TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT

MAINTENANCE MANUAL

TEST SET, ELECTRONIC CIRCUIT PLUG-IN UNIT AN/ARM-87 (NSN 6625-00-908-0358)

HEADQUARTERS, DEPARTMENT OF THE ARMY

16 SEPTEMBER 1981

WARNING

Be careful when working on the 115-volt ac line connections and the 250 and 500 volt dc circuits. Serious injury or death may result from contact with these terminals.

DON'T TAKE CHANCES !

Review safety precautions in TB 385-4. Do not make internal connections or adjustments alone. Always have another person available to help in the case of an accident. Avoid shock – ground the test set. The protective grounding terminals of the test set and of test measurement equipment must be connected to the equipment ground (safety) conductor of power cords. Connect to a circuit that has a safety ground conductor, or otherwise connect the chassis to a safety ground.

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2. IF POSSIBLE TURN OFF THE ELECTRICAL POWER

3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

4. SEND FOR HELP AS SOON AS POSSIBLE

5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

TECHNICAL MANUAL
No. 11-6625-467-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *16 September 1981*

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TEST SET, ELECTRONIC CIRCUIT PLUG-IN UNIT AN/ARM-87 (NSN 6625-00-908-0358)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

In either case, a reply will be furnished direct to you.

LIST OF ILLUSTRATIONS

***This manual supersedes TM 11–6625–467-45, 29 December 1965 including all changes.**

LIST OF ILLUSTRATIONS—Continued

LIST OF ILLUSTRATIONS—Continued

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1-1. Scope

This manual covers the overall functioning of Test Set, Electronics Circuit Plug-In Unit AN/ARM-87, and contains instructions for direct support and general support maintenance of the test set.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and pro cedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System.

b. Report of Item and Packaging Discrepancies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVNATINST 4355.73/AFR 400.54/MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your AN/ARM-87 needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

1-5. Calibration

The calibration bulletin pertinent to the AN/ARM-87 is TB 11-6625-467-35.

CHAPTER 2

FUNCTIONING OF EQUIPMENT

Section I. BLOCK DIAGRAM FUNCTIONING

2-1. General Test Set Functioning

Test Set, Electronic Circuit Plug-In Unit AN/ARM-87, is composed of a series of 13 plug-in circuit cards containing various circuits for testing individual Radio Set AN/ARC-54 modules. Four CIRCUIT SELECTOR switches on the test set front panel connect the desired circuits to the module under test. A TEST METER on the test set front panel provides a visual indication of the module performances, A general description of the various circuits in the test set and their uses is given below.

a. Voltmeter Circuits. Several of the test set circuits are used in nearly every test performed on the AN/ARC-54 modules. The most extensively used circuit is the audio amplifier/detector. This circuit is used in conjunction with the TEST METER to perform as an electronic alternating current (at) voltmeter. Low-level signals in the frequency range of 150 hertz (Hz) to 500 kilohertz (kHz) are connected to the audio amplifier/detector input. The audio amplifier/detector amplifies the low-level signal, rectifies it, and applies the resulting direct current (de) voltage to the TEST METER for readout. The voltmeter circuit measures ac voltages both from the modules and from the test set itself. Oscillators in the test set that have variable output amplitudes are set to the proper output level through the use of the ac voltmeter circuit. A radio frequency (RF) amplifier/detector circuit provides a similar arrangement for measuring of 3 to 70 megahertz (MHz). Dc voltages in the modules and the test set are measured by bypassing the amplifiers and applying the dc voltage directly to the TEST METER.

b. Oscillators. There are eight oscillator circuits in the test set. Each oscillator produces a single frequency and has an adjustable output amplitude. The oscillator outputs connect to the CIRCUIT SELECTOR switches which route the oscillator outputs to the desired points. The eight oscillators generate frequencies of 150 Hz, 1 kHz, 10kHz, 500kHz, 3.975MHz, 5.925MHz, 30MHz, and 68MHz.

(1) The 150 Hz oscillator is used to check the tone squelch circuits in the receive audio module.

(2) The 1 khz oscillator simulates audio signals for all AN/ARC-54 modules.

(3) The 10 kHz oscillator frequency is above the audio response of the AN/ARC-54 and is used to simulate noise for carrier squelch tests.

(4) The 500 kHz oscillator is used to perform checks on the fixed intermediate frequency (IF) module. This oscillator is capable of being frequency modulated. Tests on the 500 kHz discriminator are performed by the use of the oscillator in this mode.

(5) The 3.975 and 5.925 megahertz osculatory are used in performing tests on the AN/ARC-54 variable IF module.

(6) The 30 and 68 megahertz oscillators test the RF amplifier and power amplifier modules on the AN/ARC-54 RF subchassis.

(7) As stated above, each oscillator output amplitude is variable. The oscillator amplitude controls are on the test set front panel. Before an oscillator is used in the AN/ARC-54 module testing procedures, the oscillator output is always connected to a voltmeter circuit (*a* above) to set the output level before it is applied to the module circuit. The low frequency oscillator outputs are routed through the CIRCUIT SELECTOR switches. The 3.975 and 5.925 megahertz oscillator and the 30 and 68 megahertz oscillator outputs appear at RF connectors on the front panel. RF jumper cables supplied with the test set are used to connect these oscillator outputs to the modules and voltmeter circuits.

c. Power Supplies. The test set contains two low voltage power supplies and a high voltage power supply to furnish operating power to both the test set internal circuits and to the module under test. The low voltage power supplies produce negative and positive 27.5 volts dc. The high voltage power supply produces +250 and +500 volts dc for operation of the AN/ARC-54 power amplifier. All power supply voltages are regulated. The positive 27.5 volt power supply has a special feature that allows the output voltage to be pulsed. The pulse simulates a switching transient and is used to test the despike circuit in the AN/ARC-54 power supply module. The POWER SELECTOR switch selects the various power supply modes of operation, that is, despike mode, high voltage, etc. The positive 27.5 volt power supply has a current rating of 8 amperes. This voltage is accessible at the. EXTERNAL terminals on the test set and can be used to furnish power for a complete Radio Set AN/ARC-54.

d. Frequency Measuring Circuits. The test set contains circuits for measuring and adjusting the 150 Hz and 500 kHz oscillators in the AN/ARC-54. Both circuits consist of selective amplifiers that are tuned to the frequency to be measured. A sample of the oscillator output is applied to the selective amplifier, and the selective amplifier output connects to the ac voltmeter circuit. The oscillator is then tuned for a maximum reading on the TEST METER. The 500 kHz selective amplifier has, in addition to a crystal filter, a bandpass filter. With a calibrated signal level input, the circuit will yield a known output level for all frequencies within the bandpass of the filter. When used in this mode, the circuit acts as a go-no-go tester.

e. Diode Switch Circuits. The diode switch circuits are used to test the homer module. The diode switches are driven by the 100 Hz oscillator in the homer module. By application of gating signals to the switch circuits, both homer left and homer right signals are simulated.

f. Loads. The test set provides loads for the AN/ARC-54 power supply and power amplifier modules. Loads are necessary for testing the modules under simulated operating conditions.

g. Terminating Impedances and Bias Voltages. The AN/ARC-54 modules are tested individually on the test set. The input and output impedances that the module normally connects to during operation are simulated by resistors, and capacitors in the test set. Bias voltages, including age (automatic gain control), are also provided.

2-2. Signal Paths

The test set consists of many different individual circuits such as oscillators, amplifiers, detectors, and discriminators; each performs a distinct function. Some of the circuits produce test signals for application to an AN/ARC-54 module; others are connected as ac or dc voltmeters for measuring module output voltages. Because all functional circuits in the test set are not used at one time, and many are used to perform tests on more than one module, the test set provides a means to program the functional circuits. The programing is accomplished by four 10-position rotary switches marked CIRCUIT SELECTOR A,B,C, AND D. The inputs and outputs of both the module circuits and the functional circuits connect to the CIRCUIT SELECTOR switches. The switches perform like a switchboard, connecting the test circuits to various module circuits for testing. Each functional circuit is discussed in paragraphs 2-3 through 2-18 in terms of other circuits that are used and in terms of the CIRCUIT SELECTOR switches responsible for programing the desired circuit into the test routine. Tables 2-1 through *2-8* show the signal paths for each CIRCUIT SELECTOR program specified in the operating procedures and self-tests of TM 11-6625-467-12. ‘These tables should prove helpful not only in understanding how the test set operates but also in troubleshooting the test set.

2-3. FREQUENCY SELECTOR-MC Switches Signal Paths

(fig. 2-1)

The AN/ARC-54 tuning system is composed of three five-wire re-entrant systems, one for .05 megahertz tuning and two for whole-megahertz tuning. Switches S7, S8, and S9 in the test set generate codes that tune the AN/ARC-54 RF subchassis to any desired frequency in the range of 30.00 to 69.95 megahertz in steps of .05 megahertz. Switches S7 and S8 select the whole megahertz frequency and switch S9 selects the .05 megahertz increments. Switch S9 generates a different ground sequence on the .05 megahertz select lines for each of 20 switch positions. (See table 2-9 for the grounding sequence.) Switch S8 generates two separate coded sequences to select whole megahertz frequencies in the range of 30 to 69 megahertz. (See table 2-10 for the grounding sequence.) Coding for the 30 megahertz range is identical with the coding for the 50 megahertz range; also the code for the 40 and 60 megahertz ranges are the same. Switch sections S8B and S8D generate the code for the 40 and 60 megahertz ranges. Switch S7 selects one of the two codes and generates an ambiguity code that distinguishes the 30 megahertz code from the 50 megahertz code or the 40 megahertz code from the 60 megahertz code. Switch S8E generates a coded ground to distinguish the odd and even megahertz frequencies.

2-4. Voltmeter Signal Paths

(fig. 2-2)

Oscillator output levels, module output levels, and various other ac and dc voltages are measured by the voltmeter in the test set. Figure 2-2 illustrates how ac voltages (150 Hz to 500 kHz), radio frequency voltages (3 to 70 MHz), and dc voltages are measured. The types of voltage measurement are discussed below.

a. Ac Voltage Measurements. Ac voltages in the test set within the frequency range of 150 Hz to 500 kHz are measured as shown in A, figure 2-2. The ac voltages to be measured connect to CIRCUIT SELECTOR switches B and C which select the de-

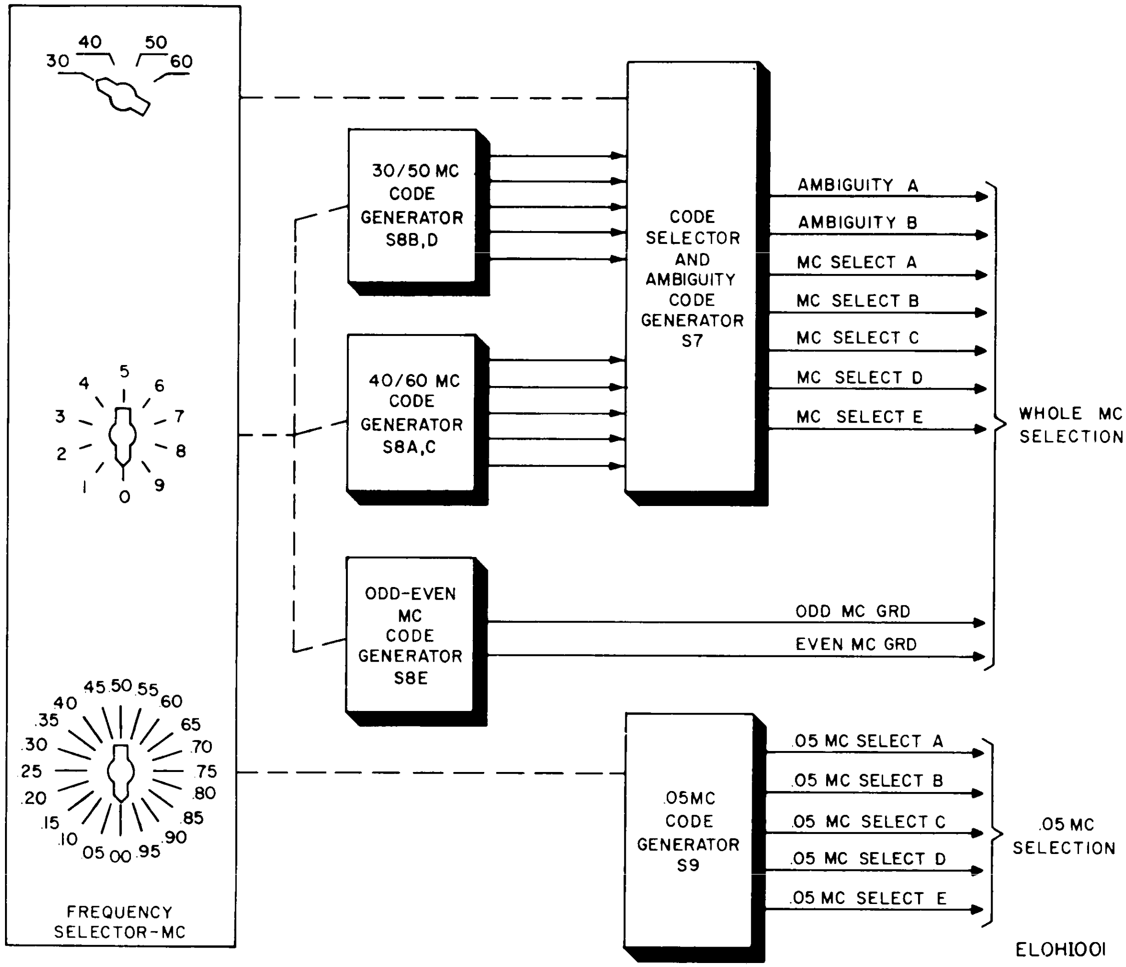


Figure 2-1. Frequency selector switch circuit, functional diagram.

sired voltage. CIRCUIT SELECTOR A selects either CIRCUIT SELECTOR B or C and connects the selected output to the audio amplifier/detector input. The audio amplifier/detector amplifies and detects the ac input voltage and produces a dc output voltage that is proportional to the input amplitude. CIRCUIT SELECTOR A also connects the audio amplifier/detector output to the PRESS TO TEST switch. The PRESS TO TEST switch connects the dc voltage to the TEST METER to readout.

b. RF Voltage Measurement. Radio frequency (RF) voltages in the test set, within the frequency range of 3 to 70 megahertz, are measured as shown *in* B, figure 2-2. The RF voltages are connected to front panel connectors RF VM1, RF VM2, RF VM3, and RF VM4 by RF jumper cables supplied with the equipment. The four inputs, RF VM1 through RF VM4, match 50 ohm, 150 ohm, 200 ohm, and 600 ohm input impedances, respectively. The RF amplifier/detector amplifies and detects the RF input voltage and produces a dc output voltage that is proportional to the RF input amplitude. CIRCUIT SELECTOR B or C connects the RF amplifier/detector output to CIRCUIT SELECTOR A. CIRCUIT SELECTOR A connects either CIRCUIT SELECTOR B or C to the PRESS TO TEST switch. The PRESS TO TEST switch connects the dc voltage to the TEST METER for readout.

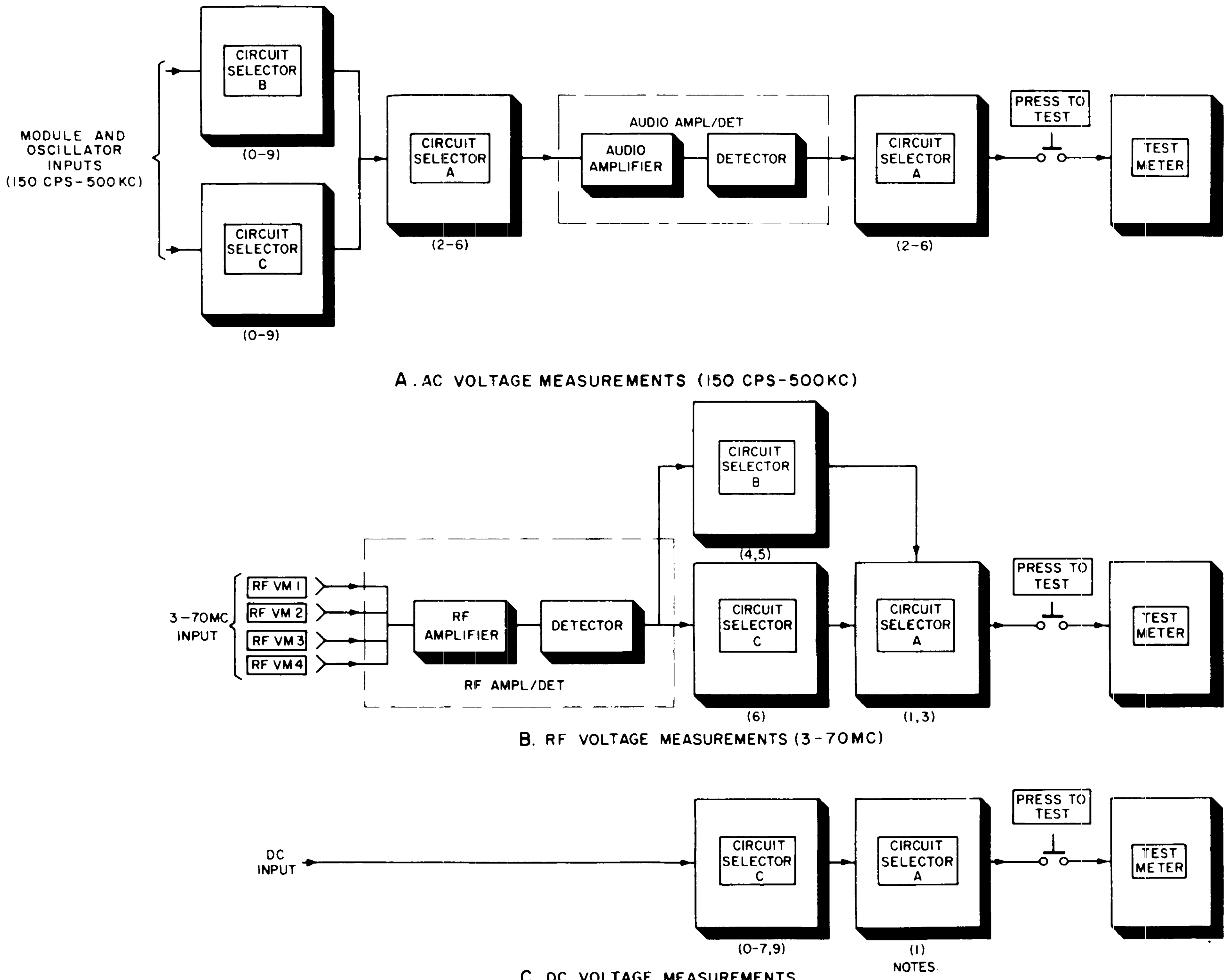
c. Dc Voltage Measurements. Dc voltages in the test set are measured as shown in C, figure 2-2. The dc voltages connect to CIRCUIT SELECTOR C. CIRCUIT SELECTOR C selects the dc voltage to be measured and applies the voltage to the TEST METER through the PRESS TO TEST switch.

2-5. 150 Hz Oscillator/Counter Signal Paths

(fig. 2-3)

The 150 Hz oscillator/counter is a single circuit that performs two functions as follows:

a. 150 Hz Oscillator. The circuit is connected as an oscillator by CIRCUIT SELECTOR D (position 1) which connects the output of the 150 Hz amplifier to the circuit input. The 150 CPS AMPL control varies the oscillator output level. CIRCUIT SELECTOR B (position 4) connects the 150 Hz oscillator to the



NOTES.

1. [box] INDICATES EQUIPMENT MARKING
2. NUMBERS SHOWN IN ( ) INDICATE CIRCUIT SELECTOR SETTING FOR FUNCTION SHOWN

Figure 2-2. Test set voltmeter circuit, functional diagram.

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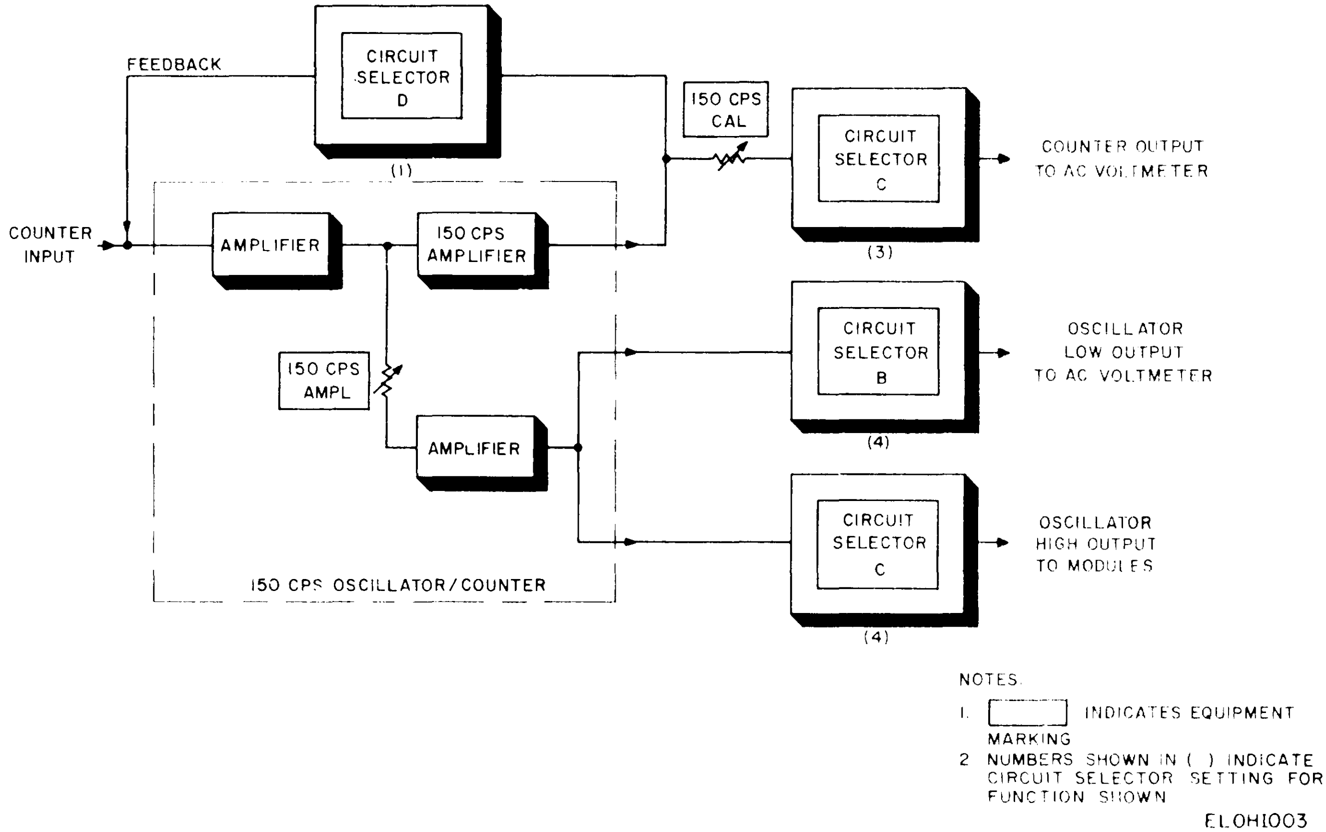


Figure 2-3. 150 Hz oscillator/counter circuit functional diagram.

various module inputs.

b. 150 Hz Counter. The 150 Hz counter is a selective amplifier circuit that measures the frequency of the 150 Hz oscillator in the sel-call module. For counter operation, CIRCUIT SELECTOR D opens the feed back loop and the circuit operates as a selective amplifier. The 150 CPS CAL control adjusts the output amplitude of the counter circuit. CIRCUIT SELECTOR C (position 3) connects the counter output to the ac voltmeter circuit for readout.

2-6. 1 kHz Oscillator Signal paths

(fig. 2-4)

The 1 kHz oscillator produces a 1 kHz sine wave output. The 1 KC AMPL control varies the amplitude of both the high and low outputs. CIRCUIT SELECTOR B connects the low output to either the ac voltmeter circuit or the distortion detector. CIRCUIT SELECTOR C connects the low output to the ac voltmeter circuit for readout. The 1 kHz high output connects to CIRCUIT SELECTOR D which distributes it to the different module inputs.

2-7. 10 kHz Oscillator Signal Paths

(fig. 2-5)

The 10 kHz oscillator produces a 10 kHz sine wave for testing the module circuits. CIRCIUIT SELECTOR D, when set to position 2 or 8, supplies operating voltage to the oscillator. The 10 KC AMPL control adjusts the 10 kHz output amplitude. In position 5, CIRCUIT SELECTOR C connects the low oscillator output to the ac voltmeter circuit for readout. CIRCUIT SELECTOR. in position 2, connects the high oscillator output to the module circuits.

2-8. 500 kHz FM Oscillator Signal Paths

(fig. 2-6)

The 500 kilohertz frequency-modulated (fm) oscillator produces a 500 kHz sine wave output for testing the module circuits. The oscillator is capable of being frequency modulated by a 1 kHz signal, In positions 4 through 7, CIRCUIT SELECTOR connects +27.5 volts dc operating voltage to the 500 kHz oscillator. CIRCUIT SELECTOR D also connects the 1 kHz oscillator output to the modulation input in position 5 and 6. The 500 KC AMPL, control adjusts the 500 kHz oscillator output level. CIRCUIT SELECTOR A, in position 6 or 7, connects the high oscillator output to the 500 kHz switch circuit. CIRCUIT SELECTOR D, when set to position 5, 6, or 7, connects the high oscillator output to the input of the fixed IF module 500 kHz input.

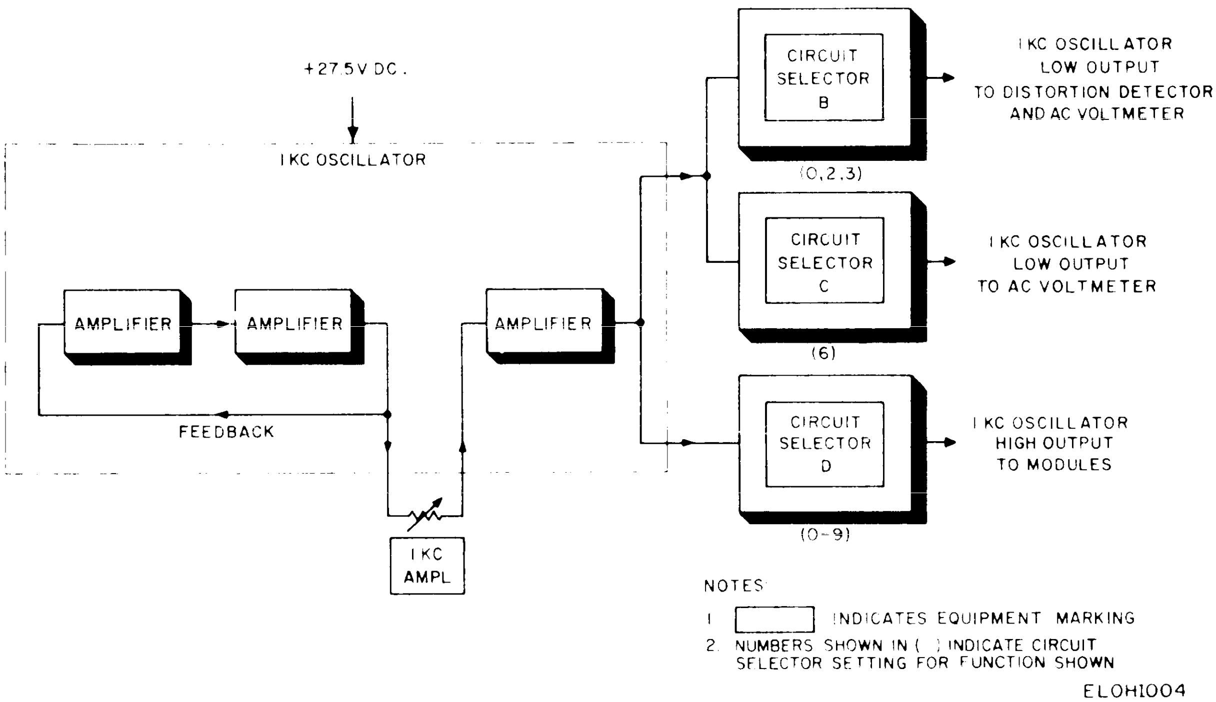


Figure 2-4. 1kHz oscillator circuit, functional diagram.

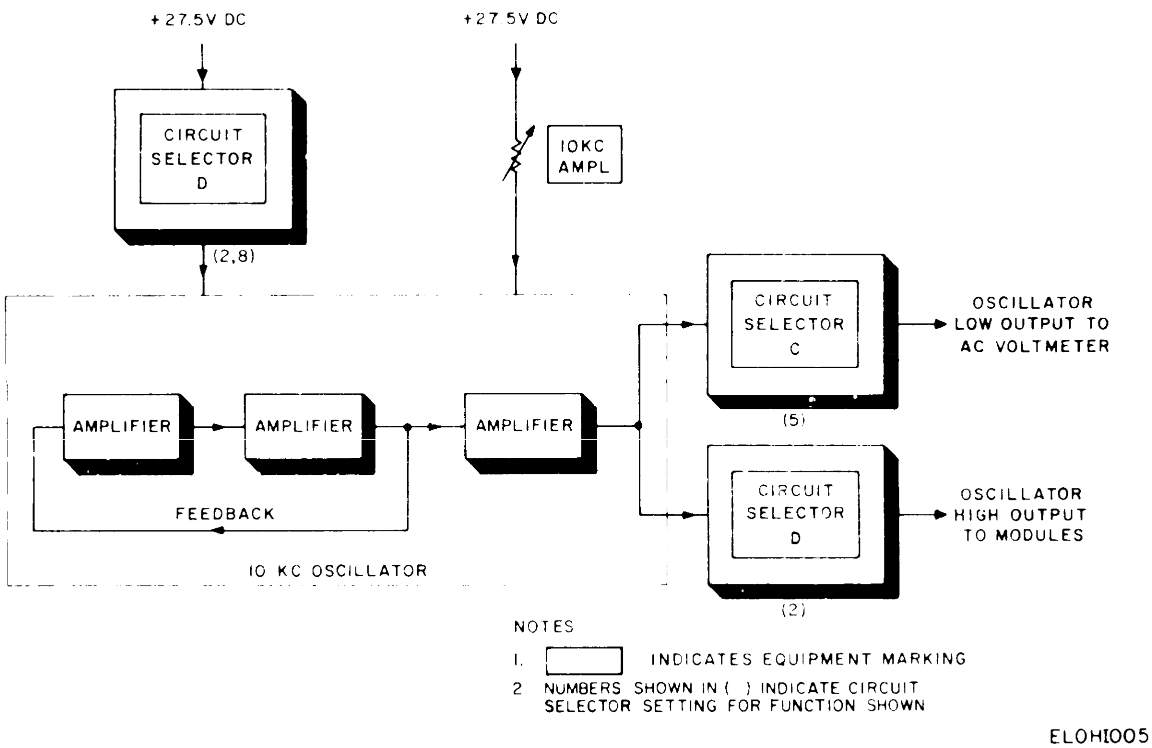


Figure 2-5. 10-kHz oscillator circuit functional diagram.

2-9. 3.975 MHz Oscillator Signal Paths

(fig. 2-7)

The 3.975 megahertz oscillator produces a 3.975 megahertz sine wave output signal. The oscillator output appears at the 3 MC jack of the test set. CIRCUIT SELECTOR D (position 9) connects +27.5 volts dc to the LOW FREQ AMPL control, and CIRCUIT SELECT0R C (position 8) connects the LOW FREQ AMPL control output to the oscillator. The LOW FREQ AMPL control adjusts the oscillator

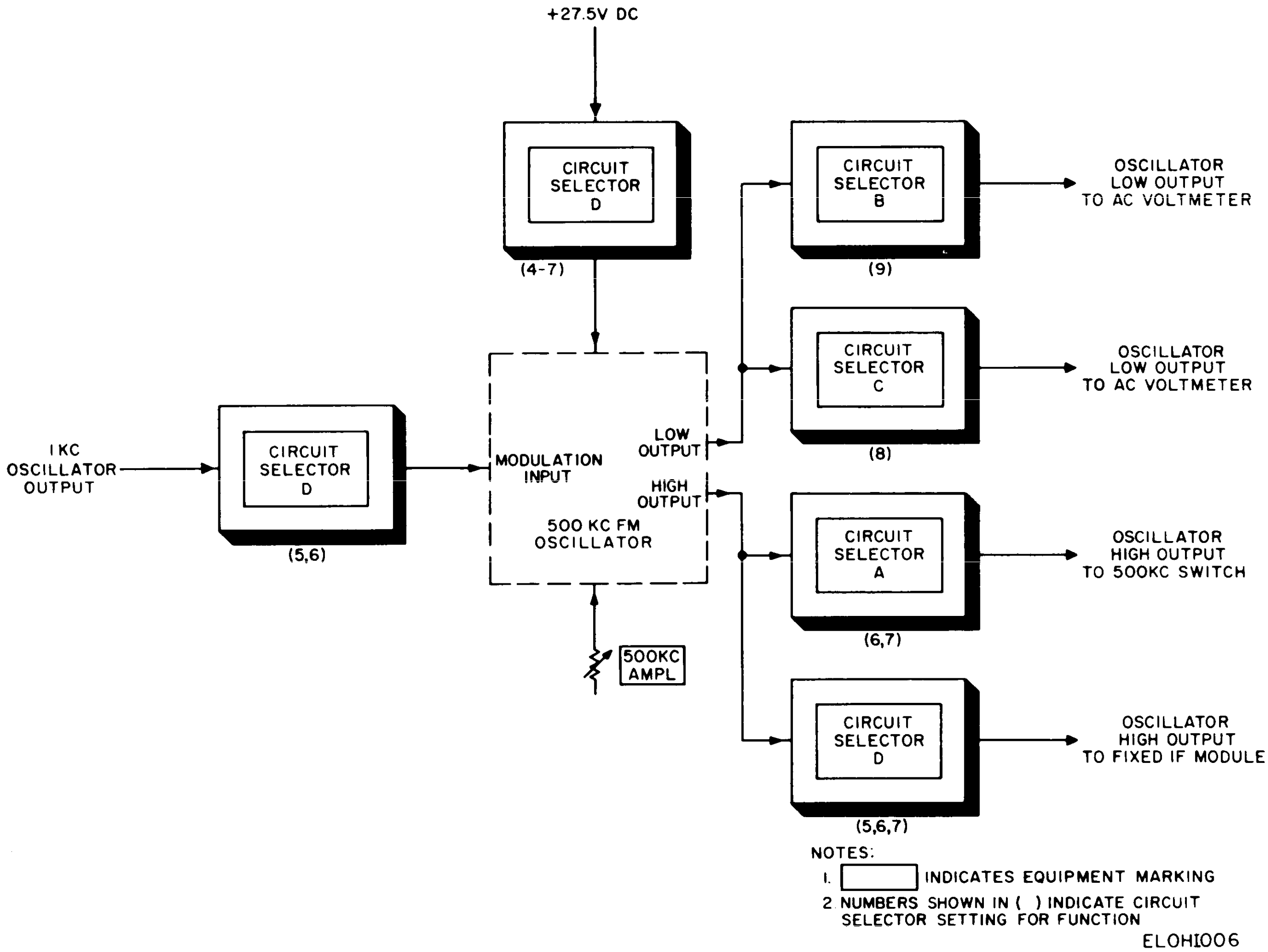


Figure 2-6. 500-kHz fm oscillator circuit ,functional diagram.

output level. The oscillator circuit contains a level detector circuit that samples the oscillator output and produces a proportional dc output. CIRCUIT SELECTOR B (position 1) connects the level detector output to the dc voltmeter circuit for readout.

2-10. 5.925 MHz Oscillator Signal Paths
(fig. 2-8)

The 5.925 megahertz oscillator produces a 5.925 megahertz sine wave output signal. The oscillator ouput appears at the 5 MC jack on the test set front panel. CIRCUIT SELECTOR D (position 9) connects +27.5 volts dc to the LOW FREQ AMPL control, and CIRCUIT SELECTOR C (position 9) applies the control output to the oscillator. The LOW FREQ AMPL control adjusts the oscillator output level. The oscillator circuit contains a level detector circuit that samples the 5.925 megahertz output and produces a proportional dc output. CIRCUIT SELECTOR B (position 2) connects the level detector output to the dc voltmeter circuit for readout.

2-11. 30 MHz Oscillator Signal Paths
(fig. 2-9)

The 30 megahertz oscillator produces a 30 megahertz sine wave output. The oscillator output appears at the 30 MC jack on the front panel of the test set. In position 3, CIRCUIT SELECTOR D connects +27.5 volts dc to the HIGH FREQ AMPL control which adjusts the oscillator output level. Either CIRCUIT SELECTOR A or C connects the HIGH FREQ AMPL control output to the 30 megahertz oscillator. In position O, CIRCUIT SELECTOR A completes the path. In position 7, CIRCUIT SELECTOR C completes the path.

2-12. 68 MHz Oscillator Signal Paths
(fig. 2-10)

The 68 megahertz oscillator produces a 68 megahertz sine wave output signal. The oscillator output appears at the 68 MC jack on the front panel of the test set. In position 3, CIRCUIT SELECTOR D con-

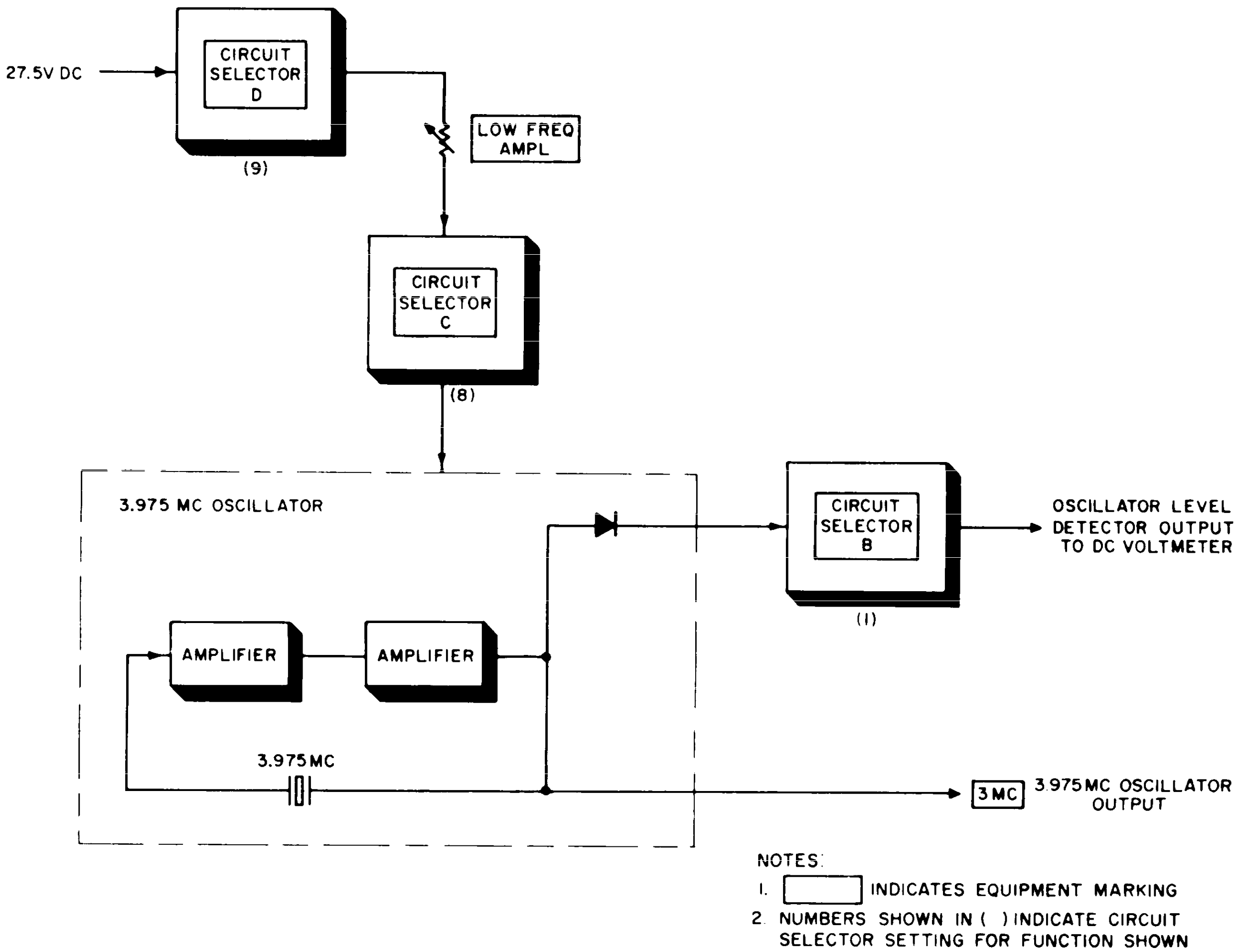


Figure 2-7. 3.975-MHz osillator circuit, functional diagram.

nects +27.5 volts dc to the HIGH FREQ AMPL control which adjusts the oscillator output level. In position 6, CIRCUIT SELECTOR C completes the path from the HIGH FREQ AMPL control to the 68 megahertz oscillator circuit.

2-13. 500 kHz Switch Signal Paths
(fig. 2-11)

The 500 kilohertz switch circuit applies a 500 kilohertz signal modulated by a 100 hertz square wave to the homer module. The signal simulates homer left and right signals. The 100 hertz oscillator in the homer module applies the 100 hertz square wave modulating signal direct to the switch circuit. Applying ground to either gate input causes a 180° phase reversal of the modulated output signal. In position 3, CIRCUIT SELECTOR C applies ground to the minus gate input and in position 9, CIRCUIT SELECTOR C grounds the plus gate input. In position 6 or 7, CIRCUIT SELECTOR A connects the 500 kHz fm oscillator to the gate circuit. (Refer to paragraph 2-8 for details of the 500 kHz fm oscillator circuit).

2-14. 30 MHz Switch Signal Paths.
(fig. 2-12)

The 30 megahertz switch circuit applies a 30 megahertz signal modulated by a 100 hertz squarewave to the homer module. The signal simulates homer left and right signals. The 100 hertz oscillator in the homer module applies the 100 hertz square wave modulating signal direct to the switch circuit. Ground applied to either gate input causes a 180° phase reversal of the modulating voltage. In position 0, CIRCUIT SELECTOR C applies ground to both the minus and plus gate switch circuit inputs; in position 1, it grounds the plus gate input, and in position 2, the minus gate input is grounded. The 30 megahertz oscillator connects to the switch circuit through an RF jumper cable connected between the 30 MC and RF SW IN jacks on the test front panel. The circuit output appears at the RF SW OUT jack on the front panel and connects to the homer module through an RF jumper cable.

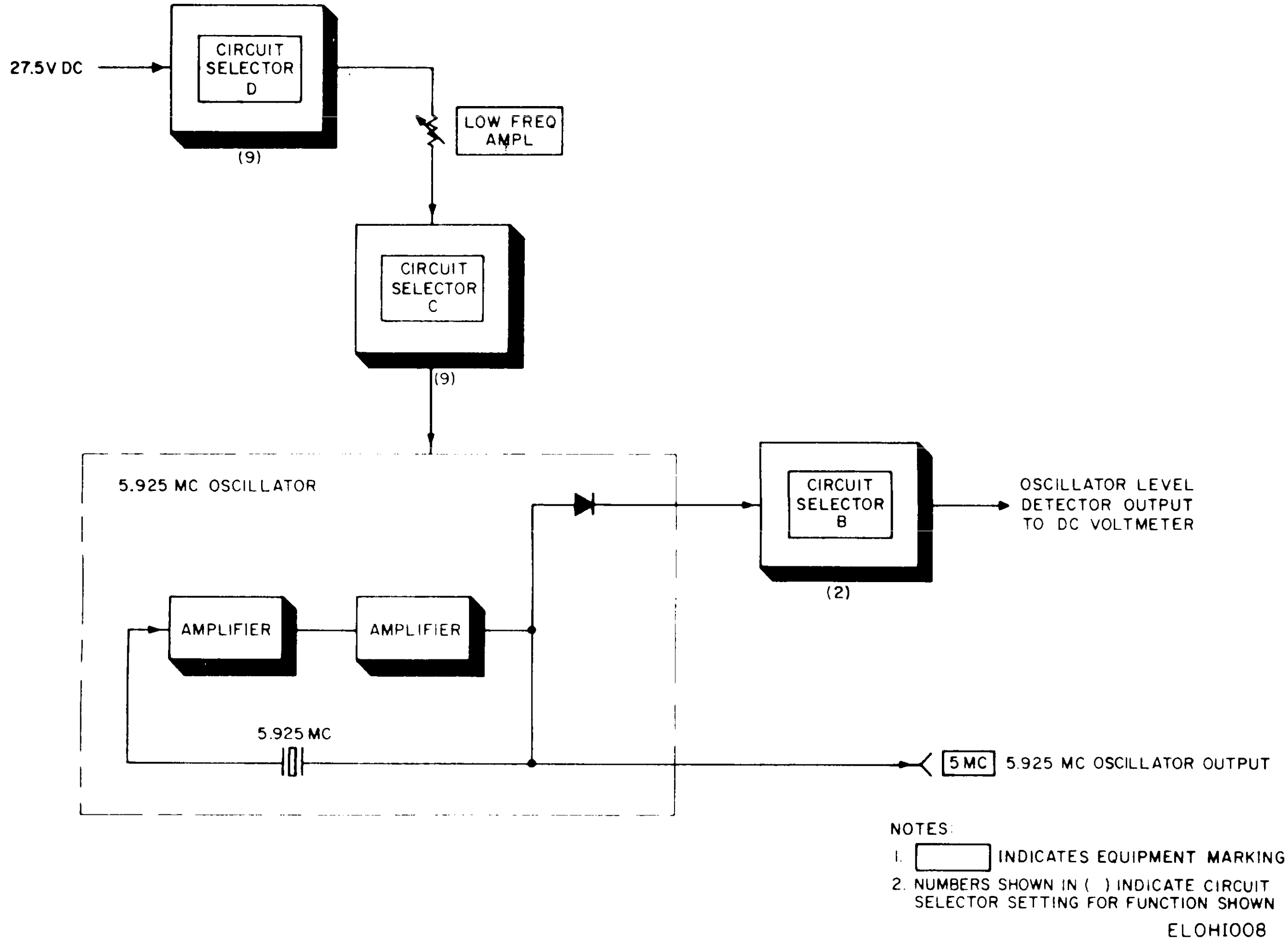


Figure 2-8. 5.925 MHz oscillator circuit, functional diagram

2-15. 500 KHz Filter Signal Paths

(fig. 2-13)

The 500 kilohertz filter circuit consists of two types of filters, a bandpass filter and a crystal filter. The circuits are used to check and calibrate the frequency of the 500 kilohertz oscillator in the transmit audio module. In position 3, CIRCUIT SELECTOR D connects the transmit audio module 500 kilohertz oscillator to the filter input through the 500 KC FILTER control. The KC FILTER control adjusts the input amplitude to the filter circuit which can be directly monitored by the ac voltmeter circuit. The bandpass filter (mechanical filter) has a center frequency of 500 kHz and a bandwidth of ± 700 Hz at the -6 decibel (half voltage) level. To determine whether the frequency is within the ±700 Hz of 500 kHz, set the input level to the filter circuit to a desired level; then switch the ac voltmeter circuit to the bandpass filter output, The crystal filter has a much narrower bandpass than the bandpass filter and is used to adjust the oscillator frequency. The ac voltmeter circuit connects to the crystal filter output, and the oscillator frequency is adjusted for a peak reading.

2-16. Distortion Detector Signal Paths

(fig. 2-14)

The distortion detector circuit measures distortion generated by various AN/ARC-54 module circuits. The distortion detector operates by use of a 1 kHz frequency; therefore, the 1 kHz oscillator circuit (para 2-6) is used in conjunction with the distortion detector. The 1 kHz oscillator connects to the module circuit input. The circuit outputs connect to the CIRCUIT SELECTOR B. CIRCUIT SELECTOR B, in position 0, 1, 2, or 3, connects the desired circuit to the distortion detector input. DIST DET (distortion detector) control R4 couples the CIRCUIT SELECTOR B output to the distortion detector circuit and adjusts the amplitude of the signal to a desired level. Two steps are involved in using the distortion detector. First, the amplifier output is connected directly to the voltmeter circuit through

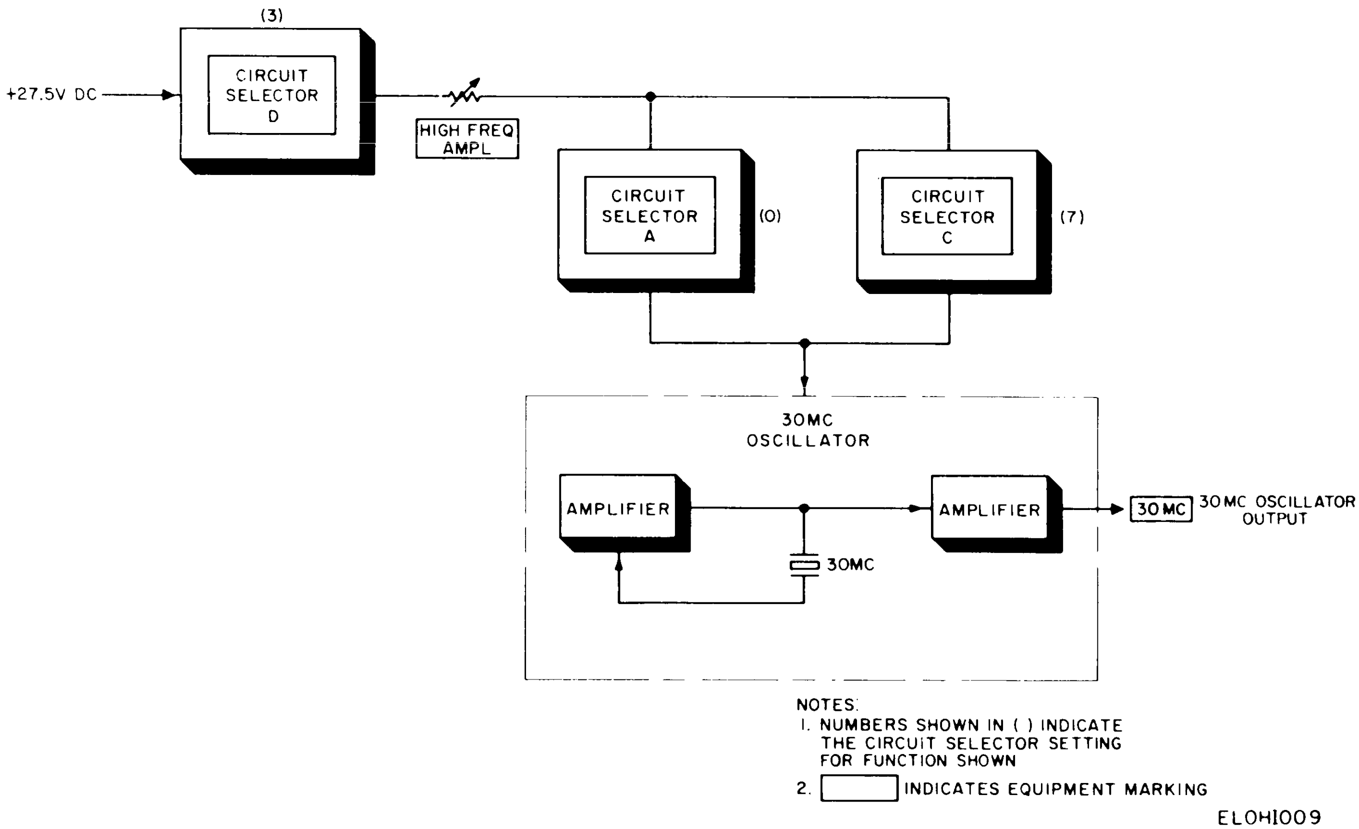


Figure 2-9. 30 MHz oscillator circuit, functional diagram.

CIRCUIT SELECTOR C (position 1). The DIST DET control is adjusted for a specified reading on the TEST METER. This reading represents 100 percent distortion. Next, CIRCUIT SELECTOR C is switched to position O. The amplifier output must now pass through highpass filter FL1 before it reaches the voltmeter circuit. The highpass filter only passes frequencies above 1 kHz; therefore, the fundamental frequency is filtered out and all that remain are the harmonic components generated as a result of nonlinear amplification in the module circuit under test. The TEST METER indicates the amplitude of these harmonic components as a percentage of the original signal amplitude.

2-17. 500 kHz Discriminator Signal Paths

(fig. 2-15)

The 500 kHz discriminator demodulates the fm 500 kilohertz output of the transmit audio module. In position 3, CIRCUIT SELECTOR A connects the transmit audio module 500 kilohertz output to the discriminator input. The discriminator output connects to one of two places through CIRCUIT SELECTOR switches. In position 2, CIRCUIT SELECTOR B connects the discriminator output to the distortion detector circuit. CIRCUIT SELECTOR C, in position 2, connects the discriminator output to the ac voltmeter circuit.

2-18. RF Power Detector Signal Paths

(fig. 2-16)

The test set RF power detector circuit provides a means to measure the AN/ARC-54 power amplifier output power. The power amplifier connects to J9 on the test set when the AN/ARC-54 RF subchassis is plugged into J2. Connector J9 applies the RF power to attenuator AT1 which provides a 50 ohm load impedance for the power amplifier. The attenuator also acts as a power divider and applies a portion of the input power to power detector A14. The power detector rectifies the RF signal and produces a dc output voltage that is proportional to the RF input voltage. The dc output of the power detector is applied to CIRCUIT SELECTOR B. CIRCUIT SELECTOR B (position 0) connects the dc voltage to CIRCUIT SELECTOR A. When CIRCUIT SELECTOR A is in position O, it transfers the dc voltage to the dc voltmeter circuit for readout.

2-19. Signal Paths (Operating Procedures) of CIRCUIT SELECTOR Switches

The test set contains a group of functional circuits such as oscillators, amplifiers, and detectors, connected together by a switching arrangement for

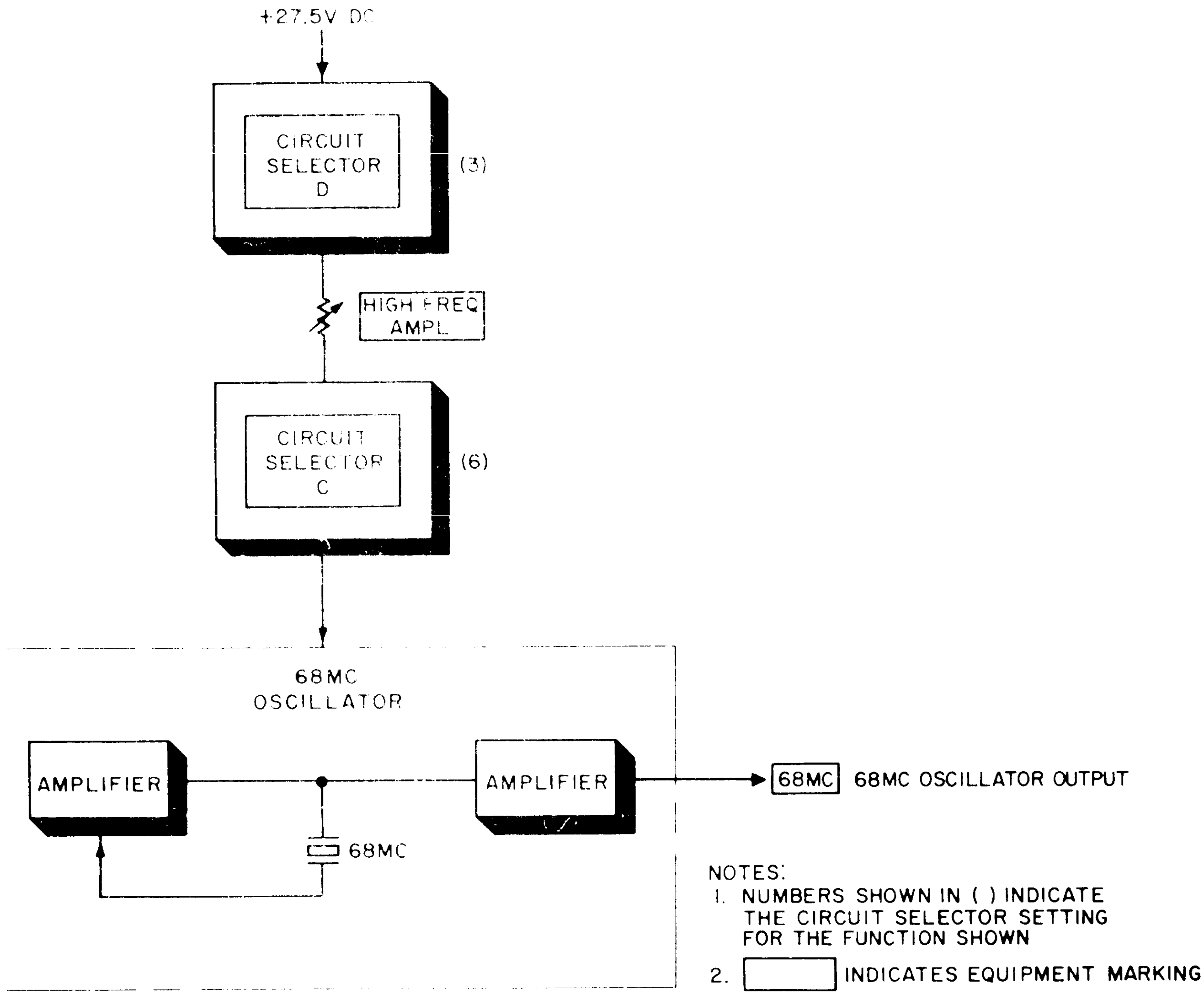


Figure 2-10. 68 MHz osillator circuit, functional diagram.

testing individual modules of Radio Set AN/ ARC-54. The switching arrangement consists of four 10-position, 6-deck, front panel rotary switches labeled CIRCUIT SELECTOR A, B, C, and D. The inputs and outputs of the AN/ARC-54 modules, as well as the inputs and outputs of the functional cir cuits, connect to the switches. Setting the switches to specified positions connects a complete test arrangement for a given module circuit. Operating procedures given in TM 11-6625-467-12 list the CIRCUIT SELECTOR switch setting for each module test. Tables 2-1 through 2-7 below are keyed to the operating procedures in TM 11-6625 467-12. The STEP column. the TEST NAME column, and the CIRCUIT SELECT SWITCH columns in the tables correspond to similarly titled columns in the operating procedures. Tables 2-1 through 2-7 explain the function of each CIRCUIT SELECTOR switch wafer. Only the switch wafers that perform a specific function for the test being performed are listed. Table 2-1 includes the RF JUMPER CABLE column. This column describes the function of RF jumper cables connected as part of the test. Use tables 2-1 through 2-7 to determine the testing configuration for any module circuit. Figure FO-3, which is a schematic diagram of the CIRCUIT SELECTOR switches, shows the routing of the test signals through the switches; refer to this figure to determine the signal flow for any CIR-CUIT SELECTOR switch setting.

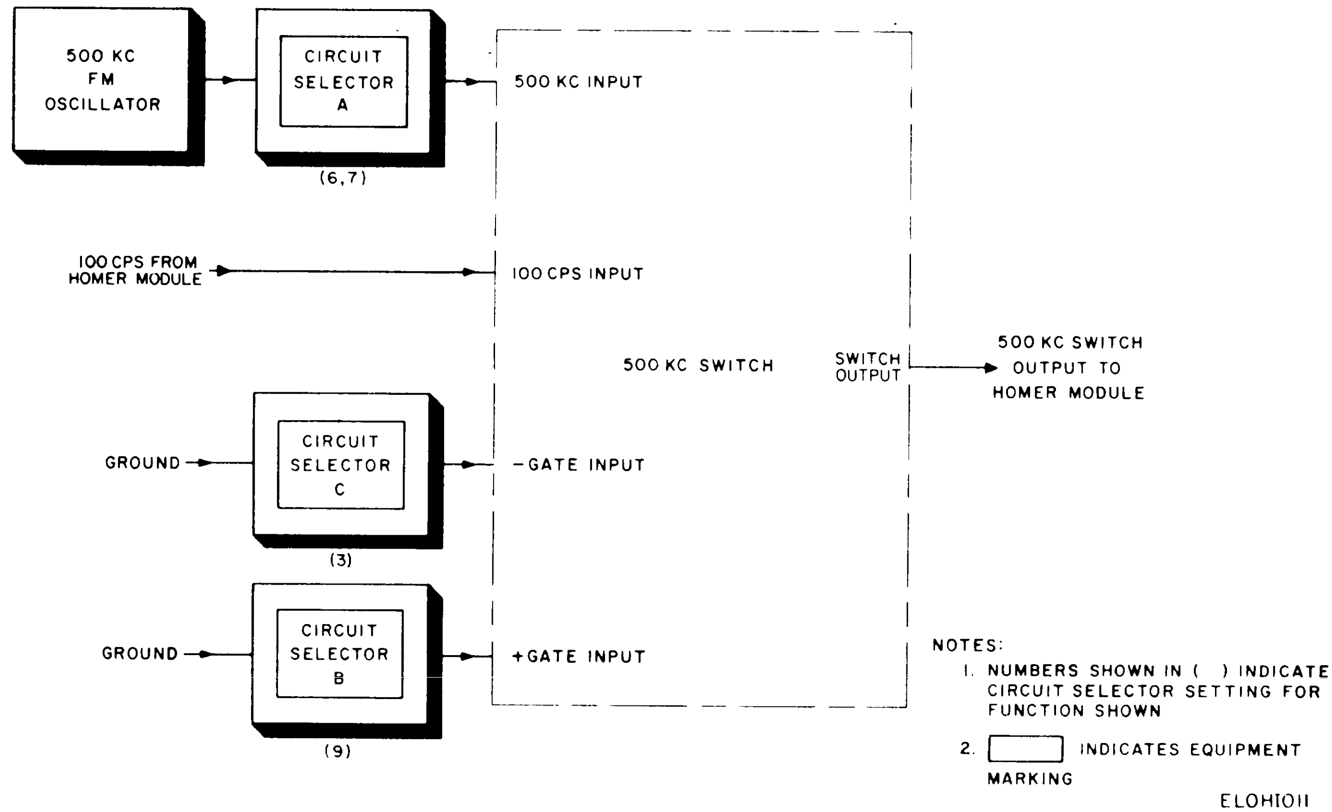


Figure 2-11. 500 kHz switch circuit, functional diagram.

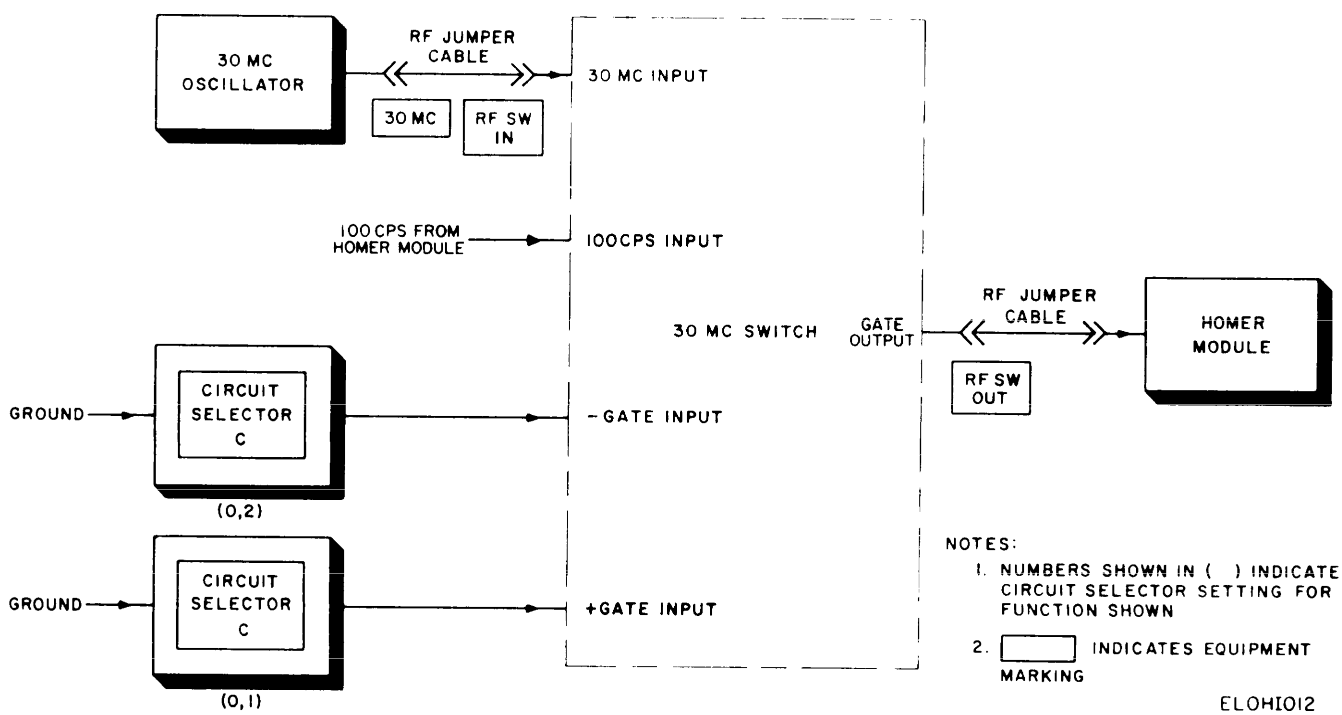


Figure 2-12. 30 MHz switch circuit, functional diagram.

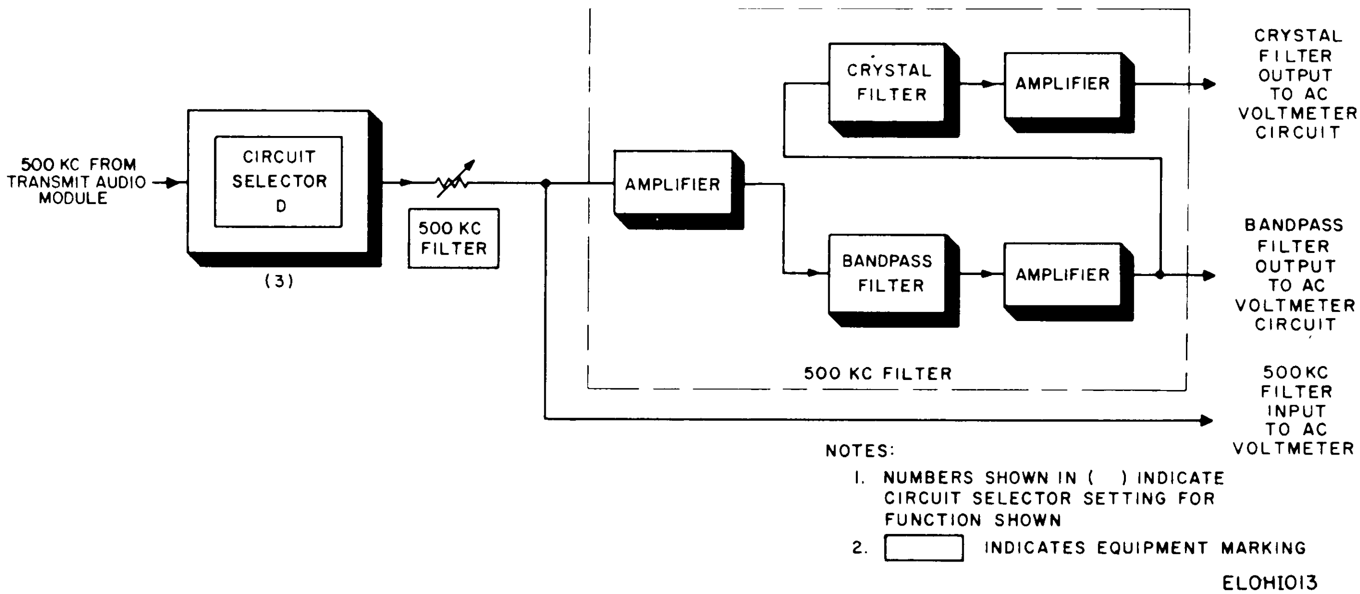


Figure 2-13. 500 kHz filter circuit, functional diagram.

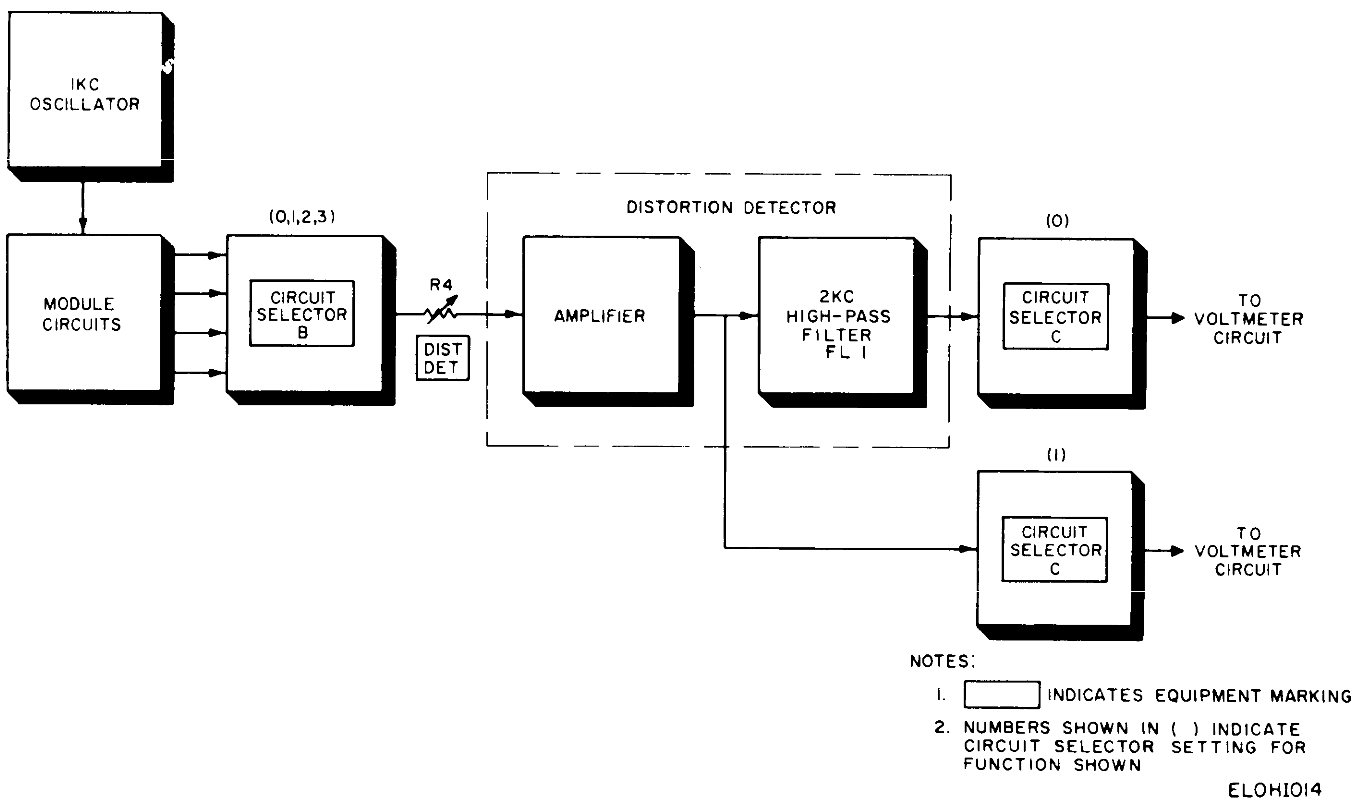


Figure 2-14. Distort ion detector circuit, functional diagram.

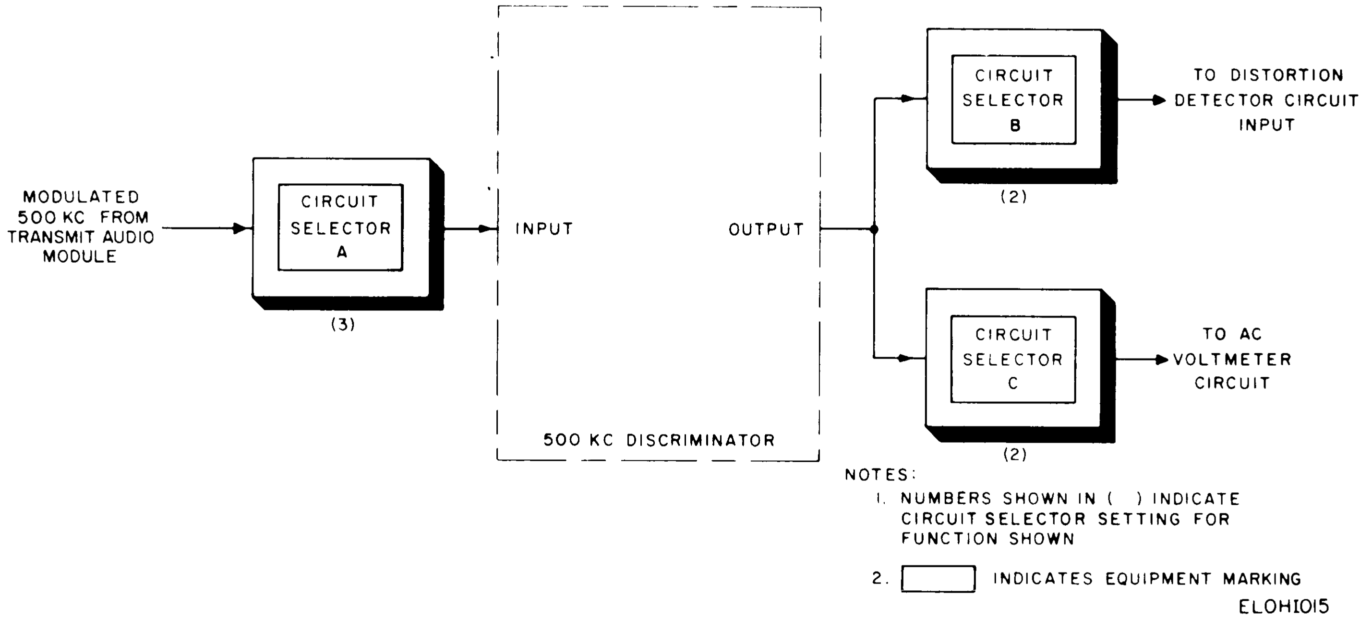


Figure 2-15. 500 kHz discriminator circuit, functional diagram.

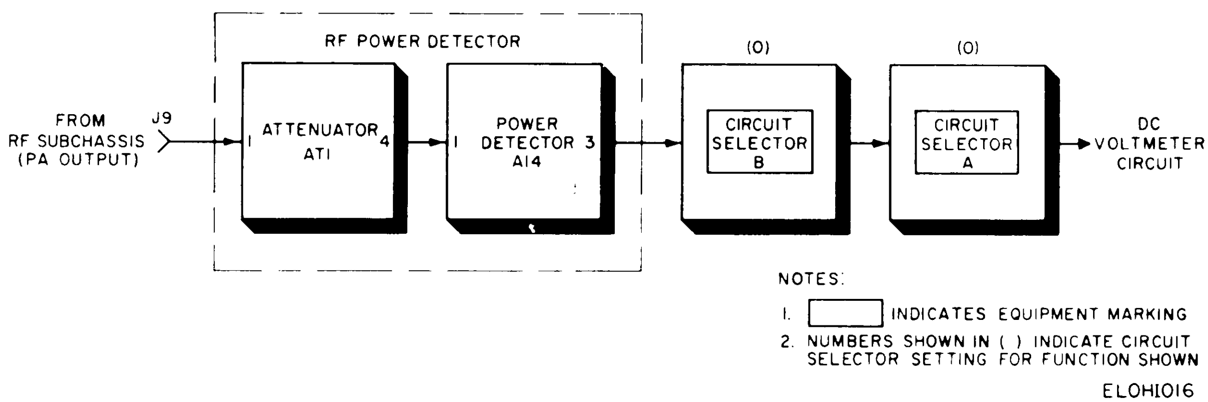


Figure 2-16. RF power detector circuit, functional diagram.

Table 2-1. RF Subchassis Test Switch Positions

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
1	Lfo RF amplitude.	0	5	X	X	A B	Connects S4A to meter +. Connects ground to meter −	A	Connects RF ampl/det output to S3A.	----	Switch S5 has no function for this test.	----	Switch S6 has no function for this test.	W1	Connects the lfo module output to the RF ampl/det 200-ohm input.
2	Lfo dc to meter--	1	X	5	X	A B	Connects S5A to meter +. Connects ground to meter −.	----	Switch S4 has no function for this test.	A	Connects RF subchassis lfo meter output to S3A.	----	Switch S6 has no function for this test.		
3	Hfo RF amplitude.	0	5	X	X	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects RF ampl/det output to S3A.	----	Switch S5 has no function for this test.	----	Switch S6 has no function for this test.	W4	Connects the hfo module output to the RF ampl/det 600-ohm input.
4	Hfo dc to meter--	1	X	4	X	A B	Connects S5A to meter +. Connects ground to meter −.	----	Switch S4 has no function for this test.	A	Connects RF chassis hfo meter output to S3A.	----	Switch S6 has no function for this test.		
5	*a.* Variable IF receive gain (low end).	0	1	8	9	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects 3.975-mc detector output to S3A.	C D	Connects the LOW FREQ AMPL control to S5D. Connects LOW FREQ AMPL control to 3.975-mc osc.	B	Connects operating voltage to the 3.975-mc osc.		

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
5	*a*. Variable IF receive gain (low end).--Con.	6	4	8	9	A	Connects audio ampl/det output to meter +.	E	Connects variable IF module 500-kc output to S3C.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to the 3.975-mc osc.	W4	Connects the 3.975-mc osc output to vif module input.
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 3.975-mc osc.				
						C	Connects S4E to audio ampl/det input.								
	b. Variable IF receive gain (high end).	0	2	9	9	A	Connects S4A to meter +.	A	Connects 5.925-mc detector output to S3A.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to the 5.925-mc osc.		
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 5.925-mc osc.				
										E	Connects ground to RF subchassis ptt ground input.				

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
5.	b. Variable IF receive gain (high end)-Con.	6	4	9	9	A	Connects audio ampl/det output to meter +.	E	Connects variable IF module 500-kc output (low) to S3C.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to the 5.925-mc osc.	W4	Connects the 5.925-mc osc output to vif module input.
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 5.925-mc osc.				
						C	Connects S4E to audio ampl/det input.								
6	*a*. Receive gain (30 mc).	0	4	7	3	A	Connects S4A to meter +.	A	Connects RF ampl/det output to S3A.	C	Connects HIGH FREQ AMPL control to S5D.	B	Connects operating voltage to 30-mc osc.	W4	Connects 30-mc osc output to RF ampl/det 50-ohms input.
						B	Connects ground to meter −.			D	Connects HIGH FREQ AMPL control to 30-mc osc.				
						D	Connects HIGH FREQ AMPL control to S3E.								
						E	Connects HIGH FREQ AMPL control to 30-mc osc.								
		6	5	7	3	A	Connects audio ampl/det output to meter +.	E	Connects the 500-kc vif module output (high) to audio ampl/det input.	C	Connects HIGH FREQ AMPL control to S5D.	B	Connects operating voltage to 30-mc osc.	W4	Connects 30-mc osc output to 70-db attenuator.
						B	Connects ground to meter −.			D	Connects HIGH FREQ AMPL control to 30-mc osc.			W2	Connects 70-db attenuator output to RF subchassis RF input.
						C	Connects S4E to audio ampl/det input.								

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
6	b. Receive gain (68 mc).	0	5	6	3	A	Connects S4A to meter +.	A	Connects RF ampl/det output to S3A.	C	Connects HIGH FREQ AMPL control to S5D.	B	Connects operating voltage to 68-mc osc.	W5	Connects 68-mc osc output to RF ampl/det 50-ohms input.
						B	Connects ground to meter −.			D	Connects HIGH FREQ AMPL control to 68-mc osc.				
		6	5	6	3	A	Connects audio ampl/det output to meter +.	E	Connects the 500-kc vif module output to audio ampl/det input.	C	Connects HIGH FREQ AMPL control to S5D.	B	Connects operating voltage to 68-mc osc.	W5	Connects 68-mc osc output to 70-db attenuator.
						B	Connects ground to meter −.			D	Connects HIGH FREQ AMPL control to 68-mc osc.			W4	Connects 70-db attenuator output to RF subchassis RF input.
						C	Connects S4E to audio ampl/det input.								
		6	5	6	3	A	Connects audio ampl/det output to meter +.	E	Connects the 500-kc vif module output to audio ampl/det input.	C	Connects HIGH FREQ AMPL control to S5D.	B	Connects operating voltage to 68-mc osc.	W5	Connects 68-mc osc output to 70-db attenuator.
						B	Connects ground to meter −.			D	Connects HIGH FREQ AMPL control to 68-mc osc.			W4	Connects 70-db attenuator output to RF subchassis RF input.
						C	Connects S4E to audio ampl/det input.								

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
7	*a.* RF amplifier transmit mode (30 mc).	0	1	8	9	A B	Connects S4A to meter +. Connects ground to meter –.	A	Connects the 3.975-mc osc detector output to S3A.	C D	Connects LOW FREQ AMPL control to S5D. Connects LOW FREQ AMPL control to 3.975-mc osc.	B	Connects operating voltage to 3.975-mc osc.		
		0	5	8	9	A B	Connects S4A to meter +. Connects ground to meter –.	A	Connects RF ampl/det output to S3A.	C D E	Connects LOW FREQ AMPL control to S5D. Connects LOW FREQ AMPL control to 3.975-mc osc. Connects ground to RF subchassis ptt ground through S1.	B	Connects operating voltage to 3.975-mc osc.	W2 W3	Connects 3.975-mc osc output to RF amplifier module input. Connects output of RF amplifier module to RF ampl/det 600-ohm input.

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
7	b. RF amplifier transmit mode (69.95 mc).	0	2	9	9	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects the 5.925-mc osc detector output to S3A.	C D	Connects LOW FREQ AMPL control to S3D. Connects LOW FREQ AMPL control to 5.925-mc osc.	B	Connects operating voltage to 5.925-mc osc.		
		0	5	9	9	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects RF ampl/det output to S3A.	C D E	Connects LOW FREQ AMPL control to S5D. Connects LOW FREQ AMPL control to 5.925-mc osc. Connects ground to RF subchassis ptt ground through S1.	B	Connects operating voltage to 5.925-mc osc.	W2 W3	Connects 5.925-mc osc output to RF amplifier module input. Connects output of RF amplifier module to RF ampl/det 600-ohm input.

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
8	*a*. RF amplifier and power amplifier modules (30 mc).	0	1	8	9	A	Connects S4A to meter +.	A	Connects 3.975-mc osc detector output to S3A.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to 3.975-mc osc.		
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 3.975-mc osc.				
		0	0	8	9	A	Connects S4A to meter +.	A	Connects power detector output to S3A.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to 3.975-mc osc.	W2	Connects 3.975-mc osc output to RF amplifier module input.
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 3.975-mc osc.				
										E	Connects ground to RF subcarrier ptt ground through S1.				

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
8	*b.* RF amplifier and power amplifier module (69.95 mc).	0	2	9	9	A	Connects S4A to meter +.	A	Connects 5.925-mc osc detector output to S3A.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to 5.925-mc osc.		
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 5.925-mc osc.				
		0	0	9	9	A	Connects S4A to meter +.	A	Connects power detector output to S3A.	C	Connects LOW FREQ AMPL control to S5D.	B	Connects operating voltage to 5.925-mc osc.	W2	Connects 5.925-mc osc output to RF amplifier module input.
						B	Connects ground to meter −.			D	Connects LOW FREQ AMPL control to 5.925-mc osc.				
										E	Connects ground to RF subchassis ptt ground through S1.				

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test Name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
9	Transmit gain.	6	9	9	7	A	Connects audio ampl/det output to meter +.	E	Connects 500-kc osc cal output to S3C.	----	Switch S5 has no function for this test; it is placed in position 9 for this reason.	B	Connects operating voltage to 500-kc osc.		
						B	Connects ground to meter −.					C	Connects 500-kc osc output to the vif module 500-kc input.		
						C	Connects S4E to audio ampl/det input.					D	Connects 500-kc osc output to the vif module 500-kc input.		
		0	0	9	7	A	Connects S4A to meter +.	A	Connects power detector output to S3A.	E	Connects ground to RF subchassis ptt ground through S1.	B	Connects operating voltage to 500-kc osc.		
						B	Connects ground to meter −.					C	Connects 500-kc osc output to S6D.		
												D	Connects 500-kc osc output to vif module 500-kc input.		

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
10	*a*. Power amplifier alignment check.	6	9	9	7	A	Connects audio ampl/det output to meter +.	E	Connects 500-kc osc cal output to S3C.	....	Switch S5 has no function for this test; it is placed in position 9 for this reason.	B	Connects operating voltage to the 500-kc.		
						B	Connects ground to meter −.					C	Connects 500-kc osc output to S6D.		
						C	Connects S4E to audio ampl/det input.					D	Connects 500-kc osc output to vif module 500-kc input.		
		0	0	9	7	A	Connects S4A to meter +.	A	Connects power detector output to S3A.	E	Connects ground to RF subchassis ptt ground through S1.	B	Connects operating voltage to 500-kc osc.		
						B	Connects ground to meter −.					C	Connects 500-kc osc output to S6D.		
												D	Connects 500-kc osc output to vif module 500-kc input.		
	b. Power amplifier grid current (30 mc).	7	0	9	7	A	Connects S4F to meter +.	F	Connects ground to S3A.	F	Connects pa grid current monitor to S3B.	....	Switch S6 has no function for this test; it is placed in position 7 for this reason.		
						B	Connects S5F to meter −.								

Table 2-1. RF Subchassis Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
10	c. Power amplifier plate current (30 mc).	9	X	9	7	A B	Connects ground to meter +. Connects S6A to meter −.	----	Switch S4 has no function for this test.	E	Connects ground to RF subchassis ptt ground through S1.	A B C D	Connects the high voltage current monitor line to S3B. Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to vif module 500-kc input.		
	d. Power amplifier grid current (69.95 mc).	7	0	9	7	A B	Connects S4F to meter +. Connects S5F to meter −.	F	Connects ground to S3A.	F	Connects pa grid current monitor to S3B.	----	Switch S6 has no function for this test; it is placed in position 7 for this reason.		

Table 2-2. Homer Module Test Switch Positions.

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
1	*a*. Over target.	8	X	X	X	A	Connects homer signal strength (+) to meter +.						
						B	Connects homer signal strength (−) to meter −.						
	b. On course.	7	9	4	3	A	Connects homer course A signal to meter +.	F	Connects homer course A signal to S3A.	F	Connects homer course B signal to S3B.	----	Switch S6 has no function for this test; it is placed in position 3 for this reason.
						B	Connects homer course B signal to meter −.						
		7	8	3	3	A	Connects homer course B signal to meter +.	F	Connects homer course B signal to S3A.	F	Connects homer course A signal to S3B.	----	Switch S6 has no function for this test; it is placed in position 3 for this reason.
						B	Connects homer course A signal to meter −.						
2	Synchronous detector.	6	9	3	4	A	Connects audio ampl/det output to meter +.	C	Connects ground to + gate of 500-kc switch through S4D.	----	Switch S5 has no function for this test; it is placed in position 4 for this reason.	B	Connects +27.5 vdc operating voltage to 500-kc osc.
						B	Connects ground to meter −.	D	Connects ground to + gate of 500-kc switch.				
						C	Connects 500-kc fm osc meter output to audio ampl/det input.	E	Connects 500-kc osc output to S3C wiper.				
						D	Connects 500-kc fm osc output to wiper of S3E.						
						E	Connects 500-kc fm osc output from S3D to 500-kc fm switch input.						

Table 2-2. Homer Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
2	Synchronous detector—Continued	7	9	4	4	A	Connects the + homer course signal to meter +.	C	Connects ground to + gate of 500-kc switch through S4D.	----	Switch S3 has no function for this test and is placed in position 4 for this reason.	B	Connects +27.5-vdc operating voltage to 500-kc osc.
						B	Connects the − homer course signal to meter−.	D	Connects ground to + gate of 500-kc switch.				
						D	Connects 500-kc fm osc output to S3E wiper.						
						E	Connects 500-kc fm osc output from S3D to 500-kc switch input.						
		7	8	3	4	A	Connects the + homer course signal to meter +.	----	Switch S4 has no function for this test and is placed in position 8 for this reason.	E	Connects ground to + gate of 500-kc switch.	B	Connects +27.5-vdc operating voltage to 500-kc osc.
						B	Connects the − homer course signal to meter −.						
						D	Connects 500-kc fm osc output to S3E wiper.						
						E	Connects 500-kc fm osc output from S3D to 500-kc switch input.						

Table 2-2. Homer Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
3	Antenna diode switch.	0	4	2	3	A	Connects RF ampl/ det output from S4A to meter +.	A	Connects RF ampl/ det output to S3A.	E	Connects ground to + gate input of 30-mc switch.	B	Connects +27.5-vdc to HIGH FREQ AMPL control.
						B	Connects ground to meter —.						
						D	Connects variable dc from HIGH FREQ AMPL control to S3E wiper.						
						E	Connects variable dc to the 30-mc osc.						
		0	5	2	3	A	Connects RF ampl/ det output from S4A to meter +.	A	Connects RF ampl/ det output to S3A.	E	Connects ground to + gate input of 30-mc switch.	B	Connects +27.5-vdc to HIGH FREQ AMPL control.
						B	Connects ground to meter —.						
						D	Connects variable dc from HIGH FREQ AMPL control to S3E wiper.						
						E	Connects variable dc to 30-mc osc.						
		0	5	0	3	A	Connects RF ampl/ det output from from S4A to meter +.	A	Connects RF ampl/ det output to S3A.	C	Connects ground to S5D wiper.	B	Connects +27. 5 vdc to HIGH FREQ AMPL control.
						B	Connects ground to meter —.			D	Connects ground to — gate input of 30-mc switch.		
						D	Connects variable dc from HIGH FREQ AMPL control to S3E.			E	Connects ground to + gate input of 30-mc switch.		
						E	Connects variable dc to 30-mc osc.						

Table 2-2. Homer Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
3	Antenna diode switch-Con.	0	5	1	3	A B D E	Connects RF ampl/ det output from S4A to meter +. Connects ground to meter −. Connects variable dc from HIGH FREQ AMPL control to S3E wiper. Connects variable dc to 30-mc osc.	A	Connects RF ampl/ det output to S3A.	C D	Connects ground to * S5D wiper. Connects ground to − gate input of 30-mc switch.	B	Connects +27.5 vdc to HIGH FREQ AMPL control.
		0	5	0	3	A B D E	Connects RF ampl/ det output from S4A to meter +. Connects ground to meter −. Connects variable dc from HIGH FREQ AMPL control to S3E. Connects variable dc to 30-mc osc.	A	Connects RF ampl/ det output to S3A.	C D E	Connects ground to S5D wiper. Connects ground to − gate input of 30-mc switch. Connects ground to + gate input of 30-mc switch.	B	Connects +27.5 vdc to HIGH FREQ AMPL control.

Table 2-3. Receive Audio Module Test Switch Positions.

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
1	Audio Gain	5	7	6	0	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 1-kc osc cal output to S3C.	E	Connects 1-kc osc output to rec audio module audio input.
						B	Connects ground to meter −.	D	Connects ground to carrier ground input on module.	E	Connects ground to module tone ground input.	F	Connects ground to module carrier ground input.
						C	Connects S5B to audio ampl/det input.						
		6	7	1	0	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	....	Switch S5 has no function for this test, it is placed in position 1 for this reason.	E	Connects output of 1-kc osc to rec audio module audio input.
						B	Connects ground to meter −.	D	Connects ground to carrier ground input on module.			F	Connects ground to carrier ground input on module.
						C	Connects switch S4E to audio ampl/det input.	E	Connects audio output of module to S3C.				
2	Audio Distortion.	5	1	1	0	A	Connects audio ampl/det output to meter +.	C	Connects audio output of module to S4D.	B	Switch S5 has no function for this test, it is placed in position 1 for this reason.	E	Connects 1-kc osc output to module audio input.
						B	Connects ground to meter −.	D	Connects output of module to dist det input.			F	Connects ground to module carrier ground input.
						C	Connects S5B to audio ampl/det input.						
		5	1	0	0	A	Connects audio ampl/det output to meter +.	C	Connects audio output of module to S4D.	B	Connects dist det output to audio ampl/det input.	E	Connects 1-kc osc output to module audio input.
						B	Connects ground to meter −.	D	Connects audio output of module to dist det input.			F	Connects ground to carrier ground input on module.
						C	Connects S5B to audio ampl/det input.						

Table 2-3. Receive Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
3	*a.* Carrier Squelch Level.	5	7	6	6	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 1-kc osc cal output to S3C.	E	Connects 1-kc osc output to module audio input.
						B	Connects ground to meter −.	D	Connects ground to carrier ground input on module.	E	Connects ground to module tone ground input.	F	Connects ground to carrier ground input on module.
						C	Connects S5B to audio ampl/det input.						
		6	7	5	8	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	C	Connects +27.5 volts dc to S5D.	B	Connects operating voltage to 10-kc osc.
						B	Connects ground to meter −.	D	Connects ground to carrier ground input on module.	D	Connects +27.5 volts dc to module TR bus (receive mode).	E	Connects 1-kc osc output to module audio input.
						C	Connects S4E to audio ampl/det input.	E	Connects audio output of module to S3C.	B	Connects the 10-kc osc low output to S3C.		
		5	7	5	8	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	C	Connects +27.5 volts dc to S5D.	B	Connects operating voltage to 10-kc osc.
						B	Connects ground to meter −.	D	Connects ground to carrier ground input on module.	D	Connects +27.5 volts dc to module TR bus (receive mode).	E	Connects 1-kc osc output to module audio input.
						C	Connects S5B to audio ampl/det input.						

Table 2-3. Receive Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
3	*b*. Relay Position 1.	1	7	5	8	A B	Connects S5A to meter +. Connects ground to meter −.	C	Connects ground to S4D.	A C D	Connects module tone rexmit ground output to S3A. Connects +27.5 volts dc to S5D. Connects +27.5 volts dc to module TR bus (receive mode).	B E	Connects operating voltage to 10-kc osc. Connects 1-kc osc output to module audio input.
	c. Squelch Disable.	6	7	4	8	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4E to audio amp/det input.	C D E	Connects ground to S4D. Connects ground to module carrier ground input. Connects module audio output to S3C.	C D E	Connects +27.5 volts dc to S5D. Connects +27.5 volts to module TR bus (receive mode). Connects ground to module squelch disable ground input.	B E	Connects operating voltage to 10-kc osc. Connects 1-kc osc output to module audio input.
	d. Relay position 2	1	7	4	8	A B	Connects S5A to meter +. Connects ground to meter −.	C D	Connects ground to S4D. Connects ground to module carrier ground input.	A C D E	Connects module carrier rexmit ground to S3A. Connects +27.5 volts dc to S5D. Connects +27.5 volts dc to module TR bus (receive mode). Connects ground to module squelch disable input.	B E	Connects operating voltage to 10-kc osc. Connects 1-kc osc output to module audio input.

Table 2-3. Receive Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
3	e. Transmit mode.	6	7	2	8	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	C	Connects −27.5 volts dc to S5D.	B	Connects operating voltage to 10-kc osc.
						B	Connects ground to meter −.	D	Connects ground to module carrier ground input.	D	Connects −27.5 volts dc to module TR bus (transmit mode).	E	Connects 1-kc osc output to module audio input.
						C	Connects S4E to audio ampl/det input.	E	Connects module audio output to S3C.				
4	Unsquelch 150-cps amplitude.	5	7	6	0	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 1-kc osc cal output to S3C.	E	Connects 1-kc osc output to module audio input.
						B	Connects ground to meter −.	D	Connects ground to module carrier ground input.	E	Connects ground to module tone ground input.	F	Connects ground to module carrier ground input.
						C	Connects S5B to audio ampl/det input.						
		6	0	6	1	A	Connects audio ampl/det output to meter +.	E	Connects module audio output to S3C.	E	Connects ground to module tone ground input.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter −.					C	Connects 150-cps osc feedback output to S6D.
						C	Connects S4E to audio ampl/det input.					D	Connects 150-cps osc feedback output to 150-cps osc input.
												E	Connects 1-kc osc output to module audio input.
		5	0	4	1	A	Connects audio ampl/det output to meter +.	- - - -	Switch S4 has no function for this test, it is placed in position 0 for this reason.	C	Connects +27.5 volts dc to S5D.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter −.			D	Connects +27.5 volts dc to module TR bus (receive mode).	C	Connects 150-cps osc feedback output to S6D.
						C	Connects S5B to audio ampl/det input.			E	Connects ground to module squelch disable input.	D	Connects 150-cps osc feedback output to 150-cps osc input.
												E	Connects 1-kc osc output to module audio input.

Table 2-3. Receive Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
5	Sidetone	4	2	X	7	A	Connects audio ampl/det output to meter +.	B	Connects 1-kc osc cal. output to S3C.	----	Switch S5 has no function for this test and may be in any position.	E	Connects 1-kc osc output to module sidetone input.
						B	Connects ground to meter −.						
						C	Connects S4B to audio ampl/det input.						
		6	7	2	7	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	C	Connects −27.5 volts dc to S5D.	E	Connects 1-kc osc output to module sidetone input.
						B	Connects ground to meter −.	D	Connects ground to module carrier ground input.	D	Connects −27.5 volts dc to module TR bus (transmit mode).		
						C	Connects S4E to audio ampl/det input.	E	Connects module audio output to S3C.				

Table 2-4. Transmit Audio Module Test Switch Positions.

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
1	500-kc frequency check.	4	0	7	3	A	Connects audio ampl/det output to meter +.	B	Connects the 500-kc mechanical filter input to S3C.	E	Connects ground to module transmit ground input.	C	Connects module 500-kc output to filter circuit input.
						B	Connects ground to meter −.					D	Connects module 500-kc output to S6C.
						C	Connects S4B to audio ampl/det input.						
		4	1	7	3	A	Connects audio ampl/det output to meter +.	B	Connects 500-kc bandpass filter output to S3C.	E	Connects ground to module transmit ground input.	C	Connects module 500-kc output to filter circuit input
						B	Connects ground to meter −.					D	Connects module 500-kc output to S6C.
						C	Connects S4B to audio ampl/det input.						
		6	1	7	3	A	Connects audio ampl/det output to meter +.	E	Connects 500-kc crystal filter output to S3C.	E	Connects ground to module transmit ground input.	C	Connects module 500-kc output to filter circuit input.
						B	Connects ground to meter −.					D	Connects module 500-kc output to S6C.
						C	Connects S4E to audio ampl/det input.					E	Connects 1-kc osc output to module audio input.
2	500-kc amplitude.	4	6	7	4	A	Connects audio ampl/det output to meter +.	B	Connects module 500-kc output to S3C.	E	Connects ground to module transmit ground input.	C	Connects ground to module transmit ground input.
						B	Connects ground to meter −.	C	Connects +10 volts dc to S4D.			D	Connects ground to S6C.
						C	Connects S4B to audio ampl/det input.	D	Connects +10 volts dc to module side-tone gate input.			E	Connects 1-kc osc output to module audio input.

Table 2-4. Transmit Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
3	Distortion check.	3	2	6	4	A	Connects audio ampl/det output to meter +.	C	Connects discriminator output to S4D.	B	Connects 1-kc osc cal output to S3C.	C	Connects ground to module transmit ground input.
						B	Connects ground to meter −.	D	Connects discriminator output to distortion det input.	E	Connects ground to module security ground input.	D	Connects ground to S6C.
						C	Connects S5B to audio ampl/det input.					E	Connects 1-kc osc output to module audio input.
						D	Connects module 500-kc output to discriminator input.						
						E	Connects module 500-kc output to S3D.						
		3	2	1	4	A	Connects audio ampl/det output to meter +.	C	Connects discriminator output to S4D.	B	Connects the distortion det cal output to S3C.	C	Connects ground to module transmit ground input.
						B	Connects ground to meter −.	D	Connects discriminator output to distortion det input.			D	Connects ground to S6C.
						C	Connects module 500-kc output to discriminator input.					E	Connects 1-kc osc output to module audio input.
						E	Connects module 500-kc output to S3D.						
		3	2	0	4	A	Connects audio ampl/det output to meter +.	C	Connects discriminator output to S4D.	B	Connects distortion detector output to S3C.	C	Connects ground to module transmit ground input.
						B	Connects ground to meter −.	D	Connects discriminator output to distortion det input.			D	Connects ground to S6C.
						C	Connects S5B to audio ampl/det input.					E	Connects 1-kc osc output to module audio input.
						D	Connects module 500-kc output to discriminator input.						
						E	Connects module 500-kc output to S3D.						

Table 2-4. Transmit Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
4	Deviation check.	3	6	6	4	A	Connects audio ampl/det output to meter +	C	Connects +10 volts dc to S4D.	B	Connects 1-kc osc cal output to S3C.	C	Connects ground to module transmit ground input.
						B	Connects ground to meter −.	D	Connects +10 volts dc to module sidetone gate input.	E	Connects ground to module security ground input.	D	Connects ground to S6C.
						C	Connects S5B to audio ampl/det input.					E	Connects 1-kc osc output to module audio input.
						D	Connects module 500-kc output to discriminator input.						
						E	Connects module 500-kc output to S3D.						
		3	6	2	4	A	Connects audio ampl/det output to meter +.	C	Connects +10 volts dc to S4D.	B	Connects the discriminator output to S3C.	C	Connects ground to module transmit ground input.
						B	Connects ground to meter −.	D	Connects +10 volts dc to module sidetone gate input.			D	Connects ground to S6C.
						C	Connects S5B to audio ampl/det input.					E	Connects 1-kc osc output to module audio input.
						D	Connects module 500-kc output to discriminator input.						
						E	Connects module 500-kc output to S3D.						
5	150-cps tone input.	3	5	4	1	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 150-cps osc meter output to S3C.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter −.	D	Connects ground to module transmit ground input.			C	Connects 150-cps osc feedback output to S6D.
						C	Connects S5B to audio ampl/det input.					D	Connects 150-cps osc feedback output to 150-cps osc input.

Table 2-4. Transmit Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
5	150-cps tone input—Con.	3	5	2	1	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects discriminator output to S3C.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter −.	D	Connects ground to module transmit ground input.			C	Connects 150-cps osc feedback output to S6D.
						C	Connects S5B to audio ampl/det input.					D	Connects 150-cps osc feedback output to 150-cps osc input.
						D	Connects module 500-kc output to discriminator input.						
						E	Connects module 500-kc output to S3D.						
6	Sidetone gate	3	5	6	3	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 1-kc osc cal output to S3C.	E	Connects 1-kc osc output to module audio input.
						B	Connects ground to meter −.	D	Connects ground to module transmit ground input.	E	Connects ground to module security ground input.		
						C	Connects S5B to audio ampl/det input.						
						D	Connects module 500-kc output to discriminator input.						
						E	Connects module 500-kc output to S3D.						

Table 2-4. Transmit Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
6	Sidetone gate-Con.	3	5	7	3	A B C D E	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input. Connects module 500-kc output to discriminator input. Connects module 500-kc output to S3D.	C D	Connects ground to S4D. Connects ground to module transmit ground input.	B E	Connects module sidetone output to S3C. Connects ground to module transmit ground input.	E	Connects 1-kc osc output to module audio input.
7	Sidetone	3	6	7	3	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	C D	Connects +10 volts dc to S4D. Connects +10 dc to module sidetone gate input.	B	Connects module sidetone output to S3C.	E	Connects 1-kc osc output to module audio input.
8	Security ground.	3	7	7	3	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	C D	Connects ground to S4D. Connects ground to module security ground input.	B E	Connects module sidetone output to S3C. Connects ground to module transmit ground input.	E	Connects 1-kc osc output to module audio input.
9	Carrier ground 1.	0	8	5	4	A B	Connects S4A to meter +. Connects ground to meter −.	A C D	Connects module 150-cps tone input to S3A. Connects +10 volts dc to S4D. Connects +10 volts dc to module 150-cps tone input.	----	Switch S5 has no function for this test; it is placed in position 5 for this reason.	C D	Connects ground to module transmit ground input. Connects ground to S6C.

Table 2-4. Transmit Audio Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
10	Carrier ground 2.	0	8	6	4	A B	Connects S4A to meter +. Connects ground to meter −.	A C D	Connects module 150-cps tone input to S3A. Connects +10 volts dc to S4D. Connects +10 volts dc to module 150-cps tone input.	E	Connects ground to module security ground input.	C D	Connects ground to module transmit ground input. Connects ground to S6C.
11	Retransmit ground 1.	0	9	6	4	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects module retransmit ground output to S3A.	E	Connects ground to module security ground input.	C D	Connects ground to module transmit ground input. Connects ground to S6C.
12	Retransmit ground 2.	0	9	6	3	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects module retransmit ground output to S3A.	E	Connects ground to module security ground input.	----	Switch S5 has no function for this test; it is placed in position 3 for this reason.
13	Meter output	2	9	7	4	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4B to audio ampl/det input.	B	Connects module meter output to S3C.	E	Connects ground to module transmit ground input.	C D	Connects ground to module transmit ground input. Connects ground to S6C.

Table 2-5. Fixed IF Module Test Switch Positions

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
1	*a.* Discriminator alignment.	3	6	8	5	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 6 for this reason.	B	Connects 500-kc fm osc low output to S3C.	B C D	Connects operating voltage to the 500-kc osc. Connects 500-kc osc output to module 500-kc input. Connects 500-kc osc output to module 500-kc input.
		3	6	6	5	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 6 for this reason.	B	Connects 1-kc osc low output to S3C.	E	Connects 1-kc osc output to 500-kc osc modulation input.
		6	6	6	5	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4E to audio ampl/det input.	E	Connects module discriminator output to S3C.	----	Switch S5 has no function for this test; it is placed in position 6 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc modulation input.
		3	3	1	5	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	C D	Connects module security output to S4D. Connects module security output to distortion detector input.	B	Connects distortion detector calibrate output to S3C.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.

Table 2-5. Fixed IF Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
1	a. Discriminator or alignment-Cont.	3	3	0	5	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	C D	Connects module security output to S4D. Connects module security output to distortion detector input.	B	Connects distortion detector output to S3C.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.
	b. Output to encoder 1 (test No. 1).	6	8	6	5	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4E to audio ampl/det input.	E	Connects module encoder output to S3C.	----	Switch S5 has no function for this test; it is placed in position 6 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.
	c. Agc to homer (test No. 1).	0	7	6	5	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects module homer agc to S3A.	----	Switch S5 has no function for this test; it is placed in position 6 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc on output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.

Table 2-5. Fixed IF Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
	d. Agc to RF amplifier and vif modules.	0	6	6	5	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects module agc to RF amp and vif module to S3A.	----	Switch S5 has no function for this test; it is placed in position 6 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.
	e. Output to encoder 2 (test No. 2).	3	8	8	6	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.		Switch S4 has no function for this test; it is placed in position 8 for this reason.	B	Connects 500-kc osc cal output to S3C.	B	Connects operating voltage to 500-kc osc.
		6	8	8	6	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4E to audio ampl/det input.	E	Connects module encoder output to S3C.		Switch S5 has no function for this test; it is placed in position 8 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.

Table 2-5. Fixed IF Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
	f. Agc to homer (test No. 2).	0	7	8	0	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects module homer agc output to S3A.	....	Switch S5 has no function for this test; it is placed in position 8 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to S6D. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.
	g. Agc to RF amplifier and vif module 2.	0	6	8	6	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects module agc and vif and rf amp output to S3A.	....	Switch S5 has no function for this test; it is placed in position 8 for this reason.	B C D E	Connects operating voltage to 500-kc osc. Connects 500-kc osc output to module 500-kc input. Connects 500-kc osc output to module 500-kc input. Connects 1-kc osc output to 500-kc osc modulation input.

Table 2-5. Fixed IF Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
2	500-kc amplitude to homer module.	3	4	8	7	A	Connects audio ampl/det output to meter +.	----	Switch S4 has no function for this test; it is placed in position 4 for this reason.	B	Connects 500-kc osc cal output to S3C.	B	Connects operating voltage to 500-kc osc.
						B	Connects ground to meter −.					C	Connects 500-kc osc output to S6D.
						C	Connects S5B to audio ampl/det input.					D	Connects 500-kc osc output to module 500-kc input.
		3	4	9	7	A	Connects audio ampl/det output to meter +.	----	Switch S4 has no function for this test; it is placed in position 4 for this reason.	B	Connects module 500-kc output to S3C.	B	Connects operating voltage to 500-kc osc.
						B	Connects ground to meter −.					C	Connects 500-osc output to S6D.
						C	Connects S5B to audio ampl/det input.					D	Connects 500-kc osc output to module 500-kc input.

Table 2-6. Sel-Call Module Test Switch Positions

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
1	150-cps transmit tone amplitude.	4	5	3	0	A	Connects audio ampl/det output to meter +.	B	Connects module 150-cps transmit tone to S3C.	C	Connects -27.5 volts dc to S5D.	----	Switch S6 has no function for this test; it is placed in position 0 for this reason.
						B	Connects ground to meter -.	C	Connects ground to S4D.	D	Connects -27.5 volts dc to module TR bus (transmit mode).		
						C	Connects S4B to audio ampl/det input.	D	Connects ground to S3D.				
						D	Connects ground from S4D to S3E.						
						E	Connects ground to module noise output.						
2	150-cps transmit tone frequency.	5	5	3	1	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 150-cps osc output to S3C.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter -.	D	Connects ground to S3D.	C	Connects -27.5 volts dc to S5D.	C	Connects the 150-cps osc feedback output to the osc input.
						C	Connects S5B to audio ampl/det input.			D	Connects -27.5 volts dc to module TR bus (transmit mode).	D	Connects the 150-cps osc feedback output to the osc input.
						D	Connects ground from S4D to S3E.						
						E	Connects ground to module noise output.						
		5	5	3	0	A	Connects audio ampl/det output to meter +.	C	Connects ground to S4D.	B	Connects 150-cps osc output to S3C.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter -.	D	Connects ground to S3D.	C	Connects -27.5 volts dc to S5D.	C	Connects module 150-cps receive tone to S5D.
						C	Connects S5B to audio ampl/det input.			D	Connects -27.5 volts dc to module TR bus (transmit mode).	D	Connects module 150-cps receive tone input to 150-cps counter input.
						D	Connects ground from S4D to S3E.						
						E	Connects ground to module noise output.						

Table 2-6. Sel-Call Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
3	Bandwidth check (150 cps).	5	4	4	1	A	Connects audio ampl/det output to meter +.	C	Connects 150-cps osc output to S4D.	B	Connects the 150-cps osc cal output to S3C.	B	Connects operating voltage to 150-cps osc.
						B	Connects ground to meter –.	D	Connects 150-cps osc output to module audio input.	C	Connects +27.5 volts dc to S5D.	C	Connects 150-cps osc feedback output to S6D.
						C	Connects S5B to audio ampl/det input.			D	Connects +27.5 volts dc to module TR bus (receive mode).	D	Connects 150-cps osc feedback output to 150-cps osc input.
		2	4	4	1	A	Connects audio ampl/det output to meter +.	B	Connects module 150-cps receive tone output S3C.	C	Connects +27.5 volts dc to S5D.	B	Connects operating voltage to 150-cps osc/counter.
						B	Connects ground to meter –.	C	Connects 150-cps osc output to S4D.	D	Connects +27.5 volts dc to module TR bus (receive mode).	C	Connects 150-cps osc feedback output to S6D.
						C	Connects S4B to audio ampl/det input.	D	Connects 150-cps osc output to module audio input.			D	Connects 150-cps osc feedback output to 150-cps osc input.
4	Bandwidth check (1,000 cps).	2	2	4	3	A	Connects audio ampl/det output to meter +.	B	Connects 1-kc osc cal output to S3C.	C	Connects +27.5 volts dc to S5D.	E	Connects 1-kc osc output to module tone and noise input.
						B	Connects ground to meter –.			D	Connects +27.5 volts dc to module TR bus (receive mode).		
						C	Connects S4B to audio ampl/det input.						
		2	4	4	3	A	Connects audio ampl/det output to meter +.	B	Connects module 150-cps receive tone output to S3C.	C	Connects +27.5 volts dc to S5D.	E	Connects 1-kc osc output to module tone and nosie input.
						B	Connects ground to meter –.			D	Connects +27.5 volts dc to module TR bus (receive mode).		
						C	Connects S4B to audio ampl/det input.						

Table 2-6. Sel-Call Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function
5	Squelch disable.	2	4	4	4	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4B to audio ampl/det input.	B	Connects module 150-cps receive tone output to S3C.	C D	Connects +27.5 volts dc to S5D. Connects +27.5 volts dc to module TR bus (receive mode).	C D E	Connects ground to module squelch disable input. Connects ground to S6C. Connects 1-kc osc output to module tone and noise input.
6	Noise amplifier.	2	7	4	8	A B C	Connects audio ampl/det output to meter +. Connects grd to meter −. Connects S4B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 7 for this reason.	C D	Connects +27.5 volts dc to S5D. Connects +27.5 volts dc to module TR bus (receive mode).	----	Switch S6 has no function for this test; it is placed in position 8 for this reason.
		3	7	5	8	A B C	Connects audio ampl/det output to meter +. Connects grd to meter −. Connects S5B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 7 for this reason.	B	Connects 10-kc osc low output to S3C.	----	Switch S6 has no function for this test; it is placed in position 8 for this reason.

Table 2-7. Power Supply Module Test Switch Positions

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
1	+27.5-vdc output.	1	X	0	4	A B	Connects S5A to meter +. Connects ground to meter −.	----	Switch S4 has no function for this test.	A	Connects module +27.5-volt dc output to S3A.	C D	Connects ground to module ptt ground input. Connects ground to S6C.
2	+500-vdc output.	1	X	1	4	A B	Connects S5A to meter +. Connects ground to meter −.	----	Switch S4 has no function for this test.	A	Connects module +500-volt dc output to S3A.	C D	Connects ground to module ptt ground input. Connects ground to S6C.
3	+250-vdc output.	1	X	2	4	A B	Connects S5A to meter +. Connects ground to meter −.	----	Switch S4 has no function for this test.	A	Connects module +250-volt dc output to S3A.	C D	Connects ground to module ptt ground input. Connects ground to S6C.
4	−27.5-vdc output.	9	X	X	4	A B	Connects ground to meter +. Connects S6A to meter −.	----	Switch S4 has no function for this test.	----	Switch S4 has no function for this test.	A C D	Connects module −27.5-volt dc output to S3A. Connects ground to module ptt ground input. Connects ground to S6C.
5	27.5-vac output.	6	2	X	4	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4E to audio ampl/det input.	E	Connects module 27.5-volt ac output to S3C.	----	Switch S5 has no function for this test.	C D	Connects ground to module ptt ground input. Connects ground to S6C.

Table 2-7. Power Supply Module Test Switch Positions - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function
6	27.5-vac output.	6	3	X	4	A	Connects audio ampl/det output to meters +.	E	Connects module 27.5-volt ac output to S3C.		Switch S5 has no function for this test.	C	Connects ground to module ptt ground input.
						B	Connects ground to meter −.					D	Connects ground to S6C.
						C	Connects S4E to audio ampl/det input.						
7	Despike test	1	X	3	8	A	Connects S6A to meter +.	----	Switch S4 has no function for this test.	A	Connects the despike detector output to S3A.	C	Connects module +27.5-volt despiked output to S6D.
						B	Connects ground to meter −.					D	Connects module +27.5-volt despiked output to despike detector input.
		1	X	3	9	A	Connects S5A to meter +.	----	Switch S4 has no function for this test.	A	Connects despike detector output to S3A.	C	Connects spiked +27.5-volt output to S6D.
						B	Connects ground to meter −.					D	Connects spiked +27.5-volt output to despike detector input.

2-20. Signal Paths (Operator's PMCS chart) of CIRCUIT SELECTOR Switches

The operator's PMCS chart in TM 11-6625-467-12 specifies various selfchecks for the test set. Functional tests in the operator's PMCS chart test the eight oscillator circuits and the distortion detector. The CIRCUIT SELECTOR switch settings for these tests and the function of each CIRCUIT SELECTOR switch wafer for each self-test switch program are given in table 2-8 below. Only the switch wafers that perform a specific function for the test being performed are listed. The TEST NAME columns show the setting and function of each switch wafer. The RF JUMPER CABLE column describes the function of RF jumper cables connected as part of the test. If additional information for any other CIRCUIT SELECTOR switch setting is needed, refer to figure FO-3.

Table 2-8. CIRCUIT SELECTOR Switches Signal Paths

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
1	150-cps oscillator.	3	5	4	1	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 5 for this reason.	B	Connects 150-cps oscillator output to S3C.	B C D	Connects operating voltage to 150-cps osc. Connects 150-cps osc feed-back output to S6D. Connects 150-cps osc feed-back output to 150-cps osc input.		
2	1-kc oscillator.	5	7	6	0	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 7 for this reason.	B	Connects 1-kc osc cal output to S3C.	----	Switch S6 has no function for this test; it is placed in position 0 for this reason.		
3	10-kc oscillator.	5	7	5	8	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S5B to audio ampl/det input.	----	Switch S4 has no function for this test; it is placed in position 7 for this reason.	B	Connects 10-kc osc low output to S3C.	B	Connects operating voltage to 10-kc osc.		

Table 2-8. CIRCUIT SELECTOR Switches Signal Paths - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
4	500-kc oscillator.	6	9	4	4	A B C	Connects audio ampl/det output to meter +. Connects ground to meter −. Connects S4E to audio ampl/det input.	E	Connects 500-kc fm oscillator low output to S3C.		Switch S5 has no function for this test; it is placed in position 4 for this reason.	B	Connects operating voltage 500-kc fm oscillator.		
5	3.975-mc oscillator.	0	1	8	9	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects 3.975-mc osc detector output to S3A.	C D	Connects LOW FREQ AMPL control to S5D. Connects LOW FREQ AMPL control to 3.975 mc osc.	B	Connects operating voltage to 3.975-mc osc.		
6	5.925-mc oscillator.	0	2	9	9	A B	Connects S4A to meter +. Connects ground to meter −.	A	Connects 5.925-mc osc detector output to S3A.	C D	Connects LOW FREQ AMPL control to S5D. Connects LOW FREQ AMPL control to 5.925-mc osc.	B	Connects operating voltage to 5.925-mc osc.		

Table 2-8. CIRCUIT SELECTOR Switches Signal Paths - Continued

Step	Test name	CIRCUIT SELECTOR switches				CIRCUIT SELECTOR switch A (S3)		CIRCUIT SELECTOR switch B (S4)		CIRCUIT SELECTOR switch C (S5)		CIRCUIT SELECTOR switch D (S6)		RF jumper cables	
		A	B	C	D	Section	Function	Section	Function	Section	Function	Section	Function	No.	Function
7	30-mc oscillator.	0	4	7	3	A B D E	Connects S4A to meter +. Connects ground to meter −. Connects HIGH FREQ AMPL control to S3E. Connects HIGH FREQ AMPL control to 30-mc osc.	A	Connects RF ampl/det output to S3A.	C D	Connects HIGH FREQ AMPL control to S5D. Connects HIGH FREQ AMPL control to 30-mc osc.	B	Connects operating voltage to 30-mc osc.	W4	Connects 30-mc osc output to RF ampl/det 50-ohm input.
8	68-mc oscillator.	1	4	6	3	A B	Connects S5A to meter +. Connects ground to meter −	----	Switch S4 has no function for this test; it is placed in position 4 for this reason.	A C D	Connects RF ampl/det output to S3A. Connects HIGH FREQ AMPL control to S5D. Connects HIGH FREQ AMPL control to 68-mc oscillator.	B	Connects operating voltage to 68-mc osc.	W4	Connects 30-mc output to RF ampl/det 50-ohm input.

Table 2-8. CIRCUIT SELECTOR Switches Signal Paths - Continued

Step	Test name	CIRCUIT SELECTOR switches A	B	C	D	CIRCUIT SELECTOR switch A (S3) Section	Function	CIRCUIT SELECTOR switch B (S4) Section	Function	CIRCUIT SELECTOR switch C (S5) Section	Function	CIRCUIT SELECTOR switch D (S6) Section	Function	RF jumper cables No.	Function
9	Distortion detector.	5	7	6	0	A	Connects audio ampl/det output to meter +.	----	Switch S4 has no function for this test; it is placed in position 7 for this reason.	B	Connects 1-kc osc cal output to S3C.	----	Switch S6 has no function for this test; it is placed in position 0 for this reason.		
						B	Connects ground to meter −.								
						C	Connects S5B to audio ampl/det input.								
		3	0	1	2	A	Connects audio ampl/det output to meter +.	C	Connects 1-kc osc low output to S4D.	B	Connects distortion det cal output to S3C.	----	Switch S6 has no function for this test; it is placed in position 2 for this reason.		
						B	Connects ground to meter −.	D	Connect 1-kc osc low output to distortion det input.						
						C	Connects S5B to audio ampl/det input.								
		3	0	0	2	A	Connects audio ampl/det output to meter +	C	Connects 1-kc osc low output to S4D.	B	Connects distortion det output to S3C.	----	Switch S6 has no function for this test; it is placed in position 2 for this reason.		
						B	Connects ground to meter −.	D	Connects 1-kc osc low output to distortion det input.						
						C	Connects S5B to audio ampl/det input.								

Section II. DETAILED CIRCUIT FUNCTIONING

2-21. Introduction

The test set is composed of several functional circuits listed in *a* through *p* below. The referenced paragraph presents the function for that circuit only. Many of the circuits are not located entirely on one circuit card; therefore, following the signal paths on the overall schematic diagram is difficult. A simplified schematic diagram of the associated circuit accompanies each circuit description. The simplified diagrams show only the details of the circuit being considered and leave out wires and components concerned with other circuits. If the circuit components are located on more than one circuit card, or on a circuit card and the chassis, the simplified diagrams show them connected in a logical manner. Notes and reference designations indicate the physical location of the components.

a. 150 Hz oscillator/counter (para 2-22).
b. 1 kHz oscillator (para 2-23).
c. 10 kHz oscillator (para 2-24).
d. 500 kHz fm oscillator (para 2-25).
e. 3.975 and 5.925 MHz oscillators (para 2-26).
f. 30 and 68 MHz oscillators (para 2-27).
g. Distortion detector (para 2-28).
h. Audio amplifier/detector (para 2-29).
i. RF amplifier/detector (para 2-30).
j. 500 kHz filter (para 2-31).
k. 500 kHz switch (para 2-32).
l. 500 kHz discriminator (para 2-33).
m. 30 MHz switch (para 2-34).
n. Frequency selection circuit (para 2-35).
o. Power supply circuits (para 2-36 through 2-43).
p. CIRCUIT SELECTOR switches (para 2-44).

2-22. 150 Hz Oscillator/Counter
(fig. 2-17)

b The 150 Hz oscillator/counter operates in either of two modes, the 150 Hz oscillator mode or the 150 Hz counter mode. In the 150 Hz oscillator mode, the circuit generates a 150 Hz sine wave. In the 150 Hz counter mode, the circuit operates as a frequency measuring device. The two operational modes are discussed in *a* and *b* below.

a. Counter Mode.

(1) In the counter mode of operation, the input to the circuit is an externally generated 150-Hz sine wave signal. The circuit of transistor Q1 is an emitter follower which presents a high impedance to the external circuit and a low impedance to the clipper circuit. The clipper circuit, consisting of diodes CR1 and CR2 and associated resistors, clips the sine wave output of the emitter follower and produces a constant-amplitude square wave at the input of emitter follower Q2. Emitter follower Q2 current amplifies the square wave and applies it to the base of Q3. The amplifier circuit of Q3 amplifies the square wave signal and applies it to the base of tuned amplifier Q4. The high-Q LC tank circuit in the collector circuit of Q4 is tuned to 150 Hz. The tuned amplifier produces a sine wave output at the collector of Q4. Capacitor C7 couples the sine wave signal to a voltage divider consisting of R19 and 150 CPS CAL control R3. The 150 CPS CAL control adjusts the sine wave voltage level input to the metering circuit. The output of the tuned amplifier is frequency dependent as shown in B, figure 2-17. The tank circuit in the collector of Q4 has a high-Q, causing a sharp voltage dropoff when the frequency deviates from 150 Hz. Before the counter circuit is used, the circuit must be calibrated by connection of the circuit in the 150-Hz oscillator mode of operation (*b* below) and adjustment of the 150 CPS CAL control for a predetermined meter reading. (Note that the circuit may be calibrated in the oscillator mode because the output of the clipper circuit is the same regardless of the mode of operation of the circuit.) This meter reading represents the indication for an input frequency of exactly 150 Hz.

(2) After the circuit is calibrated, the oscillator feedback loop is disconnected and the unknown frequency applied to the counter input. If the unknown frequency is exactly 150 Hz (the same as the oscillator frequency), the output voltage to the meter is the same as that produced by the internal oscillator; however, if the frequency is either above or below the 150-Hz center frequency, the tuned amplifier voltage is proportionally lower and causes a proportionally lower meter reading.

b. 150-Hz Oscillator Mode. In the 150-Hz oscillator mode, a feedback loop (shown by dashed lines) is connected from the timed amplifier output to the circuit input through resistor R27. The circuits of transistors Q1 through Q4 operate the same as for the counter mode of operation. The feedback voltage at the base of Q4 is in phase with the existing voltage and sustains circuit oscillation. The circuit oscillates at the natural resonant frequency of the tank circuit composed of L3 and the parallel capacitors in the collector circuit of Q4. The reason for this primarily is that the maximum regenerative (in phase) feedback occurs at this frequency. The circuit output is taken at the emitter of Q1 and applied to a second emitter follower Q5 through 150 CPS AMPL control R10. A voltage divider consisting of R25 and R26 at the emitter of Q5 provides high and low level circuit outputs. The high-level output (150

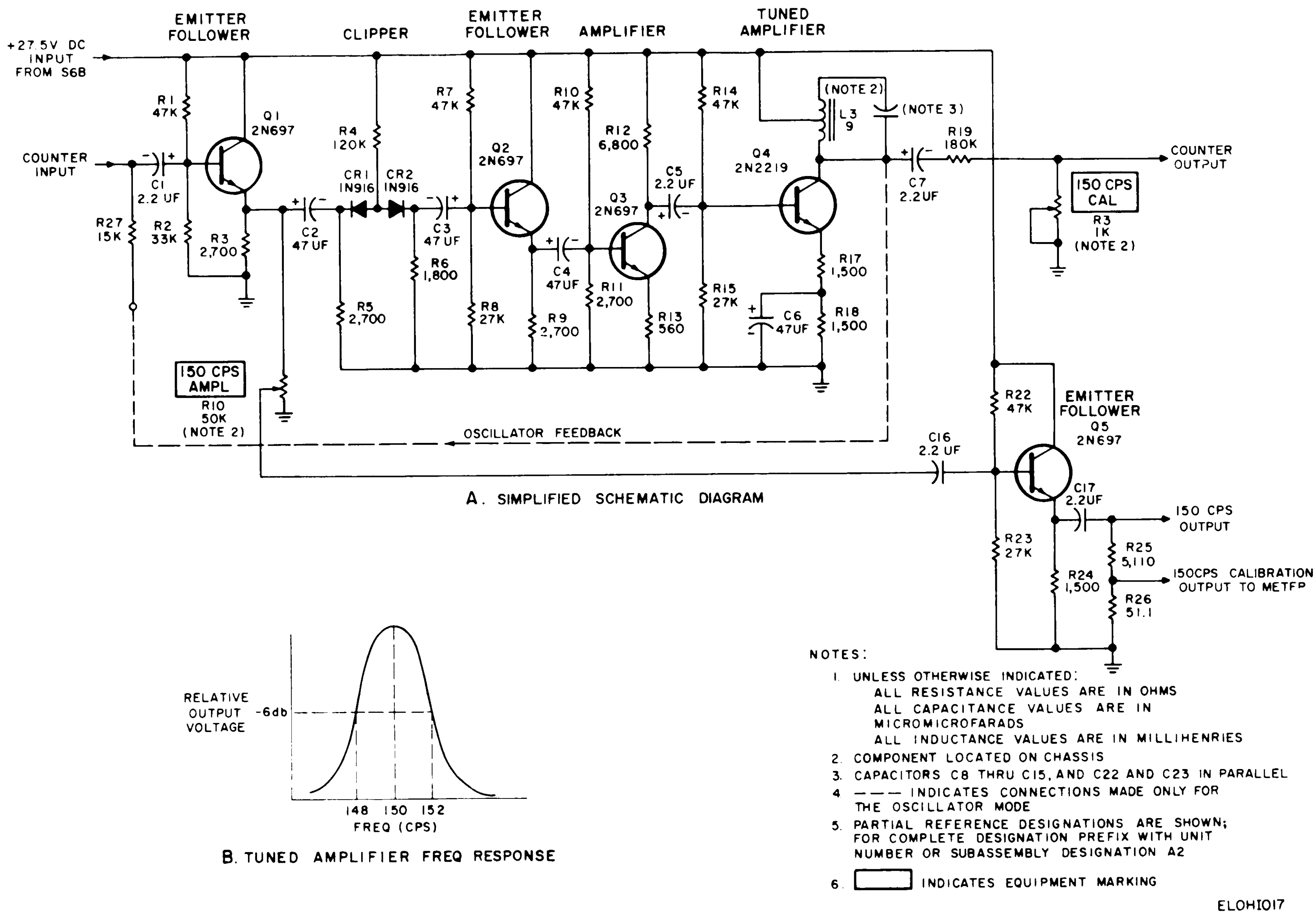


Figure 2-17. 150 Hz oscillator/counter circuit, simplified schematic diagram.

Hz) connects to module inputs for various tests. The low-level voltage divider output (to the meter) connects to the metering circuit for calibration purposes. The 150 CPS AMPL control adjusts the circuit to any desired level.

2-23. 1 kHz Oscillator

(fig. 2-18)

The l-kHz oscillator is composed of four transistors and associated circuits that produce a 1,000 Hz sine wave at the output. Transistors Q1 and Q2 form a tuned amplifier feedback circuit that oscillates at a frequency of 1,000 Hz. The output at the collector of transistor Q1 is directly coupled to the base of Q2. The emitter follower circuit of Q2 current-amplifies the Q1 collector signal and applies it back to the Q1 emitter circuit through the feedback circuit composed of R16 and Cl. The emitter follower circuit does not invert the phase of the input signal; thus the feedback signal present at the emitter of Q1 reinforces the signal at the collector to sustain circuit oscillation. The L and C parts in the collector circuit of Q1 are tuned to 1,000 Hz and cause the circuit to oscillate at that frequency. Capacitor C2 and 1 KC AMPL control R9 couple the output of the oscillator from the emitter of Q2 to the base of amplifier Q3. The 1 KC AMPL control varies the driving signal to Q3 to provide output amplitude control. Amplifier stage Q3 amplifies the 1 kHz signal and provides a low-impedance l-kHz circuit output. Resistors R24 and R25 form a voltage divider that provides a low-amplitude output at the junction of the two resistors. In position 5, switch S6F connects resistor R27 in parallel with R25 to reduce the low output by one-half.

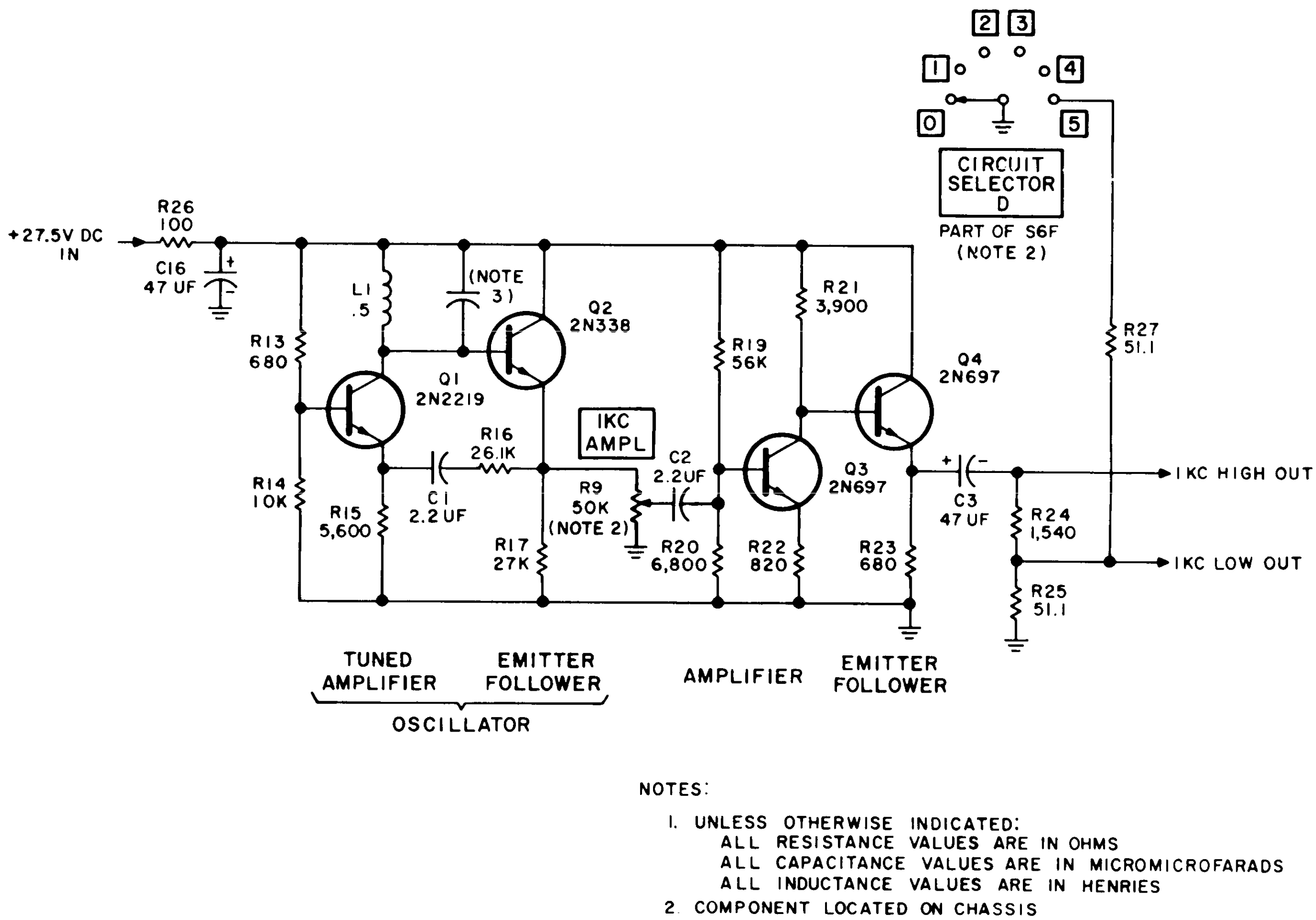


Figure 2-18. 1 kHz oscillator circuit simplified schematic diagram.

2-24. 10 kHz Oscillator

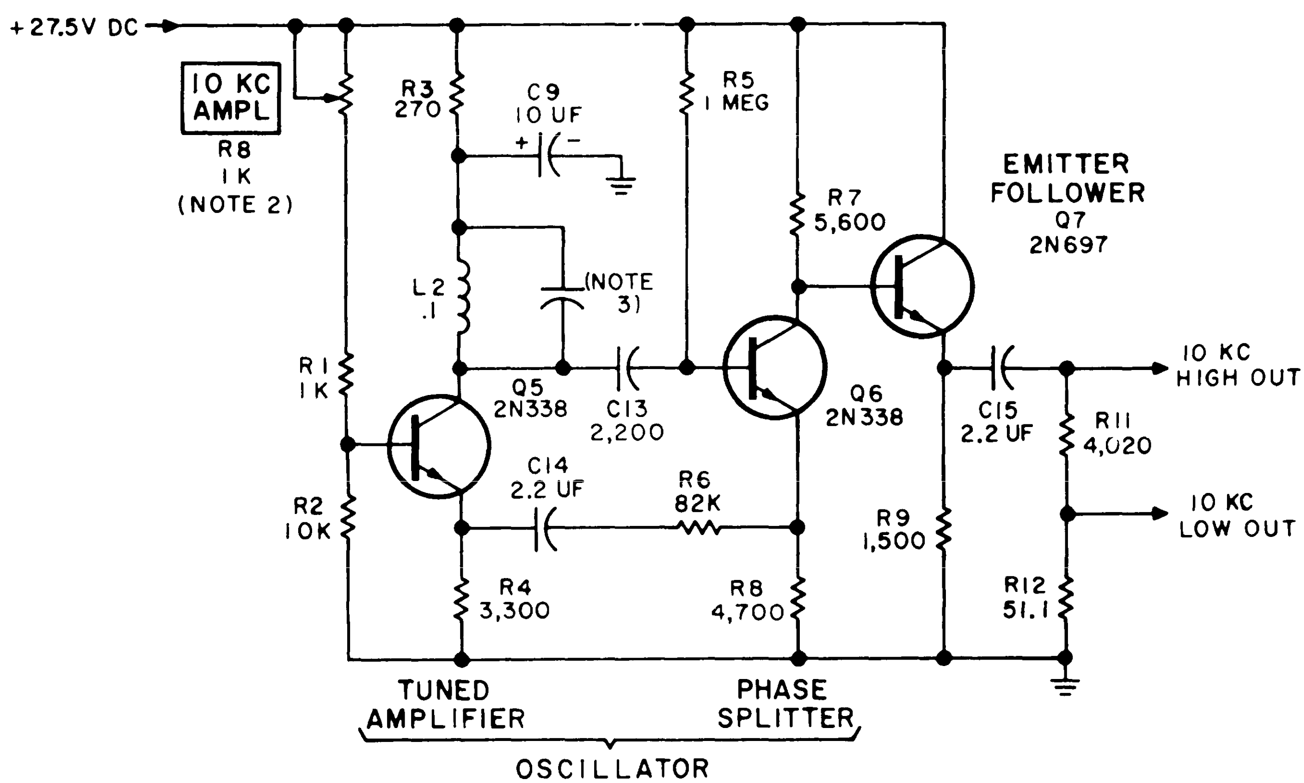
(fig. 2-19)

The 10-kHz oscillator circuit is composed of three transistors and associated circuits that produce a 10-kHz sine wave output. Transistors Q5 and Q6 form a tuned amplifier/feedback circuit that oscillates at a frequency of 10-kHz. Capacitor C13 couples the 10 kHz signal from the collector of Q5 to the base of Q6. The circuit of transistor Q6 is a split-load phase inserter. The feedback circuit composed of resistor R6 and capacitor C14 couples the signal from the emitter of Q6 back to the emitter of Q5. The signal at the emitter of a phase splitter is not phase inverted; therefore, the feedback signal present at the emitter of Q5 reinforces the signal at the collector of Q5 and causes sustained circuit oscillations. The L and C parts in the collector circuit of Q5 are resonant at 10 kHz and cause the circuit to oscillate at that frequency. The emitter follower circuit of transistor Q7 receives its input from the collector circuit of Q6. Emitter follower Q7 current-amplifies the 10-kHz signal and provides a low impedance 10-kHz circuit output. Resistors R11 and R12 form a voltage divider that provides a low-amplitude circuit output at the junction of the two resistors.

2-25. 500-kHz Frequency-Modulated Oscillator

(fig. 2-20)

The 500-kHz fm oscillator produces a 500-kHz fre-



NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MI CROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN HENRIES
2. COMPONENT LOCATED ON CHASSIS
3. COMBINATION OF C10, C11, AND C12 IN PARALLEL
4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATION A3
5. ▭ INDICATES EQUIPMENT MARKING

ELOH1019

Figure 2-19. *10-kHz oscillator circuit, simplified schematic diagram*

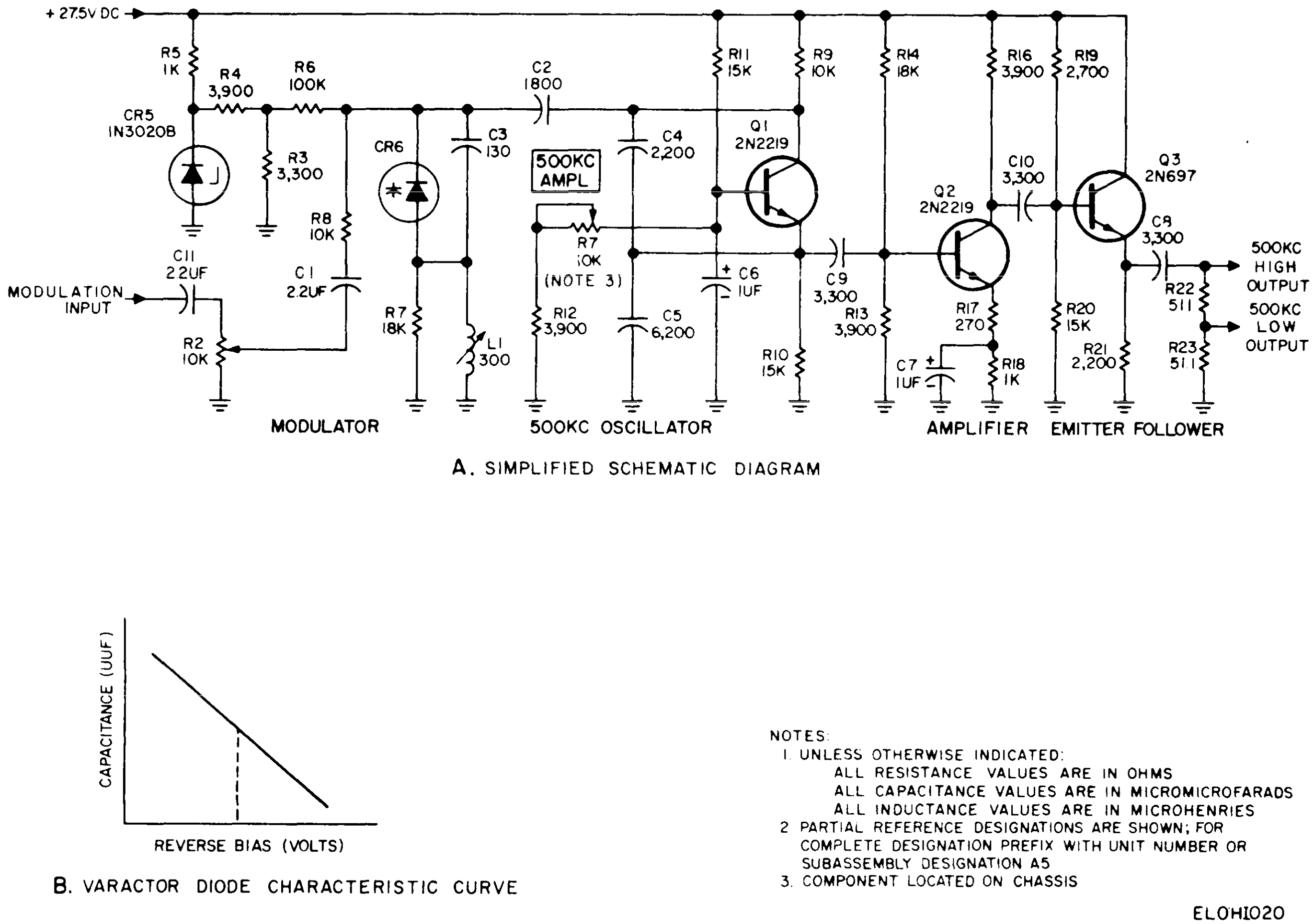


Figure 2-20. 500-kHz fm oscillator circuit, simplified schematic digram.

quency-modulated signal. The circuit is composed of an oscillator, a modulator, an amplifier, and an output emitter follower. The oscillator circuit is an inductance-capacitance (LC) oscillator composed of transistor Q1 and associated components. Capacitors C2 through C5, inductor Ll, and varactor diode CR6 form the 500 kHz LC tank circuit. The tank circuit connects to the emitter circuit of transistor Q1, and the feedback path is from the emitter of Q1 to the junction of capacitors C4 and C5. 500 KC AMPL control R7 varies the bias on transistor Ql, thereby controlling the 500-kHz output amplitude. A reverse bias voltage is applied to varactor diode CR6 by Zener diode CR5 (a constant reference voltage device) in conjunction with voltage divider R3 and R4 through series resistor R6. The capacitance of varactor diode CR6 varies inversely with the voltage impressed across it. A typical voltage-capacitance curve of a varactor diode is given in B, figure 2-20. The modulating signal is applied to the cathode of CR6 through C11, R2, C1, and R8. Variable resistor R2 controls the modulating signal amplitude and thereby controls the deviation sensitivity of the circuit. The modulating signal voltage at the cathode of CR6 varies the reverse bias of the diode. Since the diode capacitance is inversely proportional to the bias voltage, the oscillator frequency varies around the 500-kHz center frequency at an audio rate. Capacitor C9 couples the 500-kHz oscillator output to the base of transistor Q2. Transistor Q2 amplifies the signal and applies it to a voltage divider consisting of resistars R22 and R23. The high-signal output voltage of the voltage divider applies the frequency-modulated 500 kHz signal to switches in the test set for various module tests. The low-signal output voltage of the voltage divider is applied to the meter circuit and is used for calibration purposes.

2-26. 3.975 MHz and 5.925 MHz Oscillators

(fig. 2-21)

The 3.975 MHz and 5.925 MHz oscillator circuits are identical except the crystal frequencies are different. For purposes of this discussion, only the 3.975 MHz oscillator is considered. The oscillator circuit is a Colpitts-type crystal oscillator with collector-to-emitter regeneration. Capacitors C2 and C3 form a voltage divider across the oscillator output. The portion of the output voltage across C3 is connected to

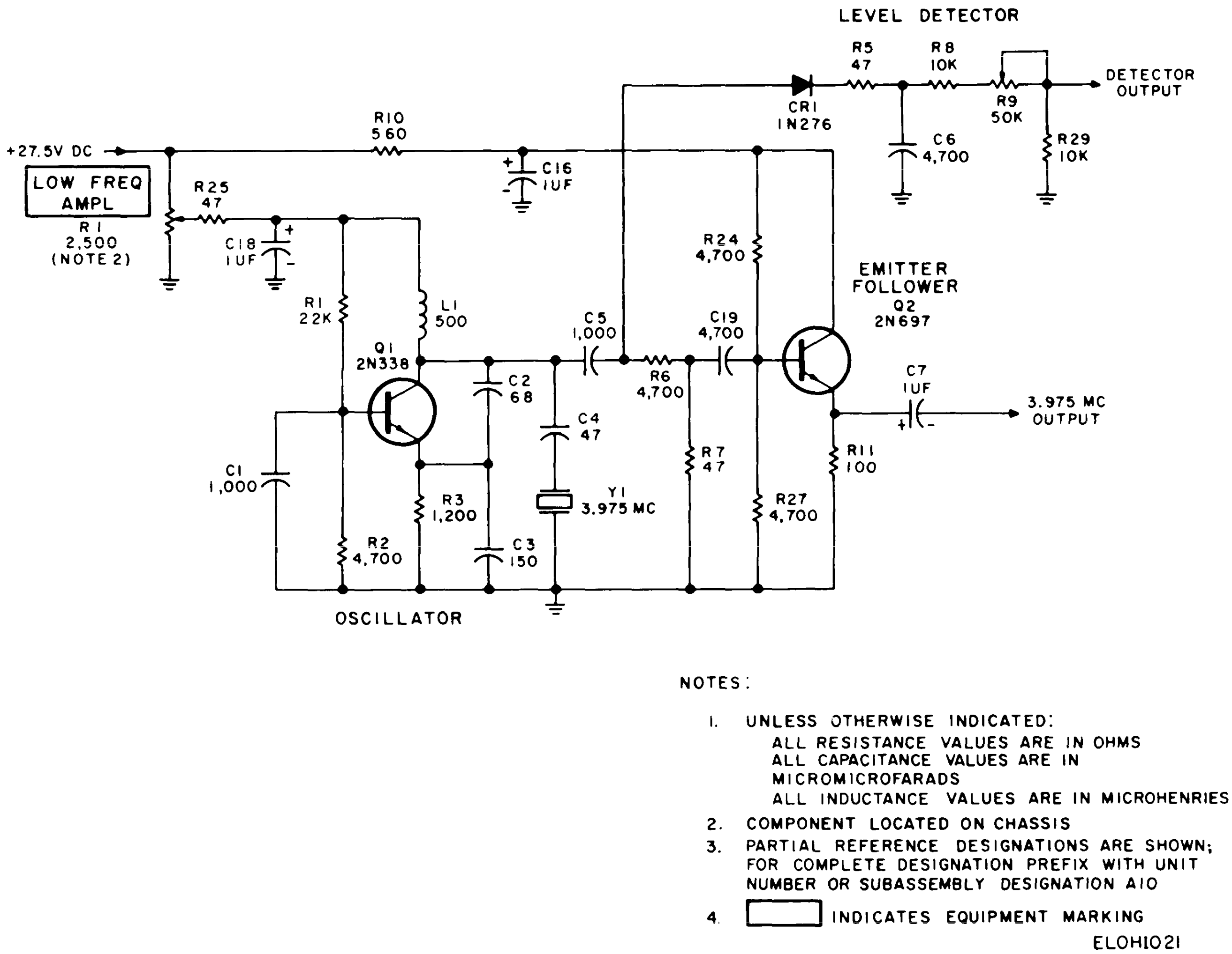


Figure 2-21. 3.975 MHz oscillutor circuit simplified schematic diagram.

the emitter of Q1. The voltage at this point is in phase with the voltage at the collector and thereby sustains oscillators in the circuit. Capacitors C2 and C3 shunting the 3.975-MHz crystal of C4 in series with the crystal also have a slight effect upon the frequency. LOW FREQ AMPL control R1 varies the dc voltage at the collector of the oscillator. This voltage directly controls the output amplitude of the oscillator. Capacitor C5 couples the oscillator output to the input of emitter follower Q2. Resistors R6 and R7 form a voltage divider network that educes the amplitude of the signal at the base of Q2. The emitter follower circuit current-amplifies the signal and provides a low-impedance output. A level detector consisting of diode CR1, resistor R5, and capacitor C6 samples the output of the oscillator and produces a dc level that is proportional to the output amplitude of the oscillator. Resistors R8, R9, and R29 form an adjustable voltage divider for the detector output. The divider output connects to the meter circuit in the test set. Resistor R9 calibrates the detector output. Capacitor C18, and resistor R25 form a decoupling network along with RF choke L1.

2-27. 30 MHz and 68 MHz Oscillators

(fig. 2-22)

The 30-megahertz and 68-megahertz oscillators are identical except for component values. For the purposes of this discussion, only the 30-MHz oscillator is considered. The oscillator circuit is a Colpitts-type with collector-to-emitter feedback using a crystal in the feedback path. Inductor L1 and capacitors C3 and C4 in the collector of Q1 are resonant at 30 megahertz. Crystal Y1 couples the output from the tuned circuit back to the emitter circuit of Q1. The crystal acts as a series-tuned circuit and offers minimum impedence to a 30-megahertz resonant frequency. At frequencies above or below 30-megahertz, Y1 is reactive and causes a phase shift in the feedback voltage appearing at the emitter of Q1. At a frequency of 30 megahertz, the reactive components of Y1 cancel and the feedback voltage to the

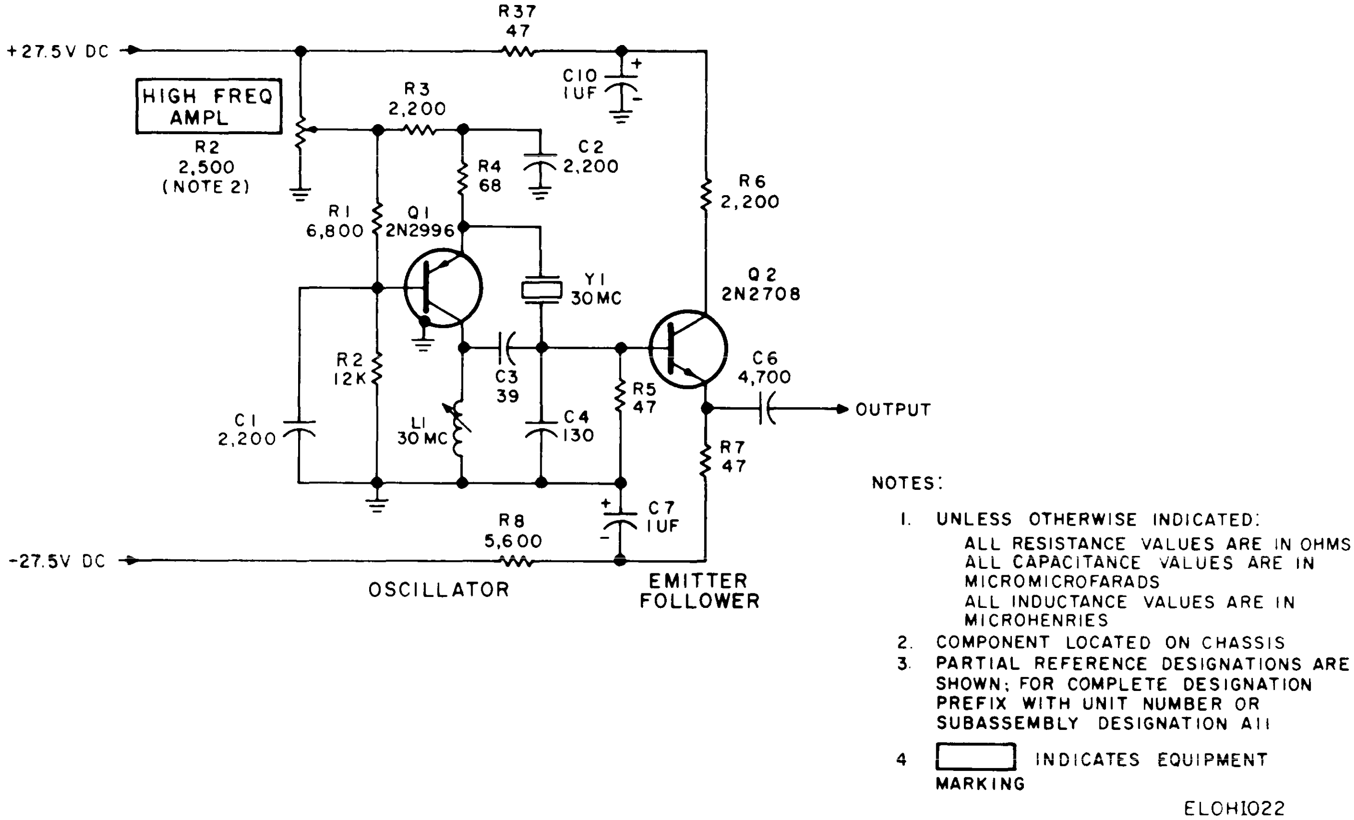


Figure 2-22.30 MHz oscillator circuit, simplied schematic diagram.

emitter has zero phase shift, thus sustaining circuit oscillation. HIGH FREQ AMPL control R2 varies the dc level at the emitter of Q1. This voltage controls the oscillator output level. Transistor Q2 is the output emitter follower circuit. The circuit transforms the high oscillator output impedance to a low-output impedance. The emitter follower circuit also prevents the external circuits from loading the crystal oscillator.

2-28. Distortion Detector

(fig. 2-23)

The distortion detector measures the harmonic distortion of a 1 kHz signal. The circuit is composed of transistor amplifier Q6, 2-kHz high pass filter FL1, and associated components. The distorted 1-kHz signal is applied to the distortion detector input. DIST DET control R4 adjusts the signal input level. Capacitor C19 couples the input signal from R4 to the base of transistor Q6. The amplifier circuit of transistor Q6 amplifies the signal and applies it to filter FL1 and to a voltage divider consisting of R35 and R36. Both the voltage divider output and the high pass filter output connect to the meter circuit through switches. In the use of the distortion detector, first the meter circuit is switched to the voltage divider output and DIST DET control R4 is adjusted for a predetermined meter reading. This reading represents 100-percent distortion. After this calibration is made, the high pass filter output (distortion detector output) is connected to the meter circuit. The high pass filter removes the 1-kHz fundamental frequency and leaves only the harmonic components of the signal present at the distortion output. The meter indicates the voltage value of the harmonic components present at the distortion output, thereby giving an indication of the harmonic distortion of the input signal.

2-29. Audio Amplifier/Detector

(fig. 2-24)

The audio amplifier/detector circuit in conjunction with the TEST METER performs as an electronic voltmeter in the test set. The CIRCUIT SELECTOR switches connect various oscillator and module circuit outputs in the frequency range of 150-Hz to 500-kHz to the audio amplifier/detector input. The circuit amplifies and rectifies signals and applies the resulting dc voltage to the meter circuit. Capacitor C15 couples the input signal to the base of transistor Q1. The emitter follower circuit of Q1, current amplifies the signal and applies it to the base of Q2 through coupling capacitor C16. The amplifier circuit of transistor Q2 amplifies the signal and applies it to the base of transistor Q3 through C19 and sensitivity control R11. Resistor R11 controls the signal

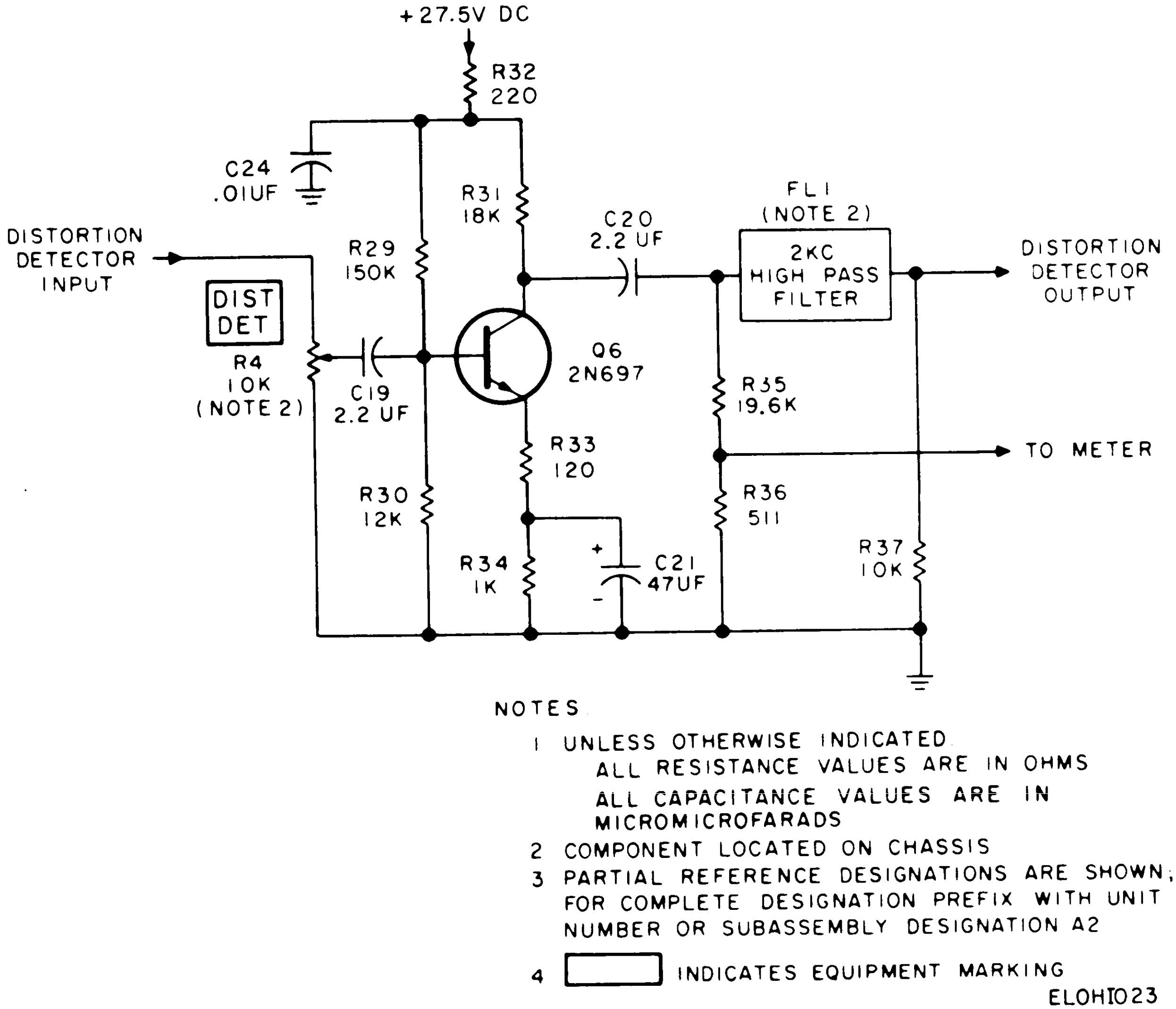


Figure 2-23. Distortion detector circuit simplified schemattic diagram.

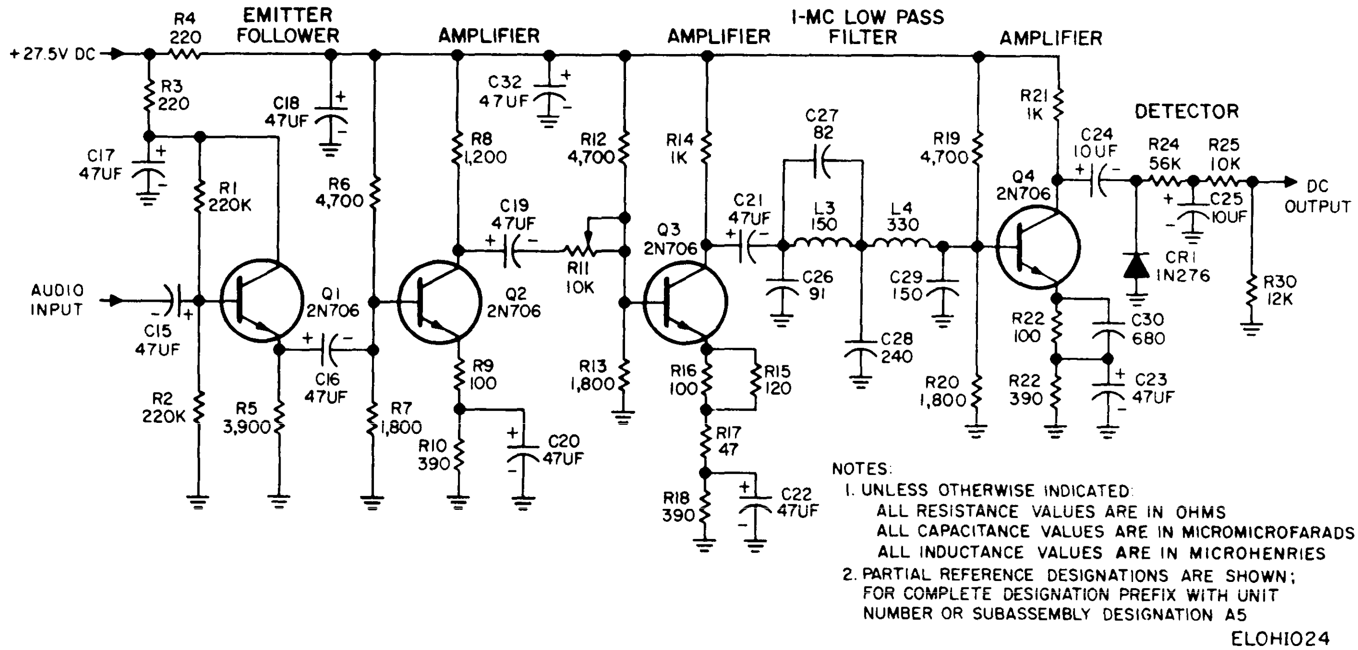


Figure 2-24 Audio amplifier/detector circuit, simplified schematic diagram.

drive at the base of Q3, thereby controlling the gain of the entire circuit. The amplifier circuit of transistor Q3 further amplifies the signal and applies it to the 1-megahertz low pass filter circuit consisting of inductors L3 and L4 and capacitors C26, C27, C28, and C29. The low pass filter is a two-section pi-type filter with a cutoff frequency of approximately 1 megahertz. Extraneous signals above 1 megahertz are attenuated and do not affect the output dc level. The amplifier circuit of transistor Q4 amplifies the signal again and applies it to the detector circuit. Resistor R22 and capacitor C30 in the emitter circuit of Q4 provide frequency compensation to extend the linear amplification range of the amplifier. The detector circuit is composed of diode CR1, resistor R24, and capacitor C25. On the positive half cycles, capacitor C25 charges through R24 to a level proportional to the peak amplitude of the ac signal at the collector of Q4. Resistors R25 and R30 form a voltage divider. The output of the circuit is taken from the junction of R25 and R30.

2-30. RF Amplifier/Detector

(fig. **2-25)**

The radio frequency (RF) amplifier/detector circuit is used in conjunction with the meter circuit to measure RF signal levels in the test set. The four inputs to the amplifier, 50 ohms, 150 ohms, 200 ohms, and 600 ohms, are connected to RF jacks RF VM 1, RF VM 2, RF VM 3, and RF VM 4, respectively, on the front panel. The four circuit inputs match the different impedances encountered in RF level measurements. The inputs also present varying amounts of attenuation to the input signal, the 50-ohm input having the least attenuation and the 500-ohm input having the most. Capacitor C9 couples the attenuator output to the base circuit of RF amplifier Q3. The amplifier circuit of transistor Q3 amplifies the RF signal and applies it to the base of transistor Q2. The amplifier circuit of transistor Q2 further amplifies the RF signal and applies it to the input of emitter follower Q3. Capacitors C4 and C5 in the emitter circuits of transistors Q2 and Q3 are emitter peaking capacitors that extend the high-frequency response of the amplifier circuits. Capacitor C5 is variable and is adjusted to make the frequency response of the amplifier essentially flat from 3 to 70 megahertz. The transistor Q1 emitter follower circuit current-amplifies the RF signal and applies it to the detector circuit. Diode CR1 in the detector circuit rectifies the RF voltage. A dc voltage proportional to the RF input level appears across capacitor C2. Resistors R1 and R4 are meter multiplier resistors in series with the output to the meter circuit. Resistor R1 is variable and is adjusted to calibrate the circuit.

2-31. 500-kHz Filter

(fig. 2-26)

The 500-kHz filter circuit is composed of three transistor amplifier circuits and two 500-kHz filters. The circuit may be used as either a wide or narrow bandpass filter for checking and adjusting the 500-kHz oscillator frequency in the transmit audio module of Radio Set AN/ARC-54. The wideband mode is used for go-no-go testing of the 500-kHz oscillator, and

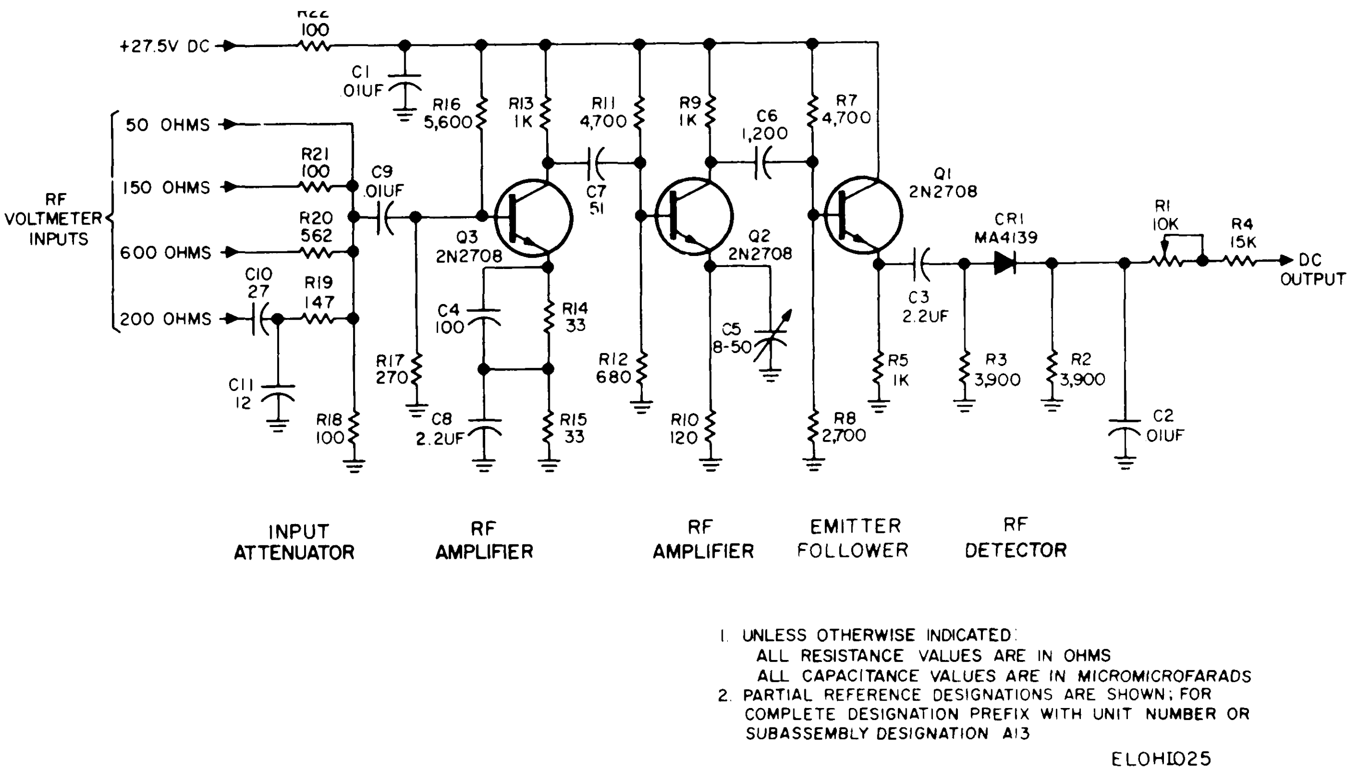


Figure 2-25. RF amplifier/detector circuit, simplified schematic diagram.

the narrow band mode is used to adjust the 500-kHz oscillator frequency. The circuit operation for each mode is discussed below.

a. Wide Band Operation. The 500 KC FILTER control adjusts the amplitude of the 500-kHz input. Capacitor Cl couples the input signal to the base of transistor Q1. The amplifier circuit of transistor Q1 amplifies the 500-kHz signal and applies it to 500-kHz bandpass filter FL2. Filter FL2 is a mechanical bandpass filter with a center frequency of 500-kHz and a pass band of ±700 Hz at the —6-db points. A graphical representation of the pass band of filter FL2 is shown in B, figure 2-26. Capacitors C4, C5, C9, and C10 tune the center frequency of the filter to exactly 500 kHz. The Q2 emitter follower circuit provides a high impedance input circuit for the filter output. Resistor R32 is a circuit calibration control that adjusts the circuit output level for a given input. In using the circuit for making go-no-go frequency checks of a 500-kHz signal, first the 500-kHz input signal at the movable arm of R6 is connected to the metering circuit and R6 is adjusted for a specified calibration point on the TEST METER. Second, the meter is connected to the 500-kHz bandpass filter output. The response of the bandpass filter is essentially flat in the frequency range of 500 kHz ±700 Hz (B, fig. 2-26). If the frequency is within the pass band of the filter, the resulting meter reading will be greater than one-half of the meter reading obtained during calibration.

NOTE

Amplifier Q1 compensates for losses in the filters. If the frequency falls outside the pass band, a meter reading of less than half the calibration reading will be obtained.

b. Narrow Band Operation. The circuit operation for the narrow band or crystal mode is essentially the same as for wide band operation except that a crystal filter is added to the circuit. A graphical representation of the crystal filter pass band is given in C, figure 2-26. Notice that the pass band of the crystal filter is much narrower than that of the mechanical filter. The narrow band mode of operation is used to adjust the oscillator in the transmit audio module to 500 kHz Y100 Hz. In the narrow band operation, the 500-kHz oscillator output connects to 500 KC FILTER potentiometer R6, which is set for a convenient TEST METER indication. The metering circuit is connected to the crystal filter output and the 500-kHz oscillator frequency is adjusted for a peak TEST METER reading.

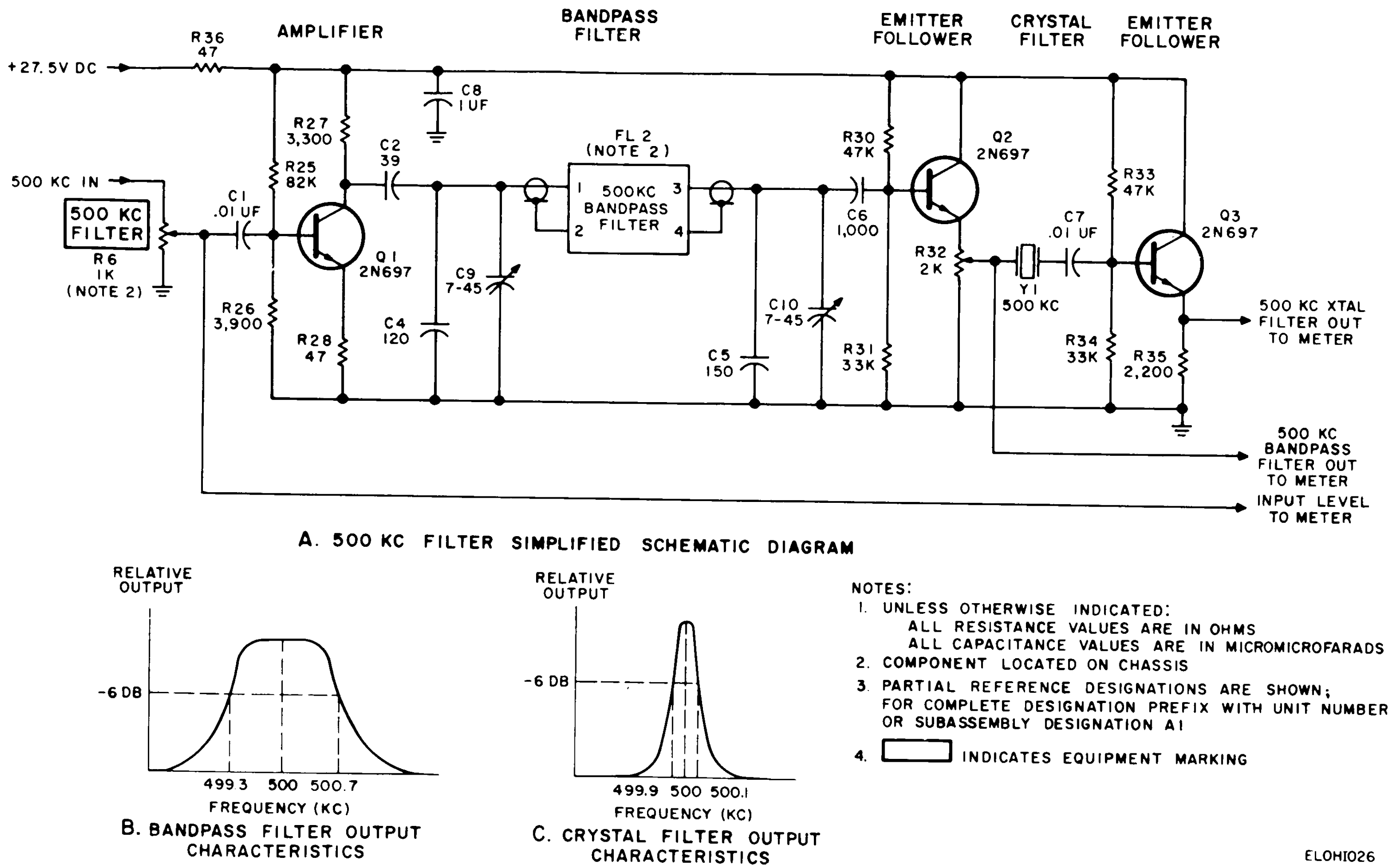


Figure 2-26. 500-kHz filter circuit, simplified schematic diagram.

2-32. 500 kHz Switch

(fig. 2-27)

a. The 500-kHz switch receives two signal inputs: a 500-kHz sine wave from the 500-kHz oscillator and a 100-HZ square wave from the AN/ARC-54 homer module. By connecting grounds to the gate inputs, the switch circuit produces signals that simulate homer right and homer left signals. The +27.5 volts dc connected to the junction of R38 and R32 reverse bias diode CR1. The voltage divider consisting of R28 and R27 places approximately a 3-volt reverse bias on diode CR2. The –27.5 volts dc similarly bias diodes CR3 and CR4 through resistor R31 and voltage divider R25 and R26. Capacitor C12 couples the 500-Hz input to the anodes of diodes CR1 and CR2, and to the cathodes of diodes CR3 and CR4. Without a 100-Hz square wave applied to the circuit, the diodes are reverse biased and block the 500-kHz from the output circuit. the 100-Hz square wave (amplitude of 8 volts peak to peak) enters the circuit through R24 and L2. The positive half cycle of the 100-Hz square wave forward biases CR2 to allow the 500-kHz signal to pass through diode CR2, inductor L3, and capacitor C15 to the output. Inductor L3, presents 700 ohms of inductive reactance to the 500-kHz signal, and the output signal is attenuated approximately 3 db. The negative half cycle of the 100-HZ square wave forward biases diode CR3 to allow the 500-kHz signal to pass through diode CR3, inductor L4, and capacitor C13. Inductor L4 attenuates the 500-kHz output signal approximately 3 db as explained for L3 above. The output waveforms for the various conditions of the gate inputs are shown in B, figure 2-27.

b. With ground applied to the + gate, ground is present at the cathode terminal of diode CR1. The positive half cycle of the 100-Hz square wave forward biases diode CR1 and causes the 500-kHz signal to pass through diode CR1, capacitor C18, and capacitor C15 to the output. With diode CR1 forward biased, the 500-kHz signal bypasses inductor L3 and arrives at the output with zero attenuation. The negative half cycle of the 100-HZ square wave forward biases diode CR3 and causes the 500-kHz signal to apear at the output attenuated 3 db as explained above. The resultant output signal is shown in B, figure 2-27. The 500-kHz sine wave is modulated approximately 30 percent by the 100-Hz square wave with the maximum amplitude portion occurring during the positive half cycle of the square wave. With ground applied to the — gate, the same action occurs on the negative half cycle of the 100-Hz square wave. Diode CR4 is forward biased and causes the 500-kHz signal to bypass L4 via Cr4 and CR14. During the positive half cycle, diode CR2 is forward biased and the 500-kHz signal is attenuated by inductor L3. The output waveform for this condition is shown in B, figure 2-27. The waveform is identical with that for the + gate ground except that the maximum voltage occurs during the negative half cycle of the square wave. Inductors L2, L6, and L7, and capacitors C17, C19 and C20 are low pass filters that have a high impedance to 500-kHz and a low impedance to 100 Hz. Capacitors C13 and C15 are output coupling capacitors that block the dc level from the output signal. Inductor L5 and capacitor C16 are resonant at 500-kHz; this circuit smoothes the output and removes switching transients.

2-33. 500-kHz Discriminator

(fig. 2-28)

The 500-kHz discriminator changes a frequency-modulated, 500-kHz carrier into an audio signal corresponding to the original modulating signal. The original modulating signal causes a variation in the instantaneous frequency of the carrier signal either above or below the center, or resting frequency. The discriminator output voltage varies linearly according to the instantaneous frequency of the input signal. The rate at which the input frequency deviates from the center frequency determines the output signal frequency; the amount that the input frequency deviates from the center frequency determines the amplitude of the output signal. Capacitor Cl couples the 500-kHz fm input signal to the base of transistor Q5. The circuit of transistor Q5 amplifies the signal and applies it to the limiter circuit. The limiter circuit, consisting of diodes CR4 and CR5, clips the 500-kHz output of Q5, and the input to the discriminator is kept at a constant level of approximately 0.6 volt. Capacitor C2 couples the 500-kHz signal at the collector of Q5 to the discriminator circuit.

a. At the center frequency of 500-kHz capacitors C4 and C5 and inductor L1 form a parallel-resonant circuit that offers high impedance to current flow through the remaining portion of the discriminator; therefore, at the center frequency, the discriminator output is zero. Variable inductor L1 tunes the parallel-resonant circuit to precisely 500-kHz.

b. When the frequency swings below 500-kHz, the series lc circuit consisting of capacitors C4 and C7 and inductor L1, approaches resonance and current flow through this path increases.

c. When the frequency swings above 500-kHz, the series lc circuit, consisting of capacitors C5, C6, C9 and C10 and inductor L1, approaches resonance and current flow increases through this path. (Capacitors C9 and C10 are 500-kHz filter bypass capacitors that are essentially short circuits at the operating

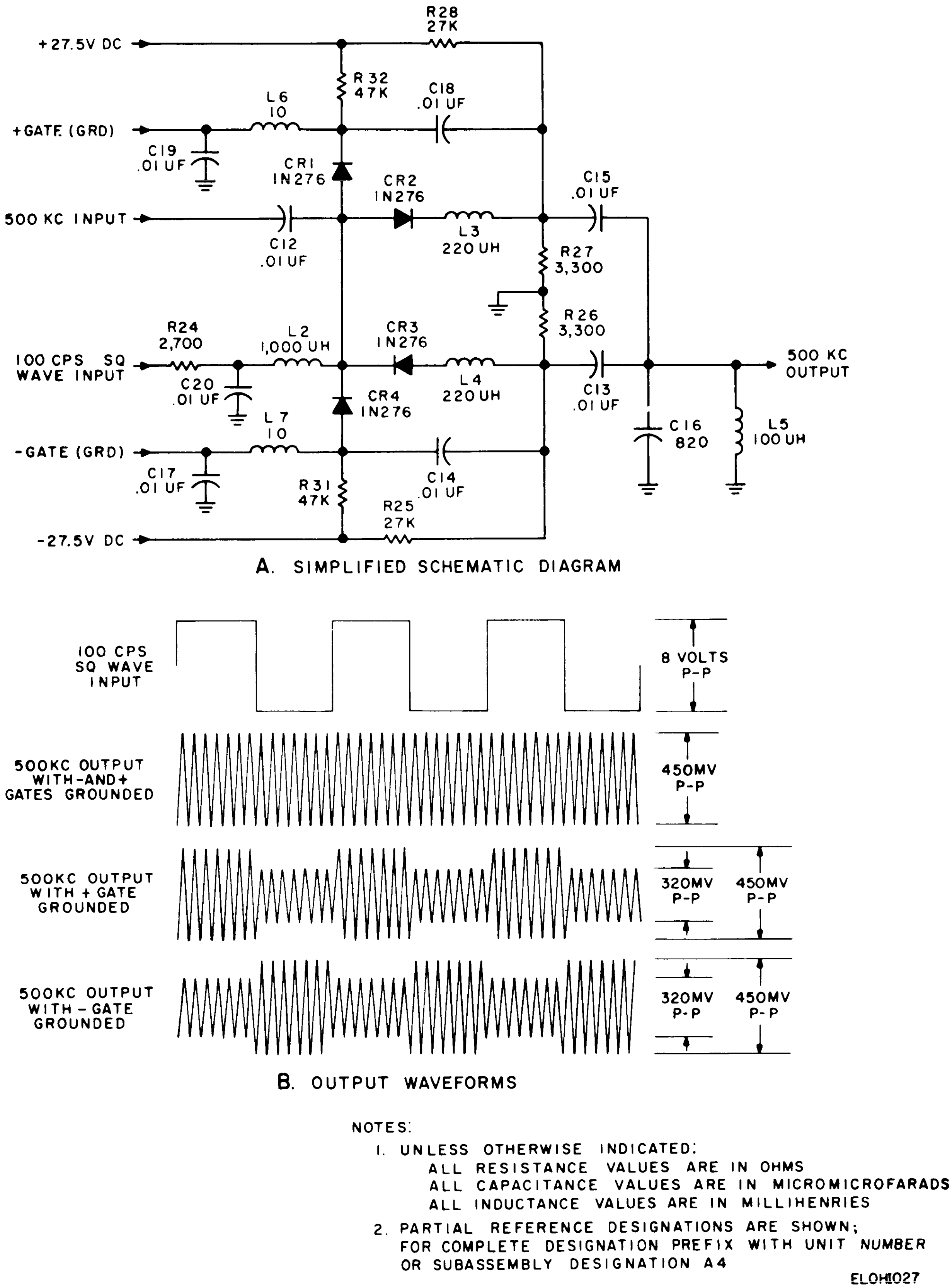
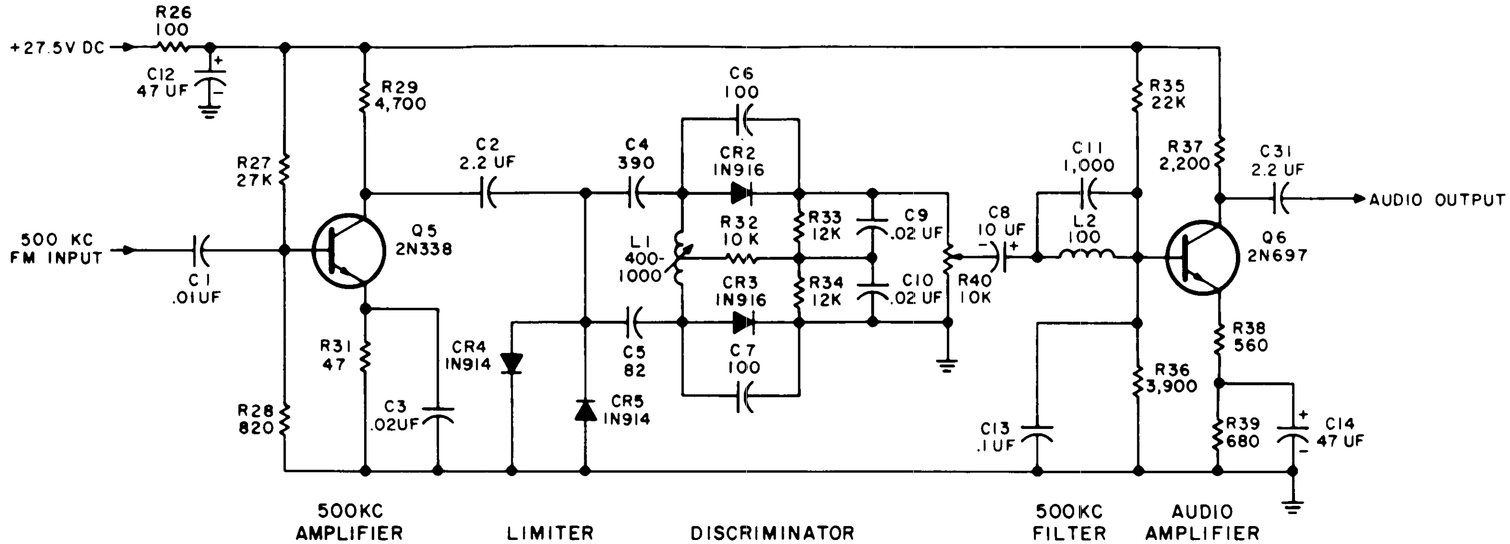
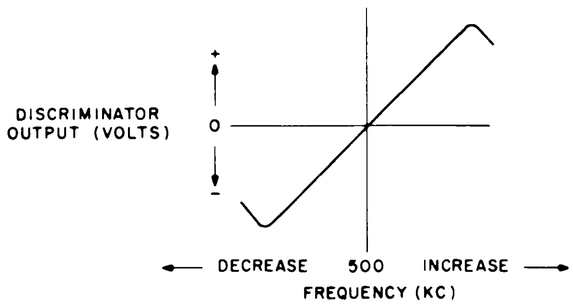


Figure 2-27. 500-kHz switch circuit, simplified schematic diagram.



A. SIMPLIFIED SCHEMATIC DIAGRAM



B. TYPICAL DISCRIMINATOR CHARACTERISTIC CURVE

NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATION A5

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Figure 2-28. 500-kHz discriminator circuit, simplified schematic diagram.

frequencies of the discriminator).

d. As the frequency of the incoming signal swings below 500-kHz and approaches the resonant frequency of inductor L1 and capacitor C4 and C7, the combined impedance decreases. This decrease results in an increase in the voltage developed across capacitor C7. During one half cycle, diode CR3 conducts and bypasses the current around capacitor C7 during the next half cycle, and capacitor C7 charges and then discharges through one-half of inductor L1, dropping resistor R32, and load resistor R34. The current flow through resistor R34 produces a negative discriminator output. As the frequency continues to decrease below 500-kHz, the voltage developed across capacitor C7 increases, and subsequently the discriminator output becomes more negative.

e. When an excursion of the incoming signal is above the center frequency, an opposite site of conditions exists. The impedance of the series lc circuit, consisting of capacitors C5, C6, C9 and C10 and inductor L1, decreases and current flow through this circuit increases. The rectifying action of diode CR2 causes current to flow through one-half of inductor L1, dropping resistor R32 and the load resistor R33. In this case, the current flow through the load resistor is opposite in direction to the current flow when the signal swings below the center frequency; therefore, the discriminator output signal depends on how greatly the signal deviates from the center frequency, 500-kHz. A deviation toward a higher frequency produces a negative voltage output. The frequency versus output voltage curve of the discriminator is shown in B, figure 2-28.

f. Resistor R40 is adjustable and sets the output amplitude of the discriminator. Inductor L2 and capacitor C11 are resonant at 500-kHz. The tuned circuit is in series with the signal path and forms a band elimination filter for 500-kHz frequencies that might be present at the output of the discriminator. Transistor Q6 amplifies the audio output of the discriminator, and the circuit output is taken at the collector of Q6.

2-34. 30 MHz Switch

(fig. 2-29)

The 30-megahertz switch receives two signal inputs: a 30-megahertz sine wave from the 30-megahertz oscillator and a 100-HZ square wave from the AN/ARC-54 homer module.

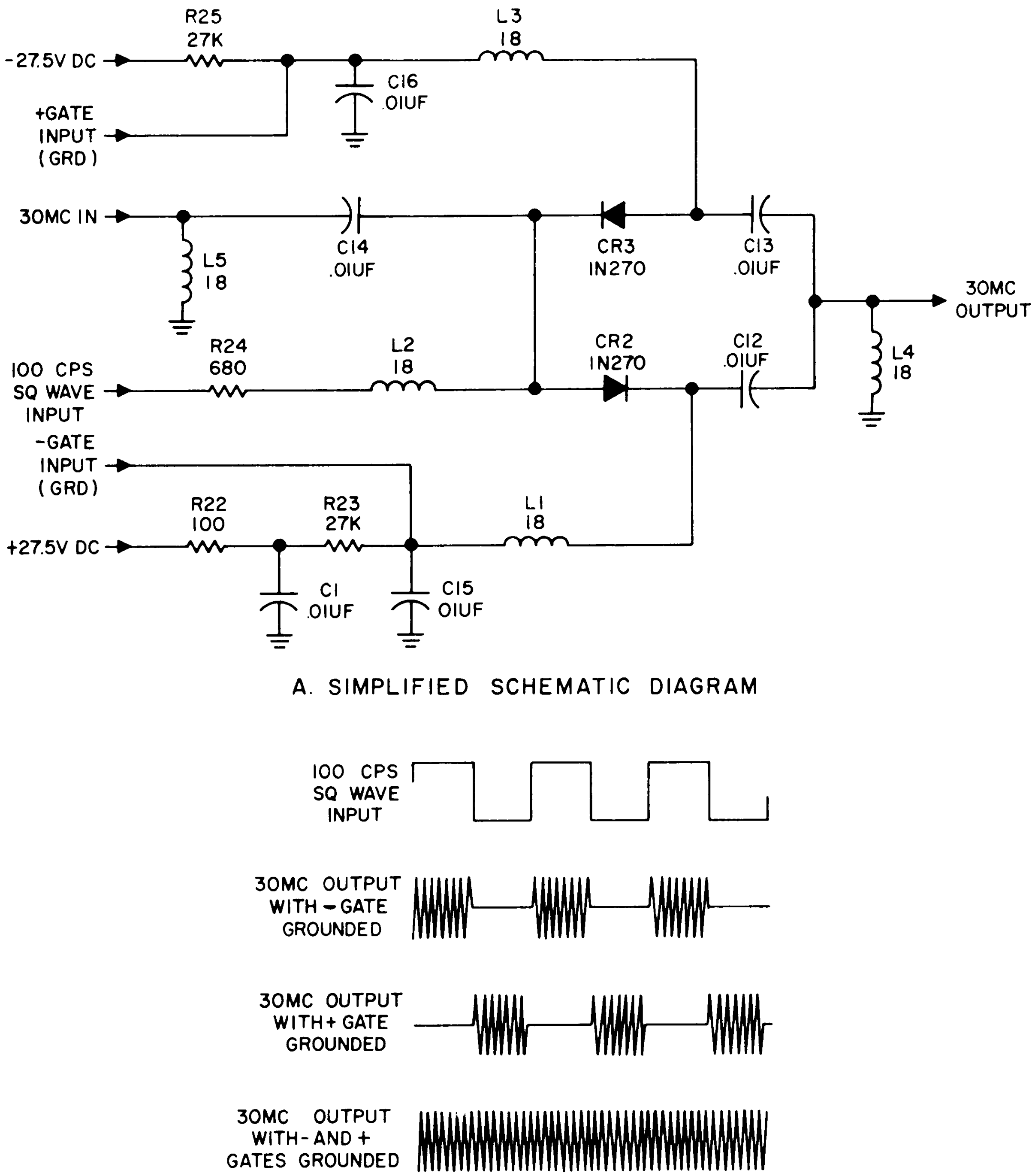
a. By connecting grounds to the gate inputs, the switch circuit produces signals that check the diode switch circuit in the AN/ARC-54 homer module. The –27.5 volts dc connected to the anode of diode CR3 and the ±27.5 volts dc connected to the cathode of diode CR2 reverse bias the diodes and thereby keep them nonconducting with no grounds applied to the gate inputs. Capacitor C14 couples the 30 megahertz signal to one side of the diode switch With neither gate input grounded, both diodes are reverse biased and block the 30 megahertz signal from the output. With the positive gate input grounded, diode CR3 conducts on the negative half cycles of the 100-HZ square wave The conduction path is from the square wave Input terminal through R24, L2, CR3, and 1,3 to ground. During the conduction period, diode CR3 acts as a short circuit and the 30-megahertz signal passes through diode CR3 and capacitor L13 to the output. The positive half cycle of the 100-HZ square wave reverse hisses diode CR3 and blocks the 30-megahertz signal from the output With the negative gate grounded, the opposite action occurs. Diode CR2 is forward biased on the positive half cycles and allows the 30-megahertz signal to pass through CR2 to the output. With both the negative and positive gates grounded, a constant amplitude, 30-megahertz signal appears at the output. The output waveforms for each gate condition are shown in B, figure 2-29.

b. Inductors L.1 through L5 have a high impedante at 30-megahertz and a low impedance at 100 Hz. Inductors L1 and L3 block the 30-megahertz signal from the power supply and gate circuits. Inductor L2 passes the 100-Hz square wave hut prevents the 30-megahertz signal from entering the external circuit. Inductor Lt5 prevent the 100-Hz square wave from feeding back to the 30-megahertz oscillator circuit. Inductor 1.4 provides a high ac impedance ground return for the 30 megahertz output signal.

2-35. Frequency Selection Circuit

(fig. 2-30 thru 2-32)

a. General. Frequency selection for the' AN/ARC-54 RF subchassis is performed by FREQUENCY SELECTOR-MC switches S7, S8 and S9. The frequency selection is accomplished by three five-wire reentrant, open seeking switching circuits. Figure 2-30 is a schematic diagram of simple open-seeking reentrant system. With the, switches in the positions shown,switch S1. applied ground to terminal 1 of S2. Ground from terminaL C of S2, to motor B1 causes the motor to operate, aind S2 is turned in a clockwise direction. When the open segment of S2 reaches terminal 2, the circuit opens and the motor stops. The action is the same for any position set by S1. Note that switches S1 and S2 are physically complementary. All reentrant systems have this characteristic. Figure 2-31 is a schematic diagram of the test set FREQUENCY SELECTOR-MC switches. Although the switching arrangement



NOTE:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN:
   FOR COMPLETE DESIGNATION PREFIX WITH UNIT
   NUMBER OR SUBASSEMBLY DESIGNATION A13

EL0H1029

Figure 2-29. 30 MHz switch circuit, simplified schematic diagram.

is more complex, the switches provide a basic function similar to S1 in the simple switching arrangement of figure 2-30. The test set switching circuits are described in *b* and c below.

b. 0.05 Megahertz Switching. Switch S9 selects fractional megahertz in steps of 0.05 megahertz. Figure 2-32 shows the 0.05 megahertz selector switch connected to a typical drive circuit. Switch S9 is shown in the .00 position with megahertz select lines A and E grounded by S9 rear. Drive motor B1 has positioned S1 so that megahertz select A and E lines are disconnected from the driver motor. When S9 is set to the .05 position, S9 rear grounds the megahertz select B line only. A ground path from the megahertz select B line, through contact 3 on S1 front, energizes the motor. The motor turns S1 in the direction shown by the arrows. When the switch segment leaves contact 3 on S1 front, the ground circuit to the motor is opened and the motor stops. The same action occurs for other positions of the switch. Table 2-9 below shows the coding for the 0.05 megahertz selector switch.

c. Whole Megahertz Tuning. Figure 2-31 shows the complete test set tuning circuit. Switches S7 and S8 perform the whole-megahertz tuning. Switch S8 generates three sets of codes. One code covers the 30- to 39- and the 50- to 59-megahertz ranges; another code covers the 40- to 49- and 60- to 69-megahertz ranges; a third code discriminates between odd and even megahertz by placing alternate grounds on the odd-even megahertz lines. Switch S8B and S8D form another five-wire code generator for the 40- and 60-megahertz ranges. In positions 30 and 50, switch S7 connects the five lines A through E. The codes for frequencies in the 30- and 50-megahertz range are therefore identical. Switch S7 selects one of the two codes by generating an ambiguity code. For the 30-megahertz range, switch S7A, section Z grounds megahertz ambiguity line A. Megahertz ambiguity line B is grounded when S7 is set to 50. The same general concept is true for positions 40 and 60 of switch S7. Switch S7 connects the five lines from S8A and S8C to the megahertz select lines A through E. Megahertz ambiguity line A is grounded in the 40 position, and megahertz ambiguity line B is grounded in the 60 position, distinguishing the two frequency ranges. Switch S8 also generates an odd-even megahertz code for the low frequency oscillator in the AN/ARC-54 RF subchassis. Switch S8E grounds the even megahertz cycle ground line on all even megahertz switch settings (that is, O, 2,4,6, . . . and so forth) and grounds the odd megahertz ground line on all odd megahertz settings. The combination of switches S7 and S8 tune the RF subchassis to any whole megahertz frequency in the 30- to 70-megahertz frequency range. Table 2-10 below shows the ground for each whole megahertz setting.

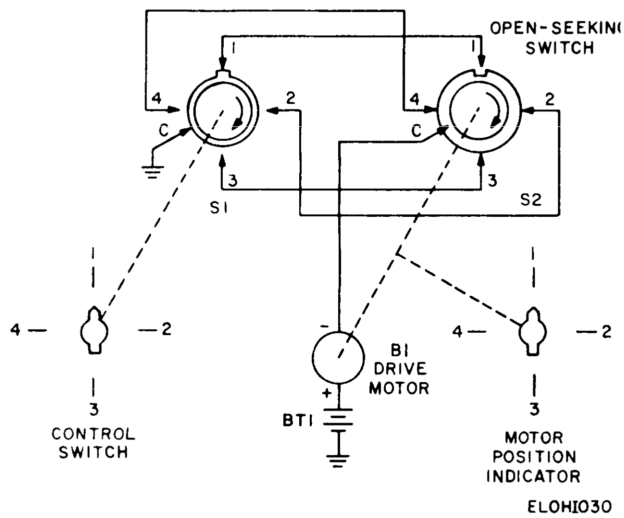


Figure 2-30. Four-wire reentrant tuning system, simplified schematic diagram.

2-36. Power Supply Circuits

(fig. FO-2)

The test set contains a positive 27.5-volt regulated power supply, a negative 27.5-volt regulated power supply, and a positive 500-volt regulated power supply. Figure FO-2 is a simplified schematic diagram showing the power supplies and associated switching and metering circuits. Paragraphs 2-37 through 2-43 describe the power supplies and associated circuits.

2-37. Primary Power Circuit

(fig. FO-2)

The primary power circuit for the test set may be connected for either 115-volt operation or 230-volt operation by changing the connection of plug P1. Figure FO-2 shows P1 connected to J30. Wires on jack J30 connect the primary windings of transformer T1 in parallel. Under this condition, the unit operates from a 115-volt power source. For 230-volt operation, plug P1 connects to J31. In this case, the primary windings are connected in series. Interlock switch S12 disconnects power from transformer T1 when the unit is taken out of the case. Taps on the primary of transformer T1 are connected to terminal board TB1. The connection shown in figure FO-2 are for normal line voltages of 115/230 volts. If low line voltage conditions exist, wires from pins A and B of plug PI are connected to terminals 3 and 4, respectively, on terminal board TB1. Using these connections, the equipment operates from a 105-volt or a 210-volt power source, depending on the place-

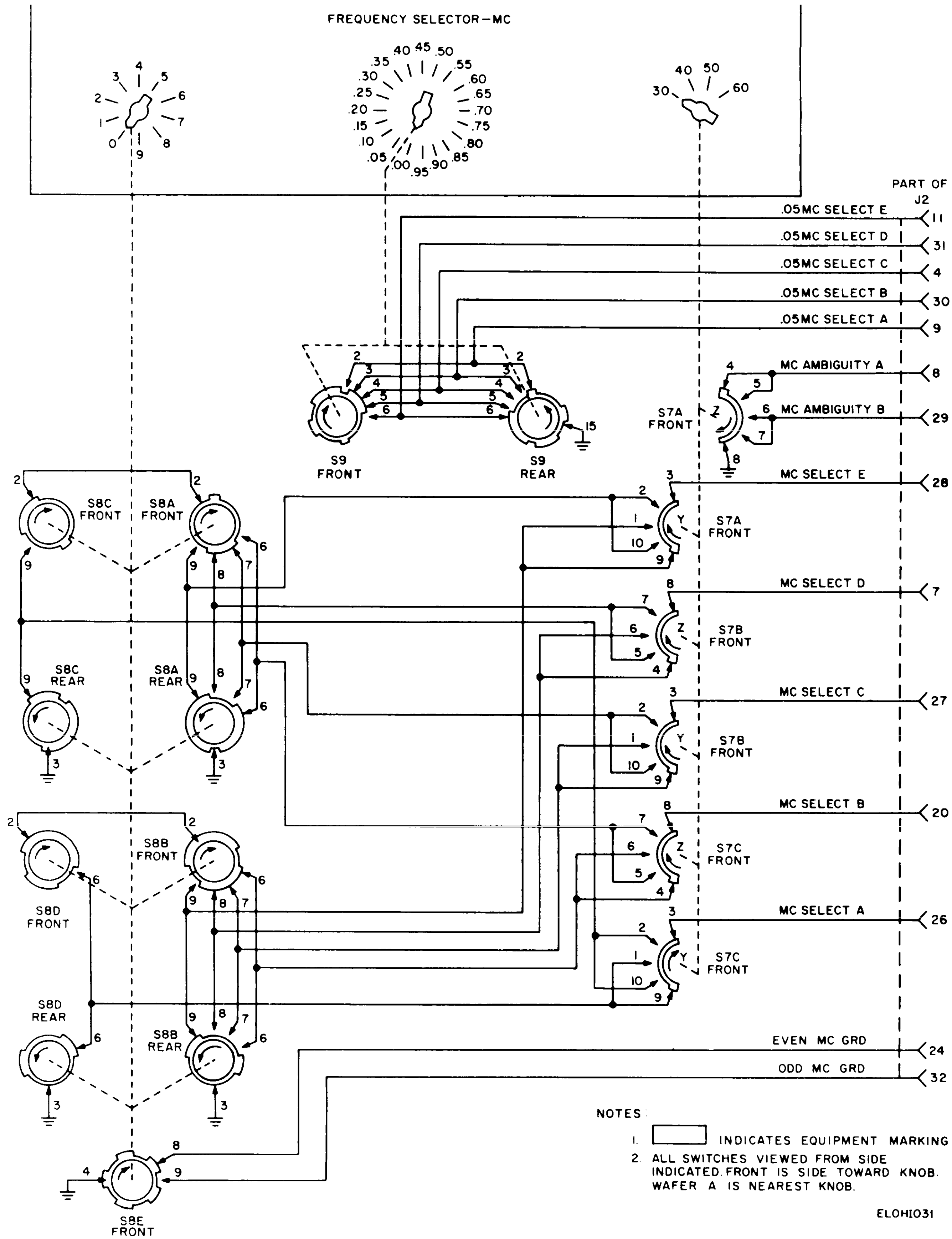


Figure 2-31. Frequency selector switch circuit, simplified schematic diagram.

Table 2-9. 005 Megahertz Selector Switch Coding

FREQUENCY SELECTOR-MC switch position (0.05MHz)	Frequency (MHz)	0.05 MHz control wire coding				
		A	B	C	D	E
0.00--------------------	0	X	0	0	0	X
0.05--------------------	.05	0	X	0	0	0
0.10--------------------	.10	0	0	X	0	0
0.15--------------------	.15	0	0	0	X	0
0.20--------------------	.20	0	0	0	0	X
0.25--------------------	.25	X	0	0	0	0
0.30--------------------	.30	X	X	0	0	0
0.35--------------------	.35	0	X	X	0	0
0.40--------------------	.40	0	0	X	X	0
0.45--------------------	.45	X	0	0	X	X
0.50--------------------	.50	X	X	0	0	X
0.55--------------------	.55	X	X	X	0	0
0.60--------------------	.60	0	X	X	X	0
0.65--------------------	.65	X	0	X	X	X
0.70--------------------	.70	X	X	0	X	X
0.75--------------------	.75	X	X	X	0	X
0.80--------------------	.80	X	X	X	X	0
0.85--------------------	.85	0	X	X	X	X
0.90--------------------	.90	0	0	X	X	X
0.95--------------------	.95	0	0	0	X	X

X-indicates ground.

O-indicates open.

Table 2-10. Whole Megahertz Selector Switch Coding

FREQUENCY SELECTOR-MC switch position		Frequency (MHz)	Control wire coding								
			Ambiguity		Odd-even		Megahertz select				
10 MHz	1 MHz		A	B	Odd	Even	A	B	C	D	E
30-------	0-------	30	X	O	O	X	X	O	O	O	X
30-------	1-------	31	X	O	X	O	O	X	O	O	O
30------	2-------	32	X	O	O	X	O	O	X	O	O
30-------	3-------	33	X	O	X	O	O	O	O	X	O
30-------	4-------	34	X	O	O	X	O	O	O	O	X
30-------	5-------	35	X	O	X	O	X	O	O	O	O
30-------	6------	36	X	O	O	X	X	X	O	O	O
30-------	7-------	37	X	O	X	O	O	X	X	O	O
30-------	8-------	38	X	O	O	X	O	O	X	X	O
30-------	9-------	39	X	O	X	O	X	O	O	X	X
40-------	0-------	40	X	O	O	X	X	X	O	O	X
40-------	1-------	41	X	O	X	O	X	X	X	O	O
40-------	2-------	42	X	O	O	X	O	X	X	X	O
40-------	3-------	43	X	O	X	O	X	O	X	X	X
40-------	4-------	44	X	O	O	X	X	X	O	X	X
40-------	5-------	45	X	O	X	O	X	X	X	O	X
40-------	6-------	46	X	O	O	X	X	X	X	X	O
40-------	7-------	47	X	O	X	O	O	X	X	X	X
40-------	8-------	48	X	O	O	X	O	O	X	X	X
40-------	9-------	49	X	O	X	O	O	O	O	X	X
50-------	0-------	50	O	X	O	X	X	O	O	O	X
50-------	1-------	51	O	X	X	O	O	X	O	O	O

Table 2-10. Whole Megahertz Selector Switch Coding - Continued

FREQUENCY SELECTOR-MC switch position		Frequency (MHz)	Control wire coding								
			Ambiguity		Odd-even		Megahertz select				
10 MHz	1 MHz		A	B	Odd	Even	A	B	C	D	E
50-------	2-------	52	0	X	0	X	0	0	X	0	0
50-------	3-------	53	0	X	X	0	0	0	0	X	0
50-------	4-------	54	0	X	0	X	0	0	0	0	X
50-------	5-------	55	0	X	X	0	X	0	0	0	0
50-------	6-------	56	0	X	0	X	X	X	0	0	0
50-------	7-------	57	0	X	X	0	0	X	X	0	0
50-------	8-------	58	0	X	0	X	0	0	X	X	0
50-------	9-------	59	0	X	X	0	X	X	0	0	X
60-------	0-------	60	0	X	0	X	X	X	0	0	X
60-------	1-------	61	0	X	X	0	X	X	X	0	0
60-------	2-------	62	0	X	0	X	0	X	X	X	0
60-------	3-------	63	0	X	X	0	X	0	X	X	X
60-------	4-------	64	0	X	0	X	X	X	0	X	X
60-------	5-------	65	0	X	X	0	X	X	X	0	X
60-------	6-------	66	0	X	0	X	X	X	X	X	0
60-------	7-------	67	0	X	X	0	0	X	X	X	X
60-------	8-------	68	0	X	0	X	0	0	X	X	X
60-------	9-------	69	0	X	X	0	0	0	0	X	X

X-indicates ground.

0-indicates open.

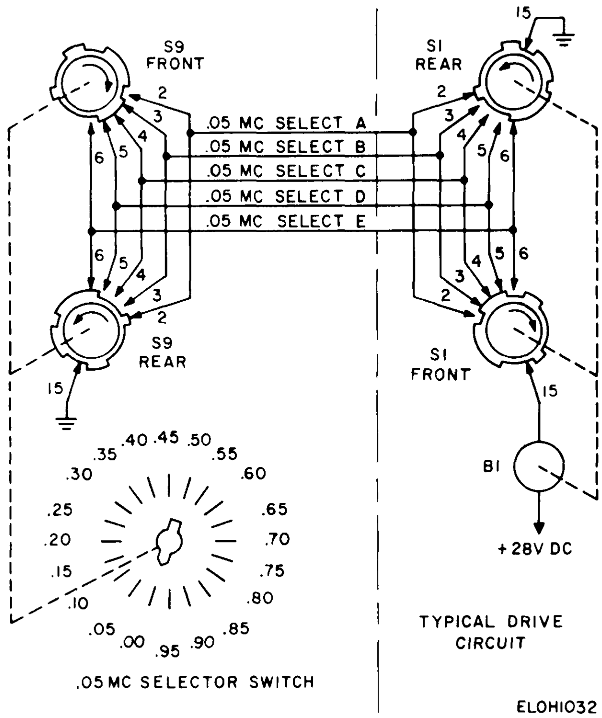


Figure 2-32. 0.05 MHz selector switch typical drive circuit, simplified schematic diagram.

ment of P1. Fuses F2 and F3 protect the primary circuit of transformer T1.

2-38. —28 Volt Regulator

(fig. FO-2)

The –27.5 volt power supply is a regulated power supply with a maximum output current of 100 milliamperes. The regulator circuit provides output voltage regulation and control and over-current protection. The –27.5 volt regulated power supply is discussed below.

a. Output Voltage Regulator. A bridge rectifier circuit consisting of diodes A8CR1 through A8CR4 rectifies the ac output of transformer T1. A pi-type filter circuit, consisting of capacitors A8C1 through A8C4 and resistor A8R1, filters the output of the bridge rectifier and applies the filtered dc voltage to the collector of series-regulator transistor A8Q2. Transistors A8Q1 and A8Q3 are connected in a cascade amplifier configuration. Zener diode A8CR9 maintains a constant bias on transistor Q1. Zener diodes A9CR10 and A8CR11 are the voltage reference for the regulator and place a constant — 10.2 volts on the emitter of transistor A8Q3. Zener diodes A8CR12 and A8CR13 in series with resistors A8R6, and A8R7 form a voltage divider across the regulator output. The two diodes have a constant 16.4-volt drop across them regardless of the regulator output voltage; therefore, any change in the regulator output voltage appears entirely across resistors A8R6 and A8R7. Resistor A8R6 is the out put voltage control. Resistor A8R8 in parallel with A8R6 reduces its effective resistance and allows a more vernier control of the bias on A8Q3. When the – 27.5 volt output becomes more negative, the voltage at the base of A8Q3 becomes more negative. As the base voltage of A8Q3 goes negative, the collector current increases. The collector current path for transistor A8Q3 is from the output of the filter circuit, through resistor A8R3, transistors A8Q1 and A8Q3 and diodes A8CR10 and A8CR11 to ground. The voltage drop across emitter resistor AlR3 increases and causes the collector current of A8Ai to decrease. The net effect is that the voltage at the junction of the two transistors becomes more positive. The base of transistor A8Q2 becomes more positive; its collector circuit internal resistance increases and thus the voltage drops across it, which causes the output voltage to decrease to the original value.

b. Overcurrent Protector Circuit. The maximum current that the — 27.5 volt power supply delivers is 100 milliamperes. An overcurrent protector circuit consisting of transistor A8Q4, resistor A8R4, and associated components limits the total current to 100 milliamperes. Assume that the output of the regulator is shorted to ground. The voltage drop across A8R4 in the emitter-to-base circuit of A8Q4 increases and places a negative voltage on the base of A8Q4. Transistor A8Q4 collector current increases and places a positive voltage on the base of transistor A8Q2. The positive voltage on the base of A8Q2 causes its internal resistance to rise and thus the regulator output voltage to decrease; this condition limits the output current to a safe value. Capacitor A8C5 is an antihunt feedback capacitor that prevents circuit oscillation. When the output current changes, transistor A8Q4 senses the change as described above. Capacitor A8C5 couples the changing or step voltage to the base of A8Q3. The circuit of transistor A8Q3 amplifies and inverts the changing voltage and applies it back to the base of A8Q2. This action prevents oscillation by presenting a large negative feedback path for any ac voltage.

2-39. +28 Volt Regulator

(fig. FO-2)

The positive 27.5-volt regulator delivers + 27.5 volts dc at a current of 7.5 amperes to the test set circuits. The circuit is a series-regulator type and stabilizes the output voltage over a wide current range. A bridge rectifier circuit consisting of diodes CR1 through CR4 rectifies the ac output of transformer T1. Inductor L2 and the parallel combination of C2 and C3 form an inverted L1-type filter that filters the output of the bridge rectifier circuit and applies it to the collector of transistors Q2 and Q3. Transistors Q,A6A1, A6A5 are cascaded voltage and current amplifiers which sample the output voltage, amplify any change, and apply a control signal to the bases of series-regulator transistors Q2 and Q3.

a For the following discussion, assume the POWER SELECTOR switch S1 is in the - 27.5V position (as shown). Zener diodes A6CR5 and A6CR6, in series with resistors A6R18 and A6R17, form a voltage divider across the regulator output. The three Zener diodes have a constant 18.8-volt drop across them regardless of the regulator output voltage; therefore, any change in the regulator output voltage appears entirely across resistors A6R17 and A6R18. Resistor A6R18 is the regulator output voltage control. Zener diode A6CR7 places a constant 5.6-volt reference voltage on the emitter of A6Q5.

b. To analyze the circuit operation, assume that the regulated output voltage rises. A positive-going voltage appears at the movable arm of resistor A6R18 and is direct coupled to the base of A6Q5. Transistor A6Q5 amplifies and inverts the positive-going voltage and applies a negative-going voltage to the base of A6Q1. Transistors A6Q1 and Q1 are emitter followers that amplify the current output of A6Q5 to a sufficient magnitude to drive series-regulator transistors Q2 and Q3. No phase inversion occurs in the emitter follower circuits; therefore, emitter follower Q1 applies a negative going signal to the bases of series-regulator transistors Q2 and Q3. The negative-going signal at the base of Q2 and Q3 increases the internal resistance of the transistors and thereby decreases the output voltage back to the original value. Resistors R11 and R12 balance the current flow through transistors Q2 and Q3 by compensating for slight differences in conduction characteristics of the transistors.

2-40. Despike Testing Circuit

(fig. FO-2)

The despike testing circuit consists of the +28-volt regulator (para 2-39), a voltage boost rectifier circuit, and a multivibrator. The purpose of the despike testing circuit is to develop a pulse in the output of the +27.5 volts dc power supply to test the despike circuit in the AN/ARC-54 power supply module.

a. The despike circuits are energized when the POWER SELECTOR switch is set to the DESPIKE position. The voltage boost circuit is composed of a bridge rectifier circuit (diodes A8CR5 through A8CR8) and an inverted L-type filter (inductor L1 and capacitor C7). The output of the voltage boost circuit is connected in series with the output of the +27.5 volt rectifier by POWER SELECTOR switch S1 when it is in the DESPIKE position. The addition of the voltage boost circuit increases the dc input to the regulator circuit approximately 15 volts-. The POWER ENTRANCE switch also applies operating voltage to the multivibrator circuit composed of transistors A6Q6 and A6Q7 and associated components. The multivibrator oscillates at a frequency of approximately 100 Hertz. The output of the multi vibrator is nonsymmetrical; the negative portion is approximately 10 milliseconds wide, and the positive portion 90 milliseconds wide. Duty cycle control A6R23 adjusts the output of the multivibrator for a symmetry ratio of 9 to 1. Resistor A6R27 couples the output of the multivibrator to transistor A6Q8. Transistor A6Q8 is turned on for 90 milliseconds and off for 10 milliseconds.

b. During its conducting period, transistor A6Q8 clamps the base of Q6Q1 (part of the +28-volt regulator) at ground potential and thereby reduces the power supply output to nearly zero. During the 10-millisecond period that A6Q8 is not conducting, transistor A6A5 regains control of the base of A6Q1. During the 10-millisecond period, the +28-volt regulator operates normally as described in paragraph 2-39; except the DESPIKE AMPL control R5 adjusts the power supply output amplitude rather than A6R18. During the 90-millisecond period that the base of A6Q1 is clamped at ground, the output of the power supply is clamped at approximately 5 volts dc. The resultant output of the +27.5-volt power supply during the despike mode of operation is a positive 10-millisecond pulses with an amplitude of 22 to 50 volts peak as set by the DESPIKE AMPL control. POWER SELECTOR switch A1A (section Y) disconnects the blower circuit during despike operation. The +27.5 volt power supply filter, consisting of Cl, C8, C9, C10, and R22 and R23 is also disconnected and enables the power supply output to be pulsed.

2-41. 800 Hz Inverter

(fig. FO-2)

a. The 800-Hz inverter is a saturable core, square-wave oscillator that produces 54 volts ac to operate the blower motor. A secondary winding on the saturable core transformer furnishes 500 volts ac for the high voltage rectifier circuit. The +28-volt dc regulator supplies operating power to the inverter circuit. Section Y of switch S1A connects +27.5 volts dc to the center tap of transformer T2 through a filter circuit consisting of capacitor Cl, C8, C9, and C10 and resistors R22 and R23. Capacitors Cl and C8 provide filtering for the +28-volt dc regulator. The combination of capacitors C9 and C10 and resistors R22 and R23 is a spike filter that prevents transients generated by the inverter circuit from entering the regulated 27.5-volt power supply circuit. The inverter circuit consists of transistors Q4 and Q5, saturable core transformer T2, resistors R24 through R27, and capacitors C11 and C12. The voltage divider consisting of R25 and R27 develops bias for transistor Q4. Resistors R24 and R26 likewise develop bias for transistor Q5.

b. When operating voltage is initially applied to the circuit, both transistors try to conduct. Circuit tolerances and minor differences in the conduction characteristics of the two transistors cause one transistor to conduct more heavily than the other. Assuming that transistor Q4 conducts harder, current flows from ground through transistor Q4, through winding 2-3 of transformer T2, and back to the +27.5 volt supply. This current flow induces a voltage in winding 1-2 of transformer T2 that drives the base of transistor Q4 negative, and the collector current increases. A voltage is also induced in winding 4-5 of transformer T2 that drives the base of transistor Q5 positive, and the collector current is reduced. This action continues until the collector current of transistor Q4 through winding 2-3 saturates the transformer core. When the core saturates, the voltage induced in transformer winding 1-2 drops to zero and the Q4 collector current decreases. As the Q4 collector current decreases, the magnetic field around transformer T2 collapses. This action induces a voltage of the opposite polarity in the transformer windings which results in a positive voltage at the base of Q4 and a negative voltage at the base of Q5; this condition causes transistor Q4 to cut off and transistor Q6 to conduct through winding 3-4 of transformer T2. The same action repeats as the Q5 collector current through winding 3-4 saturates the core. Capacitors C11 and C12 in the base circuits of transistors Q5 and Q4, respectively, couple the sharp leading and trailing edges of the voltage waveforms on winding 1-2 and 3-4 to the bases of each transistor. The transistors switch from conduction to nonconduction during the leading and trailing edges of the voltage wave. If the sharp rise and fall of these waveforms are preserved, the transistors switch more rapidly; therefore, less power is dissipated in the transistors during the switching interval. The inverter output is a 54-volt, 800-Hz square wave that is symmetrical with reference to ground. The output appears at the emitters of transistors Q4 and A5. Blower motor B1 connects directly to the inverter output.

2-42. High Voltage Power Supply

(fig. FO-2)

The secondary winding on 800-Hz inverter transformer T2 supplies approximately 500 volts ac to the high-voltage rectifier circuit. The high-voltage rectifier circuit produces 500-volt and 250-volt outputs. A conventional bridge rectifier circuit, consisting of diodes A7CR1 through A7CR4, rectifies the ac output of transformer T2. The voltage across the bridge is 500 volts dc. Capacitors C4 and C5, connected across the bridge output, filter the 500-volt output. The center tap of the 500-volt transformer winding connects to the junction of the two filter capacitors. Diodes A7CR1 and A7CR4 function as a conventional full wave rectifier and place +250 volts dc on the positive side of C4 with respect to the negative side. Diodes A7CR2 and A7CR3 likewise function as a negative full wave power supply and place a negative 250 volts dc on the negative end of capacitor C5 with respect to the positive side. The net result is + 500 volts dc at the positive side of C5. The 5-ohm combination of resistors A7R16 and A7R17 connects the negative side of capacitor C5 to ground. The 5-ohm resistance develops a small dc voltage that is proportional to the circuit output current. Meter multiplier resistor A7R18 connects the dc voltage to the TEST METER through the CIRCUIT SELECTOR switches. Resistors A7R5 and A7R6 are bleeder resistors connected across each leg of the power supply. The high-voltage power supply operates anytime the 800-Hz inverter is energized; however, relay K1 prevents the high voltage from appearing at RF CHASSIS connector J2. Relay K1 energizes only when the three following conditions exist: the POWER SELECTOR switch is set to HIGH VOLTAGE, CIRCUIT SELECTOR C is set to position 9 or 10, and an AN/ARC-54 RF chassis is connected to J2. HIGH VOLTAGE ON indicator DS2 is connected in parallel with the coil of relay K2 and indicates that high voltage is present at J2.

2-43. Power Supply Metering Circuit

(fig. FO-2)

All power supply output voltages in the test set can be checked by the use of the test set TEST METER. POWER SELECTOR switch S1 connects meter multiplier resistors to the respective power supplies. The PRESS TO MONITOR VOLTAGE button connects the selected meter multiplier resistor to the TEST METER. The TEST METER indicates 65 percent if the power supply voltage is correct. The TEST METER is protected against accidental overload by two diodes, A15CR1 and A15CR2, in parallel with it. The forward conduction voltage of the diodes is slightly higher than the full-scale voltage of the meter. When the full-scale voltage of the meter is exceeded, the diodes shunt the excess current around the meter. Each power supply metering circuit is discussed in *a* through *d* below.

a. -27.5-Volt Metering Circuit. Resistor A8R10 is the series meter multiplier resistor. When POWER SELECTOR switch S1 is in the -27.5V position, resistor A8R10 connects the 27.5-volt power supply through contacts 13 and 12 of S1C FRONT TO TERMINAL 4 of PRESS TO MONITOR VOLTAGE switch S10. Switch S1C rear grounds S10-1.Pushing S10 connects -27.5 volts to the negative side of the TEST METER and ground to the positive side. The TEST METER indicates 65 percent with -27.5 volts applied to meter multiplier resistor A8R10.

b. +25.5Volt Metering Circuit. The +27.5 volt metering circuit is similar to the -27.5 volt circuit discussed in *a* above. Resistor A6R2 is the meter multiplier resistor. When POWER SELECTOR switch S1 is in the NORMAL or EXTTERNAL posi-supply output through contacts 2 or 5 and 18 of S1C REAR TO TERMINAL 1 of PRESS TO MONITOR VOLTAGE switch S10. Switch S1C front grounds S10-4. pUSHING S10 connects +27.5 volts to the positive side of the TEST METER and ground to the negative side.The TEST METER indicates 65 percent with +27.5 volts applied to multiplier A6R2

c. +500 Volts Metering Circuit. Because both the +500 and +250 volt outputs are derived from the same power supply, only the +500 volts is the metered Resistor A7R13 and A7R15 comprise a voltage divider across the +500 volts supply. The voltage at the junction of these two resistors is reduced to approximately 85 volts. When POWER SELECTOR switch S1 is in the HIGH VOLTAGE position, resistor A7R14 (meter multiplier resistor) connects the 85 volts through contacts 3 and 18 of S1C rear to terminal 1 of PRESS TO MONITOR VOLTAGE switch S10. Switch S1C front grounds S10-4. Pushing S10 connects the divider circuit to the positive side of the TEST METER and ground to the negative side. The TEST METER indicates 65 percent with 500 volts applied to the voltage divider.

d. Despike Metering Circuit. The despike metering circuit measures the output of the +27.5 volt power supply when the test set is operating in the despike mode. Diode A7CR6 rectifies the pulse out put of the +27.5 volt power supply. Capacitor A7C4 filters therectified output. The voltage at the junction if A7C4 and diode A7CR6 is a dc voltage approximately equual to the peak voltage of the pulse output of the power supply. Resistor A7R12 is the meter series with adjustable resistor A7R12 is the meter multiplier resistor. When POWER SELECTOR switch S1 is the DESPIKE position, the two resistor connect the despike rectifier output contacts 4 and 18 of S1C rear to terminal 1 of PRESS TO MONITOR VOLTAGE switch S10. Switch S1C front grounds S10-4. Pushing S10 connects the despike rectifier output to the positive side of the TEST METER and ground to the negative side. Resistor A7R12 is adjusted so that a 40-volt pulse output from the power supply (including the dc level above ground) produces an 80 percent TEST METER reading.

2-44. CIRCUIT SELECTOR Switches

(fig, FO-31

a. General. The CIRCUIT SELECTOR switches on the test set perform the switching necessary for testing the AN/ARC-54 modules. Figure FO-3 consists of a simplified schematic diagram showing the four CIRCUIT SELECTOR switches, the AN/ARC-54 module connectors, and the functional test set circuits. Tables 2-1 through 2-8 of this manual describe the function of each CIRCUIT SELECTOR switch wafer for the program settings in the operating procedures and the operator's PMCS chart in TM 11-6625-467-12. Figure FO-3 supplements this information with switch contact numbers and circuit card terminal numbers which are very helpful in troubleshooting the test set.

b. Arrangement of CIRCUIT SET,ELECTOR Switch Schematic Diagram. Figure FO-3 does not show point-to-point wiring of the test set. The diagram shows the logical routing of test set signals and gives functional names to each signal path. The front panel controls and other components associated with the functional circuits but not located on the circuit cards are shown on the extreme right hand side of figure FO-3.

c. Using CIRCUIT SELECTOR Switch Schematic Diagram. The diagram can be used as an aid in troubleshooting the test set (para 3-6 and 3-7) or to analyze the circuit operation.

(1) If the 30-megahertz oscillator circuit is to be turned on and the output level set to some specified reading on the TEST METER, refer to figure FO-3 and notice that the HIGH FREQ AMPL control connects to pin B of XA1l through two switch sections, S3E-1 and S5D-8. The lower section of figure FO-4 shows the 30 MC OSC LEVEL CONT OUTPUT connected to S3E-1 and S5D-8. This condition indicates that when S3 (CIRCUIT SELECTOR A) is in position 0 (the CIRCUIT SELECTOR position will always be one number less than the switch contact number), the HIGH FREQ AMPL control output (R2-2) connects to the 30-megahertz oscillator through S3D and S3E. A second path exists through switch S5 (CIRCUIT SELECTOR C) when S5 is in position 7. Now refer to HIGH FREQ AMPL control R2 (figure FO-3, extreme right hand side); the movable arm is shown to connect to the two places discussed above, S3D-1 and S5C-7, 8. (The connection to S5C7 is used for another function

not related to the 30-megahertz oscillator). Note that R2-3 receives an input from S6B-4. Refer to figure FO-3 again and note that wafer S6B (CIRCUIT SELECTOR D) has an input of +27.5 volts dc. In position 3, the movable contact connects +27.5 volts S6B-4 which is connected to terminal 3 of HIGH FREQ AMPL control R2.

(2) So far, note that if CIRCUIT SELECTOR D is in position 3 and CIRCUIT SECLECTOR C is in position 7 or CIRCUIT SELECTOR A is in position O, +27.5 volts is connected to the HIGH FREQ AMPL control which acts as a variable voltage divider. The movable arm of the voltage divider connects to the input of the 30-megahertz oscillator through one or two paths, S3 or S5. Therefore, with a CIRCUIT SELECTOR program setting of 0XX3 or XX73, the 30-megahertz oscillator operates and produces a 30-megahertz output at XA1l pin C. Note that XA1l pin C connects directly to J25, a front panel connector labeled 30 MC. The RF amplifier/detector circuit must be used to measure the amplitude of the 30-megahertz output signal. In figure FO-4, note that the 50-ohm RF amplifier/detector input connects to the front panel connector RF VM1. By the use of an RF jumper cable, the 30 MC jack is connected to the RF amplifier/detector circuit through the RF VM1 jack.

(3) Next the output of the RF amplifier/detector circuit must be connected to the TEST METER. The RF amplifier/detector circuit output (XA13-P) connects to three places: S4A-5, S4A-6, and S4A-7. Refer to figure FO-3 and note that the output of S5A connects to S3A-2 and the output of S4A connects to S3A-1. The output of switch S3 connects to the TEST METER through the PRESS TO TEST switch. From the above it is seen that, with a program setting of 04X3 or 05X3, the 30-megahertz oscillator is activated and connected to the TEST METER. Position 6 of S5 cannot be used because S5 must be in position 7 to connect the HIGH FREQ AMPL control output to the 30-megahertz oscillator if S3 is not in position O. Pushing PRESS TO TEST switch S2 connects the RF amplifier/detector circuit output to the TEST METER. The 30-megahertz oscillator can now be set for any specified reading by adjusting the HIGH FREQ AMPL control.

CHAPTER 3

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

NOTE

Direct support and general support maintenance instructions are combined to be performed as Aviation Intermediate Maintenance (AVIM).

Section I. TROUBLESHOOTING

3-1. Tools and Equipment

Tools, test equipment and accessories authorized for use by aviation intermediate maintenance personnel for the AN/ARM-87 are listed in table 3-1.

3-2. General Instructions

Troubleshooting at the aviation intermediate maintenance level includes all the techniques outlined for aviation unit maintenance plus any special or additional techniques required to isolate a defective part.

a. The first step in servicing a defective test set is to localize the trouble. Localization means tracing the trouble to a defective functional circuit or circuit card. Ideally a fault is localized to a particular circuit card by the use of the self test procedures in the operator/crew preventive maintenance checks and services in TM 11-6625-467-12. The self check pro cedures cannot, however, reveal all possible troubles in the module tester. Other troubles are detected while performing the Radio Set AN/ ARC-54 module test procedures. A complete AN/ARC-54 known to be in good operating condition is part of the maintenance test equipment required at the general support and direct support

Table 3-1, Tools and Test Equipment

NOMENCLATURE	NSN
AMPLIFIER, Radio Frequency AM-1881/U	5895-00-092-7924
ANALYZER, Spectrum TS-723()/U...	6625-00-668-9418
GENERAL RADIO, Frequency Meter and Discriminator Type GR-1142-A	
GENERATOR, Signal AN/URM-127	6625-00-783-5965
FREQUENCY METER AN/USM-26.	6625-00-610-2236
GENERATOR, Signal AN/GRM-50	6625-00-003-3238
GENERATOR, Signal AN/URM-70	6625-00-519-2104
GENERATOR, Signal SG-299/U	6625-00-269-1457
MULTIMETER, AN/USM-223	6625-00-999-7465
MULTIMETER, Meter ME-26/U	6625-00-360-2493
OSCILLOSCOPE AN/USM-182A	6625-00-133-1196
oscilloscope AN/USM-140	6625-00-987-6603
TOOL KIT, Electronic Equipment TK-105/G	5180-00-610-8177
PREAMPLIFIER AM-31740()/USM.	6625-00-799-8110
PROD, Test MX-2517/U	6625-00-511-5383
TEST SET, Transistor TS-1836/U	6625-00-893-2628
TOOL KIT, Electronic Equipment TK-100/G	5180-00-605-0079
TRANSFORMER, CN-16/U	5950-00-688-5722
VOLTMETER, Electronic AN/URM-145	6625-00-973-3986
VOLTMETER, Electronic ME-30A/U.	6625-00-643-1670
VOLTMETER, Electronic ME-202()/U.	6625-00-709-0288

maintenance level. Duplicate the module test wherein the fault occurred, then by the use of schematic diagrams, functional diagrams, and the voltage and resistance table, the trouble can be localized to a functional circuit. The CIRCUIT SELECTOR switches signal path tables 2-1 to 2-7 explain the function of each CIRCUIT SELECTOR switch for all switch settings in the operating procedures. The signal paths for switch settings given in the operator crew preventive maintenance checks and services are presented in table 2-8. The CIRCUIT SELECTOR switch functional diagram (fig. FO-3) shows the signal routing for any switch setting. Both the table and the functional diagram will prove very helpful in localizing troubles in the test set.

b. After a trouble has been localized to a functional circuit or circuit card, the trouble must be isolated. Isolation means the locating of defective part or parts responsible for the abnormal indication. Some defective parts such as burned resistors and arcing shorted transformers, can often be located by sight, smell, and hearing. Most defective parts, however, must be isolated by checking voltage, resistance, waveforms, and so forth.

3-3. Servicing Transistor Circuits

a. General. In general, the servicing procedures and test equipment used for other types of electronic equipment may be used for transistor circuits. Those cases which required special precautions are outlined below. If the equipment under test contains transistors, even though they may not be in the circuit under test, the precautions should be observed because of the possibility of accidentally connecting into a transistor circuit.

b. Test Equipment.

(1) Transistor damage caused by test equipment is usually the result of accidentally applying too much current or voltage to the transistor elements. One source of such current is from the powerline when test equipment with transformerless power supplies are used. The test equipment recommended for testing the test set has transformer-type power supplies; however, if substitute equipment should be used, check its power supply. If line isolation is required, a suitable transformer is identified by National Stock Number 5950-00-356-1779. If the equipment is equipped with a line filter, it is also possible to damage transistors from line current, even though the test equipment has a power transformer in the power supply. The line filter may act as a voltage divider, applying 55 volts ac to the transistors. To eliminate trouble of this type, connect a ground wire from the chassis of the equipment under test to the chassis of the test equipment before any other connections are made.

(2) Multimeters that have sensitivities of less than 5,000 ohms per volt should not be used in transistor circuits. Multimeters with lower sensitivities draw excessive current through many types of transistors, thereby damaging them. Use 20,000 -ohms-per-volt meters or vacuum tube volt-meters (vtvm) when checking all transistor circuits. Verify the ohmmeter circuit (even those in vtvm) on all scales with an external, low-resistance milliammeter in series with the ohmmeter leads. If the ohmmeter draws more than 1 milliampere on any range, this range cannot be used safely on small transistors.

(3) Electric soldering irons may also damage transistors because of leakage current. To check a soldering iron for leakage current, connect an ac voltmeter between the tip of the iron and a ground connection (water pipe or line ground). Allow the iron to heat, and then check for voltage indications on the meter. Reverse the plug in the receptacle and again check for voltage. If there is any indication on the meter, isolate the iron from the line with a transformer. If the iron is heated, it may be used without the isolation transformer if it is unplugged before touching the transistor. A ground wire between the tip of the soldering iron and the chassis of the equipment being repaired will also prevent damage from leakage current.

c. Soldering Techniques. Light duty soldering irons of 20 to 25 watts are adequate for transistor work and should be used. When installing or removing a soldered-in transistor, grasp the transistor lead between the solder joint and the transistors with a long-nosed pliers. The pliers absorb heat that would otherwise conduct into the transistor from the soldering iron. Be sure that wires being soldered to transistor terminals are pretinned so that the connection can be made quickly. Excessive heat may damage the transistor.

d. Circuit Measurements. When measuring resistances of circuits containing transistors or semiconductor diodes, remember that these components are polarity sensitive; therefore, follow the directions in the notes given in the resistance tables to be sure that the correct polarity and range is applied to the circuit from the ohmmeter. Capacitors used in transistor circuits usually have large values; therefore, it takes time to charge these capacitors when an ohmmeter is connected to a circuit containing them. Allow sufficient time for the capacitors to fully charge or the readings obtained will be subject to error. In some cases, it may be best to isolate the components in question and measure them individually. Test probes used for transistor circuit measurements should be clean and sharp. Because many of the resistors used in transistorized circuits have low values, any additional resistance introduced by dirty test probes may make a good resistor measure out of tolerance. The etched circuit boards in the equipment are covered with an epoxy coating. The test probes used should be sharp enough to pierce the epoxy coating and make good contact to the circuit under test. The clearance between socket terminals, wires, and other components is usually very small. It is easy to cause accidental short circuits with a test probe having a long, exposed tip. Short circuits are very damaging to transistor circuits; it is, therefore, a good practice to cover all but about one-eighth inch of the exposed tips of test probes with plastic tape or some other insulation.

e. ohmmeter Checks of Transistors. If a transistor tester is not available, a good ohmmeter may be used for testing. Be sure the ohmmeter meets the requirements given in *b* above.

(1) *Checking PNP transistors.* Connect the positive lead of the ohmmeter to the base and the negative lead to the emitter. A resistance reading of 50,000 ohms or more should be obtained. Connect the negative lead to the collector. The meter should again read 50,000 ohms or more. Reconnect the circuit with the negative lead of the ohmmeter to the base. Connect the positive lead to the emitter and read the resistance. The meter should read 500 ohms or less. Connect the positive lead to the collector. The meter should read 500 ohms or less. Connect the positive lead to the collector. The meter should read 500 ohms or less.

(2) *Checking NPN transistors.* Connect the negative lead of the ohmmeter to the base and the positive lead to the emitter. A resistance reading of 50,000 ohms or more should be obtained. Connect the positive lead to the collector. The meter should again read 50,000 ohms or more. Reconnect the circuit with the positive lead of the ohmmeter to the base. Connect the negative lead to the emitter and read the resistance. The meter should read 500 ohms or less. Connect the negative lead to the collector. The meter should read 500 ohms or less.

3-4. Localizing Troubles

a. There are two types of troubles that are likely to occur in the test set: troubles that are detected by performing the self check procedures in the operator/crew preventive maintenance checks and services (TM 11-6625-467-12), and troubles that occur during the performance of the operating procedures and cannot be detected by the self check routines. The self check procedures localize the first type of trouble to a circuit card or to the chassis of the test set. Aviation intermediate maintenance must perform additional procedures to localize the second type of trouble. An example of this type of trouble would be an open terminating resistor. The test set contains many resistors that simulate terminating resistances for the AN/ARC-54 module circuits. To localize a trouble of this type, first find in which module test the trouble occurred. Obtain an AN/ARC-54 module of the same type; one which is known to be in proper operating condition. Plug the module into the test set and perform the test procedure for that module to the point where an incorrect reading is obtained. At this point, note the setting of the CIRCUIT SELECTOR switches on the test set. Refer to the CIRCUIT SELECTOR switch functional diagram (fig. FO-3) and trace the complete circuit path of the test being performed. The CIRCUIT SELECTOR switches are composed of six wafers each. Many of the wafers are not used on every test. The CIRCUIT SELECTOR switch, tables 2-1 through 2-7, show which wafers are used and explain the function provided by each switch wafer by every CIRCUIT SELECTOR switch setting in the test procedures. Use these charts to aid in tracing the signal path.

NOTE

If none of the tests on the module can be performed, there is a possibility that no power is being applied to the module. Refer to the power distribution diagram (fig. 3-1) and make voltage checks at the appropriate pins on the module connectors.

b. The following is an example of a typical trouble that might occur during the operating test. Assume that step No. 7 of the transmit audio module test (table 3-5, TM 11-6625-467-12) yields a TEST METER reading of O percent on a knov;n good transmit audio module. Referring to table 2-4 of this manual, note that S6E connects the 1 kHz oscillator output to the module audio input. Figure FO-3 shows that the audio input to the transmit audio module is pin 1 of J3. With an oscilloscope, check for the presence of a 1 kHz voltage at J3-1. Again referring to table 2-4, note the S5B connects the module sidetone output to S3C, and S3C connects the sidetone to the audio amplifier/detector input. Figure FO-3 shows that the sidetone output of the transmit audio module is J3-11. With an oscilloscope, check for a 1 kHz voltage at this point. If no voltage is present, there is no point in checking the input to the audio amplifier/detector (XA5- 17). However, if the voltage is present, notice that resistors A9R43 and A9R44 form a voltage output (fig. FO-3). If A9R43 is open, the signal cannot reach S5B-8. Check for the presence of a 1 kHz signal at terminal 8 of S5B. If 1.0 signal is present, the trouble is localized to circuit board A9 (load No. 1, HV5). Remove the load No. 1 circuit card and check A9R43 with an ohmmeter. If the resistor is good, continue tracing the signal path through the audio amplifier/detector to the TEST METER. If no 1 kHz voltage appears at the sidetone output, another possible source of trouble is the sidetone gate input. Table 2-4 shows that switch S4C connects a positive 10 volts dc through S4D to the sidetone gate input of the module. Using a multimeter, check for +10 volts at J3-5. If the voltage is not present, trace it back through S4C and S4D. The positive 10 volts originates in the power supply; refer to figure FO-2 to isolate troubles in the power supply.

NOTE

The audio amplifier/detector amplifies and rectifies the 1 kHz signal. The output is, therefore, a dc voltage that is proportional in amplitude to the amplitude of the 1 kHz input signal.

c. Use the same techniques as in *b* above to localize any trouble that occurs during the performance of the test procedures.

3-5. Isolating Troubles

a. Once a trouble has been localized to a functional circuit in the test set, further tests and measurements must be made to isolate the trouble to a component part. The most useful tool that a technician has for troubleshooting any circuit is his complete understanding of the circuit operation. When a trouble has been localized to a functional circuit, refer to chapter 2 and review the principles of operation of the circuit. Chapter 2 contains simplified schematic diagrams of each functional circuit. These schematic diagrams do not contain the components, switches, and circuits that are not directly involved with the circuit operation. These circuits are more easily understood than those on the overall schematic diagrams (fig. 3-32 through 3-44). It is necessary, however, to refer to the overall schematic diagrams for pin numbers on switches and circuit cards. Usually a functional circuit, such as the audio amplifier/detector, is completely contained on a single circuit card. Isolating a trouble on a single circuit card is relatively easy, because all the components are easily accessible and are close to each other. A few circuits, such as the 500-kHz bandpass filter and the +28-volt power supply, have components located on several circuit cards and on the chassis. The simplified schematic diagrams are particularly useful for these circuits.

b. The first step in isolating a fault in the test set is to extend the suspected circuit card above the card cage with the board extender (fig. 3-9). Next, energize the circuit, by setting up the conditions under which the circuit failed. Paragraph *c* below is an example of how a trouble could be isolated in a faulty audio amplifier/detector circuit.

c. Assume that the trouble cited in paragraph 3-6b was localized to the audio amplifier/detector circuit card. Using the extender card, extend audio amplifier/detector circuit card HU7 above the card cage. Plug a transmit audio module known to be good into J3 and set the CIRCUIT SELECTOR switches to 3673. Refer to the schematic diagram for the audio amplifier/detector circuit (fig. 3-36). Using the oscilloscope, check for the presence of a 1 kHz signal at pin 17 (test point J2) on the circuit card and note the amplitude of the signal. Next check for a 1-kHz signal at the emitter of Q1. Transistor Q1 is an emitter follower; therefore, the amplitude of the signal at the emitter should be just slightly less than the input. Transistor Q2 is an amplifier. Check the waveform at the collector of Q2 with the oscilloscope. The signal amplitude should be several times greater than that measured at the emitter of Q1. Transistor Q3 and Q4 are also amplifiers. Check for a 1-kHz signal at the collectors of each transistor and note that the signal amplitude is greater than at the output of the preceding stage. Diode CR1 is the detector diode. Measure the dc level present at the cathode of CR1. The dc voltage should be approximately equal to the peak value of the signal voltage at the collector of Q4. Resistor R24, R25, and R30 form an output voltage divider. The dc output at pin 8 should be approximately one-sixth of the value of the dc voltage at the cathode of CR1. When a signal level at the output of a stage appears to be low or if no signal is present, refer to table 3-2, voltage and resistance readings and check the dc voltages and resistances on the emitter, base, and collector of the suspected stage. If the transistor appears to be faulty, check it with the transistor tester. Refer to paragraphs 3-9 and 3-10 for replacement of parts on circuit cards.

d. Use the techniques in c above to isolate all faults in the test set. For faults in the power supply circuit, refer to the simplified power supply schematic diagram (fig. FO-2).

3-6. Parts Location

When troubleshooting the test set, the exact location of a component part may not be apparent. Figures 3-2 through 3-24 show the location of each component part in the test set. Figures 3-11 through 3-24 show the parts on each of the 13 circuit cards and RF power detector assembly. The remaining figures show the location of the chassis-mounted parts. Some parts require special procedures for removal and installation. Refer to paragraphs 3-11 through 3-16 before removing any parts.

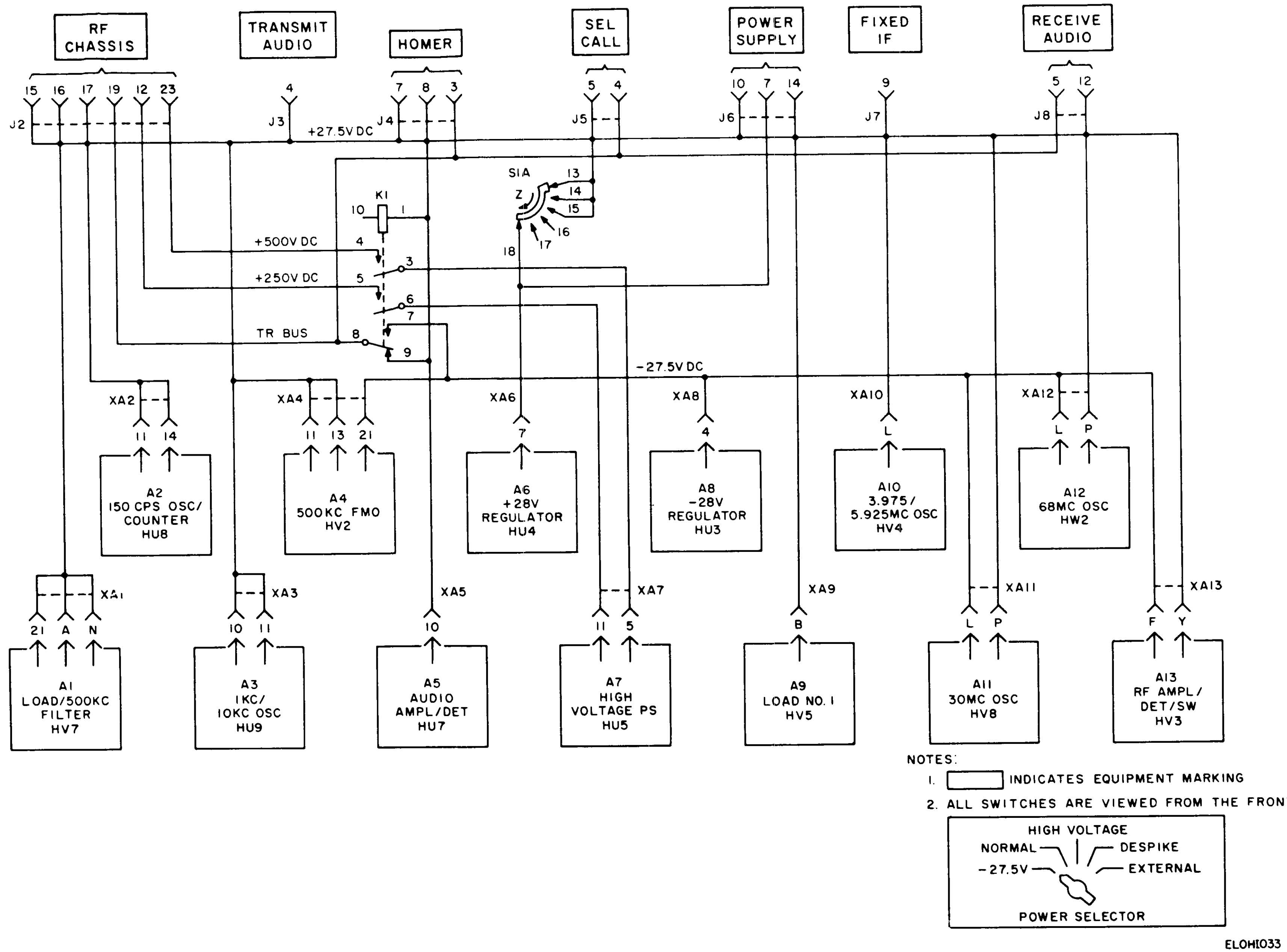


Figure 3-1. Dc power distribution schematic diagram.

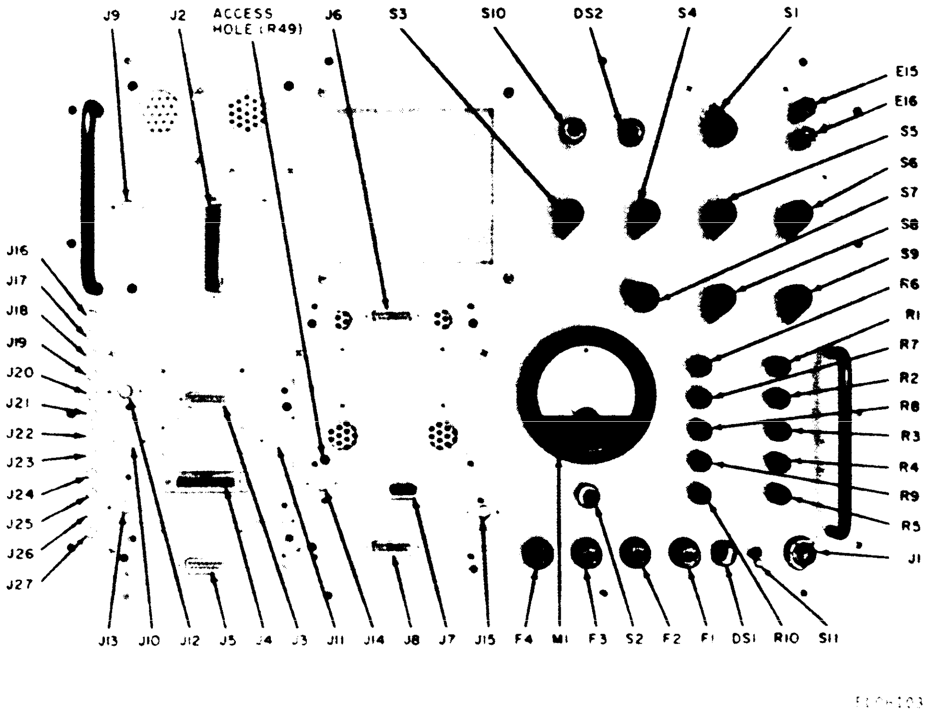


Figure 3-2. Test set, front panel component identification.

3-7. Voltage and Resistance Measurements

The normal voltage and resistance measurements taken at the emitter, base, and collector of each transistor are presented in table 3-2. Use these measurements and the schematic diagrams to isolate troubles in the test set.

WARNING

Use insulated test probes when making required voltage measurements. Always disconnect the power cord from the test panel before touching any of the internal parts. Ground points of high potential to remove residual voltage.

a. Voltage measurements. The voltage readings in table 3-2 were obtained under the conditions given in (1) through (4) below. Always make voltage measurements under these same conditions or the readings obtained may be inaccurate.

(1) Make all voltage measurements with a 20,000 ohms-per-volt multimeter (AN/USM-223 or equivalent) unless otherwise specified.

(2) Make all voltage measurements with respect to chassis ground. Use the circuit board extender to extend the circuit card above the card cage.

(3) Make all voltage measurements with power applied and the POWER SELECTOR switch set to NORMAL. The CIRCUIT SELECTOR switch column specifies the setting of the CIRCUIT SELECTOR switches where applicable. An X appearing in the CIRCUIT SELECTOR switches column indicates the position of the switch.

(4) Special conditions for voltage measurements are listed in the Other Conditions column.

b. Resistance Measurements. The resistance readings in table 3-2 were obtained under the conditions given in (1) through (4) below. Always make resistance measurements under these conditions or the readings obtained may be inaccurate.

(1) Make all resistance measurements with a 20,000 ohm-per-volt multimeter (AN/USM-223 or equivalent).

(2) Make all resistance measurements on the plug-in circuit cards with the circuit cards disconnected from the chassis.

(3) Make resistance measurements on the chassis with all circuit cards in place and power disconnected.

(4) Make all resistance measurements with respect to chassis ground or circuit card ground, whichever is applicable. make the resistance measurements with the negative ohmmeter probe connected to ground.

c. *Table.* The following table 3-2 lists the voltages and resistance at the emitter, base, and collector of each transistor in the test set. Unless otherwise indicated, all voltage readings are positive de. The CIRCUIT SELECTOR switch settings and the instructions in the Other Conditions column pertain to the voltage measurements only. Make the specified switch and control settings before making each voltage measurement.

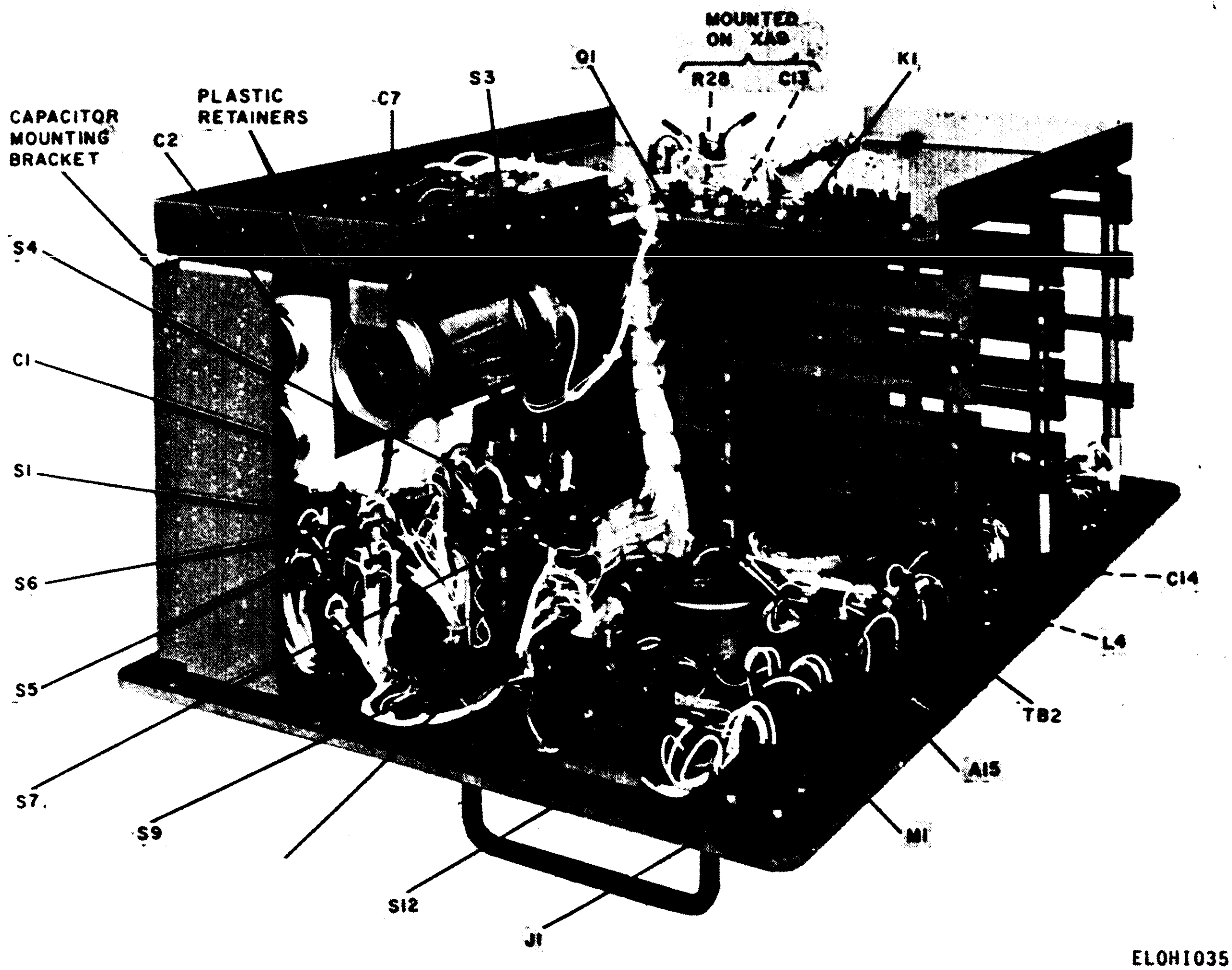


Figure 3-3. Test set parts location, right side view.

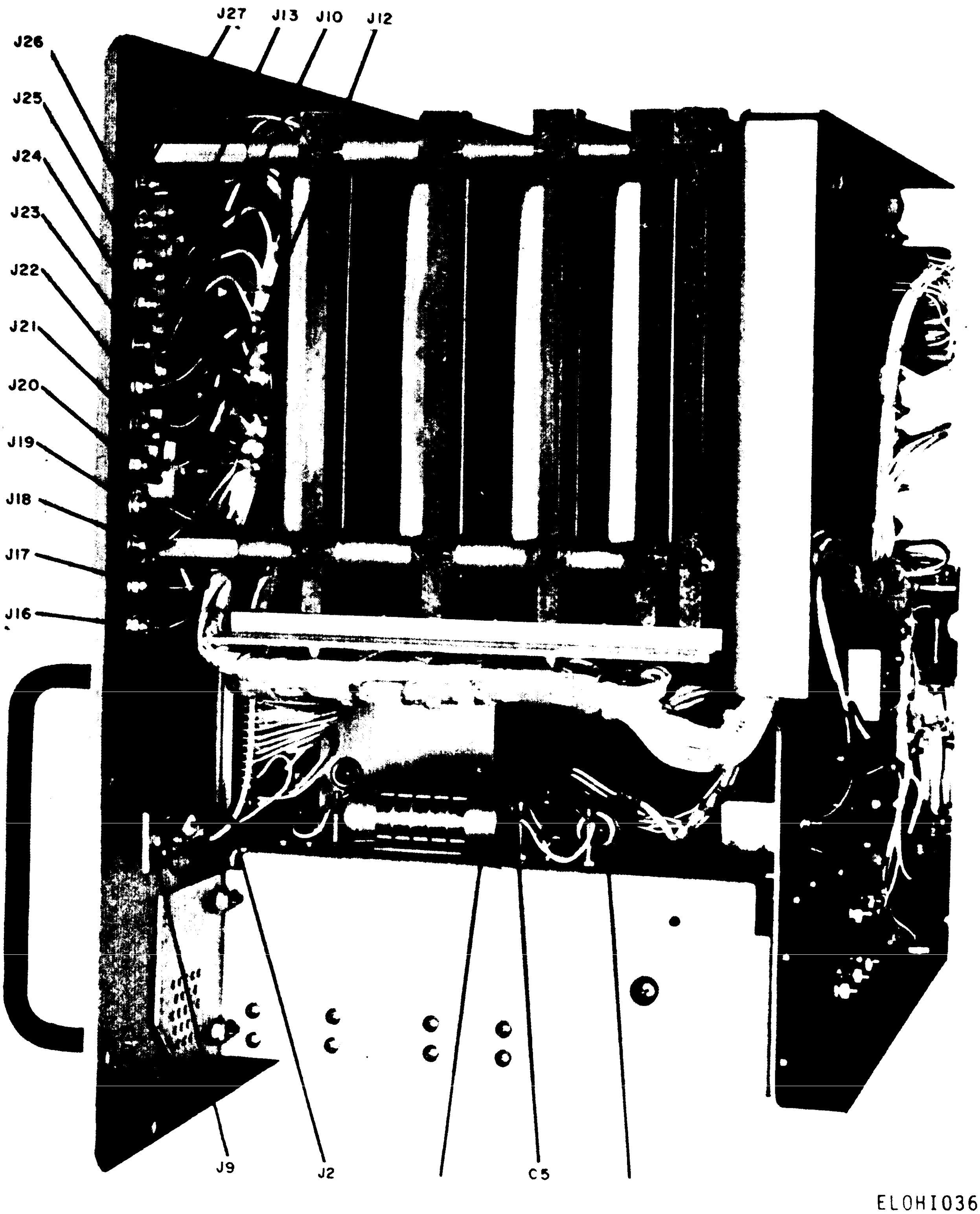


Figure 3-.4. Test set parts location, left side view.

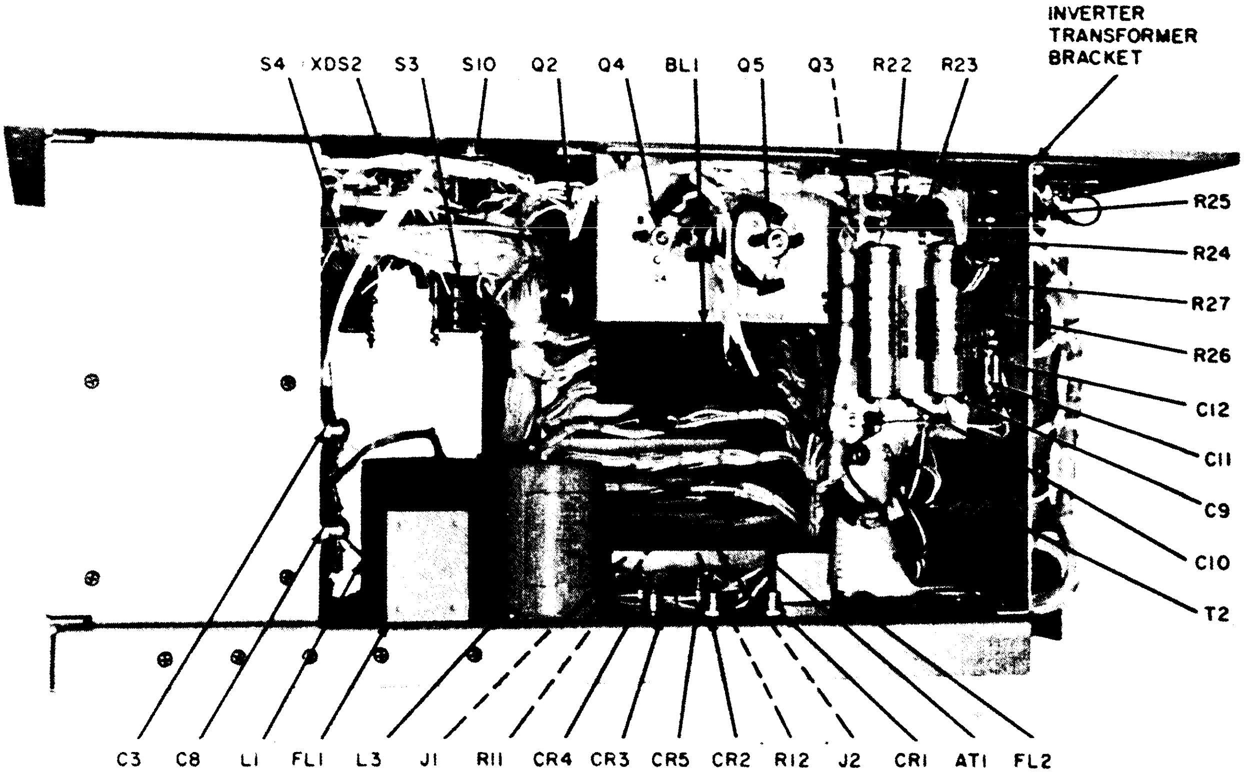


Figure 3-5. Test set parts location, top view.

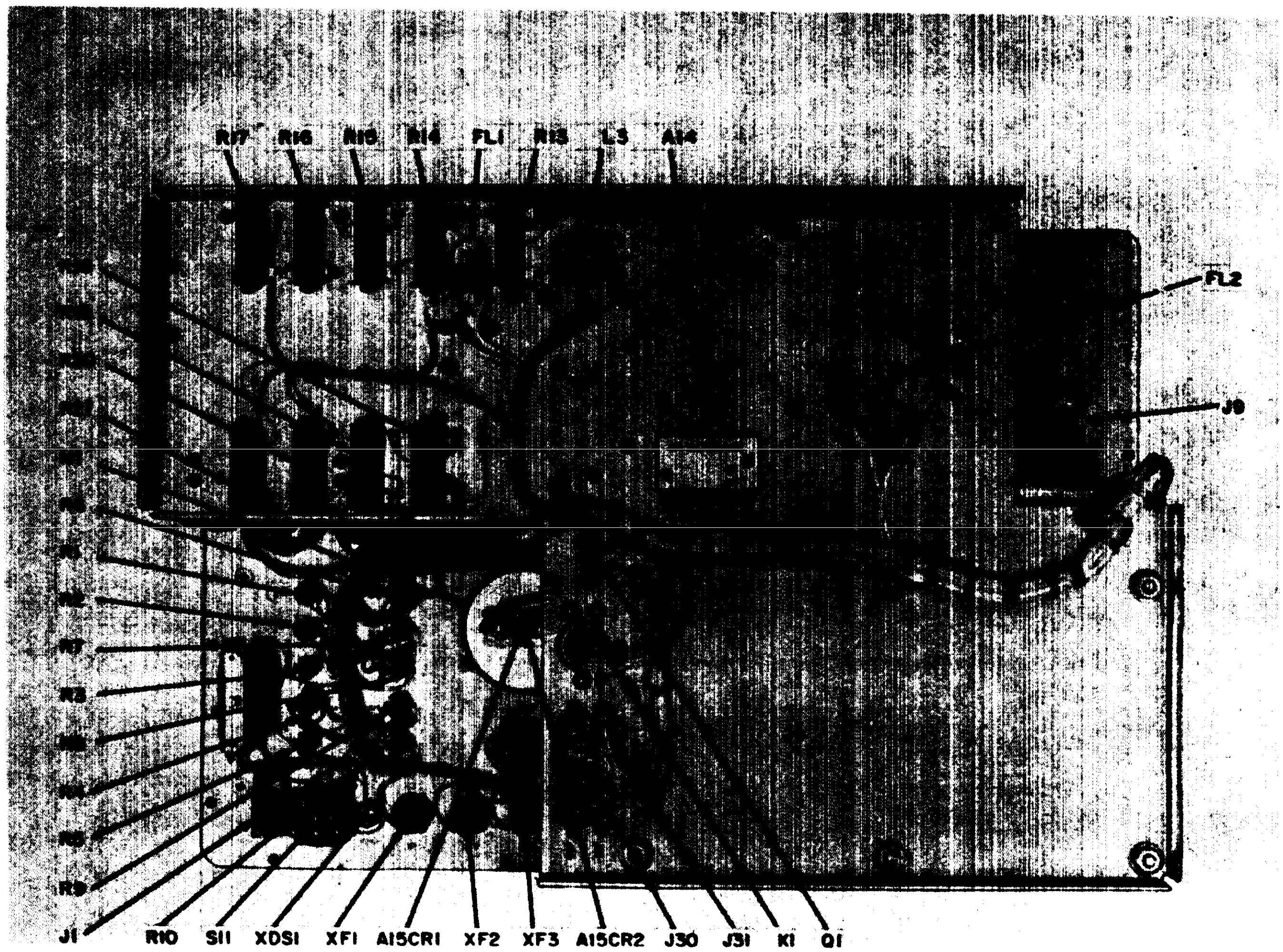


Figure 3-6. Test set parts location, rear subpanel.

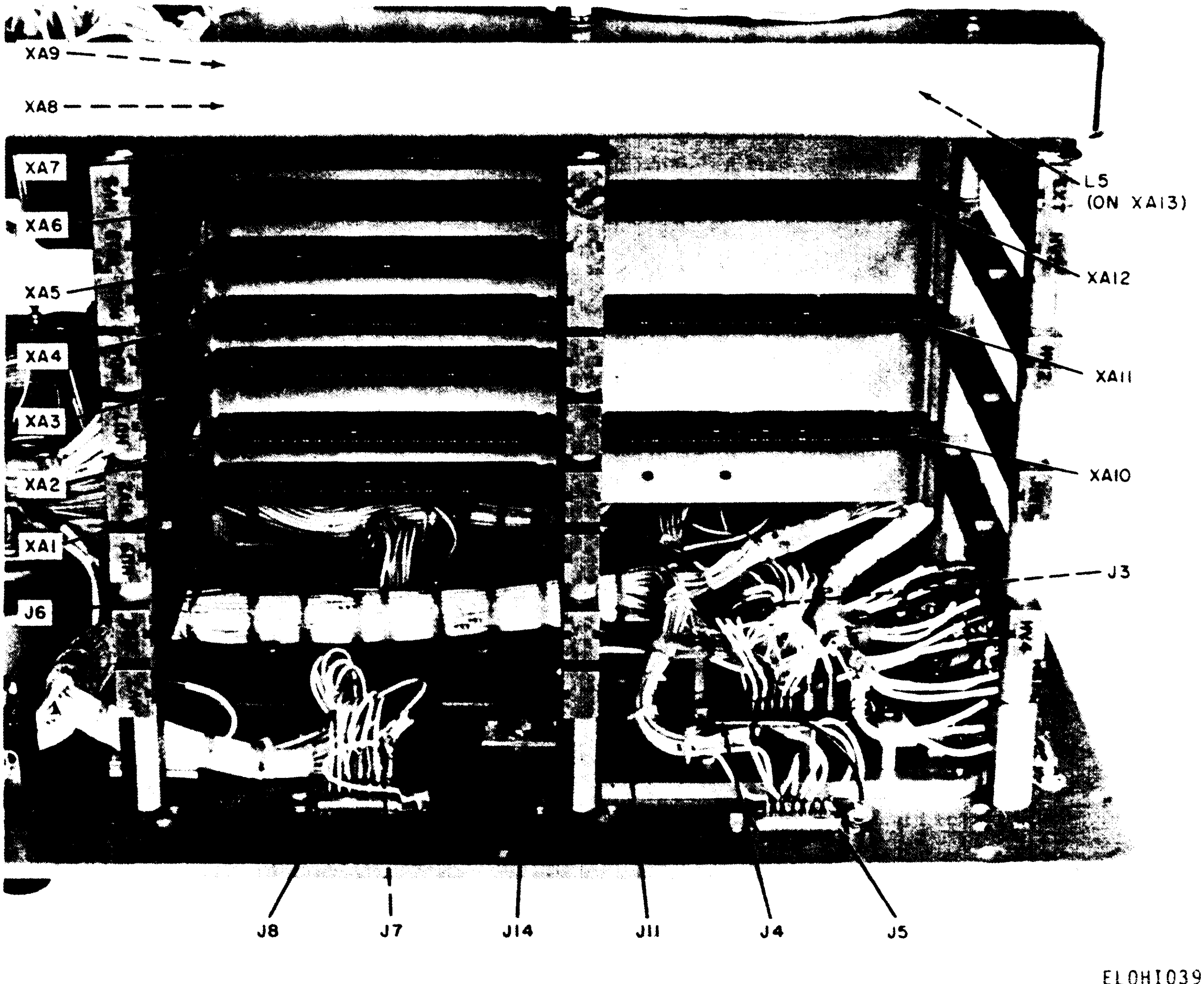


Figure 3-7. Test set parts location card cage (cards removed).

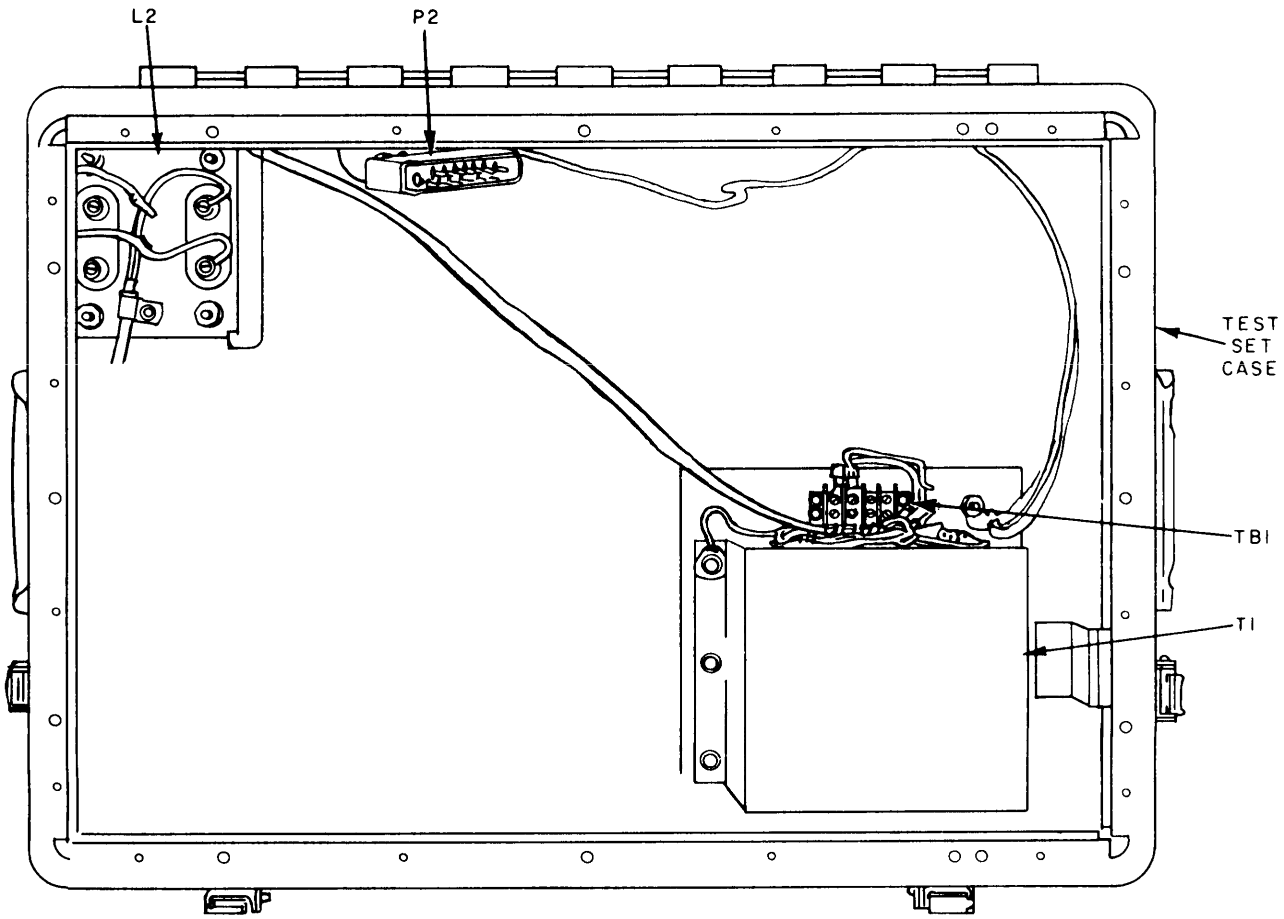


Figure 3-8. Test set parts location, case.

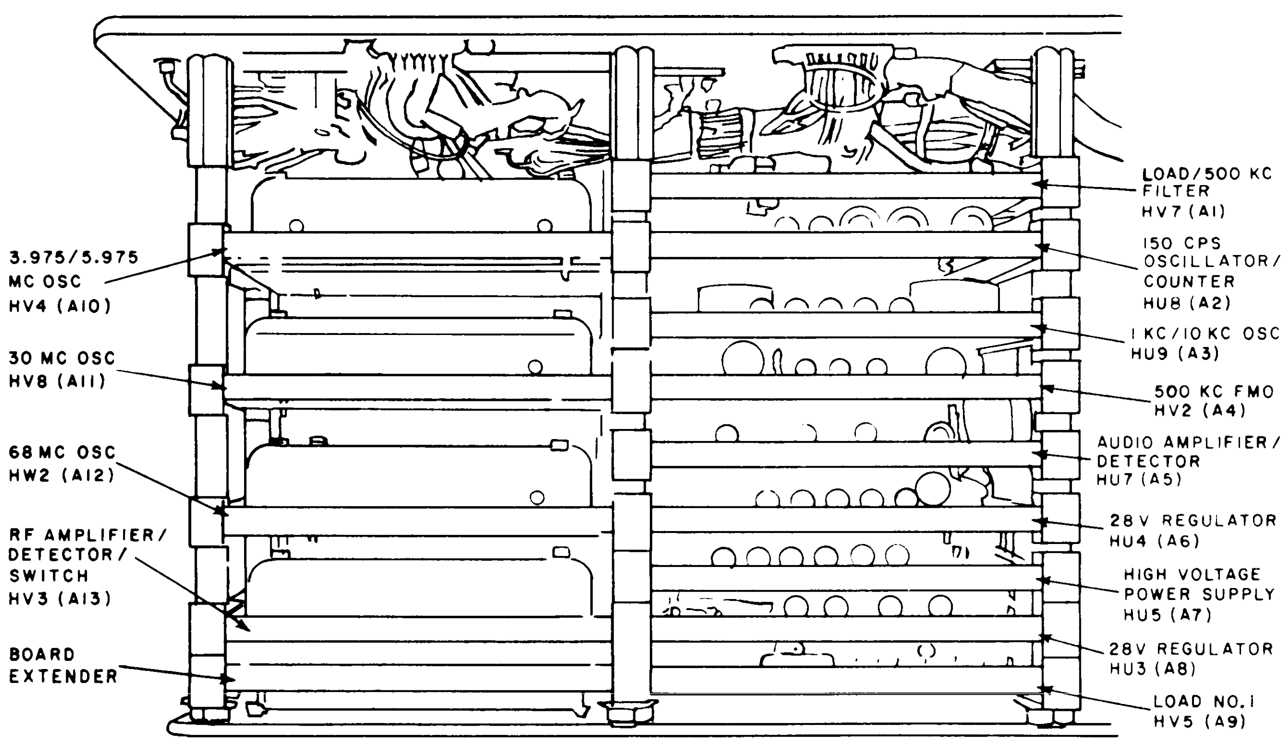


Figure 3-9. Test set circuit card location.

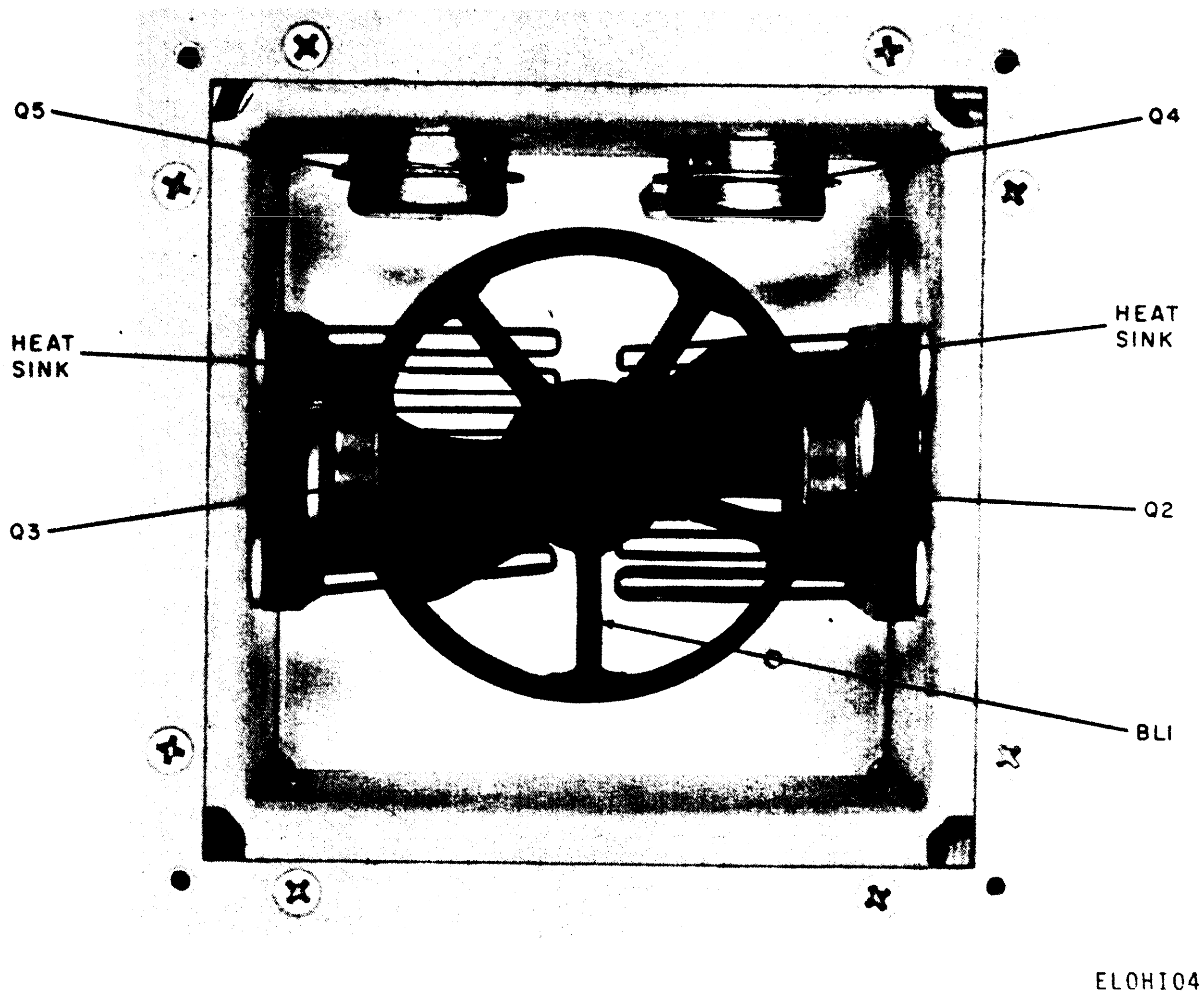


Figure 3-10. Blower wall parts location, top view.

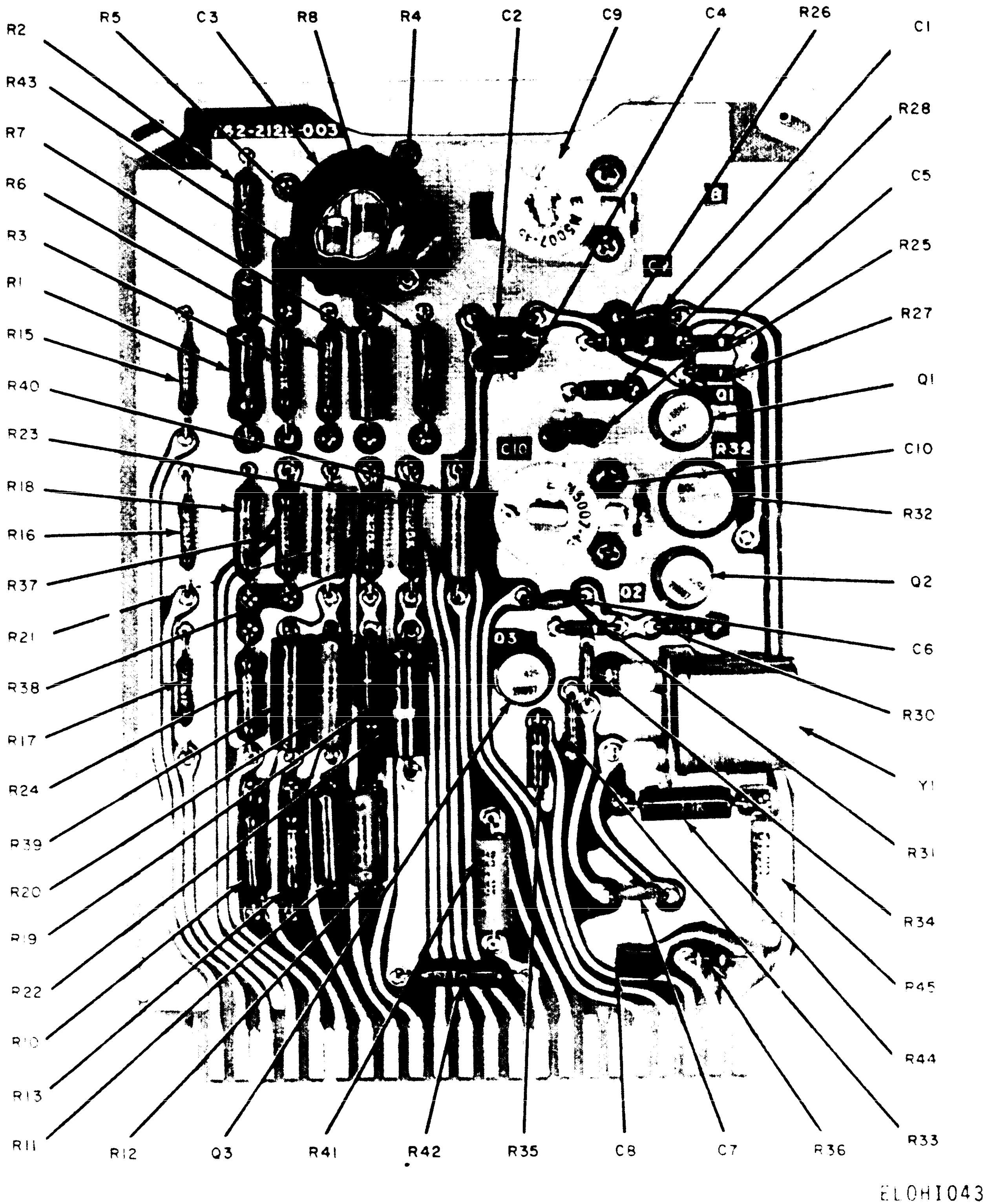
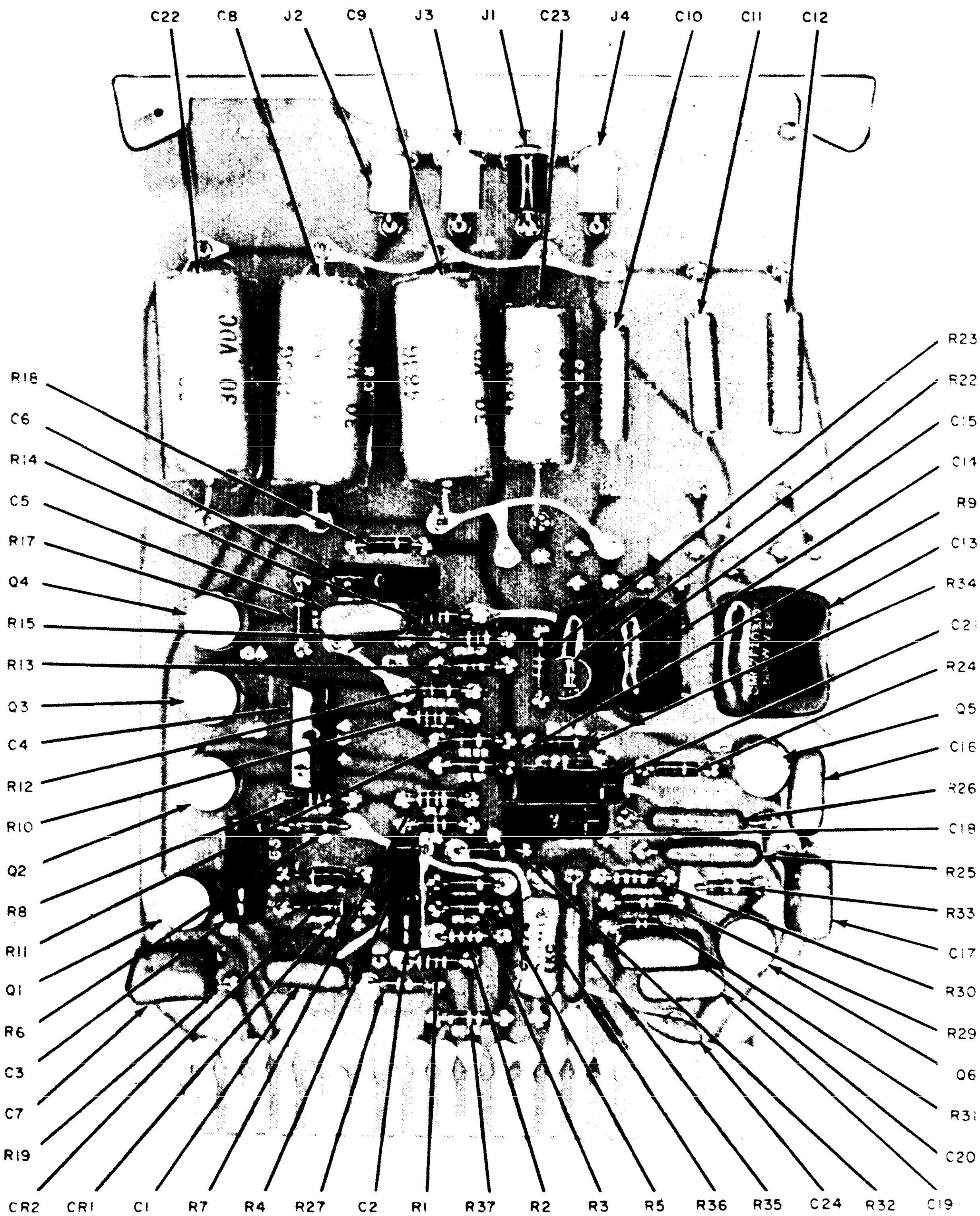


Figure 3-11. Load/500-kHz filter circuit card HV7, parts location.



ELOH1044

Figure 3-12. 150-Hz oscillator/counter circuit card HU8, parts location.

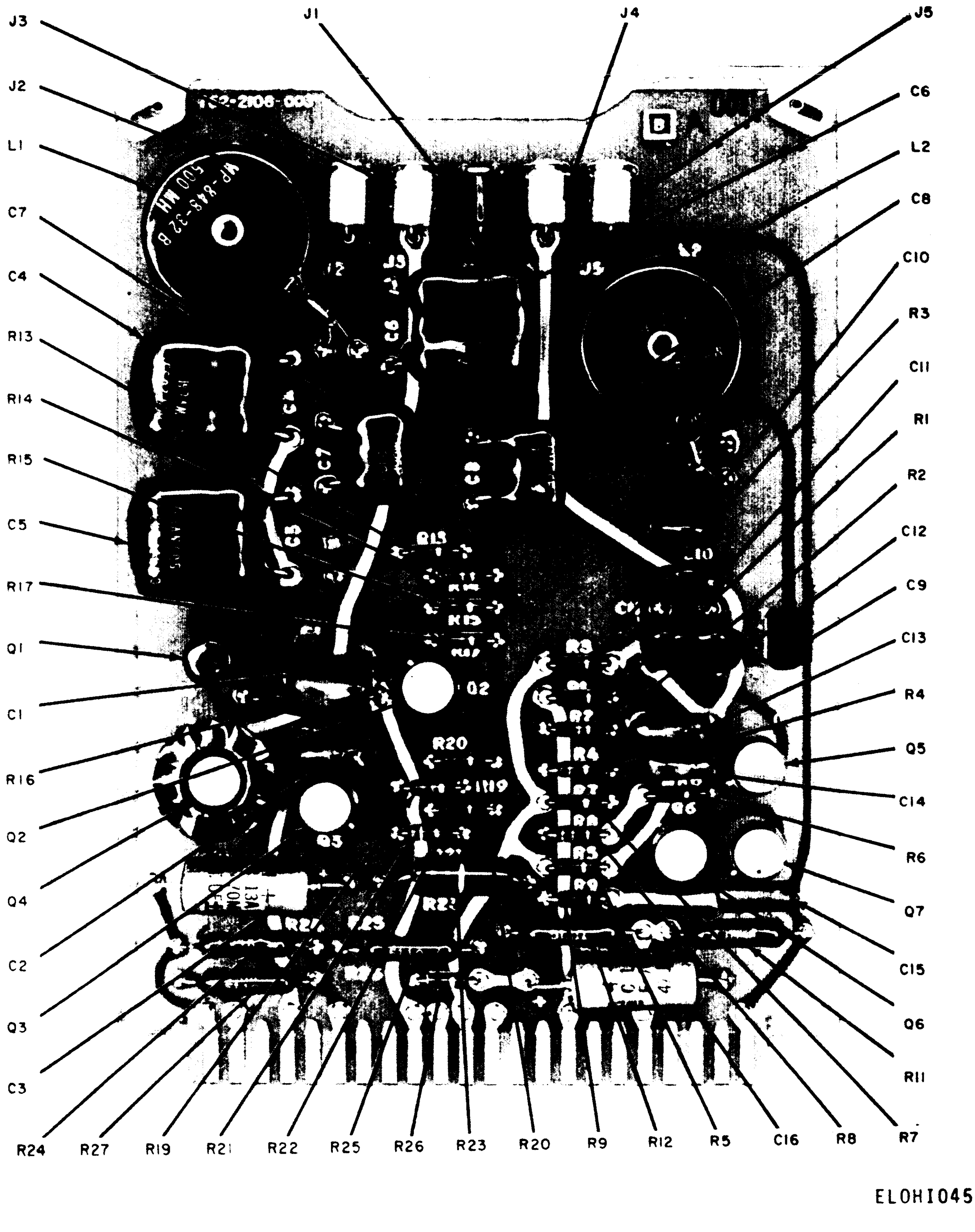


Figure 3-13. 1-kHz/10-kHz oscillator circuit card HU9, parts location.

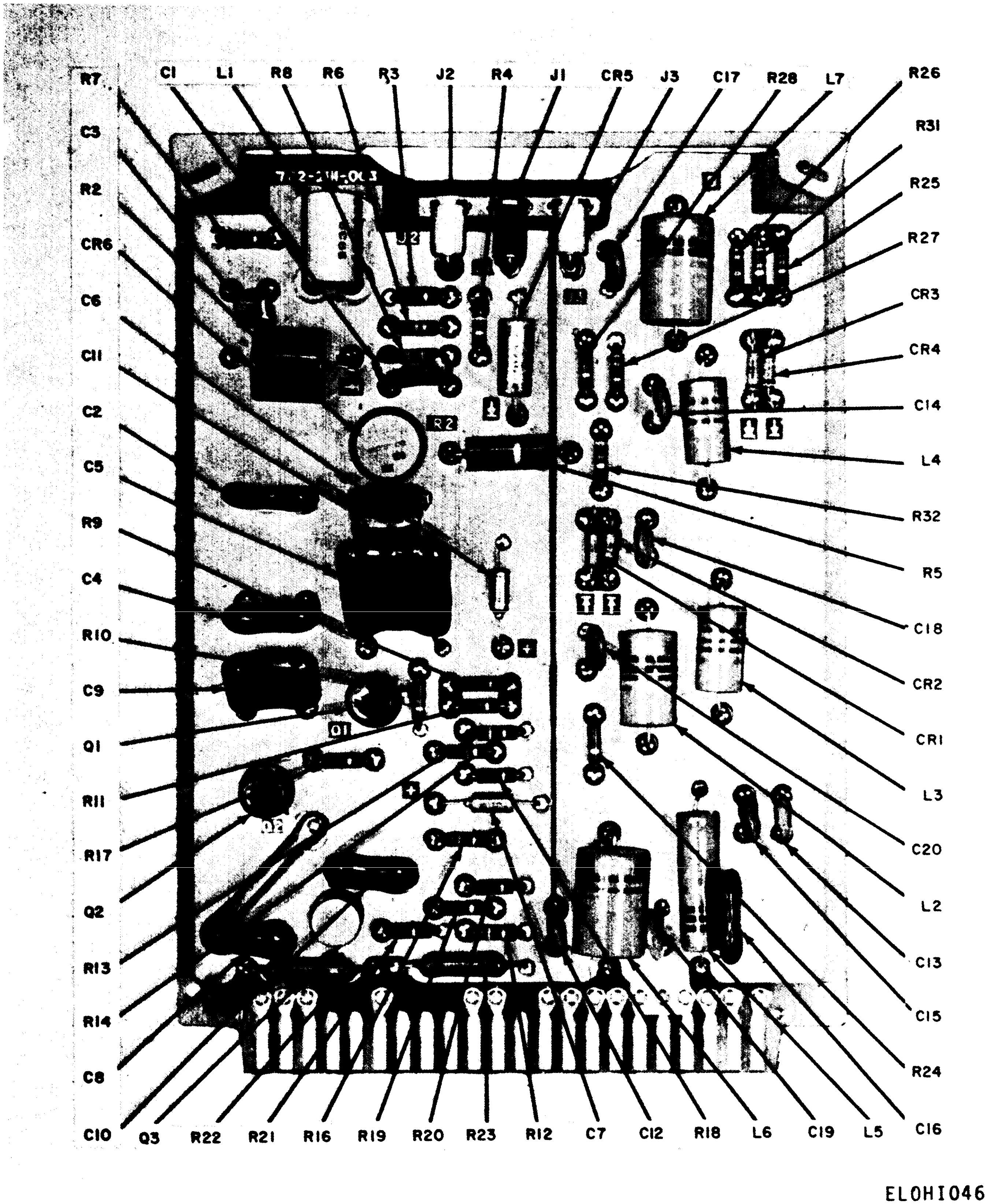
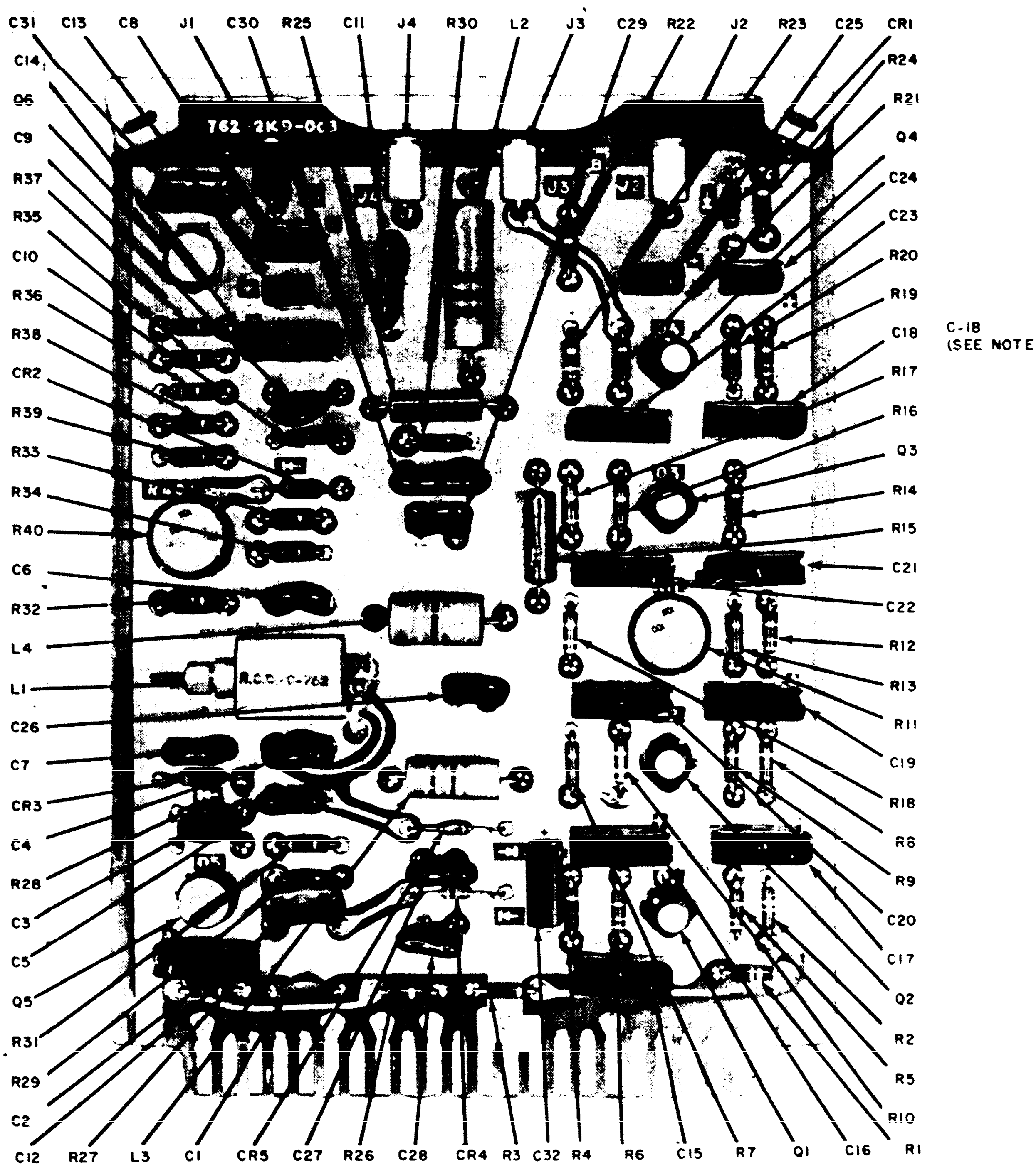


Figure 3-14, 500-kHz fm oscillator circuit card HV2, parts location.



NOTE: C32 AND C18, AS SHOWN, ARE PRESENT ONLY IN SETS S/N 1–10. IN ALL OTHER SETS, C18 IS LOCATED IN POSITION SHOWN FOR C32.

Figure 3-15. Audio amplifier/detector circuit card HU7, parts location.

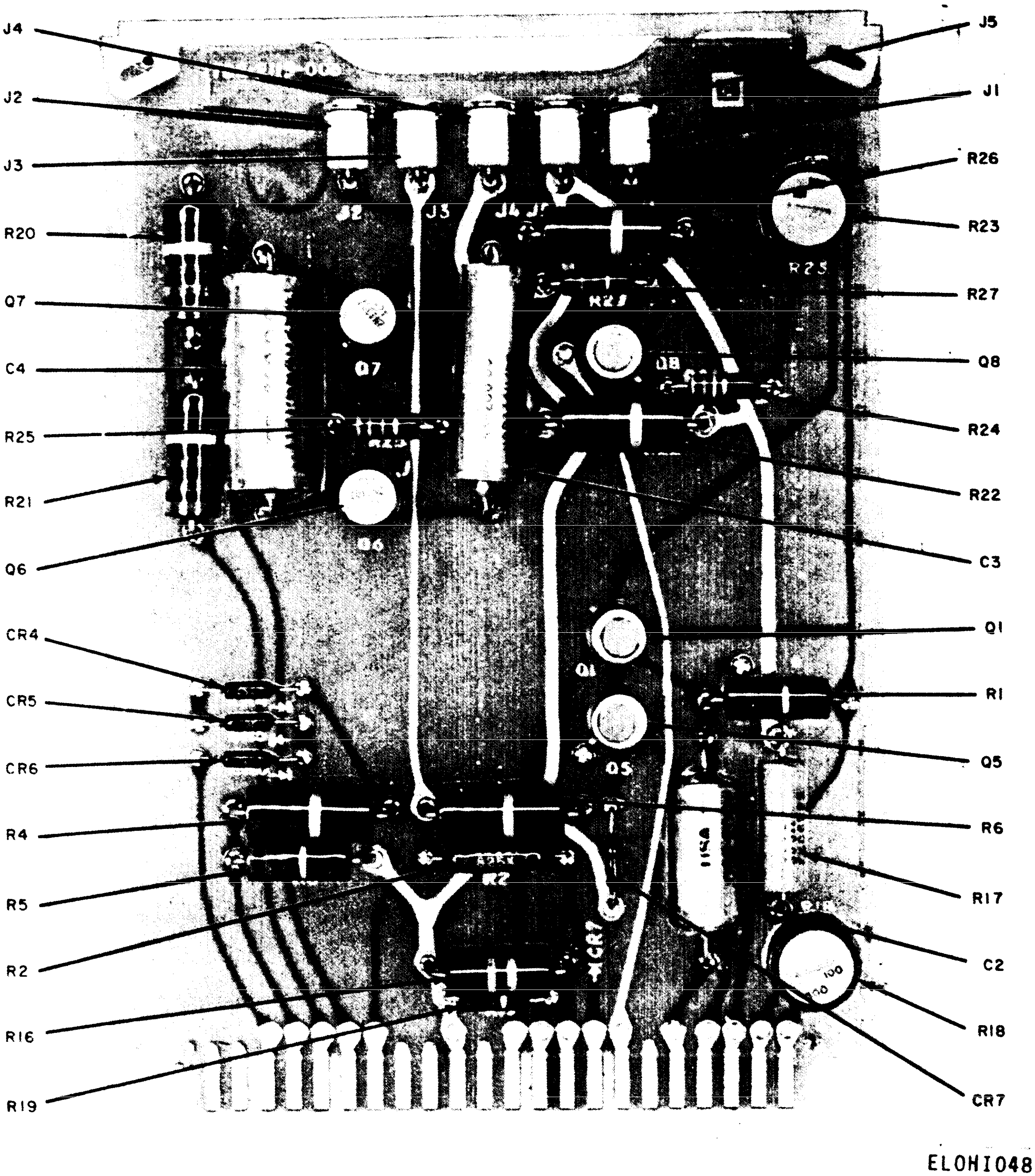


Figure 3-16. +28-volt regulator circuit card HU4, parts location.

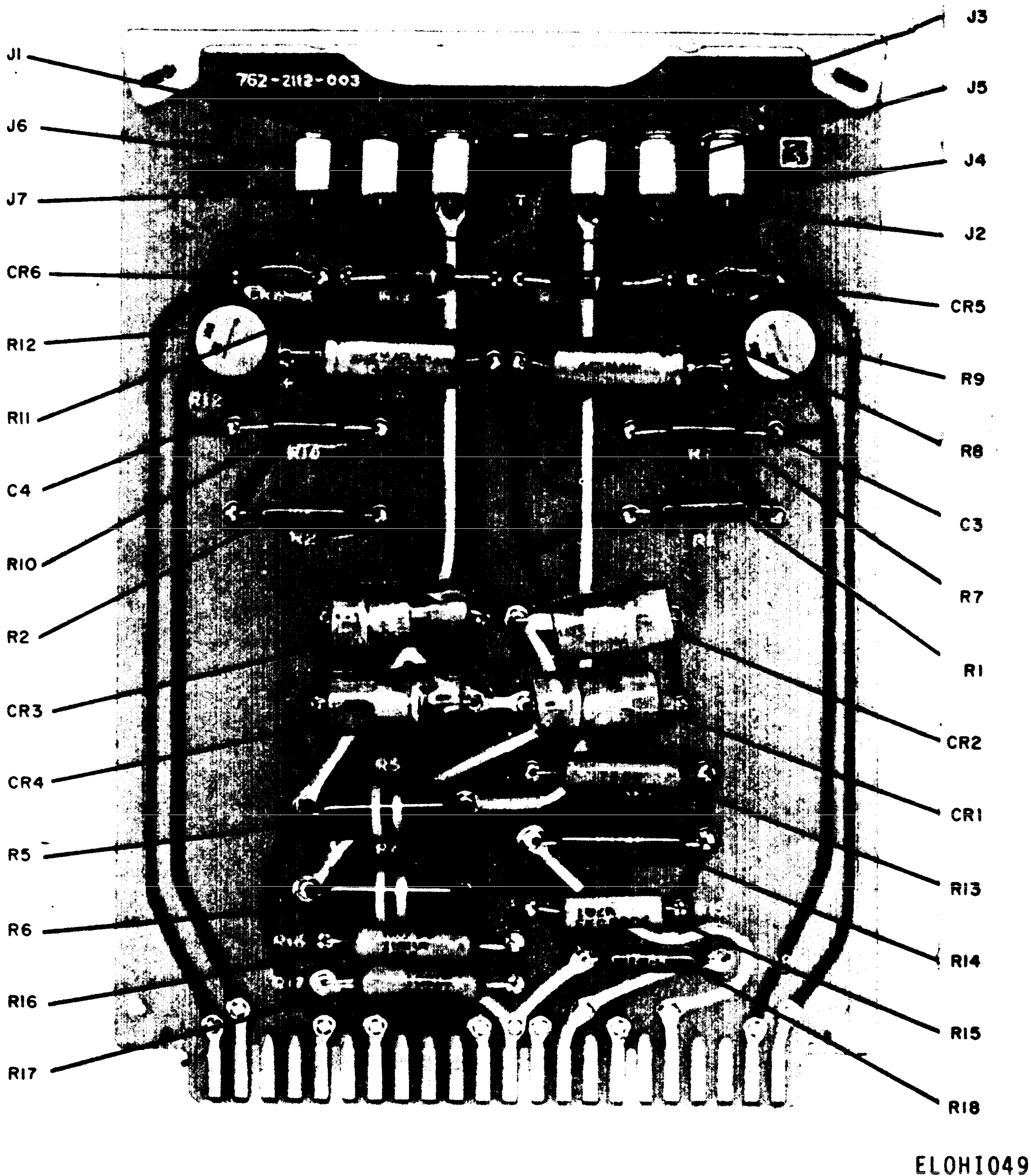


Figure 3-17. High voltage power supply circuit card HU5, parts location.

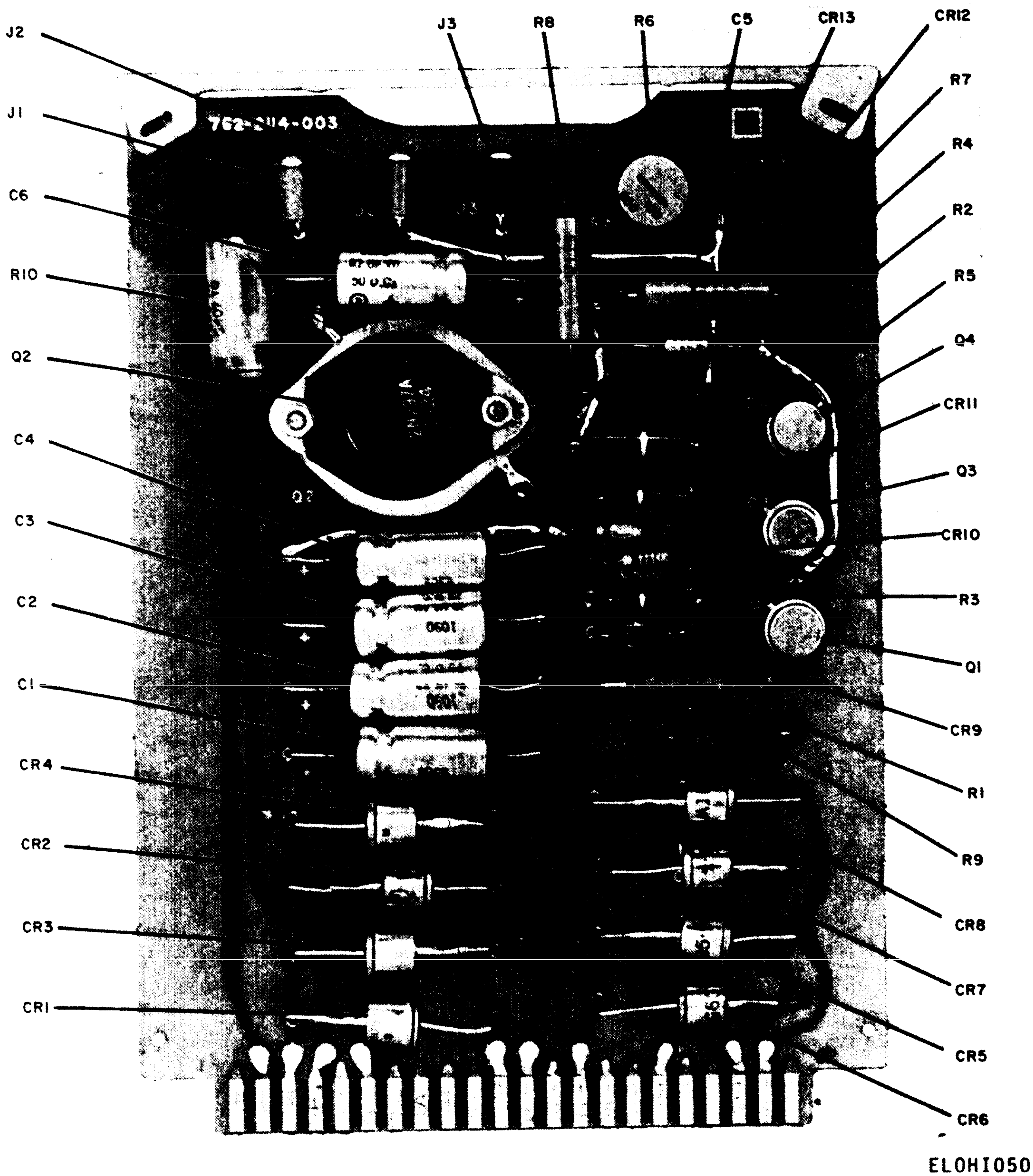


Figure S-18. – 28-volt regulator circuit card HU3, parts location.

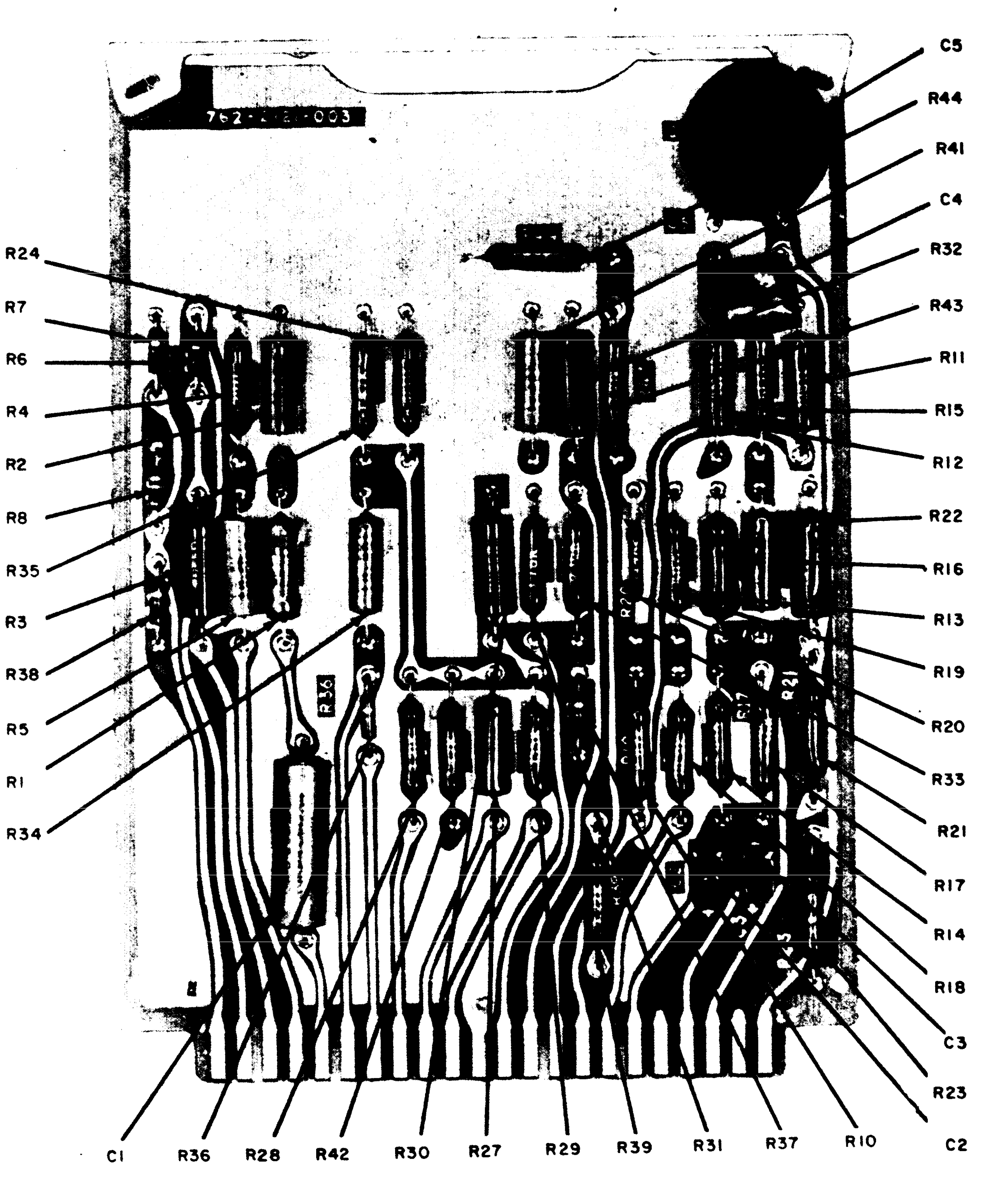


Figure 3-19. Load No. 1 circuit card HV5, parts location.

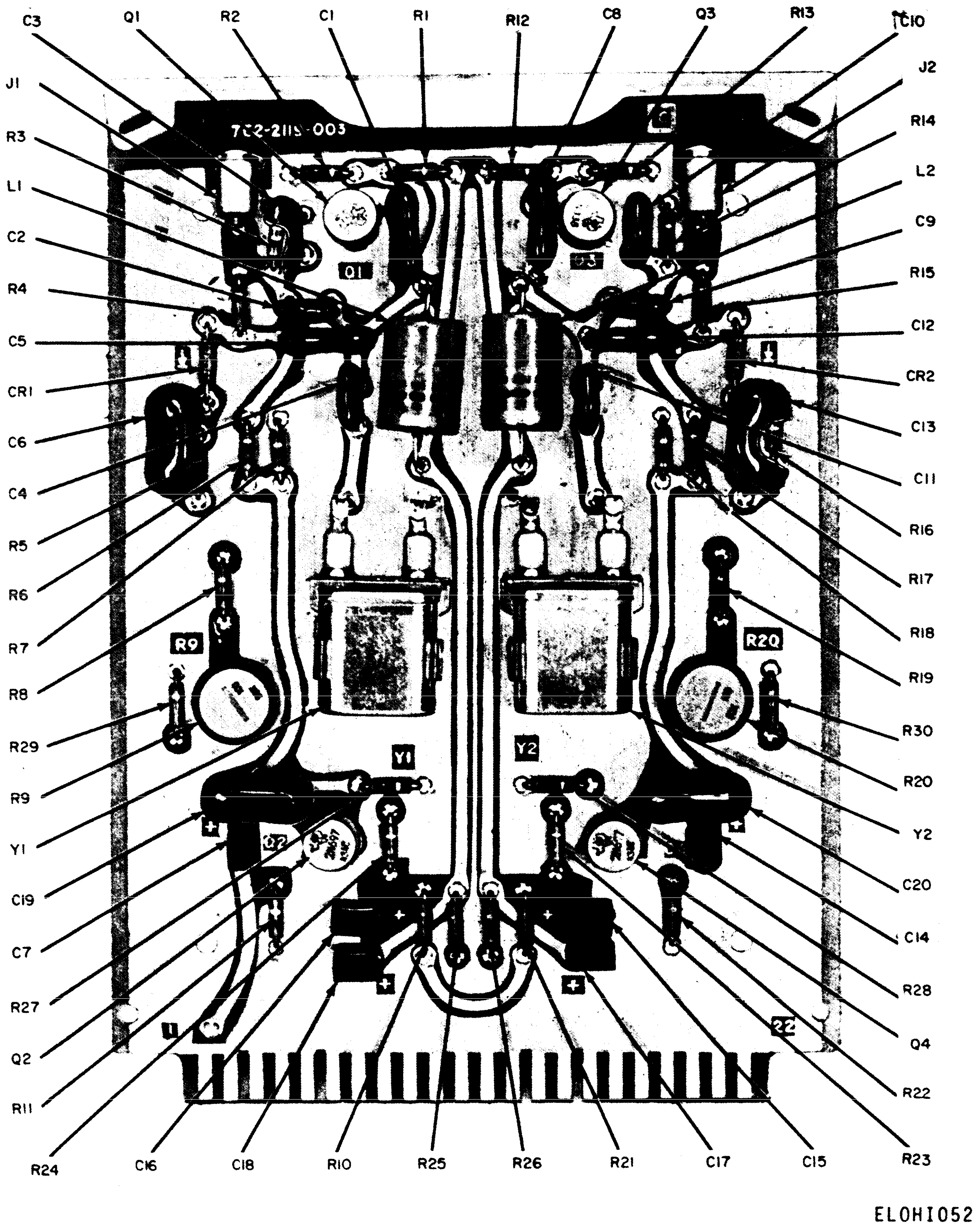


Figure 9-20. 3.975/5.925 MHz oscillator circuit card HV4, parts location.

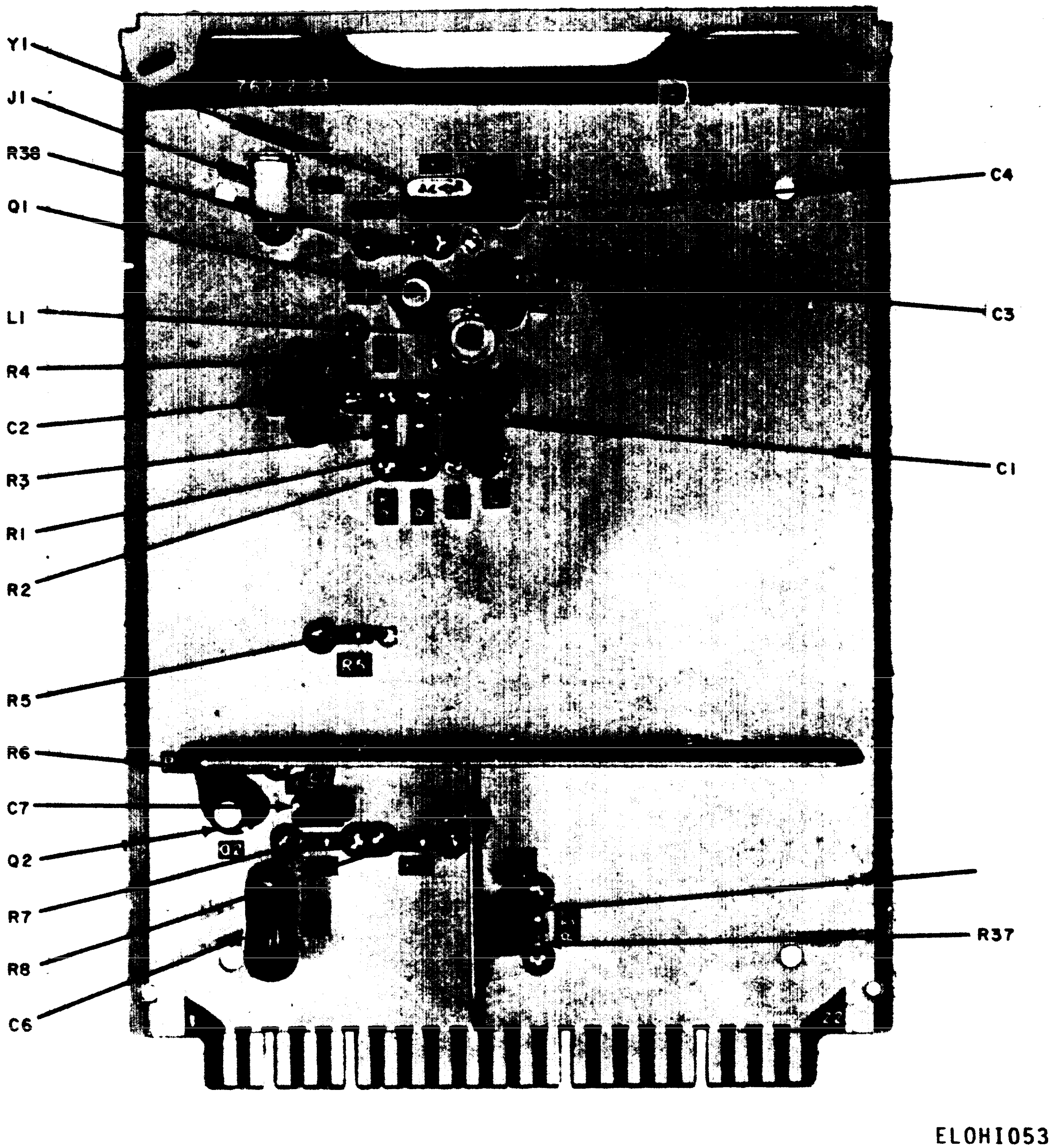


Figure 3-21. 30-MHz oscillutor circuit card HV8, parts location

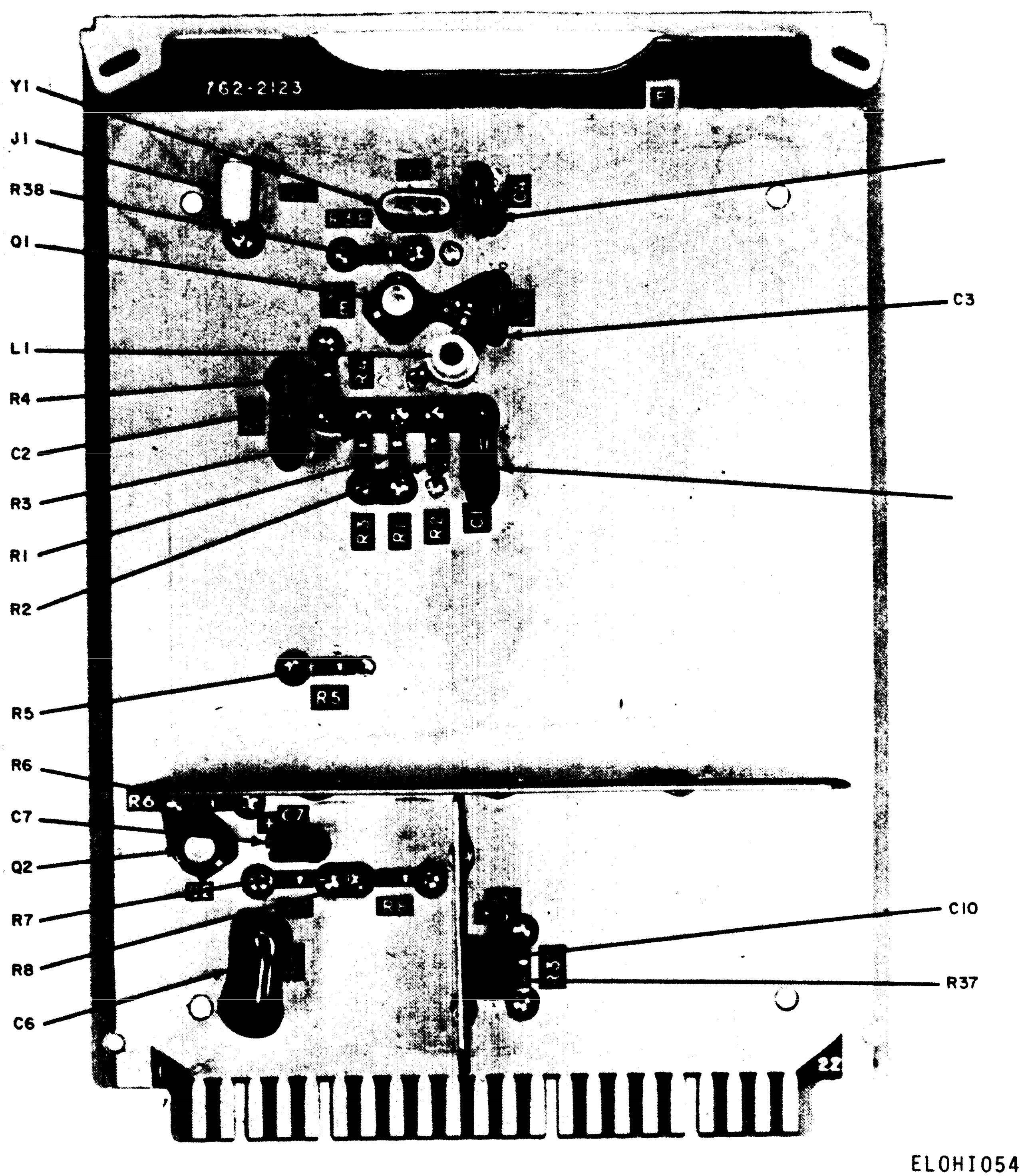


Figure 3-22. 68-MHz oscillator circuit card HW2, parts location.

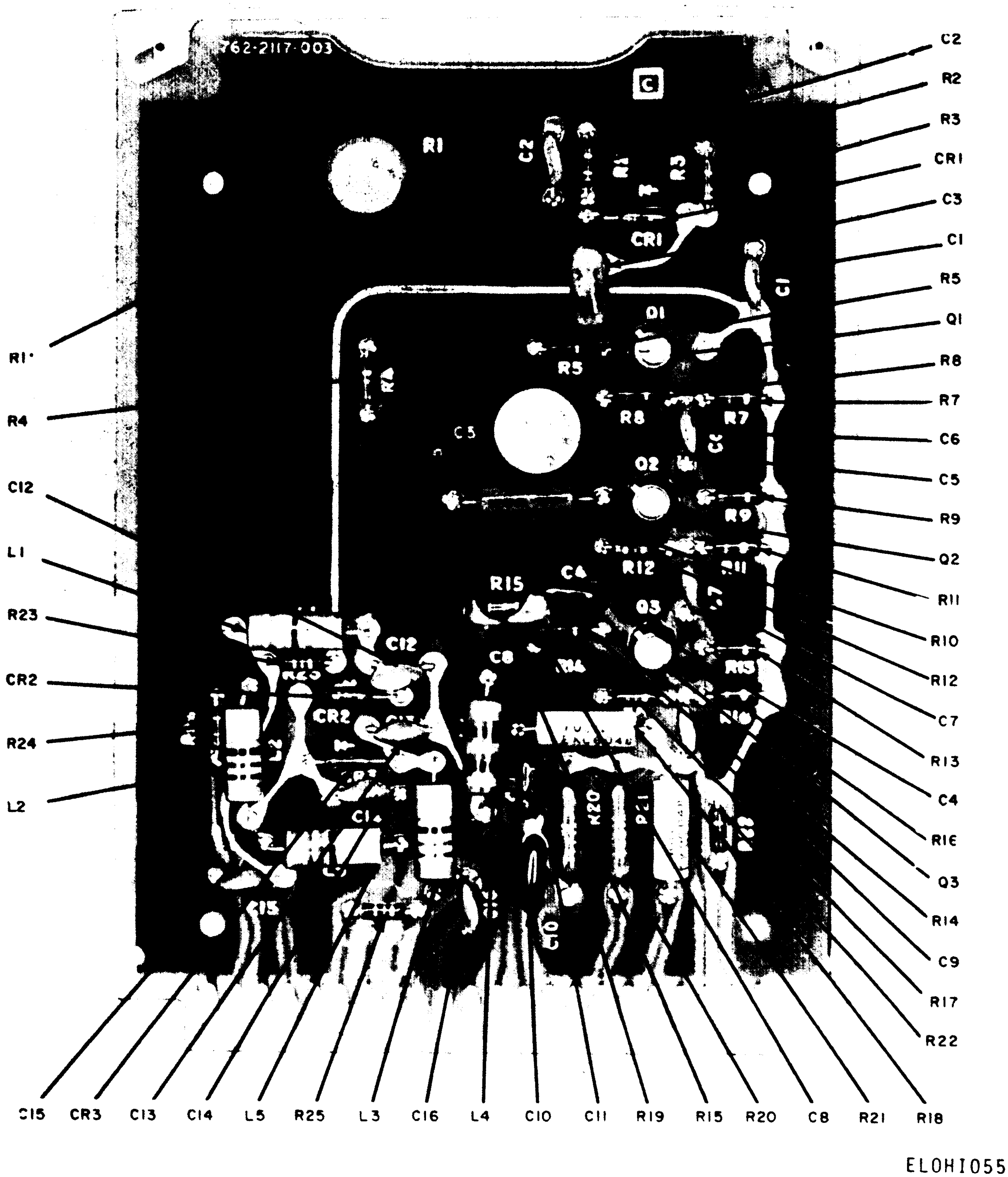


Figure 3-23. RF amplifier/detector switch circuit card HV3, parts location.

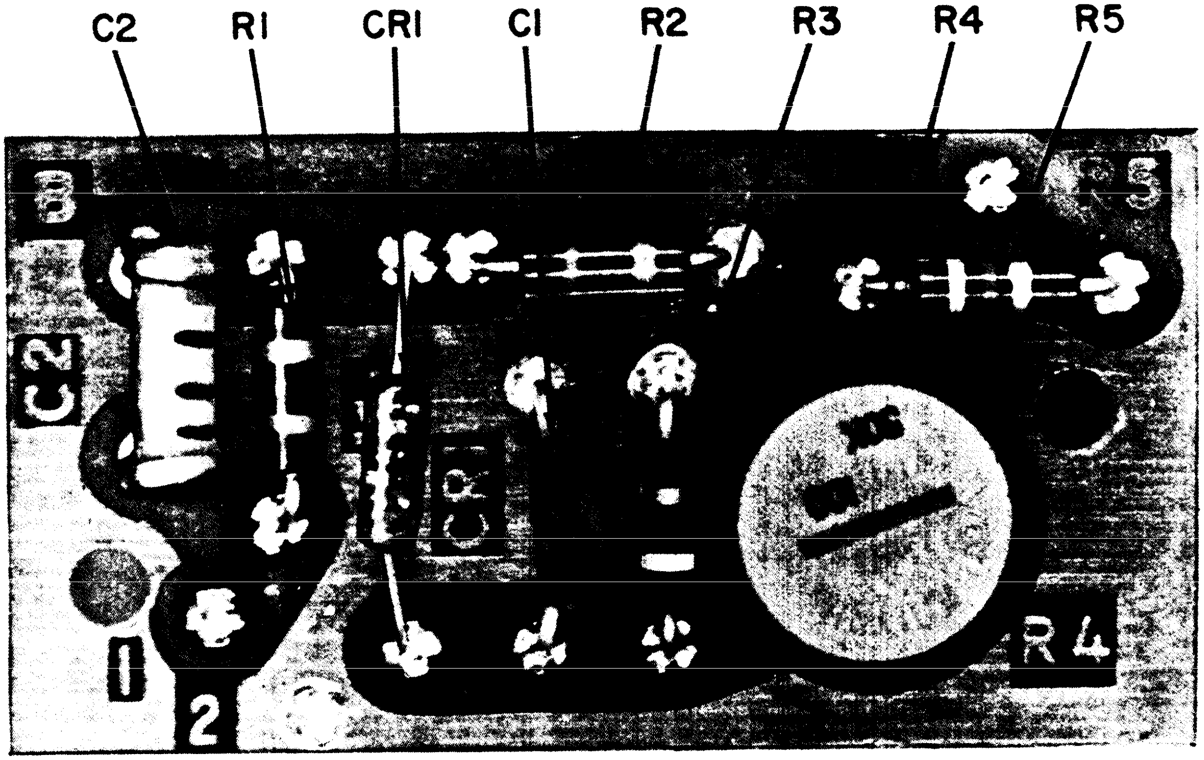


Figure 3-24. Power detector assembly A14, parts location.

TABLE 3-2. VOLTAGE AND RESISTANCE READINGS

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
+28-VOLT REGULATOR								
A6Q1	X	X	X	X				NONE.
E					29.5	200K	X100,000	
B					30.0	13K	X1000	
C					37.8	10K	X1000	
A6Q5	X	X	X	X				NONE.
E					5.4	2.2K	X1000	
B					6.0	7.3K	X1000	
C					30.0	13.5K	X1000	
A6Q6	X	X	X	X				Set the POWER SELECTOR switch to DESPIKE.
E					27	500K	X100,000	
B					28	1.5K	X1000	
C					24	900	X1000	
A7Q7	X	X	X	X				Set the POWER SELECTOR switch to DESPIKE.
E					27	500K	X100,000	
B					27.7	1.5K	X1000	
C					2.2	900	X1000	
A6Q8	X	X	X	X				Set the POWER SELECTOR switch to DESPIKE.
E					0	0	X1	
B					1.4	2.7K	X1000	
C					5.5	5K	X1000	
-28-VOLT REGULATOR								
A8Q1	X	X	X	X				Set the POWER SELECTOR switch to NORMAL.
E					-47.0	4.3K	X1000	
B					-46.5	2.6K	X1000	
C					-28.0	3.2K	X1000	
A8Q2	X	X	X	X				NONE.
E					-27.9	3.3K	X1000	
B					-28.0	3.2K	X1000	
C					-50.0	3.2K	X1000	
A8Q3	X	X	X	X				NONE.
E					-10.2	3.2K	X1000	
B					-10.8	800	X1000	
C					-28.0	3.2K	X1000	
A8Q4	X	X	X	X				NONE.
E					-27.5	3.3K	X1000	
B					-28.0	3.3K	X1000	
C					-28.0	3.2K	X1000	

TABLE 3-2. VOLTAGE AND RESISTANCE READINGS

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
3.975/5.925-MHZ OSCILLATOR								
A10Q1	X	X	8	9				Set the LOW FREQ AMPL control fully clockwise.
E					3.75	13K	X1000	
B					4.5	35K	X1000	
C					26.8	28K	X1000	
A10Q2	X	X	8	9				Set the LOW FREQ AMPL control fully clockwise.
E					3.0	110	X10	
B					3.6	230	X10	
C					9.1	55K	X1000	
A10Q3	X	X	9	9				Set the LOW FREQ AMPL control fully clockwise.
E					3.3	12.5K	X1000	
B					3.0	35K	X1000	
C					27.0	170K	X100,000	
A10Q4	X	X	9	9				Set the LOW FREQ AMPL control fully clockwise.
E					3.15	100	X10	
B					2.7	220	X10	
C					9.2	56K	X1000	
30 MHZ OSCILLATOR								
A11Q1	X	X	7	3				Set the HIGH FREQ AMPL control fully clockwise.
E					18.4	2.5K	X1000	
B					18.1	12.5K	X1000	
C					0	0	X1	
A11Q2	X	X	7	3				Set the HIGH FREQ AMPL control fully clockwise
E					-.5	100K	X100,000	
B					0	50	X10	
C					16.0	1 meg	X100,000	

TABLE 3-2. VOLTAGE AND RESISTANCE READINGS

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
68-MHZ OSCILLATOR								
A12Q1	X	X	6	3				Set the HIGH FREQ AMPL control fully clockwise.
E	------	------	------	------	17.8	2.5K	X1000	
B	------	------	------	------	17.5	12.5K	X1000	
C	------	------	------	------	0	0	X1	
A12Q2	X	X	6	3				Set the HIGH FREQ AMPL control fully clockwise.
E	------	------	------	------	-.5	100K	X100,000	
B	------	------	------	------	0	50	X1000	
C	------	------	------	------	16.0	1 meg	X100,000	
RF AMPLIFIER DETECTOR								
A13Q1	X	X	X	X				NONE.
E	------	------	------	------	7.2	1.0K	X1000	
B	------	------	------	------	7.7	2.1K	X1000	
C	------	------	------	------	24.2	2.2K	X1000	
A13Q2	X	X	X	X				NONE.
E	------	------	------	------	1.1	120	X10	
B	------	------	------	------	1.6	200	X10	
C	------	------	------	------	15.2	3.2K	X1000	
A13Q3	X	X	X	X				NONE.
E	------	------	------	------	.5	72	X10	
B	------	------	------	------	1.27	140	X10	
C	------	------	------	------	17.4	3.2K	X1000	

TABLE 3-2. VOLTAGE AND RESISTANCE READING

CHASSIS

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
Q1	X	X	X	X				NONE.
E					29.0	90	X10	
B					29.5	260	X10	
C					38.0	500	X10	
Q2	X	X	X	X				NONE.
E					27.9	3.8K	X1000	
B					29.0	90	X10	
C					38.0	7.1K	X1000	
Q3	X	X	X	X				NONE.
E					27.9	3.8K	X1000	
B					29.0	90	X10	
C					38.0	7.1K	X1000	
Q4	X	X	X	X				NONE.
E					25.0	25	X10	
B					27.0	135	X10	
C					0.	0	X1	
Q5	X	X	X	X				NONE.
E					25.0	25	X10	
B					27.0	135	X10	
C					0	0	X1	

LOAD/500-HZ FILTER

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
A1Q1	X	X	X	X				NONE.
E					.25	48	X10	
B					.85	130	X10	
C					7.0	34K	X1000	
A1Q2	X	X	X	X				NONE.
E					7.0	2.1K	X1000	
B					7.8	5.5K	X1000	
C					27.0	28K	X1000	
A1Q3	X	X	X	X				NONE.
E					8.0	2.2K	X1000	
B					8.2	5.4K	X1000	
C					27.0	28K	X1000	

TABLE 3-2. VOLTAGE AND RESISTANCE READINGS

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
150-HZ OSCILLATOR/COUNTER								
A2Q1	X	X	X	O				NONE.
E					8.8	2.7K	X1000	
B					8.9	5.7K	X1000	
C					27.5	13K	X1000	
A2Q2	X	X	X	O				NONE.
E					2.3	2.8K	X1000	
B					2.85	5.6K	X1000	
C					27.5	13K	X1000	
A2Q3	x	x	x	o				NONE.
E					1.0	500	X1000	
B					1.5	2.5K	X1000	
C					15.0	21K	X1000	
A2Q4	X	X	X	O				NONE.
E					7.85	3.3K	X1000	
B					7.9	6K	X1000	
C					27.5		X100,000	
A2Q5	X	X	X	O				NONE.
E					7.4	1.5K	X1000	
B					7.55	4.5K	X1000	
C					27.5	13K	X1000	
A2Q6	X	X	X	O				NONE.
E					1.1	850	X1000	
B					1.4	4K	X1000	
C					8.0	120K	X100,000	
1-KHZ/10-KHZ OSCILLATOR								
A3Q1	X	X	X	X				NONE.
E					22.0[a] 22.5[b]	6.5K[a] 7.0K[b]	X1000	
B					22.7[a] 22.0[b]	3.9K[a] 3.5K[b]	X1000	
C					23.8[a] 24.0[b]	3.7K[a] 3.3K[b]	X1000	
A3Q2	X	X	X	X				NONE.
E					23.0[a] 23.3[b]	30K[a] 25K[b]	X1000	
B					23.7[a] 23.9[b]	3.7K[a] 3.3K[b]	X1000	
C					24.5	3.4K[a] 3.0K[b]	X1000	
A3Q3	X	X	X	X				NONE.
E					2.1	900	X1000	
B					2.6	3.6K	X1000	
C					14.2	3.9K	X1000	
A3Q4	X	X	X	X				NONE.
E					13.6	700	X1000	
B					14.2	3.8K	X1000	
C					24.5	3.4K	X1000	
A3Q5	X	X	X	2				NONE.
E					23.5[a] 21.8[b]	3.2K[a] 2.7K[b]	X1000	
B					24.0[a] 22.3[b]	5.7K[a] 5.2K[b]	X1000	
C					25.0[a] 24.9[b]	6.1K[a] 5.5K[b]	X1000	

TABLE 3-2. VOLTAGE AND RESISTANCE READINGS

TEST POINT	CIRCUIT SELECTOR switches				VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
	A	B	C	D				
					1-KHZ/10-KHZ OSCILLATOR--CONTINUED			
A3Q6	X	X	X	X				NONE.
E					8.3[c] 5.8[d]	5.3K[c] 4.8K[d]	X1000	
B					9.0[c,e] 6.4[d,e]	11.7K[c] 10.3K[d]	X1000	
C					16.8[c] 19.2[d]	5.4K[c] 4.9K[d]	X1000	
A3Q7	X	X	X	X				NONE.
E					15.8[c] 18.8[d]	1.7K[c] 1.5K[d]	X1000	
B					16.8[c] 19.3[d]	5.4K[c] 4.9K[c]	X1000	
C					27.5	5.6K[c] 5.0K[d]	X1000	

[a]For S/N sets 1-10.

[b]For S/N sets 11 and up.

[c]For S/N sets 1-27.

[d]For S/N sets 28 and

[e]Reading taken with Multimeter ME-26A/U.

TABLE 3-2. VOLTAGE AND RESISTANCE READINGS

TEST POINT	CIRCUIT SELECTOR switches A	B	C	D	VOLTAGE (volts)	RESISTANCE (ohms)	OHMMETER RANGE	OTHER CONDITIONS
500-KHZ FM OSCILLIATOR								
A4Q1	X	X	X	4				NONE.
E					6.6	15K	X1000	
B					7.1	10.5K	X1000	
C					22.6	16K	X1000	
A4Q2	X	X	X	4				NONE.
E					4.2	1.3K	X1000	
B					4.7	3.1K	X1000	
C					13.9	9.0K	X1000	
A4Q3	X	X	X	4				NONE.
E					22.2	2.2K	X1000	
B					23.0	3.9K	X1000	
C					27.2	3.7K	X1000	
AUDIO AMPLIFIER DETECTOR								
A5Q1	X	X	X	X				NONE.
E					10.8	4K	X1000	
B					11.0	5K	X1000	
C					26.8	2.3K	X1000	
A5Q2	X	X	X	X				NONE.
E					4.42	500	X1000	
B					5.1	1.4K	X1000	
C					11.2	2.8K	X1000	
A5Q3	X	X	X	X				NONE.
E					4.4	500	X1000	
B					5.0	1.4K	X1000	
C					10.5	2.9K	X1000	
A5Q4	X	X	X	X				NONE.
E					4.5	500	X1000	
B					5.2	1.5K	X1000	
C					10.6	2.9K	X1000	
A5Q5	X	X	X	X				NONE.
E					.15	48	X10	
B					.75	140	X10	
C					11.7	7.6K	X1000	
A5Q6	X	X	X	X				NONE.
E					3.5	1.3K	X1000	
B					4.05	2.9K	X1000	
C					21.0	4.1K	X1000	

3-8. Oscilloscope Waveforms

a. The test set is composed mainly of oscillators and amplifiers which are most easily checked by the use of voltage level measurements. However, if it is more desirable to use an oscilloscope for signal tracing, refer to the schematic diagrams and check the various test points in the circuit for the presence or absence of a signal waveform. The 800 Hz inverter circuit (fig. FO-2) and the 500 kHz (fig. 3-35) and 30 MHz (fig. 3-44) switch circuits are most easily analyzed by the use of an oscilloscope. Figure 3-25 shows the waveforms a various points in these circuits.

b. Use Oscilloscope UN/USM-182 to obtain the waveforms. Before comparing the waveforms with the normal waveforms shown, carefully read the notes on the waveform illustrations and insure that the exact conditions under which the normal waveforms were taken are duplicated.

c. A departure from the normal waveform indicates trouble between the point at which the waveform is observed to be normal and the point where the abnormal waveform is observed. For example, if the output of a transistor appears normal, and the drive at the base of the second transistor is normal, but no signal appears at the collector of the second transistor, it is an indication of trouble in the second transistor stage. First check the transistor by the use of the transistor tester (TS-1836/U) and replace the transistor, if faulty. If the transistor checks good, continue troubleshooting the circuit by the use of table 3-2, voltage and resistance readings. Do not overlook the fact that a short circuit in a following stage may reflect back and give the same indication.

Section II. MAINTENANCE OF TEST SET, ELECTRONIC CIRCUIT PLUG-IN UNIT AN/ARM-87

3-9. General Parts Replacement Techniques

a. Replacement of Circuit Cards. The circuit cards in the test set are slot-coded to prevent inserting a card in the wrong plug. Be very careful when removing and replacing circuit cards in the card cage. Do not use excessive force or the cards may become damaged. After a circuit card is repaired or replaced, always perform the adjustment procedures applicable to that circuit card before returning the equipment to the user. Refer to paragraph 3-10 for details on printed circuit card repair. Table 3-3 below lists the 13 circuit cards and the power detector assembly. Listed adjacent to the circuit cards is the applicable adjustment procedure location. Some cards have more than one adjustment procedure; perform all the specified procedures after a repair operation even if the repair did not affect the other circuits on the circuit card.

b. Soldering. Use a pencil-type iron with a capacity of 20 or 25 watts. Check to see that the iron tip is isolated from the ac line (para 3-3). Do not use a soldering gun; damaging voltages can be induced into the equipment. Solder transistor and diode leads quickly; semiconductor devices are easily damaged by heat. Whenever possible, use a heat sink (such as a long-nosed pliers) between the soldering iron and the component.

c. Parts Replacement. Alway replace defective parts with identical good parts. For replacing parts on the printed circuit cards, refer to paragraph 3-10. When replacing wiring or components on the chassis, choose the new wires or components as nearly like the original as possible.

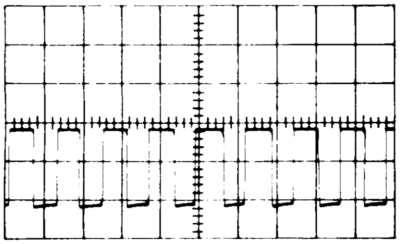
d. Switch Replacement. When replacing a multicontact rotary switch, always identify the wires before removing them from the switch terminals. White adhesive tape or masking tape marked with the switch terminal number works ideally. If it is necessary to remove cable lacing during the replacement of a switch, always replace the lacing alter the new switch is installed.

3-10. Printed Circuit Card Repair

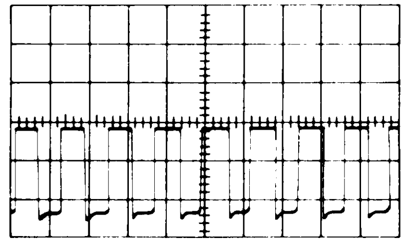
Parts mounted on printed circuit cards are bonded to the cards to protect the parts from humidity and moisture. This bonding, or postcoating, also protects the parts against excessive vibration in service. If the repair process requires that a part be

Table 3-3. Circuit Card Adjustment Procedures

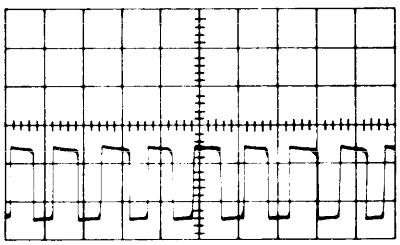
Ref desig	Circuit card name	Adjustment procedure (para No.)
A1	Load/500-kHz filter HV7	3-28
A2	150-Hz oscillator/counter HU8, ...	3-22
A3	l-kHz/10-khz oscillator HU9. . . . . .,	3-23
A4	500-kHz fm oscillator HV2	3-24, 3-25
A5	Audio amplifier/detector HU7. . .	3-20, 3-29
A6	+28-volt regulator HU4	3-18, 3-30
A7	High voltage power supply HU5 ., .,	3-31
A8	-28-volt regulator HUB,...,..	3-19
A9	Load No. l HV5	None
A10	3.975-5.925-MHz oscillator HV4	3-26, 3-27
A11	30-MHz oscillator HV8	3-32
A12	68-MHz oscillator HW2	3-33
A13	RF amplifier/detector/switch HV3	3-21
A14	Power detector assembly .	3-34



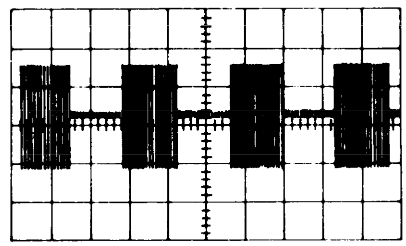
1
INVERTER
Q4-Q5 EMITTER
VERT - 20V/CM
HORIZ - IMS/CM
SYNC - INT



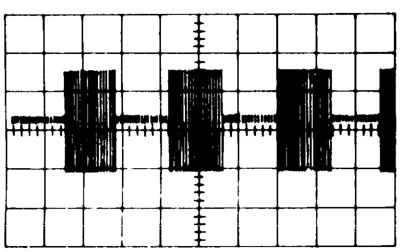
2
INVERTER
Q4-Q5 BASE
VERT - 20V/CM
HORIZ - IMS/CM
SYNC - INT



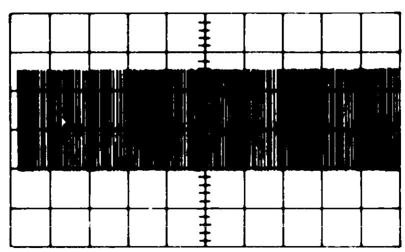
3
INVERTER
T2-6 OR T2-8
VERT-20V/CM (XIO PROBE)
HORIZ-IMS/CM
SYNC-INT



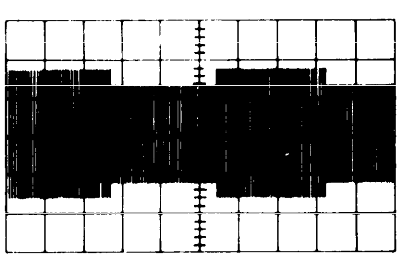
4
30 MC SWITCH (-GATE)
RF SW OUT J17
HOMER MODULE PLUGGED IN
CIRCUIT SELECTOR 0523
SYNC-EXT, 100CPS FROM HOMER
VERT-.1V/CM
HORIZ-5MS/CM



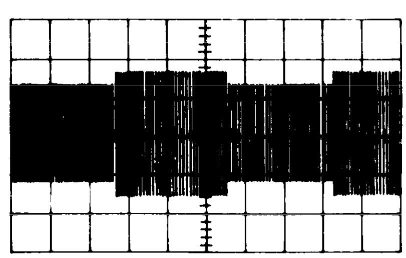
5
30 MC SWITCH (+GATE)
RF SW OUT J17
HOMER MODULE PLUGGED IN
CIRCUIT SELECTOR 0513
SYNC-EXT, 100CPS FROM HOMER
VERT- 1V/CM
HORIZ-5MS/CM



6
30 MC SWITCH (+AND-GATES)
RF SW OUT J17
HOMER MODULE PLUGGED IN
CIRCUIT SELECTOR 0503
SYNC-EXT, 100CPS FROM HOMER
VERT- 1V/CM
HORIZ-5MS/CM



7
500 KC SWITCH (+GATE)
TEST POINT J13
HOMER MODULE PLUGGED IN
CIRCUIT SELECTOR 7944
SYNC-EXT, 100CPS FROM HOMER
VERT- 1V/CM
HORIZ-2MS/CM



8
500 KC SWITCH (-GATE)
TEST POINT J13
HOMER MODULE PLUGGED IN
CIRCUIT SELECTOR 7834
SYNC-EXT, 100CPS FROM HOMER
VERT-.1V/CM
HORIZ-2MS/CM

Figure 3-25. Oscilloscope Waveforms.

removed from the board and replaced with another part, the following procedure should be followed. The bonding agent used in recoating the boards is a postcoating material, Dennis 1169. This material consists of two parts, Dennis 1169A and 1169B. The two parts must be mixed at the time of use.

a. Inspect the card for evidence of burns, scorches, or heat damage; corroded metal parts or terminals, or damage of the base laminate. If any of these defects are evident, replace the entire board rather than attempting repair. If the board appears repairable, proceed to *b* below.

b. Remove the designated part from the card by destroying the protective postcoating with a hot soldering iron, and then unsolder the part and lift it off the board with a pair of long-nosed pliers.

CAUTION

Do not use soldering irons rated above 25 watts on cards bearing transistors, cerafil capacitors, or other heat sensitive components. Also, be very careful when removing components from the card so that the circuits are not damaged.

c. If necessary, remove the excess solder from the joint with a soldering iron.

d. Insert the new wire or component lead in the correct eyelet and clinch the wire over the eyelet.

e. Apply solder to the joint using any rosin flux core solder. Do not use a solder that has a core of hydrazine, acid, or other unapproved flux. Do not keep the iron on the joint longer than necessary to complete the solder flow throughout the joint.

f. Inspect the solder joint to be sure the solder completely covers the joint and there is a smooth continuous band of solder between the eyelet flares and the circuitry. Note also that there are no cold or fractured solder joints or nonadherence of solder to metal and no excess solder globules, peaks, strings, or bridges of solder between adjacent parts or circuits.

g. Clean the joint to remove the flux; use a medium-bristled brush and a small amount of organic solvent. Remove as much of the melted plastic and flux from the soldered area as possible. Remove excess solvent and dissolved flux with an absorbent material.

NOTE

Use a solvent sparingly since the postcoating will also be dissolved. Apply a small amount to the area of the solder joint only.

h. Mix one part of Dennis 1169A liquid with one part Dennis 1169B liquid. Mix these two liquids together in a stainless steel, wax free paper, or polyethylene container and stir with a stainless steel spatula or equivalent. Mix thoroughly.

i. Apply the mixture to the newly soldered joint; cover all areas where the original coating was damaged and any new parts which were added. Use a soft-bristled brush to apply the mixture.

j. Allow the newly coated cards to dry to a tackfree condition (approx. 2 hours) before installing them in the equipment. The final cure takes approximately 7 days at room temperature or 1 hour at +60° C. (+140°F.); however, the equipment may be operated during the curing period.

3-11. Removal and Replacement of Stud-Type Diodes

(fig. 3-26)

The stud-type diodes in the test set must be electrically insulated from the chassis to which they are mounted. Follow the procedures in *a* and *b* below when removing or replacing this type diode.

a. Removal.

(1) Unsolder the wire or wires connected to the anode lead of the diode.

(2) Remove the nut from the bottom of the chassis.

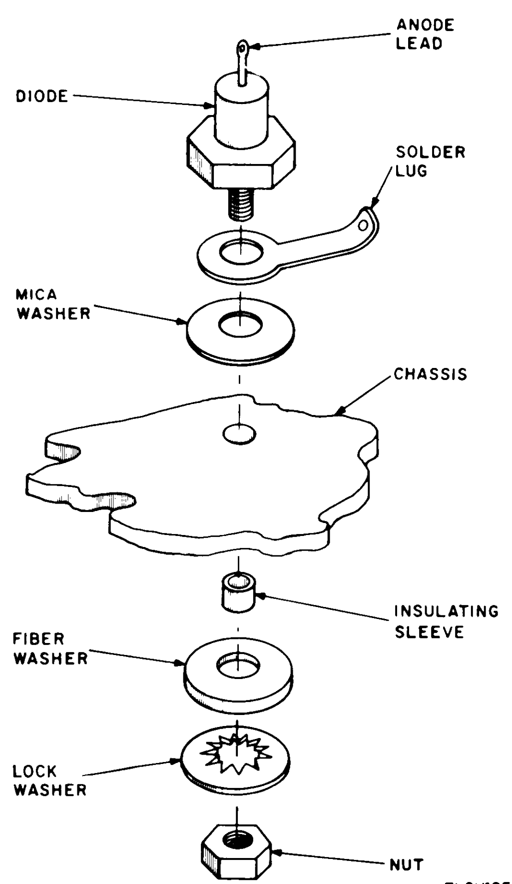


Figure 9-26. Insulated mounting of stud-type diodes.

(3) Remove the lockwasher and fiber washer from the diode stud.

(4) Lift the diode up and remove it from the chassis.

NOTE

The insulating sleeve may stay in the chassis; if so, let it remain there for use with the replacement diode.

b. Replacement.

(1) Place the mica washer over the hole in the chassis.

(2) Slip the solder lug over the stud on the replacement diode and push the stud through the hole in the chassis.

(3) Slip the insulating sleeve over the stud from the bottom of the chassis and slide it into the chassis hole so that the diode stud is insulated from the chassis.

(4) Place the fiber washer and lockwasher on the diode stud.

CAUTION

Do not overtighten the diode nut; the stud threads are made of a copper alloy for good electrical connection, and they will strip quite easily.

(5) Place the nut on the diode stud and tighten.

CAUTION

When soldering the anode lead, place a heat sink (such as long-nosed pliers) between the soldering iron and diode.

(6) Solder the wire to the diode anode lead.

3-12. Removal and Replacement of Transistors Q2 and Q3

(fig. 3-5 and 3-7)

Transistors Q2 and Q3 are mounted on heat sinks located on each side of the blower BL1 well assembly (fig. 3-5). The stud nut on transistor Q2 is accessible and can be removed without difficulty; however, special procedures are necessary for removing and replacing transistor Q3. Follow the procedures in *a* and *b* below when removing or replacing transistor Q3.

a. Removal.

(1) Unsolder and identify the wires from the transistor base and emitter terminals. (Do not unsolder wires on collector terminal lug.)

(2) Remove the four machine screws (19) from the front panel and the four machine screws (19) from the rear panel that secure the inverter transformer bracket (fig. 3-27).

(3) Lift up the inverter transformer bracket (approx. ½ inch) and, using a socket wrench and extension, remove the collector stud hexagonal nut (16) on transistor Q3 (4).

(4) Remove the solder lug (20) and wires (do not remove wires from solder lug) from the collector stud.

(5) Remove the four machine screws (19) that hold the blower air filter (2, fig. 3-27) to the front panel.

(6) Remove the blower filter (2).

(7) Remove transistor Q3 (4) from the heat sink (5) in the blower wall.

b. Replacement.

(1) Place the transistor on the heat sink in the blower well (guide pin on transistor prevents incorrect mounting of the transistor).

(2) Hold the transistor on the heat sink with one hand and slip the solder lug (20) (with wires) over the collector stud with the other hand.

(3) While still holding the transistor on the heat sink, start the hexagonal nut (16) on the collector stud and tighten thumbtight.

CAUTION

Do not overtighten the collector stud hexagonal nut (16); the stud threads may strip.

(4) Lift up the inverter transformer bracket (fig. 3-5) approximately ½ inch; use a socket wrench and extension to tighten the hexagonal nut on transistor Q3.

(5) Replace the four machine screws (19) in the front panel and the four machine screws (19) in the rear panel that secure the inverter transformer bracket.

(6) Replace the blower air filter (2) and four machine screws (19) on the front panel of the test set.

NOTE

See soldering hints in paragraph 3-9b before soldering the wires to the emitter and base connectors of the transistor.

(7) Solder the wires to the emitter and base of the new transistor.

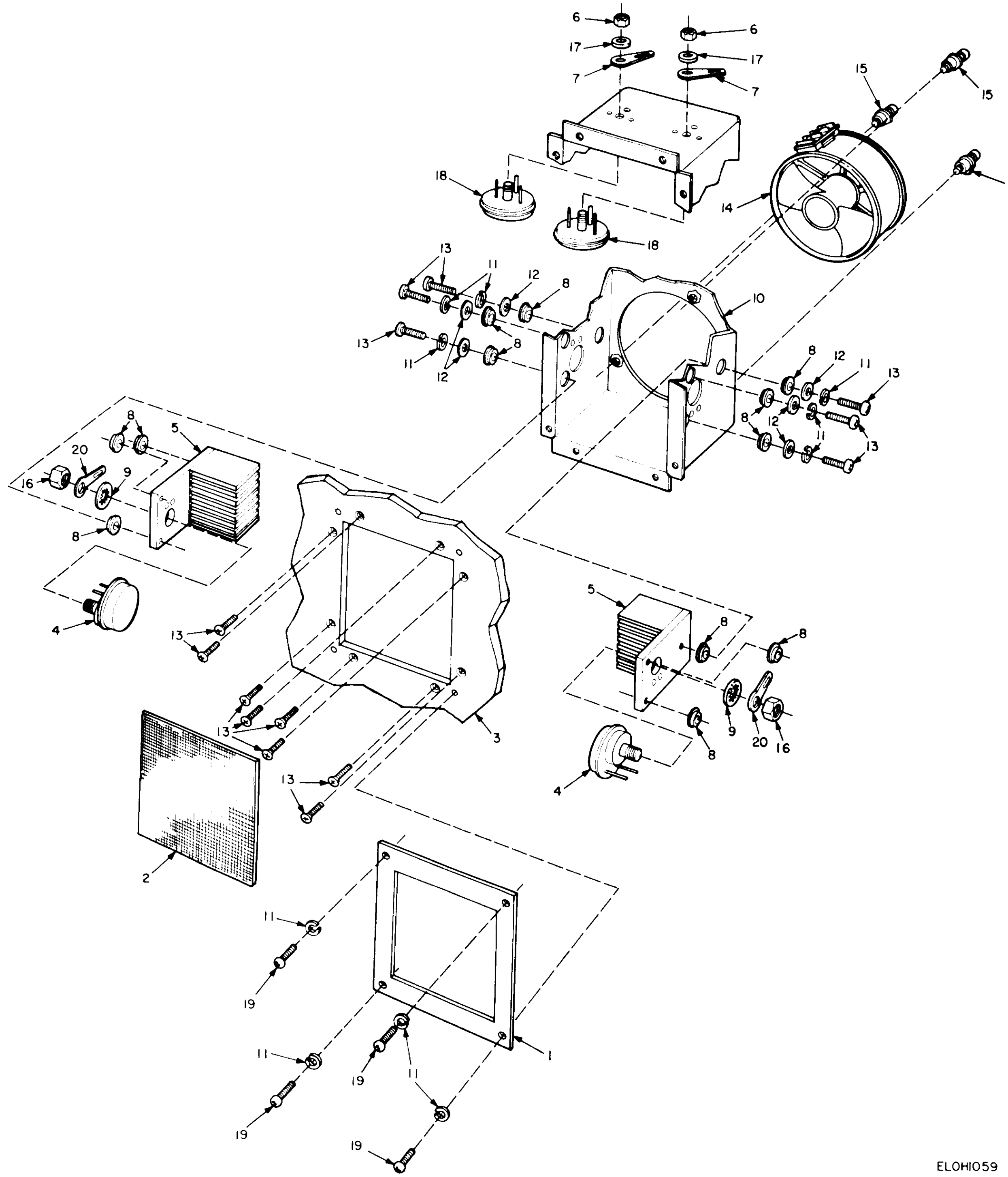
3-13. Removal and Replacement of Filter Capacitors C1, C2, C3, and C8

(fig. 3-3 and 3-5)

Capacitors C1, C2, C3, and C8 are large filter capacitors mounted in plastic retainers in the extreme upper right hand corner of the test set chassis. When removing or replacing these capacitors, follow the procedures in a and *b* below.

a. Removal.

(1) Remove the two screws along the top of the front panel and the top screw on the right side of the front panel (located between the EXTERNAL



1. Filter retainer (MP33)
2. Air filter (FL3)
3. Front panel (MP36)
4. Transistor 2N1016B (Q2, Q3)
5. Heat sink, electrical (E11)
6. Hex nut 10-32 (p/o MP 110)
7. Solder lug No. 10 (p/o MP 110)
8. Insulated flanged spacer (p/o item 5)
9. Lockwasher, internal tooth (p/o item 4)
10. Blower assembly (MP22)
11. Lockwasher No. 6 (H22)
12. Flat washer No. 6 (H16)
13. Machine screw 6-32 × 1/2 (H70)
14. Blower motor
15. Synchro clamp (H79)
16. Hex nut 5/16 -32 (p/o item 4)
17. Flat washer No. 10 (p/o MP 110)
18. Transistor 2N174 (Q4, Q5)
19. Machine screw 6-32× 5/16 (H67)
20. Solder lug 5/16 (p/o item 4)

Figure 3-27. Blower well assembly, exploded view.

jacks) that secure the capacitor mounting bracket to the front panel.

(2) Remove the three screws from the rear panel that correspond in position to the screws removed in (1) above.

(3) Swing the capacitor mounting bracket OUT, making the capacitors and plastic retainers accessible.

(4) Loosen (do not remove) the two screws in the plastic retainer that hold the capacitor being removed.

(5) Disconnect and identify the wires from the capacitor screw terminals.

(6) Remove the capacitor.

b. Replacement.

(1) Place the capacitor into the plastic retainer and orient so that the positive terminal (red dot) is toward the bottom.

(2) Tighten the two screws in the plastic retainer to secure the capacitor.

(3) Replace the wires on the capacitor screw terminals.

(4) Swing the capacitor mounting bracket back to the original position.

(5) Replace the six screws that secure the capacitor mounting bracket in the front and rear panels.

3-14. Removal and Replacement of Blower Motor

(fig. 3-27)

The blower motor is mounted on the rear of the blower assembly. Perform the following procedures when removing and replacing the blower motor.

a. Removal.

(1) Disconnect and identify the wires on the blower motor terminal strip.

(2) Loosen (do not remove) the three synchro clamp (15) screws that secure the blower motor.

(3) Turn the synchro clamps (15) so that the flat edge faces the blower motor.

(4) Remove the blower motor (14) from the rear; be careful not to damage parts or wiring.

b. Replacement.

(1) Fit the recessed end of the blower motor (14) into the blower well assembly.

(2) Twist the synchro clamps (15) so that the flat side is away from the blower motor (14) and the round side is in the blower motor groove.

(3) Tighten the synchro clamp (15) screws.

(4) Replace the wires on the blower motor terminal strip.

3-15. Removal and Replacement of Heat Sinks in Blower Assembly

(fig. 3-27)

Perform the following procedures when removing or replacing the heat sinks in the blower assembly:

a. Removal.

(1) Remove the four machine screws (19) and four lockwashers (11) that secure the filter retainer (1) to the front panel (3).

(2) Unsolder the leads from the emitter, base, and collector of the transistor (4).

(3) Remove the three machine screws (13), lockwashers (11), flat washers (12), and the insulated flanged spacers (8).

NOTE

Three of the insulated flanged spacers (8) are located between the heat sink and the blower assembly and must be removed from inside the blower assembly.

(4) Remove the heat sink (5) from the inside of the blower assembly (10).

b. Replacement.

(1) Place three insulated flanged spacers (8) into the holes from the inside of the blower assembly (10).

(2) Place the heat sink over the spacers and align the holes.

(3) Place a lockwasher (11), flat washer (12), and insulated flanged spacer (8) on a machine screw (13) and start the screw into the threaded hole in the heat sink (5).

(4) Repeat the procedure in (3) above for the remaining two screws.

(5) Insure that the recessed portion of the insulated flanged spacers (8) are seated in the blower assembly holes. Tighten the three machine screws (13).

(6) Solder the wires to the emitter, base, and collector terminals of the transistor (4).

3-16. Removal and Replacement of Circuit Card Connectors

(fig. FO-4)

Perform the following procedures when removing or replacing circuit card connectors:

a. Removal.

(1) Remove the circuit cards from the card cage.

(2) Set the test set on the bench with the card cage facing down.

(3) Unsolder and identify the wires going to the receptacle connector (4) that is to be removed.

(4) Remove the 15 machine screws (12) and the 15 lockwashers (13) from the connector plate (3).

(5) Lift up the connector plate (5) approximately 3/4 inch and remove the connector.

NOTE

The tips on the card guides (14 and 15) fit into the receptacle connectors (4). Lift straight up on connectors when removing then..

b. Replacement.

(1) Connect any jumper wires that are required on the connector plate (3).

(2) Lift up the connector plate approximately ¾ inch and place the receptacle connector (4) on the card guide (14 and 15) tips.

(3) Replace the 15 machine screws (12) and the 15 lockwashers (13) in the connector plate (3).

(4) Solder the wires to the terminals on the connector plate (3).

(5) Replace the keys in the new connector. The chart below (table 3-4) shows the keying code for each circuit card connector.

3-17. General Adjustment Procedures

Paragraphs 3-18 through 3-34 describe adjustment procedures for the various functional circuits in the test set. Always perform the adjustment procedures for a circuit after a repair operation. The adjustment procedures can also be used in troubleshooting the test set by attempting to adjust a circuit that is suspected to be faulty. If the circuit cannot be adjusted, the fault is probably in that circuit. When a complete alignment of the test set is necessary, perform the adjustment procedures in the order of their appearance. The adjustment procedures and paragraph references are listed in *a* through *q* below.

a. +28-volt regulator adjustment (para 3-18).

b. –28-volt regulator adjustment (para 3-19).

c. Audio amplifier/detector gain adjustment

d. RF amplifier/detector gain and frequency response adjustment (para 3-21).

e. 150 Hz oscillator/counter adjustment (para 3-22).

f. 1-kHz oscillator adjustment (para 3-23).

g. 500-kHz fm oscillator frequency adjustment (para 3-24).

h. 500-kHz fm oscillator deviation sensitivity adjustment (para 3-25).

i. 3.975 MHz oscillator detector output amplitude adjustment (para 3-26).

j. 5.925 MHz oscillator detector output amplitude adjustment (para 3-27).

k. 500-kHz bandpass filter adjustment (para 3-28).

l. 500-kHz discriminator adjustment (para 3-29).

m. Spiking circuit duty cycle adjustment (para 3-30).

n. Despike detector adjustment (para 3-31).

o. 30-MHz oscillator tuning adjustment (para 3-32).

p. 68-MHz oscillator tuning adjustment (para 3-33).

q. RF power detector adjustment (para 3-34).

3-18. +28-Volt Regulator Adjustment

Perform the following procedures to adjust the +28-volt regulator:

a. Remove the test set from the case.

b. Using the module extender board, extend +28-volt regulator circuit card HU4 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Connect the ME-202/U between J3 (+) and J5

TABLE 3-4, Circuit Card Connector Keying Code

Ref desig. prefix.	Code No.	Name	Keying code
A1	HV7	Load/500-kc filter	B-C, E-F, P-R, U-V
A2	HU8	150-cps oscillator/counter	B-C, E-F, N-P, V-W
A3	HU9	1-kc/10-kc oscillator	B-C, E-F, N-P, W-X
A4	HV2	500-kc fm oscillator	B-C, E-F, N-P, X-Y
A5	HU7	Audio amplifier/detector	B-C, E-F, N-P, U-V
A6	HU4	+ 28-volt regulator	B-C, E-F, N-P, S-T
A7	HU5	High voltage power supply	B-C, E-F, N-P, T-U
A8	HU3	– 28-volt regulator	B-C, E-F, N-P, R-S
A9	HV5	Load No. 1	B-C, E-F, P-R, T-U
A10	HV4	3.975-/5.925-mc oscillator	B-C, E-F, P-R, S-T
A11	HV8	30-mc oscillator	B-C, E-F, P-R, V-W
A12	HW2	68-mc oscillator	B-C, E-F, P-R, X-Y
A13	HV3	RF amplifier/detector/switch	B-C, E-F, N-P, Y-Z

(–) on the circuit card and adjust R18 for +27.5 volts dc on the ME-202/U.

g. Remove the extender card and replace the +28-volt deregulator circuit in the card cage.

3-19. —28-Volt Regulator Adjustment

Perform the following procedures to adjust the –28-volt regulator:

a. Remove the test set from the case.

b. Using the module extender board, extend –28-volt regulator card HU3 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f Connect the ME-202/U between J2 (–) and J3 (+) and adjust R6 on the circuit card for – 27.5 volts dc on the ME-202/U.

g. Remove the module extender board and replace the –28-volt regulator card in the card cage.

3-20. Audio Amplifier/Detector Gain Adjustment

Perform the following procedures to adjust the audio amplifier/detector gain:

a. Remove the test set from the case.

b. Using the module extender board, extend the audio amplifier/detector circuit card HU7 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set the CIRCUIT SELECTOR switches to 2200.

g. Connect the ME-30A/U (ac voltmeter) between J2 and ground on the audio amplifier/detector circuit card and adjust the 1 KC AMPL control on the front panel of the test set for 15 millivolts on the ME-30A/U.

h. Push the PRESS TO TEST button on the test set and adjust R11 on the circuit card for a reading of 70 percent on the TEST METER.

i. Remove the module extender board and replace the audio amplifier/detector circuit card in the card cage.

3-21. RF Amplifier/Detector Gain and Frequency Response Adjustment

Perform the following procedures to adjust the RF amplifier/ detector:

a. Remove the test set from the case.

b. Using the module extender board, extend RF amplifier/detector/switch circuit card HV3 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set the CIRCUIT SELECTOR switches to 0500.

g. Connect the AN/ GRM-50 (vhf signal generator) RF output to the RF VM 1 jack on the test set and set up the generator to produce a 3-MHz, 63-millivolt, unmodulated output.

h. Push the PRESS TO TEST button on the test set and adjust R1 on the circuit card for a reading of 90 percent on the TEST METER.

i. Increase the frequency of the AN/ GRM-50 to 65-MHz. (Insure that the output is still 63 millivolts.)

j. Press the PRESS TO TEST button and adjust capacitor C5 on the circuit card for a reading of 90 percent on the TEST METER.

k. Repeat procedures given in g through *j* above until no further adjustment is necessary.

l. Remove the extender card and replace the RF amplifier/detector/switch circuit card in the card cage.

3-22. 150-Hz Oscillator/Counter Adjustment

Perform the following procedures to adjust the 150-Hz oscillator/counter:

a. Remove the test set from the case.

b. Using the module extender board, extend 150-Hz oscillator/counter circuit card HU8 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft on interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set CIRCUIT SELECTOR switches to 3241.

g. Connect the AN/USM-26 (frequency counter) to J4 on the circuit card.

Table 3-5. Capacitor Frequency Adjustment

Capacitor	Frequency Shift (Hz)
C23	7.5
C10	2.5
C11	2.5
C12	1.5
C13	0.6
C14	0.3
C15	0.1

h. Adjust the oscillator frequency reading on the AN/USM-26 to 150-Hz by adding or removing capacitors from the circuit card. Table 3-4 shows the capacitors provided on the circuit card for frequency adjustment and the amount of adjustment each provides, Adding capacitance lowers the frequency; removing capacitance raises the frequency.

i. Remove the module extender board and replace the 150-Hz oscillator/counter circuit in the card cage.

3-23. 1-kHz Oscillator Adjustment

Perform the following procedures to adjust the l-kHz oscillator:

a. Remove the test set from the case.

b. Using the module extender board, extend the l-kHz/10-kHz oscillator circuit card HU9 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set the CIRCUIT SELECTOR switches to 5760.

g. Push the PRESS TO TEST switch and adjust the 1KC AMPL control for a reading of 100 percent on the TEST METER.

h. Connect the frequency meter to pin 1 of the circuit card (use module extender board) and read the output frequency.

i. If the frequency is 1,000 Hz ±50, no circuit adjustment is needed. If the output frequency exceeds the specified limits, add or remove capacitors from the collector circuit of transistor Q1. Capacitors C4 through C8 are normally in the circuit (fig. 3-34). An extra pair of connections exist on circuit card HU9 for an additional capacitor (fig. 3-13). Table 3-5 shows the amount of adjustment provided by different sizes of capacitors. Adding capacitance lowers the frequency; removing capacitance increases the frequency.

3-24. 500-kHz Fm Oscillator Frequency Adjustment

Perform the following procedures to adjust the 500-kHz oscillator frequency.

a. Remove the test set from the case.

b. Using the module extender board, extend 500-kHz fm oscillator circuit card HV2 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft on interlock switch S12 to the override position.

Table 3-6. Capacitance Frequency Adjustment

Capacitance (micromicrofarads)	Frequency Shift (Hz)
1,200	11.86
2,200	23.4
3,300	31.2
4,700	37.5

e. Set the POWER SELECTOR switch to NORMAL.

f Set CIRCUIT SELECTOR switches to 0004.

g. Connect the frequency meter to J3 on the circuit card and adjust L1 for 500 kHz.

h. Remove the module extender board and replace the 500-kHz fm oscillator card in the card cage.

3-25. 500-kHz Fm Oscillator Deviation Sensitivity Adjustment

(fig. 3-28)

Perform the following procedures to adjust the 500-kHz fm oscillator deviation sensitivity:

a. Remove the test set from the case.

b. Using the module extender board, extend 500-kHz fm oscillator card HV2 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Set the POWER SELECTOR switch to NORMAL.

e. Pull the shaft of interlock switch S12 to the override position.

f. Construct a low pass filter using a 5-millihenry inductor and a 560-micromicrofarad capacitor as shown in figure 3-28.

g. Connect the circuit as shown in figure 3-28. (Do not connect wires shown by dashed lines).

h. Set the CIRCUIT SELECTOR switches to 2205.

i. Set the audio oscillator frequency to 1,000 Hz at an amplitude of 1 volt as read on the ME-30A/U (ac voltmeter).

j. Leaving the rest of the circuit connected, remove the ac voltmeter from pin 2 of the 500-kHz fm oscillator circuit card and connect it to the junction of the inductor and capacitor in the low pass filter as shown by the dashed lines in figure 3-28.

k. Set the RANGE switch on the GR-1142-A to 1.5 MC and adjust R2 on the 500-kHz fm oscillator circuit card for a deviation of 9.5 kHz.

l. Disconnect the equipment and replace the 500-kHz fm oscillator circuit card in the card cage.

3-26. 3.975 MHz Oscillator Detector Output Amplitude Adjustment

Perform the following procedures to adjust the 3.975 MHz oscillator detector output amplitude:

a. Remove the test set from the case.

b. Using the module extender board, extend 3.975-/5.925-MHz oscillator circuit card HV4 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL,

f. Set the CIRCUIT SELECTOR switches to 0189.

g. Connect the AN/URM-145 (RF voltmeter) to the 3 MC jack on the front panel of the test set and adjust the LOW FREQ AMPL control for 29 millivolts on the AN/URM-145.

h. Push the PRESS TO TEST button and adjust R9 on the circuit card for a reading of 100 percent on the TEST METER.

i. Remove the module extender board, and replace the 3.975-/5.925-MHz oscillator card in the card cage.

3-27. 5.925 MHz Oscillator Detector Output Amplitude Adjustment

Perform the following procedures to adjust the 5.925-MHz oscillator detector output amplitude:

a. Remove the test set from the case.

b. Using the module extender card, extend 3.975-/5.925-MHz oscillator circuit card HV4 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set the CIRCUIT SELECTOR switches to 0299.

g. Connect the AN/URM-145 to the 5 MC jack on the front panel of the test set and adjust the LOW FREQ AMPL control for 29 millivolts on the AN/URM-145.

h. Push the PRESS TO TEST button and adjust R20 on the circuit card for a reading of 100 percent on the TEST METER.

i. Remove the module extender board and replace the 3.975-5.925-MHz oscillator circuit in the card cage.

3-28. 500-kHz Bandpass Filter Adjustment

Perform the following procedures to adjust the 500-kHz bandpass filter:

a. Remove the test set from the case.

b. Connect power to the equipment and set the POWER switch to ON.

c. Pull the shaft of interlock switch S12 to the override position.

d. Set the POWER SELECTOR switch to NORMAL.

e. Set the CIRCUIT SELECTOR switches to 6103.

f. Connect the vhf signal generator to J12 (coaxial connector near transmit audio module plug-in, figure 3-2) and set the output level to 100 millivolts.

g. Push the PRESS TO TEST button and adjust the AN/GRM-50 frequency control (approximately 500 kHz) for a peak reading on the TEST METER.

NOTE

Obtain a convenient on-scale TEST METER reading by adjusting the 500 KC FILTER control on the front panel of the test set.

h. Set the CIRCUIT SELECTOR switches to 2003.

i. Push the PRESS TO TEST button and set the 500 KC FILTER control for a reading of 47 percent on the TEST METER reading.

j. Set the CIRCUIT SELECTOR switches to 2103.

k. Push the PRESS TO TEST button and adjust trimmer capacitors C9 and C10 on the load/500-kHz filter circuit card HV7 for a peak reading on the TEST METER.

l. Push the PRESS TO TEST button and adjust R32 (use access hole in the front panel, figure 3-2) for a reading of 80 percent on the TEST METER.

m. Disconnect the vhf signal generator from J12.

3-29. 500-kHz Discriminator Adjustment
(fig. 3-29)

The procedure for adjusting the discriminator center frequency is presented in *a* below. The procedure for adjusting the discriminator output level is presented in *b* below. Perform the two procedures in sequence. Before performing the procedures, insure that the 500-kHz fm oscillator frequency is adjusted properly (para 3-24):

a. Distriminator Center Frequency Adjustment.

(1) Remove the test set from the case.

(2) Using the module extender board, extend the audio amplifier/detector circuit card HU7 above the card cage.

(3) Connect the equipment as shown in figure 3-29. (Do not connect wires shown by dashed lines.)

(4) Connect power to the equipment and set the POWER switch to ON.

(5) Set the POWER SELECTOR switch to NORMAL.

(6) Set the CIRCUIT SELECTOR switches to 3215.

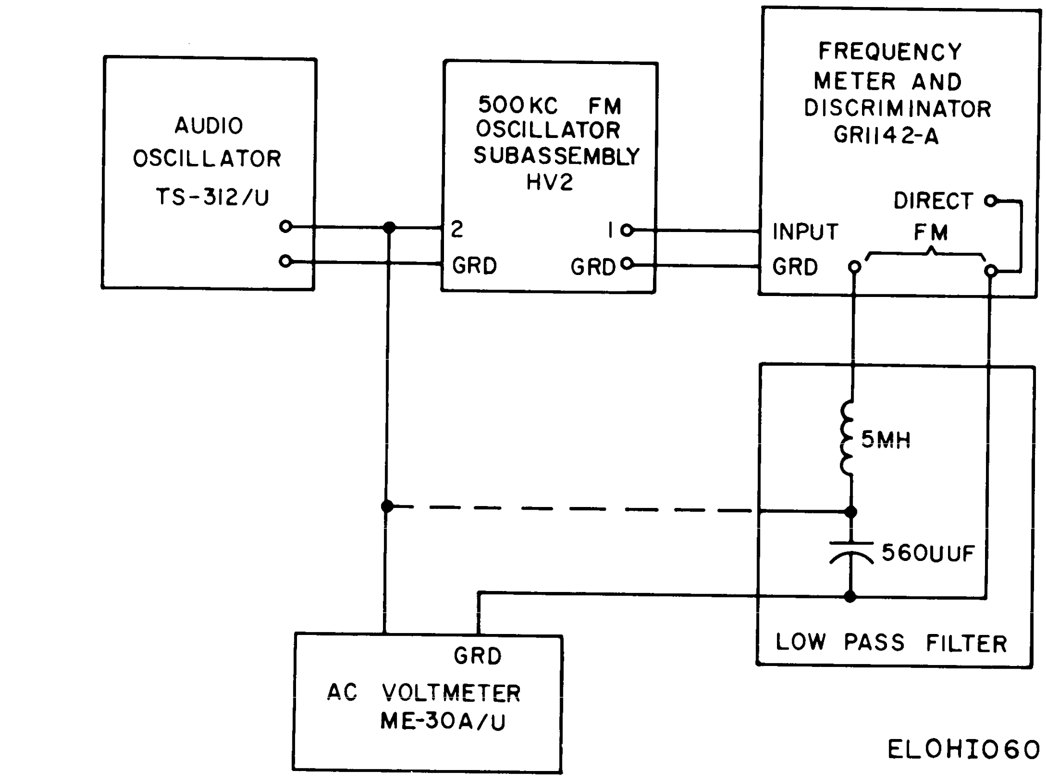


Figure 3-28. 500-kHz oscillator deviation sensitivity adjustment, test setup.

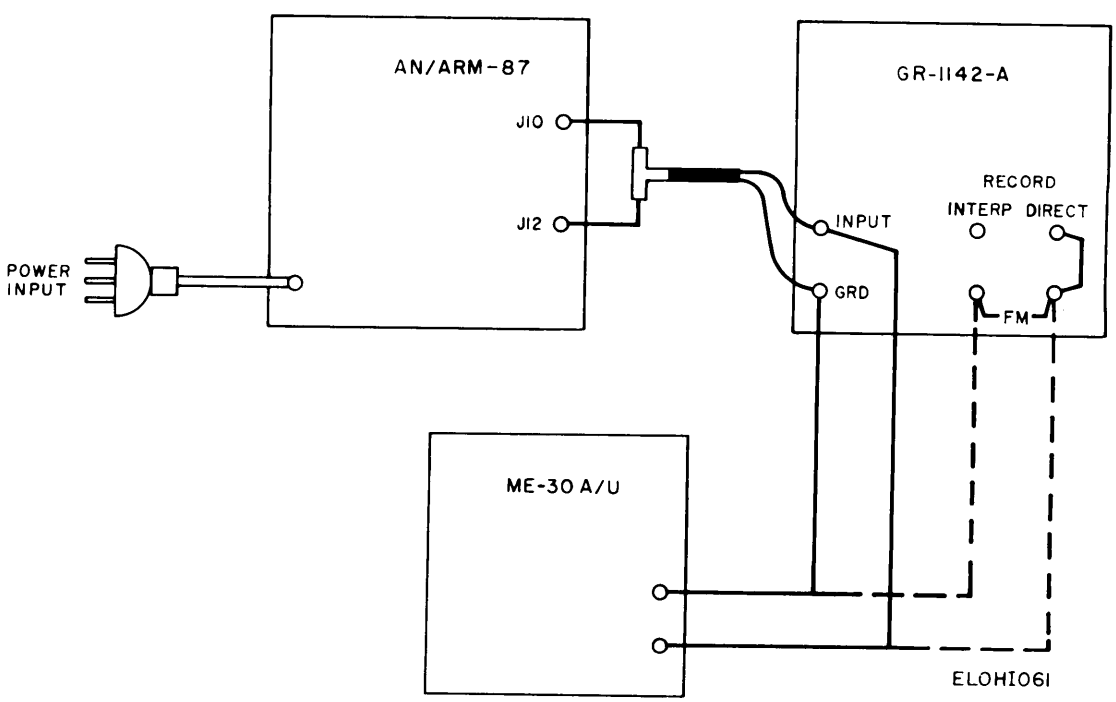


Figure 3-29. 500-kHz discriminator adjustment test equipment setup.

(7) Pull the shaft of interlock switch S12 to the override position.

(8) Adjust the 500 KC AMPL control on the test set for 15 millivolts on the ME-30A/U.

(9) Disconnect the ME-30A/U from the INPUT and GRD terminals on the GR-1142-A and connect it to the FM terminals as shown by the dashed lines in figure 3-29.

(10) Adjust the 1 KC AMPL control on the test set for a deviation of 9.5 kHz as read on the GR 1142-A and ME-30A/U.

(11) Connect the ME-30A/U to pin 1 on the audio amplifier/detector circuit card.

(12) Adjust L1 on the audio amplifier/detector circuit for a maximum reading on the ME-30A/U.

(13) Push the PRESS TO TEST button and readjust L1 for a minimum reading on the TEST METER.

NOTE

Leave the equipment connected to make the discriminator output level adjustment in *b* below.

b. Discriminator Output Level Adjustment.

(1) Connect the ME-30A/U to pin 1 on the audio amplifier/detector circuit card.

(2) Adjust R40 on the audio amplifier,/detector circuit card for 15 millivolts on the ME-30A/U.

3-30. Despiking Circuit Duty Cycle Adjustment

Perform the following procedures to adjust the spiking circuit duty cycle for a ratio of 9 to 1:

a. Remove the test set from the case.

b. Using the module extender board, extend the +28-volt regulator circuit card HU4 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Set the POWER SELECTOR switch to DESPIKE.

e. Pull the shaft of interlock switch S12 to the override position.

f. Connect the AN/USM-182A (oscilloscope) to pin 16 on the +28-volt regulator circuit card.

g. Adjust the oscilloscope so the leading edges of two of the positive pulses coincide with the 1st and 10th horizontal lines on the oscilloscope mask (fig. 3-30).

h. Adjust R23 on the +28-volt regulator circuit card so the trailing edge of the first positive pulse coincides with the second horizontal line on the oscilloscope mask.

i. Repeat adjustments in *g* and *h* above until no further adjustment is necessary.

3-31. Despike Detector Adjustment

The test set contains two despike detector circuits; one detects the spiking circuit output amplitude and the other detects the spike amplitude of the AN/ARC-54 power supply. Perform the following procedures to adjust both circuits:

a. Remove the test set from the case.

b. Using the module extender board, extend the high-voltage power supply circuit card HU5 above the card cage.

c. Connect power to the equipment and set the POWER switch to ON.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to DESPIKE.

f. Connect the AN/USM-182A to J3 on the +28-volt regulator card HU4.

g. Adjust the DE SPIKE AMPL control on the test set for a spike amplitude of 40 volts (including the dc level above ground).

h. Push the PRESS TO MONITOR VOLTAGE button and adjust R12 on the high-voltage power supply circuit card HU5 for a TEST METER reading of 80 percent.

i. Set the POWER switch to OFF and connect a jumper between J4 and J6 on the high-voltage power supply circuit card HU5. Return the POWER switch to the ON position.

j. Set the CIRCUIT SELECTOR switches to 1030.

k. Push the PRESS TO MONITOR VOLTAGE button and adjust the DESPIKE AMPL control for a reading of 80 percent on the TEST METER.

l. Push the PRESS TO TEST button and adjust R9 on the high voltage power supply circuit card HU5 for a reading of 80 percent on the TEST METER.

m. Remove the jumper connected in *i* above.

3-32. 30-MHz Oscillator Tuning Adjustment

Perform the following procedures to insure that the collector circuit of the 30-megahertz transistor is tuned properly:

a. Remove the test set from the case.

b. Connect power to the test set and set the POWER switch to ON.

c. Using the module extender board, extend the

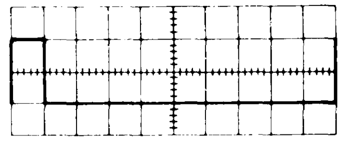


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Figure 3-30. Oscilloscope pattern of despiking pulses when despiking circuit is properly adjusted.

30-megahertz oscillator card HV8 above the card cage.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set the CIRCUIT SELECTOR switches to 0473.

g. Connect rf jumper cable W4 from the 30 MC jack to RF VM1.

h. Push the PRESS TO TEST button and adjust the HIGH FREQ AMPL control for a reading of approximately 50 percent on the TEST METER.

i. Push the PRESS TO TEST button and adjust L1 on the 30-megahertz oscillator circuit card HV8 for a maximum reading on the TEST METER.

3-33. 68-MHz Oscillator Tuning Adjustment

Perform the following procedures to insure that the collector circuit of the 68-megahertz oscillator transistor is tuned properly:

a. Remove the test set from the case.

b. Connector power to the test set and set the POWER switch to ON.

c. Using the module extender board, extend the 68-megahertz oscillator circuit card HW2 above the card cage.

d. Pull the shaft of interlock switch S12 to the override position.

e. Set the POWER SELECTOR switch to NORMAL.

f. Set the CIRCUIT SELECTOR switches to 0563.

g. Connect RF jumper cable W4 from the 68 MC jack to RF VM1.

h. Push the PRESS TO TEST button and adjust the HIGH FREQ AMPL control for a reading of approximately 50 percent on the TEST METER.

i. Push the PRESS TO TEST button and adjust L1 on the 68-megahertz oscillator circuit card HW2 for a maximum reading on the TEST METER.

3-34. RF Power Detector Adjustment

(fig. 3-31)

Perform the following procedures to adjust the power detector circuit:

a. Remove the test set from the case and set the test set on the bench so the power detector assembly on the rear subpanel (fig. 3-6) is accessible.

b. Connect the equipment as shown in figure 3-31.

c. Pull interlock switch S12 to the override position.

d. Set the POWER SELECTOR switch to NORMAL.

e. Connect power to the test set.

f. Set the FREQUENCY SELECTOR-MC switches to 50.00.

g. Set the CIRCUIT SELECTOR switches to 6997.

h. Push the PRESS TO TEST switch and adjust the 500 KC AMPL control for a reading of 30 percent on the TEST METER.

i. Set the CIRCUIT SELECTOR switches to 0097.

j. Set the POWER SELECTOR switch to HIGH VOLTAGE.

k. Note the reading on the AN/URM-145.

NOTE

If the RF voltmeter reading is greater than 35 volts, reduce the setting of the 500 KC AMPL control.

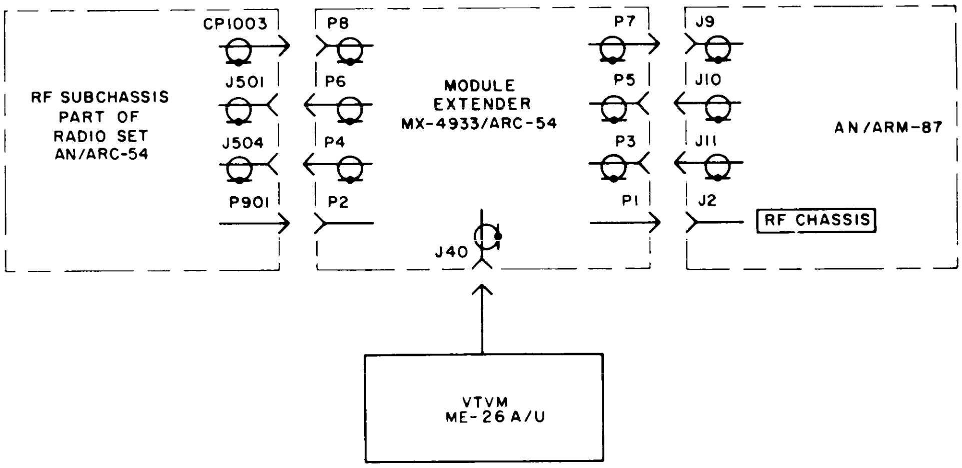
l. Using the chart in B, figure 3-31, determine the TEST METER reading that corresponds to the RF voltmeter reading (*k* above).

m. Adjust R4 on the RF detector subassembly (A14) (fig. 3-6) for the TEST METER reading determined in *1* above.

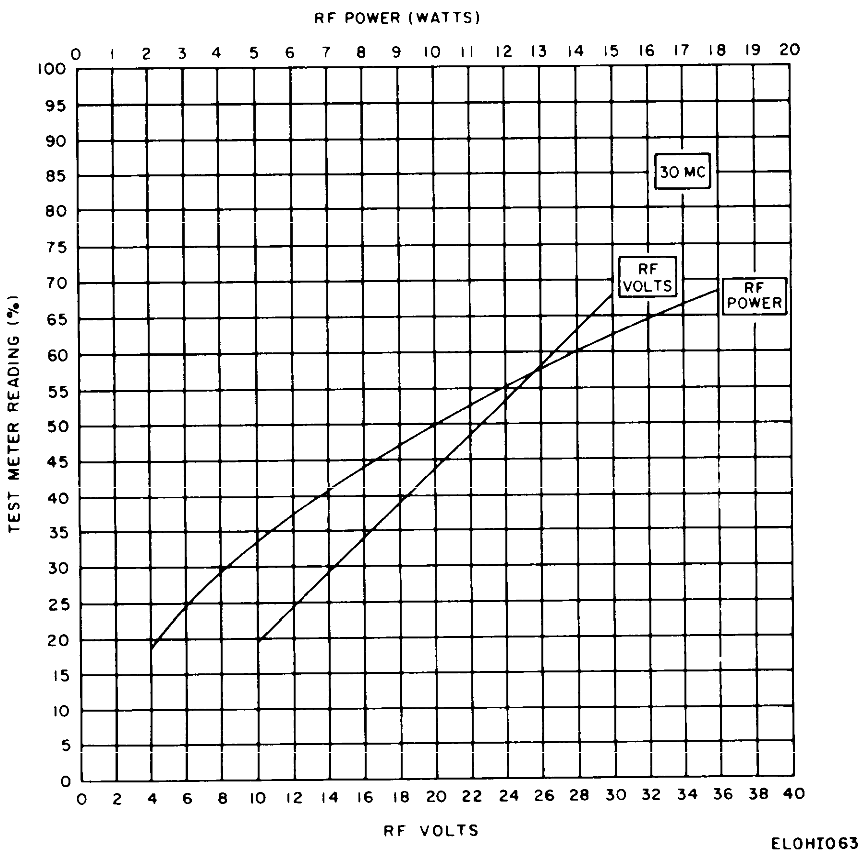
n. Disconnect the equipment.

3-35. General Support and Direct Support Testing Procedures

The self-check tests of table 4-1, Operator/Crew Preventive Maintenance Checks and Services in TM 11-6625-467-12 determine the acceptability of the repaired AN/ARM-87. These self-check procedures test the various internal power supplies for correct voltages and the internal oscillator for proper operation. If all the tests are satisfactory, the AN/ARM-87 can be considered to meet acceptable direct support and general support inspection standards.



A. EQUIPMENT SETUP



B. POWER AND VOLTAGE
VS TEST METER READING CHART

Figure 3-31. Power detector adjustment, test equipment setup.

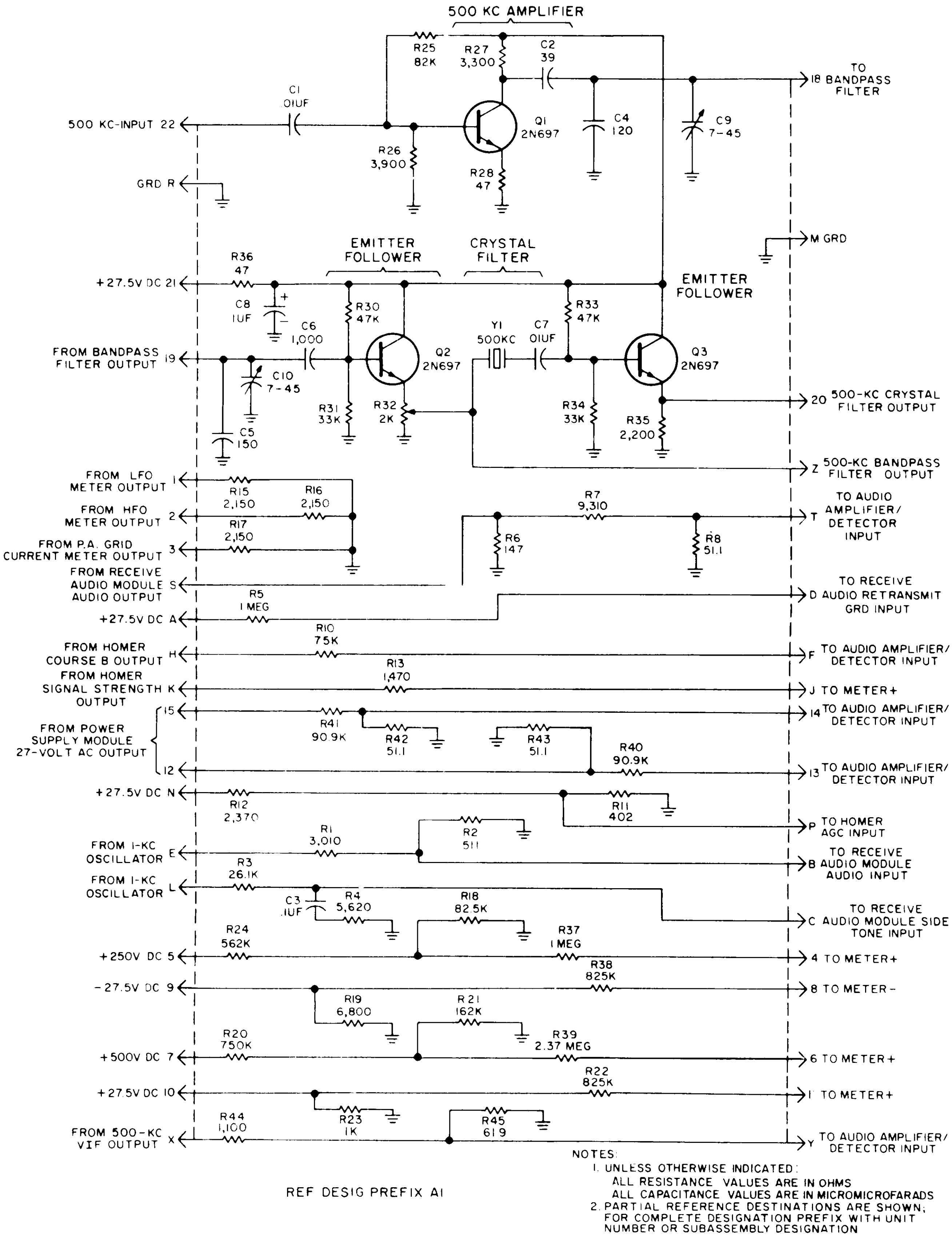


Figure 3-32. Load/500-kHz filter circuit card, schematic diagram (assembly A1).

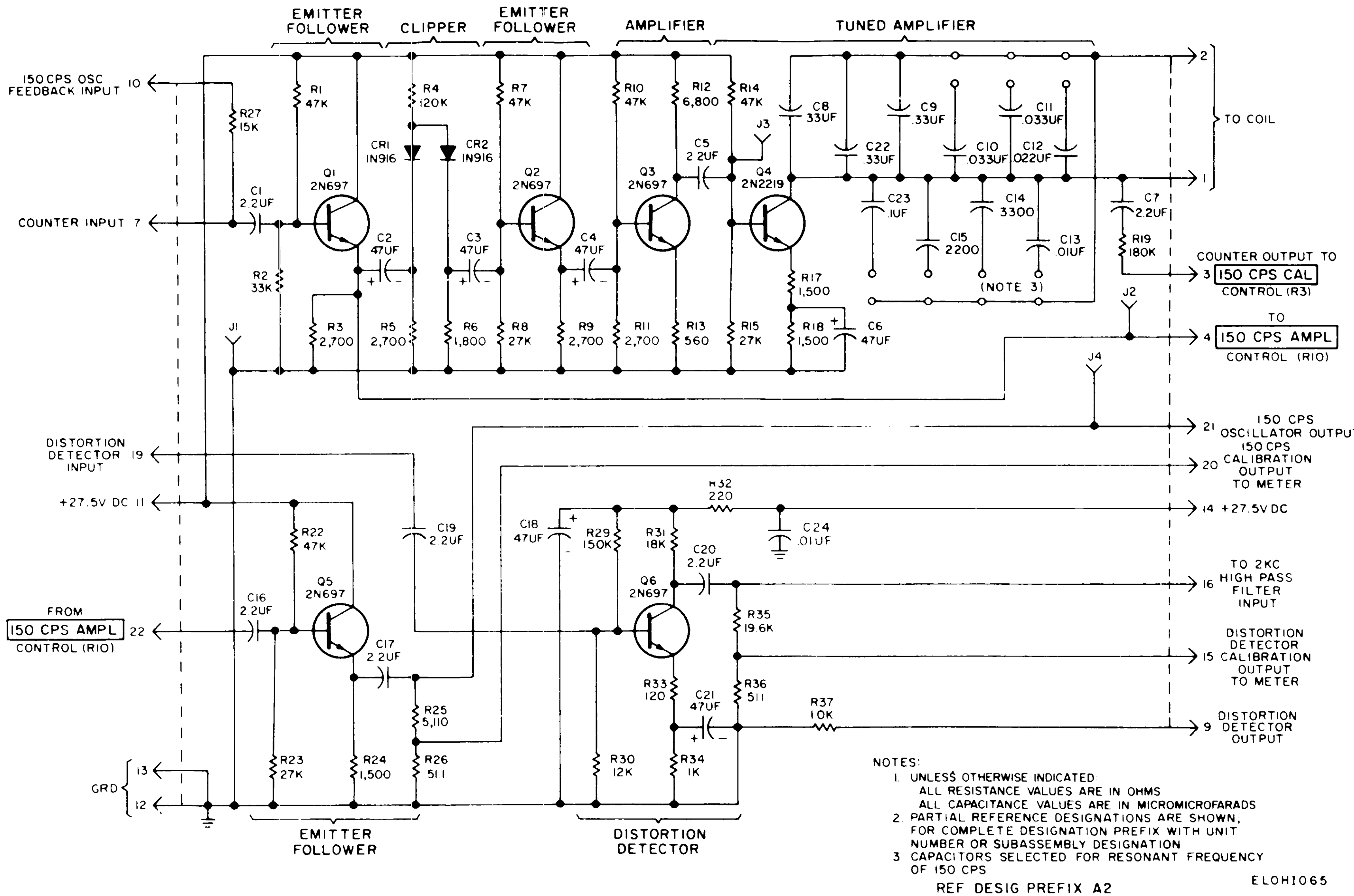


Figure 3-33. 150-Hz oscillator/counter circuit card, schematic diagram (assembly A2).

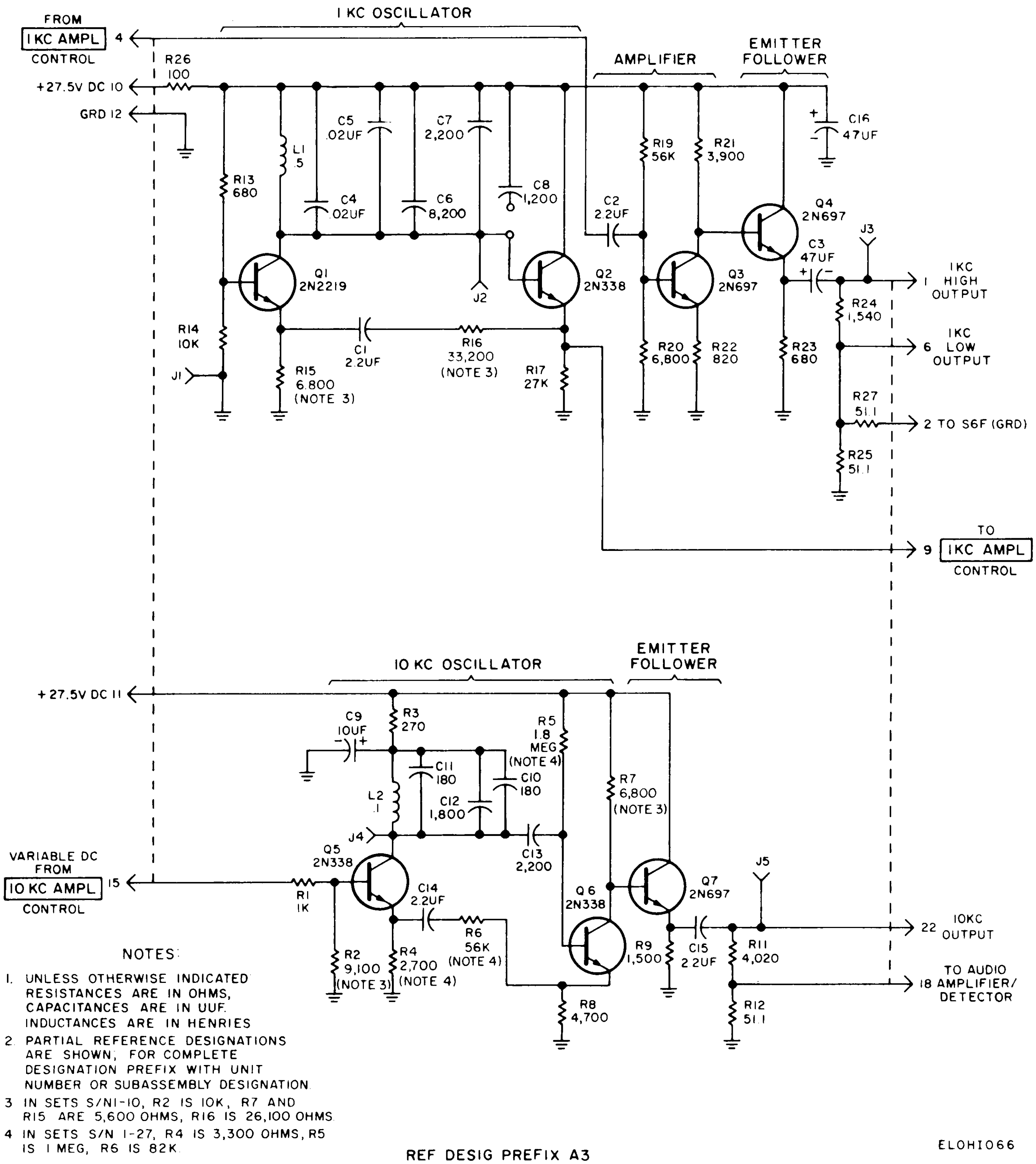


Figure 3-34. 1-kHz/10-kHz oscillator circuit card, schematic diagram (assembly A3)

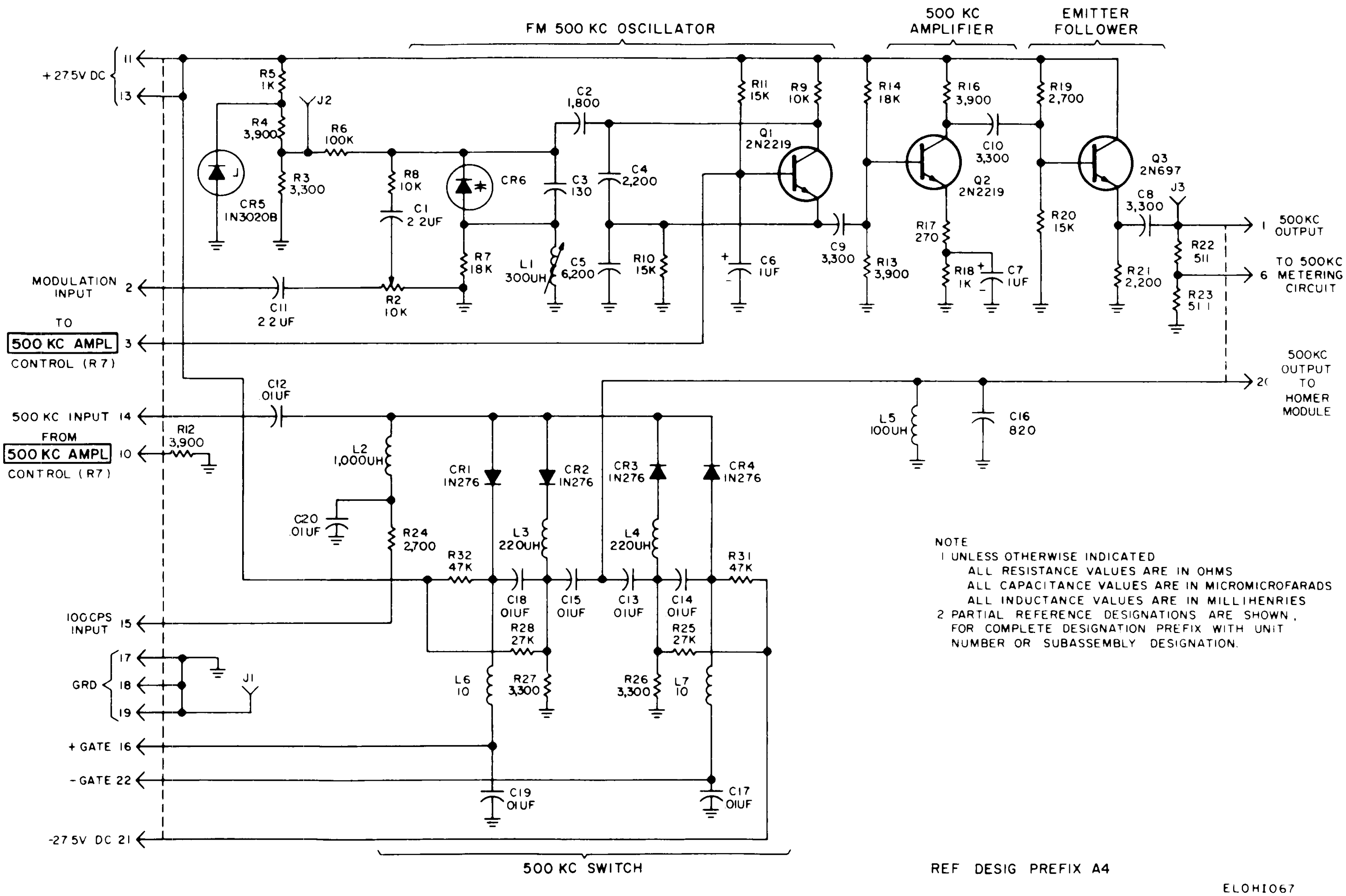


Figure 3-35. 500-kHz fm oscillator circuit card, schematic diagram (assembly A4).

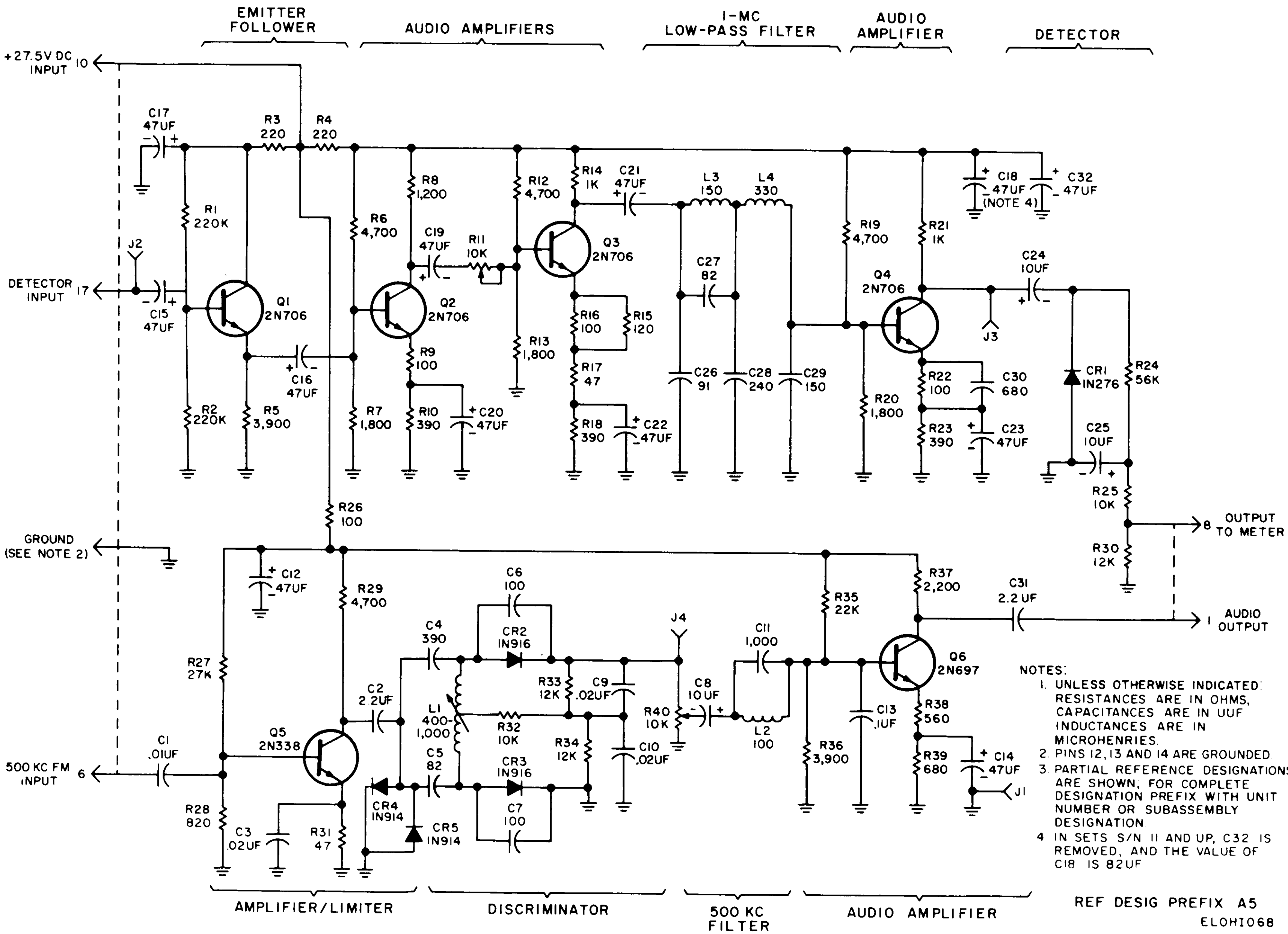


Figure 3-36. Audio amplifier/detector circuit card, schematic diagram (assembly A5).

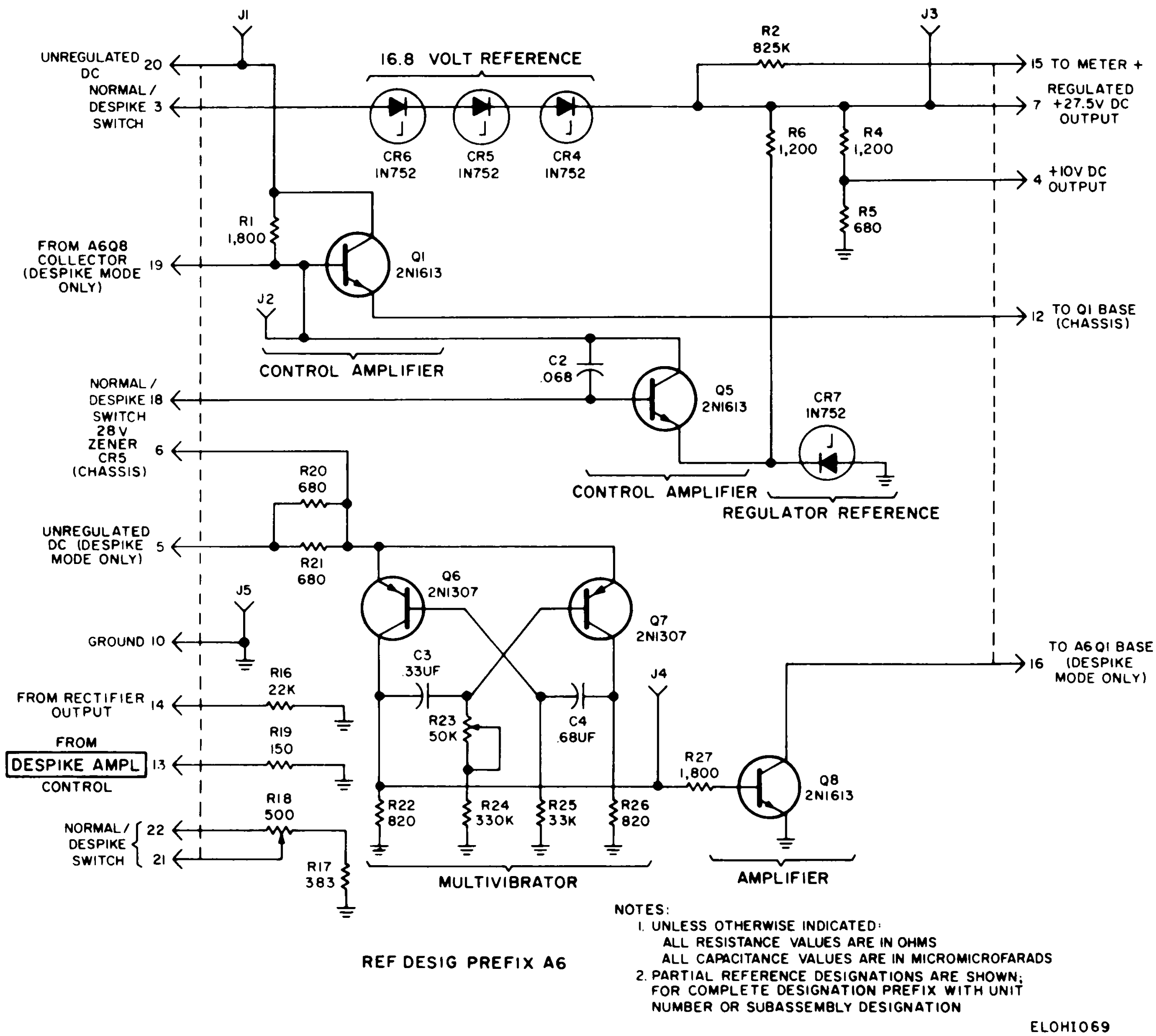
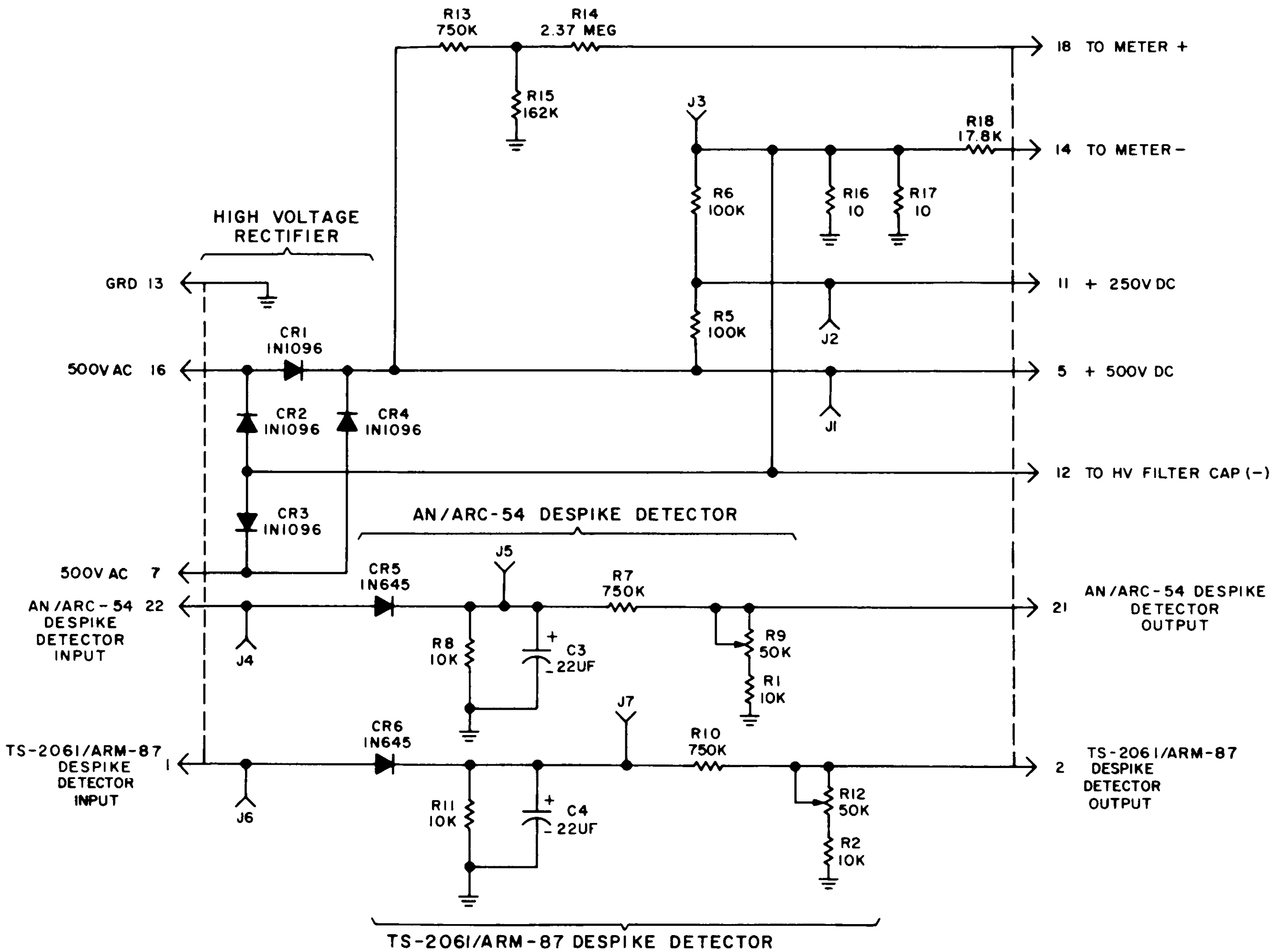


Figure 3-37. +28-volt regulator circuit card, schematic diagram (assembly A6).

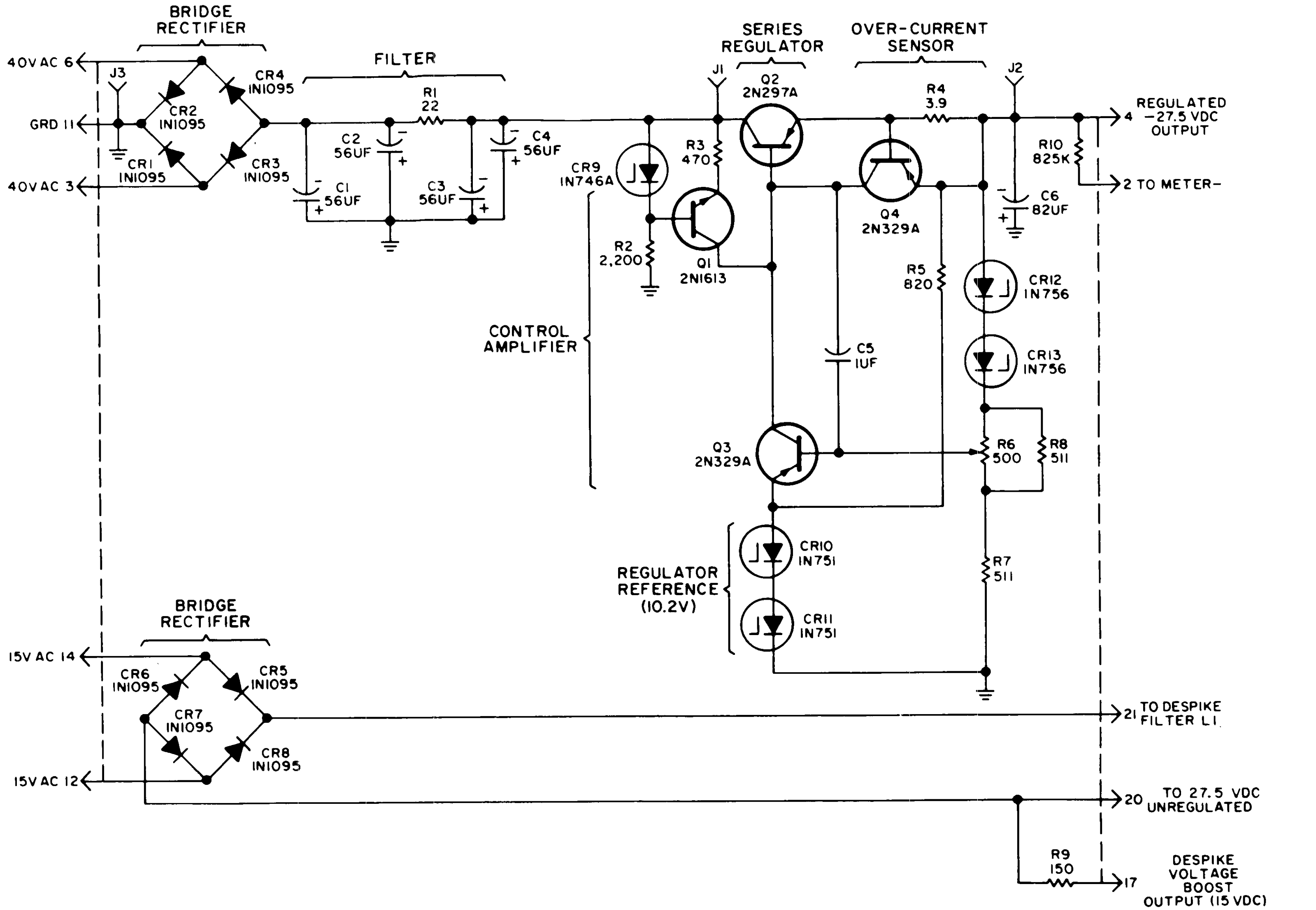


NOTE:
1. UNLESS OTHERWISE INDICATED;
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATION

REF DESIG PREFIX A7

ELOHI070

Figure 3-38. High voltage power supply circuit card, schematic diagram (assembly A7).

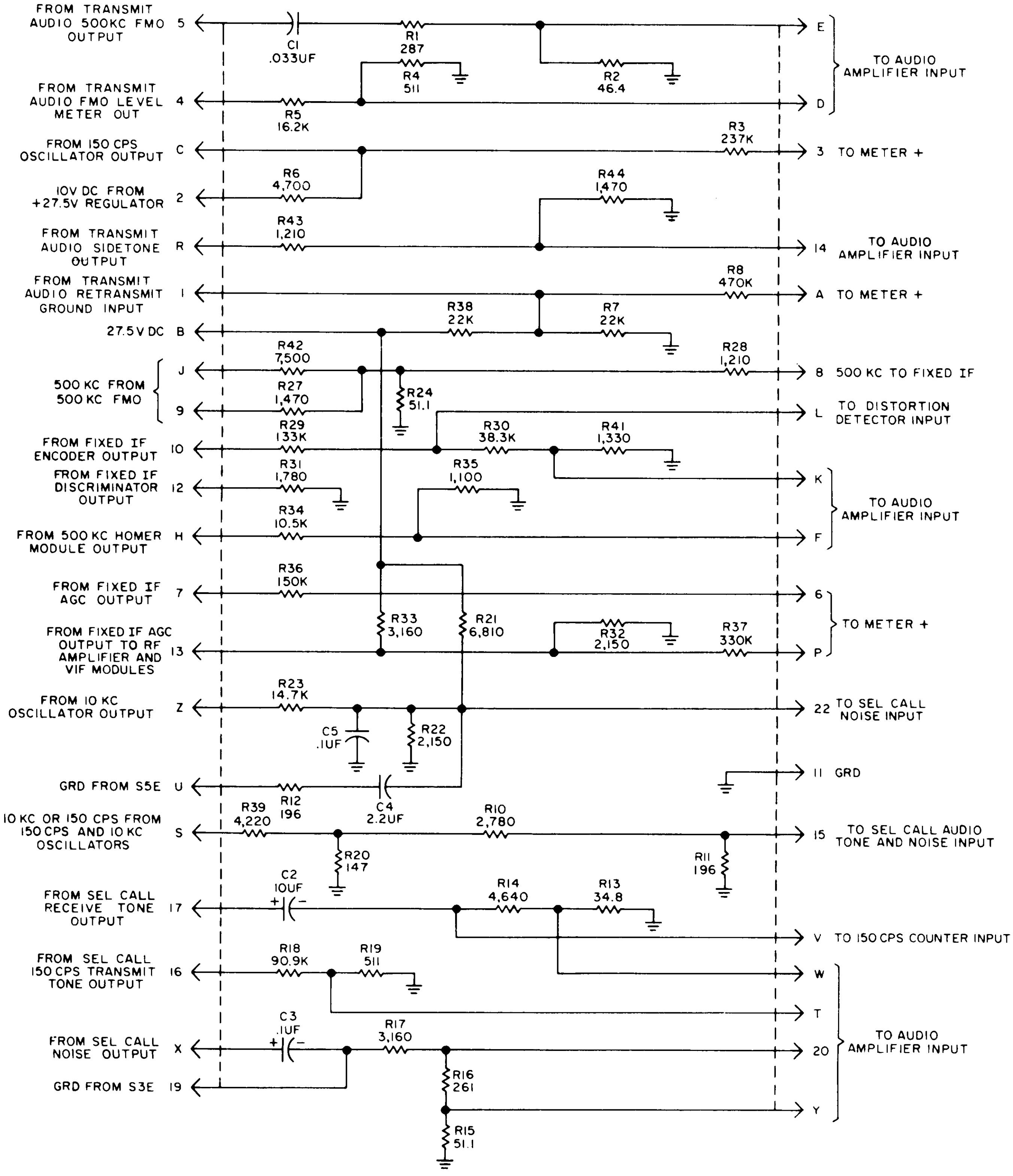


REF DESIG PREFIX A8

NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. PARTIAL PEFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATION

EL0HI071

Figure 3-39. –28-volt regulator circuit card, schematic diagram (assembly A8).



REF DESIG PREFIX A9

NOTES:
1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER OR SUBASSEMBLY DESIGNATION

EL0HI072

Figure 3-40. Load No. 1 circuit card, schematic diagram (assembly A9).

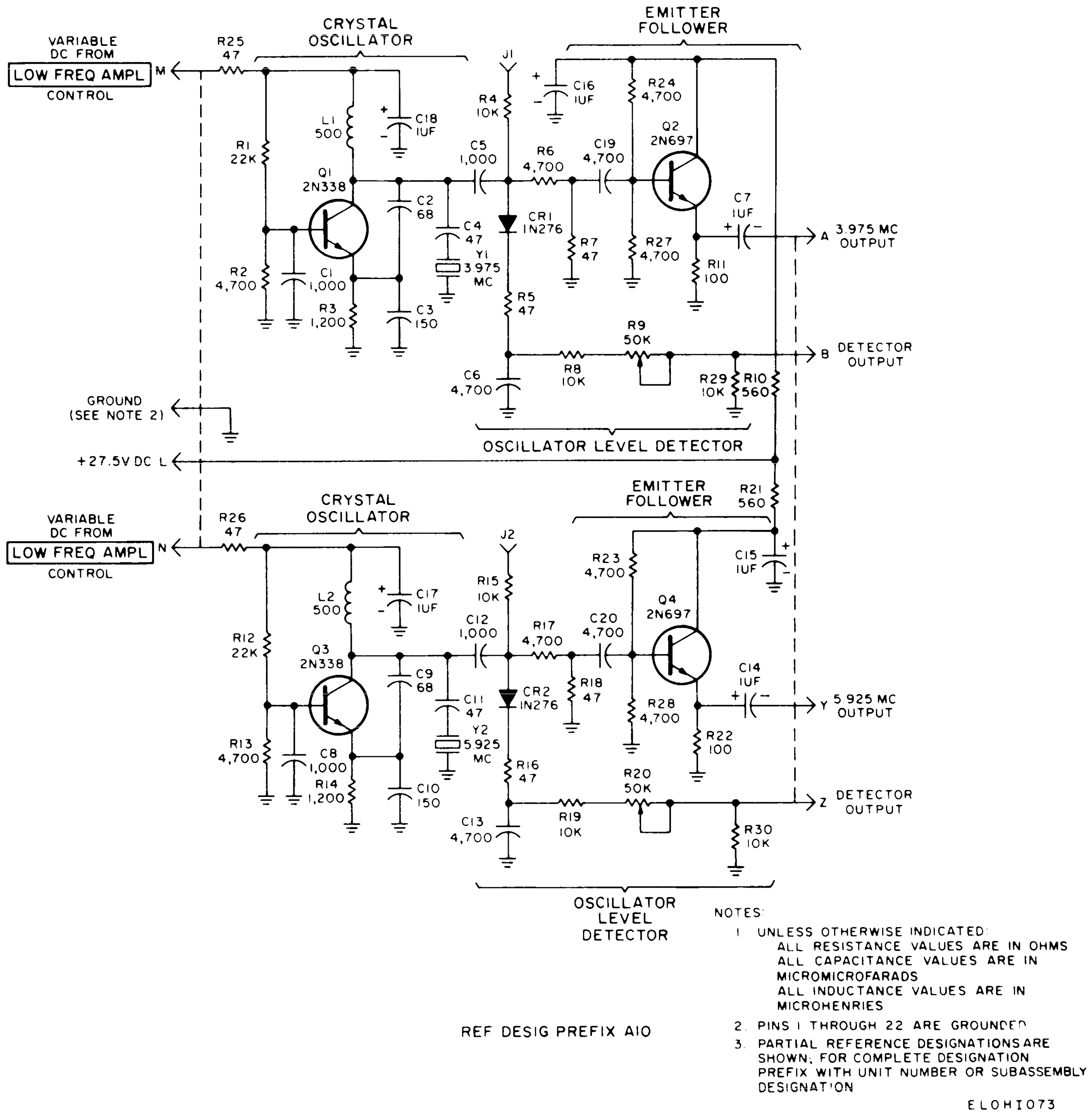


Figure 3-41. 3.975-5.925 mHz oscillator circuit card, schematic diagram (assembly A10).

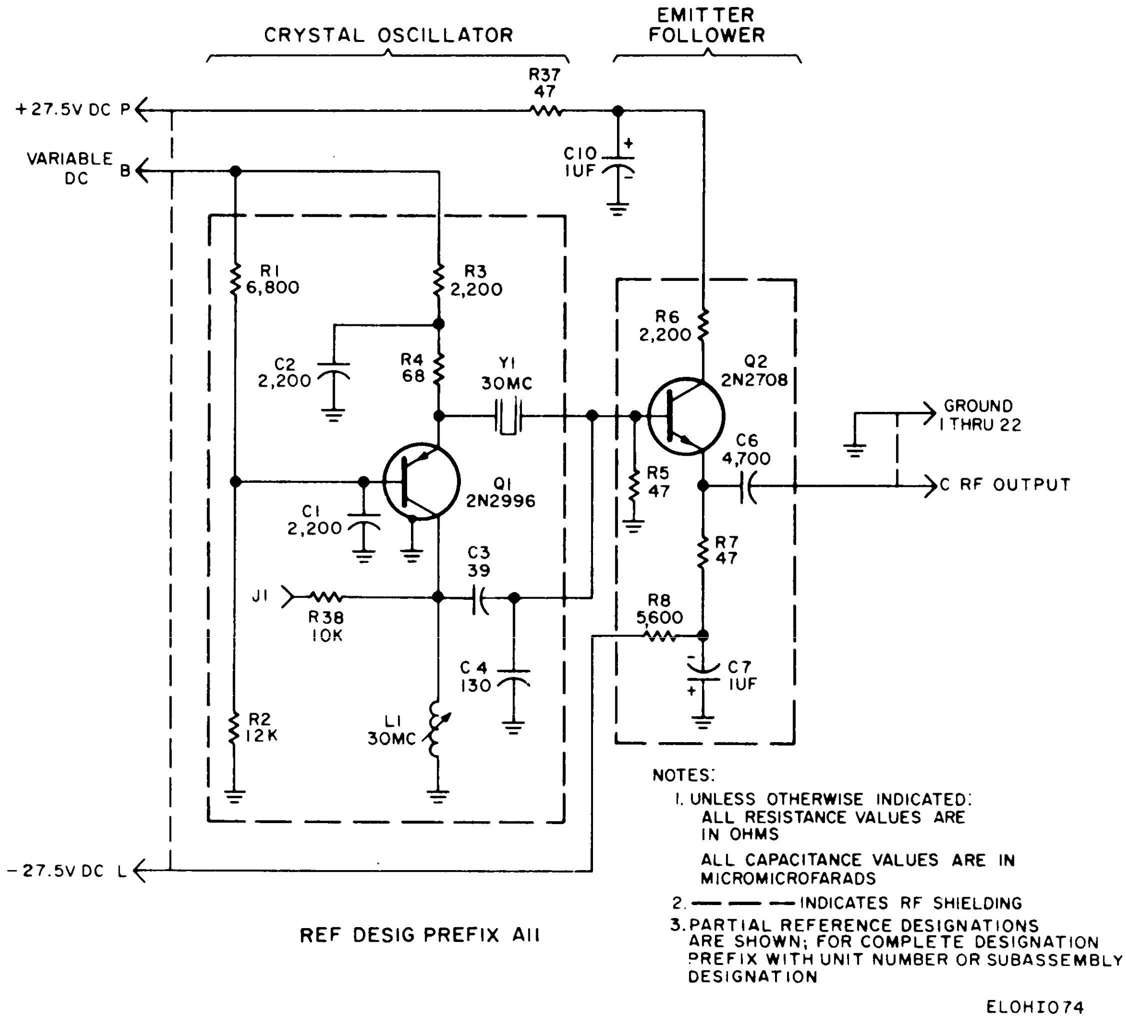


Figure 3-42. MHz oscillator circuit card schematic diagram (assembly A11).

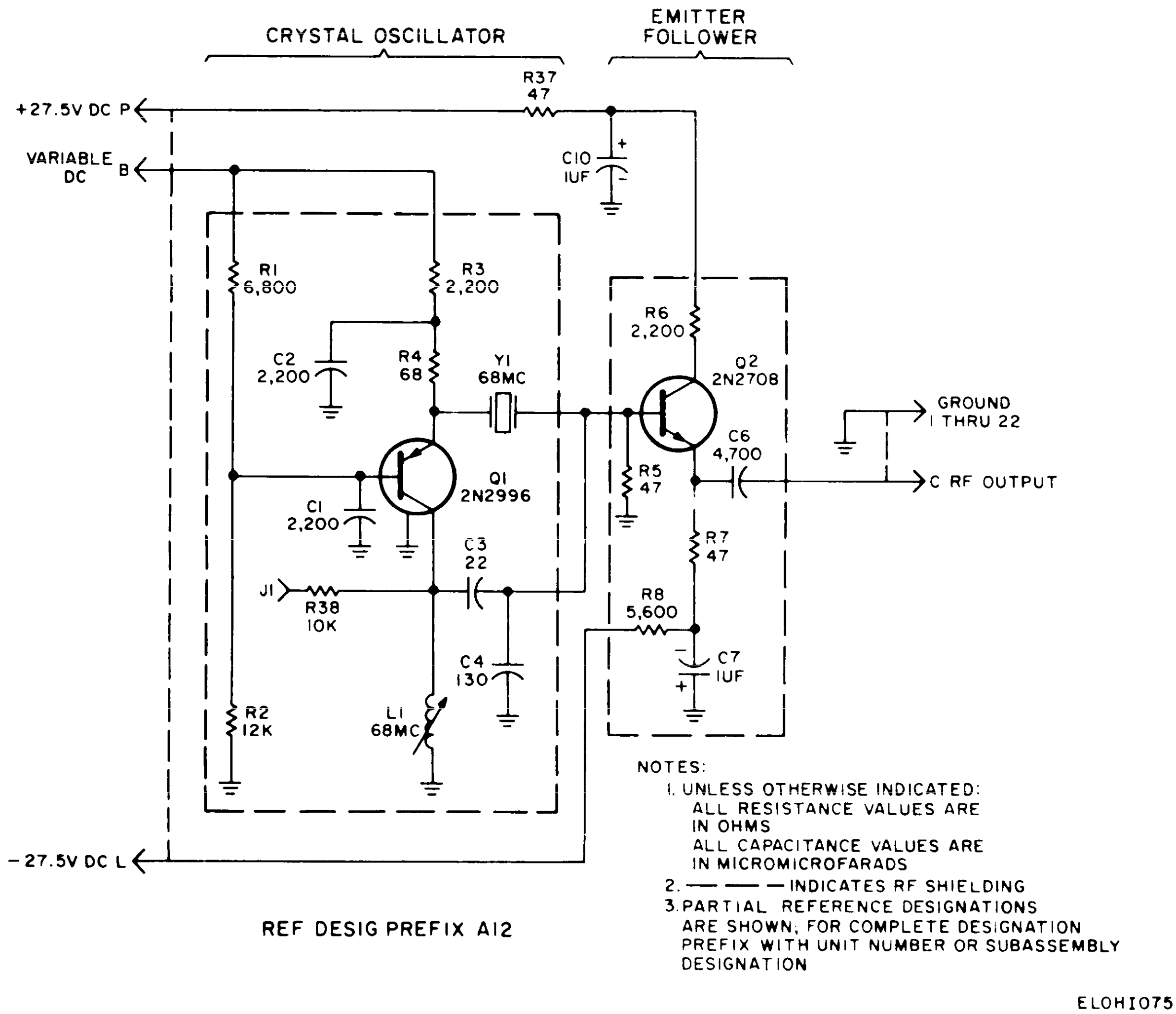


Figure 3-43. 68-MHz oscillator circuit card, schrematic diagram (assembly A12).

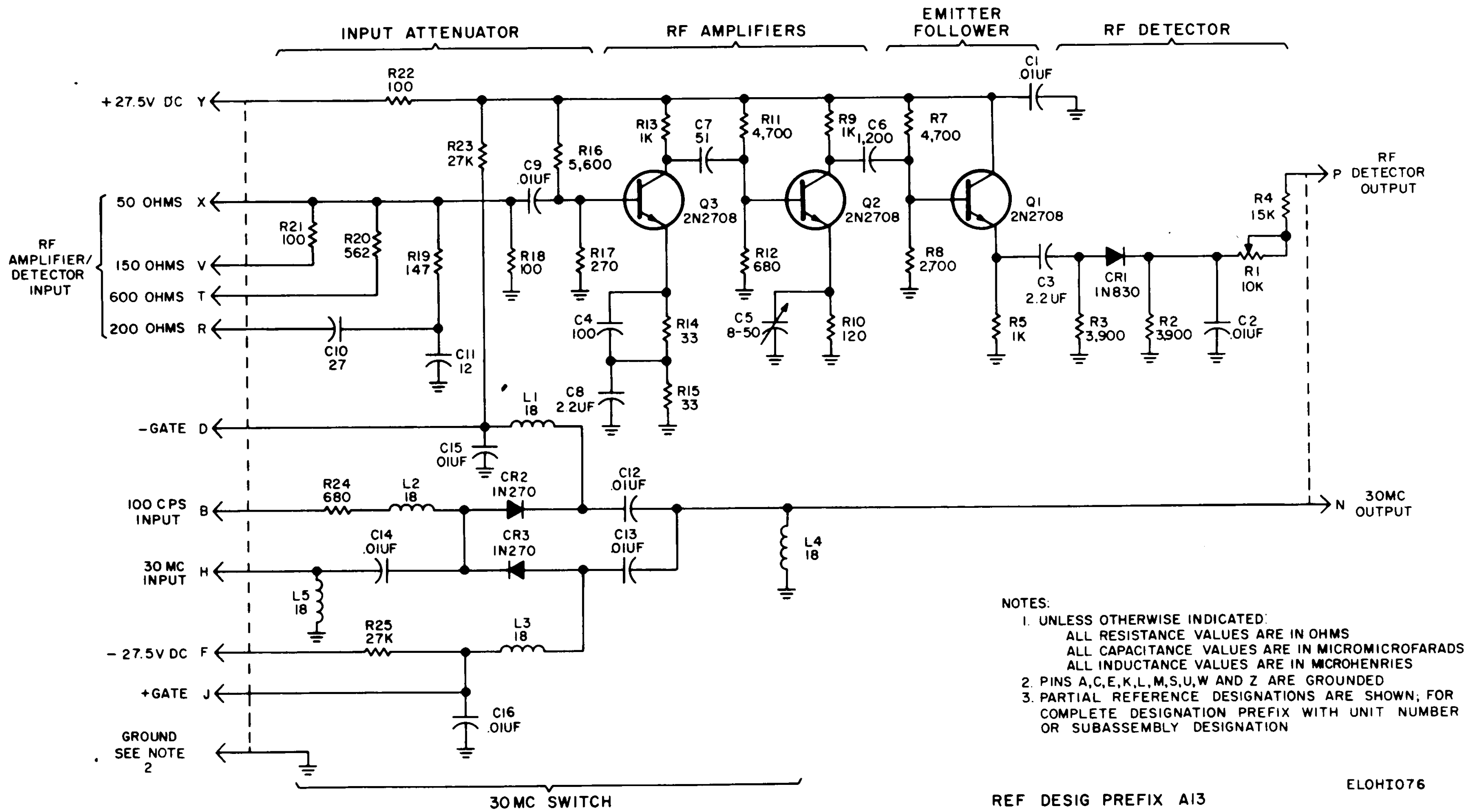
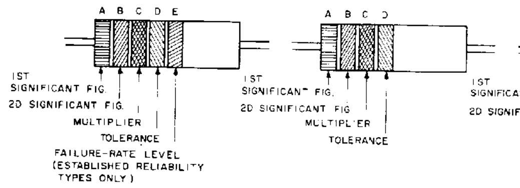


Figure 3-44. RF amplifier/detector switch circuit card, schematic diagram (assembly A13).

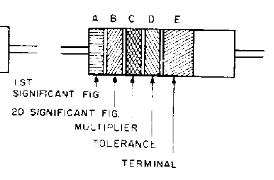
APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Publications.
TB 11-6625-467-35	Calibration Procedures for Electronic Circuit Plug-In Unit Test Set AN/ARM-87 (NSN 6625-00-908-0358).
TB SIG 355-1	Depot Inspection Standard for Repaired Signal Equipment.
TB SIG 355-2	Depot Inspection Standard for Refinishing Repaired Signal Equipment.
TB SIG 355-3	Depot Inspection Standard for Moisture and Fungus Resistant Treatment.
TM 11-5821-244-12	Operator's and Organizational Maintenance Manual for Radio Set AN/ARC-54 (NSN 5821-00-082-3598).
TM 11-5821-244-34	Direct Support and General Support Maintenance Manual: Radio Set AN/ARC-54 (NSN 5821-00-082-3598).
TM 11-6625-200-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Multimeters ME-26A/U (NSN 6625-00-360-2493), ME-26B/U and ME-26C/U (6625-00-646-9409) and ME-26D/U.
TM 11-6625-261-12	Operator's and Organizational Maintenance Manual: Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U, and TS-382F/U.
TM 11-6625-320-12	Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-366-15	Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual: Multimeters TS-352/U, TS-352A/U, and TS-352B/U (NSN 6625-00-553-0142).
TM 11-6625-467-12	Operator's and Organizational Maintenance Manual: Test Set, Electronic Circuit Plug-In Unit AN/ARM-87 (NSN 6625-00-908-0358).
TM 11-6625-524-14	Operator, Organizational, and Field Maintenance Manual: Voltmeter, Electronic AN/URM-145.
TM 11-6625-539-15	Operator, Organizational, Field and Depot Maintenance Manual: Transistor Test Set TS-1836/U.
TM 11-6625-573-14	Operator's, Organizational, Direct Support and General Support Maintenance Manual for Generator Signal AN/GRM-50 (FSN 6625-868-9353)
TM 11-6625-599-12	Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools Lists: Voltmeter, Electronic AN/USM-98A and AN/USM-98B.
TM 11-6625-601-12	Operator's and Organizational Maintenance Manual: Maintenance Kit, Electronic Equipment MK-733/ARC-54 (NSN 5821-00-901-4327).
TM 38-750	The Army Maintenance Management System (TAMMS).



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.



COLOR CODE MARKING FOR FILM-TYPE RESISTORS.

TABLE 1
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS.

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM.
BLACK	0	BLACK	0	BLACK	1	SILVER	±10 (COMP. TYPE ONLY)	BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10	GOLD	±5	RED	P=0.1	
RED	2	RED	2	RED	100	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)	ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000			WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000					
BLUE	6	BLUE	6	BLUE	1,000,000					
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH.)
BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.
BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)
BAND D — THE RESISTANCE TOLERANCE.
BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE - RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1-1/2 TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

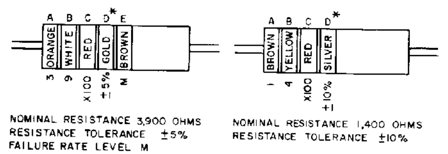
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

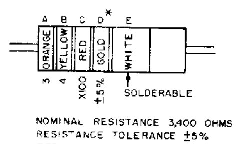
2R7 = 2.7 OHMS 10R0 = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED. IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



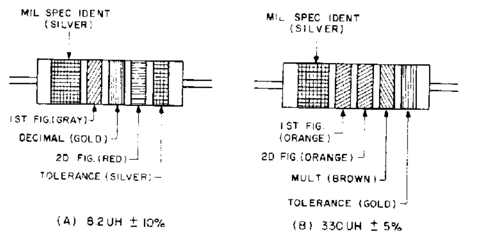
COMPOSITION-TYPE RESISTORS



FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD.

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED.

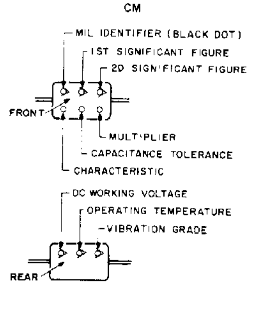
TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

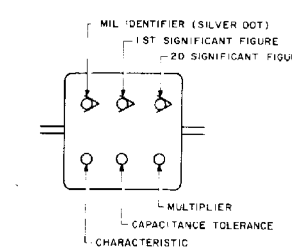
MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

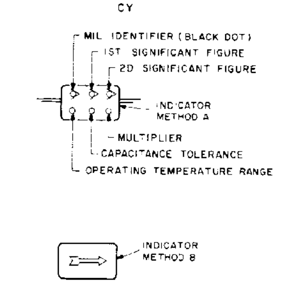
CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB.



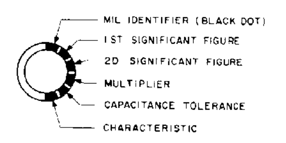
MICA-DIELECTRIC



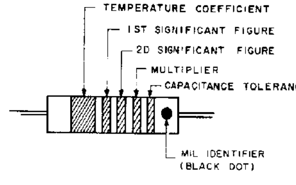
PAPER-DIELECTRIC



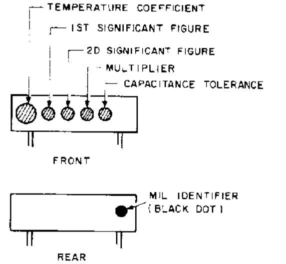
GLASS-DIELECTRIC, GLASS CASE



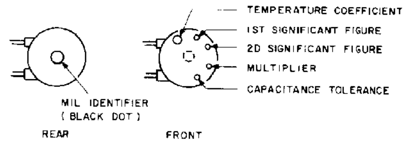
MICA, BUTTON TYPE



AXIAL LEAD



RADIAL LEAD



DISK-TYPE

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER	CAPACITANCE TOLERANCE CM	CN	CY	CB	CHARACTERISTIC CM	CN	CB	DC WORKING VOLTAGE CM	OPERATING TEMP. RANGE CY, CM	VIBRATION GRADE CM
BLACK	CM, CY, CB	0	0	1		±20%	±20%			A			−55° to +70°C	10-55 HZ
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				−55° to +85°C	
ORANGE		3	3	1,000		±30%			D		D	300		
YELLOW		4	4	10,000					E				−55° to +125°C	10-2,000 HZ
GREEN		5	5		±5%				F			500		
BLUE		6	6										−55° to +150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1			±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC

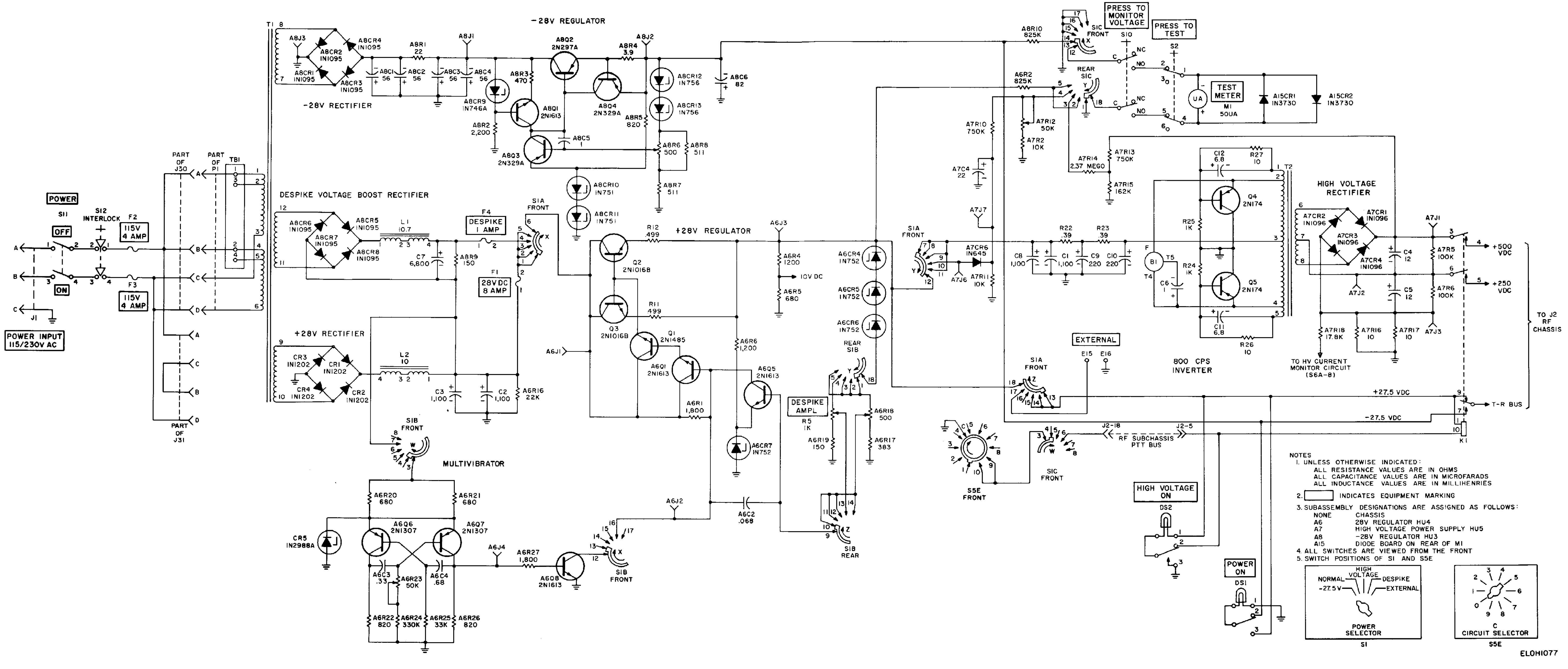
COLOR	TEMPERATURE COEFFICIENT 4	1ST SIG FIG	2D SIG FIG	MULTIPLIER 1	CAPACITANCE TOLERANCE: CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	MIL ID
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	−30	1	1	10	±1%		
RED	−80	2	2	100	±2%	±0.25 UUF	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		±5%	±0.5 UUF	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

1. THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF.
2. LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS: MIL-C-5, MIL-C-20D, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.
* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

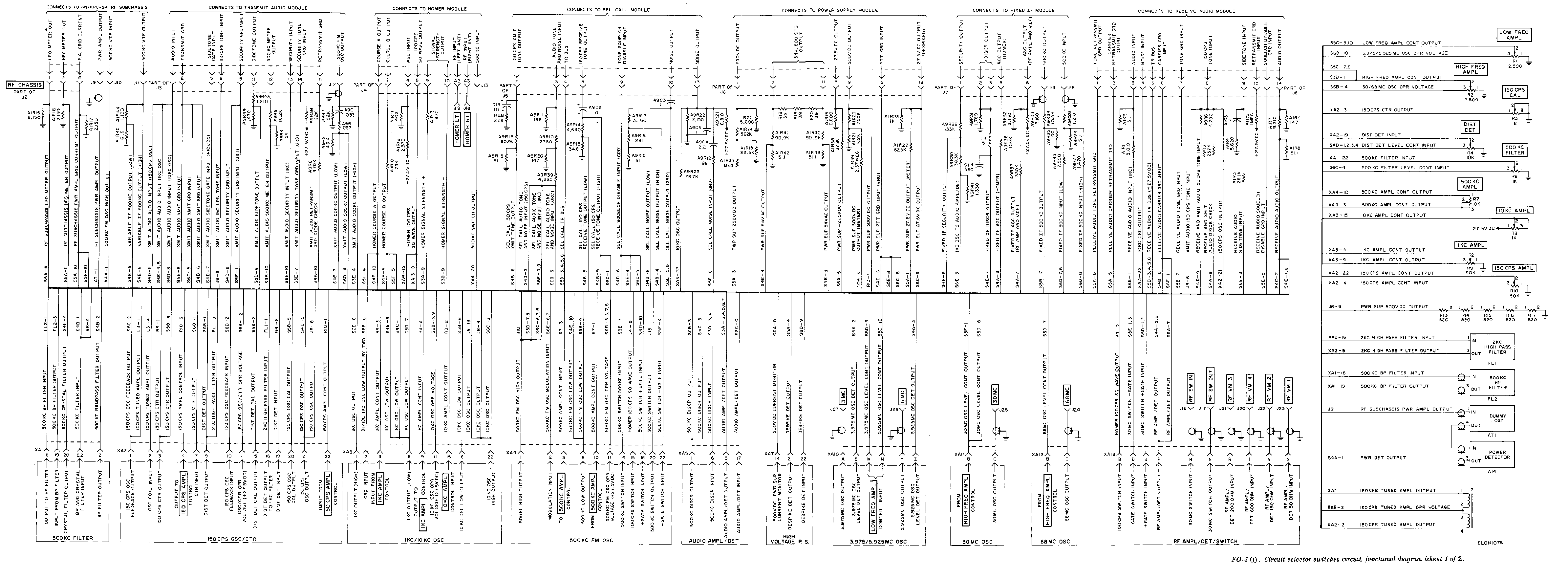
C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS.

ESC-FM 913-73

FO-1. Resistor and capacitor color code chart.

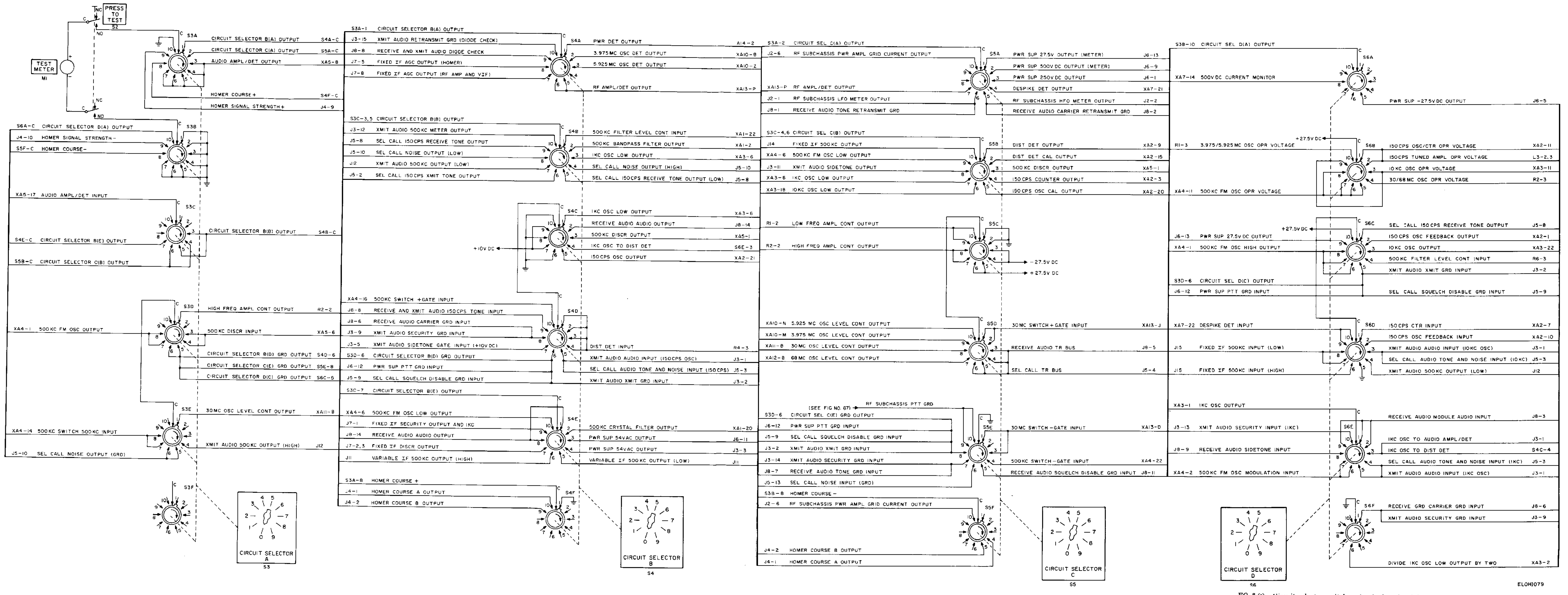


FO-2. Power supply circuits, simplified schematic diagram.

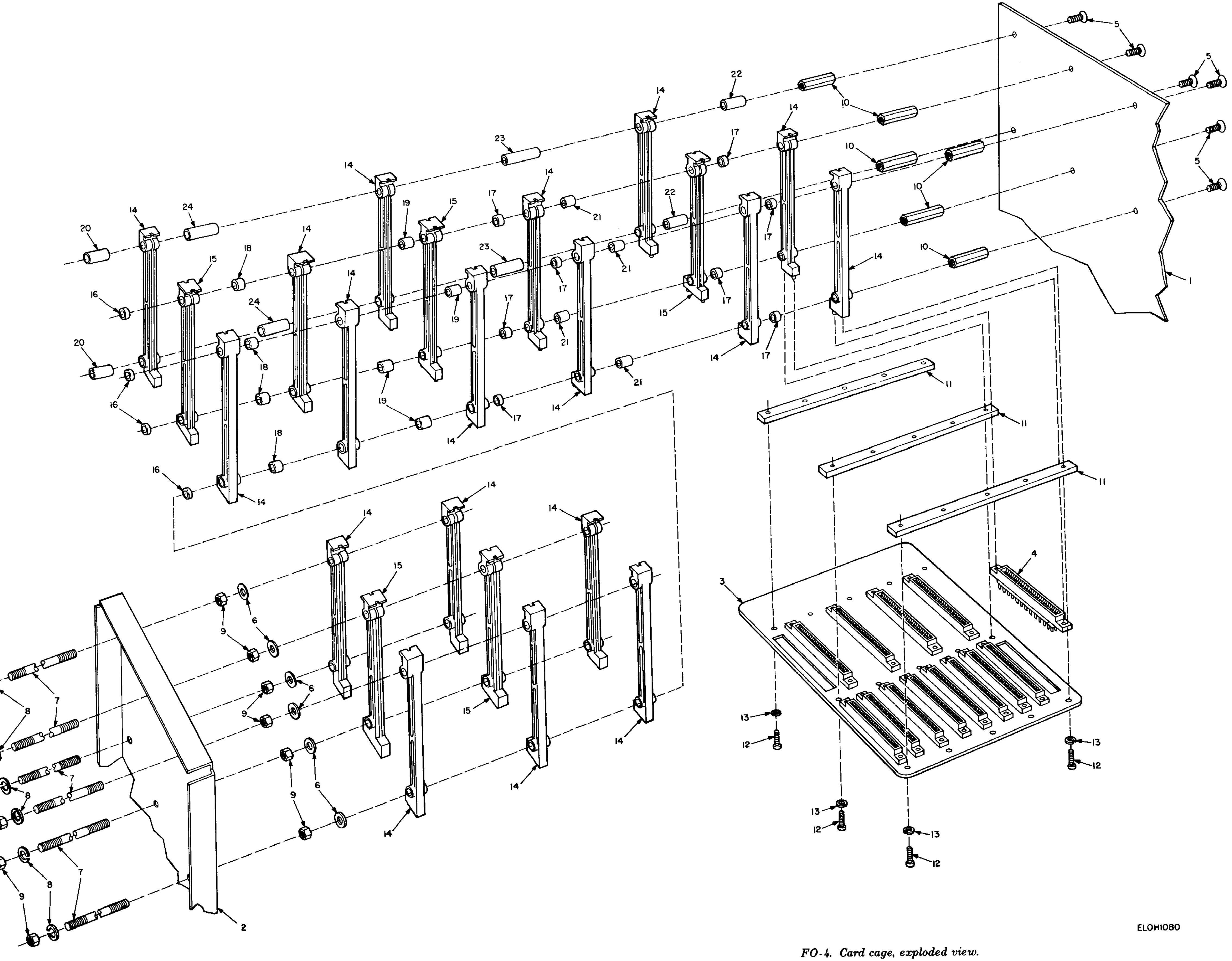


FO-3 (1). Circuit selector switches circuit, functional diagram (sheet 1 of 2).

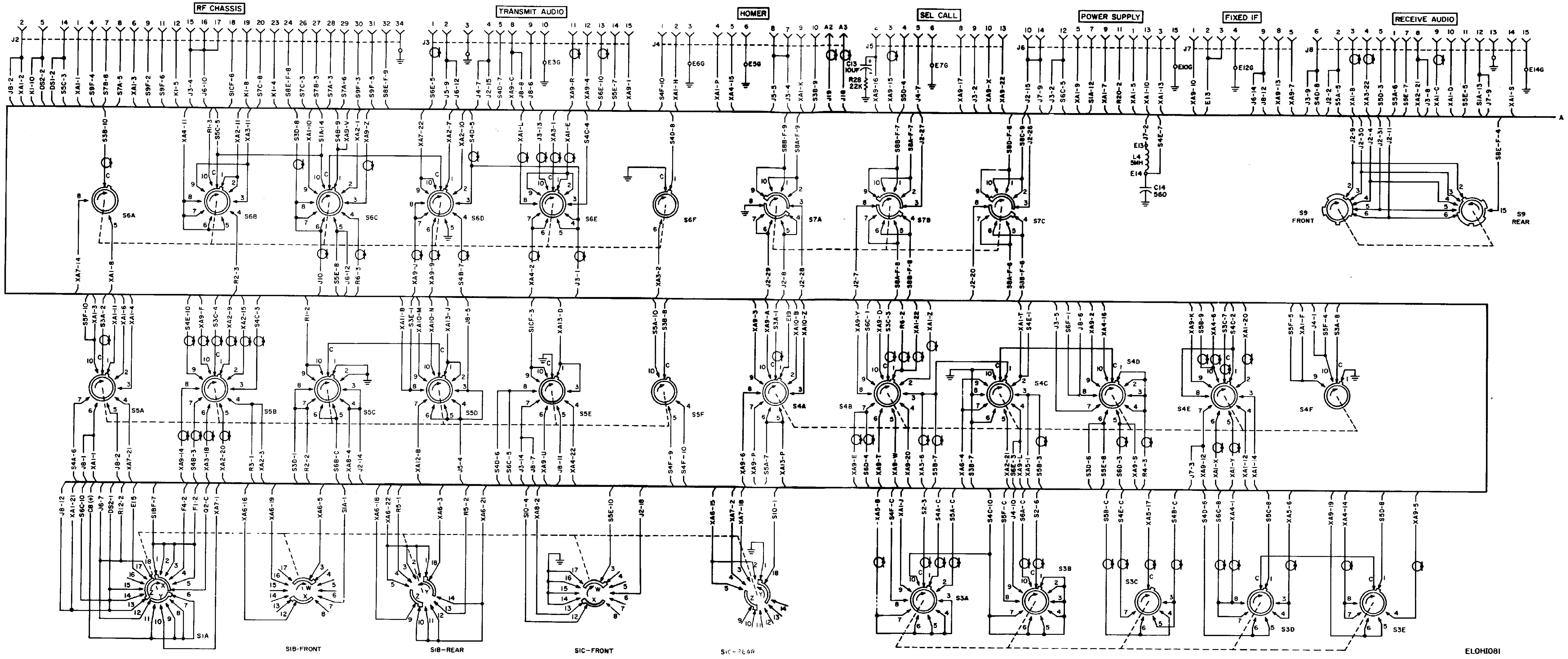
NOTES:
1. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS ALL INDUCTANCE VALUES ARE IN MILLIHENRIES
2. [box] INDICATES EQUIPMENT MARKING
3. ALL SWITCHES ARE VIEWED FROM THE FRONT



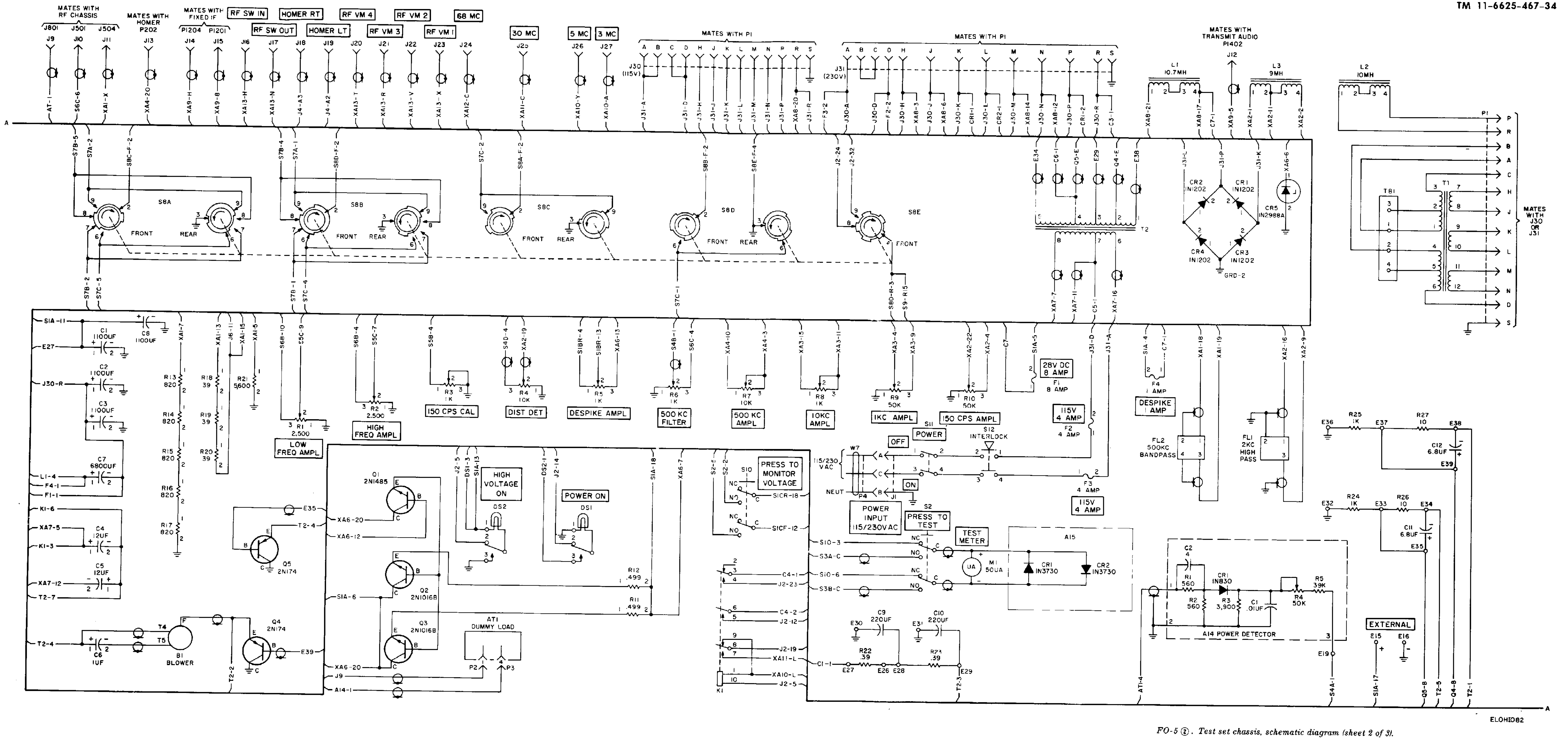
FO-3 (2). Circuit selector switches circuit, functional diagram (sheet 2 of 2).



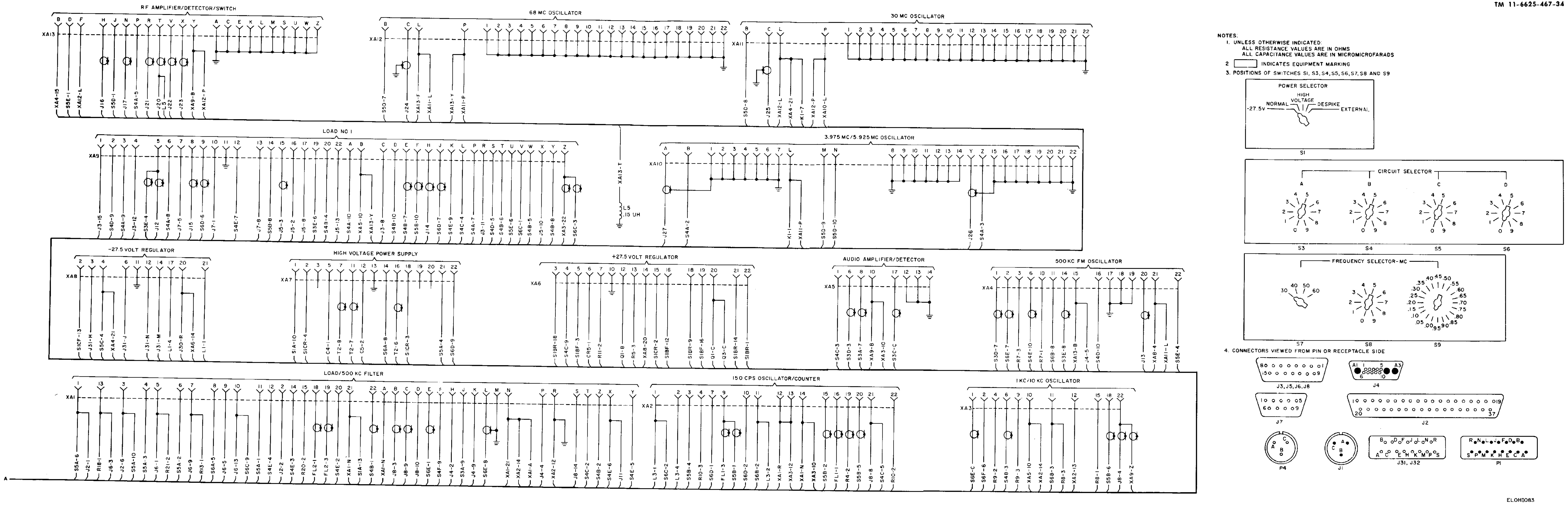
FO-4. Card cage, exploded view.



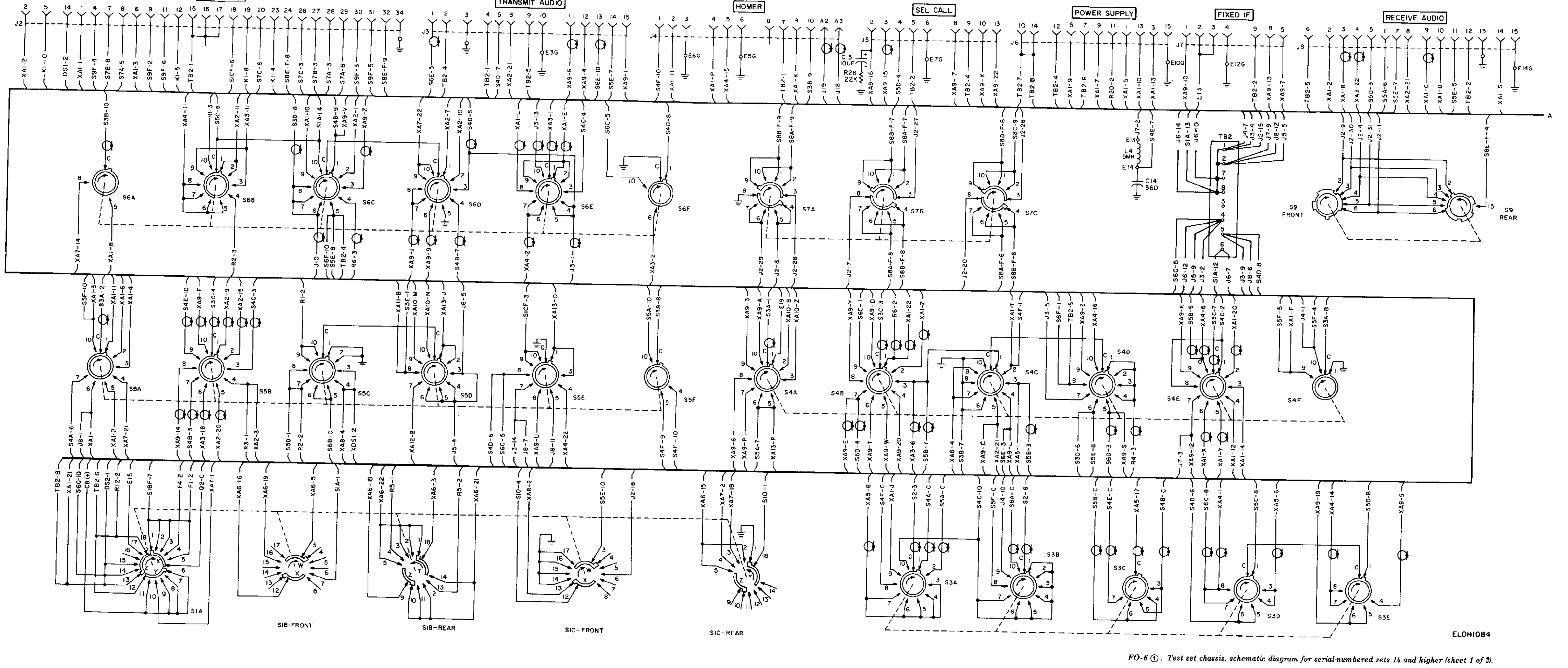
FO-5 ①. Test set chassis, schematic diagram (sheet 1 of 3).



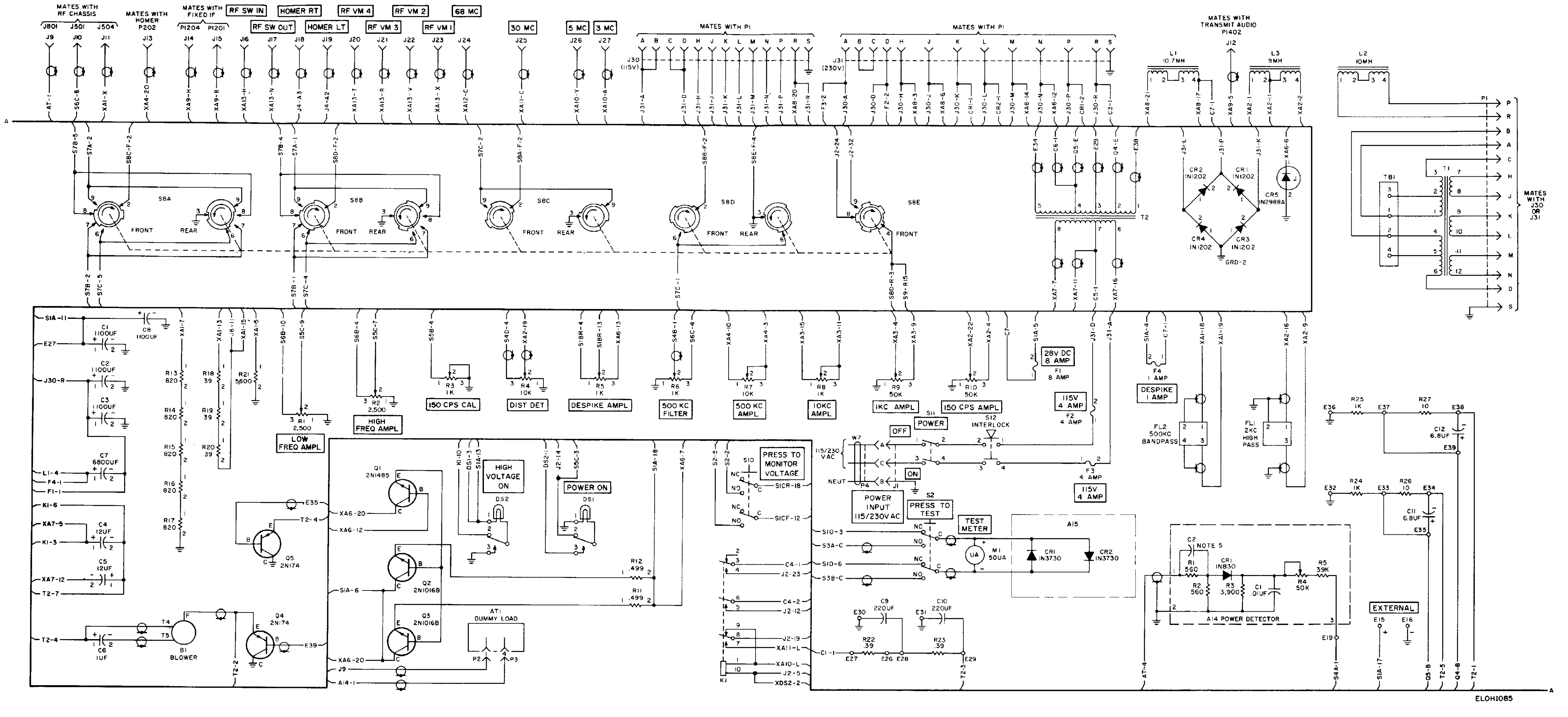
FO-5 (2). Test set chassis, schematic diagram (sheet 2 of 3).



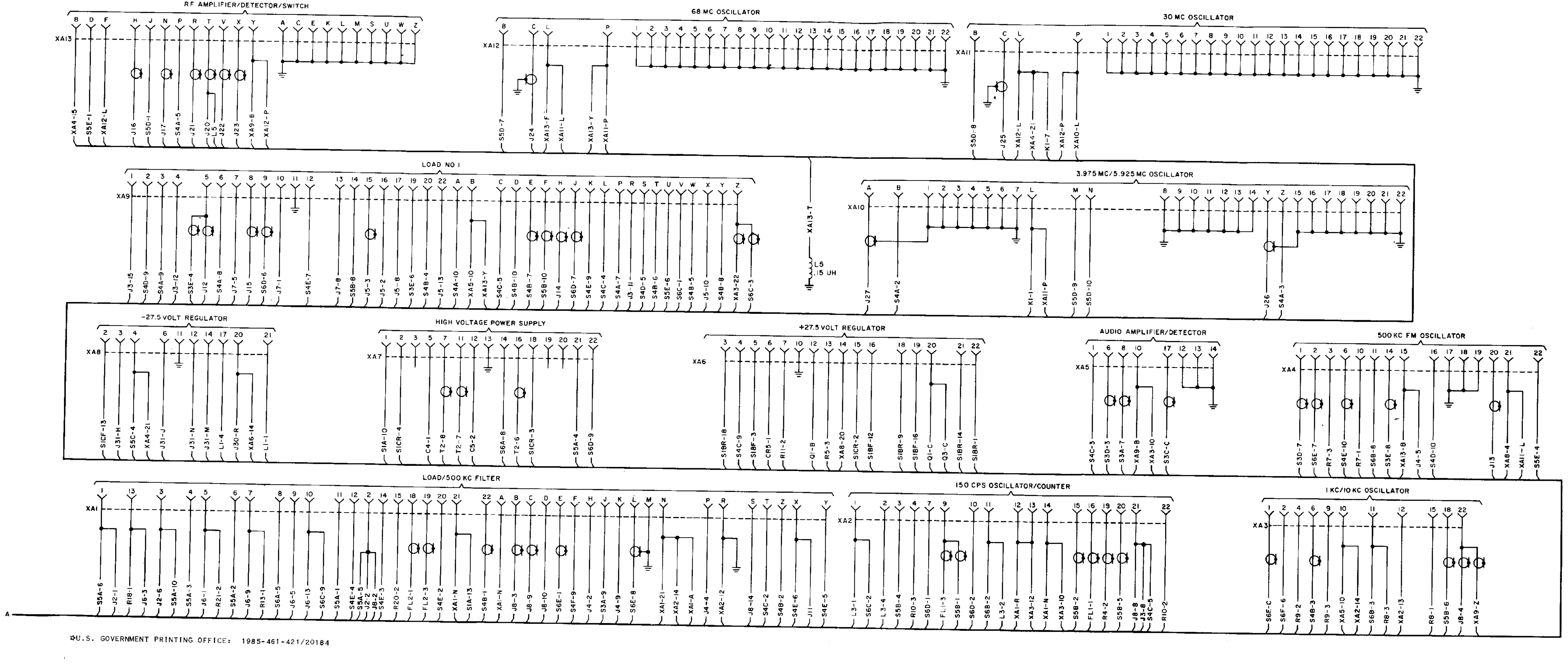
FO-5 (3). Test set chassis, schematic diagram (sheet 3 of 3).



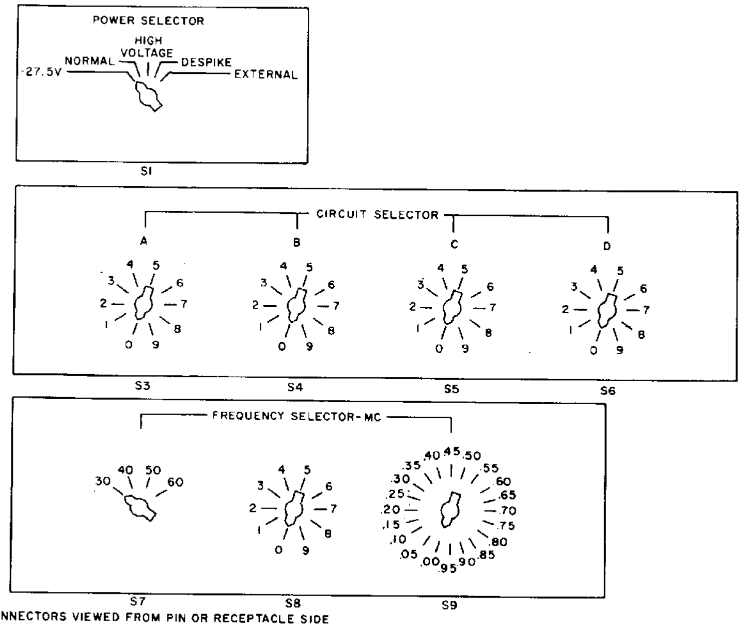
FO-6 ①. Test set chassis, schematic diagram for serial-numbered sets 14 and higher (sheet 1 of 3).



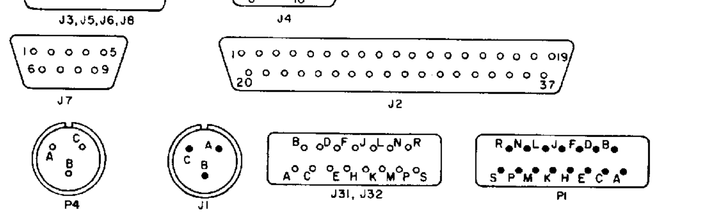
FO-6 ②. Test set chassis, schematic diagram for serial-numbered sets 14 and higher (sheet 2 of 3).



NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. [ ] INDICATES EQUIPMENT MARKING
3. POSITIONS OF SWITCHES S1, S3, S4, S5, S6, S7, S8 AND S9



4. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



5. IN SOME SETS A14C2 IS OMITTED; WHEN PRESENT THE VALUE IS 1, 1.5, 2, 3, 4, OR 5UUF AS FACTORY-SELECTED.

ELOH1086

FO-6 ③. Test set chassis, schematic diagram for serial-numbered sets 14 and higher (sheet 3 of 3).

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT PIN-POINT WHERE IT IS: PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure the the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE: SSG I. M. DeSpiritof

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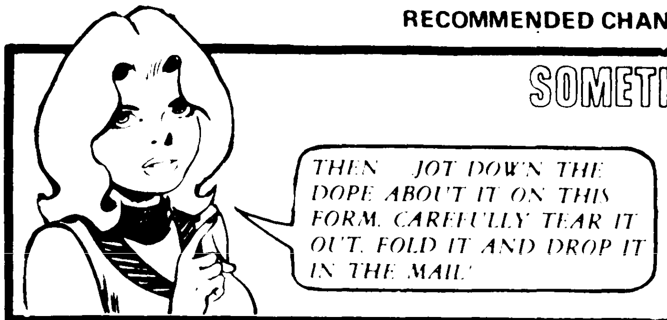

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-6625-467-34	16 Sep 81	Test Set, Electronic Circuit Plug-In Unit AN/ARM-87

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