WATKINS-JOHNSON

INSTRUCTION MANUAL

FOR

TYPE 112 AND 112-1 MICROWAVE RECEIVER

WATKINS—JOHNSON COMPANY
700 Quince Orchard Road
Gaithersburg, Maryland 20760

Revised 11/14/75
WJ/200-6-76 o/x

WARNING

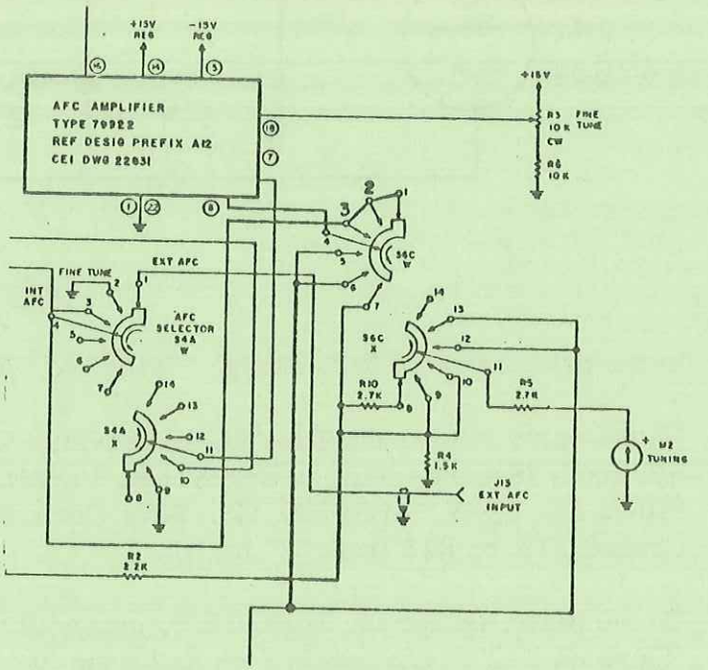
This equipment employs voltages which are dangerous and may be fatal if contacted. Extreme caution should be exercised in working with the equipment with any of the protective covers removed.

ADDENDA

The following changes should be incorporated in the instruction manual for the Types 112 and 112-1 Receiver.

1. Main Chassis Schematic, Figure 6-22. At A5, the 160/21.4 MHz Converter, add a jumper between C21 and C17. Delete the wire connecting to C17 from pin B of J6.

2. Change wiring of switch section S6C-W in Figure 6-22 as shown in the drawing below.

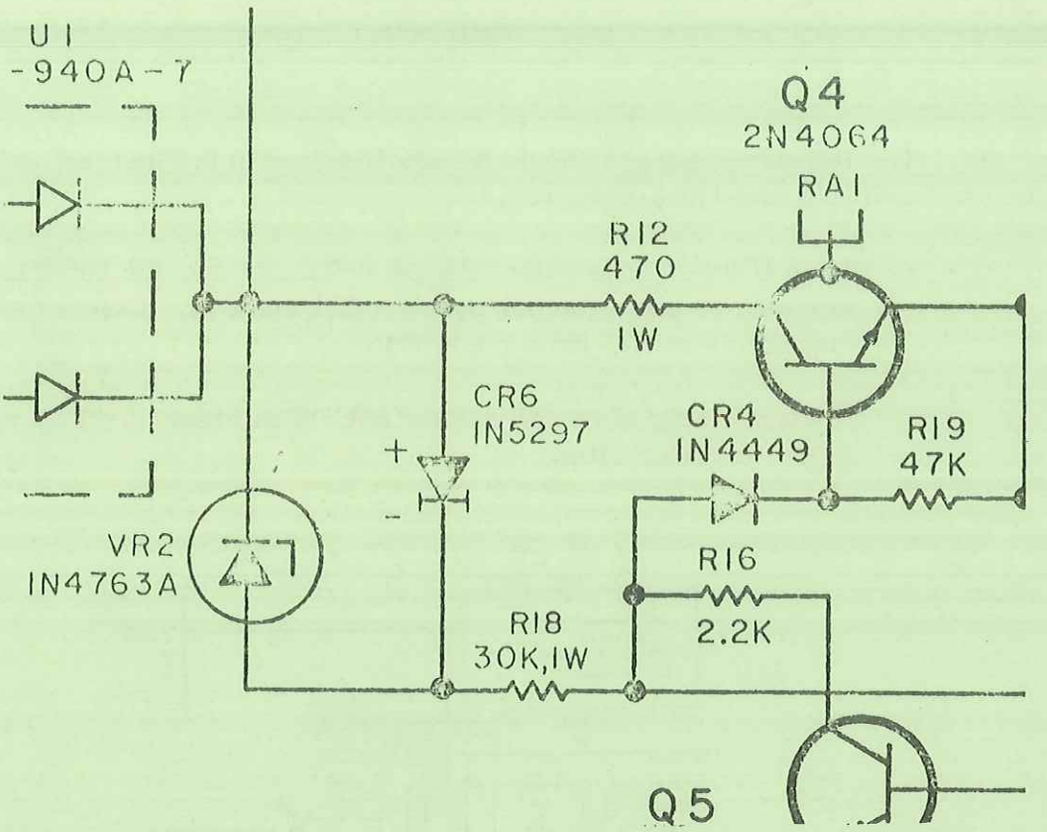


3. Change the part number for VR2, on the parts list for the Type 76183 +28/+150V Power Supply from 1N3819 to 1N4763A.

4. Add to the parts list for the Type 76183 Power Supply: DIODE, Part Number 1N5297, Manufacturer Code 04713.

5. Delete R17 from parts list of the Type 76183.

6. Change Figure 6-1 (Schematic Diagram, Type 76183 +28/+150 Power Supply) as shown in the following figure.



7. In the title of Figure 6-2, change "76164" to "76184".

8. On the parts list for the Type 71285 160-21.4 Converter, change R23 from "Same as R15" to RESISTOR, FIXED, COMPOSITION, 910 Ω, 5%, 1/4W, RCR07G911JS, Mfr. Code 81349. Change QTY on R15 from "2" to "1".

9. On the parts list for the Type 71285, change R24 from 150 Ω to "Same as R12". Change QTY on R12 from "1" to "2".

10. Add to the parts list for the Type 71285: *R25 RESISTOR, FIXED, COMPOSITION, .33 Ω, 1/4W, RCR07G330JS, Mfr. Code 81349.

11. On Figure 6-5 (Schematic Diagram, Type 71285 160-21.4 MHz Converter):

    a. Change R23 from 470 to 910.

    b. Change R24 from 150 to 300.

    c. Add R25: "33 (NOTE 4)" connected from the junction of C23 and L7 to ground.

12. On Figure 6-6, Schematic Diagram, Type 72304-1 160 MHz IF Amplifier 10-20 MHz BW (A6): Add NOTE 3 to R36 and change its value to 750 Ω. Add "*" to R36 in parts list and change part number to RCR0751JS, Mfr. Code 81349.

13. On Figure 6-12, Schematic Diagram, Type 7361 Video Amplifier (A9) change the part number of Q3 from 2N2222 to 2N2222A. Make the same change on the parts list for the Type 7361 Video Amplifier.

14. On Figure 6-20, Schematic Diagram, Type 21974 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13A1), change value of C15 to 43 pF. Change part number in parts list to CM05ED430J03.

NOTES

TABLE OF CONTENTS

Paragraph		Page
	SECTION I	
	GENERAL DESCRIPTION	
1.1	Electrical Characteristics	1-1
1.2	Mechanical Characteristics	1-2
1.3	Equipment Supplied	1-2
1.4	Equipment Required But Not Supplied	1-2
	SECTION II	
	CIRCUIT DESCRIPTION	
2.1	General	2-1
2.2	Functional Description	2-1
2.3	Type 71285 160/21.4 MHz Converter	2-5
2.4	Type 72304-1 160 MHz IF Amplifier	2-6
2.5	Type 79640 160 MHz Limiter/Discriminator	2-7
2.6	Type 72295 21.4 MHz IF Amplifier	2-8
2.7	Type 7361 Video Amplifier	2-10
2.8	Type 7866 AGC Amplifier	2-10
2.9	Type 7444 Audio Amplifier	2-11
2.10	Type 79922 AFC Amplifier	2-12
2.11	Type 72299 21.4 MHz IF Amplifier (500 kHz/1MHz BW)	2-13
2.12	Type 72301 21.4 MHz IF Amplifier (2 MHz/4 MHz BW)	2-14
2.13	Type 76183 +28/+150V Power Supply Regulator	2-14
2.14	Type 76164 +6V Power Supply Regulator	2-15
2.15	Type 76185 +5V Power Supply Regulator	2-15
2.16	Type 76186 -15V Power Supply Regulator	2-16
	SECTION III	
	INSTALLATION AND OPERATION	
3.1	Unpacking and Inspection	3-1
3.2	Installation	3-1
3.3	Operation	3-3
3.4	Preparation for Reshipment and Storage	3-5
	SECTION IV	
	MAINTENANCE	
4.1	General	4-1
4.2	Cleaning and Lubrication	4-1
4.3	Inspection for Damage and Wear	4-1
4.4	Alignment and Adjustment Procedure	4-1
4.5	Troubleshooting	4-15

Paragraph		Page
	SECTION V REPLACEMENT PARTS LIST	
5.1	Unit Numbering Method	5-1
5.2	Reference Designation Prefix	5-1
5.3	List of Manufacturers	5-1
5.4	Parts List	5-3
	SECTION VI SCHEMATIC DIAGRAMS	

LIST OF ILLUSTRATIONS

Illustration		Page
Figure 1-1	Type 112 Receiver, Front View	1-0
Figure 2-1	Type 112 and 112-1 Receiver, Functional Block Diagram	2-0
Figure 3-1	Type 112 and 112-1 Receiver, Critical Dimensions	3-6
Figure 4-1	Test Setup, 160 MHz IF Amplifier Alignment (A6)	4-3
Figure 4-2	Typical Response, 160 MHz IF Amplifier (20 MHz BW)	4-4
Figure 4-3	Typical Response, 160 MHz IF Amplifier (10 MHz BW)	4-4
Figure 4-4	Test Setup, 160/21.4 MHz Converter Alignment (A5)	4-5
Figure 4-5	Typical Response, 160/21.4 MHz Converter	4-6
Figure 4-6	Test Setup, 160 MHz Limiter Alignment (A7)	4-7
Figure 4-7	Test Setup, 160 MHz Limiter Alignment (A7)	4-7
Figure 4-8	Test Setup, 160 MHz Limiter/Discriminator Alignment (A7)	4-8
Figure 4-9	Typical Response, 160 MHz Limiter/Discriminator	4-9
Figure 4-10	Test Setup, 21.4 MHz IF Amplifier Alignment (A8) 100 kHz BW	4-10
Figure 4-11	Typical Response, 21.4 MHz IF Amplifier (100 kHz BW)	4-9
Figure 4-12	Test Setup, 21.4 MHz FM Limiter/Discriminator Alignment (A8A3), 100 kHz BW	4-11
Figure 4-13	Typical Response, 21.4 MHz Limiter/Discriminator (100 kHz BW)	4-12
Figure 4-14	Test Setup, 21.4 MHz IF Amplifier Alignment (A13A1)	4-13
Figure 4-15	Typical Response, 21.4 MHz IF Amplifier (2 MHz BW)	4-14
Figure 4-16	Typical Response, 21.4 MHz IF Amplifier (4 MHz BW)	4-14
Figure 4-17	Test Setup, 21.4 MHz FM Limiter/Discriminator Alignment	4-15
Figure 4-18	Typical Response, 21.4 MHz Limiter/Discriminator (4 MHz BW)	4-16
Figure 4-19	Typical Response, 21.4 MHz Limiter/Discriminator (2 MHz BW)	4-16
Figure 4-20	Transistor and Integrated Circuit Pin Configurations	4-26
Figure 5-1	Type 112 Receiver, Front View, Component Locations	5-6
Figure 5-2	Type 112 Receiver, Rear View, Component Locations	5-6
Figure 5-3	Type 112 Receiver, Top View, Component Locations	5-7
Figure 5-4	Typical 112 Receiver, Bottom View, Component Locations	5-8
Figure 5-5	Type 76183 +28V/+150V Power Supply Regulator (A1), Component Locations	5-16
Figure 5-6	Type 76184 +6V Power Supply Regulator (A2), Component Locations	5-18
Figure 5-7	Type 76185 +15V Power Supply Regulator (A3), Component Locations	5-21

LIST OF ILLUSTRATIONS (Cont.)

Illustration		Page
Figure 5-8	Type 76186 -15V Power Supply Regulator (A4), Component Locations	5-24
Figure 5-9	Type 71285 160/21.4 MHz Converter (A5), Component Locations	5-27
Figure 5-10	Type 71285 160/21.4 MHz Converter (A5), Component Locations	5-28
Figure 5-11	Part 16456 Balanced Mixer Board (A5A1), Component Locations	5-33
Figure 5-12	Type 72304-1 160 MHz IF Amplifier (10-20 MHz BW) (A6), Component Locations	5-35
Figure 5-13	Type 72304-1 160 MHz IF Amplifier (10-20 MHz BW) (A6), Component Locations	5-36
Figure 5-14	Type 72304-1 160 MHz IF Amplifier (10-20 MHz BW) (A6), Component Locations	5-37
Figure 5-15	Part 15164 Amplifier (A6A1, A6A2), Component Locations	5-46
Figure 5-16	Part 15203 Video Amplifier (A6A3), Component Locations	5-48
Figure 5-17	Type 79640 160 MHz Limiter/Discriminator (A7), Component Locations	5-50
Figure 5-18	Type 79640 160 MHz Limiter/Discriminator (A7), Component Locations	5-51
Figure 5-19	Type 72295 21.4 MHz IF Amplifier (100 kHz BW) (A8), Component Locations	5-58
Figure 5-20	Part 15295 IF Amplifier (100 kHz BW) (A8A1), Component Locations	5-61
Figure 5-21	Part 15298 IF Output Amplifier (100 kHz BW) (A8A2), Component Locations	5-64
Figure 5-22	Part 15196 FM Limiter/Discriminator (100 kHz BW) (A8A3), Component Locations	5-68
Figure 5-23	Type 7361 Video Amplifier (A9), Component Locations	5-71
Figure 5-24	Type 7866 AGC Amplifier (A10), Component Locations	5-74
Figure 5-25	Type 7444 Audio Amplifier (A1), Component Locations	5-77
Figure 5-26	Type 79922 AFC Amplifier (A12), Component Locations	5-80
Figure 5-27	Type 72301 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13), Component Locations	5-82
Figure 5-28	Part 21974 21.4 MHz IF Amplifier (A13A1), Component Locations	5-85
Figure 5-29	Part 16613 FM Limiter/Discriminator Board (A13A2), Component Locations	5-94

Illustration		Page
Figure 5-30	Type 72299 21.4 MHz IF Amplifier (500 kHz/1 MHz BW) (A13), Component Locations	5-98
Figure 5-31	Part 21954 21.4 MHz IF Amplifier (A13A1), Component Locations	5-101
Figure 5-32	Part 15170 FM Limiter/Discriminator Board (A13A2), Component Locations	5-110
Figure 6-1	Type 76183 +28/+150 Power Supply Regulator (A1), Schematic Diagram	6-1
Figure 6-2	Type 76164 +6V Power Supply Regulator (A2), Schematic Diagram	6-2
Figure 6-3	Type 76185 +15V Power Supply Regulator (A3), Schematic Diagram	6-3
Figure 6-4	Type 76186 -15V Power Supply Regulator (A4), Schematic Diagram	6-4
Figure 6-5	Type 71285 160/21.4 MHz Converter (A5), Schematic Diagram	6-5
Figure 6-6	Type 72304-1 160 MHz IF Amplifier (10-20 MHz BW) (A6), Schematic Diagram	6-6
Figure 6-7	Type 79640 160 MHz Limiter/Discriminator (A7), Schematic Diagram	6-7
Figure 6-8	Type 72295 21.4 MHz IF Amplifier (100 kHz BW) (A8), Schematic Diagram	6-8
Figure 6-9	Part 15295 IF Input Amplifier (100 kHz BW) (A8A1), Schematic Diagram	6-9
Figure 6-10	Part 15298 IF Output Amplifier (100 kHz BW) (A8A2), Schematic Diagram	6-10
Figure 6-11	Part 15196 21.4 MHz FM Limiter/Discriminator (100 kHz BW) (A8A3), Schematic Diagram	6-11
Figure 6-12	Type 7361 Video Amplifier (A9), Schematic Diagram	6-12
Figure 6-13	Type 7866 AGC Amplifier (A10), Schematic Diagram	6-13
Figure 6-14	Type 7444 Audio Amplifier (A11), Schematic Diagram	6-14
Figure 6-15	Type 79922 AFC Amplifier (A12), Schematic Diagram	6-15
Figure 6-16	Type 72299 21.4 MHz IF Amplifier (0.5 MHz/1 MHz BW) (A13), Schematic Diagram	6-16
Figure 6-17	Part 21954 21.4 MHz IF Amplifier (500 kHz/1 MHz BW) (A13A1), Schematic Diagram	6-17
Figure 6-18	Part 15170 21.4 MHz FM Limiter/Discriminator (A13A2), Schematic Diagram	6-18
Figure 6-19	Type 72301 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13), Schematic Diagram	6-19
Figure 6-20	Part 21974 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13A1), Schematic Diagram	6-20
Figure 6-21	Part 16613 21.4 MHz FM Limiter/Discriminator (2 MHz/4 MHz BW) (A13A2), Schematic Diagram	6-21

LIST OF ILLUSTRATIONS (Cont.)

Illustration		Page
Figure 6-22	Type 112, 112-1 Receiver, Main Chassis Schematic . . .	6-22

LIST OF TABLES

Table		Page
Table 1-1	Type 112 Microwave Receiver, Specifications	ix
Table 4-1	Troubleshooting Chart	4-18
Table 4-2	Typical Transistor and Integrated Circuit Pin Voltages	4-22

Table 1-1. Type 112 Microwave Receiver, Specifications

Types of Reception	AM, FM, or Pulse
Frequency Range	1-12 GHz, Using Interchangeable Tuning Heads
1st IF Center Frequency	160 MHz
2nd IF Center Frequency	21.4 MHz
IF Bandwidths	100 kHz, 10 MHz, and 20 MHz are standard: 500 kHz and 1 MHz or 2 and 4 MHz, customer selected
LO Output	-20 dBm, minimum into a 50-ohm load
160 MHz SM Output	3 μV, minimum
21.4 MHz SM Output	3 μV, minimum
NB Pre Detector Output	30 mV out with 1 mV into 160 MHz Converter. (In AGC mode)
WB Pre Detector Output	6 mV out with 1 mV into 160 MHz Converter. (In AGC mode)
Video Output Capability	2.2 V P-P, into 91-ohm load
Ext. AFC Input	±1 Volt
Video Frequency Response	20 Hz to 15 MHz
Video Output Impedance	93 ohms, unbalanced
Video Output Level	2 volts, peak-to-peak
Audio Frequency Response	100 Hz to 20 kHz
Audio Output	Balanced (100 mW, minimum into 600-ohm load)
Panel Meters	Tuning and signal strength
Input Power	115 or 230 Vac, 50-400 Hz
Power Consumption	50 watts, approximately (includes tuning head)
Dimensions	19 inches wide, 3.5 inches high, and 19 inches deep
Weight	23-1/2 lbs. without tuning head
Meters	Tuning and Signal Strength

NOTES

Figure 1-1. Type 112 Receiver, Front View

SECTION I

GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

1.1.1 The Type 112 Microwave Receiver is designed to receive, amplify, and demodulate AM, FM, and Pulse signals in the 1 GHz to 12 GHz frequency range. This band of frequencies is covered by five, optional drop-in tuning heads. These tuning heads are the Watkins-Johnson, CEI TH-series. Types and the frequency coverage of each is listed below:

TH-120	1 GHz to 2 GHz
TH-240	2 GHz to 4 GHz
TH-245	2 GHz to 4.5 GHz
TH-480	4 GHz to 8 GHz
TH-812	8 GHz to 12 GHz

A 112 Receiver will accommodate one tuning head at a time. The five tuning heads are documented in separate instruction manuals available from the Watkins-Johnson Company. In addition to standard IF bandwidths of 100 kHz, 10 MHz and 20 MHz normally supplied, optional IF bandwidths of 500 kHz and 1 MHz or 2 MHz and 4 MHz are available. Two of the optional bandwidths can be included making a total of five. The desired bandwidth can be selected by a front panel switch.

1.1.2 Front-panel potentiometers are provided for adjustment of the audio and video gain. The RF gain (in the AM/MAN mode) and for vernier tuning of the drop-in head. The latter feature is available when the front-panel AFC switch is placed in the FINE TUNE position. This switch also permits selection of either internal (INT) or external (EXT) automatic frequency control (AFC). External AFC operation permits the local oscillator in the tuning head to be locked to a reference source such as an electronic frequency counter having digital automatic frequency control (DAFC) capability. The stability of the receiver under these conditions approaches that of the reference source used in the counter. Internal AFC operation is available when other than the 10 MHz or 20 MHz IF bandwidth is selected. The AFC circuitry operates from an output provided by the FM discriminator in the operative IF bandwidth channel.

1.1.3 A front-panel toggle switch has been included to provide aural enhancement of pulse-modulated signals. Placing this switch in the ON position activates pulse-stretching circuitry located on the audio amplifier allowing the pulse signals to be monitored by an audio reproduction device such as a loudspeaker or headphones.

1.1.4 Rear-apron connectors on the 112 Receiver provide a 21.4 MHz predetection IF output, a local oscillator output, a 160-MHz signal monitor output plus a video output. The audio signal is available from a front-panel headphone jack or from a terminal strip on the rear apron.

1.2 MECHANICAL CHARACTERISTICS

1.2.1 The Type 112 Receiver is designed for mounting in a standard 19-inch rack. As shown in Figures 1-1 and 5-1, all of the operating controls are located on the front panel. Although shown in both illustrations, the tuning head is not a part of the receiver. The one shown is the Type TH-120 which tunes from 1-2 GHz. The other four tuning heads are similar in appearance and cover the remaining frequency spectrum from 2 to 12 GHz.

1.2.2 The front panel of the receiver mounts all the controls normally needed for the operation of the receiver. These are the IF BANDWIDTH, function, AFC, VIDEO GAIN, AURAL ENHANCEMENT, FINE TUNE, AUDIO GAIN, RF GAIN, PHONES, POWER and the tuning knob. In addition a SIGNAL STRENGTH METER and a TUNING METER are mounted on the front panel.

1.2.3 Located on the rear apron of the receiver are the RF INPUT jack J1, the LO OUTPUT jack J2, the 160 MHz SM OUTPUT jack J3, the 21.4 MHz SM OUTPUT jack J4, the NB PREDET OUTPUT jack J11, the VIDEO OUTPUT jack J12, the EXT AFC INPUT jack J13, Terminal board TB1, fuses F1 and F2, the 115/230 Vac input power selector switch S2 and the ac power cord. Jacks J1, J3, J4, J11, J12, J13 and J15 are type BNC connectors. Jack J2 is a type N connector.

1.2.4 The front rear, and side panels of the receiver are made of aluminum as well as the top and bottom dust covers and main deck. The main chassis contains thirteen subassemblies. Eight of these are constructed on plug-in printed wiring boards. The five remaining subassemblies are in brass chassis which have been plated with precious metal for improved conductivity and durability.

1.3 EQUIPMENT SUPPLIED

This equipment consists of the Type 112 Microwave Receiver main chassis only. Pertinent specifications are provided in Table 1-1.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

1.4.1 The Type 112 Microwave Receiver is designed to operate with the TH-Series Tuning Heads. It is not capable of independent operation.

1.4.2 One tuning head is required, based on the operating frequency ranges of interest. The following tuning heads are presently available.

Type	Frequency Range
TH-120	1 to 2 GHz
TH-240	2 to 4 GHz
TH-245	2 to 4.5 GHz
TH-480	4 to 8 GHz
TH-812	8 to 12 GHz

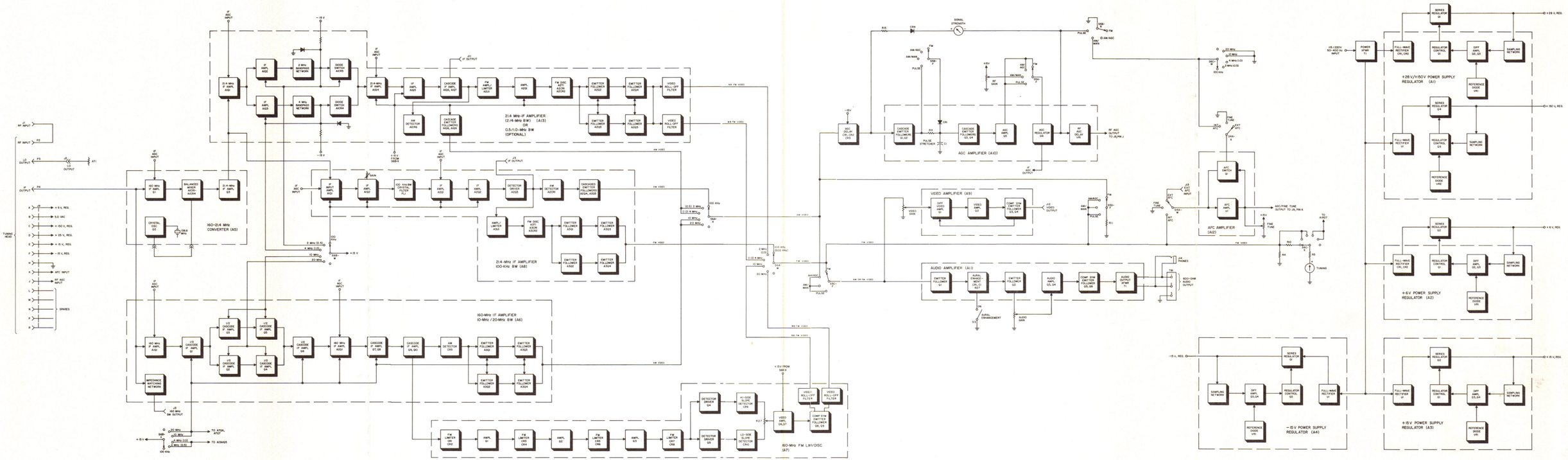


Figure 2-1. Type 112 and 112-1 Receiver, Functional Block Diagram

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

Operation of the various circuits in the 112 Receiver are explained in the following paragraphs. The functional description is oriented to the block diagram level, whereas the detailed circuit description is oriented to the schematic diagram level. Note that the unit numbering method is used for electrical components which means that parts on subassemblies and modules carry a prefix before the usual class letter and number of the item (such as A6Q1 and A8R1). These prefixes are omitted in the text except in those cases where confusion might result from their omission.

2.2 FUNCTIONAL DESCRIPTION

2.2.1 The 112 Receiver and drop-in tuning head combination form a double-conversion, superheterodyne unit designed to receive, amplify and demodulate AM, FM, and Pulse signals. The functional block diagram, Figure 2-1, depicts a typical 112 Receiver containing the standard IF bandwidths of 100 kHz, 10 MHz, and 20 MHz, plus two of the optional IF bandwidths of 2 MHz and 4 MHz. This configuration has been chosen to simplify explanation of the electronic circuitry.

2.2.2 Incoming RF signals within the range of the optional tuning head are first connected to jack J1 on the rear apron of the receiver. These signals are then connected through a coaxial cable to plug P2 which attaches to the input of the tuner. From this point the signals are amplified and converted to a 160-MHz IF output by the drop in tuning head. The 160 MHz IF signal is applied to plug P4 and through another coaxial cable to the input of the 160 to 21.4 MHz Converter, A5. A connection within A5 also routes the IF signal to the input of 160 MHz IF Amplifier, A6.

2.2.3 The input stage in the converter module, A5Q1, is a dual insulated gate field-effect amplifier (IGFET). It is gain-controlled by the application of a voltage (AGC) from AGC amplifier.A10 in the FM, AM/AGC, and PULSE mode. A gain control voltage derived from the front panel RF GAIN control is applied to the stage in the AM/MAN mode. The second stage in the converter is a balanced mixer circuit containing diodes A5A1CR1 through A5A1CR4. It receives the amplified signals from A5Q1 and heterodynes them with the output of crystal oscillator A5Q2, a 138.6-MHz signal, to produce predominantly sum and difference outputs. The difference output of 21.4 MHz is amplified by the output stage in the converter, A5Q3, and is applied to the input of the 21.4-MHz C.F. 2/4 MHz bandwidth IF Amplifier, A13. A parallel connection within this module provides an output which is applied to the input of the 100-kHz bandwidth IF strip, A8.

2.2.4 A second IGFET (A13A1Q1) is used as the input amplifier stage in this dual-bandwidth IF amplifier. Output signals from the drain of this gain-controlled stage are coupled out through one of two parallel paths. Both paths are similar in that each contains an input amplifier, a bandpass determining network, and an output diode switch. The path through which the IF signal is passed is determined by the setting of the IF BANDWIDTH switch, S6, on the front panel. This is a five-position rotary switch that supplies the operating voltage for the amplifier in the particular path as well as opens and closes the output switch. In this case, when the 2-MHz bandwidth is selected, the path containing A13A1Q2 and Diode Switch A13A1CR3 and CR1 is activated. Selection of the 4-MHz bandwidth activates the path containing A13A1Q3 and diode switch A13A1CR4 and CR2. The output switches ensure that no feedthrough occurs in the unused path. Transistor A13A1Q4, a gain-controlled IGFET, amplifies the IF signal from the path in operation and drives to a fourth amplifier stage, A13A1Q5. This stage is also activated by a section of the IF BANDWIDTH switch. Amplified output signals from this stage are coupled to cascaded amplifiers A13A1Q6 and A13A1Q7. This circuit provides the predetection output appearing at rear apron jack J11 as well as the input to the FM discriminator circuits in this IF strip. This signal is also detected by AM detector diode A13A1CR6 and is coupled through cascaded emitter followers A13A1Q8 and A13A1Q9 to section S6A-X of the IF bandwidth switch. Integrated circuit A13A2U1 functions as an FM amplifier and limiter which drives an additional amplifier stage, A13A2Q1. This transistor supplies the input to the discriminator circuit containing transformer A13A2T1 and diodes A13A2CR1 and A13A2CR2. FM video signals from the discriminator are coupled out through parallel paths each of which contains a pair of emitter followers plus filter to trap 21.4 MHz. The FM video signal applied to the filters is taken from the output developed by emitter followers A13A2Q4 and Q13A2Q5 which are connected in a complementary symmetry configuration. Both wide-band and narrow-band FM video outputs from this subassembly are applied to section S6A-W of the IF BANDWIDTH switch.

2.2.5 Dual insulated-gate field-effect transistor A8A1Q1 functions as the IF input stage in the 100-kHz bandwidth IF amplifier, A8. This gain-controlled transistor amplifies the 21.4-MHz signal obtained from subassembly A13 and applies it to a second amplifier stage, A8A1Q2. A potentiometer located in the emitter circuit of this stage permits the gain to be adjusted during initial alignment. Amplified output signals from A8A1Q2 are coupled through the bandwidth determining element, 100-kHz crystal filter A8FL1, to a third amplifier stage, A8A2Q1. Additional gain is provided by a fourth amplifier, A8A2Q2. The gain required to drive the AM detector, the predetection IF output and the FM discriminator circuits is provided by a fifth amplifier, A8A2Q3. Diode A8A2CR1 demodulates the AM signals and couples the resultant video output through cascaded emitter followers A8A2Q4 and A8A2Q5 to section S6A-X of the IF BANDWIDTH switch. Amplification and limiting of FM signals is performed by integrated circuit A8A3U1. It, in turn, drives the discriminator circuit made up of transformer A8A3T1 and diodes A8A3CR1 and A8A3CR2. Video output signals are coupled through parallel emitter followers A8A3Q1 and A8A3Q2 to complementary symmetry output emitter followers A8A3Q3 and A8A3Q4. This FM video output is applied to IF BANDWIDTH switch section S6A-W.

2.2.6 Incoming 160-MHz IF signals obtained from converter module A5 are applied directly to input amplifier stage A6A1Q1 on the 10/20-MHz bandwidth IF strip, A6. In addition, this input is fed through an 8-dB pad to rear-apron 160-MHz SM OUTPUT jack, J3, for use by a signal monitor having a 160-MHz input center frequency. The second stage in the IF strip, A6Q1, operates as one-half of a cascode amplifier. The second half is formed by one of two transistors: A6Q2 or A6Q3. The stage in operation is determined by the position of the IF BANDWIDTH switch. If the 10-MHz bandwidth is selected, transistor A6Q3 is activated. When the 20-MHz bandwidth is selected, transistor A6Q2 turns on to form the second half of the cascode circuit. Additional amplification of the 160-MHz IF signal occurs in another cascode circuit formed by A6Q6 in conjunction with A6Q4 or A6Q5 depending on the position of the IF BANDWIDTH switch. Following this cascode circuit, is a second dual-gate, field-effect amplifier, A6A2Q1. This transistor, as well as A6A1Q1, is gain-controlled by the application of IF AGC voltage. Two additional cascode IF amplifier circuits follow A6A2Q1. These circuits contain transistors A6Q7-A6Q8 and A6Q9-A6Q10. Two outputs are provided from the latter circuit. One output is applied to AM detector diode A6CR5. The other output is applied to the FM discriminator circuits. Demodulated AM signals from A6CR5 are coupled through parallel emitter followers A6A3Q1 and A6A3Q2 to output emitter followers A6A3Q3 and A6A3Q4. These two transistors are connected in a complementary symmetry configuration to provide a single AM video output that is applied to section S6A-X of the IF BANDWIDTH switch.

2.2.7 Amplitude limiting of FM signals from A6 prior to demodulation occurs in the 160-MHz FM limiter/discriminator module A7. Four limiters are employed, each of which is composed of two back-to-back diodes (A7CR1 through A7CR8) separated by an amplifier stage. The gain of the amplifiers is controlled by the action of the limiting diodes as they effectively shunt the tank circuits with increasing signal strength. Limited FM signals are applied in parallel to detector driver transistors A7Q4 and A7Q5 which, in turn, drive discriminator detectors A7CR9 and A7CR10. Video outputs from these diodes are summed across potentiometer A7R27 to produce the FM video output Transistors A7Q6 and A7Q7 amplify the video output from the discriminator and apply it to complementary symmetry emitter followers A7Q8 and A7Q9. Separate video roll-off filters are employed to set the 10-MHz and 20-MHz video bandwidths. Both video signals are applied to section S6A-W of the IF BANDWIDTH switch.

2.2.8 The AM video signals from each of the IF amplifiers, A6, A7, and A13, are connected to respective positions on IF BANDWIDTH switch section S6A-X. Selection of the desired IF bandwidth connects the associated AM video signal to the switch arm and then to the AGC delay circuits and MODE switch sections S5-C and S5-D. The FM video signals from each of the IF strips are all connected to IF BANDWIDTH switch section, S6A-W. Video signals from the arm of this switch section are connected to various other switch sections (see Figure 2-1) including the FM position on S5C-F. The arm of S5C-F supplies the input to the audio amplifier, A11, and the video gain control. From the arm of this control, the signal is applied to the video module, A9.

2.2.9 The audio amplifier input stage, A11Q1, is an emitter follower functioning as a low-impedance source driver for a pulse stretching network. This circuit, titled aural enhancement, permits pulse input signals to be monitored with a loudspeaker or headphones. The front-panel AURAL ENHANCEMENT switch activates this circuit when placed in the ON position. A second emitter follower, A11Q2, drives audio amplifier transistors A11Q3 and A11Q4 through the front panel AUDIO GAIN control. The audio output circuit consists of complementary symmetry emitter followers A11Q5 and A11Q6. Impedance matching between the output stages and the 600-ohm load is made by transformer A11T1. Audio signals are available from pins 1 and 2 of terminal board TB1 and the front-panel headphones jack.

2.2.10 The video module receives its input from the VIDEO GAIN potentiometer. This signal is amplified by A9Q1, a dual NPN transistor connected in a differential amplifier configuration. Additional amplification is provided by A9Q2 which, in turn, drives output complementary symmetry emitter followers A9Q3 and A9Q4. Amplified video signals are connected to jack J12 on the rear apron.

2.2.11 Prior to entering the AGC amplifier, the output from the AM detector in the activated IF strip is passed through a delay network containing diodes CR1 through CR3. Once the AM detector voltage reaches sufficient amplitude to overcome the delay circuit, the voltage is coupled through a pair of cascoded emitter follower stages, A10Q1-A10Q2 and A10Q3-A10Q4 separated by a pulse stretching network to AGC amplifier A10Q5. When the PULSE mode is selected the pulse stretching circuit is activated, producing a more linear AGC output during the reception of pulse-modulated signals. Following the second cascode emitter follower circuit are the IF and RF AGC amplifier and regulator stages, A10Q5 and A10Q6, plus an RF AGC delay diode, A10VR1. Section S5A-F of the MODE switch controls the type of input to the AGC output stages - either the signal from A10Q5 or the output from the RF GAIN potentiometer on the front panel. Gain control voltage for the IF circuits is taken from regulator stage A10Q6 whereas RF AGC voltage is obtained from the delay network following this stage. The RF AGC output is connected to pin "J" of jack J9, the multipin receptacle that supplies power and control voltages to the associated RF tuning head.

2.2.12 An additional feature of the 112 Receiver is the capability of internal or external automatic frequency control (AFC). Module A12 is included to perform this function. A three-position rotary switch (S4) on the front panel controls this module by selecting the correct input and activating an internal electronic switch. The internal (INT) AFC mode can only be employed when either the 10-MHz or 20-MHz IF bandwidths are selected. When this configuration is set, the dc portion of the wideband FM discriminator is applied to AFC amplifier A12U1 through S4A-W. Electronic switching transistor A12Q1 has been opened by the ground applied through S6C-W and S4A-X. Consequently, the FM input signal is amplified summed with the FINE TUNE voltage and fed back to the local oscillator in the RF tuner. A feedback signal occurs only when the local oscillator has drifted off frequency producing an output from the FM discriminator that is other than a "zero-volt" condition. The feedback voltage will correct the tuner local

oscillator frequency. Selection of external AFC (EXT) permits the receiver frequency to be controlled when any IF bandwidth is used. The source of an external frequency control voltage, for example, can be an electronic frequency counter having DAFC capability. This correction voltage enters the receiver through jack J13 and is connected to the AFC amplifier stage (A12U1) by switch S4A-W. A third method of voltage frequency control is through the use of the front panel FINE TUNE control. This potentiometer supplies a voltage to the RF tuner when the FINE TUNE position is selected. Grounds are applied to the AFC amplifier input and electronic switch removing them from the circuit. All of the frequency control voltages enter the RF tuner through pin "K" of jack J9.

2.2.13 The power supply in the 112 Receiver is designed to operate from 115 or 220 Vac, 50-400 Hz. The receiver will also operate from 230 Vac by changing the connections to the power transformer primary windings (see Figure 6-22). Four etched circuit boards are used to supply the regulated operating voltages. Regulator board A1 supplies both +28V and +150V outputs. The 28-volt supply utilizes main chassis power transistor Q1 as a series regulator which is controlled by transistor Q1 on the board. A full-wave rectifier, A1CR1-A1CR2, supplies the dc input to the series regulator. A sampling network connects voltage changes from the regulated output to a differential amplifier, A1Q2-A1Q3, which supplies an error voltage output. The error voltage is produced by comparison of the sampled input with a fixed reference set by A1VR1. It is amplified by the differential circuit and used to control the conduction through A1Q1, which, in turn, controls the series regulator. A similar configuration is used to form the +150V circuit. The series regulator in this case is A1Q4 with zener diode VR2 supplying the fixed reference. A differential amplifier is not used in this case. The sampled output voltage is applied directly to the control transistor, A1Q5. The remaining three power supply boards are almost identical to the +28V circuit. The +6V board, A2, is functionally identical. This board utilizes a second main chassis power transistor, Q2. The +15V board, A3, and the -15V board, A4, are similar except that series regulator transistors are included as an integral part of each module.

2.3 TYPE 71285 160/21.4 MHz CONVERTER

The schematic diagram for the Type 71285 160/21.4 MHz Converter is Figure 6-5; its reference designation prefix is A5. The 160 MHz IF signal from the tuning head is connected to jack J1 which is wired to output jack J2, to drive the input of module A6. The input at J1 is also coupled through capacitor C1 to the input of RF amplifier Q1.

2.3.1 The input stage of the converter, Q1, is a dual IGFET (insulated gate field-effect transistor). The incoming 160 MHz IF signal is coupled to gate number 1 (pin 3) and the output is taken at the drain (pin 1). This stage is gain controlled by application of a negative-going AGC voltage to gate number 2 (pin 2). The AGC voltage is applied to the gate through feedthrough capacitor C6 and resistors R8, R5, R6. This stage, operates at maximum gain until AGC action begins. Capacitor C5 holds the gain-controlled gate at ac ground potential. The drain is tuned to 160 MHz with C8, C13, and L3 and the amplified output is coupled through capacitor C15 to the balanced mixer.

2.3.2 The balanced mixer consists of diodes A1CR1 through A1CR4 and transformers A1T1 and A1T2. The balanced configuration of the mixer suppresses both the input frequency and LO frequency and passes only the sum and difference of these frequencies. The signals out of the balanced mixer are taken at the center tap of A1T2. Inductor L5 and capacitor C20 form a tuned circuit for the difference frequency (21.4 MHz) and L8 and C26 form a series trap for the sum frequency (298.6 MHz). The selected difference frequency is coupled to the base of transistor Q3 and is taken out at the collector. Inductor L7 and capacitor C25 resonate the collector to the 21.4 MHz output frequency.

2.3.3 The local oscillator consists of transistor Q2 which operates in a grounded base circuit with the frequency controlled by crystal Y1. The crystal is in the feedback path from the tuned circuit made up of C11, C12, C14 and L4. Capacitor C14 is used to set the tuned circuits frequency to the crystal frequency. Inductor L2 is used to tune out the capacitance of the crystal holder. The LO signal is coupled through C18 to jack J5, W1, J4, and R18 to A1T2.

2.4 TYPE 72304-1 160 MHz IF AMPLIFIER

The schematic diagram for the Type 72304-1 160 MHz IF Amplifier is Figure 6-6; its reference designation prefix is A6. The 160 MHz signal is connected to jack J1. The signal is then passed through a resistive attenuator consisting of R1, R3 and R55 and out of the module at jack J2. The 160 MHz signal at jack J2 is taken out of the receiver at rear apron connector J3 as the 160 MHz SM OUTPUT. The signal at J1 is also applied to the input amplifier.

2.4.1 Input Amplifier. - The input amplifier stage, A1Q1, is a dual insulated-gate field effect transistor. It is mounted on a small etched circuit board which carries the reference designation prefix A1. Incoming signals to this stage are obtained from impedance matching transformer T1 which matches the output impedance of the IF source to the input impedance of A1Q1. IF signals from T1 are coupled through dc-blocking capacitor C56 to gate number 1 (pin 3) of A1Q1. Amplified signals are taken from the drain connection (pin 1). Gain control voltage from the AGC amplifier or manual gain control is fed through feedthrough capacitor C2 and resistor R6 to gate number 2 (pin 2) of A1Q1 which is held at ac ground by A1C1. The drain load for the amplifier is formed by the tuned circuit consisting of variable capacitor C13 and transformer T2. Resistor R8 provides the desired loading of the tank to set the circuit Q. The transformer is tapped to set the proper impedance between A1Q1 and the following stage, Q1. Blocking capacitor C15 couples the IF signal from T2 to the base of this stage.

2.4.2 10/20 MHz IF Amplifiers. -

2.4.2.1 Transistor Q1, a common emitter amplifier, forms the first half of a cascode IF amplifier circuit. It operates in conjunction with either Q2 or Q3 depending on the setting of the front-panel IF BANDWIDTH switch, S3. This switch applies +15V to feedthrough C3 when the 10-MHz bandwidth is selected, and to feedthrough C4 when the 20-MHz bandwidth is selected. Assuming that the 10-MHz bandwidth is selected, +15V is fed to

the collector circuit of Q3 through the tank inductor L3, and to the base through diode CR2 activating the stage. At the same time, diode CR4 is forward biased, clamping the base of the following stage, Q5, allowing it to conduct. The double-tuned bandpass filter containing variable capacitors C23 and C29, sets the bandwidth of this path at 10-MHz. Transformer T4 in the filter output section is tapped to set the proper impedance match between the filter and the input of the next amplifier. Coupling of the IF signal from the filter to the base of Q5 is through blocking capacitor C31. The 20-MHz network containing transistors Q2 and Q4 is functionally identical to the 10-MHz circuit. Electrical differences exist in the values of the bandwidth determining components that produce the wider response.

2.4.2.2 Transistor Q4 or Q5 operates in conjunction with Q6 to form a second cascode IF amplifier. The active transistor depends upon the bandwidth selected. The collector load for Q6 is made up of a single-tuned circuit containing transformer T5 and variable capacitor C36. Capacitor C37 couples amplified signals from the tap on transformer T5 to the signal gate (pin 3) of the next gain-controlled transistor, A2Q1. This is a dual IGFET operating in a common source circuit. Output signals developed across drain load resistor R36 are coupled through C38 and a single-tuned circuit made up of C39 and T6, to a third cascode amplifier.

2.4.2.3 The third cascode IF amplifier is composed of transistors Q7 and Q8. Biasing of these two stages is similar to the cascode circuit described in paragraph 2.4.2.1. The collector load for the output half of the cascode amplifier is a single-tuned filter made up of tapped transformer T7 and variable capacitor C42. Amplified signals from this network are taken from the transformer tap and coupled through capacitor C43 to a fourth cascode amplifier. This network, consisting of transistors Q9 and Q10, supplies two outputs. One is fed to detector diode CR5 and the other is a predetection 160-MHz IF signal which is fed to the input of the limiter/discriminator subassembly. The collector of Q10 is tuned to the IF frequency by C49. Blocking capacitor C48 feeds the IF signal to CR5 where it is demodulated and filtered by C46 and L5. Inductor L4 provides the dc return path for the diode, while R51 develops the output signal.

2.4.2.4 Part 15203 Video Amplifier. - The complete reference designation prefix for this subassembly is A1A3. It consists of a pair of emitter followers, Q1 and Q2, driving output transistors Q3 and Q4. The two latter stages are connected as complementary symmetry emitter followers. The AM video signal is connected to module pin E1 and the output signal is taken from module pin E4. Parasitic suppresor R54 and filter inductor L8 connect the AM signal to jack J4. Tapped transformer T8 supplies the input IF signal for the limiter/discriminator (A7). It is coupled through capacitor C50 to jack J3.

2.5 TYPE 79640 160 MHz LIMITER/DISCRIMINATOR

The schematic diagram for the Type 79640 160 MHz Limiter/Discriminator is Figure 6-7; its reference designation prefix is A7. Four limiters, each separated by an amplifier, plus a discriminator and video amplifier are included on this chassis.

2.5.1 FM Limiters. - Input signals applied to J1 are routed to the tap on T3. From T3 there are two signal paths. One path routes signals back out of the assembly at J2 for use as a wideband predetect source. The other path couples signals to T4, which resonates with C1. Limiting-diodes CR1 and CR2 -- the first of four limiting pairs -- clip the positive and negative peaks thereby reducing amplituded variations. Signals from Q1 are limited by CR3-CR4 and applied to Q2. The collector stage of Q2 is resonated by L6 and C8. Signals here are limited by the third pair of limiting diodes, CR5-CR6, and applied to Q3. This stage too has a resonant collector stage (C12, T2) containing limiting diodes (CR7-CR8). From T2, the signals are coupled to the Discriminator stage. Diode CR11 provides detection for TP1.

2.5.2 FM Discriminator. - A pair of slope detectors are used to demodulate the FM signal. Each is driven by a separate amplifier stage. The circuit containing diode CR9 is tuned to the high side of 160-MHz while the network containing CR10 is tuned to the low side. Since the polarities of the diodes are opposite, a negative and a positive response is produced. Also, since the detectors are tuned to different frequencies, the response peaks are separated by 30 MHz. The outputs of the slope detectors are summed across balance resistor R27 and combine to form the conventional discriminator S-curve response. Demodulated FM signals taken from the arm of the discriminator balance potentiometer are filtered by L3 before being coupled through C24 and R30 to the output video amplifier. The dc component of the discriminator output is fed through R29 and feedthrough C25, to front panel switch S6C and to the front panel tuning meter M2.

2.5.3 Video Amplifier. - The output video amplifier circuit consists of an NPN transistor, Q6, dc-coupled to Q7, a PNP transistor. These two stages provide the necessary voltage gain to drive complementary symmetry emitter followers Q8 and Q9. The latter two transistors are biased to operate Class AB. Negative dc feedback to set the overall gain of the amplifier is taken at the junction of emitter resistors R41 and R42 and fed to the emitter of Q6 through R37. The amount of feedback is determined by the ratio of this resistor and R35. Silicon diodes CR13 and CR14 determine the idling currents of Q8 and Q9 and eliminate crossover distortion while improving thermal stability. Since the transistors and diodes are made of the same material they exhibit the same temperature coefficient of voltage characteristics. A rise in temperature lowers the base-emitter voltage drop of the transistors tending to make them conduct harder. However, the diode voltage drop decreases by the same amount so that the voltage applied to the bases also decreases, holding the collector current nearly constant. Parallel video outputs are provided from the emitter followers. Each is fed through a low-pass video roll-off filter to respective output connectors. The filter containing L4 has a cut-off frequency of 20 MHz while the filter made up of L7 and C29 has a 10 MHz cut-off frequency. Both video outputs are connected through coaxial cables to section S6A of the IF BANDWIDTH MHz switch.

2.6 TYPE 72295 21.4 MHz IF AMPLIFIER

Figure 6-8 is the schematic diagram for the Type 72295 21.4 MHz IF Amplifier assembly; its reference designation prefix is A8. The assembly consists of an IF input amplifier (A8A1), an IF output amplifier (A8A2), and a 21.4 MHz limiter discriminator (A8A3) which are shown in Figures 6-9, 6-10 and 6-11 respectively. The IF signals to

the amplifier are brought in at jack J1. The signal passes through a resistive divider consisting of R1 and R2 and is taken out of the module at jack J2 where it is connected to the receiver rear apron connector J4 as the 21.4 MHz SM OUTPUT. The signal is also applied to the IF input amplifier (A8A1).

2.6.1 Part 15295 IF Input Amplifier. - The input stage, Q1, of the IF input amplifier is a dual-gate IGFET. The incoming 21.4 MHz IF signal is coupled to gate number 1 (pin 3) and the output is taken at the drain (pin 1). This stage is gain controlled by application of a negative-going AGC voltage to gate number 2 (pin 2) through resistors R3 and R4. This stage operates at maximum gain until AGC action begins. Capacitor C3 holds the gain-controlled gate at ac ground potential. The amplified signal is taken out at the drain and coupled through R7 and C6 to the base of transistor Q2. The gain of this stage is set by potentiometer R12 which controls the emitter current and degeneration of the transistor. The collector of Q2 is tuned to 21.4 MHz by capacitor C10 and inductor L2 and the signal is taken out of the amplifier at pin E4. The IF signal is then passed through a 100 kHz bandwidth filter (see Figure 6-8) and applied to the IF output amplifier.

2.6.2 Part 15298 IF Output Amplifier. - The first stage of the IF output amplifier is a dual gate IGFET. The 21.4 MHz IF signal is applied to gate number 1 and is taken out at the drain. This stage is gain controlled by application of a negative-going AGC voltage on gate number 2. The amplified signal is coupled through dc blocking capacitor C6 to the base of transistor Q2. This stage further amplifies the 21.4 MHz signal and drives Q3 through C9, a neutralized common emitter amplifier. This stage drives transformer T1 and AM detector diode CR1. Capacitor C14 tunes the secondary of T1 and is used to shape the response of the 100 kHz wide signal which is coupled through dc blocking capacitor C12 and resistor R18 to the limiter in A8A3. This same signal is applied to a capacitive voltage divider made up of C13 and C15 and is wired to jack J3 (see Figure 6-8) as a 21.4 MHz IF signal. Inductor L3 and capacitors C16 and C17 from low pass filter to remove any 21.4 MHz component from the detected signal. Transistors Q4 and Q5 are cascoded complementary emitter followers which provide video drive without loading the preceeding stages. Inductor L2 and capacitor C20 form an additional low pass filter to eliminate any 21.4 MHz component remaining in the video output.

2.6.3 Part 15196 21.4 MHz FM Limiter/Discriminator. - The 21.4 MHz input is applied to pin E1. Capacitors C1 and C2 peak the input signal to amplifier/limiter U1 which operates as an amplifier for small signals and as an over-driven amplifier/limiter for larger signals. Resistor R16 completes the bias network between the high and low level inputs of U1. Zener diode VR1 reduces the supply voltage to 3.3 volts to provide the correct value to operate U1. The output of U1 is tuned by L2, C4 and C6. The primary of transformer T1 is in series with L2 to provide an impedance stepdown. Capacitor C7 couples the IF reference voltage to the transformer secondary. Diodes CR1 and CR2 demodulate the FM signal and apply it to the bases of cascoded emitter followers Q1 and Q2 which in turn drive emitter followers Q3 and Q4. Inductor L3 and capacitor C13 remove any remaining 21.4 MHz from the video signal.

2.7 TYPE 7361 VIDEO AMPLIFIER

The schematic diagram for this module is Figure 6-12; its reference designation prefix is A9. Video input signals from the arm of mode switch S5B are applied to VIDEO GAIN potentiometer R9 (see Figure 6-22) and then to the video amplifier module pin 14. They are the coupled through C1 and R1 to the input of Q1, a dual NPN transistor. This stage is connected in a differential amplifier configuration with the video input being applied to pin 2 and a feedback signal being connected to pin 6. The difference between these two inputs is amplified and taken from pin 1. It is dc-coupled to the base of Q2, a PNP transistor. These two stages provide the necessary voltage gain to drive complementary symmetry emitter followers Q3 and Q4. Silicon diodes CR1 and CR2 perform the same function for this circuit as diodes CR13 and CR14 do for the circuit explained in paragraph 2.5.3. The amplified video signal taken from the function of emitter resistors R16 and R17 is fed through parasitic suppressor R18 and inductor L1 to module pin 4. The dc portion of this signal is fed back to Q1 through R10 to set the gain of the amplifier. The amount of feedback is determined by the ratio of R9 and R10. These resistors have 1% tolerances to prevent differences in gain between various type 7361 video amplifiers. From module pin 4, the amplified video signal is fed through a coaxial cable to rear-apron jack J12.

2.8 TYPE 7866 AGC AMPLIFIER

Figure 6-13 is the schematic diagram for the AGC amplifier; the reference designation prefix is A10. The module provides gain control voltage for the receiver IF amplifiers and an RF gain control voltage for the associated tuning head. In AM video signal from the operating AM detector is applied to pin 19 of the module after passing through main chassis diodes CR1, CR2, and CR3. (Refer to Figure 6-22). These diodes set the AGC threshold by requiring a 1.8 volt rise in AM detector voltage before AGC action begins. The positive going AM detector voltage is applied to the base of Q1 through R1. Transistors Q1 and Q2 are complementary emitter followers which provide buffering of the input voltage. From the emitter resistor of Q2 the voltage is coupled through a modulation filter consisting of R4 and C1 to the base of Q3 in the AM and FM reception modes. In the PULSE mode, the main chassis function switch connects module pins 21 and 20 which applies the emitter voltage of Q2 to C1 through diode CR1. When the emitter voltage of Q2 is coupled through R4, the AGC time constant is formed by R4, C1, and the shelf network consisting of R5 and C2. In the pulse mode, the emitter voltage of Q2 charges C1 rapidly through CR1. When the pulse signal amplitude falls, CR1 becomes reverse biased and the discharge path for C1 and C2 is through R4. This fast charge, slow discharge, effect provides a stretching action of the pulsed AM detector voltage input. The shelf network consisting of R5 and C2 forms a portion of the AGC time constant network and helps to stabilize the AGC circuit operation. Transistors Q3 and Q4 form a second pair of complementary emitter followers. From the emitter of Q4, the developed voltage is applied to the base of Q5 a common emitter amplifier with a gain of approximately thirty. The amplified voltage at the collector is

applied to the function switch through module pin 10. Resistor R19 and C4 form a second shelf network at the collector. Either the voltage from Q5, or a gain control voltage from the front panel RF GAIN control is returned to the module through pin 6 and applied to the base of Q6. Transistor Q6 functions as an emitter follower driving both the RF and IF AGC lines. The RF AGC voltage is taken from the emitter of Q6 through R26 and R27 and appears at module pin 4. Due to the biasing of Q6, it is conducting with no input voltage conditions and its emitter voltage is approximately +14 volts. As the AM detector voltage to the module increases the voltage at the emitter of Q6 swings negative from the initial +14 volt level. Zener diode VR1 clamps the RF AGC voltage at +8.2 volts until the voltage at the junction of R26 and R27 falls below this level. When this occurs, RF AGC action begins and the voltage at module pin 4 follows the emitter voltage of Q6. Resistor R27 and C6 provide additional filtering of the RF AGC voltage. The IF AGC voltage from module pin 16 is taken from the junction of R14 and R24 and under no signal conditions is approximately +5 volts. When AGC action begins and Q6 conducts less heavily, the voltage at pin 16 swings less positive from the initial +5 volt condition. Diode CR2 prevents the junction of R23 and R24 from ever going more negative than -0.6 volts. The front panel signal strength meter is connected to module pins 12 and 3. A meter biasing arrangement is used consisting of R12, R13, R11, R10, and diodes CR4 and CR3. These components allow the meter to rest at zero with no signal input to the receiver, and prevent the meter from everreading backwards. Resistor R9 connects the meter positive terminal to the emitter of Q4. At this point, the buffered AM detector voltage swings positive with increases in signal strength.

2.9 TYPE 7444 AUDIO AMPLIFIER

Figure 6-14 is the schematic for this module; its reference designation prefix is A11. The appropriate audio signal from the mode switch is applied to the module at pin 19, coupled through series resistor R1 and capacitor C1 to the base of emitter follower Q1. From the emitter of Q1, the audio is passed through CR1 and applied to the base of emitter follower Q2. Capacitor C2 and resistor R6 form a pulse stretching network which is operable when the AURAL ENHANCEMENT switch S3 on the receiver front panel is placed in the ON position. The signal from the emitter of Q2 is coupled through C3 and R9 to pin 21 which connects to the front panel AUDIO GAIN potentiometer, R1, from the arm of R1 the audio voltage is returned to the module at pin 17, coupled resistor R10 and capacitor C4 to the base of transistor Q3, which is dc-coupled to Q4. Transistors Q3 and Q4 provide the necessary voltage gain to drive complementary symmetry emitter followers Q5 and Q6. The latter two transistors are biased to operate Class B. Negative dc feedback to set the over-all gain of the amplifier is taken at the junction of emitter resistors R19 and R20 and fed to the emitter of Q3 through R14. Silicon diodes CR2 and CR3 serve three functions. First, they determine the idling currents of Q5 and Q6. Secondly, they eliminate crossover distortion while preventing thermal runaway. And third, they compensate for the base-emitter voltage drops of Q5 and Q6. Since the transistors and diodes are made of the same material they exhibit the same temperature coefficient of voltage characteristics. A rise in temperature lowers the base-emitter voltage drop of the transistors tending to make them conduct harder. However, the diode voltage drop decreases by the same amount so that the voltage applied to the bases also

decreases, holding the collector current nearly constant. Resistors R19 and R20 are included in the emitter circuits of Q5 and Q6 to provide additional feedback with low-input signal levels. These resistors permit an imperfect match between diodes CR2 and CR3 and the base-emitter junctions of Q5 and Q6. With little or no input signal the drop across the resistors is a few tenths of a volt. Large input signals would cause the drop to become excessive except that CR4 and CR5 become forward biased and limit the drop to approximately 0.6 volt. Capacitor C5 provides additional drive through R7 for Q6 during the negative-going portion of the input signal. The audio signal is coupled through C6 to the primary winding of transformer T1. The secondary winding provides a balanced 600-ohm output at module pins 2 and 3 which are wired to rear apron pins 1 and 2 on TB1 and also to PHONES jack J14 on the front panel.

2.10 TYPE 79922 AFC AMPLIFIER

The schematic diagram for this module is Figure 6-15; its reference designation prefix is A12. This module allows incremented control of the local oscillator frequency of the installed tuning head in three operating modes: INT AFC, FINE TUNE, and EXT AFC. A control voltage output is provided which is applied to a varactor diode in the tuning head local oscillator circuit. The control voltage varies the capacitance of the varactor and thus the tuned frequency. In the INT AFC mode, the dc portion of the operating FM discriminator is used by the module to control the local oscillator frequency in such a manner that a received signal is held very close to the receiver IF center frequency thus cancelling drift of the local oscillator and drift of the received signal. This operating mode can only be used in the 100 kHz, 2 MHz or 4 MHz (100 kHz, 0.5 MHz, and 1 MHz for the 112-1) IF bandwidth positions. In the EXT AFC position, an external control voltage can be used to vary the tuning head local oscillator frequency. When the FINE TUNE position is used, the front panel control allows the operator to make small changes in the tuned frequency manually.

2.10.1 INT AFC. - In the internal AFC mode, the dc portion of the FM discriminator output is applied through front panel switch S4A-W to module pin 8. The dc voltage is applied to the inverting input of operational amplifier U1 through R1. In this mode U1 functions as an integrating amplifier with C2 and C3 the integrator ac negative feedback capacitors. Transistor Q1 is a field-effect transistor switch which provides a negative feedback path around U1 in the FINE TUNE mode reducing its gain to nearly unity. Since U1 has only an ac negative feedback path, its dc gain is extremely high in the INT AFC mode. Output voltage from U1 is coupled through R5 to module pin 16 which connects to the tuning head local oscillator varactor diode. Resistors R5 and R6 form a voltage divider which sums the AFC voltage from U1 and the fine tuning voltage from the front panel control applied through module pin 18. Diode CR1 prevents the voltage at the junction of the summing resistors from ever going more negative than -0.6 volts to protect the varactor diode in the tuning head. Potentiometer R4 allows adjustment of U1 for zero volts output with zero volts input. When the discriminator output voltage is other than zero, the module provides a voltage to the tuning head which will cause the LO frequency to shift in such a manner that the received signal is shifted to the IF center frequency. This causes the discriminator output voltage to return to nearly zero. Thus the AFC loop holds the received signal centered in the receiver IF passband.

2.10.2 EXT AFC. - The operation of the AFC amplifier module in this mode is identical to the INT AFC mode except that an appropriate input must be provided to rear panel jack J13. An external IF amplifier/FM discriminator using the receiver rear panel IF output, or a frequency counter having digital automatic frequency control (DAFC) may be used for this purpose.

2.10.3 FINE TUNE. - In the FINE TUNE position, front panel switch S4A grounds pins 7 and 8 of the module. With module pin 7 grounded, FET switch Q1 conducts providing a low impedance negative feedback path around U1 reducing its gain to nearly unity. This in combination with the grounding of the amplifier input effectively removes it from the circuit leaving only the fine tuning voltage applied to the tuning head.

2.11 TYPE 72299 21.4 MHz IF AMPLIFIER (500 kHz/1 MHz BW)

Figure 6-16 is the schematic diagram for the Type 72299 21.4 MHz IF Assemblt; its reference designation prefix is A13. The assembly consists of a 21.4 MHz IF Amplifier (A13A1) and a 21.4 MHz FM Limiter Discriminator (A13A2) which are shown in Figures 6-17 and 6-18 respectively. The IF signals are brought into the amplifier at jack J1. The IF signal is fed back out of the module at jack J2 as well as being fed to the IF Amplifier board (A13A1) at pin E1.

2.11.1 Part 21954 21.4 MHz IF Amplifier. - The input stage of the IF Amplifier (Q1) is a type 3N140 dual-gate IGFET. The incoming 21.4 MHz IF signal is coupled to gate number 1 (pin 3) and the output is taken at the drain (pin 1). This stage is gain controlled by application of a negative-going AGC voltage to gate number 2 (pin 2) through resistors R3 and R4. This stage operates a maximum gain until AGC action begins. Capacitor C2 holds the gain-controlled gate at ac ground potential. The amplified signal is taken out at the drain and coupled through R8 and C8 to the base of transistors Q2 and Q3. The gain of these stages are set by potentiometers R15 and R17. Either the 500 kHz circuit path or the 1 MHz circuit path is activated by applying +15 volts from the IF BANDWIDTH MHz switch S6B to the base of either Q2 or Q3 and to diodes CR1, CR3 or CR2, CR4. The collectors of Q2 and Q3 drive BPF's which are tuned to 21.4 MHz with a bandwidth of either 500 kHz (Q2) or 1 MHz (Q3). The signal is then fed to another stage of IF amplification Q4, a dual gate IGFET. The 21.4 MHz IF signal is fed into gate number 1 and is taken out at the drain. This stage is gain controlled by application of a negative-going AGC voltage on a gate number 2. The amplified signal is fed through resistor R38 and dc blocking capacitor C52 to the base of transistor Q5. This stage further amplifies the 21.4 MHz signal and feeds it through a T-pad made up of R51, R52 and R53 to a cascode amplifier consisting of Q6 and Q7. The collector of Q6 is tuned to 21.4 MHz by L9 and C59 and the 21.4 MHz output is coupled through C62 to pin E10 and then to rear apron jack J11 which is the NB PRE-DET OUTPUT. The 21.4 MHz signal is also fed through R62 to pin E11 and then to the 21.4 MHz Limiter/Discriminator (A13A2). The IF signal from Q6 is also coupled through C61 to diode CR6 where it is detected. The detected signal is applied to the base of Q8. Transistors Q8 and Q9 are cascoded emitter followers which provide video drive without loading the preceeding stages. This stage is actuated only in the 500 kHz IF bandwidth position by application of +15 volts at

module pin E12. Inductor L11 and capacitor C69 form a filter to eliminate any 21.4 MHz component remaining in the video output.

2.11.2 Part 15170 21.4 MHz FM Limiter/Discriminator. - The input to this unit is at pin E1. Capacitor C1 and inductor L1 peak the input signal to amplifier/limiter U1 which operates as an amplifier for small signals and as an over-driven amplifier/limiter for larger signals. Resistor R1 completes the bias network between the high and low level inputs of U1. Zener diode VR1 reduces the supply voltage to 3.3 volts to provide the correct value to operate U1. The output of U1 is tuned by L2 with C5 and C6 in parallel and the primary of transformer T1. Capacitor C7 couples the IF reference voltage to the transformer secondary. Diodes CR1 and CR2 demodulate the FM signal and apply it to the bases of cascoded emitter followers Q1 and Q2 which in turn drive emitter followers Q3 and Q4. Inductor L3 and capacitor C13 remove any remaining 21.4 MHz from the narrow band FM video signal. A wideband FM signal is also taken out at pin E5 with L4 and C14 and C15 removing any remaining 21.4 MHz from the wideband signal.

2.12 TYPE 72301 21.4 MHz IF AMPLIFIER (2 MHz/4 MHz BW)

Figure 6-19 is the schematic diagram for the Type 72301 21.4 MHz IF Amplifier Assembly; its reference designation prefix is A13. The assembly consists of a 21.4 MHz IF Amplifier (A13A1) and a 21.4 MHz FM Limiter/Discriminator (A13A2) which are shown in Figures 6-20 and 6-21 respectively. The operation of this amplifier assembly is identical to that described in paragraph 2.11 except for the two bandwidths. This assembly has bandwidth of 2 MHz and 4 MHz. The Type 72301 21.4 MHz IF Amplifier is used in the Type 112 Receiver and the Type 72299 21.4 MHz IF Amplifier is used in the Type 112-1 Receiver.

2.13 TYPE 76183 +28/+150V POWER SUPPLY REGULATOR

The schematic diagram for this module is Figure 6-1; its reference designation prefix is A1.

2.13.1 +28V Power Supply Regulator. - Transistor Q1 on the main chassis (see Figure 6-22) functions as a series regulator whose conduction is controlled by Q1, an emitter follower. Transistors Q2 and Q3 are connected in a differential amplifier configuration. The base of Q3 is held at a fixed potential by zener diode VR1. The base of Q2 is connected to the regulated output through a sampling network consisting of fixed resistors R5 and R7, and potentiometer R6. The signals at the bases of the two stages are summed in the common emitter circuit to produce an amplified signal at the collector of Q2 that is the difference between the two inputs. Thus, any fluctuation in the output voltage is sensed by Q2, amplified and inverted and fed to the base of Q1. For example, if the output voltage rises (becomes more positive) Q2 will conduct harder, causing an increased voltage drop across R1 and R2. This lowers the forward bias voltage and the current flow through Q1. As a result, the current flow through external transistor Q1

is reduced, returning the output voltage to its nominal value. A differential amplifier is used in the comparison circuit as variations in base-emitter voltage due to temperature changes in one transistor will tend to cancel similar changes in the other. This configuration also permits the reference diode VR1 to be placed in the base circuit rather than the emitter, as is the case with a one-stage error amplifier. Less current flows through the diode, resulting in a more stable reference voltage.

2.13.2 +150V Power Supply Regulator. - Transistor Q4 is a series regulator whose conduction is controlled by transistor Q5. Zener diode VR2 sets a reference voltage and thus the base current for Q4 which flows through R18 and CR4. A portion of the base current also flows through R16 and transistor Q5 which senses any change in the output voltage of the power supply. If for example the output voltage rises, the base voltage on Q5 will increase causing it to conduct harder, thus diverting some of the base current from Q4 causing the output voltage to decrease. Diode CR5 prevents the base of Q5 from going more than 0.6 volts greater than the emitter. Transistor Q6 functions as a current regulator. If the current increases so that the voltage drop across R11 exceeds 0.6 volts then Q6 will conduct, lowering the output voltage and limiting the output current to 40 ma.

2.14 TYPE 76164 +6V POWER SUPPLY REGULATOR

The schematic diagram for this module is Figure 6-2; its reference designation prefix is A2. Transistor Q2 on the main chassis (see Figure 6-22), functions as a series regulator whose conduction is controlled by Q1, an emitter follower. Transistors Q2 and Q3 are connected in a differential amplifier configuration. The base of Q3 is held at a fixed potential by zener diode VR1. The base of Q2 is connected to the regulated output through a sampling network consisting of fixed resistors R6 and R8 and potentiometer R7. The signals at the bases of the two stages are summed in the common emitter circuit to produce an amplified signal at the collector of Q2 that is the differences between the two inputs. Thus, any fluctuation in the output voltage is senses by Q2, amplified and inverted and fed to the base of Q1. For example, if the output voltage rises, Q2 will conduct harder, causing an increased voltage drop across R1 and R3. This lowers the forward bias voltage and the current flow through Q1. As a result, the current flow through external transistor Q1 is reduced, returning the output voltage to its nominal value. Resistor R4 connects the base of Q2 to the input side of the regulator so that voltage fluctuations at this point can be sensed and compensated for by Q1. A differential amplifier is used in the comparison circuit as variations in base-emitter voltage due to temperature changes in one transistor will tend to cancel similar changes in the other. This configuration also permits the reference diode VR1 to be placed in the base circuit rather than the emitter, as is the case with a one-stage error amplifier. Less current flows through the diode, resulting in a more stable reference voltage.

2.15 TYPE 76185 +15V POWER SUPPLY REGULATOR

The schematic diagram for this module is Figure 6-3; its reference designation prefix is A4. Transistor Q1 functions as a series regulator whose conduction is controlled by Q2, an emitter follower. Transistors Q3 and Q4 are connected in a

differential amplifier configuration. The base of Q4 is held at a fixed potential by zener diode VR1. The base of Q3 is connected to the regulated output through a sampling network consisting of fixed resistors R6 and R8, and potentiometer R7. The signals at the bases of the two stages are summed in the common emitter circuit to produce an amplified signal at the collector of Q3 that is the difference between the two inputs. Thus, any fluctuation in the output voltage is sensed by Q3, amplified and inverted and fed to the base of Q2. For example, if the output voltage rises Q3 will conduct harder, causing an increased voltage drop across R2 and R3. This lowers the forward bias voltage and the current flow through Q2. As a result, the current flow through Q1 is reduced, returning the output voltage to its nominal value. Resistor R4 connects the base of Q3 to the input side of the regulator so that voltage fluctuations at this point can be sensed and compensated for by Q1. A differential amplifier is used in the comparison circuit as variations in base-emitter voltage due to temperature changes in one transistor will tend to cancel similar changes in the other. This configuration also permits the reference diode VR1 to be placed in the base circuit rather than the emitter, as is the case with a one-stage error amplifier. Less current flows through the diode, resulting in a more stable reference voltage.

2.16 TYPE 76186 -15V POWER SUPPLY REGULATOR

Figure 6-4 is the schematic diagram for this power supply: A4 is its reference designation prefix. This board is functionally identical to the +15V board described in paragraph 2.15. The polarity of the diodes, transistors and capacitors has been reversed to supply the negative voltage. Transistors Q2 functions as a dc amplifier in this case, as the high current output of the emitter follower used in the +15V supply is not required.

SECTION III

INSTALLATION AND OPERATION

3.1 UNPACKING AND INSPECTION

3.1.1 Examine the shipping carton for damage before the equipment is unpacked. If the carton has been damaged, try to have the carrier's agent present when the equipment is unpacked. If not, retain the shipping cartons and padding material for the carrier's inspection if damage to the equipment is evident after it has been unpacked.

3.1.2 See that the equipment is complete as listed on the packing slip. Contact Watkins-Johnson Company, CEI Division, or your Watkins-Johnson representative with details of any shortage. The absence of a minor component that does not affect proper functioning should not prevent the equipment from being used.

3.1.3 The unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. It is, therefore, ready for use upon receipt. After uncrating and checking contents against the packing slip, visually inspect all exterior surfaces for dents and scratches. Remove the dust covers and inspect the internal components for apparent damage. Check the internal cables for loose connections and plug-in items, such as printed wiring boards, which may have been loosened from their receptacles.

3.2 INSTALLATION

3.2.1 Receiver Installation. - The Type 112 Receiver is designed for mounting in a standard 19-inch rack. The unit will occupy 3.5 inches of vertical space and extend approximately 19 inches back into the rack. Critical dimensions are shown in Figure 3-1. If used in a mobile installation, some means should be devised to support the sides and/or rear of the equipment. A brace extending along the sides from the front panel to the rear apron is preferred. Do not rely solely on the front-panel mounting hardware to support the unit. The rack installation should allow a free flow of air through the holes in the top and bottom dust covers. For this reason, at least 1/8-inch of clearance above and below the unit should be provided. The installation should also allow access to the rear panel so that the input and output connections can be made and changed if desired. The rear apron connections to the receiver are described in the following paragraphs. A rear view of the receiver is shown in Figure 5-2.

3.2.2 Tuning Head Removal and Installation. - To remove a TH Series Tuning Head from the Type 112 or 112-1 Receiver proceed as follows:

(1) Remove the receiver from the equipment rack and place it on its side on the work surface.

(2) Loosen the two screw fasteners at the rear of the top dust cover and slide the cover off.

(3) Loosen the two screw fasteners at the rear of the bottom dust cover and slide the cover off.

(4) Remove the largest of the three allen wrenches mounted on the underside of the chassis. Remove the tuning knob from the tuning shaft by loosening the two setscrews with the allen wrench. Return the allen wrench to its mounting clip.

(5) Disconnect the interconnecting cables between the tuning head and the receiver chassis as follows:

(a) Disconnect the multipin power connector from the multipin jack J9 on the main chassis.

(b) Disconnect the LO coaxial cable connector from the LO coupler Z4 of the tuning head.

(c) Disconnect the subminiature plug from jack J2 of the 160-MHz IF Preamplifier A1 located on the tuning head.

(d) Disconnect the semi-rigid tubing connector from the YIG filter FL1 which is located on the left rear corner of the tuning head. Carefully move the semi-rigid tubing and connector away from the jack on the YIG filter.

(6) Remove the eight screws which hold the tuning head to the main chassis. The screws are removed from the top side of the chassis.

(7) Working on the bottom side of the receiver move the rear end of the tuning head down and away from the main chassis.

(8) Remove the head by moving it down and away from the main chassis so that the tuning shaft clears the front panel.

(9) To install a tuning head reverse the above procedure. It is not necessary to remove any of the subassemblies, modules or cables which are permanently affixed to the tuning head. Make certain that there are no cables pinched between the tuning head and main chassis when tightening the eight screws which secure the tuning head to the main chassis.

3.2.3 Power Connections. - Turn the POWER switch OFF. Plug the power cord into a 115 or 230 Vac, 50-400 Hz, source. The third pin of the power plug grounds the unit. If a three-pin receptacle is not available use the three-to-two pin adapter provided. Be sure to attach the wire from the adapter to a suitable ground. Before energizing the receiver, check the rear-apron input power selector switch, S5, to make sure it is in the proper position for the line voltage being used. (As received from the factory the transformer is wired for 115/215 Vac. To wire for 115/230 Vac operation move the wire from pin 16 of the transformer to pin 3 of the transformer -- see Figure 6-22.)

3.2.4 Antenna Connection. - Connect the antenna to R. F. INPUT jack J1. This jack is a type N connector.

3.2.5 Local Oscillator Output. - The LO OUTPUT jack J2 is a type N connector. This output will deliver 22 mV, minimum, into a 50-ohm load. (This connector is provided with a cap which is to be kept in place on the connector when not in use to prevent LO radiation.)

3.2.6 160 MHz Signal Monitor Output. - A 160 MHz signal to drive a signal monitor is available at the 160 MHz SM OUTPUT jack J3, a type BNC connector.

3.2.7 21.4 MHz Signal Monitor Output. - A 21.4 MHz signal to drive a signal monitor is available at the 21.4 MHz SM OUTPUT jack J4, a type BNC connector.

3.2.8 Narrow Band Pre-Detected Output. - A 21.4 MHz narrow band undetected IF signal is available at the NB PRE-DET OUTPUT jack J11, a type BNC connector.

3.2.9 Video Output. - The video output from the receiver is available at a BNC connector marked VIDEO J12. This output will deliver 2 volts peak-to-peak into a 93 ohm unbalanced load.

3.2.10 AFC Connection. - An external voltage for automatic frequency control may be connected to the EXT AFC INPUT jack J13, a BNC connector.

3.2.11 Wide Band Pre-Detected Output. - A 160 MHz wide band undetected IF signal is available at the WB PRE-DET OUTPUT jack J15, a type BNC connector.

3.2.12 Phones Output. - The 600-ohm audio output is available at PHONES jack J14 located on the receiver front panel. This output is in parallel with the audio output available at TB1, terminals 1 and 2.

3.2.13 Balanced Audio Output. - A 100 mW, 600-ohm balanced audio output is available at terminal strip TB1, terminals 1 and 2. Note that the PHONES output jack J14 is in parallel with this output.

3.2.14 External RF Preamplifier. - Provision has been made for attaching an external RF preamplifier in place of an isolator on the tuning heads. A plate can be found on the rear apron which covers two holes intended for type N connectors which are used in the preamplifier installation.

3.3 OPERATION

The operation of the controls and switches on the Type 112 Receiver are explained in the following paragraphs.

3.3.1 Power Switch. - The POWER toggle switch controls the ac input to the receiver. Make certain that the setting of the rear-apron voltage selector switch marked 115V/230V is set to match the power source before the receiver is energized.

3.3.2 Tuning Mode Switch. - The tuning mode switch is used to select FM, AM AGC, AM MAN, or PULSE tuning modes.

3.3.3 IF Bandwidth Switch. - The IF BANDWIDTH MHz switch is used to select the appropriate bandwidth for the signal being received.

3.3.4 AFC Mode Switch. - The AFC mode switch is used to select EXT AFC (external AFC), FT (fine tune), or INT AFC (internal AFC) modes. In the EXT AFC position the receiver oscillator fine tuning is controlled by an external source (such as a counter) which is connected to rear apron jack J13. In the FT position the receiver oscillator fine tuning is controlled by the FINE TUNING control on the front panel. In the INT AFC position the receiver oscillator is controlled from within the receiver in a closed loop tuning system.

3.3.5 Fine Tuning Control. - The FINE TUNING control is an electronic vernier on the main tuning control. With this control set initially at midrange, it is possible to increase or decrease the tuned frequency when the receiver is in the manual tuning mode.

3.3.6 RF Gain Control. - The RF GAIN control sets the gain of the receiver in the MAN tuning mode with the reception mode switch set for AM/MAN reception. Turning the control in a clockwise direction increases the gain.

3.3.7 Audio Level Control. - The AUDIO LEVEL control sets the level of all audio outputs from the receiver including the PHONES jack and the balanced audio output at terminals 1 and 2 of TB1.

3.3.8 Video Gain Control. - The video level at the rear-apron VIDEO OUTPUT jack J12 is set by the VIDEO GAIN control.

3.3.9 Aural Enhancement. - The AURAL ENHANCEMENT switch is used in the pulse mode to provide a stretching action to the pulses so that they may be monitored aurally.

3.3.10 Tuning Meter. - The TUNING meter indicates the relative position of a signal in the passband of the selected IF amplifier.

3.3.11 Signal Strength Meter. - The SIGNAL STRENGTH meter indicates the relative signal strength of received signals.

3.3.12 Phones Jack. - The PHONES jack provides an audio monitoring point on the front panel. The impedance of the headphones should be 600 ohms.

3.3.13 Main Tuning. - All of the tuning heads for the Type 112 Receiver operate in a similar manner. A main tuning knob with crank has been provided to manually tune a single frequency as indicated on the tape dial.

3.4 PREPARATION FOR RESHIPMENT AND STORAGE

3.4.1 If the unit must be prepared for reshipment, the packaging methods should follow the pattern established in the original shipment. If retained, the original materials can be reused to a large extent or will at a minimum provide excellent guidance for the repackaging effort.

3.4.2 If time permits, contract packing and packaging firms can be found in many cities. Based on an examination of the equipment and the proposed method of shipment, these firms can usually perform a reliable repackaging service.

3.4.3 As a minimum, cover the painted surfaces of the unit with wrapping paper. Pack the unit securely in a strong corrugated container (350 lb/sq inch bursting test) with 2-inch rubberized hair pads placed along all surfaces of the equipment. If rubberized hair is not available, use a 6-inch layer of excelsior. If neither of these filler materials are available, use crumpled paper, rags, or any other available materials to provide as much cushioning as possible.

3.4.4 Conditions during storage and shipment should normally be limited as follows:

(a) Maximum humidity: 95% (no condensation)

(b) Temperature range: -30 °C to +85 °C

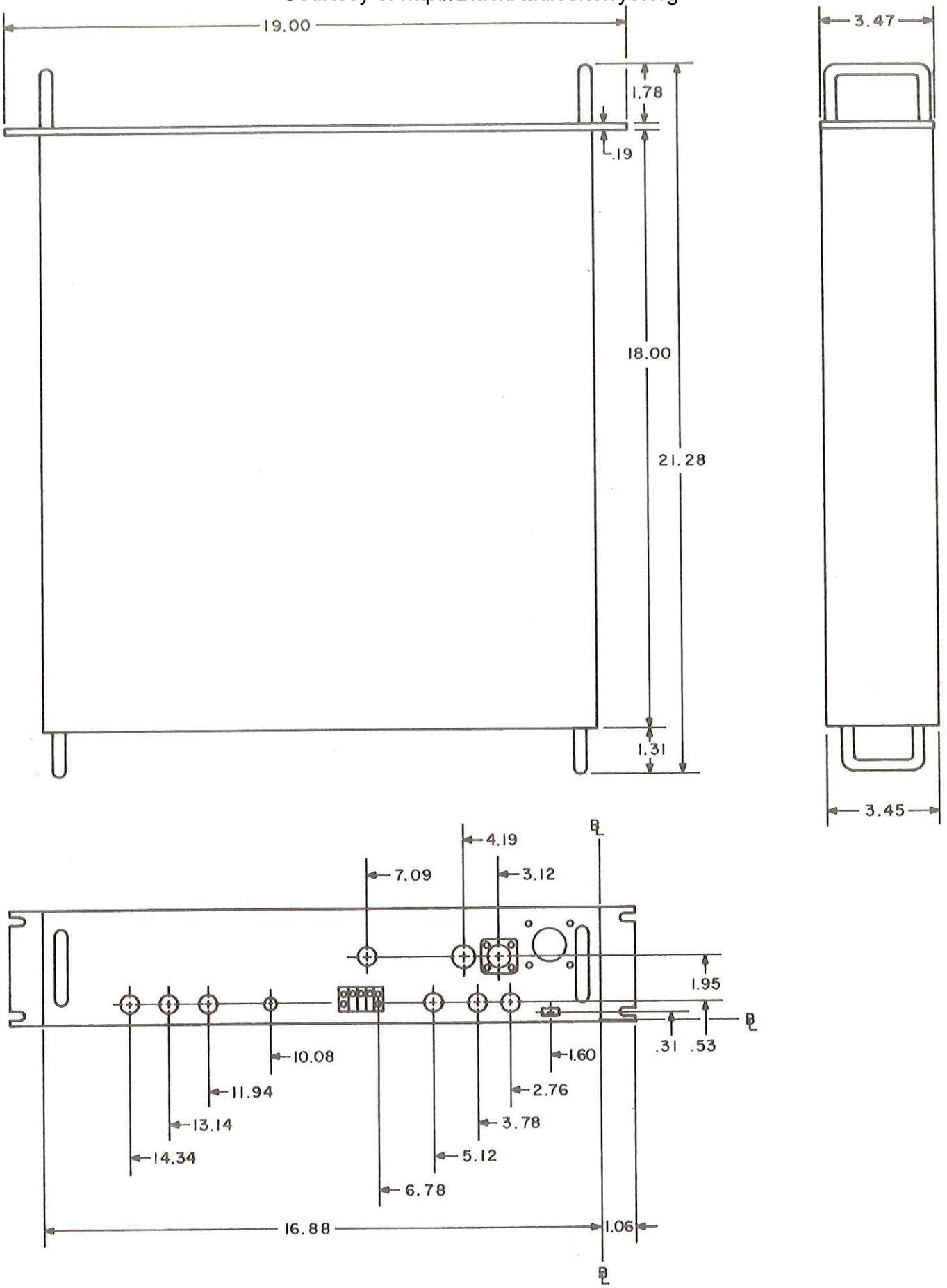


Figure 3-1. Type 112 and 112-1 Receiver, Critical Dimensions

SECTION IV

MAINTENANCE

4.1 GENERAL

The Type 112 Receiver has been conservatively designed to operate for extended periods of time with little or no routine maintenance. An occasional cleaning and inspection are the only preventive maintenance operations recommended. The intervals for these operations should be based on the operating environment. Should trouble occur, repair time will be minimized if the maintenance technician is familiar with the circuit descriptions found in Section II. Reference should also be made to the block diagram Figure 2-1, and to the schematic diagrams found in Section VI. A complete parts list and illustrations showing part locations can be found in Section V.

4.2 CLEANING AND LUBRICATION

The unit should be kept free of dust, moisture, grease, and foreign matter to insure trouble-free operation. If available, use low velocity compressed air to blow accumulated dust from the exterior and interior of the unit. A clean dry cloth, a soft bristled brush, or a cloth saturated with cleaning compound may also be used. The Type 112 Receiver does not require lubrication.

4.3 INSPECTION FOR DAMAGE OR WEAR

Many potential or existing troubles can be detected by a visual inspection of the unit. For this reason, a complete visual inspection should be made for indications of mechanical and electrical defects on a periodic basis, or whenever the unit is inoperative. Electronic components that show signs of deterioration should be checked and a thorough investigation of the associated circuitry should be made to verify proper operation. Damage to parts due to heat is often the result of other less apparent troubles in the circuit. It is essential that the cause of overheating be determined and corrected before replacing the damaged parts. Mechanical parts, and front panel controls and switches should be inspected for excessive wear, looseness, misalignment, corrosion, and other signs of deterioration.

4.4 ALIGNMENT AND ADJUSTMENT PROCEDURES

4.4.1 General. - The following alignment procedure is suitable when making adjustments after replacing transistors or components. Only those controls specifically referred to within a series of steps given for aligning a particular circuit affect the alignment of that circuit. Those controls not mentioned in any one series of steps may be left in any position. The alignment of the receiver should be performed only with suitable equipment by technicians thoroughly familiar with the unit. If the limits and tolerances specified in the following procedures cannot be obtained, than a factory alignment is necessary.

4.4.2 Test Equipment Required. - Table 4-1 lists the test equipment which is required for maintenance and alignment of the 112 and 112-1 Receivers.

Item	Instrument Type	Characteristics	Use	Recommended Instrument
1	Oscilloscope	500 kHz vertical bandwidth	Troubleshooting alignment	Tektronix 503 with X10 probe
2	Signal Generator	20 MHz to 170 MHz	Alignment (external marker)	HP-608E with headphones
3	Sweep Generator	20 MHz to 170 MHz frequency range, variable sweep width	Troubleshooting alignment	Telonic SM-2000 w/ SH-1M plug-in head
4	VTVM	Standard	Power Supply checks	RCA, Type WV-98C
5	Step Attenuator	Variable from 0 to 20 db	Alignment	Kay, Type 31-0
6	Variac	Variable from 0 to 125 Vac	Power Supply checks	General Radio, W5MT3A
7	50 ohm Detector	-	Alignment	Telonic XD-3A

4.4.3 Control Settings. - Before starting the alignment, place the front panel controls in the positions indicated. Controls not mentioned will not affect the procedures.

(1) Reception Mode - AM/MAN
(2) RF Gain - Max CW
(3) IF Bandwidth - Consistent with the bandwidth being aligned.

4.4.4 Power Supplies. - Adjust the power supplies as follows:

(1) Connect the receiver power input to the variac. Maintain the receiver line voltage at 115 Vac or 230 Vac as appropriate.
(2) Connect the digital multimeter to AITPI.
(3) Adjust AIR14 for a +150 Vdc reading.
(4) Connect the digital multimeter to AITP2.
(5) Adjust AIR6 for a +28 Vdc reading.
(6) Connect the digital multimeter to A2TP1.

(7) Adjust A2R7 for a +6 Vdc reading.
(8) Connect the digital multimeter to A3TP1.
(9) Adjust A3R7 for a +15 Vdc reading.
(10) Connect the digital multimeter to A4TP1.
(11) Adjust A4R6 for a -15 Vdc reading.
(12) Adjust the line voltage to 125 Vac or 250 Vac and recheck the previous test points for proper regulation.
(13) Adjust the line voltage to 105 Vac or 210 Vac and recheck the previous test points for proper regulation.

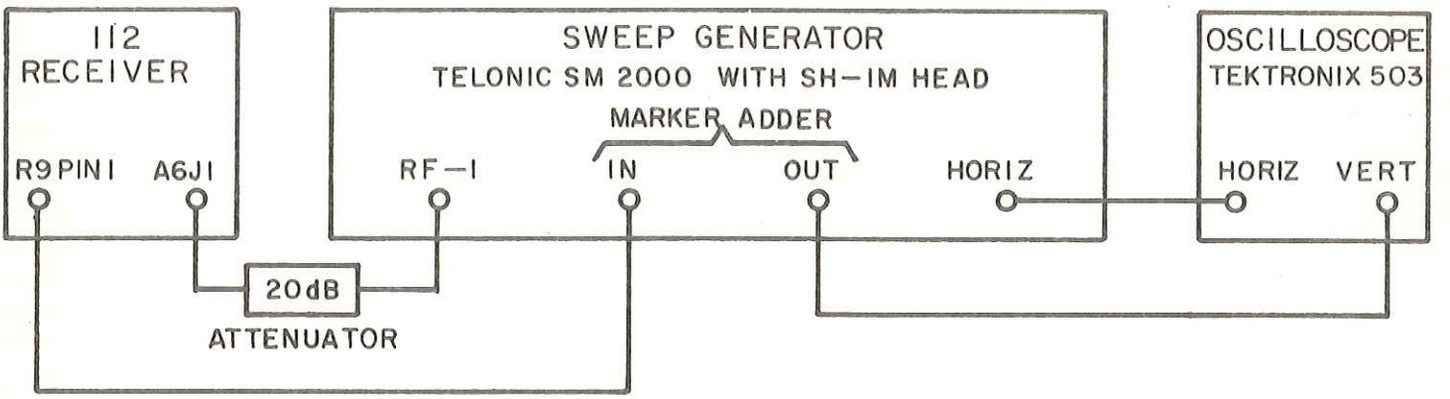


Figure 4-1. Test Setup, 160 MHz IF Amplifier Alignment (A6)

4.4.5 160 MHz IF Amplifier (10-20 MHz BW) (A6). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-1. Resistor R9 pin 1 in Figure 4-1 refers to the front panel video gain control.
(2) Place the IF Bandwidth switch in the 20 MHz position.
(3) Set the sweep generator to 160 MHz. Turn on the internal 160 MHz marker or apply an external 160 MHz marker. A signal generator (Item 2 Table 4-1) applied to the external marker input of the sweep generator will produce a usable marker. Use the signal generators 1 MHz crystal calibrator to calibrate the marker signal in 1 MHz steps.
(4) Adjust the oscilloscope and sweep generator controls to display a response curve similar to the oscillograph shown in Figure 4-2.
(5) Adjust capacitor A6C13 for maximum gain.
(6) Adjust capacitors A6C22 and A6C28 to produce the desired bandwidth.
(7) Adjust capacitors A6C36, A6C42, A6C39 and A6C49 for a maximum amplitude, symmetrical response about the marker and for flatness of response.
(8) Place the IF Bandwidth switch in the 10 MHz position.
(9) Adjust capacitor A6C23 to produce the desired bandwidth.

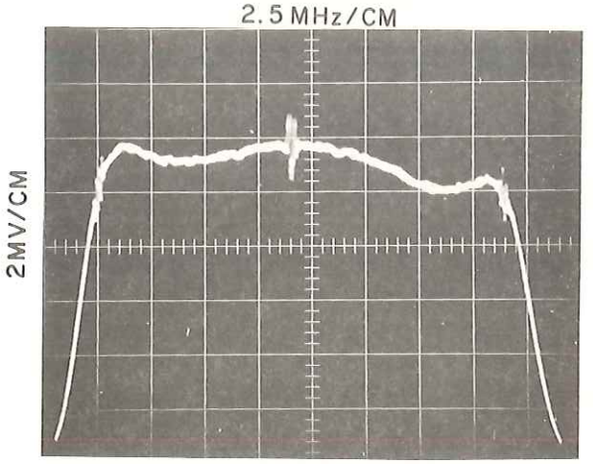


Figure 4-2. Typical Response, 160 MHz IF Amplifier (20 MHz BW)

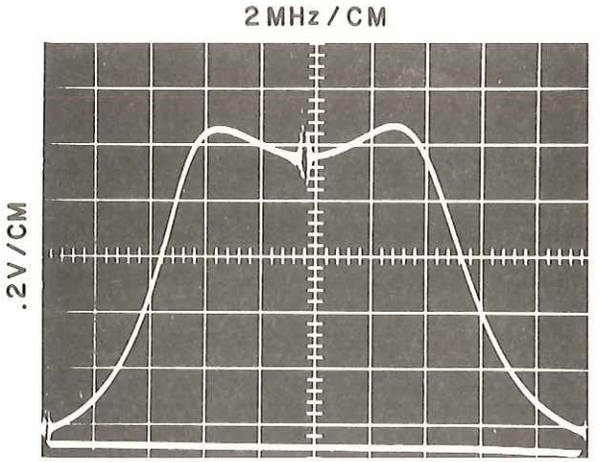


Figure 4-3. Typical Response, 160 MHz IF Amplifier (10 MHz BW)

(10) Adjust capacitors A6C23 and A6C29 for proper response and symmetry. A typical response curve is shown in Figure 4-3.

4.4.6 160/21.4 MHz Converter (A5). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-4.

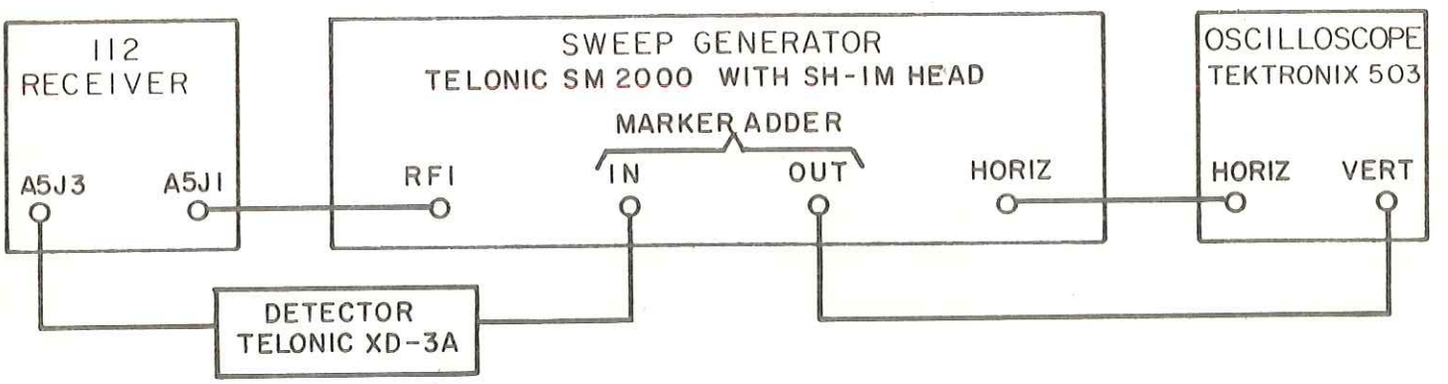


Figure 4-4. Test Setup, 160/21.4 MHz Converter Alignment (A5)

(2) Remove the connector at A5J2.
(3) Set the sweep generator output frequency to 160 MHz. Turn on the internal 160 MHz marker or apply an external 160 MHz marker.
(4) Adjust the oscilloscope and sweep generator controls to display a response curve.
(5) Adjust capacitor A5C14 for maximum signal amplitude.
(6) Adjust capacitors A5C13 and A5C8 for symmetry and response. A typical response curve is shown in Figure 4-5.

4.4.7 160 MHz Limiter/Discriminator (A7). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-6.

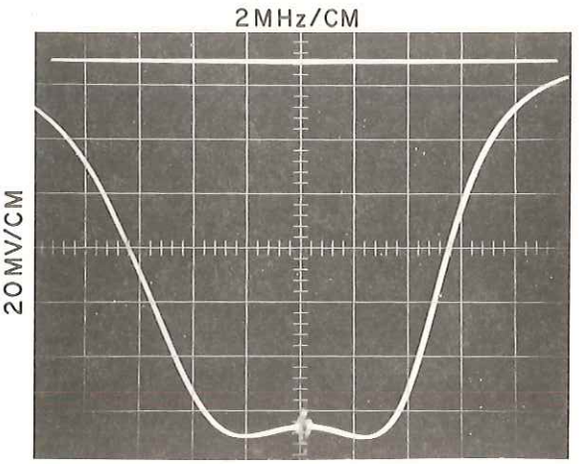


Figure 4-5. Typical Response, 160/21.4 MHz Converter

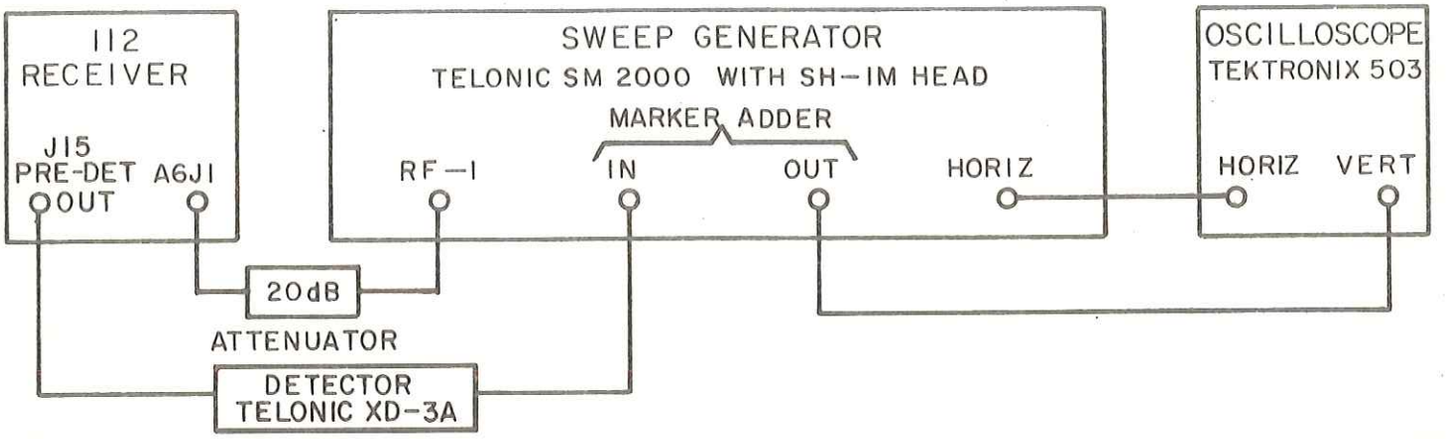


Figure 4-6. Test Setup, 160 MHz Limiter Alignment (A7)

(2) Set the sweep generator output frequency to 160 MHz with the generator output level just high enough to display a signal on the oscilloscope.
(3) Turn on the internal 160 MHz marker or apply an external 160 MHz marker.
(4) Adjust capacitor A7C1 for a maximum symmetrical response centered on the marker pip.
(5) Reconnect the equipment as shown in Figure 4-7.

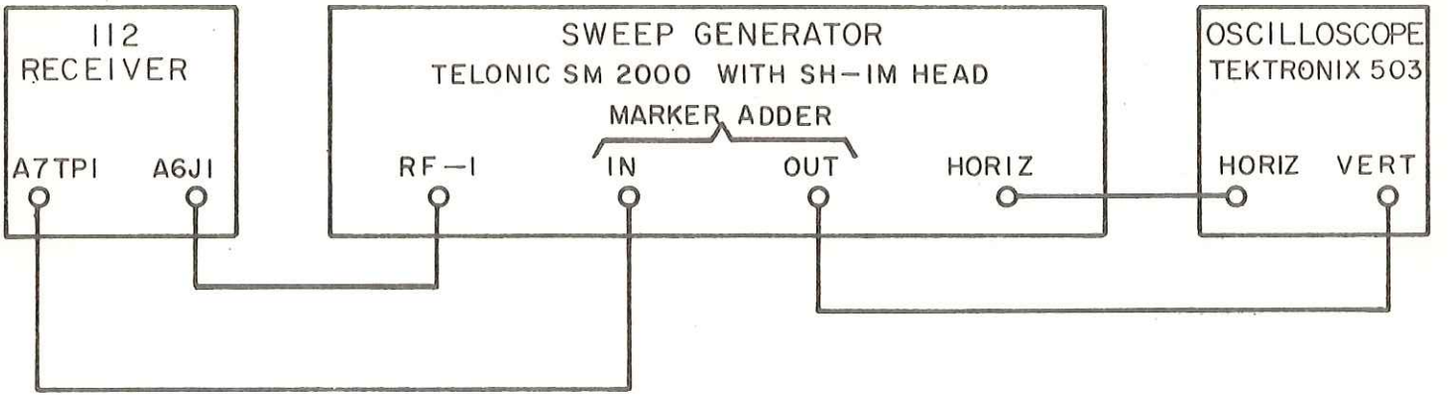


Figure 4-7. Test Setup, 160 MHz Limiter Alignment (A7)

(6) Adjust A7C8 and A7C12 for a maximum amplitude response while maintaining symmetry of the signal. If the signal begins to clip or limit it may be necessary to reduce the output level of the signal generator.
(7) Reconnect equipment as shown in Figure 4-8.

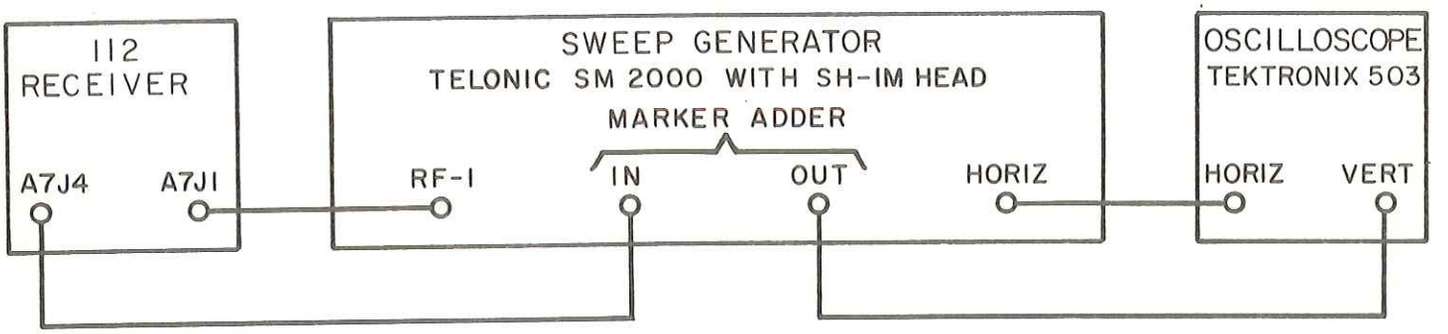


Figure 4-8. Test Setup, 160 MHz Limiter/ Discriminator Alignment (A7)

(8) Set the sweep generator output frequency to 160 MHz. Continue using the 160 MHz internal marker or the external marker source.
(9) Adjust the oscilloscope and sweep generator controls to display a discriminator "S" curve.
(10) Remove the vertical input to the oscilloscope and center the sweep trace at the zero "Y" axis gradicule.
(11) Reconnect the vertical input to the oscilloscope. Insure the input is dc coupled to the vertical amplifier.
(12) Adjust A7R27 for zero crossing at the 160 MHz marker point.
(13) Adjust capacitors A7C20 and A7C21 for peak-to-peak symmetry. A typical response curve is shown in Figure 4-9.

4.4.8 21.4 MHz IF Amplifier (100 kHz BW) (A8). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-10.

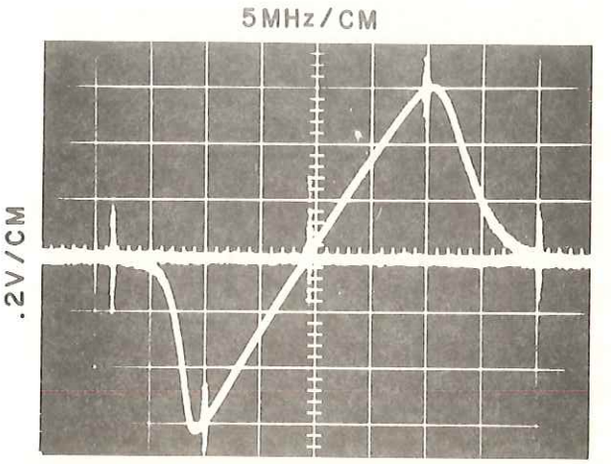


Figure 4-9. Typical Response, 160 MHz Limiter/Discriminator

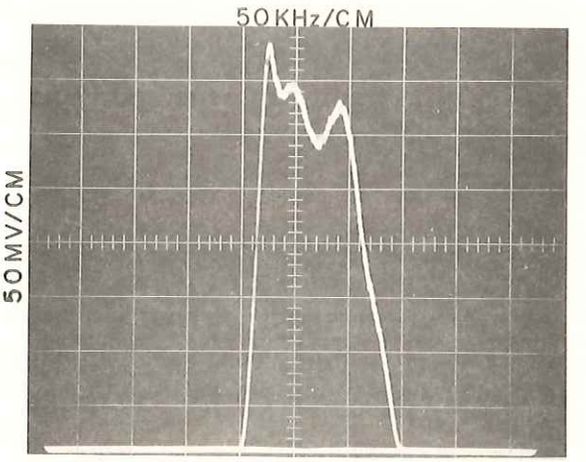


Figure 4-11. Typical Response, 21.4 MHz IF Amplifier (100 kHz BW)

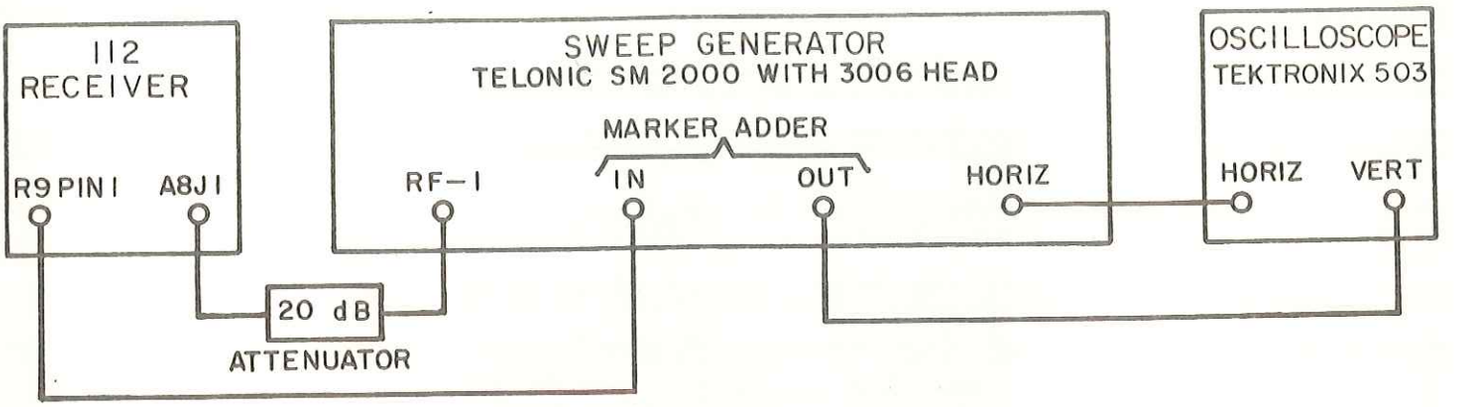


Figure 4-10. Test Setup, 21.4 MHz IF Amplifier Alignment (A8), 100 kHz BW

(2) Place the IF Bandwidth switch in the .1 MHz position and the reception mode switch on FM.
(3) Set the sweep generator output frequency to 21.4 MHz. Turn the internal or external 21.4 MHz marker on.
(4) Adjust the oscilloscope and sweep generator controls to display a response curve.

NOTE

Due to the narrow 100 kHz bandwidth being sweep by the sweep generator some instability will be noticed on the oscilloscope.

(5) Adjust A8A1C10 for proper shaping and response.
(6) Adjust A8A1R12 for maximum signal amplitude.
(7) Adjust A8A2C14 for overall response. A typical response curve is shown in Figure 4-11. It should be noted that the response characteristics are largely determined by filter FL1 and it may not be possible to obtain a flat response across the 100 kHz BW.

4.4.9 21.4 MHz FM Limiter/Discriminator, (100 kHz BW) (A8A3). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-12.

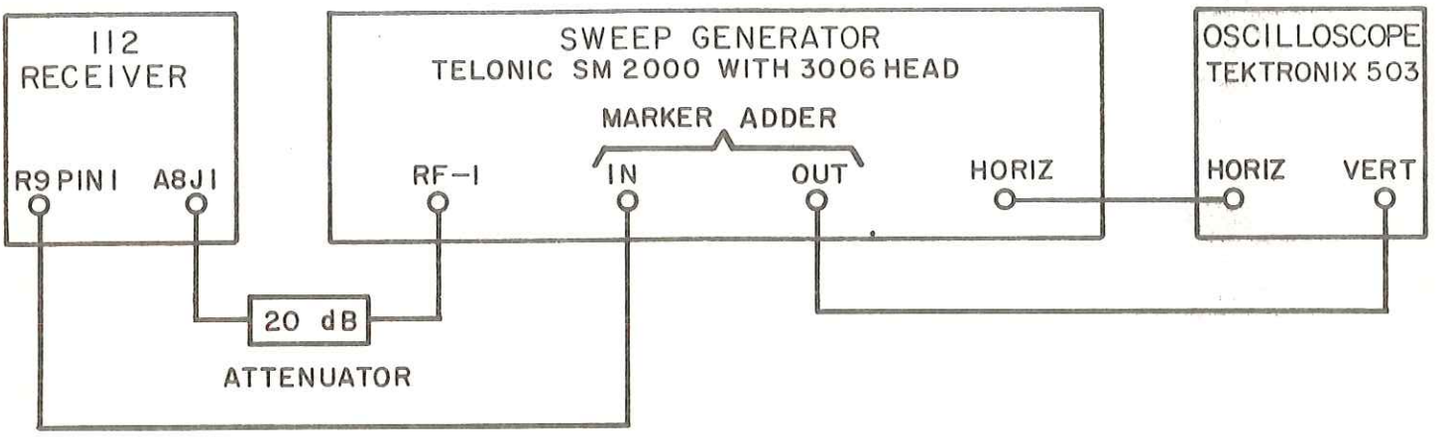


Figure 4-12. Test Setup, 21.4 MHz FM Limiter/Discriminator Alignment (A8A3), 100 kHz BW

(2) Place the IF Bandwidth switch in the .1 MHz position and the reception mode switch on FM.
(3) Set the sweep generator frequency to 21.4 MHz. Turn on the internal 21.4 MHz marker or apply an external 21.4 MHz marker.
(4) Adjust the oscilloscope and sweep generator controls until an "S" curve response is obtained.
(5) Adjust C8 to center the S-curve at 21.4 MHz.
(6) Adjust C4 for a symmetrical response. A typical response is shown in Figure 4-13.

NOTE

The difference between the Types 112 and 112-1 Receivers is at module A13. The basic alignment procedure of both type receivers is identical. However, several component designations and the front panel bandwidth markings differ. The oscillographs shown in Figure 4-15 through 4-18 are typical of the 2 MHz and 4 MHz bandwidth IF amplifiers used in the Type 112 Receiver. Overall response curves of the IF amplifiers used in the Type 112-1 Receiver are similar to those of the Type 112 Receiver with the exception of the response bandwidths. The alignment steps for module A13 are outlined in paragraphs 4.4.10 and 4.4.11.

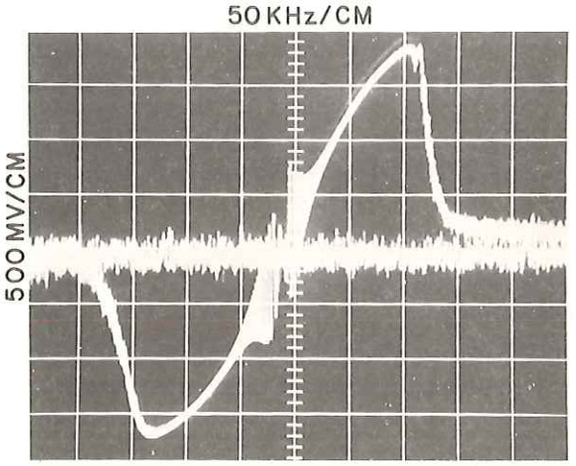


Figure 4-13. Typical Response, 21.4 MHz Limiter/Discriminator (100 kHz BW)

4.4.10 21.4 MHz IF Amplifier (A13A1). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-14. Resistor R9 pin 1 refers to the front panel VIDEO GAIN potentiometer.

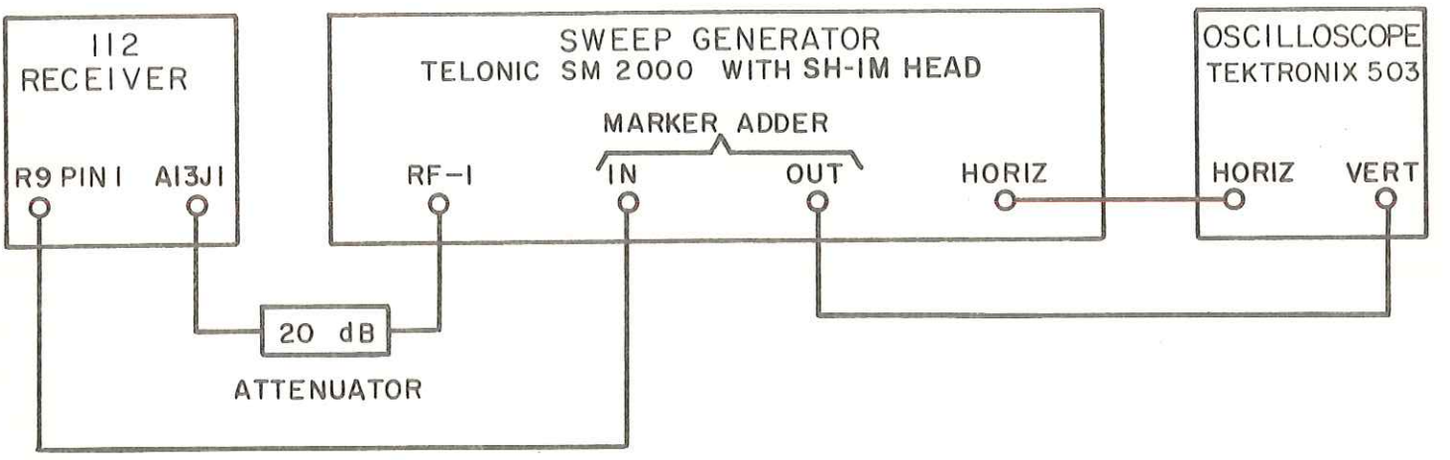


Figure 4-14. Test Setup, 21.4 MHz IF Amplifier Alignment (A13A1)

(2) Remove the connector from A13J2.
(3) Insure the mode switch is in the AM MAN position and the RF GAIN control is in its maximum CW position.
(4) Place the IF bandwidth switch in the 2 MHz position (.5 MHz position for the 112-1 Receiver.)
(5) Set the sweep generator output frequency to 21.4 MHz. Turn on the sweep generator's internal 21.4 MHz and 1 MHz markers or apply external 21.4 MHz and 1 MHz markers.
(6) Adjust the oscilloscope and sweep generator controls to display a response curve.
(7) Adjust potentiometer A13A1R15 for a maximum amplitude response.
(8) Adjust capacitors A13A1C18, A13A1C24, A13A1C30 and A13A1C37 for proper bandwidth and symmetry. Figure 4-15 illustrates a typical response for the 2 MHz bandwidth used in the Type 112 Receiver.
(9) Adjust capacitor A13A1C59 for maximum gain while retaining the response shape shown in figure 4-15.
(10) Place the IF bandwidth switch in the 4 MHz position (1 MHz position for the 112-1 Receiver).
(11) Adjust potentiometer A13A1R17 for maximum gain.
(12) Adjust capacitors A13A1C19, A13A1C25, A13A1C31, A13A1C38 for proper bandwidth and symmetry (adjust capacitors A13A1C16, A13A1C25, A13A1C31, and A13A1C38 for the 112-1 Receiver.)

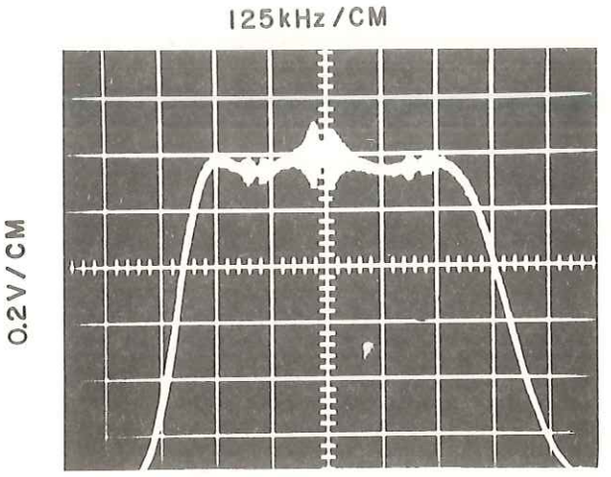


Figure 4-15. Typical Response, 21.4 MHz IF Amplifier (2 MHz BW)

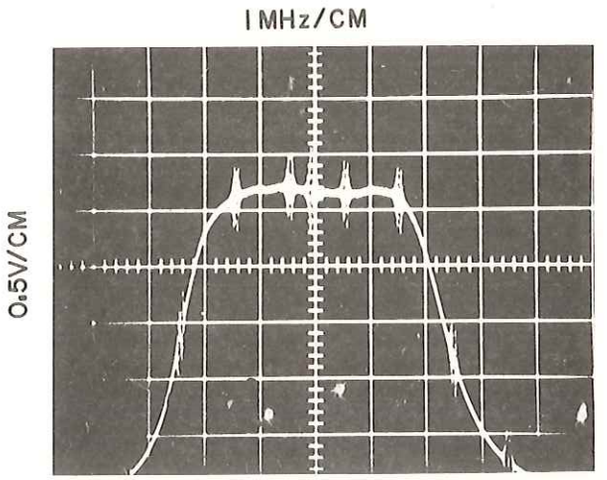


Figure 4-16. Typical Response, 21.4 MHz IF Amplifier (4 MHz BW)

(13) Readjust capacitor A13A1C59 for maximum gain. Switch between the .5/1 MHz bandwidths or the 2/4 MHz bandwidths on both type receivers to obtain an optimum response. A typical response for the 4 MHz bandwidth IF amplifier is shown in Figure 4-16.

4.4.11 21.4 MHz FM Limiter/Discriminator (A13A2). - Proceed as follows:

(1) Connect the equipment as shown in Figure 4-17. Resistor R9 pin 1 refers to the front panel VIDEO GAIN potentiometer.

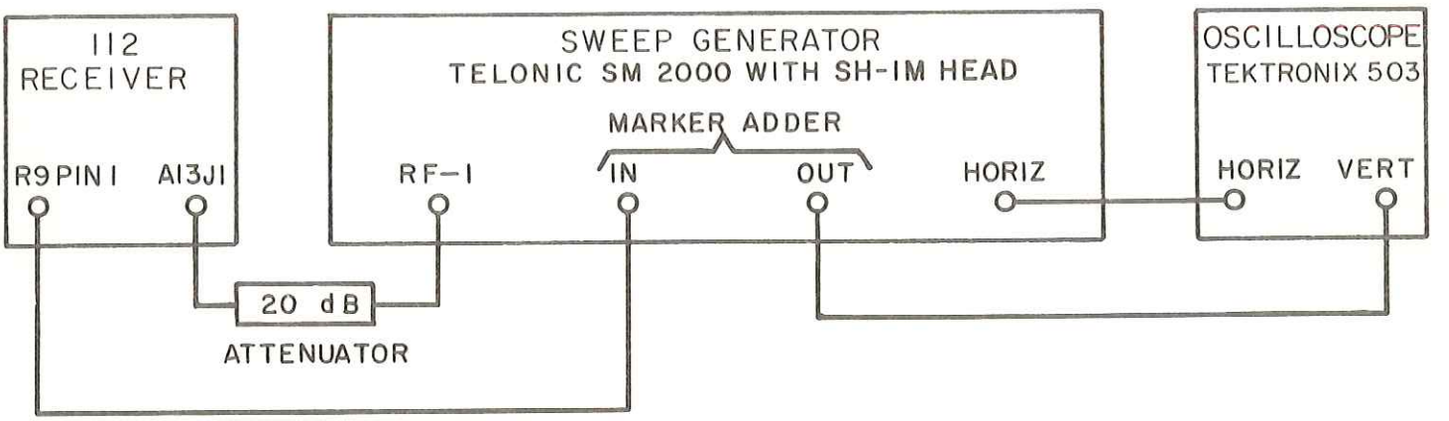


Figure 4-17. Test Setup, 21.4 MHz FM Limiter/Discriminator Alignment (A13A2)

(2) Place the IF bandwidth switch in the 4 MHz position (1 MHz position on the 112-1 Receiver).
(3) Set the sweep generator output frequency to 21.4 MHz. Turn-on the internal 21.4 MHz marker or apply an external 21.4 MHz marker to the sweep generator.
(4) Adjust the oscilloscope and sweep generator controls until an "S" curve response is obtained.
(5) Adjust A13A2C11 to center the "S" curve at 21.4 MHz (adjust A13A2C8 on the 112-1 Receiver).
(6) Adjust A13A2C9 for peak-to-peak symmetry (adjust A13A2C5 on the 112-1 Receiver). A typical response for the 112 Receiver's 4 MHz and 2 MHz bandwidth discriminator's are shown in Figure 4-18 and Figure 4-19.

4.5 TROUBLESHOOTING

4.5.1 General. - Initial troubleshooting of the 112 and 112-1 Receiver should be directed towards localizing the malfunction to a particular module or circuit group.

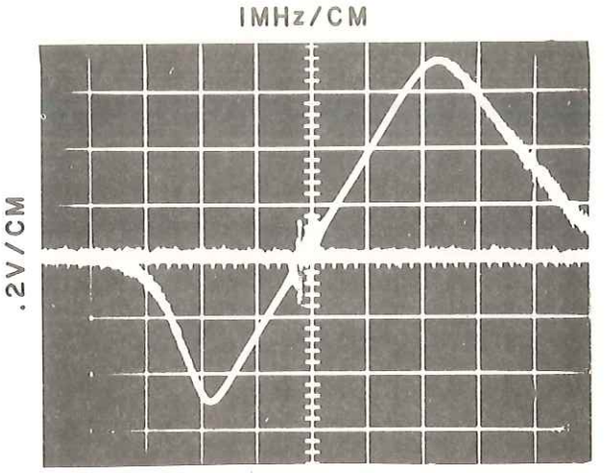


Figure 4-18. Typical Response, 21.4 MHz Limiter/Discriminator (4 MHz BW)

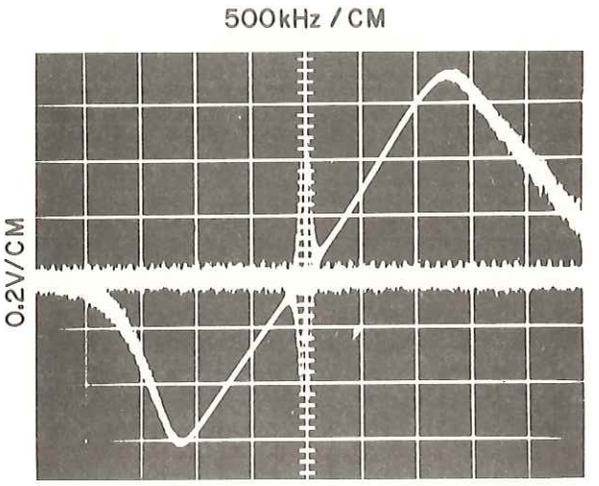


Figure 4-19. Typical Response, 21.4 MHz Limiter/Discriminator (2 MHz BW)

After the problem has been located, the receiver can be returned to operation by substituting the defective module with one known to be in good condition. Trouble-shooting aids such as the troubleshooting chart (Table 4-2), the circuit description (Section II), typical transistor element voltages (Table 4-3), the alignment procedure (Section 4), and the schematic diagrams (Section 6) are helpful in the troubleshooting effort.

4.5.2 Localizing Troubles. - The troubleshooting chart, Table 4-2, is designed to show logical methods of troubleshooting the 112 and 112-1 Receiver circuits. Since it is impossible to cover each problem which may occur in the receiver, the trouble-shooting chart is provided only to aid maintenance personnel in the troubleshooting effort. When a trouble occurs, find the related TROUBLE INDICATION which are listed in the left column of the troubleshooting chart. When the trouble is localized make voltage checks to isolate the problem to a particular circuit element.

Table 4-1. TROUBLESHOOTING CHART

ITEM	TROUBLE INDICATION	PROBABLE FAULT	DIAGNOSTIC PROCEDURE
1	Power pushbutton and tuner tape dial do not illuminate when receiver power is ON.	a. Fuse F1 or F2 defective, switches S1 or S2 defective, faulty power transformer T1. b. Multipin connector J9 defective or not connected. c. Indicator lights defective.	a. Check AC input circuits for malfunction. b. Check J9. c. Check indicator lights.
2	Receiver totally inoperative.	a. Defective AC input circuits. b. Power supply(s) defective. c. Faulty plug-in tuner.	a. Check AC input circuits. b. Check power supplies. c. Replace tuner with operating unit and check receiver circuits for proper operation.
3	Receiver malfunctions in AM and AM AGC reception modes (10 and 20 MHz BW). Other modes of operation are normal.	a. Defective 160 MHz IF input circuits. b. Defective sections X and W of S6B. c. Defect in 10 MHz/20 MHz IF amplifier strip. d. Misalignment.	a. Check stages A6A1Q1 and A6Q1. b. Check switches. c. Check A6Q6 through A6Q10, A6A2Q1, and A6A3Q1 through A6A3Q4. d. Perform alignment procedure presented in paragraph 4.4.5.
4	Receiver malfunctions in FM reception mode (10 and 20 MHz BW). Other modes of operation are normal.	a. Defect in 10 MHz/20 MHz IF amplifier strip. b. 160 MHz Limiter/Discriminator defective or misaligned.	a. See Item 3-C. b. Check circuits by performing alignment presented in paragraph 4.4.7.

Table 4-1. TROUBLESHOOTING CHART (Cont.)

5	Receiver malfunctions in the the AM, AM AGC, and FM modes when selecting the 10 MHz BW only.	a. Defect in 10 MHz filter/ amplifier circuit. b. Absence of switching voltage from S6B-W.	a. Check A6Q3 and A6Q5 for operation and proper alignment. Perform alignment presented in paragraph 4.4.5. b. Check A6C3 for +15 vdc.
6	Receiver malfunctions in the AM, AM AGC, and FM modes when selecting the 20 MHz BW only.	a. Defect in 20 MHz filter/ amplifier circuits. b. Absence of switching voltage from S6B-W.	a. Check A6Q2 and A6Q4 for operation and proper alignment. Perform alignment presented in paragraph 4.4.5. b. Check A6C4 for +15 Vdc.
7	Receiver malfunctions in .1 MHz, 2 MHz and 4 MHz (.5 MHz and 1 MHz versus 2 MHz and 4 MHz BW in 112-1 model) bandwidth. The 10 MHz and 20 MHz bandwidths operate normally.	a. Malfunction in 160/21.4 MHz converter (A5).	a. Check circuits on the converter module (A5) and check alignment as outlined in paragraph 4.4.6.
8	Receiver malfunctions in the 2 MHz and 4 MHz (.5 and 1 MHz in 112-1 model) bandwidths in the AM mode of operation. The 20 MHz, 10 MHz, and .1 MHz bandwidths operate normally.	a. Defective 21.4 MHz IF input circuit. b. Defective IF and audio detector circuits. c. Switch S6B-X defective.	a. Check A13A1Q1. b. Check A13A1Q5 through A13A1Q9, and A13A1CR6. c. Check for +15 Vdc at feedthrough capacitor C5 on module A13. Ensure the BW select switch is in the 2 or 4 MHz (.5 MHz and 1 MHz for 112-1 Receiver) position.
9	Receiver malfunctions in the FM reception mode (2 and 4 MHz bandwidth) only. The 1 MHz, 10 MHz, and 20 MHz bandwidths operate normally.	Defective or misaligned 21.4 MHz Limiter/Discriminator circuits (A13A2).	Check circuits by performing alignment presented in paragraph 4.4.11.

Table 4-1. TROUBLESHOOTING CHART (Cont.)

10	Receiver malfunctions when selecting the AM, AM AGC, or FM mode when selecting the 2 MHz (.5 MHz in 112-1 Receiver) BW only.	Defect or misalignment in the 2 MHz (.5 MHz) BW amplifier/ filter circuits.	Check A13A1Q2, the 2 MHz Bandpass filter network, and switch A13A1CR1 for operation. Perform the alignment outlined in paragraph 4.4.10.
11	Receiver malfunctions when selecting the AM, AM AGC, or FM modes when selecting the 4 MHz (1 MHz in the 112-1 Receiver) BW only.	Defect or misalignment in the 4 MHz (1 MHz) BW amplifier/ filter circuits.	Check A13A1Q3, the 4 MHz bandpass filter network, and switch A13A1CR4 for operation. Perform the alignment outlined in paragraph 4.4.10.
12	Receiver malfunctions in the AM AGC and FM modes but operates normally in the AM MAN mode of operation.	a. Defect in IF AGC circuits.	a. Connect a 160 MHz AM signal modulated at 1000 Hz into A5J1. Observe the IF AGC voltage at A10 pin 16 with a VTVM. Set the attenuator on the signal generator for minimum output. The IF AGC level should be approximately 3.4 vdc. Place the IF bandwidth switch in the 100 kHz position and increase the signal generator output level. At approximately -70 dbm (-50 dbm in 10 MHz IF BW) threshold will occur and the AGC voltage will decrease to approximately -1.0 vdc. If test A fails check stages A10Q1 through A10Q6.

Table 4-1. TROUBLESHOOTING CHART (Cont.)

12		b. Defect in RF AGC Circuits.	b. Observe the RF AGC voltage at A10 pin 4. Set the attenuator on the signal generator for minimum output. The RF AGC level should be approximately 7.5 vdc. Increase the signal generator output level. At approximately -70 dbm (100 kHz BW) or -50 dbm in the 10 MHz BW position AGC threshold will occur and the AGC voltage will decrease to approximately 1.0 vdc. If test B fails check A10Q1 through A10Q6 and associated circuits.
		c. Defective gain controlled amplifier.	c. Check the gain controlled amplifiers in the RF and selected IF amplifiers.
13	RF GAIN control has no effect on output level in AM MAN mode of operation.	a. Defective RF GAIN control potentiometer. b. Faulty gain control circuitry	a. Check potentiometer R7. b. Vary the RF GAIN control and check the RF and IF AGC voltages at A10 pins 4 and 16. See Item 12A and B for IF anf RF gain control voltages.
		c. Defective gain controlled amplifier.	c. Check the gain controlled amplifiers in the RF and selected IF amplifiers.
14	No video output from rear apron jack J12. Audio output normal.	a. Defective video amplifier. b. Defective Video Gain potentiometer.	a. Check stages A9Q1 through A9Q4. b. Vary the video gain control and check signal at A9 pin 14 with oscilloscope.
15	No audio output from rear apron terminal TB-1. Video output normal.	a. Defective audio amplifier.	a. Check stages A11Q1 through A11Q6 by signal tracing with oscilloscope. Check audio gain potentiometer.

Table 4-2. Typical Transistor and Integrated Circuit Pin Voltages

		Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
A1Q1	2N4074								28.7	29.4	49.2
A1Q2	2N4074								6.8	7.5	29.4
A1Q3	2N4074								6.8	7.5	23.9
A1Q4	2N4064								152.0	153.0	230.0
A1Q5	2N3440								28.1	28.7*	152.0
A1Q6	2N929								152.0	153.0	153.0
A2Q1	2N4074								6.6	7.2	13.1
A2Q2	2N4074								3.2	3.8*	7.2
A2Q3	2N4074								3.2	2.9	6.0
A3Q1	2N4074								15.6	16.2	25.2
A3Q2	2N3055								15.0	15.6	25.2
A3Q3	2N3478								6.9	7.6*	16.2
A3Q4	2N4074								6.9	7.5	14.5
A4Q1	2N3055								-24.3	-23.7	-15.0
A1Q2	2N4037								-15.0	-15.6	-23.7
A4Q3	2N4037								- 6.6	- 7.2*	-15.6
A4Q4	2N4037								- 6.6	- 7.2	-14.5
A5Q1	3N140	14.7	4.5	0.8	1.3						
A5Q2	2N3478								3.3	3.9	13.5
A5Q3	2N3478								2.1	2.9	13.4
A6Q1	2N3933								-12.1	-11.3	- 0.6
A6Q2 (1)	2N3933								- 0.6	0.0	15.0
A6Q3 (2)	2N3933								- 0.6	0.0	15.0
A6Q4 (1)	2N3933								-12.0	-11.3	- 0.7
A6Q5 (2)	2N3933								-12.0	-11.3	- 0.7
A6Q6	2N3933								- 0.7	0.0	14.1
A6Q7	2N3933								- 0.7	0.0	13.5

Table 4-2. Typical Transistor and Integrated Circuit Pin Voltage

		Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
A6Q8	2N3933								-12.1	-11.4	- 0.7
A6Q9	2N5109								- 8.5	- 7.7	- 0.7
A6Q10	2N5109								- 0.7	- 0.0	14.7
A6A1Q1	3N140	13.5	4.5	0.7	1.5						
A6A2Q1	3N140	9.5	6.5	0.8	1.8						
A6A3Q1	2N929								- 0.8	- 0.2	14.8
A6A3Q2	2N3251								0.5	- 0.2	- 14.4
A6A3Q3	2N3251								- 0.2	- 0.8	- 15.0
A6A3Q4	2N2270								0.0	0.5	15.0
A7Q1	2N3933								-13.0	-12.3	0.0
A7Q2	2N3933								-13.0	-12.3	0.0
A7Q3	2N3933								-13.0	-12.3	0.0
A7Q4	2N3933								-13.0	-12.3	0.0
A7Q5	2N3933								-13.0	-12.3	0.0
A7Q6 (3)	2N2222								1.8	2.5	12.4
A7Q7 (3)	2N3251								-13.0	12.4	0.7
A7Q8 (3)	2N2222								0.0	0.7	14.5
A789 (3)	2N3251								0.0	- 0.7	-14.5
A8A1Q1 (5)	3N140	14.5	3.2	0.9	1.5						
A8A1Q2 (5)	2N3933								2.9(4)	3.6	14.6
A8A2Q1 (5)	3N140	14.3	2.7	0.9	1.8						
A8A2Q2 (5)	2N3933								3.9	4.6	12.2
A8A2Q3 (5)	2N3478								3.5	4.3	13.8
A8A2Q4 (5)	2N3251								0.6	0.0	-14.5
A8A2Q5 (5)	2N2270								0.0	0.6	15.0
A8A3U1 (5)	μA719C	1.9	1.9	--	--	0.0	11.0	--	--	--	11.0
A8A3Q1 (5)	2N3251								0.6	0.0	-14.7

Table 4-2. Typical Transistor and Integrated Circuit Pin Voltages

		Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
A8A3Q2 (5)	2N929								0.6	0.0	14.8
A8A3Q3 (5)	2N929								0.0	0.6	15.0
A8A3Q4 (5)	2N3251								0.0	- 0.6	-15.0
A9Q1	2N3423	11.8	0.0	- 0.7	--	- 0.7	0.0	12.9	--		
A9Q2	2N3251								12.5	11.8	0.7
A9Q3	2N2222								0.0	0.7	14.8
A9Q4	2N3251								0.0	- 0.7	-14.7
A10Q1	2N3251								- 1.2	- 1.8	-14.5
A10Q2	2N2222								- 1.8	- 1.2	14.3
A10Q3	2N3251								- 0.9	- 1.4	-14.5
A10Q4	2N2222								- 1.5	- 0.9	14.3
A10Q5	2N2222								0.0	- 1.5	14.1
A10Q6	2N2222								13.5	14.1	14.3
A11Q1	2N929								7.4	8.0	28.0
A11Q2	2N929								6.4	7.1	28.0
A11Q3	2N929								0.6	1.2	27.5
A11Q4	2N3251								28.0	27.4	14.7
A11Q5	2N2270								14.0	14.7	28.0
A11Q6	2N4037								13.5	12.8	0.0
A12Q1 (6)	U1899E	0.0	--	0.0	0.0						
A12U1 (6)	μA741C	-15.0	0.0	0.0	-15.	-15.0	0.0	15.0	--		
A13A1Q1	3N140	11.4	3.2	0.8	1.6						
A13A1Q2 (7)	2N3933								2.7	3.4	13.7
A13A1Q3 (8)	2N3933								2.7	3.4	13.7
A13A1Q4	3N140	11.6	3.2	.45	1.5						
A13A1Q5	2N3933								3.7	4.5	12.0
A13A1Q6	2N5109								9.4	10.0	26.7
A13A1Q7	2N5109								2.6	3.4	8.9
A13A1Q8	2N3251								0.8	0.0	-14.5
A13A1Q9	2N2270								0.2	0.8	15.0

Table 4-2. Typical Transistor and Integrated Circuit Pin Voltages

		Integrated Circuit Pin Numbers									
		1	2	3	4	5	6	7	8	9	10
		Field Effect Transistor Pins							Transistor Elements		
Ref. Desig.	Type	Drain	Gate 2	Gate 1	Source				Emitter	Base	Collector
A13A2U1	μA719C	2.0	2.0	--	--	0.0	14.6	--	--	--	11.0
A13A2Q1	2N5109								- 0.7	0.0	13.6
A13A2Q2	2N3251								0.6	0.0	-14.7
A13A2Q3	2N929								- 0.6	0.0	14.8
A13A2Q4	2N929								0.0	0.6	15.0
A13A2Q5	2N3251								0.0	- 0.6	-15.0

TEST CONDITIONS: All readings are positive dc with respect to chassis unless otherwise noted; readings taken with DANA Digital Voltmeter, Model 5500; no signal input to receiver; control settings as follows unless otherwise noted; function in AM-AGC; INT-AFC; all again controls fully cw.

NOTES:

* Value varies with setting of potentiometer

1. Select 20 mHz IF BW
2. Select 10 MHz IF BW
3. Select either 10 or 20 MHz IF BW
4. Varies with setting of A8A1R12
5. Select 100 kHz IF BW
6. Set AFC to FINE TUNE
7. Select either .5 or 2 MHz IF BW
8. Select either 1 or 4 MHz IF BW

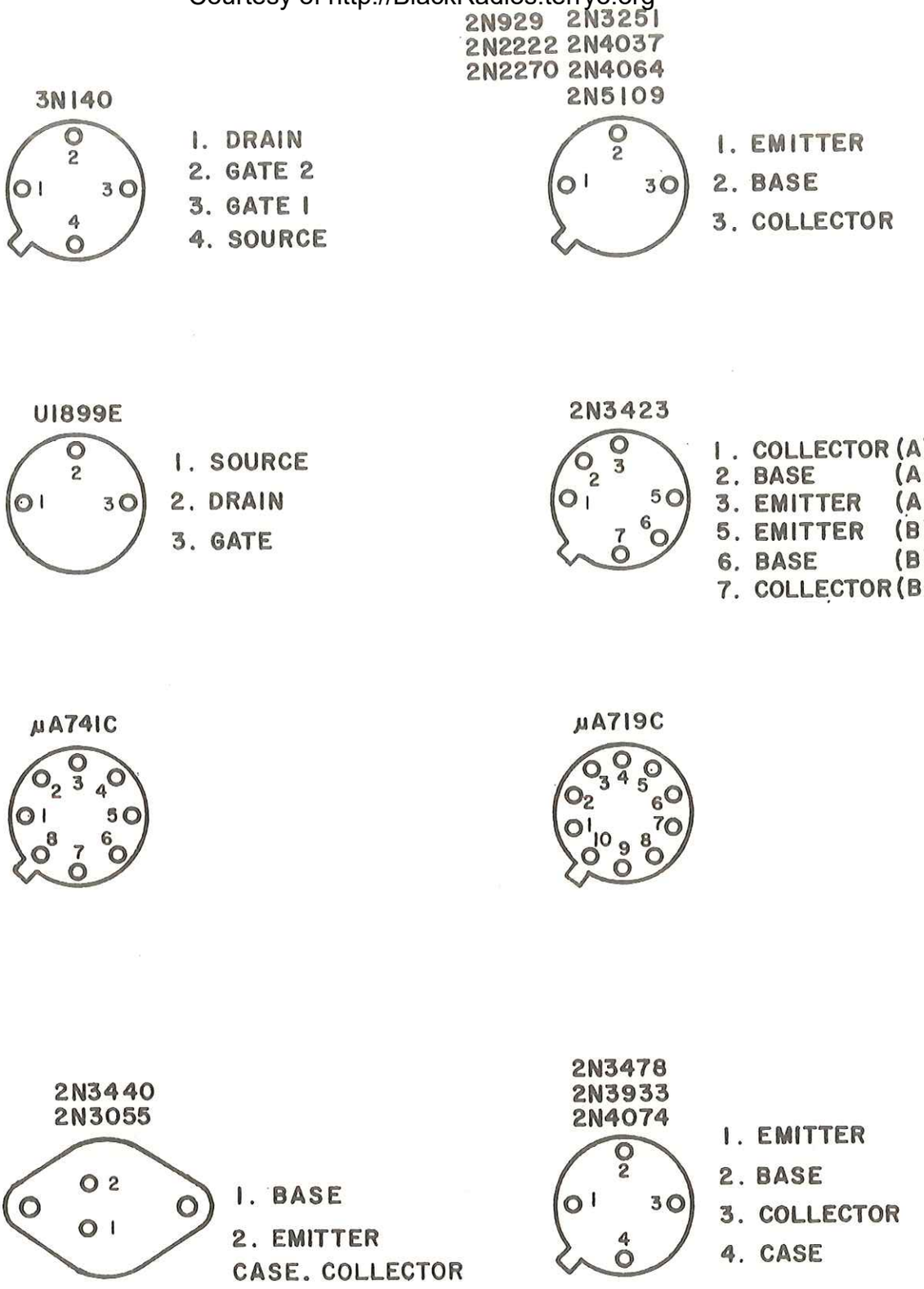


Figure 4-20. Transistor and Integrated Circuit, Pin Configurations

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 method follows:

Read 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. Prefixes are provided on drawings and illustrations within the titles in parentheses.

5.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address	Mfr. Code	Name and Address
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204	04713	Motorola Semiconductor Products, Incorporated 5005 East McDowell Road Phoenix, Arizona 85008
02114	Ferroxcube Corporation of America Mt. Marion Road Saugerties, New York 12477	06001	General Electric Company Capacitor Department P.O. Box 158 Irmo, South Carolina 29063
04013	Taurus Corporation 1 Academy Hill Lambertville, New Jersey 08530	07263	Fairchild Camera & Instrument Corporation Semiconductor Division 313 Frontage Road Mountain View, California 94040

Mfr. Code	Name and Address
13103	Thermalloy Company 8717 Diplomacy Row Dallas, Texas 75247
14632	Watkins-Johnson Company 700 Quince Orchard Road Gaithersburg, Maryland 20760
16179	Omni-Spectra, Incorporated 24600 Hallwood Ct. Farmington, Michigan 48024
21604	The Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207
26805	Americon Corporation 87 Rumford Avenue Waltham, Massachusetts 02154
28480	Hewlett Packard Company 1501 Page Mill Road Palo Alto, California 94304
49956	Raytheon Company Lexington, Massachusetts 02173
56289	Sprague Electric Company Marshall Street North Adams, Massachusetts 01247
71279	Cambridge Thermionic Corp. 445 Concord Avenue Cambridge, Massachusetts 02138
71590	Globe-Union Incorporated Centralab Division P.O. Box 591 Milwaukee, Wisconsin 53201
71785	Cinch Manufacturing Company Howard B. Jones Division 1026 South Homan Avenue Chicago, Illinois 60624
72136	Electro Motive Manufacturing Co., Inc. South Park & John Streets Willimantic, Connecticut 06226
72982	Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512
73138	Beckman Instruments, Inc. Helipot Division 2500 Harbor Boulevard Fullerton, California 92634
73899	JFD Electronics Company Division of Stratford Retreat House 15th at 62nd Street Brooklyn, New York 11219
74306	Piezo Crystal Company 100 K Street Carlisle, Pennsylvania 17013
74868	Bunker-Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810
75915	Littelfuse, Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
76854	Oak Manufacturing Company Division of Oak Electro/Netics Corp. South Main Street Crystal Lake, Illinois 60014
80131	Electronic Industries Association 2001 Eye Street, N.W. Washington, D.C. 20006

Mfr. Code	Name and Address
80294	Bourns, Incorporated 1200 Columbia Avenue Riverside, California 92507
81073	Grayhill Incorporated 561 Hillgrove Avenue LaGrange, Illinois 60525
81312	Winchester Electronics Div. Litton Industries, Incorporated Main Street & Hillside Ave. Oakville, Connecticut 06779
81349	Military Specifications
82389	Switchcraft, Incorporated 5527 North Elston Avenue Chicago, Illinois 60630
87034	Marco-Oak Industries Division of Oak Electro/ Netics Corporation 207 South Helena Street Anaheim, California 92803
91293	Johanson Manufacturing Co. P.O. Box 329 Boonton, New Jersey 07005
91418	Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646
91506	Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703
92193	United States Smelting Works Inc. Bristol Sts. Philadelphia, Pennsylvania
93459	Weinschel Engineering Company Clopper Road Gaithersburg, Maryland 20760
95121	Quality Components, Inc. P.O. Box 113 St. Mary's, Pennsylvania 15857
95146	Alco Electronics Products, Inc. 3 Wolcott Avenue Lawrence, Massachusetts 01843
99800	American Precision Industries Delevan Electronics Division 270 Quaker Road East Aurora, New York 14052
99848	Wilco Corporation 4030 West 10th Street P.O. Box 22248 Indianapolis, Indiana 46222

5.4 PARTS LIST

When ordering replacement parts from CEI Division, specify the type and serial number of the equipment, and the reference designation and description of each part ordered. The Manufacturers and Manufacturer's Part Numbers listed are included as a guide to the user of the equipment in the field and do not necessarily agree with the parts installed in the equipment. Except in those cases specifically noted, the replacement part may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original part.

NOTE

As improved semiconductors become available it is the policy of CEI to incorporate them in proprietary products. For this reason some transistors and diodes installed in an equipment may not agree with those specified in the parts lists and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

5.4.1 Types 112, 112-1 Receivers, Main Chassis

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	+28/+150V POWER SUPPLY REGULATOR	1	76183	14632
A2	+6V POWER SUPPLY REGULATOR	1	76184	14632
A3	+15V POWER SUPPLY REGULATOR	1	76185	14632
A4	+15V POWER SUPPLY REGULATOR	1	76186	14632
A5	160/21.4 MHz CONVERTER	1	71285	14632
A6	160 MHz IF AMPLIFIER (10/20 MHz BW)	1	72304-1	14632
A7	160 MHz LIMITER/DISCRIMINATOR	1	79640	14632
A8	21.4 MHz IF AMPLIFIER (100 kHz BW)	1	72295	14632
A9	VIDEO AMPLIFIER	1	7361	14632
A10	AGC AMPLIFIER	1	7866	14632
A11	AUDIO AMPLIFIER	1	7444	14632
A12	AFC AMPLIFIER	1	79922	14632
A13	21.4 MHz IF AMPLIFIER (2 MHz/4 MHz BW) (112 only)	1	72301	14632
A13	21.4 MHz IF AMPLIFIER (500 kHz/1 MHz BW) (112-1 only)	1	72299	14632
A14	TUNING HEAD (SEPARATE DOCUMENTATION)			
AT1	TERMINATION, RESISTIVE	1	CT-NM	93459
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 40/40 μF, -10+75%, 250V	1	TVL-2520	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 1400 μF, -10+100%, 50V	1	86F164M	06001
C3	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 500V	1	SM(.01μF, M)	91418
CR1	DIODE	2	1N4449	80131
CR2	NOT USED			
CR3	NOT USED			

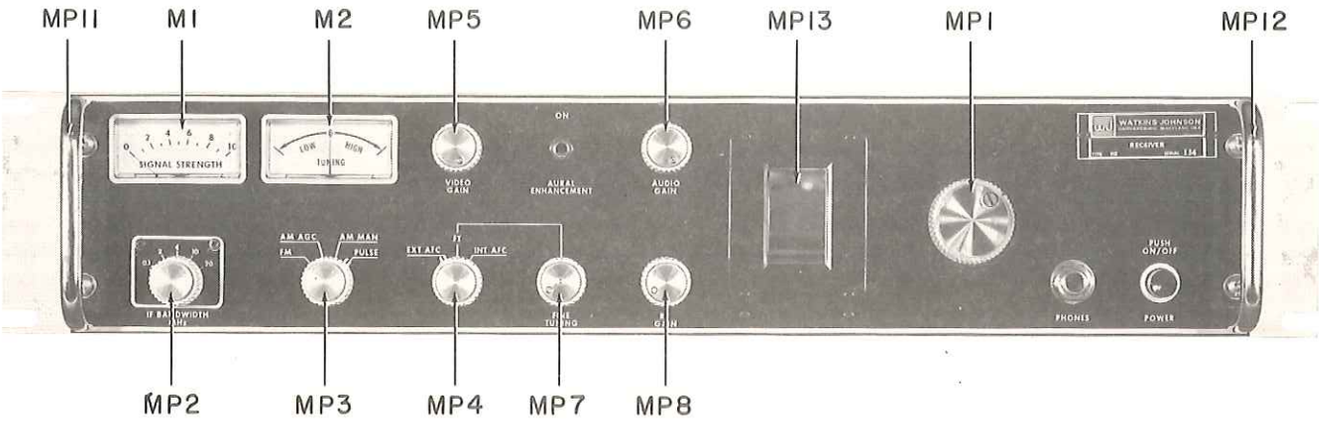


Figure 5-1. Type 112 Receiver, Front View, Component Locations

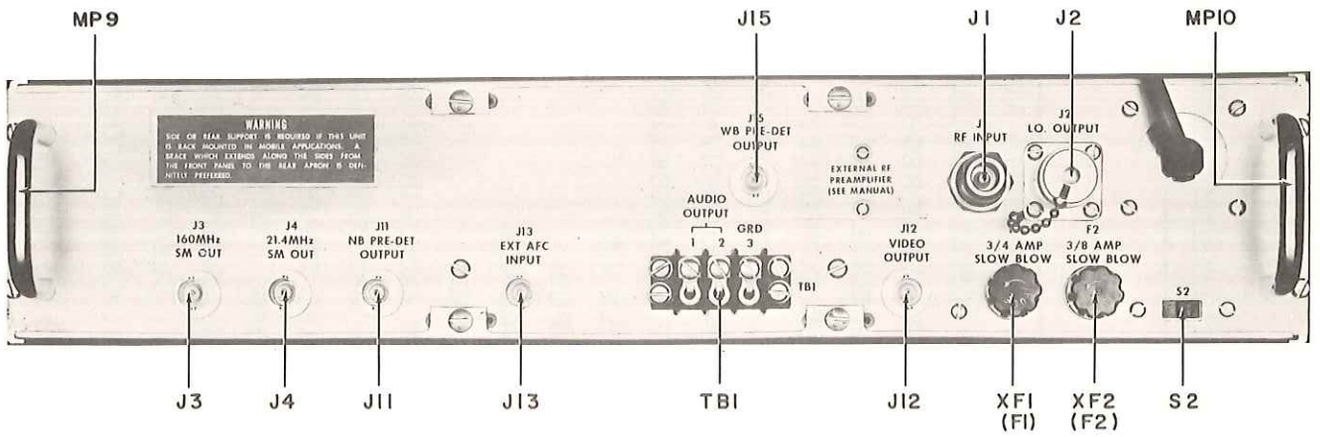


Figure 5-2. Type 112 Receiver, Rear View, Component Locations

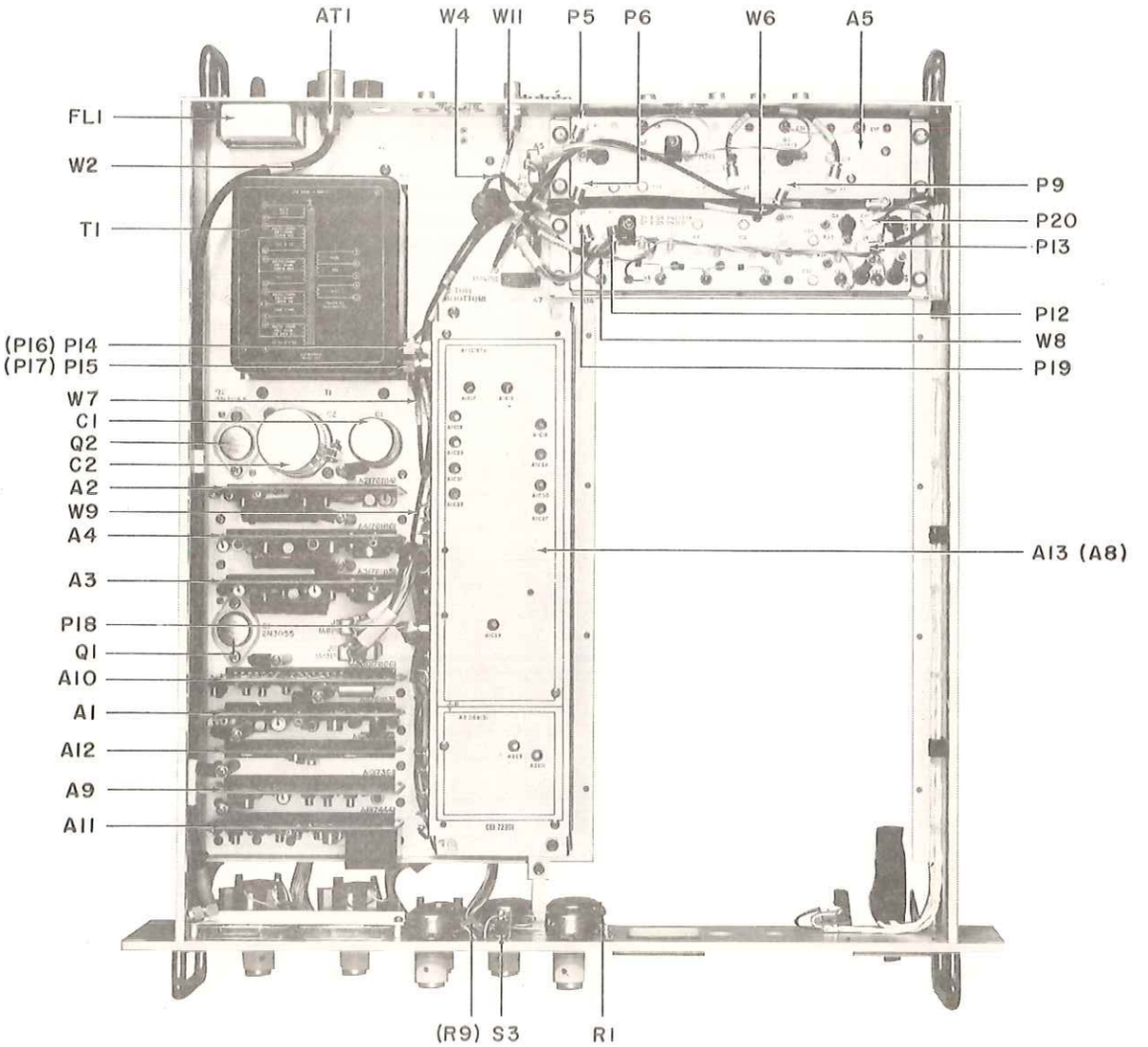


Figure 5-3. Type 112 Receiver, Top View, Component Locations

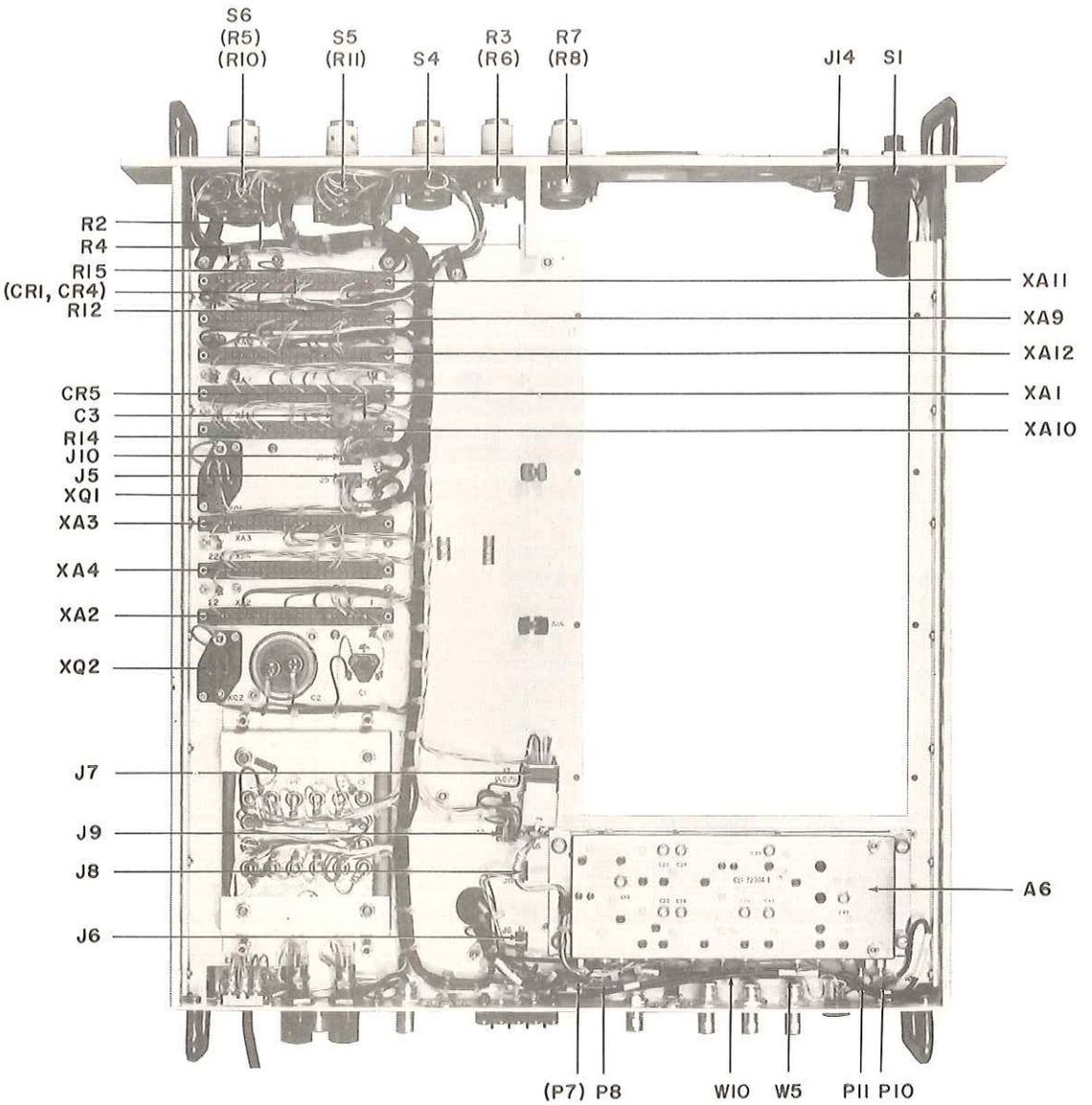


Figure 5-4. Type 112 Receiver, Bottom View, Component Locations

REF DESIG	DESCRIPTION		QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR4	DIODE		1	1N270	80131
CR5	Same as CR1				
DS1	LAMP, NEON	Part of S1		A1H	87034
F1	FUSE, 3AG, SLOW-BLOW: 3/4A		1	F02B250V3/4A	81349
F2	FUSE, 3AG, SLOW-BLOW: 3/8A		1	F02B250V3/8A	81349
FL1	FILTER, POWER		1	JN33-694B	56289
J1	CONNECTOR, JACK, N SERIES	Part of W1	1	3004-7985	26805
J2	CONNECTOR, JACK, N SERIES	Part of W2	1	UG-1095A/U	81349
J3	CONNECTOR, JACK, BNC SERIES	Part of W5	5	17825-1002	74868
J4	Same as J3	Part of W10			
J5	CONNECTOR, RECEPTACLE, MULTIPIN		3	SLE-14SNSS	81312
J6	CONNECTOR, RECEPTACLE, MULTIPIN		3	SLE-7SNSS	81312
J7	Same as J6				
J8	Same as J6				
J9	Same as J5				
J10	Same as J5				
J11	Same as J3	Part of W9			
J12	Same as J3				
J13	CONNECTOR, RECEPTACLE, BNC SERIES		1	UG-1094/U	81349
J14	CONNECTOR, PHONE JACK		1	L-11	82389
J15	Same as J3				
J16	CONNECTOR, RECEPTACLE, MULTIPIN		1	126-198	02660

REF DESIG	DESCRIPTION		QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
M1	METER, SIGNAL STRENGTH		1	14524-1	14632
M2	METER, TUNING		1	14549-1	14632
MP1	CRANK ASSEMBLY		1	11755-2	14632
MP2	KNOB		3	PS70PL2/LG	21604
MP3	Same as MP2				
MP4	Same as MP2				
MP5	KNOB		4	PS70D2/LG	21604
MP6	Same as MP5				
MP7	Same as MP5				
MP8	Same as MP5				
MP9	HANDLE		2	415-1250-01-02	71279
MP10	Same as MP9				
MP11	HANDLE		2	415-1252-02-02	71279
MP12	Same as MP11				
MP13	WINDOW		1	11448-3	14632
MP14	COVER		2	30625-8	14632
MP15	Same as MP14				
P1	NOT USED				
P2	CONNECTOR, PLUG, SMA SERIES	Part of W1	1	201-2A	16179
P3	CONNECTOR, PLUG, SMA SERIES	Part of W2	1	521-1	16179
P4	CONNECTOR, PLUG, SMC SERIES	Part of W3	17	UG-1466/U	81349
P5	Same as P4	Part of W3			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
P6	Same as P4 Part of W4			
P7	Same as P4 Part of W4			
P8	Same as P4 Part of W5			
P9	Same as P4 Part of W6			
P10	Same as P4			
P11	Same as P4 Part of W8			
P12	Same as P4 Part of W8			
P13	Same as P4			
P14	Same as P4 Part of W6			
P15	Same as P4 Part of W7			
P16	Same as P4 Part of W7			
P17	Same as P4 Part of W10			
P18	Same as P4 Part of W9			
P19	Same as P4 Part of W11			
P20	Same as P4			
Q1	TRANSISTOR	2	2N3055	80131
Q2	Same as Q1			
R1	RESISTOR, VARIABLE, COMPOSITION: 10 kΩ, 10%, 2W	3	RV4NAYSD103A	81349
R2	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R3	Same as R1			
R4	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	2	RCR07G152JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	2	RCR07G272JS	81349

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R6	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R7	Same as R1			
R8	Same as R4			
R9	RESISTOR, VARIABLE, COMPOSITION: 100 Ω, 10%, 2W	1	RV4NAYSD101A	81349
R10	Same as R5			
R11	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4W	1	RCR07G271JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	1	RCR07G273JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4W	1	RCR07G912JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
S1	SWITCH, PUSHBUTTON: SPDT	1	617-6A1H	87034
S2	SWITCH, SLIDE: DPDT	1	11A1211	82389
S3	SWITCH, TOGGLE: SPDT	1	MST-115D	95146
S4	SWITCH, MODIFIED	1	1128-32	14632
S5	SWITCH, MODIFIED	2	1128-02	14632
S6	Same as S5			
T1	TRANSFORMER	1	15948	14632
TB1	TERMINAL BOARD	1	353-18-03-001	71785
W1	CABLE AND CONNECTOR ASSEMBLY	1	32855-1	14632
W2	CABLE AND CONNECTOR ASSEMBLY	1	30020-1344	14632
W3	CABLE AND CONNECTOR ASSEMBLY	1	30020-1345	14632
W4	CABLE AND CONNECTOR ASSEMBLY	1	30020-1346	14632

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
W5	CABLE AND CONNECTOR ASSEMBLY	1	30020-1347	14632
W6	CABLE AND CONNECTOR ASSEMBLY	1	30020-1348	14632
W7	CABLE AND CONNECTOR ASSEMBLY	1	30020-1349	14632
W8	CABLE AND CONNECTOR ASSEMBLY	1	30020-1350	14632
W9	CABLE AND CONNECTOR ASSEMBLY	1	30020-1351	14632
W10	CABLE AND CONNECTOR ASSEMBLY	1	30020-1352	14632
W11	CABLE AND CONNECTOR ASSEMBLY	1	30020-1353	14632
XA1	CONNECTOR, PRINTED CIRCUIT CARD	8	250-22-30-170	71785
XA2 thru XA12	Same as XA1			
XF1	FUSEHOLDER	2	342004	75915
XF2	Same as XF1			
XQ1	SOCKET, TRANSISTOR	2	8038-1G1	91506
XQ2	Same as XQ1			
	Accessory items to be furnished with equipment:			
AI1	CONNECTOR, PLUG, MULTIPIN	1	126-195	02660

5.4.2 Type 76183 +28 V/+150 V Power Supply Regulator

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 35 V	2	CS13BF476K	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 35 V	1	CS13BF106K	81349
C3	Same as C1			
CR1	DIODE	2	1N4998	80131
CR2	Same as CR1			
CR3	DIODE	1	1N462A	80131
CR4	DIODE	1	1N4449	80131
CR5	Same as CR4			
CR6	DIODE	1	1N5297	80131
Q1	TRANSISTOR	3	2N4074	80131
Q2	Same as Q1			
Q3	Same as Q1			
Q4	TRANSISTOR	1	2N4064	80131
Q5	TRANSISTOR	1	2N3440	80131
Q6	TRANSISTOR	1	2N929	80131
R1	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R2	Same as R1			
R3	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 9.09 kΩ, 5%, 1/4W	1	RN60D9091F	81349
R6	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R7	RESISTOR, FIXED, FILM: 2.74 kΩ, 1%, 1/4W	1	RN60D2741F	81349

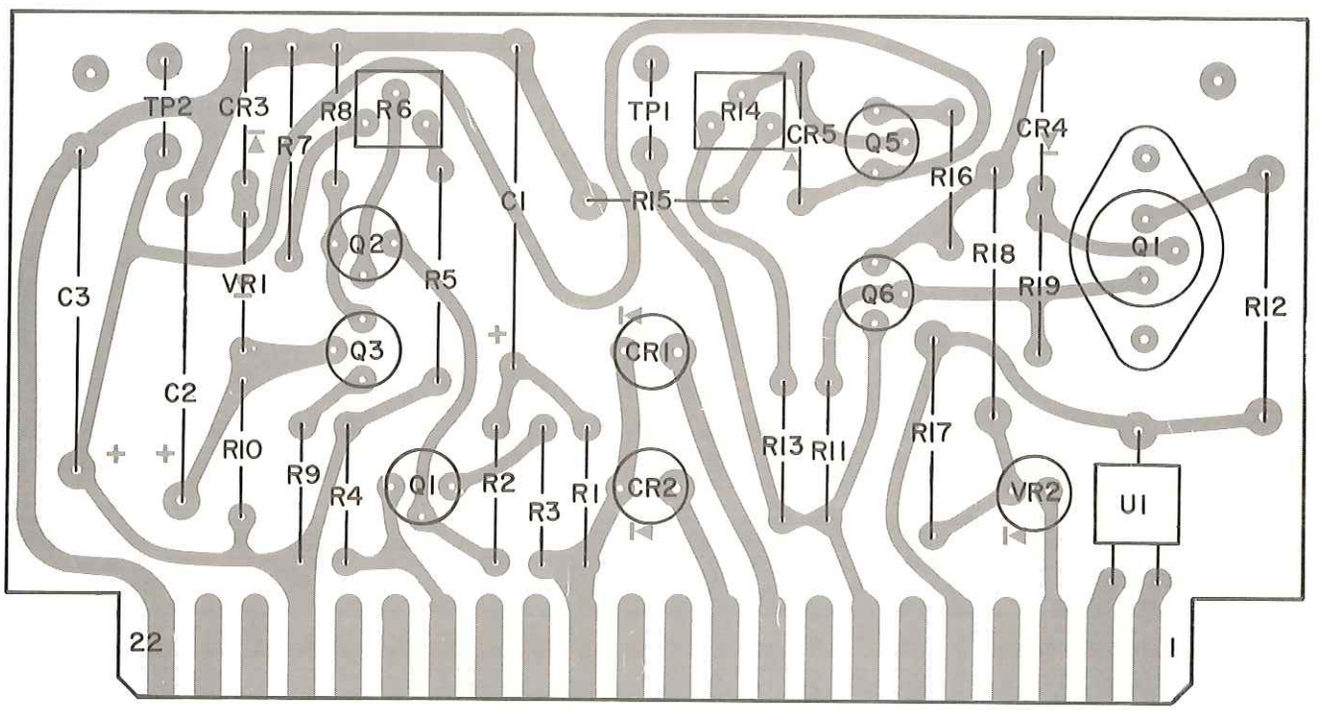


Figure 5-5. Type 76183 +28V/+150V Power Supply Regulator (A1), Component Locations

REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R8	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4W	1	RCR07G122JS	81349
R9	Same as R4			
R10	RESISTOR, FIXED, COMPOSITION: 9.1 kΩ, 5%, 1/4W	1	RCR07G912JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 15 Ω, 5%, 1/4W	1	RCR07G150JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1W	1	RCR32G471JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R14	RESISTOR, VARIABLE, FILM: 10 kΩ, 30%, 1/2W	1	62PAR10K	73138
R15	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R17	NOT USED			
R18	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1W	1	RCR32G303JS	81349
R19	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
RA1	RADIATOR, TRANSISTOR	1	2225B	13103
TP1	TEST POINT	2	TJ-203R	49956
TP2	Same as TP1			
U1	RECTIFIER ASSEMBLY	1	MDA940A-7	04713
VR1	VOLTAGE REGULATOR	1	1N754A	80131
VR2	VOLTAGE REGULATOR	1	1N4763A	80131

5.4.3 Type 76184 +6V Power Supply Regulator

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 450 μF, -10+75%, 25V	1	39D457G025FJ4	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 25 μF, -10+75%, 25V	1	30D256G025CB2	56289
C3	CAPACITOR, MICA, DIPPED: 180 pF, 5%, 500V	1	CM05FD181J03	81349
C4	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 10%, 15V	1	CS13BD226K	81349
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μF, 10%, 20V	1	CS13BE106K	81349
CR1	DIODE	2	1N3253	80131
CR2	Same as CR1			
CR3	DIODE	1	1N462A	80131
Q1	TRANSISTOR	3	2N4074	80131
Q2	Same as Q1			
Q3	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R3	Same as R1			
R4	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	RCR07G222JS	81349
R7	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R8	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RCR07G392JS	81349
R9	Same as R6			
R10	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R11	Same as R6			

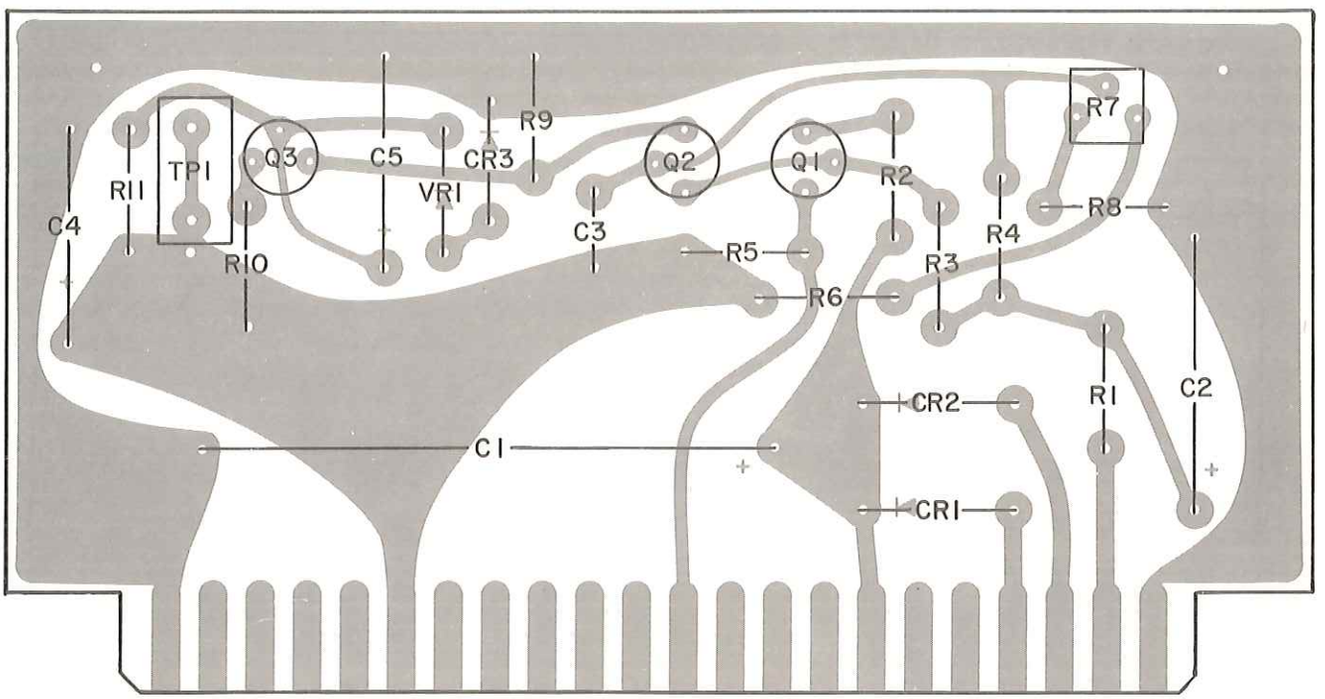


Figure 5-6. Type 76184 +6V Power Supply Regulator (A2), Component Locations

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
TP1	TIP JACK	1	TJ-202BR	49956
VR1	VOLTAGE REGULATOR	1	1N746A	80131

5.4.4 Type 76185 +15V Power Supply Regulator

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 450 μF, -10+75%, 25V	1	39D457G025FJ4	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 25 μF, -10+75%, 25V	1	30D256G025CB2	56289
C3	CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μF, -10+75%, 25V	1	30D106G025BB2	56289
C4	CAPACITOR, MICA, DIPPED: 180 pF, 5%, 500V	1	CM05FD181J03	81349
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 10%, 35V	1	CS13BF226K	81349
CR1	DIODE	1	1N462A	80131
Q1	TRANSISTOR	2	2N4074	80131
Q2	TRANSISTOR	1	2N3055	80131
Q3	TRANSISTOR	1	2N3478	80131
Q4	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	RCR07G222JS	81349
R7	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R8	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R9	Same as R6			
R10	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R11	Same as R6			
TP1	TEST POINT	1	TJ-203R	49956

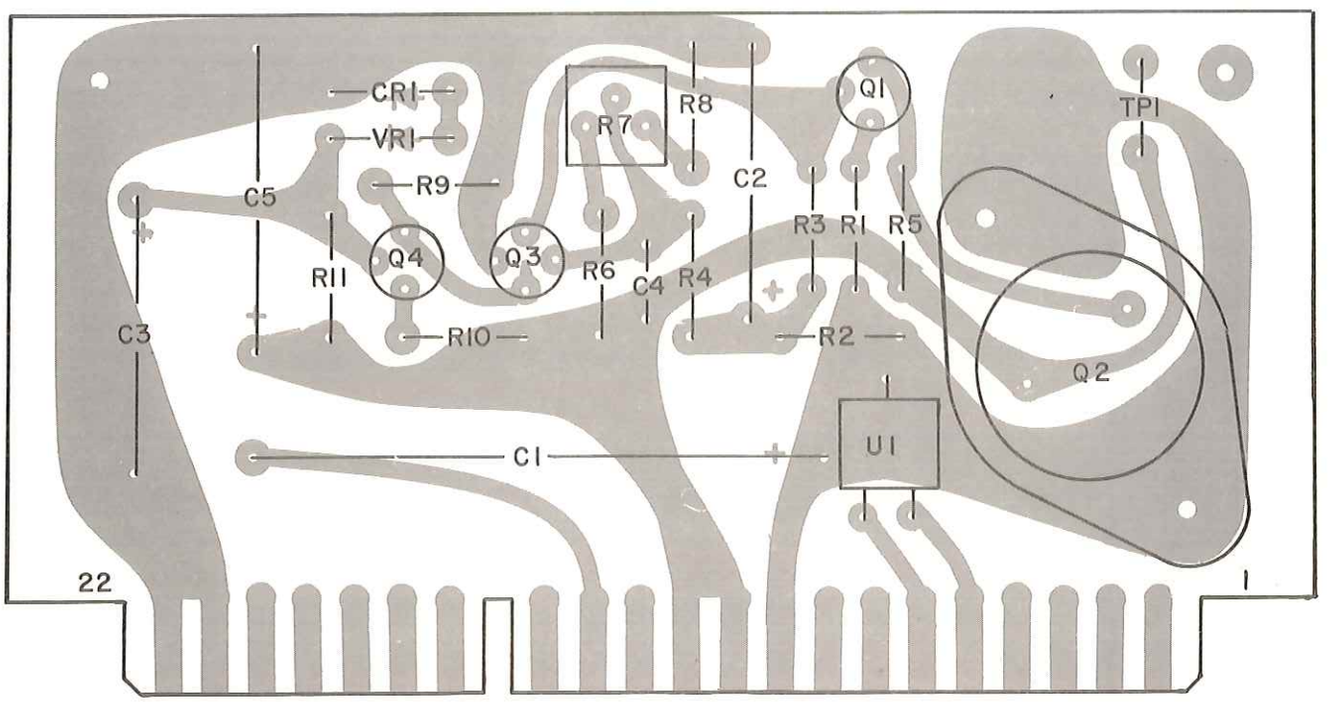


Figure 5-7. Type 76185 +15V Power Supply Regulator (A3), Component Locations

REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
U1	INTEGRATED CIRCUIT	1	MDA940A-3	04713
VR1	VOLTAGE REGULATOR	1	1N754A	80131

5.4.5 Type 76186 -15V Power Supply Regulator

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, ALUMINUM: 450 μF, -10+75%, 25V	1	39D457G025FJ4	56289
C2	CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μF, -10+75%, 25V	2	30D106G025BB2	56289
C3	Same as C2			
C4	CAPACITOR, MICA, DIPPED: 200 pF, 5%, 500V	1	CM05FD201J03	81349
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 20V	1	CS13BE476K	81349
CR1	DIODE	1	1N462A	80131
Q1	TRANSISTOR	1	2N3055	80131
Q2	TRANSISTOR	3	2N4037	80131
Q3	Same as Q2			
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	2	RCR07G682JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	3	RCR07G222JS	81349
R6	RESISTOR, VARIABLE, FILM: 1 kΩ, 30%, 1/2W	1	62PAR1K	73138
R7	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R8	Same as R5			
R9	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
R10	Same as R5			
TP1	TEST POINT	1	TJ-210V	49956
U1	SILICON RECTIFIER	1	MDA950A-3	04713

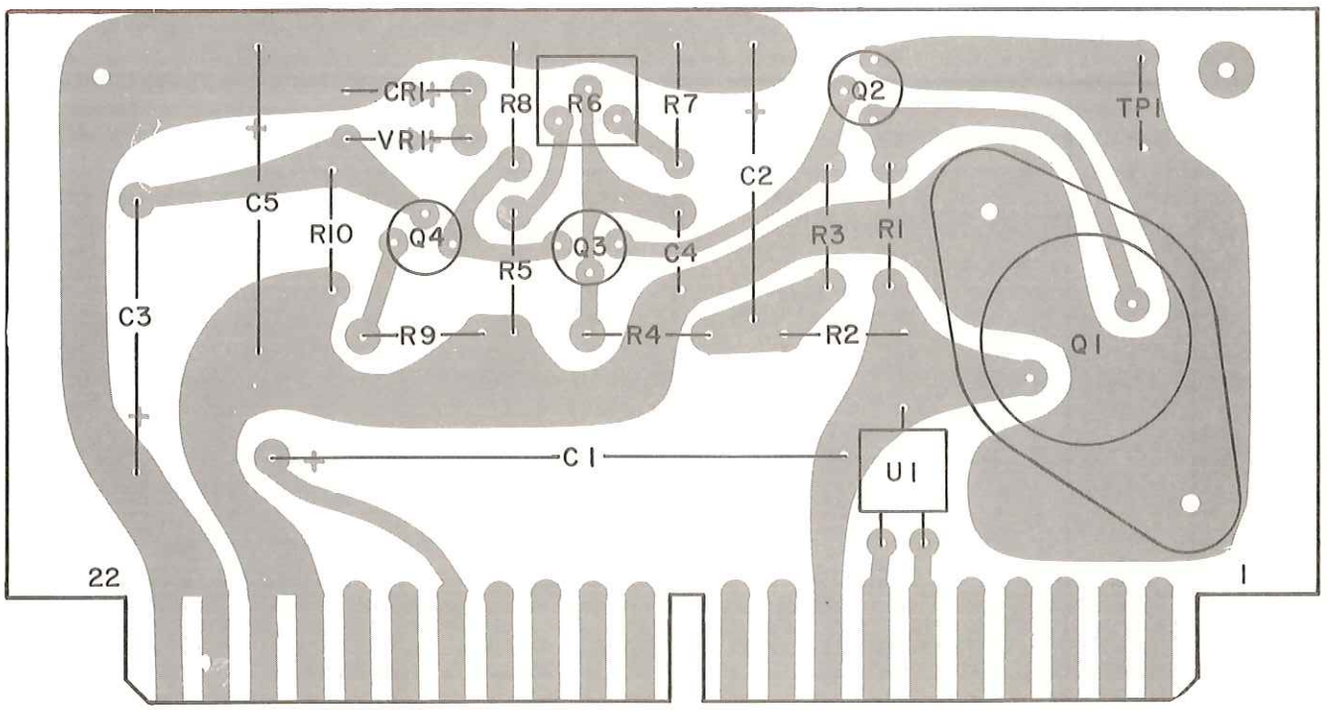


Figure 5-8. Type 76186 -15V Power Supply Regulator (A4), Component Locations

REF DESIG PREFIX A4

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
VR1	VOLTAGE REGULATOR	1	1N754A	80131

5.4.6 Type 71285 160/21.4 MHz Converter

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	BALANCED MIXER BOARD	1	16456	14632
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	7	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, STANDOFF: 1000 pF, GMV, 500V	4	SS5D-102W	01121
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	3	FA5C-102W	01121
C7	Same as C2			
C8	CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V	3	5202	91293
C9	Same as C1			
C10	CAPACITOR, COMPOSITION, TUBULAR: 0.82 pF, 10%, 500V	1	QC(.82pF, K)	95121
C11	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF, ±0.25 pF, 500V	1	301-000-C0J0-279C	72982
C12	CAPACITOR, CERAMIC, TUBULAR: 22 pF, 5%, 500V	2	301-000-C0G0-220J	72982
C13	Same as C8			
C14	Same as C8			
C15	CAPACITOR, CERAMIC, TUBULAR: 2.0 pF, ±0.25 pF, 500V	1	301-000-C0K0-209C	72982
C16	Same as C2			
C17	Same as C6			
C18	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ±0.1 pF, 500V	1	301-000-C0K0-159B	72982
C19	Same as C2			
C20	Same as C12			
C21	Same as C6			

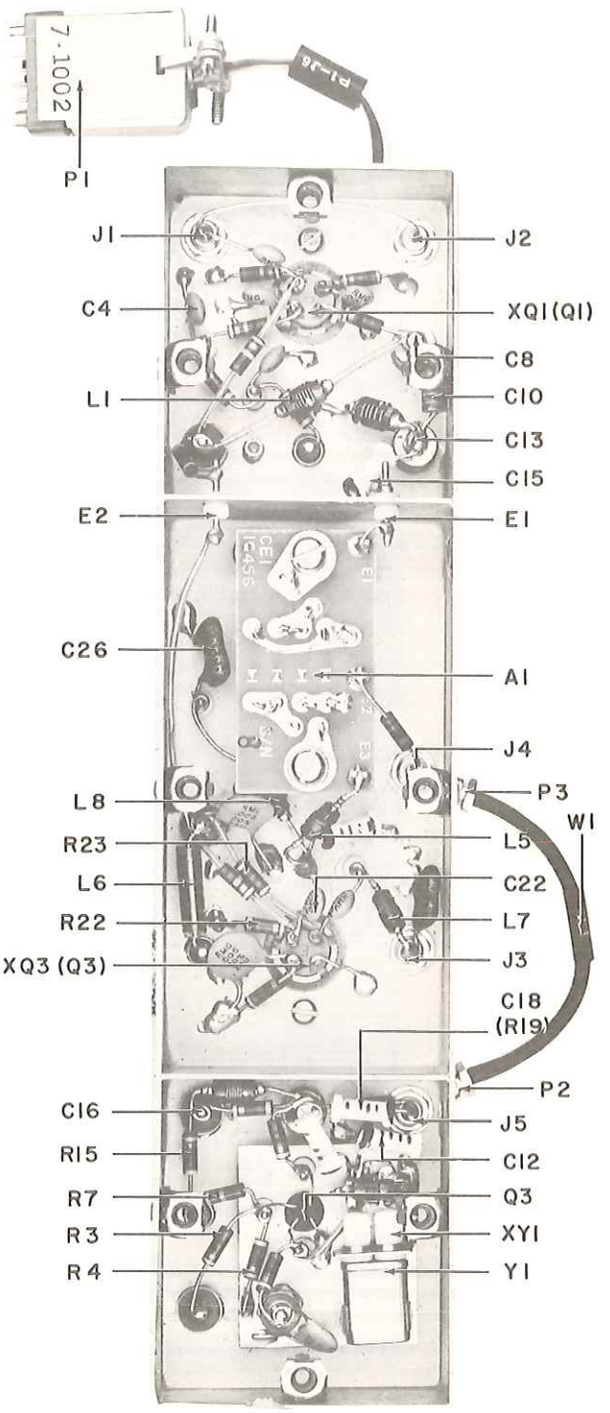


Figure 5-9. Type 71285 160/21.4 MHz Converter (A5), Component Locations

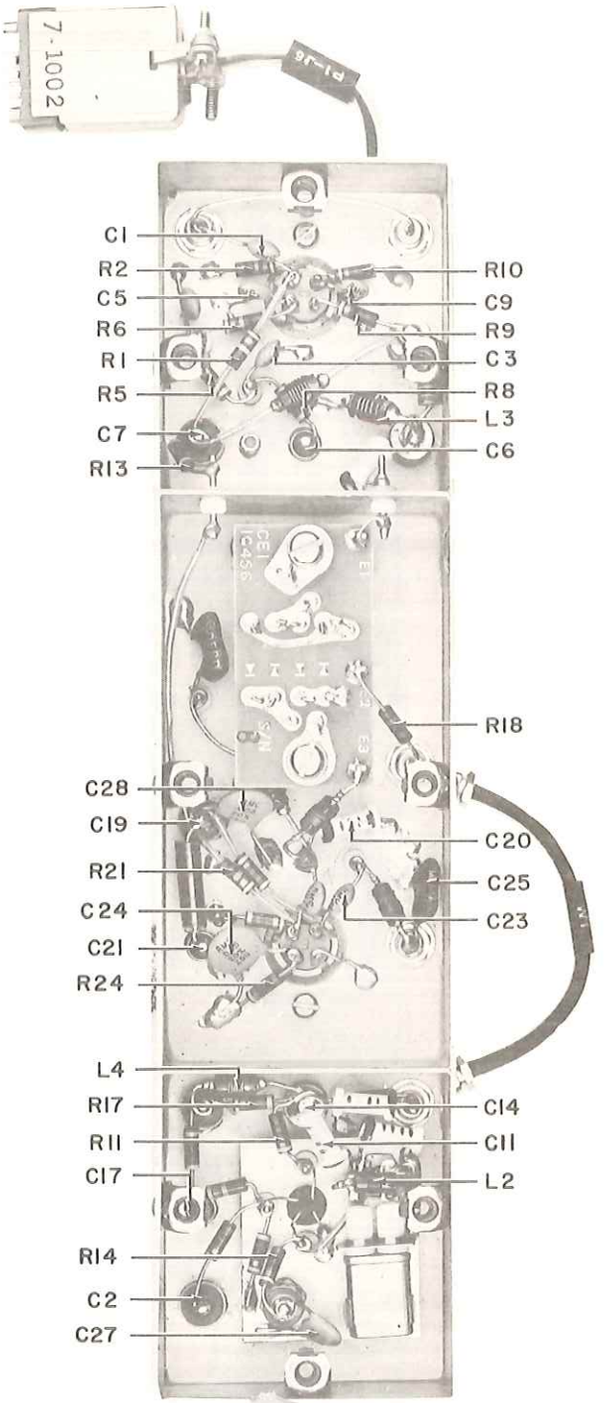


Figure 5-10. Type 71285 160/21.4 MHz Converter (A5), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C22	Same as C1			
C23	Same as C1			
C24	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	2	SM(5000pF, M)	91418
C25	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C26	CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500V	1	CM05CD150J03	81349
C27	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V	1	B(470pF, M)	91418
C28	Same as C24			
E1	TERMINAL, FEEDTHRU	2	SFU-16	04013
E2	Same as E1			
J1	CONNECTOR, RECEPTACLE, MINIATURE SERIES	5	UG-1464/U	81349
J2	Same as J1			
J3	Same as J1			
J4	Same as J1			
J5	Same as J1			
L1	COIL, FIXED	2	21210-34	14632
L2	COIL, FIXED: 0.24 μH	3	200-11	99848
L3	Same as L1			
L4	COIL, FIXED	1	21210-29	14632
L5	Same as L2			
L6	COIL, FIXED	1	1131-37	14632
L7	Same as L2			
L8	COIL, FIXED	1	21210-37	14632

REF DESIG PREFIX A5

REF DESIG	DESCRIPTION		QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
MP1	COVER		1	21968-2	14632
P1	CONNECTOR, PLUG, MULTIPIN		1	SLE-7P-NSSH13	81312
P2	CONNECTOR, PLUG, MINIATURE SERIES	Part of W1	2	UG-1466/U	81349
P3	Same as P2	Part of W1			
Q1	TRANSISTOR		1	3N187	80131
Q2	TRANSISTOR		2	2N3478	80131
Q3	Same as Q2				
R1	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W		1	RCR07G154JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W		2	RCR07G103JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W		1	RCR07G100JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W		5	RCR07G472JS	81349
R5	Same as R4				
R6	Same as R2				
R7	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4W		1	RCR07G123JS	81349
R8	Same as R4				
R9	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W		2	RCR07G220JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 300 Ω, 5%, 1/4W		3	RCR07G301JS	81349
R11	Same as R9				
R12	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W		1	RCR07G102JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W		1	RCR07G470JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4W		1	RCR07G820JS	81349
R15	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W		2	RCR07G471JS	81349

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R16	NOT USED			
R17	Same as R4			
* R18	RESISTOR, FIXED, COMPOSITION: 18 Ω, 5%, 1/4W	1	RCR07G180JS	81349
R19	Same as R10			
R20	NOT USED			
R21	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	1	RCRo7G183JS	81349
R22	Same as R4			
R23	RESISTOR, FIXED, COMPOSITION: 910 Ω, 5%, 1/4W	1	RCR07G911JS	81349
R24	Same as R10			
* R25	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	5	RCR07G330JS	81349
XQ1	SOCKET, TRANSISTOR	2	22-16-4	81073
XQ2	NOT USED			
XQ3	Same as XQ2			
XY1	SOCKET, CRYSTAL	1	8004-1G1	91506
Y1	CRYSTAL, QUARTZ: 138.600 MHz	1	98202-03	14632
W1	CABLE ASSEMBLY	1	30020-1378	14632
*	Nominal value. Final value to be factory selected.			

5.4.6.1 Part 16456 Balanced Mixer Board

REF DESIG PREFIX A5A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR1	DIODE	4	5082-2800	28480
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
T1	TRANSFORMER	2	21727-1	14632
T2	Same as T1			

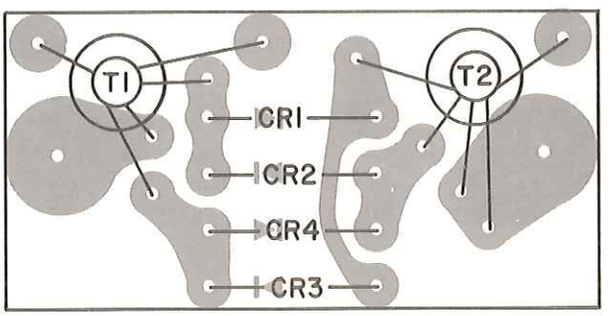


Figure 5-11. Part 16456 Balanced Mixer Board (A5A1), Component Locations

5.4.7 Type 72304-1 160-MHz IF Amplifier (10-20 MHz BW)

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	AMPLIFIER	2	15164	14632
A2	Same as A1			
A3	VIDEO AMPLIFIER	1	15203	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	14	FA5C-102W	01121
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	Same as C1			
C8	Same as C1			
C9	Same as C1			
C10	Same as C1			
C11	Same as C1			
C12	Same as C1			
C13	CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V	9	5202	91293
C14	CAPACITOR, CERAMIC, STANDOFF: 1000 pF, GMV, 500V	17	SS5D-102W	01121
C15	CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V	6	B(470pF, M)	91418
C16	CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±0.5 pF, 500V	1	301-000-C0H0-100D	72982
C17	Same as C14			
C18	Same as C1			
C19	Same as C14			

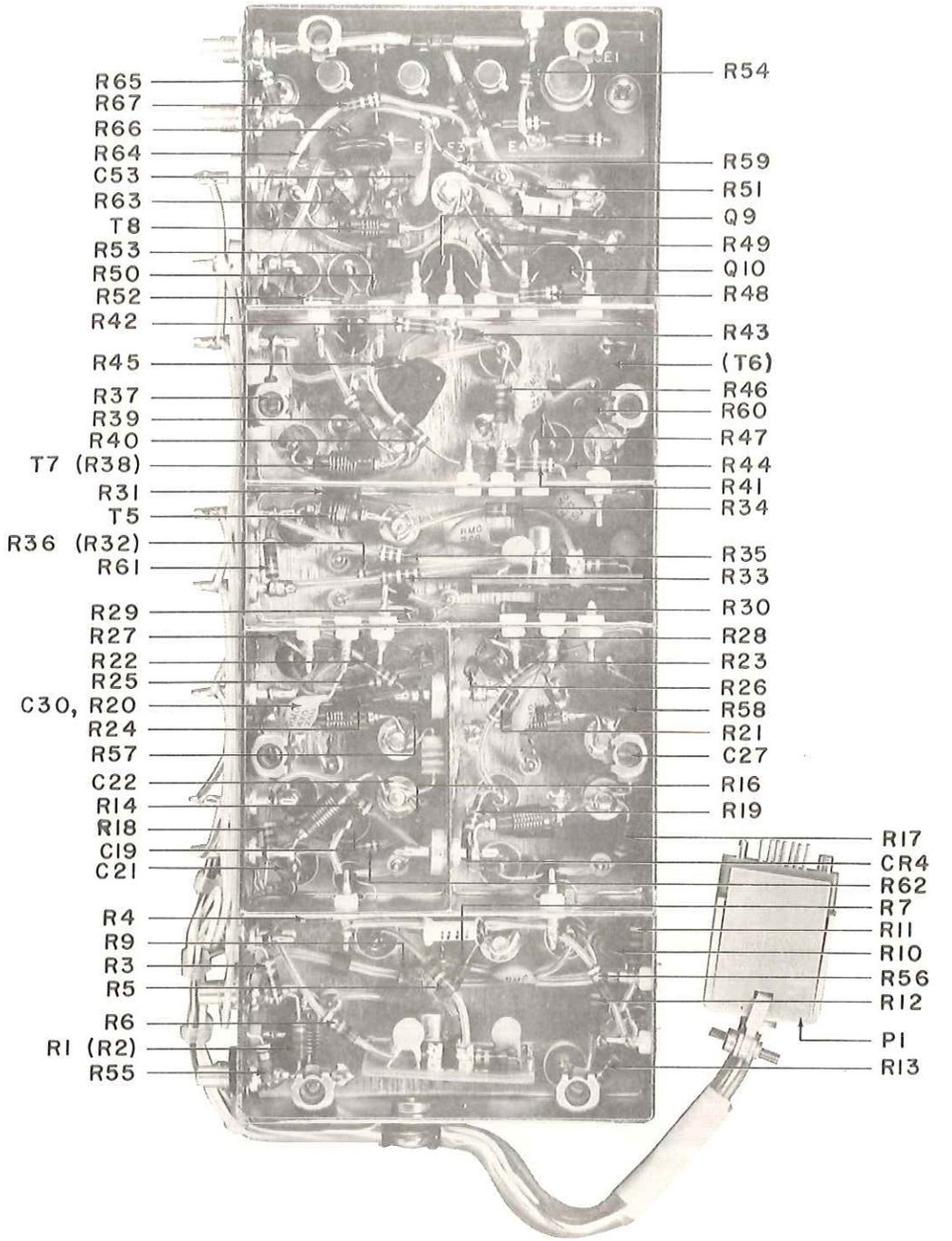


Figure 5-12. Type 72304-1 160 MHz IF Amplifier (10 - 20 MHz BW) (A6), Component Locations

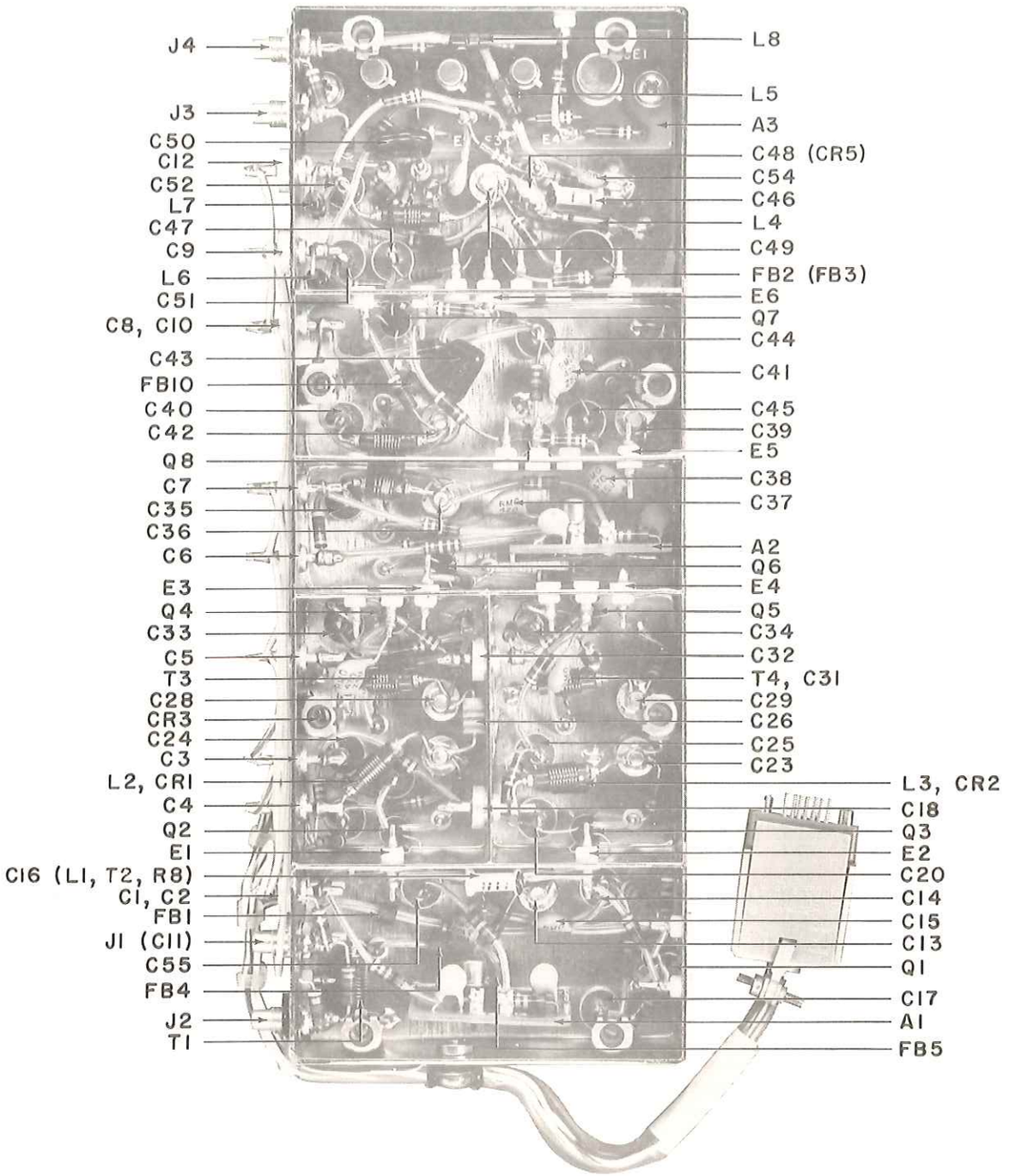


Figure 5-13. Type 72304-1 160 MHz IF Amplifier (10 - 20 MHz BW) (A6), Component Locations

THIS FIGURE HAS BEEN DELETED

Figure 5-14. Type 72304-1 160 MHz IF Amplifier (10-20 MHz BW) (A6), Component Locations

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C20	Same as C14			
C21	Same as C14			
C22	Same as C13			
C23	Same as C13			
C24	Same as C14			
C25	Same as C14			
C26	CAPACITOR, COMPOSITION, TUBULAR: 0.82 pF, 10%, 500V	1	QC(.82pF,K)	95121
C27	CAPACITOR, COMPOSITION, TUBULAR: 0.36 pF, 10%, 500V	1	QC(.36pF,K)	95121
C28	Same as C13			
C29	Same as C13			
C30	Same as C15			
C31	Same as C15			
C32	Same as C1			
C33	Same as C14			
C34	Same as C14			
C35	Same as C14			
C36	Same as C13			
C37	Same as C15			
C38	Same as C15			
C39	Same as C13			
C40	Same as C14			
C41	Same as C15			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C42	Same as C13			
C43	CAPACITOR, MICA, DIPPED: 51 pF, 2%, 500 V	1	CM05ED510G03	81349
C44	Same as C14			
C45	Same as C14			
C46	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.25 pF, 500V	1	301-000-C0H0-479C	72982
C47	Same as C14			
C48	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	4	SM(1000pF, GMV)	91418
C49	Same as C13			
C50	CAPACITOR, MICA, DIPPED: 1000 pF, 2%, 500 V	1	CM05FD101G03	81349
C51	Same as C14			
C52	Same as C14			
C53	Same as C48			
C54	Same as C48			
C55	Same as C14			
C56	Same as C48			
CR1	DIODE	4	1N462A	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	DIODE	1	5082-2800	28480
E1	TERMINAL, FEEDTHRU	6	SFU-16	04013
E2	Same as E1			

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
E3	Same as E1			
E4	Same as E1			
E5	Same as E1			
E6	Same as E1			
FB1	FERRITE BEAD	6	56-590-65/4A	02114
FB2 thru FB5	Same as FB1			
FB6 thru FB9	NOT USED			
FB10	Same as FB1			
J1	CONNECTOR, RECEPTACLE, SUBMINIATURE SERIES	4	UG-1464/U	81349
J2	Same as J1			
J3	Same as J1			
J4	Same as J1			
L1	COIL, FIXED	1	21210-68	14632
L2	COIL, FIXED	2	21210-69	14632
L3	Same as L2			
L4	COIL, FIXED	1	1131-40	14632
L5	COIL, FIXED: 0.24 μH	4	200-11	99848
L6	Same as L5			
L7	Same as L5			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
L8	Same as L5			
MP1	COVER	1	21991-1	14632
P1	CONNECTOR, PLUG, MULTIPIN	1	SLE-7PNSSH13	81312
Q1	TRANSISTOR	8	2N2857	80131
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Same as Q1			
Q7	Same as Q1			
Q8	Same as Q1			
Q9	TRANSISTOR	2	2N5109	80131
Q10	Same as Q9			
R1	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4W	3	RCR07G271JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 4.7 Ω, 5%, 1/4W	1	RCR07G4R7JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4W	1	RCR07G121JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	4	RCR07G471JS	81349
R5	RESISTOR, FIXED. COMPOSITION: 160 kΩ, 5%, 1/4W	2	RCR07G164JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	7	RCR07G103JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	8	RCR07G220JS	81349
R8	Same as R4			
R9	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	8	RCR07G100JS	81349

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R10	Same as R6			
R11	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	4	RCR07G303JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 2 kΩ, 5%, 1/4W	3	RCR07G202JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	RCR07G470JS	81349
R14	Same as R9			
R15	Same as R9			
R16	Same as R7			
R17	Same as R7			
R18	Same as R6			
R19	Same as R6			
R20	Same as R11			
R21	Same as R11			
R22	Same as R6			
R23	Same as R6			
R24	Same as R9			
R25	Same as R12			
R26	Same as R12			
R27	Same as R13			
*R28	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R29	Same as R7			
R30	Same as R7			

* Nominal value. Final value to be factory selected.

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R31	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	5	RCR07G102JS	81349
R32	Same as R7			
R33	Same as R4			
R34	Same as R5			
R35	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
*R36	RESISTOR, FIXED, COMPOSITION: 750 Ω, 5%, 1/4W	1	RCR07G751JS	81349
R37	Same as R4			
R38	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	RCR07G681JS	81349
R39	Same as R7			
R40	Same as R13			
R41	Same as R11			
R42	Same as R31			
R43	Same as R31			
R44	Same as R6			
R45	Same as R9			
R46	Same as R1			
*R47	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/4W	1	RCR07G270JS	81349
R48	Same as R9			
R49	Same as R9			
R50	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	3	RCR07G2R7JS	81349
R51	RESISTOR, FIXED, COMPOSITION: 3 kΩ, 5%, 1/4W	1	RCR07G302JS	81349
R52	Same as R1			

* Nominal value. Final value to be factory selected.

REF DESIG PREFIX A6

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R53	Same as R31			
R54	Same as R9			
R55	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4W	1	RCR07G820JS	81349
R56	Same as R7			
R57	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RCR07G392JS	81349
R58	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R59	RESISTOR, FIXED, COMPOSITION: 220 kΩ, 5%, 1/4W	1	RCR07G224JS	81349
R60	Same as R31			
R61	RESISTOR, FIXED, COMPOSITION: 430 kΩ, 5%, 1/4W	1	RCR07G434JS	81349
R62	RESISTOR, FIXED, COMPOSITION: 51 kΩ, 5%, 1/4W	1	RCR07G513JS	81349
R63	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	2	RCR07G151JS	81349
R64	RESISTOR, FIXED, COMPOSITION: 36 Ω, 5%, 1/4W	1	RCR07G360JS	81349
R65	Same as R63			
R66	Same as R50			
R67	Same as R50			
T1	TRANSFORMER	1	11464-5	14632
T2	TRANSFORMER	2	11464-6	14632
T3	TRANSFORMER	3	11464-50	14632
T4	Same as T3			
T5	TRANSFORMER	1	11464-33	14632
T6	Same as T2			
T7	Same as T3			
T8	TRANSFORMER	1	11464-13	14632

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	2	SM(1000pF,GMV)	91418
C2	Same as C1			
Q1	TRANSISTOR	1	3N187	80131
R1	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349

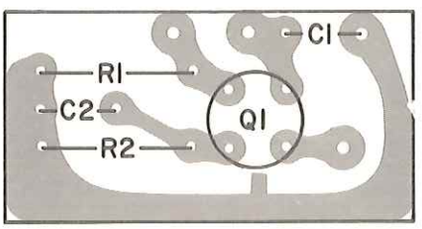


Figure 5-15. Part 15164 Amplifier (A6A1, A6A2), Component Locations

5.4.7.2 Part 15203 Video Amplifier

REF DESIG PREFIX A6A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q1	TRANSISTOR	1	2N929	80131
Q2	TRANSISTOR	2	2N3251	80131
Q3	Same as Q2			
Q4	TRANSISTOR	1	2N2270	80131
R1	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R2	Same as R1			
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 2.4 kΩ, 5%, 1/4W	2	RCR07G242JS	81349
R5	Same as R4			
R6	Same as R3			
R7	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	2	RCR07G220JS	81349
R8	Same as R7			

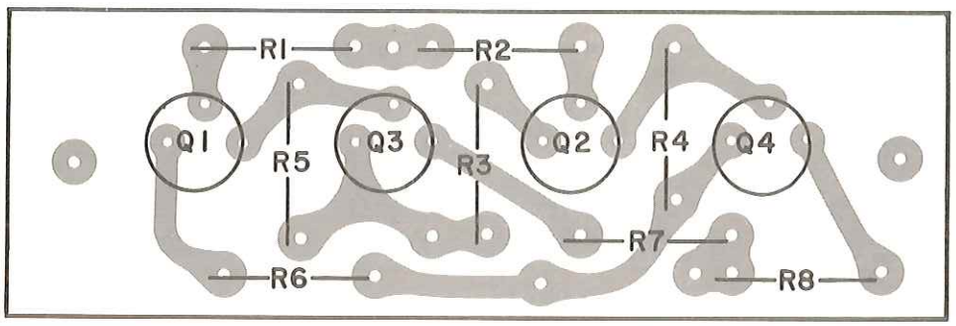


Figure 5-16. Part 15203 Video Amplifier (A6A3), Component Locations

5.4.8 Type 79640 160-MHz Limiter/Discriminator

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V	5	5202	92193
C2	CAPACITOR, CERAMIC, STANDOFF: 470 pF, 20%, 500V	8	SS5A-4712	01121
C3	CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500V	7	FA5C-4712	01121
C4	Same as C2			
C5	CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V	1	CM05ED330J03	81349
C6	Same as C3			
C7	Same as C2			
C8	Same as C1			
C9	CAPACITOR, MICA, DIPPED: 56 pF, 5%, 500V	1	CM05ED560J03	81349
C10	Same as C3			
C11	Same as C2			
C12	Same as C1			
C13	Same as C2			
C14	CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±0.5 pF, 500V	5	301-000-C0H0-100D	72982
C15	Same as C14			
C16	Same as C3			
C17	Same as C2			
C18	Same as C2			
C19	Same as C2			
C20	Same as C1			
C21	Same as C1			
C22	Same as C14			

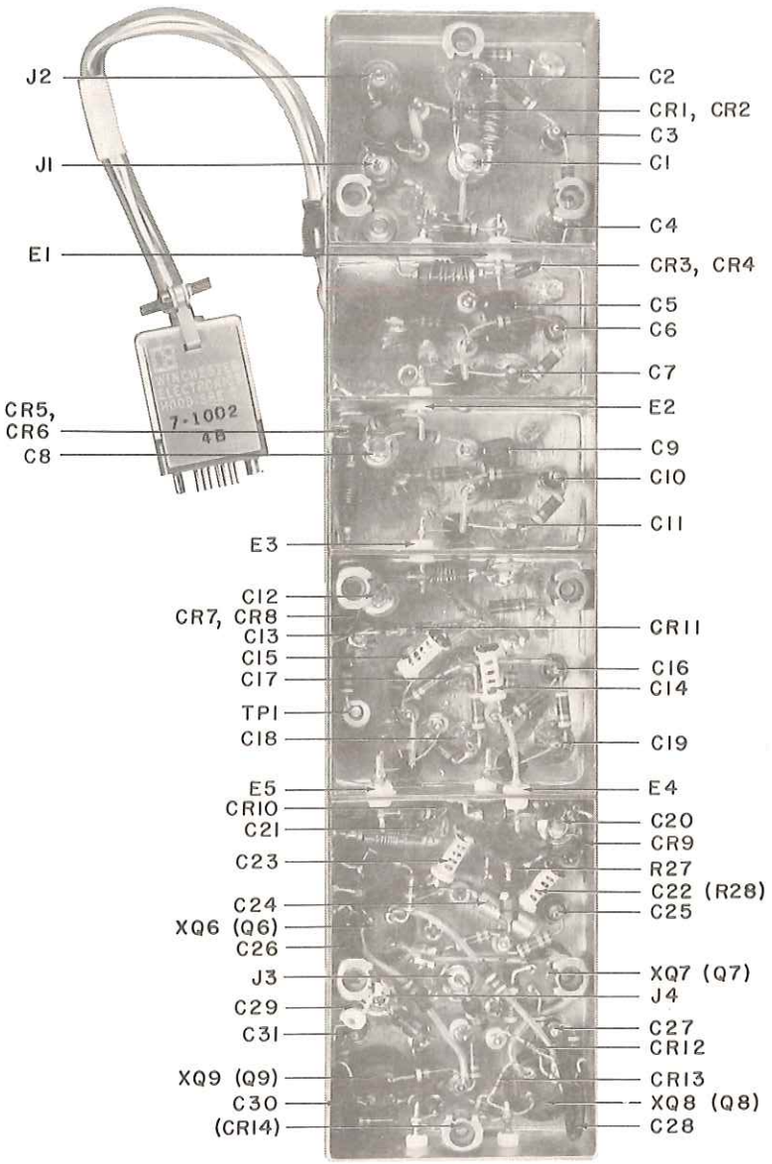


Figure 5-17. Type 79640 160 MHz Limiter/Discriminator (A7), Component Locations

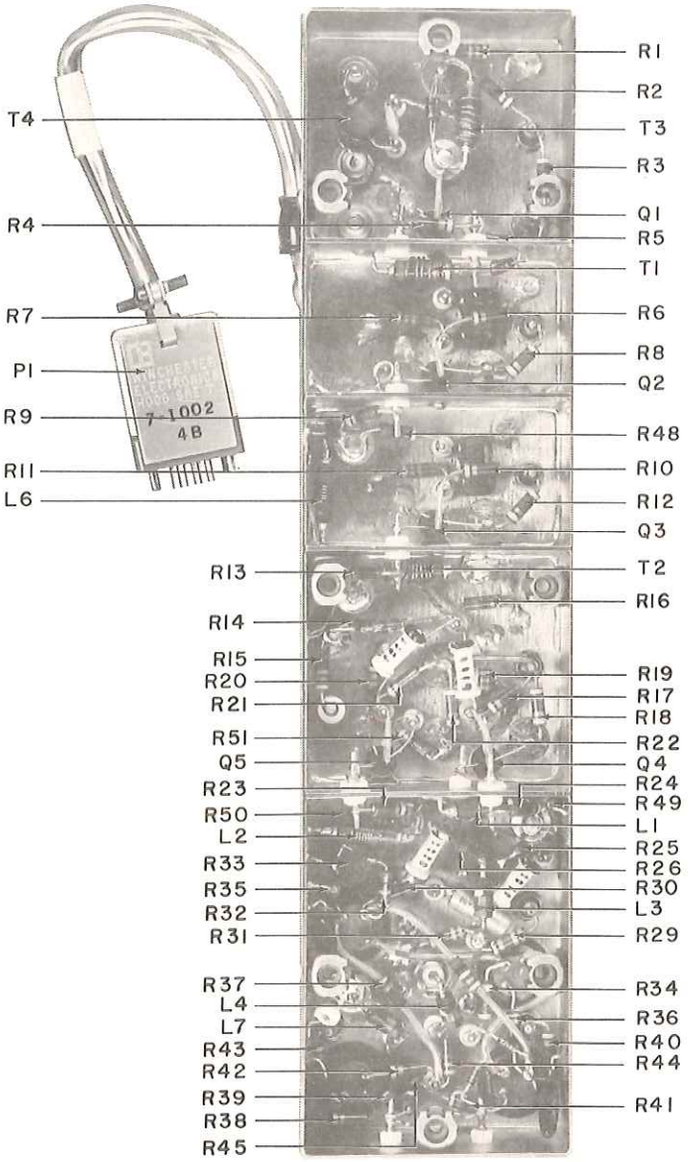


Figure 5-18. Type 79640 160 MHz Limiter/Discriminator (A7), Component Locations

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C23	Same as C14			
C24	CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 μF, 10%, 35V	1	CS13BF475K	81349
C25	Same as C3			
C26	CAPACITOR, MICA, DIPPED: 36 pF, 5%, 500V	1	CM05ED360J03	81349
C27	Same as C3			
C28	CAPACITOR, CERAMIC, DISC: 0.1 μF, -20+80%, 25V	2	DFJ-3	73899
C29	Same as C14			
C30	Same as C28			
C31	Same as C3			
C32	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500 V	1	SM (1000 pF, P)	91418
CR1	DIODE	10	5082-2303	28480
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	Same as CR1			
CR6	Same as CR1			
CR7	Same as CR1			
CR8	Same as CR1			
CR9	Same as CR1			
CR10	Same as CR1			
CR11	DIODE	1	1N82AG	80131
CR12	DIODE	3	1N4446	80131

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
CR13	Same as CR12			
CR14	Same as CR12			
E1	TERMINAL, FEEDTHRU	5	SFU-16	04013
E2	Same as E1			
E3	Same as E1			
E4	Same as E1			
E5	Same as E1			
J1	CONNECTOR, RECEPTACLE, SUBMINIATURE SERIES	4	UG-1464/U	81349
J2	Same as J1			
J3	Same as J1			
J4	Same as J1			
L1	COIL, FIXED	1	21210-41	14632
L2	COIL, FIXED	1	21210-8	14632
L3	COIL, FIXED: 0.24 μH	3	200-11	99848
L4	Same as L3			
L5	NOT USED			
L6	COIL, FIXED	1	1131-86	14632
L7	Same as L3			
MP1	COVER	1	21968-1	14632
P1	CONNECTOR, PLUG, MULTIPIN	1	SLE-7P-NSSH13	81312
Q1	TRANSISTOR	5	2N2857	80131
Q2	Same as Q1			

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	TRANSISTOR	2	2N2222	80131
Q7	TRANSISTOR	2	2N3251	80131
Q8	Same as Q6			
Q9	Same as Q7			
R1	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	8	RCR07G103JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	5	RCR07G222JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	6	RCR07G471JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	10	RCR07G220JS	81349
R5	Same as R4			
R6	Same as R2			
R7	Same as R1			
R8	Same as R3			
R9	Same as R4			
R10	Same as R2			
R11	Same as R1			
R12	Same as R3			
R13	Same as R4			
R14	Same as R1			
R15	Same as R1			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R16	RESISTOR, FIXED, COMPOSITION: 56 Ω, 5%, 1/4W	1	RCR07G560JS	81349
R17	Same as R2			
R18	Same as R3			
R19	Same as R1			
R20	Same as R1			
R21	Same as R2			
R22	Same as R3			
R23	Same as R4			
R24	Same as R4			
R25	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4W	3	RCR07G122JS	81349
R26	Same as R25			
R27	RESISTOR, VARIABLE, WIRE-WOUND: 200 Ω, 5%, 1/2W	1	3300S-1-201	80294
R28	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	4	RCR07G332JS	81349
R29	Same as R28			
R30	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R31	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R32	RESISTOR, FIXED, COMPOSITION: 20 kΩ, 5%, 1/4W	1	RCR07G203JS	81349
R33	RESISTOR, VARIABLE, WIRE-WOUND: 10 kΩ, 5%, 1/2W	1	3300S-1-103	80294
R34	Same as R3			
R35	RESISTOR, FIXED, COMPOSITION: 680 Ω, 5%, 1/4W	1	RCR07G681JS	81349
R36	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4W	1	RCR07G121JS	81349
R37	RESISTOR, FIXED, COMPOSITION: 5.1 kΩ, 5%, 1/4W	1	RCR07G512JS	81349

REF DESIG PREFIX A7

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R38	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R39	Same as R25			
R40	Same as R4			
R41	Same as R4			
R42	Same as R4			
R43	Same as R4			
R44	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4W	1	RCR07G121JS	81349
R45	Same as R38			
R46	NOT USED			
R47	NOT USED			
R48	Same as R38			
R49	Same as R28			
R50	Same as R28			
*R51	RESISTOR, FIXED, COMPOSITION: 12 Ω, 5%, 1/4W	1	RCR07G120JS	81349
T1	TRANSFORMER	3	21818-2	14632
T2	Same as T1			
T3	TRANSFORMER	1	23558-3	14632
T4	Same as T1			
TP1	TEST POINT	1	TJ-6	04013
XQ6	SOCKET, TRANSISTOR	4	22-16-2	81073
XQ7	Same as XQ6			
XQ8	Same as XQ6			
XQ9	Same as XQ6			

* Nominal value. Final value factory selected.

5.4.9 Type 72295 21.4-MHz IF Amplifier (100 kHz BW)

REF DESIG PREFIX A8

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	IF INPUT AMPLIFIER	1	15295	14632
A2	IF OUTPUT AMPLIFIER	1	15298	14632
A3	FM LIMITER DISCRIMINATOR	1	15196	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	9	FA5C-102W	01121
C2	Same as C1			
C3	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	2	SM(1000 pF, GMV)	91418
C4	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	3	SM(5000 pF, M)	91418
C5	Same as C3			
C6	Same as C1			
C7	Same as C4			
C8	Same as C1			
C9	Same as C1			
C10	NOT USED			
C11	Same as C4			
C12	Same as C1			
C13	Same as C1			
C14	Same as C1			
C15	Same as C1			
E1	TERMINAL, FEEDTHRU	1	SFU-16	04013
FB1	FERRITE BEAD	4	56-590-65/4A	02114
FB2	Same as FB1			
FB3	Same as FB1			

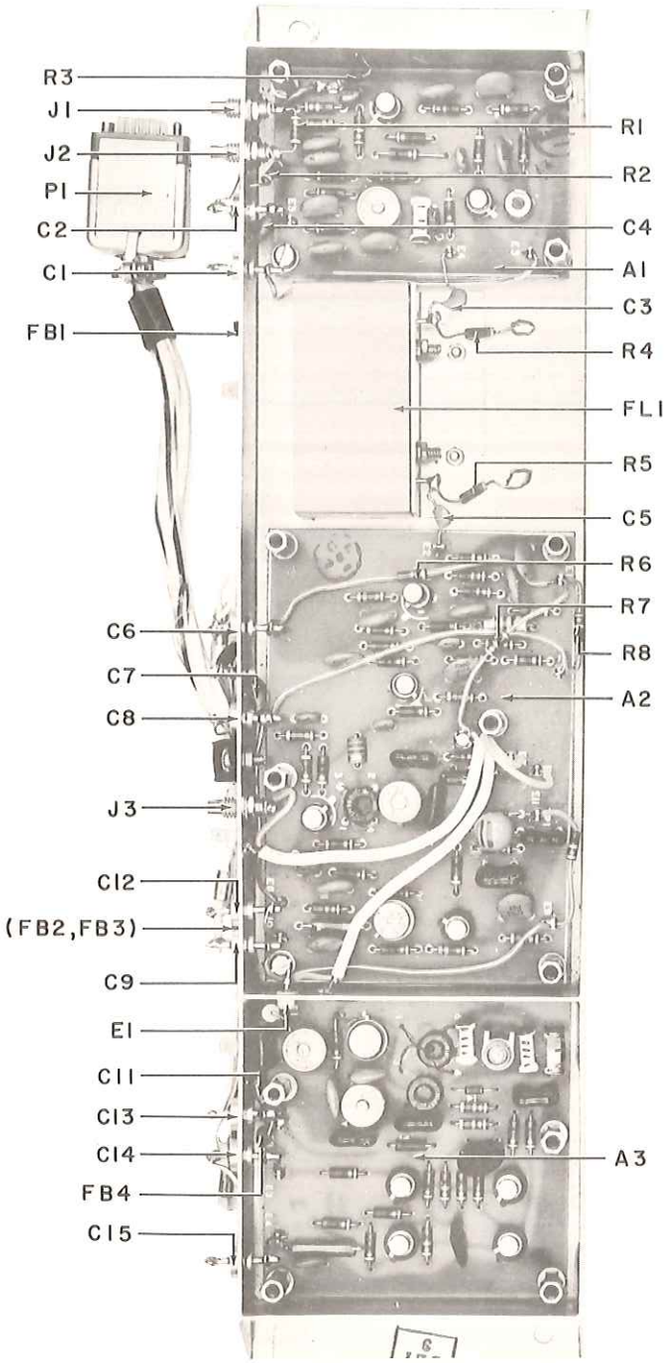


Figure 5-19. Type 72295 21.4 MHz IF Amplifier (100 kHz BW) (A8), Component Locations

REF DESIG PREFIX A8

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
FB4	Same as FB1			
FL1	FILTER, BANDPASS: 21.4-MHz C. F., 100 kHz BW	1	6063674	74306
J1	CONNECTOR, RECEPTACLE, SUBMINIATURE SERIES	3	UG-1464/U	81349
J2	Same as J1			
J3	Same as J1			
L1	COIL, FIXED: 1 μH	1	1537-12	99800
MP1	COVER	1	22369-1	14632
P1	CONNECTOR, PLUG, MULTIPIN	1	SLE-14P-N SSH13	81312
R1	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	1	RCR07G471JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/4W	1	RCR07G561JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	RCR07G303JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349

5.4.9.1 Part 15295 IF Amplifier (100 kHz BW) REF DESIG PREFIX A8A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	2	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	8	SM(5000pF, M)	91418
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	Same as C1			
C7	Same as C2			
C8	Same as C2			
C9	CAPACITOR, CERAMIC, TUBULAR: 1 pF, ±.25 pF, 500V	1	301-000-C0K0-109C	72982
C10	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	1	538-011D9-35	72982
C11	Same as C2			
C12	Same as C2			
L1	NOT USED			
L2	COIL, FIXED	1	3641-12	71279
Q1	TRANSISTOR	1	3N187	80131
Q2	TRANSISTOR	1	2N2857	80131
R1	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	3	RCR07G102JS	81349
R4	Same as R2			
R5	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349

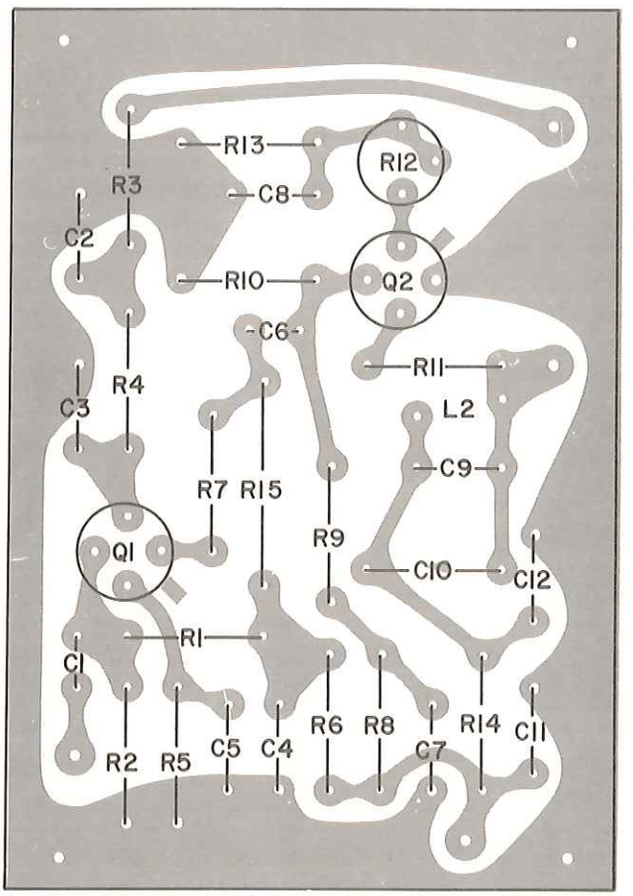


Figure 5-20. Part 15295 IF Amplifier (100 kHz BW) (A8A1), Component Locations

REF DESIG PREFIX A8A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R7	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349
R8	Same as R3			
R9	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R12	RESISTOR, VARIABLE, FILM: 100 Ω, 30%, 1/2W	1	62PR100	73138
R13	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4W	1	RCR07G821JS	81349
R14	Same as R6			
R15	Same as R3			

5.4.9.2 Part 15298 IF Output Amplifier (100 kHz BW)

REF DESIG PREFIX A8A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	7	SM(5000pF, M)	91418
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	4	SM(1000pF, GMV)	91418
C7	Same as C6			
C8	Same as C1			
C9	Same as C6			
C10	CAPACITOR, COMPOSITION, TUBULAR: 0.68 pF, 10%, 500V	1	QC(.68pF, K)	95121
C11	Same as C6			
C12	CAPACITOR, MICA, DIPPED: 62 pF, 5%, 500V	1	CM05ED620J03	81349
C13	CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V	1	CM05ED270J03	81349
C14	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	1	538-011D9-35	72982
C15	CAPACITOR, MICA, DIPPED: 300 pF, 5%, 500V	1	CM05FD301J03	81349
C16	CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500V	1	CM05FD151J03	81349
C17	CAPACITOR, MICA, DIPPED: 330 pF, 5%, 500V	1	CM05FD331J03	81349
C18	Same as C1			
C19	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	2	C023B101F103M	56289
C20	Same as C19			
CR1	DIODE	1	5082-2800	28480
L1	COIL, FIXED: 22 μH	1	1537-44	99800

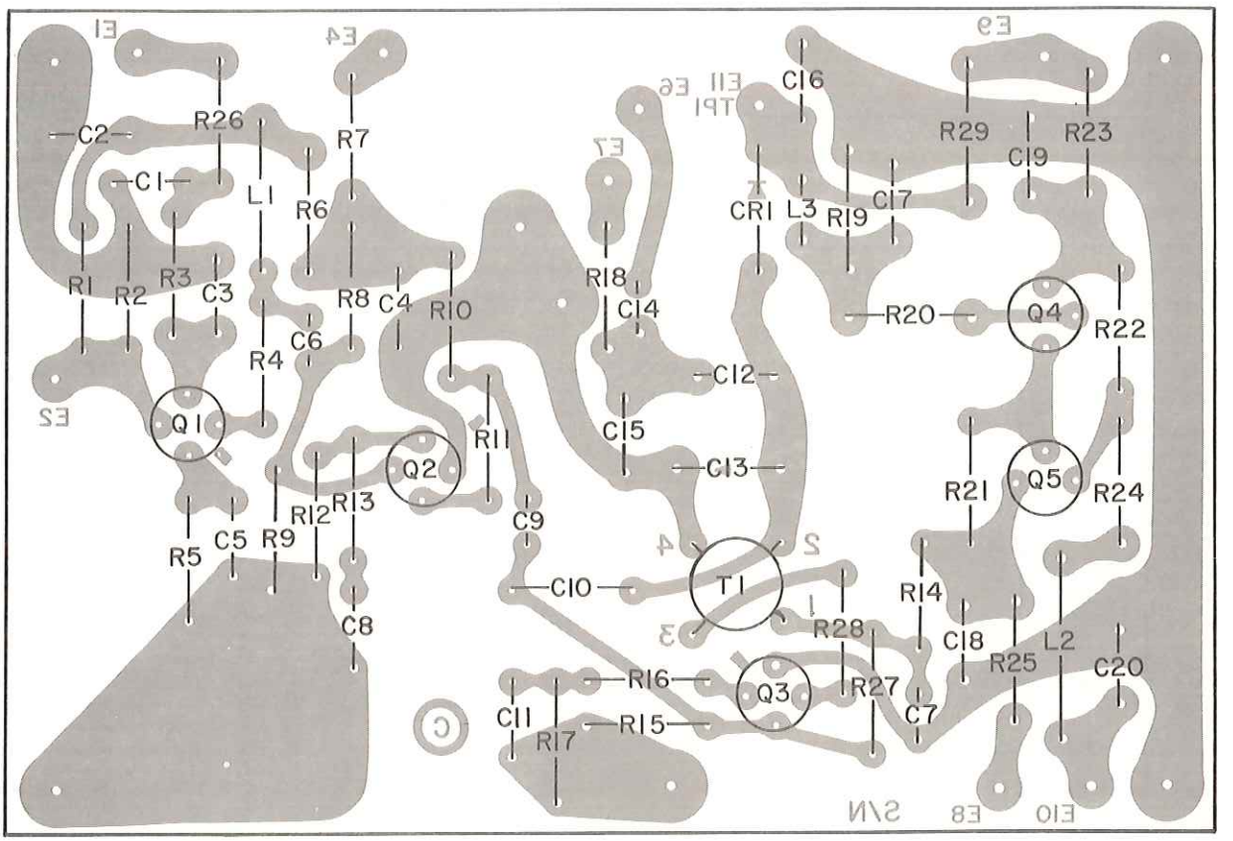


Figure 5-21. Part 15298 IF Output Amplifier (100 kHz BW) (A8A2), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
L2	COIL, FIXED	1	1131-41	14632
L3	COIL, FIXED: 22 mH	1	3635-53	71279
Q1	TRANSISTOR	1	3N187	80131
Q2	TRANSISTOR	1	2N2857	80131
Q3	TRANSISTOR	1	2N3478	80131
Q4	TRANSISTOR	1	2N3251	80131
Q5	TRANSISTOR	1	2N2270	80131
R1	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	5	RCR07G103JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	2	RCR07G220JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	5	RCR07G470JS	81349
R7	Same as R6			
R8	Same as R2			
R9	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	2	RCR07G471JS	81349
R11	Same as R4			
R12	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4W	1	RCR07G821JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	3	RCR07G100JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	1	RCR07G101JS	81349
R15	Same as R9			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R16	Same as R13			
R17	Same as R10			
R18	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	RCR07G2R7JS	81349
R19	Same as R2			
R20	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R21	RESISTOR, FIXED, COMPOSITION: 2.4 kΩ, 5%, 1/4W	1	RCR07G242JS	81349
R22	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R23	Same as R6			
R24	Same as R13			
R25	Same as R6			
R26	Same as R20			
R27	Same as R2			
R28	Same as R6			
R29	RESISTOR, FIXED, COMPOSITION: 1 MΩ, 5%, 1/4W	1	RCR07G105JS	81349
T1	TRANSFORMER	1	21092-7	14632

5.4.9.3 Part 15196 FM Limiter Discriminator (100 kHz BW)

REF DESIG PREFIX A8A3

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	1	538-011D9-35	72982
C2	CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V	1	CM05ED330J03	81349
C3	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	2	SM(5000pF,M)	91418
C4	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V	2	538-011A2-8	72982
C5	Same as C3			
C6	CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V	1	CM05ED270J03	81349
C7	CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V	1	CM05CD100D03	81349
C8	CAPACITOR, VARIABLE, AIR: 1-10 pF, 250V	1	6371	91293
C9	CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±.5 pF, 500V	1	301-000-C0H0-100D	72982
C10	CAPACITOR, MICA, DIPPED: 22 pF, 5%, 500V	1	CM05ED220J03	81349
C11	CAPACITOR, CERAMIC, DISC: 0.1 μF, -20+80%, 25V	2	DFJ-3	73899
C12	Same as C11			
C13	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	1	C023B101F103M	56289
C14	CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±.5 pF, 500V	1	301-000-S2H0-100D	72982
C15	CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±.25 pF, 500V	1	301-000-S2H0-479C	72982
CR1	DIODE	2	5082-2900	28480
CR2	Same as CR1			
L1	NOT USED			
L2	COIL, FIXED	1	20681-12	14632
L3	COIL, FIXED	1	1131-37	14632
Q1	TRANSISTOR	2	2N3251	80131
Q2	TRANSISTOR	2	2N929	80131

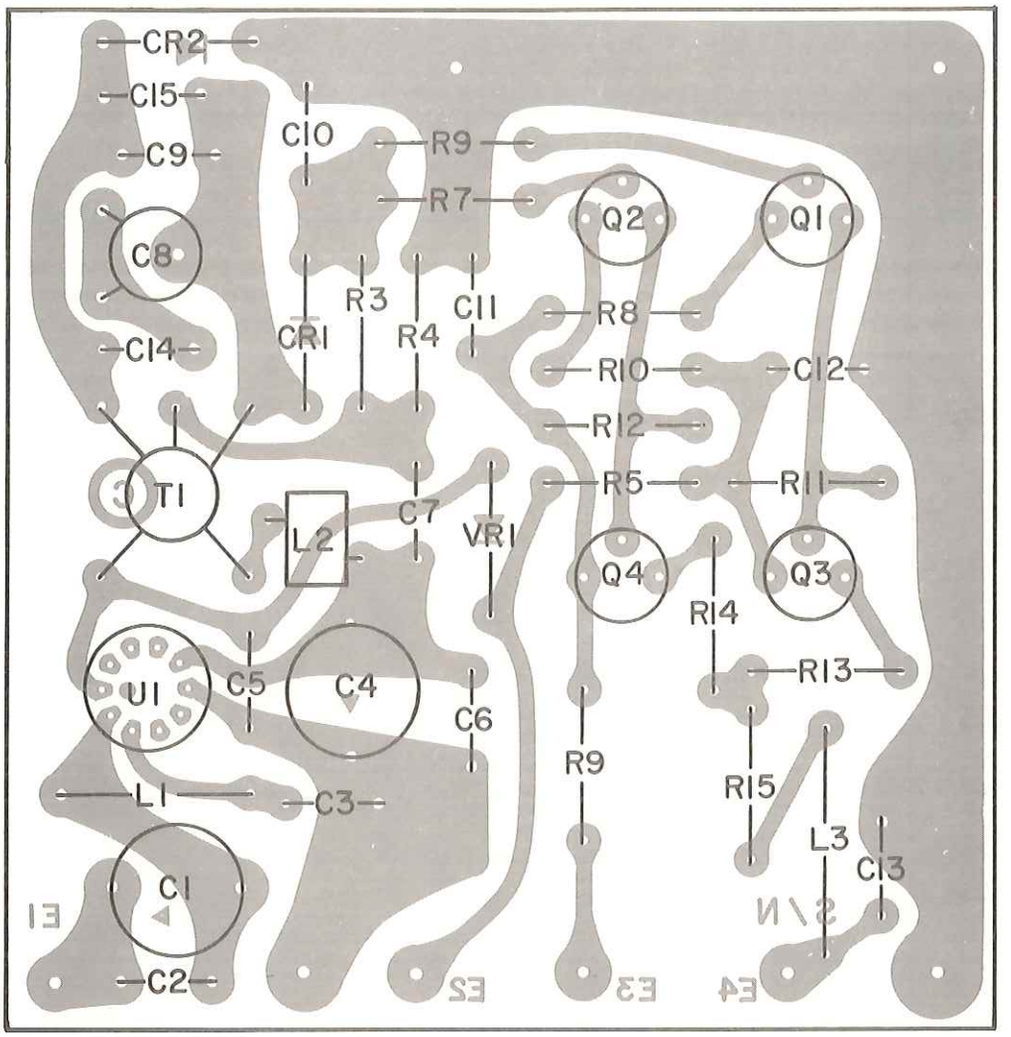


Figure 5-22. Part 15196 FM Limiter/Discriminator (100 kHz BW) (A8A3), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q3	Same as Q2			
Q4	Same as Q1			
R1	NOT USED			
R2	NOT USED			
R3	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	2	RCR07G473JS	81349
R4	Same as R3			
R5	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	4	RCR07G220JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R7	Same as R6			
R8	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R9	Same as R5			
R10	Same as R8			
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R12	Same as R11			
R13	Same as R5			
R14	Same as R5			
R15	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4W	1	RCR07G820JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 51 Ω, 5%, 1/4W	1	RCR07G510JS	81349
T1	TRANSFORMER	1	21427-15	14632
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263
VR1	VOLTAGE REGULATOR	1	1N746A	80131

5.4.10 Type 7361 Video Amplifier

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 15 μF, 10%, 20V	1	CS13BE156K	81349
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 20V	2	CS13BE476K	81349
C3	CAPACITOR, COMPOSITION, TUBULAR: .12 pF, 10%, 500V	1	QC (.12 pF, K)	95121
C4	Same as C2			
CR1	DIODE	3	1N4446	80131
CR2	Same as CR1			
CR3	Same as CR1			
L1	COIL, FIXED: 0.68 μH	1	203-11	99848
Q1	TRANSISTOR	1	2N3423	80131
Q2	TRANSISTOR	2	2N3251	80131
Q3	TRANSISTOR	1	2N2222	80131
Q4	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
* R2	RESISTOR, FIXED, COMPOSITION: 22 MΩ, 5%, 1/4W	1	RCR07G226JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 1.1 kΩ, 5%, 1/4W	1	RCR07G112JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	2	RCR07G471JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	2	RCR07G220JS	81349
R6	Same as R4			
R7	Same as R5			
R8	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	1	RCR07G152JS	81349
R9	RESISTOR, FIXED, FILM: 1.1 kΩ, 1%, 1/4W	1	RN60D1101F	81349
R10	RESISTOR, FIXED, FILM: 21.5 kΩ, 1%, 1/4W	1	RN60D2152F	81349

* Nominal value. Final value to be factory selected.

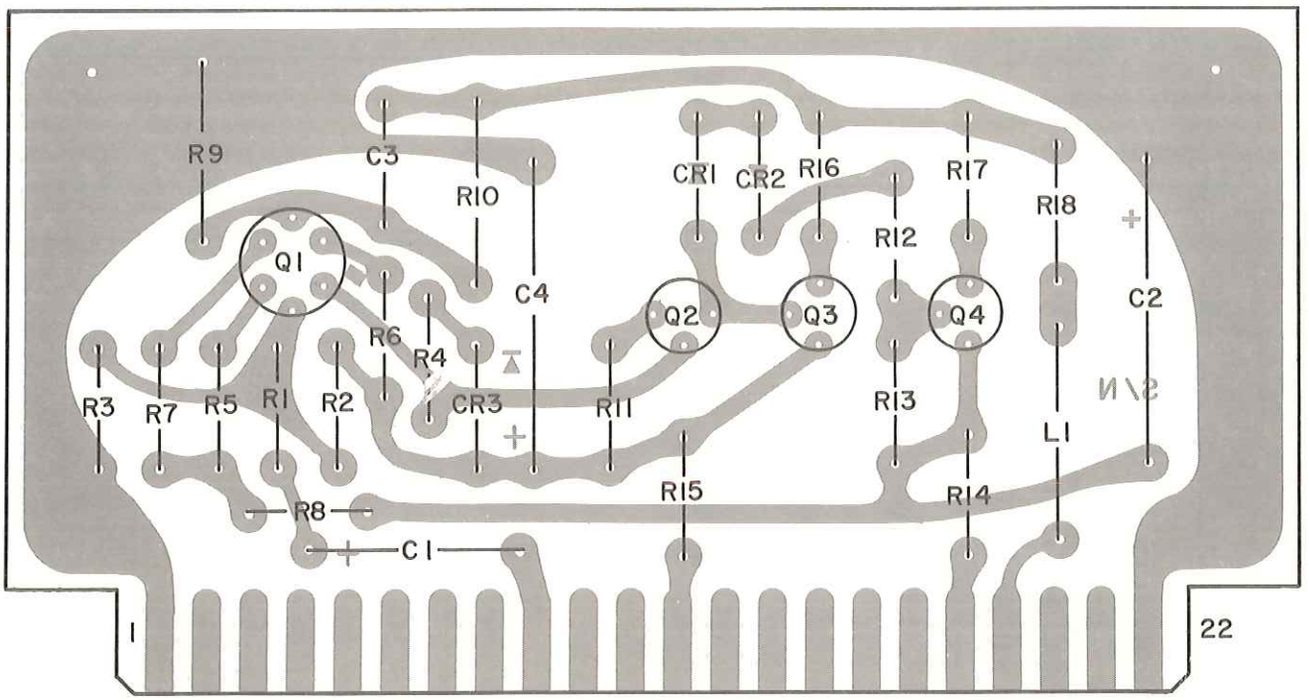


Figure 5-23. Type 7361 Video Amplifier (A9), Component Locations

REF DESIG PREFIX A9

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R11	RESISTOR, FIXED, COMPOSITION: 200 Ω, 5%, 1/4W	1	RCR07G201JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 2.7 Ω, 5%, 1/4W	1	RCR07G2R7JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4W	1	RCR07G122JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R15	Same as R14			
R16	RESISTOR, FIXED, COMPOSITION: 27 Ω, 5%, 1/4W	2	RCR07G270JS	81349
R17	Same as R16			
R18	RESISTOR, FIXED, COMPOSITION: 91 Ω, 5%, 1/4W	1	RCR07G910JS	81349

5.4.11 Type 7866 AGC Amplifier

REF DESIG PREFIX A10

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	1	C023B101F103M	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	3	CS13BF105K	81349
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 35V	1	CS13BF225K	81349
C4	Same as C2			
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μF, 10%, 35V	1	CS13BF476K	81349
C6	Same as C2			
CR1	DIODE	1	1N4446	80131
CR2	DIODE	3	1N462A	80131
CR3	Same as CR2			
CR4	Same as CR2			
Q1	TRANSISTOR	2	2N3251	80131
Q2	TRANSISTOR	4	2N2222	80131
Q3	Same as Q1			
Q4	Same as Q2			
Q5	Same as Q2			
Q6	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	3	RCR07G102JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	4	RCR07G103JS	81349
R3	Same as R2			
R4	RESISTOR, FIXED, COMPOSITION: 270 kΩ, 5%, 1/4W	1	RCR07G274JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/4W	1	RCR07G561JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349

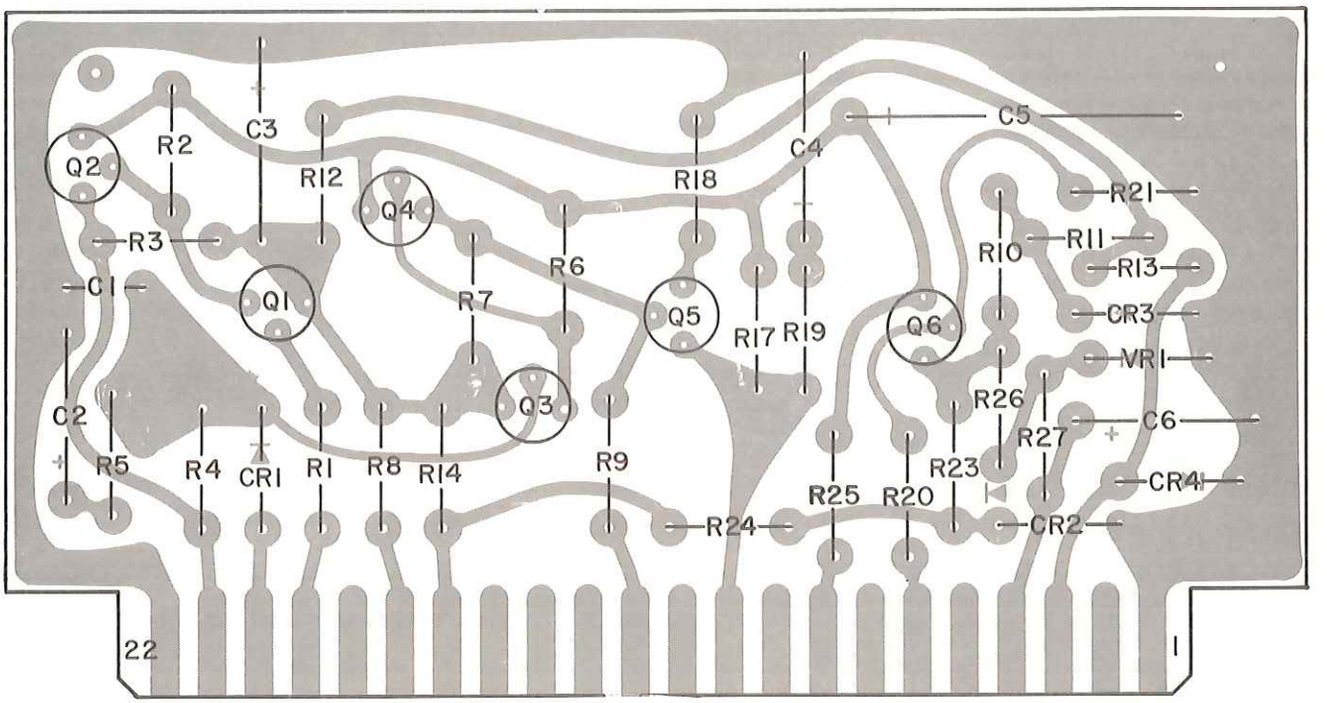


Figure 5-24. Type 7866 AGC Amplifier (A10), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R7	Same as R2			
R8	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	1	RCR07G333JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R11	RESISTOR, FIXED, COMPOSITION: 39 kΩ, 5%, 1/4W	3	RCR07G393JS	81349
R12	RESISTOR, FIXED, COMPOSITION: 51 kΩ, 5%, 1/4W	1	RCR07G513JS	81349
R13	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	1	RCR07G102JS	81349
R14	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R15	NOT USED			
R16	NOT USED			
R17	Same as R2			
R18	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R19	RESISTOR, FIXED, COMPOSITION: 2 kΩ, 5%, 1/4W	1	RCR07G202JS	81349
R20	Same as R1			
R21	RESISTOR, FIXED, COMPOSITION: 10 MΩ, 5%, 1/4W	1	RCR07G106JS	81349
R22	NOT USED			
R23	Same as R10			
R24	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R25	Same as R8			
R26	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	1	RCR07G392JS	81349
R27	Same as R1			
VR1	VOLTAGE REGULATOR	1	1N756A	80131

5.4.12 Type 7444 Audio Amplifier

REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μF, 10%, 35V	1	CS13BF105K	81349
C2	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	1	C023B101F103M	56289
C3	CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μF, 10%, 35V	2	CS13BF225K	81349
C4	Same as C3			
C5	CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μF, 10%, 15V	1	CS13BD226K	81349
C6	CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μF, 10%, 20V	1	CS13BE107K	81349
CR1	DIODE	1	1N4446	80131
CR2	DIODE	4	1N462A	80131
CR3	Same as CR2			
CR4	Same as CR2			
CR5	Same as CR2			
Q1	TRANSISTOR	3	2N929	80131
Q2	Same as Q1			
Q3	Same as Q1			
Q4	TRANSISTOR	2	2N3251	80131
Q5	TRANSISTOR	1	2N2270	80131
Q6	Same as Q4			
R1	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 43 kΩ, 5%, 1/4W	1	RCR07G433JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	5	RCR07G101JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 3.9 kΩ, 5%, 1/4W	2	RCR07G392JS	81349

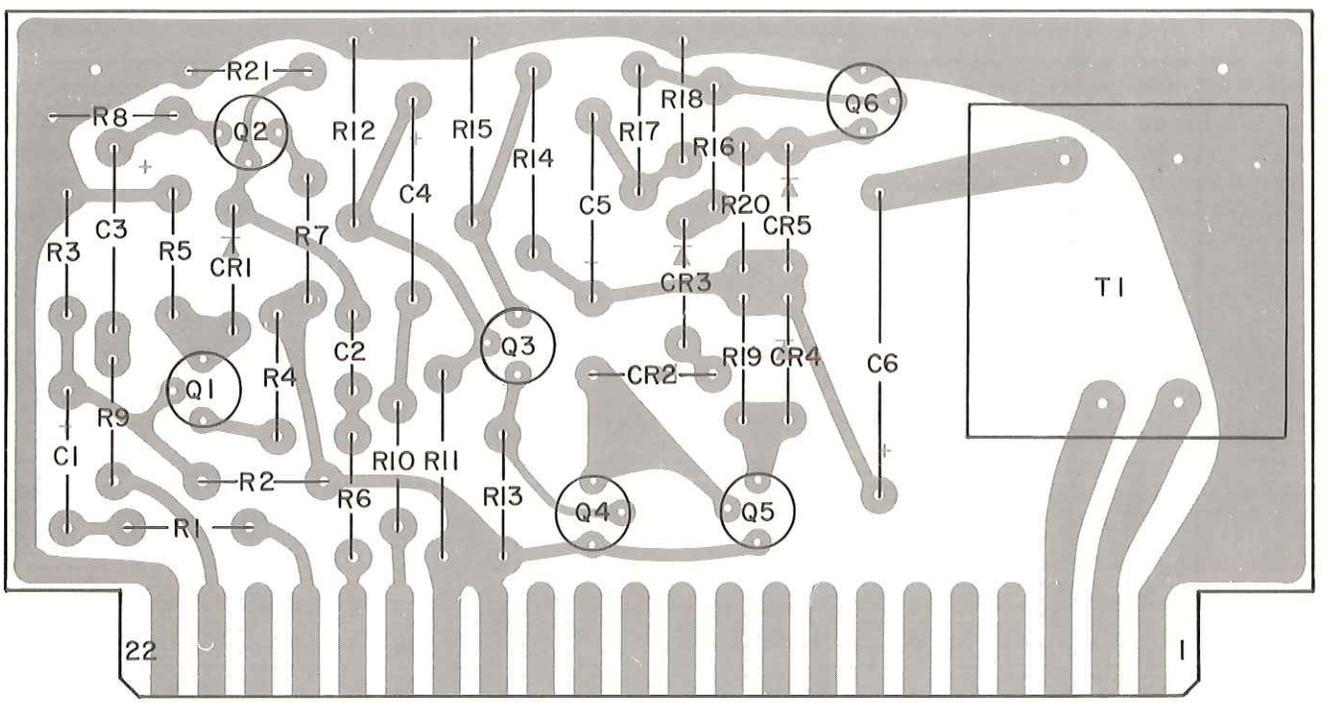


Figure 5-25. Type 7444 Audio Amplifier (A1), Component Locations

REF DESIG PREFIX A11

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R6	Same as R4			
R7	Same as R4			
R8	Same as R5			
R9	Same as R4			
R10	Same as R1			
R11	RESISTOR, FIXED, FILM: 301 kΩ, 1%, 1/4W	1	RN60D3013F	81349
R12	RESISTOR, FIXED, FILM: 14.7 kΩ, 1%, 1/4W	1	RN60D1472F	81349
R13	RESISTOR, FIXED, COMPOSITION: 2 kΩ, 5%, 1/4W	1	RCR07G202JS	81349
R14	RESISTOR, FIXED, FILM: 20 kΩ, 1%, 1/4W	1	RN60D2002F	81349
R15	RESISTOR, FIXED, FILM: 562 Ω, 1%, 1/4W	1	RN60D5620F	81349
R16	Same as R4			
R17	RESISTOR, FIXED, COMPOSITION: 1.5 kΩ, 5%, 1/4W	2	RCR07G152JS	81349
R18	Same as R17			
R19	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	2	RCR07G470JS	81349
R20	Same as R19			
R21	RESISTOR, FIXED, COMPOSITION: 2.7 MΩ, 5%, 1/4W	1	RCR07G275JS	81349
T1	TRANSFORMER	1	13335	14632

5.4.13 Type 79922 AFC Amplifier

REF DESIG PREFIX A12

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, ELECTROLYTIC, TANTALUM: .1 μF, 10%, 35V	2	150D104X9035A2	56289
C2	CAPACITOR, ELECTROLYTIC, TANTALUM: 1 μF, 10%, 35V	4	CS13BF105K	81349
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	Same as C1			
CR1	DIODE	1	1N4449	80131
Q1	TRANSISTOR	1	U1899E	15818
R1	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	1	RCR07G103JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	3	RCR07G104JS	81349
R3	Same as R2			
R4	RESISTOR, VARIABLE, FILM: 10 kΩ, 10%, 3/4W	1	89PR10K	73138
R5	Same as R2			
R6	RESISTOR, FIXED, COMPOSITION: 75 kΩ, 5%, 1/4W	1	RCR07G753JS	81349
U1	INTEGRATED CIRCUIT	1	U5B7741393	07263

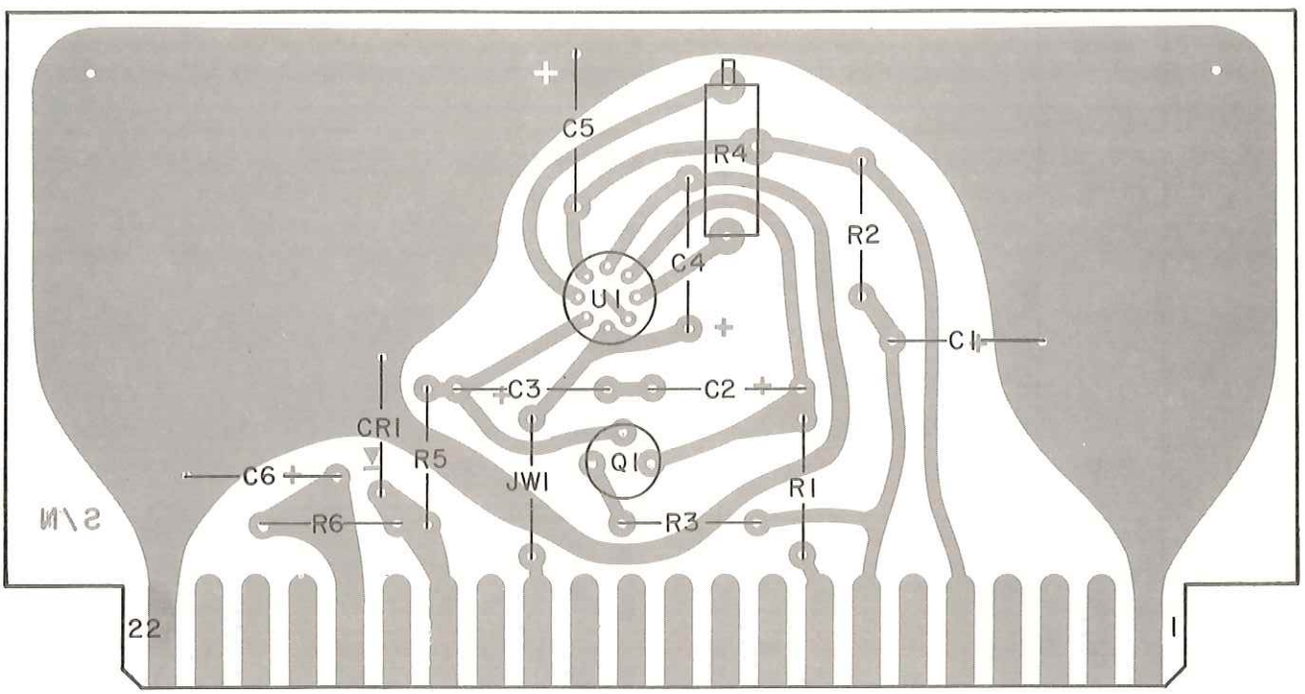


Figure 5-26. Type 79922 AFC Amplifier (A12), Component Locations

5.4.14 Type 72301 21.4-MHz IF Amplifier (2 MHz/4 MHz BW),(Type 112 Only) REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	21.4 MHz IF AMPLIFIER	1	21974	14632
A2	FM LIMITER/DISCRIMINATOR BOARD	1	16613	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	8	FA5C-102W	01121
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500V	3	FA5C-4712	01121
C8	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	2	SM(5000pF,M)	91418
C9	Same as C1			
C10	Same as C8			
C11	Same as C1			
C12	Same as C7			
C13	Same as C7			
C14	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100V	1	8131M100-651-104M	72982
E1	TERMINAL, FEEDTHRU	1	SFU-16	04013
FB1	FERRITE BEAD	2	56-590-65/4A	02114
FB2	Same as FB1			
J1	CONNECTOR, RECEPTACLE, MINIATURE SERIES	3	UG-1464/U	81349
J2	Same as J1			
J3	Same as J1			
MP1	COVER	1	22370-1	14632

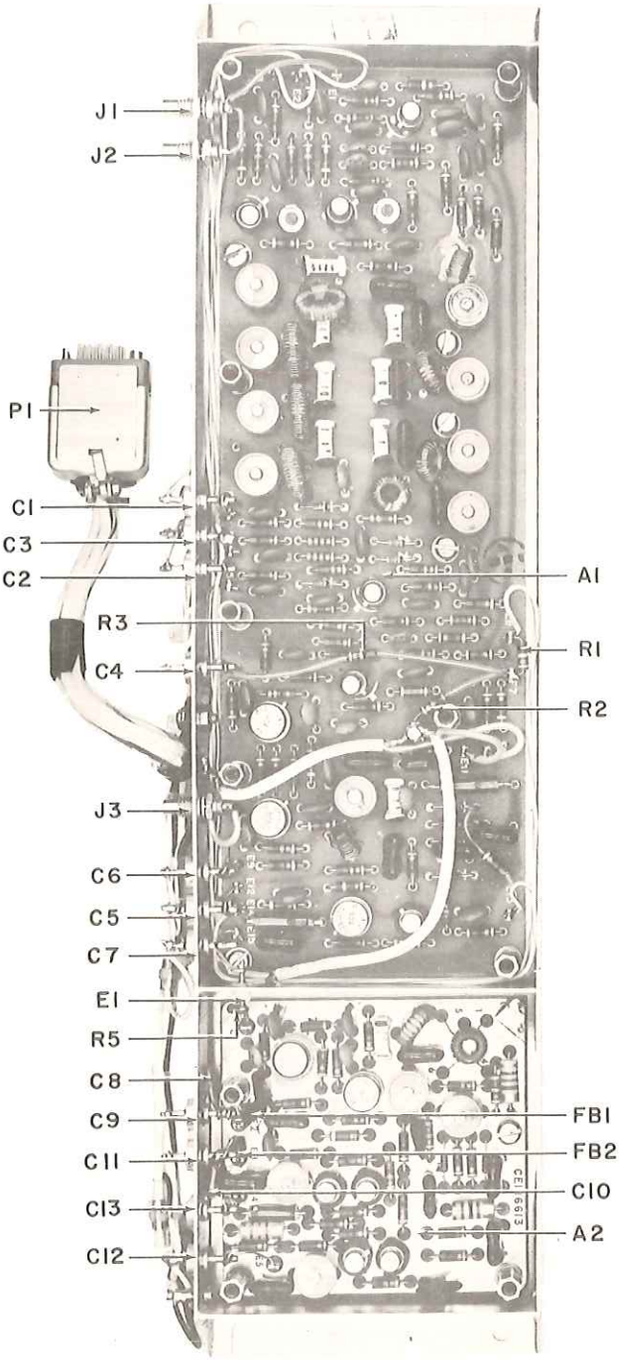


Figure 5-27. Type 72301 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
P1	CONNECTOR, PLUG, MULTIPIN	1	SLE-14P-NSSH13	81312
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	RCR07G303JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R4	NOT USED			
R5	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349

5.4.14.1 Part 21974 21.4-MHz IF Amplifier (Type 112 Only)

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	8	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	26	C023B101E502M	56289
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	Same as C1			
C7	Same as C2			
C8	Same as C1			
C9	Same as C2			
C10	Same as C2			
C11	Same as C2			
C12	Same as C2			
C13	CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500V	1	CM05ED470J03	81349
C14	NOT USED			
C15	CAPACITOR, MICA, DIPPED: 43 pF, 5%, 500V	3	CM05ED430J03	81349
C16	CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±0.5 pF, 500V	1	301-000-C0H0-100D	72982
C17	Same as C2			
C18	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V	5	538-011A2-8	72982
C19	CAPACITOR, VARIABLE, CERAMIC: 5.5-18 pF, 350V	3	538-011A5.5-18	72982
C20	CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ±0.1 pF, 500V	3	301-000-C0K0-159B	72982
C21	Same as C2			
C22	CAPACITOR, MICA, DIPPED: 18 pF, 5%, 500V	2	CM05CD180J03	81349

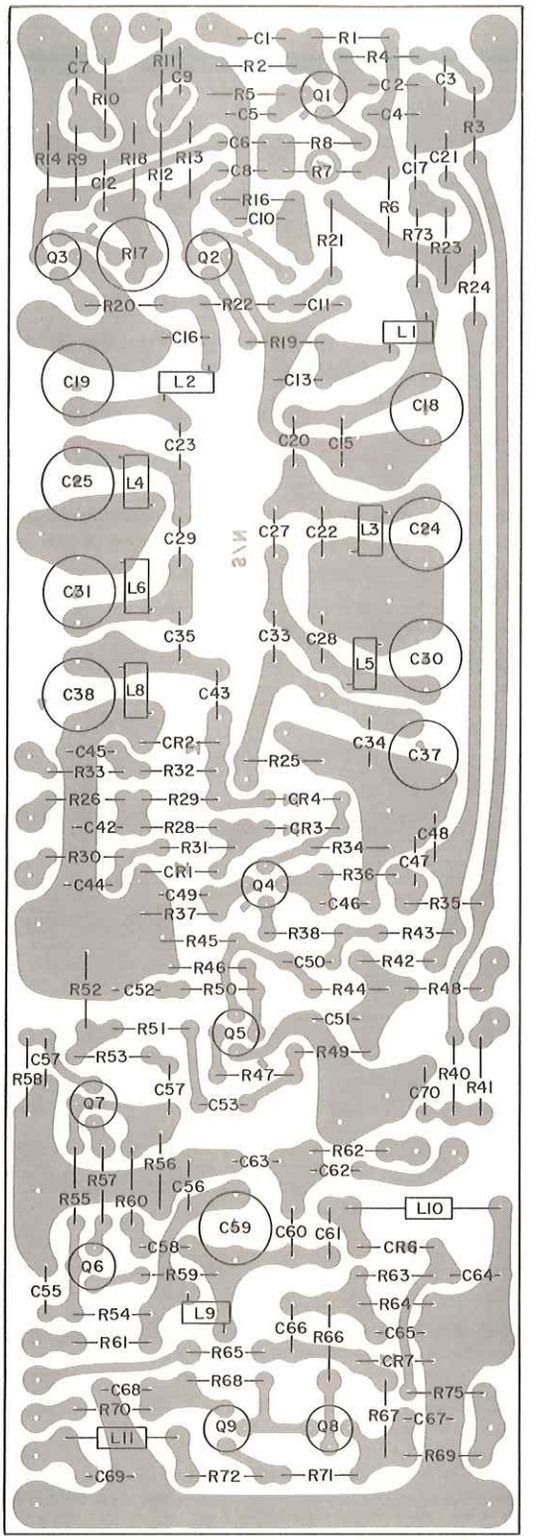


Figure 5-28. Part 21974 21.4 MHz IF Amplifier (A13A1), Component Locations

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C23	CAPACITOR, CERAMIC, TUBULAR: 1.2 pF, ±0.1 pF, 500V	1	301-000-C0K0-129B	81349
C24	Same as C18			
C25	Same as C19			
C26	NOT USED			
C27	CAPACITOR, CERAMIC, TUBULAR: 2.0 pF, ±0.25 pF, 500V	1	301-000-C0K0-209C	72982
C28	Same as C22			
C29	CAPACITOR, CERAMIC, TUBULAR: 1.8 pF, ±0.1 pF, 500 V	1	301-000-C0K0-189B	72982
C30	Same as C18			
C31	Same as C19			
C32	NOT USED			
C33	Same as C20			
C34	CAPACITOR, MICA, DIPPED: 10 pF, ±0.1 pF, 500V	1	CM05CD100D03	81349
C35	Same as C20			
C36	NOT USED			
C37	Same as C18			
C38	Same as C18			
C39	NOT USED			
C40	NOT USED			
C41	Same as C2			
C42	Same as C2			
C43	Same as C1			
C44	Same as C2			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C45	Same as C2			
C46	Same as C2			
C47	Same as C2			
C48	Same as C2			
C49	Same as C2			
C50	Same as C1			
C51	Same as C2			
C52	Same as C2			
C53	Same as C1			
C54	Same as C1			
C55	Same as C2			
C56	Same as C2			
C57	Same as C2			
C58	Same as C2			
C59	CAPACITOR, VARIABLE, CERAMIC: 3-15 pF, 350V	1	538-011D3-15	72982
C60	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF, ±0.5 pF, 500V	1	301-000-C0H0-689D	72982
C61	Same as C1			
C62	CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V	1	CM04ED270J03	81349
C63	CAPACITOR, MICA, DIPPED: 68 pF, 5%, 500V	1	CM05ED680J03	81349
C64	CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V	1	CM05ED330J03	81349
C65	CAPACITOR, MICA, DIPPED: 39 pF, 5%, 500 V	2	CM05ED390J03	81349
C66	Same as C65			

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C67	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	2	C023B101F103M	56289
C68	Same as C67			
C69	CAPACITOR, MICA, DIPPED: 620 pF, 5%, 300V	1	DM15-621J	72136
C70	Same as C2			
CR1	DIODE	4	1N4446	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	NOT USED			
CR6	DIODE	1	5082-2800	28480
CR7	DIODE	1	1N462A	80131
L1	COIL, FIXED	1	20681-17	14632
L2	COIL, FIXED	1	20681-69	14632
L3	COIL, FIXED	3	20681-26	14632
L4	COIL, FIXED	3	20681-54	14632
L5	Same as L3			
L6	Same as L4			
L7	Same as L3			
L8	Same as L4			
L9	COIL, FIXED	1	20681-65	14632
L10	COIL, FIXED	1	1131-37	14632
L11	COIL, FIXED	1	1131-15	14632

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q1	TRANSISTOR	2	3N187	80131
Q2	TRANSISTOR	3	2N2857	80131
Q3	Same as Q2			
Q4	Same as Q1			
Q5	Same as Q2			
Q6	TRANSISTOR	2	2N5109	80131
Q7	Same as Q6			
Q8	TRANSISTOR	1	2N3251	80131
Q9	TRANSISTOR	1	2N2270	80131
R1	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	5	RCR07G103JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	9	RCR07G102JS	81349
R4	Same as R2			
R5	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	4	RCR07G101JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	3	RCR07G471JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	2	RCR07G220JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	3	RCR07G153JS	81349
R10	Same as R3			
R11	Same as R3			
R12	Same as R9			
R13	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	3	RCR07G472JS	81349

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R14	Same as R13			
R15	RESISTOR, VARIABLE, FILM: 500 Ω, 30%, 1/2W	2	62PR500	73138
R16	RESISTOR, FIXED, COMPOSITION: 2 kΩ, 5%, 1/4W	2	RCR07G202JS	81349
R17	Same as R15			
R18	Same as R16			
R19	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	6	RCR07G470JS	81349
R20	Same as R19			
R21	Same as R6			
R22	Same as R3			
R23	Same as R6			
R24	Same as R8			
R25	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	2	RCR07G332JS	81349
R26	Same as R3			
R27	NOT USED			
R28	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RCR07G333JS	81349
R29	Same as R28			
R30	Same as R3			
R31	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	3	RCR07G273JS	81349
R32	Same as R31			
R33	Same as R3			
R34	Same as R2			
R35	Same as R3			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R36	Same as R2			
R37	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R38	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	3	RCR07G220JS	81349
R39	NOT USED			
R40	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R41	Same as R13			
R42	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	RCR07G470JS	81349
R43	Same as R7			
R44	Same as R2			
R45	Same as R13			
R46	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4W	1	RCR07G821JS	81349
R47	Same as R38			
R48	Same as R42			
R49	Same as R7			
R50	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R51	Same as R38			
R52	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	1	RCR07G151JS	81349
R53	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	1	RCR07G330JS	81349
R54	Same as R9			
R55	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	RCR07G682JS	81349
R56	Same as R13			
R57	Same as R19			

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R58	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4W	1	RCR07G271JS	81349
R59	Same as R42			
R60	Same as R9			
R61	Same as R6			
R62	Same as R19			
R63	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	1	RCR07G222JS	81349
R64	Same as R63			
R65	Same as R31			
R66	Same as R3			
R67	RESISTOR, FIXED, COMPOSITION: 56 kΩ, 5%, 1/4W	1	RCR07G563JS	81349
R68	RESISTOR, FIXED, COMPOSITION: 2.4 kΩ, 5%, 1/4W	1	RCR07G242JS	81349
R69	Same as R19			
R70	Same as R19			
R71	Same as R25			
R72	Same as R50			
R73	RESISTOR, FIXED, COMPOSITION: 1.8 kΩ, 5%, 1/4W	1	RCR07G182JS	81349
R74	NOT USED			
R75	RESISTOR, FIXED, COMPOSITION: 1 MΩ, 5%, 1/4W	1	RCR07G105JS	81349

5.4.14.2 Part 16613 FM Limiter/Discriminator Board, (Type 112 Only)

REF DESIG PREFIX A13A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	2	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	3	C023B101E502M	56289
C3	CAPACITOR, CERAMIC, DISC: .05 μF, -20+80%, 25V	1	DFJ-1	73899
C4	Same as C2			
C5	Same as C1			
C6	Same as C2			
C7	CAPACITOR, MICA, DIPPED: 560 pF, 5%, 300V	1	DM15-561J	72136
C8	CAPACITOR, CERAMIC, TUBULAR: 3.3 pF, ±.1 pF, 500V	1	301-000-C0J0-339B	72982
C9	CAPACITOR, VARIABLE, CERAMIC: 2.5-11 pF, 350V	4	538-011D9-35	72982
C10	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	1	CM05FD101J03	81349
C11	Same as C9			
C12	CAPACITOR, MICA, DIPPED: 10 pF, ±.5 pF, 500V	3	CM05CD100D03	81349
C13	Same as C12			
C14	Same as C12			
C15	CAPACITOR, CERAMIC, DIPPED: .1 μF, -20+80%, 25V	2	DFJ-3	73899
C16	CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500V	1	CM05FD151J03	81349
C17	CAPACITOR, MICA, DIPPED: 1000 pF, 5%, 100V	1	DM15-102J	72136
C18	Same as C15			
C19	Same as C9			
C20	Same as C9			
CR1	DIODE	2	5082-2800	28480
CR2	Same as CR1			

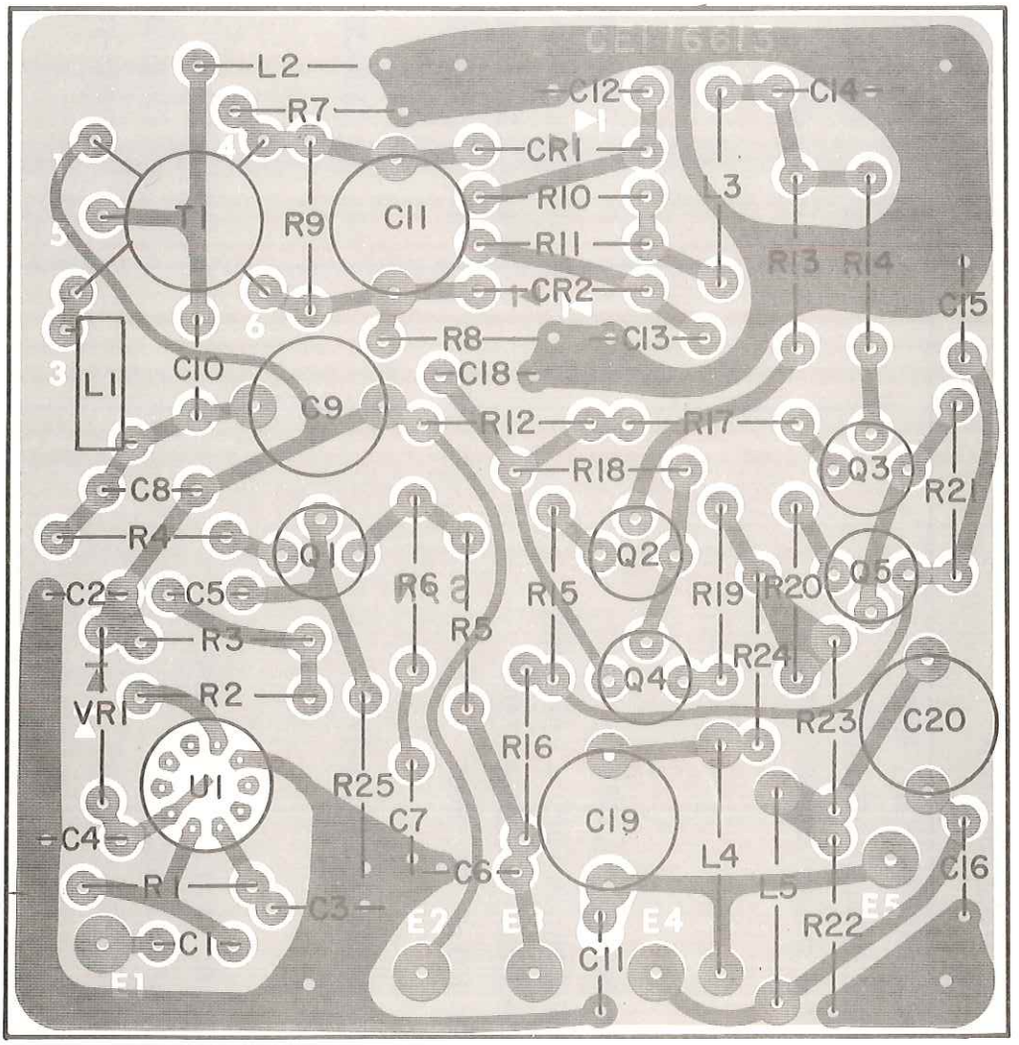


Figure 5-29. Part 16613 FM Limiter/Discriminator Board (A13A2), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
L1	COIL, FIXED	1	20681-70	14632
L2	COIL, FIXED: 18 μH	1	1537-42	99800
L3	COIL, FIXED: 200 μH	1	1537-90	99800
L4	COIL, FIXED	1	1131-40	14632
L5	COIL, FIXED: 5.6 μH	1	1437-30	99800
Q1	TRANSISTOR	1	2N5109	80131
Q2	TRANSISTOR	2	2N3251	80131
Q3	TRANSISTOR	2	2N929	80131
Q4	Same as Q3			
Q5	Same as Q2			
R1	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	4	RCR07G221JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R3	Same as R1			
R4	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	3	RCR07G101JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 910 Ω, 5%, 1/4W	1	RCR07G911JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 6.2 Ω, 5%, 1/4W	1	RCR07G6R2JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 470 kΩ, 5%, 1/4W	1	RCR07G474JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 36 kΩ, 5%, 1/4W	1	RCR07G363JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 12 kΩ, 5%, 1/4W	1	RCR07G123JS	81349
R10	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	2	RCR07G472JS	81349
R11	Same as R10			
R12	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	4	RCR07G220JS	81349

REF DESIG PREFIX A13A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R13	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R14	Same as R13			
R15	Same as R4			
R16	Same as R12			
R17	Same as R4			
R18	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R19	Same as R12			
R20	Same as R12			
R21	Same as R18			
R22	Same as R1			
R23	Same as R1			
R24	RESISTOR, FIXED, COMPOSITION: 82 Ω, 5%, 1/4W	2	RCR07G820JS	81349
R25	Same as R24			
T1	TRANSFORMER	1	21427-18	14632
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263
VR1	VOLTAGE REGULATOR	1	1N749A	80131

5.4.15 Type 72299 21.4-MHz IF Amplifier (500 kHz/1 MHz BW), (Type 112-1 Only) REF DESIG PREFIX A13

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
A1	21.4 MHz IF AMPLIFIER	1	21954	14632
A2	FM LIMITER/DISCRIMINATOR BOARD	1	15170	14632
C1	CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V	8	FA5C-102W	01121
C2	Same as C1			
C3	Same as C1			
C4	Same as C1			
C5	Same as C1			
C6	Same as C1			
C7	CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500V	3	FA5C-4712	01121
C8	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V	2	SM(5000pF, M)	91418
C9	Same as C1			
C10	Same as C8			
C11	Same as C1			
C12	Same as C7			
C13	Same as C7			
C14	CAPACITOR, CERAMIC, DISC: 0.1 μF, 20%, 100V	1	8131M100-654-104M	72982
E1	TERMINAL, FEEDTHRU	1	SFU-16	04013
FB1	FERRITE BEAD	2	56-590-65/4A	02114
FB2	Same as FB1			
J1	CONNECTOR, RECEPTACLE, SUBMINIATURE SERIES	3	UG-1464/U	81349
J2	Same as J1			
J3	Same as J1			
MP1	COVER	1	22354-1	14632

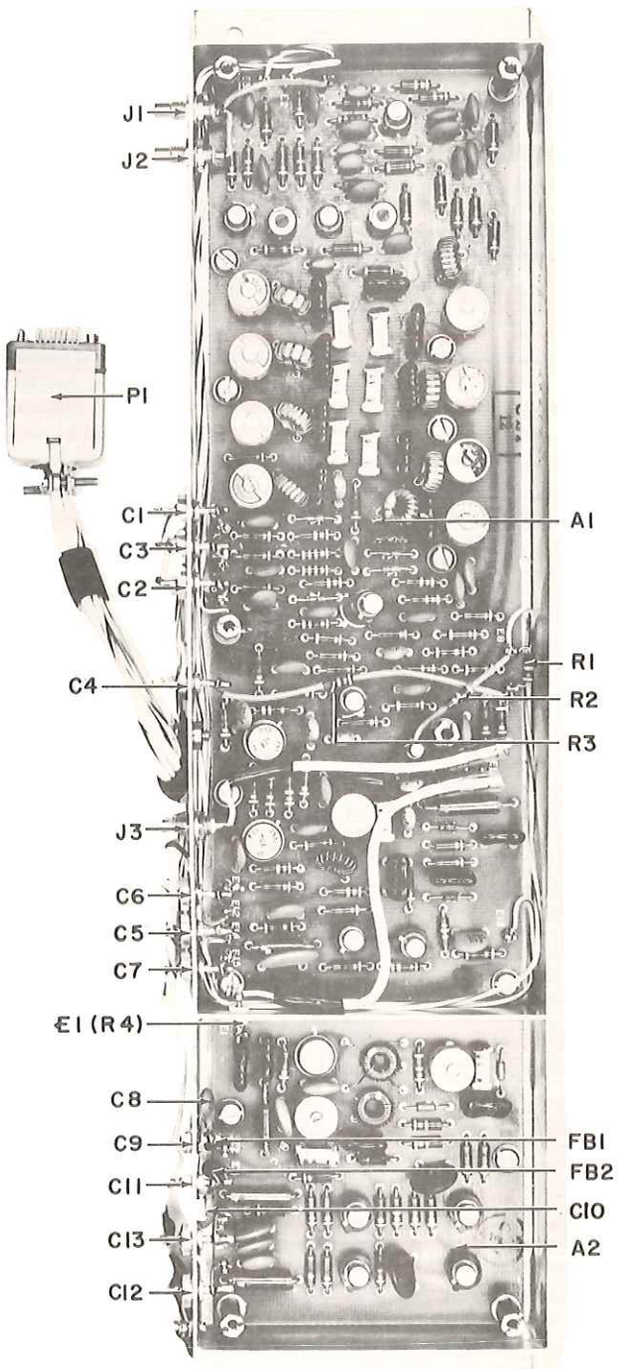


Figure 5-30. Type 72299 21.4 MHz IF Amplifier (500 kHz/1 MHz BW) (A13), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
P1	CONNECTOR, PLUG, MULTIPIN	1	SLE-14P-NSSH13	81312
R1	RESISTOR, FIXED, COMPOSITION: 100 kΩ, 5%, 1/4W	1	RCR07G104JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 30 kΩ, 5%, 1/4W	1	RCR07G303JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	1	RCR07G153JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	1	RCR07G220JS	81349

5.4.15.1 Part 21954 21.4-MHz IF Amplifier (Type 112-1 Only)

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V	9	SM(1000pF, GMV)	91418
C2	CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V	26	C023B101E502M	56289
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	Same as C1			
C7	Same as C2			
C8	Same as C1			
C9	Same as C2			
C10	Same as C2			
C11	Same as C2			
C12	Same as C2			
C13	CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V	2	CM05FD101J03	81349
C14	Same as C1			
C15	CAPACITOR, MICA, DIPPED: 91 pF, 5%, 500V	8	CM05FD910J03	81349
C16	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	8	538-011D9-35	72982
C17	Same as C2			
C18	Same as C16			
C19	Same as C15			
C20	CAPACITOR, CERAMIC, TUBULAR: 2.7 pF, ±0.25 pF, 500V	1	301-000-C0J0-279C	72982
C21	Same as C2			
C22	Same as C15			

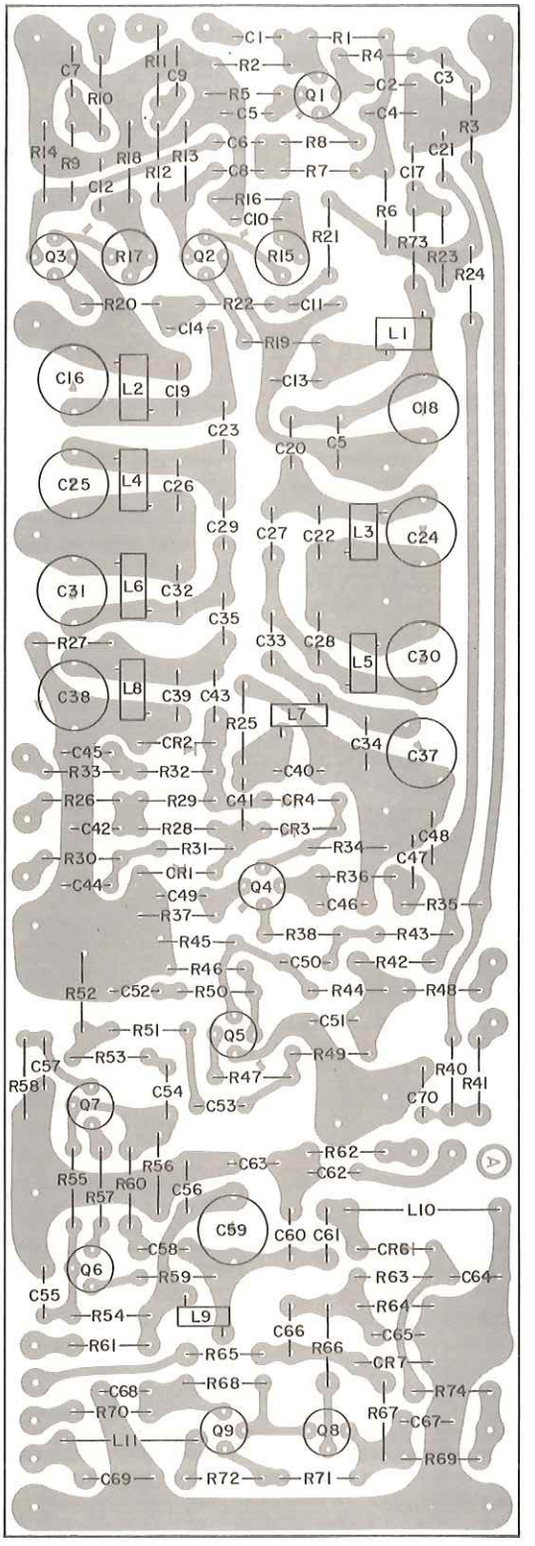


Figure 5-31. Part 21954 21.4 MHz IF Amplifier (A13A1), Component Locations

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C23	CAPACITOR, CERAMIC, TUBULAR: 3.3 pF, ±0.25 pF, 500V	2	301-000-C0J0-339C	72982
C24	Same as C16			
C25	Same as C16			
C26	Same as C15			
C27	CAPACITOR, CERAMIC, TUBULAR: 2.0 pF, ±0.25 pF, 500V	1	301-000-C0K0-209C	72982
C28	Same as C15			
C29	CAPACITOR, CERAMIC, TUBULAR: 3.6 pF, ±0.25 pF, 500V	1	301-000-C0J0-369C	72982
C30	Same as C16			
C31	Same as C16			
C32	Same as C15			
C33	CAPACITOR, CERAMIC, TUBULAR: 2.4 pF, ±0.25 pF, 500V	1	301-000-C0J0-249C	72982
C34	Same as C15			
C35	Same as C23			
C36	NOT USED			
C37	Same as C16			
C38	Same as C16			
C39	Same as C15			
C40	Same as C13			
C41	Same as C2			
C42	Same as C2			
C43	Same as C1			
C44	Same as C2			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C45	Same as C2			
C46	Same as C2			
C47	Same as C2			
C48	Same as C2			
C49	Same as C2			
C50	Same as C1			
C51	Same as C2			
C52	Same as C2			
C53	Same as C1			
C54	Same as C1			
C55	Same as C2			
C56	Same as C2			
C57	Same as C2			
C58	Same as C2			
C59	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V	1	538-011A2-8	72982
C60	CAPACITOR, CERAMIC, TUBULAR: 6.8 pF, ±0.5 pF, 500V	1	301-000-C0H0-689D	72982
C61	Same as C1			
C62	CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V	1	CM04ED270J03	81349
C63	CAPACITOR, MICA, DIPPED: 68 pF, 5%, 500V	1	CM05ED680J03	81349
C64	CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V	1	CM05ED330J03	81349
C65	CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500V	2	CM05FD151J03	81349
C66	Same as C65			

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C67	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	2	C023B101F103M	56289
C68	Same as C67			
C69	CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000V	1	JF(2200pF, M)	91418
C70	Same as C2			
CR1	DIODE	4	1N4446	80131
CR2	Same as CR1			
CR3	Same as CR1			
CR4	Same as CR1			
CR5	NOT USED			
CR6	DIODE	1	5082-2800	28480
CR7	DIODE	1	1N462A	80131
L1	COIL, FIXED	2	20681-8	14632
L2	COIL, FIXED	6	20681-15	14632
L3	Same as L2			
L4	Same as L2			
L5	Same as L2			
L6	Same as L2			
L7	Same as L1			
L8	Same as L2			
L9	COIL, FIXED	1	20681-42	14632
L10	COIL, FIXED	1	1131-37	14632
L11	COIL, FIXED	1	1131-41	14632

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
L12	COIL, FIXED	1	20681-43	14632
Q1	TRANSISTOR	2	3N140	80131
Q2	TRANSISTOR	3	2N2857	80131
Q3	Same as Q2			
Q4	Same as Q1			
Q5	Same as Q2			
Q6	TRANSISTOR	2	2N5109	80131
Q7	Same as Q6			
Q8	TRANSISTOR	1	2N3251	80131
Q9	TRANSISTOR	1	2N2270	80131
R1	RESISTOR, FIXED, COMPOSITION: 150 kΩ, 5%, 1/4W	1	RCR07G154JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	5	RCR07G103JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	8	RCR07G102JS	81349
R4	Same as R2			
R5	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	4	RCR07G101JS	81349
R7	RESISTOR, FIXED, COMPOSITION: 470 Ω, 5%, 1/4W	2	RCR07G471JS	81349
R8	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	2	RCR07G220JS	81349
R9	RESISTOR, FIXED, COMPOSITION: 15 kΩ, 5%, 1/4W	4	RCR07G153JS	81349
R10	Same as R3			
R11	Same as R3			
R12	Same as R9			

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R13	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	4	RCR07G472JS	81349
R14	Same as R13			
R15	RESISTOR, VARIABLE, FILM: 500 Ω, 30%, 1/2W	2	62PR500	73138
R16	RESISTOR, FIXED, COMPOSITION: 820 Ω, 5%, 1/4W	3	RCR07G821JS	81349
R17	Same as R15			
R18	Same as R16			
R19	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	6	RCR07G470JS	81349
R20	Same as R19			
R21	Same as R6			
R22	RESISTOR, FIXED, COMPOSITION: 1.2 kΩ, 5%, 1/4W	1	RCR07G122JS	81349
R23	Same as R6			
R24	Same as R8			
R25	RESISTOR, FIXED, COMPOSITION: 2.2 kΩ, 5%, 1/4W	5	RCR07G222JS	81349
R26	Same as R3			
R27	Same as R25			
R28	RESISTOR, FIXED, COMPOSITION: 33 kΩ, 5%, 1/4W	2	RCR07G333JS	81349
R29	Same as R28			
R30	Same as R3			
R31	RESISTOR, FIXED, COMPOSITION: 27 kΩ, 5%, 1/4W	3	RCR07G273JS	81349
R32	Same as R31			
R33	Same as R3			
R34	Same as R2			

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R35	Same as R3			
R36	Same as R2			
R37	RESISTOR, FIXED, COMPOSITION: 330 Ω, 5%, 1/4W	1	RCR07G331JS	81349
R38	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	3	RCR07G220JS	81349
R39	NOT USED			
R40	RESISTOR, FIXED, COMPOSITION: 2.7 kΩ, 5%, 1/4W	1	RCR07G272JS	81349
R41	Same as R13			
R42	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	3	RCR07G470JS	81349
R43	NOT USED			
R44	Same as R2			
R45	Same as R13			
R46	Same as R16			
R47	Same as R38			
R48	Same as R42			
R49	Same as R7			
R50	RESISTOR, FIXED, COMPOSITION: 10 Ω, 5%, 1/4W	2	RCR07G100JS	81349
R51	Same as R38			
R52	RESISTOR, FIXED, COMPOSITION: 150 Ω, 5%, 1/4W	1	RCR07G151JS	81349
R53	RESISTOR, FIXED, COMPOSITION: 33 Ω, 5%, 1/4W	1	RCR07G330JS	81349
R54	Same as R9			
R55	RESISTOR, FIXED, COMPOSITION: 6.8 kΩ, 5%, 1/4W	1	RCR07G682JS	81349
R56	RESISTOR, FIXED, COMPOSITION: 4.7 kΩ, 5%, 1/4W	1	RCR07G472JS	81349

REF DESIG PREFIX A13A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
R57	Same as R19			
R58	RESISTOR, FIXED, COMPOSITION: 270 Ω, 5%, 1/4W	1	RCR07G271JS	81349
R59	Same as R42			
R60	Same as R9			
R61	Same as R6			
R62	Same as R19			
R63	Same as R25			
R64	Same as R25			
R65	Same as R31			
R66	Same as R3			
R67	RESISTOR, FIXED, COMPOSITION: 56 kΩ, 5%, 1/4W	1	RCR07G563JS	81349
R68	RESISTOR, FIXED, COMPOSITION: 2.4 kΩ, 5%, 1/4W	1	RCR07G242JS	81349
R69	Same as R19			
R70	Same as R19			
R71	RESISTOR, FIXED, COMPOSITION: 3.3 kΩ, 5%, 1/4W	1	RCR07G332JS	81349
R72	Same as R50			
R73	Same as R25			
R74	RESISTOR, FIXED, COMPOSITION: 510 kΩ, 5%, 1/4W	1	RCR07G514JS	81349

5.4.15.2 Part 15170 FM Limiter/Discriminator Board, (Type 112-1 Only)

REF DESIG PREFIX A13A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
C1	CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V	1	538-011D9-35	72982
C2	CAPACITOR, MICA, DIPPED: 5000 pF, 20%, 500V	3	SM(5000pF, M)	91418
C3	Same as C2			
C4	Same as C2			
C5	CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V	1	538-011A2-8	72982
C6	CAPACITOR, CERAMIC, TUBULAR: 2.2 pF, ±0.1 pF, 500V	1	301-000-C0J0-229B	72982
C7	CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V	2	CM05CD100D03	81349
C8	CAPACITOR, VARIABLE, AIR: 1-10 pF, 250V	1	6371	91293
C9	CAPACITOR, CERAMIC, TUBULAR: 1 pF, ±0.25 pF, 500V	2	301-000-U2K0-109C	72982
C10	Same as C7			
C11	CAPACITOR, CERAMIC, DISC: 0.1 μF, -20+80%, 25V	2	DFJ-3	73899
C12	Same as C11			
C13	CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V	1	C023B101F103M	56289
C14	CAPACITOR, CERAMIC, DISC: 1500 pF, 10%, 1000V	2	DD-152	91418
C15	Same as C14			
C16	Same as C9			
CR1	DIODE	2	5082-2800	28480
CR2	Same as CR1			
CR3	DIODE	1	1N462A	80131
L1	COIL, FIXED: 2.7 μH	1	1537-22	99800
L2	COIL, FIXED	1	20681-42	14632
L3	COIL, FIXED	2	1131-37	14632
L4	Same as L3			

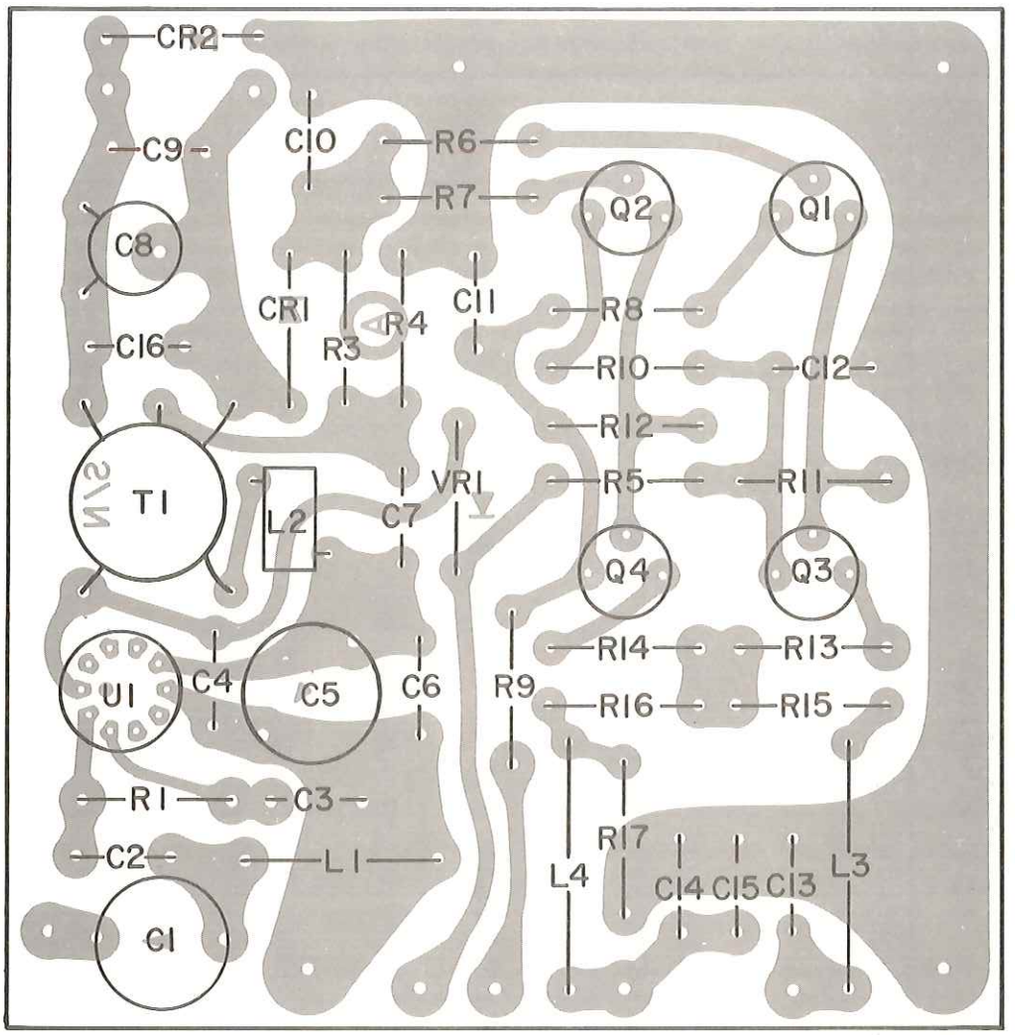


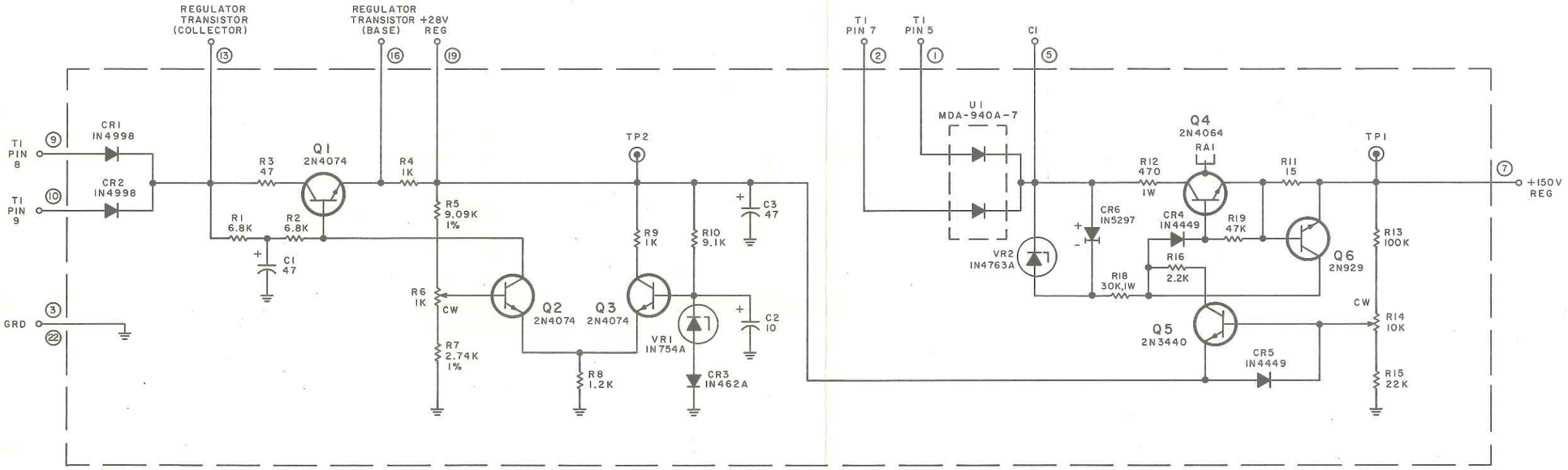
Figure 5-32. Part 15170 FM Limiter/Discriminator Board (A13A2), Component Locations

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
Q1	TRANSISTOR	2	2N3251	80131
Q2	TRANSISTOR	2	2N929	80131
Q3	Same as Q2			
Q4	Same as Q1			
R1	RESISTOR, FIXED, COMPOSITION: 51 Ω, 5%, 1/4W	1	RCR07G510JS	81349
R2	RESISTOR, FIXED, COMPOSITION: 47 kΩ, 5%, 1/4W	1	RCR07G473JS	81349
R3	RESISTOR, FIXED, COMPOSITION: 18 kΩ, 5%, 1/4W	1	RCR07G187JS	81349
R4	RESISTOR, FIXED, COMPOSITION: 22 kΩ, 5%, 1/4W	1	RCR07G223JS	81349
R5	RESISTOR, FIXED, COMPOSITION: 22 Ω, 5%, 1/4W	4	RCR07G220JS	81349
R6	RESISTOR, FIXED, COMPOSITION: 1 kΩ, 5%, 1/4W	2	RCR07G102JS	81349
R7	Same as R6			
R8	RESISTOR, FIXED, COMPOSITION: 100 Ω, 5%, 1/4W	2	RCR07G101JS	81349
R9	Same as R5			
R10	Same as R8			
R11	RESISTOR, FIXED, COMPOSITION: 10 kΩ, 5%, 1/4W	2	RCR07G103JS	81349
R12	Same as R11			
R13	Same as R5			
R14	Same as R5			
R15	RESISTOR, FIXED, COMPOSITION: 47 Ω, 5%, 1/4W	1	RCR07G470JS	81349
R16	RESISTOR, FIXED, COMPOSITION: 120 Ω, 5%, 1/4W	1	RCR07G121JS	81349
R17	RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W	1	RCR07G221JS	81349
T1	TRANSFORMER	1	21427-9	14632

REF DESIG PREFIX A13A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE
U1	INTEGRATED CIRCUIT	1	U5F7719393	07263

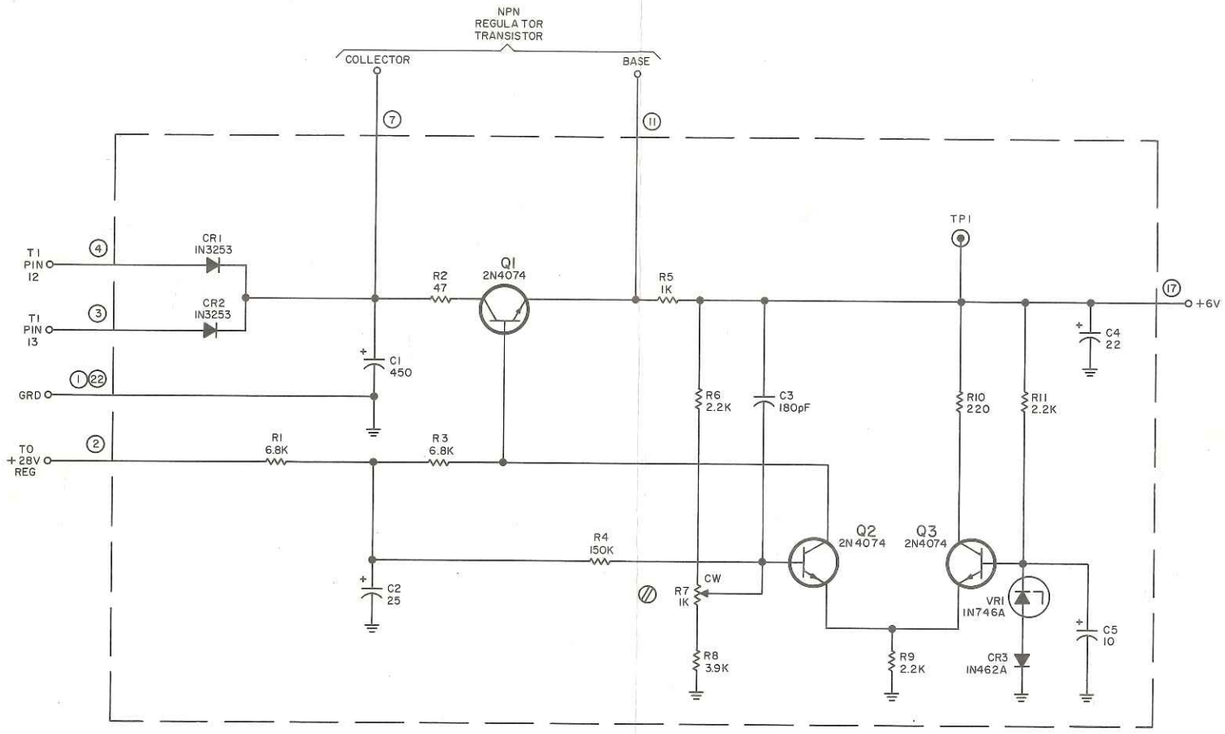
SECTION VI
SCHEMATIC DIAGRAMS



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. CW ON R6, R14 DENOTES CLOCKWISE ROTATION OF ACTUATOR.

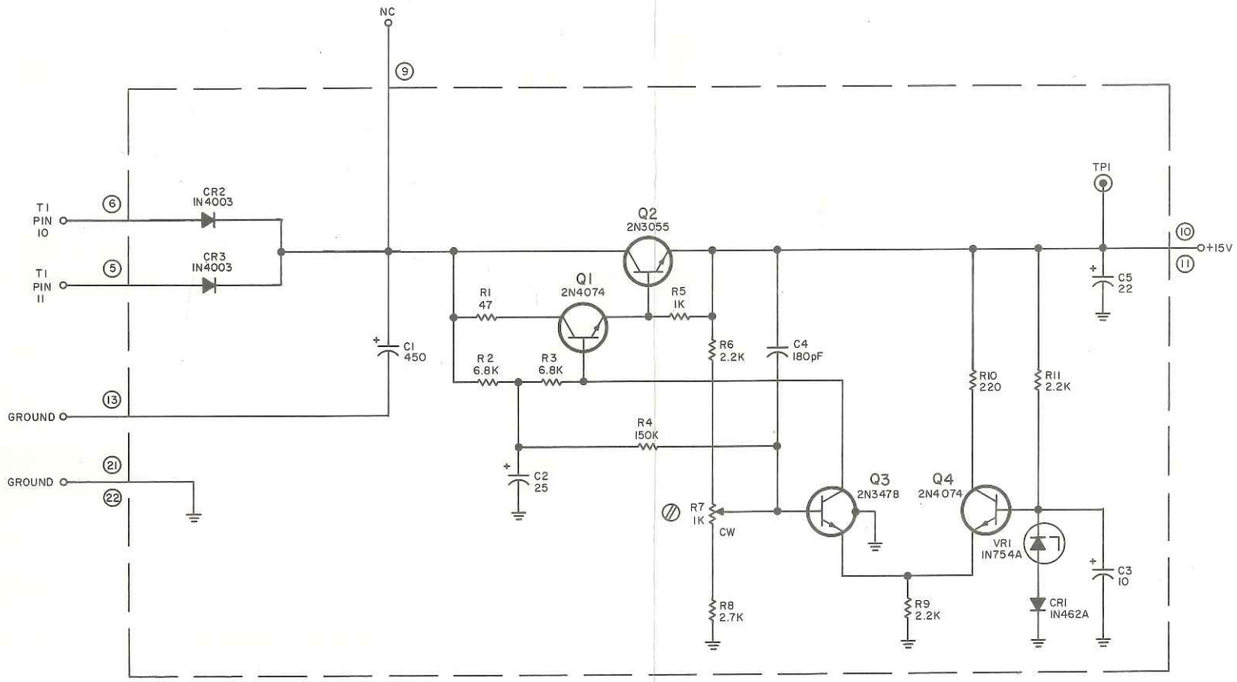
Figure 6-1. Type 76183 +28/+150 Power Supply Regulator (A1), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.

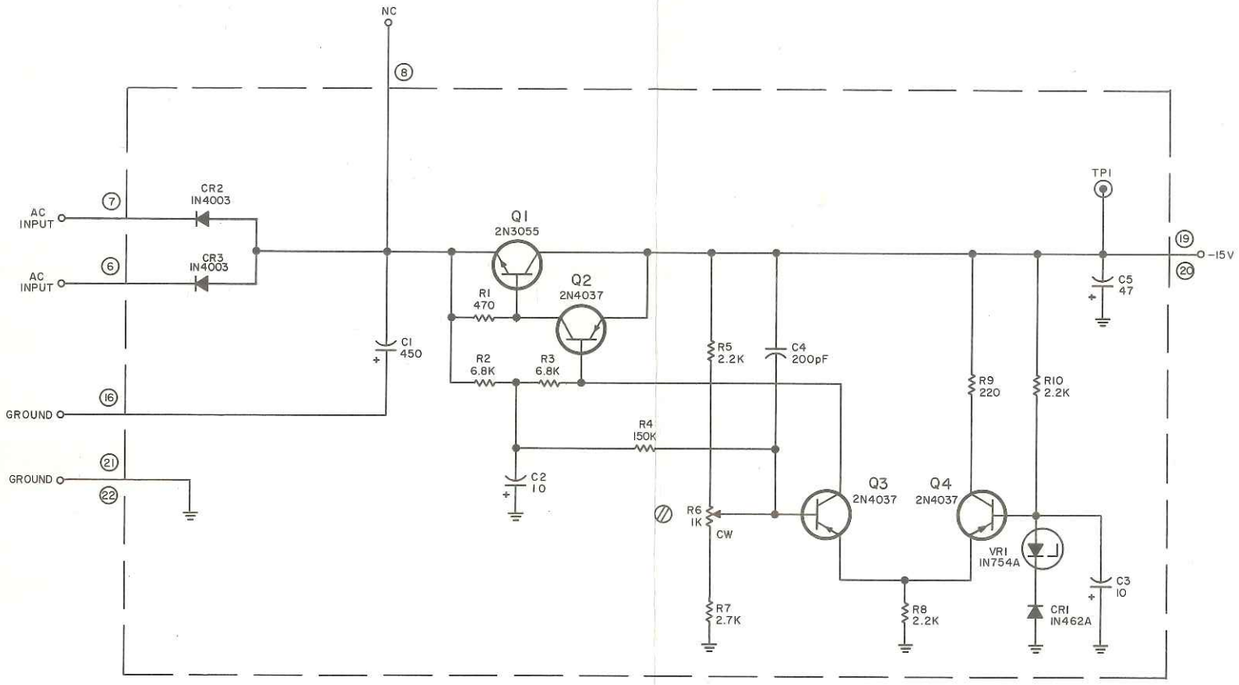
Figure 6-2. Type 76184 +6V Power Supply Regulator (A2), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.
   b) CW INDICATES CLOCKWISE ROTATION.

Figure 6-3. Type 76185 +15V Power Supply Regulator (A3), Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.

Figure 6-4. Type 76186 -15V Power Supply Regulator (A4), Schematic Diagram

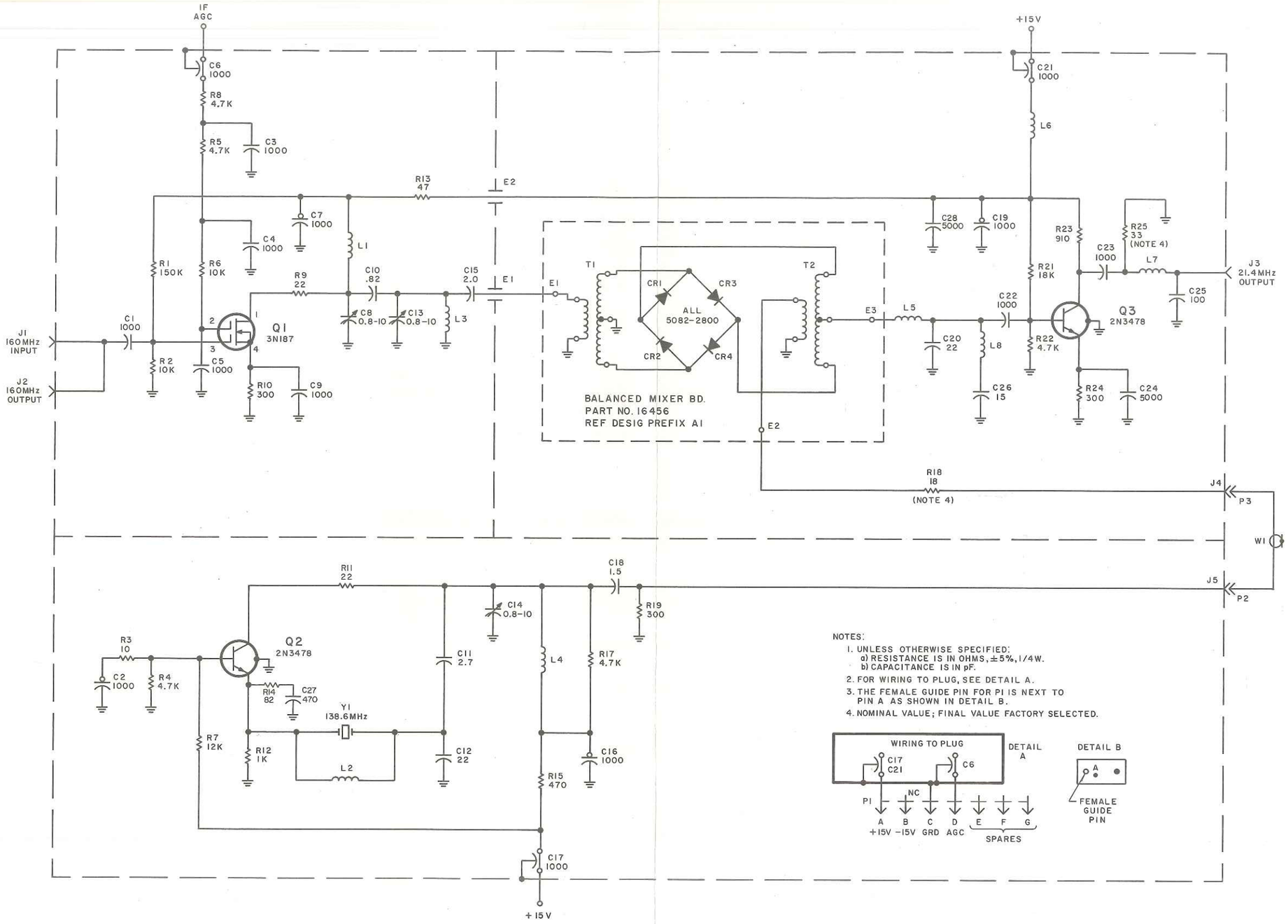


Figure 6-5. Type 71285 160/21.4 MHz Converter (A5), Schematic Diagram

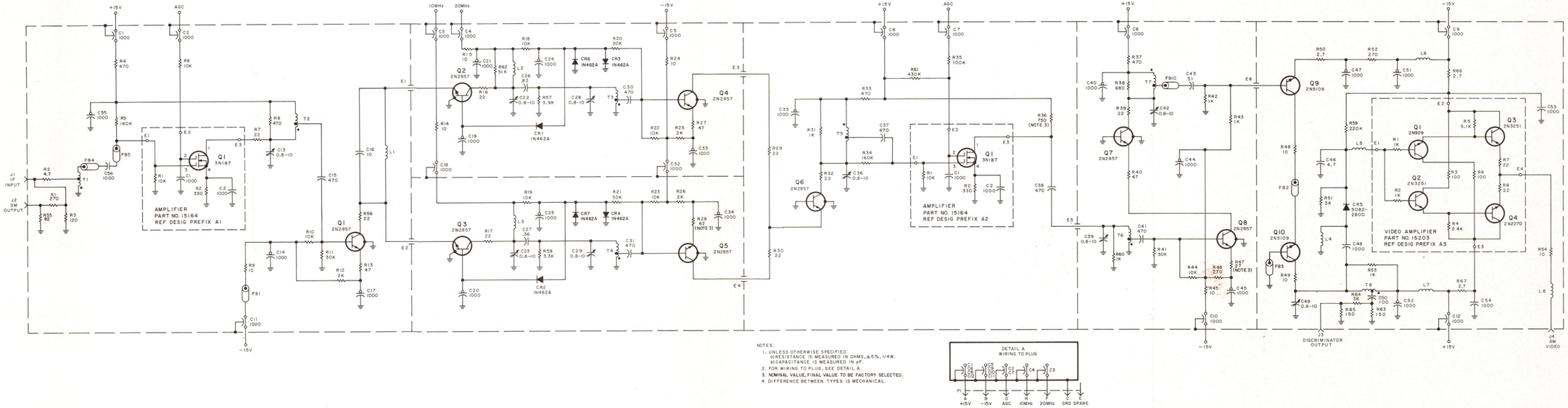


Figure 6-6. Type 72304-1 160 MHz IF Amplifier (10-20 MHz BW) (A6), Schematic Diagram

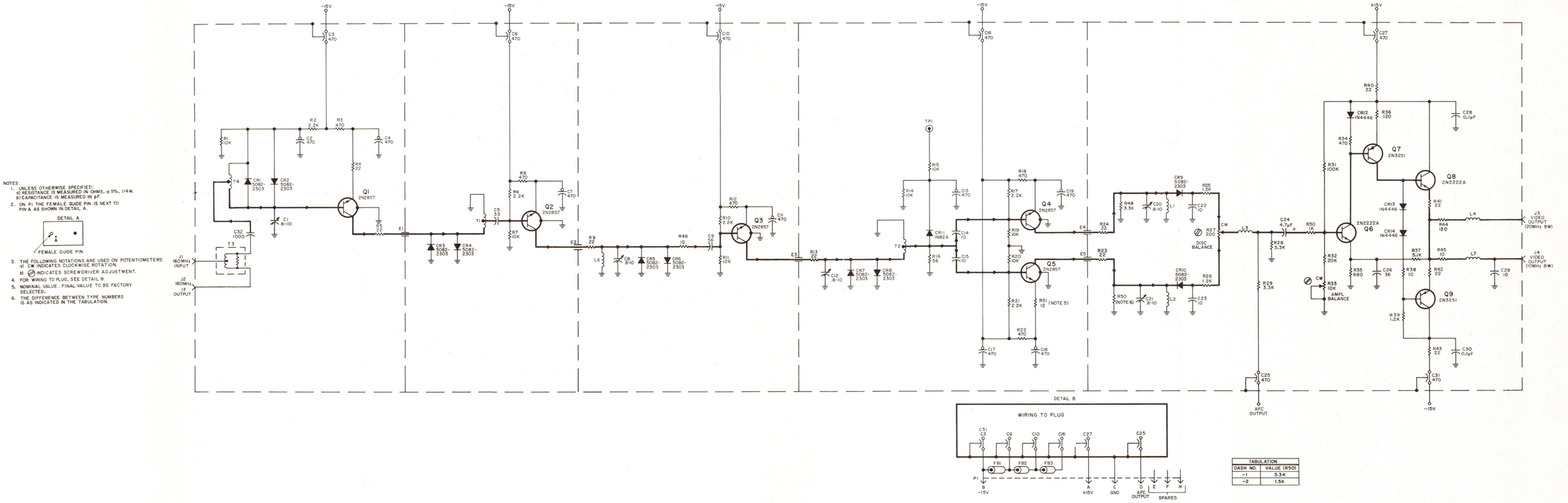
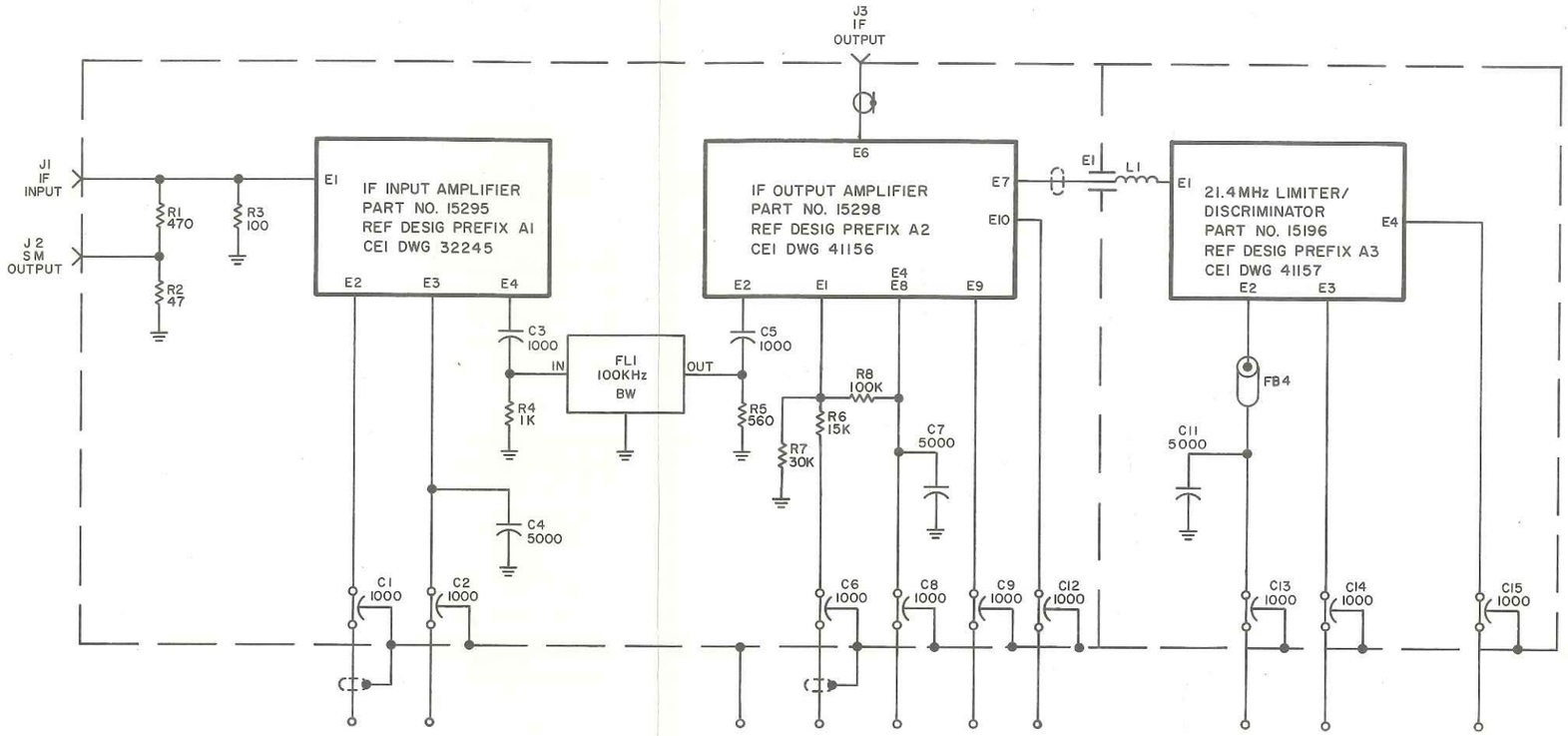
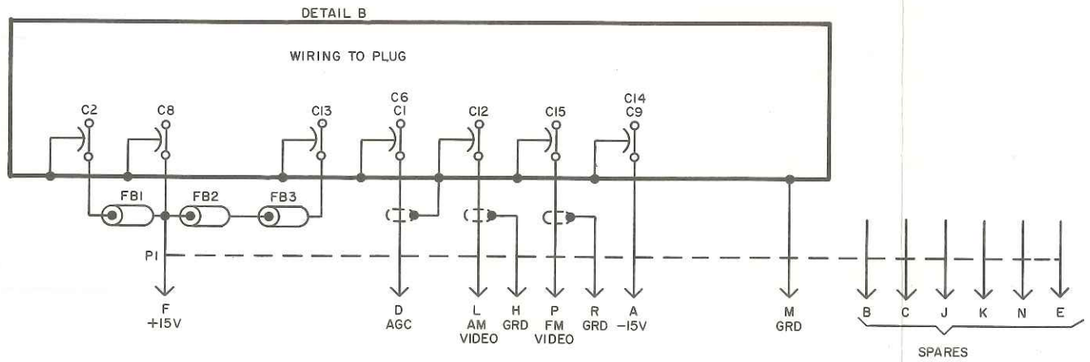


Figure 6-7. Type 79640 160 MHz Limiter/Discriminator (A7), Schematic Diagram



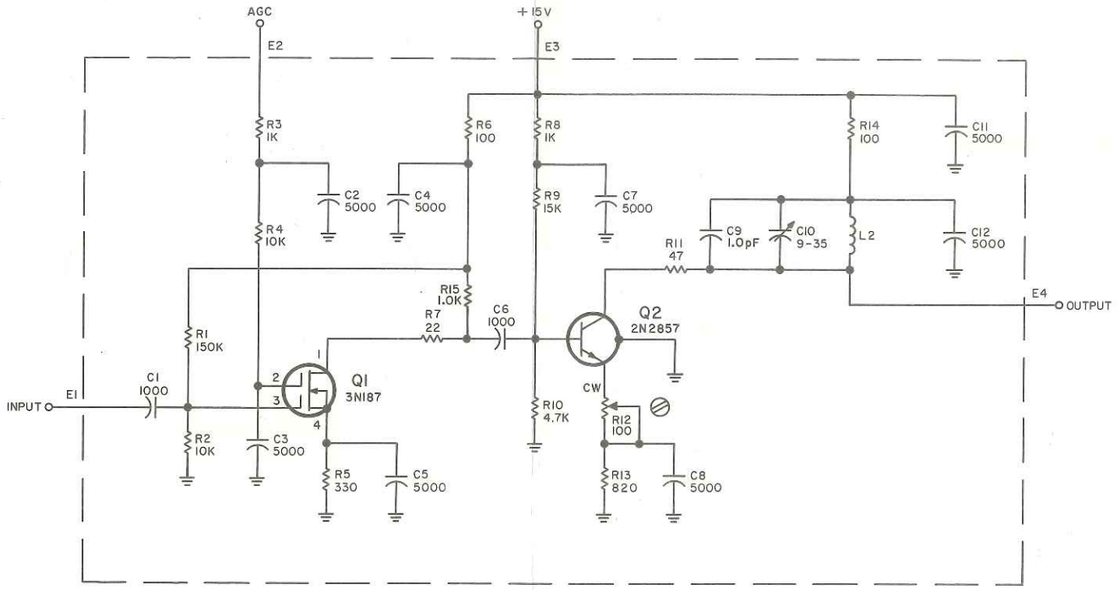


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. THE FEMALE GUIDE PIN FOR P1 IS NEXT TO PIN A AS SHOWN IN DETAIL A.

3. FOR WIRING TO PLUG SEE DETAIL B.
4. CABLES SHOULD BE TYPE RG-188/U INSTALLED WITHOUT FERRULES AND WITH BOTH ENDS GROUNDED. MUST BE AS SHORT AS POSIBLE

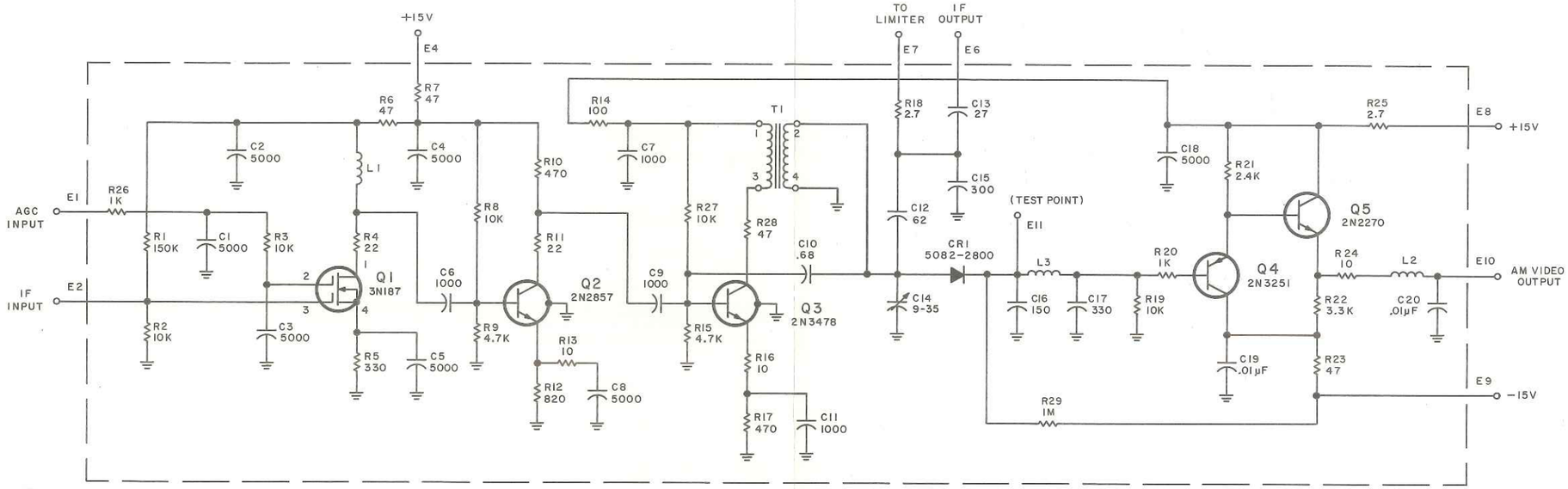
Figure 6-8. Type 72295 21.4 MHz IF Amplifier (100 kHz BW) (A8), Schematic Diagram



NOTES:

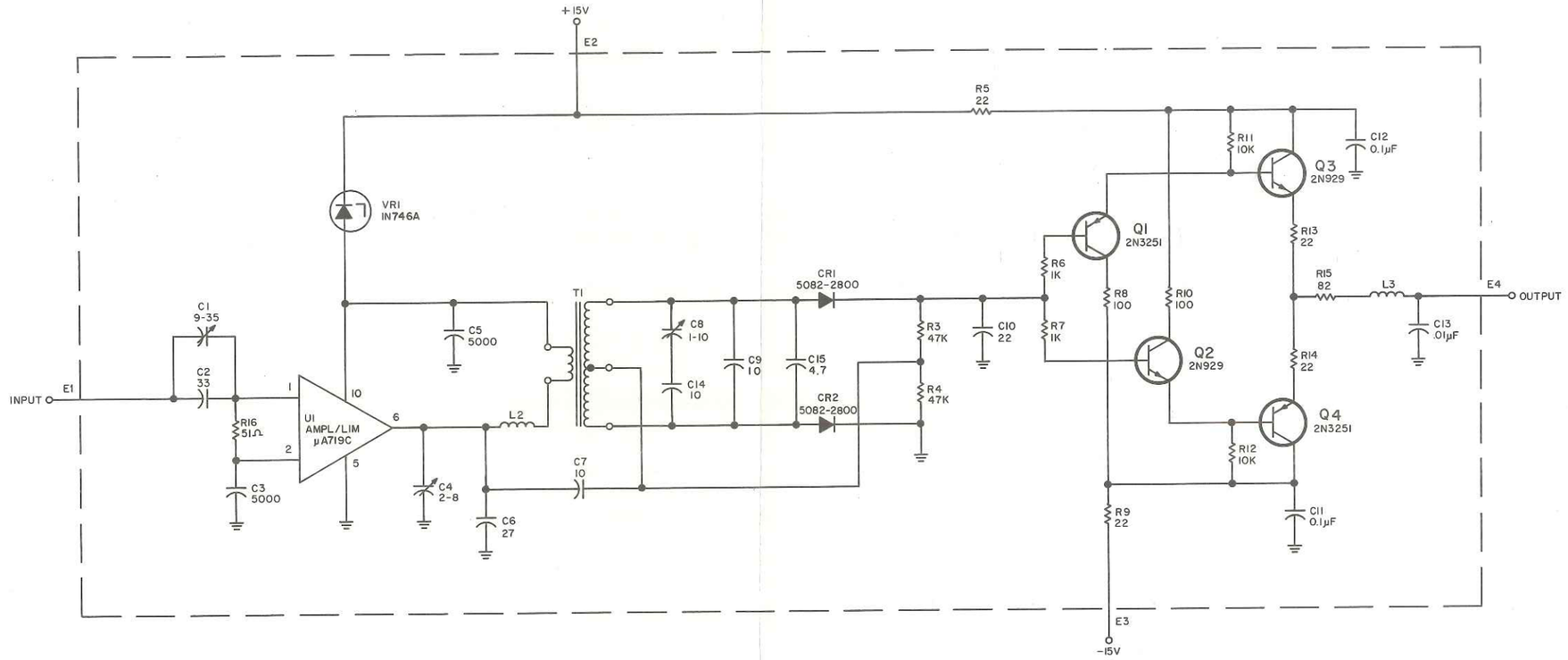
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.

Figure 6-9. Part 15295 IF Input Amplifier (100 kHz BW) (A8A1), Schematic Diagram



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

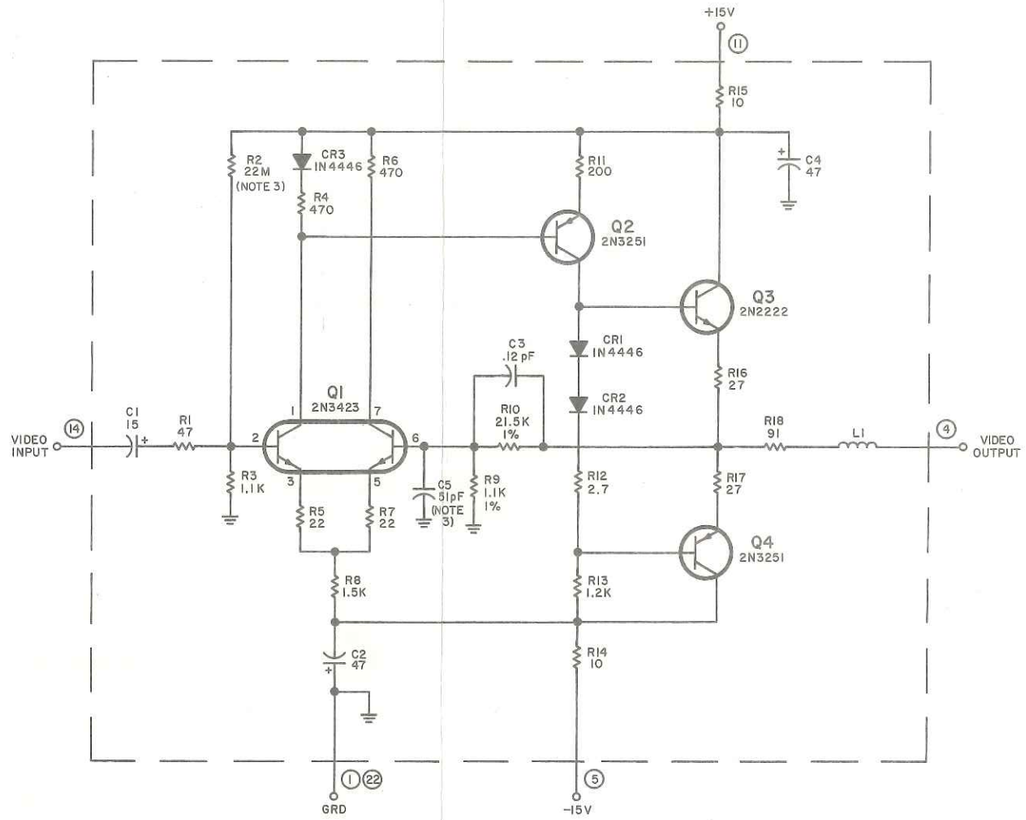
Figure 6-10. Part 15298 IF Output Amplifier (100 kHz BW) (A8A2), Schematic Diagram



NOTES

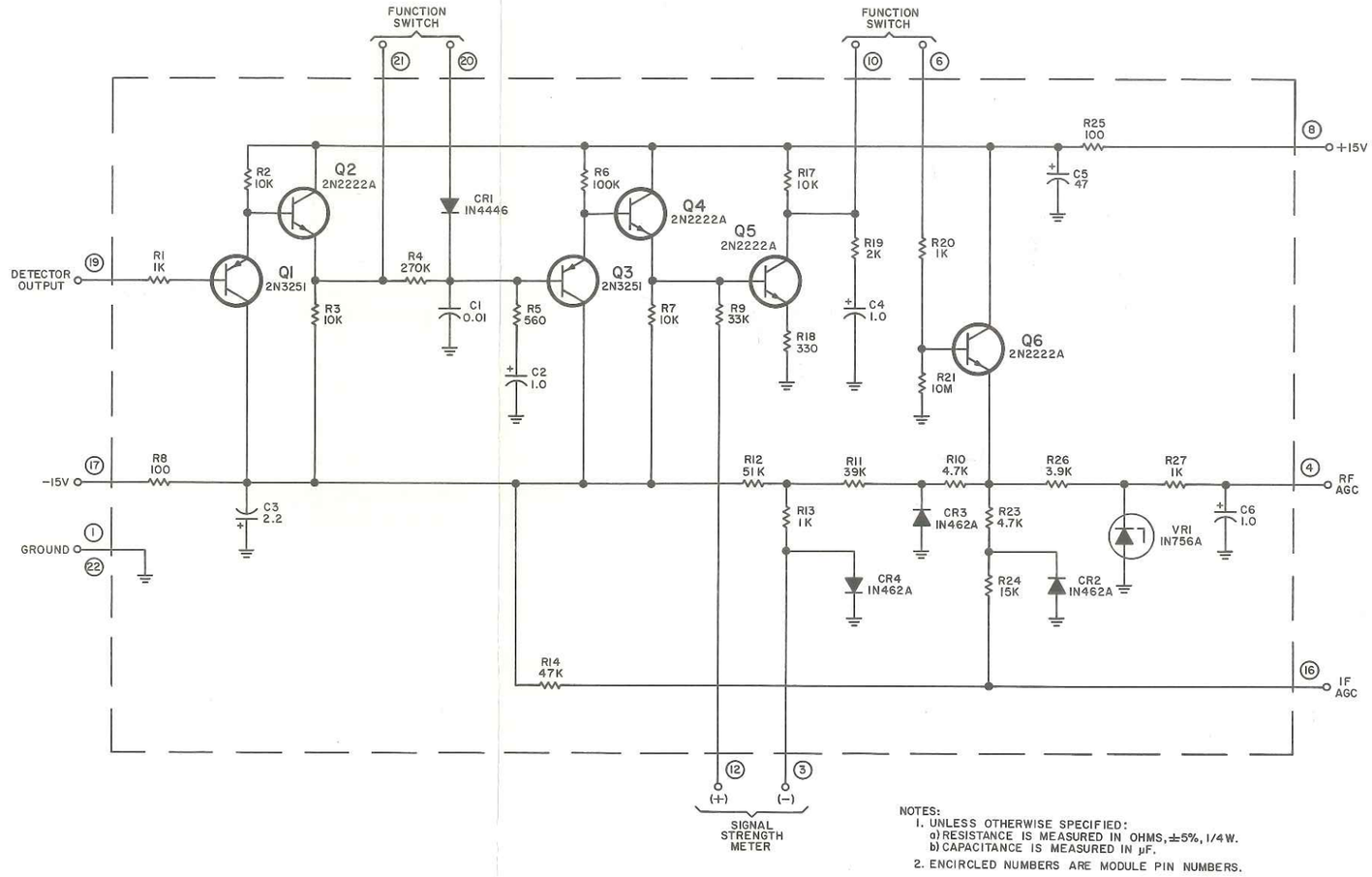
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.

Figure 6-11. Part 15196 21.4 MHz Limiter/Discriminator (100 kHz BW) (A8A3), Schematic Diagram



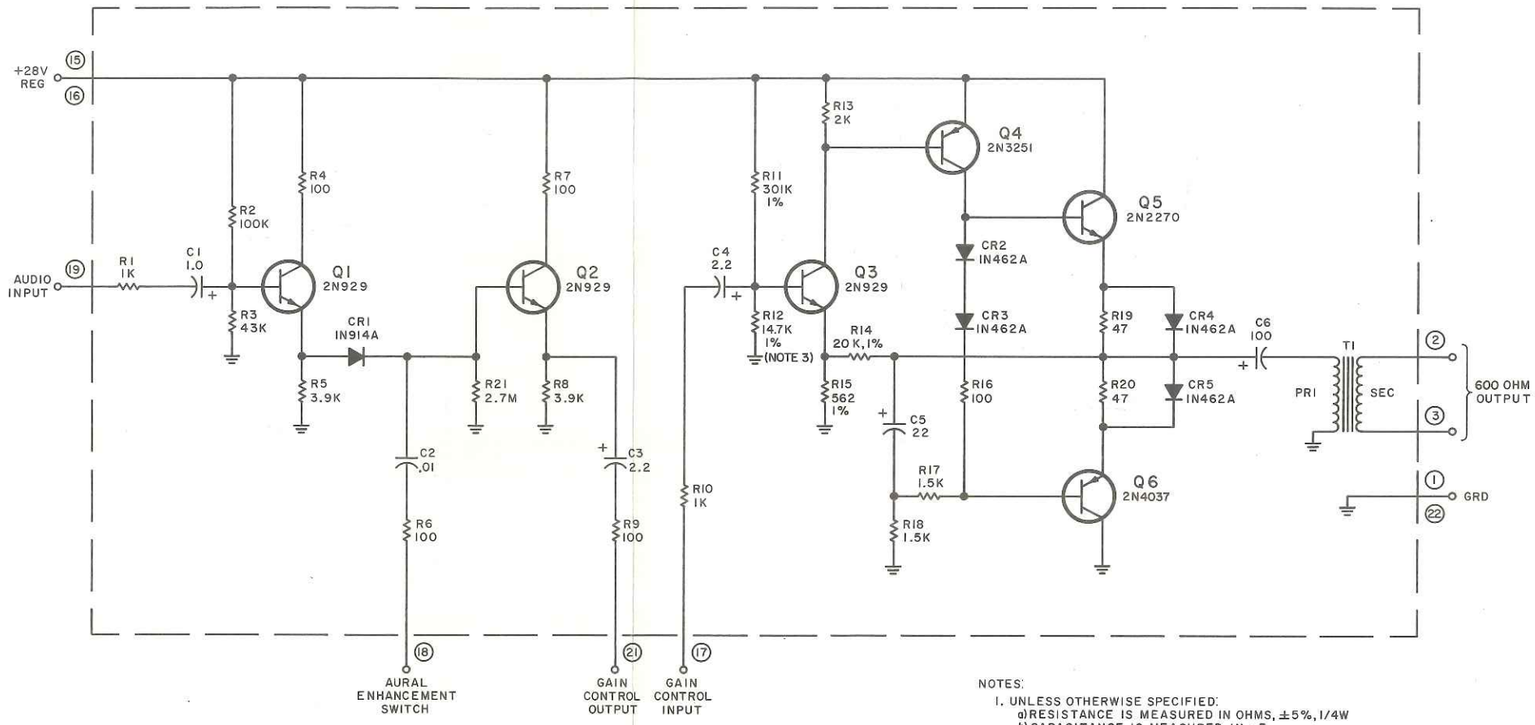
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. NOMINAL VALUE; FINAL VALUE FACTORY SELECTED.

Figure 6-12. Type 7361 Video Amplifier (A9), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4 W.
   b) CAPACITANCE IS MEASURED IN μF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 6-13. Type 7866 AGC Amplifier (A10), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W
   b) CAPACITANCE IS MEASURED IN µF
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. NOMINAL VALUE, FINAL VALUE FACTORY SELECTED.

Figure 6-14. Type 7444 Audio Amplifier (A11), Schematic Diagram

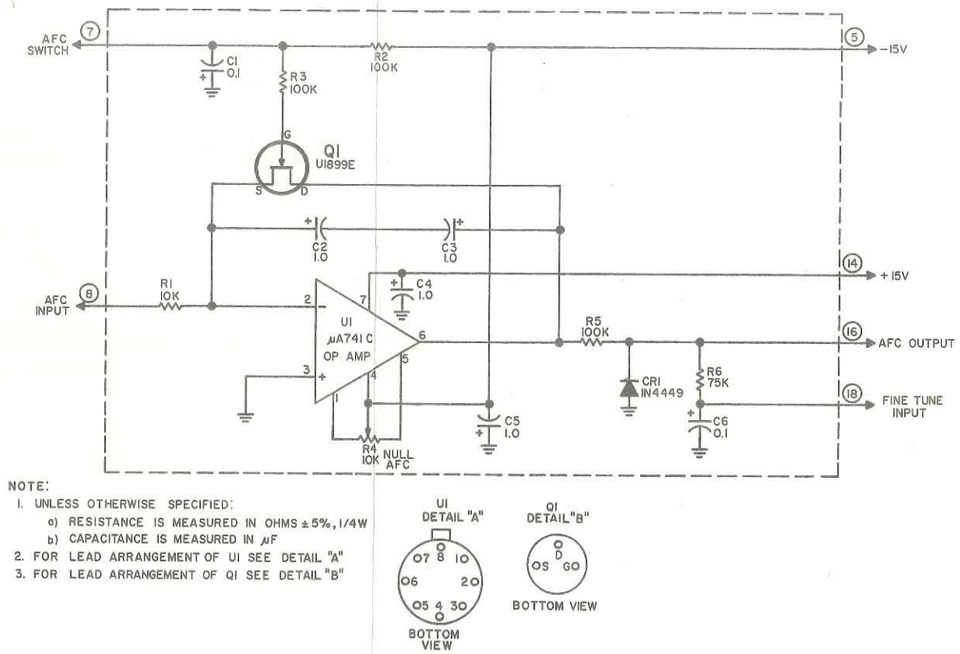
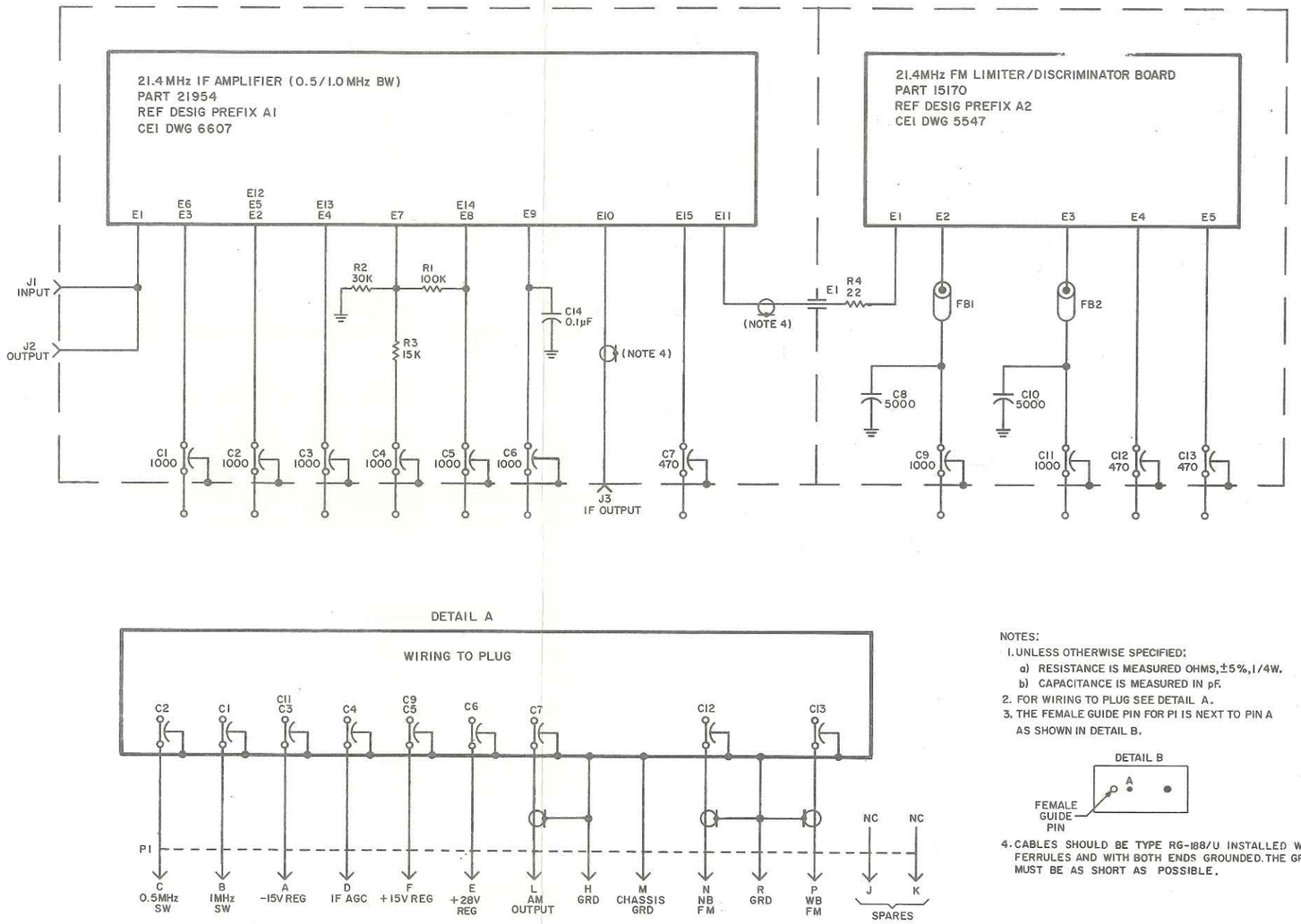


Figure 6-15. Type 79922 AFC Amplifier (A12), Schematic Diagram

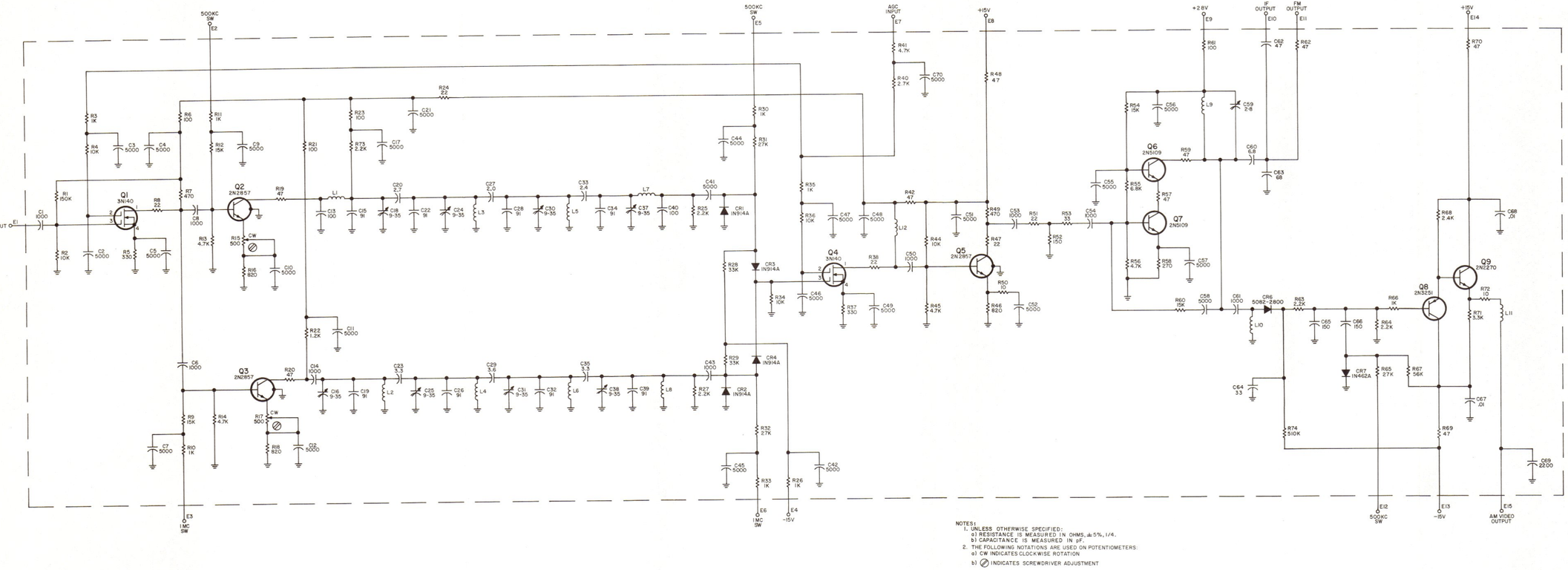


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. FOR WIRING TO PLUG SEE DETAIL A.
3. THE FEMALE GUIDE PIN FOR P1 IS NEXT TO PIN A AS SHOWN IN DETAIL B.

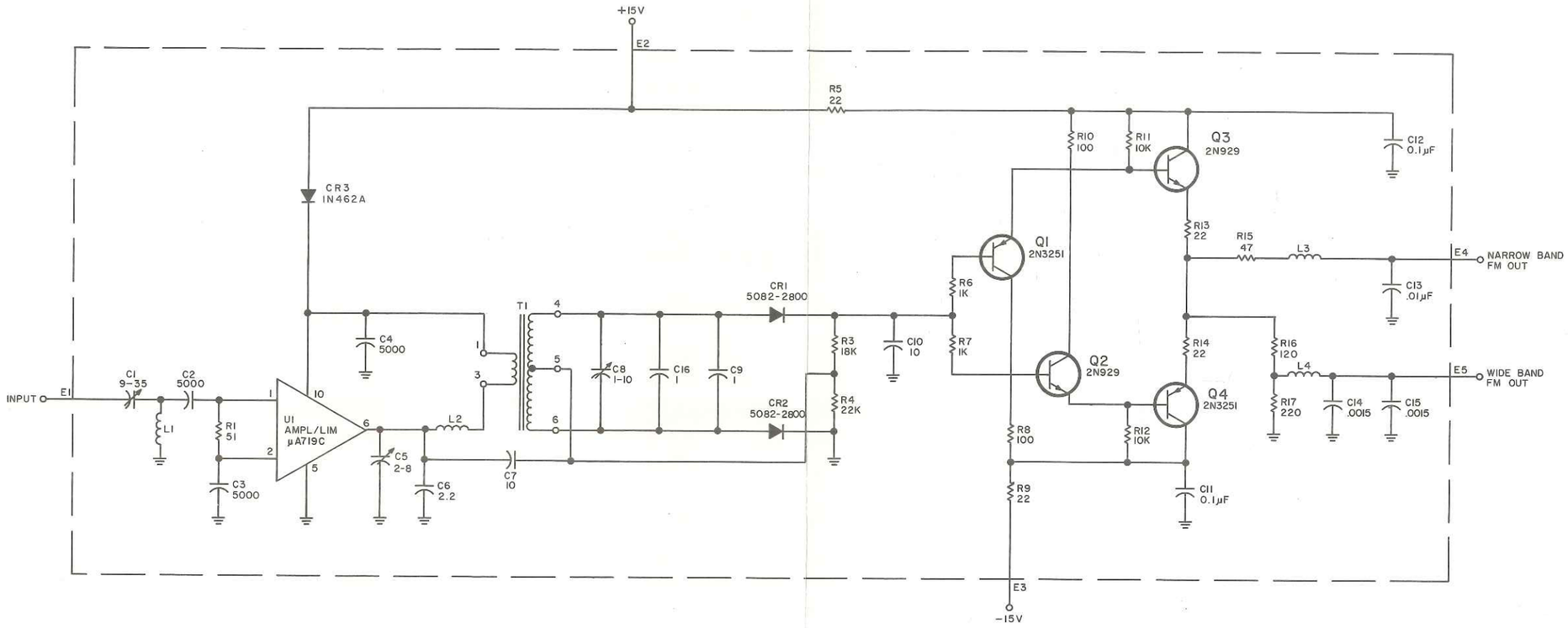
4. CABLES SHOULD BE TYPE RG-188/U INSTALLED WITHOUT FERRULES AND WITH BOTH ENDS GROUNDED. THE GROUND MUST BE AS SHORT AS POSSIBLE.

Figure 6-16. Type 72299 21.4 MHz IF Amplifier (0.5 MHz/1 MHz BW) (A13), Schematic Diagram



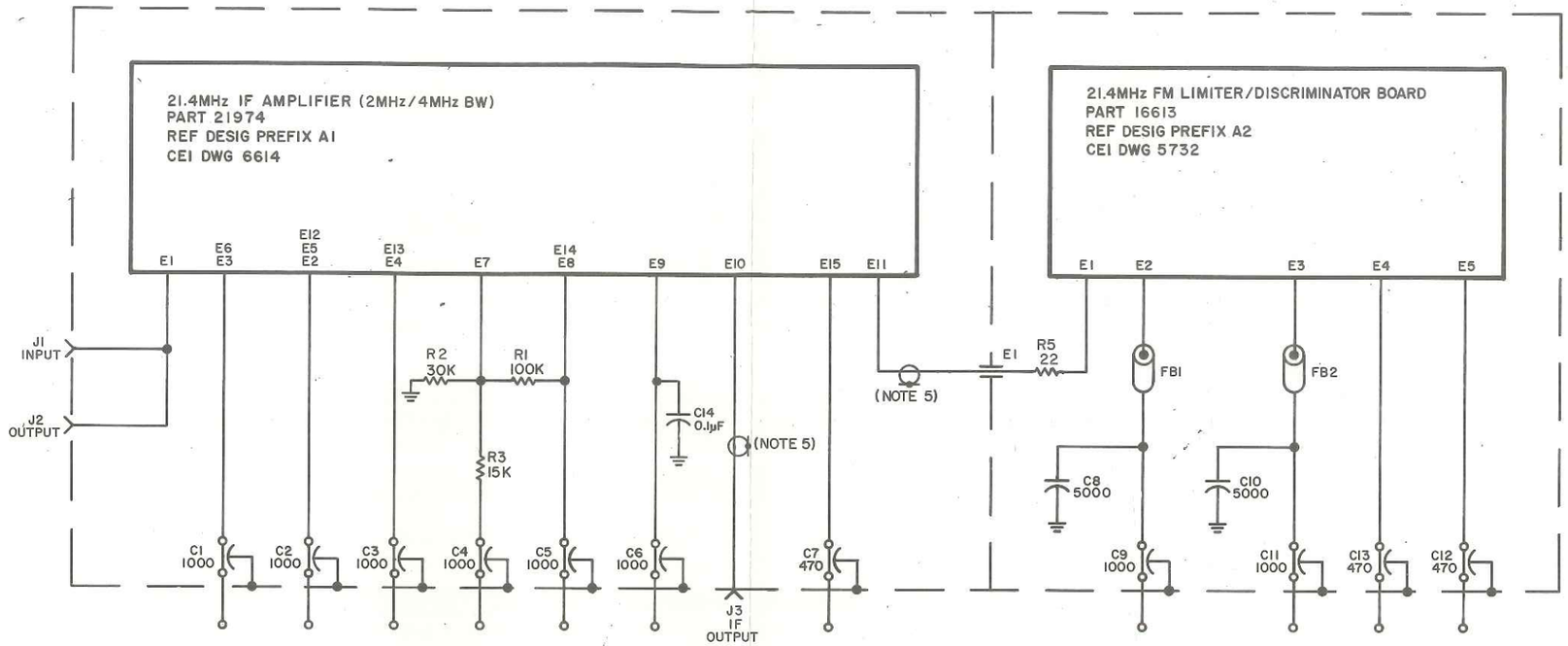
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4.
   b) CAPACITANCE IS MEASURED IN pF.
2. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT

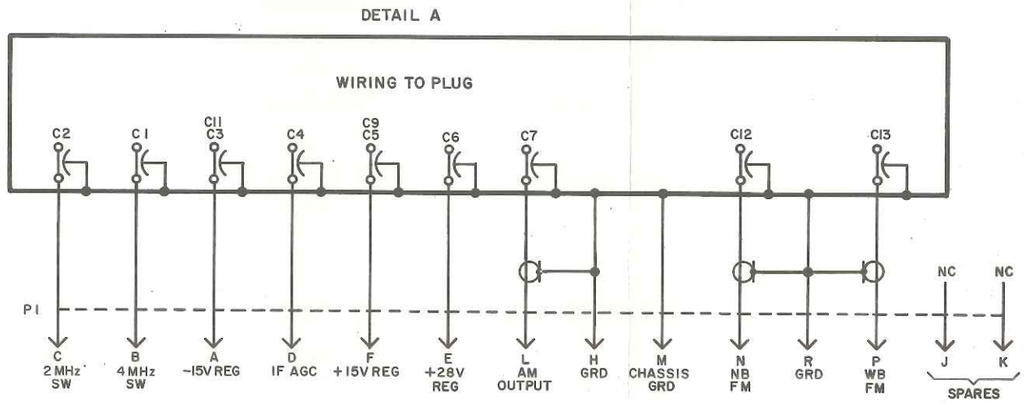
Figure 6-17. Part 21954 21.4 MHz Amplifier (500 kHz/1 MHz BW) (A13A1), Schematic Diagram



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

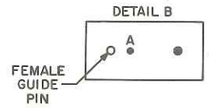
Figure 6-18. Part 15170 21.4 MHz FM Limiter/ Discriminator (A13A2), Schematic Diagram





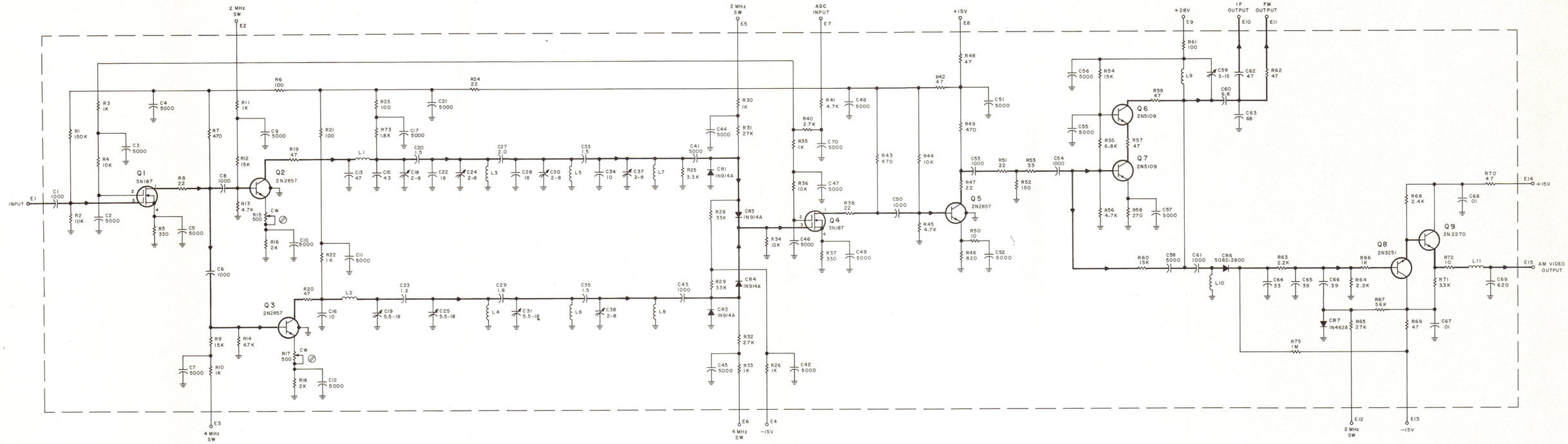
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. FOR WIRING TO PLUG SEE DETAIL A.
3. THE FEMALE GUIDE PIN FOR P1 IS NEXT TO PIN A AS SHOWN IN DETAIL B.



4. REF DESIG W1 IS ASSIGNED TO THE CABLE TERMINATING AT P1.
5. CABLES SHOULD BE TYPE RG-188/U INSTALLED WITHOUT FERRULES AND WITH BOTH ENDS GROUNDED. THE GROUND MUST BE AS SHORT AS POSSIBLE.
6. CABLES SHOULD BE TYPE RG-174/U FOR WIRING TO PLUG FOR C7, C12 & C13.

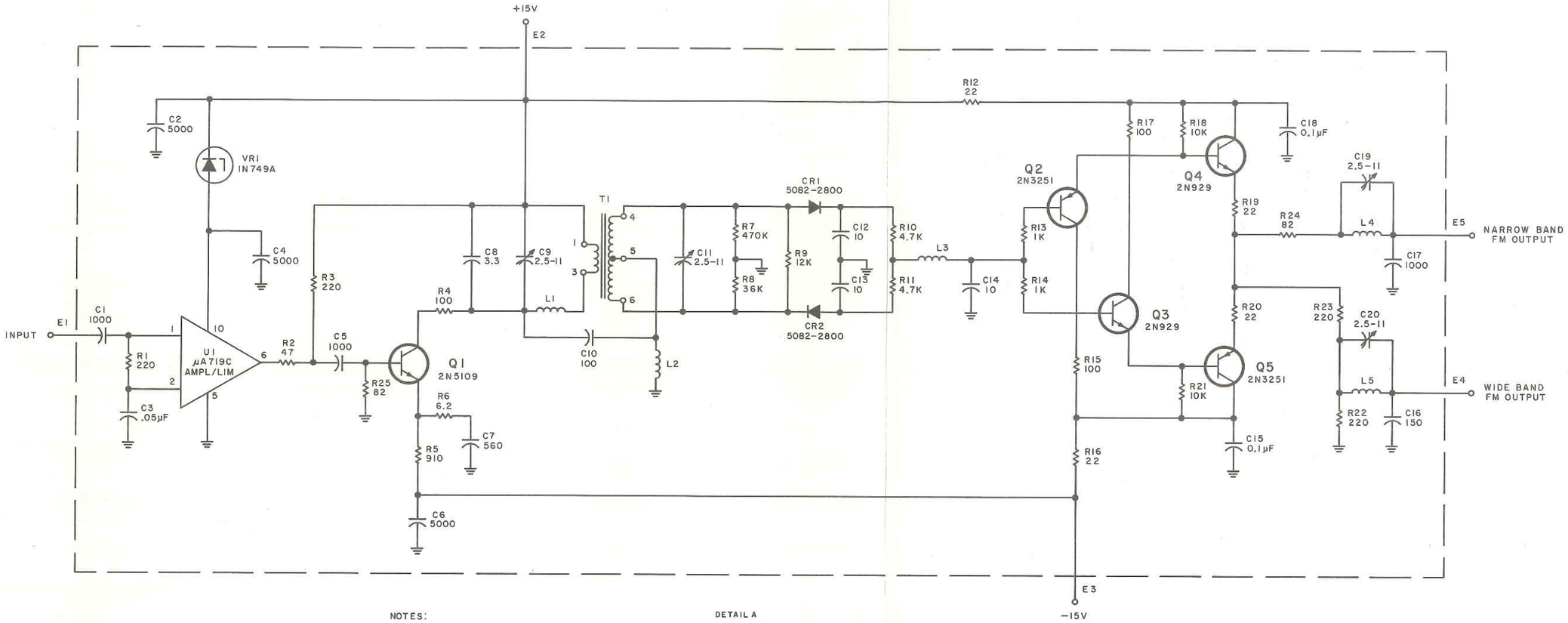
Figure 6-19. Type 72301 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION OF CONTROL KNOB.
   b) ⊘ INDICATES SCREWDRIVER ADJUSTMENT.
3. HEAVY LINE DENOTES MAIN SIGNAL PATH.

HIGHEST REF DESIG USED	REF DESIG NOT USED
C70	C14,C26, C32,C36, C39,C40.
R75	R27,R39, R74.
Q9	- - -
L11	- - -
CR7	CR5

Figure 6-20. Part 21974 21.4 MHz IF Amplifier (2 MHz/4 MHz BW) (A13A1), Schematic Diagram



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS IN pF.
2. FOR U1 PIN ARRANGEMENT, SEE DETAIL A.

Figure 6-21. Part 16613 21.4 MHz FM Limiter/ Discriminator (2 MHz/4 MHz BW) (A13A2), Schematic Diagram

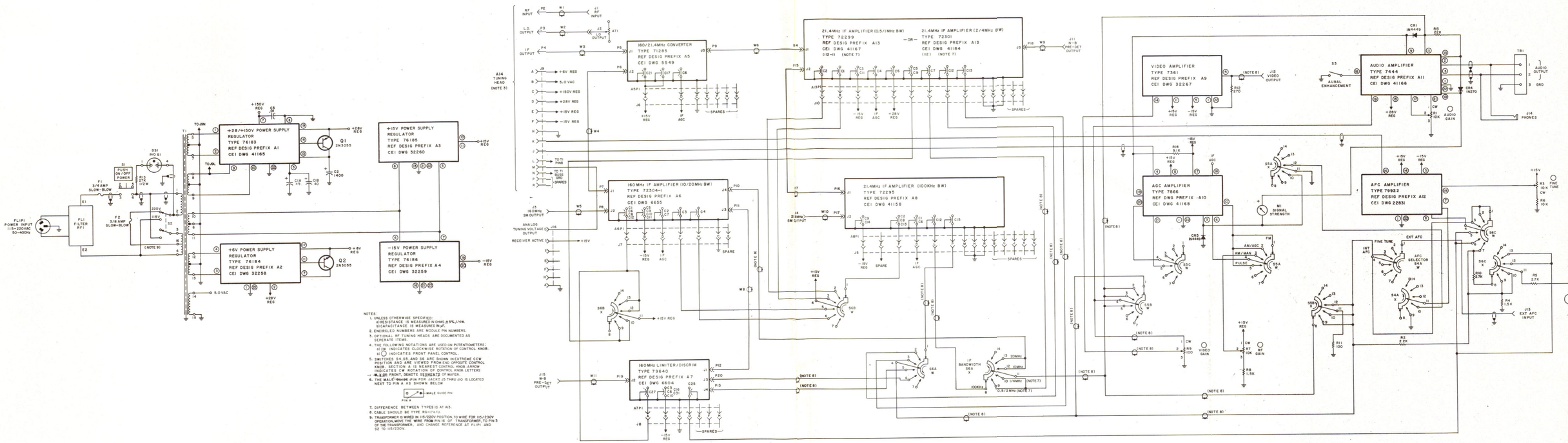
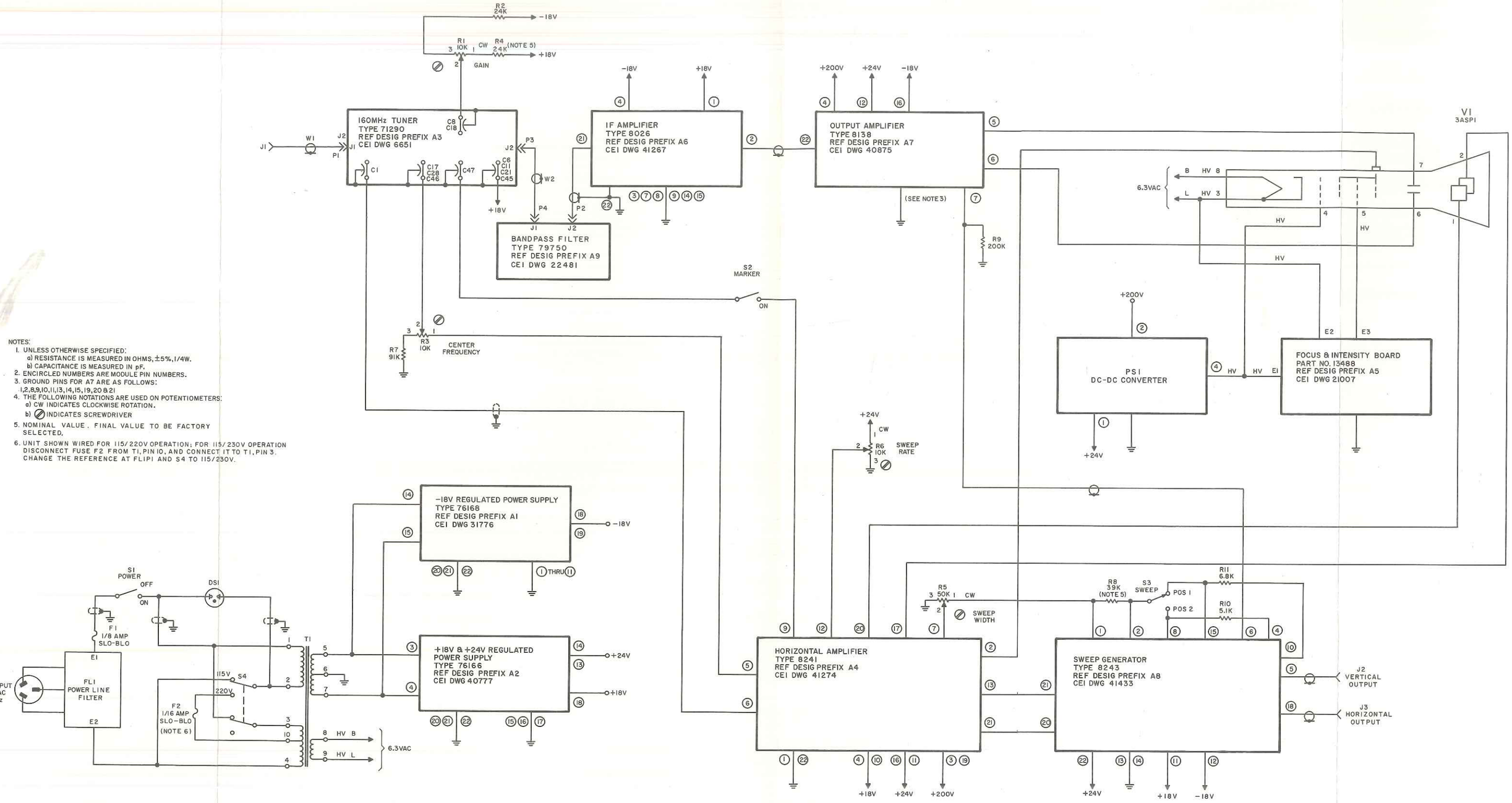


Figure 6-22. Type 112, 112-1 Receiver, Main Chassis Schematic Diagram



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN pF.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. GROUND PINS FOR A7 ARE AS FOLLOWS:
   1,2,8,9,10,11,13,14,15,19,20 & 21
4. THE FOLLOWING NOTATIONS ARE USED ON POTENTIOMETERS:
   a) CW INDICATES CLOCKWISE ROTATION.
   b) ⊘ INDICATES SCREWDRIVER
5. NOMINAL VALUE. FINAL VALUE TO BE FACTORY SELECTED.
6. UNIT SHOWN WIRED FOR 115/220V OPERATION; FOR 115/230V OPERATION DISCONNECT FUSE F2 FROM T1, PIN 10, AND CONNECT IT TO T1, PIN 3. CHANGE THE REFERENCE AT FLIPI AND S4 TO 115/230V.

Change 1
12/3/75

Figure 6-11. Types SM-1621 and SM-1622 Signal Monitors, Main Chassis Schematic Diagram