INSTRUCTION MANUAL

FOR

TYPE WJ-8615D VHF/UHF COMPACT RECEIVER

WATKINS-JOHNSON

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

This addendum applies to the WJ-8615 VHF/UHF Receivers. The Noise Figure listed in the **Table of Specifications** should be revised as follows:

Noise Figure	8 dB maximum (12 dB, 500-1100 MHz with FE Option) Add 1.5 dB for FE Option (20-500 MHz) Add 2.5 dB for Tracking Preselector Option (2-500 MHz)

The A1A11 module (Type 796317-1) is now a Type 796250-2. The CW Demodulator/Swiched IF module has been replaced with the Type 796250-2 ISB/CW Demodulator as the standard module. **Figure 1-1** is the schematic diagram for the Type 796250-X Demodulator. Filters FL1 and FL2 are not included on the CW Demodulator. Narrowband/Wideband selection, at P1 pin 23, has been eliminated, along with U10 and many of the wideband filtering components. The following parts list describes the components contained on the Type 796250-2 ISB/CW Demodulator. **Table 1**, on the schematic diagram, lists the component differences between the ISB/CW Demodulator (796250-1) and the CW Demodulator (796250-2).

Type 796250-2, ISB/CW Demodulator REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 1000 pF, 10%, 200 V	10	CK05BX102K	81349	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	11	34453-1	14632	
C4	Same as C1				
C5	Same as C1				
C6	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	12	C023B101E502M	56289	
C7	Same as C3				
C8	Same as C3				
C9	Same as C6				
C10	Same as C3				
C11	Same as C3				
C12	Same as C6				
C13	Capacitor, Ceramic, Disc: 100 pF, 10%, 200 V	2	CK05BX101K	81349	
C14	Same as C13				
C15	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	6	34452-1	14632	
C16	Same as C3				
C17	Same as C3				
C18	Same as C3				
C19	Same as C6				
C20	Same as C6				
C21	Same as C6				
C22	Same as C15				
C23	Same as C15				
C24	Same as C3				
C25	Same as C3				
C26	Same as C3				
C27	Same as C6				
C28	Same as C6				
C29	Same as C6				
C30	Same as C15				
C31	Same as C15				
C32	Same as C1				
C33	Same as C6				
C34	Same as C1				
C35	Same as C6				
C36	Same as C15				
C37 Thru C41	Not Used				
C42	Same as C1				

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C43	Capacitor, Ceramic, Monolithic: 120 pF, 2%, 500 V	4	200-100-NPO-121G	51642	
C44	Same as C43				
C45	Capacitor, Ceramic, Disc: 15 pF, 5%, 50 V	1	8101-050-C0G0-150J	72982	
C46	Same as C43				
C47	Same as C43				
C48	Same as C1				
C49	Not Used				
C50	Same as C1				
C51	Not Used				
C52	Same as C1				
C53	Same as C6				
C54	Capacitor, Electrolytic, Tantalum: 10 µF, 10%, 20 V	3	CS13BE106K	81349	
C55	Same as C54				
C56	Same as C54				
CR1	Diode	2	MPN3401	04713	
CR2	Same as CR1				
CR3	Diode	1	1N4446	80131	
E1	Terminal, Forked	4	140-1019-02-01	71279	
E2	Same as E1				
E3	Same as E1				
E4	Same as E1				
FB1	Ferrite Bead	2	56-590-65-4A	02114	
FB2	Same as FB1				
*FL1	Crystal Filter Lower Sideband 10.7 MHz	1	92218	14632	
*FL2	Crystal Filter Upper Sideband 10.7 MHz	1	92217	14632	
L1	Coil, Fixed: 100 µH, 5%	2	1537-76	99800	
L2	Same as L1				
L3	Coil, Fixed: 3.9 µH, 10%	2	1025-34	99800	
L4	Same as L3				
L5	Coil, Variable: 68 mH nominal	2	6740-12	04213	
L6	Same as L5				
P1	Receptacle Assembly	2	102585-7	00779	
P2	Same as P1				
P3	Connector, Jack	1	2002-7571-005	19505	
R1	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	6	CF1/8-100K/J	09021	
R2	Resistor, Fixed, Film: 7.5 kΩ, 5%, 1/8 W	4	CF1/8-7.5K/J	09021	
R3	Same as R2				
R4	Same as R1				
R5	Same as R2				

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R6	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	2	CF1/8-470 OHMS/J	09021	
R7	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	2	CF1/8-22 OHMS/J	09021	
R8	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	10	CR1/8-100 OHMS/J	09021	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	3	62PAR1K	73138	
R12	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R13	Resistor, Fixed, Film: 12 kΩ, 5%, 1/8 W	3	CF1/8-12K/J	09021	
R14	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	2	CF1/8-2.7K/J	09021	
R15	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	2	CF1/8-220 OHMS/J	09021	
R16	Same as R14				
R17	Same as R15				
R18	Same as R1				
R19	Resistor, Fixed, Film: 680 kΩ, 5%, 1/8 W	2	CF1/8-680K/J	09021	
R20	Same as R1				
R21	Same as R19				
R22	Same as R8				
R23	Resistor, Fixed, Film: 3 kΩ, 5%, 1/8 W	4	CF1/8-3K/J	09021	
R24	Same as R23				
R25	Same as R8				
R26	Same as R11				
R27	Same as R13				
R28	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	4	CF1/8-3.3K/J	09021	
R29	Same as R28				
R30	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	3	CF1/8-1.0K/J	09021	
R31	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	2	CF1/8-2.2K/J	09021	
R32	Same as R1				
R33	Resistor, Fixed, Film: 75 kΩ, 5%, 1/8 W	2	CF1/8-75K/J	09021	
R34	Same as R8				
R35	Same as R8				
R36	Same as R23				
R37	Same as R23				
R38	Same as R8				
R39	Same as R11				
R40	Same as R13				
R41	Same as R28				
R42	Same as R28				
R43	Same as R30				
R44	Same as R31				
R45	Same as R1				
R46	Same as R33				

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R47	Not Used				
R48	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	2	CF1/8-56 OHMS/J	09021	
R49	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R50	Resistor, Fixed, Film: 82 kΩ, 5%, 1/8 W	2	CF1/8-82K/J	09021	
R51	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R52	Resistor, Fixed, Film: 68 kΩ, 5%, 1/8 W	1	CF1/8-68K/J	09021	
R53	Same as R50				
R54	Resistor, Fixed, Film: 200 kΩ, 5%, 1/8 W	1	CF1/8-200K/J	09021	
R55	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	3	CF1/8-10K/J	09021	
R56	Resistor, Fixed, Film: 150 kΩ, 5%, 1/8 W	1	CF1/8-150K/J	09021	
R57	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	62PAR100K	73138	
R58	Resistor, Fixed, Film: 2.2 MΩ, 5%, 1/8 W	1	CF1/8-2.2M/J	09021	
R59 Thru R67	Not Used				
R68	Same as R6				
R69	Resistor, Fixed, Film: 27Ω, 5%, 1/8 W	1	CF1/8-27 OHMS/J	09021	
R70	Same as R8				
R71	Same as R55				
R72	Same as R8				
R73	Same as R55				
R74	Same as R7				
R75	Same as R30				
R76	Same as R2				
R77	Same as R48				
R78	Not Used				
R79	Resistor, Fixed, Film: 51 kΩ, 5%, 1/8 W	1	CF1/8-51 K/J	09021	
R80	Not Used				
R81	Not Used				
T1	Transformer	2	T9-1	15542	
T2	Same as T1				
T3	Transformer	2	T4-1	15542	
T4	Same as T3				
U1	Monolithic CMOS Analog Switch	1	DG301CJ	17856	
U2	Balanced Modulator/Demodulator	3	MC1496P	04713	
U3	Dual Operational Amplifier	2	MC1458N	18324	
U4	Same as U2				
U5	Same as U2				
U6	Same as U3				
U7	Voltage Regulator	1	LM317H	27014	

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U8	Not Used				
U9	Video IF/RF Amplifier	1	SL1611C	52648	
U10	Not Used				
U11	Not Used				
U12	Integrated Circuit	1	LH0002CN	27014	
U13	Monolithic CMOS Analog Switch	1	DG303CJ	17856	
W1	Cable Assembly	1	280566-1	14632	

*Components used only on the Type
796250-1 CW Demodulator

NOTES: 1. UNLESS OTHERWISE SPECIFIED.
a) CAPACITANCE IS IN pF.
b) RESISTANCE IS IN OHMS, ±5%, 1/8W.
c) INDUCTANCE IS IN μH.
2. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.

TABLE I

TYPE	FL1	FL2	TITLE
796250-1	92218	92217	ISB/CW DEMODULATOR
796250-2	N/U	N/U	CW DEMODULATOR

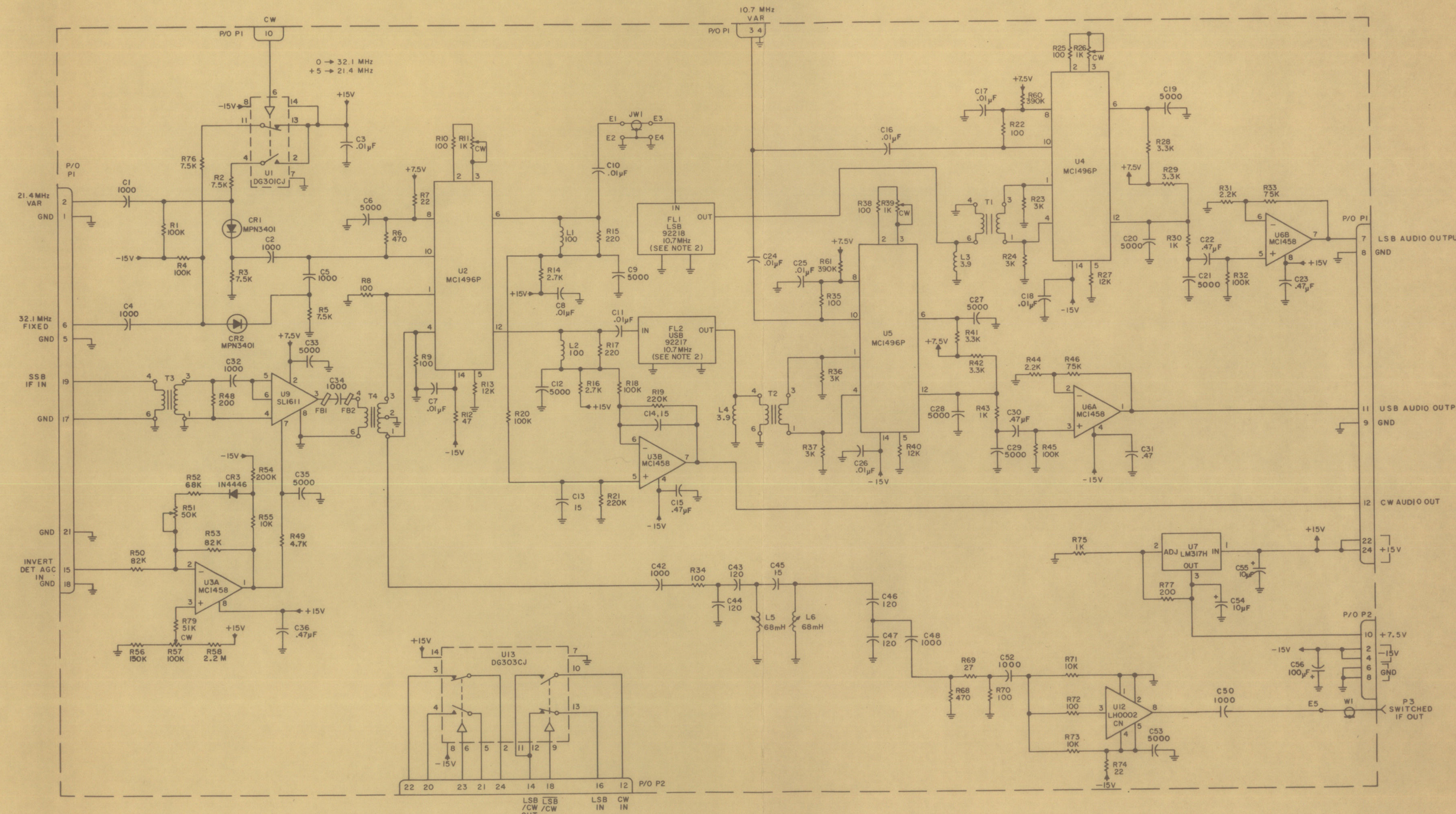


Figure 1-1. Type 796250-X Demodulator (A1A11), Schematic Diagram 580175

TABLE OF CONTENTS

SECTION I

GENERAL DESCRIPTION

SECTION II

INSTALLATION AND OPERATION

TABLE OF CONTENTS

SECTION II

INSTALLATION AND OPERATION (Cont'd)

SECTION III

CIRCUIT DESCRIPTION

TABLE OF CONTENTS

SECTION IV

MAINTENANCE

TABLE OF CONTENTS

SECTION IV

MAINTENANCE (Cont'd)

SECTION V

REPLACEMENT PARTS LIST

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF CONTENTS

LIST OF TABLES (Cont'd)

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS (Cont'd)

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS (Cont'd)

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS (Cont'd)

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS (Cont'd)

SECTION I

GENERAL DESCRIPTION

Figure 1-1. WJ-8615D VHF/UHF Compact Receiver

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-8615D VHF/UHF Compact Receiver is a fully synthesized and digitally controlled receiver designed to operate in the VHF/UHF frequency range. It receives AM, FM, CW, PULSE and ISB (optional) emissions over a frequency range of 20-500 MHz or 20-1100 MHz with the Frequency Extender (FE) option. The receiver is capable of manual operation utilizing the front panel controls. Remote control capabilities are incorporated utilizing an IEEE-488 Interface Bus allowing the WJ-8615D Compact Receiver to communicate with an external device. An ideal controller for the handoff configuration is a WJ-861XB Receiver in the Master/Slave mode which controls up to 14 receivers. The front panel of the WJ-8615D indicates the controller commands or the operator may control the receiver locally. During the manual operating mode, all receiver functions are controlled by the front panel controls. The operating parameters are selected by depressing the appropriate front panel pushbutton. LED's in the display illuminate indicated receiver parameters.

Internal frequency tuning circuitry of the WJ-8615D Compact Receiver includes the 1st and 2nd LO Synthesizers and 3rd Synthesizer. These synthesizers determine the tuned frequency to a resolution of 100 Hz. A tuning knob on the front panel and two tuning rate pushbuttons provide tuning capability. Tuning is performed in 10 MHz to 100 Hz steps as determined by the FASTER or SLOWER tuning rate pushbutton. The tuning rate pushbuttons change the tuning increment which is indicated in the display by a flashing digit. Pressing the TUNE LOCK pushbutton disables the tuning knob, preventing accidental frequency changes.

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

1.2 MECHANICAL CHARACTERISTICS

The WJ-8615D Compact Receiver is designed in a half-rack configuration. It occupies 3.5 inches of vertical rack space and two receivers may be installed side by side for a 19 inch rack. Refer to **Figure 2-2** for an outline of a two receiver configuration utilizing accessory mounting hardware furnished with receiver. The receiver extends approximately 22 inches to the tips of the rear panel handles. The main chassis, top, bottom, front, rear and internal compartments are constructed of aluminum. Except for the Line Audio control and the Voltage Select switch mounted on the rear panel, all operating controls are mounted on the front panel, while all input and output cables (except for the phones jack) connect to the rear panel.

A black bezel, etched with control markings is mounted to the front panel. The pushbuttons and display LED's mount on a printed circuit board positioned behind the front panel and extend through cutouts in the front panel and bezel. All other controls mount to the front panel.

The rear panel mounts all input and output connectors, except for the phones jack mentioned above. An N type connector is provided for the ANTENNA input. All other connectors are BNC type except for the multi-pin connectors for AUX and REMOTE CONTROL. External 10 MHz reference is selected automatically when a 10 MHz signal, 0 dBm, is applied to the 10 MHz REF connector. LINE AUDIO, which controls the rear panel AUDIO OUTPUT connector is mounted on the rear panel alongside of the audio output connectors. A circular fuse holder (XF1) mounts the operational line fuse.

The top cover is held in place with machine-type screws. Loosening these screws permit removal of the top cover, exposing the four main compartments. The Power Distribution circuit, RF/IF modules, Digital I/O modules and Synthesizer modules are in separate compartments for mechanical support and shielding purposes. Removal of the top cover permits access to all of the plug-in modules.

Removal of the bottom cover, held in place with machine-type screws, exposes the motherboard that mounts the plug-in modules.

1.3 EQUIPMENT SUPPLIED

Equipment supplied consists of the receiver and a detachable line cord.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

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

1) Antenna, 50-ohm
2) Audio monitoring equipment:
   - o speaker panel, 600-ohm
   - o headphones set, 600-ohm, with 1/4 inch Tip-Ring-Sleeve connector
   - o tape recorder
3) Computer device, IEEE-488 compatible

Table 1-1. WJ-8615D VHF/UHF Compact Receiver, Specifications

Frequency	20-500 MHz 500-1100 MHz with FE Option
Detection Modes	AM, FM, CW and PULSE (SSB optional)
Tuning Scheme	Frequency synthesized local oscillators locked to internal reference
Reference Accuracy	1 part in 10^6 or external 10 MHz reference input
Tuning Resolution	100 Hz synthesized (20 Hz with SSB option)
Synthesizer Tuning Speed	3 msec typical, 50 msec maximum
RF Input Impedance	50-ohms, nominal
Input VSWR	2.5:1 typical 3:1 maximum
Noise Figure	8 dB maximum

Table 1-1. WJ-8615D VHF/UHF Compact Receiver, Specifications (Cont'd)

Intermodulation	
2nd Order Intercept Point	+50 dBm minimum
3rd Order Intercept Point	-5 dBm minimum
Frequency Reference	
Internal	±1 x 10^{-6} over 0° - 50°C
External	10 MHz at 0 dBm nominal
Ultimate FM (S+N)/N	40 dBm minimum in 50 kHz BW
Oscillator Phase Noise (20 kHz from carrier)	-105 dBc typical, with internal reference
LO Radiation	-100 dBm typical at RF input
Image Rejection	85 dB minimum
IF Rejection	90 dB minimum
Internal Spurious	Equivalent to -115 dBm maximum of the RF Input
Reciprocal Mixing	With an input signal at a rated sensitivity level; an out-of-band signal removed 350 kHz in the 20 kHz IF Bandwidth at a level of 70 dB above rated sensitivity will not degrade the desired output signal ratio (S+N)/N by more than 3 dB.
Broadband IF Output (4 MHz)	Centered at 21.4 MHz
Gain Control Modes	Manual/Automatic 100 dB range minimum
Video Outputs (simultaneous)	AM, 1 volt peak FM, 1 volt peak 91-ohms
IF Bandwidths available * (any 5 field installable)	See **Table I**
IF Shape Factor	See **Table I**
AM Stability	6 dB maximum from AGC threshold to a level 100 dB above AGC threshold (maximum input -5 dBm)
Switched Video Output	1 Volt peak-to-peak; nominal, into 91 ohm load for FM with peak frequency deviation at 30% of the IF Bandwidth and AM with 50% modulation. DC coupled for FM and AM
FM Monitor	DC coupled FM output, 1 volt peak-to-peak minimum, equal to 30% of the selected IF bandwidth into 91 ohm load
Video Amplifier Frequency Response	DC to 1/2 IF Bandwidth for FM monitor; DC to 1/2 IF Bandwidth for AM/FM switched video output
Line Audio Output	10 mW, minimum, into 600 ohms for 50% AM or FM peak frequency deviation equivalent to 30% of the IF bandwidth

Table 1-1. WJ-8615D VHF/UHF Compact Receiver, Specifications (Cont'd)

Table I. Available Bandwidths and Rated Sensitivity

Bandwidth (kHz)	Max. Shape Factor 3:60 dB	Sensitivity (dBm)
6	3:1	-109
10	3:1	-107
20	3:1	-104
50	3:1	-100
100	3:1	-97
300	4:1	-92
500	4:1	-90
1000	4:1	-87
2000	4:1	-84
4000	4:1	-81

Audio Amplifier Distortion	2.5% typical, 3% maximum
COR/Squelch	Adjustable threshold from noise level to approximately 80 dB above noise. COR output provides a TTL output along with a 100 mA "sink-to-ground". Maximum external switching voltage is +24 Vdc at the 100 mA current-sink output.
Weight	25 pounds, approximately
Size	3.5 inches height x 8.5 inches width x 21 inches depth, nominally
AC Input	115/230 VAC ±15%; 47-62 Hz

Sensitivity Conditions:

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

FM - Input signal FM modulated at a 1 kHz rate with a peak deviation equal to 30% of the selected IFBW, produces a minimum video output (S+N)/N ratio of 17 dB. (Note: A 400 Hz modulation rate is required for 20 kHz IF BW and below.)

SECTION II

INSTALLATION AND OPERATION

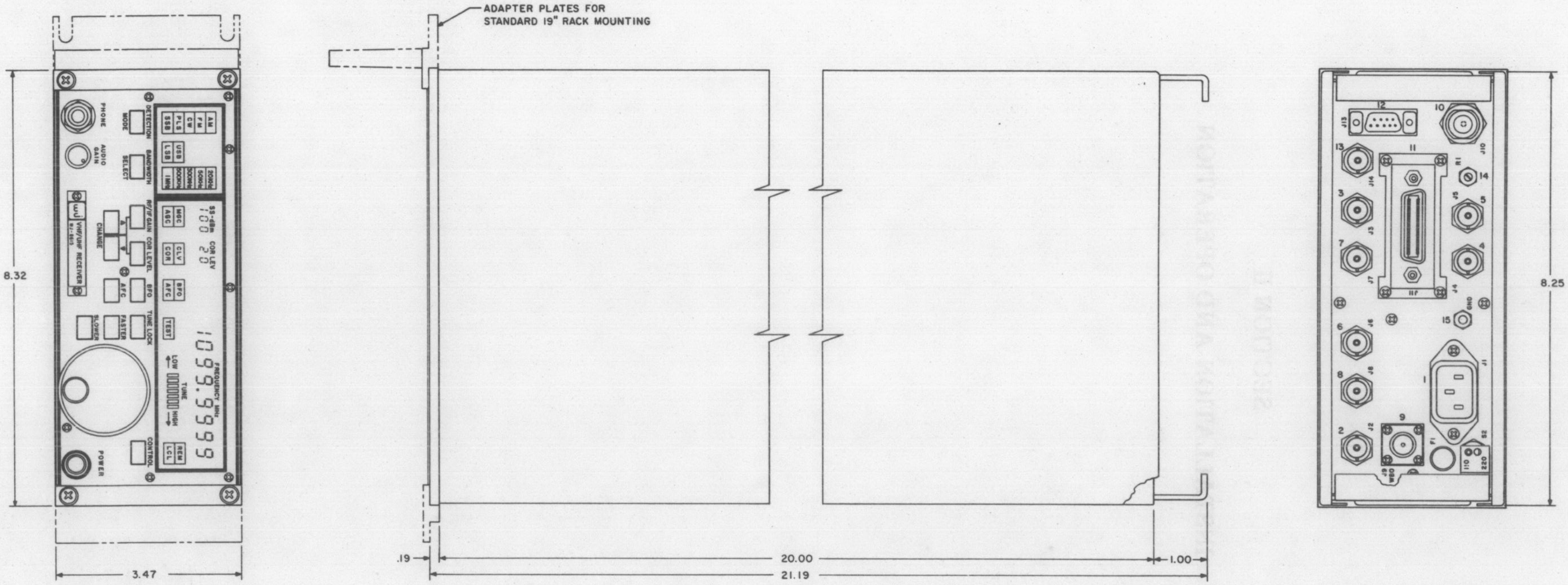


Figure 2-1. WJ-8615D Compact Receiver, Critical Dimensions

SECTION II

INSTALLATION AND OPERATION

2.1 UNPACKING AND INSPECTION

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

2.2 INSTALLATION

The WJ-8615D Compact Receiver is designed for mounting in a half-rack configuration. Two units side-by-side occupy the full 19 inch requirement for a standard equipment rack. The receiver occupies 3.5 inches of vertical rack space and extends approximately 22 inches into the rack to the tips of the rear protective handles. Do not rely solely on front panel mountings to support the receiver. Utilize Jonathan Type QD110 slides, mounted to the sides of the receiver for support. A 1.75 inch space above and below the unit is recommended for rack mounting configuration along with forced air convection. Refer to **Figure 2-2** for racking equipment utilizing furnished mounting hardware.

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

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

2.2.1 RECEIVER OPERATING CONFIGURATION

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

2.2.1.1 Receiver Option Configuration

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

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

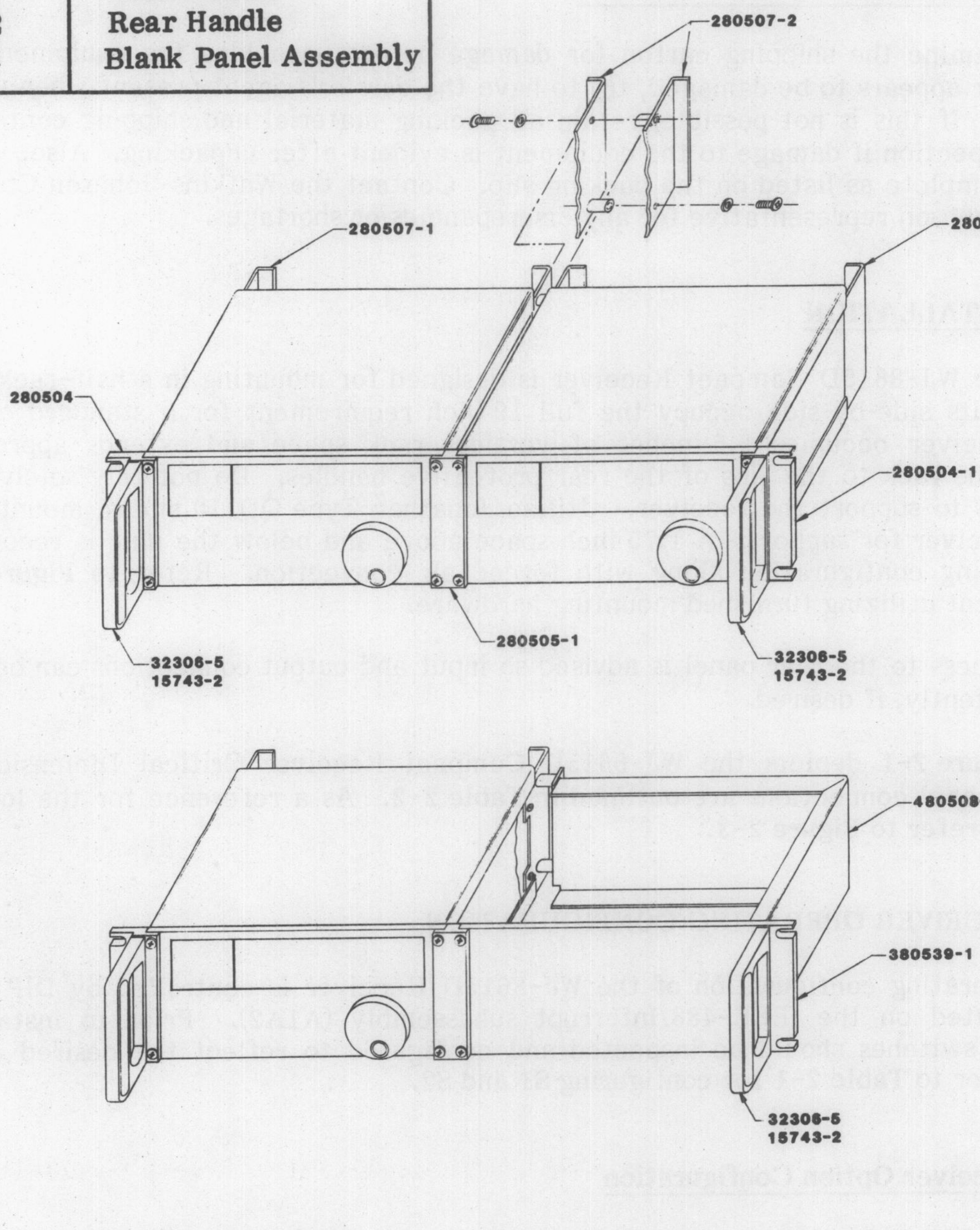


Figure 2-2. WJ-8615D Configuration of Rack Mounting Accessories

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

Switch S1 on A1A2

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

Switch S2 on A1A2

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

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

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

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

2.2.1.2 IEEE-488 Interface Configuration

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

2.2.1.3 Front Panel Definitions

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

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

d1AG-	Diagnostics, receiver test mode; refer to **pargraph 4.5.1.**
488 -	488 address, selectable from 0 to 30.
SLA -	Slave function, when enabled, receiver is controlled via WJ-861XB family of "master" receivers. With function off, the receiver is configured for remote operation via an external controlling device.
SSb -	Allows selection of sideband operation.
FE -	Frequency extender, extends frequency coverage of receiver to 1100 MHz. (Requires the 500 to 1100 MHz FE option)
HF -	HF frequency extenstion, extends frequency coverage of receiver to 2 MHz. (Requires HF Input Filter)

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

NOTE

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

NOTE (Cont'd)

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

Table 2-2. Table of Connectors

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

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

NOTE

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

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

2.2.2 CONNECTOR SIGNALS

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

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

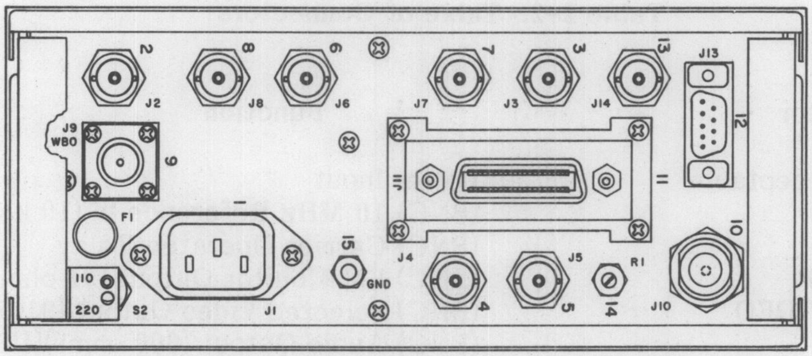


Figure 2-3. WJ-8615D Compact Receiver, Rear Panel Connectors

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

2.2.2.4 **FM MON (J4)** - The FM Monitor BNC connector provides a DC coupled FM output. The level is 1 Volt peak-to-peak, minimum, into 91 ohms, for input signals with a peak deviation equal to 30% of the selected IF Bandwidth.

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

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

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

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

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

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

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

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

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

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

2.3 EQUIPMENT MALFUNCTIONS

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

2.4 OPERATION

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

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

2.4.1 CONTROLS AND INDICATORS (STANDARD LOCAL OPERATION)

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

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

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

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

Table 2-3. Table of Controls and Indicators

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

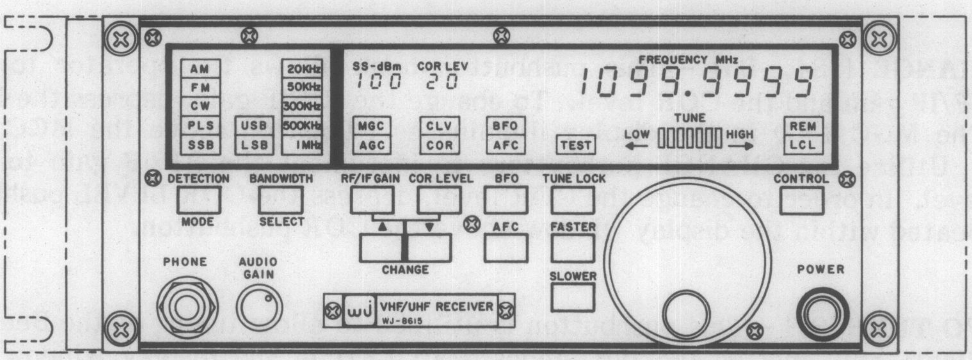


Figure 2-4. WJ-8615D Compact Receiver, Front Panel Controls and Indicators

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

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

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

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

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

2.4.1.8 **AFC (S8)** - Depression of the AFC pushbutton switches the Automatic Frequency Control on (AFC LED illuminated) or off (AFC LED extinguished). When this function is enabled, it corrects for any frequency drift keeping the receiver locked onto the desired signal, as long as the signal strength is sufficient to exceed the programmed COR level. The AFC circuitry has a tracking range of ±10 times the selected IF bandwidth. AFC is disabled for 1 second when a bandwidth change or a rotation of the tuning knob occurs.

NOTE

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

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

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

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

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

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

2.5 REMOTE OPERATION

The IEEE-488 Remote Interface provides talk and listen capabilities between the receiver and external equipment, such as calculators, minicomputers or other IEEE-488 equipped controlling devices. The data is transferred between units in a bit-parallel, byte serial form, utilizing sixteen interconnection lines. These lines consist of eight bi-directional data bus lines, three data byte transfer lines and five management lines. Data or address information is transferred between devices, utilizing the data bus lines. Refer to **Figure 2-5.**

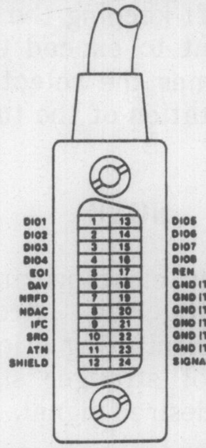


Figure 2-5. Configuration of IEEE-488 Data Bus.

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

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

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

Two types of data transfer are supported on the WJ-8615D Compact Receiver. One type of data transfer on the IEEE-488 interface bus is ASCII. This type of transfer utilizes ASCII mnemonics to control the receiver. The termination may be CR, LF (Carriage Return, Line Feed) or LF (Line Feed) or EOI (End or Identify) set on the last character of the transfer. These mnemonics may be strung together utilizing a semicolon. Another type of data transfer supported by the WJ-8615D Compact Receiver is binary. This type of data transfer allows single information bytes to control the receiver. In the binary operation, a command or group of commands must end with EOI (End or Identify) set on the last byte of the command. Commands may not be strung with a semicolon or terminated with CR (Carriage Return) or LF (Line Feed). The ASCII operation format tends to be self-documenting and easy to understand. Binary, on the other hand lessens the number of bytes that must be transferred and has a faster execution speed. In the ASCII format, the message consists of a series of data bytes that form one of the mnemonics listed in **Table 2-4.** Each byte is one ASCII character of the mnemonic. When the mnemonic contains a variable value, the mnemonic is followed by a number representing that value. Each digit of the number is applied as a separate ASCII character. In the binary format, the mnemonic is one 8-bit byte containing the hexadecimal code corresponding to the mnemonic. When a variable value is to be included in the message, it is sent as one or more additional data bytes, representing the binary or hexadecimal value. During ASCII operation, only ASCII commands are valid and only ASCII responses are returned. In binary operation, only binary commands are valid and only binary responses are returned.

2.5.1 GENERAL

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

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

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

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

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

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

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

Table 2-4. Mnemonics and Binary Codes

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(_) - Represents the default mode.

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

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

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

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

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

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

(b) - A single byte of binary information.

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

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

(_) - Represents the default mode.

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

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

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

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

(b) - A single byte of binary information.

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

Message: Send tuned frequency of 25.ØØØØ MHz

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "FRQ25"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP-85 TALK
ASCII message may have leading zeros.	3	1	Ø	26		8615D LISTEN
Total none blank character count ≧15,	4	Ø	Ø	46	F	
for single commands, exponential	5	Ø	Ø	52	R	DATA TO
format not supported. IE: "FRQ	6	Ø	Ø	51	Q	WJ-8615D
ØØ25.ØØØØ is valid message.	7	Ø	Ø	32	2	
EOI may be the terminator.	8	Ø	Ø	35	5	
	9	Ø	Ø	ØD	(CR)	
	1Ø	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 60, Ø, 37, Ø, Ø	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP-85 TALK
All bytes must be sent with no spaces	3	1	Ø	26		8615D LISTEN
or terminator characters.	4	Ø	Ø	3C	6Ø	FREQ CODE
	5	Ø	Ø	ØØ	Ø	BYTE 1
	6	Ø	Ø	25	37	BYTE 2
	7	Ø	Ø	ØØ	Ø	BYTE 3
	8	Ø	1	ØØ	Ø	BYTE 4

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

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

Message: turn AFC on

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "AFC"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	41	A	
	5	Ø	Ø	46	F	DATA TO
	6	Ø	Ø	43	C	WJ-8615D
	7	Ø	Ø	ØD	(CR)	
	8	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 66	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	1	26		8615D LISTEN
	4	Ø	1	42	66	AFC/ON CODE

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

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

Message: turn AFC off

ASCII Mode	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "AFC/"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	41	A	
	5	Ø	Ø	46	F	DATA TO
	6	Ø	Ø	43	C	WJ-8615D
	7	Ø	Ø	2F	/	
	8	Ø	Ø	ØD	(CR)	
	9	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 67	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	43	67	AFC/OFF CODE

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

Table 2-13. Sending an AM Detection Command

Message: send AM detection mode

ASCII Mode	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "AM"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	41	A	DATA TO
	5	Ø	Ø	4D	M	WJ-8615D
	6	Ø	Ø	ØD	(CR)	
	7	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 72	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	48	72	AM CODE

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

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

Message: send COR off

ASCII Mode	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "COR 81"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	43	C	
	5	Ø	Ø	4F	O	DATA TO
	6	Ø	Ø	52	R	WJ-8615D
	7	Ø	Ø	34	8	
	8	Ø	Ø	31	1	
	9	Ø	Ø	ØD	(CR)	
	1Ø	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 87, 81	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP 85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	57	87	COR CODE
	5	Ø	1	29	81	VALUE

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

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

Message: set BFO to -3.99 kHz

(Message valid only if VBFO option is installed)

ASCII Mode	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "BFO -3.99"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	42	B	
	5	Ø	Ø	46	F	DATA TO
	6	Ø	Ø	4F	O	WJ-8615D
	7	Ø	Ø	2D	-	
	8	Ø	Ø	37	3	
	9	Ø	Ø	2E	.	
	1Ø	Ø	Ø	39	9	
	11	Ø	Ø	39	9	
	12	Ø	Ø	ØD	(CR)	
	13	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 57, Ø, 15, 153, Ø	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	2Ø		8615D LISTEN
Bit 3 of byte 6 is the sign bit	4	Ø	Ø	39	57	BFO CODE
Ø = +, 1 = - ,	5	Ø	Ø	ØØ	ØØ	BYTE 1
The remaining 3 bits are BCD 1's of kHz digit.	6	Ø	Ø	ØF	15	BYTE 2
i.e. byte 6 for +3 kHz = 03 Hex.	7	Ø	Ø	99	153	BYTE 3
byte 6 for -3 kHz = 0B Hex.	8	Ø	1	ØØ	Ø	BYTE 4

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

Table 2-16. Sending a Frequency Request

Message: request frequency (assume 25 MHz last sent)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "FRQ?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
Instruct WJ-8615D to prepare to output	3	1	Ø	26		8615D LISTEN
frequency information when made	4	Ø	Ø	46	F	
a talker	5	Ø	Ø	52	R	DATA TO
	6	Ø	Ø	51	Q	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	CR	
	9	Ø	Ø	ØA	LF	TERMINATOR
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
	13	Ø	Ø	46	F	
	14	Ø	Ø	52	R	
	15	Ø	Ø	51	Q	DATA FROM
A$ will contain "FRQ ØØ25.ØØØØ".	16	Ø	Ø	2Ø		WJ-8615D
	17	Ø	Ø	3Ø	Ø	
	18	Ø	Ø	3Ø	Ø	
	19	Ø	Ø	32	2	
Frequency response is always 15	2Ø	Ø	Ø	35	5	
characters.	21	Ø	Ø	2E	.	
	22	Ø	Ø	3Ø	Ø	
	23	Ø	Ø	3Ø	Ø	
	24	Ø	Ø	3Ø	Ø	
	25	Ø	Ø	3Ø	Ø	
	26	Ø	Ø	ØD	CR	
	27	Ø	Ø	ØA	LF	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 62	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	3E		REQUEST FREQUENCY
Enter 7Ø6 using "#%, #%K"; A$	1	1	Ø	3F		UNLISTEN
	2	1	Ø	35		HP85 LISTEN
Image causes enter to terminate on EOI	3	1	Ø	46		8615D TALK
only.	4	Ø	Ø	3C	6Ø	FREQ CODE
	5	Ø	Ø	ØØ	Ø	BYTE 1
A$ will contain frequency data in packed	6	Ø	Ø	25	37	BYTE 2
BCD.	7	Ø	Ø	ØØ	Ø	BYTE 3
	8	Ø	1	ØØ	Ø	BYTE 4

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

Table 2-17. Sending an AFC Condition Request

Message: request AFC condition (assume AFC off)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "AFC?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
Instruct WJ-8615D to prepare to output	3	1	Ø	26		8615D LISTEN
AFC status when made a talker.	4	Ø	Ø	41	A	
	5	Ø	Ø	46	F	DATA TO
	6	Ø	Ø	43	C	WJ-8615D
	7	Ø	Ø	3F	?	
	Ø	Ø	ØD	ØD	CR	
	Ø	Ø	ØA	ØA	LF	TERMINATOR
Enter 7Ø6; A$	8	1	Ø	3F		UNLISTEN
	9	1	Ø	35		HP85 LISTEN
	1Ø	1	Ø	46		8615D TALK
A$ will contain "AFC/".	11	Ø	Ø	41	A	
	12	Ø	Ø	46	F	DATA FROM
	13	Ø	Ø	43	C	WJ-8615D
	14	Ø	Ø	2F	/	
	15	Ø	Ø	ØD	(CR)	
	16	Ø	Ø	ØA	(LF)	TERMINATOR
				(Response in AFC On)		
Enter 7Ø6; A$	8	1	Ø	3F		UNLISTEN
	9	1	Ø	35		HP85 LISTEN
	1Ø	1	Ø	46		8615D TALK
A$ will contain "AFC".	11	Ø	Ø	41	A	
	12	Ø	Ø	46	F	DATA FROM
	13	Ø	Ø	43	C	WJ-8615D
	14	Ø	Ø	ØD	(CR)	
	15	Ø	1	ØA	(LF)	TERMINATOR

Binary Mode	#	ATN	EOI	HEC	DEC	Comment
*Print using "B"; 68	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	44	68	REQUEST AFC
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
	7	1	Ø	46		8615D TALK
A$ will contain 1 byte binary data.	8	Ø	1	43	67	AFC ON

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

Table 2-18. Sending a Bandwidth Size Request

Message: request size of currently selected bandwidth (assume 1Ø kHz)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "BWC?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
Instruct 8615D to output size of	3	1	Ø	26		8615D LISTEN
selected BW in kHz when made an	4	Ø	Ø	42	B	
active talker.	5	Ø	Ø	57	W	DATA TO
	6	Ø	Ø	43	C	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	(CR)	
	9	Ø	Ø	ØA	(LF)	TERMINATOR
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
A$ will contain "BWC 1Ø".	12	1	Ø	46		8615D TALK
	13	Ø	Ø	42	B	
	14	Ø	Ø	57	W	DATA FROM
	15	Ø	Ø	43	C	WJ-8615D
	16	Ø	Ø	2Ø		
	17	Ø	Ø	2Ø		
	18	Ø	Ø	31	1	
	19	Ø	Ø	3Ø	Ø	
	2Ø	Ø	Ø	ØD	CR	
	21	Ø	1	ØA	LF	TERMINATOR
				(assume 4 MHz)		
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
A$ will contain "BWC 4ØØØ".	12	1	Ø	46		8615D TALK
	13	Ø	Ø	42	B	
	14	Ø	Ø	57	W	DATA FROM
	15	Ø	Ø	43	C	WJ-8615D
	16	Ø	Ø	34	4	
	17	Ø	Ø	3Ø	Ø	
	18	Ø	Ø	3Ø	Ø	
	19	Ø	Ø	3Ø	Ø	
	2Ø	Ø	Ø	ØD	(CR)	
	21	Ø	1	ØA	(LF)	TERMINATOR
Binary Mode	**#**	**ATN**	**EOI**	**HEX**	**DEC**	**Comment**
*Print using "B"; 158	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	9E	158	BW SIZE REQUEST
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	B5		HP85 LISTEN
	7	1	Ø	46		8615D TALK
A$ will contain binary BW size	8	Ø	Ø	9C	156	BW CODE
information.	9	Ø	Ø	ØØ	Ø	BINARY CODED
	1Ø	Ø	1	ØA	1Ø	BANDWIDTH IN kHz
				(Assume 4 MHz)		
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
Byte 1, Byte 2	7	1	Ø	46		8615D TALK
	8	Ø	Ø	9C	156	BW CODE
A$ will contain binary BW size	9	Ø	Ø	ØF	15	BINARY CODED
information.	1Ø	Ø	1	AØ	16Ø	BANDWIDTH IN kHz

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

Table 2-19. Sending a Detection Mode Request

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "DET?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP 85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	44	D	
	5	Ø	Ø	45	E	DATA TO
	6	Ø	Ø	54	T	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	(CR)	
	9	Ø	Ø	ØA	(LF)	TERMINATOR
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
	13	Ø	Ø	41	A	
A$ will contain "AM".	14	Ø	Ø	4D	M	DATA FROM
	15	Ø	Ø	2Ø		WJ-8615D
	16	Ø	Ø	ØD	(CR)	
	17	Ø	1	ØA	(LF)	TERMINATOR
				(Assume PLS)		
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
A$ will contain "PLS".	13	Ø	Ø	5Ø	P	
	14	Ø	Ø	4C	L	DATA FROM
	15	Ø	Ø	53	S	WJ-8615D
	16	Ø	Ø	ØD	(CR)	
	17	Ø	1	ØA	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 95	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 LISTEN
	3	1	Ø	26		8615D TALK
	4	Ø	1	5F	95	REQUEST DETECTION MODE
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
A$ will contain 1 byte binary information.	7	1	Ø	46		8615D TALK
	8	Ø	1	48	72	AM CODE
				(Assume PLS)		
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
A$ will contain 1 byte binary information.	7	1	Ø	46		8615D TALK
	8	Ø	1	78	120	PLS CODE

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

Table 2-20. Sending a COR Level Request

Message: request COR level, (assume off)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "COR?"	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	43	C	
	5	Ø	Ø	4F	O	DATA TO
	6	Ø	Ø	52	R	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	(CR)	
	9	Ø	Ø	ØA	(LF)	TERMINATOR
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
	13	Ø	Ø	43	C	
A$ will contain "COR Ø81".	14	Ø	Ø	4F	O	DATA FROM
	15	Ø	Ø	52	R	WJ-8615D
	16	Ø	Ø	2Ø		
	17	Ø	Ø	3Ø	Ø	
	18	Ø	Ø	34	8	
	19	Ø	Ø	31	1	
	2Ø	Ø	Ø	ØD	(CR)	
	21	Ø	1	ØA	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
		1	Ø	3F		UNLISTEN
*Print using "B"; 89		1	Ø	55		HP85 TALK
		1	Ø	26		8615D LISTEN
		Ø	1	59	89	REQUEST COR
Enter 7Ø6 using "#%, #%K"; A$	1	1	Ø	3F		UNLISTEN
	2	1	Ø	35		HP85 LISTEN
A$ will contain 2 bytes binary	3	1	Ø	46		8615D TALK
information.	4	Ø	Ø	57	87	COR CODE
	5	Ø	1	29	81	VALUE

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

Table 2-21. Sending a BFO Frequency Request

Message: request frequency (assume -3.60 kHz)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "BFO?"	1	1	Ø	3F		UNLISTED
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	42	B	
	5	Ø	Ø	46	F	DATA TO
	6	Ø	Ø	4F	O	WJ-8615D
	7	Ø	Ø	3F	?	
	8	Ø	Ø	ØD	(CR)	
	9	Ø	Ø	ØA	(LF)	TERMINATOR
Enter 7Ø6; A$	1Ø	1	Ø	3F		UNLISTEN
	11	1	Ø	35		HP85 LISTEN
	12	1	Ø	46		8615D TALK
A$ will contain "BFO -ØØ3.6ØØØ".	13	Ø	Ø	42	B	
	14	Ø	Ø	46	F	DATA FROM
	15	Ø	Ø	4F	Ø	WJ-8615D
	16	Ø	Ø	2Ø		
	17	Ø	Ø	2D	-	
	18	Ø	Ø	3Ø	Ø	
	19	Ø	Ø	3Ø	Ø	
	2Ø	Ø	Ø	33	3	
	21	Ø	Ø	2E	.	
	22	Ø	Ø	36	6	
	23	Ø	Ø	3Ø	Ø	
	24	Ø	Ø	3Ø	Ø	
	25	Ø	Ø	3Ø	Ø	
	26	Ø	Ø	ØD	(CR)	
	27	Ø	1	ØA	(LF)	TERMINATOR
*Binary Mode	#	ATN	EOI	HEX	DEC	Comment
Print using "B"; 59	1	1	Ø	3F		UNLISTED
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	1	3B	59	REQUEST BFO
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
A$ will contain 5 bytes BFO information.	7	1	Ø	46		8615D TALK
	8	Ø	Ø	39	57	BFO CODE
	9	Ø	Ø	ØØ	Ø	BYTE 1
	1Ø	Ø	Ø	ØB	11	BYTE 2
	11	Ø	Ø	6Ø	96	BYTE 3
	12	Ø	1	ØØ	ØØ	BYTE 4
				(Assume 3.60 kHz)		
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
A$ will contain 5 bytes BFO information.	7	1	Ø	46		8615D TALK
	8	Ø	Ø	39	57	BFO CODE
	9	Ø	Ø	ØØ	Ø	BYTE 1
	1Ø	Ø	Ø	Ø3	Ø3	BYTE 2
	11	Ø	Ø	6Ø	96	BYTE 3
	12	Ø	1	ØØ	ØØ	BYTE 4

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

Table 2-22. Sending a Signal Strength Level Request

Message: read signal strength (assume SS=95)

ASCII Mode	Actual Bus Transfer					
	#	ATN	EOI	HEX	ASCII	Comment
Output 7Ø6 using "K"; "SS?"	1	Ø	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	Ø	26		8615D LISTEN
	4	Ø	Ø	53	S	
	5	Ø	Ø	53	S	DATA TO
	6	Ø	Ø	3F	?	WJ-8615D
	7	Ø	Ø	ØD	(CR)	
	8	Ø	Ø	ØA	(LF)	TERMINATOR
Enter 7Ø6; A$	9	1	Ø	3F		UNLISTEN
	1Ø	1	Ø	35		HP85 LISTEN
	11	1	Ø	46		8615D TALK
	12	Ø	Ø	53	S	
	13	Ø	Ø	53	S	DATA FROM
A$ will contain "SS Ø95".	14	Ø	Ø	2Ø		WJ-8615D
	15	Ø	Ø	2Ø		
	16	Ø	Ø	3Ø	Ø	
	17	Ø	Ø	39	9	
	18	Ø	Ø	35	5	
	19	Ø	Ø	ØD	(CR)	
	2Ø	Ø	Ø	ØA	(LF)	TERMINATOR
Binary Mode	#	ATN	EOI	HEX	DEC	Comment
*Print using "B"; 137	1	1	Ø	3F		UNLISTEN
	2	1	Ø	55		HP85 TALK
	3	1	9	26		8615D LISTEN
	4	Ø	1	89	137	REQUEST SS
Enter 7Ø6 using "#%, #%K"; A$	5	1	Ø	3F		UNLISTEN
	6	1	Ø	35		HP85 LISTEN
Signal strength is returned in binary	7	1	Ø	46		8615D TALK
format.	8	Ø	Ø	87	135	SS CODE
	9	Ø	1	5F	95	SS BYTE

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

2.6 ERRORS

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

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

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

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

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

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

2.7 PREPARATION FOR RESHIPMENT

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

SECTION III

CIRCUIT DESCRIPTION

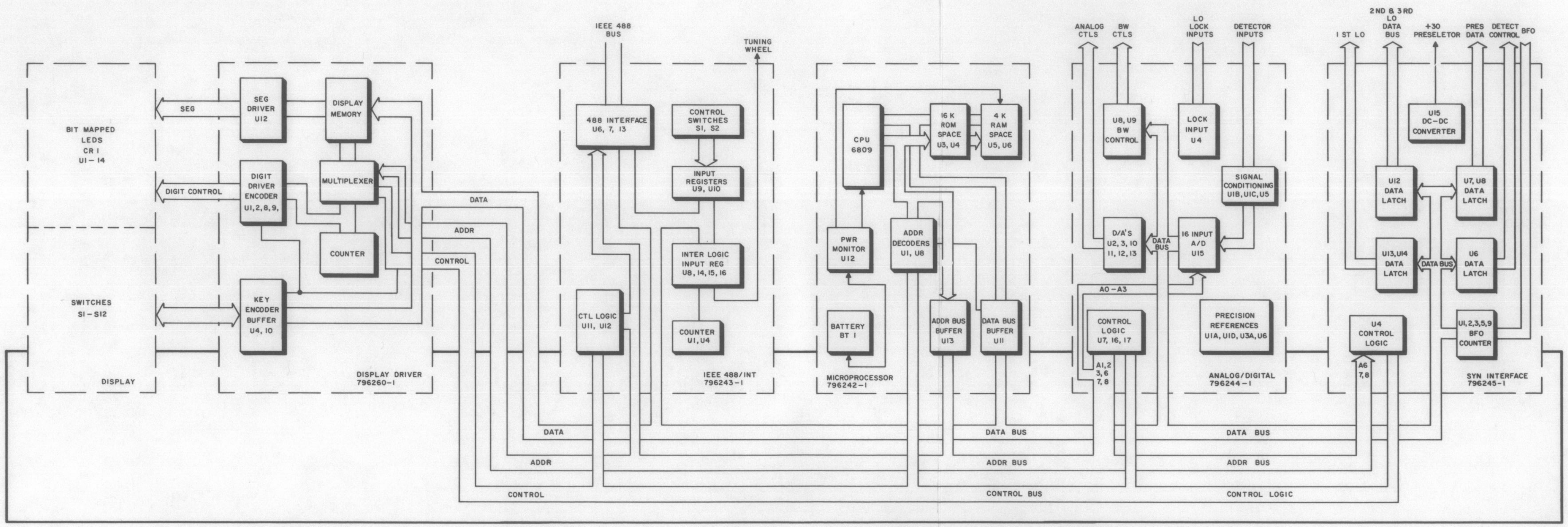


Figure 3-1. Digital Control Section
Functional Block Diagram 580205

SECTION III

CIRCUIT DESCRIPTION

3.1 GENERAL

The operating circuitry of the WJ-8615D Compact Receiver is contained in three main sections. Each section contains the circuitry required to perform specific portions of the overall receiver operation. The sections are interconnected via a common Motherboard (A1) which permits the various sections to perform as a single unit under the control of the Digital Control Section. Operation of the Digital Control, Synthesizer and RF/IF Sections are described in the following paragraphs. Reference to the Functional Block Diagrams in this section and to the Schematic Diagrams in Section VI supplement the following circuit descriptions.

3.2 DIGITAL CONTROL SECTION

3.2.1 FUNCTIONAL DESCRIPTION

This microprocessor controlled Digital Control Section continuously monitors the operation of the receiver and provides control signals directing its operation. The primary subassemblies responsible for controlling the receiver are the Microprocessor (A1A3), IEEE-488/Interrupt (A1A2), Analog/Digital (A1A4), Synthesizer Interface (A1A5) and Front Panel Display (A1A1). These subassemblies and their interconnections are illustrated in the Digital Control Section Functional Block Diagram, **Figure 3-1**. In addition to the primary control subassemblies, an option slot is provided to extend the control capabilities and provide enhancements to the operation of the receiver.

The Microprocessor (A1A3) performs the task of controlling the operation of the receiver by providing control signals to the various receiver circuits and monitoring the receiver operation. This subassembly consists of a microprocessor, a list of operating instructions contained in ROM (Read-Only-Memory) and 2 k bytes of RAM (Random-Access-Memory) where the microprocessor stores and retrieves variable data as required, as it performs its control function. Under the direction of the program, the microprocessor continuously monitors the receiver operation and performs tasks as required. Communication between the microprocessor and the other subassemblies within the Digital Control Section is established utilizing the 16-line address bus and the 8-line data bus of the microprocessor. Each of the input and output circuits on the Synthesizer Interface, Analog/Digital, IEEE-488 Interrupt and Front Panel Display as well as the option slot are assigned specific addresses. By placing the appropriate address on the address bus, the microprocessor communicates with the desired location via the data bus. The control bus which is comprised of the I/O enable, Read/Write and IRQ lines permit the microprocessor to activate the required circuit by controlling the direction and timing of the data flow and to sense when a circuit is exercising the IRQ line (request service by the microprocessor).

Analog/Digital subassembly (A1A4) is utilized to convert analog data from various receiver circuits such as LO Lock inputs and Detector inputs into digital form to be read by the microprocessor. These signals are conditioned and applied to D to A converters to be read by the microprocessor when address lines A0 through A3 are enabled. Control data is applied to the other receiver circuits via the analog control lines and the bandwidth control lines.

IEEE-488 Interrupt subassembly (A1A2) provides interfacing between the receiver and external controlling devices and provides interrupt latching circuitry that generates interrupt requests (IRQ) which are applied to the microprocessor. Interrupt requests are generated by the front panel when a detection mode is changed, an IF bandwidth is changed or when the tuned frequency is changed. This subassembly provides control logic to the 1st LO and 2nd LO/3rd Synthesizer and to the BFO counter. When interrupts occur, this subassembly alerts the microprocessor via the $\overline{IRQ}$ line that a service request has been made.

Synthesizer Interface subassembly (A1A5) is utilized to provide interface between the microprocessor and the 1st LO and 2nd LO/3rd Synthesizer. The data latches on this subassembly provide the BCD words for tuned frequency information, detection mode information and optional Tracking Preselector information. Also included on this subassembly are printer and RS-232 compatible printer outputs.

Front Panel Display subassembly (A1A1) contains hardware generated refresh logic. Data written by the microprocessor is hardware refreshed by the Display Driver subassembly (A1A1A1). This subassembly consists of a dual ported memory which comprises 16 bytes of bit-mapped LED display. Switch matrix encoders, upon a key closure, set the key available line to the microprocessor along with the key code and is made available to the data bus via data bus buffers.

3.2.2 DETAILED CIRCUIT DESCRIPTION

3.2.2.1 Type 796242-1 Microprocessor (A1A3)

The reference designation for the microprocessor subassembly is (A1A3). Refer to **Figure 6-4** for the Type 796242-1 Microprocessor schematic diagram.

Y1, a 4.9152 MHz crystal oscillator establishes the microprocessor (U7) internal clock frequency. The circuit comprised of capacitors C1 and C2 assures that the crystal oscillates at its fundamental frequency. U12A and U12B create a time delay circuit to allow the power supply to settle before enabling the reset circuitry of the microprocessor. Capacitor C3 creates a time delay, due to its charge time, for the +5 Vdc to settle before the microprocessor is reset. The microprocessor must see 4.8 V, minimum for power up. Power down conditions exists when the dc level is 4.7 V or less.

Integrated circuit U7 is the MC68B09 microprocessor. Pins 2 ($\overline{NMI}$), and 40 ($\overline{HLT}$) are not utilized under normal operating conditions and are terminated high, disabling these inputs. $\overline{NMI}$ (Non Maskable Input), pin 2, is utilized to start the signature analysis program when pulled low. $\overline{HLT}$ (Halt), pin 40, is utilized to stop the microprocessor activity when pulled low. $\overline{IRQ}$ and $\overline{FIRQ}$ are the interrupt request lines which receive inputs from the IEEE-488 Interrupt subassembly (A1A2) when an interrupt is requested. Data I/O lines consists of D0 through D7. These lines connect to the memories and to the data bus on the motherboard to read from and write data into the input and output circuits of the Digital Control Section. Pin 32, the Read/Write line of the microprocessor indicates whether the microprocessor is in a Read (High) or a Write (Low) state. A0 through A8 are connected to the Address Bus of the motherboard and to the memories. Address lines A13, A14 and A15 go to a 4 to 10 decoder (U1), which decodes the address lines to divide the address space into 8K byte blocks.

The lowest 8 K block (0000-1FFF) from U1, pin 1 is applied to decoder U8B where the address space is further divided into 2 K blocks. The first 2 K block (0000-07FF) is applied to RAM U6 via inverter U12B. The second 2 K block (0800-0FFF) is applied to RAM U5 via inverter U12C. The last 2 K block (1800-1FFF) is the I/O block which is divided into four 512 byte block, via U8A, for I/O control. I/O 1 controls the operation of the IEEE-488 subassembly (A1A2) and the Front Panel Display (A1A1). I/O 2 goes to the Synthesizer Interface subassembly (A1A5) and I/O 3 goes to the Analog/Digital subassembly (A1A4). I/O 4 is not utilized in the present configuration. When these control lines are pulled low, the respective subassemblies are activated.

U5 and U6 comprise the RAM's. These integrated circuits each contain 2048 memory locations 8 bits wide. The RAM's connect to the data bus lines D0 through D7 and address lines A0 through A10. The chip select inputs $\overline{CS}$ permit selection of each RAM in accordance with the address. The $\overline{CS}$ lines are enabled via U12B and U12C in accordance with address lines A11 and A12. U5 is not utilized in the present receiver configuration, but is available to provide expansion capabilities. JW3 and JW4 allow the use of an EPROM instead of a RAM in the U5 location. U12B and U12C provide data retention logic for the RAM's. The $\overline{CS}$ (chip select) lines remain high which prevents RAM access during power interruptions.

The read-only-memory is comprised of EPROM's U3 and U4. Each EPROM connects to address lines A0 through A12 providing 8 K memory locations each for a total of 16 K bytes of read-only-memory. These EPROM's are sequentially enabled in accordance with address lines A13, A14 and A15 via decoder U1. Each select output of U1 goes to the $\overline{CS}$ and $\overline{OE}$ inputs of one of the EPROM's enabling it when the line is pulled low. JW1 is utilized to decide what size memory chips are in U3 and U4 locations by jumping the select lines to the output of U1. JW5 allows the use of a RAM instead of an EPROM in the U4 location. Address line A13, pin 26 is utilized if a type 27128 EPROM is used.

Integrated circuit U11 connects to the data bus and is enabled by the I/O enable line. This bidirectional transceiver transfers data between and the microprocessor and the motherboard of the receiver. The direction of the data flow is controlled by the R/$\overline{W}$ line of the microprocessor. U13A supplies address lines A0 through A3 and U13B supplies address lines A5 through A8. Address line A4 is not buffered. Integrated circuits U11, U13A and U13B provide buffering to prevent excessive loading of the data and address busses.

When the receiver is powered up, +5 Vdc is applied to RAM's U5 and U6 via board terminals 49 and 50. When power is removed, the backup battery BT1 applies a nominal voltage of 2.8 Vdc, supplying approximately 1 μA of standby current to the RAM's. This prevents stored data in the RAM's from being lost when power is removed. Additional battery current drain is prevented by R9. CR5 isolates the battery, BT1 from the +5 V power supply line during normal receiver operation. In the absence of +5 V, CR5 is forward biased by BT1 providing backup power to the RAM circuitry.

NOTE

BT1 is a primary lithium cell which under normal operating conditions, is expected to last 10 years. When the microprocessor board is removed, the battery is disconnected. DO NOT place this assembly on a metallic surface.

3.2.2.2 Type 796244-1 Analog/Digital (A1A4)

The reference designation for the Analog/Digital subassembly is (A1A4). Refer to **Figure 6-5** for the Type 796244-1 Analog/Digital schematic diagram.

Integrated circuit U6 provides the precision 10 Vdc reference. From this circuit, U1A and Q1 provide the 10 Vdc reference for digital to analog converters U10, U11, U12 and U13. Integrated circuit U1D and Q2 provide the -13 Vdc reference for level shifter U8 so that the bandwidth code can be read on the Audio/Video subassembly. U3A provides the 4.95 Vdc reference for analog to digital converter U15.

Address converter U7 takes the I/O 3 line from the microprocessor and further decodes it with address lines A6, A7 and A8 yielding 64 byte blocks for this subassembly. These blocks are write lines thus U7 is enabled on a write cycle. A read on the I/O 3 line causes the output of inverter U17B to become active which reads the last result of conversion occurring in analog to digital converter U15.

Analog to digital converter U15 is selected by writing 1D40 into the address to start conversion. The leading edge of 1D40 latches the ALE input and the trailing edge of 1D40 starts the conversion process. When conversion is complete EOC signals the microprocessor that conversion is complete. U15 runs with $\overline{E}$ clock and its conversion time is less than 80 µsec. Connector pin 39, AM/PEAK is the dc representation of the peak component seen on the AM Demodulator. This is utilized for sideband and pulse AGC operations. Pin 40, AM/AC is the dc representation of the ac component seen on the AM Demodulator. Pin 41, AM/DC is the dc component seen on the AM Demodulator. This is utilized for AM and FM AGC operations. Pin 42, FM/AC is the dc representation of the ac component seen on the FM Discriminator. Pin 43, FM/DC is the dc component seen on the FM Discriminator. This is utilized for AFC operation and for the tuning meter. Pin 44, LOG/VIDEO is the dc component seen on the LOG Detector. Pin 46. FP USB is the upper channel audio for the front panel. This is half-wave rectified so that U15 sees the dc representation. Pin 47, FP LSB is the lower channel audio, also half-wave rectified. Connector pins 45 and 48 are not utilized in the present configuration. U15, pin 14, is a sense point for the microprocessor for testing power supply voltages. R-C filters are incorporated at pins 39 through 42 and pin 44 to strip off high frequency noise from these lines. Pin 43 also has an R-C filter and a clamping diode, CR5 to make certain that the FM dc level does not go negative. The 2nd LO fine tune voltage applied to connector pin 6 is a range between 2 to 10 V buffered via U1C and converted via U5B to a 0 to 5 V signal to be applied to U15. This is for future receiver diagnostic tests. The bandwidth code enters connector pin 4 as a current source. U1B converts this to a voltage of 0 to 10 V and converted again to 0 to 5 V via U5A before being applied to U15. Integrated circuits U5A and U5B protect U15 from seeing ground or voltage levels greater than 5 V.

Analog to digital converters U10, U11 and U12 are dual 8 bit converters. The A half of the converters are selected by writing 1C00 in the address and the B half is selected by writing 1C01 in the address. Since the operation of these converters is similar, U10 will be discussed in detail. The current output of U10A and U10B is converted to a voltage via U2B and U2C. An internal latch within U10 maintains the last seen voltage. Connector pin 14 (IF NORM) is a voltage between 0 to 13 V which selects the amount of attenuation for the IF normalization on the IF bandwidth subassembly for the selected bandwidth. This is also utilized to add attenuation for AGC operation. Pin 16 (IF AGC) is a voltage between 0 to 13 V utilized for controlling the amount of IF attenuation on the bandwidth subassembly. Pin 18 (DET AGC) is a voltage between 0 to 13 V, utilized for controlling the amount of AM Demodulator attenuation. Pin 20 (BFO TV) is a voltage between 0 to 10 V utilized the 21.4 MHz variable oscillator on the Reference Generator subassembly. Pin 25 (AUX D/A) is applied to rear panel connector J13 and is intended for future use. Pin 22 (VHF AGC) is a voltage between 0 to 13 V utilized to control the amount of attenuation for the RF Converter subassembly. Pin 24 (UHF AGC) is a voltage between 0 to 13 V, utilized to control the amount of attenuation for the optional Frequency Extender subassembly.

The 12 bit digital to analog converter (U13) provides a current output which is converted to 0 to 13 V via U3D. This controls the coarse tune voltage for the 2nd LO Synthesizer subassemby. The two byte address of U13 is 1CC1 and 1CC0.

Data bus latch U14 provides an output from information at D5 to select FM $\overline{\text{NAR}}$/MID (narrow/midband) discriminators as required by the size of the selected IF bandwidth. D6 selects FM WIDE (wideband) discriminator as required by the size of the selected IF bandwidth.

Bandwidth and COR data latch U9 provides IF bandwidth selection via data bus lines D0 through D4. Also provided is the wideband/narrowband control line via D5. These lines, D0 through D5 are level shifted to the precision reference voltage via U8. A logic "1" is 13 V, and a logic "0" is 0 V. D6 is the spare driver line intended for future use and D7 is the external COR control line. Both D6 and D7 are open collector transistor pulled-up to +5 V in order to drive TTL devices directly. CR1 and CR2 provide voltage spike protection for relay switching.

Inverters U16C and U16F are utilized to pulse the 2nd LO/3rd Synthesizer clock lines. U16E provides a buffered direction finder control line to the rear panel connector J13 derived from the UHF/VHF control line. A logic "1" indicates the receiver is tuned between 20 and 500 MHz and logic "0" represents tuned frequencies greater than 500 MHz.

Integrated circuit U4B is the unlock sensor for the 1st LO Synthesizer subassembly. R1 and C2 form the low pass filter. Resistors R2 through R5 form a hysteresis loop around comparator U4B to compare the 1st LO lock line with the reference of U5. A logic "1" indicates unlock and a logic "0" indicates lock. U4A is the 2nd LO/3rd Synthesizer subassembly unlock sensor. R6 and C1 form the low-pass filter. Resistors R7 through R10 form a hysteresis loop around comparator U4A to compare the 2nd LO/3rd Synthesizer lock line with the reference of U5. A logic "1" indicates unlock and a logic "0" indicates lock.

3.2.2.3 Type 796243-1 IEEE-488/Interrupt (A1A2)

The reference designation for the IEEE-488/Interrupt subassembly is (A1A2). Refer to **Figure 6-3** for the Type 796243-1 IEEE-488/Interrupt schematic diagram.

Address decoder U12 provides four 64 byte write address blocks and four 64 byte read address blocks. The third write block from U12 enables address decoder U11 which provides eight single address control lines. Writing address 1800 enables interrupt latch U16. Addresses 1800-18BF write the front panel control signals. The single byte address decoder U11 is enabled by writing addresses 1900-191F. Outputs of U11 are utilized as interrupt reset and start signals and LO clock signals. Writing 1903 creates a 407 µsec. negative going pulse utilized to strobe data into the 2nd LO divider logic. Writing 1906 creates a 407 µsec. negative going pulse utilized to strobe data into the 3rd Synthesizer divider logic. Writing 1907 creates a 407 µsec. negative going pulse utilized to start the BFO counter on the Synthesizer Interface subassembly.

Address decoder U5D decodes the read and write address from 19C0 to 19FF for the IEEE-488 interface integrated circuit, U13. U13 has eight internal registers which are selected by address lines A0 through A12. U13 provides IEEE-488 interface logic along with control of switch register U10 which is utilized for 488 address information. Integrated circuits U6 and U7 are 488 interface buffers utilized to obtain the proper drive characteristics for IEEE-488 standard operation. U13 is capable of generating interrupts via interrupt comparator U14.

The 1.2 kHz Q10 output of interrupt timer and frequency divider U1 provides an .833 msec. interrupt clock to the $\overline{\text{IRQ}}$ interrupt on the microprocessor subassembly via interrupt latch U4B. U4B is reset by writing address 1905 via U11. The .833 msec. clock signal drives the front panel refresh logic to update the front panel display. U1 generates a 3.33 msec. clock which generates an interrupt via interrupt latch U4A. U4A is reset by writing address 1900 via U11. The 3.33 msec clock signal indicates key closures when a front panel pushbutton is depressed.

Integrated circuit U2B, (BFO counter interrupt latch) generates a single counter up signal, 50 msec. after the start signal of the counter. U2B is reset by writing to address 1904 via U11. The keyboard available line from the front panel generates an interrupt on key closures via interrupt latch U2A. U2A is reset by writing to address 1902 via U11.

Input register U8A shows the following status when an output is enabled:

- D7 indicates analog to digital conversion is complete.
- D6 indicates tuning wheel quadrature signals.
- D5 indicates tuning wheel movement and direction.
- D4 indicates key available.

Tuning wheel inputs TW1 and TW2 utilize schmitt triggers U3A and U3B for input filtering and hysteresis. U8B is a spare input register which responds to reading address 1980 on data lines. D0 and D1. Switch register U9 is accessed by reading address 1900.

Integrated circuit U16 is a hardware interrupt mask register, with each of its six outputs allowing enabling/disabling of interrupt signals. U16 is accessed by writing 1800 on data lines D0 through D5. These data lines enable the following:

- D0 enables the 3.33 msec. interrupt from U4.
- D1 enables the SPR (spare) interrupt from U3E (SPR IN 1).
- D2 enables the front panel keyboard interrupts from U2A.
- D3 enables the 488 interrupts from U13.
- D4 enables the BFO counter interrupts from U2B.
- D5 enables the 833 msec. clock interrupts from U4B to the $\overline{\text{FIRQ}}$ line to the microcprocessor subassembly.

Interrupt comparator U14 compares interrupt mask register U16 with interrupt latches. Upon finding a logic "1" in both U16 and a latch for a given interrupt generates $\overline{\text{IRQ}}$ to the microprocessor subassembly.

Interrupt status register U15 allows the microprocessor to read the current interrupt latches. Data lines D0 through D7 are accessed by R1800 and indicate the following:

- D0 indicates active 3.33 msec. interrupt from U4A.
- D1 indicates active SPR (spare) interrupt from U3E.
- D2 indicates active keyboard interrupt from U2A.

D3 indicates active 488 interrupt from U13.
D4 indicates active BFO counter interrupt from U2B.
D5 indicates active $\overline{\text{FIRQ}}$ interrupt from U4B.
D6 indicates active 1st LO lock from Analog/Digital subassembly.
D7 indicates active 2nd LO/3rd Synthesizer lock from Analog/Digital subassembly.

3.2.2.4 Type 796245-1 Synthesizer Interface (A1A5)

The reference designation for the Synthesizer Interface subassembly is (A1A5). Refer to **Figure 6-6** for the Type 796245-1 Synthesizer Interface schematic diagram.

Address decoder U4 provides eight 64 byte write address blocks selected via the I/O 2 control line from the microprocessor. Data latch U14 is enabled by writing to address 1A00. This latch contains the 100 MHz digit (in BCD form) for the 1st LO, on data lines D0 through D3 (2^1 through 2^8). Data line D4 is the 1st LO load signal. D5 and D6 are the UHF LO control lines (U^1 and U^2) and the UHF/$\overline{\text{VHF}}$ control line is D7. Data latch U13 is enabled by writing to address 1A40. This latch contains the 10 MHz digit (in BCD form) for the 1st LO, on data lines D4 through D7 (1^1 through 1^8). Data line D3 is the 7/$\overline{2}$ control line for the 1st LO. Data latch U12 is enabled by writing address 1A80. This latch controls the 2nd LO/3rd Synthesizer data/address bus and fine tune control. Data lines D0 through D3 form a 4 bit data bus to both LO's. D4, D5 and D6 form the LO address lines for the 2nd LO/3rd Synthesizer. D7 controls the 2nd LO fine tune off/on. Data latch U8 is enabled by writing address 1B40. This latch controls the optional Tracking Preselector subassembly. Data lines D0 and D1 form the address lines for the Tracking Preselector. D2, D3 and D4 form the preselector band code signals. D5 forms the preselector strobe control line. D6 forms the serial output line via TTL to 232 converter U10. D7 forms the printer out line via U10. Data latch U7 is enabled by writing address 1B80. This latch is also utilized for the optional Tracking Preselector subassembly. Data lines D0 through D7 form the frequency control lines. Data latch U6 is enabled by writing address 1BC0. This latch controls the demodulator and squelch circuitry of the receiver. D0 forms the $\overline{\text{FM}}$/AM control line which selects AM or FM detection mode. D1 enables CW, selects CW audio and gates the 21.4 MHz oscillator on the Reference Generator subassembly. D2 enables CW or SSB, selects SSB audio and gates the 10.7 MHz fixed and variable oscillators on the Reference Generator subassembly. D3 enables USB/$\overline{\text{LSB}}$ and selects the USB or LSB filter on the CW/ISB Demodulator subassemby along with the appropriate audio channel. D4 enables ISB and selects both upper and lower ISB and audio channels. D5 enables the squelch circuitry and disables the audio output. D6 is not used in the present configuration. D7 enables the AM peak dump control line which allows dumping of the AM peak detector onto the Audio/Video subassembly. Resistor pack R7 is the data bus pull-up.

Integrated circuits U5, U1, U3 and U9 form the BFO counter logic circuitry. Counter U5A provides a 50 msec. pulse, initiated by the counter start signal from the microprocessor. On time out, a counter done signal from U5A is applied to the 488 Interrupt subassembly. Schmitt triggers U1A and U1B make up the input conditioning circuitry for VBFO High/Low signals, from the phase comparator on the Reference Generator subassembly. U1C and U1D allow gating under the control of U5A of the difference frequency from the VBFO High/Low into 256 bit counter U3. U9 responds to R1A00 to read the number of counts in U3. Logic for U9 is provided via U5B.

DC-DC converter U15 provides 5 to 30 V for the optional Tracking Preselector subassembly when this option is installed in the receiver.

3.2.2.5 Type 796260-1 Front Panel Display (A1A1)

The reference designation for the Front Panel Display subassembly is (A1A1). Refer to **Figure 6-2** for the Type 796260-1 Front Panel Display schematic diagram.

The front panel logic contains hardware generated refresh logic. LED bar display U13 is the front panel tuning meter. Integrated circuits U1 through U5 and U8 through U11 are front panel indicators nomenclated on **Figure 6-2**. A 3 digit, seven segment LED (U6) is the signal strength indicator. A 2 digit, seven segment LED (U7) is the COR level indicator. U12 and U14, 4 digit, seven segment LED's provide the tuned frequency display. Integrated circuits U6, U7, U12 and U14 share a common cathode. The front panel display is mapped into a 16 x 8 matrix of multiplexed refreshed LED's. The switch bank is mapped into a 3 x 4 matrix of normally open, close on contact switches.

3.2.2.5.1 Part 380411-1 Display Driver (A1A1A1)

Data written by the microprocessor is hardware refreshed by this subassembly. A dual ported memory, U11 and U5 make up 16 bytes for the bit mapped display. The microprocessor accesses the memory by creating a "write front panel signal" on U3, pin 1 which maps address lines A0 through A3 which is applied to U5 and U11. A delayed write signal via R1, CR1 and C10 is applied to memories U11 and U5. Display data is stored in the 16 x 8 memory via the microprocessor.

When not interrupted by the microprocessor, the display creates a self refresh. Address counter U6 is mapped to the address lines of U11 and U5 via U3. These address lines are applied to 3 to 8 decoders, U1 and U2 for digit selection. The most significant address line of address counter U6 controls the access of either U1 or U2 depending on the state of the line. U1 is accessed when the line is high, U2 is accessed when the line is low. At each address that U6 cycles through, data is obtained from RAM's U11 and U5 and is applied to the source driver U12 as anode information. One of the outputs of U1 and U2 is enabled, selecting one of sixteen digits via current drivers U8 and U9. Duty cycle control for display intensity is maintained via U7A and U7B, which are one shots and are fired at the beginning of each display address. U4B and U10 become the switch matrix encoders upon a key closure. U10 sets the key available line to the microprocessor, along with a key code on outputs 20 through 23, making them available to the data bus via data bus buffer U4B, on data lines D0 through D3.

3.3 RF/IF SECTION

3.3.1 FUNCTIONAL DESCRIPTION

Refer to the RF/IF Section Functional Block Diagram (**Figure 3-2**) for the following function description.

The incoming 20 to 500 MHz RF signal enters the receiver via the ANTENNA input connector (J10) and is applied to the (A1A14) module. This module is either the Input Filter subassembly or the optional Tracking Preselector. Refer to the optional Tracking Preselector instruction manual for its description. Another available option in this signal path is the Frequency Extender. Refer to the optional Frequency Extender instruction manual for its description. This discussion deals with the Input Filter subassembly. This filter functions as a

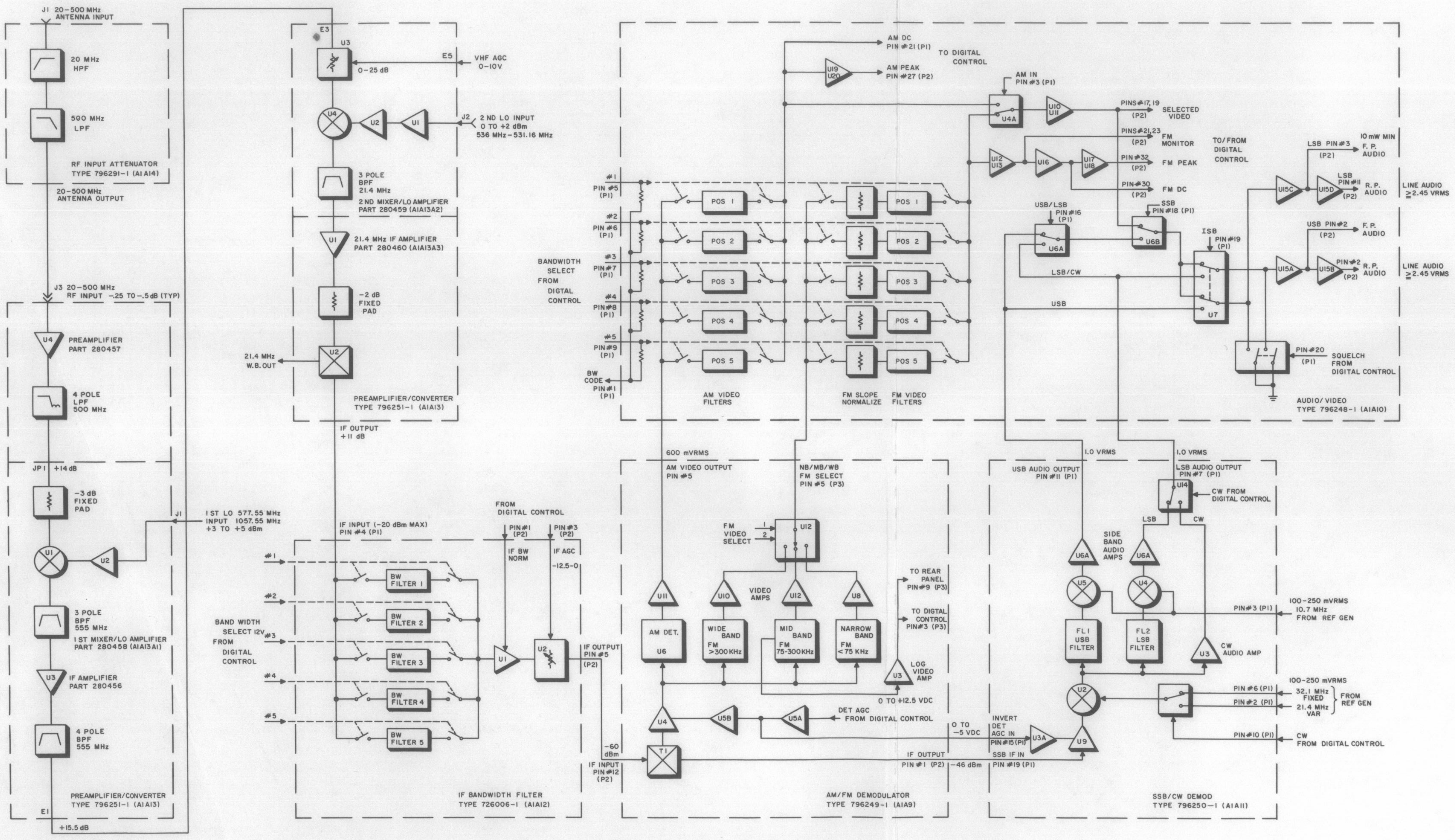


Figure 3-2. WJ-8615 RF/IF Section Functional Block Diagram 580243

wide bandpass filter, rejecting signals below 20 MHz and above 500 MHz. From this subassembly, the 20 to 500 MHz RF signal is applied to the Preamplifier/Converter subassembly (A1A13).

Amplification of the incoming RF signal and conversion to a fixed 21.4 MHz IF is the primary function of this subassembly. This subassembly is comprised of four sections: Preamplifier/Low pass filter, 1st Mixer/LO Amplifier, Gain Control and 2nd Mixer/LO Amplifier. Within the 1st Mixer/LO Amplifier, the RF signal is mixed with a 577.5501 to 1057.5501 MHz 1st LO signal from the Synthesizer Section. The LO frequency varies 5 MHz with a 10 kHz offset in 100 Hz steps. The output of the 1st mixer is a band of frequencies with center frequencies from 557.5501 to 552.5501 MHz. For example, when the receiver is tuned to 120.0000 or 125.0000, the IF output frequency is centered at 557.5501 MHz. When the receiver is tuned to 124.9999 or 129.9999, the IF output frequency is centered at 552.5501 MHz. The output is filtered and amplified restoring the signal level lost in the conversion process.

The output of the 1st Mixer/LO Amplifier is applied to the 2nd Mixer/LO Amplifier where the 557.5501 to 552.5501 MHz 1st IF is mixed with the 2nd LO signal from the Synthesizer Section, providing a 21.4 MHz 2nd IF. Gain control is also provided in this stage via the Digital Control Section. The 2nd LO signal varies from 531.1501 to 536.1501 MHz in 10 kHz steps, providing a 10 kHz tuning resolution. The 21.4 MHz IF signal is then amplified and applied to the IF BW Filter Amplifier subassembly (A1A12). Samples of the IF signal are also applied to the SM/IF OUTPUT connector J9 and to the SW IF OUTPUT connector J8 on the receiver rear panel. The 21.4 MHz IF output to the IF BW Filter subassembly is applied to the appropriate filter via switching signals provided by the Digital Control Section.

The IF OUTPUT of the selected IF BW Filter is applied to the AM/FM Demodulator subassembly (A1A9) where the IF signal is amplified linearily and logarithmically for video detection and signal strength representation. IF AGC is applied to the Analog/Digital subassembly (A1A4) in the Digital Control Section for AGC (automatic gain control) or MGC (manual gain control) operation. IF NORM is the normalized gain of the product of the bandwidth through the RF/IF signal path depending on the selected IF bandwidth, which is applied to the Digital Control Section.

AM/FM Demodulator subassembly (A1A9) amplifies the IF output of the IF BW Filter subassembly (A1A12) both linearly and logarithmically. Linear amplification of the 21.4 MHz IF is applied to the FM Demodulator circuitry for detection of FM video and to the AM Demodulator circuitry for detection of AM video. A logarithmic amplifier circuit provides a dc output voltage that varies logarithmically with the signal strength. This dc voltage is summed with a sample of the detected AM video providing an indication of the signal strength to the Digital Control Section. FM video is applied to the FM video filters on the Audio/Video subassembly (A1A10). Log video is applied to the Digital Control Section and to the auxiliary connector J13 on the rear panel representing the video signal from 0 to approximately 60 dB above the noise floor of the receiver. AGC from the Digital Control Section is applied to this subassembly for AGC (automatic gain control) or MGC (manual gain control) operation.

Detected FM video is amplified and applied to the FM MON connector (J4) on the receiver rear panel via the Audio/Video subassembly (A1A10). AM and FM video is applied to the appropriate video response modules according to the selected IF bandwidth via the Digital Control Section. Depending on the detection mode selected, the AM or FM video is amplified and applied to the SEL VIDEO connector (J5) on the receiver rear panel. The video signal is also applied to the audio circuitry where the signal is amplified and applied to the REAR PANEL AUDIO connectors (J6 and J7) and to the front panel PHONES jack (J12), under the control of the Digital Control Section. LOG video from the AM/FM Demodulator subassembly

(A1A9) and the COR level from the Digital Control Section are applied to this subassembly to activate the COR circuitry. When the LOG video level is greater than the COR reference level from the Digital Control Section, the COR circuitry is activated. This activates the audio outputs and provide a 100 mA current-sink via the COR connector (J3 on the receiver rear panel) to ground, activating external equipment.

3.3.2 DETAILED CIRCUIT DESCRIPTION

3.3.2.1 Type 796251-1 Preamplifier/Converter Assembly (A1A13)

The reference designation for the Preamplifier/Converter Assembly is (A1A13). Refer to **Figure 6-16** for the Type 796251-1 Preamplifier/Converter Assembly schematic diagram.

RF signals enter the Preamplifier/Converter subassembly via connector (A1A13J3) from the A1A4 module and are applied to the input of preamplifier/low pass filter (U4). The signal is amplified by U4, a low-noise, broad-band amplifier, which provides 15 dB of gain to RF signals from 20-500 MHz. The amplified output at U4 (pin 4) is applied to the low pass filter comprised of L10 through L14 and C15 through C18. This circuit has an insertion loss of .75 dB for frequencies below 500 MHz. This filter is an elliptic four-pole low pass filter that increases attenuation rapidly for frequencies above 500 MHz. This filter attenuates RF signals in close proximity to the receiver's 1st IF frequency, image frequencies and additionally rejects conducted LO signals from the 1st mixer (U1). Variable capacitors C15 through C18 provide a means of tuning the filter for the best response.

From the 500 MHz low pass filter, the RF signal is applied to the 1st Mixer/LO Amplifier subassembly (A1A13A1) via JP1. Bias for the RF signal attenuated approximately 30 dB via R1, R2 and R3 and the signal is applied to the RF port of mixer U1. The 577.5501 to 1057.5501 MHz LO is input from the Synthesizer Section at the 1st LO IN (A1A13J1) and is applied to broad-band amplifier U2. U2 provides +12 dB of gain, increasing the LO signal level to +15 dBm at the LO port of mixer U1. Double-balanced mixer U1 combines the RF signal with the 577.5501 to 1057.5501 MHz LO signal providing a difference frequency of from 552.5501 to 557.5501 MHz which is within the 1st IF of the receiver. This difference frequency is selected via the bandpass filter comprised of L3, L4 and L5, and C3, C4 and C5, at the mixer output. The signal enters the filter via a matching network comprised of L2, C24, L19 and the tap in inductor L3, which matches the filter impedance to 50 ohms, the nominal output impedance of mixer, U1. This filter is a three-pole bandpass filter with an insertion loss of approximately 2 dB. The bandwidth of this filter is 25 MHz centered at 555.5 MHz. Variable capacitors, C3, C4 and C5 provide a means of tuning each filter pole for the best overall response and capacitors C10 and C11 provide coupling between the poles. The filter output from the tap in inductor L5 and matching element L17 transfers the filter output to 50 ohms prior to the signal being applied to IF amplifier U3.

U3 is a broad-band amplifier providing 15 dB of gain to the IF Frequency centered at 555.5 MHz. It compensates for the conversion loss in the mixer and the loss in each of the bandpass filter networks. The output of amplifier U3 is applied to a four-pole bandpass filter via L18. This bandpass filter is comprised of L6 through L9, C6 through C9, and C12 through C14. Matching component L18 and the tap in L6 establish the 50 ohm input impedance which is the characteristic output impedance of IF amplifier U3. This filter is a four-pole bandpass filter with an approximate 20 MHz bandwidth centered at 555.5 MHz. Variable capacitors C6 through C9 provide a means of tuning each filter pole for the best overall response and capacitors C12 through C14 provide coupling between the poles. This filter output is applied via the tap in inductor L9 and C1 to match the output impedance of the filter with the input of PIN diode attenuator A2U3.

3.3.2.1.1 Part 280459-1 2nd Mixer/LO Amplifier (A1A13A2)

Part 280459-1 2nd Mixer/LO Amplifier receives the 17 MHz wide frequency spectrum from the 1st Mixer/LO Amplifier and applies it to the PIN diode attenuator (U3) which is utilized to control the module gain. It provides approximately 3 dB of fixed loss when the AGC voltage from the Digital Control Section is maximum (12.5 Vdc). When AGC voltage is minimum, attenuation provided by U3 increases to 28 dB. From U3, the signal is applied to the R port of double-balanced mixer U4. U4 has an insertion loss of approximately 6 dB.

The 2nd LO signal from the Synthesizer Section enters this subassembly via connector J2 and is amplified by broad-band amplifiers U1 and U2. Signal level of the 2nd LO at J2 is approximately 3 dB and is increased to 17 dB by U1 and U2. It is applied to the L port of U4. The R port and L port signals are combined in mixer U4 providing a difference frequency of 21.4 MHz. This 21.4 MHz difference frequency from U4 is applied to the bandpass filter comprised of L3, L4 and L5 and C9 through C13. Bandpass of this filter is 8 MHz and the 1 dB bandwidth is 6 MHz. Insertion loss is .75 dB. R3 and C8 on the output of U4 terminate the undesired mixing products, falling at frequencies higher than 21.4 MHz. Output of the bandpass filter is applied to a three-pole low pass filter comprised of C14 through C21 and L1. The 100 MHz center frequency of this filter attenuates any remaining 2nd LO harmonics before the 21.4 MHz IF signal is applied to the 21.4 MHz IF Amplifier (A1A13A3).

3.3.2.1.2 Part 280460-1 21.4 MHz IF Amplifier (1A13A3)

The 21.4 MHz IF output from C23 on the 2nd Mixer/LO Amplifier subassembly (A1A13A2) is applied to the 21.4 MHz IF Amplifier subassembly (A1A13A3). Broad-band amplifier U1 amplifies the IF signal by 18 dB and applies it to resistor network R4, R5 and R6. This network attenuates the IF signal by 2 dB before being applied to power divider U2. U2 divides the signal between the two output ports. The WB IF/SM OUT is applied to the rear panel connector J9 and the 21.4 MHz IF OUT is applied to the IF BW Filter subassembly (A1A12). The insertion loss of power divider U2 is approximately 3.75 dB.

Also contained within this module is the AGC circuitry. This circuitry consists of R1, R2 and R3, CR1 and CR2 which shapes the AGC control voltage from the Digital Control Section to contour this voltage before it is applied to the PIN diode attenuator U3 on the 2nd Mixer/LO Amplifier subassembly (A1A13A2). The overall gain of the Preamplifier/Converter subassembly (A1A13) is 17 dB.

3.3.2.2 Type 726006-1 IF BW Filter Amplifier (A1A12)

The reference designation for the IF BW Filter Amplifier subassembly is (A1A12). Refer to **Figure 6-15** for the Type 726006-1 IF BW Filter Amplifier schematic diagram.

The 21.4 MHz IF input is applied to the IF BW Filter Amplifier subassembly at connector pin 4 from the Preamplifier/Converter subassembly (A1A13). The maximum signal level is -20 dBm, which is applied to the primary of T1. This transformer provides an impedance match between the Preamplifier/Converter subassembly and the crystal filters FL1 through FL5. Since the operation of the five IF BW filters is similar, only one will be discussed in detail. Filter FL1 band limits the 21.4 MHz IF signal to the stated bandwidth via the Digital Control Section (see **Table 3-1**) and applies the band limited signal via the voltage divider comprised of C13, CR11 and CR12 to the wideband amplifier (U1).

U1 applies the amplified IF signal for the selected bandwidth to attenuator U2. U2 provides 36 dB of attenuation before the 21.4 MHz IF is applied to connector pin 5 via C33. Transistor Q1 and its associated circuitry applies +6 Vdc to amplifier U1.

IF NORM (connector pin 1) connects to the Analog/Digital subassembly (A1A4) of the Digital Control Section to monitor the gain of the IF strip. The level of this signal increases as the bandwidth selection narrows. Bandwidth selection occurs in the Digital Control Section and is applied to connector pins 3, 5, 7, 9 and 11. IF AGC (connector pin 3) varies the level of the IF output according to the signal strength of the received signal.

Table 3-1. Available IF Bandwidths

	Bandwidth (kHz)	Bandwidth Code (Decimal)			A-D Volts	A1A10AX R1 Value (kΩ)	Relative IF Gain (dB)
		Min.	Center	Max.			
Narrowband Discriminator	3.2	20	26	2C	.741	162	0
	6	2D	33	39	.992	121	0
	10	3A	40	46	1.259	95.3	0
	15	47	4C	52	1.489	80.6	-2
	20	53	5A	5F	1.762	68.1	-3
	50	6D	73	79	2.239	53.6	-7
Midband Discriminator	50	7A	81	87	2.526	47.5	-7
	75	88	8E	93	2.778	43.2	-8.8
	100	94	99	9E	2.985	40.2	-10
	250	9F	A4	AB	3.209	37.4	-14
	300	AD	B4	B9	3.529	34.0	-14.7
Wideband Discriminator	500	BA	BE	C4	3.704	32.4	-17
	1000	C5	CC	D2	3.987	30.1	-20
	2000	D3	DB	E0	4.286	28.0	-23
	4000	E1	E6	EB	4.494	26.7	-26

3.3.2.3 Type 796250-2 CW Demodulator/Switched IF (A1A11)

The reference designation for the CW Demodulator subassembly is (A1A11). Refer to **Figure 6-14** for the Type 796250-2 CW Demodulator/Switched IF schematic diagram.

The 21.4 MHz IF is applied to impedance matching transformer T1 via connector pin 19. From T1 the matched 21.4 MHz IF signal is applied to the balanced modulator/demodulator (U1) via amplifier U2 and impedance matching transformer T2.

AGC input from the D/A converter subassembly is applied to operational amplifier U3A via connector pin 15 at a level from 0 to approximately +12 Vdc. Gain control voltage of from 0 to 6 Vdc is applied from the output of U3A to RF/IF video amplifier U2.

U1, a balanced modulator/demodulator, produces an output voltage of up to +8 Vdc which is proportional to the 21.4 MHz IF signal (pin 1) and the 21.4 MHz VBFO signal (pin 10). Pin 12 provides the 21.4 MHz signal to the audio amplifier U3A and pin 6 provides the 21.4 MHz signal to audio amplifier U3B. Gain of U1 is adjustable via potentiometer R2. CW audio is applied from U3B to connector pin 12.

From the secondary tap of transformer T2 (pin 1), the 21.4 MHz IF signal is applied to the narrow-band/wideband filter circuitry. A TTL level "high", applied to connector pin 23 (SW IF OUT SELECT) is applied to U4, enabling the narrow band circuitry comprised of C16 through C22, L3, L4, R34 and R35. The narrow band circuitry is a 500 kHz band pass filter which provides this signal to connector J1 via current amplifier U6 and to the receiver rear panel connector SW IF OUT J8. A TTL level "low" applied to connector pin 23 enables the wideband circuitry via U4. This circuitry comprised of C23, C24, CR4, CR5, L5, L6, R38 and R39 is a wideband filter passing signals above 500 kHz to connector J1 via current amplifier U6 and to receiver rear panel connector SW IF OUT J8. Gain of current amplifier U6 is variable utilizing potentiometer R38.

Analog switch U5 is utilized to disconnect the CW audio from the receiver when CW is not selected. CW AUDIO OUT (connector pin 12 of connector P1) is externally applied to CW IN (connector pin 12 of connector P2) via the motherboard. When a TTL "high" from the Digital Control Section is applied to connector pin 18, U5 is enabled and the CW signal is applied at connector pin 14.

3.3.2.4 Type 796250-1 ISB/CW Demodulator (A1A11) (Optional)

The reference designation prefix for this optional ISB/CW Demodulator subassembly is (A1A11). Refer to **Figure 6-14** for the optional Type 796250-1 ISB/CW Demodulator schematic diagram.

This subassembly is similar to the Type 796250-2 CW Demodulator/Switched IF subassembly. The difference is the inclusion of the sideband circuitry discussed in the following paragraphs. Refer to **paragraph 3.3.2.3** for a discussion of the CW Demodulator circuitry.

The positive output of balanced modulator/demodulator U2 is applied to LSB BF filter FL1. The output signal of FL1 is 10.6977 MHz which is applied to balanced modulator/demodulator U4 via impedance matching transformer T1. 10.7 MHz from the Reference Generator subassembly is applied to U4 pin 10 via connector pin 3. The output of U4 is applied to audio amplifier U6B and also is applied to connector pin 7 as the LSB AUDIO OUTPUT. Potentiometer R34 provides gain control of the LSB audio signal level.

The negative output of balanced modulator/demodulator U2 is applied to USB BF filter FL2. The output signal of FL2 is 10.7023 MHz which is applied to balanced modulator/demodulator U5 via impedance matching transformer T2. 10.7 MHz from the Reference Generator subssembly is applied to U5 pin 10 via connector pin 3. The output of U5 is applied to audio amplifier U6A and also is applied to connector pin 11 as the USB AUDIO OUTPUT. Potentiometer R47 provides gain control of the USB audio signal level.

3.3.2.5 Type 796248-1 Audio/Video (A1A10)

The reference designation for the Audio/Video subassembly is A1A10. Refer to **Figure 6-12** for the Type 796248-1 Audio/Video schematic diagram.

FM video from the AM/FM Demodulator subassembly (A1A9) enters this subassembly at connector pin 4 and is applied to the five position BW/Video Response module. Normalized FM Video, which is the limited DC offset voltage from the FM Discriminators has a bandwidth of approximately 1/2 of the selected bandwidth. This signal is applied to the FM Video amplifier circuitry comprised of amplifier U9 and R12 through R15, C5 and C6. A sample of this signal is taken from current amplifier U8 and applied to the receiver rear panel via connector pin 23. The DC amplitude of the FM video signal is applied to the Digital Control Section at connector pin 30 via operational amplifier U15. A sample of this DC amplitude is applied to amplifier U10 and to the bridge rectifier (CR1 through CR4) removing any AC component. This signal is applied to the Digital Control Section at connector pin 32 via amplifier U11. The FM peak value is a dc level, proportional to the frequency deviation of the FM signal level applied to the receiver rear panel.

AM video from the AM/FM Demodulator subassembly (A1A9) enters this subassembly at connector pin 21 and is applied to the five position BW/Video Response module. Normalized AM Video, which is the limited DC offset voltage from the AM Discriminators has a bandwidth of approximately 1/2 of the selected bandwidth. This signal is applied to amplifier U12 which amplifies the dc signal and applies it to the bridge rectifier comprised of CR5 through CR8. This bridge rectifier removes any AC component before the signal is applied to the Digital Control Section at connector pin 34 via amplifier U13. The AM peak value is a dc level proportional to the AM signal strength.

AM/$\overline{\text{FM}}$ select line enables U4, which switches between normalized FM (TTL "low") and AM video (TTL "high"). In the AM video position (TTL "high") the AM video signal is applied to the AM Video amplifier circuitry comprised of amplifier U5, R7 and R8. The AM video signal is applied at the SELECTED VIDEO OUT (connector pins 17 and 19) via amplifier U6 and resistors R1 and R2. A sample of the AM video signal is applied to analog switch U1. Analog switches U1 and U2 are enabled by the Digital Control Section and select between AM, FM, SSB and CW, determining which audio signals are to be applied to the audio amplifier circuitry.

Audio signals are applied to amplifiers U7A and U7B via analog switch U3. U7B applies the audio signal to the left portion of the front panel audio. A sample of this audio signal is applied to the LEFT AUDIO OUT (connector pin 7) via amplifier U7D. Potentiometer R32 establishes the gain of this portion of the audio signal path. U7A applies the audio signal to the right portion of the front panel audio. A sample of this audio signal is applied to the RIGHT AUDIO OUT (connector pin 11) via amplifier U7C. Potentiometer R28 establishes the gain of this portion of the audio signal path. The overall signal response of the audio section is 700 Hz to 7 kHz at a level adjustable to 10 mW.

3.3.2.6 Type 796249-1 AM/FM Demodulator (A1A9)

The reference designation for the AM/FM Demodulator subassemby is (A1A9). Refer to **Figure 6-11** for the Type 796249-1 AM/FM Demodulator schematic diagram.

IF input signals from the IF BW Filter Amplifier subassembly (A1A12) are applied to connector pin 12, IF INPUT. The IF signal is applied to wideband amplifier U4 via C14. A sample of the amplified IF is applied to connector pin 1 via power splitter transformer T1. Transformer T4 is another power splitter that provides the IF signal to quadrature detector U1. Gain equalization is accomplished utilizing potentiometer R3. The detector output of U1 is applied to a tank circuit comprised of R1, L15, L3, C6 and C8. This tuned circuit establishes the medium band discriminator with a band break point of 75 kHz. Narrow band video is applied to operational amplifier U2 and to the analog switch U12 which applies the medium band IF signal to connector pin 4. Analog switch U12 is enabled by the Digital Control Section via connector pins 5 and 6. Potentiometer R2 provides the narrow band IF video gain adjustment. A logarighmic video sample is applied to operational amplifier U3 from quadrature detector U1. This signal is applied to connector pin 3 as the LOG VIDEO. It is a dc output voltage proportional to the log of the input signal. Potentiometer R24 provides the LOG VIDEO gain adjust.

A sample of the IF signal is applied to quadrature detector U7 via transformer T4. The tuned circuit comprised of Y1, L9 and L10 forms the narrow band portion of the AM/FM Demodulator. This filtered signal is applied to pin 5 of analog switch U12, via operational amplifier U8. The output level is adjustable via potentiometer R6. DC decoupling for the midband section is accomplished utilizing the circuit comprised of C33, C34, C19 through C21, R35 and R36 via the stabilizer output (pin 14) of video IF amplifier/demodulator U6. Supply voltage for U6 is applied to pin 13 from the narrow band section.

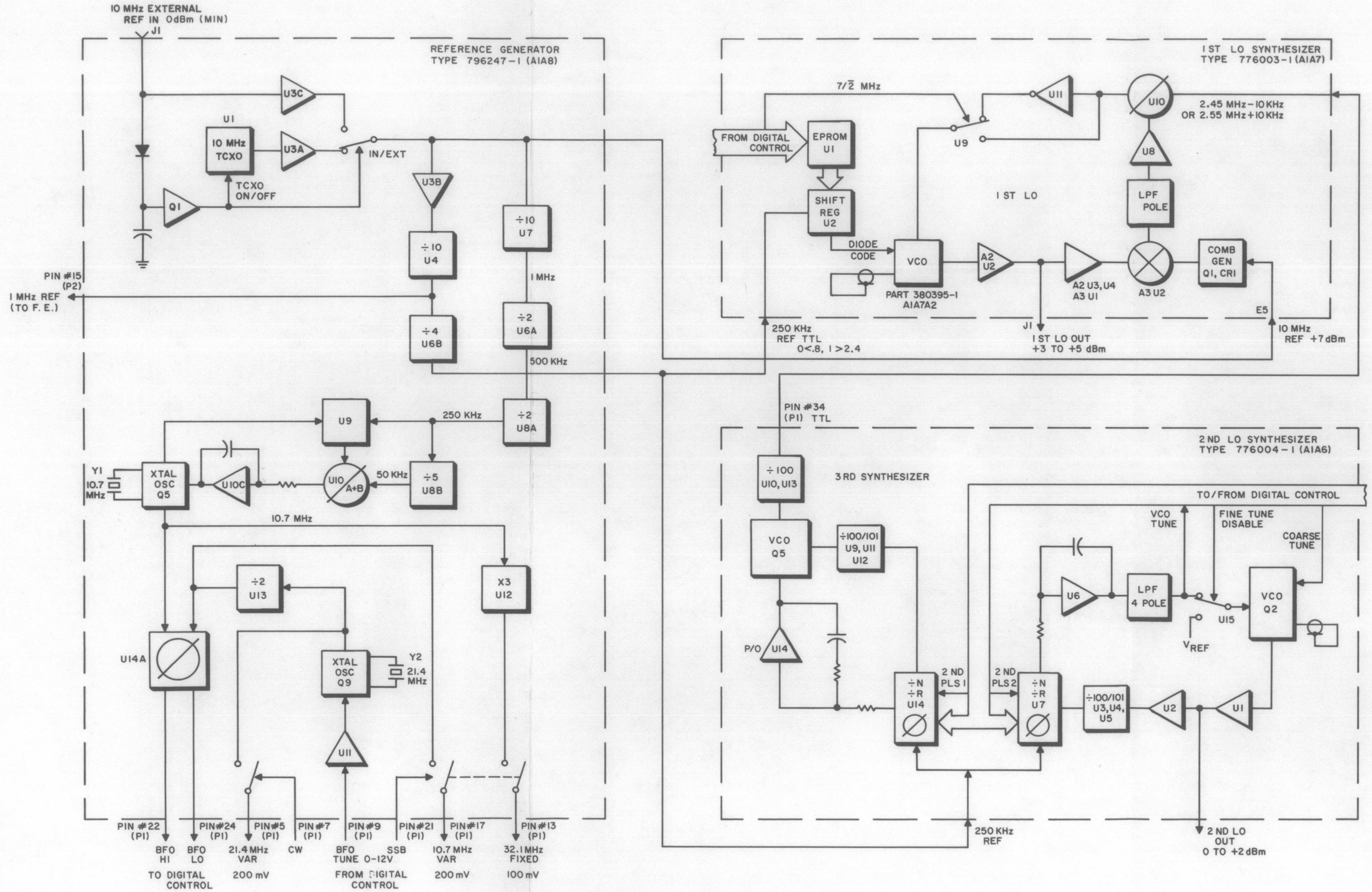
IF signals from video IF amplifier/demodulator U6 are filtered via L8, C27 and R39 before being applied to the wideband circuitry. The wideband circuitry is enabled by the Digital Control Section via analog switch U13. IF amplifier U9 applies the IF signal to the Foster-Seely discriminator L14, C48 and R55 via transformer T6. The wideband IF signal is amplified by video amplifier U10 and applied to pin 13 of analog switch U12.

3.4 SYNTHESIZER SECTION

3.4.1 FUNCTIONAL DESCRIPTION

The subassemblies that comprise the Synthesizer Section are illustrated in the Synthesizer Section Functional Block Diagram, **Figure 3-3**. Refer to **Figure 3-4** for the following functional description.

The Reference Generator (A1A8) provides the 250 kHz, 32.1 MHz, 21.4 MHz and 10.7 MHz reference signals required by the Synthesizer Section to produce the required output signals. This subassembly contains a 10 MHz temperature-compensated crystal oscillator (TCXO) which functions as the main time base of the receiver. A series of frequency dividers then divide this frequency producing the 250 kHz reference signals 32.1 MHz, 21.4 MHz and 10.7 MHz are also produced utilizing the 10 MHz TCXO as the time base. In this configuration, all of the reference signals are phase-locked to the same time base.



SYNTHESIZER TUNING SCHEME			
CARRIER FREQ.	1 ST LO	2 ND LO	3 RD LO
20.0000 – 24.9999 MHz	577.5500 – 577.5599 MHz	536.1500 – 531.1600 MHz	2.4500 – 2.4401 MHz
25.0000 – 29.9999 MHz	582.5500 – 582.5599 MHz	536.1500 – 531.1600 MHz	2.5500 – 2.5599 MHz

Figure 3-3. WJ-8615 Synthesizer Section Functional Block Diagram 480503

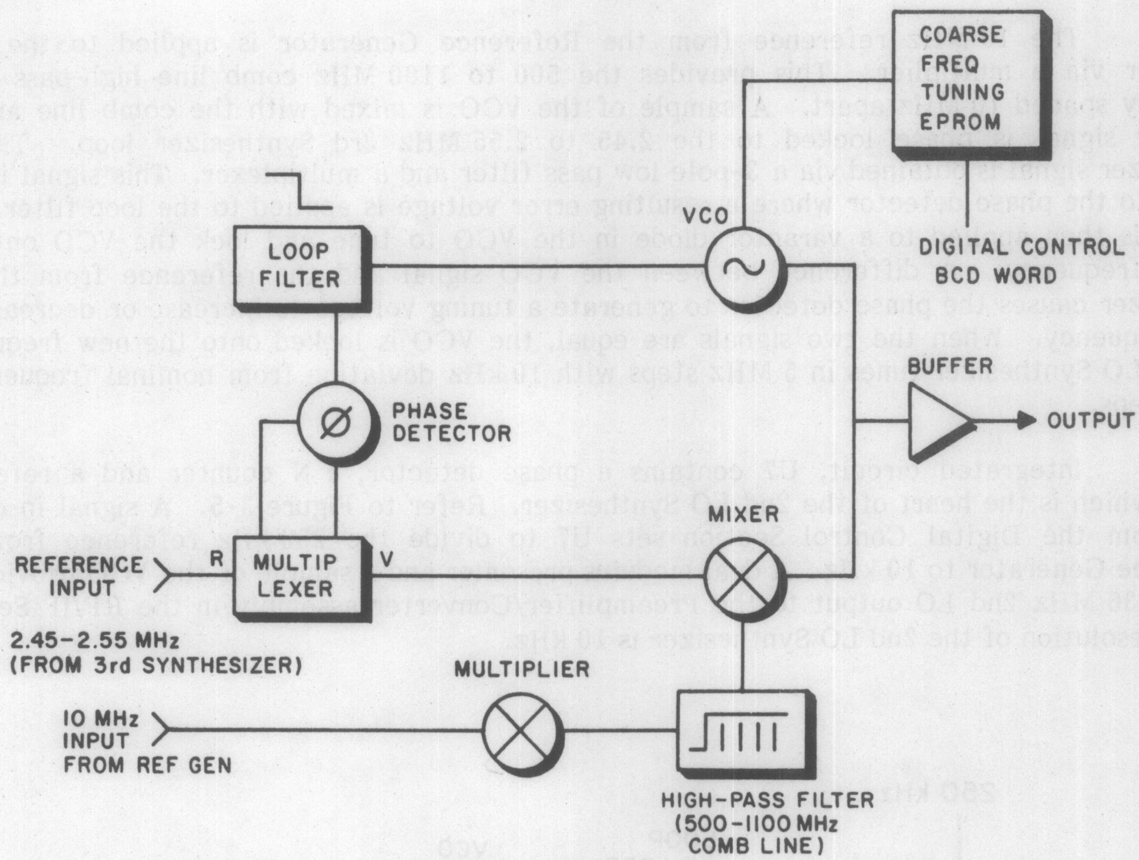


Figure 3-4. 1st LO Synthesizer Simplified Block Diagram

A connection from the Reference Generator subassembly to the rear panel of the receiver (J2) accepts a 10 MHz external reference when it is desired to reference the receiver from an external time base. The external 10 MHz reference signal, at a level of from 0 to +20 dB, then provides the time base for the receiver. Switching from internal reference to external reference is automatically transferred when the external signal level reaches 0 dB.

The 2.45 to 2.55 MHz 3rd Synthesizer loop frequency is applied to the 1st LO Synthesizer (A1A7). This input provides the reference utilized by the 1st LO Synthesizer phase-locked-loop circuitry producing the 1st LO output. The 1st LO Synthesizer is comprised of an EPROM, a shift register, a voltage controlled oscillator (VCO), a phase detector and a loop filter. From the Digital Control Section, coarse frequency information in the form of a BCD word is applied as the EPROM address. The addressed location EPROM then provides the appropriate tuning words via the shift register to update the diode code for the VCO. Refer to **Figure 3-4.**

The 3rd Synthesizer loop frequency is applied to the 1st LO Synthesizer (A1A7). This input provides the reference utilized by the 1st LO Synthesizer phase-locked-loop circuitry to produce the 1st LO output. This output frequency to the 1st LO Synthesizer provides the 100 Hz fine tune resolution. Two frequency bands are provided depending on the 5 MHz steps of the 1st LO. These bands are 2.55 to 2.56 MHz and 2.44 to 2.45 MHz.

The 10 MHz reference from the Reference Generator is applied to the comb generator via a multiplier. This provides the 500 to 1100 MHz comb line high-pass filter, frequency spaced 10 MHz apart. A sample of the VCO is mixed with the comb line and the resulting signal is phase locked to the 2.45 to 2.55 MHz 3rd Synthesizer loop. The 3rd Synthesizer signal is obtained via a 3-pole low pass filter and a multiplexer. This signal is then applied to the phase detector where a resulting error voltage is applied to the loop filter. This voltage is then applied to a varactor diode in the VCO to tune and lock the VCO onto the desired frequency. A difference between the VCO signal and the reference from the 3rd Synthesizer causes the phase detector to generate a tuning voltage to increase or decrease the VCO frequency. When the two signals are equal, the VCO is locked onto the new frequency. The 1st LO Synthesizer tunes in 5 MHz steps with 10 kHz deviation from nominal frequency in 10 Hz steps.

Integrated circuit, U7 contains a phase detector, ÷ N counter and a reference divider which is the heart of the 2nd LO Synthesizer. Refer to **Figure 3-5**. A signal in digital form from the Digital Control Section sets U7 to divide the 250 kHz reference from the Reference Generator to 10 kHz. A dual modulus prescaler and a sample of the VCO provide the 531 to 536 MHz 2nd LO output to the Preamplifier/Converter assembly in the RF/IF Section. Tuning resolution of the 2nd LO Synthesizer is 10 kHz.

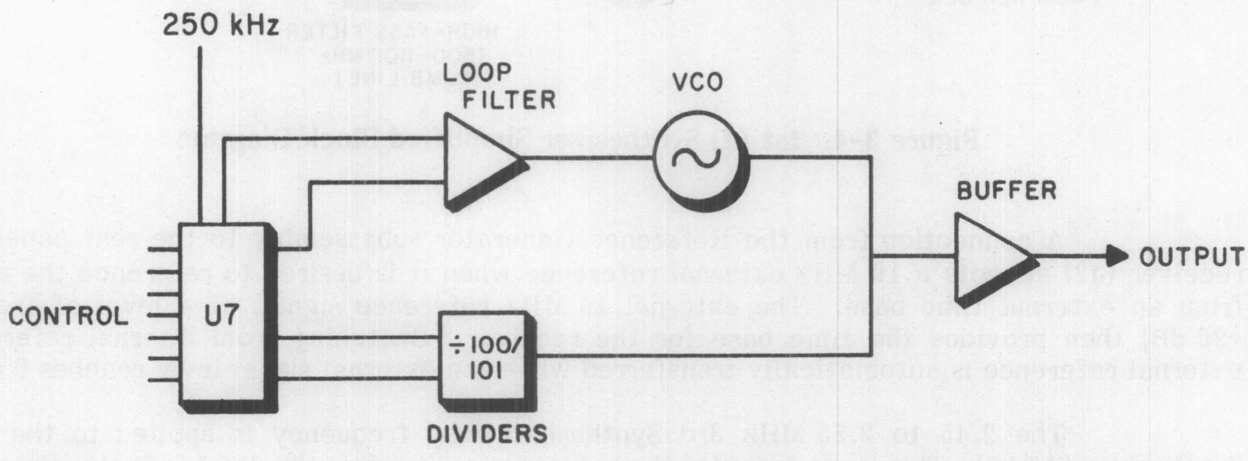


Figure 3-5. 2nd LO Synthesizer, Simplified Block Diagram

Integrated circuit U14 is the same as U7 in the 2nd LO Synthesizer, as it is the heart of the 3rd Synthesizer. The 250 kHz reference from the Reference Generator is applied to U14 and a signal in digital form from the Digital Control Section sets U14 to divide this reference down to 10 kHz. The VCO is set at 244 to 256 MHz and the output of this assembly is divided down by a factor of 10 two times yielding the 2.44 to 2.56 3rd Synthesizer output. Refer to **Figure 3-6**.

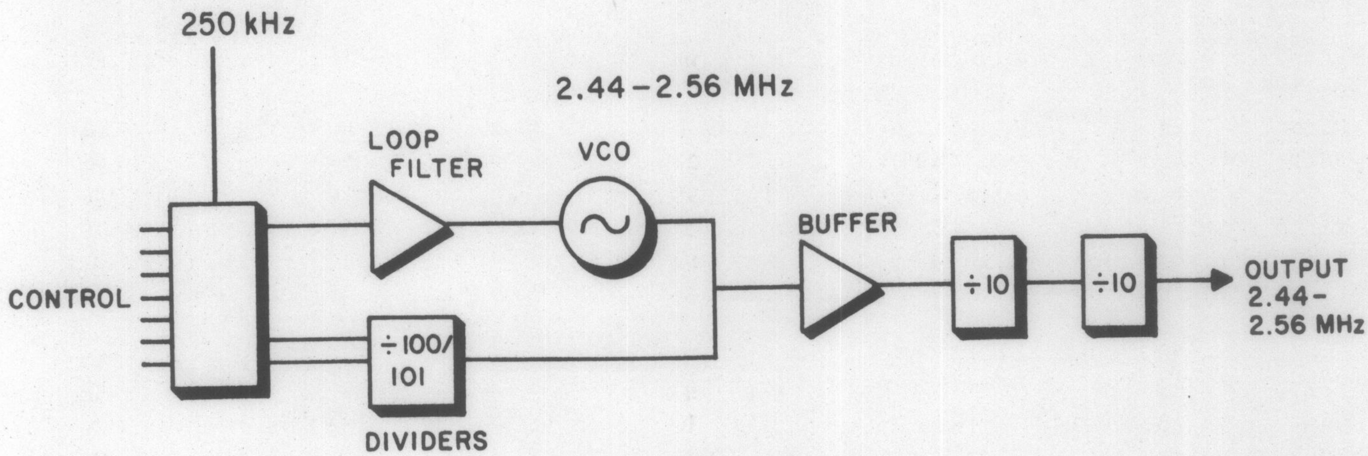


Figure 3-6. 3rd Synthesizer, Simplified Block Diagram

SECTION IV

MAINTENANCE

SECTION IV

MAINTENANCE

4.1 GENERAL

The WJ-8615D Compact Receiver is designed to operate for extended periods of time with minimum routine maintenance. Cleaning, inspection and performance tests should be performed at regular intervals, consistent with the facility's normal scheduling and after repairs have been made.

4.2 CLEANING AND LUBRICATION

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

4.3 INSPECTION FOR DAMAGE OR WEAR

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

4.4 TEST EQUIPMENT REQUIRED

The test equipment listed in **Table 4-1** or their equivalents are required to perform the troubleshooting procedures, performance checks and alignment procedures that follows.

4.5 TROUBLESHOOTING PROCEDURES AND FAULT ISOLATION

Troubleshooting the WJ-8615D Compact Receiver can be performd by placing the receiver in its Standard Local Operation mode (refer to **paragraph 2.4.1**) or the Test Mode (refer to **paragraph 2.4.2**) and observing the receiver operation while in these modes. To eliminate external conditions as a possible cause of the malfunction, the equipment listed in **Table 4-1** should be utilized to inject the appropriate test signals and to monitor the results of the receiver outputs.

To monitor the overall receiver capability to produce an output signal at each rear panel connector, follow these steps.

1. Inject a 255.5550 MHz FM signal at -40 dBm with 30% peak deviation of the selected IF bandwidth into the RF input connector (J10) on the receiver rear panel.

2. Energize the receiver.

3. Refer to **paragraph 2.2.1** for an explanation of the signals present at each rear panel output connector.

The performance tests that follow and the Troubleshooting Table (**Table 4-2**) are provided as an aid for localizing the cause of a malfunction to a particular subassembly within the receiver. Reference should also be made to the receiver block diagrams provided in **Section III** of the WJ-8615D Instruction Manual and to the schematic diagrams provided in **Section VI.**

Table 4-1. Test Equipment Required

Equipment	Description	Type
Autotransformer	Variable	W5MT3W (General Radio)
Digital Voltmeter	High Impedance	Fluke 8100A
RF Millivoltmeter	Calibrated in dB	Boonton 92B
	Probe	Boonton 91-12F
	"T" Adapter	Boonton 91-14A
	50Ω Termination	Boonton 91-15A
AC Voltmeter	Wideband, High Impedance	HP-400EL
Distortion Analyzer	550 kHz to 65 MHz	HP-334A
RF Analyzer	Log Transmission, Plug In	Wiltron 640
	Log Reflection, Plug In	Wiltron T50
		Wiltron R50
Oscilloscope	DC to 35 MHz	Tektronix T935
Frequency Counter	DC to 50 MHz	HP-5245L
Feedthru Termination	600Ω	Tektronix 011-0092-00
Signal Generator	20 Hz to 1024 MHz, with	HP-8640B
	Audio oscillator option	Option 001, 002
Signal Generator	450 to 1230 MHz	HP-612A
Sweep Generator	1 to 1500 MHz	Wiltron 650
Combiner	2 to 400 MHz	Olketron B-HJ-302G-1
Power Supply	0 to 30 Vdc	HP-6216A
		HP3585
Spectrum Analyzer	Display Section	HP-141T
	IF Section	HP-8552B
	RF Section	HP-8554B
Noise Figure Indicator	10 MHz to 40 GHz	Ailtech 7512-004
Noise Source	10 MHz to 1.5 GHz	Ailtech 7615
Attenuator	10 dB Coaxial	AEL AFA-10
Attenuator	0 to 80 dB	TF-10141 (WJ-SPD)

Table 4-1. Test Equipment Required (Cont'd)

Equipment	Description	Type
Post Amplifier	21.4 MHz	TF-10142 (WJ-SPD)
Pulse Generator	10 mV to 12 V into 50Ω	Data pulse 106A
Computer Device	IEEE-488 compatible	HP-9825A
	ROM	HP-98210A
	ROM	HP-98213A
	Interface	HP-98034A
Load	50Ω (Resistor, Fixed, Film: 1/4 W)	CF1/4-50 OHMS/J
Test Cable		30047 (WJ-SPD)
Test Cable		30054 (WJ-SPD)
Test Cable		30059 (WJ-SPD)
IF Filter	21.4 MHz, 60 kHz BW	TF-15003-1 (WJ-SPD)
Network Analyzer	500 kHz to 1.3 GHz	HP-8505
Transmission/Reflectance Bridge	50Ω	HP-8502A
Function Generator	1μHz to 21 MHz	HP-3325
Balanced Mixer	3 to 1000 MHz	M1A (WJ-SPD)

NOTE

To prevent damage to the receiver circuitry, always de-energize the receiver before removing or installing any subassembly.

Table 4-2. WJ-8615D Troubleshooting Table

Symptom	Probable Cause	Corrective Action
Receiver totally inoperative. Front panel blank, no signal at any output connector.	Fuse F1 blown.	Locate and correct cause of blown fuse. Replace the fuse.
	Defective power switch S1.	Check operation of switch S1. Replace if defective.
	Defective Power Supply.	Refer to **paragraph 4.6.1.**
	Defective Digital Control Section.	Refer to **paragraph 4.6.3**
Receiver front panel controls function but no signals at any output connector.	Defective Digital Control Section.	Refer to **paragraph 4.6.4**

Table 4-2. WJ-8615D Troubleshooting Table (Cont'd)

Symptom	Probable Cause	Corrective Action
	Defective Synthesizer Section. Defective Converter (A1A13).	Refer to **paragraph 4.6.4** Refer to **paragraph 4.6.2.5**
Receiver front panel indicators randomly illuminated. Front panel controls inoperative. Erroneous or nonexistant signals at output connectors.	On microprocessor subassembly A1A3, IC's U3 and U4 not installed or installed in wrong socket.	Install U3 and U4 correctly.
Receiver operates normally. Front panel controls inoperative. Wideband IF Output normal; all other outputs inoperative. Malfunction occurs with all bandwidth selections.	Header U2 missing. Receiver is in remote mode. Defective Digital Control Section IF Bandwidth Filter subassembly (A1A12) defective. AM/FM Demodulator subassembly (A1A9) defective.	Install U2. Depress CONTROL, returing returning receiver to local mode. Refer to **paragraph 4.6.3** Replace subassembly. Replace subassembly.
Wideband IF Output normal. All other outputs function on one or more, but not all bandwidths.	Defective Digital Control Section IF Bandwidth Filter subassembly (A1A12) defective. CW Demodulator/SW IF subassembly (A1A11) defective.	Refer to **paragraph 4.6.3** Replace subassembly. Replace subassembly.
Switched IF Output inoperative, all other outputs function normally.	CW Demodulator/SW IF subassembly (A1A11) defective.	Replace subassembly.
FM Monitor Output inoperative, all bandwidths affected. FM Monitor Output inoperative, in one or more, but not all bandwidth selections.	Audio/Video subassembly (A1A10) defective. Defective Digital Control Section AM/FM Demodulator subassembly (A1A9) defective.	Replace subassembly. Refer to **paragraph 4.6.3** Replace subassembly
No FM Video at the Switched Video Output when FM Detection is selected. FM Monitor output normal.	Defective Digital Control Section Audio/Video subassembly (A1A10) defective.	Refer to **paragraph 4.6.3** Replace subassembly

4.5.1 DIAGNOSTIC TEST PROCEDURES

Diagnostic testing is a built-in function of the WJ-8615D VHF/UHF Compact Receiver. It is designed to allow troubleshooting or fault analysis from the front panel. Refer to **paragraph 2.2.1** for a description of DIP switch S1 on the IEEE-488/Interrupt subassembly (A1A2) in order for the diagnostic test function to operate properly.

In the diagnostic test mode, the receiver has many of its software loops opened to aid maintenance personnel in ascertaining the cause of a particular fault. Before attempting to utilize the receiver diagnostics, power up receiver to verify that no error conditions exist as indicated in the front panel display. Refer to **paragraph 2.7** for a description of the error codes.

4.5.1.1 Diagnostic Test Set-Up Procedures

Apply power to the receiver while depressing the CONTROL pushbutton in. The display indicates "dEF oFF". Rotate the tuning wheel to "dEF oFF". Depress CHANGE until the display indicates "d1AG oFF". Rotate the tuning wheel to "d1AG on". Depress CONTROL, the front panel display is back to normal operation with the TEST LED illuminated. Switch position 8 of S1 is an over-ride utilized to turn the diagnostic test on within the receiver.

4.5.2 The following paragraphs describe each of the diagnostic tests and expected results. **Table 4-4** indicates the function of the front panel LED's and pushbuttons.

4.5.2.1 <u>**Select Bandwidth**</u> - Depress and hold this pushbutton in to indicate the position of the IF bandwidth filter (slot 1 through 5) and the filter size (kHz) in the display window. The -dBm display indicates the IF bandwidth code (refer to **Table 3-1**). A non-existed IF bandwidth filter is indicated as 0000.

4.5.2.2 <u>**Manual Gain Control Test Mode**</u> - In the Manual Gain Control Test mode, the operator may enter fixed attenuation ranging from 0 to 114 dB by utilizing the CHANGE ↑/↓ pushbuttons. The attenuation level is displayed in the -dBm display. Depress the MGC pushbutton as required to produce a front panel LED display reflecting the MCG LED illuminated and the CLV LED extinguished.

4.5.2.3 <u>**MGC, CLV**</u> - With these pushbuttons depressed and the corresponding LED's illuminated, utilization of the AM Detector is indicated in the -dBm display from 0 to 100%.

4.5.2.4 <u>**AGC, CLV**</u> - With these pushbuttons depressed and the corresponding LED's illuminated, relative signal strength is indicated in the -dBm display.

4.5.2.5 <u>**AGC**</u> - With this pushbutton depressed, the COR LEV display indicates a specific test code (see **Table 4-4**). The -dBm display indicates the value of that code. Utilize the CHANGE ↑/↓ pushbuttons to step through the tests.

Table 4-3. Test Codes and Values

The following tests are enabled only when the AGC LED is illuminated.

Test Code (COR LEV)	Description	Value (-dBm)	Comments
FA	Peak deviation of FM AC value	0 - 255	
Fd	FM DC level for FM Discriminator	0 - 255	127 typical with signal centered in IF.
LG	LOG Detector (0 - 60 dB above noise floor)	0 - 255	
bc	Voltage equivalent of bandwidth select code.	0 - 255	Depress SELECT BANDWIDTH to step through bandwidths. Refer to **Table 3-1** for specific codes.
2L	2nd LO tuning voltage at 5 MHz.	0 - 255	100 to 140 typical
AP	AM Peak Detector level	0 - 255	
AA	AM AC modulation	0 - 200	0 = 0%, 200 = 100%
XX	Normal COR operation		

NOTE

For the FA, Fd, LG, 2L and AP tests, a value indication at the extremes indicates a fault. Refer to the Performance Test **paragraph 4.6** to isolate the fault.

4.5.2.6 AFC - This pushbutton removes the ±10 times the selected bandwidth limitation (**paragraph 2.4.1.8**), allowing the AFC circuitry to track from the lowest tuned frequency to the highest tuned frequency.

4.5.2.7 BFO - This pushbutton removes the software correction from the BFO circuitry, causing it to be open-looped. The BFO counter does not run during this test.

4.5.2.8 TUNE LOCK - Depressing this pushbutton indicates the frequency of the 1st LO Synthesizer from the microprocessor.

4.5.2.9 **FASTER** - Depressing this pushbutton indicates the frequency of the 2nd LO Synthesizer from the microprocessor.

4.5.2.10 **SLOWER** - Depressing this pushbutton indicates the frequency of the 3rd Synthesizer from the microprocessor.

Table 4-4. Diagnostic Tests

MGC	AGC	CLV	Description of Test with LED Illuminated
ON	OFF	OFF	Provides operator with a selection up to 114 dB of attenuation. Refer to **paragraph 4.5.2.2.**
ON	OFF	ON	Utilization of AM Detector is indicated in the -dBm display. Refer to **paragraph 4.5.2.3.**
OFF	ON	ON	Provides signal strength indication in -dBm display. Refer to **paragraph 4.5.2.4.**
OFF	ON	OFF	COR LEV window displays a code described in **Table 4-4.** The -dBm display indicates the value for the specific code. Refer to **paragraph 4.5.2.5**
AFC			Enables receiver to tune across entire frequency range. Refer for **paragraph 4.5.2.6.**
BFO			Removes software correction from BFO. Refer to **paragraph 4.5.2.7.**

Front Panel Pushbutton	Description of Test
TUNE LOCK	Provides 1st LO Synthesizer frequency from microprocessor. Refer to **paragraph 4.5.2.8.**
FASTER	Provides 2nd LO Synthesizer frequency from microprocessor. Refer to **paragraph 4.5.2.9.**
SLOWER	Provides 3rd Synthesizer frequency from microprocessor. Refer to pargraph 4.5.2.10.
CONTROL	Places receiver into the REMOTE mode.

NOTE

The receiver should not be placed into the diagnostic operation mode if the IEEE-488 interface bus is utilized. Certain pushbutton sequences stop 488 operation.

4.5.3 **RETURNING RECEIVER TO NORMAL OPERATION**

To return the receiver to normal operation, depress the POWER on/off switch. Depress it again and the front panel display indicates normal operation with the TEST LED extinguished.

4.6 **PERFORMANCE TESTS**

The performance test procedures provided in this section may be utilized for periodic performance testing, as an aid in troubleshooting or as a performance test after repairs have been completed. These procedures should be executed only by skilled technicians, utilizing the equipment listed in **Table 4-1** or their equivalents.

Unless otherwise specified in a particular test procedure, the receiver controls should be set to the Standard Test Settings listed in **Table 4-5** for each of the performance tests.

Table 4-5. Receiver Standard Test Setting

Front Panel:	Frequency:	255.5550 MHz
	Detect Mode:	AM
	Gain Mode:	AGC
	Bandwidth:	#3
	Tuning Speed:	1 kHz
	AFC:	OFF
	Audio Gain:	Midrange
	RF/IF Gain:	Maximum
	COR Level:	00
	Control:	Local
Rear Panel:	Line Audio Adjust (R1):	Midrange

4.6.1 **POWER SUPPLY TESTS**

1. Prior to applying power to the receiver, check the line cord receptacle and the voltage selector switch (S2) as described in **paragraph 2.2.1.1.**

2. Connect the receiver to the Type W5MT3W Variable Autotransformer. Set the autotransformer output voltage to a voltage corresponding to the selected voltage by S2, described in step 1.

3. Apply power to the receiver by depressing the POWER switch. Note the power consumption, indicated by the Autotransformer wattmeter. The power consumption should be no greater than 35 watts. (If the FE-2 option is installed, power consumption should be no greater than 45 watts.)

4. Utilizing the Type 8100A Digital Voltmeter, measure the output voltage for the DC supplies at the test points listed in **Table 4-6A.** The measured voltage should fall within the limits specified in the table.

Table 4-6A. Power Supply Voltages

Test Point	Supply	Limits
A1J2-2	+15	+15.00 ±0.75 Vdc
A1J12-9	+5A	5.00 ±0.25 Vdc
A1J2-4	+5B	5.00 ±0.25 Vdc
A1J2-3	-15	-15.00 ±0.75 Vdc
A1J6-3	+5C	5.00 ±0.25 Vdc
A1J6-4	+5D	5.00 ±0.25 Vdc

5. Utilize the digital voltmeter to set the output of the autotransformer to 97.7 Vac rms and with the probe, measure and record the voltage of the DC supplies as indicated in **Table 4-6B.**

Table 4-6B. Power Supply Voltages

Test Point	Supply	Limits
A1J2-2	+15	+15.00 ±0.75 Vdc
A1J2-3	-15	-15.00 ±0.75 Vdc
A1J12-9	+5A	5.00 ±0.25 Vdc

6. Utilize the digital voltmeter to set the output of the autotransformer to 132.2 Vac rms and with the probe, measure and record the voltage of the DC supplies as indicated in **Table 4-6C.**

Table 4-6C. Power Supply Voltages

Test Point	Supply	Limits
A1J2-2	+15	+15.00 ±0.75 Vdc
A1J2-3	-15	-15.00 ±0.75 Vdc
A1J12-9	+5A	5.00 ±0.25 Vdc

7. Set S2 to the 220 V position and connect the receiver to the AC power supply output.

8. Utilize the digital voltmeter to set the output amplitude of the AC power supply to 264.5 Vac rms.

9. Utilize the digital voltmeter probe to measure and record the voltage of the DC supplies as indicated in **Table 4-6D.**

Table 4-6D. Power Supply Voltages

Test Point	Supply	Limits
A1J2-2	+15	+15.00 ±0.75 Vdc
A1J2-3	-15	-15.00 ±0.75 Vdc
A1J12-9	+5A	5.00 ±0.25 Vdc

10. Monitor each of the DC supplies as indicated below with the oscilloscope probe. Decrease the output amplitude of the auto-transformer until spikes appear on the oscilloscope trace. Utilizing the digital voltmeter, measure and record the input voltage to the receiver at this point. The input voltage should be no less than 195.5 Vac rms.

Test Point	Supply
A1J2-2	+15
A1J2-3	-15
A1J12-9	+5A

4.6.2 RF/IF SECTION, PERFORMANCE TESTS

4.6.2.1 IF Amplifier Performance Tests

1) Connect the test equipment as illustrated in **Figure 4-1.**

2) Set the receiver to the Standard Test Setting described in **Table 4-5,** except select the AGC off mode and connect the RF millivoltmeter to the SWITCHED IF OUT connector (J8) on the receiver rear panel.

3) Adjust the Type 8640B signal generator for a 255.5550 MHz signal, no modulation and set the output to minimum (maximum attenuation). Set the TF-10141 attenuator for a 3 dB loss.

4) Increase the signal generator output level to produce a -30 dBm indication on the RF millivoltmeter.

5) Set the attenuator to 0 dB and increase the signal generator frequency until the RF millivoltmeter again reads -30 dBm. Note the generator frequency.

6) Decrease the signal generator frequency, past 255.5550 MHz, until the millivoltmeter again reaches -30 dBm. Note the generator frequency.

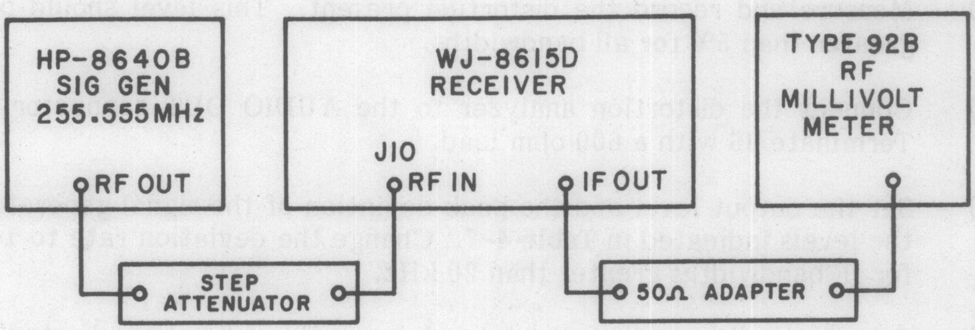


Figure 4-1. IF Amplifier Performance Test, Equipment Connections

7) Compute the 3 dB bandwidth by subtracting the frequency reading obtained in **step 4** from the frequency obtained in **step 5.** The computed bandwidth should equal the selected IF bandwidth ±10%.

8) Set the signal generator frequency for 255.5550 MHz and adjust the output level for -30 dBm reading on the RF millivoltmeter.

9) Tune the receiver across the IF passband while observing variations in level above and below the -30 dBm reference. The level variations should be no greater than 2.0 dB peak-to-peak.

10) Select bandwidth #2 and repeat **steps 3 through 9.**

11) Select bandwidth #3 and repeat **steps 3 through 9.**

12) Select bandwidth #4 and repeat **steps 3 through 9.**

13) Select bandwidth #5 and repeat **steps 3 through 9.**

4.6.2.2 AM-FM Demodulator Performance Test

1) Connect the test equipment as illustrated in **Figure 4-2.**

2) Set the receiver to the Standard Test Setting described in **Table 4-5,** except, select FM Detection and the #1 bandwidth.

3) Adjust the signal generator for a 255.5550 MHz signal at an output level of -65 dBm. FM modulate the output signal at a 400 kHz rate, with the appropriate peak deviation from **Table 4-7**.

4) Connect the Type 332A Distortion Analyzer to the FM MON connector (J4) on the rear panel. Terminate J4 with a 91 ohm load.

5) Measure and record the distortion present. This level should be no greater than 5% for all bandwidths.

6) Connect the distortion analyzer to the AUDIO OUT connector (J6). Terminate J6 with a 600 ohm load.

7) Set the output level and the peak deviation of the signal generator to the levels indicated in **Table 4-7**. Change the deviation rate to 1 kHz for IF bandwidths greater than 20 kHz.

8) Ensure the line audio output level is capable of being adjusted to a minimum of 2.45 Vrms.

9) Select bandwidth #2 and repeat **steps 3 through 8.**

10) Select bandwidth #3 and repeat **steps 3 through 8.**

11) Select bandwidth #4 and repeat **steps 3 through 8.**

12) Select bandwidth #5 and repeat **steps 3 through 8.**

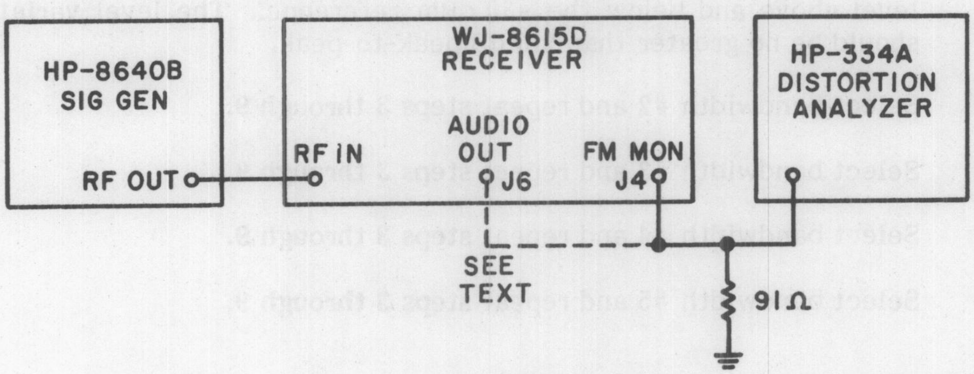


Figure 4-2. AM-FM Demodulator Performance Test, Equipment Connections

4.6.2.2.1 **FM Monitor Output**

1) Connect the test equipment as illustrated in **Figure 4-2.**

2) Set the receiver to the Standard Test Setting described in **Table 4-5.**

3) On the receiver, set the FM detection mode.

4) Set the output level and peak deviation of the signal generator in accordance with **Table 4-7.**

5) Measure and record the output level present at the FM MON output connector (J4). This level should be from 0.63 to 1.25 Vrms. Terminate J4 with a 91 ohm load.

4.6.2.3 **AGC Performance Test**

1) Set the receiver to the Standard Test Setting described in **Table 4-5,** except select bandwidth #1.

2) Adjust the signal generator to AM modulate at 50% and adjust its output to the levels specified in **Table 4-7.**

Table 4-7. Input Conditions for Sensitivity Conditions

Bandwidth (kHz)	Input Level (dBm)	30% Deviation (kHz)	Noise Floor (dBm)
6.4	-109	1.9	-128
10	-107	3	-126
20	-104	6	-123
50	-100	15	-119
75	-98	22.5	-117
100	-97	30	-116
300	-92	90	-111
500	-90	150	-109
1000	-87	300	-107
2000	-84	600	-103
4000	-81	1200	-100

3) Connect the RF millivoltmeter to the SW IF connector (J8).

4) Adjust the Line Audio output amplitude for an output level of 1.94 Vrms (-2 dB). Note the IF output amplitude on the RF millivoltmeter.

5) Increase the output level of the signal generator to -8.5 dB.

6) Calculate and record the change in audio output amplitude from the result in **step 4**. This change should be no greater than 6 dB.

7) Calculate and record the change in IF output amplitude from the result in **step 4**. This change should be no greater than 12 dB.

8) If the receiver is equipped with the FE-2 option, repeat **steps 4 through 6** except tune the receiver and the signal generator to 501 MHz. Maximum input level in UHF is -13.5 dBm.

4.6.2.3.1 **Pulse Operation**

1) Connect the test equipment as illustrated in **Figure 4-3**.

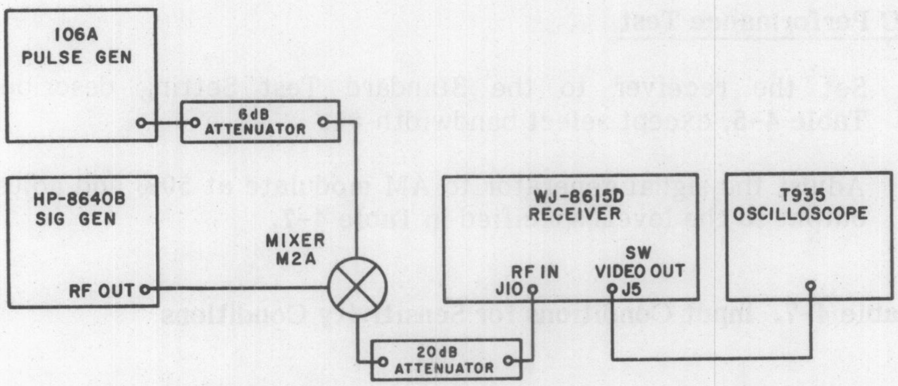


Figure 4-3. Pulse Operation Performance Test, Equipment Interconnections

2) Select the Pulse Detection mode on the receiver and connect the oscilloscope to the SW VIDEO OUT connector (J5). Select a bandwidth of 1 MHz or greater.

3) Set the Type 106A Pulse Generator output level to 5.0 V peak with a pulse width and repetition rate as determined from **Table 4-8.**

Table 4-8. Pulse AGC Test Conditions

Bandwidth (kHz)	Pulse Width	Repetition Rate (kHz)	RF Generator Level (dBm)
1000	1 μs	100 Hz	-77
2000	0.5 μs	100 Hz	-74
4000	0.25 μs	100 Hz	-71

4) Set the RF generator output level as determined in **Table 4-8.**

NOTE

Insertion loss of the mixer is typically 7 dB, nominal.

5) Note the amplitude of the video output as displayed on the oscilloscope.

6) Increase the output level of the RF generator to -5 dBm.

7) Note the amplitude of the video output pulse as displayed on the oscilloscope. This level should be no greater than twice the amplitude noted in **step 5** (equivalent to a 6 dB change).

4.6.2.4 Audio/Video Performance Test

1) Connect the test equipment as illustrated in **Figure 4-4.**

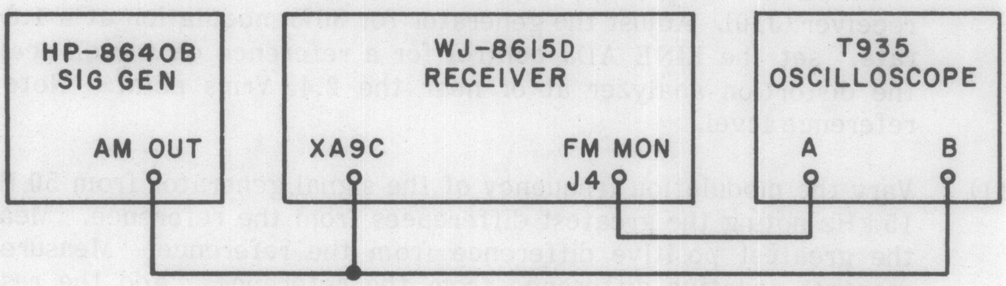


Figure 4-4. Audio/Video Performance Test, Equipment Connections

2) Remove AM/FM Demodulator subassembly (A1A9). Set the receiver to FM Detection and select the #1 bandwidth.

3) Connect the audio signal generator to pin 4 of connector XA9C and to channel B of the oscilloscope. Adjust the generator to produce a 1 kHz signal at 2 V peak-to-peak amplitude as observed on channel B of the oscilloscope. Remove the oscilloscope probe.

4) Connect the channel A input of the oscilloscope, and a 93Ω termination to J4 (FM MON) on the receiver rear panel. Observe that the signal level at J4 is between 2 and 3 V peak-to-peak.

5) Move the channel A input of the oscilloscope and the 93Ω termination to J5 (SEL VID) on the receiver rear panel. Observe that no AM signal is present.

6) Select AM detection mode. Move the input signal from the signal generator to pin 5 of connector XA9A. Observe a signal of from .8 to 1.5 V peak-to-peak displayed on the A trace of the oscilloscope.

7) Connect the channel B input of the oscilloscope and a 600Ω termination to the J6 or J7 (AUDIO) outputs on the receiver rear panel.

8) Operate the LINE ADJ control (R1) on the rear panel to the point just before clipping of the audio signal peaks as observed on the oscilloscope. The amplitude should be no less than 7.0 V peak-to-peak.

9) Set the output level of the signal generator to -60 dBm and set the LINE ADJ control for 2.45 Vrms as indicated by the distortion analyzer voltmeter. The distortion should be no greater than 5%.

10) Replace the AM/FM Demodulator subassembly (A1A9). Set the controls of the signal generator for variable, internal and AM modulation. Connect the generator output to the RF input of the receiver (J10). Adjust the generator for 30% modulation at a 1.0 kHz rate. set the LINE ADJ control for a reference on the dB scale of the distortion analyzer at or near the 2.45 Vrms point. Note the reference level.

11) Vary the modulation frequency of the signal generator from 50 Hz to 15 kHz noting the greatest differences from the reference. Measure the greatest positive difference from the reference. Measure the greatest negative difference from the reference. Add the results. The sum should be no greater than 2.0 dB.

12) Connect the distortion analyzer, set for voltmeter operation, to the SEL VID connector (J5). Set the signal generator as specified in **Table 4-8** for the selected bandwidth. AM modulate the signal generator 50% at a 1 kHz rate (400 Hz rate for bandwidths 20 kHz).

13) Measure the AM video output level present on the distortion analyzer. This level should be 0.21 to 0.59 Vrms.

14) Select the FM detection mode and adjust the signal generator as in step 12 except FM modulate at a peak deviation of 30% of the selected IF bandwidth. The FM video output level present on the distortion analyzer should be 0.21 to 0.59 Vrms.

4.6.2.5 **Preamplifier/Converter Performance Test**

1) Connect the test equipment as illustrated in **Figure 4-5.**

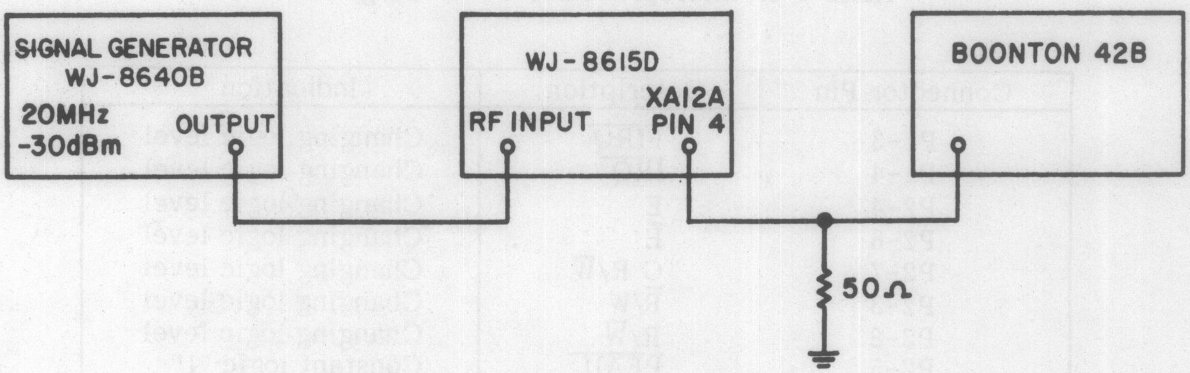


Figure 4-5. Preamplifier/Converter Performance Test, Equipment Connections

2) Set the receiver to 20.0000 MHz, IF bandwidth #1, AGC OFF and AFC OFF.

3) Set the RF generator for 20 MHz at -30 dBm and apply signal to J10.

4) Remove the IF Filter/Amplifier subassembly (A1A12).

5) Connect RF cable to connector XA12A, pin 4 and measure the level with the RF millivoltmeter with a 50 ohm termination. Gain through the module should be 18 dB ±1.5 dB.

6) If the IF gain is less than 16.5 dB, refer to the module alignment procedure, **paragraph 4.7.1.1** to isolate the faulty stage.

4.6.3 DIGITAL CONTROL SECTION, PERFORMANCE TESTS

4.6.3.1 Microprocessor Power Tests

1) Set the oscilloscope for a DC coupled input with the horizontal sweep set to 0.5 μsec/Div.

2) Connect the oscilloscope to the XA3 connector pins listed in **Table 4-9** and observe the results as described in the table.

Table 4-9. Microprocessor Control Signals

Connector Pin	Description	Indication
P1-3	$\overline{\text{FIRQ}}$	Changing logic level
P1-4	$\overline{\text{IRQ}}$	Changing logic level
P2-4	E	Changing logic level
P2-6	$\overline{\text{E}}$	Changing logic level
P2-7	G R/$\overline{\text{W}}$	Changing logic level
P2-3	$\overline{\text{R}}$/W	Changing logic level
P2-8	R/$\overline{\text{W}}$	Changing logic level
P2-5	$\overline{\text{PFAIL}}$	Constant logic "1"
P2-14	BATT OUT	2.8 Vdc
P2-50	+5 V	+5 Vdc

Logic "1" = +2.7 V Logic "0" = 0 V

3) To verify the operation of the microprocessor power monitor circuit, connect CH1 of the oscilloscope to U7 pin 7 (+5 V) of the microprocessor (A1A3). Trigger to CH1 NORM+. Connect CH2 to A1A3 TP22 ($\overline{\text{PFAIL}}$), set the oscilloscope to 2 V/Div and 2 msec/Div.

4) Apply power to the receiver. Verify that $\overline{\text{PFAIL}}$ (CH2) does not go high until at least 1 msec. after +5 V (CH1 stabilizes.

5) Remove power from receiver. Verify that CH1 (+5 V) is still at least 4.5 V when the trigger occurs. Trigger to CH2 NORM-.

6) If any of these test fail, it indicates improper power monitor circuit operation. This circuit must function in order to perform the following Digital Control Section diagnostic tests.

4.6.3.2 Static Microprocessor Diagnostic Tests

The following test verify the basic operation of the microprocessor, I/O decoders, system software and the diagnostic software. Signature analysis is utilized to verify the results of most of these tests. The data lines of the microprocessor are separated from the bus by a diagnostic header forcing the data lines to a "NOP" instruction. This causes the microprocessor to function like a 16-bit binary counter. All possible combinations of the 16 address lines are presented allowing all input decoders to be verfied for proper operation. This also allows data from the EPROMS to be placed on the data bus for verification. These tests should be performed in the order presented because each test depends on the verification of the components of the preceding tests.

4.6.3.2.1 Microprocessor Test

1) This test should be run with all cards installed in the Digital Control Section of the receiver.

2) Remove the jumper pack from the U2 slot and install the diagnostic header into the U2 socket.

3) Connect and adjust the HP-5004A Signature Analyzer as indicated in **Table 4-10.**

4) Perform the signature analysis on the first entry (+5 Vdc) in **Table 4-10** to verify setup. A failure indicates improper hook-up, a shorted start/stop signal, or improper setup of the signature analyzer.

5) If everything in **step 4** has been checked and the +5 Vdc signature still does not correspond to that specified in the table, replace the mircroprocessor and test again.

6) Verify the remaining signatures in **Table 4-10.**

7) A fault indicates:

- an open or shorted address line
- a defective microprocessor

Table 4-10. Microprocessor Tests

Signature Analyzer Setting and Connection		
START	STOP	CLOCK
Trailing Edge A1A3 (TP8) U7 pin 23	Trailing Edge A1A3 (TP8) U7 pin 23	Trailing Edge A1A3 (TP2) U7 pin 34

Test Number	Signature Name	Test Point	Signature
1	+5	A1A3 U3 pin 1	0003
2	A0	U13 pin 2	UUUU
3	A1	U13 pin 17	FFFF
4	A2	U13 pin 4	8484

Table 4-10. Microprocessor Tests (Cont'd)

Test Number	Signature Name	Test Point	Signature
5	A3	U13 pin 15	P763
6	A4	P1 pin 17	1U5P
7	Z5	U13 pin 6	0356
8	A6	U13 pin 13	U759
9	A7	U13 pin 8	6F9A
10	A8	U13 pin 11	7791
11	A10	U8 pin 3	37C5
12	A9	U8 pin 2	6321
13	A11	U8 pin 14	6U28
14	A12	U8 pin 13	4FCA
15	A13	U1 pin 15	4868
16	A14	U1 pin 14	9UP1
17		U3 pin 20	1183
18		U4 pin 20	64HF
19		U8 pin 15	C9U1
20		U10 pin 5	7074
21		U10 pin 11	PF63
22	(TP10)	U8 pin 10	ZF1U
23		U8 pin 1	09UA
24	$\overline{\text{I/O 1}}$	P1 pin 33	3H82
25	$\overline{\text{I/O 2}}$	P1 pin 34	796P
26	$\overline{\text{I/O 3}}$	P1 pin 35	U5F0
27	$\overline{\text{I/O 4}}$	P1 pin 36	C8H5
28		U12 pin 4	7-77
29		U12 pin 9	PF60
30		U6 pin 18	7074
31		U5 pin 18	PF63
32	BAO	P1 pin 9	U4F8
33	BA1	P1 pin 11	6U0A
34	BA2	P1 pin 13	H228
35	BA3	P1 pin 15	7951
36	BA4	P1 pin 17	1U5P
37	BA5	P1 pin 19	579P
38	BA6	P1 pin 21	72A8
39	BA7	P1 pin 23	9U12
40	BA8	P1 pin 25	3289
41	(R1800)	A1A2 U15 pin 1	3113
42	(R1880)	U8 pin 1	H96P
43	(R1900)	U9 pin 1	U5A0
44	(R1980)	U8 pin 15	247H
45	(19C0-19FF)	U13 pin 3	U699
46	$\overline{\text{(ASE)}}$	U10 pin 1	F9CU
47	$\overline{\text{RAD}}$	A1A4 U15 pin 21	U5F3
48		A1A5 U9 pin 1	796P
49		U9 pin 11	796H
50		A1A4 U17 pin 5	U5F3

4.6.3.2.2 Address Bus Test

1) Perform **steps 1 through 6** of **paragraph 4.6.3.2.1** utilizing **Table 4-10.**

2) A fault indicates:

- an open or shorted address line
- a defective soure. It is suggested that signatures be verified at the 1C before replacing the IC's.

Table 4-11. Address Bus Test

Signature Analyzer Setting and Connection

START	STOP	CLOCK
Trailing A1A3 (TP8) Edge U7 pin 23	Trailing A1A3 (TP8) Edge U7 pin 23	Trailing A1A3 (TP2) Edge U7 pin 34

NOTE: Momentarily short TP3 to ground.

Test Number	Signature Name	Test Point	Signature
1	+5	A1A2 U5 pin 1	0003
2	(W1800)	U16 pin 9	3113
3	$\overline{\text{WFP}}$	P1 pin 22	H96P
4		U11 pin 4	U5A0
5	(W1900)	U4 pin 1	C930
6	(W1902)	U2 pin 1	6C90
7	$\overline{\text{2nd PLS}}$	P1 pin 16	HAP7
8	(W1904)	U2 pin 13	76CA
9	(W1905)	U4 pin 13	1HAH
10	$\overline{\text{3rd PLS}}$	P1 pin 14	8768
11	$\overline{\text{CTR ST}}$	P1 pin 12	A1H9
12	(W1C00)	A1A4 U10 pin 16	6AC0
13	(A1C40)	U11 pin 16	U804
14	(W1C80)	U12 pin 16	2UPC
15	(W1CC0)	U13 pin 1	953C
16	(W1D00)	U9 pin 11	617C
17	(W1D40)	U16 pin 1	0965
18		U15 pin 32	0966
19	(W1D80)	U14 pin 11	1F55
20	(W1A00)	A1A5 U14 pin 11	H9H1
21		U13 pin 11	7AC2
22		U12 pin 11	9671
23		P2 pin 14	2FF0
24		U4 pin 11	H2A8
25		U8 pin 11	H2A8
26		U7 pin 11	A0U4
27		U6 pin 11	F568

4.6.3.2.3 Front Panel Keyboard Test

1) This test is an imbedded routine contained in firmware. To start routine, momentarily ground A1A3 TP5.

2) Receiver front panel display indicates: S1G - An A. --

3) At this time any front panel key may be depressed and the key code for that key is indicated. The display indicates: COdE ---X. Refer to **Table 4-12** for the key codes.

Table 4-12. Front Panel Key Codes

Key	Key Code	Key	Key Code
Det Mode	0	BFO	9
BW Select	4	AFC	d
RF/IF Gain	8	Tune Lock	5
Change	A	Faster	2
Change	E	Slower	6
COR Level	C	Control	1

4) To exit this test, remove power from the receiver.

4.6.3.2.4 Digital-to-Analog Ramp Tests

1) Utilize an oscilloscope to confirm the correct signals are present. Connect CH1 to A1A5 TP11.

2) DC couple Trigger to CH1, TRIG NORM, - slope.

3) Utilize CH2 to probe indicated tests points on the Analog/Digital subassembly A1A5. Refer to **Table 4-13**.

4) Unless specified otherwise, ramps are positive going from 0 to approximately +13 Vdc at approximately 4 V/msec.

Table 4-13. Digital-to-Analog Ramps

Test Point	Nomenclature	Ramp
P2 pin 14	IF NORM	1.5 msec. after trigger
P2 pin 16	IF AGC	5.4 msec. after trigger
P2 pin 18	DET AGC	9.0 msec.
P2 pin 20	BFO TV	13 msec.
P2 pin 22	VHF AGC	17 msec.
P2 pin 24	UHF AGC	21 msec.
P2 pin 26	2nd LO COARSE TUNE	25 msec. after trigger (at .33 V/msec. slope)

4.6.3.2.5 **Control Line Tests**

1) Perform **steps 1 through 6** of **paragraph 4.6.3.2.1** utilizing **Table 4-14.**

2) A fault indicates:

- an open or shorted address line
- a defective souce.

Table 4-14. Control Line Test

Signature Analyzer Setting and Connection

START	STOP	CLOCK
Leading A1A5 (TP11) Edge U14 pin 12	Trailing A1A5 (TP11) Edge U14 pin 12	Trailing A1A3 (TP10) Edge U8 pin 10

Test Number	Signature Name	Test Point	Signature
1	+5	A1A5 U2 pin 16	4802
2	2nd LO D0	P2 pin 25	7F8P
3	2nd LO D1	P2 pin 26	HA7A
4	2nd LO D2	P2 pin 27	F418
5	2nd LO D3	P2 pin 28	H154
6	2nd LO A0	P2 pin 29	pC4A
7	2nd LO A1	P2 pin 30	6F25
8	2nd LO A1	P2 pin 31	04P8
9	Fine on/off	P2 pin 32	38HC
10	SP1	P2 pin 33	26HP
11	SP2	P2 pin 34	P24A
12	7/$\overline{2}$	P2 pin 35	FA17
13	SP3	P2 pin 36	
14	1^1	P2 pin 37	4C8C
15	1^2	P2 pin 38	88H6
16	1^4	P2 pin 39	9U3A
17	1^8	P2 pin 40	A495
18	2^1	P2 pin 41	96PF
19	2^2	P2 pin 42	725C
20	2^4	P2 pin 43	P5PH
21	2^8	P2 pin 44	5CP0
22	$\overline{FLOAD}$	P2 pin 45	4802
23	U^1	P2 pin 46	85PA
24	U^2	P2 pin 47	77F7
25	UHF/$\overline{VHF}$	P2 pin 48	6PCP
26	$\overline{FM}$/AM	P1 pin 3	8977
27	CW	P1 pin 4	872H
28	CW + $\overline{SSB}$	P1 pin 5	2C0P
29	USB/$\overline{LSB}$	P1 pin 6	57FF

Table 4-14. Control Line Test (Cont'd)

Test Number	Signature Name	Test Point	Signature
30	1SB	P1 pin 7	HF8C
31	SQUELCH	P1 pin 8	8589
32	PRESEL ATTN	P1 pin 9	HA0F
33	AM PK DMP	P1 pin 10	A4H5
34	PRESEL D0	P1 pin 11	CA49
35	PRESEL D1	P1 pin 13	9638
36	PRESEL D2	P1 pin 14	84A7
37	PRESEL D3	P1 pin 15	2AP4
38	PRESEL D4	P1 pin 16	2F06
39	PRESEL D5	P1 pin 17	CU26
40	PRESEL D6	P1 pin 18	5642
41	PRESEL D7	P1 pin 19	HFH3
42	PRESEL D8	P1 pin 20	A6PA
43	PRESEL D9	P1 pin 22	2659
44	PRE CODE 0	P1 pin 24	4A12
45	PRE CODE 1	P1 pin 26	F823
46	PRE CODE 2	P1 pin 27	3UU7
47	$\overline{\text{PRE STB}}$	P1 pin 28	P432
48	PRINTER	U10 pin 3	4F6F
49	SERIAL OUT	U10 pin 2	1FU5
50		A1A4 U8 pin 3	P3A6
51		U8 pin 5	5P9H
52		U8 pin 7	462F
53		U8 pin 9	8FA9
54		U8 pin 11	AU23
55		U8 pin 14	PF38
56		U9 pin 16	HA99
57		U9 pin 19	H5FC
58	SPR DRV	P1 pin 29	929C
59	COR EXT	P1 pin 31	9HF9
60	SPR4	P2 pin 28	8P2P
61	SPR5	P2 pin 30	85P5
62	SPR6	P2 pin 32	8134
63	SPR7	P2 pin 34	C321
64	SPR8	P2 pin 35	F477
65	FM $\overline{\text{NAR}}$/MID	P2 pin 36	426C
66	FM WIDE	P2 pin 37	952H
67	SPR9	P2 pin 38	569P
68		A1A2 U14 pin 12	1HHA
69		U14 pin 10	0L49
70		U14 pin 4	5717
71		U14 pin 2	3610
72		U5 pin 4	2016
73		U4 pin 12	1776

4.6.3.3 **Dynamic Microprocessor Test**

The following test should be run only after all of the static tests in **paragraph 4.6.3.2** have been completed and the proper operation of all boards and software has been verified. The dynamic test checks the standard non-interrupt functions of the Digital Control Section.

4.6.3.3.1 **Buffered Data Lines**

1) This test will test the buffered data lines. Install signature header in A1A3U2.
2) Apply power to receiver.
3) Momentarily ground A1A3 TP5.
4) Refer to **Table 4-15** for signature analysis.

Table 4-15. Buffered Data Line Test

Signature Analyzer Setting and Connection

START	STOP	CLOCK
Leading Edge A1A5 (TP11) U14 pin 12	Trailing Edge A1A5 (TP11) U14 pin 12	Leading Edge A1A3 U8 pin 9

Test Number	Signature Name	Test Point	Signature
1	+5	U15 pin 24	446P
2	DIO 0	P2 pin 9	850A
3	DIO 1	P2 pin 11	7445
4	DIO 2	P2 pin 13	F8P5
5	DIO 3	P2 pin 15	PF9U
6	DIO 4	P2 pin 17	C583
7	DIO 5	P2 pin 19	1F5F
8	DIO 6	P2 pin 21	649U
9	DIO 7	P2 pin 23	53AF

4.6.4 **SYNTHESIZER SECTION PERFORMANCE TESTS**

4.6.4.1 **Reference Generator, Performance Tests**

1) Connect the frequency counter first to connector pin 17 of P2, then to connector pin 13. Observe that the frequency present at both connector pins is 250 kHz.

2) Connect the frequency counter to connector pin 13 of P1 and observe the frequency present. This frequency should be 32.1 MHz.

3) Remove the frequency counter and observe the waveform present at connector pins 17 and 13 of P2 and pin 13 of P1. The waveform present at each connector pin should be a symmetrical square wave switching between 0 and approximately +4 V.

4.6.4.2 1st LO Synthesizer, Performance Tests

1) Connect the frequency counter to the 1st LO Synthesizer output jack A2J1.

2) Utilizing the oscilloscope, verify the presence of the 250 kHz reference, from the reference generator, at connector pin 15 of P1.

3) Tune the receiver to the frequencies listed in **Table 4-16** and observe the 1st LO frequency varies as listed in the table.

4) If the results are not as listed in **Table 4-16**, utilize the oscilloscope to verify the BCD control words provided at the indicated P1 connector pins.

Table 4-16. 1st LO Synthesizer Frequency vs. Tuned Frequency

Tuned Freq. (MHz)	1st LO Freq. (MHz) (A2J1)	Control Logic Input 100 MHz					(A1A7P1) 10 MHz					7/12
		Bit	8	4	2	1	Bit	8	4	2	1	
20.0000	577.55		0	1	0	1		0	1	1	1	1
25.0000	582.55		0	1	0	1		1	0	0	0	0
50.0000	607.55		0	1	1	0		0	0	0	0	1
250.0000	807.55		1	0	0	0		0	0	0	0	1
336.0000	892.55		1	0	0	0		1	0	0	1	0
499.0000	1052.55		0	0	0	0		0	1	0	1	0
	XA7A pins:		7	12	5	22		24	20	18	16	19

5) Remove the frequency counter from A2J1 and connect the RF millivoltmeter and a 50 ohm load. Observe the output level is at least +3 dBm.

6) Tune the receiver through the 20-500 MHz frequency range while observing the output level on the RF millivoltmeter. Observe the output level of at least +3 dBm is present throughout the frequency range of the 1st LO.

4.6.4.3 2nd LO Synthesizer, Performance Tests

1) Connect the frequency counter to the 2nd LO output jack A1A6J1. Observe the frequency present is between 531.16 to 536.16 MHz.

2) Remove the frequency counter from A1A6J1 and connect the RF millivoltmeter and a 50 ohm load. Observe the output level is approximately +2 dBm.

3) Tune the receiver through the 20-25 MHz frequency range tuning in 10 kHz steps while observing the output level on the RF millivoltmeter. Observe the output level of at least +3 dBm is present throughout the frequency range of the 2nd LO.

4) Verify the presence of +5 V at connector pins 4 and 31 of P1.

4.7 ALIGNMENT PROCEDURES

The following alignment procedures should not be performed on a routine basis. These alignment procedures should be performed after repairs have been completed or as a touch-up after a subassembly has been replaced. Only after it has been determined that alignment is necessary, should any adjustment be made. **Table 4-17** lists the WJ-8615D standard unit settings to be utilized during the alignment procedures.

The typical signal waveforms illustrated in the following alignment procedures are reproductions of actual waveform responses. Due to the variables involved with alignment, the equipment utilized, equipment settings, and component interaction, the waveforms should be used as alignment aids rather than waveform models. Oscilloscope voltage settings (V/DIV) will vary depending on the test equipment utilized.

Table 4-17. Standard Alignment Settings

Parameter	Setting
CONTROL	LCL
FREQUENCY MHz	100.0000
TUNING RATE	Digit Flashing 100 Hz
BFO	OFF
AFC	OFF
COR LEVEL	00
RF/IF GAIN	MAXIMUM
BANDWIDTH SELECT	300 kHz (or less)
DETECTION MODE	AM
GAIN CONTROL	MGC

4.7.1 RF/IF SECTION ALIGNMENT PROCEDURE

4.7.1.1 Preamplifier/Converter (A1A13), Alignment

1) Extend the Preamplifier/Converter module via test cable TC30047 and connect the test equipment as illustrated in **Figure 4-6.** Refer to **Figure 5-27** and **Figure 5-29** for jumper (JP) locations.

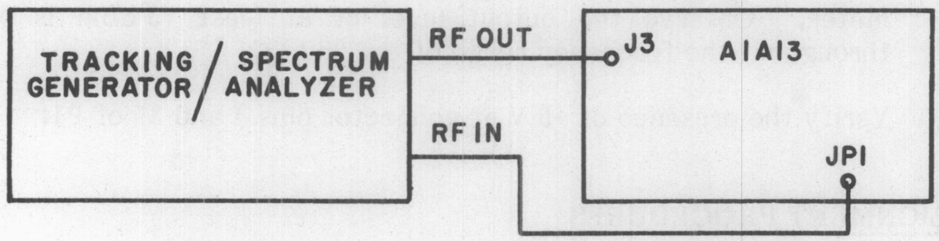


Figure 4-6. Low-pass Filter Alignment, Equipment Connections

2) Adjust C15, C16, C17 and C18 to produce the response illustrated in **Figure 4-7.** Note the frequency and the component adjustment for each point. The Pre-Amp LPF filter response should be flat from 20-500 MHz and have 12-14 dB of gain.

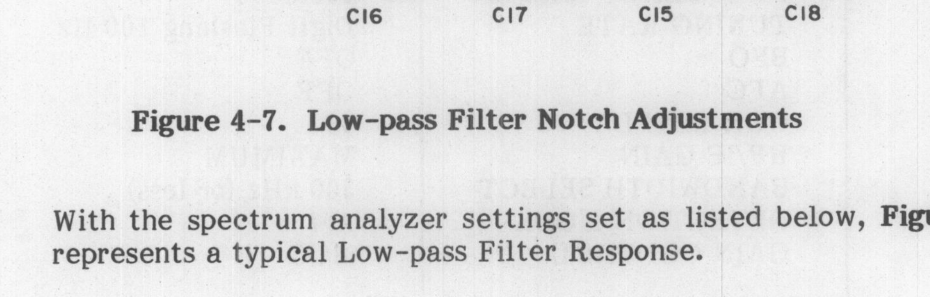


Figure 4-7. Low-pass Filter Notch Adjustments

With the spectrum analyzer settings set as listed below, **Figure 4-8** represents a typical Low-pass Filter Response.

Spectrum Analyzer Settings

Center Frequency	570 MHz
Bandwidth	300 kHz
Scan Per Div	0 - 1250 MHz
Input Atten	20 dB
Scan Time	5 msec
Log Ref	10 dB Log 10

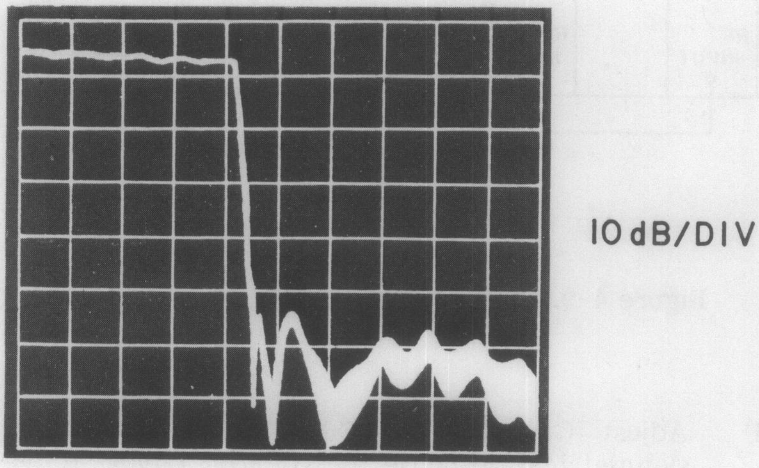


Figure 4-8. Low-pass Filter Response

3) Remove (A1A13) A1JP1 and insert a jumper connector at (A1A13) A1JP1 and another jumper connector at (A1A13) A2JP1.

4) Calibrate the Wiltron for a 0 dBm reference on the center trace of the display with the following Wiltron settings:

T50	G50	
10 dB/div	Marker	5 MHz
	Sweep Width	5 MHz
	Center Freq.	555 MHz
	Sweep Rate	Fast
	Trigger	Auto
	RF	-20 dB

5) Connect the equipment as illustrated in **Figure 4-9** and adjust the Offset on the Wiltron to verify the gain. (Change the T50 dB/div to 1 dB/div provide greater accuracy.)

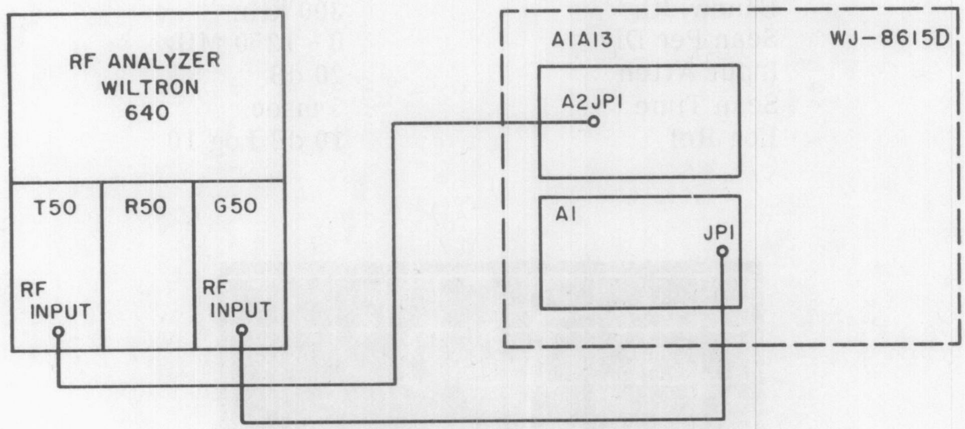


Figure 4-9. 1st Converter Alignment, Equipment Connections

6) Adjust C3, C4, C5, C6, C7, C8 and C9 to produce the best symmetrical response at 555 MHz having between 8.5 and 9 dB of gain and a 3 dB bandwidth of between 15 and 17 MHz. **Figure 4-10** illustrates a typical First Converter Signal Response.

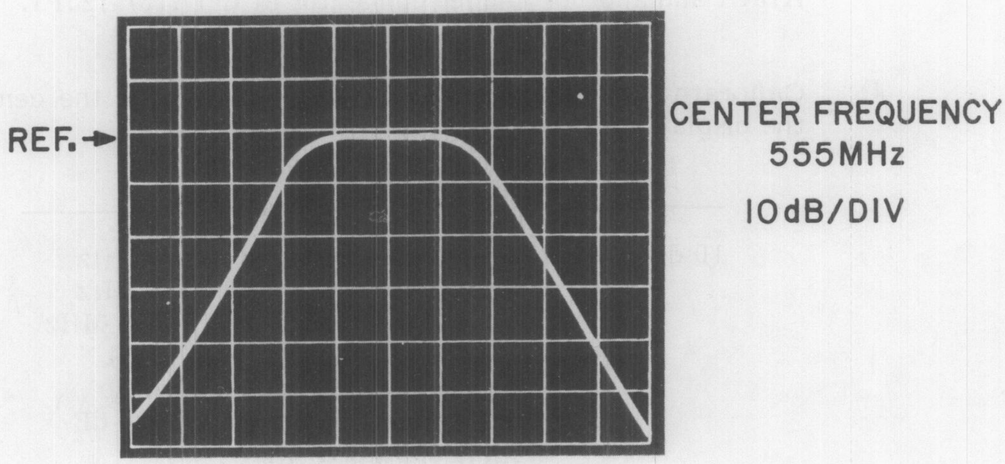


Figure 4-10. First Converter Typical Response

7) Connect the test equipment as illustrated in **Figure 4-11.**

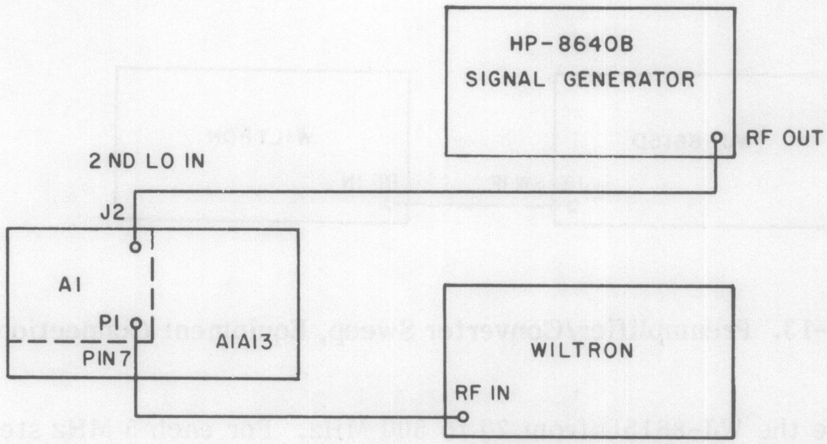


Figure 4-11. Second Converter Alignment, Equipment Connections

8) Set the signal generator to 533.6 MHz, CW, at an output level of +3 dBm and center the Wiltron display frequency at 555 MHz.

9) Adjust A2 L3, L4 an L5 to produce a flat response, 6 MHz wide at the 1 dB bandwidth, and having 6 dB gain as illustrated in **Figure 4-12.**

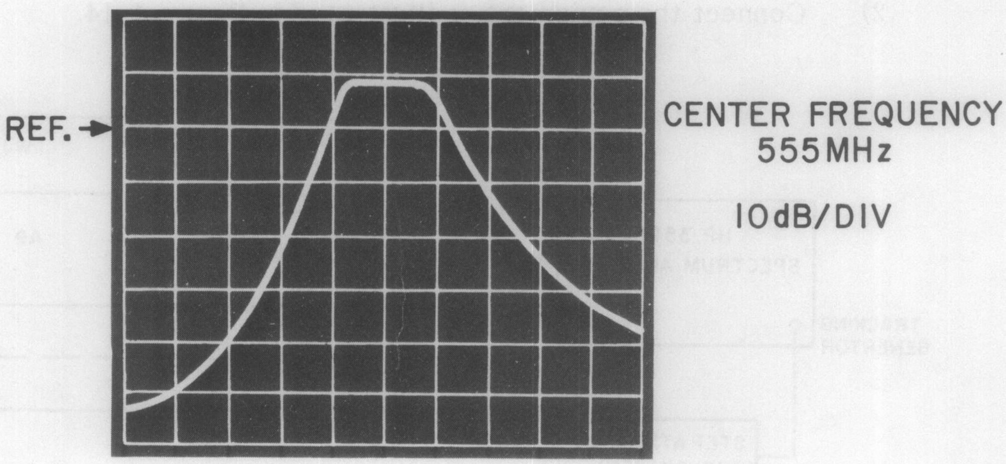


Figure 4-12. Typical Second Converter Response

10) Reinstall and secure all the jumpers in their proper locations and connect the test equipment as illustrated in **Figure 4-13.** Set the Wiltron to display 5 MHz per division.

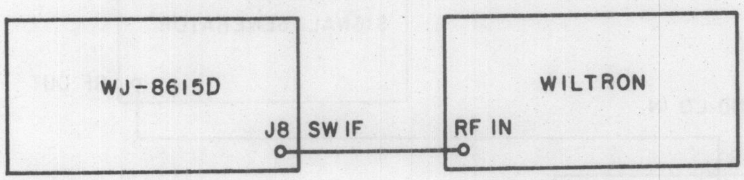


Figure 4-13. Preamplifier/Converter Sweep, Equipment Connections

11) Tune the WJ-8615D from 20 to 500 MHz. For each 5 MHz step, tune the Receiver 2nd LO response across the 1st LO response and verify an overall gain of 18 dB and that the 2nd LO response does not roll off excessively or drop out at any point across the receiver input range.

4.7.1.2 IF BW Filter Amplifier (A1A12), Alignment

1) Remove the Preamplifier/Converter module (A1A13) from the receiver.

2) Connect the equipment as illustrated in **Figure 4-14.**

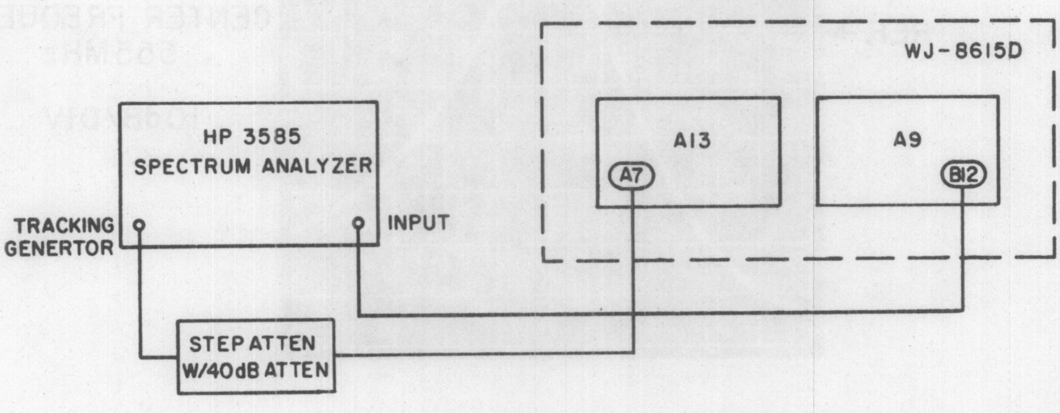


Figure 4-14. IF Amplifier, Equipment Connections

3) Adjust the spectrum analyzer to display the bandpass response of each bandwidth filter which is selected.

4) Select each receiver bandwidth and view the spectrum analyzer display. Refer to **Figure 4-15** (narrow band) and **Figure 4-16** (wideband) for typical filter responses. Adjust (A1A12) L1 to produce the least amount of ripple for all the bandwidths.

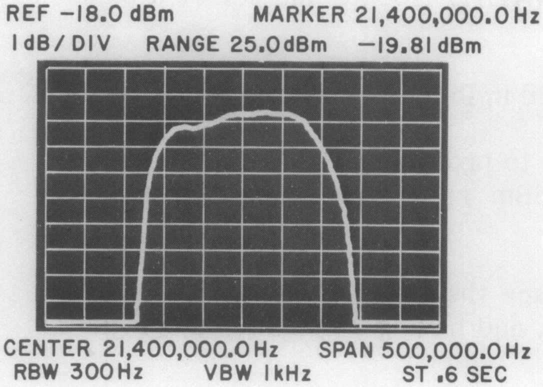


Figure 4-15. Narrow Band IF Filter Response

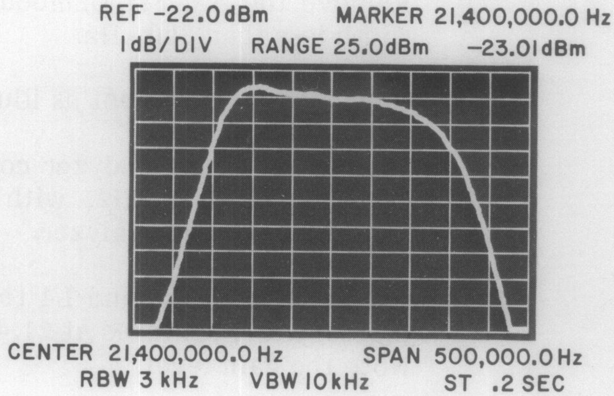


Figure 4-16. Wideband IF Filter Response

4.7.1.3 **CW Demodulator (A1A11), Alignment**

1) Set the receiver to the settings listed in **Table 4-17**, except select CW detection mode and the BFO to 0.

2) Connect the test equipment as illustrated in **Figure 4-17**.

3) Set and lock the signal generator to the same frequency as the receiver with a -60 dBm, CW output.

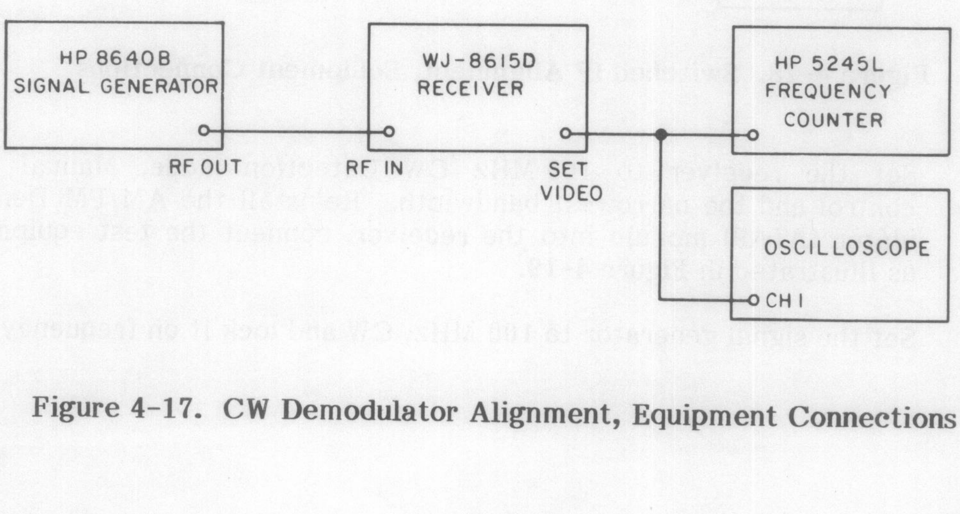


Figure 4-17. CW Demodulator Alignment, Equipment Connections

4) Observe the output of J5 on the frequency counter and the oscilloscope. They both should indicate approximately 0 Hz.

5) Depress the BFO key on the receiver and offset the BFO by 1 kHz.

6) Observe the frequency counter and the oscilloscope to verify the presence of a 1 kHz video signal.

7) Remove the AM/FM Demodulator (A1A9) module and select a bandwidth less than 300 kHz.

8) Connect the equipment as illustrated in **Figure 4-18.**

9) Set the spectrum analyzer controls to produce a 500 kHz wide sweep, centered at 21.4 MHz, with a 0 dBm reference (5 dB/DIV) at the center line of the analyzer.

10) Adjust (A1A11) L3 and L4 to produce the optimum response 380 kHz (±10%) wide, centered at 21.4 MHz, and having 14 dB (±2 dB) of gain. Note the gain level.

11) Select a bandwidth greater than or equal to 500 kHz and adjust (A1A11) R36 for the same gain level noted in Step 10.

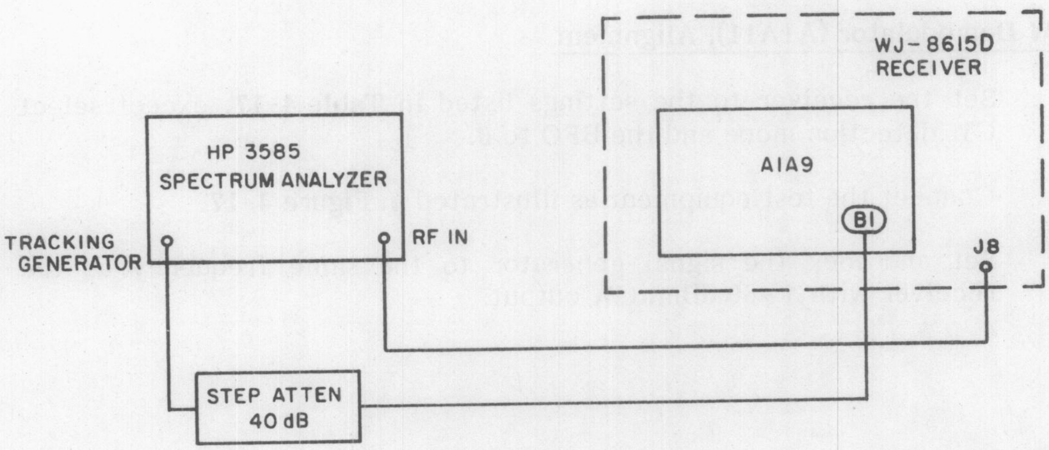


Figure 4-18. Switched IF Alignment, Equipment Connections

12) Set the receiver to 100 MHz CW Detection mode, Manual gain control and the narrowest bandwidth. Reinstall the AM/FM Demodulator (A1A9) module into the receiver, connect the test equipment as illustrated in **Figure 4-19.**

13) Set the signal generator to 100 MHz, CW and lock it on frequency.

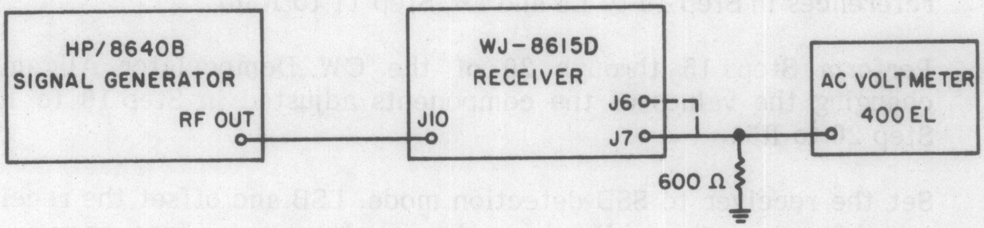


Figure 4-19. BFO Audio Alignment, Equipment Connections

14) On the receiver, select BFO and offset the BFO by 1 kHz. With the Audio Gain (R1) at maximum adjust (A1A11) R2 for an output level of 3.5 V rms on the voltmeter.

15) Connect the test equipment as illustrated in **Figure 4-20.**

16) Set the receiver to the parameters listed in **Table 4-17.**

17) Set the signal generator to 100 MHz CW at the minimum sensitivity level for the selected bandwidth (Refer to **Table 1** of **Table 1-1.**)

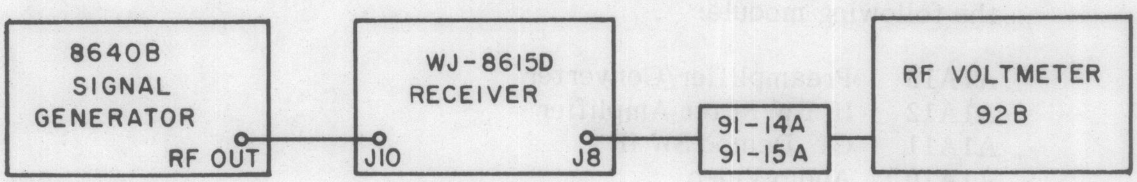


Figure 4-20. Gain Control Alignment, Equipment Connections

18) Adjust (A1A11) R20 until the SW IF (J8) output level on the RFVM decreases approximately 1/2 dB. Note the output level on the voltmeter.

19) Set the receiver RF/IF GAIN to minimum (0) and increase the signal generator output level 42 dB.

20) Adjust (A1A11) R13 to set the SW IF output to the same level on the RFVM as noted in Step 19.

4.7.1.4 ISB/CW (Optional) Demodulator (A1A11), Alignment

1) To align the optional ISB/CW Demodulator (A1A11) perform Steps 1 through 11 for the CW Demodulator module. Change the component references in Step 10 to L5 and L6, Step 11 to R36.

2) Perform Steps 15 through 20 of the CW Demodulator Alignment changing the values of the components adjusted in Step 18 to R57, Step 20 to R51.

3) Set the receiver to SSB detection mode, LSB and offset the receiver tuned frequency by 1 kHz above the signal generator frequency.

4) Set the signal generator output level to the minimum sensitivity level for the selected receiver bandwidth and connect the test equipment as illustrated in **Figure 4-18.**

5) Adjust (A1A11) R26 for 3.5 V on the ACVM at J7.

6) Select USB and tune the receiver 1 kHz below the signal generator.

7) Connect the test equipment as illustrated in **Figure 4-19.**

8) Adjust (A1A11) R38 to produce a 3.5 V reading on the ACVM.

4.7.1.5 AM/FM Demodulator (A1A9), Alignment

1) This module must be aligned in the receiver. Adjustments may be made through access holes on the backside of the module. Remove the following module:

A1A13	Preamplifier/Converter
A1A12	IF BW Filter Amplifier
A1A11	CW Demod SW IF
A1A10	Audio Video

2) Connect the test equipment as illustrated in **Figure 4-21** and ensure the green jumper wire on TC30059 is connected to pin 3 and not to pin 4. Turn the pot on TC30059 fully clockwise prior to applying power to the receiver.

3) On the receiver, set the manual gain control to maximum.

4) Adjust the sweep generator controls to produce a 2 MHz wide response with the center at 21.4 MHz, and with a -60 dBm output level. Set the F width to 2 MHz.

5) On the AM/FM Demodulator module (A9) adjust C46 and C57 to produce a flat and symmetrical response centered at 21.4 MHz and 650 kHz (±10%) wide at the 3 dB points. **Figure 4-22** illustrates the typical AM Detector response for bandwidths less than 300 kHz.

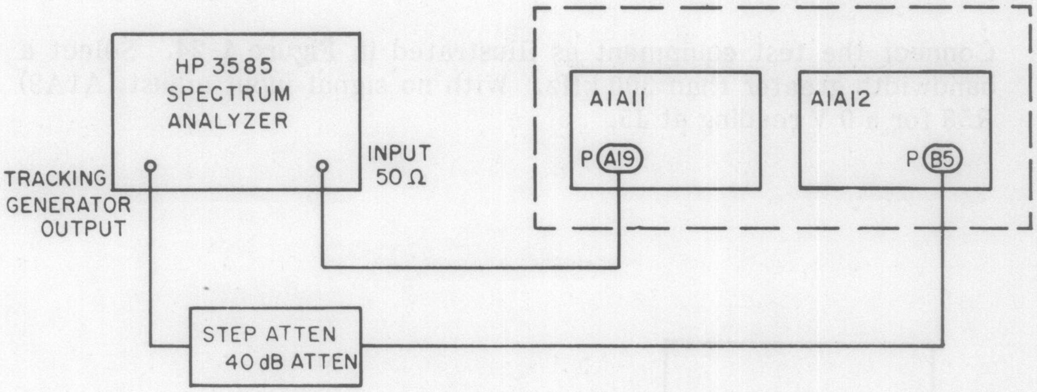


Figure 4-21. AM/FM Demodulator Alignment, Equipment Connections

6) Turn the receiver off and adjust the pot on TC30059 fully counter clockwise and then power the up.

7) Reset the sweep generator controls to display a response from 10.7 MHz to 32 MHz. Set the bandwidth select to Start/Stop with -60 dBm output level. Set the sweep generator start frequency to 10.7 MHz and the stop frequency to 32 MHz.

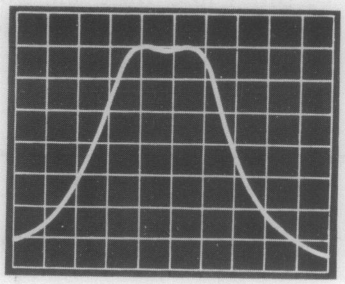


Figure 4-22. AM Detector Response 300 kHz

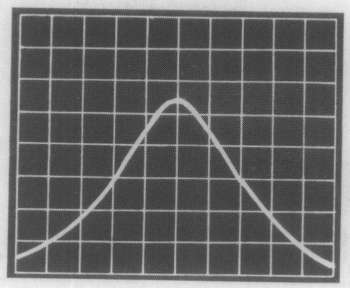


Figure 4-23. AM Detector Response 300 kHz

8) Verify that the displayed bandwidth is 5.5 MHz wide (±20%) at the 3 dB points. **Figure 4-23** illustrates a typical AM Detector response for bandwidths 300 kHz.

9) Connect the test equipment as illustrated in **Figure 4-24.** Select a bandwidth greater than 300 kHz. With no signal input adjust (A1A9) R58 for a 0 V reading at J5.

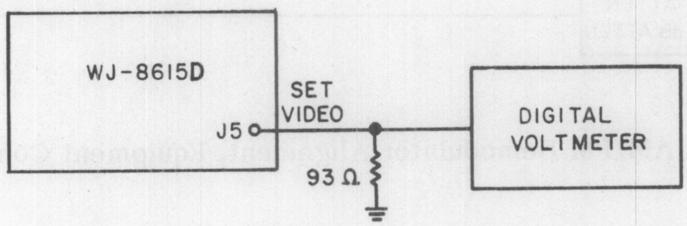


Figure 4-24. Video Alignment, Equipment Connections

10) Select a bandwidth from 50 to 300 kHz (50, 100 or 300) and adjust (A1A9) R-80 for a 0 V reading at J5.

11) Select a bandwidth less than 50 kHz (6, 10, or 20) and adjust (A1A9) R74 for a 0 V reading at J5.

12) Connect the test equipment as illustrated in **Figure 4-25.** Ensure the green jumper wire on TC30059 is connected to pin 4 and that the pot is fully clockwise tack solder a 50Ω resistor load between ground and pin 19 of XA11.

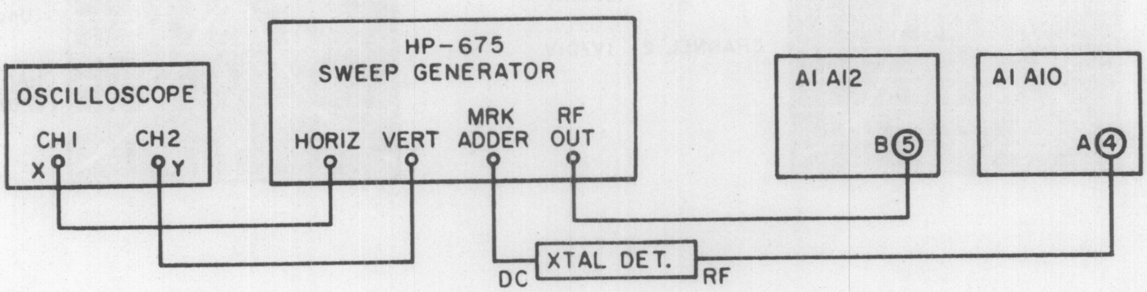


Figure 4-25. FM Discriminator Alignment, Equipment Connections

13) Adjust the sweep generator to produce a 21.4 MHz marker at the center of the oscilloscope. Set the F width to 100 kHz and the output level to -60 dBm.

14) Adjust (A1A9) L9 and L11 for the best symmetry and a zero crossover at 21.4 MHz. See **Figure 4-26** for a typical narrow-band response.

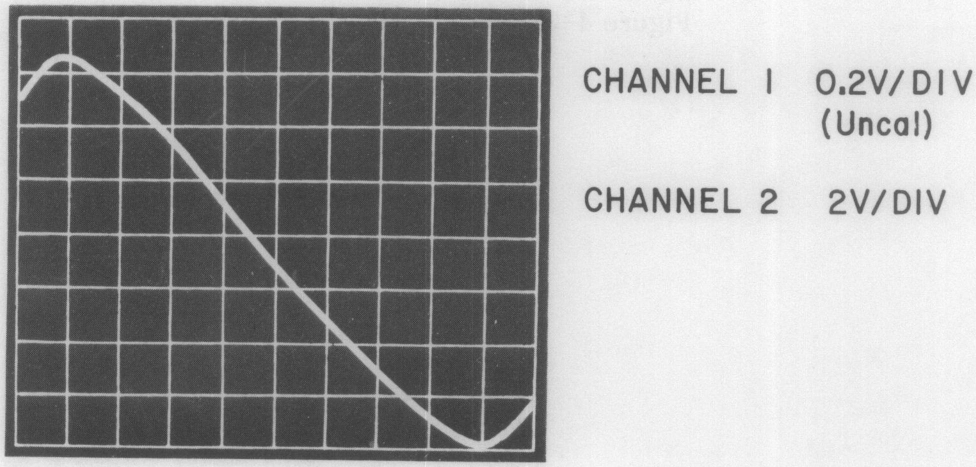


Figure 4-26. Narrow-band FM Discriminator Typical Response

15) Turn the receiver off and adjust the pot on TC30059 to its midrange and turn the receiver power on. Set the sweep generator F width to 1 MHz. Adjust (A1A9) L15 (the coarse tune) and C6 (the fine tune) for maximum symmetry and a zero crossover at 21.4 MHz. See **Figure 4-27** for a typical mid-band response.

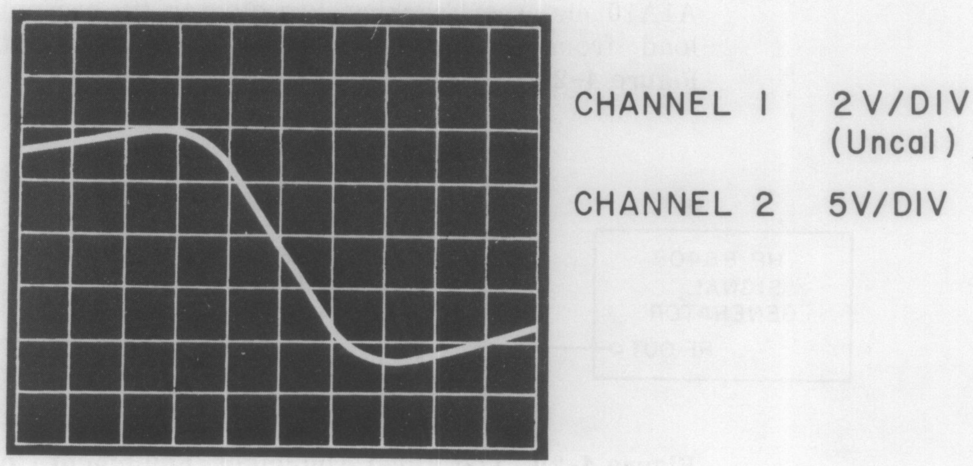


Figure 4-27. Mid-band and FM Discriminator Typical Response

16) Turn receiver off and adjust the pot on TC30059 fully counter clockwise before applying power to the receiver again. Increase the sweep generator F width to 5 MHz. Adjust (A1A9) L13 for maximum symmetry and L14 for a 21.4 MHz zero crossover. See **Figure 4-28** for a typical wideband response.

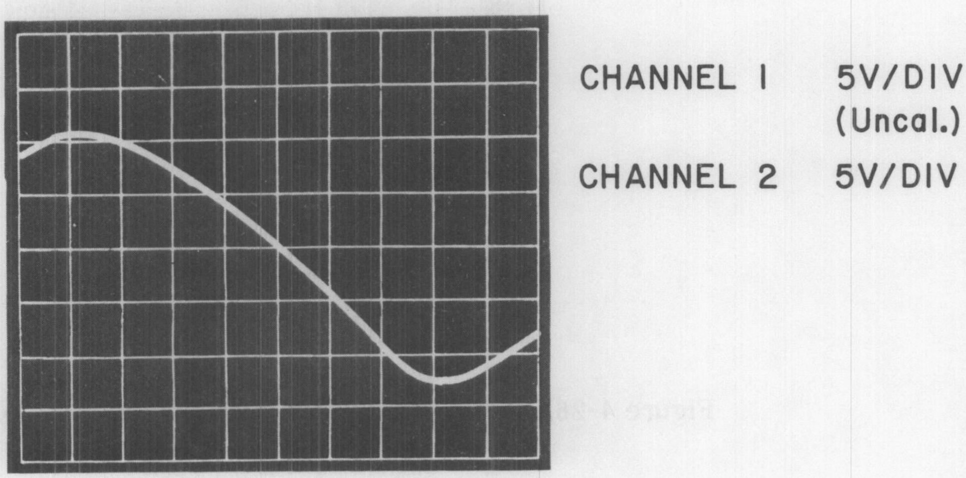


Figure 4-28. Wideband FM Discriminator Typical Response

17) Reinstall the modules removed in Step 1: A1A13, A1A12, A1A11, A1A10 and the Tracking Preselector (if present) unsolder the 50Ω load from XA11 and connect the equipment as illustrated in **Figure 4-29.**

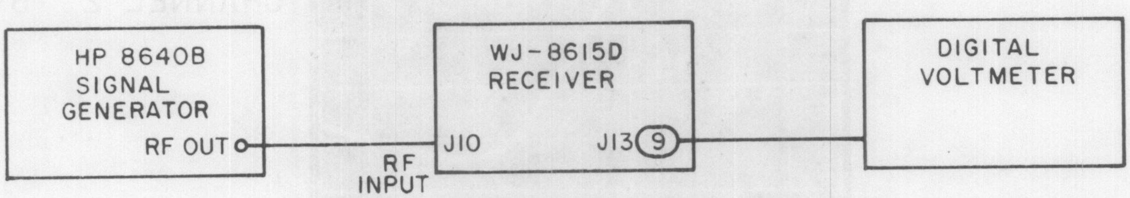


Figure 4-29. Log Video Alignment, Equipment Connections

18) Select the widest bandwidth installed in the receiver and set the signal generator to the sensitivity level listed in **Table 1.**

19) Adjust (A1A9) R13 for +0.25 Vdc at the Log Video Output (J13 pin 9).

20) Increase the signal generator output level 60 dB and adjust R24 for a +4.8 Vdc reading at the Log Video Output.

21) Disconnect the signal generator from the receiver input (J10). With no signal in, adjust R8 for +2 Vdc at A1A4 TP12.

22) Reset the signal generator output level to the minimum sensitivity level of the bandwidth selected (refer to **Table 1**) and reconnect the signal generator to J10 of the WJ-8615D.

23) Adjust (A1A9) R8 for a +2 Vdc reading on the voltmeter at A1A4 TP12.

24) With the receiver set to: AM detection mode, Manual gain control, and the gain control to maximum (255 displayed on the SS - dBm location), set the signal generator output to 3 dB below the minimum sensitivity level of the bandwidth selected. (Example: If the 50 kHz BW is selected set the signal generator output to -100 dBm.)

25) Connect the digital voltmeter to A1A4 TP12 and adjust A1A9 R21 until the voltage begins to drop. Note the DC voltage level.

26) Turn the receiver gain control to minimum (0 displayed), increase the signal generator output level 44 dB, and adjust A1A9 R32 to the same voltage level at A1A4 TP12 as noted in Step 25.

4.7.1.6 Audio/Video (A1A10), Alignment

1) Set the receiver to AM detection mode, AGC, and select the narrowest receiver bandwidth.

2) AM modulate the signal generator 50% at a 1 kHz rate. Set the signal generator output level to -60 dBm.

3) Connect the test equipment as illustrated in **Figure 4-30** and adjust R8 for 400 mV rms at the Set Video (J5).

4) Set the receiver to FM detection mode and select a bandwidth less than 50 kHz.

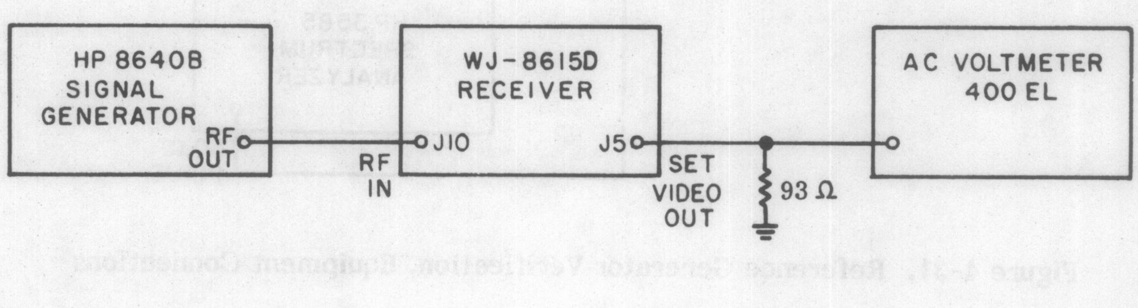


Figure 4-30. Audio/Video Alignment, Equipment Connections

5) Set the signal generator output level at -60 dBm and FM modulate the signal at 30% peak deviation (of the selected receiver bandwidth) at a 1 kHz rate (400 Hz rate if the receiver bandwidth is 20 kHz or less).

6) Adjust (A1A10) R83 for an output level of 400 mV rms at J5.

7) On the receiver, select a bandwidth from 50 kHz through 300 kHz. Reset the signal generator peak deviation to be 30% of the selected bandwidth.

8) Adjust (A1A10) R76 for a 400 mV rms output level at J5.

9) Select a receiver bandwidth greater than 300 kHz and reset the signal generator peak deviation to 30% of the selected bandwidth.

10) Adjust (A1A10) R63 for an indication of 400 mV rms on the ACVM at J5.

4.7.1.7 **Reference Generator (A1A8), Alignment**

1) Set the WJ-8615D Receiver to the Test mode, SSB detection mode and connect the test equipment as illustrated by the dashed line in **Figure 4-31.**

2) Observe the displayed frequency on the frequency counter and note the frequency. The displayed frequency should be 10 MHz (±10 Hz). Note the frequency.

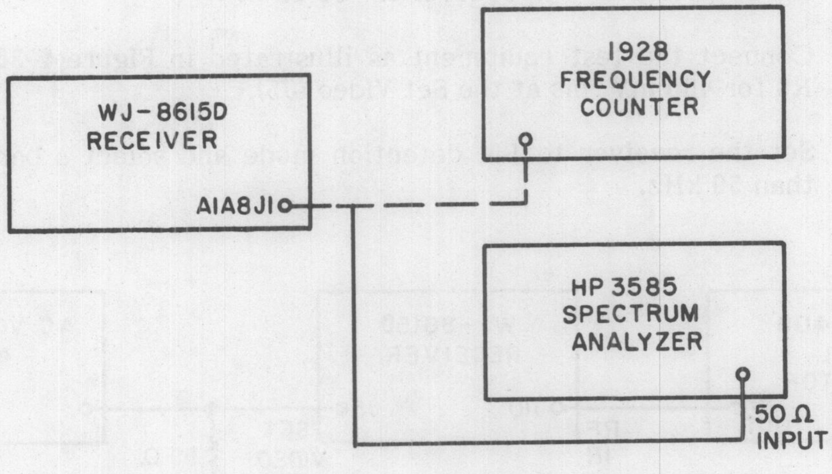


Figure 4-31. Reference Generator Verification, Equipment Connections

3) Connect the test equipment as illustrated in **Figure 4-31** by the solid line.

4) Verify that the output level at J1 is a minimum of +7 dBm. Adjust the spectrum analyzer to display the spurious products and ensure that the products are a minimum of 70 dB down from the 10 MHz reference signal.

5) Connect the test equipment as illustrated in **Figure 4-32** and set the signal generator to 10.01 MHz, CW, and at a 0 dBm level.

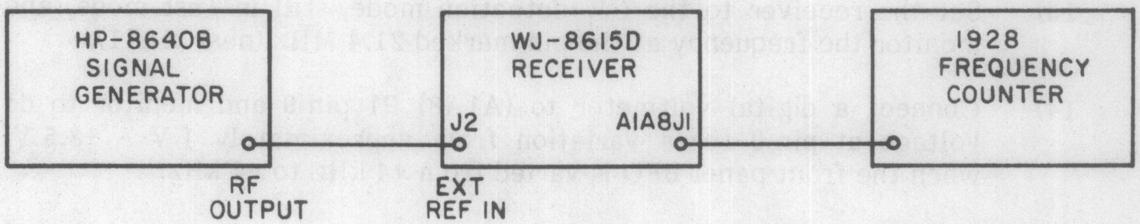


Figure 4-32. Reference Generator External Operation, Equipment Connections

6) Verify that the frequency indicated on the frequency counter is 10.01 MHz.

7) Disconnect the signal generator from the EXT REF IN (J2) and observe that the frequency counter indicates the same frequency as noted in Step 2.

8) Connect the test equipment as illustrated in **Figure 4-33.**

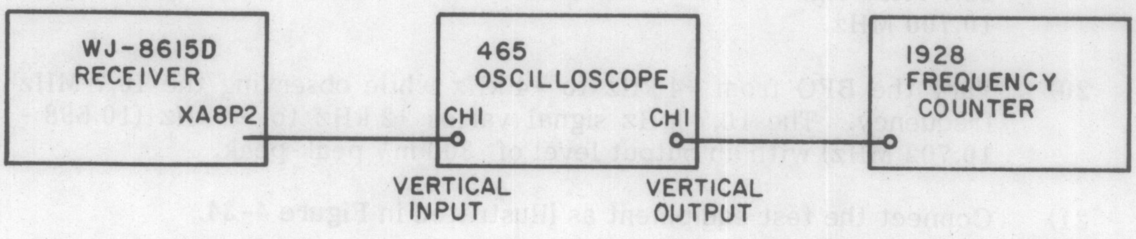


Figure 4-33. Reference Generator Waveform, Equipment Connections

9) Connect the oscilloscope probe to A8P2 pins 15, 17, and 13. Verify the presence and frequency of signals on the P2 connector pins for the A1A8 module.

P2 Pin	Frequency	Amplitude	Duty Cycle
15	1 MHz	4 Vpk	80%
17	250 kHz	4 Vpk	50%
13	250 kHz	4 Vpk	50%

10) Connect a digital voltmeter to A1A8P2 pin 3 (TP5) and adjust A1A8 C18 for 2.2 V.

11) With the receiver in SSB detection mode, connect the oscilloscope probe to the pin (on the bottom of the motherboard, near XA11) labeled 32.1 MHz and verify the presence of a signal.

12) Adjust (A1A8) L8 and L9 to produce a peak output level as observed on the oscilloscope at the 32.1 MHz pin.

13) Set the receiver to the CW detection mode, still in Test mode, and monitor the frequency at the pin marked 21.4 MHz (near XA11).

14) Connect a digital voltmeter to (A1A8) P1 pin 9 and monitor to dc voltage at pin 9 for a variation from approximately 1 V - +8.5 V, when the front panel BFO is varied from +4 kHz to -4 kHz.

15) Connect a frequency counter at (A1A8) P1 pin 5 and adjust (A1A8) C52 to produce a variation of 8 kHz in the 21.4 MHz output frequency when the BFO is varied from +4 kHz to -4 kHz.

16) Set the WJ-8615D BFO to 000 on the front panel and monitor the voltage at (A1A8) P1 pin 9. The voltage should read 4.55 Vdc.

17) Adjust R35 for a frequency reading of 21.400 MHz at (A1A8) P1 pin 5. Ensure the voltage level on the oscilloscope is 300 mV peak-peak.

18) Repeat Steps 15 through 17 and readjust as required.

19) Set the unit to SSB detection mode, the BFO to 000, and measure the 10.7 MHz signal (near XA11 labeled 10.7 MHz). The frequency is 10.700 MHz.

20) Vary the BFO from +4 kHz to -4 kHz while observing the 10.7 MHz frequency. The 10.7 MHz signal varies +2 kHz to -2 kHz (10.698 - 10.702 MHz) with an output level of 300 mV peak-peak.

21) Connect the test equipment as illustrated in **Figure 4-34**.

22) Offset the BFO to produce a voltage greater than 4.55 Vdc at (A1A8) P1 pin 5 and observe the oscilloscope. Channel 1 should display a sawtooth waveform. Verify that adjusting the BFO to its limit increases the sawtooth frequency.

23) Offset the BFO again to produce a voltage less than 4.55 Vdc at P1 pin 5. Verify that a sawtooth waveform is displayed on Channel 2 of the oscilloscope. Verify that adjusting the BFO to its limit, in the same direction causes the displayed sawtooth repetition rate to increase.

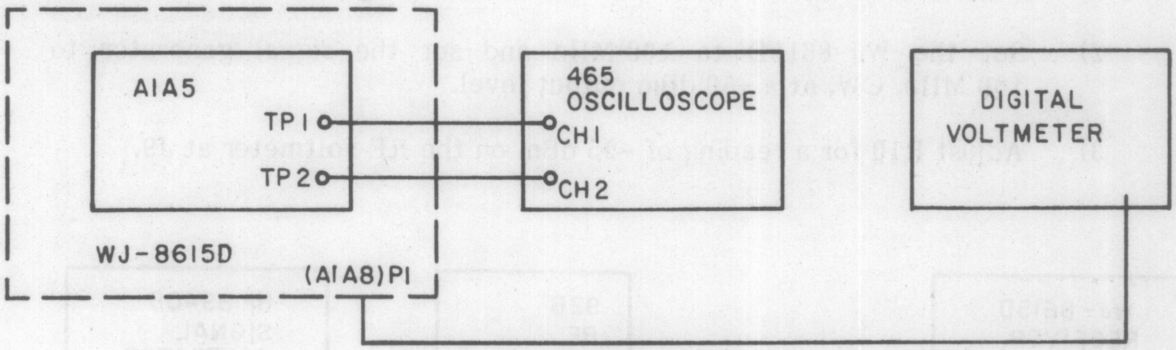


Figure 4-34. Variable BFO Alignment, Equipment Connections

24) Ensure the positive sawtooth peak is +3.5 V (as referenced to ground). Ensure the negative sawtooth peak is +0.4 V (as referenced to ground).

25) Disconnect all test equipment and reinstall all modules.

4.7.1.8 LO Synthesizer (A6 and A7), Alignment

Alignment of either the 1st LO Synthesizer or the 2nd LO Synthesizer should not be attempted due to the complexity of the test procedures and test equipment required. Alignment of the 1st LO and 2nd LO Synthesizers is not recommended. Alignment of both LO Synthesizer modules is extremely critical, requiring the utilization of an automatic test setup, and an extensive test procedure.

4.7.1.9 Analog/Digital (A1A4), Alignment

1) Place the WJ-8615D Receiver into the Diagnostic Test mode of operation. (Refer to **Section IV paragraph 4.5.2.5.**)

2) Set the COR LEVEL to display **b c** in the COR LEV display.

3) Depress the BANDWIDTH key to select bandwidths 1 through 5. Each time the SELECT BANDWIDTH pushbutton is depressed, hold the pushbutton in until the front panel display indicates the bandwidth and the bandwidth code.

4) Note the SS - dBm display for each bandwidth selected. Ensure that each bandwidth is within the limits listed in **Table 3-1.**

5) Adjust (A1A4) R12 to produce the best average indication for all five bandwidths.

4.7.1.10 **Wideband Output Amplifier (A2), Alignment**

1) Connect the test equipment as illustrated in **Figure 4-35.**

2) Set the WJ-8615D to 100 MHz and set the signal generator to 100 MHz, CW, at a -50 dBm output level.

3) Adjust R10 for a reading of -25 dBm on the RF voltmeter at J9.

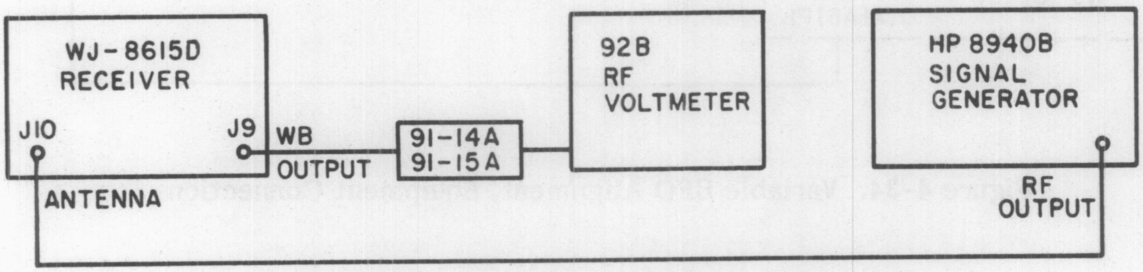


Figure 4-35. Wideband Amplifier, Equipment Connections

4) Reset the signal generator output level to -76 dBm and CW.

5) Observe the Wideband Output level, at J9, on the RF voltmeter. It should indicate no less than -30 dBm.

SECTION V

REPLACEMENT PARTS LIST

SECTION V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules) and parts. An example of the unit numbering method 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)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Reference Designation Prefixes are provided on drawings and illustrations in parentheses within the figure titles.

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
00779	AMP, Incorporated P.O. Box 3608 Harrisburg, PA 17105
01037	Pyroferric-New York, Inc. 621 E 216th Street Bronx, NY 10467
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, WI 53204
01281	TRW Semiconductors, Inc. 14520 Aviation Boulevard Lawndale, CA 90260
01295	Texas Instruments, Inc. Semiconductor-Components Div. 13500 North Central Expressway Dallas, Texas 75231
02114	Ferroxcube Corp. P.O. Box 359 Mt. Marion Road Saugerties, NY 12477
02735	RCA Corporation Solid State Division Route 202 Somerville, NJ 08876
04013	Taurus Corporation 1 Academy Hill Lambertville, NJ 08530

Mfr. Code	Name and Address
04213	Caddell-Burns Mfg. Co., Inc. 40 E. Second Street Mineola, NY 11501
04713	Motorola, Incorporated Semiconductor Products Division 5005 East McDowell Road Phoenix, AZ 80058
05245	Components Corporation 2857 N. Halsted Street Chicago, IL 60657
05397	Union Carbide Corporation Materials Systems Division 11901 Madison Avenue Cleveland, OH 44101
07263	Fairchild Camera & Instr., Corp. Semiconductor Division 464 Ellis Street Mountain View, CA 94040
09021	Airco Electronics, Inc. Bradford, PA 17055
09353	C & K Components, Inc. 103 Morse Street Watertown, MA 02172
14482	Watkins-Johnson Company 3333 Hillview Avenue Palo Alto, CA 94304
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, MD 20878
15542	Mini-Circuits Laboratory Div. of Scientific Comp. Corp. 2913 Quentin Road Brooklyn, NY 11229
16179	Omni-Sprectra, Inc. 24600 Hallwood Ct. Farmington, MI 48024
16428	Belden Corporation P.O. Box 1101 Richmond, IN 47374
17856	Siliconix, Inc. 2201 Laurelwood Rd. Santa Clara, CA 95050
18324	Signetics Corporation 811 East Arques Avenue Sunnyvale, CA 94086
19505	Applied Engineering Products Co. Division of Samarius, Inc. 300 Seymour Avenue Derby, CT 06418
22526	Berg Electronics, Inc. Youk Expressway New Cumberland, PA 17070
24355	Analog Devices, Inc. P.O. Box 280 Norwood, MA 02062
24539	Avantek, Inc. 3175 Bowers Ave. Santa Clara, CA 95051
25088	Siemens America, Inc. 186 Wood Avenue S. Iselin, NJ 08830
27014	National Semi-Conductor Corp. 2950 San Ysidro Way Santa Clara, CA 95051
27956	Relcom 3333 Hillview Ave. Palo Alto, CA 94304
28480	Hewlett-Packard Co. Corporate Headquarters 1501 Page Mill Road Palo Alto, CA 94304

Mfr. Code	Name and Address	Mfr. Code	Name and Address
29990	American Technical Ceramics Division of Phase Industries 1 Norden Lane Huntington Station, NY 11746	71400	Bussman Manufacturing Division of McGraw-Edison Co. 2536 W. University Street St. Louis, MO 63107
31433	Union Carbide Corp. Highway 276, S.E. Greenville, SC 29606	72136	Electro Motive Mfg. Co., Inc. South Park & John Streets Willimantic, CT 06226
31918	IEE/Schadow, Inc. 8081 Wallace Road Eden Prairie, MN 55343	72982	Erie Tech. Products, Inc. 644 West 12th Street Erie, PA 16512
33095	Spectrum Control, Inc. 152 E. Main Street Fairview, PA 16415	73138	Beckman Instr., Inc. Helipot Division 2500 Harbor Blvd. Fullerton, CA 92634
34649	Intel Corp. 3065 Bowers Avenue Santa Clara, CA 95051	73445	Amperex Elctrnc. Corp. 230 Duffy Avenue Hicksville, LI, NY 11802
52648	Plessey Memories, Inc. DBA Plessey Semiconductors 1674 McGraw Avenue Santa Ana, CA 92705	73899	JFD Electronics Co. 15th at 62nd Street Brooklyn, NY 11219
52673	KSW Electronics Corp. South Bedford St. Burlington, MA 01803	74306	Piezo Crystal Co. 100 K Street Carlisle, PA 17013
55322	Samtech Inc. 810 Progress Blvd. New Albany, IN 47150	75378	CTS Knights Inc. 400 Reimann Ave Sandwich, IL 60548
56289	Sprague Electric Co. Marshall Street North Adams, MA 01247	76055	Mallory Controls Div. P.R. Mallory and Co., Inc. P.O. Box 327 State Road 28 W Frankfort, IN 46041
70903	Belden Corporation 415 South Kilpatrick Chicago, IL 60644	80058	Joint Electronic Type Designation System
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, MA 02138	80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, DC 20006

Mfr. Code	Name and Address
80294	Bourns, Incorporated Instrument Division 6135 Magnolia Avenue Riverside, CA 92506
81073	Grayhill Incorporated 561 Hillgrove Avenue LaGrange, IL 60525
81349	Military Specifications
81350	Joint Army-Navy Specifications
82389	Switchcraft, Inc. 5555 North Elston Avenue Chicago, IL 60630
91293	Johanson Mfg. Company P.O. Box 329 Boonton, NJ 07005
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, IL 60646
91506	Augat, Incorporated 33 Perry Avenue Attleboro, MA 02703
91984	Maida Development Co. 214 Academy Street Hampton, VA 23369
92194	Alpha Wire Corporation 711 Lidgerwood Avenue Elizabeth, NJ 07207
94375	Plessey Connector Division, Inc. 400 Moreland Road Commach, Long Island, NY 11725
95121	Quality Components, Inc. P.O. Box 113 St. Mary's, PA 15857

5.4 PARTS LIST

The parts list which follows contains all electrical parts used in the equipment and certain mechanical parts which are subject to unusual wear or damage. When ordering replacement parts from the Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation and description of each part ordered. The list of manufacturers provided in **paragraph 5.3** and the manufacturer's part number for components are included as a guide to the user of the equipment in the field. These parts may not necessarily agree with the parts installed in the equipment; however, the parts specified in this list will provide satisfactory operation of the equipment. Replacement parts may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original indicated part. In the case of components 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.

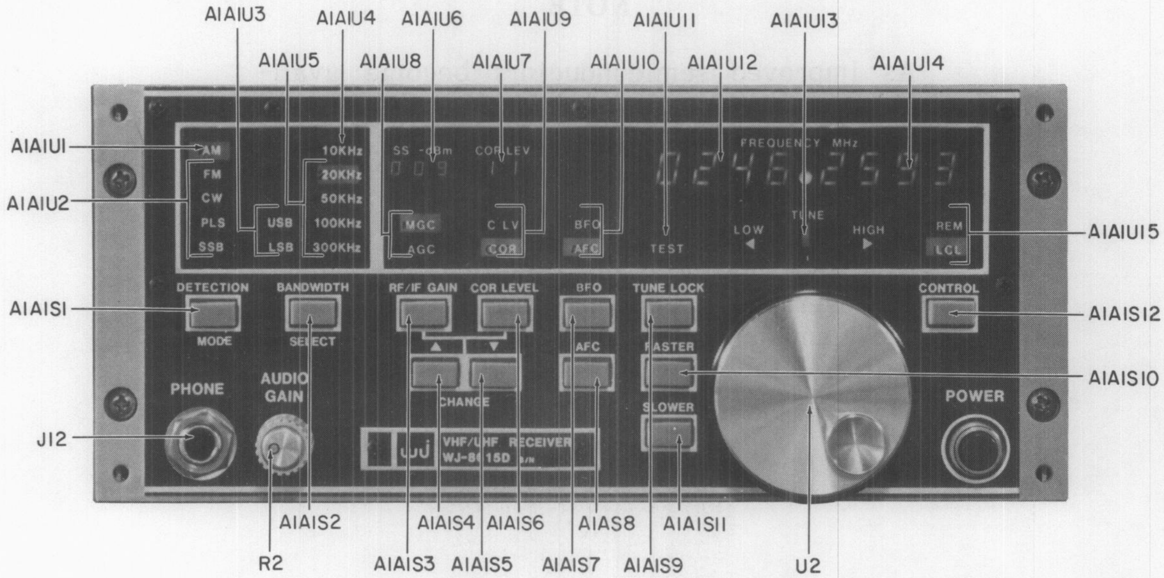


Figure 5-1. Type WJ-8615D VHF/UHF Compact Receiver, Front View Location of Components

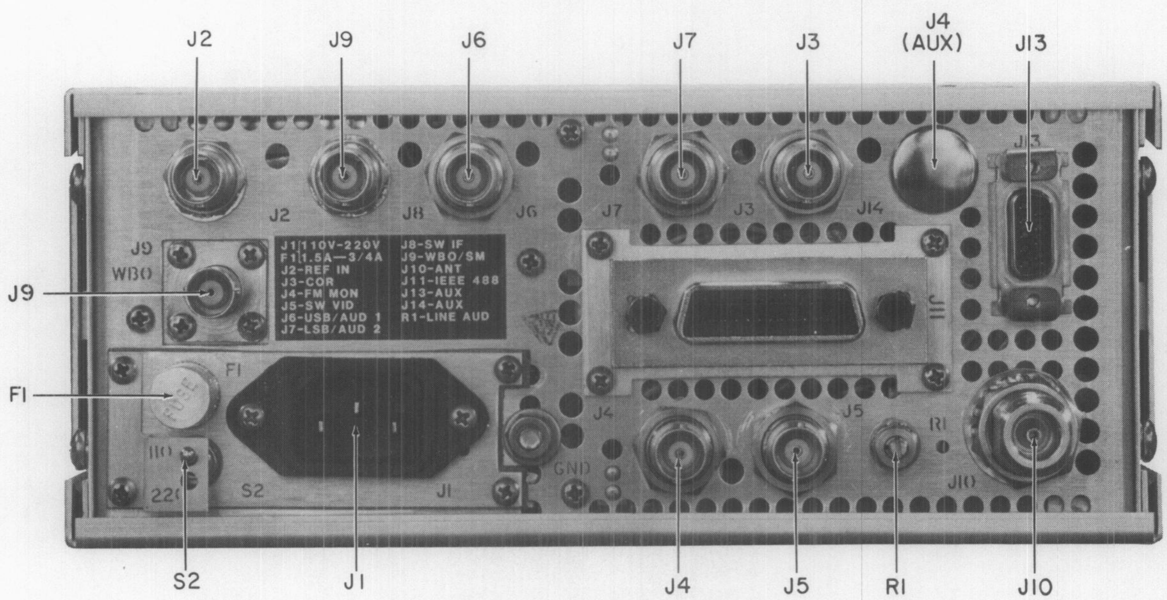
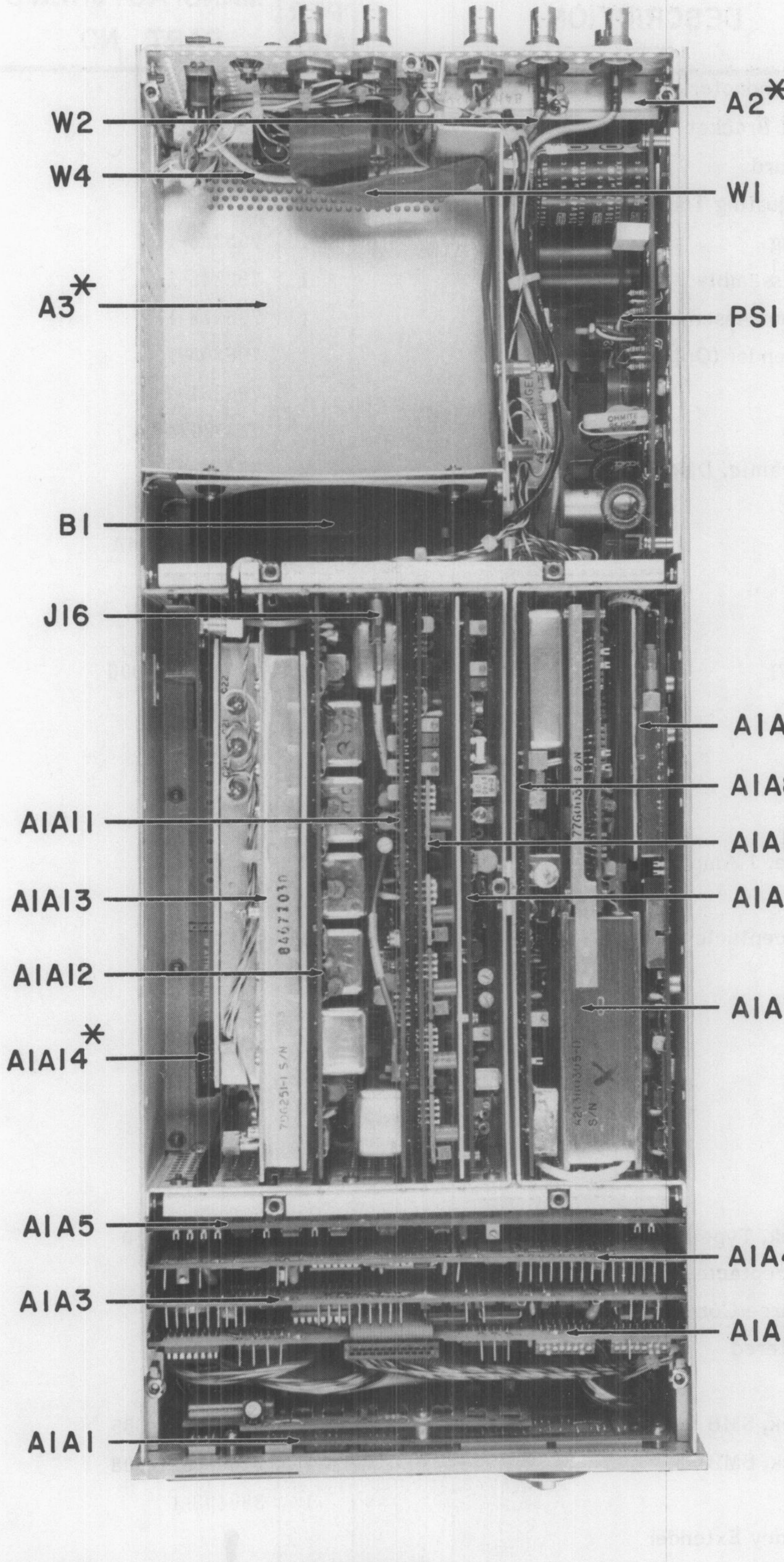


Figure 5-2. Type WJ-8615D VHF/UHF Compact Receiver, Rear View Location of Components

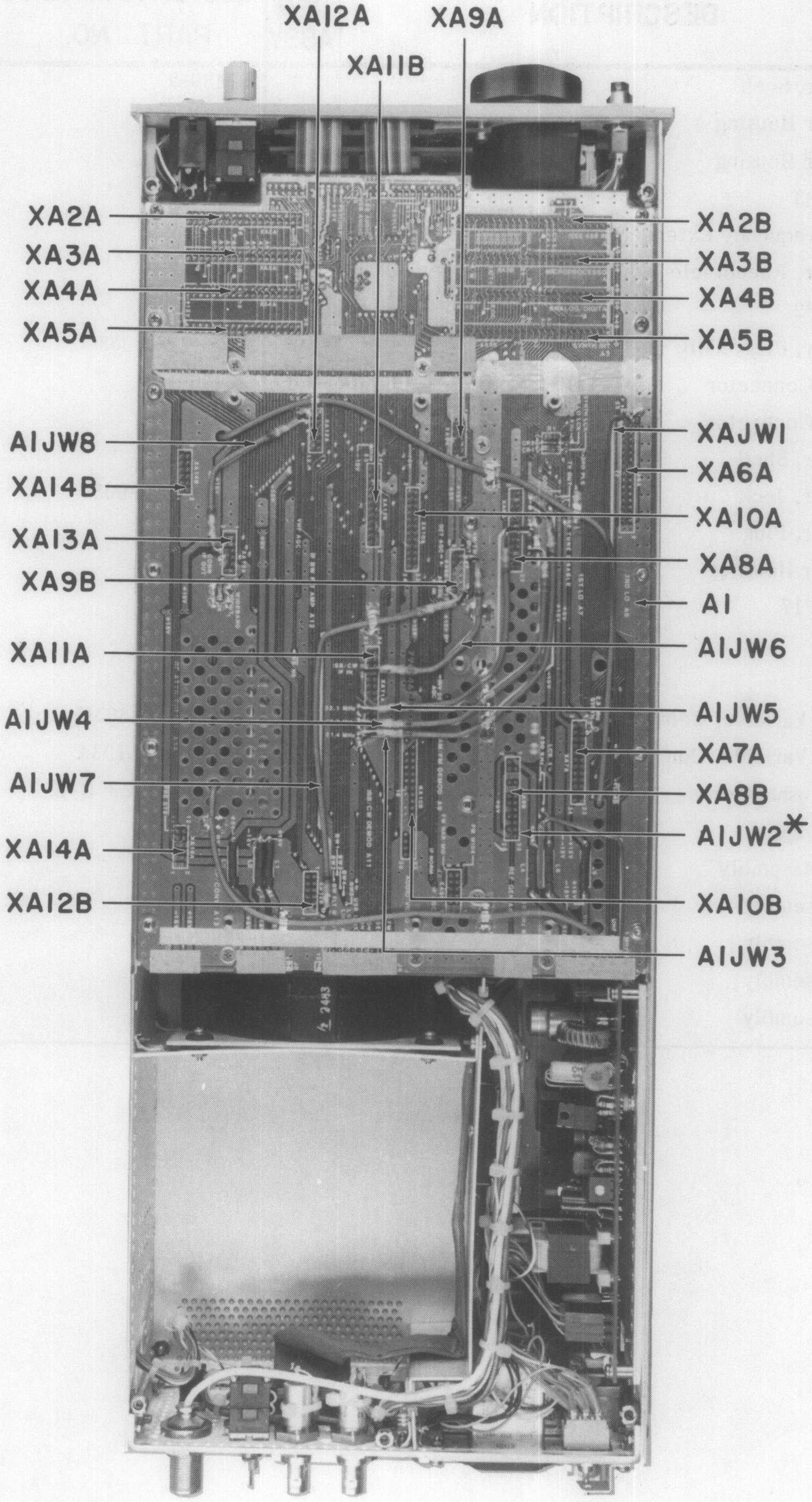
5.5 **TYPE WJ-8615D VHF/UHF COMPACT RECEIVER, MAIN CHASSIS**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
AI-1	Line, Cord 3 Conductor, 6 FT	1	17600	16428	
AI-2	Center Support Bracket	1	280505-1	14632	
AI-3	Handle, PC Board	1	15689-1	14632	
AI-4	Alignment, Adjusting Tool	1	5284	73899	
AI-5	Connector, Plug	1	205206-1	00779	
A1	Motherboard Assembly	1	796246-1	14632	
A2	Wideband Output Assembly (Optional)	1	796318-1	14632	
A3	Frequency Extender (Optional)	1	796303-1	14632	
A4	Line Filter	1	796351-1	14632	
B1	Blower Fan	1	TFD8024RA	99999	
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	2	34453-1	14632	
C2	Same as C1				
FB1	Ferrite Bead	10	56-590-65-4A	02114	
FB2 Thru FB10	Same as FB1				
FL1	Filter, EMI, RFI	3	1240-030-0000	72982	
FL2	Filter, EMI	2	52-706-301	33095	
FL3	Same as FL2				
FL4	Same as FL1				
FL5	Same as FL1				
F1	Fuse, Cartridge, 1 Amp Slo-Blo	2	213001	79515	
J1	Filter, Power	1	1EF1	05245	
J2	Connector, Receptacle	2	225398-7	00779	
J3	Part of FL1				
J4	Part of FL2				
J5	Part of FL3				
J6	Part of FL4				
J7	Part of FL5				
J8	Same as J2				
J9	Part of A2				
J10	Connector, Jack, Type N	1	3004-7388-10	16179	
J11	Connector, Receptacle	1	553122-1	00779	
J12	Phone Jack, Three Conductor	1	L-112B	82389	
J13	Connector, Filtered	1	841251-1	00779	
J14	Not Used				
J15	Connector, Jack, SMB	1	2106-7521-005	19505	
J16	Connector, Jack, SMB	1	2106-7521-008	19505	
PS1	Power Supply	1	380408-1	14632	
P1	Part of Frequency Extender				
P2	Connector Housing	2	87499-7	00779	



*DENOTES OPTIONAL COMPONENT

Figure 5-3. Type WJ-8615D VHF/UHF Compact Receiver, Top View Location of Components



* DENOTES HIDDEN COMPONENT

Figure 5-4. Type WJ-8615D VHF/UHF Compact Receiver, Bottom View Location of Components

MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
P3	Connector, Shell	2	87499-9	00779	
P4	Connector Housing	1	2-87499-1	00779	
P5	Connector Housing	1	87499-3	00779	
P6	Same as P3				
P7	Part of Frequency Extender				
P8	Connector, Receptacle	1	1-88377-0	00779	
P9	Same as P2				
P10	Connector, Plug, SMB	1	2105-7521-008	19505	
P11	Housing, Connector	1	87456-4	00779	
P12	Housing, Connector	1	87456-6	00779	
P13	Connector, Shell	1	87456-8	00779	
P15	Connector, Jack	1	2002-7571-005	19505	
P16	Connector, Plug	1	640441-4	99999	
P17	Connector Housing	2	102269-4	00779	
P18	Same as P17				
P19	Housing	1	640440-3	00779	
P20	Housing	1	2-64044-0	00779	
R1	Resistor, Variable, Composition: 50 kΩ, 10%, 1 W	1	70C3L040L503U	01121	
R2	Resistor, Variable, Composition: 10 kΩ, 10%, 1 W	1	70C3N048L103A	01121	
S1	Switch, Pushbutton	1	8161-S-H-Z3-Q-E	09353	
S2	Switch, Toggle	1	MTA-306D	95146	
U1	Encoder Assembly	1	SP-16		
W1	Cable Assembly	1	380511-1	14632	
W2	Cable Assembly	1	280574-1	14632	
W3	Cable Assembly	1	280575-1	14632	
W4	Cable Assembly	1	280573-1	14632	

5.5.1 **TYPE 796246-1 MOTHERBOARD ASSEMBLY** REF DESIG PREFIX **A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Front Panel Display	1	796260-1	14632	
A2	IEEE 488/Interrupt	1	796243-1	14632	
A3	Microprocessor	1	796242-1	14632	
A4	Analog/Digital	1	796244-1	14632	
A5	Synthesizer Interface	1	796245-1	14632	
A6	2nd LO Synthesizer	1	776004-1	14632	
A7	1st LO Synthesizer	1	776003-1	14632	
A8	Reference Generator	1	796247-1	14632	
A9	AM/FM Demodulator	1	796249-1	14632	
A10	Audio/Video	1	796248-1	14632	
A11	CW Demodulator Switched IF	1	796317-1	14632	
A12	IF BW Filter	1	726006-1	14632	
A13	RF Converter	1	796251-1	14632	
A14	RF Input Filter	1	796291-1	14632	
CR1	Diode	2	1N4449	80131	
CR2	Same as CR1				
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 100 V	45	8121-100-651-103M	72982	
C2 Thru C7	Same C1				
C8	Capacitor, Ceramic, Monolithic: 470 pF, 5%, 100 V	12	8121-100-C0G0-471J	72982	
C9 Thru C17	Same C8				
C18 Thru C22	Same as C1				
C23	Capacitor, Ceramic, Disc: .01 µF, 10%, 100 V	37	CK05BX103K	81349	
C24 Thru C30	Same as C23				
C31	Same as C1				
C32	Same as C23				
C33	Same as C1				
C34	Same as C1				
C35 Thru C38	Same as C23				
C39	Same as C1				
C40	Same as C23				
C41	Same as C23				
C42	Same as C1				
C43 Thru C64	Same as C23				
C65	Capacitor, Ceramic, Disc: .01 µF, 20%, 200 V	2	8131A200Z5U103M	72982	

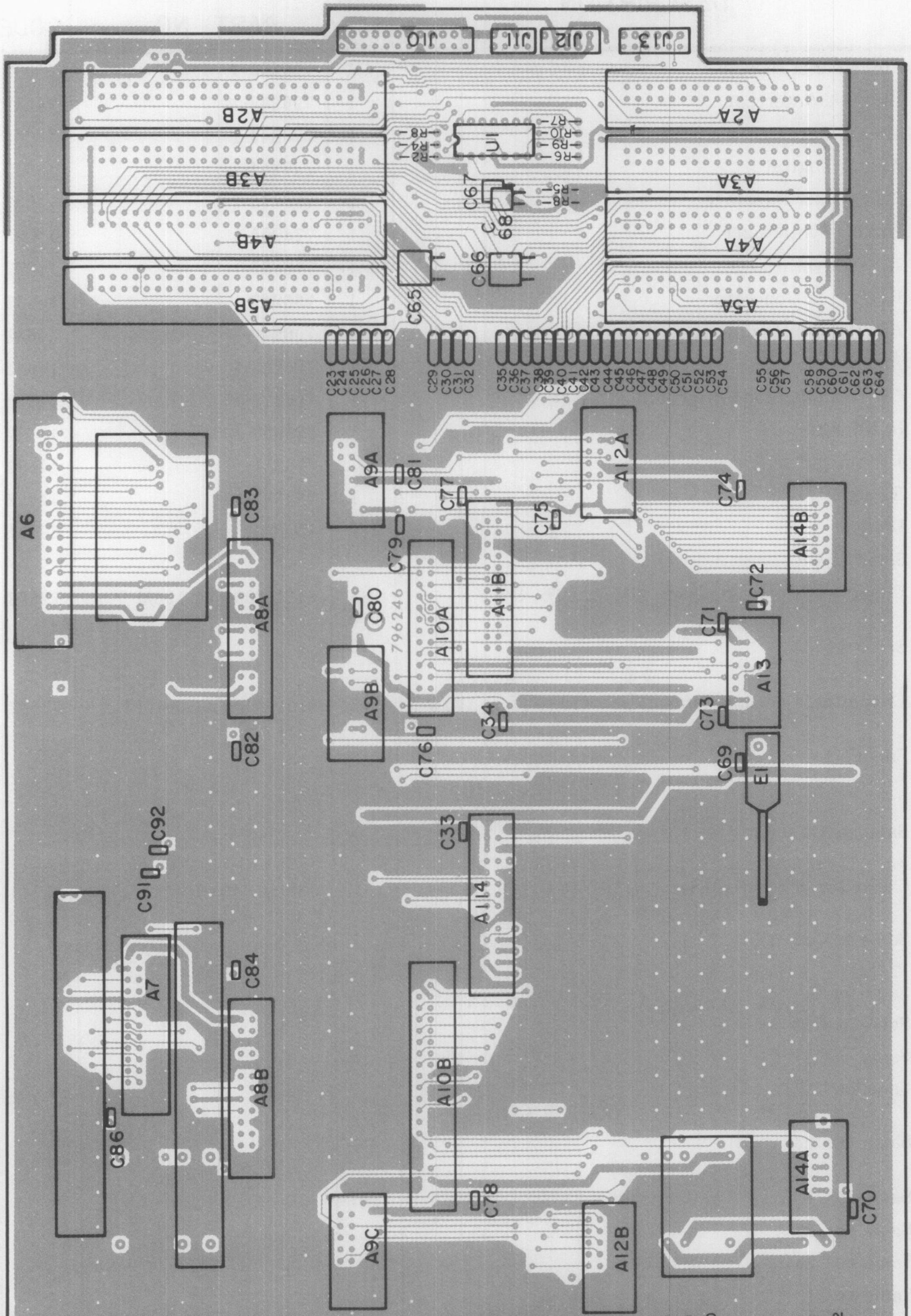


Figure 5-5. Type 796246-1, Motherboard Assembly (A1), Top View, Location of Components

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C66	Same as C65				
C67	Same as C8				
C68	Same as C8				
C69 Thru C96	Same as C1				
C97	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	2	8121-050-651-104M	72982	
C98	Same as C97				
J1	Post, Feedthru	12	PE7-14045	00779	
J2 Thru J7	Same as J1				
J8	Not Used				
J9 Thru J13	Same as J1				
L1	Inductor Assembly	6	180227-1	14632	
L2 Thru L6	Same as L1				
P1	Not Used				
P2	Not Used				
P3	Connector, Plug	3	17-0402/RD178	19505	
P4	Same as P3				
P5	Connector, Plug	2	2105-7521-005	19505	
P6	Same as P5				
P7	Same as P3				
R1	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R2	Resistor, Fixed, Composition: 10 MΩ, 5%, 1/8 W	1	RCR05G106JS	81349	
R3	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	4	CF1/8-10K/J	09021	
R4	Same as R3				
R5	Same as R3				
R6	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	2	CF1/8-47K/J	09021	
R7	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	2	CF1/8-56 OHMS/J	09021	
R8	Same as R3				
R9	Same as R6				
R10	Same as R7				
U1	Quad Operational Amplifier	1	MC3403P	04713	
W1	Not Used				
W2	Cable Assembly	1	280556-1	14632	
W3	Cable Assembly	1	280555-1	14632	
W4	Cable Assembly	1	280571-1	14632	
XA6	Same as XA2A				
XA7	Header Assembly	2	532950-5	00779	

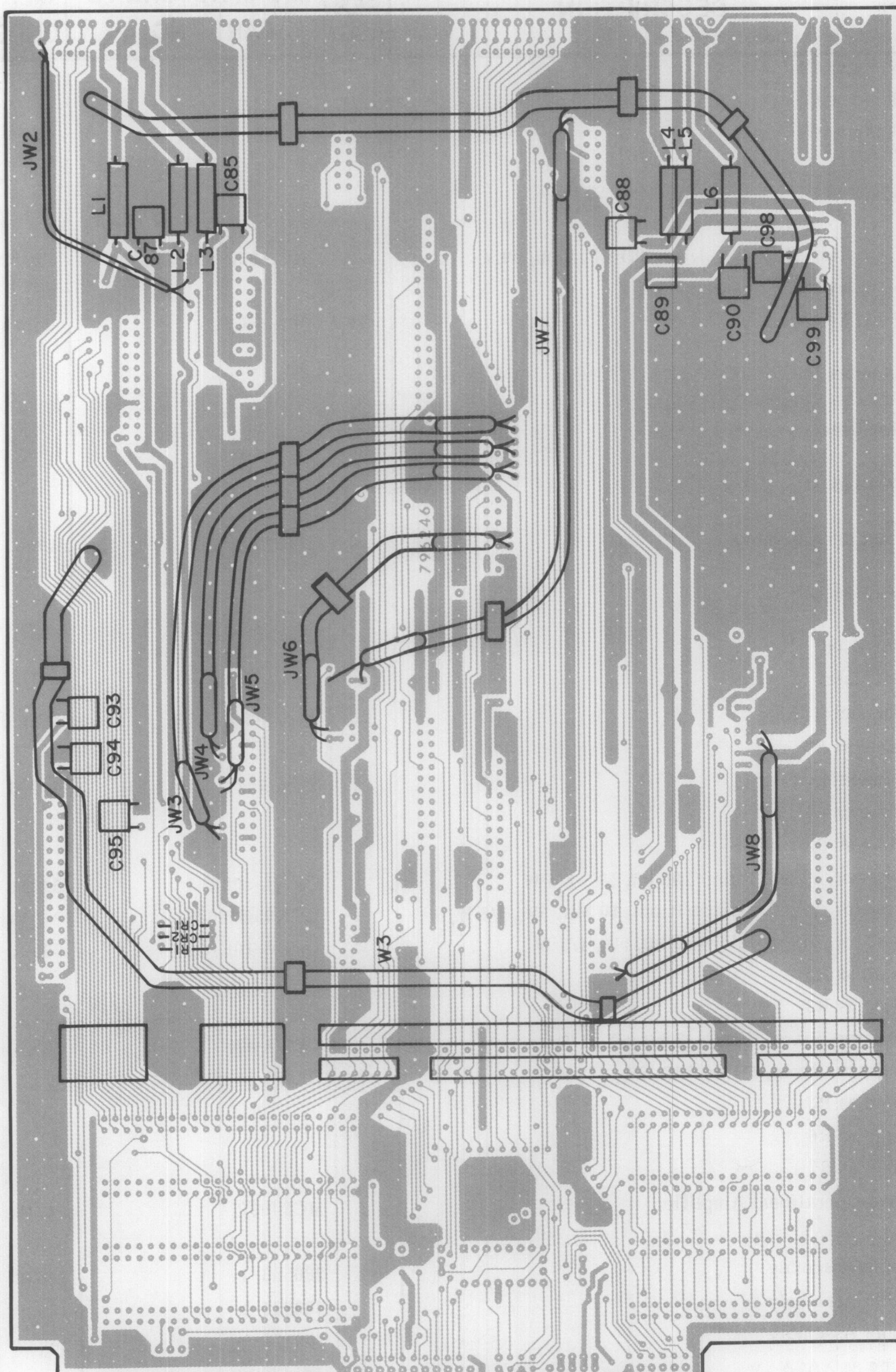


Figure 5-6. Type 796246-1, Motherboad Assembly (A1), Bottom View Location of Components

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
XA13	Same as XA9A				
XA2A	Header Assembly	6	532950-2	00779	
XA2B	Header Assembly	4	532950-3	00779	
XA3A	Same as XA2A				
XA3B	Same as XA2B				
XA4A	Same as XA2A				
XA4B	Same as XA2B				
XA5A	Same as XA2A				
XA5B	Same as XA2B				
XA8A	Header Assembly, Modified	4	280494-2	14632	
XA8B	Same as XA8A				
XA9A	Header Assembly	6	532950-4	00779	
XA9B	Same as XA9A				
XA9C	Same as XA9A				
XA10A	Same as XA7				
XA10B	Same as XA2A				
XA11A	Same as XA8A				
XA11B	Same as XA8A				
XA12A	Header Assembly, Modified	2	280494-1	14632	
XA12B	Same as XA12A				
XA14A	Same as XA9A				
XA14B	Same as XA9B				

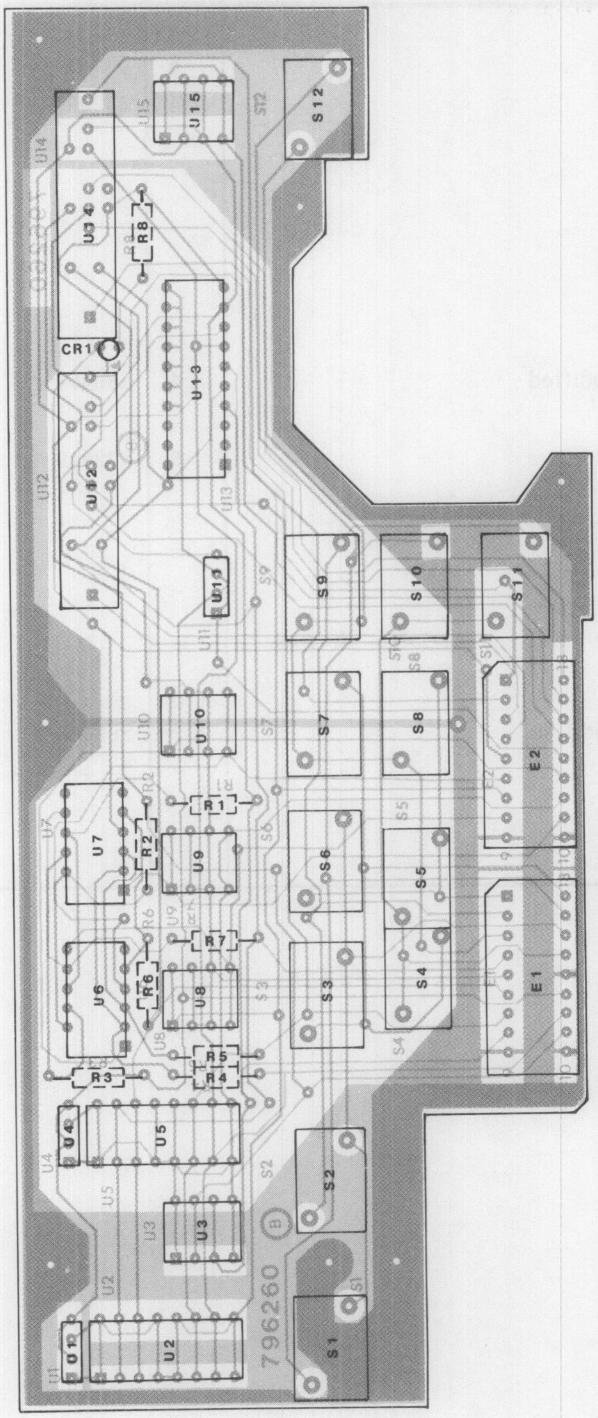


Figure 5-7. Type 796260-1, Front Panel Display (A1A1)
Location of Components

5.5.1.1 **Type 796260-1 Front Panel Display** REF DESIG PREFIX **A1A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Display Driver Assembly	1	380411-1	14632	
CR1	Diode	1	HLMP-1301	28480	
P1	Cable, Plug	2	CP-18-D-2-SR1	55322	
P2	Same as P1				
R1	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	8	CF1/8-56 OHMS/J	09021	
R2 Thru R8	Same as R1				
S1	Keyswitch	12	MDP-AG-160520	31918	
S2 Thru S12	Same as S1				
U1	LED Light Bar	3	HLMP-2300	28480	
U2	LED Light Bar	2	HLMP-2620	28480	
U3	LED Light Bar	5	HLMP-2600	28480	
U4	Same as U1				
U5	Same as U2				
U6	LED Display	2	DL-330M	25088	
U7	Same as U6				
U8	Same as U3				
U9	Same as U3				
U10	Same as U3				
U11	Same as U1				
U12	Display	2	DL-4770	25088	
U13	10 Element Bar Graph	1	HDSP-4820	28480	
U14	Same as U12				
U15	Same as U3				

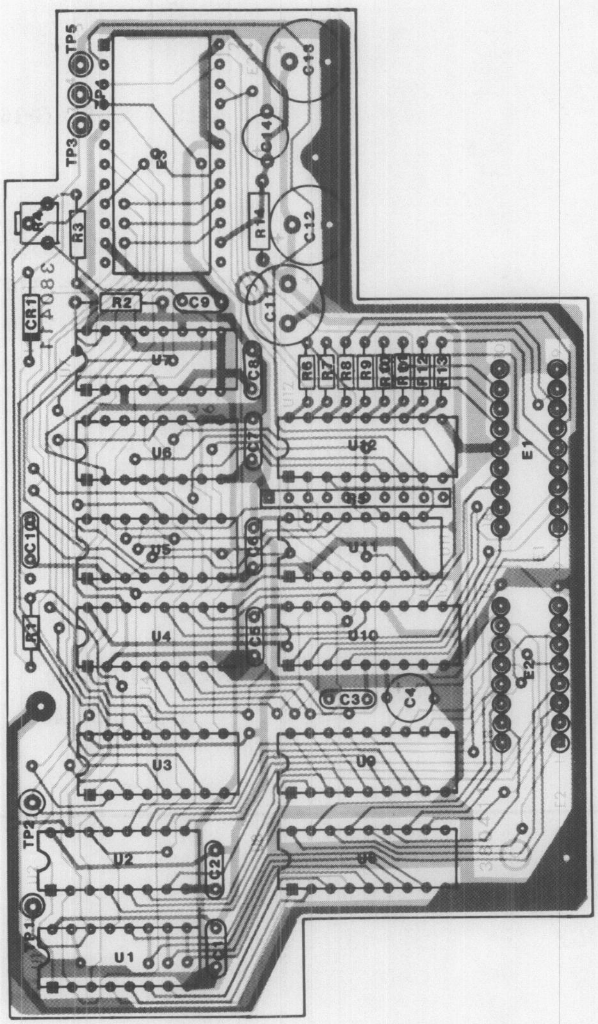


Figure 5-8. Part 380411-1, Front Panel Display Driver Assembly (A1A1A1) Location of Components

5.5.1.1.1 **Part 380411-1 Front Panel Display Driver Assembly** REF DESIG PREFIX A1A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	1	1N4449	80131	
C1	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	5	34475-1	14632	
C2	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	3	34453-1	14632	
C3	Same as C1				
C4	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	196D475X0035JE3	56289	
C5	Same as C1				
C6	Same as C2				
C7	Same as C1				
C8	Same as C2				
C9	Capacitor, Ceramic, Disc: .022 µF, 10%, 100 V	1	CK06BX223K	81349	
C10	Capacitor, Ceramic, Disc: 47 pF, 5%, 100 V	1	8111-100-C0G0-470J	72982	
C11	Capacitor, Electrolytic, Aluminum: 1000 µF, 6.3 V	3	ECE-AOJV102S	61058	
C12	Same as C11				
C13	Same as C11				
C14	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
P1	Cable Plug Assembly	1	280529-1	14632	
R1	Resistor, Fixed, Film: 390Ω, 5%, 1/4 W	1	CF1/4-390 OHMS/J	09021	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
R3	Resistor, Fixed, Film: 5.6 kΩ, 5%, 1/4 W	1	CF1/4 5.6K/J	09021	
R4	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	62PAR100K	73138	
R5	Resistor, Network	1	765-1-R10K	73138	
R6	Resistor, Fixed, Film: 5.6Ω, 5%, 1/8 W	8	CF1/8-5.6 OHMS/J	09021	
R7 Thru R13	Same as R6				
R14	Resistor, Fixed, Film: 2.7Ω, 5%, 1/4 W	1	CF1/4-2.7/OHMS/J	09021	
U1	8-Bit Addressable Latch	2	SN74LS259N	01295	
U2	Same as U1				
U3	TTL-LS Multiplexer	1	SN74LS157N	01295	
U4	CMOS Hex Buffer 3-State	1	MM80C97N	27014	
U5	64-Bit Random Access Memories	2	SN74LS189AN	01295	
U6	Integrated Circuit	1	SN74LS161AN	01295	
U7	Integrated Circuit	1	SN74LS123N	01295	
U8	Darlington Transistor Array	2	ULN-2813A	56289	
U9	Same as U8				
U10	CMOS 16 Key Encoder	1	MM74C922N	27014	
U11	Same as U5				
U12	Source Driver	1	UDN2981A	56289	

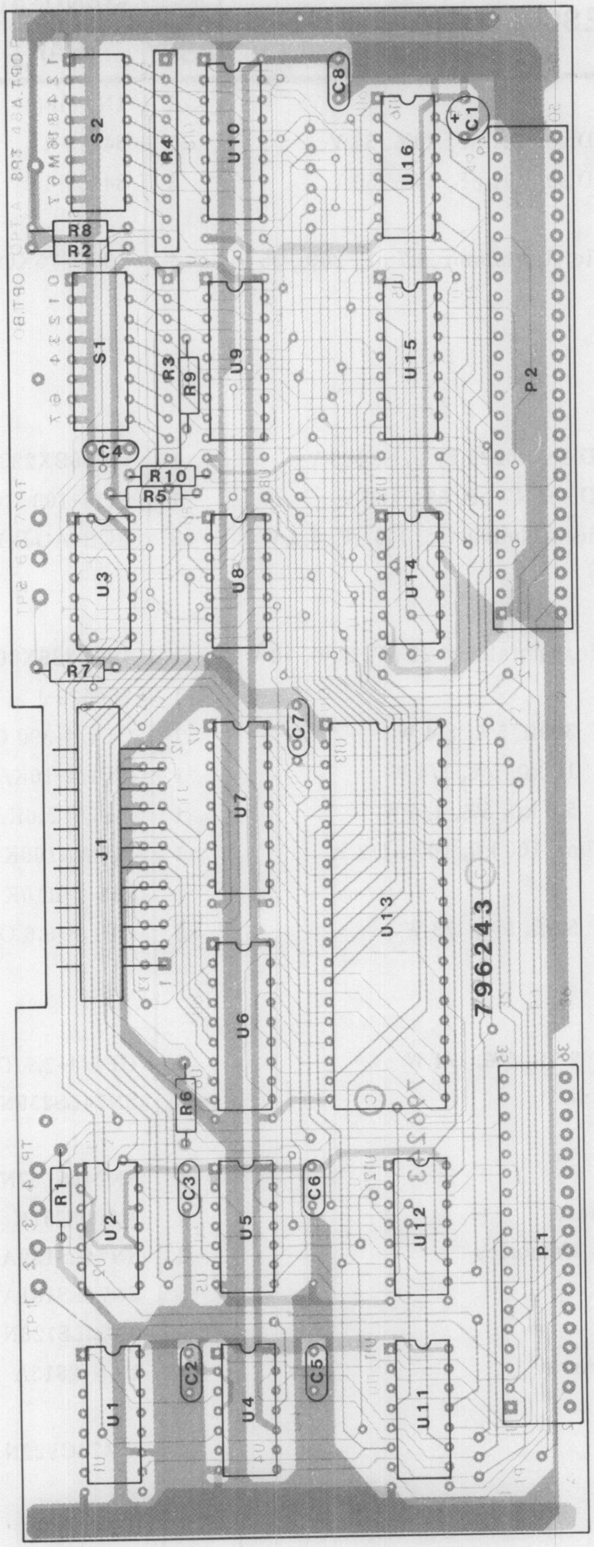


Figure 5-9. Type 796243-1, IEEE-488/Interrupt (A1A2)
Location of Components

5.5.1.2 **Type 796243-1 IEEE-488/Interrupt** REF DESIG PREFIX **A1A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 220 μF, 20%, 10 V	1	196D227X0010TE4	56289	
C2	Capacitor, Ceramic, Disc: 0.1μF, 20%, 50 V	3	34475-1	14632	
C3	Same as C2				
C4	Same as C2				
C5	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	4	34453-1	14632	
C6	Same as C5				
C7	Same as C5				
C8	Same as C5				
J1	Connector, Receptacle	1	65624-124	22526	
P1	Receptable Assembly	1	102585-8	00779	
P2	Receptacle Assembly	1	102585-3	00779	
R1	Resistor, Fixed, Film: 2.7 MΩ, 5%, 1/4 W	2	CF1/4-2.7M/J	09021	
R2	Same as R1				
R3	Resistor, Network	2	765-1-R22K	73138	
R4	Same as R3				
R5	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	5	CF1/4-100K/J	09021	
R6 Thru R9	Same as R5				
R10	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF1/4-10K/J	09021	
S1	Switch, DIP	2	76PSB08S	81073	
S2	Same as S1				
TP1	Test Point	8	460-2970-02-04-00	71279	
TP2 Thru TP8	Same as TP1				
U1	14 Bit Ripple Counter	1	CD4020BE	02735	
U2	CMOS Dual Flip-Flop, Type D	2	MM74C74N	27014	
U3	Hex Schmitt Trigger	1	MM74C14N	27014	
U4	Same as U2				
U5	Dual 4-Input Nand Gate	1	MM74C20N	27014	
U6	Octal GPIB Transceiver	1	841137-2	14632	
U7	Octal GPIB Transceiver	1	841137-1	14632	
U8	CMOS Hex Buffer 3-State	1	MM80C97N	27014	
U9	8-Bit Latch	3	MM74C373N	27014	
U10	Same as U9				
U11	ISO-CMOS Octal Decoder	2	MD74SC138AC	36665	
U12	Same as U11				
U13	General Purpose Interface Adapter	1	MC68B488	04713	
U14	CMOS Dual Expandable A01 Gate	1	MC145068BCP	04713	
U15	Same as U9				
U16	Hex Flip-Flop, Type D	1	MM74C174N	27014	
XU13	Socket, IC	1	540AG10D	91506	

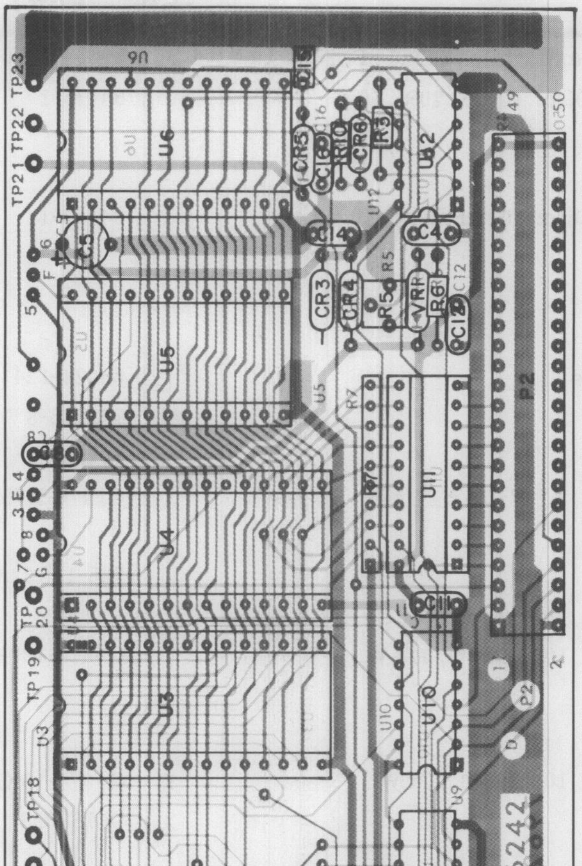


**Figure 5-10. Type 796242-1 Microprocessor (A1A3)
Location of Components**

5.5.1.3 **Type 796242-1 Microprocessor** REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
BT1	Battery	1	1935	00681	
CR1	Diode	1	1N995	80131	
CR2	Not Used				
CR3	Not Used				
CR4	Diode	1	1N4003	80131	
CR5	Diode	1	5082-2800	28480	
C1	Capacitor, Mica, Dipped: 27 pF, 2%, 500 V	2	CM04ED270G03	81349	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	9	34453-1	14632	
C4	Same as C3				
C5	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 15 V	1	196D226X0015KE3	56289	
C6 Thru C11	Same as C3				
C12	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	2	34475-1	14632	
C13	Capacitor, Micro-Q, Dipped: .03 µF, 25 V, 50 V, 2 Pin	1	Q-17.03	31745	
C14	Same as C12				
C15	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	1	B-GP1000PFP	91418	
P1	Receptable Assembly	1	102585-8	00779	
P2	Receptable Assembly	1	102585-3	00779	
R1	Resistor, Network	1	765-1-R10K	73138	
R2	Resistor, Fixed, Film: 300 kΩ, 5%, 1/4 W	1	CF1/4-300K/J	09021	
R3	Resistor, Fixed, Film: 200 kΩ, 5%, 1/4 W	1	CF1/4-200K/J	09021	
R4	Not Used				
R5	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R6	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	1	CF1/4-1M/J	09021	
R7	Resistor, Network	2	765-1-R22K	73138	
R8	Same as R7				
R9	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R10	Resistor,Fixed, Film: 6.2 MΩ, 5%, 1/4 W	1	CF1/4-6.2M/J	09021	
TP1	Pin, Test Point	23	460-2970-02-04-00	71279	
TP2 Thru TP23	Same as TP1				
U1	Decoder, BCD to Decimal	1	SN74LS145N	01295	
U2	DIP Header, Programmed	1	180246-1	14632	
U3	EPROM, Programmed	1	190169-86	14632	
U4	EPROM, Programmed	1	190169-87	14632	
U5	Not Used				
U6	2048-Word X 8-Bit Ram	1	HM6116LP-4	58014	
U7	2 MHz 8-Bit Microprocessor	1	MC68B09P	04713	

REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U8	CMOS Octal Decoder/Demultiplexer	1	MD74SC139AC	36665	
U9	Integrated Circuit	1	SN74LS32N	01295	
U10	Hex Inverter, TTL-LS	1	SN74LS04N	01295	
U11	ISO-CMOS Octal Bus Transceiver	1	MD74SC245AC	36665	
U12	CMOS Quad 2 Input Nand Gate	1	MM74C00N	27014	
U13	ISO-CMOS, 3-State Octal Buffer, Line Driver	1	MD74SC244AC	36665	
VR1	Diode	1	1N746A	80131	
XU2	Socket, IC 20 Pin DIP	3	ICL-203-S6-G	06776	
XU3	Socket, IC 28 Pin DIP	2	528AG10D	91506	
XU4	Same as XU3				
XU5	Socket, IC 24 Pin DIP	2	524-AG10D	91506	
XU6	Same as XU5				
XU7	Socket, IC 40 Pin DIP	1	540AG10D	91506	
XU11	Same as XU2				
XU13	Same as XU11				
Y1	Crystal, Quartz: 4.91520 MHz	1	MP042	75378	

5.5.1.4 **Type 796244-1 Analog/Digital** REF DESIG PREFIX **A1A4**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	2	1N4003	80131	
CR2	Same as CR1				
CR3	Diode	3	1N4449	80131	
CR4	Same as CR3				
CR5	Same as CR3				
C1	Capacitor, Ceramic, Disc: 4700 pF, 10%, 200 V	1	CK05BX472K	81349	
C2	Capacitor, Ceramic, Disc: 1000 pF, 10%, 200 V	10	CK05BX102K	81349	
C3	Same as C2				
C4	Same as C2				
C5	Capacitor, Ceramic, Disc: .033 μF, 10%, 100 V	1	CK06BX333K	81349	
C6	Same as C2				
C7	Capacitor, Ceramic, Disc: 1.0 μF, 20%, 50 V	1	8131-050-651-105M	72982	
C8	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	10	34453-1	14632	
C9	Same as C2				
C10	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	2	34452-1	14632	
C11	Same as C10				
C12	Same as C2				
C13	Capacitor, Electrolytic, Tantalum: 4.7 μF, 20%, 35 V	2	196D475X0035JE3	56289	
C14	Same as C13				
C15	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	4	196D225X0035JE3	56289	
C16	Same as C15				
C17	Same as C15				
C18	Same as C8				
C19	Same as C8				
C20	Same as C8				
C21	Same as C15				
C22	Same as C8				
C23	Same as C8				
C24	Same as C8				
C25	Capacitor, Electrolytic, Tantalum: 22 μF, 20%, 10 V	1	196D226X0010JE3	56289	
C26	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	4	34475-1	14632	
C27	Same as C26				
C28	Same as C26				
C29	Same as C8				
C30	Same as C8				
C31	Same as C8				
C32	Same as C2				
C33	Same as C2				
C34	Capacitor, Micro-Q, Dipped: .03 μF, Z5V, 50 V	1	Q-20.03	31745	
C35	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	
C36	Same as C2				
C37	Same as C2				
C38	Same as C26				
E1	Test Point	20	460-2970-02-04-00	71279	

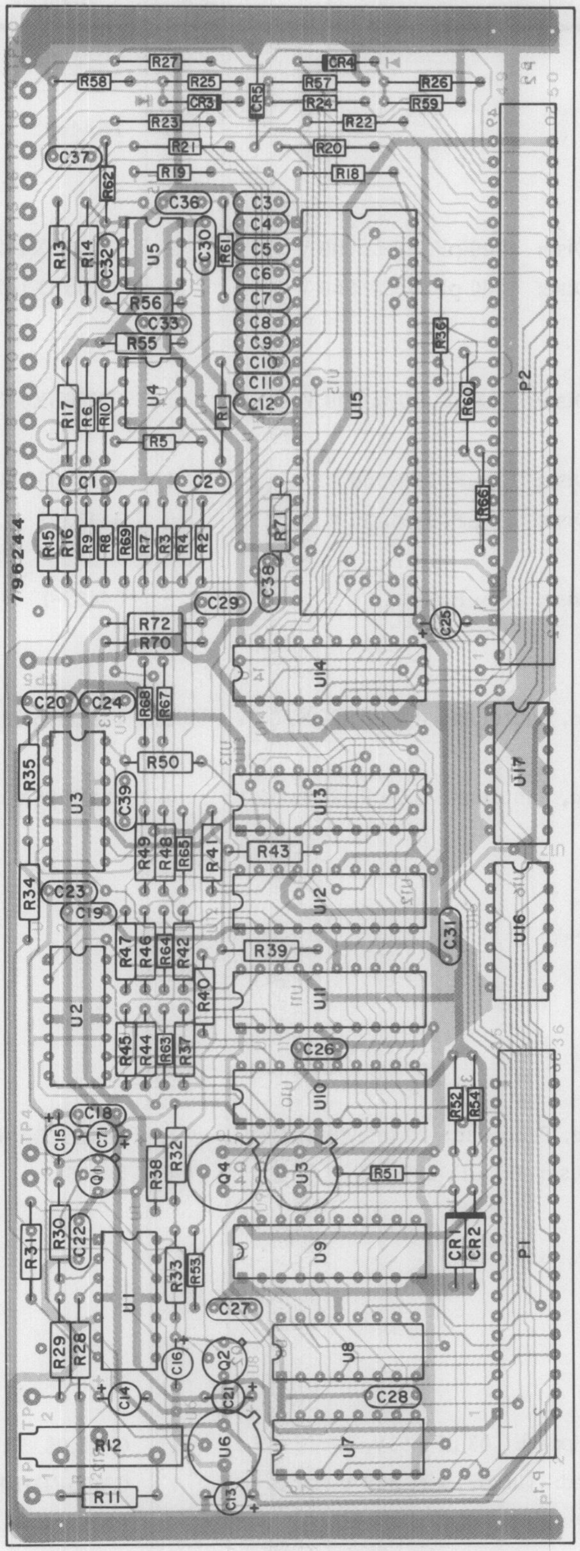


Figure 5-11. Type 796244-1, Analog/Digital (A1A4)
Location of Components

REF DESIG PREFIX A1A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
E2 Thru E20	Same as E1				
P1	Receptable Assembly	1	102585-8	00779	
P2	Receptable Assembly	1	102585-3	00779	
Q1	Transistor	1	2N2907/JAN	81350	
Q2	Transistor	1	2N2222A	80131	
Q3	Transistor	2	2N2270	80131	
Q4	Same as Q3				
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	6	CF1/8-1.0K/J	09021	
R2	Resistor, Fixed, Film: 5.1 kΩ, 5%, 1/8 W	7	CF1/8-5.1K/J	09021	
R3	Same as R2				
R4	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	4	CF1/8-100K/J	09021	
R5	Resistor, Fixed, Composition: 6.8 MΩ, 5%, 1/8 W	2	RCR05G685JS	81349	
R6	Same as R1				
R7	Same as R2				
R8	Same as R2				
R9	Same as R4				
R10	Same as R5				
R11	Resistor, Fixed, Film: 9.09 kΩ, 1%, 1/10 W	1	RN55C9091F	81349	
R12	Resistor, Trim, Film: 2 kΩ, 10%, 3/4 W	1	89PR2K	73138	
R13	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	4	RN55C1003F	81349	
R14	Same as R13				
R15	Resistor, Fixed, Film: 22.1 kΩ, 1%, 1/10 W	2	RN55C2212F	81349	
R16	Resistor, Fixed, Composition: 147 kΩ, 1%, 1/2 W	1	RN60D1473F	81349	
R17	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10 W	4	RN55C1002F	81349	
R18	Resistor, Fixed, Film: 100 Ω, 5%, 1/8 W	4	CF1/8-100 OHMS/J	09021	
R19	Same as R18				
R20	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	2	CF1/8-10K/J	09021	
R21	Same as R18				
R22	Resistor, Fixed, Film: 18 kΩ, 5%, 1/8 W	1	CF1/8-18K/J	09021	
R23	Same as R1				
R24	Resistor, Fixed, Film: 150 kΩ, 5%, 1/8 W	1	CF1/8-150K/J	09021	
R25	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	2	CF1/8-20K/J	09021	
R26	Same as R25				
R27	Same as R18				
R28	Resistor, Fixed, Film: 15 kΩ, 1%, 1/10 W	2	RN55C1502F	81349	
R29	Same as R15				
R30	Resistor, Fixed, Film: 28.7 kΩ, 1%, 1/10 W	1	RN55C2872F	81349	
R31	Same as R17				
R32	Resistor, Fixed, Film: 33.2 kΩ, 1%, 1/10 W	1	RN55C3322F	81349	
R33	Same as R17				

REF DESIG PREFIX A1A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R34	Same as R28				
R35	Resistor, Fixed, Film: 14.7 kΩ, 1%, 1/10 W	1	RN55C1472F	81349	
R36	Same as R2				
R37	Resistor, Fixed, Film: 562Ω, 1%, 1/10 W	11	RN55C5620F	81349	
R38	Same as R37				
R39	Resistor, Fixed, Film: 5.62 kΩ, 1%, 1/10 W	1	RN55C5621F	81349	
R40	Same as R37				
R41	Same as R37				
R42	Same as R37				
R43	Resistor, Fixed, Film: 56.2Ω 1%, 1/10 W	1	RN55C56R2F	81349	
R44 Thru R49	Same as R37				
R50	Resistor, Fixed, Film: 51.1Ω, 1%, 1/10 W	1	RN55C51R1F	81349	
R51	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	2	CF1/8-470 OHMS/J	09021	
R52	Same as R2				
R53	Same as R51				
R54	Same as R2				
R55	Same as R13				
R56	Same as R13				
R57	Resistor, Fixed, Film: 75 kΩ, 5%, 1/8 W	1	CF1/8-75K/J	09021	
R58	Same as R4				
R59	Same as R4				
R60	Same as R1				
R61	Same as R1				
R62	Same as R1				
R63	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	7	CF1/8-100 OHMS/J	09021	
R64 Thru R69	Same as R63				
R70	Same as R17				
R71	Resistor, Fixed , Film: 7.5 kΩ, 1%, 1/10 W	1	RN55C7501F	81349	
R72	Resistor, Fixed, Film: 30.1 kΩ, 1%, 1/10 W	1	RN55C3012F	81349	
U1	Quad Operational Amplifier	3	MC3403P	04713	
U2	Same as U1				
U3	Same as U1				
U4	Operational Amplifier	1	LM358AN	27014	
U5	BI MOS Operational Amplifier	1	CA3260E	02735	
U6	Monolithic Band-Gap Voltage Reference	1	AD581J	24355	
U7	ISO-CMOS Octal Decoder, 3 Binary Input	1	MD74SC138AC	36665	
U8	Hex Level Shifter	1	MC14504BCP	04713	
U9	Octal Flip-Flop, Type D	2	MM74C374N	27014	

REF DESIG PREFIX A1A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U10	Dual 8-Bit Buffered Multiplying DAC	3	AD7528JN	24355	
U11	Same as U10				
U12	Same as U10				
U13	D to A Converter	1	DAC1230LCD	27014	
U14	Same as U9				
U15	Converter A/D 8 Bit 16 Channel Multiplexer	1	ADC0817CCN	27014	
U16	Hex Inverter TTL-LS	1	SN74LS04N	01295	
U17	TTL/And Gate	1	SN74LS11N	01295	

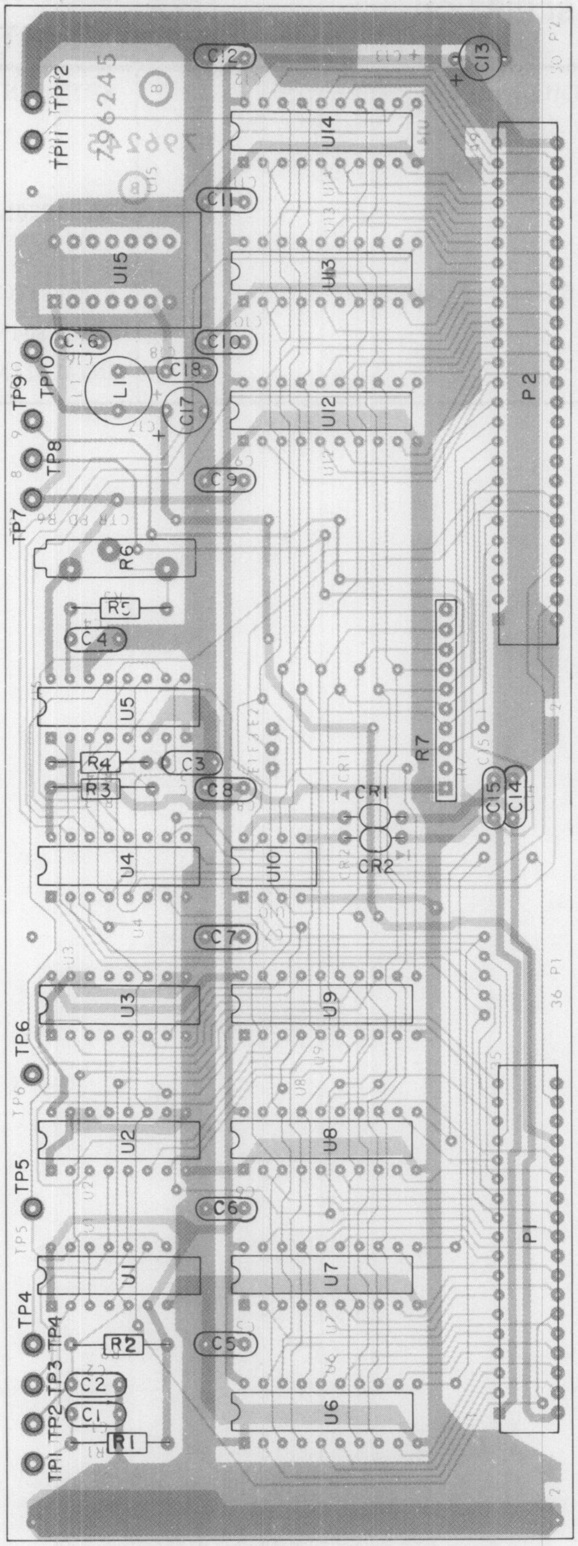


Figure 5-12. Type 796245-1, Synthesizer Interface (A1A5)
Location of Components

5.5.1.5 **Type 796245-1 Synthesizer Interface** REF DESIG PREFIX **A1A5**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	2	1N4003	80131	
CR2	Same as CR1				
C1	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	6	34453-1	14632	
C2	Same as C1				
C3	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM05FD101G03	81349	
C4	Capacitor, Ceramic, Disc: 1 μF, 2%, 50 V	1	8131-050-651-105M	72982	
C5	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	8	34475-1	14632	
C6	Same as C1				
C7	Same as C5				
C8	Same as C1				
C9	Same as C5				
C10	Same as C1				
C11	Same as C5				
C12	Same as C1				
C13	Capacitor, Electrolytic, Tantalum: 22 μF, 20%, 10 V	1	196D226X0010JE3	56289	
C14	Same as C5				
C15	Same as C5				
C16	Same as C5				
C17	Capacitor, Electrolytic, Tantalum: 4.7 μF, 20%, 35 V	1	196D475X0035JE3	56289	
C18	Same as C5				
P1	Receptable Assembly	1	102585-8	00779	
P2	Receptable Assembly	1	102585-3	00779	
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/2 W	2	CF1/4-1K/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 20 kΩ, 5%, 1/2 W	1	CF1/4-20K/J	09021	
R4	Resistor, Fixed, Film: 15 kΩ, 5%, 1/2 W	1	CF1/4-15K/J	09021	
R5	Resistor, Fixed, Composition: 110 kΩ, 5%, 1/2 W	1	RCR07G114JS	81349	
R6	Resistor, Variable, Film: 50 kΩ, 10%, 3/4 W	1	89PR50K	73138	
R7	Resistor, Network	1	765-1-R22K	73138	
U1	CMOS Quad 2 Input Nand Schmitt Trigger	1	CD4093BE	02735	
U2	Synchronous 4 Bit UP, Down Binary Counter	2	SN74C193N	01295	
U3	Same as U2				
U4	Integrated Circuit	1	SN74LS138AC	01295	
U5	Integrated Circuit	1	SN74LS123N	01295	
U6	Octal Flip-Flop, Type D	6	MM74C374N	27014	
U7	Same as U6				
U8	Same as U6				
U9	8-Bit Latch	1	MM74C373N	27014	
U10	Integrated Circiut	1	SN75150N-8	01295	
U11	Not Used				
U12	Same as U6				
U13	Same as U6				
U14	Same as U6				

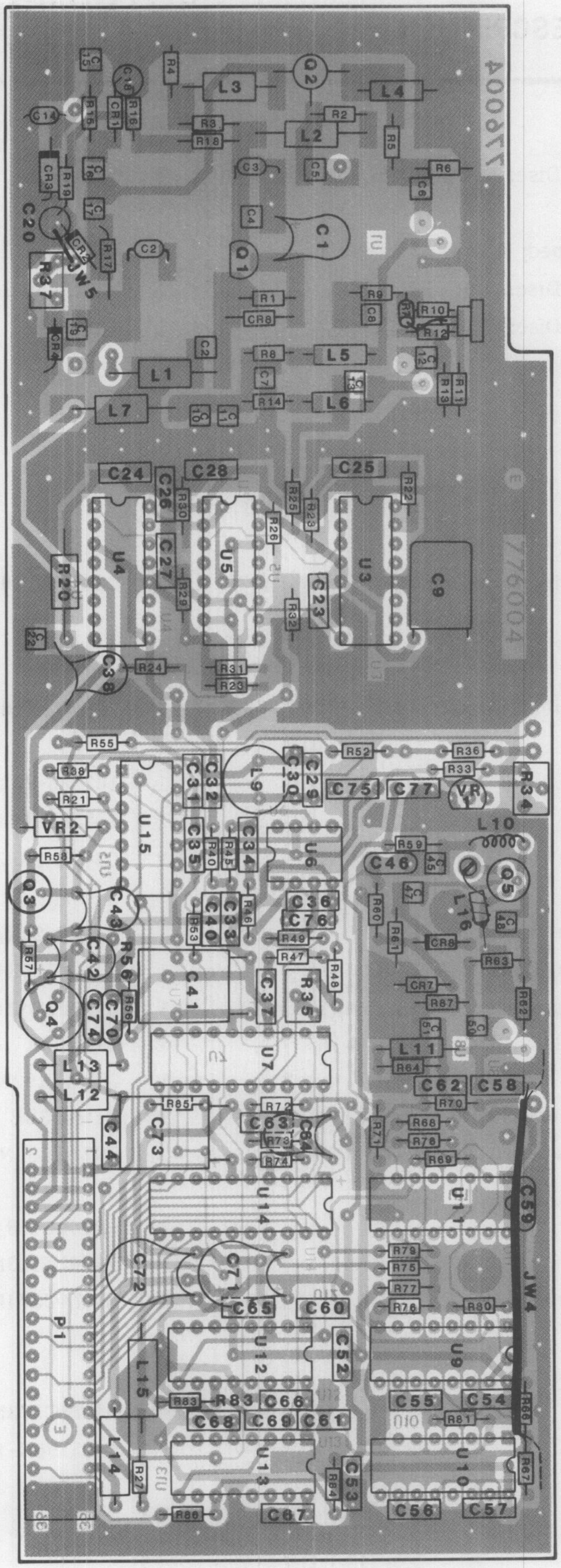


Figure 5-13. Type 776004-1, 2nd LO Synthesizer (A1A6)
Location of Components

5.5.1.6 **Type 776004-1 2nd LO Synthesizer** REF DESIG PREFIX A1A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	4	U11-3102	52673	
CR2	Same as CR1				
CR3	Diode	3	1N4449	80131	
CR4	Same as CR3				
CR5	Diode	2	1N4446	80131	
CR6	Diode	2	1N754A	80131	
CR7	Same as CR1				
CR8	Same as CR1				
CR9	Same as CR5				
CR10	Same as CR3				
C1	Capacitor, Electrolytic, Tantalum: 22 μF, 20%, 10 V	1	196D226X0010JE3	56289	
C2	Capacitor, Ceramic, Chip: 4700 pF, 10%, 50 V	3	C1210C472K5XAH	31433	
C3	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	24	34453-1	14632	
C4	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	13	C1210E471K1GAH	31433	
C5 Thru C8	Same as C4				
C9	Capacitor, Electrolytic, Tantalum: 100 μF, 20%, 10 V	1	MMJ-010-107R-20	14674	
C10	Same as C2				
C11	Same as C4				
C12	Same as C4				
C13	Same as C4				
C14	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	8	34475-1	14632	
C15	Same as C4				
C16	Capacitor, Ceramic, Chip: 4.7 pF, ±0.25 pF, 500 V	1	ATC700B4R7CP500X	29990	
C17	Capacitor, Variable, Ceramic: 1-3 pF, 100 V	1	518-000A1-3	72982	
C18	Capacitor, Ceramic, Chip: 200 pF, 50%, 500 V	2	32-257578-40	91984	
C19	Same as C4				
C20	Same as C18				
C21	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	1	196D225X0035JE3	56289	
C22	Same as C2				
C23 Thru C28	Same as C3				
C29	Capacitor, Ceramic, Disc: 680 pF, 10%, 200 V	1	CK05BX681K	81349	
C30	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	1	C023B101E502M	56289	
C31	Same as C14				
C32	Same as C14				
C33	Capacitor, Ceramic, Disc: 1000 pF, 10%, 200 V	1	CK05BX102K	81349	
C34	Capacitor, Ceramic, Disc: .022 μF, 10%, 100 V	2	CK06BX223K	81349	

REF DESIG PREFIX A1A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C35	Same as C14				
C36	Same as C14				
C37	Same as C34				
C38	Same as C1				
C39	Not Used				
C40	Same as C3				
C41	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	2	196D227X0010TE4	56289	
C42	Same as C1				
C43	Same as C42				
C44	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	3	34452-1	14632	
C45	Capacitor, Ceramic, Chip: 470 pF, 20%, 200 V	1	ATC100B471MP	29990	
C46	Same as C3				
C47	Capacitor, Ceramic, Chip: 47 pF, 5%, 500 V	1	ATC100B470JP500	29990	
C48	Capacitor, Ceramic, Chip: 6.2 pF, ±0.25 pF, 500 V	1	ATC700B6R2CP500X	29990	
C49	Not Used				
C50	Capacitor, Ceramic, Chip: 4.7 pF, ±0.1 pF, TOL, 500 V	1	ATC100B4R7BP500X	29990	
C51	Same as C4				
C52 Thru C61	Same as C3				
C62	Same as C14				
C63	Same as C14				
C64	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	196D475X0035JE3	56289	
C65	Same as C14				
C66 Thru C69	Same as C3				
C70	Same as C44				
C71	Capacitor, Electrolytic, Tantalum: 47 µF, 20%, 20 V	2	196D476X0020PE4	56289	
C72	Capacitor, Electrolytic, Tantalum: 100 µF, 20%, 20 V	1	196D107X0020TE4	56289	
C73	Same as C41				
C74	Same as C44				
C75	Capacitor, Ceramic, Disc: 470 pF, 20%, 1000 V	2	BHD470-20PCT	91418	
C76	Same as C75				
C77	Same as C3				
J1	Connector, Receptacle, SMB	1	212	19505	
L1	Coil, Fixed: 1.0 µF, 10%	1	1537-12	99800	
L2	Coil, Fixed: 30 µH, 5%	2	1537-50	99800	
L3	Same as L2				
L4	Coil, Fixed, Mold: 0.1 µH	1	1025-94	99800	
L5	Coil, Fixed, Mold: .22 µH, 10%	3	1025-04	99800	

REF DESIG PREFIX A1A6

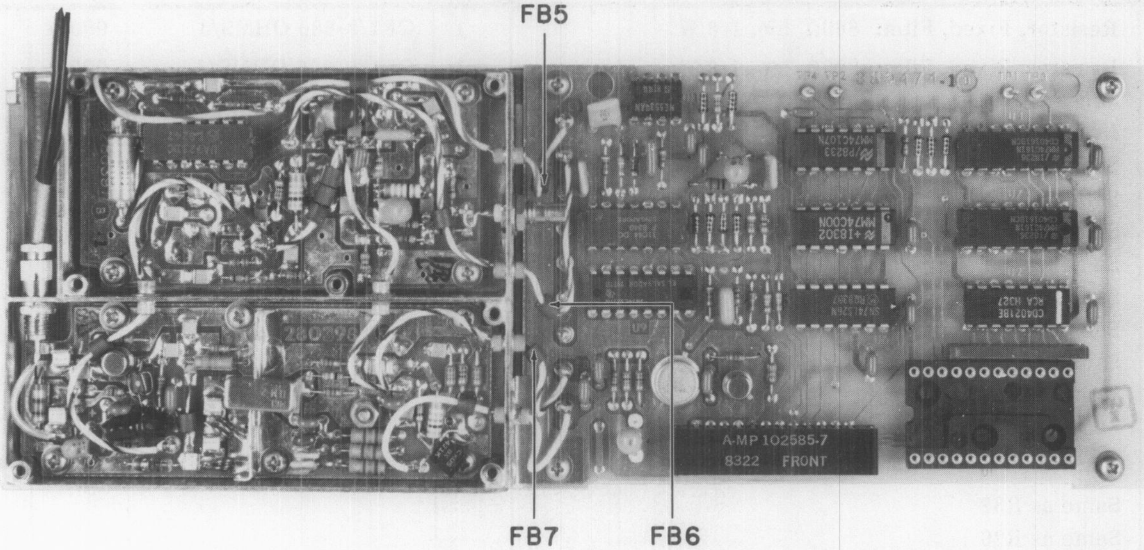
REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L6	Same as L5				
L7	Coil, Fixed: 10 μH, 10%	2	1537-36	99800	
L8	Same as L7				
L9	Coil, Fixed: 47 mH, 10%	1	553-3635-57	71279	
L10	Coil	1	1129-52	14632	
L11	Same as L5				
L12	Inductor	4	170134-1.	14632	
L13	Same as L12				
L14	Same as L12				
L15	Same as L12				
L16	Inductor	1	21209-38	14632	
P1	Receptable Assembly	1	102585-8	00779	
Q1	Transistor	1	2N3906	80131	
Q2	Transistor	1	BFR96	73445	
Q3	Transistor	1	2N2222A	80131	
Q4	Transistor	1	2N2270	80131	
Q5	Transistor	1	U310	17856	
R1	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1.8 W	7	CF1/8-4.7K/J	09021	
R2	Resistor, Fixed, Film: 180p, 5%, 1/8 W	1	CF1/8-180 OHMS/J	09021	
R3	Resistor, Fixed, Film: 5.1 kΩ, 5%, 1/8 W	1	CF1/8-5.1K/J	09021	
R4	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	CF1/8-8.2K/J	09021	
R5	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	1	CF1/8-150 OHMS/J	09021	
R6	Resistor, Fixed, Film: 36Ω, 5%, 1/8 W	1	CF1/8-36 OHMS/J	09021	
R7	Resistor, Fixed, Film: 15Ω, 5%, 1/8 W	5	CF1/8-15 OHMS/J	09021	
R8	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	3	CF1/8-56 OHMS/J	09021	
R9	Same as R7				
R10	Same as R7				
R11	Resistor, Fixed, Film: 130Ω, 5%, 1/8 W	2	CF1/8-130 OHMS/J	09021	
R12	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	3	CF1/8-120 OHMS/J	09021	
R13	Same as R11				
R14	Same as R8				
R15	Same as R1				
R16	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	3	CF1/8-47 OHMS/J	09021	
R17	Same as R1				
R18	Same as R1				
R19	Same as R16				
R20	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	

REF DESIG PREFIX A1A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R21	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	2	CF1/8-47K/J	09021	
R22	Same as R7				
R23	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	CF1/8-68 OHMS/J	09021	
R24	Resistor, Fixed, Film: 91Ω, 5%, 1/8 W	2	CF1/8-91 OHMS/J	09021	
R25	Same as R7				
R26	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/8 W	4	CF1/8-1.5K/J	09021	
R27	Resistor, Fixed, Film: 2.7Ω, 5%, 1/8 W	1	CF1/8-2.7 OHMS/J	09021	
R28	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	6	CF1/8-1.0K/J	09021	
R29	Same as R28				
R30	Resistor, Fixed, Film: 3 kΩ, 5%, 1/8 W	3	CF1/8-3K/J	09021	
R31	Same as R30				
R32	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/8 W	4	CF1/8-6.8K/J	09021	
R33	Same as R30				
R34	Resistor, Variable, Film: 1 kΩ, 10%, 1/4 W	1	3262W1-104	80294	
R35	Resistor, Variable, Film: 5 kΩ, 10%, 1/4 W	1	3262X-1-502	80294	
R36	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	5	CF1/8-10K/J	09021	
R37	Not Used				
R38	Same as R36				
R39	Not Used				
R40	Resistor, Fixed, Film: 390Ω, 5%, 1/8 W	2	CF1/8-390 OHMS/J	09021	
R41 Thru R44	Not Used				
R45	Same as R40				
R46	Resistor, Fixed, Film: 330 kΩ, 5%, 1/8 W	2	CF1/8-330K/J	09021	
R47	Same as R46				
R48	Resistor, Fixed, Film: 6.8 kΩ, 5%, 1/8 W	2	CF1/8-6.8K/J	09021	
R49	Same as R48				
R50	Not Used				
R51	Not Used				
R52	Same as R1				
R53	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	4	CF1/8-2.7K/J	09021	
R54	Not Used				
R55	Same as R36				
R56	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	3	CF1/8-100 OHMS/J	09021	
R57	Resistor, Fixed, Film: 330Ω, 5%, 1/8 W	1	CF1/8-330 OHMS/J	09021	
R58	Same as R28				
R59	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	CF1/8-22 OHMS/J	09021	
R60	Same as R36				
R61	Same as R36				

REF DESIG PREFIX A1A6

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R62	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	1	CF1/8-680 OHMS/J	09021	
R63	Resistor, Fixed, Film: 820Ω, 5%, 1/8 W	1	CF1/8-820 OHMS/J	09021	
R64	Same as R8				
R65	Not Used				
R66	Same as R12				
R67	Same as R12				
R68	Same as R28				
R69	Same as R53				
R70	Same as R1				
R71	Same as R21				
R72	Same as R1				
R73	Same as R53				
R74	Same as R28				
R75	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	1	CF1/8-3.3K/J	09021	
R76	Same as R32				
R77	Same as R26				
R78	Same as R53				
R79	Same as R24				
R80	Same as R26				
R81	Same as R26				
R82	Not Used				
R83	Same as R28				
R84	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	CF1/8-470 OHMS/J	09021	
R85	Same as R56				
R86	Same as R16				
R87	Resistor, Fixed, Film: 270Ω, 5%, 1/8 W	1	CF1/8-270 OHMS/J	09021	
U1	Amplifier	3	GPD-321	24539	
U2	Same as U1				
U3	Program Divider by 10/11	1	SP8680B	52648	
U4	Divide by 10/11	3	SP8690B	52648	
U5	ECL Dual Flip-Flop, Type D	2	MC10131L	04713	
U6	Single Low Noise Operational Amplifier	1	NE5534N	18324	
U7	4-Bit Data Bus Input PLL Frequency Synthesizer	2	MC145146P	04713	
U8	Same as U1				
U9	Two Modulus Prescaler	2	SP8685B	52648	
U10	Same as U9				
U11	Same as U5				
U12	Same as U4				
U13	Same as U4				
U14	Same as U7				
U15	Analog Switch	1	DG303CJ	17856	
VR1	Diode	1	LM329CZ	27014	
VR2	Diode	1	1N754A	80131	
W1	Cable Assembly Coaxial	1	280565-1	14632	



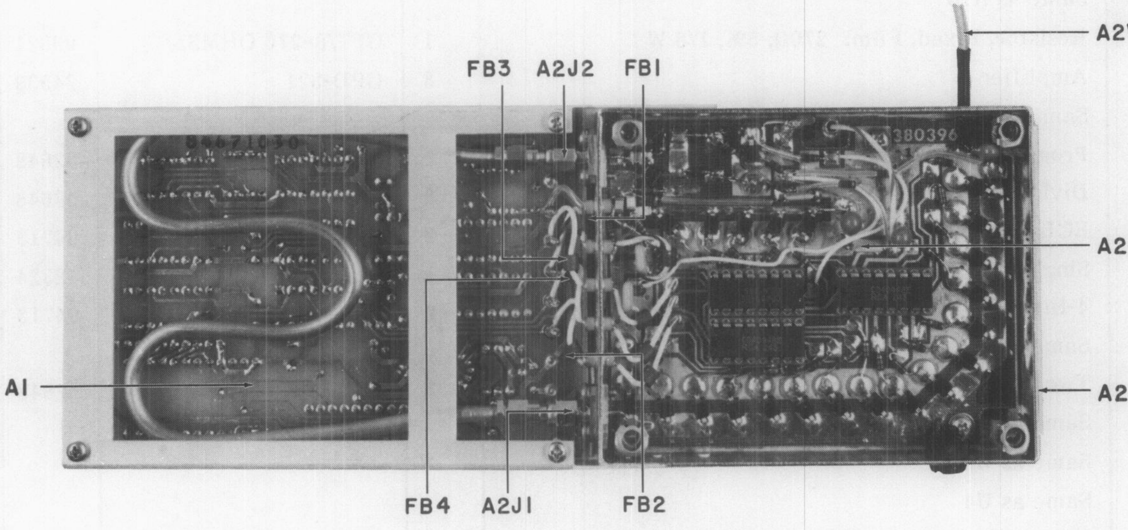


Figure 5-14. Type 776003-1, 1st LO Synthesizer (A1A7) Location of Components

5.5.1.7 **Type 776003-1 1st LO Synthesizer** REF DESIG PREFIX **A1A7**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	1st LO Synthesizer Assembly	1	380474-1	14632	
A2	1st LO Synthesizer VCO Assembly	1	380395-1	14632	
FB1	Ferrite Bead	7	56-590-65-4A	02114	
FB2 Thru FB7	Same as FB1				

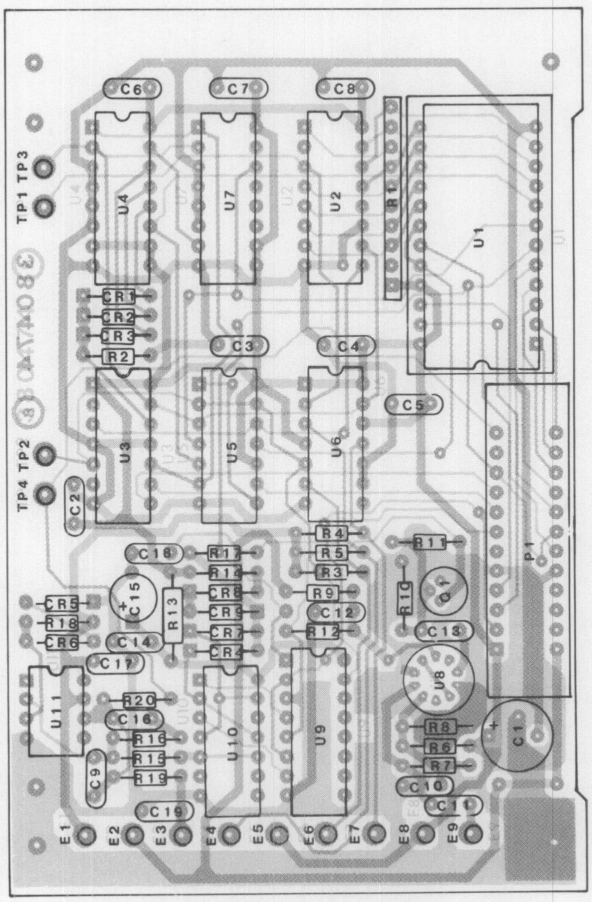


Figure 5-15. Part 380474-1, 1st LO Synthesizer Assembly (A1A7A1)
Location of Components

5.5.1.7.1 **Part 380474-1 1st LO Synthesizer Assembly** REF DESIG PREFIX **A1A7A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	9	1N4449	80131	
CR2 Thru CR9	Same as CR1				
C1	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	2	196D226X0010JE3	56289	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	12	34475-1	14632	
C3 Thru C8	Same as C2				
C9	Capacitor, Ceramic, Disc: .10 µF, 20%, 50 V	3	34453-1	14632	
C10	Same as C2				
C11	Same as C2				
C12	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	1	34452-1	14632	
C13	Same as C2				
C14	Same as C2				
C15	Same as C1				
C16	Capacitor, Ceramic, Disc: 1 µF, 20%, 50 V	1	8131-050-651-105M	72982	
C17	Same as C2				
C18	Same as C9				
C19	Same as C9				
P1	Receptacle Assembly	1	102585-7	00779	
Q1	Transistor	1	2N2222A	80131	
R1	Resistor, Network	1	4310R101-473	80294	
R2	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R3	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	3	CF1/8-3.3K/J	09021	
R4	Same as R3				
R5	Same as R3				
R6	Resistor, Fixed, Film: 2 kΩ, 5%, 1/8 W	2	CF1/8-2K/J	09021	
R7	Resistor, Fixed, Film: 51Ω, 5%, 1/8 W	1	CF1/8-51 OHMS/J	09021	
R8	Same as R6				
R9	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	2	CF1/8-1.0K/J	09021	
R10	Resistor, Fixed, Film: 5.1 kΩ, 5%, 1/8 W	1	CF1/8-5.1K/J	09021	
R11	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	CF1/8-8.2K/J	09021	
R12	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	2	CF1/8-470 OHMS/J	09021	
R13	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R14	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	3	CF1/8-4.7K/J	09021	
R15	Resistor, Fixed, Film: 3.9k, 5%, 1/8 W	1	CF1/8-3.9K/J	09021	
R16	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	1	CF1/8-56 OHMS/J	09021	
R17	Same as R9				
R18	Same as R14				
R19	Same as R12				
R20	Same as R14				
U1	16 k, UV EPROM	1	B2716	34649	

REF DESIG PREFIX A1A7A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U2	Integrated Circuit	1	CD4021AE	02735	
U3	Dual Flip-Flop, Type J-K	1	MM74C107N	27014	
U4	Syncronous 4-Bit Binary Counter	2	MM74C161N	27014	
U5	CMOS Quad 2 Input Nand Gate	1	MM74C00N	27014	
U6	Quadruple 2-Input Interface Positive Nand Gate	1	SN74LS26N	01295	
U7	Same as U4				
U8	Differential Video Amplifier	1	N5733K	18324	
U9	TTL-LS Multiplexer	1	SN74LS157N	01295	
U10	Phase Frequency Detector	1	11C44DC	07263	
U11	Single Low Noise Operational Amplifier	1	NE5534N	18324	

5.5.1.7.2 **Part 380395-1 1st LO Synthesizer VCO Assembly** REF DESIG PREFIX **A1A7A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	VCO Assembly	1	380396-1	14632	
A2	Buffer Assembly	1	280397-1	14632	
A3	Mixer Assembly	1	280398-1	14632	
C1	Capacitor, Ceramic, Feedthru: 330 pF, 300 V	11	CSK 13793	72982	
C2 Thru C11	Same as C1				
C12	Capacitor, Ceramic, Feedthru: 1000 pF, 300 V	1	CSK 15163	72982	
E1	Not Used				
E2	Connector, Terminal	1	17-0220/RD178	19505	
FB1	Ferrite Bead	9	56-590-65-4A	02114	
FB2 Thru FB9	Same as FB1				
J1	Connector, Receptacle	1	2004-7511-000	19505	
J2	Connector, Receptacle, SMC	2	50-045-4524-89	98291	
J3	Same as J2				
P1	Connector, Plug, SMC	2	152/141	19505	
P2	Same as P1				
P3	Connector, Plug	1	2105-7521-005	19505	
R1	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	1	C3-470R-5PCT	24546	
R2	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	1	C3-22R-5PCT	24546	
W1	Cable Assembly	1	280534-1	14632	
W2	Cable Assembly	1	280535-1	14632	

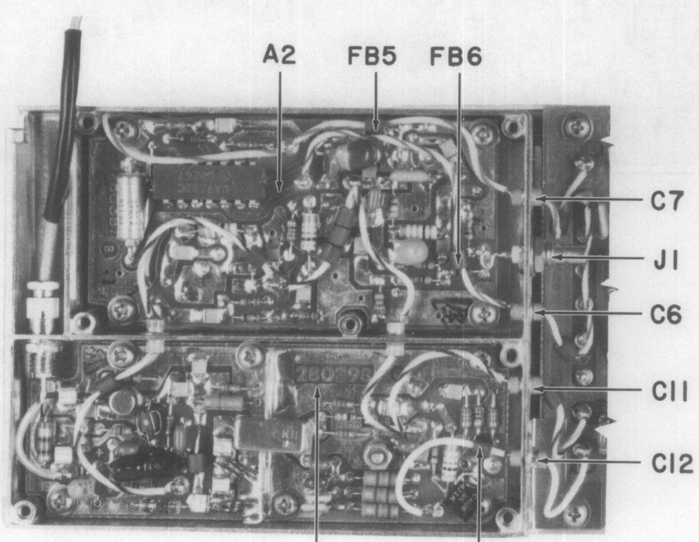


Figure 5-16. Part 380395-1, 1st LO Synthesizer VCO Assembly (A1A7A2) Location of Components

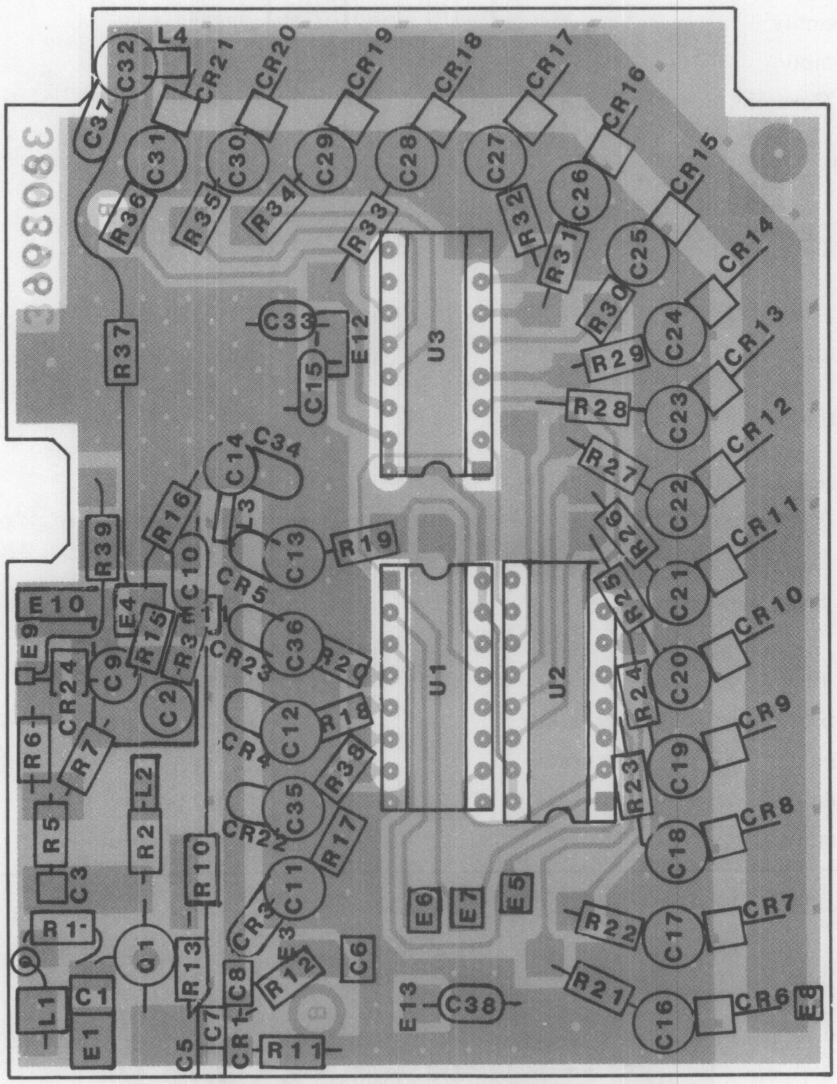


Figure 5-17. Part 380396-1, VCO Assembly (A1A7A2A1)

Location of Components

5.5.1.7.2.1 **Part 380396-1 VCO Assembly** REF DESIG PREFIX **A1A7A2A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	1	U11-3102	52673	
CR2	Not Used				
CR3	Diode	22	MPN3401	04713	
CR4 Thru CR24	Same as CR3				
C1	Capacitor, Ceramic, Chip: 330 pF, 10%, 200 V	1	ATC700B331KP200X	29990	
C2	Capacitor, Ceramic, Chip: 200 pF, 50%, 500 V	25	32-257578-40	91984	
C3	Capacitor, Ceramic, Chip: 4.7 pF, ±0.1 pF, 500 V	2	ATC100B4R7BP500X	29990	
C4	Not Used				
C5	Capacitor, Ceramic, Chip: 3 pF, ±0.25 pF, 500 V	1	ATC700B3R0CP500X	29990	
C6	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	1	C1210E471K1GAH	31433	
C7	Same as C3				
C8	Capacitor, Ceramic, Chip: 18 pF, 5%, 500 V	1	ATC100B180JP500X	29990	
C9	Same as C2				
C10	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	3	34453-1	14632	
C11 Thru C14	Same as C2				
C15	Same as C10				
C16 Thru C32	Same as C2				
C33	Capacitor, Electrolytic, Tantalum: 22 μF, 20%, 15 V	3	196D226X0015KE3	56289	
C34	Same as C33				
C35	Same as C2				
C36	Same as C2				
C37	Same as C33				
C38	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	1	34452-1	14632	
C39	Capacitor, Ceramic, Chip: 2.4 pF, ±0.25 pF, 500 V	1	ATC700B2R4CP500	29990	
C40	Same as C10				
FB1	Ferrite Bead	1	56-590-65-4A	02114	
L1	Coil, Fixed	1	180067-1	14632	
L2	Coil, Fixed	1	22292-120	14632	
L3	Inductor	1	180066-1	14632	
L4	Inductor	1	180065-1	14632	
Q1	Transistor	1	BFR96	73445	
R1	Resistor, Fixed, Film: 180Ω, 5%, 1/8 W	1	C3-180R-5PCT	24546	
R2	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	4	C3-100R-5PCT	24546	
R3	Same as R2				
R4	Not Used				
R5	Resistor, Fixed, Film: 15Ω, 5%, 1/8 W	2	C3-15R-5PCT	24546	
R6	Same as R5				

REF DESIG PREFIX **A1A7A2A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R7	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	C3-68R-5PCT	24546	
R8	Not Used				
R9	Not Used				
R10	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	C3-8.2K-5PCT	24546	
R11	Resistor, Fixed, Film: 27 kΩ, 5%, 1/8 W	1	C3-27K-5PCT	24546	
R12	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	1	C3-47K-5PCT	24546	
R13	Resistor, Fixed, Film: 4.3 kΩ, 5%, 1/8 W	1	C3-4.3K-5PCT	24546	
R14	Not Used				
R15	Same as R2				
R16	Same as R2				
R17	Resistor, Fixed, Film: 1 kΩ, 5%, 1/8 W	22	C3-1K-5PCT	24546	
R18 Thru R36	Same as R17				
R37	Resistor, Fixed, Film: 27Ω, 5%, 1/8 W	1	C3-27R-5PCT	24546	
R38	Same as R17				
R39	Same as R17				
U1	8 Stage Shift and Store Bus	3	CD4094BE	02735	
U2	Same as U1				
U3	Same as U1				

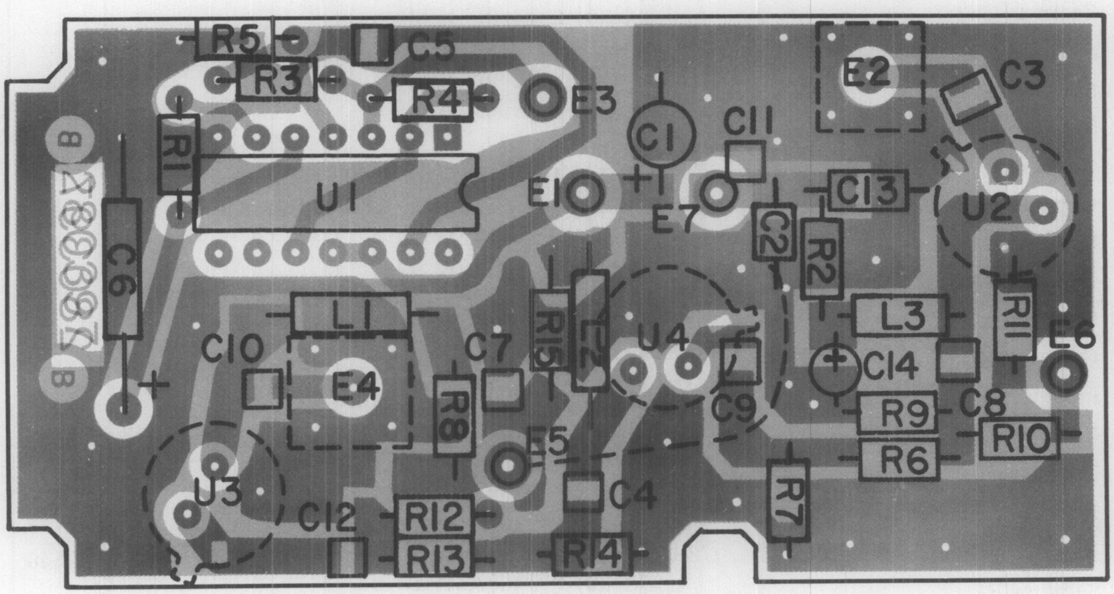


Figure 5-18. Part 280397-1, Buffer Assembly (A1A7A2A2)
Location of Components

5.5.1.7.2.2 **Part 280397-1 Buffer Assembly** REF DESIG PREFIX **A1A7A2A2**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 18 μF, 10%, 20 V	1	196D186X9020KE3	56289	
C2	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	1	34475-1	14632	
C3	Capacitor, Ceramic, Chip: 470 pF, 10%, 200 V	7	C1210E471K1GAH	31433	
C4	Same as C3				
C5	Same as C3				
C6	Capacitor, Electrolytic, Tantalum: 10 μF, 10%, 20 V	1	CS13BE106K	81349	
C7	Capacitor, Ceramic, Chip: 4700 pF, 10%, 50 V	2	C1210C472K5XAH	31433	
C8	Same as C3				
C9	Same as C3				
C10	Same as C3				
C11	Same as C7				
C12	Same as C3				
C13	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	1	34452-1	14632	
C14	Capacitor, Electrolytic, Tantalum: 22 μF, 20%, 10 V	1	196D226X0010JE3	56289	
FB1	Ferrite Bead	3	56-590-65-4A	02114	
FB2	Same as FB1				
FB3	Same as FB1				
L1	Coil, Fixed, Molded: 0.1 μF	3	1025-94	99800	
L2	Same as L1				
L3	Same as L1				
R1	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	2	C3-4.7K-5PCT	24546	
R2	Resistor, Fixed, Film: 39Ω, 5%, 1/8 W	1	CF1/8-39 OHMS/J	09021	
R3	Same as R1				
R4	Resistor, Fixed, Film: 6.8Ω, 5%, 1/8 W	1	CF1/8-6.8 OHMS/J	09021	
R5	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	CF1/8-8.2K/J	09021	
R6	Resistor, Fixed, Film: 300Ω, 5%, 1/8 W	3	CF1/8-300 OHMS/J	09021	
R7	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	3	CF1/8-100 OHMS/J	09021	
R8	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	2	CF1/8-68 OHMS/J	09021	
R9	Same as R6				
R10	Resistor, Fixed, Film: 18Ω, 5%, 1/8 W	1	CF1/8-18 OHMS/J	09021	
R11	Same as R6				
R12	Same as R7				
R13	Same as R8				
R14	Same as R7				
R15	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	1	CF1/8-56 OHMS/J	09021	
U1	Precision Voltage Regulator	1	723DC	07263	
U2	Amplifier	3	GPD-321	24539	
U3	Same as U2				
U4	Same as U2				

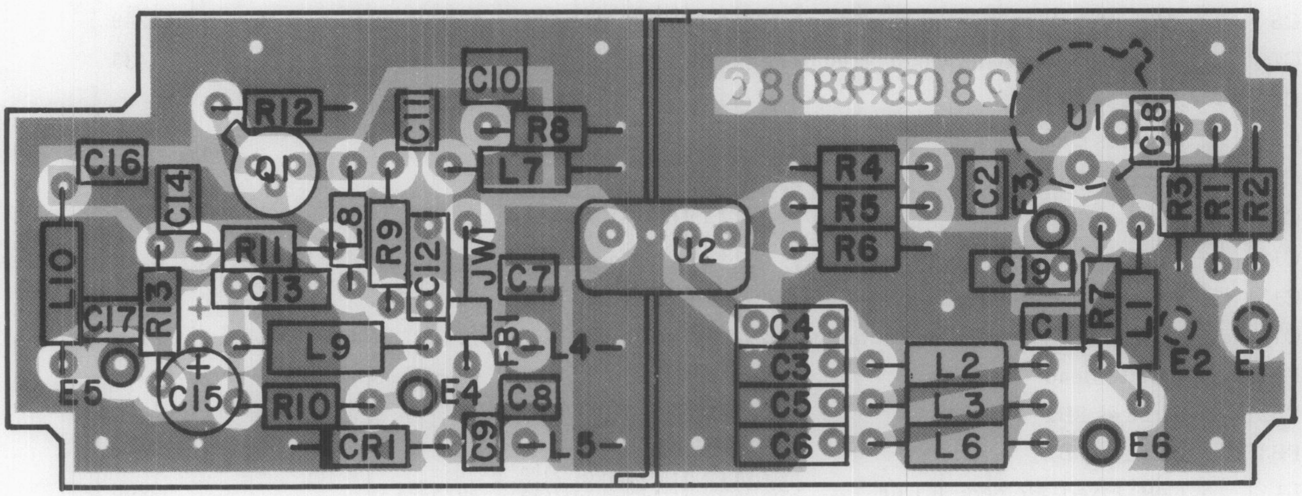


Figure 5-19. Part 280398-1, Mixer Assembly (A1A7A2A3)
Location of Components

5.5.1.7.2.3 **Part 280398-1 Mixer Assembly** REF DESIG PREFIX **A1A7A2A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	1	5082-0112	28480	
C1	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	6	C1210E471K1GAH	31433	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: 750 pF, 5%, 50 V	1	8121-050-C0G0-751J	72982	
C4	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	4	8131M100-651-104M	72982	
C5	Capacitor, Ceramic, Disc: 1500 pF, 5%, 50 V	2	8121-050-C0G0-152J	72982	
C6	Same as C5				
C7	Capacitor, Ceramic, Chip: 1.5 pF, ±.25 pF, 500 V	1	ATC100B1R5BP500X	29990	
C8	Capacitor, Ceramic, Chip: 3.0 pF, ±.25 pF, 500 V	1	ATC 100B3R0CP500X	29990	
C9	Capacitor, Ceramic, Chip: 4.7 pF, 500 V, ±.25 pF	1	ATC100B4R7CP500X	29990	
C10	Same as C1				
C11	Same as C1				
C12	Same as C4				
C13	Same as C4				
C14	Same as C1				
C15	Capacitor, Electrolytic, Tantalum: 1 μF, 20%, 35 V	1	196D105X0035HE3	56289	
C16	Capacitor, Ceramic, Chip: 180 pF, 20%, 200 V	2	ATC100B181MC200X	29990	
C17	Same as C16				
C18	Same as C1				
C19	Same as C4				
C20	Capacitor, Ceramic, Disc: 470 pF, 10%, 200 V	1	CK05BX471M	81349	
FB1	Ferrite Bead	1	56-590-65-4A	02114	
L1	Coil, Fixed, Molded: 0.1 μH	1	1025-94	99800	
L2	Coil, Fixed: 2.2 μH, 10%	3	1025-28	99800	
L3	Same as L2				
L4	Coil	2	180221-1	14632	
L5	Same as L4				
L6	Same as L2				
L7	Coil, Fixed, Molded	1	1025-36	99800	
L8	Coil	1	16209-8	14632	
L9	Coil	1	170134-1	14632	
L10	Coil, Fixed, Mold: 1.0 μH, 10%	1	1025-20	99800	
Q1	Transistor	1	2N2222A	80131	
R1	Resistor, Fixed, Film: 56Ω, 5%, 1/8 W	1	CF1/8-56 OHMS/J	09021	
R2	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	2	CF1/8-120 OHMS/J	09021	
R3	Same R2				
R4	Resistor, Fixed, Film: 150Ω, 5%, 1/8 W	2	CF1/8-150 OHMS/J	09021	
R5	Resistor, Fixed, Film: 39Ω, 5%, 1/8 W	1	CF1/8-39 OHMS/J	09021	
R6	Same as R4				
R7	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	CF1/8-68 OHMS/J	09021	
R8	Resistor, Fixed, Film: 270Ω, 5%, 1/8 W	1	CF1/8-270 OHMS/J	09021	

REF DESIG PREFIX A1A7A2A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R9	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	1	CF1/8-120 OHMS/J	09021	
R10	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	1	CF1/8-10 OHMS/J	09021	
R11	Resistor, Fixed, Film: 2 kΩ, 5%, 1/8 W	1	CF1/8-2K/J	09021	
R12	Resistor, Fixed, Film: 15Ω, 5%, 1/8 W	1	CF1/8-15 OHMS/J	09021	
R13	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
U1	Amplifier	1	GPD-321	24539	
U2	Mixer, Double Balanced	1	TFM-2	15542	

5.5.1.8 Type 796247-1 Reference Generator REF DESIG PREFIX A1A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	4	5082-2800	28480	
CR2	Diode	1	U11-3102	52673	
CR3	Diode, Varicap	1	KV3901	52673	
CR4	Same as CR1	1	1N4446	80131	
CR5	Same as CR1				
CR6	Same as CR1				
CR7	Diode	2	1N995	80131	
CR8	Same as CR7				
C1	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 50 V	11	34475-1	14632	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	19	34453-1	14632	
C4	Same as C1				
C5	Capacitor, Ceramic, Monolithic: 220 pF, 2%, 100 V	4	150-100-NPO-221G	51642	
C6	Same as C3				
C7	Not Used				
C8	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	6	34452-1	14632	
C9	Capacitor, Electrolytic, Tantalum: 2.2 μF, 20%, 35 V	4	196D225X0035JE3	56289	
C10	Same as C9				

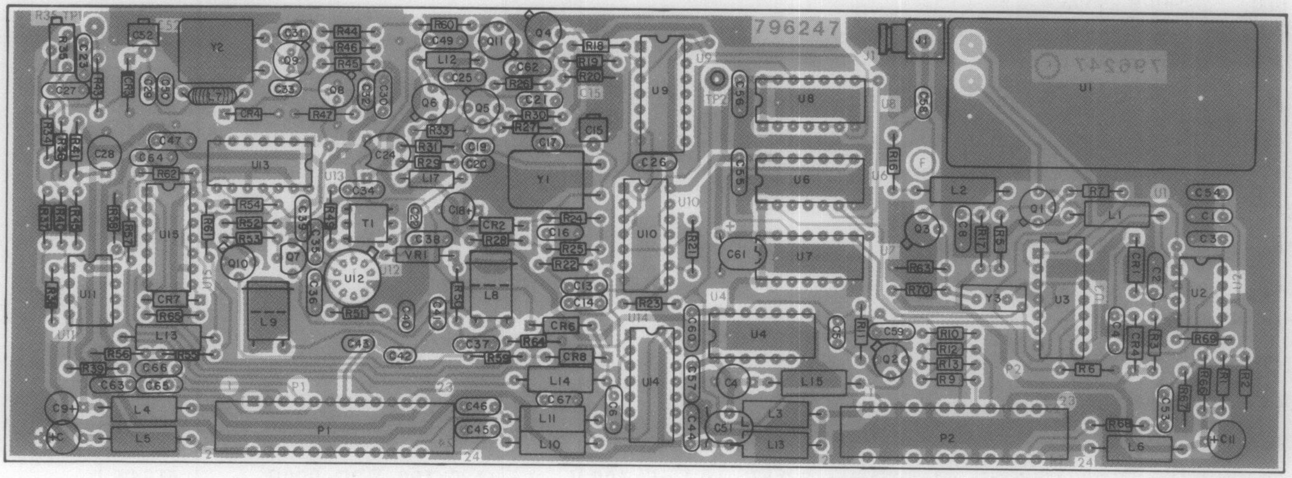


Figure 5-20. Type 796247-1, Reference Generator (A1A8)
Location of Components

REF DESIG PREFIX A1A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C11	Capacitor, Electrolytic, Tantalum: 220 µF, 20%, 10 V	1	196D227X0010TE4	56289	
C12	Not Used				
C13	Same as C8				
C14	Same as C3				
C15	Capacitor, Variable, Ceramic: 2.5-9 pF, 100 V	1	518-002A2.5-9	72982	
C16	Same as C3				
C17	Capacitor, Ceramic, Monolithic: 12 pF, 5%, 100 V	2	100-100-NPO-120J	51642	
C18	Capacitor, Electrolytic, Tantalum: 18 µF, 10%, 20 V	2	196D186X9020KE3	56289	
C19	Same as C5				
C20	Same as C5				
C21	Same as C3				
C22	Capacitor, Ceramic, Disc: 3.9 pF, ±.25 pF, 100 V	1	8101-100-C0J0-399C	72982	
C23	Same as C1				
C24	Same as C18				
C25	Same as C3				
C26	Same as C3				
C27	Same as C1				
C28	Capacitor, Mica, Dipped: 47 pF, 20%, 500 V	2	196D475X0035JE3	56289	
C29	Same as C17				
C30	Same as C1				
C31	Capacitor, Ceramic, Monolithic: 100 pF, 2%, 100 V	1	200-100-NPO-101G	51642	
C32	Capacitor, Ceramic, Monolithic: 68 pF, 2%, 100 V	1	200-100-NPO-680G	51642	
C33	Capacitor, Mica, Dipped: 1000 pF, 5%, 100 V	3	DM15-102J	72136	
C34 Thru C38	Same as C3				
C39	Same as C1				
C40	Capacitor, Ceramic, Monolithic: 22 pF, 5%, 100 V	1	100-100-NPO-220J	51642	
C41	Capacitor, Ceramic, Monolithic: 1.0 pF, ±.1 pF, 100 V	1	8101-100-C0K0-109B	72982	
C42	Capacitor, Ceramic, Monolithic: 36 pF, ±2%, 100 V	1	150-100-NPO-360G	51642	
C43	Same as C5				
C44	Same as C1				
C45	Same as C3				
C46	Same as C3				
C47	Same as C1				
C48	Same as C9				
C49	Same as C3				
C50	Capacitor, Ceramic, Monolithic: 2.0 pF, ±0.1 pF, 100 V	1	100-100-NPO-209B	51642	
C51	Same as C9				
C52	Capacitor, Variable, Ceramic: 1.25-3 pF, 100 V	1	518-000A1.25-3	72982	
C53	Capacitor, Mica, Dipped: 330 pF, 5%, 500 V	1	CK05BX331K	81349	
C54	Same as C8				
C55	Same as C1				
C56	Same as C1				

REF DESIG PREFIX A1A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C57	Same as C8				
C58	Same as C33				
C59	Same as C8				
C60	Same as C8				
C61	Same as C11				
C62	Same as C3				
C63	Same as C3				
C64	Same as C33				
C65	Same as C33				
C66	Same as C3				
C67	Same as C3				
J1	Connector, Receptacle, SMB	1	210	19505	
L1	Coil, Fixed: 27 μH, 5%	1	1537-48	99800	
L2	Coil, Fixed: 4.7 μH, 10%	2	1537-28	99800	
L3	Coil, Fixed: 100 μH, 5%	3	1537-76	99800	
L4	Coil, Fixed, Molded: 330 μH, 5%	1	2500-04	99800	
L5	Same as L3				
L6	Same as L3				
L7	Coil	1	180310-1	14632	
L8	Coil, Variable: .68 μH	2	MS21381-11	83125	
L9	Same as L8				
L10	Coil, Fixed: 22 μH, 5%	4	1537-44	99800	
L11	Same as L10				
L12	Coil, Fixed: 15 μH, 10%	1	1537-48	99800	
L13	Same as L3				
L14	Same as L10				
L15	Same as L10				
L16	Same as L2				
L17	Coil, Fixed, Molded	1	1025-36	99800	
P1	Receptacle Assembly	2	102585-7	00779	
P2	Same as P1				
Q1	Transistor	2	2N3906	80131	
Q2	Transistor	7	2N2222A	80131	
Q3 Thru Q7	Same as Q2				
Q8	Transistor	1	2N2369	80131	
Q9	Transistor	1	2N2857	80131	
Q10	Same as Q2				
Q11	Same as Q2				
R1	Resistor, Fixed, Film: 5.6 kΩ, 5%, 1/8 W	3	CF1/8-5.6K/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 120 kΩ, 5%, 1/8 W	1	CF1/8-120K/J	09021	
R4	Not Used				

REF DESIG PREFIX A1A8

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R5	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	5	CF1/8-1.0K/J	09021	
R6	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	7	CF1/8-470 OHMS/J	09021	
R7	Same as R6				
R8	Not Used				
R9	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	2	CF1/8-22 OHMS/J	09021	
R10	Same as R6				
R11	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	9	CF1/8-10K/J	09021	
R12	Resistor, Fixed, Film: 120Ω, 5%, 1/8 W	2	CF1/8-120 OHMS/J	09021	
R13	Same as R12				
R14	Not Used				
R15	Not Used				
R16	Resistor, Fixed, Film: 150Ω, 5%, 1/4 W	1	CF1/4-150 OHMS/J	09021	
R17	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	1	CF1/8-10 OHMS/J	09021	
R18	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	5	CF1/8-100 OHMS/J	09021	
R19	Resistor, Fixed, Film: 18 kΩ, 5%, 1/8 W	2	CF1/8-18K/J	09021	
R20	Resistor, Fixed, Film: 2.0 kΩ, 5%, 1/8 W	1	CF1/8-2.0K/J	09021	
R21	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R22	Resistor, Fixed, Film: 5.1 kΩ, 5%, 1/8 W	1	CF1/8-5.1K/J	09021	
R23	Same as R11				
R24	Same as R11				
R25	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	2	CF1/8-1.0K/J	09021	
R26	Same as R25				
R27	Same as R11				
R28	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R29	Resistor, Fixed, Film: 27Ω, 5%, 1/8 W	1	CF1/8-27 OHMS/J	09021	
R30	Same as R9				
R31	Same as R6				
R32	Not Used				
R33	Resistor, Fixed, Film: 200Ω, 5%, 1/8 W	1	CF1/8-200 OHMS/J	09021	
R34	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/8 W	1	CF1/8-1.5K/J	09021	
R35	Resistor, Trimmer, Film: 10 kΩ, 10%, 3/4 W	1	860X10K	94271	
R36	Same as R11				
R37	Same as R11				
R38	Same as R11				
R39	Same as R6				
R40	Resistor, Fixed, Film: 15 kΩ, 5%, 1/8 W	1	CF1/8-15K/J	09021	
R41	Resistor, Fixed, Film: 3.0 kΩ, 5%, 1/8 W	1	CF1/8-3.0K/J	09021	
R42	Resistor, Fixed, Film: 39 kΩ, 5%, 1/8 W	1	CF1/8-39K/J	09021	
R43	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	3	CF1/8-100K/J	09021	
R44	Same as R21				
R45	Same as R5				
R46	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/8 W	1	CF1/8-8.2K/J	09021	
R47	Same as R5				
R48	Not Used				
R49	Resistor, Fixed, Film: 510Ω, 5%, 1/8 W	1	CF1/8-510 OHMS/J	09021	

REF DESIG PREFIX **A1A8**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R50	Same as R18				
R51	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R52	Same as R43				
R53	Resistor, Fixed, Film: 27 kΩ, 5%, 1/8 W	1	CF1/8-27K/J	09021	
R54	Same as R6				
R55	Same as R18				
R56	Resistor, Fixed, Film: 39Ω, 5%, 1/8 W	1	CF1/8-39 OHMS/J	09021	
R57	Same as R18				
R58	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	CF1/8-68 OHMS/J	09021	
R59	Same as R43				
R60	Same as R11				
R61	Same as R5				
R62	Same as R5				
R63	Same as R1				
R64	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	1	CF1/8-47K/J	09021	
R65	Same as R40				
R66	Resistor, Fixed, Film: 20 kΩ, 5%, 1/8 W	1	CF1/8-20K/J	09021	
R67	Same as R19				
R68	Same as R6				
R69	Resistor, Fixed, Film: 220 kΩ, 5%, 1/8 W	1	CF1/8-220K/J	09021	
R70	Same as R11				
T1	Transformer	1	T4-1	15542	
U1	Crystal, Oscillator	1	841112	14632	
U2	Peripheral Interface Dual Single Ended Receiver	1	SN75140N	01295	
U3	Integrated Circuit	1	SN74125N	01295	
U4	TTL/Latches Flip-Flops	3	SN74LS196N	01295	
U5	Not Used				
U6	Presettable Decade and Binary Counter	1	SN74LS197N	01295	
U7	Same as U4				
U8	Same as U4				
U9	Dual Flip-Flop, Type-D	2	SN74LS74N	01295	
U10	Phase Frequency Detector	2	11C44DC	07263	
U11	Dual Operational Amplifier	1	MC1458N	18324	
U12	Wideband Amplifier	1	CA3011	02735	
U13	Same as U9				
U14	Same as U10				
U15	Quadruple 2-Input Positive Nand Gate	1	SN74LS00N	01295	
VR1	Diode	1	1N746A	80131	
Y1	Crystal, Quartz: 10.7 MHz	1	CR64U 10.7MHz	80058	
Y2	Crystal, Quartz: 21.415 MHz	1	91805-34	14632	
Y3	Crystal, Quartz: 10.000 MHz	1	CR64U 10.000 MHz	80058	

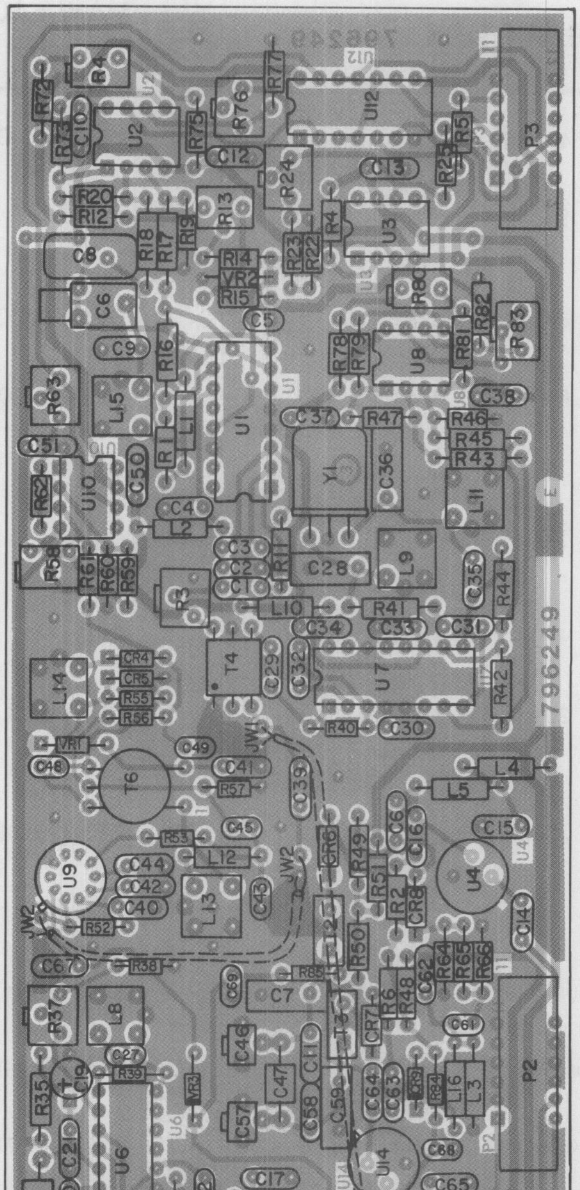


Figure 5-21. Type 796249-1, AM/FM Demodulator Assembly (A1A9) Location of Components

5.5.1.9 **Type 796249-1 AM/FM Demodulator Assembly** REF DESIG PREFIX A1A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	3	1N462A	80131	
CR2	Same as CR1				
CR3	Same as CR1				
CR4	Diode	2	5082-2800	28480	
CR5	Same as CR4				
CR6	Diode	4	MPN3401	04713	
CR7	Same as CR6				
CR8	Same as CR6				
CR9	Same as CR6				
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	20	34453-1	14632	
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Monolithic: 510 pF, 2%, 100 V	6	300-100-NPO-512G	51642	
C5	Capacitor, Ceramic, Monolithic: 100				
C6	Capacitor, Variable, Air: 0.6-6 pF, 250 V	1	5701	91293	
C7	Capacitor, Ceramic,Tubular: 2.2 pF, ±.25 pF, 500 V	2	301-000U2J0-229C	72982	
C8	Capacitor, Ceramic, Monolithic: 180 pF, 2%, 100 V	2	150-100-NPO-181G	51642	
C9	Same as C4				
C10	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	5	34475-1	14632	
C11	Capacitor, Ceramic, Monolithic: 20 pF, 5%, 100 V	3	100-100-NPO-200J	51642	
C12	Same as C10				
C13	Same as C10				
C14	Same as C1				
C15	Same as C4				
C16	Same as C1				
C17	Capacitor, Ceramic, Disc: 1000 pF, 10%, 200 V	1	CK05BX102K	81349	
C18	Capacitor, Ceramic, Disc: 5000 pF, 20%, 500 V	1	B-GP5000PFM	91418	
C19	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	1	196D475X0035JE3	56289	
C20	Same as C1				
C21	Same as C1				
C22	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	4	34452-1	14632	
C23	Capacitor, Ceramic, Tubular: 10 pF, ±0.5 pF, 500 V	2	301-000U2J0-100D	72982	
C24	Same as C23				
C25	Capacitor, Ceramic, Monolithic: 82 pF, 2%, 100 V	2	200-100-NPO-820G	51642	
C26	Same as C25				
C27	Same as C11				
C28	Capacitor, Ceramic, Tubular: 6.8 pF, ±.5 pF, 500 V	2	301-000T2J0-689D	72982	
C29 Thru C35	Same as C1				

REF DESIG PREFIX A1A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C36	Capacitor, Ceramic, Tubular: 10 pF, ±.5 pF, 500 V	1	301-000T2J0-100D	72982	
C37	Same as C22				
C38	Same as C22				
C39 Thru C42	Same as C1				
C43	Capacitor, Ceramic, Tubular: 1.5 pF, ±.25 pF, 500 V	1	301-000C0K0-159C	72982	
C44	Same as C1				
C45	Capacitor, Ceramic, Tubular: 2.7 pF, ±0.25 pF, 500 V	1	301-000C0J0-279C	72982	
C46	Capacitor, Variable, Ceramic: 2.5-9 pF, 100 V	1	518-002A2.5-9	72982	
C47	Capacitor, Composition, Tubular: .62 pF, 10%, 500 V	1	QCO.62PFK	95121	
C48	Capacitor, Ceramic, Monolithic: 15 pF, 5%, 100 V	1	100-100-NPO-150J	51642	
C49	Capacitor, Ceramic, Monolithic: 3.0 pF, ±0.1 pF, 100 V	1	100-100-NPO-309B	51642	
C50	Same as C10				
C51	Same as C10				
C52	Same as C22				
C53	Same as C22				
C54	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
C55	Capacitor, Electrolytic, Tantalum: 10 µF, 20%, 20 V	2	196D106X0020JE3	56289	
C56	Same as C55				
C57	Same as C46				
C58	Same as C11				
C59	Same as C7				
C60	Same as C1				
C61	Capacitor, Ceramic, Monolithic: 120 pF, 2%, 100 V	1	200-100-NPO-121G	51642	
C62	Same as C8				
C63	Same as C1				
C64	Same as C1				
C65	Same as C4				
C66	Same as C1				
C67	Same as C1				
C68	Same as C1				
C69	Same as C1				
L1	Coil, Fixed, Molded: 10 µH	3	1025-44	99800	
L2	Coil, Fixed: 18 µH, 10%	2	1025-50	99800	
L3	Coil, Fixed: .33 µH, 10%	1	1025-08	99800	
L4	Same as L1				
L5	Coil, Fixed: 2.2 µH, 10%	1	1025-28	99800	
L6	Coil, Fixed, Molded: 82 µH	2	1025-66	99800	

REF DESIG PREFIX A1A9

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L7	Same as L6				
L8	Coil, Variable: 2.2 μH	3	6740-17	04213	
L9	Coil, Variable: 2.2-3.9 μH	1	6740-19	04213	
L10	Same as L2				
L11	Same as L8				
L12	Coil, Fixed: 2.7 μH, 10%	1	1025-24	99800	
L13	Same as L8				
L14	Coil, Variable: 6.8-12.0 μH	1	6740-25	04213	
L15	Coil, Variable: .33 μH	1	6740-7	04213	
L16	Coil, Fixed: .47 μH	1	1025-12	99800	
L17	Same as L5				
L18	Same as L1				
P1	Receptacle Assembly	3	102585-6	00779	
P2	Same as P1				
P3	Same as P1				
R1	Resistor, Fixed, Film: 3.0 kΩ, 5%, 1/8 W	1	CF1/8-3K/J	09021	
R2	Resistor, Fixed, Film: 15 kΩ, 5%, 1/8 W	4	CF1/8-15K/J	09021	
R3	Resistor, Trimmer, Film: 500Ω, 10%, 1/2 W	2	62PAR500	73138	
R4	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF1/4-100K/J	09021	
R5	Resistor, Fixed, Film: 560Ω, 5%, 1/8 W	1	CF1/8 560 OHMS/J	09021	
R6	Same as R2				
R7	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	2	CF1/8-100 OHMS/J	09021	
R8	Same as R3				
R9	Resistor, Fixed, Film: 51Ω, 5%, 1/8 W	2	CF1/8-51 OHMS/J	09021	
R10	Resistor, Fixed, Film: 270 kΩ, 5%, 1/8 W	1	CF1/8-270K/J	09021	
R11	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	2	CF1/8-220 OHMS/J	09021	
R12	Resistor, Fixed, Film: 51 kΩ, 5%, 1/8 W	5	CF1/8-51K/J	09021	
R13	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	1	860X10K	94271	
R14	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	1	CF1/8-2.7K/J	09021	
R15	Same as R12				
R16	Resistor, Fixed, Film: 4.7 kΩ, 1%, 1/10 W	2	RN55C4751F	81349	
R17	Resistor, Fixed, Film: 46.4 kΩ, 1%, 1/10 W	2	RN55C4642F	81349	
R18	Resistor, Fixed, Film: 51.1 kΩ, 1%, 1/10 W	2	RN55C5112F	81349	
R19	Resistor, Fixed, Film: 150 kΩ, 5%, 1/8 W	2	CF1/8-150K/J	09021	
R20	Same as R19				
R21	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	3	62PR50K	73138	
R22	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	10	CF1/8-10K/J	09021	
R23	Resistor, Fixed, Film: 5.1 kΩ, 5%, 1/8 W	2	CF1/8-5.1K/J	09021	
R24	Resistor, Trimmer, Film: 10 kΩ, 10%, 1/2 W	2	62PAR10K	73138	
R25	Same as R7				

REF DESIG PREFIX **A1A9**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R26	Resistor, Fixed, Film: 24 kΩ, 5%, 1/8 W	1	CF1/8-24K/J	09021	
R27	Same as R22				
R28	Same as R23				
R29	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	6	CF1/8-1K/J	09021	
R30	Resistor, Fixed, Film: 75 kΩ, 5%, 1/8 W	1	CF1/8-75K/J	09021	
R31	Same as R22				
R32	Same as R24				
R33	Same as R22				
R34	Same as R4				
R35	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8 47 OHMS/J	09021	
R36	Resistor, Fixed, Composition: 150Ω, 5%, 1/2 W	1	RCR20G151JS	81349	
R37	Resistor, Trimmer, Film: 2 kΩ, 10%, 1/2 W	1	62PR2K	73138	
R38	Same as R29				
R39	Same as R29				
R40	Same as R11				
R41	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	1	RN55C2211F	81349	
R42	Same as R16				
R43	Same as R17				
R44	Resistor, Fixed, Film: 11 kΩ 1%, 1/10 W	1	RN55C1102F	81349	
R45	Same as R18				
R46	Resistor, Fixed, Film: 68 kΩ, 5%, 1/8 W	2	CF1/8-68K/J	09021	
R47	Same as R46				
R48	Same as R12				
R49	Same as R2				
R50	Same as R2				
R51	Same as R12				
R52	Same as R9				
R53	Resistor, Fixed, Film: 680Ω, 5%, 1/8 W	1	CF1/8 680 OHMS/J	09021	
R54	Same as R22				
R55	Resistor, Fixed, Film: 1.5 kΩ, 5%, 1/8 W	3	CF1/8-1.5K/J	09021	
R56	Resistor, Fixed, Film: 22 kΩ, 5%, 1/8 W	2	CF1/8-22K/J	09021	
R57	Same as R56				
R58	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	860X-100K	94271	
R59	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/8 W	1	CF1/8-1M/J	09021	
R60	Resistor, Fixed, Film: 7.5 kΩ, 5%, 1/8 W	1	CF1/8-7.5K/J	09021	
R61	Same as R22				
R62	Same as R12				
R63	Resistor, Trimmer, Film: 200 kΩ, 10%, 1/2 W	1	62PR200K	73138	
R64	Resistor, Fixed, Film: 200 Ω, 5%, 1/8 W	2	CF1/8-200 OHMS/J	09021	
R65	Resistor, Fixed, Film: 27Ω, 5%, 1/8 W	1	CF1/8-27 OHMS/J	09021	
R66	Same as R64				

REF DESIG PREFIX **A1A9**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R67	Same as R29				
R68	Same as R29				
R69	Same as R55				
R70	Same as R55				
R71	Same as R29				
R72	Resistor, Fixed, Film: 27 kΩ, 5%, 1/8 W	4	CF1/8-27K/J	09021	
R73	Same as R22				
R74	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	2	860X-5K	94271	
R75	Same as R72				
R76	Same as R21				
R77	Same as R22				
R78	Same as R72				
R79	Same as R22				
R80	Same as R74				
R81	Same as R72				
R82	Same as R22				
R83	Same as R21				
R84	Same as R7				
R85	Same as R7				
T1	Transformer	3	T4-1	15542	
T2	Transformer	2	180252-1	14632	
T3	Same as T2				
T4	Same as T1				
T5	Same as T1				
T6	Transformer Assembly	1	380552-1	14632	
U1	FM IF System	2	CA3189E	02735	
U2	Dual Operational Amplifier	3	MC1458N	18324	
U3	BI MOS Operation Amplifier	1	CA3160AE	02735	
U4	Wideband RF Amplifier	2	MWA130	04713	
U5	Same as U2				
U6	Integrated Circuit	1	TDA440	94375	
U7	Same as U1				
U8	Same as U2				
U9	Wideband FM IF Amplifier High-Gain	1	CA3012	02735	
U10	Operational Amplifier	2	LM318N	27014	
U11	Same as U10				
U12	Monolithic CMOS Analog Switch	1	DG303CJ	17856	
U13	Monolithic CMOS Analog Switch	1	DG301CJ	17856	
U14	Same as U4				
VR1	Diode	2	1N754A	80131	
VR2	Diode	1	1N746A	80131	
VR3	Same as VR1				
Y1	Discriminator, Crystal	1	3099	74306	

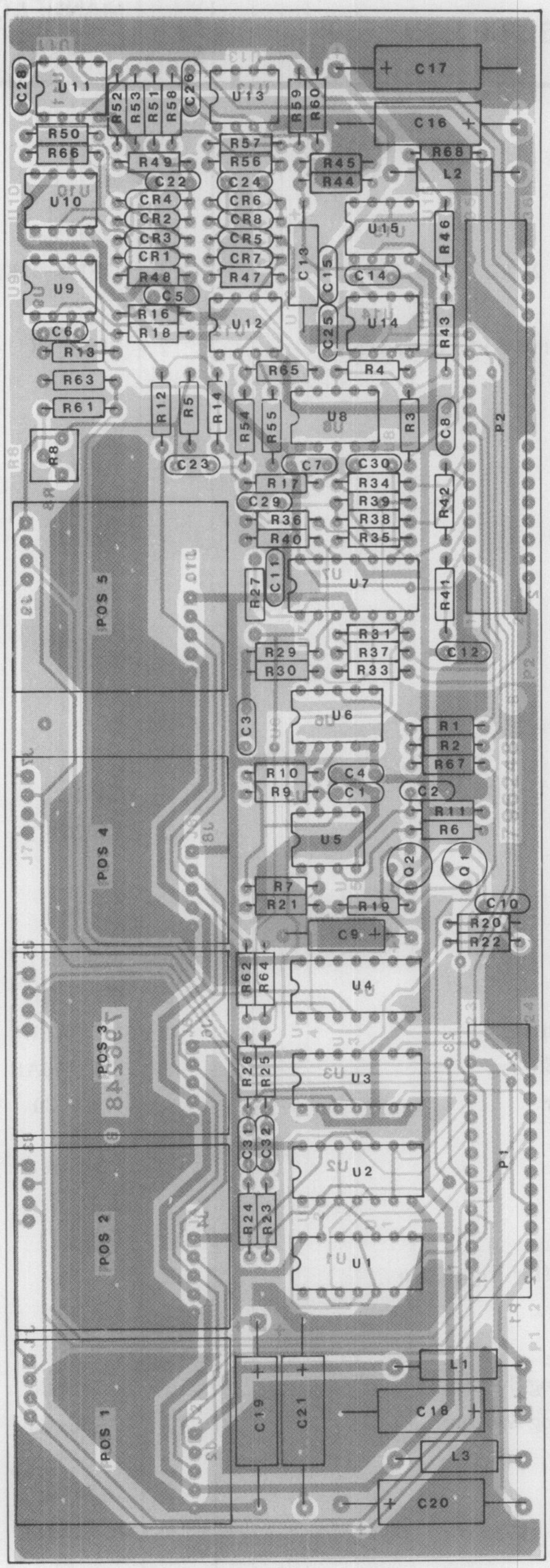


Figure 5-22. Type 796248-1, Audio/Video Assembly (A1A10) Location of Components

5.5.1.10 **Type 796248-1 Audio/Video Assembly** REF DESIG PREFIX A1A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	8	5082-2800	28480	
CR2 Thru CR8	Same as CR1				
C1	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	17	34452-1	14632	
C2 Thru C8	Same as C1				
C9	Capacitor, Electrolytic, Tantalum: 4.7 µF, 10%, 35 V	2	CS13BF475K	81349	
C10	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	4	34475-1	14632	
C11	Same as C1				
C12	Same as C1				
C13	Same as C9				
C14	Same as C1				
C15	Same as C1				
C16	Capacitor, Electrolytic, Tantalum: 100 µF, 20%, 35 V	6	MTP107M035P1C	76055	
C17 Thru C21	Same as C16				
C22	Capacitor, Ceramic, Disc: .047 µF, 10%, 100 V	2	CK06BX473K	81349	
C23	Same as C1				
C24	Same as C22				
C25	Same as C10				
C26	Same as C10				
C27	Not Used				
C28	Same as C10				
C29 Thru C32	Same as C1				
J1	Pin Jack	45	006-4827	98291	
J2 Thru J10	Same as J1				
L1	Coil, Fixed, Molded: 100 µH, 5%	3	2500-28	99800	
L2	Same as L1				
L3	Same as L1				
P1	Receptacle Assembly	1	102585-7	00779	
P2	Receptable Assembly	1	102585-8	00779	
POS1	See **Figure 6-12, Table A**	5	280542-X	14632	
POS2 Thru POS5	Same as POS1				
Q1	Transistor	1	2N2222A	80131	
Q2	Transistor	1	2N3251	80131	
R1	Resistor, Fixed, Film: 100Ω, 1%, 1/10 W	7	RN55C1000F	81349	

REF DESIG PREFIX A1A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R2	Resistor, Fixed, Film: 90.9Ω, 1%, 1/10 W	2	RN55C90RF9	81349	
R3	Same as R1				
R4	Same as R2				
R5	Resistor, Fixed, Film: 1.0 kΩ, 1%, 1/10 W	6	RN55C1001F	81349	
R6	Same as R5				
R7	Resistor, Fixed, Film: 36.5 kΩ, 1%, 1/10 W	1	RN55C3652F	81349	
R8	Resistor, Variable, Film: 50 kΩ, 10%, 3/4 W	1	89PR50K	73138	
R9	Resistor, Fixed, Film: 22.1Ω, 1%, 1/10 W	4	RN55D22R1F	81349	
R10	Same as R1				
R11	Same as R9				
R12	Same as R5				
R13	Same as R5				
R14	Resistor, Fixed, Film: 5.11 kΩ, 1%, 1/10 W	3	RN55C5111F	81349	
R15	Resistor, Trimmer, Film: 20 kΩ, 10%, 3/4 W	1	89PR20K	73138	
R16	Same as R9				
R17	Same as R1				
R18	Same as R9				
R19	Resistor, Fixed, Film: 5.62 kΩ, 1%, 1/10 W	1	RN55C5621F	81349	
R20	Resistor, Fixed, Film: 22 MΩ, 5%, 1/4 W	1	CF1/4-22M/J	09021	
R21	Resistor, Fixed, Film: 56.2Ω, 1%, 1/10 W	1	RN55C56R2F	81349	
R22	Same as R1				
R23	Resistor, Fixed, Film: 51.1 kΩ, 1%, 1/10 W	6	RN55C5112F	81349	
R24	Same as R23				
R25	Same as R23				
R26	Same as R23				
R27	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	5	RN55C1003F	81349	
R28	Resistor, Trimmer, Film: 100 kΩ, 10%, 3/4 W	2	89PR100K	73138	
R29	Same as R23				
R30	Same as R23				
R31	Same as R27				
R32	Same as R28				
R33	Resistor, Fixed, Film: 562Ω, 1%, 1/10 W	4	RN55C5620F	81349	
R34	Same as R14				
R35	Resistor, Fixed, Film: 10 kΩ, 1%, 1/10	5	RN55C1002F	81349	
R36	Same as R35				
R37	Same as R33				
R38	Same as R14				
R39	Same as R35				
R40	Same as R35				
R41	Same as R33				
R42	Same as R33				

REF DESIG PREFIX A1A10

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R43	Resistor, Fixed, Film: 33.2 kΩ, 1%, 1/10 W	1	RN55C3322F	81349	
R44	Resistor, Fixed, Film: 3.65 kΩ, 1%, 1/10 W	1	RN55C3651F	81349	
R45	Resistor, Fixed, Film: 2.43 kΩ, 1%, 1/10 W	1	RN55C2431F	81349	
R46	Resistor, Fixed, Film: 9.09 kΩ, 1%, 1/10 W	1	RN55C9091F	81349	
R47	Resistor, Fixed, Film: 61.9Ω, 1%, 1/10 W	3	RN55C61R9F	81349	
R48	Same as R27				
R49	Resistor, Fixed, Film: 604 kΩ, 1%, 1/10 W	1	RN55C6043F	81349	
R50	Resistor, Fixed, Film: 499 kΩ, 1%, 1/10 W	5	RN55C4993F	81349	
R51	Same as R50				
R52	Resistor, Fixed, Film: 499 kΩ, 1%, 1/10 W	1	RN55C4993F	81349	
R53	Same as R50				
R54	Same as R35				
R55	Same as R27				
R56	Same as R27				
R57	Resistor, Fixed, Film: 249 kΩ, 1%, 1/10 W	2	RN55C2493F	81349	
R58	Same as R57				
R59	Same as R50				
R60	Same as R50				
R61	Same as R47				
R62	Same as R47				
R63	Same as R5				
R64	Same as R5				
R65	Resistor, Fixed, Film: 1.2 MΩ, 5%, 1/4 W	2	CF1/4-1.2M/J	09021	
R66	Same as R65				
R67	Same as R1				
R68	Same as R1				
U1	Monolithic CMOS Analog Switch	3	DG303CJ	17856	
U2	Same as U1				
U3	Monolithic CMOS Analog Switch	1	DG302CJ	17856	
U4	Same as U1				
U5	Buffer	4	LM318N	27014	
U6	Integrated Circuit	2	LH0002CN	27014	
U7	Quad Operational Amplifier	1	MC3403P	04713	
U8	Same as U6				
U9	Same as U5				
U10	Same as U5				
U11	BI MOS Operational Amplifier	4	CA3160AE	02735	
U12	Same as U5				
U13	Same as U11				
U14	Same as U11				
U15	Same as U11				

Table 5-1. Component Values for Selected IF Bandwidth

Type	IF BW	R1	R2	R3	C1 THRU C4	L1 & L2
280542-1	6.4 kHz	121 kΩ RN55C1213F	1.0 kΩ RN55C1001F	Not Used	.068 µF CK05BX683K	82 mH 2534-70
280542-2	10 kHz	95.3 kΩ RN55C9532F	1.58 kΩ RN55C1581F	2.80 kΩ RN55C2801F	.047 µF CK05BX473K	47 mH 2534-64
280542-3	15 kHz	80.6 kΩ RN55C8062F	2.32 kΩ RN55C2321F	1.74 kΩ RN55C1741F	.027 µF CK05BX273K	33 mH 2534-60
280542-4	20 kHz	68.1 kΩ RN55C6812F	3.16 kΩ RN55C3161F	1.47 kΩ RN55C1471F	.022 µF CK05BX223K	27 mH 553-3635-54
280542-5	40 kHz	53.6 kΩ RN55C5362F	6.19 kΩ RN55C6191F	1.21 kΩ RN55C1211F	.01 µF CK05BX103K	12 mH 2534-50
280542-6	50 kHz	47.5 kΩ RN55C4752F	1.0 kΩ RN55C1001F	Not Used	.01 µF CK05BX103K	10 mH 2534-48
280542-7	75 kHz	43.2 kΩ RN55C4322F	1.5 kΩ RN55C1501F	3.01 kΩ RN55C3011F	5600 pF CK05BX562K	6.8 mH 2534-44
280542-8	100 kHz	40.2 kΩ RN55C4022F	2.0 kΩ RN55C2001F	2.0 kΩ RN55C2001F	4700 pF CK05BX472K	2.2 mH 2534-40
280542-9	250 kHz	37.4 kΩ RN55C3742F	4.99 kΩ RN55C4991F	1.24 kΩ RN55C1241F	1800 pF CK05BX182K	4.7 mH 2534-32
280542-10	300 kHz	34.0 kΩ RN55C3402F	6.04 kΩ RN55C6041F	1.21 kΩ RN55C1211F	1500 pF CK05BX152K	1.8 mH 2534-30
280542-11	500 kHz	32.4 kΩ RN55C3242F	1.0 kΩ RN55C1001F	Not Used	820 pF CK05BX821K	1.0 mH 2534-24
280542-12	1.0 MHz	30.1 kΩ RN55C3012F	2.0 kΩ RN55C2001F	2.0 kΩ RN55C2001F	470 pF CK05BX471K	.47 mH 2534-16
280542-13	2.0 MHz	28.0 kΩ RN55C2802F	4.02 kΩ RN55C4021F	1.33 kΩ RN55C1331F	220 pF CK05BX221K	.27 mH 2534-10
280542-14	4.0 MHz	26.7 kΩ RN55C2672F	8.06 kΩ RN55C8061F	1.15 kΩ RN55C1151F	120 pF CK05BX121K	.12 mH 2534-02

5.5.1.10.1 **Part 280542-X, Bandwidth/Video Response** REF DESIG PREFIX **POS1 THRU POS5**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	See **Table 5-1**			81349	
C2	See **Table 5-1**			81349	
C3	See **Table 5-1**			81349	
C4	See **Table 5-1**			81349	
L1	See **Table 5-1**			71279	
L2	See **Table 5-1**			71279	
P1	Plug	1	180226-1	14632	
P2	Plug	1	180226-2	14632	
R1	See **Table 5-1**			81349	
R2	See **Table 5-1**			81349	
R3	See **Table 5-1**			81349	
U1	CMOS Analog Switch	1	DG306CJ	17856	

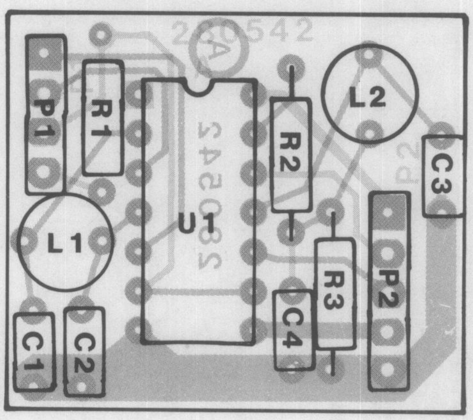


Figure 5-23. Part 280542-X, Bandwidth/Video Response (POS1 Thru POS5) Location of Components

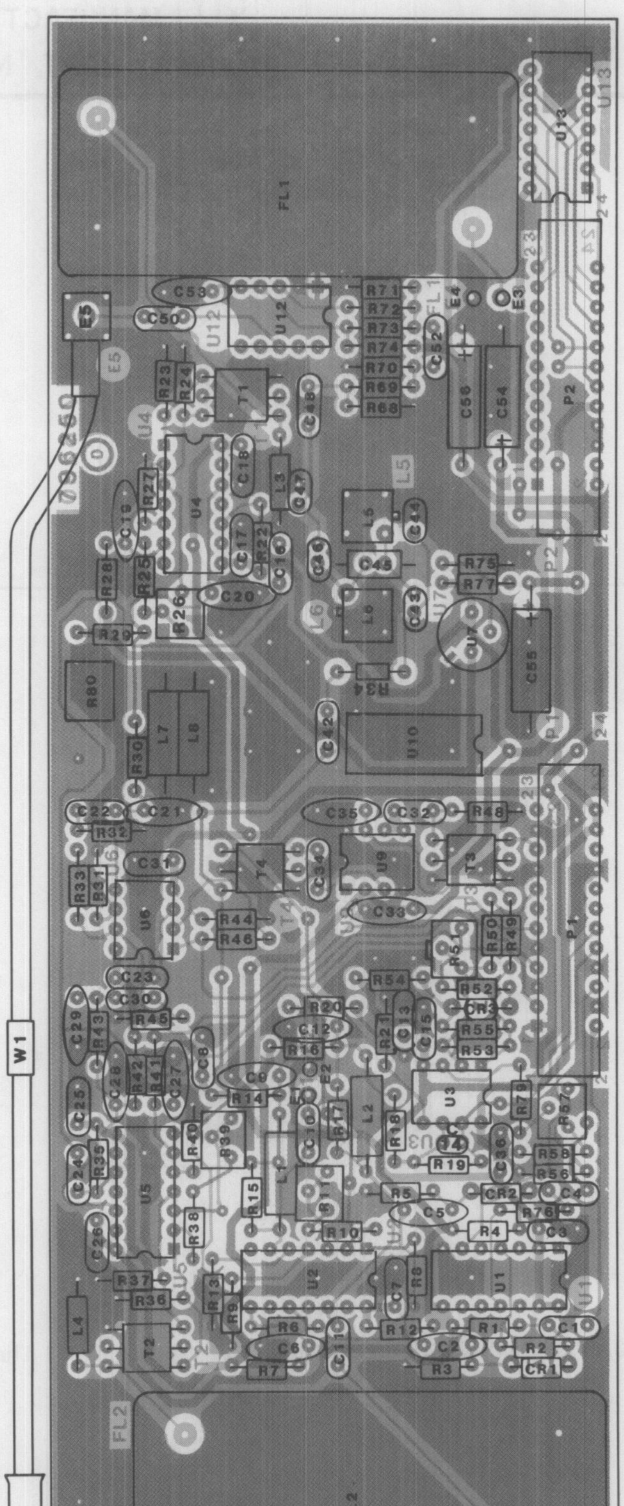


Figure 5-24. Type 796250-X, ISB/CW Demodulator (A1A11)
Location of Components

5.5.1.11 **Type 796250-X, ISB/CW Demodulator** REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	2	MPN3401	04713	
CR2	Same as CR1				
CR3	Diode	1	1N4446	80131	
C1	Capacitor, Ceramic, Disc: 1000 pF, 10%, 200 V	10	CK05BX102K	81349	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	11	34453-1	14632	
C4	Same as C1				
C5	Same as C1				
C6	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	12	C023B101E502M	56289	
C7	Same as C3				
C8	Same as C3				
C9	Same as C6				
C10	Same as C3				
C11	Same as C3				
C12	Same as C6				
C13	Capacitor, Ceramic, Monolithic: 15 pF, 5%, 100 V	3	8111-100-COGO-150J	72982	
C14	Same as C13				
C15	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	6	34452-1	14632	
C16	Same as C3				
C17	Same as C3				
C18	Same as C3				
C19	Same as C6				
C20	Same as C6				
C21	Same as C6				
C22	Same as C15				
C23	Same as C15				
C24	Same as C3				
C25	Same as C3				
C26	Same as C3				
C27	Same as C6				
C28	Same as C6				
C29	Same as C6				
C30	Same as C15				
C31	Same as C15				
C32	Same as C1				
C33	Same as C6				
C34	Same as C1				
C35	Same as C6				
C36	Same as C15				

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C37 Thru C41	Not Used				
C42	Same as C1				
C43	Capacitor, Ceramic, Monolithic: 120 pF, 2%, 500 V	4	200-100-NPO-121G	51642	
C44	Same as C43				
C45	Same as C13				
C46	Same as C43				
C47	Same as C43				
C48	Same as C1				
C49	Not Used				
C50	Same as C1				
C51	Not Used				
C52	Same as C1				
C53	Same as C6				
C54	Capacitor, Electrolytic, Tantalum: 10 μF, 10%, 20 V	3	CS13BE106K	81349	
C55	Same as C54				
C56	Same as C54				
E1	Terminal, Forked	4	140-1019-02-01	71279	
E2	Same as E1				
E3	Same as E1				
E4	Same as E1				
FB1	Ferrite Bead	2	56-590-65-4A	02114	
FB2	Same as FB1				
FL1	Filter (Not Used with 796250-2)	1	92218	14632	
FL2	Filter (Not Used with 796250-2)	1	92217	14632	
L1	Coil, Fixed: 100 μH, 5%	2	1537-76	99800	
L2	Same as L1				
L3	Coil, Fixed: 3.9 μH, 10%	2	1025-34	99800	
L4	Same as L3				
L5	Coil, Variable: 68 mH nominal	2	6740-12	04213	
L6	Same as L5				
P1	Receptacle Assembly	2	102585-7	00779	
P2	Same as P1				
P3	Connector, Jack	1	2002-7571-005	19505	
R1	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	6	CF1/8-100K/J	09021	
R2	Resistor, Fixed, Film: 7.5 kΩ, 5%, 1/8 W	4	CF1/8-7.5K/J	09021	
R3	Same as R2				
R4	Same as R1				
R5	Same as R2				
R6	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	2	CF1/8-470 OHMS/J	09021	
R7	Resistor, Fixed, Film: 22Ω, 5%, 1/8 W	2	CF1/8-22 OHMS/J	09021	

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R8	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	10	CR1/8-100 OHMS/J	09021	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Trimmer, Film: 1 kΩ, 10%, 1/2 W	3	62PAR1K	73138	
R12	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	CF1/8-47 OHMS/J	09021	
R13	Resistor, Fixed, Film: 12 kΩ, 5%, 1/8 W	3	CF1/8-12K/J	09021	
R14	Resistor, Fixed, Film: 2.7 kΩ, 5%, 1/8 W	2	CF1/8-2.7K/J	09021	
R15	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	2	CF1/8-220 OHMS/J	09021	
R16	Same as R14				
R17	Same as R15				
R18	Same as R1				
R19	Resistor, Fixed, Film: 220 kΩ, 5%, 1/8 W	2	CF1/8-220K/J	09021	
R20	Same as R1				
R21	Same as R19				
R22	Same as R8				
R23	Resistor, Fixed, Film: 3 kΩ, 5%, 1/8 W	4	CF1/8-3K/J	09021	
R24	Same as R23				
R25	Same as R8				
R26	Same as R11				
R27	Same as R13				
R28	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/8 W	4	CF1/8-3.3K/J	09021	
R29	Same as R28				
R30	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	3	CF1/8-1.0K/J	09021	
R31	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/8 W	2	CF1/8-2.2K/J	09021	
R32	Same as R1				
R33	Resistor, Fixed, Film: 75 kΩ, 5%, 1/8 W	2	CF1/8-75K/J	09021	
R34	Same as R8				
R35	Same as R8				
R36	Same as R23				
R37	Same as R23				
R38	Same as R8				
R39	Same as R11				
R40	Same as R13				
R41	Same as R28				
R42	Same as R28				
R43	Same as R30				
R44	Same as R31				
R45	Same as R1				
R46	Same as R33				
R47	Not Used				

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R48	Resistor, Fixed, Film: 200Ω, 5%, 1/8 W	2	CF1/8-200 OHMS/J	09021	
R49	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/8 W	1	CF1/8-4.7K/J	09021	
R50	Resistor, Fixed, Film: 82 kΩ, 5%, 1/8 W	2	CF1/8-82K/J	09021	
R51	Resistor, Trimmer, Film: 50 kΩ, 10%, 1/2 W	1	62PAR50K	73138	
R52	Resistor, Fixed, Film: 68 kΩ, 5%, 1/8 W	1	CF1/8-68K/J	09021	
R53	Same as R50				
R54	Resistor, Fixed, Film: 200 kΩ, 5%, 1/8 W	1	CF1/8-200K/J	09021	
R55	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	3	CF1/8-10K/J	09021	
R56	Resistor, Fixed, Film: 150 kΩ, 5%, 1/8 W	1	CF1/8-150K/J	09021	
R57	Resistor, Trimmer, Film: 100 kΩ, 10%, 1/2 W	1	62PAR100K	73138	
R58	Resistor, Fixed, Film: 2.2 MΩ, 5%, 1/8 W	1	CF1/8-2.2M/J	09021	
R59 Thru R67	Not Used				
R68	Same as R6				
R69	Resistor, Fixed, Film: 27Ω, 5%, 1/8 W	1	CF1/8-27 OHMS/J	09021	
R70	Same as R8				
R71	Same as R55				
R72	Same as R8				
R73	Same as R55				
R74	Same as R7				
R75	Same as R30				
R76	Same as R2				
R77	Same as R48				
R78	Not Used				
R79	Resistor, Fixed, Film: 51 kΩ, 5%, 1/8 W	1	CF1/8-51 K/J	09021	
R80	Not Used				
R81	Not Used				
T1	Transformer	2	T9-1	15542	
T2	Same as T1				
T3	Transformer	2	T4-1	15542	
T4	Same as T3				
U1	Monolithic CMOS Analog Switch	1	DG301CJ	17856	
U2	Balanced Modulator/Demodulator	3	MC1496P	04713	
U3	Dual Operational Amplifier	2	MC1458N	18324	

REF DESIG PREFIX A1A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U4	Same as U2				
U5	Same as U2				
U6	Same as U3				
U7	Voltage Regulator	1	LM317H	27014	
U8	Not Used				
U9	Video IF/RF Amplifier	1	SL1611C	52648	
U10	Not Used				
U11	Not Used				
U12	Integrated Circuit	1	LH0002CN	27014	
U13	Monolithic CMOS Analog Switch	1	DG303CJ	17856	
W1	Cable Assembly	1	280566-1	14632	

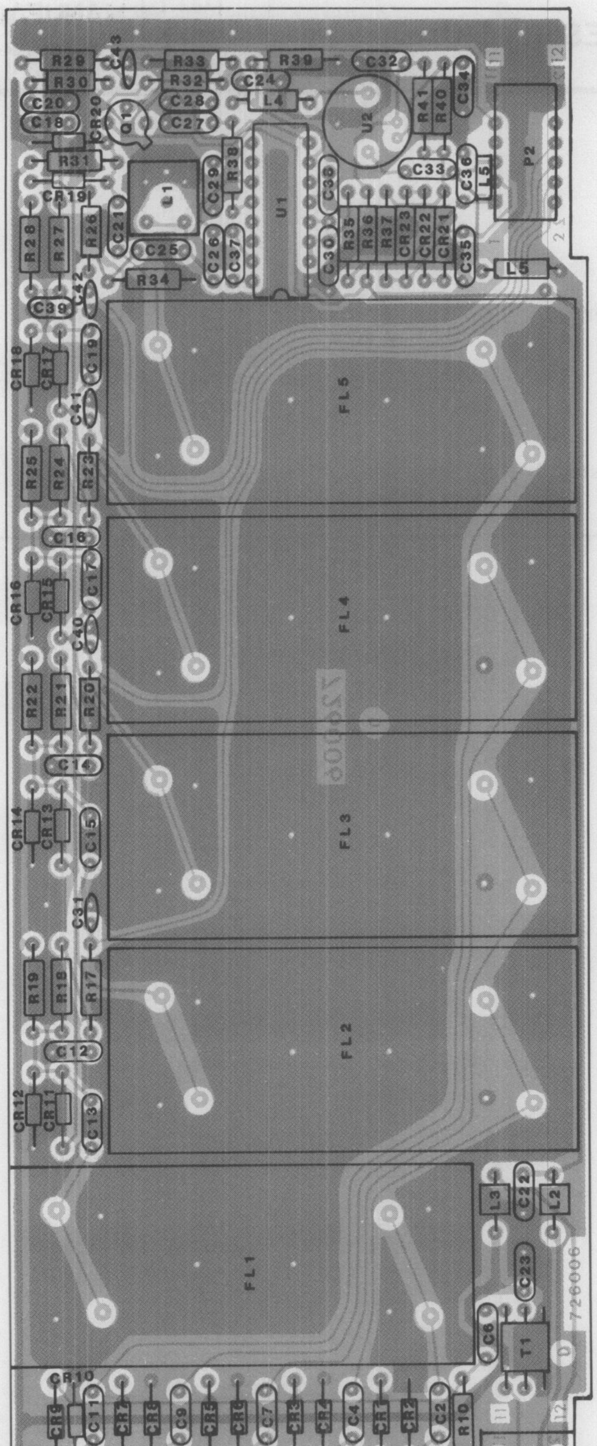


Figure 5-25. Type 726006-1, IF BW Filter Amplifier (A1A12)
Location of Components

5.5.1.12 **Type 726006-1 IF BW Filter Amplifier** REF DESIG PREFIX A1A12

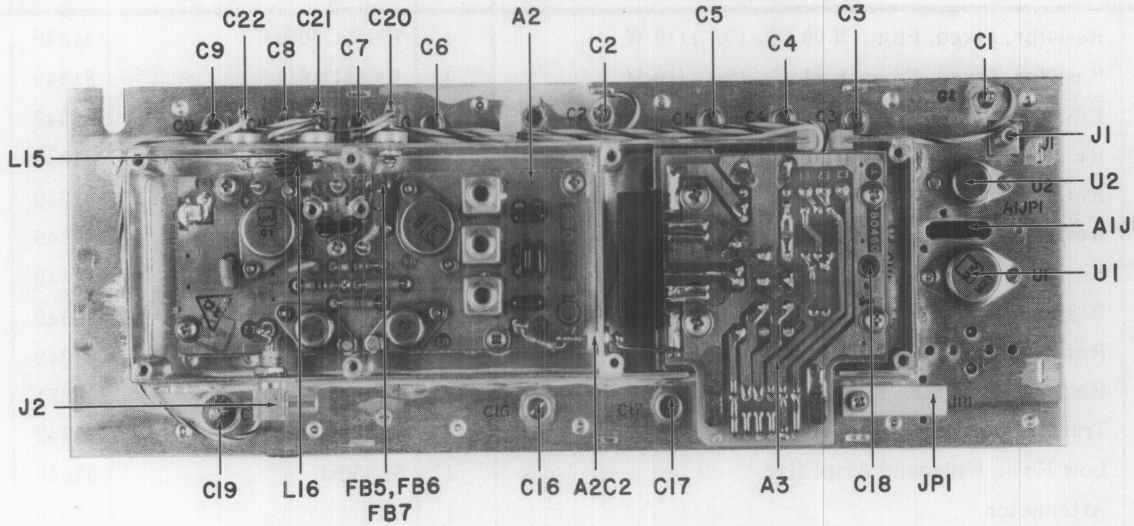
REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	20	MPN3401	04713	
CR2 Thru CR20	Same as CR1				
CR21	Diode	3	1N4449	80131	
CR22	Same as CR21				
CR23	Same as CR21				
C1	Capacitor, Ceramic, Disc: .01 pF, 20%, 50 V	12	34453-1	14632	
C2	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	23	C023B101E502M	56289	
C3	Same as C1				
C4	Same as C2				
C5	Same as C1				
C6	Same as C2				
C7	Same as C2				
C8	Same as C1				
C9	Same as C2				
C10	Same as C1				
C11	Same as C2				
C12	Same as C1				
C13	Same as C2				
C14	Same as C1				
C15	Same as C2				
C16	Same as C1				
C17	Same as C2				
C18	Same as C1				
C19	Same as C2				
C20	Same as C1				
C21	Same as C2				
C22	Same as C1				
C23	Same as C1				
C24	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	1	34452-1	14632	
C25 Thru C30	Same as C2				
C31	Coil, Fixed,: 0.39 μH, 10%	1	1025-10	99800	
C32	Same as C2				
C33	Capacitor, Mica, Dipped: 120 pF, 2%, 500 V	1	CM05FD121G03	81349	
C34 Thru C38	Same as C2				
C39	Capacitor, Mica, Dipped: 33 pF 2%, 500 V	1	CM05ED330G03	81349	
FL1	See **Figure 6-16, Table A**				
FL2	See **Figure 6-16, Table A**				

REF DESIG PREFIX A1A12

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
FL3	See **Figure 6-16, Table A**				
FL4	Not Used				
FL5	Not Used				
L1	Coil, Variable: 68 mH	1	6740-12	04213	
L2	Coil, Fixed	2	16209-4	99800	
L3	Same as L2				
L4	Coil, Fixed, Mold: .33 μH, 10%	1	1025-08	99800	
P1	Receptacle Assembly	2	102585-6	00779	
P2	Same as P1				
Q1	Transistor	1	2N2222A	80131	
R1	Resistor, Fixed, Film: 5.11 kΩ, 1%, 1/10 W	21	RN55C5111F	81349	
R2	Same as R1				
R3	Resistor, Fixed, Film: 30.1 kΩ, 1%, 1/10 W	10	RN55C3012F	81349	
R4	Same as R1				
R5	Same as R1				
R6	Same as R3				
R7	Same as R1				
R8	Same as R1				
R9	Same as R3				
R10	Same as R1				
R11	Same as R1				
R12	Same as R1				
R13	Same as R3				
R14	Same as R1				
R15	Same as R1				
R16	Same as R3				
R17	Same as R1				
R18	Same as R1				
R19	Same as R3				
R20	Same as R1				
R21	Same as R1				
R22	Same as R3				
R23	Same as R1				
R24	Same as R1				
R25	Same as R3				
R26	Same as R1				
R27	Same as R1				
R28	Same as R3				
R29	Same as R1				
R30	Same as R1				
R31	Same as R3				

REF DESIG PREFIX A1A12

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R32	Resistor, Fixed, Film: 9.09 kΩ, 1%, 1/10 W	1	RN55C9091F	81349	
R33	Resistor, Fixed, Film: 6.81 kΩ, 1%, 1/10 W	1	RN55C6811F	81349	
R34	Resistor, Fixed, Film: 274Ω, 1%, 1/10 W	1	RN55C2740F	81349	
R35	Resistor, Fixed, Film: 3.92 kΩ, 1%, 1/10 W	1	RN55C3921F	81349	
R36	Resistor, Fixed, Film: 100Ω, 1%, 1/10 W	1	RN55C1000F	81349	
R37	Resistor, Fixed, Film: 100 kΩ, 1%, 1/10 W	1	RN55C1003F	81349	
R38	Resistor, Fixed, Film: 39.2Ω, 1%, 1/10 W	1	RN55C3922F	81349	
R39	Resistor, Fixed, Film: 750Ω, 1%, 1/10 W	1	RN55C7500F	81349	
R40	Resistor, Fixed, Film: 2.21 kΩ, 1%, 1/10 W	1	RN55C2211F	81349	
R41	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/4 W	1	CF1/4-1M/J	09021	
T1	Transformer	1	T4-1	15542	
U1	Low Noise Wideband Amplifier	1	SL550D	52648	
U2	Attenuator	1	G1	27956	



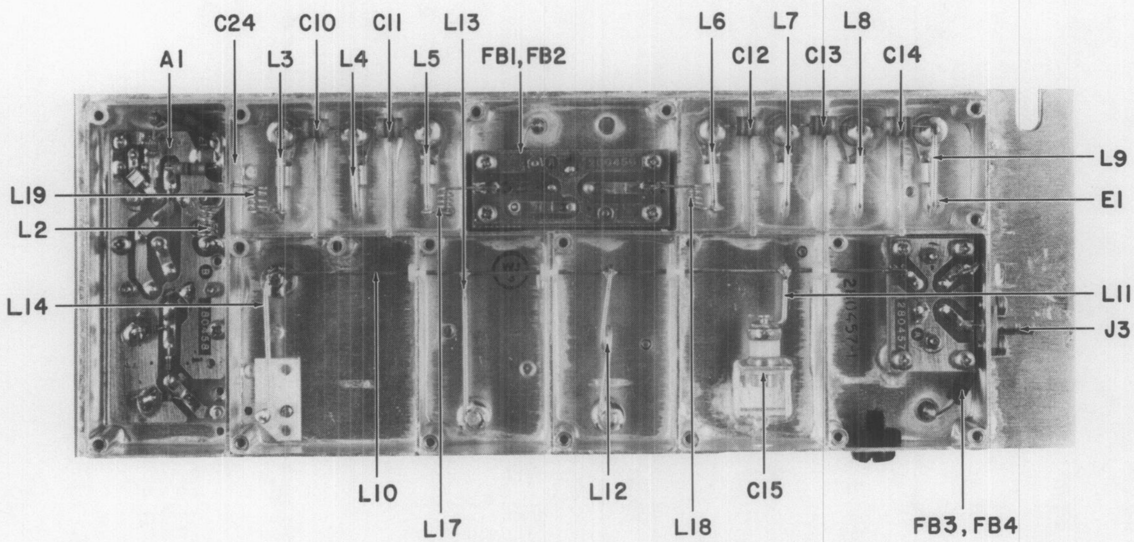


Figure 5-26. Type 796251-1, Preamplifier/Converter Assembly (A1A13) Location of Components

5.5.1.13 **Type 796251-1 Preamplifier/Converter Assembly** REF DESIG PREFIX A1A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	1st Mixer, LO Amplifier Assembly	1	280458-1	14632	
A2	2nd Mixer, LO Amplifier Assembly	1	280459-1	14632	
A3	21.4 MHz IF Amplifier Assembly	1	280460-1	14632	
C1	Capacitor, Ceramic, Feedthru: .05 μF, GMV, 300 V	1	54-785-002-503P	33095	
C2	Capacitor, Ceramic, Feedthru: 1000 pF, CMV, 150 V	5	54-809-002-FC102P	33095	
C3	Capacitor, Variable, Air: .8-10 pF, 250 V	7	5752	91293	
C4 Thru C9	Same as C3				
C10	Capacitor, Composition, Tubular: .36 pF, 10%, 500 V	2	QCO.36PFK	95121	
C11	Same as C10				
C12	Capacitor, Composition, Tubular: .27 pF, 10%, 500 V	2	QCO.27PFK	95121	
C13	Capacitor, Composition, Tubular: 0.22 pF, 10%, 500 V	1	QCO.22PFK	95121	
C14	Same as C12				
C15	Capacitor, Variable, Air: 0.8-10.0 pF, 250 V	4	5202	91293	
C16	Same as C15				
C17	Same as C15				
C18	Same as C15				
C19	Same as C20				
C20	Same as C20				
C21	Same as C20				
C22	Same as C20				
C23	Capacitor, Ceramic, Feedthru: 33 pF, 10%, 500 V	1	54-794-001-3301	33095	
C24	Capacitor, Modified	1	180258	14632	
E1	Terminal, Feedthru	1	SFU16Y	04013	
FB1 Thru FB10	Ferrite Bead	10	P5-1288	01037	
JP1	Jumper Plug	1	461-2872-04-03-10	71279	
J1	Part of A1				
J2	Connector, Receptacle	1	212	19505	
J3	Connector, Receptacle	1	51-045-4524-89	98291	
L1	Coil, Fixed: 0.12 μH, 10%	1	1025-96	99800	
L2	Coil	1	180217-1	14632	
L3	Inductor Assembly	7	190121-1	14632	
L4	Same as L3				
L5	Same as L3				
L6	Same as L3				
L7	Same as L3				
L8	Same as L3				
L9	Same as L3				
L10	Inductor	1	180167-1	14632	
L11	Inductor	1	180218-1	14632	

REF DESIG PREFIX A1A13

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L12	Inductor	1	180219-1	14632	
L13	Inductor	1	180220-1	14632	
L14	P/O C18				
L15	Coil, Fixed	2	16209-10	14632	
L16	Same as L15				
L17	Coil	1	180216-1	14632	
L18	Coil	1	180216-2	14632	
L19	Coil	1	180263	14632	
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
U1	Mixer, Double Balanced	1	M2T	27956	
U2	Amplifier	1	GPD 430	24539	
U3	Amplifier, RF	2	QBH-126	55027	
U4	Same as U3				

5.5.1.13.1 **Part 280458-1 1st Mixer/LO Amplifier Assembly** REF DESIG PREFIX **A1A13A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip: 47 pF, 5%, 500 V	1	ATC100B470JP500	29980	
C2	Capacitor, Ceramic, Chip: 470 pF, 10%, 100 V	1	C1210E471K1GAH	31433	
C3	Capacitor, Ceramic, Chip: 4700 pF, 10%, 50 V	1	C1210C472K5XAH	31433	
JP1	Jumper Plug	1	461-2872-04-03-10	71279	
J1	Connector, Receptacle	1	2009-7511-000	19505	
L1	Coil, Fixed: 0.15 µH	1	1025-00 (75083-3)	99800	
R1	Resistor, Fixed, Film 330Ω, 5%, 1/8 W	2	C3-330R-5PCT	24546	
R2	Resistor, Fixed, Film: 16Ω, 5%, 1/8 W	1	C3-16R-5PCT	24546	
R3	Same as R1				

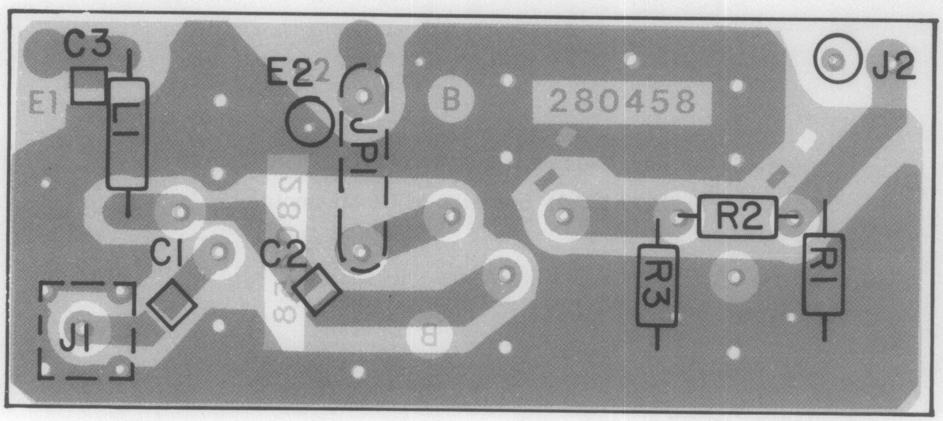


Figure 5-27. Part 280458-1, 1st Mixer/LO Amplifier Assembly (A1A13A1) Location of Components

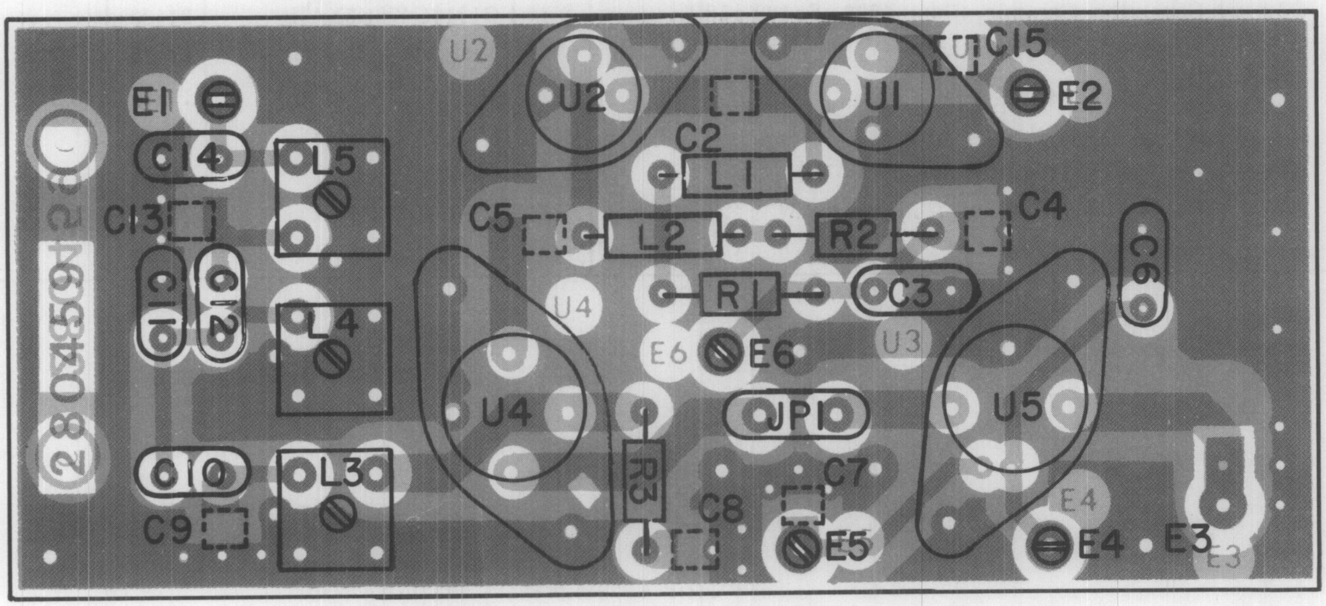


Figure 5-28. Part 280459-1, 2nd Mixer/LO Amplifier Assembly (A1A13A2) Location of Components

5.5.1.13.2 **Part 280459-1 2nd Mixer/LO Amplifier Assembly** REF DESIG PREFIX A1A13A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Chip: 1.5 pF, ±0.25 pF, 500 V	1	ATC700B5R1CP500X	29990	
C2	Capacitor, Ceramic, Chip: 47 pF, 5%, 500 V	2	ATC100B470JP500	29990	
C3	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	2	34453-1	14632	
C4	Capcitor, Ceramic, Chip: 470 pF, 10%, 100 V	3	C1210E471K1GAH	31433	
C5	Same as C4				
C6	Same as C3				
C7	Same as C4				
C8	Capacitor, Ceramic, Chip: 15 pF, 5%, 500 V	1	ATC700B150JP500X	29990	
C9	Capacitor, Ceramic, Chip: 30 pF, 5%, 500 V	2	ATC700B300JP500X	29990	
C10	Capacitor, Mica, Dipped: 10 pF, ±0.5 pF, 500 V	2	CM04CD100D03	81349	
C11	Capacitor, Mica, Dipped: 22 pF, 5%, 500 V	1	CM04ED220J03	81349	
C12	Same as C10				
C13	Same as C9				
C14	Capacitor, Mica, Dipped: 33 pF, 2%, 500 V	1	CM04ED330G03	81349	
C15	Same as C2				
E1	Terminal, Forked	5	140-1941-02-01	71279	
E2 Thru E6	Same as E1				
JP1	Jumper Plug	1	461-2872-01-03-10	71279	
L1	Coil, Fixed: 0.27 µH	2	1025-06	99800	
L2	Same as L1				
L3	Coil, Variable: 1.277 µH nominal	3	6806	04213	
L4	Same as L3				
L5	Same as L3				
R1	Resistor, Fixed, Film: 68Ω, 5%, 1/4 W	1	CF1/4 68 OHMS/J	09021	
R2	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R3	Resistor, Fixed, Film: 47Ω, 5%, 1/8 W	1	C3-47R-5PCT	24546	
U1	Amplifier	1	MWA-220	04713	
U2	Amplifier	1	MWA-230	04713	
U3	Attenuator	1	G1	27956	
U4	Mixer, Balanced	1	M2B	14482	

5.5.1.13.3 **Part 280460-1 21.4 MHz IF Amplifier Assembly** REF DESIG PREFIX **A1A13A3**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	2	1N4449	80131	
CR2	Same as CR1				
C1	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	1	34453-1	14632	
E1	Terminal, Forked	3	140-1941-02-01	71279	
E2	Same as E1				
E3	Same as E1				
L1	Coil, Fixed, Molded: 10 µH	1	1025-44	99800	
P1	Receptacle Assembly	1	102585-6	00779	
R1	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/8 W	1	CF1/8-1.0K/J	09021	
R2	Resistor, Fixed, Film: 1.0 MΩ, 5%, 1/8 W	1	CF1/8-1M/J	09021	
R3	Resistor, Fixed, Film: 100 kΩ, 5%, 1/8 W	1	CF1/8-100K/J	09021	
R4	Resistor, Fixed, Film: 10Ω, 5%, 1/8 W	1	C3-10R-5PCT	24546	
R5	Resistor, Fixed, Film: 470Ω, 5%, 1/8 W	2	C3-470R-5PCT	24546	
R6	Same as R5				
U1	Thin Film RF Linear Hybrid Amplifier	1	CA2850R	01281	
U2	Power Divider	1	PSC2-1	15542	

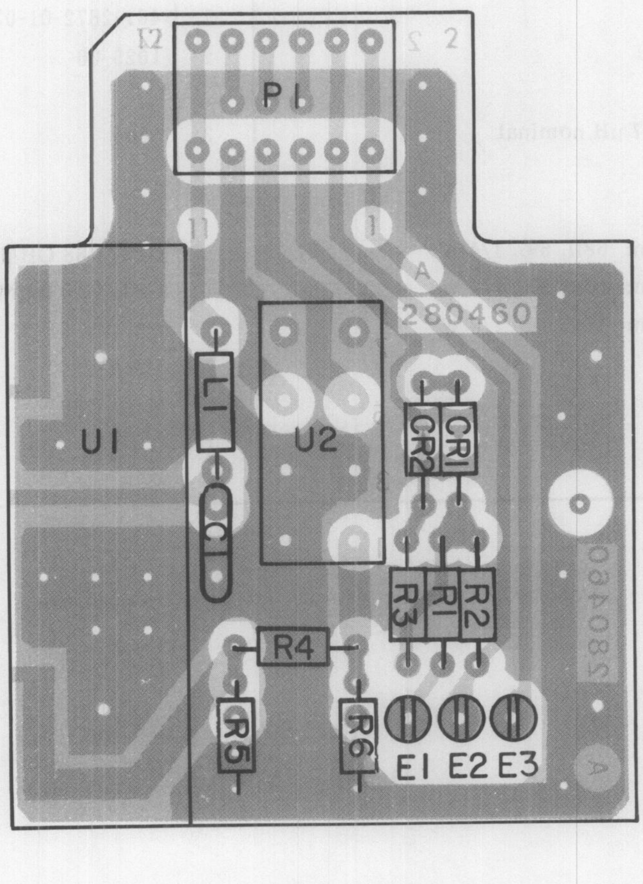


Figure 5-29. Part 280460-1, 21.4 MHz IF Amplifier Assembly (A1A13A3) Location of Components

5.5.1.14 **Type 796291-1 RF Input Filter** REF DESIG PREFIX **A1A14**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Mica, Dipped: 160 pF, 2%, 500 V	1	CM04FD161G03	81349	
C2	Capacitor, Ceramic, Chip: 4.3 pF, ±0.5 pF, 500 V	2	ATC700B4R3DP500X	29990	
C3	Capacitor, Ceramic, Chip: 8.2 pF, ±0.25 pF, 500 V	1	ATC700B8R2CP500X	29990	
C4	Same as C2				
J1	Connector, Receptacle		2009-7511-000	19505	
L1	Coil, Fixed, Molded: .47 μH, 10%	2	1537-06	99800	
L2	Same as L1				
L3	Coil, Fixed	2	170160-1	14632	
L4	Same as L3				
P1	Connector, Plug	1	2105-7521-005	19505	
W1	Cable Assembly	1	280570-1	14632	

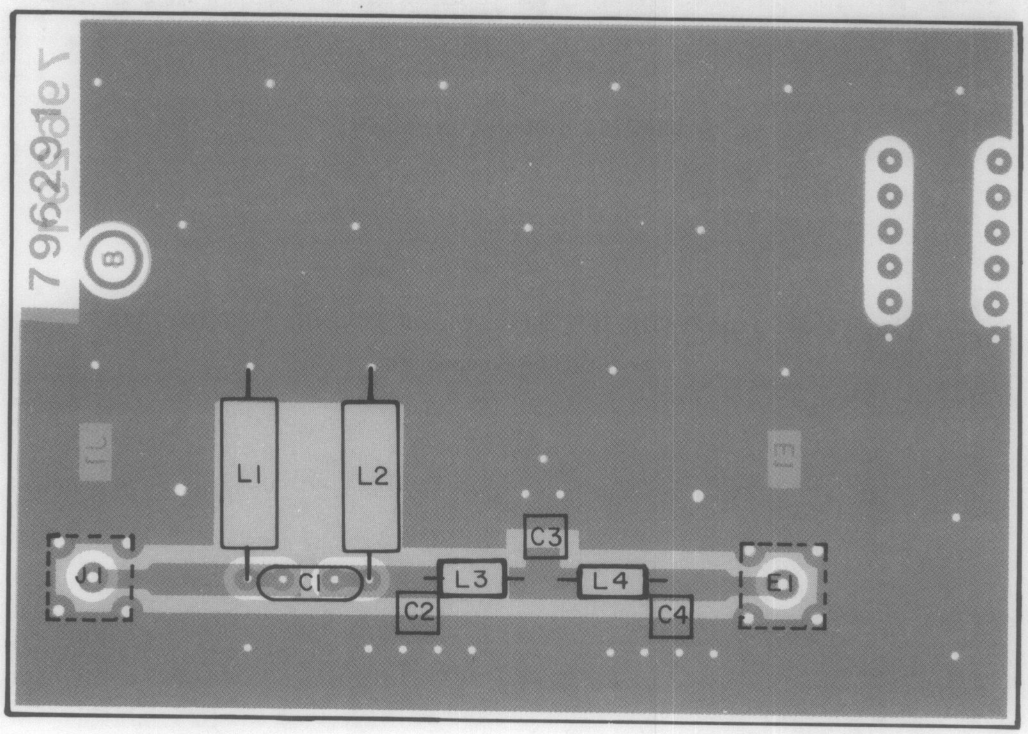


Figure 5-30. Type 796291-1, RF Input Filter (A1A14)
Location of Components

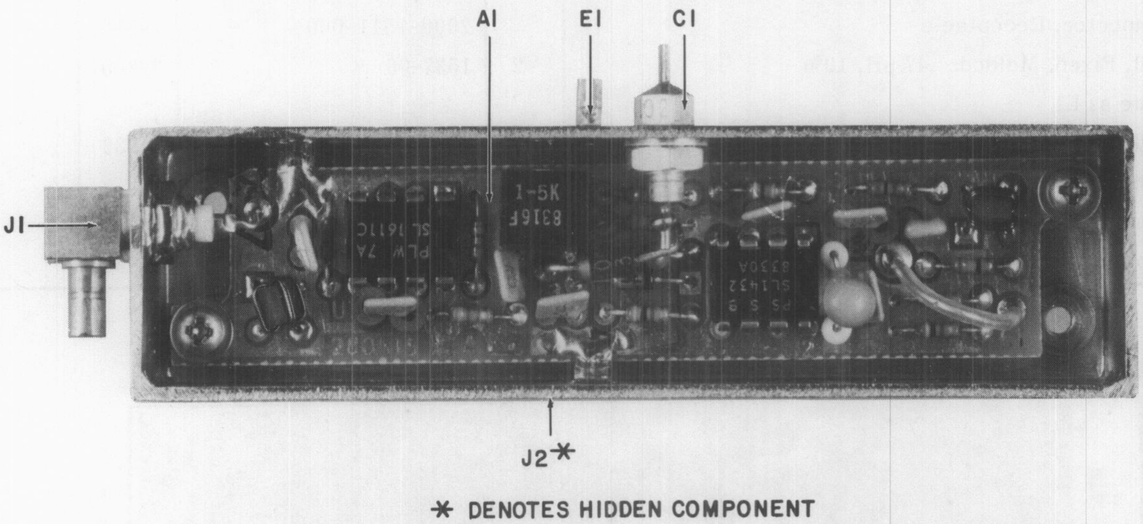


Figure 5-31. Type 796318-1, Wideband Output 21.4 MHz Amplifier (A2) Location of Components

5.5.2 **TYPE 796318-1 WIDEBAND OUTPUT 21.4 MHZ AMPLIFIER** REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	WBO 21.4 MHz Amplifier Assembly	1	280515-1	14632	
C1	Capacitor, Ceramic, Feedthru: 1000 pF, GMV, 150 V	1	54-809-002-FC102P	33095	
E1	Terminal, Forked	1	140-1941-02-01	71279	
J1	Connector, Receptacle	1	212	19505	
J2	Connector, Jack	1	3252-0000-10	16179	

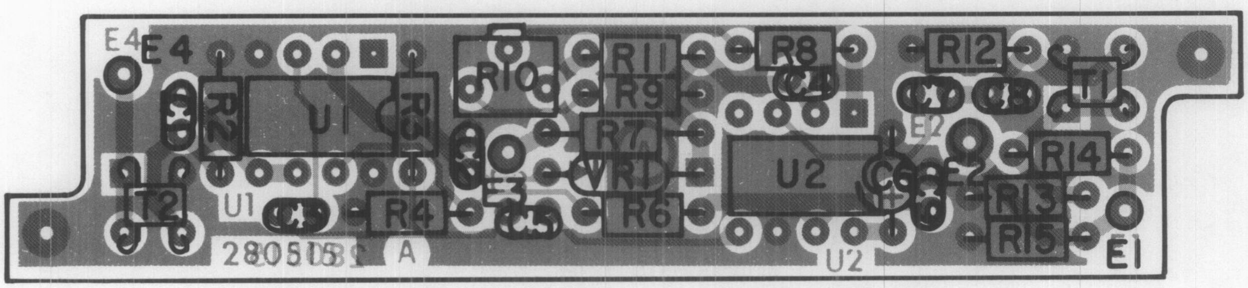


Figure 5-32. Part 280515-1, Wideband Output 21.4 MHz Amplifier Assembly (A2A1) Location of Components

5.5.2.1 **Part 280515-1 Wideband Output 21.4 MHz Amplifier Assembly** REF DESIG PREFIX A2A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode	1	1N4003	80131	
C1	Capacitor, Ceramic, Disc: 4700 pF, 20%, 50 V	7	8121-050-651-472M	72982	
C2 Thru C5	Same as C1				
C6	Capacitor, Electrolytic, Tantalum: 15 μF, 20%, 15 V	1	196D156X0015JE3	56289	
C7	Same as C1				
C8	Capacitor, Ceramic, Monolithic: 220 pF, 5%, 100 V	1	8121-100-C0G0-221J	72982	
C9	Same as C1				
FB1	Ferrite Bead	4	56-590-65-4A	02114	
FB2	Same as FB1				
FB3	Same as FB1				
FB4	Same as FB1				
R1	Not Used				
R2	Resistor, Fixed, Film: 220Ω, 5%, 1/8 W	1	CF1/8-220 OHMS/J	09021	
R3	Resistor, Fixed, Film: 100Ω, 5%, 1/8 W	1	CF1/8-100 OHMS/J	09021	
R4	Resistor, Fixed, Film: 820Ω, 5%, 1/8 W	1	CF1/8-820 OHMS/J	09021	
R5	Not Used				
R6	Resistor, Fixed, Film: 300Ω, 5%, 1/8 W	1	CF1/8-300 OHMS/J	09021	
R7	Resistor, Fixed, Film: 27Ω, 5%, 1/4 W	1	CF1/4-27 OHMS/J	09021	
R8	Resistor, Fixed, Film: 47 kΩ, 5%, 1/8 W	1	CF1/8-47K/J	09021	
R9	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R10	Resistor, Trimmer, Film: 5 kΩ, 10%, 1/2 W	1	62PAR5K	73138	
R11	Resistor, Fixed, Film: 12 kΩ, 5%, 1/8 W	1	CF1/8-12K/J	09021	
R12	Resistor, Fixed, Film: 200Ω, 5%, 1/8 W	1	CF1/8-200 OHMS/J	09021	
R13	Same as R6				
R14	Resistor, Fixed, Film: 68Ω, 5%, 1/8 W	1	CF1/8-68 OHMS/J	09021	
R15	Same as R6				
T1	Transformer	2	180204-1	14632	
T2	Same as T1				
U1	Video IF/RF Amplifier	1	SL1611C	52648	
U2	TVIF Preamplifier	1	SL1432	94375	
VR1	Diode	1	1N752A	80131	

5.5.3 **Type 796351-1 LINE FILTER** REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 1000 pF, 20%, 1000 V	4	JL1000PFM	91418	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: 0.1 mF, 20%, 600 V	2	DR50-GBM-104M	55969	
C4	Same as C3				
C5	Same as C1				
C6	Same as C1				
L1	Ferrite Choke	2	VK200-10-3B	02114	
L2	Same as L1				
L3	Coil	2	180249-1	14632	
L4	Same as L3				
L5	Coil	1	180234-1	14632	

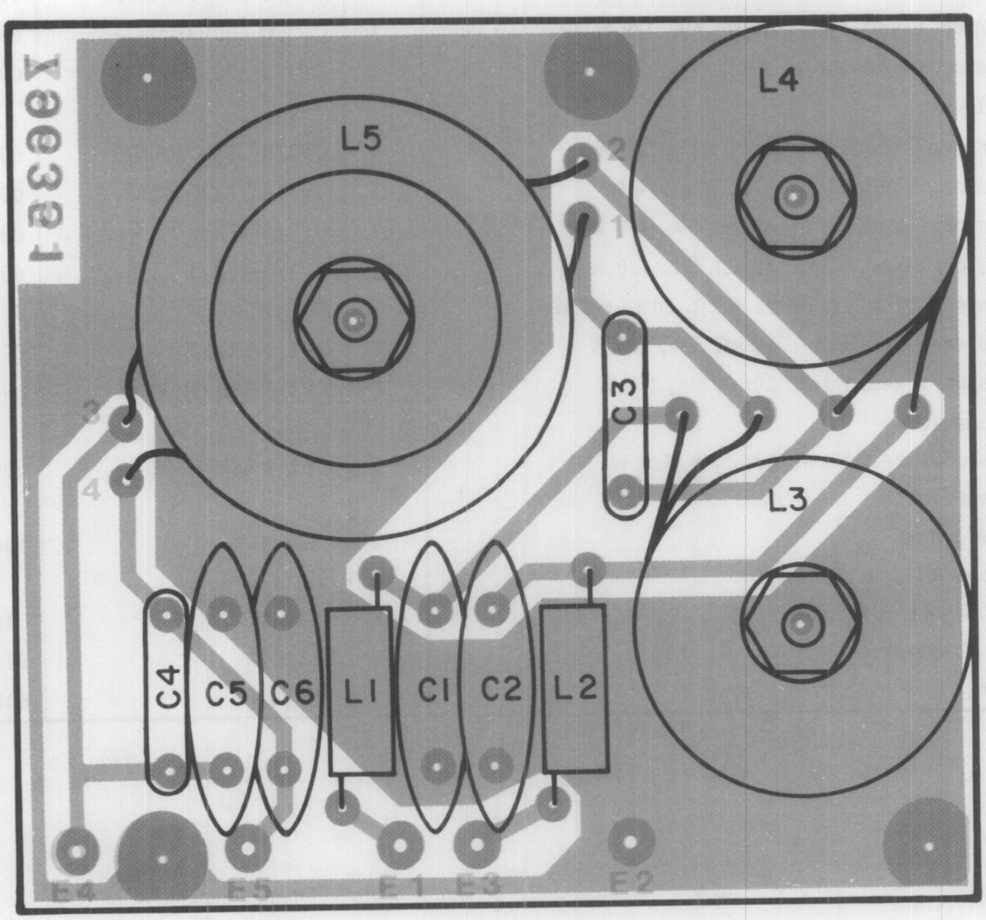


Figure 5-33. Type 796351 Line Filter (A4)
Location of Components

SECTION VI

SCHEMATIC DIAGRAMS

Figure 6-1. Type 796246-1, Motherboard Assembly (A1)
Schematic Diagram 680058

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN µF.
   c) INDUCTANCE IS IN µH.
2. ☐ SIGNATURE ANALYSIS TEST POINT.

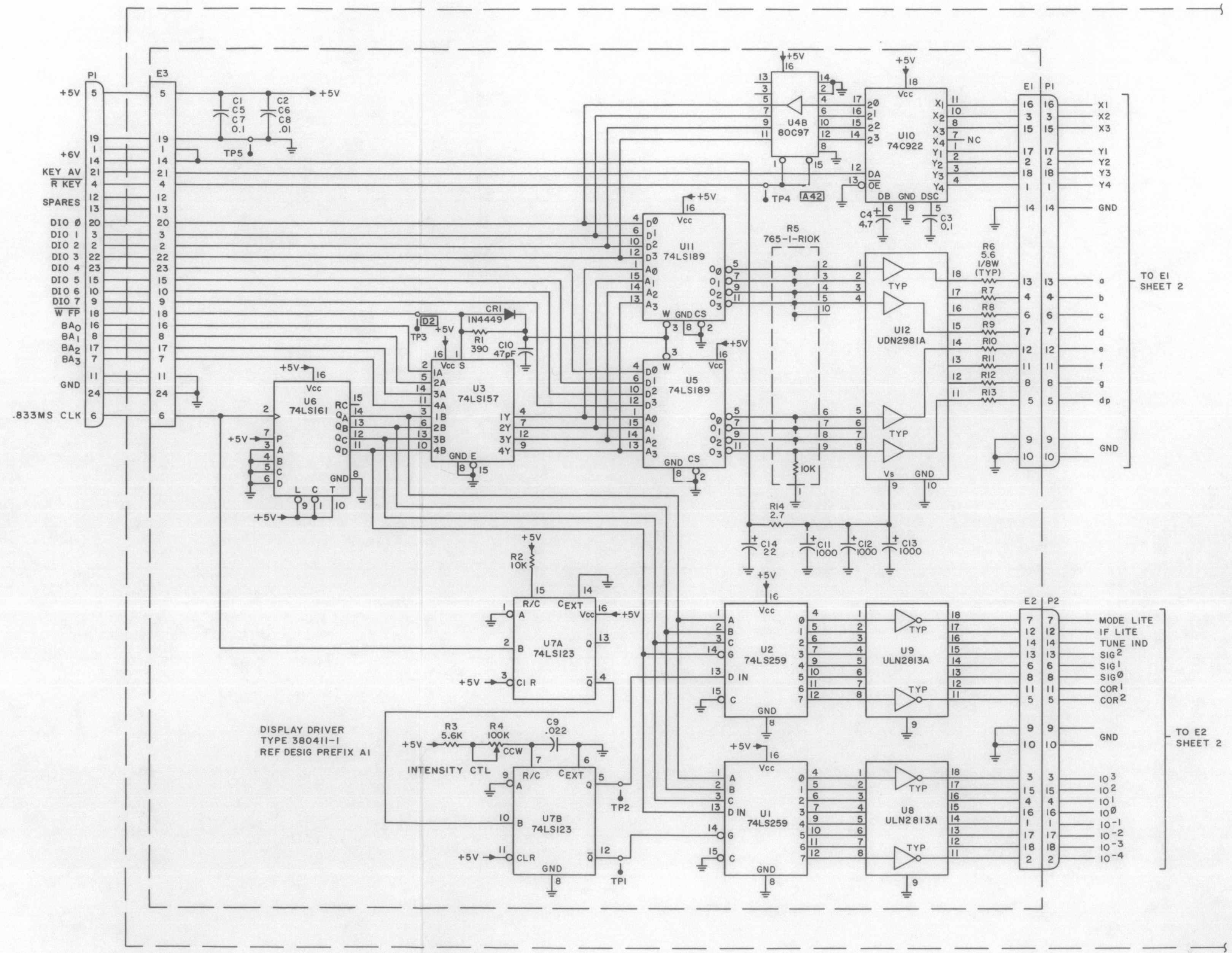


Figure 6-2. Type 796260-1, Front Panel Display (A1A1)
Schematic Diagram 580167
Sheet 1 of 2

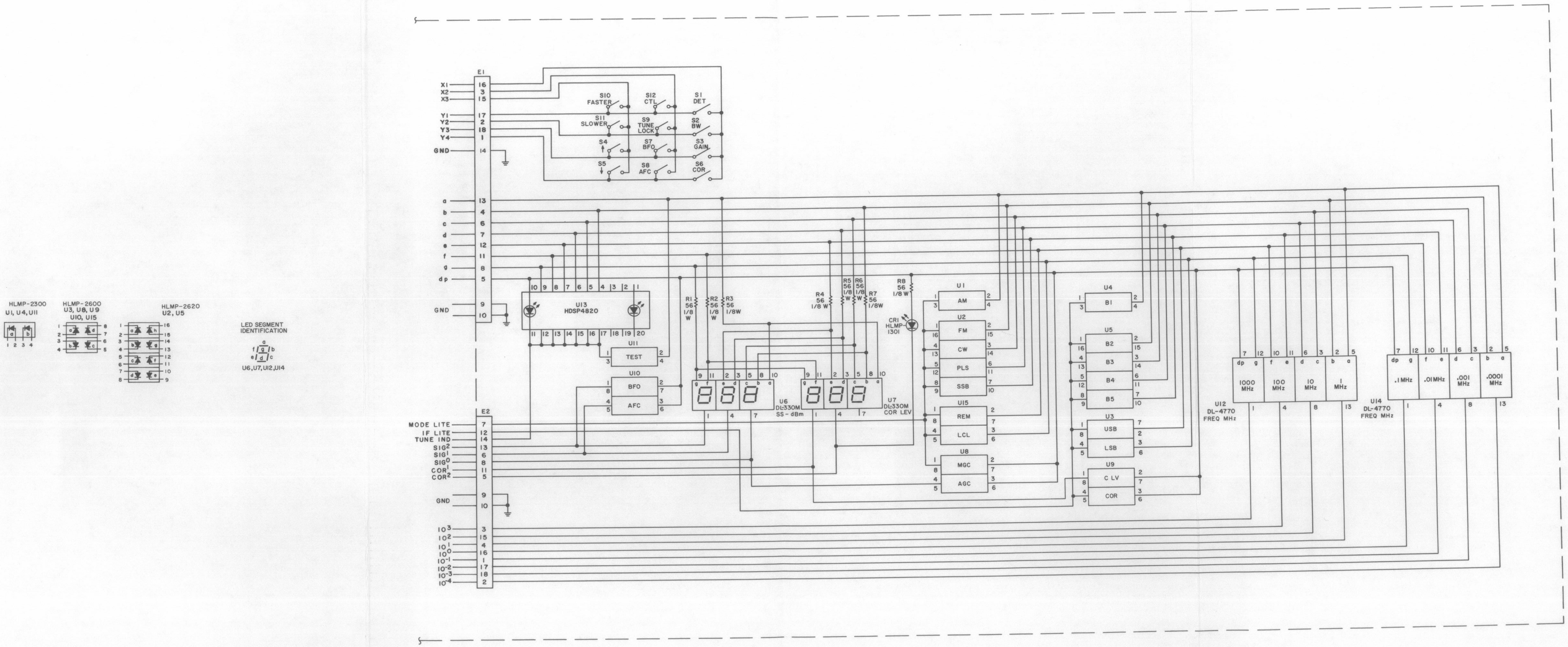


Figure 6-2. Type 796260-1, Front Panel Display (A1A1) Schematic Diagram 580167 Sheet 2 of 2

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS IN μF.
2. ▭ SIGNATURE ANALYSIS TEST POINT.

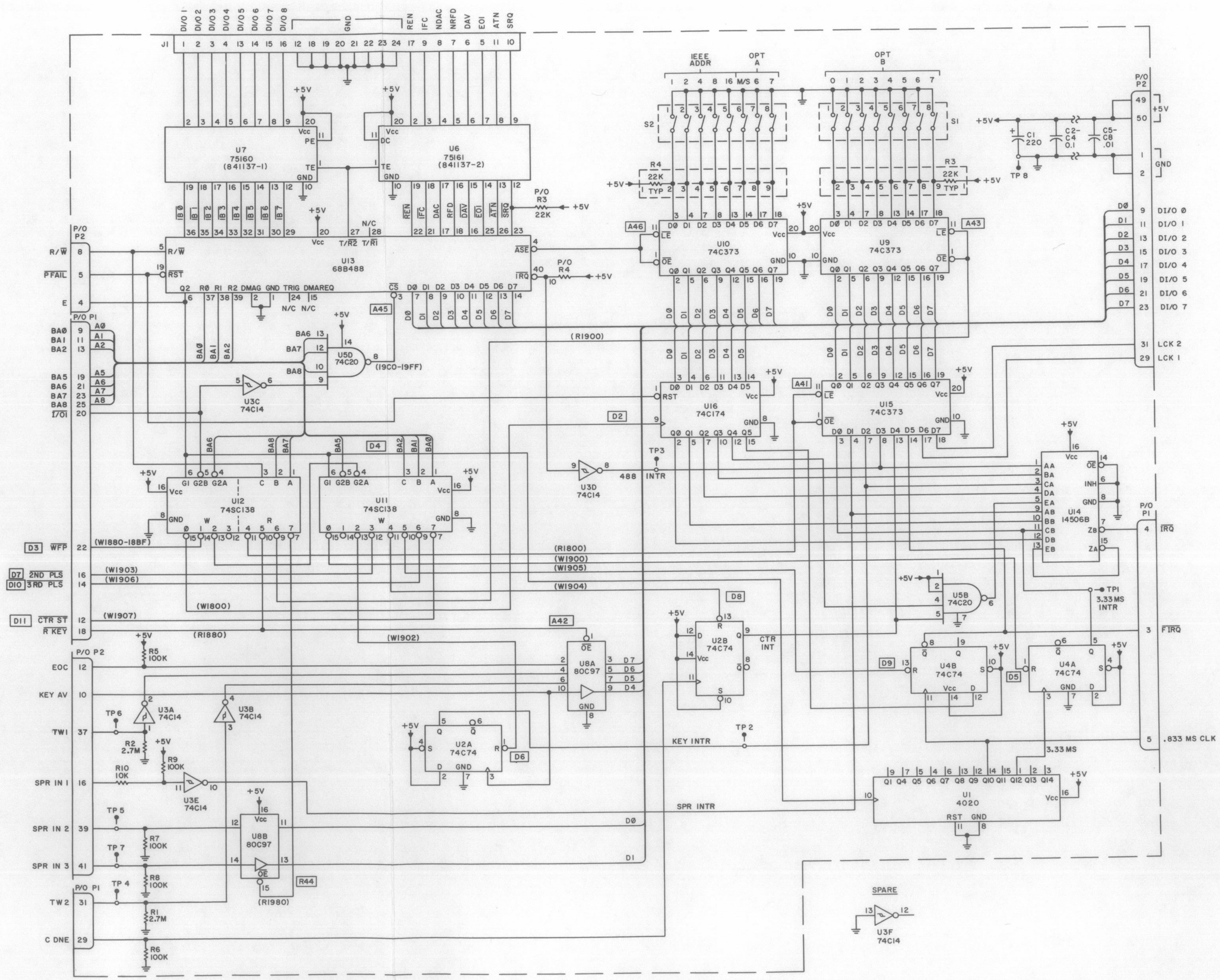
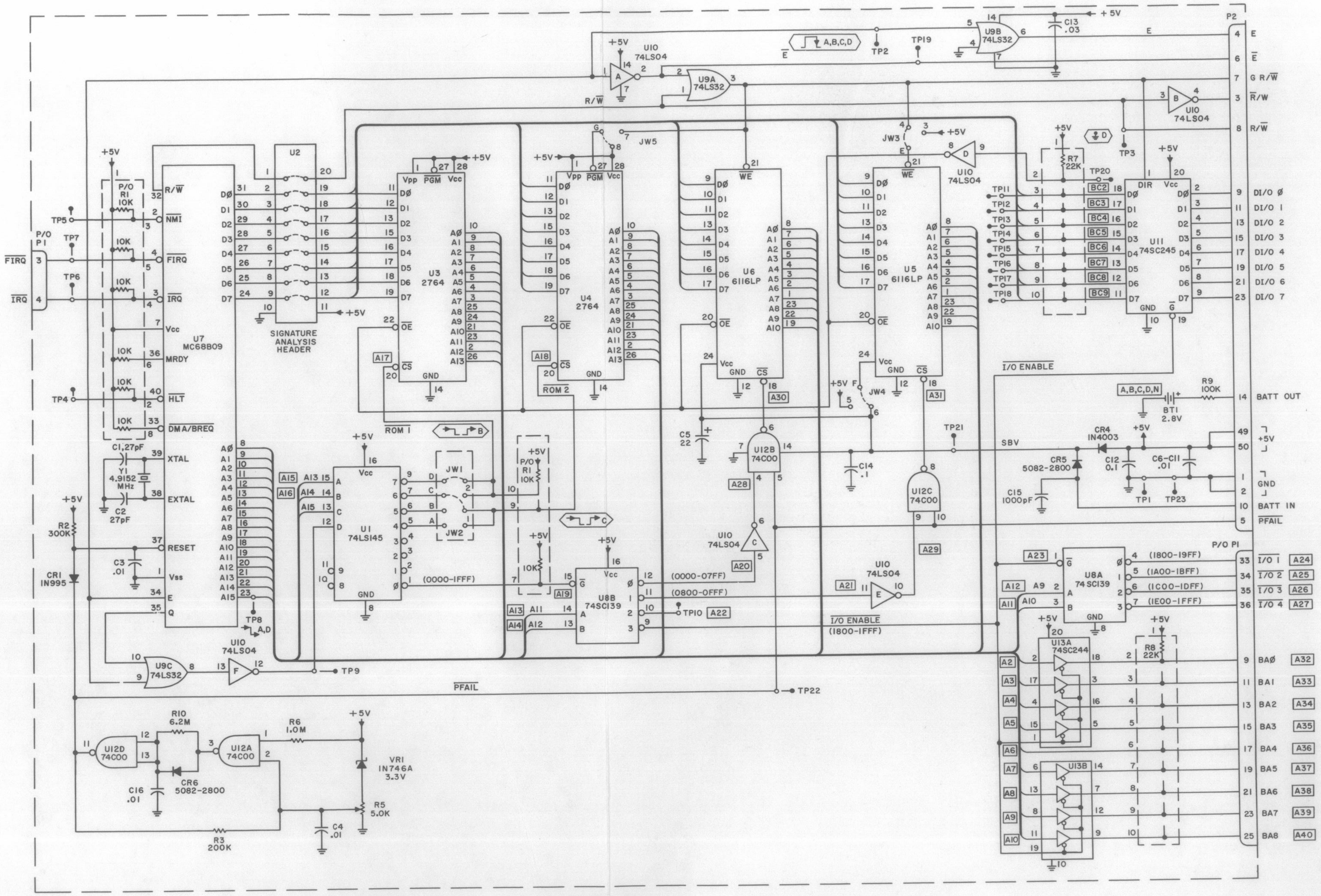


Figure 6-3. Type 796243-1, IEEE-488/Interrupt (A1A2) Schematic Diagram 580177



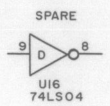
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. SIGNATURE SYMBOLS
   TEST POINT
   CONTROL SIGNAL

SIGNATURE SYMBOLS CONT.
START LEADING EDGE
START TRAILING EDGE
STOP LEADING EDGE
STOP TRAILING EDGE
CLOCK LEADING EDGE
CLOCK TRAILING EDGE

3. INSTALL SIGNATURE ANALYSIS TEST HEADER FOR TEST (A,B,C,D).

Figure 6-4. Type 796242-1, Microprocessor (A1A3) Schematic Diagram 580169

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) ALL 1% RESISTORS ARE 1/10W.
   c) CAPACITANCE IS IN μF.
2. ☐ SIGNATURE ANALYSIS TEST POINT.



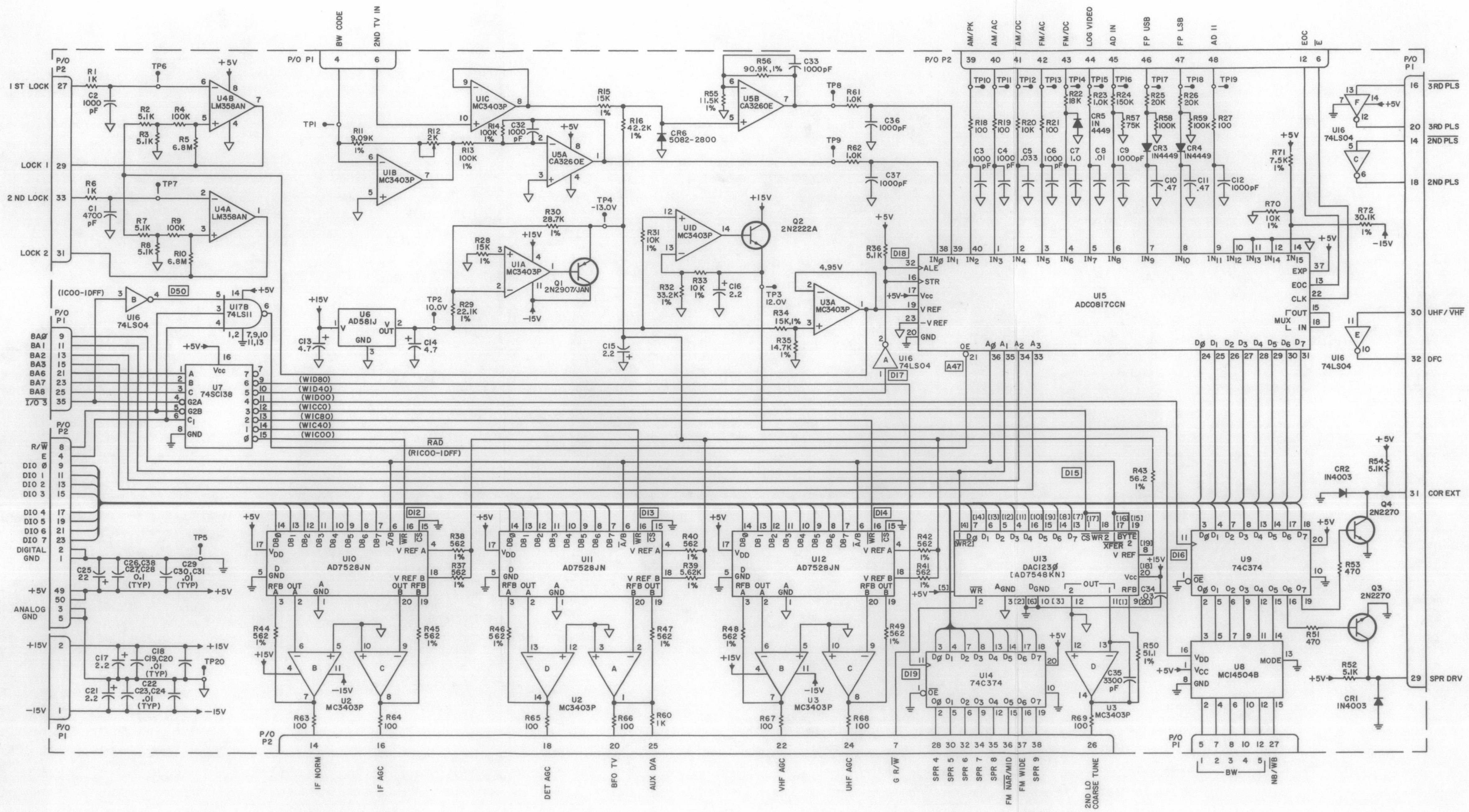


Figure 6-5. Type 796244-1, Analog/Digital (A1A4) Schematic Diagram 580176

NOTES: 1. UNLESS OTHERWISE SPECIFIED:
a) CAPACITANCE IS IN µF.
b) RESISTANCE IS IN OHMS, ±5%, 1/4W.
2. ☐ SIGNATURE ANALYSIS TEST POINT.
3. FOR DIFFERENCE IN TYPES SEE TABLE A. (−2 USED WITH TRACKING PRESELECTOR OPTION).

TABLE A

TYPE NO.	U15
796245−1	NOT USED
−2	DIP515DT

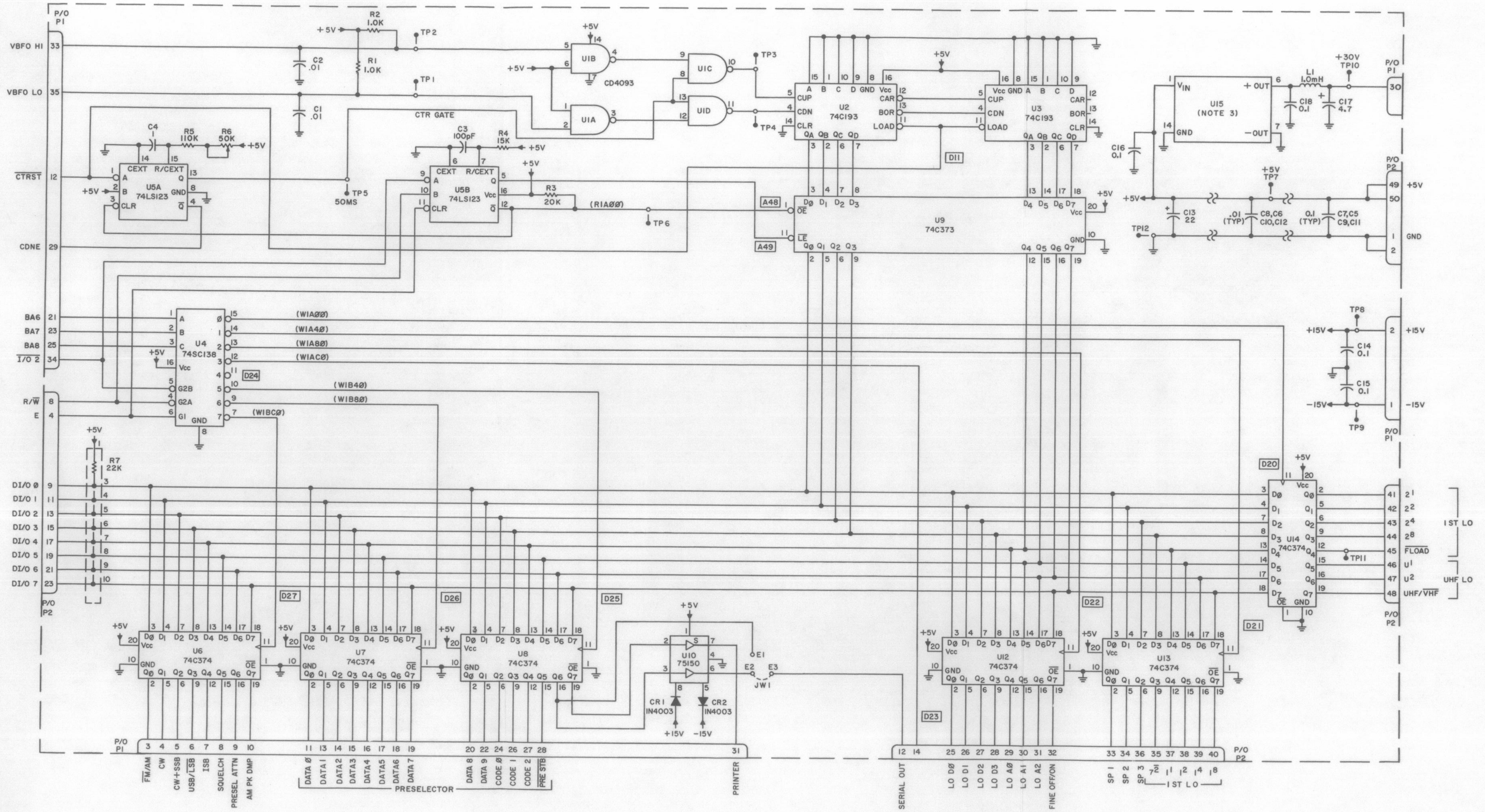


Figure 6-6. Type 796245-1, Synthesizer Interface (A1A5) Schematic Diagram 580174

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

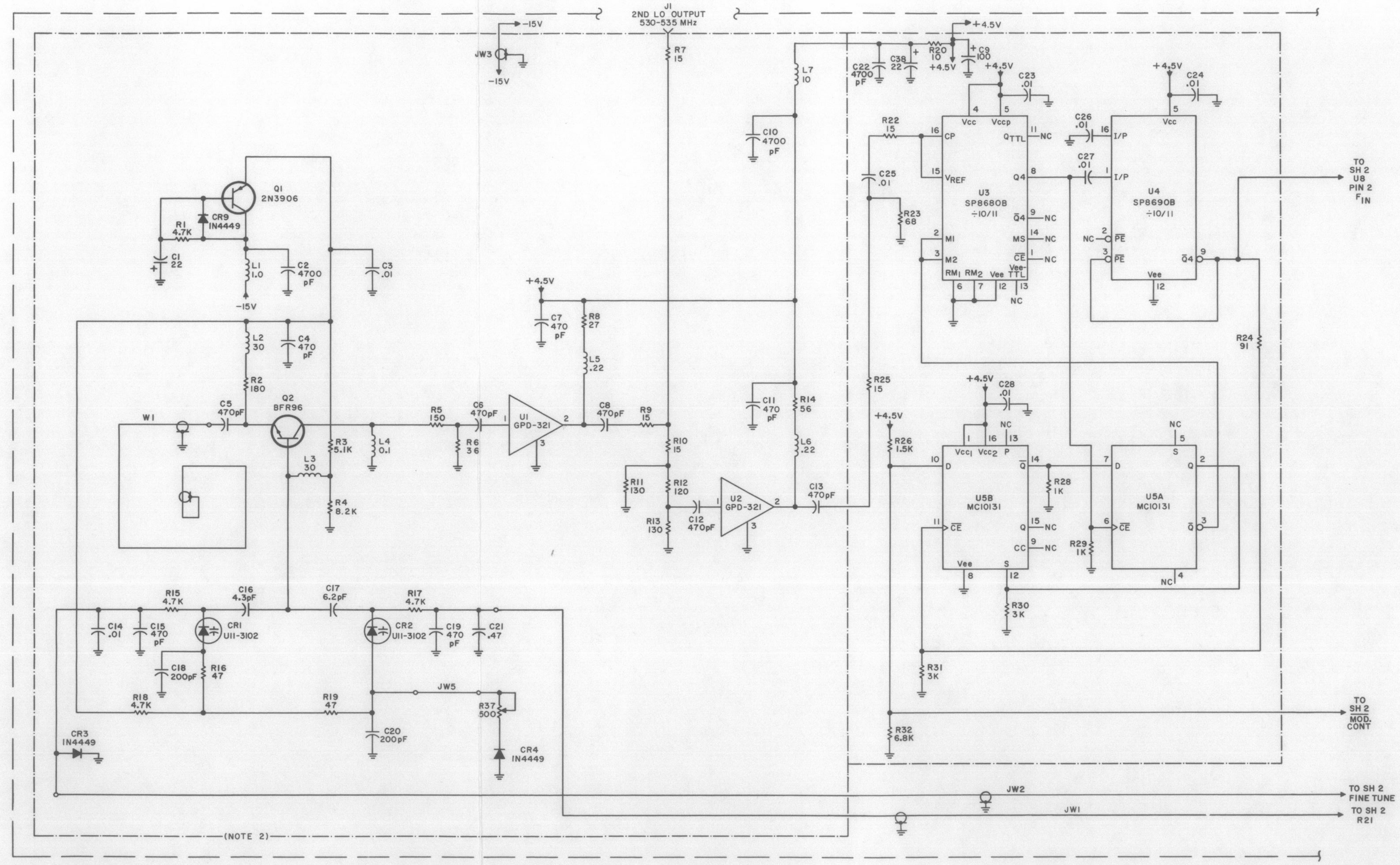


Figure 6-7. Type 776004-1, 2nd LO Synthesizer (A1A6) Schematic Diagram 580162 Sheet 1 of 2

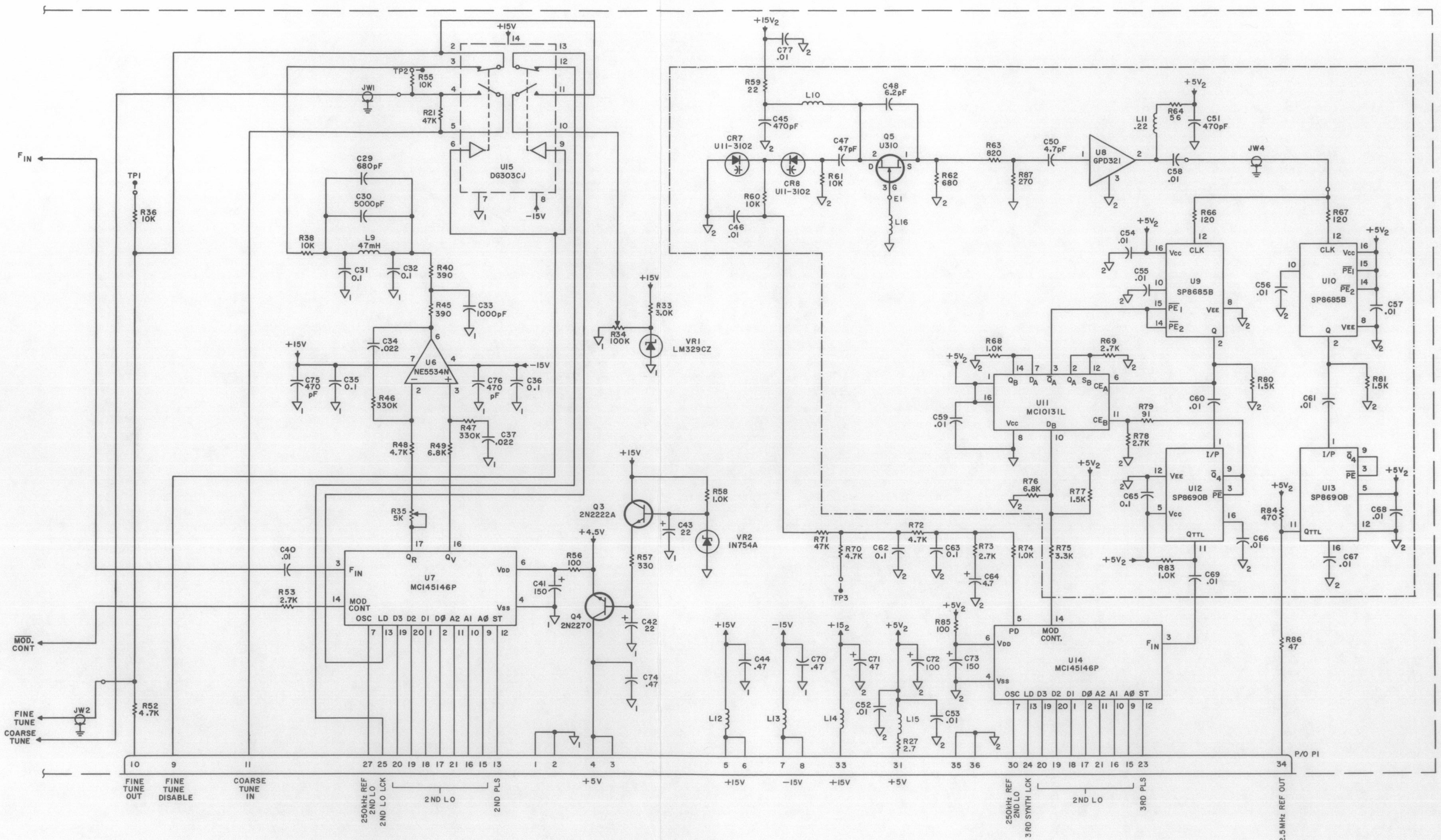
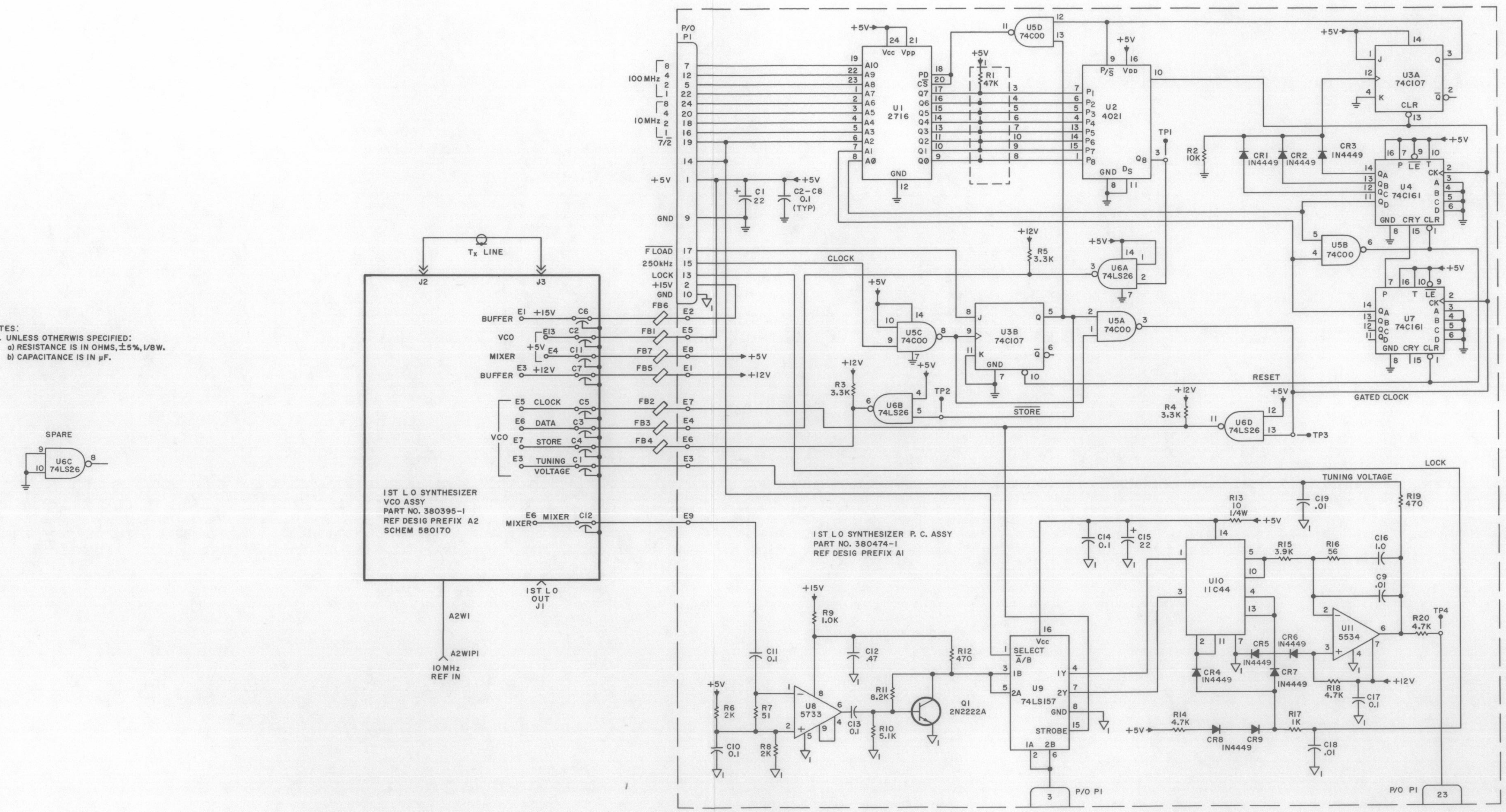


Figure 6-7. Type 776004-1, 2nd LO Synthesizer (A1A6) Schematic Diagram 580162 Sheet 2 of 2



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

Figure 6-8. Type 776003-1, 1st LO Synthesizer (A1A7) Schematic Diagram 580157

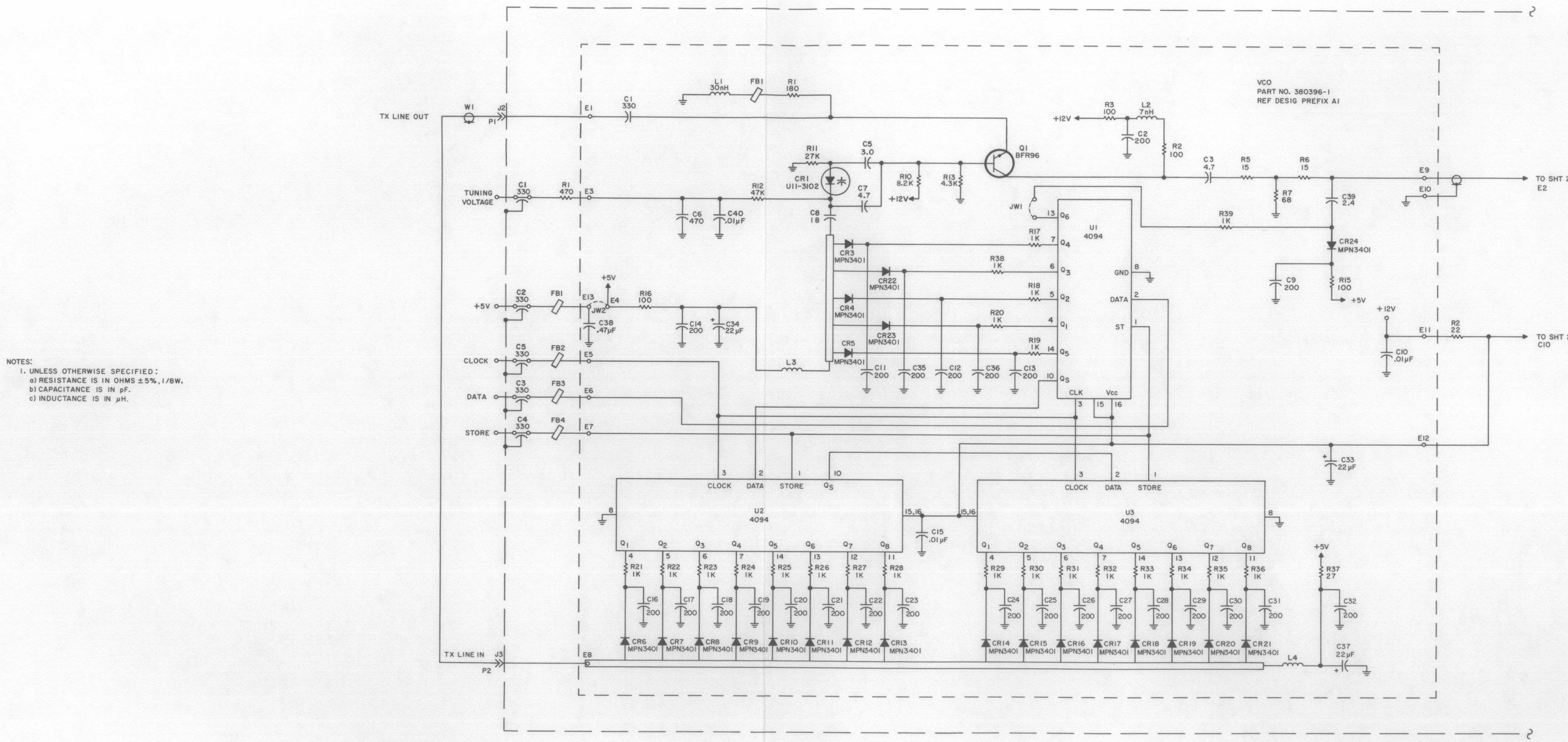


Figure 6-9. Part 380395-1, 1st LO Synthesizer VCO (A1A7A2) Schematic Diagram 580170 Sheet 1 of 2

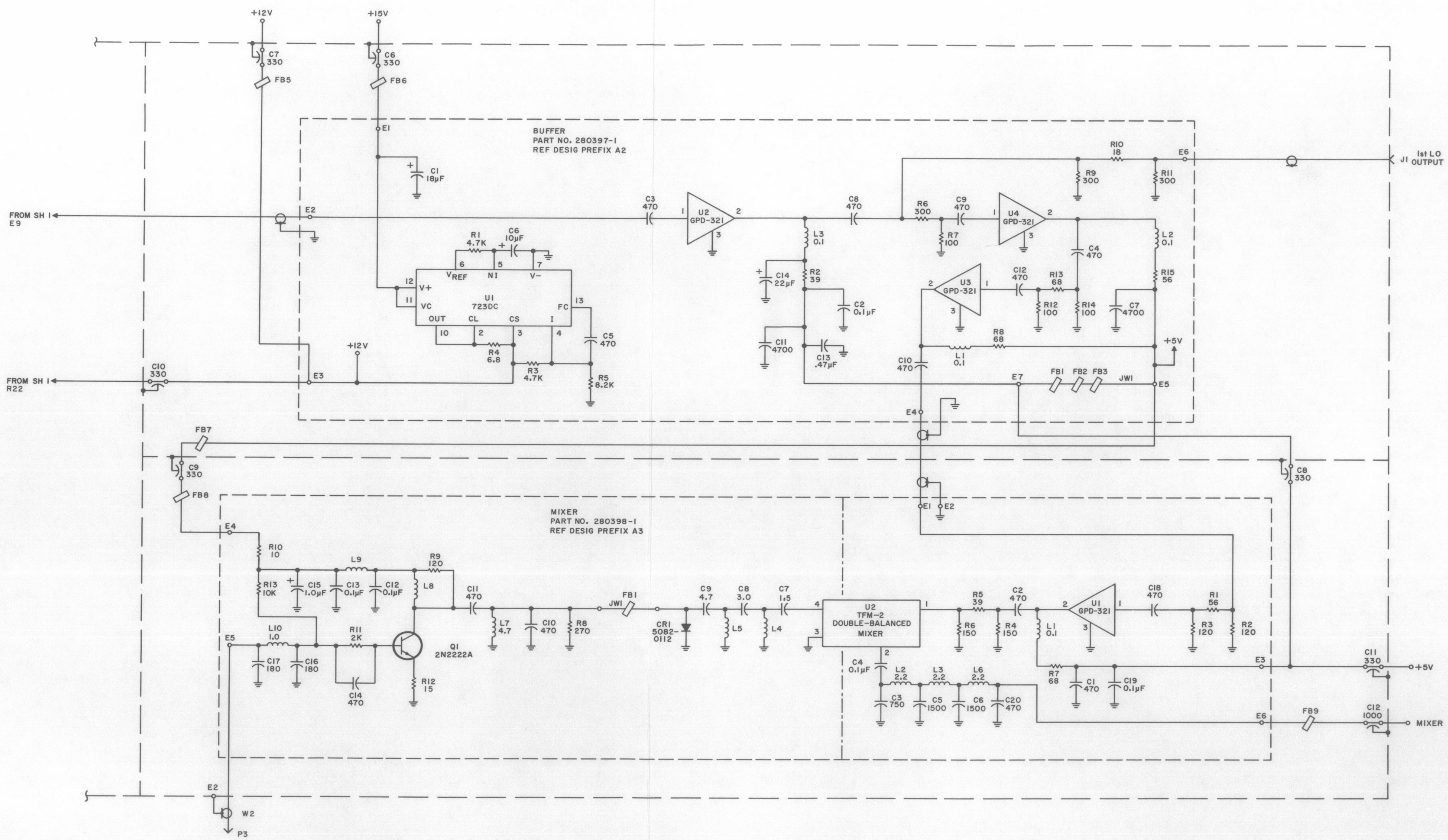


Figure 6-9. Part 380395-1, 1st LO Synthesizer VCO (A1A7A2) Schematic Diagram 580170 Sheet 2 of 2

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
   b) CAPACITANCE IS IN µF.
2. CW ON R35 DENOTES FULL CLOCKWISE POSITION OF ACTUATOR.

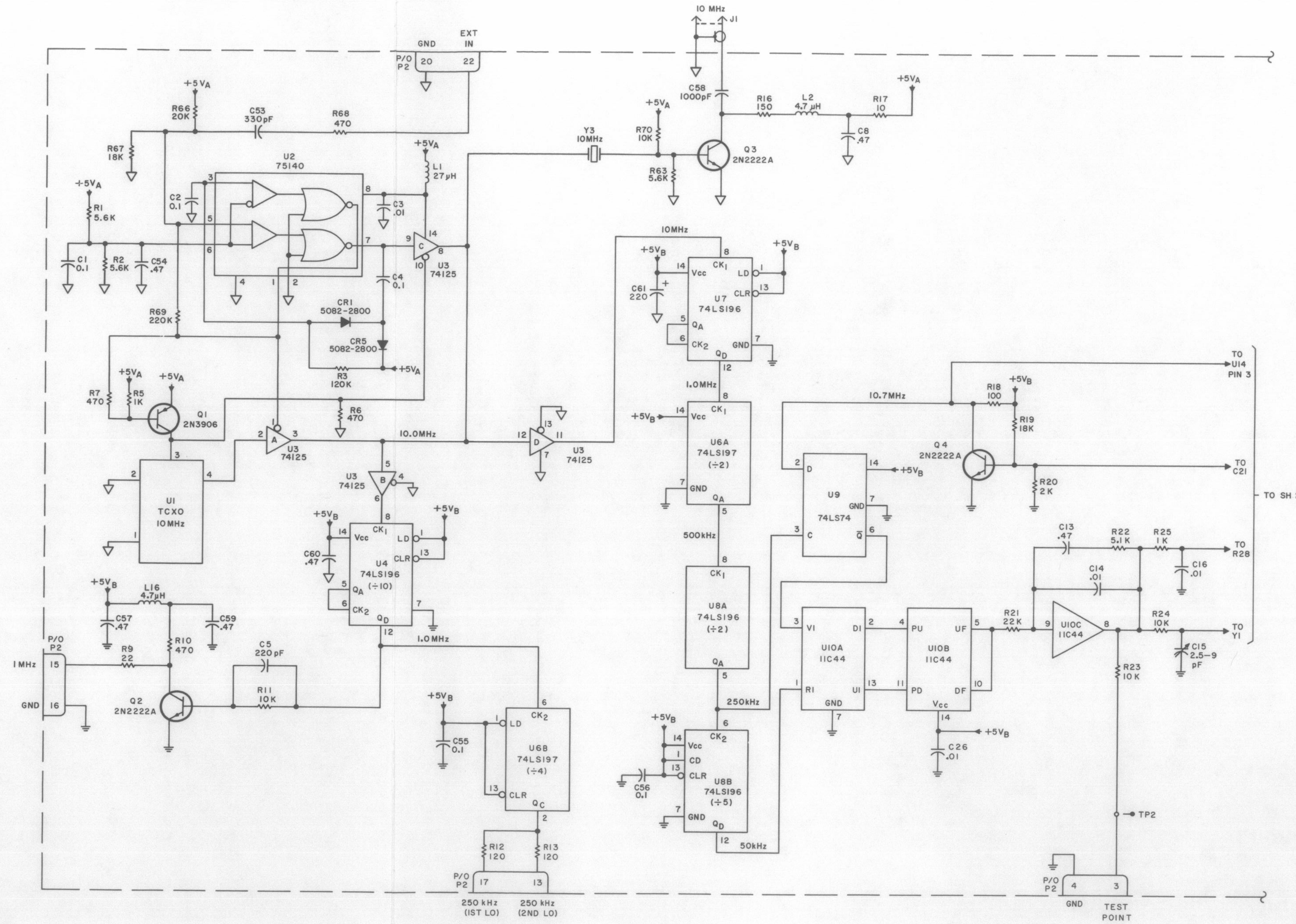


Figure 6-10. Type 796247-1, Reference Generator (A1A8) Schematic Diagram 580158 Sheet 1 of 2

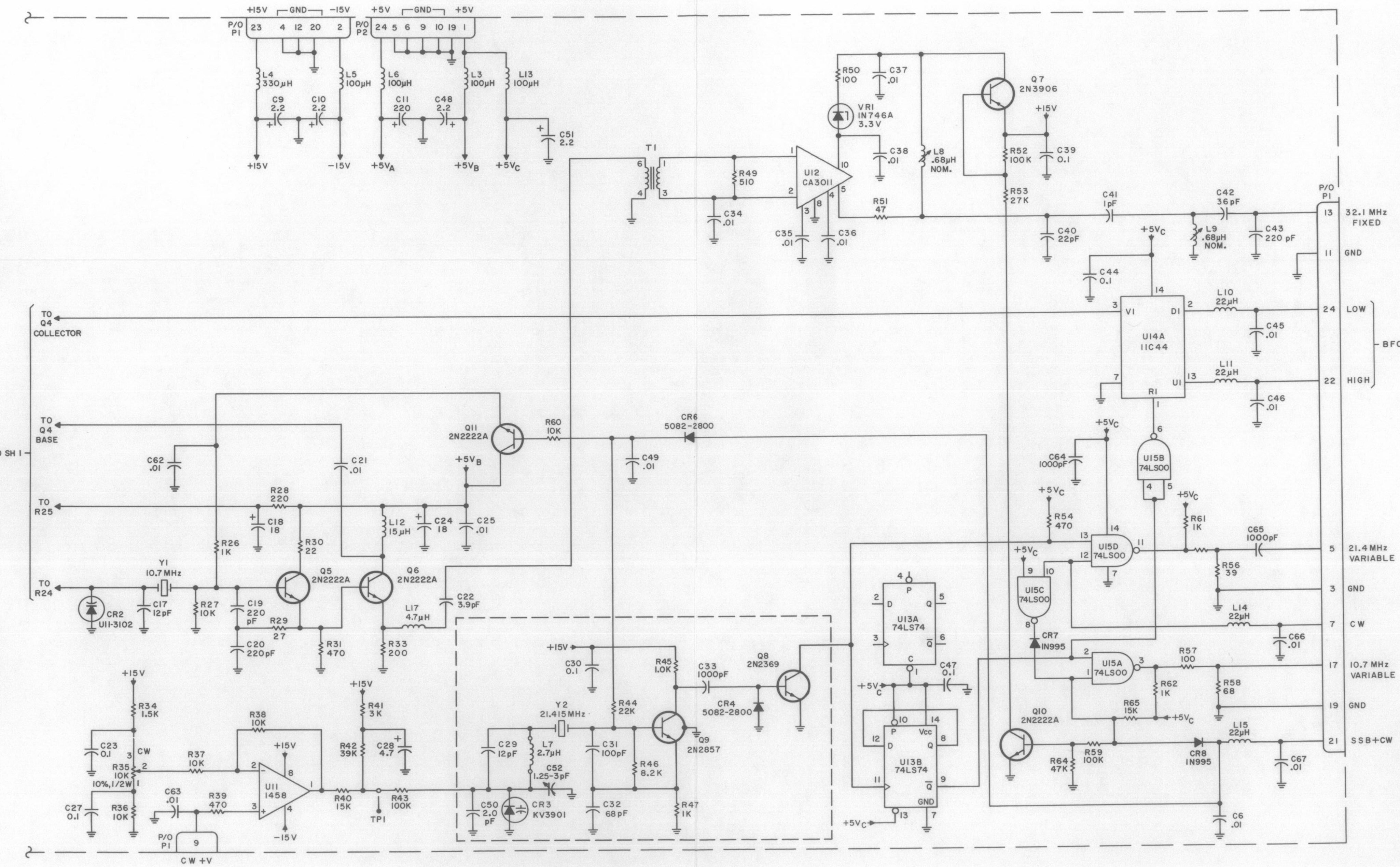


Figure 6-10. Type 796247-1, Reference Generator (A1A8) Schematic Diagram 580158 Sheet 2 of 2

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

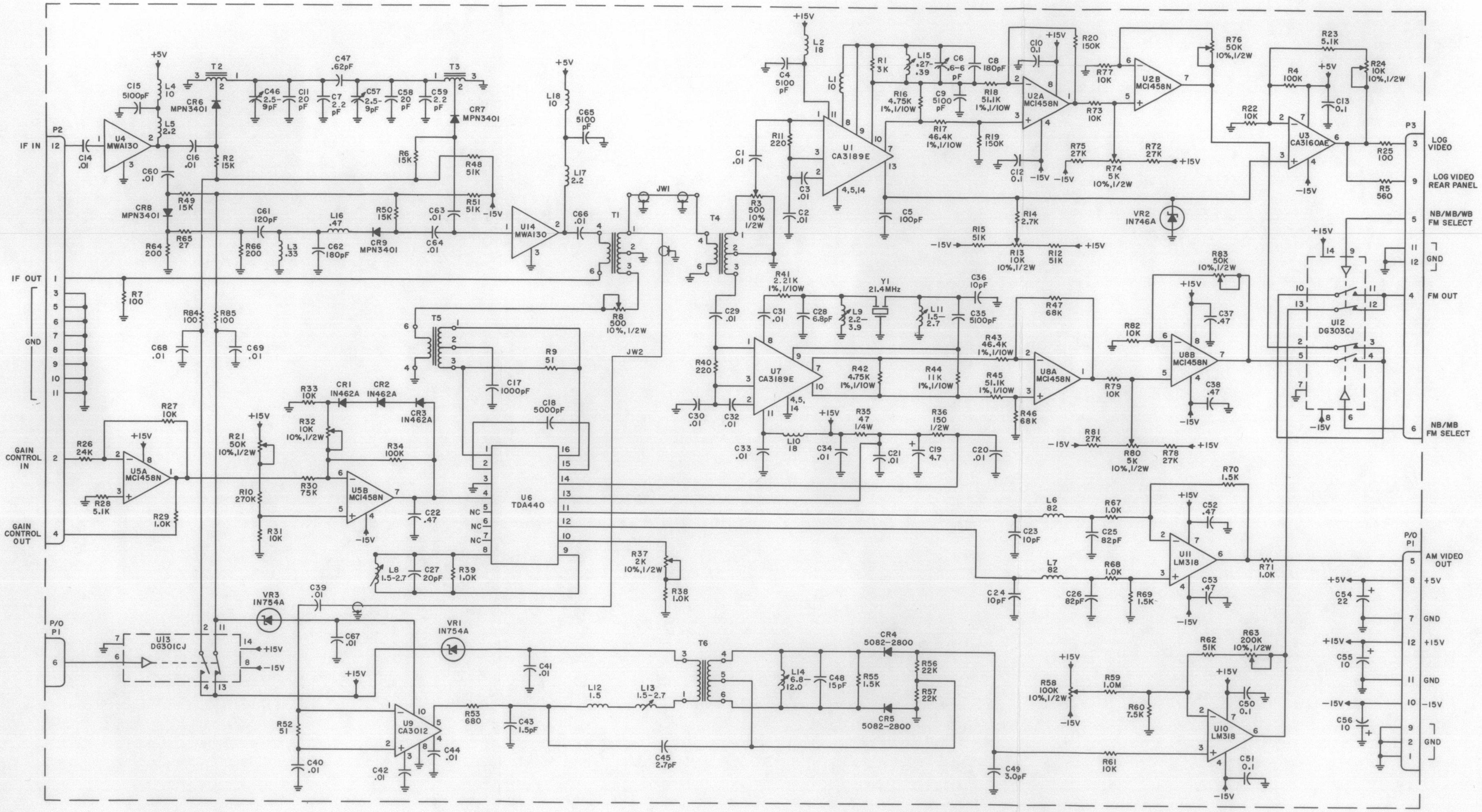


Figure 6-11. Type 796249-1, AM-FM Demodulator (A1A9) Schematic Diagram 580168

NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, 1%, 1/10W.
   b) CAPACITANCE IS IN µF.
   c) INDUCTANCE IS IN mH.
2. ALL 5% RESISTORS ARE 1/4 W.
3. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE A.

TABLE A

	280542-X BW/VIDEO RESPONSE MODULE POSITION				
TYPE NO.	POS 1	POS 2	POS 3	POS 4	POS 5
796248-1	-2	-6	-8	——	——
-2	-4	-6	-8	-10	——
-3	-6	-9	-11	-12	-13
-4	-4	-8	-10	——	——
-5	-4	-6	-8	-10	-11
-6	-8	-10	-11	-12	-13
-7	-2	-4	-6	-8	-10
-8	-6	-8	-11	-12	-13
-9	-4	-6	-10	-12	-13
-10	-4	-6	-10	——	——
-11	-2	-6	-8	-10	-14
-12	-2	-6	-9	-11	-14
-13	-2	-6	-12	——	——
-14	-4	-6	-8	-10	-12

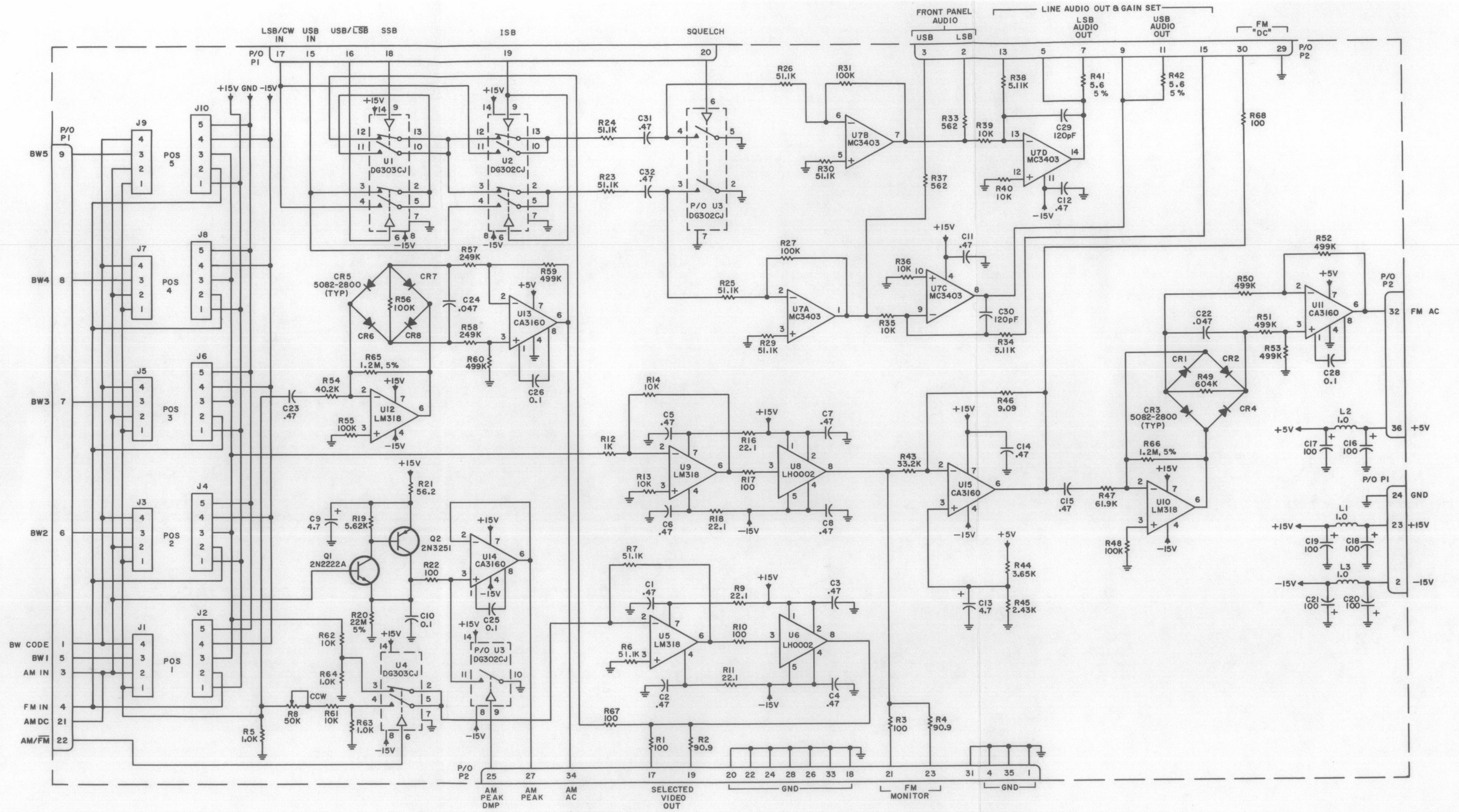


Figure 6-12. Type 796248-1, Audio/Video (A1A10) Schematic Diagram 580159

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 1%, 1/10W.
   b) CAPACITANCE IS NOTED.
   c) INDUCTANCE IS NOTED.
2. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE A.

TABLE A

TYPE & DASH NO.	IF BW AM/FM	R1	R2	R3	C1 THRU C4	L1 & L2
280542-1	6.4kHz	121kΩ	1.0kΩ	NOT USED	.068μF	82mH
-2	10kHz	95.3kΩ	1.58kΩ	2.80kΩ	.047μF	47mH
-3	15kHz	80.6kΩ	2.32kΩ	1.74kΩ	.027μF	33mH
-4	20kHz	68.1kΩ	3.16 kΩ	1.47kΩ	.022μF	27mH
-5	40kHz	53.6kΩ	6.19kΩ	1.21kΩ	.01μF	12mH
-6	50kHz	53.6kΩ	8.87kΩ	1.13kΩ	.01μF	10mH
-7	75kHz	43.2kΩ	1.0kΩ	NOT USED	5600pF	6.8mH
-8	100kHz	40.2kΩ	1.33kΩ	4.02kΩ	4700pF	4.7mH
-9	250kHz	37.4kΩ	3.32kΩ	1.43kΩ	1800pF	2.2mH
-10	300kHz	34.0kΩ	4.02kΩ	1.33kΩ	1500pF	1.8mH
-11	500kHz	32.4kΩ	1.0kΩ	NOT USED	820pF	1.0mH
-12	1.0MHz	30.1kΩ	2.0kΩ	2.0kΩ	470pF	.47mH
-13	2.0MHz	28.0kΩ	4.02kΩ	1.33kΩ	220pF	.27mH
-14	4.0MHz	26.7kΩ	8.06kΩ	1.15kΩ	120pF	.12mH

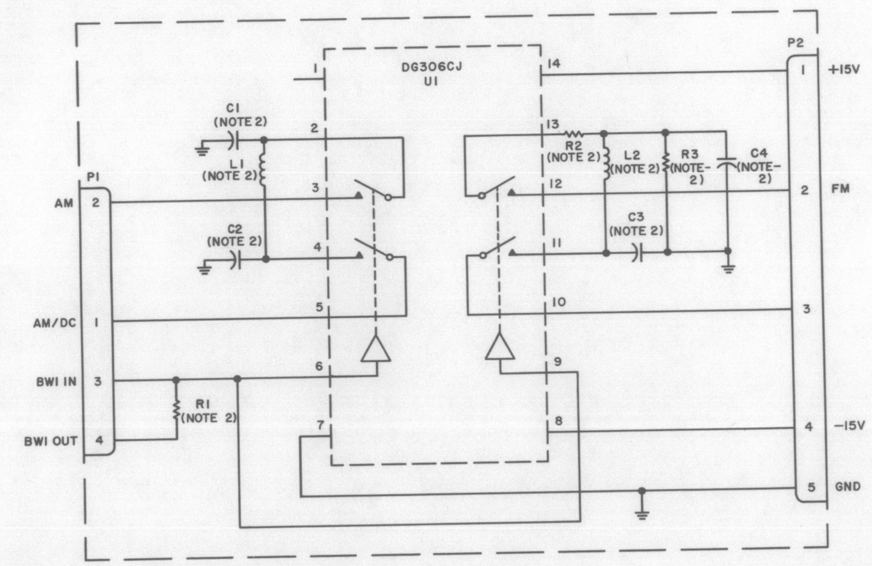


Figure 6-13. Part 280542-X, Frequency Response (A10AX) Schematic Diagram 480474

NOTES: 1. UNLESS OTHERWISE SPECIFIED.
a) CAPACITANCE IS IN pF.
b) RESISTANCE IS IN OHMS, ±5%, 1/8W.
c) INDUCTANCE IS IN µH.
2. THE DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE I.

TABLE I

TYPE	FL1	FL2	TITLE
796250-1	92218	92217	ISB/CW DEMODULATOR
796250-2	N/U	N/U	CW DEMODULATOR

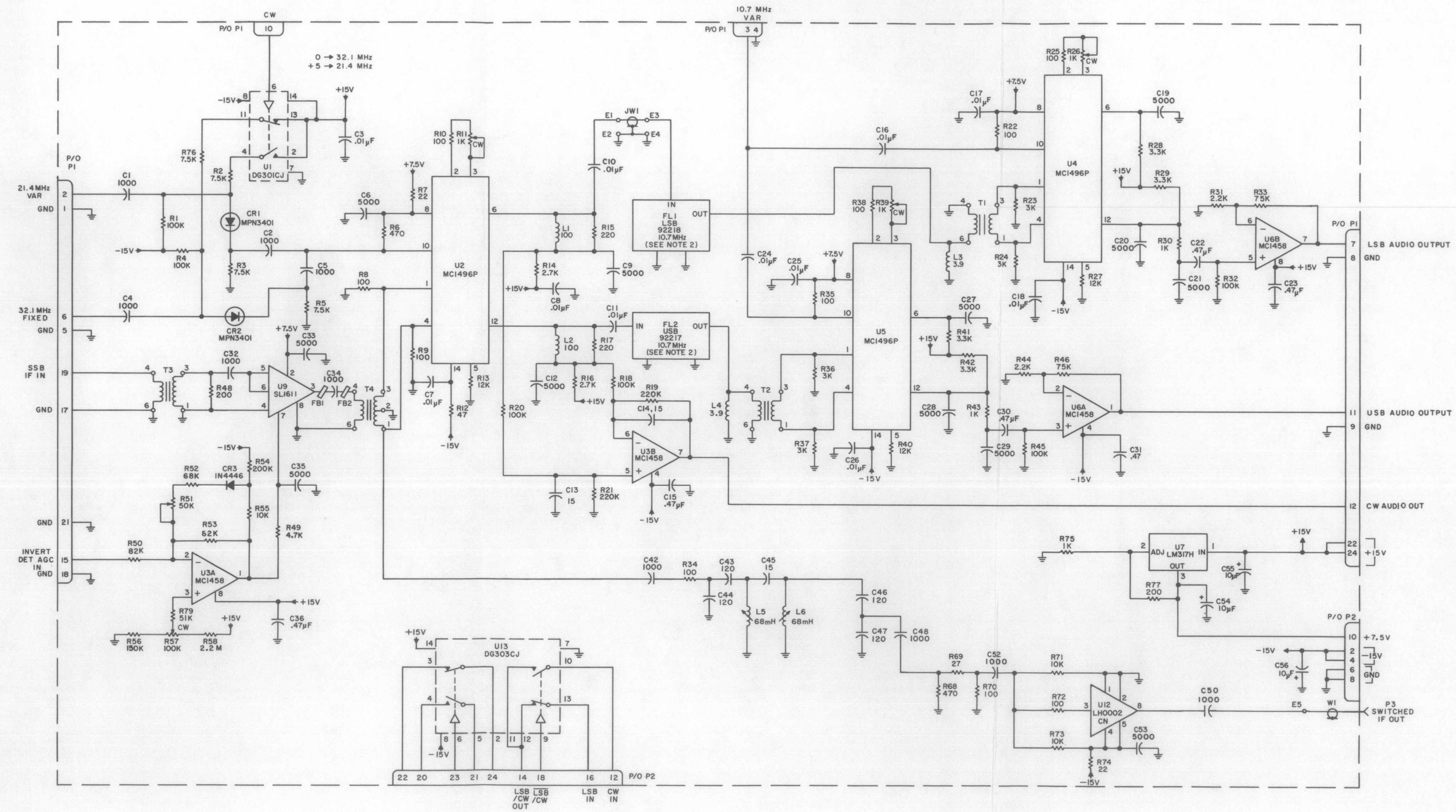


Figure 6-14. Type 796250-X, ISB/CW Demodulator (A1A11) Schematic Diagram 580175

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±1%, 1/10W.
   b) CAPACITANCE IS IN µF.
   c) INDUCTANCE IS IN µH.
2. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE A.

TABLE A

	FILTER NO. & POSITION				
TYPE NO.	FL1	FL2	FL3	FL4	FL5
726006-1	92001	92000	92024	——	——
-2	92002	92000	92024	92232	——
-3	92000	92186	92277	92278	92279
-4	92002	92024	92232	——	——
-5	92002	92000	92024	92232	92277
-6	92024	92232	92277	92278	92279
-7	92001	92002	92000	92024	92232
-8	92000	92024	92277	92278	92279
-9	92002	92000	92232	92278	92279
-10	92002	92000	92232	——	——
-11	92001	92000	92024	92232	92280
-12	92001	92000	92186	92277	92280
-13	92001	92000	92278	——	——
-14	92002	92000	92024	92232	92278

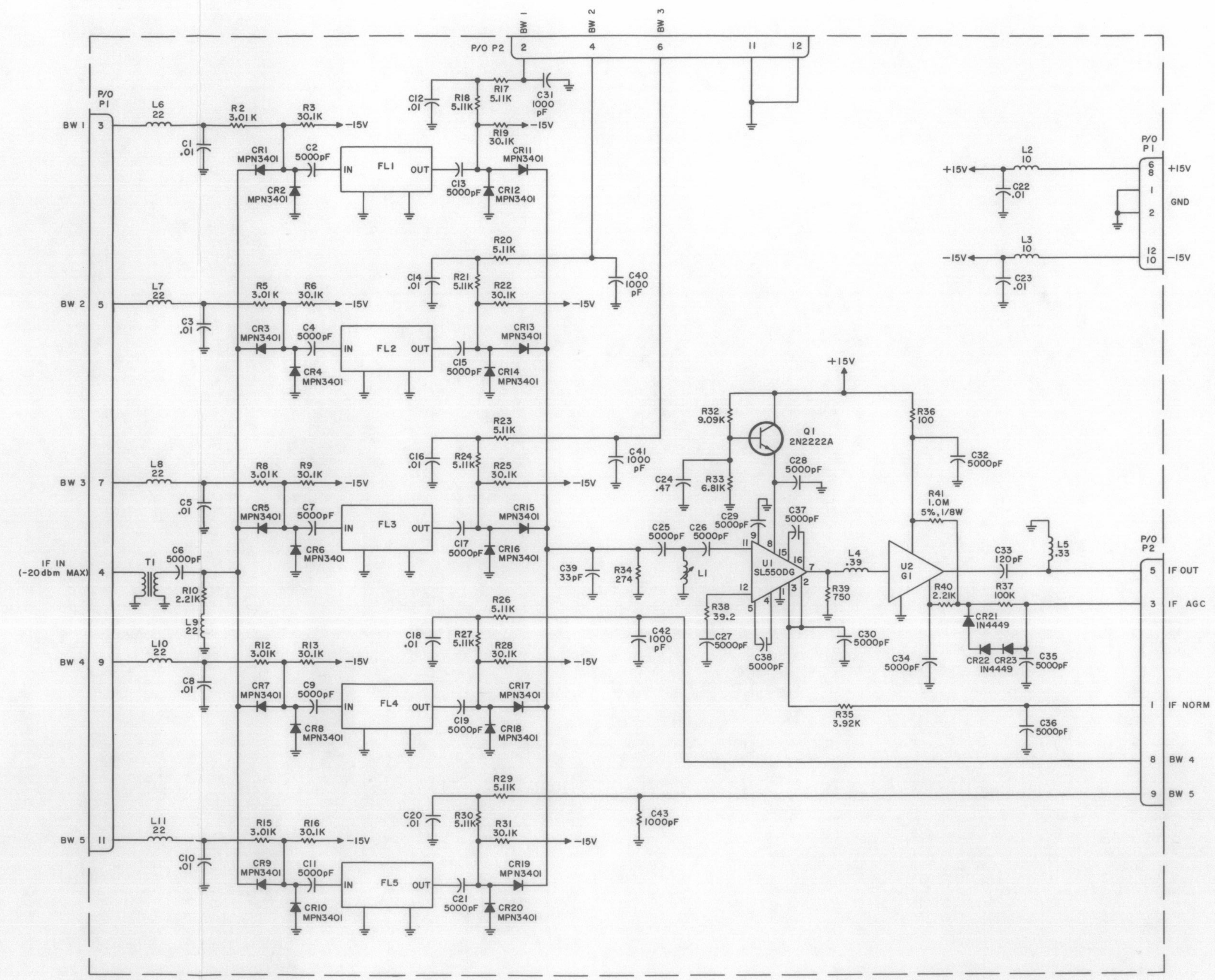
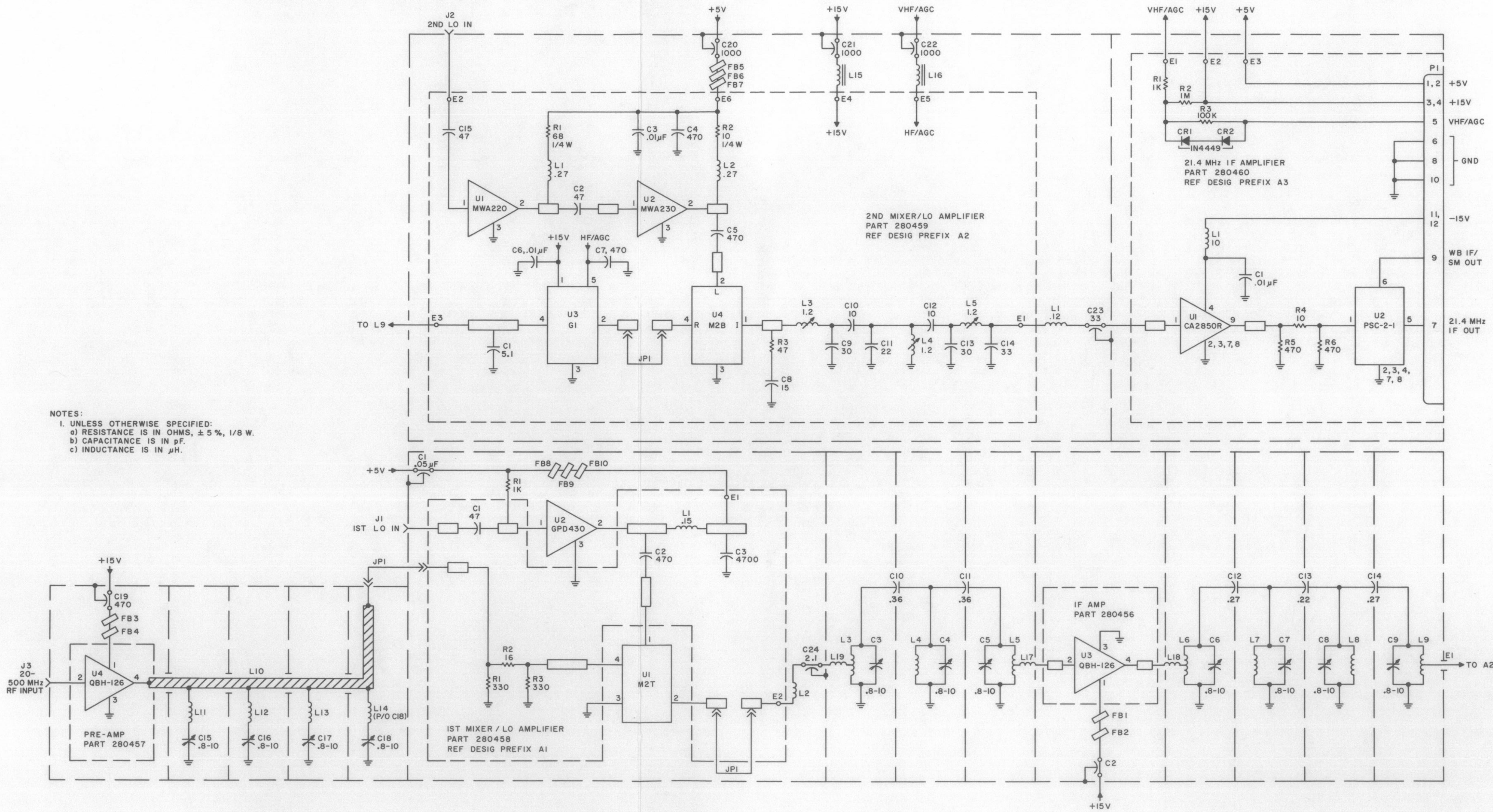


Figure 6-15. Type 726006-1, IF Bandwidth Filter (A1A12) Schematic Diagram 580161



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

Figure 6-16. Type 796251-1, Preamplifier/Converter (A1A13) Schematic Diagram 580195

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) CAPACITANCE IS IN pF.
b) INDUCTANCE IS IN μH.

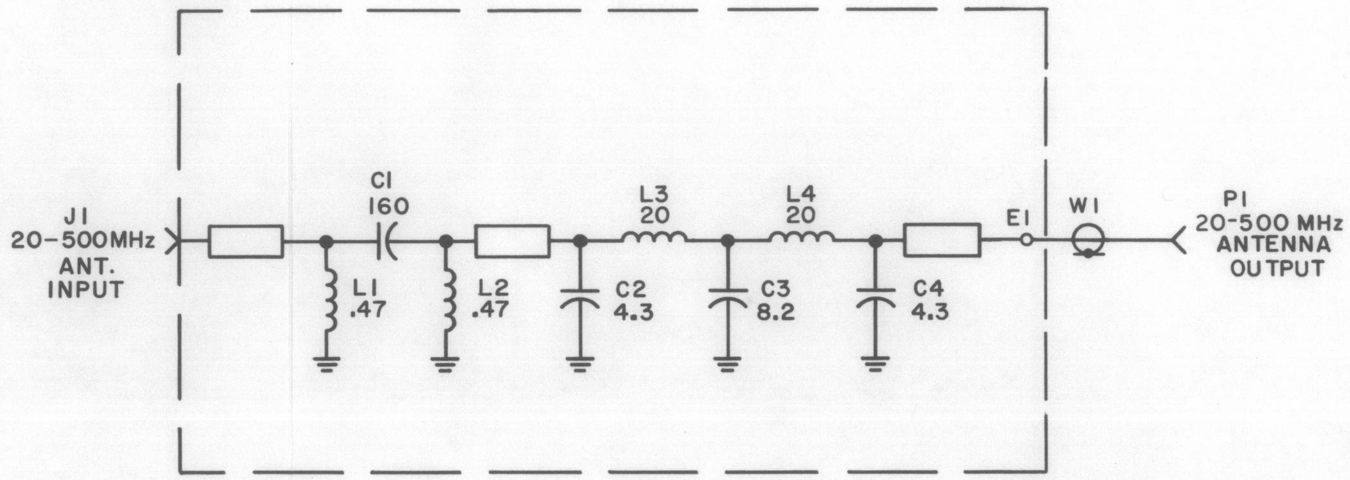


Figure 6-17. Type 796291-1, RF Input Attenuator (A1A14) Schematic Diagram 380413

NOTE:
1. UNLESS OTHERWISE SPECIFIED:
a) CAPACITANCE IS IN pF.
b) RESISTANCE IS IN OHMS, ±5% 1/8W.
2. FOR TYPE NOS., SEE TABULATION

TYPE NO.	USED ON	DIFFERENCE
796318-1	WJ-8615	MECHANICAL ONLY
796320-1	WJ-8619	

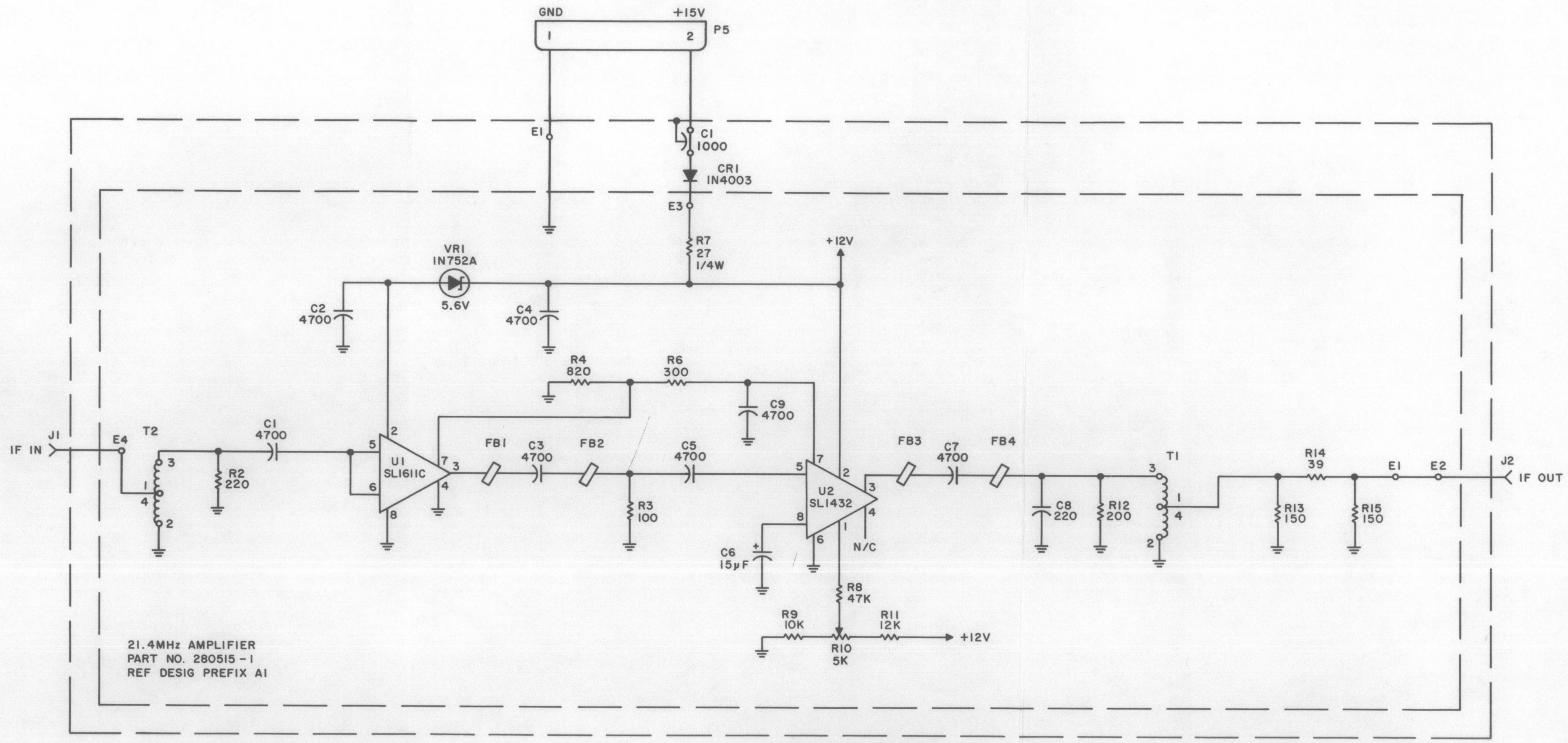
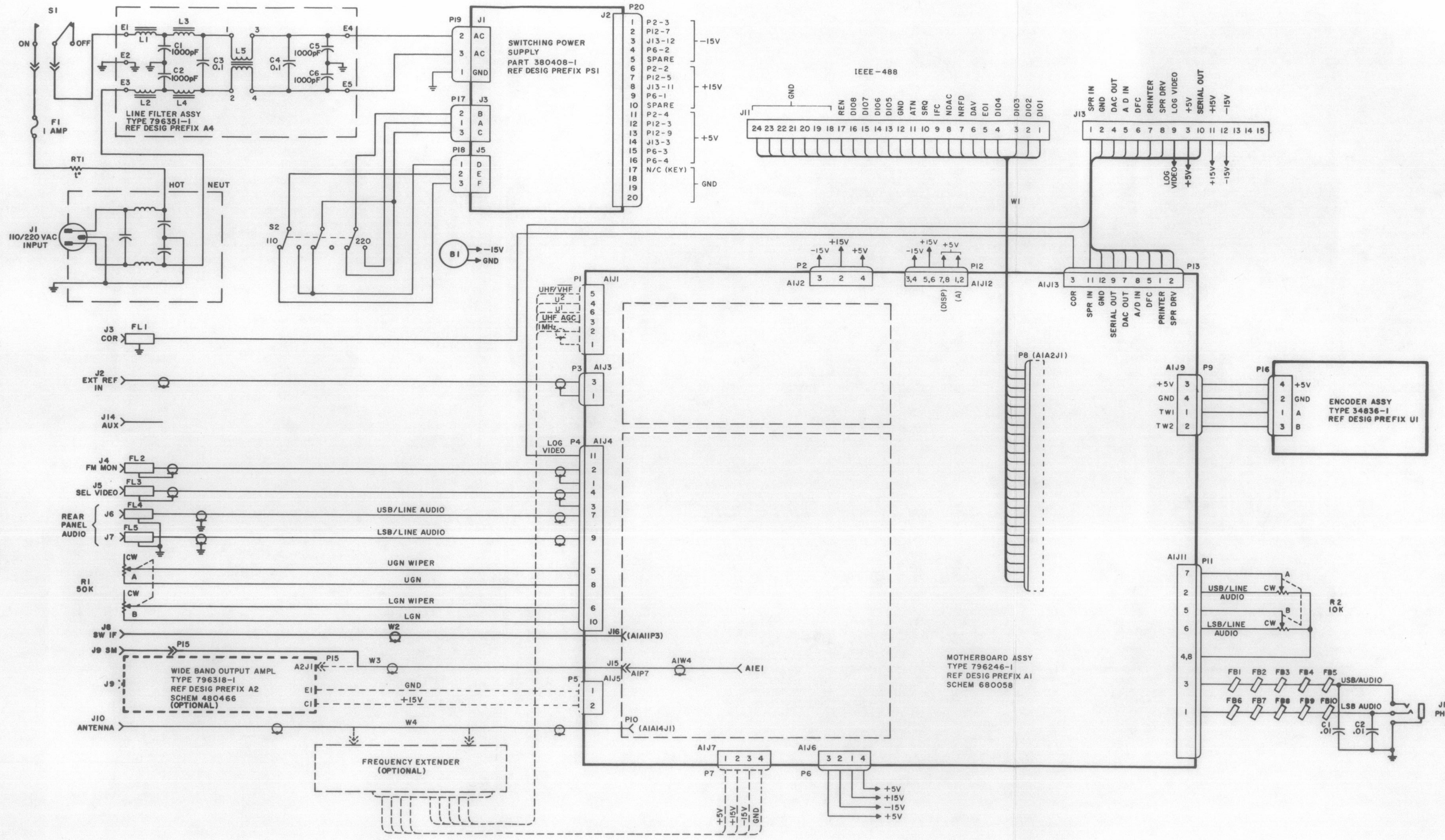


Figure 6-18. Type 796318-1, Wideband Output (A2)
Schematic Diagram 480466



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS
b) CAPACITANCE IS IN μF.

Figure 6-19. WJ-8615 Compact Receiver, Main Chassis Schematic Diagram 580215