SUPPLEMENT

FOR THE

WJ-8770-1

HF TRANSPORTABLE RECEIVER

DRS
TECHNOLOGIES

SUPPLEMENT

FOR THE

WJ-8770-1

HF TRANSPORTABLE RECEIVER

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

04/81 1st Printing
08/82 2nd Printing

WJ-8770-1 HF TRANSPORTABLE RECEIVER

1.1 GENERAL

The WJ-8770-1 HF Transportable Receiver is virtually identical to the WJ-8770 model. There is but one basic difference, the ability of the WJ-8770-1 to accept power from a 24 Vdc battery pack.

1.2 FUNCTIONAL DESCRIPTION

The WJ-8770-1 differs physically from the WJ-8770 in that it has an additional power input plug on the rear panel, designated jack J8. As can be seen from the Main Chassis schematic, Figure 6-28, jack J8, when installed, ties to the input power line from the normal power input jack, J1. The battery pack supplies 24 Vdc for operations, falling well within the equipment's normal power requirements of 22 - 32 Vdc. There are no other wiring or physical differences between the two models. Figure 2-3 shows the location of the battery power plug. A battery cover is available that provides a mounting for the battery and acts as a rear cover for the receiver.

FIELD SERVICE BULLETIN 7/10/81

WJ-8770-1 HF Transportable Receiver

A discrepancy was found regarding the audio response measurement while testing the production of the WJ-8770-1. A different set of data sometimes resulted when the BFO had a positive or negative offset with the negative offset typically yielding an out of tolerance result for the upper 3 dB limit.

An investigation of the product detector linearity, BFO level and variation, audio roll-off etc. was conducted. Some product detectors were found to be oscillating at approximately 100 MHz. Proper product detector gain/frequency response was restored with the spurious oscillation suppressed giving symmetrical data well within specification.

The oscillation was suppressed by lowering the terminating resistor (A4A1A10 R52) on the product detector's carrier input from 1 kΩ to 100Ω. The source resister (A5A4 R19) on the BFO module was reduced from 510Ω to 270Ω to restore the proper drive level.

Approximately 25 receivers were shipped prior to the incorporation of these changes, and will possibly have slightly reduced audio performance in the CW mode. Since most CW operators work in the 400-2000 Hz range, there should be no problem. The audio response in other reception modes is not affected by these changes.

If there is a problem relating to this in the field, and units are to be modified, there is no re-alignment or adjustments involved with the resistor changes.

The customer may modify the units if he determines the above problem exists or return the units to the factory for repair. If there are questions regarding this bulletin, contact your local Watkins-Johnson Company Representative or the factory directly.

1.1 GENERAL

The following paragraphs describe the changes incorporated into the WJ-8770 HF Transportable Receiver. The changes made improve the overall function and redesignate the equipment as the WJ-8770-1 HF Transportable Receiver.

The following paragraphs will describe the changes and if necessary illustrate the additions. The change descriptions start with the main chassis and proceed in reference designation sequence.

1.2 MAIN CHASSIS

1.2.1 In order to agree with the WJ-8770-1 HF Transportable Receiver Main Chassis, the following has been changed:

R4 - **FROM:** Resistor, Fixed, Composition: **120Ω**, 5%, 1/4W
P/N **RCR07G121JS**
TO: Resistor, Fixed, Composition: **120KΩ**, 5%, 1/4W
P/N **RCR07G124JS**

R8 - **FROM:** Resistor, Fixed, Composition: **82Ω**, 5%, 1/4W
P/N **RCR07G820JS**
TO: Resistor, Fixed, Composition: **130Ω**, 5%, 1/4W
P/N **RCR07G131JS**

S4 - **FROM:** Switch, Rotary, P/N **51530-01-2-GS**
TO: Switch, Rotary, P/N **51530-01-2-GN**

1.3 INPUT CONVERTER TYPE 796099 (A3)

1.3.1 The Type 796099 Input Converter has been changed to redistribute the power supply load from +15 Vdc to -15 Vdc. The parts list changes are listed below.

A1 - **FROM:** 1st Mixer/1st IF Type **34748-3**
TO: 1st Mixer/1st IF Type **370417-1**

A2 - **FROM:** 2nd Mixer/2nd IF Type **34748-3**
TO: 2nd Mixer/2nd IF Type **370417-1**

C1 - **FROM:** Capacitor, Ceramic, Feed-thru: 1000pF, GMV, 500 V
P/N 54-794-009-102W, **Qty. 4**
TO: Capacitor, Ceramic, Feed-thru: 1000pF, GMV, 500 V
P/N 54-794-009-102W, **Qty. 3**

C3 - **FROM:** Same as C1
TO: Not Used

C5 - **ADD:** Capacitor, Ceramic, Disc: 2200pF, 5%, 100V
P/N 8131-100-COGO-222U, Qty. 1

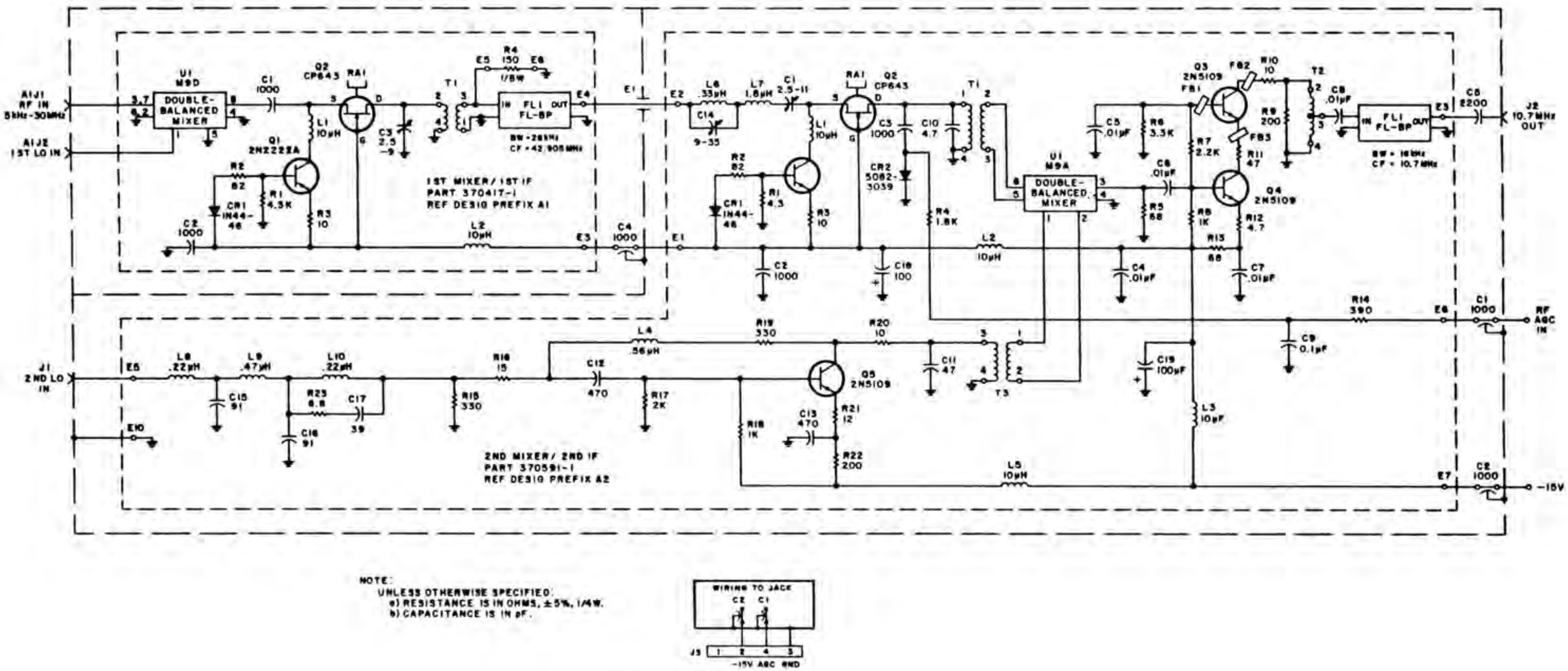


Figure 1-1. Type 796099 Input Converter (A3) Schematic Diagram 470388

1.3.2 Refer to **Figure 1-2** for Type 370417-1 1st Mixer/1st IF Location of Components. Paragraph 1.3.2.1 is the new Parts List. **Figure 1-1** is the Schematic Diagram.

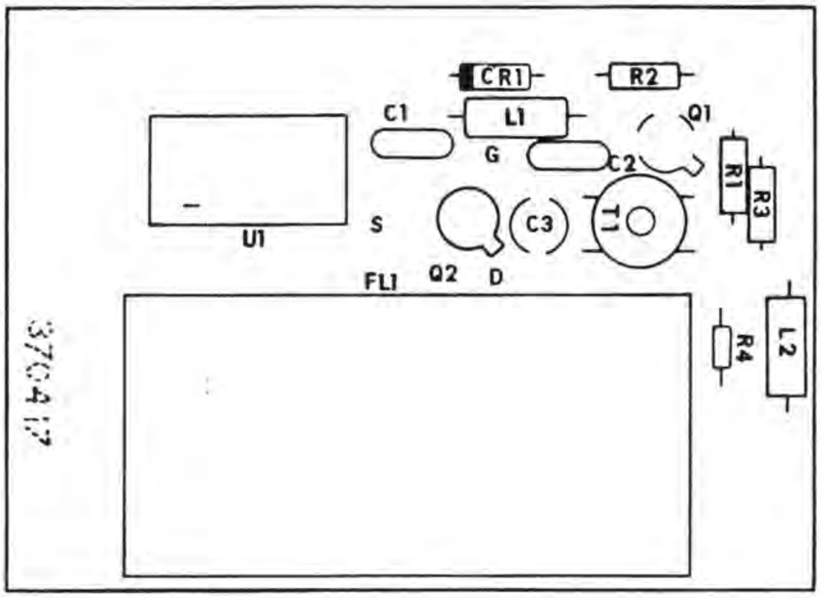


Figure 1-2. Type 370417-1, 1st Mixer/1st IF (A3A1) Location of Components

1.3.2.1 **Type 370417-1, 1st Mixer/1st IF PC Assembly** REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: 1000 pF GMV 500 V	2	B-GP1000PFP	91418	
C2	Same as C1				
C3	Capacitor, Variable, Ceramic: 2.5-9 pF 25 V	1	518-000A2.5-9	72982	
CR1	Diode	1	1N4446	80131	
FL1	Filter BP, 42.905 MHz CF 40 kHz BW	1	92212	14632	
J1	Connector, Receptacle	2	34520-1	14632	
J2	Same as J1				
L1	Coil/Fixed 10 µH 10%	2	1537-36	99800	
L2	Same as L1				
Q1	Transistor	1	2N2222A	80131	
Q2	Transistor	1	CP643	12498	
RA1	Heatsink	1	1118C	13103	
R1	Resistor, Fixed, Composition: 4.3 k, 5%, 1/4 W	1	RCR07G432JS	81349	
R2	Resistor, Fixed, Composition: 82Ω, 5%, 1/4 W	1	RCR07G820JS	81349	
R3	Resistor, Fixed, Composition: 10Ω, 5%, 1/4 W	1	RCR07G100JS	81349	
R4	Resistor, Fixed, Composition: 150Ω, 5%, 1/8 W	1	RCR05G151JS	81349	
T1	Transformer Assembly	1	22295-52	14632	
U1	Mixer/Balanced 2-500 MHz Double Bal	1	M9D	27956	

1.3.3 Refer to **Figure 1-3** for Type 370591 2nd Mixer/2nd IF Location of Components. Paragraph 1.3.3.1 is the new Parts List.

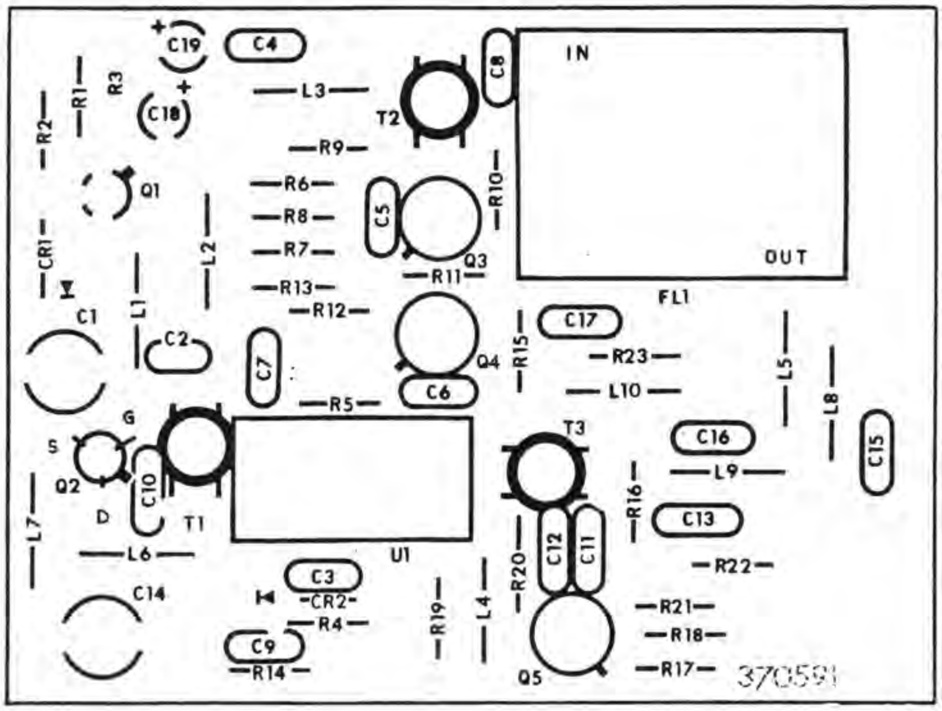


Figure 1-3. Type 370591, 2nd Mixer/2nd IF (A3A2) Location of Components

1.3.3.1 **Type 370591, 2nd Mixer/2nd IF Printed Wiring Assembly** PREF DISG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Variable, Ceramic: 2.5-11 pF, 305 V	1	538-011B2.5-11	72982	
C2	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	2	B-GP1000PFP	91418	
C3	Same as C2				
C4	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	5	34453-1	14632	
C5	Same as C4				
C6	Same as C4				
C7	Same as C4				
C8	Same as C4				
C9	Capacitor, Ceramic, Disc: .1 µF, 20% 50 V	1	34475-1	14632	
C10	Capacitor, Ceramic, Disc: 4.7 pF, PORM 0.25 pF 100 V	1	8108-100-COHO-479C	72982	
C11	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM05ED470G03	81349	
C12	Capacitor, Ceramic Disc: 470 pF, 20%, 1000 V	2	BHD470-20PCT	91418	
C13	Same as C12				
C14	Capacitor, Variable, Ceramic: 9-35 pF, 350 V	1	538-01109-35	72982	
C15	Capacitor, Mica, Dipped: 91 pF, 2%, 500 V	2	CM05FD910G03	81349	
C16	Same as C15				
C17	Capacitor, Mica, Dipped: 39 pF, 2%, 500 V	1	CM05ED390G03	81349	
C18	Capacitor, Electrolytic, Tantalum: 100 µF, 20%, 20 V	2	196D107X0020TE4	56289	
C19	Same as C18				
CR1	Diode HI Conductance PRV Silicon	1	1N4446	80131	
CR2	Diode .040 pF 1/4 W Glass Hermetic Seal with Dumet Lead	1	5082-3039	28480	
FB1	Ferrite Bread	3	56-590-65-4A	02114	
FB2	Same as FB1				
FB3	Same as FB1				
FL1	Filter BP 10.7 MHz	1	92211	14632	
L1	Coil/Fixed 10 µH 10%	4	1537-36	99800	
L2	Same as L1				
L3	Same as L1				
L4	Coil Fixed 0.56 µH 15%	1	202-11	99848	
L5	Same as L1				
L6	Coil Fixed: 0.33 µH 10%	1	1537-04	99800	
L7	Coil Fixed Mold: 1.8 µH, 10%	1	1537-18	99800	
L8	Coil Fixed Mold: .22 µH, 10%	2	1537-02	99800	
L9	Coil Fixed Mold: .47 µH, 10%	1	1537-06	99800	
L10	Same as L8				
Q1	Transistor	1	2N2222A	80131	
Q2	Transistor	1	CP643	12498	
Q3	Transistor	3	2N5109	80131	

PREF DISG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
Q4	Same as Q3				
Q5	Same as Q3				
RA1	Heatsink	1	1118C	13103	
R1	Resister, Fixed, Composition: 4.3 K, 5% 1/4 W	1	RCR07G432JS	81349	
R2	Resister, Fixed, Composition: 82Ω, 5%, 1/4 W	1	RCR07G820JS	81349	
R3	Resister, Fixed, Composition: 10Ω, 5%, 1/4 W	3	RCR07G100JS	81349	
R4	Resister, Fixed, Composition: 1.8 K, 5%, 1/4 W	1	RCR07G182JS	81349	
R5	Resister, Fixed, Composition: 68Ω, 5%, 1/4 W	2	RCR07G68OJS	81349	
R6	Resister, Fixed, Composition: 3.3 K, 5%, 1/4 W	1	RCR07G332JS	81349	
R7	Resister, Fixed, Composition: 2.2 K, 5%, 1/4 W	1	RCR07G222JS	81349	
R8	Resister, Fixed, Composition: 1.0 K, 5%, 1/4 W	2	RCR07G102JS	81349	
R9	Resister, Fixed, Composition: 200Ω, 5%, 1/4 W	2	RCR07G201JS	81349	
R10	Same as R3				
R11	Resister, Fixed, Composition: 47Ω, 5%, 1/4 W	1	RCR07G470JS	81349	
R12	Resister, Fixed, Composition: 4.7Ω, 5%, 1/4 W	1	RCR07G4R7JS	81349	
R13	Same as R5				
R14	Resister, Fixed, Composition: 390Ω, 5%, 1/4 W	1	RCR07G391JS	81349	
R15	Resister, Fixed, Composition: 330Ω, 5%, 1/4 W	2	RCR07G331JS	81349	
R16	Resister, Fixed, Composition: 15Ω, 5%, 1/4 W	1	RCR07G150JS	81349	
R17	Resister, Fixed, Composition: 2.0 K, 5%, 1/4 W	1	RCR07G202JS	81349	
R18	Same as R8				
R19	Same as R15				
R20	Same as R3				
R21	Resister, Fixed, Composition: 12Ω, 5%, 1/4 W	1	RCR07G120JS	81349	
R22	Same as R9				
R23	Resister, Fixed, Composition: 6.8Ω, 5%, 1/4 W	1	RCR07G6R8JS	81349	
T1	Transformer Assembly	1	22295-53	14632	
T2	Transformer Assembly	1	22295-54	14632	
T3	Transformer Assembly	1	22295-55	14632	
U1	Mixer/Balanced 0.05-200 MHz				

1.4 DEMODULATOR/AGC AMPLIFIER TYPE 796113 (A4A1A10)

1.4.1 The following components have been changed to upgrade the performance of this module:

R7 -	**FROM:**	Resistor, Fixed, Composition: 100Ω, 5% 1/4 W P/N RCR07G101JS **QTY. 7**
	TO:	Resistor, Fixed, Composition: 100Ω, 5% 1/4 W P/N RCR07G101JS **QTY. 9**
R29 -	**FROM:**	Resistor, Fixed, Composition: 1.0KΩ, 5% 1/4 W P/N RCR07G102JS **QTY. 5**
	TO:	Resistor, Fixed, Composition: 1.0KΩ, 5% 1/4 W P/N RCR07G102JS **QTY. 3**
R52 -	**FROM:**	Same as **R29**
	TO:	Same as **R7**
R54 -	**FROM:**	Same as **R29**
	TO:	Same as **R7**

1.5 SYNTHESIZER MOTHERBOARD TYPE 796117 (A5)

1.5.1 The following component has been changed to upgrade the performance of this module:

J2 -	**FROM:**	Connector, Receptacle, P/N **1-87227-0**
	TO:	Connector, Receptacle, P/N **2-87227-0**

1.6 PHASE LOCK LOOP TYPE 796115 (A5A2A1)

1.6.1 The following components have been changed to upgrade the performance of this module.

R1 -	**FROM:**	Resistor, Fixed, Composition: 1.0KΩ, 5% 1/4 W P/N RCR07G102JS **QTY. 3**
	TO:	Resistor, Fixed, Composition: 1.0KΩ, 5% 1/4 W P/N RCR07G102JS **QTY. 2**
R9 -	**FROM:**	Same as R1
	TO:	Resistor, Fixed, Composition: 390Ω, 5% 1/4 W P/N RCR07G391JS

1.7 VCO ASSEMBLY TYPE 796131 (A5A2A2A1)

1.7.1 The following components have changed to upgrade the performance of this module:

CR1 -	**FROM:**	Diode, P/N **IN4446, QTY 3**
	TO:	Diode, P/N **BB109/Yellow, QTY 1**
CR2 -	**FROM:**	Same as CR1
	TO:	Diode, P/N MPN3401, **Qty 3**
CR3 -	**FROM:**	Same as CR1
	TO:	Same as CR2
CR4 -	**FROM:**	Diode/Varicap, P/N BB109/Yellow
	TO:	Same as CR2
C1 -	**FROM:**	Capacitor, Ceramic, Disc: 1000pF, GMV, 500V P/N B-GP1000PFP **QTY 13**
	TO:	Capacitor, Ceramic, Disc: 1000pF, GMV, 500V P/N B-GP1000PFP **QTY 12**
Q2 -	**FROM:**	Transistor, P/N 2N3251, **QTY 2**
	TO:	Transistor, P/N 2N3251, **QTY 1**
Q3 -	**FROM:**	Same as Q2
	TO:	Transistor, P/N 2N3906

1.8 2nd LO SYNTHESIZER TYPE 796107 (A5A3)

1.8.1 The following components have been changed to upgrade the performance of this module. Refer to **Figure 1-4** for the new Location of Components.

C1 -	**FROM:**	Capacitor, Ceramic, Disc: 0.1pF, 10%, 50V P/N 8121-050-X7R0-104K, **QTY 14**
	TO:	Capacitor, Ceramic, Disc: 0.1pF, 10%, 50V P/N 8121-050-X7R0-104K, **QTY 15**
C25 -	**FROM:**	Same as C1
	TO:	Same as C2
R9 -	**FROM:**	Resistor, Fixed, Composition: 1.0KΩ, 5% 1/8 W P/N RCR05G102JS **QTY. 5**
	TO:	Resistor, Fixed, Composition: 1.0KΩ, 5% 1/8 W P/N RCR05G102JS **QTY. 4**
R70 -	**FROM:**	Same as R9
	TO:	Resistor, Fixed, Composition: 560Ω, 5%, 1/8W P/N RCR05G561JS

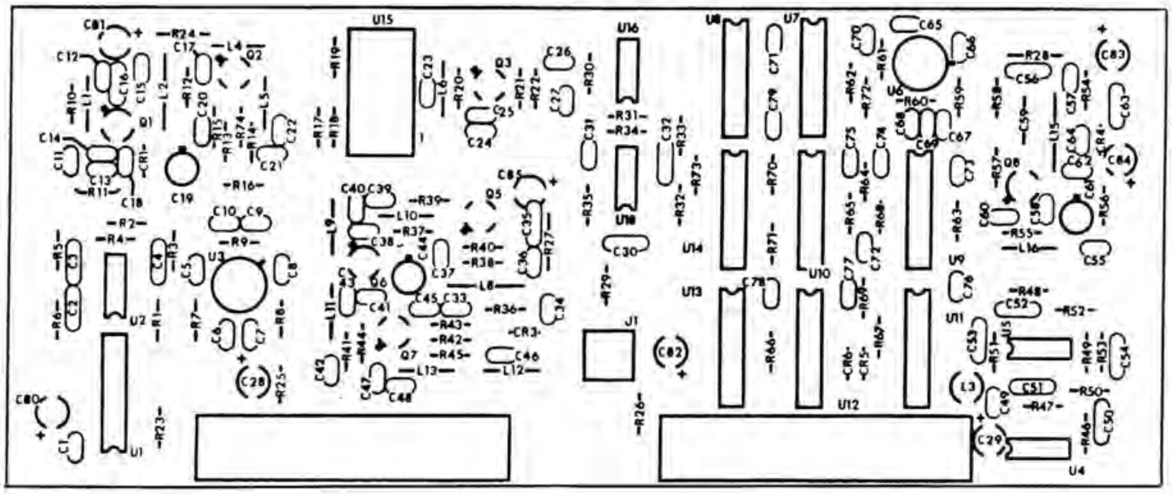


Figure 1-4. Type 796107, 2nd LO Synthesizer (A5A3) Location of Components

U6 -	**FROM:**	Spacer/Hex, P/N 8213-55-0440-7
	TO:	IC, Divide by 20, P/N SP8657M

1.9 BFO 3rd LO TYPE 796109 (A5A4)

1.9.1 The following components have been changed to upgrade performance of this module:

C12 -	**FROM:**	Capacitor, Ceramic, Disc: .47pF, 20%, 50V P/N 34452-1, **QTY 2**
	TO:	Capacitor, Ceramic, Disc: .47pF, 20%, 50V P/N 34452-1, **QTY 3**
C18 -	**FROM:**	Capacitor, Electrolytic, Tantalum: 100pF, 20%, 20V P/N 196D107XZ0020TE4, **QTY 2**
	TO:	Capacitor, Electrolytic, Tantalum: 100pF, 20%, 20V P/N 196D107X002TE4, **QTY 1**

C50 -	**FROM:**	Same as C18
	TO:	Same as C12
R19 -	**FROM:**	Resistor, Fixed, Composition: **510Ω**, 5%, 1/4W P/N **RCR07G511JS**
	TO:	Resistor, Fixed, Composition: **270Ω**, 5% 1/4W P/N **RCR07G271JS**

1.10 **AUDIO AMPLIFIER TYPE 796116 (A9)**

1.10.1 The following components have been changed to upgrade the performance of this module:

R3 -	**FROM:**	Resistor, Fixed, Film: **6.81KΩ**, 1%, 1/10W P/N **RN55C6811F**
	TO:	Resistor, Fixed, Film: **68.1KΩ**, 1%, 1/10W P/N **RN55C6812F**
R7 -	**FROM:**	Resistor, Fixed, Film: **9.09KΩ**, 1%, 1/10W P/N **RN55C9091F**
	TO:	Resistor, Fixed, Film: **90.9KΩ**, 1%, 1/10W P/N **RN55C9092F**

1.11 **FRONT COVER ASSEMBLY WITH REMOVABLE SPEAKER TYPE 796140-2 (A11)**

1.11.1 Refer to paragraph 1.11.2 for the new Parts List. **Figure 1-5** is the location of Components following the Parts List. Subassemblies follow (A11) in Reference Designation sequence:

(A11A1) - Speaker Amplifier Assembly, Type 796134-3
(A11A1A1) - Speaker Amplifier P.C. Assembly, Part 270784-1

1.11.2 **TYPE 796140-2, FRONT COVER ASSEMBLY w/REMOVABLE SPEAK ASSEMBLY** REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Removable Speaker Assembly	1	796134-3	14632	

1.11.2.1 Type 796134-3, Removable Housing Assembly with Speak Ampl REF DESIG PREFIX A11A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Speaker Amplifier PC Assembly	1	270784-1	14632	
LS1	Speaker	1	25A070T	74199	
P1	Plug Multipin	1	GC329	25330	
R1	Resistor, Fixed, Composition: 50 K, 10%, 1 W	1	70A3N056L503A	01121	

1.11.2.2 **Part 270784-1, Speaker Amplifier Printed Wiring Assembly** REF DESIG PREFIX A11A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Electrolytic, Tantalum: 200µF, 20%, 15 V	3	MTP207M015P1C	76055	
C2	Capacitor, Ceramic, Disc: .05 µF, M20P80, 25 V	1	DFJ1	73899	
C3	Same as C1				
C4	Same as C1				
C5	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 100 V	1	8131M100-651-474M	72982	
R1	Resistor, Fixed, Composition: 10Ω, 5%, 1/4 W	1	RCR07G100JS	81349	
R2	Resistor, Fixed, Composition: 510Ω, 5%, 1/2 W	1	RCR20G511JS	81349	
R3	Resistor, Fixed, Composition: 7.5 K, 5%, 1/4 W	1	RCR07G752JS	81349	
U1	Integrated Circuit	1	LM386N	27014	
VR1	Diode Zener 6.2 V	1	1N4735	80131	

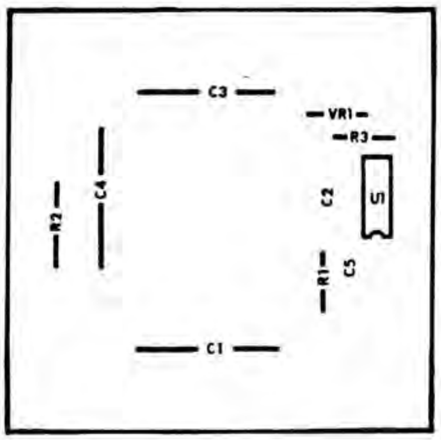
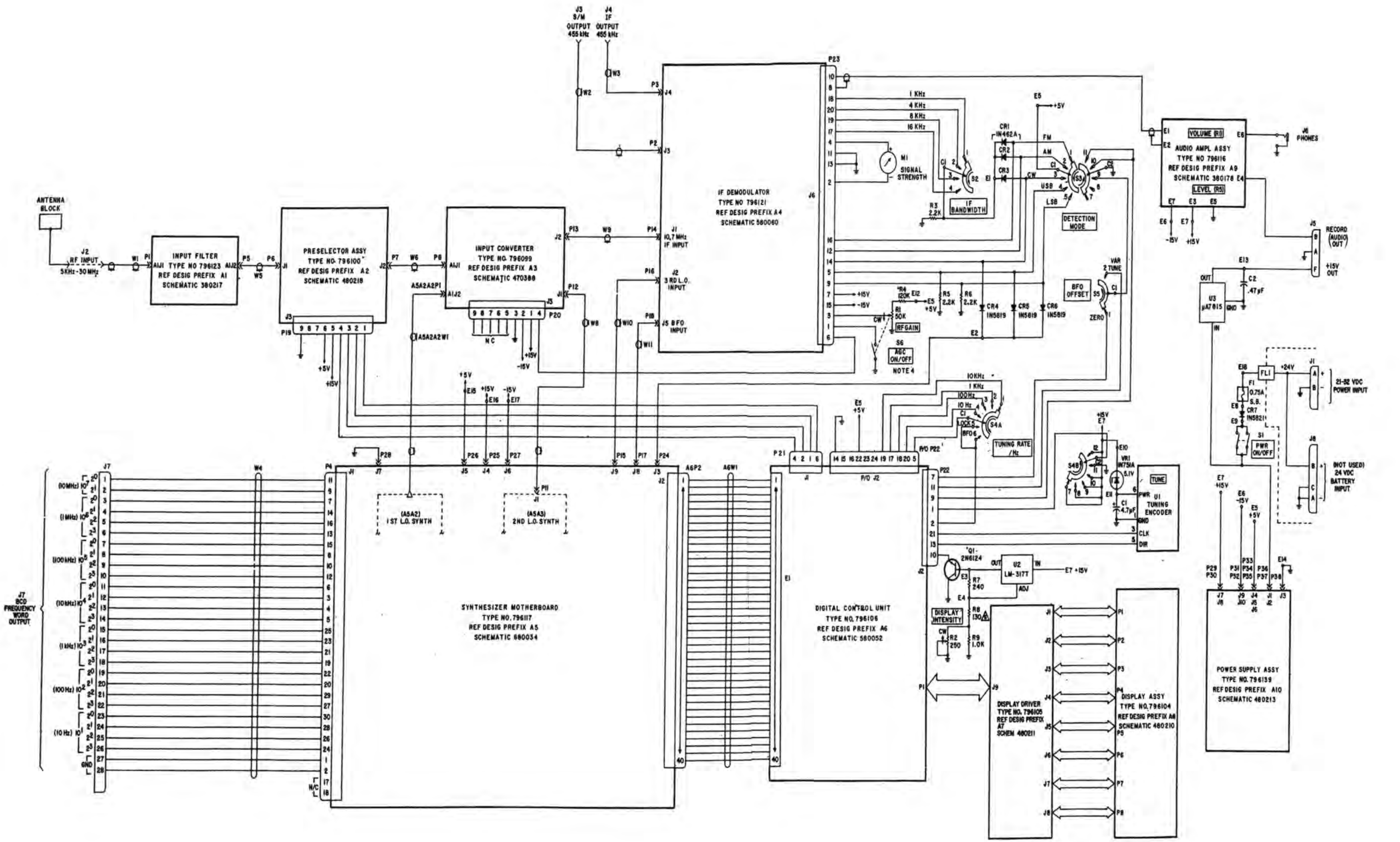


Figure 1-5. Part 270784-1, Speaker Amplifier (A11A1A1) Location of Components



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. CONNECTOR A11P1 MATES WITH J5 FOR SPEAKER AMPLIFIER OPERATION.
3. ▭ INDICATES FRONT PANEL CONTROL.
4. S6 OPENS AT MAXIMUN CW ROTATION OF R1.
5. DIFFERENCE BETWEEN A11 TYPES IS LISTED IN TABLE.
⚠ NOMINAL VALUE, FINAL VALUE FACTORY SELECT.

UNIT SERIAL NO	A11	A11A1	A11A1 SCHEM
SER NO 1-35	796140-1	796134-1	280197
SER NO 36 & UP	796140-2	796134-3	270785

Figure 1-6. WJ-8770-1 HF TRANSPORTABLE RECEIVER
Schematic Diagram 680035

Incorporate the information contained in this addendum into the Instruction Manual for WJ-8770-1 HF Transportable Receiver.

PURPOSE OF ADDENDUM

The purpose of this addendum is to describe product improvement modifications. The modifications have been incorporated into the Type 796139-2 Power Supply (A10). The Type 796139-2 module supercedes the previously utilized Type 796139.

A. TYPE 796139-2 POWER SUPPLY (A10), CIRCUIT DESCRIPTION

Refer to the Type 796139-2 Schematic Diagram, Figure 4, page 9 of this addendum.

The new power supply circuitry is located on the Type 794302-1 DC-DC Converter (A10A1). The Part 270990-1 Sense Circuit (A10A1A1) is plug-in mounted to the DC-DC Converter main printed circuit board. The Type 794302-1 module supercedes the previously utilized Type 796110.

Delete paragraph 3.6.9.1 in the WJ-8770-1 Instruction Manual and replace with the following.

3.6.9.1 Type 794302-1 DC-DC Converter (A10A1), Circuit Description

The Type 794302-1 is a pulse width modulation (PWM) regulated DC to DC Converter. It receives an input voltage of 22 to 32 Vdc from the receiver rear panel and provides regulated/current limited power supply outputs of +5 Vdc, +15 Vdc and -15 Vdc.

The +24 Vdc input is filtered and over-voltage regulated by series regulator Q4-VR1. Regulation of the +5 Vdc and ±15 Vdc supplies is provided by integrated circuits U1 and U2 respectively. Darlington switch Q1 provides current gain for the +5 Vdc supply. Darlington switch Q2 provides current gain for the ±15 Vdc supply.

Current limiting (overload protection) of the +5 Vdc supply is provided by U1's internal current sensing circuitry. Current sensing amplifier Q3 provides current limiting of the ±15 Vdc supply.

3.6.9.1.1 Series Voltage Regulator Q4, VR1

Integrated circuits U1 and U2 operate most efficiently when the input voltage is held in the +22 to +24 Vdc range. Q4, VR1 and their associated components make up a series regulator which keeps the input voltage to U1 and U2 from exceeding +24 Vdc approximately. When the DC level at Q4's base attempts to exceed +24 Vdc, VR1 becomes clamped and maintains the +24 Vdc level for module input voltages in the +24 to +32 Vdc range.

3.6.9.1.2 Sense Circuit A1

Refer to the Part 270990-1 Schematic Diagram, Figure 5, page 10 of this addendum.

Sense Circuit A1 shuts down the DC-DC Converter if the module input level falls below approximately +22 Vdc. The input voltage is applied to A1 at input terminal E1. At input levels exceeding +22 Vdc CR1 and CR2 clamp. The resulting current develops a positive voltage across R1, thereby driving Q1 and Q2 into saturation. This action keeps the collectors of Q1 and Q2 and therefore A1's E2 and E3 outputs, at 0 Vdc.

When the DC input level drops below approximately +22 Vdc CR1 and CR2 no longer conduct. Q1 and Q2 are then turned off, resulting in a positive voltage at the A1 modules E2 and E3 outputs.

The Sense Circuit's E2 and E3 outputs are applied to the SHUT-DOWN inputs of U1 and U2 respectively. When the level at either of the SHUT-DOWN inputs exceeds approximately +0.7 Vdc the corresponding IC becomes disabled, thereby avoiding excessive current due to under-voltage operation.

3.6.9.1.3 Pulse Width Modulators U1 and U2

U1 and U2 are regulating pulse width modulators (PWM) for the +5 Vdc and ±15 Vdc supplies respectively. Each provides pulse outputs utilized by the +5 Vdc and ±15 Vdc converter circuitry. Each also contains internal voltage regulation and current sensing (overload protection) circuitry.

Voltage regulation of both the +5 Vdc and ±15 Vdc supplies is accomplished in the same way. A sample of the supply output is applied to a precision voltage divider. The resistance values utilized in the voltage divider (R1-R2 for the +5 Vdc supply, R10-R11-R12 for the ±15 Vdc supply) are selected to establish a +2.5 Vdc level at the INV inputs of U1 and U2. Each IC's +5 Vdc reference voltage, V_R, is divided down in the same way to provide a +2.5 Vdc reference voltage at their NON INV inputs.

When the power supply load is increased the level at the INV input tends to decrease. At that time the PWM regulator increases the duty cycle of the pulses at its output, supplying more energy to the converter in order to maintain the proper supply output voltage level. When the INV input level tries to increase the pulse duty cycle decreases.

U1 and U2 each have an internal oscillator. The OSC outputs of U1 and U2 are connected. This synchronizes the operating frequency of the two devices at a frequency established by R5 and C6. The operating frequency is approximately 20 kHz.

3.6.9.1.4 +5 Vdc Supply

U1's C_A and C_B outputs are summed and applied via R7 to the base of Darlington switch Q1. Q1 provides the current gain necessary to drive a forward converter made up of CR1, L1 and their associated components.

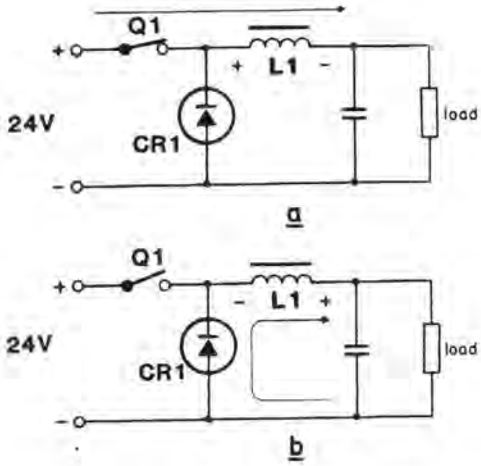


Figure 1. Forward Converter Operation.

Figure 1 illustrates forward converter operation. When the switch representing Q1 is closed (Q1 on), current is passed directly to the load and energy is stored in the field around inductor L1. When the switch opens (Q1 off) the energy stored in L1's collapsing field reverses the inductor's polarity and forces CR1 into conduction. The arrows shown in **Figure 1** illustrate current flow. It can be seen that even when Q1 is off energy continues to be supplied to the load because CR1 allows prolonged circulation of inductive current.

3.6.9.1.5 **±15 Vdc Supply**

U2's E_A and E_B outputs are summed and applied to the base of Darlington switch Q2. Q2's output is applied to the primary of transformer T1. T1 is wound by a special technique to minimize leakage inductance.

T1 is the transformer component of two separate full-wave rectifiers. CR2 and CR4 rectify the signal from T1's secondary, producing +15 Vdc. CR3 and CR5 rectify the signal from T1's secondary, producing -15 Vdc. Filters C13-L4-C2 and C12-L3-C3 remove residual 20 kHz components from the +15 and -15 Vdc supplies respectively.

Current sensing amplifier Q3 provides overload protection for the ±15 Vdc supply. Excessive current through R14 and R15 will forward bias Q3 into saturation. This action grounds pin 9 of U2, thereby limiting the pulse duty cycle at U2's output.

B. **POWER SUPPLY TROUBLESHOOTING**

Delete **Table 4-4** in the WJ-8770-1 Instruction Manual and replace with Table A. Utilize Table A to isolate the cause of failure to one of the problem areas listed in the right-

hand column. Refer to the Power Supply circuit description and schematic diagrams to aid in additional signal tracing and fault isolation.

Table A. Troubleshooting Guide

Test Point	Typical DC Voltage	Possible Problem Area
TP1	+24 V	J1, Main Chassis Wiring
U1-15	+24 V	Q4, VR1 and associated components
U1-10	0 V	A1
U2-10	0 V	A1
U1-2	+2.5 V	U1 or voltage divider R3-R4
U2-2	+2.5 V	U2 or voltage divider R8-R9
TP2	+5 V	Q1, CR1 and associated components
TP3	+15 V	CR2, CR4, Q2, Q3 and associated components
TP4	-15 V	CR3, CR5, Q2, Q3 and associated components

C. REPLACEMENT PARTS LISTS AND SCHEMATIC DIAGRAMS

The following are replacement parts lists and schematic diagrams for the Type 796139-2 Power Supply.

TYPE 794302-1 DC-DC CONVERTER REF DESIG PREFIX A10A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
A1	Sense Circuit	1	270990-1	14632	
C1	Capacitor, Electrolytic, Tantalum: 100 μF, 20%, 20 V	4	196D107X0020TE4	56289	
C2 Thru C4	Same as C1				
C5	Capacitor, Ceramic, Disc: .47 μF, 20%, 50 V	2	34452-1	14632	
C6	Capacitor, Ceramic, Disc: .01 μF, 5%, 100 V	1	8131-100C0G0-103J	72982	
C7	Capacitor, Ceramic, Disc: .01 μF, 20%, 50 V	6	34453-1	14632	
C8	Same as C7				
C9	Capacitor, Ceramic, Disc: 1000 pF, GMV, 500 V	1	B-GP1000PFP	91418	
C10	Capacitor, Electrolytic, Tantalum: 2.2 μF, 10%, 35 V	1	CS13BF225K	81349	56289
C11	Capacitor, Ceramic, Disc: 0.1 μF, 20%, 100 V	1	8131M100-651-104M	72982	
C12	Capacitor, Electrolytic, Tantalum: 27 μF, 10%, 35 V	2	196D276X9035TE4	56289	
C13	Same as C12				
C14	Capacitor, Electrolytic, Tantalum: 27 μF, 10%, 35 V	2	CS13BF276K	81349	56289
C15	Same as C14				
C16 Thru C19	Same as C7				
C20	Same as C5				
C21	Capacitor, Electrolytic, Tantalum: 2.2. μF, 20%, 35 V	1	196D225X00JE3	56289	
CR1	Diode, Schottky: 40 V, 1A	1	1N5819	80131	04713
CR2	Diode	4	VHE240	21845	
CR3 Thru CR5	Same as CR2				
CR6	Diode	1	1N4449	80131	93332
J1	Connector	10	62073-1	00779	
J2 Thru J10	Same as J1				
L1	Coil	1	30314-13	14632	
L2	Coil	4	20681-228	14632	
L3 Thru L5	Same as L2				
Q1	Transistor	1	T1P117	01295	
Q2	Transistor	1	T1P112	01295	
Q3	Transistor	1	2N3904	80131	04713
Q4	Transistor	1	2N6121	80131	04713
R1	Resistor, Fixed, Film: 5.11 kΩ, 1%, 1/10 W	8	RN55C5111F	81349	75042

REF DESIG PREFIX A10A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R2 Thru R5	Same as R1				
R6	Resistor, Fixed, Composition: 330 Ω, 5%, 1/4 W	1	RCR07G331JS	81349	01121
R7	Resistor, Fixed, Composition: 2.0 kΩ, 5%, 1/4 W	1	RCR07G202JS	81349	01121
R8 Thru R10	Same as R1				
R11	Resistor, Fixed, Film: 23.7 kΩ, 1%, 1/10 W	2	RN55C2372F	81349	75042
R12*	Same as R11				
R13	Resistor, Fixed, Composition: 510 Ω, 5%, 1/4 W	1	RCR07G511JS	81349	01121
R14	Resistor, Fixed, Wire wound: .22 Ω, 5%, 2 W	4	BWH0.22J	75042	
R15 Thru R17	Same as 14				
R18	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	2	RCR07G102JS	81349	01121
R19	Resistor, Fixed, Composition: 4.3 kΩ, 5%, 1/4 W	1	RCR07G432JS	81349	01121
R20	Same as R18				
R21	Resistor, Fixed, Composition: 100 Ω, 5%, 1/4 W	1	RCR07G101JS	81349	01121
R22	Resistor, Fixed, Composition: 82 kΩ, 5%, 1/4 W	1	RCR07G823JS	81349	01121
T1	Transformer	1	370768-1	14632	
TP1	Jack, Test Point, Red	1	TJ203R	49956	
TP2	Jack, Test Point, Orange	1	TJ2040R	49956	
TP3	Jack, Test Point, Blue	1	TJ207MB	49956	
TP4	Jack, Test Point, Violet	1	TJ210V	49956	
U1	Integrated Circuit	2	UC1524A	61637	
U2	Same as U1				
VR1	Diode, Zener: 24 V, 1W	1	1N4749	80131	04713
*	Nominal Value, Final Value Factory Selected				

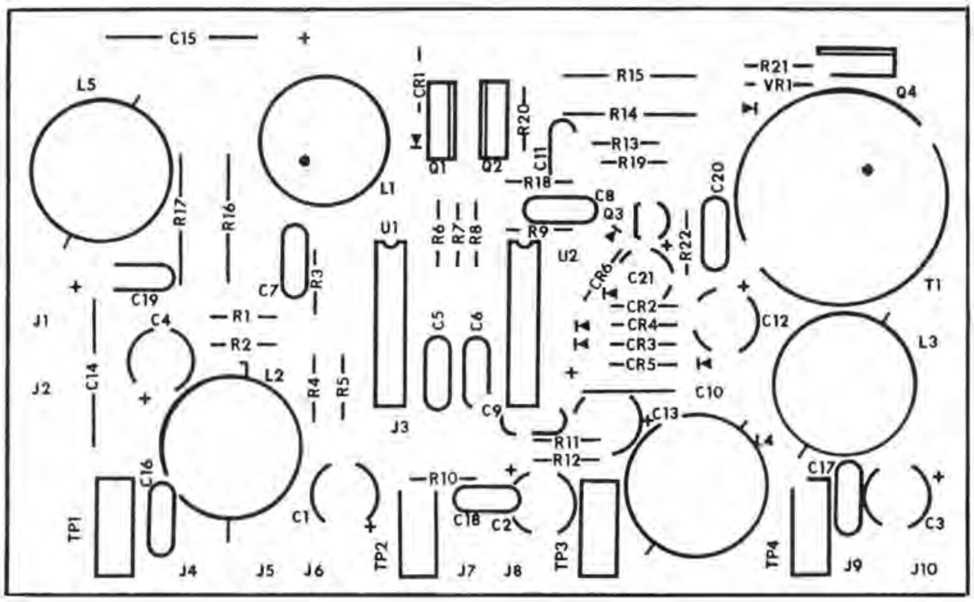


Figure 2. Type 794302-1 DC-DC Converter, Location of Components.

Part 270990-1 Sense Circuit REF DESIG PREFIX A10A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
CR1	Diode, Zener: 15 V, Silicon	1	1N965B	80131	04713
CR2	Diode, Zener: 5.1 V, Silicon	1	1N751A	80131	04713
Q1	Transistor	2	2N3904	80131	04713
Q2	Same as Q1				
R1	Resistor, Fixed, Composition: 1.0 kΩ, 5%, 1/4 W	1	RCR07G102JS	81349	01121
R2	Resistor, Fixed, Composition: 4.7 kΩ, 5%, 1/4 W	2	RCR07G472JS	81349	01121
R3	Same as R2				
R4	Resistor, Fixed, Composition: 39 kΩ, 5%, 1/4 W	2	RCR07G393JS	81349	01121
R5	Same as R4				

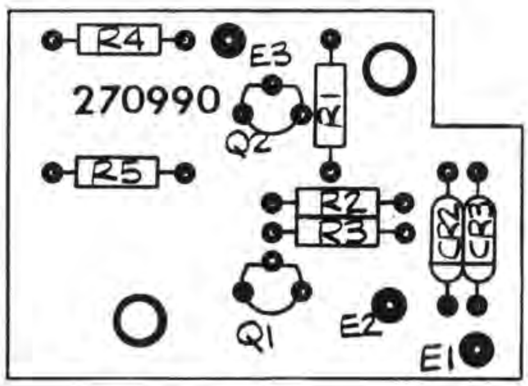
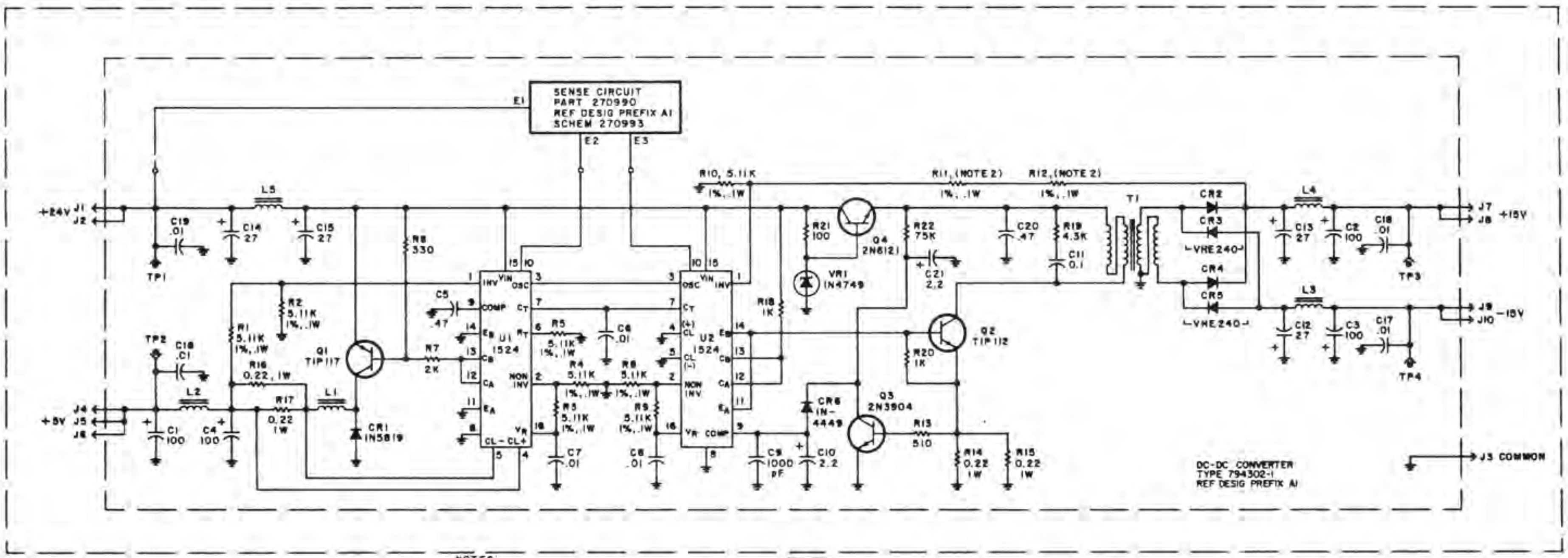


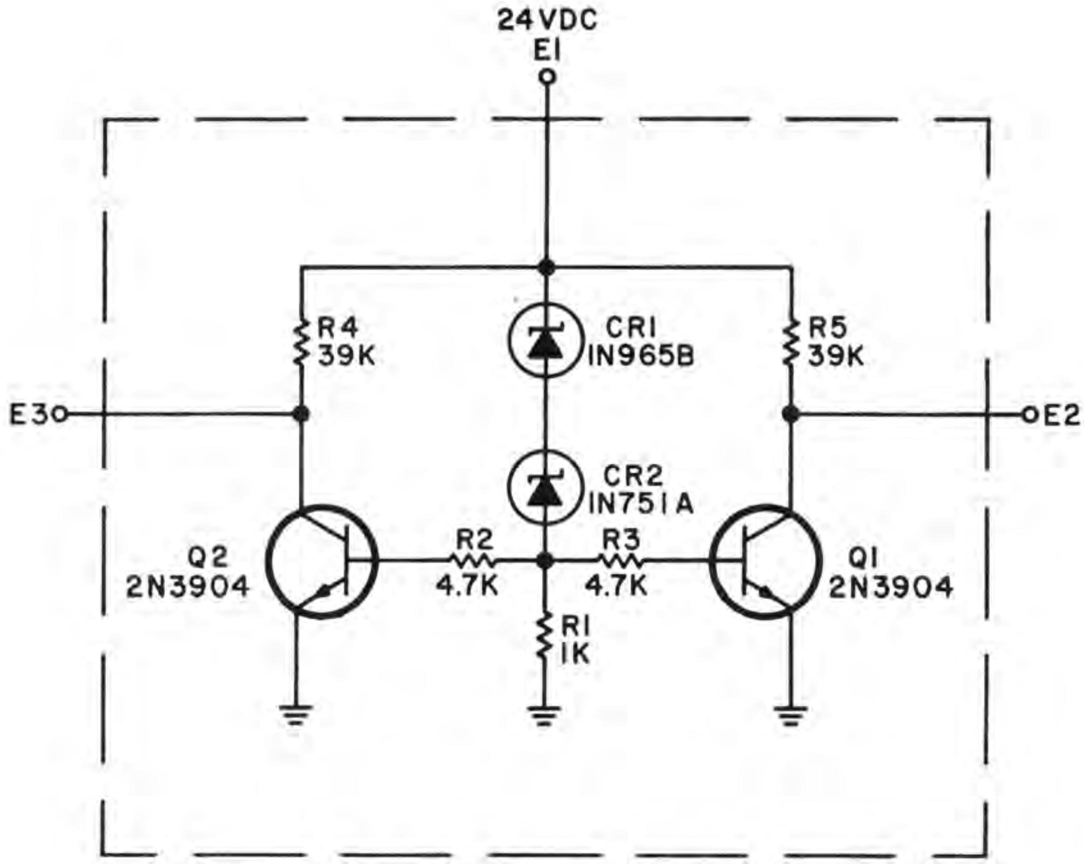
Figure 3. Part 270990-1 Sense Circuit, Location of Components.



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN μF.
2. R11 & R12 ARE FACTORY SELECTED TO SET OUTPUT TO +15V MEASURED AT TP3 (NOMINAL VALUE OF SUM OF R11 & R12, 25.5K).

UC1524A

Type 796139-2 Power Supply (A10)
Schematic Diagram



NOTES
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.

Part 270990 Sense Circuit (A10A1A1)
Schematic Diagram

INSTRUCTION MANUAL

FOR THE

WJ-8770

HF TRANSPORTABLE RECEIVER

WATKINS-JOHNSON COMPANY

700 QUINCE ORCHARD ROAD

GAITHERSBURG, MARYLAND 20878

04/81 1st PRINTING
08/82 2nd PRINTING

WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted. Extreme caution should be exercised when working on this equipment with any protective covers removed.

EQUIPMENT AND PROCEDURAL SAFETY

Equipment and procedural safety practices are paramount to both the user and manufacturer of this equipment. As a result, the following general guidelines are presented as a reminder to prevent possible injury and equipment damage.

1. Preventive and corrective maintenance on this equipment, with the protective covers removed and power applied, should be performed by skilled technicians familiar with this equipment.

2. With equipment power off and with the equipment power cord disconnected from a power source, there is a possibility that capacitors in the equipment may still be charged.

3. Replace defective equipment power fuses with fuses of the same size and type which are both specified on the equipment and in this publication.

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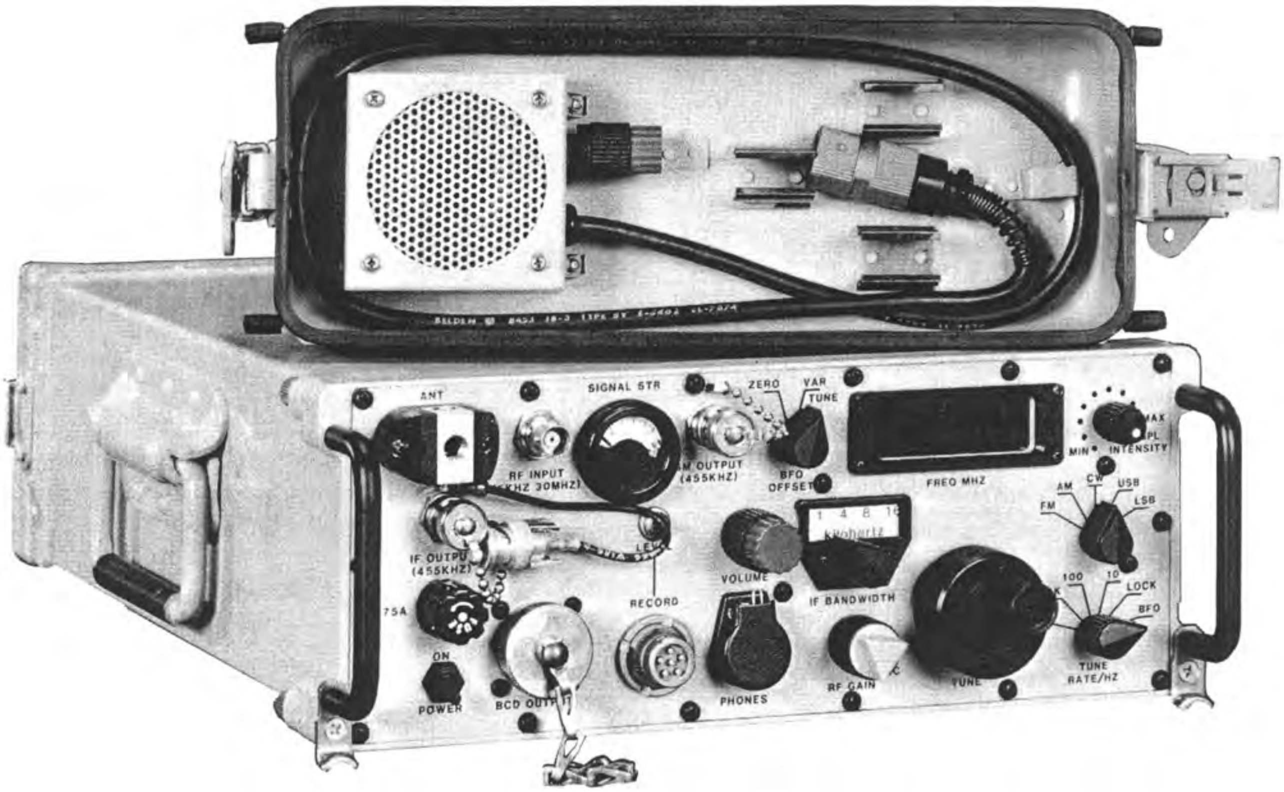

Figure 1-1. WJ-8770 HF Receiver

SECTION I

GENERAL DESCRIPTION

1.1 GENERAL

This section contains a general description of the Watkins-Johnson 8770 HF Transportable Receiver, hereafter referred to as the WJ-8770 HF Receiver or, the Receiver. Included in this section are electrical and mechanical characteristics; equipment supplied; equipment required, but not supplied and a receiver specification table for the WJ-8770 HF Receiver.

1.2 ELECTRICAL CHARACTERISTICS

The WJ-8770 HF Receiver, Figure 1-1, is designed to receive AM, FM, CW, USB, and LSB emissions over the frequency range of 5 kHz to 30.00000 MHz. The tuning knob, along with the multi-position TUNE RATE/Hz switch, provide a choice of four tuning rates; 10 Hz, 100 Hz, 1 kHz, or 10 kHz. The selected frequency, to a resolution of 10 Hz, is displayed via the seven digit LED FREQ MHz display. The TUNE RATE/Hz switch also provides selection of a LOCK position, which prevents accidental operator frequency changes, and a BFO position which, along with the BFO OFFSET switch, provides either a fixed or variable BFO offset frequency for use in the CW detection mode.

Other operator selectable parameters, in addition to the operating modes, are IF Bandwidths and Gain Mode. Selectable IF bandwidths of 1 kHz, 4 kHz, 8 kHz, and 16 kHz operate in conjunction with the AM, FM, or CW detection modes. When USB or LSB detection modes are selected, IF bandwidth selection is disabled by the DETECTION MODE switch. RF gain is controlled by the RF GAIN switch in either the variable manual mode or AGC mode. The intensity of LED FREQ MHz display is adjusted by varying the position of the DISPL INTENSITY control.

Other front panel features include the antenna (ANT) mounting/connection and its associated coax and connector to the RF input (RF INPUT) connector; a received signal strength (SIGNAL STR) meter; the signal monitor (SM OUTPUT), the intermediate frequency (IF OUTPUT), and BCD OUTPUT connectors; and the RECORD and PHONES output connectors.

The RECORD and PHONES output connectors provide the audio outputs from the Receiver. The RECORD output is a multipin connector which can be connected to either a recorder or to the speaker located in the front cover assembly. The PHONES output is a single-ended output which can be used to drive a headset.

Power input for the Receiver is via a rear panel mounted connector, J1, which accepts a 22-32 Vdc input.

1.3 MECHANICAL CHARACTERISTICS

The Receiver is compatible for use with WJ-8640/MT Mounting Trays with shock mount. It is 11.38 inches (28.90 cm) wide by 4.26 inches (10.82 cm) high and is 18.67 inches (47.42 cm) deep including front cover assembly. The Receiver is constructed of aluminum with the overall weight of a complete Receiver being approximately 19.57 pounds (8.88 Kg). All operating controls, indicators, and connectors (excluding the rear panel mounted power input connector, J1) are on the Receiver front panel.

The VOLUME, RF GAIN, TUNE, and DISPL INTENSITY controls each have a different shape and color to aid in their identification under minimal or adverse lighting conditions. The BFO SELECT; IF BANDWIDTH; AM, FM, CW, USB, LSB; and TUNE RATE/Hz select switches all have the same shape and color but are easily identified by their relative proximity to each other and the other front panel controls.

1.4 EQUIPMENT SUPPLIED

The equipment supplied consists of the WJ-8770 HF Receiver.

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Select equipment from the following general classifications to obtain full use of the WJ-8770 HF Receiver.

1. Antenna, 50 Ω
2. Audio monitoring equipment such as the following, if the speaker amplifier contained in the Type 796140 Front Cover Assembly is not used:
    a. Headphones, 600 Ω
    b. Tape recorder, 600 Ω

1.6 TYPE WJ-8770 HF RECEIVER SPECIFICATIONS

Table 1-1 lists the specifications and electrical characteristics of the WJ-8770 HF Receiver.

Table 1-1. Type WJ-8770 HF Receiver Specifications

Tuning Range	5 kHz to 30.00000 MHz
Tuning Resolution	10 Hz
Antenna Conducted Oscillator Radiation	-87 dBm, maximum
Antenna Input Protection	The antenna input will withstand the effects of RF power to +27 dBm and static build-up. The protection circuit automatically resets.
Input Impedance	50 ohms, unbalanced, nominal
IF Bandwidths (3 dB)	Standard: 1, 4, 8 and 16 kHz Optional: 0.5, 2, 6 or 12 kHz
IF Shape Factor (Typical)	IF BW — 50 dB: 3 dB 1 kHz — 5:1 4 kHz — 3:1 8 kHz — 3:1 16kHz — 2:1
Detection Modes	Standard: FM, AM, CW, USB and LSB
Gain Control Modes	Manual, AGC
AGC and Manual Range	90 dB, minimum
AGC Threshold	3.0 microvolt, typical
AGC Attack Time	15 ms, maximum
AGC Release Time	AGC: 100 ms, maximum
Frequency Display	7 digit red LED
Frequency Resolution/Readout	10 Hz
Frequency Stability: with time	2×10^{-6} per year
with temperature	1.5×10^{-6}
Synthesized BFO	± 8.0 kHz in 100 Hz steps
IF Rejection	Greater than 90 dB
Image Rejection	Greater than 90 dB
Sensitivity: (0.2-30 MHz, see CW Sensitivity for extended frequency range)	
AM Sensitivity (4 kHz IF Bandwidth)	A 1.6 microvolt signal 50% AM module at a 400 Hz rate will produce at least a 10 dB (s+n)/n ratio at the audio output.
FM Sensitivity (16 kHz IF Bandwidth)	A 3.2 microvolt signal FM modulated at a 400 Hz rate with a 4.8 kHz peak deviation will produce at least a 17 dB (s+n)/n ratio at the audio output.
CW Sensitivity (1 kHz IF Bandwidth)	
200 kHz-30 MHz	A 0.8 microvolt signal will produce at least 16 dB (s+n)/n ratio at the audio output.
50 kHz-200 kHz	A 1.8 microvolt signal will produce at least 16 dB (s+n)/n ratio at the audio output.

Table 1-1. Type WJ-8770 HF Receiver Specifications (Cont'd)

15 kHz-50 kHz	A 7.1 microvolt signal will produce at least a 16 dB (s+n)/n ratio at the audio output.
5 kHz-15 kHz	A 128 microvolt signal will produce a 16 dB (s+n)/n ratio, typically at the audio output.
USB, LSB Sensitivity	A 0.7 microvolt signal will produce a 10 dB (s+n)/n ratio at the audio output.
IF Output	455 kHz, 20 mV, minimum, at 3 microvolt input level.
Signal Monitor Output	455 kHz, center frequency, 30 kHz bandwidth.
Intermodulation Distortion:	
3rd Order Input Intercept Point	+17 dBm, minimum for signals separated by 40 kHz minimum.
Audio Phones Amplifier Response	Within 3 dB from 250 to 4000 Hz
Audio Phones Power	2.5 mW into 600 ohms
Record Amplifier Response	Within 3 dB from 20 Hz to 16 kHz
Record Output Level	1.0 Vrms across 600 ohms
Audio Distortion:	
Record or Phones Output	Less than 5% total Harmonic Distortion in AGC Slow or Manual Gain Modes.
Ultimate Signal-to-Noise Ratio	40 dB minimum in AM or FM
Meter	Signal Strength
Environmental Conditions:	
Temperature, Operating	-20° to $+60^{\circ}C$
Temperature, Non-Operating	-40° to $+70^{\circ}C$
Altitude, Operating	35,000 feet (10.67 km)
Altitude, Non-Operating	50,000 feet (15.24 km)
Humidity	98% (spray proof construction)
Power Consumption	Approximately 0.6 amps at 28 Vdc
Power Requirements	22 to 32 Vdc
Size	4.2 inches (10.82 cm) high, 11.38 inches (28.90 cm) wide, and 18.67 inches (47.42 cm) deep
Weight	Approximately 20 lbs. (9.07 kg)

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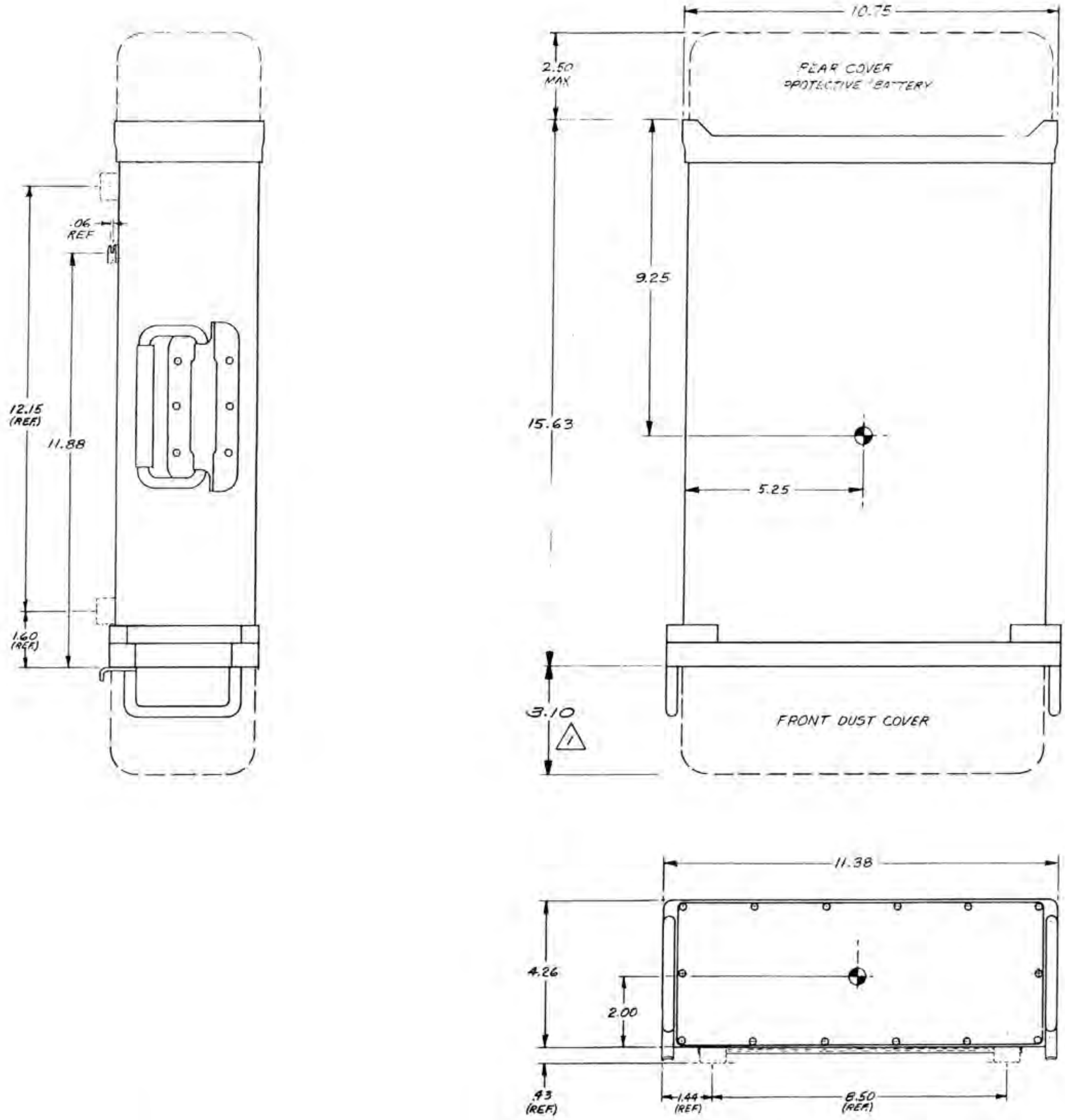

Figure 2-1. WJ-8770 Receiver, Critical Dimensions

SECTION II

INSTALLATION AND OPERATION

2.1 GENERAL

This section includes information on receipt inspection, unpacking, installation and operation of the WJ-8770 HF Receiver. Also included are details of preparation for storage and shipment.

2.2 RECEIPT INSPECTION

Inspect the shipping container for obvious damage. If the shipping container is damaged, attempt to have the carrier's agent present while the contents of the container are unpacked, checked for completeness, and the equipment inspected for mechanical damage. If it is not feasible to have the carrier's agent present, retain the damaged shipping container and equipment padding for the carrier's inspection.

2.3 UNPACKING, INSPECTION AND INVENTORY

The equipment was thoroughly inspected and adjusted for optimum performance prior to packing for shipment. It should be, therefore, ready for use upon receipt. After unpacking, inventory the equipment against the packing slip. Contact Watkins-Johnson Company, Gaithersburg, Maryland, or your Watkins-Johnson representative with details of any shortage.

Visually inspect all exterior surfaces for dents and scratches. If external damage is visible, remove the receiver from its case and inspect the internal components for apparent damage. Then check the internal cables for loose connections and plug-in items such as printed wiring boards, which may have been loosened from their receptacles.

2.4 PREPARATION FOR RESHIPMENT AND STORAGE

If the receiver must be prepared for reshipment, the packaging materials should follow the pattern established in the original shipment. If retained, the original materials can be reused to a large extent or will at a minimum provide guidance for the repackaging effort. Conditions during storage and shipment should normally be limited as follows:

Maximum humidity: 98%
Temperature Range: $-40^{\circ}C$ to $+70^{\circ}C$

2.5 INSTALLATION

The receiver is designed with carrying handles for ease of handling and mounting. Normally, the receiver will be mounted on the WJ-8640/MT Mounting Trays or similar permanent mounting apparatus. Receiver critical dimensions are shown in Figure 2-1. If the receiver is to be mounted in the presence of other equipment, adequate clearance should be provided for cables and other ancillary items required by the receiver. Ventilation of the receiver is not normally required unless it is operated in the proximity of heat-producing equipment.

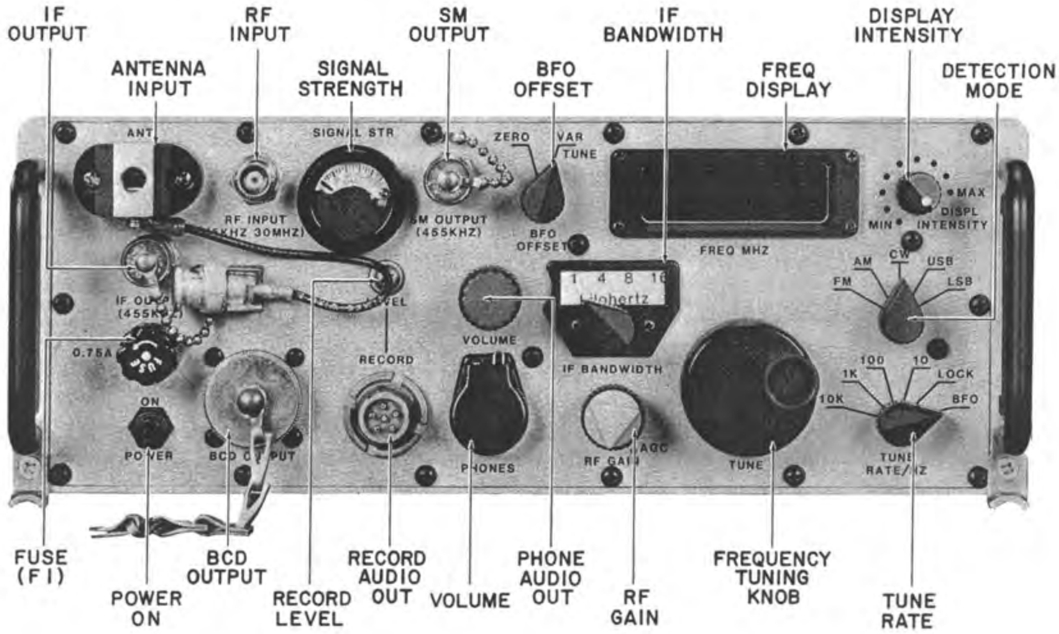

Figure 2-2. WJ-8770 Receiver, Front Panel View

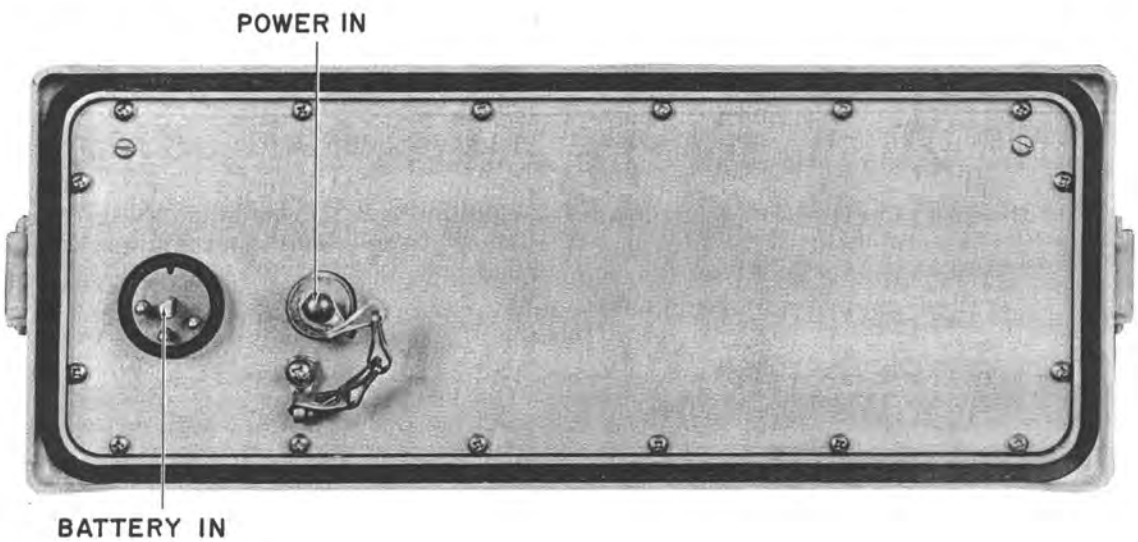

Figure 2-3. WJ-8770 Receiver, Rear Panel View

Manual transportation of the receiver should not be attempted without adequate support such as carrying straps.

2.6 INPUT/OUTPUT CONNECTIONS

Figures 2-2 and 2-3 are photographs of the front and rear panels showing the locations of the input and output connectors. Described below are the functions and input/output parameters of each connector.

2.6.1 ANTENNA INPUT

This single terminal block provides the necessary electrical and mechanical connections for a direct antenna input to the receiver.

2.6.2 RF INPUT

This BNC connector is the RF signal input for the receiver. Nominal input impedance is 50 Ω. The input is protected against signals exceeding +27 dbm (5 V rms) and static build-up.

2.6.3 POWER INPUT

This connector provides power to the receiver from a 22-32 Vdc power source.

2.6.4 IF OUTPUT

This BNC connector supplies a bandwidth-limited 455 kHz IF output signal. The level will be 20 mV, minimum, into 50 Ω in AGC mode, for RF input signals greater than 3 μV.

2.6.5 SM OUTPUT

This BNC connector provides a broad-band 455 kHz IF output signal suitable for driving a signal monitor. The signal occupies a 30 kHz bandwidth at a signal level approximately 25 dB above the receiver input level.

2.6.6 RECORD AUDIO OUTPUT

This connector provides wide-band, unbalanced audio at a level of 1.0 V rms across 600 Ω. Also available is +15 Vdc for powering ancillary equipment.

2.6.7 PHONE AUDIO OUTPUT

This output is intended to drive a 600 Ω or greater headphone set. Narrowband audio is available at a level of 2.5 mW into 600 Ω.

2.6.8 BCD OUTPUT

This connector provides receiver tuned-frequency data in Binary-Coded-Decimal (BDC) format. Identification of data lines is shown in Table 2-1.

Table 2-1. BCD Output Lines Identification

BCD Output Pin #	BCD Frequency Word Output	
J7-1	2^0	10 MHz (10^7)
J7-2	2^1	
J7-3	2^0	1 MHz (10^6)
J7-4	2^1	
J7-5	2^2	
J7-6	2^3	
J7-7	2^0	100 kHz (10^5)
J7-8	2^1	
J7-9	2^2	
J7-10	2^3	
J7-11	2^0	10 kHz (10^4)
J7-12	2^1	
J7-13	2^2	
J7-14	2^3	
J7-15	2^0	1 kHz (10^3)
J7-16	2^1	
J7-17	2^2	
J7-18	2^3	
J7-19	2^0	100 Hz (10^2)
J7-20	2^1	
J7-21	2^2	
J7-22	2^3	
J7-23	2^0	10 Hz (10^1)
J7-24	2^1	
J7-25	2^2	
J7-26	2^3	
J7-27	GND	
J7-28	GND	

2.7 OPERATION

The following paragraphs contain descriptions of the function and use of the receiver front panel controls and indicators. To provide the most rapid tuning capability to any frequency, the receiver is designed to tune itself to the center of its frequency band (15 MHz) upon initial power application.

2.7.1 POWER-ON

Actuate this switch to energize the receiver. Be sure voltage of correct polarity is connected to the receiver before energizing.

2.7.2 SIGNAL STRENGTH

This meter contains a scale with a range of 0-100 and provides a relative indication of receiver input signal strength.

2.7.3 RF GAIN

Rotating this control fully CW and engaging the detent places the receiver in the automatic gain mode. Rotating the control slightly CCW to disengage the detent places the receiver in the manual gain mode. Receiver gain is controlled by the setting of the RF GAIN control.

2.7.4 DETECTION MODE

This switch permits selection of one of the five receiver detection modes. If AM, FM or CW is selected, an IF Bandwidth position must be selected. In the USB and LSB modes, the Mode switch automatically activates the USB or LSB IF Bandwidth filter.

2.7.5 IF BANDWIDTH

This switch permits selection of IF Bandwidth in the AM, FM and CW Modes. Available bandwidths are: 1 kHz, 4 kHz, 8 kHz and 16 kHz.

2.7.6 BFO OFFSET

In the ZERO position, this switch locks the BFO frequency to a fixed 455.0 kHz. In the VAR position, the BFO frequency is adjustable over a range of ±8.0 kHz. Tuning of the BFO is accomplished via the TUNE knob when the TUNE RATE switch is in the BFO position.

2.7.7 TUNE RATE/Hz

This switch establishes the tuning rate of the receiver TUNE knob.

1. 10 kHz position. In this position, only the four most-significant digits of the readout can be varied by the TUNE knob. The

1 kHz, 100 kHz and 10 Hz digits will be locked to the frequency indicated when the 10 kHz button was engaged.

2. 1 kHz position. In this position, the five most-significant digits of the readout can be varied by the TUNE knob. The 100 Hz and 10 Hz digits are locked.

3. 100 Hz position. In this position, only the 10 Hz digit is locked. All other digits can be varied by the TUNE knob.

4. 10 Hz position. In this position, all digits can be varied by the TUNE knob.

5. LOCK position. In this position, the receiver is locked to the frequency displayed, and the TUNE knob is disabled.

6. BFO position. In this position, the TUNE knob is disabled from its receiver main tuning function and is available to vary the BFO offset frequency. With the BFO OFFSET switch in VAR TUNE, the TUNE knob can vary the BFO Frequency by ±8.0 kHz.

2.7.8 TUNE

This knob varies the receiver tuned frequency when one of the four tuning rates are selected. When BFO is selected, this knob controls BFO offset frequency.

2.7.9 VOLUME

Rotating the VOLUME control clockwise increases the output level of the PHONES audio signals.

2.7.10 LEVEL

Rotating this screwdriver adjusted control clockwise increases the output level of the RECORD audio signal.

2.7.11 SPEAKER AMPLIFIER

The unit is supplied with an auxillary speaker housed in the front cover assembly. The speaker has its own amplifier with volume control and an affixed line cord. This cord attaches to the RECORD jack, J5, located on the front panel. This jack receives its input from the receiver audio amplifier, A9, which also feeds PHONES jack, J6.

With the speaker connected via the line cord to jack J5, clockwise rotation of the audio control knob mounted on the side of the speaker box will provide an increase in speaker volume. Use of the speaker will have no effect on the PHONES jack or its associated volume control.

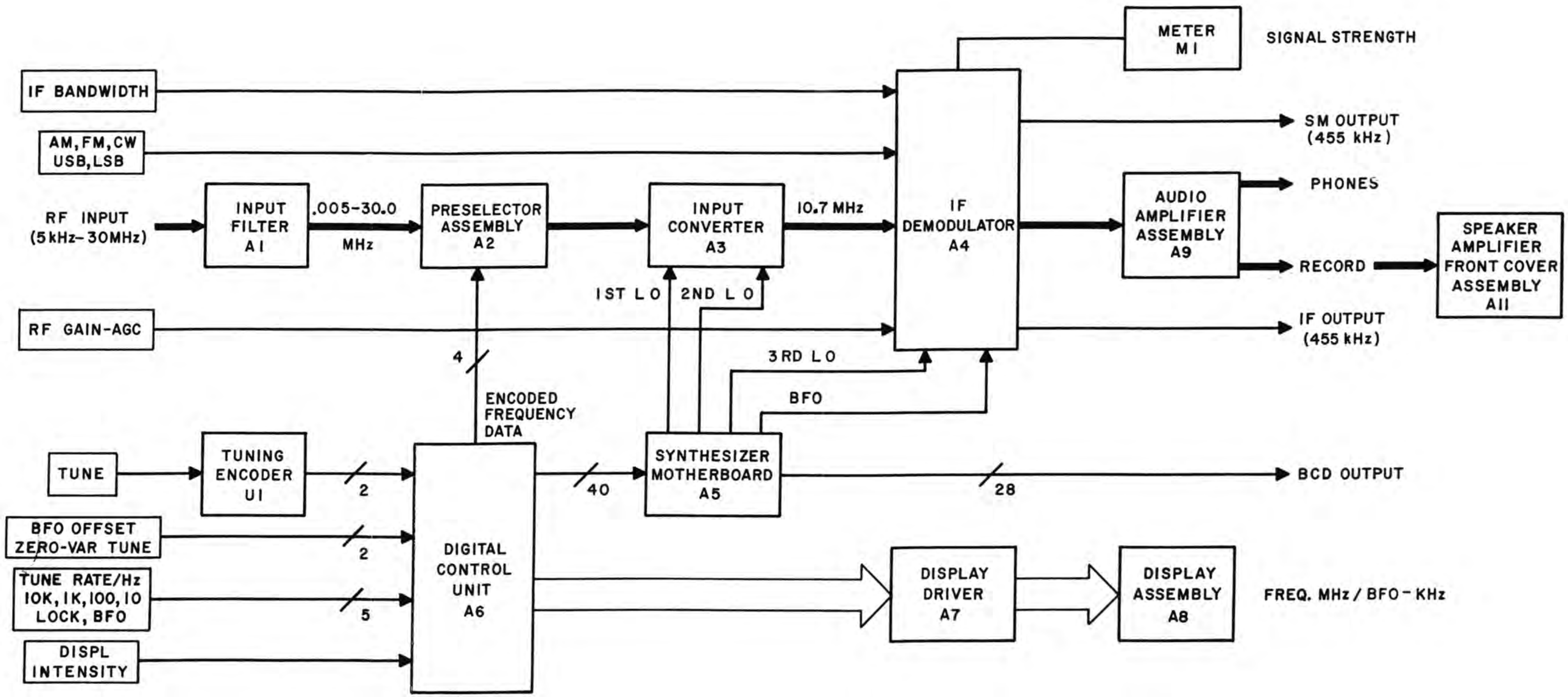

Figure 3-1. WJ-8770 Receiver, Simplified Block Diagram

SECTION III

CIRCUIT DESCRIPTION

3.1 GENERAL

This section describes the various circuits of the WJ-8770 HF Receiver. The receiver is divided into four functional groups: receiver, digital control, synthesizer and power supply. Discussions of each group consist of a functional description followed by detailed circuit descriptions. Functional block diagrams are included where required. This section is arranged in a functional rather than a numerical sequence to facilitate progressive reading.

3.1.1 OVERALL DESCRIPTION

The WJ-8770 Receiver is a triple-conversion, super-heterodyne receiver which operates in the frequency range from 5 kHz to 30 MHz. It has selected bandwidths between 1 and 16 kHz and demodulators for AM, FM, CW, USB and LSB signals. Tuning is in discrete 10 Hz steps, locked by frequency synthesizers to an internal frequency standard for accuracy and stability. The power supply sections provide regulated voltages of +15V, -15V and +5V.

3.2 RECEIVER SECTION

3.2.1 FUNCTIONAL DESCRIPTION

Refer to the receiver simplified block diagram, Figure 3-1. Signals enter the receiver via the RF IN connector on the front panel. The Input Filter accepts signals between 5 kHz and 30 MHz. These signals are passed to the Preselector consisting of ten digitally selected sub-octave filters. The preselected input signals are then applied to the Input Converter, which includes the 1st Mixer, 1st IF Amplifier, 2nd Mixer and part of the 2nd IF Amplifier. The 10.7 MHz 2nd IF output occupies a bandwidth of 16 kHz, fixed by crystal filters in the 1st and 2nd IF stages. In the 10.7 MHz/455 kHz Converter, the 2nd IF signal is down converted to the 3rd IF, 455 kHz. This signal is routed through one of the six IF filters to the IF Amplifier and the Demodulator/AGC Amplifier.

The Demodulator/AGC Amplifier provides selectable AM, FM, CW/SSB signal detection and amplification. In all detection modes, the AM detector output is processed by the AGC and used for Signal Strength Meter voltage and, in AGC mode, for RF and IF gain control.

In all modes, the AM detector is gated to the audio summing amplifier and supplies audio to the audio amplifier.

In the FM mode, the limiter and discriminator are energized. FM audio then passes through the audio summing amplifier to the audio amplifier.

In the CW/SSB mode, the CW/SSB detector is energized. The BFO signal and the 455 kHz IF are mixed and the resulting audio is passed through the audio summing amplifier to the audio amplifier.

In all modes, the detected audio from the summing amplifier is amplified by the audio amplifier and provides separate outputs for headphones and recorder.

3.2.2 TYPE 796123 DC-30 MHz INPUT FILTER ASSEMBLY (A1)

Refer to Figure 6-1 for schematic diagram of the DC-30 MHz input filter. Broadband RF signals are input to the filter assembly via RF input jack J1. The input filter assembly consists of a low-pass filter with a cut-off frequency just above 30 MHz. Additional tuned elements in the filter yield a high stop-band attenuation above 40 MHz, which eliminates LO leakage and image interference.

The input filter also serves to protect the rest of the receiver from damage due to excessive signal levels in the passband. When signals greater than +15 dBm are received at RF input jack J1, diodes CR1, CR2, VR1, and VR2 conduct, shunting excessive energy away from the receiver. Signals in the passband from DC - 30 MHz are output from the input filter via connector J2 to the sub-octave preselector filters decribed in paragraph 3.2.3.

3.2.3 TYPE 796100 INPUT PRESELECTOR (A2)

Input Preselector Assembly A2, provides sub-octave bandpass filtering of the 0.005 - 30 MHz frequency range of the receiver. A functional block diagram of the input preselector is presented in Figure 3-2. The receiver frequency tuning range is divided into ten frequency bands with each band associated with one of ten digitally selectable sub-octave filters. The selection of the correct sub-octave filter is determined by encoded frequency data from the Up/Down Counter of the Digital Control Unit. The encoded frequency data is decoded and converted into a preselector code by the preselector decoder. The preselector code is then applied to the digital control circuitry which interprets the preselector code and activates the applicable sub-octave filter. Schematic diagrams for each preselector filter and digital decoding are presented in Figures 6-2 and 6-3.

3.2.3.1 Type 791821-2 Digital Control

The digital control circuitry, Figure 6-8, consists of 4-line-to-10-line decoder U1 and five dual peripheral drivers U2 through U6. This circuitry provides the logic required to decode the 4-bit preselector code input and activate only one sub-octave filter.

When a preselector code is input to pins 12 through 15 of decoder U1, it produces ten outputs: one being active low and the remaining nine, high. With each output line associated with a NOR circuit contained in one of the five dual peripheral drivers, the active low allows the associated filter on that line to remain active while the nine filters associated with the nine high output lines are rendered inoperative.

With a selected tuned frequency of 4.0 MHz, preselector code inputs to decoder U1 are 0110 (binary). As can be seen in Table 3-1, with a tuned frequency between 3.90 - 5.99 MHz and a preselector code input of 0110, the output from decimal 6 (pin 7) of decoder U1 is active low and the remaining nine outputs are high. With inputs 1B and 2B (pins 2 and 7) tied to ground, the active low to input 1A (pin 1) of driver U4 results in a low output from output 1Y (pin 3) to the 3.9 - 6.0 MHz filter associated with the output allowing it to remain active. The high outputs on the remaining nine lines to their respective 1A and 2A inputs of drivers U2 through U6 result in a +15 Vdc control voltage to the remaining nine filters, deactivating them.

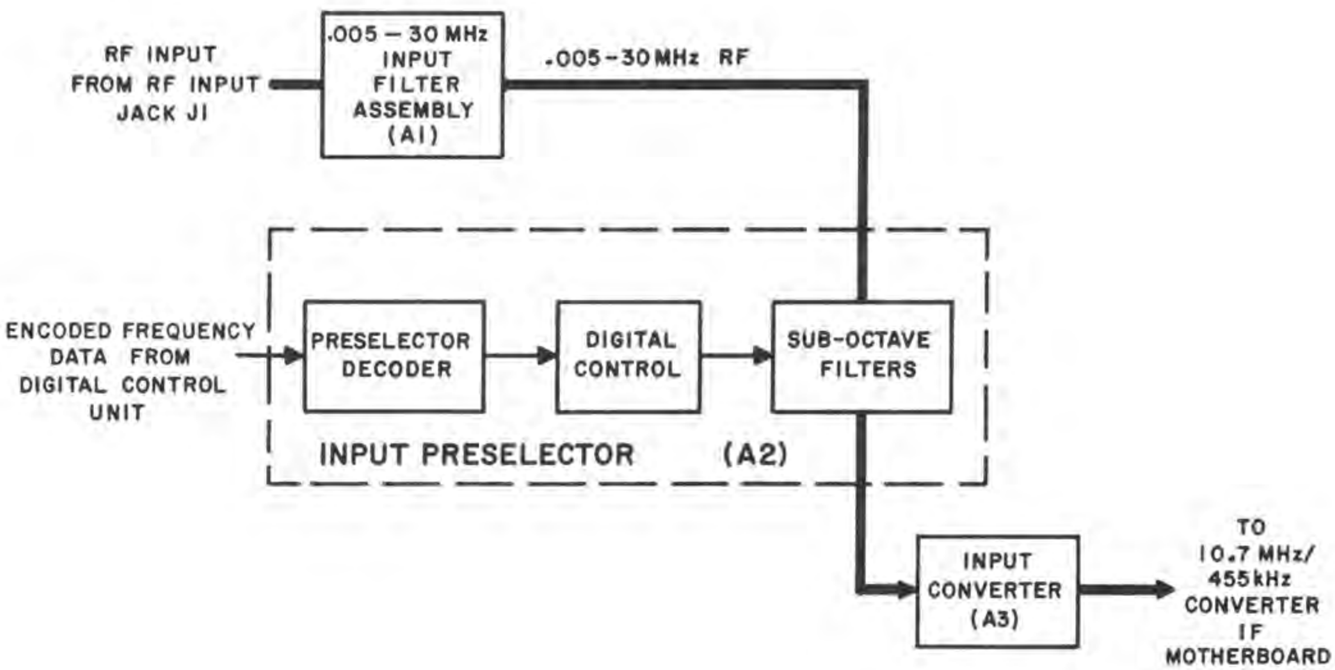

Figure 3-2. Input Preselector Functional Block Diagram

Table 3-1. Tuned Frequency to U1 Output Conversion

TUNED FREQUENCY	PRESELECTOR CODE INPUT				SN74L42N(U1) OUTPUT DECIMAL*									
	2^3	2^2	2^1	2^0	0	1	2	3	4	5	6	7	8	9
0.005 - 0.74 MHz	0	0	0	1	1	0	1	1	1	1	1	1	1	1
0.75 - 1.09 MHz	0	0	1	0	1	1	0	1	1	1	1	1	1	1
1.10 - 1.69 MHz	0	0	1	1	1	1	1	0	1	1	1	1	1	1
1.70 - 2.59 MHz	0	0	0	0	1	1	1	1	0	1	1	1	1	1
2.60 - 3.89 MHz	0	1	0	1	1	1	1	1	1	0	1	1	1	1
3.90 - 5.99 MHz	0	1	1	0	1	1	1	1	1	1	0	1	1	1
6.00 - 8.99 MHz	0	1	1	1	1	1	1	1	1	1	1	0	1	1
9.00 - 12.99 MHz	1	0	0	0	1	1	1	1	1	1	1	1	0	1
13.00 - 19.99 MHz	1	0	0	1	1	1	1	1	1	1	1	1	1	0
20.00 - 30.00 MHz	0	0	0	0	0	1	1	1	1	1	1	1	1	1

SN7543P (U2 thru U6)			
A	B	Y	
0	0	0	(ON)
0	1	1	(OFF)
1	0	1	(OFF)
1	1	1	(OFF)

NOTE:

"0" indicates a ground potential.
"1" indicates a positive potential.
Y outputs are open collector type.

*Designations for outputs do not correspond with IC pin numbers.

3.2.3.2 Sub-Octave Filters

The 0.005 - 0.75 MHz filter circuit on the 0.005 - 0.75/0.75 - 1.1 MHz filter board is a 5-pole low-pass filter. The 0.75 - 1.1 MHz filter circuit and the remaining eight filter circuits on the other four filter boards are 5-pole band-pass filters which provide minimum attenuation on all frequencies in their respective passbands and maximum attenuation on all frequencies in their respective stopbands. The pole configuration of each filter circuit is shunt, series, shunt, series, shunt. The input and output impedance of each filter circuit is 50 ohms. The DC - 30 MHz RF signal from the input filter assembly is applied to pin 1 of all five filter boards. Since the functional operation of all five filter boards is similar, the differences being component values, only one board is described in the following paragraphs.

With a selected tuned frequency of 4.0 MHz, all of the filter circuits except the 3.9 - 6.0 MHz filter circuit receive a +15 Vdc control voltage at their digital on/off control inputs, deactivating them. As described in paragraph 3.2.3.1, the active filter circuit is determined by an active low input at its digital on/off control input. With input pin 8 of the 3.9 - 6.0 MHz filter circuit, Figure 6-5, at ground potential (0 Vdc), diodes CR4, CR5, CR8, and CR9 are forward biased allowing the RF input at pin 1 to be processed through the filter circuit to RF output pin 18. Approximately 50 milliamperes dc flow through each diode ensure that the RF currents will be small by comparison even when large signals are passing through the circuit. The 4 MHz RF signal is output to the input converter.

When the 3.9 - 6.0 MHz filter circuit is active, the 2.6 - 3.9 MHz filter circuit, Figure 6-5, is inactive with a +15 Vdc control voltage at input pin 11, diodes CR1, CR2, CR3, CR6, CR7, and CR10 are reverse-biased prohibiting operation of the filter circuit.

3.2.4 TYPE 796099 INPUT CONVERTER (A3)

Input Converter Assembly A3, Figure 3-3, consists of two sub-assemblies; the 1st mixer/1st IF and the 2nd mixer/2nd IF. RF signals from Input Preselector A2, described in paragraph 3.2.3 are mixed with the 1st LO input from the 1st LO Synthesizer A5A2, described in paragraph 3.6.3, and amplified by IF amplifier Q2. The 42.905 MHz 1st IF signal, is coupled through a 40 kHz band-pass filter FL1 to the 2nd mixer/2nd IF. The schematic diagram of the input converter is presented in Figure 6-9.

The 42.905 MHz 1st IF signal input to the 2nd mixer/2nd IF is further filtered and amplified. RF AGC from Demod/AGC Amplifier A12 is provided by a PIN diode attenuator located in the signal path prior to the second mixer. The 2nd LO input from the 2nd LO Synthesizer A5A3, described in paragraph 3.6.4, is input to the 2nd Mixer/2nd IF where it is filtered, amplified, and mixed with the input from the 1st mixer/1st IF by double-balanced mixer U1. The 10.7 MHz 2nd IF signal, is then amplified by cascode amplifier Q3, Q4, filtered by the 30 kHz bandwidth, 10.7 MHz band-pass filter FL1 and output to IF Demodulator A4, described in paragraph 3.2.10.

3.2.4.1 1st Mixer/1st IF

RF input signals to the 1st mixer/1st IF, Figure 6-9, from the input preselector, may be any frequency from 5 kHz up to 30 MHz and at any level from noise floor to +5 dBm. These RF signals, along with the 42.92 to 72.91 MHz input from the 1st LO synthesizer, are applied to input pins 3 and 1, respectively, of double-balanced mixer U1. The double-balanced mixer produces the sum and difference frequencies of the two inputs.

The output signal from double-balanced mixer U1 is coupled through coupling capacitor C1 to IF amplifier Q2 which amplifies the signal to compensate for losses incurred in mixer U1. IF amplifier Q2 is a grounded-gate FET with a low noise figure, provides a good terminating impedance for mixer U1, and has a large signal handling capability. Transistor Q1 functions as a constant current source for amplifier Q2. Diode CR1 minimizes Q1 collector current changes due to temperature changes. A rise in temperature causes CR1 to develop a lower forward voltage drop which lowers the base bias of Q1 in the same proportion as the base-emitter voltage of Q1 maintaining a constant voltage across R4. A reduction in temperature results in a higher base bias on Q1. Transformer T1 is the output load for amplifier Q2 and is broad-tuned by C3 to provide the proper driving impedance for 43 MHz band-pass filter FL1.

Filter FL1 has a center frequency of 42.905 MHz and a 3 dB bandwidth of 40 kHz. It requires a 50 ohm source and load. Filter FL1 rejects unwanted signals passed by the input preselector and mixer U1 and, establishes the initial IF bandpass. The signals are output from filter FL1 to the 1st LO frequency trap on the 2nd mixer/2nd IF, described in the following paragraph.

3.2.4.2 2nd Mixer/2nd IF

The 1st IF output signal may be any frequency from 42.910 MHz to 42.900 MHz. These signals are passed through the 1st LO frequency trap, and then through a coupling

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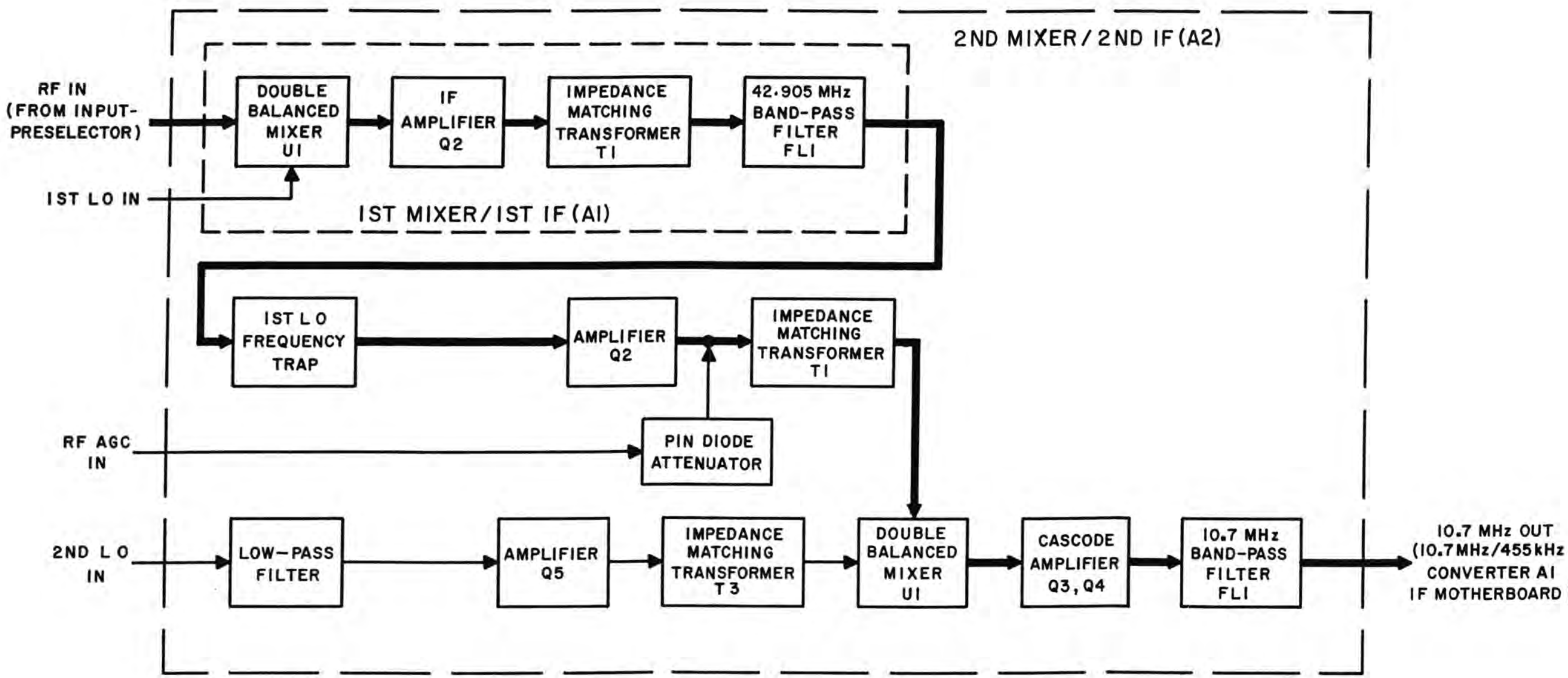

Figure 3-3. Input Converter, Functional Block Diagram

network consisting of inductor L1 and capacitor C1 to IF amplifier Q2. IF amplifier Q2, along with its ancillary components Q1 and diode CR1, function in a similar manner as that of IF amplifier Q2, described in paragraph 3.2.4.1. PIN diode CR2, in the output circuit of Q2, functions as a voltage-controlled variable resistor with the RF AGC input as its control voltage. It provides more than 10 kΩ resistance at maximum AGC input down to 20 ohms with a minimum input. The variable attenuated output of Q2 is coupled to double-balanced mixer U1 by impedance matching transformer T1.

The 32.2100 MHz to 32.2001 MHz 2nd LO input from 2nd LO Synthesizer A5A3 is filtered by low pass filter L7, C15, and L8 which prohibits introduction of any 1st LO INPUT to the 2nd LO circuitry. The 2nd LO input is then amplified by amplifier Q5 and coupled to double-balanced mixer U1 by impedance matching transformer T3.

The 1st IF input at pins 5 and 6 of mixer U1 is mixed with the 2nd LO input at pins 1 and 2 resulting in a 10.7 MHz output from pin 3. The 10.7 MHz output from 2nd mixer U1 is coupled through capacitor C6 to a bi-polar cascode amplifier consisting of common emitter stage Q4 and common base stage Q3 which provide high gain with good stability and low noise contribution. The output of common base stage Q3 is coupled to 10.7 MHz band-pass filter FL1 by transformer T2. Filter FL1 has a center frequency of 10.7 MHz, a bandwidth of 16 kHz, and requires 50 ohm terminations. The 10.7 MHz signal is output to the 10.7 MHz/455 kHz Converter A4A1.

3.2.5 TYPE 796120 IF MOTHERBOARD (A4)

IF Motherboard Assembly, Figure 3-4, provides the mounting provisions and electrical interface for:

10.7 MHz/455 kHz Converter A1,
Type 72463-XX Filters, A2 through A7,
455 kHz IF Amplifier A8,
Wideband/Narrowband Filter A9 and,
Demodulator/AGC Amplifier A10.

It also provides, via its own electrical connectors, electrical interfaces from subassemblies A1 through A10 to other assemblies of the receiver, the front and rear panel connectors, and to the receiver front panel controls and indicators.

The 10.7 MHz 2nd IF signal from Input Converter A3 and the 11.155 MHz 3rd LO signal from 3rd LO and BFO Synthesizer A5A4 are input to 10.7 MHz/455 kHz Converter A4A1, described in paragraph 3.2.6, which produces 3rd IF signals centered at 455 kHz. The 455 kHz 3rd IF signal is then output through one of the four IF bandwidth filters (16 kHz, 8 kHz, 4 kHz, or 1 kHz), operator selected via Bandwidth select switch S2, or either the LSB filter or USB filter, operator selected via Detection Mode switch S3, to 455 kHz IF Amplifier A8, described in paragraph 3.2.8.

The 455 kHz 3rd IF signal input to the 455 kHz amplifier undergoes a two-stage gain-controlled amplification and is output to Wideband/Narrowband Filter A9. The gain control input originates as either AGC or manual which is operator selected at AGC ON/OFF switch S6. The AGC or manual RF gain, with the level operator-determined via RF Gain control R1, are both input to the 455 kHz amplifier via Demodulator/AGC Amplifier A10, described in paragraph 3.2.11. The amplified 455 kHz 3rd IF signal is then output to Wide Band/Narrow Band Filter A9.

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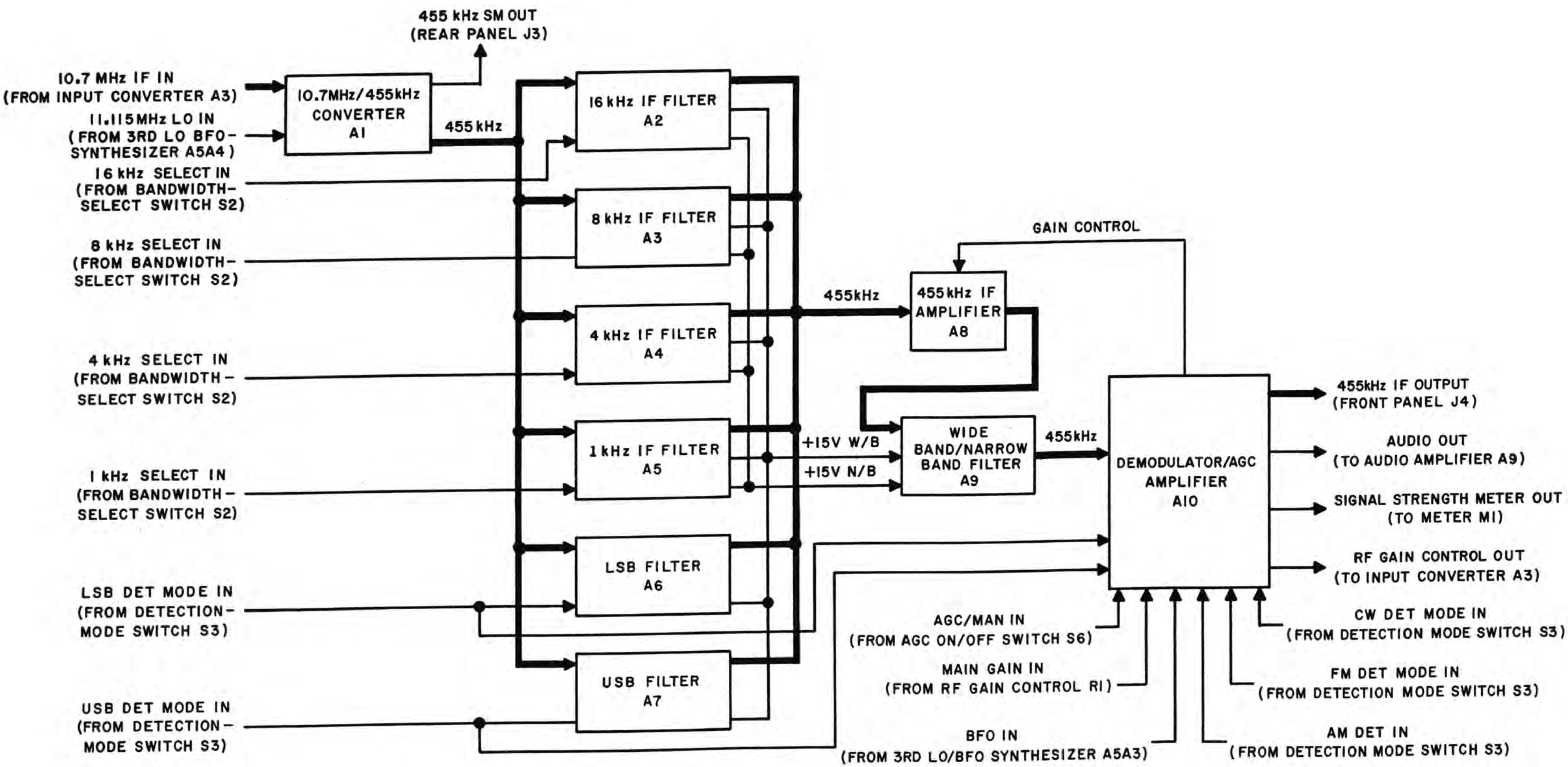

Figure 3-4. IF Motherboard, Functional Block Diagram

The 3rd IF signal input from the 455 kHz IF amplifier is applied to both the wide band and the narrow band circuits of Wide Band/Narrow Band Filter A9, described in paragraph 3.2.9. The input is passed through either the narrow band circuit which provides a 4 kHz bandwidth or the wide band circuit which provides a 35 kHz bandwidth. Circuit selection is accomplished by a switched +15 Vdc input which originates from a jumpered connection on any one of the four IF bandwidth filters or either the LSB or USB filter. The 455 kHz signal is then output to Demodulator/AGC Amplifier A10.

The 455 kHz signal input from the wide band/narrow band filter to Demodulator/AGC Amplifier A10, described in paragraph 3.2.10, is, dependent upon a +5 Vdc control signal via Detection Mode switch S3, switched through the AM, FM, or CW detector and amplifier circuit and output to Audio Amplifier Assembly A9.

3.2.6 TYPE 796101 10.7 MHz/455 kHz Converter (A4A1)

A block diagram of the 10.7 MHz/455kHz converter is presented in Figure 3-5. The 10.7 MHz 2nd IF signal from the input converter, described in paragraph 3.2.4 and the 11.155 MHz 3rd LO signal from 3rd LO and BFO Synthesizer A5A4, are input to the 10.7 MHz/455 kHz converter which produces 3rd IF signals centered at 455 kHz. The 455 kHz 3rd IF is then output to one of the four selectable IF filters, the LSB filter, or the USB Filter described in paragraph 3.2.7. A schematic diagram of the converter is presented in Figure 6-11.

The 2nd IF signal, at a nominal 7 db above the receiver input signal, is input to gate 3 of FET Q2, via input pin 1, 4-to-1 impedance matching transformer T1 and coupling capacitor C1. The 3rd LO signal is input at a fixed frequency of 11.155 MHz at pin A. It is passed through a filter comprised of C17 and 11.155 crystal Y1. which suppresses the 5 kHz sideband from the 3rd LO, to amplifier Q1. Amplifier Q1 provides an amplification factor of 20 resulting in a 3rd LO signal at gate 2 of FET Q2 of 1.4 Vrms. Resistor R14, in the output circuit of Q2, provides the load for the 5-pole low-pass filter comprised of C12, L3, C13, L4, and C14. Capacitor C12 in conjunction with inductor L2, acts as a 455 kHz filter. The 455 kHz signal output passes through the low-pass filter, which filters 10.7 MHz, 11.155 MHz, and their sum, to amplifier Q3.

Amplifier Q3 functions as an emitter-follower for the 455 kHz IF OUT circuit via capacitor C16 and output pin 6. The 455 kHz output at pin 6 has an overall gain of 25 dBm. The 455 kHz output from the collector of Q3 is passed through 16-to-1 impedance matching transformer T2 to the 455 kHz SM OUT output pin 4.

3.2.7 IF FILTERS

3.2.7.1 Type 72463-(XX) IF Filter (A4A2 Through A4A5)

IF Filter Assemblies A2 through A5, Figure 3-6, provide selectable bandwidth filtering of the 455 kHz IF Input from 10.7 MHz/455 kHz Converter Assembly A1. As can be determined from the schematic Figure 6-12, the only differences between filters are types of mechanical filters used and which filter control outputs are connected into the circuits via jumpers at output pins D and E. Due to the similarity of the circuits, only one IF filter, 1 kHz Filter A4A5, is described in the following paragraphs.

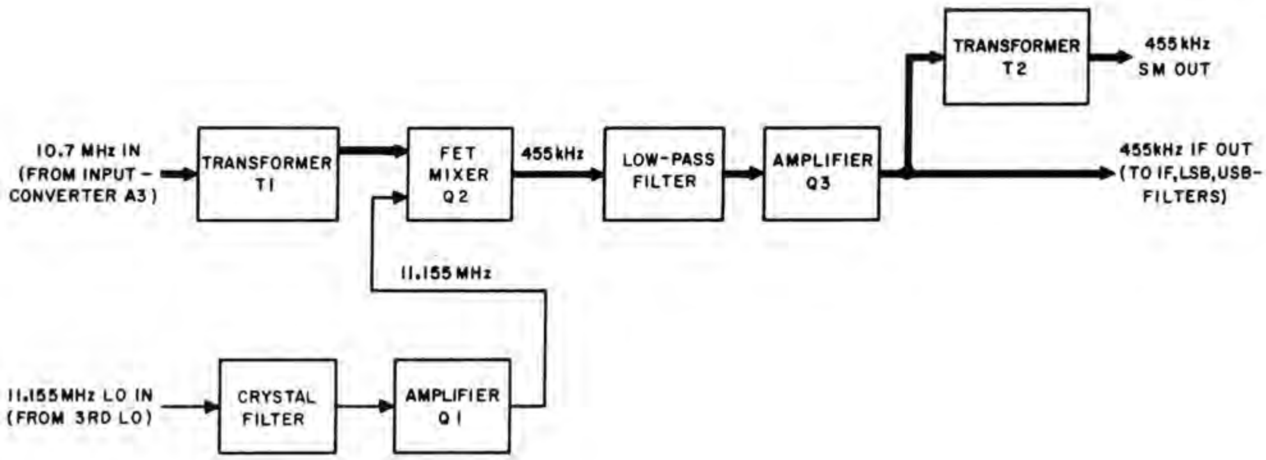

Figure 3-5. 10.7 MHz/455 kHz Converter Block Diagram

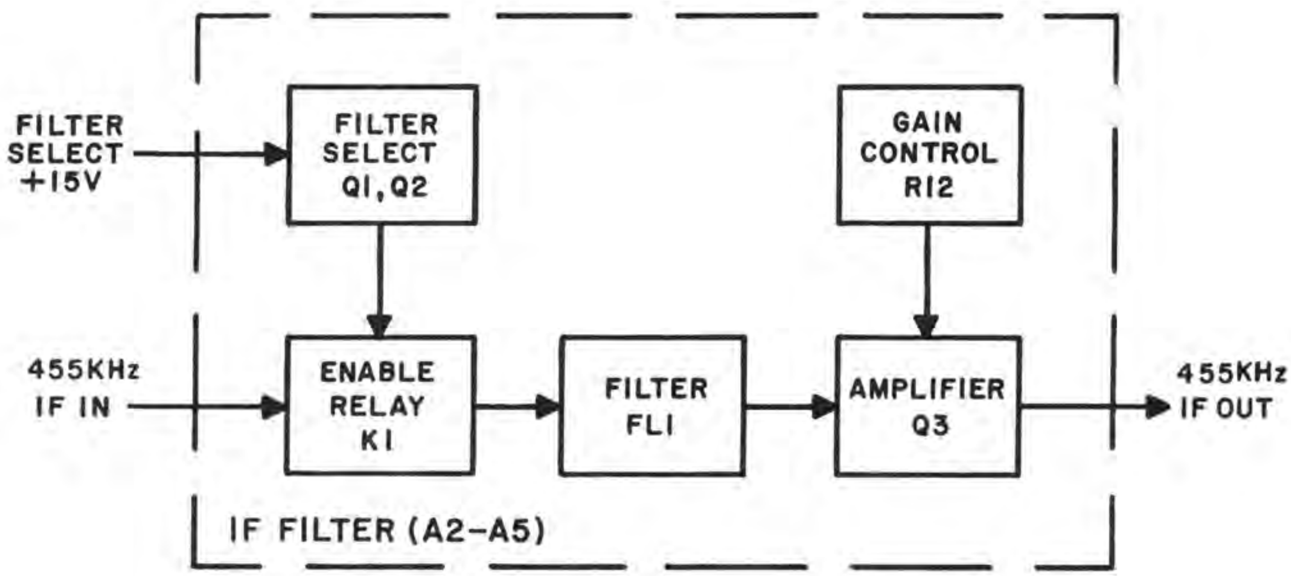

Figure 3-6. IF Filter Block Diagram

With the receiver in the FM, AM, or CW detection mode and with the 1 kHz bandwidth selected, the 455 kHz 3rd IF from the 10.7 MHz/455 kHz converter is input to 1 kHz Filter A4A5, Figure 6-12, at input pin 6 and a +5 Vdc filter control input level is input at pin F. The +5 Vdc filter control input is via switch S3, in the FM, AM, or CW detection mode, IF Bandwidth switch S2 contact 1, and input pin 18 of the IF demodulator.

The +5 Vdc filter control input, applied to the base of Q1, via input pin F, causes Q1 to turn on. With Q1 turned on, collector current flow from Q1 through the base-emitter junction of Q2 causes Q2 to saturate. With the coil of relay K1 in the collector circuit of Q2, when Q2 saturates, it causes the jumpered filter control output, pin E, to Wide Band/Narrow Band Filter A9, described in paragraph 3.2.9 to go to +15 Vdc. It also causes relay K1 to activate, allowing the 455 kHz input at pin 6 to be passed through the 1 kHz filter FL1 and isolation amplifier Q3 to IF output pin 1. The 455 kHz IF signal with a 1 kHz bandwidth is then output to 455 kHz IF Amplifier A8, described in paragraph 3.2.8.

3.2.7.2 Type 72463-17 LSB Filter (A4A6)

LSB Filter Assembly A4A6, passes lower sideband frequencies from 452.3 kHz to 454.8 kHz in a manner similar to that described for IF Filter Assemblies A2 through A5 described in paragraph 3.2.7.1. As can be determined from the schematic, the only differences between the LSB filter and the IF filters are types of mechanical filters, select circuit components, and the filter control output jumpers.

With the receiver in the LSB detection mode, the 455 kHz 3rd IF from the 10.7 MHz/455 kHz converter is input to LSB Filter A4A6, at input pin 6 and the +5 Vdc control input level is input at pin F. The +5 Vdc filter control input is via switch S3, in the LSB detection mode, and input pin 9 of the IF demodulator. The LSB filter circuit functions as described for IF Filter Assemblies, paragraph 3.2.7.1, with only one exception; the jumper for the filter control output is from E1 to E3, resulting in the output at pin D.

3.2.7.3 Type 72463-18 USB Filter (A4A7)

USB Filter Assembly A4A7, passes upper sideband frequencies from 455.2 to 457.7 in a manner similar to that described for IF Filter Assemblies A2 through A5, paragraph 3.2.7.1. As can be determined from the schematic, the only differences between the USB filter and the IF filters are types of mechanical filters, select circuit components, and the filter control output jumpers.

With the receiver in the USB mode, the 455 kHz 3rd IF from the 10.7 MHz/455 kHz converter is input to USB Filter A4A7, at input pin 6 and the +5 Vdc control input level is input at pin F. The +5 Vdc control input is via switch S3, in the USB detection mode, and input pin 5 of the IF demodulator. The USB filter circuit functions as described for IF Filter Assemblies, paragraph 3.2.7.1, with only one exception; the jumper for the filter control output is from E1 to E3, resulting in the output at pin D.

3.2.8 TYPE 796103 455 kHz IF AMPLIFIER

A block diagram of the IF amplifiers is presented in Figure 3-7. The 455 kHz IF amplifier consists of two gain-controlled, dual-gate FETs and their ancillary circuit components. The 455 kHz IF signal is input to the assembly via pin A6, undergoes a two-stage gain-controlled amplification and is output via connector F to the wide band/narrow band IF amplifier described in paragraph 3.2.9.

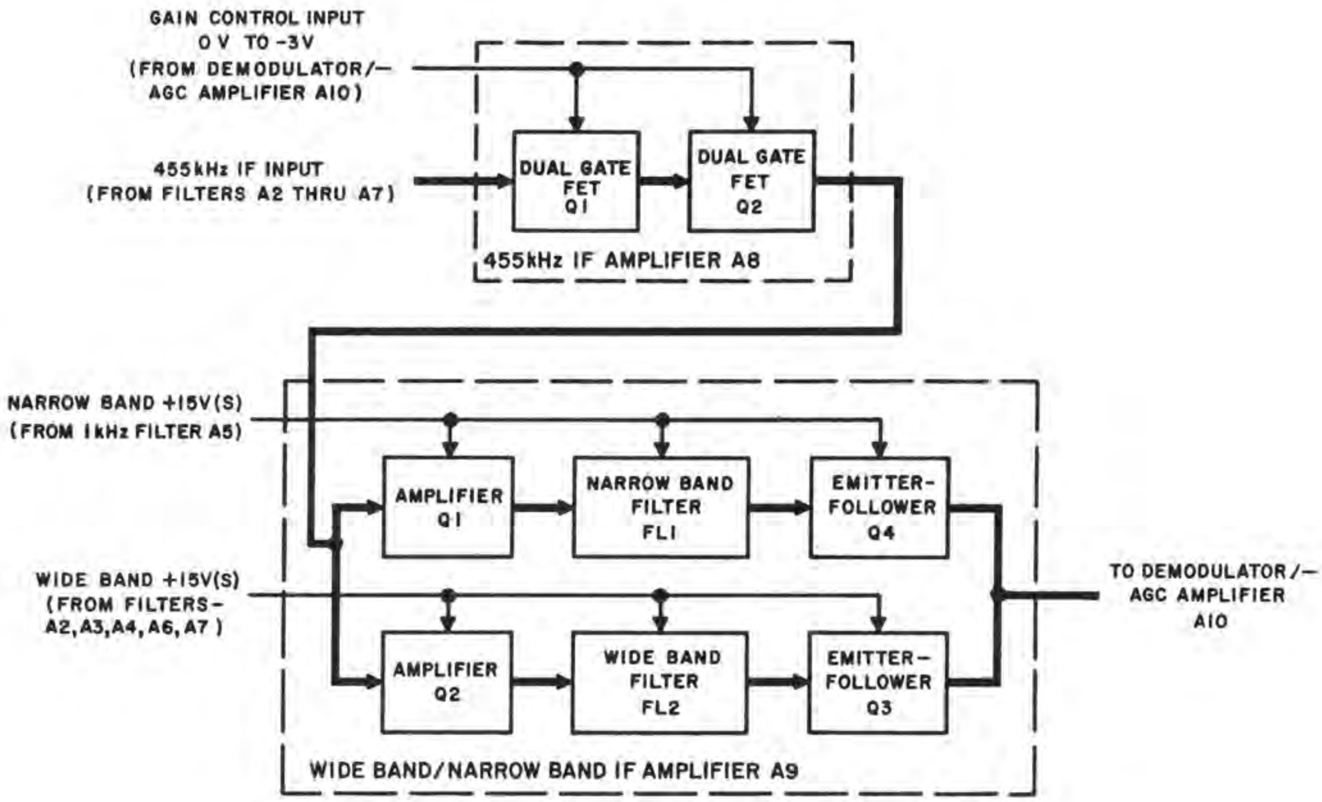

Figure 3-7. 455 KHz IF and WB/NB IF Amplifier Block Diagram

Referring to the schematic diagram, Figure 6-13, Q1 and Q2 are cascaded FET amplifiers. The 455 kHz signal from the IF filter is applied through capacitor C1 to gate 1 of Q1. The drain output of Q1 is developed across inductor L1 and applied through coupling capacitor C6 to gate 1 of Q2. The gain control signal is input through connector C to gate 2 of both Q1 and Q2. Thermistors RT1 and RT2 provide temperature compensation for Q1 and Q2. As inherent temperature rise during operation causes the resistance of Q1 and Q2 to increase, RT1 and RT2 decrease in resistive value.

The drain output of Q2 is developed across inductor L2 and the IF output is taken from the arm of gain control potentiometer R16. Gate 1 bias for Q1 is developed by a voltage divider consisting of resistors R1 and R2 and gate 1 bias for Q2 is developed by resistors R9 and R10. Gate 2 of Q1 is biased at approximately 3.0 Vdc by resistors R3, R5, and CR1 at 0.0 V AGC input. The bias on gate 2 of Q1 does not fall until the AGC voltage becomes sufficiently negative to reverse bias CR1, effectively removing it from the circuit. Further negative increases in AGC voltage are then reflected in a more negative bias on gate 2 of Q1, reducing the amplifier gain. The AGC input to Q2 affects it as described for Q1.

3.2.9 TYPE 796102 WIDE BAND/NARROW BAND IF AMPLIFIER

Referring to the schematic diagram, Figure 6-14, the wide band/narrow band IF amplifier consists of a wide band IF amplifier comprising amplifiers Q1 and Q4, filter FL1, and ancillary components and a narrow band circuit. The narrow band circuit is comprised of amplifiers Q2 and Q3, filter FL2, and ancillary components. The 455 kHz signal is input to the assembly from the 455 kHz IF amplifier, described in paragraph 3.2.8 via connector P1, pin F. Band selection is accomplished by a switched +15 Vdc source. When selected, the narrow band circuit provides a 4 kHz bandwidth at 6 dB. The wide band circuit provides a 35 kHz bandwidth at 6 dB. The selected wide band or narrow band IF output is via connector P1, pin A, to the demodulator/AGC amplifier described in paragraph 3.2.10.

The IF signal input from the 455 kHz amplifier is applied simultaneously to both the wide band and the narrow band circuits. As stated in the previous paragraph, selection of the wide or narrow band circuit is performed by application of a switched +15 Vdc source to the base bias voltage dividers of the selected amplifiers, Q2 and Q3 for wide band or Q1 and Q4 for narrow band.

Assuming that the wide band circuit is activated with a +15 Vdc input at connector P1, pin D, amplifiers Q2 and Q3 conduct. The IF signal is amplified by common-emitter amplifier Q2. Resistor R10 provides de-generative feedback for improved signal handling capability. Capacitor C8 couples the output from Q2 to wide-band filter FL2. Filter FL2 is a bandpass filter of a nominal 35 kHz at 6 dB, which is narrow enough to suppress any broadband noise but wide enough not to restrict the overall receiver bandwidth. The output from FL2 is coupled by capacitor C12 to emitter follower amplifier Q3 and then is output to demodulator/AGC amplifier A4A10, described in paragraph 3.2.10, via connector P1, pin A. The narrow band circuit, when selected, operates in a manner similar to that just described for the wide band circuit.

3.2.10 TYPE 796113 DEMODULATOR/AGC AMPLIFIER (A4A10)

The demodulator/AGC amplifier, Figure 3-8, provides selectable AM, FM, CW/SSB signal detection and amplification of the 455 kHz input signal from the wide band/narrow band IF amplifier described in paragraph 3.2.9. After detection and amplification, the selected

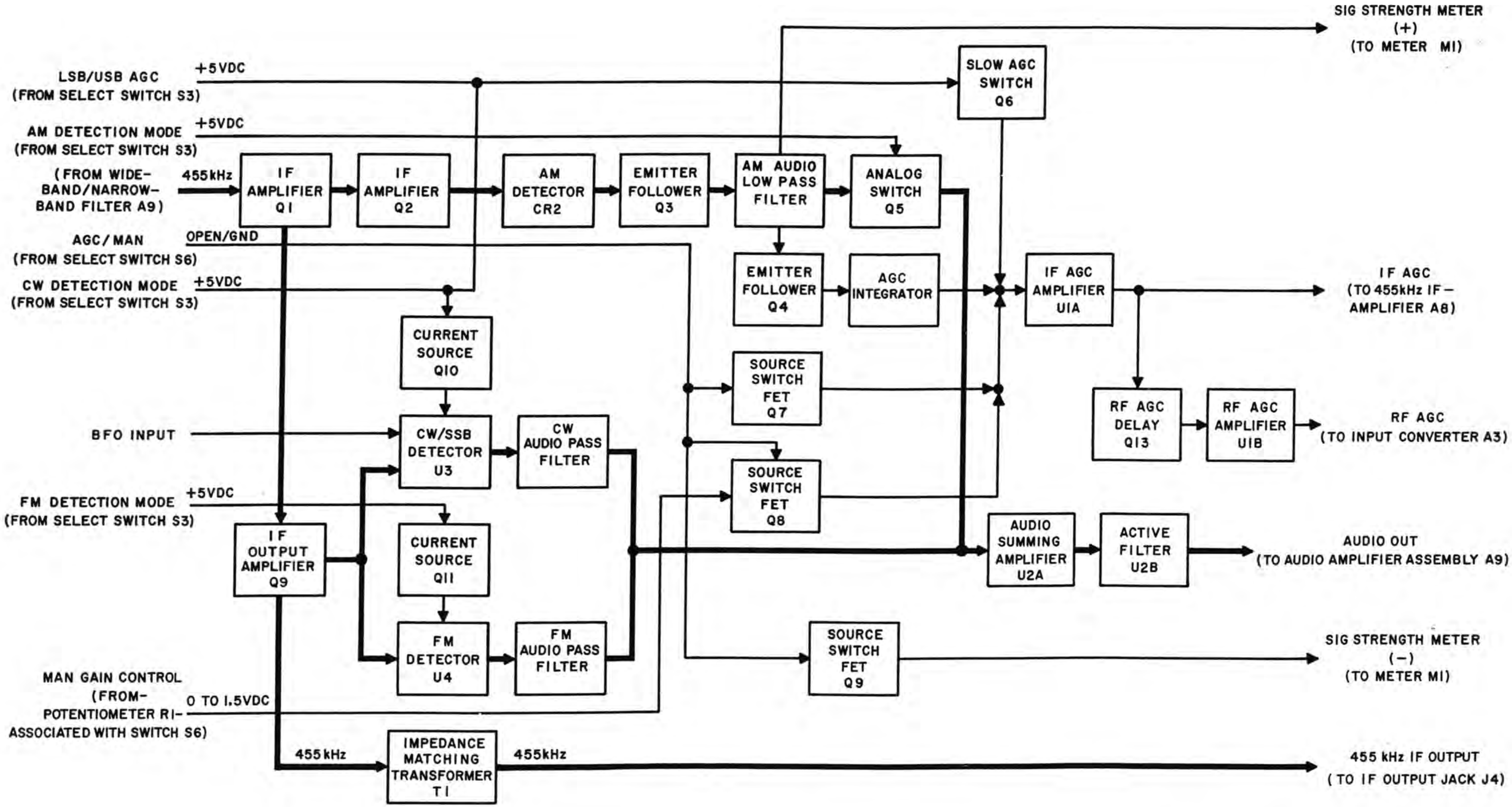

Figure 3-8. IF Demodulator, Block Diagram

signal is output to the audio amplifier assembly, described in paragraph 3.2.11. The demodulator/AGC amplifier also provides IF AGC to the 455 kHz amplifier described in paragraph 3.2.8; RF AGC to the input converter described in paragraph 3.2.4; a 455 kHz IF signal to the front panel mounted IF output jack; and the output to the front panel mounted signal strength meter.

3.2.10.1 AM Detection Mode

In the AM detection mode, the 455 kHz 3rd IF is input to the demodulator/AGC amplifier, Figure 6-15, via input pin B18 and coupling capacitor C1 to the base of amplifier Q1, the first IF amplifier of the two-stage IF amplifier comprising Q1 and Q2. The input signal is amplified by Q1 and applied to the base of Q2 where it is further amplified and output to the base of Q3 via AM detector CR2. Amplifier Q1 also acts as an emitter-follower, coupling the 455 kHz input through capcitor C22 to the base of IF amplifier/emitter-follower Q9.

Amplifier Q3 acts as an emitter-follower, coupling the AM signal through the AM low-pass filter comprised of inductor L3 and capacitor C11 to analog switch Q5 and to the base of amplifier Q4. With a +5 Vdc input at pin A14 from selector switch S3 in the AM detection mode, analog switch Q5 conducts, passing the AM audio signal to audio summing amplifier U2A. From U2A, the signal is output through active filter U2B and pin 10 to Audio Amplifier Assembly A9 described in paragraph 3.2.11.

In the AM detection mode, IF amplifier/emitter-follower Q9 acts strictly as an IF amplifier. The 455 kHz input at its base is amplified and output to front panel mounted IF Output jack J4 via impedance matching transformer T1.

3.2.10.2 FM Detection Mode

In the FM detection mode, the 455 kHz 3rd IF is input via pin B18 and coupling capacitor C1 to the base of amplifier Q1 where it is amplified by the Q1 and Q2 stages and coupled through to IF AGC amplifier U1A if the reciver is in the AGC mode. Amplifier Q1 also acts as an emitter-follower, coupling the 455 kHz input to the base of IF amplifier/emitter-follower Q9.

The 455 kHz input at the base of Q9 is amplified and output to IF Output jack J4 via transformer T1. In the FM detection mode, with +5 Vdc input at pin A1 to current source Q11, Q9 also acts as an emitter-follower coupling the 455 kHz signal to quadrature FM detector U4. The FM output from detector U4 is filtered by the low-pass filter, comprised of inductor L6 and capacitor C42, and is input to summing amplifier U2A.

3.2.10.3 CW Detection Mode

In the CW detection mode, the 455 kHz 3rd IF is input via pin B18 and coupling capacitor C1 to the base of amplifier Q1 where it is amplified by the Q1 and Q2 stages and coupled through to the IF AGC amplifier in a manner similar to that just described for the FM detection mode described above. The differences between the modes are as follows. In the CW mode or in the LSB AGC or USB AGC mode, the +5 Vdc input at pin A7 (CW mode), at pin B8 (LSB AGC mode), or at B7 (USB AGC mode) is applied to the gate of slow AGC switch Q6 causing it to conduct. Capacitor C15, in the drain circuit of Q6, and capacitor C17 both have an attack time of 15 msec, however, due to the difference in their decay times; two to four seconds for C15 and 100 msec for C17, receiver gain change as a result of gaps in the CW or SSB input signal are minimized.

As in the other detection modes, the 455 kHz input is coupled to the base of IF amplifier/emitter-follower Q9, amplified and output to IF Output jack J4. In the CW mode, Q9 acts as an emitter-follower, coupling the 455 kHz input to signal input pin 1 of CW/SSB detector U3. With BFO OFFSET switch S5 in the ZERO position, the BFO input from 3rd LO/BFO Synthesizer A5A4 at pin B12 is 455 kHz. In the VAR TUNE position, the BFO input is from 447 kHz to 463 kHz in 100 Hz steps. The BFO input is coupled through capacitor C26 and input to carrier input pin 8 of detector U3. The output at pin 6 contains sum and difference frequency components of the 455 kHz input to pin 1 and the fundamental and odd harmonics of the BFO input at pin 8. The output from pin 8 is passed through a CW audio pass filter, comprised of inductor L4 and capacitor C32, and input to audio summing amplifier U2A.

3.2.10.4 USB/LSB Detection Modes

In either the USB mode or LSB mode, the demodulator/AGC amplifier circuit operation is essentially the same as that described for the CW detection mode, the major differences being the BFO input at pin B12 is fixed at 455 kHz and the IF input frequency is as selected/tuned.

3.2.10.5 AGC Mode

In the AGC mode, with the front panel mounted RF GAIN switch, S6 in the AGC position, a 0 Vdc, or electrical open, is input at pin B6 enabling -15 Vdc to be applied to the gates of source switch FETs Q7, Q8, and Q12, holding them at cut-off. Amplifier Q4 acts as an emitter-follower and outputs the AGC signal through AGC delay CR5 to IF AGC amplifier U1A. The amplified AGC signal (with a voltage swing from 0.0 to -3.0 volts, dependent upon input signal strength) is output to the 455 kHz IF amplifier, described in paragraph 3.2.8, via pin B3. It then passes through RF AGC delay Q13 and the RF AGC shaping circuit comprised of CR6, CR7, and R38, to RF AGC amplifier U1B. The amplified RF AFC signal (with a voltage swing from 0.0 to +4.0 Vdc, dependent on input signal strength) is output to the input converter, described in paragraph 3.2.4, via pin B1.

3.2.10.6 Manual Gain Mode

In the manual gain mode, with the front panel mounted RF GAIN switch S6 in the non-AGC position, a ground potential is available at pin B6 which is applied to the gates of source switch FETs Q7, Q8, and Q12 enabling them to conduct. With Q7 conducting, the ground potential is present at the juncture between AGC delay diode CR5 and resistor R23, effectively blocking the AGC circuit to IF AGC amplifier U1A. With Q12 conducting, the ground potential is also present at the juncture between voltage regulator VR1 and output pin B4, grounding the negative side of front panel mounted signal strength meter M1. With Q8 conducting, the 0.0 to -1.5 volt analog voltage input (with 0.0 volts representing maximum manual gain and -1.5 volts, minimum manual gain) is applied to IF AGC amplifier U1A. The amplified output from U1A, which ranges from 0.0 to -3.0 volts (0.0 to -1.5 volts manual gain input voltage), is output to the 455 kHz IF amplifier via pin B3 and, to RF AGC amplifier U1B via the RF AGC delay and RF AGC shaping circuits. The amplified output from U1B, which ranges from 0.0 to +4.0 volts (0.0 to -1.5 volts manual gain input voltage), is output to the input converter via pin B1.

3.2.11 TYPE 796116 AUDIO AMPLIFIER (A9)

Audio Amplifier Assembly A9, Figure 6-25, consists of a dual operational amplifier and ancillary circuit components. The audio output, AM, FM, CW, USB and LSB, from pin A18 of the demodulator/AGC amplifier, described in paragraph 3.2.10, is input at E1 and applied to two amplifier circuits. After amplification, the two audio outputs are available at front panel mounted jacks; RECORD jack J5 and PHONES jack J6.

The audio input signal to the record circuit is fed through potentiometer R1, assembly-mounted adjustment, to OP AMP U1A. U1A provides a voltage gain of 4 to the input signal and outputs the audio signal to RECORD jack J5.

The audio input signal to the phones circuit is fed through potentiometer R5, which is mechanically linked to the front panel volume control, to OP AMP U1B. U1B provides a 3 dB roll-off at 3.8 kHz and outputs the audio signal to PHONES jack J6.

3.3 TYPE 796106 DIGITAL CONTROL UNIT (A6)

The digital control unit, Figure 3-9, is the interface between the front panel controls and the synthesizer section. It provides the means of converting voltages, representing operator selectable parameters, into control signal levels for use by the synthesizer section, described in paragraph 3.6, preselector assembly A2, described in paragraph 3.2.3, and display driver assembly A7, described in paragraph 3.4. Up/down counters U1 through U7 and BFO up/down counters U8 and U9 are C-MOS type 14510B presettable synchronously clocked D-type flip-flops with T-type gating structure to provide BCD count sequence. The schematic diagram of the digital control assembly is presented in Figure 6-22. A general description of this type counter is presented in the following paragraph as an aid in understanding how the digital control unit circuit functions.

The 14510B is a presettable up/down decade counter. With a high input at up/down input pin 10, the counter will increment by one for each rising edge of the clock pulse at clock input pin 15. Conversely, with a low input at pin 10, the counter decrements by one for each rising edge of the clock pulse at pin 15. Conversely, with a low input at pin 10, the counter decrements by one for each rising edge of the clock pulse at pin 15. With a high input at parallel enable pin 1, clocking is inhibited. Counters U1 through U7 and U8 and U9 are cascaded by tying their respective carry output pins, pin 7, to the carry input pins, pin 5, to the following counter and by connecting the control inputs, as clock, up/down, and parallel enable, in parallel. With a high at carry input pin 5, clocking is inhibited. The carry output, normally high, goes low during a carry condition. Carry conditions occur when the counter is in a 0 state during down counting or in a 9 state during up counting. As a result, any stage in a counter chain clocks only when all preceding stages are in carry conditions.

In the digital control unit, counters U1 through U7 form a presettable, seven-digit, up/down decade counter. Their outputs drive the display driver and the synthesizer motherboard. The display driver converts the data into signals used to light appropriate segments of the frequency word display on display assembly A8, described in paragraph 3.5. The LO and BFO synthesizers on the synthesizer motherboard described in paragraph 3.6, use the data to establish the correct 1st through 3rd LO and BFO frequencies.

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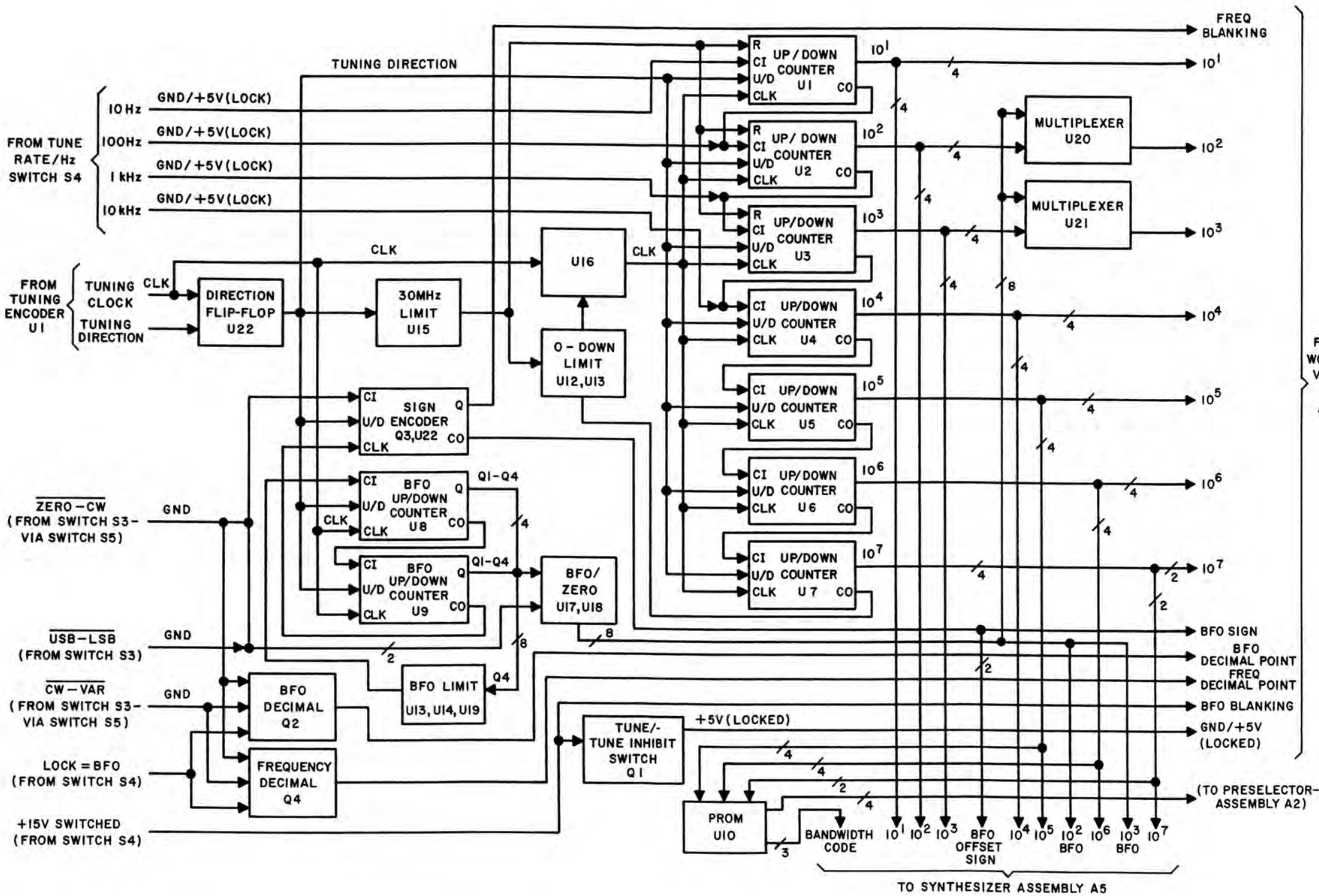

Figure 3-9. Digital Control, Block Diagram

For the purposes of this discussion, the circuit description of the digital control unit is divided into two parts. The first part describes how the digital control unit functions in either the AM or FM detection modes in both the unlocked and locked tuning states. The second part describes only those circuit components which are unique to the CW, USB, or LSB modes (Figure 3-10).

3.3.1 AM, FM DETECTION MODES

In either the AM or FM detection mode with the TUNE RATE/Hz switch S4 in the 10 Hz position, tuning clock and tuning direction signals are input to direction flip-flop U22 from tuning encoder U1, described in paragraph 3.3.4, via pins 21 and 13, respectively. After inversion by inverter U12, the input clock pulse lags the input direction pulse by 90 degrees if the receiver frequency is being up-tuned (clockwise rotation of tuning encoder U1). Conversely, when being down-tuned (counterclockwise rotation of tuning encoder U1), the input clock pulse leads the input direction pulse by 90 degrees.

When being up-tuned, the high output from pin 1 of U22 is applied to up/down input pin 10 of each up/down counter, U1 through U7, and to input pin 5 of 30 MHz limit U15. As previously stated, the enabled counter increments by one upon receipt of each rising edge of the clock pulse at pin 15. The high at pin 5 of U15, at any frequency less than 30 MHz, has no effect on the low output from U15 to input pin 2 of NOR gate U13. The low at input pin 1 of U13, at any frequency other than 0, and the low at pin 2, result in a high output from U13 to input pin 6 of U16.

The positive-going clock pulse from output pin 4 of U12 is applied to input pin 9 of AND gate U16 and also through resistor R5 to input pin 8 of U16. Resistor R5 acts as a delay for the leading edge of the clock pulse to pin 8. The clock output from pin 10 of U16 is passed through capacitor C24, which along with resistor R31, causes it to be of shorter duration, and when to input pin 5 of AND gate U16, along with the high input at pin 6 from NOR gate U13, a high output at pin 4 results. The positive-going clock pulse is now made available at the clock inputs, pin 15, of counters U1 through U7 and to both input pins 8 and 9 of OR gate U11. The high output from pin 10 of U11 is input to pin 5 of OR gate U11 and output to input pin 20 of PROM U10. The negative-going portion of the clock pulse at pin 20 is used to latch the outputs from counters U5 through U7 into the PROM which, effectively, uses the data at its A inputs as addresses for preselector and band switch codes.

With TUNE RATE/Hz switch S4 in the 10k position, the +15 Vdc on the wiper arm of deck B of switch S4 is input to the digital control unit at pin 1 of connector J2. The +15 Vdc is applied to input pin 2 of X-NOR gate U14 which acts as a debounce. The high output from AND gate U19 to tune/tune inhibit switch Q1 results in a low, or ground, output from pin 5 of connector J2. The ground potential at pin 5 is applied through the wiper arm of deck A of switch S4 to input pin 19 of connector J2. With a low now at carry input pin 5 of counter U4, the clock input at pin 15 is enabled, allowing U4 to increment for each rising edge of a clock pulse. Counter U4 outputs, via its Q output pins, the operator selected frequency data to the 1st LO synthesizer and to the display driver.

When up-tuning, 30 MHz limit switch U15 prohibits frequency selection above 30.00 MHz in the following manner. With a selected frequency of 30.00 MHz, outputs Q1 and Q2, pins 6 and 11, of counter U7 are both high. The highs from pins 6 and 11 are applied to input pins 4 and 3, respectively, of 30 MHz limit switch U15. With a high, representing the up-tuning direction, already available at pin 5 of U15, the output from pin 6 of U15 goes high.

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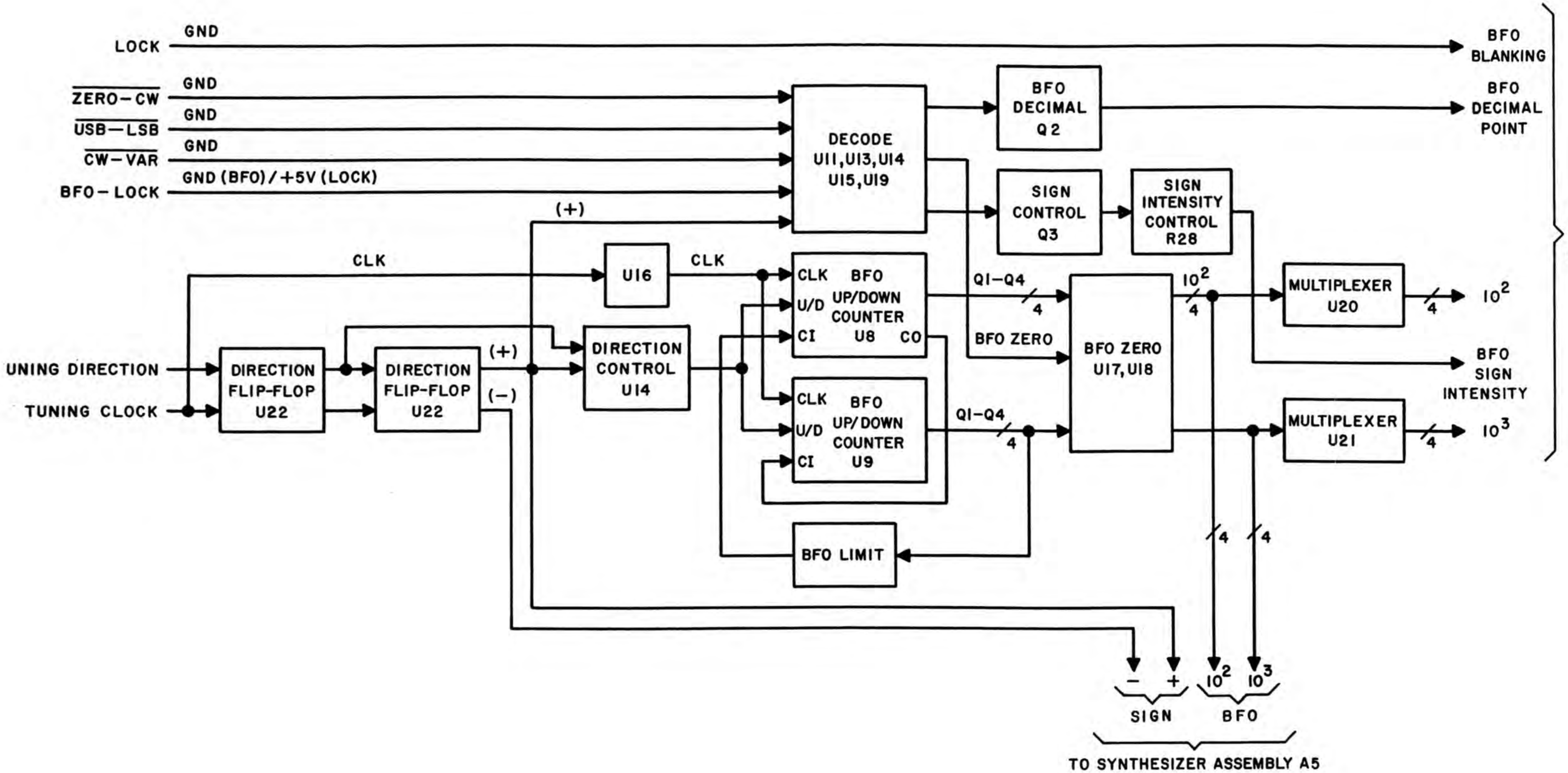

Figure 3-10. Digital Control BFO Tuning

This high is applied to reset pins, pin 9, of counters U1, U2, and U3 and to input pin 2 of NOR gate U13. The high at pin 9 of counters U1, U2, and U3 causes these counters to be reset to zero. The high at pin 2 of NOR gate U13 and the existing low at pin 1 result in a low output from pin 3 of U13 to input pin 6 of AND gate U16. With a low at input pin 6, the output from U16 pin 4 is low which stops any further up-tuning clock pulse to counters U4, through U7.

With TUNE RATE/Hz switch S4 in the LOCK position, the front panel mounted FREQ MHz display goes blank and the tuning encoder control is disabled. In the lock position, the wiper arm of deck B of switch S4 is at ground potential, or low. This ground potential is applied to the power input pin, pin 6, of tuning encoder U1 and to pin 1 of connector J2 of the digital control unit. The ground, or low, at pin 1 is applied to the base and emitter of frequency decimal switch Q4, shutting it off, and to input pin 12 of AND gate U19. The resultant low output from pin 11 of U19 is output from the digital control unit via pin 8 of connector P1 to the $\overline{BL}$ input pins of drivers U1 through U4 and driver U7 on display driver assembly A7. With a low at the $\overline{BL}$ input pins, the outputs from drivers U1 through U4 and driver U7 to display assembly A8 all go low resulting in a blank display. The low output from pin 11 of U19 is also applied to the select input (SEL) pins, pin 11, of multiplexers U20 and U21. A low input at pin 11 of U20 and U21 causes the Y output lines to drivers U5 and U6 on the display driver assembly to go low resulting in displays U5 and U6 going blank.

When being down-tuned, the low output from pin 1 of U22 is applied to up/down input pin 10 of each up/down counter, U1 through U7, and to input pin 5 of 30 MHz limit U15. With a low input at up/down pin 10, the enabled counter decrements by one for each rising edge of the clock pulse at clock pulse at clock input pin 15. When the counter decrements to a 0 state, the level from carry output pin 7 to carry input pin 5 of the next counter goes low causing it to decrement upon receipt of each clock pulse. When the carry output from counter U7 to pin 9 of 0-down limit U12 goes low, it results in a high input to pin 1 of NOR gate U13. The normal high output from pin 3 of U13 to pin 6 of AND gate U16 goes low resulting in a low output from pin 4 of U16 to the clock input pins of the counters.

3.3.2 USB, LSB DETECTION MODES - BFO ZERO

In the USB detection mode or the LSB detection mode, the digital control unit functions as described for the AM, FM detection modes, paragraph 3.3.1, with the following exception; the BFO output from the digital control unit to the synthesizer assembly is zero, resulting in a fixed 455 kHz BFO output from the BFO synthesizer to the demodulator/AGC amplifier in the USB/LSB detection modes.

With the detection mode switch in either the USB or LSB position and BFO OFFSET switch S5 in the ZERO position, the ground potential on the wiper arm of front panel mounted detection mode switch S3 is applied to either contact 10 (LSB) or contact 11 (USB). This ground, or low, is applied to input pins 2 and 8 of AND gate U15 through pin 9 of connector J2. The low output from pin 9 of U15 is input to pins 6, 8, 2, and 12 of quad AND gate U18 and to input pins 6, 8, 2, and 12 of quad AND gate U17. With each gate electrically located between the Q outputs of BFO up/down counters U8 and U9, the low outputs to the BFO synthesizer via pins 24, 26, 25, 23 (10^2) and pins 22, 19, 20, 21 (10^3) represent a zero BFO frequency word.

3.3.3 CW DETECTION MODE - BFO VARIABLE

In the CW detection mode with BFO OFFSET switch S5 in the ZERO position, the digital control unit functions as described for the USB, LSB detection modes described in paragraph 3.3.2; the BFO output from the BFO synthesizer to the demodulator/AGC amplifier is fixed at 455 kHz. With the BFO OFFSET switch in the VAR position, the BFO offset can be 8.0 kHz above or below the 455 kHz BFO output. BFO up/down counters U8 and U9 function as described in paragraph 3.3.2.

In the CW detection mode with BFO OFFSET switch S5 in the VAR position, ground potention at wiper arm C2 of detection mode switch S3 is made available to wiper arm C1 of BFO OFFSET switch S5 via contact point 9 of switch S3. In the VAR position, this ground potential, or low, is input to the digital control unit through pin 11 of connector J2. From pin 11, it is input to pin 1 of OR gate U11. With TUNE RATE/Hz switch S4 in the BFO position, ground potential at wiper arm C1 of deck A of switch S4 is input to the digital control unit through pin 2 of connector J2. From pin 2, it is input to pins 2 and 13 of quad OR gate U11.

The lows at pins 2 and 1 of OR gate U11 result in a low output at pin 3 which is applied to pin 1 of AND gate U19 and to pin 13 of NOR gate U13. The low output from U19 is applied to pin 13 of AND gate U19, to the base of BFO decimal switch Q2 causing it to conduct, and to pin 1 of inverter U12, which produces a high to the base of frequency decimal switch Q4 causing it to shut off. The high output from Q2 is output from the digital control unit to the display driver via pin 13 of connector P1. The low at input pin 13 of U19 results in a low output at pin 11 of U19 to the select input pin, pin 1, of multiplexers U20 and U21 where, along with lows on their enable pins, pin 15, disables their B inputs and enables their A inputs. The low output from pin 11 of U19 is also applied to pin 8 of NOR gate U13 which, when tuning a BFO offset below 455 kHz, produces a high output to pin 11 of AND gate U13. This high at pin 11 along with the highs at pins 12 and 13 result in a high output from pin 10 of U13 which is inverted by NOR gate U14 and applied to the base of sign control switch Q3, causing it to conduct and produce a high at pin 25 of connector P1. This high at pin 25 is input to the display driver and output to display assembly numeric display DS-4 via pin 3 of connector P4 causing segment g of the seven-segment display to light which denotes a minus sign.

When up tuning, the high output from pin 10 of OR gate U14 is input to up/down input pin 10 of counters U8 and U9, and to pin 5 of AND gate U19. With counter U9's Q4 output low (except when producing a digital 8) applied to pin 6 of AND gate U19, a low output from pin 4 to pin 12 of NOR gate U13 results. This low, along with the low at pin 13 from pin 3 of OR gate U11, results in a high output from pin 11 of U13 to pin 12 of NOR gate U14. With input pin 13 of U14 at ground potential, U14 acts as a simple inverter producing a low input at carry input pin 5 of counter U8, enabling the clock input. The circuit from pin 2 of counter U9, just described, functions as an 8.0 kHz limiter for the BFO in the following manner.

With a BFO offset of 8.0 kHz, the Q1 through Q4 outputs of U8 and Q1 through Q3 of U9 are low. The high at the Q4 output, pin 2, of counter U9 is applied to pin 5 of AND gate U18 and to pin 6 of AND gate U19. The high at pin 5 of U18 is subsequently output from the digital control unit via pin 9 of U21 and pin 29 of connector P1 through driver U5 on the display driver assembly, described in paragraph 3.4, to seven-segment display DS5 on the display assembly, described in paragraph 3.5. The high at pin 6 of U19 and the high at pin 5 of U19 result in a high output from pin 4 of U19 to pin 12 of NOR gate U13. The resultant low output from pin 11 of U13 is inverted by NOR gate U14. The high output from pin 11 of U14 is applied to carry input pin 5 of counter U8, inhibiting the clock input, pin 15, and preventing U8 from incrementing.

When down-tuning the BFO offset in the 8 kHz to 0 kHz range, the output from pin 13 of sign flip-flop U22 remains high while the output from pin 1 of direction flip-flop U22 goes low. This places a low input at pin 9 and a high at pin 8 of NOR gate U14. The resultant low output from pin 10 of U14 is applied to up/down pin 10 of counters U8 and U9 causing U8 to decrement by one for each received clock pulse at pin 15.

When counters U8 and U9 have decremented to zero, the carry output, pin 7, from U9 changes from high to low. The low output from pin 7 of U9 is input to pins 5 and 6 of NOR gate U13 resulting in a high output at pin 4 of U13. This high is applied to input pins 1 and 12 of quad AND gate U16. The highs at pin 1 and pin 2 of U16 result in a high at reset input pin 10 of sign flip-flop U22 causing it to change state with a high output at pin 12 and a low at pin 13. The high output from pin 12 is output from the digital control unit via pin 14 of connector E1. Conversely, the low output from pin 13 to the BFO synthesizer via pin 13 of connector E1 goes low.

The low output from pin 13 of sign flip-flop U22 is applied to pin 8 of NOR gate U14 and to pin 9 of NOR gate U13. The low at pin 8 of U14, along with the low at pin 9 of U14, results in a high output from pin 10 to the up/down inputs of U8 and U9. The low at pin 9 of NOR gate U13 along with the low at pin 8 result in a high to pin 11 of AND gate U15. This high at pin 11, along with the highs at pins 12 and 13, results in a high to input pin 5 of NOR gate U14 which acts as a simple inverter. The resultant low output from U14 causes signal control switch Q3 to turn on, placing a high at pin 25 of connector P1. This high at pin 25 is used to turn on segment g of seven-segment display DS-4, indicating a minus sign.

This assembly converts tuning knob rotation to digital pulses for the Manual Tuning Up/Down Counter. When the tuning knob is turned, each of the two output lines from the encoder will swing repeatedly between approximately +5V and 0V. If the knob is rotated at constant speed, these two outputs will appear as trains of square waves. Due to the internal mechanics of the encoder, the transitions of these two wave trains will be staggered in time with respect to each other. When the knob is rotated clockwise to increase tuned frequency, the square wave on the direction line will appear to lead that on the clock line as in Figure 3-25. The action of the up/down counter depends on the level of its up/down input at the instant its clock line goes high. The level of the up/down input at any other time has no effect. Therefore, clockwise rotation causes the counter to count up and the tuned frequency to increase.

If the tuning knob is rotated counterclockwise, the sequence of outputs is reversed; the direction square wave lags the clock square wave. In this case, the direction line will be low when the clock line swings high, causing the counter to count down, thus reducing the tuned frequency.

The two outputs of the encoder go through approximately 120 cycles per revolution of its input shaft.

The encoder assembly uses infrared optics to accomplish its internal functions. It is not considered a repairable assembly.

3.3.4 Preselector Decode

The preselector decode employs a bipolar 2048 bit ROM, U10, to convert the selected digitally formatted frequency data from the Up/Down counter, into a preselector code for use by the digital control circuitry.

With a selected tuned frequency of 4.0 MHz, the inputs to ROM U3 are as follows:

A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	1	0	0	0	0	0

With the binary inputs to ROM U3 grouped by powers of ten as follows:

	10^7		10^6				10^5		
	2^1	2^0	2^3	2^2	2^1	2^0	2^2	2^2	2^1
	A8	A7	A6	A5	A4	A3	A2	A1	A0,
an input of	0	0	0	1	0	0	0	0	0

is,

$$4 \times 10^6 \text{ or, } 4 \text{ MHz.}$$

ROM U3 converts these inputs into a 4-bit preselector code of 0110. The 0110 preselector code is applied to the input of the digital control circuitry.

3.4 TYPE 796105 DISPLAY DRIVER ASSEMBLY (A7)

The display driver assembly, Figure 3-11, consists of seven BCD-to-7-segment latch decoder drivers which decode the BCD encoded frequency word data from the digital control unit, described in paragraph 3.3. The decoded data is then output from the display driver assembly to the display assembly, described in paragraph 3.5, via the seven output lines associated with each of the seven display drivers.

The frequency and BFO offset frequency data are input to the display driver assembly from the digital control unit, described in paragraph 3.3, via connector J9. When used as drivers for the frequency display, in MHz, driver U1 represents the most significant digit (MSD) and U7 represents the least significant digit (LSD). When used in the BFO offset mode, driver U5 represents the MSD and U6, the LSD.

Table 3-2 lists the relationships between inputs to, and outputs from, drivers U1 through U7, along with the various decimal numerals which may be decoded by the drivers and displayed on the display assembly. As can be determined from the table and Figures 6-23 and 6-24, driver U1, which employs only the 1 and 2 BCD input, can only decode and display a 0, 1, 2, or be blank. In the lock mode, with TUNE RATE/Hz switch S4 in the LOCK position, or in the BFO variable mode, a low is put to the blanking ($\overline{BL}$) input pins of drivers U1 through U4 and U7, blanking their outputs. Blanking of drivers U5 and U6 is performed by multiplexers U20 and U21 on the digital control unit.

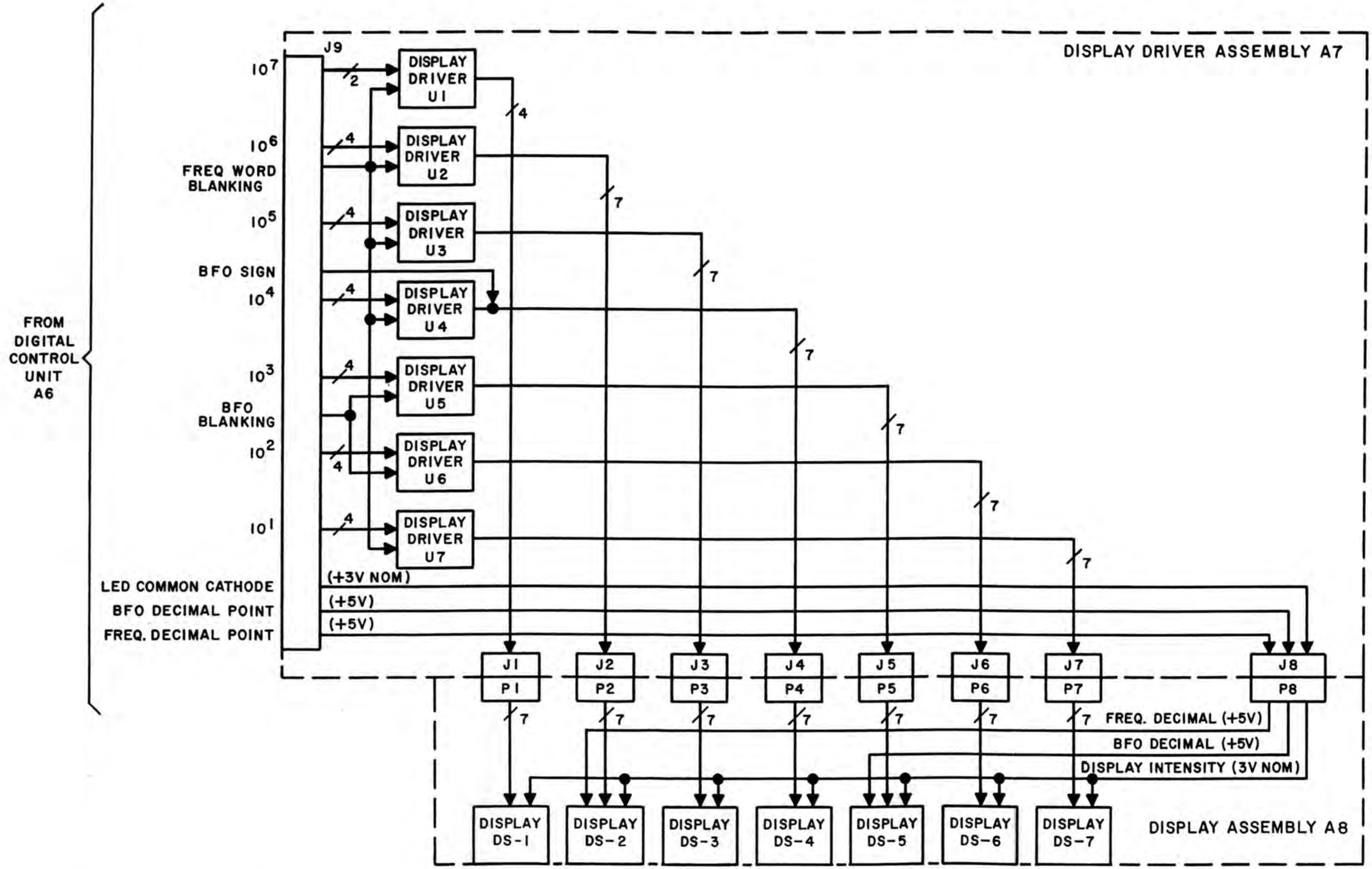

Figure 3-11. Display Driver, Block Diagram

Table 3-2. Display Driver Input to Output Relationships

Inputs to U1 through U7					Outputs from U1 through U7						
Decimal	Pin 0	Pin C	Pin B	Pin A	Pin g	Pin f	Pin e	Pin d	Pin c	Pin b	Pin a
0	0	0	0	0	0	1	1	1	1	1	1
1	0	0	0	1	0	0	0	0	1	1	0
2	0	0	1	0	1	0	1	1	0	1	1
3	0	0	1	1	1	0	0	1	1	1	1
4*	0	1	0	0	1	1	0	0	1	1	0
5*	0	1	0	1	1	1	0	1	1	0	1
6*	0	1	1	0	1	1	1	1	1	0	0
7*	0	1	1	1	0	0	0	0	1	1	1
8*	1	0	0	0	1	1	1	1	1	1	1
9*	1	0	0	1	1	1	0	0	1	1	1

*Does not apply to MSD driver U1.

3.5 TYPE 796104 DISPLAY ASSEMBLY (A8)

The display assembly consists of seven 7-segment LED displays with each display capable of displaying a single decimal digit.

The decoded frequency and BFO offset frequency data are input to displays DS1 through DS7, from the display driver assembly, described in paragraph 3.4, via their respective 7-pin connectors, P1 through P7. When used to display receiver tuned frequency, in MHz, DS1 represents the MSD and DS7 represents the LSD. In this mode of operation, a decimal point is displayed on DS2. When used in the BFO offset mode, DS5 represents the MSD and DS6, the LSD. In this mode of operation, a decimal point is displayed on DS5 and displays DS1 through DS3 and DS7 are blank. When the BFO offset frequency is in the range between 455 kHz and 447 kHz, a minus sign is displayed on DS4.

Table 3-3 lists the relationships between the inputs from the display driver assembly via connectors P1 through P7 and the displayed digit.

3.6 SYNTHESIZER SECTION

3.6.1 SYNTHESIZER RELATIONSHIPS

Figure 3-1 shows the relationship of the synthesizers to the receiver signal processing. Together, three synthesizers translate all RF input signals to 455 kHz. Other stages of the receiver then demodulate this 455 kHz IF. If the receiver operates in the CW or a sideband mode, a fourth synthesizer signal beats with the 455 kHz IF to produce an audio output. The tuning process involves the 1st and 2nd LO; the 3rd LO is fixed at 11.155 MHz and the BFO varies ±8.0 kHz from 455 kHz.

Table 3-3. Display Input to Segment Relationships

Decimal/ Indication	Inputs via P1 through P7 Pin 3	Pin 4	Pin 2	Pin 1	Pin 5	Pin 6	Pin 7	Display Segment Lights						
0	0	1	1	1	1	1	1	-	F	E	D	C	B	A
1	0	0	0	0	1	1	0	-	-	-	-	C	B	-
2	1	0	1	1	0	1	1	G	-	E	D	-	B	A
3[1]	1	0	0	1	1	1	1	G	-	-	D	C	B	A
4[1]	1	1	0	0	1	1	0	G	F	-	-	C	B	-
5[1]	1	1	0	1	1	0	1	G	F	-	D	C	-	A
6[1]	1	1	1	1	1	0	0	G	F	E	D	C	-	-
7[1]	0	0	0	0	1	1	1	-	-	-	-	C	B	A
8[1]	1	1	1	1	1	1	1	G	F	E	D	C	B	A
9[1]	1	1	0	0	1	1	1	G	F	-	-	C	B	A
Blank	0	0	0	0	0	0	0	-	-	-	-	-	-	-
-[2]	1	0	0	0	0	0	0	G	-	-	-	-	-	-

[1]Does not apply to DS1.
[2]Applies to DS4 only.

The 1st LO tunes from 42.91 MHz to 72.90 MHz, in 10 kHz steps. This range corresponds to an RF input range of 00.00000 MHz to 29.99999 MHz. Each 10 kHz step of the 1st LO causes a different 10 kHz section of the RF spectrum to be converted to the center of the 1st IF range (42.90 MHz to 42.91 MHz) by taking the difference products from the 1st Mixer. A filter follows the 1st mixer which passes signals in this 10 kHz range, plus their sidebands which extend approximately 9 kHz beyond each end of this range, for a total bandwidth of 28 kHz.

The 2nd LO tunes from 32.21000 MHz to 32.20001 MHz, in 10 Hz steps. This range allows conversion of any signal in the 1st IF range to the center frequency of the 2nd IF (10.7 MHz), by the 2nd Mixer. A 16 kHz bandpass filter follows the 2nd Mixer to set the receiver's maximum IF bandwidth. As the receiver is tuned upward, the 2nd LO tunes downward across its entire range, then returns to its starting frequency as the 1st LO steps up to its next increment. This interlocking sweep action allows any 10 Hz increment of the RF range to be converted to the center of the 10.7 MHz 2nd IF passband.

The 3rd LO provides an 11.15500 MHz signal to the 3rd Mixer. Signals centered on 10.7 MHz output from the 2nd Mixer mix with the signal from the 3rd LO to produce signals centered at 455 kHz. The output from the 3rd Mixer passes through another bandpass filter either to be demodulated by other stages in the receiver or mixed with the BFO output for CW or Sideband detection.

The BFO Synthesizer produces a signal ranging from 447 kHz to 463 kHz. This range centers about 455 kHz (±8.0 kHz) and beats with the 455 kHz signal from the 3rd Mixer to produce an audio output.

All four synthesizer circuits are synchronized by a common Time Base. Reference frequencies of 1 MHz, 50 kHz, 20 kHz, 8 kHz, 5 kHz and 1 kHz are supplied from a 2 MHz temperature compensated crystal oscillator (TCXO).

Table 3-4 provides an example of frequency translation from the RF input to the output of the 3rd Mixer. This translation begins with an RF input signal of 00.00000 MHz (column A) and ends with a signal centered at 455 kHz. Columns B and C are tabulated for input frequencies of 00.00500 and 00.01999 MHz, respectively. In column C, notice that the 1st LO has stepped up to its second increment (42.92 MHz).

The 2nd Mixer translates the signals in the 1st IF range to the 2nd IF frequency of 10.7 MHz. The 9.99 kHz range of the 2nd LO works with the increment sizes of the 1st LO to provide a translation of all 1st IF signals to 10.7 MHz. The corresponding 2nd LO frequencies are shown in Table 3-4 along with the resultant 2nd IF of 10.7 MHz. To determine the 1st LO and 2nd LO frequencies corresponding to a received RF frequency, refer to the examples in Table 3-5.

Table 3-4. 1st and 2nd LO Tuning Increments

	RF INPUT	A (0.00000 MHz)	B (0.00500 MHz)	C (0.01999 MHz)
1st MIXER	1st LO	42.91000	42.91000	42.92000
	RF INPUT	-00.00000	-00.00500	-00.01999
	1st IF	42.91000	42.90500	42.90001
2nd MIXER	1st IF	42.91000	42.90500	42.90001
	2nd LO	-32.21000	-32.20500	-32.20001
	2nd IF	10.70000	10.70000	10.70000
3rd MIXER	3rd LO		11.15500	
	2nd IF		-10.70000	
	3rd IF		0.45500	
4th MIXER	3rd IF		0.455	AM or FM
	BFO		-0.455 ±8.0 kHz	DEMODULATOR
	AUDIO		±8.0 kHz	

The 3rd Mixer converts the 10.7 MHz 2nd IF to 455 kHz. A fixed 3rd LO frequency of 11.15500 MHz provides the necessary difference frequency for this conversion. The 3rd IF resultant is shown only in column B. Demodulation of the 3rd IF takes place either in the 4th Mixer (product detector) or in the AM or FM demodulation stages of the receiver.

In the CW detection mode, the product detector combines the 455 kHz signal from the 3rd Mixer with the 455 ±8.0 kHz variable BFO signal. The resultant signal is an audible tone for monitoring. For single sideband demodulation, the BFO signal is fixed at 455 kHz, and is mixed with the filtered 3rd IF sideband to produce an audio signal.

3.6.2 PHASE LOCK LOOPS

3.6.2.1 General

The phase lock loop is the method used in this receiver to provide accurate numerical control of the local oscillator frequencies. This technique allows the oscillators to be controlled by any appropriate source of BCD digital data, including remote control sources. The basic phase lock loop is composed of four circuits: a phase detector, a low-pass filter (sometimes called a lead-lag filter, integrator, or loop filter), a voltage-controlled oscillator (VCO), and a frequency divider (counter). A basic phase lock loop configuration is shown in Figure 3-12. Depending on the application, the frequency divider circuit may be fixed (to divide by a certain number), or may be programmable to divide by any number in a specific range (20 to 29, for example). The frequency divider may consist of several counters cascaded together, to provide division by a large number. The operation of the basic phase lock loop requires a stable fixed frequency source, to be used as the reference frequency. This receiver contains a temperature-compensated crystal oscillator (TCXO) to provide the basic reference frequency. Both fixed and programmable loops are discussed in the following paragraphs.

Table 3-5. 1st and 2nd LO Frequencies Versus Tuned Frequency

To Obtain 1st and 2nd LO frequencies for any tuned frequency
Example: 15.75635 MHz

To obtain the 1st LO frequency, use the four most significant digits from the readout.	To obtain the 2nd LO frequency, use the three least significant digits from the readout.
15.75XXX	XX.XX635
Add 42.91 to these digits	Subtract them from 32.21000
$\begin{array}{r} 15.75 \\ +\ \underline{42.91} \\ 58.66 \end{array}$ = 1st LO frequency	$\begin{array}{r} 32.21000 \\ -\ \underline{0.00635} \\ 32.20365 \end{array}$ = 2nd LO frequency

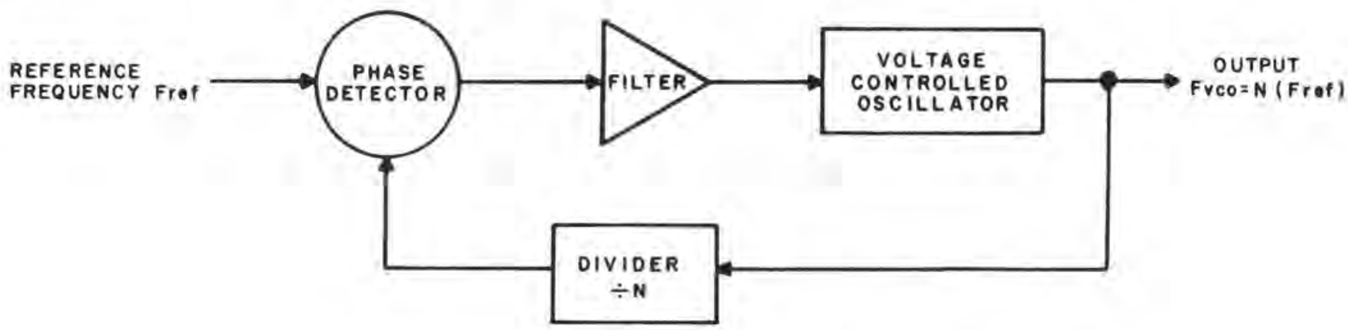

Figure 3-12. Basic Phase Lock Loop Configuration

3.6.2.2 Basic Phase Lock Loop

The basic phase lock loop technique compares the frequency and phase of an incoming reference signal to the output of the voltage controlled oscillator (VCO). If the two signals differ in frequency and/or phase, an error voltage is generated by the phase detector/filter and applied to the VCO, causing it to correct in the direction required for decreasing the frequency/phase difference. The phase detector produces output pulses which are related to the frequency/phase difference. The filter circuit averages (integrates) these pulses into a proportional error correction voltage. This voltage is applied to control the capacitance of a varicap diode in the VCO circuit, and thus tune the VCO toward the correct frequency. The correction procedure continues until lock is achieved, after which the VCO will track the incoming reference signal.

Dividing a VCO output by two before applying it to the phase detector results in an error voltage that drives the VCO to twice the reference frequency. A divide-by-3 action results in an error voltage that drives the VCO to three times the reference frequency. Thus, the reference frequency is always multiplied by the divider ratio to give the VCO output frequency. From this, the following relationship can be given:

$$F_{vco} = N\,(F_{ref})$$

An example of the basic phase lock loop technique, using numbers, will provide an understanding of its actual operation. Referring to Figure 3-13, the desired frequency is obtained by programming the variable divider through selectable inputs. Assuming the VCO is locked at the desired frequency of 25 MHz, this signal enters the input of the (in this case) divide-by-25 counter (divider). The counter emits a pulse at its output each time 25 pulses enter its input. Therefore, the 25 MHz input results in an output of 1 MHz. This 1 MHz signal is compared to the reference frequency of 1 MHz, indicating a locked situation. If the divider's output had been less than 1 MHz, the phase detector would have produced pulses to drive the VCO to a higher frequency. Similarly, if the divider's output had been greater than 1 MHz, the VCO would have been driven to a lower frequency. An important concept to be noted here is that the phase lock loop's output frequency is dependent upon the selectable inputs of the variable divider.

3.6.2.3 Phase Lock Loop Prescaling Technique

A variation of the basic phase lock loop, shown in Figure 3-14, is utilized in the 1st and 2nd LO Synthesizers. The divider portion consists of a two modulus prescaler and two programmable counters. The two-modulus (divider) prescaler accepts the output from the VCO and divides it by one of two numbers (P or P+1). The prescaler in the 1st LO is a divide-by-50/51 counter and the 2nd LO prescaler is a divide-by-100/101 counter. The swallow counter controls the number of times the prescaler divides by P+1. The programmable counter counts the number of pulses from the prescaler. Totally, these three components provide for coarse (N) and fine (A) tuning of the VCO.

In operation, the prescaler divides by P+1, A times. For every P+1 pulse from the prescaler, both the swallow counter and programmable counter are decremented by 1. The prescaler divides by P+1 until the swallow counter reaches its zero state. At this point, the modulus of the prescaler changes to P and the swallow counter is disabled. The prescaler then divides by P until the remaining count in the programmable counter (N-A) decrements to zero. At this time the output of the programmable counter emits a pulse while the swallow and programmable counters are reset. The cycle then repeats.

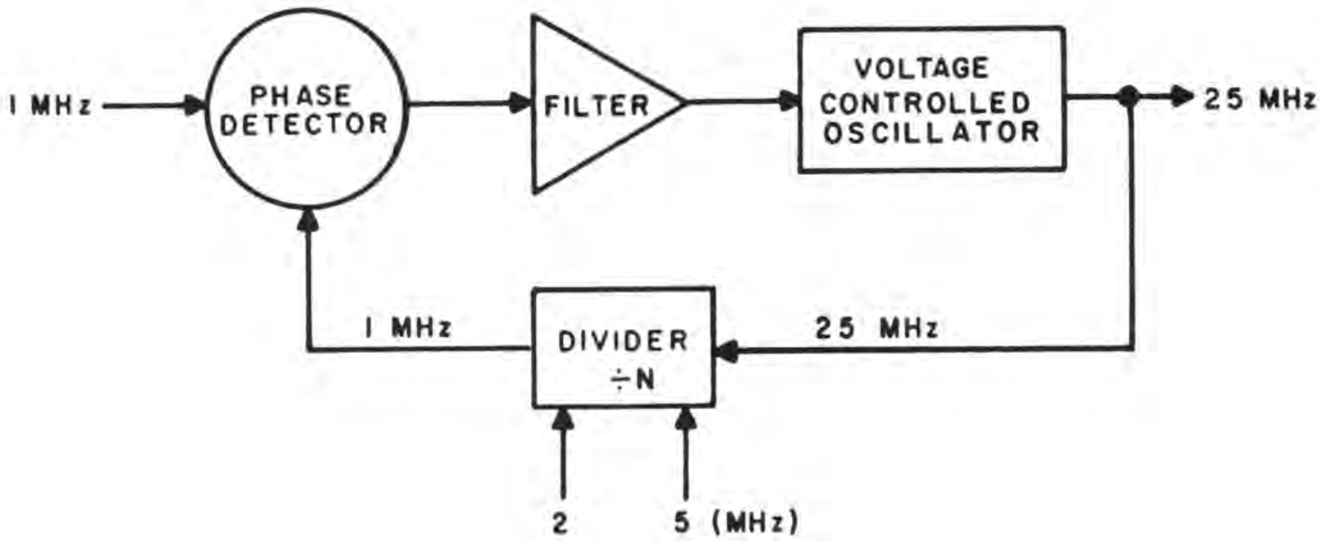

Figure 3-13. Programmable Phase Lock Loop

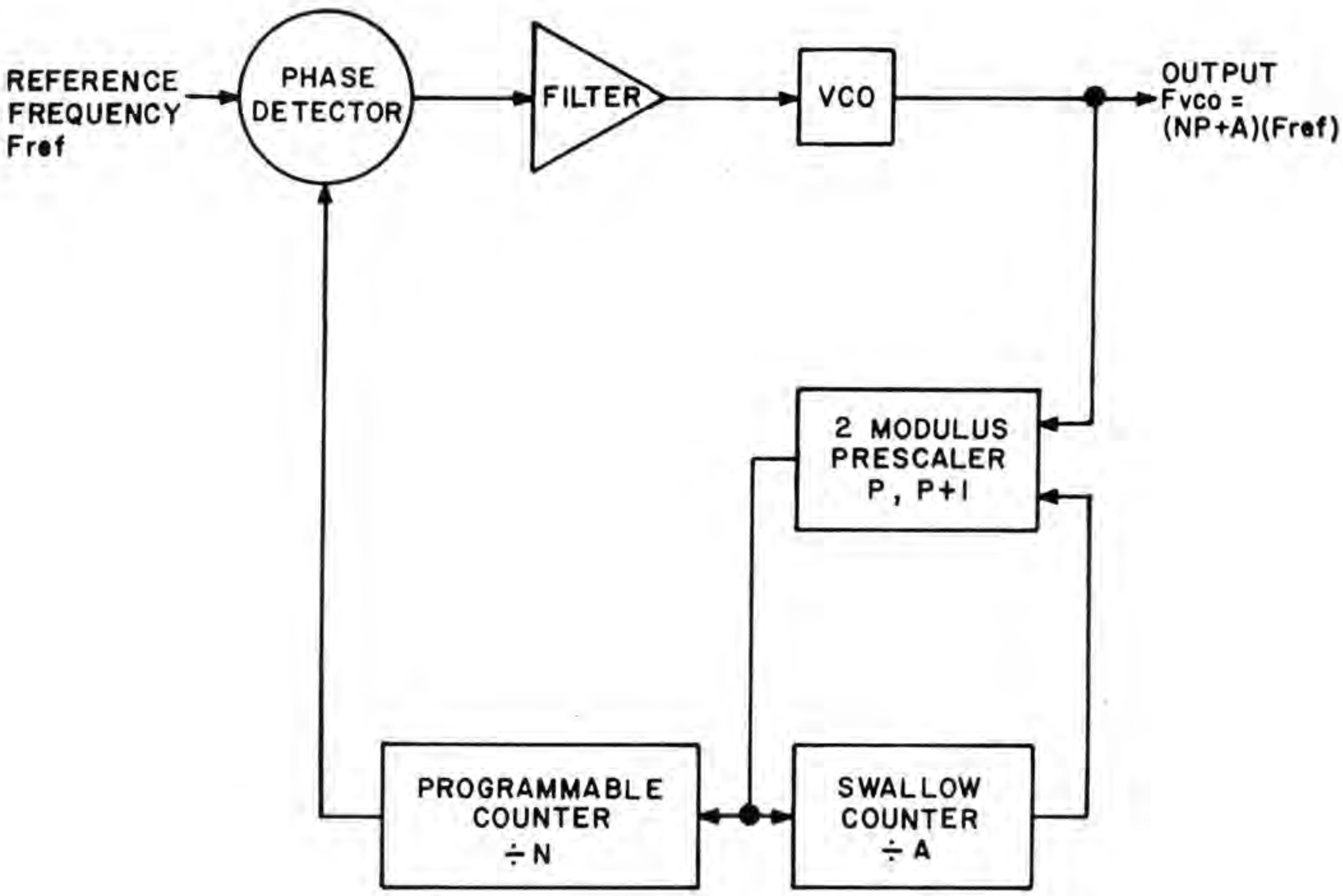

Figure 3-14. Two-Modulus Prescaling in the Phase Lock Loop

An example of the two-modulus prescaling technique is given in Figure 3-15. For illustration, a VCO output of 153 MHz is desired. Selected into the programmable counter are the two most significant digits, 1 and 5. Selected into the swallow counter is the least significant digit, 3. Under lock conditions, the divider has an input of 153 MHz and an output of 1 MHz.

To produce a 1 MHz signal from a 153 MHz signal requires a divide ratio of 153. The table in Figure 3-15 shows a count sequence with 153 input pulses resulting in one output pulse. Similarly, a 153 MHz input results in a 1 MHz output. The programmable counter emits a pulse every time it counts 15 pulses. With the swallow counter set to three, the prescaler divides-by-11 three times and then switches to the divide-by-10 state. At this point, the programmable counter needs 12 input pulses before emitting an output pulse. The prescaler then divides-by-10 twelve times to finish the count sequence. With 3 counts of 11 (3x11=33), and 12 counts of 10 (12x10=120), one output pulse emits from the programmable counter every 153 input pulses (33+120=153).

The two phase lock loop types described are used throughout the WJ-8770 synthesizer section. The 1st LO and part of the 2nd LO utilize the prescaler configuration while the 3rd LO and another part of the 2nd LO use a fixed divide-by-N ratio. The BFO uses the two modulus prescaling technique configuration. Common to all the synthesizers in this receiver is the phase detector used. It will be described in detail below.

3.6.2.4 Phase Detector

The phase detector used in all of the synthesizers is actually a frequency and phase detector followed by an integrator/amplifier and low-pass filter. Table 3-6 provides some information about the phase detectors used in the synthesizers.

Table 3-6. Receiver's Phase Lock Loop Characteristics

Synthesizer		Phase Detector Ref. Des.	Phase Detector Ref. Freq.	Prog Divider?	VCO Range	Output Freq.
1st LO		U1	20 kHz	YES	85.82 145.80 MHz	42.91 - 72.90 MHz
	32 MHz	U1	2 MHz	NO	32 MHz	
2nd LO	PROG	U4	8 kHz	YES	168.00 - 160.01 MHz	
	OUT	U16		NO	210.00 - 200.01 kHz	32.21 - 32.20 MHz
3rd LO		U15	5 kHz	NO	11.155 MHz	11.155 MHz
BFO		U1	1 kHz	YES	4.471 - 4.629 MHz	447.1 - 462.9 kHz

The phase detector receives a fixed reference frequency at one input (R) and a variable frequency at input (V) from the divider section. The detector responds only to differences between the two inputs and has four output states as shown in Figure 3-16. If the frequency and phase at the V and R inputs match exactly, outputs U and D remain high. If V leads R in phase, U remains high and D goes low. When V and R are different in frequency, the output at V and D varies high and low at a rate proportional to the frequency difference.

PROGRAM COUNTER	SWALLOW COUNTER	PRESCALER COUNTS	INPUT PULSES
15	3	0	0
14	2	11	11
13	1	11	22
12	0	11	33
11	-	10	43
10	-	10	53
9	-	10	63
8	-	10	73
7	-	10	83
6	-	10	93
5	-	10	103
4	-	10	113
3	-	10	123
2	-	10	133
1	-	10	143
0	-	10	153

153 INPUT PULSES = 1 OUTPUT PULSE

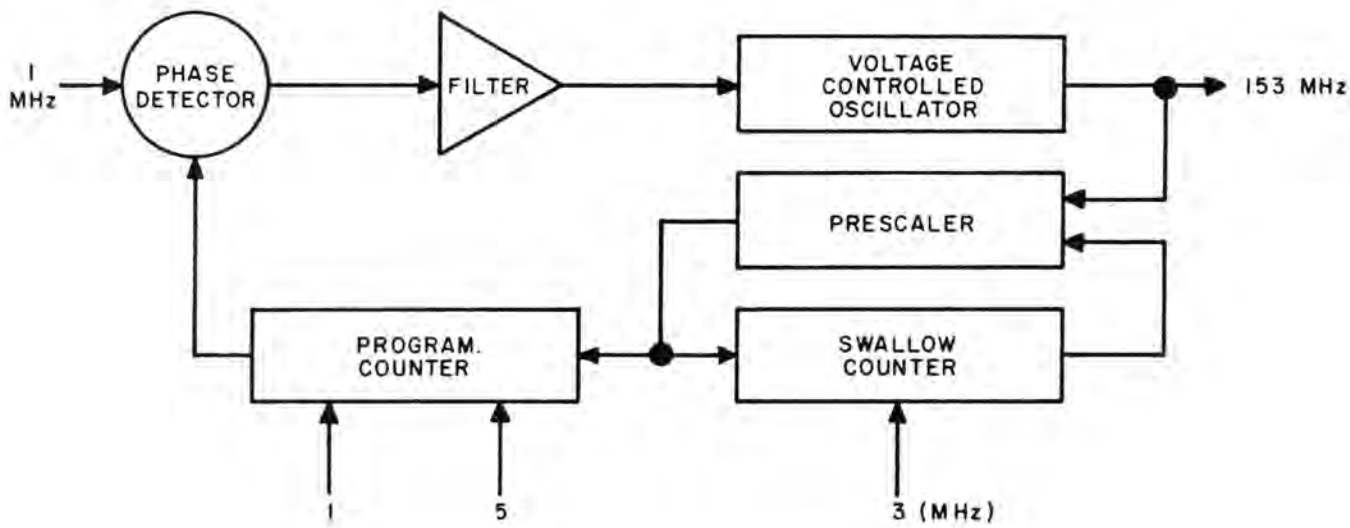

Figure 3-15. Prescaler Dividing Technique

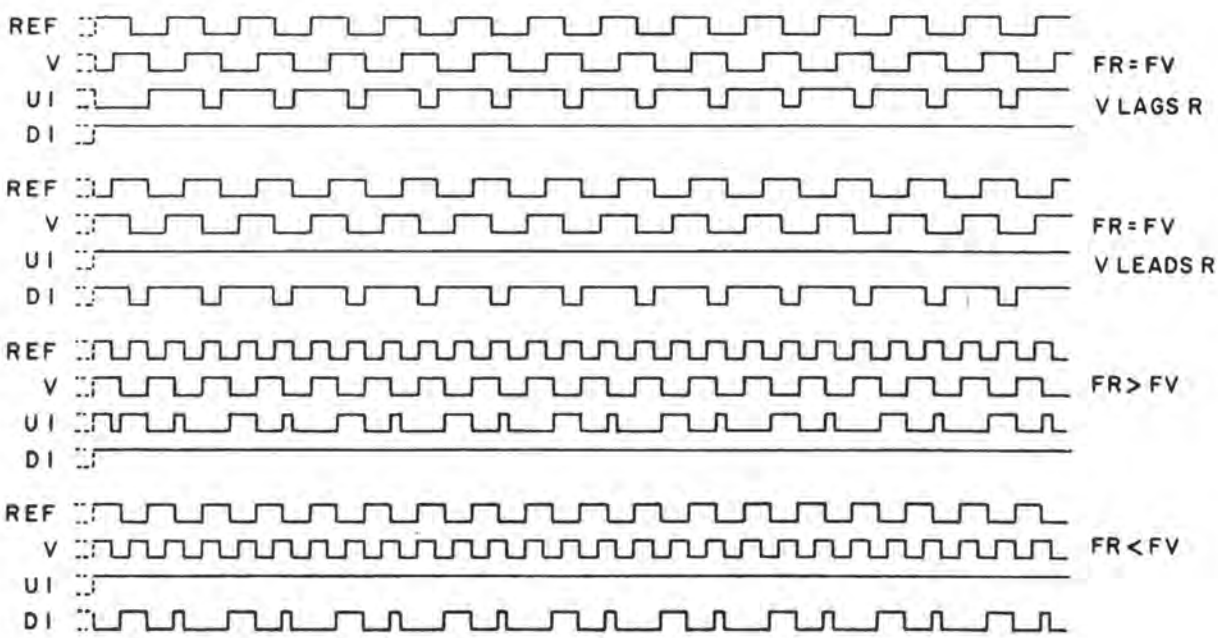

Figure 3-16. Phase Detector Timing Diagram

Under lock conditions, when V and R are identical in phase and frequency, the output pulses from U and D will be extremely narrow spikes. Large frequency differences between V and R will produce wide pulses at the U and D outputs.

The integrator/amplifier and low-pass filter convert the U and D output pulses into a variable voltage-level proportional to the frequency or phase difference between V and R. This voltage output is the VCO tuning voltage which is applied to the varicap tuning diode in the VCO tank circuit, thereby controlling the VCO frequency.

3.6.3 TYPE 796133 1st LO SYNTHESIZER

The 1st LO Synthesizer utilizes a phase locked loop configuration with the prescaling technique previously described in paragraph 3.6.2.3. The output of the 1st LO tunes in 10 kHz steps from 42.91 MHz to 72.90 MHz. A block diagram of the 1st LO is shown in Figure 3-17.

3.6.3.1 Functional Description

The programmable divider, phase detector and low-pass filter of the 1st LO Synthesizer are contained on the main circuit board (Type 796115); the VCO and tuning voltage control circuits are mounted separately, but together with the main circuit board, they form a combined assembly. The phase detector and filter of the 1st LO will be discussed lightly since a detailed description of these circuits can be found in paragraph 3.6.2.4 of the phase locked loop section. Refer to Figure 3-17 for the following discussion.

A two-modulus prescaler (described in paragraph 3.6.2.3) is used at the input to the divide-by-N counter to divide down the frequency of the VCO so that it can be handled by the conventional low-power Schottky counters. The phase detector, U1, compares the 20 kHz reference frequency from the Time Base with the output frequency of the programmable counter. The difference in frequency and phase between these two signals produces a series of short pulses at the output of the phase detector. These pulses are integrated by integrator U2 and the low-pass filter to provide tuning voltage for the VCO. An octal band-switching code, generated by octal encoders U13 and U14 from the divider section, switches the VCO to one of eight tuning ranges spaced 8 MHz apart.

The VCO has 2 inputs and 2 outputs. Inputs are a tuning voltage from the phase detector and a band-switching octal code from the octal encoder. The VCO output frequency operates from 85.82 MHz to 145.80 MHz. This range is sent to the programmable divider of the phase lock loop. The VCO output frequency is also sent to a single divider which reduces the frequency range to 42.91 MHz to 72.90 MHz. This range is output from the VCO board as the 1st LO signal.

The programmable divider has an input range from 85.82 MHz to 145.80 MHz, in 20 kHz steps, and must divide each of these frequencies down to 20 kHz. This calls for the programmable divider to have a divide ratio of 4291 (85.82 MHz divided-by 20 kHz) to 7290 (145.82 MHz divided-by 20 kHz).

The counters within the programmable divider, U5, U6, U7 and U8, must have a divide range from 4291 to 7290. The nature of the counting cycle dictates that the counters be preset to 5271 for a divide ratio of 4291, and to 8270 for a divide ratio of 7290. The preset inputs to the counters come from the four most significant digits of the tuned frequency and range from 0000 to 2999. BCD adders U7, U8, U9 and U10 are preset to add 5271 to the tuned

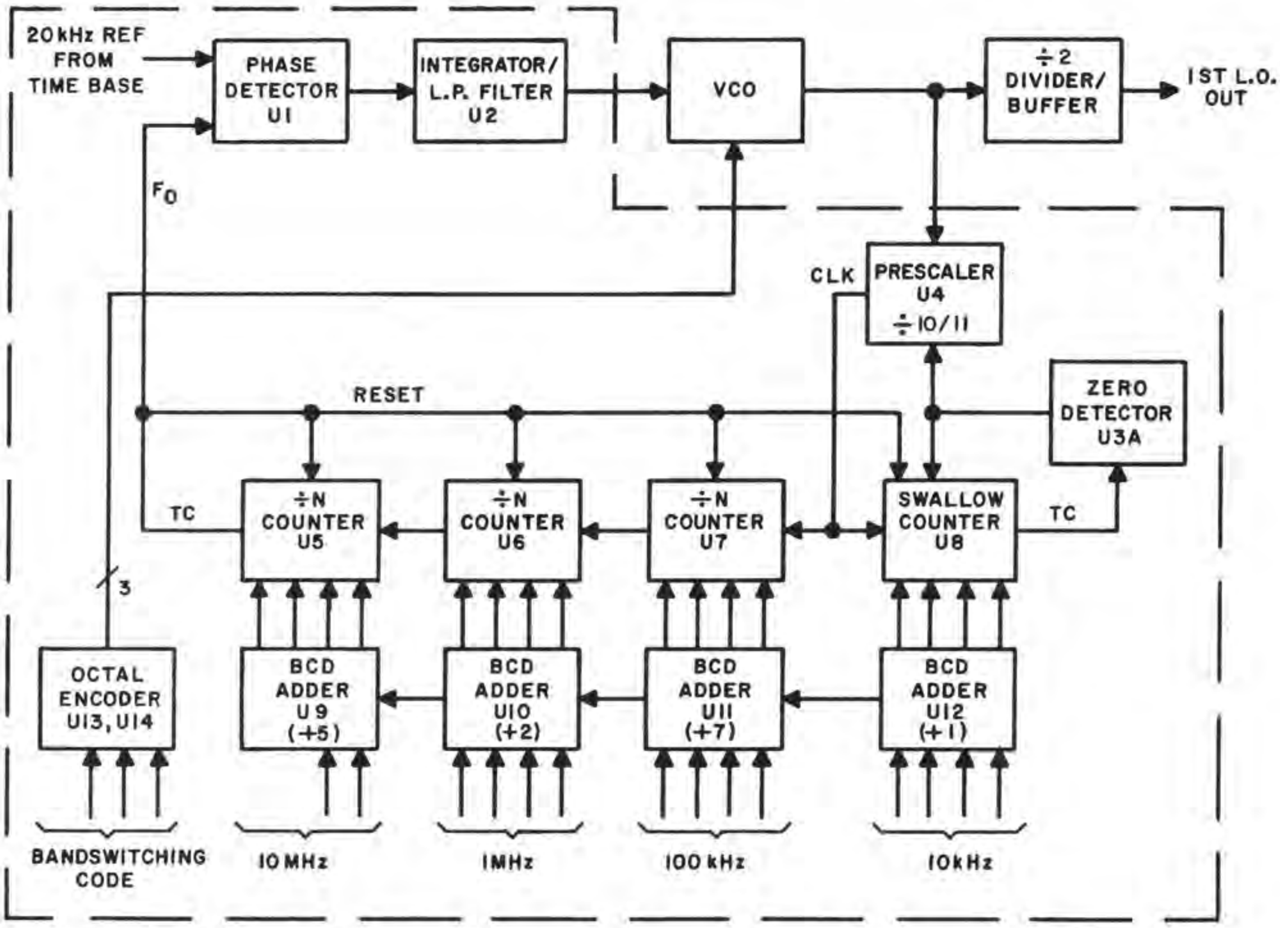

Figure 3-17. 1st LO Functional Block Diagram

frequency inputs giving the correct preset inputs to the counters (0000 + 5271 = 5271; 2999 + 5271 = 8270).

3.6.3.2 Circuit Description

3.6.3.2.1 Counting Cycle

The VCO output frequency, 85.82 MHz to 145.80 MHz is too high for the counters to operate properly. Therefore, a high-speed, two modulus prescaler (U4) is used to divide the VCO frequency to a frequency that can be handled by the counters. Prescaler U1 divides by either 10 or 11.

As shown in Figure 3-17, the counter consists of two parts: a programmable counter (U5, U6 and U7) and a swallow counter (U8). Both counters receive the same clock pulse from the prescaler output. By having the swallow counter control the prescaler, the represented count will decrement by 11 when both the programmable counter and the swallow counter are counting. When the swallow counter reaches terminal count, the prescaler begins dividing by 10 and the swallow counter is disabled for the remainder of the cycle.

Figure 3-18 depicts the 1st counting cycle. The prescaler divides by 11 until the swallow counter reaches terminal count. This causes zero detector U3A to go high, setting the prescaler to 10 and disabling the swallow counter. The programmable counter continues to count down until U5 reaches zero. When this occurs, the U6 terminal count (TC) goes low on the next clock pulse (10 VCO output pulses), resetting the counters to the preset number on their inputs. Zero detector U3A is also reset, enabling the swallow counter and setting the prescaler to 11.

Refer to the schematic diagram of the 1st LO, Figure 6-18, to aid in understanding the circuit descriptions presented below.

3.6.3.2.2 Prescaler, U4

The prescaler input frequency ranges from 85.82 MHz to 145.80 MHz. The prescaler divides this by 10 when its PE 1 input is high and by 11 when PE 1 is low. When the swallow counter, U3, is enabled, PE 1 is held low and the prescaler divides by 11. When the swallow counter reaches terminal count, PE 1 goes high and the prescaler divides by 10 for the remainder of the count cycle.

3.6.3.2.3 BCD Adders, U9, U10, U11 and U12

The BCD adders, U9, U10, U11 and U12 serve to translate BCD data from the tuned frequency input to the values required for presetting the programmable counter. Each adder receives a BCD digit on its B input lines. BCD data permanently wired in on its A input lines is summed with the B input data. The sum, A + B, is output on the adder's S lines. Each adder has carry out and carry in lines for handling overflows from sums greater than 9. This allows the four adders to handle four-digit decimal numbers. The A input lines on each adder are permanently wired to the following BCD digits: U9, 5; U10, 2; U11, 7; U12, 1. In this manner, the BCD adders numerically add 5271 to the four-digit number input from the tuned frequency data. The new four-digit number is applied to the preset input lines of the programmable counter.

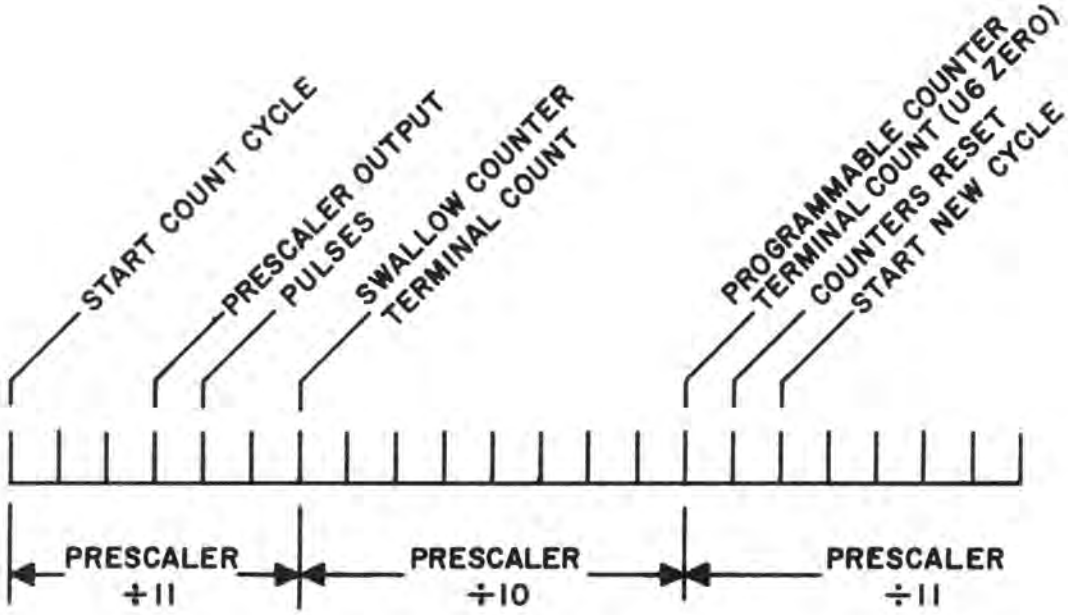

Figure 3-18. 1st LO Counting Cycle

3.6.3.2.4 Programmable Counter, U5, U6 and U7

U5, U6 and U7 are wired as presettable down counters and are synchronously clocked at pin 2 from the prescaler output. The terminal count outputs of each counter are tied to the enable inputs of the following counters. U6 is decremented one count when U7 goes through a terminal count. When U6 has counted down to state zero, its terminal count output is delayed for an additional 100 clock pulses. At this point, U6's Enable T input is brought low by U7, passing U6's delayed terminal count to U5. U5 is decremented one count when it receives U6's terminal count. U5, U6 and U7 count down until U5 reaches a terminal count condition. At this point the reset line is brought low, reloading the counters to their preset values.

3.6.3.2.5 Swallow Counter, U8

Swallow counter, U8, is wired as a presettable down-counter and is clocked at pin 2 from the prescaler output. At the beginning of the count cycle, U8 is loaded with its preset value and begins counting down. Each clock pulse from the prescaler decrements U8 by one count. When U8 reaches its terminal count, zero detector U3A brings U8's Enable P input high. This disables the swallow counter for the remainder of the count cycle.

3.6.3.2.6 Count Sequence

Table 3-7 illustrates the count-down sequence of the 1st LO divider for two tuned frequency settings, 00.00XXX MHz and 29.99XXX MHz. For a receiver setting of 00.00XXX MHz, the first LO counter presets are loaded with 5271 by BCD adders U9, U10, U11 and U12. The swallow counter, U8, and the programmable counter, U5, U6 and U7, are both decremented by 1 prescaler output pulse for each 11 prescaler input pulses. When the swallow counter reaches its terminal count, it is disabled and the prescaler divide mode changes to 10. When the programmable counter reaches terminal count, the cumulative number of pulses into the prescaler equals 4291. Since the loop reference frequency equals 20 kHz, the VCO frequency is 4291 times 20 kHz, or 85.82 MHz. The VCO output to the mixer is divided by 2, resulting in an actual LO output of 42.91 MHz. This is the 1st LO frequency corresponding to a receiver tuned frequency of 00.00XXX MHz.

For a receiver setting of 29.99XXX, the 1st LO counter presets are loaded with 8270 by BCD adders U9, U10, U11 and U12. Since the swallow counter, U8, is initially loaded with zero, the counting cycle begins with the swallow counter at terminal count and the prescaler divide mode at 10. The programmable counter, U5, U6 and U7 is decremented by 1 count for each 10 prescaler input pulses. When the programmable counter reaches terminal count, the cumulative number of pulses into the prescaler equals 7290. The VCO output frequency is thus 7290 times 20 kHz or 145.80 MHz. The actual LO output is 72.90 MHz (145.80 MHz 2) which is the 1st LO frequency corresponding to a receiver tuned frequency of 29.99XXX MHz.

3.6.4 TYPE 796107 2nd LO SYNTHESIZER

3.6.4.1 Functional Description

The 2nd LO tunes from 32.20001 to 32.21000 MHz in 10 Hz steps. Three phase lock loops are utilized to produce the 2nd LO output. The 2nd LO functional block diagram is shown in Figure 3-19.

Table 3-7. 1st LO Divider Countdown Cycles

Prescaler Mode	Pulses Into Prescaler New	Pulses Into Prescaler Cum	Prescaler Output Pulses	U8	U7	U6	U5	COMMENTS
11	0	0	0	1	7	2	5	Tuned freq. = 00.00XXX MHz
	11	11	1	0	6	2	5	Swallow CTR Terminal Count
10	10	21	1	0	5	2	5	
	50	71	5	0	0	2	5	
	10	81	1	0	9	1	5	U4 Terminal Count
	100	181	10	0	9	0	5	U5 Terminal Count Disabled
	90	271	9	0	0	0	5	
	10	281	1	0	9	9	5	
	900	1181	90	0	9	0	4	U5 Terminal Count Disabled
	90	1271	9	0	0	0	4	
	10	1281	1	0	9	9	3	
	900	2181	90	0	9	0	3	U5 Terminal Count Disabled
	90	2271	9	0	0	0	3	
	10	2281	1	0	9	9	2	
	900	3181	90	0	9	0	2	U5 Terminal Count Disabled
	90	3271	9	0	0	0	2	
	10	3281	1	0	9	9	1	
	900	4181	90	0	9	0	1	U5 Terminal Count Disabled
	90	4271	9	0	0	0	1	
	10	4281	1	0	9	9	0	
	10	4291	1	1	7	2	5	U6 Terminal Count Reload
	4291 x 20 kHz = 85.82 MHz							
10	0	0	0	0	7	2	8	Tuned freq. = 29.99XXX MHz
	70	70	7	0	0	2	8	
	10	80	1	0	9	1	8	
	90	170	9	0	0	1	8	
	10	180	1	0	9	0	8	U5 Terminal Count Disabled
	90	270	9	0	0	0	8	
	10	280	1	0	9	9	7	
	900	1180	90	0	9	0	7	U5 Terminal Count Disabled
	90	1270	9	0	0	0	7	
	10	1280	1	0	9	9	6	
	5900	7180	590	0	9	0	1	U5 Terminal Count Disabled
	90	7270	9	0	0	0	1	
	10	7280	1	0	9	9	0	
	10	7290	1	0	7	2	8	U6 Terminal Count Reload
	7290 x 20 kHz = 145.80 MHz							

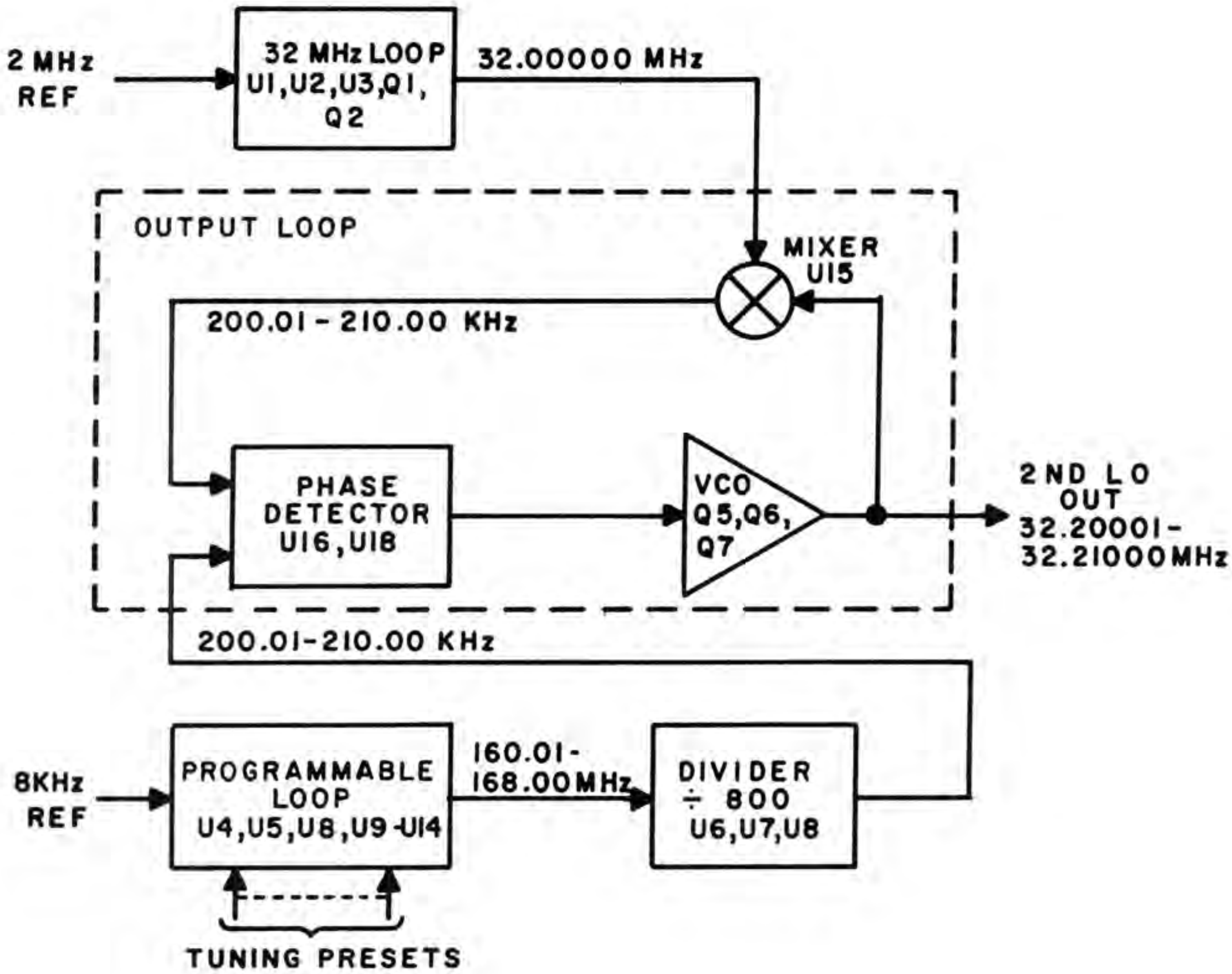

Figure 3-19. 2nd LO Functional Block Diagram

The 32 MHz loop receives a 2 MHz reference signal and translates it into a 32 MHz reference signal. The programmable loop receives an 8 KHz reference signal and tuning preset data from the digital control section, producing an output frequency of 160.01 to 168.00 MHz. A divide-by-800 divider stage reduces this output to 200.01 to 210.000 kHz. The output loop combines the 32 MHz signal and the 200.01 to 210.00 kHz signal to produce the 32.20001 to 32.21000 MHz 2nd LO output signal.

An explanation of the 2nd LO output loop operation will clarify the overall operation of this synthesizer. The phase detector, U16, will be satisfied when the mixer output is equal in phase and frequency to the divide-by-800 divider output. The phase detector achieves this condition by shifting the VCO so the difference between the 2nd LO output frequency and the 32 MHz reference frequency is equal to the divider output frequency.

3.6.4.2 Circuit Description

The 2nd LO will be discussed in the following order: 32 MHz loop, programmable loop and output loop. Refer to the 2nd LO schematic diagram, Figure 6-20, as an aid in understanding circuit operation.

The 32 MHz loop uses the basic configuration shown in Figure 3-12. VCO output from Q1 is applied to buffer Q2. Output from Q2 is tapped and routed through divide-by-16 counter U3, dividing the 32 MHz VCO output down to 2 MHz. This signal and the 2 MHz reference signal from the time base are compared in phase detector U1. The dc voltage from U1 varies the capacitance of varactor diode CR1, which varies the oscillation frequency of VCO Q1. Q2 is a buffer amplifier with two isolated outputs. One output drives divider U3 as stated above. The other output is applied to mixer U15. In operation, phase detector U1 maintains the divider output frequency equal to the 2 MHz reference frequency by holding the VCO precisely at 32 MHz.

The programmable phase lock loop incorporates a two-modulus prescaler, swallow counter, phase detector, filter and VCO. The output from this loop at Q8 is applied to U6 and U9. U9 and U10 form a two-modulus prescaler with divide ratios of 100 and 101. U10 divides by 11 when $\overline{PE1}$ and $\overline{PE2}$ are both held low. This will occur only during the swallow counting sequence when $\overline{PE1}$ is held low by U12. At the beginning of the counting sequence, $\overline{PE1}$ is low and $\overline{PE2}$ is held high by U10. U9 divides by ten for 90 input pulses from the VCO and passes nine pulses to U10's CLK input. At this point, U10's TC output goes low for one input pulse, simultaneously bringing $\overline{PE2}$ on U9 low. This enables U9 to divide by 11 once. Dividing by 10 nine times (9 x 10) and dividing by 11 once (1 x 11) results in a divide ratio of 101 (90 + 11). This division of 101 continues until the swallow counter, U11 and U12, reaches terminal count. At this point, U12 brings $\overline{PE1}$ on U9 high, and the prescaler divides by 100 (9 x 10 + 1 x 10) for the remainder of the counting cycle.

The swallow counter consists of U11 (a decade counter) and U12 (a binary counter). The counter can be loaded with any number between 00 and 99, inclusive. During a load pulse, U11 and U12 are loaded to their preset values. U12's $Q_B$and $Q_D$outputs both go low, bringing $\overline{PE1}$ on U9 low. This sets the prescaler to divide by 101 as described above. When U12 reaches state 1010, $Q_B$and Q_D go high, bringing $\overline{PE1}$ on U9 high and setting the prescaler to divide by 100. At the same time, the U11 and U12 EN$\overline{P}$ inputs are brought high, disabling the swallow counter for the remainder of the count cycle. Because U11 and U12 operate in an up-counting mode, U1 will be in state 0000 when U12 is clocked to state 1010. This sets the terminal count for the swallow counter at 100 (10 + 0).

The main programmable counter consists of binary counter U13 and U14. U13 can be loaded with any value between 0 and 9, and U14 is always loaded with 2. During a counting cycle, U13 and U14 count up synchronously until terminal count is reached at U14. At this point, U14 and U13 are at states 15 and 1 respectively. The 15 in the second digit (U14) is worth 240 (15 x 16) so the terminal count is 240 (U14) + 1 (U13) = 241. Each count of the programmable counter is equal to 100 counts of the overall divider chain, so the actual terminal count for the programmable counter is 241 x 100 = 24100.

Combining the terminal counts of the swallow and programmable counters will yield the overall terminal count. The swallow counter terminal count is 100 and for the programmable counter is 24100. Terminal count for the whole chain is 24100 + 100 = 24200. The programmable counter is always loaded with 32 plus the preset input to U13. The swallow counter is loaded with the preset inputs to U11 and U12. The overall divider chain is therefore loaded with 3200 (32 x 100) plus the inputs to U13, U12 and U11.

Assume 000 is loaded into the 2nd LO. The preset input is 3200 + 000 = 3200. The divide ratio is 24200 - 3200 = 21000. Assume 999 is loaded. The preset input is 3200 + 999 = 4199 and the divide ratio is 24200 - 4199 = 20001.

The output of the programmable loop VCO enters the counter at pin 16 of U9 and exits at pin 11 of U14. The VCO signal is divided by 21000 for a tuned frequency of XX.XX000 MHz and by 20001 for a frequency of XX.XX999 MHz. The divided output goes to phase detector U4 where it is compared with the 8 kHz reference from the Time Base. The phase detector output is filtered by U5 and applied to varactor diode CR4 in the VCO circuit. In actual operation, phase detector U4 controls the VCO frequency so the divided output frequency equals 8 kHz, the reference frequency. For a dial setting of XX.XX000 the VCO frequency is 8 kHz x 21000 = 168.00 MHz and for a dial setting of XX.XX999, the VCO frequency is 8 kHz x 20001 = 160.01 MHz.

The VCO output goes through an additional counter composed of U6, U7 and U8. This divide-by-800 counter divides the VCO output frequency range of 168.00-160.01 MHz down to 210.00-200.01 kHz and applies it to the phase detector U16 in the output loop.

The output loop consists of a phase detector, U16 and U18, a VCO, Q5, Q6 and Q7, and a mixer, U15. The VCO normally operates with an output frequency between 32.20001 MHz and 32.21000 MHz. The VCO output is tapped from the collector at Q5 and applied to mixer U15. The mixer combines the VCO signal with the 32 MHz reference signal and produces a difference frequency range of 200.010 kHz to 210.000 kHz. The phase detector, U16, receives inputs from the mixer and the programmable loop. The output from the phase detector is filtered by U18 and applied to varactor diode, CR3, in the VCO.

Operation of the output loop is as follows: With a dial setting of XX.XX000, the output from the programmable loop is 210.00 kHz. The phase detector, U16, sets the output loop VCO frequency at 32.21000 MHz. The mixer, U15, mixes this frequency with the 32 MHz reference signal, producing an output frequency of 210.00 kHz. The phase detector sees a frequency of 210.00 kHz on both inputs and holds the VCO at 32.21000 MHz. If the dial setting is changed to XX.XX999 MHz, the programmable loop output frequency changes to 200.01 kHz. The phase detector changes the VCO frequency to 32.20001 MHz, which changes the mixer output to 200.01 kHz. The phase detector now sees a frequency of 200.01 kHz on both inputs and holds the VCO at 32.20001 MHz.

The VCO output signal also enters buffer amplifier, Q7, where it is amplified and output as the 2nd LO signal.

3.6.5 TYPE 796109 3rd LO SYNTHESIZER

The 3rd LO Synthesizer is part of the BFO/3rd LO board, 796109. The 3rd LO has an input of two reference frequencies and utilizes a phase lock loop and digital mixer to produce a fixed output frequency of 11.155 MHz.

3.6.5.1 Functional Description

Figure 3-20 is a functional block diagram of the 3rd LO. The VCO is a crystal-controlled oscillator whose output frequency is slightly adjustable by varactor diode CR6. The buffered 11.155 MHz VCO output is converted to square pulses by U16 and fed to the digital mixer. The digital mixer produces an output frequency equal to the difference between the VCO frequency (11.155 MHz) and the frequency that is the nearest integral multiple of the 50 kHz reference (223 x 50 kHz = 11.15 MHz). In this case, the difference is 5 kHz. The phase detector compares the digital mixer output with the 5 kHz reference and adjusts the VCO frequency as necessary to hold the digital mixer output at 5 kHz.

3.6.5.2 Circuit Description

A detailed description of 3rd LO operation follows. Refer to Figure 6-21, the BFO/3rd LO Schematic Diagram as an aid in understanding the operation of the 3rd LO.

The 11.155 MHz crystal, Y1, in conjunction with Q4, form a crystal-controlled oscillator. Due to the stabilizing effect of Y1, the normal frequency of oscillation of the VCO will be quite close to 11.155 MHz. The actual VCO frequency, however, is determined by the net capacitance, composed of C30, C31 and varactor CR6, in series with Y1.

The VCO output signal from Q4 is amplified by Q5, a broad-band buffer amplifier. This isolates the VCO and boosts the VCO signal level. The buffer amplifier provides two separate, isolated outputs: the signal at the collector is tapped and leaves the 3rd LO board as the 3rd LO output signal; the signal at Q5's emitter is tapped and fed to the sine-TTL converter, U16.

U16A is wired as a Schmitt-trigger inverter. The sine wave VCO signal from Q5 enters U16A and is changed to square wave pulses by virtue of the "snap-action" hysteresis of the Schmitt-trigger. U16B is wired as an inverter and serves to sharpen up the edges of the square wave output from U16A.

The digital mixer, U14A, is a D-type flip-flop. The inputs to the digital mixer are the 50 kHz reference and the square-wave 11.155 MHz VCO signal from the sine-TTL converter. The output, $\overline{Q}$, of U14A, is a square wave whose frequency is the difference between the flip-flop D-input frequency (11.155 MHz) and the nearest integral multiple of the clock input frequency (50 kHz reference). In this case the difference is 11.155 MHz - (223 x 50 kHz) = 5 kHz. The 5 kHz output from the digital mixer is fed to the phase detector, U15.

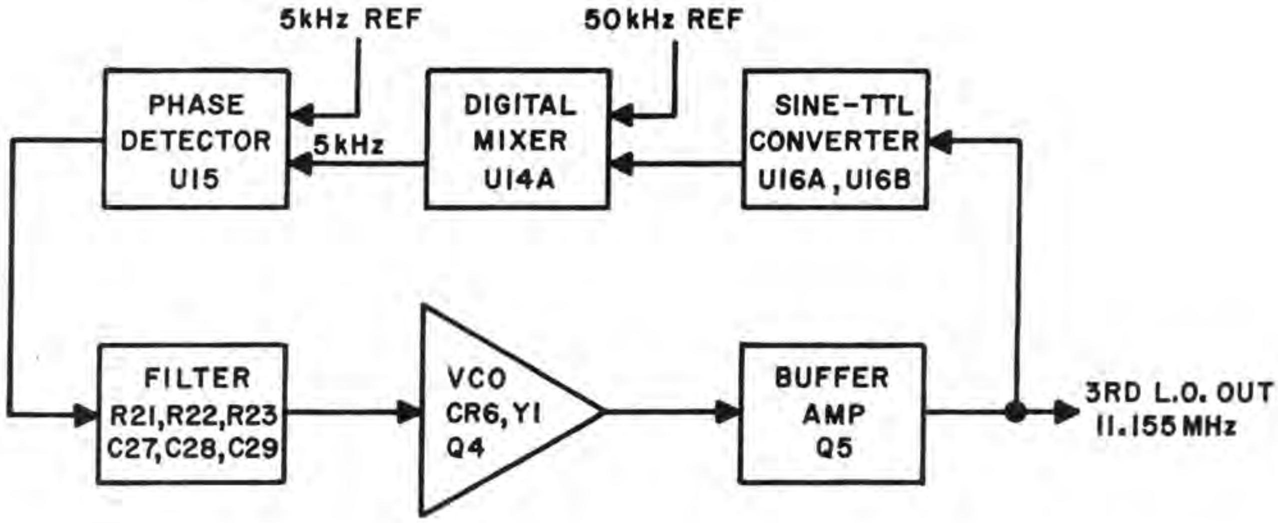

Figure 3-20. 3rd LO Functional Block Diagram

The phase detector, U15, compares the 5 kHz output from the digital mixer with the 5 kHz reference signal. Any difference in frequency or phase between the two inputs is reflected as a change in the pulse output of U15. After suitable filtering, the pulse output from U15 is a dc voltage which is applied to varactor diode, CR6, in the VCO circuit. By controlling the dc voltage on CR6, the phase detector can vary the VCO frequency so as to maintain its frequency of oscillation at 11.155 MHz and thus keep the output of the digital mixer at 5 kHz.

3.6.6 TYPE 796109 BFO SYNTHESIZER

The BFO Synthesizer is part of the BFO/3rd LO board, 796109. This synthesizer utilizes the two modulus configuration shown in Figure 3-14 to produce an output of 455 kHz ±8.0 kHz.

3.6.6.1 Functional Description

A functional block diagram of the BFO is shown in Figure 3-21. The VCO operates at a frequency of 4.470 MHz to 4.630 MHz. A presettable divider with divide ratios of 4470 to 4630 divides the VCO output frequency down to 1 kHz. The actual divide ratio is determined by the BFO preset input from the Digital Control Section. The phase detector compares the divider output with the 1 kHz reference signal and shifts the VCO frequency as necessary to maintain the divider output at 1 kHz. An output divide-by-10 divider reduces the VCO frequency to between 447.0 kHz and 463.0 kHz as required by the product detector.

3.6.6.2 Circuit Description

Refer to the BFO Functional Block Diagram, Figure 3-21, and the BFO Schematic Diagram, Figure 6-21, to aid in understanding the circuit descriptions presented below.

3.6.6.2.1 Counting Cycle

A presettable, divide-by-N counter is used to divide the VCO frequency down to 1 kHz. The counter consists of three parts: prescaler, swallow counter and programmable counter.

U12 is a binary up-counter wired as a two-modulus prescaler with divide ratios of ten and eleven. The actual divide ratio is determined by U12's preset inputs which in turn are determined by the state of the swallow counter.

The swallow counter and the programmable counter both receive the same clock pulse for the prescaler output. When the swallow counter is in the counting mode, that is, has not reached terminal count, the prescaler is preset with 11 and operates in the divide-by-11 mode. When the swallow counter reaches terminal count, the zero detector simultaneously disables the swallow counter and changes the prescaler count to 10. The prescaler divides by ten for the remainder of the count cycle.

The end of cycle detector is activated when the programmable counter reaches its terminal count condition. At this point, one clock pulse is sent to the phase detector and both counters are reset to their preset values.

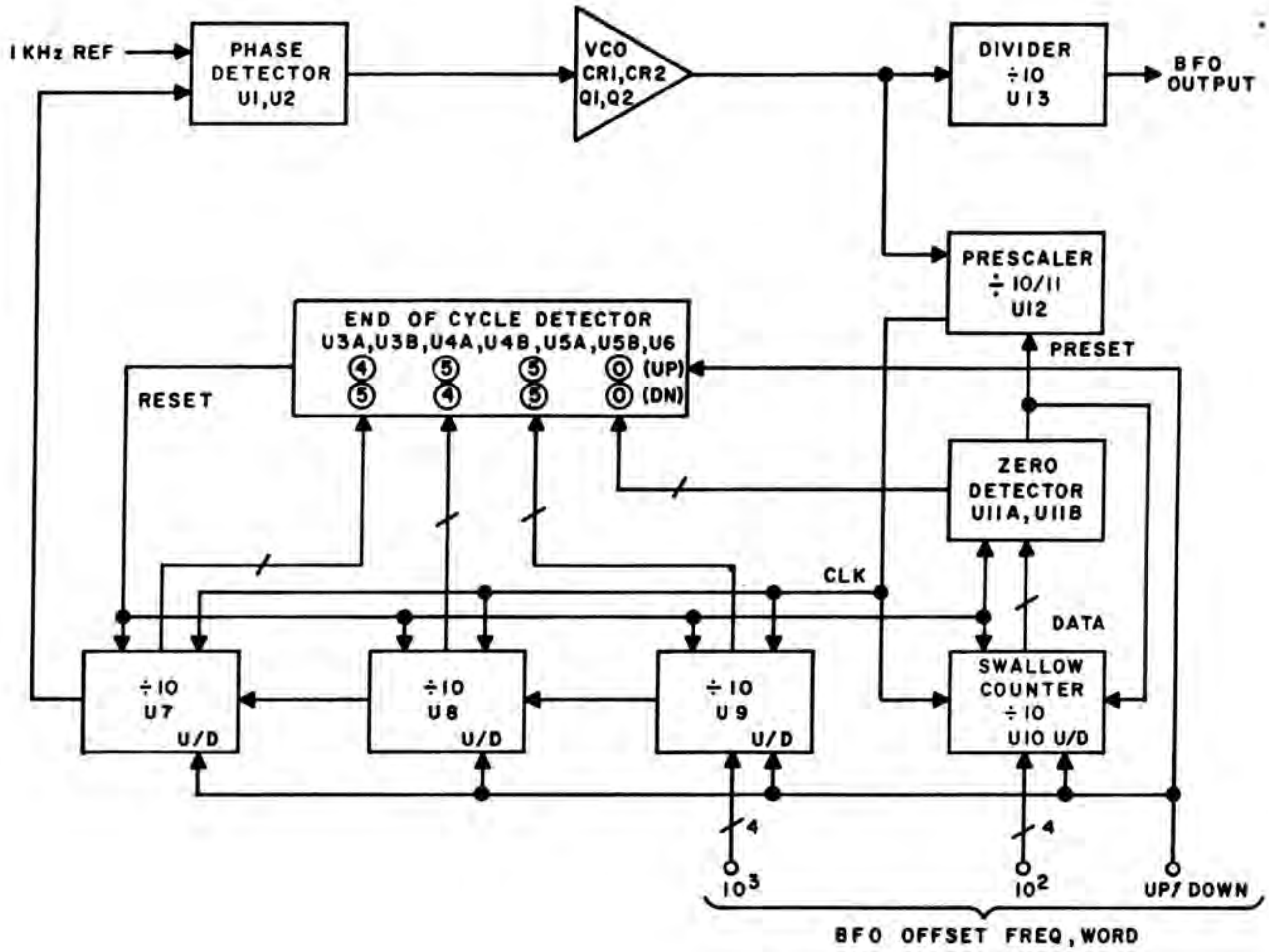

Figure 3-21. BFO Functional Block Diagram

3.6.6.2.2 Prescaler, U12

The prescaler input frequency ranges from 4.470 to 4.630 MHz. The prescaler divides this by 11 or 10 depending on the state of its preset inputs. U12 is a binary counter, wired to count down. At the beginning of the count cycle, U12's ripple count output loads it with the preset value of 11. U12 then acts as a divide-by-11 divider. When the swallow counter reaches terminal count, the zero detector changes U12's preset value to 10. U12 then acts as a divide-by-10 divider.

3.6.6.2.3 Swallow Counter

The BFO Synthesizer swallow counter is formed by U10, a presettable binary up/down counter. U10's preset inputs can be preset from zero to nine by the BFO Offset Frequency Word. At the beginning of the count cycle, U10's "CI" input is held low by the zero detector. Under this condition, the swallow counter and the programmable counter both increment or decrement by one count for each clock pulse from the prescaler. When U10 reaches state zero, the zero detector sees this as a terminal count condition. The prescaler is then changed to divide-by-ten and U10's "CI" input is brought high, disabling the swallow counter for the remainder of the count cycle. At the completion of the count cycle, the reset pulse from the End of Cycle Detector loads U10 to its preset value. The zero detector then brings U10's "CI" input low again, readying the swallow counter for another count cycle.

3.6.6.2.4 Programmable Counter

The programmable counter is formed by U7, U8 and U9. U7 and U8 are preset with zero. U9 is preset from the BCD Offset Frequency Word. The three counters are cascaded with a clock input from the prescaler. U9 cascades to U8 and clocks U8 on its 1 to 0 transition when down-counting, or on its 9 to 0 transition when up-counting. U8 cascades to U7 in similar fashion.

The programmable counter counts from the preset values of U7, U8 and U9 down to a terminal count of 545 when down-counting, or up to a terminal count of 455 when up-counting. At terminal count, the End of Cycle Detector sends out a reset pulse which resets the programmable counters to their preset value.

3.6.6.2.5 End of Cycle Detector

The terminal counts of both the swallow counter and the programmable counters are detected by the End of Cycle Detector, U3A, U3B, U4A, U4B, U5A, U5B and U6. The End of Cycle Detector monitors the logic state outputs of the programmable counter and the output of the swallow counter zero detector. The detector has three terminal count values: for + offsets with X.0 kHz loaded, terminal count is 4550; for + offsets with X.X kHz loaded, terminal count is 4540; for all - offsets, terminal count is 5450. Changes in the detector are programmed by the Offset Sign line.

The programmable and swallow counters begin at their preset values and count up to 4550 for + offsets; for - offsets, they begin at their preset values and count down to 5450. When terminal count is reached, the output of U4B goes high, clocking flip-flop U3A. The output of U3A, which is the reset pulse, goes high for about one microsecond. It is then reset to zero by R18 and C49 acting on the Reset pin.

3.6.6.2.6 Count Sequence

The BFO Synthesizer countdown sequence will now be examined and will facilitate understanding the overall operation. Several BFO offset settings will be discussed for illustrative purposes.

First we will consider "+" offset settings. Under this condition, the Offset Sign line is low, the programmable counter is set for down counting and the End of Cycle Detector is set for a terminal count of 5450.

Assume an offset setting of +0.0 kHz. The swallow counter will be preset with zero. Thus, at the start of the count cycle, the swallow counter will be disabled and the prescaler set for divide-by-ten. The programmable counter will start from zero and count down to 545. Total pulses from the VCO will be 0(0) + 10(000-545) = 4550. VCO frequency is (1 kHz) x (4550) = 4.550 MHz.

Assume an Offset setting of +7.9 kHz. The swallow counter will start counting from 9 and the programmable counter at 007. Total pulses from the VCO will be 11(9-0) + 10((007-545) -9) = 4629. VCO frequency is (1 kHz) x (4629) = 4.629 MHz.

Next, we will consider "-" offset settings. Under this condition, the Offset Sign line is high, the programmable counter is set for up-counting and the End-of-Cycle Detector is set for a terminal count of 4550.

Assume an offset setting of - 0.0 kHz. The swallow counter will be preset with zero. Thus, at the start of the count cycle, the swallow counter will be disabled and the prescaler set for divide-by-10. The programmable counter will start from zero and count up to 455. Total pulses from the VCO will be 0(0) + 10(455-000) = 4550. VCO frequency is (1 kHz) x (4550) = 4.550 MHz.

Assume an offset setting of -7.9 kHz. The swallow counter will start counting from 9 and the programmable counter from 007. Total pulses from the VCO will be 11(0-9) + 10((454-007)-1) = 4471 VCO frequency is (1 kHz) x (4471) = 4.471 MHz.

The VCO signal at Q2 has a frequency range of 4.470 MHz to 4.630 MHz. U13 is a decade counter wired as a divide-by-10 divider. The output of U13 is the BFO signal with a frequency range of 4470 kHz to 463.0 kHz.

3.6.7 TYPE 796111 TIME BASE GENERATOR

3.6.7.1 Functional Description

The heart of the Time Base is the 2 MHz temperature compensated crystal oscillator (TCXO), U1. U1 generates a highly stable signal adjustable to within ± 1 Hz of 2 MHz. The 2 MHz signal is run through a series of divide-by-N counters to reduce it to frequencies of 50 kHz, 20 kHz, 8 kHz and 5 kHz as required by the various receiver synthesizers. A functional block diagram of the Time Base Generator is presented in Figure 3-22.

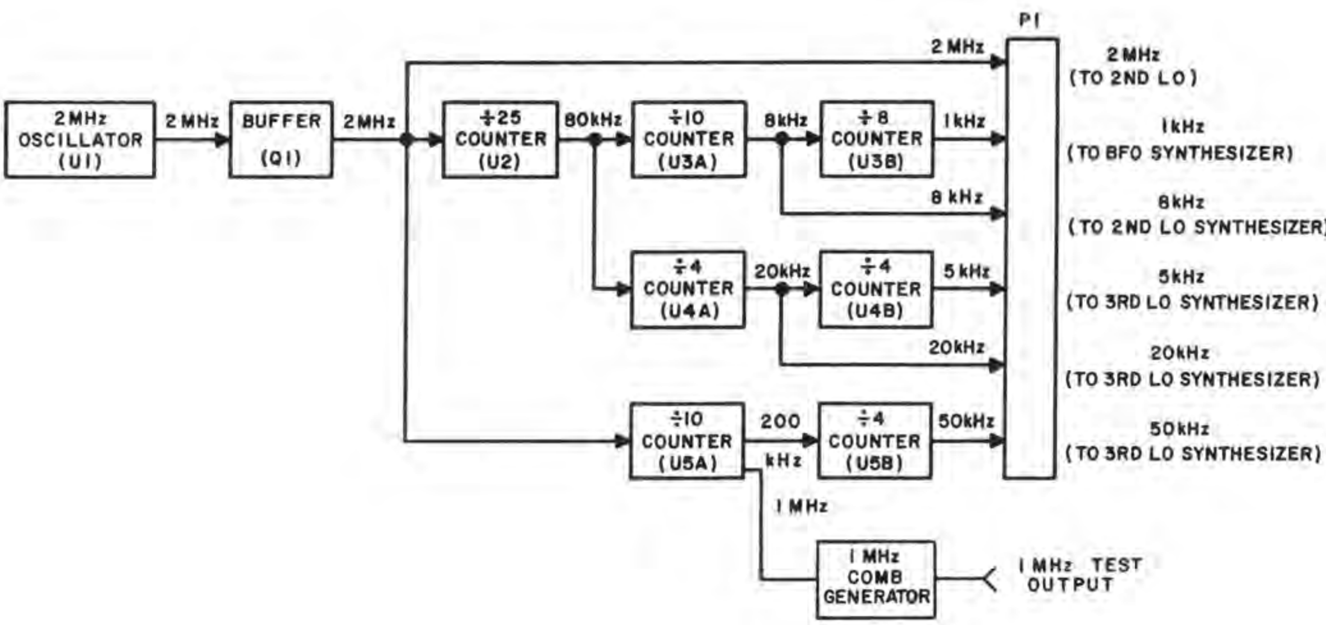

Figure 3-22. Time Base Functional Block Diagram

3.6.7.2 Circuit Description

Refer to Figure 6-17, Time Base Generator Schematic Diagram. The low-level, temperature-stable 2 MHz signal from U1 is amplified by Q1, which also serves to isolate U1 from the divider circuitry. Q1's output is split three ways: to P1-7 which feeds a 2 MHz reference signal to the 2nd LO; to dividers U2 and U5A.

U2 is a dual divide-by-N BCD counter. It is wired to function as a divide-by-25 divider. U2 takes the 2 MHz signal from Q1 and reduces it to 80 kHz. The 80 kHz output from U2 is then sent to U3A and U4A.

U3A is a BCD up-counter wired as a divide-by-10 divider. It reduces the 80 kHz signal from U2 to 8 kHz. This 8 kHz signal goes to P1-6 where it is fed to the 2nd LO. The 8 kHz signal also goes to U3B which is wired as a divide-by-8 divider. It reduces the 8 kHz from U3A to 1 kHz. This 1 kHz signal goes to P1-5 where it is fed to the BFO Synthesizer.

U4A is a BCD up-counter wired as a divide-by-4 divider. It reduces the 80 kHz signal from U2 to 20 kHz. This 20 kHz signal goes to P1-8 where it is fed to the 3rd LO. The 20 kHz signal also goes to U4B which is wired as a divide-by-4 divider. It reduces the 20 kHz signal from U4A to 5 kHz. This 5 kHz signal goes to P1-4 where it is fed to the 3rd LO.

U5A is a BCD up-counter wired as both a divide-by-2 and a divide-by-10 divider. The 2 MHz signal from U2 is fed to the Clock input of U5A. U5A's divide-by-2 output provides a 1.0 MHz signal which goes to J1, the 1.0 MHz test output jack. U5A's divide-by-10 output provides a 200 kHz signal which goes to U5B.

U5B is a BCD up-counter wired as a divide-by-4 divider. It reduces the 200 kHz signal from U5A to 50 kHz. This 50 kHz signal goes to P1-3 where it is fed to the 3rd LO.

3.6.8 TYPE 796117 SYNTHESIZER MOTHERBOARD

The Synthesizer Motherboard provides for the interconnection of the Digital Control, the three Synthesizer Boards, Time Base and LO outputs. Functionally, the Motherboard accomplishes the following:

1. Inputs Frequency Word Data, BFO Offset Data and control signals from the Digital Control.
2. Distributes Frequency Word Data to 1st and 2nd LO Synthesizers.
3. Routes BFO offset data to the BFO Synthesizer.
4. Distributes control signals to appropriate synthesizers.
5. Distributes Time Base reference signals to appropriate synthesizers.
6. Distributes LO output signals to appropriate receiver mixers.

3.6.8.1 Circuit Description

Refer to Figure 6-16, the Synthesizer Motherboard Schematic Diagram. Tuned frequency data enters the Motherboard on J2, pins 1-18 and 27-40. BFO Offset Frequency Data enters on J2, pins 19-26. The Tuned Frequency and BFO offset data pass through the Motherboard in a bus format and exit as BCD Output Data on J1.

The 1st LO plugs into A2P1 on the Motherboard and receives Tuned Frequency Data from J2, pins 15-18 and 27-40. The 2nd LO plugs into A3P1 and A3P2 on the Motherboard and receives Tuned Frequency Data from J2, pins 1-12. The 3rd LO/BFO plugs into A4P1 and A4P2 on the Motherboard. The BFO receives Offset Frequency Data from J2, pins 13 and 19-26.

The Time Base plugs into A1P1 on the Motherboard and distributes the following reference signals to the Synthesizers: 20 kHz to the 1st LO; 2 MHz and 8 kHz to the 2nd LO; 50 kHz and 5 kHz to the 3rd LO; 1 kHz to the BFO.

The output signals from the 1st and 2nd LO's come directly from their assemblies and do not route through the Motherboard. The BFO output goes through J8 on the Motherboard and the 3rd LO output goes through J9.

3.6.9 TYPE 796139 POWER SUPPLY

The Power Supply receives +22-32 Vdc from an external power pack and converts it to the +5 Vdc and the ±15 Vdc required by the various receiver circuits.

3.6.9.1 Circuit Description

Refer to Figure 6-26, Power Supply Schematic Diagram. Direct current voltage in the range of +21 to +32 Vdc is input to the receiver via J1 on the rear panel. The dc voltage is applied to dc-to-dc converters PS1 and PS2.

PS1 is designed to operate at a nominal input voltage of +24 Vdc, although it will operate satisfactorily with input voltages as low as +21 Vdc. PS1 converts the input voltage to a square wave which is fed to a step-down toroidal transformer. The transformer output is rectified and filtered by L1 and C2 to produce a ripple-free +5 Vdc output.

Zener diode VR1 and transistor Q1 collectively form an input voltage regulator. For input voltages between +24 and +32 Vdc, VR1 is clamped, maintaining the input voltage to PS1 at +24 Vdc. By so regulating the input voltage, the +5 Vdc output is maintained within acceptable limits.

PS2 also operates with a nominal input of +24 Vdc. PS2 converts the input voltage to a square wave which is fed to a step-up toroidal transformer with a center-tapped primary. A bridge rectifier converts the transformer output to + and - dc voltages with the center tap as ground. The + and - voltages are filtered by L2 and C5, and L3 and C8, to produce ripple-free ±15 Vdc outputs.

VR2 and Q2 operate as VR1 and Q1 above to form an input voltage regulator. The input to PS2 is clamped at +24 Vdc for input voltages between +24 and +32 Vdc. Regulating the input maintains the ±15 Vdc outputs within acceptance limits.

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SECTION IV

MAINTENANCE

4.1 GENERAL

This section contains maintenance information and procedures for the WJ-8770 HF Receiver. Included are preventive maintenance procedures, performance verification tests, troubleshooting and fault isolation procedures, repair information and alignment procedures. The troubleshooting procedures in this section are of sufficient depth to allow fault isolation to the component level.

4.2 TEST EQUIPMENT REQUIRED

All test equipment required to perform the maintenance procedures given in this section are listed in Table 4-1. Equivalent test equipment may be substituted for that listed.

4.3 TEST FACILITIES

The following items describe the minimum test facility requirements for performing maintenance of the WJ-8770 HF Receiver.

1. Power - A primary source of ac power capable of supplying 115 Vac at 5.0 amperes minimum is required to operate the test equipment. A source of dc power capable of supplying 22 - 32 Vdc at 0.6 amperes is required to operate the receiver.
2. Work Area - A test bench is required with sufficient area to support the receiver and all required test equipment.
3. Environment - Unless otherwise specified, the following environmental conditions shall be observed.
   a. Temperature - $+25^{o}C \pm 5^{o}C$ ($+77^{o}F \pm 9^{o}F$)
   b. Humidity - 90% Max.
   c. Altitude - Room Ambient

4.4 PREVENTIVE MAINTENANCE

The receiver has been designed for optimum performance over extended periods of time with minimal maintenance. However, to improve the reliability of the receiver and prevent breakdowns, cleaning, visual inspections, and performance tests should be accomplished as part of a preventive maintenance routine, as outlined in Table 4-2.

Table 4-1. Test Equipment Required

Instrument Type	Required Characteristics	Recommended Instrument
Signal Generator	AM, FM, CW, RF output, from -130 dBm to 0 dBm	HP8640B
Oscilloscope	dc to 50 MHz	HP180C
RF Voltmeter	1 mV to 3.0V; -50 dBm to +20 dBm	Boonton 92B
Power Supply	0 - 40 volts, 0 - 1.5 Amp.	HP-6289A
Spectrum Analyzer	100 kHz - 110 MHz	HP-141T, 8553B, 8552B
Digital Counter	0 to 500 MHz	HP5303A
AC Voltmeter	1 mV to 300V, full scale	HP-400E
DVM	dc ranges; 1% or better	Fluke 8100A
Dummy Load, 600 Ω	4-W dissipation	Two 1200 Ω, 2-W resistors in parallel
Headphones	Mono, 600 Ω impedance	Telex 820-4
Tracking Generator	100 kHz - 110 MHz	HP-8443A

Table 4-2. Periodic Maintenance Schedule

Procedure	Interval	Comments
Cleaning	60 days	Interval variable depending on the operating environment.
Lubrication	30 days	Interval variable depending on equipment use.
Inspection for Damage	60 days	Interval variable depending on operating environment and equipment use.
Performance Tests	180 days	Interval variable depending on operating environment and equipment use.
Adjustment/Alignment	--	Adjustment/Alignment keyed to results of Performance Tests.

4.4.1 CLEANING

Cleaning should be performed to remove accumulated dust, grease, and other contamination, and to ensure trouble-free operation.

CAUTION

Avoid the use of chemical cleaning agents containing benzene, toluene, zylene, acetone, or similar solvents. These chemicals may damage the plastics used in this receiver.

1. Exterior - Dust the cabinet with a soft cloth. Dust the front panel controls with a small soft-bristled paint brush. Dirt clinging to the cabinet may be removed with a clean, lint-free cloth dampened with a mild detergent and water solution. Avoid using abrasive cleaners. They will scratch the front panel.

2. Interior - Dust in the interior of the unit should be removed before it builds up enough to cause arcing and short circuits during periods of high humidity. Dust is best removed by dry, low-pressure air. Dirt clinging to surfaces may be removed with a soft-bristled paint brush or a clean, lint-free cloth dampened with a mild detergent and water solution. Use a cotton tipped applicator for cleaning in narrow spaces and on the circuit boards.

4.4.2 LUBRICATION

The optical encoder assembly shaft requires periodic lubrication to prevent excessive wear. The other rotating assemblies in the receiver are sealed and do not require lubrication. To lubricate the encoder assembly shaft, perform the following steps:

CAUTION

Excessive lubrication of the encoder shaft may destroy the optical characteristics of the encoder wheel.

1. Place the receiver in a vertical position and remove the encoder knob.

2. Apply one (1) drop of SAE 5W-20W oil to the encoder shaft at the retaining ring.

3. Reassemble the encoder assembly knob and rotate the knob several times to distribute the lubricant.

4.4.3 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing faults can be detected by making a visual inspection of the unit. For this reason, a complete visual inspection should be made on a routine basis and whenever the receiver is inoperative. At a minimum, the following items should be visually inspected.

1. Inspect the equipment covers and front panel for condition of finish and panel markings.
2. Inspect for dents, punctures, or warped areas.
3. Inspect quarter-turn fasteners and receptacles.
4. Inspect the external surfaces for loose or missing screws or washers.
5. Inspect the receptacles for conditions of pins, contacts, and mountings.
6. Inspect the internal components for signs of deterioration, discoloration, or charring. Check for melted insulation and damaged, cracked, or broken components.
7. Inspect the printed circuit boards for damaged tracks, loose connections, corrosion, or other signs of deterioration.
8. Inspect the PC connectors, interface connectors, and chassis wiring for excessive wear, looseness, misalignment, corrosion, or other signs of deterioration.

4.5 PERFORMANCE TESTS

4.5.1 GENERAL

The Performance Tests outlined in this Section define the Minimum Performance Standards which ensure receiver operability in all detection modes, gain modes and IF bandwidths. The given tests should be used for initial inspection, for preventive maintenance checks, to develop specific fault symptons for troubleshooting or to verify receiver performance after repairs have been made.

4.5.2 MINIMUM PERFORMANCE STANDARDS

Table 4-3 summarizes the parameters tested by the Performance Tests. To be acceptable for use, the receiver should meet or exceed all minimum performance standards listed.

Table 4-3. Receiver Minimum Performance Standards

Parameter to be Tested	Performance Standard
Receiver Gain, Input to IF Out	82 dB ±2 dB on all bandwidths
S/N Ratio, Input to IF Out	10 dB with -103 dBm input level and 4 kHz bandwidth
AM Detection Mode, Input to Phone Out	Audibility in headphones with -97 dBm input and 50% modulation
Record Audio Out in AM Mode	1.0 Vac into 600 Ω with -97 dBm input and 50% modulation.
CW Detection Mode, Input to Phone Out	Audibility in headphone with -97 dBm unmodulated input
FM Detection Mode, Input to Phone Out	Audibility in headphones with -97 dBm input and 4.8 kHz deviation
USB, and LSB Detection Modes, Input to Phone Out	Audibility in headphones with -97 dBm unmodulated input
Manual Gain Control	100 dB control range
AGC Performance	Control range -97 dBm to +3 dBm with 6 dB output change
Frequency Tuning Accuracy	±100 Hz at 500 kHz and 29.99999 MHz

4.5.3 PROCEDURE GUIDELINES

When conducting the Peformance Tests, the technician should comply with the following guidelines:

1. Read each test procedure thoroughly before attempting to perform the test.
2. Hook up the proper test equipment as indicated in the Test Setup figure for each test.
3. Set the test equipment and receiver controls as directed for each test.
4. Allow a minimum of 30 minutes warm-up time for test equipment prior to performing any of the tests.

5. Unless otherwise specified, acceptable tolerances are ±3 dB for signal levels and ±20% for ac and dc supply voltages.

6. The tests should be performed in the order given. If a malfunction is noted, refer to paragraph 4.6 for troubleshooting information.

4.5.4 POWER-UP TEST

1. Set receiver controls as follows:

   a. RF Gain - Maximum CCW

   b. Phone Level - Maximum CCW

   c. Tuning Rate - Disable

   d. Detection Mode - AM

2. Energize the receiver by lifting the POWER ON switch on the front panel.

3. Adjust the Intensity control for a comfortable display intensity. The display should indicate 15.00000 MHz.

4. Select the 10 Hz, 100 Hz, 1 kHz and 10 kHz tuning rates in succession and, using the tuning knob, verify that the Frequency Display increments and decrements correctly for each rate selected.

5. De-energize the receiver.

4.5.5 IF GAIN TEST

1. Connect the test equipment as shown in Figure 4-1.

2. Set the Signal Generator output frequency to 15.00000 MHz and output level to -97 dBm.

3. Set the RF Voltmeter to the -10 dBm range.

4. Set the receiver controls as follows:

   a. RF Gain - Maximum CW

   b. IF Bandwidth - 16 kHz

   c. Tuning Rate - 10 Hz

   d. Detection Mode - AM

   e. Gain Mode - Manual

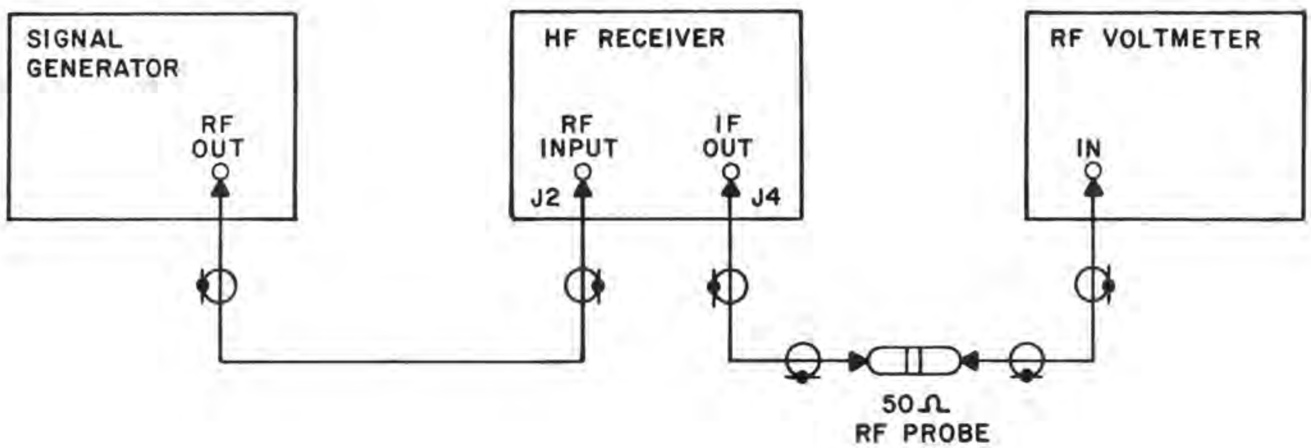

Figure 4-1. IF Gain Test

5. Energize the receiver.

6. The Signal Strength meter should indicate approximately 1/2 scale and the RF Voltmeter should indicate -15 dBm ±2 dBm.

7. Select 8 kHz, 4 kHz and 1 kHz bandwidths in succession. For each bandwidth, the RF Voltmeter should indicate -15 dBm ±2 dBm.

8. Set the Signal Generator output frequency to 15.0015 MHz. Select USB mode. The RF Voltmeter should indicate -15 dBm ±2 dBm.

9. Set the Signal Generator output frequency to 14.9985 MHz. Select LSB mode. The RF Voltmeter should indicate -15 dBm ±2 dBm.

NOTE

Bandwidths whose levels are slightly out of tolerance may be corrected by adjusting R12 on the IF Filter Board associated with the out of tolerance bandwidth.

10. Select AM mode and 16 kHz bandwidth.

11. Turn off the Signal Generator RF Output.

12. The RF Voltmeter should indicate a level no greater than -25 dBm.

13. Turn on the Signal Generator RF Output.

14. Tune the Signal Generator and the receiver to 500 kHz, 1.0 MHz, 1.5 MHz, 2.0 MHz, 3.0 MHz, 5.0 MHz, 7.0 MHz, 11.0 MHz and 25.0 MHz in succession. At each frequency, the receiver IF output level should be within 2 dB of the level obtained in Step 6 above.

15. De-energize the receiver and disconnect the test equipment.

4.5.6 DETECTION MODE PERFORMANCE TEST

1. Connect the test equipment as shown in Figure 4-2.

2. Set the Signal Generator output frequency to 15.00000 MHz and output level to -97 dBm. Set the Generator for 50% AM modulation at 400 Hz.

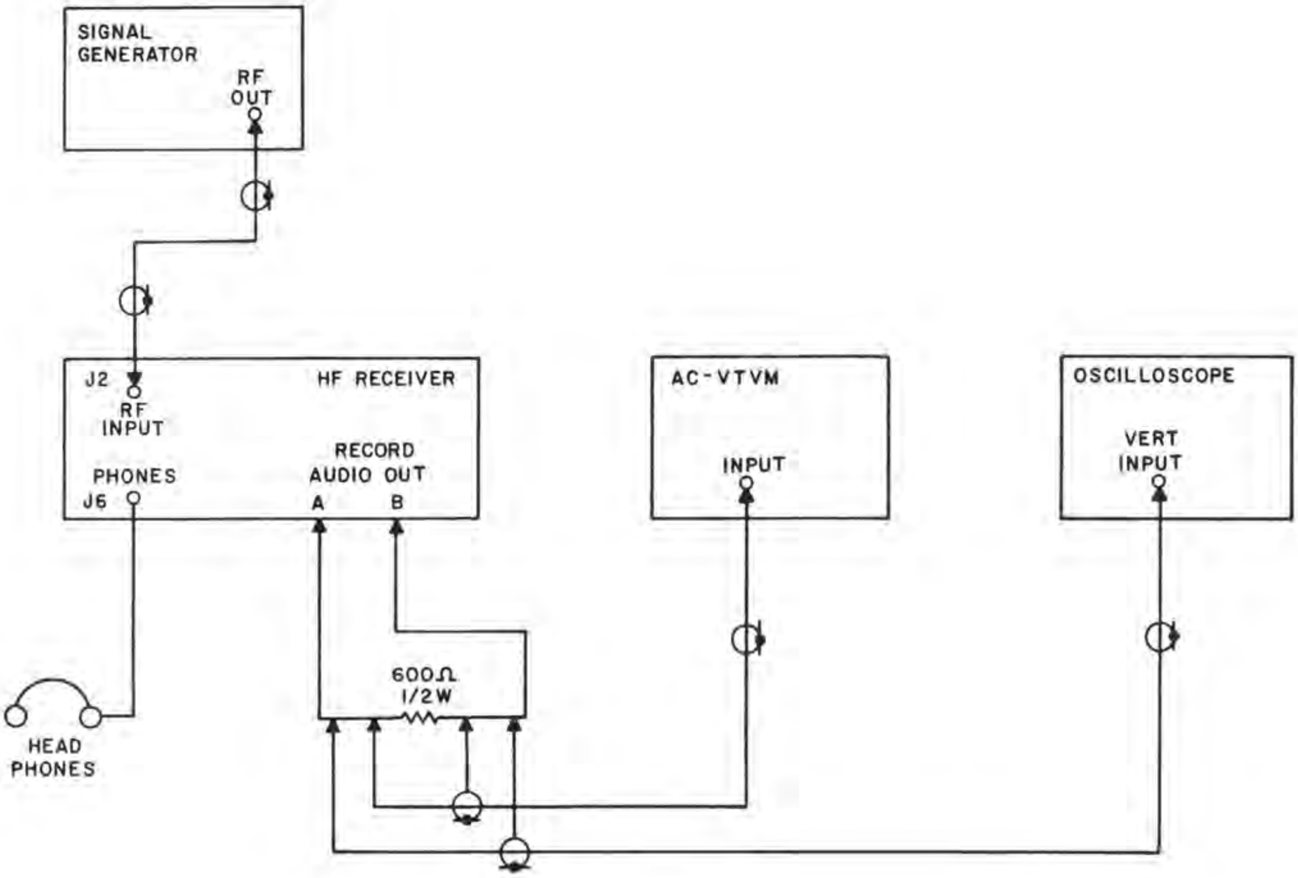

Figure 4-2. Detection Mode Performance Test

3. Set the AC Voltmeter to the 3 Vac range.

4. Set the receiver controls as follows:

   a. RF Gain - Maximum CW

   b. Phone Level - Maximum CCW

   c. IF Bandwidth - 1 kHz

   d. Tuning Rate - 10 Hz

   e. Detection Mode - AM

   f. Gain Mode - Manual

5. Energize the receiver.

6. Rotate the PHONE level control until a 400 Hz tone is heard in the headphones at a comfortable listening level. The tone should be clear and free from noise, hum and other signal distortions.

7. Adjust the RECORD level control for an AC Voltmeter indication of 1.0 Vac.

8. The oscilloscope should show a clean sine wave with no evidence of clipping or distortion.

9. Turn off the Signal Generator modulation.

10. Set the receiver MODE switch to CW. Set the TUNE RATE switch to BFO and adjust the TUNE knob for a BFO offset of +0.4 kHz.

11. A clear, distinct 400 Hz tone should be heard in the headphones.

12. Set the Signal Generator output frequency to 15.00040 MHz.

13. Set the receiver MODE switch to USB. A clear, distinct 400 Hz tone should be heard in the headphones.

14. Set the Signal Generator output frequency to 14.99960 MHz.

15. Set the receiver MODE switch to LSB. A clear, distinct 400 Hz tone should be heard in the headphones.

16. Set the Signal Generator output frequency to 15.00000 MHz. Set the Generator modulation to FM, modulation frequency to 400 Hz, and deviation to 4.8 kHz.

17. Set the receiver MODE switch to FM and the BANDWIDTH switch to 16 kHz.

18. A clear, distinct 400 Hz tone should be heard in the headphones.

19. De-energize the receiver and disconnect the test equipment.

4.5.7 MAN/AGC PERFORMANCE TEST

1. Connect the test equipment to the receiver as shown in Figure 4-3.

2. Set the Signal Generator output frequency to 15.00000 MHz and output level to -97 dBm. Set the Generator for 50% AM modulation at 400 Hz.

3. Set the receiver controls as follows:

   a. RF Gain - Maximum CW

   b. IF Bandwidth - 1 kHz

   c. Tuning Rate - 10 Hz

   d. Detection Mode - AM

   e. Gain Mode - Manual

4. Energize the receiver.

5. Adjust the RECORD level control for an indication of 1.0 Vac on the AC Voltmeter.

6. Increase the Signal Generator output level in 10 dBm increments until +3 dBm output is reached. For each 10 dBm increase, rotate the RF Gain control counterclockwise until the RECORD AUDIO output level indicates 1.0 Vac on the AC Voltmeter.

7. Decrease the Generator output level to -97 dBm.

8. Set the receiver to the AGC Gain Mode.

9. Adjust the RECORD level control for an indication of 0.5 Vac on the AC Voltmeter.

10. Increase the Signal Generator output level to +3 dBm.

11. The AC Voltmeter should indicate no greater than 1.0 Vac.

12. De-energize the receiver and disconnect the test equipment.

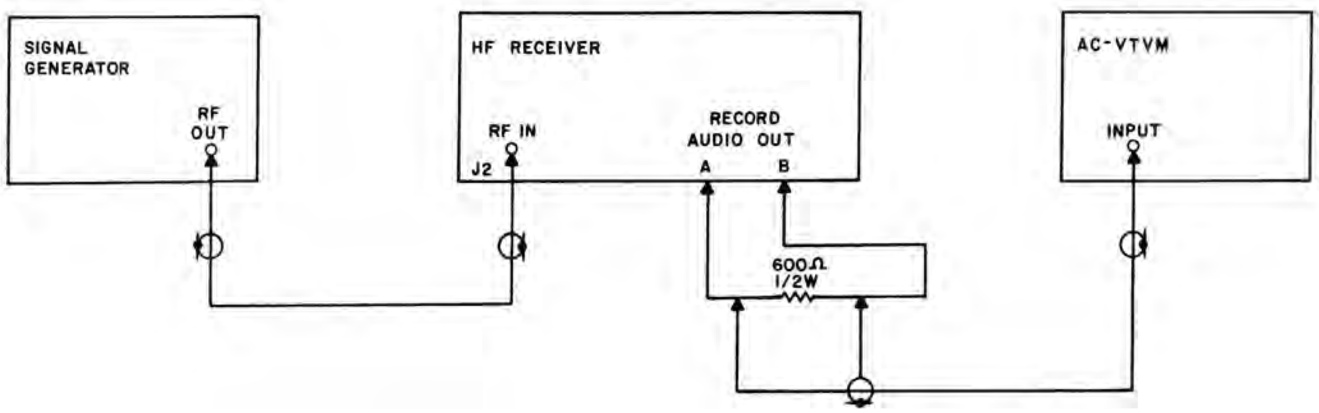

Figure 4-3. MAN/AGC Performance Test

4.5.8 FREQUENCY TUNING PERFORMANCE TEST

1. Connect the test equipment to the receiver as shown in Figure 4-4.
2. Set the Signal Generator output frequency to 0.50000 MHz and output level to -60 dBm.
3. Set the Frequency Counter to provide 10 Hz resolution of a 1 second sample rate.
4. Set the receiver controls as follows:

   a. RF Gain - Maximum CCW

   b. IF Bandwidth - 1 kHz

   c. Tuning Rate - 10 kHz

   d. Detection Mode - AM

5. Energize the receiver and tune to 0.50000 MHz.
6. The Frequency Counter should indicate 455.00 kHz ±0.10 kHz.
7. Tune the receiver and Signal Generator to 29.99000 MHz.
8. The Frequency Counter should indicate 455.00 kHz ±0.10 kHz.
9. De-energize the receiver and disconnect the test equipment.

4.6 CORRECTIVE MAINTENANCE

4.6.1 GENERAL

Corrective Maintenance includes the testing, troubleshooting, repair and alignment necessary to return a defective receiver to a satisfactory operating condition. Information is contained in this paragraph to troubleshoot the receiver to a replaceable assembly or PC board. Individual assembly and PC board repair procedures are contained in paragraph 4.7. Receiver alignment procedures are contained in paragraph 4.8.

4.6.2 CORRECTIVE MAINTENANCE GUIDELINES

A receiver will require corrective maintenance as a result of failure to pass any initial inspection testing, failure to meet the minimum performance standards in Table 4-3, failure to pass any of the Performance Tests in paragraph 4.5 or operator-observed malfunctions during normal receiver operation.

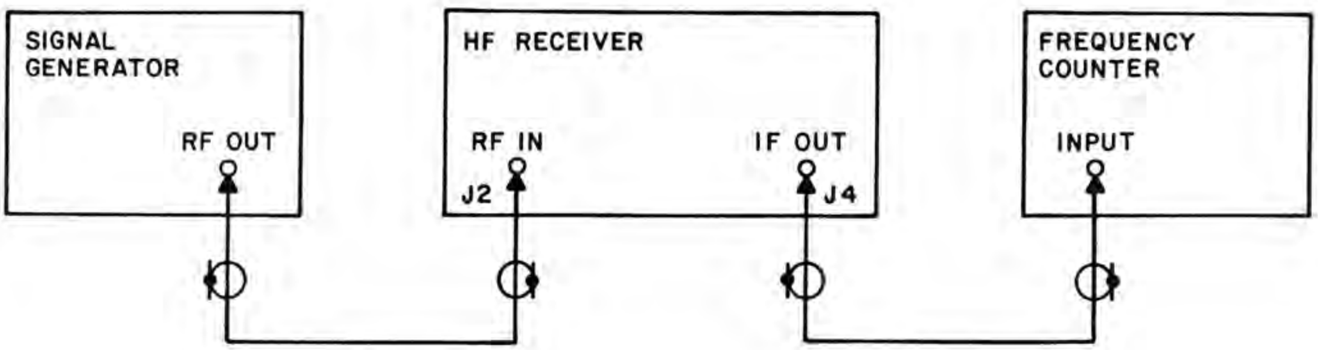

Figure 4-4. Frequency Tuning Performance Test

Figure 4-5, the Troubleshooting Flowchart, is provided as an aid in localizing defective assemblies and PC boards within the receiver. To troubleshoot a defective receiver, refer to Figure 4-5 and proceed as follows:

1. Begin at START and proceed horizontally through the Chart. Perform the indicated Performance Tests until a fault (NO) is indicated.

2. Localize the fault to a defective assembly or PC board by proceeding vertically through the troubleshooting path and performing the indicated tests.

3. Replace the defective module or PC board and perform any required alignments or adjustments (see paragraph 4.8).

4. Verify receiver operation by performing the Performance Tests in paragraph 4.5. If the results are satisfactory, the receiver may be returned to service.

5. The defective assembly or PC board removed in Step 3 may be repaired by referring to the component level troubleshooting and repair procedures in paragraph 4.7 below.

4.7 COMPONENT LEVEL TROUBLESHOOTING AND REPAIR

4.7.1 GENERAL

This paragraph contains the procedures for testing and repairing defective receiver assemlbies and PC boards. Troubleshooting Tests are provided to help identify fault symptons, to localize defective components and to verify assembly or PC board performance after repair. It should be noted that the procedures in this paragraph are provided as a guide and are not intended to substitute for proper signal tracing technique by skilled personnel familiar with the receiver. In addition, the circuit descriptions in Chapter III and Schematic Diagrams in Chapter V are an essential in troubleshooting receiver assemblies and PC boards.

4.7.2 PROCEDURE GUIDELINES

1. Allow 20 minutes for test equipment warm-up prior to testing.

2. Read the procedure thoroughly before beginning any test.

3. Comply with all pre-test setup conditions.

4. After the repair, verify correct assembly or PC board operation by repeating the test procedure.

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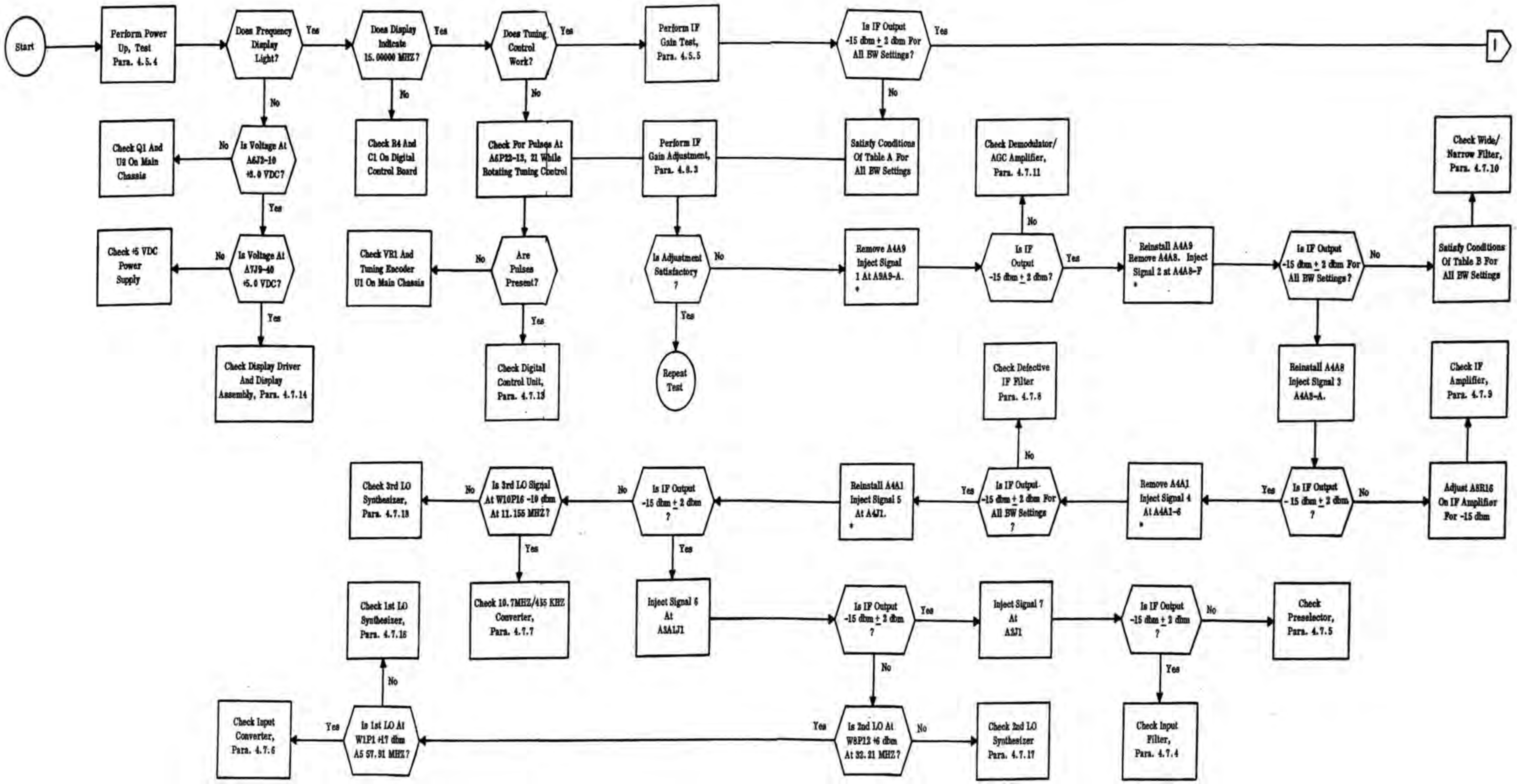

Signals

Signal 1	455 KHZ	Un Mod at -28 dbm
Signal 2	455 KHZ	Un Mod at -40 dbm
Signal 3	455 KHZ	Un Mod at -61 dbm
Signal 4	455 KHZ	Un Mod at -72 dbm
Signal 5	10.7 MHZ	Un Mod at -90 dbm
Signal 6	15.00000 MHZ	Un Mod at -100 dbm
Signal 7	15.00000 MHZ	Un Mod at -98 dbm

NOTE - *indicates extender card.

TABLE A BW SWITCHING VOLTAGE

PIN	16 KHZ	8 KHZ	4 KHZ	1 KHZ
P23-17	+5	0	0	0
P23-19	0	+5	0	0
P23-20	0	0	+5	0
P23-18	0	0	0	+5

TABLE B WIDE/NARROW SWITCHING VOLTAGE

	16 KHZ	8 KHZ	4 KHZ	1 KHZ
A4A9-D	+15	+15	+15	0
A4A9-E	0	0	0	15

NOTE: To resolve incorrect voltage levels, check Q2 and CR2 on appropriate IF filter board.

Figure 4-5. Troubleshooting Flowchart (1 of 2)

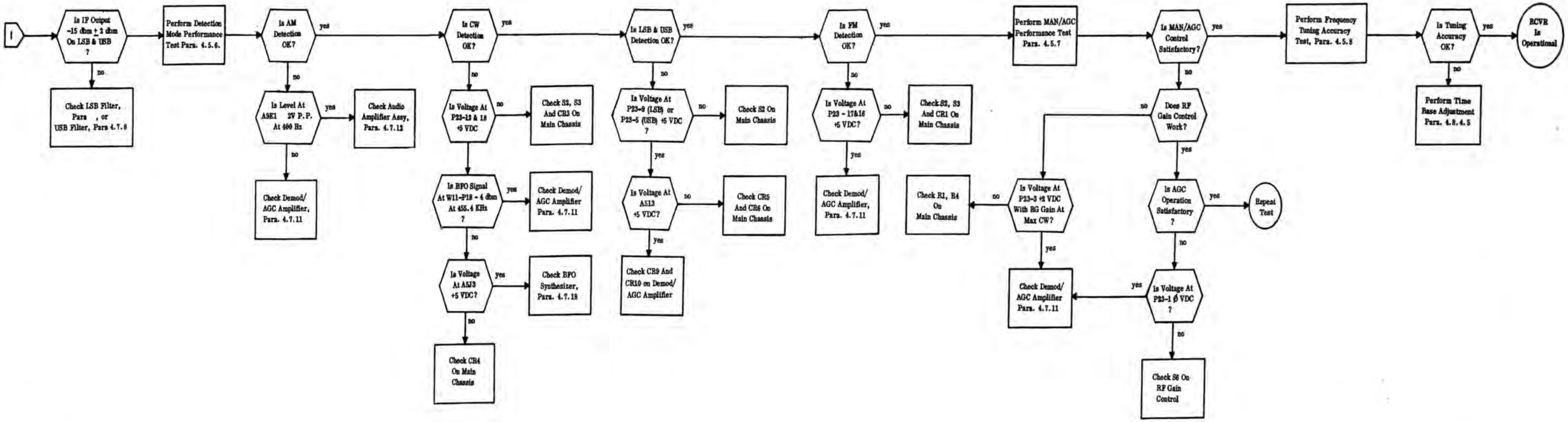

Figure 4-5. Troubleshooting Flowchart (2 of 2)

4.7.3 POWER SUPPLY TESTING AND TROUBLESHOOTING

4.7.3.1 Pre-test Setup

1. Remove the Power Supply from the receiver chassis.
2. Remove the Power Supply protective cover.
3. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.3.2 Test Procedure

1. Energize the receiver.
2. Using a dc voltmeter, check the voltages of the points indicated in Table 4-4.
3. If a failure is encountered, check or replace the components indicated in Table 4-3.
4. If the failure is still present, refer to the Power Supply Circuit Description, paragraph 3.6.9 and the Power Supply Schematic Diagram, Figure 6-26 to aid in additional signal tracing and fault isolation.
5. After the fault has been corrected, verify proper operation by rechecking the voltages in Table 4-4.

Table 4-4. Power Supply Voltage Level Checks

Test Point	Voltage	Key Components
TP1	+24	J1; wiring
PS1 - 2	+2	VR1, Q1
PS1 - 3	+5	PS1, C2, C3
TP2	+5	L1
PS2 - 2	+2	VR2, Q2
PS2 - 3	+15	PS2, C5, C6
TP3	+15	L2
PS2 - 5	-15	C8, C9
TP4	-15	L3

4.7.4 INPUT FILTER TESTING AND TROUBLESHOOTING

4.7.4.1 Pre-Test Setup

1. Remove the Input Filter from the receiver chassis.
2. Remove the Input Filter protective cover.

3. Disconnect W1P1 from A1J1 and W5P6 from A1J2.

4. Connect the Signal Generator output to A1J1.

5. Set the Generator output frequency to 1.0 MHz and output level to 0 dBm.

6. Connect the 50 Ω probe of the RF Voltmeter to A1J2. Set the Voltmeter to the 0 dBm range.

4.7.4.2 Test Procedure

1. Begin at 1.0 MHz and tune the Signal Generator to 5.0 MHz, 10.0 MHz, 15.0 MHz, 20.0 MHz, 25.0 MHz, and 30.0 MHz, successively, maintaining the output level at 0 dBm for each frequency.

2. The RF Voltmeter should indicate an output level between 0 dBm and -2 dBm for each frequency.

3. Disconnect test equipment from the Input Filter.

4. Excessive filter loss is usually caused by shorted or leaky capacitors or zener diodes. If the filter exhibits excessive loss, perform continuity checks on these components with an ohmmeter.

5. After replacing any components, verify filter performance by repeating Steps 1 and 2 above.

4.7.5 PRESELECTOR TESTING AND TROUBLESHOOTING

4.7.5.1 Pre-Test Setup

1. Remove the Preselector protective cover.

2. Disconnect W5P6 from A2J1 and W6P7 from A2J2.

3. Connect the Signal Generator output to A2J1.

4. Connect the 50 Ω probe of the RF Voltmeter to A2J2.

5. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.5.2 Test Procedure

1. Energize the receiver.

2. Refer to Table 4-5. Tune the receiver and Signal Generator successively to each of the frequencies listed. At each frequency, set the Generator output level to 0 dBm and verify that the RF Voltmeter indicates an output level between 0 dBm and -2 dBm.

Table 4-5. Preselector Filter Parameters

Freq. (MHz)	Filter No.	Filter Select Pin	Comments
0.5	A2A1	13	With the filter active,
1.0	A2A1	6	voltage readout will be
1.5	A2A2	12	+0.5 Vdc
2.0	A2A2	7	
3.0	A2A3	11	
5.0	A2A3	8	With the filter inactive,
7.0	A2A4	14	voltage readout will be
11.0	A2A4	4	+15 Vdc
25.0	A2A5	5	

3. If excessive loss is encountered at any frequency, use a DC Voltmeter to check the Filter Select Voltage at the indicated pin.

   a. If the Select Voltage is correct, check diodes CR1 - CR10 on the affected filter. Also check capacitors for shorts or leakage.

   b. If the Select Voltage is not correct, refer to paragraph 3.3.3 and troubleshoot the Digital Control, A2A6.

4. If any filter components are changed, repeat Step 2 above to verify filter performance.

4.7.6 INPUT CONVERTER TESTING AND TROUBLESHOOTING

4.7.6.1 Pre-Test Setup

1. Remove the Input Converter from the receiver chassis.

2. Remove the Input Converter protective cover.

3. Disconnect W6P6 from A1J1.

4. Connect the Signal Generator output to A1J1.

5. Set the Generator output frequency to 15.00000 MHz and output level to -20 dBm.

6. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.6.2 Test Procedure

1. Energize the receiver.

2. Using a high impedance RF Voltmeter, check the signal levels at the points indicated in Table 4-6. Signal frequencies, where indicated, may be verified with an oscilloscope or frequency counter.

Table 4-6. Input Converter Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
U1 - 3	30 mV	15.0 MHz	Input Wiring	
R4	60 mV	43.0 MHz	U9, Q1, Q2	1st IF Signal
E4	30 mV	43.0 MHz	FL1	
T1 - 3 to 2	30 mV	43.0 MHz	Q1, Q2	
L8 - E5	500 mV	32.2 MHz	Input Wiring	2nd LO Input
T3 - 1 to 2	1 V	32.2 MHz	Q5	
M9A - 3	20 mV	10.7 MHz	M9A	2nd IF Signal
FL1 - 1	100 mV	10.7 MHz	Q3, Q4	
FL2 - 2	70 mV	16.7 MHz	FL1	

3. If a failure is encountered, check or replace the components indicated in Table 4-6.

4. If the failure is still present, refer to the Input Converter Circuit Description, paragraph 3.2.4 and the Input Converter Schematic Diagram, Figure 6-9 to aid in additional signal tracing and fault isolation.

5. After the fault isolation has been corrected, verify proper operation by rechecking the signal levels in Table 4-6.

4.7.7 10.7 MHz/455 kHz CONVERTER TESTING AND TROUBLESHOOTING

4.7.7.1 Pre-test Setup

1. Disconnect W9P14 from A4J1.
2. Place the Converter board on an extender board.
3. Connect the Signal Generator output to A4J1.
4. Set the Generator output frequency to 10.7 MHz and output level to -20 dbm.
5. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.7.2 Test Procedure

1. Energize the receiver.
2. Using a high impedance RF Voltmeter, check the signal levels at the points indicated in Table 4-7. Signal frequencies, where indicated, may be verified with an oscilloscope or frequency counter.
3. If a failure is encountered, check or replace the components indicated in Table 4-7.

Table 4-7. 10.7 MHz/455 kHz Converter Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
Q2 - 2	2.5 V	11.155 MHz	Q1, Y1	3rd LO Signal
Q2 - 3	20 mV	10.7 MHz	T1	
Q3 - E	200 mV	455 kHz	Q2	3rd IF Signal
XA1 - 6	200 mV	455 kHz	Q3	

4. If the failure is still present, refer to the 10.7 MHz/455 kHz Converter Circuit Description, paragraph 3.2.6 and the 10.7 MHz/455 kHz Converter Schematic Diagram, Figure 6-11 to aid in additional signal tracing and fault isolation.
5. After the fault has been corrected, verify proper operation by rechecking the signal levels in Table 4-7.

4.7.8 IF FILTER TESTING AND TROUBLESHOOTING

4.7.8.1 Pre-Test Setup

1. Remove the 10.7 MHz/455 kHz Converter, A4A1A1.
2. Place the IF Filter (A2 - A7) to be tested on an extender board.
3. Connect the Signal Generator output to pin A4A1A1 - 6.
4. Set the Generator output frequency to 455 kHz for Filters A2 - A5, 454.5 kHz for A6 or 456.6 for A7, and set output level to -20 dBm.
5. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.8.2 Test Procedure

1. Energize the receiver. Set the receiver BANDWIDTH control to correspond to the bandwidth of the IF Filter under test.
2. Using a high impedance RF Voltmeter, check the signal levels at the points indicated in Table 4-8. Signal frequencies, where indicated, may be verified with an oscilloscope or frequency counter.

Table 4-8. IF Filter Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
Q2 - C	+15 Vdc	---	Q1, Q2	Use DC Voltmeter
E1	+15 Vdc	---	CR2	
K1 - 7, 8	20 mV	455 kHz	K1	
C7	15 mV	455 kHz	FL1	
Pin 1	50 mV	455 kHz	Q3	Adjust R12

3. If a failure is encountered, check or replace the components indicated in Table 4-8.
4. If the failure is still present, refer to the IF Filter Circuit Description, paragraph 3.2.7 and the IF Filter Schematic Diagram, Figure 6-12 to aid in additional signal tracing and fault isolation.
5. After the fault has been corrected, verify proper operation by rechecking the signal levels in Table 4-8.

4.7.9 455 kHz IF AMPLIFIER TESTING AND TROUBLESHOOTING

4.7.9.1 Pre-Test Setup

1. Place the 455 kHz amplifier A4A1A8 on an extender board.

2. Connect the Signal Generator output to pin A4A1A8 - A.

3. Set the Generator output frequency to 455 kHz and output level to -40 dBm.

4. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

5. Set receiver for MAN Gain Mode with RF Gain Control at maximum CW.

4.7.9.2 Test Procedure

1. Energize the receiver.

2. Using a high impedance RF Voltmeter, check the signal levels at the points indicated in Table 4-9. Signal frequencies, where indicated, may be verified with an oscilloscope or frequency counter.

Table 4-9. 455 kHz IF Amplifier Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
CR1 Anode	-2.0 Vdc	---	R4, CR1	Use Dc Voltmeter
Q1 - 1	30 mV	455 kHz	Q1	
Q2 - 1	300 mV	455 kHz	Q2	
Pin F	200 mV	455 kHz	R16	Adjust R16

3. If a failure is encountered, check or replace the components indicated in Table 4-9.

4. If the failure is still present, refer to the 455 kHz IF Amplifier Circuit Description, paragraph 3.2.8 and the 455 kHz IF Amplifier Schematic Diagram, Figure 6-13 to aid in additional signal tracing and fault isolation.

5. After the fault has been corrected, verify proper operation by rechecking the signal levels in Table 4-9.

4.7.10 WIDE/NARROW FILTER TESTING AND TROUBLESHOOTING

4.7.10.1 Pre-Test Setup

1. Remove the 455 kHz IF Amplifier, A4A1A8.
2. Place the Wide/Narrow Filter, A4A1A9, on an extender board.
3. Connect the Signal Generator output to pin A4A1A8 - F.
4. Set the Generator output frequency to 455 kHz and output level to -20 dBm.
5. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.10.2 Test Procedure

1. Energize the receiver.
2. Using a high impedance RF Voltmeter, check the signal levels at the point indicated in Table 4-10. Signal frequencies, where indicated, may be verified with an oscilloscope or frequency counter.

Table 4-10. WB/NB Filter Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
Q2 - C	200 mV	455 kHz	Q2	Set receiver to 16 kHz BW.
R14	100 mV	455 kHz	FL-2	
Pin - A	100 mV	455 kHz	Q3	
Q1 - C	200 mV	455 kHz	Q1	Set receiver to 1 kHz BW
R13	100 mV	455 kHz	FL-1	
Pin - A	100 mV	455 kHz	Q4	

3. If a failure is encountered, check or replace the components indicated in Table 4-10.
4. If the failure is still present, refer to the WB/NB Filter Circuit Description, paragraph 3.2.9 and the WB/NB Filter Schematic Diagram, Figure 6-14 to aid in additional signal tracing and fault isolation.
5. After the fault has been corrected, verify proper operation by rechecking the signal levels in Table 4-10.

4.7.11 DEMOD/AGC AMPLIFIER TESTING AND TROUBLESHOOTING

4.7.11.1 Pre-Test Setup

1. Remove WB/NB Filter A4A1A9.
2. Place the Demod/AGC Amplifier A4A1A10 on an extender board.
3. Connect the Signal Generator output to pin A4A1A9 - A.
4. Set the Generator output frequency to 455 kHz and output level to -26 dBm.
5. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

4.7.11.2 Test Procedure

1. Energize the receiver.
2. Using a high impedance RF Voltmeter, or Oscilloscope where indicated, check the signal levels at the points indicated in Table 4-11. Signal frequencies, where indicated, may be verified with an oscilloscope or frequency counter.
3. If a failure is encountered, check or replace the components indicated in Table 4-11.
4. If the failure is still present, refer to the Demod/AGC Amplifier Circuit Description, paragraph 3.2.10 and the Demod/AGC Amplifier Schematic Diagram, Figure 6-29 to aid in additional signal tracing and fault isolation.
5. After the fault has been corrected, verify proper operation by rechecking the signal levels in Table 4-11.

4.7.12 AUDIO AMPLIFIER TESTING AND TROUBLESHOOTING

4.7.12.1 Pre-Test Setup

1. Remove Demod/AGC Amplifier, A4A1A10.
2. Remove the receiver front panel to gain access to the Audio Amplifier.
3. Connect the Signal Generator output to pin A4A10-A18.
4. Set the Generator output frequency to 400 Hz and output level to 0.7 Vrms.
5. Connect a 24 Vdc power supply to J1 on the receiver rear panel.

Table 4-11. Demod/AGC Amplifier Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
CR2 Anode	100 mv	455 KHz	Q1, Q2	Set receiver to AM Mode
Pin B-12	70 mv	455 KHz	Q9, T1	
TP-E1	2V P-P	400 Hz	CR2, Q3	50% AM at 400 Hz
U2A-7	2V P-P	400 Hz	Q5, U2A	50% AM at 400 Hz
U2B-1	2V P-P	400 Hz	U2B	50% AM at 400 Hz
U3-1	7 mv	455.4 KHz	Q9	Set Generator to 455.4 kHz no modulation, Set receiver to CW.
L4-C32	.1V P-P	400 Hz	U3, Q10, CR13	
L6-C42	2V P-P	400 Hz	U4, Q11	Set Generator to 455 kHz, FM deviation 4.8 kHz at 400 Hz modulation. Set receiver to FM.
Pin B-3	-2 VDC		Q4, U1	Turn off Generator Modlation. Set receiver to AGC.

4.7.12.2 Test Procedure

1. Energize the receiver.

2. Using a high impedance Oscilloscope check the signal levels at the points indicated in Table 4-12. Signal frequencies where indicated, may be verified with the oscilloscope or frequency counter.

3. If a failure is encountered, check or replace the components indicated in Table 4-12.

4. If a failure is still present, refer to the Audio Amplifier Circuit Description, paragraph 3.2.11 and the Audio Amplifier Schematic Diagram, Figure 6-25 to aid in additional signal tracing and fault isolation.

5. After the fault has been corrected, verify proper operation by rechecking the signal levels in Table 4-12.

Table 4-12. Audio Amplifier Signal Level Checks

Test Point	Signal Level	Signal Freq.	Key Components	Comments
U1A-5	1V P-P	400 Hz	R1	Set RECORD and PHONE level controls to mid-range.
U1A-7	8V P-P	400 Hz	U1	
E4	8V P-P	400 Hz	C3, C4	
U1B-3	1V P-P	400 Hz	R5	
U1B-1	10V P-P	400 Hz	U1	

4.7.13 DIGITAL CONTROL TESTING AND TROUBLESHOOTING

1. Energize the receiver. If the display does not indicate 15.00000 MHz, C1 may be defective. Momentarily bridge C1 with a jumper wire. If the display does not reset to 15.00000 MHz, check R4 and counters U1 - U7.

2. Rotate the TUNE knob CW and CCW in the 10 Hz, 100 Hz, 1 kHz and 10 kHz TUNE RATE positions. If tuning is correct for all tune Rates, proceed to Step 3. If some of the TUNE RATE positions are inoperative, check counters U1 - U7. If the display does not increment at all, proceed as follows:

   a. Check the level at U22-1 with an oscilloscope. The level should be high when tuning CW and low when tuning CCW. If not, check U22 and U12.

   b. Check the level at U16-4. A train of short, positive-going pulses should be observed as the TUNE KNOB is rotated. If not, check U12, U13, U15 and U16.

3. Select the BFO position on the TUNE RATE switch. Rotate the TUNE KNOB CW and CCW and observe the display tune from -8.0 to +8.0. If not, proceed as follows:

   a. Check the level at U14-10. The level should be high when tuning CW and low when tuning CCW. If not, check U13, U14, U16 and U22.

   b. Check the level at U14-11. The level should be low when tuning the receiver. If not, check U11, U13, U14 and U19.

   c. Check counters U8 and U9 and gates U17 and U18.

4.7.14 DISPLAY DRIVER/ASSEMBLY TESTING AND TROUBLESHOOTING

1. Energize the receiver. If all displays fail to illuminate, check level at J9-8. If level is not high, check U19 and CR4 on the Digital Control Board.

2. If some of the displays fail to illuminate, check the levels on pins a to g on the affected displays. If all pins are low, check the appropriate driver U1-U7 on the Display Driver. Otherwise, replace the affected display.

3. If any of the displays fail to increment when tuning the receiver, check the appropriate driver U1-U7 on the Display Driver. If OK, check the appropriate counter U1-U7 on the Digital Control Board.

4.7.15 TIME BASE TESTING AND TROUBLESHOOTING

1. Place the Time Base board on an extender board.

2. Refer to Table 4-13 and use a Frequency Counter to check the indicated Test Points. When a failure is encountered, check or replace the indicated components.

Table 4-13. Time Base Parameters

Test Point	Frequency	Key Components
U1-1	2 MHz	U1
Q1-C	2 MHz	Q1, R3
U2-1	80 kHz	U2
U3-5	8 kHz	U3
U3-13	1 kHz	U3
U4-4	20 kHz	U4
U4-12	5 kHz	U4
U5-5	200 kHz	U5
U5-12	50 kHz	U5
J1	1.0 MHz	CR1, U5

4.7.16 1st LO TESTING AND TROUBLESHOOTING

1. Place the 1st LO Synthesizer on an extender card.

2. Refer to Table 4-14 and check the VCO Band Select circuitry. If the Band Select Voltages do not agree with the Table, check U13 and U14.

Table 4-14. VCO Band Select Code

TUNED FREQUENCY	BAND E5	SELECT E4	VOLTAGE E3
0 - 3.99 MHz	+5	+5	+5
4 - 7.99 MHz	+5	+5	0
8 - 11.99 MHz	+5	0	+5
12 - 15.99 MHz	+5	0	0
16 - 19.99 MHz	0	+5	+5
20 - 23.99 MHz	0	+5	0
24 - 27.99 MHz	0	0	+5
28 - 29.99 MHz	0	0	0

3. Tune the receiver to 00.00000 MHz. Under this condition, the Divider Section has an overall divide ratio of 4291. Use the Frequency Counter to compare the frequencies at U4-1 and U5-12 to verify the divide ratio. If not correct, proceed as follows:

   a. Refer to paragraph 3.6.3.2.3 and verify the presets to U5, U6, U7 and U8 with a Voltmeter. If not correct, check U9, U10, U11 and U12.

   b. Refer to paragraph 3.6.3.2.4 and check the operation of counters U4, U5, U6, U7 and U8.

4. Check the phase detector, U1. If the frequencies at U1-3 and U1-1 are close together, output at U1-5 will be narrow spikes. If the frequencies at U1-3 and U1-1 are far apart, U1-5 output will be wide pulses.

5. Check the loop filter, U2. The output at U2-6 will be negative, depending on the pulse width from U1. If the output is 0 or a very large negative or positive level, replace U2.

6. Check the VCO tuning by shorting pin E1 to ground and observing a frequency change at U4-1. If a very small or no change is noted, replace CR1.

7. If the phase lock loop on the 1st LO is working correctly, then check U1, Q3 and Q4 on the VCO assembly for failure.

4.7.17 2nd LO TESTING AND TROUBLESHOOTING

1. Determine which of the three loops is causing the problem. When the problem loop is determined, troubleshoot as described in Steps 2, 3 or 4.

a. 32 MHz Loop - Proper operation is indicated by a 32 MHz signal at the collector of Q2. If not, proceed to Step 2.

b. Programmable Loop - Proper operation is indicated by a 200 kHz signal at U8-1 when the receiver is tuned to 15.00099 MHz and 210 kHz when the receiver is tuned to 15.00000 MHz. If not, proceed to Step 3.

c. Output Loop - Proper operation is indicated by a frequency of 32.20 to 32.21 MHz at J1. If not, proceed to Step 4.

2. 32 MHz Loop.

a. U3 - U3 is a divide-by-16 counter. Compare frequencies at pins 1 and 4 to verify the divide ratio.

b. Phase Detector - Proper operation of U1 is indicated by narrow or wide pulses at pin 5, depending on the difference in frequencies at pins 1 and 3.

c. Loop Filter - The output at U2-6 is a dc voltage between -5 and +5 Vdc which is proportional to the pulse width from U1.

d. VCO - If VCO oscillates, but does not lock, replace CR1. Otherwise, check Q1 and Q2.

3. Programmable Loop.

a. U6, U7, and U8 - These three counters form a divide-by-800 divider. Compare frequencies at U6-1 and U8-1 to verify divide ratio.

b. Pre-Scaler - Check U9 and U10 by tuning the receiver to 15.00099 MHz. Check the frequencies at U9-1 and U10-15 to verify a divide-by-100 ratio.

c. Programmable Counter - Tune the receiver to 15.00000 MHz. This sets the programmable counter to a divide-by-20 ratio. Check the frequencies at U13-2 and U14-15 to verify this ratio.

d. Phase Detector - Proper operation of U4 is indicated by narrow or wide pulses at pin 5 depending on the difference in frequencies at pins 3 and 6.

e. Loop Filter - The output at U5-6 is a dc voltage between -5 and +5 Vdc which is proportional to the pulse width from U1.

f. If the VCO oscillates, but does not lock, replace CR4. Otherwise, check Q8.

4. Output Loop.

   a. Mixer U15 - Check the operation of U15 by measuring frequencies of U15-8 and U15-1. The output of U15 at R20 should be the difference between these two.

   b. Phase Detector - Proper operation of U16 is indicated at pin 5, depending on the difference in frequencies at pins 3 and 6.

   c. Loop Filter - The output at U18 pin 5 is a dc voltage between-5 and +5 Vdc which is proportional to the pulse width from U16.

   d. VCO - If the VCO is oscillating, but will not lock, replace CR3. Otherwise, check Q5 and Q6. If the Output Loop is locked and no output appears at J1, check Q7.

4.7.18 3rd LO TESTING AND TROUBLESHOOTING

1. Digital Mixer - The output at U14-8 should be approximately 5 kHz.

2. Phase Detector - The output at U15-5 consists of narrow or wide pulses depending on the difference in frequency on pins 3 and 6.

3. Sine-TTL Converter - If the VCO is oscillating, the output at U16-6 will be a square wave at approximately 11.155 MHz.

4. VCO - If the VCO oscillates but will not lock, replace CR6 or Y1. If the VCO is dead, check Y1, Q4 or Q5.

4.7.19 BFO TESTING AND TROUBLESHOOTING

1. Set the TUNE RATE switch to BFO and adjust the display to +0.0.

2. Prescaler - The prescaler divide ratio is ten. Measure the frequencies at U12-2 and U12-11 to verify this.

3. Programmable Counters - The counter divide ratio is 455. Measure the frequencies at U12-11 and Test Point E1 to verify this. If the divide ratio is not correct, refer to paragraph 3.6.6.2 and check the counters U7 - U10, the Zero Detector, and the End of Cycle Detector.

4. Phase Detector - The output of U1-5 should consist of narrow or wide pulses, depending on the frequency difference at pins 3 and 6.

5. Loop Filter - The output at U2-6 should be a dc voltage between -5 and +5 Vdc which is proportional to the pulse width from U1.

6. VCO - If the VCO oscillates, but will not lock, check CR1 and CR2. Otherwise check Q1 and Q2.

7. Output Divider - U13 provides a divide-by-10 ratio. The output at U13-9 should be 455.00 kHz. If the output is dead or incorrect, replace U13.

4.8 ALIGNMENT/ADJUSTMENT PROCEDURES

4.8.1 GENERAL

The following Alignment and Adjustment procedures should only be performed when indicated by the results of Performance Testing (paragraph 4.5) or after replacing PC board components. Prior to performing any Alignment or Adjustment, be sure to allow 30 minutes for Test Equipment warm-up.

4.8.2 INPUT CONVERTER ADJUSTMENT

1. Loosen the screws holding the Input Converter module to the chassis. Pull the module out and remove its cover. Connect Test Equipment as shown in Figure 4-6.

2. Set the receiver controls as follows:

   a. RF Gain - Maximum CW

   b. Detection Mode - AM

   c. Gain Mode - Manual

   d. Bandwidth - 16 kHz

   e. Tuning Rate - 10 Hz

3. Energize the receiver.

4. Set the Signal Generator output frequency to 15.0000 MHz and output level to -97 dBm.

5. Adjust C3 of A3A1 and C1 of A3A2 for a maximum indication on the RF Voltmeter.

6. Deenergize the receiver and disconnect the test equipment.

7. Replace the cover on the Input Converter. Install the Input Converter in the chassis.

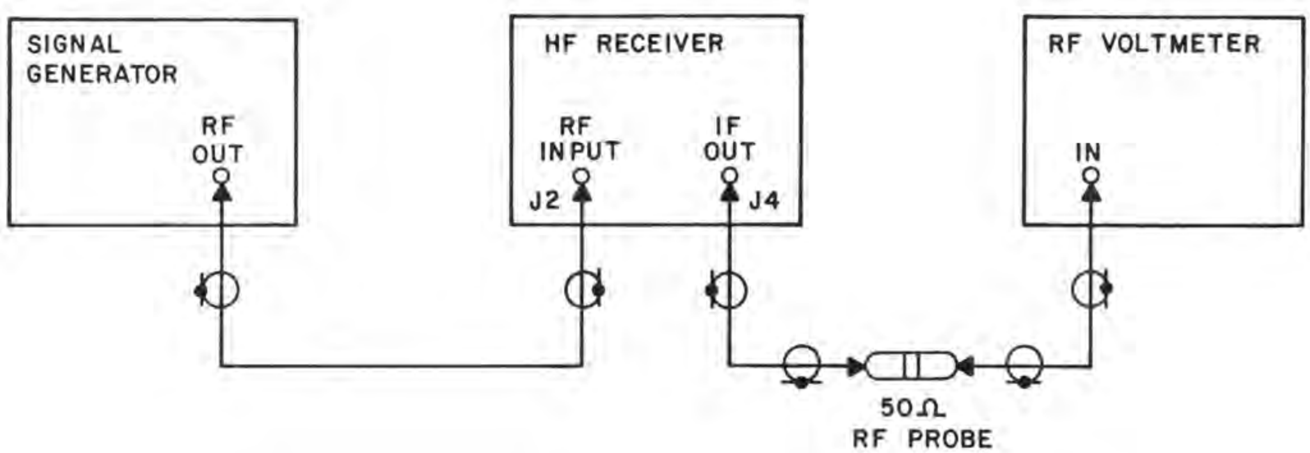

Figure 4-6. Input Converter Alignment

4.8.3 IF GAIN ADJUSTMENT

1. Remove the IF Motherboard cover plate on the right side of the receiver chassis. Connect Test Equipment as shown in Figure 4-7.

2. Set A4A1A8-R16 at approximately mid-range.

3. Set the receiver controls as follows:

   a. RF Gain - Maximum CW

   b. Detection Mode - AM

   c. Gain Mode - Manual

   d. Bandwidth - 16 kHz

   e. Tuning Rate - 10 Hz

4. Set the Signal Generator output frequency to 15.00000 MHz and output level to -97 dBm.

5. Energize the receiver.

6. Adjust A4A1A2-R12 for a -15 dBm reading on the RF Voltmeter.

7. Switch the receiver to 8 kHz bandwidth. Adjust A4A1A3-R12 for a -15 dBm reading.

8. Switch the receiver to 4 kHz bandwidth. Adjust A4A1A4-R12 for a -15 dBm reading.

9. Switch the receiver to 1 kHz bandwidth. Adjust A4A1A5-R12 for a -15 dBm reading.

10. Switch the receiver to USB Mode. Set the Signal Generator frequency to 15.00000 MHz. Adjust A4A1A6-R12 for a -15 dBm reaidng.

11. Switch the receiver to LSB Mode. Set the Signal Generator frequency to 15.0000 MHz. Adjust A4A1A7-R12 for a -15 dBm reading.

12. If -15 dBm cannot be obtained at each step above, readjust A4A1A8-R16 slightly and repeat Steps 6 through 11.

13. De-energize the receiver and disconnect the Test Equipment.

14. Replace the IF Motherboard cover plate.

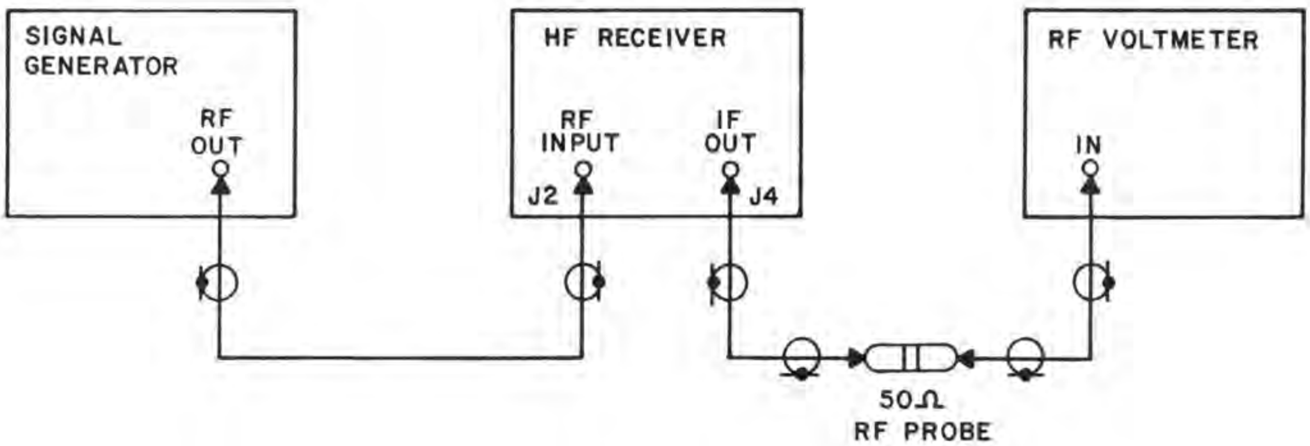

Figure 4-7. IF Gain Adjustment

4.8.4 SYNTHESIZER ALIGNMENT

4.8.4.1 1st LO Synthesizer Alignment

The only alignment points for the 1st LO are in the 1st LO VCO which is a very sensitive circuit; care must be taken to ensure proper operation.

1. Place the 1st LO on an extender card.
2. Remove the VCO front plate.
3. Connect a Digital Voltmeter to pin A1E1.
4. Refer to Table 4-15. Beginning at Band 0, adjust the indicated components until the voltage at pin A1E1 stays within limits as the receiver is tuned through Band 0.

Table 4-15. VCO Alignment Procedures

VCO Band	Band Freq. Limits	Voltage at Pin A1E1 (Typical)	A2A1 Alignment Component
0	0 - 3.99 MHz	<8.0 to <-5.0 Vdc	C3
1	4 - 7.99 MHz	<8.0 to <-5.0 Vdc	L2
2	8 - 11.99 MHz	<8.0 to <-5.0 Vdc	L3
3	12 - 15.99 MHz	<8.0 to <-5.0 Vdc	L2 & L3
4	16 - 19.99 MHz	<8.0 to <-5.0 Vdc	L4
5	20 - 23.99 MHz	<8.0 to <-5.0 Vdc	L2 & L4
6	24 - 27.99 MHz	<8.0 to <-5.0 Vdc	L3 & L4
7	28 - 30 MHz	<8.0 to <-5.0 Vdc	L2, L3 & L4

5. Repeat for Bands 2 through 7. As suggested in Table 4-15, the inductors align more than one band and a compromise between bands may be necessary.
6. De-energize the receiver.
7. Disconnect the Digital Voltmeter. Replace the VCO front plate and place the 1st LO back in the receiver.

4.8.4.2 2nd LO Synthesizer Alignment

The 2nd LO Synthesizer Alignment consists of a 32 MHz Loop Alignment, a Programmable Loop Alignment and an Output Loop Alignment. Perform the procedure in the given sequence.

1. Preliminary Setup

    a. Mount the 2nd LO Synthesizer on an extender board.

    b. Energize the receiver and allow 30 minutes for warm-up.

2. 32 MHz Loop Alignment

    a. Connect a Digital Voltmeter to Test Point E1.

    b. Adjust C19 until a Voltmeter reading of 7.5 Vdc is observed with the alignment tool withdrawn from the VCO shield.

3. Programmable Loop Alignment

    a. Connect a Digital Voltmeter to Test Point E2.

    b. Tune the receiver to 15.00999 MHz

    c. Adjust C61 until a Voltmeter reading of -8.0 Vdc is observed with the alignment tool withdrawn from the VCO shield.

4. Output Loop Alignment

    a. Connect a Digital Voltmeter to Test Point E3.

    b. Tune receiver to 15.00499 MHz.

    c. Adjust C44 until a Voltmeter reading of 7.5 Vdc is observed with the alignment tool withdrawn from the VCO shield.

    d. Using a Frequency Counter, verify that a frequency of 32.205010 MHz ±3 Hz is present at J1.

4.8.4.3 3rd LO Synthesizer Alignment

1. Mount the 3rd LO/BFO Synthesizer on an extender board.

2. Connect a Digital Voltmeter to Test Point E3.

3. Adjust C30 until a Voltmeter reading of 2.5 Vdc is observed.

4.8.4.4 BFO Synthesizer Alignment

1. Mount the 3rd LO/BFO Synthesizer on an extender board.

2. Connect a Digital Voltmeter to Test Point E2.

3. Set receiver mode to CW, BFO offset to ZERO.

4. Adjust C8 until a Voltmeter reading of 7.5 Vdc is observed.

4.8.4.5 Time Base Alignment

1. Connect a Frequency Counter to the 1 MHz Test Output test point on the Time Base.

2. Insert an adjustment tool into the access hole on the side of the TCXO on the Time Base. Adjust the TCXO trimmer until the Frequency Counter indicates 1.000000 MHz ±1 Hz.

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 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 Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation of each part ordered. The list of manufacturers provided in paragraph 5.5 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 semi-conductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semi-conductors designated in the manual may be substituted in every case with satisfactory results.

5.4 ASSEMBLY REVISION LEVEL

The purpose of the Assembly Revision Level is to identify the "as built" configuration of an assembly or subassembly. The parts list and illustrations that follow, depict the revision levels of the assemblies and subassemblies at the time of preparation of the manual, which may or may not agree with the purchased equipment. However, they will serve as a guide for any necessary maintenance to be performed. Refer to Table 5-1, for the Equipment Assembly Revision Level Record, located in the rear of the parts lists section.

5.5 LIST OF MANUFACTURERS

The List of Manufacturers that follows is listed numerically by the manufacturer's Federal Supply Code or "Code Ident" as it appears in the parts list.

CODE	NAME AND ADDRESS	ZIP
00779	AMP INC HARRISBURG,PENNSYLVANIA	17105
01121	ALLEN-BRADLEY CO MILWAUKEE,WISCONSIN	53204
01295	TEXAS INST INC SEMICOND COMP DIV DALLAS,TEXAS	75231
02114	FERROXCUBE CORP SAUGERTIES,NEW YORK	12477
02735	RCA CORP SOLID STATE DIV SOMERVILLE,NEW JERSEY	08876
04013	TAURUS CORP LAMBERTVILLE,NEW JERSEY	08530
04239	GE COMPANY CHEM/METALLURTICAL VENTURES EDMORE,MICHIGAN	49928
04713	MOTOROLA INC SEMICOND PROD DIV PHOENIX,ARIZONA	85008
06540	AMATOM ELECTRONIC HARDWARE DIV OF MITE CORP NEW HAVEN,CONNECTICUT	06515
06776	ROBERTSON-NUGENT INC ALBANY,INDIANA	47150
07263	FAIRCHILD SEMICOND DIV MT VIEW,CALIFORNIA	94040
12498	TELEDYNE CRYSTALONICS CAMBRIDGE,MASSACHUSETTS	02140
13103	THERMALLOY CO DALLAS,TEXAS	75234
14632	WATKINS-JOHNSON CO CEI DIV GAITHERSBURG,MARYLAND	20760
15542	MINI-CIRCUITS LABORATORIES BROOKLYN,NEW YORK	11229
15818	TELEDYNE SEMICONDUCTOR MT VIEW,CALIFORNIA	94040
17856	SILICONIX INC SANTA CLARA,CALIFORNIA	95050
18324	SIGNETICS CORP SUNNYVALE,CALIFORNIA	94086
18565	CHOMERICS INC WOBURN,MASSACHUSETTS	01801
19505	APPLIED ENGINEERING PRODUCTS CO DERBY,CONNECTICUT	06418
22526	BERG ELECTRONICS INC NEW CUMBERLAND,PENNSYLVANIA	17070
23480	ELECTRONIC HARDWARE CORP JAMAICA,NEW YORK	11433
25088	SIEMENS AMERICA INC SOUTH ISELIN,NEW JERSEY	08830
25330	GENERAL CONNECTOR CORP NEWTON,MASSACHUSETTS	02158
25350	DONALD BRUCE AND CO CHICAGO,ILLINOIS	60618
27014	NATIONAL SEMI-CONDUCTOR CORP SANTA CLARA,CALIFORNIA	95051

CODE	NAME AND ADDRESS	ZIP
27735	F-DYNE ELECTRONICS BRIDGEPORT,CONNECTICUT	06605
27956	RELCOM PALO ALTO,CALIFRONIA	94304
28480	HEWLETT-PACKARD CO PALO ALTO,CALIFORNIA	94304
33095	SPECTRUM CONTROL INC FAIRVIEW,PENNSYLVANIA	16415
49956	RAYTHEON CO LEXINGTON,MASSACHUSETTS	02173
50829	SEMICONDUCTOR CIRCUITS INC HAVERHILL,MASSACHUSETS	01830
51406	MURATA CORP OF AMERICA ELMSFORD,NEW YORK	10523
51642	CENTRE ENGINEERING INC STATE COLLEGE,PENNSYLVANIA	16801
52648	PLESSY SEMICONDUCTORS IRVINE,CALIFORNIA	92714
55322	SAMTEC INC NEW ALBANY,INDIANA	47150
56289	SPRAGUE ELECTRIC CO NORTH ADAMS,MASSACHUSETTS	01247
70903	BELDEN CORP CHICAGO,ILLINOIS	60644
71279	CAMBRIDGE THERMIONIC CORP CAMBRIDGE,MASSACHUSETTS	02138
71285	CAMILLUS CUTLERY CO CAMILLUS,NEW YORK	13031
71400	BUSSMAN MFG DIV OF MC GRAW-EDISON CO ST LOUIS,MISSOURI	63107
71468	ITT CANNON ELECTRIC SANTA ANA,CALIFORNIA	92702
71482	CP CLARE CO CHICAGO,ILLINOIS	60645
71785	CINCH CONNECTOR OPERATIONS OF TRW ELK GROVE VILLAGE,ILLINOIS	60007
72136	ELECTRO MOTIVE MANUFACTURING CO INC WILLIAMANTIC,CONNECTICUT	06226
72982	ERIE TECHNOLOGICAL PRODUCTS INC ERIE,PENNSYLVANIA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV FULLERTON,CALIFORNIA	92634
73899	JFD ELECTRONICS CO BROOKLYN,NEW YORK	11219
74199	QUAM NICHOLS CO CHICAGO,ILLINOIS	60637
74868	BUNKER RAMO CORP AMPHENOL RF DIV DANBURY,CONNECTICUT	06810
75915	LITTELFUSE INC DES PLAINES,ILLINOIS	60016
76055	MALLORY CONTROLS DIV OF PR MALLORY CO INC FRANKFORT,INDIANA	46041

CODE	NAME AND ADDRESS	ZIP
77820	BENDIX CORP ELECTRICAL COMPONENTS DIV SIDNEY,NEW YORK	13838
80058	JOINT ELECTRONICS TYPE DESIGNATION SYSTEM	
80131	ELECTRONIC INDUSTRIES ASSOCIATION WASHINGTON,DC	20006
81030	INTERNATIONAL INSTRUMENTS INC DIV OF SIGMA INST INC ORANGE,CONN	06477
81073	GRAYHILL INC LA GRANGE,ILLINOIS	60525
81349	MILITARY SPECIFICATIONS	
81350	JOINT ARMY-NAVY SPECIFICATIONS	
82389	SWITCHCRAFT INC CHICAGO,ILLINOIS	60630
84411	TRW CAPACITORS OGALLALA,NEBRASKA	69153
91293	JOHANSON MFG CO BOONTON,NEW JERSEY	07005
91418	RADIO MATERIALS CO CHICAGO,ILLINOIS	60646
91506	AUGAT INC ATTLEBORO,MASSACHUSETTS	02703
92825	WHITSO INC SCHILLER PARK,ILLINOIS	
94144	RAYTHEON CO COMPONENTS DIV QUINCY,MASSACHUSETTS	02169
95104	COLLINS RADIO CO RICHARDSON,TEXAS	75080
95121	QUALITY COMPONENTS INC ST MARYS,PENNSYLVANIA	15857
95146	ALCO ELECTRONIC PRODUCTS INC LAWRENCE,MASSACHUSETTS	01842
96906	MILITARY STANDARDS	
97539	APM-HEXSEAL CORP ENGLEWOOD,NEW JERSEY	07631
99800	DELEVAN ELECTRONICS DIV AMERICAN PRECISION IND AURORA,NEW YORK	14052
99848	WILCO CORP INDIANAPOLIS,INDIANA	46222

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	INPUT FILTER ASSEMBLY	1	796123 (SEP PL)	14632	
A2	INPUT PRESELECTOR ASSEMBLY	1	796100 (SEP PL)	14632	
A3	INPUT CONVERTER ASSEMBLY	1	796099 (SEP PL)	14632	
A4	IF DEMODULATOR ASSEMBLY	1	796121 (SEP PL)	14632	
A5	SYNTHESIZER MOTHERBOARD	1	796117 (SEP PL)	14632	
A6	DIGITAL CONTROL UNIT PC ASSEMBLY	1	796106 (SEP PL)	14632	
A7	DISPLAY DRIVER PC ASSEMBLY	1	796105 (SEP PL)	14632	
A8	DISPLAY PC ASSEMBLY	1	796104 (SEP PL)	14632	
A9	AUDIO AMPLIFIER PC ASSEMBLY	1	796116 (SEP PL)	14632	
A10	POWER SUPPLY ASSEMBLY	1	796139 (SEP PL)	14632	
A11	SPEAKER AMPLIFIER (FRONT COVER ASSY)	1	796140 (SEP PL)	14632	
A12	REAR COVER ASSY (BATTERY HOUSING)		796161 (SEP PL)	14632	
A5A1	TIMEBASE GENERATOR PC ASSEMBLY	1	796111 (SEP PL)	14632	A5
A5A2	1ST LO SYNTHESIZER ASSEMBLY	1	796133 (SEP PL)	14632	A5
A5A3	2ND LO SYNTHESIZER PC ASSEMBLY	1	796107 (SEP PL)	14632	A5

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A5A4	3RD LO/BFO SYNTHESIZER PC ASSEMBLY	1	796109 (SEP PL)	14632	A5
CR1	DIODE	3	1N462A	80131	
CR2	S/A CR1				
CR3	S/A CR1				
CR4	DIODE SCHOTTKY BARRIER RECTIFIER 40V 1A	3	1N5819	80131	
CR5	S/A CR4				
CR6	S/A CR4				
CR7	DIODE SCHOTTKY BARRIER RECTIFIER 3AMP 30V	1	1N5821	80131	
C1	CAP/ELEC/TANT 4.7UF 20PCT 35V	1	196D475X0035JE3	56289	
C2	CAP/CER/DISC 0.47UF 20PCT 100V	1	8131M100-651-474M	72982	
E1	TERMINAL	18	7A1A1	92825	
E2	S/A E1				
E3	S/A E1				
E4	S/A E1				
E5	S/A E1				
E6	S/A E1				
E7	S/A E1				

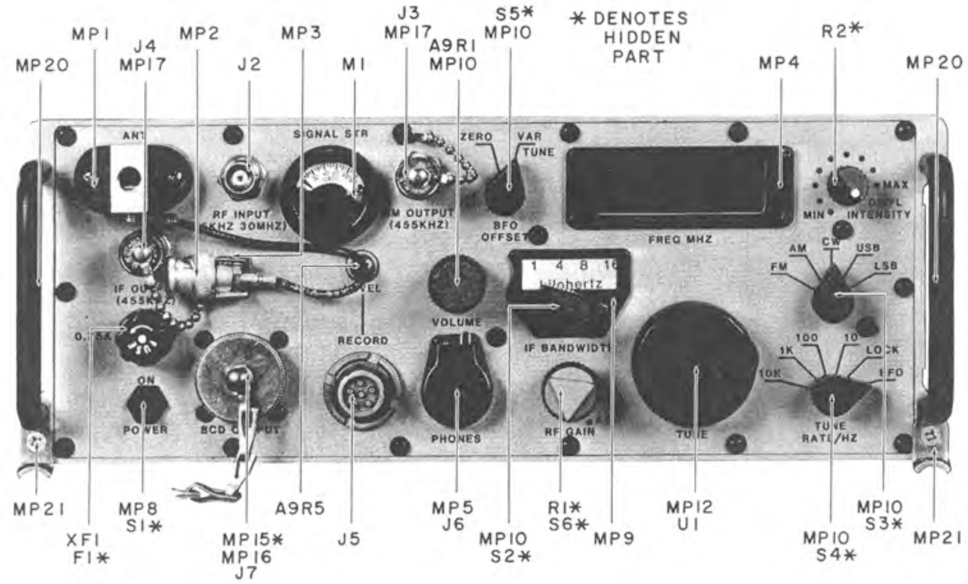

Figure 5-1. WJ-8770 HF Receiver, Front View, Location of Components

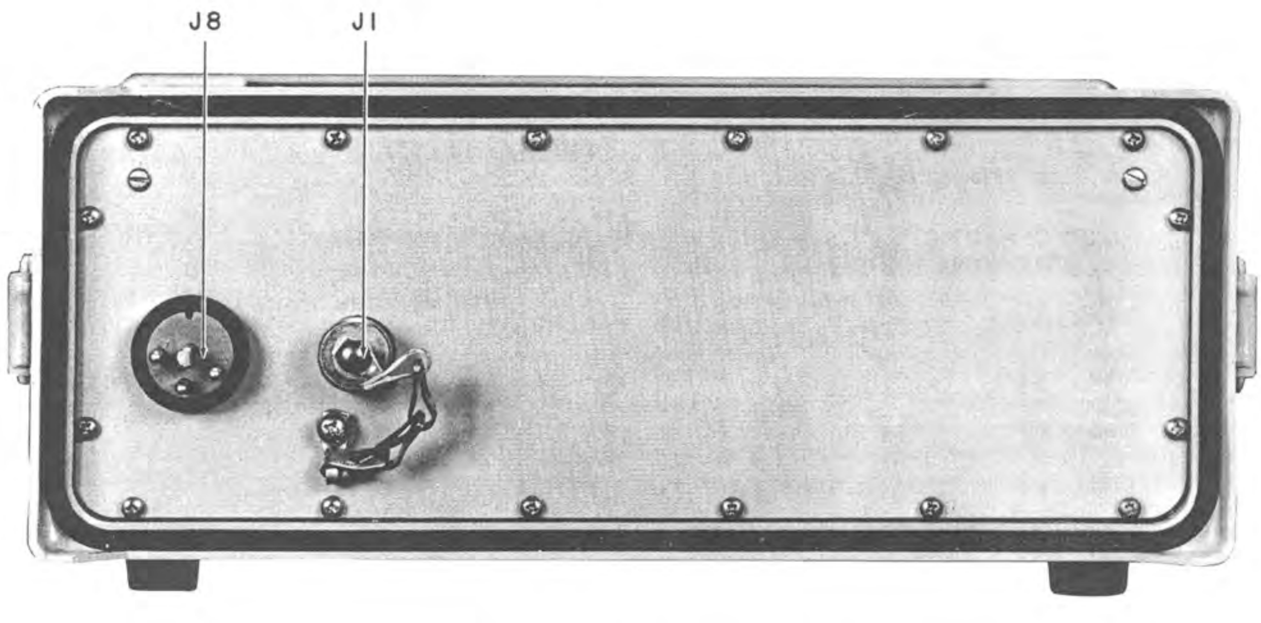

Figure 5-2. WJ-8770 HF Receiver, Rear View, Location of Components

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
E8	S/A E1				
E9	S/A E1				
E10	S/A E1				
E11	S/A E1				
E12	S/A E1				
E13	S/A E1				
E14	S/A E1				
E15	S/A E1				
E16	S/A E1				
E17	S/A E1				
E18	S/A E1				
FL1	FILTER LP	1	9051-100-0000	72982	
F1	FUSE/CARTRIDGE 3/4 AMP 3AG SLOW	1	MDL3/4	71400	XF1
J1	CONN/RECEP MULTIPIN 3 PINS	1	JTP02RE-8-98P(014)	77820	
J2	CONN/RECEP STR RR MT TO 0.24 THK DUAL CRIMP RG174	3	225398-7	00779	
J3	S/A J2				
J4	S/A J2				
J5	CONN/RECEP MULTIPIN	1	GC283	25350	

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
J6	CONN/PHONE JACK	1	L11	82389	
J7	CONN/RECEP	1	JTP02RE14-37S	77820	
J8	CONN/RECEP MULTIPIN	1	GC075	25330	
MP1	ANTENNA ADAPTER BLOCK ASSY	1	25112	14632	
MP2	JUMPER CABLE ASSY	1	18698	14632	
MP3	CLIP/COMP	1	6014-23CC	91506	
MP4	BEZEL/DISPLAY	1	280155	14632	
MP5	COVER JACK COVER FOR 3/8-32 PHONE JACK/BLACK	1	515	82389	J6
MP6	TACTILE KNOB BUSHING ASSY	1	25250-1	14632	R1
MP7	KNOB/ROUND	1	50-2WD-1G	94144	R2
MP8	SWITCH/BOOT TOGGLE	1	N5030LRFI	97539	S1
MP9	ESCUTCHEON PLATE ASSY	1	25117	14632	S2
MP10	KNOB/POINTER CONTROL	4	50-5-1G	94144	S2-S5
MP12	KNOB/SPINNER SPINNER BLACK MATTE FINISH FOR 1/4 SHAFT	1	3S28	23480	U1
MP14	CONTACT PIN CRIMP SNAP-IN RCPT 20-24 AWG WIRE REELED	72	86492-2	00779	

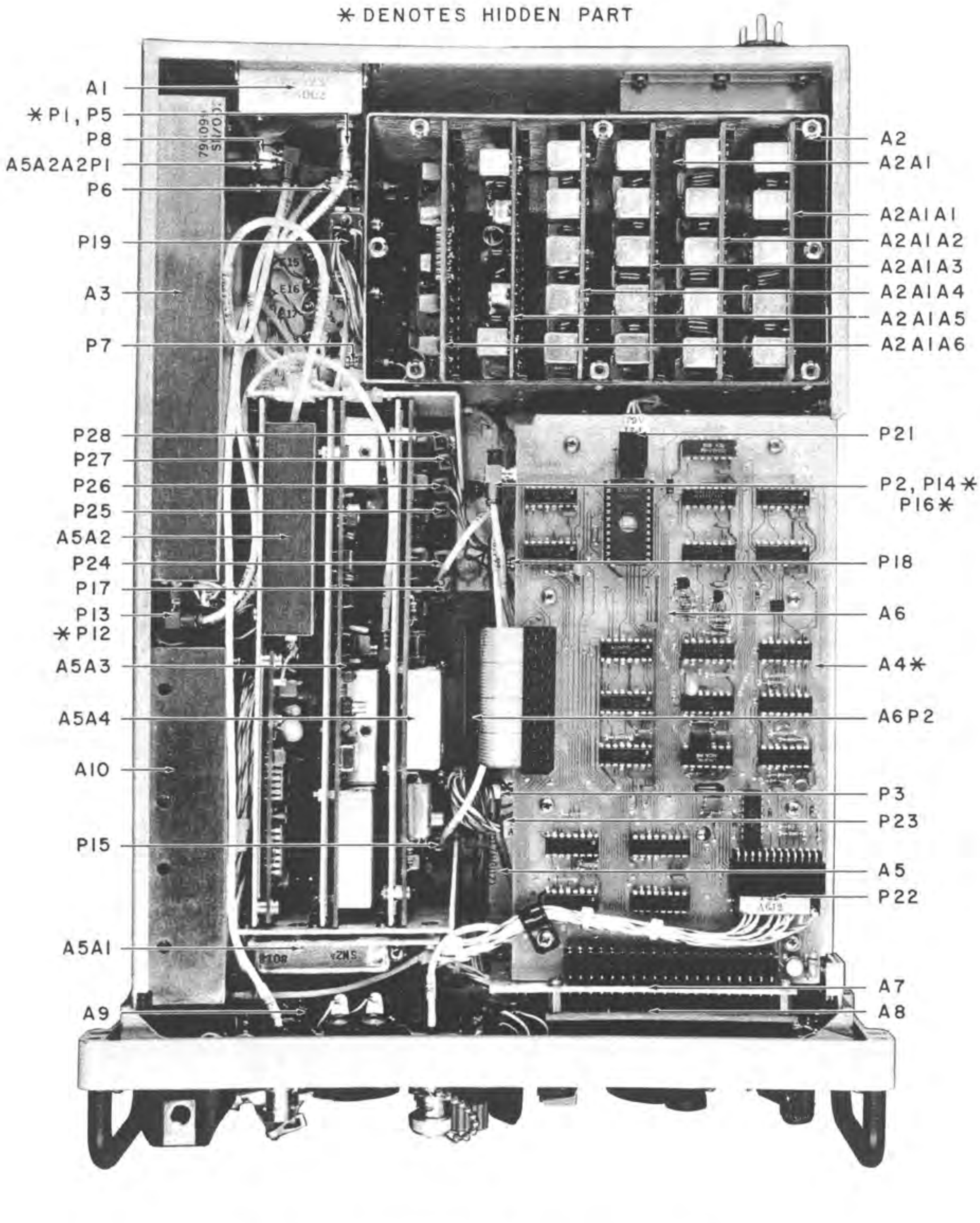

Figure 5-3. WJ-8770 HF Receiver, Top View, Location of Components

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
MP15	GASKET/RFI 0.906 SQ WITH CUT-OUT FOR SHELL SIZE 14 CYLINDRICAL CONN	1	30-01-4692-1212	18565	J7
MP16	CAP PROTECTION CAP PROTECTION COVER FOR SHELL SIZE 14 (MS27511A-14C)	1	10-241800-147	71285	J7
MP17	CONN/CAP	2	31-006	74868	J3,J4
MP18	CONN/CAP FOR GC283 CONN	1	GC800	25350	J5
MP19	TACTILE KNOB BUSHING ASSEMBLY	1	25250-4	14632	A9R5
MP20	HANDLE MODIFIED	2	18685-1	14632	
MP21	RETAINER HOOK, MODIFIED	2	18656-1	14632	
MP22	SCREW/CAPTV SOCKET HD 8-32X7/8	4	MS16995-29	96906	
MP23	CONTACT CRIMP SNAP-IN RCPT 20-24 AWG WIRE , REELED	18	66504-4	00779	P19
MP24	HOUSING STRAIGHT STYLE RECEPTACLE	15	1-480417-0	00779	P24-P38
MP25	CASE SUBASSEMBLY	1	480076	14632	
MP26	SCREW/CAPTV	4	6108-SS-1032	06540	
M1	METER/SIG/STR	1	MR05W100DCUA	81030	

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
P1	CONN/PLUG	7	UG1465/U	80058	
P2	CONN/PLUG	7	UG1466U	80058	
P3	S/A P2				
P4	CONN/PLUG	1	2-87456-6	00779	
P5	S/A P1				
P6	S/A P1				
P7	S/A P1				
P8	S/A P1				
P9	NOT USED				
P10	NOT USED				
P11	CONN/PLUG SMC SNAP-ON RIGHT ANGLE FOR RG-188	1	205/188	19505	
P13	S/A P2				
P14	S/A P2				
P15	S/A P2				
P16	S/A P1				
P17	S/A P1				
P18	S/A P2				
P19	CONN/RECEP 9 POS D STYLE ACCEPTS NO. 20 CRIMP SOCKETS	2	205203-1	00779	
P20	S/A P19				

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
P21	HOUSING/CONNECT MOD IV	1	87456-2	00779	
P22	CONN/PLUG 24 POS DBL ROW 0.10 CTRS FOR CRIMP SNAP IN CONTACTS MOD IV	1	2-87456-0	00779	
P23	CONN/PLUG 20 POS DBL ROW 0.10 CTRS FOR CRIMP CONTACTS	1	1-87456-6	00779	
P24	CONN/PLUG FASTON RCPT FOR 20-22AWG WIRE MATES W/STYLE B TAB	15	42236-1	00779	
P25	S/A P24				
P26	S/A P24				
P27	S/A P24				
P28	S/A P24				
P29	S/A P24				
P30	S/A P24				
P31	S/A P24				
P32	S/A P24				
P33	S/A P24				
P34	S/A P24				
P35	S/A P24				
P36	S/A P24				

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
P37	S/A P24				
P38	S/A P24				
Q1	TRANSISTOR PNP POWER TO-220 PKG	1	2N6124	80131	
R1	RES/VAR/COMPO 50K 10PCT 1W W/SPDT SWITCH DETENT IN CW POSN	1	21M244	01121	
R2	RES/VAR 250 OHM,10%,1/2W	1	RV6NAYSD251A	81349	
R3	RES/FIXED/COMPO 2.2K 5PCT .25W	3	RCR07G222JS	81349	
R4	RES/FIXED/COMPO 120 OHMS 5PCT .25W	1	RCR07G121JS	81349	
R5	S/A R3				
R6	S/A R3				
R7	RES/FIXED/COMPO 240 OHMS 5PCT .25W	1	RCR07G241JS	81349	
R8	RES/FIXED/COMPO 82 OHMS 5PCT .25W	1	RCR07G820JS	81349	
R9	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
S1	SWITCH/TOGGLE	1	MTA206N	95146	

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
S2	SWITCH/ROTARY 1 SEC 2 POLE 5 POSN NON-SHORT 1/4-32 BSHG W/SHAFT & PANEL SEAL	1	9S30-01-2-4N	81073	
S3	SWITCH/ROTARY 1 SEC 2 POLE 5 POSN NON-SHORT 1/4-32 BSHG W/SHAFT & PANEL SEAL	1	9S30-01-2-5N	81073	
S4	SWITCH/ROTARY 1SEC 2POLE/SEC 6POS/POLE 30D S/SEAL	1	51S30-01-2-6S	81073	
S5	SWITCH/ROTARY 1SEC 6POLE/SEC 2POS/POLE 30D NS/SEAL	1	9S30-01-6-2N	81073	
S6	INTEGRAL PART OF R1				
U1	ENCODER 127 PULSES PER REVOLUTION 12V DC 3/8-32 BSHG	1	380231	14632	
U2	VOLTAGE RGLTR + 1.2-37V ADJUSTABLE 1.5A TO-220 PKG	1	LM317T	27014	
U3	VOLTAGE RGLTR +15V TO 220 CASE	1	MC7815CT	04713	
VR1	DIODE ZENER 5.1V SILICON	1	1N751A	80131	
W1	CABLE ASSEMBLY	1	17300-300-1	14632	
W2	CABLE ASSEMBLY	1	17300-300-2	14632	
W3	CABLE ASSEMBLY	1	17300-300-3	14632	

TYPE NUMBER WJ-8770-1 REVISION B SCHEMATIC 680035

TITLE - HF TRANSPORTABLE RECEIVER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
W4	CABLE ASSEMBLY	1	380220	14632	
W5	CABLE ASSEMBLY	1	17300-300-4	14632	
W6	CABLE ASSEMBLY	1	17300-300-5	14632	
W7	NOT USED				
W8	CABLE ASSEMBLY	1	17300-300-6	14632	
W9	CABLE ASSEMBLY	1	17300-300-7	14632	
W10	CABLE ASSEMBLY	1	17300-300-8	14632	
W11	CABLE ASSEMBLY	1	17300-300-9	14632	
XF1	FUSEHOLDER 3AG SIZE DRIP PROOF	1	342004PA	75915	
1ACC	ACCESSORY ITEMS				
1ACC1	CONN/PLUG	1	JT06RE14-37P SR	77820	
1ACC2	CONN/PLUG MULTIPIN	1	JT06RE-8-98S(386)	77820	
1ACC3	SYNTHESIZER EXTENDER BOARD		796125 (SEP PL)	14632	
1ACC4	1ST LO EXTENDER BOARD		796138 (SEP PL)	14632	
1ACC5	IF EXTENDER BOARD		791458 (SEP PL)	14632	
1ACC6	PRESELECTOR/IF EXTENDER BOARD		796034 (SEP PL)	14632	
1ACC7	DISPLAY CABLE EXTENDER		380233 (SEP PL)	14632	

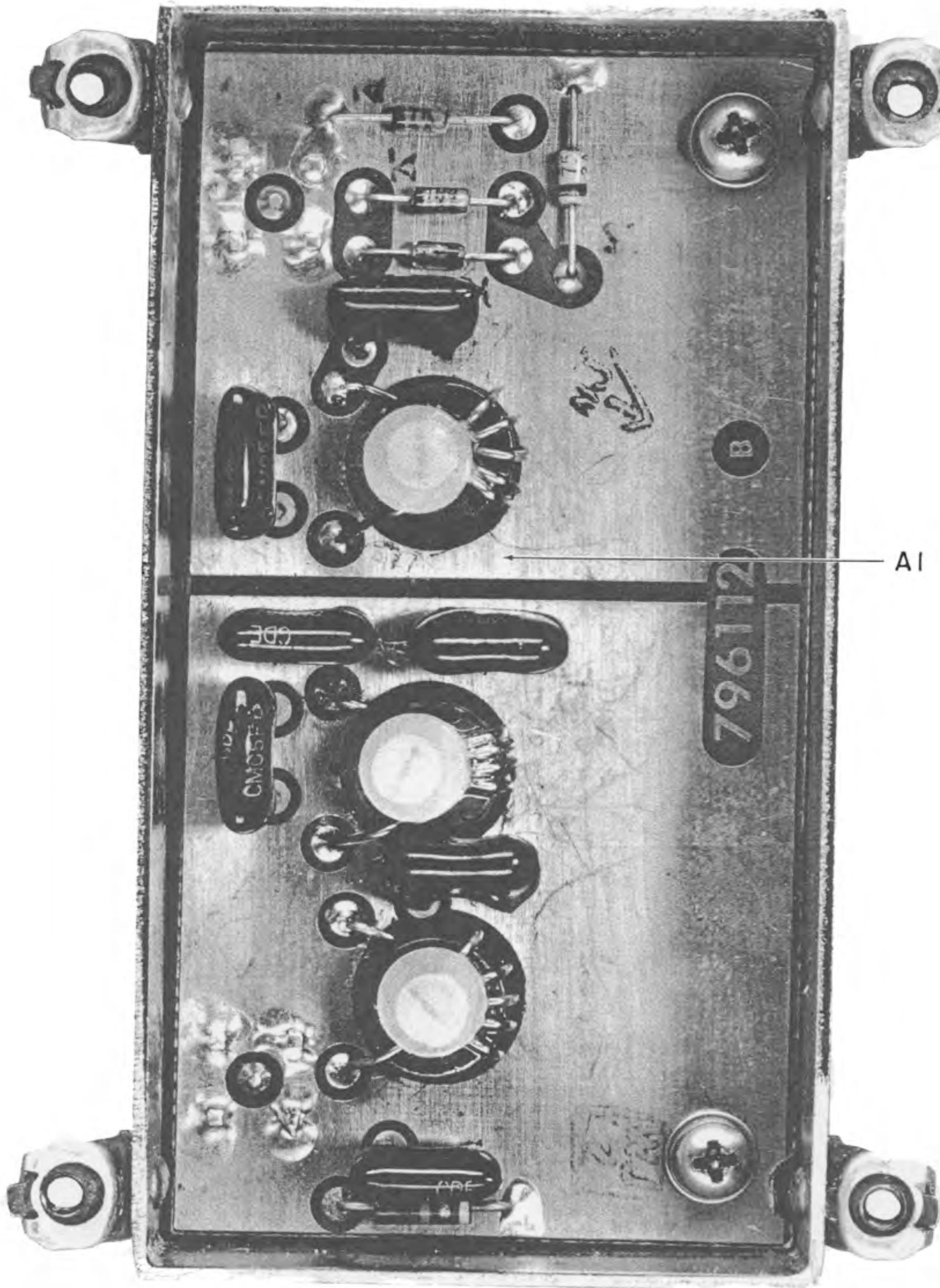

Figure 5-4. Type 796123 Input Filter Assembly (A1), Location of Components

TYPE NUMBER 796123 REVISION A SCHEMATIC 380217

TITLE - INPUT FILTER ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	INPUT FILTER PRINTED WIRING ASSEMBLY	1	796112 (SEP PL)	14632	

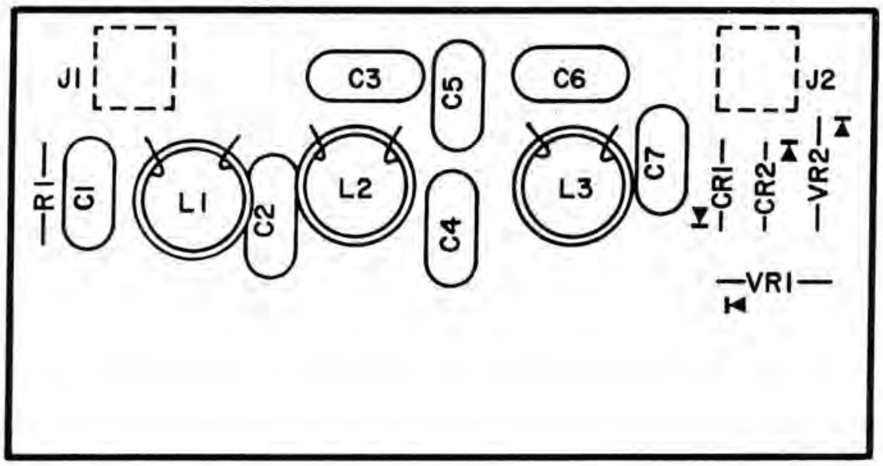

Figure 5-5. Type 796112 Input Filter (A1A1), Location of Components

TYPE NUMBER 796112 REVISION A SCHEMATIC 380217

TITLE - INPUT FILTER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N4449	80131	
CR2	S/A CR1				
C1	CAP/MICA/DIPPED 68PF 2PCT 500V	1	CM05ED680G03	81349	
C2	CAP/MICA/DIPPED 160PF 2PCT 500V	2	CM05FD161G03	81349	
C3	CAP/MICA/DIPPED 62PF 2PCT 500V	1	CM05ED620G03	81349	
C4	S/A C2				
C5	CAP/MICA/DIPPED 15PF 5PCT 500V	1	CM05CD150J03	81349	
C6	CAP/MICA/DIPPED 22PF 5PCT 500V	1	CM05ED220J03	81349	
C7	CAP/MICA/DIPPED 120PF 2PCT 500V	1	CM05FD121G03	81349	
J1	CONN/RECEP	2	34520-1	14632	
J2	S/A J1				
L1	COIL/FXD	2	20681-211	14632	
L2	COIL/FXD	1	20681-212	14632	
L3	S/A L1				
R1	RES/FIXED/COMPD 10K 5PCT .25W	1	RCR07G103JS	81349	
VR1	DIODE ZENER 6.2V SILICON	2	1N753A	80131	
VR2	S/A VR1				

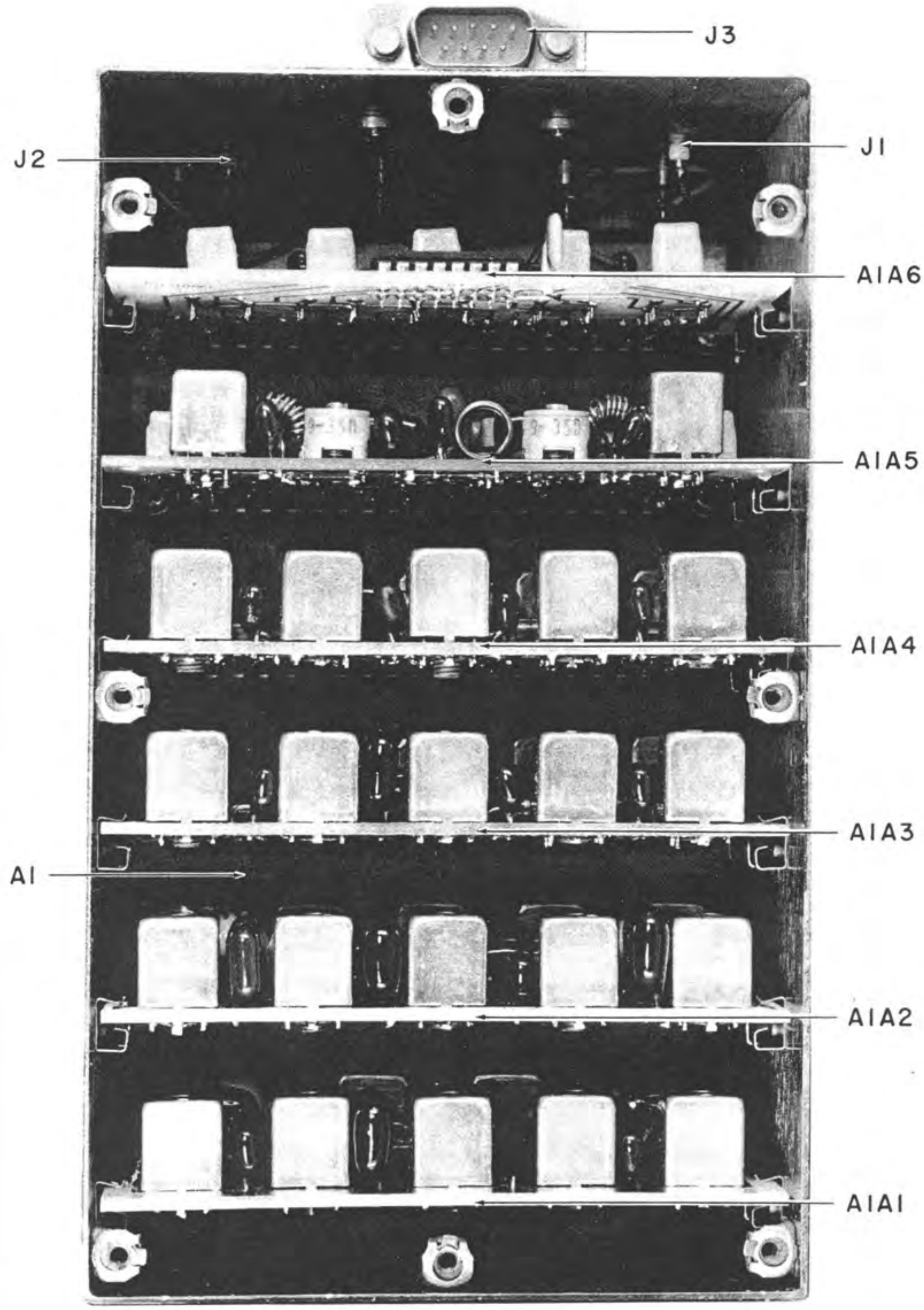

Figure 5-6. Type 796100 Input Preselector (A2), Location of Components

TYPE NUMBER 796100 REVISION A SCHEMATIC 480218

TITLE - INPUT PRESELECTOR

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	MOTHERBOARD PC ASSEMBLY	1	34936	14632	
A1A1	INPUT FILTER PC ASSEMBLY	1	796016 (SEP PL)	14632	
A1A2	INPUT FILTER PC ASSEMBLY	1	791769 (SEP PL)	14632	
A1A3	INPUT FILTER PC ASSEMBLY	1	791770 (SEP PL)	14632	
A1A4	INPUT FILTER PC ASSEMBLY	1	791771 (SEP PL)	14632	
A1A5	INPUT FILTER PC ASSEMBLY	1	791772 (SEP PL)	14632	
A1A6	DIGITAL BOARD PC ASSEMBLY	1	791821-2 (SEP PL)	14632	
C1	CAP/CER/FDTHRU .05UF GMV 300V	6	54-785-002-503P	33095	
C2	S/A C1				
C3	S/A C1				
C4	S/A C1				
C5	S/A C1				
C6	S/A C1				
C7	CAP/CER/DISC .47UF 20PCT 50V Z5U .300 SQ .200 LEADS	2	34452-1	14632	
C8	S/A C7				
J1	CONN/RECEP	2	10-0104-002	19505	

TYPE NUMBER 796100 REVISION A SCHEMATIC 480218

TITLE - INPUT PRESELECTOR

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
J2	S/A J1				
J3	CONN/PLUG 9 PIN D STYLE W/SLDR CUPS	1	DE-9P	71468	
L1	COIL/TOROIDAL	2	280163-1	14632	
L2	S/A L1				

TYPE NUMBER 34936 REVISION SCHEMATIC

TITLE - MOTHER BOARD

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
E1-E9	TERMINAL/FORKED	9	140-1941-02-01	71279	
XA1	CONN/PLUG	6	530692-5	00779	
XA2	S/A XA1				
XA3	S/A XA1				
XA4	S/A XA1				
XA5	S/A XA1				
XA6	S/A XA1				

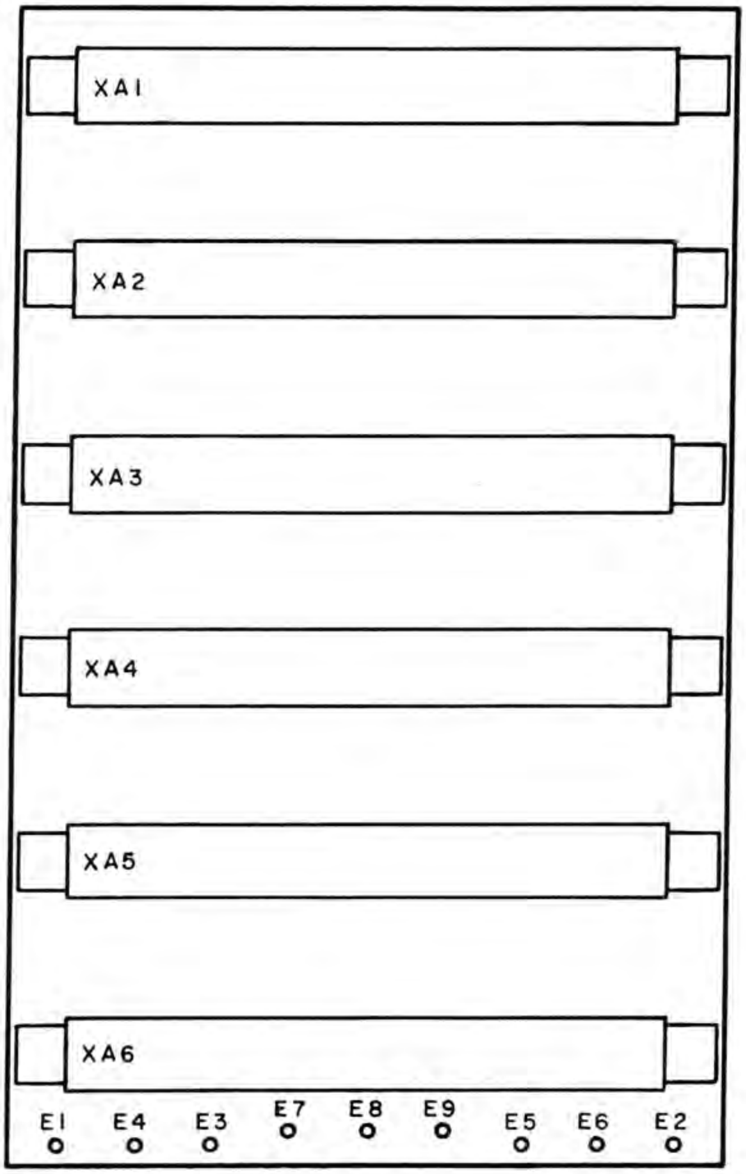

Figure 5-7. Type 34936 Preselector Motherboard (A2A1), Location of Components

TYPE NUMBER 796016 REVISION SCHEMATIC 480020

TITLE - 5-750KHZ/.75-1.1MHZ FILTER PC ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE PIN SWITCHING	6	MPN3401	04713	
CR2	S/A CR1				
CR3	S/A CR1				
CR4	S/A CR1				
CR5	S/A CR1				
CR6	S/A CR1				
C1	CAP/ELEC/TANT 2.2UF 20PCT 35V	3	196D225X0035JE3	56289	
C2	CAP/CER/DISC 0.47UF 20PCT 100V	4	8131M100-651-474M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 4700PF 2PCT 500V	2	CM06FD472G03	81349	
C5	CAP/MICA/DIPPED 820PF 2PCT 300V	2	DM15-821G	72136	
C6	CAP/MICA/DIPPED 1000PF 2PCT 100V	2	DM15-102G	72136	
C7	CAP/MICA/DIPPED 300PF 2PCT 500V	2	CM05FD301G03	81349	
C8	CAP/POLYES/FOIL .01UF 2PCT 100V	1	PE51-.010-100-2	27735	
C9	CAP/MICA/DIPPED 1500PF 2PCT 500V	1	CM06FD152G03	81349	
C10	S/A C6				

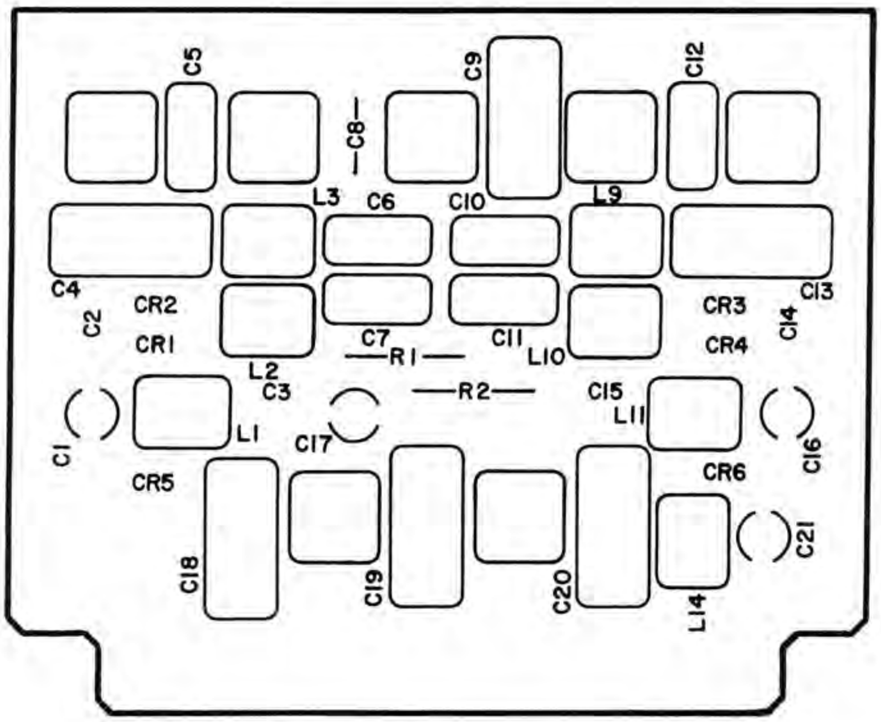

Figure 5-8. Type 796016 Input Filter (A2A1A1),
Location of Components

TYPE NUMBER 796016 REVISION SCHEMATIC 480020

TITLE - 5-750KHZ/.75-1.1MHZ FILTER PC ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C11	S/A C7				
C12	S/A C5				
C13	S/A C4				
C14	S/A C2				
C15	S/A C2				
C16	S/A C1				
C17	CAP/ELEC/TANT 4.7UF 20PCT 35V	1	196D475X0035JE3	56289	
C18	CAP/MICA/DIPPED 4300PF 2PCT 500V	2	CM06FD432G03	81349	
C19	CAP/MICA/DIPPED 7500PF 2PCT 100V	1	DM19-752G	72136	
C20	S/A C18				
C21	S/A C1				
L1	COIL/FIXED 4.7MH 10PCT	4	553-3635-45	71279	
L2	COIL/FIXED 1.0MH 10PCT	3	553-3635-37	71279	
L3	S/A L1				
L4	COIL VARIABLE	2	34960-9	14632	
L5	COIL VARIABLE	2	34960-6	14632	
L6	COIL VARIABLE	1	34960-1	14632	
L7	S/A L5				

TYPE NUMBER 796016 REVISION SCHEMATIC 480020

TITLE - 5-750KHZ/.75-1.1MHZ FILTER PC ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L8	S/A L4				
L9	S/A L2				
L10	S/A L2				
L11	S/A L1				
L12	COIL VARIABLE	2	34960-5	14632	
L13	S/A L12				
L14	S/A L1				
R1	RES/FIXED/COMPO 15 OHMS 5PCT .5W	2	RCR20G150JS	81349	
R2	S/A R1				

TYPE NUMBER 791769 REVISION SCHEMATIC 43728

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N4446	80131	
CR2	DIODE PIN SWITCHING	8	MPN3401	04713	
CR3	S/A CR2				
CR4	S/A CR2				
CR5	S/A CR2				
CR6	S/A CR2				
CR7	S/A CR2				
CR8	S/A CR2				
CR9	S/A CR2				
CR10	S/A CR1				
C1	CAP/CER/DISC 0.47UF 20PCT 100V	10	8131M100-651-474M	72982	
C2	S/A C1				
C3	S/A C1				
C4	CAP/MICA/DIPPED 4300PF 2PCT 500V	3	CM06FD432G03	81349	
C5	CAP/MICA/DIPPED 270PF 2PCT 500V	2	CM05FD271G03	81349	
C6	CAP/MICA/DIPPED 1000PF 2PCT 100V	2	DM15-102G	72136	
C7	CAP/MICA/DIPPED 3900PF 2PCT 500V	1	CM06FD392G03	81349	
C8	CAP/MICA/DIPPED 3600PF 2PCT 500V	1	CM06FD362G03	81349	

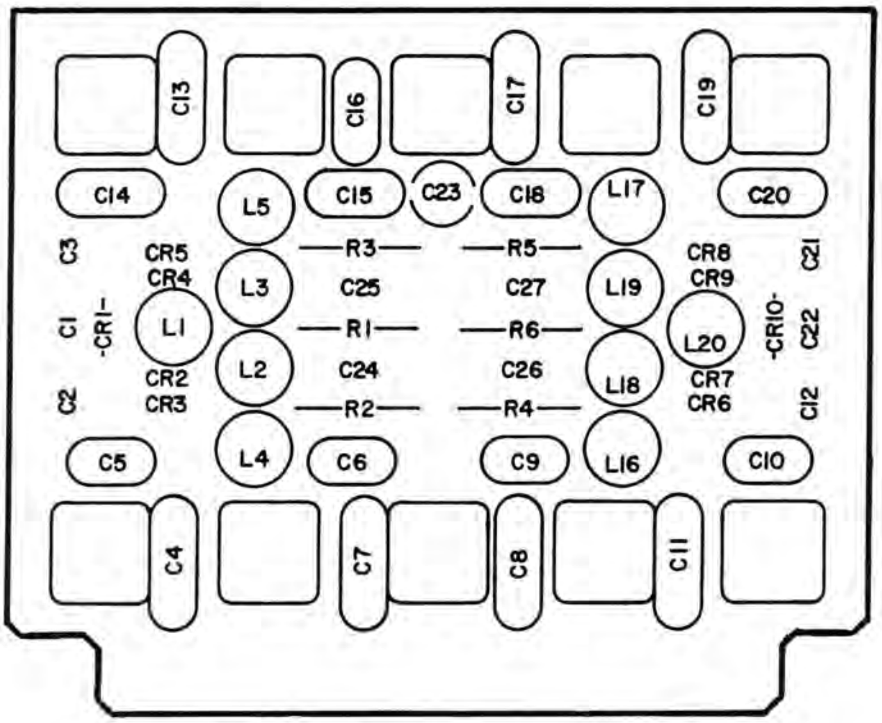

Figure 5-9. Type 791769 Input Filter (A2A1A2), Location of Components

TYPE NUMBER 791769 REVISION SCHEMATIC 43728

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C9	S/A C6				
C10	S/A C5				
C11	S/A C4				
C12	S/A C1				
C13	CAP/MICA/DIPPED 3000PF 2PCT 500V	2	CM06FD302G03	81349	
C14	CAP/MICA/DIPPED 180PF 2PCT 500V	2	CM05FD181G03	81349	
C15	CAP/MICA/DIPPED 620PF 2PCT 300V	2	DM15-621G	72136	
C16	CAP/MICA/DIPPED 1200PF 2PCT 100V	1	DM15-122G	72136	
C17	S/A C4				
C18	S/A C15				
C19	S/A C13				
C20	S/A C14				
C21	S/A C1				
C22	S/A C1				
C23	CAP/ELEC/TANT 4.7UF 20PCT 35V	1	196D475X0035JE3	56289	
C24	S/A C1				
C25	S/A C1				
C26	S/A C1				

TYPE NUMBER 791769 REVISION SCHEMATIC 43728

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C27	S/A C1				
L1	COIL/FIXED 560UH 10PCT	10	553-3635-34	71279	
L2	S/A L1				
L3	S/A L1				
L4	S/A L1				
L5	S/A L1				
L6	COIL VARIABLE	2	34960-2	14632	
L7	COIL VARIABLE	2	34960-5	14632	
L8	COIL VARIABLE	1	34960-8	14632	
L9	S/A L7				
L10	S/A L6				
L11	COIL VARIABLE	2	34960-17	14632	
L12	COIL VARIABLE	2	34960-4	14632	
L13	COIL VARIABLE	1	34960-16	14632	
L14	S/A L12				
L15	S/A L11				
L16	S/A L1				
L17	S/A L1				
L18	S/A L1				
L19	S/A L1				

TYPE NUMBER 791769 REVISION SCHEMATIC 43728

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L20	S/A L1				
R1	RES/FIXED/COMPO 15 OHMS 5PCT .5W	2	RCR20G150JS	81349	
R2	RES/FIXED/COMPO 30 OHMS 5PCT 1/2W	4	RCR20G300JS	81349	
R3	S/A R2				
R4	S/A R2				
R5	S/A R2				
R6	S/A R1				

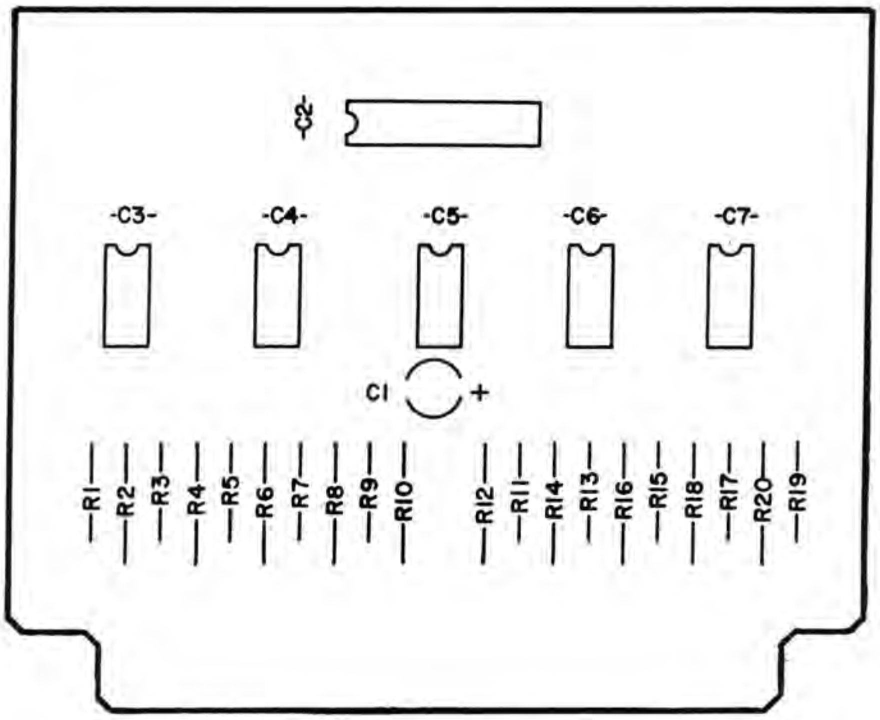

Figure 5-10. Type 791770 Input Filter (A2A1A3),
Location of Components

TYPE NUMBER 791770 REVISION SCHEMATIC 43729

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N4446	80131	
CR2	DIODE PIN SWITCHING	8	MPN3401	04713	
CR3	S/A CR2				
CR4	S/A CR2				
CR5	S/A CR2				
CR6	S/A CR2				
CR7	S/A CR2				
CR8	S/A CR2				
CR9	S/A CR2				
CR10	S/A CR1				
C1	CAP/CER/DISC .1UF 20PCT 100V	6	8131M100-651-104M	72982	
C2	S/A C1				
C3	S/A C1				
C4	CAP/MICA/DIPPED 1800PF 2PCT 500V	2	CM06FD182G03	81349	
C5	CAP/MICA/DIPPED 270PF 2PCT 500V	3	CM05FD271G03	81349	
C6	CAP/MICA/DIPPED 430PF 2PCT 300V	3	DM15-431G	72136	
C7	CAP/MICA/DIPPED 3600PF 2PCT 500V	1	CM06FD362G03	81349	
C8	S/A C6				

TYPE NUMBER 791770 REVISION SCHEMATIC 43729

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C9	S/A C5				
C10	S/A C4				
C11	S/A C1				
C12	CAP/MICA/DIPPED 1000PF 2PCT 100V	2	DM15-102G	72136	
C13	CAP/MICA/DIPPED 330PF 2PCT 500V	2	CM05FD331G03	81349	
C14	S/A C6				
C15	CAP/MICA/DIPPED 300PF 2PCT 500V	1	CM05FD301G03	81349	
C16	CAP/MICA/DIPPED 2000PF 2PCT 500V	1	CM06FD202G03	81349	
C17	S/A C5				
C18	S/A C13				
C19	S/A C12				
C20	S/A C1				
C21	S/A C1				
C22	CAP/ELEC/TANT 4.7UF 20PCT 35V	1	196D475X0035JE3	56289	
C23	CAP/CER/DISC 0.47UF 20PCT 100V	4	8131M100-651-474M	72982	
C24	S/A C23				
C25	S/A C23				
C26	S/A C23				

TYPE NUMBER 791770 REVISION SCHEMATIC 43729

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L1	COIL/FIXED 100UH 5PCT /MIL P/N MS90538-12/	10	1537-76 (90538-12)	99800	
L2	S/A L1				
L3	S/A L1				
L4	S/A L1				
L5	S/A L1				
L6	COIL VAR	2	34960-10	14632	
L7	COIL VAR	2	34960-11	14632	
L8	COIL VAR	1	34960-14	14632	
L9	S/A L7				
L10	S/A L6				
L11	COIL VAR	2	34960-18	14632	
L12	COIL VAR	2	34960-19	14632	
L13	COIL VARIABLE	1	34960-13	14632	
L14	S/A L12				
L15	S/A L11				
L16	S/A L1				
L17	S/A L1				
L18	S/A L1				
L19	S/A L1				
L20	S/A L1				

TYPE NUMBER 791770 REVISION SCHEMATIC 43729

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R1	RES/FIXED/COMPO 15 OHMS 5PCT .5W	2	RCR20G150JS	81349	
R2	RES/FIXED/COMPO 27 OHMS 5PCT .5W	4	RCR20G270JS	81349	
R3	S/A R2				
R4	S/A R2				
R5	S/A R2				
R6	S/A R1				

TYPE NUMBER 791771 REVISION E SCHEMATIC 43730

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N4446	80131	
CR2	DIODE PIN SWITCHING	8	MPN3401	04713	
CR3	S/A CR2				
CR4	S/A CR2				
CR5	S/A CR2				
CR6	S/A CR2				
CR7	S/A CR2				
CR8	S/A CR2				
CR9	S/A CR2				
CR10	S/A CR1				
C1	CAP/CER/DISC .1UF 20PCT 100V	6	8131M100-651-104M	72982	
C2	S/A C1				
C3	S/A C1				
C4	CAP/MICA/DIPPED 620PF 5PCT 300V	2	DM15-621J	72136	
C5	CAP/MICA/DIPPED 160PF 2PCT 500V	2	CM05FD161G03	81349	
C6	CAP/MICA/DIPPED 1300PF 2PCT 500V	1	CM06FD132G03	81349	
C7	S/A C5				
C8	S/A C4				

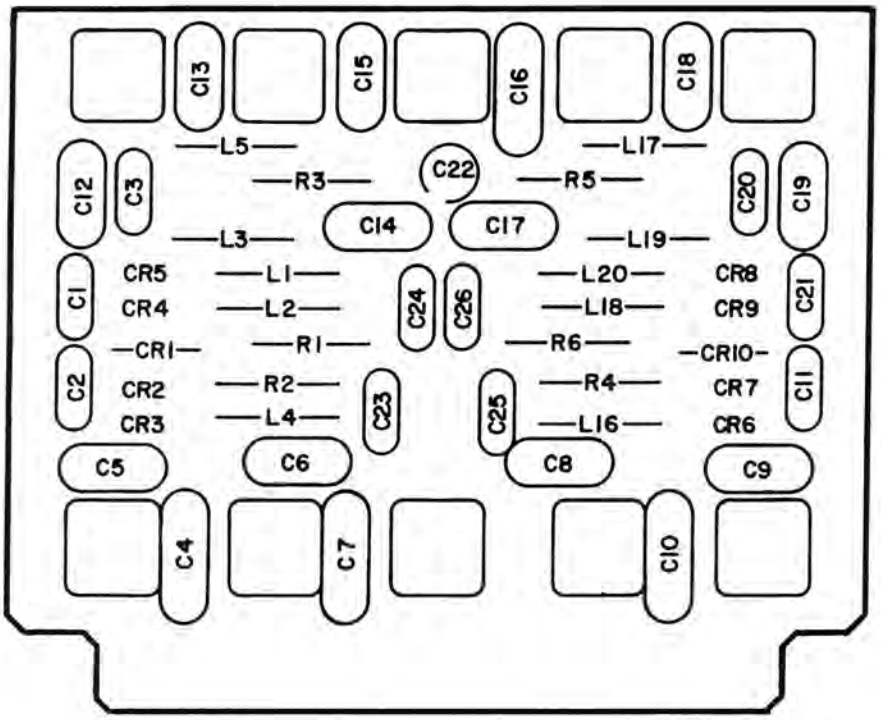

Figure 5-11. Type 791771 Input Filter (A2A1A4), Location of Components

TYPE NUMBER 791771 REVISION E SCHEMATIC 43730

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C9	S/A C1				
C10	CAP/MICA/DIPPED 680PF 2PCT 300V	2	DM15-681G	72136	
C11	CAP/MICA/DIPPED 110PF 2PCT 500V	2	CM05FD111G03	81349	
C12	CAP/MICA/DIPPED 1200PF 2PCT 100V	1	DM15-122G	72136	
C13	S/A C11				
C14	S/A C10				
C15	S/A C1				
C16	S/A C1				
C17	CAP/ELEC/TANT 4.7UF 20PCT 35V	1	196D475X0035JE3	56289	
C18	CAP/CER/DISC 0.47UF 20PCT 100V	4	8131M100-651-474M	72982	
C19	S/A C18				
C20	S/A C18				
C21	S/A C18				
L1	COIL/FIXED 47UH 5PCT	10	1537-60 (90538-04)	99800	
L2	S/A L1				
L3	S/A L1				
L4	S/A L1				
L5	S/A L1				

TYPE NUMBER 791771 REVISION E SCHEMATIC 43730

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L6	COIL VAR	2	34960-14	14632	
L7	COIL VAR	2	34960-22	14632	
L8	COIL VAR	3	34960-21	14632	
L9	S/A L7				
L10	S/A L6				
L11	S/A L8				
L12	COIL VAR	2	34960-15	14632	
L13	COIL VAR	1	34960-20	14632	
L14	S/A L12				
L15	S/A L8				
L16	S/A L1				
L17	S/A L1				
L18	S/A L1				
L19	S/A L1				
L20	S/A L1				
R1	RES/FIXED/COMPO 16 OHMS 5PCT .5W	2	RCR20G160JS	81349	
R2	RES/FIXED/COMPO 30 OHMS 5PCT 1/2W	4	RCR20G300JS	81349	
R3	S/A R2				
R4	S/A R2				
R5	S/A R2				

TYPE NUMBER 791771 REVISION E SCHEMATIC 43730

TITLE - INPUT PRESELECTOR FILTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R6	S/A R1				

TYPE NUMBER 791772 REVISION D SCHEMATIC 43731

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N4446	80131	
CR2	DIODE PIN SWITCHING	8	MPN3401	04713	
CR3	S/A CR2				
CR4	S/A CR2				
CR5	S/A CR2				
CR6	S/A CR2				
CR7	S/A CR2				
CR8	S/A CR2				
CR9	S/A CR2				
CR10	S/A CR1				
C1	CAP/CER/DISC .1UF 20PCT 100V	6	8131M100-651-104M	72982	
C2	S/A C1				
C3	S/A C1				
C4	CAP/MICA/DIPPED 360PF 2PCT 500V	2	CM05FD361G03	81349	
C5	CAP/MICA/DIPPED 91PF 2PCT 500V	2	CM05FD910G03	81349	
C6	CAP/MICA/DIPPED 620PF 2PCT 300V	1	DM15-621G	72136	
C7	S/A C5				
C8	S/A C4				

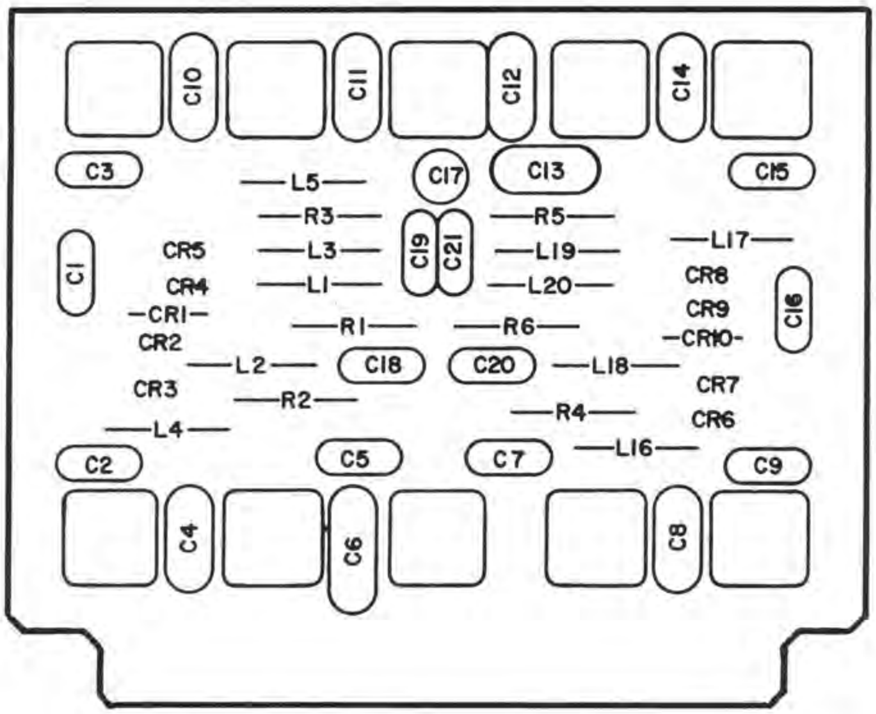

Figure 5-12. Type 791772 Input Filter (A2A1A5),
Location of Components

TYPE NUMBER 791772 REVISION D SCHEMATIC 43731

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C9	S/A C1				
C10	CAP/MICA/DIPPED 240PF 2PCT 500V	2	CM05FD241G03	81349	
C11	CAP/MICA/DIPPED 30PF 2PCT 500V	2	CM05ED300G03	81349	
C12	CAP/MICA/DIPPED 390PF 2PCT 500V	1	CM05FD391G03	81349	
C13	S/A C11				
C14	S/A C10				
C15	S/A C1				
C16	S/A C1				
C17	CAP/ELEC/TANT 4.7UF 20PCT 35V	1	196D475X0035JE3	56289	
C18	CAP/CER/DISC 0.47UF 20PCT 100V	4	8131M100-651-474M	72982	
C19	S/A C18				
C20	S/A C18				
C21	S/A C18				
C22	CAP/VAR/CERAMIC 9-35PF 350V N650	4	538-011D9-35	72982	
C23	S/A C22				
C24	S/A C22				
C25	S/A C22				
C26	CAP/MICA/DIPPED 27PF 2PCT 500V	1	CM05ED270G03	81349	

TYPE NUMBER 791772 REVISION D SCHEMATIC 43731

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L1	COIL/FIXED 4.7UH 10PCT	10	1537-28 (18130-16)	99800	
L2	S/A L1				
L3	S/A L1				
L4	S/A L1				
L5	S/A L1				
L6	COIL/VARIABLE 0.297-0.363UH	2	558-7107-07	71279	
L7	COIL/FXD TOROIDAL	2	20681-213	14632	
L8	COIL/FIX AIR	1	1129-54	14632	
L9	S/A L7				
L10	S/A L6				
L11	COIL/VARIABLE 0.162-0.198UH	2	558-7107-04	71279	
L12	COIL/FXD TOROIDAL	2	20681-214	14632	
L13	COIL/FXD AIR	1	1129-55	14632	
L14	S/A L12				
L15	S/A L11				
L16	S/A L1				
L17	S/A L1				
L18	S/A L1				
L19	S/A L1				

TYPE NUMBER 791772 REVISION D SCHEMATIC 43731

TITLE - INPUT PRESELECTOR FILTER PRINT CKT ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L20	S/A L1				
R1	RES/FIXED/COMPO 16 OHMS 5PCT .5W	2	RCR20G160JS	81349	
R2	RES/FIXED/COMPO 30 OHMS 5PCT 1/2W	4	RCR20G300JS	81349	
R3	S/A R2				
R4	S/A R2				
R5	S/A R2				
R6	S/A R1				

TYPE NUMBER 791821-2 REVISION A SCHEMATIC 43732

TITLE - INPUT PRESELECTOR DIGITAL CONTROL ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/ELEC/TANT 1UF 20PCT 35V	1	196D105X0035HE3	56289	
C2	CAP/CER/DISC .1UF 20PCT 100V	6	8131M100-651-104M	72982	
C3	S/A C2				
C4	S/A C2				
C5	S/A C2				
C6	S/A C2				
C7	S/A C2				
R1	RES/FIXED/COMPO 10K 5PCT .25W	10	RCR07G103JS	81349	
R2	RES/FIXED/COMPO 22 OHMS 5PCT .5W	10	RCR20G220JS	81349	
R3	S/A R1				
R4	S/A R2				
R5	S/A R1				
R6	S/A R2				
R7	S/A R1				
R8	S/A R2				
R9	S/A R1				
R10	S/A R2				
R11	S/A R1				
R12	S/A R2				

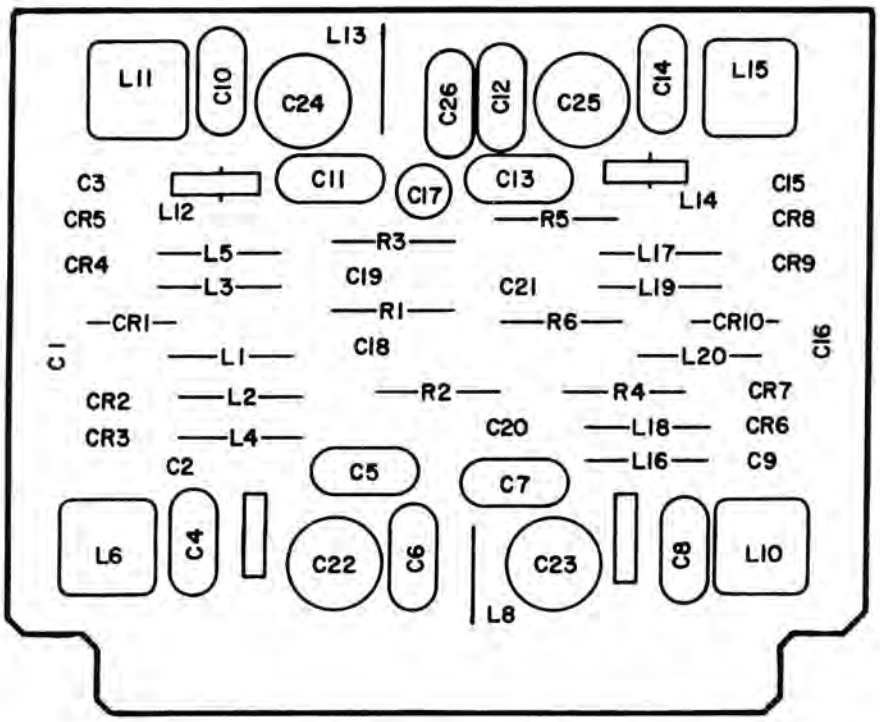

Figure 5-13. Type 791821-2 Digital Control (A2A1A6), Location of Components

TYPE NUMBER 791821-2 REVISION A SCHEMATIC 43732

TITLE - INPUT PRESELECTOR DIGITAL CONTROL ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R13	S/A R1				
R14	S/A R2				
R15	S/A R1				
R16	S/A R2				
R17	S/A R1				
R18	S/A R2				
R19	S/A R1				
R20	S/A R2				
U1	I C BCD TO DECIMAL CONVERTER	1	MM74C42N	27014	
U2	I C DUAL CMOS "OR" PERIPHERAL DRIVER	5	DS3633N	27014	
U3	S/A U2				
U4	S/A U2				
U5	S/A U2				
U6	S/A U2				

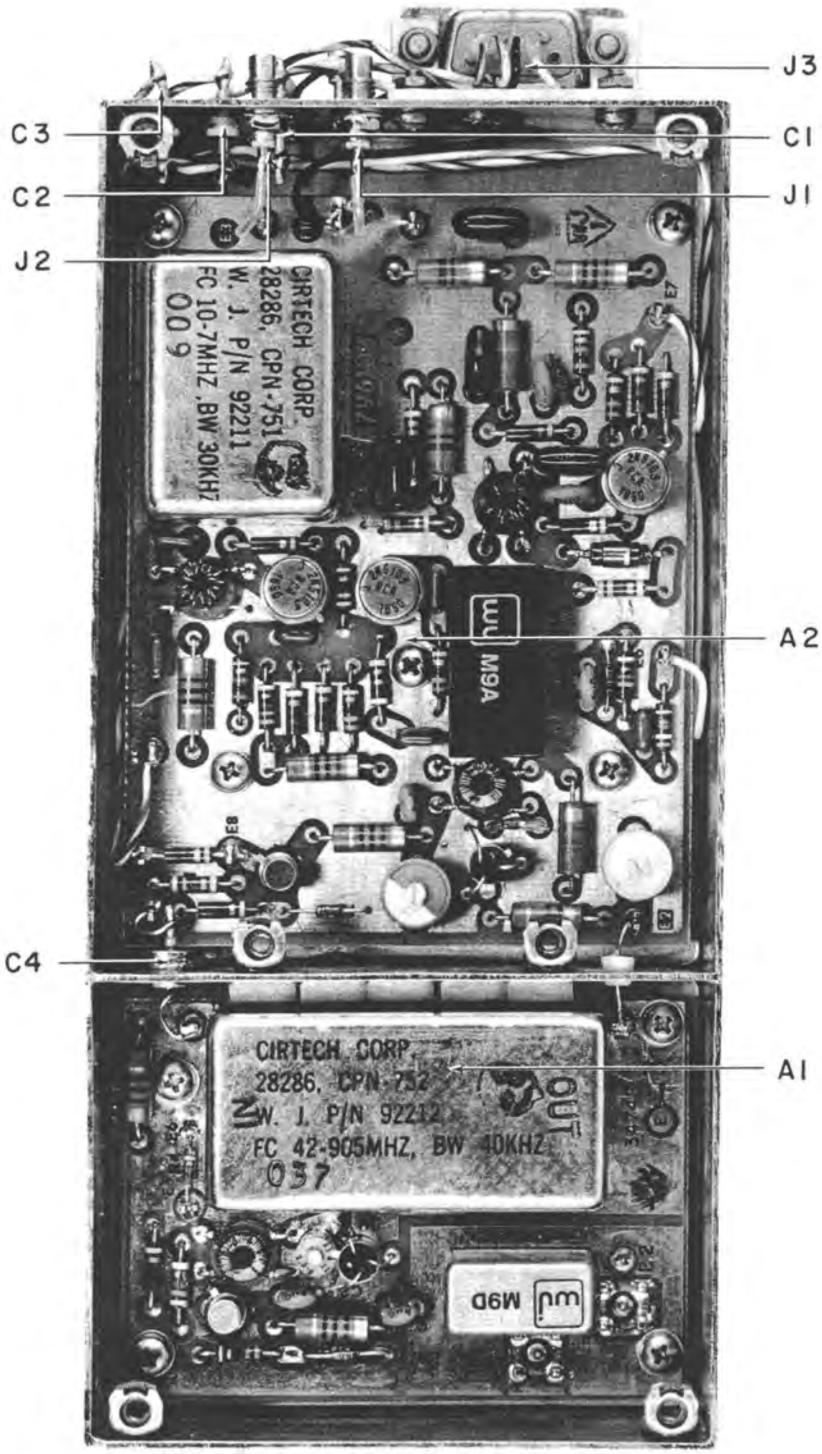

Figure 5-14. Type 796099 Input Converter (A3), Location of Components

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TYPE NUMBER 796099 REVISION A SCHEMATIC 580059

TITLE - INPUT CONVERTER

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	1ST MIXER/1ST IF, PC ASSEMBLY	1	34748-3 (SEP PL)	14632	
A2	2ND MIXER/2ND IF, PC ASSEMBLY	1	796108 (SEP PL)	14632	
C1	CAP/CER/FDTHRU 1000PF GMV 500V	4	54-794-009-102W	33095	
C2	S/A C1				
C3	S/A C1				
C4	S/A C1				
J1	CONN/RECEP	2	UG1464U	19505	
J2	S/A J1				
J3	DESCRIPTION PROBLEM	1	DEM-9P	71468	

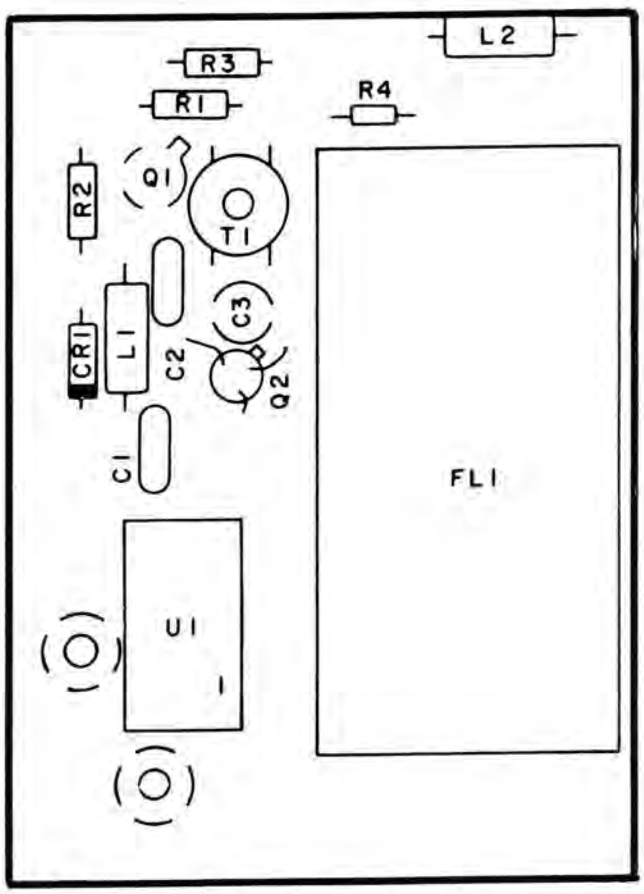

Figure 5-15. Type 34748-3 1st Mixer/1st IF (A3A1), Location of Components

TYPE NUMBER 34748-3 REVISION A SCHEMATIC

TITLE - 1ST MIXER/1ST IF PC ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	1	1N4446	80131	
C1	CAP/CER/DISC 1000PF GMV 500V	2	8-GP1000PFP	91418	
C2	S/A C1				
C3	CAP/VAR/CERAMIC 2.5-9PF 25V NPO	1	518-000A2.5-9	72982	
FL1	FILTER BP 42.905MHZ CF 40KHZ BW	1	92212	14632	
J1	CONN/RECEP	2	34520-1	14632	
J2	S/A J1				
L1	COIL/FIXED 10UH 10PCT	2	1537-36 (14046-4)	99800	
L2	S/A L1				
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	CP643	12498	
PA1	HEATSINK	1	1118C	13103	Q2
R1	RES/FIXED/COMPO 4.3K 5PCT .25W	1	RCR07G432JS	81349	
R2	RES/FIXED/COMPO 82 OHMS 5PCT .25W	1	RCR07G820JS	81349	
R3	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	

TYPE NUMBER 34748-3 REVISION A SCHEMATIC

TITLE - 1ST MIXER/1ST IF PC ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R4	RES/FIXED/COMPO 150 OHMS 5PCT .125W	1	RCR05G151JS	81349	
T1	TRANSFORMER ASSY	1	22295-52	14632	
U1	MIXER/BALANCED	1	M9D	27956	

TYPE NUMBER 796108 REVISION A SCHEMATIC 480212

TITLE - 2ND MIXER/2ND IF PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	1	1N4446	80131	
CR2	DIODE	1	5082-3039	28480	
C1	CAP/VAR/CERAMIC 2.5-11PF 350V N300	1	538-011B2.5-11	72982	
C2	CAP/CER/DISC 1000PF GMV 500V	2	B-GP1000PFP	91418	
C3	S/A C2				
C4	CAP/CER/DISC .01UF 20PCT 50V	5	34453-1	14632	
C5	S/A C4				
C6	S/A C4				
C7	S/A C4				
C8	S/A C4				
C9	CAP/CER/DISC .1UF 20PCT 50V	1	34475-1	14632	
C10	CAP/CER/DISC 4.7PF PORM 0.25PF 100V NPO	1	8101-100-COHO-479C	72982	
C11	CAP/MICA/DIPPED 47PF 2PCT 500V	1	CM05ED470G03	81349	
C12	CAP/CER/DISC 470PF 20PCT 1000V	2	B470PFM	91418	
C13	S/A C12				
C14	CAP/VAR/CERAMIC 9-35PF 350V N650	1	538-011D9-35	72982	

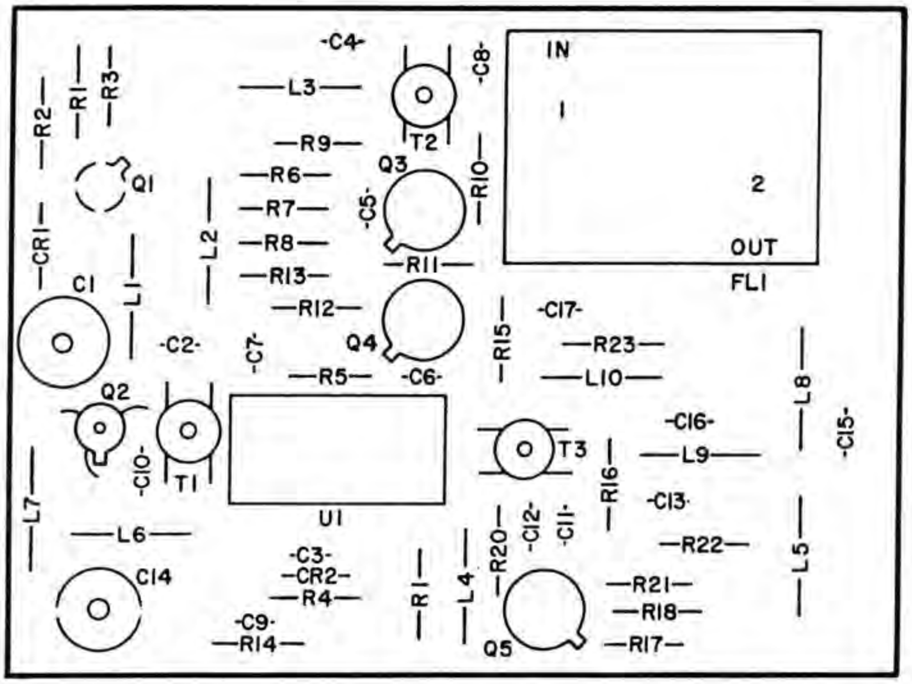

Figure 5-16. Type 796108 2nd Mixer/2nd IF (A3A2), Location of Components

TYPE NUMBER 796108 REVISION A SCHEMATIC 480212

TITLE - 2ND MIXER/2ND IF PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C15	CAP/MICA/DIPPED 91PF 2PCT 500V	2	CM05FD910G03	81349	
C16	S/A C15				
C17	CAP/MICA/DIPPED 39PF 2PCT 500V	1	CM05ED390G03	81349	
FB1	FERRITE BEAD	3	56-590-65-4A	02114	Q3
FB2	S/A FB1				Q3
FB3	S/A FB1				Q3
FL1	FILTER BP 10.7 MHZ	1	92211	14632	
L1	COIL/FIXED 10UH 10PCT	4	1537-36 (14046-4)	99800	
L2	S/A L1				
L3	S/A L1				
L4	COIL/FIXED 0.56UH 15PCT	1	202-11	99848	
L5	S/A L1				
L6	COIL/FIXED 0.33UH 10PCT /MIL P/N MS18130-3/	1	1537-04 (18130-3)	99800	
L7	COIL/FIXED/MOLD 1.8UH 10PCT	1	1537-18 (18130-11)	99800	
L8	COIL/FIXED/MOLD .22UH 10PCT	2	1537-02 (18130-2)	99800	
L9	COIL/FIXED/MOLD .47UH 10PCT	1	1537-06 (18130-4)	99800	

TYPE NUMBER 796108 REVISION A SCHEMATIC 480212

TITLE - 2ND MIXER/2ND IF PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L10	S/A L8				
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	CP643	12498	
Q3	TRANSISTOR	3	2N5109	80131	
Q4	S/A Q3				
Q5	S/A Q3				
RA1	HEATSINK	1	1118C	13103	Q2
R1	RES/FIXED/COMPO 4.3K 5PCT .25W	1	RCR07G432JS	81349	
R2	RES/FIXED/COMPO 82 OHMS 5PCT .25W	1	RCR07G820JS	81349	
R3	RES/FIXED/COMPO 10 OHMS 5PCT .25W	3	RCR07G100JS	81349	
R4	RES/FIXED/COMPO 1.8K 5PCT .25W	1	RCR07G182JS	81349	
R5	RES/FIXED/COMPO 68 OHMS 5PCT .25W	2	RCR07G680JS	81349	
R6	RES/FIXED/COMPO 3.3K 5PCT .25W	1	RCR07G332JS	81349	
R7	RES/FIXED/COMPO 2.2K 5PCT .25W	1	RCR07G222JS	81349	

TYPE NUMBER 796108 REVISION A SCHEMATIC 480212

TITLE - 2ND MIXER/2ND IF PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R8	RES/FIXED/COMPO 1.0K 5PCT .25W	2	RCR07G102JS	81349	
R9	RES/FIXED/COMPO 200 OHMS 5PCT .25W	2	RCR07G201JS	81349	
R10	S/A R3				
R11	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R12	RES/FIXED/COMPO 4.7 OHMS 5PCT .25W	1	RCR07G4R7JS	81349	
R13	S/A R5				
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 330 OHMS 5PCT .25W	2	RCR07G331JS	81349	
R16	RES/FIXED/COMPO 15 OHMS 5PCT .25W	1	RCR07G150JS	81349	
R17	RES/FIXED/COMPO 2.0K 5PCT .25W	1	RCR07G202JS	81349	
R18	S/A R8				
R19	S/A R15				
R20	S/A R3				
R21	RES/FIXED/COMPO 12 OHMS 5PCT .25W	1	RCR07G120JS	81349	

TYPE NUMBER 796108 REVISION A SCHEMATIC 480212

TITLE - 2ND MIXER/2ND IF PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R22	S/A R9				
R23	RES/FIXED/COMPO 6.8 OHMS 5PCT .25W	1	RCR07G6R8JS	81349	
T1	TRANSFORMER ASSEMBLY	1	22295-53	14632	
T2	TRANSFORMER ASSEMBLY	1	22295-54	14632	
T3	TRANSFORMER ASSEMBLY	1	22295-55	14632	
U1	MIXER/BALANCED 0.05-200MHZ HI-LEVEL DOUBLE BAL FL AT R 25DB MIN PC MOUNT	1	M9A	27956	

TYPE NUMBER 796121 REVISION A SCHEMATIC 580060

TITLE - IF/DEMODULATOR ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	MOTHERBOARD PC ASSEMBLY	1	796120	14632	
A1A1	10.7 MHZ/455 KHZ CONVERTER PC ASSEMBLY	1	796101	14632	
A1A2	16 KHZ IF FILTER PC ASSEMBLY	1	72463-22	14632	
A1A3	8 KHZ IF FILTER PC ASSEMBLY	1	72463-21	14632	
A1A4	4 KHZ IF FILTER PC ASSEMBLY	1	72463-20	14632	
A1A5	1 KHZ IF FILTER PC ASSEMBLY	1	72463-19	14632	
A1A6	LSB FILTER PC ASSEMBLY	1	72463-17	14632	
A1A7	USB FILTER PC ASSEMBLY	1	72463-18	14632	
A1A8	455 KHZ IF AMPLIFIER PC ASSEMBLY	1	796103	14632	
A1A9	WB/NB FILTER PC ASSEMBLY	1	796102	14632	
A1A10	DEMOD/AGC AMPLIFIER PC ASSEMBLY	1	796113	14632	

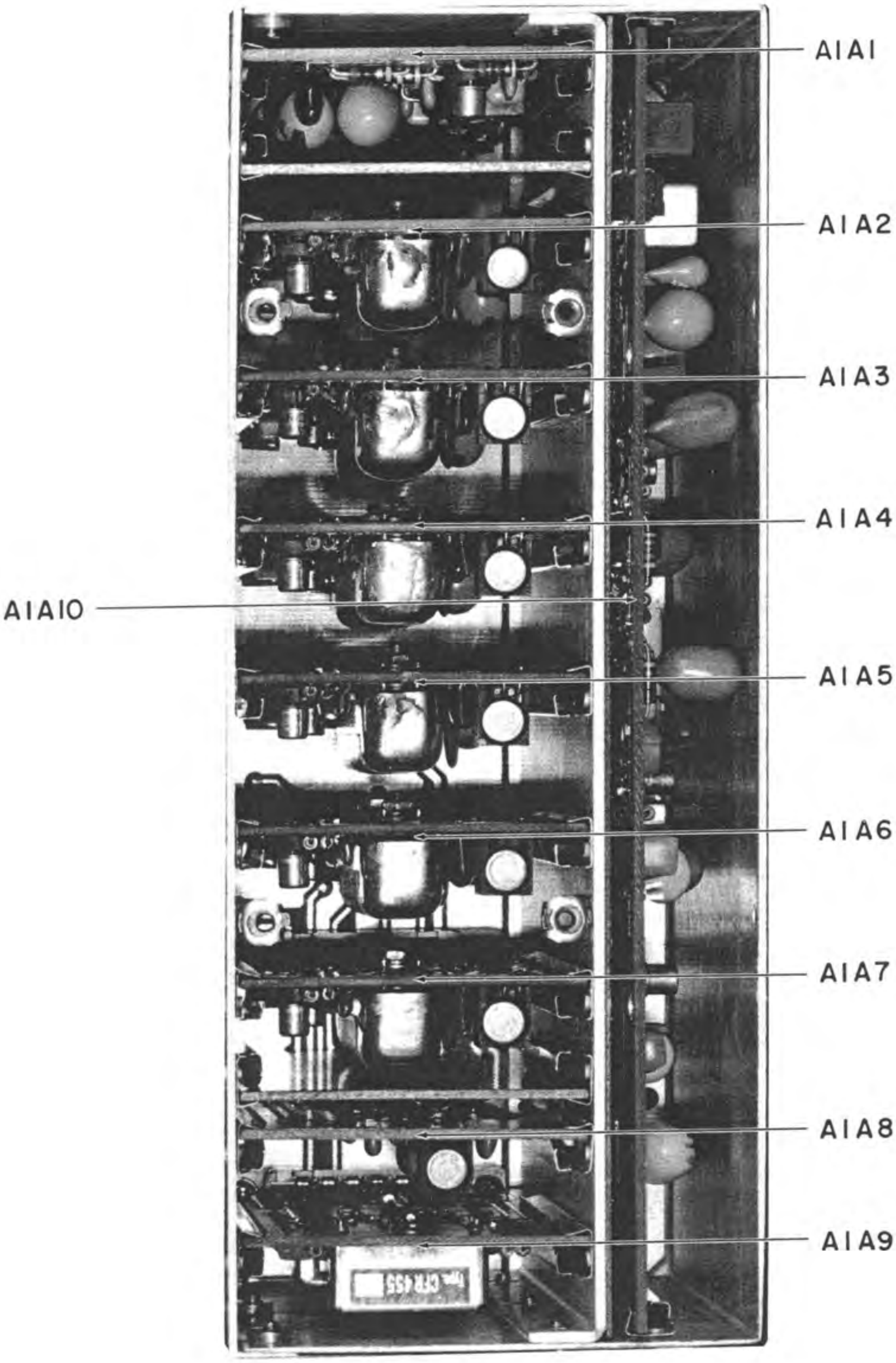

Figure 5-17. Type 796121 IF/Demodulator Assembly (A4), Location of Components

TYPE NUMBER 796120 REVISION A SCHEMATIC 580060

TITLE - IF MOTHERBOARD PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
J1	CONN/RECEP	5	34520-1	14632	
J2	S/A J1				
J3	S/A J1				
J4	S/A J1				
J5	S/A J1				
J6	CONN/RECEP 20 PIN STR HEADER ASSY DBL ROW 0.10 CTRS	1	1-87227-0	00779	
XA1	CONN/PC BOARD 6 PIN DOUBLE SIDED W/DIP SLDR PINS 0.156 CTRS	9	252-06-30-160	71785	
XA2	S/A XA1				
XA3	S/A XA1				
XA4	S/A XA1				
XA5	S/A XA1				
XA6	S/A XA1				
XA7	S/A XA1				
XA8	S/A XA1				
XA9	S/A XA1				
XA10A	CONN/PC BOARD 18 PIN DOUBLE SIDED W/DIP SLDR PINS 0156 CTR	2	252-18-30-160	71785	

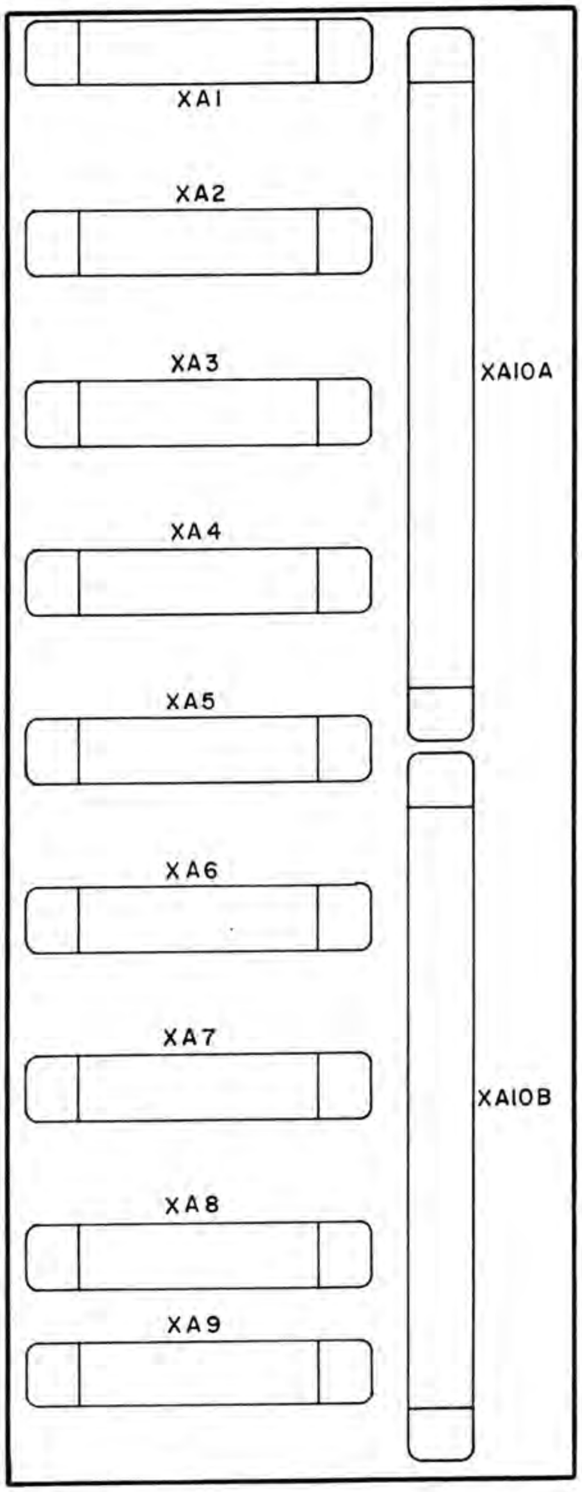

Figure 5-18. Type 796120 IF Motherboard (A4A1), Location of Components

TYPE NUMBER 796120 REVISION A SCHEMATIC 580060

TITLE - IF MOTHERBOARD PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
XA10B	S/A XA10A				

TYPE NUMBER 796101 REVISION A SCHEMATIC 480207

TITLE - 10.7 MHZ/455 KHZ CONVERTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/CER/DISC .01UF 20PCT 50V	5	34453-1	14632	
C2	S/A C1				
C3	CAP/CER/DISC .1UF 20PCT 50V	5	34475-1	14632	
C4	CAP/MICA/DIPPED 270PF 2PCT 500V	1	CM05FD271G03	81349	
C5	CAP/MICA/DIPPED 68PF 2PCT 500V	1	CM05ED680G03	81349	
C6	S/A C1				
C7	S/A C1				
C8	S/A C1				
C9	S/A C3				
C10	CAP/CER/DISC .47UF 20PCT 50V Z5U .300 SQ .200 LEADS	1	34452-1	14632	
C11	S/A C3				
C12	CAP/MICA/DIPPED 150PF 2PCT 500V	1	CM05FD151G03	81349	
C13	CAP/MICA/DIPPED 100PF 2PCT 500V	1	CM05FD101G03	81349	
C14	CAP/MICA/DIPPED 51PF 2PCT 500V	1	CM05ED510G03	81349	
C15	S/A C3				
C16	S/A C3				

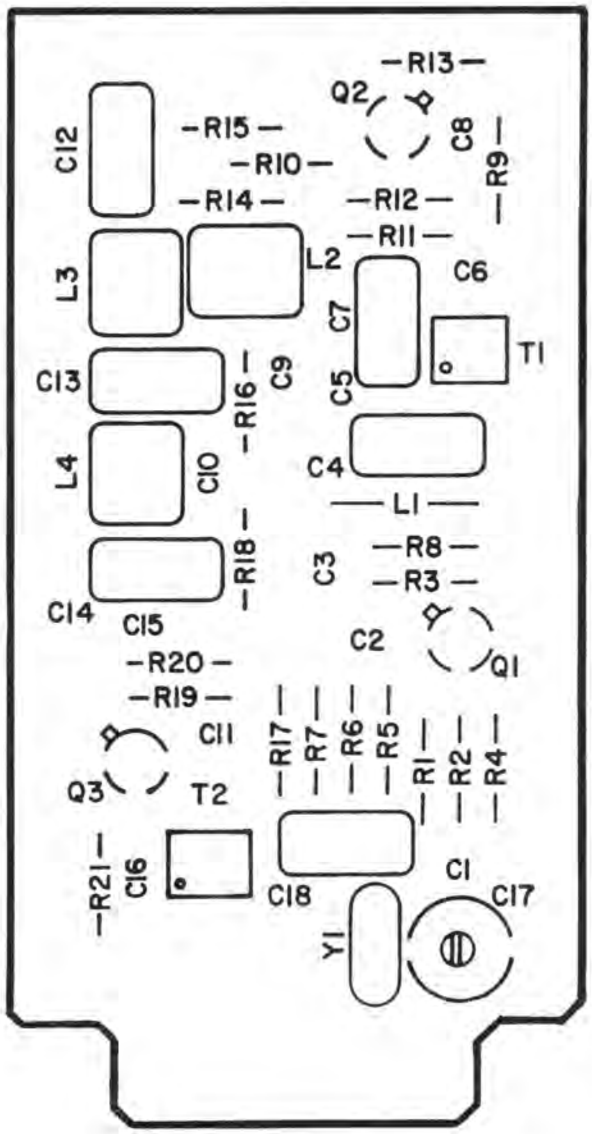

Figure 5-19. Type 796101 10.7 MHz/455 kHz Converter (A4A1A1), Location of Components

TYPE NUMBER 796101 REVISION A SCHEMATIC 480207

TITLE - 10.7 MHZ/455 KHZ CONVERTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C17	CAP/VAR/CERAMIC 9-35PF 350V N650	1	538-011D9-35	72982	
C18	CAP/MICA/DIPPED 12PF 5PCT 500V	1	CM05CD120J03	81349	
L1	COIL/FIXED 3.3UH 10PCT	1	1537-24 (18130-14)	99800	
L2	COIL/FIXED 1.2MH 10PCT	3	553-3635-38	71279	
L3	S/A L2				
L4	S/A L2				
Q1	TRANSISTOR	1	2N2857	80131	
Q2	TRANSISTOR (3N187)	1	841001-1	14632	
Q3	TRANSISTOR	1	2N2222A	80131	
R1	RES/FIXED/COMPO 51 OHMS 5PCT .25W	1	RCR07G510JS	81349	
R2	RES/FIXED/COMPO 16K 5PCT .25W	1	RCR07G163JS	81349	
R3	RES/FIXED/COMPO 10 OHMS 5PCT .25W	2	RCR07G100JS	81349	
R4	RES/FIXED/COMPO 4.7K 5PCT .25W	1	RCR07G472JS	81349	
R5	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 796101 REVISION A SCHEMATIC 480207

TITLE - 10.7 MHZ/455 KHZ CONVERTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R6	RES/FIXED/COMPO 27 OHMS 5PCT .25W	1	RCR07G270JS	81349	
R7	RES/FIXED/COMPO 220 OHMS 5PCT .25W	2	RCR07G221JS	81349	
R8	RES/FIXED/COMPO 180 OHMS 5PCT .25W	1	RCR07G181JS	81349	
R9	RES/FIXED/COMPO 240 OHMS 5PCT .25W	1	RCR07G241JS	81349	
R10	RES/FIXED/COMPO 150K 5PCT .25W	1	RCR07G154JS	81349	
R11	RES/FIXED/COMPO 18K 5PCT .25W	1	RCR07G183JS	81349	
R12	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R13	RES/FIXED/COMPO 620 OHMS 5PCT .25W	1	RCR07G621JS	81349	
R14	RES/FIXED/COMPO 5.1K 5PCT .25W	1	RCR07G512JS	81349	
R15	S/A R3				
R16	S/A R7				
R17	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	

TYPE NUMBER 796101 REVISION A SCHEMATIC 480207

TITLE - 10.7 MHZ/455 KHZ CONVERTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R18	RES/FIXED/COMPO 100 OHMS 5PCT .25W	1	RCR07G101JS	81349	
R19	RES/FIXED/COMPO 9.1K 5PCT .25W	1	RCR07G912JS	81349	
R20	RES/FIXED/COMPO 13K 5PCT .25W	1	RCR07G133JS	81349	
R21	RES/FIXED/COMPO 2.0K 5PCT .25W	1	RCR07G202JS	81349	
T1	TRANSFORMER RF 10KHZ-800MHZ 50 OHM IMPD RATIO 4	1	T4-1	15542	
T2	TRANSFORMER RF 10KHZ-800MHZ 50 OHM IMPD RATIO 16	1	T16-1	15542	
Y1	CRYSTAL/QUARTZ	1	CR64U 11.155MHZ	80058	

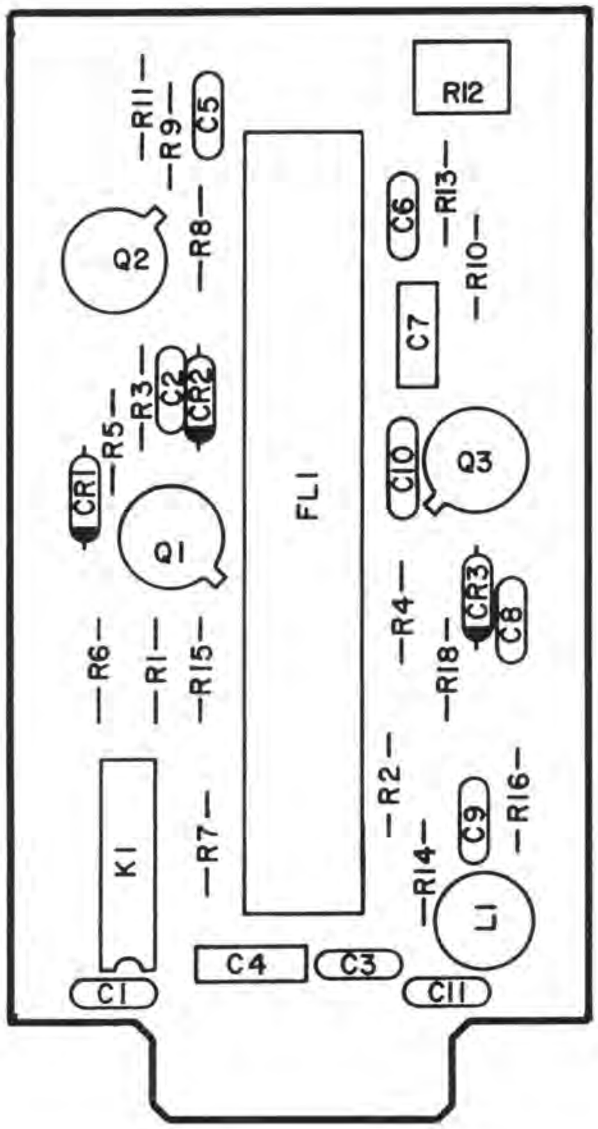

Figure 5-20. Type 72463-17 through 22 IF Filter (A4A1A2 through A4A1A7), Location of Components

TYPE NUMBER 72463-22 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N462A	80131	
CR2	S/A CR1				
CR3	DIODE 3 PELLET IN SERIES	1	1N4157	80131	
C1	CAP/CER/DISC .01UF 20PCT 200V	4	8131A200Z5U103M	72982	
C2	CAP/CER/DISC .1UF 20PCT 100V	4	8131M100-651-104M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 51PF 2PCT 500V	2	CM05ED510G03	81349	
C5	S/A C2				
C6	S/A C1				
C7	S/A C4				
C8	S/A C1				
C9	S/A C2				
C10	CAP/CER/DISC .02UF 20PCT 100V	1	C023B101H203M	56289	
C11	S/A C1				
FL1	FILTER MECH 455KHZ CF 16KHZ BW	1	92062-10	14632	
JW1	NOT USED				
JW2	WIRE/ELEC/BUSS AWG BUS WIRE	AR	8021 22 AWE BUSSWIRE	70903	

TYPE NUMBER 72463-22 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
K1	RELAY	1	PRMEIA005	71482	
L1	COIL/FIXED 1.2MH 10PCT	1	553-3635-38	71279	
MP1	TRANSIPAD	3	7717-44DAP	13103	Q1-Q3
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	2N2907/JAN	81350	
Q3	TRANSISTOR (3N187)	1	841001-1	14632	
R1	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
R2	RES/FIXED/COMPO 22K 5PCT .25W	2	RCR07G223JS	81349	
R3	S/A R2				
R4	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R5	RES/FIXED/COMPO 750 OHMS 5PCT .25W	1	RCR07G751JS	81349	
R6	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R7	RES/FIXED/COMPO 4.7K 5PCT .25W	1	RCR07G472JS	81349	
R8	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 72463-22 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R9	RES/FIXED/COMPO 56K 5PCT .25W	1	RCR07G563JS	81349	
R10	RES/FIXED/COMPO 5.6K 5PCT .25W	1	RCR07G562JS	81349	
R11	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R12	RES/TRIM/FILM 10K 10PCT .5W	1	62PAR10K	73138	
R13	RES/FIXED/COMPO 12K 5PCT .25W	1	RCR07G123JS	81349	
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 47K 5PCT .25W	1	RCR07G473JS	81349	
R16	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R17	NOT USED				
R18	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	

TYPE NUMBER 72463-21 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N462A	80131	
CR2	S/A CR1				
CR3	DIODE 3 PELLET IN SERIES	1	1N4157	80131	
C1	CAP/CER/DISC .01UF 20PCT 200V	4	8131A200Z5U103M	72982	
C2	CAP/CER/DISC .1UF 20PCT 100V	4	8131M100-651-104M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 51PF 2PCT 500V	2	CM05ED510G03	81349	
C5	S/A C2				
C6	S/A C1				
C7	S/A C4				
C8	S/A C1				
C9	S/A C2				
C10	CAP/CER/DISC .02UF 20PCT 100V	1	C023B101H203M	56289	
C11	S/A C1				
FL1	FILTER MECH 455KHZ CF 8KHZ BW	1	92062-8	14632	
JW1	NOT USED				
JW2	WIRE/ELEC/BUSS AWG BUS WIRE	AR	8021 22 AWE BUSSWIRE	70903	

TYPE NUMBER 72463-21 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
K1	RELAY	1	PRMEIA005	71482	
L1	COIL/FIXED 1.2MH 10PCT	1	553-3635-38	71279	
MP1	TRANSIPAD	3	7717-44DAP	13103	Q1-Q3
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	2N2907/JAN	81350	
Q3	TRANSISTOR (3N187)	1	841001-1	14632	
R1	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
R2	RES/FIXED/COMPO 22K 5PCT .25W	2	RCR07G223JS	81349	
R3	S/A R2				
R4	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R5	RES/FIXED/COMPO 750 OHMS 5PCT .25W	1	RCR07G751JS	81349	
R6	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R7	RES/FIXED/COMPO 4.7K 5PCT .25W	1	RCR07G472JS	81349	
R8	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 72463-21 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R9	RES/FIXED/COMPO 56K 5PCT .25W	1	RCR07G563JS	81349	
R10	RES/FIXED/COMPO 5.6K 5PCT .25W	1	RCR07G562JS	81349	
R11	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R12	RES/TRIM/FILM 10K 10PCT .5W	1	62PAR10K	73138	
R13	RES/FIXED/COMPO 12K 5PCT .25W	1	RCR07G123JS	81349	
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 47K 5PCT .25W	1	RCR07G473JS	81349	
R16	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R17	NOT USED				
R18	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	

TYPE NUMBER 72463-20 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N462A	80131	
CR2	S/A CR1				
CR3	DIODE 3 PELLET IN SERIES	1	1N4157	80131	
C1	CAP/CER/DISC .01UF 20PCT 200V	4	8131A200Z5U103M	72982	
C2	CAP/CER/DISC .1UF 20PCT 100V	4	8131M100-651-104M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 51PF 2PCT 500V	2	CM05ED510G03	81349	
C5	S/A C2				
C6	S/A C1				
C7	S/A C4				
C8	S/A C1				
C9	S/A C2				
C10	CAP/CER/DISC .02UF 20PCT 100V	1	C023B101H203M	56289	
C11	S/A C1				
FL1	FILTER MECH 455KHZ CF 4KHZ BW	1	92062-6	14632	
JW1	NOT USED				
JW2	WIRE/ELEC/BUSS AWG BUS WIRE	AR	8021 22 AWE BUSSWIRE	70903	

TYPE NUMBER 72463-20 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
K1	RELAY	1	PRMEIA005	71482	
L1	COIL/FIXED 1.2MH 10PCT	1	553-3635-38	71279	
MP1	TRANSIPAD	3	7717-44DAP	13103	Q1-Q3
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	2N2907/JAN	81350	
Q3	TRANSISTOR (3N187)	1	841001-1	14632	
R1	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
R2	RES/FIXED/COMPO 22K 5PCT .25W	2	RCR07G223JS	81349	
R3	S/A R2				
R4	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R5	RES/FIXED/COMPO 750 OHMS 5PCT .25W	1	RCR07G751JS	81349	
R6	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R7	RES/FIXED/COMPO 4.7K 5PCT .25W	1	RCR07G472JS	81349	
R8	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 72463-20 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R9	RES/FIXED/COMPO 56K 5PCT .25W	1	RCR07G563JS	81349	
R10	RES/FIXED/COMPO 5.6K 5PCT .25W	1	RCR07G562JS	81349	
R11	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R12	RES/TRIM/FILM 10K 10PCT .5W	1	62PAR10K	73138	
R13	RES/FIXED/COMPO 12K 5PCT .25W	1	RCR07G123JS	81349	
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 47K 5PCT .25W	1	RCR07G473JS	81349	
R16	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R17	NOT USED				
R18	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	

TYPE NUMBER 72463-19 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N462A	80131	
CR2	S/A CR1				
CR3	DIODE 3 PELLET IN SERIES	1	1N4157	80131	
C1	CAP/CER/DISC .01UF 20PCT 200V	4	8131A200Z5U103M	72982	
C2	CAP/CER/DISC .1UF 20PCT 100V	4	8131M100-651-104M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 51PF 2PCT 500V	2	CM05ED510G03	81349	
C5	S/A C2				
C6	S/A C1				
C7	S/A C4				
C8	S/A C1				
C9	S/A C2				
C10	CAP/CER/DISC .02UF 20PCT 100V	1	C023B101H203M	56289	
C11	S/A C1				
FL1	FILTER MECH 455KHZ CF 1KHZ BW	1	92062-3	14632	
JW1	WIRE/ELEC/BUSS AWG BUS WIRE	AR	8021 22 AWE BUSSWIRE	70903	
JW2	NOT USED				

TYPE NUMBER 72463-19 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
K1	RELAY	1	PRMEIA005	71482	
L1	COIL/FIXED 1.2MH 10PCT	1	553-3635-38	71279	
MP1	TRANSIPAD	3	7717-44DAP	13103	Q1-Q3
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	2N2907/JAN	81350	
Q3	TRANSISTOR (3N187)	1	841001-1	14632	
R1	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
R2	RES/FIXED/COMPO 22K 5PCT .25W	2	RCR07G223JS	81349	
R3	S/A R2				
R4	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R5	RES/FIXED/COMPO 750 OHMS 5PCT .25W	1	RCR07G751JS	81349	
R6	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R7	RES/FIXED/COMPO 4.7K 5PCT .25W	1	RCR07G472JS	81349	
R8	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 72463-19 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R9	RES/FIXED/COMPO 56K 5PCT .25W	1	RCR07G563JS	81349	
R10	RES/FIXED/COMPO 5.6K 5PCT .25W	1	RCR07G562JS	81349	
R11	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R12	RES/TRIM/FILM 10K 10PCT .5W	1	62PAR10K	73138	
R13	RES/FIXED/COMPO 12K 5PCT .25W	1	RCR07G123JS	81349	
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 47K 5PCT .25W	1	RCR07G473JS	81349	
R16	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R17	NOT USED				
R18	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	

TYPE NUMBER 72463-17 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N462A	80131	
CR2	S/A CR1				
CR3	DIODE 3 PELLET IN SERIES	1	1N4157	80131	
C1	CAP/CER/DISC .01UF 20PCT 200V	4	8131A200Z5U103M	72982	
C2	CAP/CER/DISC .1UF 20PCT 100V	4	8131M100-651-104M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 27PF 2PCT 500V	2	CM05ED270G03	81349	
C5	S/A C2				
C6	S/A C1				
C7	S/A C4				
C8	S/A C1				
C9	S/A C2				
C10	CAP/CER/DISC .02UF 20PCT 100V	1	C023B101H203M	56289	
C11	S/A C1				
FL1	FILTER MECH 455KHZ LSB F455Z24C	1	526-9900-010	95104	
JW1	NOT USED				
JW2	WIRE/ELEC/BUSS AWG BUS WIRE	AR	8021 22 AWE BUSSWIRE	70903	

TYPE NUMBER 72463-17 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
K1	RELAY	1	PRMEIA005	71482	
L1	COIL/FIXED 1.2MH 10PCT	1	553-3635-38	71279	
MP1	TRANSIPAD	3	7717-44DAP	13103	Q1-Q3
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	2N2907/JAN	81350	
Q3	TRANSISTOR (3N187)	1	841001-1	14632	
R1	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
R2	RES/FIXED/COMPO 22K 5PCT .25W	3	RCR07G223JS	81349	
R3	S/A R2				
R4	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R5	RES/FIXED/COMPO 750 OHMS 5PCT .25W	1	RCR07G751JS	81349	
R6	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R7	RES/FIXED/COMPO 1.2K 5PCT .25W	1	RCR07G122JS	81349	
R8	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 72463-17 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R9	S/A R2				
R10	RES/FIXED/COMPO 2.2K 5PCT .25W	1	RCR07G222JS	81349	
R11	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R12	RES/TRIM/FILM 10K 10PCT .5W	1	62PAR10K	73138	
R13	RES/FIXED/COMPO 9.1K 5PCT .25W	1	RCR07G912JS	81349	
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 47K 5PCT .25W	1	RCR07G473JS	81349	
R16	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R17	NOT USED				
R18	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	

TYPE NUMBER 72463-18 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	2	1N462A	80131	
CR2	S/A CR1				
CR3	DIODE 3 PELLET IN SERIES	1	1N4157	80131	
C1	CAP/CER/DISC .01UF 20PCT 200V	4	8131A200Z5U103M	72982	
C2	CAP/CER/DISC .1UF 20PCT 100V	4	8131M100-651-104M	72982	
C3	S/A C2				
C4	CAP/MICA/DIPPED 27PF 2PCT 500V	2	CM05ED270G03	81349	
C5	S/A C2				
C6	S/A C1				
C7	S/A C4				
C8	S/A C1				
C9	S/A C2				
C10	CAP/CER/DISC .02UF 20PCT 100V	1	C023B101H203M	56289	
C11	S/A C1				
FL1	COIL/VARIABLE 0.198-0.242UH	1	558-7107-05	71279	
JW1	NOT USED				
JW2	WIRE/ELEC/BUSS AWG BUS WIRE	AR	8021 22 AWE BUSSWIRE	70903	

TYPE NUMBER 72463-18 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
K1	RELAY	1	PRMEIA005	71482	
L1	COIL/FIXED 1.2MH 10PCT	1	553-3635-38	71279	
MP1	TRANSIPAD	3	7717-44DAP	13103	Q1-Q3
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	1	2N2907/JAN	81350	
Q3	TRANSISTOR (3N187)	1	841001-1	14632	
R1	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
R2	RES/FIXED/COMPO 22K 5PCT .25W	3	RCR07G223JS	81349	
R3	S/A R2				
R4	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R5	RES/FIXED/COMPO 750 OHMS 5PCT .25W	1	RCR07G751JS	81349	
R6	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R7	RES/FIXED/COMPO 1.2K 5PCT .25W	1	RCR07G122JS	81349	
R8	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

TYPE NUMBER 72463-18 REVISION A SCHEMATIC 480219

TITLE - IF AMPLIFIER PC SUB-ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R9	S/A R2				
R10	RES/FIXED/COMPO 2.2K 5PCT .25W	1	RCR07G222JS	81349	
R11	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R12	RES/TRIM/FILM 10K 10PCT .5W	1	62PAR10K	73138	
R13	RES/FIXED/COMPO 9.1K 5PCT .25W	1	RCR07G912JS	81349	
R14	RES/FIXED/COMPO 390 OHMS 5PCT .25W	1	RCR07G391JS	81349	
R15	RES/FIXED/COMPO 47K 5PCT .25W	1	RCR07G473JS	81349	
R16	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R17	NOT USED				
R18	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	

TYPE NUMBER 796103 REVISION A SCHEMATIC 480209

TITLE - 455 KHZ IF AMPLIFIER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	1	1N462A	80131	
C1	CAP/CER/DISC .01UF 20PCT 50V	4	34453-1	14632	
C2	CAP/CER/DISC .1UF 20PCT 50V	6	34475-1	14632	
C3	S/A C1				
C4	S/A C2				
C5	S/A C2				
C6	S/A C1				
C7	S/A C1				
C8	S/A C2				
C9	S/A C2				
C10	S/A C2				
L1	COIL/FIXED 3.3MH 10PCT	2	553-3635-43	71279	
L2	S/A L1				
Q1	TRANSISTOR (3N187)	2	841001-1	14632	
Q2	S/A Q1				
RT1	TERMINATION/RES 100 OHM AT 25 DEG	2	3D102	04239	
RT2	S/A RT1				
R1	RES/FIXED/COMPO 120K 5PCT .25W	2	RCR07G124JS	81349	

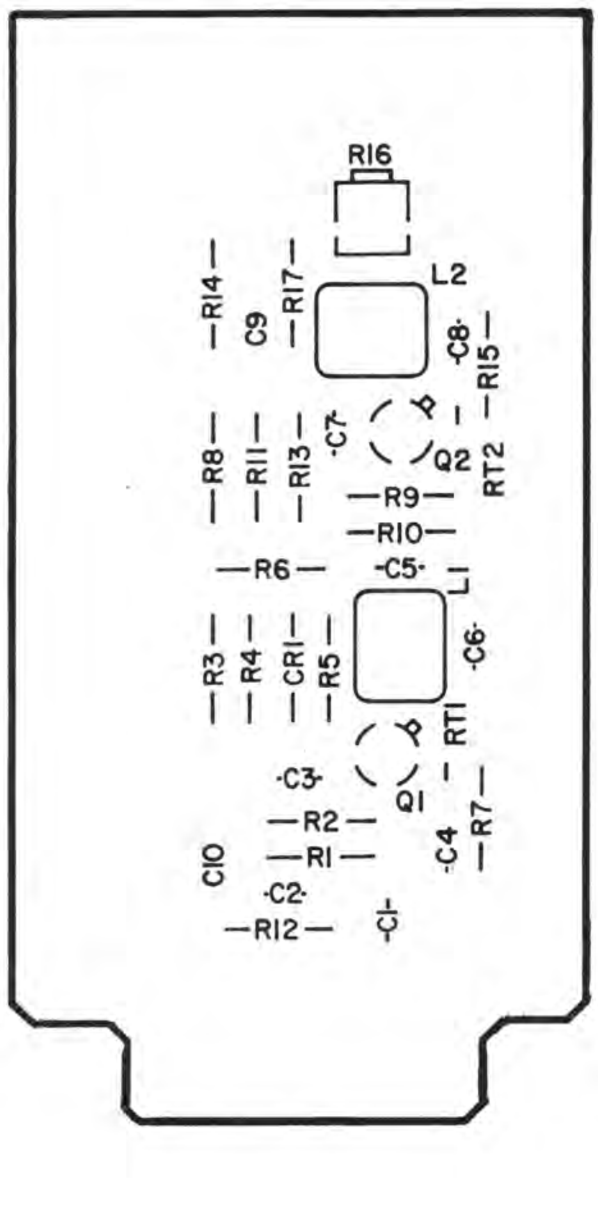

Figure 5-21. Type 796103 455 kHz IF Amplifier (A4A1A8), Location of Components

TYPE NUMBER 796103 REVISION A SCHEMATIC 480209

TITLE - 455 KHZ IF AMPLIFIER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R2	RES/FIXED/COMPO 10K 5PCT .25W	2	RCR07G103JS	81349	
R3	RES/FIXED/COMPO 150K 5PCT .25W	2	RCR07G154JS	81349	
R4	RES/FIXED/COMPO 4.7K 5PCT .25W	1	RCR07G472JS	81349	
R5	RES/FIXED/COMPO 22K 5PCT .25W	2	RCR07G223JS	81349	
R6	RES/FIXED/COMPO 330 OHMS 5PCT .25W	2	RCR07G331JS	81349	
R7	RES/FIXED/COMPO 270 OHMS 5PCT .25W	2	RCR07G271JS	81349	
R8	RES/FIXED/COMPO 100 OHMS 5PCT .25W	1	RCR07G101JS	81349	
R9	S/A R1				
R10	S/A R2				
R11	S/A R3				
R12	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R13	S/A R5				
R14	S/A R6				
R15	S/A R7				

TYPE NUMBER 796103 REVISION A SCHEMATIC 480209

TITLE - 455 KHZ IF AMPLIFIER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R16	RES/TRIM/FILM 1K 10PCT .5W	1	62PAR1K	73138	
R17	RES/FIXED/COMPO 470 OHMS 5PCT .25W	1	RCR07G471JS	81349	

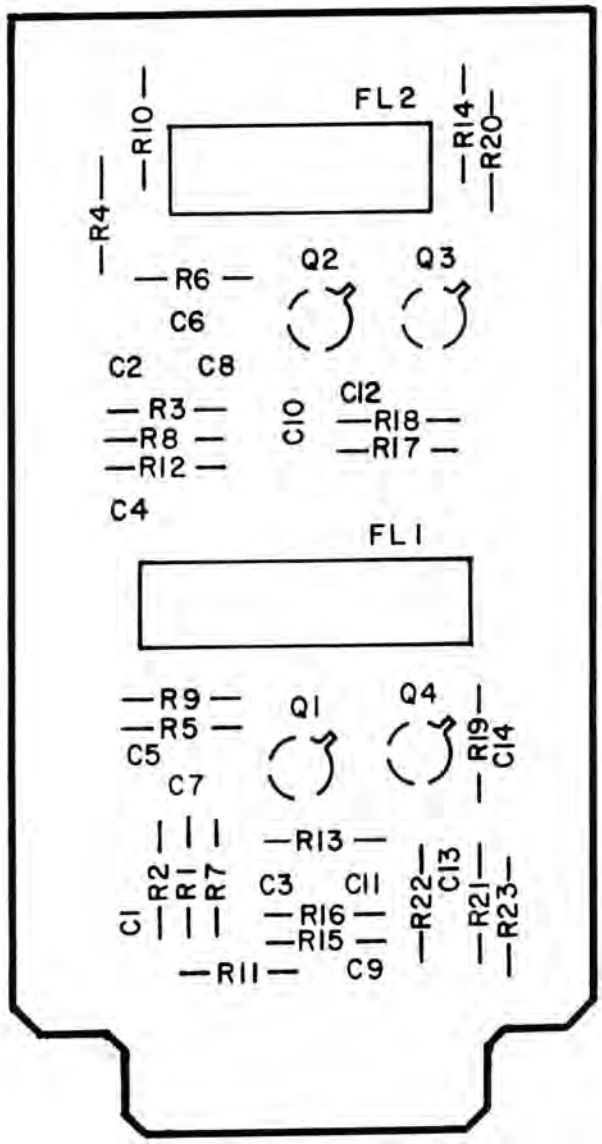

Figure 5-22. Type 796102 WB/NB Filter (A4A1A9), Location of Components

TYPE NUMBER 796102 REVISION A SCHEMATIC 480208

TITLE - WIDE BAND/NARROW BAND FILTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/CER/DISC .01UF 20PCT 50V	2	34453-1	14632	
C2	S/A C1				
C3	CAP/CER/DISC .1UF 20PCT 50V	12	34475-1	14632	
C4	S/A C3				
C5	S/A C3				
C6	S/A C3				
C7	S/A C3				
C8	S/A C3				
C9	S/A C3				
C10	S/A C3				
C11	S/A C3				
C12	S/A C3				
C13	S/A C3				
C14	S/A C3				
FL1	FILTER/CERAMIC 455KHZ CF 4KHZ BW	1	CFS-455I	51406	
FL2	FILTER/CERAMIC 455KHZ CF 26KHZ BW	1	CFR-455A	51406	
Q1	TRANSISTOR	4	2N2222A	80131	
Q2	S/A Q1				
Q3	S/A Q1				

TYPE NUMBER 796102 REVISION A SCHEMATIC 480208

TITLE - WIDE BAND/NARROW BAND FILTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
Q4	S/A Q1				
R1	RES/FIXED/COMPO 22K 5PCT .25W	4	RCR07G223JS	81349	
R2	RES/FIXED/COMPO 6.8K 5PCT .25W	4	RCR07G682JS	81349	
R3	S/A R1				
R4	S/A R2				
R5	RES/FIXED/COMPO 1.0K 5PCT .25W	3	RCR07G102JS	81349	
R6	S/A R5				
R7	RES/FIXED/COMPO 2.0K 5PCT .25W	1	RCR07G202JS	81349	
R8	RES/FIXED/COMPO 1.1K 5PCT .25W	1	RCR07G112JS	81349	
R9	RES/FIXED/COMPO 150 OHMS 5PCT .25W	1	RCR07G151JS	81349	
R10	RES/FIXED/COMPO 110 OHMS 5PCT .25W	1	RCR07G111JS	81349	
R11	RES/FIXED/COMPO 220 OHMS 5PCT .25W	2	RCR07G221JS	81349	
R12	S/A R11				
R13	RES/FIXED/COMPO 3.3K 5PCT .25W	1	RCR07G332JS	81349	

TYPE NUMBER 796102 REVISION A SCHEMATIC 480208

TITLE - WIDE BAND/NARROW BAND FILTER PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R14	RES/FIXED/COMPO 1.3K 5PCT .25W	1	RCR07G132JS	81349	
R15	S/A R1				
R16	S/A R2				
R17	S/A R1				
R18	S/A R2				
R19	RES/FIXED/COMPO 100 OHMS 5PCT .25W	2	RCR07G101JS	81349	
R20	S/A R5				
R21	RES/FIXED/COMPO 47 OHMS 5PCT .25W	2	RCR07G470JS	81349	
R22	S/A R19				
R23	S/A R21				

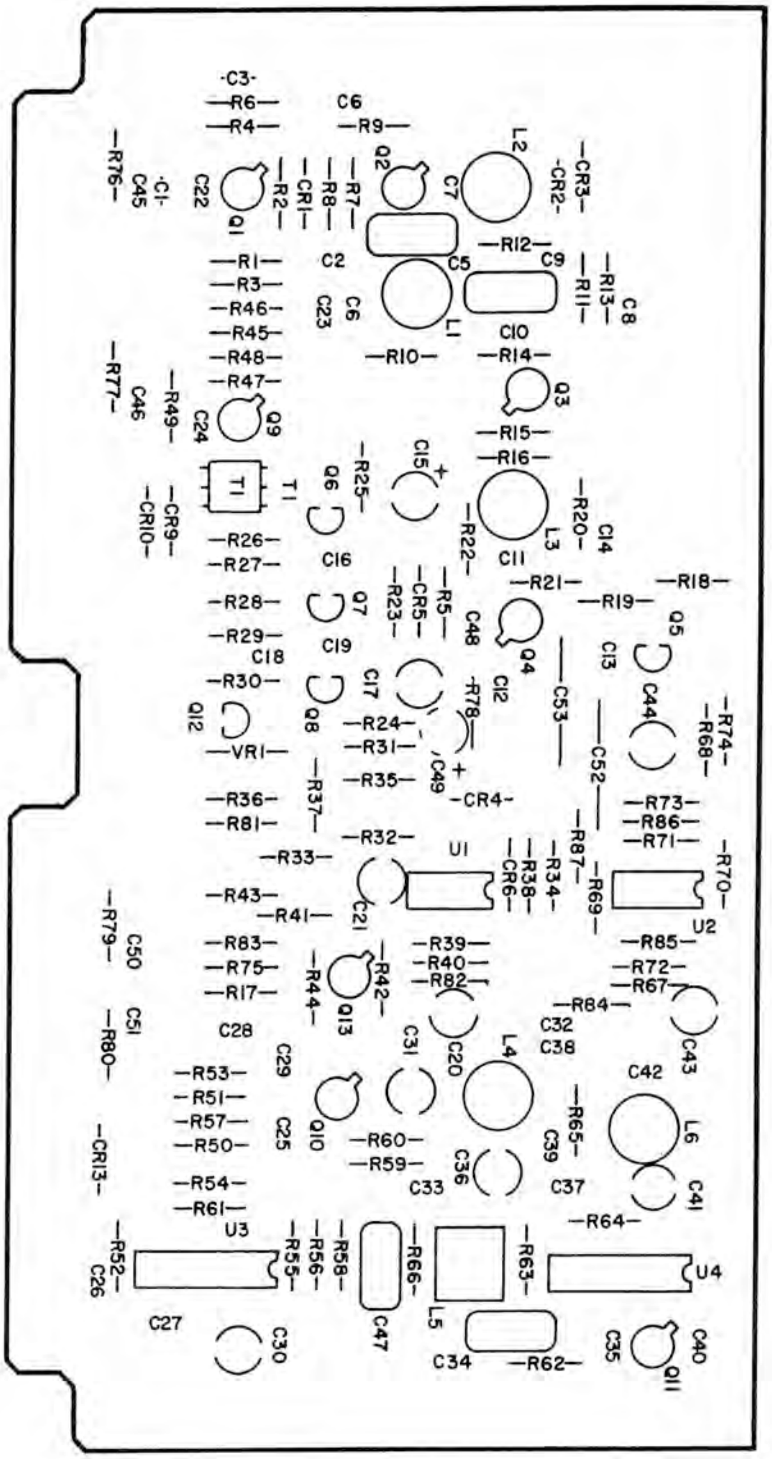

Figure 5-23. Type 796113 Demodulator/AGC Amplifier (A4A1A10), Location of Components

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	8	1N4449	80131	
CR2	DIODE	2	5082-2800	28480	
CR3	S/A CR2				
CR4	S/A CR1				
CR5	S/A CR1				
CR6	S/A CR1				
CR7	NOT USED				
CR8	NOT USED				
CR9	S/A CR1				
CR10	S/A CR1				
CR11	NOT USED				
CR12	NOT USED				
CR13	S/A CR1				
C1	CAP/CER/DISC .1UF 20PCT 50V	25	34475-1	14632	
C2	S/A C1				
C3	S/A C1				
C4	S/A C1				
C5	CAP/MICA/DIPPED 10PF 0.5PF TOL 500V	1	CM05CD100D03	81349	
C6	S/A C1				
C7	S/A C1				

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C8	S/A C1				
C9	CAP/MICA/DIPPED 100PF 2PCT 500V	1	CM05FD101G03	81349	
C10	CAP/CER/DISC .47UF 20PCT 50V Z5U .300 SQ .200 LEADS	7	34452-1	14632	
C11	CAP/CER/DISC .022UF 10PCT 100V	1	CK06BX223K	81349	
C12	S/A C10				
C13	S/A C1				
C14	S/A C10				
C15	CAP/ELEC/TANT 47UF 20PCT 20V	1	196D476X0020PE4	56289	
C16	S/A C1				
C17	CAP/ELEC/TANT 2.2UF 20PCT 35V	1	196D225X0035JE3	56289	
C18	S/A C1				
C19	S/A C1				
C20	CAP/ELEC/TANT 27UF 10PCT 35V	5	196D276X9035TE4	56289	
C21	S/A C20				
C22	S/A C1				
C23	S/A C1				
C24	S/A C1				

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C25	S/A C1				
C26	S/A C1				
C27	S/A C1				
C28	S/A C1				
C29	S/A C1				
C30	CAP/ELEC/TANT 100UF 20PCT 20V	2	196D107X0020TE4	56289	
C31	CAP/ELEC/TANT 4.7UF 20PCT 35V	2	196D475X0035JE3	56289	
C32	CAP/CER/DISC 3300PF 10PCT 200V	1	CK06BX332K	81349	
C33	S/A C1				
C34	CAP/MICA/DIPPED 24PF 5PCT 500V	1	CM05ED240J03	81349	
C35	S/A C1				
C36	S/A C30				
C37	S/A C1				
C38	S/A C1				
C39	S/A C1				
C40	CAP/CER/DISC 2200PF 10PCT 200V	1	CK06BX222K	81349	
C41	S/A C31				
C42	CAP/CER/DISC 1500PF 10PCT 200V	1	CK06BX152K	81349	

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C43	S/A C20				
C44	S/A C20				
C45	S/A C10				
C46	S/A C10				
C47	CAP/MICA/DIPPED 560PF 5PCT 300V	1	DM15-561J	72136	
C48	S/A C1				
C49	S/A C20				
C50	S/A C10				
C51	S/A C10				
C52	CAP/PLASTIC/TUB .01UF 5PCT 100V	2	663UW103-5-1W	84411	
C53	S/A C52				
L1	COIL/FIXED 6.8MH 10PCT	3	553-3635-47	71279	
L2	S/A L1				
L3	S/A L1				
L4	COIL/FIXED 47MH 10PCT	1	553-3635-57	71279	
L5	COIL/VARIABLE 198-242UH	1	558-7107-41	71279	
L6	COIL/FIXED 3.3MH 10PCT	1	553-3635-43	71279	
Q1	TRANSISTOR	7	2N2222A	80131	

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
Q2	TRANSISTOR	1	2N3251	80131	
Q3	S/A Q1				
Q4	S/A Q1				
Q5	TRANSISTOR	5	U1899E	15818	
Q6	S/A Q5				
Q7	S/A Q5				
Q8	S/A Q5				
Q9	S/A Q1				
Q10	S/A Q1				
Q11	S/A Q1				
Q12	S/A Q5				
Q13	S/A Q1				
R1	RES/FIXED/COMPO 27K 5PCT .25W	4	RCR07G273JS	81349	
R2	RES/FIXED/COMPO 330 OHMS 5PCT .25W	5	RCR07G331JS	81349	
R3	RES/FIXED/COMPO 3.3K 5PCT .25W	1	RCR07G332JS	81349	
R4	S/A R2				
R5	RES/FIXED/COMPO 2.2K 5PCT .25W	2	RCR07G222JS	81349	

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R6	S/A R2				
R7	RES/FIXED/COMPO 100 OHMS 5PCT .25W	7	RCR07G101JS	81349	
R8	RES/FIXED/COMPO 220 OHMS 5PCT .25W	1	RCR07G221JS	81349	
R9	RES/FIXED/COMPO 270 OHMS 5PCT .25W	1	RCR07G271JS	81349	
R10	RES/FIXED/COMPO 4.7K 5PCT .25W	3	RCR07G472JS	81349	
R11	RES/FIXED/COMPO 33K 5PCT .25W	2	RCR07G333JS	81349	
R12	RES/FIXED/COMPO 47K 5PCT .25W	3	RCR07G473JS	81349	
R13	S/A R7				
R14	RES/FIXED/COMPO 47 OHMS 5PCT .25W	2	RCR07G470JS	81349	
R15	RES/FIXED/COMPO 15K 5PCT .25W	2	RCR07G153JS	81349	
R16	S/A R2				
R17	RES/FIXED/COMPO 360K 5PCT .25W	2	RCR07G364JS	81349	
R18	RES/FIXED/COMPO 1.0M 5PCT .25W	4	RCR07G105JS	81349	

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R19	RES/FIXED/COMPO 43K 5PCT .25W	4	RCR07G433JS	81349	
R20	S/A R7				
R21	S/A R14				
R22	RES/FIXED/COMPO 100K 5PCT .25W	3	RCR07G104JS	81349	
R23	S/A R11				
R24	RES/FIXED/COMPO 82K 5PCT .25W	2	RCR07G823JS	81349	
R25	RES/FIXED/COMPO 1.2K 5PCT .25W	1	RCR07G122JS	81349	
R26	S/A R18				
R27	S/A R17				
R28	S/A R18				
R29	RES/FIXED/COMPO 1.0K 5PCT .25W	5	RCR07G102JS	81349	
R30	S/A R29				
R31	S/A R24				
R32	RES/FIXED/COMPO 75K 5PCT .25W	1	RCR07G753JS	81349	
R33	S/A R7				
R34	S/A R7				
R35	S/A R18				

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R36	S/A R10				
R37	RES/FIXED/COMPO 11K 5PCT .25W	1	RCR07G113JS	81349	
R38	RES/FIXED/COMPO 1.8K 5PCT .25W	1	RCR07G182JS	81349	
R39	S/A R1				
R40	S/A R1				
R41	RES/FIXED/COMPO 22K 5PCT .25W	1	RCR07G223JS	81349	
R42	S/A R15				
R43	RES/FIXED/COMPO 470 OHMS 5PCT .25W	3	RCR07G471JS	81349	
R44	RES/FIXED/COMPO 1.5K 5PCT .25W	1	RCR07G152JS	81349	
R45	S/A R1				
R46	S/A R10				
R47	S/A R43				
R48	S/A R43				
R49	S/A R22				
R50	RES/FIXED/COMPO 10K 5PCT .25W	1	RCR07G103JS	81349	
R51	RES/FIXED/COMPO 5.1K 5PCT .25W	2	RCR07G512JS	81349	

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R52	S/A R29				
R53	RES/FIXED/COMPO 3.0K 5PCT .25W	2	RCR07G302JS	81349	
R54	S/A R29				
R55	RES/FIXED/COMPO 3.9K 5PCT .25W	4	RCR07G392JS	81349	
R56	RES/FIXED/COMPO 130K 5PCT .25W	1	RCR07G134JS	81349	
R57	S/A R12				
R58	RES/FIXED/COMPO 150 OHMS 5PCT .25W	2	RCR07G151JS	81349	
R59	S/A R55				
R60	S/A R55				
R61	S/A R2				
R62	S/A R12				
R63	S/A R22				
R64	S/A R58				
R65	RES/FIXED/COMPO 51 OHMS 5PCT .25W	1	RCR07G510JS	81349	
R66	S/A R51				
R67	S/A R53				
R68	S/A R19				

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R69	RES/FIXED/COMPO 2.0K 5PCT .25W	1	RCR07G202JS	81349	
R70	S/A R19				
R71	RES/FIXED/COMPO 120K 5PCT .25W	2	RCR07G124JS	81349	
R72	S/A R7				
R73	RES/FIXED/COMPO 62K 5PCT .25W	1	RCR07G623JS	81349	
R74	S/A R7				
R75	S/A R29				
R76	RES/FIXED/COMPO 10 OHMS 5PCT .25W	4	RCR07G100JS	81349	
R77	S/A R76				
R78	RES/FIXED/COMPO 24K 5PCT .25W	2	RCR07G243JS	81349	
R79	S/A R76				
R80	S/A R76				
R81	S/A R78				
R82	RES/FIXED/COMPO 2.7K 5PCT .25W	1	RCR07G272JS	81349	
R83	S/A R5				
R84	S/A R55				
R85	S/A R19				

TYPE NUMBER 796113 REVISION A SCHEMATIC 580055

TITLE - DEMODULATOR/AGC AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R86	S/A R71				
R87	RES/FIXED/COMPO 68K 5PCT .25W	1	RCR07G683JS	81349	
T1	TRANSFORMER RF 10KHZ-800MHZ 50 OHM IMPD RATIO 16	1	T16-1	15542	
U1	I C DUAL OP-AMP LOW POWER	1	CA258G	02735	
U2	I C	1	MC1458N	18324	
U3	I C MONOLITHIC DUAL OP AMP AND DUAL COMPARATOR	1	MC1596L	04713	
U4	I C LIMITING IF AMP/QUAD DETECTOR 16V	1	MC1357P	04713	
VR1	DIODE ZENER 3.3V SILICON	1	1N746A	80131	

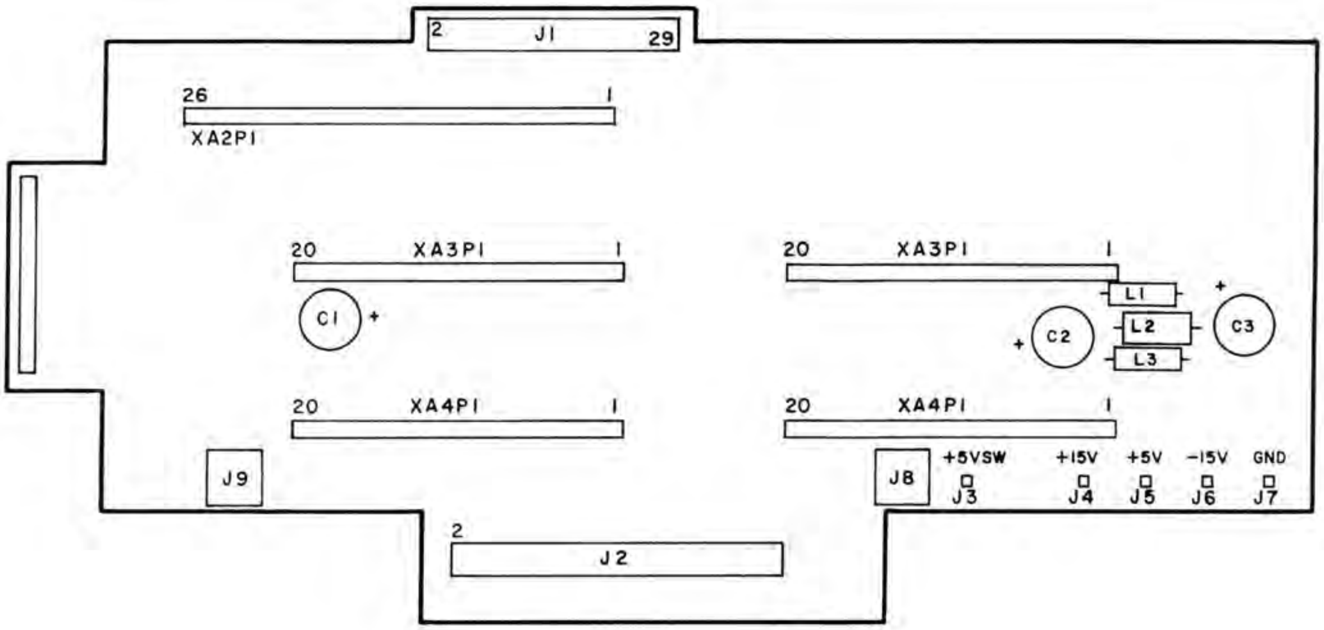

Figure 5-24. Type 796117 Synthesizer Motherboard (A5), Location of Components

TYPE NUMBER 796117 REVISION A SCHEMATIC 680034

TITLE - SYNTHESIZER MOTHERBOARD PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/ELEC/TANT 220UF 20PCT 10V	1	196D227X0010TE4	56289	
C2	CAP/ELEC/TANT 100UF 20PCT 20V	2	196D107X0020TE4	56289	
C3	S/A C2				
J1	CONN/RECEP 30 PIN STR HEADER ASSY DBL ROW 0.10 CTRS	1	1-87227-5	00779	
J2	CONN/RECEP 20 PIN STR HEADER ASSY DBL ROW 0.10 CTRS	1	1-87227-0	00779	
J3	CONN/RECEP FASTON TAB 0.110 WIDE X 0.02 THK P.C. MT STYLE B	5	62073-1	00779	
J4	S/A J3				
J5	S/A J3				
J6	S/A J3				
J7	S/A J3				
J8	CONN/RECEP	2	109	19505	
J9	S/A J7				
L1	COIL/FIXED 27UH 5PCT	2	1537-48 (4455-2J)	99800	
L2	FERRITE CHOKE	1	VK200-10-3B	02114	
L3	S/A L1				

TYPE NUMBER 796117 REVISION A SCHEMATIC 680034

TITLE - SYNTHESIZER MOTHERBOARD PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
XA1P1	CONN/RECEP 12 PIN STR HEADER ASSY SGL ROW 0.10 CTRS	1	1-87224-2	00779	
XA2P1	CONN/RECEP 26 PIN STR HEADER ASSY SGL ROW 0.10 CTRS	1	2-87224-6	00779	
XA3P1	CONN/RECEP 20 PIN STR HEADER ASSY SGL ROW 0.10 CTRS	4	2-87224-0	00779	
XA3P2	S/A XA3P1				
XA4P1	S/A XA3P1				
XA4P2	S/A XA3P1				

TYPE NUMBER 796111 REVISION A SCHEMATIC 480214

TITLE - TIME BASE GENERATOR PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	1	5082-2800	28480	
C1	CAP/CER/DISC .1UF 20PCT 50V	6	34475-1	14632	
C2	CAP/MICA/DIPPED 30PF 2PCT 500V	1	CM05ED300G03	81349	
C3	S/A C1				
C4	S/A C1				
C5	S/A C1				
C6	S/A C1				
C7	S/A C1				
C8	CAP/MICA/DIPPED 10PF 0.5PF TOL 500V	2	CM05CD100D03	81349	
C9	S/A C8				
C10	CAP/ELEC/TANT 220UF 20PCT 10V	1	196D227X0010TE4	56289	
J1	JACK/TIP RT ANGLE GREEN	1	TJ206GN	49956	
P1	CONN/PLUG 12 SKT SGL ROW 0.10 CTRS PC MT 0.310 X 0.10 HOLE PATTERN	1	65001-010	22526	
Q1	TRANSISTOR	1	2N706	80131	
R1	RES/FIXED/COMPO 10K 5PCT 0.125W	2	RCR05G103JS	81349	
R2	S/A R1				

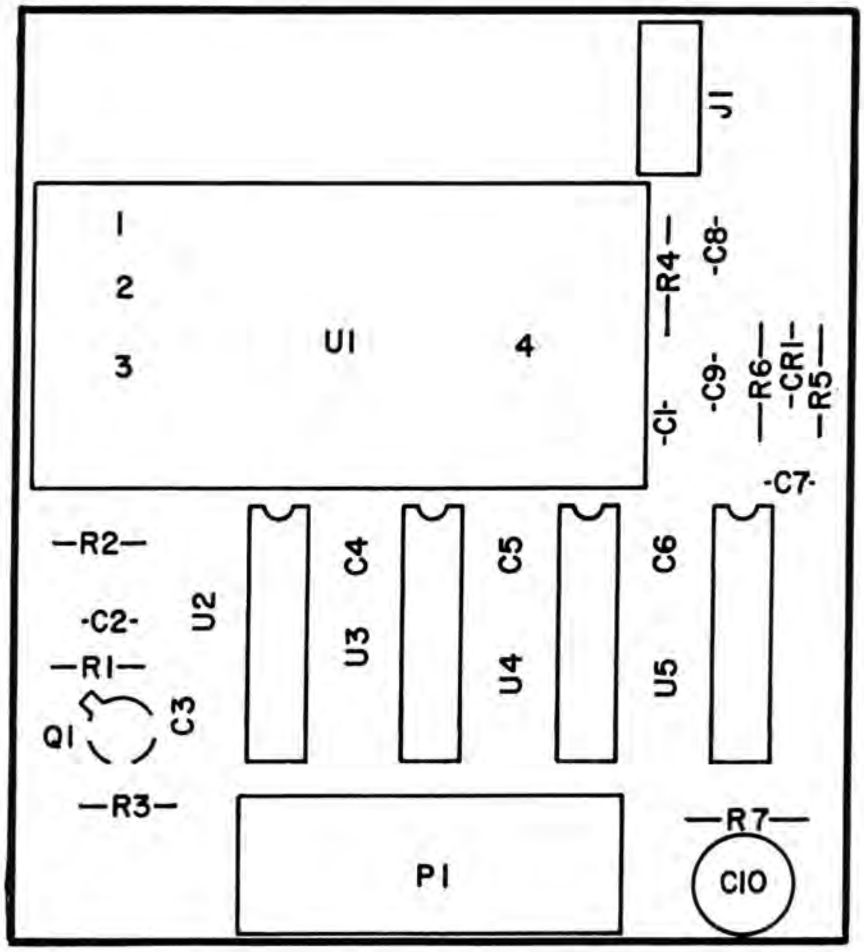

Figure 5-25. Type 796111 Time Base Generator (A5A1), Location of Components

TYPE NUMBER 796111 REVISION A SCHEMATIC 480214

TITLE - TIME BASE GENERATOR PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R3	RES/FIXED/COMPO 750 OHM 5PCT .125W	1	RCR05G751JS	81349	
R4	RES/FIXED/COMPO 1.0K 5PCT .25W	1	RCR07G102JS	81349	
R5	RES/FIXED/COMPO 10K 5PCT .25W	2	RCR07G103JS	81349	
R6	S/A R5				
R7	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
U1	TCXO 2MHZ	1	841055	14632	
U2	I C DUAL PROGRAMMABLE BCD/BINARY COUNTER	1	MC14569BCP	04713	
U3	I C DUAL BCD UP COUNTER	3	MC14518BCP	04713	
U4	S/A U3				
U5	S/A U3				

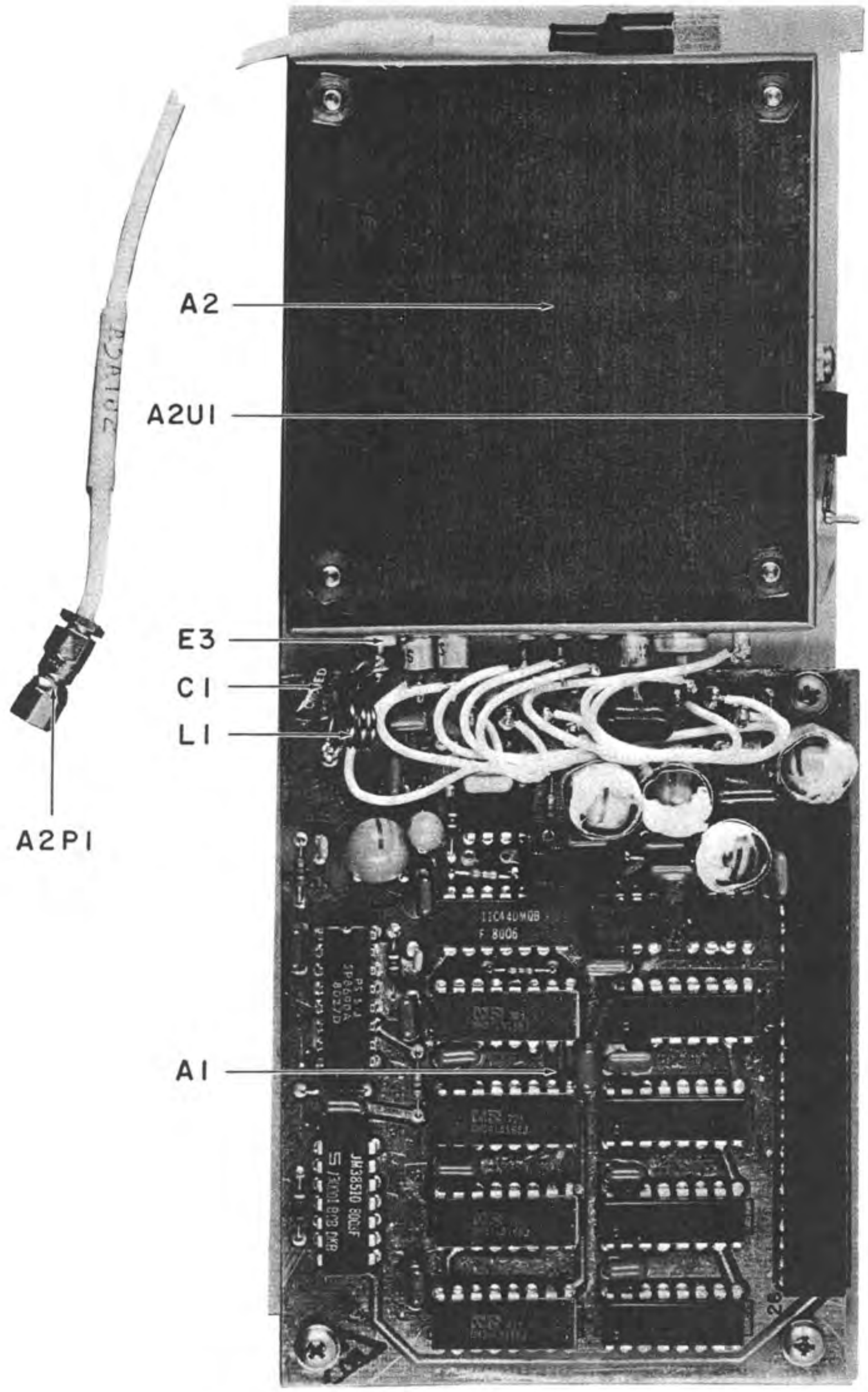

Figure 5-26. Type 796133 1st LO Synthesizer (A5A2),
Location of Components

TYPE NUMBER 796133 REVISION B SCHEMATIC 580056

TITLE - 1ST L.O./SYNTHESIZER ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	PHASE LOCK LOOP PRINTED WIRING ASSEMBLY	1	796115 (SEP PL)	14632	
A2	VCO ASSEMBLY	1	796132 (SEP PL)	14632	
C1	CAP/MICA/DIPPED 20PF 5PCT 500V	1	CM05ED200J03	81349	
L1	COIL/FXD/AIR	1	22292-106	14632	

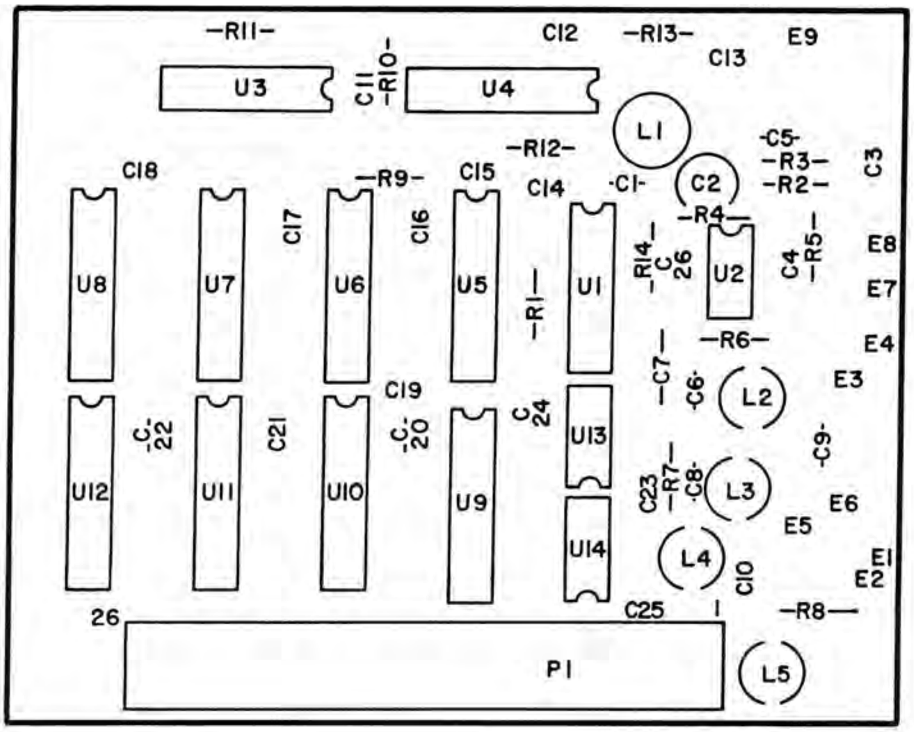

Figure 5-27. Type 796115 Phase Lock Loop (A5A2A1),
Location of Components

TYPE NUMBER 796115 REVISION A SCHEMATIC 580056

TITLE - PHASE LOCK LOOP PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/CER/DISC .1UF 20PCT 50V	11	34475-1	14632	
C2	CAP/ELEC/TANT 22UF 20PCT 10V	1	196D226X0010JE3	56289	
C3	CAP/CER/DISC .47UF 20PCT 50V Z5U .300 SQ .200 LEADS	7	34452-1	14632	
C4	CAP/CER/DISC .22UF 10PCT 50V STABLE	1	8131-050-X7R0-224K	72982	
C5	S/A C3				
C6	S/A C3				
C7	CAP/POLYES/FOIL .012UF 2PCT 100V	1	PE51-.012-100-2	27735	
C8	S/A C3				
C9	CAP/MICA/DIPPED 750PF 5PCT 300V	2	DM15-751J	72136	
C10	S/A C9				
C11	S/A C1				
C12	S/A C1				
C13	CAP/CER/DISC 1000PF 10PCT 100V	2	8111-100-X7R0-102K	72982	
C14	S/A C13				
C15	S/A C1				
C16	S/A C1				

TYPE NUMBER 796115 REVISION A SCHEMATIC 580056

TITLE - PHASE LOCK LOOP PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C17	S/A C1				
C18	S/A C1				
C19	S/A C1				
C20	S/A C1				
C21	S/A C1				
C22	S/A C1				
C23	S/A C3				
C24	S/A C3				
C25	S/A C3				
L1	COIL/FIXED 680UH 10PCT	1	553-3635-35	71279	
L2	COIL/FIXED 47MH 10PCT	1	553-3635-57	71279	
L3	COIL/FIXED 27MH 10PCT	1	553-3635-54	71279	
L4	COIL/FIXED 100MH 10PCT	2	553-3635-61	71279	
L5	S/A L4				
P1	CONN/PLUG 26 SKT SGL ROW 0.10 CTRS PC MT 0.310 X 0.10 HOLE PATTERN	1	65001-038	22526	
R1	RES/FIXED/COMPO 1.0K 5PCT 0.125W	3	RCR05G102JS	81349	
R2	RES/FIXED/COMPO 27K 5PCT 0.125W	1	RCR05G273JS	81349	

TYPE NUMBER 796115 REVISION A SCHEMATIC 580056

TITLE - PHASE LOCK LOOP PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R3	RES/FIXED/COMPO 3K 5PCT .125W	1	RCR05G302JS	81349	
R4	RES/FIXED/COMPO 10K 5PCT 0.125W	1	RCR05G103JS	81349	
R5	RES/FIXED/COMPO 100 OHMS 5PCT 0.125W	2	RCR05G101JS	81349	
R6	S/A R5				
R7	RES/FIXED/COMPO 2K 5PCT 0.125W	1	RCR05G202JS	81349	
R8	RES/FIXED/COMPO 22K 5PCT .125W	1	RCR05G223JS	81349	
R9	S/A R1				
R10	RES/FIXED/COMPO 1.5K 5PCT 0.125W	1	RCR05G152JS	81349	
R11	RES/FIXED/COMPO 3.6K 5PCT .125W	1	RCR05G362JS	81349	
R12	RES/FIXED/COMPO 68K 5PCT 0.125W	1	RCR05G683JS	81349	
R13	S/A R1				
U1	I C PHASE-FREQUENCY DETECTOR	1	11C44DM	07263	
U2	I C OP-AMP GENERAL PURPOSE OPT TEMP RANGE -40 DEG TO 85 DEG C	1	SA741CN	18324	
U3	I C QUAD 2 INPUT NAND GATE	1	SN54LS00J	01295	

TYPE NUMBER 796115 REVISION A SCHEMATIC 580056

TITLE - PHASE LOCK LOOP PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
U4	I C 200MHZ DIVIDE BY 10/11	1	SP8690M	52648	
U5	I C SYNCHRONOUS UP/DOWN DECADE COUNTER	4	SN54LS168J	01295	
U6	S/A U5				
U7	S/A U5				
U8	S/A U5				
U9	I C NBCD ADDER	4	MC14560BCP	04713	
U10	S/A U9				
U11	S/A U9				
U12	S/A U9				
U13	I C DUAL CMOS NAND PERIPHERAL DRIVER	2	DS3632N-8	27014	
U14	S/A U13				

TYPE NUMBER 796132 REVISION A SCHEMATIC 480139

TITLE - VCO ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	VCO PRINTED WIRING ASSEMBLY	1	796131 (SEP PL)	14632	
C1	CAP/CER/FDTHRU 1000PF GMV 500V	1	54-794-009-102W	33095	
C2	CAP/CER/FDTHRU .05UF GMV 300V	3	54-785-002-503P	33095	
C3	CAP/CER/FT 1200PF GMC 100V	3	10122-1	51642	
C4	S/A C3				
C5	S/A C3				
C6	NOT USED				
C7	S/A C2				
C8	S/A C2				
C9	CAP/CER/DISC .47UF 20PCT 50V Z5U .300 SQ .200 LEADS	1	34452-1	14632	
E1	TERM/FDTHRU/INS	3	SFU16Y	04013	
E2	S/A E1				
E3	S/A E1				
E4	CONN/TERM	1	144/188	19505	
P1	CONN/PLUG	1	UG1465/U	80058	
R1	RES/FIXED/COMPO 27 OHMS 5PCT 0.125W	1	RCR05G270JS	81349	
R2	RES/FIXED/COMPO 1.2K 5PCT .125W	3	RCR05G122JS	81349	

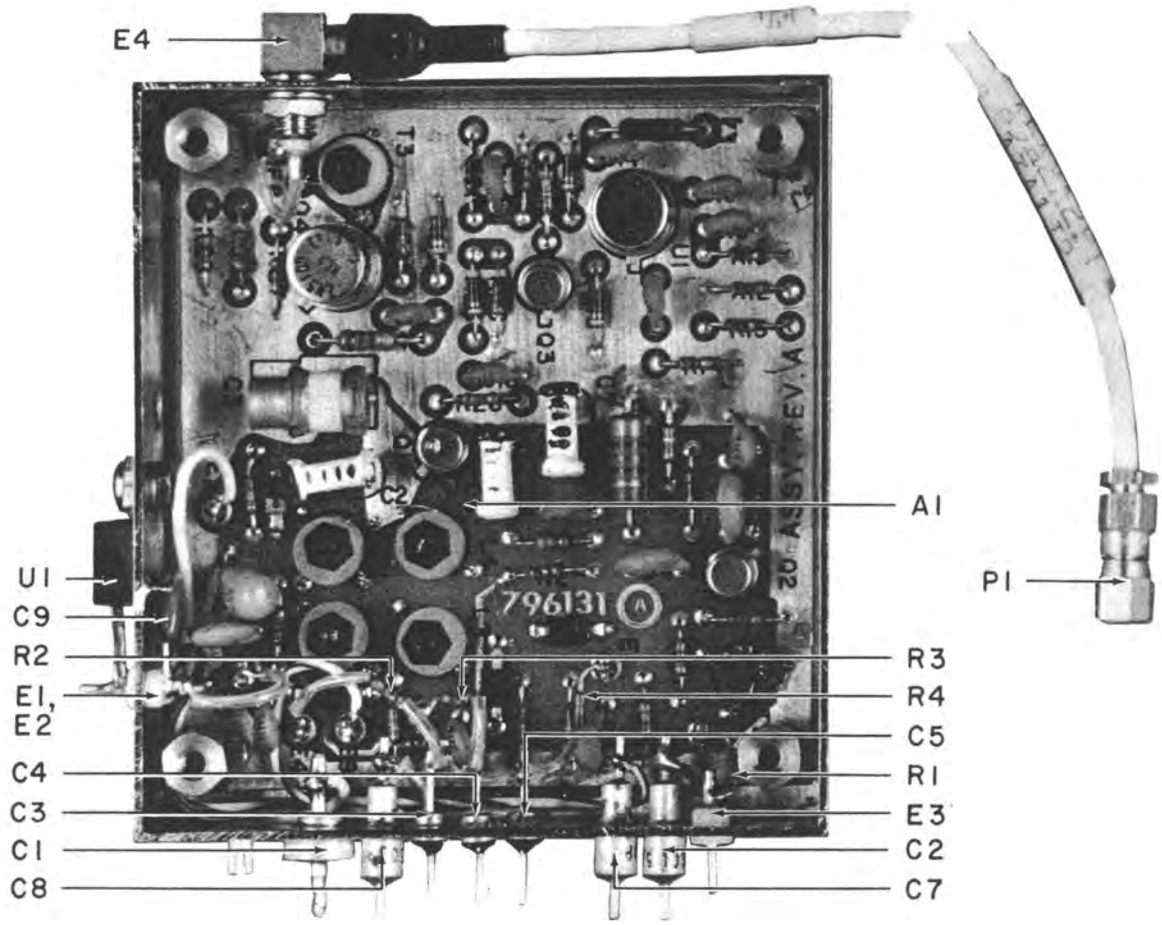

Figure 5-28. Type 796132 VCO Assembly (A5A2A2), Location of Components

TYPE NUMBER 796132 REVISION A SCHEMATIC 480139

TITLE - VCO ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R3	S/A R2				
R4	S/A R2				
U1	VOLTAGE RGLTR 12V 1AMP TO-220 PKG	1	7812UC	07263	
W1	CABLE ASSEMBLY	1	17300-300-10	14632	

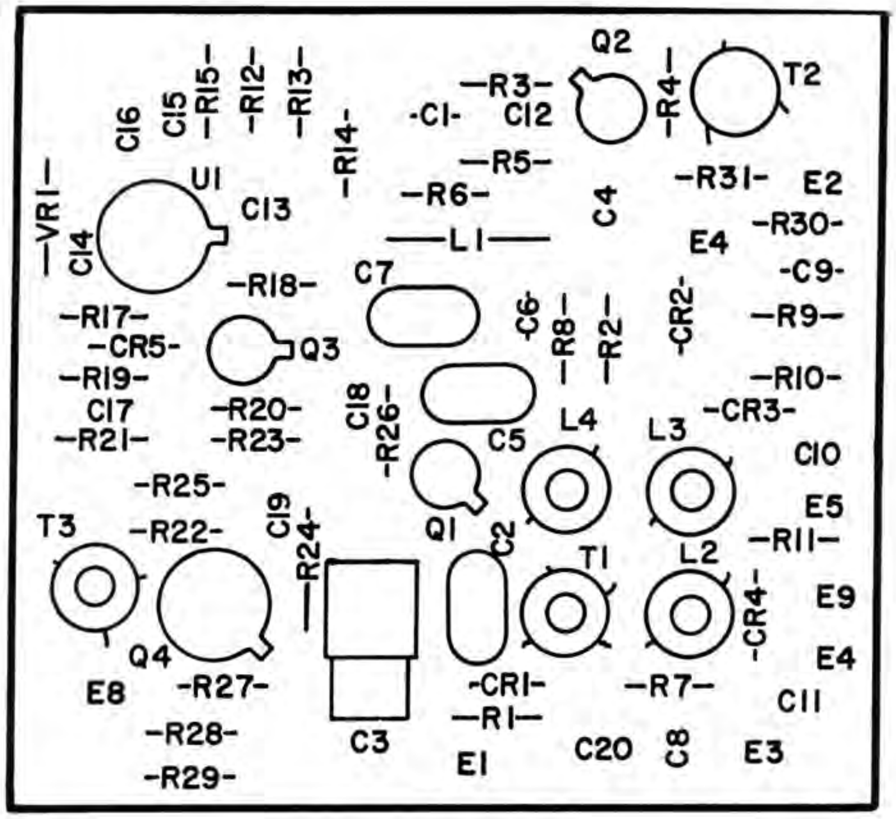

Figure 5-29. Type 796131 VCO P.C. Assembly (A5A2A2A1), Location of Components

TYPE NUMBER 796131 REVISION A SCHEMATIC 480139

TITLE - VCO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE	3	1N4446	80131	
CR2	S/A CR1				
CR3	S/A CR1				
CR4	DIODE/VARICAP	1	BB109-YELLOW	25088	
CR5	DIODE	1	1N914/JAN	81350	
C1	CAP/CER/DISC 1000PF GMV 500V	13	B-GP1000PFP	91418	
C2	CAP/CER/TUBULAR 15PF 5PCT 500V NPO	1	301-000C0G0-150J	72982	
C3	CAP/VAR/AIR .8-10.0PF 250V MIL P/N PC26J100	1	5201/W HDW	91293	
C4	CAP/CER/DISC 470PF 20PCT 1000V	3	B470PFM	91418	
C5	CAP/CER/TUBULAR 5.1PF .5PF TOL 500V NPO	1	301-000C0H0-519D	72982	
C6	S/A C1				
C7	CAP/CER/TUBULAR 10PF 0.5PF TOL 500V NPO	1	301-000C0H0-100D	72982	
C8	S/A C4				
C9	S/A C1				
C10	S/A C1				
C11	S/A C1				

TYPE NUMBER 796131 REVISION A SCHEMATIC 480139

TITLE - VCO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C12	S/A C4				
C13	S/A C1				
C14	S/A C1				
C15	S/A C1				
C16	S/A C1				
C17	S/A C1				
C18	S/A C1				
C19	S/A C1				
C20	CAP/ELEC/TANT 18UF 10PCT 20V	1	196D186X9020KE3	56289	
L1	COIL/FIXED 1.2UH 10PCT	1	1537-14 (18130-9)	99800	
L2	COIL/FXD TOROIDAL	1	20681-217	14632	
L3	COIL/FXD TOROIDAL	2	20681-218	14632	
L4	S/A L3				
Q1	TRANSISTOR N-CHANNEL SILICON JUNCTION F.E.T.	1	U310	17856	
Q2	TRANSISTOR	2	2N3251	80131	
Q3	S/A Q2				
Q4	TRANSISTOR	1	2N5109	80131	
R1	RES/FIXED/COMPO 22K 5PCT .125W	4	RCR05G223JS	81349	

TYPE NUMBER 796131 REVISION A SCHEMATIC 480139

TITLE - VCO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R2	RES/FIXED/COMPO 10 OHMS 5PCT 0.125W	3	RCR05G100JS	81349	
R3	RES/FIXED/COMPO 510 OHMS 5PCT 0.125W	1	RCR05G511JS	81349	
R4	RES/FIXED/COMPO 220 OHMS 5PCT .125W	2	RCR05G221JS	81349	
R5	RES/FIXED/COMPO 3K 5PCT .125W	1	RCR05G302JS	81349	
R6	RES/FIXED/COMPO 3.9K 5PCT .25W	1	RCR07G392JS	81349	
R7	RES/FIXED/COMPO 100 OHMS 5PCT 0.125W	3	RCR05G101JS	81349	
R8	RES/FIXED/COMPO 330 OHMS 5PCT 0.125W	1	RCR05G331JS	81349	
R9	S/A R1				
R10	S/A R1				
R11	S/A R1				
R12	S/A R7				
R13	RES/FIXED/COMPO 68 OHMS 5PCT 0.125W	1	RCR05G680JS	81349	
R14	S/A R7				
R15	RES/FIXED/COMPO 15K 5PCT 0.125W	1	RCR05G153JS	81349	
R16	NOT USED				
R17	RES/FIXED/COMPO 1.5K 5PCT 0.125W	3	RCR05G152JS	81349	

TYPE NUMBER 796131 REVISION A SCHEMATIC 480139

TITLE - VCO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R18	S/A R17				
R19	RES/FIXED/COMPO 1.0K 5PCT 0.125W	1	RCR05G102JS	81349	
R20	S/A R4				
R21	S/A R2				
R22	RES/FIXED/COMPO 2.2K 5PCT 0.125W	1	RCR05G222JS	81349	
R23	S/A R17				
R24	RES/FIXED/COMPO 120 OHMS 5PCT .25W	1	RCR07G121JS	81349	
R25	S/A R2				
R26	RES/FIXED/COMPO 22 OHMS 5PCT .125W	1	RCR05G220JS	81349	
R27	RES/FIXED/COMPO 300 OHMS 5PCT 0.125W	2	RCR05G301JS	81349	
R28	RES/FIXED/COMPO 18 OHMS 5PCT .125W	1	RCR05G180JS	81349	
R29	S/A R27				
R30	RES/FIXED/COMPO 33 OHMS 5PCT .125W	1	RCR05G330JS	81349	
R31	RES/FIXED/COMPO 27 OHMS 5PCT 0.125W	1	RCR05G270JS	81349	
T1	TRANSFORMER	1	21428-95	14632	
T2	TRANSFORMER	2	21278-30	14632	

TYPE NUMBER 796131 REVISION A SCHEMATIC 480139

TITLE - VCO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
T3	S/A T2				
U1	I C 300MHZ DIV BY 2 HIGH SPEED	1	SP8604B	52648	
VR1	DIODE ZENER 6.8V SILICON	1	1N754A	80131	

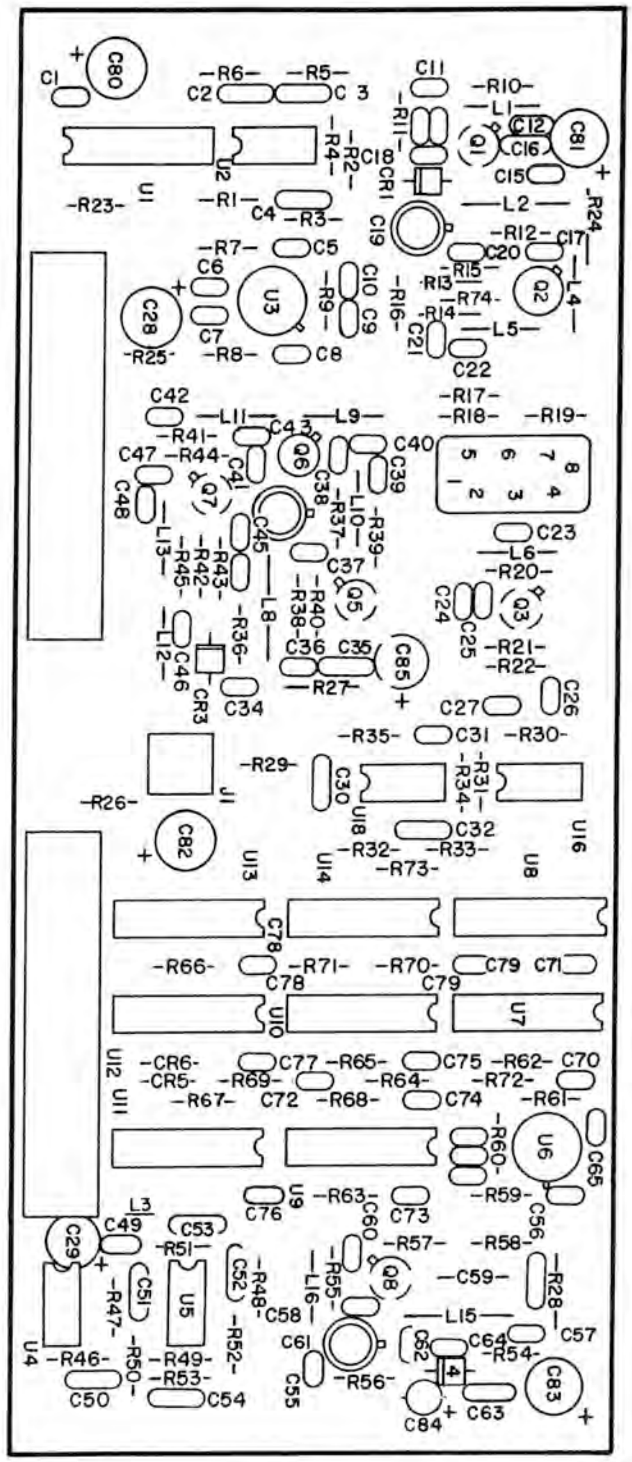

Figure 5-30. Type 796107 2nd LO Synthesizer (A5A3), Location of Components

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE/VARICAP	2	BB109-YELLOW	25088	
CR2	NOT USED				
CR3	S/A CR1				
CR4	DIODE/VARICAP	1	BB105B	25088	
CR5	DIODE	2	5082-2800	28480	
CR6	S/A CR5				
C1	CAP/CER/DISC 0.1UF 10PCT 50V STABLE	14	8121-050-X7R0-104K	72982	
C2	CAP/CER/DISC 0.47UF 10PCT 50V STABLE	16	8131-050-X7R0-474K	72982	
C3	S/A C2				
C4	S/A C2				
C5	S/A C1				
C6	CAP/CER/DISC 2200PF 10PCT 50V STABLE	14	8121-050-X7R0-222K	72982	
C7	S/A C6				
C8	S/A C6				
C9	S/A C6				
C10	S/A C6				
C11	S/A C6				
C12	S/A C6				

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C13	CAP/CER/DISC 120PF 5PCT 50V NPO	2	8121-050-COGO-121J	72982	
C14	CAP/CER/DISC 27PF 5PCT 50V NPO	1	8111-050-COGO-270J	72982	
C15	S/A C6				
C16	S/A C2				
C17	S/A C6				
C18	CAP/CER/DISC 4.3PF PORM 0.25PF 50V NPO	2	8101-050-COHO-439C	72982	
C19	CAP/VAR/AIR 1.0-10PF 250V PC VERT	3	8052	91293	
C20	CAP/CER/DISC 2.2PF PORM 0.1PF 50V NPO	4	8101-050-COJO-229B	72982	
C21	CAP/CER/DISC 39PF 5PCT 50V NPO	2	8111-050-COGO-390J	72982	
C22	CAP/CER/DISC 200PF 5PCT 50V NPO	3	8121-050-COGO-201J	72982	
C23	CAP/CER/DISC 1100PF 5PCT 50V NPO	2	8121-050-COGO-112J	72982	
C24	S/A C23				
C25	S/A C2				
C26	S/A C1				
C27	S/A C1				

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C28	CAP/ELEC/TANT 100UF 20PCT 10V	2	196D107X0010PE4	56289	
C29	CAP/ELEC/TANT 220UF 20PCT 10V	1	196D227X0010TE4	56289	
C30	S/A C2				
C31	CAP/CER/DISC 0.01UF 10PCT 50V STABLE	1	8121-050-X7R0-103K	72982	
C32	S/A C2				
C33	S/A C18				
C34	S/A C6				
C35	S/A C2				
C36	S/A C6				
C37	S/A C20				
C38	S/A C6				
C39	CAP/CER/DISC 43PF 5PCT 50V NPO	1	8111-050-COGO-430J	72982	
C40	S/A C22				
C41	CAP/CER/DISC 24PF 5PCT 50V NPO	1	8111-050-COGO-240J	72982	
C42	S/A C6				
C43	S/A C13				
C44	S/A C19				
C45	S/A C20				

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C46	S/A C6				
C47	S/A C21				
C48	S/A C22				
C49	S/A C1				
C50	S/A C2				
C51	S/A C2				
C52	S/A C2				
C53	S/A C2				
C54	S/A C2				
C55	CAP/CER/DISC 330PF 10PCT 100V	10	8101-100-X7R0-331K	72982	
C56	S/A C2				
C57	S/A C55				
C58	S/A C20				
C59	CAP/COMPO/TUB .51PF 10PCT 500V	1	QC0.51PFK	95121	
C60	S/A C55				
C61	S/A C19				
C62	CAP/CER/DISC 15PF 5PCT 50V NPO	1	8101-050-COG0-150J	72982	
C63	S/A C2				
C64	S/A C55				

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C65	S/A C1				
C66	S/A C55				
C67	S/A C55				
C68	S/A C55				
C69	S/A C55				
C70	S/A C1				
C71	S/A C1				
C72	S/A C1				
C73	S/A C55				
C74	S/A C55				
C75	S/A C1				
C76	S/A C1				
C77	S/A C1				
C78	S/A C1				
C79	S/A C1				
C80	S/A C28				
C81	CAP/ELEC/TANT 4.7UF 20PCT 35V	3	196D475X0035JE3	56289	
C82	CAP/ELEC/TANT 22UF 20PCT 10V	1	196D226X0010JE3	56289	
C83	S/A C81				
C84	CAP/ELEC/TANT 1UF 20PCT 35V	1	196D105X0035HE3	56289	

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C85	S/A C81				
J1	CONN/RECEP SMC SNAP-ON STRAIGHT PC MT	1	209	19505	
L1	COIL/FIXED/MOLD 15UH 10PCT	5	1025-48 (75084-14)	99800	
L2	COIL/FIXED 0.68UH 10PCT /MIL P/N MS18130-4/	2	1537-08 (18130-6)	99800	
L3	COIL/FIXED 100MH 10PCT	1	553-3635-61	71279	
L4	S/A L1				
L5	COIL/FIXED 0.68UH	3	1025-16 (75083-11)	99800	
L6	COIL FIXED MOLD 5.6UH 10PCT	1	1025-38	99800	
L7	NOT USED				
L8	S/A L2				
L9	S/A L1				
L10	S/A L5				
L11	S/A L1				
L12	S/A L1				
L13	S/A L5				
L14	NOT USED				
L15	COIL	1	21210-37	14632	

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L16	COIL/FIXED/MOLD 1.0UH 10PCT	1	1025-20 (75083-13)	99800	
P1	CONN/PLUG 20 SKT SGL ROW 0.10 CTRS PC MT 0.310 X 0.10 HOLE PATTERN	2	65001-026	22526	
P2	S/A P1				
Q1	TRANSISTOR N-CHANNEL SILICON JUNCTION F.E.T.	3	U310	17856	
Q2	TRANSISTOR	4	2N2857	80131	
Q3	S/A Q2				
Q4	NOT USED				
Q5	S/A Q2				
Q6	S/A Q1				
Q7	S/A Q2				
Q8	S/A Q1				
R1	RES/FIXED/COMPO 3.3K 5PCT .125W	8	RCR05G332JS	81349	
R2	RES/FIXED/COMPO 27K 5PCT 0.125W	1	RCR05G273JS	81349	
R3	RES/FIXED/COMPO 3K 5PCT .125W	1	RCR05G302JS	81349	
R4	RES/FIXED/COMPO 15K 5PCT 0.125W	1	RCR05G153JS	81349	
R5	RES/FIXED/COMPO 2.2K 5PCT 0.125W	7	RCR05G222JS	81349	

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R6	RES/FIXED/COMPO 100 OHMS 5PCT 0.125W	4	RCR05G101JS	81349	
R7	RES/FIXED/COMPO 8.2K 5PCT 0.125W	1	RCR05G822JS	81349	
R8	RES/FIXED/COMPO 39K 5PCT 0.125W	3	RCR05G393JS	81349	
R9	RES/FIXED/COMPO 1.0K 5PCT 0.125W	5	RCR05G102JS	81349	
R10	RES/FIXED/COMPO 300 OHMS 5PCT 0.125W	2	RCR05G301JS	81349	
R11	RES/FIXED/COMPO 22K 5PCT .125W	5	RCR05G223JS	81349	
R12	RES/FIXED/COMPO 13K 5PCT 0.125W	1	RCR05G133JS	81349	
R13	RES/FIXED/COMPO 4.3K 5PCT 1/8W	3	RCR05G432JS	81349	
R14	RES/FIXED/COMPO 22 OHMS 5PCT .125W	3	RCR05G220JS	81349	
R15	RES/FIXED/COMPO 910 OHMS 5PCT 1/8W	1	RCR05G911JS	81349	
R16	RES/FIXED/COMPO 240 OHMS 5PCT 0.125W	1	RCR05G241JS	81349	
R17	RES/FIXED/COMPO 30 OHMS 5PCT 0.125W	2	RCR05G300JS	81349	
R18	RES/FIXED/COMPO 27 OHMS 5PCT 0.125W	1	RCR05G270JS	81349	
R19	S/A R17				

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R20	RES/FIXED/COMPO 51 OHMS 5PCT 0.125W	1	RCR05G510JS	81349	
R21	RES/FIXED/COMPO 68K 5PCT 0.125W	2	RCR05G683JS	81349	
R22	RES/FIXED/COMPO 10K 5PCT 0.125W	1	RCR05G103JS	81349	
R23	RES/FIXED/COMPO 4.7 OHMS 5PCT 0.125W	1	RCR05G4R7JS	81349	
R24	RES/FIXED/COMPO 1.5K 5PCT 0.125W	4	RCR05G152JS	81349	
R25	RES/FIXED/COMPO 10 OHMS 5PCT 0.125W	1	RCR05G100JS	81349	
R26	RES/FIXED/COMPO 330 OHMS 5PCT 0.125W	1	RCR05G331JS	81349	
R27	S/A R24				
R28	S/A R9				
R29	S/A R6				
R30	S/A R1				
R31	S/A R1				
R32	S/A R11				
R33	S/A R13				
R34	RES/FIXED/COMPO 16K 5PCT 0.125W	3	RCR05G163JS	81349	
R35	S/A R5				
R36	S/A R11				

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R37	S/A R34				
R38	RES/FIXED/COMPO 2.7K 5PCT 0.125W	1	RCR05G272JS	81349	
R39	S/A R14				
R40	RES/FIXED/COMPO 470 OHMS 5PCT 0.125W	1	RCR05G471JS	81349	
R41	S/A R10				
R42	S/A R34				
R43	S/A R1				
R44	S/A R14				
R45	RES/FIXED/COMPO 820 OHMS 5PCT .125W	1	RCR05G821JS	81349	
R46	S/A R1				
R47	S/A R1				
R48	S/A R6				
R49	S/A R11				
R50	S/A R13				
R51	S/A R8				
R52	S/A R5				
R53	S/A R6				
R54	RES/FIXED/COMPO 47K 5PCT 0.125W	1	RCR05G473JS	81349	
R55	RES/FIXED/COMPO 220 OHMS 5PCT .125W	1	RCR05G221JS	81349	

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R56	S/A R11				
R57	RES/FIXED/COMPO 47 OHMS 5PCT 0.125W	2	RCR05G470JS	81349	
R58	S/A R57				
R59	S/A R9				
R60	S/A R8				
R61	S/A R5				
R62	S/A R1				
R63	S/A R9				
R64	S/A R21				
R65	S/A R24				
R66	S/A R5				
R67	RES/FIXED/COMPO 3.6K 5PCT .125W	2	RCR05G362JS	81349	
R68	S/A R24				
R69	S/A R67				
R70	S/A R9				
R71	S/A R1				
R72	S/A R5				
R73	S/A R5				
R74	RES/FIXED/COMPO 10 OHMS 5PCT 0.125W	1	RCR05G100JS	81349	

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
U1	I C PHASE-FREQUENCY DETECTOR	1	11C44DM	07263	
U2	I C OP-AMP GENERAL PURPOSE OPT TEMP RANGE -40 DEG TO 85 DEG C	3	SA741CN	18324	
U3	I C DIVIDE BY 16 HIGH SPEED	1	SP8659M	52648	
U4	I C PHASE DETECTOR	2	MM74C932N	27014	
U5	S/A U2				
U6	SPACER/HEX THRD 4-40 1/4 ACRFLT 3/8LG SST PASSIVE FNSH	1	8213-SS-0440-7	06540	
U7	I C DECADE COUNTER	1	SN54LS290J	01295	
U8	I C DUAL D FLIP FLOP	1	CD4013BE	02735	
U9	I C 200MHZ DIVIDE BY 10/11	1	SP8690M	52648	
U10	I C SYNCHRONOUS UP/DOWN DECADE COUNTER	2	SN54LS168J	01295	
U11	S/A U10				
U12	I C SYNCHRONOUS UP/DOWN BINARY COUNTER	3	SN54LS169J	01295	

TYPE NUMBER 796107 REVISION A SCHEMATIC 680037

TITLE - 2ND LO SYNTHESIZER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
U13	S/A U12				
U14	S/A U12				
U15	MIXER/BALANCED	1	M6D	27956	
U16	S/A U4				
U17	NOT USED				
U18	S/A U2				

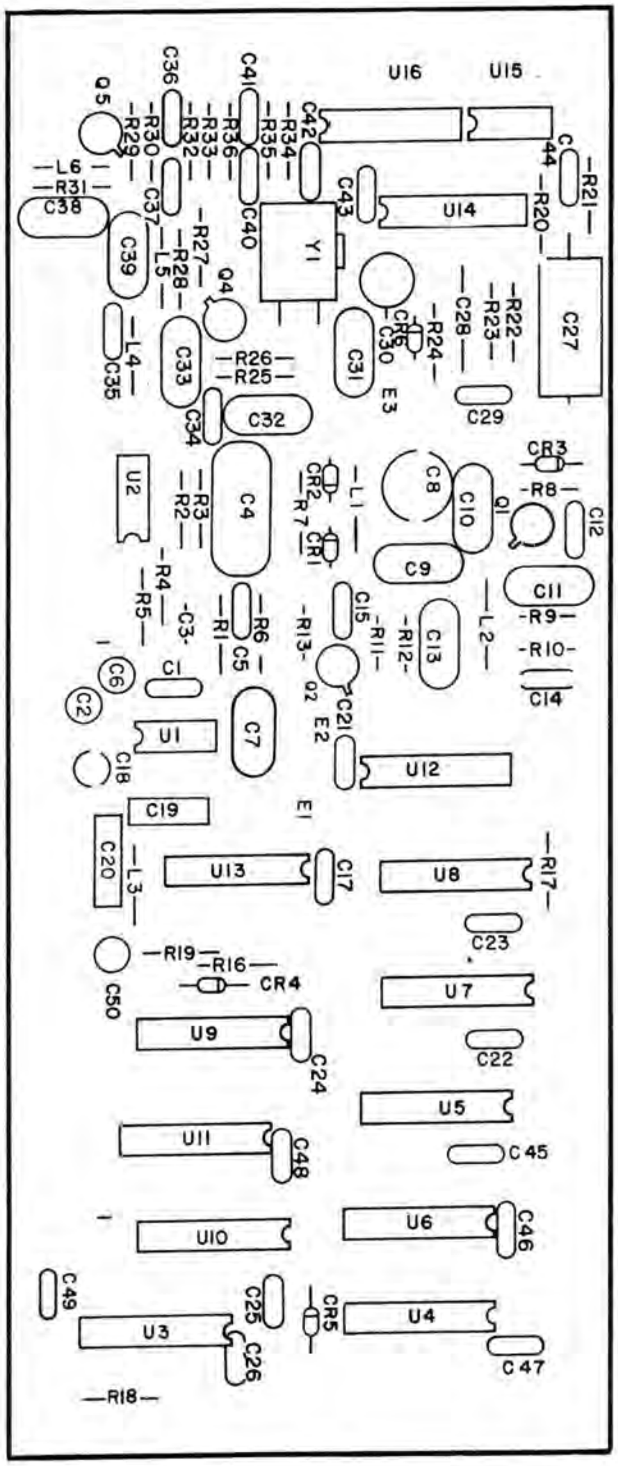

Figure 5-31. Type 796109 BFO/3rd LO (A5A4), Location of Components

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	DIODE/VARICAP	2	BB109-YELLOW	25088	
CR2	S/A CR1				
CR3	DIODE	3	1N4446	80131	
CR4	S/A CR3				
CR5	S/A CR3				
CR6	DIODE/VARICAP	1	BB105B	25088	
C1	CAP/CER/DISC .1UF 20PCT 50V	14	34475-1	14632	
C2	CAP/ELEC/TANT 18UF 10PCT 20V	1	196D186X9020KE3	56289	
C3	CAP/CER/DISC .01UF 20PCT 50V	11	34453-1	14632	
C4	NOT USED				
C5	S/A C1				
C6	CAP/ELEC/TANT 22UF 20PCT 10V	1	196D226X0010JE3	56289	
C7	S/A C1				
C8	CAP/VAR/CERAMIC 2.5-11PF 350V N300	1	538-011B2.5-11	72982	
C9	CAP/MICA/DIPPED 82PF 2PCT 500V	1	CM05ED820G03	81349	
C10	CAP/MICA/DIPPED 680PF 2PCT 300V	2	DM15-681G	72136	
C11	S/A C10				

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C12	CAP/CER/DISC .47UF 20PCT 50V Z5U .300 SQ .200 LEADS	2	34452-1	14632	
C13	CAP/MICA/DIPPED 150PF 2PCT 500V	1	CM05FD151G03	81349	
C14	S/A C3				
C15	S/A C1				
C16	NOT USED				
C17	S/A C1				
C18	CAP/ELEC/TANT 100UF 20PCT 20V	2	196D107X0020TE4	56289	
C19	CAP/POLYES/FOIL 6800PF 2PCT 100V	1	PE51-.0068-100-2	27735	
C20	CAP/POLYES/FOIL .015UF 2PCT 100V	1	PE51-.015-100-2	27735	
C21	S/A C1				
C22	S/A C1				
C23	S/A C1				
C24	S/A C1				
C25	S/A C1				
C26	S/A C1				
C27	CAP/ELEC/TANT 150UF 10PCT 15V	1	CS13BD157K	81349	
C28	CAP/ELEC/TANT 10UF 10PCT 20V	1	CS13BE106K	81349	

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C29	S/A C3				
C30	CAP/VAR/AIR 1.0-10PF 250V PC VERT	1	8052	91293	
C31	CAP/MICA/DIPPED 18PF 5PCT 500V	1	CM04CD180J03	81349	
C32	CAP/MICA/DIPPED 220PF 2PCT 500V	1	CM04FD221G03	81349	
C33	CAP/MICA/DIPPED 470PF 2PCT 500V	1	DM15-471G	72136	
C34	S/A C3				
C35	S/A C12				
C36	CAP/CER/DISC 1000PF GMV 500V	1	B-GP1000PFP	91418	
C37	S/A C3				
C38	CAP/MICA/DIPPED 43PF 2PCT 500V	1	CM05ED430G03	81349	
C39	CAP/MICA/DIPPED 240PF 2PCT 500V	1	CM05FD241G03	81349	
C40	S/A C3				
C41	S/A C3				
C42	S/A C1				
C43	S/A C1				
C44	S/A C1				
C45	S/A C3				

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C46	S/A C3				
C47	S/A C3				
C48	S/A C3				
C49	CAP/CER/DISC 68PF 5PCT 100V NPO	1	8121-100-COG0-680J	72982	
C50	S/A C18				
FB1	FERRITE BEAD	2	56-590-65-4A	02114	C39
FB2	S/A FB1				C39
L1	COIL/FIXED 15UH 10PCT	1	1537-40 (14046-6)	99800	
L2	COIL/FIXED 22UH 10PCT	1	1537-44 (14046-8)	99800	
L3	COIL/FIXED/MOLD 27UH 10PCT	1	1025-54 (75084-17)	99800	
L4	COIL/FIXED 120UH 10PCT	2	1025-70	99800	
L5	S/A L4				
L6	COIL/FIXED/MOLD	1	1025-36 (75084-8)	99800	
P1	CONN/PLUG 20 SKT SGL ROW .10 CTR	2	65001-026	22526	
P2	S/A P1				
Q1	TRANSISTOR N-CHANNEL SILICON JUNCTION F.E.T.	1	U310	17856	
Q2	TRANSISTOR	1	2N2222A	80131	

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
Q3	NOT USED				
Q4	TRANSISTOR	2	2N706	80131	
Q5	S/A Q4				
R1	RES/FIXED/COMPO 33K 5PCT .25W	3	RCR07G333JS	81349	
R2	S/A R1				
R3	RES/FIXED/COMPO 300K 5PCT .25W	1	RCR07G304JS	81349	
R4	RES/FIXED/COMPO 3.6K 5PCT .25W	1	RCR07G362JS	81349	
R5	RES/FIXED/COMPO 18K 5PCT .25W	1	RCR07G183JS	81349	
R6	RES/FIXED/COMPO 22K 5PCT .25W	2	RCR07G223JS	81349	
R7	S/A R1				
R8	RES/FIXED/COMPO 100K 5PCT .25W	1	RCR07G104JS	81349	
R9	RES/FIXED/COMPO 47 OHMS 5PCT .25W	1	RCR07G470JS	81349	
R10	RES/FIXED/COMPO 330 OHMS 5PCT .25W	1	RCR07G331JS	81349	
R11	RES/FIXED/COMPO 6.8K 5PCT .25W	1	RCR07G682JS	81349	

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R12	RES/FIXED/COMPO 1.0K 5PCT .25W	3	RCR07G102JS	81349	
R13	S/A R12				
R14	NOT USED				
R15	NOT USED				
R16	RES/FIXED/COMPO 10K 5PCT .25W	3	RCR07G103JS	81349	
R17	S/A R16				
R18	RES/FIXED/COMPO 3.3K 5PCT .25W	2	RCR07G332JS	81349	
R19	RES/FIXED/COMPO 510 OHMS 5PCT .25W	1	RCR07G511JS	81349	
R20	S/A R18				
R21	S/A R1				
R22	RES/FIXED/COMPO 8.2K 5PCT .25W	2	RCR07G822JS	81349	
R23	RES/FIXED/COMPO 12K 5PCT .25W	1	RCR07G123JS	81349	
R24	S/A R6				
R25	S/A R22				
R26	S/A R16				
R27	RES/FIXED/COMPO 22 OHMS 5PCT .25W	1	RCR07G220JS	81349	

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R28	RES/FIXED/COMPO 470 OHMS 5PCT .25W	4	RCR07G471JS	81349	
R29	RES/FIXED/COMPO 5.1K 5PCT .25W	1	RCR07G512JS	81349	
R30	RES/FIXED/COMPO 2.7K 5PCT .25W	2	RCR07G272JS	81349	
R31	S/A R30				
R32	RES/FIXED/COMPO 220 OHMS 5PCT .25W	1	RCR07G221JS	81349	
R33	S/A R28				
R34	S/A R12				
R35	S/A R28				
R36	S/A R28				
U1	I C PHASE DETECTOR	2	MM74C932N	27014	
U2	I C OP-AMP GENERAL PURPOSE OPT TEMP RANGE -40 DEG TO 85 DEG C	1	SA741CN	18324	
U3	I C DUAL D FLIP FLOP	1	CD4013BE	02735	
U4	I C DUAL 4 INPUT AND GATE	1	CD4082BE	02735	

TYPE NUMBER 796109 REVISION A SCHEMATIC 580054

TITLE - BFO/3RD LO PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
U5	I C DUAL 4 INPUT NOR GATE	2	CD4002BE	02735	
U6	I C CMOS QUAD EXCLUSIVE OR GATE	1	CD4030BE	02735	
U7	I C BCD UP/DOWN COUNTER	4	MC14510BCP	04713	
U8	S/A U7				
U9	S/A U7				
U10	S/A U7				
U11	S/A U5				
U12	I C SYNCHRONOUS UP/DOWN BINARY COUNTER	1	SN54LS169J	01295	
U13	I C DECADE COUNTER	1	SN54LS290J	01295	
U14	I C	1	SN54LS74J	01295	
U15	S/A U1				
U16	I C QUAD 2 INPUT NAND GATE	1	SN54LS00J	01295	
Y1	CRYSTAL/QUARTZ	1	CR64U 11.155MHZ	80058	

TYPE NUMBER 796106 REVISION A SCHEMATIC 680036

TITLE - DIGITAL CONTROL UNIT PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
CR1	NOT USED				
CR2	NOT USED				
CR3	NOT USED				
CR4	DIODE	2	1N4446	80131	
CR5	S/A CR4				
C1	CAP/ELEC/TANT 4.7UF 20PCT 35V	2	196D475X0035JE3	56289	
C2	CAP/MICA/DIPPED 470PF 5PCT 500V	1	DM15-471J	72136	
C3	S/A C1				
C4	CAP/ELEC/TANT 18UF 10PCT 20V	1	196D186X9020KE3	56289	
C5	NOT USED				
C6	CAP/CER/DISC .1UF 20PCT 50V	18	34475-1	14632	
C7	S/A C6				
C8	S/A C6				
C9	S/A C6				
C10	S/A C6				
C11	S/A C6				
C12	S/A C6				
C13	S/A C6				
C14	S/A C6				

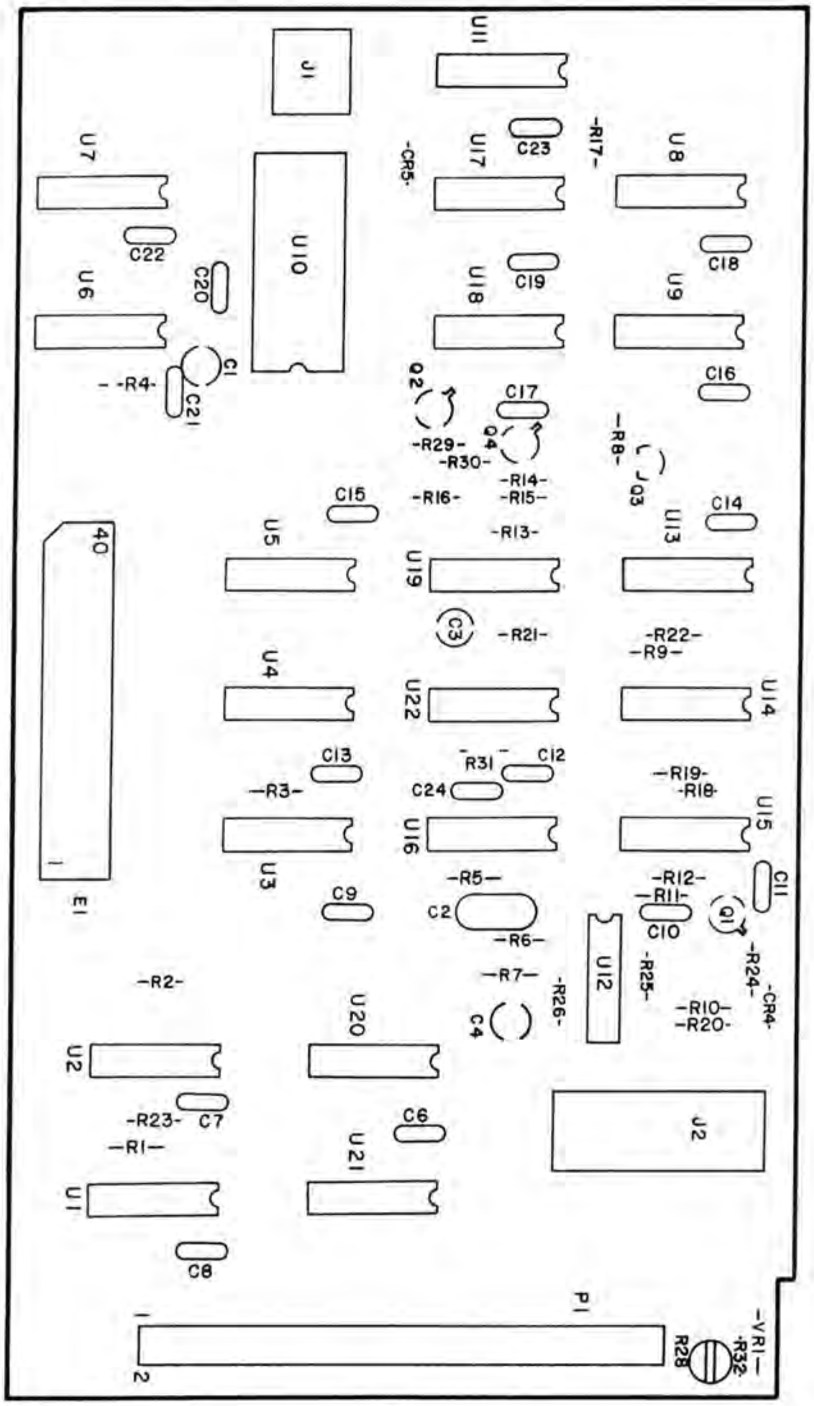

Figure 5-32. Type 796106 Digital Control (A6),
Location of Components

TYPE NUMBER 796106 REVISION A SCHEMATIC 680036

TITLE - DIGITAL CONTROL UNIT PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C15	S/A C6				
C16	S/A C6				
C17	S/A C6				
C18	S/A C6				
C19	S/A C6				
C20	S/A C6				
C21	S/A C6				
C22	S/A C6				
C23	S/A C6				
C24	CAP/CER/DISC 2200PF 10PCT 200V	1	CK06BX222K	81349	
E1	CONN/PADDLE BD 40 PIN 0.08 POST LENGTH	1	88213-8	00779	
J1	CONN/RECEP 6 PIN RIGHT ANGLE HEADER ASSY DBL ROW 0.10 CTRS MOD II	1	87382-9	00779	
J2	CONN/RECEP 24 PIN RIGHT ANGLE HEADER ASSY 0.10 CTRS MOD II	1	87571-9	00779	
P1	CONN/PLUG 40 SKT DBL ROW 0.15 CTR	1	65002-026	22526	

TYPE NUMBER 796106 REVISION A SCHEMATIC 680036

TITLE - DIGITAL CONTROL UNIT PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
P2	CONN/PLUG/KIT 40 SKT DBL ROW FOR FLAT CABLE (KIT INCL 88378-1 HSG & 88340-1 C/SR)	1	88476-7	00779	
Q1	TRANSISTOR	1	2N2222A	80131	
Q2	TRANSISTOR	3	2N3906	80131	
Q3	S/A Q2				
Q4	S/A Q2				
R1	RES/FIXED/COMPO 22K 5PCT .125W	11	RCR05G223JS	81349	
R2	S/A R1				
R3	S/A R1				
R4	RES/FIXED/COMPO 5.1K 5PCT 0.125W	1	RCR05G512JS	81349	
R5	S/A R1				
R6	RES/FIXED/COMPO 4.7K 5PCT 0.125W	4	RCR05G472JS	81349	
R7	S/A R6				
R8	RES/FIXED/COMPO 10K 5PCT 0.125W	6	RCR05G103JS	81349	
R9	RES/FIXED/COMPO 12K 5PCT 0.125W	4	RCR05G123JS	81349	
R10	S/A R8				
R11	S/A R8				

TYPE NUMBER 796106 REVISION A SCHEMATIC 680036

TITLE - DIGITAL CONTROL UNIT PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R12	S/A R9				
R13	RES/FIXED/COMPO 100 OHMS 5PCT 0.125W	2	RCR05G101JS	81349	
R14	S/A R8				
R15	S/A R9				
R16	S/A R13				
R17	S/A R1				
R18	S/A R1				
R19	S/A R1				
R20	S/A R1				
R21	S/A R1				
R22	S/A R1				
R23	S/A R8				
R24	RES/FIXED/COMPO 2.4K 5PCT .125W	1	RCR05G242JS	81349	
R25	S/A R6				
R26	S/A R6				
R27	NOT USED				
R28	RES/TRIM/FILM 500 OHM 10PCT .5W	1	62PR500	73138	
R29	S/A R8				
R30	S/A R9				

TYPE NUMBER 796106 REVISION A SCHEMATIC 680036

TITLE - DIGITAL CONTROL UNIT PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
R31	S/A R1				
R32	RES/FIXED/COMPO 10 OHMS 5PCT 0.125W	1	RCR05G100JS	81349	
U1	I C BCD UP/DOWN COUNTER	9	MC14510BCP	04713	
U2	S/A U1				
U3	S/A U1				
U4	S/A U1				
U5	S/A U1				
U6	S/A U1				
U7	S/A U1				
U8	S/A U1				
U9	S/A U1				
U10	INTEGRATED CKT (PROGRAMMED IM6654IJG	1	841072	14632	
U11	I C QUAD 2 INPUT OR	1	CD4071BE	02735	
U12	I C HEX SCHMITT TRIGGER	1	CD40106BE	02735	
U13	I C QUAD 2 INPUT NOR GATE	1	MC14001BCP	04713	
U14	I C QUAD EXCLUSIVE NOR GATE	1	CD4077BE	02735	

TYPE NUMBER 796106 REVISION A SCHEMATIC 680036

TITLE - DIGITAL CONTROL UNIT PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
U15	I C TRIPLE 3 INPUT AND	1	CD4073BE	02735	
J16	I C QUAD 2 INPUT AND	4	CD4081BE	04713	
U17	S/A U16				
U18	S/A U16				
U19	S/A U16				
U20	I C QUAD 2 INPUT MULTIPLEXER	2	MM74C157N	27014	
U21	S/A U20				
U22	I C DUAL D FLIP FLOP	1	CD4013BE	02735	
VR1	DIODE ZENER 10V SILICON	1	1N758A	80131	
W1	CABLE ASSEMBLY	1	380241-1	14632	
XU10	SOCKET/IC 24 PIN DIP 0.20 PROFILE W/ANTI-WICKING BARRIER	1	ICN-246-S5-T	06776	

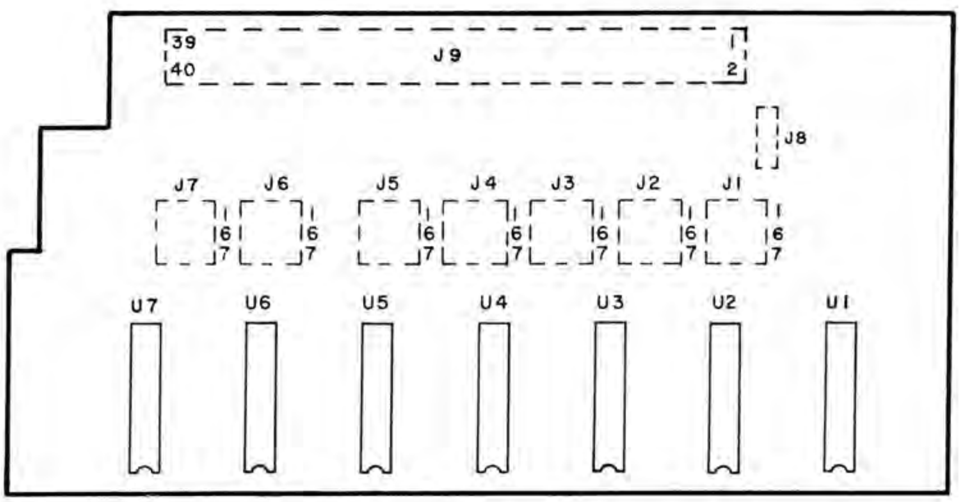

Figure 5-33. Type 796105 Display Driver (A7), Location of Components

TYPE NUMBER 796105 REVISION A SCHEMATIC 480211

TITLE - DISPLAY DRIVER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
J1	CONN/RECEP 7 SKT SGL ROW STRIP 0.10 CTRS MATES W/0.015-0.022 DIA PIN PC MT	7	SS-107-G-2	55322	
J2	S/A J1				
J3	S/A J1				
J4	S/A J1				
J5	S/A J1				
J6	S/A J1				
J7	S/A J1				
J8	CONN/RECEP 3 SKT SGL ROW STRIP 0.10 CTRS MATES W/0.015-0.022 DIA PIN PC MT	1	SS-103-G-2	55322	
J9	CONN/RECEP 40 PIN STR HEADER ASSY DBL ROW 0.15 CTRS	1	2-87228-0	00779	
U1	I C BCD TO 7 DESCRIPTION PROBLEM	7	MC14511BCP	04713	
U2	S/A U1				
U3	S/A U1				
U4	S/A U1				
U5	S/A U1				

TYPE NUMBER 796105 REVISION A SCHEMATIC 480211

TITLE - DISPLAY DRIVER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
U6	S/A U1				
U7	S/A U1				

TYPE NUMBER 796104 REVISION A SCHEMATIC 480210

TITLE - DISPLAY PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
DS1	DISPLAY LED NUMERIC 7SEG 0.375 INCH RED COM CATH RH DEC W/LENS CAP	7	FND367	07263	
DS2	S/A DS1				
DS3	S/A DS1				
DS4	S/A DS1				
DS5	S/A DS1				
DS6	S/A DS1				
DS7	S/A DS1				
P1	TERMINAL STRIP 7 PIN SGL ROW 0.166LG X 0.018RND 0.10 CTRS PC MT	7	TS-107-G-A1	55322	
P2	S/A P1				
P3	S/A P1				
P4	S/A P1				
P5	S/A P1				
P6	S/A P1				
P7	S/A P1				
P8	TERMINAL STRIP 3 PIN SGL ROW 0.166LG X 0.018RND 0.10CTRS PC MOUNT	1	TS-103-G-A1	55322	
XDS1	SOCKET/IC 10 PIN DIP 0.280 PROFILE	7	FNS700	07263	

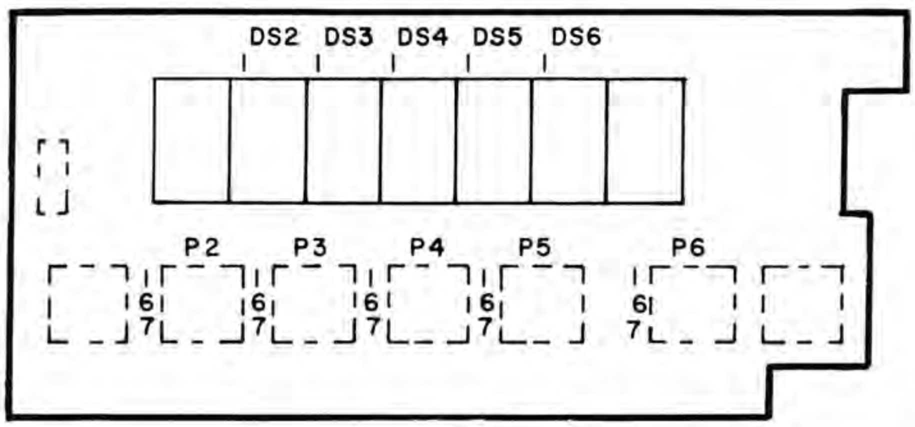

Figure 5-34. Type 796104 Display P.C. Assembly (A8), Location of Components

TYPE NUMBER 796104 REVISION A SCHEMATIC 480210

TITLE - DISPLAY PRINTED WIRING ASSY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
XDS2	S/A XDS1				
XDS3	S/A XDS1				
XDS4	S/A XDS1				
XDS5	S/A XDS1				
XDS6	S/A XDS1				
XDS7	S/A XDS1				

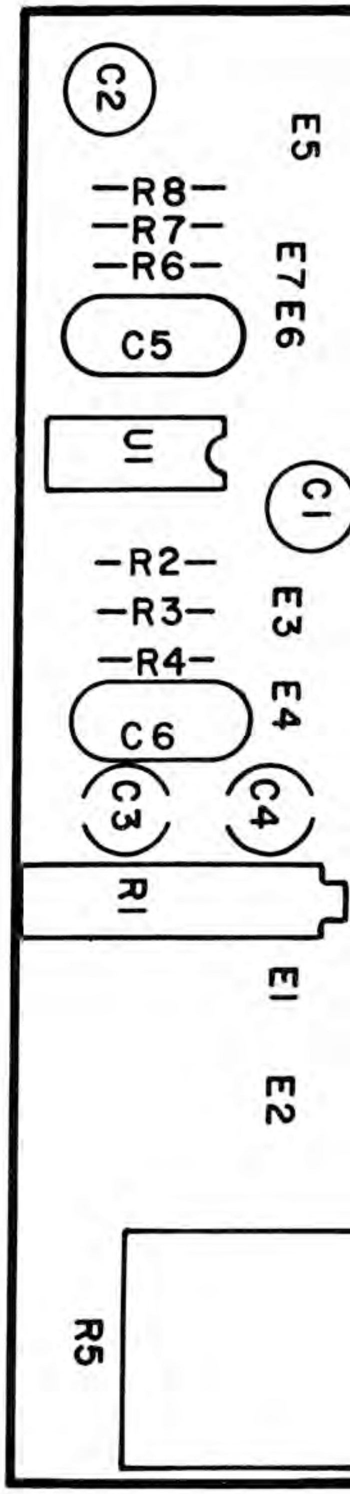

Figure 5-35. Type 796116 Audio Amplifier (A9), Location of Components

TYPE NUMBER 796116 REVISION A SCHEMATIC 380178

TITLE - AUDIO AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/ELEC/TANT 18UF 10PCT 20V	2	196D186X9020KE3	56289	
C2	S/A C1				
C3	CAP/ELEC/TANT 100UF 20PCT 20V	2	196D107X0020TE4	56289	
C4	S/A C3				
C5	CAP/MICA/DIPPED 430PF 5PCT 500V	1	DM15-431J	72136	
C6	CAP/MICA/DIPPED 270PF 2PCT 500V	1	CM05FD271G03	81349	
R1	RES/TRIM/FILM 10K 10PCT 0.75W	1	89PR10K	73138	
R2	RES/FIXED/COMPO 10K 5PCT 0.125W	2	RCR05G103JS	81349	
R3	RES/FIXED/FILM 6.81K 1PCT 0.10W	1	RN55C6811F	81349	
R4	RES/FIXED/COMPO 620 OHM 5PCT 0.125W	2	RCR05G621JS	81349	
R5	RES/VAR/COMPO 25K 10PCT 1W LINEAR	1	70M3N056L253U	01121	
R6	S/A R2				
R7	RES/FIXED/FILM 9.09K 1PCT 0.10W	1	RN55C9091F	81349	
R8	S/A R4				
U1	I C	1	MC1458N	18324	

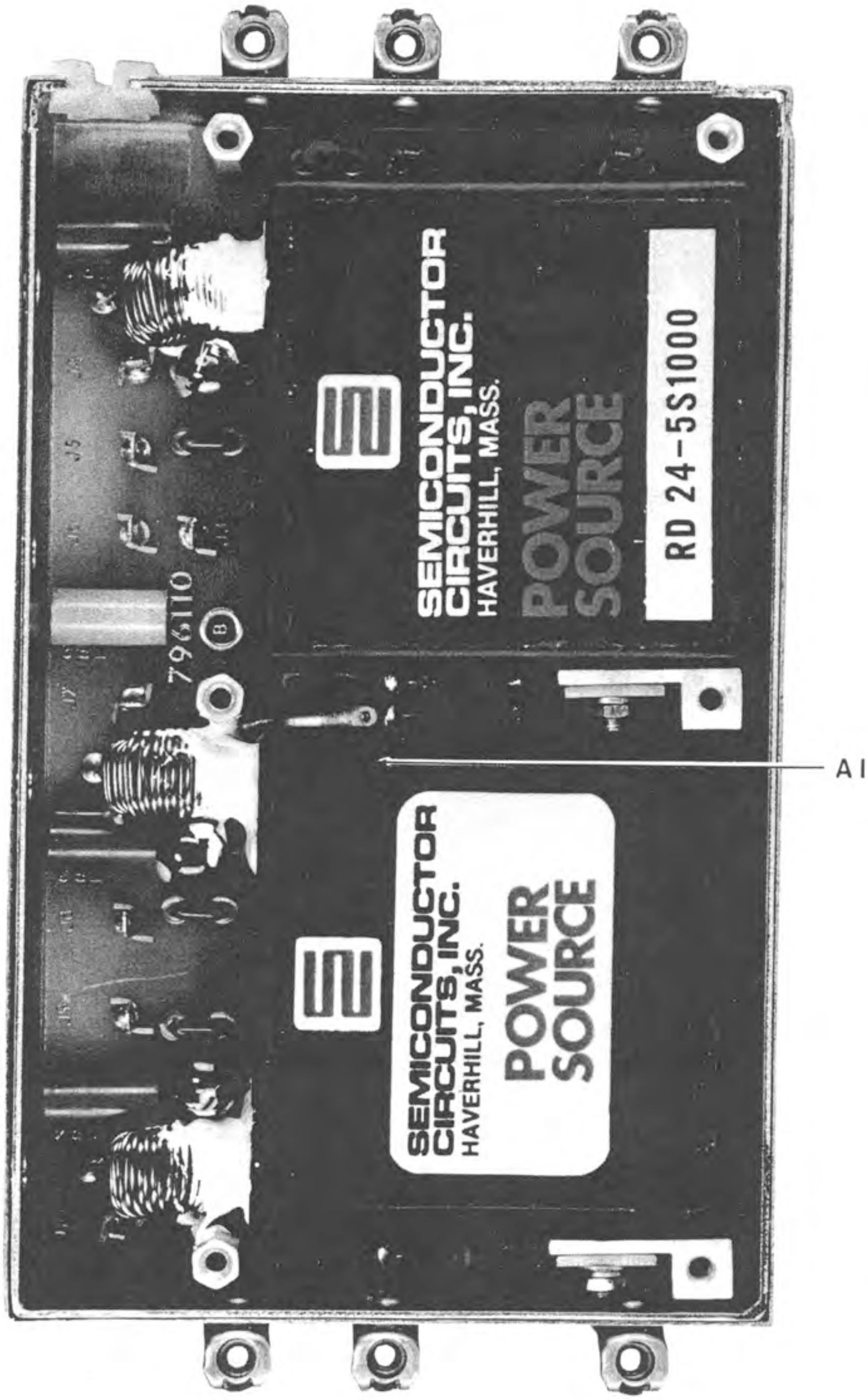

Figure 5-36. Type 796139 Power Supply Assembly (A10), Location of Components

TYPE NUMBER 796139 REVISION A SCHEMATIC 480213

TITLE - POWER SUPPLY ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	POWER SUPPLY PRINTED WIRING ASSEMBLY	1	796110 (SEP PL)	14632	

TYPE NUMBER 796110 REVISION A SCHEMATIC 480213

TITLE - POWER SUPPLY PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/CER/DISC .01UF 20PCT 50V	6	34453-1	14632	
C2	CAP/ELEC/TANT 100UF 20PCT 20V	3	196D107X0020TE4	56289	
C3	S/A C1				
C5	S/A C2				
C6	S/A C1				
C7	S/A C1				
C8	S/A C2				
C9	S/A C1				
J1	CONN/RECEP FASTON TAB 0.110 WIDE X 0.02 THK P.C. MT STYLE B	10	62073-1	00779	
J2	S/A J1				
J3	S/A J1				
J4	S/A J1				
J5	S/A J1				
J6	S/A J1				
J7	S/A J1				
J8	S/A J1				
J9	S/A J1				
J10	S/A J1				

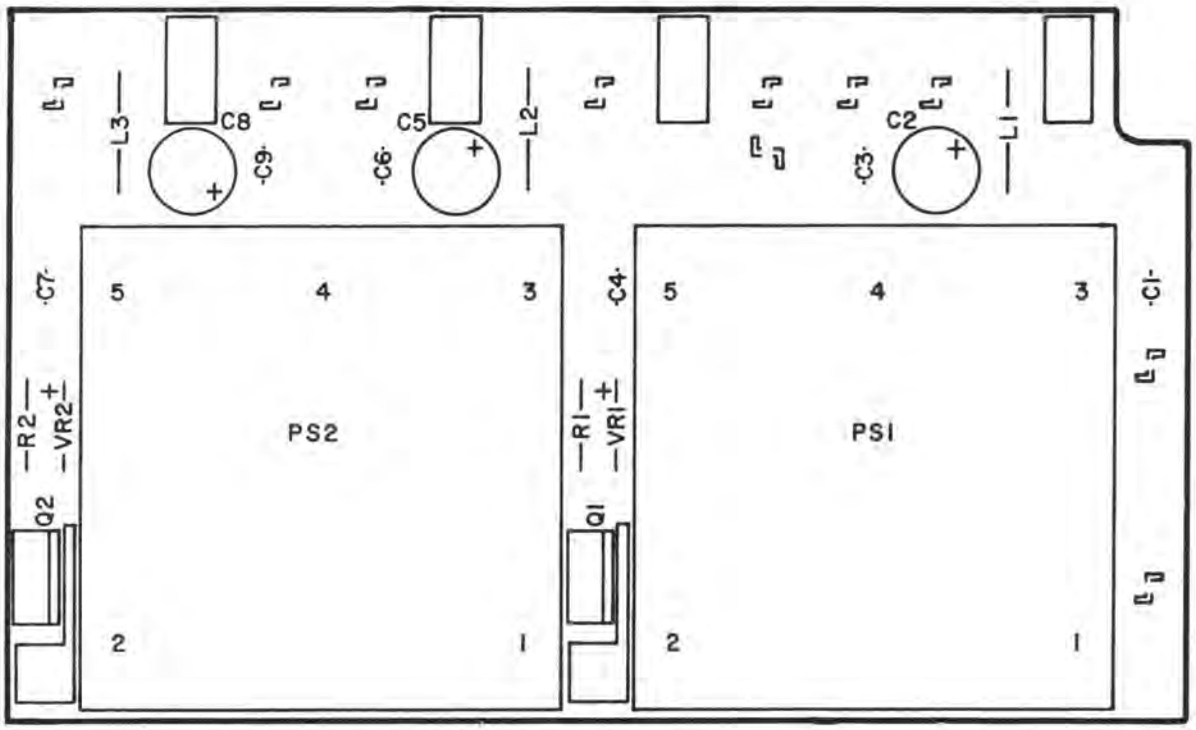

Figure 5-37. Type 796110 Power Supply P.C. Assembly (A10A1), Location of Components

TYPE NUMBER 796110 REVISION A SCHEMATIC 480213

TITLE - POWER SUPPLY PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
L1	COIL	3	20681-216	14632	
L2	S/A L1				
L3	S/A L1				
PS1	CONVERTER/DC-DC 21.6-26.4VDC INPUT 5V OUTPUT 1AMP PC MT	1	RD24-5S1000	50829	
PS2	CONVERTER/DC-DC 21.6-26.4VDC INPUT PORM 15V OUTPUT 250MA PC MT	1	RD24-15D250	50829	
Q1	TRANSISTOR PNP POWER TO-220 PKG	2	2N6124	80131	
Q2	S/A Q1				
R1	RES/FIXED/COMPO 100 OHMS 5PCT .25W	2	RCR07G101JS	81349	
R2	S/A R1				
TP1	JACK/TIP RT ANGLE RED	1	TJ203R	49956	
TP2	JACK/TIP RIGHT ANGLE PC MOUNT ORANGE	1	TJ204OR	49956	
TP3	JACK/TIP RT ANGLE PC MT BLUE	1	TJ207MB	49956	
TP4	JACK/TIP PC VIOLET RT ANGLE	1	TJ210V	49956	
VR1	DIODE ZENER 24V SILICON 1W DO-41 CASE	2	1N4749	80131	

TYPE NUMBER 796140 REVISION B SCHEMATIC 680035

TITLE - FRONT COVER ASSEMBLY W/REMOVABLE SPEAKER ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	REMOVABLE SPEAKER ASSEMBLY	1	796134-1 (SEP PL)	14632	

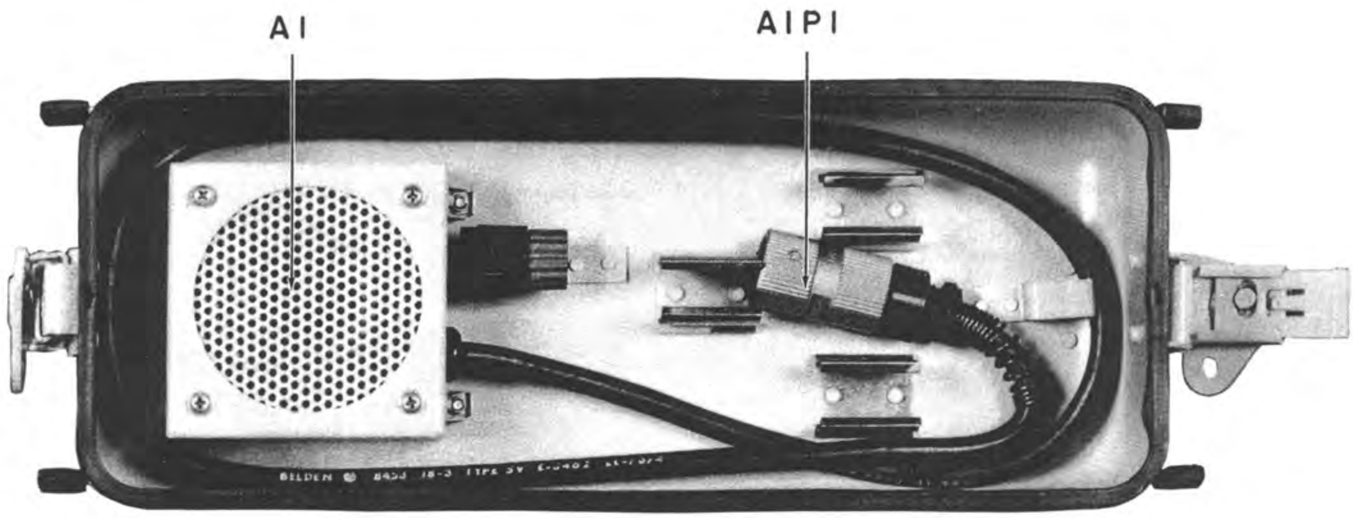

Figure 5-38. Type 796140 Front Cover Assembly
with Removable Speaker Assembly (A11),
Location of Components

TYPE NUMBER 796134-1 REVISION A SCHEMATIC 280197

TITLE - REMOVABLE SPEAKER ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
A1	SPEAKER AMPLIFIER PC ASSY	1	796119-1 (SEP PL)	14632	
LS1	SPEAKER	1	25A070T	74199	
P1	PLUG MULTIPIN	1	GC329	25330	
R1	RES/VAR/COMPO 50K 10PCT .5W LINEAR	1	RV6NAYSD503A	81349	

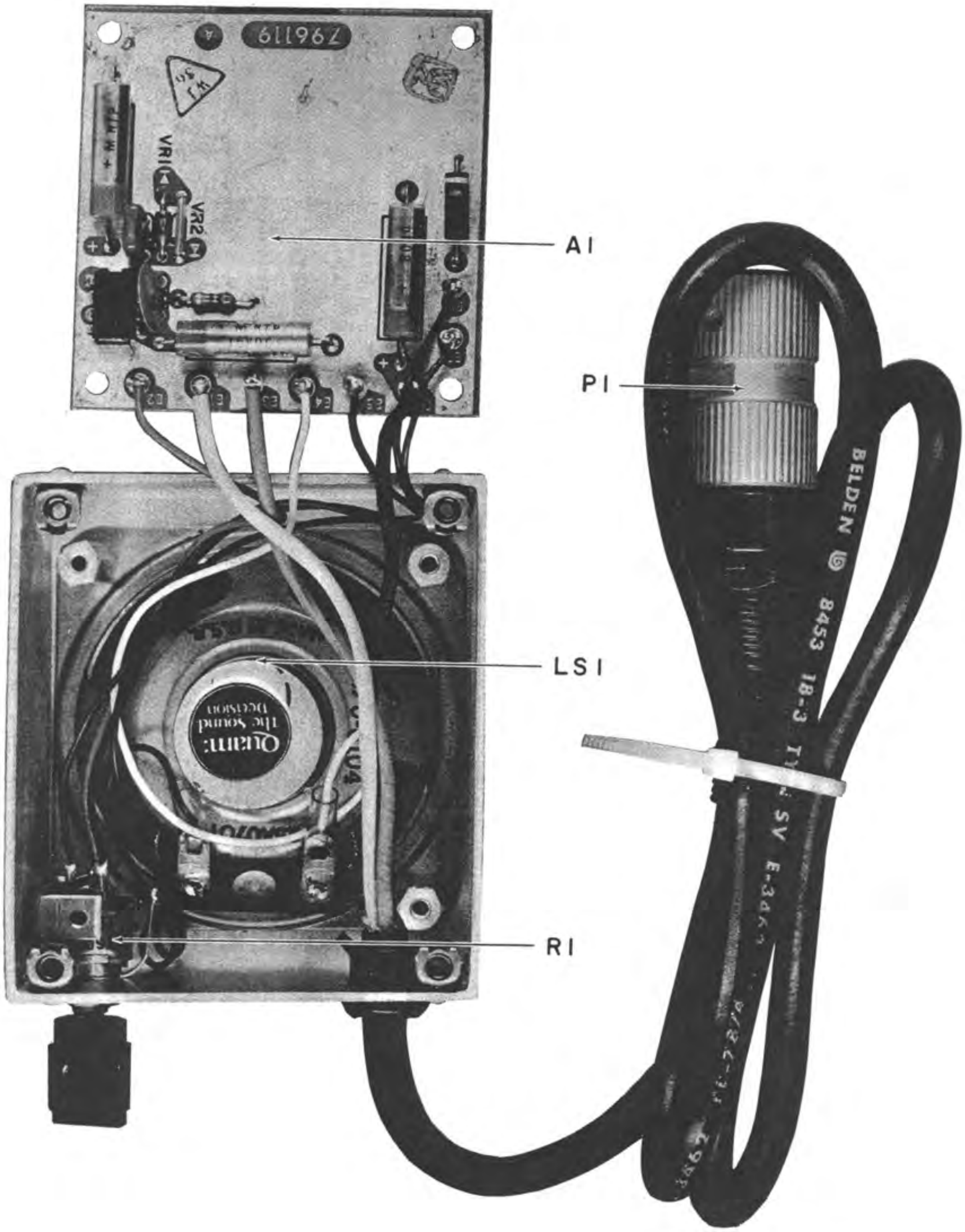

Figure 5-39. Type 796134-1 Speaker Amplifier Assembly (A11A1), Location of Components

TYPE NUMBER 796119-1 REVISION B SCHEMATIC 280197

TITLE - SPEAKER AMPLIFIER PRINTED WIRING ASSEMBLY

REF DESIG	DESCRIPTION	QTY/ EQPT	PART NUMBER	CODE IDENT	REF ASSY
C1	CAP/ELEC/TANT 200UF 20PCT 15V	3	MTP207M015P1C	76055	
C2	CAP/CER/DISC .05UF M20P80 25V	1	DFJ1	73899	
C3	S/A C1				
C4	S/A C1				
C5	CAP/CER/DISC 0.47UF 20PCT 100V	1	8131M100-651-474M	72982	
R1	RES/FIXED/COMPO 10 OHMS 5PCT .25W	1	RCR07G100JS	81349	
R2	RES/FIXED/COMPO 510 OHMS 5PCT .5W	1	RCR20G511JS	81349	
U1	I C AUDIO/RADIO 9V	1	LM386N	27014	
VR1	DIODE ZENER 6.2V SILICON 1W DO-41 CASE	1	1N4735	80131	
VR2	DIODE ZENER 5.1V SILICON	1	1N751A	80131	

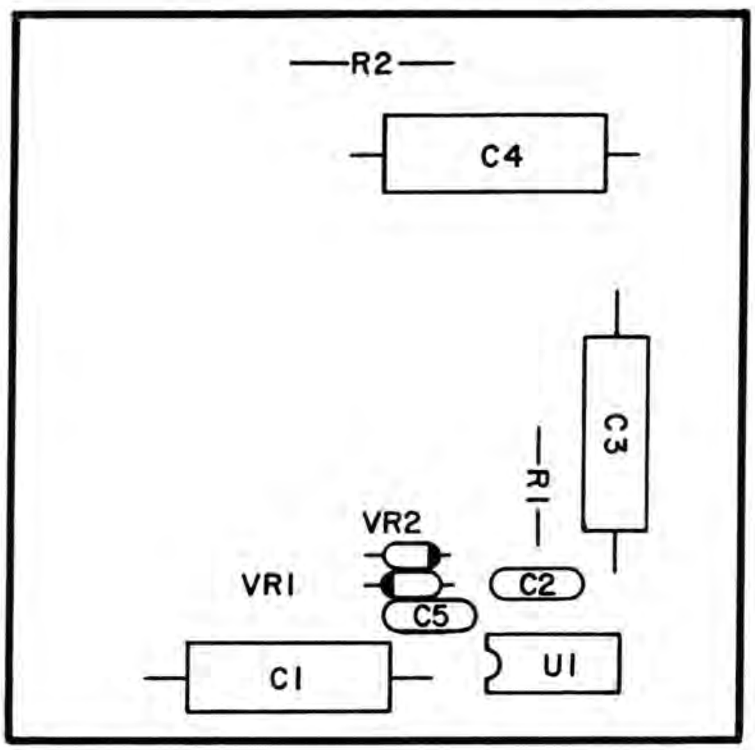

Figure 5-40. Type 796119-1 Speaker Amplifier P.C. Assembly (A11A1A1), Location of Components

TABLE 5-1

Equipment Assembly Revision Level Record

TYPE NUMBER	REF. DESIG	DESCRIPTION	ASSY REV. LEVEL
WJ-8770		HF Receiver, Main Chassis	A
796123	A1	Input Filter Assembly	A
796112	A1A1	Input Filter P.C. Assembly	A
796100	A2	Input Preselector Assembly	A
34936	A2A1	Motherboard P.C. Assembly	A
796016	A2A1A1	Input Preselector Filter P.C. Assembly	A
791769	A2A1A2	Input Preselector Filter P.C. Assembly	A
791770	A2A1A3	Input Preselector Filter P.C. Assembly	A
791771	A2A1A4	Input Preselector Filter P.C. Assembly	B
791772	A2A1A5	Input Preselector Filter P.C. Assembly	B
791821-2	A2A1A6	Input Preselector Digital Control P.C. Assy	A
796099	A3	Input Converter Assembly	A
34748-3	A3A1	1st Mixer/1st IF P.C. Assembly	A
796108	A3A2	2nd Mixer/2nd IF P.C. Assembly	A
796121	A4	IF/Demodulator Assembly	A
796120	A4A1	IF Motherboard P.C. Assembly	A
796101	A4A1A1	10.7 MHz/455 kHz Converter P.C. Assembly	A
72463-22	A4A1A2	16 kHz IF Filter P.C. Assembly	A
72463-21	A4A1A3	8 kHz IF Filter P.C. Assembly	A
72463-20	A4A1A4	4 kHz IF Filter P.C. Assembly	A
72463-19	A4A1A5	1 kHz IF Filter P.C. Assembly	A
72463-17	A4A1A6	LSB Filter P.C. Assembly	A
72463-18	A4A1A7	USB Filter P.C. Assembly	A
796103	A4A1A8	455 kHz IF Amplifier P.C. Assembly	A
796102	A4A1A9	WB/NB Filter P.C. Assembly	A
796113	A4A1A10	Demodulator/AGC Amplifier P.C. Assembly	A
796117	A5	Synthesizer Motherboard P.C. Assembly	A
796111	A5A1	Time Base Generator P.C. Assembly	A
796133	A5A2	1st LO/Synthesizer Assembly	A
796115	A5A2A1	Phase Lock Loop P.C. Assembly	A
796132	A5A2A2	VCO Assembly	A
796131	A5A2A2A1	VCO P.C. Assembly	A
796107	A5A3	2nd LO/Synthesizer P.C. Assembly	A
796109	A5A4	BFO/3rd LO P.C. Assembly	A
796106	A6	Digital Control P.C. Assembly	A
796105	A7	Display Driver P.C. Assembly	A
796104	A8	Display P.C. Assembly	A
796116	A9	Audio Amplifier P.C. Assembly	A
796139	A10	Power Supply Assembly	A
796110	A10A1	Power Supply P.C. Assembly	A
796140	A11	Front Cover Assy W/Removable Speaker Assy	A
796134-1	A11A1	Speaker Amplifier Assembly	A
796119-1	A11A1A1	Speaker Amplifier P.C. Assembly	A

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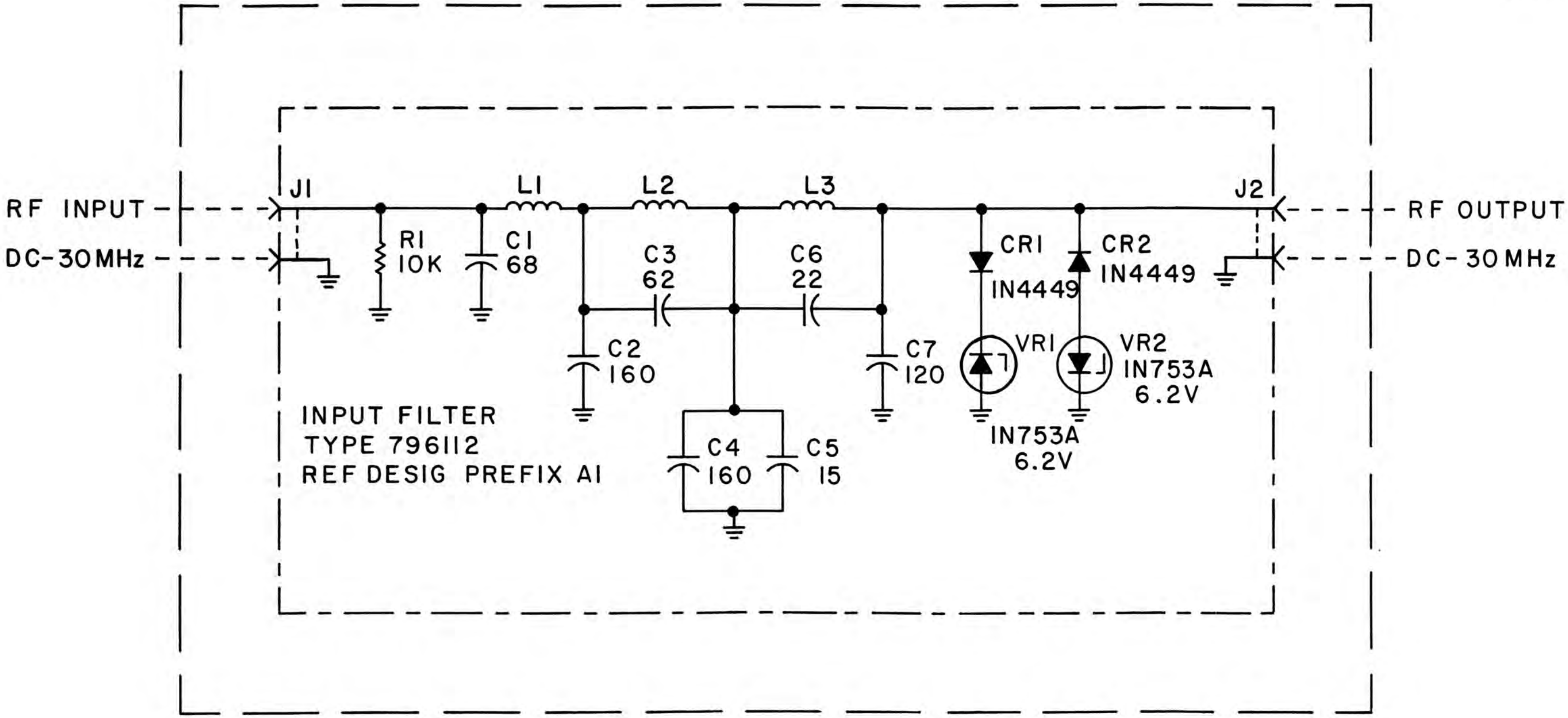
SECTION VI

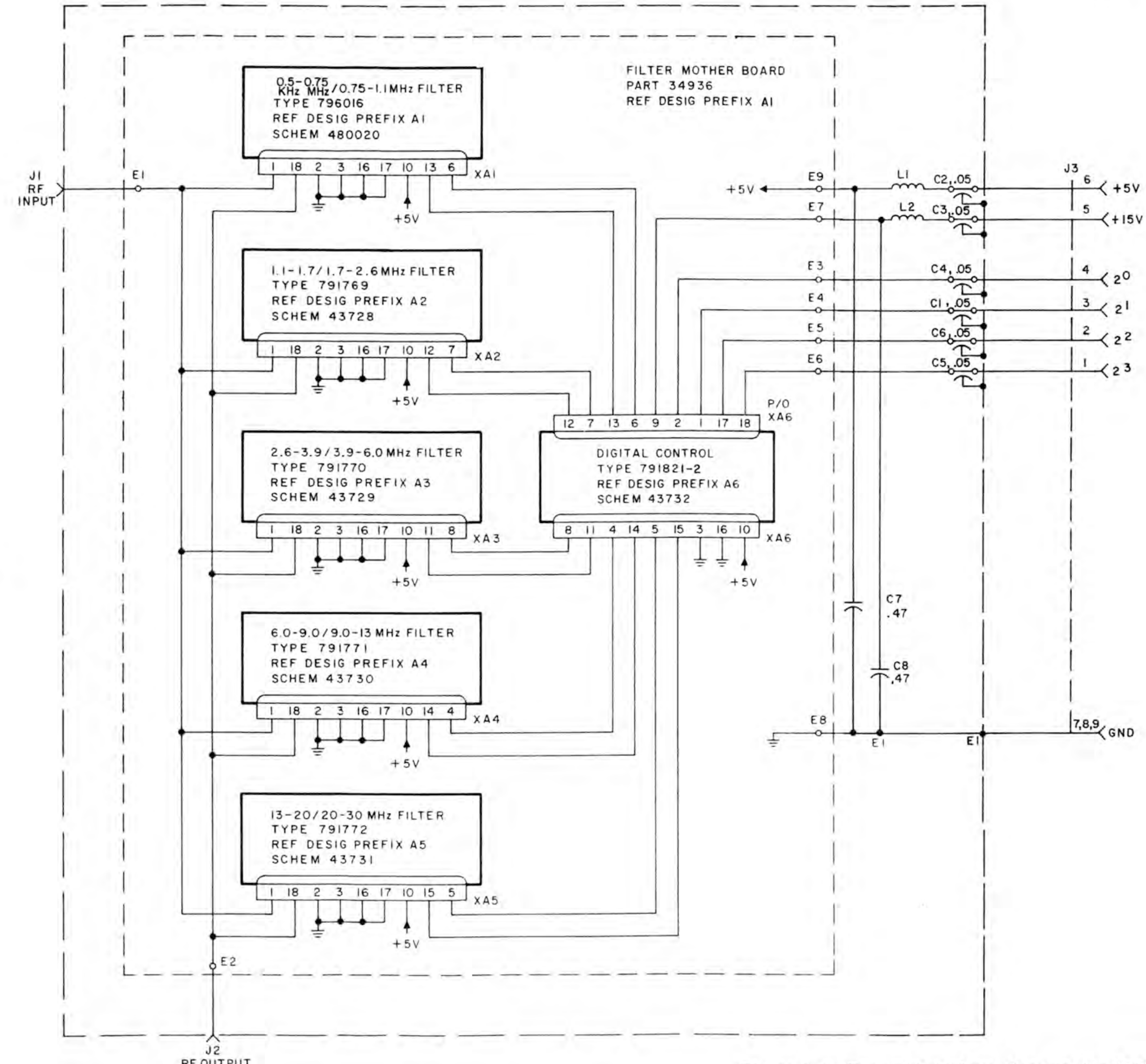
SCHEMATIC DIAGRAMS

Included in this section are the schematic diagrams necessary for understanding the operation of, troubleshooting problems in, and effecting repairs to the Watkins-Johnson WJ-8770 HF Transportable Receiver.



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.

Figure 6-1. Type 796123 Input Filter (A1), Schematic Diagram (380217)



NOTE
1. UNLESS OTHERWISE SPECIFIED
a) CAPICATANCE IS IN µF.

Figure 6-2. Type 796100 Input Preselector (A2), Schematic Diagram (480218)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN pF.

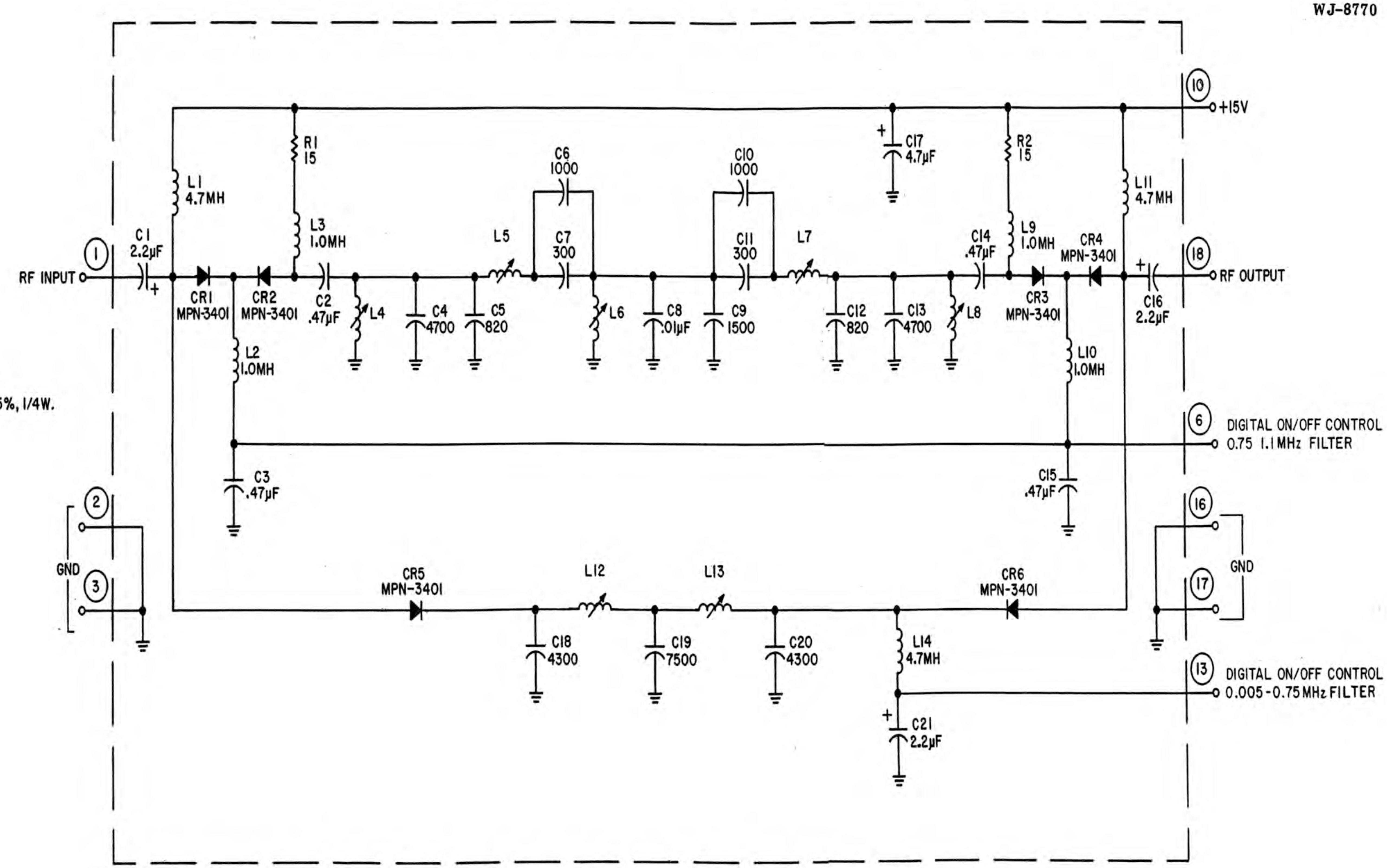
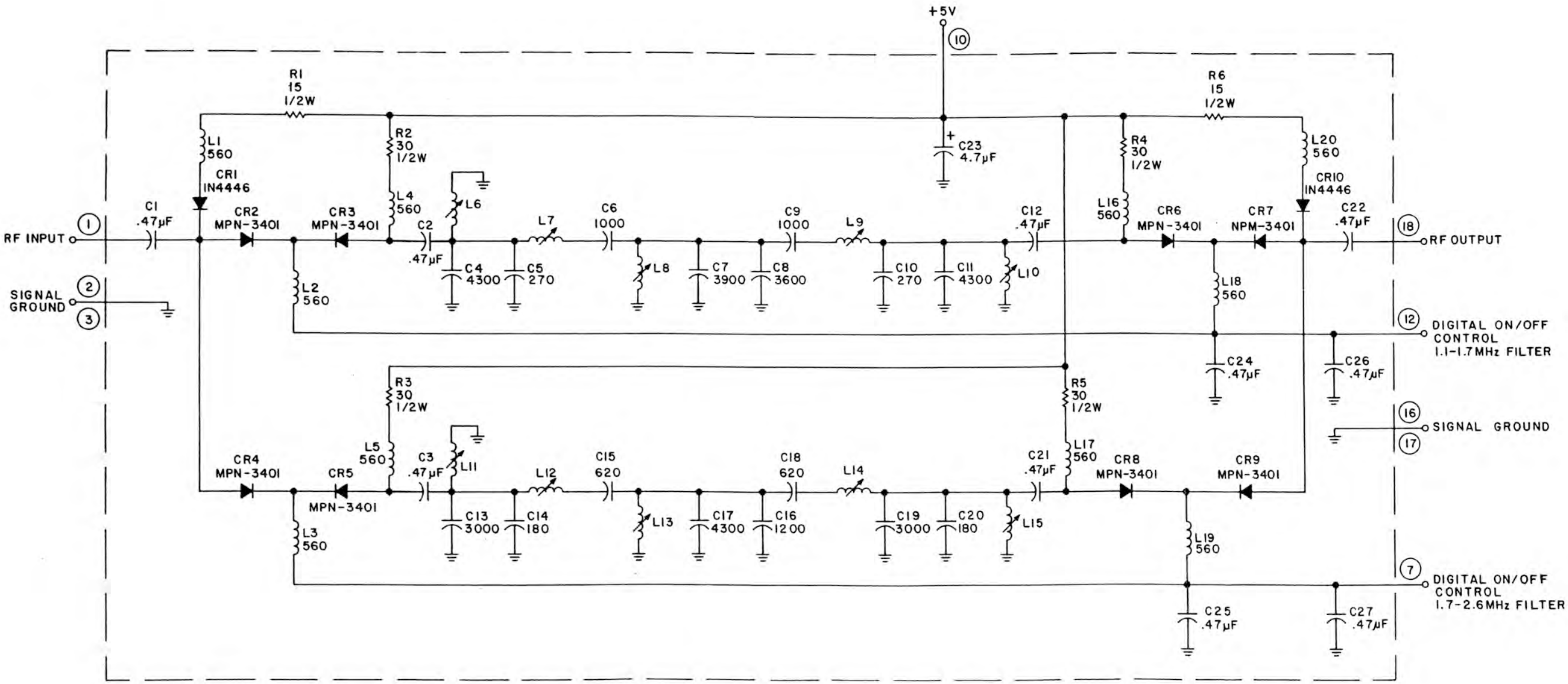


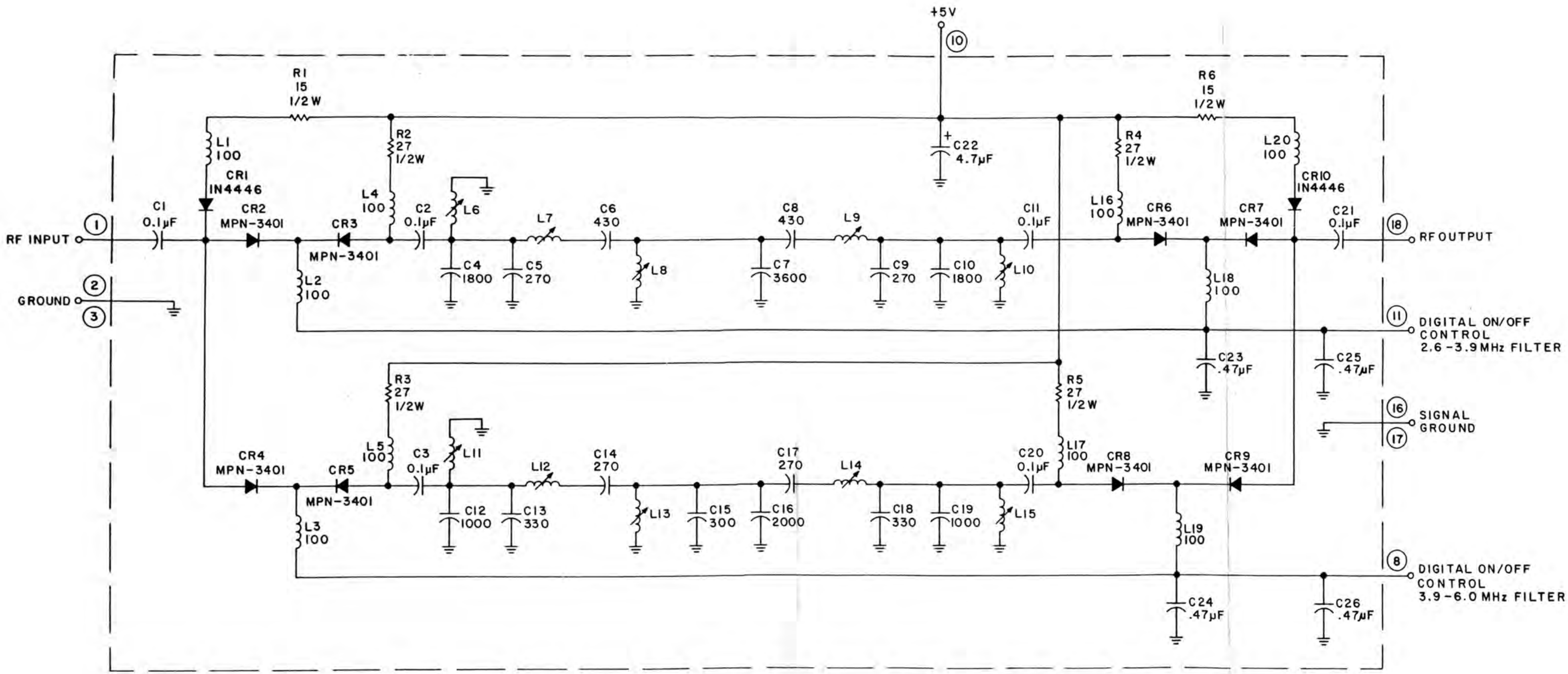
Figure 6-3. Type 796016
5-750 kHz/0.75-1.1 MHz Filter (A2A1A1),
Schematic Diagram (480020)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W
   b) CAPACITANCE IS pF.
   c) INDUCTANCE IS µH.

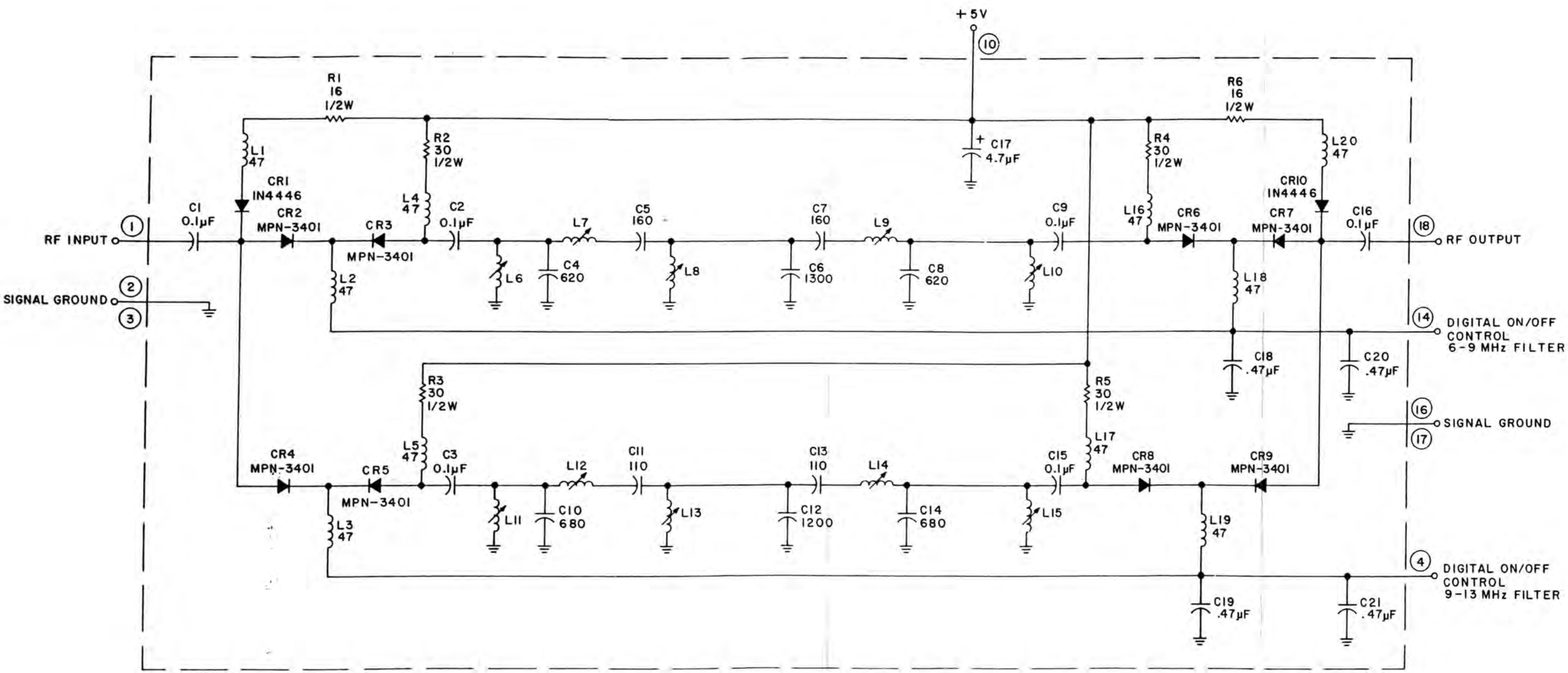
Figure 6-4. Type 791769 Input Preselector Filter (A2A1A2), Schematic Diagram (43728)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W
   b) CAPACITANCE IS pF.
   c) INDUCTANCE IS µH.

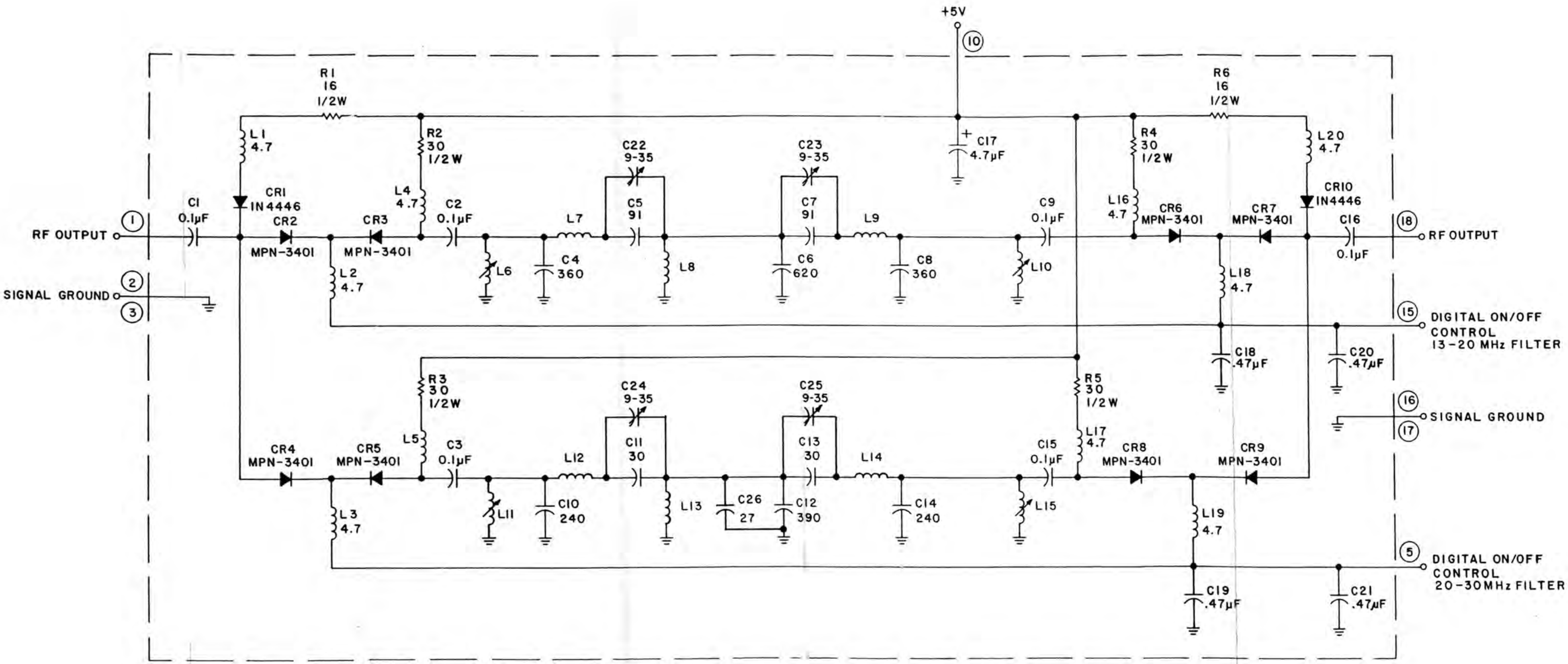
Figure 6-5. Type 791770 Input Preselector Filter (A2A1A3), Schematic Diagram (43729)



NOTES:

1. UNLESS OTHEWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4 W
   b) CAPACITANCE IS pF.
   c) INDUCTANCE IS μH.

Figure 6-6. Type 791771 Input Preselector Filter (A2A1A4). Schematic Diagram (43730)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ± 5%, 1/4W
   b) CAPACITANCE IS pF.
   c) INDUCTANCE IS µH.

Figure 6-7. Type 791772 Input Preselector Filter (A2A1A5), Schematic Diagram (43731)

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. ENCIRCLE NUMBERS ARE MODULE PINS.
3. DIFFERENCE BETWEEN TYPES IS SHOWN IN TABLE 1.

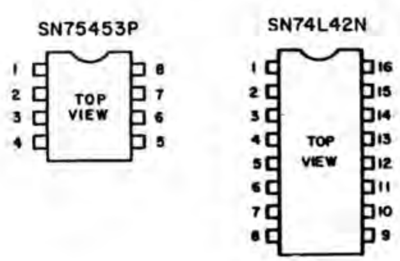


TABLE 1

TYPE	R2, R4, R18, R20	R6, R8, R10, R12, R14, R16	U1	U2-U6
791821-1	12 1/2W	10 1/2W	SN74L42N	SN75453P
791821-2	22 1/2W	22 1/2W	MN174C42N	DS3633N

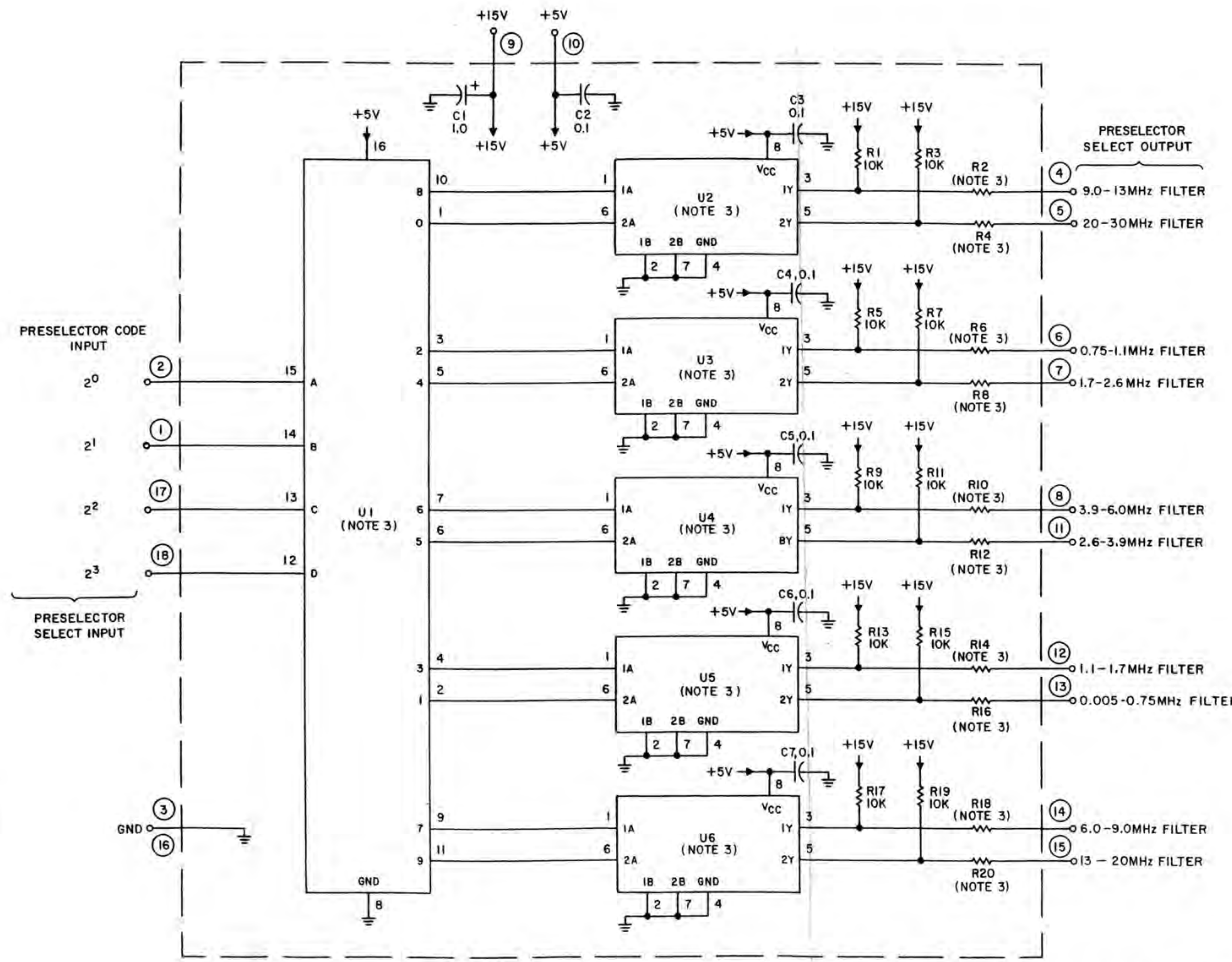
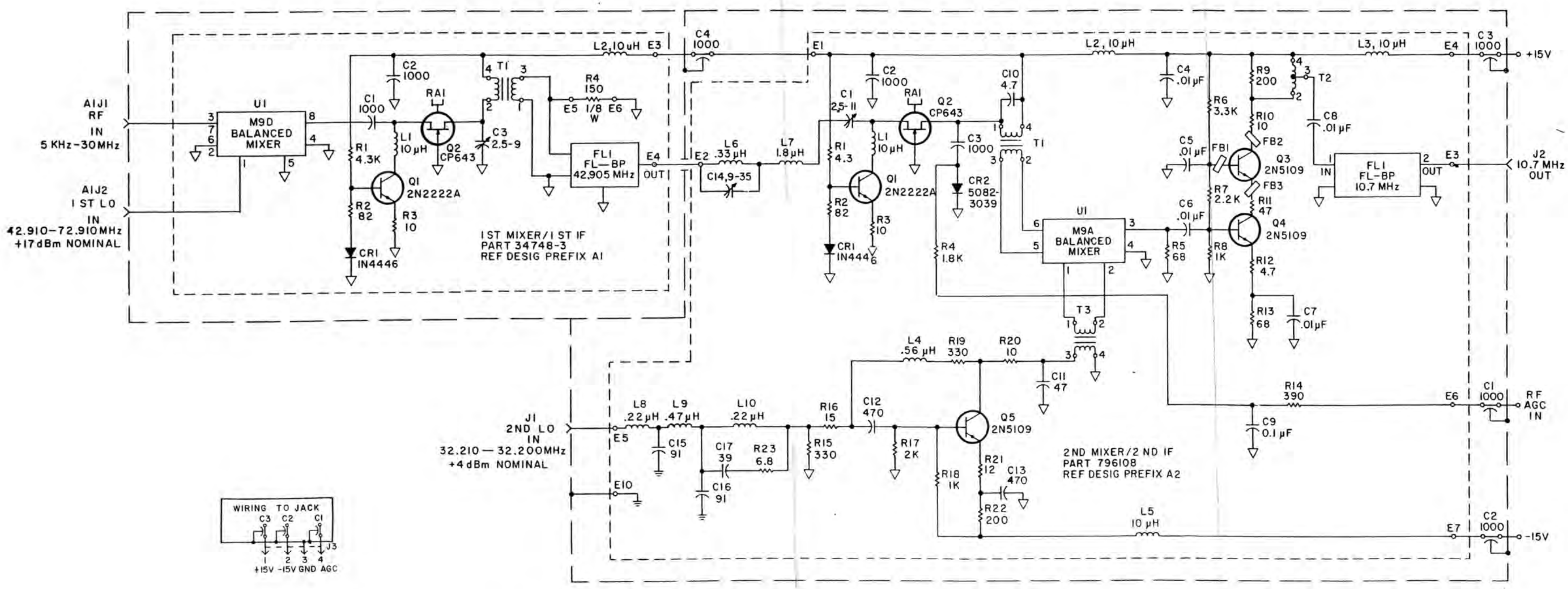


Figure 6-8. Type 791821-2 Input Preselector Digital Control (A2A1A5). Schematic Diagram (43732)



NOTES
1. UNLESS OTHERWISE SPECIFIED
a) RESISTANCE IS IN OHMS,±5%,1/4W.
b) CAPACITANCE IS IN pF

Figure 6-9. Type 796099 Input Converter (A3). Schematic Diagram (580059)

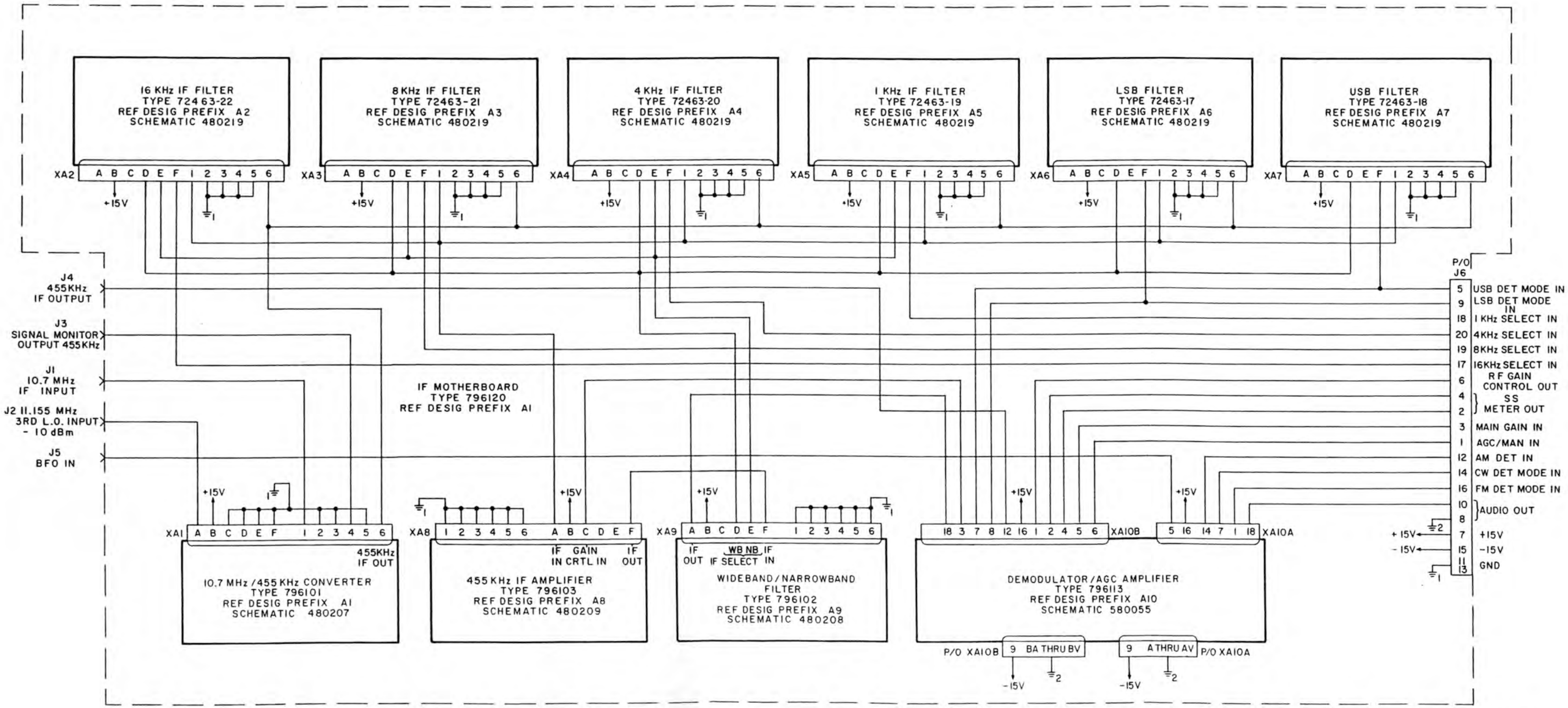
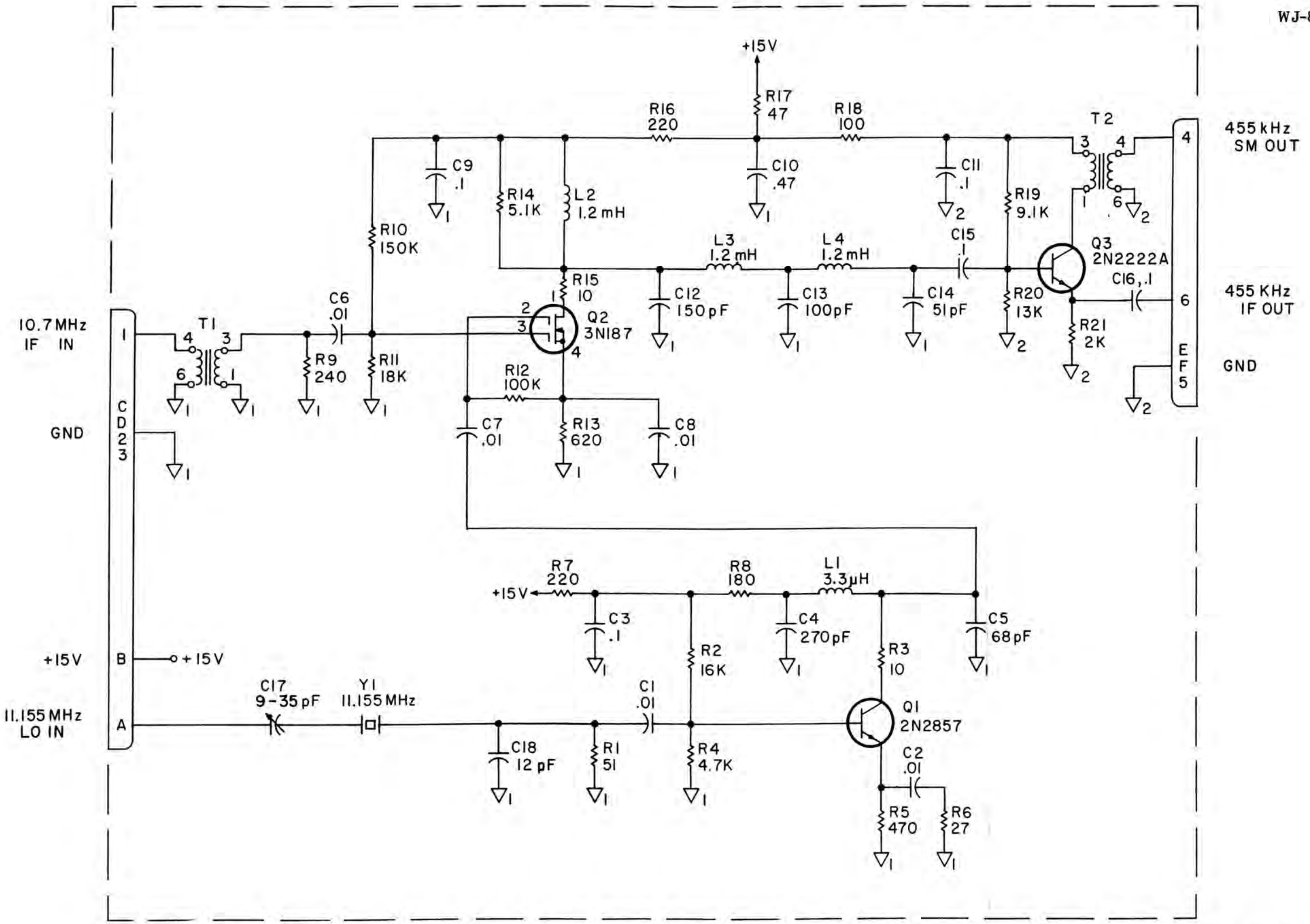


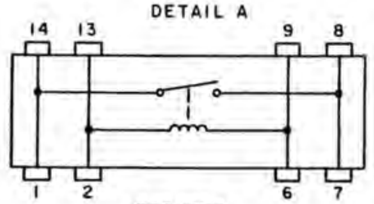
Figure 6-10 Type 796121 IF/Demodulator (A4), Schematic Diagram (580060)



NOTES:
1. (UNLESS OTHERWISE SPECIFIED);
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN μF.

Figure 6-11. Type 796101 10.7 MHz/455 kHz Converter (A4A1A1), Schematic Diagram (480207)

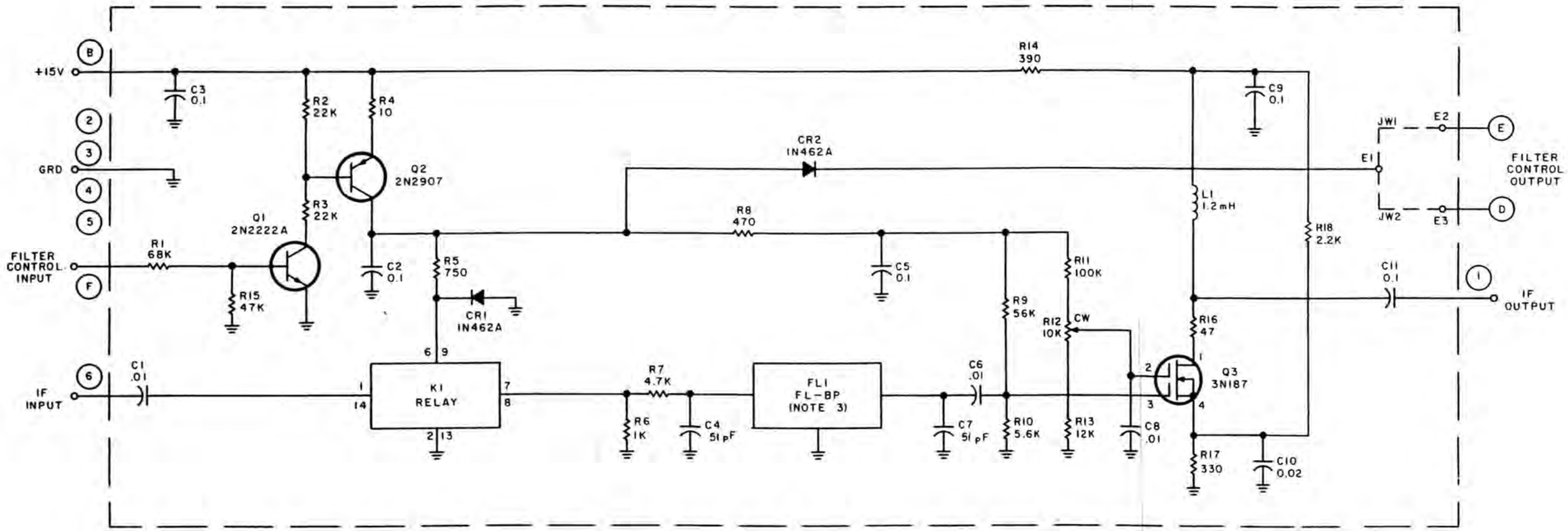
DETAIL A



TOP VIEW

DETAIL B

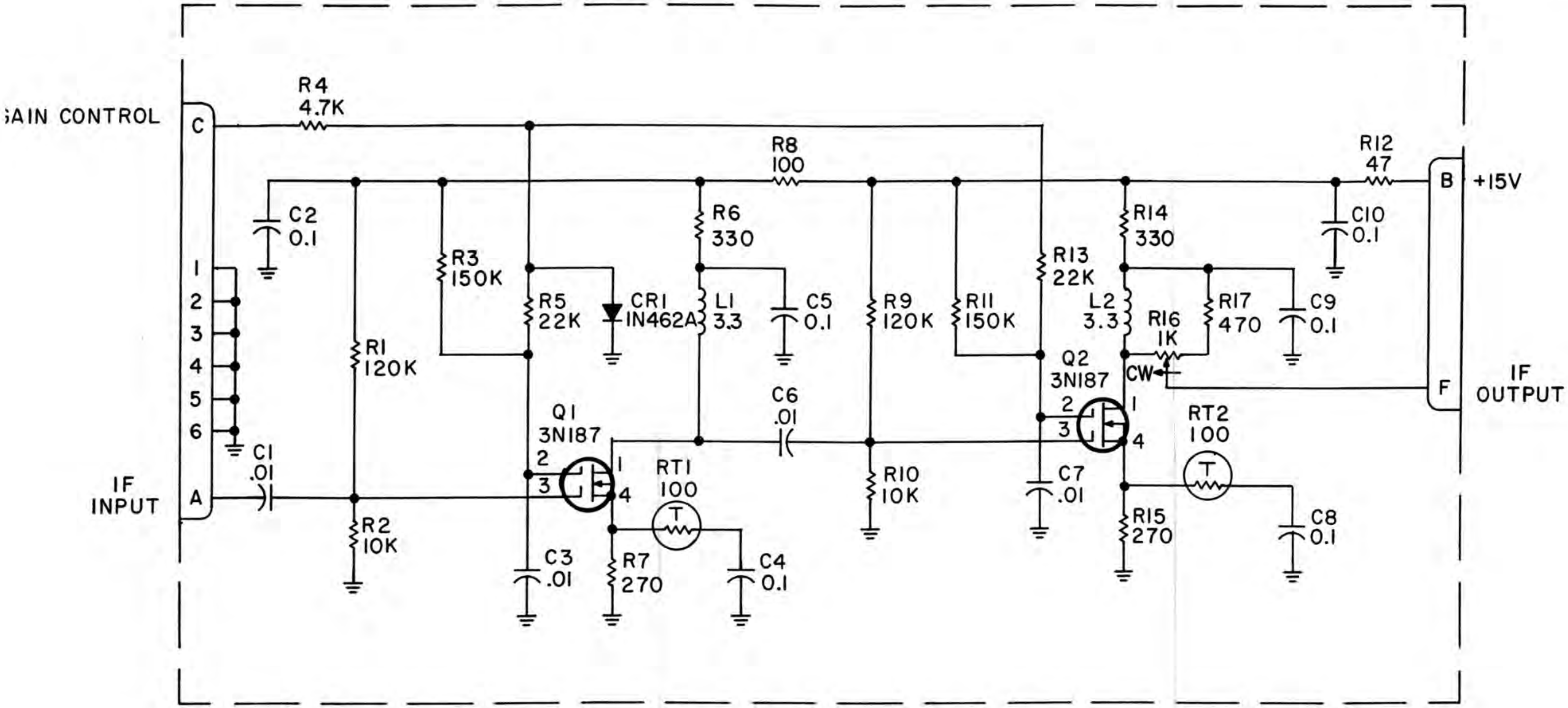
TYPE	BANDWIDTH	FLI	JWI	JW2
72463-1	200Hz	92062-1	X	
72463-2	500Hz	92062-2	X	
72463-3	1kHz	92062-3	X	
72463-4	2kHz	92062-4	X	
72463-5	3kHz	92062-5		X
72463-6	4kHz	92062-6		X
72463-7	6kHz	92062-7		X
72463-8	8kHz	92062-8		X
72463-9	12kHz	92062-9		X
72463-10	16kHz	92062-10		X
72463-11	500Hz	92062-11	X	
72463-12	1kHz	92062-12	X	
72463-13	2.1kHz	92062-13	X	
72463-14	4.0kHz	92062-14		X
72463-15	8.0kHz	92062-15		X
72463-16	16 kHz	92062-10		X



NOTES:

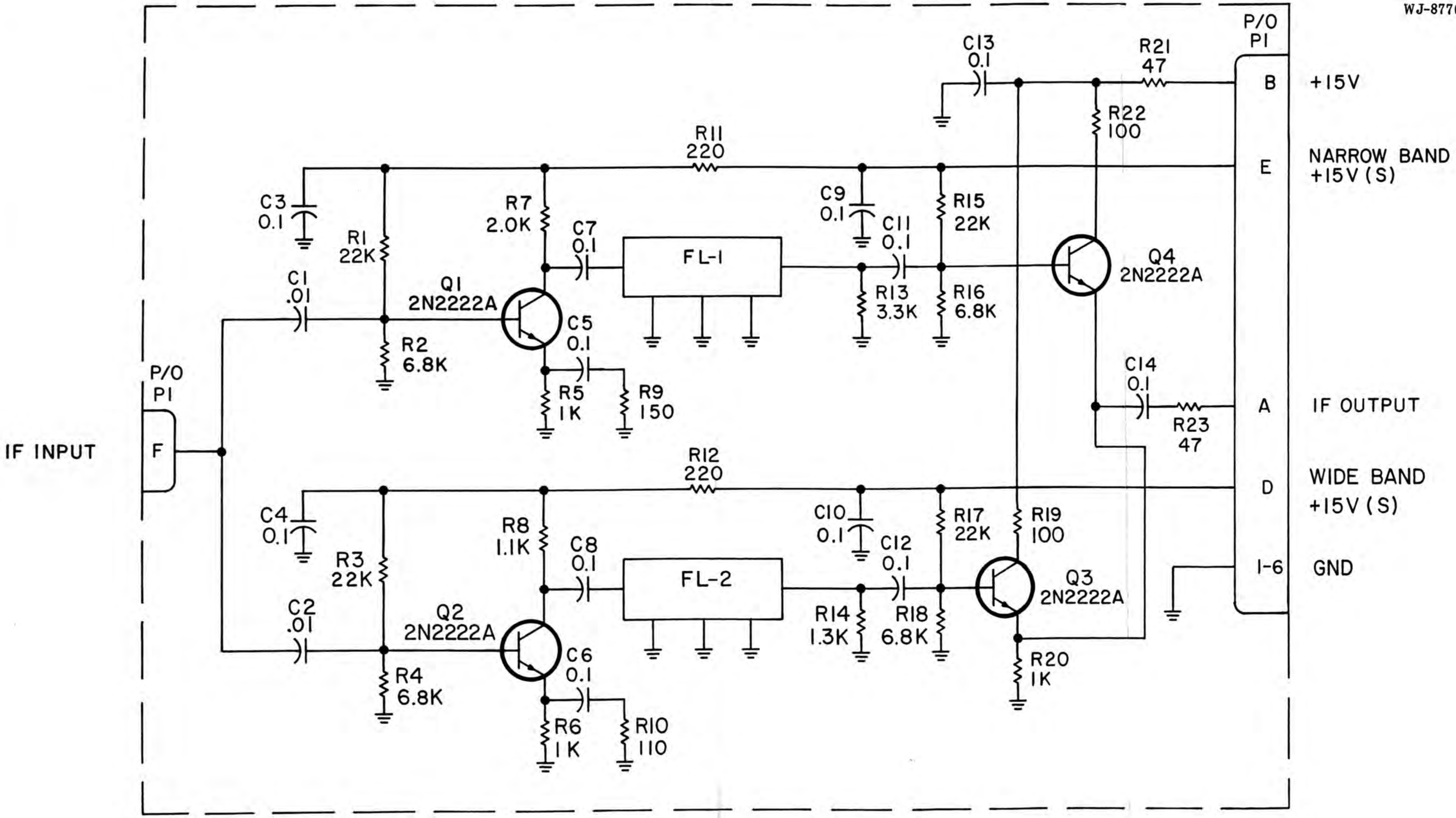
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. DIFFERENCE BETWEEN TYPES IS SHOWN IN DETAIL B.
4. DETAIL LEAD ARRANGEMENT FOR K1 IS SHOWN IN DETAIL A.
5. CW ON R12 INDICATES CLOCKWISE ROTATION OF ACTUATOR.

Figure 6-12. Type 72463-17 thru-22 IF Amplifier (A4A1A2 thru A4A1A7), Schematic Diagram (42710)



NOTES:
1.(UNLESS OTHERWISE SPECIFIED).
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN μF.
c) INDUCTANCE IS IN mH.
2. CW ON R16 INDICATES CLOCKWISE ROTATION.

Figure 6-13. Type 796103 455 kHz IF Amplifier (A4A1A8), Schematic Diagram (480209)



NOTES
1. UNLESS OTHERWISE SPECIFIED:
a.) RESISTANCE IS IN OHMS ±5%, 1/4W.
b.) CAPACITANCE IS IN µF.

Figure 6-14. Type 796102 WB/NB Filter (A4A1A9), Schematic Diagram (480208)

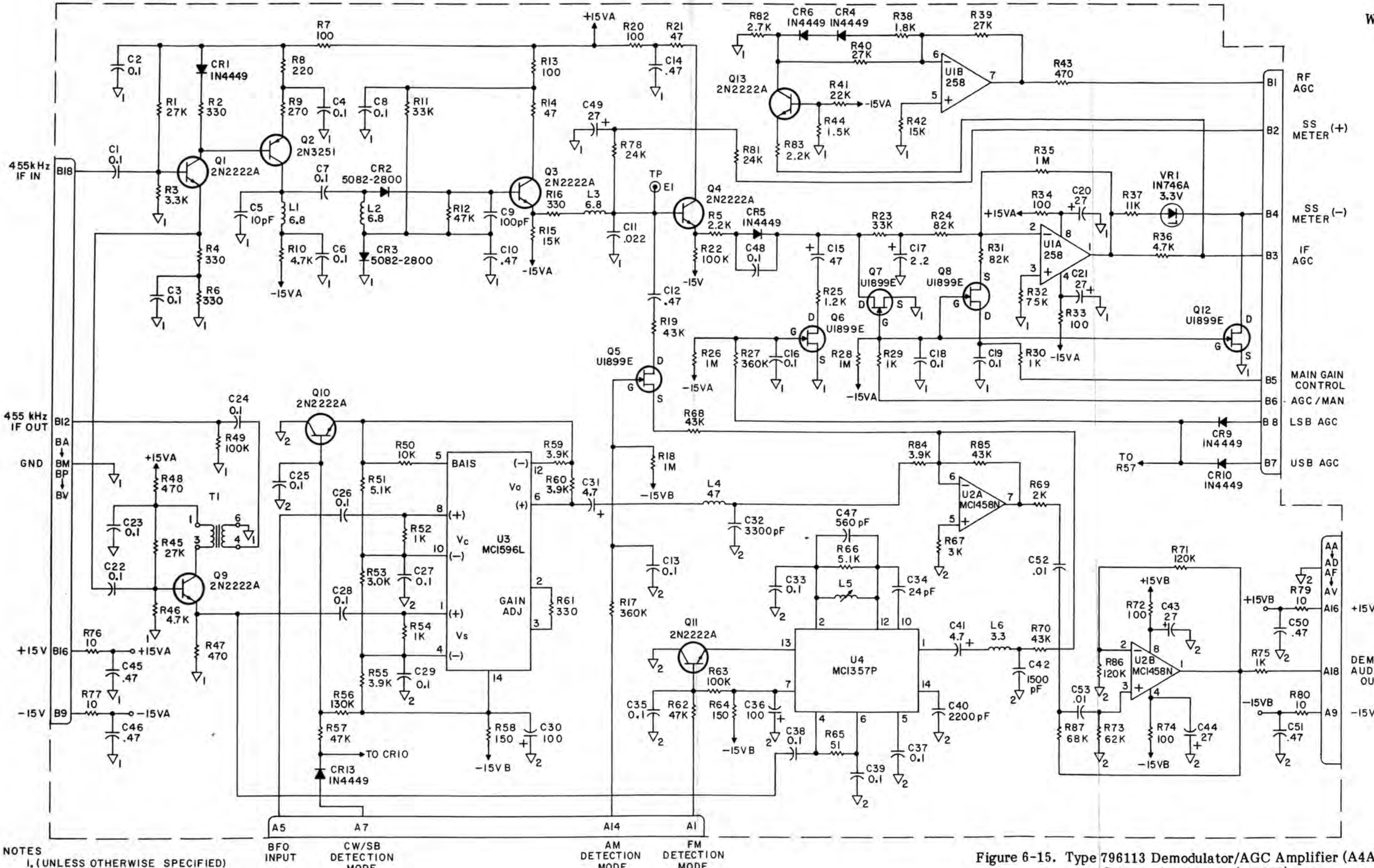


Figure 6-15. Type 796113 Demodulator/AGC Amplifier (A4A1A10), Schematic Diagram (580055)

NOTES
1. (UNLESS OTHERWISE SPECIFIED)
a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
b) CAPACITANCE IS IN μF.
c) INDUCTANCE IS IN mH.

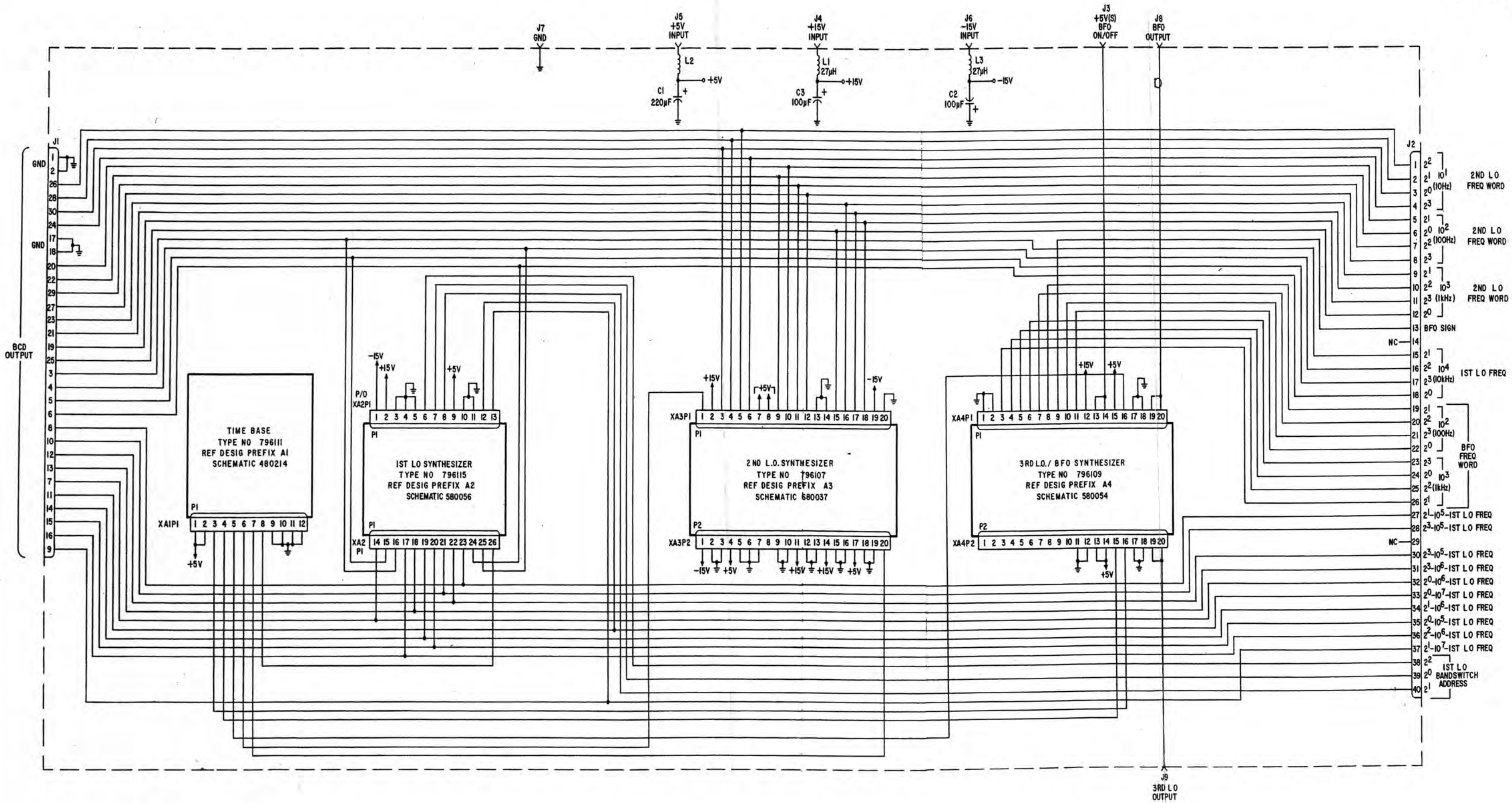
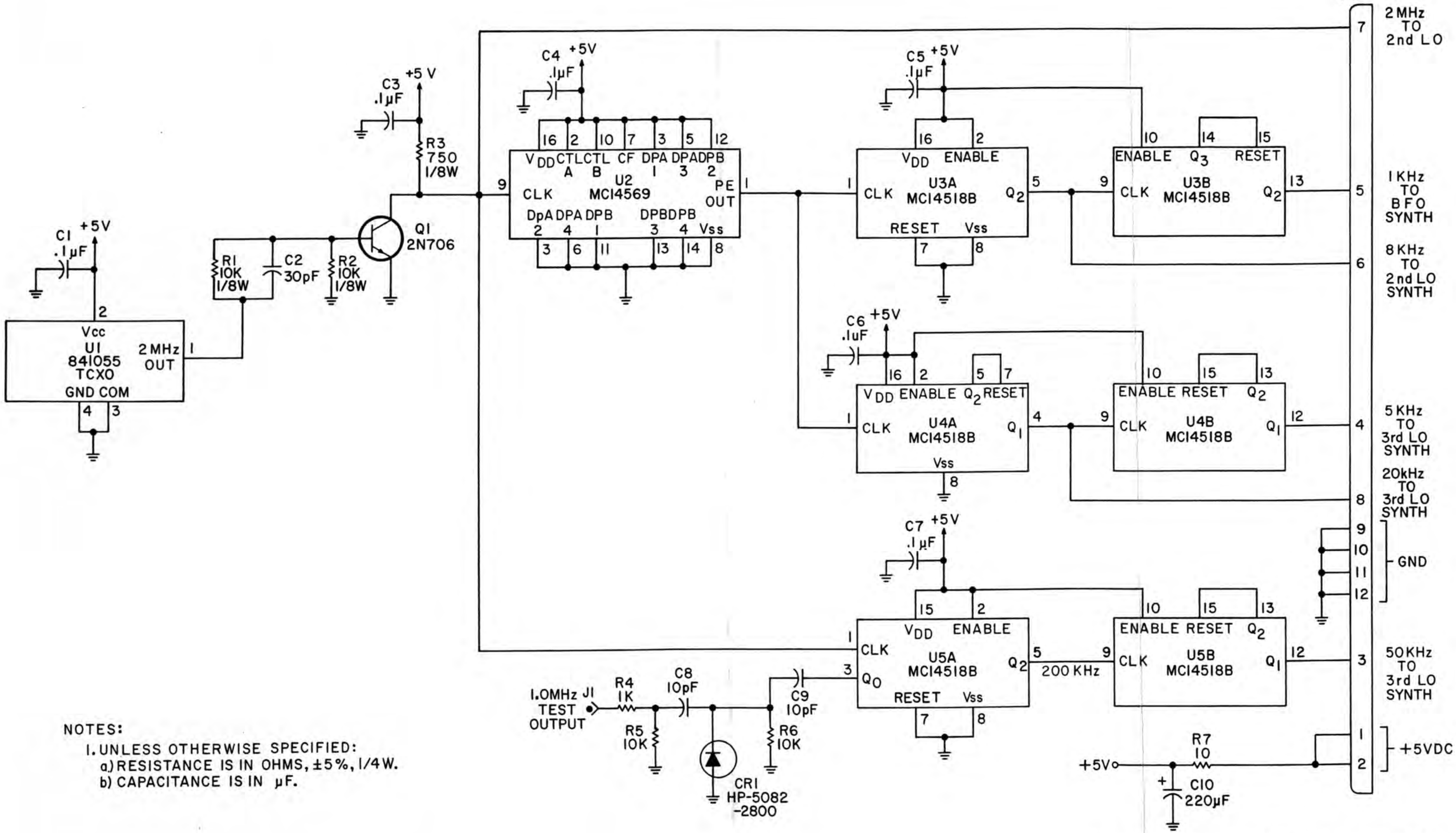


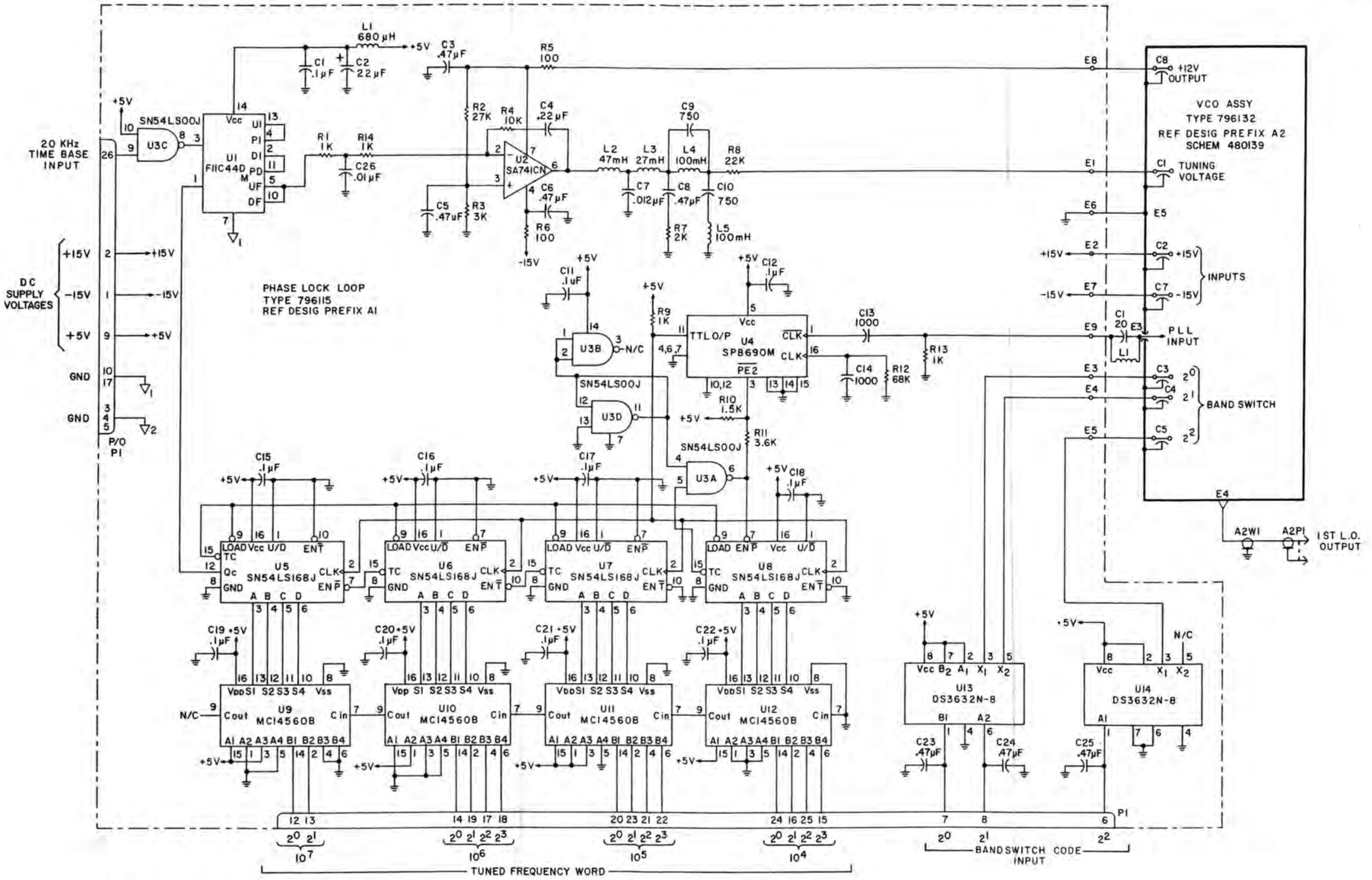
Figure 6-16. Type 796117 Synthesizer Motherboard (A5), Schematic Diagram (680034)

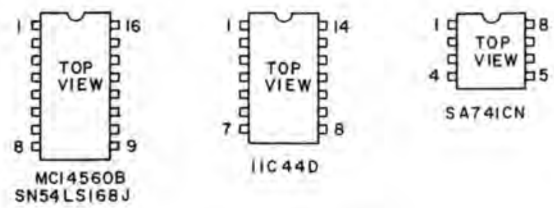


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN μF.

Figure 6-17. Type 796111 Time Base Generator (A5A1), Schematic Diagram (480214)





REF DESIG	Vcc	GND
U1	14	7
U2	7	4
U3	14	7
U4	5	7
U5 THRU U8	16	8
U9 THRU U12	16	8
U13 AND U14	8	4

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

Figure 6-18. Type 796133 1st LO/Synthesizer (A5A2). Schematic Diagram (580056)

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

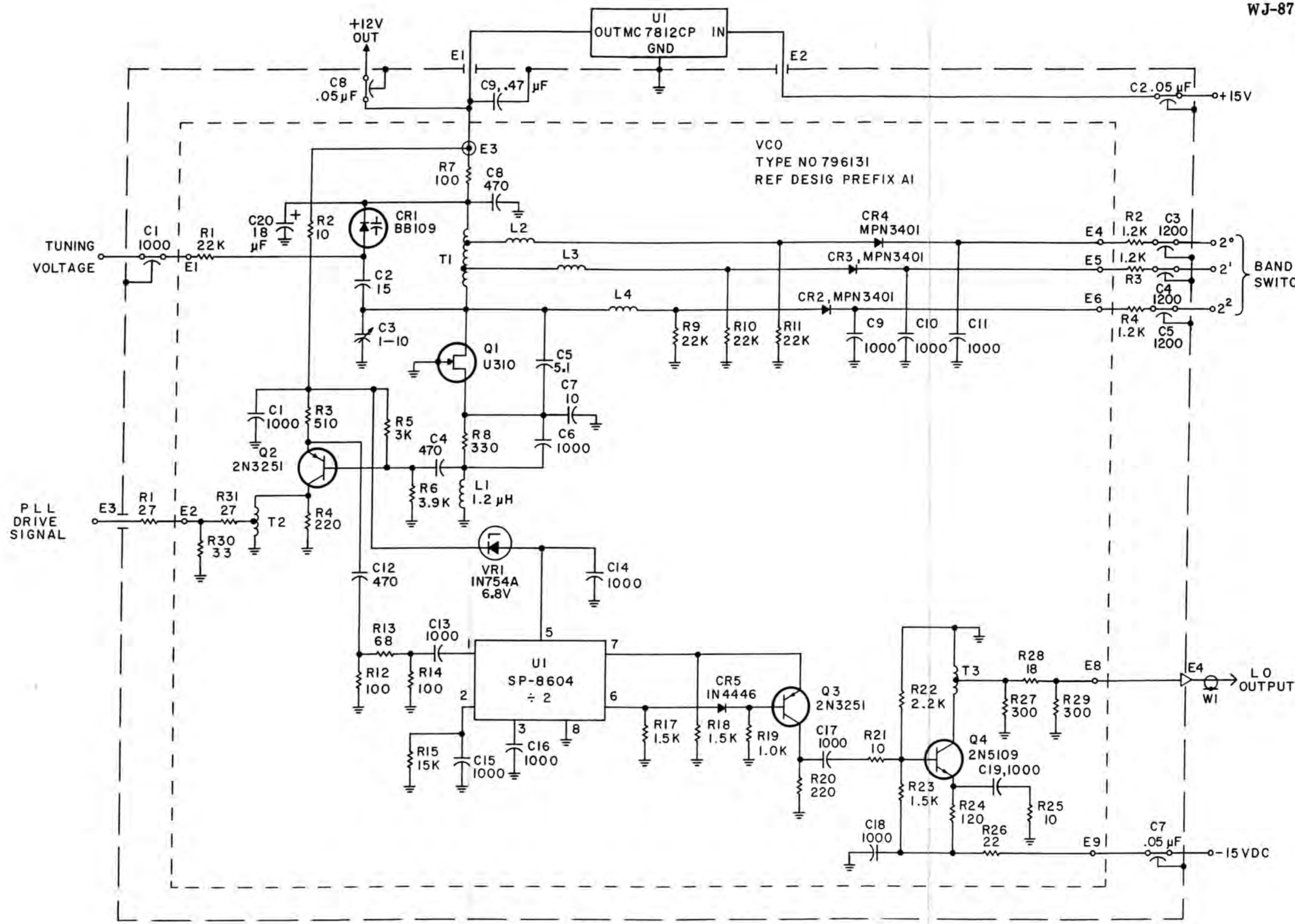


Figure 6-19. Type 796132 VCO Assembly (A5A2A2). Schematic Diagram (480139)

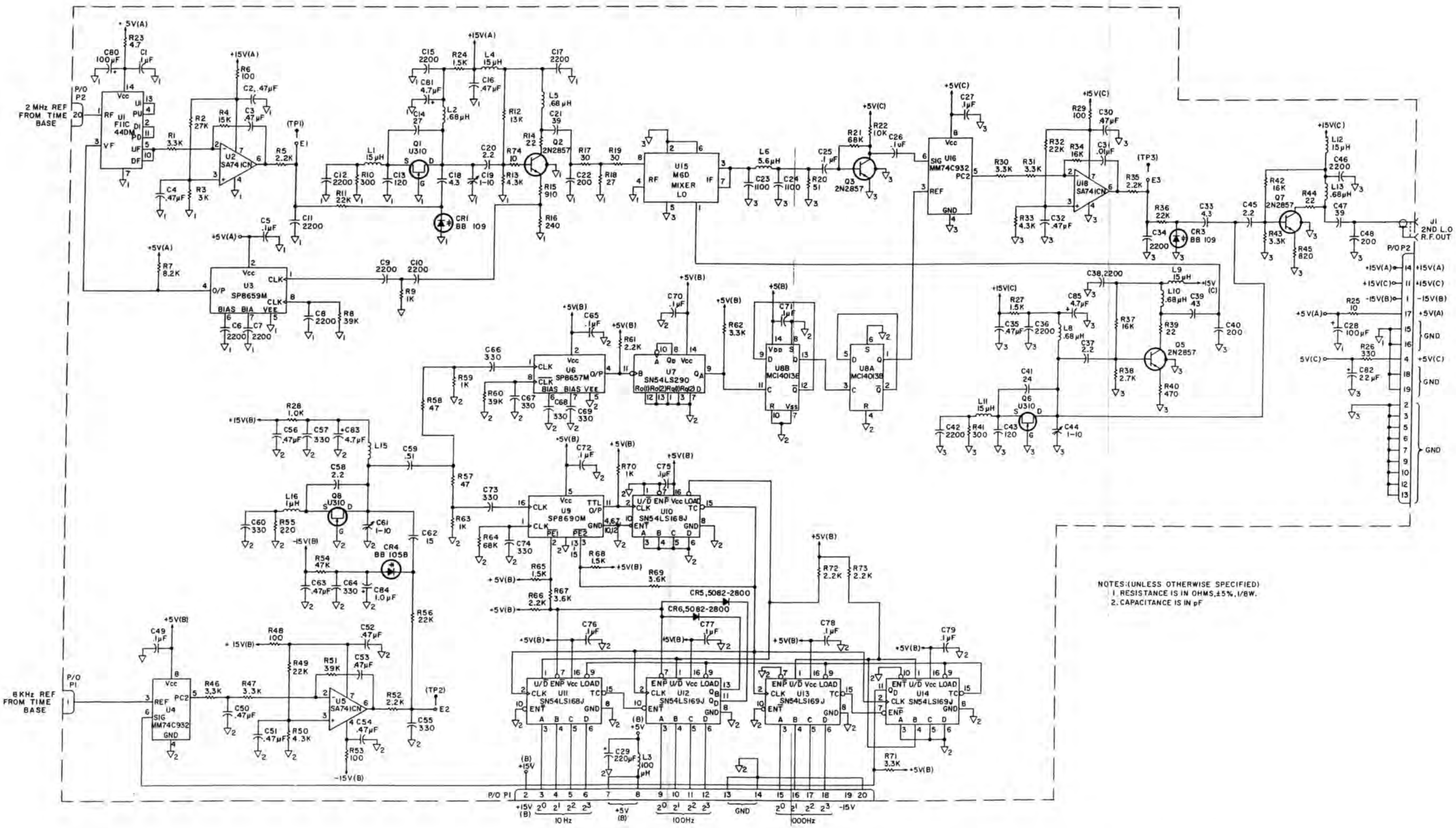
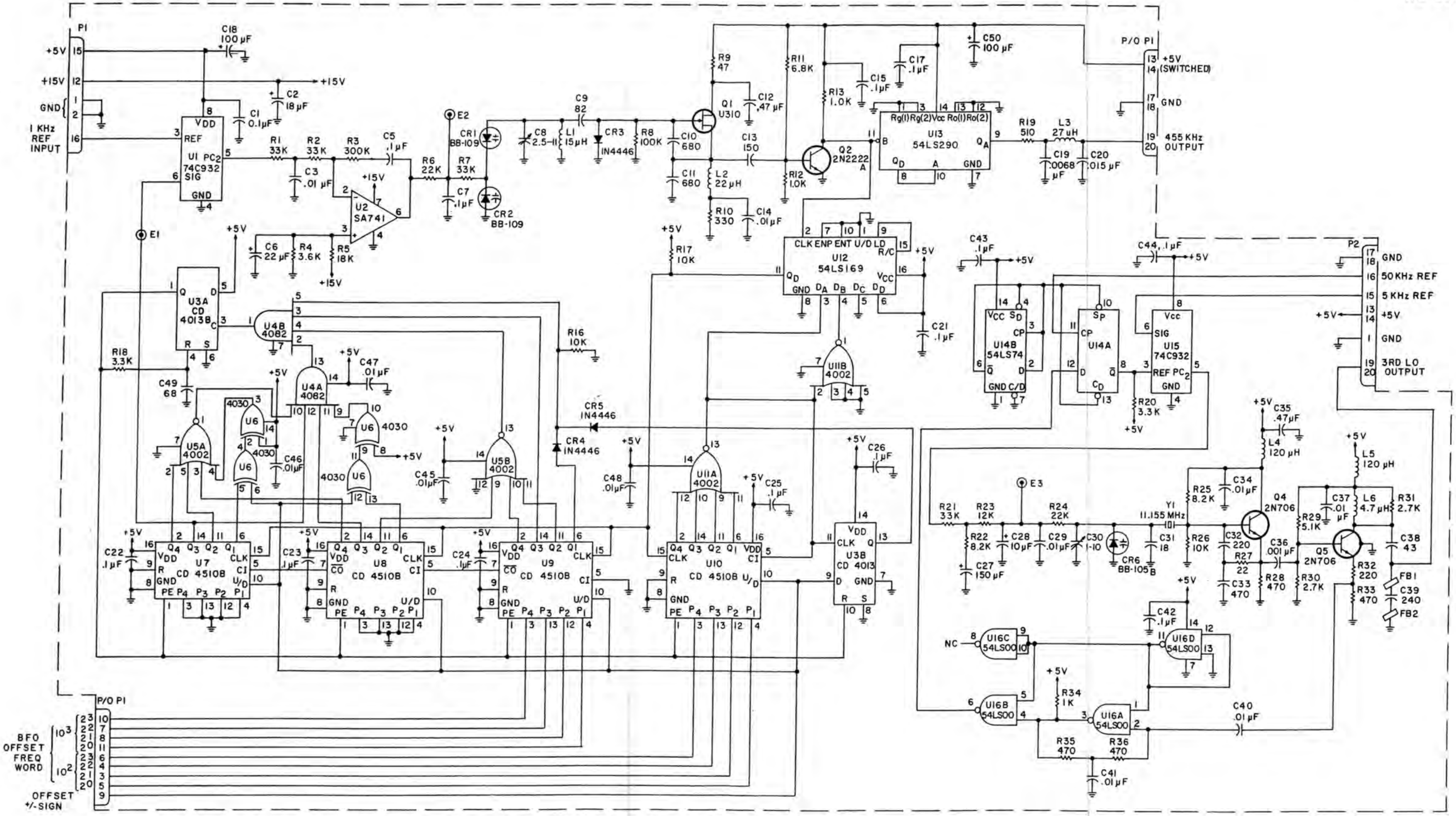
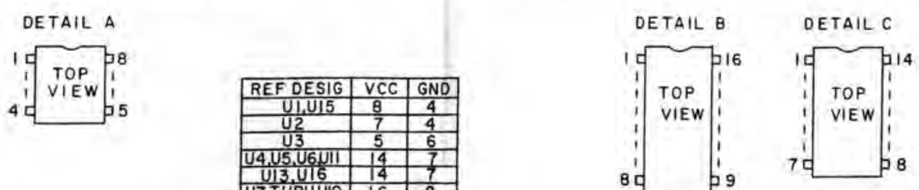


Figure 6-20. Type 796107 2nd LO Synthesizer (A5A3), Schematic Diagram (680037)



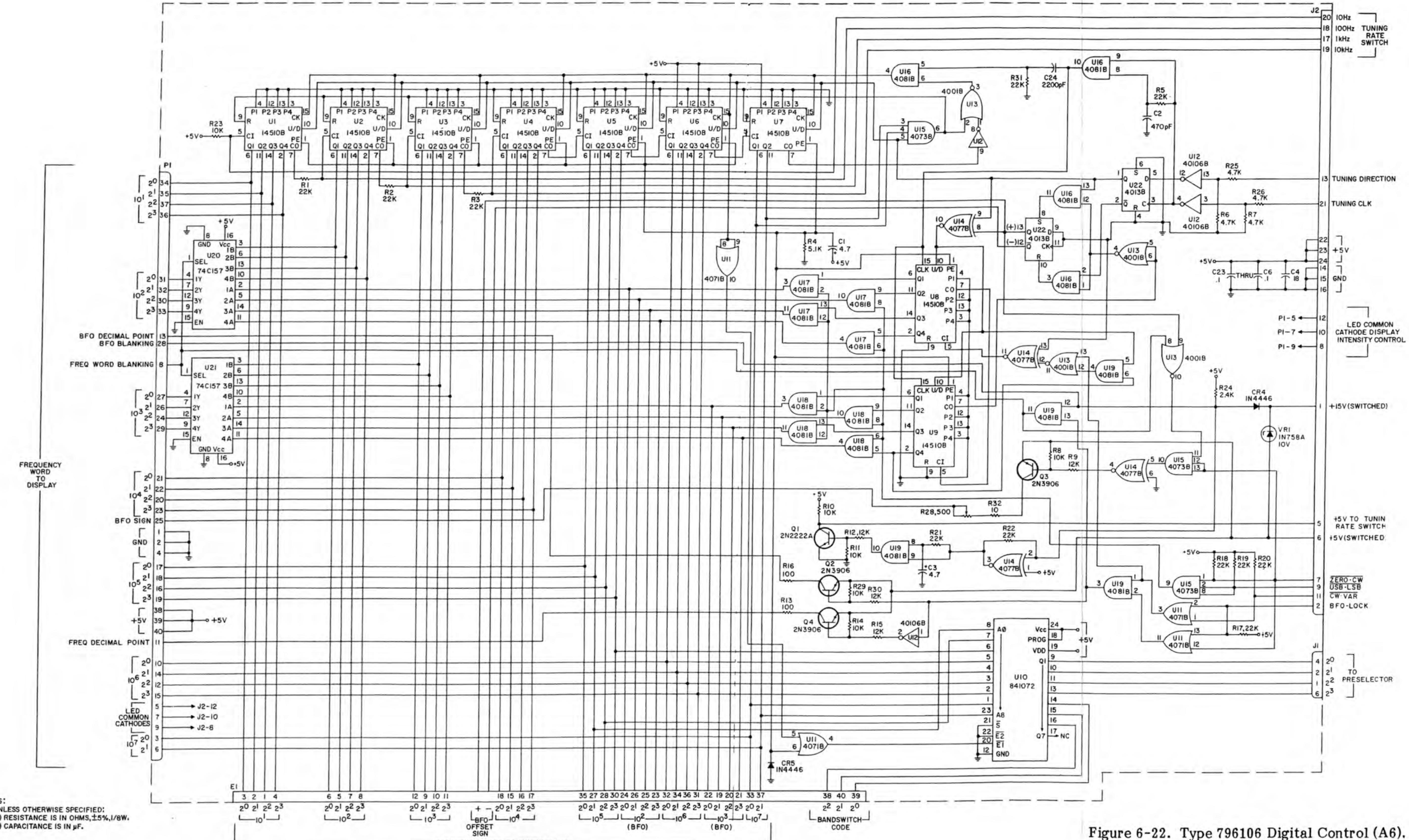
NOTES:

1. UNLESS OTHERWISE SPECIFIED
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.



REF DESIG	VCC	GND
U1,U15	8	4
U2	7	4
U3	5	6
U4,U5,U6,U11	14	7
U13,U16	14	7
U7 THRU U10	16	8
U12	16	8
U14	14	1

Figure 6-21. Type 796109 BFO/3rd LO Synthesizer (A5A4). Schematic Diagram (580054)



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

Figure 6-22. Type 796106 Digital Control (A6). Schematic Diagram (680036)

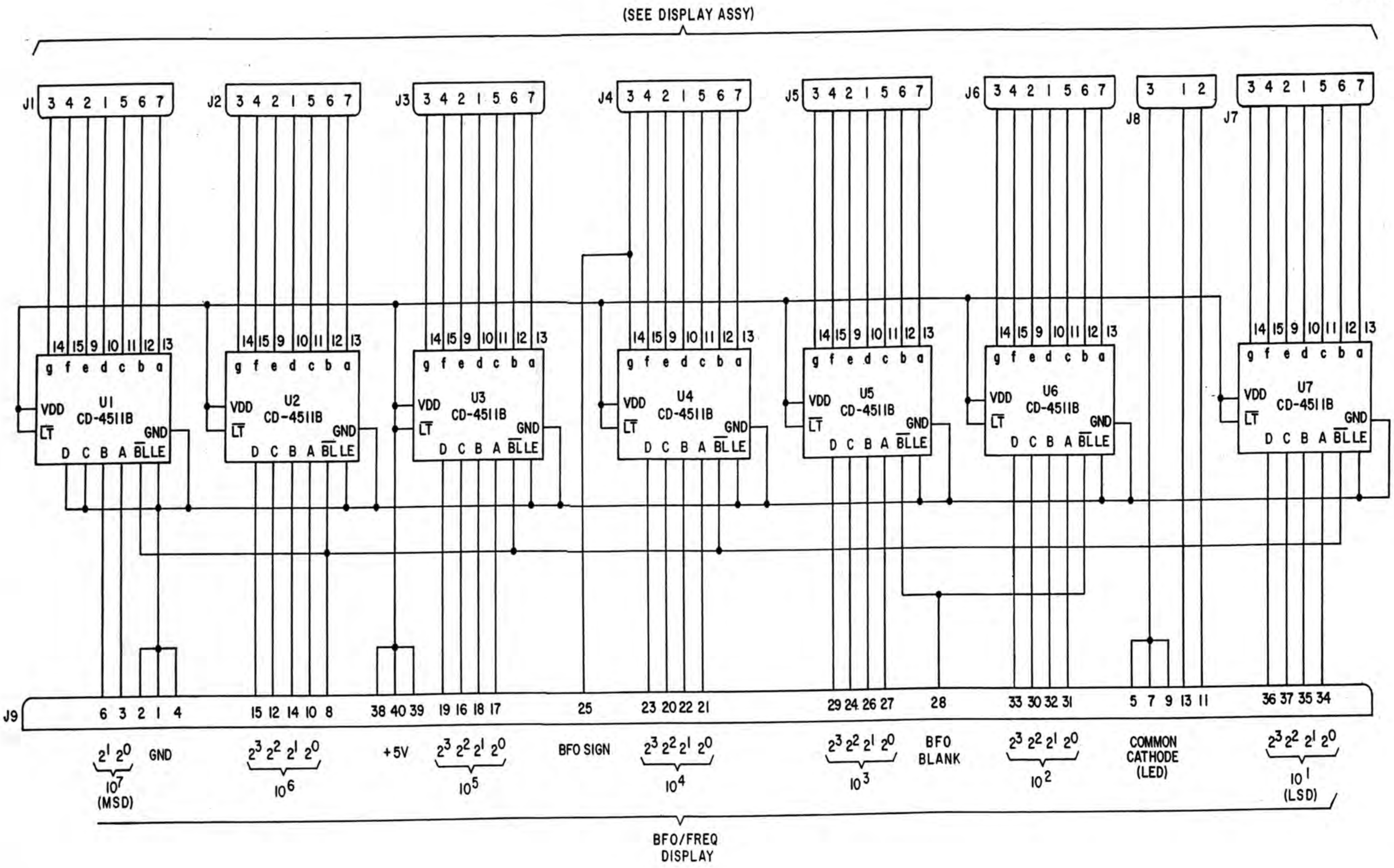


Figure 6-23. Type 796105 Display Driver (A7). Schematic Diagram (480211)

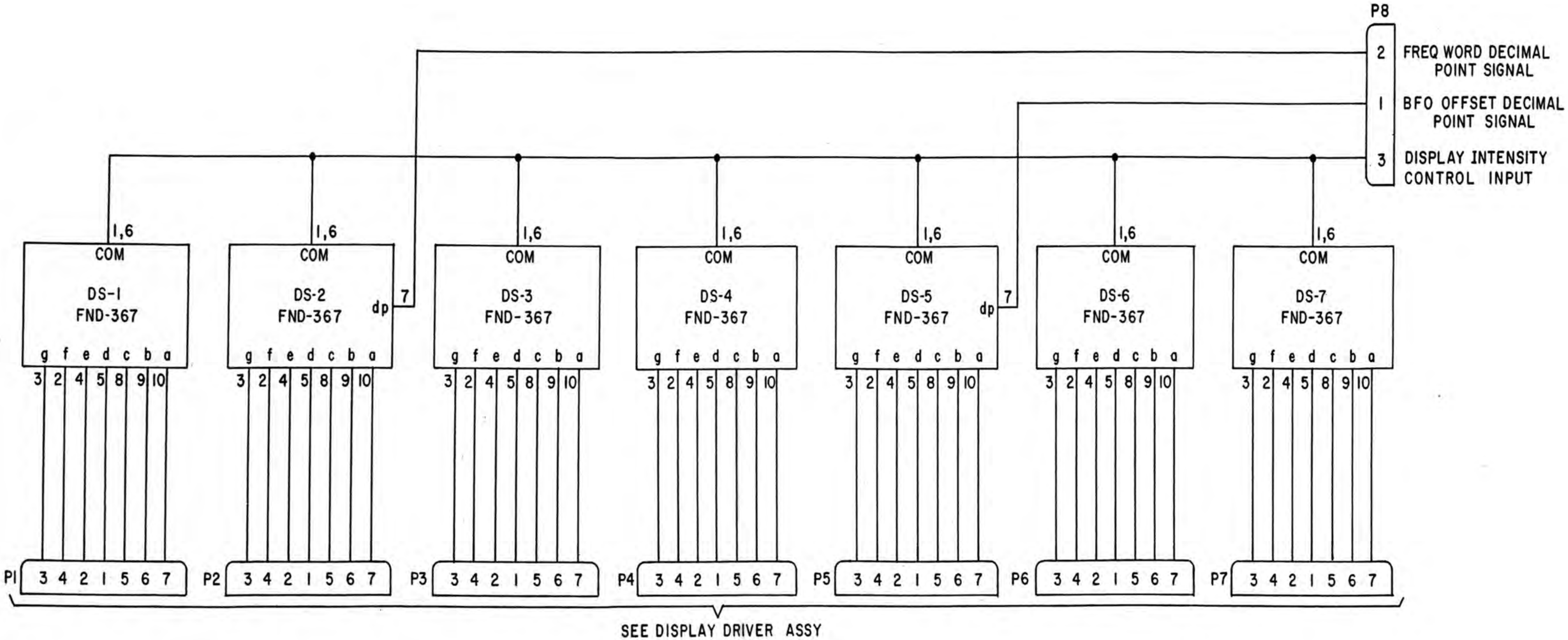


Figure 6-24. Type 796104 Display Board (A8). Schematic Diagram (480210)

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

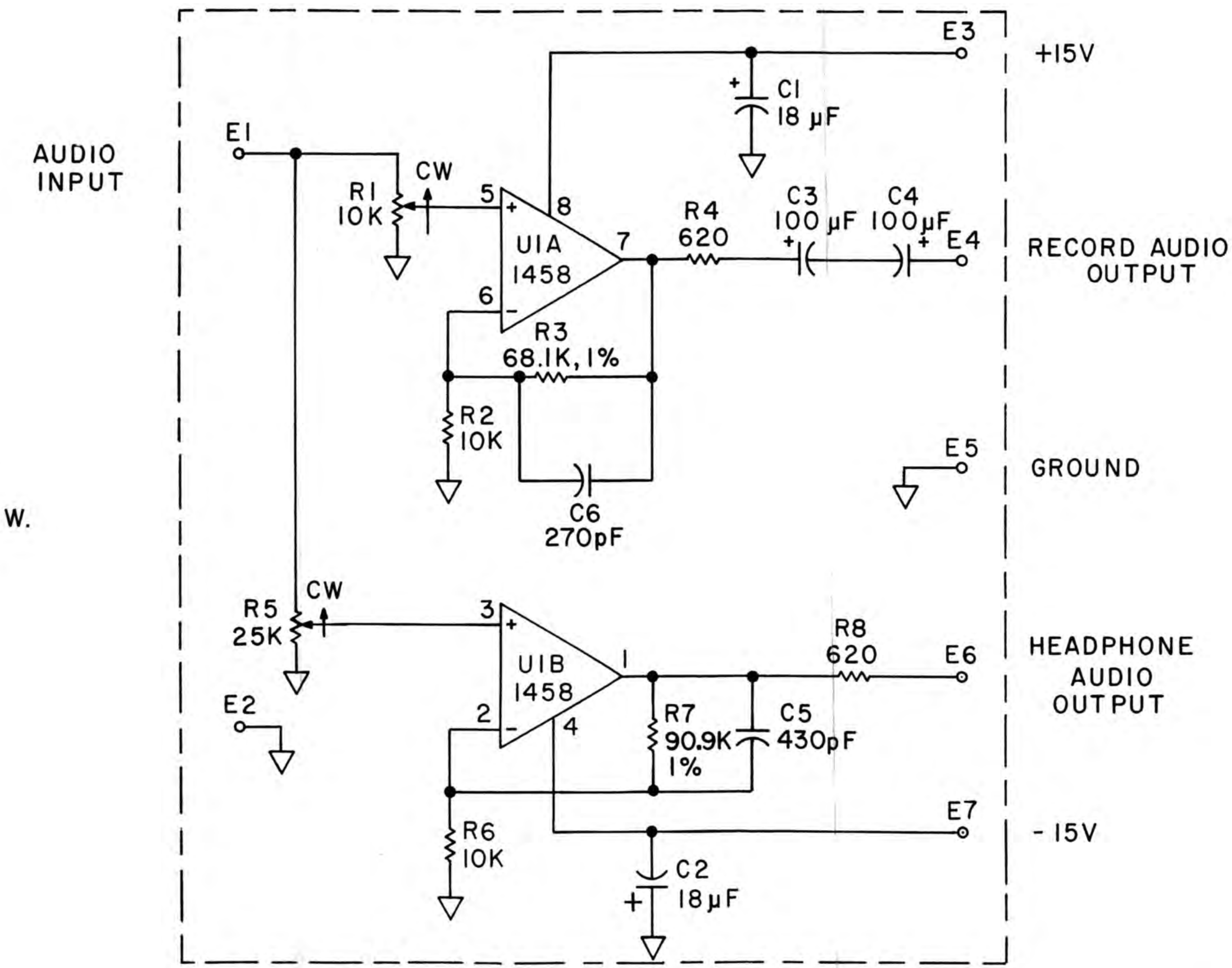
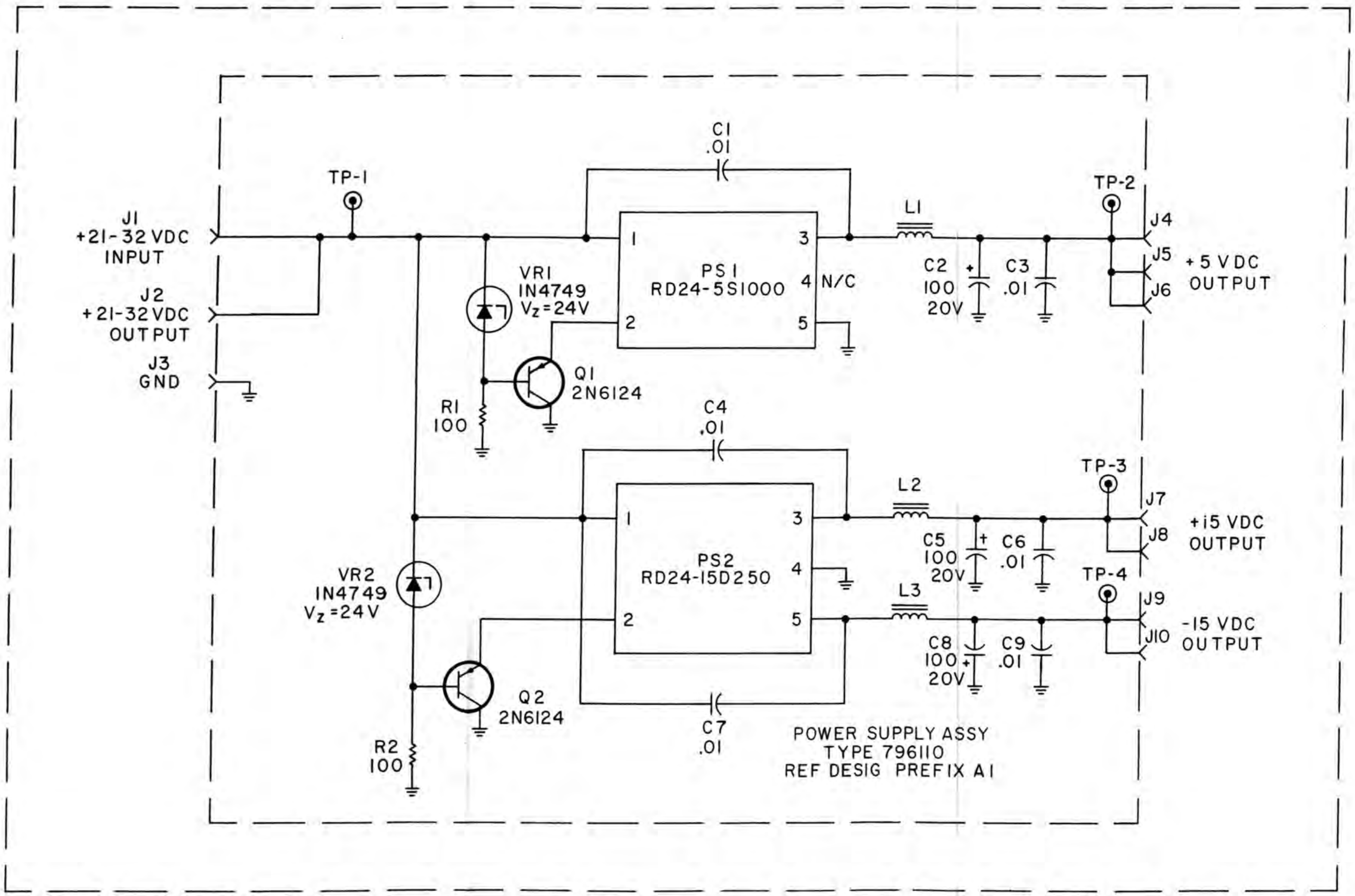


Figure 6-25. Type 796116 Audio Amplifier (A9), Schematic Diagram (380178)



NOTES
1. UNLESS OTHERWISE SPECIFED
   a RESISTANCE IS IN OHMS ±5%, 1/4 W
   b CAPACITANCE IS IN μF.

Figure 6-26. Type 796139 Power Supply (A10), Schematic Diagram (480213)

NOTES:
1. DIFFERENCE BETWEEN TYPES IS MECHANICAL.

USED ON	TYPE	(A1) TYPE
WJ-8770-1	796134-1	796119-1
WJ-8640-3A	796134-2	796119-2

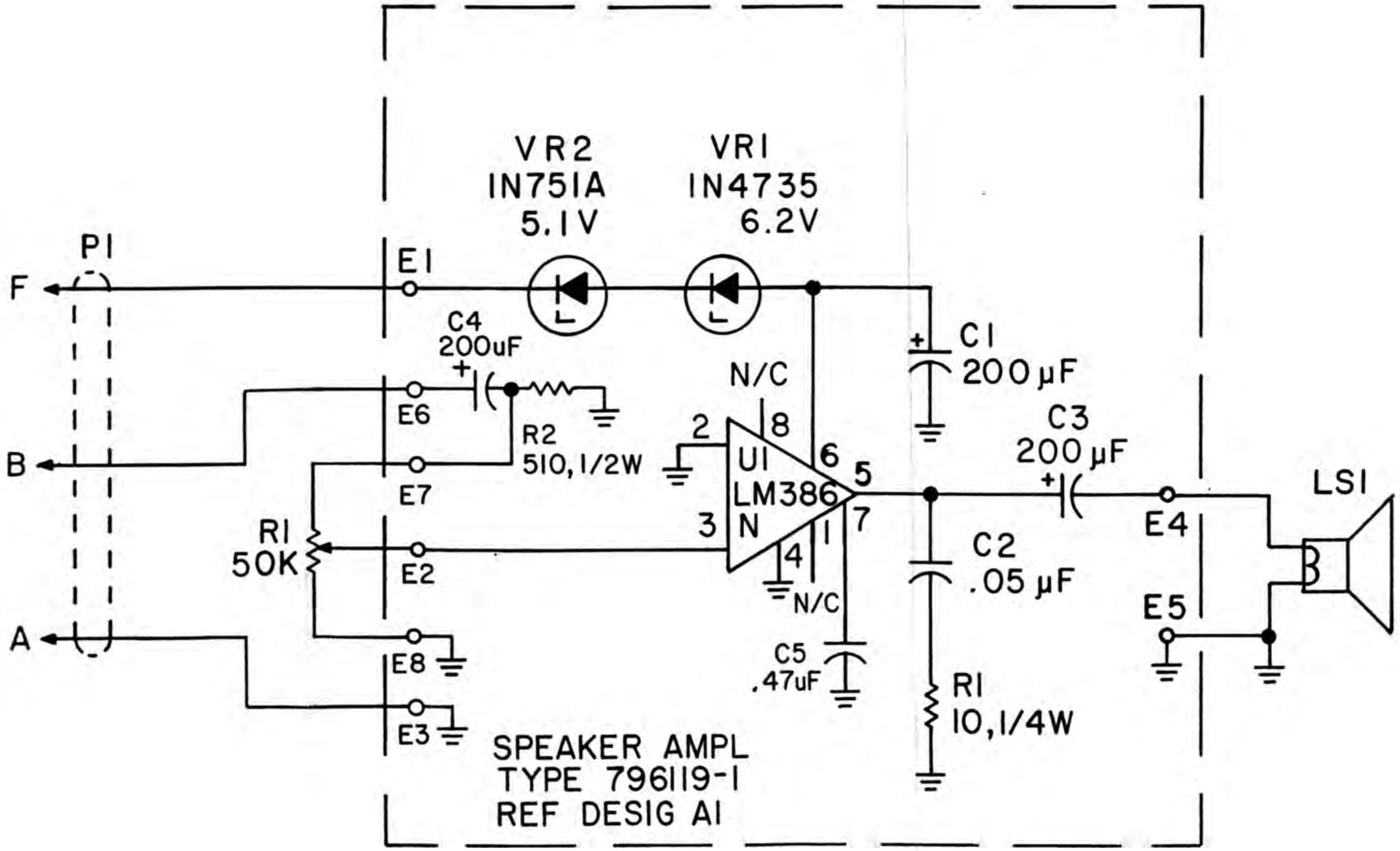


Figure 6-27. Type 796134-1 Speaker Amplifier (A11). Schematic Diagram (280197)

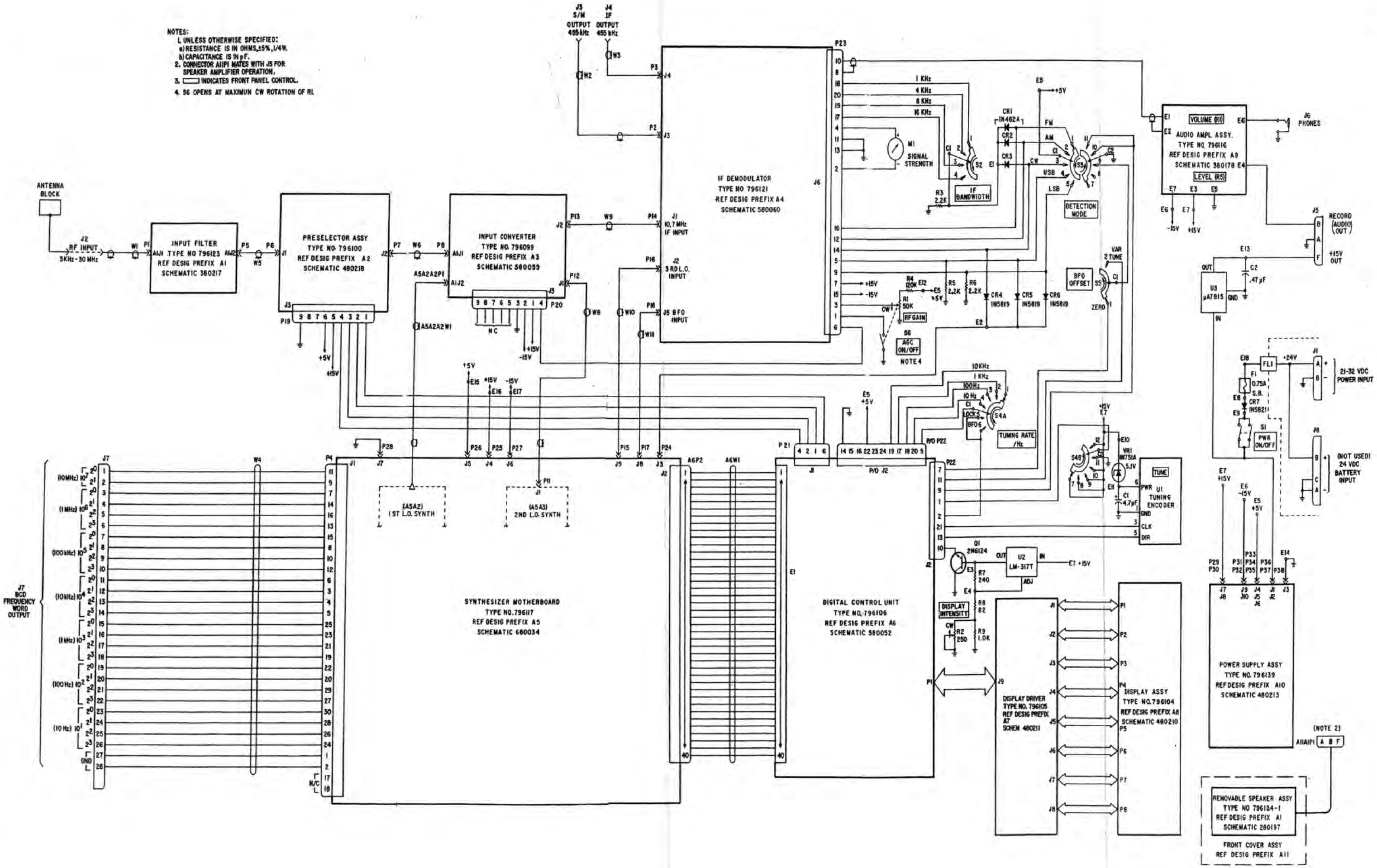


Figure 6-28. Type WJ-8770-1 HF Transportable Receiver (Main Chassis) Schematic Diagram (680035)

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