



WATKINS-JOHNSON

INSTRUCTION MANUAL
FOR
TYPES DM-112 AND DM-112-1 DEMODULATORS

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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.

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Table 1-1. Types DM-112 and DM-112-1 Demodulators, Specifications

| | |
|------------------------------------|---------------------------------------------------------------------------------------------------|
| Input Frequency | Operates from a 160-MHz IF input |
| Second IF Frequency | 21.4 MHz |
| *IF Bandwidths | 100 kHz, 2 MHz, 4 MHz, 10 MHz, 500 kHz, 1 MHz, and 20 MHz, selectable by front-panel switch |
| Types of Reception | AM-Man, AM-AGC, FM, and Pulse |
| Predetection Outputs: | |
| 160 MHz | Produces 5 mV, minimum, into a 50-ohm load for input signal levels above AGC threshold |
| 21.4 MHz | Produces 10 mV, minimum, into a 50-ohm load for input signal levels above AGC threshold |
| Signal Monitor Output | A 21.4-MHz output providing 8 dB gain, minimum, from the 160-MHz input |
| Video Output Level | 2 volts, peak-to-peak into a 93-ohm load |
| Video Frequency Response | 20 Hz to 15 MHz |
| Audio Output Level | 100 mV, minimum, into a 600-ohm load, balanced |
| Panel Meters | Tuning and signal strength |
| Signal Monitor Section: | |
| Input Center Frequency | 160 MHz |
| Sweepwidth | 20 MHz |
| Sweep Linearity | Linear overall to within 5% of the total sweepwidth |
| Sweep Rate | 5 Hz to 25 Hz, nominal, continuously variable |
| Intermediate Frequencies | 60 MHz and 21.4 MHz |
| Local Oscillator Frequencies: | |
| 1st Local Oscillator | 220 MHz, $\pm 1/2$ sweepwidth |
| 2nd Local Oscillator | 81.4 MHz, crystal controlled |
| Resolution | Minimum 6-dB valley between signals 200 kHz apart |

| | |
|------------------------------|-------------------------------------------------------------------------------------------|
| Image Rejection | 60 dB, minimum |
| IF Rejection | 60 dB, minimum |
| Gain Control Range | 60 dB, minimum |
| Crystal Marker | 160 MHz, $\pm 0.01\%$ |
| Outputs | Auxiliary Vertical and Horizontal Outputs |
| Tuner AGC Output | Negative-going voltage from +10V to +6V for zero signal input to large signal input |
| Tuner AFC Output | Suitable to operate with the MTF-100 Microwave Tuning Frame |
| Input Power | 115/230 Vac $\pm 10\%$, 48-62/398-402 Hz |
| Power Consumption | 30 watts, approximately |
| Dimensions | 3.5 inches high, 19 inches wide, and 18 inches deep |
| Weight | 25 lbs., approximately |

* Type DM-112: IF Bandwidths are 100 kHz, 2 MHz, 4 MHz, 10 MHz, and 20 MHz.

Type DM-112-1: IF Bandwidths are 500 kHz, 1 MHz, 100 kHz, 10 MHz and 20 MHz.



Figure 1-1. Type DM-112-() Demodulator,
Front View

SECTION I GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

1.1.1 The Types DM-112 and DM-112-1 Demodulators are designed to provide AM, FM, and PULSE detection from a 160 MHz IF input signal. They can be used with any tuner having a 160 MHz IF output signal. The demodulators use single conversion with an input frequency of 160 MHz and a second IF of 21.4 MHz. Five IF bandwidths are provided. Of these, 100 kHz, 10 MHz and 20 MHz are standard. Two additional IF frequencies of 500 kHz and 1 MHz or 2 MHz and 4 MHz are customer selected. Selection of the desired bandwidth is by means of a front panel switch.

1.1.2 The demodulators include a built-in signal monitor operating from the 160 MHz IF input. It provides a visual display of signals in a band around the received signal. The signal monitor has a maximum sweep width of 20 MHz. The sweep rate is continuously variable from 5 Hz to 25 Hz.

1.1.3 For the three narrow bandwidths the demodulators convert the 160 MHz IF signal to a 21.4 MHz second IF signal. Predetection outputs are available at both IF frequencies as well as a 21.4 MHz signal monitor output. In addition to the predetection and signal monitor outputs, the demodulators provide video, audio, tuner AGC, and tuner AFC outputs.

1.2 MECHANICAL CHARACTERISTICS

1.2.1 The front panel of the demodulators mount all the controls normally needed for the operation of the demodulator. These are the IF BANDWIDTH MHz, RECEPTION MODE, VIDEO GAIN, IF GAIN, AUDIO GAIN, AURAL ENHANCEMENT, PHONES and POWER. In addition, a SIGNAL STRENGTH METER and a TUNING METER are mounted on the front panel. The controls for the built-in signal monitor are also mounted on the front panel and are MARKER, SWEEP WIDTH MHz, CENTER FREQUENCY, SWEEP RATE Hz, INTENSITY, FOCUS and GAIN.

1.2.2 Located on the rear apron of the demodulators are the 160 MHz IF INPUT jack J1, the VERT OUTPUT jack J2, the HORIZ OUTPUT jack J3, the 21.4 MHz SM OUTPUT jack J4, the TUNER AGC OUTPUT jack J9, the NB PRE-DET OUTPUT jack J11, the VIDEO OUTPUT jack J12, the AFC OUTPUT jack J13, the WB PRE-DET OUTPUT jack J15, SWEEP switch S7, terminal board TB1, fuses F1 and F2, the 115/230 Vac input power selector switch S2 and the ac power cord. Jacks J1, J2, J3, J4, J9, J11, J12, J13 and J15 are BNC connectors.

1.2.3 The front, rear, and side panels of the demodulators are made of aluminum as well as the top and bottom dust covers and main deck. The main chassis contains eighteen subassemblies. Nine of these are constructed on plug-in printed wiring boards. The nine 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 DM-112 or the Type DM-112-1 Demodulator main chassis only. The dimensions are given in Table 1-1.

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

The Type DM-112 or DM-112-1 Demodulator is designed to operate with any tuner which has a 160 MHz IF output. The demodulators are not capable of independent operation.

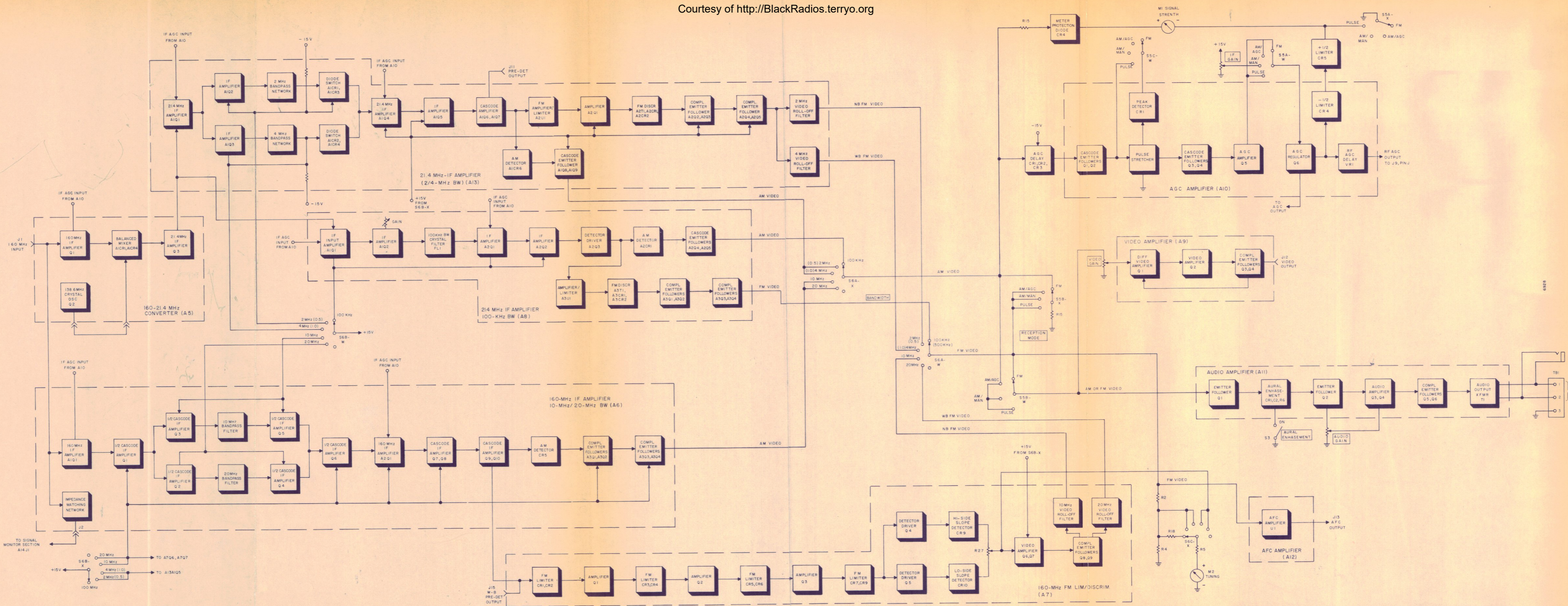


FIGURE 2-1a. TYPES DM-112 AND DM-112-1 DEMODULATORS, FUNCTIONAL BLOCK DIAGRAM

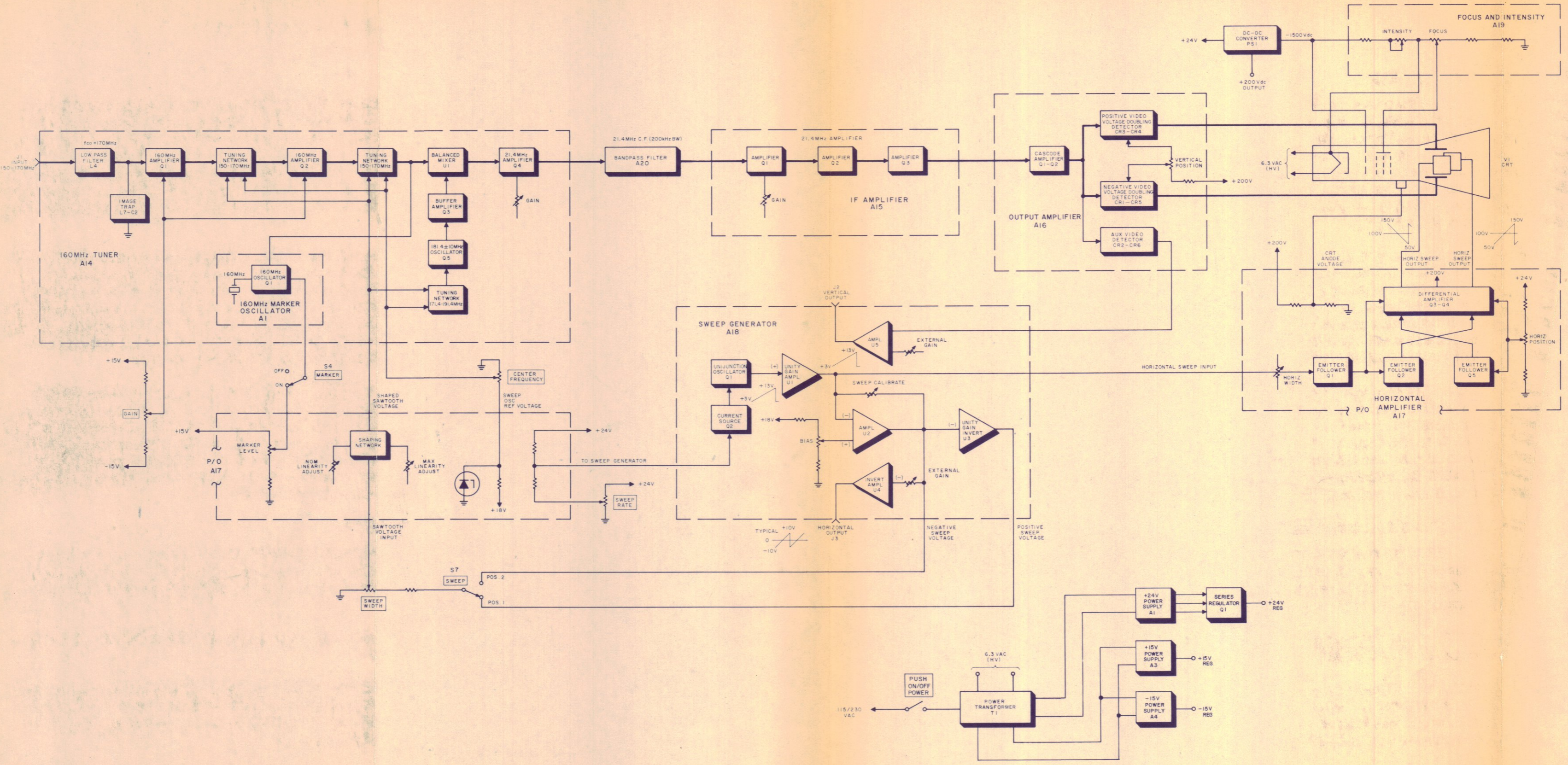


FIGURE 2-1b. TYPES DM-112 AND DM-112-1 DEMODULATORS, FUNCTIONAL BLOCK DIAGRAM

SECTION II

CIRCUIT DESCRIPTION

2.1 GENERAL

Circuit operation in the DM-112 and DM-112-1 Demodulators is explained in the following paragraphs. The functional description is oriented to the block diagrams (Figures 2-1a and 2-1b), while the detailed circuit descriptions refer to the relevant schematics in Section VI. Note that the unit numbering method is used. Thus, the complete designator for an electrical component located on a subassembly or module includes a prefix before the usual class letter and numbers of the item (e. g., A6A1Q1; A8R2). These prefixes are included in the text only when necessary to avoid ambiguity.

2.1.1 Use. - The DM-112 and DM-112-1 Demodulator Units are designed for use with any tuner that has a 160 MHz IF output. For example, they can be used with any of the TH-()A and B Series Microwave Tuning Heads mounted in the MTF-100 and MTF-101 Microwave Tuning Frames. The combination of tuner and demodulator forms a versatile, double-conversion superheterodyne unit that can receive, amplify, and demodulate AM, FM, and Pulse signals and at the same time provide a visual display of the RF spectrum surrounding the signal being received.

2.1.2 Difference in Types. - Both demodulators incorporate standard, switch-selected IF bandwidths of 100 kHz, 10 MHz, and 20 MHz. In addition, the DM-112 provides IF bandwidths of 2 MHz and 4 MHz, while the DM-112-1 includes bandwidths of 500 kHz and 1 MHz. This difference, which involves the substitution of one circuit board for another at module A13, is the sole distinction between the DM-112 and DM-112-1 Demodulators. Since the boards contained in A13 are similar, a functional description is provided only for the DM-112 configuration.

2.2 FUNCTIONAL DESCRIPTION

Circuit functions in the DM-112 Demodulator are conveniently grouped in a section for demodulation and a section for signal monitoring. This organization has been preserved, both in the two-part functional block diagram and in the subparagraphs which follow.

2.2.1 Demodulator Section. - For the functional block diagram of the demodulator section, refer to Figure 2-1a.

2.2.1.1 A 160 MHz first-IF signal is connected to jack J1 on the demodulator rear apron. Coaxial cable supplies the signal to the 160-to-21.4 MHz Converter (A5), the 10 and 20 MHz bandwidth IF amplifiers (A6), and, via an impedance-matching network on A6, to the 160 MHz Tuner (A14).

2.2.1.2 The converter input amplifier, A5Q1, is a dual-gate MOSFET. The 160 MHz input signal is applied to one gate; the IF AGC signal from module A10 is applied to the other gate to control the gain of the stage. The output of A5Q1 is supplied to one input of balanced mixer board A5A1. The other mixer input is furnished from 138.6 MHz crystal-controlled oscillator Q2. The mixer heterodynes the two input frequencies to produce an output that contains predominately sum and difference frequencies. The 21.4 MHz difference frequency (second IF) is filtered and amplified through double-tuned amplifier A5Q3, then coupled out of module A5 to the narrow-band IF amplifiers.

2.2.1.3 The 21.4 MHz second-IF signal is connected to the input of 2 and 4 MHz bandwidth IF amplifiers A13 and, through a parallel connection within A13, to 100 kHz bandwidth IF amplifier A8. On both boards the input stages are IF AGC gain-controlled. Dual-gate MOSFETs A8A1Q1 and A13A1Q1 are functionally identical to A5Q1.

2.2.1.3.1 On A8, the drain of the input stage feeds the base of amplifier A8A1Q2. A potentiometer 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 another IF AGC-controlled MOSFET, 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 AM signals and couples the resultant video through complementary, direct-coupled emitter followers A8A2Q4 and A8A2Q5 to section S6A-X of the front panel IF bandwidth switch. FM signals are amplified and limited by integrated circuit A8A3U1, which in turn, drives the discriminator circuit made up of transformer A8A3T1 and diodes A8A3CR1 and A8A3CR2. The output signal is coupled through parallel complementary emitter followers A8A3Q1 and A8A3Q2 to complementary, push-pull emitter followers A8A3Q3 and A8A3Q4. This FM video output is applied to IF bandwidth switch section S6A-W.

2.2.1.3.2 The output from the drain of A13A1Q1 is coupled through one of two parallel paths. Each path contains an input amplifier, a bandpass determining network, and an output diode switch. The path through which the IF signal passes is determined by the setting of the IF bandwidth switch, S6. Sections S6B-W and S6B-X of this switch control the application of the +15 volt supply to the IF amplifiers. On A13, when the 2-MHz bandwidth is selected, the path containing A13A1Q2 and diode switch A13A1CR1-CR3, is activated. Selection of the 4-MHz bandwidth activates the path containing A13A1Q3 and diode switch A13A1CR2-CR4. The output switches eliminate any feedthrough from the unused path. Transistor A13A1Q4, another gain-controlled MOSFET, amplifies the IF signal from the path in operation and drives 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 cascode amplifier A13A1Q6 and Q7. This circuit provides the predetection output appearing at the rear apron jack J11, the input to the FM discriminator circuit in the IF strip, and the signal input to AM detector diode A13A1CR6. The AM video

output from A13A1CR6 is coupled through cascade 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 two parallel paths, each of which contains a complementary pair of emitter followers plus a filter to trap 21.4 MHz. Wide- and narrow-band FM video outputs from the two roll-off filters are applied to section S6A-W of the IF bandwidth switch.

2.2.1.4 The 160 MHz first IF signal is cabled from module A5 to the input of 10/20 MHz bandwidth IF amplifier A6. Within A6, the signal is connected to one gate of dual-gate MOSFET input amplifier A6A1Q1, and connects to module A14 through an impedance-matching 8-dB resistive pad. The second stage in the IF strip, A6Q1, operates as one-half of a cascode amplifier. The other half is formed by one of the two transistors A6Q2 or A6Q3. The stage that operates 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. Following passage through a bandpass filter, additional amplification of the 160-MHz IF signal occurs in another cascode circuit formed by A6Q6 in conjunction with either A6Q4 or A6Q5, again depending on the position of the IF bandwidth switch. Following A6Q5 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 to its second gate. Two additional cascode amplifiers follow A6A2Q1, containing transistors A6Q7-A6Q8 and A6Q9-A6Q10. Two outputs are provided from the latter circuit. One output is applied to AM detector diode A6CR5, and the other is coupled to the FM discriminator circuitry on module A7. Demodulated AM signals from A6CR5 are coupled through complementary emitter followers A6A3Q1 and A6A3Q2 to output emitter followers A6A3Q3 and A6A3Q4. These two transistors are also connected in a complementary configuration. Their outputs are connected to provide a single AM video signal that is applied to section S6A-X of the IF bandwidth switch.

2.2.1.5 FM signals from A6 are amplitude limited prior to demodulation in the 160-MHz FM limiter/discriminator module A7. Four limiters are employed, each of which is composed of a pair of back-to-back shunt diodes (A7CR1 through A7CR8). The first three diode pairs shunt the base circuits of three common-emitter amplifiers A7Q1, A7Q2, and A7Q3; the final pair shunts the collector of A7Q3. From this final limiter, 1.4V PP FM signals are applied to parallel detector-driver transistors A7Q4 and A7Q5. These in turn, drive high- and low-side slope detectors A7CR9 and A7CR10. Video outputs from these diodes are summed across potentiometer A7R27 to produce the FM video signal. Complementary, DC-coupled transistors A7Q6 and A7Q7 amplify the FM video and apply it to complementary emitter followers A7Q8 and A7Q9. Separate roll-off filters are employed in the 10-MHz and 20-MHz bandwidth video outputs. The two FM video signals are applied to section S6A-W of the IF bandwidth switch.

2.2.1.6 The three AM video lines from IF amplifiers A6, A7, and A13 are connected to IF bandwidth switch section S6A-X. When an IF bandwidth is selected, the appropriate AM video signal is connected to the signal strength meter circuit (M1), to the AGC delay network at the input to AGC amplifier module A10, and to two sections of the front panel Reception Mode switch, S5.

2.2.1.7 The five FM video outputs are similarly connected to switch section S6A-W, and the selected FM signal is coupled to switch section S6C-X at the input to the tuning meter circuit (M2), to the AFC amplifier module (A12), and to the same two sections of the Reception Mode switch, S5B-W and S5B-X. In the first switch section, the FM video signal is wired to the FM position and the AM video signal is wired to the AM/AGC, AM/MAN, and PULSE positions; in the second section, the wiring is exactly reversed. Depending on the reception mode selected, the output of switch section S5B-W supplies either AM or FM video to the front panel VIDEO GAIN control at the input to video amplifier module A9, and also to audio amplifier module A11. The output of S5B-X is grounded through resistor R15, which replaces the load of the video gain potentiometer for the unselected video channel and ensures that both AM and FM video lines drive a constant load.

2.2.1.8 Before entering AGC amplifier module A10, the AM video signal is passed through a delay network comprising diodes CR1 through CR3. AM detector voltage that exceeds the delay threshold (about 2 volts) is coupled into the AGC amplifier through complementary, cascade emitter followers A10Q1-A10Q2. A pulse-stretching network couples the output of A10Q2 into a second cascade emitter follower stage, A10Q3-A10Q4. When the demodulator is operated in the PULSE reception mode, switch section S5C-W connects peak detector CR1 into the pulse stretcher, thereby producing a more linear AGC output when the unit is receiving pulse modulation. The output of A10Q4 is direct-coupled into AGC amplifier A10Q5, and the output of A10Q5 is connected to switch section S5A-W. In all reception modes except AM/MAN, this signal is supplied to AGC regulator stage A10Q6. In the AM/MAN mode, the output of the front panel IF GAIN potentiometer is supplied instead. The gain control voltage (IF AGC) for the demodulator's IF circuitry is taken directly from A10Q6, while RF AGC voltage is drawn across a delay network containing Zener diode A10VR1. The RF AGC voltage is supplied to the unit's associated RF tuning heads via rear apron jack J9 pin J.

2.2.1.9 The FM video signal from S6A-W is connected to AFC amplifier module A12 and coupled through operational amplifier A12U1. The resulting AFC signal is output from the DM-112 through rear apron jack J13. When the DM-112 Demodulator is used in conjunction with the TH series microwave tuning heads mounted in the MTF-100 and MTF-101 frames, the AFC signal is supplied to the energized tuning head via an AFC ON/OFF switch and a fine-tuning potentiometer, which are located on the MTF-100 chassis.

2.2.1.10 The video amplifier module (A9) receives its input from the VIDEO Gain potentiometer. This signal is amplified by A9Q1, a dual NPN transistor connected as a differential amplifier. Additional amplification is provided by A9Q2 which, in turn, drives output complementary emitter followers A9Q3 and A9Q4. Amplified video signals are connected to jack J12 on the rear apron.

2.2.1.11 The audio amplifier input stage, A11Q1, is an emitter follower functioning as a low-impedance driver for a pulse stretching network. This network 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 amplifiers A11Q3 and A11Q4 through the front panel AUDIO GAIN control. The audio output circuit consists of complementary emitter followers A11Q5 and A11Q6. Impedance matching between the output stages and the 600-ohm load is provided by transformer A11T1. Audio signals are available from pins 1 and 2 of terminal board TB1 and from the front panel PHONES jack.

2.2.2 Signal Monitor Section. - The functional block diagram of the Signal Monitor section is provided in Figure 2-1b.

2.2.2.1 The 160 MHz first IF signal from A6J2 is connected to the 160 MHz Tuner module at jack A14J1, and is coupled across an image trap (A14L7-C2) and a 170 MHz low-pass filter (A14L4-C4) before amplification by dual-gate MOSFETs A14Q1 and A14Q2. The control gates of both stages are connected to the front panel GAIN potentiometer, and the drain circuits are sweep tuned over a frequency range of up to ± 10 MHz by application of sawtooth voltage to varactor diodes CR2 and CR3. The 150-170 MHz output signal from A14Q2 is applied to one input of 21.4 MHz balanced mixer A14U1. The local oscillator signal for A14U1 is generated by varactor-tuned oscillator A14Q5 and buffered by amplifier A14Q3. Varactor diode A14CR4 is swept by the same sawtooth voltage that is applied to the other two varactors, thereby maintaining the local oscillator frequency at a constant 21.4 MHz above the signal frequency, or, within the range from 171.4 to 191.4 MHz.

2.2.2.2 Subassembly A14A1 comprises a 160 MHz crystal-controlled oscillator. The output from this oscillator is injected across varactor CR3 to provide a center frequency marker on the CRT display. The supply voltage to the oscillator, and hence the amplitude of the marker signal, is regulated by the marker level potentiometer located on module A17. Application of power to the oscillator is controlled by the front panel MARKER switch, S2.

2.2.2.3 The 21.4 MHz difference frequency output from mixer A14U1 is passed through tuned amplifier A14Q4, whose gain can be adjusted to provide proper input level to the following stages. The output of A14Q4 is coupled to bandpass filter module A20, which determines the maximum resolution of the signal monitor section. The filter has a 3 dB bandwidth of 200 kHz. Following filtration, the 21.4 MHz signal is coupled to IF amplifier module A15, where it is further amplified by dual-gate MOSFETs A15Q1 through A15Q3. Each stage is tuned to 21.4 MHz to provide additional IF selectivity. The gain of A15Q1 can be adjusted to provide the desired drive level for the Output Amplifier module, A16. Cascode amplifier A16Q1-A16Q2 provides additional gain for the IF signal, and drives three voltage-doubling video detectors comprising diodes A16CR1 through A16CR6. Two of the detectors

provide balanced video outputs to the CRT vertical deflection plates. The output of the third detector is coupled to module A18, amplified and buffered by op. amp. A18U5, and connected to rear apron vertical output jack J2.

2.2.2.4 Sweep Generator module A18 develops the sawtooth sweep waveforms needed both for the CRT horizontal deflection plates and for the varactor tuning networks on module A14. The basic waveform, a sawtooth with a linear slope from +3 to +13 volts, is generated by unijunction transistor oscillator A18Q1. The repetition rate of the sawtooth is controlled by current source A18Q2, which in turn is controlled by the front panel SWEEP RATE potentiometer via a voltage divider located on module A17. The sawtooth output from oscillator A18Q1 is buffered by unity-gain op. amp. A18U1, and then connected to the inverting input of op. amp. A18U2, to the sweep calibrate potentiometer, and to the horizontal amplifier circuitry on module A17. Amplifier A18U2 provides gain and shifts the sawtooth reference level so that the linear slope begins at +10V and ends at -10V. The gain is set by the sweep calibrator potentiometer, and the magnitude of the level shift is controlled by the bias potentiometer, whose output is applied to the noninverting input of the stage. Amplifier A18U2 drives three lines. One is output to front panel SWEEP switch S3 as the negative sweep voltage, another is coupled through unity-gain, inverting operational amplifier A18U3 to produce the positive sweep voltage for connection to S3, and the third is coupled through operational amplifier A18U4 to the rear apron horizontal output jack, J3.

2.2.2.5 The horizontal amplifier circuitry on module A17 drives the CRT horizontal deflection plates. The sawtooth wave from A18U1 is applied to emitter follower A17Q1 across the horizontal width control potentiometer. The output of A17Q1 drives the bases of A17Q2 and A17Q3, while the horizontal position potentiometer provides a dc level that drives the bases of A17Q4 and A17Q5. Cross-coupling the emitters of these four stages (Q2-Q4; Q3-Q5) produces a compound differential amplifier, both halves of which are controlled by both inputs, with opposed phasing. The twin phase-inverted outputs, taken from the collectors of high-voltage transistors A17Q3 and A17Q4, are sawtooth waves with linear slopes between approximate limits of +50 and +150 volts. These waves are applied to the CRT horizontal deflection plates.

2.2.2.6 SWEEP switch S3, which selects either the positive or negative sweep voltage for application to the tuner module, permits the DM-112 signal monitor section to display a properly oriented frequency spectrum regardless of the mixing techniques (high-beat or low-beat) used to generate the 160 MHz IF. The output of S3 is fed through the front panel SWEEP WIDTH potentiometer to the sawtooth shaping network, A17VR2-A17VR3. This network, together with the two linearity adjustment potentiometers, modified the sawtooth waveshape to compensate for the nonlinear varactor diode characteristic.

2.2.2.7 Various components and modules are associated with the production of operating voltages required by the cathode ray tube. First, the necessary high voltages, +200 and -1500 Vdc, are generated from the +24 Vdc supply by dc-dc converter PS1. The +200 volt line is connected to the vertical position control on module A16, to the horizontal sweep amplifiers A17Q3 and A17Q4, and to a voltage

divider on module A17 from which the CRT anode voltage is drawn. The -1500 volt line is connected directly to the CRT control grid, and also to the focus and intensity voltage divider on module A19. From the two control potentiometers on A19, negative potentials are connected to the CRT cathode and focus grids.

2.2.3 Power Supplies. - Three power supplies provide the primary regulated dc voltages, +24V and $\pm 15V$, needed to operate the DM-112 Demodulator. The supplies receive ac input from the power line via transformer T1. The primary connections to T1 can be switched by rear apron switch S2 to adapt the DM-112 for use with either 115 or 220 volt ac sources. Connections to the transformer can also be manually rewired to adapt the DM-112 for use with a 230 Vac source. Since the three power supplies are functionally identical, only the +24 volt supply will be described. The input ac is immediately passed through full-wave rectifier A1CR1-A1CR2, and the dc output is connected to series regulator Q1, a power transistor mounted on the main chassis. (The series regulators for the two 15 volt supplies are contained within the power supply modules.) The regulated output of Q1 is connected to the various circuit loads, and also to a sampling network within the power supply. The sample is fed across zener reference diode A1VR1 to one input of differential amplifier A1Q2-A1Q3, and across a level adjustment potentiometer to the other input. The differential amplifier generates an error signal, which is applied to regulator control amplifier A1Q1. The output of A1Q1 controls the series regulator, Q1.

2.3 TYPE 76194 +24V POWER SUPPLY

Figure 6-1 is the schematic diagram for this assembly; its reference designation prefix is A1. The operation of the +24V power supply is basically identical to the power supply circuits described in paragraph 2.4. The series regulator transistor, Q1, is mounted on the main chassis of the DM-112 to facilitate greater heat dissipation.

2.4 TYPE 76185 +15V POWER SUPPLY REGULATOR

The schematic diagram for this module is Figure 6-2; its reference designation prefix is A3. 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.

2.5 TYPE 76186 -15V POWER SUPPLY REGULATOR

Figure 6-3 is the schematic diagram for this power supply; its reference designation prefix is A4. This board is functionally identical to the +15V board described in paragraph 2.4. 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.

2.6 TYPE 71285 160/21.4 MHz CONVERTER

The schematic diagram for the Type 71285 160/21.4 MHz Converter is Figure 6-4; its reference designation prefix is A5. The 160 MHz IF signal from the external tuner 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.

2.6.1 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.

2.6.2 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.

2.6.3 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.

2.7 TYPE 72304-1 160 MHz IF AMPLIFIER

The schematic diagram for the Type 72304-1 160 MHz IF Amplifier is Figure 6-5; 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.

2.7.1 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.

2.7.2 10/20 MHz IF Amplifier. -

2.7.2.1 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.

2.7.2.2 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.

2.7.2.3 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.

2.7.3 Part 15203 Video Amplifier. - The complete reference designation prefix for this subassembly is A6A3. 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 suppressor 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.

2.8 TYPE 79640 160 MHz LIMITER/DISCRIMINATOR

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

2.8.1 FM Limiters. - Four pairs of back-to-back diodes, CR1 through CR8, are used as the FM limiters. Each pair is connected in an opposite polarity arrangement in order to limit both the positive and negative half cycles of the input signal. A common emitter amplifier, connected between each pair, provides some gain when the signal is below the limiting level. Incoming signals from jack J1 are coupled through C32 to the first limiter. Positive-going half cycles in excess of 0.6V are shunted by diode CR1 while negative-going half cycles are limited by CR2. Inductor L5 and variable capacitor C1 tune the base of the first amplifier, Q1, to the IF frequency. Additional tuned networks are included in the collector circuits of the second and third amplifiers, Q2 and Q3. Limited FM signals taken from the tap on transformer T2 are coupled through individual blocking capacitors to separate detector driver stages.

2.8.2 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.

2.8.3 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.

2.9 TYPE 72295 21.4 MHz IF AMPLIFIER

Figure 6-7 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 Figure 6-8, 6-9, and 6-10. 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).

2.9.1 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 6-9) and applied to the IF output amplifier.

2.9.2 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 form a low pass filter to remove any 21.4 MHz component from the detected signal. Transistors Q4 and Q5 are cascaded complementary emitter followers which provide video drive without loading the preceding stages. Inductor L2 and capacitor C20 form an additional low pass filter to eliminate any 21.4 MHz component remaining in the video output.

2.9.3 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 cascaded 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.

2.10 TYPE 7361 VIDEO AMPLIFIER

The schematic diagram for this module is Figure 6-11; 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 6-30) and then to the video amplifier module pin I4. They are 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.

2.11 TYPE 7866 AGC AMPLIFIER

Figure 6-12 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, the 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 6-30). 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 ever reading 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.

2.12 TYPE 7444 AUDIO AMPLIFIER

Figure 6-13 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 and coupled through R10 and 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.

2.13 TYPE 79973 AFC AMPLIFIER

The schematic diagram for this module is Figure 6-14; its reference designation prefix is A12. This module delivers a control voltage output which may be processed by external equipment to make it compatible with any associated microwave tuner. The AFC amplifier is operable only in the 100 kHz, 2 MHz or 4 MHz IF bandwidth positions of the DM-112 demodulator and the 100 kHz, 500 kHz and 1 MHz IF bandwidth positions of the DM-112-1 demodulator. In these bandwidths, the dc portion of the operating FM discriminator is amplified and may be used to control the tuner local oscillator frequency such that a received signal is held very close to the IF center frequency thus cancelling drift of the local oscillator and drift of the received signal. The dc voltage from the discriminator is applied through module pin 8 and R2 to the non-inverting input of operational amplifier U1, which serves as a non-inverting amplifier with a gain of two. Negative feedback is accomplished through R3. Potentiometer R4 allows adjustment of U1 for zero volts output with zero volts input. When the discriminator output voltage is other than zero, the AFC amplifier increases it and applies it through module pin 16 to the AFC output jack J13.

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

Figure 6-15 is the schematic diagram for the Type 72299 21.4 MHz IF 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 6-16 and 6-17 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.

2.14.1 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 at 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 bases of transistors Q2 and Q3. The gain of these stages is 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 cascaded emitter followers which provide video drive without loading the preceding 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.

2.14.2 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 cascaded 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.

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

Figure 6-18 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 Figure 6-19 and 6-20 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 DM-112 and the Type 72299 21.4 MHz IF Amplifier is used in the Type DM-112-1 Demodulator.

2.16 TYPE 71290 160 MHz TUNER

Figure 6-21 is the schematic diagram for this assembly; its reference designation prefix is A14. The Type 8307 160 MHz Marker Oscillator is mounted within assembly A14; its reference designation prefix is A14A1. Figure 6-22 is the schematic diagram for the Marker Oscillator.

2.16.1 RF Amplifiers. - Input signals are applied to jack, J1, and are filtered by a lowpass filter consisting of L4 and the input capacitance of Q1. The filter is adjusted to roll off at 170 MHz. Inductor L7 and C2 form an image trap tuned to 201.4 MHz. Capacitor C4 couples the filter output to amplifier Q1 through ferrite bead FB1. The ferrite bead functions as a parasitic suppressor to stabilize the stage. Bias for gate 1 (pin 3) of the IGFET (insulated gate field effect transistor) is developed by voltage divider R4-R5. Gain control voltage is applied to gate 2 (pin 2) through R6. Capacitor C7 holds gate 2 at RF ground. Self bias for the stage is developed across R7 and C10 is the source resistor bypass. The drain of Q1 is resonated by a voltage tuned tank circuit consisting of C13, L2, C14, and varactor diode CR2. Inductor L1 is an RF choke to supply drain voltage to Q1. Resistor R8 is an additional parasitic suppressor for the stage. Capacitor C12 is a dc blocking capacitor and provides coupling between Q1 and its tank circuit. Trimmer C13 is the band set capacitor for the tank and the varactor diode is used to voltage tune the tank. Initial reverse bias for the varactor is taken from the arm of the CENTER FREQ front panel control and coupled to the diode through R10. Tuning voltage (sawtooth) is applied to the varactor through R1, R3, R9, and R11. Capacitor C15 holds the anode of the varactor at RF ground, and C14 couples the varactor into the tank circuit. Capacitor C16 lightly couples the output of Q1 to Q2. Amplifier Q2 is functionally identical to Q1. Output from the tank circuit of Q2 is taken from the tap of T3 which provides impedance matching for the RF signal input to balanced mixer U1.

2.16.2 Oscillator Buffer. - Transistor Q5 is the voltage tuned oscillator for the 160 MHz tuner. Base bias is taken from the junction of R34 and R35, and the emitter current is set by R38. Capacitors C43 and C44 provide an impedance step up and

regenerative feedback for the oscillator. The voltage tuned tank circuit consists of T1, C36, C34, and varactor CR4. The oscillator tunes from 171.4 to 191.4 MHz (21.4 MHz above 160 MHz \pm 1/2 sweep width). This signal is coupled through C31 to the base of buffer amplifier Q3. Transistor Q3 functions as a common emitter amplifier and it is broadly tuned to the oscillator center frequency. Output from the buffer is taken from the center tap of T2 and coupled through C24 to mixer U1.

2.16.3 Balanced Mixer and 21.4 MHz Amplifier. - Integrated circuit U1 is a balanced mixer. It provides sum and difference of its input frequencies as outputs. The RF and LO signals are suppressed at the mixer output (pin 4). An additional RF input signal is applied to the mixer when the 160 MHz marker oscillator (A3A1) is activated. This signal provides a center frequency marker on the display CRT. A parallel tuned circuit consisting of C49 and L6 is resonant at the 21.4 MHz mixer difference frequency. Resistor R28 and C23 couple the 21.4 MHz signal to Q4. Transistor Q4 functions as a neutralized common emitter amplifier. Its collector is tuned by T4, C41, and C42. Feedback to neutralize the stage is coupled back to the base through C50. Gain of the stage is controlled by the setting of R33 which determines the effectiveness of emitter bypass C39.

2.16.4 160 MHz Marker Oscillator. - Operating voltage for the oscillator is applied through feedthrough capacitor C1. This voltage comes from a voltage divider located in module A4 after passing through front panel MARKER switch, S2. Base bias is taken from the junction of R2 and R4. Capacitor C2 holds the bias at RF ground. Emitter current through Q1 is set by R6. The collector circuit is broadly resonated at 160 MHz by L1, C3, and R7. Feedback to sustain oscillation is fed back to the emitter through crystal Y1. Output from the oscillator is taken from voltage divider capacitors C5-C6.

2.17 TYPE 8026 IF AMPLIFIER

Figure 6-23 is the schematic diagram for this module; its reference designation prefix is A15. The circuit consists of three cascaded amplifier stages tuned to 21.4 MHz. The stages are functionally identical except for the first stage which contains a gain adjustment circuit. Dual insulated gate field-effect transistors are used for all three stages. The overall purpose of this module is to provide selectivity for the 21.4 MHz input and output signals rather than voltage gain. The overall bandwidth of the amplifier is 300 kHz, nominal.

2.17.1 A capacitive divider impedance matching network is provided by C1 and C2 which resonate at 21.4 MHz with L1. Bias on gate 2 (pin 2) of Q1 is set by R5 in conjunction with R2, R3, and R4. Source bias on the stage is clamped by diode CR1 from the -18V supply through R13 and R8. A small amount of source degeneration is provided by R7 to stabilize the stage. From the drain of Q1, the output from the stage is coupled through parasitic suppressor R6 to a tuned circuit consisting of L2, C7, and C8 which resonates the stage and provides impedance matching to Q2. The remaining two stages are identical to Q1 with the exception of the gain adjust circuit.

2.18 TYPE 8138 OUTPUT AMPLIFIER

Figure 6-24 is the schematic diagram for the output amplifier; its reference designation prefix is A16. This module is driven by IF amplifier A15.

2.18.1 Cascode Amplifier. - Transistors Q1 and Q2 form a 21.4 MHz cascode amplifier. Input signals to the amplifier are applied through a double-tuned band-pass network consisting of L1, C3, and L2. Input to the base of Q2 is taken from a capacitive divider (C4 and C5) and coupled through C6. Transistors Q1 and Q2 are biased from the +24 and -15 volt supply inputs by R2, R3, R4, and R7. Capacitor C7 holds the base of Q1 at RF ground. Inductor L3, C11, and C12 tune the stage to 21.4 MHz. The cascode amplifier drives detector circuits which supply vertical drive to the CRT deflection plates and a vertical output.

2.18.2 Vertical Output Detector. - The vertical output detector consists of diodes CR2 and CR6 and associated components and is driven from the junction of C11 and C12. A half wave voltage doubler detector circuit is used for the vertical output. On the negative half cycles of the output of Q1, C11 and C12 charge to approximately the peak of the voltage applied to the detector. On the positive half cycles CR6 conducts supplying a dc voltage that is approximately the peak-to-peak value of the applied RF signal to R12 and C19. Resistor R12 and C19 form a pulse stretching circuit to increase the response of the vertical display for pulse type signals. The vertical output is coupled through R17 to module pin 7. Capacitor C22 supplies additional filtering for the vertical output.

2.18.3 CRT Vertical Detectors. - The detector circuit which drives the vertical deflection plates of the CRT consists of diodes CR1, CR5, CR3, CR4, and associated components. Voltage doubler circuits are used to obtain the required voltage swing at the CRT deflection plates. Output voltages of equal amplitude but opposite polarity are produced at module pins 5 (positive) and 6 (negative). In addition a dc vertical position voltage is obtained from the +200 volt supply and the vertical position is adjustable with R13. Considering the positive output circuit, on the negative half-cycles of the input signal CR3 is forward biased and C13 charges to the peak value of the applied signal less the drop across CR3. The current flow through the capacitor results in the end connected to the diodes being positive with respect to the other end. On the positive half-cycles CR4 is forward biased so that current flows charging C17. Since C13 is already charged to almost the peak applied voltage and is in series with the input voltage, its potential is added to the peak value of the applied voltage. Thus, C17 is charged to the peak of the applied voltage plus the charge across C17. As a result, the voltage across C17 is approximately equal to the peak-to-peak value of the applied voltage. Capacitors C15, C20, and resistor R14 supply filtering of the positive vertical output voltage. The negative voltage detector circuit is functionally identical to the positive detector.

2.19 TYPE 8241 HORIZONTAL AMPLIFIER

Figure 6-25 is the schematic diagram for this assembly; its reference designation prefix is A17.

2.19.1 Horizontal Amplifier. - Transistors Q1 through Q5 form the horizontal amplifier circuit. The horizontal sweep input is applied through module pin 21 to potentiometer R3. From the arm of R3 the sweep voltage is applied directly to the base of emitter follower Q1 which drives Q2 and Q3. Transistor Q2 is an emitter follower driving the emitter of Q4 through R10. Transistors Q3 and Q4 form a differential amplifier. High voltage transistors are used to provide the necessary voltage drive to the CRT horizontal deflection plates. Note that both sides of the differential amplifier are dc coupled to two input sources. The sawtooth (horizontal sweep) voltage is applied directly to the base of Q3 from Q1 and to the emitter of Q4 after passing through emitter follower Q2. A horizontal position voltage is also applied to both sides of the differential amplifier. This voltage is taken from the arm of R18, applied to the base of Q4 through R15, and after passing through emitter follower Q5 is applied to the emitter of Q3. This circuit arrangement makes it possible to vary the horizontal position control without changing the gain of the differential amplifier. During the positive-going ramp of the sawtooth input, Q1, Q2, and Q3 conduct harder. This causes increased drop across R8, the collector load for Q3, and the voltage at module pin 20 swings negative. Simultaneously, the positive-going sawtooth voltage at the emitter of Q2 is applied to the emitter of Q4 through R10. This voltage causes Q4 to conduct less and its collector voltage swings positive since the base voltage on Q4 is held constant. With the collector voltages of Q4 high and Q3 low, the CRT beam is attracted to the deflection plate connected to the collector of Q4 through module pin 17. Retrace of the beam occurs on the trailing edge of the sawtooth when the sawtooth input swings rapidly negative. This causes the collector voltage of Q3 to rapidly swing positive attracting the CRT beam back to the plate connected to Q3. By adjusting R18, the horizontal position of the sweep trace can be changed. This control determines the quiescent current through Q3 and Q4, and thus the no-signal voltage on the CRT horizontal deflection plates. Assuming that R18 is rotated in the clockwise direction, the voltage on the bases of Q4 and Q5 goes more positive causing both transistors to conduct harder. This causes the collector voltage of Q4 to decrease and the emitter voltage of Q5 to swing positive. The positive voltage swing is coupled through R9 to the emitter of Q3 causing it to conduct less. The result is an increase in its collector voltage and the CRT beam is attracted to the plate connected to Q3. If R18 is rotated in the counter-clockwise direction, the opposite effect occurs. In that case, the sweep trace shifts in the direction of the deflection plate connected to Q4. Resistors R14, R15, and R16 form a current divider network, which maintains a constant input impedance for the horizontal position voltage inputs to Q4. This holds the gain of Q4 constant regardless of the setting of R18.

2.19.2 Sawtooth Shaping Network. - This network modifies the shape of the sawtooth output of the sweep generator before it is applied to the voltage tuning elements in A14. This is done to compensate for the non-linearity in the change in capacity of the varactors with a linear sawtooth applied. If an unmodified sawtooth were applied to the 160 MHz tuner (A14), signals which are equidistant from the 160 MHz center frequency would appear at different distances from the center of the CRT screen. Thus, by shaping the tuning voltage waveform, the frequency sweep is made linear.

2.19.2.1 The sweep voltage polarity from sweep generator A18 is selected by sweep switch S3 and coupled through R8 to the front panel SWEEP WIDTH control. From the arm of the SWEEP WIDTH control, the sawtooth is applied to module pin 7 of the horizontal amplifier board. The SWEEP WIDTH control determines the maximum amplitude of the sawtooth applied to the shaping circuit and thus the maximum frequency sweep. With the sawtooth input at its maximum negative excursion, the reverse bias applied to the varactor diodes is at maximum, resulting in the high end of the frequency sweep. At this point, diodes CR1 and VR2 are biased to conduction, placing R23 in parallel with R22. This parallel combination forms a voltage divider with R24 which governs the output at module pin 6 for a given negative sweep input. As the sawtooth swings positive, a point is reached where CR1 and VR2 stop conducting. When this occurs, R23 is effectively removed from the circuit and the output voltage decreases for a given input. This is the first break point in the slope of the shaped sawtooth output. The sawtooth is not further modified until it has crossed the zero volt axis and becomes sufficiently positive to cause CR2 to conduct. Conduction through CR2 places R25 and R26 in parallel with R24 providing the second break point in the slope of the shaped output. The third "break point" occurs when the sawtooth voltage is sufficiently positive to cause VR3 to conduct placing R27 and R28 in parallel with R24, R25, and R26. The "break point" potentiometers are provided to adjust the slope of the sawtooth at the two positive points to maximize the linearity of the sweep on the low frequency end of the sweep dispersion range.

2.19.3 Marker Amplitude Adjust. - Potentiometer R29 and R30 form a voltage divider from the +15V supply. The output voltage from module pin 9 is applied to the 160 MHz marker oscillator (A14A1) to set the desired amplitude of the center frequency marker.

2.19.4 CRT Anode Voltage Divider. - Resistors R31 and R32 form a voltage divider from the +200V supply to provide +100V on the CRT anode.

2.19.5 Sweep Rate Voltage Divider. - Resistors R20 and R21 in conjunction with the main chassis SWEEP RATE control form a voltage divider from the +24V supply. The output voltage from module pin 13 is applied to the current generator which supplies charging current to the capacitor for the sweep oscillator in module A8.

2.19.6 Sweep Oscillator Reference. - Zener diode VR1 provides +8.2V output through module pin 5. This voltage is applied to main chassis CENTER FREQUENCY potentiometer R3 and R7. The voltage from the arm of R3 sets the initial bias on the varactor tuning elements in 160 MHz tuner A3.

2.20 TYPE 8243 SWEEP GENERATOR

Figure 6-26 is the sweep generator schematic diagram; the reference designation prefix is A18. This board generates the basic sawtooth waveform, and supplies horizontal sweep, positive sweep voltage, negative sweep voltage and external sweep outputs. In addition, the vertical output amplifier is located on the board.

2.20.1 Sawtooth Generator. - Unijunction transistor Q1, capacitor C5, and current source Q2 form the sawtooth oscillator. Transistor Q2 supplies the charging current for C5 and supplies a constant charging current to the capacitor determined by the rate voltage input from the main chassis SWEEP RATE control. This current charges C5 at a linear rate until the PN junction of Q1 becomes forward biased. When this occurs, the capacitor is rapidly discharged through the unijunction transistor until the charge across C5 is insufficient to hold Q1 in conduction. Then the capacitor begins charging again through Q2 and the cycle repeats.

2.20.2 Unity Gain Amplifier, U1. - Operational amplifier U1 functions as a buffer between the sawtooth oscillator and the remainder of the sweep circuitry. The sawtooth input from C5 is applied to the non-inverting input (pin 3). Negative feedback from pin 6 to pin 2 is employed. The output coupled through R9 to module pin 20 swings from +3 to +13 volts. A portion of the output of U1 is applied to the inverting input of U2.

2.20.3 Inverter/Level Shifter, U2. - Operational amplifier U2 receives the sawtooth input at the inverting input (pin 2). A dc offset voltage is applied to the non-inverting input (pin 3) from potentiometer R5. Potentiometer R5 is a portion of a voltage divider from the +15 volt supply consisting of R4, R5, and R6. Negative feedback from pin 6 through R11 and R10 is used to set the stage gain. Potentiometers R5 and R11 are adjusted to supply a 10 volt peak-to-peak negative sawtooth centered about zero volts from module pin 4. The sawtooth output of U2 also drives U3 and U4.

2.20.4 Unity Gain Inverter, U3. - This operational amplifier supplies the positive sweep voltage output at module pin 10. Negative feedback is supplied through R15. The ratio of resistor R15 and input resistor R13 sets the stage gain at one.

2.20.5 External Sweep Output Amplifier, U4. - Operational amplifier U4 is also driven by U2. It supplies the external sweep output at rear panel jack J3 through module pin 18. It is an inverting amplifier and its gain is adjustable from unity to approximately X2. Potentiometer R14 is adjusted to provide a 20 volt peak-to-peak output at J3.

2.20.6 Vertical Output Amplifier, U5. - This operational amplifier supplies vertical output signals at rear panel jack J2 through module pin 5. Its input is supplied by the vertical output detector circuit in output amplifier A16. Input signals are applied through module pin 6. The vertical signal is taken from the junction of R19 and R20 and applied to the non-inverting input of U5. A vertical gain adjustment circuit is provided by a negative feedback voltage divider consisting of R17, R18, and R21. Potentiometer R18 is adjusted to provide 1 volt peak output at jack J2 with a 10 μ V input signal applied to the signal monitor.

2.21 PART 13488 FOCUS AND INTENSITY BOARD

Figure 6-27 is the schematic diagram; the reference designation prefix is A19. This module is a voltage divider circuit which supplies various element voltages for the cathode ray tube. The divider operates between -1500 volts applied to E1

from supply module PS-1 and ground. Voltage for the focus grid is adjusted by R4 and the voltage between the CRT cathode and control grid (INTENSITY) is adjustable by R2. The total resistance of the divider is 15 megohms, and the drop is thus 100V per mehohm. Thus the voltage between cathode and control grid can be varied between 10 and 60V, and the focus grid voltage between 390 and 140V. Capacitor C1 is a ripple filter which prevents intensity modulation of the CRT trace by ac hum.

2.22 TYPE 79750 BANDPASS FILTER

Figure 6-28 is the schematic diagram for this module; its reference designation prefix is A20. The filter has a 21.4 MHz center frequency and a bandwidth of 200 kHz. Components of the filter, with the exception of the input and output connectors, are constructed on a printed circuit board mounted within the filter assembly.

2.22.1 Part 16029 Filter PC Board. - The reference designation of this board is A20A1. The circuit is a two section bandpass filter tunable by C2 and C4. Coupling between the two section is through C6.

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.

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. Inspect the internal components for apparent damage. Check the internal cables for loose connections and printed wiring boards which may have been loosened from their receptacles.

3.2 INSTALLATION

3.2.1 General. - The Types DM-112 and DM-112-1 Demodulators are designed for mounting in a standard 19-inch rack. The unit will occupy 3.5 inches of vertical space and will extend approximately 18 inches back into the rack. If used in a mobile installation, some means should be devised to support the side 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.

3.2.2 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, S2, to make sure it is in the proper position for the line voltage being used.

3.2.3 160 MHz Input (J1). - Connect the 160 MHz IF input from the associated tuner to 160 MHz INPUT jack J1.

3.2.4 Vertical Output (J2). - The vertical output for application to an auxiliary video display is available at VERT OUT jack J2. This output will supply 1V peak, nominal, into a 100 k Ω load.

3.2.5 Horizontal Output (J3). - The signal monitor horizontal sweep voltage is available at HORIZ OUT jack J3. This output will deliver a 20V PP output, nominal, into a 100 k Ω load.

3.2.6 21.4 MHz Signal Monitor Output (J4). - A 21.4 MHz signal to drive a signal monitor is available at the 21.4 MHz SM OUTPUT jack J4.

3.2.7 Tuner AGC Output (J9). - Connect TUNER AGC OUTPUT jack J9 to the AGC input jack of the associated tuner.

3.2.8 Narrow Band Pre-Detected Output (J11). - A 21.4 MHz narrow band undetected IF signal is available at the NB PRE-DET OUTPUT jack J11.

3.2.9 Video Output (J12). - The video output from the demodulator is available at VIDEO OUTPUT jack J12. This output will deliver a 2V PP signal into a 93 ohm unbalanced load.

3.2.10 AFC Output (J13). - An AFC voltage for connection to the associated tuner is available at AFC OUTPUT jack J13.

3.2.11 Wide Band Pre-Detected Output (J15). - A 160 MHz wide band undetected IF signal is available at the WB PRE-DET OUTPUT jack J15.

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

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

3.3 OPERATION

The controls and indicators on the Types DM-112 and DM-112-1 Demodulators operate as follows:

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

3.3.2 Audio Gain Control. - The AUDIO GAIN control sets the level of all audio outputs from the demodulator, including the PHONES jack and the audio output at terminals 1 and 2 of TBI.

- 3.3.3 Video Gain Control. - The video level at the rear apron VIDEO OUTPUT jack J12 is set by the VIDEO GAIN control.
- 3.3.4 Reception Mode Switch. - The four-position reception mode switch selects one of the following types: PULSE, FM, AM/AGC, or AM/MAN.
- 3.3.5 IF Bandwidth Switch. - The IF BANDWIDTH switch selects any one of five IF bandwidths.
- 3.3.6 Aural Enhancement. - When activated, the AURAL ENHANCEMENT switch inserts a pulse stretching network into the audio amplifier circuit.
- 3.3.7 Tuning Meter. - The TUNING meter indicates the relative position of a signal in the passband of the selected IF amplifier.
- 3.3.8 Signal Strength Meter. - The SIGNAL STRENGTH meter indicates the relative signal strength of received signals.
- 3.3.9 Phones Jack. - The PHONES jack provides an audio monitoring point on the front panel. The impedance of this output is 600 ohms.
- 3.3.10 IF Gain. - The gain of the demodulator is controlled by the IF GAIN potentiometer when the AM/MAN mode is selected.
- 3.3.11 Intensity Control. - The brightness of the trace on the CRT screen is governed by the INTENSITY control.
- 3.3.12 Focus Control. - The FOCUS control provides a means of obtaining a sharp trace on the face of the CRT.
- 3.3.13 SM Gain Control. - The SM (signal monitor) GAIN control varies the amplitude of the CRT display.
- 3.3.14 Center Frequency Control. - The CENTER FREQ control changes the horizontal position of the marker pips on the CRT screen. During normal operation, this control is used to center the internal marker on the screen.
- 3.3.15 Marker Switch. - Placing the MARKER toggle switch in the ON position will cause a pip to appear on the CRT screen. This pip indicates the center of the signal monitor response as well as the center of the demodulator's IF bandpass.
- 3.3.16 Sweep Width Control. - The SWEEP WIDTH MHz control varies the width of the frequency spectrum being viewed. The control will vary the sweep width from 0 to 20 MHz.
- 3.3.17 Sweep Rate Control. - The SWEEP RATE Hz control varies the horizontal sweep rate from 5 to 25 Hz.

3.3.18 Sweep Direction Switch. - The rear-panel sweep direction switch, S3, reverses the spectrum display on the CRT. Observing the signal monitor display, tune the associated receiver higher in frequency. Intercepted signals should first appear at the right-hand end of the trace and move to the left. If signals appear at the left-hand of the trace and move to the right, change the position of the sweep direction switch.

3.4 INTERPRÉTATION OF SIGNALS

The following list is presented as a guide for interpretation of various signals and waveforms that might appear on the CRT.

- (1) An unmodulated carrier without noise or random disturbances will appear as a deflection with fixed height.
- (2) A carrier that is amplitude modulated will appear as a deflection of variable height. If the modulation rate is high, sidebands may appear.
- (3) A single-tone-modulated FM signal will appear as a group of spikes corresponding to the center frequency and the sidebands.
- (4) Noise appears as varying irregularities or "grass" along the base line and may be eliminated by a reduction of the GAIN control setting.

3.5 PREPARATION FOR RESHIPMENT AND STORAGE

3.5.1 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.

3.5.2 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.

3.5.3 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.

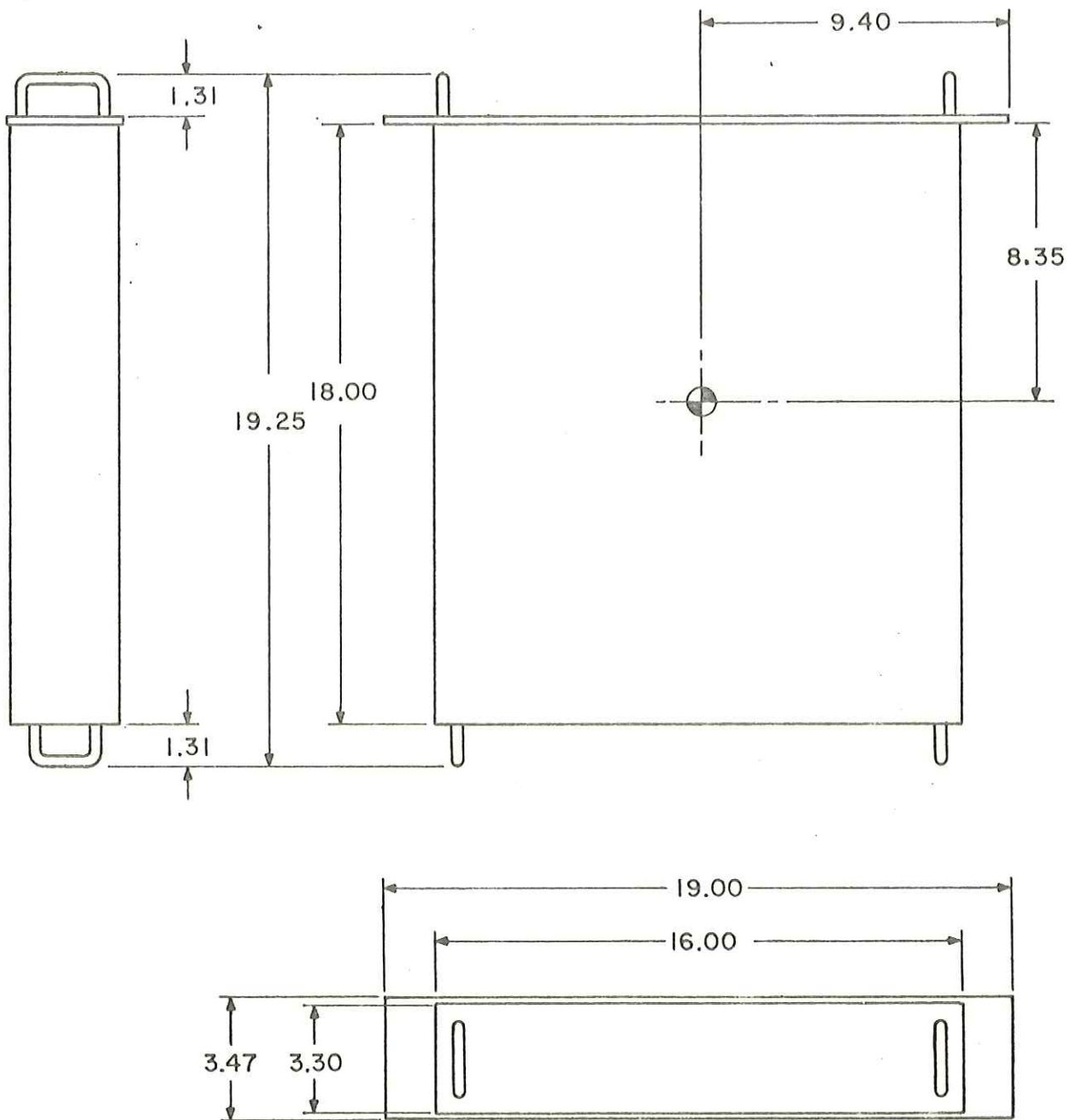


Figure 3-1. Type DM-112-() Demodulator, Critical Dimensions

SECTION IV MAINTENANCE

4.1 GENERAL

The Types DM-112 and DM-112-1 Demodulators have 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 diagrams Figures 2-1a and 2-1b, 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 Types DM-112 and DM-112-1 Demodulators do 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 demodulator 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 DM-112 and DM-112-1 Demodulators.

Table 4-1. Required Test Equipment

| Item | Instrument Type | Characteristics | Use | Recommended Instrument |
|------|-------------------|---------------------------------------------------------|-----------------------------|--------------------------------------|
| 1 | Oscilloscope | 500 kHz vertical bandwidth | Troubleshooting alignment | Tektronix 503 with X 10 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 / 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 |
| 8 | Frequency Counter | Count 160 MHz | Signal Monitor alignment | CMC-738A with 735C plug-in |

4.4.3 Control Settings. - Before alignment of the demodulator circuits, 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 demodulator line voltage at 115 Vac or 230 Vac as appropriate.
- (2) Connect the VTVM to A1 pin 18.
- (3) Adjust A1R6 for a +24 Vdc reading.
- (4) Connect the VTVM to A3TP1.
- (5) Adjust A3R7 for a +15 Vdc reading.
- (6) Connect the VTVM to A4TP1.
- (7) Adjust A4R6 for a -15 Vdc reading.

- (8) Adjust the line voltage to 125 Vac or 250 Vac and recheck the previous test points for proper regulation.
- (9) Adjust the line voltage to 105 Vac or 210 Vac and recheck the previous test points for proper regulation.

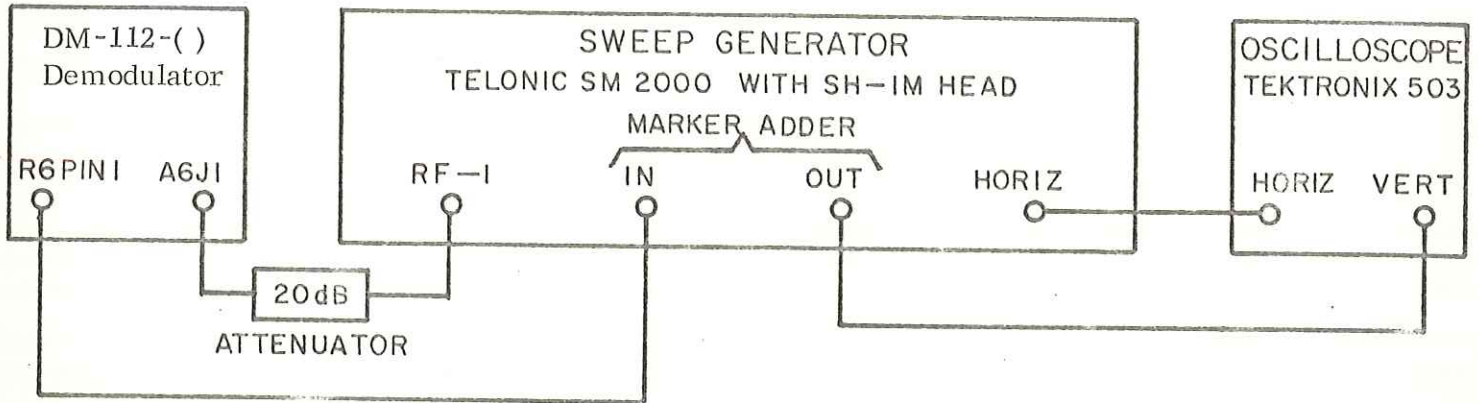


Figure 4-1. Test Setup, 160 MHz IF Amplifier Alignment (A6)

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 R6 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 oscilloscope 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.

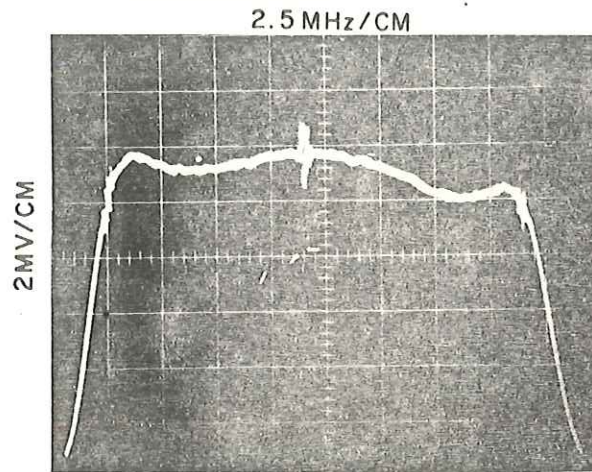


Figure 4-2. Typical Response, 160 MHz IF Amplifier (20 MHz BW)

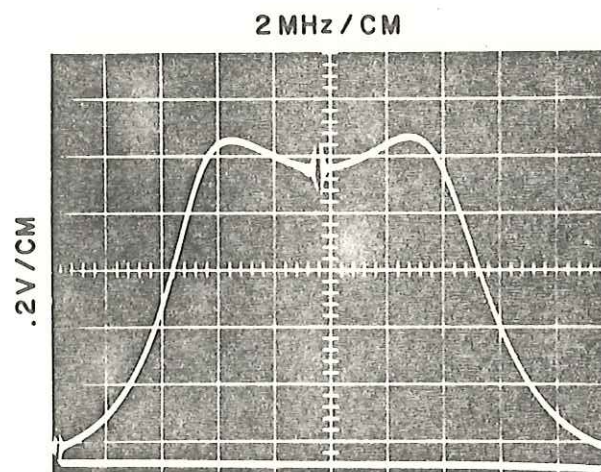


Figure 4-3. Typical Response, 160 MHz IF Amplifier (10 MHz BW)

- (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.

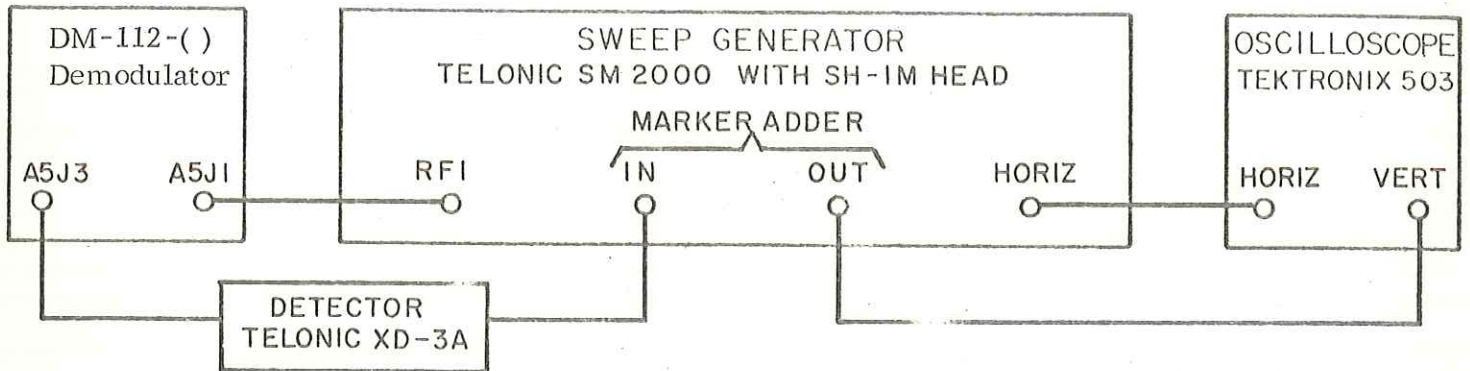


Figure 4-4. Test Setup, 160/21.4 MHz Converter Alignment (A5)

- (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.

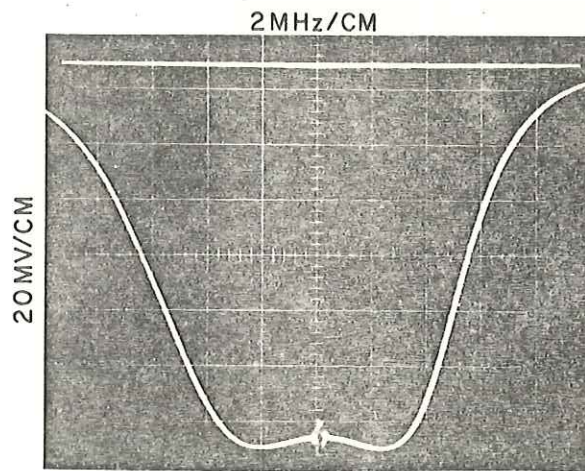


Figure 4-5. Typical Response, 160/21.4 MHz Converter

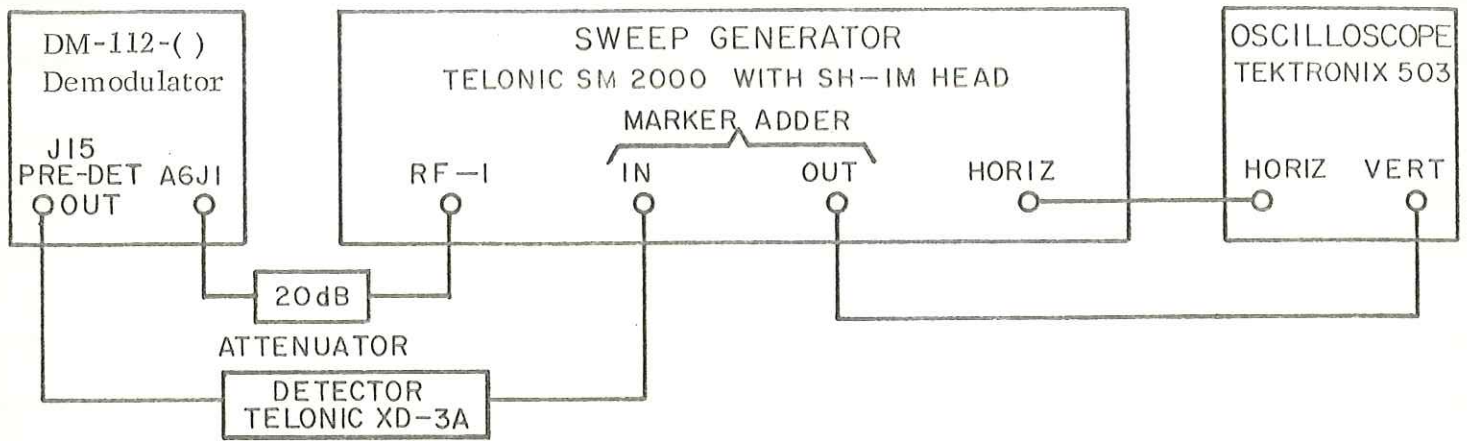


Figure 4-6. Test Setup, 160 MHz Limiter/Discriminator Alignment (A7)

- (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.

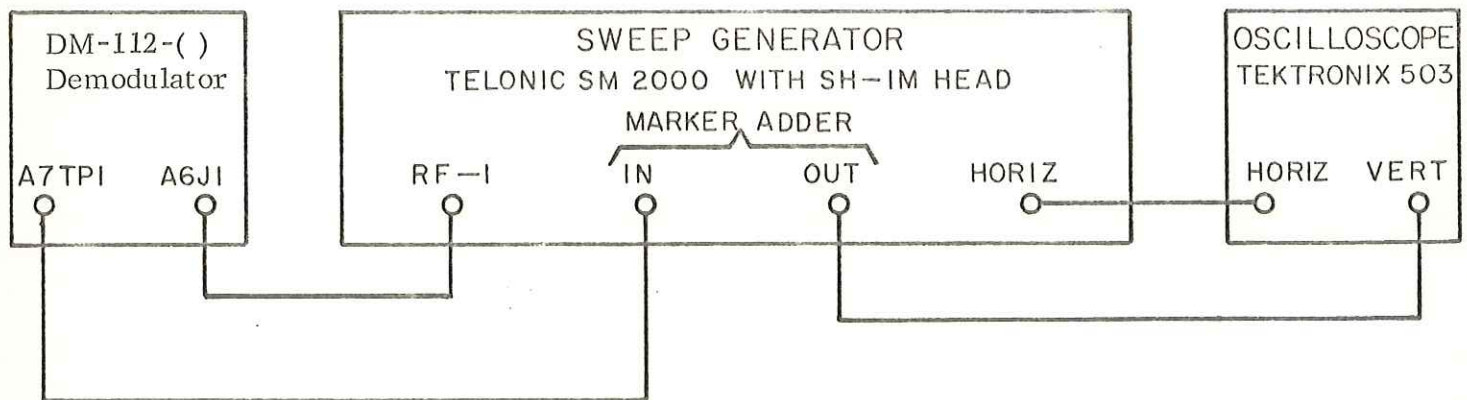


Figure 4-7. Test Setup, 160 MHz Limiter/Discriminator Alignment (A7)

- (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.

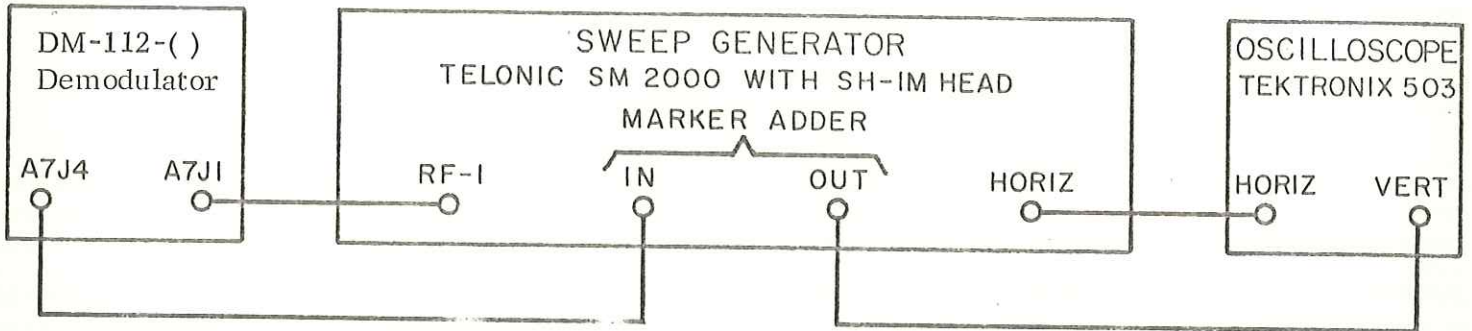


Figure 4-8. Test Setup, 160 MHz Limiter/
Discriminator Alignment (A7)

- (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.

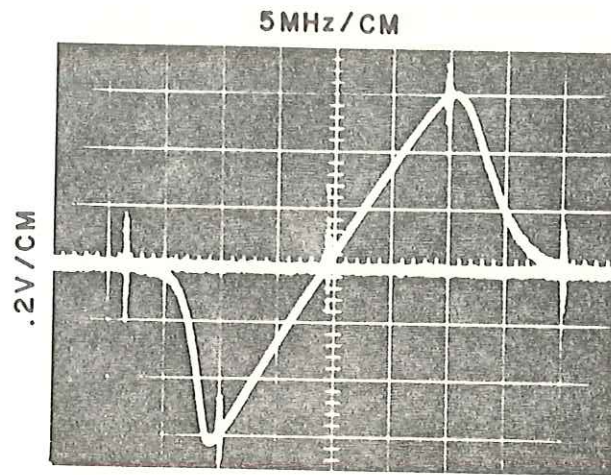


Figure 4-9. Typical Response, 160 MHz Limiter/Discriminator

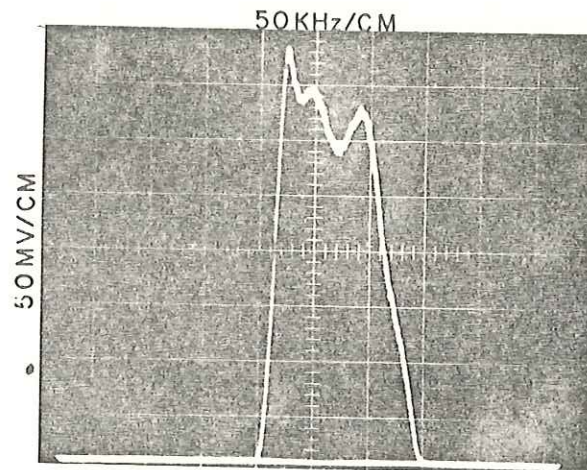


Figure 4-11. Typical Response, 21.4 MHz IF Amplifier (100 kHz BW)

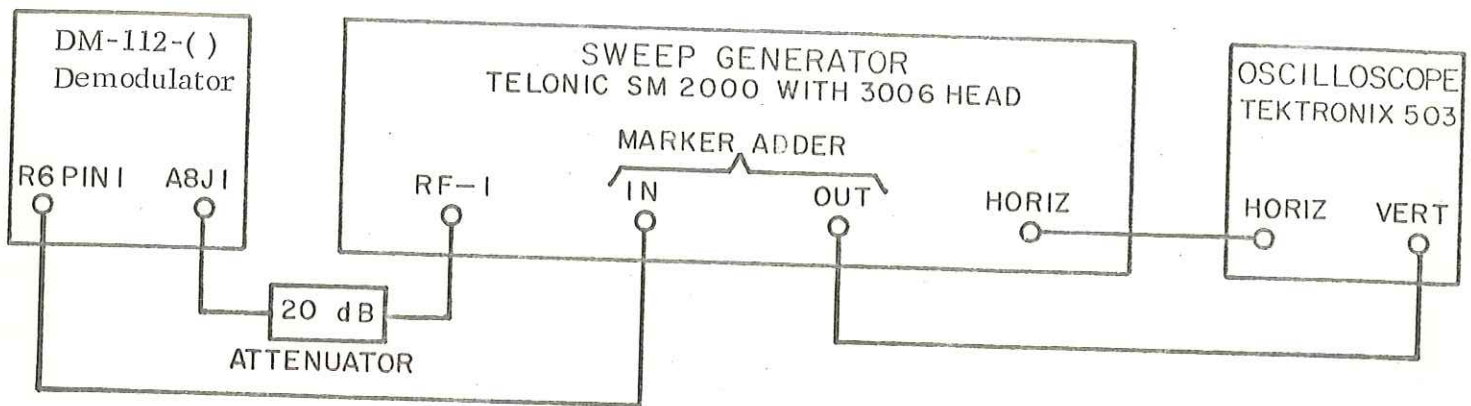


Figure 4-10. Test Setup, 21.4 MHz IF Amplifier Alignment (A8), 100 kHz BW

- (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 swept 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.

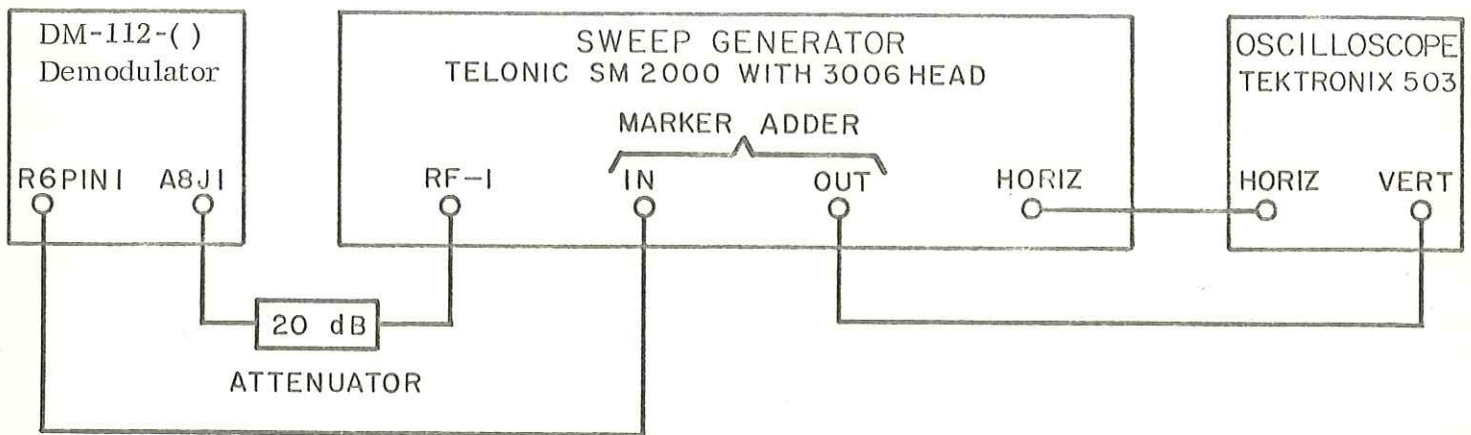


Figure 4-12. Test Setup, 21.4 MHz
FM Limiter/Discriminator Alignment
(A8A3), 100 kHz BW

- (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 DM-112 and DM-112-1 Demodulators is at module A13. The basic alignment for both units 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 DM-112. Overall response curves of the IF amplifiers used in the Type DM-112-1 are similar to those of the Type DM-112 with the exception of the response bandwidths. The alignment steps for module A13 are outlined in paragraphs 4.4.10 and 4.4.11.

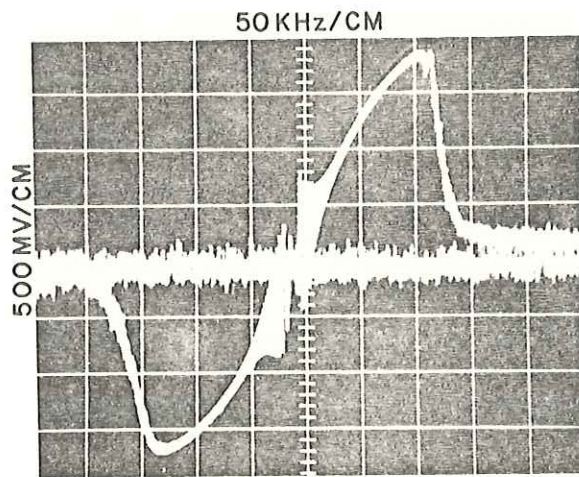


Figure 4-13. Typical Response, 21.4 MHz
Limiter/Discriminator (100 kHz BW)

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

- (1) Connect the equipment as shown in Figure 4-14. Resistor R6 pin 1 refers to the front panel VIDEO GAIN potentiometer.

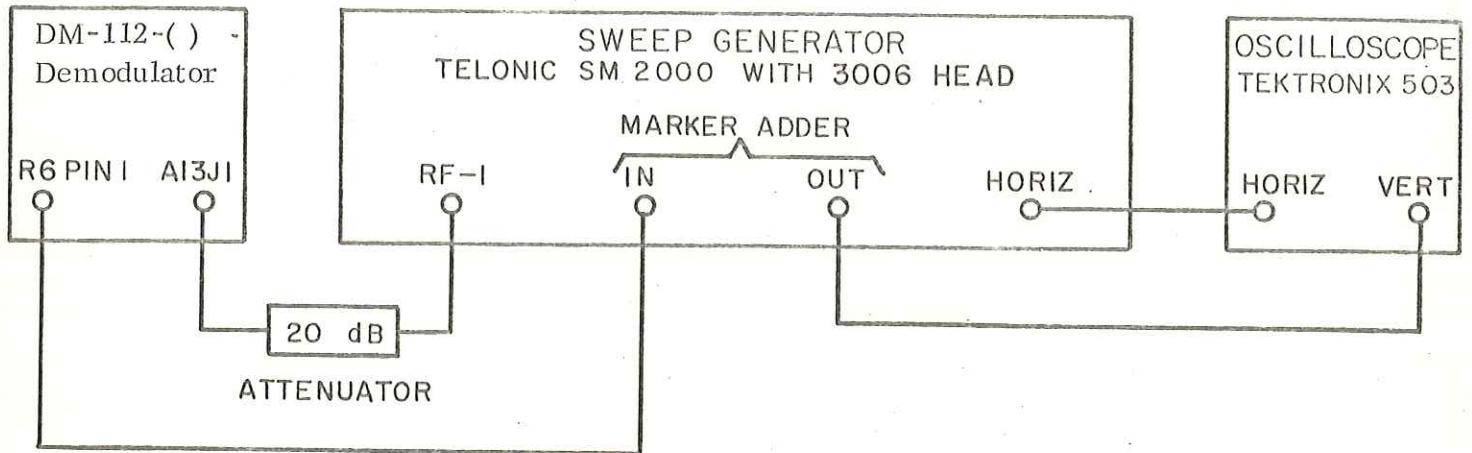


Figure 4-14. Test Setup, 21.4 MHz IF Amplifier Alignment (A13A1)

- (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 DM-112-1.)
- (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 A13AIR15 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 DM-112.
- (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 DM-112-1).
- (11) Adjust potentiometer A13AIR17 for maximum gain.

Courtesy of <http://BlackRadios.terryo.org>

(12)

Adjust capacitors A13A1C19, A13A1C25, A13A1C31, A13A1C38 for proper bandwidth and symmetry (adjust capacitors A13A1C16, A13A1C25, A13A1C31, and A13A1C38 for the DM-112-1).

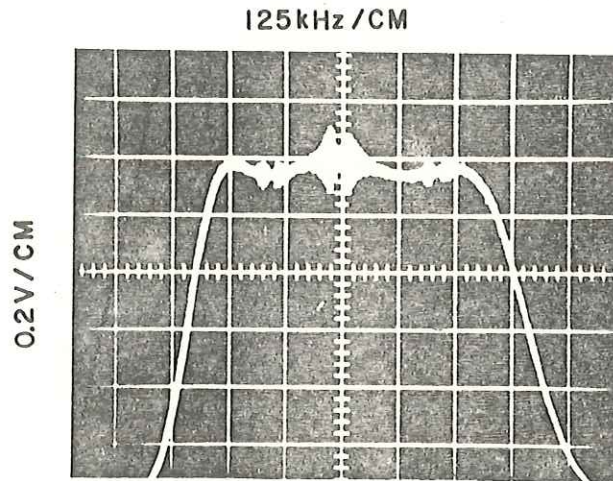


Figure 4-15. Typical Response, 21.4 MHz IF Amplifier (2 MHz BW)

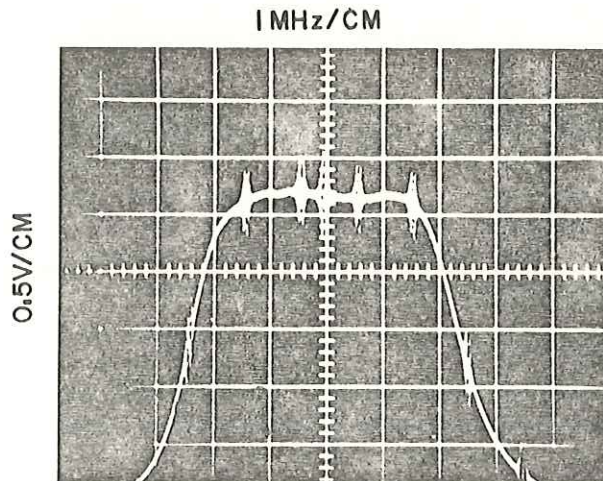


Figure 4-16. Typical Response, 21.4 MHz IF Amplifier (4 MHz BW)

- (13) Readjust capacitor A13A1C59 for maximum gain. Switch between the .5/1 MHz bandwidths or the 2/4 MHz bandwidths on both type demodulators 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 R6 pin 1 refers to the front panel VIDEO GAIN potentiometer.

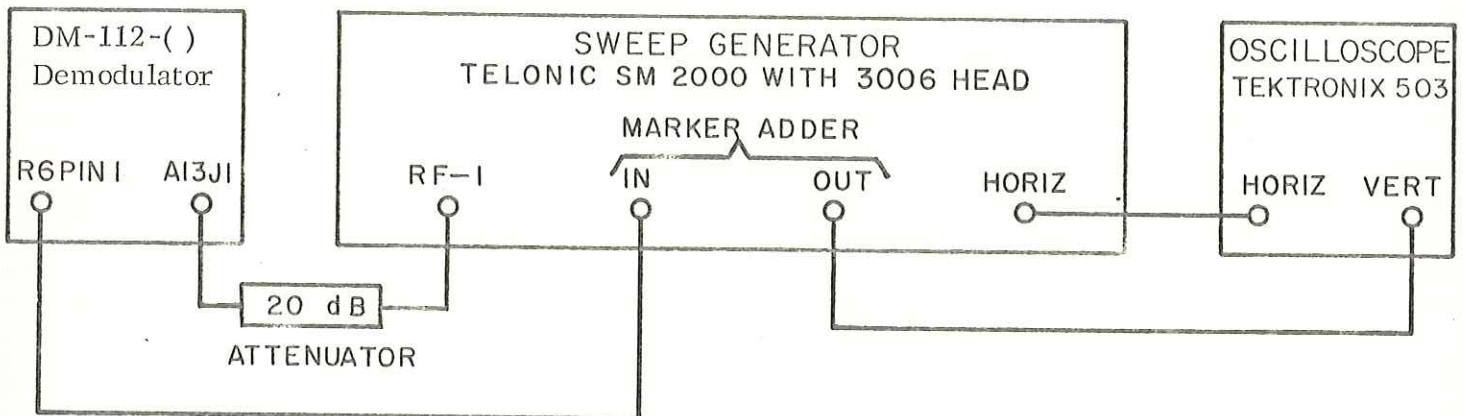


Figure 4-17. Test Setup, 21.4 MHz FM Limiter/Discriminator Alignment (A13A2)

- (2) Place the IF bandwidth switch in the 4 MHz position (1 MHz position on the DM-112-1).
- (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 DM-112-1).
- (6) Adjust A13A2C9 for peak-to-peak symmetry (adjust A13A2C5 on the DM-112-1). A typical response for the DM-112 4 MHz and 2 MHz bandwidth discriminator's are shown in Figure 4-18 and Figure 4-19.

Courtesy of <http://BlackRadios.terryo.org>
1MHz/CM

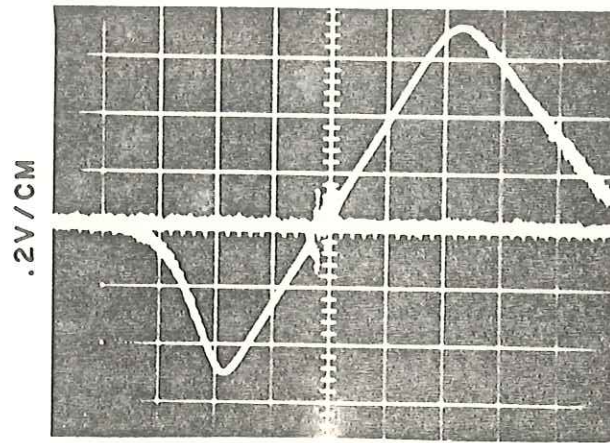


Figure 4-18. Typical Response, 21.4 MHz
Limiter/Discriminator (4 MHz BW)

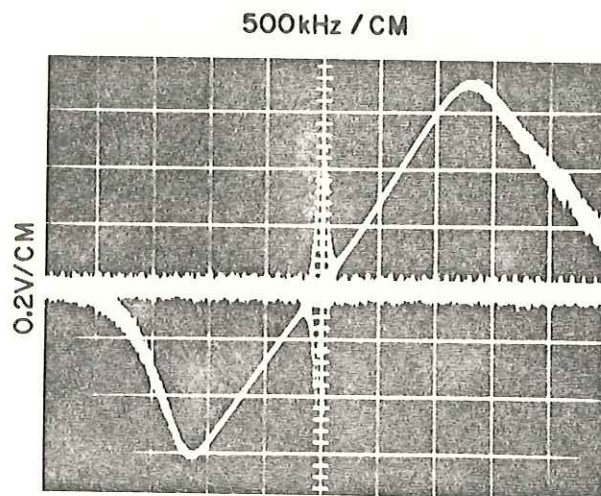


Figure 4-19. Typical Response, 21.4 MHz
Limiter/Discriminator (2 MHz BW)

WARNING

High voltages for operation of the CRT are present at many points in the signal monitor circuits. Exercise caution when working with the unit. Special care should always be taken to discharge PS1. Do not rely on bleeder circuits. An open circuit may have occurred which leaves lethal charges present.

4.4.12 Course Sweep Alignment. - The following adjustments will provide a course alignment of the sweep circuits. Proper adjustment will provide a trace on the CRT which will allow a more precise alignment in the following paragraphs.

4.4.12.1 Sweep Generator (A18). - Proceed as follows:

- (1) Set the signal monitor controls as follows:
 - a. FOCUS - MAX CW
 - b. INTENSITY - MAX CW
 - c. SWEEP RATE - MAX CW
 - d. SWEEP WIDTH - MAX cw
 - e. MARKER - OFF
 - f. SWEEP, S7 - POS. 2
 - g. CENTER FREQUENCY - CENTER RANGE REFERENCE
 - h. GAIN - MAX CW
- (2) Connect the oscilloscope vertical input to pin 20 of XA18. Adjust the oscilloscope controls to display the sawtooth waveform. The sawtooth should start at +3 volts and rise to +13 volts. This response indicates proper operation of the sawtooth generator.
- (3) Connect the oscilloscope vertical input to pin 4 of XA18. Observe the oscilloscope and adjust A18R5 (BIAS) to center the waveform about zero volts. Adjust A18R11 (SWEEP CAL) for maximum amplitude of the sawtooth without clipping and then re-center the sawtooth with A18R5 (BIAS).
- (4) Adjust A16R13 (vertical position) to place the CRT trace near the bottom of the screen. Adjust the FOCUS and INTENSITY controls as desired. Re-adjust A16R13 as necessary.

4.4.12.2 Horizontal Amplifier. - Proceed as follows:

- (1) Adjust A17R3 for minimum horizontal deflection on the CRT screen.
- (2) Center the horizontal trace with A17R18 (HORIZ POS).
- (3) Adjust A17R3 (HORIZ WIDTH) for a trace width approximately 10% greater than full width.

NOTE

Insufficient trace width will cause the CRT retrace to be visible at the left side of the CRT screen during later adjustments.

4.4.13 RF and Sweep Alignment. - These adjustments will provide proper linearity of the sweep circuitry and a 20 MHz RF bandwidth for the signal monitor.

4.4.13.1 21.4 MHz Circuits. - Proceed as follows:

- (1) Set the SWEEP WIDTH control to maximum CCW.
- (2) Connect the test equipment as shown in Figure 4-20.

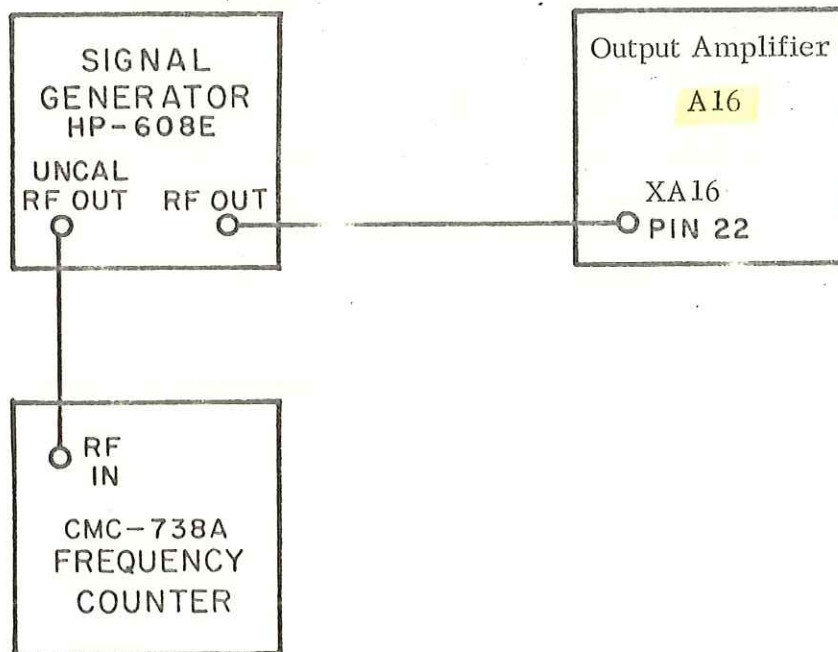


Figure 4-20. Test Setup, 21.4 MHz RF Alignment

- (3) Adjust the signal generator for a 21.4 MHz CW output signal at sufficient amplitude to obtain a vertical deflection on the CRT.
- (4) Using the non-metallic slot driver, adjust A16L3 for maximum vertical CRT trace deflection. Reduce the signal generator output level to keep the CRT trace on screen.
- (5) Repeat step (4) adjusting A16L2, then A16L1.
- (6) Connect the signal generator to pin 21 of XA15. Repeat step (4) adjusting A15L4, A15L3, A15L2, and A15L1 in the order given.
- (7) Move the signal generator output cable to A20J1. Adjust the signal generator output level to obtain a half screen vertical CRT trace deflection.
- (8) Adjust A20A1C4 and A20A1C2 for maximum vertical CRT trace deflection in the order given reducing the signal generator output as necessary to keep the trace on screen. Restore the original cable connection to A20.

4.4.13.2 160 MHz RF and Sweep Circuits. - Proceed as follows:

- (1) Set the SWEEP WIDTH control maximum CW; GAIN maximum CW.
- (2) Connect the equipment as shown in Figure 4-21.

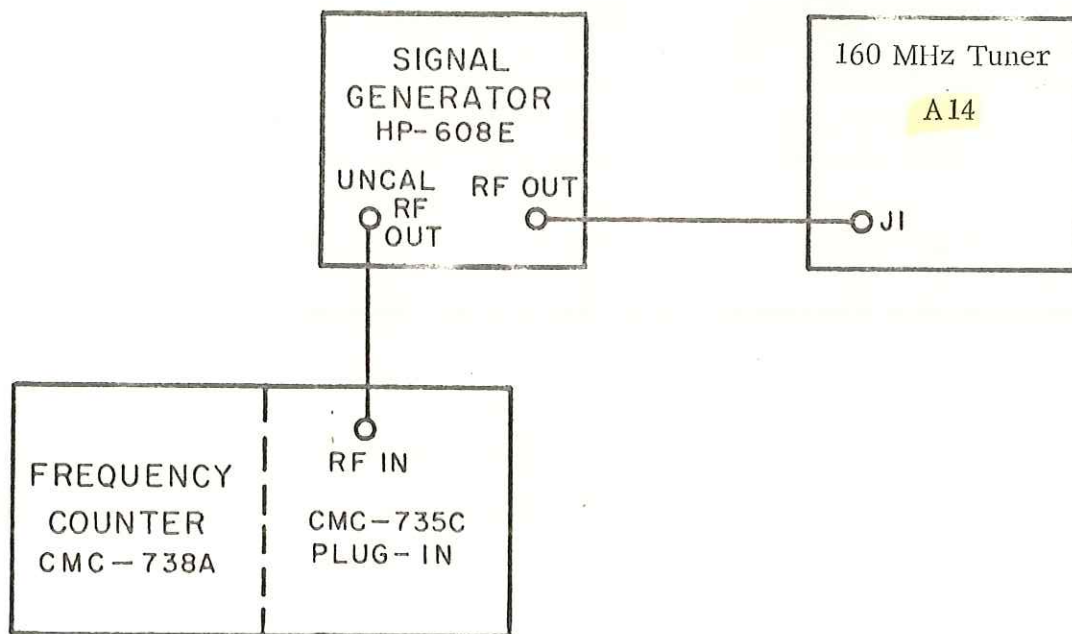


Figure 4-21. Test Setup, 160 MHz, RF and Sweep Circuit Alignment

- (3) Adjust A14C2 for minimum capacity (maximum CCW). Set A14R33 to the maximum CW position.
- (4) Adjust the signal generator for a 160 MHz CW signal and set the output level for a 160 MHz signal on the CRT screen. Note the trace position of the 160 MHz pip and set the signal generator output level to minimum.
- (5) Set the GAIN control to maximum CCW and then set A17R29 (MARKER) maximum CCW. Turn the MARKER switch ON. Adjust A14A1C3 until the 160 MHz marker appears and then for maximum amplitude. Set A17R29 (MARKER) for a convenient marker level.
- (6) Center the marker on the CRT screen with A14C36 and adjust A14C25 for maximum marker deflection.
- (7) Vary the SWEEP WIDTH control while observing the marker signal. Slowly adjust A14C36 until the marker pip does not move horizontally as the SWEEP WIDTH control is changed from maximum CCW to maximum CW. This adjustment is facilitated by observing the top of the marker pip.
- (8) Adjust A17R18 (HORIZ POS) to center the marker on the CRT screen if necessary. Repeat step (7) to insure that the marker does not move horizontally as the SWEEP WIDTH control is varied.
- (9) Set the SWEEP WIDTH control as desired. Use the Cambion 2033 tuning tool, adjust A14T4 for maximum marker amplitude. Turn the marker OFF.
- (10) Set the GAIN control to 3/4 of maximum CW. Adjust the signal generator output level for a half-screen deflection 160 MHz pip. Adjust A14C13 and A14C23 for maximum signal deflection reducing the signal generator as necessary to maintain a half-screen deflection.

4.4.14 20 MHz Bandwidth Adjustment. - Proceed as follows:

- (1) Connect the equipment as shown in Figure 4-21. Adjust the signal generator controls for a 10 μ V 160 MHz CW output.
- (2) Set the SWEEP WIDTH maximum CW and the GAIN control for nearly full screen vertical deflection of the 160 MHz pip.

- (3) Tune the signal generator from 150 to 170 MHz and note the point of maximum vertical pip deflection. At the point of maximum deflection set the GAIN control for a full screen pip.
- (4) Tune the signal generator over the 150-170 MHz range while observing the CRT screen and note the point of minimum vertical pip deflection. At that frequency, increase the signal generator output to 14.1 μ V (3 dB). The resulting vertical pip deflection should be at least full screen. If not, adjust A14C13 and A14C23 for a compromise over the 150-170 MHz range which will provide the 20 MHz bandwidth at the -3 dB points.
- (5) If the preceding adjustments do not obtain the required 3 dB bandwidth, A14C25 can be peaked at the frequency of minimum deflection as noted in step (4). If this adjustment is required, return the signal generator to 160 MHz and re-center the pip on the CRT screen with A14C36 and then repeat step (4).

4.4.15 Image Trap Adjustment. - Proceed as follows:

- (1) Turn the MARKER switch on. Connect the equipment as shown in Figure 4-21. Set the signal generator output level to 1 mV and tune the generator to approximately 201.4 MHz. Tune the signal to center the signal pip over the 160 MHz marker and turn the MARKER switch off.
- (2) Set the signal generator output level for a half-screen pip deflection and adjust A14C2 for minimum deflection. Adjust the GAIN control as necessary to obtain the maximum image null.

4.4.16 Width and Linearity Adjustments. - Proceed as follows:

- (1) Connect the equipment as shown in Figure 4-21. Turn the MARKER switch ON.
- (2) Tune the signal generator to 170 MHz with a 10 μ V CW output signal. Adjust the GAIN control for a convenient 170 MHz pip deflection.
- (3) Adjust A18R11 (SWEEP CAL) to move the 170 MHz pip to the right most graticule line on the CRT screen. Re-center the 160 MHz marker with A18R5 (BIAS). Repeat until the 170 MHz pip and 160 MHz marker are in the proper positions.

- (4) Tune the signal generator to 155 MHz and adjust A17R26 (HORIZ NOM LIN) to place the signal pip halfway between the center and left-most graticule lines.
- (5) Tune the signal generator to 150 MHz and adjust A17R28 (HORIZ MAX LIN) to position the 150 MHz pip on the left-most CRT graticule line.
- (6) Repeat steps (2) through (5) until the width and linearity adjustments are correctly set. Turn the signal generator output level to minimum. Turn the MARKER switch off.

4.4.17 Vertical Position. - Proceed as follows:

- (1) With the FOCUS, INTENSITY, and GAIN controls set as desired, adjust A16R13 (vertical position) to position the CRT trace on the base line of the CRT graticule.
- (2) The vertical position varies slightly with changes in intensity and focus. Adjust A16R13 as desired for normal settings of the focus and intensity controls.

4.4.18 Vertical and Horizontal Output Level Adjustments. - Proceed as follows:

- (1) Connect the equipment as shown in Figure 4-22.
- (2) Adjust the signal generator for a 160 MHz CW output at a level of 10 μ V.
- (3) Adjust the GAIN control for a full screen 160 MHz pip deflection.
- (4) Adjust A18R18 (EXT VERT) for a 1.0 volt peak vertical output as displayed on the oscilloscope.
- (5) Adjust A18R14 (EXT HORIZ) for a 10 cm horizontal deflection of the oscilloscope trace with the oscilloscope external horizontal controls in the 2 V/CM position.

4.4.19 Marker Amplitude. - Proceed as follows:

- (1) With no external input, place the MARKER switch on.
- (2) Adjust A17R29 (MARKER) for a 75% of full screen marker pip deflection.

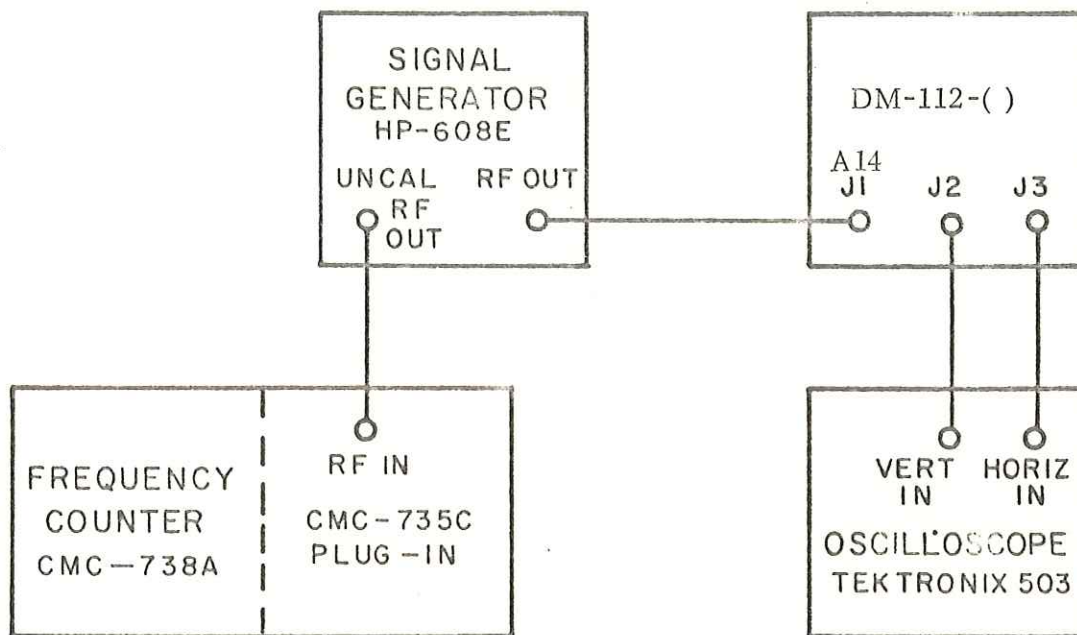


Figure 4-22. Test Setup, Vertical and Horizontal Output Adjustments

4.5 SIGNAL MONITOR PERFORMANCE CHECKS

Selected performance tests are presented in subsequent paragraphs which can be used to determine the relative performance of the signal monitor.

4.5.1 Sensitivity, Linearity, Flatness of Response, Center Frequency, and 160 MHz Marker Test. - The following tests will ensure proper sensitivity, linearity, flatness of response, center frequency and marker accuracy.

4.5.1.1 Proceed as follows:

- (1) Signal Generator, Hewlett Packard, Type 608E.
- (2) Frequency Counter, Computer Measurements Co., Type 738A with a Type 735C plug in.

4.5.1.2 Proceed as follows:

- (1) Connect the signal generator output to the A14J1.
- (2) Connect the signal generator UNCAL RF OUT to the frequency counter RF input.

(3) Make the following control settings:

FOCUS and INTENSITY - AS DESIRED

SWEEP WIDTH - MAX CW

SWEEP RATE - MAX CW

SWEEP, S7 - POS. 2

CENTER FREQ - CENTER RANGE REFERENCE

GAIN - MAX CW

MARKER - ON

- (4) Adjust the signal generator controls for a 10 μ V 155 MHz CW output. Reduce the signal monitor GAIN until the 155 MHz signal is the same height as the 160 MHz marker.
- (5) Slowly tune the signal generator toward 160 MHz while reducing the SWEEP WIDTH control until a zero beat is obtained with the 160 MHz marker. At zero beat, the frequency counter readout should be between 159.984 and 160.016 MHz. This verifies correct performance of the 160 MHz marker. The vertical pip should be centered on the CRT screen. This verifies correct alignment of the sweep oscillator.

- (6) Turn the MARKER off. Set the SWEEP WIDTH to maximum CW and adjust the signal monitor GAIN control to MAX CW. The 160 MHz signal response should be at least one inch high. This verifies proper sensitivity for the signal monitor.
- (7) Adjust the GAIN control for a vertical deflection slightly less than full screen. Tune the signal generator from 150 to 170 MHz and note the points of minimum and maximum pip amplitude. At the frequency of maximum pip amplitude adjust the GAIN control for a full screen deflection. Tune the signal generator to the frequency of minimum pip amplitude in the 150-170 MHz range. Increase the signal generator output to obtain a full screen deflection. The generator output should be no more than $14.1 \mu\text{V}$ (3 dB increase). This verifies a maximum of 3 dB ripple in the bandpass.
- (8) Return the signal generator output level to $10 \mu\text{V}$ and tune it to 150 MHz. The pip should be centered over the left-most graticule line on the CRT screen $\pm 1/2$ division. Tune the signal generator to 155 MHz. The pip should be centered between the center and left-most graticule lines $\pm 1/2$ division. Tune the signal generator to 165 MHz. The pip should be centered between the center and right-most graticule lines $+1/2$ division. Tune the signal generator to 170 MHz. The pip should be centered over the right-most graticule line $+1/2$ division. This verifies adequate sweep linearity.
- (9) Place rear panel sweep switch, S7, to POS. 1. The vertical pip should move to the left-most graticule line on the CRT face. This verifies proper operation of the sweep direction reversing circuits.

4.5.2 Vertical and Horizontal Outputs. - This test will ensure proper output levels from the rear panel vertical and horizontal outputs.

4.5.2.1 The following test equipment is required:

- (1) Signal Generator, Hewlett-Packard, Type 608E.
- (2) Oscilloscope, Tektronix, Type 503.

4.5.2.2 Proceed as follows:

- (1) Connect the signal generator, oscilloscope and DM-112 as shown in Figure 4-22.
- (2) Place the controls in the positions specified in paragraph 4.5.1.2, step 3.

- (3) Adjust the signal generator for a 10 μ V 160 MHz CW output. Set the oscilloscope vertical controls for 0.2V/CM and external horizontal controls for 2V/CM.
- (4) Adjust the GAIN control for a full screen 160 MHz pip. The oscilloscope display should be a 10 CM horizontal deflection with a 5 CM vertical pip centered horizontally on the tube face.

NOTE

Adequate performance is indicated with the vertical, horizontal, and centering parameters within 5% of that indicated in step (4) above.

4.6 TROUBLESHOOTING

4.6.1 General. - Initial troubleshooting of the DM-112 and DM-112-1 Demodulator should be directed towards localizing the malfunction to a particular module or circuit group. After the problem has been located, the demodulator can be returned to operation by substituting the defective module with one known to be in good condition. Troubleshooting aids such as the troubleshooting chart, the circuit description (Section II), typical transistor element voltages, alignment and performance check procedures (Section 4), and the schematic diagrams (Section 6) are helpful in the troubleshooting effort.

4.6.2 Localizing Troubles. - The demodulator and signal monitor troubleshooting chart, Tables 4-2 and 4-3, are designed to show logical methods of troubleshooting the DM-112 and DM-112-1 circuits. Since it is impossible to cover each problem which may occur in the unit, the troubleshooting chart is provided only to aid maintenance personnel in the troubleshooting effort. When a trouble occurs, find the related TROUBLE INDICATION which is listed in the left column of the troubleshooting chart. When the trouble is localized make signal and voltage checks to isolate the problem to a particular circuit element.

Table 4-2. Demodulator Section Troubleshooting Chart

| ITEM | TROUBLE INDICATION | PROBABLE FAULT | DIAGNOSTIC PROCEDURE |
|------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Power pushbutton will not illuminate when unit power is ON. | <ul style="list-style-type: none"> a. Fuse F1 or F2 defective, switches S1 or S2 defective, faulty power transformer T1. b. Indicator light defective. | <ul style="list-style-type: none"> a. Check AC input circuits for malfunction. b. Check indicator light. |
| 2 | Demodulator totally inoperative. | <ul style="list-style-type: none"> a. Defective AC input circuits. b. Power supply(s) defective. c. Associated tuner defective. | <ul style="list-style-type: none"> a. Check AC input circuits. b. Check power supplies. c. Substitute tuner input with signal generator test signal. |
| 3 | Unit malfunctions in AM and AM AGC reception modes (10 and 20 MHz BW). Other modes of operation are normal and input is proper. | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> 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 | Unit malfunctions in FM reception mode (10 and 20 MHz BW). Other modes of operation are normal and input is proper. | <ul style="list-style-type: none"> a. Defect in 10 MHz/ 20 MHz IF amplifier strip. b. 160 MHz Limiter/Discriminator defective or misaligned. | <ul style="list-style-type: none"> a. See Item 3-C. b. Check circuits by performing alignment presented in paragraph 4.4.7. |

Courtesy of <http://BlackRadios.terryo.org>

Table 4-2. Demodulator Section Troubleshooting Chart (Cont.)

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

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Table 4-2. Demodulator Section Troubleshooting Chart (Cont.)

| | | | |
|----|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 | Unit 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. |
| 10 | Unit malfunctions when selecting the AM, AM AGC, or FM mode when selecting the 2 MHz (.5 MHz in DM-112-1 Unit) BW only. | Defect or misalignment in the 2 MHz (.5 MHz) BW amplifier/filter circuits. | Check A13AIQ2, the 2 MHz Band-pass filter network, and switch A13AICR1 for operation. Perform the alignment outlined in paragraph 4.4.10. |
| 11 | Unit malfunctions when selecting the AM, AM AGC, or FM modes when selecting the 4 MHz (1 MHz in the DM-112-1 Unit) BW only. | Defect or misalignment in the 4 MHz (1 MHz) BW amplifier/filter circuits. | Check A13AIQ3, the 4 MHz band-pass filter network, and switch A13AICR4 for operation. Perform the alignment outlined in paragraph 4.4.10. |
| 12 | Unit malfunctions in the AM, 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 4-2. Demodulator Section Troubleshooting Chart (Cont.)

| | | | |
|----|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | | <p>b. Defect in RF AGC Circuits.</p> <p>c. Defective gain controlled amplifier.</p> | <p>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.</p> <p>c. Check the gain controlled amplifiers in the RF and selected IF amplifiers.</p> |
| 13 | <p>RF GAIN control has no effect on output level in AM MAN mode of operation.</p> | <p>a. Defective RF GAIN control potentiometer.</p> <p>b. Faulty gain control circuitry.</p> <p>c. Defective gain controlled amplifier.</p> | <p>a. Check potentiometer R7.</p> <p>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 and RF gain control voltages.</p> <p>c. Check the gain controlled amplifiers in the RF and selected IF amplifiers.</p> |
| 14 | <p>No video output from rear apron jack J12. Audio output normal.</p> | <p>a. Defective video amplifier.</p> <p>b. Defective Video Gain potentiometer.</p> | <p>a. Check stages A9Q1 through A9Q4.</p> <p>b. Vary the video gain control and check signal at A9 pin 14 with oscilloscope.</p> |

Table 4-2. Demodulator Section Troubleshooting Chart (Cont.)

| | | | |
|----|---------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------|
| 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. |
|----|---------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------|

Courtesy of <http://BlackRadios.terry.org>

Table 4-3. Signal Monitor Section Troubleshooting Chart

| | TROUBLE SYMPTOM | PROBABLE FAULT | DIAGNOSTIC PROCEDURE |
|--|---------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Power supply voltages normal, no CRT trace | Sweep circuit failure, focus and intensity board failure, or CRT failure | Check: sweep generator A18, horizontal amplifier A17, focus and intensity board A19, and vertical trace positioning circuit on output amplifier A16. |
| | CRT trace normal, no signal (vertical deflection) | Failure of 160 MHz Tuner A14, bandpass filter A20, IF amplifier A15, or output amplifier A16. | Supply an input signal at the proper frequency to each module beginning with output amplifier A16 and check for vertical deflection on the CRT. Continue tracing in this manner until the faulty RF module is located. |

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

| | | Integrated Circuit Pin Numbers | | | | | | | | | | |
|-------------|--------|--------------------------------|--------|--------|--------|---|---|---|-------|-------|-------|---------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| Ref. Desig. | Type | Field Effect Transistor Pins | | | | | | | | | | |
| | | Drain | Gate 2 | Gate 1 | Source | | | | | | | Emitter |
| Q1 | 2N3055 | | | | | | | | 24.3 | 24.6 | 35.6 | |
| A1Q1 | 2N4074 | | | | | | | | 24.6 | 25.2 | 35.1 | |
| A1Q2 | 2N4074 | | | | | | | | 6.92 | 7.5 | 25.2 | |
| A1Q3 | 2N4074 | | | | | | | | 6.92 | 7.5 | 19.16 | |
| 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 | |
| A4Q2 | 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 | | | | 3.3 | 3.9 | 13.5 | |
| A5Q2 | 2N3478 | | | | | | | | 2.1 | 2.9 | 13.4 | |
| A5Q3 | 2N3478 | | | | | | | | -12.1 | -11.3 | -0.6 | |
| A6Q1 | 2N3933 | | | | | | | | -0.6 | 0.0 | 15.0 | |
| A6Q2 (1) | 2N3933 | | | | | | | | -0.6 | 0.0 | 15.0 | |
| A6Q3 (2) | 2N3933 | | | | | | | | -12.0 | -11.3 | -0.7 | |
| A6Q4 (1) | 2N3933 | | | | | | | | -12.0 | -11.3 | -0.7 | |
| A6Q5 (2) | 2N3933 | | | | | | | | -0.7 | 0.0 | 14.1 | |
| A6Q6 | 2N3933 | | | | | | | | -0.7 | 0.0 | 13.5 | |
| A6Q7 | 2N3933 | | | | | | | | -12.1 | -11.4 | -0.7 | |
| A6Q8 | 2N3933 | | | | | | | | -8.5 | -7.7 | -0.7 | |
| A6Q9 | 2N5109 | | | | | | | | -0.7 | -0.0 | 14.7 | |
| 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 | | | | | | | |

Table 4-4. 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 | | | | | | | | | |
| Ref. Desig. | Type | Drain | Gate 2 | Gate 1 | Source | | | | | |
| A6A3Q1 | 2N929 | | | | | | | | | |
| A6A3Q2 | 2N3251 | | | | | | | | | |
| A6A3Q3 | 2N3251 | | | | | | | | | |
| A6A3Q4 | 2N2270 | | | | | | | | | |
| A7Q1 | 2N3933 | | | | | | | | | |
| A7Q2 | 2N3933 | | | | | | | | | |
| A7Q3 | 2N3933 | | | | | | | | | |
| A7Q4 | 2N3933 | | | | | | | | | |
| A7Q5 | 2N3933 | | | | | | | | | |
| A7Q6 (3) | 2N2222 | | | | | | | | | |
| A7Q7 (3) | 2N3251 | | | | | | | | | |
| A7Q8 (3) | 2N2222 | | | | | | | | | |
| A7Q9 (3) | 2N3251 | | | | | | | | | |
| A8A1Q1 (5) | 3N140 | 14.5 | 3.2 | 0.9 | 1.5 | | | | | |
| A8A1Q2 (5) | 2N3933 | 14.3 | 2.7 | 0.9 | 1.8 | | | | | |
| A8A2Q1 (5) | 3N140 | | | | | | | | | |
| A8A2Q2 (5) | 2N3933 | | | | | | | | | |
| A8A2Q3 (5) | 2N3478 | | | | | | | | | |
| A8A2Q4 (5) | 2N3251 | | | | | | | | | |
| A8A2Q5 (5) | 2N2270 | | | | | | | | | |
| A8A3U1 (5) | μA719C | 1.9 | 1.9 | -- | -- | 0.0 | 11.0 | -- | -- | -- |
| A8A3Q1 (5) | 2N3251 | | | | | | | | | |
| A8A3Q2 (5) | 2N929 | | | | | | | | | |
| A8A3Q3 (5) | 2N929 | | | | | | | | | |
| A8A3Q4 (5) | 2N3251 | | | | | | | | | |
| A9Q1 | 2N3423 | 11.8 | 0.0 | -0.7 | -- | 0.0 | 0.0 | 12.9 | 11.8 | 0.7 |
| A9Q2 | 2N3251 | | | | | | | | | |
| A9Q3 | 2N2222 | | | | | | | | | |
| A9Q4 | 2N3251 | | | | | | | | | |
| | Transistor Elements | | | | | | | | | |
| | | Emitter | Base | Collector | | | | | | |
| | | - 0.8 | - 0.2 | 14.8 | | | | | | |
| | | 0.5 | - 0.2 | -14.4 | | | | | | |
| | | - 0.2 | - 0.8 | -15.0 | | | | | | |
| | | 0.0 | 0.5 | 15.0 | | | | | | |
| | | -13.0 | -12.3 | 0.0 | | | | | | |
| | | -13.0 | -12.3 | 0.0 | | | | | | |
| | | -13.0 | -12.3 | 0.0 | | | | | | |
| | | -13.0 | -12.3 | 0.0 | | | | | | |
| | | 1.8 | 2.5 | 12.4 | | | | | | |
| | | -13.0 | 12.4 | 0.7 | | | | | | |
| | | 0.0 | 0.7 | 14.5 | | | | | | |
| | | 0.0 | - 0.7 | -14.5 | | | | | | |
| | | 2.9(4) | 3.6 | 14.6 | | | | | | |
| | | 3.9 | 4.6 | 12.2 | | | | | | |
| | | 3.5 | 4.3 | 13.8 | | | | | | |
| | | 0.6 | 0.0 | -14.5 | | | | | | |
| | | 0.0 | 0.6 | 15.0 | | | | | | |
| | | -- | -- | 11.0 | | | | | | |
| | | 0.6 | 0.0 | -14.7 | | | | | | |
| | | 0.6 | 0.0 | 14.8 | | | | | | |
| | | 0.0 | 0.6 | 15.0 | | | | | | |
| | | 0.0 | - 0.6 | -15.0 | | | | | | |
| | | -- | 11.8 | 0.7 | | | | | | |
| | | 12.5 | 0.7 | 14.8 | | | | | | |
| | | 0.0 | - 0.7 | -14.7 | | | | | | |

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

| Ref. Desig. | Type | Integrated Circuit Pin Numbers | | | | | | | | | | | | | | | | | | | |
|-------------|--------|--------------------------------|--------|--------|--------|------------------------------|------|---------|------|-----------|----|---------------------|--|--|--|--|--|--|--|--|--|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | | | | | | | |
| | | Drain | Gate 2 | Gate 1 | Source | Field Effect Transistor Pins | | | | | | Transistor Elements | | | | | | | | | |
| | | | | | | | | Emitter | Base | Collector | | | | | | | | | | | |
| A10Q1 | 2N3251 | | | | | | | | | | | | | | | | | | | | |
| A10Q2 | 2N2222 | | | | | | | | | | | | | | | | | | | | |
| A10Q3 | 2N3251 | | | | | | | | | | | | | | | | | | | | |
| A10Q4 | 2N2222 | | | | | | | | | | | | | | | | | | | | |
| A10Q5 | 2N2222 | | | | | | | | | | | | | | | | | | | | |
| A10Q6 | 2N2222 | | | | | | | | | | | | | | | | | | | | |
| A11Q1 | 2N929 | | | | | | | | | | | | | | | | | | | | |
| A11Q2 | 2N929 | | | | | | | | | | | | | | | | | | | | |
| A11Q3 | 2N929 | | | | | | | | | | | | | | | | | | | | |
| A11Q4 | 2N3251 | | | | | | | | | | | | | | | | | | | | |
| A11Q5 | 2N2270 | | | | | | | | | | | | | | | | | | | | |
| A11Q6 | 2N4037 | | | | | | | | | | | | | | | | | | | | |
| A12U1 | μA741C | -15.0 | 0.0 | 0.0 | -15.0 | 0.0 | 15.0 | | | | | | | | | | | | | | |
| A13A1Q1 | 3N140 | 11.4 | 3.2 | 0.8 | | | | | | | | | | | | | | | | | |
| A13A1Q2 (6) | 2N3933 | | | | | | | | | | | | | | | | | | | | |
| A13A1Q3 (7) | 2N3933 | | | | | | | | | | | | | | | | | | | | |
| A13A1Q4 | 3N140 | 11.6 | 3.2 | .45 | 1.5 | | | | | | | | | | | | | | | | |
| A13A1Q5 | 2N3933 | | | | | | | | | | | | | | | | | | | | |
| A13A1Q6 | 2N5109 | | | | | | | | | | | | | | | | | | | | |
| A13A1Q7 | 2N5109 | | | | | | | | | | | | | | | | | | | | |
| A13A1Q8 | 2N3251 | | | | | | | | | | | | | | | | | | | | |
| A13A1Q9 | 2N2270 | | | | | | | | | | | | | | | | | | | | |
| A13A2U1 (8) | μA719C | 2.0 | 2.0 | -- | -- | 14.6 | -- | | | | | | | | | | | | | | |
| A13A2Q1 (8) | 2N5109 | | | | | | | | | | | | | | | | | | | | |
| A13A2Q2 (8) | 2N3251 | | | | | | | | | | | | | | | | | | | | |
| A13A2Q3 (8) | 2N929 | | | | | | | | | | | | | | | | | | | | |
| A13A2Q4 (8) | 2N929 | | | | | | | | | | | | | | | | | | | | |
| A13A2Q5 (8) | 2N3251 | | | | | | | | | | | | | | | | | | | | |

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

| | | Integrated Circuit Pin Numbers | | | | | | | | | |
|-------------|--------|--------------------------------|--------|--------|--------|-----|------|------|---------|------|-----------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Ref. Desig. | Type | Field Effect Transistor Pins | | | | | | | | | |
| | | Drain | Gate 2 | Gate 1 | Source | | | | | | |
| | | | | | | | | | Emitter | Base | Collector |
| A13A2U1 (9) | μA719C | 2.0 | 2.0 | -- | -- | 0.0 | 14.4 | -- | -- | -- | 14.4 |
| A13A2Q1 (9) | 2N3251 | | | | | | | | 0.6 | 0.0 | -14.7 |
| A13A2Q2 (9) | 2N929 | | | | | | | | -0.6 | 0.0 | 14.8 |
| A13A2Q3 (9) | 2N929 | | | | | | | | 0.0 | 0.6 | 15 |
| A13A2Q4 (9) | 2N3251 | | | | | | | | 0.0 | -0.6 | -15 |
| A14Q1 | 3N187 | 18.5 | 3.55 | 1.2 | 1.5 | | | | 7.8 | 8.6 | 18.0 |
| A14Q2 | 3N187 | 18.5 | 3.55 | 1.2 | 1.6 | | | | 3.0 | 3.7 | 18.5 |
| A14Q3 | 2N2857 | | | | | | | | 8.0 | 8.8 | 18.0 |
| A14Q4 | 2N3933 | | | | | | | | 3.9 | 4.5* | 9.0 |
| A14Q5 | 2N2857 | | | | | | | | | | |
| A14A1Q1 | 2N3933 | | | | | | | | | | |
| A15Q1 | 3N140 | 13.5 | 2.7 | 0.0 | 0.7 | | | | | | |
| A15Q2 | 3N140 | 17.1 | 0.0 | 0.0 | 0.0 | | | | -1.4 | -0.7 | 22.5 |
| A15Q3 | 3N140 | 17.2 | 3.7 | 0.0 | 0.9 | | | | -10.2 | -9.4 | -1.6 |
| A16Q1 | 2N3933 | | | | | | | | 6.8 | 7.3 | 23.2 |
| A16Q2 | 2N3933 | | | | | | | | 6.2 | 6.8 | 23.2 |
| A17Q1 | 2N2270 | | | | | | | | 6.3 | 6.8 | 102.0 |
| A17Q2 | 2N2270 | | | | | | | | 6.2 | 6.7 | 94.0 |
| A17Q3 | 2N3440 | | | | | | | | 6.8 | 7.4 | 23.2 |
| A17Q4 | 2N3440 | | | | | | | | | | |
| A17Q5 | 2N2270 | | | | | | | | | | |
| A18Q1 | 2N2646 | 8.0 | GND | 22.5 | 22.5 | | | | | | |
| A18Q2 | 2N3251 | | | | | | | | | | |
| A18U1 | μA741 | | 8.0 | 8.0 | -8.3 | | 8.0 | 23.2 | 20.0 | 19.2 | 8.0 |
| A18U2 | μA741 | | 5.5 | 5.5 | -17.8 | | 0.0 | 18.4 | | | |
| A18U3 | μA741 | | 0.0 | 0.0 | -17.8 | | 0.0 | 18.4 | | | |
| A18U4 | μA741 | | 0.0 | 0.0 | -17.8 | | 0.0 | 18.4 | | | |
| A18U5 | μA741 | | 0.0 | 0.0 | -17.8 | | 0.0 | 18.4 | | | |

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; all gain controls fully cw.

* 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. Select either .5 or 2 MHz IF BW
7. Select either 1 or 4 MHz IF BW
8. DM-112 only
9. DM-112-1 only
10. Front panel controls for assemblies A14 through A18 are as follows:

INTENSITY - MAX CW
FOCUS - MAX CW
MARKER - ON
SWEEP WIDTH - MAX CW
CENTER FREQ - MAX CW
SWEEP RATE - MAX CW
GAIN - MAX CW
SWEEP, S7 - POS. 2

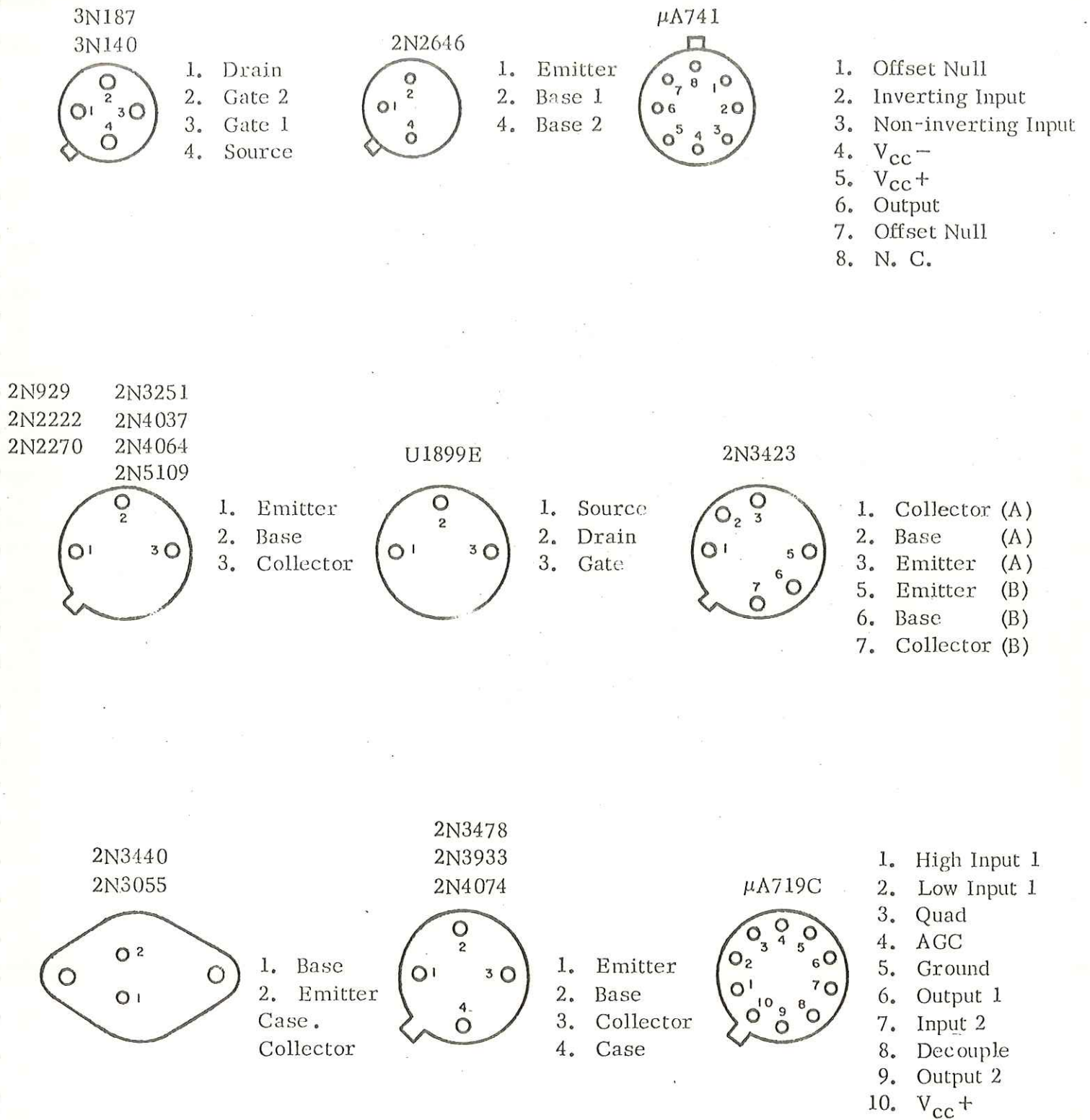


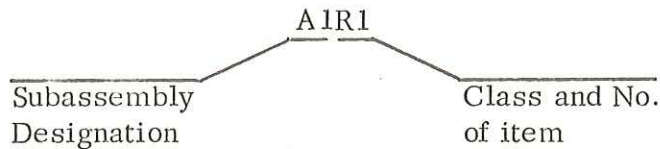
Figure 4-23. Transistor and Integrated Circuit Pin Configurations

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:



Identify from right to left as: First (1) resistor (R) of first (1) subassembly (A)

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

5.2 REFERENCE DESIGNATION PREFIX

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

5.3 LIST OF MANUFACTURERS

| <u>Mfr. Code</u> | <u>Name and Address</u> | <u>Mfr. Code</u> | <u>Name and Address</u> |
|------------------|------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------|
| 01121 | Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 52304 | 04013 | Taurus Corporation 1 Academy Hill Lambertville, New Jersey 08530 |
| 02114 | Ferroxcube Corporation Post Office Box 359 Mt. Marion Road Saugerties, New York 12477 | 04713 | Motorola Semiconductor Products Inc. 5005 East McDowell Road Phoenix, Arizona 85008 |
| 02735 | RCA Corporation Solid State Division Route 202 Somerville, New Jersey 08876 | 06001 | General Electric Company Capacitor Department Post Office Box 158 Irmo, South Carolina 29063 |

| <u>Mfr. Code</u> | <u>Name and Address</u> | <u>Mfr. Code</u> | <u>Name and Address</u> |
|------------------|------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------|
| 07263 | Fairchild Camera and Instrument Corp. Semiconductor Division 464 Ellis Street Mountain View, California 94040 | 56289 | Sprague Electric Company Marshall Street North Adams, Massachusetts 01247 |
| 11293 | Sylvania Electric Products Inc. Sylvania Electronic System Division 40 Sylvan Road Waltham, Maryland 02154 | 71279 | Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, Massachusetts 02138 |
| 14632 | Watkins-Johnson Company CEI Division 6006 Executive Boulevard Rockville, Maryland 20852 | 71400 | Bussman Manufacturing Division of McGraw-Edison Co. 2536 West University Street St. Louis, Missouri 63107 |
| 21604 | The Buckeye Stamping Company 555 Marion Road Columbus, Ohio 43207 | 71590 | Globe-Union Incorporated Centralab Division Post Office Box 591 Milwaukee, Wisconsin 53201 |
| 25088 | Siemens America, Incorporated 350 5th Avenue New York, New York 10001 | 71785 | Cinch Manufacturing Company Howard B. Jones Division 1026 South Homan Avenue Chicago, Illinois 60624 |
| 27193 | Cutler-Hammer, Incorporated Special Products Division 4201 North 27th Street Milwaukee, Wisconsin 53216 | 72136 | Electro Motive Manufacturing Co., Inc. South Park & John Streets Willimantic, Connecticut 06226 |
| 27956 | Relcom 2329 Charleston Road Mountain View, California 94040 | 72982 | Erie Technological Products, Inc. 644 West 12th Street Erie, Pennsylvania 16512 |
| 28480 | Hewlett Packard Company 1501 Page Mill Road Palo Alto, California 94304 | 73138 | Beckman Instruments, Incorporated Helipot Division 2500 Harbor Boulevard Fullerton, California 92634 |
| 49956 | Raytheon Company 141 Spring Street Lexington, Massachusetts 02173 | 73899 | JFD Electronics Company Division of Stratford Retreat House 15th at 62nd Street Brooklyn, New York 11219 |

| <u>Mfr. Code</u> | <u>Name and Address</u> | <u>Mfr. Code</u> | <u>Name and Address</u> |
|----------------------|--------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 74306 | Piezo Crystal Company 100 K Street Carlisle, Pennsylvania 17013 | 81312 | Winchester Electronics Division Litton Industries, Incorporated Main Street & Hillside Avenue Oakville, Connecticut 06779 |
| 74868 | Bunker-Ramo Corporation The Amphenol RF Division 33 East Franklin Street Danbury, Connecticut 06810 | 81349 | Military Specifications |
| 75042 | IRC Division of TRW Incorporated 401 North Broad Street Philadelphia, Pennsylvania 19108 | 82389 | Switchcraft, Incorporated 5555 North Elston Avenue Chicago, Illinois 60630 |
| 75915 | Littelfuse, Incorporated 800 East Northwest Highway Des Plaines, Illinois 60016 | 87034 | Marco-Oak Industries Division of Oak Electro/Netics Corporation 207 South Helena Street Anaheim, California 92803 |
| 79727 | C-W Industries Post Office Box 96 550 Davisville Road Warminster, Pennsylvania 18974 | 91293 | Johanson Manufacturing Company Post Office Box 329 Boonton, New Jersey 07005 |
| 80058 | Joint Electronic Type Designation System | 91418 | Radio Materials Company 4242 West Bryn Mawr Avenue Chicago, Illinois 60646 |
| 80131 | Electronic Industries Association 2001 Eye Street, N. W. Washington, D. C. 20006 | 91506 | Augat, Incorporated 33 Perry Avenue Attleboro, Massachusetts 02703 |
| 80294 | Bourns, Incorporated 1200 Columbia Avenue Riverside, California 92507 | 92193 | United States Smelting Works Inc. Bristol Streets Philadelphia, Pennsylvania 19140 |
| 81073 | Grayhill Incorporated 561 Hillgrove Avenue LaGrange, Illinois 60525 | 83332 | Sylvania Electric Products, Inc. Semiconductor Products Division 100 Sylvan Road Woburn, Massachusetts 01801 |

| <u>Mfr. Code</u> | <u>Name and Address</u> | <u>Mfr. Code</u> | <u>Name and Address</u> |
|----------------------|-------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------|
| 95121 | Quality Components, Incorporated Post Office Box 113 St. Mary's, Pennsylvania 15957 | 99800 | American Precision Industries Delevan Electronics Division 270 Quaker Road East Aurora, New York 14052 |
| 95146 | Alco Electronics Products, Inc. 3 Walcott Avenue Lawrence, Massachusetts 01843 | 99848 | Wilco Corporation 4030 West 10th Street Post Office Box 22248 Indianapolis, Indiana 46222 |

5.4 PARTS LIST

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

NOTE

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

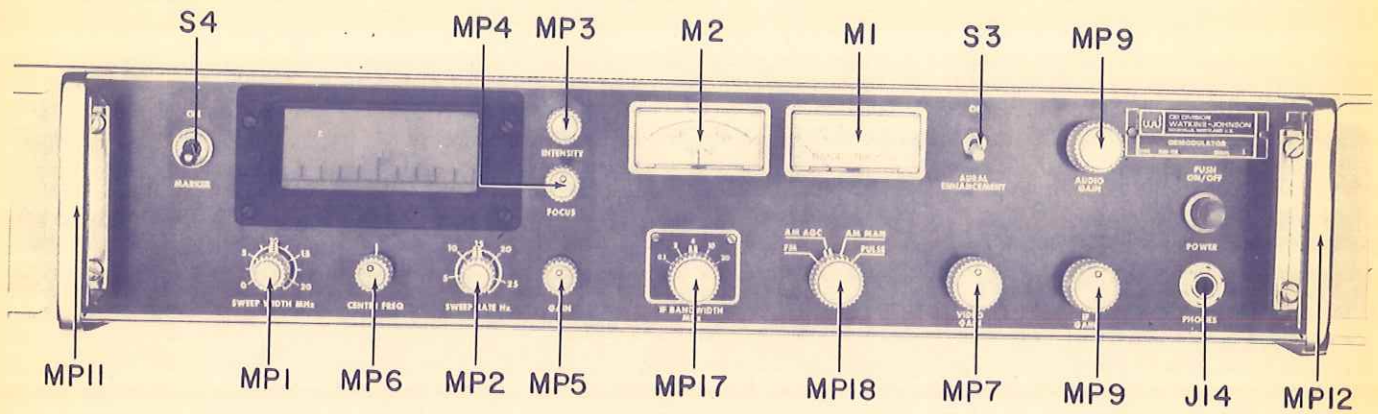


Figure 5-1. Type DM-112-() Demodulator, Front View, Location of Components

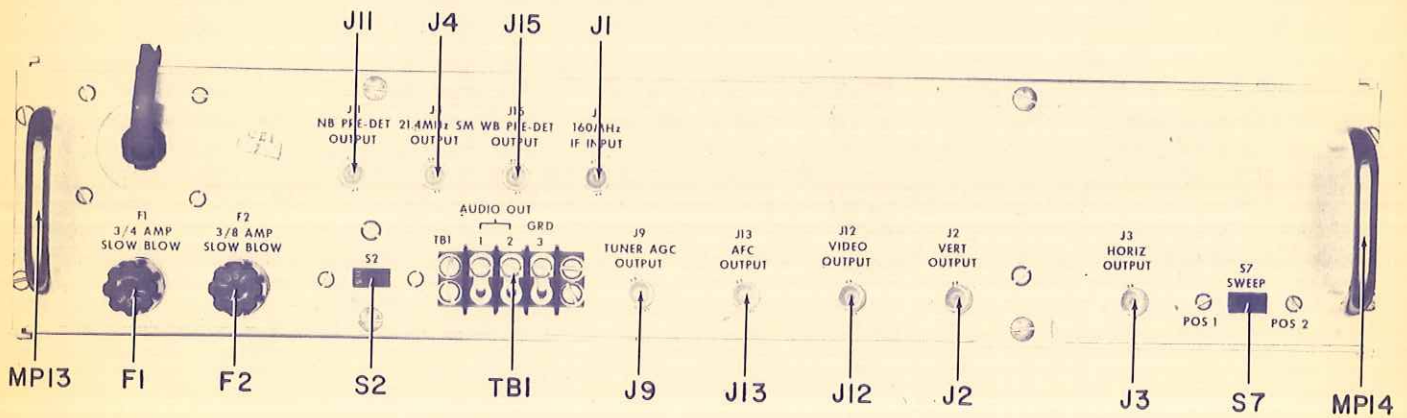


Figure 5-2. Type DM-112-() Demodulator, Rear View, Location of Components

5.4.1 Types DM-112, DM-112-1 Demodulator, Main Chassis

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | +24V POWER SUPPLY | 1 | 76194 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| A2 | NOT USED | | | | |
| A3 | +15V POWER SUPPLY | 1 | 76185 | 14632 | |
| A4 | -15V POWER SUPPLY | 1 | 76186 | 14632 | |
| A5 | 160-21.4 MHz CONVERTER | 1 | 71285 | 14632 | |
| A6 | 160 MHz IF AMPLIFIER | 1 | 72304-1 | 14632 | |
| A7 | 160 MHz LIMITER/DISCRIMINATOR | 1 | 79640 | 14632 | |
| A8 | 21.4 MHz IF AMPLIFIER | 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 | 79973 | 14632 | |
| A13 | 21.4 MHz IF AMPLIFIER (DM-112 ONLY) | 1 | 72301 | 14632 | |
| A13 | 21.4 MHz IF AMPLIFIER (DM-112-1 ONLY) | 1 | 72299 | 14632 | |
| A14 | 160 MHz TUNER | 1 | 71290 | 14632 | |
| A15 | IF AMPLIFIER | 1 | 8026 | 14632 | |
| A16 | OUTPUT AMPLIFIER | 1 | 8138 | 14632 | |
| A17 | HORIZONTAL AMPLIFIER | 1 | 8241 | 14632 | |
| A18 | SWEEP GENERATOR | 1 | 8243 | 14632 | |
| A19 | FOCUS AND INTENSITY BOARD | 1 | 13488 | 14632 | |
| A20 | BANDPASS FILTER | 1 | 79750 | 14632 | |

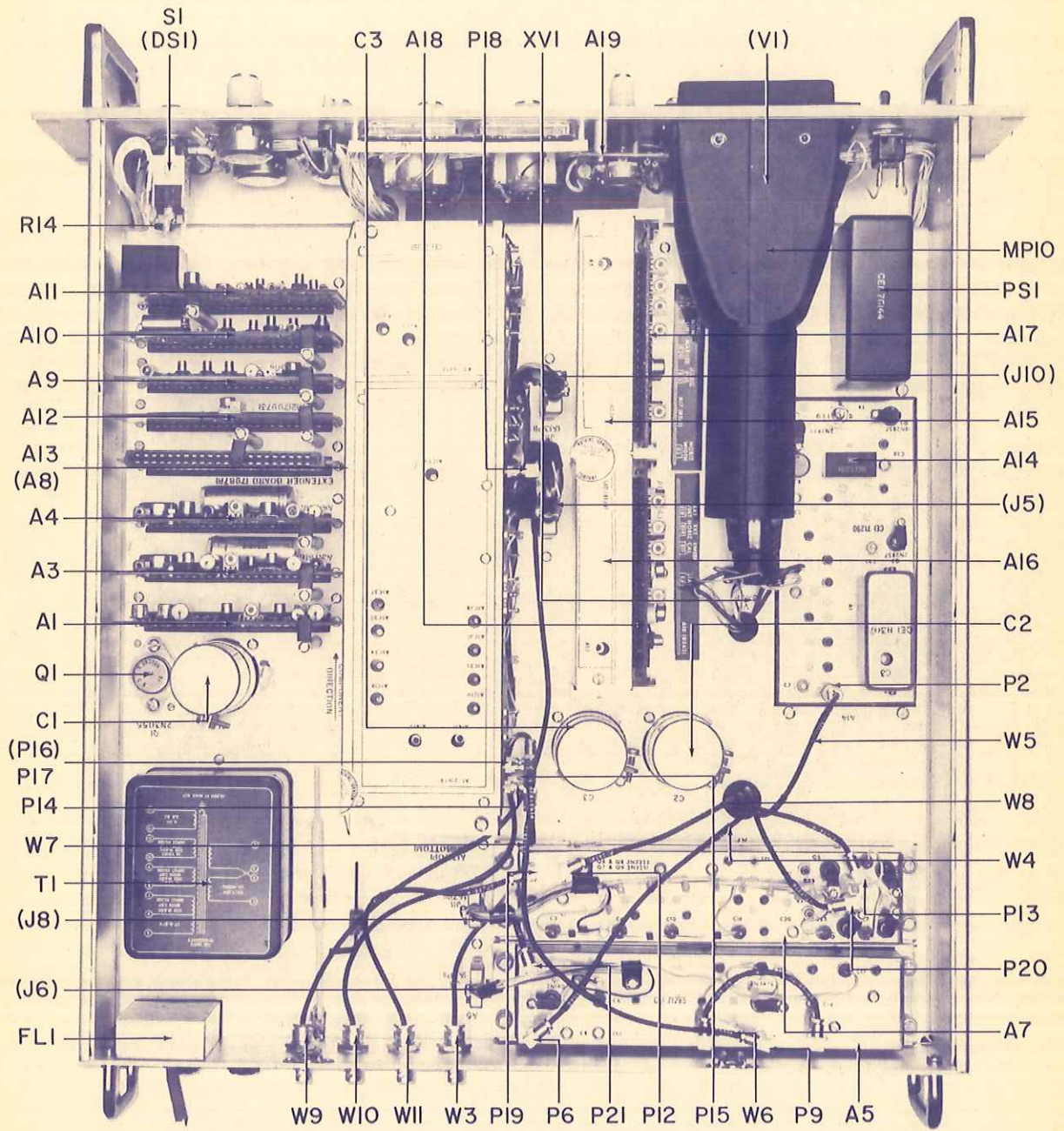


Figure 5-3. Type DM-112-() Demodulator, Top View, Location of Components.

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| CR1 | DIODE | 4 | 1N4449 | 80131 | 93332 |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| CR4 | DIODE | 1 | 1N270 | 80131 | 93332 |
| CR5 | Same as CR1 | | | | |
| C1 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 1400 μ F, -10+100%, 50V | 3 | 86F164M | 06001 | |
| C2 | Same as C1 | | | | |
| C3 | Same as C1 | | | | |
| DS1 | LAMP, NEON | 1 | A1H | 87034 | |
| FL1 | FILTER, LOW-PASS | 1 | JN33-694B | 56289 | |
| F1 | FUSE, CARTRIDGE: 3/4A, 3 AG | 1 | MDL3/4 | 71400 | |
| F2 | FUSE, CARTRIDGE: 3/8A, 3 AG | 1 | MDL3/8 | 71400 | |
| J1 | CONNECTOR, RECEPTACLE | 7 | 17825-1002 | 74868 | |
| J2 | Same as J1 | | | | |
| J3 | Same as J1 | | | | |
| J4 | Same as J1 | | | | |
| J5 | CONNECTOR, RECEPTACLE | 2 | SLE14SNSS | 81312 | |
| J6 | CONNECTOR, RECEPTACLE | 2 | SLE7SNSS | 81312 | |
| J7 | Same as J6 | | | | |
| J8 | Same as J6 | | | | |
| J9 | CONNECTOR, RECEPTACLE | 2 | UG1094U | 80058 | 74868 |

Courtesy of <http://BlackRadios.terryo.org>

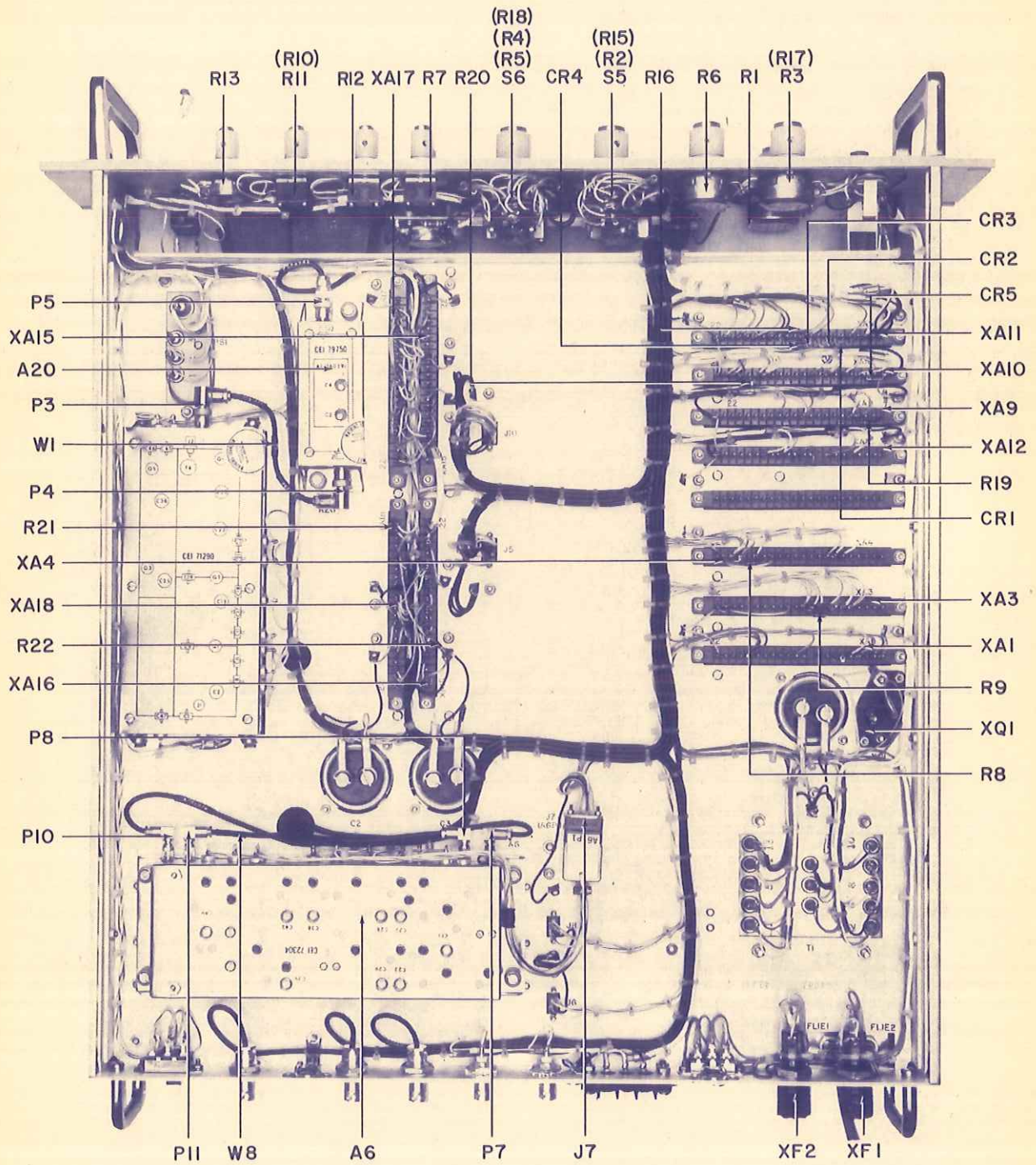


Figure 5-4. Type DM-112-() Demodulator, Bottom View, Location of Components

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| J10 | Same as J5 | | | | Courtesy of http://BlackRadios.terryo.org |
| J11 | Same as J1 | | | | |
| J12 | Same as J1 | | | | |
| J13 | Same as J9 | | | | |
| J14 | JACK, TELEPHONE | 1 | L11 | 82389 | |
| J15 | Same as J1 | | | | |
| M1 | METER, SIGNAL STRENGTH | 1 | 14524-1 | 14632 | |
| M2 | METER, TUNING | 1 | 14549-1 | 14632 | |
| MP1 | KNOB | 2 | PS50PL1 (GREY) | 21604 | |
| MP2 | Same as MP1 | | | | |
| MP3 | KNOB | 4 | PS50D1 (GREY) | 21604 | |
| MP4 | Same as MP3 | | | | |
| MP5 | Same as MP3 | | | | |
| MP6 | Same as MP3 | | | | |
| MP7 | KNOB | 3 | PS70D2 (GREY) | 21604 | |
| MP8 | Same as MP7 | | | | |
| MP9 | Same as MP7 | | | | |
| MP10 | TUBE SHIELD | 1 | 31310-1 | 14632 | |
| MP11 | HANDLE | 2 | 32306-2 | 14632 | |
| MP12 | Same as MP11 | | | | |
| MP13 | HANDLE | 2 | 415-1250-02-02-00 | 71279 | |

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-----------------------|---------------------|----------------------------|--------------|----------------------------------------------------------------------------------------------|
| MP14 | Same as MP13 | 2 | 32574-5 | 14632 | Courtesy of http://BlackRadios.terry.org 74868 |
| MP15 | COVER, TOP AND BOTTOM | | | | |
| MP16 | Same as MP15 | 2 | PS70PL2 (GREY) | 21604 | |
| MP17 | KNOB | | | | |
| MP18 | Same as MP17 | 1 | 76144 | 14632 | |
| PS1 | CONVERTER, DC-DC | | | | |
| P1 | NOT USED | | | | |
| P2 | CONNECTOR, PLUG | 3 | 44950 | 74868 | |
| P3 | CONNECTOR, PLUG | 1 | 45775 | 74868 | |
| P4 | Same as P2 | | | | |
| P5 | Same as P2 | | | | |
| P6 | CONNECTOR, PLUG | 16 | UG1466/U | 80058 | |
| P7 | Same as P6 | | | | |
| P8 | Same as P6 | | | | |
| P9 | Same as P6 | | | | |
| P10 | Same as P6 | | | | |
| P11 | Same as P6 | | | | |
| P12 | Same as P6 | | | | |
| P13 | Same as P6 | | | | |
| P14 | Same as P6 | | | | |
| P15 | Same as P6 | | | | |
| | Part of W5 | | | | |
| | Part of W1 | | | | |
| | Part of W1 | | | | |
| | Part of W4 | | | | |
| | Part of W4 | | | | |
| | Part of W5 | | | | |
| | Part of W6 | | | | |
| | Part of W8 | | | | |
| | Part of W8 | | | | |
| | Part of W6 | | | | |
| | Part of W7 | | | | |

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| P16 | Same as P6 Part of W7 | | | | |
| P17 | Same as P6 Part of W10 | | | | |
| P18 | Same as P6 Part of W9 | | | | |
| P19 | Same as P6 Part of W11 | | | | |
| P20 | Same as P6 | | | | |
| P21 | Same as P6 Part of W3 | | | | |
| Q1 | TRANSISTOR | 1 | 2N3055 | 80131 | 04713 |
| R1 | RESISTOR, VARIABLE, COMPOSITION: 10 k Ω , 10%, 2W | 2 | RV4NAYSD103A | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 1 | RCR07G222JS | 81349 | 01121 |
| R3 | Same as R1 | | | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 1.5 k Ω , 5%, 1/4W | 2 | RCR07G152JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 2.7 k Ω , 5%, 1/4W | 2 | RCR07G272JS | 81349 | 01121 |
| R6 | RESISTOR, VARIABLE, COMPOSITION: 100 Ω , 10%, 2W | 1 | RV4NAYSD101A | 81349 | 01121 |
| R7 | RESISTOR, VARIABLE, COMPOSITION: 10 k Ω , 10%, 1W | 3 | 70A3N056L103U | 01121 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 24 k Ω , 5%, 1/4W | 1 | RCR07G243JS | 81349 | 01121 |
| R9* | RESISTOR, FIXED, COMPOSITION: 18 k Ω , 5%, 1/4W | 1 | RCR07G183JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 91 k Ω , 5%, 1/4W | 1 | RCR07G913JS | 81349 | 01121 |
| R11 | Same as R7 | | | | |
| R12 | Same as R7 | | | | |
| R13 | RESISTOR, VARIABLE, COMPOSITION: 50 k Ω , 10%, 1W | 1 | 70A3N056L503U | 01121 | 01121 |
| R14 | RESISTOR, FIXED, COMPOSITION: 27 k Ω , 5%, 1/2W | 1 | RCR20G273JS | 81349 | 01121 |

* Nominal value. Final value to be factory selected.

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R15 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 1 | RCR07G101JS | 81349 | 01121 |
| R16 | RESISTOR, FIXED, COMPOSITION: 33 k Ω , 5%, 1/4W | 1 | RCR07G333JS | 81349 | 01121 |
| R17 | Same as R4 | | | | |
| R18 | Same as R5 | | | | |
| R19 | RESISTOR, FIXED, COMPOSITION: 270 Ω , 5%, 1/4W | 1 | RCR07G271JS | 81349 | 01121 |
| R20 | RESISTOR, FIXED, COMPOSITION: 9.1 k Ω , 5%, 1/4W | 1 | RCR07G912JS | 81349 | 01121 |
| R21* | RESISTOR, FIXED, COMPOSITION: 39 k Ω , 5%, 1/4W | 1 | RCR07G393JS | 81349 | 01121 |
| R22 | RESISTOR, FIXED, COMPOSITION: 200 k Ω , 5%, 1/4W | 1 | RCR07G204JS | 81349 | 01121 |
| S1 | SWITCH, PUSH BUTTON: SPDT | 1 | 671-6A1H | 87034 | |
| S2 | SWITCH, SLIDE | 1 | 46256LFR | 82389 | |
| S3 | SWITCH, TOGGLE | 1 | MST115D | 95146 | |
| S4 | SWITCH, TOGGLE | 1 | 8280K16 | 27193 | |
| S5 | SWITCH, ROTARY | 2 | 1128-2 | 14632 | |
| S6 | Same as S5 | | | | |
| S7 | SWITCH, SLIDE | 1 | GF326 | 79727 | |
| TB1 | TERMINAL BOARD | 1 | 353-18-03-001 | 71785 | |
| T1 | TRANSFORMER | 1 | 16012 | 14632 | |
| V1 | TUBE, CIRCUIT | 1 | 3ASP1 | 93332 | |
| W1 | CABLE ASSEMBLY | 1 | 30020-1822 | 14632 | |
| W2 | NOT USED | | | | |
| W3 | CABLE ASSEMBLY | 1 | 30020-1823 | 14632 | |

* Nominal value. Final value to be factory selected.

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| | | | | | Courtesy of http://BlackRadios.terryo.org |
| W4 | CABLE ASSEMBLY | 1 | 30020-1824 | 14632 | |
| W5 | CABLE ASSEMBLY | 1 | 30020-1825 | 14632 | |
| W6 | CABLE ASSEMBLY | 1 | 30020-1826 | 14632 | |
| W7 | CABLE ASSEMBLY | 1 | 30020-1827 | 14632 | |
| W8 | CABLE ASSEMBLY | 1 | 30020-1828 | 14632 | |
| W9 | CABLE ASSEMBLY | 1 | 30020-1829 | 14632 | |
| W10 | CABLE ASSEMBLY | 1 | 30020-1830 | 14632 | |
| W11 | CABLE ASSEMBLY | 1 | 30020-1831 | 14632 | |
| XA1 | CONNECTOR, PRINTED CIRCUIT BOARD | 12 | 250-22-30-170 | 71785 | |
| XA3 | Same as XA1 | | | | |
| XA4 | Same as XA1 | | | | |
| XA5 | Same as XA1 | | | | |
| XA9 | Same as XA1 | | | | |
| XA10 | Same as XA1 | | | | |
| XA11 | Same as XA1 | | | | |
| XA12 | Same as XA1 | | | | |
| XA15 | Same as XA1 | | | | |
| XA16 | Same as XA1 | | | | |
| XA17 | Same as XA1 | | | | |
| XA18 | Same as XA1 | | | | |
| XF1 | FUSEHOLDER | 2 | 342004 | 75915 | |

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| XF2 | Same as XF1 | 1 | 8038-1G1 | 91506 | Courtesy of http://BlackRadios.terryo.org |
| XQ1 | SOCKET, TRANSISTOR | 1 | 9859-2 | 11293 | |
| XV1 | SOCKET, CRT | | | | |

5.4.2 Type 76194 +24V Power Supply

REF DESIG PREFIX A1

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| CR1 | DIODE | 2 | IN4998 | 80131 | 93332 |
| CR2 | Same as CR1 | | | | |
| CR3 | DIODE | 1 | IN462A | 80131 | 93332 |
| C1 | CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μ F, 10%, 35V | 2 | CS13BF476K | 81349 | 56289 |
| C2 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μ F, -10+75%, 25V | 1 | 30D106G025BB2 | 56289 | |
| C3 | Same as C1 | | | | |
| Q1 | TRANSISTOR | 3 | 2N2222A | 80131 | 02735 |
| Q2 | Same as Q1 | | | | |
| Q3 | Same as Q1 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 6.8 k Ω , 5%, 1/4W | 2 | RRCR07G682JS | 81349 | 01121 |
| R2 | Same as R1 | | | | |
| R3 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RRCR07G470JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RRCR07G102JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, FILM: 7.5 k Ω , 1%, 1/4W | 1 | RN60D7501F | 81349 | 75042 |
| R6 | RESISTOR, VARIABLE, FILM: 1 k Ω , 10%, 1/2W | 1 | 62PAR1K | 73138 | |
| R7 | RESISTOR, FIXED, FILM: 2.7 k Ω , 1%, 1/4W | 1 | RN60D2741F | 81349 | 75042 |
| R8 | RESISTOR, FIXED, COMPOSITION: 1.2 k Ω , 5%, 1/4W | 1 | RRCR07G122JS | 81349 | 01121 |
| R9 | Same as R4 | | | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 9.1 k Ω , 5%, 1/4W | 1 | RRCR07G912JS | 81349 | 01121 |
| VR1 | DIODE, ZENER | 1 | IN754A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terryo.org>

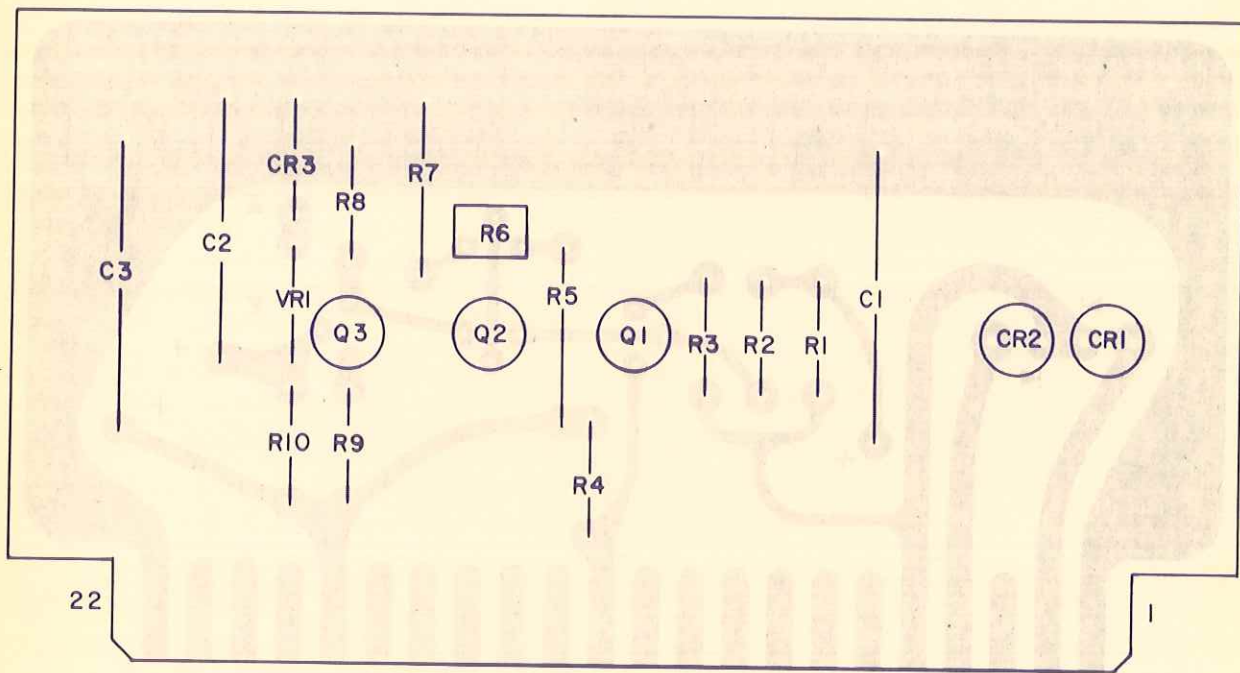


Figure 5-5. Type 76194 +24V Power Supply (A1),
Location of Components

5.4.3 Type 76185 +15V Power Supply

REF DESIG PREFIX A3

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|-----------|--------------------------------------------------------------|---------------|-------------------------|-----------|--------------|
| CR1 | DIODE | 1 | 1N462A | 80131 | 93332 |
| C1 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 450 μ F, -10+75%, 25V | 1 | 39D457G025FJ4 | 56289 | |
| C2 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 25 μ F, -10+75%, 25V | 1 | 30D256G025CB2 | 56289 | |
| C3 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μ F, -10+75%, 25V | 1 | 30D106G025BB2 | 56289 | |
| C4 | CAPACITOR, MICA, DIPPED: 180 pF, 5%, 500V | 1 | CM05FD18IJ03 | 81349 | 72136 |
| C5 | CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μ F, 10%, 35V | 1 | CS13BF226K | 81349 | 56289 |
| Q1 | TRANSISTOR | 2 | 2N2222A | 80131 | 02735 |
| Q2 | TRANSISTOR | 1 | 2N3055 | 80131 | 04713 |
| Q3 | TRANSISTOR | 1 | 2N3478 | 80131 | 02735 |
| Q4 | Same as Q1 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 6.8 k Ω , 5%, 1/4W | 2 | RCR07G682JS | 81349 | 01121 |
| R3 | Same as R2 | | | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 150 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 1 | RCR07G102JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 3 | RCR07G222JS | 81349 | 01121 |
| R7 | RESISTOR, VARIABLE, FILM: 1 k Ω , 10%, 1/2W | 1 | 62PAR1K | 73138 | |
| R8 | RESISTOR, FIXED, COMPOSITION: 2.7 k Ω , 5%, 1/4W | 1 | RCR07G272JS | 81349 | 01121 |
| R9 | Same as R6 | | | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 220 Ω , 5%, 1/4W | | | | |
| R11 | Same as R6 | 1 | RCR07G221JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

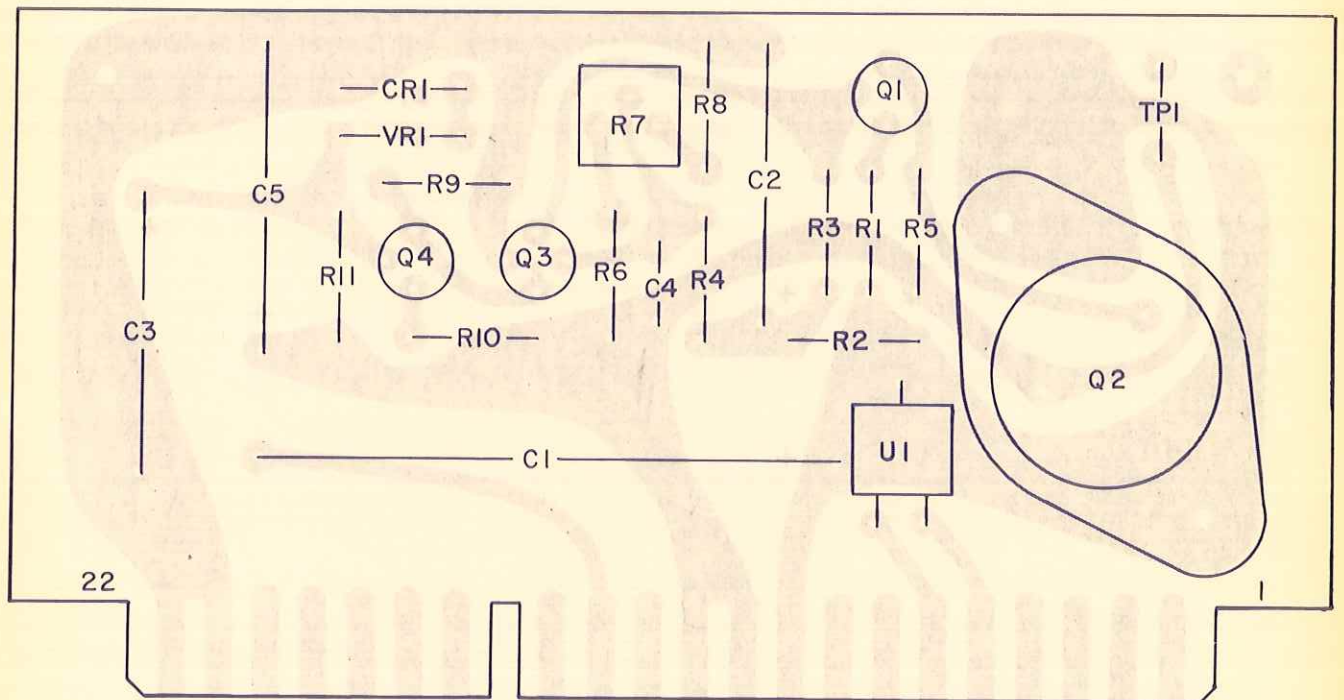


Figure 5-6. Type 76185 +15V Power Supply (A3),
Location of Components

REF DESIG PREFIX A3

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------|---------------------|----------------------------|--------------|-----------------|
| TPI | JACK, TIP | 1 | TJ203R | 49956 | |
| UI | RECTIFIER ASSEMBLY | 1 | MDA940A3 | 04713 | |
| VRI | DIODE, ZENER | 1 | 1N754A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terry.org>

5.4.4 Type 76186 -15V Power Supply

REF DESIG PREFIX A4

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| CR1 | DIODE | 1 | IN462A | 80131 | 93332 |
| C1 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 450 μ F, -10+75%, 25V | 1 | 39D457G025FJ4 | 56289 | |
| C2 | CAPACITOR, ELECTROLYTIC, ALUMINUM: 10 μ F, -10+75%, 25V | 2 | 30D106G025BB2 | 56289 | |
| C3 | Same as C2 | | | | |
| C4 | CAPACITOR, MICA, DIPPED: 200 pF, 5%, 500V | 1 | CM05FD201J03 | 81349 | 72136 |
| C5 | CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μ F, 10%, 20V | 1 | CS13BE476K | 81349 | 56289 |
| Q1 | TRANSISTOR | 1 | 2N3055 | 80131 | 04713 |
| Q2 | TRANSISTOR | 3 | 2N4037 | 80131 | 02735 |
| Q3 | Same as Q2 | | | | |
| Q4 | Same as Q2 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 1 | RCR07G471JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 6.8 k Ω , 5%, 1/4W | 2 | RCR07G682JS | 81349 | 01121 |
| R3 | Same as R2 | | | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 150 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 3 | RCR07G222JS | 81349 | 01121 |
| R6 | RESISTOR, VARIABLE, FILM: 1 k Ω , 10%, 1/2W | 1 | 62PAR1K | 73138 | |
| R7 | RESISTOR, FIXED, COMPOSITION: 2.7 k Ω , 5%, 1/4W | 1 | RCR07G272JS | 81349 | 01121 |
| R8 | Same as R5 | | | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 220 Ω , 5%, 1/4W | 1 | RCR07G221JS | 81349 | 01121 |
| R10 | Same as R5 | | | | |
| TPI | JACK, TIP | 1 | TJ210V | 49956 | |

Courtesy of <http://BlackRadios.terry.org>

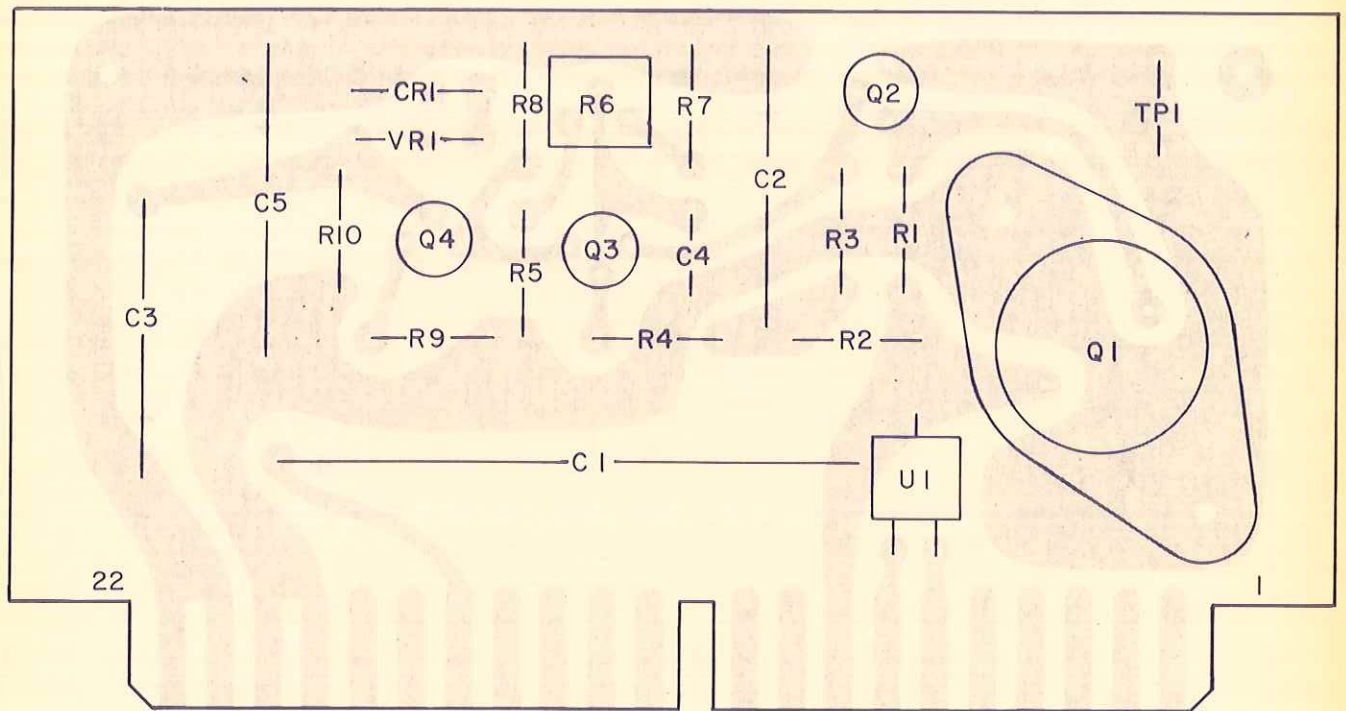


Figure 5-7. Type 76186 -15V Power Supply (A4),
Location of Components

REF DESIG PREFIX A4

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------|---------------------|----------------------------|--------------|-----------------|
| U1 | RECTIFIER ASSEMBLY | 1 | MDA950A3 | 04713 | 04713 |
| VR1 | DIODE, ZENER | 1 | 1N754A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terry.org>

5.4.5 Type 71285 I60-21.4 MHz Converter

REF DESIG PREFIX A5

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | BALANCED MIXER BOARD | 1 | 16456 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| C1 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 8 | SM1000PPF | 91418 | |
| C2 | CAPACITOR, CERAMIC, STANDOFF: 1000 pF, GMV, 500V | 3 | SS5D102W | 01121 | |
| C3 | Same as C1 | | | | |
| C4 | Same as C1 | | | | |
| C5 | Same as C1 | | | | |
| C6 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V | 3 | FA5C102W | 01121 | |
| C7 | Same as C1 | | | | |
| C8 | CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V | 3 | 2954 | 91293 | |
| C9 | Same as C1 | | | | |
| C10 | CAPACITOR, COMPOSITION, TUBULAR: 0.82 pF, 10%, 500V | 1 | QC0.82PPK | 95121 | |
| C11 | CAPACITOR, CERAMIC, TUBULAR: 2.7 pF, ± 0.25 pF, 500V | 1 | 301-000C0J0279C | 72982 | |
| C12 | CAPACITOR, CERAMIC, TUBULAR: 22 pF, 5%, 500V | 2 | 301-000C0G0220J | 72982 | |
| C13 | Same as C8 | | | | |
| C14 | Same as C8 | | | | |
| C15 | CAPACITOR, CERAMIC, TUBULAR: 2.0 pF, ± 0.25 pF, 500V | 1 | 301-000C0K0209C | 72982 | |
| C16 | Same as C2 | | | | |
| C17 | Same as C6 | | | | |
| C18 | CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ± 0.1 pF, 500V | 1 | 301-000C0K0159B | 72982 | |
| C19 | Same as C2 | | | | |
| C20 | Same as C12 | | | | |

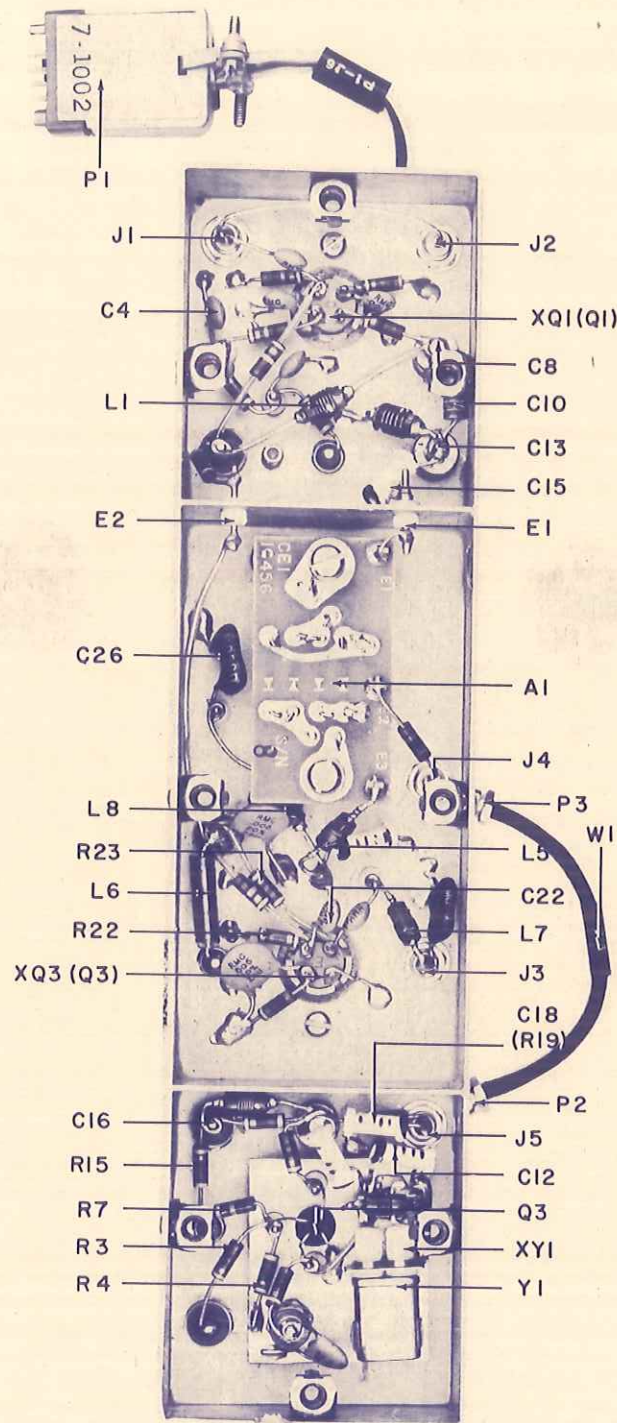


Figure 5-8. Type 71285 160-21.4 MHz Converter (A5),
Location of Components

REF DESIG PREFIX A5

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C21 | Same as C6 | | | | |
| C22 | Same as C1 | | | | |
| C23 | Same as C1 | | | | |
| C24 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 2 | SM5000PFM | 91418 | |
| C25 | CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V | 1 | CM05FD101J03 | 81349 | 72136 |
| C26 | CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500V | 1 | CM05CD150J03 | 81349 | 72136 |
| C27 | CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V | 1 | B470PFM | 91418 | |
| C28 | Same as C24 | | | | |
| E1 | TERMINAL, FEEDTHRU, INSULATED | 2 | SFU16 | 04013 | |
| E2 | Same as E1 | | | | |
| J1 | CONNECTOR, RECEPTACLE | 5 | UG1464U | 80058 | 74868 |
| 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 μ H, 15% | 3 | 200-11 | 99848 | |
| L3 | Same as L1 | | | | |
| L4 | COIL, FIXED | 1 | 21210-29 | 14632 | |
| L5 | Same as L2 | | | | |
| L6 | INDUCTOR | 1 | 1131-37 | 14632 | |

Courtesy of <http://BlackRadios.terryo.org>

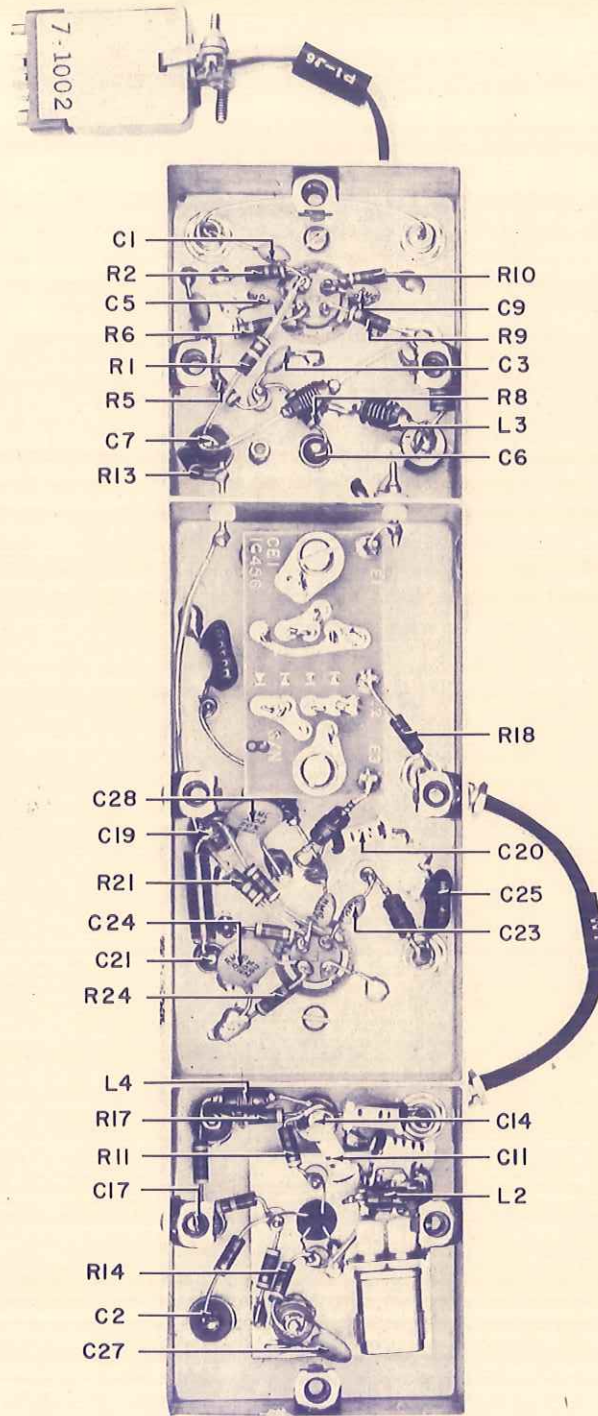


Figure 5-9. Type 71285 160-21.4 MHz Converter (A5),
Location of Components

REF DESIG PREFIX A5

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| L7 | Same as L2 | 1 | 21210-37 | 14632 | |
| L8 | COIL, FIXED | 1 | 21968-2 | 14632 | |
| MP1 | COVER | 1 | SLE7PNSSH13 | 81312 | |
| P1 | CONNECTOR, PLUG | 2 | UG1466/U | 80058 | 74868 |
| P2 | CONNECTOR, PLUG | | | | |
| P3 | Same as P2 | | | | |
| Q1 | TRANSISTOR | 1 | 3N140 | 80131 | 02735 |
| Q2 | TRANSISTOR | 2 | 2N3478 | 80131 | 02735 |
| Q3 | Same as Q2 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 150 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 2 | RCR07G103JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 1 | RCR07G100JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 5 | RCR07G472JS | 81349 | 01121 |
| R5 | Same as R4 | | | | |
| R6 | Same as R2 | | | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 12 k Ω , 5%, 1/4W | 1 | RCR07G123JS | 81349 | 01121 |
| R8 | Same as R4 | | | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 2 | RCR07G220JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 300 Ω , 5%, 1/4W | 2 | RCR07G301JS | 81349 | 01121 |
| R11 | Same as R9 | | | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 300 Ω , 5%, 1/4W | 2 | RCR07G301JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

REF DESIG PREFIX A5

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R13 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R14 | RESISTOR, FIXED, COMPOSITION: 82 Ω , 5%, 1/4W | 1 | RCR07G820JS | 81349 | 01121 |
| R15 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 2 | RCR07G471JS | 81349 | 01121 |
| R16 | NOT USED | | | | |
| R17 | Same as R4 | | | | |
| R18* | RESISTOR, FIXED, COMPOSITION: 18 Ω , 5%, 1/4W | 2 | RCR07G180JS | 81349 | 01121 |
| R19 | Same as R10 | | | | |
| R20 | NOT USED | | | | |
| R21 | RESISTOR, FIXED, COMPOSITION: 18 k Ω , 5%, 1/4W | 1 | RCR07G183JS | 81349 | 01121 |
| R22 | Same as R4 | | | | |
| R23 | RESISTOR, FIXED, COMPOSITION: 910 Ω , 5%, 1/4W | 1 | RCR07G911JS | 81349 | 01121 |
| R24 | Same as R12 | | | | |
| R25* | RESISTOR, FIXED, COMPOSITION: 33 Ω , 5%, 1/4W | 1 | RCR07G330JS | 81349 | 01121 |
| W1 | CABLE ASSEMBLY | 1 | 30020-1378 | 14632 | |
| XQ1 | SOCKET, TRANSISTOR | 2 | 22-16-4 | 81073 | |
| XQ3 | Same as XQ1 | | | | |
| XY1 | SOCKET, CRYSTAL | 1 | 8004-IG1 | 91506 | |
| Y1 | CRYSTAL, QUARTZ | 1 | 98204-5 | 14632 | |

Courtesy of <http://BlackRadios.terry.org>

* Nominal value. Final value to be factory selected.

5.4.5.1 Part 16456 Balanced Mixer Board

REF DESIG PREFIX A5A1

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------|---------------------|----------------------------|--------------|-------------------------------------------------------------------------------------|
| CR1 | DIODE | 4 | 5082-2800 | 28480 | Courtesy of http://BlackRadios.terry.org |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| CR4 | Same as CR1 | | | | |
| T1 | TRANSFORMER | 2 | 21727-1 | 14632 | |
| T2 | Same as T1 | | | | |
| | | | | | |
| | | | | | |

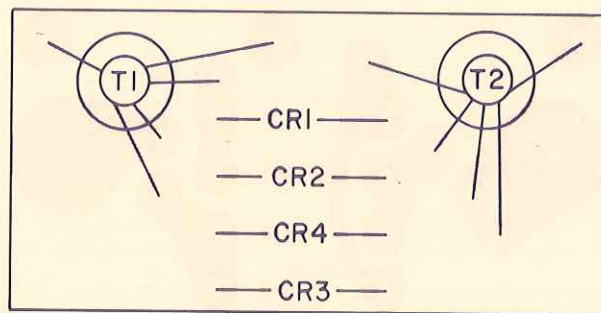


Figure 5-10. Part 16456 Balanced Mixer Board (A5A1),
Location of Components

5.4.6 Type 72304-1 160 MHz IF Amplifier

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | IF AMPLIFIER | 2 | 15164 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| A2 | Same as A1 | | | | |
| A3 | VIDEO AMPLIFIER | 1 | 15203 | 14632 | |
| CR1 | DIODE | 4 | 1N462A | 80131 | |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| CR4 | Same as CR1 | | | | |
| CR5 | DIODE | 1 | 5082-2800 | 28480 | |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V | 14 | FA5C102W | 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 | 2954 | 91293 | |

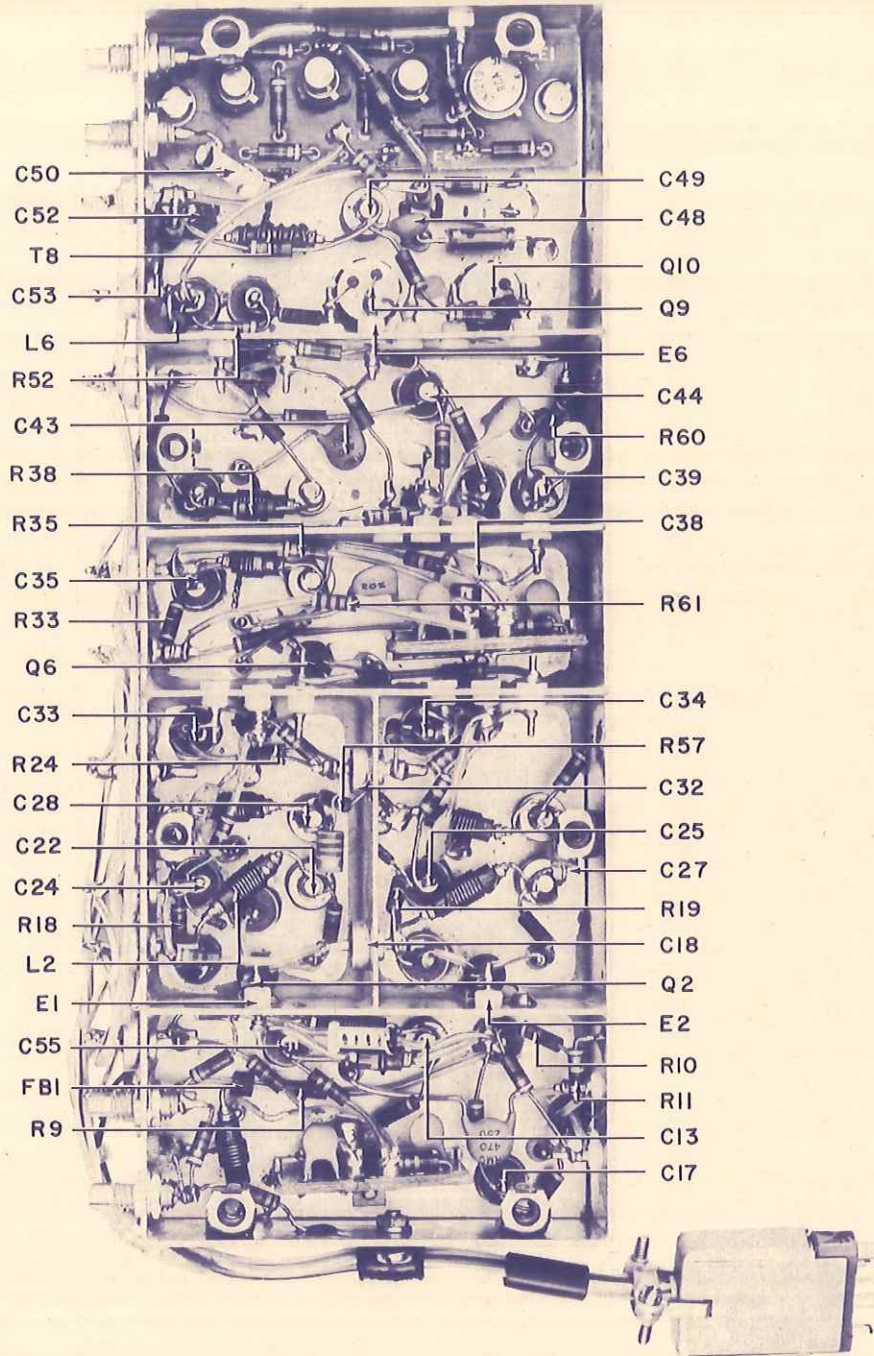


Figure 5-11. Type 72304-1 160 MHz IF Amplifier (A6),
Location of Components

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| C14 | CAPACITOR, CERAMIC, STANDOFF: 1000 pF, GMV, 500V | 17 | SS5D102W | 01121 | Courtesy of http://BlackRadios.terryo.org |
| C15 | CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V | 7 | B470PFM | 91418 | |
| C16 | CAPACITOR, CERAMIC, TUBULAR: 10 pF, ± 0.5 pF, 500V | 1 | 301-000C0H0100D | 72982 | |
| C17 | Same as C14 | | | | |
| C18 | Same as C1 | | | | |
| C19 | Same as C14 | | | | |
| 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 | QC0.82PFFK | 95121 | |
| C27 | CAPACITOR, COMPOSITION, TUBULAR: 0.36 pF, 10%, 500V | 1 | QC0.36PFFK | 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 | | | | |

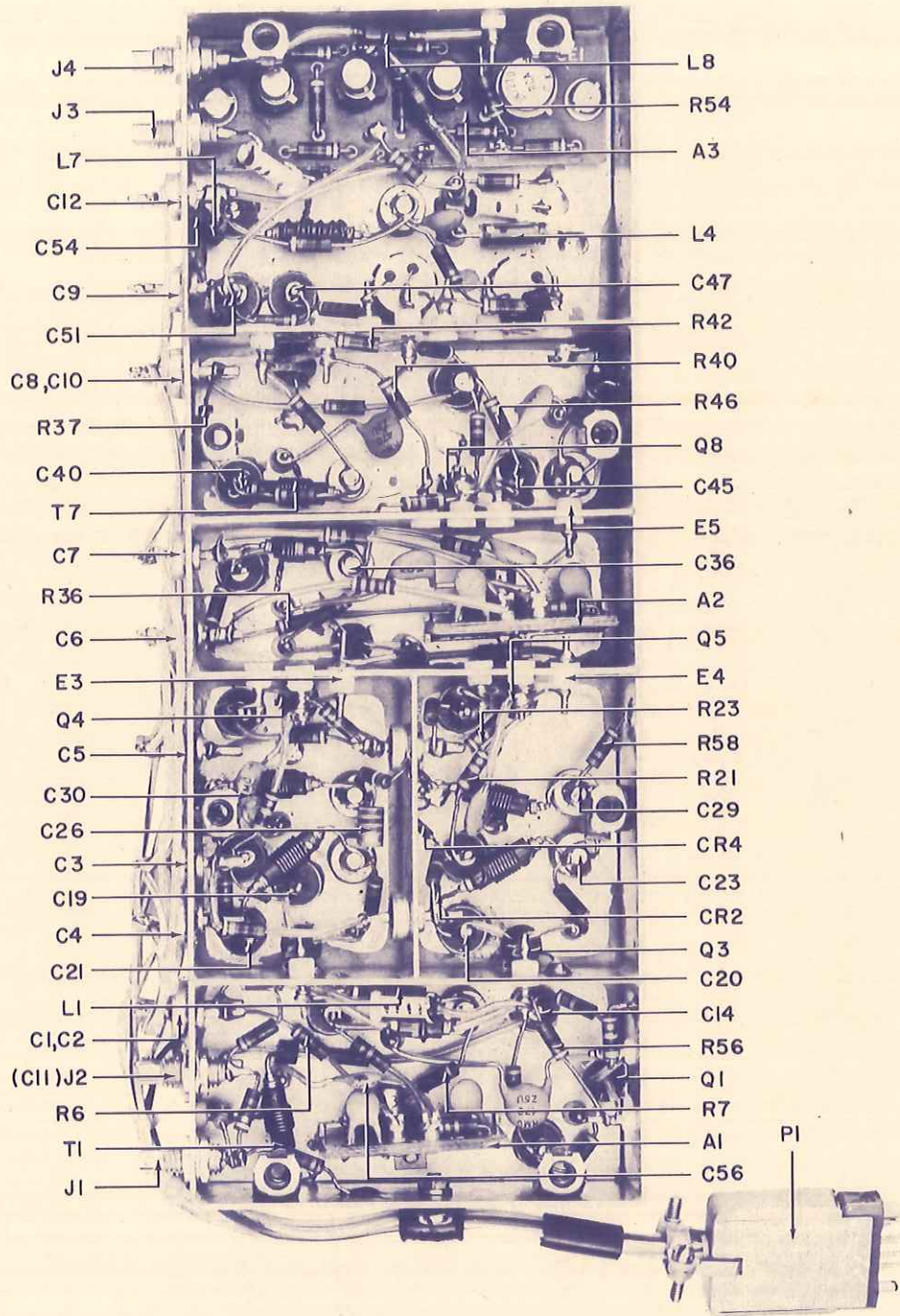


Figure 5-12. Type 72304-1 160 MHz IF Amplifier (A6),
Location of Components

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| C35 | Same as C14 | | | | Courtesy of http://BlackRadios.terryo.org |
| C36 | Same as C13 | | | | |
| C37 | Same as C15 | | | | |
| C38 | Same as C15 | | | | |
| C39 | Same as C13 | | | | |
| C40 | Same as C14 | | | | |
| C41 | Same as C15 | | | | |
| C42 | Same as C13 | | | | |
| C43 | Same as C15 | | | | |
| C44 | Same as C14 | | | | |
| C45 | Same as C14 | | | | |
| C46 | CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ± 0.25 pF, 500V | 1 | 301-000C0H0479C | 72982 | |
| C47 | Same as C14 | | | | |
| C48 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 4 | SM1000PPF | 91418 | |
| C49 | Same as C13 | | | | |
| C50 | CAPACITOR, CERAMIC, TUBULAR: 2.7 pF, ± 0.25 pF, 500V | 1 | 301-000C0J0279C | 72982 | |
| C51 | Same as C14 | | | | |
| C52 | Same as C14 | | | | |
| C53 | Same as C48 | | | | |
| C54 | Same as C48 | | | | |
| C55 | Same as C14 | | | | |

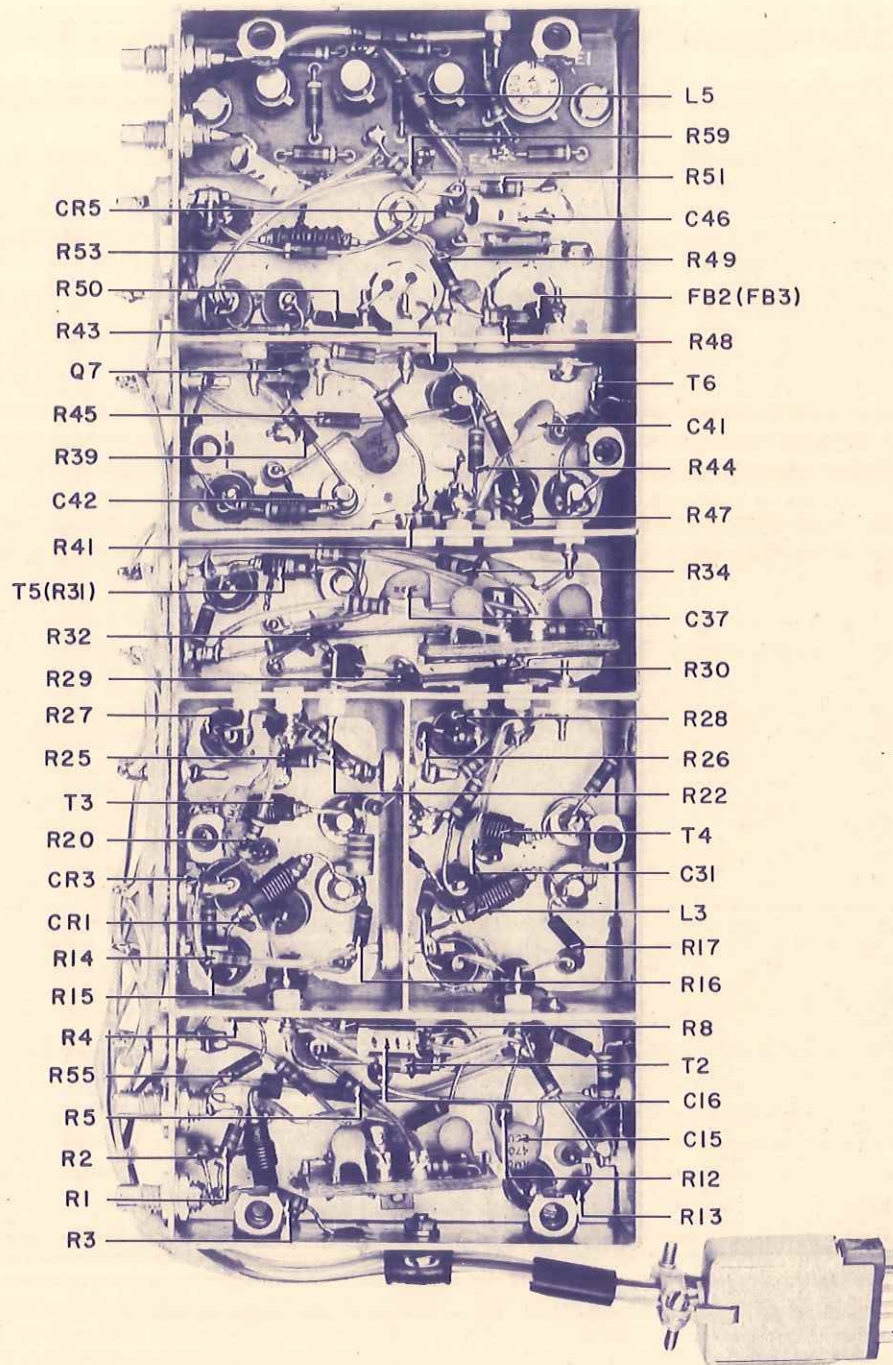


Figure 5-13. Type 72304-1 160 MHz IF Amplifier (A6),
Location of Components

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------|---------------------|----------------------------|--------------|------------------------------------------------------------------------------------------------|
| C56 | Same as C48 | 6 | SFU16 | 04013 | Courtesy of http://BlackRadios.terryo.org 74868 |
| E1 | TERMINAL, FEEDTHRU, INSULATED | | | | |
| E2 | Same as E1 | | | | |
| E3 | Same as E1 | | | | |
| E4 | Same as E1 | | | | |
| E5 | Same as E1 | | | | |
| E6 | Same as E1 | | | | |
| FB1 | FERRITE BEAD | 3 | 56-590-65-4A | 02114 | |
| FB2 | Same as FB1 | | | | |
| FB3 | Same as FB1 | | | | |
| J1 | CONNECTOR, RECEPTACLE | 4 | UG1464U | 80058 | |
| 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 μ H, 15% | 4 | 200-11 | 99848 | |
| L6 | Same as L5 | | | | |
| L7 | Same as L5 | | | | |

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| L8 | Same as L5 | | | | |
| MP1 | COVER | 1 | 21991-1 | 14632 | |
| P1 | CONNECTOR, PLUG | 1 | SLE7PNSSH13 | 81312 | |
| Q1 | TRANSISTOR | 8 | 2N2857 | 80131 | 02735 |
| 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 | 02735 |
| Q10 | Same as Q9 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 270 Ω , 5%, 1/4W | 1 | RCR07G271JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 4.7 Ω , 5%, 1/4W | 1 | RCR07G4R7JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 120 Ω , 5%, 1/4W | 1 | RCR07G121JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 4 | RCR07G471JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 160 k Ω , 5%, 1/4W | 2 | RCR07G164JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 8 | RCR07G103JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 8 | RCR07G220JS | 81349 | 01121 |
| R8 | Same as R4 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R9 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 8 | RRCR07G100JS | 81349 | 01121 |
| R10 | Same as R6 | | | | |
| R11 | RESISTOR, FIXED, COMPOSITION: 30 k Ω , 5%, 1/4W | 4 | RRCR07G303JS | 81349 | 01121 |
| R12 | RESISTOR, FIXED, COMPOSITION: 2.0 k Ω , 5%, 1/4W | 3 | RRCR07G202JS | 81349 | 01121 |
| R13 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 3 | RRCR07G470JS | 81349 | 01121 |
| 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 | RRCR07G470JS | 81349 | 01121 |
| R29 | Same as R7 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

* Nominal value. Final value to be factory selected.

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R30 | Same as R7 | 5 | RRCR07G102JS | 81349 | 01121 |
| R31 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | | | | |
| R32 | Same as R7 | | | | |
| R33 | Same as R4 | | | | |
| R34 | Same as R5 | | | | |
| R35 | Same as R6 | | | | |
| R36 | RESISTOR, FIXED, COMPOSITION: 750 Ω , 5%, 1/4W | 2 | RRCR07G751JS | 81349 | 01121 |
| R37 | Same as R4 | | | | |
| R38 | RESISTOR, FIXED, COMPOSITION: 680 Ω , 5%, 1/4W | 1 | RRCR07G681JS | 81349 | 01121 |
| 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 R36 | | | | |
| R47* | RESISTOR, FIXED, COMPOSITION: 82 Ω , 5%, 1/4W | 2 | RRCR07G820JS | 81349 | 01121 |
| R48 | Same as R9 | | | | |
| R49 | Same as R9 | | | | |
| R50 | RESISTOR, FIXED, COMPOSITION: 2.7 Ω , 5%, 1/4W | 1 | RRCR07G2R7JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

* Nominal value. Final value to be factory selected.

REF DESIG PREFIX A6

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R51 | RESISTOR, FIXED, COMPOSITION: 3.0 k Ω , 5%, 1/4W | 1 | RRCR07G302JS | 81349 | 01121 |
| R52 | RESISTOR, FIXED, COMPOSITION: 270 Ω , 5%, 1/4W | 1 | RRCR07G271JS | 81349 | 01121 |
| R53 | Same as R31 | | | | |
| R54 | Same as R9 | | | | |
| R55 | Same as R47 | | | | |
| R56 | Same as R7 | | | | |
| R57 | RESISTOR, FIXED, COMPOSITION: 3.9 k Ω , 5%, 1/4W | 1 | RRCR07G392JS | 81349 | 01121 |
| R58 | RESISTOR, FIXED, COMPOSITION: 3.3 k Ω , 5%, 1/4W | 1 | RRCR07G332JS | 81349 | 01121 |
| R59 | RESISTOR, FIXED, COMPOSITION: 47 k Ω , 5%, 1/4W | 1 | RRCR07G473JS | 81349 | 01121 |
| R60 | Same as R31 | | | | |
| R61 | RESISTOR, FIXED, COMPOSITION: 43 k Ω , 5%, 1/4W | 1 | RRCR07G433JS | 81349 | 01121 |
| T1 | TRANSFORMER | 1 | 11464-5 | 14632 | |
| T2 | TRANSFORMER | 3 | 11464-6 | 14632 | |
| T3 | TRANSFORMER | 3 | 11464-50 | 14632 | |
| T4 | Same as T3 | | | | |
| T5 | TRANSFORMER | 1 | 11464-33 | | |
| T6 | Same as T2 | | | | |
| T7 | Same as T3 | | | | |
| T8 | Same as T2 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

5.4.6.1 Part 15164 IF Amplifier

REF DESIG PREFIX A6A1, A6A2

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C1 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 2 | SM1000PPF | 91418 | |
| C2 | Same as C1 | | | | |
| Q1 | TRANSISTOR | 1 | 3N140 | 02735 | 01121 |
| R1 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 1 | RCR07G103JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 1 | RCR07G331JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

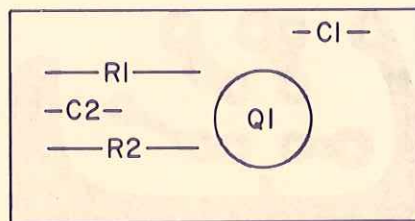


Figure 5-14. Part 15164 IF Amplifier (A6A1), (A6A2),
Location of Components

5.4.6.2 Part 15203 Video Amplifier

REF DESIG PREFIX A6A3

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| Q1 | TRANSISTOR | 1 | 2N929 | 80131 | 04713 |
| Q2 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |
| Q3 | Same as Q2 | | | | |
| Q4 | TRANSISTOR | 1 | 2N2270 | 80131 | 02735 |
| R1 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RCR07G102JS | 81349 | 01121 |
| R2 | Same as R1 | | | | |
| R3 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 2 | RCR07G101JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 2.4 k Ω , 5%, 1/4W | 1 | RCR07G242JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 5.1 k Ω , 5%, 1/4W | 1 | RCR07G512JS | 81349 | 01121 |
| R6 | Same as R3 | | | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 2 | RCR07G220JS | 81349 | 01121 |
| R8 | Same as R7 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

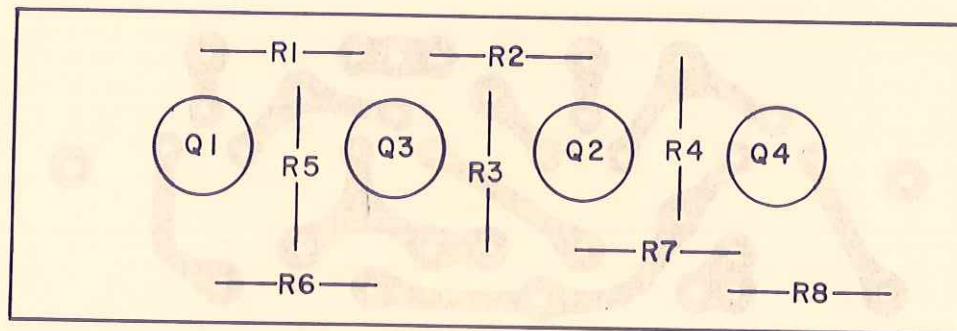


Figure 5-15. Part 15203 Video Amplifier (A6A3),
Location of Components

5.4.7 Type 79640 160 MHz Limiter/Discriminator

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| 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 | 93332 |
| CR12 | DIODE | 3 | 1N4446 | 80131 | 93332 |
| CR13 | Same as CR12 | | | | |
| CR14 | Same as CR12 | | | | |
| C1 | CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V | 5 | 2954 | 92193 | |
| C2 | CAPACITOR, CERAMIC, STANDOFF: 470 pF, 20%, 500V | 8 | SS5D4712 | 01121 | |
| C3 | CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500V | 7 | FA5C4712 | 01121 | |
| C4 | Same as C2 | | | | |
| C5 | CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V | 1 | CM05ED330J03 | 81349 | 72136 |
| C6 | Same as C3 | | | | |
| C7 | Same as C2 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

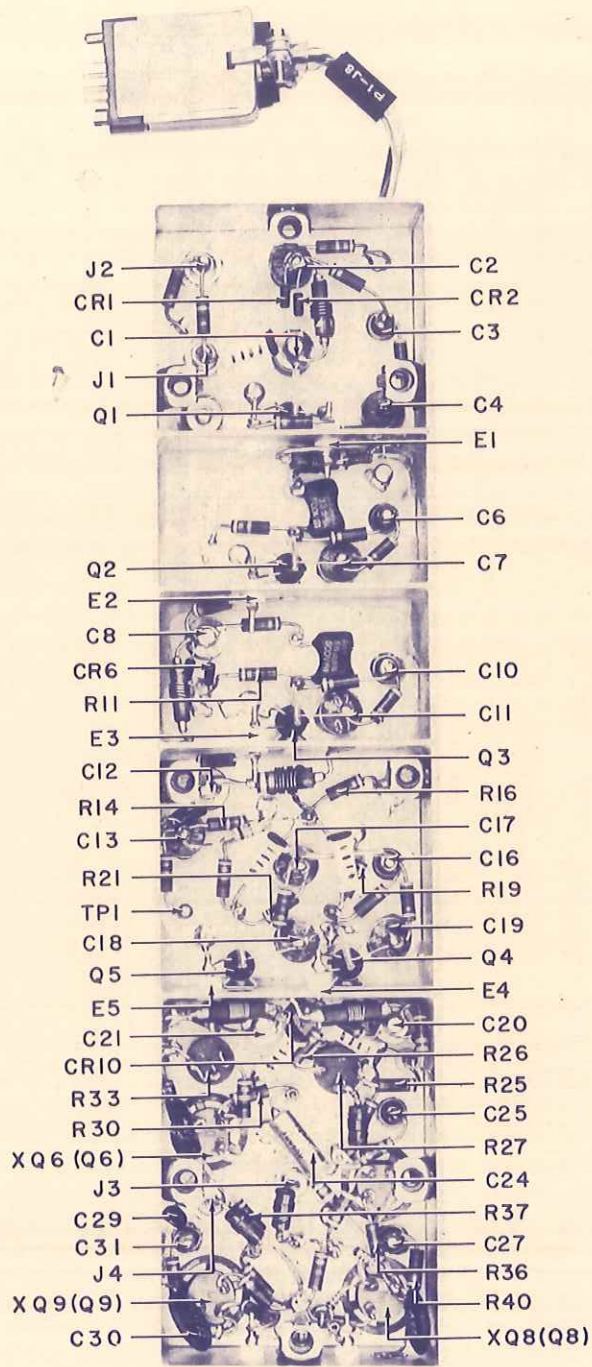


Figure 5-16. Type 79640 160 MHz Limiter/Discriminator (A7),
Location of Components

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C8 | Same as C1 | | | | |
| C9 | CAPACITOR, MICA, DIPPED: 56 pF, 5%, 500V | 1 | CM05ED560J03 | 81349 | 72136 |
| 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 | 301-000C0H0100D | 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 | | | | |
| C23 | Same as C14 | | | | |
| C24 | CAPACITOR, ELECTROLYTIC, TANTALUM: 4.7 μ F, 10%, 35V | 1 | CS13BF475K | 81349 | 56289 |
| C25 | Same as C3 | | | | |
| C26 | CAPACITOR, MICA, DIPPED: 36 pF, 5%, 500V | 1 | CM05ED360J03 | 81349 | 72136 |
| C27 | Same as C3 | | | | |
| C28 | CAPACITOR, CERAMIC, DISC: 0.1 μ F, -20+80%, 25V | 2 | DFJ3 | 73899 | |

Courtesy of <http://BlackRadios.terryo.org>

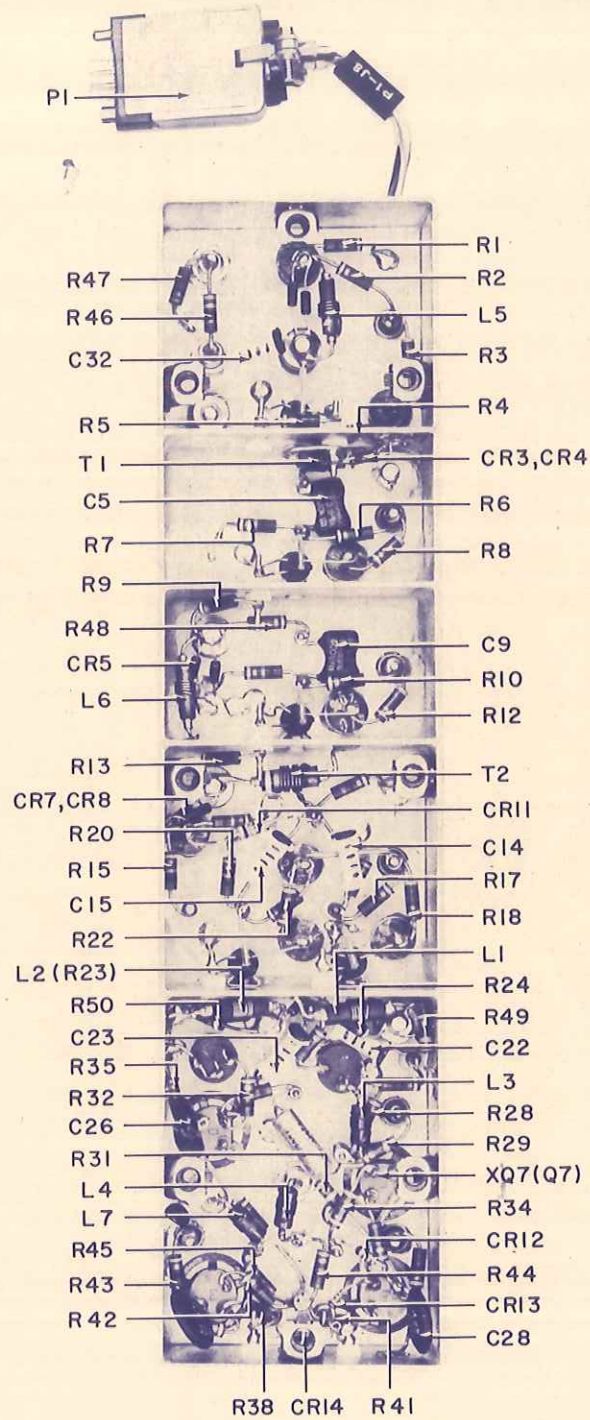


Figure 5-17. Type 79640 160 MHz Limiter/Discriminator (A7),
Location of Components

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-----------------------------------------------------|---------------------|----------------------------|--------------|------------------------------------------------------------------------------------------------|
| C29 | Same as C14 | | | | Courtesy of http://BlackRadios.terryo.org 74868 |
| C30 | Same as C28 | | | | |
| C31 | Same as C3 | | | | |
| C32 | CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.25 pF, 500V | 1 | 301-000C0H0479C | 72982 | |
| E1 | TERMINAL, FEEDTHRU, INSULATED | 5 | SFU16 | 04013 | |
| E2 | Same as E1 | | | | |
| E3 | Same as E1 | | | | |
| E4 | Same as E1 | | | | |
| E5 | Same as E1 | | | | |
| J1 | CONNECTOR, RECEPTACLE | 4 | UG1464U | 80058 | |
| J2 | Same as J1 | | | | |
| J3 | Same as J1 | | | | |
| J4 | Same as J1 | | | | |
| L1 | INDUCTOR | 1 | 21210-41 | 14632 | |
| L2 | INDUCTOR | 1 | 21210-8 | 14632 | |
| L3 | COIL, FIXED: 0.24 μH, 15% | 3 | 200-11 | 99848 | |
| L4 | Same as L3 | | | | |
| L5 | INDUCTOR | 1 | 1131-24 | 14632 | |
| L6 | INDUCTOR | 1 | 1131-86 | 14632 | |
| L7 | Same as L3 | | | | |
| MPI | COVER | 1 | 21968-1 | 14632 | |

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| P1 | CONNECTOR, PLUG | 1 | SLE7PNSSH13 | 81312 | |
| Q1 | TRANSISTOR | 5 | 2N2857 | 80131 | 02735 |
| Q2 | Same as Q1 | | | | |
| Q3 | Same as Q1 | | | | |
| Q4 | Same as Q1 | | | | |
| Q5 | Same as Q1 | | | | |
| Q6 | TRANSISTOR | 2 | 2N2222A | 80131 | 04713 |
| Q7 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |
| Q8 | Same as Q6 | | | | |
| Q9 | Same as Q7 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 8 | RCR07G103JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 5 | RCR07G222JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 6 | RCR07G471JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 10 | RCR07G220JS | 81349 | 01121 |
| 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 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R12 | Same as R3 | | | | |
| R13 | Same as R4 | | | | |
| R14 | Same as R1 | | | | |
| R15 | Same as R1 | | | | |
| R16 | RESISTOR, FIXED, COMPOSITION: 56 Ω , 5%, 1/4W | 1 | RCR07G560JS | 81349 | 01121 |
| 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 k Ω , 5%, 1/4W | 3 | RCR07G122JS | 81349 | 01121 |
| R26 | Same as R25 | | | | |
| R27 | RESISTOR, VARIABLE, WIRE-WOUND: 200 Ω , 5%, 1/2W | 1 | 3300S1-201 | 80294 | |
| R28 | RESISTOR, FIXED, COMPOSITION: 3.3 k Ω , 5%, 1/4W | 4 | RCR07G332JS | 81349 | 01121 |
| R29 | Same as R28 | | | | |
| R30 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 1 | RCR07G102JS | 81349 | 01121 |
| R31 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |
| R32 | RESISTOR, FIXED, COMPOSITION: 20 k Ω , 5%, 1/4W | 1 | RCR07G203JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R33 | RESISTOR, VARIABLE, W-W: 10 k Ω , 5%, 1/2W | 1 | 3300S-1-103 | 80294 | |
| R34 | Same as R3 | | | | |
| R35 | RESISTOR, FIXED, COMPOSITION: 680 Ω , 5%, 1/4W | 1 | RCR07G681JS | 81349 | 01121 |
| R36 | RESISTOR, FIXED, COMPOSITION: 120 Ω , 5%, 1/4W | 2 | RCR07G121JS | 81349 | 01121 |
| R37 | RESISTOR, FIXED, COMPOSITION: 5.1 k Ω , 5%, 1/4W | 1 | RCR07G512JS | 81349 | 01121 |
| R38 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 2 | RCR07G100JS | 81349 | 01121 |
| 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 | 01121 |
| R45 | Same as R38 | | | | |
| R46 | RESISTOR, FIXED, COMPOSITION: 33 Ω , 5%, 1/4W | 1 | RCR07G330JS | 81349 | 01121 |
| R47 | Same as R36 | | | | |
| R48 | RESISTOR, FIXED, COMPOSITION: 150 Ω , 5%, 1/4W | 1 | RCR07G151JS | 81349 | 01121 |
| R49 | Same as R28 | | | | |
| R50 | Same as R28 | | | | |
| TP1 | JACK, TIP | 1 | TJ6 | 04013 | |
| T1 | INDUCTOR | 2 | 21818-2 | 14632 | |
| T2 | Same as T1 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A7

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------------------|-----------------------------------------------------------------|---------------------|----------------------------|--------------|-------------------------------------------------------------------------------------|
| XQ6 XQ7 XQ8 XQ9 | SOCKET, TRANSISTOR Same as XQ6 Same as XQ6 Same as XQ6 | 4 | 22-16-2 | 81073 | Courtesy of http://BlackRadios.terry.org |

5.4.8 Type 72295 21.4 MHz IF Amplifier

REF DESIG PREFIX A8

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | IF INPUT AMPLIFIER | 1 | 15295 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| A2 | IF OUTPUT AMPLIFIER | 1 | 15298 | 14632 | |
| A3 | FM LIMITER DISCRIMINATOR | 1 | 15196 | 14632 | |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V | 9 | FA5C102W | 01121 | |
| C2 | Same as C1 | | | | |
| C3 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 2 | SM1000PFP | 91418 | |
| C4 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 3 | SM5000PFM | 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, INSULATED | 1 | SFU16 | 04013 | |
| FB1 | FERRITE BEAD | 4 | 56-590-65-4A | 02114 | |
| FB2 | Same as FB1 | | | | |

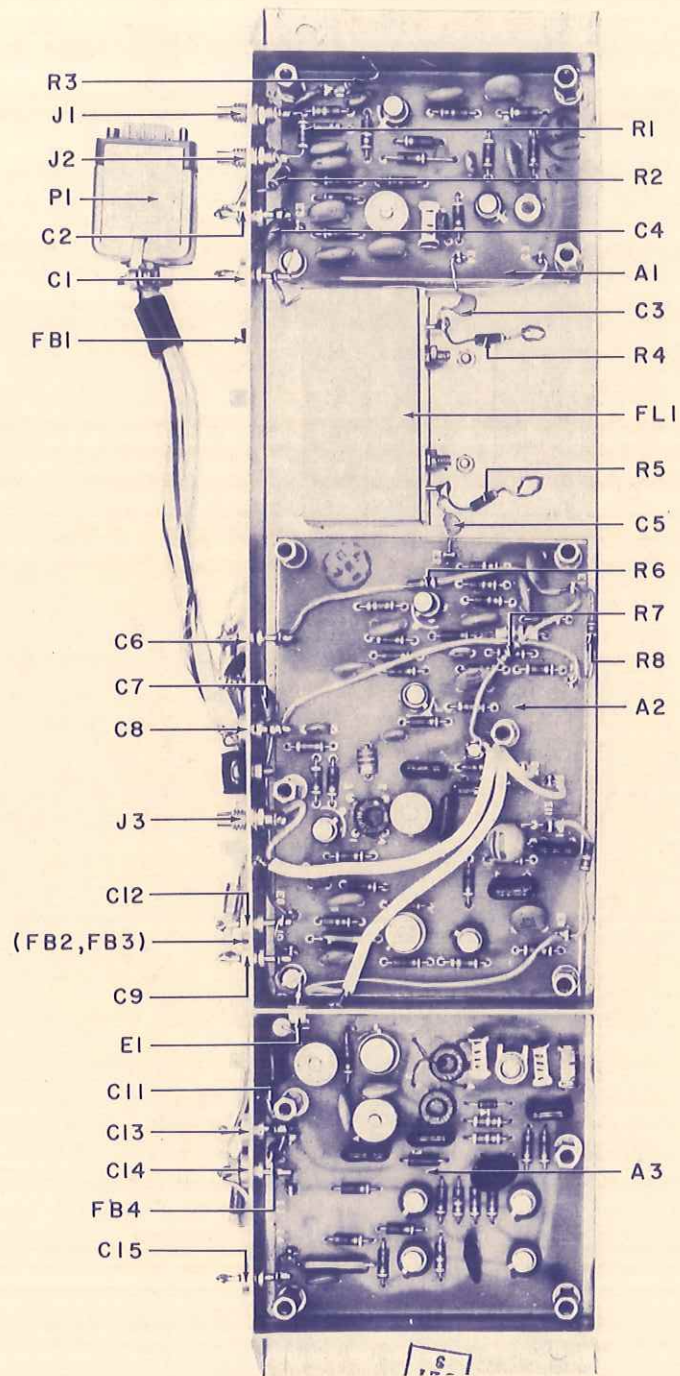


Figure 5-18. Type 72295 21.4 MHz IF Amplifier (A8),
Location of Components

REF DESIG PREFIX A8

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| FB3 | Same as FB1 | | | | |
| FB4 | Same as FB1 | | | | |
| FL1 | FILTER AND BANDPASS | 1 | 6063674 | 74306 | |
| J1 | CONNECTOR, RECEPTACLE | 3 | UG1464U | 80058 | 74868 |
| J2 | Same as J1 | | | | |
| J3 | Same as J1 | | | | |
| L1 | COIL, FIXED: 1.0 μ H, 10% | 1 | 1537-12 | 99800 | |
| MPI | COVER | 1 | 22369-1 | 14632 | |
| P1 | CONNECTOR, PLUG | 1 | SLE14FNSSH13 | 81312 | |
| R1 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 1 | RCR07G471JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 1 | RCR07G101JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 1 | RCR07G102JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 560 Ω , 5%, 1/4W | 1 | RCR07G561JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 1 | RCR07G153JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 30 k Ω , 5%, 1/4W | 1 | RCR07G303JS | 81349 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

5.4.8.1 Part 15295 IF Input Amplifier

REF DESIG PREFIX A&A1

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| C1 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 2 | SM1000PFP | 91418 | Courtesy of http://BlackRadios.terryo.org |
| C2 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 8 | SM5000PFM | 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: 1.0 pF, ± 0.25 pF, 500V | 1 | 301-000C0K0109C | 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: 1.0 μ H, 10% | 1 | 3641-12 | 71279 | |
| Q1 | TRANSISTOR | 1 | 3N140 | 80131 | 02735 |
| Q2 | TRANSISTOR | 1 | 2N2857 | 80131 | 02735 |
| R1 | RESISTOR, FIXED, COMPOSITION: 150 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 2 | RCR07G103JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 3 | RCR07G102JS | 81349 | 01121 |
| R4 | Same as R2 | | | | |
| R5 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 1 | RCR07G331JS | 81349 | 01121 |

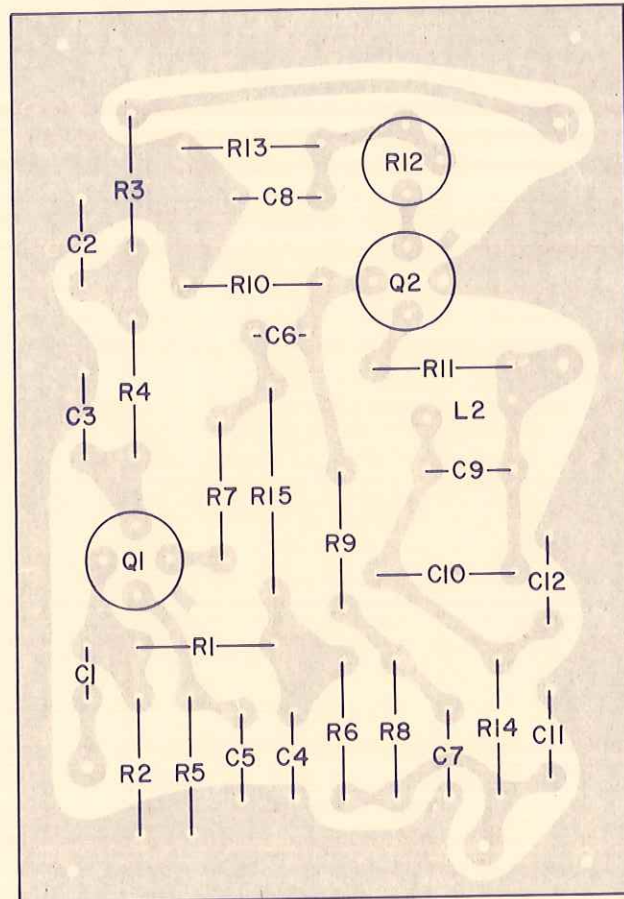


Figure 5-19. Part 15295 IF Input Amplifier (A8A1),
Location of Components

REF DESIG PREFIX A8A1

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R6 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 2 | RCR07G101JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 1 | RCR07G220JS | 81349 | 01121 |
| R8 | Same as R3 | | | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 1 | RCR07G153JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 1 | RCR07G472JS | 81349 | 01121 |
| R11 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R12 | RESISTOR, VARIABLE, FILM: 100 Ω , 10%, 1/2W | 1 | 62PR100 | 73138 | |
| R13 | RESISTOR, FIXED, COMPOSITION: 820 Ω , 5%, 1/4W | 1 | RCR07G821JS | 81349 | 01121 |
| R14 | Same as R6 | | | | |
| R15 | Same as R3 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

5.4.8.2 Part 15298 IF Output Amplifier

REF DESIG PREFIX A8A2

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-----------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| CR1 | DIODE | 1 | 5082-2800 | 28480 | Courtesy of http://BlackRadios.terryo.org |
| C1 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 7 | SM5000PPFM | 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 | SM1000PPFP | 91418 | |
| C7 | Same as C6 | | | | |
| C8 | Same as C1 | | | | |
| C9 | Same as C6 | | | | |
| C10 | CAPACITOR, COMPOSITION, TUBULAR: 0.68 pF, 10%, 500V | 1 | QC0.68PPFK | 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 | CM04ED270J03 | 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 | | | | |

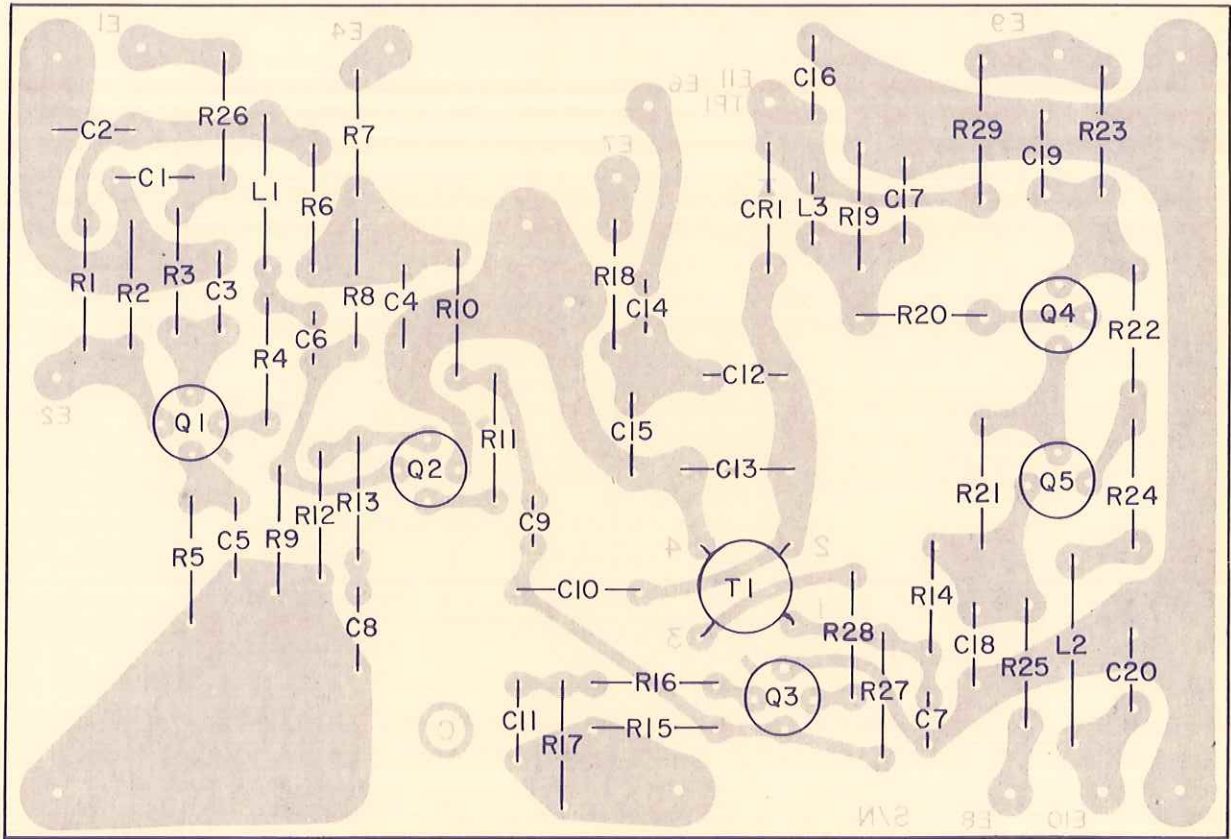


Figure 5-20. Part 15298 IF Output Amplifier (A8A2),
Location of Components

REF DESIG PREFIX A8A2

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| L1 | COIL, FIXED: 22 μ H, 10% | 1 | 1537-44 | 99800 | |
| L2 | INDUCTOR: 4.0 μ H, 10% | 1 | 1131-41 | 14632 | |
| L3 | COIL, FIXED: 22 MHz, 10% | 1 | 3635-53 | 71279 | |
| Q1 | TRANSISTOR | 1 | 3N140 | 80131 | 02735 |
| Q2 | TRANSISTOR | 1 | 2N3933 | 80131 | 02735 |
| Q3 | TRANSISTOR | 1 | 2N3478 | 80131 | 02735 |
| Q4 | TRANSISTOR | 1 | 2N3251 | 80131 | 04713 |
| Q5 | TRANSISTOR | 1 | 2N2270 | 80131 | 02735 |
| R1 | RESISTOR, FIXED, COMPOSITION: 150 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 5 | RCR07G103JS | 81349 | 01121 |
| R3 | Same as R2 | | | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 2 | RCR07G220JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 1 | RCR07G331JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 4 | RCR07G470JS | 81349 | 01121 |
| R7 | Same as R6 | | | | |
| R8 | Same as R2 | | | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 2 | RCR07G472JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 2 | RCR07G471JS | 81349 | 01121 |
| R11 | Same as R4 | | | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 820 Ω , 5%, 1/4W | 1 | RCR07G821JS | 81349 | 01121 |
| R13 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 3 | RCR07G100JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

REF DESIG PREFIX A8A2

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R14 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 1 | RCR07G101JS | 81349 | 01121 |
| R15 | Same as R9 | | | | |
| R16 | Same as R13 | | | | |
| R17 | Same as R10 | | | | |
| R18 | RESISTOR, FIXED, COMPOSITION: 2.7 Ω , 5%, 1/4W | 2 | RCR07G2R7JS | 81349 | 01121 |
| R19 | Same as R2 | | | | |
| R20 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RCR07G102JS | 81349 | 01121 |
| R21 | RESISTOR, FIXED, COMPOSITION: 2.4 k Ω , 5%, 1/4W | 1 | RCR07G242JS | 81349 | 01121 |
| R22 | RESISTOR, FIXED, COMPOSITION: 3.3 k Ω , 5%, 1/4W | 1 | RCR07G332JS | 81349 | 01121 |
| R23 | Same as R6 | | | | |
| R24 | Same as R13 | | | | |
| R25 | Same as R18 | | | | |
| R26 | Same as R20 | | | | |
| R27 | Same as R2 | | | | |
| R28 | Same as R6 | | | | |
| R29 | RESISTOR, FIXED, COMPOSITION: 1.0 M Ω , 5%, 1/4W | 1 | RCR07G105JS | 81349 | 01121 |
| T1 | TRANSFORMER, TOROIDAL | 1 | 21092-7 | 14632 | |

Courtesy of <http://BlackRadios.terryo.org>

5.4.8.3 Part 15196 FM Limiter/Discriminator

REF DESIG PREFIX A8A3

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|-----------|-----------------------------------------------------|---------------|-------------------------|-----------|--------------|
| CR1 | DIODE | 2 | 5082-2800 | 28480 | |
| CR2 | Same as CR1 | | | | |
| C1 | CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V | 1 | 538-011D9-35 | 72982 | |
| C2 | CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V | 1 | CM05ED330J03 | 81349 | 72136 |
| C3 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 2 | SM5000PFM | 91418 | |
| C4 | CAPACITOR, VARIABLE, CERAMIC: 2-8 pF, 350V | 1 | 538-011A2-8 | 72982 | |
| C5 | Same as C3 | | | | |
| C6 | CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V | 1 | CM05ED270J03 | 81349 | 72136 |
| C7 | CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V | 1 | CM05CD100D03 | 81349 | 72136 |
| C8 | CAPACITOR, VARIABLE, AIR: 1-10 pF, 250V | 1 | 6371 | 91293 | |
| C9 | CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±0.5 pF, 500V | 1 | 301-000C0H0100D | 72982 | |
| C10 | CAPACITOR, MICA, DIPPED: 22 pF, 5%, 500V | 1 | CM05ED220J03 | 81349 | 72136 |
| C11 | CAPACITOR, CERAMIC, DISC: 0.1 μF, -20+80%, 25V | 2 | DFJ3 | 73899 | |
| C12 | Same as C11 | | | | |
| C13 | CAPACITOR, CERAMIC, DISC: 0.01 μF, 20%, 100V | 1 | C023B101F103M | 56289 | |
| C14 | CAPACITOR, CERAMIC, TUBULAR: 10 pF, ±0.5 pF, 500V | 1 | 301-000S2H0-100D | 72982 | |
| C15 | CAPACITOR, CERAMIC, TUBULAR: 4.7 pF, ±0.25 pF, 500V | 1 | 301-000S2H0-479C | 72982 | |
| L1 | NOT USED | | | | |
| L2 | COIL, TOROIDAL | 1 | 20681-12 | 14632 | |
| L3 | INDUCTOR | 1 | 1131-37 | 14632 | |
| Q1 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |

Courtesy of <http://BlackRadios.terry.org>

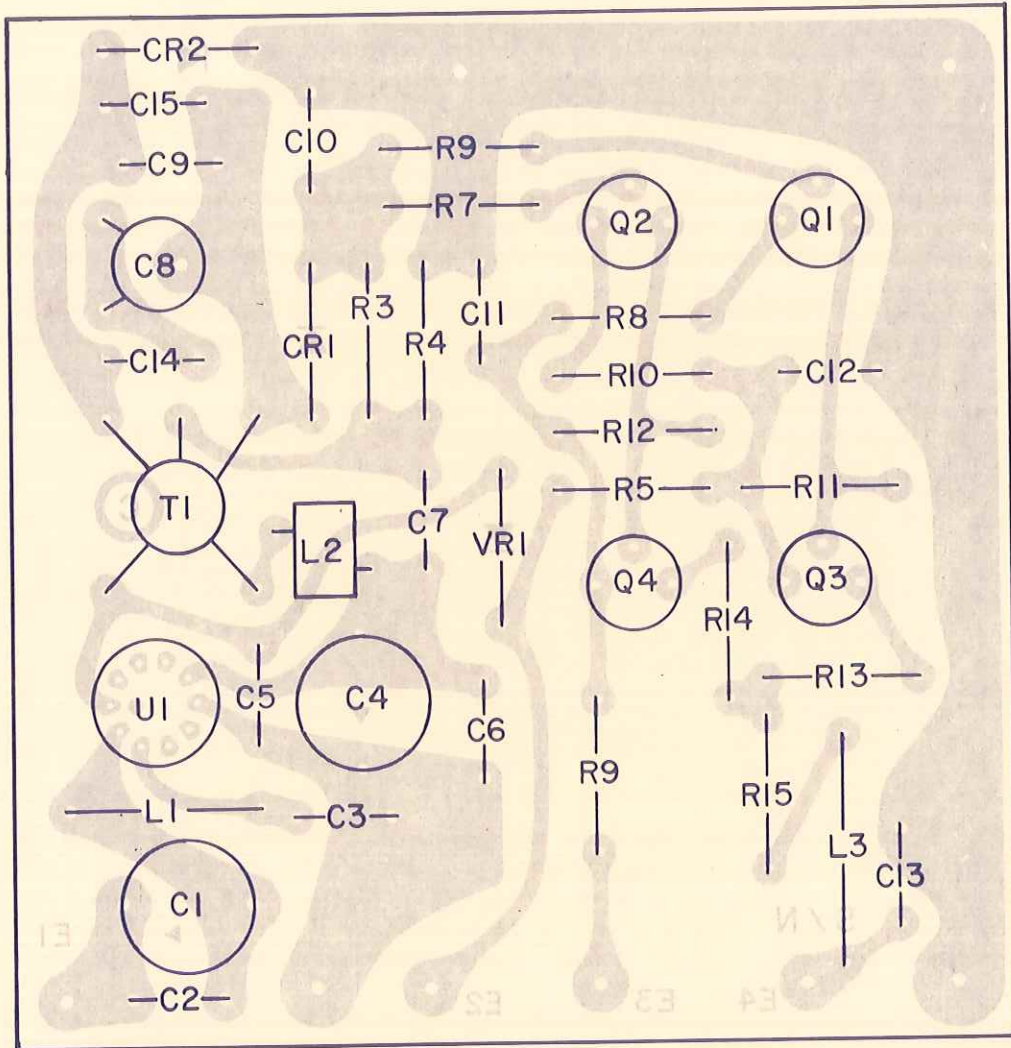


Figure 5-21. Part 15196 FM Limiter/Discriminator (A8A3),
Location of Components

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| Q2 | TRANSISTOR | 2 | 2N929 | 80131 | 04713 |
| Q3 | Same as Q2 | | | | |
| Q4 | Same as Q1 | | | | |
| R1 | NOT USED | | | | |
| R2 | NOT USED | | | | |
| R3 | RESISTOR, FIXED, COMPOSITION: 47 k Ω , 5%, 1/4W | 2 | RCR07G473JS | 81349 | 01121 |
| R4 | Same as R3 | | | | |
| R5 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 4 | RCR07G220JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RCR07G102JS | 81349 | 01121 |
| R7 | Same as R6 | | | | |
| R8 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 2 | RCR07G101JS | 81349 | 01121 |
| R9 | Same as R5 | | | | |
| R10 | Same as R8 | | | | |
| R11 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 2 | RCR07G103JS | 81349 | 01121 |
| R12 | Same as R11 | | | | |
| R13 | Same as R5 | | | | |
| R14 | Same as R5 | | | | |
| R15 | RESISTOR, FIXED, COMPOSITION: 82 Ω , 5%, 1/4W | 1 | RCR07G820JS | 81349 | 01121 |
| R16 | RESISTOR, FIXED, COMPOSITION: 51 Ω , 5%, 1/4W | 1 | RCR07G510JS | 81349 | 01121 |
| T1 | TRANSFORMER, TOROIDAL | 1 | 21427-15 | 14632 | |
| U1 | INTEGRATED CIRCUIT | 1 | U5F7719393 | 07263 | |

REF DESIG PREFIX A8A3

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------|---------------------|----------------------------|--------------|-----------------|
| VR1 | DIODE, ZENER | 1 | 1N746A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terryo.org>

5.4.9 Type 7361 Video Amplifier

REF DESIG PREFIX A9

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| CR1 | DIODE | 3 | 1N4446 | 80131 | 93332 |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| C1 | CAPACITOR, ELECTROLYTIC, TANTALUM: 15 μ F, 10%, 20V | 1 | CS13BE156K | 81349 | 56289 |
| C2 | CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μ F, 10%, 20V | 2 | CS13BE476K | 81349 | 56289 |
| C3 | CAPACITOR, COMPOSITION, TUBULAR: 0.12 pF, 10%, 500V | 1 | QC0.12PFK | 95121 | |
| C4 | Same as C2 | | | | |
| L1 | COIL, FIXED: 0.68 μ H, 15% | 1 | 203-11 | 99848 | |
| Q1 | TRANSISTOR | 1 | 2N3423 | 80131 | 02735 |
| Q2 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |
| Q3 | TRANSISTOR | 1 | 2N2222A | 80131 | 04713 |
| Q4 | Same as Q2 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R2* | RESISTOR, FIXED, COMPOSITION: 22 M Ω , 5%, 1/4W | 1 | RCR07G226JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 1.1 k Ω , 5%, 1/4W | 1 | RCR07G112JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 470 Ω , 5%, 1/4W | 2 | RCR07G471JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 2 | RCR07G220JS | 81349 | 01121 |
| R6 | Same as R4 | | | | |
| R7 | Same as R5 | | | | |
| R8 | RESISTOR, FIXED, COMPOSITION: 1.5 k Ω , 5%, 1/4W | 1 | RCR07G152JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, FILM: 1.1 k Ω , 1%, 1/4W | 1 | RN60D1101F | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

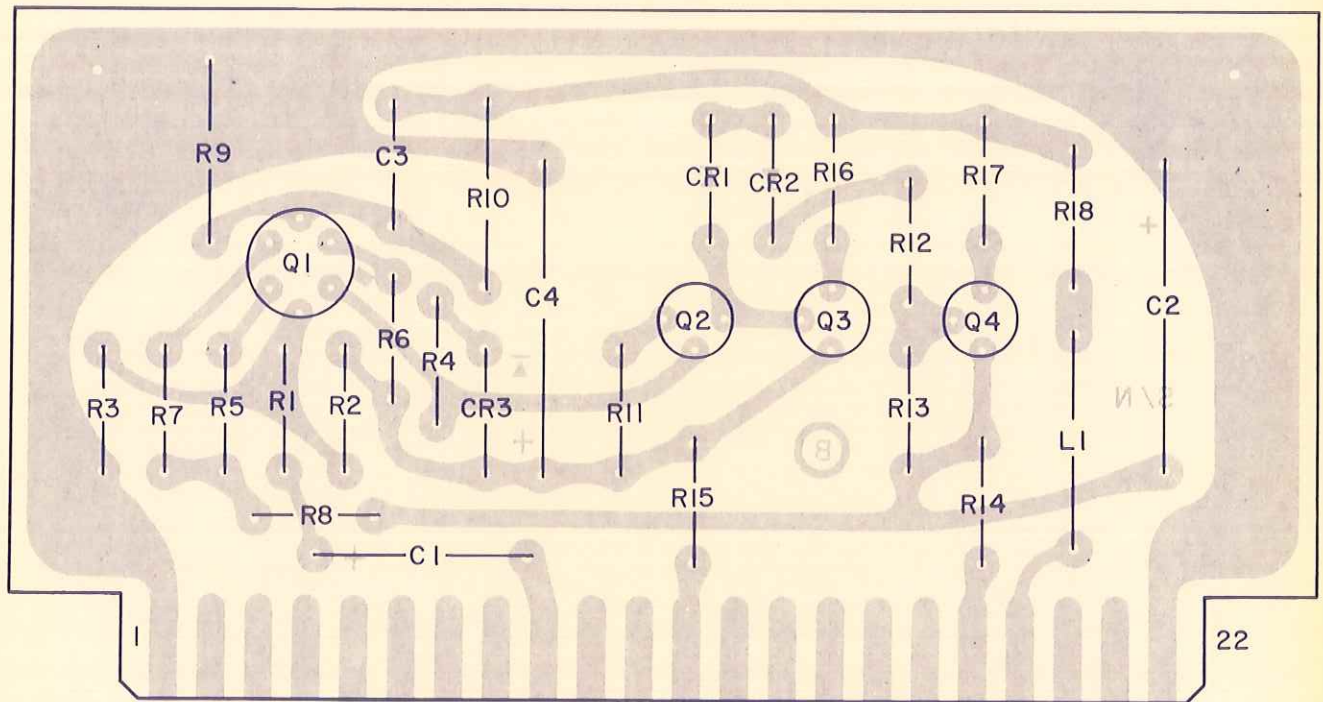


Figure 5-22. Type 7361 Video Amplifier (A9),
Location of Components

REF DESIG PREFIX A9

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R10 | RESISTOR, FIXED, FILM: 21.5 k Ω , 1%, 1/4W | 1 | RN60D2152F | 81349 | 75042 |
| R11 | RESISTOR, FIXED, COMPOSITION: 200 Ω , 5%, 1/4W | 1 | RCR07G204JS | 81349 | 01121 |
| R12 | RESISTOR, FIXED, COMPOSITION: 2.7 Ω , 5%, 1/4W | 1 | RCR07G2R7JS | 81349 | 01121 |
| R13 | RESISTOR, FIXED, COMPOSITION: 1.2 k Ω , 5%, 1/4W | 1 | RCR07G122JS | 81349 | 01121 |
| R14 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 2 | RCR07G100JS | 81349 | 01121 |
| R15 | Same as R14 | | | | |
| R16 | RESISTOR, FIXED, COMPOSITION: 27 Ω , 5%, 1/4W | 2 | RCR07G270JS | 81349 | 01121 |
| R17 | Same as R16 | | | | |
| R18 | RESISTOR, FIXED, COMPOSITION: 91 Ω , 5%, 1/4W | 1 | RCR07G910JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

5.4.10 Type 7866 AGC Amplifier

REF DESIG PREFIX A10

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|-----------|----------------------------------------------------------|---------------|-------------------------|-----------|--------------|
| CR1 | DIODE | 1 | 1N4446 | 80131 | 93332 |
| CR2 | DIODE | 3 | 1N462A | 80131 | 93332 |
| CR3 | Same as CR2 | | | | |
| CR4 | Same as CR2 | | | | |
| C1 | CAPACITOR, CERAMIC, DISC: 0.01 μ F, 20%, 100V | 1 | C023B101F103M | 56289 | 56289 |
| C2 | CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μ F, 10%, 35V | 3 | CS13BF105K | 81349 | 56289 |
| C3 | CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μ F, 10%, 35V | 1 | CS13BF225K | 81349 | 56289 |
| C4 | Same as C2 | | | | |
| C5 | CAPACITOR, ELECTROLYTIC, TANTALUM: 47 μ F, 10%, 35V | 1 | CS13BF476K | 81349 | 56289 |
| C6 | Same as C2 | | | | |
| Q1 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |
| Q2 | TRANSISTOR | 4 | 2N2222A | 80131 | 04713 |
| Q3 | Same as Q1 | | | | |
| Q4 | Same as Q2 | | | | |
| Q5 | Same as Q2 | | | | |
| Q6 | Same as Q2 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 3 | RCR07G102JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 4 | RCR07G103JS | 81349 | 01121 |
| R3 | Same as R2 | | | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 270 k Ω , 5%, 1/4W | 1 | RCR07G274JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 560 Ω , 5%, 1/4W | 1 | RCR07G561JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

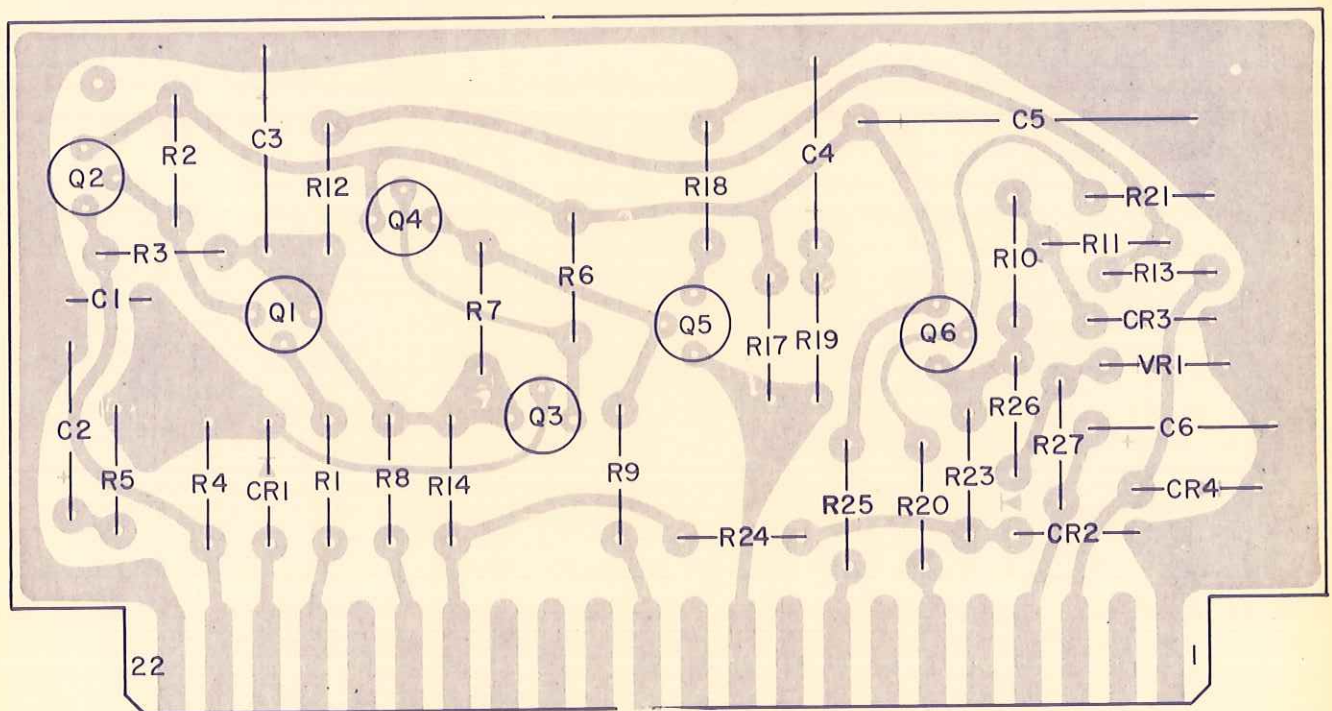


Figure 5-23. Type 7866 AGC Amplifier (A10),
Location of Components

REF DESIG PREFIX A10

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R6 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |
| R7 | Same as R2 | | | | |
| R8 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 2 | RCR07G101JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, COMPOSITION: 33 k Ω , 5%, 1/4W | 1 | RCR07G333JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 2 | RCR07G472JS | 81349 | 01121 |
| R11 | RESISTOR, FIXED, COMPOSITION: 39 k Ω , 5%, 1/4W | 3 | RCR07G393JS | 81349 | 01121 |
| R12 | RESISTOR, FIXED, COMPOSITION: 51 k Ω , 5%, 1/4W | 1 | RCR07G513JS | 81349 | 01121 |
| R13 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 1 | RCR07G102JS | 81349 | 01121 |
| R14 | RESISTOR, FIXED, COMPOSITION: 47 k Ω , 5%, 1/4W | 1 | RCR07G473JS | 81349 | 01121 |
| R15 | NOT USED | | | | |
| R16 | NOT USED | | | | |
| R17 | Same as R2 | | | | |
| R18 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 1 | RCR07G331JS | 81349 | 01121 |
| R19 | RESISTOR, FIXED, COMPOSITION: 2.0 k Ω , 5%, 1/4W | 1 | RCR07G202JS | 81349 | 01121 |
| R20 | Same as R1 | | | | |
| R21 | RESISTOR, FIXED, COMPOSITION: 10 M Ω , 5%, 1/4W | 1 | RCR07G106JS | 81349 | 01121 |
| R22 | NOT USED | | | | |
| R23 | Same as R10 | | | | |
| R24 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 1 | RCR07G153JS | 81349 | 01121 |
| R25 | Same as R8 | | | | |
| R26 | RESISTOR, FIXED, COMPOSITION: 3.9 k Ω , 5%, 1/4W | 1 | RCR07G392JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A10

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------|---------------------|----------------------------|--------------|-----------------|
| R27 VR1 | Same as R1 DIODE, ZENER | 1 | IN756A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terry.org>

5.4.11 Type 7444 Audio Amplifier

REF DESIG PREFIX ALL

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|-----------|----------------------------------------------------------|---------------|-------------------------|-----------|--------------|
| CR1 | DIODE | 1 | 1N4446 | 80131 | 93332 |
| CR2 | DIODE | 4 | 1N462A | 80131 | 93332 |
| CR3 | Same as CR2 | | | | |
| CR4 | Same as CR2 | | | | |
| CR5 | Same as CR2 | | | | |
| C1 | CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μ F, 10%, 35V | 1 | CS13BF105K | 81349 | 56289 |
| C2 | CAPACITOR, CERAMIC, DISC: 0.01 μ F, 20%, 100V | 1 | C023B101F103M | 56289 | 56289 |
| C3 | CAPACITOR, ELECTROLYTIC, TANTALUM: 2.2 μ F, 10%, 35V | 2 | CS13BF225K | 81349 | 56289 |
| C4 | Same as C3 | | | | |
| C5 | CAPACITOR, ELECTROLYTIC, TANTALUM: 22 μ F, 10%, 15V | 1 | CS13BD226K | 81349 | 56289 |
| C6 | CAPACITOR, ELECTROLYTIC, TANTALUM: 100 μ F, 10%, 20V | 1 | CS13BE107K | 81349 | 56289 |
| Q1 | TRANSISTOR | 3 | 2N929 | 80131 | 04713 |
| Q2 | Same as Q1 | | | | |
| Q3 | Same as Q1 | | | | |
| Q4 | TRANSISTOR | 1 | 2N3251 | 80131 | 04713 |
| Q5 | TRANSISTOR | 1 | 2N2270 | 80131 | 02735 |
| Q6 | TRANSISTOR | 1 | 2N4037 | 80131 | 02735 |
| R1 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RCR07G102JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 43 k Ω , 5%, 1/4W | 1 | RCR07G433JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 5 | RCR07G101JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

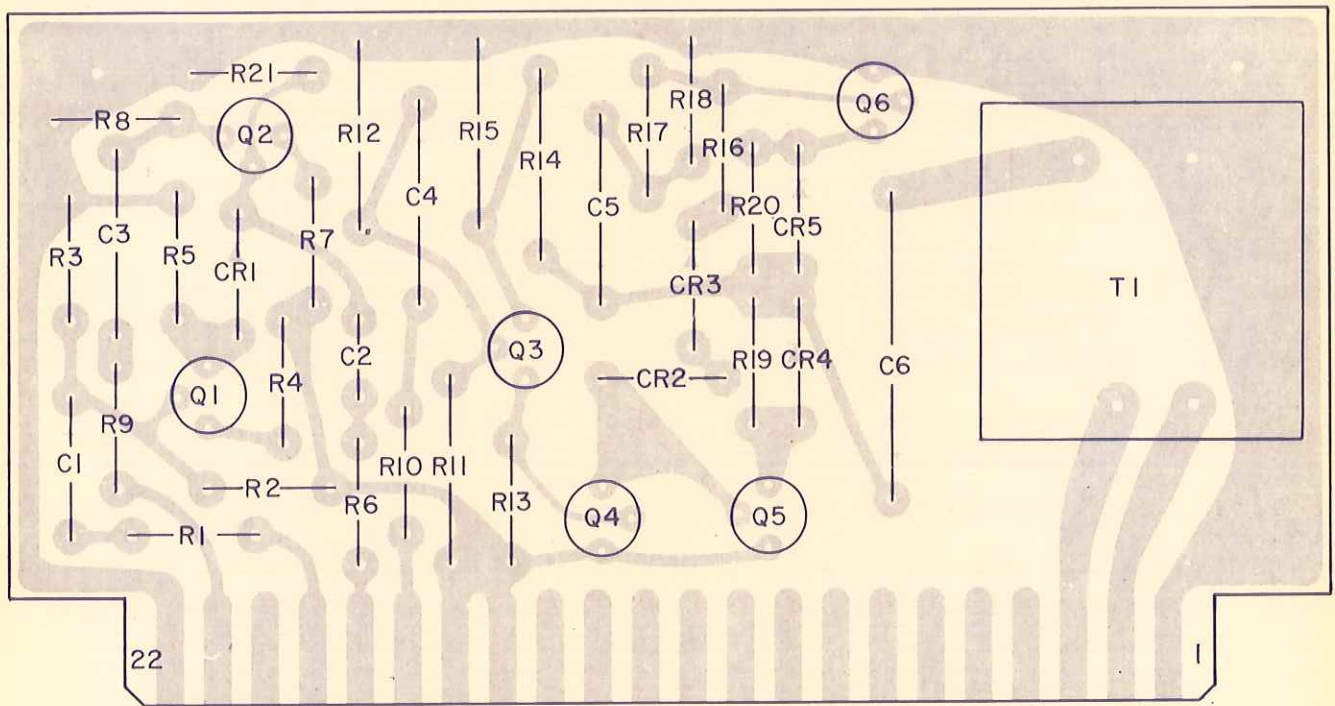


Figure 5-24. Type 7444 Audio Amplifier (A11),
Location of Components

REF DESIG PREFIX ALL

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R5 | RESISTOR, FIXED, COMPOSITION: 3.9 k Ω , 5%, 1/4W | 2 | RCR07G392JS | 81349 | 01121 |
| 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 k Ω , 1%, 1/4W | 1 | RN60D3013F | 81349 | 75042 |
| R12 | FERRITE CORE: 13.7 k Ω , 1%, 1/4W | 1 | RN60D1372F | 81349 | 75042 |
| R13 | RESISTOR, FIXED, COMPOSITION: 2.0 k Ω , 5%, 1/4W | 1 | RCR07G202JS | 81349 | 01121 |
| R14 | RESISTOR, FIXED, FILM: 20.0 k Ω , 1%, 1/4W | 1 | RN60D2002F | 81349 | 75042 |
| R15 | RESISTOR, FIXED, FILM: 562 Ω , 1%, 1/4W | 1 | RN60D5620F | 81349 | 75042 |
| R16 | Same as R4 | | | | |
| R17 | RESISTOR, FIXED, COMPOSITION: 1.5 k Ω , 5%, 1/4W | 2 | RCR07G152JS | 81349 | 01121 |
| R18 | Same as R17 | | | | |
| R19 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 2 | RCR07G470JS | 81349 | 01121 |
| R20 | Same as R19 | | | | |
| R21 | RESISTOR, FIXED, COMPOSITION: 2.7 M Ω , 5%, 1/4W | 1 | RCR07G275JS | 81349 | 01121 |
| T1 | TRANSFORMER | 1 | I3335 | I4632 | |

Courtesy of <http://BlackRadios.terry.org>

5.4.12 Type 79973 AFC Amplifier

REF DESIG PREFIX A12

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R1 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 2 | RCR07G104JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 51 k Ω , 5%, 1/4W | 1 | RCR07G513JS | 81349 | 01121 |
| R3 | Same as R1 | | | | |
| R4 | RESISTOR, VARIABLE, FILM: 10 k Ω , 10%, 3/4W | 1 | 89PR10K | 73138 | |
| U1 | INTEGRATED CIRCUIT | 1 | U5B7741393 | 07263 | |

Courtesy of <http://BlackRadios.terry.org>

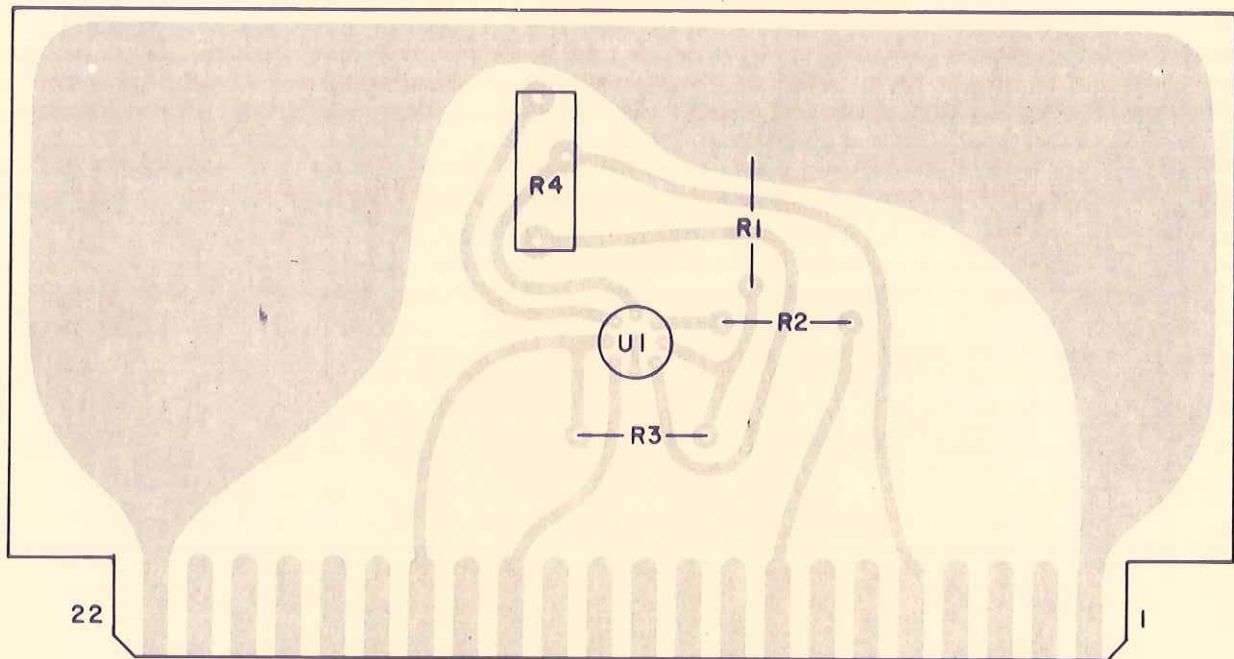


Figure 5-25. Type 79973 AFC Amplifier (A12),
Location of Components

5.4.13 Type 72301 21.4 MHz IF Amplifier

REF DESIG PREFIX A13 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|-----------|--------------------------------------------------|---------------|-------------------------|-----------|---------------------------------------------------------------------------------------|
| A1 | 21.4 MHz IF AMPLIFIER | 1 | 21974 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| A2 | 21.4 MHz FM LIMITER/DISCRIMINATOR | 1 | 16613 | 14632 | |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V | 8 | FA5C102W | 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 | FA5C4712 | 01121 | |
| C8 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 2 | SM5000PFM | 91418 | |
| C9 | Same as C1 | | | | |
| C10 | Same as C8 | | | | |
| C11 | Same as C1 | | | | |
| C12 | Same as C7 | | | | |
| C13 | Same as C7 | | | | |
| E1 | TERMINAL, FEEDTHRU, INSULATED | 1 | SFU16 | 04013 | |
| FB1 | FERRITE BEAD | 2 | 56-590-65-4A | 02114 | |
| FB2 | Same as FB1 | | | | |
| J1 | CONNECTOR, RECEPTACLE | 3 | UG1464U | 80058 | 74868 |
| J2 | Same as J1 | | | | |
| J3 | Same as J1 | | | | |

REF DESIG PREFIX A13 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| MP1 | COVER | 1 | 22370-1 | 14632 | |
| P1 | CONNECTOR, PLUG | 1 | SLE14PNSSH13 | 81312 | |
| R1 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 30 k Ω , 5%, 1/4W | 1 | RCR07G303JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 1 | RCR07G153JS | 81349 | 01121 |
| R4 | NOT USED | | | | |
| R5 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 1 | RCR07G220JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

5.4.13.1 Part 21974 21.4 MHz IF Amplifier

REF DESIG PREFIX A13A1 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| CR1 | DIODE | 4 | 1N4446 | 80131 | 93332 |
| 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 | 93332 |
| C1 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 8 | SM1000PFP | 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 | 72136 |
| C14 | NOT USED | | | | |

Courtesy of <http://BlackRadios.terryo.org>

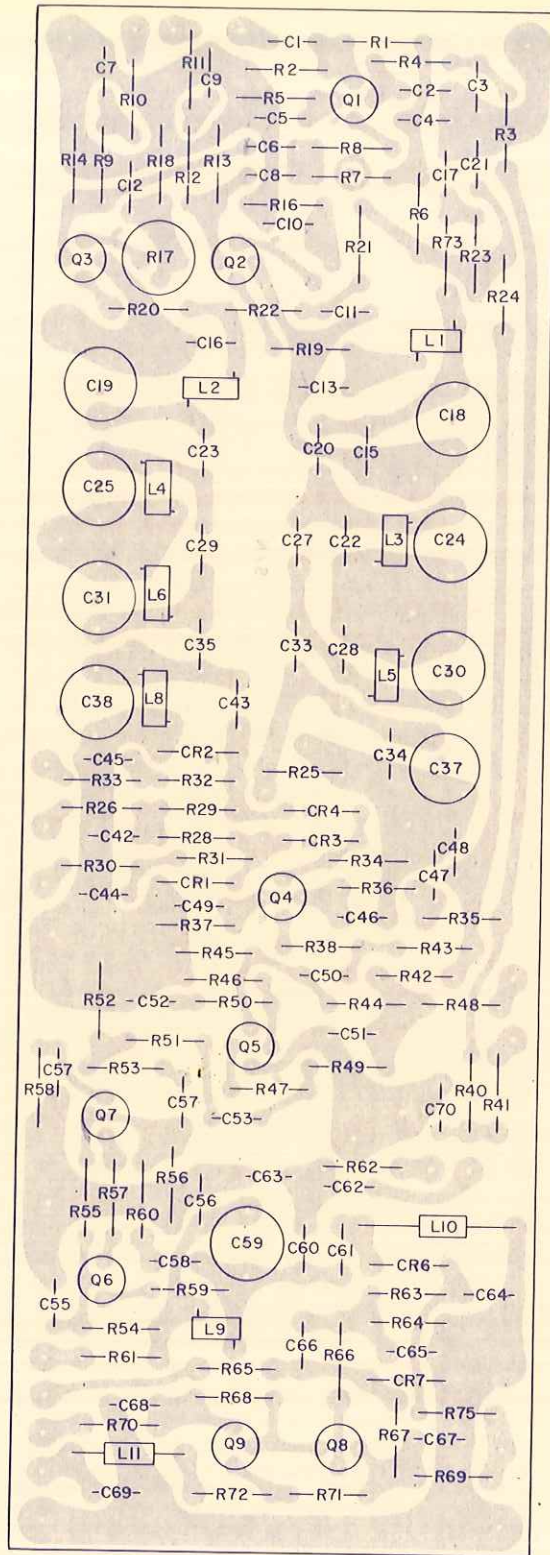


Figure 5-27. Part 21974 21.4 MHz IF Amplifier (A13A1), (DM-112 only)
Location of Components

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C15 | CAPACITOR, MICA, DIPPED: 43 pF, 5%, 500V | 1 | CM05ED430J03 | 81349 | 72136 |
| C16 | CAPACITOR, CERAMIC, TUBULAR: 10 pF, ± 0.5 pF, 500V | 1 | 301-000C0H0100D | 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 | DV11PS18A | 72982 | |
| C20 | CAPACITOR, CERAMIC, TUBULAR: 1.5 pF, ± 0.1 pF, 500V | 4 | 301-000C0K0159B | 72982 | |
| C21 | Same as C2 | | | | |
| C22 | CAPACITOR, MICA, DIPPED: 18 pF, 5%, 500V | 2 | CM05CD180J03 | 81349 | 72136 |
| C23 | CAPACITOR, CERAMIC, TUBULAR: 1.2 pF, ± 0.1 pF, 500V | 1 | 301-000C0K0129B | 72982 | |
| C24 | Same as C18 | | | | |
| C25 | Same as C19 | | | | |
| C26 | NOT USED | | | | |
| C27 | CAPACITOR, CERAMIC, TUBULAR: 2.0 pF, ± 0.25 pF, 500V | 1 | 301-000C0K0209C | 72982 | |
| C28 | Same as C22 | | | | |
| C29 | Same as C20 | | | | |
| C30 | Same as C18 | | | | |
| C31 | Same as C19 | | | | |
| C32 | NOT USED | | | | |
| C33 | Same as C20 | | | | |
| C34 | CAPACITOR, MICA, DIPPED: 10 pF, ± 0.5 pF, 500V | 1 | CM05CD100D03 | 81349 | 72136 |
| C35 | Same as C20 | | | | |

Courtesy of <http://BlackRadios.terry.org>

REF DESIG PREFIX A13A1 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| C36 | NOT USED | | | | Courtesy of http://BlackRadios.terryo.org |
| 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 | | | | |
| 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 | | | | |

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| 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 | 301-000C0H0689D | 72982 | |
| C61 | Same as C1 | | | | |
| C62 | CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V | 1 | CM04ED270J03 | 81349 | 72136 |
| C63 | CAPACITOR, MICA, DIPPED: 68 pF, 5%, 500V | 1 | CM05ED680J03 | 81349 | 72136 |
| C64 | CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V | 1 | CM05ED330J03 | 81349 | 72136 |
| C65 | CAPACITOR, MICA, DIPPED: 39 pF, 5%, 500V | 2 | CM05ED390J03 | 81349 | 72136 |
| C66 | Same as C65 | | | | |
| C67 | CAPACITOR, CERAMIC, DISC: 0.01 μ F, 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 | | | | |
| L1 | COIL, TOROIDAL | 1 | 20681-17 | 14632 | |
| L2 | COIL, TOROIDAL | 1 | 20681-69 | 14632 | |
| L3 | COIL, TOROIDAL | 3 | 20681-26 | 14632 | |
| L4 | COIL, TOROIDAL | 3 | 20681-54 | 14632 | |
| L5 | Same as L3 | | | | |
| L6 | Same as L4 | | | | |
| L7 | Same as L3 | | | | |

Courtesy of <http://BlackRadios.terry.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| L8 | Same as L4 | 1 | 20681-65 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| L9 | COIL, TOROIDAL | 1 | 1131-37 | 14632 | |
| L10 | INDUCTOR | 1 | 1131-15 | 14632 | |
| L11 | INDUCTOR | 1 | 3N140 | 80131 | |
| Q1 | TRANSISTOR | 2 | 2N2857 | 80131 | |
| Q2 | TRANSISTOR | 3 | | | |
| 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 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | |
| R2 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 5 | RCR07G103JS | 81349 | |
| R3 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 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 | |

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R9 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 3 | RCR07G153JS | 81349 | 01121 |
| R10 | Same as R3 | | | | |
| R11 | Same as R3 | | | | |
| R12 | Same as R9 | | | | |
| R13 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 3 | RCR07G472JS | 81349 | 01121 |
| R14 | Same as R13 | | | | |
| R15 | RESISTOR, VARIABLE, FILM: 500 Ω , 10%, 1/2W | 2 | 62PR500 | 73138 | |
| R16 | RESISTOR, FIXED, COMPOSITION: 2.0 k Ω , 5%, 1/4W | 2 | RCR07G202JS | 81349 | 01121 |
| R17 | Same as R15 | | | | |
| R18 | Same as R16 | | | | |
| R19 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 9 | RCR07G470JS | 81349 | 01121 |
| 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 k Ω , 5%, 1/4W | 2 | RCR07G332JS | 81349 | 01121 |
| R26 | Same as R3 | | | | |
| R27 | NOT USED | | | | |
| R28 | RESISTOR, FIXED, COMPOSITION: 33 k Ω , 5%, 1/4W | 2 | RCR07G333JS | 81349 | 01121 |
| R29 | Same as R28 | | | | |

Courtesy of <http://BlackRadios.terry.org>

REF DESIG PREFIX A13A1 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R30 | Same as R3 | 3 | RCR07G273JS | 81349 | 01121 |
| R31 | RESISTOR, FIXED, COMPOSITION: 27 k Ω , 5%, 1/4W | | | | |
| R32 | Same as R31 | | | | |
| R33 | Same as R3 | | | | |
| R34 | Same as R2 | | | | |
| R35 | Same as R3 | | | | |
| R36 | Same as R2 | | | | |
| R37 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 1 | RCR07G331JS | 81349 | 01121 |
| R38 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 3 | RCR07G220JS | 81349 | 01121 |
| R39 | NOT USED | | | | |
| R40 | RESISTOR, FIXED, COMPOSITION: 2.7 k Ω , 5%, 1/4W | 1 | RCR07G272JS | 81349 | 01121 |
| R41 | Same as R13 | | | | |
| R42 | Same as R19 | | | | |
| R43 | Same as R7 | | | | |
| R44 | Same as R2 | | | | |
| R45 | Same as R13 | | | | |
| R46 | RESISTOR, FIXED, COMPOSITION: 820 Ω , 5%, 1/4W | 1 | RCR07G821JS | 81349 | 01121 |
| R47 | Same as R38 | | | | |
| R48 | Same as R19 | | | | |
| R49 | Same as R7 | | | | |
| R50 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 2 | RCR07G100JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A13A1 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R51 | Same as R38 | | | | |
| R52 | RESISTOR, FIXED, COMPOSITION: 150 Ω , 5%, 1/4W | 1 | RCR07G151JS | 81349 | 01121 |
| R53 | RESISTOR, FIXED, COMPOSITION: 33 Ω , 5%, 1/4W | 1 | RCR07G330JS | 81349 | 01121 |
| R54 | Same as R9 | | | | |
| R55 | RESISTOR, FIXED, COMPOSITION: 6.8 k Ω , 5%, 1/4W | 1 | RCR07G682JS | 81349 | 01121 |
| R56 | Same as R13 | | | | |
| R57 | Same as R19 | | | | |
| R58 | RESISTOR, FIXED, COMPOSITION: 270 Ω , 5%, 1/4W | 1 | RCR07G271JS | 81349 | 01121 |
| R59 | Same as R19 | | | | |
| R60 | Same as R9 | | | | |
| R61 | Same as R6 | | | | |
| R62 | Same as R19 | | | | |
| R63 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 2 | RCR07G222JS | 81349 | 01121 |
| R64 | Same as R63 | | | | |
| R65 | Same as R31 | | | | |
| R66 | Same as R3 | | | | |
| R67 | RESISTOR, FIXED, COMPOSITION: 56 k Ω , 5%, 1/4W | 1 | RCR07G563JS | 81349 | 01121 |
| R68 | RESISTOR, FIXED, COMPOSITION: 2.4 k Ω , 5%, 1/4W | 1 | RCR07G242JS | 81349 | 01121 |
| R69 | Same as R19 | | | | |
| R70 | Same as R19 | | | | |
| R71 | Same as R25 | | | | |

Courtesy of <http://BlackRadios.terry.org>

REF DESIG PREFIX A13A1 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R72 | Same as R50 | 1 | RCR07G182JS | 81349 | 01121 |
| R73 | RESISTOR, FIXED, COMPOSITION: 1.8 k Ω , 5%, 1/4W | 1 | RCR07G182JS | 81349 | 01121 |
| R74 | NOT USED | | | | |
| R75 | RESISTOR, FIXED, COMPOSITION: 1.0 M Ω , 5%, 1/4W | 1 | RCR07G105JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

5.4.13.2 Part 16613 21.4 MHz FM Limiter/Discriminator

REF DESIG PREFIX A13A2 (DM-112 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| CR1 | DIODE | 2 | 5082-2800 | 28480 | Courtesy of http://BlackRadios.terryo.org |
| CR2 | Same as CR1 | | | | |
| C1 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 2 | SM1000PFP | 91418 | |
| C2 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V | 3 | C023B101E502M | 56289 | |
| C3 | CAPACITOR, CERAMIC, DISC: 0.05 μ F, -20+80%, 25V | 1 | DFJ1 | 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, \pm 0.1 pF, 500V | 1 | 301-000C0J0339B | 72982 | |
| C9 | CAPACITOR, VARIABLE, CERAMIC: 2.5-11 pF, 350V | 4 | 538-011-B2.5-11 | 72982 | |
| C10 | CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V | 1 | CM05FD101J03 | 81349 | |
| C11 | Same as C9 | | | | |
| C12 | CAPACITOR, MICA, DIPPED: 10 pF, \pm 0.5 pF, 500V | 3 | CM05CD100D03 | 81349 | |
| C13 | Same as C12 | | | | |
| C14 | Same as C12 | | | | |
| C15 | CAPACITOR, CERAMIC, DISC: 0.1 μ F, -20+80%, 25V | 2 | DFJ3 | 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 | | | | |

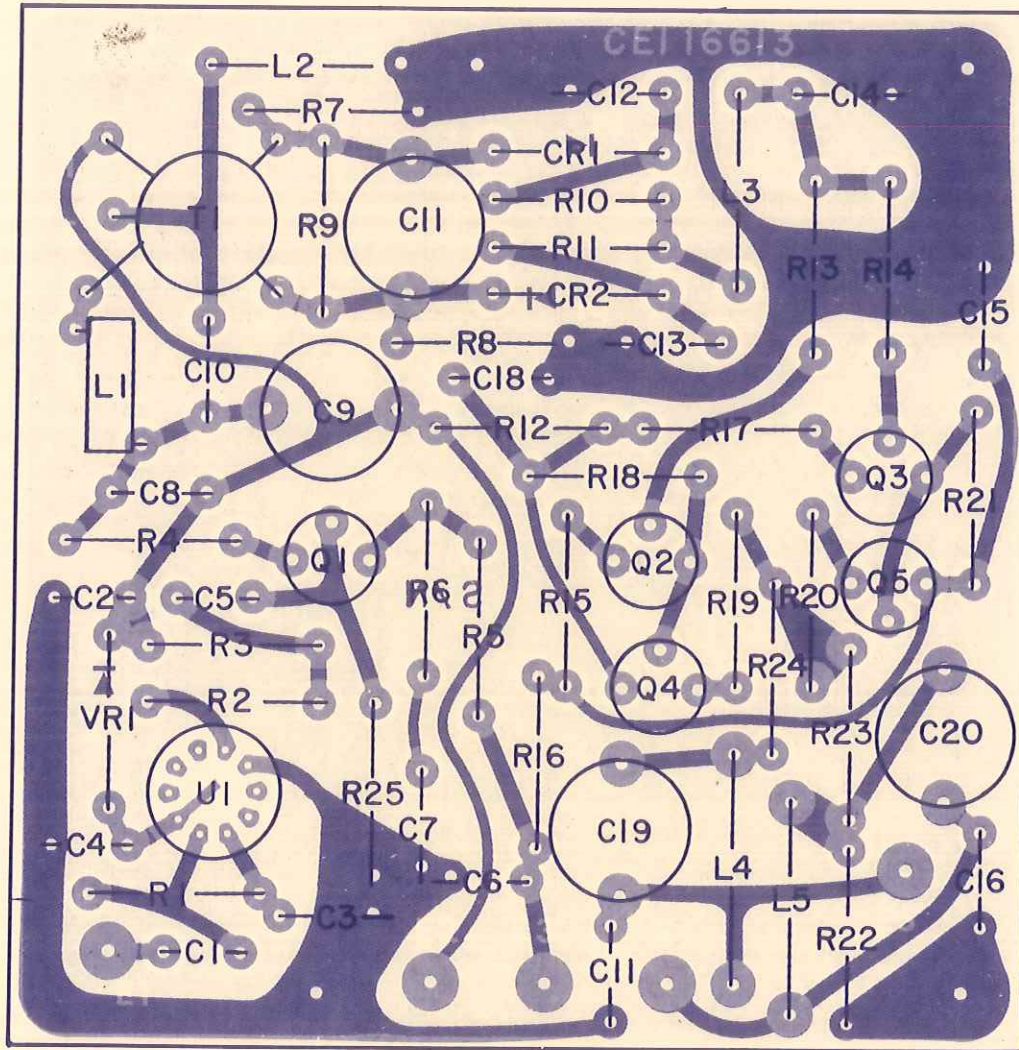


Figure 5-28. Part 16613 21.4 MHz FM Limiter/Discriminator (A13A2), (DM-112 only), Location of Components

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C20 | Same as C9 | | | | |
| L1 | COIL, TOROIDAL | 1 | 20681-70 | 14632 | |
| L2 | COIL, FIXED: 18 μ H, 10% | 1 | 1537-42 | 99800 | |
| L3 | COIL, FIXED: 200 μ H, 5% | 1 | 1537-90 | 99800 | |
| L4 | COIL, FIXED | 1 | 1131-40 | 14632 | |
| L5 | COIL, FIXED: 5.6 μ H, 10% | 1 | 1537-30 | 99800 | |
| Q1 | TRANSISTOR | 1 | 2N5109 | 80131 | 02735 |
| Q2 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |
| Q3 | TRANSISTOR | 2 | 2N929 | 80131 | 04713 |
| Q4 | Same as Q3 | | | | |
| Q5 | Same as Q2 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 220 Ω , 5%, 1/4W | 4 | RCR07G221JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R3 | Same as R1 | | | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 3 | RCR07G101JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 910 Ω , 5%, 1/4W | 1 | RCR07G911JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 6.2 Ω , 5%, 1/4W | 1 | RCR07G6R2JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 470 k Ω , 5%, 1/4W | 1 | RCR07G474JS | 81349 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 36 k Ω , 5%, 1/4W | 1 | RCR07G363JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, COMPOSITION: 12 k Ω , 5%, 1/4W | 1 | RCR07G123JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 2 | RCR07G472JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R11 | Same as R10 | | | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 4 | RCR07G220JS | 81349 | 01121 |
| R13 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RCR07G102JS | 81349 | 01121 |
| R14 | Same as R13 | | | | |
| R15 | Same as R4 | | | | |
| R16 | Same as R12 | | | | |
| R17 | Same as R4 | | | | |
| R18 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 2 | RCR07G103JS | 81349 | 01121 |
| 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 | 01121 |
| R25 | Same as R24 | | | | |
| T1 | TRANSFORMER, TOROIDAL | 1 | 21427-18 | 14632 | |
| U1 | INTEGRATED CIRCUIT | 1 | U5F7719393 | 07263 | |
| VR1 | DIODE, ZENER | 1 | 1N749A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terryo.org>

5.4.14 Type 72299 21.4 MHz IF Amplifier

REF DESIG PREFIX A13 (DM-112-1 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | 21.4 MHz IF AMPLIFIER | 1 | 21954 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| A2 | 21.4 MHz FM LIMITER | 1 | 15170 | 14632 | |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pF, GMV, 500V | 8 | FA5C102W | 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 | FA5C4712 | 01121 | |
| C8 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 2 | SM5000PFM | 91418 | |
| C9 | Same as C1 | | | | |
| C10 | Same as C8 | | | | |
| C11 | Same as C1 | | | | |
| C12 | Same as C7 | | | | |
| C13 | Same as C7 | | | | |
| E1 | TERMINAL, FEEDTHRU, INSULATED | 1 | SFU16 | 04013 | |
| FB1 | FERRITE BEAD | 2 | 56-590-65-4A | 02114 | |
| FB2 | Same as FB1 | | | | |
| J1 | CONNECTOR, RECEPTACLE | 3 | UG1464U | 80058 | 74868 |
| J2 | Same as J1 | | | | |
| J3 | Same as J1 | | | | |

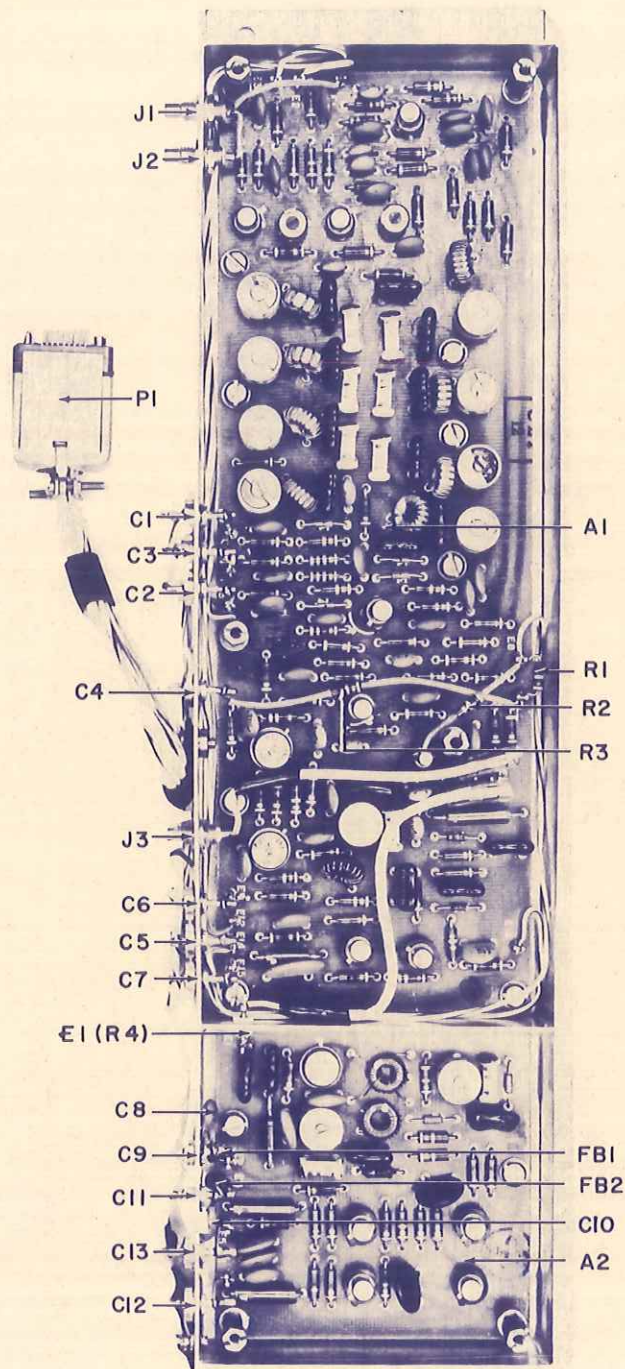


Figure 5-29. Type 72299 21.4 MHz IF Amplifier (A13), (DM-112-1 only),
Location of Components

REF DESIG PREFIX A13 (DM-112-1 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| MPI | COVER | 1 | 22354-1 | 14632 | |
| P1 | CONNECTOR, PLUG | 1 | SLE14FNSSH13 | 81312 | |
| R1 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 30 k Ω , 5%, 1/4W | 1 | RCR07G303JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 1 | RCR07G153JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 1 | RCR07G220JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

5.4.14.1 Part 21954 21.4 MHz IF Amplifier

REF DESIG PREFIX A13A1 (DM-112-1 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|-----------|----------------------------------------------|---------------|-------------------------|-----------|--------------|
| CR1 | DIODE | 4 | IN4446 | 80131 | 93332 |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| CR4 | Same as CR1 | | | | |
| CR5 | NOT USED | | | | |
| CR6 | DIODE | 1 | 5082-2800 | 28480 | |
| CR7 | DIODE | 1 | IN462A | 80131 | 93332 |
| C1 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 9 | SM1000PFGMV | 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 | 72136 |
| C14 | Same as C1 | | | | |

Courtesy of <http://BlackRadios.terry.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C15 | CAPACITOR, MICA, DIPPED: 91 pF, 5%, 500V | 8 | CM05FD910J03 | 81349 | 72136 |
| 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 | 301-000C0J0279C | 72982 | |
| C21 | Same as C2 | | | | |
| C22 | Same as C15 | | | | |
| C23 | CAPACITOR, CERAMIC, TUBULAR: 3.3 pF, ± 0.25 pF, 500V | 2 | 301-000C0J0339C | 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 | 301-000C0K0209C | 72982 | |
| C28 | Same as C15 | | | | |
| C29 | CAPACITOR, CERAMIC, TUBULAR: 3.6 pF, ± 0.25 pF, 500V | 1 | 301-000C0J0369C | 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 | 301-000C0J0249C | 72982 | |
| C34 | Same as C15 | | | | |
| C35 | Same as C23 | | | | |

Courtesy of <http://BlackRadios.terry.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------|---------------------|----------------------------|--------------|-----------------|
| 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 | | | | |
| 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 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| 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 | 301-000C0H0689D | 72982 | |
| C61 | Same as C1 | | | | |
| C62 | CAPACITOR, MICA, DIPPED: 27 pF, 5%, 500V | 1 | CM04ED270J03 | 81349 | 72136 |
| C63 | CAPACITOR, MICA, DIPPED: 68 pF, 5%, 500V | 1 | CM05ED680J03 | 81349 | 72136 |
| C64 | CAPACITOR, MICA, DIPPED: 33 pF, 5%, 500V | 1 | CM05ED330J03 | 81349 | 72136 |
| C65 | CAPACITOR, MICA, DIPPED: 150 pF, 5%, 500V | 2 | CM05FD151J03 | 81349 | 72136 |
| C66 | Same as C65 | | | | |
| C67 | CAPACITOR, CERAMIC, DISC: 0.01 μ F, 20%, 100V | 2 | C023B10IF103M | 56289 | |
| C68 | Same as C67 | | | | |
| C69 | CAPACITOR, CERAMIC, DISC: 2200 pF, 20%, 1000V | 1 | JF2200PFM | 91418 | |
| C70 | Same as C2 | | | | |
| L1 | COIL, TOROIDAL | 2 | 20681-8 | 14632 | |
| L2 | COIL, TOROIDAL | 6 | 20681-15 | 14632 | |
| L3 | Same as L2 | | | | |
| L4 | Same as L2 | | | | |
| L5 | Same as L2 | | | | |
| L6 | Same as L2 | | | | |
| L7 | Same as L1 | | | | |

Courtesy of <http://BlackRadios.terry.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| L8 | Same as L2 | 1 | 20681-42 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| L9 | COIL, TOROIDAL | 1 | 1131-37 | 14632 | |
| L10 | COIL, FIXED | 1 | 1131-41 | 14632 | |
| L11 | COIL, FIXED | 1 | 20681-43 | 14632 | |
| L12 | COIL, TOROIDAL | 1 | 3N140 | 80131 | |
| Q1 | TRANSISTOR | 2 | 2N2857 | 80131 | |
| Q2 | TRANSISTOR | 3 | | | |
| 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 k Ω , 5%, 1/4W | 1 | RCR07G154JS | 81349 | |
| R2 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 5 | RCR07G103JS | 81349 | |
| R3 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 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 | |

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R8 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 2 | RCR07G220JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 4 | RCR07G153JS | 81349 | 01121 |
| R10 | Same as R3 | | | | |
| R11 | Same as R3 | | | | |
| R12 | Same as R9 | | | | |
| R13 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 4 | RCR07G472JS | 81349 | 01121 |
| 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 | 01121 |
| R17 | Same as R15 | | | | |
| R18 | Same as R16 | | | | |
| R19 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 6 | RCR07G470JS | 81349 | 01121 |
| R20 | Same as R19 | | | | |
| R21 | Same as R6 | | | | |
| R22 | RESISTOR, FIXED, COMPOSITION: 1.2 k Ω , 5%, 1/4W | 1 | RCR07G122JS | 81349 | 01121 |
| R23 | Same as R6 | | | | |
| R24 | Same as R8 | | | | |
| R25 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 5 | RCR07G222JS | 81349 | 01121 |
| R26 | Same as R3 | | | | |
| R27 | Same as R25 | | | | |
| R28 | RESISTOR, FIXED, COMPOSITION: 33 k Ω , 5%, 1/4W | 2 | RCR07G333JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R29 | Same as R28 | | | | |
| R30 | Same as R3 | | | | |
| R31 | RESISTOR, FIXED, COMPOSITION: 27 k Ω , 5%, 1/4W | 3 | RCR07G273JS | 81349 | 01121 |
| R32 | Same as R31 | | | | |
| R33 | Same as R3 | | | | |
| R34 | Same as R2 | | | | |
| R35 | Same as R3 | | | | |
| R36 | Same as R2 | | | | |
| R37 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 1 | RCR07G331JS | 81349 | 01121 |
| R38 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 3 | RCR07G220JS | 81349 | 01121 |
| R39 | NOT USED | | | | |
| R40 | RESISTOR, FIXED, COMPOSITION: 2.7 k Ω , 5%, 1/4W | 1 | RCR07G272JS | 81349 | 01121 |
| R41 | Same as R13 | | | | |
| R42 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 3 | RCR07G470JS | 81349 | 01121 |
| 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 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R50 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 2 | RCR07G100JS | 81349 | 01121 |
| R51 | Same as R38 | | | | |
| R52 | RESISTOR, FIXED, COMPOSITION: 150 Ω , 5%, 1/4W | 1 | RCR07G151JS | 81349 | 01121 |
| R53 | RESISTOR, FIXED, COMPOSITION: 33 Ω , 5%, 1/4W | 1 | RCR07G330JS | 81349 | 01121 |
| R54 | Same as R9 | | | | |
| R55 | RESISTOR, FIXED, COMPOSITION: 6.8 k Ω , 5%, 1/4W | 1 | RCR07G682JS | 81349 | 01121 |
| R56 | Same as R13 | | | | |
| R57 | Same as R19 | | | | |
| R58 | RESISTOR, FIXED, COMPOSITION: 270 Ω , 5%, 1/4W | 1 | RCR07G271JS | 81349 | 01121 |
| 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 k Ω , 5%, 1/4W | 1 | RCR07G563JS | 81349 | 01121 |
| R68 | RESISTOR, FIXED, COMPOSITION: 2.6 k Ω , 5%, 1/4W | 1 | RCR07G242JS | 81349 | 01121 |
| R69 | Same as R19 | | | | |
| R70 | Same as R19 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A13A1 (DM-112-1 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R71 | RESISTOR, FIXED, COMPOSITION: 3.3 k Ω , 5%, 1/4W | 1 | RCR07G332JS | 81349 | 01121 |
| R72 | Same as R50 | | | | |
| R73 | Same as R25 | | | | |
| R74 | RESISTOR, FIXED, COMPOSITION: 510 k Ω , 5%, 1/4W | 1 | RCR07G514JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

5.4.14.2 Part 15I70 21.4 MHz FM Limiter

REF DESIG PREFIX A13A2 (DM-112-1 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| CR1 | DIODE | 2 | 5082-2800 | 28480 | Courtesy of http://BlackRadios.terryo.org |
| CR2 | Same as CR1 | | | | |
| C1 | CAPACITOR, VARIABLE, CERAMIC: 9-35 pF, 350V | 1 | 538-011D9-35 | 72982 | |
| C2 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 500V | 3 | SM5000PFM | 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 | 301-000C0J0229B | 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: 1.0 pF, ± 0.25 pF, 500V | 2 | 301-000U2K0109C | 72982 | |
| C10 | Same as C7 | | | | |
| C11 | CAPACITOR, CERAMIC, DISC: 0.1 μ F, -20+80%, 25V | 2 | DFJ3 | 73899 | |
| C12 | Same as C11 | | | | |
| C13 | CAPACITOR, CERAMIC, DISC: 0.01 μ F, 20%, 100V | 1 | C023B101F103M | 56289 | |
| C14 | CAPACITOR, CERAMIC, DISC: 1500 pF, 10%, 1000V | 2 | DD152 | 71590 | |
| C15 | Same as C14 | | | | |
| C16 | Same as C9 | | | | |
| L1 | COIL, FIXED: 2.7 μ H, 10% | 1 | 1537-22 | 99800 | |
| L2 | COIL, TOROIDAL | 1 | 20681-42 | 14632 | |
| L3 | INDUCTOR | 2 | 1131-37 | 14632 | |

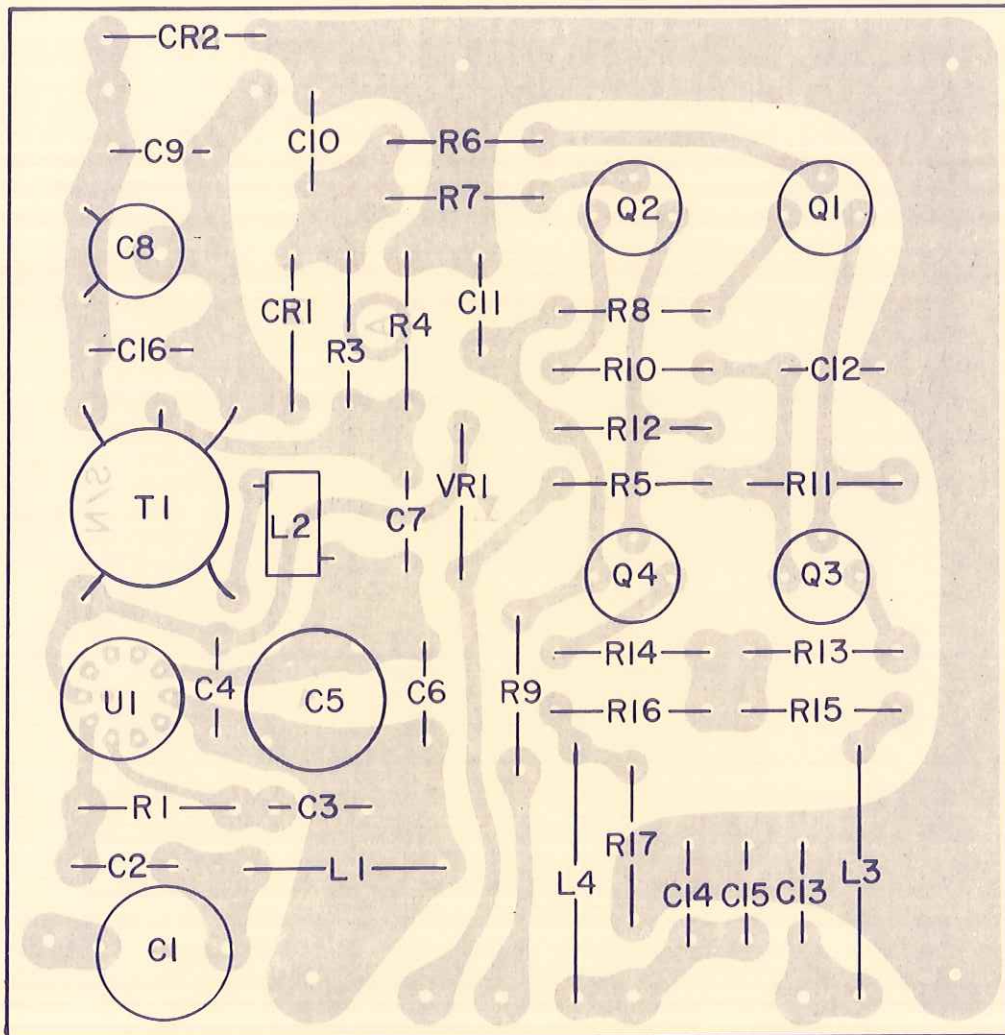


Figure 5-31. Part 15170 21.4 MHz Limiter/Discriminator (A13A2), (DM-112-1 only), Location of Components

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| L4 | Same as L3 | | | | |
| Q1 | TRANSISTOR | 2 | 2N3251 | 80131 | 04713 |
| Q2 | TRANSISTOR | 2 | 2N929 | 80131 | 04713 |
| Q3 | Same as Q2 | | | | |
| Q4 | Same as Q1 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 51 Ω , 5%, 1/4W | 1 | RCR07G510JS | 81349 | 01121 |
| R2 | NOT USED | | | | |
| R3 | RESISTOR, FIXED, COMPOSITION: 18 k Ω , 5%, 1/4W | 1 | RCR07G183JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 22 k Ω , 5%, 1/4W | 1 | RCR07G223JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 22 Ω , 5%, 1/4W | 4 | RCR07G220JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 2 | RCR07G102JS | 81349 | 01121 |
| R7 | Same as R6 | | | | |
| R8 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 2 | RCR07G101JS | 81349 | 01121 |
| R9 | Same as R5 | | | | |
| R10 | Same as R8 | | | | |
| R11 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 2 | RCR07G103JS | 81349 | 01121 |
| R12 | Same as R11 | | | | |
| R13 | Same as R5 | | | | |
| R14 | Same as R5 | | | | |
| R15 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R16 | RESISTOR, FIXED, COMPOSITION: 120 Ω , 5%, 1/4W | 1 | RCR07G121JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

REF DESIG PREFIX A13A2 (DM-112-1 only)

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------------------------------------------------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R17 | RESISTOR, FIXED, COMPOSITION: 220 Ω, 5%, 1/4W TRANSFORMER, TOROIDAL INTEGRATED CIRCUIT DIODE | 1 | RCR07G221JS | 81349 | 01121 |
| T1 | | 1 | 21427-19 | 14632 | |
| U1 | | 1 | U5F7719393 | 07263 | |
| VR1 | | 1 | 1N462A | 80131 | 93332 |

Courtesy of <http://BlackRadios.terry.org>

5.4.15 Type 71290 160 MHz Tuner

REF DESIG PREFIX A14

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | 160 MHz MARKER OSCILLATOR | 1 | 8307 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU: 470 pF, 20%, 500V | 14 | FA5C4712 | 01121 | |
| C2 | CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V | 5 | 2954 | 91293 | |
| C3 | NOT USED | | | | |
| C4 | CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V | 9 | B470PFM | 91418 | |
| C5 | CAPACITOR, CERAMIC, STANDOFF: 470 pF, 20%, 500V | 11 | SS5D4712 | 01121 | |
| C6 | Same as C1 | | | | |
| C7 | Same as C5 | | | | |
| C8 | Same as C1 | | | | |
| C9 | Same as C1 | | | | |
| C10 | Same as C5 | | | | |
| C11 | Same as C1 | | | | |
| C12 | Same as C4 | | | | |
| C13 | Same as C2 | | | | |
| C14 | Same as C4 | | | | |
| C15 | Same as C5 | | | | |
| C16 | CAPACITOR, MICA, DIPPED: 10 pF, ±0.5 pF, 500V | 1 | CM05CD100D03 | 81349 | |
| C17 | Same as C1 | | | | |
| C18 | Same as C1 | | | | |
| C19 | Same as C1 | | | | |
| C20 | Same as C5 | | | | |

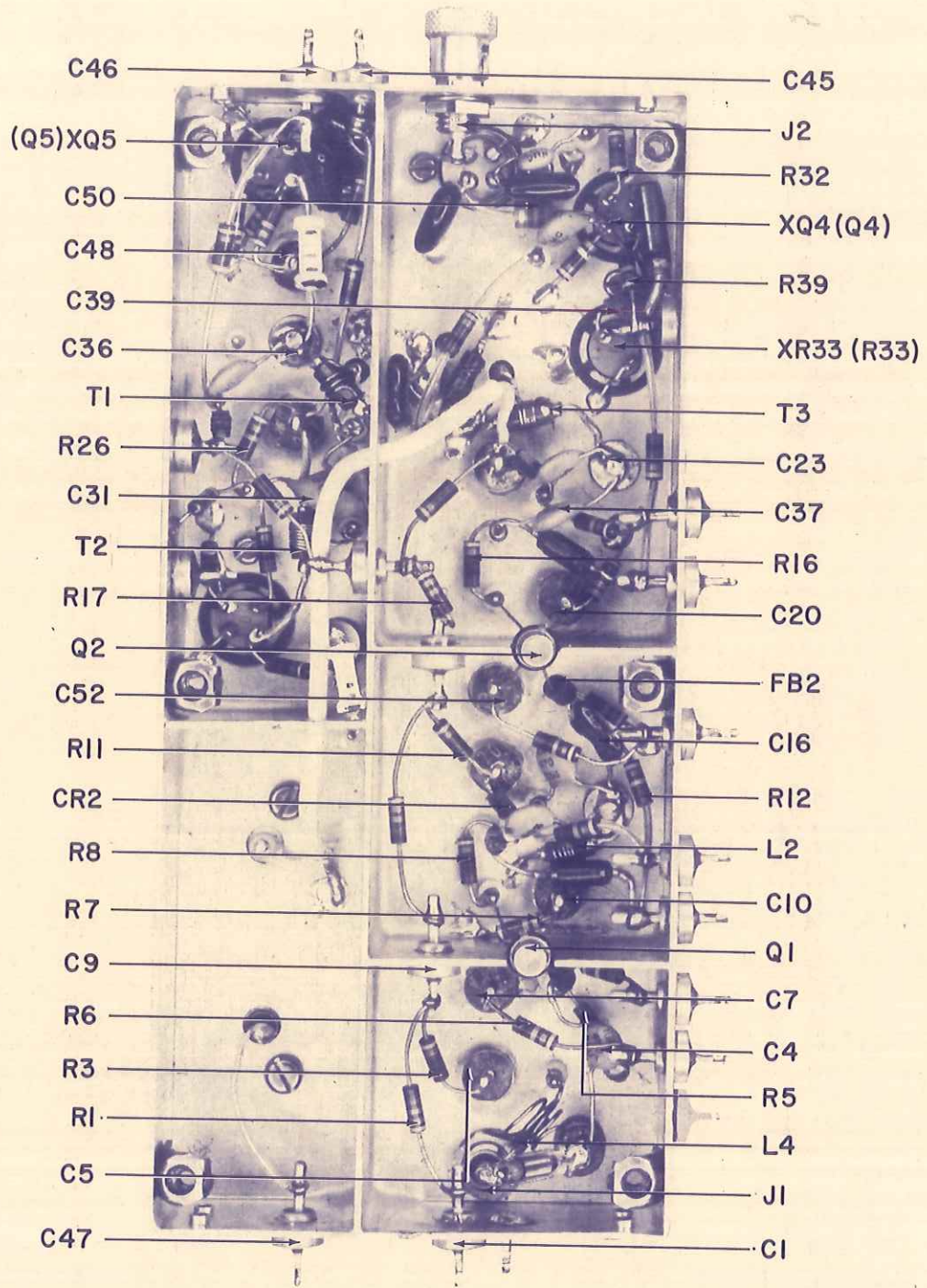


Figure 5-32. Type 71290 160 MHz Tuner (A14),
Location of Components

REF DESIG PREFIX A14

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| C21 | Same as C1 | | | | Courtesy of http://BlackRadios.terryo.org |
| C22 | Same as C1 | | | | |
| C23 | Same as C2 | | | | |
| C24 | Same as C4 | | | | |
| C25 | Same as C2 | | | | |
| C26 | Same as C4 | | | | |
| C27 | Same as C5 | | | | |
| C28 | Same as C1 | | | | |
| C29 | Same as C5 | | | | |
| C30 | Same as C5 | | | | |
| C31 | Same as C4 | | | | |
| C32 | Same as C5 | | | | |
| C33 | Same as C4 | | | | |
| C34 | Same as C4 | | | | |
| C35 | Same as C5 | | | | |
| C36 | Same as C2 | | | | |
| C37 | Same as C4 | | | | |
| C38 | CAPACITOR, CERAMIC, TUBULAR: 6.8 pF, ± 0.5 pF, 500V | 1 | 301-000C0H0689D | 72982 | |
| C39 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V | 1 | C023B101E502M | 56289 | |
| C40 | CAPACITOR, CERAMIC, DISC: 1000 pF, GMV, 500V | 1 | SM1000PPF | 91418 | |
| C41 | CAPACITOR, MICA, DIPPED: 130 pF, 5%, 500V | 2 | CM05FD131J03 | 81349 | |

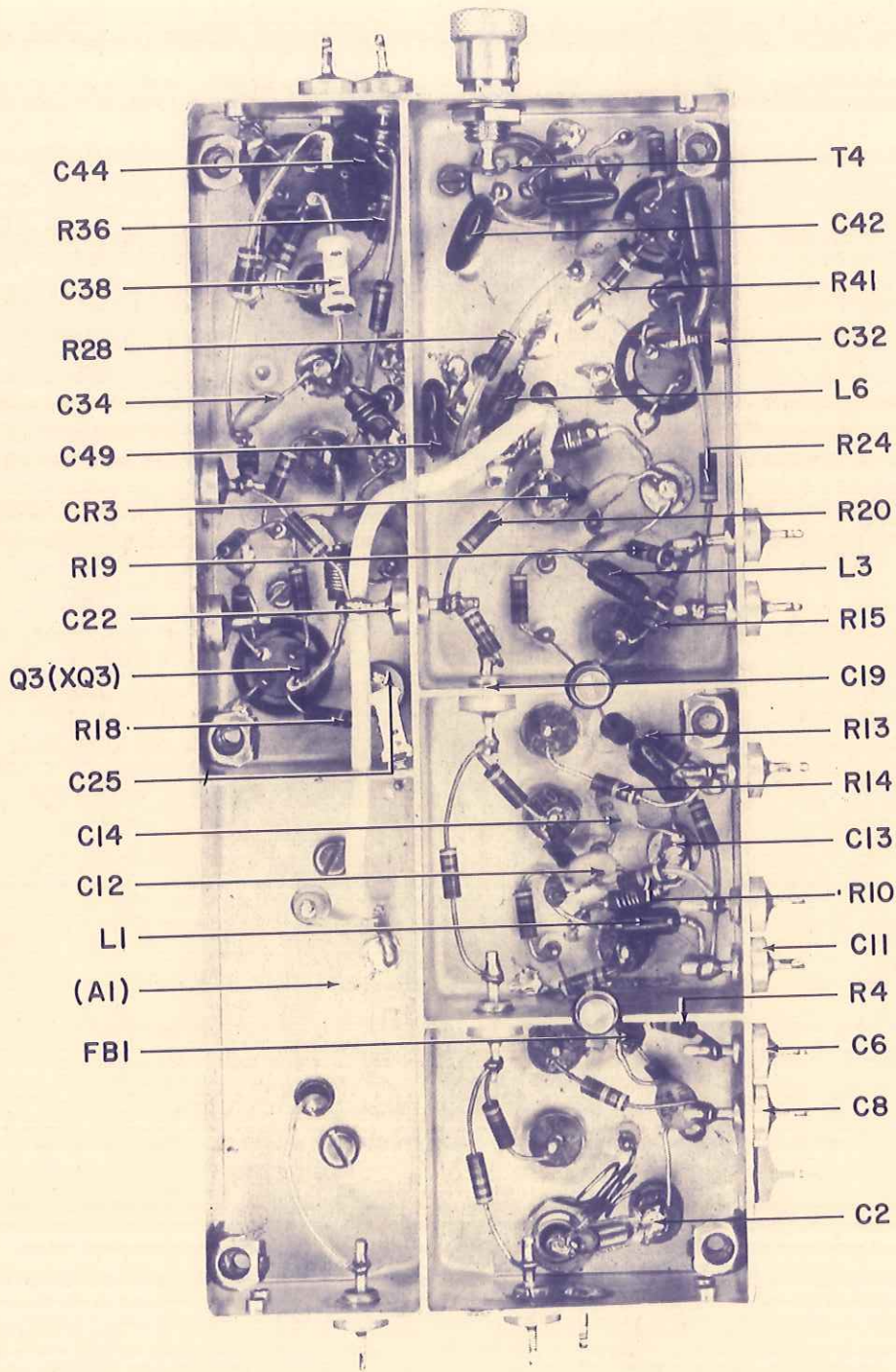


Figure 5-33. Type 71290 160 MHz Tuner (A14),
Location of Components

REF DESIG PREFIX A14

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C42 | Same as C41 | | | | |
| C43 | CAPACITOR, MICA, DIPPED: 20 pF, 5%, 500V | 1 | CM05ED200J03 | 81349 | 72136 |
| C44 | CAPACITOR, MICA, DIPPED: 15 pF, 5%, 500V | 1 | CM05CD150J03 | 81349 | 72136 |
| C45 | Same as C1 | | | | |
| C46 | Same as C1 | | | | |
| C47 | Same as C1 | | | | |
| C48 | CAPACITOR, CERAMIC, STANDOFF: 1000 pF, GMV, 500V | 1 | SS5D102W | 01121 | |
| C49 | CAPACITOR, MICA, DIPPED: 220 pF, 5%, 500V | 1 | CM05FD221J03 | 81349 | 72136 |
| C50 | CAPACITOR, COMPOSITION, TUBULAR: 0.68 pF, 10%, 500V | 1 | QC0.68PFFK | 95121 | |
| C51 | CAPACITOR, CERAMIC, TUBULAR: 5.1 pF, ± 0.5 pF, 500V | 1 | 301-000C0H0519D | 72982 | |
| C52 | Same as C5 | | | | |
| CR1 | NOT USED | | | | |
| CR2 | DIODE, VARICAP | 3 | BB105B | 25088 | |
| CR3 | Same as CR2 | | | | |
| CR4 | Same as CR2 | | | | |
| FB1 | FERRITE BEAD | 2 | 56-590-65-4A | 02114 | |
| FB2 | Same as FB1 | | | | |
| J1 | CONNECTOR, RECEPTACLE | 2 | 46025 | 74868 | |
| J2 | Same as J1 | | | | |
| L1 | COIL, FIXED: 1.0 μ H, 15% | 2 | 205-11-10 | 99848 | |
| L2 | INDUCTOR, FIXED | 1 | 1131-72 | 14632 | |

Courtesy of <http://BlackRadios.terryo.org>

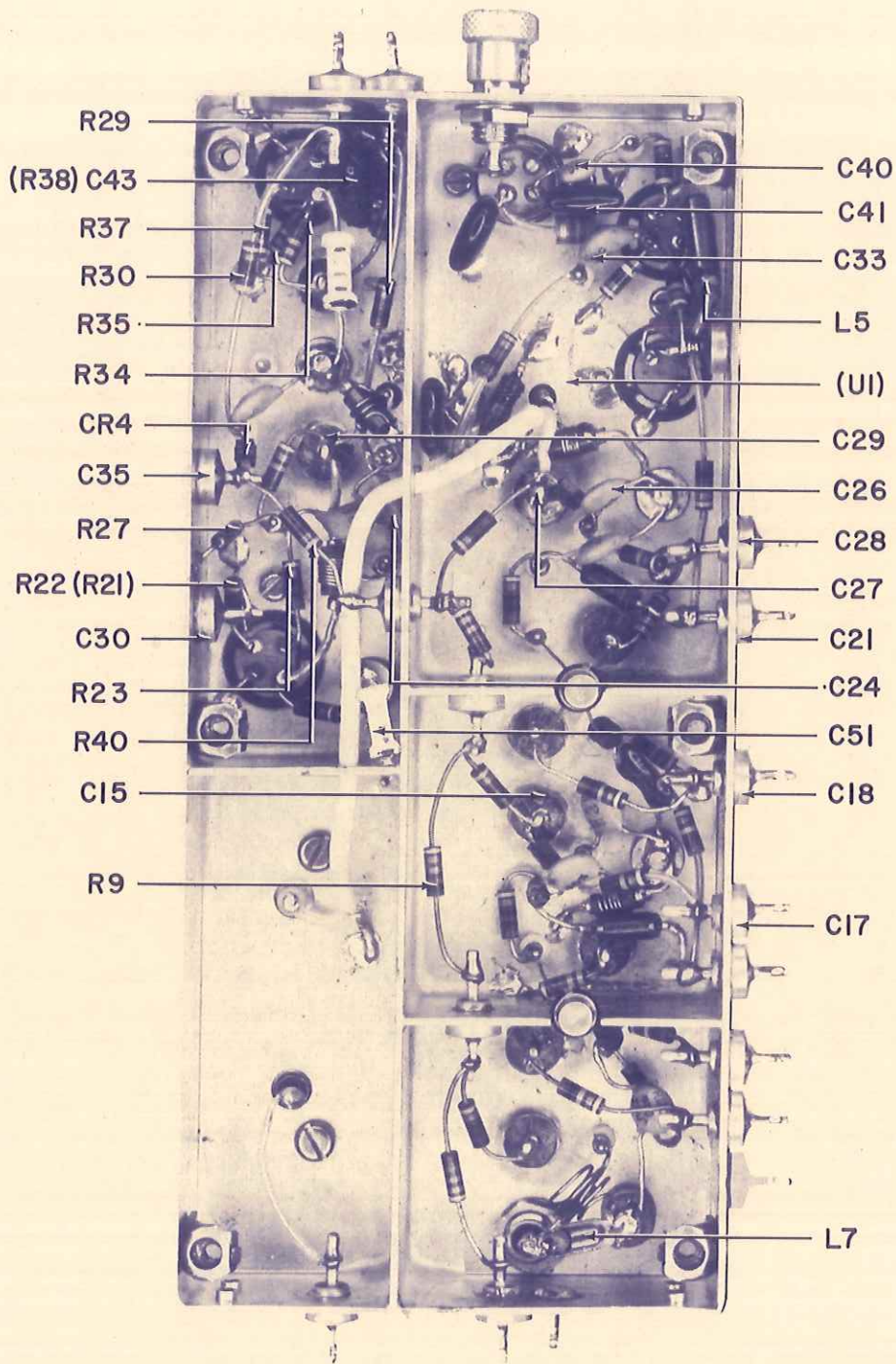


Figure 5-34. Type 71290 160 MHz Tuner (A14),
Location of Components

REF DESIG PREFIX A14

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| L3 | Same as L1 | | | | |
| L4 | COIL, FIXED | 1 | 1129-41 | 14632 | |
| L5 | INDUCTOR | 1 | 1131-37 | 14632 | |
| L6 | COIL, FIXED: 0.24 μ H, 15% | 1 | 200-11 | 99848 | |
| L7 | INDUCTOR, FIXED | 1 | 21210-36 | 14632 | |
| MP1 | COVER | 1 | 15813-1 | 14632 | |
| Q1 | TRANSISTOR | 2 | 3N187 | 80131 | 02735 |
| Q2 | Same as Q1 | | | | |
| Q3 | TRANSISTOR | 2 | 2N2857 | 80131 | 02735 |
| Q4 | TRANSISTOR | 1 | 2N3933 | 80131 | 02735 |
| Q5 | Same as Q3 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 2.7 Ω , 5%, 1/4W | | | | |
| R2 | NOT USED | 3 | RCR07G2R7JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 2.2 k Ω , 5%, 1/4W | 4 | RCR07G222JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 150 k Ω , 5%, 1/4W | 2 | RCR07G154JS | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 4 | RCR07G103JS | 81349 | 01121 |
| R6 | Same as R5 | | | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 330 Ω , 5%, 1/4W | 2 | RCR07G331JS | 81349 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 5 | RCR07G100JS | 81349 | 01121 |
| R9 | Same as R1 | | | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 22 k Ω , 5%, 1/4W | 2 | RCR07G223JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A14

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R11 | Same as R3 | | | | |
| R12 | Same as R4 | | | | |
| R13 | Same as R5 | | | | |
| R14 | Same as R5 | | | | |
| R15 | Same as R7 | | | | |
| R16 | Same as R8 | | | | |
| R17 | Same as R1 | | | | |
| R18 | Same as R8 | | | | |
| R19 | Same as R10 | | | | |
| R20 | Same as R3 | | | | |
| R21 | RESISTOR, FIXED, COMPOSITION: 1.8 k Ω , 5%, 1/4W | 2 | RCR07G182JS | 81349 | 01121 |
| R22 | RESISTOR, FIXED, COMPOSITION: 27 Ω , 5%, 1/4W | 1 | RCR07G270JS | 81349 | 01121 |
| R23 | Same as R8 | | | | |
| R24 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 4 | RCR07G101JS | 81349 | 01121 |
| R25 | NOT USED | | | | |
| R26 | RESISTOR, FIXED, COMPOSITION: 18 k Ω , 5%, 1/4W | 4 | RCR07G183JS | 81349 | 01121 |
| R27 | Same as R26 | | | | |
| R28 | Same as R24 | | | | |
| R29 | Same as R24 | | | | |
| R30 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 1 | RCR07G472JS | 81349 | 01121 |
| R31 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 1 | RCR07G102JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A14

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R32 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 1 | RCR07G470JS | 81349 | 01121 |
| R33 | RESISTOR, VARIABLE, WIRE-WOUND: 100 Ω , 5%, 1W | 1 | 100-101J | 75042 | |
| R34 | Same as R26 | | | | |
| R35 | Same as R26 | | | | |
| R36 | Same as R24 | | | | |
| R37 | Same as R8 | | | | |
| R38 | Same as R21 | | | | |
| R39 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 1 | RCR07G153JS | 81349 | 01121 |
| R40 | Same as R3 | | | | |
| R41 | RESISTOR, FIXED, COMPOSITION: 3.9 k Ω , 5%, 1/4W | 1 | RCR07G392JS | 81349 | 01121 |
| T1 | TRANSFORMER | 1 | 11464-60 | 14632 | |
| T2 | TRANSFORMER | 1 | 11464-27 | 14632 | |
| T3 | TRANSFORMER | 1 | 11464-41 | 14632 | |
| T4 | TRANSFORMER | 1 | 13106 | 14632 | |
| U1 | MIXER, BALANCED | 1 | M6 | 27956 | |
| XQ3 | SOCKET, TRANSISTOR | 3 | 22-16-4 | 81073 | |
| XQ4 | Same as XQ3 | | | | |
| XQ5 | Same as XQ3 | | | | |
| XR33 | SOCKET, RESISTOR | 1 | 22-16-2 | 81073 | |

Courtesy of <http://BlackRadios.terryo.org>

5.4.15.1 Part 8307 160 MHz Marker Oscillator

REF DESIG PREFIX A14A1

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| A1 | 160 MHz MARKER OSCILLATOR | 1 | 15830 | 14632 | Courtesy of http://BlackRadios.terryo.org |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU | 1 | FA5C-4712 | 01121 | |
| E1 | TERMINAL, FEEDTHRU | 1 | SFU-16 | 04013 | |

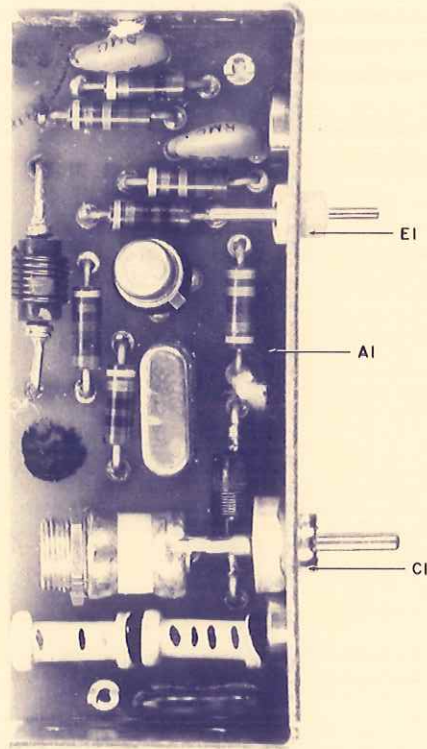


Figure 5-35. Part 8307 160 MHz Marker Oscillator (A14A1),
Location of Components

5.4.15.1.1 Part 15830 160 MHz Marker Oscillator

REF DESIG PREFIX A14A1A1

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C1 | CAPACITOR, CERAMIC, DISC: 470 pF, 20%, 1000V. | 2 | B(470PFM) | 91418 | |
| C2 | Same as C1 | | | | |
| C3 | CAPACITOR, VARIABLE, AIR: 0.8-10 pF, 250V | 1 | 2951 | 92193 | |
| C4 | CAPACITOR, CERAMIC, TUBULAR: 10 pF, ± 0.5 pF, 500V | 1 | 301-000C0H0-100D | 72982 | |
| C5 | CAPACITOR, CERAMIC, TUBULAR: 3.0 pF, ± 0.25 pF, 500V | 1 | 301-000C0J0-309C | 72982 | |
| C6 | CAPACITOR, MICA, DIPPED: 47 pF, 5%, 500V | 1 | CM05ED470J03 | 81349 | 72136 |
| L1 | INDUCTOR | 1 | 21210-83 | 14632 | |
| L2 | INDUCTOR, FIXED: 0.24 μ H | 1 | 200-11 | 99848 | |
| Q1 | TRANSISTOR | 1 | 2N3933 | 07688 | 02735 |
| R1 | RESISTOR, FIXED, COMPOSITION: 1 k Ω , 5%, 1/4W | 1 | RCR07G102JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 18 k Ω , 5%, 1/4W | 2 | RCR07G183JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 2 | RCR07G100JS | 81349 | 01121 |
| R4 | Same as R2 | | | | |
| R5 | Same as R3 | | | | |
| R6 | RESISTOR, FIXED, COMPOSITION: 3.3 k Ω , 5%, 1/4W | 1 | RCR07G332JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 620 Ω , 5%, 1/4W | 1 | RCR07G621JS | 81349 | 01121 |
| Y1 | CRYSTAL, QUARTZ: 160 MHz | 1 | 98203-01 | 14632 | |

Courtesy of <http://BlackRadios.terryo.org>

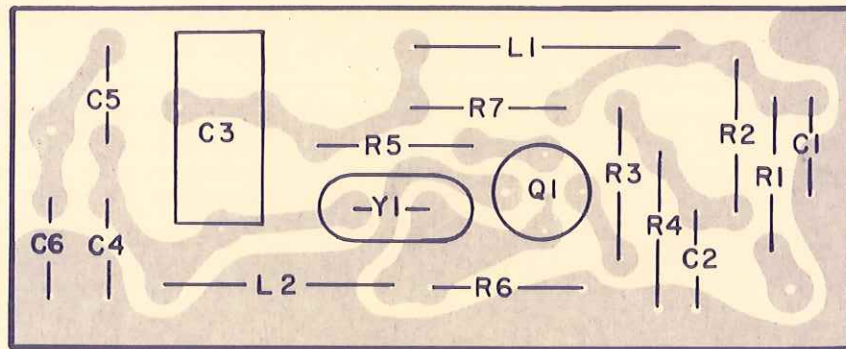


Figure 5-36. Part 15830 160 MHz Marker Oscillator (A14A1A1),
Location of Components

5.4.16 Type 8026 IF Amplifier

REF DESIG PREFIX A15

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| CR1 | DIODE | 3 | 1N462A | 80131 | 93332 |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| C1 | CAPACITOR, MICA, DIPPED: 75 pF, 5%, 500V | 1 | CM05ED750J03 | 81349 | 72136 |
| C2 | CAPACITOR, MICA, DIPPED: 2200 pF, 5%, 500V | 2 | CM06FD222J03 | 81349 | 72136 |
| C3 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V | 13 | C023B101E502M | 56289 | |
| C4 | Same as C3 | | | | |
| C5 | Same as C3 | | | | |
| C6 | Same as C3 | | | | |
| C7 | CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V | 2 | CM05FD101J03 | 81349 | 72136 |
| C8 | CAPACITOR, MICA, DIPPED: 300 pF, 5%, 500V | 2 | CM05FD301J03 | 81349 | 72136 |
| C9 | Same as C3 | | | | |
| C10 | Same as C3 | | | | |
| C11 | Same as C3 | | | | |
| C12 | Same as C3 | | | | |
| C13 | Same as C7 | | | | |
| C14 | Same as C8 | | | | |
| C15 | Same as C3 | | | | |
| C16 | Same as C3 | | | | |
| C17 | Same as C3 | | | | |
| C18 | Same as C3 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

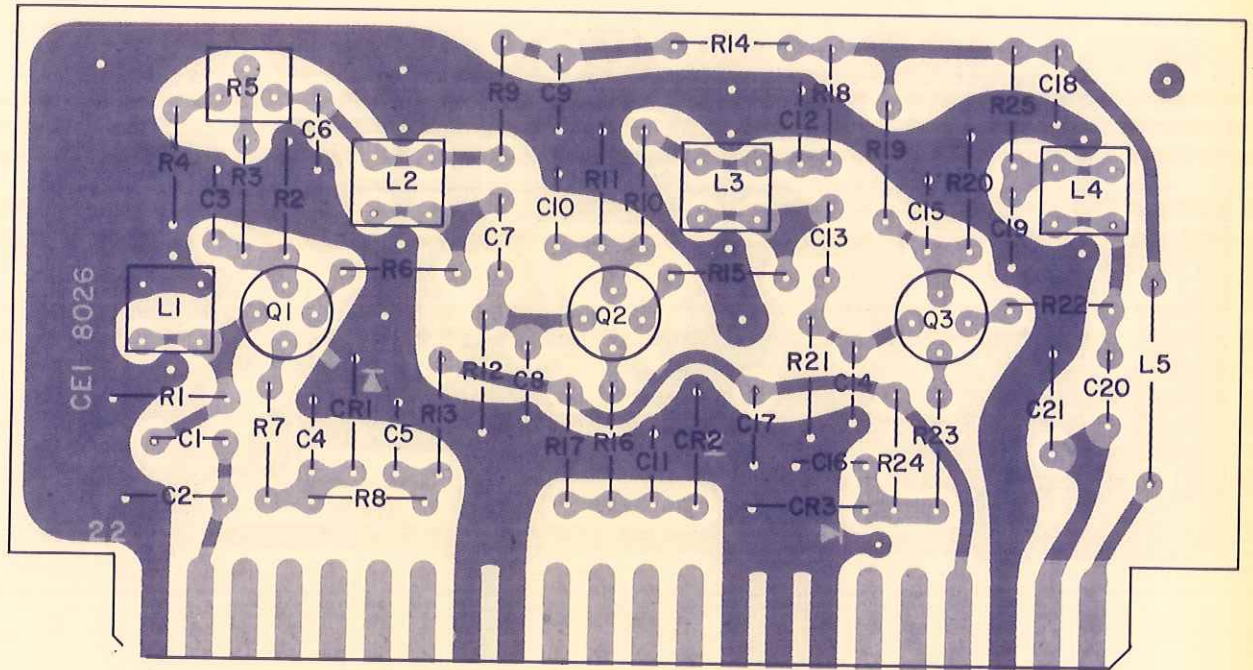


Figure 5-37. Type 8026 IF Amplifier (A15),
Location of Components

REF DESIG PREFIX A15

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C19 | Same as C3 | | | | |
| C20 | CAPACITOR, MICA, DIPPED: 82 pF, 5%, 500V | 1 | CM05ED820J03 | 81349 | 72136 |
| C21 | Same as C2 | | | | |
| L1 | COIL, VARIABLE: 0.612-0.748 μ H | 4 | 7107-11 | 71279 | |
| L2 | Same as L1 | | | | |
| L3 | Same as L1 | | | | |
| L4 | Same as L1 | | | | |
| L5 | INDUCTOR | 1 | 1131-37 | 14632 | |
| Q1 | TRANSISTOR | 3 | 3N187 | 80131 | 02735 |
| Q2 | Same as Q1 | | | | |
| Q3 | Same as Q1 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 2 | RCR07G103JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 30 k Ω , 5%, 1/4W | 3 | RCR07G303JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 120 k Ω , 5%, 1/4W | 3 | RCR07G124JS | 81349 | 01121 |
| R4 | Same as R1 | | | | |
| R5 | RESISTOR, VARIABLE, FILM: 50 k Ω , 10%, 1/2W | 1 | 62PAR50K | 73138 | |
| R6 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 3 | RCR07G470JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 10 Ω , 5%, 1/4W | 3 | RCR07G100JS | 81349 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 9.1 k Ω , 5%, 1/4W | 2 | RCR07G912JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, COMPOSITION: 1.0 k Ω , 5%, 1/4W | 4 | RCR07G102JS | 81349 | 01121 |
| R10 | Same as R3 | | | | |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A15

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R11 | Same as R2 | | | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 2 | RCR07G104JS | 81349 | 01121 |
| R13 | Same as R8 | | | | |
| R14 | Same as R9 | | | | |
| R15 | Same as R6 | | | | |
| R16 | Same as R7 | | | | |
| R17 | RESISTOR, FIXED, COMPOSITION: 7.5 k Ω , 5%, 1/4W | 2 | RCR07G752JS | 81349 | 01121 |
| R18 | Same as R9 | | | | |
| R19 | Same as R3 | | | | |
| R20 | Same as R2 | | | | |
| R21 | Same as R12 | | | | |
| R22 | Same as R6 | | | | |
| R23 | Same as R7 | | | | |
| R24 | Same as R17 | | | | |
| R25 | Same as R9 | | | | |

Courtesy of <http://BlackRadios.terry.org>

5.4.17 Type 8138 Output Amplifier

REF DESIG PREFIX A16

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------|---------------------|----------------------------|--------------|---------------------------------------------------------------------------------------|
| CR1 | DIODE | 6 | 5082-2800 | 28480 | Courtesy of http://BlackRadios.terryo.org |
| CR2 | Same as CR1 | | | | |
| CR3 | Same as CR1 | | | | |
| CR4 | Same as CR1 | | | | |
| CR5 | Same as CR1 | | | | |
| CR6 | Same as CR1 | | | | |
| C1 | CAPACITOR, CERAMIC, DISC: 5000 pF, 20%, 100V | 6 | C023B101E502M | 56289 | |
| C2 | CAPACITOR, MICA, DIPPED: 82 pF, 5%, 500V | 1 | CM05ED820J03 | 81349 | |
| C3 | CAPACITOR, COMPOSITION, TUBULAR: 3.3 pF, 10%, 500V | 1 | QC3.3PFK | 95121 | |
| C4 | CAPACITOR, MICA, DIPPED: 75 pF, 5%, 500V | 1 | CM05ED750J03 | 81349 | |
| C5 | CAPACITOR, MICA, DIPPED: 2200 pF, 5%, 500V | 1 | CM06FD222J03 | 81349 | |
| C6 | Same as C1 | | | | |
| C7 | Same as C1 | | | | |
| C8 | Same as C1 | | | | |
| C9 | Same as C1 | | | | |
| C10 | Same as C1 | | | | |
| C11 | CAPACITOR, MICA, DIPPED: 110 pF, 5%, 500V | 2 | CM05FD111J03 | 81349 | |
| C12 | Same as C11 | | | | |
| C13 | CAPACITOR, MICA, DIPPED: 39 pF, 5%, 500V | 4 | CM05ED390J03 | 81349 | |
| C14 | Same as C13 | | | | |
| C15 | CAPACITOR, MYLAR, DIPPED: 0.22 μF, 20%, 400V | 2 | B32234B6224M | 25088 | |

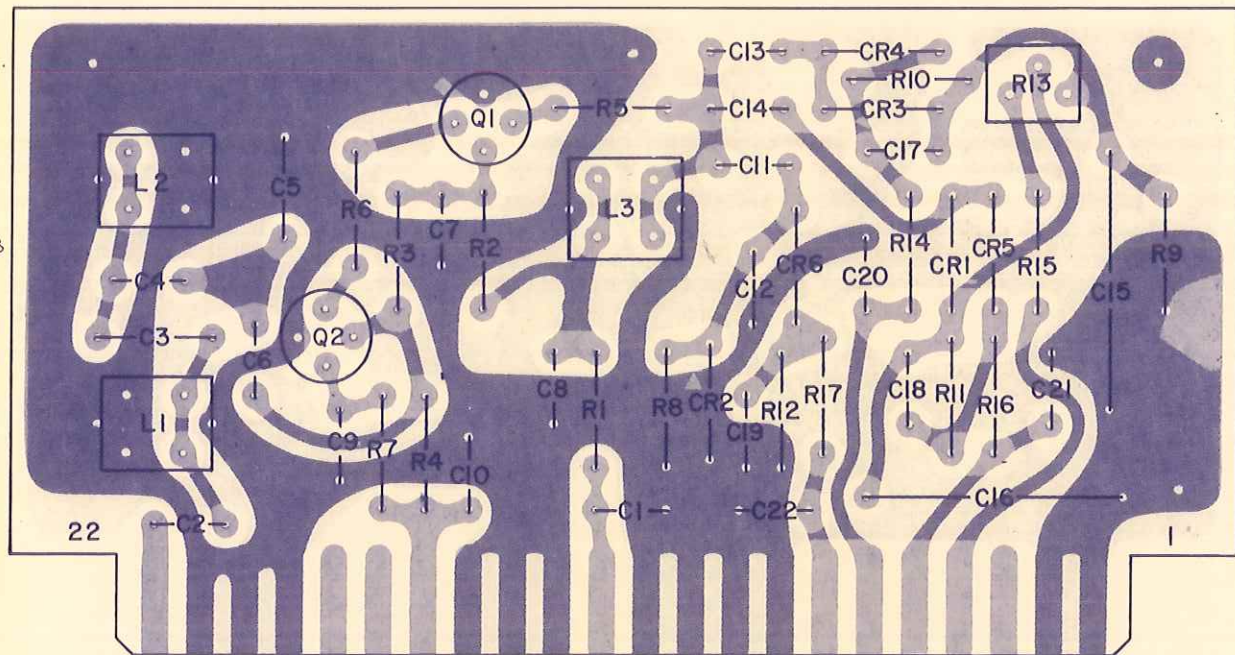


Figure 5-38. Type 8138 Output Amplifier (A16),
Location of Components

REF DESIG PREFIX A16

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C16 | Same as C15 | | | | |
| C17 | Same as C13 | | | | |
| C18 | Same as C13 | | | | |
| C19 | CAPACITOR, MICA, DIPPED: 100 pF, 5%, 500V | 1 | CM05FD101J03 | 81349 | 72136 |
| C20 | CAPACITOR, MICA, DIPPED: 10 pF, ± 0.5 pF, 500V | 3 | CM05CD100D03 | 81349 | 72136 |
| C21 | Same as C20 | | | | |
| C22 | Same as C20 | | | | |
| L1 | COIL, VARIABLE: 0.612-0.748 μ H | 2 | 7107-11 | 71279 | |
| L2 | Same as L1 | | | | |
| L3 | COIL, VARIABLE: 0.9-1.1 μ H | 1 | 7107-13 | 71279 | |
| Q1 | TRANSISTOR | 2 | 2N3933 | 80131 | 02735 |
| Q2 | Same as Q1 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 100 Ω , 5%, 1/4W | 1 | RCR07G101JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 24 k Ω , 5%, 1/4W | 1 | RCR07G243JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 9.1 k Ω , 5%, 1/4W | 2 | RCR07G912JS | 81349 | 01121 |
| R4 | Same as R3 | | | | |
| R5 | RESISTOR, FIXED, COMPOSITION: 47 Ω , 5%, 1/4W | 2 | RCR07G470JS | 81349 | 01121 |
| R6 | Same as R5 | | | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 1.8 k Ω , 5%, 1/4W | 1 | RCR07G182JS | 81349 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 3 | RCR07G104JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, COMPOSITION: 200 k Ω , 5%, 1/4W | 1 | RCR07G204JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terryo.org>

REF DESIG PREFIX A16

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R10 | RESISTOR, FIXED, COMPOSITION: 2.2 M Ω , 5%, 1/4W | 2 | RCR07G225JS | 81349 | 01121 |
| R11 | Same as R10 | | | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 10 M Ω , 5%, 1/4W | 1 | RCR07G106JS | 81349 | 01121 |
| R13 | RESISTOR, VARIABLE, FILM: 50 k Ω , 10%, 1/2W | 1 | 62PAR50K | 73138 | |
| R14 | Same as R8 | | | | |
| R15 | RESISTOR, FIXED, COMPOSITION: 240 k Ω , 5%, 1/4W | 1 | RCR07G244JS | 81349 | 01121 |
| R16 | Same as R8 | | | | |
| R17 | RESISTOR, FIXED, COMPOSITION: 1.0 M Ω , 5%, 1/4W | 1 | RCR07G105JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

5.4.18 Type 8241 Horizontal Amplifier

REF DESIG PREFIX A17

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CCODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|---------------|-----------------|
| CR1 | DIODE | 2 | IN462A | 80131 | 93332 |
| CR2 | Same as CR1 | | | | |
| Q1 | TRANSISTOR | 3 | 2N2270 | 80131 | 02735 |
| Q2 | Same as Q1 | | | | |
| Q3 | TRANSISTOR | 2 | 2N3440 | 80131 | 04713 |
| Q4 | Same as Q3 | | | | |
| Q5 | Same as Q1 | | | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 220 k Ω , 5%, 1/4W | 3 | RCR07G224JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 1.8 k Ω , 5%, 1/4W | 1 | RCR07G182JS | 81349 | 01121 |
| R3 | RESISTOR, VARIABLE, FILM: 200 k Ω , 10%, 1/2W | 1 | 62PAR200K | 73138 | |
| R4 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 4 | RCR07G104JS | 81349 | 01121 |
| R5 | Same as R4 | | | | |
| R6 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 2 | RCR07G472JS | 81349 | 01121 |
| R7 | RESISTOR, FIXED, COMPOSITION: 15 k Ω , 5%, 1/4W | 4 | RCR07G153JS | 81349 | 01121 |
| R8 | Same as R1 | | | | |
| R9 | Same as R7 | | | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 6.8 k Ω , 5%, 1/4W | 1 | RCR07G682JS | 81349 | 01121 |
| R11 | Same as R1 | | | | |
| R12 | Same as R7 | | | | |
| R13 | Same as R7 | | | | |
| R14 | RESISTOR, FIXED, COMPOSITION: 22 k Ω , 5%, 1/4W | 3 | RCR07G223JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

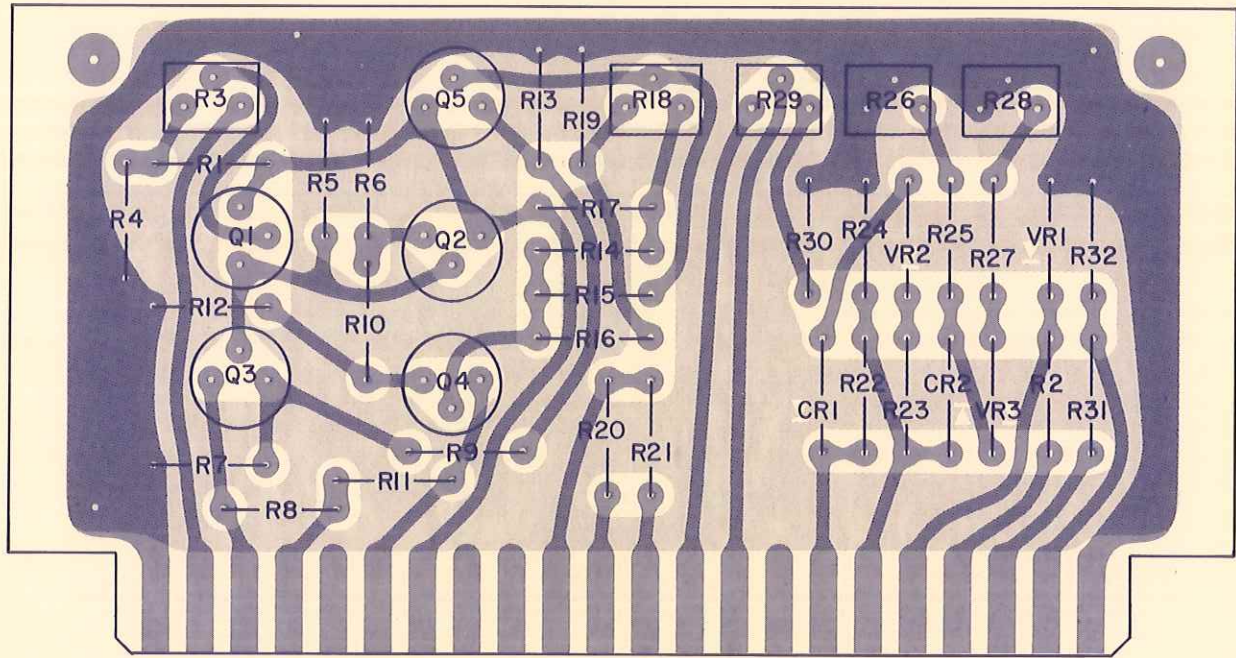


Figure 5-39. Type 8241 Horizontal Amplifier (A17),
Location of Components

REF DESIG PREFIX A17

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|---------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R15 | Same as R14 | | | | |
| R16 | Same as R14 | | | | |
| R17 | RESISTOR, FIXED, COMPOSITION: 30 k Ω , 5%, 1/4W | 1 | RCR07G303JS | 81349 | 01121 |
| R18 | RESISTOR, VARIABLE, FILM: 10 k Ω , 10%, 1/2W | 2 | 62PAR10K | 73138 | 01121 |
| R19 | RESISTOR, FIXED, COMPOSITION: 10 k Ω , 5%, 1/4W | 1 | RCR07G103JS | 81349 | 01121 |
| R20 | RESISTOR, FIXED, COMPOSITION: 56 k Ω , 5%, 1/4W | 1 | RCR07G563JS | 81349 | 01121 |
| R21 | RESISTOR, FIXED, COMPOSITION: 8.2 k Ω , 5%, 1/4W | 1 | RCR07G822JS | 81349 | 01121 |
| R22 | RESISTOR, FIXED, COMPOSITION: 130 k Ω , 5%, 1/4W | 1 | RCR07G134JS | 81349 | 01121 |
| R23 | RESISTOR, FIXED, COMPOSITION: 240 k Ω , 5%, 1/4W | 2 | RCR07G244JS | 81349 | 01121 |
| R24 | Same as R23 | | | | |
| R25 | Same as R4 | | | | |
| R26 | RESISTOR, VARIABLE, FILM: 500 k Ω , 10%, 1/2W | 2 | 62PAR500K | 73138 | |
| R27 | Same as R4 | | | | |
| R28 | Same as R26 | | | | |
| R29 | Same as R18 | | | | |
| R30 | Same as R6 | | | | |
| R31 | RESISTOR, FIXED, COMPOSITION: 330 k Ω , 5%, 1/4W | 2 | RCR07G334JS | 81349 | 01121 |
| R32 | Same as R31 | | | | |
| VR1 | DIODE, ZENER | 1 | 1N756A | 80131 | 04713 |
| VR2 | DIODE, ZENER | 1 | 1N746A | 80131 | 04713 |
| VR3 | DIODE, ZENER | 1 | 1N749A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terryo.org>

5.4.19 Type 8243 Sweep Generator

REF DESIG PREFIX A18

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|----------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C1 | CAPACITOR, ELECTROLYTIC, TANTALUM: 10 μ F, 10%, 25V | 2 | CS13BE106K | 81349 | 56289 |
| C2 | Same as C1 | | | | |
| C3 | CAPACITOR, CERAMIC, DISC: 0.1 μ F, 20%, 100V | 2 | 8131M100-651-104M | 72982 | |
| C4 | Same as C3 | | | | |
| C5 | CAPACITOR, ELECTROLYTIC, TANTALUM: 1.0 μ F, 10%, 35V | 1 | CS13BF105K | 81349 | 56289 |
| Q1 | TRANSISTOR | 1 | 2N2646 | 80131 | 04713 |
| Q2 | TRANSISTOR | 1 | 2N3251 | 80131 | 04713 |
| R1 | RESISTOR, FIXED, COMPOSITION: 360 Ω , 5%, 1/4W | 1 | RCR07G361JS | 81349 | 01121 |
| R2 | RESISTOR, FIXED, COMPOSITION: 4.7 k Ω , 5%, 1/4W | 1 | RCR07G472JS | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 22 k Ω , 5%, 1/4W | 1 | RCR07G223JS | 81349 | 01121 |
| R4 | RESISTOR, FIXED, COMPOSITION: 24 k Ω , 5%, 1/4W | 1 | RCR07G243JS | 81349 | 01121 |
| R5 | RESISTOR, VARIABLE, FILM: 50 k Ω , 10%, 1/2W | 2 | 62PAR50K | 73138 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 130 k Ω , 5%, 1/4W | 1 | RCR07G134JS | 81349 | 01121 |
| R7* | RESISTOR, FIXED, COMPOSITION: 3.9 k Ω , 5%, 1/4W | 1 | RCR07G392JS | 81349 | 01121 |
| R8 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 6 | RCR07G104JS | 81349 | 01121 |
| R9 | RESISTOR, FIXED, COMPOSITION: 91 k Ω , 5%, 1/4W | 1 | RCR07G913JS | 81349 | 01121 |
| R10 | RESISTOR, FIXED, COMPOSITION: 120 k Ω , 5%, 1/4W | 1 | RCR07G124JS | 81349 | 01121 |
| R11 | RESISTOR, VARIABLE, FILM: 100 k Ω , 10%, 1/2W | 2 | 62PAR100K | 73138 | |
| R12 | RESISTOR, FIXED, COMPOSITION: 47 k Ω , 5%, 1/4W | 2 | RCR07G473JS | 81349 | 01121 |
| R13 | Same as R8 | | | | |
| R14 | Same as R5 | | | | |

Courtesy of <http://BlackRadios.terry.org>

* Nominal vlaue. Final value to be factory selected.

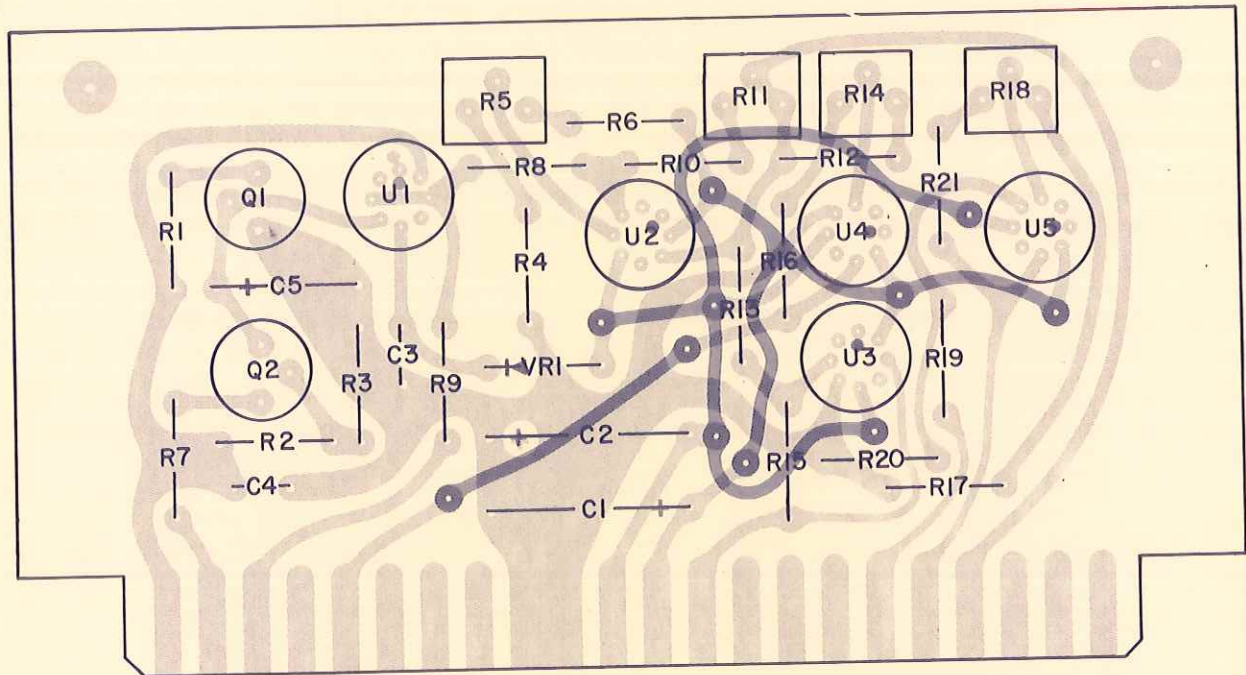


Figure 5-40. Type 8243 Sweep Generator (A18),
Location of Components

REF DESIG PREFIX A18

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|--------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| R15 | Same as R8 | | | | |
| R16 | Same as R12 | | | | |
| R17 | RESISTOR, FIXED, COMPOSITION: 62 k Ω , 5%, 1/4W | 1 | RCR07G623JS | 81349 | 01121 |
| R18 | Same as R11 | | | | |
| R19 | Same as R8 | | | | |
| R20 | Same as R8 | | | | |
| R21 | Same as R8 | | | | |
| U1 | INTEGRATED CIRCUIT | 5 | U5B7741393 | 07263 | |
| U2 | Same as U1 | | | | |
| U3 | Same as U1 | | | | |
| U4 | Same as U1 | | | | |
| U5 | Same as U1 | | | | |
| VR1 | DIODE, ZENER | 1 | 1N758A | 80131 | 04713 |

Courtesy of <http://BlackRadios.terry.org>

5.4.20 Part 13488 Focus and Intensity Board

REF DESIG PREFIX A19

| REF DESIG | DESCRIPTION | QTY. PER ASSY | MANUFACTURER'S PART NO. | MFR. CODE | RECM. VENDOR |
|--------------|-------------------------------------------------------------|---------------------|----------------------------|--------------|-----------------|
| C1 | CAPACITOR, FIXED, PLASTIC: 0.1 μ F, 10%, 100V | 1 | WMF IP1 | 14655 | |
| R1 | RESISTOR, FIXED, COMPOSITION: 100 k Ω , 5%, 1/4W | 1 | RCR07G104JS | 81349 | 01121 |
| R2 | RESISTOR, VARIABLE, COMPOSITION: 500 k Ω , 10%, 1/2W | 1 | RV5NAYSD504A | 81349 | 01121 |
| R3 | RESISTOR, FIXED, COMPOSITION: 3.3 M Ω , 5%, 1/2W | 1 | RCR20G335JS | 81349 | 01121 |
| R4 | RESISTOR, VARIABLE, COMPOSITION: 2.5 M Ω , 20%, 1/2W | 1 | RV5NAYSD255B | 81349 | 01121 |
| R5 | RESISTOR, FIXED, COMPOSITION: 3.9M Ω , 5%, 1/2W | 1 | RCR20G395JS | 81349 | 01121 |
| R6 | RESISTOR, FIXED, COMPOSITION: 4.7 M Ω , 5%, 1/2W | 1 | RCR20G475JS | 81349 | 01121 |

Courtesy of <http://BlackRadios.terry.org>

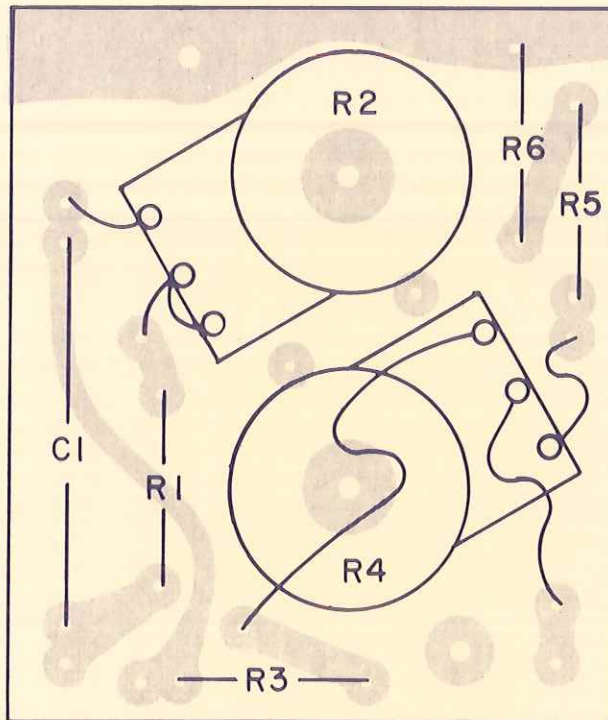


Figure 5-41. Part 13488 Focus and Intensity Board (A19),
Location of Components

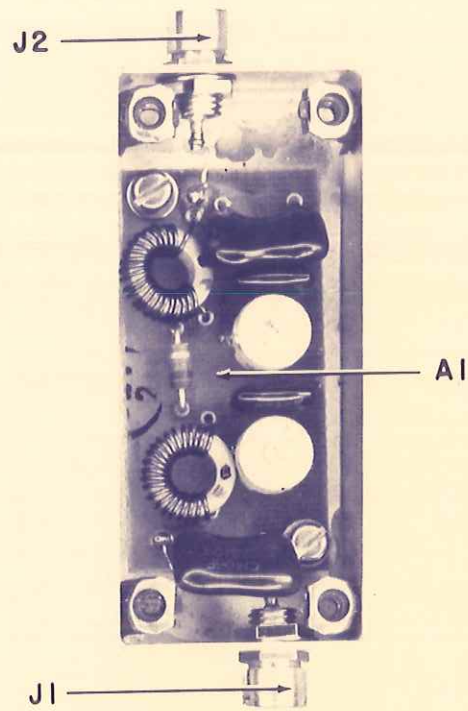


Figure 5-42. Type 79750 Bandpass Filter (A20),
Location of Components

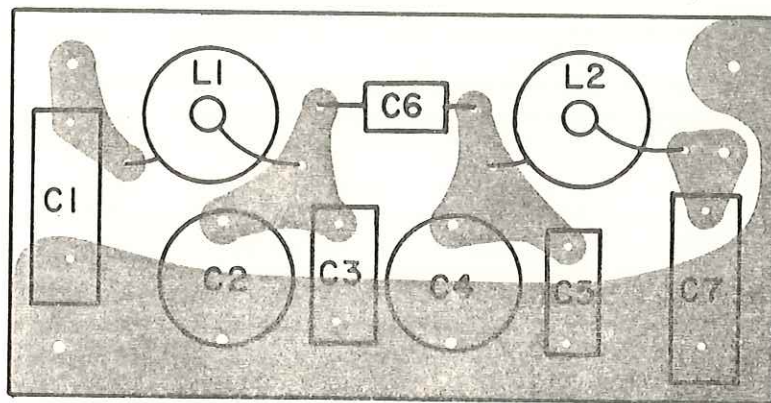


Figure 5-43. Part 16029 Bandpass Filter (A20A1),
Location of Components

Courtesy of <http://BlackRadios.terryo.org>