 pF, 10% ,50 Vdc	8	841250-17	14632	
C2 Thru C5	Same as C1				
C6	Capacitor, Tantalum: 15µF, 20%, 10V	1	841293-18	14632	
C7	Same as C1				
C8	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	1	841250-07	14632	
C9	Same as C1				
C10	Same as C1				
E1	Terminal, Forked	1	140-1019-02-01	71279	
FB1	Ferrite, Bead: 52Ω, ±25%, 100 MHz	3	CB30-3225138	00000	
FB2	Same as FB1				
FB3	Same as FB1				
P1	Connector, Terminal	1	BBS-103-G-A	55322	
R1	Resistor, Fixed: 33.0Ω, 5%, 1/8 W	2	841296-29	14632	
R2	Resistor, Fixed: 220Ω, 5%, 1/8 W	1	841296-49	14632	
R3	Resistor, Fixed: 100Ω, 5%, 1/8 W	1	841296-41	14632	
R4	Resistor, Fixed: 1.0k, 5%, 1/8 W	1	841296-65	14632	
R5	Resistor, Fixed: 22.0Ω, 5%, 1/8 W	2	841296-25	14632	
R6	Resistor, Fixed: 300Ω, 5%, 1/8	1	841296-52	14632	
R7	Same as R5				
R8	Resistor, Fixed: 47k, 5%, 1/8 W	1	841296-105	14632	
R9	Resistor, Fixed: 470Ω, 5%, 1/8 W	2	841296-57	14632	
R10	Chip, Trimmer, Pot: 5k, 25%, 1/10 W	1	RVG4C10A-502	81349	
R11	Same as R9				
R12	Not Used				
R13	Resistor, Fixed: 330Ω, 5%, 1/8 W	2	841296-53	14632	
R14	Resistor, Fixed: 15.0Ω, 5%, 1/8 W	1	841296-21	14632	
R15	Same as R13				
T1	Transformer	2	180204-1	14632	
T2	Same as T1				
U1	Integrated Circuit	1	SL1611C/DP	5248	
U2	Integrated Circuit	1	SL1432/DP	94375	

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN µF.

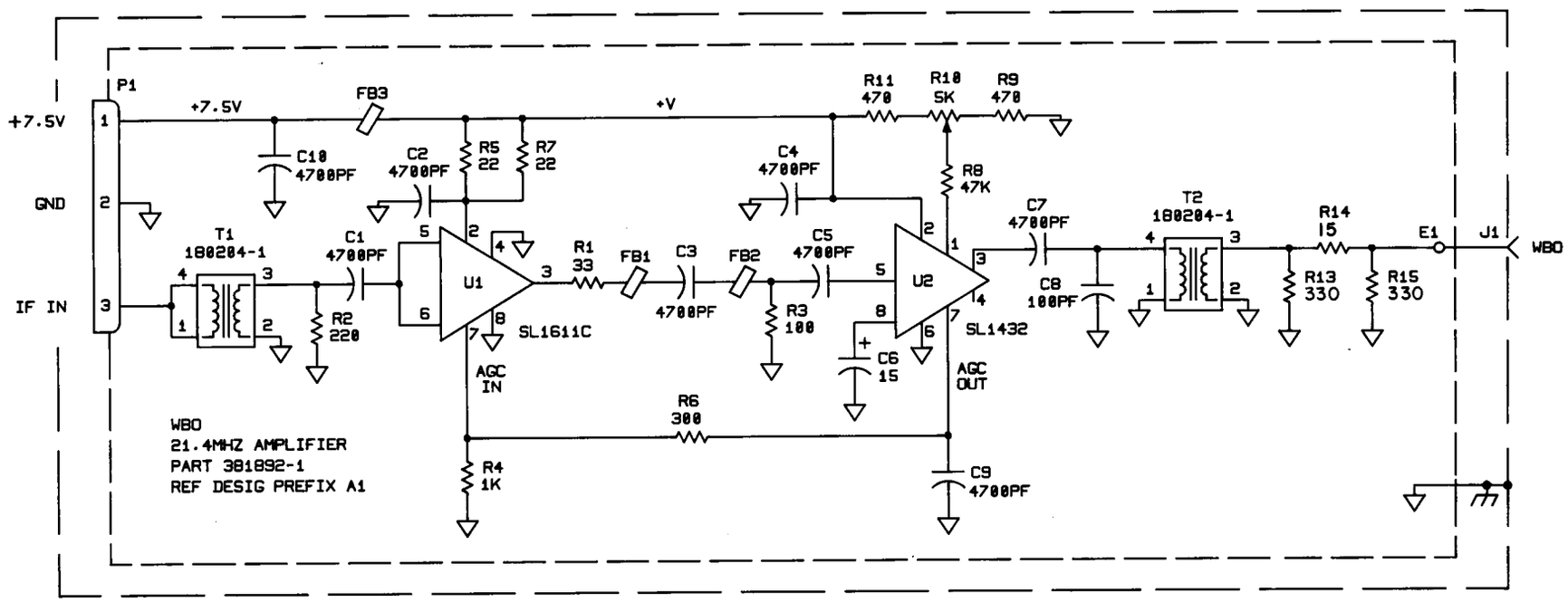


Figure B-2. Type 796784-1, WBO 21.4 MHz Amplifier Schematic Diagram 481446 (05)

APPENDIX C

WJ-860X/FE FREQUENCY EXTENDER OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

January 1990

TABLE OF CONTENTS

APPENDIX C

TYPE WJ-860X/FE FREQUENCY EXTENDER OPTION

LIST OF TABLES

LIST OF ILLUSTRATIONS

APPENDIX C

TYPE WJ-860X/FE FREQUENCY EXTENDER OPTION

C.1 GENERAL DESCRIPTION

The WJ-860X/FE Frequency Extender Option (FE) extends the tuning range of the WJ-860X VHF/UHF Surveillance Receiver "Miniceptor" from 512 MHz to 2032 MHz. The extended tuning range is accomplished by block converting ten bands of the RF spectrum to the tuning range of the Miniceptor. When the FE option is installed, the RF input at the front panel of the Miniceptor is routed directly to the FE where it in turn returns a down converted IF for further processing.

See **Table C-1** for the WJ-860X/FE Frequency Extender specifications.

C.2 MECHANICAL DESCRIPTION

The WJ-860X/FE option attaches to the rear of the Miniceptor adding 2.85 inches to the overall length of the unit (see **paragraph C.4** for installation instructions). Cables are provided with the option for electrical connection of the FE to the Miniceptor.

The FE consists of internal cabling and two circuit boards: the Type 796824-1 Synthesizer Assembly and the Type 796811-1 RF Assembly which are enclosed in an aluminum chassis.

Table C-1. WJ-860X/FE Frequency Extender Specifications

Frequency Range	512 to 2032 MHz
Gain	1 dB ±2 dB
Noise Figure	12 dB maximum
3rd Order Input Intercept Point	+3 dBm minimum
2nd Order Input Intercept Point	+45 dBm minimum
Image Rejection	80 dB minimum
IF Rejection	80 dB minimum
Conducted LO	-90 dBm maximum
Phase Noise	-102 dBc/Hz at 20 kHz offset
VSWR	3.0:1 maximum
Power Requirements	+5.5 Vdc at 270 mA
(Supplied from Miniceptor)	+12 Vdc at 30 mA
	+7.5 Vdc at 85 mA
	-7.5 Vdc at 20 mA
	+30 Vdc at 5 mA
Dimensions	1.5" x 6.5" x 2.85"
Weight	1 lb. 8 oz.

C.3 FUNCTIONAL DESCRIPTION

Figure C-1 is a functional block diagram of the FE which includes the functional relationship of the FE to the Miniceptor. As shown in the block diagram, the FE can be separated into two functional sections: Synthesizer and RF Filtering, which are further discussed in the following.

The RF input at the front panel of the Miniceptor is routed directly to the FE when installed. The RF is input to the FE's RF Filtering section where it encounters one out of five possible band filter circuits. When the Miniceptor is tuned to frequencies between 512 and 2032 MHz, control signals are sent from the Miniceptor's digital controller to the RF Filtering section via the FE's digital interface. These control signals select the proper band filter in accordance with the tuned frequency.

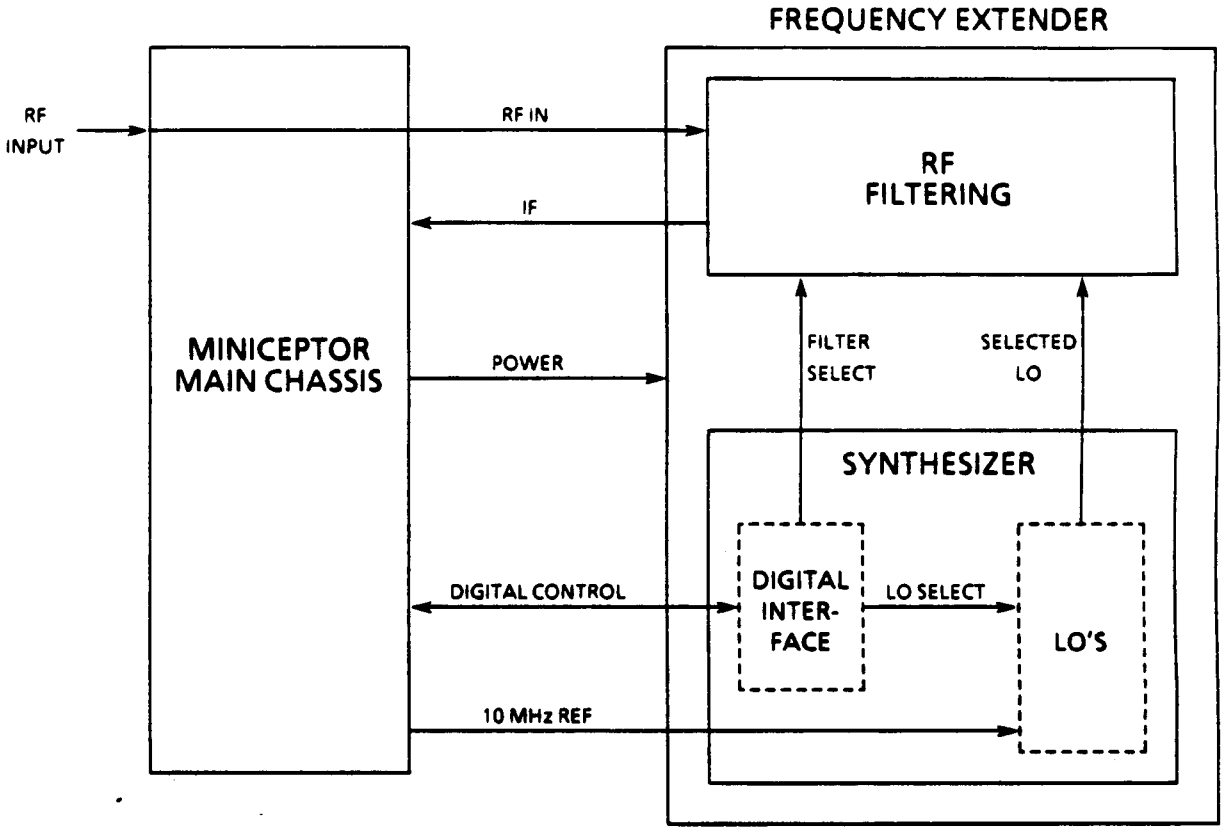


Figure C-1. Functional Block Diagram

The Synthesizer section of the FE provides five different LO's which are also selected by digital control in response to the tuned frequency. The selected LO, which is referenced to the 10 MHz reference from the Miniceptor, is mixed with the bandlimited signal in the RF Filtering section to produce an IF signal which is routed back to the Miniceptor for further processing. Table C-2 lists the resultant IF output of the FE versus the tuned frequency

of the Miniceptor. When the tuned frequency is within the normal tuning range of the Miniceptor, below 512 MHz, the RF filtering and LO circuits of the FE are bypassed.

Table C-2. IF Output of the FE Versus Miniceptor Tuned Frequency

Tuned Frequency	Band Number	LO	IF Output
512-580 MHz	1	880 MHz	368-300 MHz
580-690 MHz	2	960 MHz	380-270 MHz
690-850 MHz	3	1200 MHz	510-350 MHz
850-1010 MHz	4	1360 MHz	510-350 MHz
1010-1230 MHz*	5	1520 MHz	510-290 MHz*
1230-1315 MHz*	6	880 MHz	350-435 MHz*
1315-1435 MHz	7	960 MHz	355-475 MHz
1435-1710 MHz	8	1200 MHz	235-510 MHz
1710-1870 MHz	9	1300 MHz	350-510 MHz
1870-2032 MHz	10	1520 MHz	350-512 MHz

* Note: Spectrum inversion occurs at approximately 1230 MHz.

C.4 INSTALLATION

The WJ-860X/FE option may be installed at the factory or in the field. For field installation perform the following procedures:

WARNING

A shock hazard exists when performing the following procedures with power applied to the Miniceptor. Ensure power is removed from the Miniceptor before proceeding.

1. **Disconnect all cabling from the Miniceptor.**
2. **Referring to Figure C-2, remove six screws to detach the rear panel of the Miniceptor.**
3. **Remove six screws to detach the front panel.**

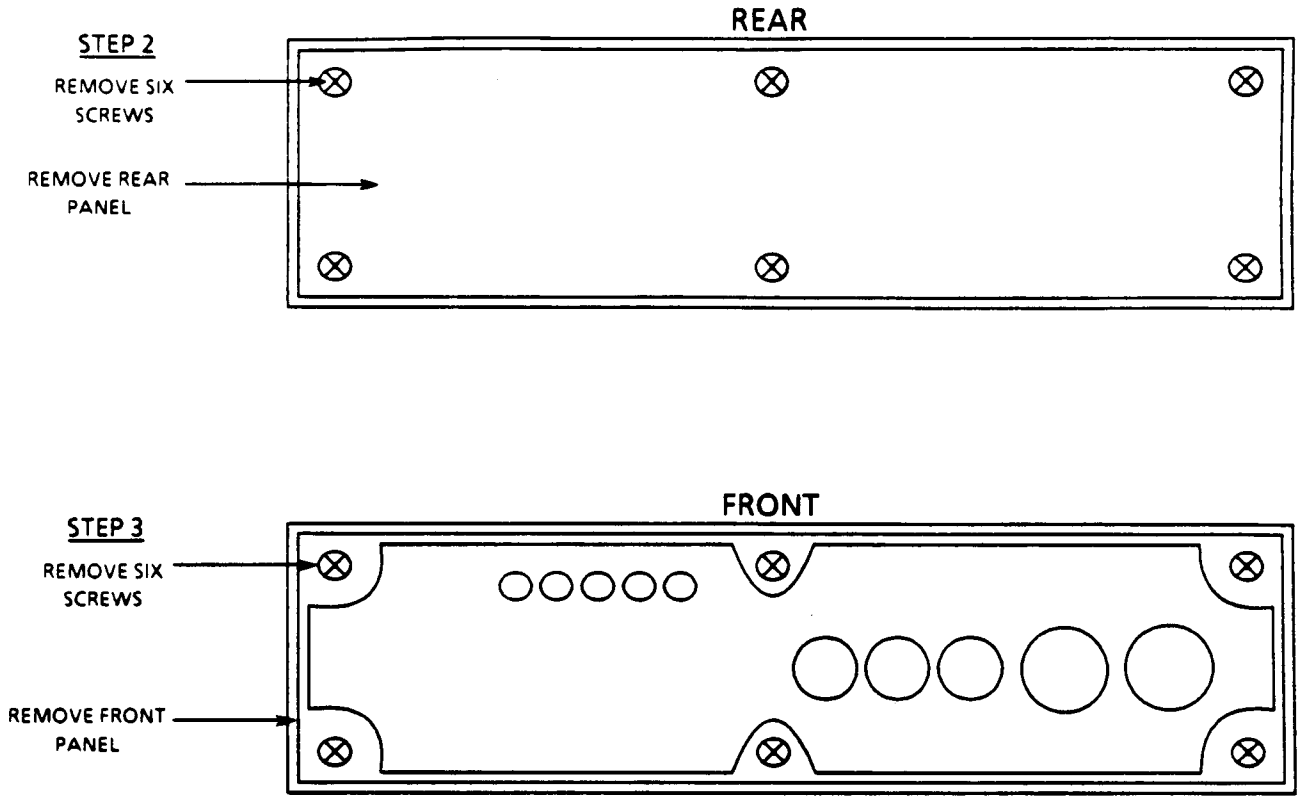


Figure C-2. Removing the Miniceptor's Front and Rear Panels

4. Carefully lift the top half of the unit from the bottom half and spread open clockwise, similar to opening a book (see **Figure C-3**).

5. Referring to **Figure C-3**, disconnect cable W6 from the RF Converter module (at J1).

6. Remove two screws, the connector bracket, and cable W6 from the unit. Remove W6 from the connector bracket.

7. Referring to **Figure C-4**, align the FE with the rear top half of the Miniceptor and hand tighten the retaining screw of the FE into the Miniceptor's chassis.

8. Install connector J4 of FE cable W3 onto the connector bracket that was removed in Step 6. Secure the connector bracket to the main chassis with the two screws that were removed in Step 6.

9. Connect FE cable W1 to connector J1 of the RF Converter module.

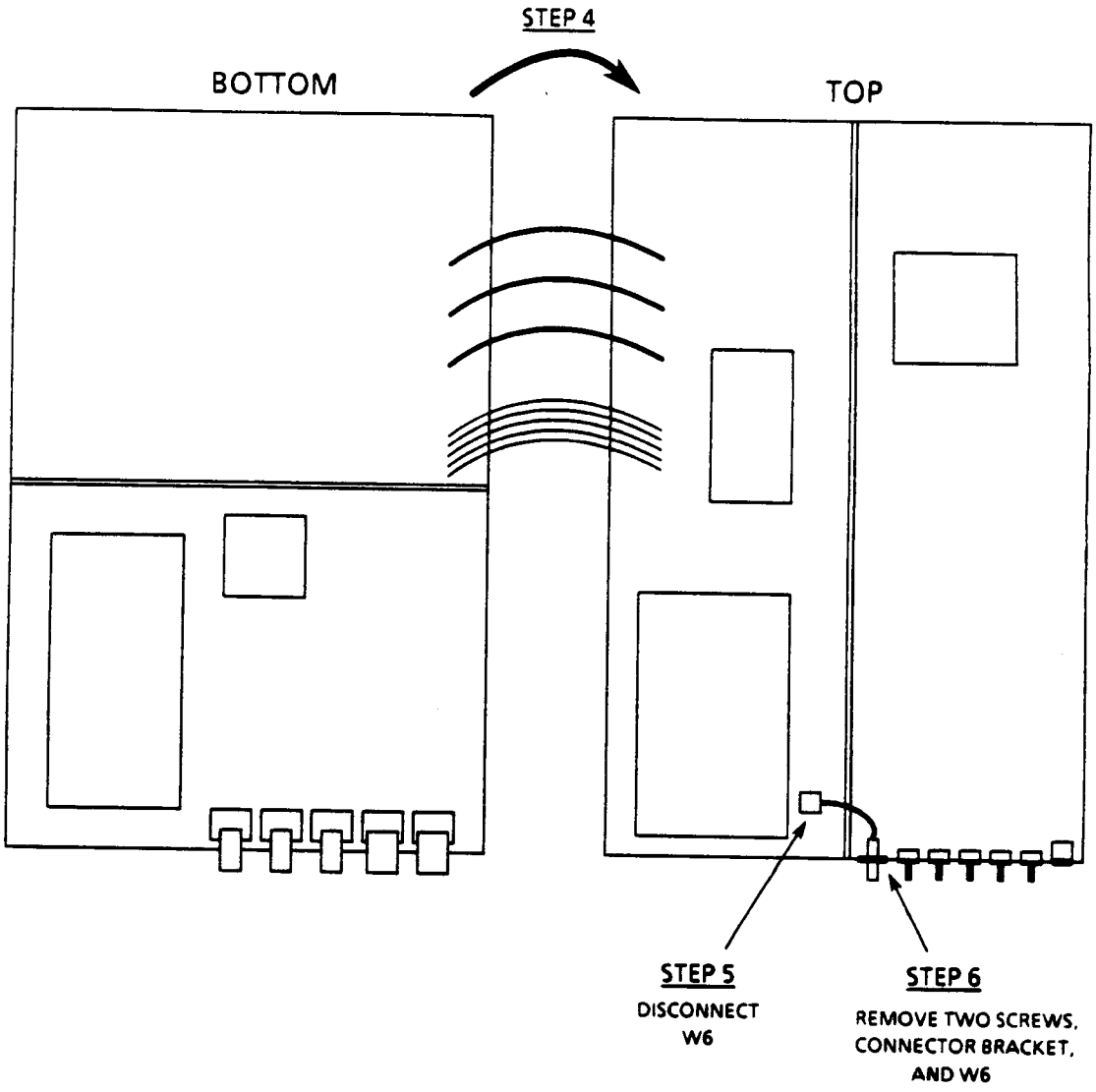


Figure C-3. Opening the Miniceptor and Removing W6

10. Connect FE cable W2 to connector J3 of the Synthesizer module.

11. Connect FE cable W4 to connector J4 of the Digital Controller module. The pin identified with a white dot on P1 of W4 inserts to pin receptacle 1 of J4.

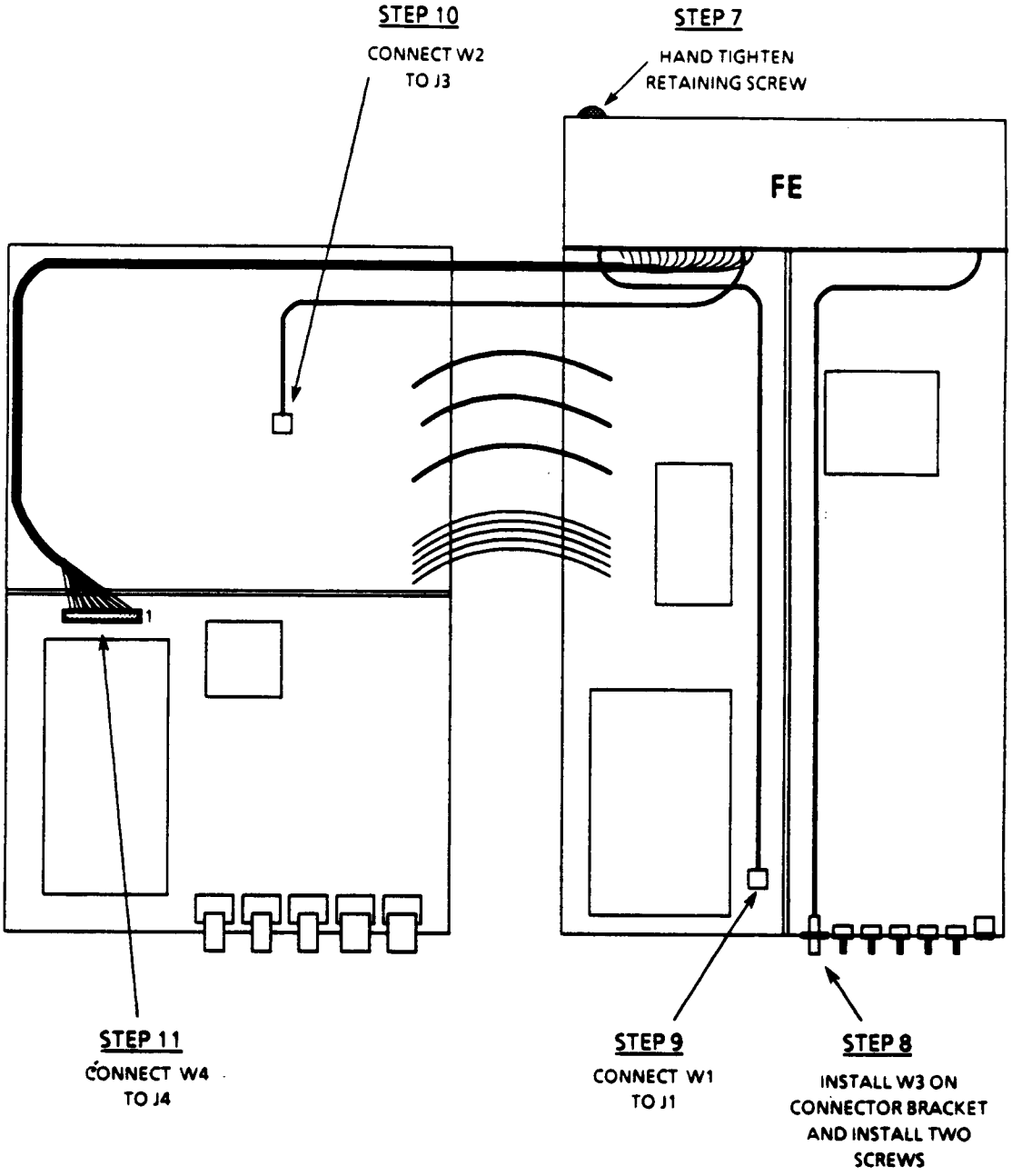


Figure C-4. Installing the FE and Connecting the Cables

CAUTION

Damage may occur to internal cabling and wiring if pinched or bent sharply when re-installing the top half of the unit to the bottom half. Ensure cables are properly positioned when reinstalling.

12. Ensuring all cabling is positioned properly, realign the bottom half of the Miniceptor with the top half.

13. Tighten the retaining screws on the rear of the FE to secure it to the Miniceptor's chassis.

14. Using a scribing tool, mark the FE option label on the rear panel that was removed in Step 2. If desired, write the serial number of the FE in the space provided near the serial number of the main chassis on the rear panel.

15. Reinstall the rear panel and six screws that were removed in Step 2.

16. Reinstall the front panel and six screws that were removed in Step 3. The Miniceptor may now be reconnected for operation.

C.5 INPUT AND OUTPUT CONNECTORS

C.5.1 **IF OUTPUT (W1P1)** - This connector provides the 235 to 512 MHz IF output of the FE. See **Table C-2** for the IF outputs of the FE versus the tuned frequency of the Miniceptor. Output impedance is 50 ohms.

C.5.2 **10 MHz REFERENCE INPUT (W2P1)** - This connector accepts the 10 MHz, -25 dBm minimum reference from the Miniceptor. Nominal input impedance is 100 ohms.

C.5.3 **RF INPUT (W3J4)** - This connector accepts the RF input from the antenna via the Miniceptor's front panel RF IN connector. Nominal input impedance is 50 ohms.

C.5.4 **POWER AND DIGITAL INTERFACE (W4P1)** - This connector provides power inputs and the control interface between the FE and the Miniceptor. **Figure C-5** illustrates the pin assignments for this connector. Explanations of the signals resident on the specific pins of this connector are provided in the following.

Serial Data Input (Pin 2) - The input on pin 2 is a serial data stream, from the Miniceptor's digital controller, consisting of 32-bit data words. These data words contain LO synthesizer and bandwidth filter select information.

Clock Input (Pin 1) - The input on this pin is a TTL level clock input used for synchronizing the serial data input to the FE's digital interface. The positive transition of the clock (from low to high) occurs in the middle of each data bit in the serial 32-bit data words input on pin 2.

Enable Input (Pin 4) - This TTL level input, when high, enables the FE's digital interface circuits, unlatching the serial data inputs. This signal is high for 1.5 µsec at the end of each 32nd clock input on pin 1.

AGC Input (Pin 5) - The input on this pin is the AGC control voltage, ranging from +2 Vdc to +8 Vdc, from the Miniceptor's digital controller. This input controls an attenuator for automatic attenuation of the FE's IF output.

Lock Detect Output (Pin 6) - This output, when high, indicates a synthesizer phase-locked loop condition in the FE.

Power Inputs - Pins 7, 8, 9, 10, and 14 are the +12 Vdc, +7.5 Vdc, -7.5 Vdc, +5.5 Vdc, and +30 Vdc power inputs, respectively, to the FE. Pins 12 and 13 are ground.

FE Installed (Pin 11) - When the FE is electrically connected to the Miniceptor and +5.5 Vdc power is applied to the FE, this pin outputs a constant +5 Vdc signal for indication to the Miniceptors digital controller that the FE is installed.

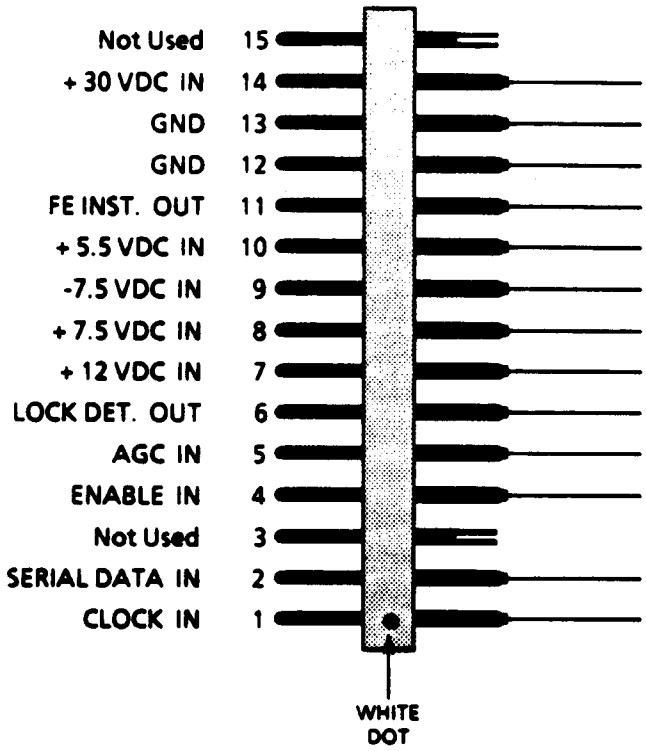


Figure C-5. Connector W4P1, Pin Assignments

C.6 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.

C.7 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).

C.8 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
32421	Microwave Semiconductor Corp. 100 School House Road Somerset, NJ 08873	33279	Aircraft Welding Company Burbank, CA
33095	Spectrum Control, Inc. 2185 W. Eighth Street Erie, PA 16505	95077	Solitron Microwave Division 1177 Blue Heron Blvd, Bldg. II Riviera Beach, FL 33404

C.9 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 C.7**, and the manufacturer's part number, provided in **paragraph C.8.1**, 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 C.8.1** 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. As a result, some transistors, diodes and integrated circuits which are installed in the unit may not agree with the parts lists or schematic diagrams of this manual. However, substitution of the semiconductor devices listed in this manual may be substituted with satisfactory results.

C.9.1 WJ-860X/FE FREQUENCY EXTENDER — MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 02				
A1	RF PC Assembly	1	796811-3	14632	
A2	Synthesizer PC Assembly	1	796824-1	14632	
C1	Capacitor, Feedthru, EMI: 1000 pF, 100 V, 10 Amp	11	54-790-018	33095	
C2 Thru C11	Same as C1				
E1	Terminal, Feedthru, Turret	1	160-2004-02-01	71279	
J1	Connector, Coaxial	3	1003-7571-019	19505	
J2	Same as J1				
J3	Same as J1				
J4	Connector, Coaxial, SMA	1	9030-9023-019	19505	
P1	Plug Assembly	1	282192-1	14632	
P2	Plug Assembly	1	282193-1	14632	
W1	Cable Assembly	1	17300-442-9	14632	
W1P1	Connector, Coaxial, SMA	1	9043-9523-019	19505	
W2	Cable Assembly	1	17300-442-10	14632	
W2P1	Connector, Coaxial, SMB	1	2002-7521-019	19505	
W3	Cable Assembly	1	17300-442-11	14632	
W4	Cable Assembly	1	17300-442-12	14632	
W4P1	Connector, Coaxial, SMC	2	1002-7571-019	19505	
W4P2	Connector, Coaxial, SMC	2	1105-7521-019	19505	
W5P1	Same as W4P1				
W5P2	Same as W4P2				

C.10 TYPE 796811-3 RF ASSEMBLY

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 01				
C1	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	57	841250-07	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic: 3.3 pF, .1 pF, 150 V	4	ATC100A3R3BP150X	29990	
C5	Capacitor, Ceramic: 6.2 pF, +.25 pF, 150 V	6	ATC100A6R2CP150X	29990	
C6	Same as C5				
C7	Same as C5				
C8	Same as C4				
C9	Same as C1				
C10	Capacitor, Ceramic: 4.3 pF, ±.1 pF, 150 V	4	ATC100A4R3BP150X	29990	
C11	Capacitor, Ceramic: 3.6 pF, ±.1 pF, 150 V	4	ATC100A3R6BP150X	29990	
C12	Same as C11				
C13	Same as C10				
C14	Capacitor, Ceramic: 100 pF	40	ATC100A101KP150X	29990	
C15 Thru C17	Same as C14				
C18 Thru C20	Same as C1				
C21 Thru C24	Same as C14				
C25	Same as C10				
C26	Same as C11				
C27	Same as C11				
C28	Same as C10				
C29	Capacitor, Ceramic: 1 pF, 1%, 150 V	14	ATC100A1R0BP150X	29990	
C30	Same as C4				
C31 Thru C33	Same as C5				
C34	Same as C4				
C35 Thru C38	Same as C1				
C39	Capacitor, Ceramic: 1.3 pF, ±.05 pF, 150 V	4	ATC100A1R3AP150X	29990	
C40	Capacitor, Ceramic: 2.7 pF, ±.1 pF, 150 V	6	ATC100A2R7BP150X	29990	
C41	Same as C40				
C42	Same as C40				
C43	Same as C39				
C44	Same as C29				
C45	Same as C29				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C46	Capacitor, Ceramic: 3.0 pF, ±.1 pF, 150 V	8	ATC100A3R0BP150X	29990	
C47 Thru C49	Same as C46				
C50 Thru C56	Same as C14				
C57 Thru C60	Same as C46				
C61	Same as C29				
C62	Same as C39				
C63 Thru C65	Same as C40				
C66	Same as C39				
C67 Thru C69	Same as C1				
C70	Same as C14				
C71	Same as C1				
C72	Same as C1				
C73	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	16	841250-19	14632	
C74	Same as C1				
C75	Capacitor, Ceramic: 1.2 pF, ±.05 pF, 150 V	4	ATC100A1R2AP150X	29990	
C76	Capacitor, Ceramic: 2.2 pF, ±.1 pF, 150 V	8	ATC100A2R2BP150X	29990	
C77 Thru C79	Same as C76				
C80	Same as C75				
C81	Same as C29				
C82	Capacitor, Ceramic: 2.4 pF, ±.1 pF, 150 V	4	ATC100A2R4BP150X	29990	
C83	Capacitor, Ceramic: 2.0 pF, ±.1 pF, 150 V	4	ATC100A2R0BP150X	29990	
C84	Same as C83				
C85	Same as C82				
C86 Thru C93	Same as C14				
C94	Same as C82				
C95	Same as C83				
C96	Same as C83				
C97	Same as C82				
C98	Same as C75				
C99 Thru C102	Same as C1				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C103 Thru C106	Same as C76				
C107	Same as C75				
C108	Same as C1				
C109	Same as C29				
C110	Same as C1				
C111	Same as C1				
C112 Thru C114	Same as C14				
C115	Not Used				
C116	Capacitor, Ceramic: 1.0 pF, ±.05 pF, 150 V	8	ATC100A1R0AP150X	29900	
C117	Capacitor, Ceramic: 1.6 pF, ±.05 pF, 150 V	12	ATC100A1R6AP150X	29990	
C118	Same as C117				
C119	Same as C117				
C120	Same as C116				
C121	Same as C1				
C122	Capacitor, Ceramic: 1.5 pF, ± .05 pF, 150 V	4	ATC100A1R5AP150X	29990	
C123	Capacitor, Ceramic: 1.1 pF, ± .05 pF, 150 V	6	ATC100A1R1AP150X	29990	
C124	Same as C123				
C125	Same as C123				
C126	Same as C122				
C127 Thru C130	Same as C14				
C131 Thru C133	Same as C1				
C134	Same as C122				
C135 Thru C137	Same as C123				
C138	Same as C122				
C139	Same as C29				
C140	Same as C116				
C141 Thru C143	Same as C117				
C144	Same as C116				
C145	Same as C1				
C146	Same as C14				
C147 Thru C149	Same as C1				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C150	Same as C116				
C151 Thru C153	Same as C117				
C154	Same as C116				
C155	Same as C29				
C156	Capacitor, Ceramic: .9 pF, ±.1 pF, 150 V	10	ATC100A0R9BP150X	29990	
C157 Thru C160	Same as C156				
C161 Thru C164	Same as C14				
C165	Same as C1				
C166 Thru C168	Same as C14				
C169 Thru C173	Same as C156				
C174	Same as C116				
C175 Thru C177	Same as C117				
C178	Same as C116				
C179 Thru C181	Same as C1				
C182	Same as C73				
C183	Same as C73				
C184	Same as C14				
C185	Same as C73				
C186	Same as C73				
C187 Thru C194	Same as C1				
C195	Same as C29				
C196	Capacitor, Ceramic: 5.1 pF, ±.25 pF, 150 V	2	ATC100A5R1CP150X	29990	
C197	Capacitor, Ceramic: 9.1 pF, ±5%, 150 V	3	ATC100A9R1JP150X	29990	
C198	Same as C197				
C199	Same as C197				
C200	Same as C196				
C201	Same as C73				
C202	Same as C73				
C203	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	6	841250-24	14632	
C204	Same as C203				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C205	Same as C73				
C206	Same as C73				
C207	Same as C203				
C208 Thru C212	Same as C73				
C213 Thru C215	Same as C203				
C216	Same as C73				
C217	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	4	841293-10	14632	
C218 Thru C220	Same as C217				
C221	Same as C29				
C222 Thru C230	Same as C1				
C231 Thru C234	Same as C29				
C235	Same as C73				
C236 Thru C239	Same as C1				
CR1	Diode	13	MP5X1433		
CR2 Thru CR13	Same as CR1				
J1	Connector, Plug	3	2285-0006	95077	
J2	Same as J1				
J3	Same as J1				
L1	Inductor: 0.1 µH, ±20%	33	B82422-A3101-M	25088	
L2	Same as L1				
L3	Etched Inductor Transmission Lines				
L4 Thru L11	Same as L3				
L12 Thru L15	Same as L1				
L16 Thru L24	Same as L3				
L25	Same as L1				
L26	Same as L1				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L27 Thru L35	Same as L3				
L36	Same as L1				
L37	Same as L1				
L38 Thru L46	Same as L3				
L47	Same as L1				
L48	Same as L1				
L49 Thru L58	Same as L3				
L59 Thru L62	Same as L1				
L63 Thru L67	Same as L3				
L68	Inductor, Chip: .040 µH, ±20%	4	L10-OR040	7W259	
L69 Thru L73	Same as L3				
L74	Same as L1				
L75	Inductor: 4.7 µH, ±20%	6	B82422-A1472-M	25088	
L76	Same as L1				
L77	Same as L1				
L78 Thru L87	Same as L3				
L88	Same as L1				
L89	Same as L1				
L90 Thru L99	Same as L3				
L100	Same as L1				
L101	Same as L1				
L102	Same as L68				
L103	Same as L1				
L104 Thru L106	Same as L3				
L107	Same as L1				
L108 Thru L113	Same as L3				
L114	Inductor, Chip: .040 µH	2	100BCT-400	02113	

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L115	Same as L114				
L116 Thru L125	Same as L3				
L126	Same as L1				
L127	Same as L1				
L128	Inductor: 47 µH, ±10%	6	NL322522-470K	54583	
L129 Thru L131	Same as L75				
L132	Same as L128				
L133	Same as L75				
L134	Same as L128				
L135	Same as L68				
L136	Same as L1				
L137	Same as L1				
L138 Thru L141	Same as L3				
L142	Same as L75				
L143	Same as L128				
L144	Same as L128				
L145	Same as L1				
L146	Same as L1				
L147	Same as L128				
L148	Same as L1				
L149	Same as L3				
L150	Same as L3				
P1	Connector	1	68755-112		
Q1	Amplifier	12	CGY-40	32421	
Q2 Thru Q11	Same as Q1				
Q12	Transistor	5	MMBT2907A	04713	
Q13 Thru Q16	Same as Q12				
Q17	Same as Q1				
R1	Resistor, Fixed: 680Ω, 5%, 1/8 W	13	841296-61	14632	
R2	Resistor, Fixed: 390 kΩ, 5%, 1/8 W	12	841296-127	14632	
R3	Resistor, Fixed, 10.0Ω, 5%, 1/8 W	12	841296-17	14632	
R4	Same as R3				
R5	Same as R3				
R6	Resistor, Fixed: 82.0Ω, 5%, 1/8 W	4	841296-39	14632	

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R7	Resistor, Fixed: 91.0Ω, 5%, 1/8 W	2	841296-40	14632	
R8	Same as R6				
R9	Same as R2				
R10	Same as R3				
R11	Same as R1				
R12	Same as R1				
R13	Same as R2				
R14	Not Used				
R15	Same as R3				
R16	Same as R3				
R17	Same as R6				
R18	Same as R7				
R19	Same as R6				
R20	Same as R2				
R21	Not Used				
R22	Same as R1				
R23	Same as R1				
R24	Same as R2				
R25	Not Used				
R26	Same as R3				
R27	Same as R3				
R28	Resistor, Fixed: 120Ω, 5%, 1/8 W	2	841296-43	14632	
R29	Resistor, Fixed: 51.0Ω, 5%, 1/8 W	1	841296-34	14632	
R30	Same as R28				
R31	Same as R2				
R32	Not Used				
R33	Same as R1				
R34	Same as R1				
R35	Same as R2				
R36	Not Used				
R37	Same as R3				
R38	Resistor, Fixed: 150Ω, 5%, 1/8 W	2	841296-45	14632	
R39	Resistor, Fixed: 33.0Ω, 5%, 1/8 W	1	841296-29	14632	
R40	Same as R38				
R41	Same as R2				
R42	Not Used				
R43	Same as R1				
R44	Same as R1				
R45	Same as R2				
R46	Not Used				
R47	Same as R3				
R48	Same as R3				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R49	Resistor, Fixed: 910Ω, 5%, 1/8 W	2	841296-64	14632	
R50	Resistor, Fixed: 5.6Ω, 5%, 1/8 W	1	841296-11	14632	
R51	Same as R49				
R52	Same as R2				
R53	Not Used				
R54	Same as R1				
R55	Same as R1				
R56	Not Used				
R57	Not Used				
R58	Same as R2				
R59	Same as R1				
R60	Same as R1				
R61	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	12	841296-89	14632	
R62	Resistor, Fixed: 33 kΩ, 5%, 1/8 W	6	841296-101	14632	
R63	Same as R61				
R64	Same as R61				
R65	Same as R62				
R66	Same as R61				
R67	Resistor, Fixed: 20 kΩ, 5%, 1/8 W	6	841296-96	14632	
R68	Resistor, Fixed: 5.1 kΩ, 5%, 1/8 W	5	841296-82	14632	
R69	Same as R68				
R70	Same as R67				
R71	Same as R61				
R72	Same as R62				
R73	Same as R61				
R74	Same as R61				
R75	Same as R62				
R76	Same as R61				
R77	Same as R67				
R78	Same as R68				
R79	Same as R68				
R80	Same as R67				
R81	Same as R61				
R82	Same as R62				
R83	Same as R61				
R84	Same as R61				
R85	Same as R62				
R86	Same as R61				
R87	Same as R67				
R88	Same as R68				
R89	Same as R67				
R90	Same as R2				

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R91	Same as R3				
U1	Attenuator, Pin Diode	1	PPF-030	24539	
U2	Mixer, Balanced	1	WJ-M4T	27956	
U3	Amplifier	3	8634002S08	14632	
U4	Same as U3				
U5	Same as U3				

C.11 TYPE 796824-1 LO SYNTHESIZER ASSEMBLY

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision 08				
C1	Capacitor, Tantalum: 3.3 µF, 20%, 16 V	4	841293-10	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Tantalum: 1.0 µF, 20%, 35 V	3	841293-05	14632	
C5	Capacitor, Ceramic: .01 µF, 10%, 50 Vdc	9	841250-19	14632	
C6 Thru C8	Same as C5				
C9	Capacitor, Ceramic: 100 pF, 5%, 50 Vdc	4	841250-07	14632	
C10	Capacitor, Ceramic: 1000 pF, 5%, 50 Vdc	4	841250-13	14632	
C11	Capacitor, Ceramic: .10 µF, 20%, 50 Vdc	31	841250-24	14632	
C12	Same as C10				
C13	Not Used				
C14	Not Used				
C15 Thru C17	Same as C11				
C18	Same as C1				
C19	Same as C4				
C20	Same as C4				
C21 Thru C23	Same as C11				
C24	Not Used				
C25	Capacitor, Ceramic: 3300 pF, 10%, 50 Vdc	2	841250-16	14632	
C26	Same as C25				
C27	Capacitor, Ceramic: 6800 pF, 10%, 50 Vdc	1	841250-18	14632	
C28	Capacitor, Ceramic: 3.6 pF, ±.1 pF, 500 V	1	ATC100B3R6BP500X	29990	
C29	Capacitor, Ceramic: 13 pF, 2%, 500 V	1	ATC100B130GP500X	29990	
C30	Capacitor, Ceramic, Variable: 1.5-6. pF, ±300, 25 Vdc	5	DVS3A6A	51406	
C31	Capacitor, Ceramic: 7.5 pF, .1 pF, 150 V	1	ATC700B7R5BP500X	29990	
C32 Thru C34	Same as C11				
C35	Capacitor, Ceramic: 6.2 pF, ±.1 pF, 500 V	3	ATC100B6R2BP500X	29990	
C36	Capacitor, Ceramic: 2.4 pF, ±.1 pF, 500 V	3	ATC100B2R4BP500X	29990	
C37	Capacitor, Ceramic: 3.3 pF, ±.1 pF, 500 V	4	ATC100B3R3BP500X	29990	
C38	Capacitor, Ceramic: 10 pF, 20%, 500 V	1	ATC700B100GP500X	29990	
C39	Same as C30				
C40	Same as C37				
C41 Thru C43	Same as C11				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C44	Same as C35				
C45	Same as C36				
C46	Capacitor, Ceramic: 1.3 pF, ±.1 pF, 500 V	1	ATC100B1R3BP500X	29990	
C47	Same as C37				
C48	Same as C30				
C49	Capacitor, Ceramic: 1.8 pF, ±.1 pF, 500 V	3	ATC100B1R8BP500X	29990	
C50 Thru C52	Same as C11				
C53	Same as C35				
C54	Capacitor, Ceramic: 1.2 pF, ±.1 pF, 500 V	3	ATC100B1R2BP500X	29990	
C55	Same as C54				
C56	Capacitor, Ceramic: 2.2 pF, ±.1 pF, 500 V	1	ATC100B2R2BP500X	29990	
C57	Same as C30				
C58	Same as C49				
C59 Thru C61	Same as C11				
C62	Capacitor, Ceramic: 1 pF, ±.1 pF, 500 V	2	ATC100B1R0BP500X	29990	
C63	Same as C62				
C64	Same as C54				
C65	Same as C37				
C66	Same as C30				
C67	Same as C47				
C68 Thru C70	Same as C11				
C71	Same as C36				
C72	Capacitor, Ceramic: .5 pF, ±.1 pF, 500 V	2	ATC100B0R5BP500X	29990	
C73 Thru C75	Same as C9				
C76	Same as C11				
C77	Capacitor, Tantalum: 68 µF, 20%, 6.3 V	4	841293-24	14632	
C78	Capacitor, Ceramic: 47 pF, 5%, 50 Vdc	2	841250-05	14632	
C79	Same as C78				
C80	Same as C11				
C81	Same as C77				
C82	Same as C72				
C83	Same as C5				
C84	Capacitor, Ceramic: 3 pF, ±.25 pF, 500 V	2	ATC100B3R0CP500X	29990	
C85	Same as C11				
C86	Same as C5				
C87	Same as C11				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C88	Same as C5				
C89	Same as C5				
C90	Same as C10				
C91	Same as C84				
C92	Same as C5				
C93	Capacitor, Tantalum: 15 µF, 20%, 25 V	3	841293-19	14632	
C94	Not Used				
C95	Same as C11				
C96	Same as C93				
C97	Same as C77				
C98	Same as C11				
C99	Same as C10				
C100	Same as C93				
C101	Same as C11				
C102	Same as C77				
C103	Same as C11				
C104	Same as C11				
C105	Capacitor, Ceramic: 100 pF, 10%, 150 V	11	ATC100A101KCA150X	29990	
C106 Thru C115	Same as C105				
CR1	Diode	5	KV31S1	26629	
CR2 Thru CR5	Same as CR1				
CR6	Dual Switching Diode	1	MMBD7000T1	04713	
DS1	Diode	1	HLMP-6620	28480	
E1	Terminal, Coaxial	2	8145-7521-019	19505	
E2	Same as E1				
E3	Not Used				
FB1	Ferrite, Bead: 31Ω	4	CB70-322513B	54583	
FB2 Thru FB4	Same as FB1				
J1	Connector, Receptacle	1	66950-012	22526	
J2	Connector, Header	1	102617-5	00779	
J3	Not Used				
L1	Inductor: 4.7 µH, ±20%	9	B82422-A1472-M	25088	
L2 Thru L8	Same as L1				
L9	Inductor: 0.1 µH, ±20%	1	B82422-A3101-M	25088	
L10	Same as L1				
P1	Connector, Coaxial	1	1105-7521-019	19505	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
P2	Connector, Coaxial	1	1002-7571-019	19505	
Q1	Transistor	10	MMBT2907A	04713	
Q2	Same as Q1				
Q3	Transistor	4	MMBT2222A	04713	
Q4	Same as Q3				
Q5	Same as Q3				
Q6	Same as Q1				
Q7	Same as Q3				
Q8 Thru Q12	Same as Q1				
Q13	Transistor	5	841464	14632	
Q14 Thru Q17	Same as Q13				
Q18	Same as Q1				
Q19	Same as Q1				
R1	Resistor, Fixed: 10 kΩ, 5%, 1/8 W	19	841296-89	14632	
R2 Thru R5	Same as R1				
R6	Resistor, Fixed: 220Ω, 5%, 1/8 W	3	841296-49	14632	
R7	Resistor, Fixed: 22.0Ω, 5%, 1/8 W	2	841296-25	14632	
R8	Resistor, Fixed: 100Ω, 5%, 1/8 W	7	841296-41	14632	
R9 Thru R11	Not Used				
R12 Thru R15	Same as R1				
R16	Resistor, Fixed: 1.0 kΩ, 5%, 1/8 W	24	841296-65	14632	
R17	Same as R16				
R18	Same as R16				
R19	Same as R8				
R20	Same as R8				
R21	Same as R16				
R22	Same as R16				
R23	Resistor, Fixed: 6.8 kΩ, 5%, 1/8 W	1	841296-85	14632	
R24	Resistor, Fixed: 3.3 kΩ, 5%, 1/8 W	8	841296-77	14632	
R25	Same as R1				
R26	Same as R16				
R27	Same as R16				
R28	Same as R6				
R29	Same as R6				
R30	Same as R24				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R31	Same as R8				
R32	Resistor, Fixed: 2.2 kΩ, 5%, 1/8 W	3	841296-73	14632	
R33	Same as R32				
R34	Same as R1				
R35 Thru R37	Same as R16				
R38	Same as R24				
R39	Resistor, Fixed: 15 kΩ, 5%, 1/8 W	7	841296-93	14632	
R40	Resistor, Fixed: 10.0Ω, 5%, 1/8 W	9	841296-17	14632	
R41	Resistor, Fixed: 150Ω, 5%, 1/8 W	5	841296-45	14632	
R42	Resistor, Fixed: 330Ω, 5%, 1/8 W	16	841296-53	14632	
R43	Resistor, Fixed: 15.0Ω, 5%, 1/8 W	7	841296-21	14632	
R44	Same as R42				
R45 Thru R47	Same as R16				
R48	Same as R24				
R49	Same as R39				
R50	Same as R40				
R51	Same as R41				
R52	Same as R42				
R53	Same as R43				
R54	Same as R42				
R55 Thru R57	Same as R16				
R58	Same as R24				
R59	Same as R39				
R60	Same as R40				
R61	Same as R41				
R62	Same as R42				
R63	Same as R43				
R64	Same as R42				
R65 Thru R67	Same as R16				
R68	Same as R24				
R69	Same as R39				
R70	Same as R40				
R71	Same as R41				
R72	Same as R42				
R73	Same as R43				
R74	Same as R42				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R75 Thru R77	Same as R16				
R78	Same as R24				
R79	Same as R39				
R80	Same as R40				
R81	Same as R41				
R82	Same as R42				
R83	Same as R43				
R84	Same as R42				
R85	Same as R42				
R86	Same as R7				
R87	Same as R42				
R88	Resistor, Fixed: 68.0Ω, 5%, 1/8 W	2	841296-37	14632	
R89	Same as R42				
R90	Same as R43				
R91	Same as R42				
R92	Same as R40				
R93	Resistor, Fixed: 33.0Ω, 5%, 1/8 W	1	841296-29	14632	
R94	Resistor, Fixed: 4.7Ω, 5%, 1/8 W	2	841296-9	14632	
R95	Same as R8				
R96	Same as R88				
R97	Same as R8				
R98	Same as R8				
R99	Same as R40				
R100	Same as R42				
R101	Same as R40				
R102	Same as R43				
R103	Same as R42				
R104	Same as R16				
R105	Resistor, Fixed: 4.7 kΩ, 5%, 1/8 W	4	841296-81	14632	
R106	Same as R94				
R107	Same as R40				
R108	Same as R105				
R109	Same as R105				
R110	Same as R32				
R111	Same as R16				
R112	Same as R105				
R113 Thru R117	Same as R1				
R118	Resistor, Fixed: 33 kΩ, 5%, 1/8 W	2	841296-101	14632	
R119	Same as R1				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R120	Same as R39				
R121	Same as R118				
R122	Same as R39				
R123	Same as R24				
R124	Same as R1				
R125	Same as R1				
U1	Integrated Circuit, Synthesizer	1	MC145152FN-2	04713	
U2	Integrated Circuit	1	8674HC74S014N	14632	
U3	Amplifier	3	MSA-0686	24539	
U4	Amplifier	1	MSA-0786-TR1	24539	
U5	Same as U3				
U6	Integrated Circuit, Digital	1	UPB588G	33279	
U7	Integrated Circuit	2	864094S016	14632	
U8	Integrated Circuit, VR	1	UA723CD	18324	
U9	Voltage Regulator	1	LM2931AD-5	27014	
U10	Amplifier	1	86062S08	14632	
U11	Same as U7				
U12	Same as U3				

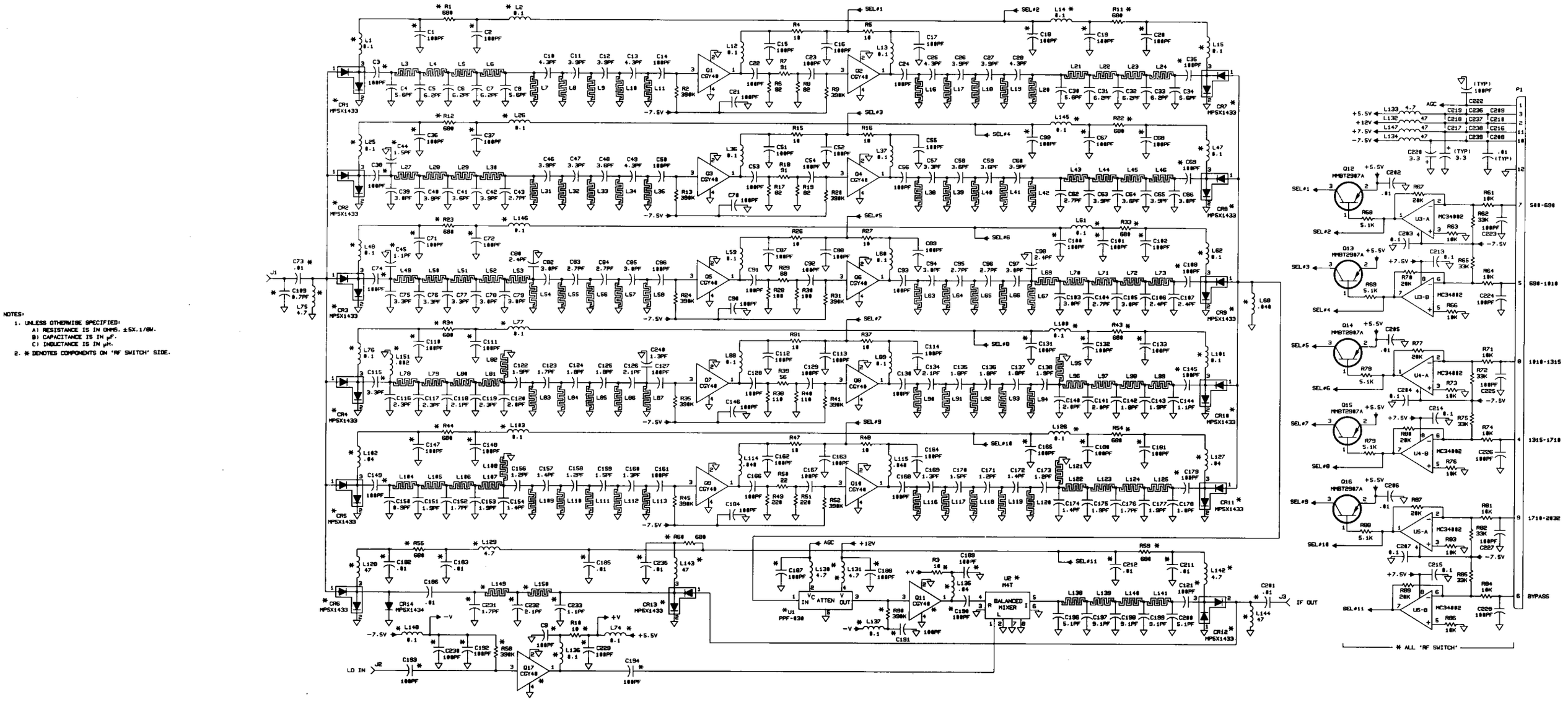


Figure C-5. Type 796811-1, RF Circuit (A1), Schematic Diagram 580948 (04)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   B) CAPACITANCE IS IN μF.
   C) INDUCTANCE IS IN μH.

Figure C-6. Type 796824-1, Synthesizer (A2), Schematic Diagram 580949 (06),

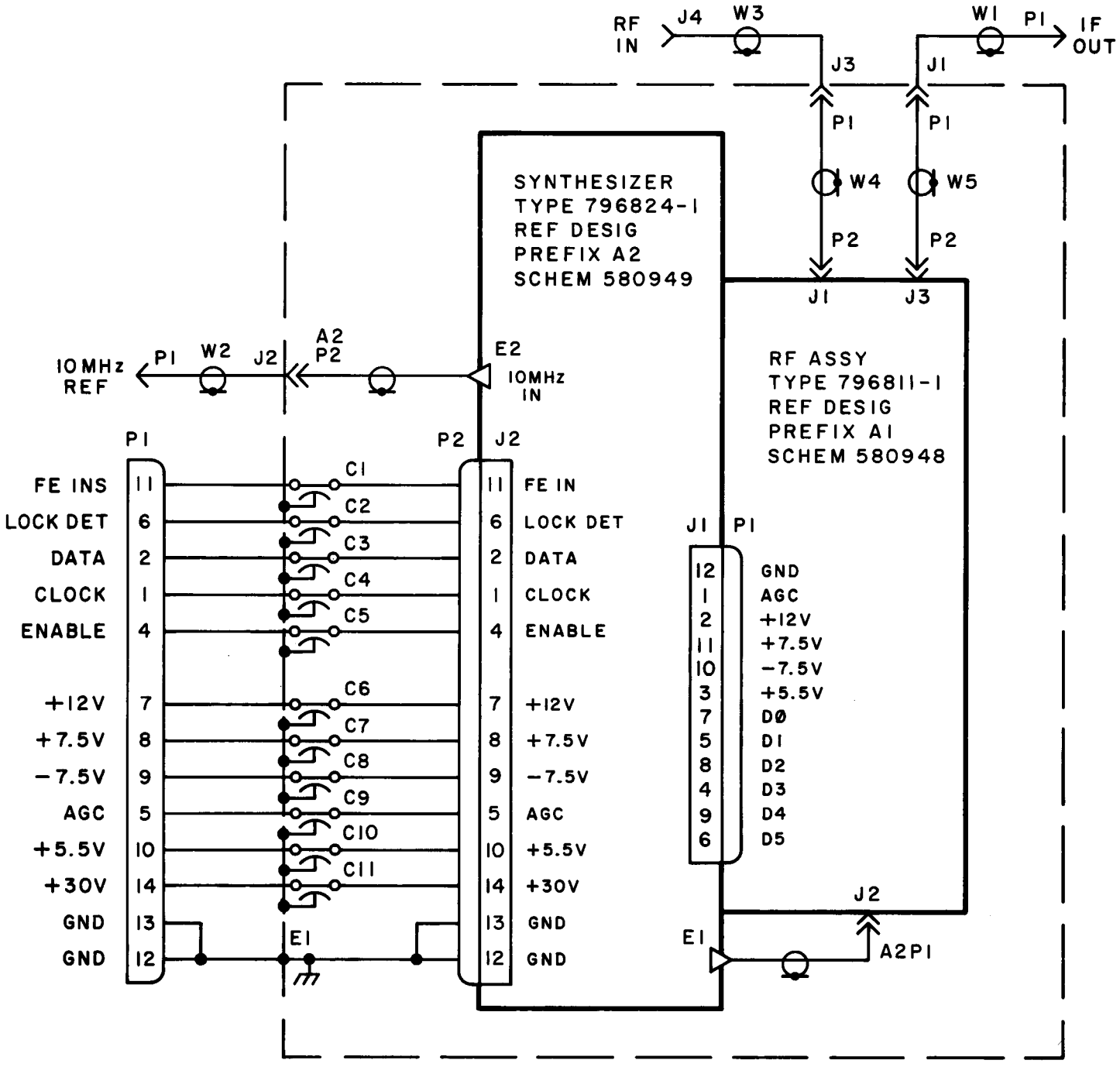


Figure C-7. Type WJ-860X/FE Frequency Extender, Main Chassis Schematic Diagram 382058 (04)