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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

65c

DS, GS AND DEPOT MAINTENANCE MANUAL

RADIO SET AN/ARC-54



HEADQUARTERS, DEPARTMENT OF THE ARMY
NOVEMBER 1965

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT
DON'T TAKE CHANCES!

DANGEROUS VOLTAGES EXIST IN
RECEIVER-TRANSMITTER, RADIO RT–348/ARC–54

Be careful when working on the 500-volt circuits. Serious injury or death may result from contact with this voltage.

CAUTION

Do not make resistance measurements on the transistorized circuits of the RT–348/ARC–54 until after referring to paragraph 4–23.

TECHNICAL MANUAL
No. 11-5821-244-25

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *17 November 1965*

DS, GS, and Depot Maintenance Manual

RADIO SET AN/ARC-54

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***This manual supersedes TM 11-5821-244-35, 20 April 1964.**

CHAPTER 1

CIRCUIT FUNCTIONING

Section I. GENERAL PRINCIPLES OF RADIO SET AN/ARC-54

1-1. Scope

a. This manual contains instructions for direct support (DS), general support (GS), and depot maintenance for Radio Set AN/ARC-54 (radio set). It includes instructions appropriate to DS, GS, and depot support for troubleshooting, testing, aligning, and repairing the radio set. It also lists tools, materials, and test equipment for DS, GS, and depot maintenance. Detailed circuit functioning of the equipment is covered in the stage analysis section.

b. The direct reporting of errors, omissions, and recommendations for improving this manual by the individual user is authorized and encouraged. DA Form 2028 (Recommended changes to DA Publications) will be used for reporting these improvements. This form will be completed by the use of pencil, pen, or typewriter and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-(NMP)-MA, Fort Monmouth, N.J., 07703.

Note. For applicable forms and records, refer to TM 11-5821-244-12.

c. 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. DA Pam 310-4 is an index of current technical manuals, technical bulletins, supply manuals, supply catalogs, supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publication.

1-2. Set Applications

a. Radio Set AN/ARC-54 provides two-way voice communications between aircraft in flight and between aircraft and ground stations. The radio set is a double-conversion, superheterodyne, frequency-modulated (fm) receiver-transmitter with 800 crystal-controlled channels in the frequency range of 30 to 69.95 megacycles (mc). Channel separation is 50 kilocycles (kc). The radio set can be used as a standard fm receiver-transmitter operating with or without carrier squelch or with tone squelch. The radio set may also be used as a homing receiver or as a part of a retransmit (airborne radio relay) system. Operation of the radio set is entirely remote controlled. The operator has the choice of any of the 800 channels. Manual selection of any of the channels may be accomplished by the rotation of two selectors on Control, Radio Set C-3835/ARC-54 (control unit) until the desired frequency appears in the indicator window. A motor in Receiver-Transmitter, Radio RT-348/ARC-54 automatically tunes the radio set to the frequency setting on the control unit. The control unit also contains a volume control, a squelch mode selector, and an operation mode selector, which enables the operator to select the following functions: push-to-talk, retransmit, or homing.

b. The radio set provides right-left, flag alarm, and signal strength information when used with a homing antenna system and a homing indicator. The homing facilities of the radio set enable the pilot of an aircraft to fly direct to any transmitter operating on any of the 800 channels within the frequency range of 30 to 69.95 mc.

c. Two Radio Sets AN/ARC-54 may be connected as an unattended two-way relay station to allow two stations in the range of the aircraft, but beyond the operating range of each other, to communicate. The two radio sets that make up the relay station are tuned to different frequencies. The radio set first receiving the signal automatically couples the signal into the second radio set for relay to the other station.

1–3. Transmit Operation
(fig. 1–1)

Figure 1–1 is a simplified block diagram of Radio Set AN/ARC–54 and associated equipment required for operation as a communications receiver-transmitter or a homing receiver. The receiver and transmitter circuits are in Receiver-Transmitter, Radio RT–348/ARC–54. The homing antennas, microphone-headset, aircraft interphone, and homing indicator are not a part of the radio set but are additional equipment required for normal operation. When the push-to-talk switch is depressed, the audio signal generated by the microphone is routed to the receiver-transmitter unit through the aircraft interphone and Control, Radio Set C–3835/ARC–54. In the receiver-transmitter unit, the audio signal is amplified and applied to an fm modulator, which varies the frequency of a 500-kc oscillator in accordance with the incoming audio signal. The frequency-modulated output of the 500-kc oscillator is combined in a mixer with a signal from a low-frequency local oscillator to produce a first intermediate frequency (IF) signal. This signal is amplified and combined in a second mixer with a signal from a high-frequency local oscillator to produce a radiofrequency (RF) signal. The RF signal is then fed through the RF driver and power amplifier stages and a harmonic-suppression filter to the antenna coupler. The antenna coupler matches the impedance of the receiver-transmitter to Antenna AS–1703/AR.

1–4. Receiver-Operation
(fig. 1–1)

a. The frequency-modulated communications signal is intercepted by the communications (or homing) antenna and routed to Receiver-Transmitter, Radio RT–348/ARC–54 through the antenna coupler. In the receiver-transmitter unit, the fm signal is amplified and then mixed with a high-frequency local oscillator signal to produce a variable IF signal. This signal is amplified and combined with a second (low-frequency) local oscillator signal to produce a lower IF signal, which is further amplified in a selective (500 kc) amplifier, and detected to produce an audio signal. The audio signal is fed through the audio driver and power amplifier stages to Control, Radio Set C–3835/ARC–54. From the control unit, the audio signal is fed through the aircraft interphone to the headset-microphone.

b. An additional function of the radio set is the homing facility. The homing signal, which may be an fm signal or an unmodulated carrier signal

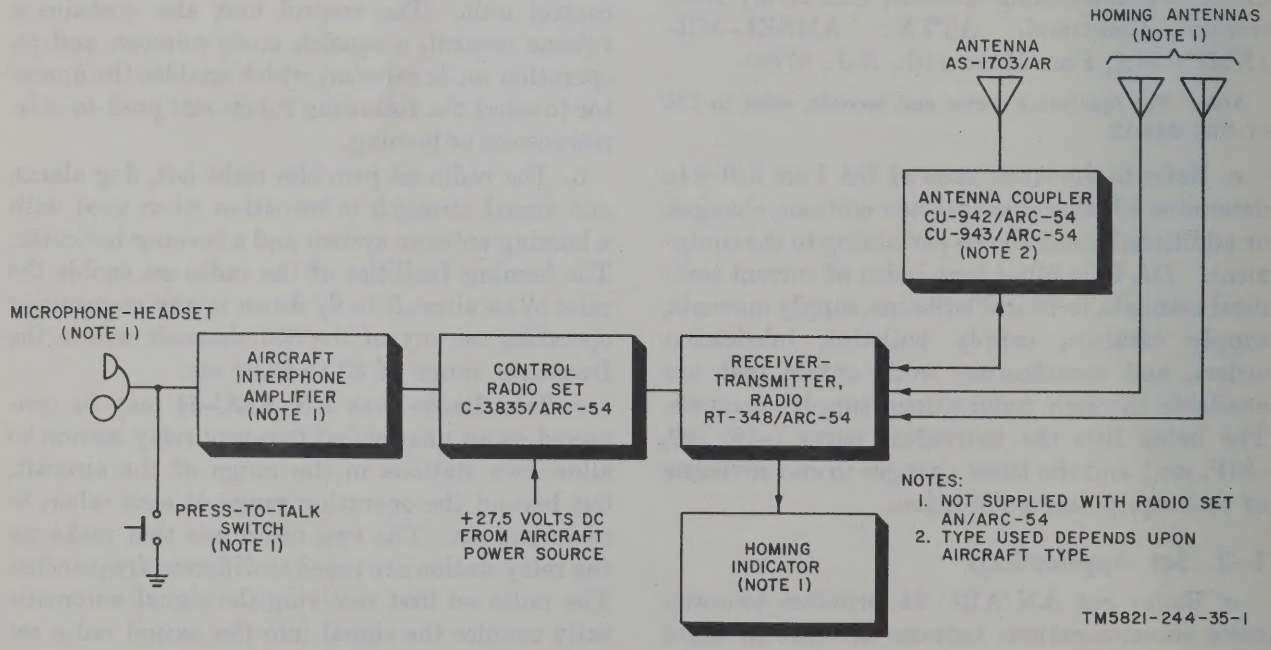


Figure 1–1. Radio Set AN/ARC–54, functional block diagram.

in the frequency range of the radio set, is intercepted by the homing antenna system and coupled to Receiver-Transmitter, Radio RT–348/ARC–54. The receiver-transmitter unit alternately samples the signal at each antenna and produces a polarized signal that is indicative of the aircraft heading in relation to the transmitting station. This signal is routed to the aircraft homing indicator. Normal fm communications are possible during homing operations.

Section II. BLOCK DIAGRAM ANALYSIS OF RECEIVER-TRANSMITTER, RADIO RT–348/ARC–54

1–5. Introduction

(fig. 6–2)

Receiver-Transmitter, Radio RT–348/ARC–54 receives and transmits frequency-modulated signals in the frequency range of 30 to 69.95 mc. The receiver-transmitter unit is a combination double-conversion superheterodyne receiver and transmitter. The tuning system, the local oscillators, and tuned RF and IF amplifiers are shared by the transmitter and receiver. The receiver-transmitter unit, when used with Control, Radio Set C–3835/ARC–54, Antenna AS–1703/AR, Antenna Coupler CU–942/ARC–54 (or CU–943/ARC–54), and a microphone-headset, provides two-way voice communications between aircraft in flight and between aircraft and ground stations. In addition to two-way voice communications, the receiver-transmitter unit contains additional circuits that provide homing and retransmit (radio relay) operations. Figure 6–2 is a block diagram of the receiver-transmitter unit arranged in relation to the actual signal paths through the unit. For simplicity, the modular plug-in units are broken down into stages. Solid lines in the figure represent the signal path during receiver operations, the long dashed lines represent the signal path for transmit operations, and the long and short dashed lines represent the homing signal path. For complete circuit details, refer to the schematic diagrams. The transmit, receive, and homing signal paths are described on a block-diagram level in paragraphs 1–6, 1–7, and 1–8. The retransmit signal path is described in paragraphs 1–92 and 1–93. A detailed stage analysis for the receiver-transmitter unit is given in paragraphs 1–9 through 1–63.

1–6. Transmitting Signal Path

(fig. 6–2)

a. The push-to-talk switch on the operator's microphone (not shown on block diagram) controls the relay and switching circuits that select, receive or transmit operation. When the operator presses the push-to-talk switch, diode switches connect the high- and low-frequency oscillator signals to the transmitter mixer stages. Antenna relay K1002 connects the communications antenna to the reflectometer circuit at the output of the transmitter. The audio signal enters the receiver-transmitter unit at the audio input terminals and passes through an audio preemphasis network to audio amplifier Q1401. The audio preemphasis network is a high-pass filter that improves the signal-to-noise ratio of the higher audio signals to permit reception of these signals without excessive noise. (A part of the audio signal from the preemphasis network also passes through sidetone switch CR1403 to audio driver amplifier Q1304 for sidetone amplification.) Audio amplifiers Q1401 and Q1402 raise the audio signal voltage to a level suitable for driving the fm modulator-oscillator C1415, Q1403. Without an audio signal, the oscillator produces a constant 500-kc signal. The audiofrequency (AF) voltage impressed across the variable capacitance diode in the frequency control circuit of the oscillator changes the frequency of the oscillator at a rate equal to the frequency of the audio signal. The magnitude of this frequency change is proportional to the amplitude of the audio signal. The fm signal is then coupled to mixer/amplifier Q501, which combines the 500-kc fm signal with the signal from low-frequency oscillator Q401. The mechanical drive assembly selects the operating frequency of the low-frequency oscillator (lfo) by inserting 1 of 20 crystals into the oscillator. The oscillator provides 20 injection signals within the frequency range of 4.475 to 5.425 mc. These injection signals pass through the low-frequency oscillator diode switch to the mixer/amplifier. The resulting mixer output, a variable IF signal in the frequency range of 3.975 to 5.925 mc, passes through variable IF amplifier Q502 to transmitter mixer Q604. The mixer combines the variable IF signal with the injection sig-

nal from crystal-controlled high-frequency oscillator Q301. The high-frequency oscillator (hfo) produces 20 frequencies within the frequency range of 26.025 and 64.025 mc. These injection signals pass through the high-frequency oscillator diode switch to the mixer. (In transmit operation, the hfo diode switch connects the output of the hfo to transmitter mixer Q604; in receive operation, the hfo switch connects the hfo to receiver mixer Q605.) The resulting mixer output, within the frequency range of 30 to 69.95 mc, passes through three rf amplifier stages, Q601, Q602, and Q603, two vacuum-tube amplifiers (voltage amplifier V801 and driver amplifier V802) and a power amplifier (V803) to the harmonic filter. The filter attenuates harmonics of the fundamental frequency. The filtered RF signal passes through the reflectometer circuit and energized antenna relay, K1002, to the communications antenna output terminal. The reflectometer circuit samples and detects forward and reflected energy on the radio set transmission lines and applies this energy sample to the TEST METER (not shown), on the front panel of the receiver-transmitter unit, to indicate the transmitting efficiency of the radio set and antenna system.

b. The sidetone control rectifier, CR1603 and CR1604, rectifies a portion of the RF signal from power amplifier V803 and supplies the resulting direct-current (dc) level to sidetone switch CR-1403. This dc level biases the sidetone switch to allow the audio signal from the audio preemphasis network to pass through audio driver amplifier Q1304 and audio power amplifier Q1305 and Q1306 to the audio output terminal of the receiver-transmitter unit.

c. The selective calling circuits allow selected radio sets to participate in group communications. When the push-to-talk switch is depressed, tone generator/selective amplifier Q102, Q103 operates as a 150 cycle-per-second (cps) oscillator. The tone is then applied to the modulator portion of fm modulator-oscillator C1415, Q1403, where it modulates the 500-kc oscillator signal in addition to the normal audio modulating signal from the preemphasis network. If another radio is operating in TONE squelch mode, it will receive only signals containing the 150-cps modulation.

d. When the radio set is used with an external security device, the encoded transmit signal from the security device goes directly to the modulator portion of fm modulator-oscillator C1415, Q1403 instead of passing through the normal signal path. The encoded signal frequency modulates the 500-kc oscillator. The remainder of the signal path is identical with the normal transmit signal path described in *a* through *c* above. During security operations, the sidetone is provided by the security device and the output of tone amplifier Q104 is grounded out.

e. Two frequency selector knobs on the control unit select the operating frequency of the receiver-transmitter unit. The whole-megacycle selector knob selects frequencies from 30 to 69 mc in 1-mc steps, the decimal-megacycle selector knob selects frequencies from 0.00 to 0.95 mc in 0.05-mc steps. The mechanical tuning system automatically inserts the proper crystals in the high- and low-frequency oscillator circuits and tunes the tank circuits in the variable IF, RF, and power amplifier stages to correspond to the frequency selected on the control unit.

f. The power supply provides operating voltages for both the transmit and receive circuits. It consists of the following stages: despiking circuit Q1501, Q1504, 54-volt AC inverter Q1502, Q1503, the −27.5-volt dc power supply, and the high-voltage power supply (+250 volts DC and +500 volts DC). Despiking circuit Q1501, Q1504 removes positive spikes from the primary dc power supply to provide filtered +27.5 volts dc for transmitter and receiver stages and chassis-mounted components. The 54-volt inverter uses the +27.5-volts from the despiking network to produce a 54-volt, 800 cps ac voltage. During channel-changing operations, the mechanical drive assembly connects this 800-cps signal to audio driver amplifier Q1304 to provide a channel-changing tone to the radio set operator. The high-voltage power supply steps up and rectifies the alternating-current (ac) voltage from the 54-volt inverter to produce plate and screen voltages (+250 and +500 volts dc) for the three vacuum-tube RF power amplifier stages, V801, V802, and V803. The −27.5-volt dc power supply rectifies the 54 volts ac to develop the −27.5 volts dc, which is used to bias the diode switches and the vacuum-tube amplifiers.

1-7. Receiving Signal Path

(fig. 6-2)

a. The receiver circuits in Receiver-Transmitter, Radio RT-348/ARC-54 are activated when the push-to-talk switch is not depressed. The RF signal, in the frequency range of 30 to 69.95 mc, enters the receiver-transmitter unit at the communications antenna input terminal, passes through antenna relay K1002, communications homing relay K202, and RF amplifiers Q601, Q602, and Q603, to receive mixer Q605. (Relay K202 connects the input terminal RF amplifier Q601 to either the communications antenna relay K1002 or to the homer switch, depending on the mode of operation.) The receiver mixer, Q605, combines the RF signal with the 26.025- to 64.025-mc injection signal from the crystal-controlled hfo, Q301, to produce a variable IF signal in the range of 3.975 to 5.925 mc. The hfo signal passes through the hfo diode switch to the receiver mixer. The resultant mixer output passes through mixer/amplifier Q501, which operates as an amplifier in receive operation, and variable IF amplifier Q502 to receiver mixer Q503. This mixer combines the variable IF signal with the 4.475- to 5.425-mc signal from the lfo, Q401, to produce a fixed IF signal of 500 kc. The lfo signal is applied to the receiver mixer through the lfo diode switch. The 500-kc IF signal from the receiver mixer passes through bandpass filter FL1201 and four fixed IF amplifiers, Q1201, Q1202, Q1203, and Q1204, to limiter Q1205. The bandpass filter provides good selectivity characteristics for the following amplifier stages. Limiter Q1205 is basically an amplifier designed so that, at a certain level, a further increase in input signal produces no change in the amplitude of the output signal. This removes amplitude variations from the IF signal, thereby insuring a signal of constant amplitude free of noise and amplitude-modulated (am) interference. Since the fm discriminator responds only to frequency variations, the intelligence contained in the modulation is not affected. Although the limiter provides some amplification, its main purpose is to limit the amplitude variations caused by signal fading and noise. Fm discriminator diodes CR1204 and CR1205 detect the audio signal and apply it to audio preamplifier Q1301. (Sel-call preamplifier Q101 also receives a portion of the audio signal and uses it to develop the squelch signal.) The audio preamplifier increases the level of the audio signal and applies it to audio gate Q1302, Q1303. The audio gate is a switching circuit that either blocks or passes the audio signal, depending upon the squelch action. Audio driver amplifier Q1304 and audio power amplifiers Q1305 and Q1306 amplify the audio signal to provide satisfactory sound volume.

b. Automatic gain control (agc) in the receiver-transmitter unit provides a uniform output from a signal of varying strength. The agc circuit controls the gain in several IF and RF amplifier stages preceding the fm discriminator. Agc detector CR1201 receives the IF signal from fiixed IF amplifier Q1204 and develops a dc voltage that varies with the strength of the incoming signal. Agc amplifiers Q1209, Q1206, and Q1210 amplify the detector output voltage and provide a gain-adjusting bias voltage to variable IF amplifier Q502, fixed IF amplifiers Q1201, Q1202, and Q1203, and RF amplifiers Q601 and Q602.

c. The receiver-transmitter unit contains a squelch circuit, which removes the background noise from the receiver audio output when no signal is present. The squelch circuits block the audio output from the receiver-transmitter unit when no signal is present, but allows the receiver-transmitter unit to operate normally when a signal is present. The receiver-transmitter unit also contains a tone-operated squelch circuit that allows messages to be received only when a 150-cps audio tone is present.

(1) In normal carrier squelch operation, sel-call preamplifier Q101 receives the noise and audio signals from the fm discriminator, amplifies the signals, and applies them to noise amplifier Q105 through a high-pass circuit (not shown in fig. 1-2) that presents a high impedance to signals in the speech range. Noise amplifiers Q105, Q106, and Q107 amplify the noise voltage and apply it to the voltage tripler. The voltage tripler simultaneously multiplies and rectifies the signal and applies it to audio gate Q1302, Q1303 for use as a control voltage. With no RF signal present, audio background noise to the noise amplifier is applied to the voltage tripler circuit, the output of which closes

the audio gate to prevent the signal from reaching the output of the receiver-transmitter unit. In the presence of an RF carrier, audio background noise is reduced by agc action, causing insufficient noise voltage to be applied to the voltage tripler, thus opening the audio gate and connecting the audio signal from the fm discriminator to the audio driver amplifier Q1304.

(2) In tone-squelch operation, sel-call preamplifier Q101 receives the audio, tone, and noise signals from the fm discriminator, amplifies the signals, and applies them to tone generator/selective amplifier Q102, Q103. In the receive condition, this dual-purpose stage operates as a selective amplifier. It amplifies the 150-cps component of the received signal and applies it to tone amplifier Q104 while rejecting other signal components. Tone amplifier Q104 amplifies the signal and applies it to the voltage tripler which detects and multiplies the signal and applies a dc voltage to audio gate Q1302, Q1303, which opens the gate, thereby allowing the audio signal to pass. When the radio set is operating in the tone-squelch mode and when the 150-cps tone is not present in the fm discriminator output, the audio gate is closed, thereby allowing no audio signal to pass through to the audio driver amplifier stage.

d. When the radio set is used with an external security device, security amplifiers Q1207 and Q1208 amplify the detected, encoded signal from the fm discriminator and apply it to the external security device for decoding. The decoded signal returns to the receiver-transmitter unit and enters audio driver amplifier Q1304. Audio driver amplifier Q1304 and audio power amplifiers Q1305 and Q1306 amplify the signal and apply it to the audio output terminal of the receiver-transmitter unit.

1–8. Homing Signal Path

(fig. 6–2)

a. Homing operation is available on any of the 800 channels in the frequency range of 30.00 to 69.95 mc. The homing circuit provides information to the aircraft homing indicator concerning the heading of the aircraft with respect to a transmitting station. A controlled-pattern antenna system intercepts the homing signal. The homer switch alternately samples the signal from first one and then the other antenna at a 100-cps rate. The resultant signal has two components. When the aircraft heading is aligned with the transmitting station, these signal components have the same signal strength. However, when the aircraft heading is to either side of the transmitting station, the strength of one component increases and the strength of the other component decreases. The composite homing signal passes through relay K202 to RF amplifier Q601. The homing signal path is identical with the receive signal path from RF amplifier Q601 through fixed IF amplifier Q1203. The signal then takes a separate path as indicated by the combination dashed and dotted lines in the block diagram.

b. The 500-kc homing amplifier, Q204, amplifies the signal from fixed IF amplifier Q1203 and applies it to homing detector CR205 and CR206, which is sensitive only to amplitude variations. The 100-cps homing amplifier, Q205, amplifies the detected signal and applies it to contacts of mechanical chopper K201, which switches the signal between two homing output terminals at a 100-cps rate. The 100-cps oscillator, Q201, Q206, drives both the homer switch and mechanical chopper. The switching action of the two circuits is synchronized so that the sampled signal from one antenna is always applied to one output terminal and the signal from the other antenna is applied to the other output terminal. The aircraft homing indicator uses these signals to provide a visual indication of the aircraft heading relative to the homing station. If the two signals have the same strength, the homing indicator indicates that the aircraft is on course. If one signal has greater amplitude than the other, the homing indicator indicates the direction in which the aircraft must fly to assume an on-course heading.

c. Homing signal-strength amplifier Q203 amplifies the agc voltage and applies it to the aircraft homing indicator to provide a visual indication of relative signal strength.

d. The squelch circuit supplies a flag alarm ground to the homing indicator. When the audio

gate, Q1302, Q1303, opens, it supplies a dc signal to retransmit switch Q1307 which energizes relay K1301 (not shown). When energized, this relay supplies a ground to the homing indicator to drop the flags. When the relay is deenergized, the alarm flags raise, indicating that the homing signal is too weak to provide proper homing information to the homing indicator.

Section III. STAGE ANALYSIS FOR RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54

1-9. General

The following paragraphs provide a stage-by-stage detailed analysis of the receiver-transmitter unit circuits. The paragraphs are arranged so that the stages are discussed in the order of signal flow when the radio set is in transmit mode. Stages that have no particular position with respect to the transmit signal flow pattern and stages that perform special functions, not part of normal transmit operation, are presented after stages in the direct path of signal flow. Some stages are active in both transmit and receive conditions and are discussed in transmit-signal-flow order. Some stages have dual purpose; that is, they perform one function in transmit mode and another function in receive mode. These are presented in transmit-signal-flow-order and their transmit and receive functions are discussed separately.

1-10. Audio Preemphasis Circuit

(fig. 1-2)

The preemphasis circuit boosts audio response at the higher audiofrequencies so that random noise will not dominate that portion of the spectrum. The preemphasis circuit consists of resistors R1401 through R1405 and capacitor C1401. The preemphasis circuit is used by connecting jumper A. When jumper A is connected, capacitor C1401 and resistors R1403 and R1405 form a high-pass filter, which couples high audiofrequencies to transformer T1401 more readily then low frequencies. The lowest frequency at which preemphasis begins is determined by the value of resistor R1403, and the high end of preemphasis is determined by the value of resistor R1405. When preemphasis is not used, jumper A is disconnected and jumper B is connected. Jumper B connects resistor R1404 into the input circuit to simulate the load presented by capacitor C1401 when preemphasis is used. Potentiometer R1402 adjusts the amplitude of audio input. Resistor R1401 assures the required minimum audio input level.

1-11. Audio Amplifiers Q1401 and Q1402

(fig. 1-2)

The audio signal from the preemphasis circuit is coupled through transformer T1401 and coupling capacitor C1402 to the base of transistor Q1401. Transistor Q1401 provides audio amplification. Base bias for Q1401 is supplied through voltage divider comprising resistors R1406 and R1407. Emitter swamping resistors R1409 and R1410 are bypassed by capacitors C1404 and C1405 to provide selective degeneration (low frequencies are degenerated more than high frequencies). Resistor R1408 is the collector-load resistor. The amplified audio signal is coupled from the collector of Q1401, through coupling capacitor C1406 to the base of second audio amplifier transistor Q1402. Base bias for Q1402 is supplied through the voltage divider comprising resistors R1418 and R1419. Resistors R1416 and R1417 are emitter swamping resistors. Resistor R1416 is bypassed by capacitor C1408 to minimize degeneration. Some degeneration is allowed by unbypassed resistor R1417 to provide gain stability. Resistor R1423 is the collector-load resistor for Q1402. The amplified audio is coupled from the collector of Q1402, through coupling capacitor C1424, to the fm modulator-oscillator circuit.

1-12. Sidetone Switch

(fig. 1-2)

A sample of the audio signal from the preemphasis circuit is coupled from the secondary winding (terminals 5 and 6) of transformer T1401 and used as sidetone audio. The signal is coupled through coupling capacitor C1403 to the cathode end of diode switch CR1403. Diode CR1403 is

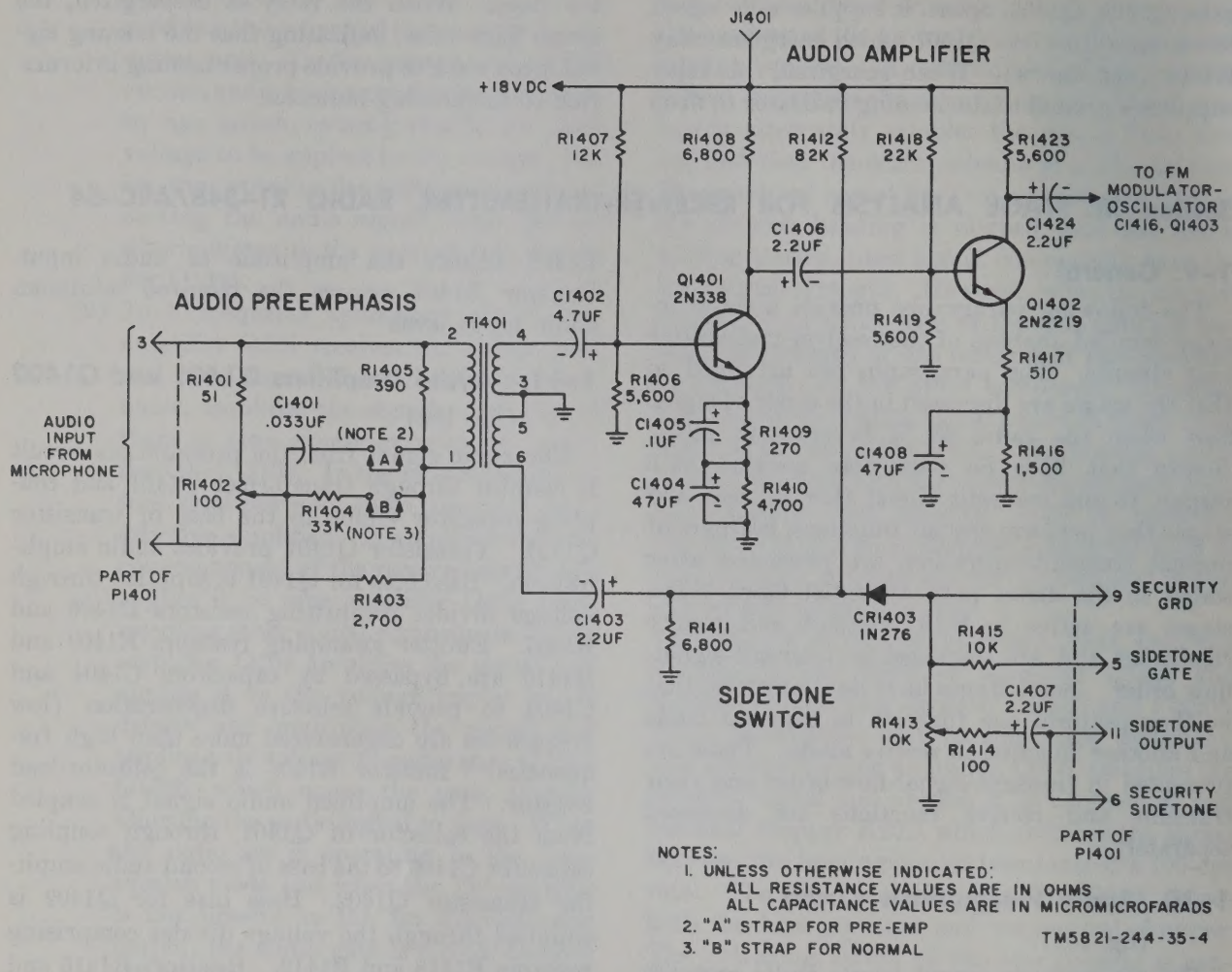


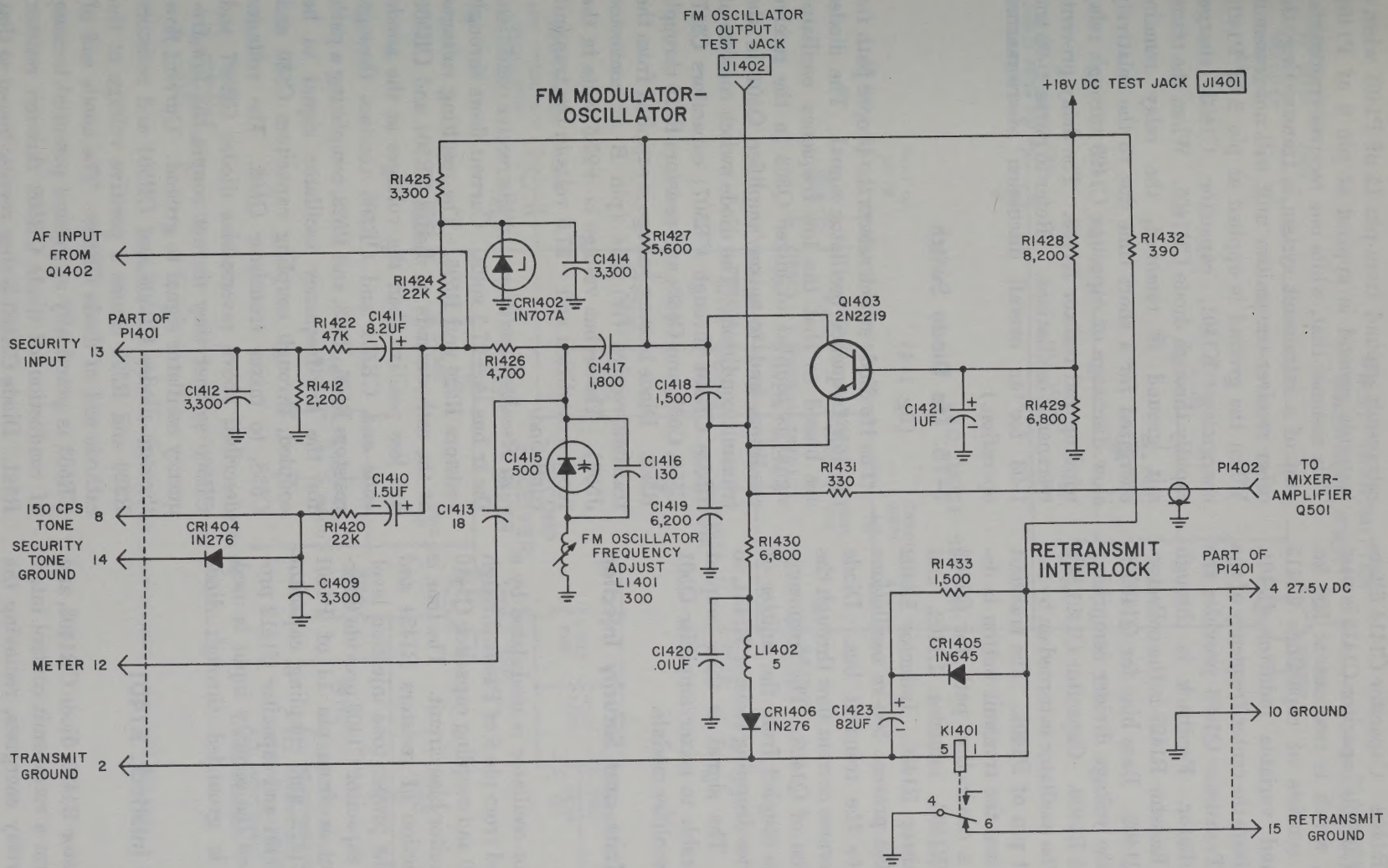
Figure 1–2. Audio preemphasis and amplifier circuits, schematic diagram.

normally reversed biased by the voltage divider consisting of resistors R1411 and R1412. When the transmitter is keyed, a portion of the carrier signal is rectified, in the harmonic filter module, to provide a positive dc potential at pin 5 of the transmit audio module. This voltage is called the sidetone gate bacuse it causes current flow through resistors R1413 and R1415, forward-biasing diode switch CR1403. With CR1403 conducting, the audio sidetone signal is coupled through CR1403 and developed across resistor R1413. The audio sidetone signal is coupled out through the wiper arm of R1413, fixed resistor R1414, and coupling capacitor C1407 to pin 11 of transmit audio module connector P1401. Resistor R1413 adjusts the level of the sidetone signal and resistor R1414 prevents overloading of transformer T1401.

1–13. Fm Modulator-Oscillator C1415, Q1403

(fig. 1–3)

The amplified audio signal from Q1402 is coupled, through coupling capacitor C1424 (fig. 1–2) and series dropping resistor R1426, to the fm modulator-oscillator circuit. The fm modulator-oscillator converts the amplitude-modulated signal to a 500-kc signal, which is frequency modulated at the frequency of the audio signal. Capacitor C1415 is a voltage-variable silicon capacitor, which functions as a modulator. The capacitance of C1415 varies inversely by a factor of the voltage applied. Variable capacitor C1415 is reverse biased from the voltage-divider regulator consisting of resistors R1424 and R1425



NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. [ ] INDICATES EQUIPMENT MARKING

TM5821-244-35-5

Figure 1–3. Fm modulator-oscillator and retransmit interlock circuits, schematic diagram.

and Zener diode CR1402. Capacitor C1414 filters the bias supply. Variable capacitor C1415 is part of a tank circuit, which is resonant at 500 kc. The tank circuit consists of capacitors C1415 through C1419 and variable inductor L1401. Inductor L1401 adjusts the center frequency of the tank to 500 kc. Transistor Q1403 provides the gain for the oscillator. Feedback is through capacitor C1418. Resistor R1427 is the collector-load resistor for Q1403. Base bias for Q1403 is supplied through the voltage divider comprising resistors R1428 and R1429. Capacitor C1421 is a filter capacitor. The oscillator is turned on by the transmit ground at pin of P1401. The transmit ground, applied when the transmit button is depressed, provides a conduction path for Q1403 through diode CR1406, inductor L1402, and emitter-biasing resistor R1430. Inductor L1402 and capacitor C1420 prevent 500-kc oscillations from coupling into the transmit bus. Diode CR1406 prevents reverse current flow through the emitter-base junction of Q1403. The frequency-modulated signal is coupled from the emitter of Q1403, through series dropping resistor R1431, to connector P1402. The signal is then coupled through a coaxial cable to mixer/amplifier Q501 in the variable IF amplifier module.

1–14. 150-Cps Tone and Security Injection Circuit

(fig. 1–3)

The fm modulator-oscillator is modulated by a 150-cps tone, coupled from pin 8 of P1401 through series resistor R1420 and coupling capacitor C1410 to the variable capacitor bias circuit. The tone is applied at the junction of resistors R1424 and R1426 to provide the proper tone injection level. Resistor R1420 and capacitor C1409 provide filtering. Security input is from pin 13 of P1401 through resistor R1422 and coupling capacitor C1411. Resistor R1421 and capacitor C1412 provide filtering. When the security input is used, the 150-cps tone is grounded through diode CR1404.

1–15. Retransmit Interlock, K1401

(fig. 1–3)

Relay K1401, resistor R1433, diode CR1405, and capacitor C1423 form a retransmit control interlock circuit. The relay energizes, removing the retransmit ground from pin 15 of P1401 when a transmit ground is applied at pin 2 of P1401. This assumes that, while one receiver-transmitter unit of a retransmit system is transmitting, the other receiver-transmitter unit will not transmit. When the ground is applied at pin 2 of P1401, energizing K1401, capacitor C1423 charges rapidly through diode CR1405. When the transmit ground is removed, the relay remains energized for a short time due to the relatively slow discharge of capacitor C1423 through relay winding and resistor R1433. The delay prevents retransmit oscillations. (Refer to paras. 1–92 and 1–93 for an overall discussion of retransmit operation.)

1–16. Lfo Diode Switch

(fig. 1–4)

The lfo diode switch selects the proper path for the low-frequency oscillator signal. The diodes are biased so that the low-frequency oscillator signal is coupled to mixer Q503 in the receive condition, and to mixer/amplifier Q501 in the transmit condition. The diode switch consists of diodes CR501 through CR507; capacitors C517, C536, C537, and C539; and resistors R519 through R526. Diode biasing voltage is supplied from the transmit-receive (tr) bus (pin B of connector J506). The tr bus voltage is +27.5 volts in the receive condition and −27.5 volts in the transmit condition.

a. Receive Condition. In the receive condition, the tr bus is +27.5 volts. Current flows through resistors R526 and R525. The resulting voltages at the cathode ends of diodes CR504 and CR506 are less positive than the voltages at the anode ends and CR504 and CR506 conduct through resistors R526, R523, and R522, completing a path for the low-frequency oscillator signal to be coupled, through coupling capacitors C536 and C538, to mixer transistor Q503. The voltages described above reverse-bias diodes CR507 and CR505 so that they do not couple the low-frequency oscillator signal to ground. Current flow through diodes CR506 and CR504 and resistors R526 and R522 causes a positive voltage at the cathode end of diode CR503. The anode end of CR503 is practically at ground potential because of conduction of diode CR502 through resistor R521. Diode CR503 is thus reverse-biased so that

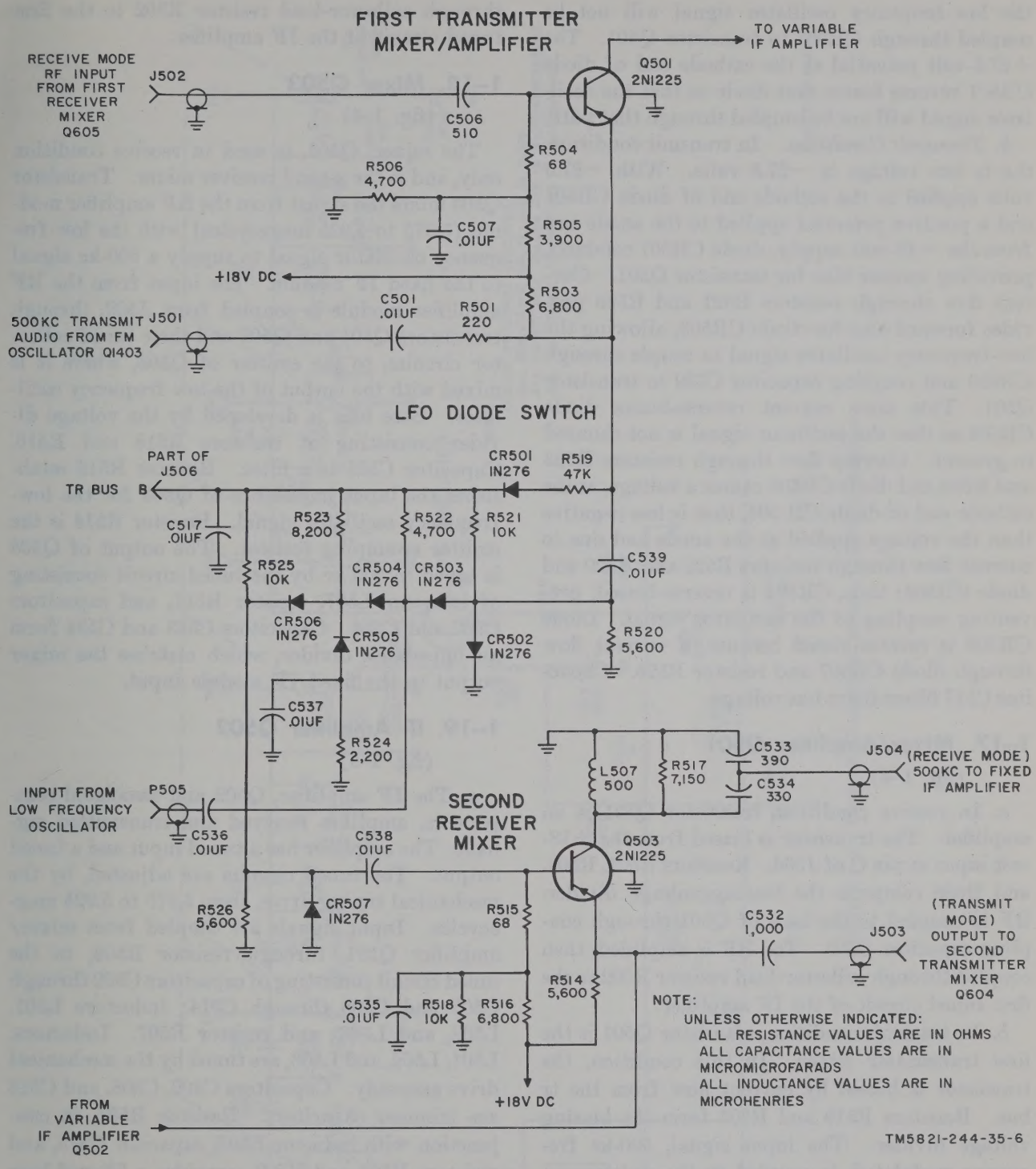


Figure 1-4. Lfo diode switch and mixer circuits, schematic diagram.

the low-frequency oscillator signal will not be coupled through CR503 to transistor Q501. The +27.5-volt potential at the cathode end of diode CR501 reverse biases that diode so that the oscillator signal will not be coupled through that path.

b. Transmit Condition. In transmit condition, the tr bus voltage is −27.5 volts. With −27.5 volts applied to the cathode end of diode CR501 and a positive potential applied to the anode end from the +18-volt supply, diode CR501 conducts, providing emitter bias for transistor Q501. Current flow through resistors R521 and R520 provides forward bias for diode CR503, allowing the low-frequency oscillator signal to couple through CR503 and coupling capacitor C539 to transistor Q501. This same current reverse-biases diode CR502 so that the oscillator signal is not shunted to ground. Current flow through resistors R523 and R524 and diode CR505 causes a voltage, at the cathode end of diode CR 504, that is less negative than the voltage applied at the anode end due to current flow through resistors R522 and R520 and diode CR503; thus, CR504 is reverse-biased, preventing coupling of the oscillator signal. Diode CR506 is reverse-biased because of current flow through diode CR507 and resistor R525. Capacitor C517 filters the tr bus voltage.

1–17. Mixer/Amplifier Q501

(fig. 1–4)

a. In receive condition, transistor Q501 is an amplifier. The transistor is biased from the +18-volt input at pin C of J506. Resistors R504, R505, and R506 comprise the biasing voltage divider. RF is coupled to the base of Q501 through coupling capacitor C506. The RF is amplified, then coupled through collector-load resistor R502 to the first tuned circuit of the IF amplifier.

b. In transmit condition, transistor Q501 is the first transmitter mixer. In this condition, the transistor is biased by current flow from the tr bus. Resistors R519 and R503 form the biasing voltage divider. The input signal, 500-kc frequency-modulated, is coupled to the emitter circuit of Q501 through coupling capacitor C501 and resistor R501. This signal is mixed with the low-frequency oscillator signal, which is coupled into the emitter through the diode switch. The mixed output, 3.975 to 5.925 megacycles, is coupled through collector-load resistor R502 to the first tuned circuit of the IF amplifier.

1–18. Mixer Q503

(fig. 1–4)

The mixer, Q503, is used in receive condition only, and is the second receiver mixer. Transistor Q503 mixes the signal from the RF amplifier module (3.975 to 4.925 megacycles) with the low-frequency oscillator signal to supply a 500-kc signal to the fixed IF module. The input from the RF amplifier module is coupled from J502, through transistors Q501 and Q502 and their tuned collector circuits, to the emitter of Q503, where it is mixed with the output of the low-frequency oscillator. Base bias is developed by the voltage divider consisting of resistors R518 and R516. Capacitor C535 is a filter. Resistor R515 establishes the input impedance of Q503 for the low-frequency oscillator signal. Resistor R514 is the emitter swamping resistor. The output of Q503 is tuned to 500 kc by the tuned circuit consisting of inductor L507, resistor R517, and capacitors C533 and C534. Capacitors C533 and C534 form an impedance divider, which matches the mixer output to the fixed IF module input.

1–19. IF Amplifier Q502

(fig. 1–5)

a. The IF amplifier, Q502 and associated components, amplifies received and transmitted signals. The amplifier has a tuned input and a tuned output. The tuned circuits are adjusted, by the mechanical tuning drive, from 3.975 to 5.925 megacycles. Input signals are coupled from mixer/amplifier Q501, through resistor R502, to the tuned circuit consisting of capacitors C502 through C505 and C508 through C514; inductors L501, L502, and L503; and resistor R507. Inductors, L501, L502, and L503, are tuned by the mechanical drive assembly. Capacitors C502, C508, and C512 are trimmer capacitors. Resistor R507, in conjunction with inductor L503, capacitor C515, and resistors R508 and R509, provides a filtered base bias voltage for transistor Q502. Capacitor C514 and inductor L503 form an impedance divider, which insures proper input signal to transistor Q502. Emitter bias is supplied through emitter resistors R511 and R512 from the +18-volt supply.

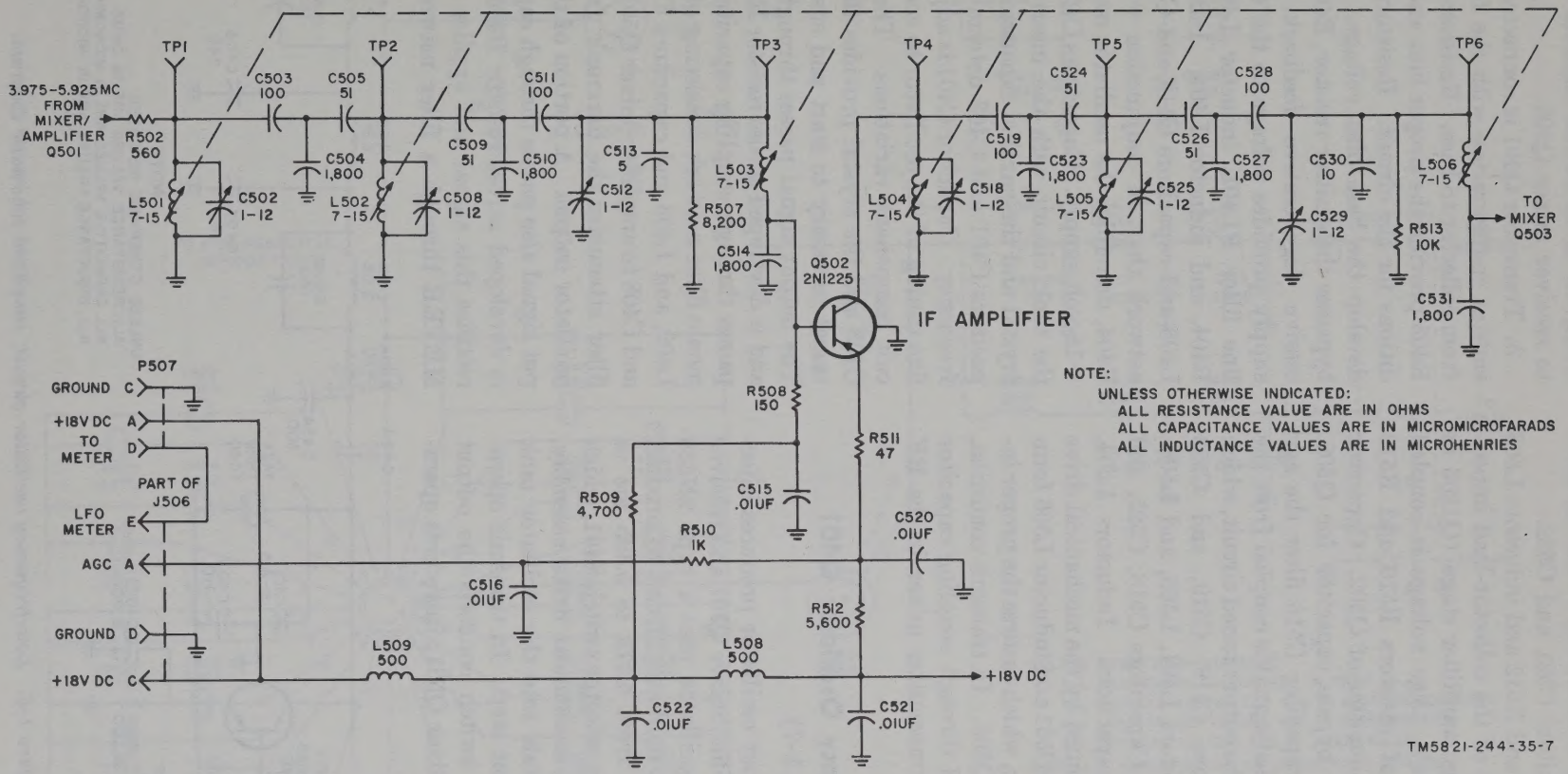


Figure 1–5. Variable IF amplifier circuit, schematic diagram.

The +18-volt supply is filtered by inductors L508 and L509 and capacitors C521 and C522.

b. Resistors R510 and R512 and inductors L508 and L509 form part of the collector-load impedance for the final agc amplifier stage (Q1206 in the fixed IF module). Agc voltage is coupled from the junction of resistors R510 and R512 through R511 to the emitter of Q502. Capacitor C520 is the emitter bypass capacitor for Q502. Resistor R510 and capacitor C516 filter the agc voltage. The amplified signal is coupled from the collector of Q502 to the output tuned circuit, which consists of capacitors C518, C519, and C523 through C531; inductors L504, L505, and L506; and resistor R513. Capacitors C518, C525, and C529 are trimmer capacitors. Inductors L504, L505, and L506 are tuned by the mechanical drive assembly. Capacitor C531 and inductor L506 form an impedance divider, which insures the proper input signal to mixer Q503. In transmit condition, the output is coupled through coupling capacitor C532 to the second transmitter mixer in the RF amplifier module.

1-20. Low-Frequency Oscillator Q401

(figs. 1-6 and 1-7)

b. The low-frequency oscillator produces injection signals for amplifier/mixer Q501 and receiver mixer Q503. The oscillator uses a type 2N338 transistor in a Pierce oscillator circuit to produce 20 injection signals from 4.475 to 5.425 mc in 0.05-mc steps. Rotary selector switch S401, which is positioned by the mechanical drive assembly, inserts 1 of 20 crystals into the oscillator tank circuit of each 0.05-mc step. In transmit operations, the lfo diode switch connects the output signal to amplifier/mixer Q501; in receive operations, the diode switch connects the output signal to receiver mixer Q503.

b. Transistor Q401 is connected in the common-emitter configuration with the feedback supplied from collector to base. Resistors R401, R402, and R403 provide the proper bias and stabilizing conditions for the circuit. Resistors R402 and R403 develop the base bias voltage. Capacitor C402 bypasses the emitter resistor, R401, to prevent excessive degenerative feedback. The +18-volt supply provides voltage to the collector through line filter FL401, inductor L405, load resistor R404, and inductor L404. Inductors L404 and L405 and capacitors C410 and C412 form a filter network that, in conjunction with load resistor R404, decouples the oscillator output signal from +18-volt supply. Capacitors C401 and C403 form the tank circuit with the inserted crystal. The crystal and the parallel capacitance offered by capacitors C401 and C403 determine the operating frequency. Capacitor C401 is adjustable to permit fine tuning of the oscillator to compensate for circuit component variations. The combination of C403 and the crystal provides the 180° phase reversal necessary to start and sustain oscillations. The output signal passes through capacitor C404 and is developed across resistor R406. This signal passes through coupling capacitor C434 to a harmonic filter network consisting of inductors L401, L402, and L403 and capacitors C405, C406, C407, and C408 to amplifier/mixer Q501. The harmonic filter attenuates the harmonic frequencies in the oscillator output. A portion of the oscillator output signal also passes through capacitor C409 and is developed across resistor R405. Diode CR411 rectifies this signal and applies it to the TEST METER through a filter network consisting of

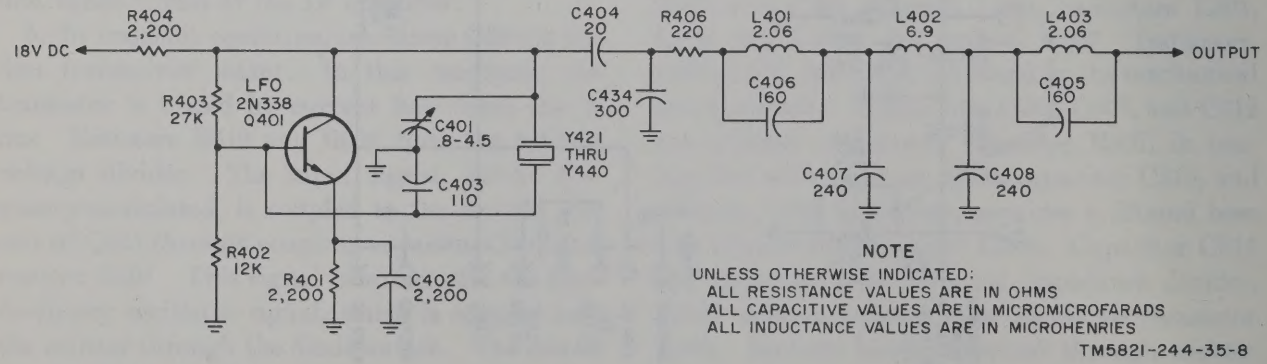


Figure 1-6. Low-frequency oscillator circuit, simplified schematic diagram.

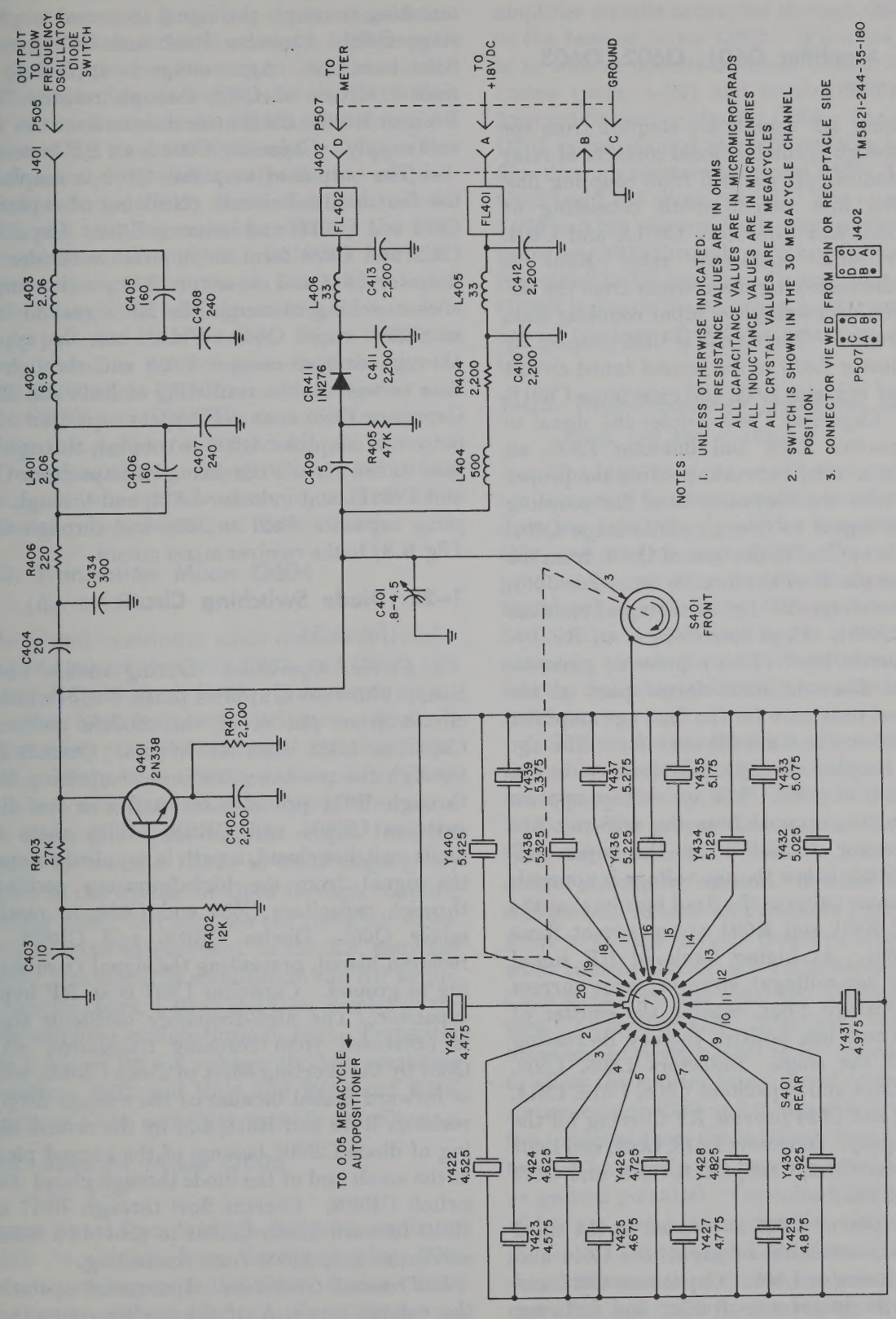


Figure 1-7. Low-frequency oscillator circuit, schematic diagram.

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inductor L406, capacitors C411 and C413, and line filter FL402.

1–21. RF Amplifier Q601, Q602, Q603

(fig. 6–19)

a. Incoming RF signals are coupled from the antenna through normally closed contacts of relay K601 and inductively coupled from coupling link L601 to the first tuned circuit consisting of inductor L602 and capacitors C601A and C604. During transmit operation, relay K601 is energized, disconnecting the antenna from the RF amplifier and connecting the input coupling link, L601, to ground. The signal is then coupled by mutual inductor L616 to the second tuned circuit consisting of inductor L603 and capacitors C601B and C608. Capacitor C609 couples the signal to Q601. Capacitor C607 and inductor L606, an impedance-matching network, provide the proper impedance over the frequency band for coupling the received signal to first amplifier stage Q601. Fixed bias is applied to the base of Q601, from the +18 volts at pin B of the module connector J601, through the voltage divider consisting of resistors R603 and R604. Capacitor C615 is an RF bypass. A ferrite bead (E609) prevents parasitic oscillations. Resistor R601 forms part of the collector-load resistance for the final agc amplifier stage (Q1206 in the fixed IF module). The agc voltage is coupled through this resistor to the emitter circuit of Q601. The agc voltage opposes the fixed dc bias, applied from the +18-volt line through resistor R602. When the input RF signal amplitude is low the agc voltage is approximately the same value as the fixed bias level at the junction of R601 and R602 so no current flows through R601. At higher levels of RF signal (with lower agc voltage) however, some current does flow through R601, causing the emitter of Q601 to become less positive thereby decreasing the gain of the stage. Inductors L605, L608, L611, and L614 and capacitors C606, C612, C614, C619, C644, and C624 provide RF filtering for the +18-volt supply. Inductors L618, L604, and L607 and capacitors C645, C605, C611, C645, and C613 filter the age line.

b. The output of Q601 is coupled to the third tuned circuit, consisting of capacitors C616 and C601C and inductor L609. Capacitors C617 and C618 form an impedance divider and inductor L610 and capacitor C628 provide impedance matching to couple the signal to second amplifier stage Q602. Resistors R607 and R608 provide fixed base bias. Agc voltage is applied to the emitter circuit of Q602 through resistor R605. Resistor R606 is the emitter resistor from the +18-volt supply. Capacitor C620 is an RF bypass.

c. The output of amplifier Q602 is coupled to the fourth tuned circuit, consisting of capacitors C621 and C601D and inductor L612. Capacitors C622 and C623 form an impedance divider and inductor L613 and capacitor C643 provide impedance matching to couple the RF signal to third amplifier stage Q603. Fixed bias is applied through emitter resistor R609 and through the base voltage divider consisting of R610 and R611. Capacitor C625 is an RF bypass capacitor. The output of amplifier Q603 is coupled, through the final tuned circuit consisting of capacitors C626 and C601E, and inductor L615, and through coupling capacitor C627 to J602 and through C629 (fig. 6–3) to the receiver mixer circuit.

1–22. Diode Switching Circuit

(fig. 6–3)

a. Receive Operation. During receive operation, +27.5 volts is applied to the diode switching circuit from pin A of the module connector. Capacitor C633 is an RF bypass. Current flow through the resistance network comprising R620 through R624 provides forward bias for diode switches CR604 and CR606. With these two diode switches closed, a path is supplied to couple the signal from the high-frequency oscillator, through capacitors C635 and C639, to receiver mixer Q605. Diodes CR605 and CR607 are reversed biased, preventing the signal from shorting to ground. Capacitor C637 is an RF bypass capacitor. The high-frequency oscillator signal is prevented from reaching transmitter mixer Q604 by the shorting effect of diode CR602, which is forward biased because of the voltage drop of resistors R619 and R618, and by the reverse biasing of diode CR603 because of the ground placed at the anode end of the diode through closed diode switch CR602. Current flow through R617 and R616 forward biases CR601 to provide a biasing current to keep Q604 from conducting.

b. Transmit Operation. In transmit operation, the voltage at pin A of the module connector is

−27.5 volts and the biasing action described in *a* above is reversed, providing a low-impedance path to the transmitter mixed and a high-impedance path to the receiver mixer. In this condition, current flow through resistors R617 and R616 reverse-biases diode CR601, preventing dc from reaching the base of transistor Q604. The high-frequency oscillator signal is coupled through inductor L617, forwarded-biased diode CR603, and coupling capacitor C632 to the base of transmitter mixer Q604. Inductor L617 attenuates the signal to provide the proper input level to mixer Q604 while providing a low resistance dc path for diode biasing. Diode CR602 is reverse biased to prevent grounding the signal. Diodes CR604 and CR606 are reverse biased and diodes CR605 and CR607 are forward biased, preventing the signal from reaching the base of receiver mixer Q605; also, Q605 is cut off by the decrease in current flow through resistor R628 because of reverse biasing of diode CR608.

1–23. Transmitter Mixer Q604

(fig. 6–3)

The second transmitter mixer consists of transistor Q604; capacitors C630, C631, and C644; and resistors R612 through R615. In transmit operation, the high-frequency oscillator signal is coupled from plug P602 through capacitor C635, inductor L617, diode CR603, and capacitor C632, to the base of mixer transistor Q604. Transistor Q604 mixes this signal with the output from the variable IF module (3.975 to 5.925 megacycles) coupled to the emitter of Q604 through coupling capacitor C630, and supplies the resulting signal (30.00 to 69.95 megacycles) to the RF amplifier circuit. The signal is amplified in the RF amplifier circuits (para. 1–21*a*) and then coupled to the power amplifier module through J602. Transistor Q604 is biased by the voltage dividers consisting of resistors R615 and R614 and R612 and R613. Capacitors C644 and C631 provide RF filtering.

1–24. Receiver Mixer Q605

(fig. 6–3)

Input signal from the high-frequency oscillator module is coupled from the input plug P602 through coupling capacitor C635, diodes CR604 and CR606, and coupling capacitor C639, to the emitter of mixer Q605. RF signal from the RF amplifier circuits is coupled through diode CR608 to the base of mixer Q605. When the radio set is in receive operation, diode CR608 is forward biased (para. 1–22) and resistor R628 provides forward operating bias for Q605. The emitter of Q605 is maintained slightly positive by current flow through resistors R626 and R625. Capacitors C642 and C641 filter out RF. The mixer output, 3.975 to 5.925 megacycles, is coupled from the collector of Q605 through autotransformer T601 to the variable IF module. In transmit operation, CR608 is reverse biased (para. 1–22*b*) and the voltage at the base of Q605 is near zero, cutting off Q605.

1–25. High-Frequency Oscillator Q301

(figs. 1–8 and 6–16)

a. The high-frequency oscillator uses a transistor connected as a common-base oscillator to produce the injection signals for transmitter mixer Q604 and receiver mixer Q605. The oscillator can produce 20 operating frequencies from 26.025 to 64.025 mc in 2-mc steps. Rotary selector switch S301, which is positioned by the mechanical drive assembly, inserts the proper crystal and inductor into the oscillator tank circuit to control the output frequency.

b. The oscillator operates at the series resonant frequency of the inserted crystal and associated inductor. Resistors R301, R302, R303, R304, and R305 provide proper bias and stabilizing conditions for the circuit. Resistor R301 is also an emitter swamping resistor. Resistor R302 is the emitter bias resistor and resistors R303 and R304 form a voltage divider that provides base bias with resistor R305, the collector-load resistor. Capacitors C301 and C303 are RF bypass capacitors. Capacitor C301 effectively connects the lower end of resistor R301 to RF ground potential to allow the emitter input signal to be developed across resistor R301 and it also aids in decoupling the ac signal from the +18-volt supply. Capacitor C303 connects the base of transistor Q301 to ac ground potential. Capacitors C304 and C305, which are connected in parallel with the selected inductor, L305 through L324, form a high-Q tank circuit between the collector and ground. Capacitors C304 and C305 form a voltage divider. The

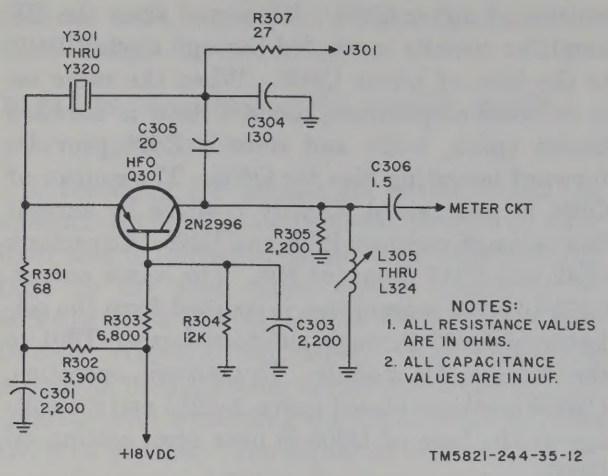


Figure 1–8. High-frequency oscillator circuit, simplified schematic diagram.

feedback voltage developed across C304 is applied through the selected crystal, Y301 through Y320, to the emitter. Transistor Q301 is connected as a common-base amplifier; therefore, no phase shift is required between the signal on the collector and the signal on the emitter. The feedback signal is not phase shifted. At resonance, the crystal impedance is low; at frequencies other than resonance, the crystal impedance is high. Therefore, the feedback from the collector to the emitter starts and sustains oscillations only at the resonant frequency of the selected crystal. Switch S301 inserts a different inductor into the collector tank circuit as each new crystal is selected so that the resonant frequency of the collector tank circuit is of the same order as the natural frequency of the crystal. Inductors L301 and L302 and capacitor C302 form an RF filter network that decouples the RF signal from the +18-volt supply. The output signal from the oscillator is taken at the junction of capacitors C304 and C305 and applied to the hfo diode switch (in the RF amplifier) through decoupling resistor R307. A portion of the output signal from the collector is rectified, filtered, and applied to the TEST METER to provide an indication of oscillator operation. Capacitor C306 couples the signal to the diode rectifier CR301. Resistor R306, inductors L303 and L304, and capacitors C307 and C308 form a filter network that provides a smooth dc signal to the TEST METER.

1–26. RF Power Amplifier Circuit

(fig. 1–9)

a. Introduction. The RF power amplifier circuit receives the low-level signal from RF amplifier Q603 and increases the power level of the signal to achieve adequate power radiation characteristics. The circuit contains three ganged-tuned, vacuum-tube amplifier stages connected in cascade. The output of the circuit is applied to either the 30- to 45.95-mc low-pass filter or the 46- to 69.95-mc low-pass filter. The mechanical drive assembly tunes each stage. The tuning range of the circuit is from 30 to 69.95 mc.

b. Rf Voltage Amplifier V801. Rf voltage amplifier V801 amplifies the 30- to 69.95-mc input signal from RF amplifier Q603. The input signal is applied to the grid circuit through coaxial connector P801 and coupling capacitor C801. Tube V801 is connected as a conventional sharp-cutoff RF pentode amplifier. Resistor R801 is a grid-leak resistor, and provides a dc return path to ground for the grid. Resistor R802 provides cathode bias. RF bypass capacitor C802 places the cathode at RF ground potential. The high-voltage power supply provides plate and screen voltages (+250 volts dc) through pin B of connector line filter FL801 and voltage-dropping resistor R804 to the screen and through plate tank inductor L801 to the plate. Capacitor C803 is the screen bypass capacitor. Resistor R803 is a screen-dropping resistor. Resistor R804 drops the +250-volt supply to a safe operating plate voltage. Capacitor C819 is an RF bypass capacitor. The plate tank circuit consists of inductor L801, tuning capacitor C805A, and trimmer capacitor C804. Capacitor C806 is an RF bypass capacitor that connects the lower end of L801 to RF ground potential. Inductor L801 and capacitor C805A, which are positioned by the differential tuning shaft in the mechanical drive assembly, tune the tank circuit. The differential and associated gear train automatically tunes the variable capacitor and the slug-tuned coils to resonance as each of the 800 channels is selected, thereby providing a fairly constant inductance-capacitance (lc) ratio across the band. A tap near the center of inductor L801 feeds the amplified signal to the grid of RF driver amplifier V802 through coupling capacitor C808.

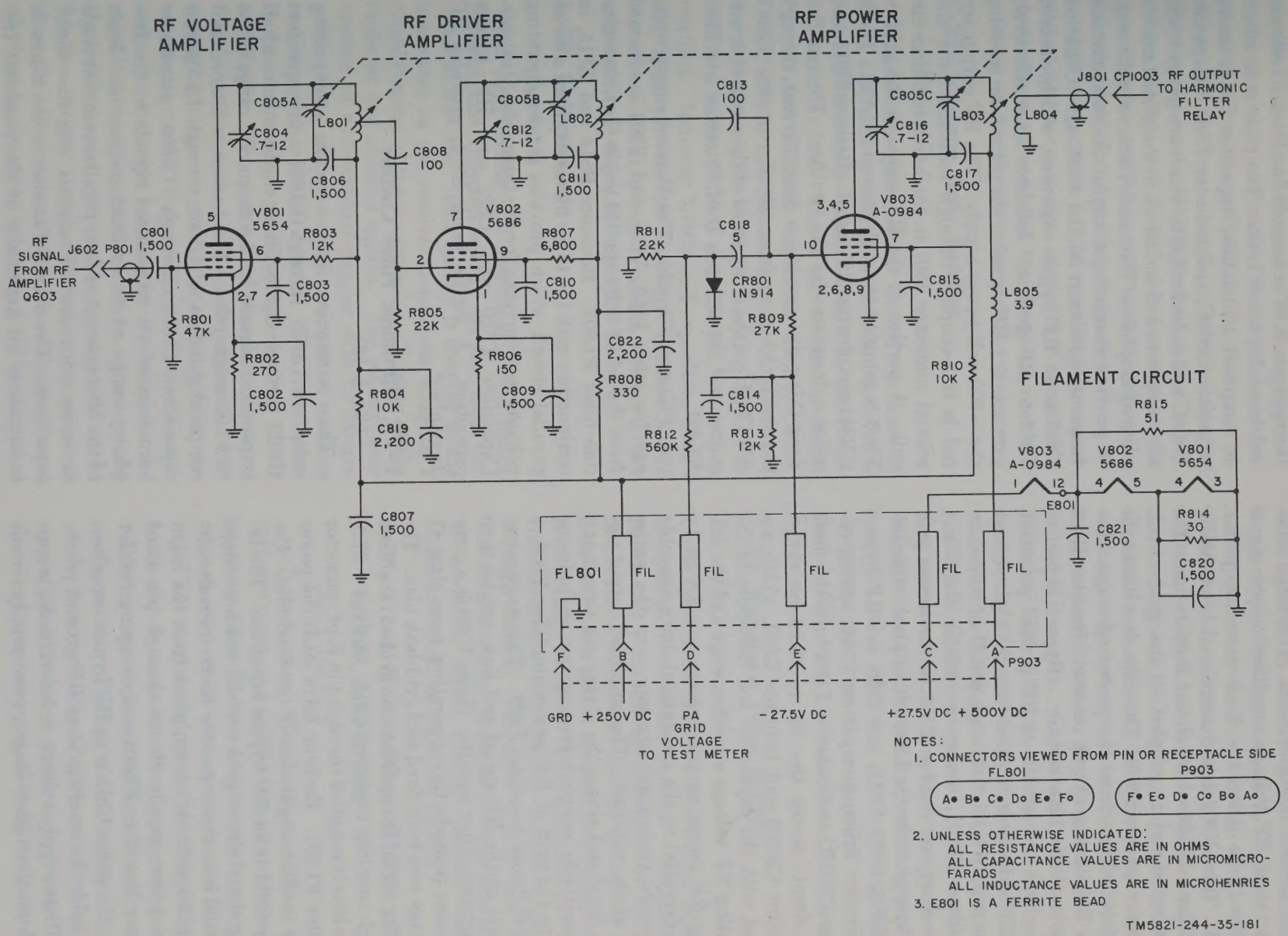


Figure 1–9. RF power amplifier circuits, schematic diagram.

c. Rf Driver Amplifier V802. This stage raises the level of RF voltage amplifier output signal sufficiently to drive the final power amplifier, V803. Tube V802 is a conventional beam-power amplifier tube biased for class AB operation. The incoming signal is coupled to the grid circuit through capacitor C808. This capacitor blocks the dc plate voltage from the preceding stage. Resistor R805 is a grid leak resistor. Resistor R806 is the cathode bias resistor. Bypass capacitor C809 places the cathode at RF ground potential. Plus 250 volts dc is supplied from the high-voltage power supply circuit through pin B of connector line filter FL801, dropping resistor R808 and screen-dropping resistor R807 to the screen grid and through inductor L802 to the plate. Capacitors C807, C810, C811, and C822 are RF bypass capacitors. Trimmer capacitor C812, tuning capacitor C805B, and inductor L802 tune the plate tank circuit across the 30- to 69.95-mc range. Capacitor C805B and inductor L802, which are ganged with the capacitors and inductors in the preceding RF voltage amplifier stage and the following RF power amplifier stage, are driven by the differential in the mechanical drive assembly to provide tuning adjustments over the entire range of the radio set. The amplified output signal is developed across the plate tank circuit and is capacitively coupled from a tap on inductor L802 to the grid of RF power amplifier V803.

d. RF Power Amplifier V803. This stage raises the level of the RF signal and link-couples it to the harmonic filter circuits. Tube V803 is a compact-beam pentode tube operating near class C. The stage uses both fixed and grid-leak bias. The incoming signal is applied to the grid of tube V803 through coupling capacitor C813. A fixed −27.5-volt dc bias is supplied through pin E of connector line filter FL801. Resistor R813 loads the power supply to allow regulation of the fixed bias. Capacitor C814 is an RF bypass capacitor. The incoming signal draws grid current which develops additional bias across resistor R809. Screen voltage (+250 volts dc) is supplied from the high-voltage power supply circuit through pin B of connector line filter FL801 and dropping resistor R810. Capacitor C815 is an RF bypass capacitor, which holds the screen grid at RF ground potential. Plate supply voltage, +500 volts dc, is supplied from the high-voltage power supply circuit through pin A of connector line filter FL801 and inductors L803 and L805. The plate tank circuit is composed of trimmer capacitor C816, tuning capacitor C805C, and inductor L803. Capacitor C805C and inductor L803, which are ganged with the capacitors and inductors in the plate tank circuits of amplifiers V801 and V802, tune the stage to provide resonance at any of the 800 selectable frequencies between 30 and 69.95 mc. Capacitor C817 is an RF bypass capacitor, which connects L801 to RF ground. Inductor L805 effectively prevents any RF signal at the plate from reaching the +500-volt power supply. The RF output signal is link-coupled through inductor L804 and coaxial connector J801 to the harmonic filter circuit. A portion of the RF signal at the grid of V803 is sampled through capacitor C818. Diode CR801 rectifies the RF signal. Resistor R811 provides a dc return for the rectifier. The rectified dc at this point provides a direct current, through current-limiting resistor R812, to the TEST SWITCH on the front panel of the receiver-transmitter unit through pin D of connector line filter FL801.

e. Filament Circuit. The filament supply voltage for tubes V801, V802, and V803 is obtained from the +27.5 volts applied to pin C of connector line filter FL801. Resistors R814 and R815, in conjunction with the three filaments, form a series parallel circuit which provides proper operating voltages and currents for the three tube filaments. Capacitors C820 and C821 are RF bypass capacitors. A ferrite bead, E801, provides RF decoupling.

1–27. Harmonic Filter Circuits

(fig. 6–13)

The harmonic filter circuit, comprising inductors L1605 through L1608 and capacitors C1611 through C1619, filters out harmonics of all transmitted signals in the frequency range of 30 to 45.95 megacycles. The harmonic filter circuit comprising inductors L1601 through L1604 and capacitors C1601 through C1609 attenuates harmonics of all transmitted signals in the frequency range of 46 to 69.95 megacycles. Both of the filters consist of four parallel-resonant traps in series with the RF signals and five shunt capacitors. The overall function of the filters is to attenuate all harmonics of the passband fre-

quencies (30.00 to 45.95 or 46 to 69.95 megacycles) while offering minimum loss to the passband frequencies. Capacitors C1627 and C1628 and inductor L1610 form a single pi-section low-pass filter to attenuate ultrahigh frequencies (uhf). Relays K1601 and K1602 are deenergized for operating frequencies from 46 to 69.95 megacycles and energized for operating frequencies from 30 to 45.95 megacycles. The switching is accomplished by the connection of pin D of the module connector to ground by the frequency selector switches at the system control box.

1-28. Sidetone Gate Rectifier

(fig. 6-13)

The sidetone gate rectifier circuit rectifies and filters a portion of the RF to provide a dc level to forward bias diode switch CR1403 in the transmit audio module. The circuit consists of diodes CR1603 and CR1604; capacitors C1610, C1620, C1621, C1622; and resistor R1607. A portion of the RF is coupled through coupling capacitor C1610 to diodes CR1603 and CR1604, where it is rectified. Inductor L1609 and capacitors C1620 and C1621 provide RF filtering. Resistor R1607 is a current-limiting resistor and capacitors C1622 and C1629 provide additional RF filtering.

1-29. Reflectometer

(fig. 6-13)

The reflectometer and associated circuit detect forward and reflected energy on the radio set transmission line. This energy is coupled to the test meter on the receiver-transmitter unit for a visual display of the transmission efficiency of the radio set and antenna system. The reflectometer consists of a directional coupler with its components (three copper strips) arranged to measure incident and reflected waves. The two outer copper strips are terminated by resistors R1601 and R1602. The center strip connects the output from the harmonic filter to the antenna. RF energy is electromagnetically coupled from the center strip to the two outer strips. For one outer strip, the inductive coupling is in phase with the capacitive coupling, and therefore adds to yield the incident wave. When the output is terminated by the proper load, no reflected waves occur since the inductive and capacitive coupling is out of phase in the other outer strip. The strip that is terminated by resistor R1602 is terminated in the proper direction to couple incident waves, which cause current flow through diode detector CR1601 and current-limiting resistor R1604. Capacitor C1626 and resistor R1603 compensate for variations in the coupling impedance of the reflectometer at different frequencies to provide a constant value of meter current throughout the frequency spectrum for any given value of transmitted RF energy. Capacitors C1624 and C1631 provides RF filtering. Reflected RF energy causes current flow through diode detector CR1602 and current-limiting resistor R1605. Capacitors C1623 and C1630 and resistor R1606 compensate for variations in the coupling impedance of the reflectometer at different frequencies to provide a constant value of meter current throughout the frequency spectrum for any given value of reflected RF energy. Capacitor C1625 provides filtering.

1-30. Bandpass Filter FL1201

(fig. 1-10)

Bandpass filter FL1201 provides a minimum bandwidth of 30 kc between the −6-decibel (db) points and a maximum bandwidth of 100 kc between the 80-db points on the selectivity curve. This stage is a sealed ceramic filter that contains several tuned circuits. The 500-kc fixed IF signal from receiver mixer Q503 is applied to the filter through coaxial connectors P1201 and P1202. The filtered output is applied to the base of fixed IF amplifier Q1201 through coaxial connector P1203 and coupling capacitor C1201.

1-31. Fixed IF Amplifiers Q1201, Q1202, Q1203, and Q1204

(fig. 1-10)

a. Introduction. Fixed IF amplifiers Q1201, Q1202, Q1203, and Q1204 amplify the output of bandpass filter FL1201 and further attenuate unwanted frequencies that appear in the filter output. The stages are high-gain voltage amplifiers connected in cascade. Each stage consists of a NPN transistor connected in a common-emitter configuration. The agc circuit regulates the gain of the first three stages. When several amplifier stages using the same power supply are tuned to the same frequency (as in these stages), oscilla-

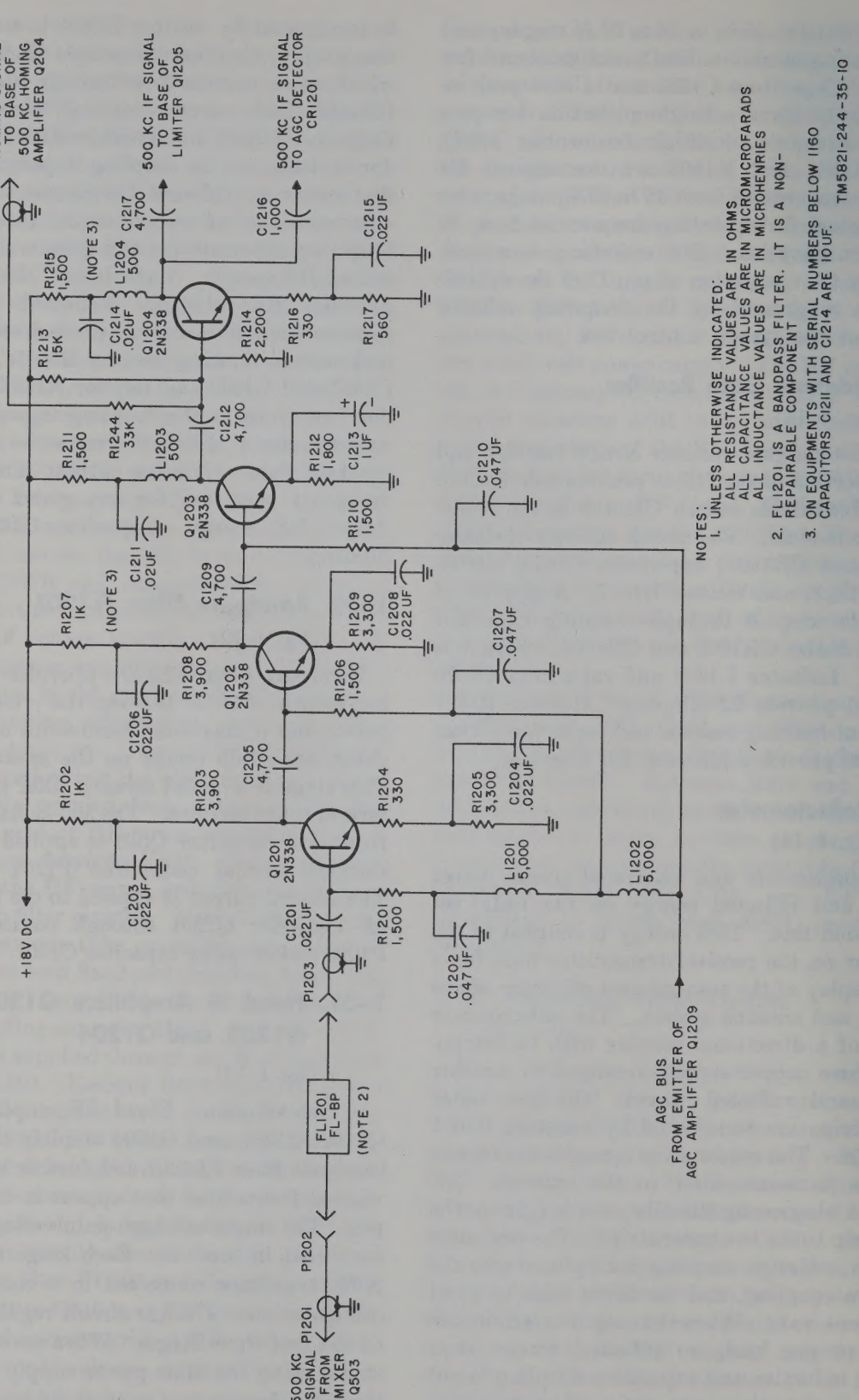


Figure 1-10. Fixed IF amplifier circuits, schematic diagram.

tions may occur as a result of coupling between stages through common impedance of the power supply. To prevent this, the collector circuit of each stage contains a decoupling network. The output of IF amplifier Q1203 is applied to final fixed IF amplifier Q1204 and to 500-kc homing amplifier Q1204. The output of fixed IF amplifier Q1204 is applied to agc detector CR1201 and through limiter Q1205 to fm discriminator CR1204, CR1205.

b. IF Amplifier Q1201. The signal from bandpass filter FL1201 is applied to the base of transistor Q1201 through coaxial connector P1203 and coupling capacitor C1201. Capacitor C1202 connects the lower end of base bias resistor R1201 to IF ground potential to allow the signal voltage to be developed across base return resistor R1201. The agc bus provides base-emitter bias voltage through a decoupling network consisting of inductors L1201 and L1202 and capacitors C1202 and C1207. The level of the age voltage changes with the strength of the incoming signal. This varying voltage controls the base-emitter forward bias of the stage, and thereby controls the gain of the stage. With an increase in signal strength, the agc voltage changes, reducing forward base-emitter bias and lowering the stage gain to bring the output signal back to normal. With a decrease in signal strength, the agc voltage increases the forward base-emitter bias and increases the gain. Resistor R1205 is the emitter swamping resistor. Capacitor C1204 bypasses the IF signal around resistor R1205 to prevent excessive degeneration. Resistor R1204, also in the emitter circuit, provides a small amount of degenerative feedback to reduce the variations in the gain of the stage. The +18-volt supply provides collector voltage through a decoupling network consisting of resistor R1202, capacitor C1203, and collector-load resistor R1203. The amplified output from the collector of Q1201 is applied to the base of IF amplifier Q1202 through coupling capacitor C1205.

c. IF Amplifier Q1202. The output of IF amplifier Q1201 is developed across base bias resistor R1206. Capacitor C1207 connects the lower end of resistor R1206 to IF ground potential. Capacitor C1207, in conjunction with resistor R1206, capacitor C1210, and inductor L1202, makes up a filter network that decouples the IF signal from the agc bus, which supplied the base-emitter bias. Resistor R1209, which is ac bypassed by capacitor C1208, is the emitter resistor. The +18-volt supply provides voltage to the collector through resistors R1207 and R1208. Resistor R1207 and capacitor C1206 form a decoupling filter which isolates the IF signal from the power supply. Transistor Q1202 amplifies the IF signal and develops the output signal across collector-load resistor R1208. The output is taken from the collector and coupled to the base circuit of IF amplifier Q1203.

d. IF Amplifier Q1203. The output of IF amplifier Q1202 is applied to the base of IF amplifier Q1203 through coupling capacitor C1209 and is developed across base bias resistor R1210. The agc bus provides base bias voltage for the stage. Capacitor C1210 is an IF bypass capacitor that places the lower end of resistor R1210 at IF ground potential, and, in conjunction with resistor R1210, decouples the IF signal from the agc circuit. Resistor R1212 develops emitter bias. Capacitor C1213 bypasses the IF signal around resistor R1212 to prevent excessive signal degeneration. The +18-volt supply provides collector voltage through a decoupling filter consisting of resistor R1211, capacitor C1211, and collector-load inductor L1203. Transistor Q1203 amplifies the IF signal and applies it through coupling capacitor C1212 to the base of IF amplifier Q1204 and through dropping resistor R1244 and coaxial connector P1204 to the base of 500-kc homing amplifier Q1204.

e. IF Amplifier Q1204. The signal from IF amplifier Q1203 is applied to the base circuit through coupling capacitor C1212. Resistors R1213 and R1214 form a voltage divider which establishes a no-signal positive (forward) bias on the base. Resistor R1214 is also the base return resistor. Resistors R1217 and R1216 develop base-emitter bias for the stage. Capacitor C1215 bypasses the IF signal around resistor R1217 to prevent excessive degeneration. The emitter resistor, R1216, provides a small amount of degenerative feedback which reduces the variations in the gain of the stage. The +18-volt supply provides collector voltage through resistor R1215 and inductor L1204. Resistor R1215 and capacitor C1214 form a decoupling filter. Inductor L1204 is the collector-load impedence. The amplified IF signal is taken from the collector and applied through coupling capacitor C1217 to the base of limiter

Q1205 and through coupling capacitor C1216 to agc detector CR1201.

1-32. Limiter Q1205

(fig. 1-11)

Limiter Q1205 eliminates amplitude variations in the IF signal before it is applied to the fm discriminator. This stage is essentially an IF amplifier, which contains a feedback network that removes both the positive and negative peaks of the input signal. The limiter uses an NPN type 2N-338 transistor connected as a common-emitter amplifier. The input signal from IF amplifier Q1204 is applied to the base circuit through coupling capacitor C1217 and current-limiting resistor R1218. Reesistors R1219 and R1220 form a voltage divider that provides base-emitter bias. Resistor R1223 is the emitter resistor. Capacitor C1219 bypasses the IF signal around resistor R1223. The +18-volt supply provides voltage to the collector through resistors R1221 and R1222. Resistor R1221 and capacitor C1218 form a decoupling filter, resistor R1222 is the collector-load resistor, and capacitor C1220 and diodes CR1202 and CR1203 form a clamping network. During the positive half-cycle of the incoming IF signal, the signal on the base of transistor Q1205 aids the forward bias of the base-emitter junction and emitter-collector current increases. The increased current flow causes a decrease in collector voltage. When the collector voltage decreases below the forward breakdown voltage of diode CR1203, approximately 0.6 volt, the diode begins to conduct, providing degenerative feedback to the base. The feedback current opposes the signal current and prevents further changes in the base-emitter bias. This action clamps the collector voltage to the forward breakdown voltage of diode CR1203. During the negative half-cycle, the negative-going signal on the base opposes the forward bias on the base-emitter junction, causing the emitter-collector current to decrease. This results in an increase in collector voltage; however, when the collector voltage reaches the forward breakdown voltage of diode CR1202, approximately 0.6 volt, the diode conducts and provides degenerative feedback to the base. This feedback current opposes the signal current and prevents further changes in the base-emitter bias. The collector voltage, in this case, is clamped to the forward breakdown voltage

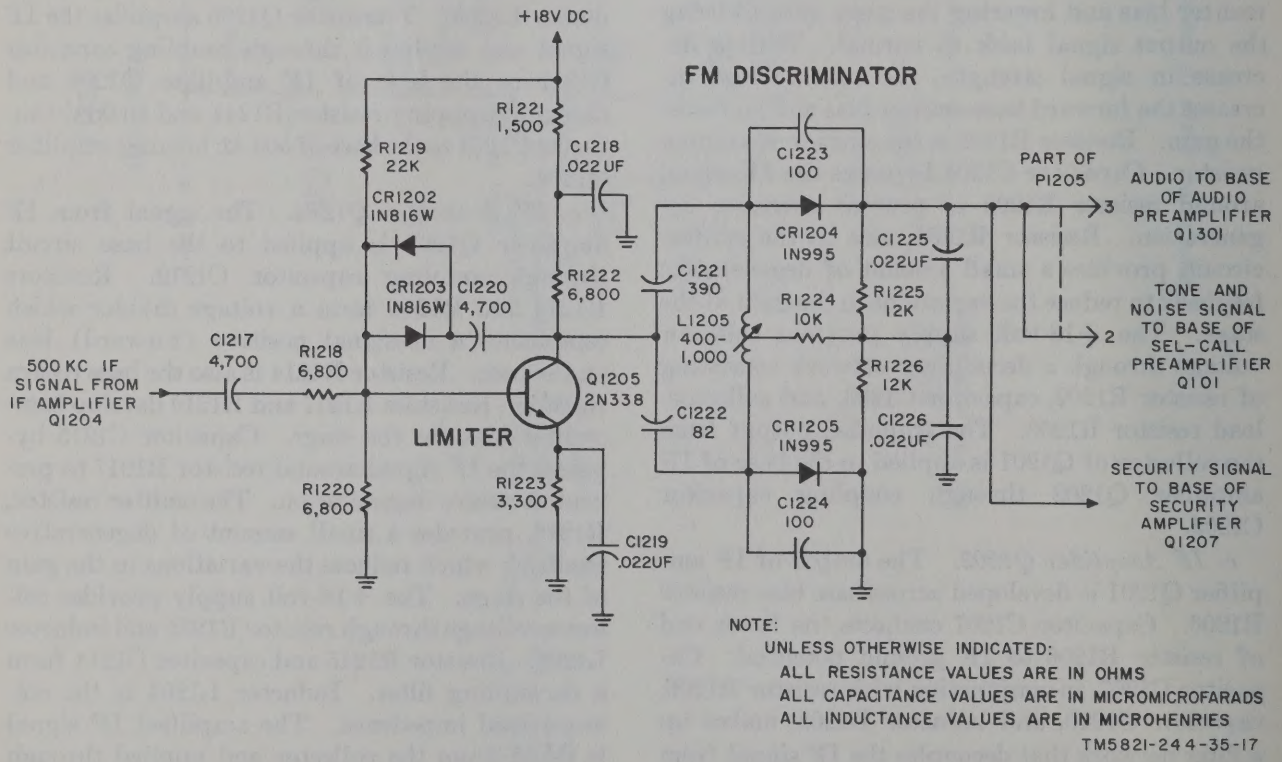


Figure 1-11. Limiter and discriminator circuits, schematic diagram.

of diode CR1202. The resulting output to the fm discriminator is a clipped 500-kc wave.

1-33. Fm Discriminator CR1204, CR1205

(fig. 1-11)

The fm discriminator changes the frequency-modulated IF 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 output of the discriminator varies linearly according to the instantaneous frequency of the incoming signal. The rate at which the input frequency deviates from the center frequency determines the output signal frequency; the amount by which the input frequency deviates from the center frequency determines the amplitude of the output signal. The IF signal from the collector of limiter Q1205 is applied to the discriminator at the junction of capacitors C1221 and C1222. At the center frequency, 500 kc, capacitors C1221 and C1222 and inductor L1205 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 L1205 tunes the parallel-resonant circuit to precisely 500 kc. When the frequency swings below 500 kc, the series 1c circuit consisting of capacitors C1221 and C1224 and inductor L1205 approaches resonance and current flow through this path increases. When the frequency swings above 500 kc, the series 1c circuit consisting of capacitors C1222, C1223, C1225, and C1226 and inductor L1205 approaches resonance and current flow increases through this path. (Capacitors C1225 and C1226 are IF bypass capacitors that are essentially short circuits at the operating frequencies of the discriminator.) As the frequency of the incoming signal swings below 500 kc and approaches the resonant frequency of inductor L1205 and capacitor C1221, the combined impedance of inductor L1205 and capacitor C1221 decreases. This results in an increase in the voltage developed across capacitor C1224. During one half-cycle, diode CR1205 conducts and bypasses the current around capacitor C1224; during the next half-cycle, capacitor C1224 charges, then discharges through one-half of inductor L1205, dropping resistor R1224 and load resistor R1226. The flow of electrons through resistor R1226 produces a negative discriminator output. As the frequency continues to swing below 500 kc, the voltage developed across capacitor C1224 increases, and, subsequently, the discriminator output becomes more negative. When the excursion of the incoming IF signal is above the center frequency, an opposite set of conditions exist. The impedance of the series 1c circuit consisting of capacitors C1222, C1223, C1225, and C1226 and inductor L1205 decreases and current flow through this circuit increases. The rectifying action of diode CR1204 causes current to flow through one-half of inductor L1205, dropping resistor R1224 and load resistor R1225. In this case, the current flow through the load resistor is opposite in direction to the current flow when the IF signal swings below the center frequency. Therefore, the discriminator output is positive. The amplitude of the discriminator output signal depends on how greatly the IF signal deviates from the 500-kc center frequency. A deviation toward a lower frequency produces a negative voltage, and a deviation toward a higher frequency produces a positive voltage at the output point (the junction of resistor R1225 and capacitor C1225). In either case, the amount of the frequency deviation determines the amplitude of the output signal. Since the amplitude of the original modulating audio voltage within the transmitter determines the amount of frequency deviation, the fm discriminator accurately reproduces the audio amplitude as well as frequency. The discriminator output is applied to the base of security amplifier Q1207, the base of audio preamplifier Q1301 through pin 3 of connector P1205, and the base of sel-call preamplifier Q101 through pin 2 of connector P1205.

1-34. Audio Preamplifier Q1301

(fig. 1-12)

The audio output from the fixed IF module is coupled into the receive audio module at J1301 and applied, through coupling capacitor C1301, to audio preamplifier Q1301. When the radio set is in receive condition, diode CR1301 is biased off and a positive voltage is applied to the base of NPN transitor Q1301 by current flow through the

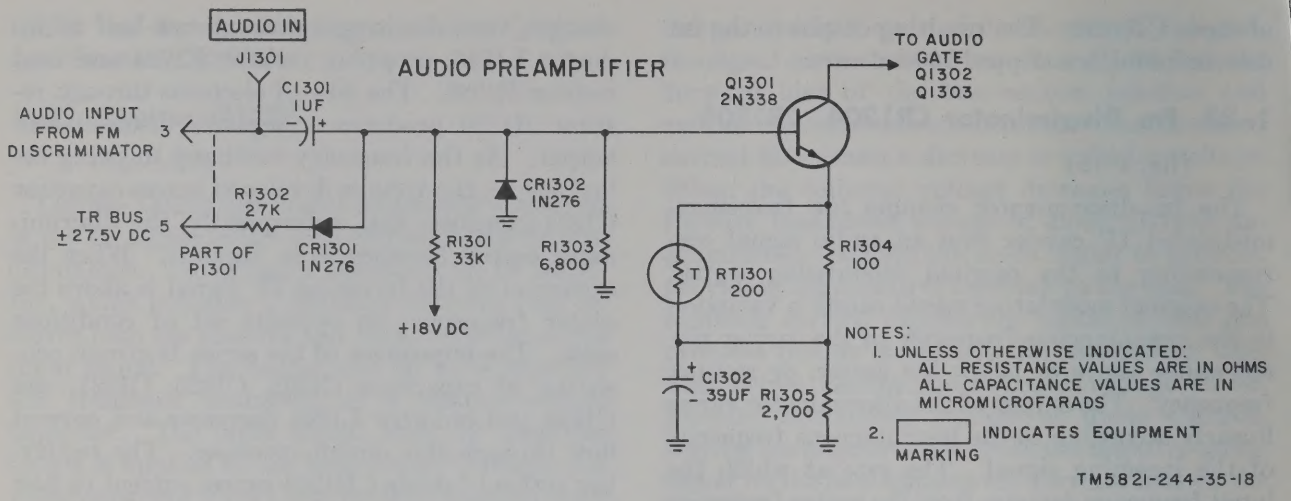


Figure 1-12. Audio preamplifier circuit, schematic diagram.

voltage divider consisting of resistors R1303 and R1301. Resistors R1304 and R1305 are emitter swamping resistors. Resistor R1305 is bypassed by capacitor C1302 to prevent degeneration. Thermistor RT1301 compensates for temperature changes. Amplified audio is direct-coupled from the collector of transistor Q1301 to the emitters of transistors Q1302 and Q1303. When the radio set is in transmit condition, diode CR1301 is forward biased by the tr bus and current flow through resistors R1302 and R1301 and diode CR1302 results in a slightly negative voltage at the base of transistor Q1301, turning Q1301 off.

1-35. Audio Gate Q1302, Q1303

(fig. 1-13)

The audio gate passes or blocks the output audio from audio preamplifier Q1301 and controls the retransmit switch, in accordance with the squelch mode being used and the presence or absence of a carrier signal. In carrier squelch mode, the presence or absence of a carrier signal is sensed at the receive audio module by the amplitude of noise input at pin 4 of the module connector. In tone squelch mode, the received tone indicates the presence of a tone-modulated carrier. This noise or tone is rectified and tripled by the voltage tripler circuit and applied to the audio gating transistors to bias the gate on or off.

a. Carrier Squelch Mode. When the radio set is operating in carrier squelch mode, a ground is applied to pin 6 of the module connector. With pin 6 grounded, diodes CR1314 and CR1305 are forward biased. With no carrier present, noise is present at pin 4 of the module connector. Forward bias on diode CR1314 results in a negative dc (rectified noise) being applied to the base of transistor Q1302, turning Q1302 off. When Q1302 is off, the positive voltage, coupled from the collector of Q1302 through resistor R1309 to the base of transistor Q1303, biases Q1303 on. When a carrier signal is present in the radio set, the noise at pin 4 of the module connector decreases to a minimum level. Since the noise level is too low to activate the voltage tripler, which is reverse biased, the base of transistor Q1302 remains positive, allowing Q1302 to conduct. With Q1302 conducting, audio signal is coupled, through forward-biased diode CR1305 and coupling capacitor C1304, to audio driver input level potentiometer R1315. Conduction of Q1302 lowers the positive bias at the base of Q1303, turning Q1303 off. With Q1303 off, the positive voltage at the collector of Q1303 increases, energizing the retransmit switch (para. 1-39). Resistors R1331, R1332, and R1333 form a voltage divider, which supplies fixed bias for transistor Q1303. This bias is adjusted by potentiometer R1332 and applied through resistor R1308 to the base of Q1303. Capacitor C1303 filters the bias supply. Resistors R1310 and R1311 form a voltage divider which develops collector bias for Q1303. Resistor R1312 is the collector load for Q1302. Diode CR1304 prevents reverse current through the emitter-base junction of Q1302. Diodes CR1305 and CR1306 are normally reverse biased through resistors R1336, R1337,

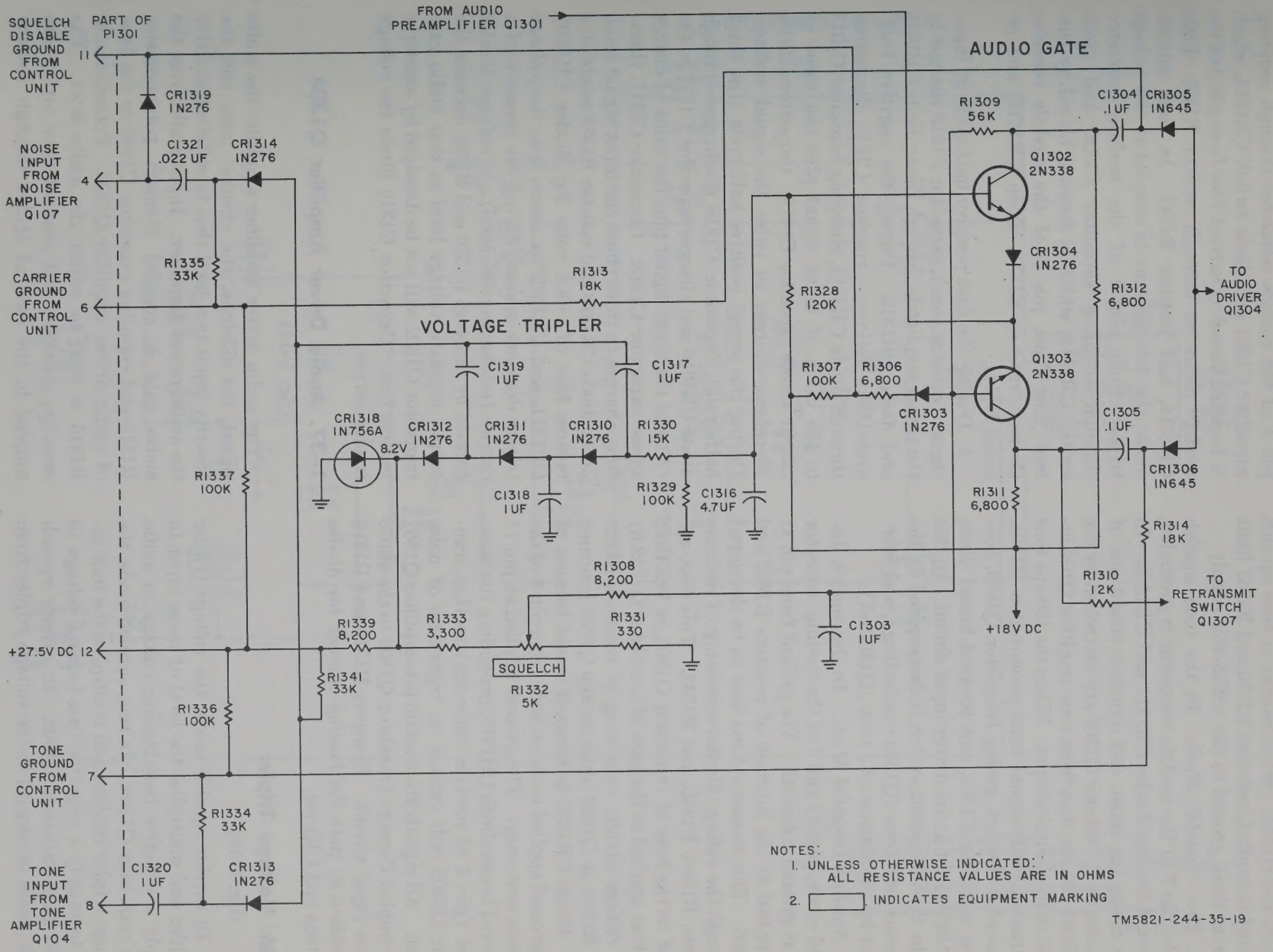


Figure 1–13. Audio gate and voltage tripler circuits, schematic diagram.

R1313, and R1314. When carrier or tone squelch ground is applied, resistors R1336 and R1337 limit current from ground to the +27.5-volt supply.

b. Tone Squelch Mode. In the tone squelch mode, pin 7 of the module connector is grounded, forward biasing diodes CR1313 and CR1306. In this mode, the static and dynamic conditions of transistors Q1302 and Q1303 are controlled by the rectified 150-cps tone from tone amplifier Q104 instead of by the noise input. When the 150-cps tone is present, audio signal from preamplifier Q1301, is coupled through gating transistor Q1303, coupling capacitor C1305, and forward-biased diode CR1306, to the audio driver input circuit. In this mode, the retransmit switch is deenergized by the presence of a tone (Q1303 conducting), and energized by the absence of a tone (Q1303 off).

c. Squelch Disabled Mode. In the squelch disabled mode, pins 11 and 6 of the module connector are at ground potential. The ground from pin 11 is applied at the junction of resistors R1307 and R1306. This causes a fixed bias to be developed through the voltage divider consisting of resistors R1306, R1308, R1332, and R1333. This bias, applied to the base of transistor Q1303, is less than the bias applied to the base of transistor Q1302 by the voltage divider consisting of resistors R1329 and R1328, so Q1302 conducts and Q1303 is turned off. Diode CR1305 is forward biased because of the ground applied to its cathode from pin 6 of the module connector. The ground applied at pin 11 forward biases diode CR1319, grounding the noise input (pin 4 of module connector) so that transistor Q1302 will remain on regardless of noise input. All signals from audio preamplifier Q1301 are coupled through transistor Q1302 to the audio driver input circuit. Resistors R1313 and R1314 provide a dc path for biasing current for diodes CR1305 and CR1306.

1–36. Voltage Tripler

(fig. 1–13)

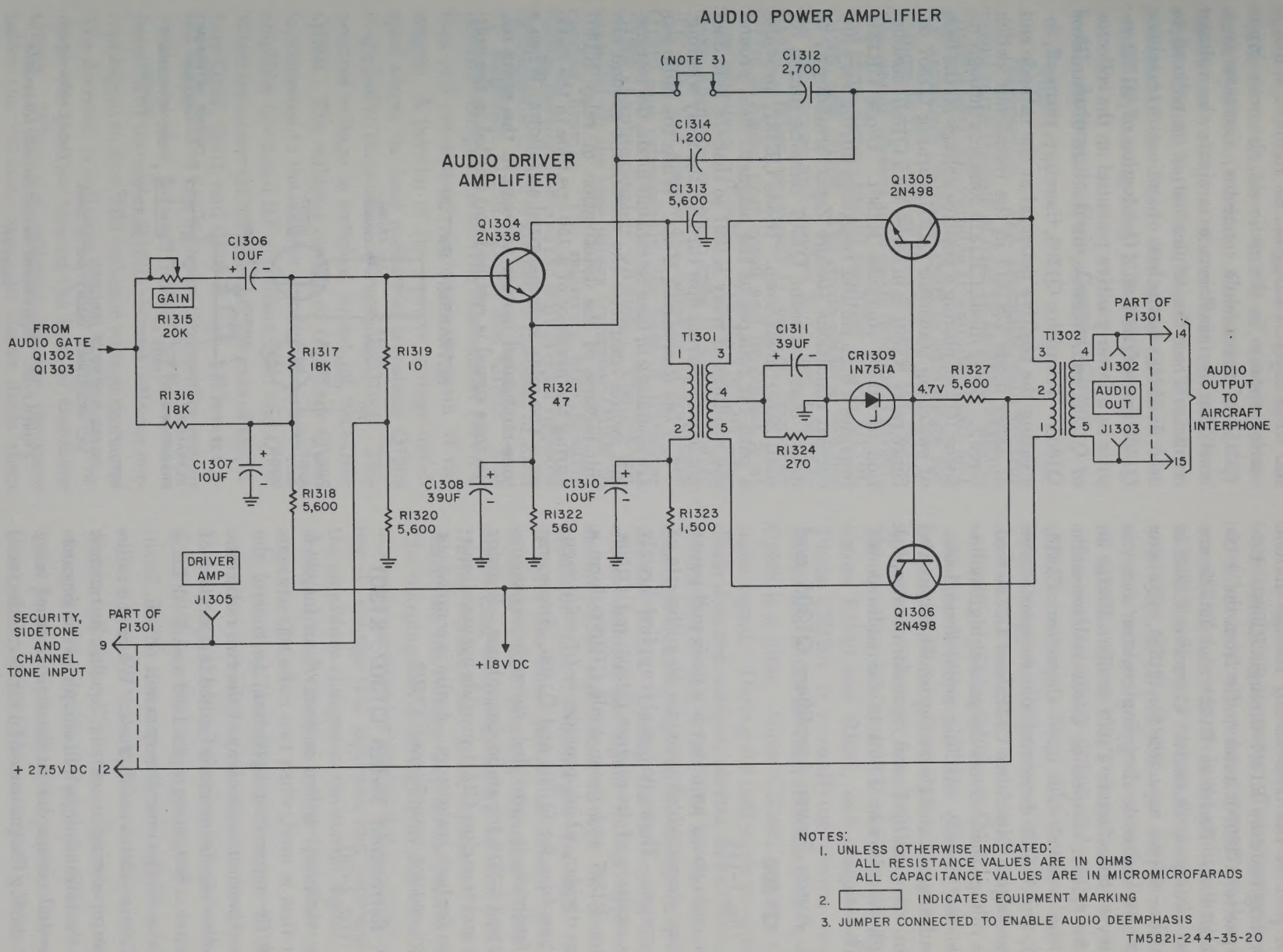
a. In carrier squelch mode, the voltage tripler rectifies and multiplies the level of noise input to supply a negative base-biasing voltage to audio gate transistor Q1302. In tone squelch mode, the voltage tripler rectifies and multiplies the tone input to supply a negative base-biasing voltage to audio gate transistor Q1302. In carrier squelch mode, noise is coupled to the voltage tripler from pin 4 of the module connector through coupling capacitor C1321 and diode switch CR1314, which is forward biased by current flow from pin 6 of the module connector through resistor R1335, diode CR1314, and resistor R1341. In tone squelch mode, the 150-cps tone is coupled to the voltage tripler from pin 8 of the module connector through coupling capacitor C1320 and diode switch CR1313, which is forward biased by current flow from pin 7 of the module conector through resistor R1334, diode CR1313, and resistor R1341.

b. During the first positive half-cycle of input signal (noise or tone), capacitor C1319 charges to the signal amplitude through Zener diode CR1318 and diode CR1312. During the negative half-cycle that follows, capacitor C1319 discharges through diode CR1311, charging capacitor C1318 to the value of input signal plus the value of charge across capacitor C1319. Capacitor C1318, therefore, charges to twice the signal voltage. During the second positive half-cycle (the third half-cycle), capacitor C1318 discharges through diode CR1310 and charges capacitor C1317 to the value of the input signal plus the value of charge across capacitor C1318. Capacitor C1317, therefore, charges to three times the input signal level. Zener diode CR1318 and resistor R1339 establish a reverse bias of +8.2 volts for diodes CR1310, CR1311, and CR1312 to assure that the voltage tripler does not operate during the presence of a carrier (minimum noise level). A voltage divider formed by resistors R1330 and R1329 decrease the output negative voltage level so that audio gate transistor Q1302 will not be damaged by excessive reverse bias. Capacitor C1316 filters the voltage tripler output.

1–37. Audio Driver Amplifier Q1304

(fig. 1–14)

The audio driver amplifier amplifies the audio signal, the sidetone, the channel tone, and the security input to a level that is sufficient to drive the audio power amplifier. Input audio from the audio gate is coupled through potentiometer R1315 and coupling capacitor C1306 to the base of audio driver amplifier Q1304. Potentiometer R1315 is used to adjust the audio level. The security, sidetone, and channel tone inputs are coupled to the base of Q1304 through resistor



NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. [ ] INDICATES EQUIPMENT MARKING
3. JUMPER CONNECTED TO ENABLE AUDIO DEEMPHASIS

TM5821-244-35-20

Figure 1–14. Audio driver and audio power amplifier circuits, schematic diagram.

R1319, part of the base-biasing voltage divider comprising resistors R1317 through R1320. Filter capacitor C1307 isolates audio from the +18-volt bias line. Resistors R1321 and R1322 are emitter swamping resistors. Capacitor C1308 is the emitter bypass capacitor for Q1304. Resistor R1323 is a series dc dropping resistor and the primary of transformer T1301 is the collector ac load for Q1304. Capacitor C1310 isolates audio from the +18-volt bias line. Capacitors C1313, C1312, and C1314 determine the response curve for the stage. Capacitors C1312 and C1314 feed back a voltage that reduces the gain at high audio-frequencies, thereby enabling audio deemphasis. The audio signal, along with any tones that may be present, is amplified and transformer-coupled through transformer T1301 to the audio power amplifier stage.

1–38. Audio Power Amplifiers Q1305 and Q1306

(fig. 1–14)

The audio power amplifier is a push-pull power amplifier circuit which provides 50 milliwatts of audio output. The audio signal is applied directly to the emitters of transistors Q1305 and Q1306. Resistor R1327 and Zener diode CR1309 form a voltage divider, which provides +4.7 volts regulated base bias for Q1305 and Q1306. Degenerative feedback is provided through capacitors C1312 and C1314 for audio deemphasis. Resistor R1324 and capacitor C1311 provide bypassed emitter bias for both transistors. Audio is coupled out through output transformer T1302.

1–39. Retransmit Switch Q1307, K1301

(fig. 1–15)

The retransmit switch is part of an interlock circuit that is used, when two radio sets are connected for retransmit operation, to control the modes (transmit or receive) of the two radio sets. The following discussion is limited to operation of the switch. See paragraphs 1–92 and 1–93 for a discussion of the overall retransmit circuit.

a. Carrier Retransmit Mode. When the radio sets are operating in carrier squelch retransmit mode, the retransmit switch completes the retransmit ground circuit due to the activation of relay K1301 during the presence of a carrier in the radio set. The relay is energized as follows: When a carrier appears in the radio set, the noise input (pin 4 of the module connector) decreases to a level that is insufficient to activate the voltage tripler. When the tripler output is reduced to zero, fixed bias on the base of audio gate transistor Q1303 turns Q1302 on. Conduction of Q1302 results in a lower positive potential on the collector of Q1302, and, likewise, on the base of transistor Q1303. Transistor Q1303, therefore, turns off, increasing the positive potential at the cathode end of Zener diode CR1315 in the retransmit switch circuit. Zener diode CR1315 conducts through resistor R1338, placing a positive voltage on the base of switching transistor Q1307, turning Q1307 on. Since relay K1301 is in series with Q1307, conduction of Q1307 energizes K1301. Diode CR1316 provides a high emitter resistance during very low current conditions (before Zener breakdown) to insure that transistor Q1307 remains turned off until Zener breakdown. Diode CR1317 provides a path for collapse of the magnetic field around the windings of relay K1301 so that the field does not oppose current flow through the relay winding.

b. Tone Retransmit Mode. When the radio sets are operating in tone retransmit mode, the retransmit switch completes the retransmit ground circuit because of the deactivation of relay K1301 during the presence of a 150-cps tone in the radio set. The relay is deenergized as follows: When a tone-modulated carrier appears in the radio set, the tone signal is rectified and tripled in the volt-

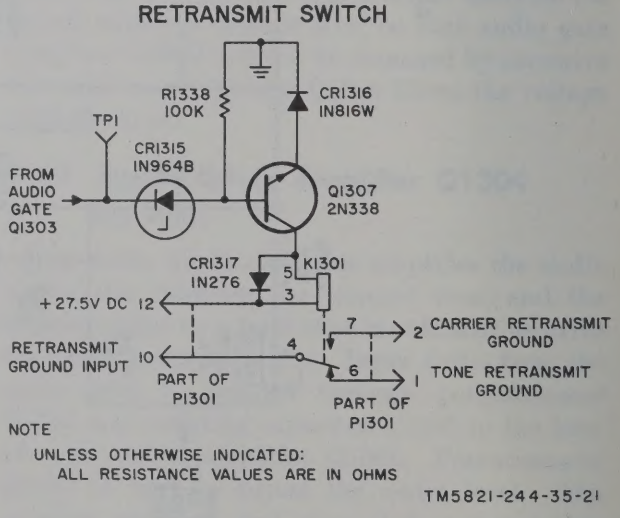


Figure 1–15. Retransmit switch circuit, schematic diagram.

age tripler circuit. The negative output from the tripler turns transistor Q1302 off, allowing transistor Q1303 to conduct. Conduction of Q1303 lowers the voltage at the cathode end of Zener diode CR1313 to a level below the breakdown potential of the diode. Transistor Q1307 is then turned off, causing relay K1301 to deenergize.

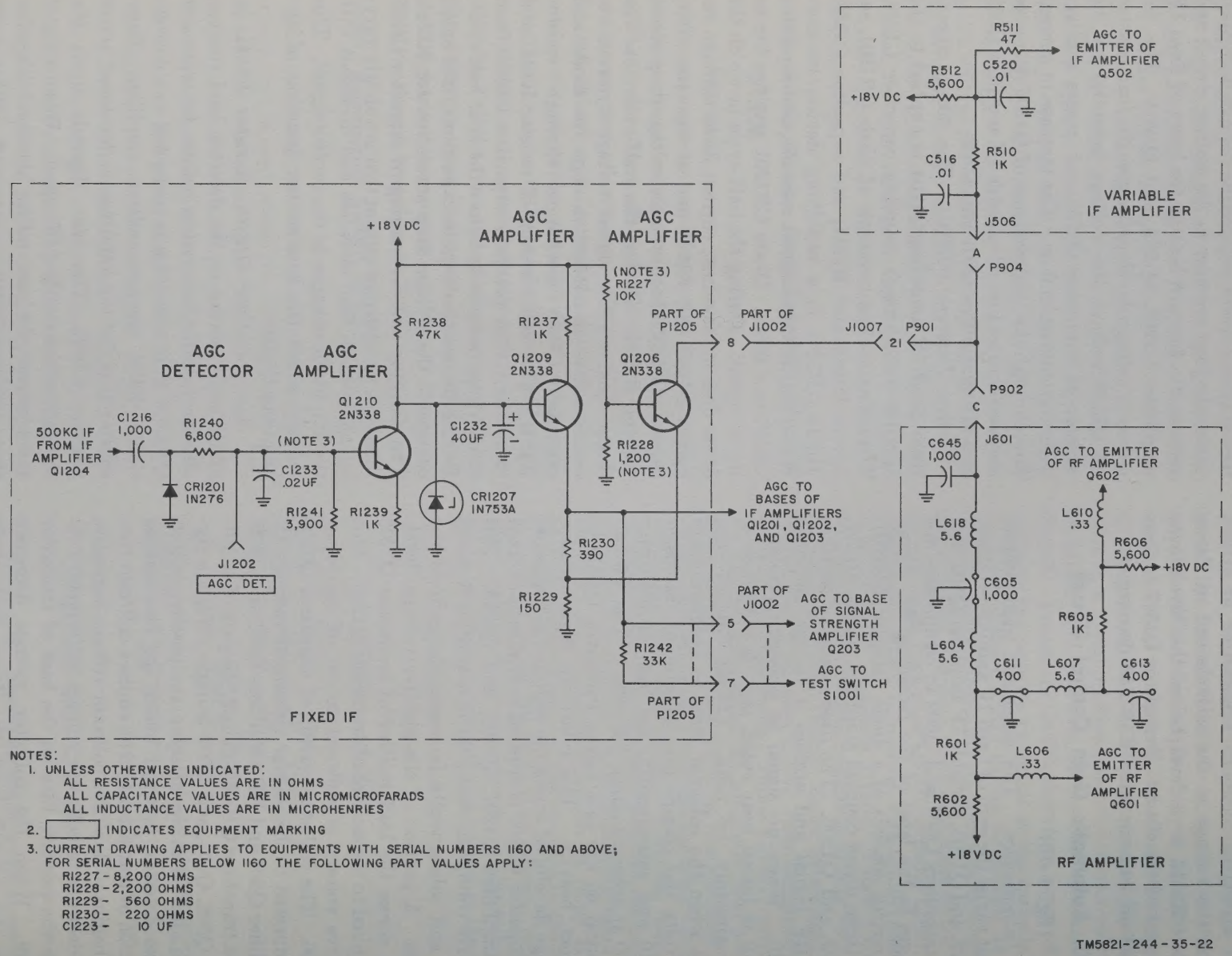
1–40. Automatic Gain Control Circuit

(fig. 1–16)

a. Introduction. The automatic gain control circuit varies the gain of fixed IF amplifiers Q1201, Q1202, and Q1203, variable IF amplifier Q502, and RF amplifiers Q601 and Q602 to compensate for changes in the level of the incoming RF signal. The circuit consists of a diode detector, CR1201, and three direct-coupled amplifier stages, Q1210, Q1209, and Q1206. The diode detector rectifies the RF signal and applies it to agc amplifier Q1210. When no signal is present, transistor Q1210 is biased near cutoff and its output is at approximately +6 volts. (Diode CR1207 conducts when the collector rises to approximately +6 volts and clamps the collector of transistor Q1210 and subsequently, the base of transistor Q1209 at approximately +6 volts.) The +6-volt potential on the base causes transistor Q1209 to conduct heavily. The relatively high positive voltage developed across the emitter-load resistors of transistor Q1209 is applied to the bases of fixed IF amplifiers Q1201, Q1202, and Q1203. This positive voltage increases the base-emitter forward bias and subsequently increases the gain of the stages. A portion of the positive voltage developed across the load resistor of transistor Q1209 is applied to the emitter of transistor Q1206. This positive voltage is sufficient to cut off transistor Q1206. The collector circuit of transistor Q1206 is connected to the emitter circuits of variable IF amplifier Q502 and RF amplifiers Q601 and Q602. When transistor Q1206 is cut off, the gain of amplifiers Q502, Q601, and Q602 is high. When a signal is applied to the detector, the positive output of the detector forward biases the base-emitter junction of transistor Q1210, emitter-collector current begins to flow, and collector voltage decreases. The decrease in collector voltage subsequently reduces the positive bias on the base of transistor Q1209. When the collector voltage decreases below the +6-volt level, the Zener diode stops conducting and the emitter-collector current of transistor Q1209 decreases. This decrease in emitter-collector current reduces the voltage developed across the load resistors in the emitter circuit and reduces the forward bias on the bases of fixed IF amplifiers Q1201, Q1202, and Q1203. The decrease in voltage developed across the load resistor of Q1209 reduces the voltage potential on the emitter of transistor Q1206 and causes emitter-collector current to flow. The increase in current flow through the load resistors of Q1206 decreases the base-emitter bias of variable IF amplifier Q502 and RF amplifiers Q601 and Q602.

b. Agc Detector CR1201. The 500-kc signal from fixed IF amplifier Q1204 is applied to the agc detector through coupling capacitor C1216. The detector circuit consists of diode CR1201, resistors R1240 and R1241, and capacitor C1233. Diode CR1201 is a rectifying device, resistors R1240 and R1241 are load resistors, and capacitor C1233 is a filter. Diode CR1201 rectifies the ac input signal. During the half-cycle in which the diode does not conduct, current flows through resistors R1240 and R1241 and at the same time, capacitor C1233 charges to the voltage drop across resistor R1241. During the half-cycle that the diode conducts, the signal voltage bypasses resistors R1240 and R1241 through the diode, and capacitor C1233 discharges through resistor R1241. The time constant of resistor R1241 and capacitor C1233 prevents capacitor C1233 from discharging completely before the next half-cycle. During the next half-cycle, capacitor C1233 again charges to the voltage drop across resistor R1241. The charging and discharging of capacitor C1233 filters the agc detector output that is a slowly varying dc voltage that increases and decreases with the amplitude changes in the carrier signal. This voltage biases the base-emitter junction of agc amplifier Q1210.

c. Agc Amplifier Q1210. Resistor R1241, in addition to serving as the detector load resistor, also serves as the base return resistor for transistor Q1210. This transistor is connected as a conventional NPN common-emitter amplifier. Base-emitter bias for the amplifier is developed across resistor R1241. The bias depends upon the strength of the rectified IF signal. When a signal is not present, the base-emitter junction is biased so that transistor Q1210 is near cutoff. When a sig-



NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. [ ] INDICATES EQUIPMENT MARKING
3. CURRENT DRAWING APPLIES TO EQUIPMENTS WITH SERIAL NUMBERS 1160 AND ABOVE; FOR SERIAL NUMBERS BELOW 1160 THE FOLLOWING PART VALUES APPLY:
   R1227 - 8,200 OHMS
   R1228 - 2,200 OHMS
   R1229 - 560 OHMS
   R1230 - 220 OHMS
   C1223 - 10 UF

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Figure 1–16. Agc circuits, schematic diagram.

nal is present, the agc voltage developed across resistor R1241 forward biases the base-emitter junction, causing transistor Q1210 to conduct. Resistor R1239 is the emitter resistor; resistor R1238 is the collector-load resistor. The +18-volt supply provides collector voltage through the load resistor. Zener diode CR1207 clamps the collector voltage to a maximum value of +6.2 volts. When the collector voltage is below +6.2 volts, the Zener diode acts as an open circuit. Capacitor C1232 filters abrupt changes in the incoming signal. The collector voltage is coupled to the base of agc amplifier Q1209.

d. Agc Amplifier Q1209. This stage uses a type 2N338 transistor connected as a dc amplifier. Resistors R1229 and R1230 are emitter-load resistors. The +18-volt supply provides collector voltage through load resistor R1237. When the input signal increases in a positive direction, the forward base-emitter bias increases and current flow increases through the transistor. This increases the voltage drop across emitter-load resistors R1229 and R1230. When the input signal swings in a negative direction, the base-emitter forward bias decreases, conduction through the transistor decreases, and the voltage drop across load resistors R1229 and R1230 decreases. The output signal developed across resistors R1229 and R1230 is applied to the base circuits of fixed IF amplifiers Q1201, Q1202, and Q1203. Resistor R1229 has a dual function. In addition to being part of the emitter-load resistance for agc amplifier Q1209, it is also the emitter resistor for agc amplifier Q1206. Therefore, the signal developed across resistor R1229 is applied to the emitter of agc amplifier Q1206.

e. Agc Amplifier Q1206. This stage uses a type 2N338 transistor connected in a conventional NPN common-emitter configuration. The voltage divider consisting of resistors R1227 and R1228 provides steady-stage base-emitter bias. The collector voltage for the stage is supplied from the +18-volt supply through three separate circuits. One circuit connects +18 volts dc to the collector through resistors R512 and R510, pin A of connector J506, pin A of connector P904, pin 21 of connector J1007, pin 8 of connector J1001, and pin 8 of connector P1205. A second circuit connects +18 volts dc to the collector through resistors R606 and R605, inductor L607, capacitor C611, inductor L604, capacitor C605, inductor L618, capacitor C645, pin B of connector J601, pin B of connector P902, pin 21 of connector P901, pin 21 of connector J1007, pin 8 of connector J1002, and pin 8 of connector P1205. A third circuit connects the +18 volts to the collector through resistors R602 and R601, inductor L604, capacitor C605, inductor L618, capacitor C645, pin B of connector J601, pin B of connector P902, pin 21 of connector P901, pin 21 of connector J1007, pin 8 of connector J1002, and pin 8 of connector P1205. Resistors R510, R512, R601, R605, and R606 are load resistors. Inductors L605, L607, and L618 and capacitors C516, C520, C605, C611, C613, and C645 form filter networks that decouple the IF and RF signals from the agc circuits. Current flow through emitter resistor R1229 controls the base-emitter bias of amplifier Q1206. When current flow increases through resistor R1229, the forward base-emitter bias decreases and emitter-collector decreases. When current flow through resistor R1229 decreases, the forward base-emitter bias increases and subsequently emitter-collector current increases. An increase in emitter-collector current reduces the output voltages supplied to the amplifiers Q502, Q601, and Q602. One output is taken from the junction of resistors R510 and R512 and applied to the emitter circuit of variable IF amplifier Q502, another output is taken from the junction of resistors R601 and R602 and applied to the emitter circuit of RF amplifier Q601, and a third output is taken from the junction of resistors R605 and R606 and applied to the emitter circuit of RF amplifier Q602.

1-41. Security Amplifiers Q1207 and Q1208

(fig. 1-17)

Security amplifiers Q1207 and Q1208 amplify the detected audio signal from the fm discriminator and apply it to external security equipment. These stages use type 2N338 transistors connected as conventional common-emitter amplifiers. The audio signal from the discriminator is coupled to the base of transistor Q1207 through coupling capacitor C1228 and dropping resistor R1232. Capacitor C1229 filters high-frequency noise from the input signal. Resistors R1234 and R1236 are the collector-load resistors for transistors Q1207 and Q1208, respectively. Resistors R1233 and

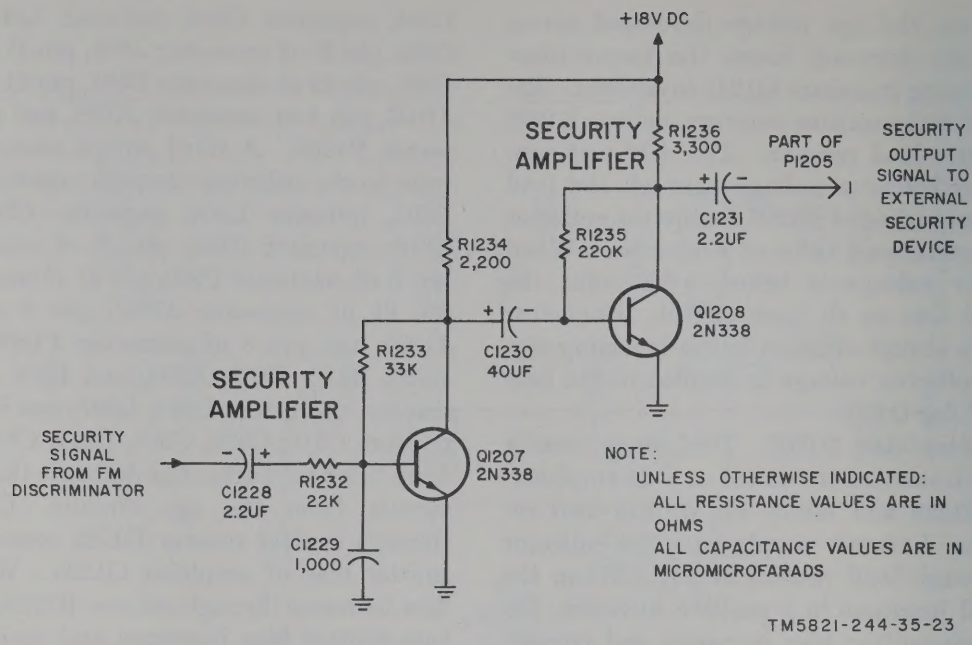


Figure 1-17. Security amplifier circuits, schematic diagram.

R1235 are the base bias and stabilizing resistors for transistors Q1207 and Q1208, respectively. The +18-volt supply provides collector voltage to the amplifiers through their respective load resistors. Capacitor C1230 couples the output signal from the collector of transistor Q1207 to the base of transistor Q1208. The output signal is applied from the collector of transistor Q1208 to external security equipment through coupling capacitor C1231.

1-42. Sel-Call Preamplifier Q101

(fig. 1-18)

Sel-call preamplifier Q101 amplifies the composite discriminator output (voice signal, tone, and noise) and supplies outputs to both the tone generator-selective amplifier circuit and the noise amplifier circuit. The +18-volt supply voltage is applied, through collector-load resistor R103, to the collector of Q101 and to the base-biasing voltage divider comprising resistor R101 and Zener diode CR101. Zener diode CR101 clamps the base bias for Q101 at +6.5 volts, which is applied through current-limiting resistor R102. Resistors R104 and R105 form the emitter-biasing resistance. Capacitor C102 bypasses R105 to prevent excessive degeneration. Audio tone and noise signals are coupled through coupling capacitor C101 to the base of Q101. The amplified output is coupled through coupling capacitor C103 to the tone generator-selective amplifier circuit. Noise output is also coupled through coupling capacitor C104 to pin 12 of the module connector. The noise

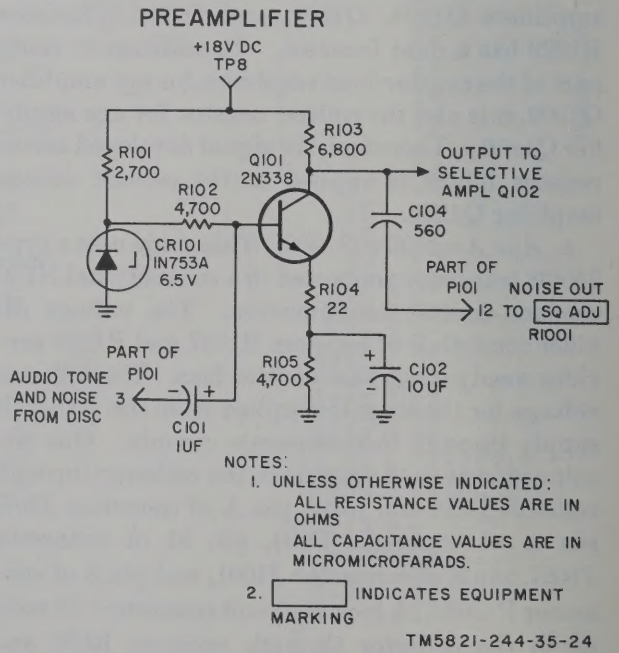


Figure 1-18. Sel-call preamplifier, schematic diagram.

is applied across the squelch adjust potentiometer (on the receiver-transmitter unit front panel), and a portion is coupled from the wiper arm of the squelch adjust potentiometer through pin 13 of the module connector to the noise amplifier circuit.

1–43. Tone Generator-Selective Amplifier Q102, Q103

(fig. 1–19)

The tone generator-selective amplifier circuit is a 150-cps generator in transmit mode and a 150-cps selective amplifier in receive mode. The circuit function is controlled by tr bus voltage, which selects the proper circuit impedance for the desired function. The circuit consists of transistors Q102 and Q103 and associated components.

a. Receive Condition. In receive condition, the tr bus voltage, applied at the junction of diodes CR102 and CR103, is positive; therefore, the diodes are forward-biased. With diodes CR102 and CR103 forward-biased, resistor R108 and capacitor C105 are shorted. In this condition, the collector impedance for transistor Q102 is formed by resistors R109 and R110 and capacitor C106. The resistance-capacitance (rc) time constant of the collector load is such that, at 150-cps, the resistance and the capacitive reactance are equal, providing 45° phase shift (voltage will lag current at the collector of Q102 by 45°). Transistor Q103 has a voltage gain very near unity. The emitter feedback circuit comprising resistors R112 and R113 and capacitor C107 also has a time constant that results in 45° phase shift at 150 cps, but is such that the phase shift introduced by the emitter-feedback circuit cancels the phase shift introduced by the collector impedance. The resulting feedback from emitter of Q103 to the emitter of Q102 will be regenerative and the circuit will have maximum gain at the desired frequency. The collector impedance is not high enough, however, to provide sufficient gain to cause the circuit to oscillate. The 150-cps tone is coupled into the circuit (along with all noise and audio signals present) through coupling capacitor C103 and is

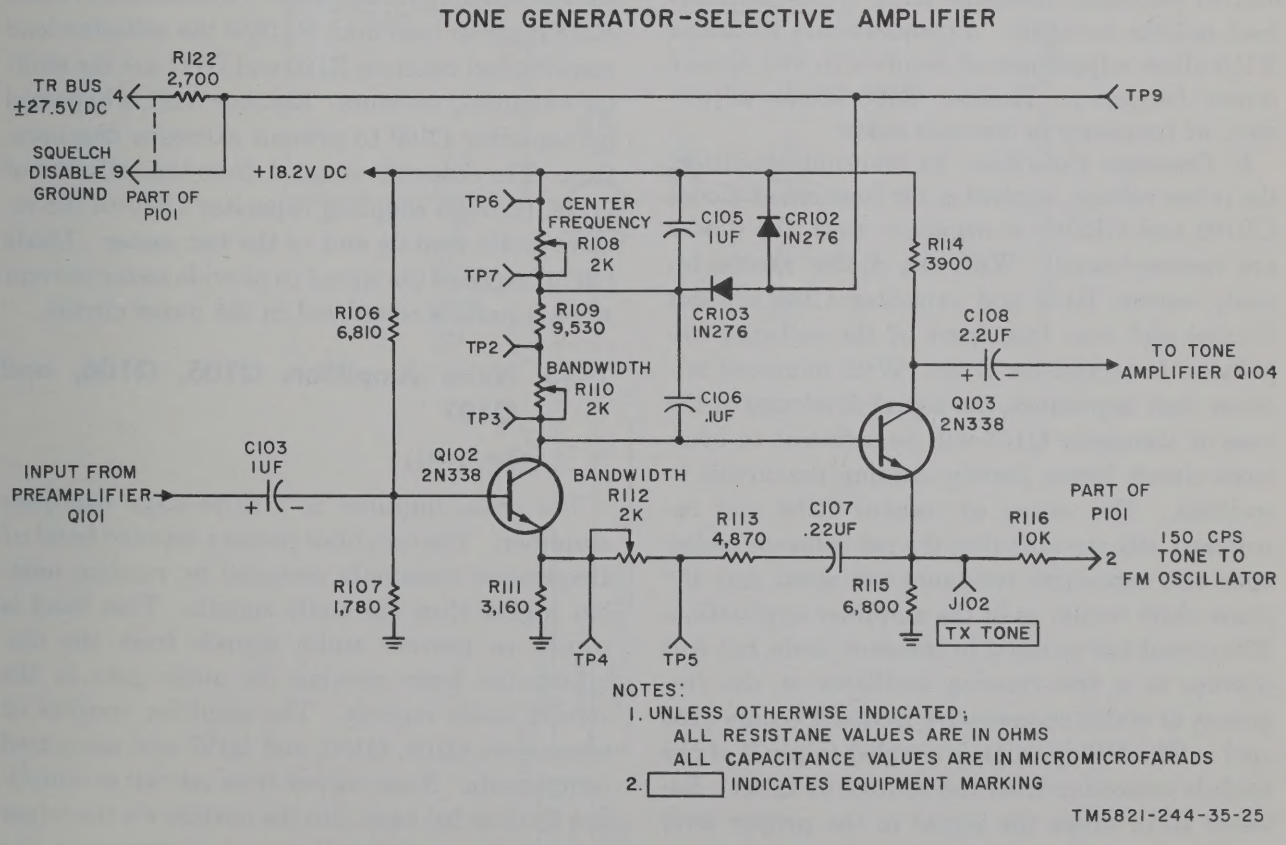


Figure 1–19. Tone generator-selective amplifier, schematic diagram.

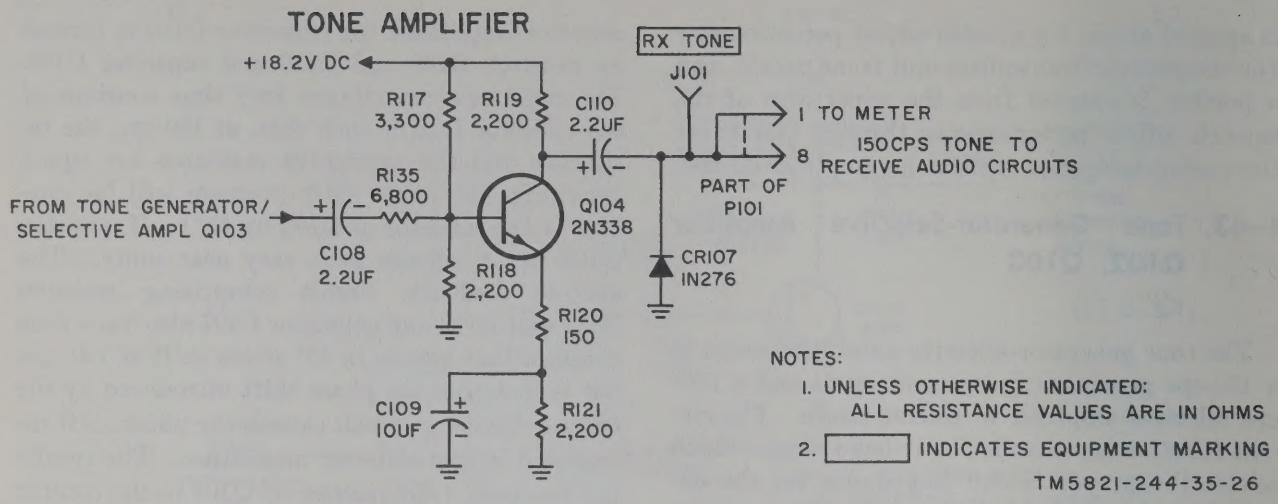


Figure 1–20. Tone amplifier, schematic diagram.

coupled from the collector of Q103 to final tone amplifier Q104. Resistors R106 and R107 determine the base bias for transistor Q102. Resistor R111 is the emitter swamping resistor for Q102 and resistor R115 is the emitter swamping resistor for Q103, both of which produce degenerative feedback. Resistor R114 is the collector-load resistor for Q103. Potentiometers R112 and R110 allow adjustment of bandwidth and receive center frequency. Resistor R108 allows adjustment of frequency in transmit mode.

b. Transmit Condition. In transmit condition, the tr bus voltage, applied at the junction of diodes CR102 and CR103, is negative; thus, the diodes are reverse-biased. With the diodes reverse-biased, resistor R108 and capacitor C105 are not shorted and now form part of the collector impedance for transistor Q102. With increased collector-load impedance, the signal developed at the base of transistor Q103 will be sufficient to overcome circuit losses, thereby causing the circuit to oscillate. The values of resistor R108 and capacitor C105 are such that the net collector resistance and capacitive reactance are equal and 45° phase shift results as in the amplifier application. The circuit has no input in transmit mode, but will operate as a free-running oscillator at the frequency at which regenerative feedback occurs (150 cps). The 150-cps tone is coupled to pin 2 of the module connector from the emitter of Q103. Resistor R116 drops the signal to the proper level for injection into the transmit audio module.

1–44. Tone Amplifier Q104

(fig. 1–20)

Tone amplifier, Q104 and associated components amplify the 150-cps tone to the level necessary to drive the receive audio circuits. The circuit is a conventional audio amplifier. Resistors R117 and R118 develop base bias, R119 is the collector-load resistor, and resistors R120 and R121 are the emitter-swamping resistors. Resistor R121 is bypassed by capacitor C109 to prevent excessive degeneration. The output is coupled from the collector of Q104, through coupling capacitor C110 to the receive audio module and to the test meter. Diode CR107 rectifies the signal to provide meter current when a path is completed in the meter circuit.

1–45. Noise Amplifiers Q105, Q106, and Q107

(fig. 1–21)

The noise amplifier is a three-stage bandpass amplifier. The amplifier passes a selected band of frequencies commonly occupied by random noise but higher than the audio signals. This band is chosen to prevent audio signals from the discriminator from opening the audio gate in the receive audio module. The amplifier consists of transistors Q105, Q106, and Q107 and associated components. Noise output from sel-call preamplifier Q101 is fed back into the module via the wiper arm of the squelch adjust potentiometer, to the

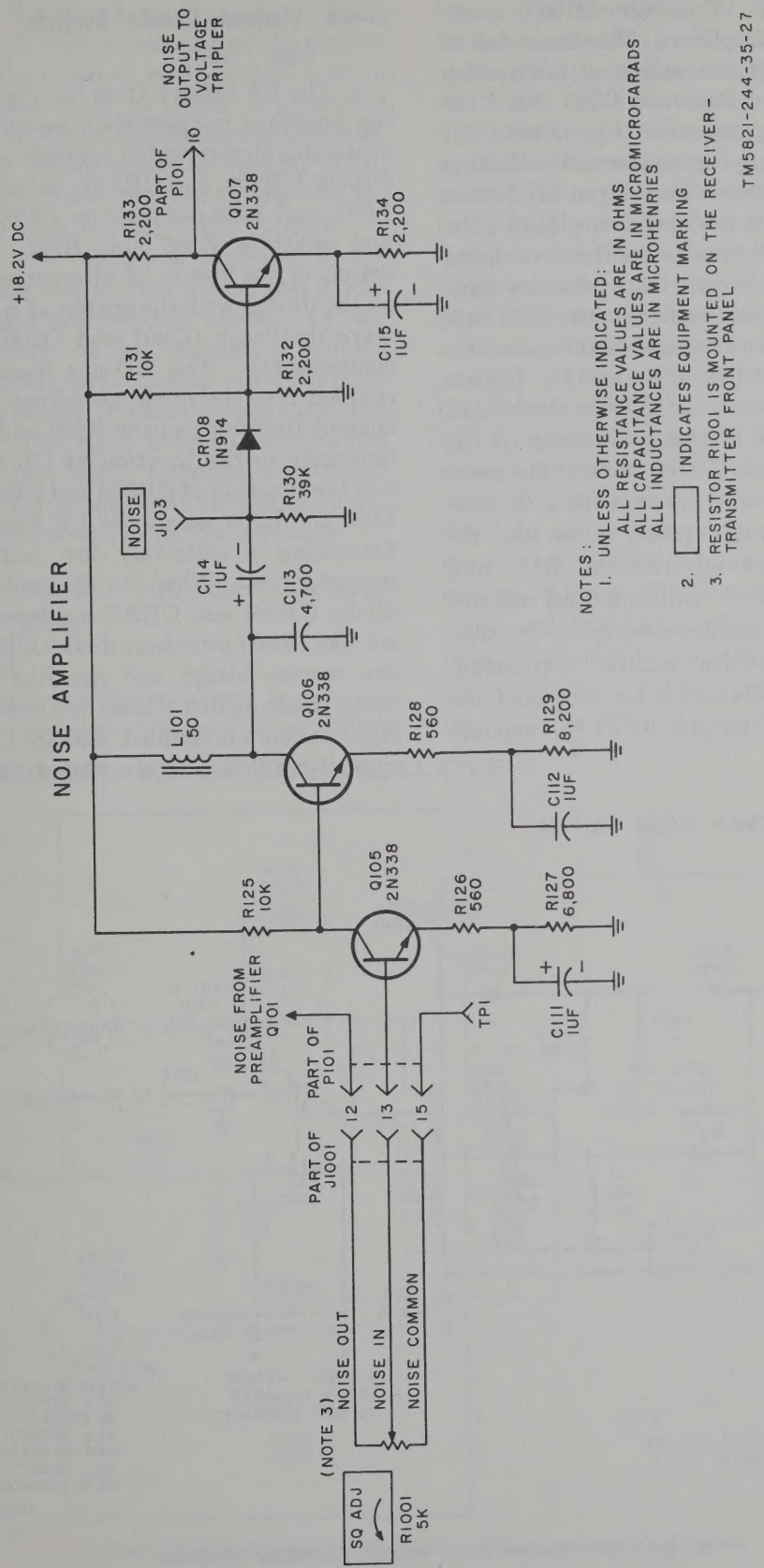


Figure 1-21. Noise amplifier, schematic diagram.

base of transistor Q105. Transistor Q105 is a conventional transistor amplifier. The base bias of Q105 is determined by the setting of the squelch adjust potentiometer. Resistors R126 and R127 are emitter-swamping resistors. Capacitor C111 provides emitter bypassing and resistor R125 is the collector-load resistor. The output of Q105 is direct-coupled to the base of transistor Q106. Resistors R128 and R129 are the emitter swamping resistors for Q106. Capacitor C112 provides emitter bypassing. Collector-load inductor L101 and capacitor C113 tune the response of the noise amplifier to pass only signals at or near 10 kc. Capacitor C114 couples the output of Q106 to the base of Q107. Test jack J103 allows monitoring of the unrectified noise. Diode CR108 rectifies the noise input to Q107. Resistor R130 provides a dc path for diode CR108 biasing current. Base bias for Q107 is developed through resistors R131 and R132. Resistor R133 is the collector-load resistor. Resistor R134 is the emitter-swamping resistor. Capacitor C115 provides emitter bypassing. Amplified negative noise spikes are coupled from the collector of Q107 to pin 10 of the module connector.

1–46. Homer Diode Switch

(fig. 1–22)

a. The RF energy from the right and left homing antennas is alternately sampled by the diode switching circuit which consists of diodes CR201, CR202, CR203, and CR210; inductors L201, L202, L203, and L206; capacitors C202 through C205; and resistors R206 and R207. The switching action is the result of alternating bias voltages on the diodes with the output of a 100-cps square-wave oscillator (Q201 and Q206 and associated components). The 100–cps biasing voltage are coupled into the diode switching circuit through current-limiting resistor R206 and applied simultaneously to the junction of CR 201 and CR203 and the junction of CR202 and CR210. RF chokes L201 and L206 isolate the RF from ground while presenting a relatively low impedance to the square waves. When the bias voltage is positive, diodes CR201 and CR202 are forward biased and act like closed switches; diodes CR203 and CR210 are reverse biased and act like open switches. Since diode switch CR201 is closed, RF from the right antenna is coupled through CR201, coupling capacitor C205, and the closed (normally open)

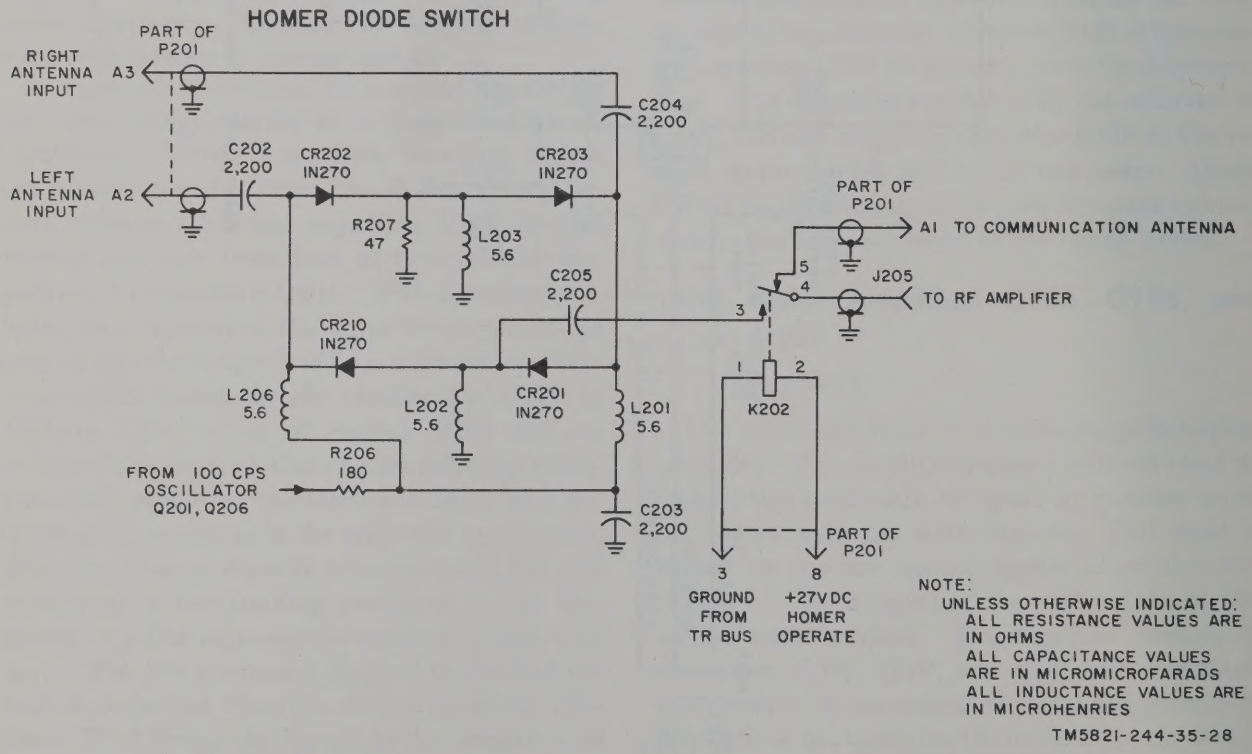


Figure 1–22. Homer diode switch, schematic diagram.

contacts of relay K 202, and out J205. Relay K202 is activated by +27 volts from pin 8 of the module connector when the radio set mode control is set to HOME. The other side of K202 is grounded (from pin 3) at all times, except during transmit. The left antenna is terminated by resistor R207. Inductors L203 and L202 provide dc grounds for the diodes while isolating RF from ground.

b. When the bias voltage is negative, diodes CR201 and CR202 are reverse biased and diodes CR203 and CR210 are forward biased. In this condition, RF from the left antenna is coupled through diode CR210 and coupling capacitor C205 and through the closed (normally open) contacts of relay K202. The right antenna is grounded through CR203 and R207. Capacitors C202 and C204 couple the RF to the diode switching circuit while providing dc isolation for the antennas.

1–47. Square - Wave 100-Cps Oscillator Q201, Q206

(fig. 1–23)

The square-wave 100-cps oscillator is a standard saturable-core square-wave oscillator. When homer operate voltage is applied to the homer module connector (pin 8), a fixed bias is developed by the voltage divider consisting of resistors R203 and R204. This bias voltage starts the oscillator. The collectors of transistors Q201 and Q206 are grounded through windings 3 and 4 of saturable reactor T201. The emitters are at +18 volts. Because of slight differences in the apparently balanced circuit, one of the transistors will start conducting harder than the other. The current thus produced through the reactor windings (3 and 4) causes a voltage to be inducted into windings 5–6 and 6–7. These voltages will be of such polarity that the transistor that started conducting harder will be driven into saturation and the other transistor will be cut off. This conduction will continue until the core of the reactor is saturated and the field starts collapsing. When the field collapses, the voltages induced into the windings will reverse, cutting off the transistor that was saturated, and driving the other transistor into saturation. The switching action is very rapid and the resulting output, induced into the secondary winding (1–2) of T201, is a square wave. The process

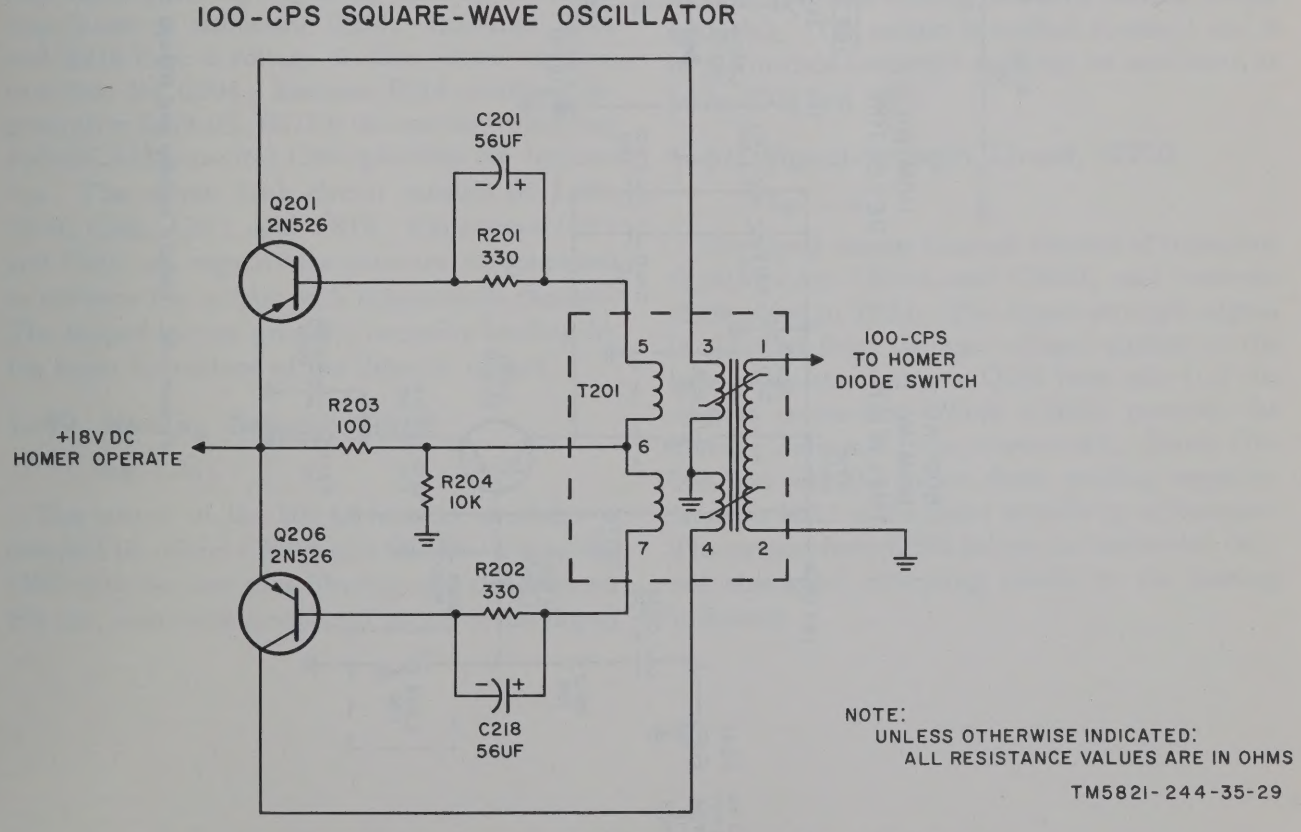


Figure 1–23. Square-wave 100-cps oscillator, schematic diagram.

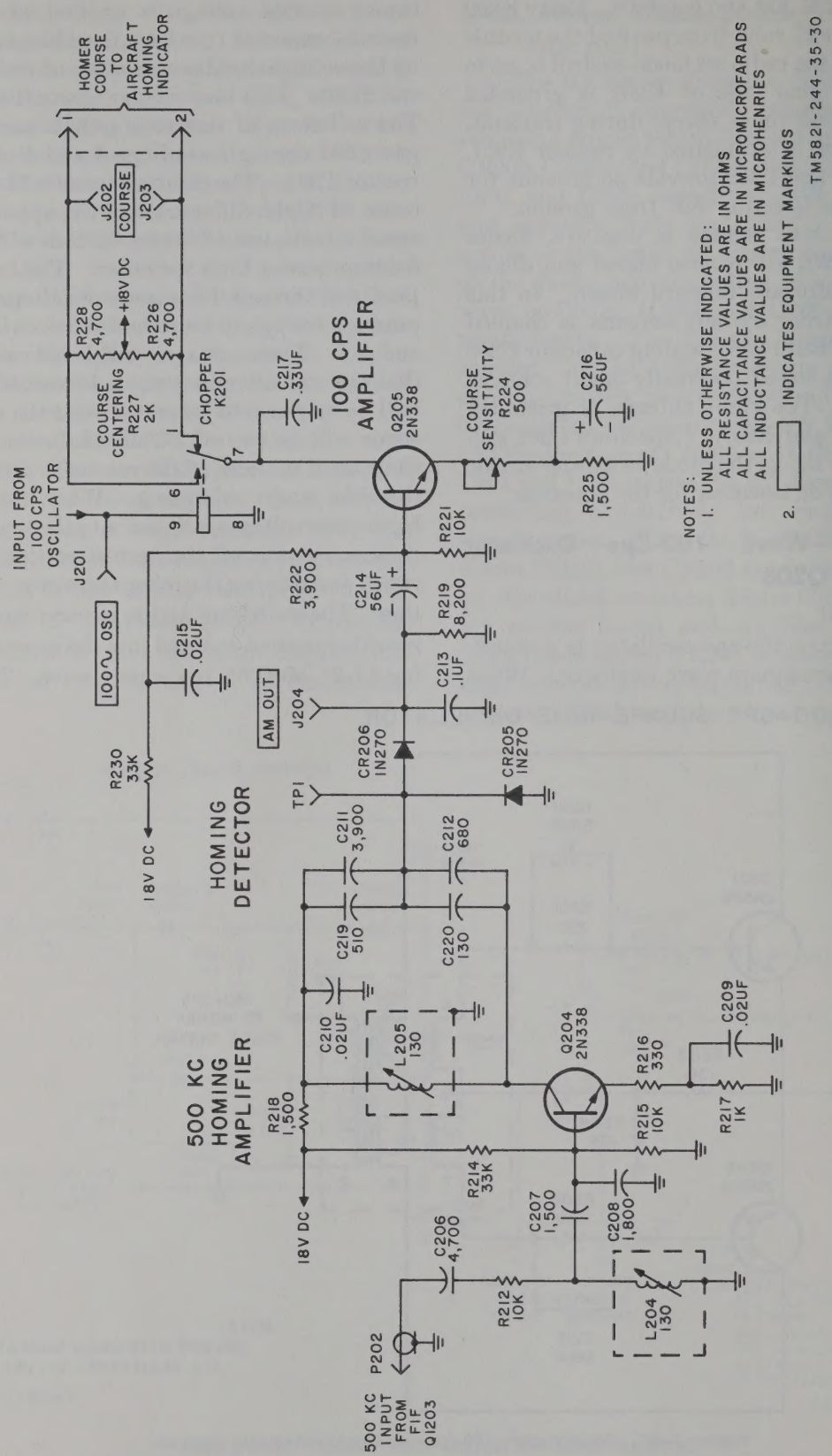


Figure 1-24. 500-Kc homing and 100-cps amplifier circuits, schematic diagram.

is repeated at a frequency determined by transformer T201. The rc networks comprising R202 and C218 and R201 and C201 provide fast switching in order to prevent transistor burnout. The amplitude of the output is determined by the turns ratio of the transformer.

1-48. 500-Kc Homing Amplifier Q204

(fig. 1-24)

After the right and left antenna energy is sampled by the diode switching circuit (para. 1-46), the signal is coupled through the RF amplifier, variable IF amplifier, fixed IF amplifier, and back to the homer module at P202. This 100-cps am signal is now superimposed on a 500-kc carrier. The 500-kc homing amplifier, consisting of transistor Q204 and associated circuitry, is a narrow bandpass amplifier, which eliminates all unwanted signal and noise that might affect the homing signal. The signal is coupled in through coupling capacitor C206, isolating resistor R212, and the input tank circuit consisting of L204, C207, and C208. The tank circuit is capacity-tapped to prevent loading the high-Q of the tank by the input impedance of transistor Q204. Resistors R214 and R215 form a voltage divider, which supplies base bias for Q204. Resistor R216 produces degenerative feedback, R217 is the emitter-swamping resistor, and capacitor C209 provides RF bypassing. The output tank circuit consists of L205, C219, C220, C211, and C212. Capacitors C211 and C212 are regative-temperature compensated to stabilize the output with temperature changes. The tapped output prevents excessive loading by the input impedance of the detector circuit.

1-49. Homing Detector Circuit

(fig. 1-24)

The output of the 500-kc homing amplifier is detected by diodes CR205 and CR206. Capacitor C213 provides low-pass filtering and the detected 100-cps, amplitude-modulated signal is developed across dc return resistor R219 and coupled through coupling capacitor C214 to the base of 100-cps homing amplifier Q205.

1-50. 100-Cps Homing Amplifier Q205

(fig. 1-24)

The detected 100-cps signal from the 500-kc homing amplifier is amplified by A205 and associated circuitry. Resistors R220, R221, and R222 form a voltage divider from +18 volts, which supplies bias voltage for transistor Q205. Capacitor C215 is a bypass capacitor. The gain of the stage can be adjusted by potentiometer R224 in the emitter circuit of Q205. Resistor R225 is the emitter-swamping resistor, and capacitor C216 provides rf bypassing to ground. Capacitor C217 filters the collector output. Mechanical chopper K201 is synchronized with the diode switching circuit (para. 1-46) to provide proper right-left meter movement in the homing indicator. The collector supply voltage is supplied through the wiper arm of potentiometer R227 and through dropping resistors R228 and R226. Adjustment of R227 provides homing indicator vertical needle centering. The output is applied to pins 1 and 2 of the module connector and may be monitored at jacks J202 and J203.

1-51. Signal-Strength Circuit, Q203

(fig. 1-25)

The signal-strength circuit consists of transistor Q203, diodes CR204 and CR211, and resistors R208 through R211. The signal-strength signal is obtained from the agc voltage, applied to the base of emitter-follower Q203 from pin 4 of the module connector. Diode CR211 protects the homing indicator from overcurrent. Diode CR-204 prevents the meter from reading negative. Resistor R211 is the meter sensitivity adjustment. The output from Q203 drives the horizontal (signal strength) indicating needle in the homing indicator.

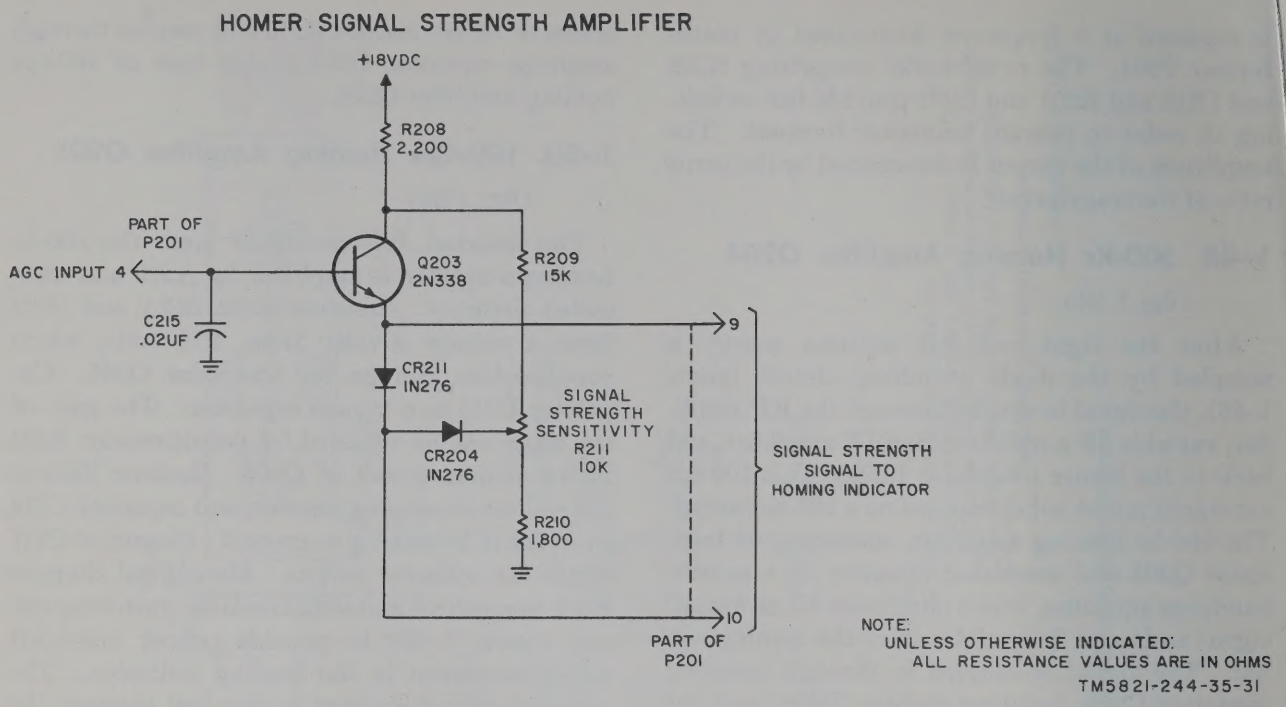


Figure 1-25. Homer signal-strength circuit, schematic diagram.

1-52. Despiking Circuit, Q1501, Q1504

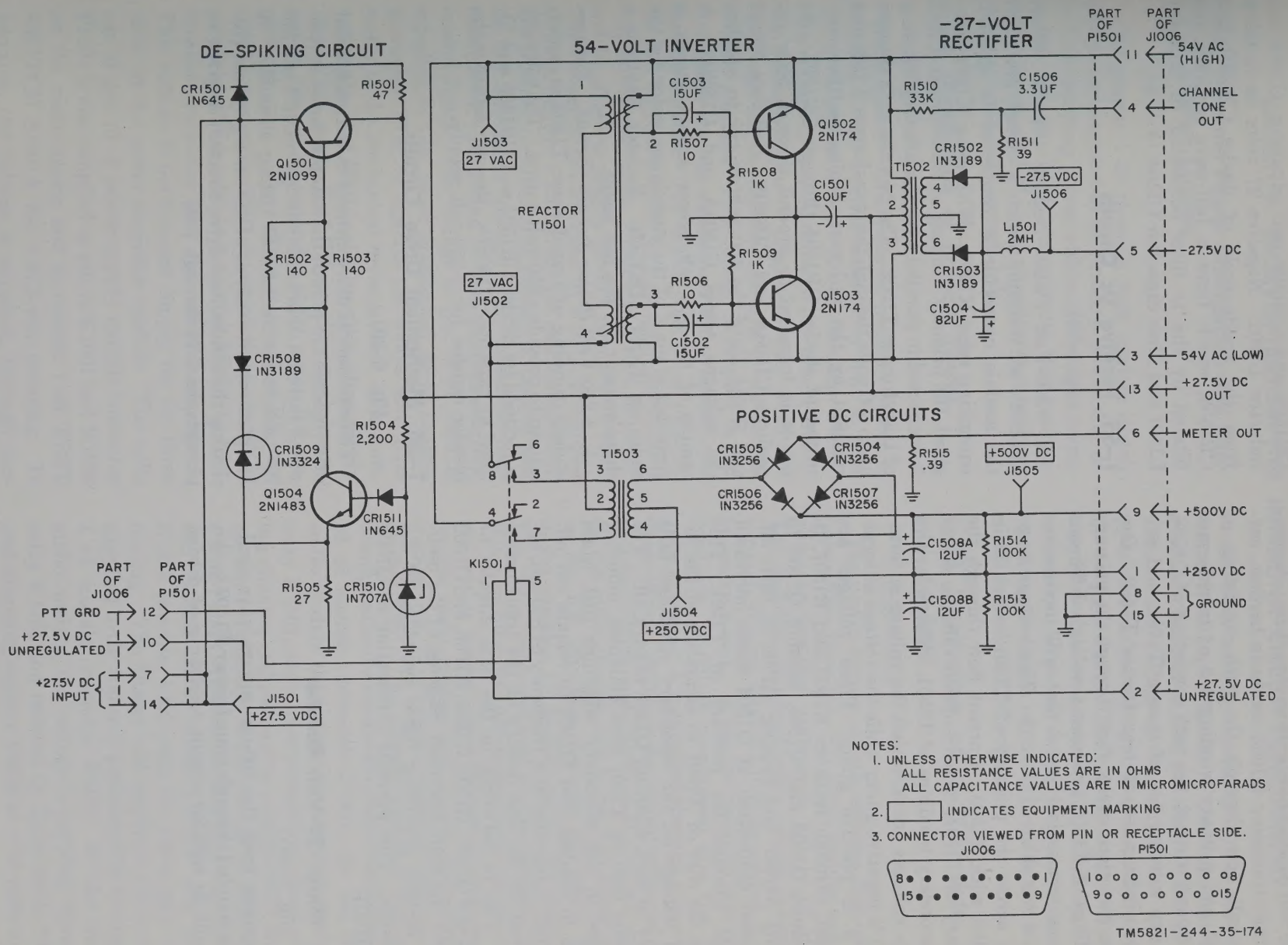
(fig. 1-26)

The despiking circuit removes positive spikes from the primary dc power by using a series switching transistor (Q1501) to open the dc line during high-amplitude positive spikes. During normal no-spike operation, switching transistor Q1501 is conducting because of the bias voltage supplied through switching transistor Q1504 and biasing resistors R1502, R1503, and R1505. Transistor Q1504 is biased on by a +6-volt dc level, which is regulated by Zener diode CR1510. Resistor R1504 limits current flow through CR1510. When a high-amplitude positive spike appears at the emitter of transistor Q1501, Zener diode CR1509 conducts through resistor R1505, increasing the positive voltage on the emitter of Q1504 and turning Q1504 off. With Q1504 turned off, the base bias is removed from transistor Q1501, turning Q1501 off for the duration of the spike. Resistor R1501 protects transistor Q1501 against high spike voltages. Positive spikes, which will tend to couple through diode CR1501 and resistor R1501, are bypassed to ground through filter capacitor C1501 in the square-wave oscillator circuit. Diodes CR1501, CR1508, and CR1511 protect the despiking circuit against reverse voltage such as would occur if the aircraft battery were accidentally connected backward.

1-53. 54-Volt, Ac Inverter Q1502, Q1503

(fig. 1-26)

Fifty-four volts 800-cps ac is provided by a saturable-core, square-wave oscillator circuit. The circuit consists of saturable reactor T1501; transistors Q1502 and Q1503; resistors R1506 through R1509; capacitors C1501 through C1503; and the primary winding of transformer T1502. Positive 27 volts is applied to the circuit at the center tap of the primary of transformer T1502. Bias for transistor Q1502 is developed by the voltage divider consisting of resistors R1508 and R1507. Bias for transistor Q1503 is developed by the voltage divider consisting of resistors R1509 and R1506. Capacitor C1501 is the despiking capacitor described in paragraph 1-52. When operating voltage is applied to the circuit, both transistors will try to conduct. Because of circuit tolerances and minor differences in the conduction characteristics of the two transistors, one tran-



NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. [ ] INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

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Figure 1–26. Power supply circuits, schematic diagram.

sistor will conduct harder than the other. Assuming that transistor Q1503 conducts hardest, current will flow through the path consisting of Q1503 and primary winding 2–3 of transformer T1502, and through the path consisting of Q1503, primary winding 1–4 of reactor T1501, and primary winding 1–2 of transformer T1502. Opposite-direction current flow through the primary windings of T1502 produces a voltage difference between terminals 1 and 3 that will increase toward a maximum of 54 volts. This voltage is applied across the primary of T1501, which is in parallel with T1502. Current flow through the primary of T1501, which induces voltages across the secondary windings of T1501. The polarities of the voltages are such that the voltage at terminal 3 is negative going while the voltage at terminal 2 is positive going. These voltages are coupled, through resistors R1506 and R1507, to transistors Q1502 and Q1503, causing Q1503 to conduct harder and causing Q1502 to turn off. Increased conduction of Q1503 causes increased current through the primary of T1501. This causes the core of T1501 to saturate and the induced voltage on the secondary windings falls rapidly to zero, allowing Q1503 to turn off. The magnetic field in T1501 then collapses, inducing voltages in the secondary windings that cause Q1502 to conduct and Q1503 to remain cut off. The cycle is repeated at a frequency of 800 cps, determined by the flux density of the transformer core. The rc networks in the base circuits of Q1502 and Q1503, R1507, C1503, R1506, and C1502 improve the high-frequency response of the oscillator, thereby providing faster switching of the transistors. This prevents overheating of Q1502 and Q1503.

1–54. Minus 27-Volt Rectifier

(fig. 1–26)

Ac power from the 800-cps square-wave oscillator is coupled through transformer T1502 to the −27-volt dc rectifier circuit consisting of diodes CR1502 and CR1503 and capacitor C1504 and inductor L1501. Negative 27 volts dc is taken from the anode ends of diodes CR1502 and CR1503, which form a full-wave rectifier, and filtered by the 1c filter consisting of inductor L1501 and filter capacitor C1504.

1–55. Positive Dc Circuits

(fig. 1–26)

a. +500-Volt Power Supply Circuit. When the radio set transmit switch is closed, pin 12 of the module connector is connected to ground, energizing relay K1501. With relay K1501 energized, the primary winding of transformer T1503 is connected in parallel with the primary winding of transformer T1502. The 54 volts ac is stepped up to 500 volts through the transformer T1503 and rectified by the full-wave bridge rectifier consisting of diodes CR1504 through CR1507. Ac ripple is bypassed to ground through filter capacitors C1508A and C1508B. Resistors R1513 and R1515 *bleed* the 500-volt supply to equalize the voltages across C1508A and C1508B. A sample of the 500-volt power supply output is provided at pin 6 of the module connector for the radio set TEST METER. Resistor R1515 is a shunt resistor for the test meter.

b. +250-Volt Power Supply Circuit. The secondary winding of transformer T1503 is center-tapped to provide a 250-volt output. The 250 volts is rectified by diodes CR1504 and CR1505 and filtered by capacitor C1508B. Resistor R1513 is the bleeder resistor for +250-volt supply.

1–56. Mechanical Drive Circuits

(fig. 6–20)

The mechanical drive cirucits in the mechanical drive module are part of the autopositioner system which includes switches in the control unit and the RF subchassis mechanical tuning assembly. A complete circuit analysis of the tuning system (including the mechanical drive circuits) is given in paragraphs 1–78 through 1–91.

Section IV. RECEIVER-TRANSMITTER INTRAUNIT CIRCUIT FUNCTIONING

1–57. Intraunit Power Distribution and Regulation Circuits

(fig. 6–21)

Paragraphs 1–58 through 1–62 explain distribution and regulation of primary power and dc and ac operating power within the receiver-transmitter unit to clarify intercircuit relationships that were not evident in the separate stage analyses in paragraphs 1–9 through 1–56.

1–58. Distribution of Primary Power

(fig. 6–21)

Unregulated +27.5 volts dc primary power is supplied to the receiver-transmitter unit at pins 16, 18, 34, and 36 of main power connector P1005. This voltage is coupled through line filter FL1001. The voltage at pin 16 is present only when the mode control on the control unit is set to the HOME position. This voltage is coupled to pin 8 of homer module connector P201 to operate the homing circuits. The +27.5 volts dc at pins 18, 34, and 36 is connected to a common point, then coupled through fuses F1001 and F1002 to pins 7 and 10 of power supply module connector P1501. The voltage at pin 10, fused by F1001, is supplied through pin 3 of P1501 to the RF subchassis relays and filament circuits. The voltage is coupled into the RF subchassis through main subchassis connector P901 pins 15 and 16 from main chassis connector J1007. The voltage at pin 16 of P901 is supplied to pin 16 of mechanical drive module connector P701 to operate the relays and drive motor in the mechanical drive module. The voltage at pin 16 of P901 is also supplied, through pin 15 of P701, to pin E of RF amplifier module connector J601 to operate relay K601 in the RF amplifier module. The voltage at pin 15 of RF subchassis connector P901 is supplied to pin C of power amplifier module connector FL801 (a combination connector and RF interference filter). This voltage is the filament supply for the three tubes in the power amplifier module. The voltage at pin 10 of power supply module connector P1501 is also supplied to relays K1001 and K1002 on the main chassis and to contact 1 of TEST SWITCH S1001A for +27.5-volt metering. In addition, the voltage is supplied, through harmonic filter module connector J1601 pin E, to relays K1601 and K1602 in the harmonic filter module. Resistor R1007 and diode CR1001 provide reverse-voltage protection if the primary power is accidentally applied to the radio set with the wrong polarity. The voltage at pin 7 of power supply module connector P1501, fused by F1002, is used by the power supply to provide despiked operating voltages of +27.5, −27.5, +500, and +250 volts dc and 54 volts ac.

1–59. Distribution of +27.5 Volts (Despiked)

(fig. 6–21)

The power supply module removes high-amplitude spikes from the +27.5-volt supply and supplies the despiked voltage to pin 13 of P1501. The despiked (but unfiltered) voltage is supplied through 100-cps filter FL1002 to contact 6 of tr bus relay K1001. When the radio set is in receive condition, K1001 is deenergized and the +27.5 volts at contact 6 is supplied through contact 4 to diode switch CR1301 in the receive audio and diode switches CR102 and CR103 in the sel-call module on the main chassis; and to the hfo diode switch in the RF amplifier, and the lfo diode switch in the variable IF module on the RF subchassis. The +27.5 volts despiked is also coupled through 100-cycle filter FL1002 to the receive audio, transmit audio, homer, fixed IF and sel-call modules on the main chassis and to the RF subchassis through pin 17 of chassis connector P901 to Zener diode CR901. The filtered, despiked +27.5 volts is supplied to the receive audio module through pin 12 of module connector P1301. In the receive audio module the voltage is supplied directly to relay K1301, audio power amplifier, diode switching circuits, and reduced to a regulated +18 volts for other transistors in the module by Zener diodes CR1307 and CR1308 and dropping resistors R1325 and R1326. Zener diode CR1318 and resistor R1339 provide +8.2 volts for audio gate circuit biasing. The filtered and despiked +27.5 volts is supplied to the transmit audio module through pin 4 of module connector P1401. In the transmit audio module, the voltage is supplied directly to relay K1401 and reduced by Zener diode CR1401 and dropping resistor R1432 to +18 volts to oper-

ate transistors Q1401, Q1402, and Q1403. Zener diode CR1402 and dropping resistor R1425 reduce the voltage still further to +6.8 volts to operate the fm modulator, varactor C1415. The filtered and despiked +27.5 volts is supplied to the homer module through pin 7 of module connector P201. In the homer module, the voltage is reduced to +18 volts by Zener diode CR207 and dropping resistor R213 to operate transistors Q203 and Q204. The filtered and despiked +27.5 volts is supplied to the fixed IF module through pin 9 of module connector P1205. In the fixed IF module, the voltage is reduced to +18 volts by Zener diode CR1206, inductor L1206, and dropping resistors R1231 and R1243. This voltage operates all the transistors in the module. The filtered and despiked +27.5 volts is supplied to the sel-call module through pin 5 of module connector P101. In the sel-call module, the voltage is reduced to +18 volts by Zener diode CR104 and dropping resistor R123 to operate transistor Q101. Zener diodes CR105 and CR106 and dropping resistor R124 provide +18.2 volts for the rest of the transistors in the module. The filtered and despiked +27.5 volts at pin 17 of RF subchassis connector P901 is reduced to +18 volts by Zener diode CR901 and dropping resistor R901 and supplied to the transmitter mixer in the RF amplifier module, and the IF amplifier, low-frequency oscillator, and high-frequency oscillator in the variable IF module. The regulated +18 volts is supplied to the RF amplifier module through pin B of module connector J601, to the variable IF module through pin C of module connector J506, to the low-frequency oscillator module through pin A of module connector J402, and to the high-frequency oscillator module through pin A of module connector J302.

1–60. Distribution of —27.5 Volts

(fig. 6–21)

The power supply module supplies −27.5 volts (despiked) through pin 5 of module connector P1501 to contact 2 of TEST SWITCH S1001B for −27.5-volt metering, to contact 7 of tr bus relay K1001, and, through chassis connector J1007 and RF subchassis connector P901 (pin 14), to the power amplifier module. The voltage is supplied to the power amplifier module through pin E of module connector FL801 and provides bias for tubes V801, V802, and V803. The −27.5 volts at contact 7 of tr bus relay K1001 is supplied, when the radio set is in the transmit mode (K1001 energized), through contact 4 to the tr bus. Distribution of this voltage is the same as distribution of the +27.5-volt tr bus voltage (when the radio set is in receive mode) (para. 1–59).

1–61. Distribution of 54 Volts Ac

(fig. 6–21)

The power supply module supplies 54 volts ac, 800 cps at pins 3 and 11 of module connector P1501. This ac voltage operates blower B1001 and provides a channel tone for the radio set (output not shown).

1–62. Distribution of +500 and +250 Volts

(fig. 6–21)

The power supply module supplies +500 and +250 volts at pins 9 and 1 respectively of module connector P1501. These voltages are supplied to the power amplifier module for plate and screen-grid voltages for the tubes. The +500 volts is supplied, through pin 23 of main chassis connector J1007 and RF subchassis connector P901, to pin A of power amplifier module connector FL801, and to the plate of V803. Also, the 500 volts DC is connected through pin 6 of P1501 to contact 9 of TEST SWITCH S1001B for metering. The +250 volts is supplied, through pin 12 of main chassis connector J1007 and RF subchassis connector P901, to pin B of power amplifier module connector FL801, and to the plates of V801 and V802.

1–63. Meeting Circuit

(fig. 1–27)

a. TEST SWITCH S1001, on the receiver-transmitter unit front panel, selects various operating voltages and outputs and applies them, through proper series resistances when necessary, to the TEST METER. TEST METER M1001, also on the receiver-transmitter unit front panel, displays these voltages to provide a quick check of the performance of the radio set. The test switch positions are marked with numbers 1 through 12. A chart marked TEST SWITCH POSITIONS tells what is measured in each position.

b. In position 1, +27.5 volts is applied to the positive meter terminal (contact 1, to contact 12, to the meter). The negative meter terminal is connected to contact 12 of S1001B, which is shorted to contact 1. Contact 1 is connected through resistor R1005 to ground. The meter requires 100 microamperes for full-scale deflection so +27.5 volts, applied through R1005 (560K ohms) provides half-scale deflection.

c. In position 2, −27.5 volts is applied to the negative meter terminal through S1001B (contact 2, to contact 12, to the meter). The positive meter terminal is connected through S1001A (contact 12 to contact 2) then through R1002 to ground. Resistor R1002 is also 560K ohms so again a normal reading is approximately half-scale deflection.

d. In position 3, a portion of the output of the low-frequency oscillator is applied to the positive meter terminal through S1001A (contact 3, to contact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12 to contact 3 to ground). In this case, no series resistor is used because the voltage being measured is the right value to produce approximately half-scale deflection.

e. In position 4, a portion of the output of the high-frequency oscillator is applied to the positive meter terminal through S1001A (contact 4, to con-

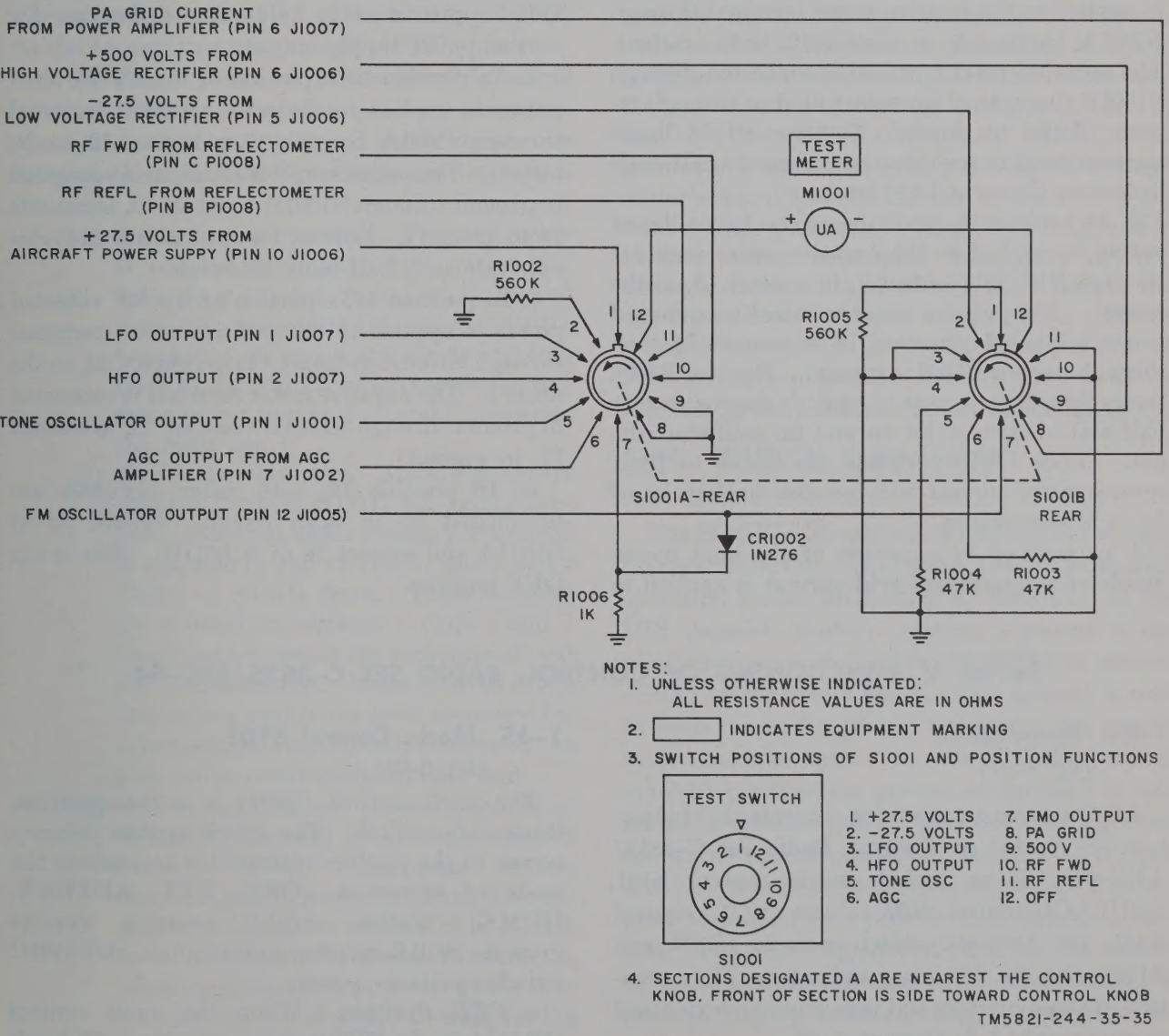


Figure 1-27. Metering circuit, schematic diagram.

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tact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12 to contact 4 to ground). Again the voltage being measured is small enough that no series resistance is required.

f. In position 5, a portion of the tone oscillator output is applied to the positive meter terminal through S1001A (contact 5, to contact 12, to the meter). The negative meter terminal is connected through S1001B (contact 12 to contact 5) then through resistor R1004 to ground. Resistor R1004 limits the meter current to provide approximately half-scale deflection for normal tone oscillator output.

g. In position 6, a portion of the agc voltage is applied to the positive meter terminal through S1001A (contact 6, to contact 12, to the meter). The negative meter terminal is connected through S1001B (contact 12 to contact 6) then through resistor R1003 to ground. Resistor R1003 limits meter current to provide approximately half-scale deflection for normal agc levels.

h. In position 7, a portion of the fm oscillator output is applied to the negative meter terminal through S1001B (contact 7, to contact 12, to the meter). The positive meter terminal is connected through S1001A (contact 12 to contact 7) then through resistor R1006 to ground. Resistor R1006 limits the meter current to provide approximately half-scale deflection for normal fm oscillator output. Diode CR1002 shunts the meter to limit reverse meter current with positive half-cycles of fm oscillator output.

i. In position 8, a portion of the final power amplifier stage control grid current is applied to the negative meter terminal through S1001B (contact 8, to contact 12, to the meter). The positive meter terminal is connected to ground through S1001A (contact 12, to contact 8, to ground). This current provides approximately half-scale deflection when the final power amplifier stage is conducting normally.

j. In position 9, a portion of the +500-volt power supply output is applied to the positive meter terminal through S1001B (contact 9, to contact 12, to the negative meter terminal). The positive meter terminal is connected to ground through S1001A (contact 12, to contact 9, to ground). Meter shunting resistor R1515 in the power supply module limits meter current to provide approximately half-scale deflection for normal power supply output.

k. In position 10, a portion of the RF forward power is applied to the positive meter terminal through S1001A (contact 10, to contact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12, to contact 10 to ground). Normal forward power provides approximately half-scale deflection.

l. In position 11, a portion of the RF reflected power is applied to the positive meter terminal through S1001A (contact 11, to contact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12, to contact 11, to ground).

m. In position 12, both meter terminals are terminated in an open circuit (contact 12 of S1001A and contact 12 of S1001B). This is the OFF position.

Section V. FUNCTIONING OF CONTROL, RADIO SET C–3835/ARC–54

1–64. Introduction

(fig. 6–22)

All the radio set operator controls and indicators are located on Control, Radio Set C–3835/ARC–54. These include mode control S101, SQUELCH control S102, volume (VOL) control R101, the frequency-select controls (S103 and S104), and the frequency indicator. The operation of these controls and indicators are explained in paragraphs 1–65 through 1–68.

1–65. Mode Control S101

(fig. 6–22)

The mode control (S101) is a four-position, three-wafer switch. The switch applies primary power to the receiver-transmitter and selects the mode of operation (OFF, PTT, RETRAN, HOME). Section S101A switches control grounds, S101B switches audio signals, and S101C switches primary power.

a. PTT Position. When the mode control (S101) is in the PTT position, primary +27.5-volt

power is applied, from pins C, D, and E of J101 through S101C, to pins F, e, and f of J101 to energize the radio set. Received audio is coupled from pins B (low) and jj (high) of J101 to contacts 5 and 11, respectively, of S101B front. These contacts are shorted to contacts 6 and 12 respectively, which couple the received audio out at pins N (high) and KK (low) to the aircraft interphone amplifier. Transmit audio is similarly connected through contacts of S101B rear. The transmit control ground, originating with depression of the radio set transmit button, is coupled through the aircraft interphone amplifier into the control unit at pin g of J101. This ground is applied, through contacts 11 and 3 of the S101A FRONT, to the transmitter push-to-talk (PTT) bus.

b. RETRAN Position. When the mode control is in the RETRAN position, primary power, retransmit control grounds, and audio signals are coupled through S101 to energize the retransmit circuits.

(1) *Primary power control.* Primary power is coupled through S101C. Plus 27.5 volts dc is applied, from pins C, D, and E of J101, to contacts 1, 2, and 3 of S101C. Contacts 1, 2, and 3 are shorted to contacts 10, 11, and 12, which couple the primary power to pins F, e, and f to operate the radio set.

(2) *Audio signal control.* Audio signals are coupled through S101B for retransmission. Received audio signals are coupled to contacts 11 and 12 (high) and 5 and 6 (low) of S101B front. These contacts are shorted to contacts 1 (high) and 7 (low), which couple the audio signals out for retransmission. Resistor R103 drops the audio signal to the level necessary for injection into the transmit circuits of the companion receiver-transmitter unit.

(3) *Retransmit control ground switching.* Retransmit control grounds are shorted through S101A. Retransmit control transmit ground is applied, from the companion radio set, to contact 12 of S101A front. Contact 12 is shorted to contact 3, which couples the ground out of the control unit (pin *v* of J101) to energize the PTT circuits in the receiver-transmitter unit. When the radio set is in retransmit receive mode, the carrier or tone retransmit control ground (from the squelch mode switch, S102) is applied to contact 4 of S101A rear. Contact 4 is shorted to contact 3, which couples the retransmit control ground out of the control unit to operate the PTT circuits in the companion radio set.

c. HOME Position. When the mode control is in the HOME position, homing signals are switched through S101A and primary power is switched through S101C. The homing indicator flags are operated by +27.5 volts applied through series-dropping resistor R102. The ground return for flag operation originates in the transmit audio module in the receiver-transmitter unit, and is applied, when sufficient signal is received to open the squelch circuits, through contacts 11 (or 12) and 1 of the SQUELCH control (S102). The ground at contact 1 of S102 is connected, through contacts 4 and 5 of S101A rear, to the homing indicator flags (common). Right-left information (homer course) is coupled from pin t of J101, through contacts 1 and 12 of S101A rear to the homing indicator vertical needle input. Signal-strength information is coupled from pin MM of J101 through contacts 11 and 9 of S101A rear to the homing indicator horizontal needle input.

1–66. SQUELCH Control S102

(fig. 6–22)

The SQUELCH control (S102) is a three-position wafer switch. The switch selects the squelch operation mode (DIS, CARR, TONE). In the DIS (squelch disable) position, a ground is applied from contact 7 of the SQUELCH control (S102) to contacts 5 and 6. This ground is used to keep the audio gating circuits in the receive audio module open. In the CARR (carrier squelch) position, the ground at contact 7 is connected to contact 6 only. This provides a ground for carrier squelch operation. In the TONE (tone squelch) position, the ground at contact 7 is applied to contact 8 to provide tone-squelch operation. The other segment of S102 applies carrier or tone retransmit ground to the mode control to provide homing indicator flag operation as described in paragraph 1–65*c*.

1–67. VOL Control R101

(fig. 6–22)

VOL control R101 is a 150-ohm potentiometer, wired in series with the received audio signal to control the audio volume. Received audio signals from contact 12 of S101B front are coupled through the wiper arm of R101 to the aircraft interphone amplifier. Resistor R104 prevents overloading the radio set audio output transformer when the volume control (R101) is adjusted to the minimum limit.

1–68. Frequency-Select Controls S103, S104

(fig. 6–22)

The radio set is tuned through the frequency range of 30 to 69.95 megacycles in 0.05-megacycle steps. Whole-megacycle selector S103 changes the frequency of the radio set in 1-megacycle steps, and 0.05-megacycle selector S104 changes the frequency of the radio set in 0.05-megacycle steps. The frequency controls are mechanically linked to the readout indicator which provides a visual presentation of the frequency selected. These switches are part of a five-wire, open-seeking reentrant system that controls the motor in the mechanical drive module. The switches in the mechanical drive module are an integral part of the system. Since the control unit switches and the mechanical drive module switches cannot be separated for explanation purposes, they are explained in detail in paragraphs 1–78 through 1–83.

Section VI. INTERUNIT CIRCUIT DETAILS FOR RADIO SET AN/ARC–54

1–69. General

a. Interunit theory is presented to provide an understanding of the interrelations of the several units in the various operations of the radio set. Such an understanding will help maintenance personnel, when troubleshooting, to sectionalize troubles to a defective unit and, in some cases, to localize troubles to a defective part within a unit.

b. This section prevents interunit power distribution and control circuits, interunit push-to-talk circuits, interunit audio circuits, interunit mode control circuits, and interunit squelch control circuits. Paragraphs 1–78 through 1–91 present interunit tuning functioning and paragraphs 1–92 and 1–93 present interunit functioning of retransmission circuits.

1–70. Power Distribution and Control Circuits

(fig. 1–28)

Primary power (+27.5 volts dc) is supplied to the radio set from the aircraft primary power bus. Primary power is applied at pins C, D, and E of the control unit electrical connector (J101). From pins C, D, and E, the power is applied to contacts 1, 2, 3, and 5 of wafer C of the mode control (S101). Control S101 is shown in the OFF position; in this position, no power is applied through the switch. When the switch is rotated to the PTT position, contacts 1, 2, and 5 are shorted to the switch segment, applying power through contacts 10, 11, and 12 to pins f, e, and F of J101. The primary power at pins f, e, and F of the control unit receptacle is connected, through the aircraft harness, to pins 34, 18, and 36 of the receiver-transmitter unit electrical connector, P1005. From P1005, the power is coupled through filter FL1001, jack J1008, and plug P1001 and applied through fuse F1002 to pin 7 of the power supply module connector P1501. Primary power is also applied through fuse F1001 to operate relays and to provide filament voltage for the power amplifier module. Resistor R1007 and diode CR1001 protect the radio set from reverse voltage. The power supply module converts the primary power into regulated, despiked operating voltages (+27.5, −27.5, and +500 volts dc and 54 volts ac). When the mode control is rotated to the RETRAN or HOME position, primary power is applied the same way, except that it is shorted through S101C at contacts 1, 2, and 3 instead of 1, 2, and 5. In the HOME position, primary power is also applied, through contacts 8 and 9 of S101A rear, to pin DD of J101. This power (homer operate) is coupled through the aircraft harness to pin 16 of the receiver-transmitter unit electrical connector P1005. From P1005, it is applied, through the filter (FL1002), J1008, and P1001 to pin 8 of the homer module connector. This power is used to

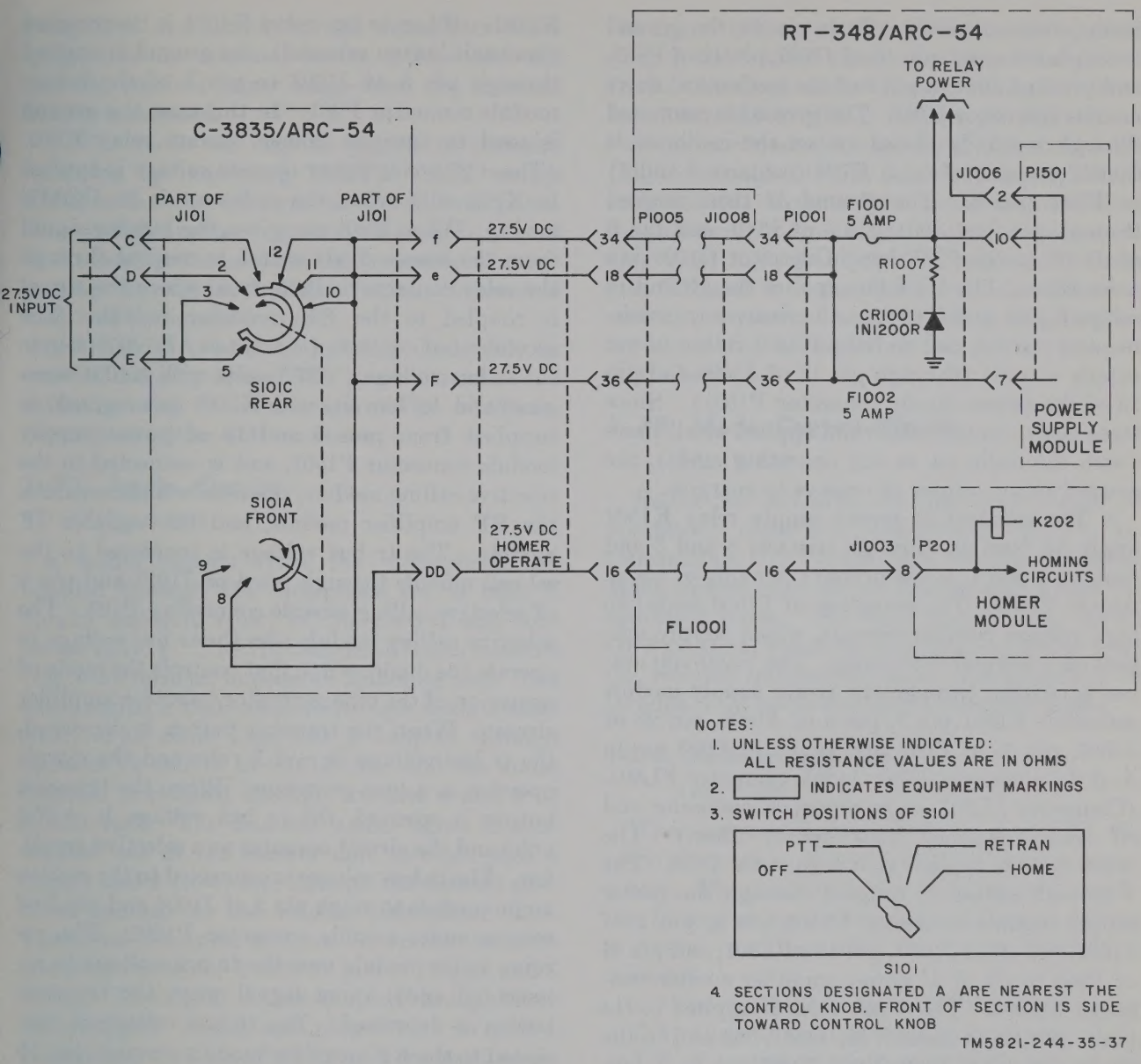


Figure 1–28. Interunit power distribution and control circuits, Radio Set AN/ARC–54.

operate the homer circuits. See paragraph 1–57 for distribution and control of primary power within the receiver-transmitter unit.

1–71. Push-to-Talk Circuits

(fig. 6–4)

a. In PTT or HOME operation, the radio set is placed in transmit condition by depressing the transmit button. The transmit button provides a ground return path for three relay coils in the receiver-transmitter unit. These relays energize to perform all the necessary functions to place the radio set in transmit mode. Figure 1–31 shows the radio set in PTT mode with the transmit button depressed.

b. When the transmit button is depressed, a ground is supplied through the transmit switch and the aircraft interphone set to pin g of the control unit connector (J101). The ground is shorted through the mode control (S101), contacts 3 and 11 in PTT mode, to pin v of the control unit connector. The ground at pin v of the control unit connector is connected, through the aircraft wiring harness to pin 42 of the receiver-transmitter unit

main power connector. From pin 42, the ground is coupled through pin 18 of J1007, pin 18 of P901, and pin 9 of J901 to pin 9 of the mechanical drive module connector P701. The ground is connected through normally closed (when the radio set is tuned) contacts of relay K703 (contacts 4 and 6) to P701 pin 2. The ground is then coupled through pin 2 of J901, pin 5 of P901, and pin 5 of J1007 to the PTT bus. Capacitor C1005 is a noise filter. The PTT bus applies the ground to relays K1001 and K1002 on the receiver-transmitter unit chassis, and to relay K1501 in the power supply module (through pin 12 of J1006 and pin 12 of the power supply connector P1501). Since these relays have +27.5 volts applied at all times (with the radio set in any operating mode), the ground return causes the relays to energize.

c. The contacts of power supply relay K1501 apply 54 volts ac, through contacts 8 and 3 and contacts 4 and 7, to the primary winding of transformer T1503. The secondary of T1503 feeds two high-voltage rectifier circuits, which supply outputs of +500 and +250 volts. The +500-volt output is coupled through the power supply module connector P1501 pin 9, pin 9 of J1006, pin 23 of J1007, pin 23 of P901, and pin A of P903 to pin A of the power amplifier module connector FL801. (Connector FL801 is a combination connector and rfi (radiofrequency interference) filter.) The +500 volts is applied as B+ for tube V803. The +250-volt output is coupled through the power supply module connector P1501 pin 1, pin 1 of J1006, pin 12 of J1007, pin 12 of P901, and pin B of P903 to pin B of power amplifier module connector FL801. The +250 volts is applied to the plate circuits of tubes V801 and V802 and to the screen circuits of V801, V802, V803.

d. The contacts of antenna relay K1002 connect RF energy from the harmonic filter module to the antenna for transmission. When relay K1002 is deenergized (transmit button released), received RF energy from the antenna is connected through contacts of K1002 to homer module P205, where it is coupled through the contacts of K202 and out J205 to the RF amplifier module.

e. Tr bus relay K1001 has two sets of contacts. One set of contacts applies a ground through pin 2 of J1005 to pin 2 of transmit audio module connector P1401. This ground is used to key fm oscillator Q1402 and to energize retransmit relay K1401. When tr bus relay K1001 is deenergized (transmit button released), the ground is applied through pin 3 of J1003 to pin 3 of the homer module connector P201. In this case, the ground is used to energize homer operate relay K202. (The +27.5-volt homer operate voltage is applied to K202 only when the radio set is in HOME mode.) When K202 energizes, the homing signal from the homer diode switch is coupled through the relay contacts to J205, from which the signal is coupled to the RF amplifier module. The second set of contacts (tr bus relay K1001) selects the tr bus voltage (−27.5 volts with K1001 energized and +27.5 volts with K1001 deenergized) is supplied from pins 5 and 13 of power supply module connector P1501, and is connected to the selective calling module, the receive audio module, the RF amplifier module, and the variable IF module. The tr bus voltage is connected to the sel-call module through pin 4 of J1001 and pin 4 of selective calling module connecting P101. The selective calling module uses the tr bus voltage to operate the diode switch that controls the mode of operation of the tone generator/selective amplifier circuit. When the transmit button is depressed, the tr bus voltage is −27.5 volts and the circuit operates as a tone generator. When the transmit button is released, the tr bus voltage is +27.5 volts and the circuit operates as a selective amplifier. The tr bus voltage is connected to the receive audio module through pin 5 of J1004 and pin 5 of receive audio module connector P1301. The receive audio module uses the tr bus voltage to remove all audio input signal when the transmit button is depressed. The tr bus voltage is connected to the RF amplifier module through pin 19 of P901, pin 19 of J1007, pin A of P902, and pin A of module connector J601. Capacitor C901 is a noise filter. The RF amplifier module uses the tr bus voltage to control the high-frequency oscillator injection; the signal is injected into the transmitter mixer stage when the transmit button is depressed and into the receiver mixer stage when the transmit button is released. The tr bus voltage is coupled to the variable IF module through pin 19 of P901, pin 19 of J1007, pin B of P904, and pin B of module connector J506. The tr bus voltage is used by the variable IF module to control the low-frequency oscillator injection. The oscil-

lator signal is injected into the transmitter mixer stage when the transmit button is depressed and into the receiver mixer stage when the transmit button is released.

f. The radio set may be placed in transmit condition by depressing XMTR TEST switch S1003 on the receiver-transmitter unit front panel. This switch applies a ground directly to pin 42 of the receiver-transmitter unit connector, thus bypassing the regular transmit button, the control unit, and the interphone set.

g. When the radio set is being used with an external security device, PTT ground is connected to the security device through pin 44 of the receiver-transmitter unit connector.

1–72. Audio Circuits

(fig. 1–29)

a. Audio signals from the microphone are coupled through the interphone set to pins Y (high) and KK (low) of the control unit connector (J101). The 110-ohm and 51-ohm resistors (fig. 6–5) form an impedance matching pad. The audio signal is then coupled through mode control S101. The audio high line is coupled through contacts 12 and 11 of S101B rear and the audio common is coupled through contacts 6 and 5 of S101B rear. The transmit audio signal is then coupled out of the control unit through pins *x* (high) and *d* (low) and through the aircraft electrical harness to the receiver-transmitter unit. The signal is coupled into receiver-transmitter unit electrical connector P1005 at pins 6 (high) and 5 (low). The signal is then coupled through filter FL1001, jack J1008, and plug P1001 to pins 1 (high) and 3 (low) of J1005 and transmit audio module electrical connector P1401. From pins 1 and 3 of P1401, the signal is coupled to the audio preemphasis network.

b. Received audio is coupled from the output of the audio power amplifier, in the receive audio module, through pins 15 (low) and 14 (high) of P1304 and J1004 to the receiver-transmitter electrical connector. The signal is coupled through pins 14 (low) and 13 (high) of plug P1001, jack J1008, filter FL1001, and plug P1005 to the aircraft electrical harness, which couples the signal to pins B (low) and JJ (high) of control unit electrical connector J101. From pins B and JJ, the signal is coupled through contacts 11 and 12 (high) and 5 and 6 (low) of mode control S101B front. Received audio (low) is coupled direct from contact 6 of S101B front to pin KK of control unit electrical connector J101. Received audio (high) is coupled to pin N of J101 through VOL control R101. Resistor R104 prevents overloading the audio output circuit (in the receive audio module) when R101 is adjusted to minimum. From pins KK and N of the control unit electrical connector, the received audio signal is amplified by the interphone set and then coupled to the operator's headset.

1–73. Mode Control Circuits

(fig. 6–23)

Radio Set AN/ARC–54 has three modes of operation; these are push-to-talk (PTT), retransmission (RETRAN), and homing (HOME). Mode control S101 on the control unit selects the operating mode. The mode control also has an OFF position, which removes primary power from the receiver-transmitter unit. Paragraphs 1–74 through 1–76 cover the three operating modes.

1–74. Push-to-Talk Mode

(fig. 6–23)

When the mode control S101 is set to PTT, the radio set operates as a two-way fm receiver-transmitter. The radio set is placed in transmit condition by depressing the transmit button and returns to receive condition when the transmit button is released.

a. Primary Power. In the PTT mode, primary +27.5 volts dc power is applied from pins C, D, and E of control unit connector J101 to contacts 1, 2, and 5 of S101C. The primary power is connected through the switch to contacts 10, 11, and 12 and from there to pins F, *e*, and *f* of control unit connector J101. Primary power is coupled from there, through the aircraft wiring, to receiver-transmitter unit connector P1005, where it is connected through pins 36, 18, and 34. Inside the receiver-transmitter unit, those three pins are connected together and the primary power is applied through fuse F1002 to pin 7 of the power supply module connector (P1501), and through fuse F1001 to pin 10 of the same connector. The power at pin 7 is used by the power supply to pro-

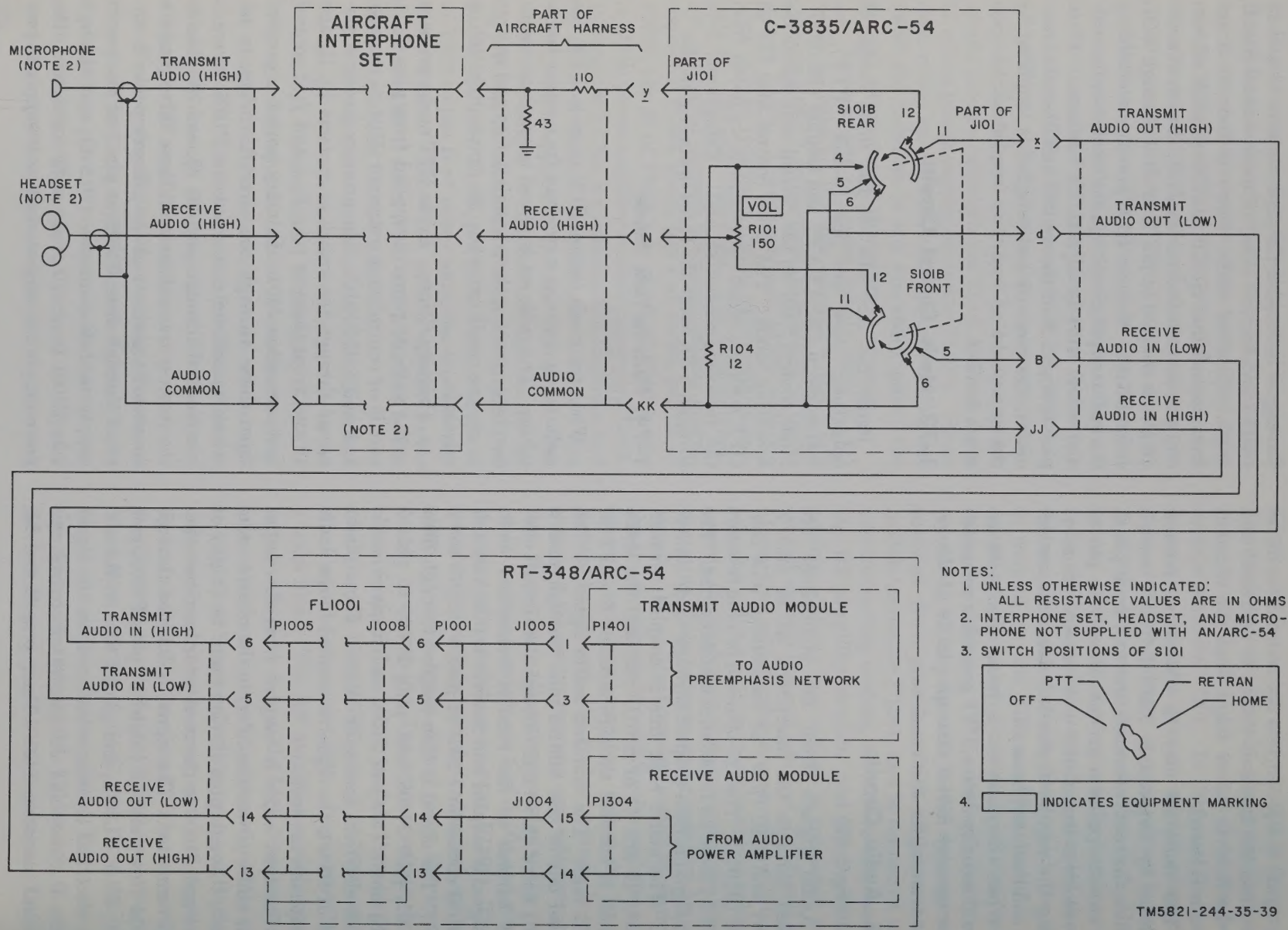


Figure 1–29. Audio circuits, Radio Set AN/ARC–54.

vide all the voltages necessary to operate the radio set. The power at pin 10 is connected to pin 2 and, from there, distributed to all the receiver-transmitter unit relays for relay-operate power, and to the power amplifier module for filament power. Resistor R1007 and diode CR1001 provide reverse-voltage protection.

b. Audio Signals. In the PTT mode, transmit audio originates at the microphone and is coupled through the aircraft interphone set and interconnecting coaxial cables to pin *y* of control unit connector J101. The audio is then coupled through S101B rear from contact 12 to contact 11 and out of the control unit through pin *x*. The audio common is connected through the control unit from pin KK to S101B rear contact 6, from contact 6 to contact 5, then out pin *d* of the control unit connector. Transmit audio (high) is coupled from pin *x* of the control unit connector to pin 6 of receiver-transmitter unit connector P1005. Audio common is coupled from pin *d* of the control unit connector to pin 5 of receiver-transmitter unit connector P1005. The audio signal at pins 6 (high) and 5 (low) is coupled into the transmit audio module through connector P1401 pins (high) and 3 (low). The transmit audio module amplifies the audio signal for transmission. Received audio is coupled from the audio output transformer in the receive audio module, through pins 14 (high) and 15 (low) of P1304 to pins 13 (high) and 14 (low) of the receiver-transmitter unit connector. Received audio (high) is then coupled to the control unit connector pin JJ while received audio (low) is coupled into the control unit of pin B. Received audio (high) is connected through S101B front from contact 11 to contact 12, and from there, through VOL control R101, the signal is coupled from the wiper arm of R101 to pin N of the control unit connector. Received audio (low) is coupled through S101B FRONT from contact 5 to contact 6, and from there to the audio common line at pin KK of the control unit connector. Received audio (high and low) is then coupled through the aircraft interphone set to the headset.

c. Transmit Control. In the PTT mode, the receiver-transmitter unit is in receive condition, except when the transmit button is depressed. When the transmit button is depressed, a ground is supplied through the aircraft interphone set to pin *q* of control unit connector J101. From there, the ground is connected through S101A front from contact 11 to contact 3. From contact 3, the ground is connected to pin *v* of the control unit and then to pins 41 and 42 of the receiver-transmitter unit connector (P1005). From pin 42, the ground is connected to the tr bus in the receiver-transmitter unit.

1–75. Retransmit Mode (RETRAN)

(fig. 6–23)

When mode control S101 is set to RETRAN, the radio sets (two required) will operate as an unattended two-way relay station. The condition of each radio set (receive or transmit) is determined by which radio set first receives a signal. This discussion is limited to interunit mode control. Paragraphs 1–92 and 1–93 discuss the overall retransmit operation.

a. Primary Power. In the RETRAN mode, primary power is applied through S101C to the receiver-transmitter unit as in paragraph 1–74*a*, except that contact 3 is used instead of contact 5.

b. Audio Signals. In the RETRAN mode, received audio is coupled from the receiver-transmitter unit into control unit connector J101 at pins JJ (high) and B (low). Received audio (high) is connected from pin JJ through S101B front from contact 11 to contact 1. From contact 1, the received audio (high) is connected to pin A of the control unit then through interconnecting cabling to radio set No. 2 for retransmission. Received audio (low) is connected from pin B through S101B front from contact 5 to contact 7. From contact 7, the received audio (low) is connected to pin PP of the control unit then through interconnecting cabling to radio set No. 2. At the control unit of radio set No. 2, these signals become retransmit audio and are coupled into the radio set at pins *c* (high) and *w* (low) of the control unit. To complete the audio path, consider radio set No. 1 (fig. 6–23) to be in transmit condition. Transmit audio is coupled through pins *c* (high) and *w* (low) of the control unit to S101B rear to contacts 1 (high) and 7 (low). Resistor R103 reduces the signal level for proper input to the companion radio set. Contact 1 connects to contact 11 and contact 7 connects to contact 5. From there, the audio signal is connected through pins *x* (high) and *d* (low) of the control unit and then through the interconnecting cabling to pins 6

(high) and 5 (low) of the receiver-transmitter unit connector (P1005). The audio is then coupled to pins 1 (high) and 3 (low) of the transmit audio module for transmission.

c. Retransmit Control. The retransmit control ground, originating in the receive audio module when a received signal causes relay K1301 to energize, is applied to the PTT bus of radio set No. 2 to energize the transmitter for retransmission. This ground is coupled from the receive audio module through pin 2 or 1 (depending on the squelch mode being used) of the module connector. The ground is then connected through pin 10 or 11 of the receiver-transmitter unit connector, and then through interconnecting wiring to pin Y or Z of the control unit connector. The ground is then coupled to SQUELCH control S102 contact 11 or 12. The ground is coupled through contact 1 of S102 to contact 4 of S101A rear. Contact 4 is connected to contact 3 in RETRAN mode, so the ground is coupled out of the control unit through pin HH of J101. The retransmit control ground is coupled into radio set No. 2 control box at pin *u* of J101. Assume that figure 6–23 now represents radio set No. 2: The ground is coupled through S101A front from contact 12 to contact 3. From contact 3, the ground is coupled out of the control unit through pin *v* of J101. The ground is then connected through interconnecting wiring to pin 42 of the receiver-transmitter unit, which connects to the tr bus to place the receiver-transmitter unit in transmit condition.

1–76. Homing Mode (HOME)

(fig. 6–23)

When the mode control (S101) is set to HOME, the radio set (if used with a suitable homing indicator and a homing antenna system) provides the operator with a visual homing capability.

a. Primary Power. Primary +27.5-volt power is applied as in paragraph 1–75*a* except that +27.5 volts is also applied to the homer module to operate the homing circuits. The homer operate voltage is coupled from contacts 10, 11, and 12 of S101C to contact 9 of S101A front. In the HOME mode, contact 9 is connected to contact 8. From contact 8 of S101A front, the homer operate voltage is connected through pin DD of the control unit connector (J101), and through interconnecting wiring, to pin 16 of the receiver-transmitter unit connector. From there it is connected to pin 8 of the homer module to operate communications homing relay K202 and other homing circuits. Homer operate voltage is also applied from contact 8 of S101A front through R102, a current limiter, to pin GG of the control unit connector. This voltage is used to operate the homing indicator flags.

b. Flag Operation. The operation of the flags depends on the ground return. This ground return originates in the transmit audio module and is connected through the receive audio module when sufficient signal is received to cause unsquelching. The ground is connected, as in RETRAN operation, through pin 1 or 2 of the receive audio module connector, through pin 10 or 11 of the receiver-transmitter unit connector, pin Z or Y of the control unit connector, and contact 11 or 12 of S102 to contact 1 of S102. From contact 1 of S102, the ground is connected to contact 4 of S101A rear, which connects to contact 5. From contact 5 of S101A rear, the ground return is connected to pin FF of the control unit connector, and then to the homing indicator to operate the flags.

c. Horizontal (Signal Strength) Needle Operation. The homing indicator horizontal needle is controlled by the signal-strength voltage from the homer module. The signal-strength voltage is coupled from the receiver-transmitter unit to pin MM of the control unit connector. From pin MM, the over-target voltage is connected to contact 11 of S101A rear. In the HOME mode, contact 11 connects to contact 9. From contact 9, the signal-strength voltage is coupled through pin NN of the control unit connector to the homing indicator. The homing indicator horizontal needle negative terminal is returned to the receiver-transmitter unit (homer module).

d. Vertical (Course) Needle Operation. The homing indicator vertical needle is controlled by the homer course voltage from the homer module. The homer course voltage is coupled from the receiver-transmitter unit to pin *t* of the control unit connector. From pin *t* it is connected through S101A rear from contact 1 to contact 12. From contact 12, the homer course voltage is connected through pin *s* of the control unit connector to the homing indicator vertical needle (+) input. The

vertical needle (−) input is returned directly to the receiver-transmitter unit (homer module).

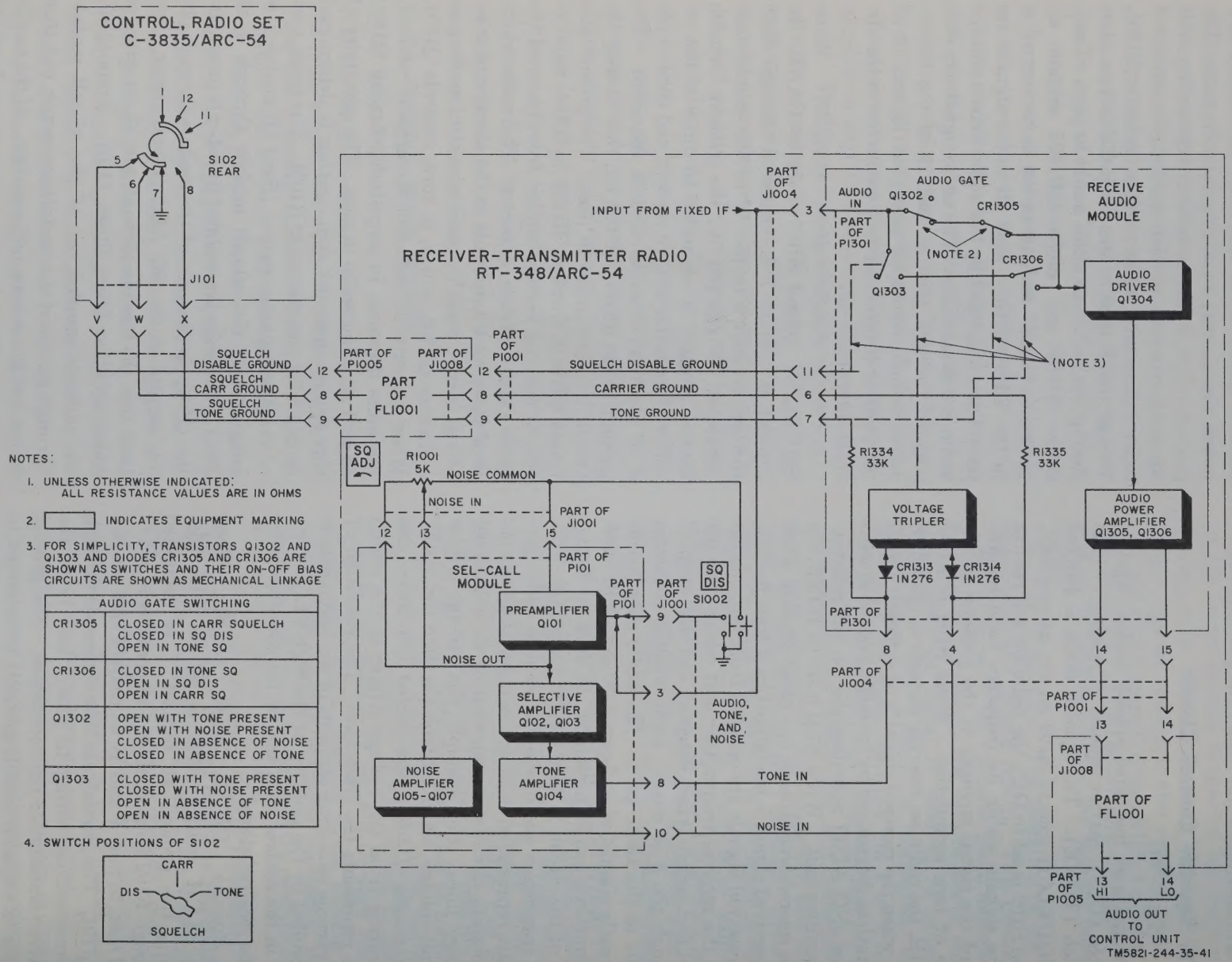
1–77. Squelch Control Circuits

(fig. 1–30)

The radio set has three squelch modes—squelch disable (DIS), carrier squelch (CARR), or tone squelch (TONE). The squelch mode is selected by SQUELCH control S102 on the control unit. When S102 is set to DIS, the radio set will receive all fm signals within its frequency band regardless of the signal strength or the presence or absence of tone modulation. When S102 is set to CARR, the radio set receiver circuits are gated on only when the received signal is of sufficient signal strength as determined by the setting of the squelch adjust (SQ ADJ) potentiometer on the receiver-transmitter unit. When S102 is set to TONE, the radio set receiver circuits are gated on only when the received signal is modulated by a 150-cps tone. All received signals are coupled from the antenna into the receiver-transmitter unit where they are amplified, heterodyned, detected, and then coupled through pin 3 of receive audio module connector P1301 to the audio gate. The audio gate circuit is greatly simplified in figure 1–30 so that its overall functions can be presented. A detailed discussion of the circuit is presented in paragraph 1–35. The transistors and diodes involved in audio gating are represented as simple switches and their on-off biasing circuits are represented as mechanical linkage lines. For example, the voltage tripler output voltage, which controls the state (on or off) of transistor Q1302, is represented by a dashed line extending from the voltage tripler to the switch that represents the transistor. The condition of the various switching elements of the audio gate is controlled by the position of the SQUELCH control in the control unit, and by the characteristics of the received signal.

a. Squelch Disable Mode (DIS). When SQUELCH control S102 is set to DIS (fig. 1–30), the ground at contact 7 is connected through S102 from contact 7 to contacts 5 and 6, and then to pins V and W of control unit connector J101. The grounds are then connected through interconnecting wiring to pins 8 and 12 of the receiver-transmitter unit connector. The ground at pin 12 (squelch disable ground) is connected to pin 11 of receive audio module connector P1301. This ground is used to bias transistor Q1303 off, causing Q1302 to remain on, thus closing the switch (as shown) to allow audio to pass. The ground at pin 8 of the receiver-transmitter unit connector (carrier squelch ground) is connected to pin 6 of receiver audio module connector P1301. This ground is used to bias diode CR1305 on, thus closing the switch to allow audio to pass. Transistor Q1302 and diode CR1305 remain on (switches closed) as long as the mode control is in the DIS position, thus all audio signals are passed and amplified by the audio driver and the audio power amplifier. The audio signals are then coupled through pins 14 and 15 of the receive audio module connector and pins 13 and 14 of the receiver-transmitter unit connector to the aircraft interphone set.

b. Carrier Squelch Mode (CARR). When SQUELCH control S102 is set to CARR, the ground at contact 7 is connected through S102 through contact 6 to pin W of the control unit connector. From pin W, the ground (squelch carrier ground) is connected to pin 8 of the receiver-transmitter unit connector, and then to pin 6 of the receive audio module connector. The ground biases diode CR1305 on, thus closing the switch to allow audio to pass. The ground also biases CR1314 through R1335 to allow noise to couple into the voltage tripler from pin 4 of the receive audio module connector. This noise, which is of significant amplitude in the absence of a received carrier signal, is used to control audio gate transistor Q1302, which, in turn, controls Q1303. When a carrier of sufficient strength is received, the noise decreases in amplitude, turning Q1302 on and allowing audio to pass. The sensitivity of this squelch-operated audio gating is determined by SQ ADJ potentiometer R1001. The noise, part of the discriminator output (fixed IF module), is coupled into the sel-call module through 3 of P101. The noise is amplified by sel-call preamplifier Q101, coupled out of the module through pin 12, coupled to the SQ ADJ potentiometer, then back into the module through pin 13, to selective noise amplifier Q105, Q106, Q107. From Q107, the noise is coupled out of the sel-call module through pin 10 of the module connector, and then to pin 4 of the receive audio module. If the amplitude of the noise is low, the gating action described



NOTES:

1. UNLESS OTHERWISE INDICATED: ALL RESISTANCE VALUES ARE IN OHMS
2. [ ] INDICATES EQUIPMENT MARKING
3. FOR SIMPLICITY, TRANSISTORS Q1302 AND Q1303 AND DIODES CR1305 AND CR1306 ARE SHOWN AS SWITCHES AND THEIR ON-OFF BIAS CIRCUITS ARE SHOWN AS MECHANICAL LINKAGE

AUDIO GATE SWITCHING	
CR1305	CLOSED IN CARR SQUELCH CLOSED IN SQ DIS OPEN IN TONE SQ
CR1306	CLOSED IN TONE SQ OPEN IN SQ DIS OPEN IN CARR SQ
Q1302	OPEN WITH TONE PRESENT OPEN WITH NOISE PRESENT CLOSED IN ABSENCE OF NOISE CLOSED IN ABSENCE OF TONE
Q1303	CLOSED WITH TONE PRESENT CLOSED WITH NOISE PRESENT OPEN IN ABSENCE OF TONE OPEN IN ABSENCE OF NOISE

4. SWITCH POSITIONS OF S102

Figure 1-30. Squelch control circuits, Radio Set AN/ARC-54.

above will occur. If the noise amplitude is high, the audio gate will open and audio will not pass. The noise can be grounded, thus disabling squelch control of the audio gate, by depressing SQ DIS switch S1002 on the receiver-transmitter unit. This has the same effect as switching the SQUELCH control on the control unit to the DIS position.

c. Tone Squelch Mode (TONE). When SQUELCH control S102 is set to TONE, the ground at contact 7 is connected through contact 8 to pin X of the control unit connector. From pin X, the ground (squelch tone ground) is connected through interconnecting wiring to pin 9 of the receiver-transmitter unit connector. From pin 9, the ground is connected to pin 7 of the receive audio module connector. This ground biases diode CR 1306 on. The ground also biases CR1313 through R1334 so that tone signal from pin 8 of the module connector can enter the voltage tripler circuit. The output of the voltage tripler (a dc potential derived from the tone signal) biases transistor Q1302 off, turning Q1303 on to complete a path for audio to pass (through Q1303 and CR1306). The tone, part of the discriminator output (fixed IF module), is coupled into the selective calling module through pin 3 of the module connector. The tone signal (if present) is amplified by sel-cal preamplifier Q101; then by tone generator selective amplifier Q102 and Q103; then by tone amplifier Q104. The amplified tone is then coupled through pin 8 of the selective calling module connector to pin 8 of the receive audio module connector where it is used, as described above, to close the audio gate. In the absence of a 150-cps tone, Q1303 will remain off, thus preventing audio from passing. All audio that passes through the audio gate is amplified by the audio driver amplifier Q1304 and audio power amplifiers Q1305 and Q1306, then coupled out through pins 14 and 15 of the receive audio module connector, through pins 13 and 14 of the receiver-transmitter unit connector, to the aircraft interphone set.

Section VII. RADIO SET AN/ARC-54 TUNING SYSTEM PRINCIPLES

1-78. Introduction

(figs. 1-31, 1-32, 1-33, and 6-24)

a. Receiver-Transmitter, Radio RT-348/ARC-54 operates on any of 800 frequency channels within range from 30 through 69, .95 mc in increments of 0.05 mc. The operating frequency is selected at Control, Radio Set C-3835/ARC-54 and the actual tuning takes place in Receiver-Transmitter, Radio RT-348/ARC-54 and Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54. The control unit provides whole- and decimal-mc control information to the mechanical tuning assembly in the receiver-transmitter unit.

b. The mechanical tuning assembly is a motor-driven electromechanical actuator, which simultaneously tunes the tank circuits in the variable IF, RF, and power amplifiers and inserts the power crystals in the high- and low-frequency oscillators as the operator selects the frequencies at the control unit. The mechanical drive assembly consists of two autopositioner circuits, a drive motor, a differential, and several gear trains and positioning cams. The autopositioner circuit is a solenoid-operated, motor-driven rotary positioning mechanism which provides automatic and precise selection of any one of a number of fixed positions, each of which is determined by switch combinations operating the solenoid. A single unidirectional motor drives both autopositioner circuits through gear trains and slip clutches. One autopositioner circuit tunes the receiver-transmitter in 1-mc increments; the other autopositioner circuit tunes the receiver-transmitter in 0.05-mc increments.

c. The tuning mechanism in the antenna coupler is similar to the autopositioner circuit used in the receiver-transmitter unit. The coupler provides constant impedance matching between the antenna and the receiver-transmitter.

1-79. Basic Autopositioner Circuit

(fig. 1-31)

a. Circuit Elements. An autopositioner is a motor-driven rotary mechanism which rotates a shaft and any devices attached to the shaft to any one of a predetermined number of positions. A basic autopositioner circuit includes a manually operated remote control switch S1, an open-seeking switch S2, a motor control relay K1, a stop-

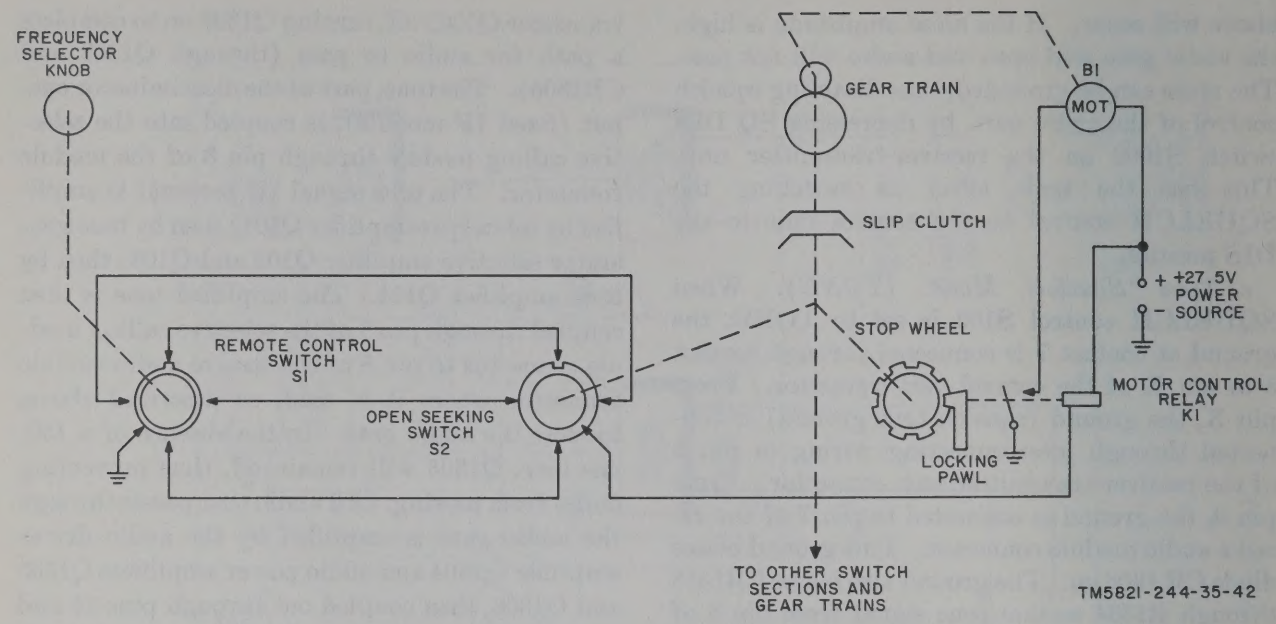


Figure 1-31. Basic autopositioner circuit, simplified schematic diagram.

wheel and locking pawl mechanism, a dc motor B1, and a slip clutch. The autopositioner converts frequency control switch position information at a remote radio set control unit into degrees of tuning shaft rotation at the receiver-transmitter unit.

b. Circuit Operation. The simplified autopositioner circuit shown in figure 1-31 is at rest because there is no ground return path for the motor control-relay solenoid through the open-seeking switch and the remote control switch. The open-seeking switch is driven by the gear train which drives the associated tuning shaft. The tuning shaft tunes the applicable receiver circuit elements of the receiver-transmitter unit to the frequency indicated on the control unit dial. When the frequency control is moved to select a different frequency digit, switch S1 is rotated so that a ground return path is completed to the control relay solenoid through open-seeking switch S2. The rotors of the two switches, S1 and S2, are constructed so that for each control position, only one specific position of open-seeking switch S1 will open the ground return path for the relay solenoid. When a new position is selected, the relay solenoid energizes and closes contacts which provide a ground return circuit for motor B1. The relay also removes the locking pawl from the stop-wheel notch. This action allows the energized motor to drive the gear train through the slip clutch. While the gear train turns the output shaft it also turns the open-seeking switch. When the tuning shaft position corresponds with the selected frequency, the open-seeking switch opens the ground return circuit from the relay to switch S1. As a result, the control relay deenergizes and opens the ground return circuit for the dc motor. This action stops the motor and releases the locking pawl. The locking pawl engages a notch in the stop wheel and prevents further rotation of the gear train. The slip clutch provides a dual function. It dissipates the kinetic energy of the motor and allows the motor to drive more than one shaft. The autopositioner circuit remains at reset until the remote frequency control knob is turned to select a new frequency. Two basic autopositioner circuits are used to tune Radio Set AN/ARC-54 from 30 to 69.95 in 0.05-mc stops. The two autopositioner circuits control and share a single dc motor. Separate slip clutches are used to isolate the open-seeking switches and stop wheels of each autopositioner circuit from the motor drive assembly. As soon as each autopositioner circuit completes a tuning cycle, the stop wheels and associated locking pawls prevent further rotation of the associated open-seeking switches and tuning shafts. However, the slip clutch allows the remaining autopositioner circuit to continue its

tuning cycles until the receiver-transmitter unit is tuned to the selected frequency.

1–80. Double-Conversion Superheterodyne System, Receive Operation

(fig. 1–32)

a. The double-conversion superheterodyne circuits change an incoming RF signal in the range from 30 through 69.95 mc to an IF signal of 500 kc. Those same double-conversion superheterodyne circuits, in transmit operaiton, change a frequency-modulated 500-kc oscillator signal to an RF signal between 30 and 69.95 mc. In each case, two mixer stages accomplish the conversion. In this paragraph, only the receiver signal path is discussed since one path is essentially the reverse of the other. The incoming RF signal passes through three tunable RF amplifier stages to a mixer stage that combines the signal with the crystal-controlled injection signal from the high-frequency oscillator to produce a first IF signal that varies between 3.975 and 5.925 mc, depending upon the frequency selected at the control unit. The following chart lists the high-frequency oscillator and IF signal produced at each of the 40 whole-megacycle frequency settings. Two tunable IF amplifier stages amplify the variable IF signal and apply it to a second mixer. This mixer combines the variable IF signal with the signal from the low-frequency oscillator to produce a fixed IF signal of 500 kc.

b. The receiver tuning range from 30 to 69.95 mc represents 40 separate 1-mc frequency groupings. Each 1-mc group contains 20 discrete frequencies separated by 0.05-mc intervals. Over the entire frequency range, a different high-frequency oscillator signal is used at each even-megacycle frequency setting. That is, 1 high-frequency oscillator signal is used for mixing with each of the 40 frequencies included in the 30-to-31.95-mc range; a different high-frequency oscillator signal is used for the frequencies included in the 32-to-33.95-mc range, etc. The signal produced by the high-frequency oscillator is always lower than the incoming RF signals, or, in other words, low-side injection is used in the first mixer. The mixing of the incoming RF and injection signals in the first mixer produces a first IF signal in the 3.975-to-5.925-mc range. As an example, consider the following three frequencies: 30, 31.95 and 32 mc.

Whole-megacycle selector setting	High-frequency oscillator injection frequency	Produced first IF signal (mc)
30	26. 025	3. 975
31	26. 025	4. 975
32	28. 025	3. 975
33	28. 025	4. 975
34	30. 025	3. 975
35	30. 025	4. 975
36	32. 025	3. 975
37	32. 025	4. 975
38	34. 025	3. 975
39	34. 025	4. 975
40	36. 025	3. 975
41	36. 025	4. 975
42	38. 025	3. 975
43	38. 025	4. 975
44	40. 025	3. 975
45	40. 025	4. 975
46	42. 025	3. 975
47	42. 025	4. 975
48	44. 025	3. 975
49	44. 025	4. 975
50	46. 025	3. 975
51	46. 025	4. 975
52	48. 025	3. 975
53	48. 025	4. 975
54	50. 025	3. 975
55	50. 025	4. 975
56	52. 025	3. 975
57	52. 025	4. 975
58	54. 025	3. 975
59	54. 025	4. 975
60	56. 025	3. 975
61	56. 025	4. 975
62	58. 025	3. 975
63	58. 025	4. 975
64	60. 025	3. 975
65	60. 025	4. 975
66	62. 025	3. 975
67	62. 025	4. 975
68	64. 025	3. 975
69	64. 025	4. 975

An incoming 30-mc signal is mixed with a 26.025-mc injection signal to produce a first IF of 3.975 mc (30 minus 26.025). When the incoming signal is 31.95 mc, it is also mixed with the same 26.025-mc injection signal to produce a first IF signal of 5.925 mc. When the incoming signal is 32 mc, it is mixed with an injection signal of 28.025 mc to produce a 3.975-mc first IF. Note that as the incoming signal and the radio set tuning increase from 30 to 31.95 mc, the injection signal remains the same; then, when the incoming signal increases to 32 mc, the injection signal increases

2 mc to 28.025 mc. Therefore, as the whole-megacycle frequency selector on the control unit is changed from one even-mc setting to another even-megacycle setting, the high-frequency oscillator signal changes in 2-mc increments. The variable IF signal from the first mixer is amplified then combined with the injection signal from the crystal-controlled low-frequency oscillator to produce an IF signal of 500 kc. The low-frequency oscillator can produce 20 discrete frequencies from 4.475 to 5.425 mc in 0.05-mc steps. The mechanical tuning circuit selects the proper crystal and tunes the IF amplifier tank circuits to the frequency of the incoming IF signal. The following chart lists the 0.05-mc selector settings, the first IF signal, and the low-frequency oscillator injection on both odd- and even whole-megacycle setting frequency. Note that both high- and low-side injections are used, depending upon the tuning of the radio set. For example, when the radio set is tuned to 30 mc, the incoming IF signal is 3.975 mc. This signal is mixed with a 4.475-mc injection signal. This injection signal is 500 kc above the incoming IF signal; therefore, the circuit uses high-side injection. The mechanical drive assembly inserts a different crystal into the low-frequency oscillator circuit as each frequency is selected at the control unit. When the radio set is tuned to 30.95 mc, the IF signal is 4.925 mc. This

0.05-megacycle selector setting	First IF signal		Low-frequency oscillator injection frequency (mc)	Second IF signal (kc)
	Even-mc setting	Odd-mc setting		
.00	3.975	4.975	4.475	500
.05	4.025	5.025	4.525	500
.10	4.075	5.075	4.575	500
.15	4.125	5.125	4.625	500
.20	4.175	5.175	4.675	500
.25	4.225	5.225	4.725	500
.30	4.275	5.275	4.775	500
.35	4.325	5.325	4.825	500
.40	4.375	5.375	4.875	500
.45	4.425	5.425	4.925	500
.50	4.475	5.475	4.975	500
.55	4.525	5.525	5.025	500
.60	4.575	5.575	5.075	500
.65	4.625	5.625	5.125	500
.70	4.675	5.675	5.175	500
.75	4.725	5.725	5.225	500
.80	4.775	5.775	5.275	500
.85	4.825	5.825	5.325	500
.90	4.875	5.875	5.375	500
.95	4.925	5.925	5.425	500

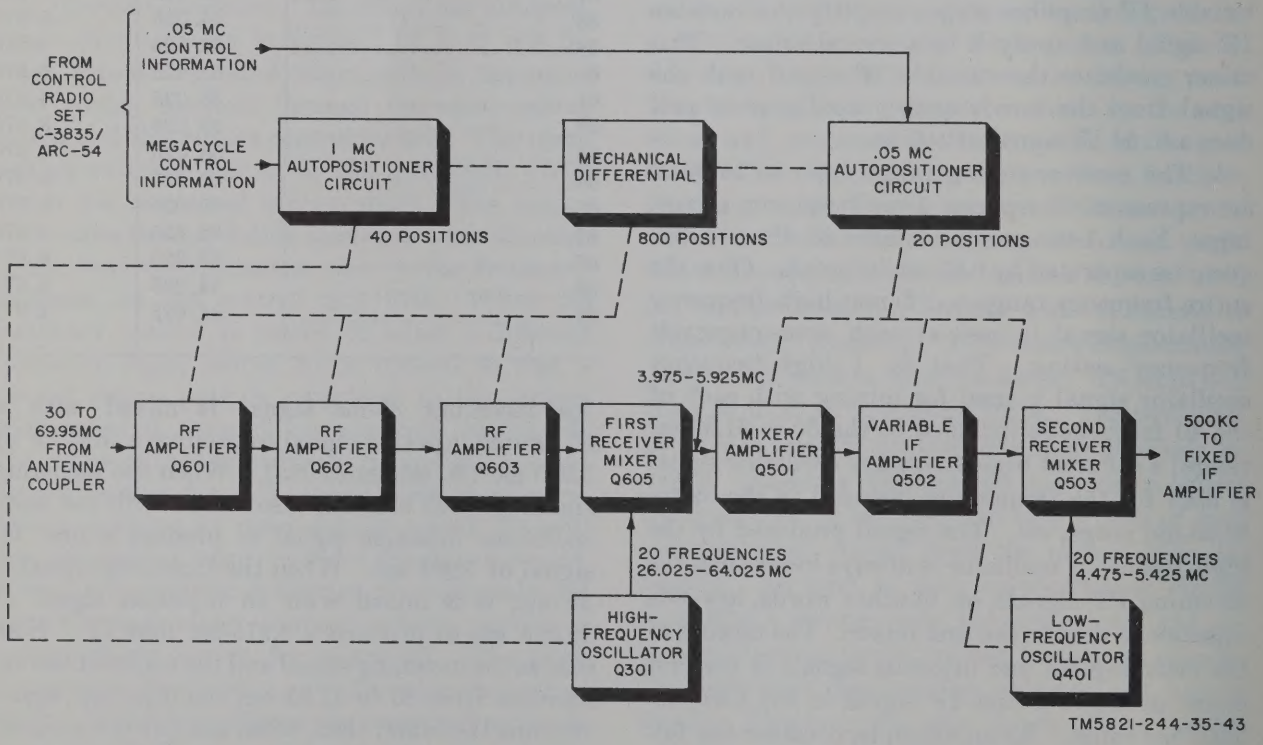


Figure 1-32. Double-conversion superheterodyne system, functional block diagram.

signal is mixed with the highest frequency produced by the oscillator, 5.425 mc, to provide the 500-kc fixed IF signal. When the radio set is tuned to 31 mc, the incoming IF signal increases to 4.925 mc, and the low-frequency oscillator signal decreases to its lowest value, 4.475 mc. The difference between these two signals, however, is 500 kc. In this case low-side injection is used. This tuning sequence continues throughout the frequency range of the radio set, with high-side injection used on even-mc bands and low-side injection used on odd-mc bands.

1–81. Frequency Selection Code

a. The whole- and 0.05-mc frequency selector switches in Control, Radio Set C–3835/ARC–54 develop a frequency selection code which controls the operation of the autopositioner circuits in the mechanical drive module in the receiver-transmitter unit. The selection code for each of the 800 available frequency channels is developed by grounding specific combinations of 10 frequency control wires. Two multiwafer rotary switches (S103 and S104) determine the combinations of frequency control wires which are grounded. The manually operated frequency selector knobs drive the rotary wafer switches.

b. The whole-megacycle frequency selector control (on the control unit) drives 20-position wafer switch S103 and the indicator dials for the first two digits (whole-megacycle frequency) which appear in the dial window. Each switch position corresponds to a 1-mc increment of operating frequency. The frequency range from 30 to 69 mc is covered in 40 steps. Since the wafer has only 20 positions, it must turn 2 revolutions to select the 40 one-megacycle increments; subsequently, the control information furnished the autopositioner circuits is ambiguous. That is, the same coding information is supplied during the second revolution of the switch that is supplied during the first revolution. Additional wafers on switch S103 supply ambiguity code information to the autopositioner circuits. The following chart lists the coding applied to combinations of the five whole-megacycle control wires for all frequency selections. The five control wires are designated (for reference purposes) 1–A through 1–E. In the chart, an X designates each control wire that is grounded for each specific pair of frequency selections.

c. The 0.05-mc control on the control unit drives 20-position rotary wafer switch S103 and the indicator drum for the third and fourth digits (decimal-megacycle frequency) that appears in the dial window. Each switch position corresponds to a 0.05-mc change in operating frequency. For each complete revolution of the switch, the frequency range from XX.0 to XX.95 mc is covered. Rotary wafer switch S104 provides coding informa-

Control wire	Position of 1-megacycle shaft																			
	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 63	44 64	45 65	46 66	47 67	48 68	49 69
1–A	X					X	X			X	X	X		X	X	X	X			
1–B		X					X	X			X	X	X		X	X	X	X		
1–C			X					X	X			X	X	X		X	X	X	X	
1–D				X					X	X			X	X	X		X	X	X	X
1–E	X				X					X	X			X	X	X		X	X	X

Control wire	Position of .05-megacycle shaft																			
	.00	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95
.05–A	X					X	X			X	X	X		X	X	X	X			
.05–B		X					X	X			X	X	X		X	X	X	X		
.05–C			X					X	X			X	X	X		X	X	X	X	
.05–D				X					X	X			X	X	X		X	X	X	X
.05–E	X				X					X	X			X	X	X		X	X	X

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tion for the five control wires designated .05–A through .05–E. The following chart indicates the combinations of control wires that are grounded for each specific 0.05-mc frequency selection.

1–82. Whole-Megacycles Tuning Circuit

(fig. 6–24)

a. The whole-megacycles autopositioner circuit includes control unit whole-megacycle selector switch S103, open-seeking switch S701, a 20-position stop wheel, a locking pawl assembly, motor control relay K701, a slip clutch and drive assembly, and a tuning shaft. The 1-mc autopositioner circuit controls the receiver-transmitter unit tuning from 30 to 69 mc in 1-mc steps. A similar circuit, using part of S103 in the control unit and S103 in the antenna coupler, controls the drive motor in the antenna coupler. The antenna coupler tuning provides the proper output impedance for the receiver-transmitter unit at all frequencies. Control wires (designated 1–A through 1–E in fig. 6–24) carry the binary frequency control information from whole-megacycle control switch S103 in the control unit to open-seeking switch S701 in the receiver-transmitter unit. A separate set of wires, similarly designated, carries the same information to S103 in the antenna coupler. For each frequency within the 30- to 69-mc range, the whole-megacycle selector switch applies a specific combination of ground connections to the two groups of control wires (para. 1–81). In figure 6–24, the switch is shown in the 30-mc position. In this position, the control wires for the receiver-transmitter unit are connected to ground through the front section of switch wafer S103A, and the control wires for the antenna coupler are connected to ground through the front section of S103B.

b. The aircraft interconnecting cables connect the control wires between the control unit and the receiver-transmitter unit and between the control unit and the antenna coupler. At the receiver-transmitter unit, the control wires are connected to a low-pass filter circuit, FL1001 (not shown), which reduces the amount of radiofrequency interference that is conducted from the receiver-transmitter unit. The control wires are connected from the filter to contacts on the front and rear sections of open-seeking switch wafer S701A through connectors J1008, P1001, J1007, P901, J901, and P701. Open-seeking switch S701 is shown at rest in the 30-mc position (fig. 6–24). Control lines mc select A and mc select E, which are connected to ground in the control unit, are connected to contacts 16 and 20. These contacts are adjacent to detents in the rear rotor of switch section S701A, and, therefore, do not connect the solenoid of relay K701 to ground. Note that the long wiping contact 1 on the rear portion of switch section S701A is connected to the negative side of the solenoid; therefore, when a contact that is connected to a grounded control wire is adjacent to a tab on the rotor, the relay is energized and the motor turns the tuning shaft.

c. When the whole-megacycle control is turned to any other position, a ground return path from relay K701 is completed through switch wafer S103A in the control unit. As an example, assume that the whole-megacycle selector is moved to the 31-mc position. This rotates whole-megacycle selector switch S103A 18° clockwise, connecting control wire mc select C to ground through contacts 12 and 18 on the front section of switch wafer S103A. As a result, a ground return circuit for the motor control relay solenoid is completed through contacts 18 and 1 on the rear section of switch wafer S701A. Since the positive side of the relay is permanently connected to +27.5 volts dc, relay K701 energizes. This action simultaneously closes motor control contacts 3 and 4 and disengages the pawl from the stop-wheel notch. The closed motor control contacts complete a dc ground return path for drive motor B701, and the motor rotates the 1-mc tuning shaft through the drive gear and slip clutch assembly. The drive motor also rotates open-seeking switch S701 and the stop wheel. The rotors of switch wafers S701A and S701B are mounted directly on the tuning shaft, and the rotors of switch wafer S701C are driven through a 4:1 speed-reducing gear train so that it rotates at one-fourth the speed of switch wafer S701A and S701B. The drive motor continues to turn the tuning shaft until the rotors of switch wafer S701A move to discrete positions that open all possible groundpaths at the negative side of relay K701. The relay then deenergizes and releases the locking pawl. The locking pawl engages a notch in the stop wheel and simultaneously opens contacts 3 and 4 on the relay. This action opens the ground circuit of motor B701.

Diode CR702 is connected to the negative side of the relay solenoid to prevent arcing. When the current through the relay is interrupted, an instantaneous inductive voltage appears across the solenoid that is much higher than the normal operating voltage. The diode shunts the resulting inductive current to ground when the magnetic field collapses to prevent damage to the relay solenoid. When the drive motor stops, the autopositioner circuit remains at rest until a new frequency is selected at the control unit.

d. The receiver-transmitter tuning circuits are always tuned from 30 to 69.95 mc. The 1-mc open-seeking switch turns 18° for each 1-mc advance in the whole-megacycle frequency setting. The open-seeking switch is a 20-position switch with 40 whole-megacycle frequencies within the tuning range; therefore, the open-seeking switch must turn through two revolutions to complete the tuning cycle. The frequency coding information supplied by the whole-megacycle frequency selector, S103A, is the same for each revolution. That is, the same code information is supplied to switch wafer S701A when the radio set is turned to 30 and 50 mc, 31 and 51 mc, 32 and 52 mc, etc (para. 1–81). The 1-mc tuning shaft is connected to the double-conversion superheterodyne tuning circuits so that approximately two revolutions of the tuning shaft are required to tune the circuits from 30 to 69 mc. When the tuning cycle is completed, the tuning system must completely recycle before tuning to a lower frequency. During the recycling operation, the tuning shaft turns two complete revolutions to return the variable capacitors and slug racks in the receiver-transmitter unit to the starting positions (30 mc). The rear section of switch wafer S103E and the front and rear sections of switch wafer S103D supply ambiguity code information to the 1-mc autopositioner circuit. Two control wires carry this code information to the receiver-transmitter unit through the aircraft interconnecting cable. This information is also carried through a separate set of wires to the antenna coupler. At the receiver-transmitter unit, the control wires are connected to filter circuit FL1001 (not shown). From the filter, the control wires are connected to stationary contacts on the front and rear sections of switch wafer S701B through connectors J1008, P1001, J1007, P901, J901, and P701. During the 30- to 49-mc tuning cycle, the rear rotor of switch wafer S701B is connected to ground; during the 50- to 69-mc tuning cycle, the front rotor of the switch wafer is connected to ground.

e. To illustrate the recycling action, assume that the receiver-transmitter unit is at rest at the 69-mc position and the control unit whole-megacycle control is set to 69 mc. In the 69-mc position, the rotors of switch wafer S701B are displaced 342° clockwise and the rotors of switch wafer S701C are displaced 175.5° clockwise from the positions shown in figure 6–24. Therefore, a complete circuit exists between the rear rotor of switch wafer S701B and the negative side of the solenoid of relay K701 through contact 11 on the rear section of switch wafer S701B, contacts 11 and 20 on the front section of switch wafer S701C, and decoupling diode CR701; however, on the 50- to 69-mc tuning cycle, the rear rotor of switch wafer S701B is not connected to ground. When the whole-megacycle frequency selector switch is changed to the 30-mc setting, the ambiguity switch wafers, S103D and S103E, connect the rear rotor of switch wafer S701B to ground. This subsequently operates relay K701, lifts the pawl from the stop wheel, and closes motor control contacts 3 and 4. The motor then turns the 1-mc tuning shaft. The contacts on switch wafer S701B and S701C are connected so that the relay ground circuit remains closed until the open-seeking switch returns to the 30-mc position as shown in figure 6–24. When the motor stops, the autopositioner circuit remains at rest until a new whole-megacycle frequency is selected at the control unit. The ambiguity switch wafers, S103D and S103E, also supply ambiguity information to the antenna coupler. Diode CR701 prevents interaction between the receiver-transmitter unit and the antenna coupler. If the receiver-transmitter unit and antenna coupler are not synchronized, feedback from one unit to the other can result in continuous tuning. Diode CR701 prevents this unwanted feedback. The 1-mc autopositioner circuit must recycle any time that a lower frequency is selected. When a lower frequency is selected, switch wafer S103A grounds a combination of the 1-mc control wires corresponding to the selected frequency. The drive motor then turns the autopositioner shaft until it reaches the 69-mc position.

The ambiguity switch wafers then provide the ground circuit for the relay until the motor turns the tuning capacitors and slug rack positioning cams through the unused revolution back to the 30-mc position. The five control wires connected between switch wafers S103A and S701A then complete the ground circuit until the autopositioner circuit is tuned to the selected frequency. The antenna coupler autopositioner circuit operates in the same manner as the receiver-transmitter whole-megacycles autopositioner circuit, except that the binary coded frequency selection information is taken from S103B instead of S103A. See paragraphs 1–94 and 1–95 for detailed circuit functioning of the antenna coupler.

1–83. Decimal-Megacycles Tuning Circuit (fig. 6–24)

a. The 0.05-mc autopositioner circuit consists of decimal-megacycle selector switch S104, open-seeking switch S702, motor control relay K702, a 20-position stop wheel and locking pawl assembly, a slip clutch and drive assembly, and a tuning shaft. The 0.05-mc autopositioner circuit controls receiver-transmitter tuning from XX.00 to XX.95 mc in 0.05-mc steps. Five control wires carry the coded frequency control information from the control unit to the mechanical drive module in the receiver-transmitter unit. The five control wires are designated .05 mc select A through .05 mc select E in figure 6–24. For each of the 20 frequencies selectable from XX.00 to XX.95 mc, rotary wafer switch S104 connects a specific combination of the control wires to ground. In figure 6–24, wafer switch S104 is in the XX.00 position with control wires .05 mc select A and .05 mc select E connected to ground through the front section of switch wafer S104. All control wires are connected to filter FL1001 (in the receiver-transmitter unit, but not shown in fig. 6–24) through connector J101, the aircraft interconnecting cable, and connector P1005. The control wires are connected from the filter to contacts on open-seeking switch wafer S702A through connectors J1008, P1001, J1007, P901, J901, and P701. In figure 6–24, the position of open-seeking switch S702 corresponds to a frequency selection of XX.00; therefore, the circuit between the negative side of relay K702 and ground is open. As a result, the 0.05-mc relay, K702, is deenergized and the 0.05-mc autopositioner circuit is at rest.

b. When the decimal-megacycle frequency control is rotated to select any frequency other than XX.00, wafer switch S104 connects a different combination of control wires to ground. This action connects the negative side of relay K702 to ground through the open-seeking switch wafer S702A and the relay energizes. This action simultaneously closes motor control contacts 3 and 4 and removes the pawl from the notch in the stop wheel. The closed relay contacts complete a dc ground return circuit for drive motor B701, and the motor rotates the 0.05-mc tuning shaft through the drive gear and slip clutch assembly. Motor B701 also rotates the open-seeking switch S702 and the stop wheel. The rotors of switch wafers S702A and S702B are mounted directly on the tuning shaft, and the rotors of switch wafer S702C are driven through a 4:1 speed reducing gear train so that they rotate at one-fourth the speed of switch wafers S702A and S702B. The drive motor turns the tuning shaft until the rotors of switch wafer S702A moves to discrete positions that open all possible groundpaths on the negative side of relay K701. This action causes the relay to deenergize and release the locking pawl. When the locking pawl releases, it opens the motor control contacts (3 and 4). This action opens the ground return circuit for motor B701. Diode CR703 is connected to the negative side of relay K702 to prevent excessive arcing across the relay solenoid when the magnetic field collapses. When the drive motor stops, the autopositioner circuit remains at rest until a new decimal-megacycle frequency is selected at the control unit.

c. Although there are only 20 selectable 0.05-mc frequency increments between each whole-megacycle increment, open-seeking switch S702 is connected electrically so that it tunes through 40 positions (two revolutions) before causing the autopositioner circuit to recycle. This action is necessary because both high- and low-side injections are used in the double-conversion superheterodyne circuits. The tank circuits tuned by the 0.05-mc tuning shaft are tuned continuously from 3.975 to 5.925 in forty 0.05-mc steps (para. 1–74). When the 1-mc autopositioner circuit is tuned to an even-megacycle frequency, the 0.05-mc autopositioner

tuning shaft turns through one revolution. When the 1-mc autopositioner circuit is tuned to an odd-megacycle frequency, the 0.05-mc autopositioner tuning shaft turns through the second revolution. At the end of the two revolutions, the 0.05-mc autopositioner circuit recycles (turns through two revolutions) to return the driven tuning elements to the starting position. The front section of switch wafer S103C furnishes odd- and even-megacycle tuning information to the 0.05-mc autopositioner circuit by alternately connecting one of two control wires to ground. The two control wires carry the odd-even megacycle code information to the receiver-transmitter unit through the aircraft interconnecting cable. In the receiver-transmitter unit, the control wires are connected to stationary contacts on the front and rear sections of switch wafer S702B through connector P1005, line filter FL1001, and connectors J1008, P1001, J1007, P901, J901, and P701. When the whole-megacycle frequency selector switch is set to an even-megacycle position, the rear rotor of switch wafer S702B is connected to ground; when the whole-megacycle frequency selector switch is set to an odd-megacycle position, the front rotor of switch wafer S702B is connected to ground. The recycling action that takes place when the 0.05-mc autopositioner circuit completes its tuning cycle is identical with the recycling action described in paragraph 1–77 for the 1-mc autopositioner circuit. A similar recycling action takes place when the whole-megacycle selector switch is changed from an odd-megacycle to an even-megacycle setting or from an even-megacycle to an odd-megacycle setting without changing the decimal-megacycle frequency setting. For *example*, assume that the radio set is tuned to 30.00 mc, as shown in figure 6–24, and the whole-megacycle selector is changed to the 31-mc position. When the autopositioner circuits are tuned to 30.00 mc, the rear rotor of switch wafer S702B is connected to ground through the front section of switch wafer S103C in the control unit; however, the rotors of switch wafer S702C are in positions that open the negative side of motor control relay K702. A complete circuit exists between the negative side of relay K702 and the front rotor of switch wafer S702B through contacts 18½ and 20 on the front section of switch wafer S702C and contact 19 on the front section of switch wafer S702B; however, the front rotor of switch wafer S702B is not connected to ground on even-megacycle frequency settings. When the whole-megacycle frequency selector is moved to the 31-mc position, the front rotor on switch wafer S702B is connected to ground, and this subsequently provides a complete ground return circuit for relay K702. The relay energizes, lifting the pawl from the stop wheel and closing the motor control contacts. The motor turns the autopositioner tuning shaft. This action connects the negative side of relay K702 to ground through open-seeking switch wafer S702A. The relay remains connected to ground through switch wafer S702A until the 0.05-mc autopositioner tuning shaft has turned one revolution. At this point, the rotors of switch wafer S702A are in a discrete position that opens all possible ground circuit to the negative side of relay K702 and the autopositioner circuit is again at rest.

1–84. Mechanical Tuning Assembly

(fig. 1–33)

a. General. The mechanical drive module in the mechanical tuning assembly rotates three mechanical output shafts to specific angular positions for each frequency selection. Drive motor B701 drives the tuning shafts and also rotates the open-seeking switches which control the 1-mc and 0.05-mc autopositioner circuits. In turn, the 1-mc and 0.05-mc autopositioner circuits control the operation of dc motor B701 (paras. 1–76 and 1–77).

b. 1-Mc Tuning Shaft. The 1-mc tuning shaft rotates the high-frequency oscillator crystal-selector switch, S301, and drives the differential which positions the tuning capacitors in the RF amplifier module and the tuning capacitors and slug racks in the RF power amplifier module. The drive motor rotates the 1-mc tuning shaft 18° for each 1-mc increment of frequency. The 1-mc tuning shaft rotates in one direction through 360° in 20 steps. When the receiver-transmitter unit is tuned from 30 to 69 mc, the 1-mc tuning shaft turns 702° in 39 18° steps. The 40th step completes the 720° of rotation, which returns the 1-mc tuning shaft to the original position. Motor B701 drives the 1-mc shaft through a speed-reduction gear train assembly and slip clutch. The 1-mc tuning shaft is coupled to a 2:1 speed-reducing gear train in the RF chassis. This gear of the tuning shaft train transmits the angular motion of

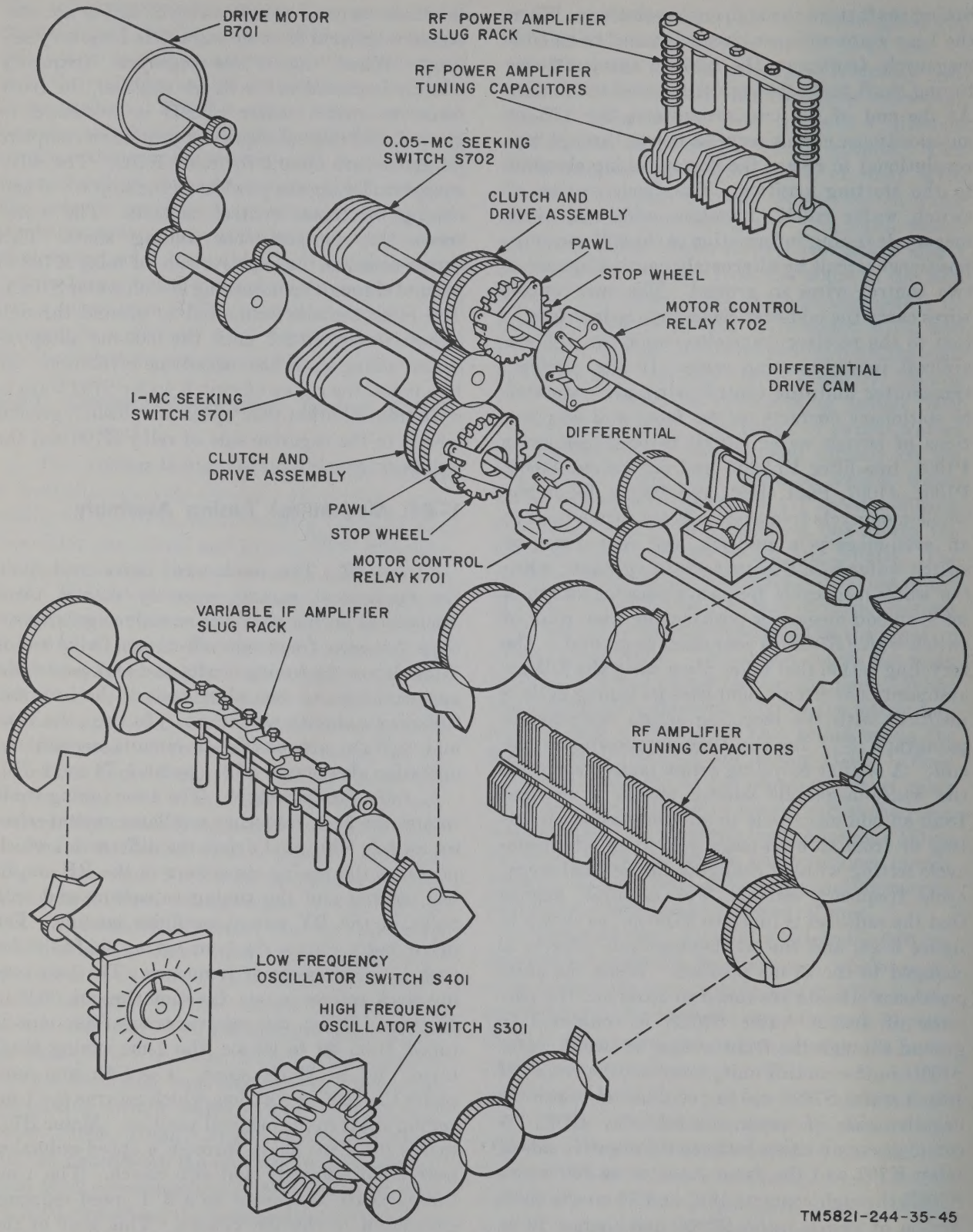


Figure 1-33. Mechanical tuning assembly, mechanical diagram.

the tuning shaft to the high-frequency oscillator switch. The selector switch rotor rotates one revolution for every two revolutions of the tuning shaft. Therefore, when the receiver-transmitter unit is tuned from 30 through 69 mc and back to 30 mc, the rotor of the high-frequency oscillator switch turns one complete revolution and returns to the starting position.

c. Differential Tuning Shaft. The differential tuning shaft positions the tuned circuit elements in the RF amplifier and RF power amplifier modules. As the receiver-transmitter is tuned in 1-mc increments, the rotational motion of the 1-mc tuning shaft is transmitted to the differential through a gear ratio of 1:1. The differential transmits this motion to the differential tuning shaft through a gear ratio of 1:1. Therefore, each time that the 1-mc tuning shaft rotates one revolution, the differential tuning shaft also rotates one revolution. During each revolution of the 0.05-mc tuning shaft, a cam (mounted on the 0.05-mc tuning shaft) positions a cam follower on the differential so that the angular motion of the 0.05-mc tuning shaft is transmitted to the differential tuning shaft. The differential tuning shaft rotates 18° for each 1-mc frequency increment and 9° for each 0.05-mc frequency increment. The operation of the differential is based on the principle that both the 1-mc and 0.05-mc tuning shaft inputs produce an output, but neither input affects the other. The differential tuning shaft rotates the tuning capacitors in the RF amplifier through a 4:1 speed-reduction gear train in the RF chassis. Therefore, the tuning capacitors turn 180° when the receiver-transmitter unit is turned through a complete tuning cycle. The differential tuning shaft also rotates the tuning capacitors and slug-rack positioning cams in the RF power amplifier module. A 4:1 speed-reducing gear train in the RF chassis transmit the angular motion of the tuning shaft to the tuning capacitors and slug-rack positioning cams.

d. 0.05-Mc Tuning Shaft. The 0.05-mc tuning shaft positions the crystal selector switch, S401, in the low-frequency oscillator module and the slug rack in the variable IF amplifier module and drives the differential. The 0.05-mc autopositioner circuit and tuning mechanism within the mechanical drive module rotate the 0.05-mc tuning shaft 18° for each 0.05-mc increment of frequency. The 0.05-mc tuning shaft turns in one direction through 360° in 20 steps. When the receiver-transmitter unit is tuned from XX.00 to XX.95 mc, the 0.05-mc tuning shaft turns 342° in 19 steps. The 20th step completes the 360° of rotation, which returns the shaft to the original position. Motor B701 drives the 0.05-mc shaft through a speed-reduction gear train and slip clutch assembly. The angular motion of the 0.05-mc tuning shaft is coupled to a slug rack positioning camshaft in the variable IF amplifier module through a 4:1 speed-reduction gear train in the RF chassis. A secondary gear train in the variable IF amplifier module transmits the angular motion of the camshaft to the rotor of crystal selector switch S401. This gear train provides a 4:1 increase in speed between the camshaft and the crystal selector switch. The two gear trains therefore provide a 1:1 ratio between the 0.05-mc tuning shaft and the switch rotor. Thus the switch rotor rotates one revolution each time the tuning shaft rotates one revolution.

1-85. High-Frequency Oscillator Module Mechanical Tuning

(fig. 1-33)

The 1-mc tuning shaft drives the rotor of 20-position crystal selector switch S301 in the high-frequency oscillator module. The switch rotor is connected to the 1-mc tuning shaft through a gear train that provides a 2:1 speed reduction; therefore, the switch rotates 360° in 40 steps as the 1-mc autopositioner circuit turns through a complete tuning cycle (720°). Crystal selector switch S301 is a printed-circuit-type switch that includes a rotor with a single wiping contact and 20 stationary contacts. The 20 stationary contacts are arranged so that the moving contact on the rotor remains on each stationary contact for two 1-mc frequency increments. At each stationary contact, the rotor connects 1 of 20 available crystals and tuning coils into the collector circuit of high-frequency oscillator Q301. Since the movable contact remains on each stationary contact for two 1-mc steps, the same crystal and associated tuning coil are used at two different whole-megacycle frequency settings. For example, crystal Y301 and inductor L305 are used when the whole-megacycle frequency selector is set to 30 mc (para. 1-25).

The same crystal and tuning coil are also used when the selector is set to 31 mc, then a new crystal and tuning coil are used at the 32- and 33-mc frequency settings.

1–86. Low-Frequency Oscillator Module Mechanical Tuning

(fig. 1–33)

The 0.05-mc tuning shaft is mechanically coupled to the rotor of crystal selector switch S401. The tuning shaft rotates the switch through 360° in 20 18° steps. At each switch position, the rotor of switch S401 connects 1 of 20 crystals into the collector of low-frequency oscillator Q401. The crystals control the operating frequency of low-frequency oscillator Q401. The switch rotor turns only in one direction. After 360° of rotation, the rotor is again at the original position.

1–87. RF Amplifier Module Mechanical Tuning

(fig. 1–33)

The differential tuning shaft positions the tuning capacitors in the RF amplifier module. An RF chassis gear train couples the angular motion of the differential tuning shaft to the capacitor shaft. The gear train, consisting of a 20-tooth gear driving an 80-tooth gear through an idler gear, provides a 4:1 speed reduction. When the differential turns through a complete tuning cycle (two revolutions), the capacitor gang turns 180°. This 180° of rotation tunes the RF amplifier circuit through the 30- to 69.95-mc tuning range. During the two revolutions in which the 1-mc autopositioner circuit recycles, the capacitors turn through the unused 180° arc to return to the 30-mc position.

1–88. RF Power Amplifier Module Mechanical Tuning

(fig. 1–33)

The differential tuning shaft positions the tuning capacitors and slug rack in the RF power amplifier module. An RF chassis gear train, which consists of a 20-tooth gear driving an 80-tooth gear through two idler gears, transfers the angular motion of the differential tuning shaft to the tuning capacitors. The gear train provides a 4 : 1 speed reduction. The capacitor shaft, therefore, turns 180° when the differential tuning shaft turns two revolutions during a tuning cycle. Two cams, mounted on the capacitor shaft, transfer the angular motion of the capacitor shaft to the slug rack. When the capacitor shaft turns 180°, the coils and capacitors in the RF power amplifier circuit are tuned through the 30- to 69.95-mc tuning range. During the two revolutions in which the autopositioner circuit recycles, the slug rack and capacitors return to the starting position, 30 mc.

1–89. Variable IF Module Mechanical Tuning

(fig. 1–33)

The 0.05-mc tuning shaft positions the slug rack in the variable IF amplifier module. An RF chassis gear train, consisting of a 20-tooth gear driving an 80-tooth gear through three idler gears, couples the angular motion of the tuning shaft to a camshaft. The gear train provides a 4 : 1 speed reduction. Two cams, mounted on the camshaft, convert the angular motion of the tuning shaft and gear train to linear motion of the slug rack.

1–90. Harmonic Filter Module Control Circuit

(fig. 6–24)

The tuning system controls the selection of filter circuits in the harmonic filter module (para. 1–27) by connecting the negative side of relays K1601 and K1602 to ground when the radio set is tuned to any frequency between 30 and 45.95 mc and the press-to-talk switch is depressed. The front section of switch wafer S103E and the rear section of switch wafer S103C control the operation of the harmonic filter relays. When the radio set is tuned to a frequency in the 30- to 45.95-mc range, a closed circuit exists between pin K of connector J101 through contact 18½ on the front section of switch wafer S103E and contacts 13 and 17 on the front section of switch wafer S103C. Pin K of connector J101 is connected to relays K1601 and J1602 through the aircraft interconnecting cable, pin 4 of connector P1005, filter FL1001, pin 4 of connector J1008, pin 4 of connector P1001, pin D of connector P1008, and pin D of connector J1601. When the press-to-talk switch is depressed,

it connects the front rotor of switch wafer S103E to ground and energizes relays K1601 and K1602. When the press-to-talk switch is released, the relays deenergize. When the radio set is tuned to a frequency in the 46- to 69.95-mc range, the rotors of switch wafers S103C and S103E are in positions that open the relay ground circuit and prevent the energizing of the relays even though the press-to-talk switch is depressed. For example, assume that the receiver-transmitter unit is tuned to 50 mc. In the 50-mc position, switch wafer S103C is in the position shown in figure 6–24. Switch wafer S103E is geared by a ratio of 4:1 to switch wafer S103C; therefore, the rotor is displaced 90° counterclockwise from the position shown in figure 6–24. Contact 18½ on switch wafer S103E is adjacent to a rotor detent. When the press-to-talk switch is depressed, the front rotor of switch wafer S103E is connected to ground; however, since contact 18½ is not making contact with the rotor, the relays are not energized.

1–91. Press-to-Talk and Channel Tone Control Circuits

(fig. 6–24)

a. Relay K703 in the mechanical drive module opens the press-to-talk circuit and closes the channel tone circuit during tuning (channel changing) operations. The relay connected in parallel with drive motor B701 is energized when the motor is operating and is deenergized when the motor is not operating.

b. The press-to-talk switch controls the operation of the tr bus relay. When the press-to-talk switch is depressed, pin 9 of connector P701 is connected to ground (para. 1–71*b*). When relay K703 is deenergized, a complete circuit exists between pin 9 and pins 2 and 14 of connector P701 through normally closed contacts 4 and 6 of relay K703. Pin 2 of connector P701 is connected to the negative side of tr bus relay K1001 through pin 2 of connector J901, pin 5 of connector P901, and pin 5 of connector J1007 (fig. 6–4). Therefore, the press-to-talk switch controls the tr bus relay when relay K703 is deenergized. When the relay is energized (during the tuning cycle), relay contacts 4 and 6 of K703 are open and even though the press-to-talk switch is depressed, it cannot energize the tr bus relay. This action automatically places the receiver-transmitter unit in the receive condition during the tuning cycle. Pin 14 of connector P701 is connected to the negative side of relay K601 in the RF amplifier through pin 14 of connector J901, pin F of connector P902, and pin F of connector J601 (fig. 6–18). This relay is energized only when the tr bus is energized.

c. During tuning operations, an 800-cps tone is supplied to the receiver-transmitter audio output circuits to indicate to the radio set operator that the tuning system is selecting a new channel (cycling). The tone from the inverter passes through pin 10 of connector P701, contacts 3 and 8 of relay K703, and pin 1 of connector P701, before going to the audio output circuits. Contacts 3 and 8 of relay K703 are open when the relay is deenergized, therefore, the channel tone circuit is open during normal transmit and receive operations and no tone is applied to the audio circuits. When the tuning system is selecting a new channel, relay contact 3 and 8 are closed and the tone is supplied to the audio circuit.

d. Neon glow tube DS701, connected across the solenoid of relay K703, is an arc suppressor that prevents excessive current through the solenoid when the magnetic field collapses.

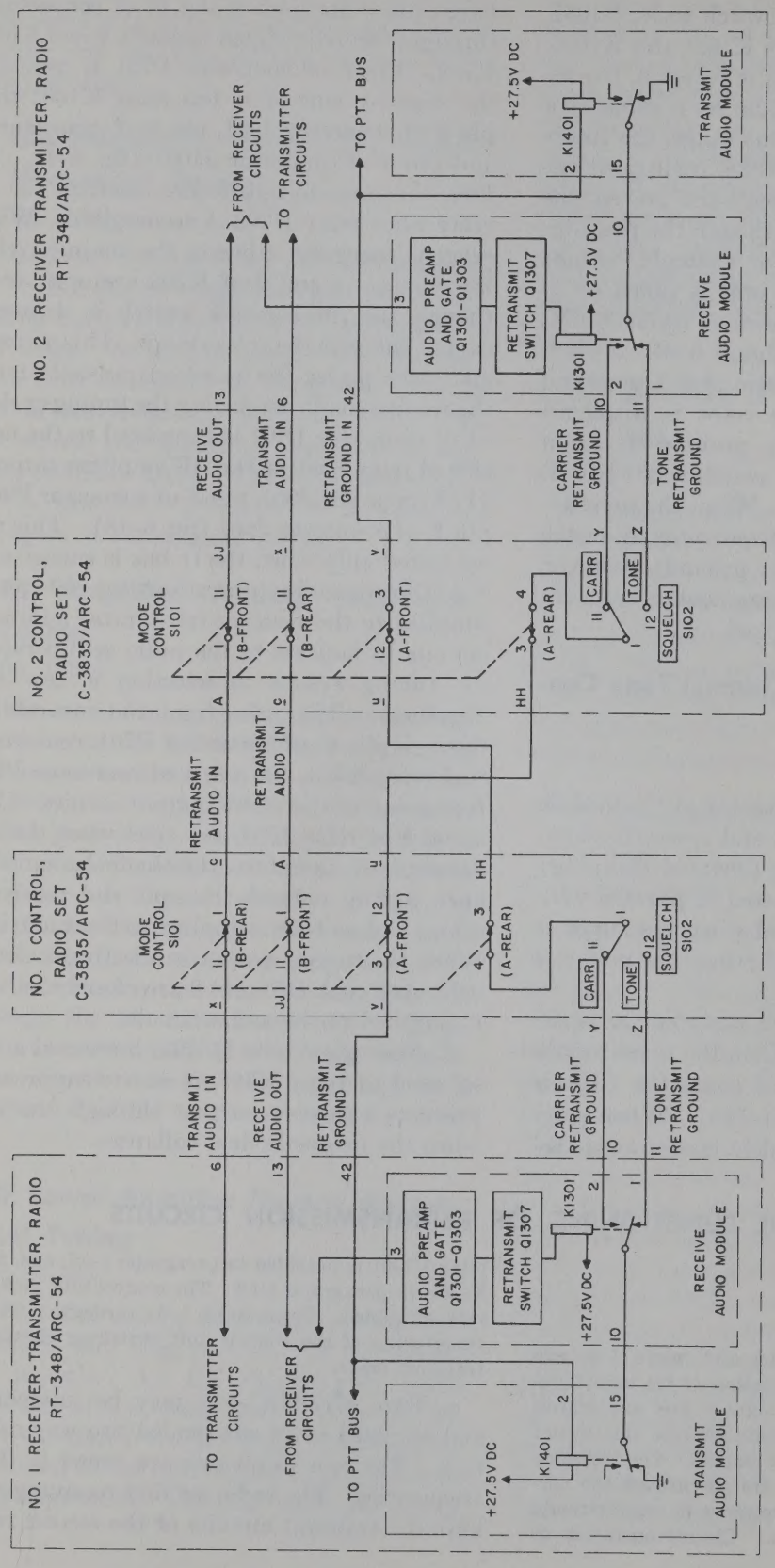
Section VIII. FUNCTIONING OF RETRANSMISSION CIRCUITS

1–92. Introduction

(fig. 1–34)

Note. The following discussion and figure 1–34 are simplified to provide a clear discussion of the overall retransmit operation. Received signals are not traced through the normal receiver circuits because this would only duplicate other parts of this manual. For the same reason, transmit signals are not traced through the normal transmitter circuits. The retransmit relay circuits are presented in simplified form. Circuit operation of relay K1401 is provided in paragraph 1–15, and, for relay K1301, in paragraph 1–39. The control unit switches are also simplified. Paragraphs 1–64 through 1–68 provide functioning of the control unit switching circuits in retransmit mode.

a. Two AN/ARC–54's may be interconnected and operated as an unattended two-way relay station. The two radio sets are tuned to different frequencies. The radio set first receiving a signal keys the transmit circuits of the second radio set



NOTES:
1. SWITCHES SHOWN WITH BOTH RADIO SETS IN STATIC (RECEIVE) CONDITION. THE SQUELCH CONTROL IS SET TO CARR AND THE MODE CONTROL IS SET TO RETRAN. CONTROL UNIT ROTARY WAFER SWITCHES ARE SIMPLIFIED TO SHOW ONLY RETRANSMIT FUNCTIONS.
2. ☐ INDICATES EQUIPMENT MARKING

TM5821-244-35-46

Figure 1-34. Retransmit operation, simplified block diagram.

and couples the received signal into the second transmitter for retransmission.

b. The relay station may be operated in either carrier squelch or tone squelch mode. (Squelch disable mode cannot be used for retransmit operation.) The radio set transmitter control circuits are interlocked by retransmit control relays to assure that the two radio sets will not transmit simultaneously and that the two radio sets will not oscillate between receive and transmit modes. Figure 1–34 is a simplified block diagram showing the retransmit relays in their deenergized condition (both radio sets in receive mode with no signal received).

1–93. Retransmit Operation

(fig. 1–34)

a. Retransmit Circuit, Static Condition. The radio sets are in the static condition when no signals are being received or transmitted and both radio sets are in receive mode.

(1) *Carrier squelch mode.* In carrier squelch mode, both the receive audio module retransmit relays (K1301) are deenergized because no carrier signal is present in either radio set. (See para. 1–39 for operation of relay K1301.) With these relays deenergized, the carrier retransmit ground return paths for the PTT (push-to-talk) buses are open, thus both transmitters are deactivated.

(2) *Tone squelch mode.* In tone squelch mode, both the receive audio module retransmit relays (K1301) are energized during the absence of a tone signal. With these relays energized, the tone retransmit ground return paths for the PTT buses are open, thus both transmitters are deactivated.

b. Retransmit Circuit, Dynamic Condition. In the following discussion consider that radio set No. 1 first receives a signal.

(1) *Carrier squelch mode.* When a signal is received by radio set No. 1, the noise level in the radio set decreases because of squelch action. The decrease in noise level operates the audio gate in the receive audio module, allowing retransmit switch Q1307, in radio set No. 1 receive audio module, to conduct, thereby energizing relay K1301. With K1301 energized, the carrier retransmit groundpath is completed allowing the ground, which originates in the transmit audio module, to be applied through the closed contacts of K1301, and then through the control units to the PTT bus of radio set No. 2. At the same time, the received signal is coupled from radio set No. 1 through the control units to the transmit circuits of radio set No. 2. The ground, placed on radio set No. 2 PTT bus, simultaneously keys the transmitter and energizes K1401. Since amplifier Q1307, in the receive audio module of radio set No. 2, is operated by the squelching of noise in the radio set (para. 1–39*a*), relay K1301 energizes during the presence of a transmitted carrier just as it does with a received carrier. To prevent this action from completing a groundpath that would energize the transmit circuits of radio set No. 1, the path is broken by the operation of relay K1401 in the transmit audio module (radio set No. 2). (Relay K1401 operated immediately upon application of the PTT ground, while the operation of K1301 was slightly delayed because of the time required for squelching.) Relay K1401 remains energized for a short time after the termination or interruption of the receiver signal. (See para. 1–15 for details of relay interlock circuit operation.) This delay is necessary because of the time required for receiver squelching. If K1401 were allowed to deenergize rapidly at the end of the receive-transmit cycle, relay K1301 (radio set No. 2), which can deenergize only after the radio set is squelched, would provide a completed path that would place radio set No. 1 in transmit mode. Radio set No. 1 would transmit a carrier until K1301 finally deenergized, at which time K1401 in radio set No. 1 would provide a ground back to radio set No. 2 . The result would be that the two radio sets would con-

tinue to transmit carriers back and forth to each other effectively disabling the relay station.

(2) *Tone squelch mode.* Retransmit operation in tone squelch mode is the same as in carrier squelch mode except that the retransmit groundpath is completed when relay K1301 is deenergized instead of when K1301 is energized. Relay K-1301 is energized in the static (no signal) condition and will deenergize when a tone signal is present. (See para. 1-39*b* for operation of K1301 in tone squelch mode.)

Section IX. FUNCTIONING OF ANTENNA AS-1703/AR AND ANTENNA COUPLERS CU-9427 ARC-54 AND CU-943/ARC-54

1-94. General

The communications antenna system for Radio Set AN/ARC-54 consists of a whip antenna (Antenna AS-1703/AR) and an impedance-matching coupler (Coupler, Antenna CU-942/ARC-54 or CU-943/ARC-54). The antenna and coupler are both mounted to the external surface of the aircraft. (The coupler is housed in a streamlined fiberglass housing.) The coupler provides impedance matching between the antenna and the receiver-transmitter unit for all channels within the frequency range of the radio set (30.00 to 69.95 megacycles). The antenna coupler contains impedance-matching circuits which are selected by rotary switches driven by an electric motor. The motor is part of a seeking switch circuit similar to the autopositioner circuit in the receiver-transmitter unit. The antenna coupler has one impedance-matching circuit for each whole-megacycle setting of the radio set. The impedance-matching circuits maintain a voltage standing wave ratio (vswr) of 2 to 1 from 40 to 70 megacycles and 3 to 1 from 30 to 40 megacycles.

1-95. Antenna AS-1703/AR

The antenna is a fiberglass whip. The antenna is vertically polarized to provide omnidirectional coverage in the azimuth plane. The radiating element is No. 16 copperweld stranded conductor terminated at the tip by a 50-megohm static suppressor. The nominal input impedance of the antenna (with coupler) is 50 ohms and the antenna will handle 20 watts of RF power.

1-96. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54

(figs. 1-35, 6-25, and 6-26)

a. General. Antenna Couplers CU-942/ARC-54 (used for fixed-wing aircraft and some large helicopter installations) and CU-943/ARC-54 (used for small helicopter installations) are identical, except for the values of inductors used at the lower frequencies. This difference is necessary because of the impedance variations caused by various aircraft. Since the aircraft fuselage acts as a reflector for RF energy, the exact shape of the fuselage and the position of the antenna on the fuselage affect the vswr of the antenna. For this reason, the two couplers are not interchangeable.

b. Circuit Description.

(1) The RF output from the receiver-transmitter unit is coupled into the antenna coupler through J102 to contact 11 of ambiguity switch S102A. From here, the signal is coupled either to the high-band switching circuit through contact 2, or to the low-band switching circuit through contact 12. The switch is positioned by motor B101, as are all switches in the unit. The signal is then coupled through an impedance-matching circuit consisting of a series inductor and a shunt capacitor. The particular inductor and capacitor used depend upon the frequency setting of the radio set. The RF energy is then coupled from the impedance-matching circuit to contact 13 of ambiguity switch S102B (if the radio set is operating in the frequency range of 50.00 to 69.95 megacycles) or contact 3 of ambiguity switch S102B (if the radio set is operating in the frequency range of 30.00 to 49.95 megacycles). From here, the signal is coupled, through contact 16 of S102B, to the antenna. In the receive condition, the signal path is reversed. Figure 1-35 shows a typical matching network for high-band frequencies and a

typical matching network for low-band frequencies.

(2) Motor B101 is part of a seeking switch circuit similar to the autopositioner circuit in the receiver-transmitter unit. When the control unit megacycle selector is switched from one frequency to another, a ground is placed on one of the control wires that comes into the antenna coupler through J101. This ground is applied, through contact 14, 15, 16, 17, or 18 of open-seeking switch S103A, to contact 12, the ground is connected to relay K101, energizing the relay, which in turn, applies power from pin J of J101 to motor B101. The motor drives all the switches, through a gear train, until the antenna coupler is tuned to the correct position. When the antenna coupler is tuned to the correct position, the ground to relay K101 is removed by S103A. Relay K101 deenergizes, removing the motor ground and shorting the motor armature, thereby stopping the motor. Diodes CR101 and CR102 prevent the grounds from being coupled back to the receiver-transmitter unit and causing the radio set to recycle. Capacitor C144 allows fast collapse of the electric field around the motor windings. Capacitor C145 allows fast collapse of the electric field around the relay winding.

(3) The ambiguity ground at pin G or F of J101 serves the same purpose as the ambiguity ground in the receiver-transmitter unit; that is, it maintains a ground for relay K101 so that motor B101 will continue to drive through positions that would otherwise be selected by ambiguous coding information. For example, refer to the chart in paragraph 1–81 that shows control wire ground coding for the 1-megacycle shaft in the receiver-transmitter unit (the information applies to the antenna coupler as well as the receiver-transmitter unit). This chart shows that the same coding information is supplied for selection of the 60-megacycle position as for selection of the 40-megacycle position. If the radio set is switched from 30 megacycles to 60 megacycles, the motor in the antenna coupler will run until it reaches the 60-megacycle position. In order for this to happen, however, the motor must run through the 40-megacycle position, which uses the same coding as the 60-megacycle position. The ambiguity switch (S102A) maintains a ground for K101 during this ambiguous-frequency crossing so that the motor will not stop at this position. When the antenna coupler reaches the 49-megacycle position, the ambiguity ground is removed by S102A, allowing the motor to stop on the next position that provides the proper code (open circuit). That position will be 60 megacycles. The function of the open-seeking switching system is described in detail in paragraph 1–82*c*, which describes an identical circuit in the receiver-transmitter.

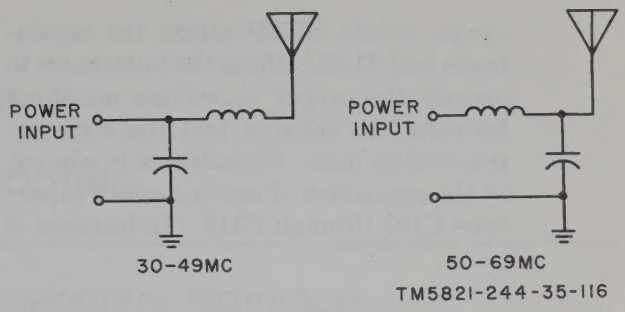


Figure 1–35. Antenna coupler matching network, simplified schematic diagram.

(4) For frequency settings of 30.00 to 49.95 megacycles, switch S101A selects the capacitance and S101B selects the inductance to provide the proper impedance matching between the antenna and the receiver-transmitter unit. Capacitance is selected by the connection of one or more of capacitors C120 through C143. Inductance is selected by the connection of one of inductors L121 through L145. The equivalent circuit for any of these selections is shown in figure 1–35. All circuits used in this frequency range (30.00 to 49.95 megacycles) are of the capacitive input configuration. For frequency settings of 50.00 to 69.95 mega-

cycles, switch S103B selects the capacitance and S103C selects the inductance to provide the proper impedance matching between the antenna and the receiver-transmitter unit. Capacitance is selected by the connection of one or more of capacitors C101 through C119. Inductance is selected by the connection of one of inductors L101 through L120. The equivalent circuit for any of these selections is shown in figure 1-35. All circuits in this frequency range (50.00 to 69.95 megacycles) are of the inductive input configuration.

CHAPTER 2

TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

Warning: **Dangerous voltages exist in the receiver-transmitter unit. Observe all safety precautions when servicing the receiver-transmitter unit.**

2–1. General Instructions

The direct and general support and depot maintenance procedures in this manual supplement the procedures described in the organizational maintenance manual (TM 11–5821–244–12). The systematic troubleshooting procedure, which begins with the operational and sectionalization checks that can be performed at an organizational level, is carried to a higher level in this manual. Sectionalizing, localizing, and isolating techniques used in the troubleshooting procedures are more advanced. Paragraphs 2–3 through 2–6 provide interunit troubleshooting procedures to be performed by field maintenance facilities; paragraphs 2–8 through 2–13 and paragraphs 2–14 through 2–16 describe intraunit (within the unit) field maintenance localizing procedures. Special test equipment available at the direct support or field maintenance level provides more conclusive test results for sectionalizing trouble to a unit. Procedures for replacing modules and parts at direct support are covered in paragraphs 3–1 through 3–13. Procedures for isolating troubles within receiver-transmitter modules are provided in chapter 4 (general support and depot maintenance). The antenna coupler is maintained at general support level (ch. 4).

2–2. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective radio set is to sectionalize the fault to a particular unit. Then, in a complex unit containing more than one functional circuit (receiver-transmitter unit), localize the trouble to a particular module. Finally, isolate the trouble to a defective part within the module. It is seldom possible to observe a symptom, diagnose the cause and immediately locate the defective part unless a part is obviously physically damaged. Generally, it is necessary to perform a sequence of operational checks, observations, and measurements before the cause of a trouble can be isolated.

b. Sectionalization. The radio set consists of a receiver-transmitter unit and its shockmount, a control unit, a whip antenna, and an antenna coupler. In addition, other units, not part of the radio set, are used in conjunction with the radio set. These are the aircraft power supply, the interphone amplifier and control unit, the homing indicator, and a homing antenna system. The radio set depends on aircraft interconnecting wiring for primary power, RF and audio signal transmission and control; therefore, when trouble occurs, the first step is to sectionalize the fault to a particular unit or to the aircraft wiring. Figure 6–5 shows interconnecting wiring between units of the radio set and units that work in conjunction with the radio set. Methods of sectionalizing troubles are:

(1) *Operational tests.* The operational tests described in the preventive maintenance checks and services charts in TM 11–5821–244–12 will aid maintenance technicians to sectionalize some troubles to a particular unit.

(2) *In-aircraft troubleshooting.* In-aircraft troubleshooting procedures are described in paragraphs 2–4 through 2–6. The in-aircraft troubleshooting procedures involve the use of the Simulator, Test Set, Radio SM–349/ARC–54, part of Maintenance Kit, Electronic Equipment MK–

Test equipment	Common name	Technical manual
Maintenance Kit, Electronic MK-733/ARC-54	Maintenance kit	TM 11-6625-601-12
Multimeter ME-26B/U	Multimeter	TM 11-6625-200-12
Signal Generator AN/URM-48	Fm signal generator	TM 11-1257
Audio Oscillator TS-382/U	Audio oscillator	TM 11-2684
Signal Generator AN/USM-44A	RF signal generator	TM 11-6625-508-10
Headset-Microphone H-101A/U	Headset/microphone	
Electronic Voltmeter ME-30B/U	Electronic voltmeter	TM 11-6625-310-12
Spectrum Analyzer TS-723/U	Spectrum analyzer	TM 11-5097
Power supply +27.5 volts	Power supply	
Frequency Meter AN/USM-26 Frequency, Electronic Converter CV-394/USA-5.	Frequency meter	TM 11-5057
Attenuators, variable 1-db steps (HP-355A)		
Attenuator, variable 10-db steps (HP-355B)		
Test Set, Electronic Circuit Plug-In Unit AN/ARM-87	Module tester	TM 11-6625-467-12
Test Set, Electron Tube TV-7/U	Tube tester	TM 11-6625-274-12
Test Set, Transistor TS-1836/U	Transistor tester	TM 11-6625-539-15

733/ARC-54. In some instances, the simulator can be used to localize the trouble to a particular circuit within a unit. The simulator also indicates aircraft wiring faults.

c. Localization. After the trouble is sectionalized to a unit, the next step is to localize the trouble to a functional circuit or module within the unit. In the case of a small unit, such as the control unit, the steps performed to sectionalize the trouble, localize the trouble to a particular circuit. In the receiver-transmitter unit, the circuits are more complex and interdependent. Methods used to localize trouble within the receiver-transmitter unit are:

(1) *Observation.* Observation involves a thorough understanding of the receiver-transmitter circuits. For example, if trouble occurs only at certain frequencies or only during transmit, the maintenance technician may be able to localize the trouble to a particular module or stage.

(2) *Troubleshooting chart.* A troubleshooting chart which contains a sequence of bench test steps is provided in paragraph 2-8. The bench test procedures require the use of the special test equipment (Maintenance Kit, Electronic Equipment MK-733/ARC-54). Localization and isolation of troubles in the antenna coupler and within plug-in modules are covered in chapter 4.

d. Isolation. After trouble has been localized to a stage or circuit, the final step is to isolate the cause of trouble to a particular component. Procedures for isolating troubles are given in chapter 4.

2-3. Test Equipment Required

The following chart lists the test equipment required for troubleshooting Radio Set AN/ARC-54. The chart includes the technical manual applicable to each piece of test equipment, and the common name, by which the equipment will be referenced.

Section II. IN-AIRCRAFT TROUBLESHOOTING

2-4. Introduction

(figs. 6-5 and 6-27)

a. When a malfunction of the radio set or associated equipment occurs, the first step in correcting the trouble is to sectionalize the cause to a particular unit in the aircraft. For example, if no audio output is heard in the pilot's headset, the cause of trouble may be in the pilot's headset, the interphone amplifier, the aircraft audio system interconnecting cables, the control unit, the receiver-transmitter unit, the communication an-

tenna, or the antenna coupler. If the preventive maintenance checks and services charts and the troubleshooting chart in TM 11–5821–244–12 do not provide sufficient information for positive sectionalization of the trouble, perform the in-aircraft troubleshooting procedures described in this section.

b. The in-aircraft troubleshooting procedures require the use of Simulator, Test Set, Radio SM–349/ARC–54 (simulator) (part of Maintenance Kit, Electronic Equipment MK–733/ARC–54). The simulator replaces the receiver-transmitter unit in the aircraft and simulates its inputs and outputs. Because the receiver-transmitter unit is generally installed in a part of the aircraft that is remote from the cockpit, two maintenance technicians are required to perform in-aircraft troubleshooting with the simulator. One maintenance technician performs the actions and checks required in the aircraft cockpit. The second maintenance technician performs the actions and checks at the simulator, which may be out of sight and beyond reach of the maintenance technician in the cockpit. The simulator has an interphone jack to enable the maintenance technicians to communicate with each other while the in-aircraft troubleshooting procedures are being performed.

c. By substituting the simulator for the receiver-transmitter unit, the following tests and measurements of the remaining units or circuits in the aircraft can be made. (Steps refer to troubleshooting chart in para. 2–6.)

(1) PTT ground continuity (step 1).
(2) Audio circuits and aircraft interphone (step 2).
(3) Aircraft primary power under simulated transmit load (step 3).
(4) Squelch control lines (step 4).
(5) Frequency selection (steps 5 and 6).
(6) Mode selections (steps 1, 2, 7, and 8).
(7) Homing indicator (steps 7 and 9).
(8) Homer operate line (step 7).
(9) Homing antenna system continuity (step 7).
(10) Retransmit control lines (steps 7 and 8).
(11) Security audio and control lines (steps 10 and 11).

Note. In the troubleshooting chart in paragraph 2–6, perform the steps in order. When the IF indication is abnormal column indicates trouble in aircraft wiring, the mating connectors are considered part of aircraft wiring. If all units and circuits appear to be functioning properly when the simulator is used, it may be assumed that the cause of the trouble is the receiver-transmitter unit or a bad shockmount connector.

2–5. SM–349/ARC–54, Installation in Aircraft

The simulator has a quick-release locking handle identical with the locking handle on the receiver-transmitter, which it replaces in the aircraft for troubleshooting purposes (TM 11–6625–601–12). Remove the receiver-transmitter from the aircraft equipment rack. Remove the simulator from its stowed position in the maintenance kit by releasing the catch and pulling the locking handle outward and downward. Extend the base of the simulator to full length so that the simulator will fit the receiver-transmitter shockmount. Install the simulator in the receiver-transmitter shockmount. Plug a headset-microphone (H–101A/U or equivalent) into the HEADSET jack on the simulator, and then proceed with the troubleshooting procedure.

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2–6. Troubleshooting Procedure

Step	Procedure	Normal indication	If indication is abnormal
1	Cockpit technician: Set the radio set control unit mode control to PTT and the intercommunication set mode control to VHF COMM. Depress the transmit button. Simulator technician: Set S1 and S3 on the simulator to OFF and set S2 to ON. Observe the lights on the simulator.	When the cockpit technician depresses the transmit button, the PTT and PTT INT lamps on the simulator should light.	If neither lamp lights, the trouble is in the radio set control unit, the aircraft wiring, or the headset. Remove the control unit and check for a ground on pin q of the aircraft connector (when transmit button is depressed). If a ground is present, the trouble is in the control unit or aircraft wiring between the control unit and the simulator. (Use the interconnection wiring diagram, fig. 6–5 or 6–27, to check wiring between units.) If a ground is not present at pin q when the transmit button is depressed, the trouble is in the aircraft interphone, headset, or wiring between the interphone and the control unit. If only one lamp lights, the trouble is in the aircraft wiring.
2	Cockpit technician: With transmit button depressed, talk into the microphone and listen for answer from simulator technician. Simulator technician: Talk into microphone.	Technicians should be able to communicate. (The cockpit technician must hold transmit button down when talking.) Should be able to communicate with cockpit technician.	If communication cannot be established (in either direction), check the mating of the simulator connector, the control unit connector, the aircraft interphone connector, and both headphone plugs. If communication is still not established, check for continuity of the audio common line through the aircraft interphone set, the control unit, and the aircraft wiring (fig. 6–5 or 6–27). If communications can be established in one direction only, remove the control unit and check for continuity between pins *x* and *y* of the control unit and for 150 ohms or less (depending on setting of VOL control) between pins N and JJ. If these readings are good, the trouble is in the aircraft interphone set, the aircraft wiring, or one of the headsets.
3	Simulator technician: Monitor the dc voltage between J1 and J2 on the simulator (use Multimeter ME–26B/U or equivalent), while momentarily depressing S2 on the simulator to LOAD. Return S2 to ON.	The voltage should be between 24 and 29 volts with S2 in either ON or LOAD position.	Check the aircraft +27.5-volt power source applied to the radio set.

Step	Procedure	Normal indication	If indication is abnormal
4	Cockpit technician: Set the SQUELCH switch on the control unit to each position; tell the simulator technician what position the switch is in after each change. Simulator technician: Observe the SQUELCH lamps.	The TONE, SEC, and CARR lamps on the simulator should light corresponding to the position of the SQUELCH control. (SEC and CARR lamps both light in DIS mode.)	If any lamp fails to light at the proper time or if any lamp is lighted when SQUELCH control is not in that position, the control unit or aircraft wiring is defective. Remove the control unit and check for continuity between the following pins on the control unit and the control unit case: pin V (DIS), pin W (CARR), pin X (TONE).
5	Cockpit technician: Starting at 69 megacycles, successively select each whole-megacycle frequency on the control unit. Give the simulator time to tune after each selection. (Wait until channel-changing tone stops.) Simulator technician: Monitor the frequency counter and the ODD MC, EVEN MC, and HAR FIL lamps on the simulator.	The frequency readout on the simulator should agree with the control unit for each setting. In addition, the EVEN MC lamp should light at each even-megacycle setting, the ODD MC lamp should light at each odd-megacycle setting, and the HAR FIL lamp should light for all settings below 46 megacycles.	If any frequency readout does not agree with the control unit setting, or if any lamps light improperly or fail to light properly, the trouble is in the control unit or the aircraft wiring between the control unit and the simulator. If replacement of the control unit fails to correct the trouble, use the interconnection wiring diagram (fig. 6–5 or 6–27) to check the aircraft wiring. See paragraph 2–17 for ohmmeter checks of the control unit.
6	Cockpit technician: Successively select each decimal-megacycle position on the control unit. Simulator technician: Monitor the frequency counter on the simulator. *Note.* Perform steps 7, 8, and 9 only for aircraft with homing capability.	The frequency counter on the simulator should agree with the control unit counter for each setting of the decimal-megacycle control.	If the simulator counter fails to agree with the control unit counter for any setting, the control unit or the aircraft wiring is defective. Use figures 6–5 or 6–27 to check the aircraft wiring if replacement of the control unit fails to correct the fault. See paragraph 2–17 for ohmmeter checks of the control unit.
7	Cockpit technician: Set the control unit mode control to HOME and the SQUELCH control to CARR. Observe the homing indicator (ID–48/ARN). Simulator technician: Observe the LEFT and RIGHT COAX CONT lamps, set S1 on the simulator to RETRAN CARR. *Note.* This step checks the ID–48/ARN flags, the carrier retransmit control line, the homer operate line, and the home antenna system.	*a.* Both LEFT and RIGHT COAX CONT (continuity) lamps should be on at all times if the aircraft has a homing antenna system installed. *Note.* This check does not eliminate the possibility of a short from center conductor to shield. To check for this, disconnect the coaxial cable at the homing antenna. (Disconnect at the transformer if the antenna has a separately housed transformer.) The COAX CONT lamps should extinguish.	*a.* If one or both COAX CONT lamps fail to light, lack of continuity through the homing antenna system is indicated. See that the antenna is installed and the coaxial cables are connected. If the cables are connected, disconnect them and check for continuity between the antenna center conductor and case. If continuity exists, the trouble is in the coaxial cables or the receiver-transmitter shockmount mating connector.

Step	Procedure	Normal indication	If indication is abnormal
		b. The HOME lamp on the simulator should light when the control unit mode switch is set to HOME.	*b.* If the HOME lamp fails to illuminate, check for continuity between pin DD of the aircraft connector that mates with the control unit, and pin 16 of the receiver-transmitter shockmount connector. If continuity exists, the trouble is in the control unit.
		c. The ID–48/ARN flags should activate when the simulator switch is set to RETRAN CARR.	*c.* If the ID–48/ARN flags fail to activate, the trouble is in the ID–48/ARN, the control unit, or the aircraft harness. Remove the control unit and check for continuity between pins Y and FF of the control unit. If continuity exists, the trouble is in the ID–48/ARN or the aircraft wiring. Remove the ID–48/ARN connector and check for continuity between pins F and H of the aircraft connector that mates with the ID–48/ARN and pin FF of the aircraft connector that mates with the control unit. If continuity exists, check for continuity between pin Y of the aircraft connector that mates with the control unit and pin 10 of the receiver-transmitter shockmount connector (simulator removed). If continuity exists, the trouble is in the ID–48/ARN.
8	Cockpit technician: Set the control unit mode control to HOME and the SQUELCH control to TONE. Observe the ID–48/ARN flags. Simulator technician: Set S1 on the simulator to RETRAN, TONE and observe the HOME lamp. *Note.* In this step, the homer flags are used to check the tone retransmit control line.	The ID–48/ARN flags should activate.	If the flags fail to activate, discontinuity in the tone retransmit control line is indicated. The trouble is in the control unit or the aircraft wiring (assuming the flags worked in step 7). Remove the control unit and check for continuity between pins Z and FF of the unit. If continuity exists, the trouble is in the aircraft wiring. Check for continuity between pin Z of the control unit mating connector (aircraft harness) and pin 11 of the receiver-transmitter shockmount connector.

Step	Procedure	Normal indication	If indication is abnormal
9	Cockpit technician: Check to see that the control unit mode control is set to HOME and the SQUELCH control is set to CARR. Observe the homing indicator (ID–48/ARN). Simulator technician: Check to see that S1 on the simulator is set to RETRAN CARR. Switch the FUNCTION SELECTOR (S3) successively to LEFT, RIGHT, and OVER TGT. *Note.* Perform step 10 only on aircraft with security transmission capability.	The ID–48/ARN vertical needle should swing left when the simulator FUNCTION SELECTOR switch is set to LEFT, and right when the switch is set to RIGHT. The ID–48/ARN horizontal needle should swing down when the simulator FUNCTION SELECTOR switch is set to OVER TGT.	If the ID–48/ARN fails to indicate properly, the trouble is in the ID–48/ARN, the control unit, or the aircraft wiring. To check the control unit, remove the unit and check for continuity between pins *s* and *t* and between pins NN and MM of the control unit. If continuity exists on both checks, the trouble is in the ID–48/ARN or the aircraft wiring.
10	Cockpit technician: Set the control unit SQUELCH control to DIS and activate the security device. Simulator technician: Set FUNCTION SELECTOR S3 to SEC and observe the simulator lamps.	The SQUELCH SEC, the PTT/SEC, and the PTT INT/SEC TONE lamps should light.	*a.* If the SQUELCH SEC lamp fails to light, the trouble is in the control unit or aircraft wiring. Remove the control unit and check for continuity between pin V and the control unit case. If continuity exists, the trouble is in the aircraft wiring; check for continuity between pin V of the aircraft connector that mates with the control unit and pin 12 of the receiver-transmitter shockmount connector (simulator removed). *b.* If the PTT/SEC lamp fails to light, check for continuity between pin K of the aircraft connector that connects to the security device and pin 44 of the receiver-transmitter shockmount connector. If continuity exists, the trouble is in the security device. *c.* If the PTT INT/SEC TONE lamp fails to light, check for continuity between pin P of the aircraft connector that mates with the security device and pin 39 of the receiver-transmitter shockmount connector. If continuity exists, the trouble is in the security device.
11	Cockpit technician: Disconnect the security device and jumper pins V, C, E, and B of the connector to ground. Simulator technician: Check for continuity from J3, J4, J5, and J6 to ground.	Continuity to ground on J3, J4, J5, and J6.	Failure to read continuity to ground at any of the jacks indicates an open circuit in the aircraft harness. If continuity is observed at all four points but there is an absence of audio during security operation, the security device is defective.

Section III. RECEIVER-TRANSMITTER, RADIO RT–348/ARC–54 TROOUBLESHOOTING

2–7. General

(fig. 6–30)

Use Test Set, Radio TS–1967/ARC–54 to perform bench troubleshooting of the receiver-transmitter. The test set enables the direct and general support maintenance technicians to apply power to and operate the receiver-transmitter while it is removed from the aircraft. When in-aircraft troubleshooting checks indicate a defective receiver-transmitter, remove the receiver-transmitter from the aircraft and place it on the test bench. Remove the unit cover and connect the receiver-transmitter and all necessary test equipment as instructed in paragraph 2–9. The operational checks (para. 2–6) should indicate the nature of the trouble. If the trouble is in transmission only, use the transmit test setup (para. 2–9*b*). If the trouble is in reception, use the receive test setup (para. 2–9*c*). Perform the procedures given in the troubleshooting chart (para. 2–11) that cover the specific trouble symptom. If the trouble symptoms are unknown, perform the operational tests listed at the beginning of the chart until the trouble symptoms are known; then refer to the applicable part of the troubleshooting chart. If no trouble is noted, forward the unit to higher level maintenance for complete testing (paras. 5–1—5–25).

Cautions:

1. Before keying the transmitter (S6 on the test set, set to XMIT or held in PTT position), make sure that the transmitter is connected to the dummy load either direct (by connecting J2 to J5 on the test set), or through the directional coupler (by connecting J2 to J3 and J5 to J6). Do not transmit when the signal generator is connected for receive tests.

2. The receiver-transmitter is extensively transistorized. Before using any ohmmeter to test transistors or transistor circuits, check the open-circuit voltage across the ohmmeter test leads. Do not use the ohmmeter if the voltage exceeds 1.5 volts. Also, since the RX1 range normally connects the ohmmeter internal battery direct across the test leads, the relatively high current (50 ma or more) may damage low-power transistors. As a general rule, do not use the RX1 scale when checking circuits that contain low-power transistors. The voltage and resistance diagrams indicate the proper ohmmeter ranges to use when making resistance checks on modules. Be sure to follow these diagrams closely and do not measure resistances at points so indicated on the diagrams. Special precautions should also be taken when soldering or unsoldering in transistorized circuits. Do not use a soldering gun; damaging currents can be induced in transistors by soldering guns. Use an isolating transformer with ac-operated soldering irons. Do not use a soldering iron rated at over 40 watts. Use a heat sink between the soldering iron and the transistor (or other semiconductor device). Special procedures for removing transistors from printed-circuit boards are given in chapter 4.

2–8. Checking for Shorts

Because of the extensive use of transistors in the receiver-transmitter, ohmmeter checks with the modules installed are not recommended. The receiver-transmitter primary power circuits are fused to protect the unit in case of shorts. If the receiver-transmitter blows a fuse in the aircraft, or during bench checks, the trouble can be localized by disconnecting certain module connectors, then connecting them one at a time and observing which connection causes the fuse to blow (primary power troubles, para. 2–11). In the troubleshooting chart (para. 2–11), functionally related circuits are grouped. The first group of the chart, which comprises the primary power circuits, gives specific steps to be taken if a fuse has blown or if a fuse blows during troubleshooting tests. If a short circuit in a module results in damage to a module component but does not blow a fuse, the troubleshooting procedures (para. 2–11) will aid in localizing the trouble to a module. Use the checks provided in paragraphs 4–1 through 4–38 to isolate the trouble within the module.

2–9. Troubleshooting Test Setups

(figs. 2–1, 2–2, 2–3, and 2–4)

If trouble symptoms are unknown, connect the equipment as described in *a* below and perform the

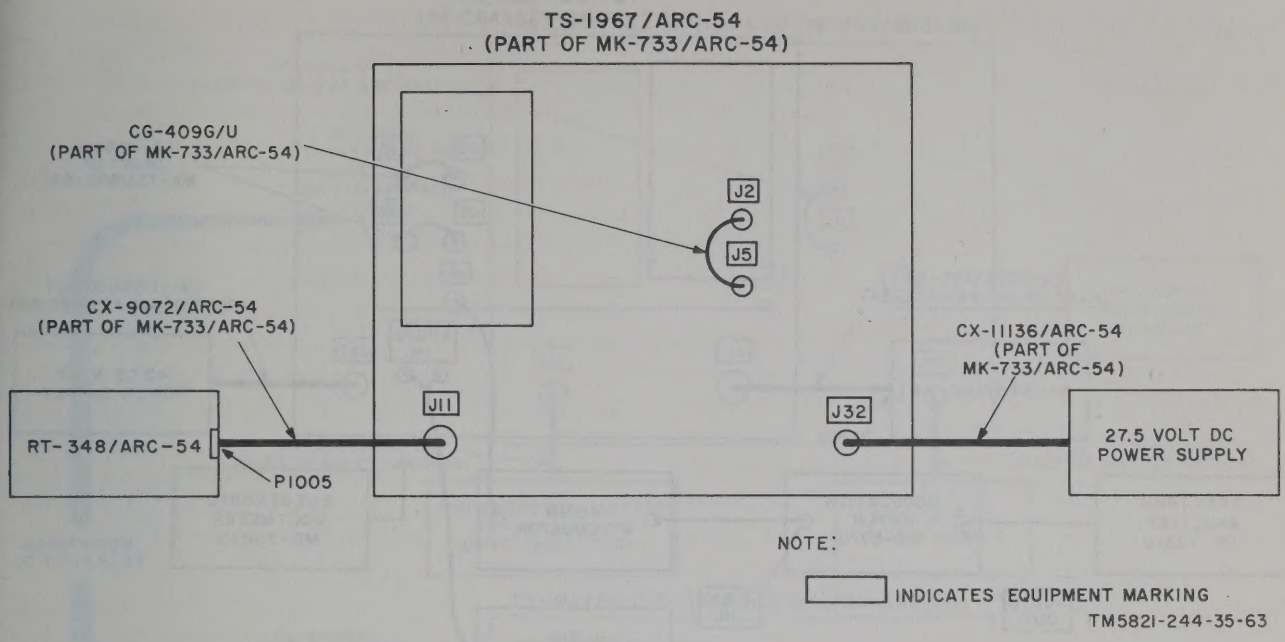


Figure 2-1. Troubleshooting test setup, preliminary operational tests.

operational checks starting with item 1 of the troubleshooting chart (para. 2-11). If trouble symptoms indicate a trouble that involves transmit operation only, connect the equipment as described in *b* below. If the trouble involves receive operation only, or both receive and transmit operation, connect the equipment as described in *c* below. If the module substitution method of troubleshooting is used, as indicated in the troubleshooting chart, a quick qualitative check of unit operation (*d* below) will verify whether or not the new module eliminates the trouble.

a. Preliminary Operational Tests (fig. 2-1).

(1) Remove the receiver-transmitter dust cover and connect the receiver-transmitter main power connector to J11 on the test set. (Use CX-9072/ARC-54 cable provided with the maintenance kit.)

(2) Connect J2 to J5 on the test set. (Use the CG-409G/U jumper cable provided with the maintenance kit.)

(3) Connect a +27.5-volt power supply to J32 on the test set.

b. Transmit Tests (fig. 2-2).

(1) Remove the receiver-transmitter cover and connect the receiver-transmitter main power connector to J11 on the test set. (Use CX-9072/ARC-54 cable provided with the maintenance kit.)

(2) Connect J2 to J3 and J5 to J6 on the test set. (Use CG-409G/U cables provided with the maintenance kit.)

(3) Connect a +27.5-volt power supply to J32 on the test set.

(4) Connect J8 to the input of the modulation meter (AUDIO IN) and connect the output of the modulation meter (AUDIO OUT) to the spectrum analyzer input.

(5) Connect the audio oscillator output to the AUDIO IN terminals on the test set.

c. Receive Tests (fig. 2-3).

(1) Remove the receiver-transmitter dust cover and connect the receiver-transmitter main power connector to the RCVR/XMTR connector on the test set. (Use CX-9072/ARC-54 cable provided with the maintenance kit.)

(2) Connect J2 to J5 on the test set; use a CG-409G/U cable provided with the maintenance kit.

(3) Connect a +27.5-volt power source to J32 on the test set.

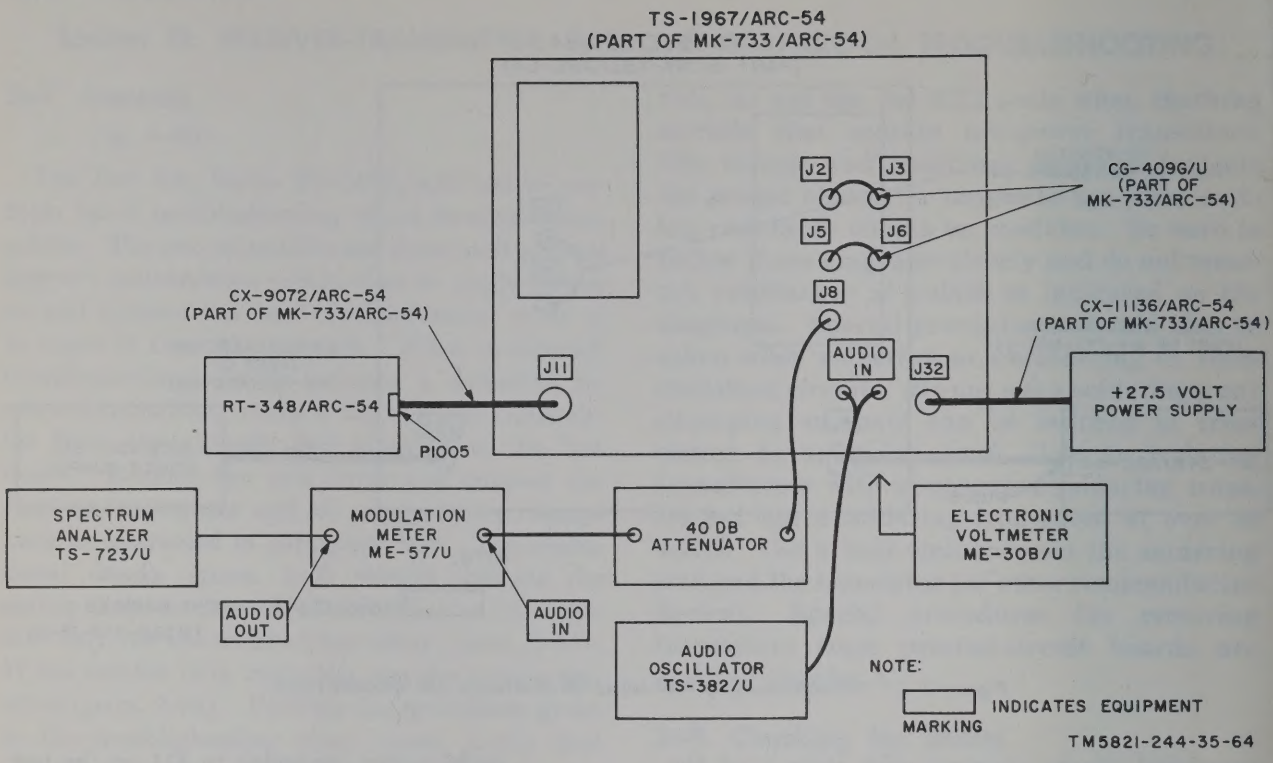


Figure 2-2. Troubleshooting test setup, transmit tests.

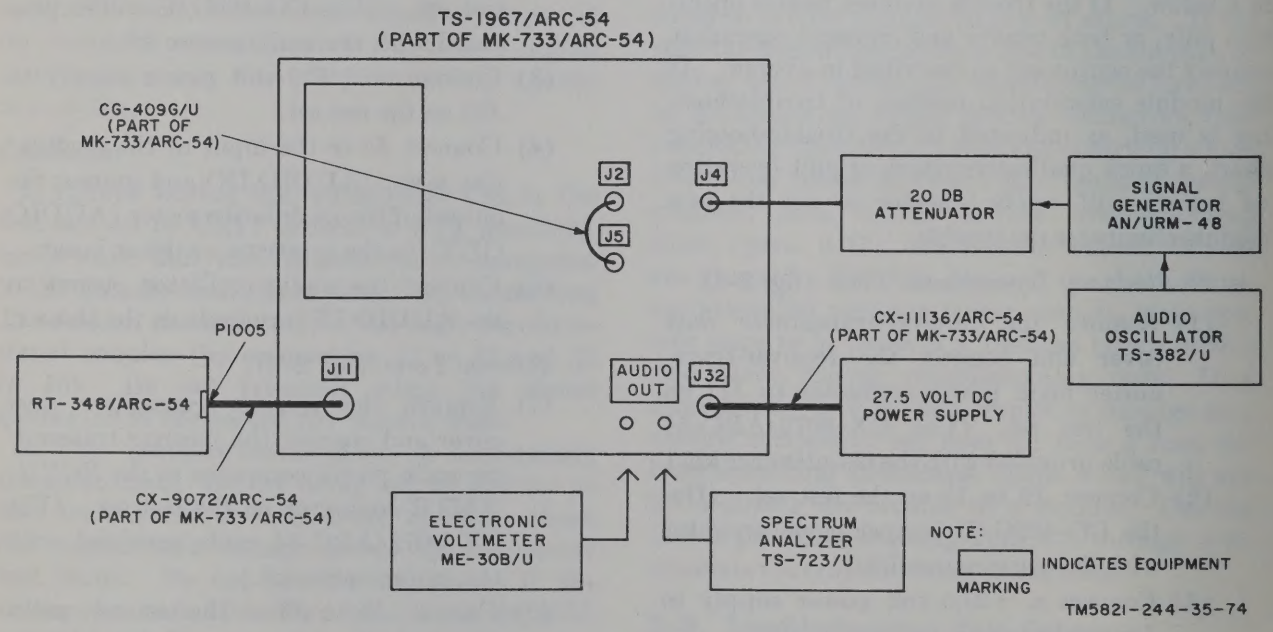


Figure 2-3. Troubleshooting test setup, receive tests.

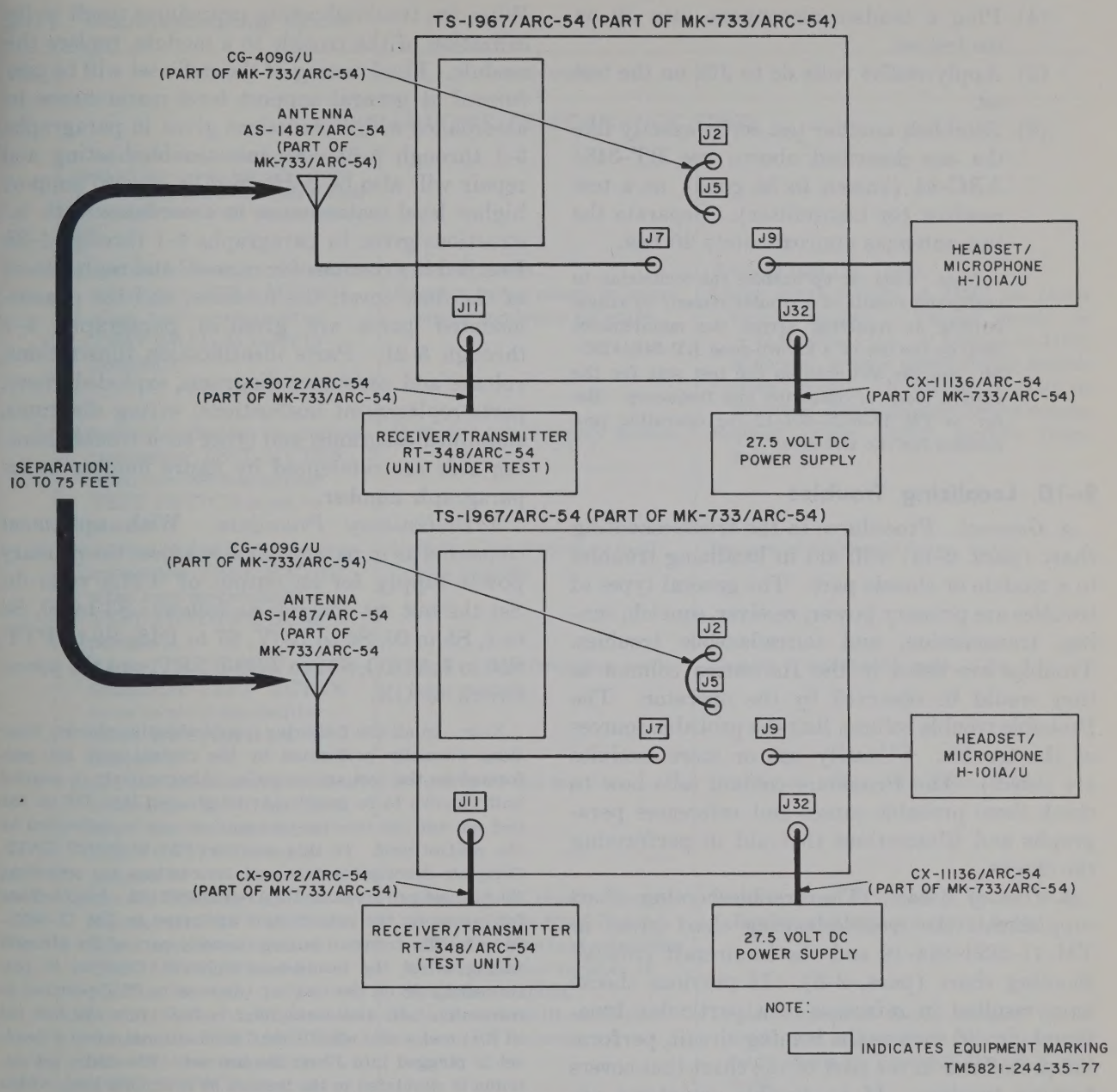


Figure 2-4. Troubleshooting test setup, qualitative checks.

(4) Connect the audio output from the audio oscillator to the external modulation input to the signal generator. Connect the rf output from the signal generator, through a 20-db attenuator, to J4 on the test set.

(5) Connect additional test equipment as required in the test procedure.

d. Qualitative Checks (fig. 2-4).

(1) Connect the unit under test to J11 of the test set; use CX-9072/ARC-54 cable.

(2) Connect jumper J2 to J5 on the test set; use CG-409G/U cable.

(3) Connect the test antenna (AS-1487/ARC-54, supplied with the MK-733/ARC-54) to J7 on the test set.

(4) Plug a headset-microphone into J9 on the test set.

(5) Apply +27.5 volts dc to J32 on the test set.

(6) Establish another test setup exactly like the one described above; use RT–348/ARC–54 (known to be good) as a test receiver (or transmitter). Separate the two antennas approximately 20 feet.

Note. This set up enables the technician to verify the results of a trouble remedy by transmitting or receiving across the maintenance shop by the use of a known-good RT–348/ARC–54. Set the switches on the test sets for the desired mode of operation and frequency. Refer to TM 11–6625–601–12 for operating procedures for the test sets.

2–10. Localizing Troubles

a. General. Procedures in the troubleshooting chart (para. 2–11) will aid in localizing troubles to a module or chassis part. The general types of troubles are primary power, receiver, squelch, tuning, transmission, and miscellaneous troubles. Troubles are listed in the Indication column as they would be observed by the operator. The Probable trouble column lists the probable sources of the trouble. (Usually one or more modules are listed.) The Procedure column tells how to check these probable causes and references paragraphs and illustrations that aid in performing the checks.

b. Use of Chart. The troubleshooting chart supplements the troubleshooting chart given in TM 11–5821–244–12 and the in-aircraft troubleshooting chart (para. 2–6). If previous checks have resulted in reference to a particular functional circuit, such as the homing circuit, perform the procedures in the part of the chart that covers homing troubles. If no trouble symptoms are known, perform the preliminary operational tests at the beginning of the chart. These tests are operational checks performed under bench test conditions by the use of the MK–733/ARC–54. Proceed with the operational checks until the trouble symptoms are known; then refer to the part of the chart referenced in the Procedure column. When the troubleshooting procedures result in localization of the trouble to a module, replace the module. Final testing of the radio set will be performed at general support level maintenance in accordance with instructions given in paragraphs 5–1 through 5–23. Module troubleshooting and repair will also be performed at general support higher level maintenance in accordance with instructions given in paragraphs 4–1 through 4–38. Detailed instructions for removal and replacement of the dust cover, the modules, and the chassis-mounted parts are given in paragraphs 3–1 through 3–21. Parts identification illustrations, voltage and resistance diagrams, exploded views, parts replacement instructions, wiring diagrams, simplified diagrams, and other such troubleshooting aids are referenced by figure number or by paragraph number.

c. Preliminary Procedure. With equipment connected as in paragraph 2–9, adjust the primary power supply for an output of +27.5 volts dc. Set the test set controls as follows: S3 to 30, S4 to 1, S5 to 00, S6 to RCV, S7 to DIS, S9 to PTT, S10 to RADIO, S11 to TEST SET, and the power switch to ON.

Note. In all the following troubleshooting checks, functions normally performed by the control unit are performed by the test set controls. Alternatively, a control unit (known to be good) may be plugged into J16 on the test set, and the receiver-transmitter may be controlled by the control unit. In this case, set S11 to CONT UNIT. Complete descriptive data and instructions for operating the test set are given in TM 11–6625–601–12. Instructions for operating the control unit are given in TM 11–5821–244–12. The transmit button (usually part of the aircraft wiring or of the headset-microphone) function is performed by S6 on the test set (depress to PTT position to transmit). An audio amplifier is built into the test set so that test audio signals may be monitored when a headset is plugged into J9 on the test set. The radio set antenna is simulated in the test set by a dummy load, which is connected to the receiver-transmitter output by the use of a jumper cable (CG–409G/U) connected between J2 and J5 on the test set. A test antenna (AS–1487/ARC–54 included as part of the MK–733/ARC–54) may be connected to J7 on the test set (para. 2–9*d*) to make qualitative checks of transmitter or receiver performance. Jack J7 is the rf output, of the receiver-transmitter under test, attenuated 30 db for transmission inside the maintenance shop.

2-11. Troubleshooting Chart

Item	Indication	Probable trouble	Procedure
	PRELIMINARY PERFORMANCE TESTS		
	Note. Connect equipment as shown in figure 2-1 and perform test meter checks outlined in paragraph 5-6. Refer to items 1 through 11 below if any check is abnormal.		
1	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 1.	A fuse is blown Primary power source or power supply module is defective.	Replace fuse (fig. 2-6). Check input voltage at J1501 on power supply module. Voltage should be +27.5 volts ±0.5. If voltage at J1501 is normal, replace power supply module (para. 3-3*m*). If voltage at J1501 is abnormal, check primary power source.
2	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 2.	Defective power supply module	Replace power supply module (para. 3-3*m*).
3	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 3.	Defective low-frequency oscillator module.	Replace rf subchassis (para. 3-3*a*).
4	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 4.	Defective high-frequency oscillator module.	Replace rf subchassis (para. 3-3*a*).
5	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 5.	Defective sel-call module	Replace sel-call module (para. 3-3*e*).
6	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 6.	Defective AGC circuit. Trouble is probably in fixed IF module but may be in rf subchassis (rf amplifier or variable IF amplifier module).	Replace fixed IF module (para. 3-3*g*). Replace rf subchassis (para. 3-3*a*).
7	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 7.	Defective transmit audio module or PTT circuit.	Replace transmit audio module (para. 3-3*k*). If replacement fails to correct fault, check PTT circuit (fig. 6-4 and 6-30).
8	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 8.	Defective power amplifier module, power supply module, or PTT circuit.	Check power supply high voltages at test jacks (fig. 2-11). If satisfactory, check tubes in power amplifier module (fig. 4-5). If trouble still exists, replace rf subchassis (para. 3-3*a*).

Item	Indication	Probable trouble	Procedure
		PRELIMINARY PREFORMANCE TESTS—Continued	
9	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 9.	Defective power supply module or power amplifier (on rf subchassis) is overloading +500-volt line.	Replace power supply module (para. 3–3*m*). If replacement fails to correct fault, replace rf subchassis (para. 3–3) and check main chassis wiring (fig. 6–30).
10	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 10 and XMTR TEST button is depressed.	Low-power output or defective reflectometer circuit.	Replace harmonic filter module (para. 3–3*o*). If power output is still low, check tubes in power amplifier module (fig. 4–5). Replace rf subchassis (para. 3–3*a*) if tubes are good.
11	Abnormal indication on receiver-transmitter TEST METER when receiver-transmitter TEST SWITCH is set to position 11.	Defective reflectometer circuit. *Note.* Low reading on position 10 will cause low reading on position 11. (See item 10 above.)	Replace harmonic filter module (para. 3–3*o*).
		PRIMARY POWER	
		Note. Connect equipment as instructed in paragraph 2–9*a*.	
		***Caution:* When replacing fuses, note that F1001 and F1002 are 5-ampere fuses. Do not install a higher rated fuse or a slow-blow fuse; damage to the equipment can result.**	
12	Blower motor fails to operate when system is turned on.	*a.* Blown fuse	*a.* Check fuses (fig. 2–6). If replacement fuse blows, see item 14 below.
		b. Defective power supply module.	*b.* Check power supply module test jacks J1502 and J1503 for 27-volt ac output. Replace power supply module if correct ac voltage is not present.
		c. Defective chassis wiring or blower motor.	*c.* Check chassis wiring (fig. 6–30) and blower. Replace blower if necessary (para. 3–5*e*).
13	Fuse F1001 blows when power is applied.	Power amplifier module filament circuit. Mechanical drive module relay K701, K702, or K703 or drive motor B701. RF amplifier module K601. RF subchassis wiring. Main chassis circuit, CR1001, R1007, or meter circuit.	Disconnect power amplifier module and rf amplifier module main power connectors (fig. 6–7); replace blown fuse, and apply power to unit. If fuse blows again, check CR1001 and R1007 (fig. 2–6) with an ohmmeter. If these components are good, remove rf subchassis and replace the fuse and apply power again. If fuse still blows, check main chassis wiring for short to ground in primary power wiring. (Use the power distribution diagram (fig. 6–21).)

Item	Indication	Probable trouble	Procedure
		PRIMARY POWER—Continued	
14	Fuse F1002 blows when power is applied.	Power supply module is defective or is overloaded by one or more other modules.	Remove all modules including rf subchassis (para. 3–3*b*) and apply power to unit. If fuse blows again, check chassis wiring for short to ground on pin 7 of J1006 (chassis connector that mates with power supply module). Resistance should be approximately 560K ohms when TEST METER is in position 1. If this reading is low, check resistor R1005 (fig. 2–6). If fuse does not blow with modules removed, replace modules one at a time, removing power while plugging in each module. Apply power after each module is inserted, and, when a fuse is blown, replace module last installed. If replacement module also causes blown fuse, check chassis mating connector that mates with module, and check all chassis wiring to module (fig. 6–30).
15	Fuse F1001 blows when transmit button is depressed.	*a.* Power amplifier module filament circuit or internal short in tube.	*a.* Disconnect main connector (P903) on power amplifier module (fig. 6–7); replace fuse, and apply power. If fuse blows again, see *b* below. If fuse does not blow with power amplifier disconnected, check all three tubes. If tubes are good, replace rf subchassis. (See paragraph 4–24 for general support removal and replacement of rf subchassis modules.)
		b. Short to ground in chassis wiring, or relay windings shorted in harmonic filter module or chassis relay K1001 or K1002.	*b.* Check resistance of relay windings on K1001 and K1002. K1001 should be approximately 600 ohms and K1002 should be approximately 150 ohms. If these two relays check good, disconnect P1008 from J1601 on harmonic filter module and measure resistance from pin E of J1601 to ground. Resistance should be approximately 75 ohms. Also, before reconnecting P1008, check resistance to ground at pin E of P1008. Meter should indicate high resistance or an open circuit.
16	Fuse F1001 blows when new frequency is selected.	Mechanical drive module has defective drive motor or a shorted relay winding.	*a.* Replace rf subchassis (para. 3–3*a*).

Item	Indication	Probable trouble	Procedure
		PRIMARY POWER—Continued	
17	Fuse F1002 blows when transmit button is depressed.	*a.* Power supply module *b.* Overload condition in sel-call module, transmit audio module, or in rf subchassis.	*a.* Check by substitution. *b.* Check by removing both sel-call and transmit audio modules and applying power. If fuse still blows, install both modules and remove and replace rf subchassis. If removal of transmit audio and sel-call modules corrects trouble, replace them one at a time. *Note.* Remove power when plugging and unplugging modules.
		RECEIVER	
		Note. Connect equipment as instructed in paragraph 2–9.	
18	No reception	*a.* Receive audio module	*a.* Check by module substitution or by signal substitution (para. 2–13) and voltage checks (fig. 2–9).
		b. Power supply module	*b.* Check by module substitution or by voltage and resistance checks (fig. 2–11).
		c. Fixed IF module	*c.* Check by module substitution or by voltage and resistance checks (fig. 2–12).
		d. Homer module	*d.* Check for continuity between J205 and P201, A1. If short circuit is not indicated, replace homer module.
		e. Antenna relay	*e.* Check for continuity between green and yellow coaxial receptacles. If short circuit is not indicated, replace antenna relay.
		f. Rf subchassis	*f.* Check by substitution.
19	Dead receiver-transmitter (no reception or transmission).	*a.* Primary power	*a.* Check fuses.
		b. Power supply module	*b.* Check by module substitution or by voltage checks (fig. 2–11).
		c. Rf subchassis	*c.* Check by subchassis substitution or by signal substitution (para. 2–13).
		d. 100-cps filter FL1002 or filter FL1001.	*d.* Check for short to ground at terminals of FL1002 (fig. 6–30). Check for short to ground at pin 34 of FL1001 (disconnect P1001).
		e. Chassis wiring short to ground.	*e.* Check chassis wiring (fig. 6–30).
20	No reception in carrier or tone squelch mode.	*a.* Sel-call module (TONE only).	*a.* Check by module substitution or by voltage checks at RX TONE (J101) and NOISE (J103) jacks (fig. 2–8).
		b. Receive audio module	*b.* Check by module substitution or by signal substitution (para. 2–13) and voltage checks at AUDIO IN (J1301) and AUDIO OUT (J1302, J1303) jacks (fig. 2–9).
		c. SQ ADJ (R1001) (carrier squelch troubles only).	*c.* Check and replace or adjust R1001 as necessary (fig. 2–6).

Item	Indication	Probable trouble	Procedure
		RECEIVER—Continued	
21	Weak or intermittent reception in carrier or tone squelch mode.	Same as item 20 above	Same as item 20 above.
22	Weak or intermittent reception (squelch disabled) on all frequencies.	Power supply module, receive audio module, fixed IF module, rf subchassis, antenna relay, or chassis wiring.	Check module by substitution or check by signal substitution (para. 2–13). Perform power supply voltage checks (fig. 2–11). Check antenna relay (fig. 6–18).
23	Poor reception on some channels	Rf subchassis	Replace the rf subchassis.
24	Reception fades after several minutes of operation (transmission is good).	Rf subchassis, receive audio module, or fixed IF module.	Check by module substitution or by signal substitution (para. 2–13) and voltage measurements.
25	Reception and transmission fade after several minutes of operation.	Rf subchassis or power supply module.	Check power supply voltages (fig. 2–11). If power supply is good, replace the rf subchassis.
26	Fluctuations (flutter) in received audio.	Squelch improperly adjusted or agc circuit (fixed IF module or rf subchassis).	Adjust squelch (para. 2–12). If trouble still exists, replace the fixed IF module. If trouble still exists, replace the rf subchassis.
27	Reception is distorted	Rf subchassis, fixed IF module, receive audio module, or harmonic filter module.	Check by substitution or by signal substitution (para. 2–13) and waveform observation.
28	Loud buzz in headset	*a.* Shielded cables not properly connected (shield ground open).	*a.* Check all shielded cables for proper mating at connectors. Check for continuity to ground at shields.
		b. 100-cycle line filter FL1002 or homer module (if buzz is present in HOME mode only).	*b.* Replace homer module. If buzz is still present, replace 100-cycle filter FL1002 (32, fig. 3–1).
		c. Homing antenna coaxial connector loose.	*c.* Check connector.
29	Reception is muffled or distorted.	Receive audio module, fixed IF module, or rf subchassis.	Check by module substitution.
30	Received signal has high level of background noise.	*a.* If noise is present in CARR squelch mode only, trouble is probably SQ ADJ (R1001) improperly adjusted (or defective) or faulty receive audio module or faulty sel-call module.	Check adjustment of SQ ADJ (para. 2–12). Check the receive audio module by module substitution. Check the sel-call module by substitution or by signal substitution and measurement of noise level at J103 NOISE test jack on the module (para. 2–13). The noise level should be less than 3 millivolts with a carrier signal present.
		b. If noise is abnormally high with squelch disabled, trouble is in fixed IF module (agc circuit) or subchassis.	*b.* Check the agc level at fixed IF module AGC DET jack (fig. 2–12). Check rf subchassis by substitution.
31	Poor selectivity (same signal heard on two or more channels; or several stations, transmitting on adjacent frequencies, heard simultaneously).	Fixed IF module (filter FL1201) defective.	Remove and replace fixed IF module.

Item	Indication	Probable trouble	Procedure
		SQUELCH	
		Note. Use same equipment connections as for receiver troubles (para. 2–9).	
32	Squelch will not disable when SQ DIS button is pressed or when control unit SQUELCH control is set to DIS.	Chassis wiring, receive audio module.	Remove sel-call module and check for ground on pins 15 and 9 of J1001 (with SQ DIS, S1002, depressed). If either pin does not indicate continuity to ground, chassis wiring is defective or S1002 (SQ DIS) is faulty. Check S1002 by setting TEST SWITCH on receiver-transmitter to position 5 and pressing SQ DIS button. If a reading is obtained on TEST METER, switch S1002 is good. If ground is present in both places, check receive audio module by substitution.
33	Tone squelch does not function properly (DIS mode good).	Receive audio module or sel-call module.	Check sel-call module by signal substitution (para. 2–13) and voltage measurements at RX TONE (J101) and TX TONE (J102) test jacks on module (fig. 2–9). If these checks are good, replace receive audio module.
34	Carrier squelch does not function properly (DIS mode good).	Receive audio module, sel-call module.	Check both modules by substitution or by signal substitution (para. 2–13) and voltage measurements (figs. 2–8 and 2–9).
		TUNING	
		Note. Connect equipment as described in paragraph 104*a*.	
35	No channeling tone during channeling (radio set tunes properly).	Rf subchassis, receive audio module, or chassis wiring. No 54-volt, 800-cps output from power supply module, but this would also cause blower not to operate and would disable high-voltage circuits.	Check power supply module for 54-volt ac output. If trouble listed is accompanied by absence of sidetone, replace the receive audio module; otherwise, replace rf subchassis. If fault is still not corrected, check chassis wiring for loss of continuity from pin 4 of J1006 (power supply mating connector) to pin 13 of J1007 (rf subchassis mating connector) and between pin 22 of J1007 and pin 9 of J1004 (receive audio module mating connector).
36	Radio set will not tune	*a.* Blown fuse F1001	*a.* If fuse F1001 is blown, replace it and determine whether an overload condition is cause of blown fuse. (See para. 2–10 items 13, 15, and 16.)
		b. Chassis wiring	*b.* Check for continuity between pins 10 and 2 of the power supply module (fig. 1–26) and between pin 2 of J1006 (mates with power supply module) and pin 16 of J1007 (mates with rf subchassis (fig. 6–18).
		c. Rf subchassis (mechanical drive module or gear train).	*c.* Replace rf subchassis.

Item	Indication	Probable trouble	Procedure
		TUNING—Continued	
37	Radio set tunes erratically (tunes to wrong frequency or intermittently fails to tune).	Chassis wiring or rf subchassis.	Check rf subchassis by substitution. If trouble still exists, use wiring diagram (fig. 6–30) to check out main chassis wiring continuity between P1005 and J1007. Check all megacycle-select and .05-megacycle select wires and all ambiguity and odd-even megacycle wires.
38	Radio set continues to tune after reaching selected frequency.	Rf subchassis or chassis wiring.	Check rf subchassis by substitution. Next, check all frequency control wires (figs. 6–5, 6–18, 6–30) for shorts to ground. (Paragraph 1–81 contains charts that give control wire ground information for all frequencies.) If any control wire is grounded when it should not be, radio will cycle continuously.
39	Radio set takes too long to tune.	Mechanical drive module defective, binding in gear train, or binding in one of the tunable modules.	Replace rf subchassis.
40	Channeling tone continues after radio is tuned.	Relay stuck in mechanical drive module, or chassis wiring short.	Replace rf subchassis. If trouble still exists, check for a chassis wiring short between pin 4 of J1006 (mates with power supply module) and pin 9 of J1004 (mates with receive audio module).
41	Unusual noises heard in receiver-transmitter during tuning.	Mechanical trouble, either in mechanical drive module, gear train, or one of driven modules.	Replace rf subchassis.
42	Radio set stops on wrong frequency.	Used by an open circuit in one of control wires (chassis wiring) or by a defective mechanical drive module (rf subchassis).	Check control wires on main chassis between main chassis connector (P1005) (fig. 6–5) and connector that mates with rf subchassis (J1007) (figs. 6–18 and 6–30). If wiring is good, replace rf subchassis.
43	No reception or transmission on any channel except 30 megacycles.	Rf subchassis tunable module splined-shaft setscrews loose or missing or faulty mechanical drive module.	Check setscrews in module splined shafts (figs. 4–1 and 6–7). Replace rf subchassis.
		TRANSMITTER	
		Note. Connect equipment as instructed in paragraph 2–9*b*	
44	No transmission (all frequencies).	Power supply module, TR bus, K1001, K1002, harmonic filter module, transmit audio module, or rf subchassis.	If sidetone is not present, check power supply high-voltage first (250 VDC and 500 VDC). Check these with S6 on test set in PTT or XMIT position. If voltages are present, check tubes in power amplifier module (para. 3–4). If tubes are good, check voltage at transmit audio module test jacks (fig. 2–10). If jacks are good, replace rf subchassis. If sidetone is present, replace harmonic filter module. If trouble still exists, check main chassis PTT circuit (fig. 6–4) including relays K1001 and K1002. Check all rf connectors.

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Item	Indication	Probable trouble	Procedure
		TRANSMITTER—Continued	
45	No transmission on some frequencies.	Harmonic filter module or rf subchassis.	If sidetone is present, check antenna relay (K1002). (Listen for click when pressing XMIT button on unit front panel.) If relay clicks, replace harmonic filter module. If sidetone is not present, replace rf subchassis.
46	Weak or no transmission on upper half (or lower half) of band only.	Harmonic filter module or chassis wiring.	Disconnect P1008 from harmonic filter module (fig. 6–18) and check resistance from pin D of P1008 to ground (power removed). Pin D should be shorted to ground for frequency settings of 45 megacycles or below and open to ground for all frequencies from 46 megacycles and up. If ohmmeter checks are good, replace harmonic filter module.
47	Weak transmission (all frequencies).	Transmit audio module, harmonic filter module, or rf subchassis.	If sidetone is weak, replace transmit audio module. Check tubes in power amplifier module (fig. 4–6). If trouble still exists, replace rf subchassis (if sidetone is not present), or harmonic filter module (if sidetone is normal).
48	Weak or distorted transmission on upper (or lower) half of band only.	Harmonic filter module or rf subchassis. (If trouble is at all frequencies, transmit audio module is defective.)	Check for sidetone. If sidetone is not present, rf subchassis is at fault. If sidetone is present, and trouble is weak output, harmonic filter is defective.
49	Transmission fades out after several minutes of operation.	Same as item 45	Same as item 45 except check power amplifier tubes first (para. 3–4).
50	Transmission is intermittent	Same as item 45	Same as item 45.
51	Transmission is noisy	Coaxial cable connections, transmit audio module, power supply module, rf subchassis, harmonic filter module.	Check cable connections; then check transmit audio, power supply, harmonic filter, and rf subchassis by substitution.
52	Loud buzz in transmission	Same as item 51 or 100-cps line filter FL1002.	Same as item 51. Also check 100-cps line filter FL1002 (fig. 6–30).
53	Transmission is distorted	Transmit audio module, harmonic filter module, rf subchassis.	Check power amplifier module tubes (fig. 4–6); then check transmit audio module, harmonic filter module, and rf subchassis by module substitution.
54	Transmission is weak on some frequencies.	Harmonic filter module or rf subchassis.	Check by substitution. If sidetone is normal on affected frequency, replace harmonic filter module; otherwise, replace rf subchassis.
		MISCELLANEOUS	
55	Test meter indicates improperly (actual voltage measurements at circuit test points are good).	Meter or meter circuit	If meter indicates properly on most scales, check meter circuit (fig. 1–24). If there is no indication at all on one or more positions, check meter switch for open contacts. Also, for absence of indication on one position, check chassis wiring (meter circuit) for an open (fig. 6–30).

Item	Indication	Probable trouble	Procedure
		MISCELLANEOUS—Continued	
56	Faulty or no homing operation	Homer module, fixed IF module, or chassis wiring.	Check for continuity between pin 16 of main chassis connector P1005 and pin 8 of J1003 (mates with homer module). If continuity is present, replace homer module. If problem still exists, replace fixed if. module.
57	Faulty or no security operation	Fixed if module or chassis wiring.	Check fixed if. module by substitution. If this does not correct trouble, check chassis wiring (fig. 6-30).
58	Radio fails to operate in RETRAN mode (retransmit installation only).	Receive audio module, transmit audio module, or chassis wiring. *Note.* Since retransmit operation depends on squelch action, any squelch troubles could cause retransmit troubles. Check receiver-transmitter for normal squelch operation.	If receiver-transmitters retransmit normally in one direction (radio No. 1 will receive and radio No. 2 will retransmit), but not in opposite direction, check, by substitution, receive audio module and transmit audio module of radio that transmits properly. If replacement of receive audio and transmit audio modules fails to correct fault, and both radios work properly when operated individually, check chassis wiring (fig. 6-30).
59	Radio oscillates in retransmit operation.	Receive audio module, transmit audio module, or squelch adjustment.	Check, and adjust as necessary, both receiver-transmitter SQ ADJ potentiometers (para. 2-12). If adjustments do not correct fault, check receive audio and transmit audio modules by substitution.
60	Retransmit operation is normal in CARR but not in TONE squelch (or vice versa).	Squelch. (See items 33-35.)	Check each receiver-transmitter individually. Check for squelch troubles in accordance with items in 33-35 above.
61	Receiver-transmitter locks in transmit (or receive) mode when operated in retransmit mode.	Receive audio module, transmit audio module, or relay K1001.	Check by substitution.

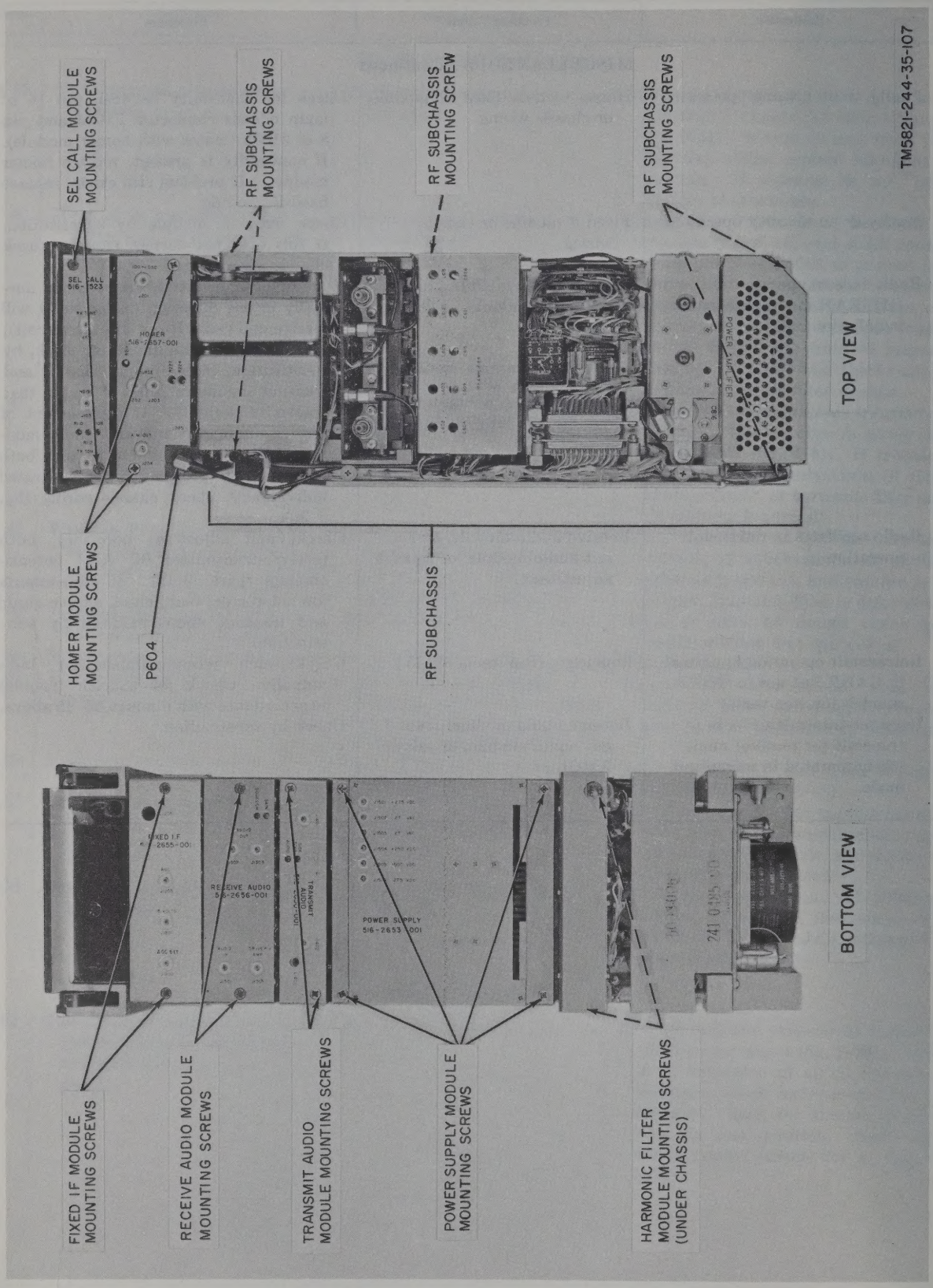


Figure 2-5. Receiver-transmitter, component identification.

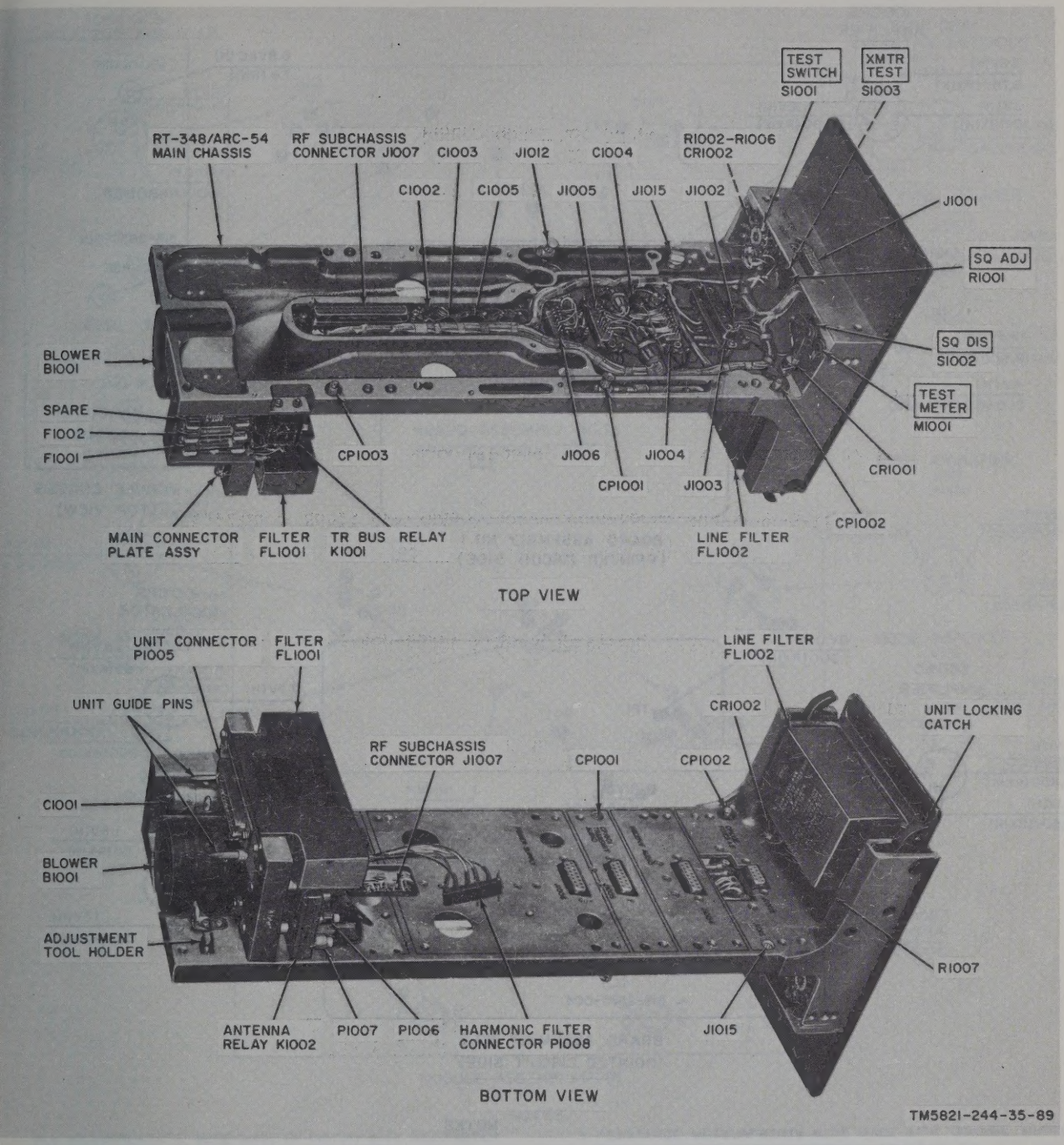
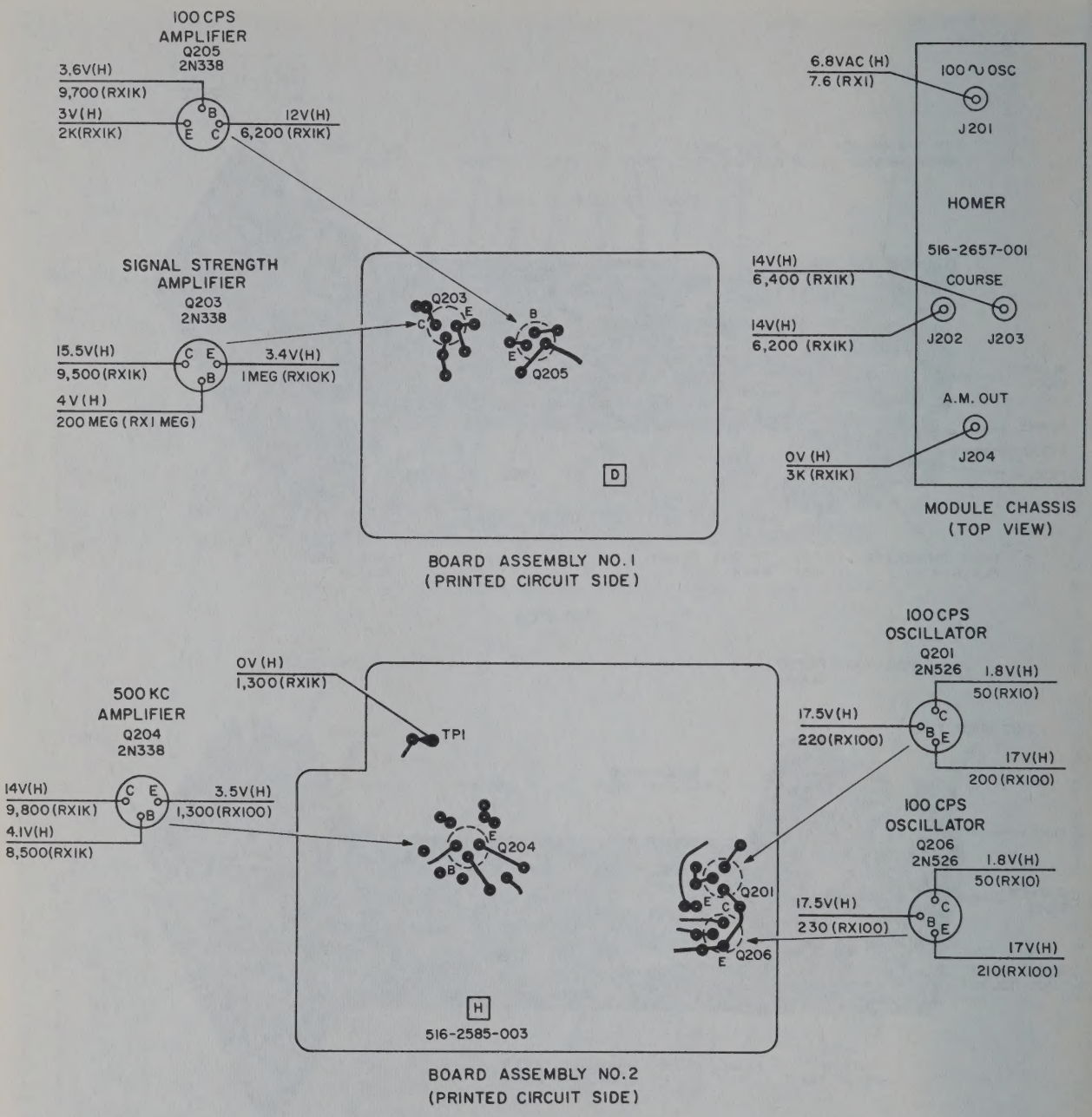


Figure 2-6. Receiver-transmitter main chassis, parts identification.

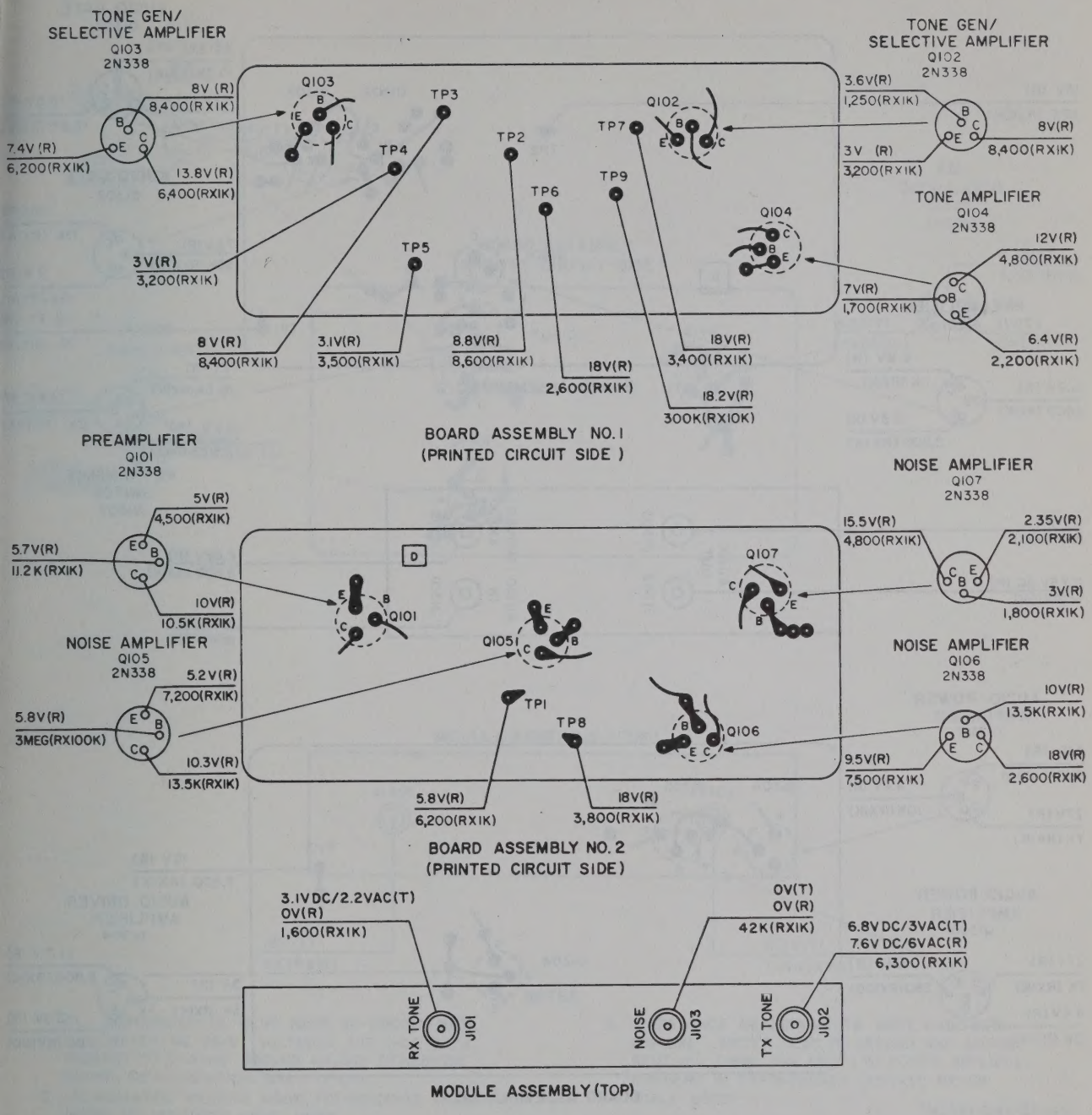


NOTES

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALE USED.
4. VOLTAGES MEASURED WITH AGC INPUT OF 4.0VDC AND INDICATOR (ID-48/ARN) CONNECTED.

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Figure 2-7. Homer module, voltage and resistance diagram.

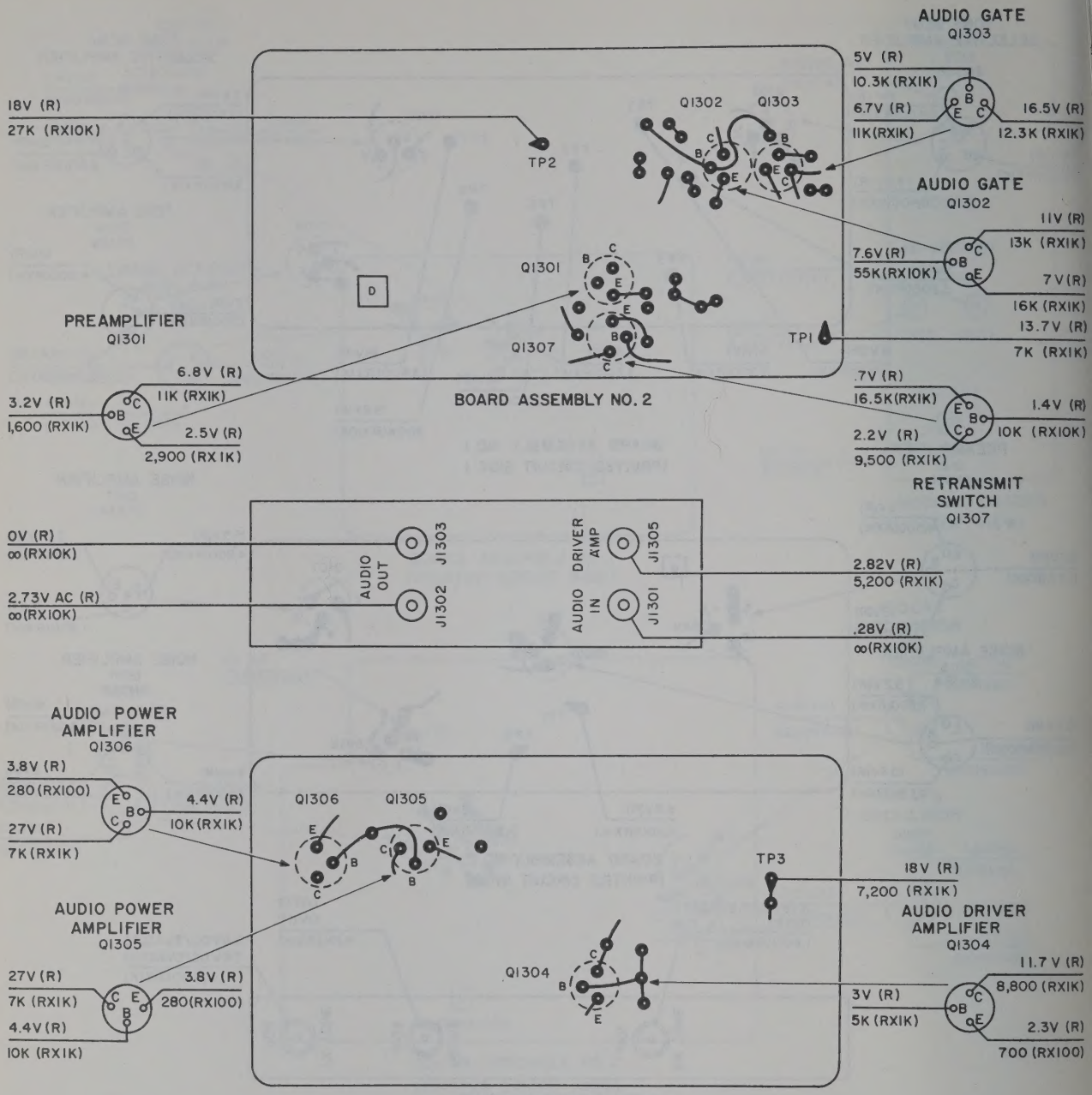


NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 2-8. Sel-call module, voltage and resistance diagram.

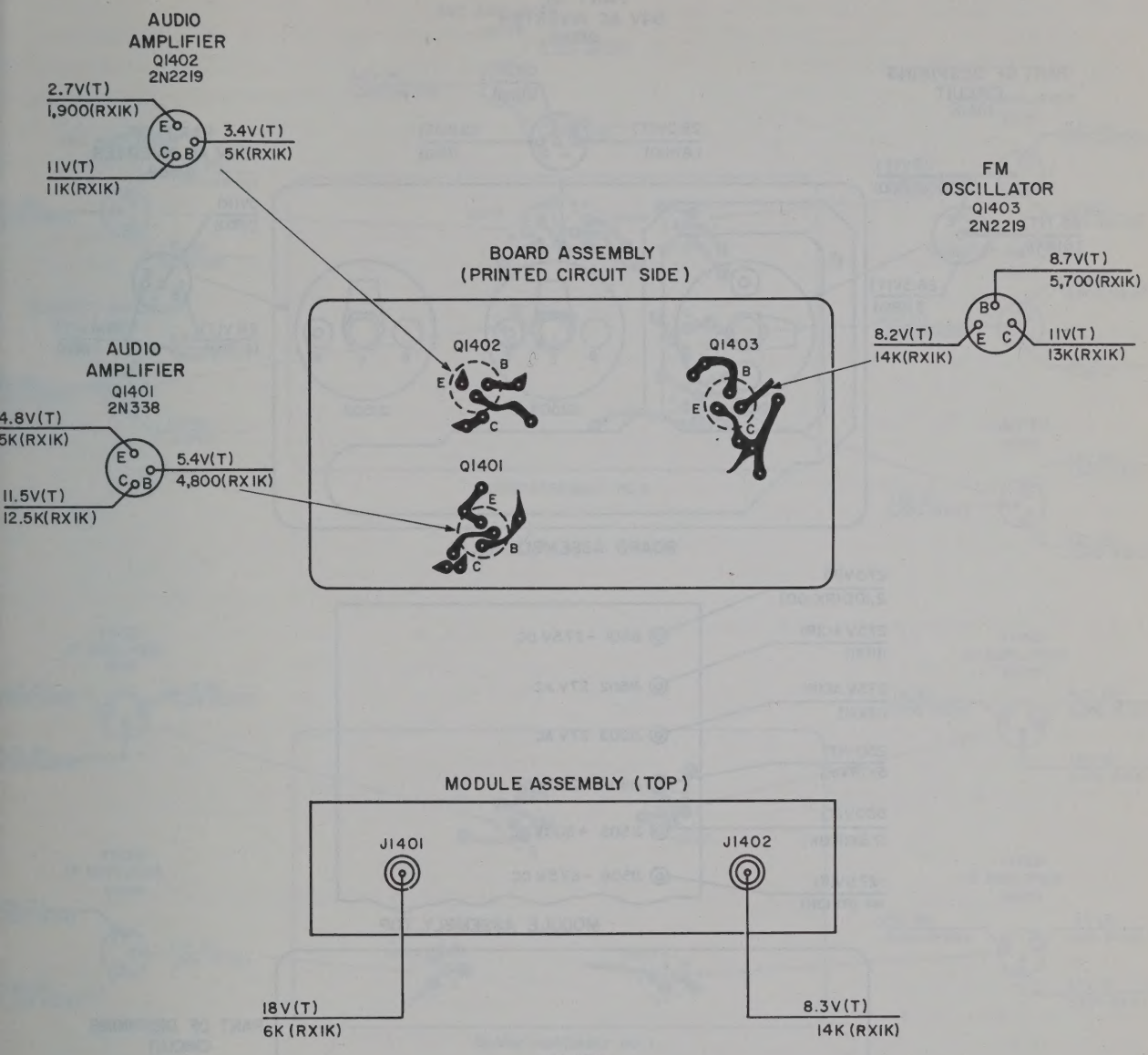


NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE + DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALES USED.

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Figure 2-9. Receive audio module, voltage and resistance diagram.

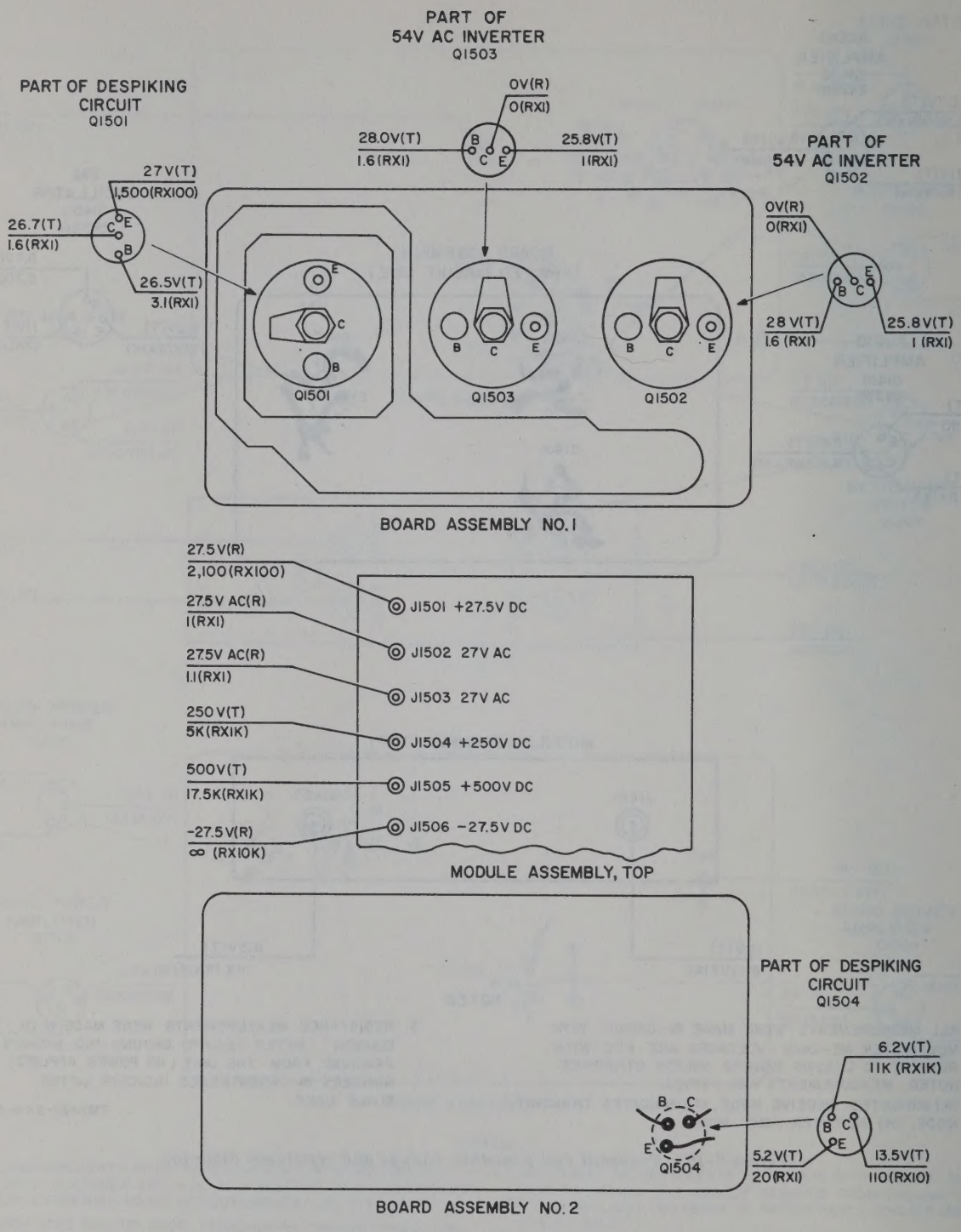


NOTES

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 2-10. Transmit audio module, voltage and resistance diagram.

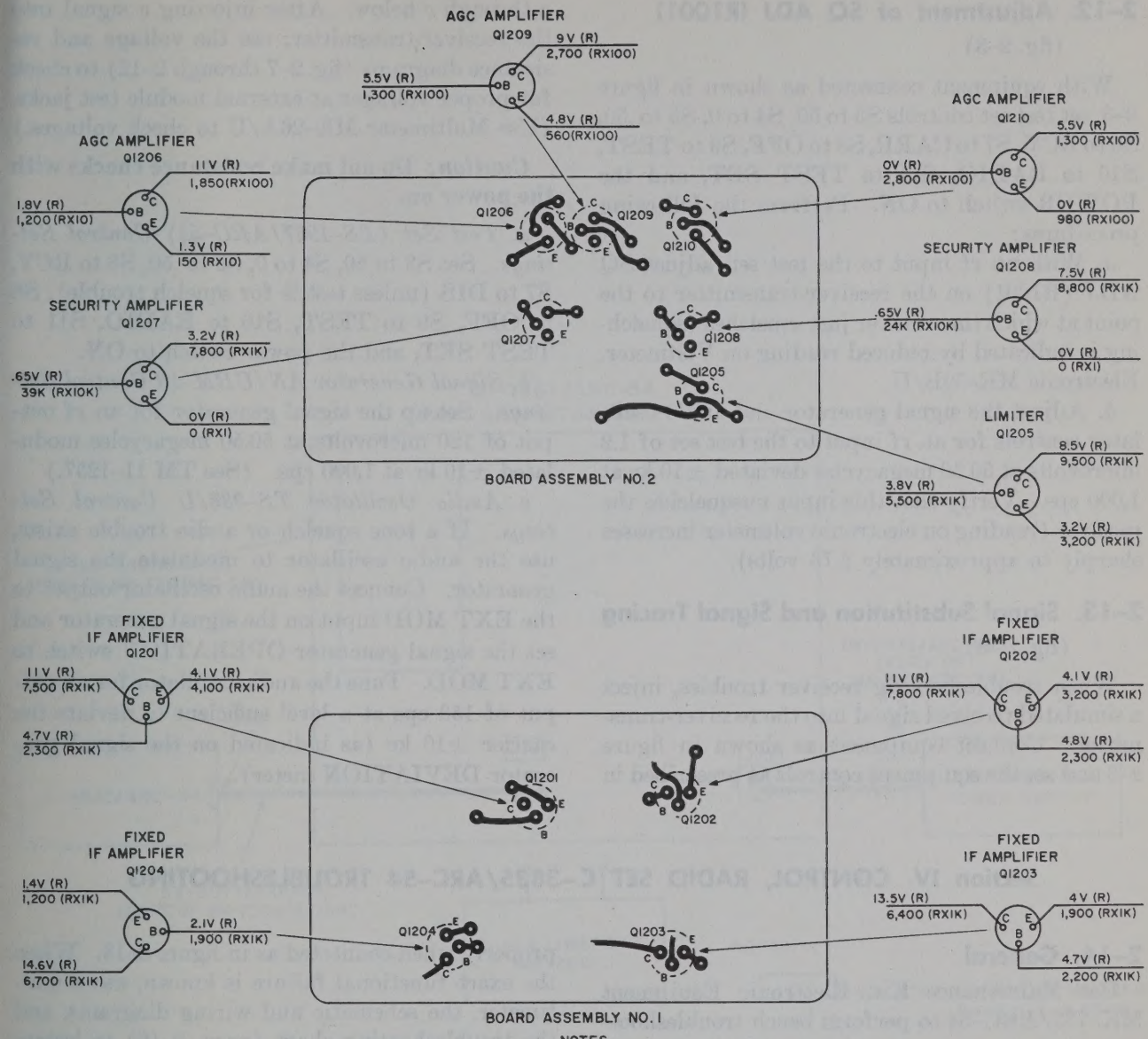


NOTES

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 2-11. Power supply module, voltage and resistance diagram.



NOTES

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.
4. DASHED LINES INDICATE TRANSISTORS ON OPPOSITE SIDE OF BOARD

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Figure 2-12. Fixed IF module, voltage and resistance diagram.

2-12. Adjustment of SQ ADJ (R1001)

(fig. 2-3)

With equipment connected as shown in figure 2-3, set test set controls S3 to 50, S4 to 0, S5 to .50, S6 to RCV, S7 to CARR, S8 to OFF, S9 to TEST, S10 to RADIO, S11 to TEST SET, and the POWER switch to ON. Perform the following procedures:

a. With no rf input to the test set, adjust SQ ADJ (R1001) on the receiver-transmitter to the point at which the receiver just squelches (squelching is indicated by reduced reading on Voltmeter, Electronic ME-30B/U.

b. Adjust the signal generator and audio oscillator controls for an rf input to the test set of 1.2 microvolts at 50.50 megacycles deviated ±10 kc at 1,000 cps. Verify that this input unsquelches the receiver (reading on electronic voltmeter increases sharply to approximately 2.73 volts).

2-13. Signal Substitution and Signal Tracing

(fig. 2-3)

When troubleshooting receiver troubles, inject a simulated received signal into the receiver-transmitter. Connect equipment as shown in figure 2-3 and set the equipment controls as prescribed in *a* through *c* below. After injecting a signal into the receiver-transmitter, use the voltage and resistance diagrams (fig. 2-7 through 2-12) to check for proper voltages at external module test jacks. (Use Multimeter ME-26A/U to check voltages.)

Caution: **Do not make resistance checks with the power on.**

a. Test Set (TS-1967/ARC-54) Control Settings. Set S3 to 50, S4 to 0, S5 to .50, S6 to RCV, S7 to DIS (unless test is for squelch trouble), S8 to OFF, S9 to TEST, S10 to RADIO, S11 to TEST SET, and the power switch to ON.

b. Signal Generator AN/URM-48 Control Settings. Set up the signal generator for an rf output of 120 microvolts at 50.50 megacycles modulated ±10 kc at 1,000 cps. (See TM 11-1257.)

c. Audio Oscillator TS-382/U Control Settings. If a tone squelch or audio trouble exists, use the audio oscillator to modulate the signal generator. Connect the audio oscillator output to the EXT MOD input on the signal generator and set the signal generator OPERATION switch to EXT MOD. Tune the audio oscillator for an output of 150 cps at a level sufficient to deviate the carrier ±10 kc (as indicated on the signal generator DEVIATION meter).

Section IV. CONTROL, RADIO SET C-3835/ARC-54 TROUBLESHOOTING

2-14. General

Use Maintenance Kit, Electronic Equipment MK-733/ARC-54 to perform bench troubleshooting of the control unit. Use the MK-733/ARC-54 as prescribed in paragraph 2-15 to localize the trouble to a particular section of the control unit; then use a multimeter and the control unit schematic diagram (fig. 6-22) to make continuity checks to isolate troubles to a faulty part or connection. Use of the maintenance kit allows the technician to operate the control unit as though it were connected to a radio set, and to observe whether or not the control unit is functioning properly when connected as in figure 2-13. When the exact functional failure is known, use a multimeter, the schematic and wiring diagrams, and the troubleshooting chart (para. 2-16) to isolate the fault. Refer to figure 2-14 for parts identification. Paragraph 2-15 gives an operational checkout procedure which should be used if the trouble symptom is not known. If the trouble symptom is known, perform the troubleshooting chart (para. 2-16) ohmmeter checks as prescribed in the Procedure column for the particular trouble symptom. Paragraph 2-17 lists resistances at the main unit connector. Use these resistances when referenced in the chart.

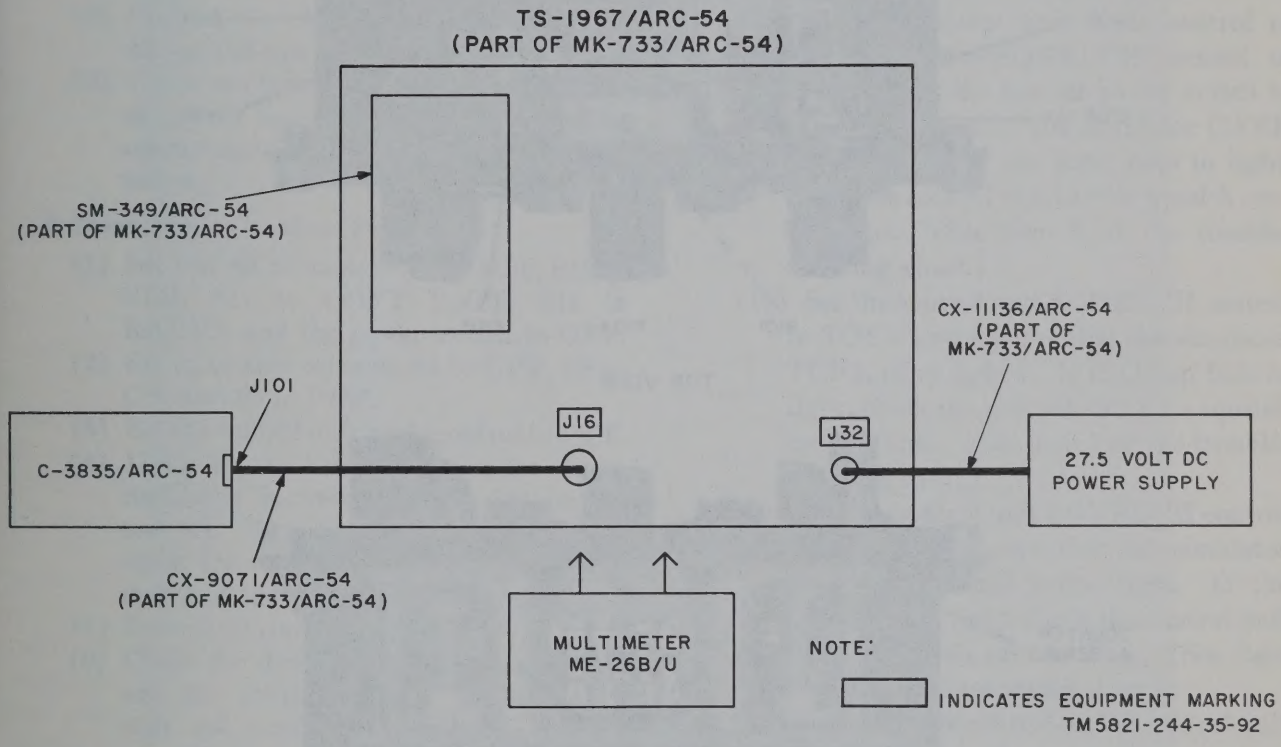


Figure 2-13. Control unit, troubleshooting test setup.

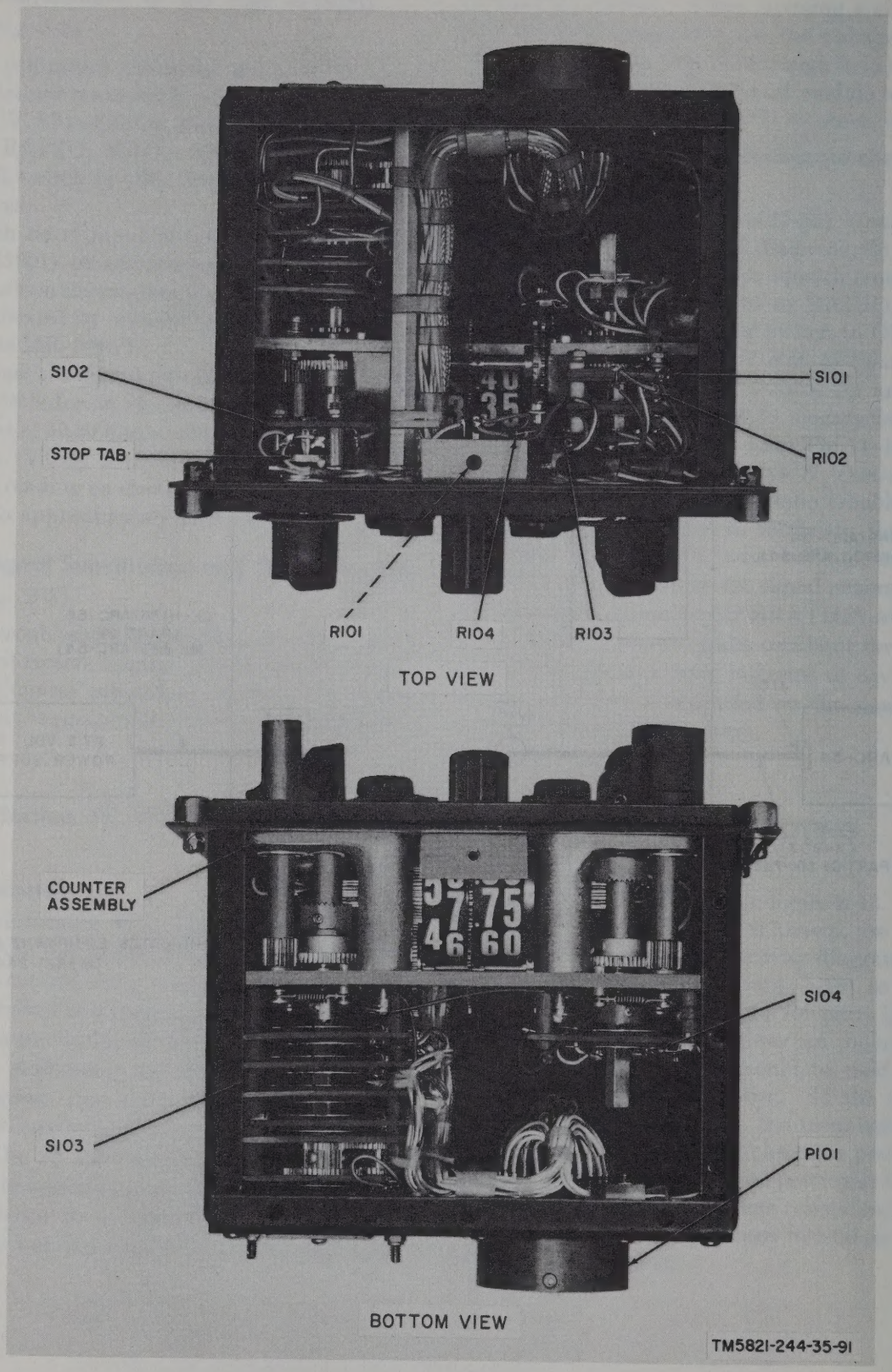


Figure 2-14. Control, Radio Set C-3835/ARC-54, parts location.

2-15. Control Unit Operational Checkout

If the trouble symptoms are not known, perform the following operational checkout by the use of the MK-733/ARC-54 and a multimeter. When the trouble symptom is known, perform the checks given in the troubleshooting chart (para. 2-16).

a. Control Unit Test Setup (fig. 2-13).

(1) Connect the control unit to J16 on the test set by the use of the CX-9071/ARC-54 cable provided as part of the maintenance kit.

(2) Connect a +27.5-volt power supply to J32 on the test set.

(3) Use a multimeter to take measurements at test set test jacks as prescribed in the operational checkout procedure (*b* below).

b. Operational Checkout Procedure.

(1) Set test set controls S6 to XMIT, S10 to SIM, S11 to CONT UNIT, S12 to RADIO, and the power switch to OFF.

(2) Set simulator controls S1 to OFF, S2 to ON, and S3 to OFF.

(3) Set the control unit mode control to PTT.

(4) Using the multimeter, check for direct continuity between J18 and J31 on the test set. If continuity does not exist, check the control unit PTT line. (See item 1 of the troubleshooting chart.)

(5) Set test set control S6 to RCV.

(6) Check for direct continuity between J24 and J25 on the test set. If continuity does not exist, check the control unit transmit audio (hi) line. (See item 2 of the troubleshooting chart.)

(7) Check for direct continuity between J21 and J31 on the test set. If continuity does not exist, check the control unit transmit audio output (lo) line. (See item 3 of the troubleshooting chart.)

(8) Check the resistance between J28 and J31 on the test set. The resistance should be approximately 162 ohms. If the resistance is low, the control unit volume (VOL) control (R101) or resistor R104 is faulty. If continuity does not exist, check the control unit receive audio (hi) line. (See item 4 of the troubleshooting chart.)

(9) Check the resistance between J30 and J31 on the test set while varying the volume (VOL) control setting on the control unit. The resistance should vary smoothly from 12 to 162 ohms. If the resistance variation is not smooth or does not reach the limits specified, the volume (VOL) control (R101) is faulty. If continuity does not exist, check the receive audio line in the control unit. (See item 5 of the troubleshooting chart.

(10) Set the control unit mode control to PTT and the SQUELCH control to CARR. Set the test set power switch to ON. Observe that the simulator CARR lamp lights. If the lamp fails to light, check the control unit carrier squelch control line. (See item 6 of the troubleshooting chart.)

(11) Set the control unit SQUELCH control to TONE and observe that the simulator TONE lamp lights. If the lamp fails to light, check the control unit tone squelch control line. (See item 7 of the troubleshooting chart.)

(12) Set the control unit SQUELCH control to DIS and observe that the simulator CARR and SEC lamps light. If the lamps fail to light, check the control unit squelch disable ground line. (See item 8 of the troubleshooting chart.)

(13) Set the mode control on the control unit to RETRAN. Check for direct continuity between J26 and J29 on the test set. If continuity does not exist, check the control unit retransmit audio (lo, receive) line. (See item 9 of the troubleshooting chart.)

(14) Set test set control S6 to XMIT and the test set power switch to OFF.

(15) Check for direct continuity between J22 and J31 on the test set. If continuity does not exist, check the control unit retransmit control ground (transmit) line. (See item 10 of the troubleshooting chart.)

(16) Set test set control S6 to RCV and simulator control S1 to RETRAN CARR. Set the control unit SQUELCH control to CARR.

(17) Check for direct continuity between J17 and J31 on the test set. If continuity does not exist, check the control unit carrier retransmit control ground (receive) circuit. (See item 11 of the troubleshooting chart.)

(18) Set simulator control S1 to RETRAN TONE and the control unit SQUELCH control to TONE (if that position is not disabled).

(19) Check for direct continuity between J28 and J19 on the test set. If continuity does not exist, check the retransmit audio (hi, receive) line in the control unit. (See item 12 of the troubleshooting chart.)

(20) Check for direct continuity between J26 and J31 on the test set. If continuity does not exist, check the retransmit audio (lo, receive) line in the control unit. (See item 13 of the troubleshooting chart.)

(21) Check for direct continuity between J23 and J31 on the test set. If continuity does not exist, check the retransmit audio (lo, transmit) line in the control unit. (See item 14 of the troubleshooting chart.)

(22) Check the resistance between J20 and J24 on the test set. The resistance should be approximately 330 ohms. If the resistance is high or low, check control unit resistor R103. If an open circuit is indicated, check the retransmit audio (hi, transmit) line in the control unit. (See item 15 of the troubleshooting chart.)

(23) Set simulator control S1 to OFF. Set the test set power switch to ON. Set the control unit mode control to PTT and the frequency controls to 30.00 megacycles. Note that the simulator FREQUENCY counter indicates 30.00 megacycles. If correct frequency is not displayed, see item 16 of the troubleshooting chart.

(24) Successively select each whole-megacycle frequency on the control unit while observing the simulator FREQUENCY counter and ODD MC and EVEN MC lamps. The counter should agree with the control unit frequency settings and the ODD MC or EVEN MC lamps should light when an off or even frequency is selected. If either lamp fails to light on the proper frequencies, or lights on the wrong frequencies, check the control unit off- or even-megacycle control line. (See item 17 of the troubleshooting chart.) If the frequency counter does not agree with the control unit setting on all frequencies, check the control unit megacycle control lines. (See item 16 of the troubleshooting chart.)

(25) Set test set control S12 to ANT COUPLER and repeat the procedure given in (24) above. If the counter fails to agree with the control unit setting on all frequencies, check the control unit antenna coupler control lines. (See item 18 of the troubleshooting chart.)

(26) Set test set control S6 to XMIT, and S12 to RADIO. Repeat the procedure given in (24) above; note, in addition, that the simulator HAR FIL lamp lights for all frequency settings from 30 through 45 megacycles, and does not light for all frequencies above 46 megacycles. If the lamps do not operate properly, check the control unit harmonic filter relay control line. (See item 19 of the troubleshooting chart.)

(27) Set test set control S6 to RCV. Beginning with the control unit .05-megacycle control set for .00 megacycles, successively select each .05-megacycle setting and observe the simulator FREQUENCY counter. The counter should agree with the control unit setting for each frequency setting. If the counters do not agree, check the control unit .05-megacycle control lines. (See item 20 of the troubleshooting chart.)

(28) Set the control unit mode control to HOME and the SQUELCH control to CARR. Observe the flags on the test set homing indicator (ID-48/ARN) and the simulator HOME lamp. When the control unit mode control is set to HOME, the flags on the homing indicator should

actuate, and the HOME lamp should light. If the flags and lamp fail to operate, check the homer operate line in the control unit. (See item 21 of the troubleshooting chart.)

(29) Set simulator control S3 to LEFT and observe the vertical needle on the homing indicator. The needle should swing left. If the needle fails to swing left, check the control unit homer course control line. (See item 22 in the troubleshooting chart.)

(30) Set simulator control S3 to OVER TGT and observe the horizontal needle on the homing indicator. The horizontal needle should swing down. If the needle does not swing down, check the control unit homer signal strength control line. (See item 23 of the troubleshooting chart.)

2–16. Troubleshooting Chart

The following chart lists the control unit troubles by symptoms, suggests probable causes of each trouble, and suggests a logical procedure for isolating each trouble. The trouble symptoms are grouped into distinct classes of troubles such as tuning, homing, and audio troubles. The troubles are also arranged in the order that they would be observed when the operational checkout (para. 2–15) is performed. The only test equipment needed for troubleshooting (assuming that the operational checkout has already been performed, or trouble symptoms are otherwise already known) is a multimeter. Also needed are the control unit schematic diagram (fig. 6–22), the control unit wiring diagram (fig. 6–31), and the frequency selection code charts (para. 2–17*m*).

Item	Indication	Probable trouble	Procedure
		AUDIO AND PTT	
1	PTT line open	Switch S101A FRONT (mode control) or wiring from switch to main connector J101.	Check for continuity between pins *v* and *q* of J101 and through S101A FRONT, contact 3 to contact 11.
2	Transmit audio (hi) line open	Switch S101B REAR (mode control) or wiring from switch to main connector J101.	Check for continuity between pins *x* and *y* of J101 and through S101B REAR contact 11 to contact 12.
3	Transmit audio (lo) line open	Switch S101B REAR (mode control) or wiring from switch to main connector J101.	Check for continuity between pins *d* and KK of J101 and through S101B REAR contact 5 to contact 6.
4	Receive audio in (hi) line open or defective volume control line.	Switch S101B FRONT (mode control), volume (VOL) control R101, resistor R104, or wiring.	Check resistance of R101 (should be approximately 150 ohms), and resistance of R104 (should be approximately 12 ohms). Check for continuity through S101B FRONT contact 11 to contact 12. Check wiring from J101 pin JJ to the switch (contact 11) and from pin KK to R104.
5	Receive audio out (hi) line open or defective volume control line.	Volume control R101, resistor R104, or wiring.	Check the resistance from the rotor terminal (terminal 2) to terminal 3 while rotating the volume control knob. Resistance should vary smoothly from zero to approximately 150 ohms. Measure resistance of R104. Resistance should be approximately 12 ohms. Check for continuity from pin N of J101, through R101 and R104 to pin KK of J101.

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Item	Indication	Probable trouble	Procedure
		SQUELCH	
6	Control unit carrier squelch control line open.	SQUELCH switch S102 or wiring.	Check for continuity from P101 pin W to pin *b* through S102 contact 6 to contact 7.
7	Control unit tone squelch control line open.	SQUELCH switch S102 or wiring.	Check for continuity from P101 pin X to pin *b* through S102 contact 7 to contact 8.
8	Control unit squelch disable control line open.	SQUELCH switch S102 or wiring.	Check for continuity from P101 pin V to pin *b* through S102 contact 5 to contact 7.
		RETRANSMIT	
9	Retransmit audio (lo) (receive) line open.	Mode control S101 or wiring----	Check for continuity from P101 pin PP to pin B through S101B FRONT contact 5 to contact 7.
10	Control unit retransmit control ground (transmit) line open.	Mode control S101 or wiring----	Check for continuity between pins *u*, *q*, and *v* of J101 through S101A FRONT contact 4 to contacts 12 and 3.
11	Control unit carrier retransmit control ground (receive) line open.	Mode control S101, SQUELCH control S102, or wiring.	Check for continuity from J101 pin Y to pin HH through S101A REAR contact 3 to contact 4 and S102 contact 1 to contact 11.
12	Control unit retransmit audio (hi) (receive) line open.	Mode control S101 or wiring----	Check for continuity from J101 pin A to pin JJ through S101B FRONT contact 11 to contact 1.
13	Control unit retransmit audio (lo) (receive) line open.	Mode control S101 or wiring----	Check for continuity from J101 pin PP to pin KK through S101B FRONT contact 6 to contact 7.
14	Control unit retransmit audio (lo) (transmit) line open.	Mode control S101 or wiring----	Check for continuity from J101 pin *w* to pin KK through S101B REAR contact 6 to contact 7. Also check for continuity from contact 5 to contact 7 and from contact 5 to pin *d* of J101.
15	Control unit retransmit audio (hi) (transmit) line open or wrong value resistance in line.	Mode control S101, resistor R103, or wiring.	Check the value of R103 (connected to S101B REAR contact 1). The value should be approximately 330 ohms. Check for the same value of resistance between J101 pins *c* and *x*. Check for continuity through S101B REAR contact 11 to contact 1.
		TUNING	
16	Simulator megacycles counter does not agree with control unit frequency.	Megacycles selector S103A, improper grounding on control lines (J101 pins *k*, *m*, BB, LL, and CC).	Use the frequency selection chart provided in paragraph 2–17*m* to determine which pins of J101 should have continuity to ground at any given frequency. Interpret any deviation from the chart as a fault in the control unit and use the wiring diagram (fig. 6–31) and multimeter to isolate the fault.

Item	Indication	Probable trouble	Procedure
		TUNING—Continued	
17	ODD MC or EVEN MC control line fault.	Megacycles selector S103C FRONT or wiring.	Check for a ground on pin *i* of J101 for every even-megacycle setting (through S101C FRONT contact 12 to contact 15), and a ground on pin *h* of J101 for every odd-megacycle setting (through S101C FRONT contact 12 to contact 14).
18	Control unit antenna coupler control lines not coding properly.	Megacycles switch S103B, improper grounding of control lines (J101 pins M, L, *j*, *z*, and AA).	Use the frequency selection chart provided in paragraph 2–17*m* to determine which pins of J101 should have continuity to ground at any given frequency. Interpret any deviation from the chart as a fault in the control unit and use the wiring diagram (fig. 6–31) and multimeter to isolate the fault.
19	Control unit harmonic filter relay control line at fault.	Megacycles switch S103E FRONT, S103C REAR, mode control S101A FRONT, or wiring.	Check for continuity between J101 pin *v* and pin K for all frequency settings below 46 megacycles and for an open circuit between pin *v* and *K* for all frequency settings above 45.95 megacycles. Continuity between the two pins is through S101A FRONT contact 3 to contact 2, through S103E FRONT contact 1 to contact 18½, and through S103C REAR contact 13 to contact 17. (See wiring diagram, fig. 6–31.)
20	Control unit .05-megacycle control lines not coding properly.	.05-megacycle control S104 improper grounding of control lines (J101 pins P, R, S, T, and U).	Use the frequency selection chart provided in paragraph 2–17*m* to determine which pins of J101 should have continuity to ground for any given frequency. Interpret any deviation from the chart as a fault in the control unit and use the wiring diagram (fig. 6–31) to isolate the fault.
		HOMING	
21	Control unit homer operate line open.	Mode control S101 or wiring----	Check for continuity from J101 pin F to pins DD and gg, through S101A FRONT contact 9 to contact 8.
22	Control unit homer course control line open.	Mode control S101 or wiring----	Check for continuity from J101 pin *t* to pin *s* through S101A REAR contact 1 to contact 12.
23	Control unit homer signal strength control line open.	Mode control S101 or wiring----	Check for continuity from J101 pin MM to pin NN through S101A REAR contact 11 to contact 9.

2–17. Control Unit Resistance Measurements

The charts below list resistance readings that should be observed at each pin of J101 for each control position. Continuity between any pins not so indicated in the charts is faulty (except *m* below). All measurements are made with Multimeter ME–26B/U. Resistances are in ohms. VOL control R101 is set fully counterclockwise except where noted; all other switches are set as indicated. Any resistance greater than 90,000 ohms is indicated by symbol ∞. The charts in *m* below indicate which pins are grounded for frequency selection. No control line pins should be grounded except as indicated in *m* below.

a. S101 OFF, S102 DIS, and Frequency Controls 30.00 Positions.

From pin	To pin	Resistance
A, B, C, D, E, K, X, Y, Z, c, d, h, n, p, q, s, t, u, v, w, x, y, EE, FF, HH, JJ, MM, NN, PP.	All pins	∞
e	f	0
f	F	0
g	G	0
i	P	0
P	U	0
H	J	0
J	M	0
W	V	0
V	r	0
b	AA	0
AA	cc	0
k	Ground	0
j	L	0
L	z	0
m	BB	0
BB	LL	0
R	S	0
S	T	0
N	KK	11–13 (R101 fully ccw)
N	KK	155–175 (R101 fully cw)
i	a	40–50
DD	GG	25–30K

b. S101 OFF and S102 CARR Positions.

From pin	To pin	Resistance
i, P, U, H, J, M, W, b, k, AA, CC.	Ground	0
V	r	0

c. S101 OFF and S102 TONE Positions.

From pin	To pin	Resistance
W	All other pins.	∞
i, P, U, H, J, M, X, b, k, AA, CC.	Ground	0

d. S101 PTT and S102 DIS Positions.

From pin	To pin	Resistance
A, X, Y, Z, c, h, u, EE, FF, HH, MM, NN, PP.	All other pins.	∞
B	KK	0
KK	d	0
C	D	0
D	E	0
F	e	0
e	f	0
G	g	0
H, J, P, i, AA, V, M, CC, k, b, W, r.	Ground	0
K	v	0
v	q	0
L	z	0
z	j	0
R	S	0
S	T	0
M	BB	0
BB	LL	0
x	y	0
B	N	11–13 (R101 ccw)
B	JJ	155–175
H	a	40–50
DD	GG	25–30K

e. S101 PTT and S102 CARR Positions.

From pin	To pin	Resistance
H, J, P, U, i, AA, M, CC, k, b, W.	Ground	0
V	r	0

f. S101 PTT and S102 TONE Positions.

From pin	To pin	Resistance
W	All other pins.	∞
H, J, P, U, i, AA, M, CC, k, b, X.	Ground	0
V	r	0

g. S101 RETRAN and S102 DIS Positions.

From pin	To pin	Resistance
X, Y, Z, h, FF, HH, MM, NN.	All other pins.	∞
C	D	0
D	E	0
F	f	0
f	e	0
G	g	0
H, J, P, U, V, M, W, AA, CC, EE, i, b, k, r.	Ground	0
L	z	0
z	j	0
R	S	0
S	T	0
d	KK	0
KK	w	0
w	PP	0
PP	B	0
m	BB	0
BB	LL	0
q	v	0
v	u	0
u	K	0
H	a	40–50
c	x	330
y	c	330
d	N	11–13 (R101 ccw)
d	A	155–175
d	JJ	155–175
DD	GG	25–30K

h. S101 RETRAN and S102 CARR Positions.

From pin	To pin	Resistance
V	r	0
Y	HH	0
H, J, P, U, M, W, AA, CC, EE, i, b, k	Ground	0

i. S101 RETRAN and S102 TONE Positions.

From pin	To pin	Resistance
W	All other pins.	∞
V	r	0
Z	HH	0
H, J, P, U, M, X, AA, CC, EE, i, b, k	Ground	0

j. S101 HOME and S102 DIS Positions.

From pin	To pin	Resistance
A, X, Y, Z, c, h, u, w, EE, FF, HH, PP.	All other pins.	∞
B	KK	0
KK	d	0
C	E	0
E	D	0
D	F	0
F	DD	0
DD	e	0
e	f	0
G	g	0
H, J, P, U, i, M, AA, CC, b, V, r, W, k.	Ground	0
K	v	0
v	q	0
L	z	0
z	j	0
R	S	0
S	T	0
m	BB	0
BB	LL	0
x	y	0
NN	MM	0
B	N	11–13 (R101 ccw).
B	JJ	155–175
C	GG	25–30K
H	a	40–50

k. S101 HOME and S102 CARR Positions.

From pin	To pin	Resistance
V	r	0
Y	FF	0
H, J, P, U, i, M, W, AA, k, CC, b.	Ground	0

l. S101 HOME and S102 TONE Positions.

From pin	To pin	Resistance
W	All other pins.	∞
V	r	0
Z	FF	0
H, J, P, U, i, M, X, AA, k, CC, b.	Ground	0

m. Frequency Selection Code Charts. The charts below indicate pins of P101 that are grounded for each setting of S103 or S104 (frequency selectors). Grounded pins not indicated by an X in the charts are pin *h*, grounded for all odd megacycles; pin *i*, grounded for all even megacycles; pins J and H, grounded for all frequency settings from 30 to 49 megacycles; and pins G and g, grounded for all frequency settings from 50 to 69 megacycles.

(1) *S103 (whole-megacycles) selector position.*

Pin	Frequency																			
	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 63	44 64	45 65	46 66	47 67	48 68	49 69
CC	X				X					X	X			X	X	X		X	X	X
LL				X					X	X			X	X	X		X	X	X	X
BB			X					X	X			X	X	X		X	X	X	X	
m		X					X	X			X	X	X		X	X	X	X		
k	X					X	X			X	X	X		X	X	X	X			

(2) *S104 (decimal-megacycles) selector position.*

Pin	Frequency																			
	00	05	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
U	X				X					X	X			X	X	X		X	X	X
T				X					X	X			X	X	X		X	X	X	X
S			X					X	X			X	X	X		X	X	X	X	X
R		X					X	X			X	X	X		X	X	X	X		
P	X					X	X			X	X	X		X	X	X	X			

CHAPTER 3

REPAIR AND ALIGNMENT

Section I. REPAIR OF RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54

3-1. General

a. This chapter covers procedures for direct support repair and general support alignment of the radio set. Paragraphs 4-1 through 4-38 cover procedures for general support repair. Direct support repair includes removal and replacement of the transmit audio, power supply, sel-call, receive audio, homer, and fixed IF modules, chassis-mounted parts, and power amplifier module tubes. Paragraphs 3-2 through 3-5 give detailed instructions for direct support repair of the receiver-transmitter. Included are instructions for removal and replacement of the unit dust cover, modules, power amplifier tubes, and chassis-mounted parts. The mechanical drive, RF amplifier, power amplifier, and variable IF modules on the RF subchassis and the antenna coupler should not be disassembled at the direct support level. Paragraphs 3-6 through 3-13 give instructions for disassembly and assembly of the control unit. Paragraphs 3-14 through 3-21 give complete instructions for both mechanical (shaft positioning) and electrical alignment of the radio set.

b. Step-by-step instructions for direct support repair of the receiver-transmitter are covered in paragraphs 3-2 through 3-5. Direct support repair consists of removal and replacement of the unit dust cover, modules, chassis-mounted parts, and final power amplifier tubes. No lubrication is required at the direct support level. Except for removal of the RF power amplifier module cover for access to tubes, no modules will be disassembled by direct support personnel. Module repairs (general support level or higher) are covered in paragraphs 4-1 through 4-38. Figure 2-5 shows the receiver-transmitter with modules installed. Figure 2-6 shows the receiver-transmitter with modules removed. Figure 3-1 shows the main chassis in exploded view.

3-2. Receiver-Transmitter Cover

The receiver-transmitter cover must be removed for access to modules or chassis parts. Filter pads (in the cover) should be replaced when dirty.

a. Cover Removal. To remove the cover, remove the two screws (one on each side) that hold the cover at the front of the unit, unfasten the two twistlock fasteners at the rear of the unit, and carefully slide the cover off the rear of the unit. (Be careful to prevent the filter pads from damage.)

b. Cover Replacement. To replace the cover, slide it carefully over the unit from the rear. (Be careful so that the filter pads clear all parts.) At the rear, secure the cover with two twistlock fasteners; at the front, secure with two PPH 4-40 x ¼-inch screws.

3-3. Receiver-Transmitter Modules

(fig. 2-5)

Module removal and replacement instructions are given in *a* through *p* below. The removal and replacement of RF subchassis modules (para. 4-24) is accomplished at general support or depot level. The RF subchassis, however, is replaceable as a unit at direct support level (*a* below). Note that the harmonic filter module can be removed only after removal of the RF subchassis. All other modules may be removed direct from the main chassis in any order desired.

Note. Before removing the RF subchassis, make sure the radio set is tuned to 30 megacycles. (Check the megacycles by reading the frequency dials on the mechanical drive module.)

a. RF Subchassis Removal.

(1) Disconnect coaxial connector P604 (fig. 2-5) from the homer module.

(2) Remove the five large Phillips flathead screws that hold the RF subchassis to the

main chassis (one at each corner on the subchassis and one near the middle on the left side).

(3) Lift the RF subchassis away from the main chassis.

b. RF Subchassis Replacement.

(1) Set the RF subchassis on the main chassis (top side) so that the RF power amplifier module is at the rear of the unit. Align the five holes in the RF subchassis base plate with the five large threaded holes in the main chassis.

(2) Secure the RF subchassis to the main chassis with five Phillips flathead screws.

(3) Connect coaxial connector P604 to coaxial receptacle J205 on the homer module.

c. Homer Module Removal. To remove the homer module, disconnect coaxial connector P604, unscrew the two module-mounting screws, and pull the module straight up.

d. Homer Module Replacement. To replace the homer module, place the homer module in position on the main chassis and press down so that electrical connector P201 engages main chassis receptacle J1003 and coaxial connector P202 engages CP1002. Connect coaxial connector P604 from RF amplifier module) to J205 on the module and secure the module with the two module-mounting screws.

e. Sel-Call Module Removal. To remove the sel-call module, unscrew the two module-mounting screws and pull the module straight up.

f. Sel-Call Module Replacement. To replace the sel-call module, place the module in position on the main chassis and press down so that electrical connector P101 engages main chassis receptacle J1001. Secure the module to the main chassis with the two module-mounting screws.

g. Fixed IF Module Removal. To remove the fixed IF module, unscrew the two module-mounting screws and pull the module straight up.

h. Fixed IF Module Replacement. To replace the fixed IF module, place the module in position on the main chassis and press down so that electrical connector P1205 engages main chassis receptacle J1002, coaxial connector P1201 engages main chassis coaxial receptacle J1015, and coaxial connector P1204 engages chassis receptacle CP1002. Secure the module to the main chassis with the two module-mounting screws.

i. Receive Audio Module Removal. To remove the receive audio module, unscrew the two module-mounting screws and pull the module straight up.

j. Receive Audio Module Replacement. To replace the receive audio module, place the module in position on the main chassis and press down so that module connector P1301 engages main chassis receptacle J1004. Secure the module to the main chassis with the two module-mounting screws.

k. Transmit Audio Module Removal. To remove the transmit audio module, unscrew the two module-mounting screws and pull the module straight up.

l. Transmit Audio Module Replacement. To replace the transmit audio module, place the module in position on the main chassis and press down so that module connector P1401 engages main chassis receptacle J1005 and coaxial connector P1402 engages main chassis coaxial receptacle CP1001.

m. Power Supply Module Removal. To remove the power supply module, unscrew the four module-mounting screws and pull the module straight up.

n. Power Supply Module Replacement. To replace the power supply module, place the module in position on the main chassis and press down so that module connector P1501 engages main chassis receptacle J1006. Secure the module to the main chassis with the four module-mounting screws.

o. Harmonic Filter Module Removal. Remove the harmonic filter module as instructed below.

Note. The RF subchassis must be removed before removing the harmonic filter module (*a* above).

(1) With the top of the receiver-transmitter upward, remove the four module-mounting screws that hold the module to the main chassis.

(2) Turn the receiver-transmitter over and disconnect coaxial cable P1002 (connector has red boot) from the antenna relay coaxial receptacle (marked with a red dot).

(3) Disconnect electrical connector P1008 (main chassis) from the module connector.

(4) Pull the module straight up.

p. Harmonic Filter Module Replacement. Replace the harmonic filter module as follows:

(1) Place the module in position on the main chassis and press down so that coaxial connector P1601 engages main chassis coaxial receptacle CP1003.
(2) Connect coaxial connector P1602 (connector has red boot) to the antenna relay coaxial receptacle marked with a red dot (receptacle farthest from the main chassis).
(3) Connect main chassis connector P1008 to module connector J1601.
(4) Secure the module to the main chassis with the four screws.

3-4. RF Power Amplifier Module Tube Replacement

The RF power amplifier module is the only module containing electron tubes and is the only module to be repaired at the direct support level. Direct support repair of the RF power amplifier is confined to tube replacement. No special procedures are required for tube replacement. All three power amplifier tubes are accessible from the top of the module after removing the perforated cover.

3-5. Receiver-Transmitter Chassis-Mounted Parts

(fig. 3-1)

Step-by-step instructions for removal and replacement of receiver-transmitter parts that are mounted to the main chassis are given below. Figure 3-1 shows all chassis-mounted parts exploded from a stripped chassis (all modules removed); in many cases, removal of all modules is not necessary. Remove only enough modules to reach the part. (Refer to para. 3-2 for cover removal and para. 3-3 for module removal.)

a. Removal of TEST METER (M1001). To remove the TEST METER, unsolder and tag the wires behind the meter (2, fig. 3-1), unscrew the meter-holding nut (4, fig. 3-1), and remove the meter through the front of the unit. Save the O-ring (3, fig. 3-1) and packing material (if used) if the same meter is to be reinstalled.

b. Replacement of TEST METER (M1001). To replace the TEST METER, insert the meter through the front of the unit (replacing preformed packing if used) and secure with the O-ring and the meter-holding nut (3 and 4, fig. 3-1). Solder the wires to terminals behind the meter.

c. Removal of TEST SWITCH (S1001). To remove the TEST SWITCH (5, fig. 3-1), set the switch to position 12, unsolder and tag all wires behind the switch, remove the screw, lockwasher, flat washer, knob, and hexagonal nut (6 through 10 respectively), and remove the switch through the rear of the unit.

d. Replacement of TEST SWITCH (S1001). To replace the TEST SWITCH, place the switch in the proper hole in the unit so that the locating key fits in the locating hole and secure with the switch hexagonal nut (10, fig. 3-1). Mount the knob (9) so that it is in position 12. (The switch is in position 12 when the rotor tab is in contact with the long stator contact.) Secure the knob with a 5/16-inch x 2-56 PPH screw, a No. 2 lockwasher, and a No. 2 flat washer (6, 7, and 8).

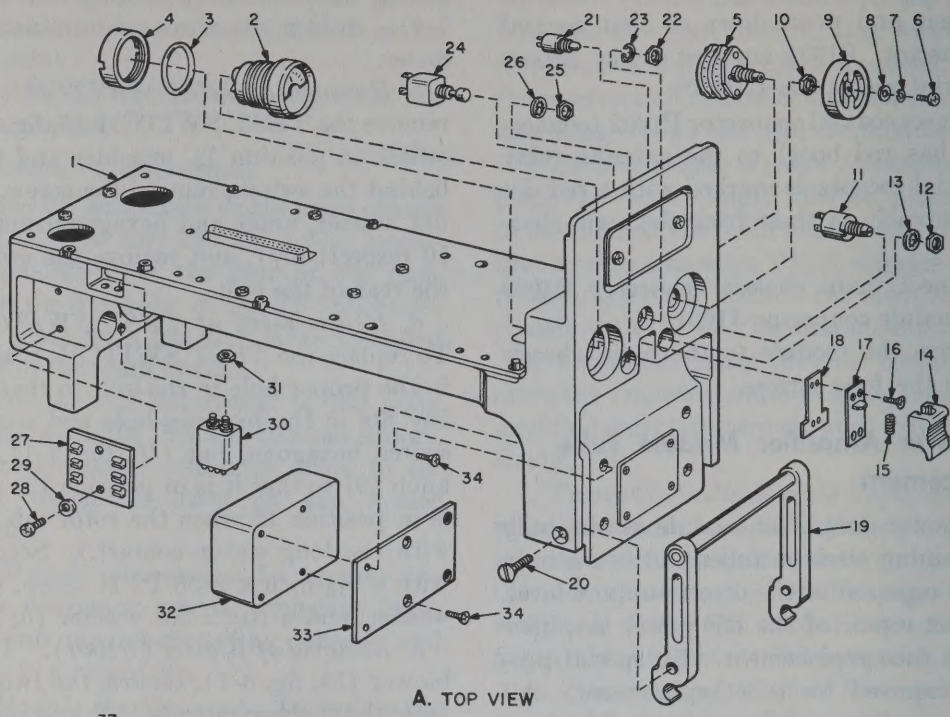
e. Removal of Blower (B1001). To remove the blower (35, fig. 3-1), remove the two screws (36) from the synchro mounts (37) and pull the blower out from the rear of the unit. Unsolder and tag the three wires and remove the blower.

f. Replacement of Blower (B1001). To replace the blower (35, fig. 3-1), solder the three wires to the three terminals; then place the blower in position so that the lettering on the blower is visible and the wires are not taut. Secure the blower to the unit with two synchro mounts (37) and screws (36).

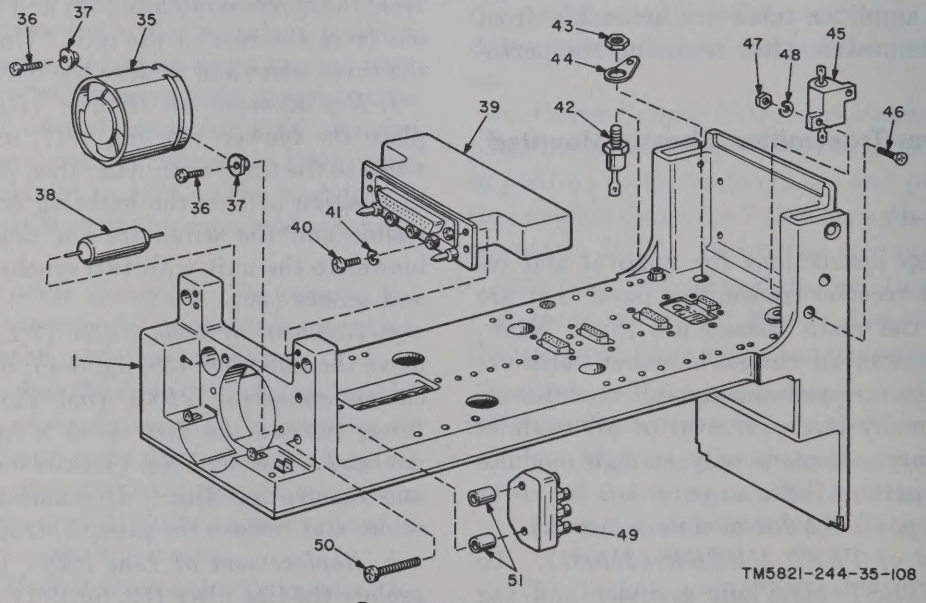
g. Removal of Line Filter (FL1001). To remove the line filter (39, fig. 3-1), disconnect main chassis connector P1001 (not shown) from the filter, remove the four 4-40 x 1/4-inch Phillips panhead screws and No. 4 lockwashers (40 and 41) and remove the filter. Disconnect the three RF cables and remove the ground strap.

h. Replacement of Line Filter (FL1001). To replace the line filter (39, fig. 3-1), place the filter in position so that the two guide pins face the rear and top of the unit (as shown in fig. 3-1) and connect main chassis connector P1001 and the three RF cables and ground strap to the filter. Secure the filter to the unit with four 4-40 x 1/4-inch Phillips panhead screws and four No. 4 lockwashers (40 and 41).

i. Removal of Antenna Relay (K1002). To remove the antenna relay (49, fig. 3-1), discon-



A. TOP VIEW



B. BOTTOM VIEW

nect the three coaxial connectors (two coaxial connectors if the harmonic filter module has been removed) from the relay; unsolder and tag the two wires that connect to the relay (side toward center of unit); and remove the two 6–32 x 1⅛-inch Phillips panhead screws and spacers (50 and 51).

j. Replacement of Antenna Relay (K1002). To replace the antenna relay (49, fig. 3–1), place the relay in position as shown in figure 3–1 and connect the three coaxial connectors (two coaxial connectors if the harmonic filter module is removed) to the relay. (Note the color coding on the connectors and the relay.) Solder the two wires to the relay. Secure the relay to the unit with two 6–32 x 1⅛-inch Phillips panhead screws and spacers (50 and 51).

← → *Figure 3-1. Receiver-transmitter main chassis, exploded view.*

1 Chassis, MP1003
2 Meter, M1001
3 O-ring
4 Meter-holding nut
5 Switch, S1001
6 Screw, H258, PPH, 2-56 x 5/16-inch
7 No. 2 shake washer
8 No. 2 flat washer
9 TEST SWITCH knob
10 TEST SWITCH hexagonal nut
11 Variable resistor, R1001, 5,000 ohms
12 Hexagonal nut, ½-inch x 32
13 Shake washer, ¼-inch
14 Machined catch
15 Catch spring
16 Screw, H257, PFH, 2-56 x ⅜-inch
17 Slide plate
18 Shim plate
19 Handle assembly, MP1001
20 Screw, handle-mounting
21 XMTR TEST switch, spring-loaded
22 Hexagonal nut (part of item 21)
23 No. 8 shake washer, H255
24 SQ DIS switch, S1002, DPST push-button
25 Hexagonal nut, ¼-inch x 32 (part of item 24)
26 ¼-inch shake washer
27 Riveted fuseboard
28 Screw, H201, PPH, 4-40 x ¼-inch
29 No. 4 flat washer, H102
30 TR BUS relay, K1001
31 Hexagonal nut, H142, 4-40
32 Filter, FL1002
33 Pressed mounting plate
34 Screw, H704, modified PFH, 4-40 x 5/16-inch
35 Blower, B1001
36 Screw
37 Synchro mount
38 Capacitor, C1001, .47 μf
39 Line filter, FL1001
40 Screw, H201, PPH, 4-40 x ¼-inch
41 No. 4 lockwasher
42 Diode, CR1002
43 Hexagonal nut, 7/16-inch (part of item 42)
44 Solder lug
45 Resistor, R1007, 1ohm, 1 watt
46 Screw, H257, PFH, 2-56 x 7/16-inch
47 Hexagonal nut, H138, 2-56
48 No. 2 lockwasher
49 Antenna relay, K1002
50 Screw, H212, PPH, 6-32 x 1⅛-inches
51 Spacer

Section II. REPAIR OF CONTROL, RADIO SET C-3835/ARC-54

3-6. General Parts Replacement Techniques (fig. 6-6)

The control unit contains no tubes, transistors, or diodes and no special soldering techniques are required. All the parts of the control unit are identified in figure 2-14. Figure 6-6 is an exploded view of the control unit. Lamps and knobs can be replaced without disassembly of the control unit. Each frequency control knob (1, 2, fig. 6-6) is held to its shaft by one 3/16-inch setscrew, the volume knob MP101 (5) is held by two 3/16-inch setscrews, and the mode selector and squelch control knobs MP112 (4, and 3, respectively), are held by two ⅛-inch setscrews. Lamps are held in position by lampholders (8, 9, 10, and 11) which can be pulled out to remove the lamps. The frequency counter (53) is not repairable and should be replaced as a unit (para. 3-12). When replacing switches, tag all wires and resistors as they are unsoldered so that they will be replaced correctly.

3-7. Repair of Mode Selector S101

Mode selector S101, which is a four-wafer, four-position rotary switch, should be replaced as a unit. To avoid contact breakage, be careful when unsoldering or soldering wires.

a. Removal of Mode Selector S101.

(1) Loosen the setscrews in the control knobs (1, 2, 3, 4, and 5) and remove all knobs from the front of the control unit.
(2) Remove the two fasteners H153 (6 and 7) and the four lampholders (8, 9, 10, and 11). The lamps will come out with the holders. Remove the illuminated panel (21).
(3) Remove the ⅜-inch hexagonal nut (32) and the lockwasher (33) from the shaft of switch S101 (34).
(4) Remove screw H170 (101) in top cover plate MP106 (69) and remove the top cover plate.
(5) Remove two screws H171 (29) from right side of staked plate (28), two Phillips panhead screws (67) from left side of rear plate (68), and three Phillips flathead screws H170 (102) from right side of bottom cover plate MP106 (70) and remove the right end plate (71).

(6) Unsolder and tag all wires and resistors (38, 39, and 40) that connect to the switch and remove the switch.

b. Replacement of Mode Selector S101.

(1) Insert the shaft of switch S101 (34, fig. 6–6) into its mounting hole and solder all wires and resistors in place. Remove the tags.

(2) Orient the switch in its hole so that the locator key is in its hole. Secure the switch with the ⅜-inch hexagonal nut (32) and lockwasher (33).

(3) Place the right end plate (71) in position and secure with two Phillips flathead screws H171 (29) at the front, two Phillips panhead screws (67) at the rear, and three Phillips flathead screws H170 (102) at the bottom.

(4) Place top cover plate MP106 (69) in position and secure with 10 Phillips flathead screws H170 (101).

(5) Replace the illuminated panel (21) and secure with two H153 fasteners (6 and 7).

(6) Replace all knobs (1, 2, 3, 4, and 5) and tighten the setscrews.

(7) Replace the four lampholders (8, 9, 10, and 11); make sure the lamps and the gaskets are intact.

3–8. Repair of SQUELCH Switch S102

Squelch switch S102, which is a three-position rotary wafer switch, should be replaced as a unit. To avoid contact breakage, be very careful when unsoldering and soldering wires.

Note. Switch S102 has a stop which prevents the switch from functioning in the TONE position. The panel marking for the TONE position is covered by a clip (20, fig. 6–6). The TONE function can be restored by removal of the clip and the stop. Refer to paragraph 3–9 for instructions.

a. Removal of SQUELCH Switch S102.

(1) Loosen the setscrews and remove all knobs (1, 2, 3, 4, and 5, fig. 6–6) from the front of the control unit.

(2) Remove two fasteners H153 (6 and 7) and four lampholders (8, 9, 10, and 11) from the illuminated panel (21) and remove the illuminated panel.

(3) Remove the ⅜-inch hexagonal nut and lockwasher (46 and 47) from the shaft of switch S102 (48).

(4) Remove the top cover plate (69).

(5) Unsolder and tag all wires that connect to the switch (three on the top and three on the bottom). (If the bottom wires cannot be reached by turning the switch, remove additional cover plates as necessary.)

(6) Remove the switch.

b. Replacement of SQUELCH Switch S102.

(1) Insert switch S102 (48, fig. 6–6) into the hole in the staked plate (28) so that the flat side of the shaft is up. Solder the wires to the switch and remove the tags.

(2) Secure the switch in the hole with the ⅜-inch hexagonal nut and the lockwasher (46 and 47).

(3) Replace all cover plates.

(4) Replace the illuminated panel (21) and secure with two H153 fasteners (6 and 7).

(5) Replace all knobs and lampholders. Tighten the setscrews in the knobs.

3–9. Modification of SQUELCH Switch S102

Modify switch S102 to restore TONE squelch (selective calling) operation as follows:

a. Perform the procedures given in paragraph 3–8*a*(1) through (4).

b. Pull the switch away from the front plate far enough to reach the mechanical stop tab. Rotate the tab one position to the left.

c. Replace switch S102 as instructed in paragraph 3–8*b*.

3–10. Repair of Megacycle Switch S103

Megacycle switch S103 is a five-wafer, 20-position rotary switch. Wafer E is separated from the rest of the wafers by a 4 to 1 gear assembly. The switch is repairable. Wafers and gears may be replaced individually, or the switch may be replaced as a unit. Switch replacement as a unit is given in *a* and *b* below; cover switch disassembly and assembly for replacement of individual wafers or gears are given in *c* and *d* below.

a. Removal of Megacycle Switch S103.

(1) Rotate the frequency controls until the counter reads 30 megacycles.

(2) Remove top cover plate MP106 (69, fig. 6–6).
(3) Remove the four Phillips panhead screws (67) that hold the rear plate (68) to right end plate MP113 (71) and left end plate MP114 (72).
(4) Holding the hexagonal nuts inside the control unit, remove the four Phillips panhead screws (63 and 66) that hold connector J101 (74) to the rear plate. Do not lose the nuts, lockwashers, or flatwashers when removing the screws.
(5) Remove the two hexagonal capnuts (59 and 60) at the rear of the unit.
(6) Remove the Phillips panhead screw (64) and lockwasher (65) that hold the rear plate to the long post (73).
(7) Remove three Phillips flathead screws H170 (102) from the rear of bottom cover plate MP106 (70) and remove the rear plate.
(8) Loosen two 1/8-inch setscrews H161 (49) in megacycle switch gear MP104 (87).
(9) Loosen the two hexagonal nuts (82 and 83) at the rear of the switch and unscrew the two 2¾-inch studs that hold the switch to the frequency counter (53). Pull wafer switch S103 (103) away from the frequency counter and put a hexagonal nut on the front of both studs to prevent the wafers from falling off.
(10) Unsolder and tag all wires; then remove the switch.

b. Replacement of Megacycle Switch S103.

(1) Remove the two hexagonal nuts from the front of the switch assembly (end farthest from the gears) and slide the switch over the switch shaft (part of the frequency counter); make sure the pilot pin of the pressed megacycle gearshaft (86, fig. 6–6) fits into the hole in the switch shaft.
(2) Screw studs H132 (61 and 62) into the frequency counter. (Orient the switch with the flat sides of the wafers toward the bottom of the control unit.)
(3) Tighten the two hexagonal nuts (82 and 83) at the rear of the switch.
(4) Solder all wires and remove the tags.
(5) Place the rear plate (68) in position and secure connector J101 (74), the two large cable clamps and the small cable clamp H292 (78 and 104), and the terminal lug (81) to the rear plate. Use 7/16-inch panhead screws for all holes except the upper left (viewed from the rear of unit); use a 3/8-inch Phillips panhead screw for this hole. Secure all clamps with a hexagonal nut (75), a lockwasher (76), and a flat washer (77) and secure the terminal lug (81) with a hexagonal nut (79) and lockwasher (80).

Note. Place the terminal lug on the short screw.

(6) Slide the rear plate forward over the two 2¾-inch studs; make sure the long post (73) aligns with the hole near connector J101. Secure the rear plate to the post with a 5/16-inch Phillips panhead screw (64) and lockwasher (65).
(7) Secure the rear plate to the end cover plates (71 and 72) with four 5/16-inch Phillips panhead screws (67). Screw hexagonal capnuts H286 (59 and 60) over the protruding studs.
(8) Replace top cover plate MP106 (69) and secure with 10 Phillips flathead screws H170 (101). Replace three Phillips flathead screws H170 (102) in bottom cover plate MP106 (70).

c. Disassembly of Megacycle Switch S103.

(1) Remove top cover plate MP106 (69, fig. 6–6).
(2) Remove all screws from the rear plate (68). (Hold the four hexagonal nuts on the inside of connector J101 (74) when removing connector screws.)
(3) Remove two hexagonal capnuts H286 (59 and 60) from the rear plate.
(4) Remove three Phillips flathead screws H170 (102) from the rear of bottom cover plate.
(5) Remove the rear plate.
(6) Remove two hexagonal nuts H142 (82 and 83) at the rear of switch S103.
(7) Loosen the two setscrews in the megacycle switch gear (87).
(8) Unsolder and tag all wires on wafers to be removed.

(9) All wafers, spacers, and gears will now slide off the rear of the studs and the switch shaft.

d. Assembly of Megacycle Switch S103.

(1) Make sure that two 2¾-inch studs H132 (61 and 62, fig. 6–6) are screwed securely into the frequency counter (53).

(2) Assemble wafers, spacers, gear plates, and gears as shown in figure 6–6 and secure with two hexagonal nuts H142 (82 and 83). Make sure all wafers are oriented as shown (that is, the flat sides of the double D hole in the wafer rotors are parellel to a line drawn through the wafer mounting holes) and that the flat side of the pressed megacycle gear shaft (86) is up. Also make sure that the pilot shaft (front side of gear shaft) fits into the hole in the end of the switch shaft (part of the frequency counter).

Note. Switch wafers S103D (90) and S103E (84) have identical rotors on the front and the rear. The front of wafer D (the side that faces the frequency counter) can be identified by inspection of the contacts; one of the short contacts is separated from a wafer mounting hole by one blank space. The gear of the wafer has a short contact directly adjacent to a mounting hole. The front of wafer S103E can be readily identified by counting the contacts; the front has two, the rear has five.

(3) After the switch is assembled, check to see that contacts of adjacent wafers do not touch and that the rear teeth mesh properly and the gears fit snugly between the gear plates. If there is any discrepancy, check to see that the spacers have been assembled in the correct order and are of the proper length (fig. 6–6).

(4) Assemble the rest of the control unit in accordance with *b*(4) through (8) above.

3–11. Repair of Kilocycle Switch S104

Kilocycle switch S104 (56, fig. 6–6) is a single-wafer, 20-position rotary switch. Removal and replacement procedures for the switch wafer are given below.

a. Removal of Kilocycle Switch S104.

(1) Remove top cover plate MP106 (69, fig. 6–6).

(2) Unsolder and tag all wires that attach to wafer switch S104 (56).

(3) Remove the two Phillips fillister head screws H226 (54 and 55) from the frequency counter (53) and slide the switch wafer off the switch shaft (part of the frequency counter). Save the two spacers.

b. Replacement of Kilocycle Switch S104.

(1) Orient wafer switch S104 (56) as shown and slide it over the shaft (part of frequency counter). Note the exact shape of the rotor (the front and the rear rotors are similar but not identical) and make sure the front is toward the frequency counter.

(2) Place the spacers (57 and 58) between the wafer and the frequency counter and secure the wafer and spacers to the frequency counter with two ⅝-inch Phillips fillister head screws H226 (54 and 55).

3–12. Repair of Volume (VOL) Control R101

Volume (VOL) control R101, which is not repairable, should be replaced as a unit. Removal and replacement procedures for R101 are given below.

a. Removal of Volume (VOL) Control R101.

(1) Remove knobs, lampholders, and the illuminated panel as prescribed in paragraph 3–8*a*(1) and (2).

(2) Remove the top cover plate (69).

(3) Remove the ¼-inch hexagonal nut (35) and the lockwasher (36) from the shaft of R101 (37).

(4) Unsolder and tag the three wires that connect to R101.

(5) Remove R101.

b. Replacement of Volume (VOL) Control R101.

(1) Solder the three wires to R101 and remove the tags.

(2) Insert variable resistor R101 (37, fig. 6–6) in the hole in the staked plate (28) and secure it with the ¼-inch hexagonal nut (35) and the lockwasher (36); make sure the locator tabs on R101 are in the locator holes in the staked plate.

(3) Replace the illuminated panel, the knobs, and the lampholders in accordance with paragraph 3-8*b*(4) and (5).
(4) Replace top cover plate MP106 (69).

3-13. Repair of Frequency Counter

The frequency counter (53, fig. 6-6), which is not repairable (except for replacement of lamps), should be replaced as a unit. Removal and replacement procedures for the frequency counter are given below.

Note. The frequency counter does not require lubrication.

a. Removal of Frequency Counter.
(1) Remove knobs, lampholders, and illuminated panel in accordance with paragraph 3-8*a*(1) and (2).
(2) Remove switch S103 in accordance with paragraph 3-10*a*(1) through (9). (Do not unsolder wires from S103.)
(3) Remove S104 in accordance with paragraph 3-11*a*(1), (2), and (3). (Do not unsolder wires from S104.)
(4) Unsolder and tag both lamp wires from the frequency counter. (Remove the bottom cover plate to reach the wires.)
(5) Remove four 3/16-inch Phillips flathead screws H171 (30, fig. 6-6) that hold the frequency counter to the staked plate and remove the frequency counter.

b. Replacement of Frequency Counter.
(1) Secure the frequency counter (53, fig. 6-6) to the staked plate (28, fig. 6-6) with four 3/16-inch Phillips flathead screws H169 (30, fig. 6-6).
(2) Solder the lamp wires to the lamp sockets and remove the tags.
(3) Replace switch S104 (56) and secure it with two Phillips fillister head screws H226 (54 and 55).
(4) Replace S103 in accordance with paragraph 3-10*b*(1) through (7).
(5) Replace the illuminated panel, lampholders, and knobs in accordance with paragraph 3-8*b*(4) and (5).
(6) Replace bottom cover plate MP106 (70).

Section III. ALIGNMENT OF RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54

3-14. General

Complete alignment of Radio Set AN/ARC-54 consists of RF subchassis mechanical alignment, individual module electrical alignment, and antenna coupler mechanical alignment. This section covers RF subchassis mechanical alignment and module electrical alignment. Procedures for aligning the antenna coupler are provided in paragraph 4-32. When installing any tunable module, align its tuning shaft in accordance with paragraph 3-16. If the module is repaired and any components are replaced that can affect the module tracking, align the module for proper tracking (paras. 3-17, 3-18, 3-19, 3-20, or 3-21) before making final mechanical alignment. Paragraph 3-17 gives the mechanical alignment procedures and paragraphs 3-18 through 3-21 give module electrical alignment procedures. Align the modules (paras. 3-17 through 3-21) in the order presented (beginning with oscillators). The procedures given in this section are for use with the AN/ARM-87. The alignment may be performed, however, with RF subchassis installed in the receiver-transmitter; in this case, Maintenance Kit, Electronic Equipment MK-733/ARC-54 will be used.

3-15. Test Equipment Required for Alignment

The following chart lists the test equipment required for performing the alignment procedures provided in this section.

Item	Technical manual	Common name	Remarks
Test Set, Electronic Circuit Plug-in Unit AN/ARM–87.	TM 11–6625–467–12	Module tester	
Voltmeter, Electronic ME–30B/U	TM 11–6625–320–12	Electronic voltmeter	
Signal Generator AN/URM–48	TM 11–1257	Fm signal generator	
Spectrum Analyzer TS–723A/U	TM 11–5097	Spectrum analyzer	
Signal Generator AN/USM–44A	TM 11–6625–508–10	RF signal generator	
Multimeter ME–26B/U	TM 11–6625–200–12	Multimeter	
Frequency Meter AN/USM–26 with Converter CV–394/USA–5.	TM 11–5057	Frequency meter	
RF Subchassis with Mechanical Drive Module (Part of RT–348/ARC–54).			Used with module tester to position the tuning shaft of the module under test.
Modified RF Subchassis			See para. 3–19.
RF Signal Generator AN/URM–25F.	TM 11–5551E	Signal generator	

3–16. Rf Subchassis Mechanical Alignment

(figs. 3–2, 3–3, and 6–7)

a. General. Performance of the following procedures assures the proper orientation of all the tunable module drive shafts so that all modules tune to the frequency that is correct for the carrier frequency selected. The mechanical drive module is used as the reference and should be tuned to the 30-megacycle position. The mechanical drive module contains a locking panel that locks the gear train in the position selected. If the mechanical drive module is tuned to 30 megacycles and is not removed from the gear train, the other tunable modules may be removed and replaced without performing the complete mechanical alignment; however, the mechanical alignment of the replaced module should be checked.

b. High-Frequency Oscillator Module. To align the tuning shaft of the high-frequency oscillator module, plug the RF subchassis into module tester AN/ARM–87 so that the RF subchassis can be tuned. (The mechanical drive module must be installed in the RF subchassis.) Proceed as follows:

(1) Make sure that the module is properly secured to the RF subchassis.

(2) Using the frequency selectors on the module tester, tune the RF subchassis to 43 megacycles. Loosen the exposed module alignment screw. (Do not loosen the screw to the extent that it will drag against the gear train when the shaft is rotated.)

(3) Tune the RF subchassis to 57 megacycles. Loosen the exposed alignment screw as in (2) above.

(4) Tune the RF subchassis to 30 megacycles and loosen the exposed alignment screw.

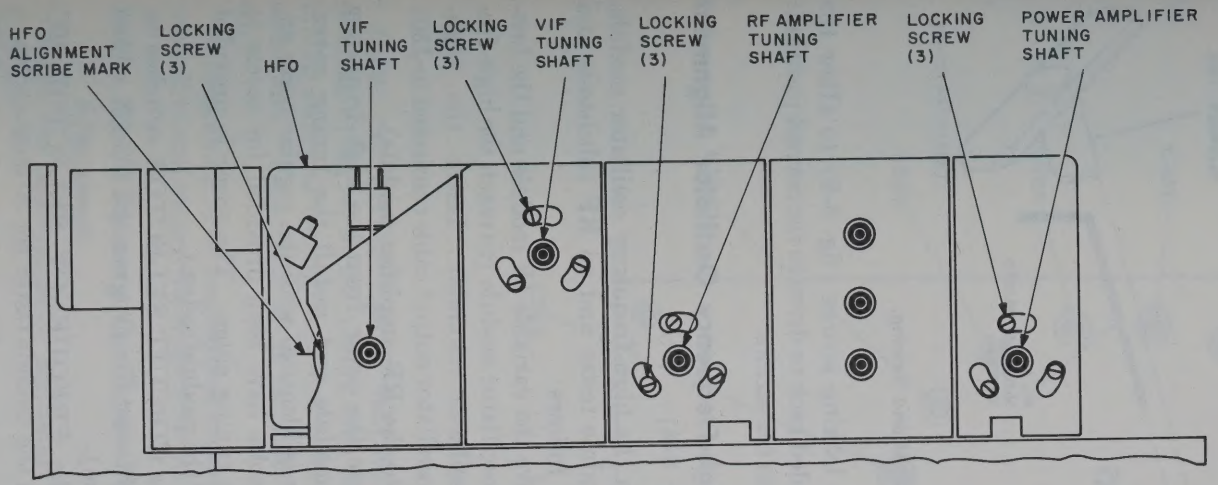
(5) Using the alignment tool (stowed) on the rear of the receiver-transmitter (main chasis) as shown in figure 3–3, rotate the high-frequency oscillator module tuning shaft to align the scribe mark on the module hub with the scribe mark on the module chassis (detail C, fig. 6–7). Tighten the exposed alignment screw.

(6) Tune the RF subchassis to 43 and 57 megacycles and tighten the other two screws.

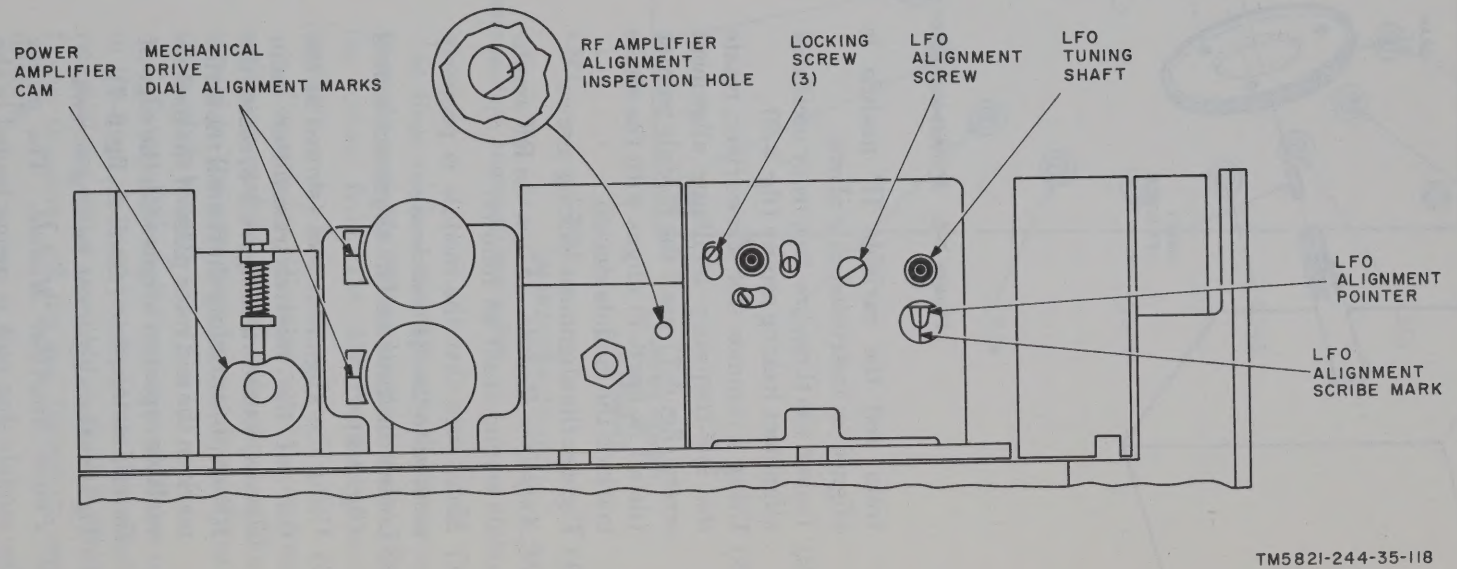
c. Variable IF Module. The variable IF module slug rack is spring loaded to the 30-megacycle position. To insure proper shaft position after installation, loosen the alignment locking screws (fig. 3–2) on the gear-train side then tighten them.

d. Low-Frequency Oscillator Module. Align the low-frequency oscillator tuning shaft, as follows:

(1) Make sure that the module is properly secured to the variable IF module gear



A. RIGHT SIDE



B. LEFT SIDE

Figure 3-2. RF subchassis, mechanical alignment.

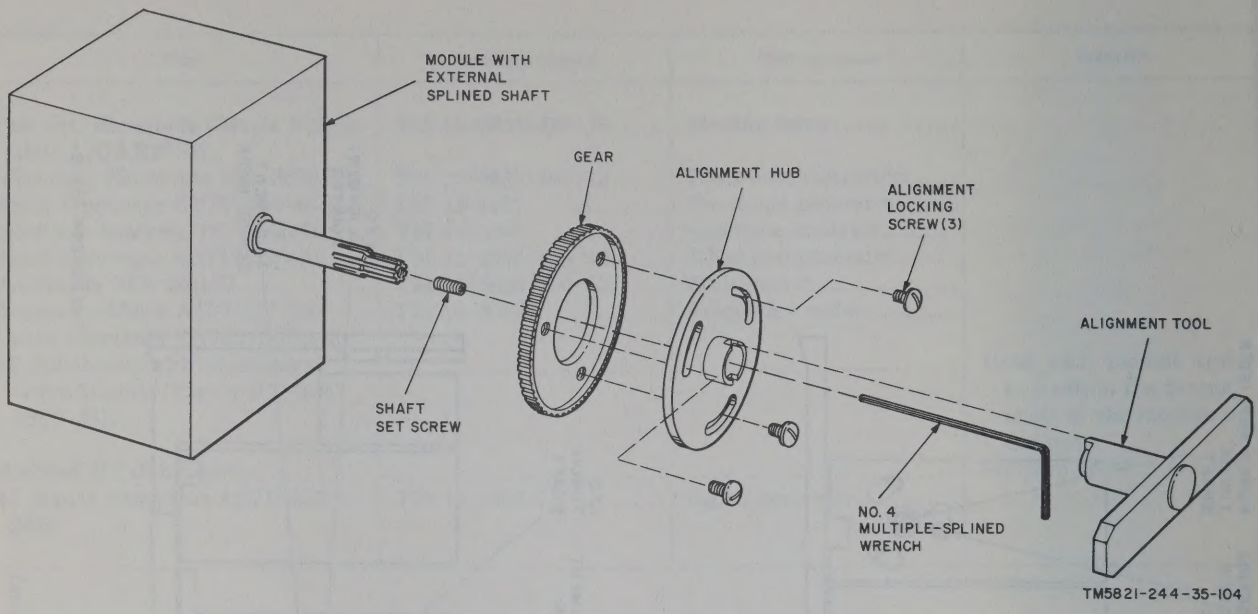


Figure 3-3. Mechanical drive module, alignment and locking.

train and the variable IF module is aligned as instructed in *c* above.

(2) Loosen the three low-frequency oscillator alignment locking screws (fig. 3-2).

(3) Using a common slot screwdriver, rotate the low-frequency oscillator alignment screw (fig. 6-7) until the module pointer (detail B, fig. 6-7) aligns with the scribe mark on the module chassis.

(4) Tighten the alignment locking screws.

e. RF Amplifier Module. Align the RF amplifier module tuning shaft as follows:

(1) Make sure that the module is properly secured to the RF subchassis.

(2) Loosen the three module alignment screws (fig. 3-2).

(3) Using the alignment tool (stowed at the rear of the receiver-transmitter main chassis) as shown in figure 3-3, rotate the RF amplifier tuning shaft until the scribe mark on the end rotor plate of the module variable capacitor aligns with the edge of the end stator plate (detail A, fig. 6-7).

(4) Tighten the alignment locking screws.

f. RF Power Amplifier Module. The power amplifier module slug rack is spring loaded to the 30-megacycle position. To insure proper shaft position after installation, loosen the three module alignment locking screws (fig. 3-2) to allow the spring-loaded rack to drive to the correct position; then tighten the screws.

3-17. High-Frequency Oscillator Alignment (fig. 3-4)

To align the high-frequency oscillator module, use the module tester and an RF subchassis and proceed as follows:

a. Remove the variable IF module and the low-frequency oscillator module (to reach the high-frequency oscillator module). Leave the high-frequency oscillator output cable connected to J301 (connects to the RF amplifier module).

b. Remove the cover from the high-frequency oscillator module and install the tuning cover. (The cover is identical with the regular cover except that holes have been provided for access to the module tuning slugs. The cover is provided as a part of the module tester.)

c. Set the CIRCUIT SELECTOR switches on the module tester for program 1X4X (X means any position).

d. Set the FREQUENCY SELECTOR-MC switches on the module tester for 30 megacycles.

e. Using a nonmetallic tuning rod, tune L305 (fig. 3-4) for maximum indication on the module tester meter (hold the PRESS TO TEST button down for reading).

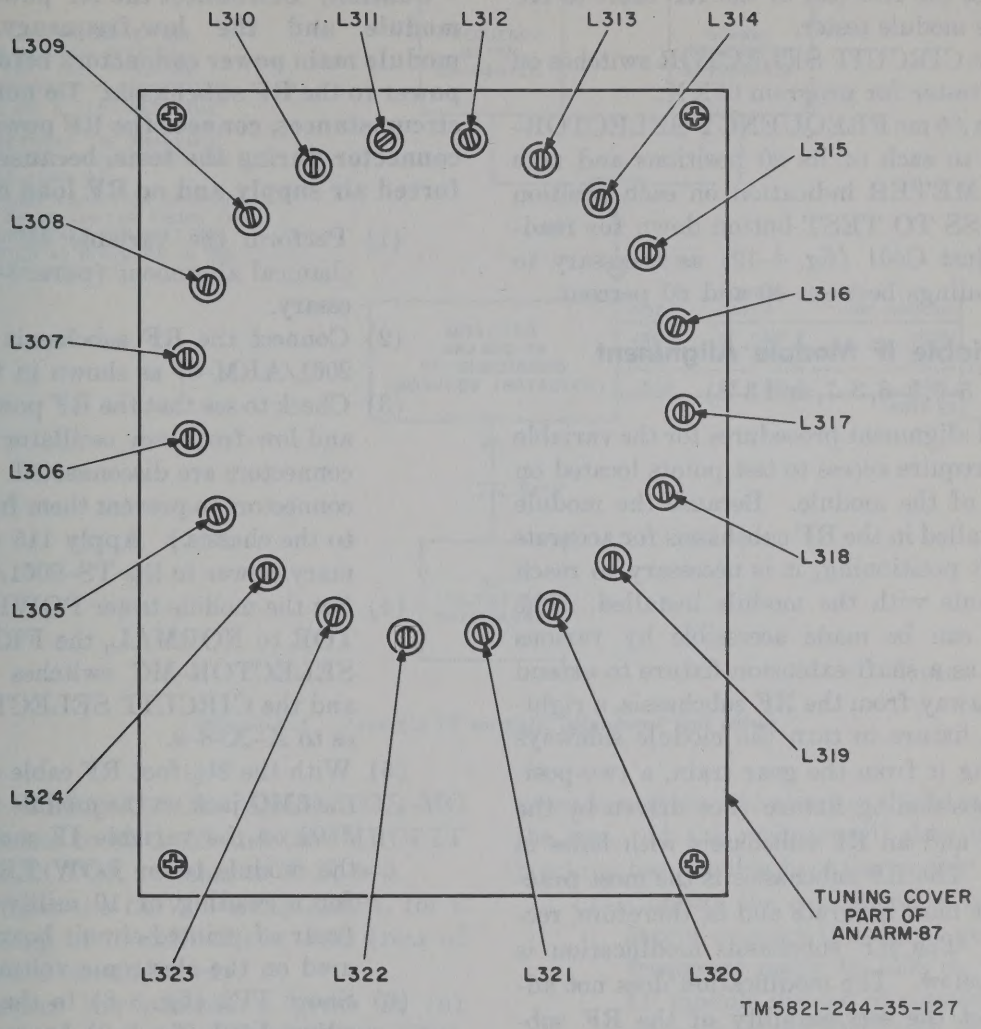


Figure 3-4. High-frequency oscillator module, alignment test points.

f. Set the FREQUENCY SELECTOR-MC switches to 32, 34, 36, etc. (every even megacycle), tuning each coil (going clockwise from L305) for maximum. Tune L306 at 32 mc, L307 at 34 mc, etc.

g. Beginning at 30 megacycles, repeat the above procedure and secure the slugs with coil.

3-18. Low-Frequency Oscillator Module Alignment

Align the low-frequency oscillator module as follows:

a. Remove the variable IF module and the low-frequency oscillator module from the RF subchassis.

b. Remove the low-frequency oscillator module from the variable IF module gear train. Remove the cover from the low-frequency oscillator module.

c. Connect an RF cable to the low-frequency oscillator module coaxial receptacle. (The cable should be the minimum length necessary to reach the module tester.)

d. Reinstall the low-frequency oscillator module in the gear train on the variable IF module, and reinstall the entire assembly in the RF subchassis. Leave the cover off the low-frequency oscillator module.

e. Perform the mechanical alignment as necessary (para. 3-16).

f. Connect the free end of the RF cable to RF VM2 on the module tester.

g. Set the CIRCUIT SELECTOR switches on the module tester for program 05XX.

h. Set the .05 mc FREQUENCY SELECTOR–MC switch to each of its 20 positions and note the TEST METER indication on each position (hold PRESS TO TEST button down for readings). Adjust C401 (fig. 4–19) as necessary to keep all readings between 40 and 80 percent.

3–19. Variable IF Module Alignment

(figs. 3–5, 3–6, 3–7, and 3–8)

Electrical alignment procedures for the variable IF module require access to test points located on the bottom of the module. Because the module must be installed in the RF subchassis for accurate tuning shaft positioning, it is necessary to reach the test points with the module installed. The test points can be made accessible by various means such as a shaft-extension fixture to extend the module away from the RF subchassis, a right-angle drive fixture to turn the module sideways while driving it from the gear train, a two-position shaft-positioning fixture (not driven by the gear train), and an RF subchassis with holes in the bottom. The RF subchassis is the most practical and the most accurate and is, therefore, recommended. The RF subchassis modification is given in *a* below. The modification does not adversely affect the serviceability of the RF subchassis and may be performed on any unit as the need arises. The alignment procedure is given in *b* below, and the tracking test, which should be run after alignment if tracking troubles are suspected, is given in *c* below.

a. RF Subchassis Modification and Cable Fabrication. To modify the RF subchassis for variable IF alignment, remove the variable IF module and drill five ⅜-inch diameter holes in the bottom of the RF subchassis as shown in figure 3–7. After making sure that the RF subchassis is clean (no pieces of aluminum left over from drilling), install the variable IF module in the subchassis. Fabricate one 2-foot extender cable, two 2-foot RF cables, and one 2½-foot RF cable (fig. 3–6).

b. Alignment Procedure. Align the variable IF module as follows:

***Caution:* Disconnect the RF power amplifi module and the low-frequency oscillat module main power connectors before applyin power to the RF subchassis. Do not, under an circumstances, connect the RF power amplifie connector during the tests, because there is n forced air supply and no RF load connected.**

(1) Perform the variable IF module me chanical alignment (para. 3–16*c*) if ne essary.

(2) Connect the RF subchassis to the TS 2061/ARM–87 as shown in figure 3–5.

(3) Check to see that the RF power amplifie and low-frequency oscillator main powe connectors are disconnected. (Cover th connectors to prevent them from shortin to the chassis.) Apply 115 volts ac pri mary power to the TS–2061/ARM–87.

(4) Set the module tester POWER SELEC TOR to NORMAL, the FREQUENC SELECTOR–MC switches to 30–0–.0 and the CIRCUIT SELECTOR switch es to X–X–8–9.

(5) With the 2½-foot RF cable connected t the 3MC jack on the module tester and t J502 on the variable IF module, adjus the module tester LOW FREQ AMP for a reading of 10 millivolts at J50 (rear of printed-circuit board) as meas ured on the electronic voltmeter.

(6) Short TP2 (fig. 3–8) to the chassis an adjust L501 (fig. 3–8) for maximum sig nal at TP1 as measured with the elec tronic voltmeter.

(7) Move the ground from TP2 to TP3 an just L503 for maximum signal at TP1.

(8) Remove the ground from TP3 and ad just L503 for maximum signal at TP1.

(9) Short TP5 to chassis and adjust L504 fo maximum signal at TP4.

(10) Move the ground from TP5 to TP6 an adjust L505 for minimum signal at TP4

(11) Remove the ground from TP6 and ad just L506 for maximum signal at TP4.

(12) Adjust L501 and L504 for maximum signal at J503. (Leave the RF amplifie cable connected to J503 and measure a the rear of the printed-circuit board.)

(13) Move the 2½-foot RF cable from th 3MC jack to the 5-mc jack and se

NOTES:

1. FREQUENCY METER AND SIGNAL GENERATOR ARE FOR OPTIONAL TRACKING TEST (SEE TRACKING TEST PROCEDURE FOR CONNECTION).
2. LETTERS L AND R DESIGNATE THE LEFT AND RIGHT RF CONNECTORS LOCATED BETWEEN THE TRANSMIT AUDIO AND HOMER CONNECTORS ON THE TS-2061/ARM-87.
3. USE THE .5UUF CAPACITOR IN SERIES WITH THE RF VOLTMETER PROBE FOR ALL MEASUREMENTS. CONNECT THE RF VOLTMETER AS DIRECTED IN THE ALIGNMENT PROCEDURE.

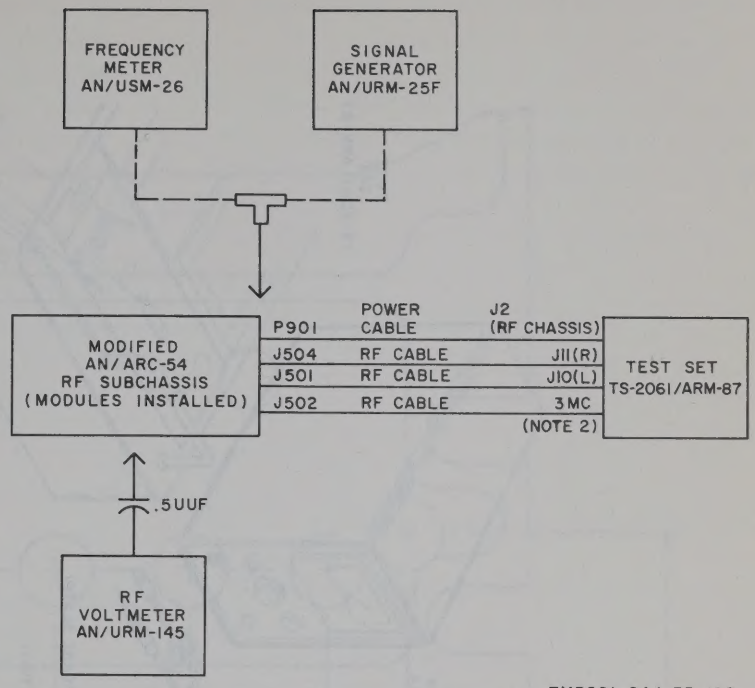


Figure 3-5. Variable IF module, alignment test setup.

the FREQUENCY SELECTOR–MC switches to 30–1–.95 and the CIRCUIT SELECTOR switches to X–X–9–9.

(14) Adjust the LOW FREQ AMPL for a reading of 10 millivolts at J502 (rear of printed-circuit board).

(15) Repeat the procedures given in (6) through (8) above, adjusting C502, C508, and C512 instead of L501, L502, and L503, respectively.

(16) Repeat the procedures given in (9) through (11) above, adjusting C518, C525, and C529 instead of L504, L505, and L506, respectively.

(17) Repeat the procedures given in (12) above, adjusting C502 and C518 instead of L501 and L504, respectively.

(18) Perform the procedure given in *c*(1) through (5) and (9) above. (The procedures given in (6) through (8) above are optional.)

c. Tracking Test. Perform the following tests (after aligning the module if tracking troubles are suspected. If the module fails this test, repeat the procedure given in *b* above until the module passes the test. If the module still does not pass the tracking test, troubleshoot the module (para. 4–7).

(1) Connect the equipment as in figure 3–5, except connect the signal generator and frequency meter to J502 on the variable IF module instead of connecting the RF cable from the 3MC jack of the module tester.

(2) Set the module tester POWER SELECTOR to NORMAL, the CIRCUIT SELECTOR to X–X–8–9, and the FREQUENCY SELECTOR–MC switches to 30–0–.00.

(3) Set up the signal generator for a 10-millivolt, 3.975–megacycle signal. Use the frequency meter to measure the frequency.

(4) Connect the electronic voltmeter to J503 on the variable IF module and fine tune the signal generator for a peak (maximum reading) on the electronic voltmeter. Record the electronic voltmeter reading.

NOTES:

1. LEGEND:
   - A- MALE CONNECTOR TO MATE WITH J2 (RF CHASSIS) ON THE TS-2061/ARM-87 COLLINS P/N 371031400 (1 EA.)
   - B- FEMALE CONNECTOR TO MATE WITH P901 (ON THE RF SUBCHASSIS) COLLINS P/N 371031900 (1 EA.)
   - C- RF MALE CONNECTOR TO MATE WITH J502 COLLINS P/N 357922700 (1 EA.)
   - D- RF MALE CONNECTORS TO MATE WITH J501, J504 AND TS-2061/ARM-87 3MC AND 5MC JACKS, COLLINS P/N 357992600 (3 EA.)
   - E- EXTENDER CABLE (FABRICATE), 2 FT. LENGTH, USE NO.26 WIRE. PINS 3, 10, 25, 33, 36, 37 MAY BE LEFT BLANK; WIRE PIN TO PIN FOR ALL OTHER PINS EXCEPT PIN 15. JUMPER PIN 15 TO PIN 16 AT -B.
   - F- RF CABLE 2 PIECES 2 FT. LENGTH AND 1 PIECE 2-1/2 FT. LENGTH COLLINS P/N 425165600
   - G- RF FEMALE CONNECTORS TO MATE WITH TS-2061/ARM-87 CONNECTORS J10(L) AND J11(R) MICRODOT P/N 31-53 (2 EA)
2. USE A SMALL SCREWDRIVER (WITH UNINSULATED BLADE) TO SHORT TEST POINTS TO GROUND (CHASSIS)
3. ACCESS TO TP6 IS THROUGH THE BASE PLATE CUTOUT AT J504. THE FIVE HOLES (DRILLED PER TEMPLATE) PROVIDE ACCESS TO TEST POINTS 1 THROUGH 5

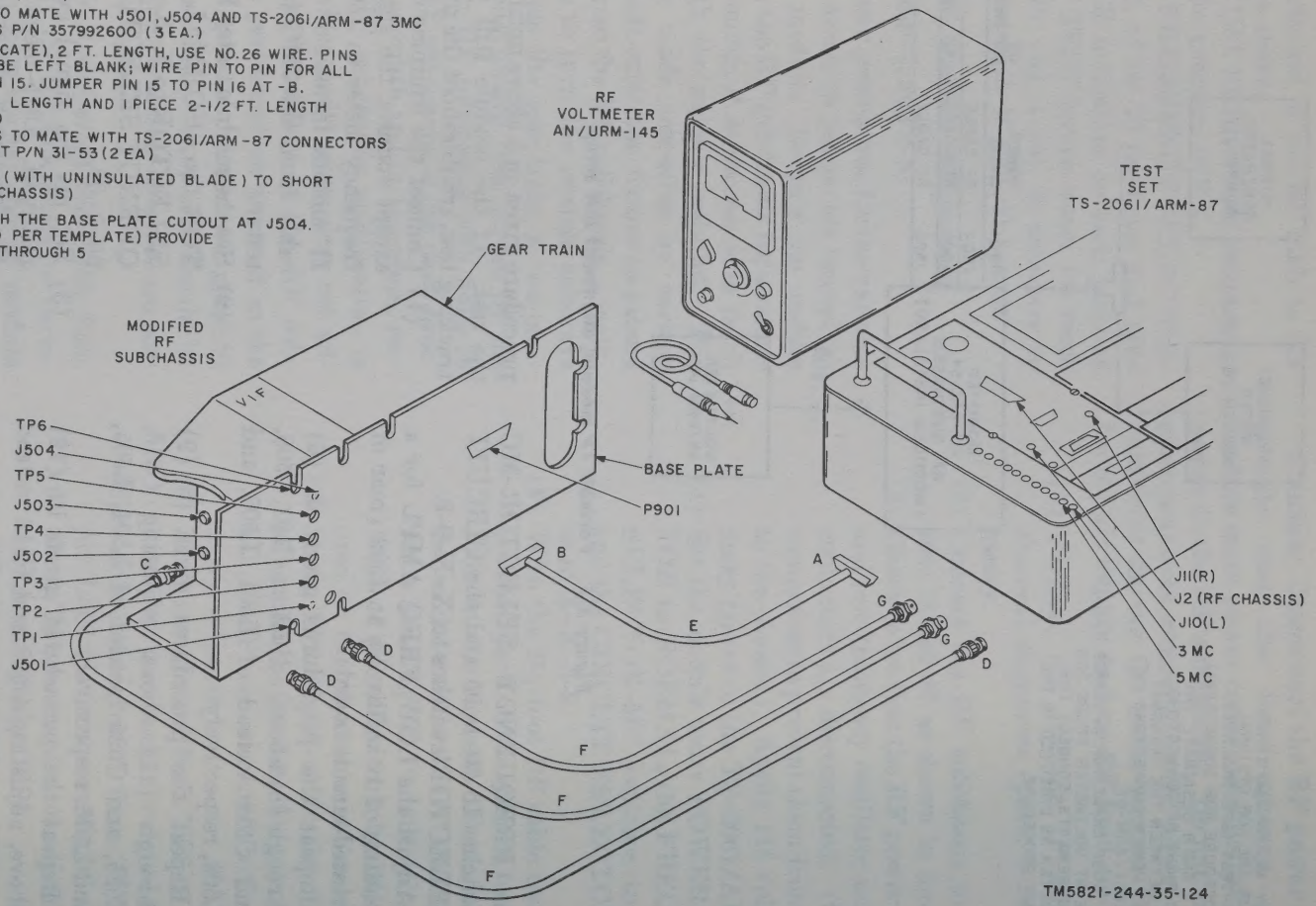


Figure 3-6. Variable IF module alignment, cable fabrication and connections.

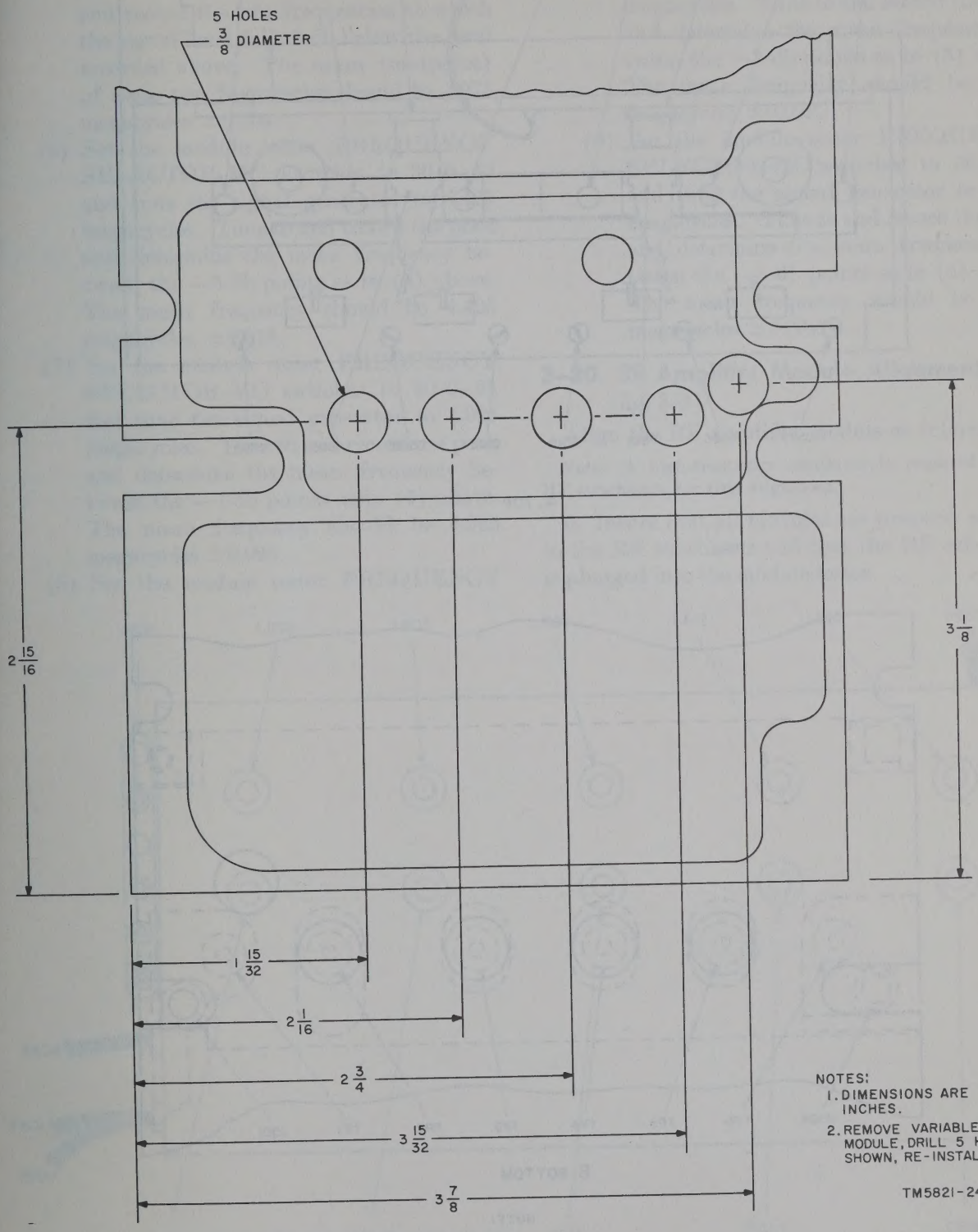
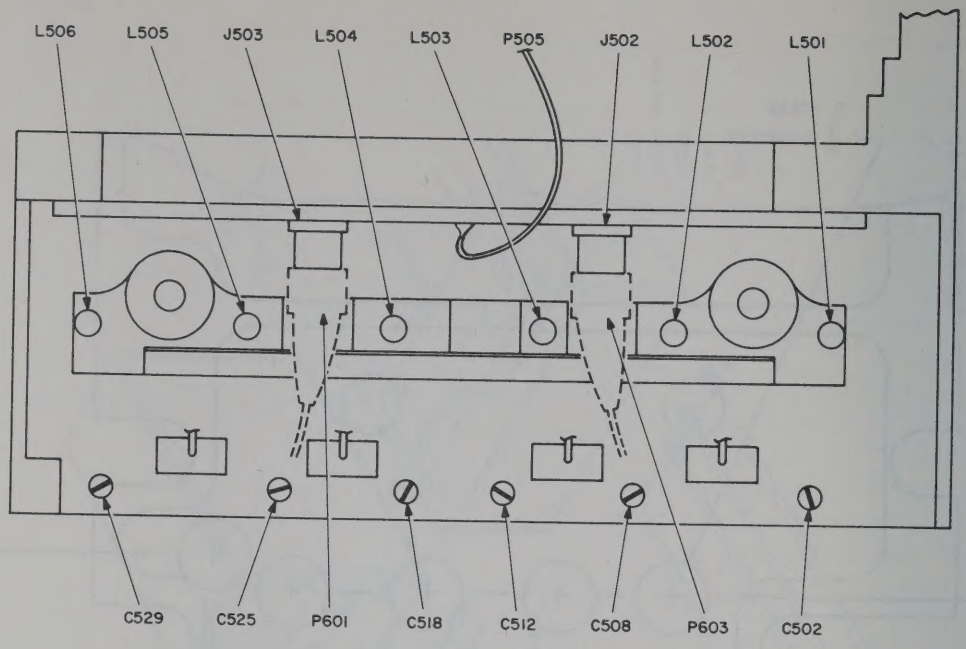
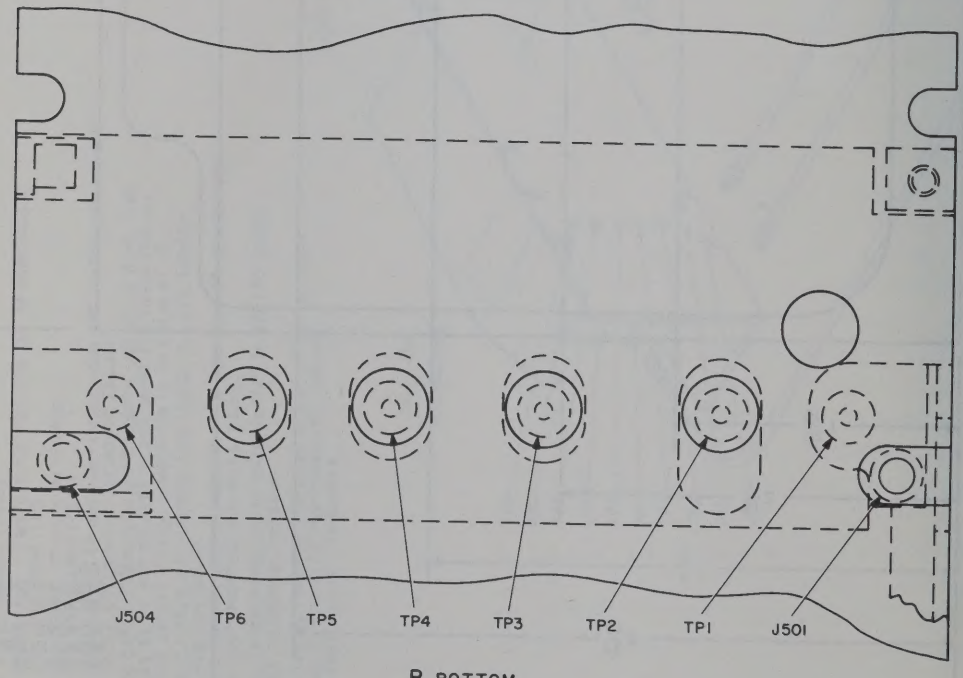


Figure 3-7. Variable IF module alignment, RF subchassis drilling template.



A. TOP



B. BOTTOM

NOTE:
THE MODIFIED RF SUBCHASSIS BASE PLATE IS SHOWN (BOTTOM VIEW) WITH SOLID LINES AND THE VIF MODULE IS SHOWN WITH DASHED LINES.

TM5821-244-35-125

Figure 3-8. Variable IF module, alignment test points.

(5) Vary the signal generator frequency above and below the center frequency and record the two frequencies at which the signal level falls 3 db below the level recorded above. The mean (midpoint) of these two frequencies should be 3.975 megacycles ±0.004.

(6) Set the module tester FREQUENCY SELECTOR-MC switches to 30-0-.40 and tune the signal generator to 4.425 megacycles. Tune to and record the peak and determine the mean frequency between the —3-db points as in (5) above. The mean frequency should be 4.425 megacycles ±0.018.

(7) Set the module tester FREQUENCY SELECTOR-MC switches to 30-0-.95 and tune the signal generator to 4.925 megacycles. Tune to and record the peak and determine the mean frequency between the —3-db points as in (5) above. The mean frequency should be 4.925 megacycles ±0.020.

(8) Set the module tester FREQUENCY SELECTOR-MC switches to 30-1-.45 and tune the signal generator to 5.425 megacycles. Tune to and record the peak and determine the mean frequency between the —3-db points as in (5) above. The mean frequency should be 5.425 megacycles ±0.022.

(9) Set the module tester FREQUENCY SELECTOR-MC switches to 30-1-.95 and tune the signal generator to 5.925 megacycles. Tune to and record the peak and determine the mean frequency between the —3-db points as in (5) above. The mean frequency should be 5.925 megacycles ±0.004.

3-20. RF Amplifier Module Alignment (fig. 3-9)

Align the RF amplifier module as follows:

Note. A high-frequency oscillator is required in the RF subchassis for this alignment.

a. Insure that all modules are properly secured to the RF subchassis and that the RF subchassis is plugged into the module tester.

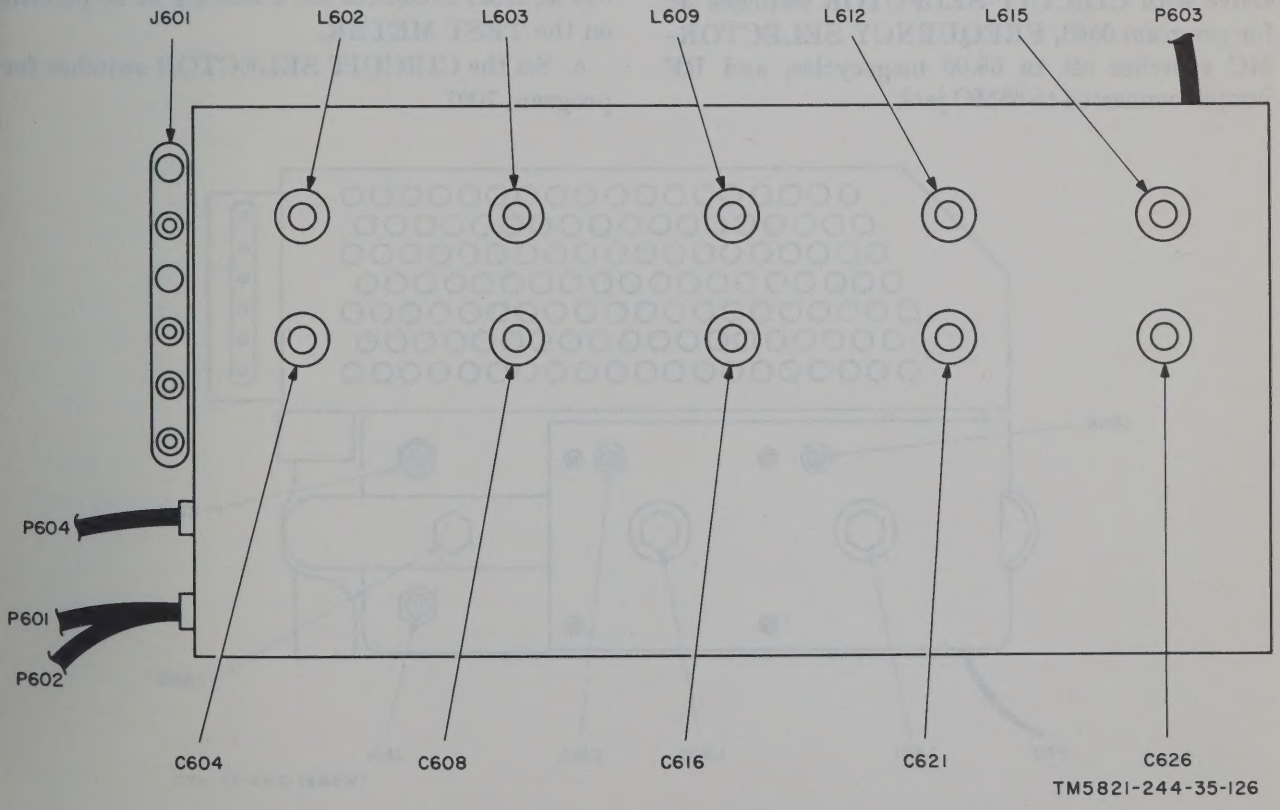


Figure 3-9. RF amplifier module, alignment test points.

b. Set the CIRCUIT SELECTOR switches on the module tester for program 0473.

c. Connect an RF jumper cable from the 30MC jack on the module tester to the RF VM1.

d. Depress the PRESS TO TEST switch and set the HIGH FREQ AMPL control for a reading of 90 percent on the module tester TEST METER.

e. Disconnect the RF jumper cable from RF VM1 and connect it from the 30MC jack to a variable RF attenuator (use HP-355B or equivalent) and connect the other end of the attenuator to P6O4 on the RF amplifier module (the cable that normally connects to the antenna relay).

f. Set the FREQUENCY SELECTOR-MC switches to 30 megacycles and set the CIRCUIT SELECTOR switches for program 6573.

g. Adjust the attenuator for a convenient reading on the TEST METER.

h. Adjust L602, L603, L609, L612, and L615 for maximum reading on the TEST METER. Use more attenuation as necessary to maintain on-scale reading.

i. Repeat the procedures given in *a* through *e* above with CIRCUIT SELECTOR switches set for program 0563, FREQUENCY SELECTOR-MC switches set to 68.00 megacycles, and RF jumper connected to 68MC jack.

j. Repeat the procedures given in *f* through above with CIRCUIT SELECTOR switches se for program 6563, FREQUENCY SELECTOR MC switches set to 68.00 megacycles, and RI jumper cable connected to 68MC jack.

k. With the configuration as in *j* above, adjus C604, C608, C616, C621, and C626 for maximun reading on the TEST METER. (L603 and C60 should be readjusted in the receiver-transmitte for minimum noise.)

3-21. RF Power Amplifier Module Alignment

(fig. 3-10)

Align the RF power amplifier module a follows:

Note. Use a known good RF subchassis complete wit properly aligned lfo, hfo, vif, and RF amplifier module

a. Insure that all modules are properly secure to the RF subchassis and the RF subchassis i plugged into the module tester.

b. Set the CIRCUIT SELECTOR switches o the module tester for program 6997 and adjust th 500 kc AMPL control for a reading of 30 percen on the TEST METER.

c. Set the CIRCUIT SELECTOR switches fo program 7097.

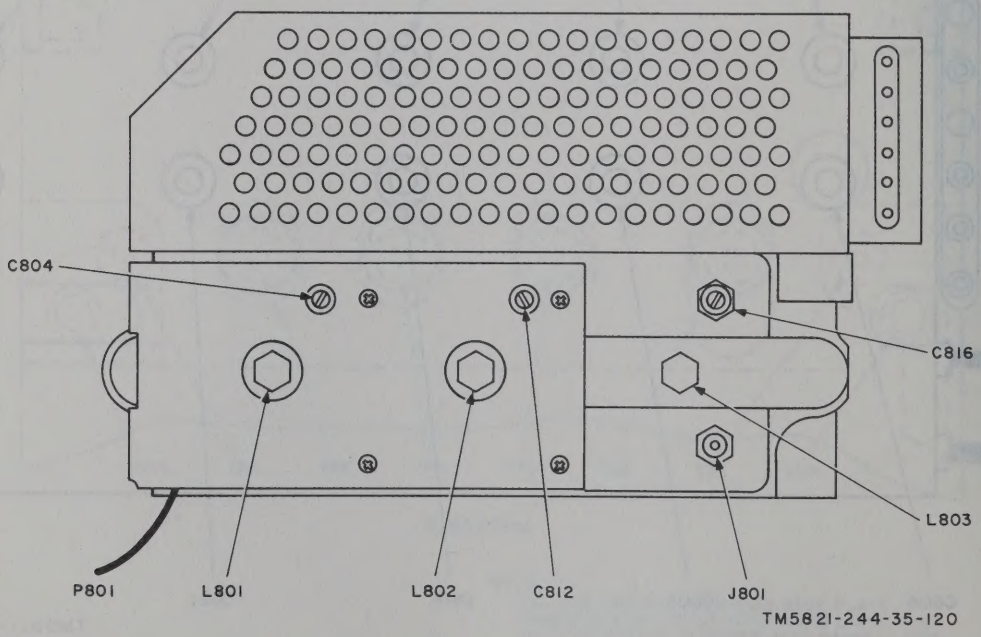


Figure 3-10. RF power amplifier module, alignment test points.

d. Set the FREQUENCY SELECTOR-MC switches to 30.00 mc.

e. Set the POWER SELECTOR switch to HIGH VOLTAGE. (This action keys the power amplifier.)

***Caution:* Do not leave the high voltage on any longer than is absolutely necessary as this causes undue heat buildup which will shorten the life of the power amplifier module.**

f. Adjust L801 and L802 (fig. 3-10) on the module for maximum reading on the TEST METER.

g. Set the CIRCUIT SELECTOR switches for program 9X97 and adjust L803 for minimum reading on the TEST METER.

h. Set the CIRCUIT SELECTOR switches for program 7097 and set the FREQUENCY SELECTOR-MC switch to 69.95 mc (60-9-.95) and adjust C804 and C812 for maximum reading on the TEST METER.

i. Using the same switch settings as in *g* above; adjust C816 for minimum reading on the TEST METER.



CHAPTER 4

GENERAL SUPPORT AND DEPOT MAINTENANCE

Section I. TROUBLESHOOTING

4-1. General Maintenance Information

This chapter covers all maintenance of Radio Set AN/ARC-54 that is performed at general support or depot level except alignment procedures, which are covered in paragraphs 3-14 through 3-21. Direct support maintenance (paras. 2-1 through 2-17 and paras. 3-1 through 3-21) includes sectionalization of trouble to a defective unit, removal and replacement of units, localization of troubles within units to a faulty chassis-mounted part or plug-in modules, and removal and replacement of chassis-mounted parts and plug-in modules. The RF subchassis is not maintained by direct support personnel. General support and depot maintenance (paras. 4-1 through 4-38) begins at the module level and includes localization of troubles within modules to a stage and isolation within the stage to a faulty part. General and depot maintenance also includes localization of RF subchassis troubles to a faulty submodule or chassis part and isolation of trouble within submodules. All module repairs are performed at general support or depot level. The antenna coupler is also maintained at general support or depot level. Procedures are provided in this section for troubleshooting the RF subchassis (para. 4-2), the RF submodules (paras. 4-3 through 4-9), the main chassis modules (paras. 4-10 through 4-17), and the antenna coupler (para. 4-21). The troubleshooting charts are keyed to trouble symptoms as observed by the operator. Module performance tests are provided (following each troubleshooting chart) to determine whether the module operates satisfactorily after repair. The tests are also useful for determining the operating condition of any doubtful module. This chapter also includes supplementary troubleshooting data such as voltage and resistance diagrams, dc resistance of coils and transformers, signal substitution checks, stage gain measurements, and parts identification illustrations. These data are referenced in the troubleshooting charts when particularly applicable. Keep in mind, however, that the charts are guides to aid in making a start. Use the supplementary data to understand equipment troubles. Do not rely completely on the charts; reference to the theory in paragraphs 1-1 through 1-95 is essential for efficient troubleshooting of the radio set.

4-2. RF Subchassis Troubleshooting

(figs. 4-1 and 4-2)

a. Test Equipment Required. The following test equipment is required for the troubleshooting procedures given in paragraphs 4-2 through 4-22.

b. RF Subchassis Operational Tests. The following operational tests provide a quick check of RF subchassis performance. The procedure is divided into checks of the performance of each module. Steps 8 and 11 (receive gain and transmit gain, respectively) check the overall performance of the RF subchassis. These tests, except for oscillator frequency tests, require no test equipment except the module tester (AN/ARM-87) and can be performed in a relatively short time. Unless previous checks have resulted in reference to a particular module, perform these tests before using the troubleshooting chart. Since the tests indicate individual module performance as well as overall performance, the tests will be useful for localization of the trouble to a module. Use the troubleshooting chart (*c* below) for further troubleshooting if these tests do not provide conclusive evidence as to the faulty module. Perform the tests again after repairing the module to insure that the trouble no longer exists and that no new troubles have appeared. Figures 4-1 and 6-7 show module removal. Figure 4-2 shows RF

subchassis chassis-mounted parts. Use the AN/ARM-87 to perform the tests below.

Notes:

1. In cases where checks suggested in the chart fail to localize the trouble, suspect the chassis wiring and RF cables and connections. Refer to figure 6-8 for chassi wiring checks. Make all resistance measurements wit power off.

2. X in the CIRCUIT SELECTOR switches column in dicates that any setting is satisfactory.

Test equipment	Technical manual	Common name
Test Set, Electronic Circuit Plug-In Unit AN/ARM-87	TM 11-6625-467-12	Module tester.
Radio Interference Measuring Set AN/URM-85	TM 11-6625-351-12	
Signal Generator AN/URM-48	TM 11-1257	Fm signal generator.
Signal Generator AN/USM-44A	TM 11-6625-508-10	RF signal generator.
Oscilloscope AN/USM-81 with AM-3174A/USM	TM 11-6625-219-12	Oscilloscope.
Maintenance Kit, Electronic Equipment MK-733/ARC-54	TM 11-6625-601-12	Maintenance kit.
Admittance Meter, General Radio Model 1602B		
Audio Oscillator TS-382/U	TM 11-2684	Audio oscillator.
Voltmeter, Electronic AN/URM-145	TM 11-6625-524-14	RF voltmeter.
Frequency Meter AN/USM-26	TM 11-5057	Frequency meter.
Electronic Voltmeter ME-30B/U	TM 11-6625-320-12	Electronic voltmeter.
Multimeter ME-26A/U	TM 11-6625-200-12	Multimeter.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	Lfo RF amplitude	0	5	X	X	(1) Connect RF jumper cable W1 from RF VM2 to RF output cable from J401 (LFO module). (2) Set FREQUENCY SELECTOR-MC switches to 30.00. (3) Depress PRESS TO TEST button and read TEST METER. (4) Repeat (2) and (3) above for frequency settings of 30.05 to 30.95 in 0.05 increments. (5) Remove RF jumper cable connected in (1) above.	10	5
2	Lfo dc to meter	1	X	5	X	(1) Set FREQUENCY SELECTOR-MC switches to 30. (2) Depress PRESS TO TEST button and read TEST METER. (3) Repeat steps (1) and (2) above for frequency settings of 30.05 to 30.95 in 0.05 increments.	17	8
3	Lfo frequency checks	0	5	X	X	Connect an RF cable between J401 on the module and the AN/USM-26 and measure the oscillator output frequency. Set FREQUENCY SELECTOR-MC switches on module tester to each 0.05 megacycle and check the frequency at each setting. The frequencies should be as follows: *Setting (mc)* — *Reading (kc)* 0.00 — 4,475±0.270 .05 — 4,525±0.270 .10 — 4,575±0.270 .15 — 4,625±0.270 .20 — 4,675±0.270 .25 — 4,725±0.270	NA	NA

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
						Setting (mc) — *Reading (kc)* 0.30 — 4,775±0.270 .35 — 4,825±0.270 .40 — 4,875±0.270 .45 — 4,925±0.270 .50 — 4,975±0.270 .55 — 5,025±0.270 .60 — 5,075±0.270 .65 — 5,125±0.270 .70 — 5,175±0.270 .75 — 5,225±0.270 .80 — 5,275±0.270 .85 — 5,325±0.270 .90 — 5,375±0.270 .95 — 5,425±0.270		
4	Hfo RF amplitude	0	5	X	X	(1) Disconnect cable attached to J301 on hfo module. (2) Connect RF jumper cable W4 from RF VM3 to J301 (hfo module). (3) Set FREQUENCY SELECTOR-MC switches to 30. (4) Depress PRESS TO TEST button and read TEST METER. (5) Repeat (3) and (4) above for all even megacycle frequencies (for example: 32, 34, etc.). (6) Remove the RF jumper cable from RF VM3 and J301 (hfo module). Replace cable removed from J301 in (1) above.	20	60
5	Hfo dc to meter	1	X	4	X	(1) Set FREQUENCY SELECTOR-MC switches to 30. (2) Depress PRESS TO TEST button and read TEST METER. (3) Repeat (1) and (2) above for all even megacycle frequencies (for example: 32, 34, etc.).	17	80
6	Hfo frequency checks	0	5	X	X	*Connect an RF cable* from J301 of the module to the AN/USM-26 and measure the oscillator output frequency. Set FREQUENCY SELECTOR-MC switches on the module tester to each even megacycle setting from 30 to 68 megacycles and check the frequency at each setting. The frequencies should be as follows: *Setting (mc)* — *Reading (kc)* 30 — 26,025±3.2 32 — 28,025±3.2 34 — 30,025±3.2 36 — 32,025±3.2 38 — 34,025±3.2 40 — 36,025±3.2 42 — 38,025±3.2 44 — 40,025±3.2 46 — 42,025±3.2 48 — 44,025±3.2 50 — 46,025±3.2	NA	NA

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
						Setting (mc) — *Reading (kc)* 52 — 48, 025±3. 2 54 — 50, 025±3. 2 56 — 52, 025±3. 2 58 — 54, 025±3. 2 60 — 56, 025±3. 2 62 — 58, 025±3. 2 64 — 60, 025±3. 2 66 — 62, 025±3. 2 68 — 64, 025±3. 2		
7*a*	Variable IF receive gain (low end).	0	1	8	9	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL control for 50% on TEST METER.		
		(AN/ARM–87 cal)						
		6	4	8	9	(2) Disconnect the cable attached to J502 (variable IF module) and connect RF jumper cable W4 from 3MC jack to J502 (variable IF module). (3) Set FREQUENCY SELECTOR–MC switches to 30. (4) Depress PRESS TO TEST button and read TEST METER.	10	6
7*b*	Variable IF receive gain (high end).	0	2	9	9	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL control for 50% on TEST METER.		
		(AN/ARM–87 cal)						
		6	4	9	9	(2) Move RF jumper cable W4 from 3MC jack to 5MC jack. (3) Set FREQUENCY SELECTOR–MC switches to 69.95. (4) Depress PRESS TO TEST button and read TEST METER. (5) Remove RF jumper cable from J502 (variable IF module) and the 5MC jack. Replace cable removed in step 7*a*(2).	10	6
8*a*	Receive gain (30 mc)----	0	4	7	3	(1) Connect RF jumper cable W4 from 30MC jack to RF VM1.		
		(AN/ARM–87 cal)						
						(2) Depress the PRESS TO TEST button and adjust HIGH FREQ AMPL for 90% on TEST METER.		
		6	5	7	3	(3) Remove RF jumper cable W4 from RF VM1 and connect it to one end of 70-db attenuator. (4) Connect RF jumper cable W2 from other end of 70-db attenuator to P604 (antenna input, RF amplifier module). (5) Set FREQUENCY SELECTOR–MC switches to 30. (6) Depress PRESS TO TEST button and read TEST METER. (7) Remove RF jumper cable W4 from 30MC jack.	17	

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
8*b*	Receive gain (68 mc)----	0	5	6	3 (AN/ARM–87 cal)	(1) Connect RF jumper cable W5 from 68MC jack to RF VM1.		
						(2) Depress PRESS TO TEST button and adjust HIGH FREQ AMPL for 90% on TEST METER.		
		6	5	6	3	(3) Remove RF jumper cable W5 from RF VM1 and 68MC jacks.		
						(4) Connect RF jumper cable W4 from 68MC jack to P604 (antenna input, RF amplifier module).		
						(5) Set FREQUENCY SELECTOR–MC switches to 68.		
						(6) Depress PRESS TO TEST button and read TEST METER.	17	
						(7) Remove RF jumper cable W2 and W4 and replace 70-db attenuator in its storage area.		
9*a*	RF amplifier transmit mode (30 mc).	0	1	8	9 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL for 100% on TEST METER.		
		0	5	8	9	(2) Set the POWER SELECTOR to HIGH VOLTAGE.		
						(3) Disconnect P601 (RF amplifier module) from J503 (variable IF module).		
						(4) Connect RF jumper cable W2 from 3MC jack to P601 (RF amplifier module).		
						(5) Disconnect P801 (power amplifier module) from J602 (RF amplifier module).		
						(6) Connect RF jumper cable W3 from RF VM4 to J602 (RF amplifier module).		
						(7) Set FREQUENCY SELECTOR–MC switches to 30.		
						(8) Depress PRESS TO TEST button and read TEST METER.	5	
						(9) Disconnect RF jumper cable W2 from 3MC jack.		
9*b*	RF amplifier transmit mode (69.95 mc).	0	2	9	9 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL for 100% on TEST METER.		
		0	5	9	9	(2) Connect RF jumper cable W2 from 5MC jack to P601 (RF amplifier module).		
						(3) Set FREQUENCY SELECTOR–MC switches to 69.95.		
						(4) Depress PRESS TO TEST button and read TEST METER.	5	
						(5) Disconnect RF jumper cable W2 from 5MC jack and W3 from RF VM4 and J602 (RF amplifier module).		
						(6) Reconnect P801 (power amplifier module) to J602 (RF amplifier module).		
						(7) Reconnect P601 (RF amplifier module) to J503 (variable IF module).		

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
10*a*	RF amplifier and power amplifier module (30 mc).	0	1	8	9 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL for 100% on TEST METER.		
		0	0	8	9	(2) Set POWER SELECTOR switch to HIGH VOLTAGE.		
						(3) Disconnect P601 (RF amplifier module) from J503 (variable IF module).		
						(4) Connect RF jumper cable W2 from 3MC jack to P601 (RF amplifier module).		
						(5) Set FREQUENCY SELECTOR-MC switches to 30.		
						(6) Depress PRESS TO TEST button and read TEST METER.	50	
						(7) Disconnect RF jumper cable W2 from 3MC jack.		
						(8) Set POWER SELECTOR switch to NORMAL.		
10*b*	RF amplifier and power amplifier modules (69.95 mc).	0	2	9	9 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL control for 100% on TEST METER.		
		0	0	9	9	(2) Set POWER SELECTOR switch to HIGH VOLTAGE.		
						(3) Connect RF jumper cable W2 from 5MC jack to P601 (RF amplifier module).		
						(4) Set FREQUENCY SELECTOR-MC switches to 69.95.		
						(5) Depress PRESS TO TEST button and read TEST METER.	50	
						(6) Disconnect RF jumper cable W2 from 5MC jack and P601 (RF amplifier module).		
						(7) Set POWER SELECTOR switch to NORMAL.		
						(8) Connect P601 (RF amplifier module) to J503 (variable IF module).		
11	Transmit gain	6	9	9	7 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 30% on TEST METER		
		0	0	9	7	(2) Set POWER SELECTOR switch to HIGH VOLTAGE.		
						(3) Set FREQUENCY SELECTOR-MC switches to 30.		
						(4) Depress PRESS TO TEST button and read TEST METER.	50	
						(5) Repeat (3) and (4) above for the following frequency settings:		
						32.05 54.60		
						34.10 56.65		
						36.15 58.70		
						38.20 60.75		
						40.25 62.80		
						42.30 64.85		
						44.35 66.90		
						46.40 69.95		
						48.45 64.85		
						49.25 66.90		
						52.55 69.95		

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
						(6) Set POWER SELECTOR switch to NORMAL.		
12*a*	Power amplifier alignment check.	6 (AN/ARM–87 cal)	9	9	7	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 30% on TEST METER.		
		0	0	9	7	(2) Set POWER SELECTOR switch to HIGH VOLTAGE.		
						(3) Set FREQUENCY SELECTOR–MC switches to 30.		
						(4) Depress PRESS TO TEST button and read TEST METER.	50	
						(5) Repeat (3) and (4) above for the following frequency settings: 40.25 60.75 49.25 69.95	[a] 50	
						(6) Set POWER SELECTOR switch to NORMAL.		
[b] 12*b*	Power amplifier grid current (30 mc).	7	0	9	7	Depress PRESS TO TEST button and adjust L801 and L802 (power amplifier module) for a maximum reading on TEST METER.	15	70
[b] 12*c*	Power amplifier plate current (30 mc).	9	X	9	7	Depress PRESS TO TEST button and adjust L803 (power amplifier module) for a minimum reading on TEST METER.	25	80
[b] 12*d*	Power amplifier grid current (69.95 mc).	7	0	9	7	(1) Set FREQUENCY SELECTOR–MC switches to 69.95.		
						(2) Depress PRESS TO TEST button and adjust C804 and C812 (power amplifier module) for a maximum reading on TEST METER.	15	70
[b] 12*e*	Power amplifier alignment.	----------				Repeat steps 12*a* through 12*d* until no further improvement in the readings can be made.		

[a] If reading is not within limits on all specified frequencies, perform steps 12*b* through 12*e*.
[b] Not required unless the requirements of step 12*a* are not met.
NA—Not applicable.

c. General Troubleshooting Information. The chart (*d* below) lists trouble indications as the troubles would appear to the organizational repairman, probable causes of the troubles, and procedures for localizing the troubles to a module or chassis part. Use the chart to supplement the operational test procedure provided in *b* above. The troubles are grouped into the following general types: troubles indicated by TEST METER tests, primary power troubles, receiver troubles, tuning troubles, and transmitter troubles. The following illustrations and data are provided and should be used as an aid in troubleshooting.

(1) RF subchassis module removal, exploded view (fig. 6–7).
(2) RF subchassis module removal, gear-train side (fig. 4–1).
(3) RF subchassis parts identification (fig. 4–2).
(4) RF subchassis wiring diagram (fig. 6–8).
(5) Receiver-Transmitter, Radio RT–348/ARC–54 wiring diagram (fig. 6–18).
(6) RF subchassis, mechanical alignment (fig. 3–2).

(7) Mechanical drive module, alignment and locking (fig. 3–3).
(8) Double-conversion superheterodyne system, functional block diagram (fig. 1–32).
(9) Mode of operation control circuits for Radio Set AN/ARC–54 (fig. 6–23).
(10) Mechanical tuning assembly, schemati diagram (fig. 1–33).
(11) Power distribution circuits (fig. 6–21)
(12) Push-to-talk circuits, functional sche matic diagram (fig. 6–4).
(13) Functioning of equipment (paras. 1– through 1–96).

d. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
	TROUBLES INDICATED BY TEST METER CHECKS		
1	Abnormal receiver-transmitter TEST METER reading on position 3 of RT–348/ARC–54 TEST SWITCH.	Low-frequency oscillator module improperly aligned or defective.	Check mechanical alignment of lov frequency oscillator module (para. 3–18 If good, check adjustment of trimme capacitor C401 in low-frequency osci lator module (para. 3–18). If this fai to correct the fault, replace modul (para. 4–24).
2	Abnormal TEST METER reading on position 4 of RT–348/ ARC–54 TEST SWITCH.	High-frequency oscillator module improperly aligned or defective.	Check mechanical alignment of high frequency oscillator module (para. 3–17 If good, check electrical alignmer (para. 3–20). If this check fails to co rect the fault, replace module (para 4–24).
3	Abnormal TEST METER reading on position 6 of RT–348/ ARC–54 TEST SWITCH.	Defective AGC circuit. Trouble is probably in variable IF module or RF amplifier module (assuming that fixed IF module is good).	Localize trouble (if the RF subchassis at fault) by substituting good R amplifier and variable IF modules fo the suspected ones (one at a time) Refer to paragraph 4–24 for removal an replacement instructions. If this doe not correct the fault, check RF sub chassis wiring (fig. 6–8).
4	Abnormal TEST METER reading on positions 8 and 9 of RT–348/ARC–54 TEST SWITCH (all frequencies).	Low (or no) RF output could be caused by improper alignment, or a failure in any of the modules on RF subchassis.	Perform operational tests in *b* above. Be fore replacing a module, check modul mechanical alignment (para. 3–16) Refer to paragraph 4–24 for module re placement instructions. Remember t align any module that you replace.
5	Abnormal TEST METER reading on position 9 of RT–348/ ARC–54 TEST SWITCH (power supply module checks good).	Power amplifier has a defect that is overloading the +500-volt supply, or chassis wiring (500-volt line) is defective.	Unplug power amplifier module connecto P903 and check for a short (or low re sistance) to chassis pin A. If chassi wiring is satisfactory, check module fo a short (or low resistance) to modul chassis at pin A of FL801. Replace module if necessary (para. 4–24). I trouble is not chassis wiring or modul wiring, check power amplifier tube V80 for internal shorting and replace i necessary (para. 3–4).
6	Abnormal TEST METER reading on position 10 of RT–348/ ARC–54 TEST SWITCH.	Same as item 4 or harmonic filter module.	Same as item 4 or harmonic filter modul (para. 4–10).
7	Abnormal TEST METER reading on positions 8 and 10 of RT–348/ARC–54 TEST SWITCH on some frequencies.	Same as item 4	Same as item 4.

Item	Indication	Probable trouble	Procedure
		PRIMARY POWER	
8	Fuse F1001 blows when power is applied.	Power amplifier, RF amplifier, or mechanical drive module or RF subchassis wiring.	If previous checks (*b* above) have localized trouble to a module on RF subchassis, replace the module (para. 4–24). If trouble has not been localized, disconnect RF amplifier module and power amplifier module power connectors and apply power to RF subchassis. If fuse still blows, mechanical drive module or RF subchassis wiring is defective. Use wiring diagram (fig. 6–8) for ohmmeter checks. Refer to figure 6–21 for distribution of dc power. Replace mechanical drive module only after other checks have failed to locate the trouble. (Refer to para. 4–24 for module replacement instructions.) If fuse does not blow with RF amplifier module connectors disconnected, one of the unplugged modules is at fault. Reconnect one of them and again apply power.
9	Fuse F1002 blows when power is applied.	This could be caused by RF subchassis wiring or by any module except the mechanical drive module.	Unplug the main electrical connectors for all the modules except the mechanical drive. Apply power to RF subchassis. If a fuse blows, check chassis wiring (fig. 6–8). If a fuse does not blow, plug in the module connectors, one at a time (remove power while making connections), until the defective module is isolated. Refer to figure 6–21 for distribution of dc power. Replace the module (para. 4–24).
10	Fuse F1001 blows when transmit button is depressed.	Power amplifier module or chassis wiring.	Disconnect power amplifier main power connector P903 and apply power. If fuse blows, check chassis wiring (fig. 6–8); otherwise, replace power amplifier module (para. 4–24). Refer to figure 6–21 for distribution of dc power.
11	Fuse F1001 blows when new frequency is selected.	Mechanical drive module defective motor or relay.	Replace mechanical drive module (para. 4–24). Perform mechanical alignment on all modules after replacing mechanical drive module (para. 3–16). Refer to figure 6–21 for distribution of dc power.
12	Fuse F1002 blows when transmit button is depressed.	RF amplifier module, variable IF module, power amplifier module, or chassis wiring.	Disconnect main power connectors from power amplifier, RF amplifier, and variable IF modules and apply power. If fuse blows, check chassis wiring (fig. 6–8). If fuse does not blow, reconnect each connector one at a time starting with the variable IF module and ending with the power amplifier. Replace the module last connected when a fuse blows. (Remove power while making connections.) Refer to figure 6–21 for distribution of dc power.

Item	Indication	Probable trouble	Procedure
		RECEIVER	
13	Dead receiver-transmitter (no reception or transmission).	Caused by any module, defective chassis wiring, or a defective coaxial cable or connector.	Disconnect main connector from eac module and check for operating voltag at applicable pins (figs. 6–21). If vol ages are present at all module conne tors, reconnect them and make pe formance checks (*b* above) to locali the trouble to a module.
14	Weak or intermittent reception on all frequencies (squelch disabled).	Alignment, low stage gain in one or more modules, defective coaxial cable, or faulty connector mating.	If reception is intermittent, check a cables and connectors. If cables a satisfactory, check mechanical and ele trical alignment of all modules (para 3–16 through 3–21). If alignment good, check gain of each module b making performance checks (*b* above
15	Poor reception and transmission on some frequencies (good on others).	Module improperly aligned, defective tuned circuit, defective mechanical assembly in one of the tunable modules, or defective gear train.	Tune the RF subchassis to several fr quencies while observing action mechanical assembly. If tuning jerky, look for trouble in the gear trai mechanical drive module, or one of th module mechanical assemblies. (Refe to paragraphs 4–23 through 4–32 fo repair procedures for mechanical a semblies.) If tuning appears to b smooth, tune to a bad channel and mak performance checks (*b* above) to localiz the trouble to one of the module tune circuits. Align the faulty module (para 3–17 through 3–21), or replace th module (para. 4–24).
16	Reception fades after several minutes of operation (transmission good).	RF amplifier or variable IF module.	Operate the RF subchassis with a signa input until the output fades. Make th performance checks (*b* above).
17	Reception and transmission fade after several minutes of operation.	Low-frequency oscillator, high-frequency oscillator, variable IF module, or RF amplifier module	Use a frequency meter, and check bot oscillators for frequency stability (Check the low-frequency oscillator a J401 and the high-frequency oscillato at J301.) If both oscillators are stable and the level of the oscillator signal does not drop when reception fades make the performance checks in above. If transmit mode is being use for checking, check the variable I module first. Replace the bad modul (para. 4–24).
18	Reception is distorted	Improper alignment or a defective module.	Perform the tests given in *b* above. If n trouble is indicated, substitute module on RF subchassis until distortion i eliminated. Check alignment of sus pected module (paras. 3–16 through 3–21).
19	Received signal has high level of background noise.	Variable IF module or RF amplifier module.	Check, with an oscilloscope, for excessiv noise at the RF amplifier module output (P603). If excessive noise is present replace the module (para. 4–24). If not replace the variable IF module (para 4–24). If trouble still exists, look fo a bad coaxial cable or connector.

Item	Indication	Probable trouble	Procedure
		TUNING	
20	No channeling tone during channeling.	Mechanical drive module or RF subchassis wiring.	Make sure the RF subchassis is tuned to 30 mc. Remove the mechanical drive module (para. 4–24) and check chassis wiring between pin 13 of P901 (main RF subchassis connector) and pin 10 of J901 (mechanical drive module mating connector) and between pin 22 of P901 and pin 1 of J901. If the wiring is good, replace the mechanical drive module with a new one. Realign all module tuning shafts after installing the mechanical drive module (para. 3–16).
21	Radio will not tune	Mechanical drive module, chassis wiring, gear train, one of the tunable module mechanical assemblies, or improper length screws used to secure modules to gear train.	Replace the mechanical drive module (para. 4–24). If this does not correct the fault, check the RF subchassis wiring between J901 (mechanical drive connector) and P901 (RF subchassis main connector). If the wiring is good, try disengaging the tuning shaft of each module from the gear train. If one of the module mechanical assemblies is binding, replace the module (para. 4–24). *Note.* Check for a foreign object lodged in the variable IF module gear train. Also, check to see that the power amplifier slug rack is not bumping against coaxial connector CP1003 (rotate the connector to clear). If the modules are satisfactory, check the RF subchassis gear train for binding. (Refer to para. 4–25 for gear-train repairs.) Check for proper length module mounting screws (fig. 4–1).
22	Radio does not tune to correct channel or intermittently fails to tune.	Mechanical drive module, or RF subchassis wiring or mating connector.	Tune to 30 mc if possible. Replace the mechanical drive module (para. 4–24). If this fails to correct the trouble, check the chassis wiring between P901 (RF subchassis main connector) and J901 (mechanical drive mating connector). Use the RF subchassis wiring diagram (fig. 6–8) to check wiring.
23	Radio set takes too long to tune	Mechanical drive module, gear train, or one of the tunable module mechanical assemblies.	Replace the mechanical drive module (para. 4–24). If this fails to correct the trouble, check each module for excessive tuning shaft drag. (If in doubt about how much torque is normally required for any module, compare it with a known good module. The difference should be noticeable because small discrepancies in torque will not slow the tuning significantly.)
24	Channeling tone continues after channeling is complete.	Mechanical drive module or RF subchassis wiring.	Check to see that the RF subchassis is tuned to 30 mc. Replace the mechanical drive module (para. 4–24). If this fails to correct the fault, check the RF subchassis wiring between J901 (mechanical drive module connector) and P901 (RF subchassis main connector). Check for ground on wires that should not be grounded.

Item	Indication	Probable trouble	Procedure
		TUNING—Continued	
25	Unusual mechanical noises during tuning.	Mechanical drive module, gear train, mechanical assembly of one of the modules, or wrong length screws used to secure modules.	If the source of noise cannot be located b listening, remove the modules, one at time, until the noisy one is remove (para. 4-24). Check to see that prop length screws are used to mount modul (fig. 4-1). Remember to realign mo ules that were removed (para. 3-16).
26	No reception or transmission on any channel except 30 mc.	Mechanical drive module defective, gear train locked up, or loose tuning shaft setscrews.	If the mechanical drive module is runnir (shafts turning) but other modules d not follow, check for absence or loos ness of tuning shaft setscrews. If th mechanical drive module is trying run but the gear train refuses to mov check for binding in one of the modul (check for proper screw lengths (fi 4-1)). If all other fails, replace th mechanical drive module (para. 4-24 Remember to realign modules after r placing the mechanical drive (par 3-16).
27	Modules will not track properly after repeated attempts to align them.	Mechanical drive module, gear train, or module mechanical assemblies have excessive backlash, worn cams, or mechanical drive module has defective drive assembly.	First, observe the operation of the tu ing racks in the power amplifier an variable IF modules. The racks ma be binding against something (tur completely through the band). Nex remove all modules (except mechan cal drive) and check for excessive bac lash in gear train. (Any backlash tha is easily discernible is excessive.) In spect the gear teeth that mesh wit module drive shafts. (Refer to para 4-25 for gear train repair procedures If the gear train seems satisfactory, re place the mechanical drive modul (para. 4-24). Remember to realig all modules after installing the new me chanical drive (para. 3-16). If troubl still exists, try operating each module i a known good RF subchassis. (Th most probable cause, if a module is a fault, is a cam in power amplifier o variable IF module either worn or ro tated slightly on the shaft, or a warpe push rod or slug rack.)
		TRANSMITTER	
28	Weak or no transmission on all frequencies.	RF subchassis wiring, alignment, or any module.	To localize the trouble to a module, per form the tests given in *b* above. Try aligning the module (para. 3-16). If this fails to restore operation replace the module (para. 4-24). If this fails to restore operation, check all coaxial cables and connectors and check chassis wiring (fig. 6-8).

Item	Indication	Probable trouble	Procedure
		TRANSMITTER—Continued	
29	Weak or no transmission on some frequencies.	If the defective channels are adjacent to each other (all at high, middle, or low end of the band), the trouble is probably improper tracking. If there are one or more defective channels that are scattered (not adjacent), the trouble is probably improper oscillator frequencies (defective crystals or oscillator alignment).	Check for proper oscillator signals (amplitude and frequency) (*b* above). If oscillator outputs are correct on the affected frequency, check RF and IF signal levels at all module inputs and outputs to localize the trouble to a module (*b* above). Check alignment of suspected module (paras. 3–11 through 3–21).
30	Transmission fades after several minutes of operation.	Oscillator drift or defective tubes in power amplifier module.	Check power amplifier tubes first. Perform tests given in *b* above.
31	Transmission is noisy	Defective module, loose coaxial connector, improper alignment, poor bonding between modules and their covers, or modules not making good contact with the chassis.	Check to see that coaxial connectors are tight and shields are properly grounded. Check power amplifier tubes. Use an oscilloscope to check all RF and IF signals for excessive noise at module inputs and outputs. Check for improper alignment (paras. 3–16 through 3–21). Substitute modules one at a time until noise is reduced. Check capacitors on RF subchassis, reheating solder joints or replacing capacitors as necessary.
32	Transmission is distorted	Improper alignment, or a defective module.	Check the mechanical alignment of all modules (para. 3–16). If alignment is good, replace each module on the RF subchassis until the distortion is eliminated.

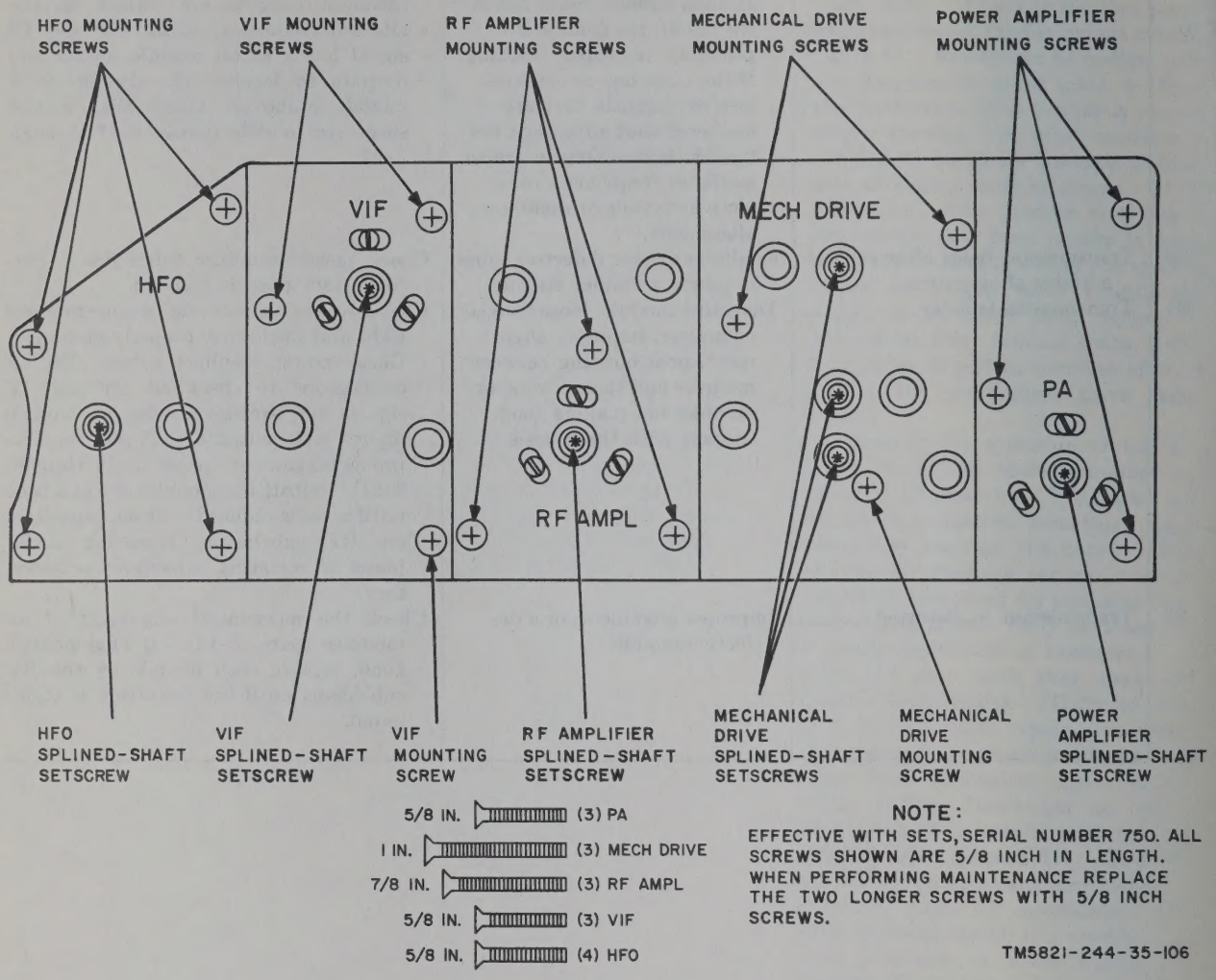


Figure 4-1. RF subchassis module removal, gear-train side.

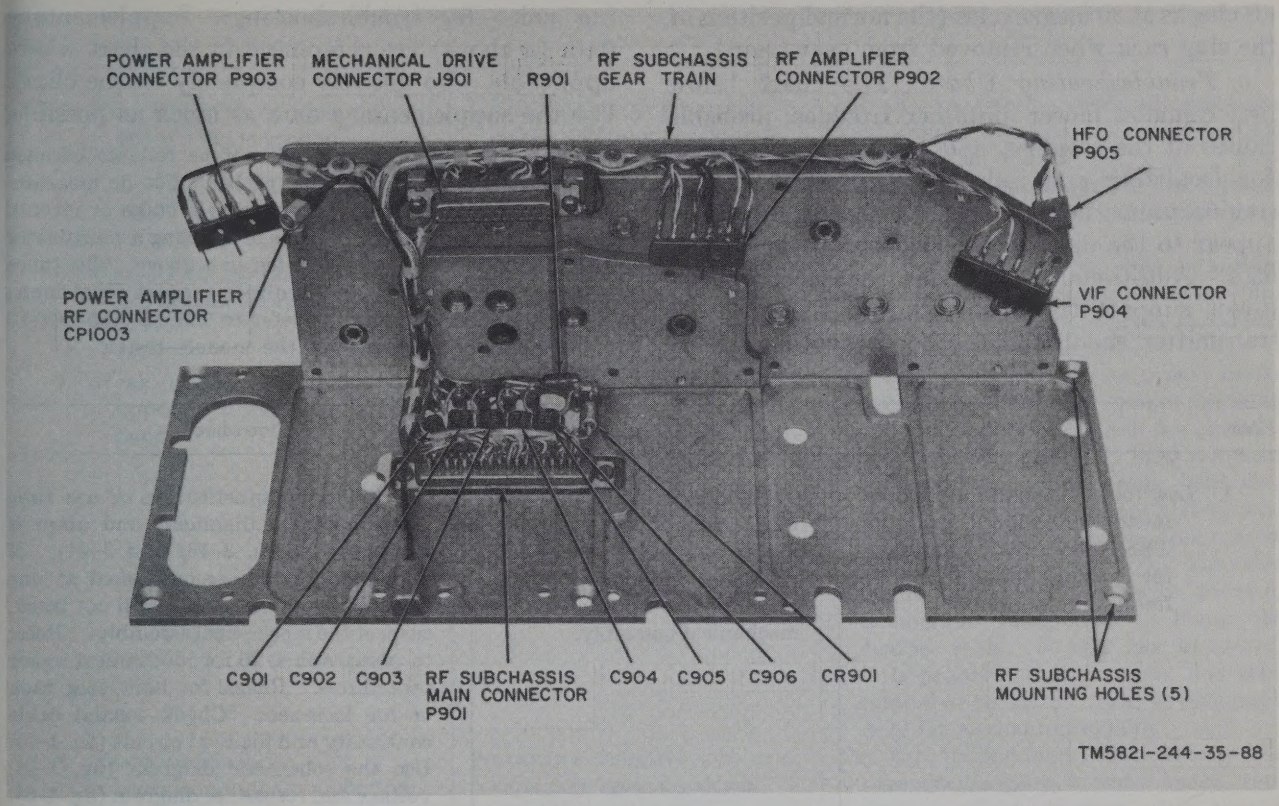


Figure 4–2. RF subchassis, parts identification.

4–3. RF Power Amplifier Module Troubleshooting

a. General. Use the chart (*c* below) as an aid in localizing and isolating RF amplifier module troubles. If trouble symptoms are not known, perform the tests given in paragraph 4–2*b*, steps 8, 9, and 10. After the trouble is localized to a stage, use the voltage and resistance diagram, dc resistance of coils and transformers table, and module schematic diagram to isolate the trouble to a defective part or connection. These illustrations and other supplementary data are listed below. After repairing the module, install it in the RF subchassis and perform the tests given in paragraph 4–2*b*.

(1) Module alignment (para. 3–16*f* mechanical; para. 3–21, electrical).
(2) RF power amplifier module schematic diagram (fig. 1–9).
(3) Circuit functioning (para. 1–26).
(4) Module tests (para. 4–2*b*, steps 8 through 10).
(5) Power amplifier module, voltage and resistance diagram (fig. 4–5).
(6) Dc resistance of coils and transformers (para. 4–18).
(7) Power amplifier module parts identification (figs. 4–3 and 4–4).
(8) General parts replacement instructions (para. 4–23).
(9) Mechanical repairs (para. 4–26).
(10) Rf power amplifier module mechanical assembly, exploded view (fig. 4–43).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the RF power amplifier module requires the use of a serviceable and properly aligned RF subchassis, a module tester (AN/ARM–87), and associated test equipment (signal generators, oscilloscope, voltmeters, etc.) necessary for the test being performed. Remove the module (para. 4–24) and tilt it so that the bottom is accessible. (Leave both coaxial cables and the power connector connected.) Remove the bottom cover for access to parts. Make

all checks at 30 megacycles (the normal position of the slug rack when removed from gear train).

c. Troubleshooting Chart. The chart below lists common power amplifier troubles, probable causes of the troubles, and suggested procedures for localizing and isolating the troubles. The trouble indications are presented as they would appear to the operator or organizational repairman. Additional indications, recorded during direct support troubleshooting of the receiver-transmitter, should be helpful in providing a starting point for troubleshooting. Supplementary data (*a* above) are referenced in the chart where applicable. Do not rely completely on the chart. Use the supplementary data as much as possible.

Note. RF measurements will not be reliable because of the detuning caused by test probes. Use dc measurements (fig. 4–5) to localize trouble to a stage or circuit. Isolate the trouble within the stage by using a multimeter and the supplementary data listed in *a* above. The tubes were probably checked by the direct support repairman; if necessary, recheck them. Refer to TM 11–6625–467–12 for operating procedures for the module tester.

Item	Indication	Probable trouble	Procedure
1	Low (or no) output from transmitter. Receiver-transmitter TEST METER reads low for positions 8 and 9 (all frequencies).	Defective tube, improper mechanical or electrical alignment, defective coaxial connector, filament circuit, amplifier circuit, filter, or mechanical assembly.	Check tubes by substitution or use tube tester. Check alignment and align if necessary (paras. 3–16*f* and 3–21). If alignment can be accomplished at one frequency but the module will not track, suspect the mechanical assembly. Refer to paragraph 4–26 for mechanical repair procedures. Check for bent slug rack or for looseness. Check coaxial cable continuity and filament circuit (fig. 1–9). Use the schematic diagram (fig. 1–9), voltage and resistance diagram (fig. 4–5), dc resistance of coil and transformer chart (para. 4–18), and the parts identification illustrations (figs. 4–3 and 4–4) for further troubleshooting.
2	High voltage (+500 or +250 volts) reads low. Abnormal TEST METER readings on position 9 or 10 of receiver-transmitter TEST SWITCH. (Power supply circuit checked good.)	Overload condition caused by internal shorting in tubes or chassis circuit.	Check tubes for internal shorting and check all chassis wiring and circuits associated with high voltages (figs. 1–9 and 4–6).
3	Fuse F1001 blows when power is applied.	Shorted capacitor in filament circuit, shorted wiring, or other overload condition caused by improper bias or defective tube.	Check the resistance from pin C to pin F of FL801. The resistance should be approximately 11 ohms. If less, check for shorted capacitor C821 or C820 and check all filament wiring (fig. 1–9). Make other voltage and resistance checks as necessary to isolate the trouble (fig. 4–5). Check filter FL801 for internal shorting.
4	Fuse F1002 blows when power is applied.	Overload condition in bias circuits or internal short in a tube.	Check the tubes first. Next, isolate the trouble to a stage, insert one tube at a time, and see which one causes the fuse to blow. ***Caution:* Turn off power when removing or replacing tubes. Use the schematic diagram (fig. 1–9) to troubleshoot bias circuits. Refer to figure 4–5 for voltage and resistance measurements and for all tube socket connections.**

Item	Indication	Probable trouble	Procedure
5	Fuse F1001 blows when transmit button is pressed.	Low resistance to ground in either +250- or +500-volt circuit. Internal short in tube socket.	Use an ohmmeter to check all resistances to ground, especially the high-voltage circuits (fig. 1–9 and fig. 4–5). Check for shorted capacitors in high-voltage circuits. Check for internal shorting in filter FL801.
6	Fuse F1002 blows when transmit button is pressed.	Low resistance to ground in −27.5-volt bias circuits.	Check all resistances (fig. 4–5) as in item 5 above except concentrate on the bias circuits. Check for shorted capacitors and shorted tube socket.
7	Weak (or no) transmission on upper (or lower) end of the band.	Probably improper tracking caused by improper electrical alignment, defective mechanical assembly, or improper orientation of coaxial cable that connects to J801.	Try to align the module for proper tracking (para. 3–21). If proper tracking can not be achieved, check the mechanical assembly carefully; look for loose or turned cam, worn cam, bent slug rack, or bent capacitor plates, etc. Check the corner of the slug rack nearest the coaxial connector (J801). The cable might have been improperly oriented, causing the slug rack to bump the coaxial cable. If this has happened, it is probable that the cam has been rotated on its shaft. Refer to paragraph 4–26 for mechanical repairs.
8	Transmission fades after several minutes of operation.	Probably a defective tube or a capacitor breaking down after the module warms up.	Try tube replacement (even though the tube checks good in tube tester, conduction might decrease after several minutes of operation). If this fails to repair the trouble, look for a defective capacitor.
9	Transmission is noisy or intermittent.	Poor solder joint, dirty or defective tube socket, defective circuit component or coaxial cable. Improper alignment.	Try tube replacement first. Check solder joints and reheat if in doubt. Inspect tube sockets carefully. Check coaxial cable and connector. Use an RF voltmeter (AN/URM–145) to help in localizing the intermittent trouble to a stage and isolating to a component. Check alignment (para. 3–21).
10	Transmission is distorted	Same as item 9 above or improper grid biasing.	Same as item 9 above, except check first for improper grid bias by making dc voltage measurements at tube sockets (fig. 4–5).

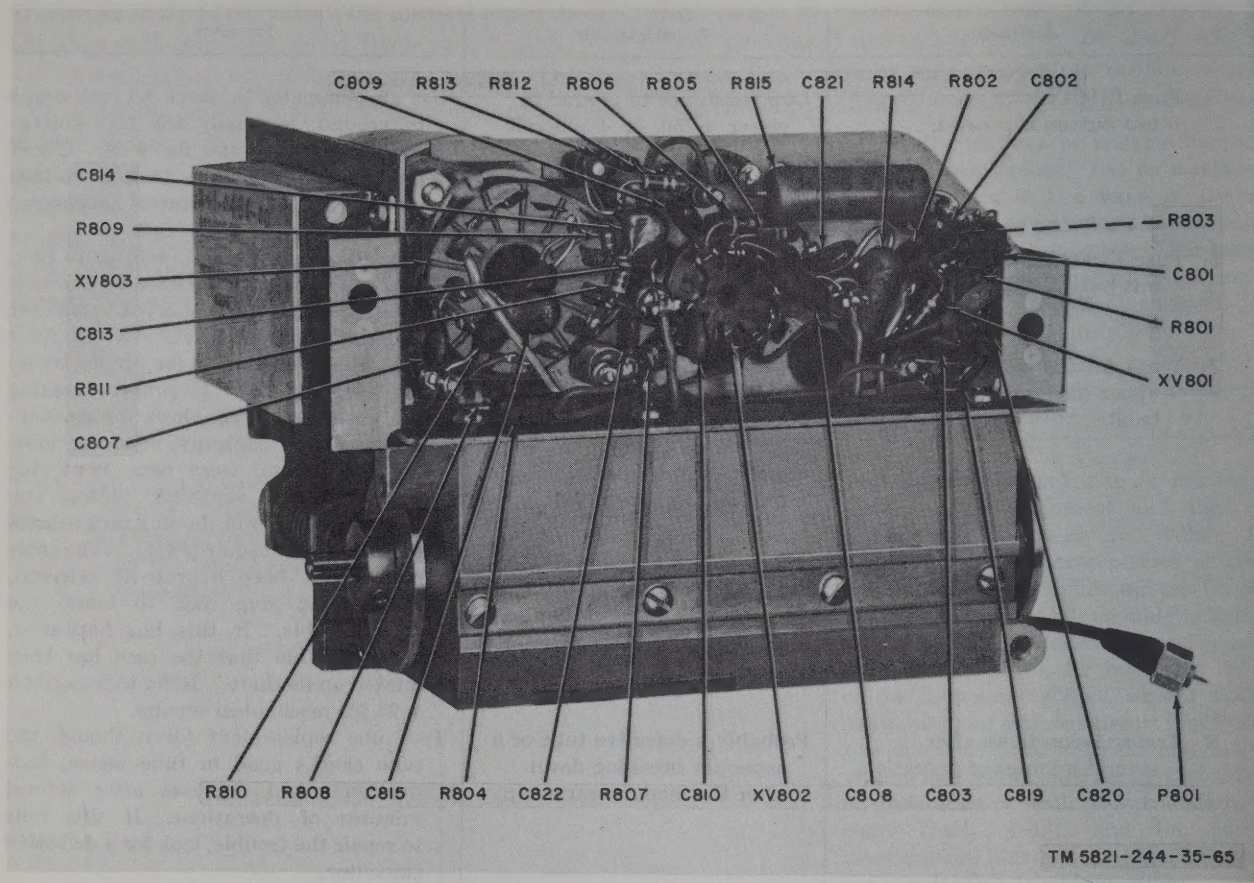


Figure 4-3. Power amplifier module, parts identification, bottom view.

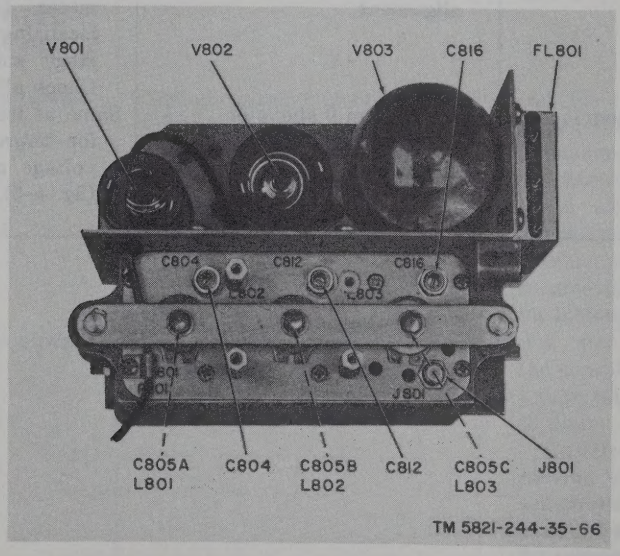
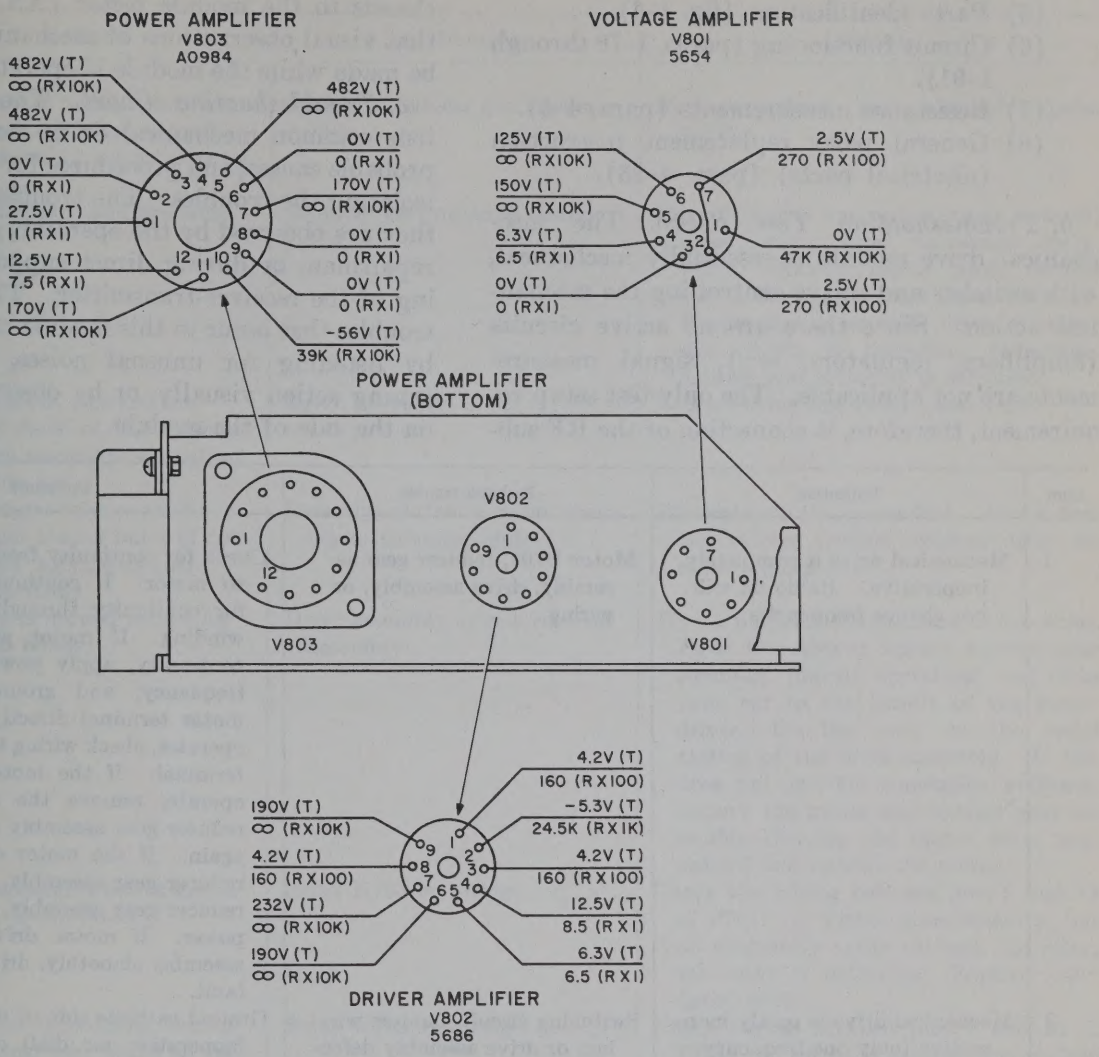


Figure 4-4. Power amplifier module, parts identification, top view.



NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 4–5. Power amplifier module, voltage and resistance diagram.

4–4. Mechanical Drive Module Troubleshooting

a. General. Use the chart (*c* below) as an aid in localizing and isolating mechanical drive module troubles. If the condition of the module is unknown, install it in a known good RF subchassis and perform the RF subchassis operational tests (para. 4–2*b*). Note any tuning problems encountered and refer to the troubleshooting chart for guidance. Do not rely on the troubleshooting chart to answer all problems. Use the following illustrations and data, which applies to the mechanical drive module, to help in troubleshooting. Refer to the repair procedures (para. 4–27) before attempting to replace parts.

(1) Module schematic diagram (fig. 6–20).
(2) Mechanical tuning system, schematic diagram (fig. 1–33).
(3) Repair procedures (para. 4–27).
(4) Mechanical drive module, exploded view (fig. 4–44).

(5) Parts identification (fig. 4–6).
(6) Circuit functioning (paras. 1–78 through 1–91).
(7) Resistance measurements (para. 4–5).
(8) General parts replacement instruction (electrical parts) (para. 4–23).

b. Troubleshooting Test Setup. The mechanical drive module is essentially mechanical, with switches and relays controlling the mechanical action. Since there are no active circuits (amplifiers, regulators, etc.), signal measurements are not applicable. The only test setup requirement, therefore, is connection of the RF subchassis to the module tester (AN/ARM–87) so that visual observations of mechanical action can be made while the module is operating.

c. Troubleshooting Chart. The chart below lists common mechanical drive module troubles, probable causes, and procedures for localizing and isolating the troubles. The troubles are listed as they are observed by the operator, organizational repairman, or during direct support bench testing of the receiver-transmitter. The majority of troubles that occur in this module can be observed by listening for unusual noises, by observing tuning action visually, or by observing the dials on the side of the module.

Item	Indication	Probable trouble	Procedure
1	Mechanical drive is completely inoperative. Radio set will not change frequencies.	Motor B701, reducer gear assembly, drive assembly, or wiring.	Check for continuity from pin 16 of P701 to motor. If continuity exists, check for continuity through motor primary winding. If motor winding indicates continuity, apply power, select a new frequency, and ground the common motor terminal directly. If the motor operates, check wiring to motor common terminal. If the motor still does not operate, remove the motor from the reducer gear assembly and apply power again. If the motor operates, remove reducer gear assembly, mount motor to reducer gear assembly, and again apply power. If motor drives reducer gear assembly smoothly, drive assembly is at fault.
2	Mechanical drive is partly inoperative (only one frequency dial turns).	Switching circuit, module wiring, or drive assembly defective.	Ground cathode side of diode CR702 (for inoperative mc dial) or K703 (for inoperative 0.05-mc dial). Apply power and check to see whether the inoperative dial will now turn. If dial does not turn, the trouble is in the switch circuit; use the schematic diagram (fig. 6–20) and an ohmmeter to troubleshoot. Refer to paragraph 4–5 for resistance measurements. If trouble still exists, drive assembly or wiring between drive assembly and motor is at fault.
3	Mechanical drive module tunes to wrong frequency.	Switching circuit	Use an ohmmeter to check for an open circuit (fig. 6–20 and para. 4–5).
4	Mechanical drive module tunes continuously.	Switching circuit (short to ground); diode CR702 or CR703 shorted, relay K701 or K702 (part of drive assembly) contacts stuck closed.	Check diodes with an ohmmeter. Disconnect common (ground) wire from relay K701 (mc dial rotating) or K702 (0.05-mc dial rotating). If the dial still turns continuously, the relay contacts are shorted internally; replace the drive assembly. If removing the wire stops the dial rotation, look for short circuit in switching circuit (para. 4–5 and fig. 6–20).

Item	Indication	Probable trouble	Procedure
5	Motor makes high-pitched whine but does not cause reducer gear assembly output gear to turn.	Defective reducer gear assembly.	Replace reducer gear assembly (para. 4–27).
6	Tuning is jerky (and probably noisy).	Reducer gear or drive assembly.	Remove motor and reducer gear (intact); leave motor wires connected (para. 4–27). Operate motor while reducer gear is disengaged from drive assembly. If operation is smooth, drive assembly slip clutch is defective. Otherwise, reducer gear assembly is defective.
7	Gears on front (toward frequency dials) of drive assembly turn normally but output shafts do not.	Drive assembly	Replace drive assembly (para. 4–27).
8	Output shafts turn normally when not loaded but will not drive RF subchassis gear train normally.	Defective clutch in drive assembly or defective motor.	Try replacing the motor first. If this does not correct trouble, replace drive assembly (para. 4–27).
9	Operation is normal except for unusual noises.	Drive assembly or reducer gear assembly.	Try to pinpoint the location of the noise. Place screwdriver against reducer gear assembly (during operation) and press your ear to the handle of the screwdriver. Do the same on the metal casting of the drive assembly. If this does not provide conclusive evidence, remove the motor and reducer gear assembly (leaving the motor wires connected) and operate the motor.
10	No transmission when transmit button is depressed.	Relay K703 or wiring	Check the wiring between pins 9 and 14 of P701. If wiring is satisfactory, but no continuity exists through the relay, the relay is defective. Replace relay (para. 4–27).
11	No channel tone during tuning or channel tone heard all the time.	Relay K703 or wiring	Check wiring between pins 1 and 10 of P701. If wiring is satisfactory, replace relay (para. 4–27).

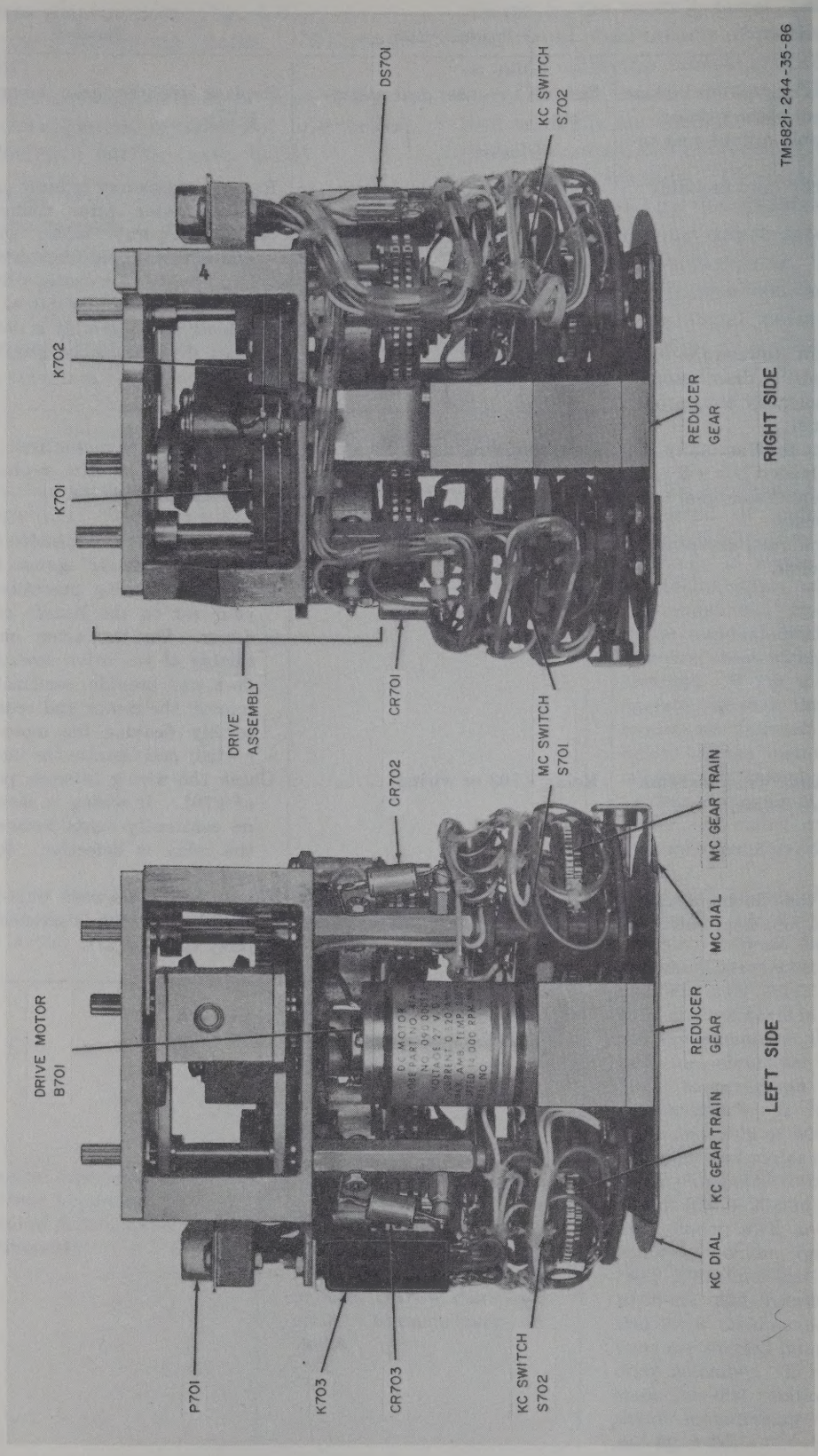


Figure 4-6. Mechanical drive module, parts identification.

4-5. Mechanical Drive Module Resistance Chart

Voltage measurements are not applicable to this module. The module must be connected into a system or module tester (AN/ARM-87) to make these measurements as the groundpaths are completed through the control unit. The X indicates grounded pin. To make the measurements, tune the unit to 30 mc, and then remove it from the gear train. Use suitable patch cable to operate the module while it is removed from the unit. The charts (*a* and *b* below) indicate points at which continuity to chassis ground should be measured at various frequency settings of the megacycles and 0.05 megacycles shafts.

a. Position of Mc Selector.

Pin No.	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 63	44 64	45 65	46 66	47 67	48 68	49 69
19	X				X					X	X			X	X	X		X	X	X
4				X					X	X			X	X	X		X	X	X	X
18			X					X	X			X	X	X		X	X	X	X	
12		X					X	X			X	X	X		X	X	X	X		
17	X					X	X			X	X	X		X	X	X	X			

Note. Pin 23 is grounded for all odd MC positions, pin 11 is grounded for all even MC positions, pin 5 is grounded for all positions from 30 to 49 MC, and pin 20 is grounded for all positions from 50 to 69 MC.

b. Position of 0.05-Mc Selector.

Pin No.	00	05	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
8	X				X					X	X			X	X	X		X	X	X
22				X					X	X			X	X	X		X	X	X	X
7			X					X	X			X	X	X		X	X	X	X	
21		X					X	X			X	X	X		X	X	X	X		
6	−X					X	X			X	X	X		X	X	X	X			

4-6. RF Amplifier Module Troubleshooting

a. General. Use the troubleshooting chart (*c* below) as an aid in localizing and isolating RF amplifier module troubles. If the trouble symptoms are not known, perform the tests given in paragraph 4-2*b*, steps 8 through 11. When complicated procedures or illustrations are required, they are referenced in the troubleshooting chart. Make full use of these procedures and illustrations, which are listed below.

(1) Module alignment (mechanical, para. 3-16; electrical, para. 3-20).
(2) Module schematic diagram (fig. 6-15).
(3) Circuit functioning (paras. 1-21 through 1-24).
(4) Module tests (para. 4-2*b*, steps 8 through 11).
(5) RF amplifier module, voltage and resistance diagram (fig. 4-10).
(6) Dc resistance of coils and transformers (para. 4-18).
(7) RF amplifier module, parts identification (figs. 4-7, 4-8, and 4-9).
(8) General parts replacement instructions (para. 4-23).
(9) Mechanical repairs (para. 4-28).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the RF amplifier module requires the use of a serviceable and properly aligned RF subchassis, a module tester (AN/ARM-87), an external +27.5-volt power source, and standard test equipment (signal generator, oscilloscope, voltmeters, etc). Remove the module (leaving coaxial cables and main connector connected) and remove the cover to allow access to the circuit components. Check to see that the tuning shaft is set to the 30-megacycle position

(rotor plate scribe mark aligned with edge of stator plates).

c. Troubleshooting Chart. The chart below lists common RF amplifier troubles, probable causes, and procedures for localizing and isolating the troubles. The trouble indications are presented as they would appear to the operator or organizational repairman. Additional indications recorded during direct support troubleshooting of the receiver-transmitter, should be helpful in providing a starting point for troubleshooting. Supplementary data (*a* above) is referenced in the chart where applicable. Do not rely completely on the chart for answers to all troubles. Use the supplementary data as much as possible and adapt troubleshooting to the particular problem involved.

Note. RF measurements will not be reliable because of the detuning caused by test probes. Dc measurements (fig. 4–10) should provide enough information to localize the trouble to a stage or circuit. Isolate the trouble within the stage by use of a multimeter and the data listed in *a* above. Refer to TM 11–6625–467–12 for operating procedures for the module tester.

Item	Indication	Probable trouble	Procedure
1	No reception or transmission (all frequencies). No sidetone.	Defective coaxial connector, poor alignment, amplifier stage inoperative, open filter choke, or shorted capacitor in +18-volt line.	Check for proper alignment. Check dc levels at Q601, Q602, and Q603 (fig. 4–10). Check transistors or try replacing suspected plate assembly. Check circuit components with an ohmmeter. (Refer to para. 4–18 for dc resistance of coils and transformers.) Check coaxial connectors. Check tuning capacitor assembly for internal shorting (rotate tuning shaft while checking).
2	No reception or transmission on upper (or lower) end of frequency band.	Improper alignment, defective tuning coils, or tunable capacitor assembly.	Inspect variable capacitor assembly carefully and check for internal shorting while rotating tuning shaft through a complete rotation. If capacitor assembly is satisfactory, try to align module (para. 3–20). Note any erratic meter deflection when adjusting each trimmer capacitor.
3	Weak reception and transmission (all frequencies).	Low stage gain in one or more amplifiers or poor alignment.	Check the alignment first. If the gain cannot be improved by alignment, try to localize the trouble by making dc measurements (fig. 4–10). If this is not conclusive, try replacing amplifier plate assemblies.
4	Weak reception and transmission at upper (or lower) end of the band.	Same as item 2	Same as item 2.
5	Weak or no reception; transmission satisfactory.	Receiver mixer (Q605), diode switch, output coaxial connector P603, input coaxial connector P604, or relay K601.	Check voltages on Q605 (fig. 4–10). Check transistor Q605. Check K601. Use the supplementary data listed in *a* above to check the diode switch circuit and mixer circuit components.
6	Weak or no transmission; reception satisfactory.	Transmitter mixer Q604, diode switch, output coaxial connector J602, input coaxial connector P601.	Check voltages on Q604 (fig. 4–10). Check transistor Q604. Check diode switch and all components associated with Q604. (Refer to supplementary data listed in *a* above.)
7	Transmission or reception excessively distorted.	Poor alignment, transistors improperly biased, loss of agc, diode switch leakage, faulty decoupling components on the +18-volt line.	Check alignment (para. 3–20). Check dc voltages at Q601, Q602, and Q603 (fig. 4–10). Check agc and decoupling circuits. Check diode switch for shorted or open diodes or any other defective parts. Check bypass capacitor on +18-volt line.

Item	Indication	Probable trouble	Procedure
8	Squeals or howls in transmit or receive.	Amplifier Q601, Q602, or Q603 is oscillating, diode switch leakage.	Check all dc levels at Q601, Q602, and Q603. Replace any suspected plate assembly. Check resistor values on plate assemblies and check transistors. Check diode switch circuit.
9	Excessive noise (receive or transmit).	Poor alignment, noisy transistors (Q601–Q605), or improper bias.	Realign the RF amplifier module (para. 3–20) and check for proper bias (fig. 4–10) on transistors. Substitute transistor plate assemblies.

4–7. Variable IF Module Troubleshooting

a. General. Use the troubleshooting chart (*c* below) as an aid in localizing and isolating variable IF module troubles. If the trouble symptoms are not known, perform the tests given in paragraph 4–2*b*, steps 7*a* through 7*d*. When complicated procedures are required, they are referenced in the troubleshooting chart. Make full use of these procedures and illustrations, which are listed below.

(1) Module alignment, mechanical (para. 3–16) or electrical (para. 3–19).
(2) Variable IF module, schematic diagram (fig. 6–17).
(3) Circuit functioning (paras. 1–16 through 1–19).
(4) Module tests (para. 4–2*b*, steps 7*a* through 7*d*).
(5) Variable IF module, voltage and resistance diagram (fig. 4–14).
(6) Dc resistance of coils and transformers (para. 4–18).
(7) Variable IF module, parts identification (figs. 4–11, 4–12, and 4–13).
(8) General parts replacement instructions (para. 4–23).
(9) Mechanical repairs (para. 4–29).
(10) Variable IF module, exploded view (fig. 4–45).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the variable IF module requires the use of a serviceable and properly aligned IF subchassis, a module tester (AN/ARM–87), an external +27.5-volt power source, and external test equipment. Remove the variable IF and low-frequency oscillator modules, leaving cables connected for operating power. Remove the cover for access to circuit components. The slug rack in the variable IF module is spring-loaded to the 30-megacycle position; no shaft positioning should be necessary unless the trouble is not evident at 30 megacycles.

c. Troubleshooting Chart. The chart below lists common variable IF troubles, probable causes, and procedures for localizing and isolating the troubles. The trouble symptoms are presented as they would appear to the operator or organizational repairman. Additional indications, recorded during bench testing (direct support) of the receiver-transmitter, should be helpful in providing a starting point for troubleshooting. Supplementary data (*a* above) are referenced in the chart where applicable. Do not rely on the chart for solutions to all troubles. Use the supplementary data as much as possible and adapt your troubleshooting approach to the trouble.

Note. RF measurements will not be reliable because of the detuning caused by test probes. Dc measurements (fig. 4–14) should provide enough information to localize the trouble to a stage or circuit. Isolate the trouble within the stage by use of a multimeter and the data listed in *a* above. Refer to TM 11–6625–467–12 for operating procedures for the module tester.

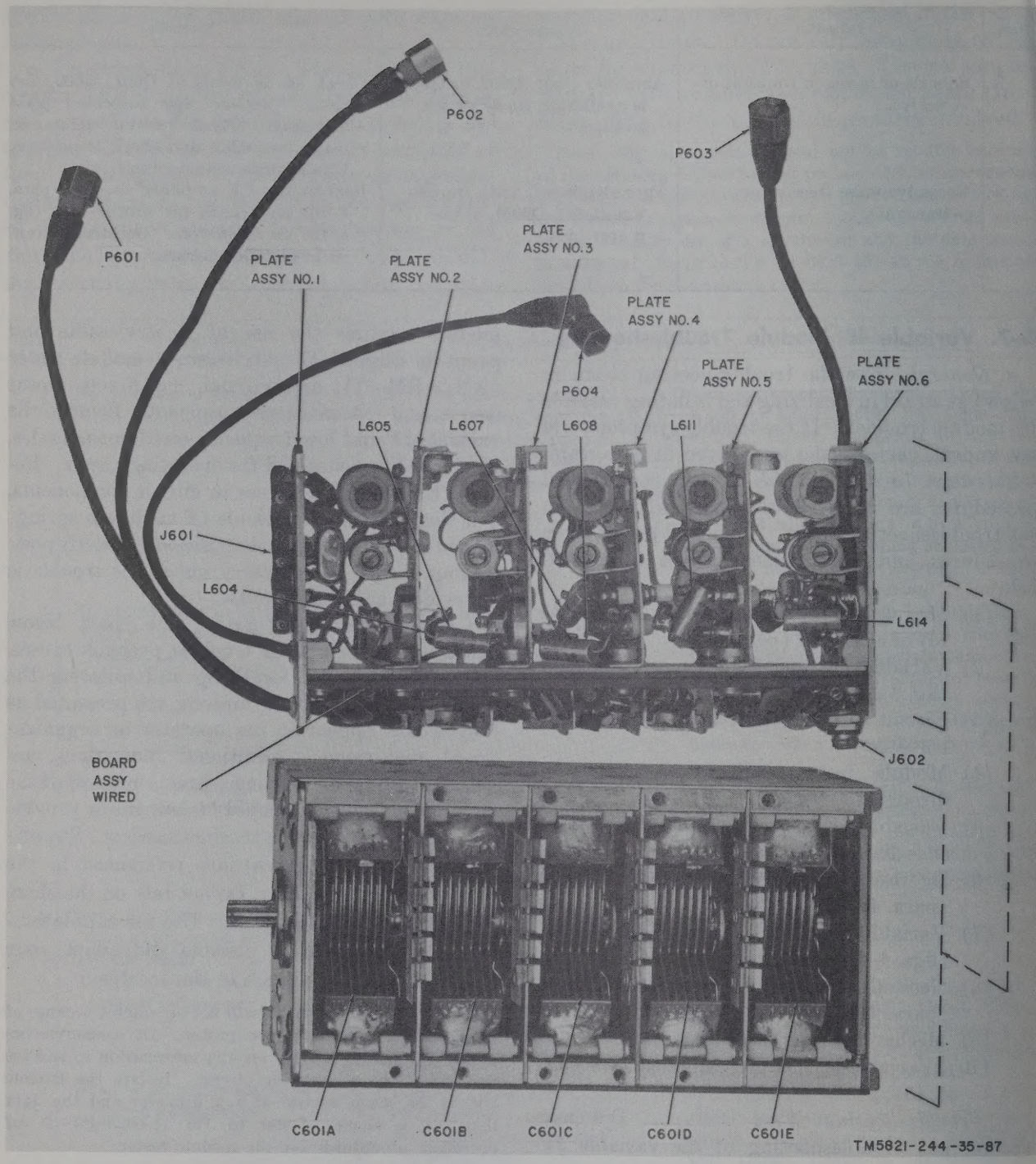


Figure 4-7. RF amplifier module, parts identification, complete view.

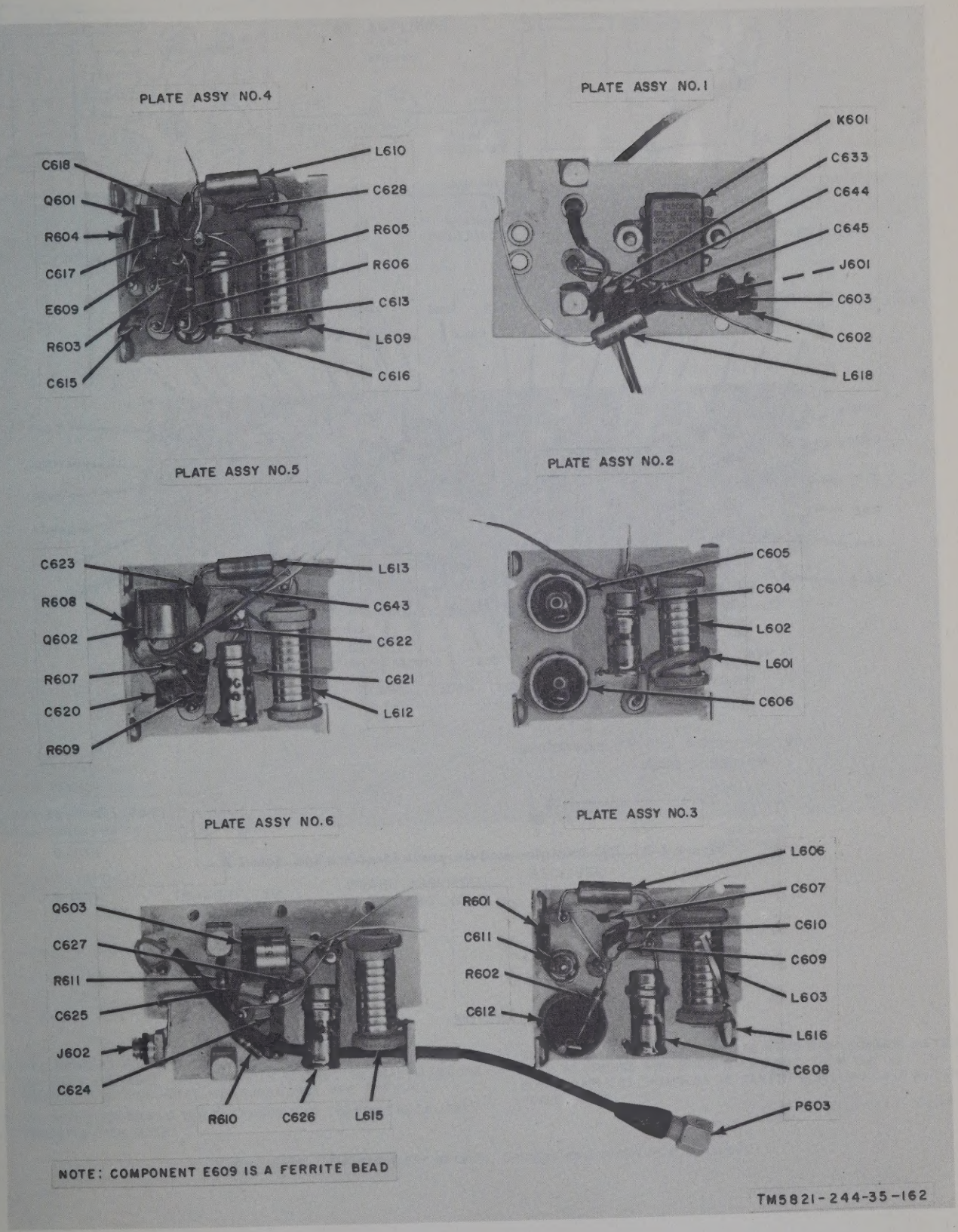


Figure 4-8. RF amplifier module, parts identification, detail A.

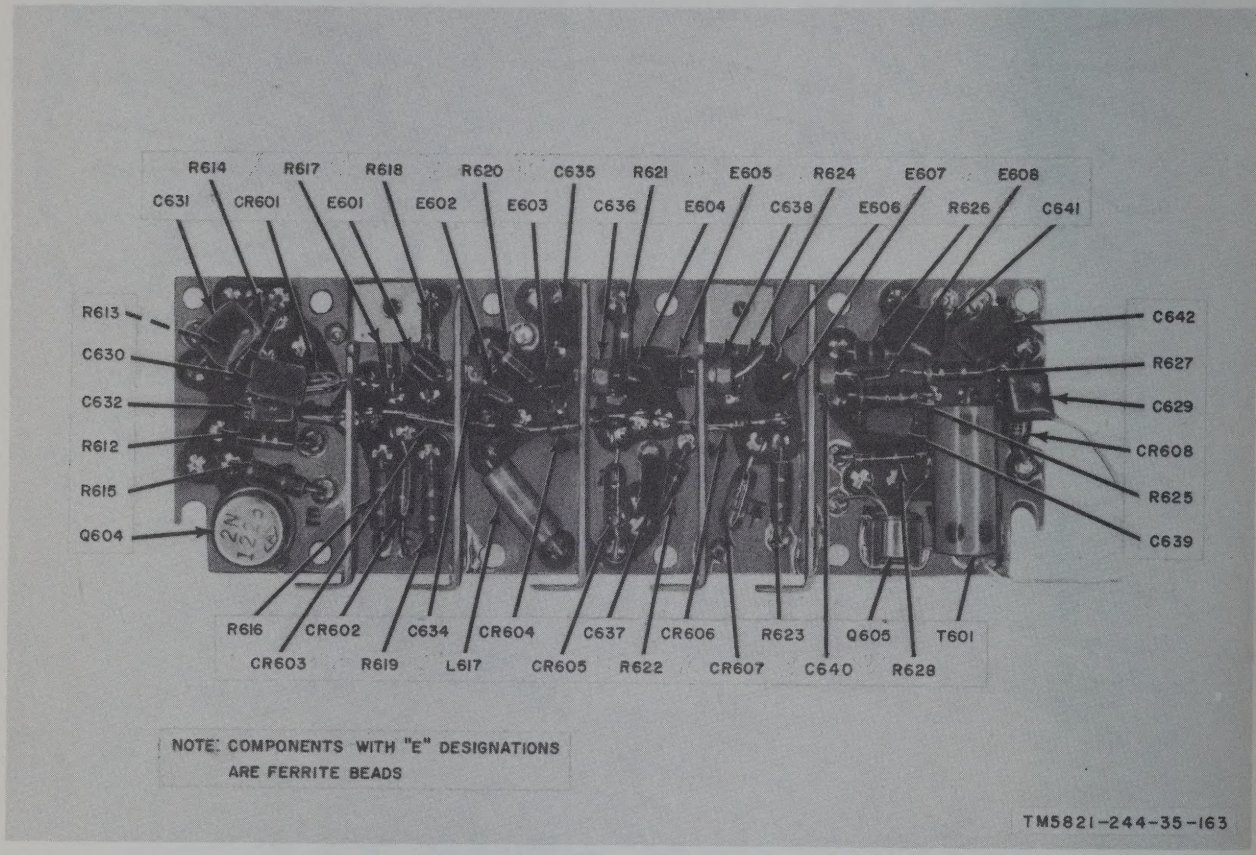
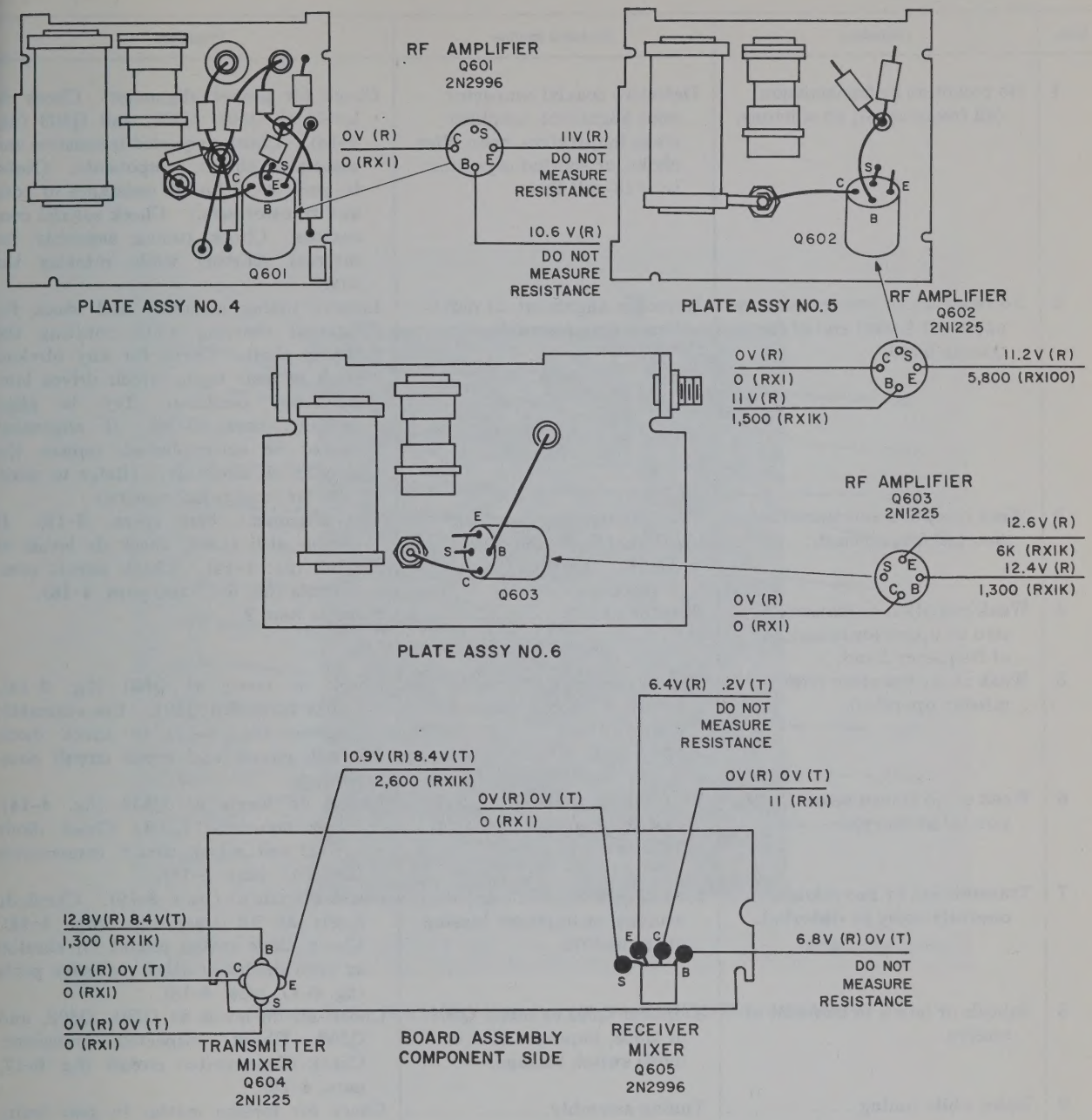


Figure 4-9. RF amplifier module, parts identification, detail B.



NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE + DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T)INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 4–10. RF amplifier module, voltage and resistance diagram.

Item	Indication	Probable trouble	Procedure
1	No reception or transmission (all frequencies), no sidetone.	Defective coaxial connector, poor alignment, amplifier stage inoperative, open filter choke, or shorted capacitor in +18-volt line.	Check for proper alignment. Check dc levels at Q501, Q502, and Q503 (fig. 4-14). Check suspected transistors and associated circuit components. (Refer to para. 4-18 for dc resistance of coils and transformers.) Check coaxial connectors. Check tuning assembly for internal shorting while rotating the shaft.
2	No reception or transmission on upper (or lower) end of frequency band.	Improper alignment, or defective tuning assembly.	Inspect tuning assembly and check for internal shorting while rotating the tuning shaft. Check for any obvious slack in gear train, which drives low-frequency oscillator. Try to align module (para. 3-19). If alignment cannot be accomplished, replace the mechanical assembly. (Refer to para. 4-29 for mechanical repairs.)
3	Weak reception and transmission (all frequencies).	Poor alignment or low stage gain in IF amplifier stage (Q502). Defective coaxial connector.	Try alignment first (para. 3-19). If trouble still exists, check dc levels at Q502 (fig. 4-14). Check circuit components (fig. 6-17 and para. 4-18).
4	Weak reception or transmission at upper (or lower) end of frequency band.	Same as item 2	Same as item 2.
5	Weak or no reception (transmission operates).	Receiver mixer Q501, diode switch, or coaxial connector J502 or J504.	Check dc levels at Q501 (fig. 4-14). Check transistor Q501. Use schematic diagram (fig. 6-17) to check diode switch circuit and mixer circuit components.
6	Weak or no transmission (reception satisfactory).	Transmitter mixer Q503, diode switch, or coaxial connector J503 or J501.	Check dc levels at Q503 (fig. 4-14). Check transistor Q503. Check diode switch and mixer circuit components (fig. 6-17, para. 4-18).
7	Transmission or reception excessively noisy or distorted.	Poor alignment, diode switch leakage, or improper biasing of transistors.	Check alignment (para. 3-19). Check dc levels at all transistors (fig. 4-14). Check diode switch circuit for shorted or open diodes or other defective parts (fig. 6-17, para. 4-18).
8	Squeals or howls in transmit or receive.	Amplifier Q502 or mixer Q501 or Q503, improper bias, or diode switch leakage.	Check all dc levels at Q501, Q502, and Q503. Check suspected transistor. Check diode switch circuit (fig. 6-17, para. 4-18).
9	Noise while tuning	Tuning assembly	Check for foreign matter in gear train. Check all parts of mechanical assembly for improper action while rotating tuning shaft. (Refer to para. 4-29 and fig. 4-45 for mechanical repairs.)

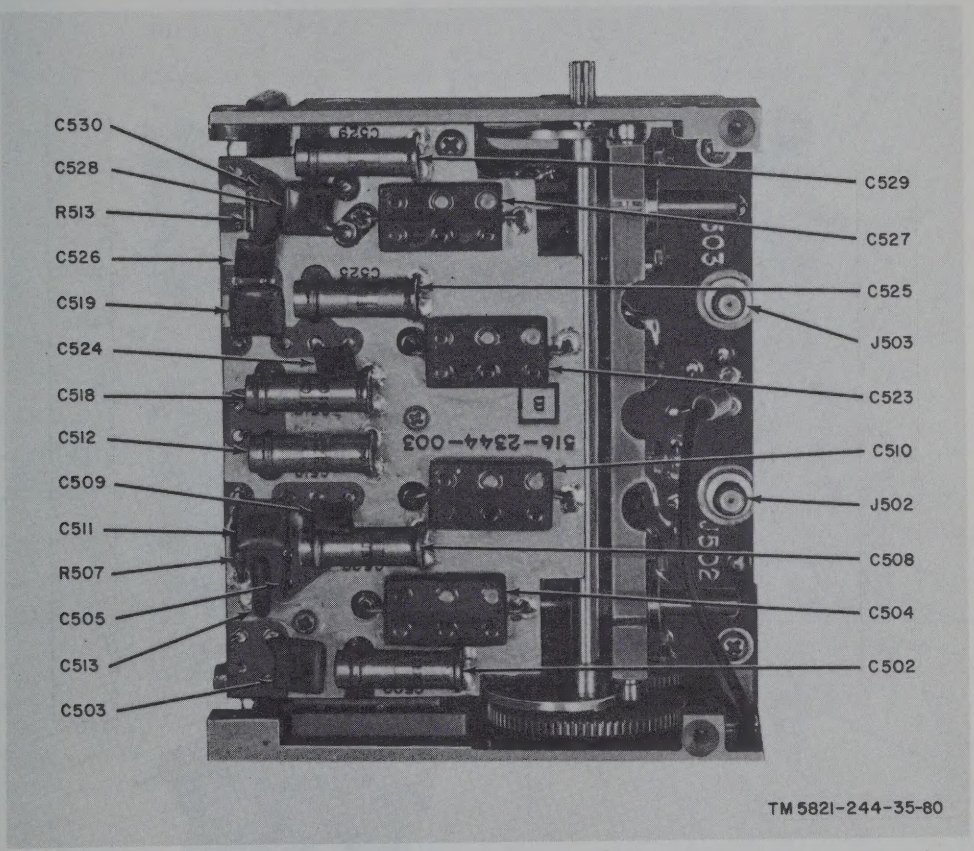


Figure 4-11. Variable IF module, parts identification, rear view.

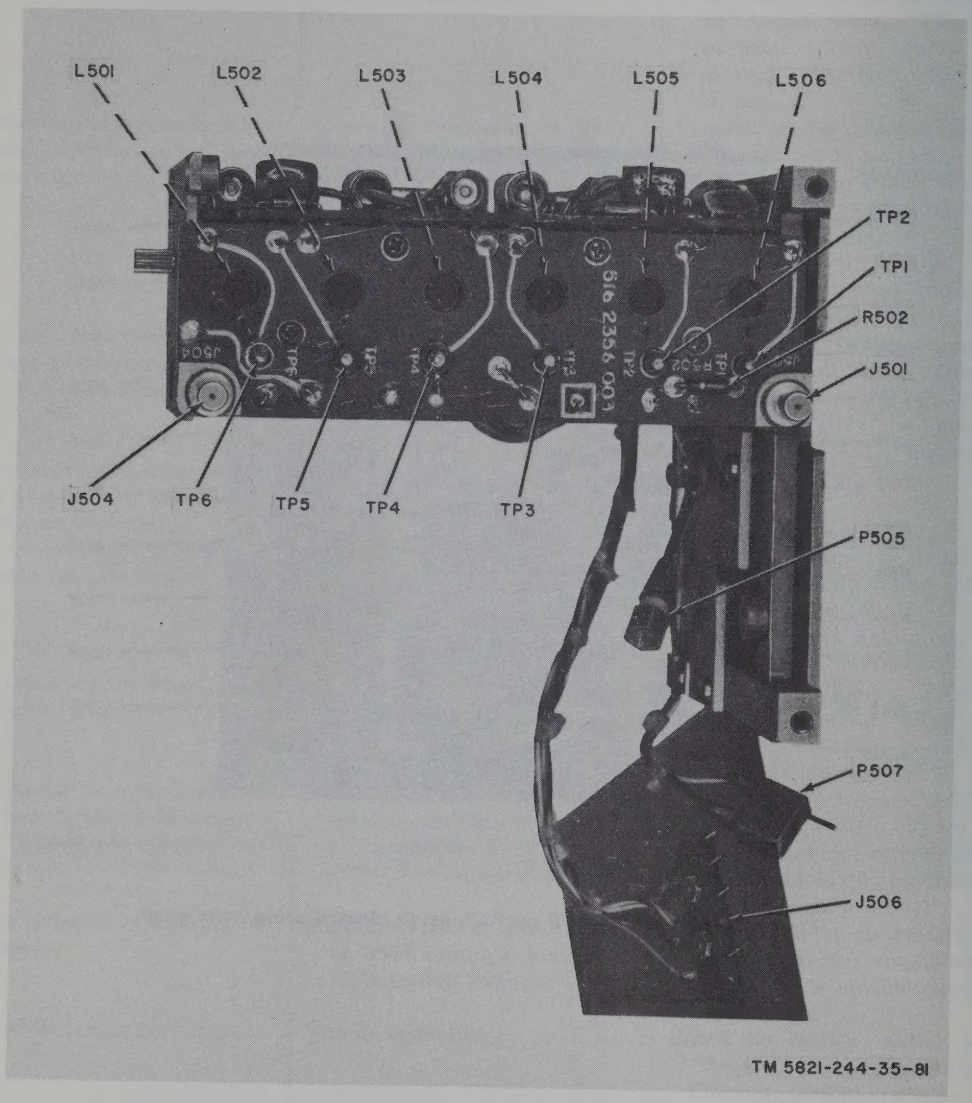


Figure 4-12. Variable IF module, parts identification, bottom view.

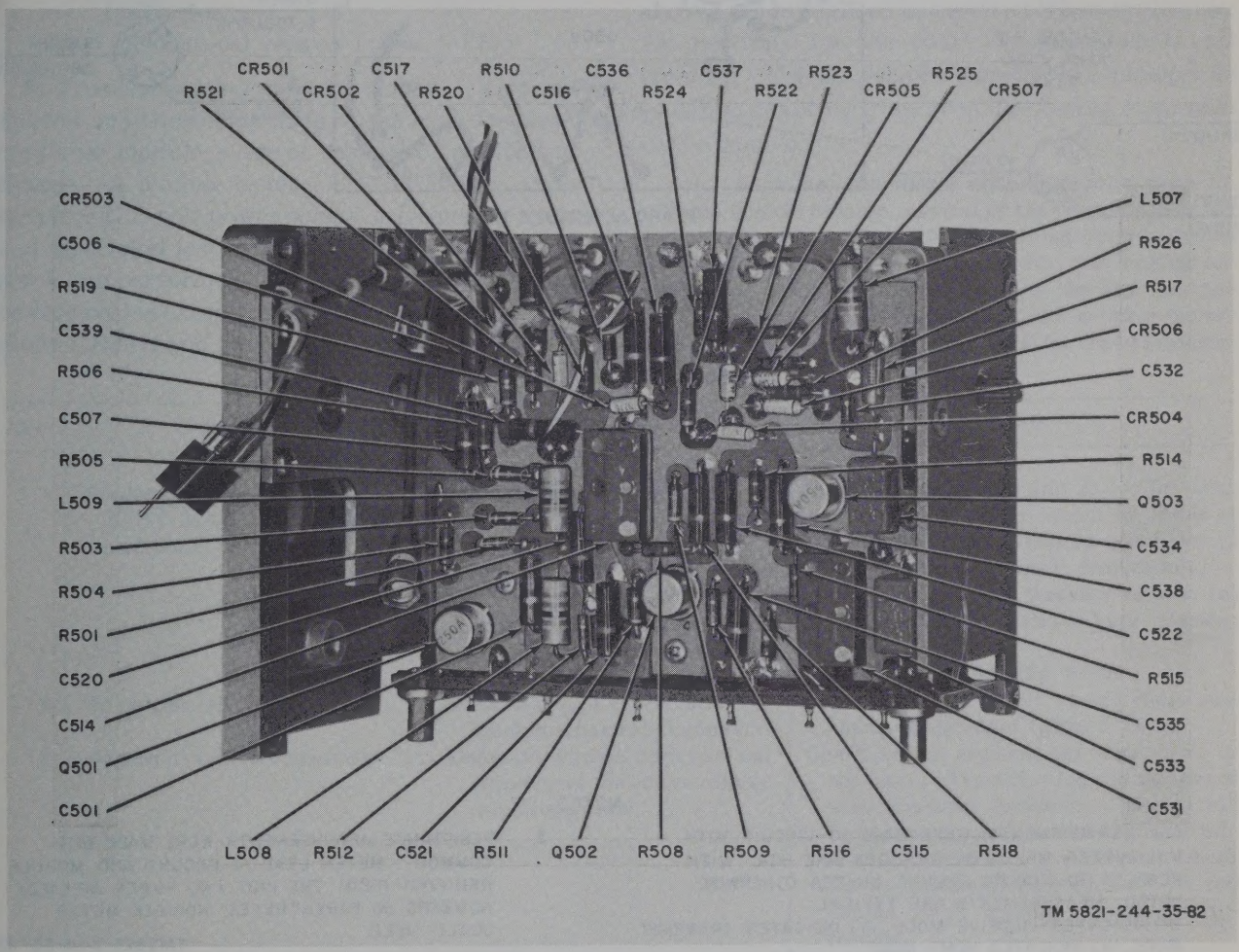
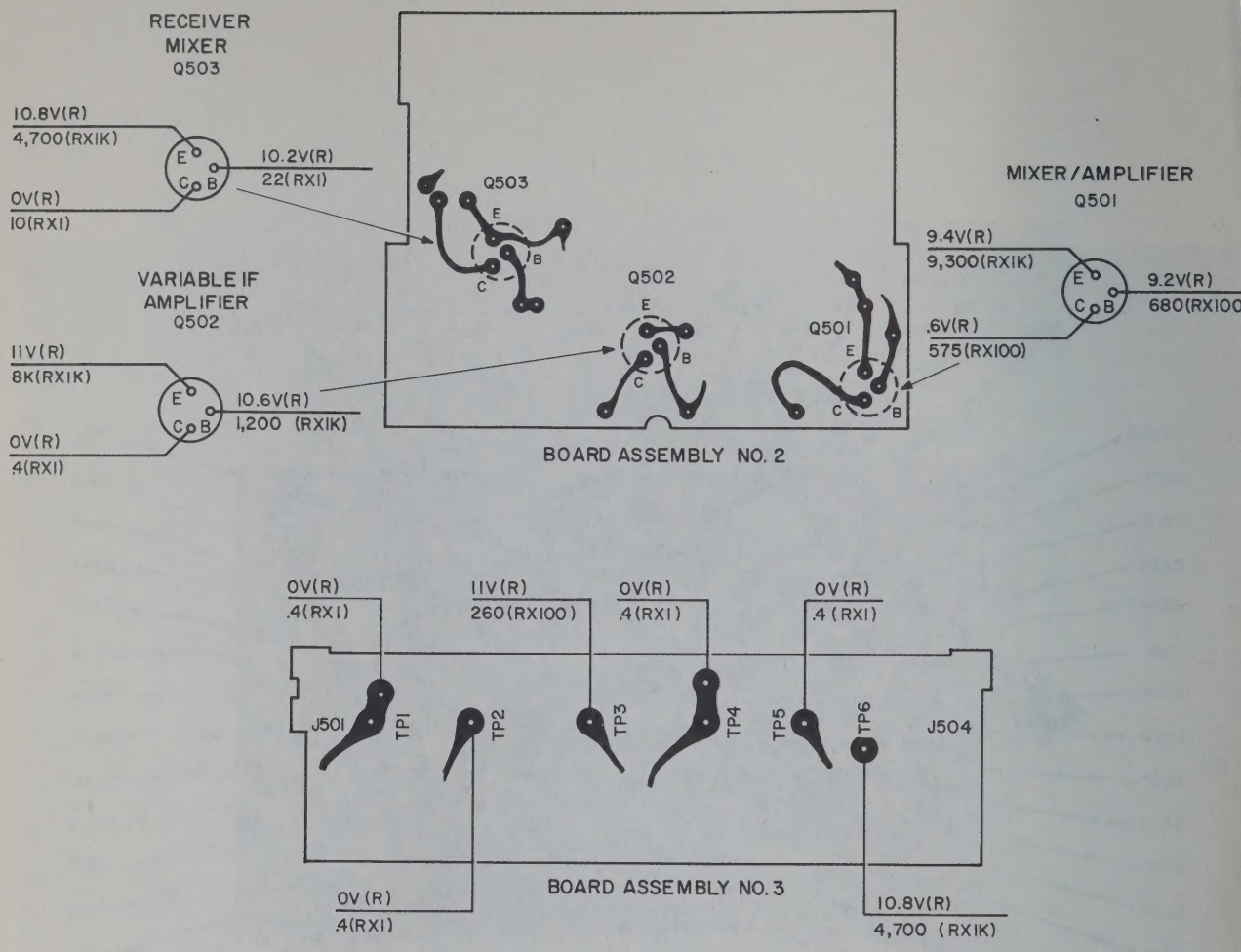


Figure 4–13. Variable IF module, parts identification, front view.



NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 4–14. Variable IF module, voltage and resistance diagram.

4–8. High-Frequency Oscillator Module Troubleshooting

a. General. Use the troubleshooting chart (*c* below) as an aid in localizing and isolating high-frequency oscillator module troubles. If the trouble symptoms are not known, perform the tests given in paragraph 4–2*b*, steps (4) through (6). When complicated procedures or illustrations are required, they are referenced in the troubleshooting chart. Make full use of these supplementary procedures and illustrations, which are listed below.

(1) Module alignment, mechanical (para. 3–16) or electrical (para. 3–17).
(2) High-frequency oscillator module, schematic diagram (fig. 6–16).
(3) Circuit functioning (para. 1–25).
(4) Troubleshooting test setup, RF subchassis (fig. 4–3).
(5) Module tests (para. 4–26, steps (4) through (6)).

(6) High-frequency oscillator module, voltage and resistance diagram (fig. 4–17).
(7) Dc resistance of coils and transformers (para. 4–18).
(8) High-frequency oscillator, parts identification (figs. 4–15 and 4–16).
(9) General parts replacement instructions (para. 4–23).
(10) Mechanical repairs (para. 4–31).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the high-frequency oscillator module requires the use of an RF subchassis. A module tester (AN/ARM–87), an external +27.5-volt power source, a frequency meter, and associated test equipment are required for the test being performed. The RF subchassis need not be serviceable except that the chassis wiring, Zener diode CR901, and resistor R901 must be good (to supply operating voltage to the module). When checking the output level or frequency, always install the cover to avoid detuning the tuned circuits.

c. Troubleshooting Chart. The chart below lists common high-frequency oscillator troubles, probable causes, and procedures for localizing and isolating the troubles. Supplementary data (*a* above) are referenced in the chart when applicable. Do not rely on the chart for solutions to all troubles. Use the supplementary data as much as possible, adapting your troubleshooting approach to the trouble.

Note. RF measurements are not reliable when made inside the module because removal of the cover detunes the oscillator tuned circuits. Use the tuning cover, supplied with the module tester (AN/ARM–87), for making adjustments. Leave the module tuned to the improper frequency for internal troubleshooting. The switch rotor tab will point to the coil and crystal used for that frequency.

Item	Indication	Probable trouble	Procedure
1	Reading on receiver-transmitter TEST METER is low for position 4.	Low stage gain (Q301), improper bias, defective meter circuit, or dirty switch contacts.	Inspect switch rotor and stator for wear or dirt. Check for proper dc levels at Q301 (fig. 4–17). Use an ohmmeter to check associated circuit components. ***Caution:* Do not measure reverse resistance of Q301 emitter-base junction (fig. 4–17).** Check meter circuit (fig. 6–16).
2	No output (all frequencies)	Same as item 1 above; also check mechanical alignment.	Same as item 1 above except check mechanical alignment (para. 3–16).
3	No output on some channels	Defective crystal, improper coil adjustment, defective coil, or defective switch.	Check switch segment for wear, dirt, or corrosion. Try adjusting coil associated with improper frequency. Locate coil by checking position of switch rotor tab. If adjustment is not successful, check for dc continuity through coil. If coil checks good, crystal is probably defective.
4	Incorrect oscillator frequency on some channels.	Defective crystals	Replace crystals.
5	Frequency drift on some channels.	Defective crystals	Replace crystals.
6	Module uses excessive current	+18-volt circuit short (or abnormally low resistance) to ground.	Check all capacitors and module rewiring for shorts. Check resistor values (fig. 6–16).
7	Oscillator output is intermittent.	Worn or dirty switch segments or warped rotor tab, defective solder joint, coaxial connector or main connector, or diode or capacitor shorting internally.	Check switch, coaxial connector, main connector, and solder joints. Check for intermittent short in diode CR301 or one of the capacitors.

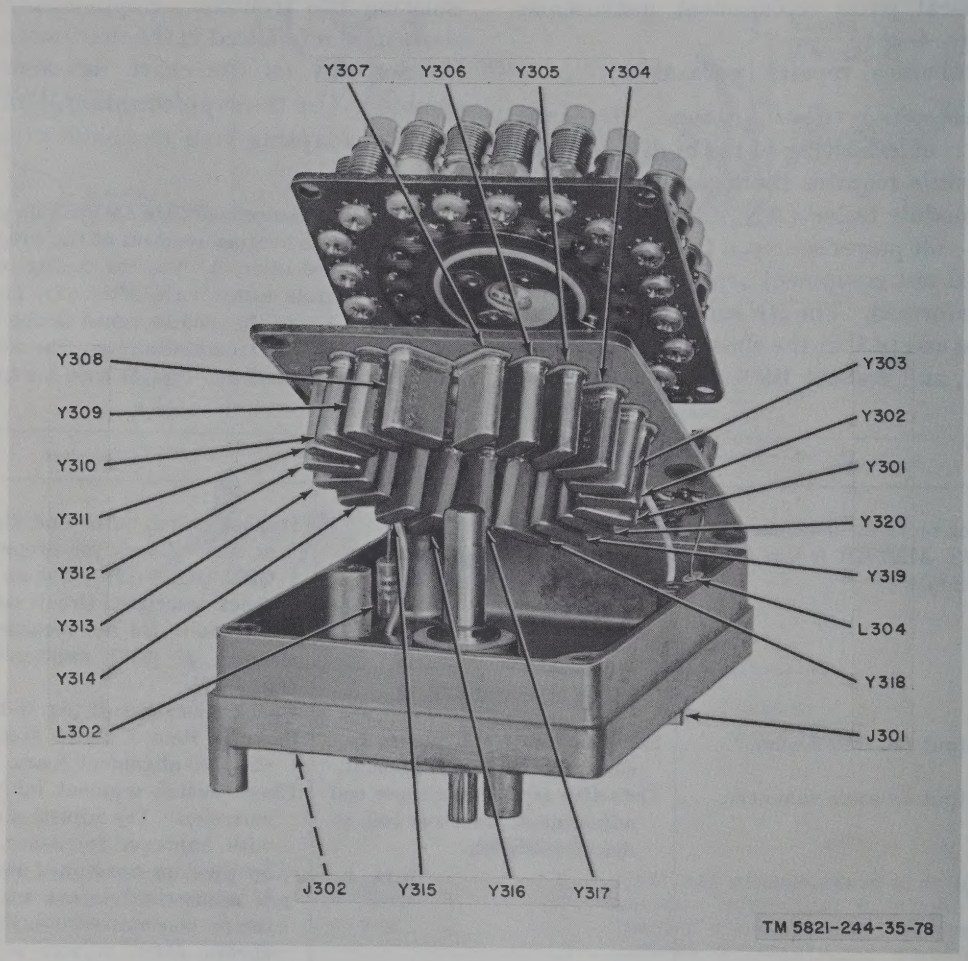


Figure 4-15. High-frequency oscillator module, parts identification, bottom view.

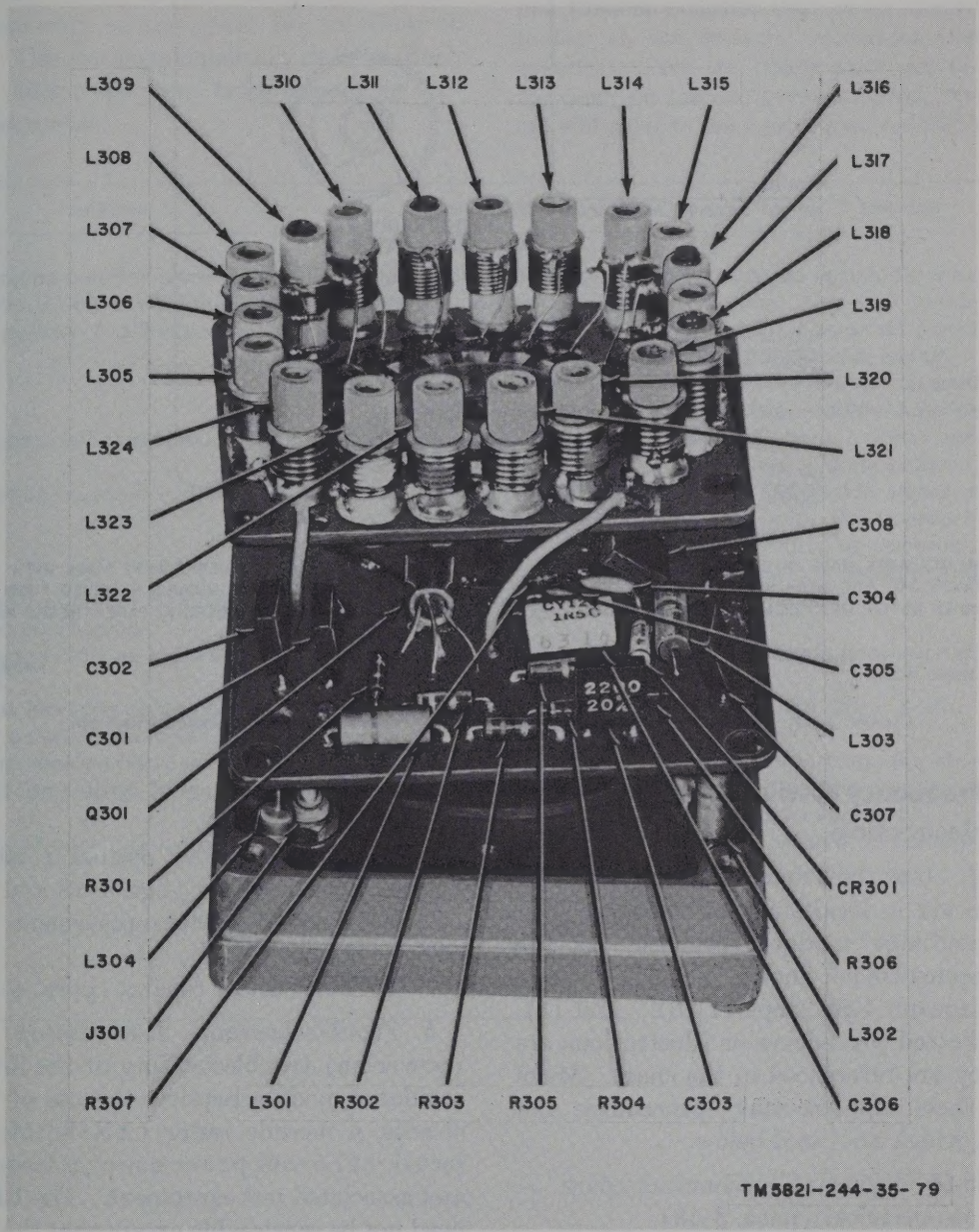
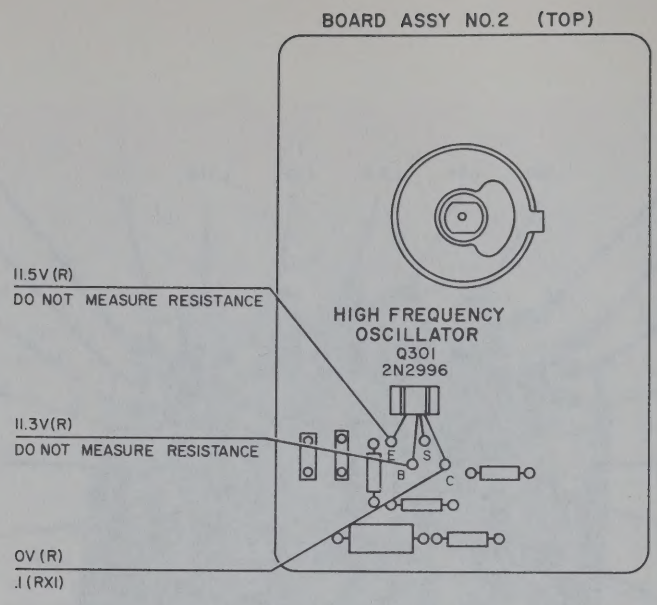


Figure 4-16. High-frequency oscillator module, parts identification, top view.



NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

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Figure 4–17. High-frequency oscillator module, voltage and resistance diagram.

4–9. Low-Frequency Oscillator Module Troubleshooting

a. General. Use the troubleshooting chart (*c* below) as an aid in localizing and isolating low-frequency oscillator module troubles. If the trouble symptoms are not known, perform the tests given in paragraph 4–2*b*, steps (1), (2), and (3). When complicated procedures or illustrations are required, they are referenced in the chart. Make full use of these supplementary procedures and illustrations, which are listed below.

(1) Module alignment, mechanical (para. 3–16) or electrical (para. 3–18).
(2) Low-frequency oscillator module, schematic diagram (fig. 1–7).
(3) Circuit functioning (para. 1–20).
(4) Module tests (para. 4–2*b*, steps (1) through (3)).
(5) Low-frequency oscillator module, voltage, and resistance diagram (fig. 4–20).
(6) Dc resistance of coils and transformers (para. 4–18).
(7) Low-frequency oscillator module, parts identification (figs. 4–18 and 4–19).
(8) General parts replacement instructions (para. 4–23).
(9) Mechanical repairs (para. 4–30).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the low-frequency oscillator module requires the use of an RF subchassis, a module tester (AN/ARM–87), an external +27.5-volt power source, a frequency meter, and associated test equipment. The RF subchassis need not be serviceable except that the chassis wiring, Zener diode CR901, and resistor R901 must be satisfactory (to supply operating voltage to the module). When checking the output level or frequency, always install the cover to avoid detuning the tuned circuits.

c. Troubleshooting Chart. The chart below lists common low-frequency oscillator troubles,

probable causes, and procedures for localizing and isolating the troubles. Supplementary data (*a* above) are referenced in the chart when applicable. Do not rely on the chart for solutions to all troubles. Use the supplementary data as much as possible, adapting your troubleshooting approach to the trouble.

Note. RF measurements are not reliable when made inside the module because removal of the cover detunes the oscillator tuned circuits. Remove the cover and adjust trimmer capacitor C401 as necessary. If trouble is present on one or more frequencies (but not all frequencies), leave the tuning shaft set to the improper frequency for internal troubleshooting. The switch rotor tab will point to the crystal used for that frequency.

Item	Indication	Probable trouble	Procedure
1	Reading on receiver-transmitter TEST METER is low for position 3 (all channels).	Low stage gain (Q401), improper bias, meter circuit, or switch worn or dirty.	Inspect the switch for wear, dirt, or corrosion. Check dc levels at Q401 (fig. 4–20). Check all circuit components including meter circuit. ***Caution:*** **Do not measure resistance of Q401 base–emitter junction (fig. 4–20).**
2	No output (all channels)	Same as item 1 above, or mechanical.	Same as item 1 above except check mechanical alignment first (para. 3–16).
3	No output on some channels	Defective crystal or switch	Check the switch stator segment associated with the improper frequency for wear, dirt, or corrosion. If switch is satisfactory, replace crystal.
4	Incorrect oscillator frequency on some channels.	Defective crystals	Replace crystals.
5	Frequency drift on some channels.	Defective crystals	Replace crystals.
6	Output level too high or too low on some channels.	Improper adjustment of C401	Adjust C401 (para. 3–18).
7	Module uses excessive current	+18-volt circuit short (or abnormally low resistance) to ground.	Check capacitors for shorts to ground. Check resistors for low values. Check wiring for shorts (fig. 1–7).
8	Oscillator output is intermittent.	Worn or dirty switch segments or bent rotor tab, defective solder joint, coaxial connector or main connector, or diode or capacitor shorting internally.	Check switch, connectors, wiring, and circuit components.

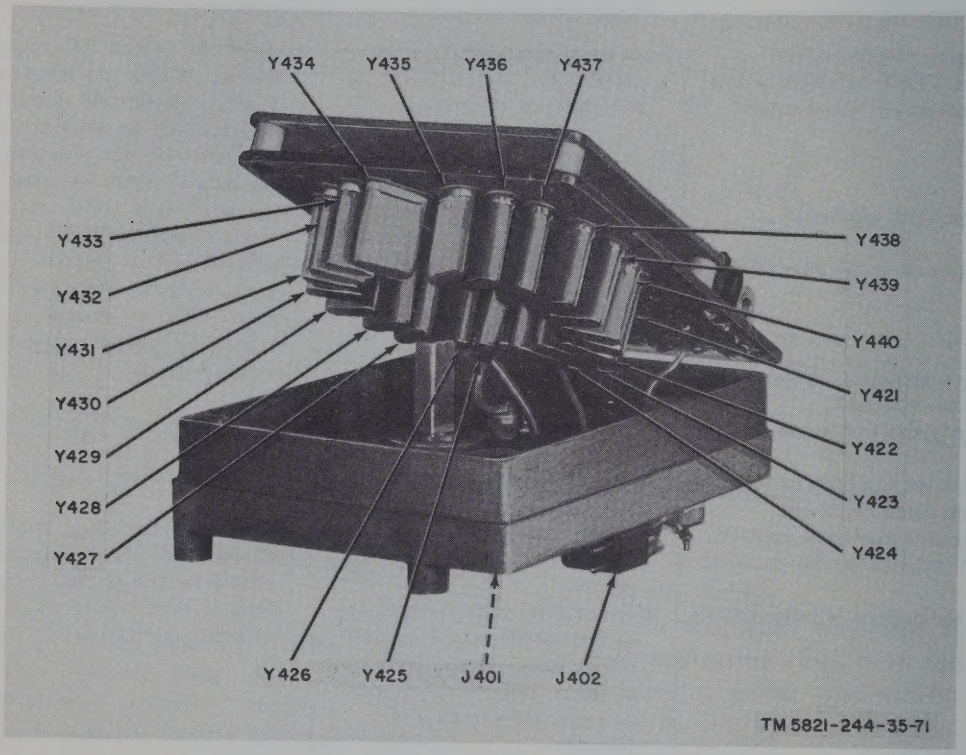


Figure 4–18. Low-frequency oscillator module, parts identification, bottom view.

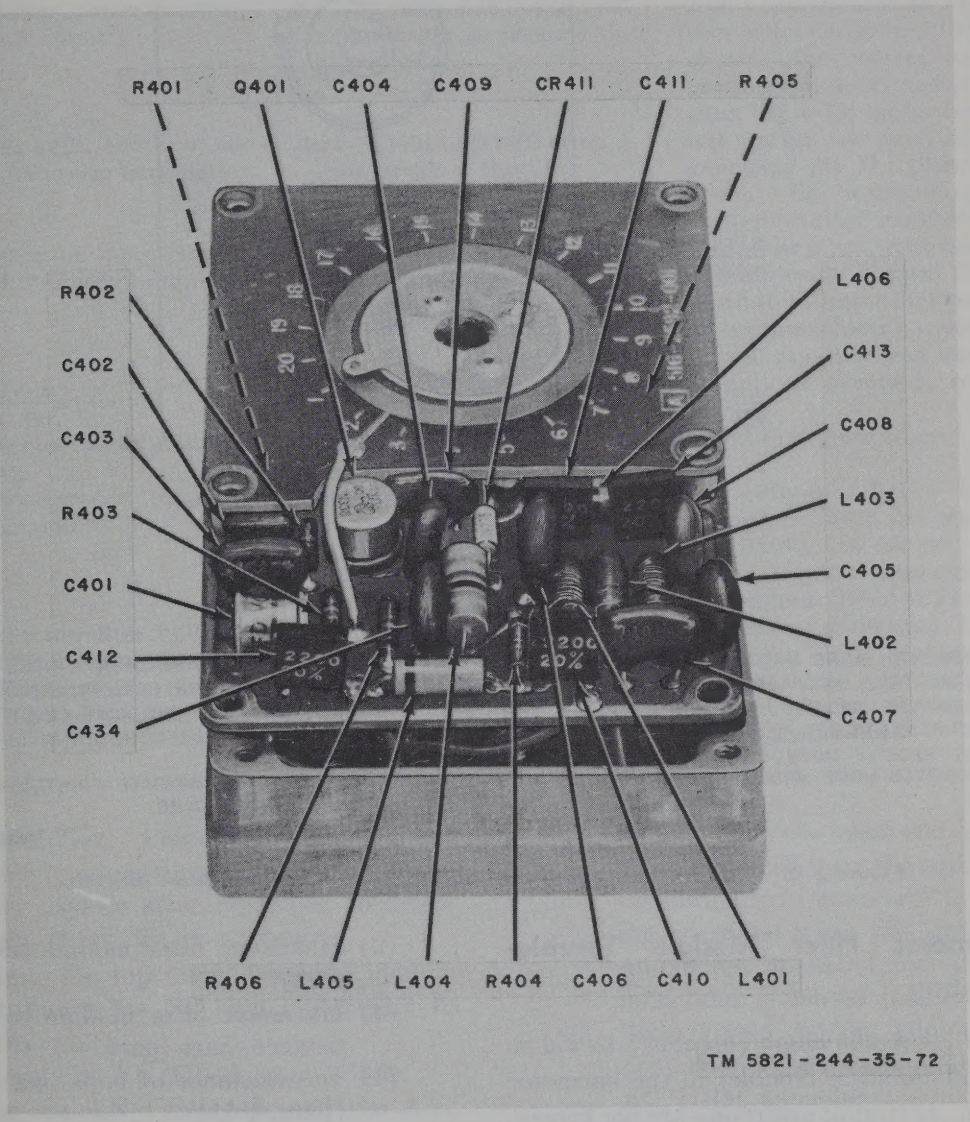
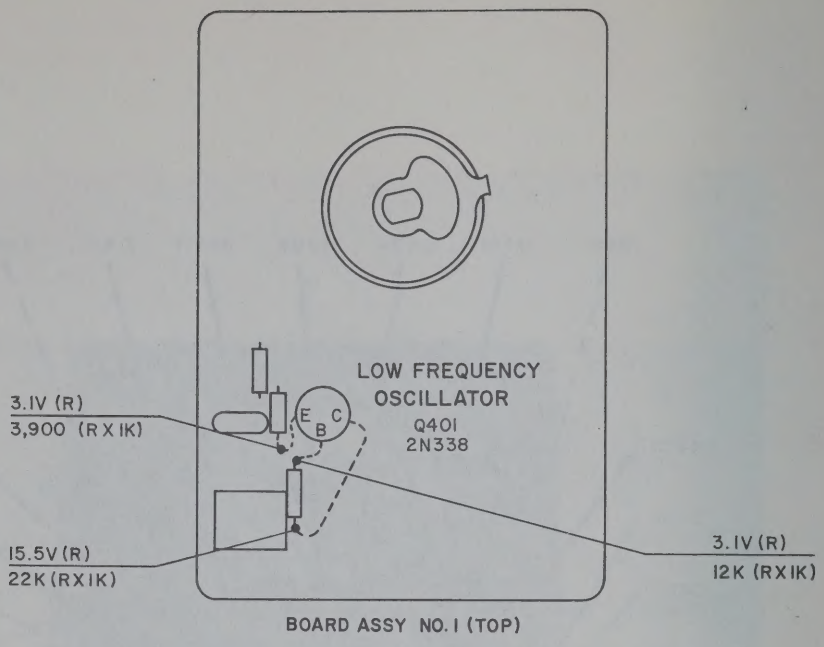


Figure 4–19. Low-frequency oscillator module, parts identification, top view.



NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.
4. DASHED LINES INDICATE PRINTED CIRCUIT WIRING ON BACK OF BOARD.

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Figure 4–20. Low-frequency oscillator module, voltage and resistance diagram.

4–10. Harmonic Filter Module Troubleshooting

a. General. Use the chart (*b* below) to aid in localizing and isolating troubles in the harmonic filter module. If trouble symptoms are not known, perform the tests given in *c* below. Illustrations and procedures that supplement the troubleshooting chart are:

(1) Harmonic filter module, schematic diagram (fig. 6–13).
(2) Harmonic filter module test setup (fig. 4–22).
(3) Harmonic filter module voltage and resistance chart (para. 4–11).
(4) Dc resistance of coils and transformers (para. 4–18).
(5) Harmonic filter module, parts indentification (fig. 4–21).
(6) General parts replacement instructions (para. 4–23). After repairing the module, perform the tests given in *c* below.

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No power output from receiver-transmitter (power amplifier output is normal).	Coaxial connector P1601 or P1602, relay K1601 or K1602, reflectometer, or sidetone gate rectifier.	Check for direct continuity from P1601 to P1602 and check to see that continuity does not exist from P1601 to module chassis. Use voltage and resistance chart (para. 4–11) and schematic diagram (fig. 6–13) for further checks.
2	Output on upper (or lower) end of the frequency band only.	Relay K1601 or K1602 or an open circuit or short to ground.	Check relays by applying power and grounding pin D. Observe relays for action. Use schematic diagram (fig. 6–13) for further troubleshooting.
3	Weak output on upper (or lower) half of frequency band.	Defective solder joint, leakage path to ground, or improperly tuned coils.	Check solder joints and reheat if in doubt. Use schematic diagram (fig. 6–13) and ohmmeter to check for leakage to ground or try unsoldering one end of any suspected capacitor and checking power output. If necessary, retune coils (*c* below).
4	High level harmonics present in output.	Improper tuning of coils	Perform tuning procedure (*c* below).
5	No sidetone present (transmission normal).	Sidetone gate detector circuit	Check diodes CR1603 and CR1604, capacitors C1620 through C1622, resistor R1607, and inductor L1609. Also check coupling capacitor C1610 and wiring from C1610 to P1601.
6	Receiver-transmitter TEST METER indicates abnormal RF FWD (position 10) or RF REFL power (position 11).	Reflectometer or associated circuit.	Use schematic diagram (fig. 6–13) to check for shorts between reflectometer metallic strips. If no shorts are indicated, check all components associated with reflectometer.

c. Operational Test. Perform the tests and adjustments below to insure proper operation of the harmonic filter module after repair, or to determine symptoms if trouble is unknown.

(1) Remove the top cover from the module and connect the RF signal generator to P1602.

(2) Connect the AN/URM–85 to P1602.

(3) Tune the AN/USM–44A and the AN/URM–85 to 70 megacycles.

Note. Carefully tune the AN/URM–85 to the generator frequency to avoid mistuning coils in the procedures that follow.

(4) Place an RF tuning wand near coils L1605, L1606, L1607, and L1608 (fig. 4–21 for coil identification) to determine whether more or less inductance is needed. If the AN/URM–85 meter reading increases when the brass end of the tuning wand is placed near the coil, less inductance is needed (spread coil). If the reading increases when the iron end of the tuning rod is placed near the coil, more inductance is needed (squeeze coil).

(5) Tune L1605, L1606, L1607, and L1608 ((4) above) for maximum reading on the AN/URM–85 meter.

(6) Retune the AN/USM–44A and the AN/URM–85 to 46 megacycles and energize the harmonic filter relays. Apply +27.5 volts dc to pins D and E of the module connector.

(7) Repeat the procedures given in (4) and (5) above for coils L1605, L1606, L1607, and L1608.

(8) Replace the module top cover.

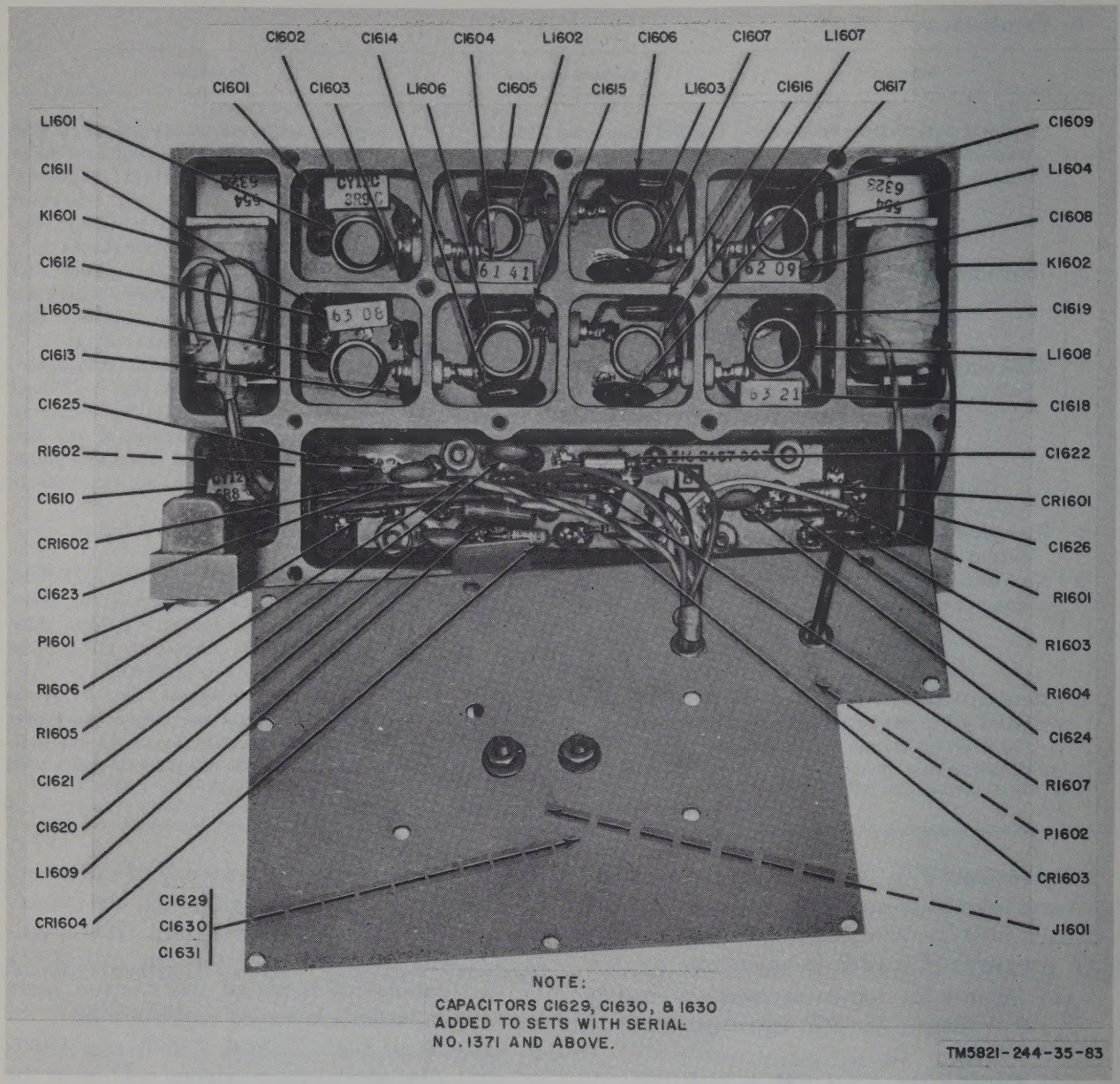


Figure 4-21. Harmonic filter module, parts identification.

(9) With relays energized and the AN/USM-44A and the AN/URM-85 tuned to 46 megacycles as above, note the harmonic filter output as measured on the AN/URM-85 meter. Disconnect the AN/URM-85 and the AN/USM-44A from the harmonic filter and connect the AN/USM-44A direct to the AN/URM-85; note the difference in meter reading on the AN/URM-85. The difference should not exceed 1 db.

(10) Repeat the procedure given in (9) above with the equipment tuned to 60 megacycles. The difference should be not less than 60 db.

(11) Repeat the procedure given in (9) above with the equipment tuned to 63 megacycles. The difference should be not less than 60 db.

(12) If the module fails ((10) or (11) above), tune L1606 (at 65.5 megacycles) and L1607 (at 60 megacycles) for mini-

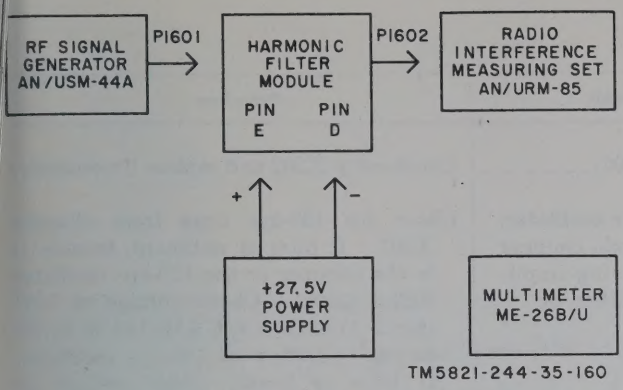


Figure 4–22. Harmonic filter module test setup, block diagram.

mum reading on the AN/URM–85 meter.

(13) Disconnect the +27.5 volts dc from pins D and E of the module connector.

(14) Make attenuation measurements as indicated in (9), (10), and (11) above; use the following frequencies and limits: 70 megacycles, not more than 1 db difference; 92 megacycles, not less than 60 db; 95 megacycles, not less than 60 db.

(15) If the module fails the tests ((14) above), tune L1602 (at 98.4 megacycles) and L1603 (at 92 megacycles) for minimum reading on the AN/URM–85 meter.

(16) Make all resistance measurements provided in paragraph 4–11.

Note. The above steps test all the circuits in the harmonic filter except the sidetone gate rectifier and the reflectometer circuit. These circuits must be tested with an RF power input of 15 watts; therefore, a power amplifier should be used or the module placed in a good RT–348/ARC–54 and operated. Under these conditions, a dc level of approximately 4 volts should be observed at pin A of the module connector (when plugged into the RT–348/ARC–54) and a dc level of approximately 0.5 volt should be observed at pin B (with RT–348/ARC–54 TEST SWITCH in any position other than position 11) and at pin A (with RT–348/ARC–54 TEST SWITCH in any position other than position 10).

4–11. Harmonic Filter Module Voltage and Resistance Chart

The chart below indicates voltages and resistances that should be observed at module connector J1601. Resistance measurements are with positive (common on ME–26A/U) ohmmeter lead to ground, power removed from the module, and the module not connected to the radio set. Voltage measurements are with the module operating in the radio set with the radio set in the transmit condition. All readings are with the ME–26A/U and may vary ±20 percent.

Pin	Resistance	Voltage
A	25K	Not less than +4 volts dc.
B	12K	0.
C	12K	50 millivolts.
D	∞	0 below 46 mc. +27.5 volts above 45.95 mc.
E	∞	+27.5 volts dc.
F	0	0.

Note. Check for approximately 70 ohms between pins F and D and check for direct continuity between the center conductors of P1601 and P1602.

4–12. Homer Module Troubleshooting

a. General. Use the chart (*b* below) as an aid in localizing and isolating homer module troubles. If trouble symptoms are not known, perform the module tests given in *c* below. After the trouble is localized to a stage, check the stage gain and use the voltage and resistance diagrams, dc resistance of coil and transformer table, and the schematic diagram to trace the trouble to a defective component or connection. Refer to paragraph 4–23 for parts replacement instructions. After repairing the module, test the module as indicated in *c* below. The schematic diagram (fig. 6–12) will be useful for troubleshooting. Illustrations and procedures that supplement the troubleshooting chart are:

(1) Homer module, parts identification (figs. 4–23 and 4–24).

(2) Homer module, voltage and resistance diagram (fig. 2–7).

(3) Dc resistance of coils and transformers (para. 4–18).

(4) Stage gain measurements (para. 4–19).

(5) Homer module adjustments (para. 4–35).

(6) General parts replacement instructions (para. 4–23).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No reception (no continuity between J205 and A1, P201).	Defective relay K202	Check relay K202 and replace if necessary.
2	No homer course operation	100-cps square-wave oscillator, homer diode switch, chopper K201, 500-kc homing amplifier, 100-cps amplifier, or relay K202.	Listen for 100-cps buzz from chopper K201. If buzz is notheard, trouble is in the chopper or the 100-cps oscillator (Q201, Q206). Check voltage at J201 (fig. 2–7) with AN/URM–145 to verify proper operation of 100-cps oscillator. If buzz is heard, check voltage at J205. If voltage is not correct, troubleshoot diode switch circuit. If diode switch is good, check 500-kc amplifier Q204, 100-cps amplifier Q205, or output circuit. Check voltage at J204 to verify proper operation of 500-kc amplifier and homer detector.
3	Vertical needle of homing indicator is not centered or indicates too far right or left.	Adjustment of R227, improper operation of diode switch circuit, improper operation of 100-cps oscillator, or defective output circuit (R226–228).	Check and adjust R227 as necessary (para. 4–35). If this does not correct the fault, check voltage at J201 to verify proper 100-cps oscillator operation and at J205 to verify proper diode switch operation.
4	Insufficient vertical needle deflection on homing indicator.	Low stage gain in 500-kc and 100-cps amplifier stages or defective voltage regulator circuit.	Check voltage at J204 to verify proper operation of 500-kc amplifier and detector circuit. If waveform is incorrect, check Q204 gain (para. 4–19) and check associated circuit. If voltage is correct, check for proper Zener voltage (+18 volts across CR208) and check stage gain of Q205. Check adjustment of R224 (para. 4–35).
5	Horizontal needle on homing indicator fails to indicate signal strength change when approaching or leaving the target (ground station).	Improper adjustment of R211, defective regulator circuit (CR207), or signal strength amplifier Q203 or associated circuit.	Check for +18 volts across CR207. Check stage gain of Q203 (para. 4–19) and check for proper adjustment of R211 (para. 4–35). Check all associated components.
6	Horizontal needle operates properly only when very close to ground station.	Improper adjustment of R211 or low stage gain (Q203).	Check for proper adjustment of R211 (para. 4–35) and check Q203 for low stage gain (para. 4–19).

c. Homer Module Operational Test. Perform the tests below to verify repair of the homer module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM–87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column, follow the instructions given in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter. If the module fails the tests, perform the adjustments given in paragraph 4–35, and then repeat the tests.

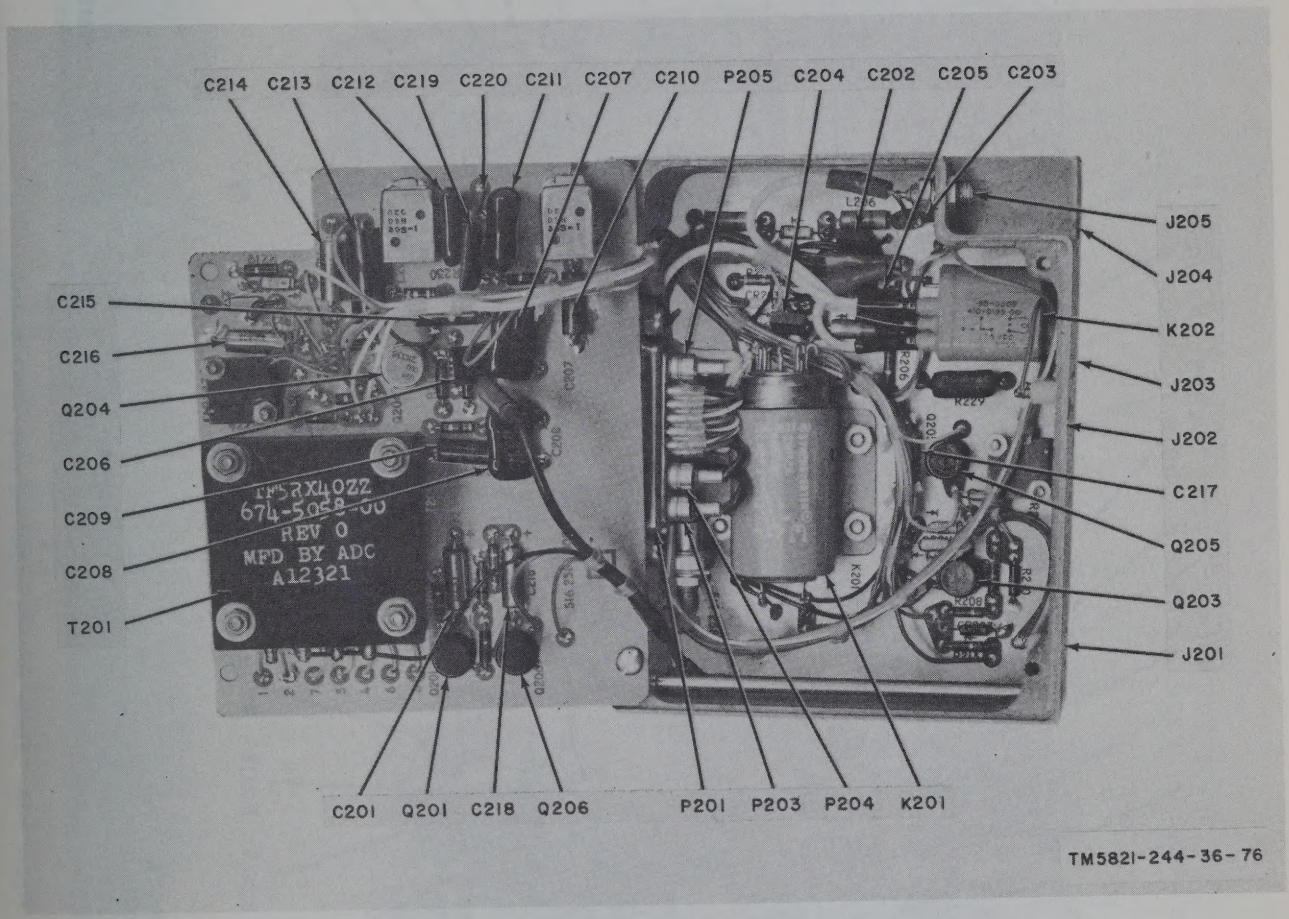


Figure 4-23. Homer module, parts identification.

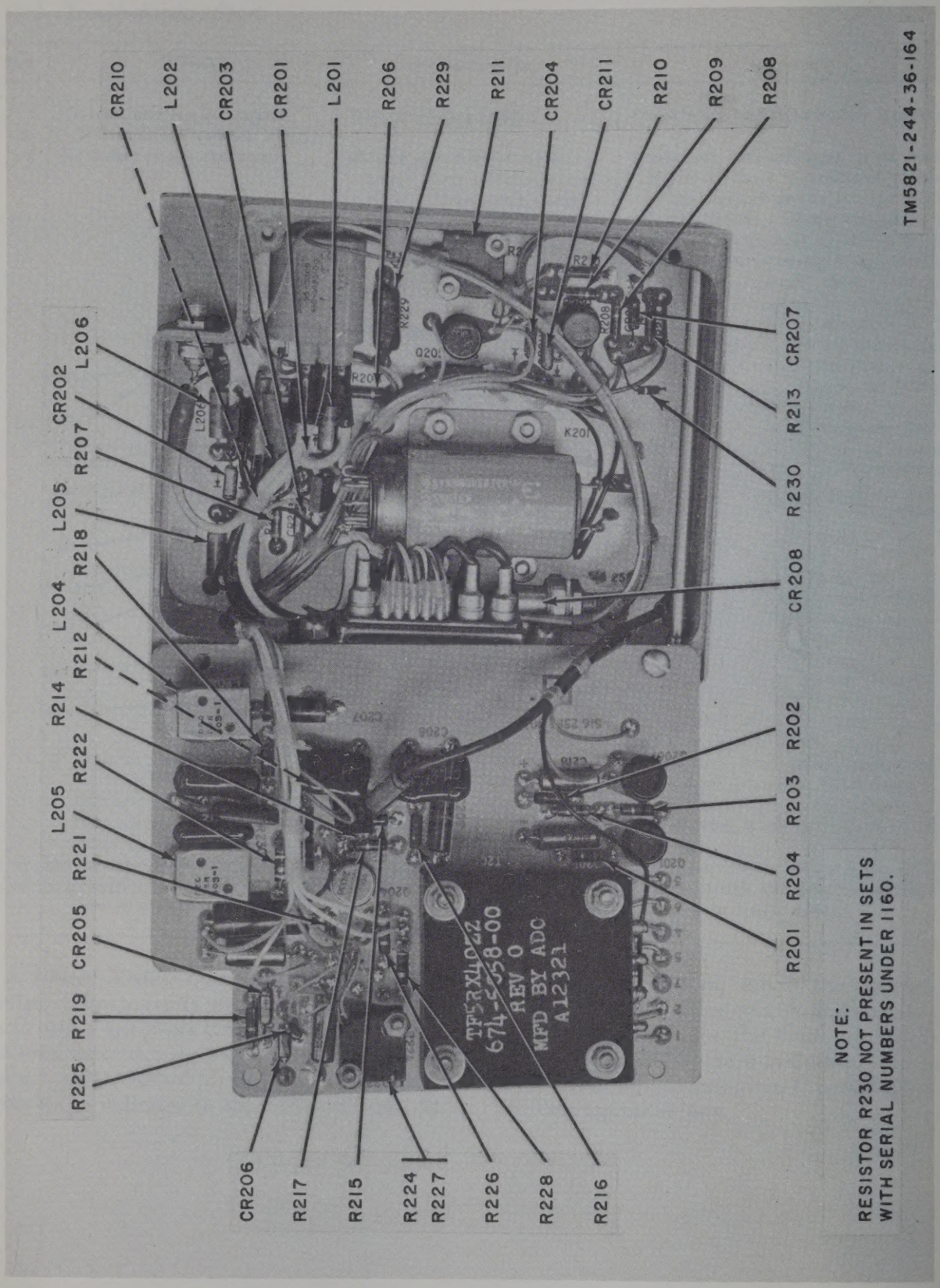


Figure 4-24. Homer module, additional parts identification.

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
1	Signal strength	8	X	X	X	Depress PRESS TO TEST button and read TEST METER.	25	
2	On-course	7	9	4	3	(1) Depress PRESS TO TEST button and read TEST METER. If meter reads downscale, proceed to next step.	------	5
		7	8	3	3	(2) Depress the PRESS TO TEST switch and read the TEST METER.	------	5
3	Synchronous detector	6	9	3	4	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL control for 68% on TEST METER.		
		(AN/ARM–87 cal)						
		7	9	4	4	(2) Depress PRESS TO TEST button and read TEST METER.	10	60
		7	8	3	4	(3) Depress PRESS TO TEST button and read TEST METER.	10	60
4	Antenna diode switch	0	4	2	3	(1) Connect RF jumper cable W4 from 30MC jack to RF VM1.		
		(AN/ARM–87 cal)				(2) Depress PRESS TO TEST button and adjust HIGH FREQ AMPL for 100% on TEST METER.		
						(3) Remove RF jumper cable W4 connected in (1) above.		
		0	5	2	3	(4) Connect RF jumper cable W4 from 30MC jack to HOMER RT.		
						(5) Connect RF jumper cable W5 from RF SW IN to J205 (homer module).		
						(6) Connect RF jumper cable W6 from RF SW OUT to RF VM1.		
						(7) Depress PRESS TO TEST button and read TEST METER.	25	
		0	5	0	3	(8) Depress PRESS TO TEST button and read TEST METER.	25 (1) ±2	
		0	5	1	3	(9) Disconnect RF jumper cable W4 from HOMER RT and connect it to HOMER LT.		
						(10) Depress PRESS TO TEST button and read TEST METER.	25	
		0	5	0	3	(11) Depress PRESS TO TEST button and read TEST METER.	25 (1) ±2	
						(12) Disconnect all RF jumper cables.		

[1] Meter divisions.

4–13. Sel-Call Module Troubleshooting

(fig. 4–26)

a. General. Use the chart (*b* below) as an aid in localizing and isolating sel-call module troubles. If trouble symptoms are not known, perform the tests given in *c* below. After the trouble is localized to a stage, check the stage gain and use the voltage and resistance diagrams, the dc resistance of coils and transformers chart, and the schematic diagram to trace the trouble to a defective component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are:

(1) Sel-call module, schematic diagram (fig. 6–11).

(2) Sel-call module, parts identification (fig. 4–25).
(3) Sel-call module, voltage and resistance diagram (fig. 2–8).
(4) Dc resistance of coils and transformers para. 4–18).
(5) Stage gain measurements (para. 4–19).
(6) Sel-call module adjustments (para. 4–34).
(7) General parts replacement instructions (para. 4–23).
(8) Sel-call module test setup, block diagram (fig. 4–26).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No reception in tone-squelch mode. Will not squelch in CARR. (Reception good with squelch disabled.)	Zener regulator CR104, CR105, or CR106 or preamplifier Q101.	Check for +18 volts across CR104 (TP8) and +6.5 volts across CR101 at TP1. Check for +9.1 volts across CR105 and +9.1 volts across CR106. If voltages are correct, check stage gain of Q101 (para. 4–19). Check all associated components.
2	No reception in tone-squelch mode.	Selective amplifier Q102 and Q103, tone amplifier Q104, or adjustment of frequency or bandwidth controls R108, R110, and R112.	Check for proper adjustment of R108, R110, and R112 (para. 4–34). If adjustments fail to correct trouble, check gain of Q102, Q103, and Q104. Check voltages at test points (fig. 2–8). Check all components associated with Q102, Q103, and Q104.
3	No reception in carrier squelch mode.	Noise amplifier Q106 oscillating.	Check for signal (approximately 10 kc) (use high gain oscilloscope) at pin 10 of module connector P101 with pin 12 of P101 grounded. If signal is present, Q106 is oscillating. Check Zener diodes CR105 and CR106. Check Q106.
4	No 150-cps tone transmission (tone-squelch reception is normal).	Shorted capacitor C105 or diode CR102 or CR103.	Check for shorted capacitor C105 or diode CR102 or CR103. Check stage gain (para. 4–19) and check for correct voltages at test points (fig. 2–8). Check components associated with Q102 and Q103.
5	Transmitted tone is not the correct frequency.	Adjustment of R108 or defective component in Q102 collector circuit or feedback circuit (C107).	Check adjustment of R108 (para. 4–34). If adjustment cannot be performed or fails to correct the fault, check Q102 and Q103 and associated components.
6	All stations received in tone-squelch mode (no selective calling).	Selective amplifiers Q102 and Q103 oscillating in receive mode.	Check for open diode CR102 or CR103, improper adjustment of R108, R110, or R112 (para. 4–34). Check for incorrect resistor values in Q102 collector and emitter circuit. Replace transistors Q102 and Q103.
7	Unable to adjust SQ ADJ (front panel adjustment) for desired squelch action.	Stage gain of Q105, Q106, or Q107 or defective diode CR108 or Zener diode CR101.	Check stage gain (para. 4–19) of Q105, Q106, and Q107. Check diode CR108 (proper dc level at base of Q107 (fig. 2–8)). Check for +6.5 volts at TP1. (Replace CR101 if not correct.)

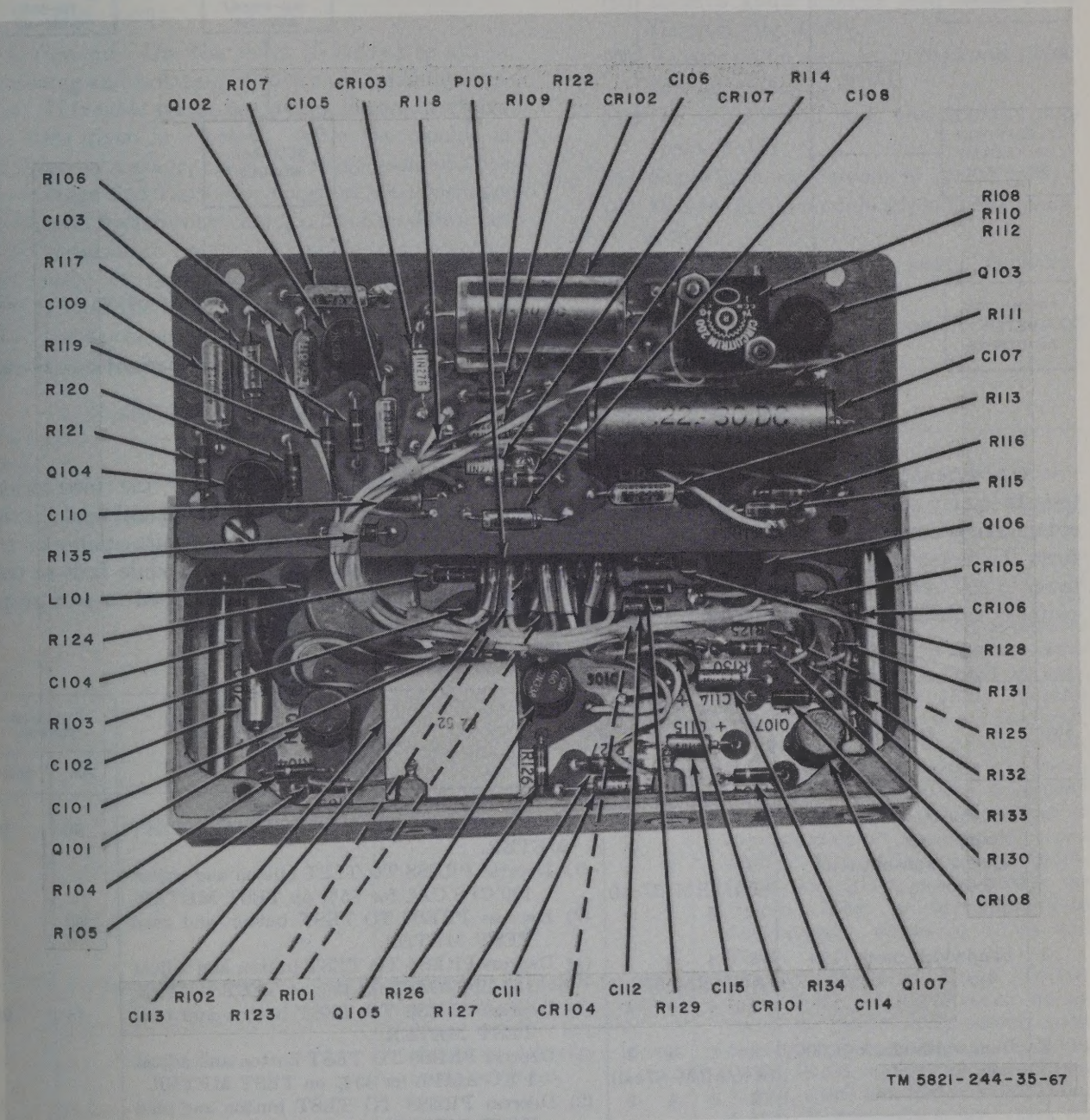


Figure 4-25. Sel-call module, parts identification.

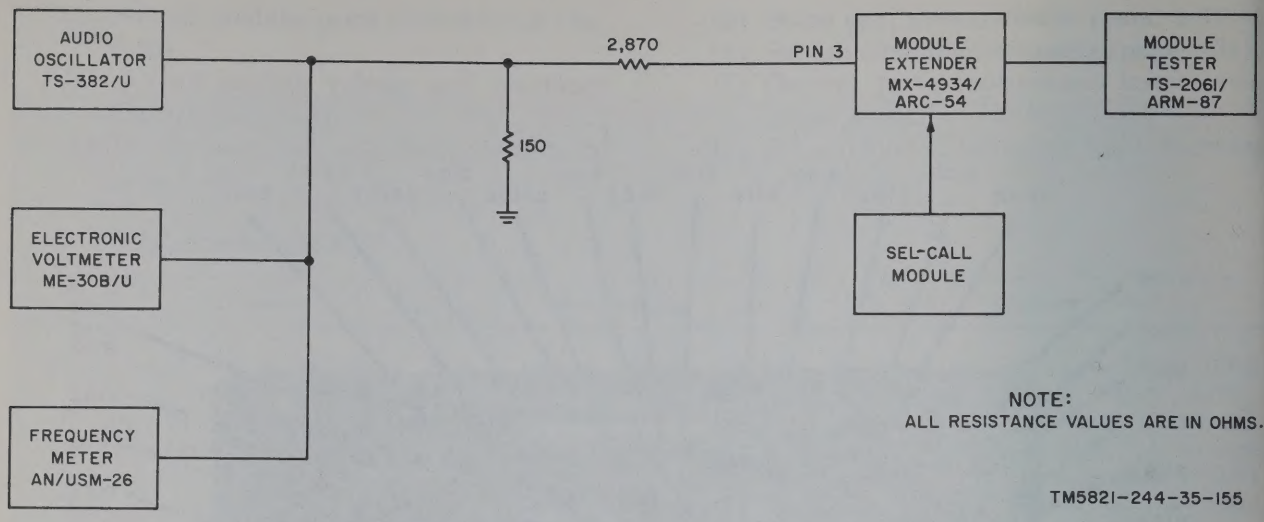


Figure 4-26. Sel-call module test setup, block diagram.

c. Operational Test. Perform the following tests to verify repair of the sel-call module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column, follow the instructions given in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter. If the module fails to test, perform the adjustments described in paragraph 4-34, and then repeat the tests.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	150-cps transmit tone amplitude.	4	5	3	0	Depress PRESS TO TEST button and read TEST METER.	50	90
2	150-cps transmit tone frequency.	5	5	3	1	(1) Depress PRESS TO TEST button and adjust		
		(AN/ARM-87 cal)				150 CPS CAL for 65% on TEST METER.		
		5	5	3	0	(2) Depress PRESS TO TEST button and read TEST METER.	50	
3	Bandwidth check (150 cps).	5	4	4	1	(1) Depress PRESS TO TEST button and adjust		
		(AN/ARM-87 cal)				150 CPS AMPL for 48% on TEST METER.		
		2	4	4	1	(2) Depress PRESS TO TEST button and read TEST METER.	45	85
4	Bandwidth check (1,000 cps).	2	2	4	3	(1) Depress PRESS TO TEST button and adjust		
		(AN/ARM-87 cal)				1 KC AMPL for 39% on TEST METER.		
		2	4	4	3	(2) Depress PRESS TO TEST button and read TEST METER.	------	5
5	Squelch disable	2	4	4	4	Depress PRESS TO TEST button and read TEST METER.	55	95

4–14. Receive Audio Module Troubleshooting

(fig. 4–29)

a. General. Use the chart (*b* below) to aid in localizing and isolating receive audio module troubles. If trouble symptoms are not known, perform the tests given in *c* below. After the trouble is localized to a stage, check the stage gain and use the voltage and resistance diagram, dc resistance of coil and transformer chart, and the module schematic diagram to isolate the trouble to a defective component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are as follows:

(1) Receive audio module, schematic diagram (fig. 6–9).
(2) Receive audio module test setup, block diagram (fig. 4–29).
(3) Receive audio module, voltage and resistance diagram (fig. 2–9).
(4) Dc resistance of coils and transformers (para. 4–18).
(5) Stage gain measurements (para. 4–19).
(6) Receive audio module adjustments (para. 4–37).
(7) Receive audio module, parts identification (figs. 4–27 and 4–28).
(8) General parts replacement instructions (para. 4–23).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	Dead receiver (no audio, sidetone, or noise or channel tone).	Audio power amplifier (Q1305, Q1306), audio driver amplifier (Q1304), audio regulator circuits (CR1307), or transformers T1302 and T1301.	Start with Q1301 and make voltage measurements on Q1301, Q1302, Q1304, Q1305, and Q1306 (fig. 2–9). If checks indicate that Q1301 is not conducting (no voltage at Q1301 collector), try jumpering collector of Q1301 to collector of Q1302. If Q1301 still does not check normal, the trouble is Q1301 or associated circuit. If Q1301 operates normally when collectors are jumpered, the trouble is Q1302 or its bias circuit. If Q1301 and Q1302 voltages are normal, check to see that CR1305 is properly biased (as indicated by dc voltage of approximately 6 to 8 volts across R1313). If so, voltage checks at Q1304, Q1305, and Q1306 should localize the trouble. Refer to paragraph 4–18 for resistance checks of T1301 and T1302.
2	Audio output is weak	Adjustment of R1315 (GAIN), low stage gain in preamplifier, driver, or power amplifier circuit, or defective +18-volt regulator circuit.	Check adjustment of R1315 (GAIN) (para. 4–37). If R1315 cannot be adjusted for proper audio output, make stage gain checks (para. 4–19) on Q1301, Q1304, Q1305, and Q1306. If stage gain is good, check transformer T1302 (para. 4–18). If stage gain is low, check for proper bias voltages (fig. 2–9) and check transistor and all associated circuits.
3	Audio is distorted	Adjustment of R1315 (GAIN), driver amplifier Q1304 too much gain, improper bias on Q1304 or Q1305 and Q1306, or defective transformer T1301 or T1302.	Check adjustment of R1315 (para. 4–37). If R1315 is properly adjusted, use voltage and resistance diagram (fig. 2–9) to check for proper bias voltages on Q1304, Q1305, and Q1306. If voltages are correct, use an oscilloscope to check for source of distortion.

Item	Indication	Probable trouble	Procedure
4	No carrier squelch (receiver noise heard as in squelch disabled mode).	Adjustment of R1332, audio gate (Q1302, Q1303), voltage tripler, audio gate bias circuits, or diode CR1305 or CR1306.	Check for proper adjustment of R1332 (para. 4–37). Check voltages in audio gate circuit, Q1302, Q1303 (fig. 2–9). If improper bias is indicated, check voltage tripler circuit and fixed bias circuits. (Q1302 should be cut off by a negative base voltage when no carrier is present. Diode CR1306 should be reverse-biased to prevent audio from coupling through it from Q1303, which is conducting.) Check diode CR1306 and its bias circuit.
5	Excessively noisy reception	Voltage tripler rectifier CR1314, filter capacitor C1316, or noise in bias supply.	Check for shorted diode CR1314. Check for defective (open) filter capacitor C1316. Check for noise in bias supply (pin 12 of P1301). Use oscilloscope to check for noise at all transistor inputs and outputs.
6	Receiver does not unsquelch or squelch properly (unable to adjust SQ ADJ for proper squelch action).	Adjustment of R1332 (squelch sensitivity), Zener diode circuit CR1318, voltage tripler, audio gate, Q1302 and Q1303, or audio gate bias circuit.	Check for proper adjustment of R1332. If this adjustment cannot be made, check for proper voltage (8.2 volts) across Zener diode CR1318. Check values of R1331–R1333. Check for proper bias voltages (fig. 2–9) on terminals of Q1302 and Q1303. If voltages are incorrect, check associated circuit components and check voltage tripler circuit.
7	No audio heard in TONE squelch mode.	Audio gate (Q1302, Q1303), audio gate bias circuits, CR1313, C1320, R1334, or CR1306 or its bias circuit.	First, check the components listed in the Probable trouble column (except the transistors). If they are good, check for proper forward biasing of CR1306 (voltage drop across it should be practically zero). Next, check dc levels at terminals of Q1302 and Q1303 (fig. 2–9) and, if they are not correct, check transistors and their bias circuits. (Voltage tripler is probably good if operation is normal in CARR squelch mode.)
8	All stations heard in TONE squelch mode (no selective calling capability).	Q1303 conducting (should be cut off), diode CR1305 conducting (should be cut off).	Check for proper voltages at Q1303 terminals (fig. 2–9). If voltages indicate that Q1303 is conducting, check adjustment of R1332 (para. 4–37) and other components in Q1303 bias circuit. Check Q1303. If CR1305 is conducting, check for shorted capacitor C1304, diode CR1305, or for any dc path to ground from cathode end of CR1305.
9	Retransmit operation abnormal (transmitter transmits carrier when no carrier is being received, or fails to transmit when carrier is received).	Bias circuit (R1310, R1311), Zener diode CR1315, relay K1301, or Q1307 or associated components.	Check for proper voltage at TP1 (fig. 2–9). If voltage is incorrect, check resistors R1310 and R1311, Zener diode CR1315, and Q1307 and associated circuit. If voltage at TP1 is correct, check transistor Q1307, relay K1301, and diode CR1317.

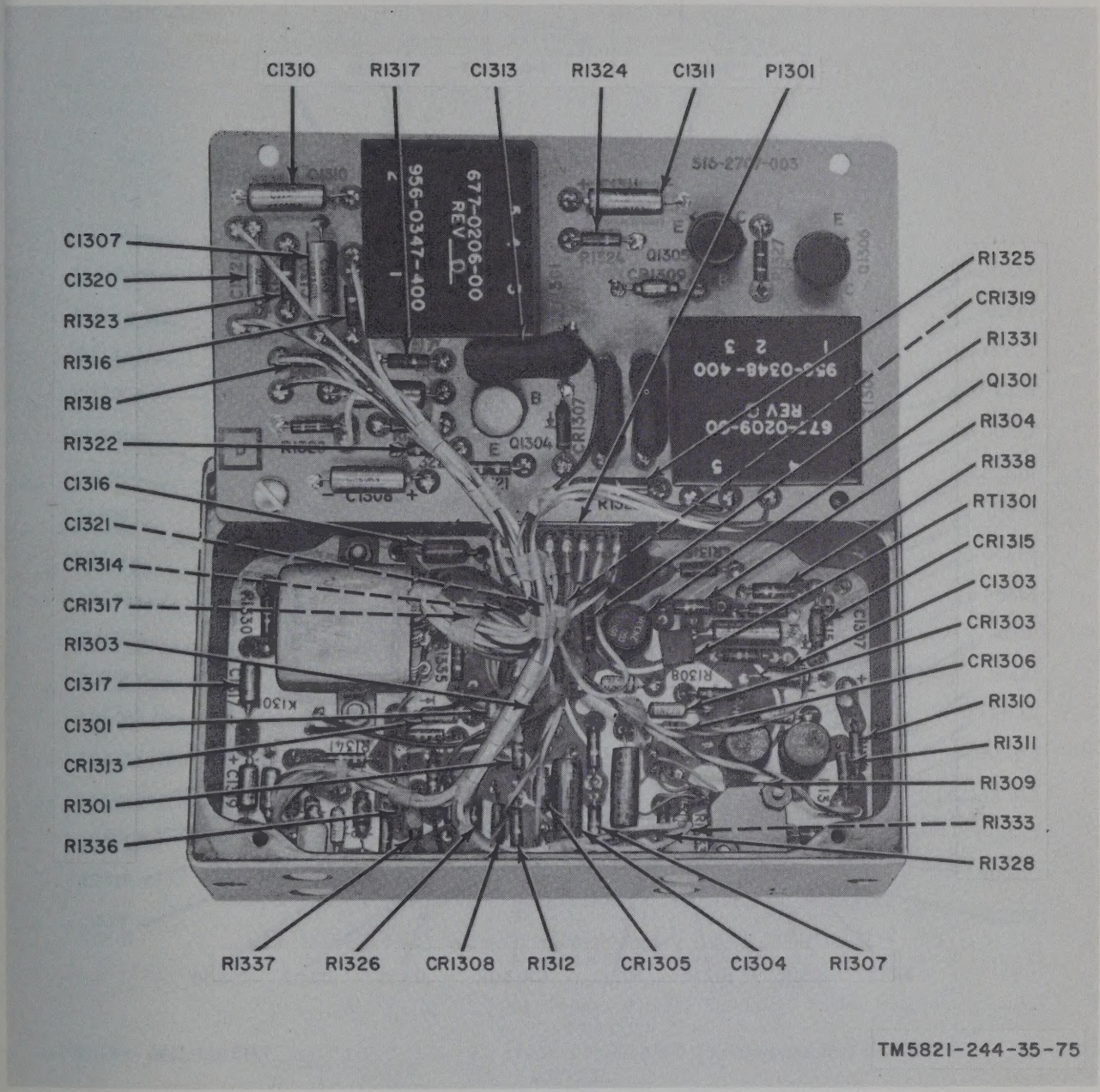


Figure 4-27. Receive audio module, parts identification.

c. Operational Test. Perform the test in the chart below to verify repair of the receive audio module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column, follow the instructions in the Instructions column, and then read the test results prescribed in the Test limits column on the module tester meter. If the module fails the tests, perform the adjustments described in paragraph 4-37, and then repeat the tests.

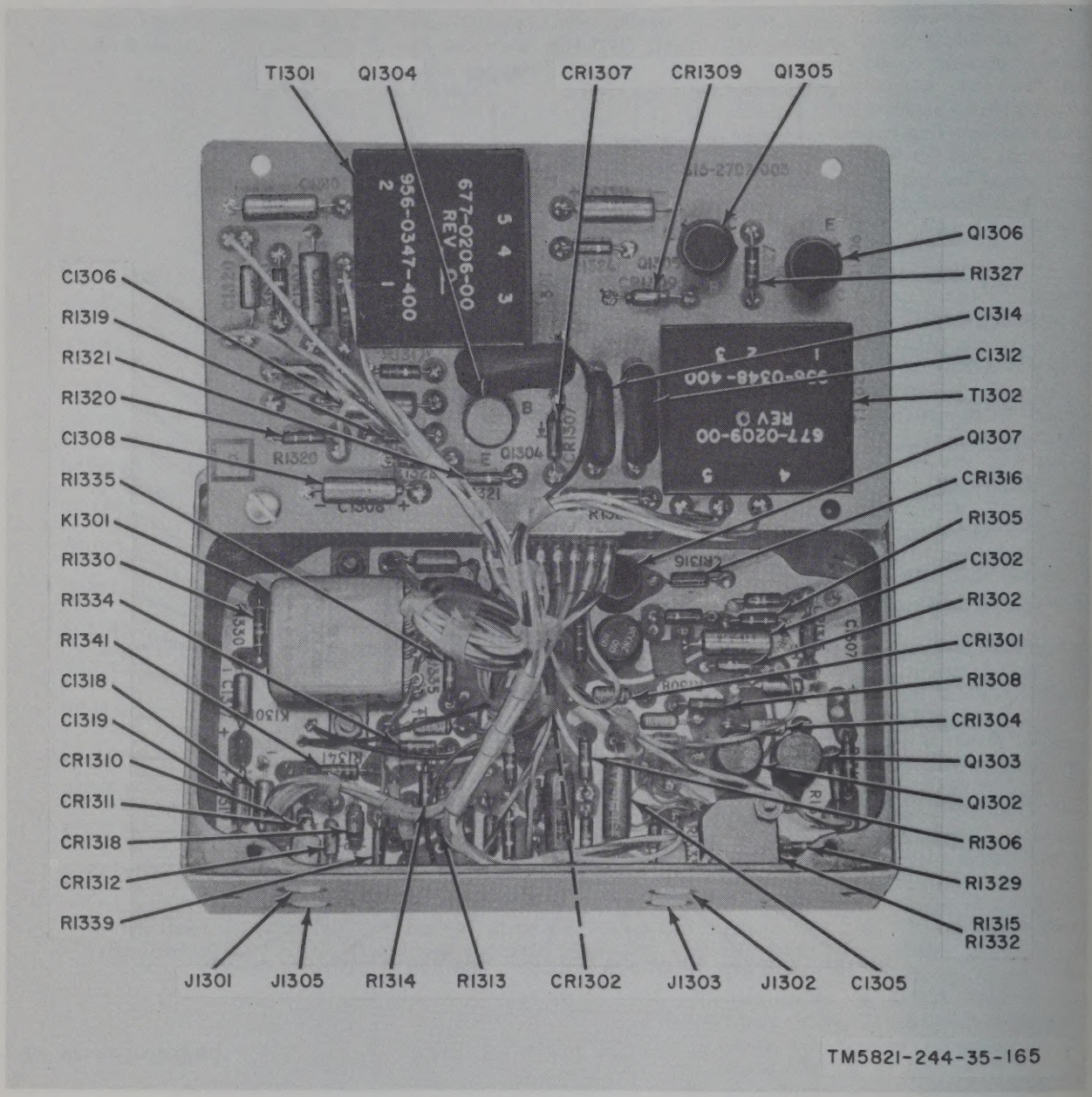


Figure 4-28. Receive audio module, additional parts identification.

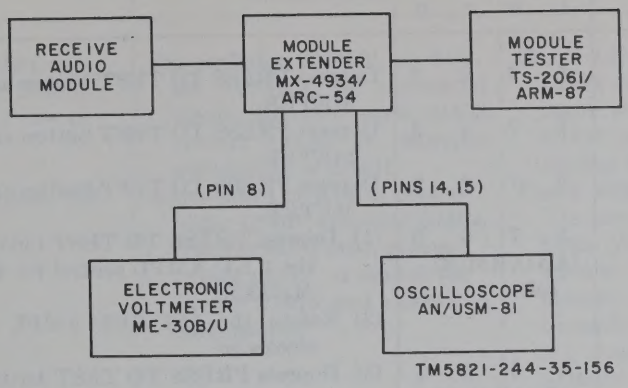


Figure 4–29. Receive audio module test setup, block diagram.

Step	Test name	Circuit selector switches A B C D	Instructions	Test limits (percent) Min	Max
1	Audio gain	5 7 6 0 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 95% on TEST METER.		
		6 7 1 0	(2) Depress PRESS TO TEST button and read TEST METER.	50	90
2	Audio distortion	5 1 1 0 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust DIST DET for 55% on TEST METER.		
		5 1 0 0	(2) Depress PRESS TO TEST button and read TEST METER.	------	85
3*a*	Carrier squelch level	5 7 6 0 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust the 1 KC AMPL control for 92% on TEST METER.		
			(2) Rotate 10 KC AMPL control fully counterclockwise.		
		6 7 5 8 (AN/ARM–87 cal)	(3) Depress PRESS TO TEST button and slowly rotate 10 KC AMPL clockwise until TEST METER suddenly drops to zero. (Do not readjust 10 KC AMPL control.)		
		5 7 5 8	(4) Depress PRESS TO TEST button and read TEST METER.	------	70
3*b*	Relay position 1	1 7 5 8	Depress PRESS TO TEST button and read TEST METER.	10	30

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
3c	Squelch disable	6	7	4	8	Depress PRESS TO TEST button and read TEST METER.	50	90
3d	Relay position 2	1	7	4	8	Depress PRESS TO TEST button and read TEST METER.	10	30
3e	Transmit mode	6	7	2	8	Depress PRESS TO TEST button and read TEST METER.	------	5
4	Unsquelch 150-cps amplitude.	5	7	6	0	(1) Depress PRESS TO TEST button and adjust the 1 KC AMPL control for 92% on TEST METER.		
		(AN/ARM–87 cal)				(2) Rotate the 150 CPS AMPL control fully clockwise.		
		6	0	6	1	(3) Depress PRESS TO TEST button and slowly decrease the setting of 150 CPS AMPL until TEST METER suddenly drops to zero. (Do not readjust 150 CPS AMPL control.)		
		(AN/ARM–87 cal)						
		5	0	4	1	(4) Depress PRESS TO TEST button and read TEST METER.	20	70
5	Sidetone	4	2	X	7	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 92% on TEST METER.		
		(AN/ARM–87 cal)						
		6	7	2	7	(2) Depress PRESS TO TEST button and read TEST METER.	50	80

4–15. Transmit Audio Module Troubleshooting

(fig. 6–10)

a. General. Use the following chart to aid in localizing and isolating transmit audio module troubles. If trouble symptoms are not known, perform the test given in *c* below. After the trouble is localized to a stage, check the stage gain and use the voltage and resistance diagram, the dc resistance of coil and transformer chart, and the module schematic diagram to isolate the trouble to a defective component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are:

(1) Transmit audio module, schematic diagram (fig. 6–10).
(2) Transmit audio module test setup, block diagram (fig. 4–32).
(3) Transmit audio module, voltage and resistance diagram (fig. 2–10).
(4) Dc resistance of coils and transformers (para. 4–18).
(5) Stage gain measurements (para. 4–19).
(6) Transmit audio module adjustments (para. 4–38).
(7) Transmit audio module, parts identification (figs. 4–30 and 4–31).
(8) General parts replacement instructions (para. 4–23).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No transmission (reading on receiver-transmitter TEST METER, position 7 low or zero).	Fm oscillator (Q1403), modulator (C1415), or associated circuit defective; open Q1403 emitter circuit or improper adjustment of L1401.	Check adjustment of L1401 (para. 4–38). Check voltages on Q1403 (fig. 2–10) and check stage gain (para. 4–19). Check C1415 and associated components including Zener diode CR1402.
2	Transmitter power is good but audio is distorted.	Adjustment of R1402, preamplifier Q1401, amplifier Q1402, transformer T1401, preemphasis circuit, or modulator circuit C1415 and associated components.	Check adjustment of R1402 (para. 4–38). Use electronic voltmeter to trace audio from pins 1 and 3 of P1401 through circuits named in Probable trouble column. When signal is lost (or abnormally reduced), check gain of preceding stage (para. 4–19) and check all voltages and resistances in the associated circuit (fig. 2–10). If all voltages and stage gains are good but modulation is still low, replace C1415.
3	Transmit audio is distorted	Improper adjustment of L1401, a transistor or C1415 is defective or being overdriven; preemphasis circuit or T1401 defective.	Check L1401 adjustment (para. 4–38). Check transistor voltages (fig. 2–10) or use an oscilloscope to trace the circuit for the source of the distortion. If the distortion seems to appear first in the modultor-oscillator circuit and all other checks are good, replace C1415.
4	Weak or no sidetone	Adjustment of R1413 (SIDETONE), diode CR1403, R1411, R1415, R1414, C1407, C1403, or T1401.	Check adjustment of R1413 (para. 4–38). If this does not correct the fault, check for sidetone audio between terminals 5 and 6 of T1401. If none, check transformer winding dc resistance (para. 4–18). If audio is present at terminals 5 and 6 of T1401, check components listed in Probable trouble column.
5	No 150-cps tone transmission	Shorted C1409, open R1420 or C1410, defective R1424, C1444, R1425, or CR1402.	Check components in order listed or trace signal from pin 8 of P1401 to oscillator circuit with electronic voltmeter.
6	Faulty retransmit interlock operation.	Relay K1401, diode CR1405, capacitor C1423, or resistor R1433.	If relay K1401 does not operate when transmit button is pressed (or pin 2 of P1401 is grounded), check to see that C1423 is not shorted. If C1423 is good, replace K1401. If relay operates but delay is not right (radios oscillate back and forth in retransmit mode), check R1433, C1423, and CR1405.
7	Abnormal (or no) security operation.	Security input circuit or open diode CR1404.	Check CR1404 for an open. If CR1404 is good, check all components in security input circuit (from pin 13 of P1401 to oscillator circuit.

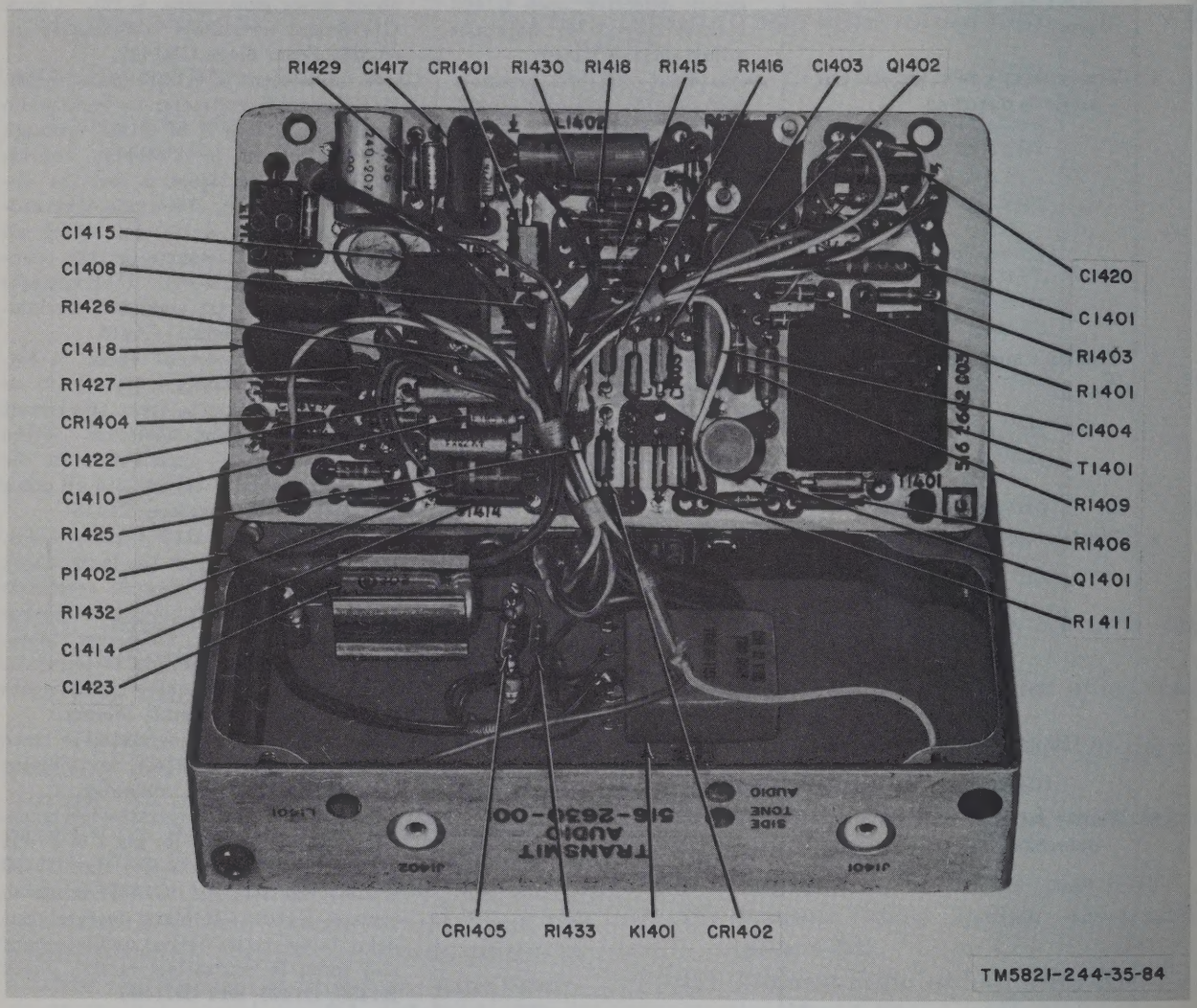


Figure 4–30. Transmit audio module, parts identification.

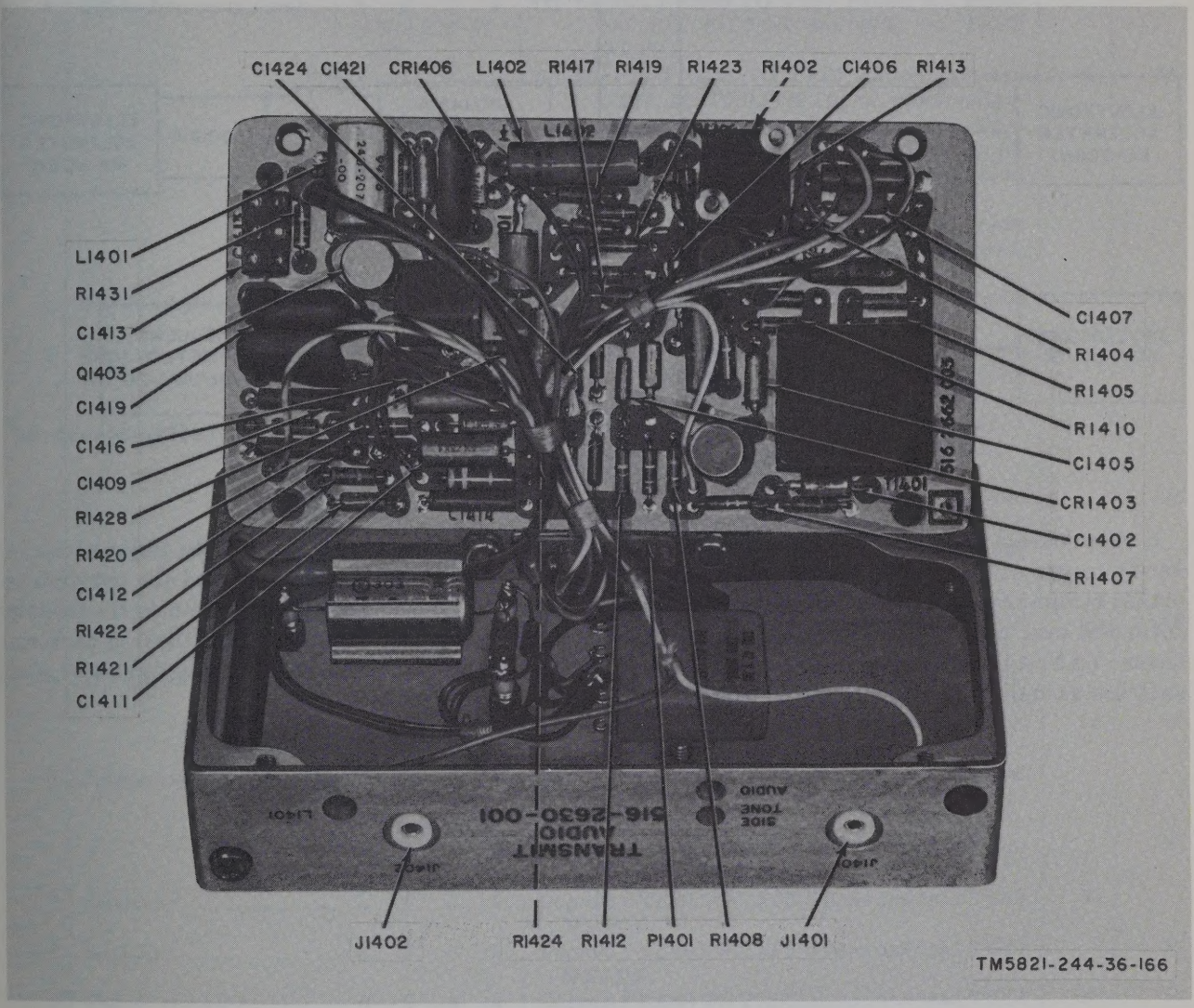


Figure 4–31. Transmit audio module, additional parts identification.

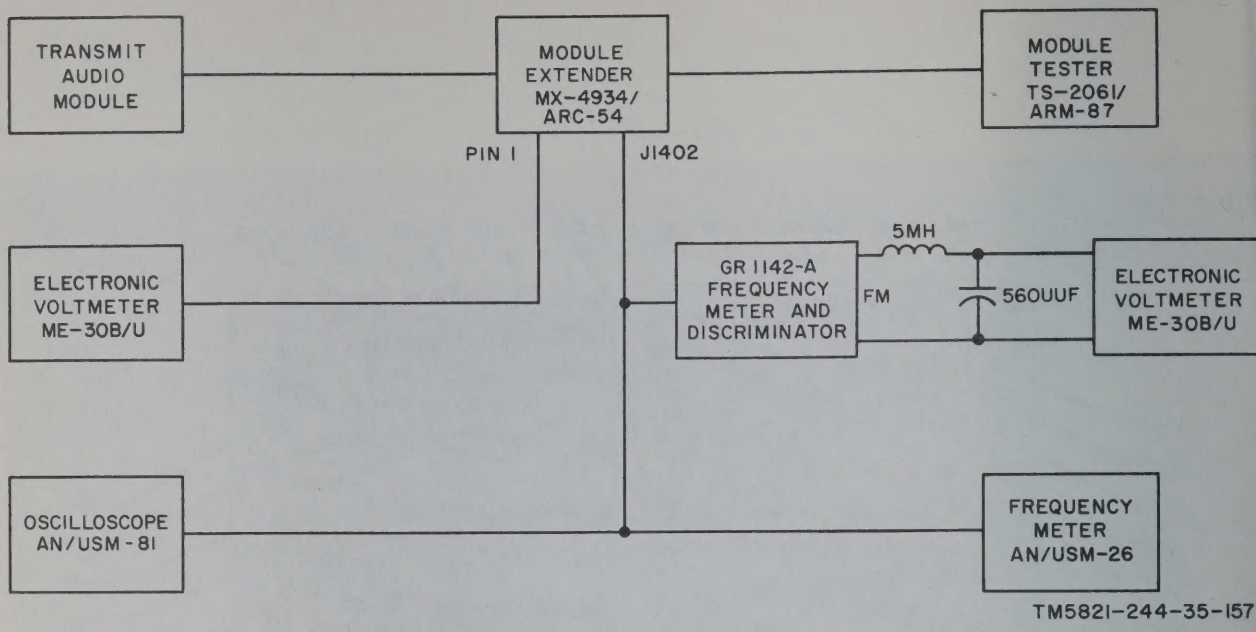


Figure 4-32. Transmit audio module test setup, block diagram.

c. Operational Test. Perform the tests below to verify repair of the transmit audio module or to obtain symptoms if trouble is unknown. To perform the test, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column, follow the instructions in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter. If the module fails the test, perform the adjustments prescribed in paragraph 4-38, and then repeat the tests.

Step	Test name	Circuit selector switches A	B	C	D	Instructions	Test limits (percent) Min	Max
1	500-kc frequency check	4	0	7	5 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 500 KC FILTER for 47% on TEST METER.		
		4	1	7	3	(2) Depress PRESS TO TEST button and read TEST METER. If out of tolerance, adjust L1401 (transmit audio module) for a reading within tolerance and proceed to (3) below. If the reading is within tolerance, proceed to step 2.	40	80
		6	1	7	3	(3) Depress PRESS TO TEST button and adjust L1401 (transmit audio module) for a peak on TEST METER.		
2	500-kc amplitude	4	6	7	4	Depress PRESS TO TEST button and read TEST METER.	40	80
3	Distortion check	3	2	6	4 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 57% on TEST METER.		
		3	2	1	4 (AN/ARM-87 cal)	(2) Depress PRESS TO TEST button and adjust DIST DET for 55% on TEST METER.		
		3	2	0	4	(3) Depress PRESS TO TEST button and read TEST METER.	------	85
4	Deviation check	3	6	6	4 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 50% on TEST METER.		
		3	6	2	4	(2) Depress PRESS TO TEST button and read TEST METER.	50	90
5	150-cps tone input	3	5	4	1	(1) Depress PRESS TO TEST button and adjust 150 CPS AMPL for 92% on TEST METER.		
		3	5	2	1	(2) Depress PRESS TO TEST button and read TEST METER.	10	40
6	Sidetone gate	3	5	6	3 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 57% on TEST METER.		
		3	5	7	3	(2) Depress PRESS TO TEST button and read TEST METER.	------	20
7	Sidetone	3	6	7	3	Depress PRESS TO TEST button and read TEST METER.	50	
8	Security	3	7	7	3	Depress PRESS TO TEST button and read TEST METER.	------	20
9	Carrier ground 1	0	8	5	4	Depress PRESS TO TEST button and read TEST METER.	30	50
10	Carrier ground 2	0	8	6	4	Depress PRESS TO TEST button and read TEST METER.	------	6
11	Retransmit ground 1	0	9	6	4	Depress PRESS TO TEST button and read TEST METER.	40	70
12	Retransmit ground 2	0	9	6	3	Depress PRESS TO TEST button and read TEST METER.	------	5
13	Meter output	2	9	7	4	Depress PRESS TO TEST button and read TEST METER.	30	

4–16. Power Supply Module Troubleshooting

a. General. Use the chart below to aid in localizing and isolating troubles in the power supply module. If trouble symptoms are not known, perform the tests given in *c* below. After the trouble is localized to a circuit or stage, check voltages and resistances, stage gain and wiring, and use the schematic diagram to isolate the trouble to a faulty component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are:

(1) Power supply module, schematic diagram (fig. 1–26).
(2) Power supply module, voltage and resistance diagram (fig. 2–11).
(3) Dc resistance of coils and transformers (para. 4–18).
(4) Stage gain measurements (para. 4–19).
(5) Power supply parts identification (figs. 4–33, 4–34, and 4–35).
(6) General parts replacement instructions (para. 4–23).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	Fuse F1001 blows when transmit button is pressed.	Relay K1501 or power supply wiring shorted to ground (chassis).	Check for a short to ground from pin 10 of P1501 (unsolder wires from contacts 1 and 5 of K1501). If wiring is good, replace K1501.
2	High voltage present in receive mode.	Relay K1501 or wiring shorted to ground (chassis).	Check for continuity to ground on pin 12 of P1501 (with wire unsoldered from contact 5 of K1501). If wiring is good, replace K1501.
3	Fuse F1002 blows when power is applied.	Despiking circuit (including C1501), 54-volt inverter, −27-volt circuit, or channel tone output circuit.	If trouble is not apparent from careful inspection of components, try disconnecting one end of C1501 and applying +27.5 volts direct to terminal 2 of T1502. If overload condition does not exist at this point, the trouble is in the despiking circuit. If overload exists here, the 54-volt inverter or the −27-volt rectifier circuit is defective. Use the voltage and resistance diagram (fig. 2–11) to make further checks in the suspected circuit. Check C1501 for internal shorting and check transformers T1501 and T1502 windings (para. 4–18). If resistor R1502, R1503, or R1505 is defective, be sure to replace it with the correct power-rated resistor (6.5 watts).
4	Fuse F1002 blows when transmit button is pressed.	High-voltage rectifier circuit, relay K1501, −27.5-volt rectifier circuit, or channel tone output circuit.	Check high-voltage filter capacitor C1508 for internal shorting. Check diodes CR1504 through CR1507. Check transformer T1503 (para. 4–18). Check relay K1501 for a short between terminals 4 and 8 or 3 and 7 (with wires disconnected from the terminals). Check −27.5-volt rectifier and filter circuit, T1502, R1510, and R1511.
5	No channel tone (dc outputs and 54 volts ac are good).	Channel tone output circuit	Check C1506 for an open. Check R1511 and R1510. Check for a wiring short to ground (chassis) at pin 4 of P1501.

Item	Indication	Probable trouble	Procedure
6	All outputs are low in amplitude.	Despiking circuit (Q1501 not saturating) or 54-volt inverter.	Check dc level at emitter and collector of Q1501 (both points should be +27.5 volts). If readings are not correct, check rest of despiking circuit (fig. 2–11). If voltage is correct at collector of Q1501, check voltages in 54-volt inverter circuit. Check T1501 (para. 4–18) and all components associated with inverter.
7	Low dc output voltage (−27.5, +250, or +500 volts).	Transformer, rectifier, or filter circuit associated with voltage that is low.	Check all components associated with dc voltage that is low. Check transformer secondary resistance (para. 4–18) and check filter capacitors for internal shorting.
8	Excessive ripple in one dc output.	Filter circuit associated with affected voltage.	Check filter capacitors (C1508 for high-voltage supply and C1504 for −27.5-volt supply), filter choke L1501, and resistors R1513 and R1514.
9	Output voltage (or voltages) too high.	Shorted winding in transformer T1501, T1502, or T1503.	If all outputs are high, check T1501 winding resistances (para. 4–18). If high-voltage or low-voltage only is high, check T1502 (low voltage) or T1503 (high voltage).
10	All outputs good but TEST METER indicates wrong on position 9.	Resistor R1515	Check R1515.

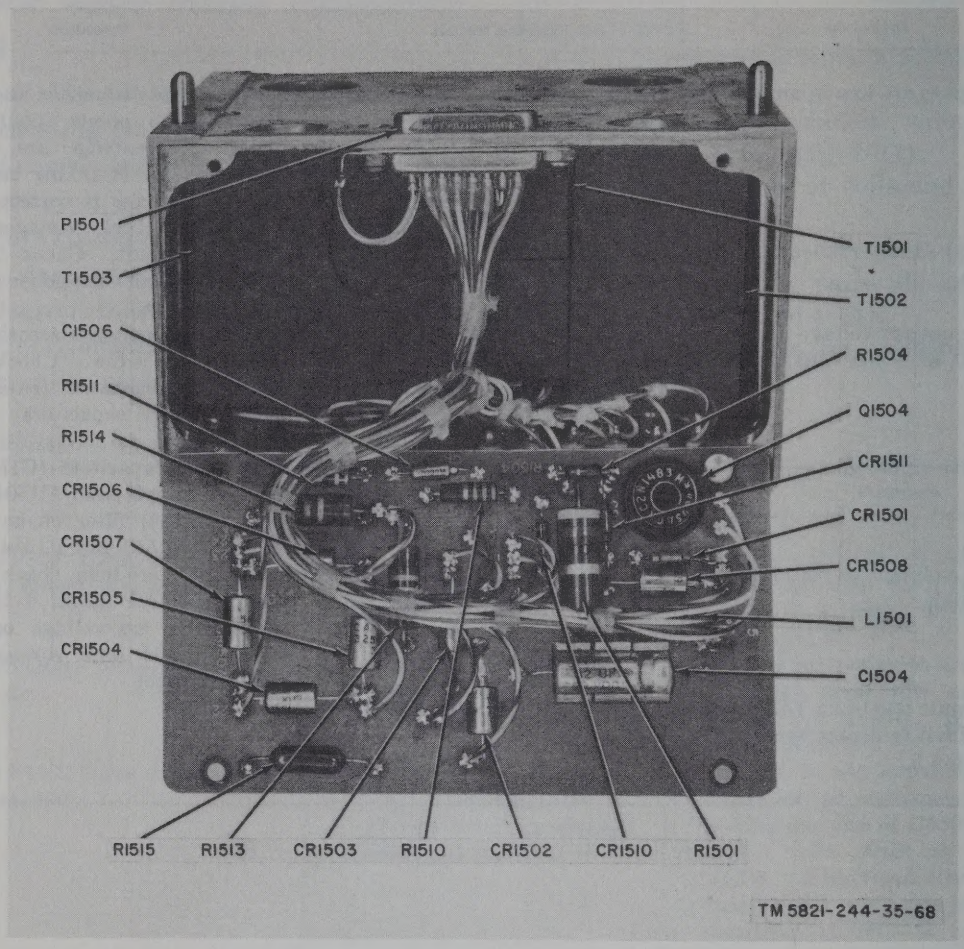


Figure 4–33. Power supply module, parts identification, rear view.

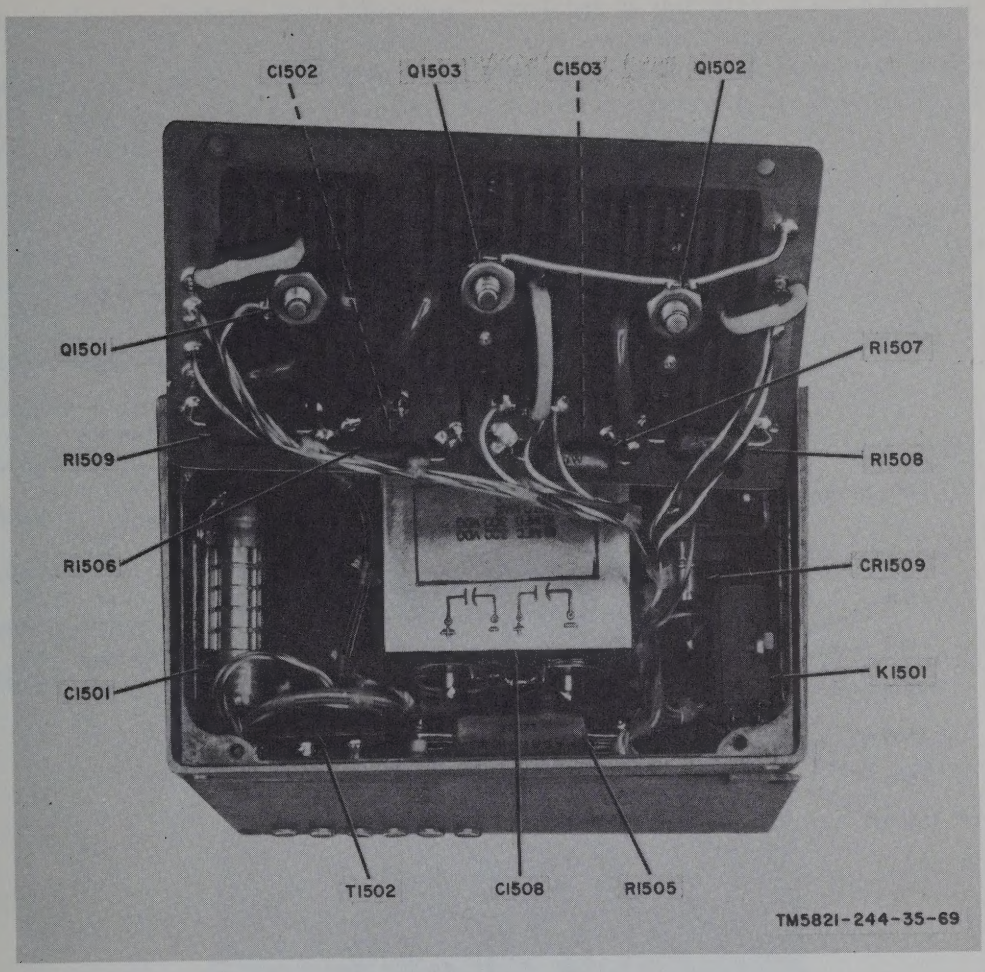


Figure 4-34. Power supply module, parts identification, front view.

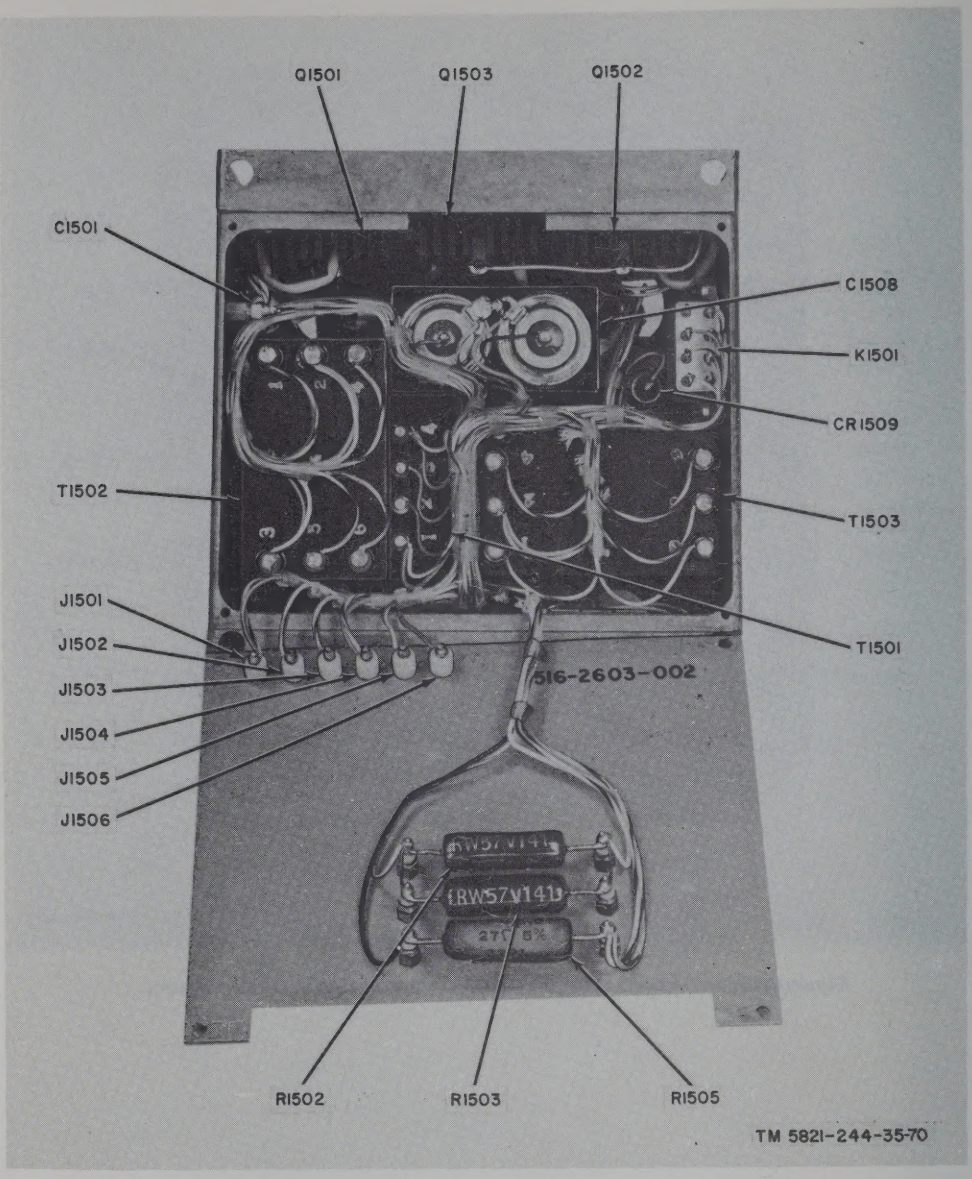


Figure 4-35. Power supply module, parts identification, top view.

c. Operational Test. Perform the following tests to verify repair of the power supply module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column, follow the instructions given in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	+27.5-volt dc output	1	X	0	4	Depress PRESS TO TEST button and read TEST METER.	60	75
2	+500-volt dc output	1	X	1	4	Depress PRESS TO TEST button and read TEST METER.	63	94
3	+250-volt dc output	1	X	2	4	Depress PRESS TO TEST button and read TEST METER.	50	65
4	—27.5-volt dc output	9	X	X	4	Depress PRESS TO TEST button and read TEST METER.	62	70
5	27.5-volt ac output	6	2	X	4	Depress PRESS TO TEST button and read TEST METER.	35	65
6	27.5-volt ac output	6	3	X	4	Depress PRESS TO TEST button and read TEST METER.	35	65
7	Despike test (AN/ARM-87 cal)	1	X	3	8	(1) Set POWER SELECTOR to DESPIKE and rotate the DESPIKE control fully counterclockwise. (2) Depress PRESS TO TEST button and increase the setting of DESPIKE AMPL until TEST METER just begins to decrease. (Do not readjust DESPIKE AMPL.)		
		1	X	3	9	(3) Depress PRESS TO TEST button and read TEST METER. (4) Set POWER SELECTOR to NORMAL.	30	45

4-17. Fixed IF Module Troubleshooting

a. General. Use the chart (*b* below) to aid in localizing and isolating troubles in the fixed IF module. If trouble symptoms are not known, perform the tests given in *c* below. After the trouble is localized to a stage or circuit, check voltages and resistances, stage gain and wiring, and use the schematic diagram to isolate the trouble to a faulty component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are:

(1) Fixed IF module, schematic diagram (fig. 6-14).
(2) Fixed IF module, voltage and resistance diagram (fig. 2-12).
(3) Dc resistance of coils and transformers (para. 4-18).
(4) Stage gain measurements (para. 4-19).
(5) Fixed IF module adjustments (para. 4-36).
(6) Fixed IF module, parts identification (figs. 4-36 and 4-37).
(7) General parts replacement instructions (para. 4-23).

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b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	Poor selectivity (adjacent channels interfere with each other).	Filter FL1201	Replace FL1201.
2	No received audio	Discriminator, adjustment of L1205, filter FL1201, amplifier Q1201, Q1202, Q1203, or Q1204, limiter Q1205, or regulator circuit (CR1206 and associated components).	Check for +18 volts at J1201. If abnormal, check Zener diode CR1206 and associated circuit. Check voltages (fig. 2–12) and stage gain (para. 4–19) for each stage beginning with Q1201. If signal level is normal at collector of Q1205, check adjustment of L1205 (para. 4–36) and check all components in discriminator circuit. Also, check to see that R1232 is correct value.
3	Received audio is weak or distorted.	Same as item 2	Same as item 2, except check L1205 adjustment first (para. 4–36).
4	Abnormal reading on TEST METER position 6 (AGC).	Agc amplifier Q1210 or Q1209, CR1201, R1240, or C1233.	Check voltages on Q1210 and Q1209 (fig. 2–12) and check gain of both stages (para. 4–19). Check diode CR1201, capacitors C1216 and C1233 and all components associated with Q1209 and Q1210. If all is normal, check Q1206 and associated components.
5	Receiver distorts on high signal strength inputs (abnormal agc action).	Agc amplifier Q1206 or associated circuit.	Check voltages on Q1206 (fig. 2–12) and check stage gain (para. 4–19). If voltage at J1203 is abnormal, check Q1209 and Q1210 and associated circuits.
6	Received audio is abnormal (or absent) in security operation.	Security amplifier Q1207 or Q1208.	Check voltages on Q1207 and Q1208 (fig. 2–12). If abnormal, check associated bias circuit. Also, check C1229 for internal shorting and C1228, C1230, and C1231 for open circuits.
7	Squelch troubles	Any squelch troubles associated with fixed if. module are gain and discriminator troubles.	See items 4 and 5.

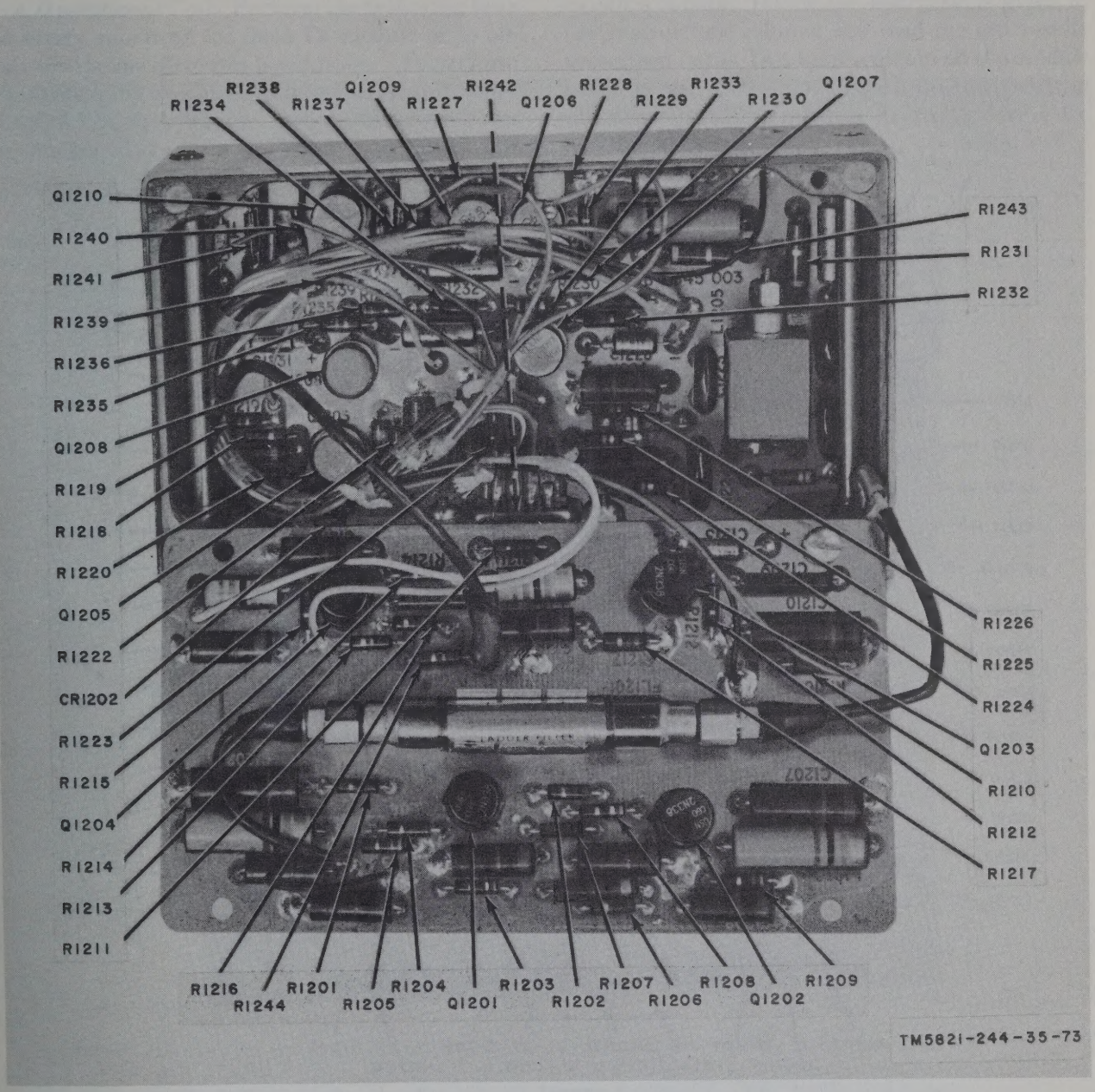


Figure 4-36. Fixed IF module, parts identification.

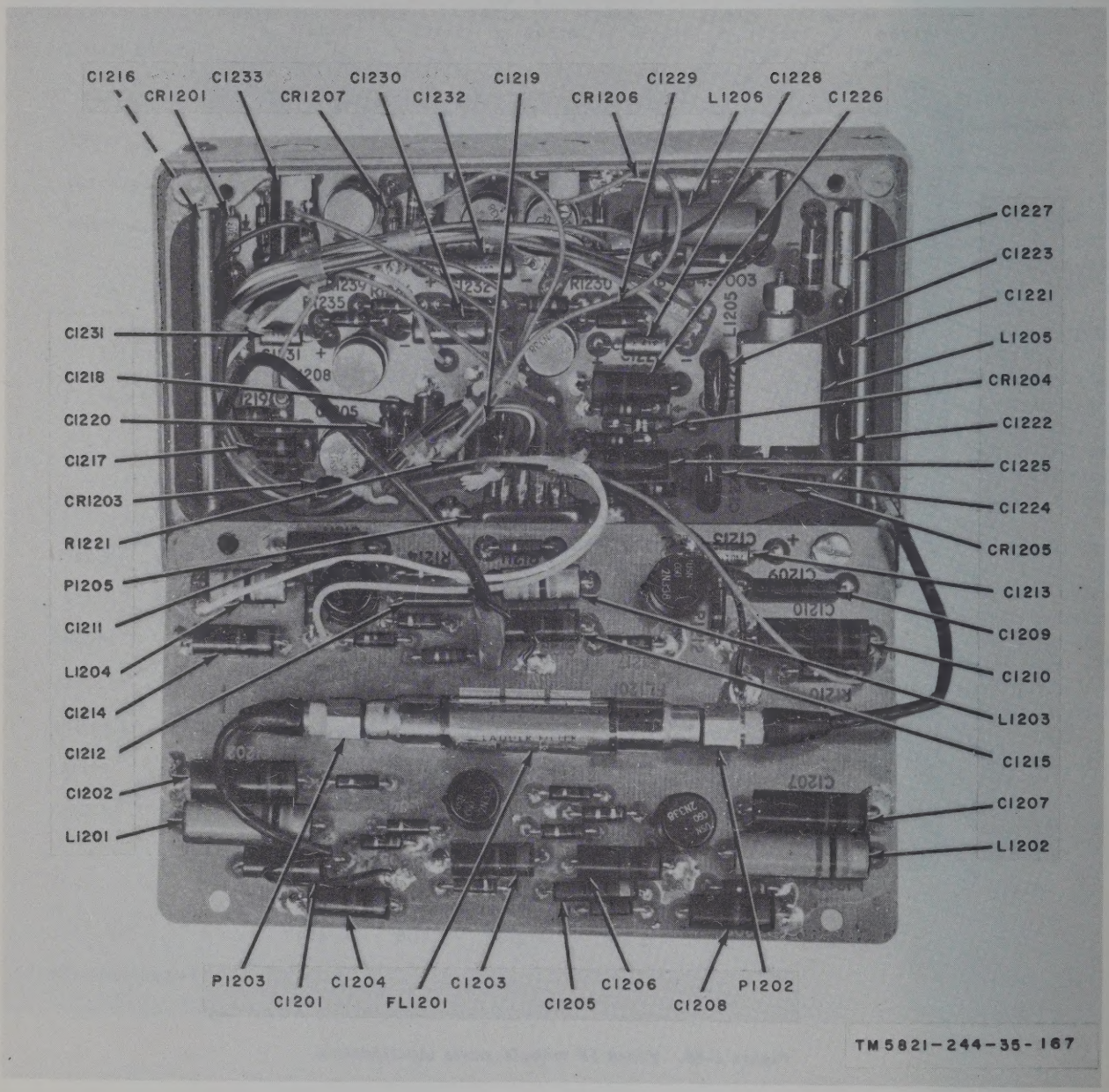


Figure 4-37. Fixed IF module, additional parts identification.

c. Operational Test. Perform the following tests to verify repair of the fixed IF module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM–87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column, follow the instructions given in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter. If the module fails the test, perform the adjustments prescribed in paragraph 4–36, and then repeat the tests.

Step	Test name	Circuit selector switches A B C D	Instructions	Test limits (percent) Min	Max
1*a*	Discriminator alignment	3 6 8 5 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 64% on TEST METER.		
		3 6 6 5 (AN/ARM–87 cal)	(2) Depress PRESS TO TEST button and adjust 1 KC AMPL for 74% on TEST METER.		
		6 6 6 5	(3) Depress PRESS TO TEST button and read TEST METER. If reading is not within limits, perform the procedures given in (4), (5), and (6) below.	40	70
		3 3 1 5	(4) Adjust DIST DET control for 55% on the TEST METER.		
		3 3 0 5	(5) Adjust L1205 (fixed IF module) for minimum indication on TEST METER.		
			Note. If off-scale reading is obtained, reduce setting of DIST DET for an on-scale reading.		
			(6) Repeat (1), (2), and (3) above.		
1*b*	Output to encoder 1	6 8 6 5	Depress PRESS TO TEST button and read TEST METER.	30	80
1*c*	Agc to homer module 1	0 7 6 5	Depress PRESS TO TEST button and read TEST METER.	20	50
1*d*	Agc to RF amplifier and vif modules.	0 6 6 5	Depress PRESS TO TEST button and read TEST METER.	40	80
1*e*	Output to encoder 2	3 8 8 6 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 64% on TEST METER.		
		6 8 8 6	(2) Depress PRESS TO TEST button and read TEST METER.	25	75
1*f*	Agc to homer module 2	0 7 8 6	Depress PRESS TO TEST button and read TEST METER.	35	75
1*g*	Agc to RF amplifier and modules 2.	0 6 8 6	Depress PRESS TO TEST button and read TEST METER.	50	98
2	500-kc amplitude to homer module.	3 4 8 7 (AN/ARM–87 cal)	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 64% on TEST METER.		
		3 4 9 7	(2) Depress PRESS TO TEST button and read TEST METER.	15	50

4-18. Dc Resistance of Transformers and Coils

The dc resistance of all transformers and coils in the receiver-transmitter are given below. All values are measured on Multimeter ME-26A/U. Because of differences in meters and circuit tolerances, the readings may vary ±20 percent.

***Caution:* When checking a coil or transformer having more than 1 ohm of resistance, remove the part from the circuit (or disconnect one lead) to avoid erroneous readings and to avoid the possibility of damage to semiconductors that may be connected across the part being checked.**

Module	Transformer or coil	Terminals	Ohms
Homer	T201	1-2	8.5% ±20
		3-4	80% ±20
		5-7	4.5% ±20
	L201, L202, L203, L206		Less than 1
	L204, L205		3.6% ±20
Receive audio	T1301	1-2	320 max
		3-5	16 max
	T1302	1-3	192 max
		4-5	18 max
Transmit audio.	T1401	1-2	37% ±20
		3-4	15% ±20
		5-6	28% ±20
	L1401		7% ±20
	L1402		48.3 max
Power supply	T1501	1-4	9.75% ±20
		1-2	Less than 1
		3-4	Less than 1
	T1502	1-3	Less than 1
		4-6	6.8% ±20
	T1503	1-3	Less than 1
		4-6	30% ±20
Sel-call	L101		28% ±20
Fixed IF	L1201, L1202, L1206.		48.3 max
	L1203, L1204		11.3 max
	L1205		12% ±20
Harmonic filter.	L1601-L1609		Less than 1
RF amplifier	T601	Red to blue.	10.5% ±20
	L601-L618		Less than 1
High-frequency oscillator.	L301-L324		Less than 1
Low-frequency oscillator.	L401-L403		Less than 1
	L404		11.3 max
	L405, L406		3 max
Variable IF	L501-L506		Less than 1
	L507-L509		11.3 max
Power amplifier.	L801-L805		Less than 1

4-19. Localizing Troubles by Stage Gain Measurements

a. General. When reception or transmission is weak and cannot be sufficiently improved by alignment of the radio set, the trouble is often due to low gain in one or more of the amplifier stages in the receiver-transmitter unit. Instructions are provided below for making measurements to determine the approximate gain of each stage. Since the voltage gain of a stage is simply the ratio of the output to the input signals, gain may be checked by measuring the signal level at the input (emitter or base) and comparing it with the signal level at the output (emitter or collector). Because of circuit tolerances, primary voltage variations, meter tolerances etc., the actual values measured may vary from module to module; the variations are within reasonable limits. The computed gains, however, should be reasonably close to those indicated by the chart. (If in doubt, check the transistor and associated circuit.) Only the main chassis modules are included in the chart. Measurement of RF signal levels in the RF subchassis modules is not practical because of the loading caused when test probes are placed near RF circuits. Dc levels (figs. 4-5, 4-10, 4-14, 4-17, and 4-20) are useful for troubleshooting these modules.

b. Test Setup for Stage Gain Checks. To make stage gain checks, plug the defective module into the module tester and apply power to the test set. Make measurements with an Electronic Voltmeter ME-30B/U except when otherwise indicated in the Instructions column.

c. Stage Gain Chart. The chart below gives ac voltages (rms) measured at inputs and outputs of transistors in the main chassis modules. Refer to the voltage and resistance diagrams (figs. 2-7 through 2-12, 4-5, 4-10, 4-14, 4-17, and 4-20) for dc measurements in all modules.

Note. Follow the procedures given in the Instructions column before proceeding with each measurement.

Module	Test point	Ac volts	Stage gain (approximate)	Instructions
Transmit Audio	Q1401 base	19 mv		Set the CIRCUIT SELECTOR switches on the module tester to 3664 and adjust the IKC AMPL control for a reading of 50% on the module tester TEST METER.
	Q1401 collector	140 mv	7.3	
	Q1402 base	140 mv		
	Q1402 collector	1 v	7.1	
	Q1403 emitter	170 mv		
	Q1403 collector	680 mv	4	
Receive Audio	Q1301 base	11 mv		Set the CIRCUIT SELECTOR switches on the module tester to 5760. Set IKC AMPL for reading of 95% on TEST METER.
	Q1301 collector	8 mv	0.7	
	Q1302 emitter	3 mv		Set CIRCUIT SELECTOR switches for program 6710 for all except Q1303. Measure Q1303 voltages with CIRCUIT SELECTOR switches set for program 6758, 10 KC AMPL adjusted for squelching (indicated by meter), and pin 6 of the module grounded.
	Q1302 collector	330 mv	110	
	Q1303 emitter	3.8 mv		
	Q1303 collector	530 mv	140	
	Q1304 base	30 mv		
	Q1304 collector	730 mv	24	
	Q1305 emitter	18 mv		
	Q1305 collector	6 v	33	
	Q1306 emitter	23 mv		
	Q1306 collector	6 v	26	
	Q1307 base	1.3 mv		
	Q1307 collector	1.3 mv	1	
Fixed IF	Q1201 base	10 mv		Set the CIRCUIT SELECTOR switches on the module tester for program 3685 and set the 500 KC AMPL control for a reading of 64% on the TEST METER. Change program to 3665 and adjust IKC AMPL for 74% on TEST METER. Change to program 3315 and set DIST DET for 55% on the TEST METER. Change to program 3305 and make measurements.
	Q1201 collector	18.7 mv	1.9	
	Q1202 base	18.5 mv		
	Q1202 collector	105 mv	57	
	Q1203 base	104 mv		
	Q1203 collector	890 mv	8.5	
	Q1204 base	880 mv		
	Q1204 collector	2.2 v	25	
	Q1205 base	155 mv		
	Q1205 collector	410 mv	2.7	*Note.* Use an RF voltmeter (AN/URM-145) for all measurements of Q1201 through Q1205.
	Q1207 base	0.36 mv		Q1206, Q1209, and Q1210 are dc amplifiers. See figure 2-12 for dc measurements.
	Q1207 collector	11 mv	30	
	Q1208 base	11 mv		
	Q1208 collector	1.85 v	168	
Homer	Q201 base	1 v		Set the CIRCUIT SELECTOR switches on the module tester for program 6934. Set the 500 KC AMPL control for a reading of 56% on the module tester TEST METER.
	Q201 collector	17.5 v	17.5	
	Q204 base	45 mv		
	Q204 collector	2.4 v	53	
	Q205 base 50 mv			*Note.* Q202 reference designation not used. Q203 is a dc amplifier. See figure 2-7 for dc measurements.
	Q205 collector	1.3 v	26	
	Q206 base	1 v		
	Q206 collector	17.5 v	17.5	

Module	Test point	Ac volts	Stage gain (approximate)	Instructions
Sel-call	Q101 base	2 mv		Set the CIRCUIT SELECTOR switches on the module tester for program 2441. Adjust the 150-cps AMPL control for a reading of 2.1 millivolts on pin 3 of the module. (Use this setup to measure Q101 through Q104.) To measure Q105 through Q107, use program 3352 and adjust the 10 KC AMPL control for a reading of 71% on the module tester TEST METER.
	Q101 collector	21 mv	10	
	Q102 base	15.5 mv		
	Q102 collector	1.75 v	113	
	Q103 base	1.75 v		
	Q103 collector	1.25 v	0. 7	
	Q104 base	210 mv		
	Q104 collector	1.5 v	7	
	Q105 base	6.4 mv		
	Q105 collector	82 mv	13	
	Q106 base	82 mv		
	Q106 collector	2.85 v	35	
	Q107 base	19 mv		
	Q107 collector	0.9 v	47	
Power supply				Transistors in the power supply perform switching functions only; stage gain measurements not practical. See figure 2–11 for dc measurements.

4–20. Signal Substitution for Troubleshooting Tests

Many troubles may be isolated by making dc voltage and resistance measurements; it is often necessary, however, especially in the case of weak reception or transmission, to simulate RF and audio signals for troubleshooting under simulated operating conditions. These signals can be easily obtained by using the module tester (AN/ARM–87). Refer to paragraph 4–19*c* for instructions for supplying signals to any main chassis module except the harmonic filter module. To simulate RF signals for the harmonic filter module, refer to paragraph 4–10 where instructions are given for using an RF signal generator (AN/USM–44A) to provide the RF signal for troubleshooting the module. To provide signals for the RF subchassis, refer to paragraph 4–2*c* where instructions are given for setting up the module tester to provide an audio-modulated RF carrier for testing purposes.

4–21. Troubleshooting of Antenna Couplers CU–942/ARC–54 and CU–943/ARC–54

(figs. 4–38 and 5–17)

a. General. Use Maintenance Kit, Electronic Equipment MK–733/ARC–54 to troubleshoot the antenna coupler. The maintenance kit enables power and tuning control codes to be applied to the antenna coupler for testing and troubleshooting when the coupler is removed from the rest of the radio set. The troubleshooting chart lists troubles, probable causes, and procedures for isolating or correcting the trouble. The symptoms are listed as they would appear to the operator or organizational maintenance man. If the symptoms are not known, perform the tests prescribed in paragraph 5–22. If trouble is encountered during the test, check the troubleshooting chart (*c* below) for possible causes and for procedures to follow. If the chart does not give the necessary information, use the following supplementary data listed in (1) through (9) below as an aid to further troubleshooting:

(1) Antenna Coupler CU–942/ARC–54, schematic diagram (fig. 6–25); Antenna Coupler CU–943/ARC–54 (fig. 6–26).

(2) Antenna coupler test connections (fig. 5–17).

(3) Antenna Couplers CU–942/ARC–54 and CU–943/ARC–54, wiring diagram (fig. 6–28).

(4) Antenna coupler parts identification (figs. 4–39, 4–40, and 4–41).

(5) Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54, exploded view (fig. 6-29).
(6) Resistance measurements (para. 4-22).
(7) Circuit functioning (para. 1-95).
(8) Repair procedures (para. 4-32).
(9) Antenna coupler, troubleshooting test setup (fig. 4-38).

b. Preliminary Procedure. Remove the fiberglass cover from the antenna coupler to allow access to parts. Connect a CX-9070/ARC-54 cable assembly (part of Maintenance Kit, Electronic Equipment MK-733/ARC-54) between ANT COUPLER J10 on the test set (TS-1967/ARC-54) and the main connector on the antenna coupler. Do not connect the external test equipment shown in figure 4-38 until you have determined that the trouble is not strictly mechanical in nature. Connect an external ±27.5-volt supply to J32 on the test set and set the POWER switch on the test set to ON. Select several different frequencies (FREQUENCY SELECTOR-MC switches) and watch the mechanical action of the coupler. If the mechanical action appears normal, connect the rest of the test equipment as shown in figure 4-38 and proceed with electrical testing (para. 5-22).

Note. When checking the tuning as above, see that the unit tunes to the correct position (fig. 5-17); check the rotors of S101 and S103 to see that they move to the correct coil position for the frequency selected.

c. Troubleshooting Chart.

Item	Indication	Probable cause	Procedure
1	Aircraft +27.5-volt fuse blows when antenna coupler is connected.	C144, C145, or wiring (pin J) shorted to ground. Relay K101 has shorted winding. Motor B101 short in primary. Internally shorted radio frequency interference filter (part of main connector).	Check the capacitors with an ohmmeter. Check the wiring (fig. 6-28) and check for a minimum of 10 ohms through the motor primary. Check for approximately 600 ohms through relay winding (pin 2 to 5). Check the filter (part of main connector) for a short to the case from pin J (resistance should be at least 100 megohms).
2	Aircraft +27.5-volt fuse blows when new frequency is selected.	Relay K101 or motor B101	Check motor and relay as indicated above.
3	Coupler will not tune	Relay K101, motor B101, capacitor C144 or C145, wiring, gear train, wrong length screws in gear plate, too long and binding gears, defective switch.	Check for a screw binding against the gear train (check, especially, the holding screws in J101 for improper length). If screw lengths are correct and gears do not appear to be binding, use the wiring diagram (fig. 6-28) and check the other items listed.
4	Coupler is noisy when tuning	Bad gears, motor assembly, or screw dragging gear train.	Check gears by visual inspection. If motor assembly is suspected (reducer gears are part of assembly), back the motor away from the gear train (para. 4-32) and rotate gear train by hand (or energize the motor while disengaged from gear train) to assure that the motor assembly is at fault before replacing.
5	Coupler tunes erratically or stops in wrong position.	Ambiguity switch S102 or defective wiring. Bad solder joints or bad relay.	If the coupler stops on the wrong frequency, check for an open ambiguity switch (S102) contact or bad wiring (fig. 6-28). If tuning is erratic, look for bad solder joint or dirty ambiguity switch (S102) contacts.

Item	Indication	Probable cause	Procedure
6	Coupler tunes continuously	Improper installation of ambiguity switch. Wiring short to ground. Relay K101 stuck closed.	See paragraph 4-32 for proper method of adjusting the ambiguity switch (S102). To check the wiring for a short circuit to ground, refer to figure 6-28.
7	Coupler will not pass RF (all frequencies).	Wiring, coaxial connector or cable, or bad switch.	Make sure that the RF receptacle that mates with the banana plug in the fiberglass cover is free to move and the braid is not broken. Use the wiring diagram (6-28) and check for continuity through all wires and switches between J102 and J103.
8	Coupler will not pass RF (some frequencies).	Defective switch, bad connection of one or more coils to the switches, or shorted capacitor.	Check connections both visually and with ohmmeter. Check capacitors for shorts.
9	Coupler takes too long to tune	Defective motor or capacitor C144 or C145 or binding gears.	Check gears for binding, check capacitors for shorting (loading the +27.5-volt supply). Replace motor if weak.
10	Mechanical drive (in receiver-transmitter) tunes continuously.	Shorted diode CR101 or CR102	Check with ohmmeter.
11	Excessive RF interference from coupler.	Defective radiofrequency interference filter (part of main connector).	Replace the connector-filter assembly.
12	Weak transmission on one or more frequencies.	Wrong value inductance or capacitance, dirty switch contacts, or defective RF cable or mating connector.	Check for dirty contacts and defective cables. Using the test setup shown in figure 116, perform admittance tests and adjust coils as necessary (para. 5-22). If admittance cannot be brought into limits by stretching or squeezing the coils, try another coil or replace the capacitor associated with the bad frequency (fig. 6-25 or 6-26).

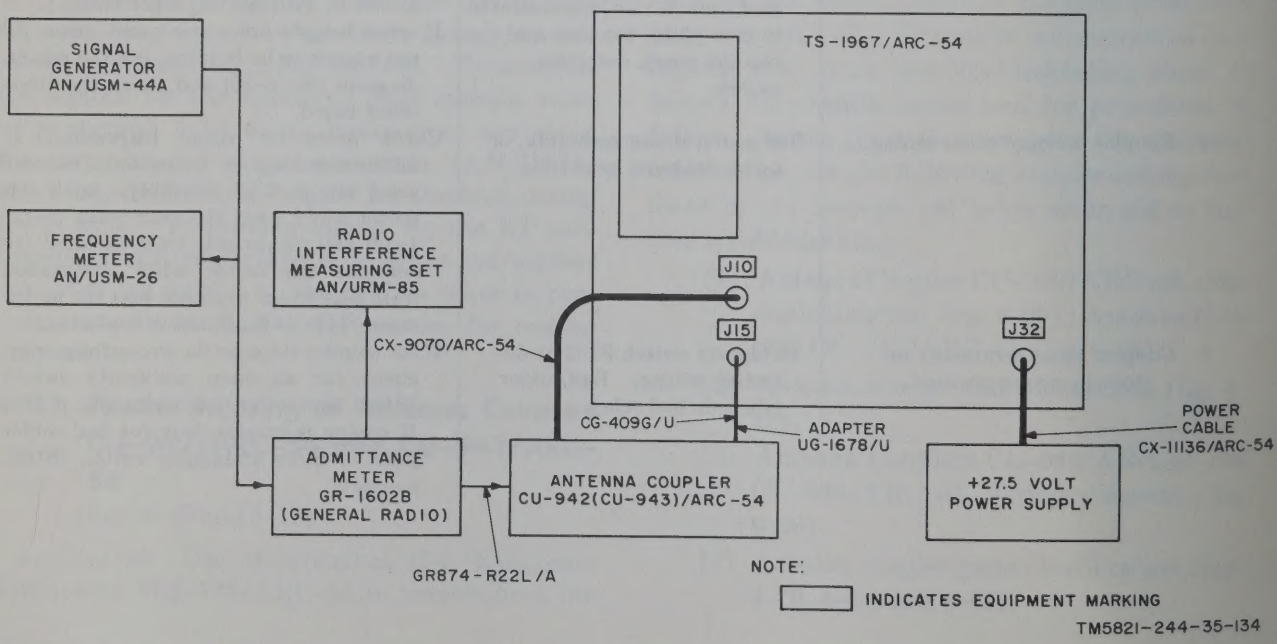


Figure 4-38. Antenna coupler troubleshooting, test setup.

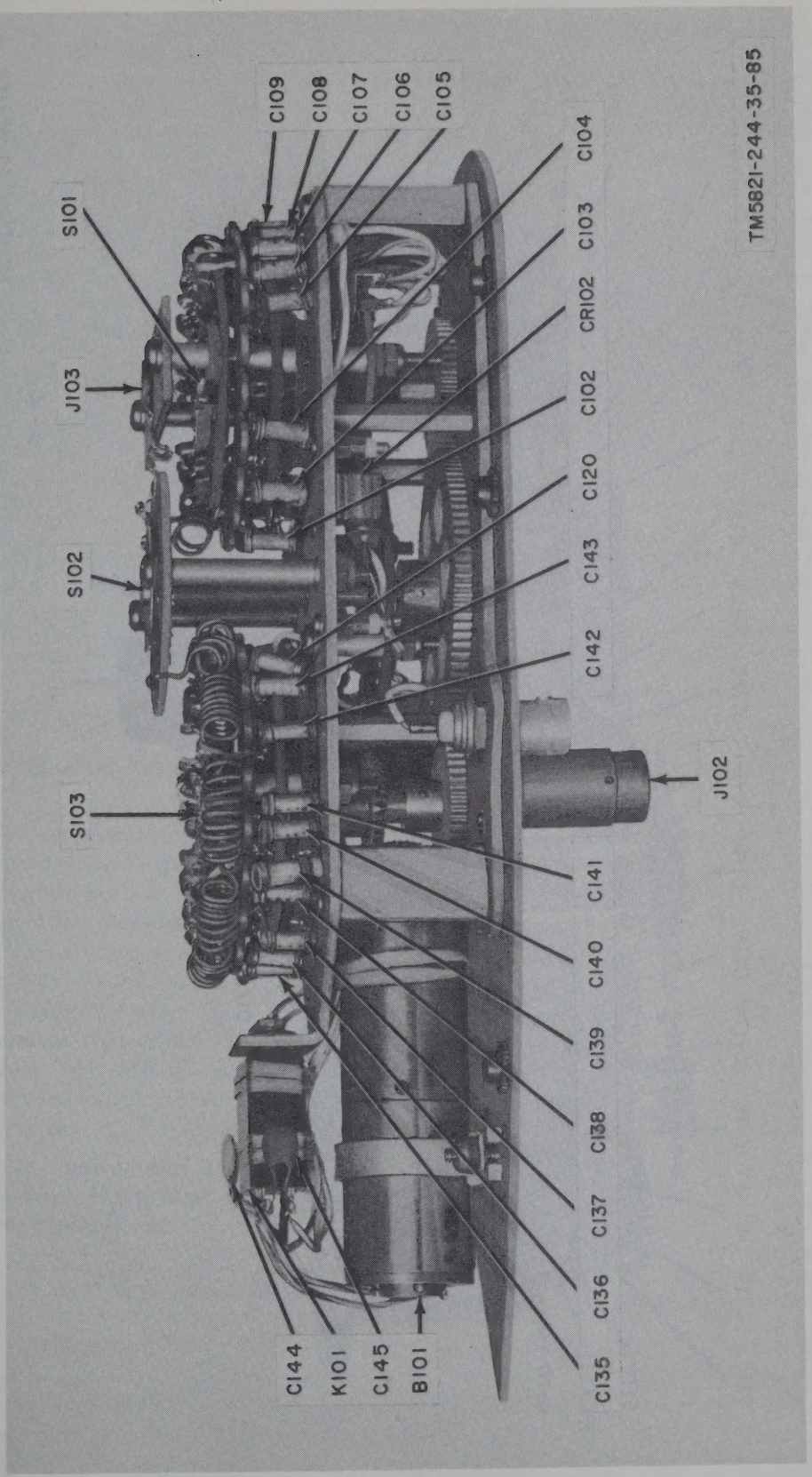


Figure 4-39. Antenna coupler, parts identification, right side view.

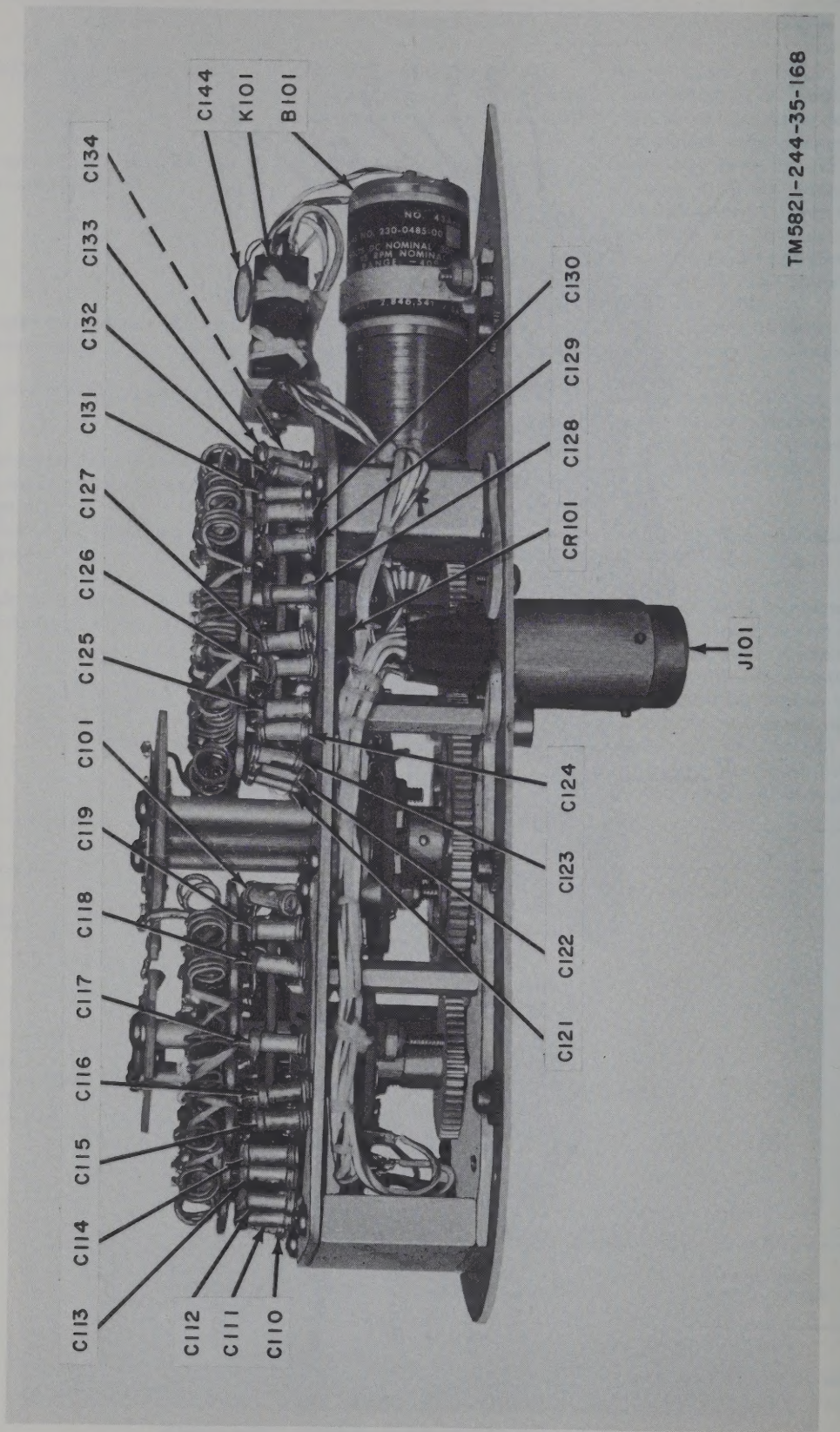


Figure 4-40. Antenna coupler, parts identification, left side view.

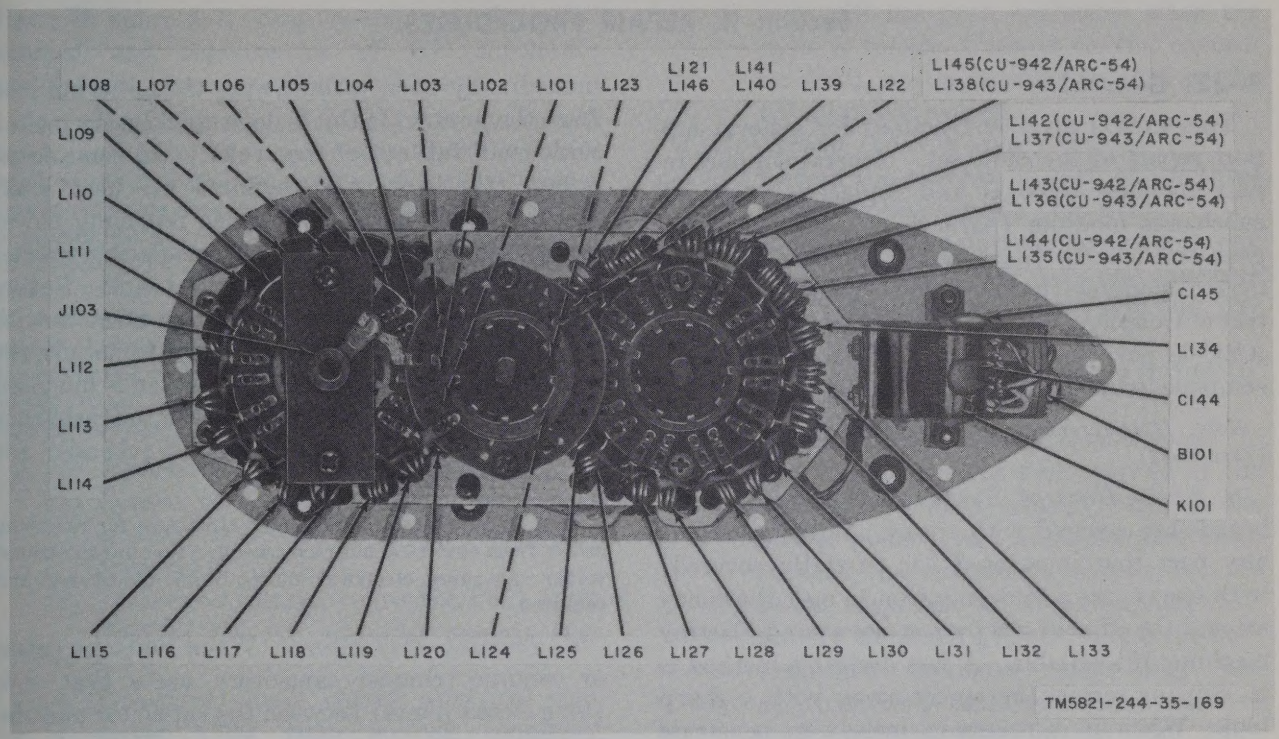


Figure 4-41. Antenna coupler, parts identification, top view.

4-22. Antenna Coupler Resistance Measurements

The antenna coupler contains no active elements (amplifiers, regulators, etc.); therefore, a voltage and resistance diagram such as that provided for the receiver-transmitter modules is not practical. Some resistance measurements, however, are useful, especially in cases where the coupler is blowing +27.5-volt aircraft fuses. The following chart lists resistances that should be measured with a Multimeter ME-26B/U or equivalent. Make the measurements with the antenna coupler tuned to 30 megacycles.

***Caution:* Remove power and disconnect the antenna coupler from the system (or test set) before measuring resistances.**

From	To	Normal resistance
Pin A	Pin E	0.
Pin A	Pin H	
Pin B	Pin D	0.
Pin B	Pin C	0.
Pin B	Pin H	
Pin C	Pin D	0.
Pin C	Pin H	
Pin D	Pin H	
Pin E	Pin H	
Pin F	All pins	
Pin G	J	600 ohms (negative meter lead to pin G).
Pin H	Chassis	0.
Pin J	Pin H	
J102	J103	0 (This measurement checks for continuity through all the coils mounted on S101. To check the coils on S103, tune the coupler to 69 megacycles and repeat the measurement.)
B101 (red)	B101 (black)	10 ohms (approximately).
K101-2	K101-5	600 ohms (approximately).
K101-1	K101-8	0.
K101-1	K101-3	

Section II. REPAIR PROCEDURES

4–23. General

This section gives instructions for general support repair of the radio set. General support repair includes removal and replacement of RF subchassis modules (para. 4–24), RF subchassis gear train parts (para. 4–25), mechanical parts driven modules (paras. 4–26 through 4–31), Antenna Couplers CU–942/ARC–54 and CU–943/ARC–54 parts (para. 4–32), and module electronic components (*a* through *e* below).

Note. The antenna coupler requires special handling (para. 4–32).

a. Epoxy-Covered Boards. All printed circuit boards are covered with epoxy. When removing any part that is covered (or partially covered) with epoxy, use a soldering iron to melt the epoxy around the edge of the part or use a sand-blasting machine, if available. A less desirable method is to chip or scrape the epoxy away with a sharp tool. When it is necessary merely to penetrate the epoxy for measuring voltage or resistance, use a sharp-pointed meter probe. After a part is replaced and the leads are soldered, apply a thin layer of epoxy to the exposed printed circuit wiring, the solder joints, and the component leads.

b. Diodes and Resistors. When soldering or unsoldering crystal diodes or resistors (especially precision resistors), solder quickly to allow as little heat conduction as possible. When wiring permits, use a heat sink (such as long-nosed pliers) between the soldering iron and the part.

***Caution:* Never use an ac-operated iron for soldering transistors unless an isolation transformer is used. Do not use a soldering gun because damaging currents can be induced that can burn out the transistors.**

c. Transistors. When soldering or unsoldering transistors, use a low-wattage iron (maximum 25 watts) and a heat sink. Solder as quickly as possible. If the transistor is soldered flush against the board, use a three-pronged or circular soldering iron tip to heat all three joints simultaneously. If this is not available, try clearing each eyelet with a wooden toothpick as the solder melts. Another method is to tap the board gently against the workbench (with transistor leads facing down) immediately upon withdrawing the soldering iron from the joint. (If this is done quickly, the melted solder will fall out of the eyelet.) In some cases, power transistors are mounted on heat sinks (power supply modules). When replacing power transistors, always replace the insulating washer between the transistor and the heat sink. Before installing the mica or fiber washer, treat it with a film of silicone fluid or equivalent to help in the transfer of heat. After the transistor is mounted and before soldering the leads, check the resistance from the transistor case to ground (chassis) for effective insulation.

Note. The use of a pressurized air nozzle for removing solder from eyelets is not recommended because splattered solder can cause electrical shorts if not discovered and removed.

d. Trimmer Capacitors. When replacing glass or ceramic trimmer capacitors, use a heat sink (long-nosed pliers) between the capacitor and the soldering iron. Excessive heat will crack the capacitor body.

e. Orientation of Parts. When any electronic part is removed, note the position of the part and its leads and replace it the same way.

4–24. Removal and Replacement of RF Subchassis Modules

(figs. 6–7 and 4–1)

All RF subchassis modules have mechanically tuned circuits. The modules are driven by the gear train (encased between two machined plates on the right side of the assembly) which, in turn, is driven by the mechanical drive module. The RF subchassis must be separated from the main chassis (para. 3–2*a*) before any of the tunable modules can be removed. Any or all of the tunable modules can be removed without misalignment of the other modules if the mechanical drive module is not removed. The replaced module will, however, require shaft alignment in accordance with the instructions given in paragraph 3–16. Before removing any tunable module (or the mechanical drive module), loosen the setscrews in the module tuning shafts. (Use a No. 4 multiple-spline wrench for removing the setscrews.) Figure 4–1 shows the location of all setscrews except the low-frequency oscillator module setscrew which is

shown in figure 6–7. Step-by-step procedures for removal and replacement of RF subchassis modules are given in *a* through *l* below.

Note. Before removing any module from the RF subchassis, make sure that the mechanical drive module is tuned to the 30-megacycle position. Before installing a mechanical drive module, make sure that it is tuned to 30 megacycles (as indicated on the frequency dials of the module). If all or several modules, including the mechanical drive module, have been removed, replace the mechanical drive module first. After removing and replacing any module on the RF subchassis, install the RF subchassis in the receiver-transmitter unit or in the module tester (AN/ARM–87), and perform the alignment procedures as instructed in paragraph 3–16.

a. RF Power Amplifier Module Removal.

(1) Loosen the RF amplifier splined-shaft setscrew located in the end of the module drive shaft (fig. 4–1).

(2) Disconnect coaxial connector P801 from J602 of the RF amplifier module (fig. 6–7).

(3) Disconnect main chassis electrical connector P903 from module connector FL801.

(4) Disconnect main chassis pendant coaxial connector CP1003 from J801 on the module.

(5) Remove the three module-mounting screws from the bottom of the module and the three screws from the gear train end of the module.

(6) Remove the module by pulling it straight away from the gear train.

b. RF Power Amplifier Module Replacement.

(1) Line up the module drive shaft with the proper hub in the gear train (fig. 6–7) and insert the shaft into the gear train.

(2) Secure the module to the RF subchassis baseplate with three module-mounting screws as shown.

(3) Secure the module to the gear train with three module-mounting screws (black screws) as shown in figure 4–1.

(4) Tighten the setscrew in the splined shaft of the module (fig. 4–1).

(5) Connect RF subchassis connector P903 to FL801 on the module. Connect RF subchassis coaxial connector CP1003 (pendant coaxial cable) to J801 on the module. Position the connector so that the slug rack will not push against it when the radio is tuned. Connect coaxial connector P801, on the module, to J602 on the RF amplifier module.

c. Mechanical Drive Module Removal.

(1) Loosen the setscrew in each of the three module-splined shafts (fig. 4–1).

(2) Remove the two module-mounting screws from the bottom (fig. 6–7) and the three screws from the gear train side (fig. 59) of the module.

(3) Remove the module by pulling it directly away from the gear train.

d. Mechanical Drive Module Replacement.

(1) Use the adjustment tool (stowed at the rear of the main chassis, next to the blower motor), and align the gear train so that the adjustment screws for the power amplifier, RF amplifier, and variable IF amplifier (fig. 6–7), and the low-frequency oscillator (fig. 4–1) are approximately centered behind their respective access holes in the gear train. (If the variable IF amplifier of the power amplifier module is installed, loosen the alignment locking screw before attempting to align the gear train.)

(2) Insert the three splined shafts of the mechanical drive module into the gear train (fig. 6–7).

(3) Secure the module to the gear train with the three module-mounting screws (fig. 4–1) and to the baseplate with two module-mounting screws (fig. 6–7).

(4) Tighten the three setscrews in the ends of the module splined shafts.

e. RF Amplifier Module Removal.

(1) Disconnect coaxial connectors P601 and P603 from the variable IF module (fig. 6–7).

(2) Disconnect coaxial connector P604 from the homer module.

(3) Disconnect coaxial connector P602 from the high-frequency oscillator module.

(4) Disconnect the power amplifier coaxial connector (P801) from the RF amplifier module.

(5) Disconnect electrical connector P902 from the RF amplifier main connector (J601).

(6) Remove two module-mounting screws from the RF subchassis baseplate and the three screws from the gear train (figs. 6–7 and 4–1 respectively).

(7) Loosen the setscrew in the module splined shaft and remove the module by pulling it directly away from the gear train.

f. RF Amplifier Module Replacement.

(1) Rotate the splined shaft of the RF amplifier module until the rotor blades of the variable capacitor are meshed with the stator blades as shown in figure 6–7, detail A.

(2) Insert the splined shaft of the module into the gear train and secure the module to the gear train with three module-mounting screws (fig. 4–1) and to the baseplate with two module-mounting screws (fig. 6–7).

Caution: **Be sure to install the correct length screws, particularly in sets bearing serial numbers below 850.**

(3) Tighten the setscrew in the module splined shaft.

(4) Connect six-pin electrical connector P902 to module connector J601.

(5) Connect power amplifier coaxial connector P801 to RF amplifier connector J602.

(6) Connect coaxial connectors P601 and P603 to variable IF connectors J503 and J502, respectively.

(7) Connect coaxial connector P602 to high-frequency oscillator connector J301.

(8) Connect coaxial connector P604 to homer module connector J205.

g. Variable IF Module Removal.

(1) Disconnect coaxial connectors P601 and P603 from J503 and J502 of the module.

(2) Remove the two module-mounting screws from the RF subchassis baseplate (fig. 6–7) and three from the gear train (fig. 4–1).

(3) Loosen the setscrew in the module drive shaft (fig. 4–1).

(4) Remove the module by pulling it directly away from the gear train.

Note. The low-frequency oscillator module is mounted on the variable IF module gear train and will be removed with the variable IF module. If it is necessary to remove the low-frequency oscillator module, refer to *i* below.

h. Variable IF Module Replacement.

Note. If the low-frequency oscillator module is removed, replace it on the variable IF gear train before replacing the variable IF module (*j* below).

(1) Insert the splined shaft of the module into the gear train.

(2) Secure the module to the RF subchassis baseplate with two module-mounting screws and to the gear train with three module-mounting screws.

(3) Connect coaxial connectors P601 and P603 to the variable IF module (J503 and J502 respectively).

(4) Tighten the module splined shaft setscrew.

i. Low-Frequency Oscillator Module Removal.

(1) Remove the variable IF module as instructed in *g* above.

(2) Disconnect coaxial connector P505 from low-frequency oscillator module connector J401.

(3) Disconnect electrical connector P507 from J402.

(4) Loosen the low-frequency oscillator module shaft setscrew.

(5) Remove the three module-mounting screws from the variable IF gear train and remove the module by pulling it directly away from the gear train.

j. Low-Frequency Oscillator Module Replacement.

(1) Set the splined shaft of the low-frequency oscillator module so that the pointer aligns with the scribe mark on the module.

(2) Insert the splined shaft into the variable IF module gear train.

(3) Secure the module to the variable IF gear train with three module-mounting screws (fig. 6–7).

(4) Tighten the low-frequency oscillator splined-shaft setscrew.

(5) Connect coaxial connector P505 to low-frequency oscillator connector J401.

(6) Connect electrical connector P507 to low-frequency oscillator connector J402.

(7) Replace the variable IF module as instructed in *h* above.

k. High-Frequency Oscillator Module Removal.

(1) Remove the variable IF module-mounting screws (two in RF subchassis baseplate and three in RF subchassis gear train (figs. 6–7 and 4–1)). Remove the high-frequency oscillator module mounting screws (four in gear train (fig. 4–1)).

(2) Loosen the setscrews in both the variable IF and high-frequency oscillator module drive shafts.

(3) Slide the variable IF module away from the gear train far enough to allow the high-frequency oscillator module splined shaft to clear the gear train.

(4) Disconnect electrical connector P905 from module connector J302 and coaxial connector P602 from J301.

(5) Remove the high-frequency oscillator module by pulling it directly away from gear train.

l. High-Frequency Oscillator Module Replacement.

(1) Rotate the splined shaft of the module so that the scribe mark on the edge of the hub aligns with the scribe mark on the module base (fig. 6–7, detail C).

(2) Insert the splined shaft into the RF subchassis gear train and secure the module to the gear train with four module-mounting screws.

(3) Tighten the setscrew in the module splined shaft.

(4) Connect coaxial connector P602 to J301 on the module.

(5) Connect electrical connector P905 to P602 on the module.

4–25. RF Subchassis Gear Train Repairs (fig. 4–42)

All gears, bearings hubs, and screws in the gear train are replaceable. The gear train may be disassembled without removing the modules if the module shaft setscrews are loosened and all module mounting screws are removed from the gear train side of the RF subchassis. To disassemble the gear train, remove the 9 Phillips flathead screws (1) that hold the gear housing plate (2) to the gear housing (3). Remove the gear housing plate. All gears are now accessible and may be removed and replaced in any sequence. The gears may be lifted directly out of the housing. The bearings require only slight pressure to free them from the gear housing or gear housing plate. Note the direction of removal in figure 4–42. The three module-alignment gears (4, 5, and 6) may be removed from their hubs (7, 8, and 9 respectively) by removing the three slothead screws (10, 11, and 12 respectively) in each.

4–26. RF Power Amplifier Module Repairs (fig. 4–43)

The RF power amplifier module has several moving parts, which may require replacement when worn. These parts are shown disassembled in figure 4–43. The following subparagraphs explain the removal and replacement of these mechanical parts. Paragraph 4–23 gives general instructions for the removal and replacement of electronic parts.

a. Removal of Matched Cams (fig. 4–43). The power amplifier module cams are a matched pair and should be removed as a pair. Perform the following steps to remove the cams.

(1) Loosen the two setscrews (1) in the right-hand cam-locking collar (2) and the two setscrews (3) in the left-hand cam-locking collar (4). Remove both collars.

(2) Lift the slug rack (9) slightly so that the cam follower rod (5) exerts no pressure on the cam. Remove the right-hand cam (7).

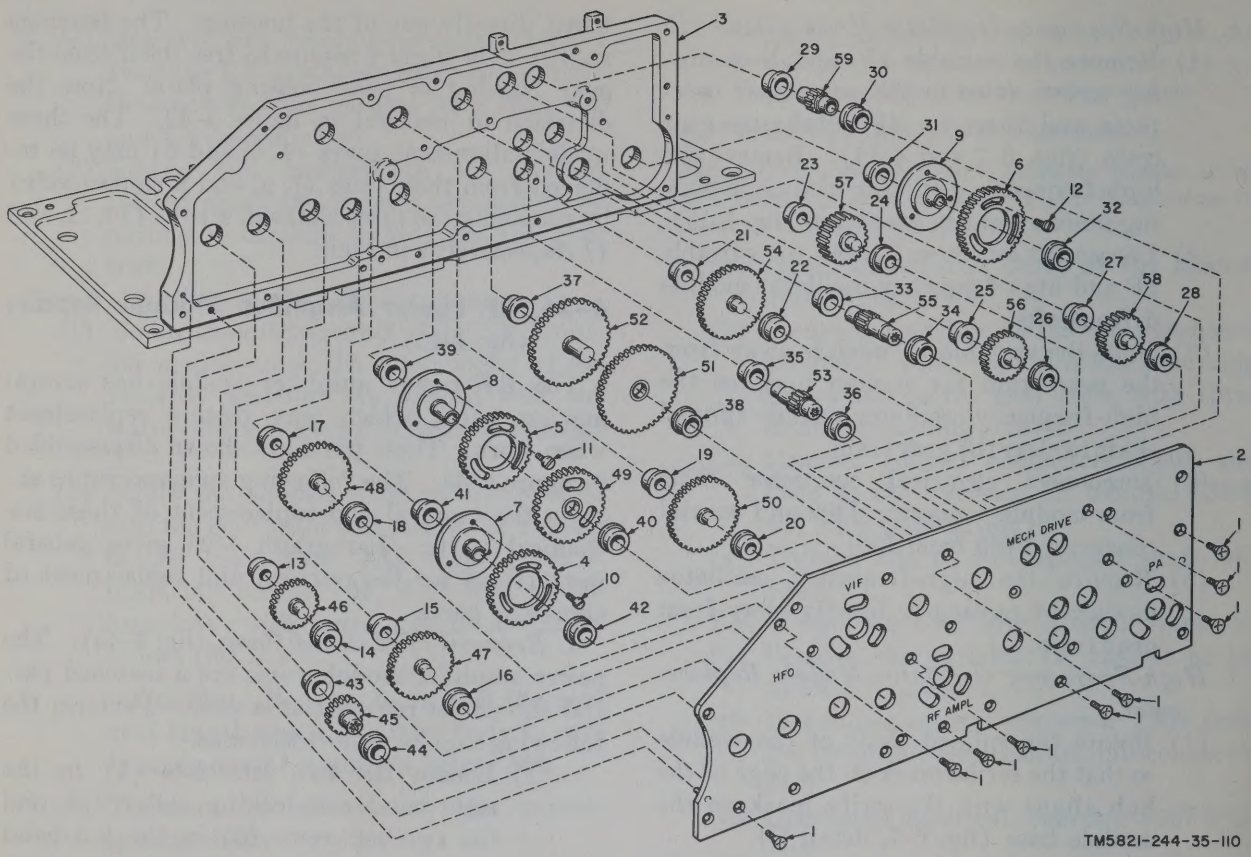
(3) Repeat the same procedure to remove the left-hand cam (8).

b. Replacement of Matched Cams. The power amplifier module cams are a matched pair and should be replaced with a matched pair. Perform the following steps to replace the cams.

(1) Look through the two holes in the left end (end opposite driven end) of the module and rotate the drive shaft so that the variable capacitor rotor plates are fully meshed with the stator plates.

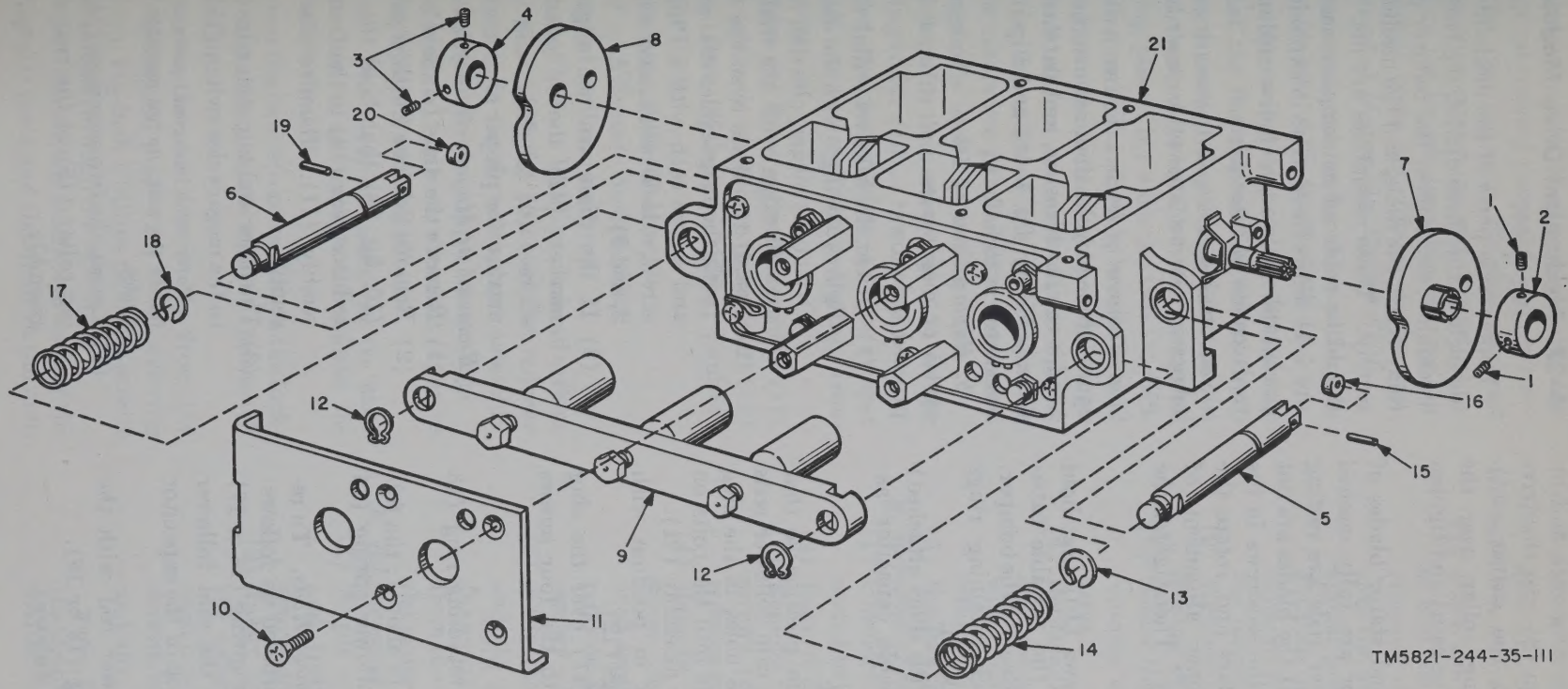
(2) Hold up on the slug rack (9) and install the right-hand cam (7) over the driven end of the drive shaft. Place the cam-locking collar (2) over the drive shaft (flush against the cam) and tighten the two setscrews (1).

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1 Screw H171, Phillips flathead, 4–40 x 5/16-inch
2 Gear housing plate
3 Machined gear housing
4 80-tooth gear MP907
5 80-tooth gear MP907
6 80-tooth gear MP907
7 Hub, VIF
8 Hub, RF AMPL
9 Hub, PA (same as item 7)
10 Screw, H154, Slothead, 4–40 x 1/8-inch
11 Screw, H154, Slothead, 4–40 x 1/8-inch
12 Screw, H154, Slothead, 4–40 x 1/8-inch
13 Radial bearing MP104, 3/16-inch
14 Radial bearing MP104, 3/16-inch
15 Radial bearing MP104, 3/16-inch
16 Radial bearing MP104, 3/16-inch
17 Radial bearing MP104, 3/16-inch
18 Radial bearing MP104, 3/16-inch
19 Radial bearing MP104, 3/16-inch
20 Radial bearing MP104, 3/16-inch
21 Radial bearing MP104, 3/16-inch
22 Radial bearing MP104, 3/16-inch
23 Radial bearing MP104, 3/16-inch
24 Radial bearing MP104, 3/16-inch
25 Radial bearing MP104, 3/16-inch
26 Radial bearing MP104, 3/16-inch
27 Radial bearing MP104, 3/16-inch
28 Radial bearing MP104, 3/16-inch
29 Radial bearing, MP105, 1/4-inch
30 Radial bearing, MP105, 1/4-inch
31 Radial bearing, MP105, 1/4-inch
32 Radial bearing, MP105, 1/4-inch
33 Radial bearing, MP105, 1/4-inch
34 Radial bearing, MP105, 1/4-inch
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36 Radial bearing, MP105, 1/4-inch
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38 Radial bearing, MP105, 1/4-inch
39 Radial bearing, MP105, 1/4-inch
40 Radial bearing, MP105, 1/4-inch
41 Radial bearing, MP105, 1/4-inch
42 Radial bearing, MP105, 1/4-inch
43 Radial bearing, MP105, 1/4-inch
44 Radial bearing, MP105, 1/4-inch
45 40-tooth gear MP903
46 50-tooth gear MP908
47 74-tooth gear MP911
48 80-tooth gear MP912
49 80-tooth idler
50 80-tooth gear MP912
51 99-tooth idler
52 99-tooth gear MP910
53 20-tooth gear MP905
54 80-tooth gear MP912
55 20-tooth gear MP904
56 50-tooth gear MP908
57 50-tooth gear MP909
58 50-tooth gear MP908
59 20-tooth gear MP906

Figure 4–42. RF subchassis gear train, exploded view.



1 Setscrew H–149, 4–48 x ¼-inch
2 Cam-locking collar
3 Setscrew H149, 4–48 x ¼-inch
4 Cam-locking collar
5 Cam follower rod
6 Cam follower rod
7 Cam, right-hand (matched with item 8)
8 Cam, left-hand (matched with item 7)
9 Slug rack, soldered (includes slugs)
10 Screw, machined, 2–56 x ¼-inch
11 Bumper
12 Rack-retaining ring H166
13 Follower retaining ring H167
14 Cam follower spring
15 Cam follower pin
16 Cam follower bearing
17 Cam follower spring
18 Follower retaining ring H167
19 Cam follower pin
20 Cam follower bearing
21 Variable capacitor assembly

Figure 4–43. RF power amplifier module mechanical assembly, exploded view.

(3) Again hold up on the slug rack and install the left-hand cam (8) over the drive shaft (end opposite the driver end). Place the cam-locking collar over the shaft (flush against the cam) and tighten the two setscrews (3).

(4) See that the rotor and stator blades of the variable capacitor are fully meshed when the cam follower rods are resting in the cam valleys. If the blades are not fully meshed, loosen the setscrews in the two cam-locking collars and rotate the drive shaft for proper alignment of rotor and stator blades. Then tighten the setscrews.

c. Removal of Slug Rack.

(1) Remove the four screws (10) that hold the bumper (11) to the variable capacitor assembly (21). Remove the bumper.

(2) Remove the two rack retaining rings (12) from the slug rack (9).

(3) Lift the slug rack (with slugs attached) away from the variable capacitor assembly.

d. Replacement of Slug Rack.

(1) Place the slug rack in position so that the round ends of the cam follower rods (5 and 6) fit into the holes in the slug rack, and the slugs fit into the coils on the variable capacitor assembly (21).

(2) Secure the slug rack in position with two rack-retaining rings (12).

(3) Install the bumper (11) over the slug rack and secure it with the four screws (10).

e. Removal of Cam Follower Rods.

(1) Remove the follower retaining ring (13 or 18).

(2) Remove the slug rack (*c* above); the follower rod and cam follower spring (14 or 17) will now fall out.

f. Replacement of Cam Follower Rods. To replace the cam follower rods, proceed as follows:

(1) Place the cam follower spring (14 or 17) in position and insert the cam follower rod (5 or 6) from the top of the capacitor assembly.

(2) Secure the cam follower rod with the follower retaining ring (13 or 18).

(3) Replace the slug rack (*d* above).

4–27. Mechanical Drive Module Repairs (fig. 4–44)

Replaceable parts of the mechanical drive module include the three diodes, the lamp, both switch assemblies, the motor, the reducer gear assembly, relay K703, the dials, and the mechanical drive assembly. These assemblies are not repairable and should be replaced as complete assemblies. Figure 4–44 shows these parts in exploded view. Subparagraphs *a* through *l* below explain removal and replacement of these parts.

Note. The reducer gear is a sealed unit, permanently lubricated. Do not attempt to repair or lubricate this unit.

a. Removal of Dials. To remove either the kilocycles or megacycles dial, remove the Phillips panhead screw, lockwasher, and flatwasher (1, 2, and 3, respectively, fig. 4–44) and slip the dial off the associated switch shaft.

b. Replacement of Dials. To replace the kilocycles or megacycles dial (5 or 4, respectively), proceed as follows:

(1) Orient the kilocycles dial (5) so that the figures .00 align with the dial marker (7). Orient the megacycles dial so that the figures 30 align with the dial marker (7).

(2) Install the dials over the switch shafts (with the megacycles dial at the bottom) and secure each with a Phillips panhead screw, a lockwasher, and a flatwasher (1, 2, and 3).

(3) If the dials are not aligned with the markers ((1) above) loosen the marker screws (6) slightly and position the marker for proper alignment.

c. Removal of Megacycles Switch S701.

(1) Remove the dials (*a* above).

(2) Remove the four Phillips panhead screws (10, fig. 98) that hold the front of the reducer gear (12) to the front support assembly (11). Remove the support assembly.

(3) Unsolder and tag each wire that connects to the megacycles switch (13).

Note. The hexagonal posts and dials will be left in the unit; do not unsolder leads from the diodes.

(4) Loosen the two setscrews (14) in the locking collar (15) at the rear of the switch assembly.

(5) Separate the switch assembly from the hexagonal spacing posts (16) by unscrewing the two 1¼-inch Phillips panhead screws that extend through the switch.

(6) Remove the switch assembly, leaving the hexagonal posts and diodes in the unit.

d. Replacement of Megacycles Switch S701.

Note. Make sure that the locking switch collar (15) is in position on the rear of the switch shaft.

(1) Place the switch in position in the unit so that the flat side of the wafers is up (toward center of unit) and secure the switch assembly to the two hexagonal spacing posts (16) with the two 1¼-inch Phillips panhead screws, which extend through the switch assembly. Make sure that all wafers are oriented as shown; that is, flat sides of the *D* hole in the wafer rotors are parallel to a line drawn through the wafer mounting holes.

(2) Tighten the two setscrews (14) in the locking collar (15).

(3) Solder the loose wires to the proper switch contacts and remove the tags from the wires.

(4) Replace the front support assembly (11) and secure it to the reducer gear (12) with four ⅜-inch Phillips panhead screws (10).

(5) Replace the dials (*b* above).

e. Removal of Kilocycle Switch S702.

(1) Remove the dials (*a* above).

(2) Remove the four Phillips panhead screws (10) that hold the front of the reducer gear (12) to the front support assembly (11). Remove the support assembly.

(3) Unsolder and tag each wire that connects to the kilocycle switch (17).

Note. The hexagonal posts and the diode will be left in the unit; do not unsolder the leads from the diode.

(4) Loosen the two setscrews (18) in the locking collar (19) at the rear of the switch assembly.

(5) Separate the switch assembly from the two hexagonal posts (20) by unscrewing the two 1½-inch Phillips panhead screws that extend through the switch.

(6) Remove the switch assembly, leaving the hexagonal posts and the diode in the unit.

f. Replacement of Kilocycle Switch S702.

Note. Make sure that the locking switch collar (19) is in position on the rear of the switch shaft.

(1) Place the switch in position in the unit so that the flat side of the wafers is down (toward the center of the unit) and secure the switch assembly to the two hexagonal posts (20) with the two 1½-inch Phillips panhead screws, which extend through the switch assembly (same as on the megacycle switch (*d* above)).

(2) Tighten the two setscrews (18) in the locking switch collar (19).

(3) Solder the loose wire to the proper switch contacts and remove the tags from the wires.

(4) Replace the front support assembly (11) and secure it to the reducer gear (12) with four ⅜-inch Phillips panhead screws (10).

(5) Replace the dials (*b* above).

g. Removal of Drive Motor B701.

(1) Unsolder and tag all wires that are connected to the drive motor (21).

(2) Remove the dials (*a* above).

(3) Remove the two 1-inch Phillips panhead screws (22) that hold the motor to the reducer gear assembly (12).

(4) Remove the ¼-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44) that hold the rear of the reducer gear assembly to the drive assembly (24).

(5) Slide the front support assembly (11) and the reducer gear assembly forward far enough for the motor to be withdrawn from the reducer gear assembly. Remove the motor.

h. Replacement of Drive Motor B701.

(1) Apply a thin layer of Grease, Aircraft and Instrument (GL) MIL–G–3278 or equivalent to the motor pinion.

(2) Insert the drive motor (21) shaft into the reducer gear assembly (12) and secure it with two 1-inch Phillips panhead screws and two No. 2 lockwashers (22 and 43).

Note. The motor should be oriented so that the identification plate is facing away from the module.

(3) Solder the two black wires to the black motor terminal and the two brown wires to the brown motor terminal. Remove the tags from the wires.

(4) Slide the front support assembly, the reducer gear assembly, and the motor (11, 12, and 21, respectively) back against the drive assembly (24). Make sure that the alignment locating button (25) on the drive assembly fits into the reducer gear assembly.

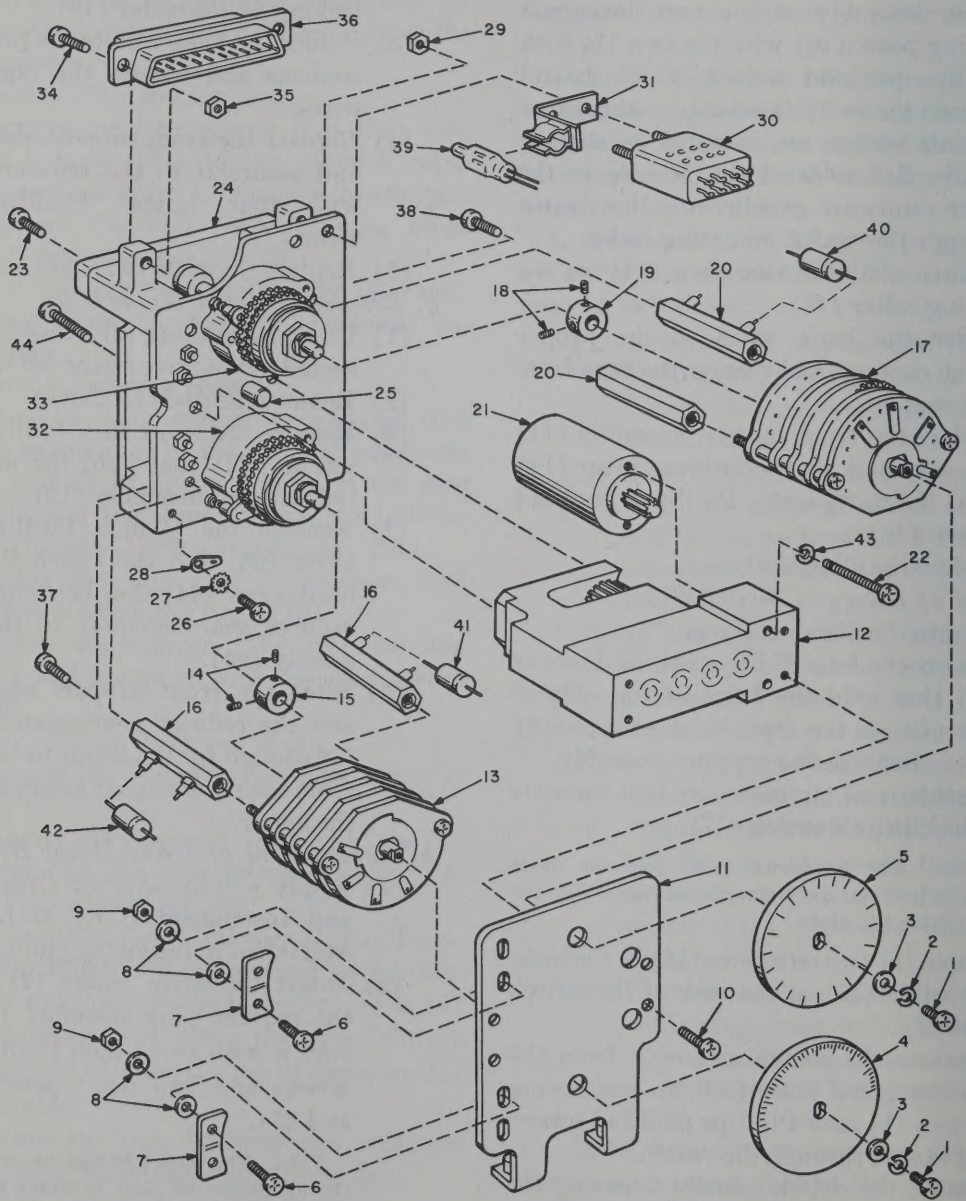
(5) Secure the reducer gear assembly to the drive assembly with the ¼-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44).

(6) Replace the dials (*b* above).

i. Removal of Reducer Gear Assembly.

(1) Remove the dials (*a* above).

(2) Remove the four ⅜-inch Phillips panhead screws (10) that hold the reducer gear assembly (12) to the front support



assembly (11) and remove the support assembly.

(3) Remove the two 1-inch Phillips panhead screws (22), which hold the drive motor (21) to the reducer gear assembly.

(4) Remove the ¼-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44) that hold the reducer gear assembly to the drive assembly (24).

(5) Hold the drive motor with one hand while pulling the reducer gear assembly straight forward (away from the drive assembly) to disengage the motor from the reducer gear assembly and the reducer gear assembly from the drive assembly.

j. Replacement of Reducer Gear Assembly.

(1) Apply a thin layer of grease (GL) or equivalent to the drive motor pinion and insert the pinion into the reducer gear assembly (12).

(2) Secure the drive motor to the reducer gear assembly with two 1-inch Phillips panhead screws (22).

(3) Position the reducer gear assembly so that the alignment locating button (25) on the drive assembly mates with the alignment hole in the rear of the reducer gear assembly and the exposed gears of the reducer gear assembly mesh with the gears on the drive assembly.

(4) Secure the reducer gear assembly to the drive assembly (24) with the ¼-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44).

(5) Secure the reducer gear assembly to the front support assembly (11) with four ⅜-inch Phillips panhead screws (10).

(6) Replace the dials (*b* above).

k. Removal of Drive Assembly.

(1) Remove the terminal lug (28) from the lower left-hand corner of the drive assembly (24).

(2) Remove the two 4–40 hexagonal nuts (29) that hold relay K703 (30) to the drive assembly. Leave the relay hanging by its wires.

(3) Unsolder the wires from the terminals of solenoids K701 and K702 (32 and 33) on the drive assembly. Tag the wires.

(4) Remove the two 7/16-inch Phillips panhead screws and hexagonal nuts (34 and 35, respectively) that hold connector P701 (36) to the drive assembly and lift the connector up to allow removal of the drive assembly.

(5) Loosen the two setscrews (14) in the locking collar (15) on the rear of the megacycles switch (13).

(6) Loosen the two setscrews (18) in the lock-

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1 Screw H193, Phillips panhead, 2–56 x ¼-inch
2 Lockwasher H244, No. 2
3 Flat washer H101, No. 8
4 Megacycles dial
5 Kilocycles dial
6 Screw H193, Phillips panhead, 2–56 x ¼-inch
7 Dial marker
8 Flat washer H101, No. 8
9 Hexagonal nut H138, 2–56
10 Screw, Phillips panhead, 4–40 x ⅜-inch
11 Support assembly
12 Reducer gear assembly
13 Megacycles switch S701, wafer
14 Setscrew H150, 4–40 x ⅛-inch
15 Switch collar
16 Hexagonal spacing post
17 Kilocycles switch S702, wafer
18 Setscrew H150, 4–40 x ⅛-inch
19 Switch collar
20 Hexagonal spacing post
21 Motor B701
22 Screw H263, Phillips panhead, 2–56 x 1-inch
23 Screw H215, Phillips panhead, 4–40 x ¼-inch
24 Drive assembly
25 Locating button
26 Screw H215, Phillips panhead, 4–40 x ¼-inch
27 No. 4 lockwasher H232
28 Terminal lug
29 Hexagonal nut H142, 4–40
30 Relay K703
31 Staked bracket
32 Solenoid K702
33 Solenoid K703
34 Screw H204, Phillips panhead, 4–40 x 7/16-inch
35 Hexagonal nut H142, 4–40
36 Connector P701
37 Screw H215, Phillips panhead, 4–40 x ¼-inch
38 Screw H215, Phillips panhead, 4–40 x ¼-inch
39 Neon lamp DS101
40 Diode CR703
41 Diode CR702
42 Diode CR701
43 No. 2 lockwasher
44 Screw H209, Phillips panhead, 4–40 x 1-inch

Figure 4–44. Mechanical drive module, exploded view.

ing collar (19) on the rear of the kilocycles switch (17).

(7) Remove the ¼-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44) that hold the rear of the reducer gear assembly (12) to the drive assembly.

(8) Remove the two ¼-inch Phillips panhead screws (37) that hold the megacycles switch hexagonal spacing posts (16) to the drive assembly and the two ¼-inch Phillips panhead screws (38) that hold the kilocycles switch hexagonal spacing posts (20) to the drive assembly. Remove the drive assembly by pulling it from the rear.

l. Replacement of Drive Assembly.

(1) Place the drive assembly (24) in position so that the gears mesh with the exposed gear of the reducer gear assembly (12) and the alignment locating button (25) fits into the alignment hole in the reducer gear assembly.

(2) Secure the drive assembly to the rear of the reducer gear assembly with the ¼-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44).

(3) Secure the drive assembly to the megacycles and kilocycles switch hexagonal posts (16 and 20) with four ¼-inch Phillips panhead screws (37 and 38).

(4) Tighten the setscrews (14 and 18) in the switch locking collars (15 and 19).

(5) Secure relay K703, the staked bracket, and lamp DS701 (30, 31, and 39) to the drive assembly with two 4–40 hexagonal nuts (29).

(6) Secure connector P701 (36) to the drive assembly with two 7/16-inch Phillips panhead screws (34) and two 4–40 hexagonal nuts (35).

(7) Secure the terminal lug (28) to the lower left-hand corner of the drive assembly with a ¼-inch Phillips panhead screw and a No. 4 lockwasher (26 and 27).

(8) Solder the two loose wires to solenoids K701 and K702 (32 and 33) and remove the tags from the wires.

4–28. RF Amplifier Module Repairs

The RF amplifier module variable capacitor assembly is not repairable and should be replaced as a unit. The rest of the module consists of one printed circuit board assembly and six electronic component plate assemblies. Refer to paragraph 4–23 for general instructions for removal and replacement of electronic parts. It is often practical to replace whole plate assemblies and repair the plate assembly later. The procedure for removing the plate assemblies is obvious. Be sure to tag unsoldered wires to insure proper reassembly. It is best to unsolder RF cables at the circuit board because RF connectors are difficult to replace.

4–29. Variable IF Module Repairs

(fig. 4–45)

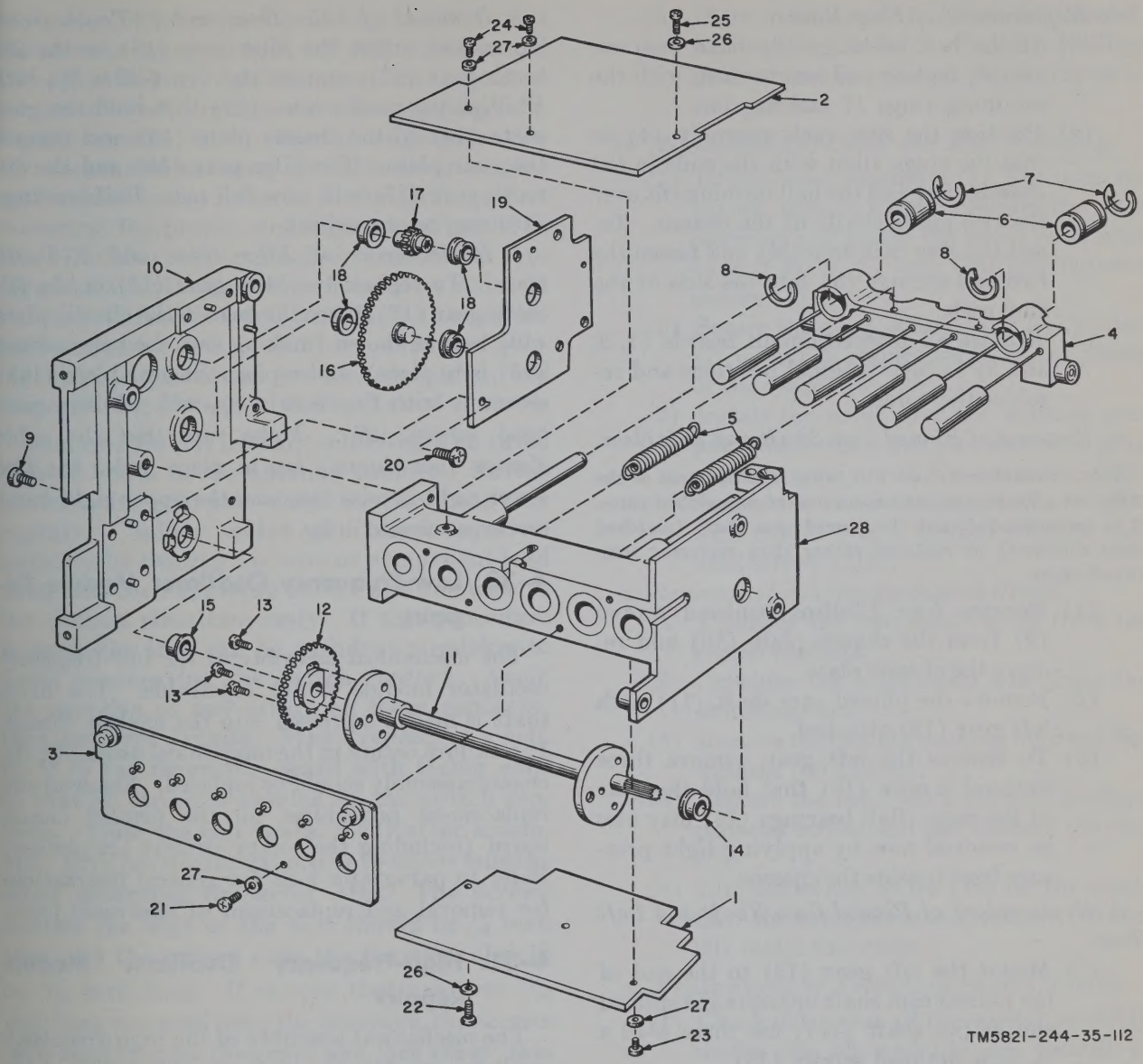
The variable IF module has six slug-tuned coils. The slugs are attached to a slug rack, which is driven by a pair of matched cams. The drive shaft, which is driven by the RF subchassis gear train, drives the cams. The drive shaft also drives a secondary gear train, which, in turn, drives the low-frequency oscillator module. The slug rack and the coil assembly are shown separately in figure 4–45; however, if a coil assembly or a slug rack is replaced, the module must be realigned in accordance with paragraph 3–19. The cams are a matched pair and must be replaced with a matched pair. Other replaceable mechanical parts (fig. 4–45) include gears, bearings, and springs. Subparagraphs *a* through *h* below explain the removal and replacement of these parts.

a. Removal of Slug Rack.

(1) Unsolder the wires between the printed circuit board assemblies (1, 2, and 3, fig. 4–45) and pull the boards away from the chassis as necessary for clearance of the slug rack assembly (4).

(2) Unfasten the two coil springs (5) from the slug rack assembly and pull the slug rack assembly (with slugs attached) away from the chassis (28), withdrawing the slugs from the coils in the chassis.

(3) If the ball bushings (6) are to be replaced, remove the retaining rings (7 and 8) from above and below the bushings. The bushings will now fall out of the slug rack.



1 Board assembly No. 1
2 Board assembly No. 2
3 Board assembly No. 3
4 Slug rack assembly
5 Coil spring
6 Ball bushings
7 Retaining ring H168
8 Retaining ring H168
9 Screw, H170, Phillips panhead, 4–40 x ¼-inch
10 Chassis plate
11 Pinned shaft
12 Left gear
13 Screw, H154, slotted, 4–40 x ⅛-inch
14 Ball bearing, MP107
15 Ball bearing, MP107
16 Idler gear, MP502
17 20-tooth gear, MP501
18 Ball bearing, MP105
19 Gear plate
20 Screw, H202, Phillips panhead, 4–40 x 5/16-inch
21 Screw, H196, Phillips panhead, 2–56 x 7/16-inch
22 Screw, H202, Phillips panhead, 4–40 x 5/16-inch
23 Screw, H217, Phillips panhead, 2–56 x 3/16-inch
24 Screw, H217 Phillips panhead, 2–56 x 3/16-inch
25 Screw, H202, Phillips panhead, 4–40 x 5/16-inch
26 No. 4 flat washer
27 No. 2 flat washer
28 Chassis

Figure 4-45. Variable IF module, exploded view.

b. Replacement of Slug Rack.

(1) If the ball bushings (6) have been removed, replace and secure them with the retaining rings (7 and 8).

(2) Position the slug rack assembly (4) so that the slugs align with the coils in the chassis (28) and the ball bushings fit over the two guide shafts of the chassis. Insert the slug rack assembly and fasten the two coil springs (5) into the side of the slug rack.

(3) Replace all printed circuit boards (1, 2, and 3) to their original positions and resolder the wires.

c. Removal of Pinned Cam Shaft and Left Gear.

Note. Unmatched cams will cause misalignment of the radio set. To insure against mating of unmatched cams, it is recommended that the pinned cam shaft (matched cams attached) be replaced rather than replacing individual cams.

(1) Remove four Phillips panhead screws (9) from the chassis plate (10) and remove the chassis plate.

(2) Remove the pinned cam shaft (11) with left gear (13) attached.

(3) To remove the left gear, remove three slothead screws (13) that hold the gear of the cam. Ball bearings (14) may also be removed now by applying light pressure from outside the chassis.

d. Replacement of Pinned Cam Shaft and Left Gear.

(1) Mount the left gear (12) to the end of the pinned cam shaft opposite the splined end of pin shaft (11); use three 4–40 x ⅛-inch slothead screws (13).

(2) Insert the splined end of the pinned cam shaft in the hole in the chassis (28). Make sure that the ball bearing (14) is installed first.

(3) See that the ball bearing (15) is in the chassis plate (10) and then press the chassis plate in position so that the free end of the pinned cam shaft fits in the hole with the ball bearing. The two guide pins to the left of the hole should fit into the guide holes in the chassis.

(4) Secure the chassis plate to the chassis with four 4–40 x ¼-inch Phillips panhead screws (9).

e. Removal of Idler Gear and 20-Tooth Gear. To remove either the idler gear (16) or the 20-tooth gear (17), remove the five 4–40 x 5/16-inch Phillips panhead screws (20) that hold the gear plate (19) to the chassis plate (10) and remove the gear plate. The idler gear (16) and the 20-tooth gear (17) will now fall out. Ball bearings (18) may be pressed out.

f. Replacement of Idler Gear and 20-Tooth Gear. To replace the idler gear (16) or the 20-tooth gear (17), place the gear in the chassis plate (10) hole as shown (making sure the ball bearing (15) is in place), and replace the gear plate (19); secure it with five 4–40 x 5/16-inch Phillips panhead screws (20). Make sure that the cable clamps (not shown) are in place under the two lower right-hand screws and the upper right-hand screw (as viewed in fig. 4–45).

4–30. Low-Frequency Oscillator Module Repairs

The mechanical assembly of the low-frequency oscillator module is not repairable. The drive shaft is machine-pressed into the module chassis. If a failure occurs in the mechanical assembly, the chassis assembly should be replaced. Removal and replacement procedures for the printed circuit board (including the rotary switch) are obvious. Refer to paragraph 4–23 for general instructions for removal and replacement of electronic parts.

4–31. High-Frequency Oscillator Module Repairs

The mechanical assembly of the high-frequency oscillator module is not repairable. The drive shaft is machine-pressed into the module chassis. If a failure occurs in the mechanical assembly, the chassis assembly should be replaced. Removal and replacement of printed circuit boards (including the rotary switch) are obvious. Refer to paragraph 4–23 for general instructions for removal and replacement of electronic parts.

4–32. Repair of Antenna Couplers CU–942/ARC–54 and CU–943/ARC–54

(fig. 6–29)

The following instructions (*a* through *ab* below) give procedures for the removal and replacement

of replaceable parts in the antenna coupler. The instructions apply to both CU–942/ARC–54 and CU–943/ARC–54. Special adjustment procedures (*d* and *x* below) are required when replacing ambiguity switch S102. Special alignment procedures are also necessary for replacement of gear shaft assemblies (*z* below). Motor B101 requires shimming for proper meshing of bevel gears (*n* below). Other subparagraphs include instructions for removal and replacement of the cover and mast assembly (*a* and *b* below), relay K101 (*o* and *p* below), connector J101 (*q* and *r* below), upper bearing plate ball bearings (*aa* and *ab* below), and lower bearing plate ball bearings (*s* and *t* below).

Caution: **Do not use any soldering iron rated over 40 watts in the antenna coupler. Switch contacts are gold-plated and conduct heat very rapidly. Solder wires or components to switches by heating the wire or component lead first, and then applying solder and the wire to the contact simultaneously. If this procedure is used, the iron can be withdrawn quickly to avoid overheating the switch contact. Avoid the exertion of any strain on these contacts; they are very fragile. When replacing a coil, tie it to the mounting board with lacing cord so that no strain is exerted on the switch contacts. Tune the coil (para. 5–22) after assembly. Give particular attention to screw lengths when mounting connector J101. The screws nearest the edge of the unit should be ¼ inch long and the screws near the bearings should be 3/16 inch long. If screws that are over 3/16 inch long are used near the bearings, the screws will bind against the gears and lock them; this will destroy the motor when power is applied to the unit.**

Note. Before repairing the antenna coupler, connect it to an AN/ARC–54 or to the MK–733/ARC–54 tester and cycle it to 30 mc.

a. Removal of Cover and Mast Assembly.

(1) Remove the twelve 4–40 x ¼-inch Phillips flathead screws (113, fig. 6–29), which extend into the cover (3) through the mounting plate (109).

(2) Grasp the cover near the front (mast end) and pull it straight away. Slight resistance should be felt because of the gripping action of the electrical plug (7).

(3) If the mast assembly (1) is to be removed, remove the four 6–32 x 7/16-inch Phillips flathead screws (4), and remove the mast and gasket.

b. Replacement of Cover and Mast Assembly.

(1) If the mast assembly (1) has been removed, replace it first. Secure the mast assembly and gasket (2) to the cover with four 6–32 x 7/16-inch Phillips flathead screws (4).

(2) Secure the plug, spacer, and lockwasher (7, 6, and 5, respectively) to the inside of the cover as shown.

(3) Install the cover over the antenna coupler; make sure that the electrical plug mates properly with the connector (22).

(4) Secure the cover to the antenna coupler with twelve 4–40 x ¼-inch Phillips flathead screws (113).

c. Removal of Ambiguity Switch S102B.

(1) Unsolder the two small wires from the switch contacts.

(2) Unsolder the large braid wire from the switch contact.

(3) Remove the two self-locking nuts and flat washers (69 and 68).

(4) Remove the two 5–40 x 1⅛-inch Phillips panhead screws and flat washers (16 and 17).

(5) Lift the switch wafer (18) off the shaft. Save the two spacers and washers (19 and 20) under the wafer.

d. Replacement of Ambiguity Switch S102B.

(1) Check to see that all three shaft assembly shafts (92, 93, and 94) are rotated so that their flat sides are parallel to each other and the scribe marks on the gears are aligned as shown in figure 6–29. If these conditions are met, proceed to (5) below. If the shaft assemblies are not properly aligned, proceed with (2) below.

(2) Loosen the two motor clamps that hold the nuts (43) and remove the four motor mounting screws (48).

(3) Slide the motor assembly (47) away from the gear train just far enough to unmesh the bevel gear on the end of the motor shaft. This will allow manual gear rotation.

(4) Rotate the gears so that the scribe marks and shafts align as described in (1) above.

Note. To avoid error due to backlash, approach the scribe-marks-aligned position by rotating the large gear counterclockwise as viewed from the top of the antenna coupler (against the normal direction of rotation). Hold the gears in this position until S102B is installed over the shaft, adjusted, and secured.

(5) Install rotary switch wafer S102B over the shaft of shaft assembly No. 2 (93) with the keying notch facing the front (end opposite motor) of the antenna coupler as shown in figure 6–29.

(6) Secure the switch with two 5–40 x 1½-inch Phillips panhead screws, six washers, two spacers, and two nuts (16, 17, 20, 68, 19, and 69, respectively). Leave the nuts (69) loose enough to allow movement of the switch in the slot holes.

(7) Hold the gears as in (4) above (unless motor has not been withdrawn from gears) and rotate the switch carefully to the position at which contact 3 of the switch is in contact with the rotor while contact 13 is not in contact with the rotor (fig. 6–29). Tighten the two switch mounting nuts (69).

(8) If the motor has been partially removed for this adjustment, reinstall it with the four 4–40 x 5/16-inch Phillips panhead screws, lockwashers, and the motor shim (48, 49, and 50, respectively).

Note. Movement of the gear train, if necessary at this point, will not affect the adjustment of S102B. Tighten the motor clamp holding nuts (43).

(9) Solder the three wires to the switch contacts. The braid wire from J103 (22) goes to the long contact. Leave a small kink in the braid wire to allow movement of J103.

e. Removal of Switch Assembly S101B. Remove S101B with the coils and mounting plate intact.

(1) Unsolder the coil that connects from S101B to S102B at the S102B end.

(2) Unsolder the bus wire that connects from S101B to S101A at the S101B end (contact on back of top wafer). Straighten the end of the wire so that it will slide through the hole in the coil mounting plate when the switch is removed.

(3) Remove the two self-locking nuts and flat washers (78 and 79) that hold the switch to the upper bearing plate.

(4) Unsolder the wire that extends through the grommet in the bearing plate and connects to S101A.

(5) Remove the switch assembly (S101A and and the grounding ring will come, too).

(6) Remove the two hexagonal nuts (15) under the grounding ring (14) and separate the switch wafers. (Place S101A and the grounding ring back over the shaft if the new switch is not being installed immediately.)

(7) Before removing any coil or capacitor, read the caution given in paragraph 4–31.

f. Replacement of Switch Assembly S101B. Perform the following steps to replace S101B:

(1) Remove S101A and the grounding ring from the shaft and assemble switch assembly S101 as shown in figure 6–29; use two 5–40 x 1⅛-inch Phillips panhead screws, four spacers, two flat washers, and two hexagonal nuts (8–15). Note that the short spacers go between S101A and the grounding ring and the long spacers go between S101B and S101A.

(2) Slide the bus wire, attached to S101A, through the hole in the coil mounting plate and solder it to the terminal on the back of S101B.

(3) Install the switch assembly over the shaft assembly with the keying notch toward the front (motor) end of the antenna coupler.

(4) Secure the switch assembly to the bearing plate with two self-locking hexagonal nuts and two flat washers (78 and 79).

(5) Solder the loose end of the coil (mounted on S101B) to the closest contact of S102B.

(6) Solder the wire that extends through the grommet in the bearing plate to the contact on the back of S101A.

(7) Before replacing any coil or capacitor, read the caution given in paragraph 4–31.

g. Removal of Rotary Switch S101A. To remove S101A, perform the procedures given in *e* above, and then unsolder the capacitors from the switch contacts. (Read the caution given in paragraph 4–31.) Tag the capacitor leads to aid in locating the proper contacts when replacing the switch.

h. Replacement of Rotary Switch S101A. To replace S101A, solder the capacitors (mounted on the grounding ring) to the proper contacts of S101A. (Read the caution given in paragraph 4–31.) If the capacitors are not tagged, refer to the wiring diagram (fig. 6–28) for proper connection. Next perform the procedures in *f* above.

i. Removal of Rotary Switch S103C. Procedures for removing S103C are identical with the procedures for removing S101A (*g* above).

j. Replacement of Rotary Switch S103C. Procedures for replacement of S103C are identical with the procedures for replacing S101B (*f* above), except that the keying notch should face the rear (end opposite motor) of the antenna coupler, and the connector bracket (24) should be installed over the switch with two No. 3 spacers and two flat washers (26 and 23, respectively). After installing the bracket, check the connector (22, fig. 6–29); it should move freely in a lateral plane.

k. Removal of Rotary Switch S103B. Procedures for removing S103B are identical with the procedures for removing S101A (*g* above).

l. Replacement of Rotary Switch S103B. Procedures for replacing S103B are identical with the procedures for replacing S101A (*h* above), except as noted in *j* above.

m. Removal of Motor Assembly B101.

(1) Unsolder the two wires from the end of the motor.

(2) Remove the two self-locking nuts and flat washers (43 and 44, respectively) from the clamp (45) and remove the clamp.

(3) Remove the four motor-mounting screws and lockwashers (48 and 49, respectively). Remove the motor assembly.

n. Replacement of Motor Assembly B101. Perform the following steps to replace the motor assembly:

(1) Select the shim (50) that allows full mesh of the motor bevel gear with the bevel gear on shaft assembly No. 1 (92) and install it between the motor assembly and the spacer block (51).

(2) Secure the motor assembly and shim in place with four 4–40 x 5/16-inch Phillips panhead screws and four lockwashers (48 and 49). The nameplate on the motor assembly should face the left side of the antenna coupler (looking from the motor end).

(3) Secure motor clamp, spacer, and motor (45, 46, and 47, respectively) to the lower bearing plate (99) with two 4–40 x 7/16-inch Phillips panhead screws, two self-locking nuts, and two flat washers (110, 43, and 44).

(4) Solder the two lose wires (extending from the relay (33)) to the terminals on the end of the motor. The terminals are color-coded. (Connect the white-brown-blue wire to the black terminal and the white-black-blue wire to the red terminal.)

o. Removal of Relay K101.

(1) Remove the lacing cord from the relay.

(2) Unsolder and tag all wires from the relay. Unsolder the two capacitors (34 and 35).

(3) Remove the two hexagonal nuts (39 and 42), the two lockwashers (38 and 41), the flat washer (40), and the solderless terminal (37) and remove the relay.

p. Replacement of Relay K101.

(1) Mount the relay to the front of the upper bearing plate (36) with the identification up. Secure the relay with two hexagonal nuts, two lockwashers, one flat washer, and the solderless terminal (39 and 42, 38 and 41, 40 and 37, respectively).

(2) Solder both capacitors (34 and 35) to the relay terminals (fig. 6–28).

(3) Solder all loose wires to the relay terminals (fig. 6–28).

(4) Fold the two capacitors over so that they rest on the side of the relay. Tie the capacitors and wiring to the relay with lacing cord.

q. Removal of Electrical Connector J101. To remove J101, remove the four screws (107 and 108). Slide the connector (106) out of the bearing plate (99), and unsolder and tag all wires.

r. Replacement of Electrical Connector J101. To replace J101, solder all the wires to the proper terminals. If not tagged, use the wiring diagram (fig. 6–30) and then slide the connector into position on the bearing plate (99). Secure the connector to the bearing plate with two 4–40 x ¼-inch Phillips panhead screws and two 4–40 x 3/16-inch Phillips panhead screws (108 and 107).

***Caution:* The shorter screws go in the holes nearest the bearings and the longer screws go in the holes nearest the edge of the bearing plate. If screws longer than 3/16-inch long are put in the holes near the bearings, the screws will bind against the gears and lock the gear train and damage to the motor will result when the unit is operated.**

s. Removal of Lower Bearings.

(1) Remove all the screws from the mounting plate (109) and remove the mounting plate.

(2) Remove the four Phillips panhead screws (107 and 108) from the power connector and slide the connector out of the lower bearing plate (99).

(3) Remove the four Phillips flathead screws (103) that hold the lower bearing plate to the hexagonal posts.

(4) Remove four Phillips panhead screws (104 and 105) that hold the lower bearing plate to the front and rear spacers.

(5) Unsolder the wire from the RF connector (100).

(6) Remove the lower bearing plate; be careful that shaft assemblies No. 2 and No. 3 (93 and 94) do not drop down and damage the two wafer switches (86 and 87).

(7) Push the bearings (95, 96, and 97) out of the bearing plate by exerting pressure from the bottom of the plate.

t. Replacement of Lower Bearings. Perform the following steps to replace the lower bearings:

(1) Press the bearings (95, 96, and 97) into the lower bearing plate (99) from the top of the plate (the side with the nut plates).

(2) If shaft assemblies No. 2 and No. 3 (93 and 94) have been allowed to drop down and become unmeshed, align them so that the scribe marks on the gears line up; then push the shafts into the upper bearing plate to mesh the gears.

(3) Place the lower bearing plate (99) in position and secure it to the four hexagonal posts (98) with four 4–40 x ¼-inch Phillips flathead screws (103).

(4) Solder the loose wire to the rf connector terminal (100).

(5) Slide the electrical connector (106) into its mounting hole in the lower bearing plate and secure it with two 4–40 x ¼-inch Phillips panhead screws (108) and two 4–40 x 3/16-inch Phillips panhead screws (107).

Note. Be sure that the two shorter screws are installed nearest the bearings; the longer screws, if installed here, will bind against the gears.

(6) Mount the mounting plate (109) to the lower bearing plate with six 4–40 x 3/16-inch Phillips flathead screws (55 and 112).

(7) Slide the motor spacer (46) under the motor and install the motor clamp (45) over the motor. Secure with two 4–40 x 7/16-inch Phillips panhead screws, two flat washers, and two self-locking nuts (110, 44, and 43).

(8) Secure the bottom of the rear spacer (51) with two 4–40 x 5/16-inch Phillips panhead screws (105).

(9) Secure the bottom of the front spacer (52) with two 4–40 x 5/16-inch Phillips panhead screws (104).

u. Removal of Megacycle Seeking Switch S103A.

(1) Perform all the procedures given in *s* above except step (7).

(2) Unsolder and tag all wires that connect to contacts of S103A (86).

(3) Remove the two self-locking nuts and flat washers (69 and 68) that hold the switch to the upper bearing plate and then remove the switch.

(4) Remove the retaining ring (77) from shaft assembly No. 3 (94) and remove the shaft assembly.

v. Replacement of Megacycle Seeking Switch S103A.

(1) Solder the loose wires to the switch contacts being careful not to break the switch contacts (fig. 6–28).

(2) Replace the shaft assembly (94), aligning it so that the scribe mark on the gear aligns with the scribe mark on the large gear.

(3) Mount the switch to the upper bearing plate (36); use the two 5–40 x 2-inch screws that extend through S101C and S101B, two No. 2 spacers (71), two self-locking nuts (90) and two flat washers (91).

(4) Complete the assembly by performing the procedures given in *t*(3) through (9) above.

w. Removal of Ambiguity Switch S102A.

(1) Perform all the procedures given in *s* above except step (7).

(2) Unsolder and tag all wires that connect to S102A (87).

(3) Remove the two self-locking nuts and flat washers (88 and 89) that hold the switch to the upper bearing plate and remove the switch.

(4) Remove the retaining ring (76) from shaft assembly No. 2 (93) and remove the shaft assembly.

x. Replacement of Ambiguity Switch S102A.

(1) Solder the loose wires to the switch contacts; be careful not to break the contacts. (Refer to the wiring diagram (fig. 6–28) if necessary.)

(2) Replace the shaft assembly (93), aligning the gear so that the scribe marks align with the scribe marks on the adjoining gears.

(3) Mount the switch to the upper bearing plate (36); use two 5–40 x 7/8-inch Phillips panhead screws and flat washers (57 and 58), two No. 4 spacers (72), and two self-locking nuts and flat washers (88 and 89). (Leave the nuts slightly loose for adjustment of the switch after the gear plates are reassembled.)

Note. The large gear has a scribe mark centered on a gear tooth and, across from it, a scribe mark centered between two teeth. When the gears are properly aligned, the marked gear tooth will align with the mark on the gear nearest the motor and the other mark will align with the mark on the gear farthest from the motor.

(4) Complete the assembly by performing the procedures given in *t*(3) through (9) above.

(5) Rotate S102A (87) in its slotted mounting holes as necessary to cause contact 7 of the switch to make contact with the switch rotary contact while contact 17 does not make contact with the rotary contact. (Use the two inspection holes that are provided in the upper bearing plate under S102B.)

Note. If this adjustment requires offcentering of the switch-mounting screws in the slotted holes, make sure that both screws (57) are offcentered by the same amount so that the switch wafer will not be warped when the mounting nuts are tightened.

(6) Tighten the two-self-locking nuts (88).

y. Removal of Shaft Assemblies.

(1) Perform the procedures given in *s*(1) through (5) above.

(2) If shaft assembly No. 2 or No. 3 (93 or 94) is to be removed, remove the applicable retaining ring (76 or 77) and slide the shaft assembly out.

(3) If shaft assembly No. 1 (92) is to be removed, loosen the four motor mounting screws (48) and slide the motor out far enough to disengage the bevel gears to allow removal of the shaft assembly.

z. Replacement of Shaft Assemblies.

(1) Insert shaft assemblies No. 2 and No. 3 (93 and 94) through their respective switches. Slide one flat washer (74 or 75) and one curved spring washer (84 or 83) over each shaft assembly. Install the retaining rings (76 and 77). Install the spring washers so that the curved sides will press against the bearing inner race as shown in figure 6–29.

(2) Insert all three shaft assemblies into the upper gear plate with the gears aligned so that all the scribe marks line up (*x*(3) above).

(3) Mesh the bevel gear on shaft assembly No. 1 with the motor bevel gear by sliding the motor in place and tightening the four motor mounting screws (48). If shaft assembly No. 1 has been replaced, check to see that the motor shim allows full

mesh of the bevel gears. If not, use a different-thickness shim. (Four different shims are provided with each motor assembly.)

Note. If the bevel gears do not mate properly with all the scribe marks aligned, the gears may be rotated slightly to achieve proper mesh. If rotary switches S102A and S102B have not been removed, the switch adjustment will not be affected.

(4) Complete the assembly by performing the procedures given in *t*(3) through (9) above.

aa. Removal of Upper Bearings.

(1) Remove the shaft assemblies (*y* above).

(2) Slide the bearings (80, 81, and 82) out of the upper bearing plate. (Bearings are pressed in from the gear side of the plate.)

ab. Replacement of Upper Bearings.

(1) Press the bearings (80, 81, and 82) into the upper bearing plate (36) from the gear side.

(2) Replace the shaft assemblies and complete the assembly of the antenna coupler by performing the procedures given in *z* above.

Section III. MODULE ADJUSTMENTS

4–33. General

This section (paras. 4–33 through 4–38) contains instructions for performing all electrical adjustments on all main chassis modules. Refer to paragraphs 3–14 through 3–21 for alignment of rf subchassis modules.

4–34. Sel-Call Module Adjustments

Make the following adjustments on the sel-call module; use the module tester (AN/ARM–87) and standard test equipment as shown in figure 4–26. Module Extender MX–4934/ARC–54 is part of Maintenance Kit, Electronic Equipment MK–733/ARC–54.

a. Preliminary Adjustments. Make the following preliminary adjustments, using the ME–26B/U, with no power applied to the module:

(1) Adjust R108 for a reading of 750 ohms between test point 6 and test point 7 on the module.

(2) Adjust R110 for a reading of 700 ohms between test point 2 and test point 3 on the module.

(3) Adjust R112 for a reading of 250 ohms between test point 4 and test point 5 on the module.

b. Tone Amplifier Adjustment. With the test setup shown in figure 4–26, make the following adjustments:

(1) Set up the CIRCUIT SELECTOR switches for program 3341 and apply power to the module.

(2) Set up the audio oscillator for an output of 35 ±1 millivolt at 145 ±0.5 cps as measured on the ME–30B/U and the AN/USM–26, respectively. (The level at pin 3 of the test adapter should be 2.1 millivolts.)

(3) Adjust R110 for a reading of 1 ±0.1 volt at pin 8.

(4) Tune the audio oscillator to 155 ±0.5 cps at the same level as above and adjust R112 for a reading of 1 ±0.1 volt at pin 8.

c. Tone Oscillator Adjustment.

(1) Set up the CIRCUIT SELECTOR switches for program 2X36 (X indicates that any setting is satisfactory).

(2) Remove the audio oscillator from the test setup and move the frequency meter input to pin 8.

(3) Measure the frequency at pin 8. If the frequency is not 150 ±1 cps, adjust R108.

4–35. Homer Module Adjustments

Make the following adjustments on the homer module; use the module tester and standard test equipment. Do not use a test adapter for homer module adjustments; plug the module directly into the module tester.

a. 500-Kc Amplifier Adjustment.

(1) Set the CIRCUIT SELECTOR switches for program 6934 and, while holding the meter PRESS TO TEST button down, adjust the 500KC AMPL controls for a reading of 68 percent on the TEST METER.

(2) Use an rf voltmeter to measure the voltage at test point 1 on the module, and adjust L204 and L205 for maximum indication.

b. Signal Strength Amplifier (Over Target) Adjustment. Set the CIRCUIT SELECTOR switches for program 8XXX and, while holding the meter PRESS TO TEST button down, adjust R211 for a meter indication of 65 percent.

c. Homer Course Adjustment.

(1) Set the CIRCUIT SELECTOR switches for program 7943.
(2) Adjust R227 for a reading of zero on the meter. (Hold the PRESS TO TEST button down for the reading.)
(3) Set the CIRCUIT SELECTOR switches for program 6934.
(4) Adjust the 500KC AMPL control on the module tester for a reading of 56 percent on the meter.
(5) Set the CIRCUIT SELECTOR switches for program 7944.
(6) Hold the PRESS TO TEST button down and adjust R224 on the module for a reading of 24 percent on the meter.
(7) Change the program to 7834 and check for reading of 24±2 percent.

4-36. Fixed IF Module Adjustment

Plug the module into the module tester (AN/ARM-87), apply power to the tester, and adjust L1205 as follows:

a. Set the module tester CIRCUIT SELECTOR switches for program 3685 and adjust the 500KC AMPL control for a reading of 64 percent on the meter.

b. Set the module tester CIRCUIT SELECTOR switches for program 3665 and adjust the 1KC AMPL control for a reading of 74 percent on the meter.

c. Set the module tester CIRCUIT SELECTOR switches for program 3315 and adjust the DIST DET control for a reading of 55 percent on the meter.

d. Set the module tester CIRCUIT SELECTOR switches for program 3305 and adjust L1205 on the fixed IF module for minimum reading on the test meter.

4-37. Receive Audio Module Adjustments

Make the following adjustments on the receive audio module; use the module tester (AN/ARM-87) and standard test equipment as shown in figure 4-29.

a. Gain Adjustment.

(1) Set the module tester CIRCUIT SELECTOR switches for program 5760 and adjust the 1KC AMPL control for a reading of 95 percent on the module tester meter. (Hold the PRESS TO TEST button down for reading.)
(2) Measure the ac voltage level from pin 14 to ground on the test adapter and adjust R1315 (GAIN) on the module for 2.73 volts rms.

b. Squelch Adjustment.

(1) Set the module tester CIRCUIT SELECTOR switches for program 5760 and adjust the 1KC AMPL control for a reading of 95 percent on the module TEST METER.
(2) Change the CIRCUIT SELECTOR switches to program 6061 and adjust the 150 CPS AMPL control for a reading of 1 volt rms (use external voltmeter) between pin 8 and ground on the test adapter.
(3) Adjust R1332 (SQUELCH) on the module counterclockwise until the voltmeter reading just drops to zero. Rotate R1332 clockwise until the 1-volt reading just reappears.
(4) Rotate the 150 CPS AMPL control on the module tester counterclockwise (holding the PRESS TO TEST button down) until the module tester meter reading decreases sharply.
(5) Measure the ac voltage at pin 8 of the test adapter. The voltage should not be less than 0.78 volt rms.

4-38. Transmit Audio Module Adjustments

Make the following adjustments on the transmit audio module; use the module tester (AN/ARM-87) and standard test equipment as shown in figure 4-32. The test adapter shown is part of Maintenance Kit, Electronic Equipment MK-733/ARC-54.

a. Oscillator Adjustment.

(1) Adjust L1401 on the module until the core adjustment screw is even with the top of the coil form.

(2) Set up the CIRCUIT SELECTOR switches on the module tester for program 4675.

(3) Use the AN/USM–26 (or equivalent) and measure the frequency at J1402 on the module. Adjust L1401 for a frequency of 500KC ±100 cps.

(4) Disconnect the frequency meter.

b. Audio Adjustment.

(1) Set up the CIRCUIT SELECTOR switches on the module tester for program 3664.

(2) Adjust the 1KC AMPL control for a reading on the module tester meter of 53 percent.

(3) Adjust R1402 (AUDIO) on the module for 70.7 millivolts rms as measured on the ME–30B/U.

c. Sidetone Adjustment.

(1) Set up the CIRCUIT SELECTOR switches on the module tester for program 3673.

(2) Adjust R1413 (SIDETONE) on the module for a reading of 19.5 millivolts rms as measured at pin 11 of the test adapter using the ME–30B/U.

CHAPTER 5

GENERAL SUPPORT AND DEPOT TESTING PROCEDURES

Section I. INTRODUCTION

5–1. General

a. Testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service Organizations responsible for general support maintenance of signal equipment to determine the acceptability of repaired signal equipment (RT–348/ARC–54, C–3835/ARC–54, and CU–942/ARC–54 (or CU–943/ARC–54)). These procedures set forth specific requirements that repaired signal equipment must meet before it is returned to the using organization. The testing procedures may also be used as a guide for the testing of equipment that has been repaired by the direct support repairman if the proper tools and test equipment are available. A summary of the test data is given in paragraph 5–23.

b. Comply with the instructions preceding the body of each chart before proceeding to the chart. Perform each test in sequence. Do not vary the sequence. For each step, perform all the actions required in the test equipment control settings columns; then perform each specific test procedure and verify it against its performance standard.

Caution: **Make sure that test set jumpers are connected as shown in each test setup illustration. These jumpers connect the RF output of the receiver-transmitter to a dummy load in the test set. If the jumpers are not in place, the equipment could become damaged.**

5-2. Test Equipment, Tools, and Materials Required

All test equipment, tools, materials, and other equipment required to perform the testing procedure given in this chapter are listed in the following charts and are authorized under TA 11–17 (Signal Field Maintenance Shops) and TA 11–100 (11–17) (Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shop, Continental United States).

a. Test Equipment.

Nomenclature	Federal stock No.	Technical manual
Maintenance Kit, Electronic Equipment MK–733/ARC–54 (two required for transmitter carrier noise test).	----------	TM 11–6625–601–12
Modulation Meter ME–57/U.	----------	TM 11–6625–400–12
Audio Oscillator TS–382/U.	6625–192–5094	
Signal Generator AN/URM–48.	----------	TM 11–1257
Electronic Voltmeter ME–30B/U.	6645–243–0562	TM 11–6625–320–12
Frequency Meter AN/USM–26 and Converter CV–394/USA–5.	----------	TM 11–5057
Attenuator, Variable 10-db steps (HP–355B).		
Attenuator, Variable (1-db steps) HP–355A (2 each).		
Multimeter, Meter ME–26A/U.	----------	TM 11–6625–200–12
Spectrum Analyzer TS–723A/U.	----------	TM 11–5097
Radio Interference Measuring Set AN/URM–85.	----------	TM 11–6625–351–12
Signal Generator AN/USM–44A.	6625–669–0258	TM 11–6625–508–10
Admittance Meter, General Radio Model 1602B.		
Receiver-Transmitter, Radio RT–348/ARC–54 (required for transmitter carrier noise test).		

b. Other Equipment.

Equipment	Federal stock No.	Technical manual
Dc power source: +27.5 ±0.5 volts dc at 10 amperes with maximum ripple and noise of 200 millivolts.		
Headset-Microphone H–101/U.	5965–296–2473	TM11–5965–215–15
Stopwatch with second hand.		
Capacitor 0.2μf		
Tool Kit, Radio Radar Repairman TK–87/U.	5180–690–4552	

5–3. Test Facilities

A primary source of dc power capable of supplying +27.5 ±0.5 volts at 10 amperes (minimum) with noise and ripple not more than 200 millivolts is required to operate the equipment. Maintenance Kit, Electronic Equipment MK–733/ARC–54 may be used for testing the entire unit of an AN/ARC–54 or any individual unit separately. The test procedures are written so that the units may be tested individually, thereby fully utilizing the capabilities of the test equipment. The simulator (SM–349/ARC–54) may be removed from the main test unit TS–1967/ARC–54 for use for on-aircraft troubleshooting while performing tests on the RT–348/ARC–54 using the TS–1967/ARC–54. The simulator is required (in the main test unit) for control unit test only.

5–4. Modification Work Orders

The performance standards listed in the tests (paras. 5–5 through 5–22) are based on the assumption that all applicable modification work orders have been performed. A listing of current modification work orders will be found in DA Pam 310–4.

Section II. GENERAL SUPPORT TESTING RECEIVER-TRANSMITTER, RADIO RT–348/ARC–54

5–5. Physical Tests and Inspection

a. Test Equipment and Materials. None.

b. Test Connections and Conditions. None.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	None.	None.	*a.* Inspect equipment covers and front panels for condition of finish and panel markings.	*a.* Exterior surfaces intended to be painted show no bare metal. Panel markings are legible.
			Note. Touchup painting is recommended instead of complete refinishing whenever practical. Screwheads, receptacles, mounting screws, Dzus fasteners, and mounting should not be painted or polished with abrasives.	
			b. Inspect for dents, punctures, or warped areas.	*b.* No dents, punctures, or warped areas are evident.
			c. Inspect springlock fasterners and receptacles.	*c.* Springlock receptacles are in good condition and secure the equipment and covers properly.
			d. Inspect external surfaces for loose or missing screws or washers.	*d.* All screws and washers are secure.
			e. Inspect receptacles for condition of pins, contacts, and mounting, for foreign particles.	*e.* All receptacles are tightly mounted. There are no bent, broken, or missing pins. Receptacle moldings are not chipped or cracked and no foreign particles are present.
			f. Inspect air filters and air outlet.	*f.* Air filters are clean and securely mounted. Air exhaust is clear.
2	None.	As required.	*a.* Operate all controls through all their positions. (Do not disturb screwdriver adjustments.)	*a.* Controls operate smoothly with no binding. Control knobs are tight on their shafts.
			b. Operate receiver-transmitter unit locking handles.	*b.* Locking handle operates smoothly and locking handle catch secures handle properly.
			c. Inspect meter	*c.* Meter glass is clean and not damaged.
3	None.	None.	Inspect the equipment for applicable modification work orders (para. 5–4).	All applicable modification work orders have been performed.

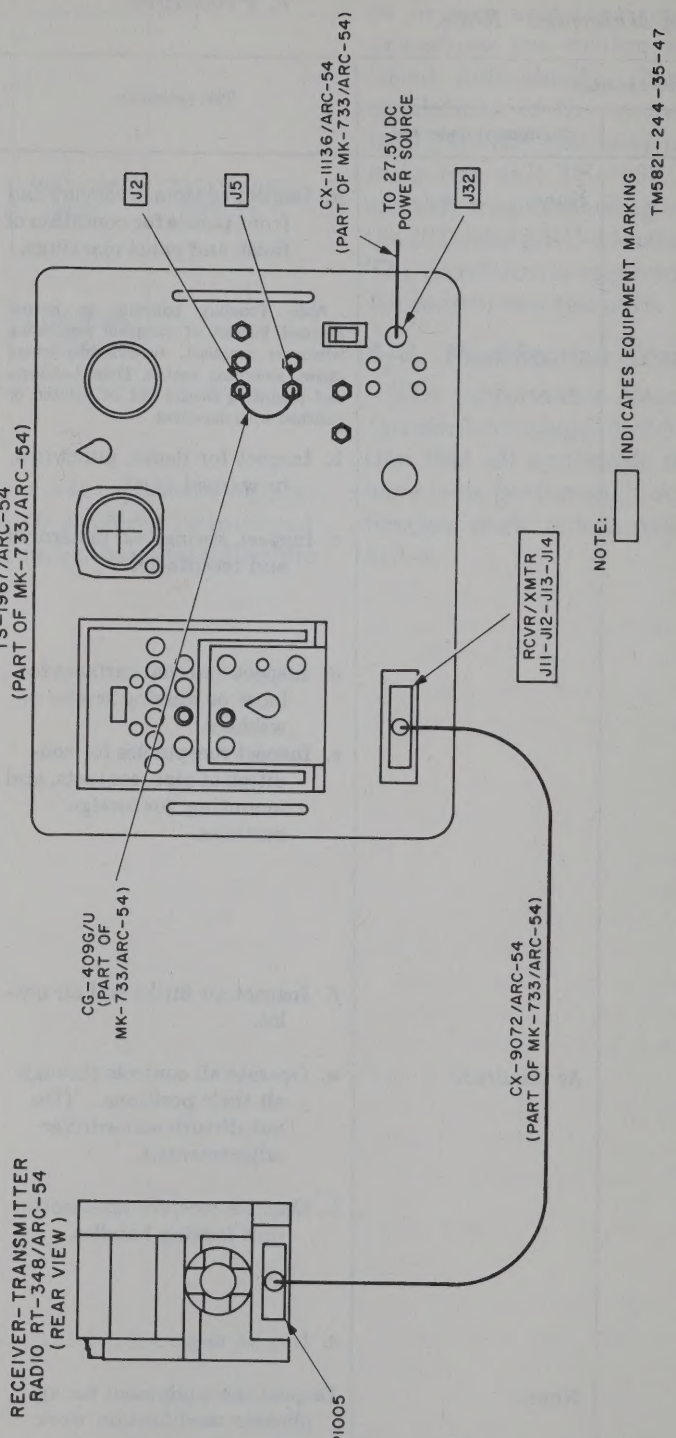


Figure 5-1. Test meter test setup

5–6. Test Meter Tests

a. Test Equipment and Materials. Maintenance Kit, Electronic Equipment MK–733/ARC–54.

b. Test Connections and Conditions. Connect equipment as shown in figure 5–1.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S3: 30. S4: 0. S5: 0.95. S6: RCV. S7: DIS (Set to TONE for position 5 test). S9: PTT. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON.	*RT–348/ARC–54* TEST SWITCH: Set as instructed in Test procedure column.	Beginning at position 1, successively select each position of the RT–348/ARC–54 TEST SWITCH and note the indication on the RT–348/ARC–54 TEST METER for each position. *Note.* Set S7 on the test set to TONE when checking position 5.	Observe the following: *Position* — *Reading* 1 — 50±30 2 — 50±30 3 — 50±30 4 — 50±30 5 — NMT[a] 20 (average). 6 — 50±30 7 — NMT 5 8 — NMT 5 9 — NMT 5 10 — NMT 5 11 — NMT 5 12 — NMT 5
2	*TS–1967/ARC–54* S3: 60. S4: 7. S5: 0.00. S6: XMIT. S7: DIS. S9: PTT. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position.	*RT–348/ARC–54* TEST SWITCH: Set as instructed in Test procedure column.	*a.* Beginning at position 1, successively select each position of the RT–348 TEST SWITCH and observe the reading on the RT–348 TEST METER for each position. *b.* Set S6 on the TS–1967 to RCV and remove the jumper between J2 and J5. Momentarily depress S6 to PTT and note the RT–348 TEST METER indication.	*a.* Observe the following: *Position* — *Reading* 1 — 50±30 2 — 50±30 3 — 50±30 4 — 50±30 5 — 50±30 6 — 50±30 7 — NLT[b] 5 8 — NLT 20 9 — 50±30 10 — NLT 20 11 — NMT 5 *b.* The reading for position 11 should be 50±30.

[a] NMT=Not more than.
[b] NLT=Not less than.

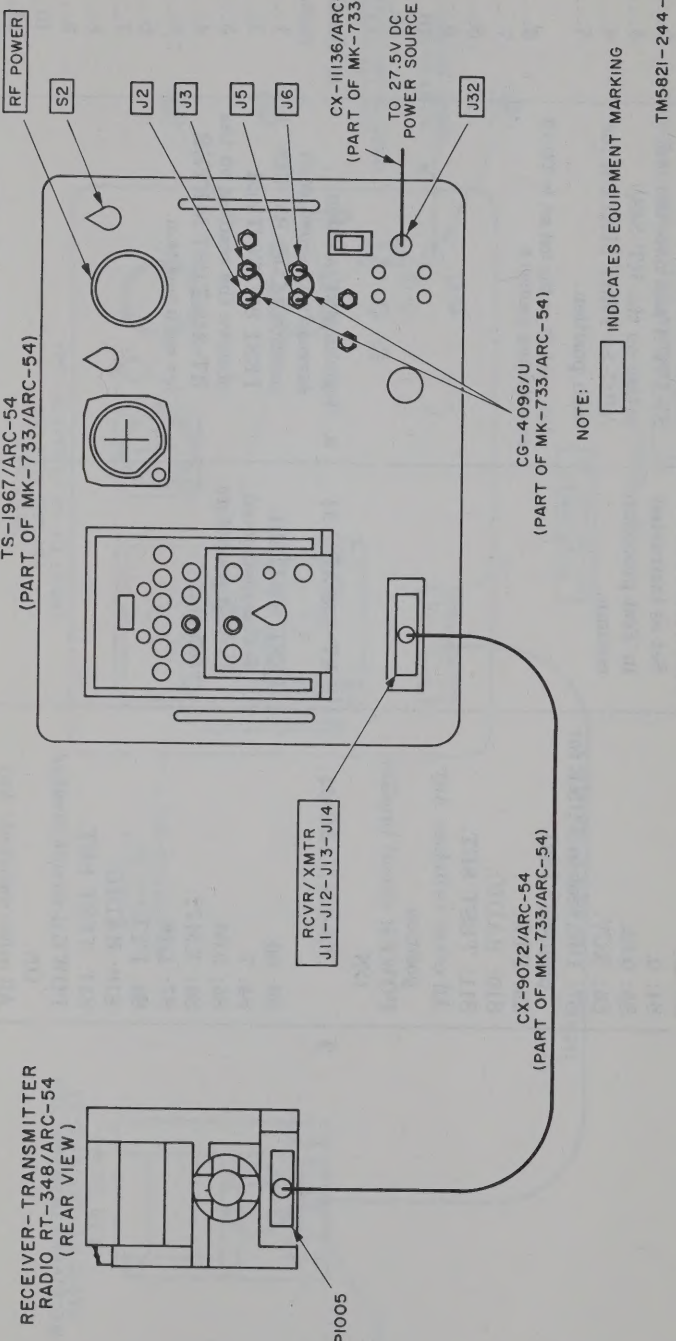


Figure 5-2. Transmitter power output test setup.

5–7. Transmitter Power Output

a. Test Equipment and Materials. Maintenance Kit, Electronic Equipment MK–733/ARC–54.

b. Test Connections and Conditions. Connect equipment as shown in figure 5–2. Turn the POWER circuit breaker on the TS–1967 to ON and allow 5 minutes for warmup.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S2: FWD. S3: 30. S4: 0. S5: 0.00. S6: RCV. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position.	None.	Starting with 30.00 megacycles, use switches S3, S4, and S5 on the TS–1967/ARC–54 to select each of the following frequencies. Depress S6 on the TS–1967/ARC–54 to PTT at each frequency setting and observe the power output as displayed on the RF POWER meter on the TS–1967/ARC–54. 30.00 40.25 50.50 60.75 32.05 42.30 52.55 62.80 34.10 44.35 54.60 64.85 36.15 46.40 56.65 66.90 38.20 48.45 58.70 68.95	Power output should not be less than 10 watts for any selected frequency.

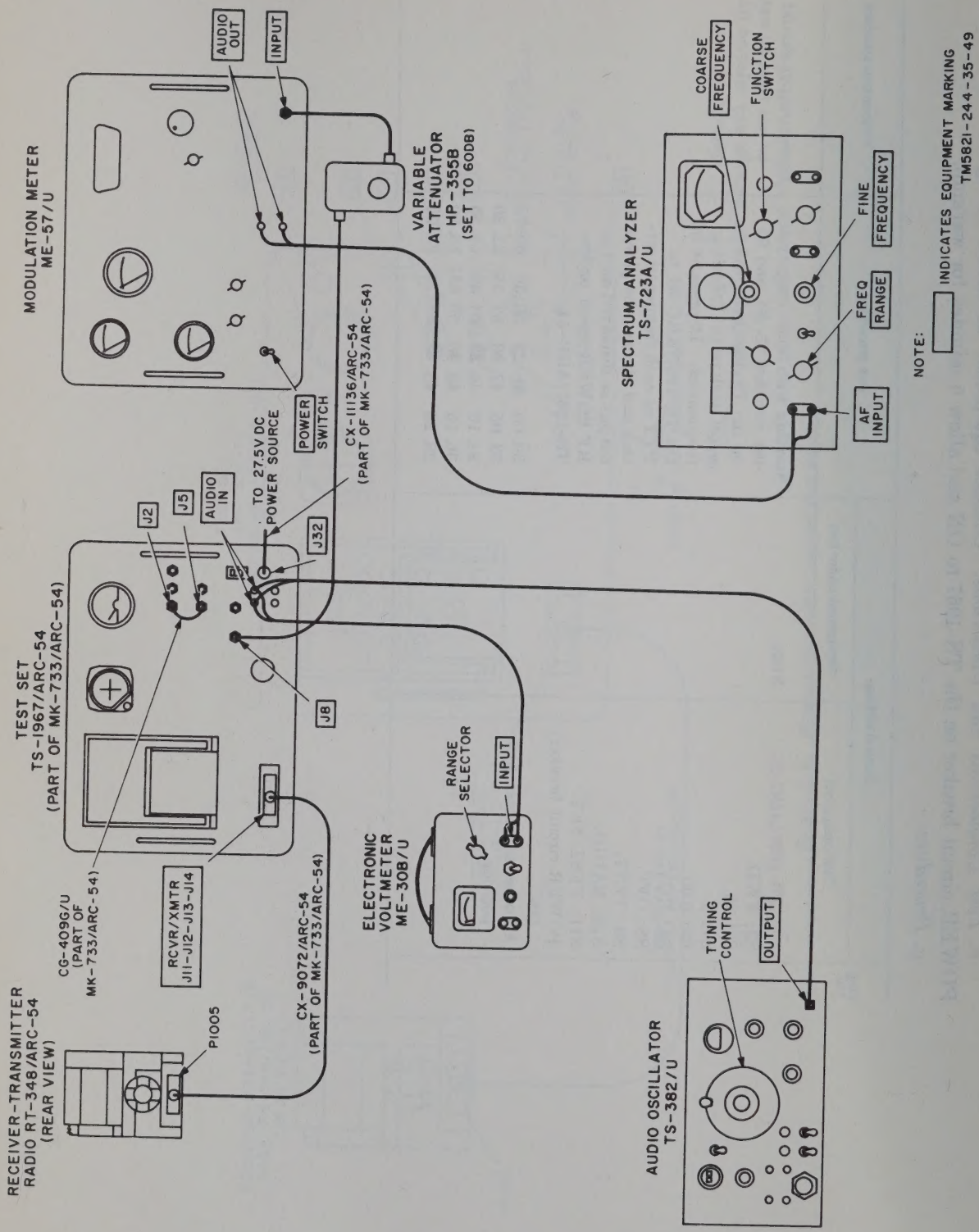


Figure 5-3. Transmitter distortion test setup.

5-8. Transmitter Distortion Test

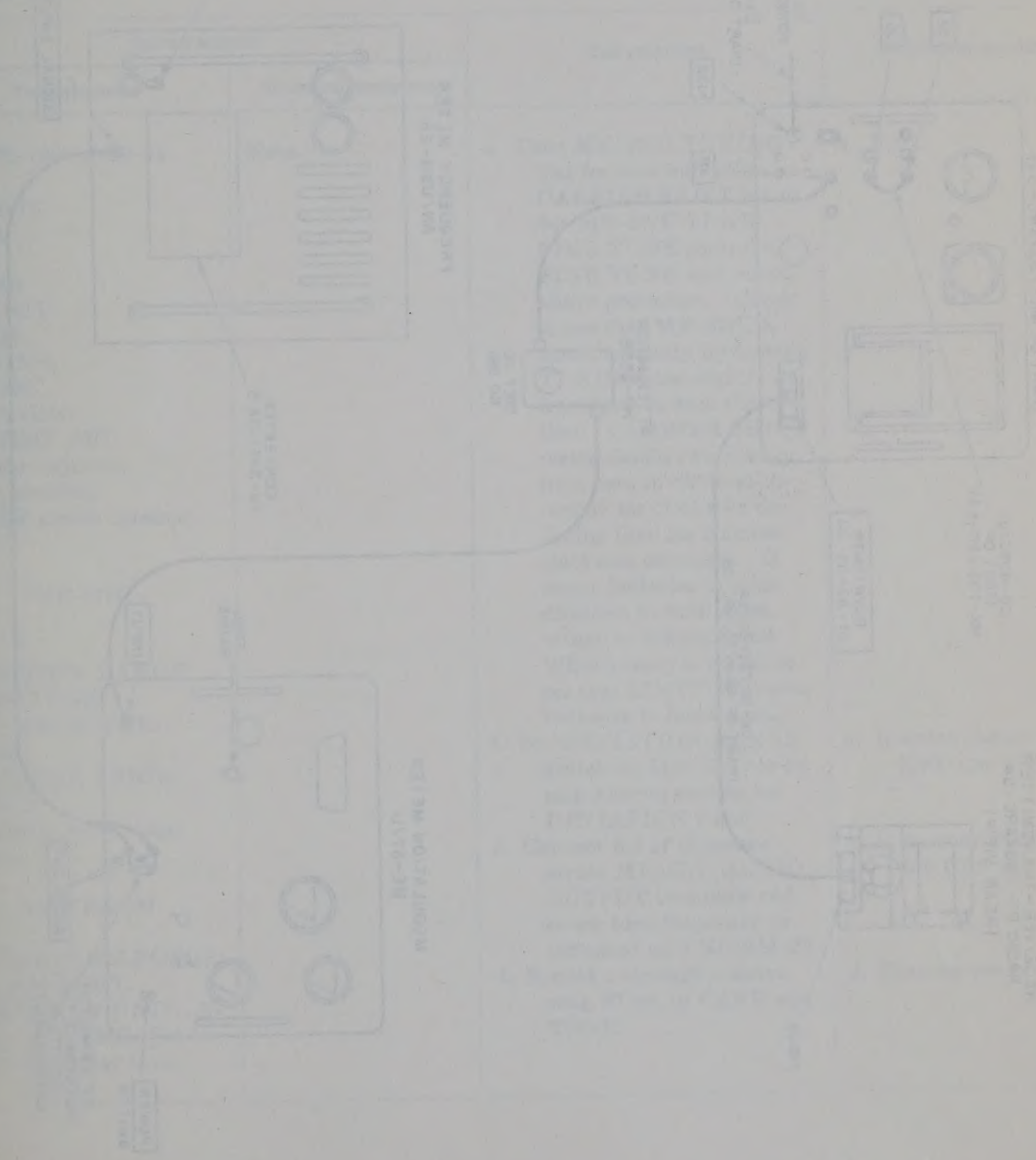
a. Test Equipment and Materials.
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Electronic Voltmeter ME-30B/U.
Audio Oscillator TS-382/U.
Modulation Meter ME-57/U.
Attenuator, HP-355B.
Spectrum Analyzer TS-723A/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-3. Turn the equipment on and allow 3 minutes for warmup.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S2: FWD. S3: 30. S4: 2. S5: 0.05. S6: XMIT. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position. *ME-30B/U* Range selector: 1 volt RMS. *TS-382/U* Main tuning dial: 100. ATTENUATOR: 10. RANGE switch: X10. Output level control: Set for 0.37 volts ac as measured on the ME-30B/U. *ME-57/U* DEVIATION RANGE: 1000 (TUNE). Band selector: 20-55. TUNE-FINE TUNE: TUNE. TUNING: 32.05 megacycles. *TS-723A/U* Function switch: DISTORTION. Coarse FREQUENCY: Tune for a sharp dip on meter. Fine FREQUENCY: Tune for maximum dip on meter. BALANCE: Adjust for minimum meter indication. Meter range switch: Set to 10% scale.	Transmit audio module AUDIO adjustment. Set as instructed in Test procedure column.	*a.* Tune the ME-57/U TUNING dial for zero indication on the CARRIER SHIFT meter. Set the ME-57/U TUNE-FINE TUNE switch to FINE TUNE and again tune for zero indication on the CARRIER SHIFT meter. To assure that the ME-57/U is tuned properly, slightly detune the TUNING dial both directions from the center setting. The CARRIER SHIFT meter should swing in both directions as the TUNING dial is rotated in both directions. Retune to zero. Set the variable attenuator so that the LIMITING meter on the ME-57/U reads in the black area. *b.* Set the DEVIATION RANGE switch on the ME-57/U to 20 and adjust the AUDIO adjustment on the RT-348/ARC-54 transmit audio module for a reading on the ME-57/U DEVIATION meter of 10KC. *c.* Measure the distortion on the TS-723A/U. *d.* Repeat *a* through *c* above at audiofrequencies of 300 and 600 cps. *e.* Repeat *a* through *d* above at carrier frequencies of 48.45 mc and 69.95 mc. (Set S3, S4, and S5 on the test set and retune the ME-57/U for each carrier frequency.)	*a.* None. *b.* None. *c.* The meter on the TS-723A/U should indicate 7% or less. *d.* Same as *c* above. *e.* Same as *c* above.

Step	Test equipment / Equipment under test	Control settings	Test procedure	Performance standard
1	TS-1967/ARC-54 Transmit audio module AUDIO adjustment, as instructed in Test procedure column.	S1: 2. S5: 0.05. S6: XMIT. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position.	a. Tune the MR-87/U TUNING dial for zero indication on the CARRIER SHIFT meter. Set the ME-87/U TUNE-FINE TUNE switch to FINE TUNE and again tune for zero indication on the CARRIER SHIFT meter. To assure that the ME-87/U is tuned properly, slightly detune the TUNING dial both directions from the center setting. The CARRIER SHIFT meter should swing in both directions as the TUNING dial is rotated in both directions. Retune to zero. Set the variable attenuator so that the LIMITING meter on the ME-87/U reads in the black area. b. Set the DEVIATION RANGE switch on the ME-87/U to 20 and adjust the AUDIO adjustment on the RT-343/ARC-54 transmit audio module for a reading on the DEVIATION meter of 10KC. c. Measure the distortion on the TS-723A/U. d. Repeat a through c above at audiofrequencies of 300 and 3000 cps. e. Repeat a through d above at carrier frequencies of 45.45 mc and 69.95 mc. Set S3, S4, and S5 on the test set and retune the ME-87/U for each carrier frequency.)	a. None.
	TS-889/U Main tuning dial: 100. ATTENUATOR: 10. RANGE switch: X10. Output level control: Set for 0.37 volts as measured on the ME-30B/U. ME-87/U DEVIATION RANGE: 1000 (TUNED). Band selector: 20-56. TUNE-FINE TUNE: TUNE. TUNING: 32.05 megacycles. TS-723A/U Function switch: DISTORTION. Coarse FREQUENCY: Tune for a sharp dip on meter. Fine FREQUENCY: Tune for maximum dip on meter. BALANCE: Adjust for minimum meter indication. Meter range switch: Set to 10% scale.	ME-30B/U Range selector: 1 volt RMS.	b. None. c. The meter on the TS-723A/U should indicate 7% or less. d. Same as c above. e. Same as c above.	



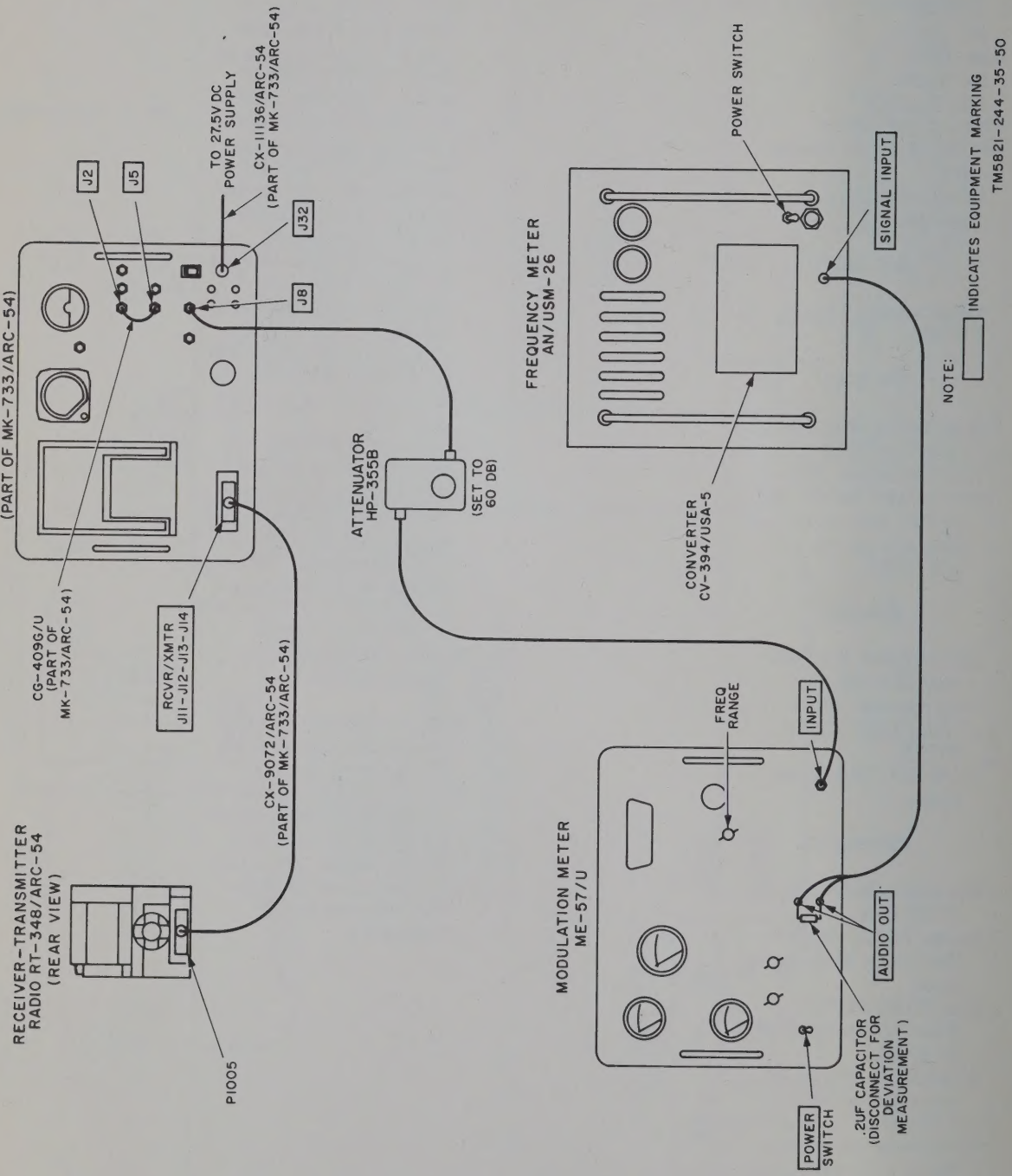


Figure 5-4. Transmitter tone deviation test setup.

5-9. Transmitter Tone Deviation

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Modulation Meter ME-57/U.
Frequency Meter AN/USM-26.
Capacitor, 0.2 μf.
Attenuator, 60 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-4. Turn the equipment on.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S2: FWD. S3: 50. S4: 0. S5: 0.50. S6: XMIT. S7: DIS. S8: TONE. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. *ME-57/U* DEVIATION RANGE: 1000 (TUNE). BAND SELECTOR: 20-55. TUNE-FINE TUNE: TUNE. TUNING: 50.50 megacycles. *AN/USM-26* FUNCTION SELECTOR: FREQUENCY. FREQUENCY UNIT: 10. DISPLAY TIME: Set for desired display time.	None.	*a.* Tune ME-57/U TUNING dial for zero indication on CARRIER SHIFT meter. Set ME-57/U TUNE-FINE TUNE control to FINE TUNE and repeat above procedure. Check to see that ME-57/U is tuned correctly by moving TUNING dial slightly off frequency in each direction. CARRIER SHIFT meter should swing away from zero in different directior for clockwise detuning than for counterclockwise detuning. If meter indicates in same direction in both cases, retune to different null. When tuning is complete, see that LIMITING meter indicates in black area. *b.* Set DEVIATION RANGE switch on ME-57/U to 20 and observe reading on DEVIATION meter. *c.* Connect 0.2 μf capacitor across ME-57/U AUDIO OUTPUT terminals and check tone frequency as indicated on AN/USM-26. *d.* Repeat *a* through *c* above with S7 set to CARR and TONE.	*a.* None. *b.* Reading should be 3,000 cps ±500. *c.* Frequency should be 150 CPS ±3. *d.* Same as above.

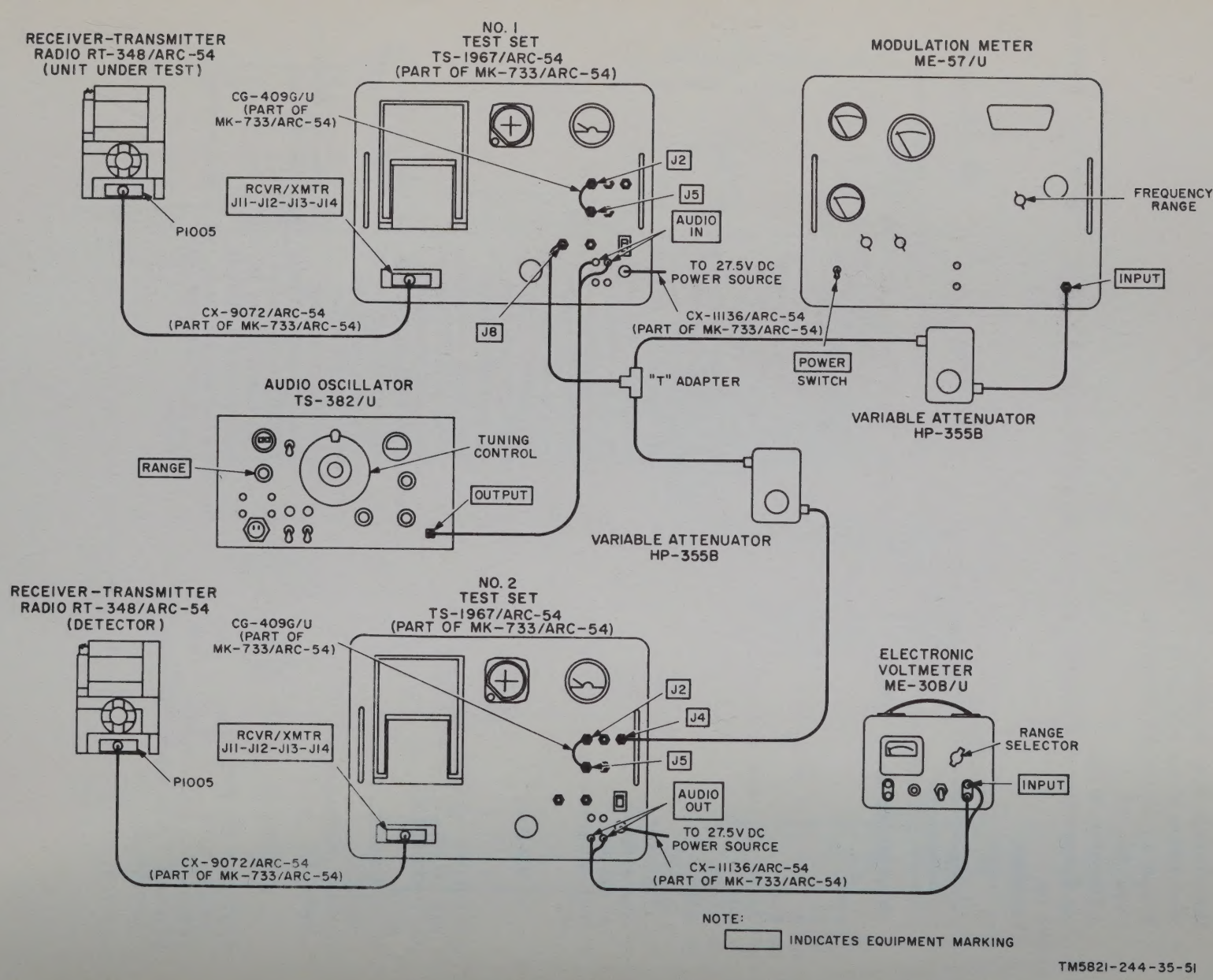


Figure 5-5. Transmitter carrier noise test setup.

5-10. Transmitter Carrier Noise

a. Test Equipment and Materials.

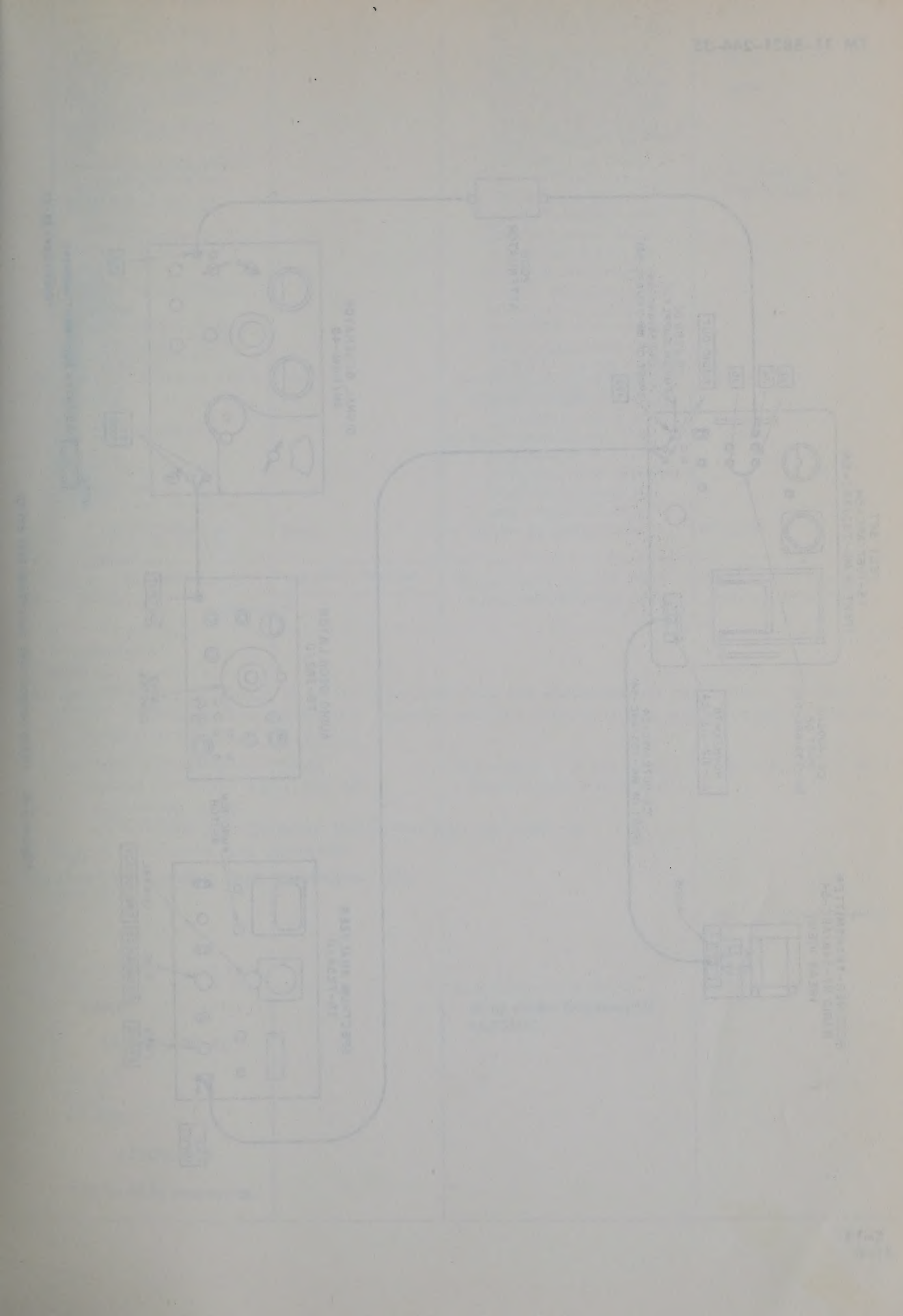
Maintenance Kits, Electronic Equipment MK-733/ARC-54 (two ea).
Receiver-Transmitter, Radio RT-348/ARC-54.
Modulation Meter ME-57/U.
Voltmeter, Electronic ME-30B/U.
Attenuators (two ea) HP-355B.
Audio Oscillator TS-382/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-5. Turn the equipment on.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*Note.* Set switches on both TS-1967/ARC-54's as indicated below: *TS-1967/ARC-54* S3: 30. S4: 1. S5: 0.00. S6: RCV. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. *ME-57/U* DEVIATION RANGE: 1000 (TUNE). BAND SELECTOR: 20-55. TUNE-FINE TUNE: TUNE. TUNING: 31 megacycles. *TS-382/U* Main tuning dial: 100. RANGE switch: X10. ATTENUATOR: 10. Out level control: Set as directed in *Test procedure* column. *ME-30B/U* Range selector: 3 volts rms. Attenuator: If variable attenuator is used, adjust it to 40 db.	None.	*a.* Set S6 on TS-1967/ARC-54 No. 1 to XMIT. *b.* Tune ME-57/U TUNING dial for zero indication on CARRIER SHIFT meter. Set ME-57/U TUNE-FINE TUNE control to five tune and repeat above procedure. Check to see that ME-57/U is tuned correctly by moving TUNING dial slightly off frequency in each direction. CARRIER SHIFT meter should swing away from zero in different direction for clockwise detuning than for counterclockwise detuning. If meter swings in same direction in both cases, retune to different null. After tuning, see that LIMITING meter indicates in black area. *c.* Adjust TS-382/U output level for reading on ME-57/U DEVIATION meter of 10KC. *d.* Reduce attenuator No. 2 setting to 20 db. *e.* Adjust GAIN adjust on RT-348/ARC-54 receive audio module for indication of 2.73 volts rms as measured on ME-30B/U. *f.* Turn off TS-382/U (do not disconnect) and measure ac voltage on ME-30B/U. (Set ME-30B/U range selector to 0.01-volt range.) *g.* Repeat *a* through *f* above, with S3, S4, and S5 (on both TS-1967/U's) set for frequency of 50.50 and 68.95 megacycles. (Retune ME-57/U for each frequency setting.)	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* Voltage should be at least 40 db below 2.73-volt reference. *g.* Same as above.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Note. Set switches on both TS-1967/ARC-54's as indicated below: TS-1967/ARC-54 S3: 30. S4: 1. S5: 0.00. S6: ROV. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. DEVIATION RANGE: 1000 (TUNE). BAND SELECTOR: 20–55. TUNE-FINE TUNE. TUNE. TUNING: 31 megacycles. TS-882/U Main tuning dial: 100. RANGE switch: X10. ATTENUATOR: 10. Out level control: Set as directed in Test procedure column. ME-30B/U Range selector: 3 volts rms. Attenuator: If variable attenuator is used, adjust it to 10 db.	None.	a. Set S6 on TS-1967/ARC-54 No. 1 to XMIT. b. Tune MD-57/U TUNING dial for zero indication on CARRIER SHIFT meter. Set ME-57/U TUNE-FINE TUNE control to five tune and repeat above procedure. Check to see that ME-57/U is tuned correctly by moving TUNING dial slightly on each side of frequency. CARRIER SHIFT meter should swing away from zero in different direction for clockwise detuning than for counterclockwise detuning. If meter swings in same direction in both cases, retune to different null. After tuning, set that LIMITING meter indicates in black area. c. Adjust TS-882/U output level for reading on MD-57/U DEVIATION meter of 10KC. d. Reduce attenuator No. 2 setting to 20 db. e. Adjust GAIN adjust on RT-348/ARC-54 receiver radio module for indication of 2.73 volts rms as measured on ME-30B/U. f. Turn off TS-882/U (do not disconnect) and measure ac voltage on ME-30B/U. (Set ME-30B/U range selector to 0.01-volt range.) g. Repeat a through f above, with S3, S4, and S5 (on both TS-1967/U's) set for frequency of 50.50 and 68.95 megacycles. (Retune ME-57/U for each frequency setting.)	a. None. b. None. c. None. d. None. e. None. f. Voltage should be at least 40 db below 2.73-volt reference. g. Same as above.



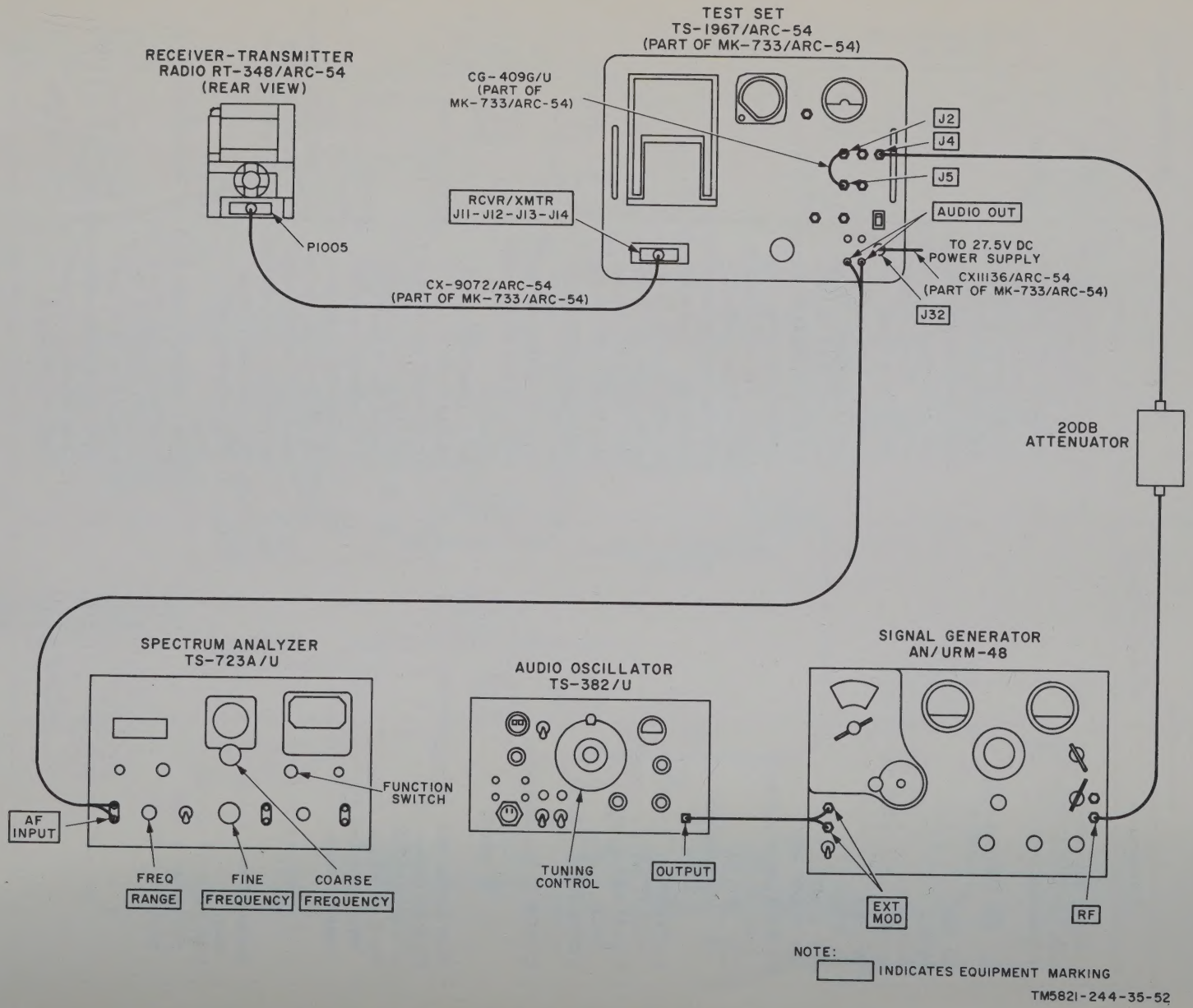


Figure 5-6. Audio output and distortion test setup.

Step	Control settings	Test equipment and test jacks	Procedure	Adjustments
	except: *TS–1967/ARC–54* S3: 60. S4: 8. S5: 0.95. *AN/URM–48* Tune to 68.95 megacycles.		using center frequency of 68.95MC.	

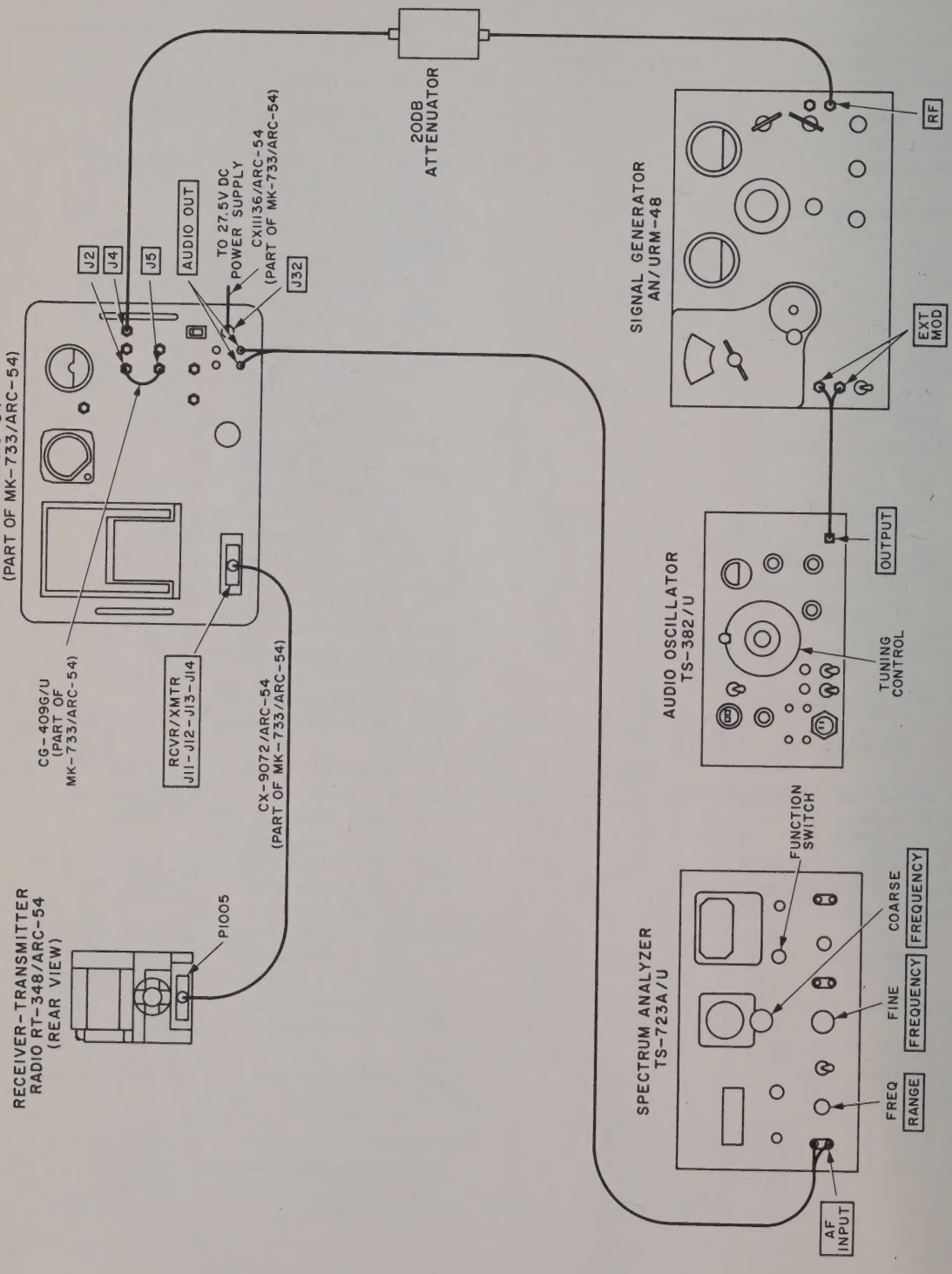


Figure 5-6. Audio output and distortion test setup.

5-11. Audio Output and Distortion Test

a. Test Equipment and Materials.

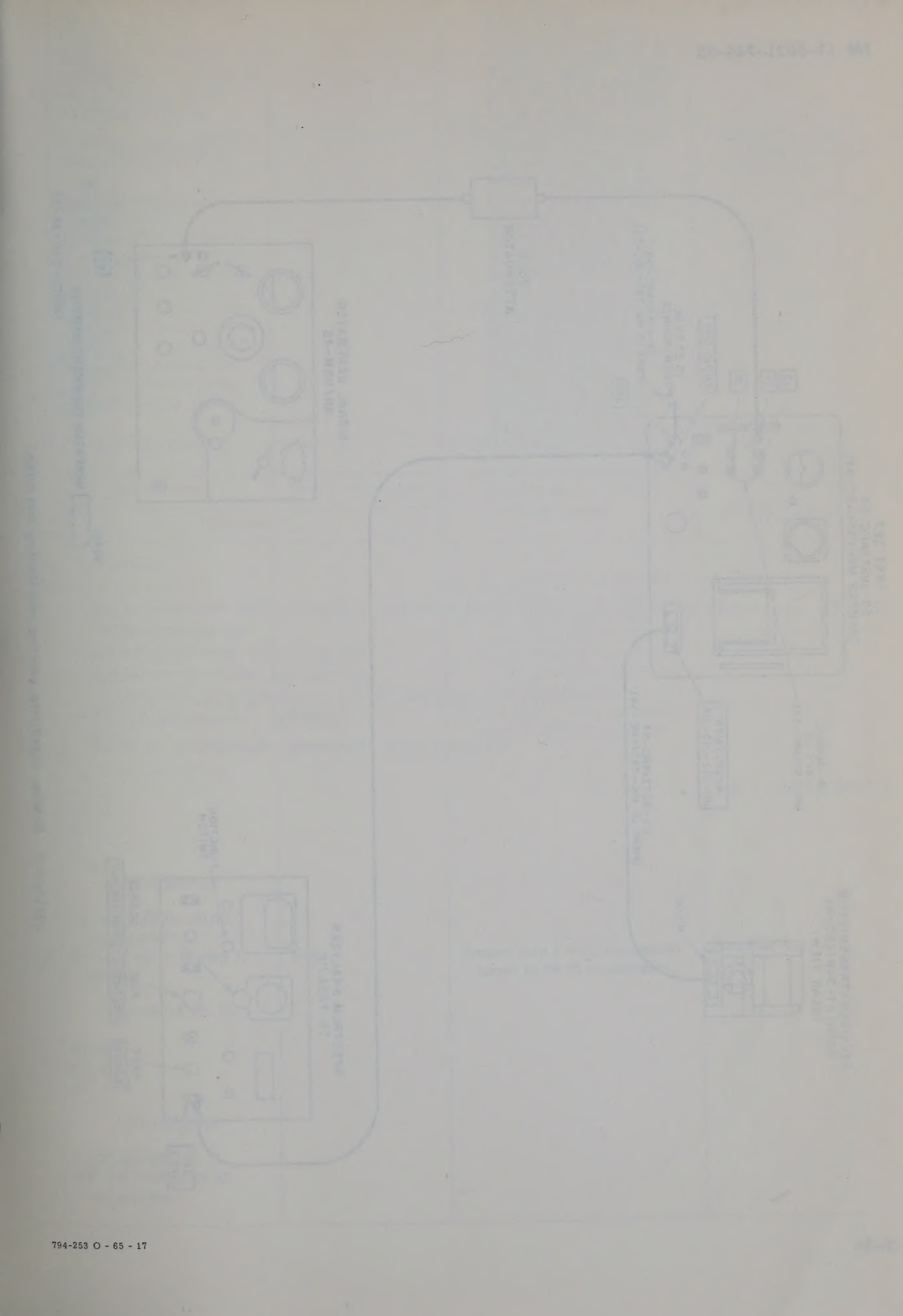
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Attenuator, 20 db.
Signal Generator AN/URM-48.
Audio Oscillator TS-382/U.
Spectrum Analyzer TS-723A/U.

b. Test Connections and Conditions. Remove the dust cover from the RT-348/ARC-54 and connect the equipment as shown in figure 5-6; then turn the equipment on and allow 5 minutes for warmup.

c. Procedure.

Step	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	*TS-1967/ARC-54* S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. *AN/URM-48* BANDSWITCH: C. RF TUNING: 31 mc. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 0 microvolts. DEVIATION LEVEL: Max ccw. *TS-382/U* Main tuning dial: 100. ATTENUATOR: 10. Output level control: Max ccw. RANGE switch: X10. *TS-723A/U* FUNCTION switch: METER. Meter range switch: 0.3 RMS volts. Coarse FREQUENCY: 100. RANGE switch: X10. INPUT control: MIN. AF-RF selector: AF.	None.	*a.* Adjust TS-382/U output level control clockwise until AN/URM-48 DEVIATION meter indicates 10 kilocycles. *b.* Note no-signal noise level on TS-723A/U (using METER function). Set AN/URM-48 RF ATTENUATOR to 120 and adjust RF TUNING dial to center frequency by tuning for null on TS-723A/U. Reduce AN/URM-48 output until noise level on TS-723A/U is 5 db less than level noted above. Repeat procedure, tuning for null each time signal is reduced until no further null can be obtained. Adjust AN/URM-48 RF ATTENUATOR to 1.2 microvolts. *c.* Set AN/URM-48 OPERATION switch to EXT MOD and adjust TS-382/U output level to deviate carrier 10 kc as indicated on AN/URM-48 DEVIATION meter. *d.* Set AN/URM-48 RF MICROVOLTS dial to 120. *e.* Tune TS-723A/U to audio-frequency by setting function switch to DISTORTION and tuning TS-723/U for minimum meter reading. *f.* Measure distortion. *g.* Measure audio level. (Use TS-723A/U METER function.)	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* Not more than 8%. *g.* 1.93 to 3.06 volts.
2	Leave controls as in step 1, except: *TS-382/U* Main tuning dial: 30. RANGE switch: X10. Output level: Readjust to maintain 10-kc deviation on DEVIATION meter.	None.	Repeat step 1 with TS-382/U adjusted for 300-cps output.	Same as step 1.
3	Leave controls as in step 1, except: *TS-382/U* Main tuning dial: 60. RANGE switch: X100. Output level: Readjust to maintain 10-kc deviation.	None.	Repeat step 1 with TS-382/U adjusted for 6,000-cps output.	Same as step 1, except audio level should be between 0.815 and 1.62 volts.
4	Set controls as in step 1, except: *TS-1967/ARC-54* S3: 50. S4: 0. S5: 50. *AN/URM-48* Tune to 50.50 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 50.50MC.	Same as steps 1, 2, and 3.
5	Set controls as in step 1, except: *TS-1967/ARC-54* S3: 60. S4: 8. S5: 0.95. *AN/URM-48* Tune to 68.95 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 68.95MC.	Same as steps 1, 2, and 3.

2	Leave controls as in step 1, except: Main tuning dial: 30. RANGE switch: X10. Output level: Readjust to maintain 10-ke deviation on DEVIATION meter.	None.	Repeat step 1 with TS-382/U adjusted for 300-cps output.	Same as step 1.
3	Leave controls as in step 1, except: Main tuning dial: 60. RANGE switch: X100. Output level: Readjust to maintain 10-ke deviation.	None.	Repeat step 1 with TS-382/U adjusted for 6,000-cps output.	Same as step 1, except audio level should be between 0.815 and 1.62 volts.
4	Set controls as in step 1, except: 83: 30. 84: 0. 85: 30. Tune to 50.50 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 50.50MC.	Same as steps 1, 2, and 3.
5	Set controls as in step 1, except: 83: 60. 84: 8. 85: 0.95. Tune to 68.95 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 68.95MC.	Same as steps 1, 2, and 3.



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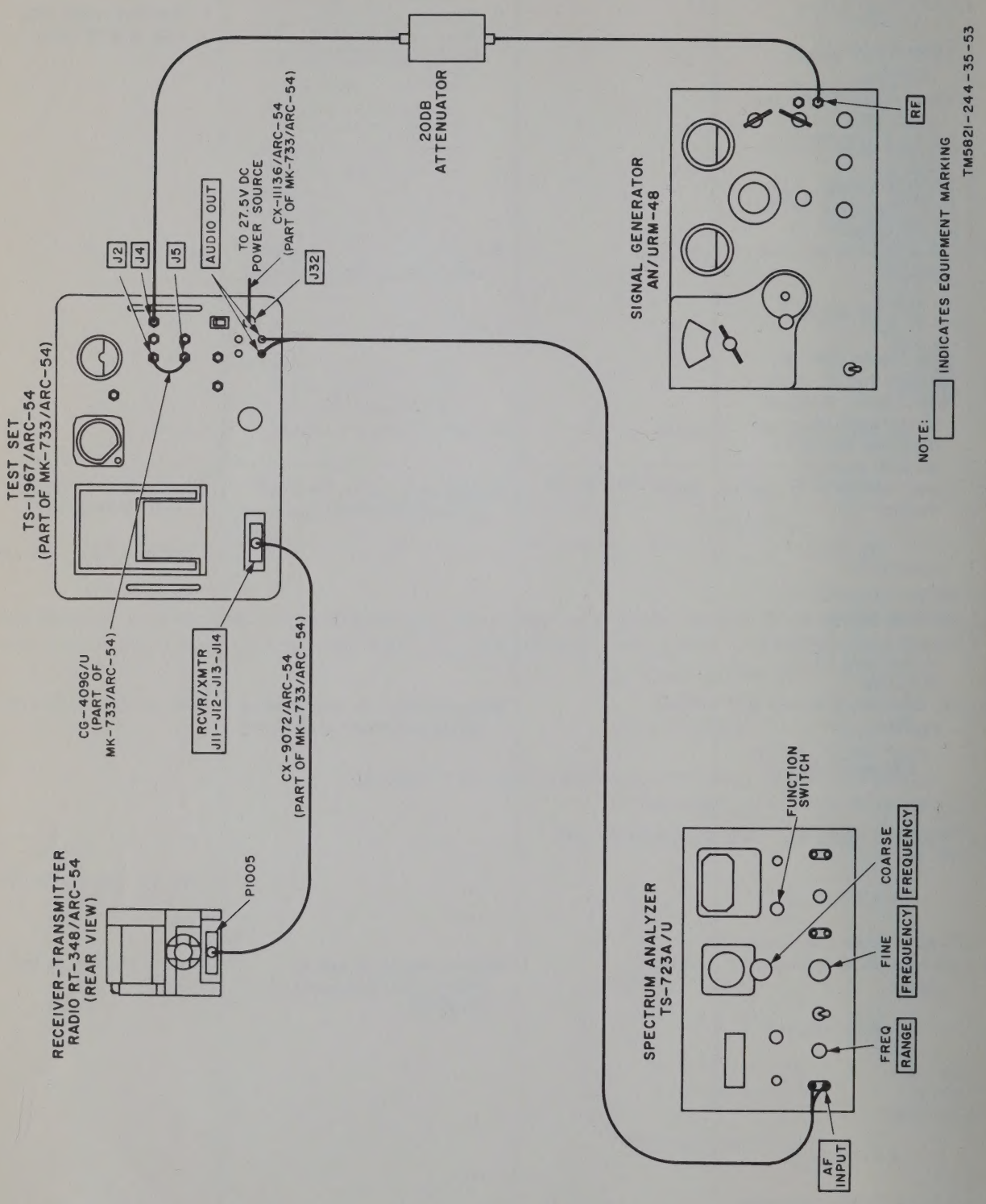


Figure 5-7. Receiver sensitivity, quieting, and limiting test setup.

	Control settings	Equipment under test	Test procedure	Performance standard
3	*AN/URM–48* RF TUNING: 50.50 megacycles. Set controls as in step 1, except: *TS–1967/ARC–54* S3: 60. S4: 8. S5: 0.95. *AN/URM–48* BANDSWITCH: D. RF TUNING: 68.95 megacycles.	None.	Repeat step 1 with equipment tuned to 68.95 megacycles.	Same as step 1.

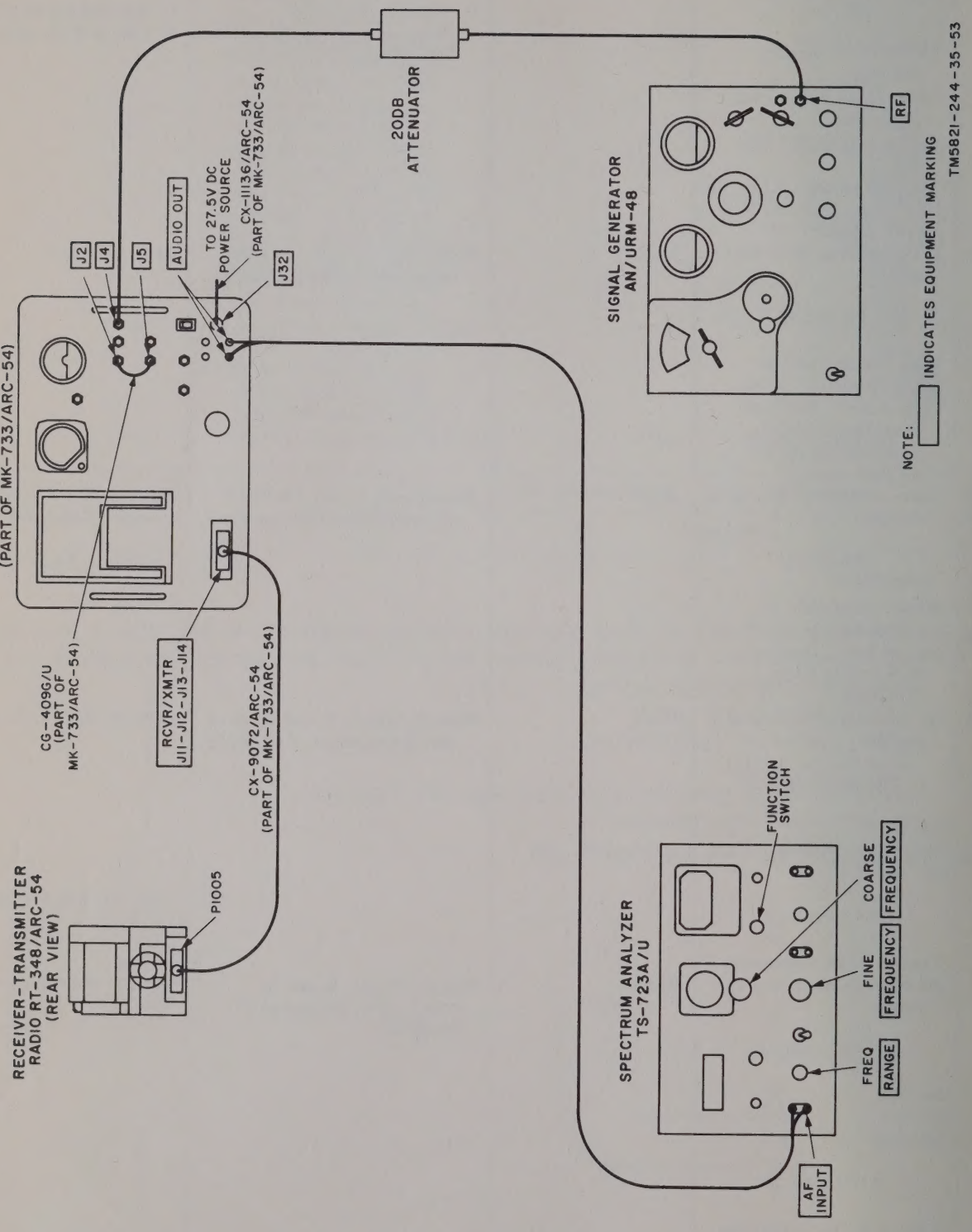


Figure 5-7. Receiver sensitivity, quieting, and limiting test setup.

5–12. Receiver Sensitivity, Quieting, and Limiting

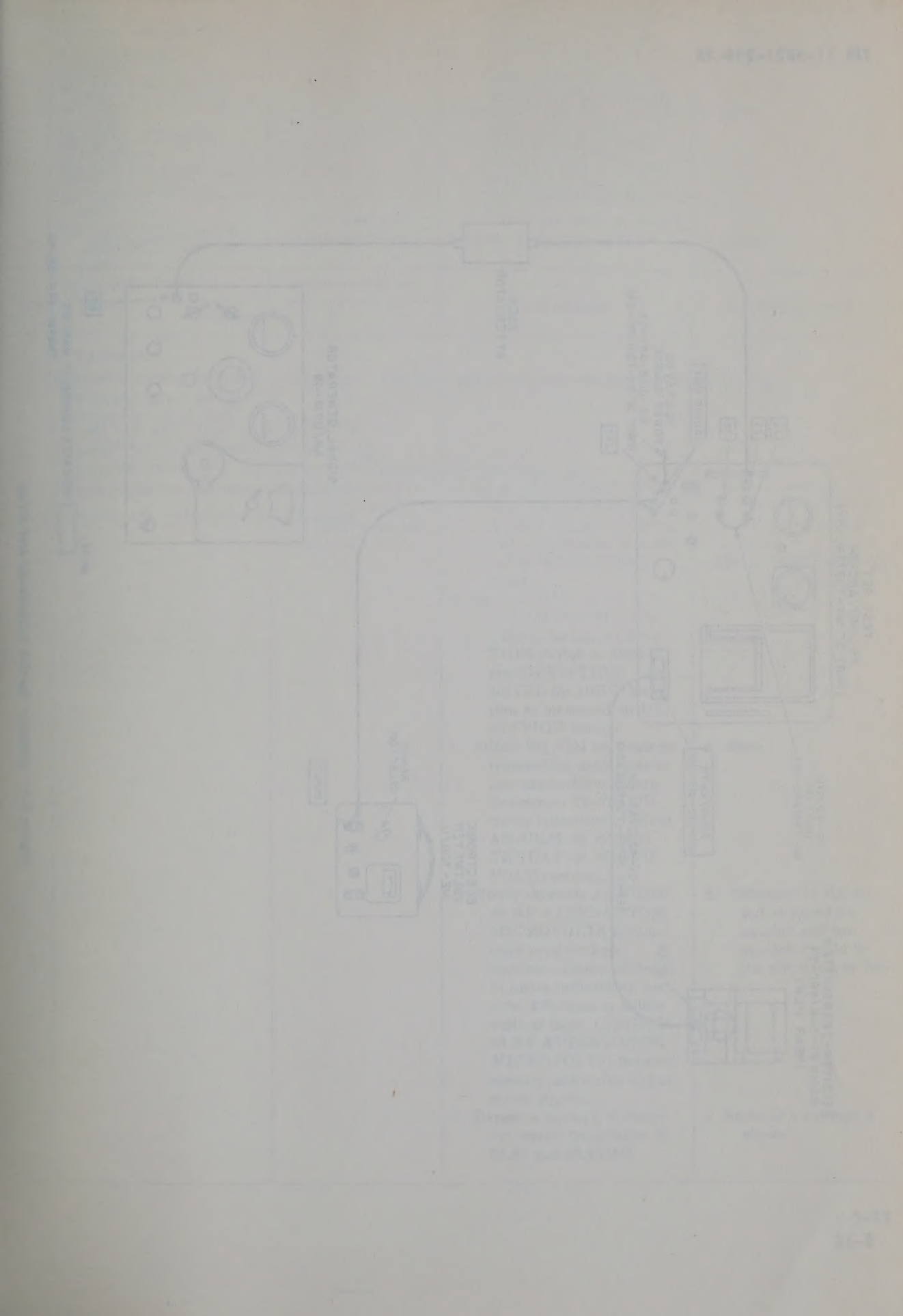
a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK–733/ARC–54.
Spectrum Analyzer TS–723A/U.
Signal Generator AN/URM–48.
Attenuator, 20 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5–7. Turn the equipment on.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. *AN/URM–48* BANDSWITCH: C. RF TUNING: 31 mc. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 0 microvolts. DEVIATION LEVEL: Max ccw. *TS–723/U* Function switch: METER. Coarse FREQUENCY: 100. RANGE switch: X10. AF–RF switch: AF. FINE FREQUENCY tune: Tune as directed in *Test procedure* column. BALANCE: Adjust for minimum meter indication (after 1-KC modulation has been applied). Meter range switch: Set to 0.3 volts rms scale. INPUT control: MIN.	None.	*a.* Note no-signal noise level on TS–723A/U meter. Set AN/URM–48 RF ATTENUATOR MICROVOLTS to 120 and tune AN/URM–48 to exact receiver frequency by tuning for null on meter. When null is obtained, reduce AN/URM–48 output until TS–723A/U indicates 5 db less than no-signal level noted above. Retune for null. Repeat above procedure until maximum null is obtained. *b.* Set AN/URM–48 OPERATION switch to 1000∼. Set AN/URM–48 DEVIATION LEVEL for 10KC deviation as indicated on AN/URM–48 DEVIATION meter. *c.* Set TS–723A/U function switch to METER, and meter range switch to 3 volts rms, and adjust R1315 (GAIN adjust) on RT–348/ARC–54 receive audio module for reading on TS–723A/U meter of 2.73 volts rms. *d.* Decrease AN/URM–48 RF ATTENUATOR MICROVOLTS to 1.2 and note level on TS–723A/U. Set AN/URM–48 OPERATION switch to MOD OFF and note decrease in reading on TS–723A/U meter. *e.* Increase AN/URM–48 RF ATTENUATOR MICROVOLTS setting to 120 microvolts, set OPERATION switch to 1000∼, and note reading on TS–723A/U meter. *f.* Set AN/URM–48 OPERATION switch to MOD OFF and note decrease in reading on TS–723A/U meter. *g.* Set AN/URM–48 OPERATION switch to 1000∼. *h.* Vary AN/URM–48 RF ATTENUATOR MICROVOLTS from 6 to 10K microvolts, observing TS–723A/U meter.	*a.* None. *b.* None. *c.* 2.73 volts rms audio output. *d.* The audio output should decrease at least 10 db. *e.* None. *f.* Audio output should decrease 40 db. (To read this change, set meter range to −30 db and add −30 db algebraically to meter db reading.) *g.* None. *h.* Audio output should not vary more than 2 db.
2	Set controls as in step 1, except: *TS–1967/ARC–54* S3: 50. S4: 0. S5: 0.50. *AN/URM–48* RF TUNING: 50.50 megacycles.	None.	Repeat step 1, with equipment tuned to 50.50 megacycles.	Same as step 1.
3	Set controls as in step 1, except: *TS–1967/ARC–54* S3: 60. S4: 8. S5: 0.95. *AN/URM–48* BANDSWITCH: D. RF TUNING: 68.95 megacycles.	None.	Repeat step 1 with equipment tuned to 68.95 megacycles.	Same as step 1.



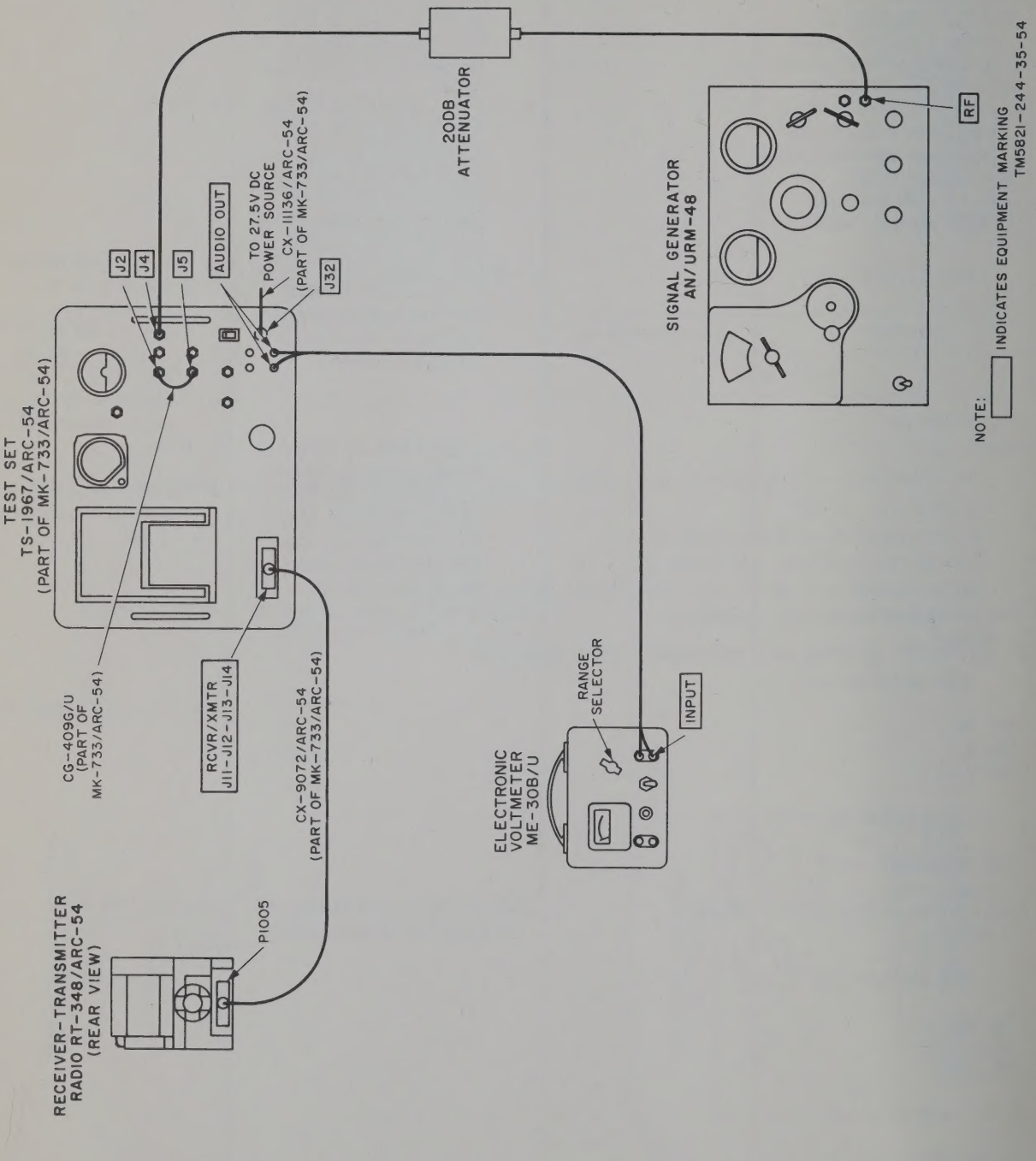


Figure 5-8. Receiver squelch adjustment test setup.

			TION switch to 1000~, and DEVIATION LEVEL for 10KC deviation as measured on DEVIATION meter.	
			c. Adjust SQ ADJ on receiver-transmitter until receiver just unsquelches (sharp increase in TS–723A/U meter indication). Note AN/URM–48 RF ATTENUATOR MICROVOLTS setting.	*c.* None.
			d. Slowly decrease AN/URM–48 RF ATTENUATOR MICROVOLTS setting until receiver just squelches (sharp decrease in meter indication), and note difference in microvolts of input (AN/URM–48 RF ATTENUATOR MICROVOLTS) between receiver unsquelch and receiver squelch.	*d.* Difference in RF input required for squelch and unsquelch should be 0.6 microvolt or less.
			e. Repeat *a* through *d* above for carrier frequencies of 50.50 and 68.95MC.	*e.* Same as *a* through *d* above.

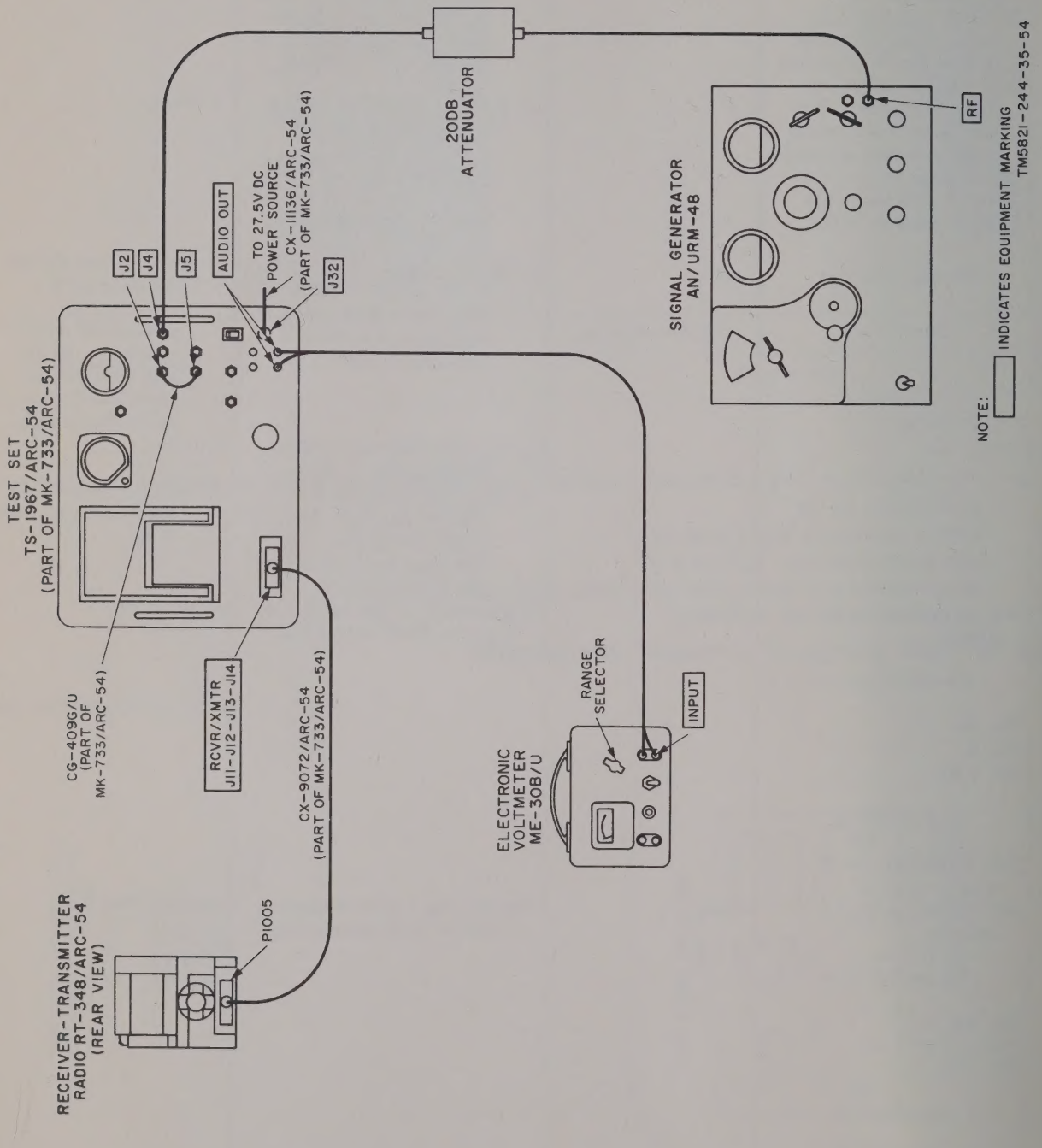


Figure 5-8. Receiver squelch adjustment test setup.

5–13. Receiver Squelch Adjustment

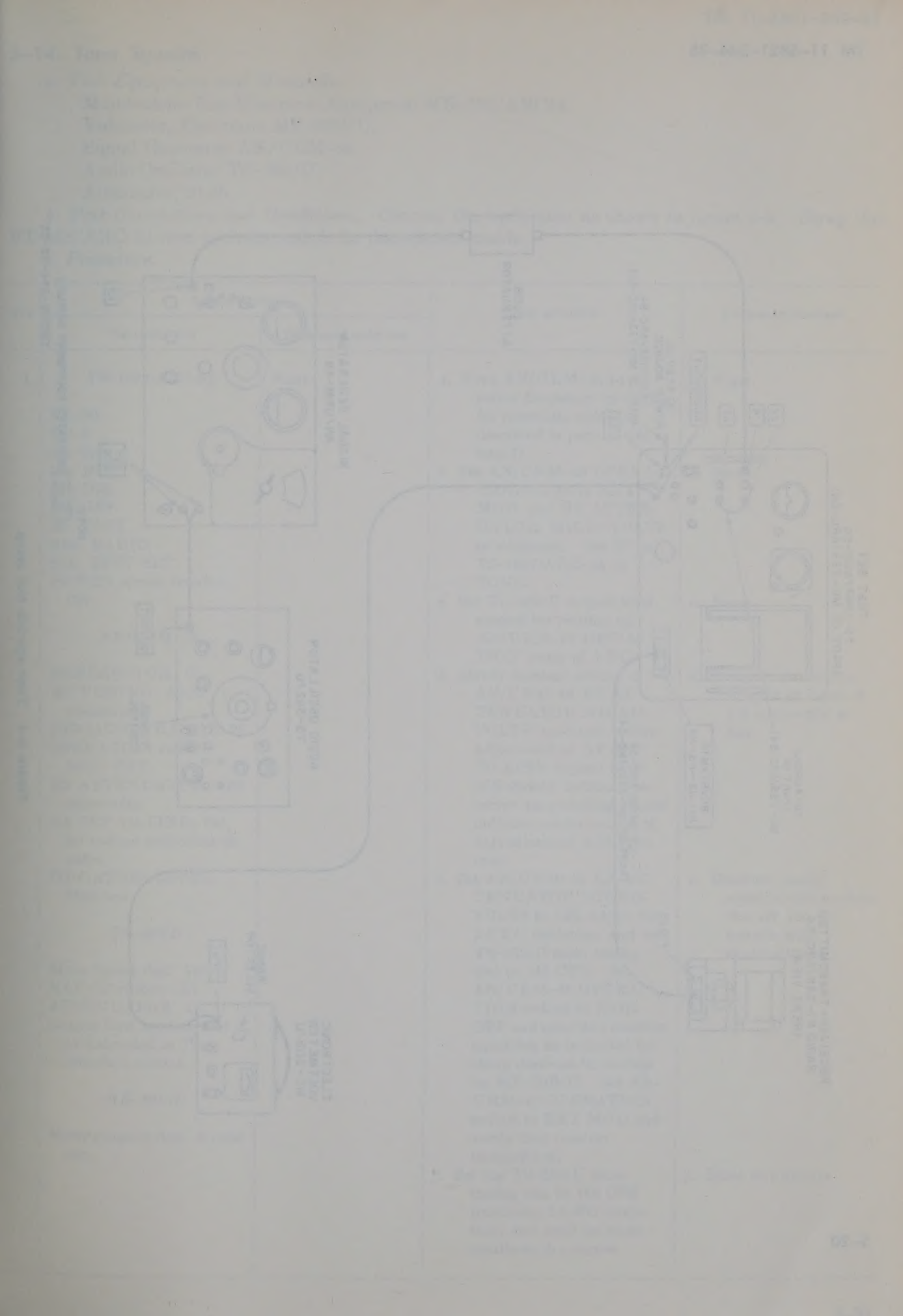
a. Test Equipment and Materials.
Maintenance Kit, Electronic Equipment MK–733/ARC–54.
Spectrum Analyzer TS–723A/U.
Signal Generator AN/URM–48.
Attenuator, 20 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5–8.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S3: 30. S4: 1. S5: 0.00. S6: RCV S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. *AN/URM–48* BANDSWITCH: C. RF TUNING: 31 MC. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR MICROVOLTS: 100 microvolts. DEVIATION LEVEL: Max ccw. *TS–723A/U* Function switch: METER. Range selector: Set to any range that gives readable indication, and lower range as necessary for nulling.	RT–348 SQ ADJ: Fully clockwise.	*a.* Tune AN/URM–48 to receiver frequency by tuning for minimum noise (as described in para. 5–12*c*, step 1). (Set ME–30B/U range selector to 3-volt range after tuning.) *b.* Set S7 on TS–1967/ARC–54 to CARR, and set AN/URM–48 OPERATION switch to 1000∼ and DEVIATION LEVEL control for 10KC deviation as measured on AN/URM–48 DEVIATION meter. *c.* Set AN/URM–48 RF ATTENUATOR MICROVOLTS dial to 0.1 microvolt. Slowly increase RF ATTENUATOR MICROVOLTS dial setting until TS–723A/U meter indicates receiver unsquelching (sharp increase in meter reading). Note reading on TS–723A/U meter.	*a.* None. *b.* None. *c.* Receiver should unsquelch at RF ATTENUATOR setting of 6 microvolts or less.
2	Leave controls as in step 1.	RT–348 SQ ADJ: Set as instructed in Test procedure column.	*a.* Set AN/URM–48 RF ATTENUATOR MICROVOLTS dial to 0.6 microvolt and measure the output on the TS–723A/U meter. *b.* Set AN/URM–48 RF ATTENUATOR MICROVOLTS to 1.2, OPERATION switch to 1000∼, and DEVIATION LEVEL for 10KC deviation as measured on DEVIATION meter. *c.* Adjust SQ ADJ on receiver-transmitter until receiver just unsquelches (sharp increase in TS–723A/U meter indication). Note AN/URM–48 RF ATTENUATOR MICROVOLTS setting. *d.* Slowly decrease AN/URM–48 RF ATTENUATOR MICROVOLTS setting until receiver just squelches (sharp decrease in meter indication), and note difference in microvolts of input (AN/URM–48 RF ATTENUATOR MICROVOLTS) between receiver unsquelch and receiver squelch. *e.* Repeat *a* through *d* above for carrier frequencies of 50.50 and 68.95MC.	*a.* Audio output should decrease at least 45 db from previous level. *b.* None. *c.* None. *d.* Difference in RF input required for squelch and unsquelch should be 0.6 microvolt or less. *e.* Same as *a* through *d* above.

1	RF ATTENUATOR MICROVOLTS: 100 microvolts.	RF SET TO LINE: Set for reading indication on meter.	e. None.
2	Leave controls as in step 1.	Set as instructed in test procedure column.	e. Audio output should decrease at least 45 db from previous level.
3			f. None.
4			e. None.
5			f. Difference in RF input required for squelch and unsquelch should be 0.6 microvolt or less
6			e. Same as through d above.



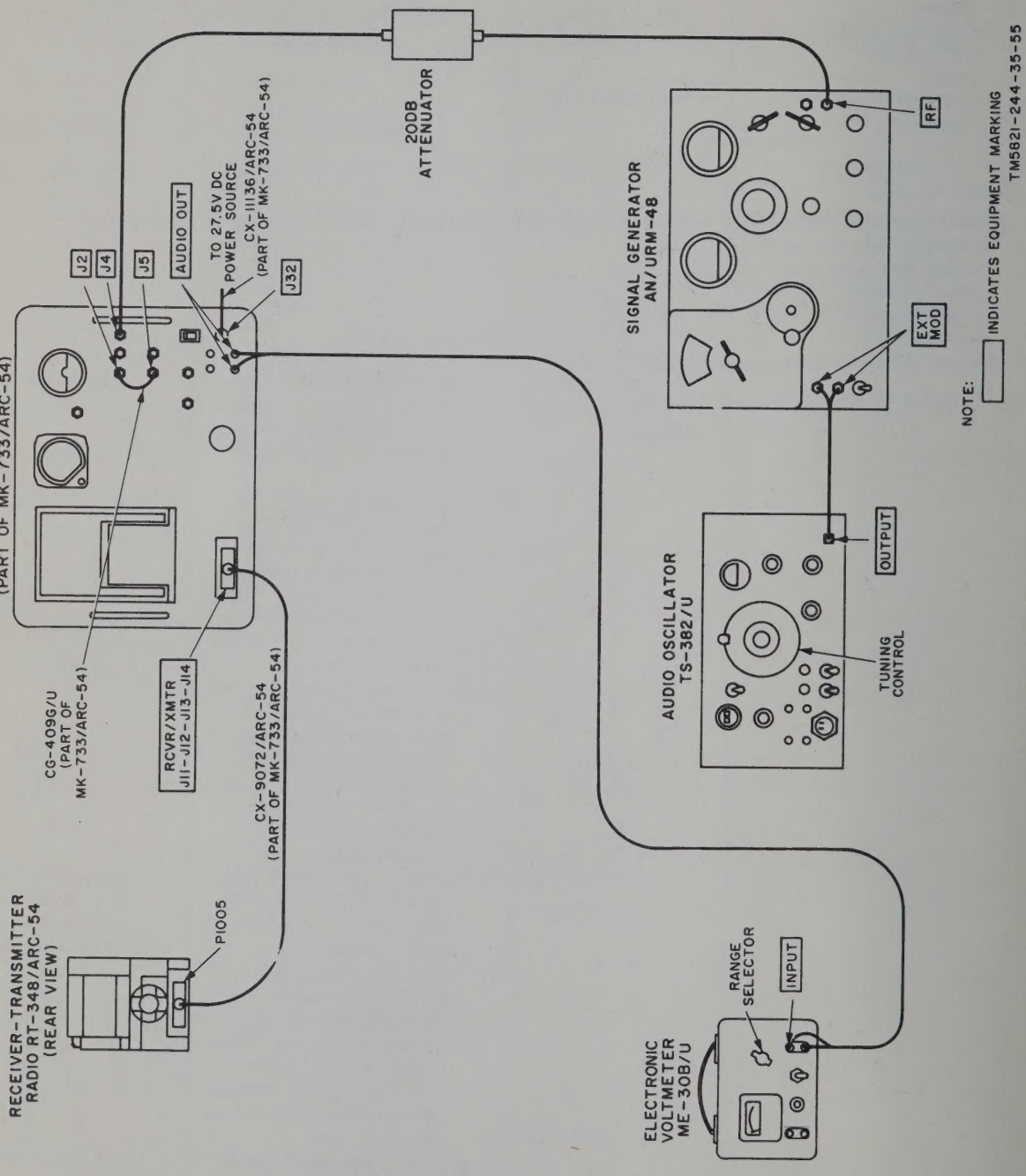


Figure 5-9. Tone squelch test setup.

5-14. Tone Squelch

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC54.
Voltmeter, Electronic ME-30B/U.
Signal Generator AN/URM-48.
Audio Oscillator TS-382/U.
Attenuator, 20 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-9. Strap the RT-348/ARC-54 receive audio module for deemphasis enable.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S3: 50. S4: 0. S5: 0.50 S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. *AN/URM-48* BANDSWITCH: C. RF TUNING: 50.50 megacycles. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF ATTENUATOR: 120 microvolts. RF SET TO LINE: Set for redline indication on meter. DEVIATION LEVEL: Max ccw. *TS-382/U* Main tuning dial: 150. RANGE switch: X1. ATTENUATOR: 10. Output level control: Set as instructed in *Test procedure* column. *ME-30B/U* Meter range switch: 3 volts rms.	None.	*a.* Tune AN/URM-48 to receiver frequency by tuning for minimum noise (as described in para. 5-12*c*, step 1). *b.* Set AN/URM-48 OPERATION switch to EXT MOD, and RF ATTENUATOR MICROVOLTS to minimum. Set S7 on TS-1967/ARC-54 to TONE. *c.* Set TS-382/U output level control for reading on AN/URM-48 DEVIATION meter of 3 KC. *d.* Slowly increase setting of AN/URM-48 RF ATTENUATOR MICROVOLTS (maintain redline adjustment of RF SET TO LINE adjust) until ME-30B/U indicates receiver unsquelching (meter indicates audio output of approximately 2.73 volts rms). *e.* Set AN/URM-48 RF ATTENUATOR MICROVOLTS to 120, adjust for 2.5 KC deviation, and set TS-382/U main tuning dial to 145 CPS. Set AN/URM-48 OPERATION switch to MOD OFF and note that receiver squelches as indicated by sharp decrease in reading on ME-30B/U. Set AN/URM-48 OPERATION switch to EXT MOD and verify that receiver unsquelches. *f.* Set the TS-382/U main tuning dial to 155 CPS (maintain 2.5-KC deviation) and note the same results as in *e* above.	*a.* None. *b.* None. *c.* None. *d.* Receiver should unsquelch at input of 1.2 microvolts or less. *e.* Receiver should squelch with modulation off and unsquelch with modulation on. *f.* Same as *e* above.

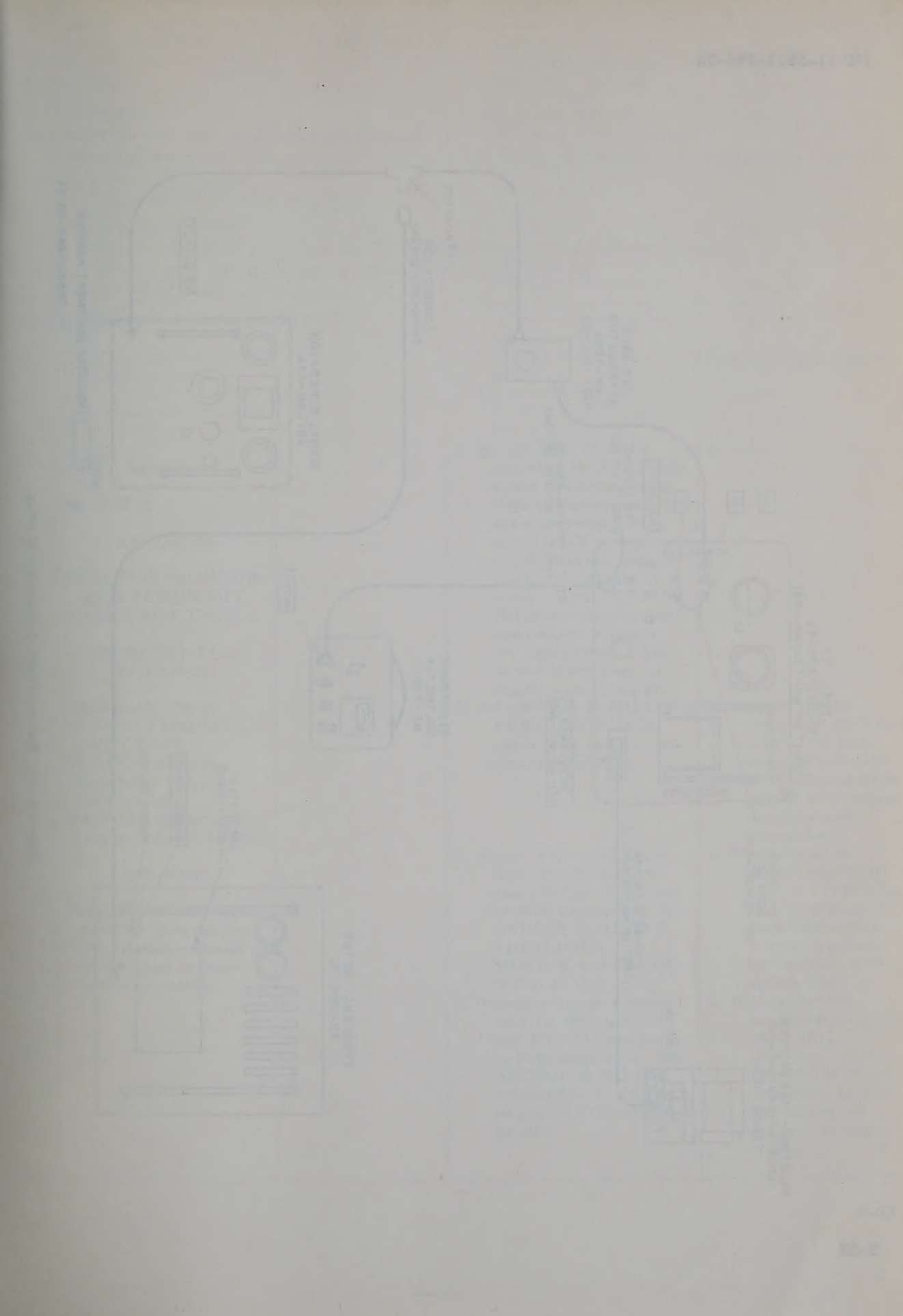
5-14. Tone Squelch

a. Test Equipment and Materials.
Maintenance Kit, Electronic Equipment MK-783/ARC54.
Voltmeter, Electronic MF-30B/U.
Signal Generator AN/URM-45.
Audio Oscillator TS-382/U.
Attenuator, 20 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-9. Strap the RT-848/ARC-54 receive audio module for deemphasis enable.

c. Procedure.

Step	Test equipment	Operator setting	Test procedure	Performance standard
		Equipment under test		
1	TS-1987/ARC-54	None.	a. Tune AN/URM-45 to receiver frequency by tuning for minimum noise (as described in para. 5-12c, step 1).	a. None.
			b. Set AN/URM-45 OPERATION switch to EXT MOD, and RF ATTENUATOR MICROVOLTS to minimum. Set S7 on TS-1987/ARC-54 to TONE.	b. None.
			c. Set TS-382/U output level control for reading on AN/URM-45 DEVIATION meter of 3 KC.	c. None.
			d. Slowly increase setting of AN/URM-45 RF ATTENUATOR MICROVOLTS (maintain reading adjustment of RF SET TO LINE adjust) until ME-30B/U indicates receiver unsquelching (meter indicates audio output of approximately 2.73 volts rms).	d. Receiver should unsquelch at input of 1.2 microvolts or less.
			e. Set AN/URM-45 RF ATTENUATOR MICROVOLTS to 120, adjust for 2.5 KC deviation, and set TS-382/U main tuning dial to 145 CPS. Set AN/URM-45 OPERATION switch to MOD OFF, and note that receiver squelches as indicated by sharp decrease in reading on ME-30B/U. Set AN/URM-45 OPERATION switch to EXT MOD and verify that receiver unsquelches.	e. Receiver should squelch with modulation off and unsquelch with modulation on.
			f. Set the TS-382/U main tuning dial to 155 CPS (maintain 2.5-KC deviation) and note the same results as in e above.	f. Same as e above.



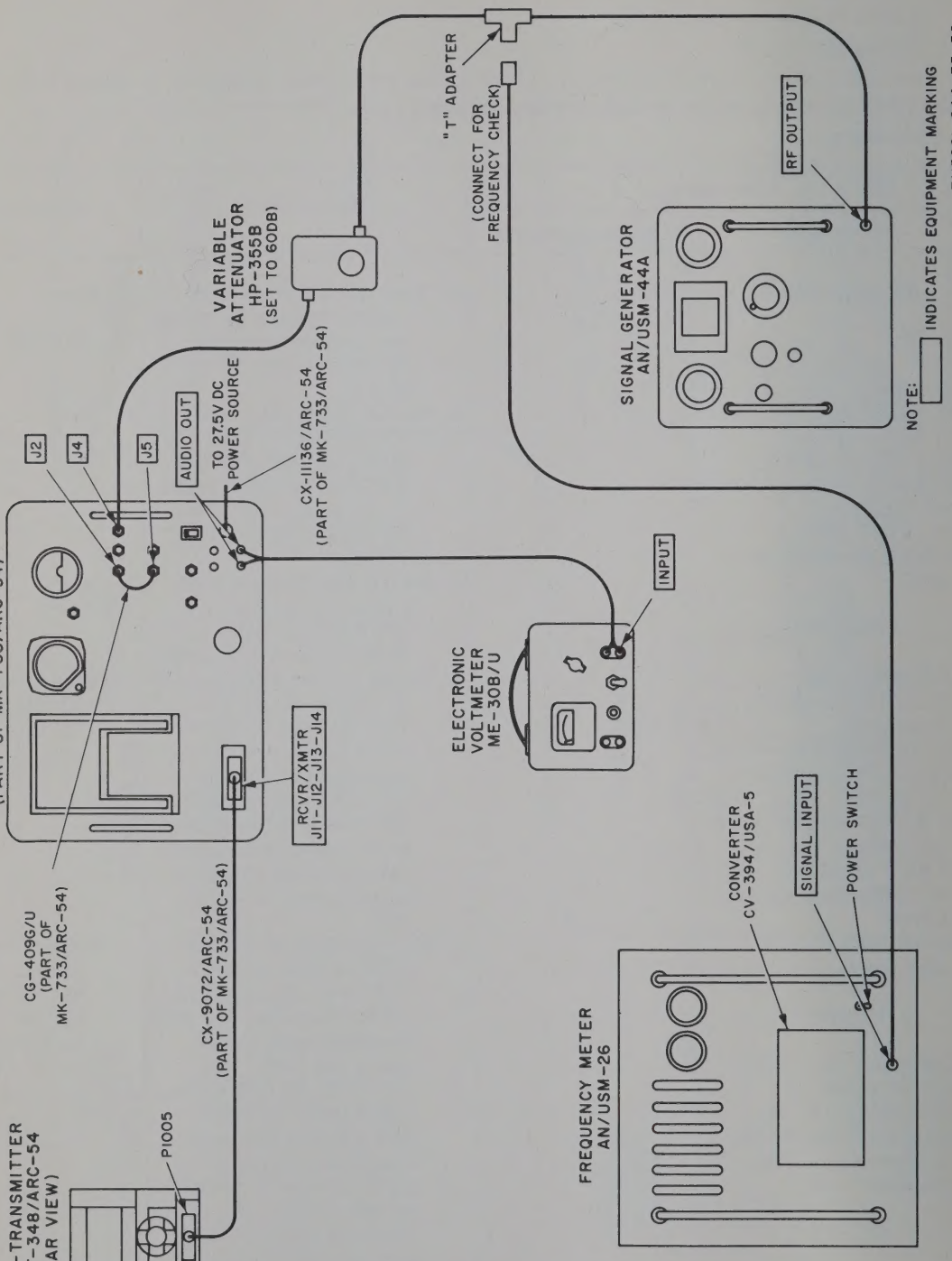


Figure 5-10. Receiver center frequency test setup.

5-15. Receiver Center Frequency

a. Test Equipment and Materials.

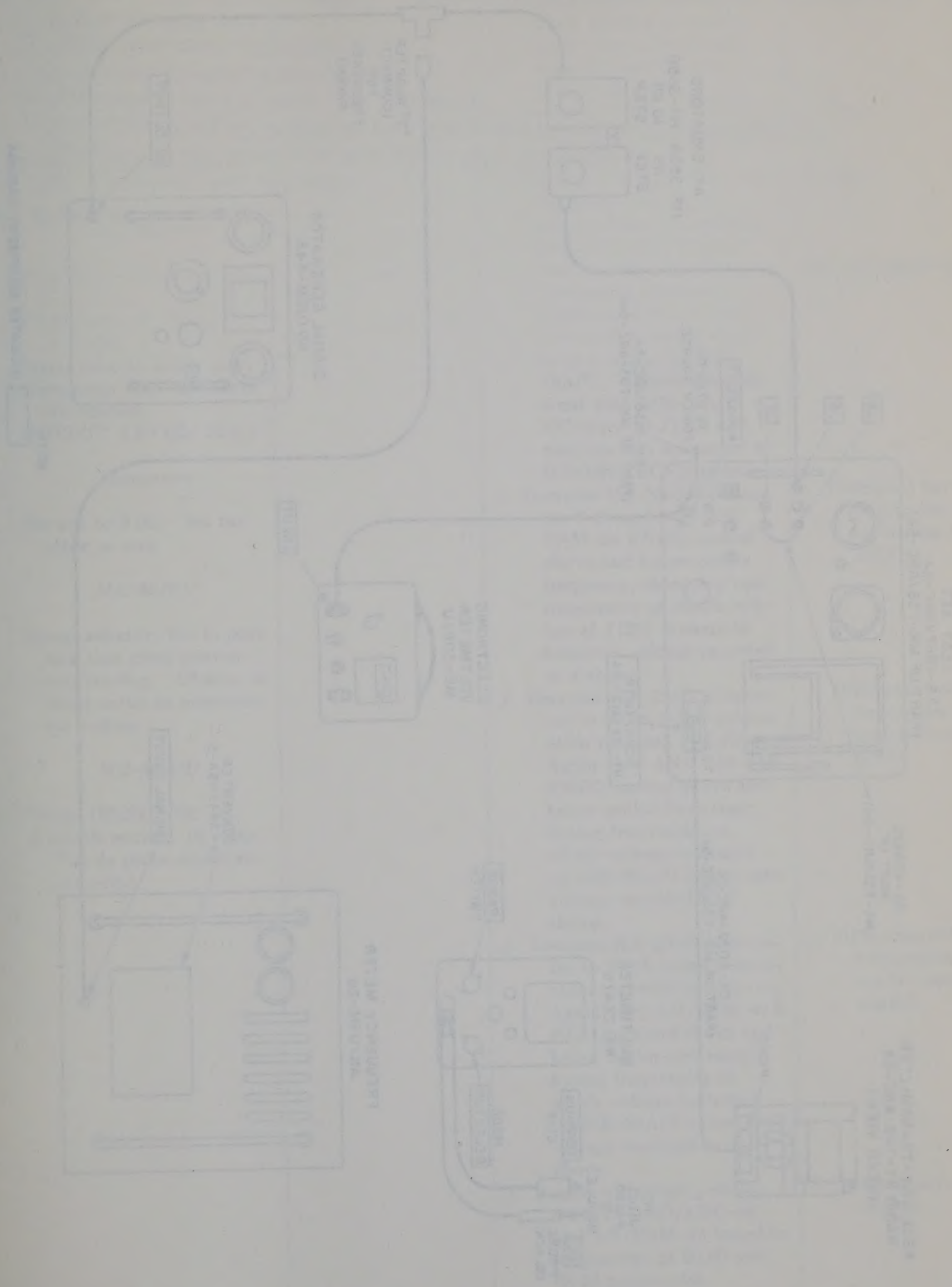
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Frequency Meter AN/USM-26 with Frequency Converter CV-394/USA-5.
Signal Generator AN/USM-44A.
Voltmeter, Electronic ME-30B/U.
Attenuator, 60 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-10. Turn on the equipment and allow 10 minutes for warmup.

c. Procedure.

Step	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	*TS-1967/ARC-54* S3: 30. S4: 1. S5: 0.00. S6: RCV S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. *AN/USM-44A* FREQUENCY RANGE: B. FREQ control: Set to 31.00 megacycles. MOD SELECTOR: CW. Attenuator dial: Minimum attenuation. *Attenuator* Set to 60 db. *AN/USM-26* FUNCTION SELECTOR: Set to FREQUENCY. FREQUENCY UNIT: 1. *CV-394/USA-5 (p/o AN/USM-26)* RANGE-MC: 20-40. MIXING FREQUENCY MCS: TUNE. TUNING: Set as instructed in *Test procedure* column. GAIN: Set as instructed in *Test procedure* column. *ME-30B/U* Range selector: Set to position that gives convenient reading. Change to lower ranges as necessary when nulling.	None.	*a.* With AN/USM-44A FREQ control set to 31.00 megacycles, set OUTPUT LEVEL control on AN/USM-44A to minimum (max ccw). Note reading on ME-30B/U. *b.* Rotate AN/USM-44A OUTPUT LEVEL control clockwise until reading on ME-30B/U decreases 5 db from level noted in *a* above. *c.* Carefully tune AN/USM-44A FINE FREQ ADJUST for null (minimum reading) on ME-30B/U. *d.* Repeat *b* and *c* above until no further reduction in reading can be obtained. *e.* Connect AN/USM-26 as shown. *f.* Rotate AN/USM-44A OUTPUT LEVEL control fully clockwise. *g.* Set AN/USM-26 GAIN control to MAX, and tune tuning dial for maximum closure of tuning eye. If eye closes completely, rotate GAIN control counterclockwise until tuning eye just slightly opens. Retune TUNING dial as necessary for maximum closure of tuning eye, and decrease GAIN control as necessary for slightly open tuning eye. *h.* Set AN/USM-26 MIXING FREQUENCY MCS switch to 30 and read frequency on counters. *i.* Repeat *a* through *h* above, with TS-1967/ARC-54 and AN/USM-44A tuned to 50.50 megacycles. Set AN/USM-26 MIXING FREQUENCY MCS to 50 and RANGE-MC to 40-100. *j.* Repeat *a* through *h* above, with TS-1967/ARC-54 and AN/USM-44A tuned to 68.95 megacycles. Set AN/USM-26 MIXING FREQUENCY MCS to 60 and RANGE-MCS to 40-100.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None. *g.* None. *h.* Frequency meter should indicate 1 mc ±5KC. (This is an actual indication of 31.000 megacycles ±0.005, since mixing frequency is 30 megacycles.) *i.* Frequency meter should indicate 500 KC ±5. (This is an actual indication of 50.500 megacycles ±0.005, since mixing frequency is 50 megacycles.) *j.* Frequency meter should indicate 8.950 MC ±5KC. (This is an actual indication of 68.950 megacycles ±0.005, since mixing frequency is 60 megacycles.)

	e. Connect AN/USM-26 as shown.	e. None.
	f. Rotate AN/USM-444A OUTPUT LEVEL control fully clockwise.	f. None.
	g. Set AN/USM-26 GAIN control to MAX, and tune tuning dial for maximum closure of tuning eye. If eye closes completely, rotate GAIN control counterclockwise until tuning eye just slightly opens. Return TUNING dial as necessary for maximum closure of tuning eye, and decrease GAIN control as necessary for slightly open tuning eye.	g. None
	h. Set AN/USM-26 MIXING FREQUENCY MCS switch to 30 and read frequency on counter.	h. Frequency meter should indicate 1 mc ± 5 KC. (This is an actual indication of 31.000 megacycles ± 0.005, since mixing frequency is 30 megacycles.)
	i. Repeat g through h above, with TS-1967/ARC-64 and AN/USM-444A tuned to 30.50 megacycles. Set AN/USM-26 MIXING FREQUENCY MCS to 30 and RANGE-MC to 40-100.	i. Frequency meter should indicate 500 KC ± 5. (This is an actual indication of 30.500 megacycles ± 0.005, since mixing frequency is 30 megacycles.)
	j. Repeat g through h above, with TS-1967/ARC-64 and AN/USM-444A tuned to 68.05 megacycles. Set AN/USM-26 MIXING FREQUENCY MCS to 60 and RANGE-MCS to 40-100.	j. Frequency meter should indicate 8.050 MC ± 5KC. (This is an actual indication of 68.050 megacycles ± 0.005, since mixing frequency is 60 megacycles.)



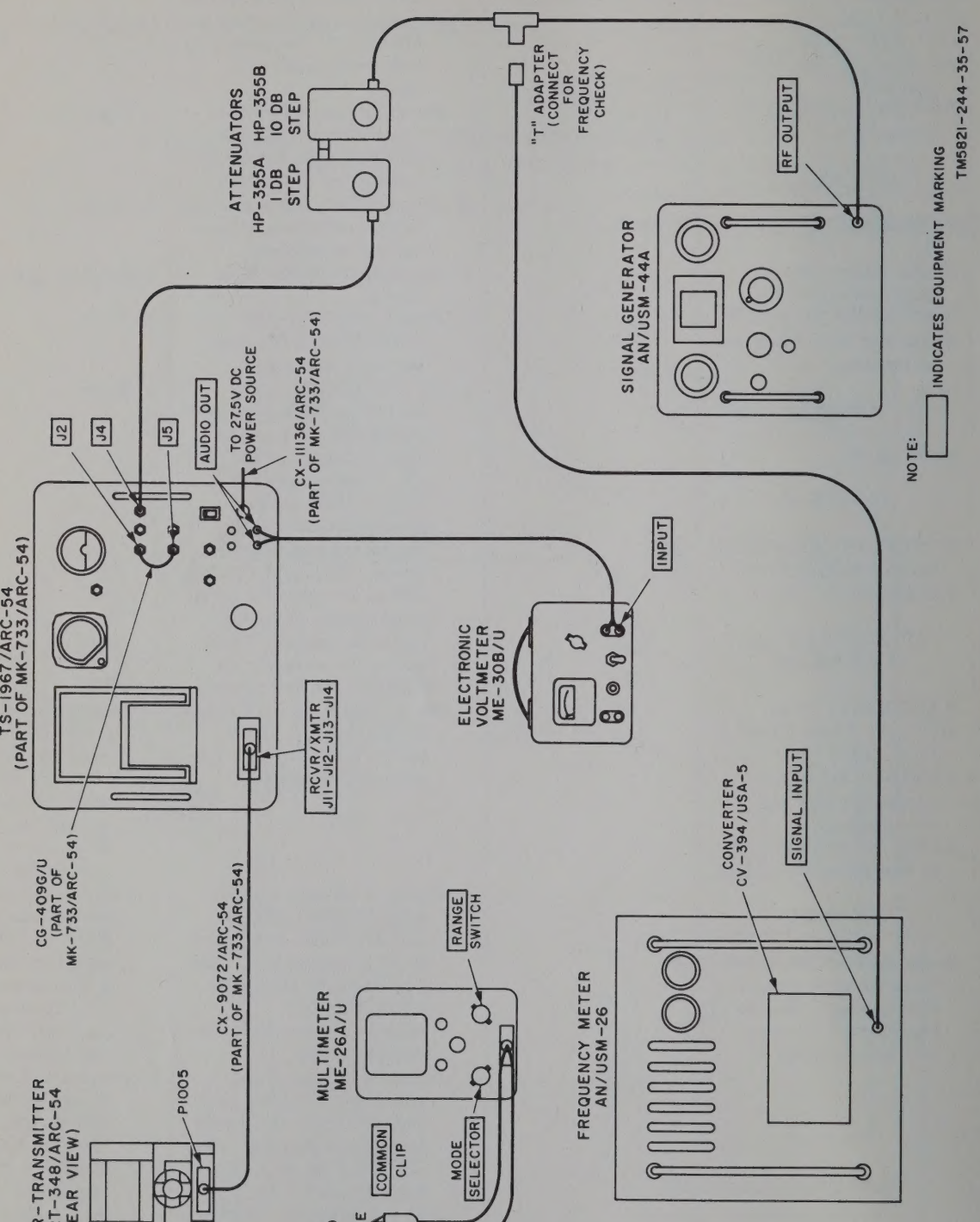


Figure 5-11. Receiver selectivity test setup.

5–16. Receiver Selectivity

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK–733/ARC–54.
Frequency Meter AN/USM–26 with Frequency Converter CV–394/USA–5.
Attenuators: one HP–355A, one HP–355B.
Voltmeter, Electronic ME–30B/U.
Signal Generator AN/USM–44A.
Multimeter ME–26A/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5–11. Do not connect the AN/USM–26 or the ME–26A/U until instructed to do so. Maintain a 6-db setting on one attenuator throughout the test.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. *AN/USM–44* FREQUENCY RANGE: B. FREQ control: Set to 31.00MC. MOD SELECTOR: CW. Attenuator dial: minimum attenuation. OUTPUT LEVEL: MAX. *Attenuators* Set one to 6 db. Set the other to zero. *ME–30B/U* Range selector: Set to position that gives convenient reading. Change to lower scales as necessary for nulling. *ME–26A/U* Mode SELECTOR: +. RANGE switch: 10 volts. (Use dc probe and common clip.)	*RT–348/ARC–54* TEST SWITCH: 6.	*a.* With AN/USM–44A control set to 31.00 megacycles, set OUTPUT LEVEL control to maximum. Note reading on ME–30B/U. *b.* Tune AN/USM–44A to exact receiver frequency by tuning for minimum noise (as described in paragraph 5–15*c*). *c.* Increase OUTPUT LEVEL control on AN/USM–44A to maximum. *d.* Observe TEST METER on RT–348/ARC–54; increase attenuator settings until ME–26A/U meter reading stops increasing. Decrease attenuation slightly and record total attenuation and voltage level indicator on ME–26A/U. (Make measurement with ME–26A/U DC probe at J1203 and common clip connected to RT–348/ARC–54 chassis.) *e.* Decrease HP–355A attenuator 6 db and vary AN/USM–44 FREQ control above and below center frequency, observing two frequencies at which voltage at J1203 is same as reference voltage recorded in *d* above. *f.* Decrease HP–355B attenuator to 60 db below attenuation recorded in *d* above. Again vary AN/USM–44A FREQ control above and below center frequency, noting frequencies at which voltage indicated on ME–26A/U agrees with voltage recorded in *d* above. *g.* Decrease HP–355B attenuator to 80 db below attenuation recorded in *d* above. Again vary AN/USM–44A FREQ control above and below center frequency, noting frequencies at which voltage indicated on ME–26A/U agrees with voltage recorded in *d* above. *h.* Repeat *a* through *g* above, with TS–1967/ARC–54 and AN/USM–44 tuned to frequencies of 50.50 and 68.95 megacycles.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* Difference between two frequencies should not be less than 30KC. *f.* Difference between two frequencies should not be more than 55KC. *g.* Difference between two frequencies should not be more than 100KC. *h.* Same as *e*, *f*, and *g* above.

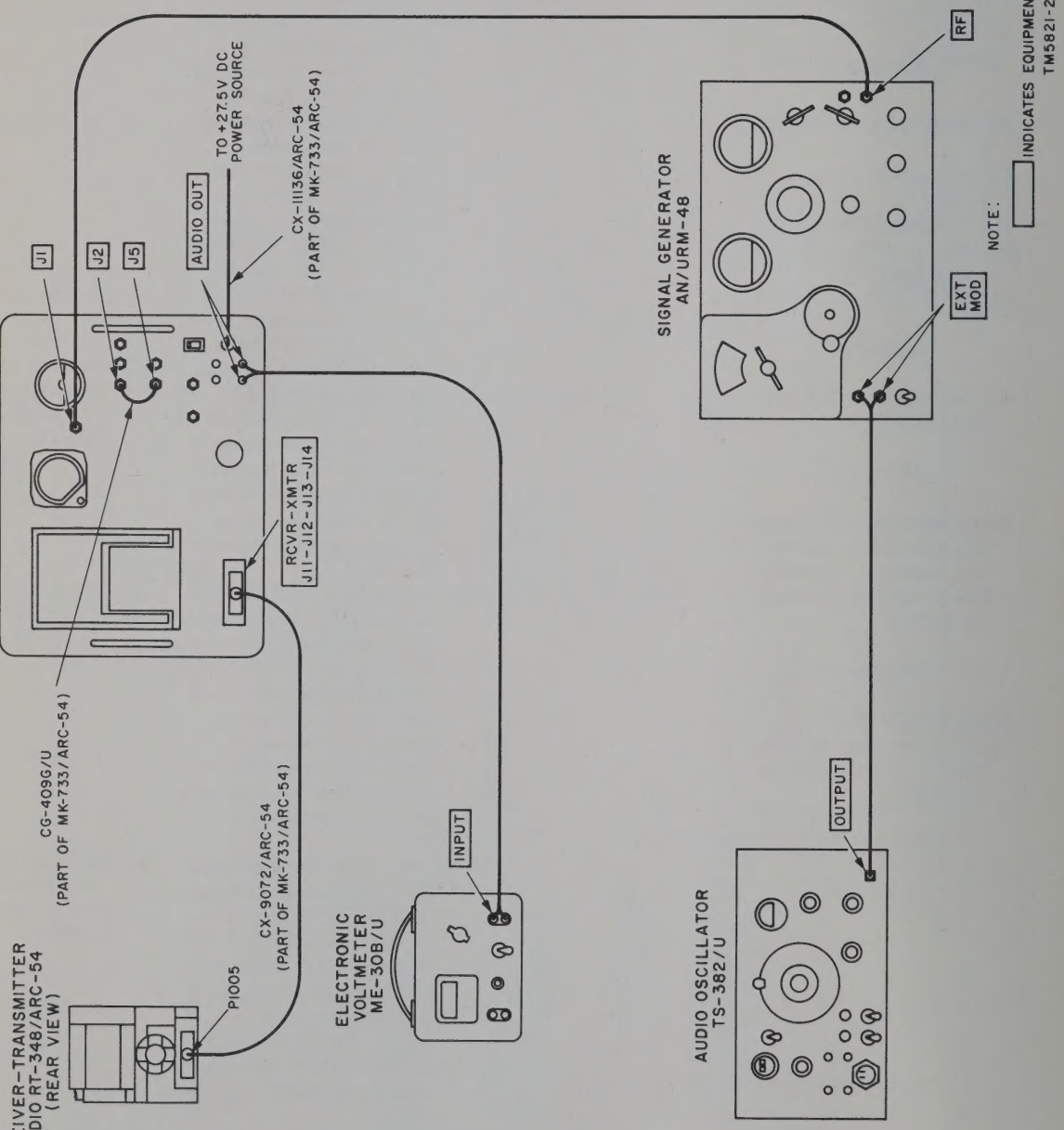


Figure 5-12. Homing test setup.

5–17. Homing

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK–733/ARC–54.
Signal Generator AN/URM–48.
Voltmeter, Electronic ME–30B/U.
Audio Oscillator TS–382/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5–12.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S3: 30. S4: 1. S5: 0.00 S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. *AN/URM–48* BANDSWITCH: C. RF TUNING: 31.00 MC. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 35 microvolts. *TS–382/U* Main tuning dial: 150. RANGE switch: X1. ATTENUATOR: 10. Output level control: Set as instructed in *Test procedure* column. *ME–30B/U* Range selector: Set to position that gives convenient reading. Change to lower ranges as necessary when nulling.	None.	*a.* Tune AN/URM–48 to receiver center frequency by adjusting RF TUNING control for null (minimum indication) on ME–30B/U. *b.* Set S7 on TS–1967/ARC–54 to CARR, S9 to HOME, and S1 to each of its three positions; note the results on Indicator ID–48/ARN (part of test set). *c.* Reduce setting of AN/URM–48 RF ATTENUATOR MICROVOLTS while observing horizontal pointer on the ID–48/ARN. *d.* Set AN/URM–48 OPERATION switch to EXT MOD and increase RF ATTENUATOR setting to 35 microvolts. Increase TS–382/U output level control until AN/URM–48 KILOCYCLES DEVIATION meter indicates 3-kc deviation. *e.* Set S7 on TS–1967/ARC–54 to TONE and observe ID–48/ARN flags. *f.* Repeat *a* through *e* above, with TS–1967/ARC–54 and AN/URM–48 adjusted to frequencies of 50.50 and 69.95 megacycles.	*a.* None. *b.* ID–48/ARN vertical pointer should swing to left, right, or center position in accordance with position of S1. *c.* ID–48/ARN horizontal pointer should swing down as RF input is reduced. *d.* None. *e.* Flags should activate. *f.* Same as *b*, *c*, and *e* above.

5-17. Homing

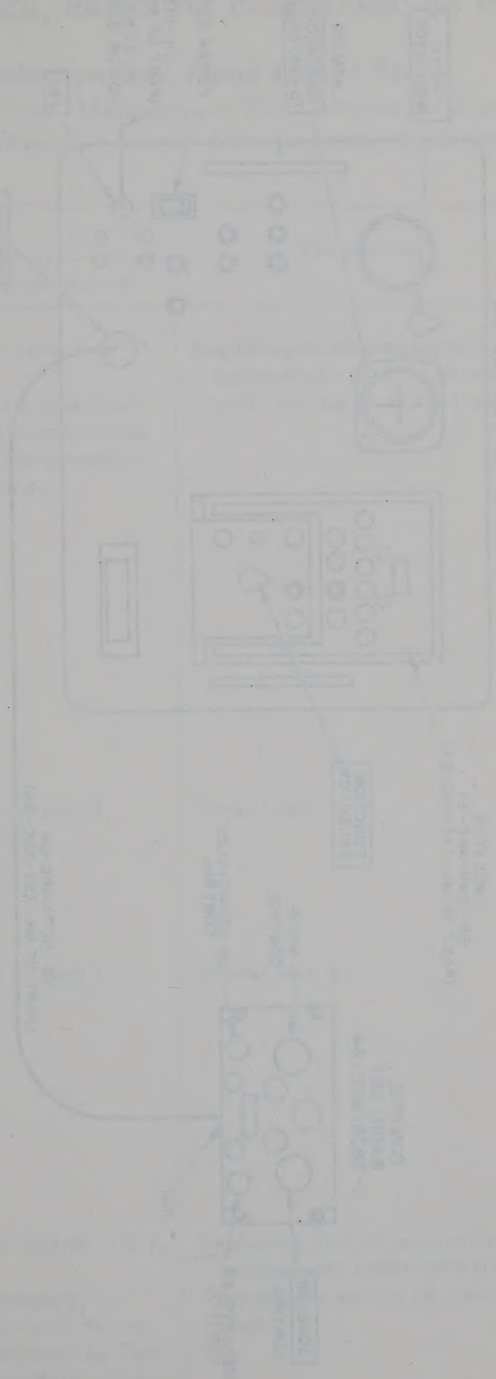
a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-738/ARC-54.
Signal Generator AN/URM-48.
Voltmeter, Electronic ME-30B/U.
Audio Oscillator TS-382/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-12.

c. Procedure.

Step	Test equipment	Control settings	Test procedure	Performance standard
		Equipment under test		
1	TS-1967/ARC-54	None.	a. Tune AN/URM-48 to receiver center frequency by adjusting RF TUNING control for null (minimum indication) on ME-30B/U.	a. None.
		SS: 30.		
		S4: T.		
		S5: 0/00		
		S6: RCV.		
		S7: DIS.	b. Set S7 on TS-1967/ARC-54 to CARR, S8 to HOME, and S1 to each of its three positions; note the results on Indicator ID-48/ARN (part of test set).	b. ID-48/ARN vertical pointer should swing to left, right, or center position in accordance with position of S1.
		S8: OFF.		
		S9: TEST.	c. Reduce setting of AN/URM-48 RF ATTENUATOR MICROVOLTS while observing horizontal pointer on the ID-48/ARN.	c. ID-48/ARN horizontal pointer should swing down as RF input is reduced.
		S10: RADIO.		
		S11: TEST.		
		POWER circuit breaker: ON.	d. Set AN/URM-48 OPERATION switch to EXT MOD and increase RF ATTENUATOR setting to 35 microvolts. Increase TS-382/U output level control until AN/URM-48 KILOCYCLES DEVIATION meter indicates 3-kc deviation.	d. None.
		AN/URM-48		
		BANDSWITCH: C.		
		RF TUNING: 31.00 MC.		
		OPERATION switch: MOD OFF.	e. Set S7 on TS-1967/ARC-54 to TONE and observe ID-48/ARN flags.	e. Flags should activate.
		RF SET TO LINE: Set for red line indication on meter.	f. Repeat a through e above, with TS-1967/ARC-54 and AN/URM-48 adjusted to frequencies of 50.50 and 69.95 megacycles.	f. Same as b, c, and e above.
		RF ATTENUATOR: 35 microvolts.		
		TS-382/U:		
		Main tuning dial: 120.		
		RANGE switch: X1.		
		ATTENUATOR: 10.		
		Output level control: Set as instructed in Test procedure column.		
		ME-30B/U:		
		Range selector: Set to position that gives convenient reading. Change to lower ranges as necessary when nulling.		



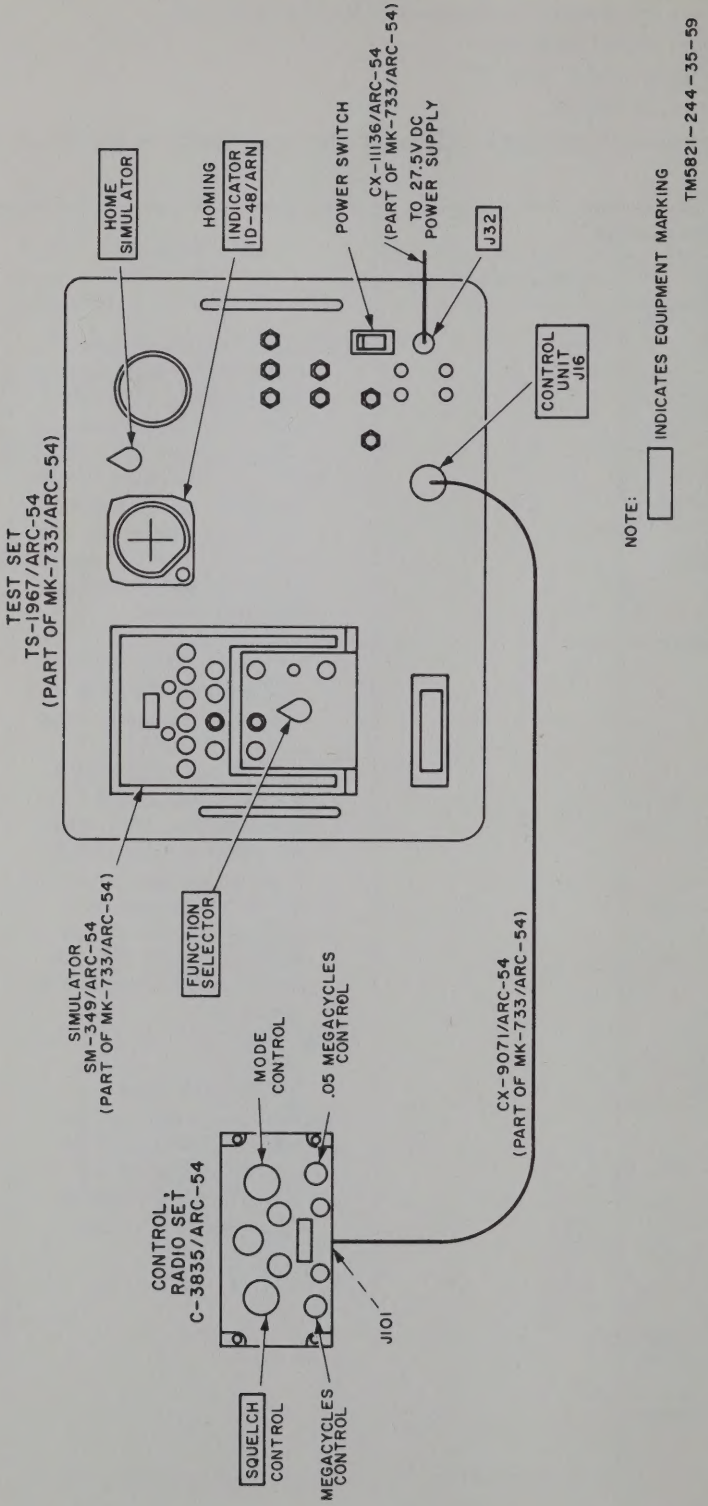


Figure 5-13. Control unit frequency selection and panel lamp test setup.

Section III. CONTROL, RADIO SET C-3835/ARC-54 FINAL TESTS

5-18. Control Unit Frequency Selection and Panel Lamps Test

a. *Test Equipment and Materials.* Maintenance Kit, Electronic Equipment MK-733/ARC-54.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-13.

c. *Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S6: RCV. POWER circuit breaker: ON. *SM-349/ARC-54* S1: OFF. S2: ON. S3: OFF.	Mode control: PTT. Megacycle control: Set as instructed in *Test procedure* column.	Beginning at 30 megacycles, successively select each megacycle setting on control unit.	Frequency counter on SM-349/ARC-54 should agree with frequency selected on control unit. Also, for even-megacycle settings, EVEN MC lamp on SM-349/ARC-54 should light, and ODD MC lamp should be extinguished. Note also, that control unit panel lamps light when TS-1967/ARC-54 POWER circuit breaker is at ON and S11 is set to CONT UNIT.
2	Leave controls as in step 1, except: *TS-1967/ARC-54* S12: AN COUPLER.	Same as step 1.	Repeat step 1.	Same as step 1.
3	Leave controls as in step 2, except: *TS-1967/ARC-54* S6: XMIT. S12: RADIO.	Same as step 1.	Repeat step 1.	Same as step 1, plus: For all frequency settings from 30 through 45 megacycles, SM-349/ARC-54 HAR FIL lamp should light. For all frequency settings from 46 through 69 megacycles, HAR FIL lamp should not light.
4	Leave controls as in step 3, except: *TS-1967/ARC-54* S6: RCV.	Mode control: PTT. 0.05 megacycles selectors: Set as instructed in *Test procedure* column.	Beginning at 0.00 megacycles, successively select each 0.05-megacycle setting on control unit.	Frequency counter on SM-349/ARC-54 should agree with frequency selected on control unit.

Section III. CONTROL, RADIO SET C-3833/ARC-54 FINAL TESTS

5-18. Control Unit Frequency Selection and Panel Lamps Test

a. Test Equipment and Materials. Maintenance Kit, Electronic Equipment MK-783/ARC-54.
b. Test Connections and Conditions. Connect the equipment as shown in figure 5-18.
c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	TS-1967/ARC-54 S6: RCV. POWER circuit breaker: ON. SM-349/ARC-54 S1: OFF. S2: ON. S3: OFF.	Mode control: PTT. Megacycle control: Set as instructed in Test procedure column.	Beginning at 30 megacycles, successively select each megacycle setting on control unit.	Frequency counter on SM-349/ARC-54 should agree with frequency selected on control unit. Also, for even-megacycle settings, EVEN MC lamp on SM-349/ARC-54 should light, and ODD MC lamp should be extinguished. Note also, that control unit panel lamps light when TS-1967/ARC-54 POWER circuit breaker is at ON and S11 is set to CONT UNIT.
2	Leave controls as in step 1, except: TS-1967/ARC-54 S12: AN COUPLER.	Same as step 1.	Repeat step 1.	Same as step 1.
3	Leave controls as in step 2, except: TS-1967/ARC-54 S6: XMIT. S12: RADIO.	Same as step 1.	Repeat step 1.	Same as step 1, plus: For all frequency settings from 30 through 45 megacycles, SM-349/ARC-54 HAR PIT. lamp should light. For all frequency settings from 46 through 69 megacycles, HAR PIT. lamp should not light.
4	Leave controls as in step 3, except: TS-1967/ARC-54 S6: RCV.	Mode control: PTT. 0.05 megacycles selectors: Set as instructed in Test procedure column.	Beginning at 0.00 megacycles, successively select each 0.05-megacycle setting on control unit.	Frequency counter on SM-349/ARC-54 should agree with frequency selected on control unit.



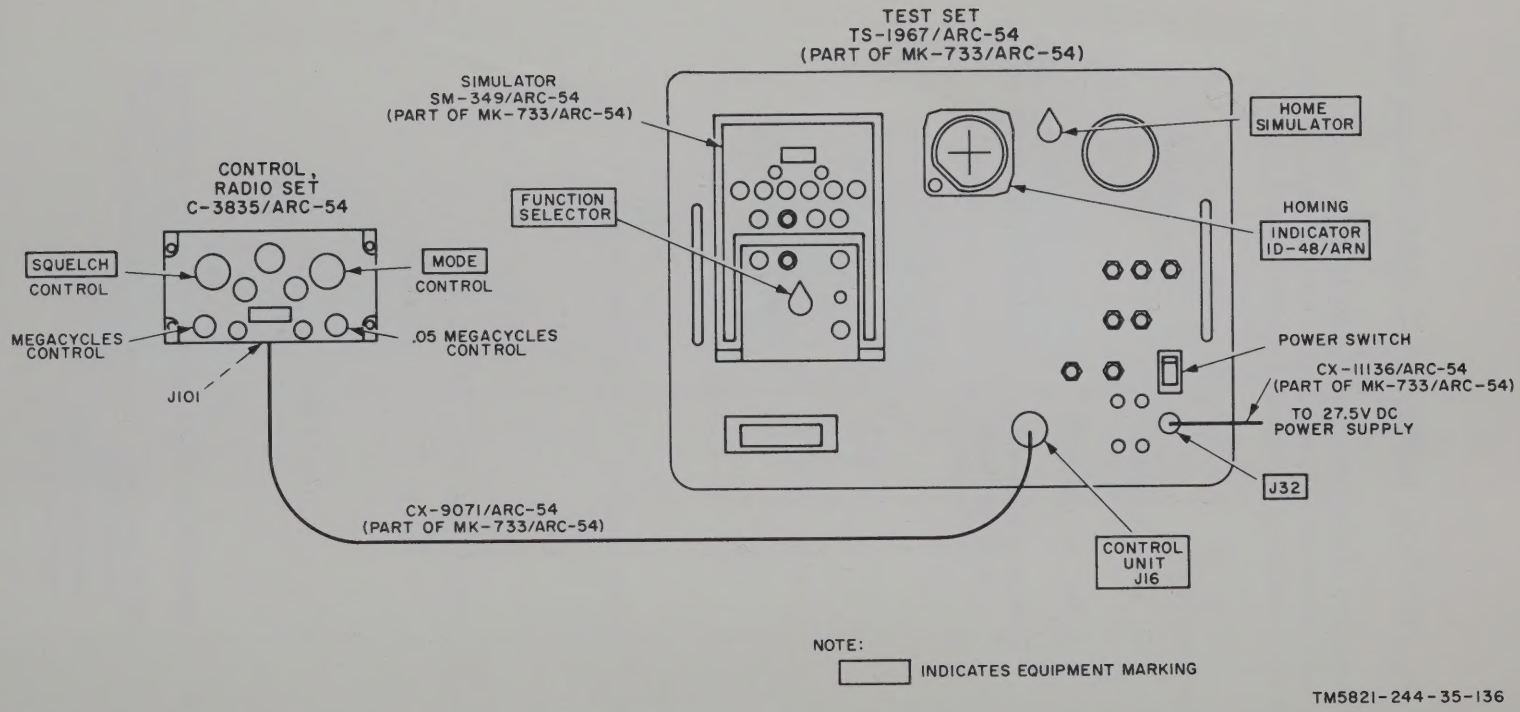


Figure 5-14. Control unit homing circuit test setup.

5–19. Control Unit Homing Test

a. Test Equipment and Materials. Maintenance Kit, Electronic Equipment MK–733/ARC–54.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5–14.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS–1967/ARC–54* S6: RCV. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: ON. *SM–349/ARC–54* S1: RETRAN CARR. S2: ON. S3: OFF.	Mode control: HOME. SQUELCH: CARR.	*a.* Observe flags on ID–48/ARN (part of TS–1967/ARC–54). *b.* Observe HOME lamp on SM–349/ARC–54.	*a.* Flags actuate when control unit mode control is set to HOME. *b.* HOME lamp lights when control unit mode control is set to HOME.
2	Leave controls as in step 1, except: *SM–349/ARC–54* S3: LEFT.	Same as step 1.	Observe vertical needle on ID–48/ARN.	Vertical needle on ID–48/ARN should swing left.
3	Leave controls as in step 1, except: *SM–349/ARC–54* S3: OVER TGT.	Same as step 1.	Observe horizontal heedle on ID–48/ARN.	Horizontal needle on ID–48/ARN should swing down.

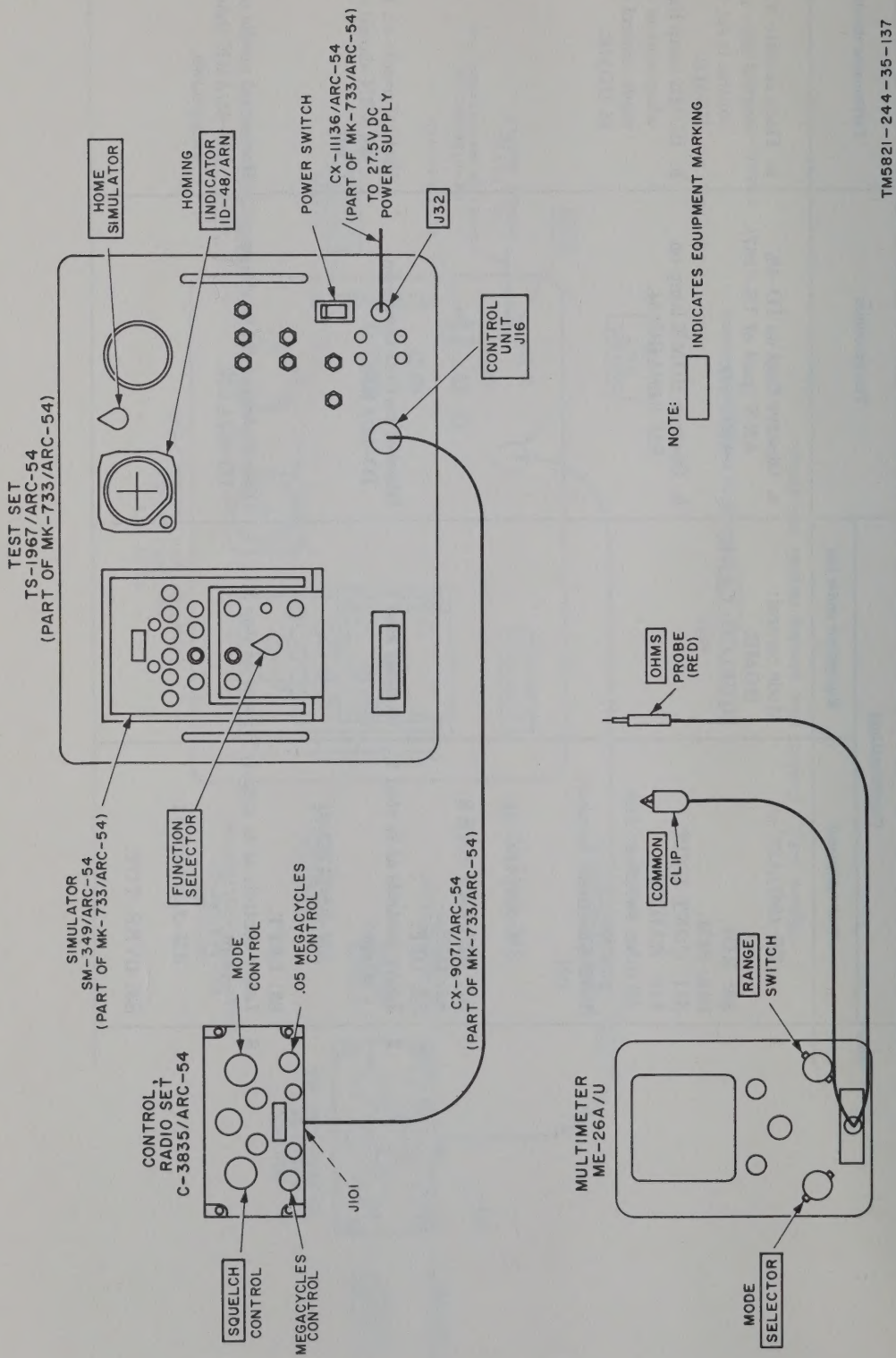


Figure 5-15. Control unit audio, PTT, and squelch circuits, test setup.

5-20. Control Unit Audio, PTT, and Squelch Circuits, Continuity Test

a. Test Equipment and Materials.
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Multimeter ME-26A/U.

b. Test Connections and Materials. Connect the equipment as shown in figure 5-15.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S6: XMIT. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: OFF. *SM-349/ARC-54* S1: OFF. S2: ON. S3: OFF.	Mode control: PTT.	Connect multimeter to test jacks J18 and J31 on TS-1967/ARC-54 and check for continuity.	Continuity should exist between J18 and J31.
2	Leave controls as in step 1, except: *TS-1967/ARC-54* S6: RCV.	Same as step 1.	*a.* Connect multimeter to test jacks J24 and J25, and check for continuity. *b.* Connect multimeter to test jacks J21 and J31, and check for continuity. *c.* Connect multimeter between test jacks J28 and J31, and measure resistance. *d.* Connect multimeter to test jacks J30 and J31, and observe resistance while rotating VOL (volume) control on control unit.	*a.* Continuity should exist between J24 and J25. *b.* Continuity should exist between J24 and J31. *c.* Resistance between J28 and J31 should be approximately 162 ohms ±32. *d.* Resistance between J30 and J31 should vary smoothly between 12 ohms ±2 and 162 ohms ±32 as VOL control on control unit is varied.
3	Leave controls as in step 2.	Mode control: RETRAN.	Connect multimeter to test jacks J26 and J29, and check for continuity.	Continuity should exist between J26 and J29.
4	Leave controls as in step 3, except: *TS-1967/ARC-54* POWER circuit breaker: ON.	SQUELCH control: Set as instructed in *Test procedure* column. Mode control: PTT.	Set SQUELCH control on control unit to each of its three positions and observe SQUELCH lamps on SM-349/ARC-54.	When SQUELCH control is set to CARR, CARR lamp should light. When SQUELCH control is set to TONE, TONE lamp should light. When SQUELCH control is set to DIS, both CARR and SEC lamps should light.

5–20. Control Unit Audio, PTT, and Squelch Circuits, Continuity Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-753/ARC-54.
Multimeter ME-26A/U.

b. Test Connections and Materials. Connect the equipment as shown in figure 5-15.

c. Procedure.

Step	Control settings		The procedure	Performance standard
	Test equipment	Equipment under test		
	TS-1967/ARC-54	Mode control: PTT.		
1	S6: XMIT. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: OFF. SM-349/ARC-54 S1: OFF. S2: ON. S3: OFF.		a. Connect multimeter to test jacks 118 and 131 on TS-1967/ARC-54 and check for continuity.	a. Continuity should exist between 118 and 131.
2	Leave controls as in step 1 except: TS-1967/ARC-54 S6: RCV.	Same as step 1.	a. Connect multimeter to test jacks 124 and 125, and check for continuity. b. Connect multimeter to test jacks 121 and 131, and check for continuity. c. Connect multimeter between test jacks 125 and 131, and measure resistance. d. Connect multimeter to test jacks 130 and 131, and observe resistance while rotating VOL (volume) control on control unit.	a. Continuity should exist between 124 and 125. b. Continuity should exist between 124 and 131. c. Resistance between 125 and 131 should be approximately 102 ohms ±32. d. Resistance between 130 and 131 should vary smoothly between 12 ohms ±2 and 102 ohms ±32 as VOL control on control unit is varied.
3	Leave controls as in step 2.	Mode control: RETRAN.	Connect multimeter to test jacks 129 and 129, and check for continuity.	Continuity should exist between 129 and 129.
4	Leave controls as in step 3, except: TS-1967/ARC-54 POWER circuit breaker: ON.	SQUELCH control: Set as instructed in Test procedure column. Mode control: PTT.	Set SQUELCH control on control unit to each of the three positions and observe SQUELCH lamp on SM-349/ARC-54.	When SQUELCH control is set to CARR, CARR lamp should light. When SQUELCH control is set to TONE, TONE lamp should light. When SQUELCH control is set to DIS, both CARR and SEC lamps should light.

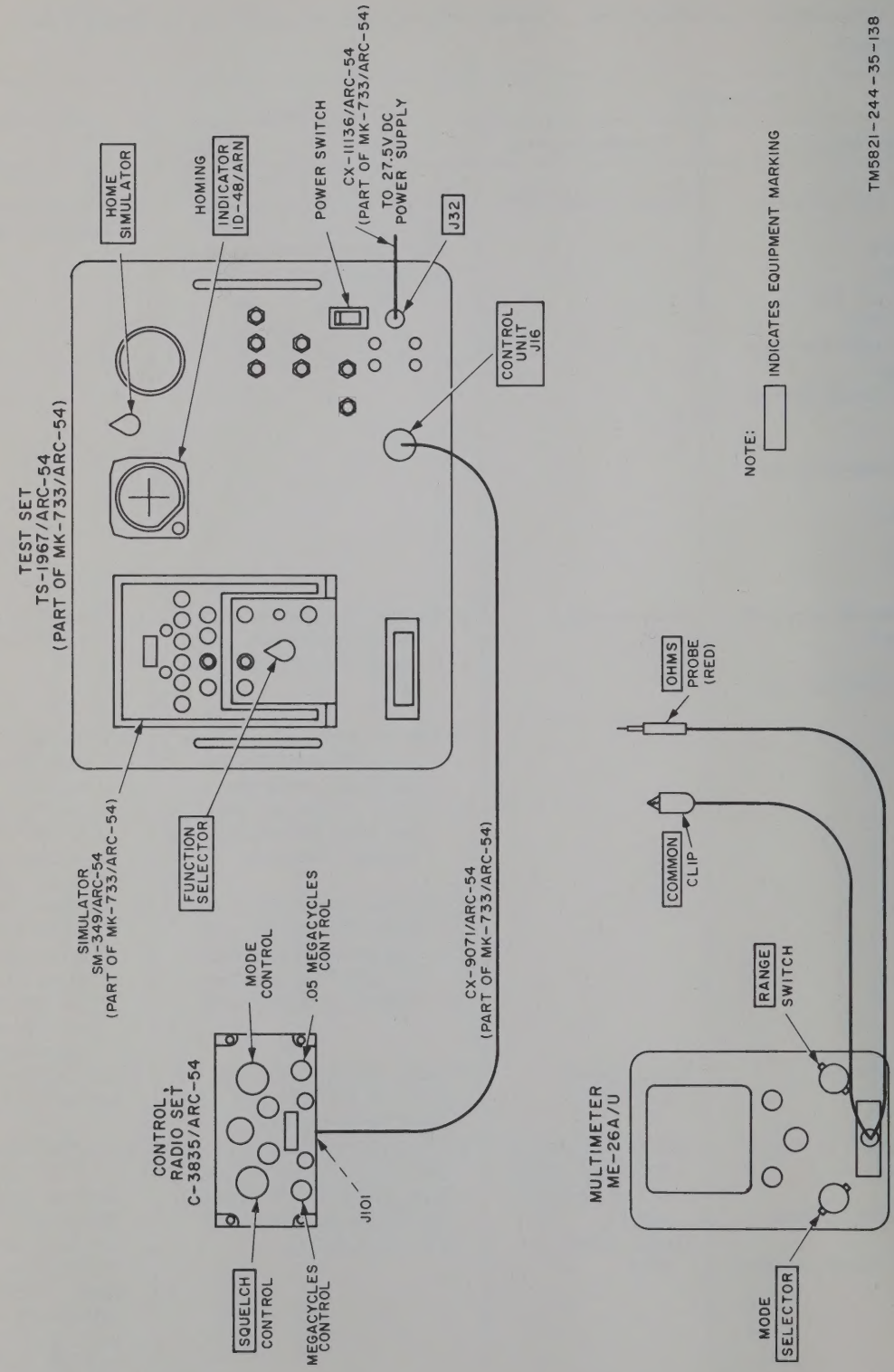


Figure 5-16. Control unit retransmit circuits, test setup.

5-21. Retransmit Circuit Test

a. Test Equipment and Materials.
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Multimeter ME-26A/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-16.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S6: XMIT. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: OFF. *SM-349/ARC-54* S1: OFF. S3: OFF. S2: ON.	Mode control: RETRAN.	Connect multimeter to test jacks J22 and J31, and check check for continuity.	Continuity should exist between J22 and J31.
2	Leave controls as in step 1, except: *TS-1967/ARC-54* S6: RCV *SM-349/ARC-54* S1: RETRAN CARR	Mode control: RETRAN. SQUELCH control: CARR.	Connect multimeter to test jacks J17 and J31, and check for continuity.	Continuity should exist between J17 and J31.
3	Leave controls as in step 2, except: *SM-349/ARC-54* S1: RETRAN TONE	Mode control: RETRAN. SQUELCH control: TONE.	*a.* Connect multimeter to test jacks J17 and J31, and check for continuity. *b.* Connect multimeter to test jacks J28 and J19, and check for continuity. *c.* Connect multimeter to test jacks J26 and J31, and check for continuity. *d.* Connect multimeter to test jacks J23 and J31, and check for continuity. *e.* Connect multimeter to test jacks J20 and J24, and measure resistance.	*a.* Continuity should exist between J17 and J31. *b.* Continuity should exist between J28 and J19. *c.* Continuity should exist between J26 and J31. *d.* Continuity should exist between J23 and J31. *e.* Resistance of 330 ohms ±33 should be measured between J20 and J24.

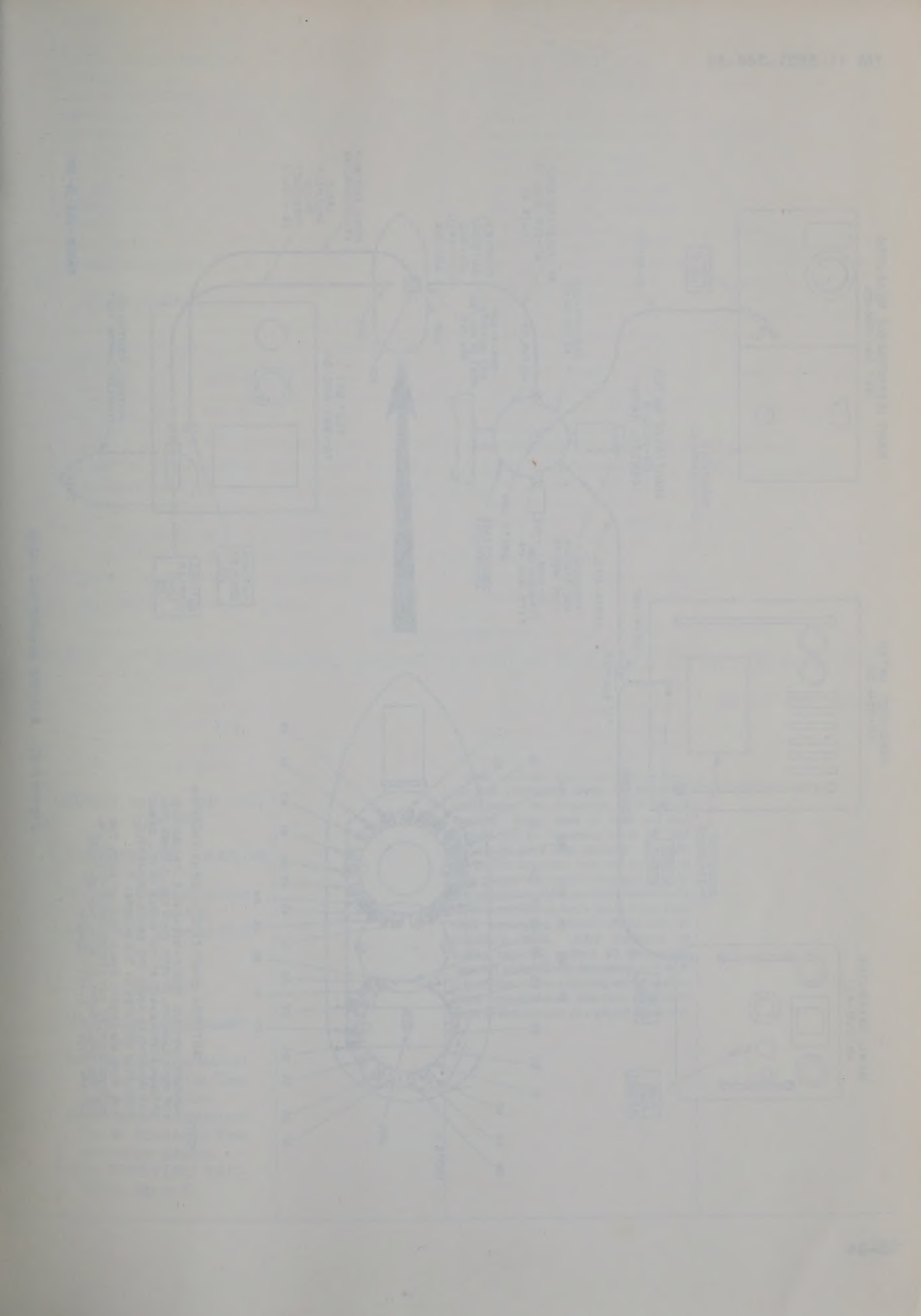
5-21. Retransmit Circuit Test

a. Test Equipment and Materials.
Maintenance Kit, Electronic Equipment MIK-783/ARC-64.
Multimeter ME-26A/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-16.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	TS-1907/ARC-64 S6: XMIT. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: OFF. SM-819/ARC-64 S1: OFF. S3: OFF. S2: ON.	Mode control: RETRAN.	Connect multimeter to test jacks 122 and 131, and check for continuity.	Continuity should exist between 122 and 131.
2	Leave controls as in step 1, except: TS-1907/ARC-64 S6: ROV SM-819/ARC-64 S1: RETRAN CARR	Mode control: RETRAN. SQUELCH control: CARR.	Connect multimeter to test jacks 117 and 131, and check for continuity.	Continuity should exist between 117 and 131.
3	Leave controls as in step 2, except: SM-819/ARC-64 S1: RETRAN TONE	Mode control: RETRAN. SQUELCH control: TONE.	a. Connect multimeter to test jacks 117 and 131, and check for continuity. b. Connect multimeter to test jacks 128 and 119, and check for continuity. c. Connect multimeter to test jacks 126 and 131, and check for continuity. d. Connect multimeter to test jacks 123 and 131, and check for continuity. e. Connect multimeter to test jacks 120 and 124, and measure resistance.	a. Continuity should exist between 117 and 131. b. Continuity should exist between 128 and 119. c. Continuity should exist between 126 and 131. d. Continuity should exist between 123 and 131. e. Resistance of 380 ohms ± 33 should be measured between 120 and 124.



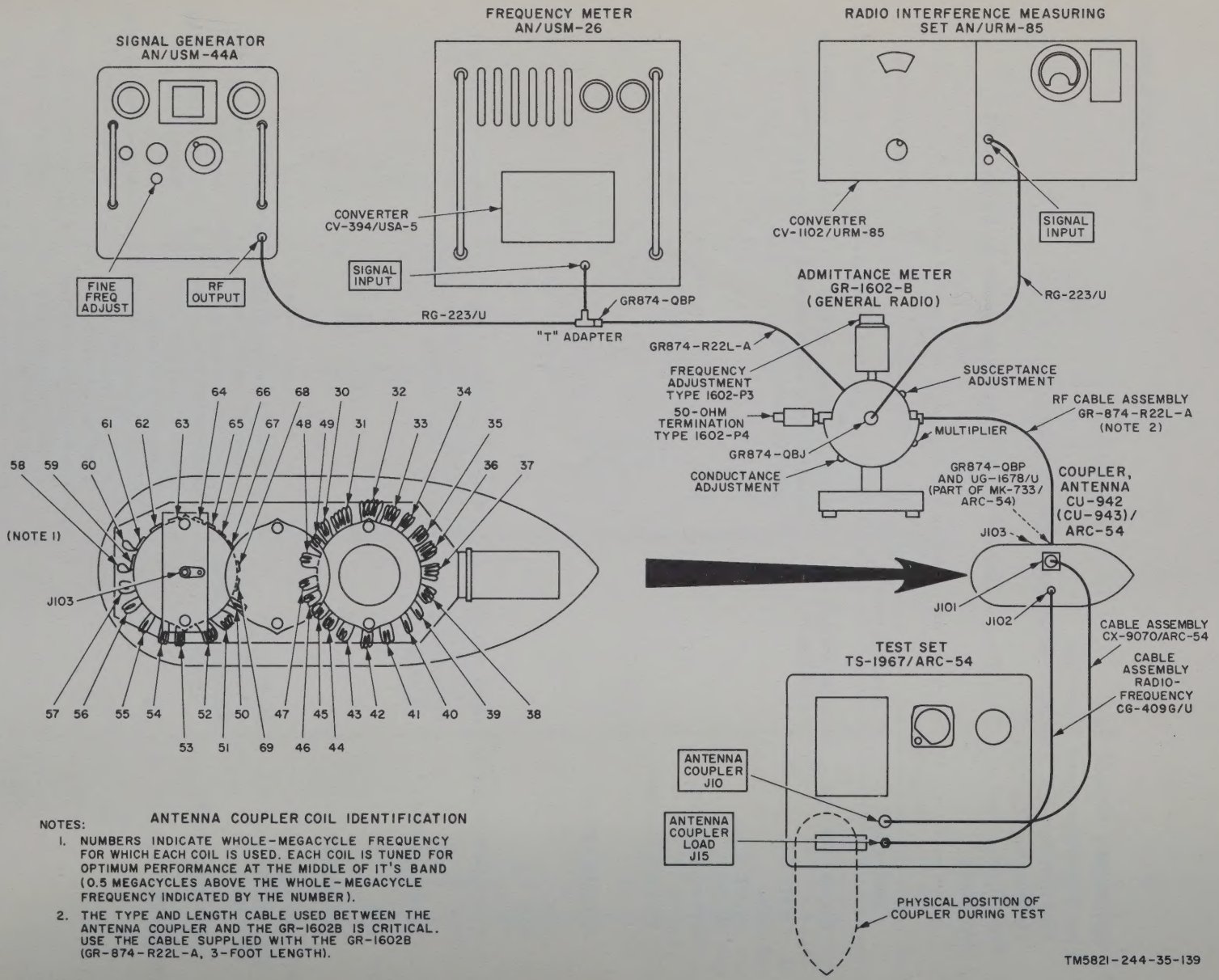
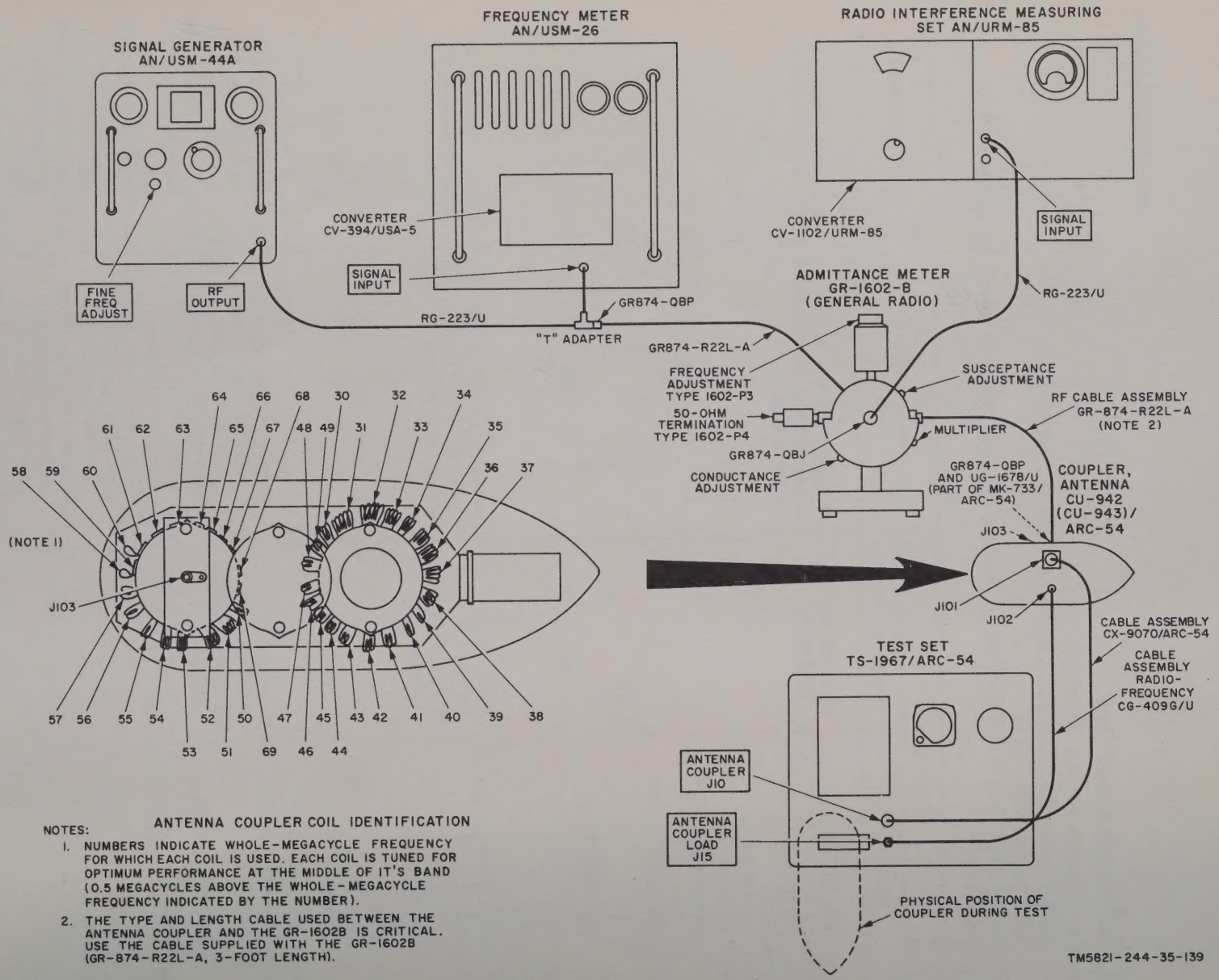


Figure 5-17. Antenna coupler test setup.

Tuning unit 2 (p/o AN/URM-85) FREQUENCY RANGE-MC: 20–70 GAIN: Set for convenient reading on meter. TUNING: Tune to 50.50 mc. *GR1602B* Frequency adjustment: Set to 50.50. Susceptance adjustment: Set as directed in Test procedure column. Conductance adjustment: Set as directed in Test procedure column. MULTIPLYING FACTOR: Set to 2.		*Note.* Perform tests beginning at 50.50 mc and proceeding down in frequency until lowest test frequency (30.50 mc) is checked. Next, start at 51.50 mc and proceed up in frequency until all test frequencies have been checked. By testing in this sequence, you will be able to tune proper coil (when necessary) as individual coils are added to circuit successively when antenna coupler is tuned away from 50.50 megacycles toward either end of frequency band. After replacing or tuning any coil, recheck all frequencies between adjusted-coil frequency and 50.50 megacycles. After replacing any capacitor, check tuning of both coils that connect to same switch contact as replaced capacitor.	



ANTENNA COUPLER COIL IDENTIFICATION

NOTES:

1. NUMBERS INDICATE WHOLE-MEGACYCLE FREQUENCY FOR WHICH EACH COIL IS USED. EACH COIL IS TUNED FOR OPTIMUM PERFORMANCE AT THE MIDDLE OF IT'S BAND (0.5 MEGACYCLES ABOVE THE WHOLE-MEGACYCLE FREQUENCY INDICATED BY THE NUMBER).
2. THE TYPE AND LENGTH CABLE USED BETWEEN THE ANTENNA COUPLER AND THE GR-1602B IS CRITICAL. USE THE CABLE SUPPLIED WITH THE GR-1602B (GR-874-R22L-A, 3-FOOT LENGTH).

Figure 5-17. Antenna coupler test setup.

Section IV. GENERAL SUPPORT TESTING, ANTENNA COUPLERS CU-942/ARC-54 and CU-943/ARC-54

5-22. Antenna Coupler Tests

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Signal Generator AN/USM-44A.
Frequency Meter AN/USM-26.
Admittance Meter, General Radio Model 1602B.
Radio Interference Measuring Set AN/URM-85 with Converter CV-1102/URM-85.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-17.

c. Procedure.

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	*TS-1967/ARC-54* S1: ON COURSE S2: FWD S3: 50 S4: 0 S5: 0.50 S6: RCV S7: DIS S8: TONE S9: PTT S10: ANT COUPLER S11: TEST SET S12: ANT COUPLER POWER circuit breaker: ON *AN/USM-44A* FREQUENCY RANGE: C FREQ control: Set to 50 mc MOD SELECTOR: CW Attenuator dial: Minimum attenuation *AN/USM-26* FREQUENCY SELECTOR: Set to FREQUENCY FREQUENCY UNIT: 1 *CV-394/USA-5 (p/o AN/USM-26)* RANGE-MC: 40-100 MIXING FREQUENCY MCS: TUNE TUNING: Set as instructed in Test procedure column. GAIN: Set as instructed in Test procedure column. *AN/URM-85* Function switch: CW AVERAGE Calibration switch: SERIES CAL & OPERATE SIGNAL ATTENUATOR DB: Set to 40. Decrease setting (after tuning AN/USM-44A) as necessary for convenient meter indication. *Tuning unit 2 (p/o AN/URM-85)* FREQUENCY RANGE-MC: 20-70 GAIN: Set for convenient reading on meter. TUNING: Tune to 50.50 mc. *GR1602B* Frequency adjustment: Set to 50.50. Susceptance adjustment: Set as directed in Test procedure column. Conductance adjustment: Set as directed in Test procedure column. MULTIPLYING FACTOR: Set to 2.	None	*a.* Rotate AN/USM-44A OUTPUT LEVEL control fully clockwise. *b.* Set AN/USM-26 GAIN control to MAX and tune TUNING dial for maximum closure of tuning eye. Decrease GAIN setting as necessary to prevent complete closure of tuning eye. *c.* Set AN/USM-26 MIXING FREQUENCY MCS switch to 50 and tune AN/USM-44A FINE FREQ ADJUST for reading on AN/USM-26 counters of 500 kc ±1 (actually 50.500 mc ±0.001). *d.* Tune AN/URM-85 TUNING dial for maximum indication on MICROVOLTS meter. *e.* Tune GR1602B susceptance and conductance adjustments (fig. 5-17) for null (minimum indication) on AN/URM-85 MICROVOLTS meter. *f.* Note setting of susceptance and conductance adjustments. If readings are not correct, set susceptance and conductance adjustments to correct values and adjust the CU-942/ARC or CU-943/ARC coil that corresponds to test frequency (50.50 mc in this case) for null on AN/URM-85 MICROVOLTS meter. See figure 5-17, detail A, for coil identification. Make adjustment by squeezing or stretching turns of coil. ***Caution:* Do not exert strain on switch contacts; they break easily.** *g.* Repeat *a* through *f* above at each frequency listed in charts (para. 5-23). Refer to charts for correct reading on each frequency. *Note.* For all frequencies below 41.50 mc, set GR1602B to 42 mc. Leave MULTIPLIER set to 2 for all checks. *Note.* Perform tests beginning at 50.50 mc and proceeding down in frequency until lowest test frequency (30.50 mc) is checked. Next, start at 51.50 mc and proceed up in frequency until all test frequencies have been checked. By testing in this sequence, you will be able to tune proper coil (when necessary) as individual coils are added to circuit successively when antenna coupler is tuned away from 50.50 megacycles toward either end of frequency band. After replacing or tuning any coil, recheck all frequencies between adjusted-coil frequency and 50.50 megacycles. After replacing any capacitor, check tuning of both coils that connect to same switch contact as replaced capacitor.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* Susceptance and conductance settings should be as indicated in appropriate chart (para. 5-23). *g.* See charts below for correct readings for each frequency.

			d. None.
			c. None.
			e. None.
			f. Receptance and conductance settings should be as indicated in appropriate chart (para. 5–23).

5-23. Conductance and Susceptance Charts

a. Antenna Coupler CU-942/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From	To	From	To
30.50	0.2	1.5	13.1	15.5
31.50	0.1	1.4	13.0	15.4
32.50	0.2	1.5	13.3	15.7
33.50	0.2	1.5	13.0	15.4
34.50	0.6	1.8	12.4	14.8
35.50	0.2	1.5	12.2	14.6
36.50	0.2	1.5	11.8	14.2
37.50	0.3	1.6	11.5	13.9
38.50	0.5	1.5	10.6	13.0
39.50	0.6	1.8	10.1	12.5
40.50	0.9	2.9	9.4	11.8
41.50	1.4	3.4	9.2	11.6
42.50	1.5	3.5	8.1	10.1
43.50	2.2	4.2	7.7	9.7
44.50	3.5	5.5	6.6	8.6
45.50	4.0	6.0	5.0	7.0
46.50	4.7	6.7	4.2	5.6
47.50	6.0	7.8	2.8	4.2
48.50	6.6	8.0	1.1	2.5
49.50	6.5	7.9	−0.4	1.0
50.50	6.3	7.7	−2.3	−3.7
51.50	6.2	7.6	−2.9	−4.3
52.50	6.4	7.8	−4.3	−5.7
53.50	6.3	7.7	−5.3	−6.7
54.50	6.5	7.9	−6.3	−7.9
55.50	6.0	7.4	−7.5	−9.9
56.50	6.3	7.7	−8.9	−10.3
57.50	5.8	7.3	−10.2	−11.6
58.50	5.9	7.3	−10.9	−12.3
59.50	5.7	7.1	−10.9	−12.3
60.50	6.3	7.7	−13.1	−14.5
61.50	5.8	7.2	−13.0	−14.4
62.50	5.6	7.1	−13.1	−14.5
63.50	4.9	6.3	−12.8	−14.2
64.50	4.4	5.9	−11.8	−13.2
65.50	4.4	5.9	−12.6	−14.0
66.50	3.7	5.2	−11.8	−13.2
67.50	3.3	4.7	−11.3	−12.7
68.50	2.6	4.0	−10.4	−11.8
69.50	2.6	4.0	−10.4	−11.8

b. Antenna Coupler CU-943/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From	To	From	To
30.50	0.1	1.0	13.8	16.2
31.50	0.1	1.0	14.0	16.4
32.50	0.2	1.2	14.0	16.4
33.50	0.3	1.4	14.1	16.5
34.50	0.5	2.3	13.5	15.9
35.50	0.4	2.0	13.2	15.6
36.50	0.6	2.5	12.5	14.9
37.50	0.5	2.3	11.9	14.3
38.50	0.4	2.0	11.0	13.4
39.50	0.9	1.3	10.4	12.8
40.50	1.5	2.9	9.9	12.3
41.50	2.0	3.0	9.9	12.3
42.50	2.3	3.7	9.9	12.3
43.50	2.9	4.3	8.0	9.4
44.50	4.3	5.7	7.1	8.5
45.50	4.8	6.2	5.3	6.7
46.50	5.6	7.0	4.3	5.7
47.50	6.5	7.9	2.8	4.2
48.50	6.8	8.2	0.9	2.3
49.50	6.6	8.0	0.2	−1.2
50.50	7.1	8.5	−1.8	−3.2
51.50	7.1	8.5	−2.5	−3.9
52.50	7.0	8.4	−4.1	−5.5
53.50	6.7	8.1	−5.3	−6.7
54.50	6.6	8.0	−6.5	−7.9
55.50	6.3	7.7	−7.8	−9.2
56.50	6.1	7.5	−9.2	−10.2
57.50	5.7	6.1	−10.3	−11.7
58.50	5.0	6.4	−10.8	−12.2
59.50	5.1	6.5	−11.0	−12.4
60.50	5.9	7.3	−13.5	−14.9
61.50	5.4	6.8	−13.0	−14.4
62.50	4.9	6.3	−13.1	−14.5
63.50	4.6	6.0	−12.8	−14.2
64.50	3.8	5.2	−11.8	−13.2
65.50	3.9	5.3	−12.7	−14.1
66.50	3.2	4.6	−11.7	−13.1
67.50	2.8	4.2	−10.8	−12.2
68.50	2.3	3.7	−10.0	−11.4
69.50	2.3	3.7	−10.1	−11.5

Section V. SUMMARY OF TEST DATA

5-24. Summary of Test Data for Receiver-Transmitter, Radio RT-348/ARC-54

Test	Performance standard	
1. TEST METER TESTS:	*Switch position*	*Reading*
a. Receive mode	1-4	50 ±30
	5	NMT 20 (avg)
	6	50 ±30
	7-11	NMT 5
b. Transmit mode	1-6	50 ±30
	7	NLT 5
	8	NLT 20
	9	50 ±30
	10	NLT 20
	11	NMT 5
c. Receive mode (jumper removed).	11	50 ±30
2. AUDIO OUTPUT AND DISTORTION.	31 mc modulated ±10 kc at 1 kc: 2.73 volts rms. 31 mc modulated ±10 kc at 300 cps: 1.93-3.06 volts rms. 31 mc modulated ±10 kc at 6 kc: 1.93-3.06 volts rms. 50.50 mc modulated ±10 kc at 1 kc: 2.73 volts rms. 50.50 mc modulated ±10 kc at 300 cps: 1.93-3.06 volts rms. 50.50 mc modulated ±10 kc at 6 kc: 1.93-3.06 volts rms. Same as above for primary power inputs of 24 and 29 volts dc.	
3. TRANSMITTER POWER OUTPUT.	10 watts or more at each of the following frequencies (mc): 30.00 40.25 50.50 60.75 32.05 42.30 52.55 62.80 34.10 44.35 54.60 64.85 36.15 46.40 56.65 66.90 38.20 48.45 58.70 68.95	
4. TRANSMITTER DISTORTION.	30 mc modulated ±10 kc at 1 kc: Maximum distortion -7%.	
5. TRANSMITTER TONE DEVIATION.	49.25 mc, 150-cps tone deviation: 3,000 cps ±500. Tone frequency: 150 cps ±3.	
6. TRANSMITTER CARRIER NOISE.	31-mc noise level of 2.73 mv or less. 50.50 mc: -40 db or more. 68.95 mc: -40 db or more.	
7. RECEIVER SENSITIVITY QUIETING AND LIMITING.	31 mc	1.2 μv: -10 db or more. 120 μv: -40 db or more. 6 to 10,000 μv: 2 db max change.
	50.50 mc	1.2 μv: -10 db or more. 120 μv: -40 db or more. 6 to 10,000 μv: 2 db max change.
	68.95 mc	1.2 μv: -10 db or more. 120 μv: -40 db or more. 6 to 10,000 μv: 2 db max change.
8. RECEIVER SQUELCH ADJUSTMENT.	31 mc	SQ ADJ clockwise: 6 μv or less should unsquelch the receiver. 0.6 μv input: -45 (from 6-μv input level). Difference between squelch and unsquelch: 0.6 μv or less.
	50.50 mc	0.6 μv input: -45 db (from 6-μv input level). Difference between squelch and unsquelch: 0.6 μv or less.
	68.95 mc	0.6 μv input: -45 db (from 6-μv input level). Difference between squelch and unsquelch: 0.6 μv or less.

Test	Performance standard
9. TONE SQUELCH.	31 mc modulated ±3 kc at 150 cps, unsquelch: 1.2 μv or less and squelch with modulation off. 50.50 mc: Same as above. 68.95 mc: Same as above. 120 μv input, modulated ±2.5 kc, audio varied from 145 to 155 cps: receiver remains unsquelched.
10. RECEIVER CENTER FREQUENCY.	31 mc ±5 kc. 50.50 mc ±5 kc. 68.95 mc ±5 kc.
11. RECEIVER SELECTIVITY.	31 mc: 6 db below reference: minimum of 30 kc between frequencies. 60 db below reference: maximum of 55 kc between frequencies. 80 db below reference: maximum of 100 kc between frequencies. 50.50 mc: Same as above. 68.95 mc: Same as above.
12. HOMING	31 mc: Homer coarse: ID-48/ARN vertical pointer swings right, left, or center, in accordance with switch setting. Signal strength: ID-48/ARN horizontal pointer swings down with reduction of RF input level. Flags: ID-48/ARN flags actuate when switch is set to TONE. 50.50 mc: Same as above. 68.95 mc: Same as above. Repeat the above for primary power outputs of 24 and 29 volts dc.

5-25. Summary of Test Data for Control, Radio Set C-3835/ARC-54

Test	Performance standard
1. FREQUENCY SELECTION AND PANEL LAMPS.	S12-RADIO: Frequency counters should agree. EVEN MC lamp lights for even megacycles. ODD MC lamp lights for odd megacycles. Panel lamps light when power is applied and test set circuit breaker is on. S12-ANT COUPLER: Same as above. S5-XMIT: Same as above plus-HAR FIL lamp lights for frequencies below 46 mc; does not light above 45 mc. 0.05 megacycle: Counters should agree.
2. HOMING TEST	Mode control to HOME: flags actuate, HOME lamp actuates. S3—LEFT: Vertical needle swings left. S3—OVER TGT: Horizontal needle swings down.
3. PTT AND SQUELCH CIRCUITS:	*Continuity*
a. PTT	*a.* Power OFF: *From* *To* PTT-XMIT: J18 J31 PTT-RCV: J24 J25 J21 J31 RETRAN: J26 J29 (162 ohms ±32) J28 J31 Rotating VOL control: resistance from J31 to J30 shall vary from 12 to 162 ohms.
b. SQUELCH	*b.* Power ON: PTT-CARR: CARR lamp lights. PTT-TONE: TONE lamp lights. PTT-DIS: CARR and SEC lamps light.

Test	Performance standard		
		Continuity	
4. RETRANSMIT CIRCUITS	Power OFF:	*From*	*To*
	RETRAN-XMIT	J22	J31
	RETRAN-CARR-RCV:	J17	J31
	RETRAN-TONE-RCV:	J17	J31
	RETRAN-TONE-RCV:	J28	J19
	RETRAN-TONE-RCV:	J26	J31
	RETRAN-TONE-RCV:	J23	J31
	RETRAN-TONE-REV: (330 ohms ±33).	J20	J24

5–26. Summary of Test Data for Coupler, Antenna CU–942/ARC–54 (CU–943/ARC–54)

Test	Performance standard
ADMITTANCE AND MECHANICAL TUNING.	See charts (paras. 5–23 and 5–24).

Section VI. DEPOT INSPECTION STANDARDS

5–27. Applicability of Depot Inspection Standards

a. The tests outlined in this section are designed to measure the performance capability of a repaired equipment. Equipment that is to be returned to stock should meet the standards given in these tests.

b. Applicable procedures of the Army depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355–1, TB SIG 355–2, and TB SIG 355–3 form a part of the requirements for testing this equipment.

5–28. Test Procedures

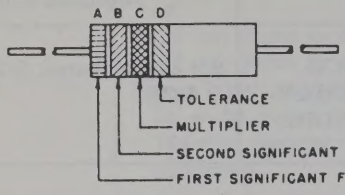
a. The test equipment and power required for depot inspection standards are the same as indicated in paragraph 5–2.

b. The operational tests for depot inspection standards are the same as the tests given in paragraphs 5–6 through 5–23. Perform the tests in the order in which they are given, and observe that the results meet the minimum standard indicated in each test.

Tests	Paragraph
Test meter	5–6
Transmitter power output	5–7
Transmitter distortion	5–8
Transmitter tone deviation	5–9
Transmitter carrier noise	5–10
Audio output and distortion	5–11
Receiver sensitivity, quieting, and limiting	5–12
Receiver squelch adjustment	5–13
Tone squelch	5–14
Receiver center frequency	5–15
Receiver selectivity	5–16
Homing	5–17
Control unit frequency selection and panel lamps	5–18
Control unit homing	5–19
Control unit audio, PTT, and squelch circuit continuity tests	5–20
Retransmit circuit	5–21
Antenna coupler	5–22

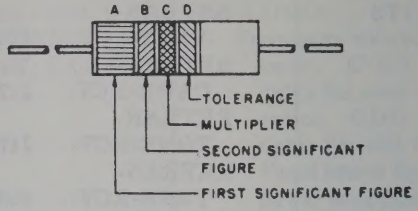
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

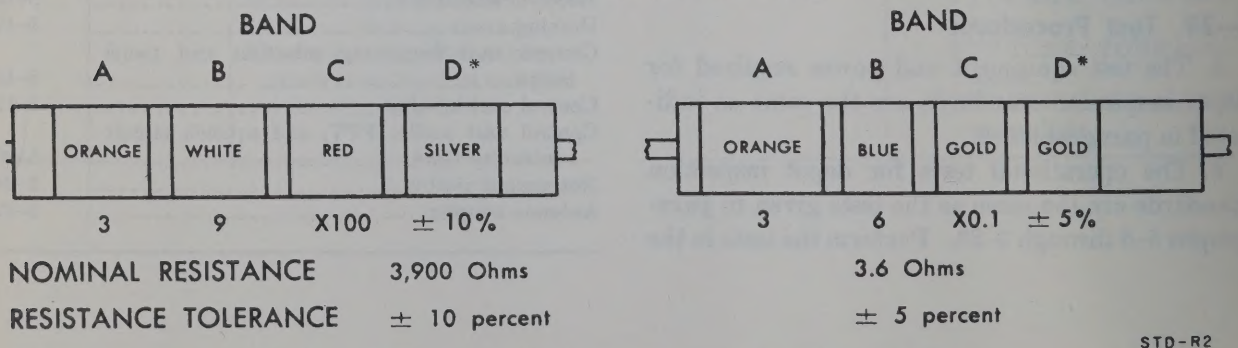


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
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		

EXAMPLES OF COLOR CODING

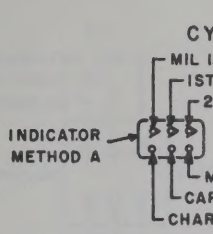


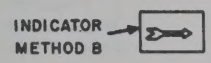
*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

Figure 5–18. Color-code markings for MIL STD resistors.

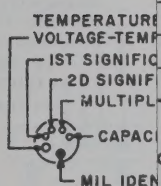
OR MILITARY STANDARD

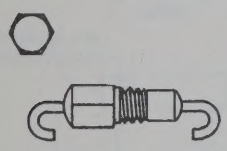
, and CB





GLASS-DIELECTRIC





FEED-THROUGH

ACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
	CY	CB	CM	CM	CM
				−55° to +70°C	10–55 cps
		B			
	C			−55° to +85°C	
		D	300		
				−55° to +125°C	10–2,000 cps
			500		
				−55° to +150°C	

or use with Group III, Temperature Compensating, Style CC

EMPERATURE OEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
				Capacitances over 10uuf	Capacitances 10uuf or less	
0	0	0	1		± 2.0uuf	CC
−30	1	1	10	± 1%		
−80	2	2	100	± 2%	± 0.25uuf	
−150	3	3	1,000			
−220	4	4				
−330	5	5		± 5%	± 0.5uuf	
−470	6	6				
−750	7	7				
	8	8	0.01			
	9	9	0.1	± 10%		
+100					± 1.0uuf	

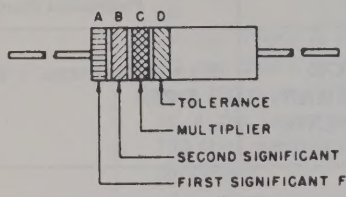
e capacitance in uuf.

MIL–C–11272, and MIL–C–10950 respectively.

5.

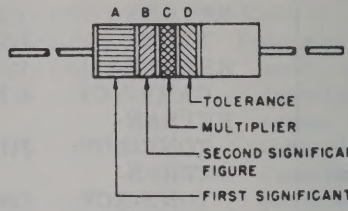
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

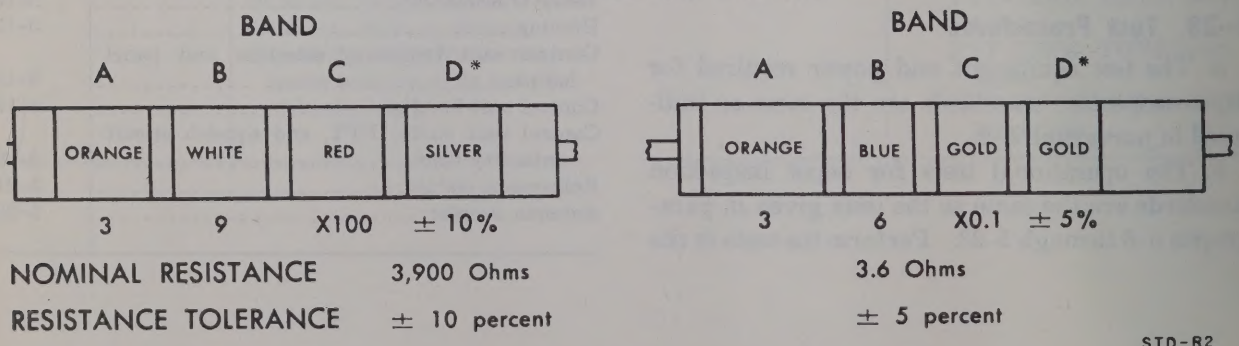


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
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		

EXAMPLES OF COLOR CODING

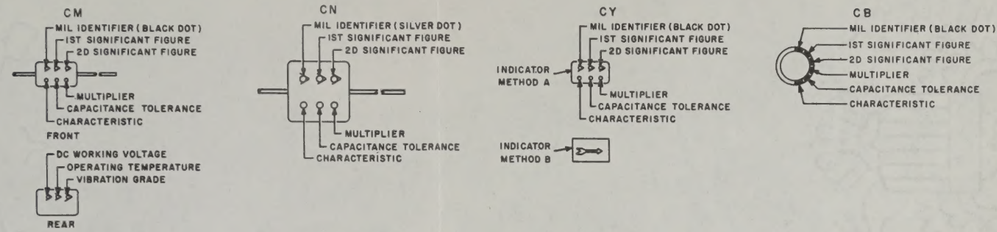


*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

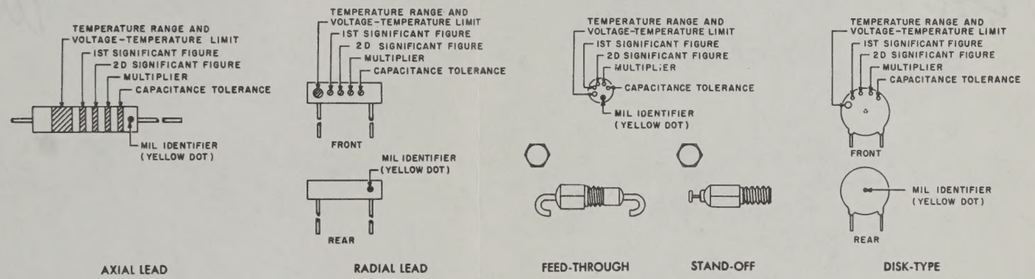
Figure 5-18. Color-code markings for MIL STD resistors.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC

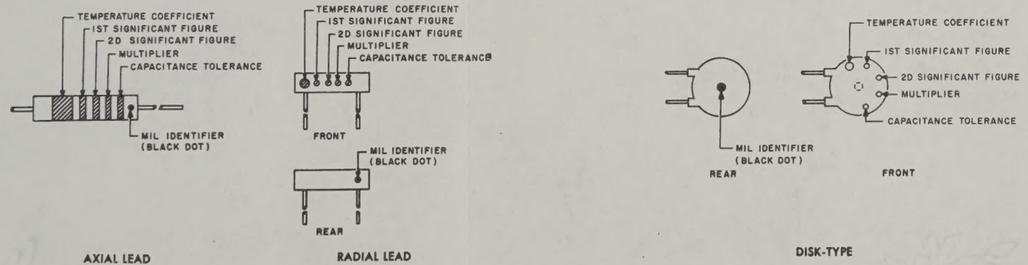


Figure 6-1. Color-code markings for MIL STD capacitors.

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		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 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

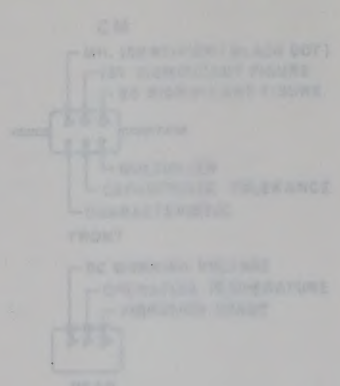
TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

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–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

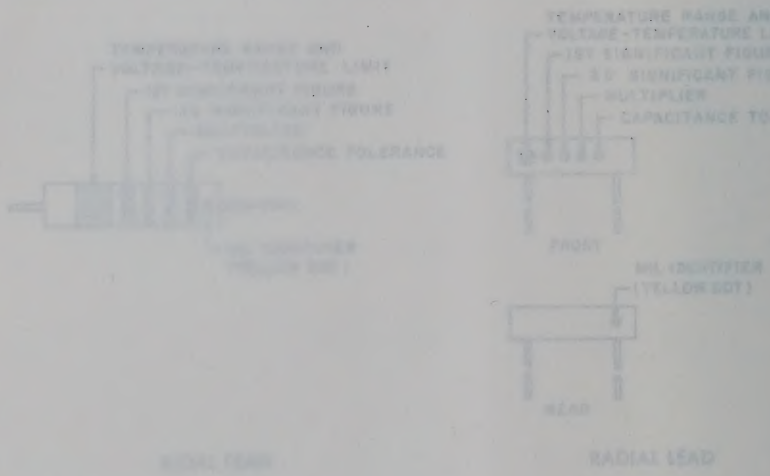
COLOR CODE MARKING FC

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY

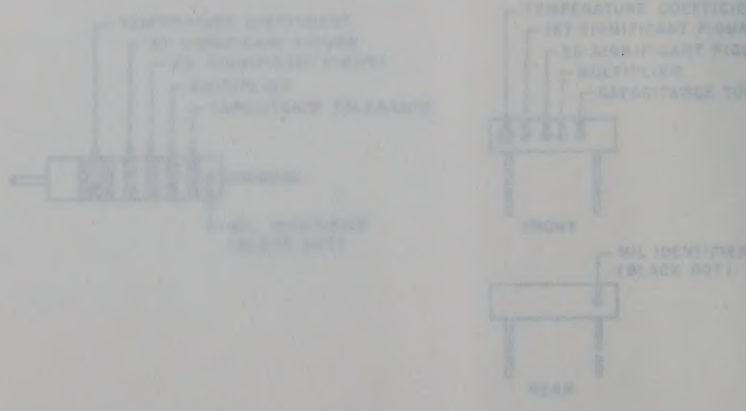


MICA-DIELECTRIC PAPER-DIELECTRIC

GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Sty



GROUP III Capacitors, Fixed, Ceramic Dielectric (Temperature Compe

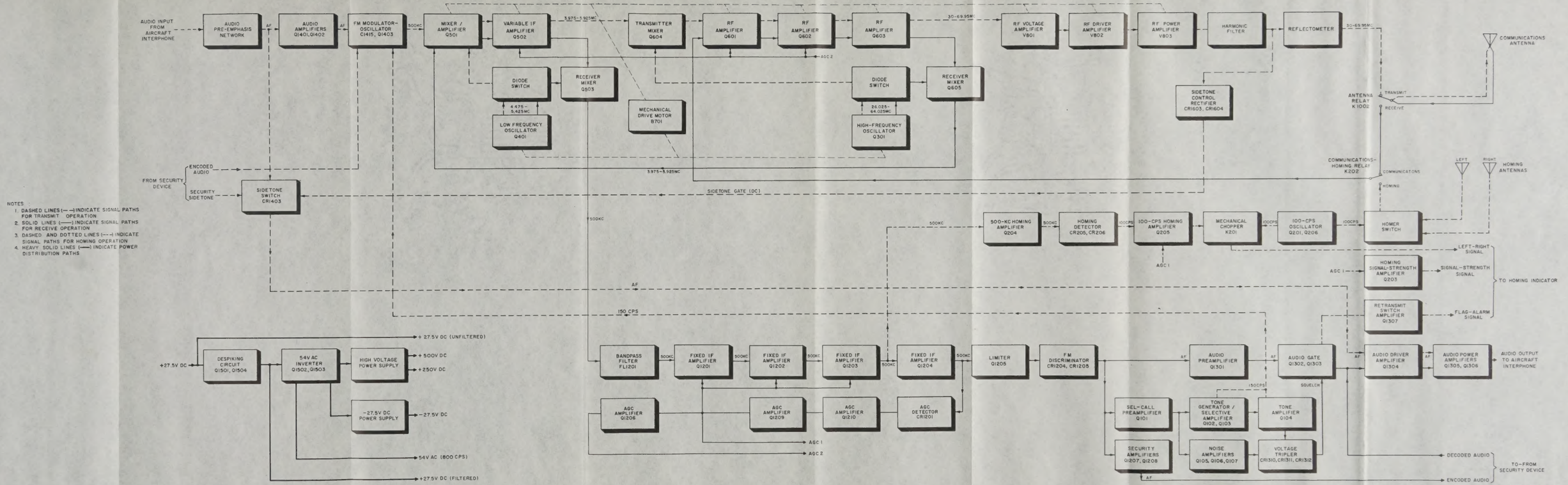


CHAPTER 6

FINAL ILLUSTRATIONS (FOLDOUTS)

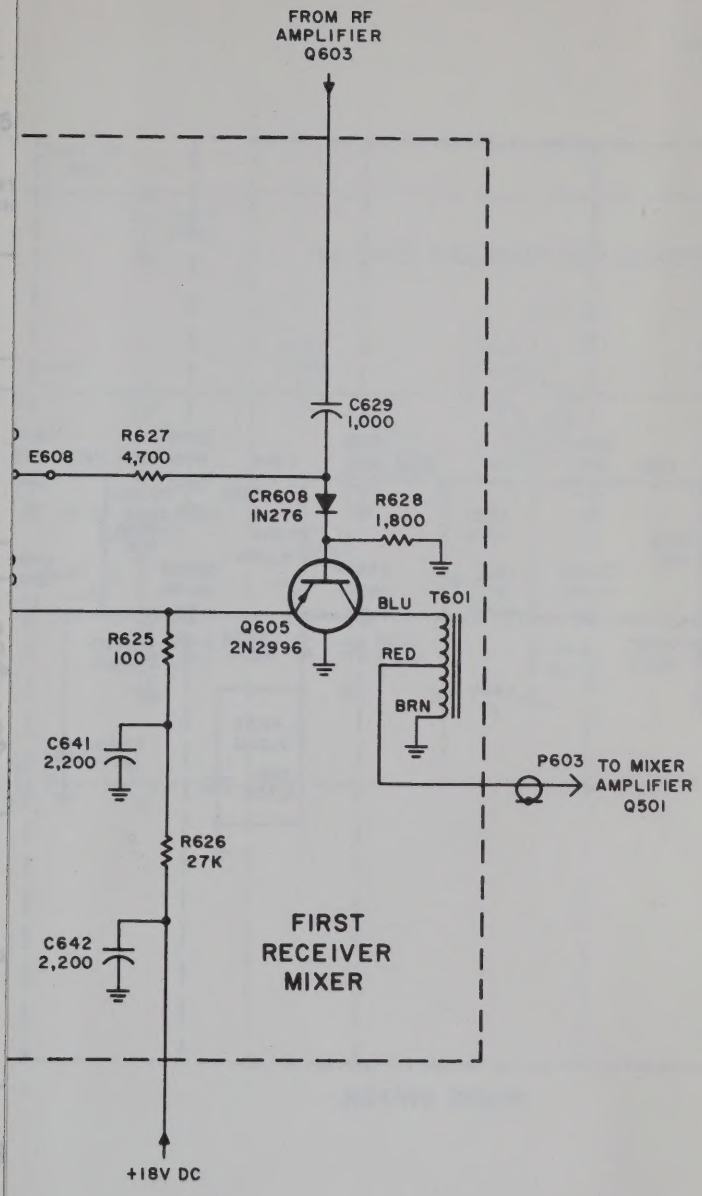
The foldout illustrations located in this chapter are useful in troubleshooting and maintenance of Radio Set AN/ARC-54. These foldout illustrations pertain to the capacitor color-code chart, schematic diagrams of modules, interconnection diagrams, and wiring diagrams. A complete list of foldout illustrations follows.

Fig. No.	*Title*
6-1	Color-code markings for MIL STD capacitors.
6-2	Receiver-Transmitter, Radio RT-348/-ARC-54 block diagram.
6-3	Hfo diode switch and mixer circuits, schematic diagram.
6-4	Push-to-talk circuits, Radio Set AN/-ARC-54.
6-5	Radio Set AN/ARC-54, interconnection wiring diagram.
6-6	Control, Radio Set C-3835/ARC-54, exploded view.
6-7	RF subchassis, exploded view, module removal.
6-8	RF subchassis, wiring diagram.
6-9	Receive audio module, schematic diagram.
6-10	Transmit audio module, schematic diagram.
6-11	Sel-call module, schematic diagram.
6-12	Homer module, schematic diagram.
6-13	Harmonic filter module, schematic diagram.
6-14	Fixed IF module, schematic diagram.
6-15	RF amplifier module, schematic diagram.
6-16	High-frequency oscillator module, schematic diagram.
6-17	Variable IF, module, schematic diagram.
6-18	Receiver-Transmitter, Radio RT-348/-ARC-54, wiring diagram.
6-19	RF amplifier circuits, schematic diagram.
6-20	Mechanical drive circuit schematic diagram.
6-21	Intraunit power distribution and regulation circuits, schematic diagram.
6-22	Control, Radio Set C-3835/ARC-54, schematic diagram.
6-23	Mode control circuits, Radio Set AN/-ARC-54.
6-24	Tuning system, schematic diagram.
6-25	Antenna Coupler CU-942/ARC-54, schematic diagram.
6-26	Antenna Coupler CU-943/ARC-54, schematic diagram.
6-27	Radio Set AN/ARC-54, retransmit system interconnection wiring diagram.
6-28	Antenna Coupler CU-942/ARC-54 (or CU-943/ARC-54), wiring diagram.
6-29	Antenna Coupler CU-942/ARC-54 (or CU-943/ARC-54), exploded view.
6-30	Receiver-Transmitter, Radio RT-348/-ARC-54, main chassis wiring diagram.
6-31	Control, Radio Set C-3835/ARC-54, wiring diagram.



NOTES
1. DASHED LINES (— —) INDICATE SIGNAL PATHS FOR TRANSMIT OPERATION
2. SOLID LINES (——) INDICATE SIGNAL PATHS FOR RECEIVE OPERATION
3. DASHED AND DOTTED LINES (— · —) INDICATE SIGNAL PATHS FOR HOMING OPERATION
4. HEAVY SOLID LINES (▬▬) INDICATE POWER DISTRIBUTION PATHS

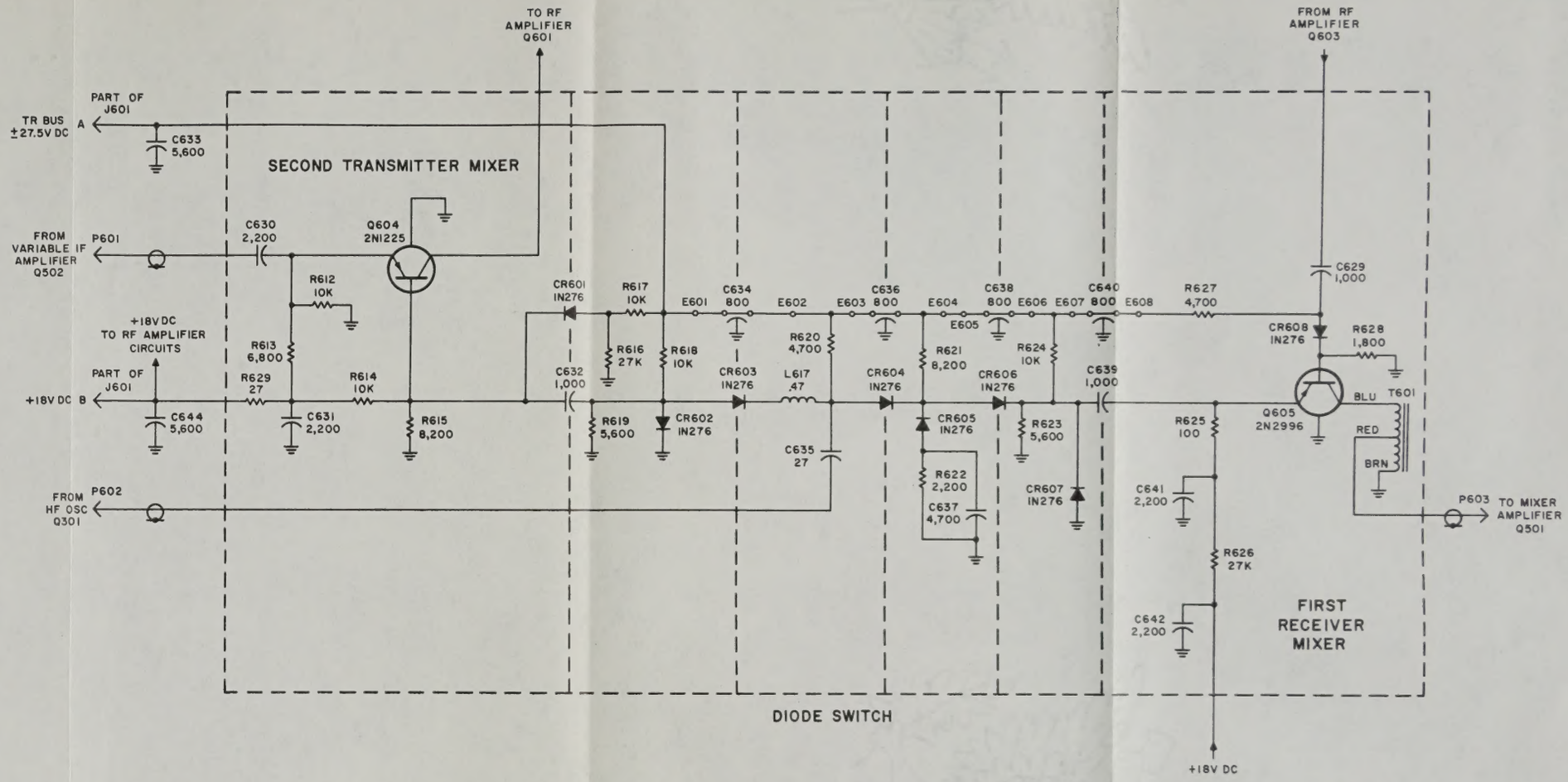
Figure 6-2. Receiver-Transmitter, Radio RT-348/ARC-54, block diagram.



TES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. COMPONENTS WITH E REFERENCE DESIGNATIONS ARE FERRITE BEAD ISOLATORS
3. DASHED LINES INDICATE RF SHIELDING

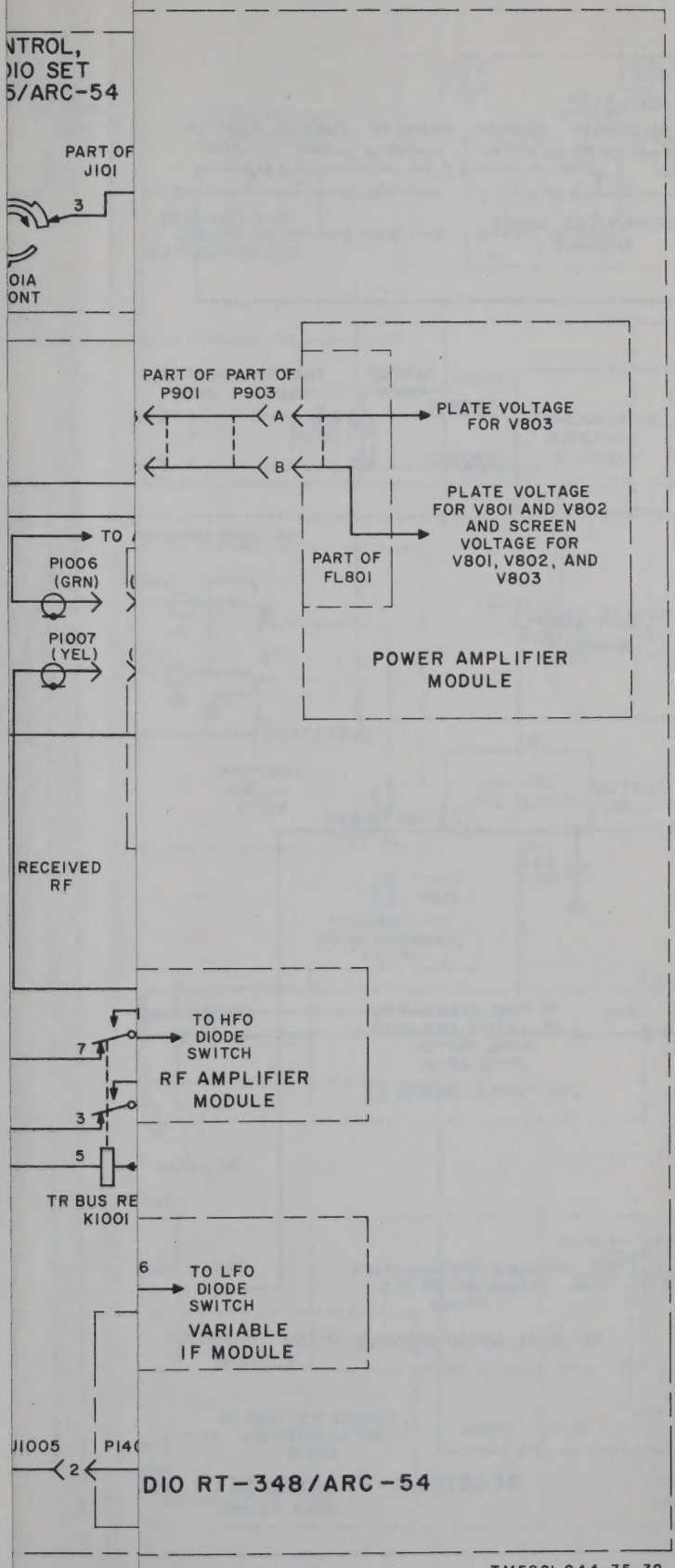
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NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. COMPONENTS WITH E REFERENCE DESIGNATIONS ARE FERRITE BEAD ISOLATORS
3. DASHED LINES INDICATE RF SHIELDING

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Figure 6-3. Hfo diode switch and mixer circuits, schematic diagram.


NTROL,
)IO SET
5/ARC-54
PART OF
J101
3
)IA
ONT
PART OF P901
PART OF P903
A
B
PLATE VOLTAGE FOR V803
PLATE VOLTAGE FOR V801 AND V802 AND SCREEN VOLTAGE FOR V801, V802, AND V803
PART OF FL801
POWER AMPLIFIER MODULE
TO
P1006 (GRN)
P1007 (YEL)
RECEIVED RF
TO HFO DIODE SWITCH
7
RF AMPLIFIER MODULE
3
5
TR BUS RE
K1001
6
TO LFO DIODE SWITCH
VARIABLE IF MODULE
J1005
P14(
2
DIO RT-348/ARC-54
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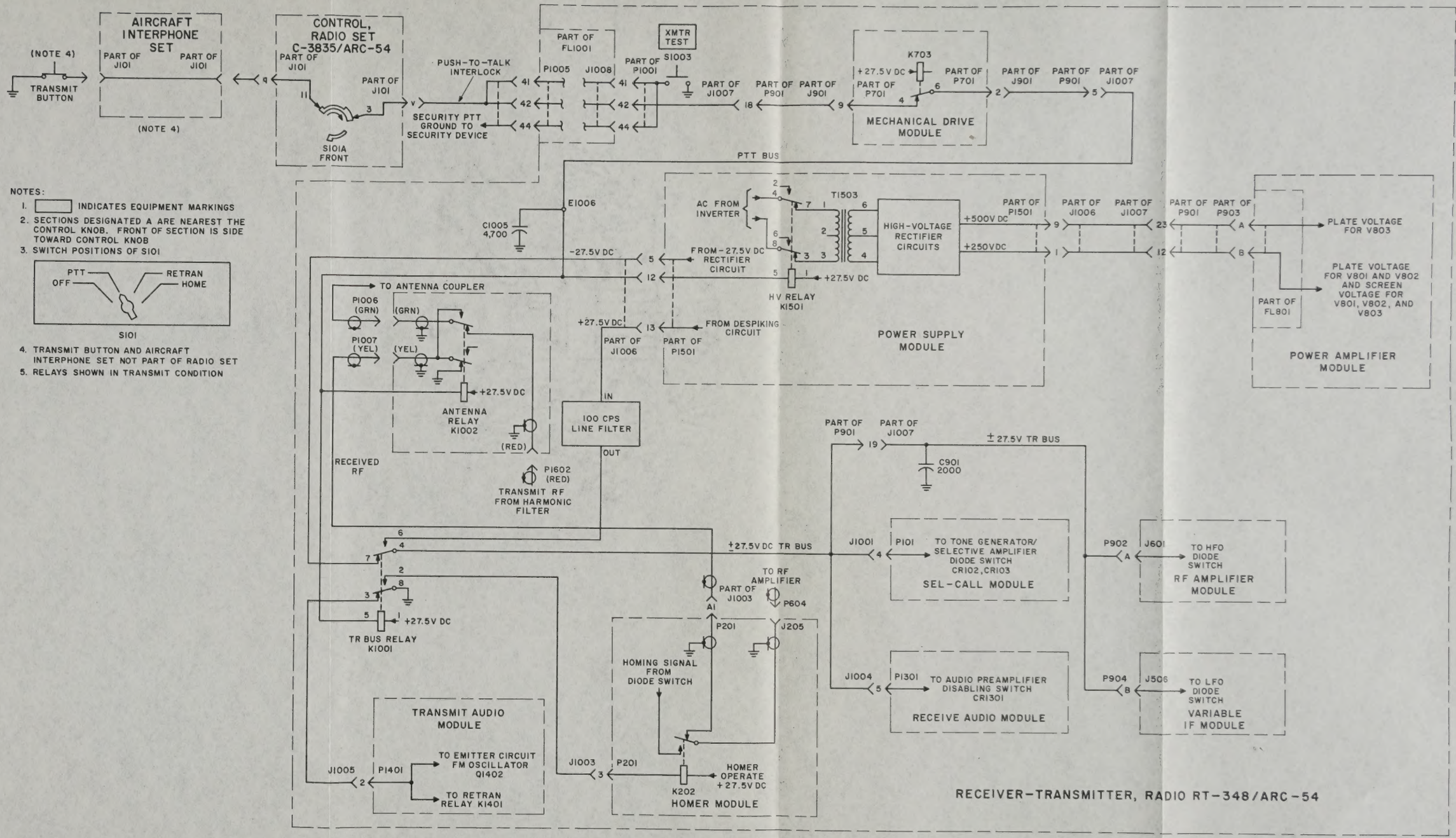
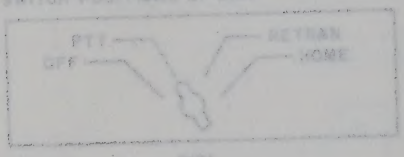


Figure 6-4. Push-to-talk circuits, functional schematic diagram.



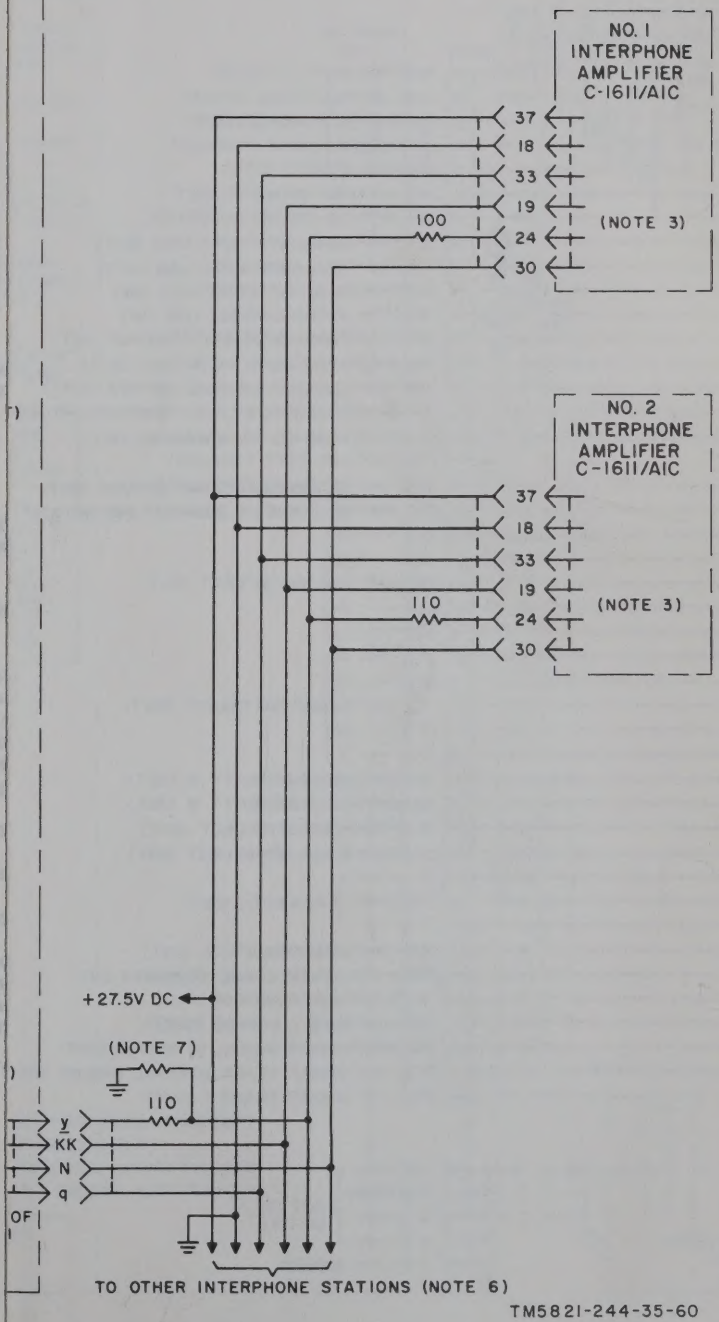
NOTES:

1. [ ] INDICATES EQUIPMENT MARKINGS
2. SECTIONS DESIGNATED A ARE NEAREST THE CONTROL KNOB. FRONT OF SECTION IS SIDE TOWARD CONTROL KNOB.
3. SWITCH POSITIONS OF S101



S101

4. TRANSMIT BUTTON AND AIRCRAFT INTERPHONE SET NOT PART OF RADIO SET
5. RELAYS SHOWN IN TRANSMIT CONDITION

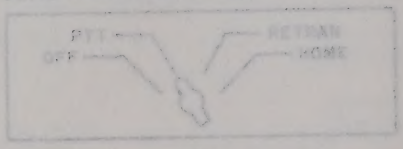


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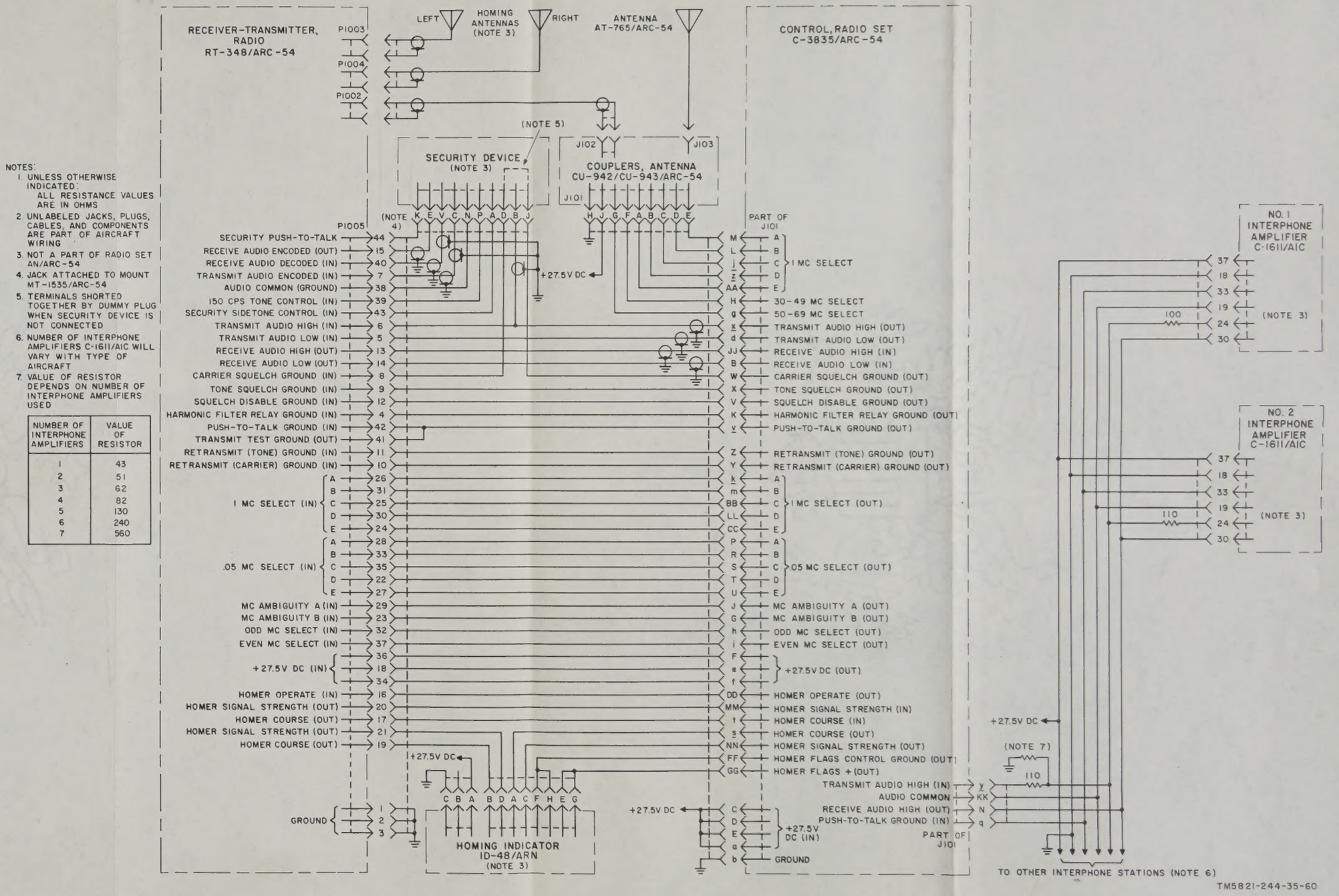
NOTES:

1. [ ] INDICATES EQUIPMENT MARKINGS
2. SECTIONS DESIGNATED A ARE NEAREST THE CONTROL KNOB. FRONT OF SECTION IS SIDE TOWARD CONTROL KNOB
3. SWITCH POSITIONS OF S101



S101

4. TRANSMIT BUTTON AND AIRCRAFT INTERPHONE SET NOT PART OF RADIO SET
5. RELAYS SHOWN IN TRANSMIT CONDITION



NOTES:

1. UNLESS OTHERWISE INDICATED: ALL RESISTANCE VALUES ARE IN OHMS
2. UNLABELED JACKS, PLUGS, CABLES, AND COMPONENTS ARE PART OF AIRCRAFT WIRING
3. NOT A PART OF RADIO SET AN/ARC-54
4. JACK ATTACHED TO MOUNT MT-1535/ARC-54
5. TERMINALS SHORTED TOGETHER BY DUMMY PLUG WHEN SECURITY DEVICE IS NOT CONNECTED
6. NUMBER OF INTERPHONE AMPLIFIERS C-1611/AIC WILL VARY WITH TYPE OF AIRCRAFT
7. VALUE OF RESISTOR DEPENDS ON NUMBER OF INTERPHONE AMPLIFIERS USED

NUMBER OF INTERPHONE AMPLIFIERS	VALUE OF RESISTOR
1	43
2	51
3	62
4	82
5	130
6	240
7	560

Figure 6-5. Radio Set AN/ARC-54, interconnection wiring diagram.

NOTES:

1. UNLESS OTHERWISE INDICATED ALL RESISTANCE ARE IN OHMS
2. UNLABELED JACKS CABLES, AND COMPO ARE PART OF AIRC WIRING
3. NOT A PART OF RA AN/ARC-34
4. [illegible] ATTACHED TO MT-[illegible]/ARC-34
5. TERMINALS SHORTE TOGETHER BY JUM WHEN SECURITY DE NOT CONNECTED
6. NUMBER OF INTERP AMPLIFIERS C-1611/ MAY WITH TYPE AIRCRAFT
7. VALUE OF RESISTO DEPENDS ON NUMB INTERPHONE AMPLI USED

NUMBER OF INTERPHONE AMPLIFIERS	VA RES
1	
2	
3	
4	
5	
6	
7	

r knob
r knob
knob MP112
knob MP112
e knob MP101
er H153
er H153
older, long
older, long
older E101, short
older E102, short
, lampholder
, lampholders
, lampholder
lampholder
incandescent DS103
incandescent DS104
incandescent DS102
incandescent DS101

ated panel
w H160, 6–40 x ⅛-inch
w H160, 6–40 x ⅛-inch
ase XDS102
ase XDS101
nut H156, 6–32
nut H156, 6–32
plate
H171, PFH 4–40 x 5/16-inch
H169, PFH 4–40 x 3/16-inch
stener
nal nut, ⅜-inch
sher, ⅜-inch external teeth
S101, wafer
nal nut, ¼–32
sher, ¼-inch external teeth
e resistor R101, 150 ohms
esistor R104, 12 ohms
esistor R103, 330 ohms
esistor R102, 27K ohms
H171, PFH 4–40 x 5/16-inch
nal nut, ⅜-inch
sher, ⅜-inch internal teeth
nal nut, ⅜-inch
sher, ⅜-inch internal teeth
nal nut, ⅜-inch
sher, ⅜-inch external teeth
S102, wafer
v H161, 4–48 x ⅛-inch
v H280, 4–40 x 3/16-inch
v H280, 4–40 x 3/16-inch
v H280, 4–40 x 3/16-inch

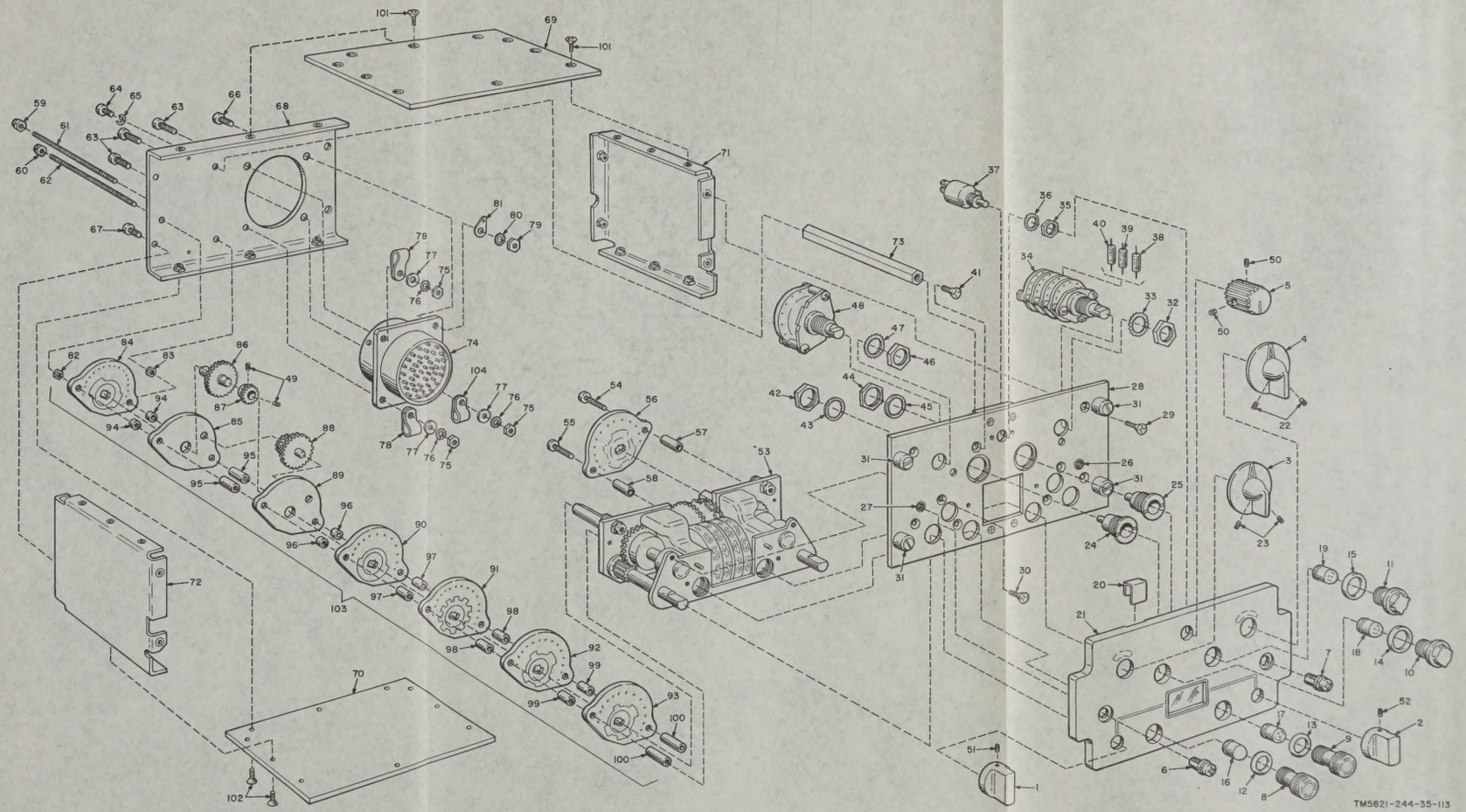
53 Frequency counter
54 Screw H226, PFILH 4–40 x ⅝-inch
55 Screw H226, PFILH 4–40 x ⅝-inch
56 Switch S104, wafer
57 Spacer, No. 4
58 Spacer, No. 4
59 Hexagonal capnut H286
60 Hexagonal capnut H286
61 Stud H132, 4–40 x 2¾-inch
62 Stud H132, 4–40 x 2¾-inch
63 Screw H195, PPH 4–40 x 7/16-inch
64 Screw PPH 4–40 x 5/16-inch
65 Lockwasher H113
66 Screw H188, PPH 4–40 x ⅜-inch
67 Screw, PPH 4–40 x 5/16-inch
68 Rear plate
69 Top cover plate MP106
70 Bottom cover plate MP106
71 Right end plate MP113
72 Left end plate MP114
73 Long post, hexagonal
74 Connector J101
75 Hexagonal nut H139 4–40
76 Lockwasher No. 4, external teeth
77 Flat washer H102
78 Cable clamp H291
79 Hexagonal nut H139 4–40
80 Lockwasher No. 4, external teeth
81 Terminal lug
82 Hexagonal nut H142 4–40
83 Hexagonal nut H142 4–40
84 Switch wafer S103E
85 Gear plate
86 Pressed megacycle gearshaft
87 Megacycle switch gear MP104
88 Pressed idler gearshaft
89 Gear plate
90 Switch wafer S103D
91 Switch wafer S103C
92 Switch wafer S103B
93 Switch wafer S103A
94 Switch spacer No. 1
95 Switch spacer No. 3
96 Switch spacer No. 1
97 Switch spacer No. 2
98 Switch spacer No. 2
99 Switch spacer No. 2
100 Switch spacer No. 4
101 Screw H170, PFH 4–40 x ¼-inch
102 Screw H170, PFH 4–40 x ¼-inch
103 Wafer switch S103
104 Cable clamp H292

Figure 6–6. Control, Radio Set C–3835/ARC–54, exploded view.

NOTES:

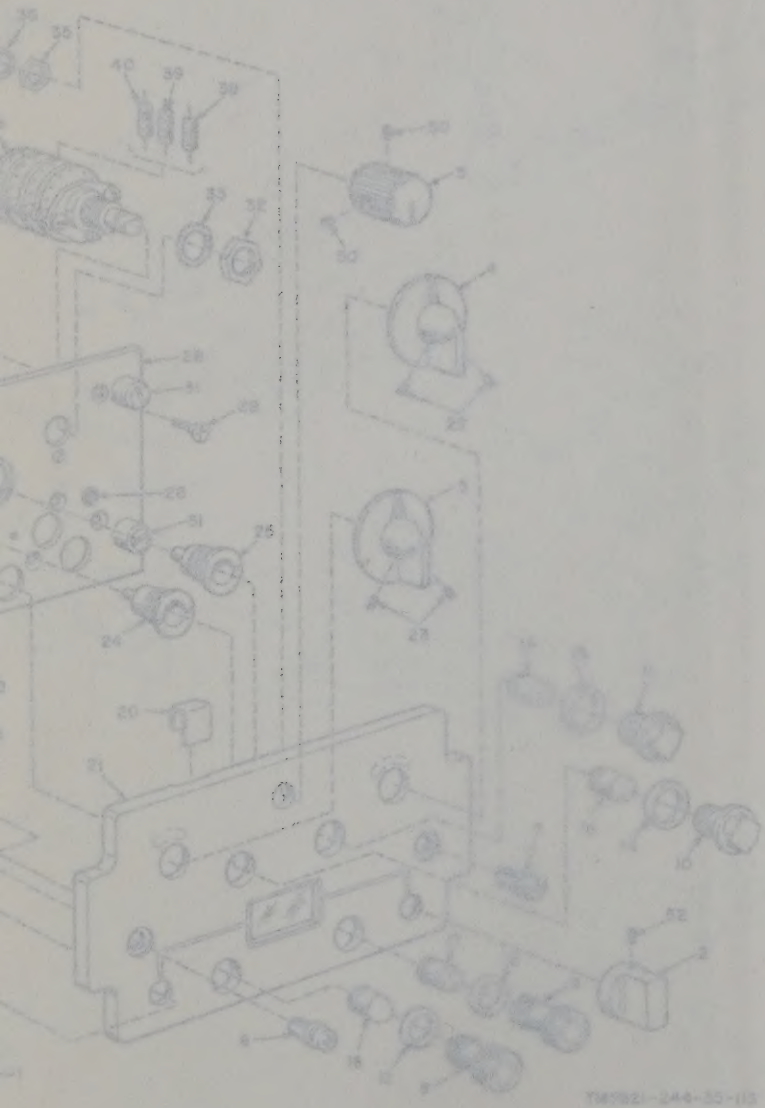
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE ARE IN OHMS
2. UNLABELED JACKS, CABLES, AND COMP ARE PART OF AIRC WIRING
3. NOT A PART OF RA AN/ARC-54
4. JACK ATTACHED TO MT-1295/ARC-54
5. TERMINALS SHORTE TOGETHER BY JUM WHEN SECURITY DE NOT CONNECTED
6. NUMBER OF INTERP AMPLIFIERS C-811/A MAY BE WITH TYPE AIRCRAFT
7. VALUE OF RESISTO DEPENDS ON NUMB INTERPHONE AMPL USED

NUMBER OF INTERPHONE AMPLIFIERS	VA
1	
2	
3	
4	
5	
6	
7	

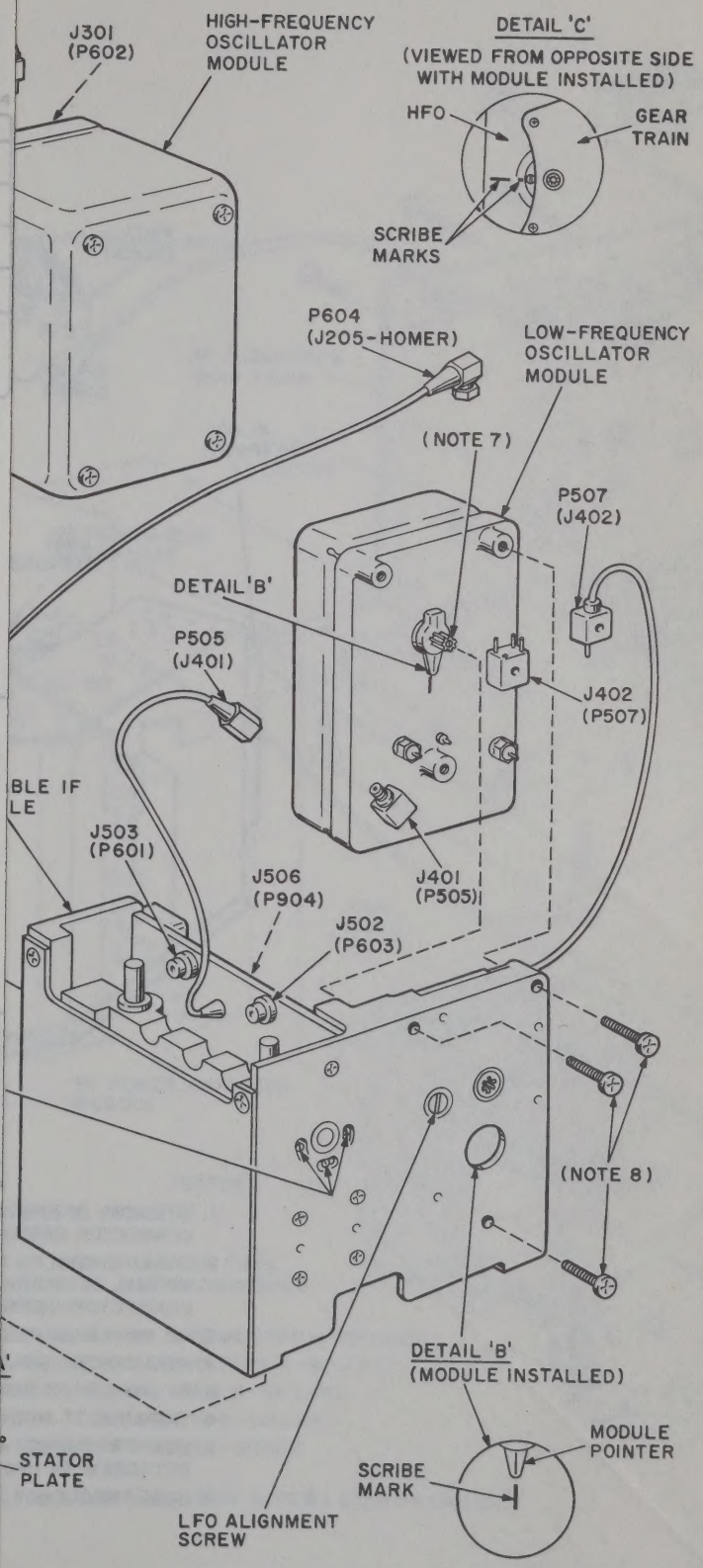


1 Counter knob
2 Counter knob
3 Switch knob MP112
4 Switch knob MP112
5 Volume knob MP101
6 Fastener H153
7 Fastener H153
8 Lampholder, long
9 Lampholder, long
10 Lampholder E101, short
11 Lampholder E102, short
12 Gasket, lampholder
13 Gasket, lampholders
14 Gasket, lampholder
15 Gasket, lampholder
16 Lamp, incandescent DS103
17 Lamp, incandescent DS104
18 Lamp, incandescent DS102
19 Lamp, incandescent DS101
20 Clip
21 Illuminated panel
22 Setscrew H160, 6-40 x 1/8-inch
23 Setscrew H160, 6-40 x 1/8-inch
24 Lamp base XDS102
25 Lamp base XDS101
26 Clinch nut H156, 6-32
27 Clinch nut H156, 6-32
28 Staked plate
29 Screw H171, PFH 4-40 x 5/16-inch
30 Screw H169, PFH 4-40 x 3/16-inch
31 Dzus fastener
32 Hexagonal nut, 3/8-inch
33 Lockwasher, 3/8-inch external teeth
34 Switch S101, wafer
35 Hexagonal nut, 1/4-32
36 Lockwasher, 1/4-inch external teeth
37 Variable resistor R101, 150 ohms
38 Fixed resistor R104, 12 ohms
39 Fixed resistor R103, 330 ohms
40 Fixed resistor R102, 27K ohms
41 Screw H171, PFH 4-40 x 5/16-inch
42 Hexagonal nut, 3/8-inch
43 Lockwasher, 3/8-inch internal teeth
44 Hexagonal nut, 3/8-inch
45 Lockwasher, 3/8-inch internal teeth
46 Hexagonal nut, 3/8-inch
47 Lockwasher, 3/8-inch external teeth
48 Switch S102, wafer
49 Setscrew H161, 4-48 x 1/8-inch
50 Setscrew H280, 4-40 x 3/16-inch
51 Setscrew H280, 4-40 x 3/16-inch
52 Setscrew H280, 4-40 x 3/16-inch
53 Frequency counter
54 Screw H226, PFILH 4-40 x 5/8-inch
55 Screw H226, PFILH 4-40 x 3/8-inch
56 Switch S104, wafer
57 Spacer, No. 4
58 Spacer, No. 4
59 Hexagonal capnut H286
60 Hexagonal capnut H286
61 Stud H132, 4-40 x 2 3/4-inch
62 Stud H132, 4-40 x 2 3/4-inch
63 Screw H195, PPH 4-40 x 7/16-inch
64 Screw PPH 4-40 x 5/16-inch
65 Lockwasher H113
66 Screw H188, PPH 4-40 x 3/8-inch
67 Screw, PPH 4-40 x 5/16-inch
68 Rear plate
69 Top cover plate MP106
70 Bottom cover plate MP106
71 Right end plate MP113
72 Left end plate MP114
73 Long post, hexagonal
74 Connector J101
75 Hexagonal nut H139 4-40
76 Lockwasher No. 4, external teeth
77 Flat washer H102
78 Cable clamp H291
79 Hexagonal nut H139 4-40
80 Lockwasher No. 4, external teeth
81 Terminal lug
82 Hexagonal nut H142 4-40
83 Hexagonal nut H142 4-40
84 Switch wafer S103E
85 Gear plate
86 Pressed megacycle gearshaft
87 Megacycle switch gear MP104
88 Pressed idler gearshaft
89 Gear plate
90 Switch wafer S103D
91 Switch wafer S103C
92 Switch wafer S103B
93 Switch wafer S103A
94 Switch spacer No. 1
95 Switch spacer No. 3
96 Switch spacer No. 1
97 Switch spacer No. 2
98 Switch spacer No. 2
99 Switch spacer No. 2
100 Switch spacer No. 4
101 Screw H170, PFH 4-40 x 1/4-inch
102 Screw H170, PFH 4-40 x 1/4-inch
103 Wafer switch S103
104 Cable clamp H292

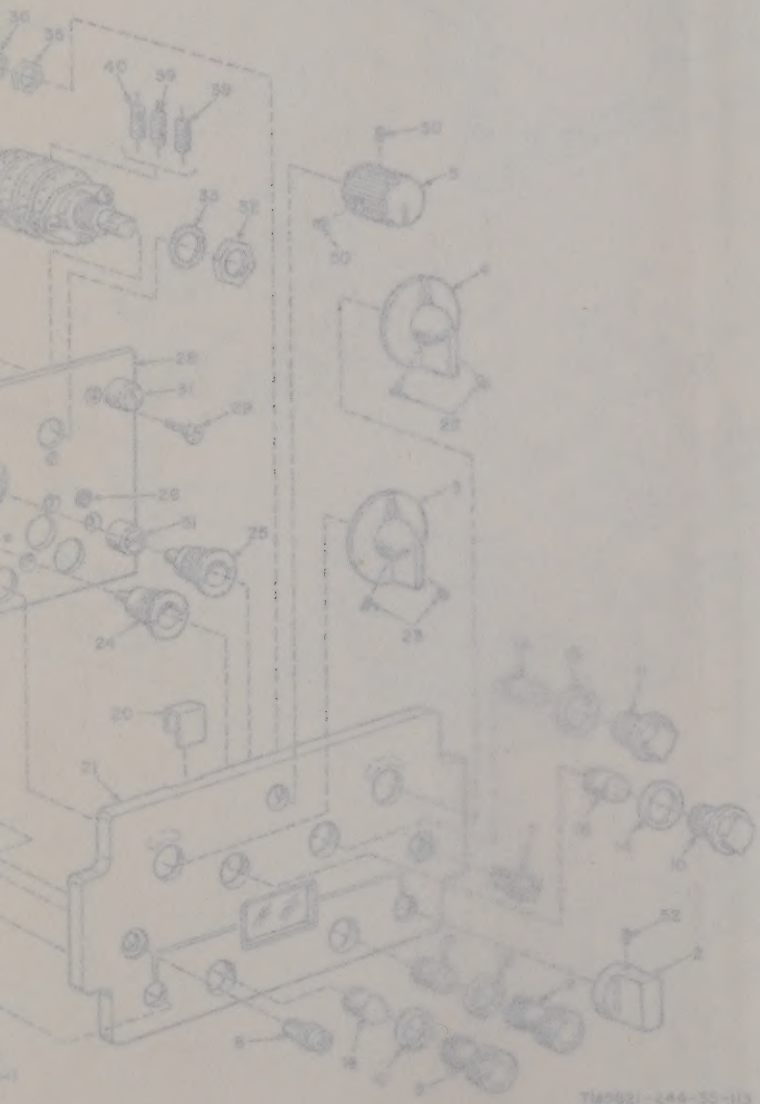
Figure 6-6. Control, Radio Set C-3835/ARC-54, exploded view.



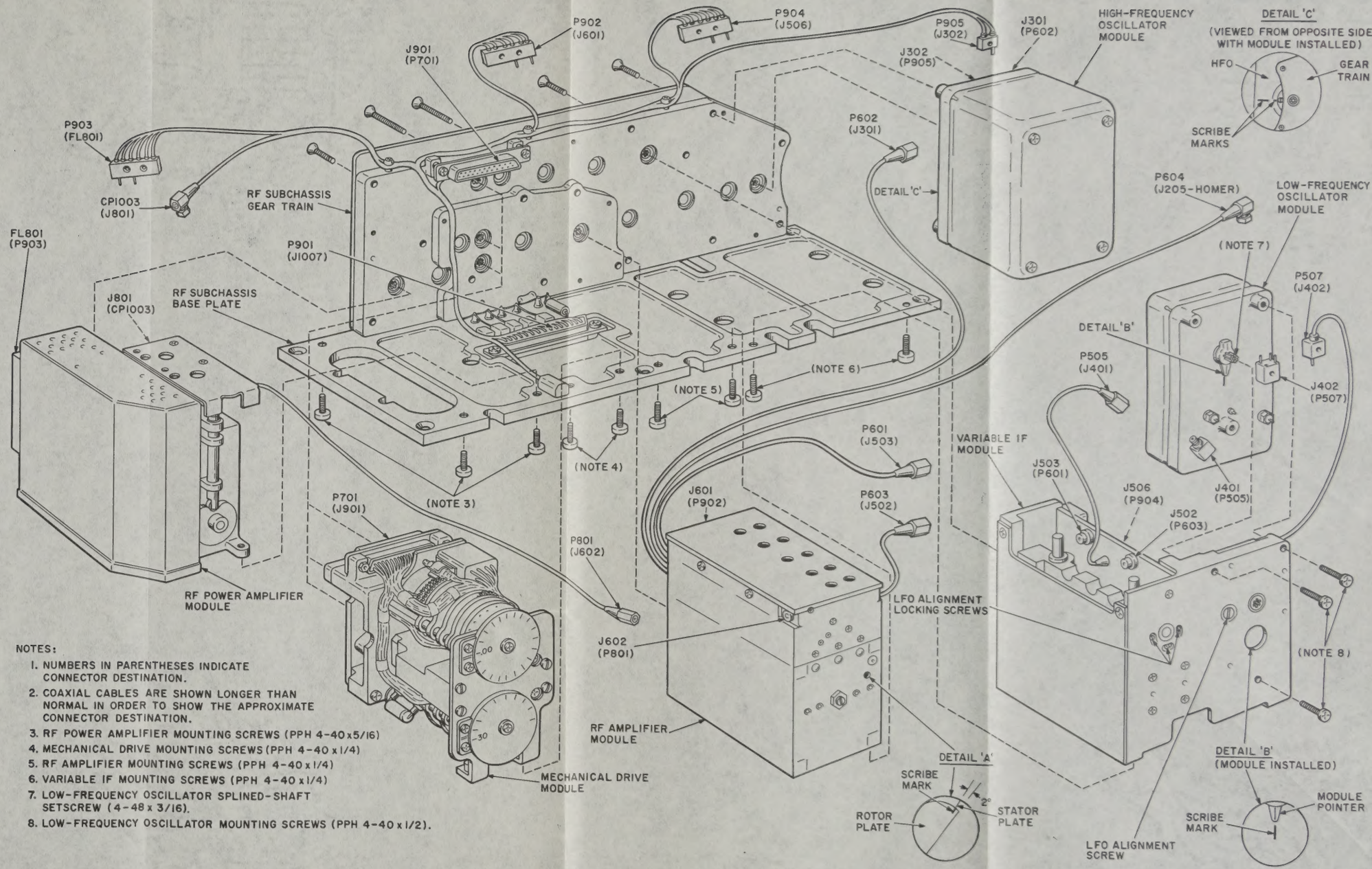
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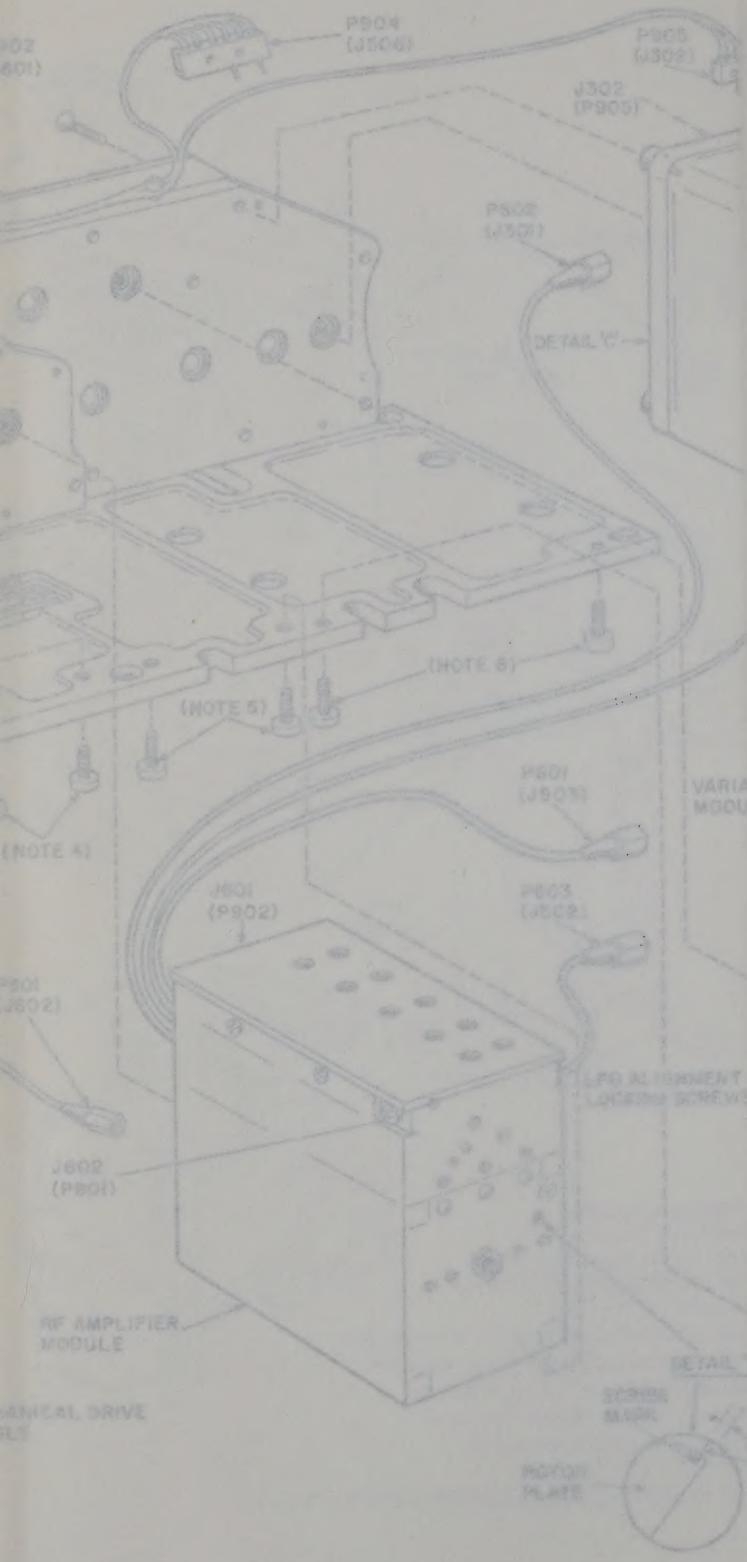
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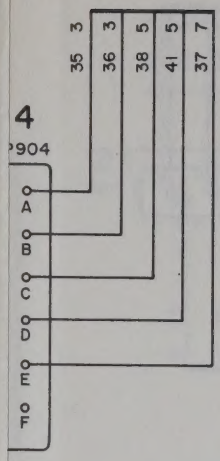
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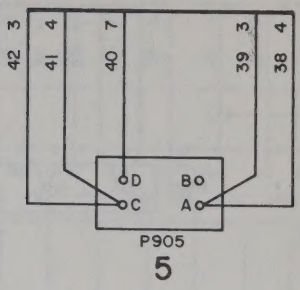
1. NUMBERS IN PARENTHESES INDICATE CONNECTOR DESTINATION.
2. COAXIAL CABLES ARE SHOWN LONGER THAN NORMAL IN ORDER TO SHOW THE APPROXIMATE CONNECTOR DESTINATION.
3. RF POWER AMPLIFIER MOUNTING SCREWS (PPH 4-40 x 5/16)
4. MECHANICAL DRIVE MOUNTING SCREWS (PPH 4-40 x 1/4)
5. RF AMPLIFIER MOUNTING SCREWS (PPH 4-40 x 1/4)
6. VARIABLE IF MOUNTING SCREWS (PPH 4-40 x 1/4)
7. LOW-FREQUENCY OSCILLATOR SPLINED-SHAFT SETSCREW (4-48 x 3/16).
8. LOW-FREQUENCY OSCILLATOR MOUNTING SCREWS (PPH 4-40 x 1/2).

Figure 6-7. Rf subchassis exploded view, module removal.



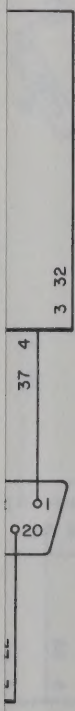
Rf subchassis exploded view, module removal.



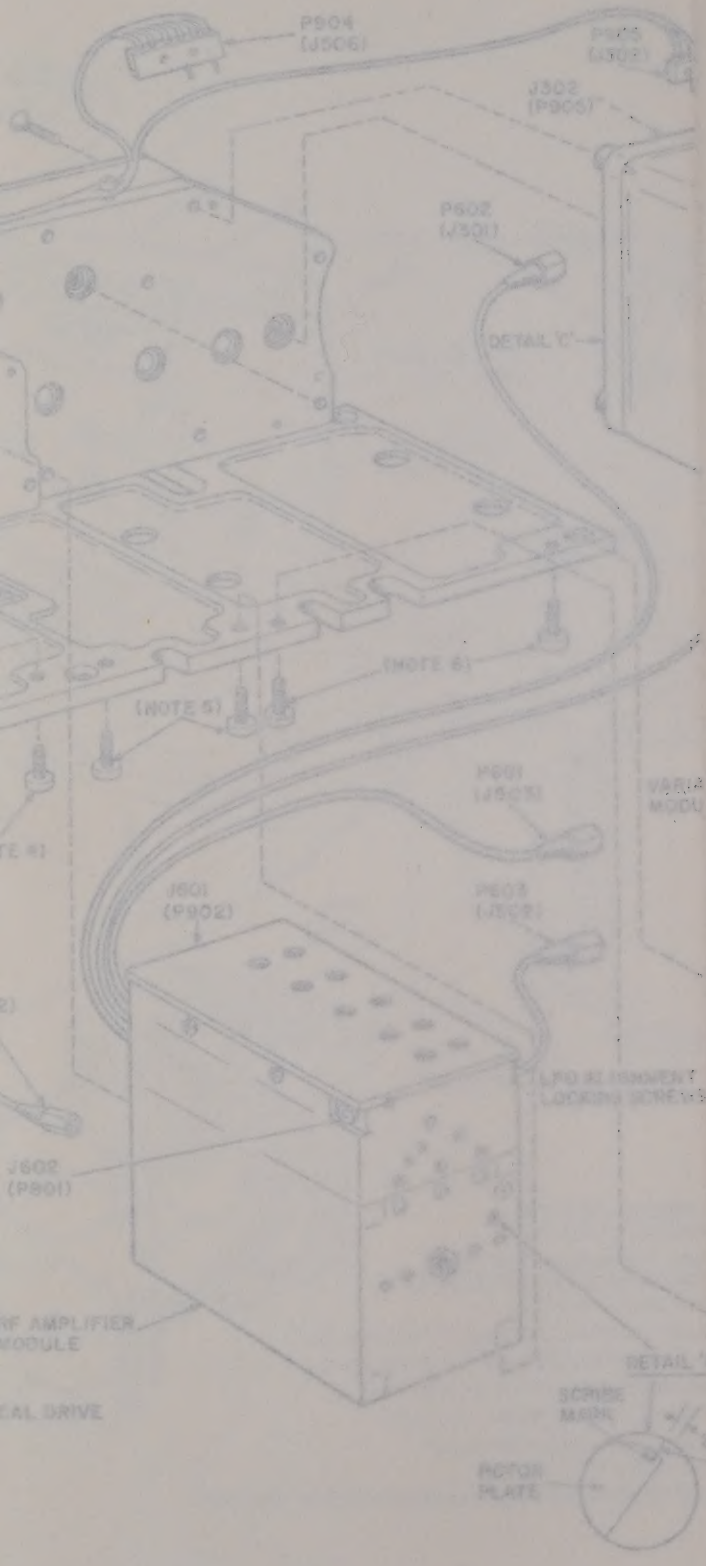


NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER, ADJACENT TO THE STATION TO WHICH THE WIRE RUNS
2. ⊂⊃— DENOTES SHIELDED CONNECTION



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...f switchassis exploded view, module removal.

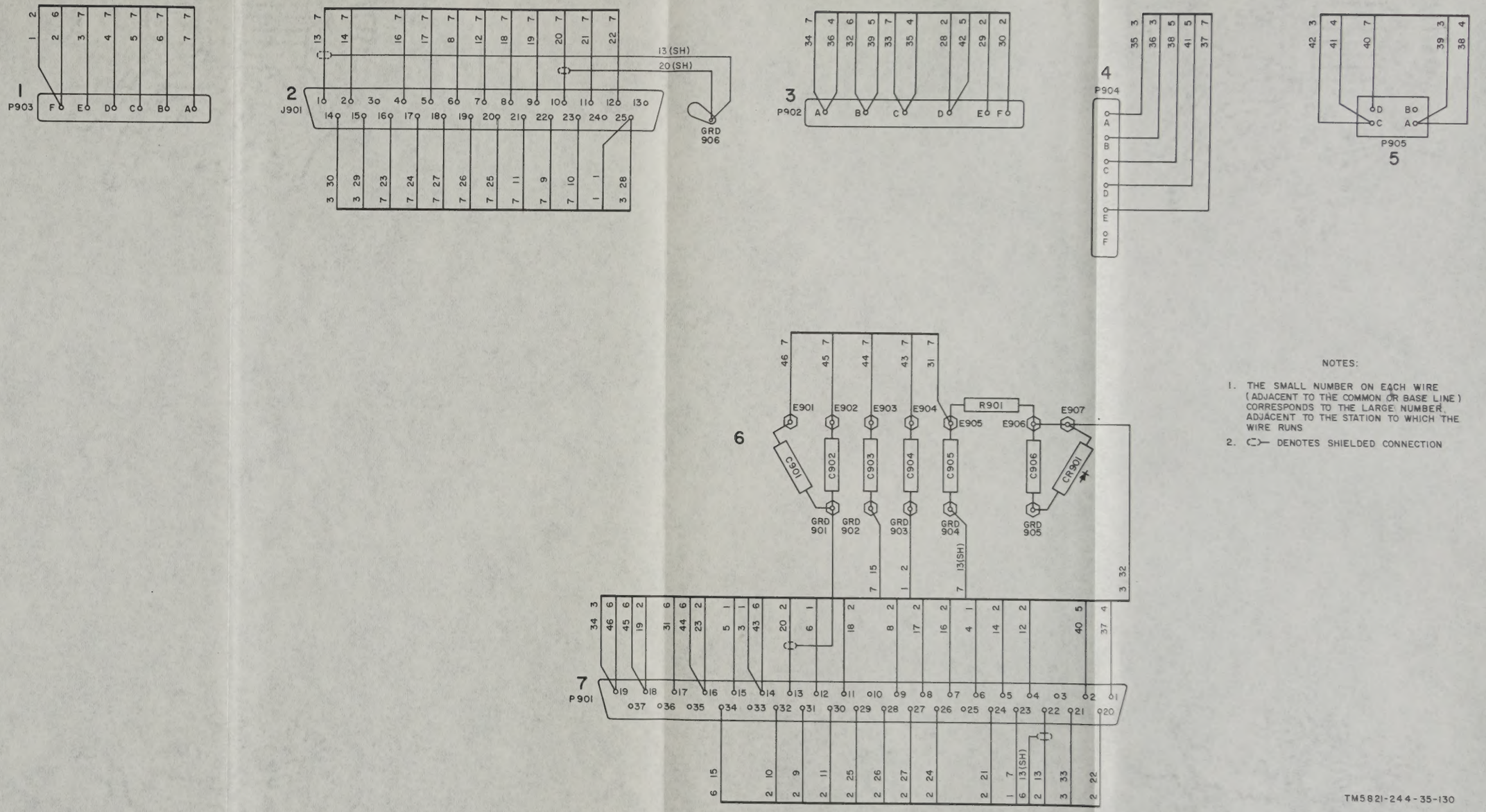
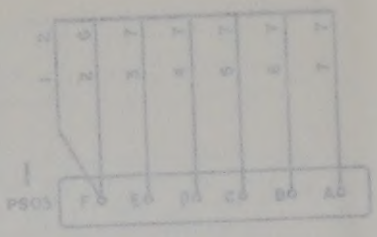


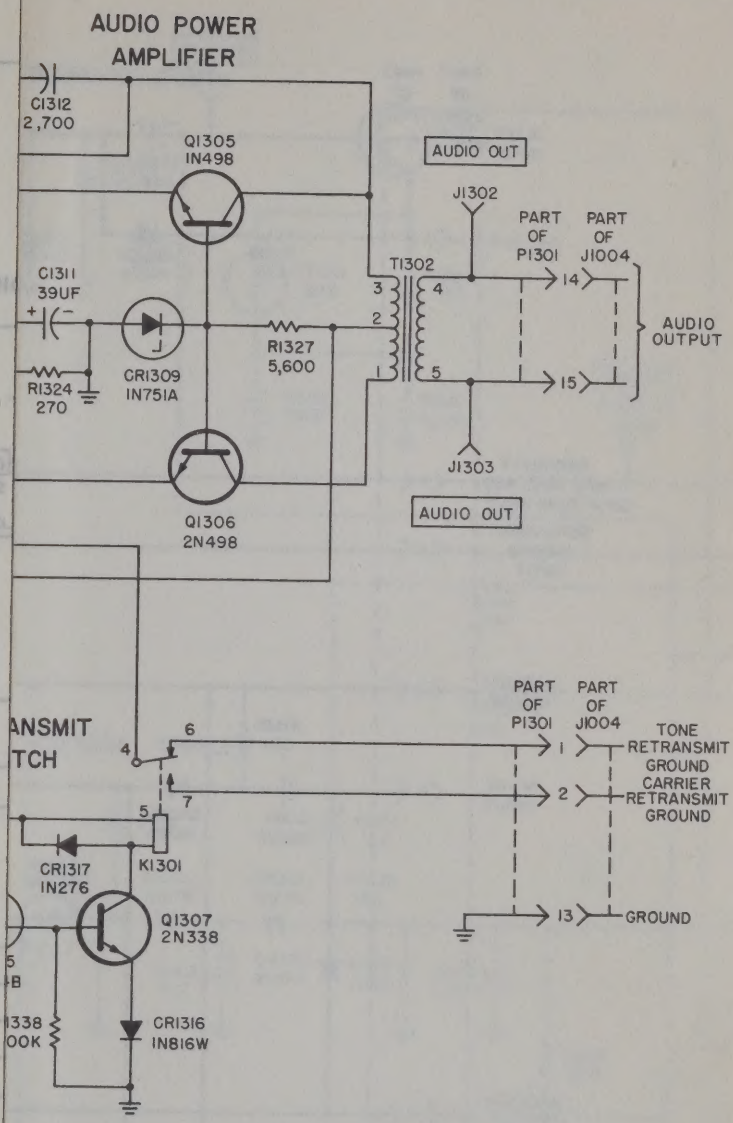
Figure 6–8. Rf subchassis wiring diagram.

NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS
2. ⊂⊃— DENOTES SHIELDED CONNECTION

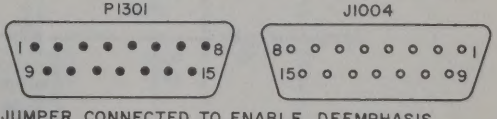
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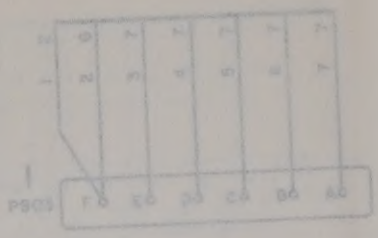
NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. [ ] INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



4. JUMPER CONNECTED TO ENABLE DEEMPHASIS

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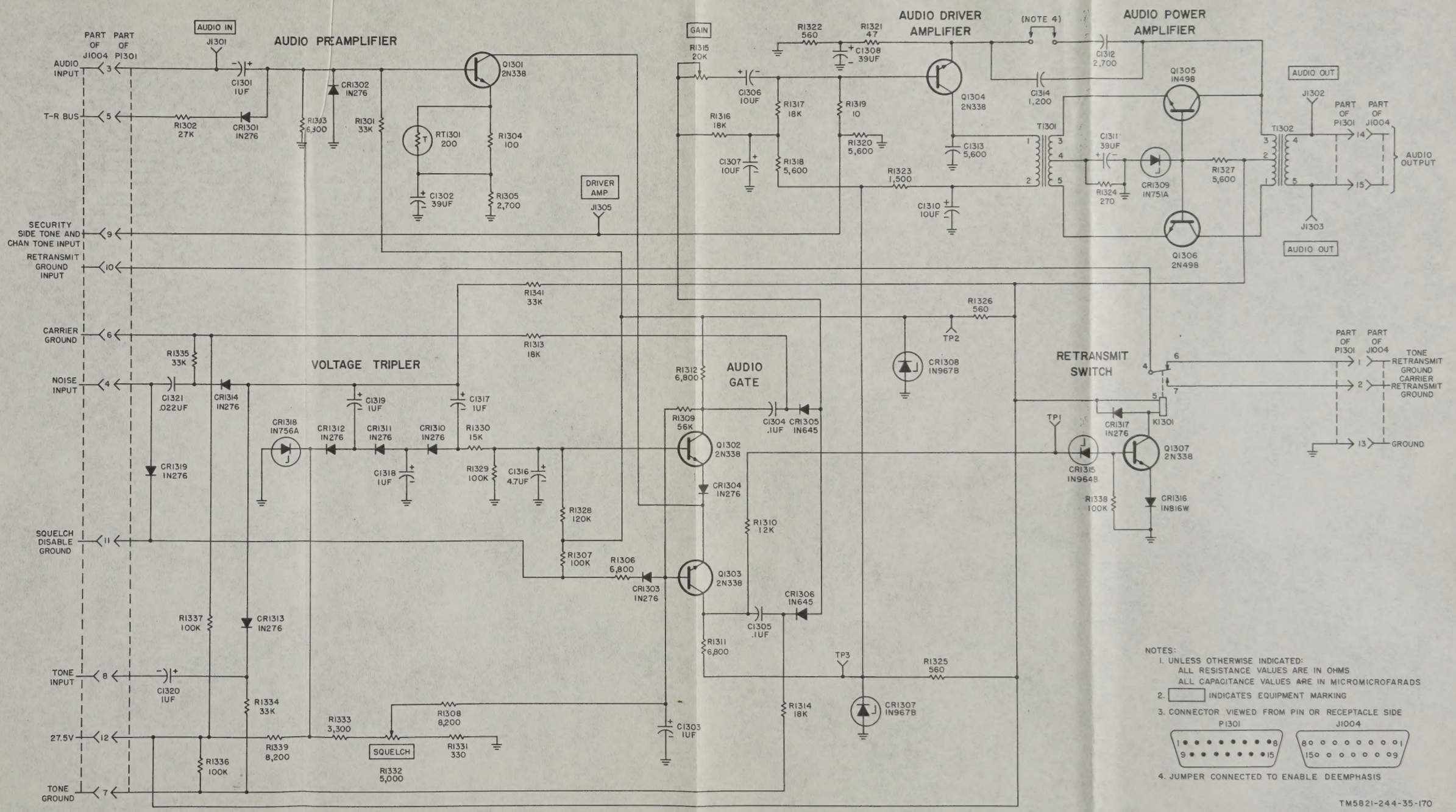
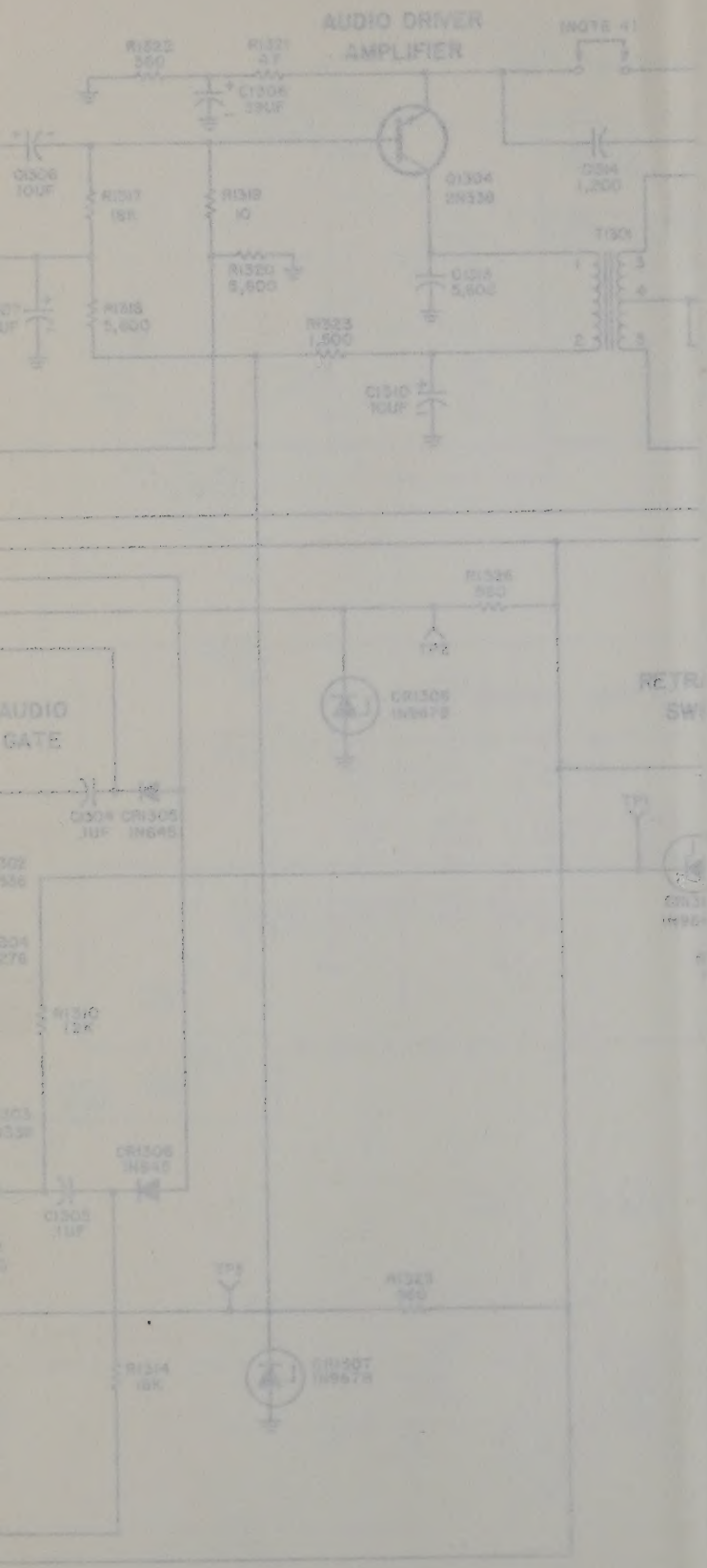
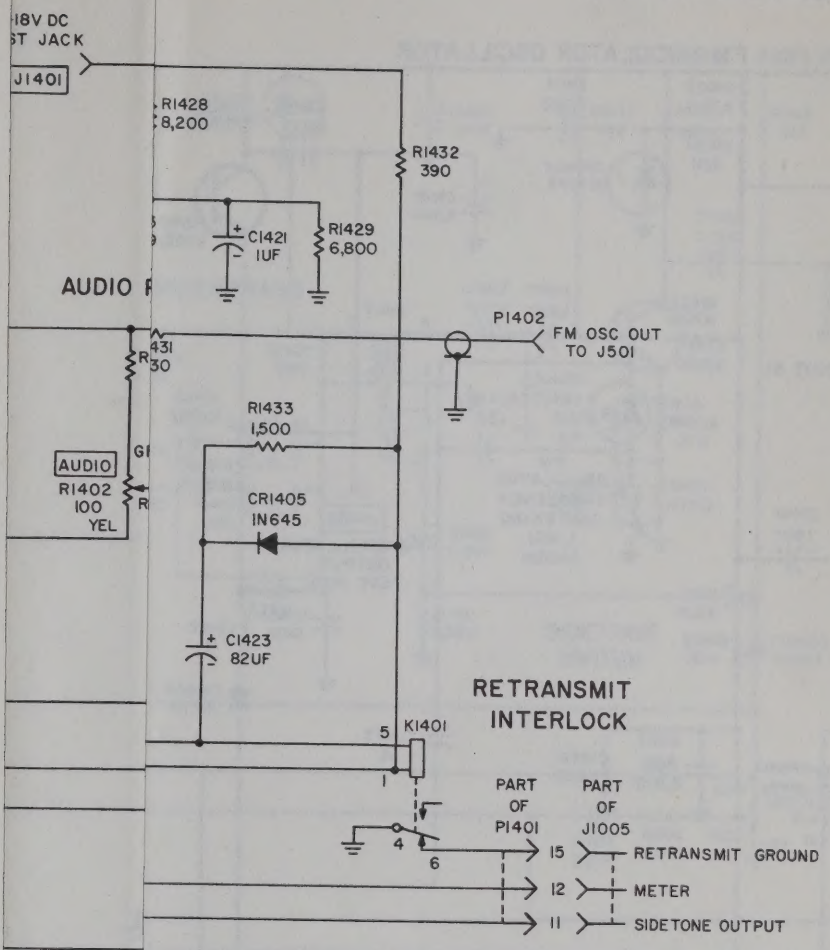


Figure 6-9. Receive audio module, schematic diagram.

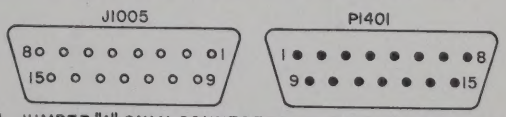


module, schematic diagram.



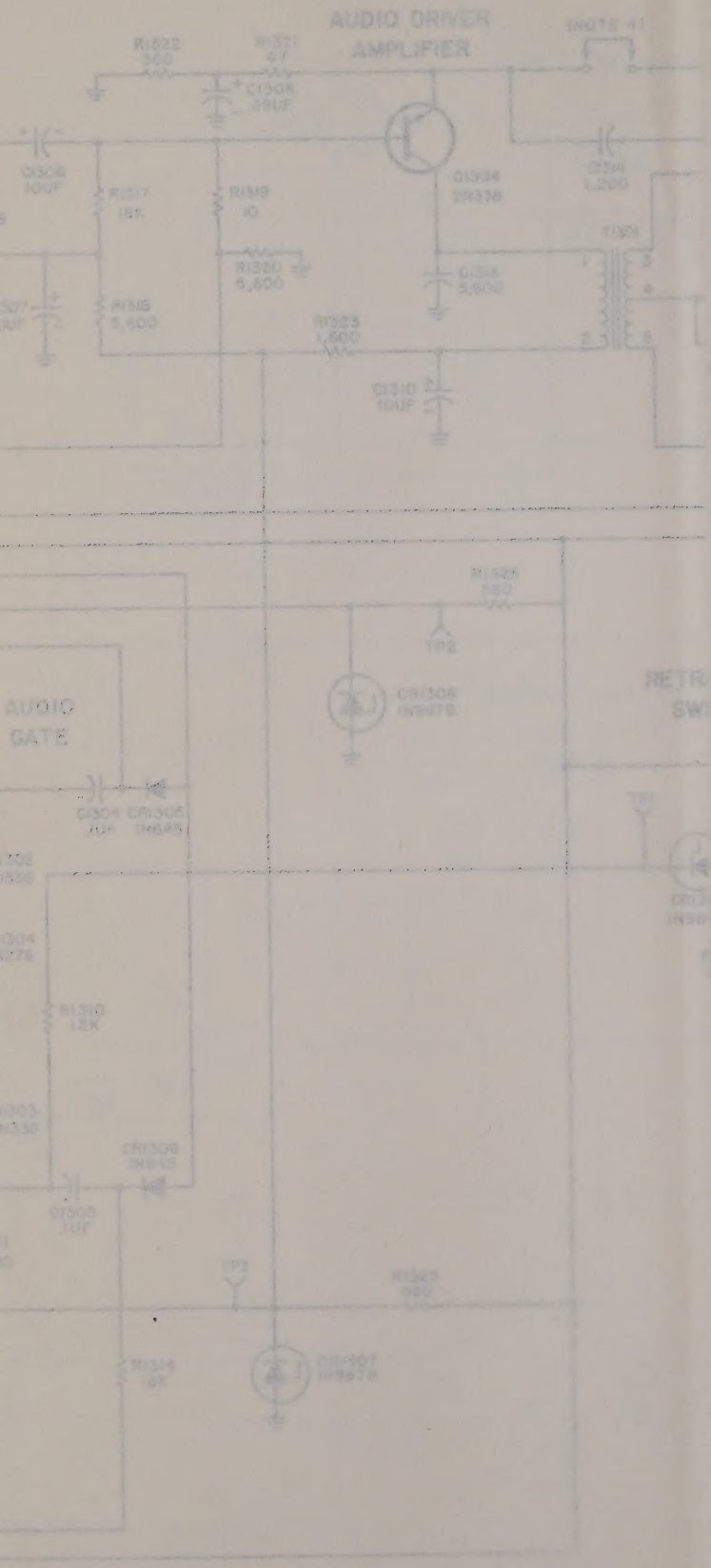
NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. [ ] INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE

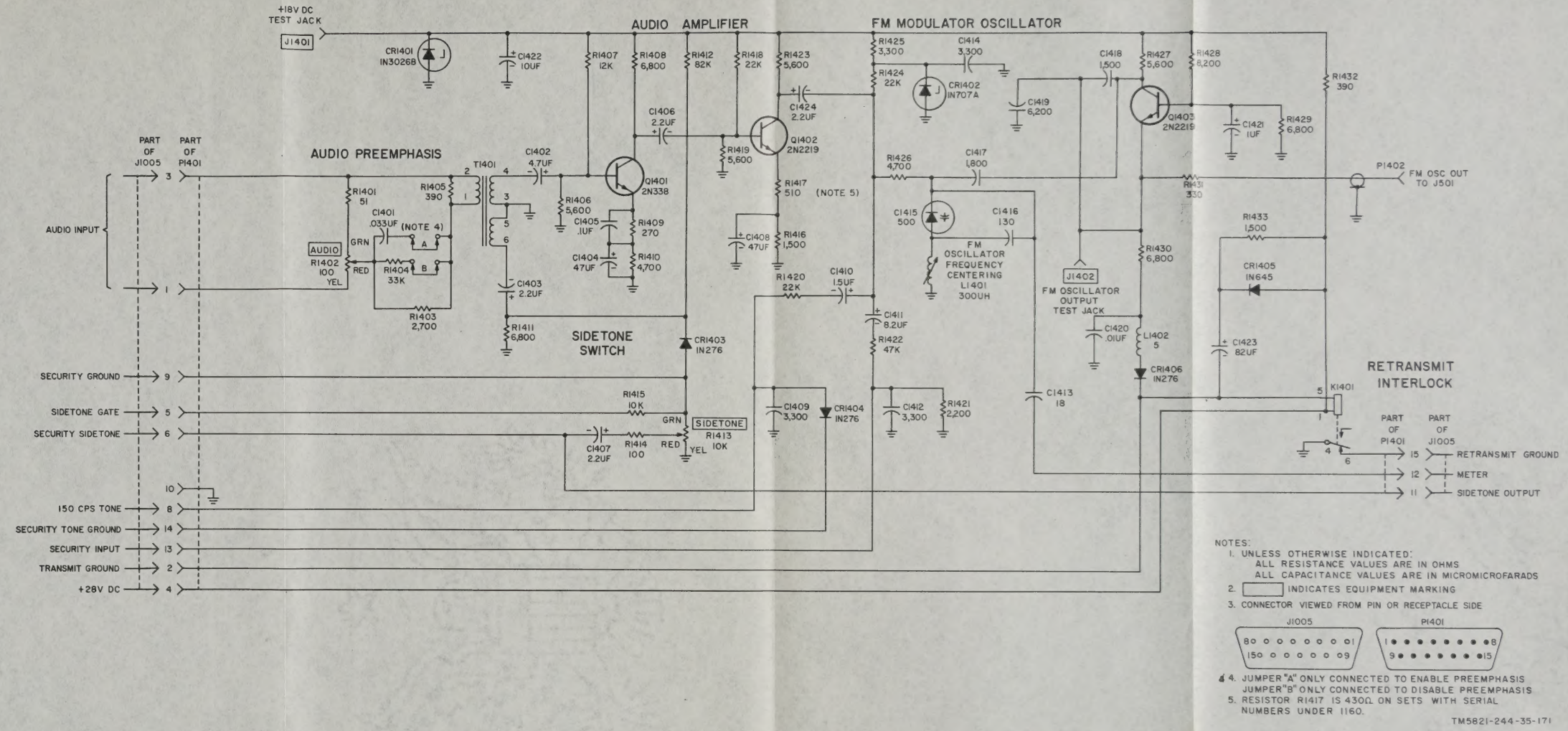


4. JUMPER "A" ONLY CONNECTED TO ENABLE PREEMPHASIS
   JUMPER "B" ONLY CONNECTED TO DISABLE PREEMPHASIS
5. RESISTOR R1417 IS 430Ω ON SETS WITH SERIAL NUMBERS UNDER 1160.

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modelo, schematic diagram.

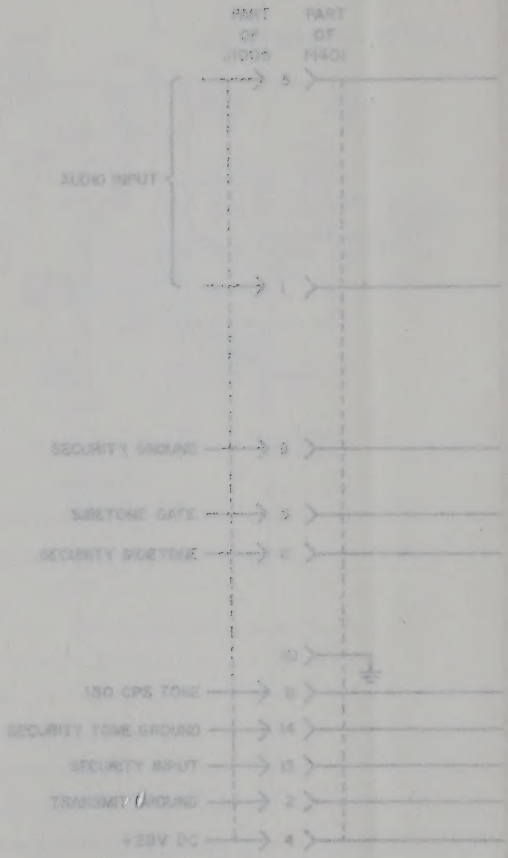


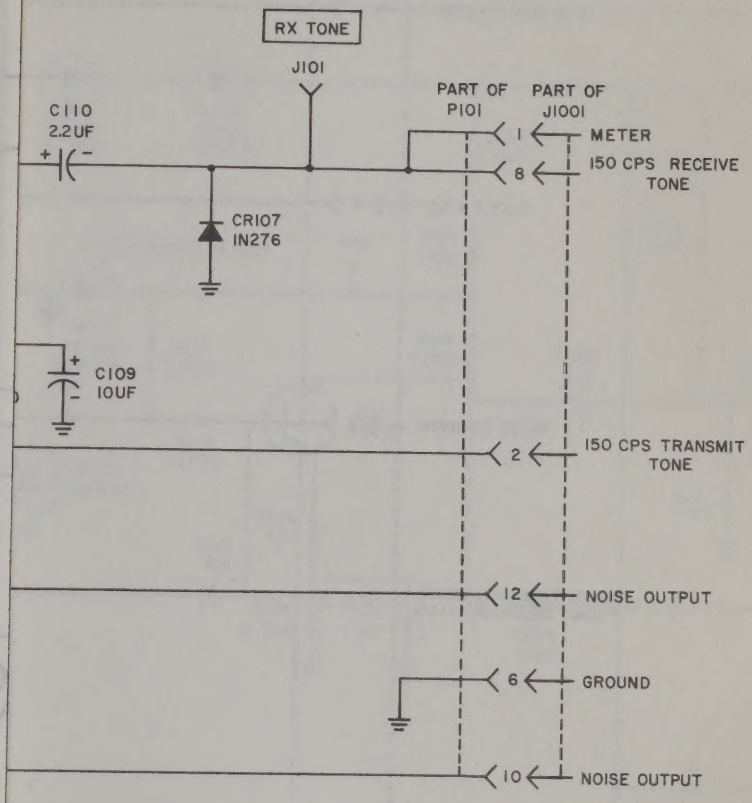
NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. [ ] INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE

4. JUMPER "A" ONLY CONNECTED TO ENABLE PREEMPHASIS
   JUMPER "B" ONLY CONNECTED TO DISABLE PREEMPHASIS
5. RESISTOR R1417 IS 430Ω ON SETS WITH SERIAL NUMBERS UNDER 1160.

TM5821-244-35-171

Figure 6–10. Transmit audio module, schematic diagram.

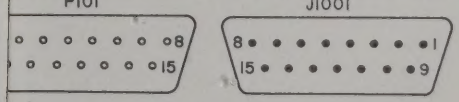

PART OF J1001
PART OF P1401
AUDIO INPUT
SECURITY GROUND
SUBTONE GATE
SECURITY SUBTONE
150 CPS TONE
SECURITY TONE GROUND
SECURITY INPUT
TRANSMIT GROUND
+28V DC



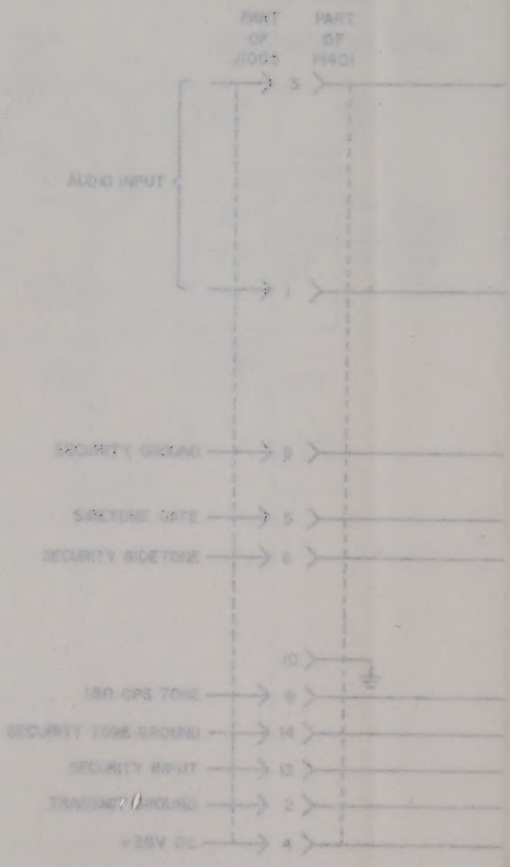
SS OTHERWISE INDICATED:
L RESISTANCE VALUES ARE IN OHMS
L CAPACITANCE VALUES ARE IN MICROMICROFARADS

INDICATES EQUIPMENT MARKING

ECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.



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PART OF J1005
PART OF P1401
5
AUDIO INPUT
1
9
5
6
10
8
14
13
2
4

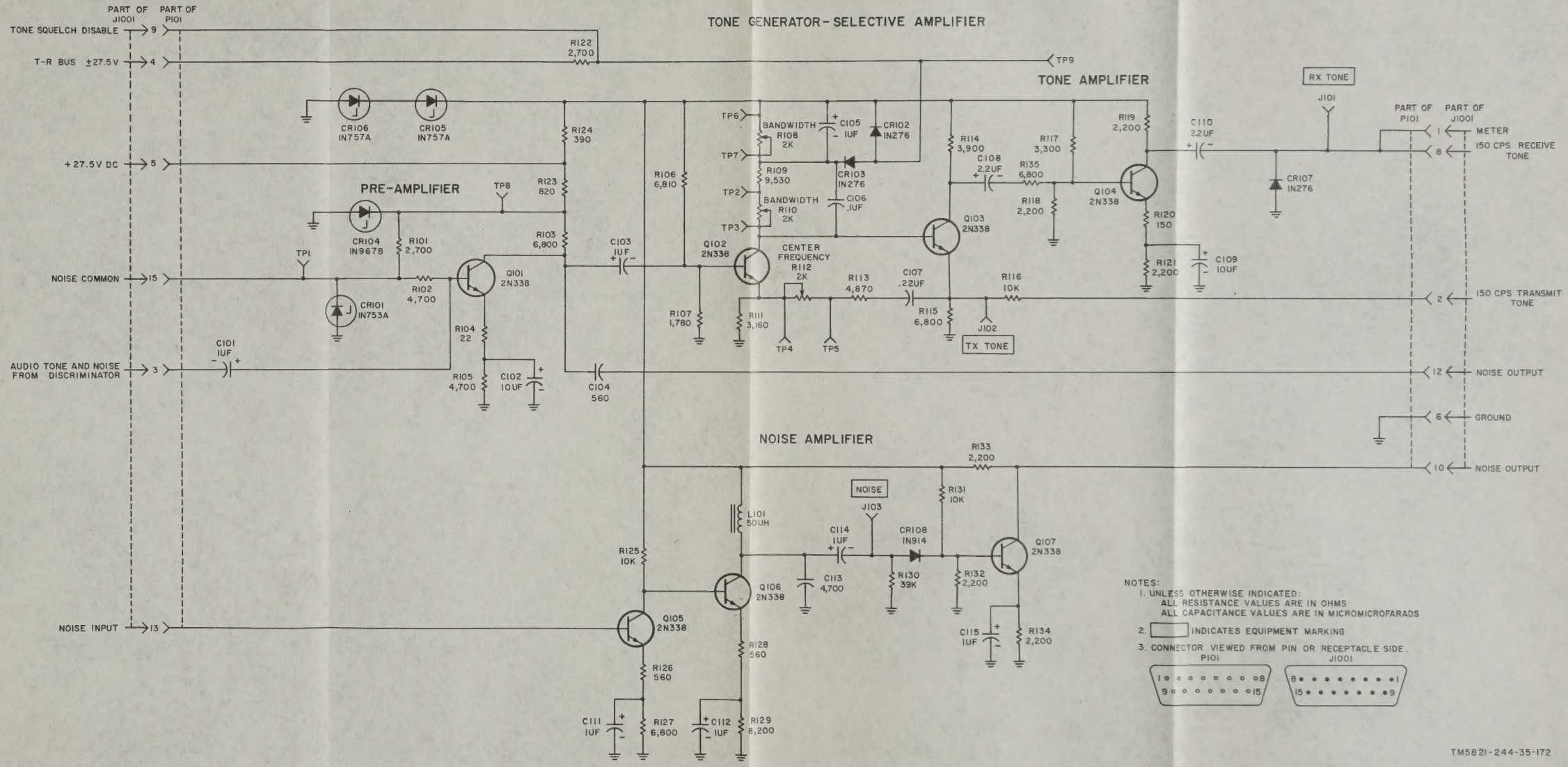
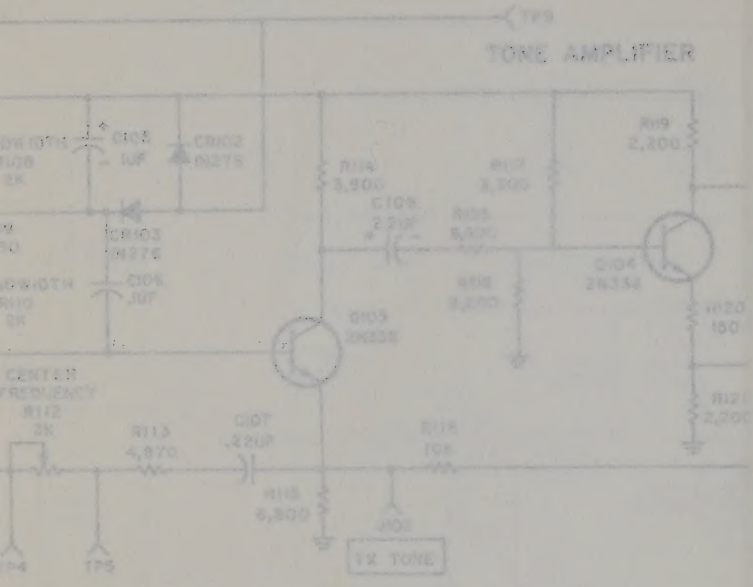
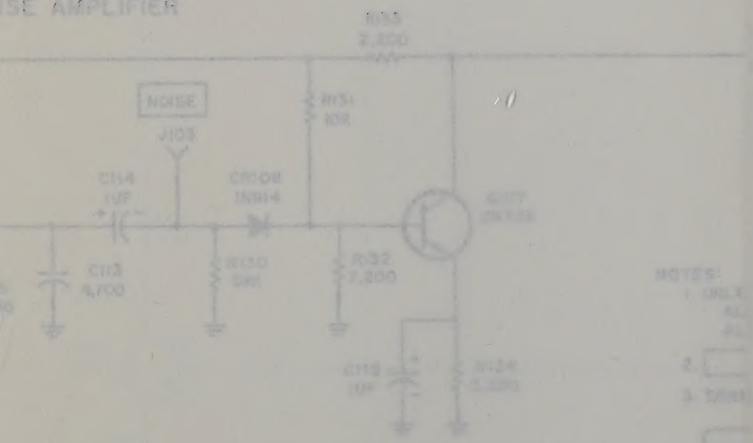


Figure 6-11. Sel-call module, schematic diagram.

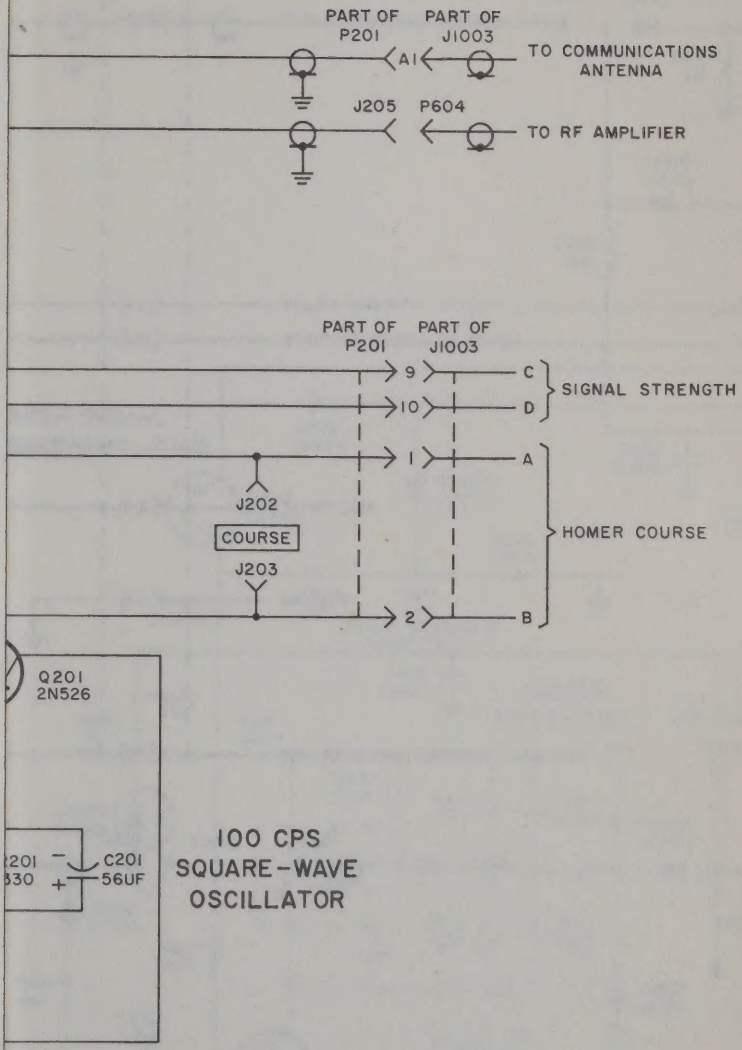
RATOR - SELECTIVE AMPLIFIER



SE AMPLIFIER

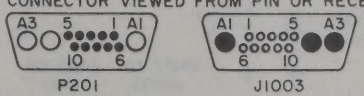


odel, schematic diagram

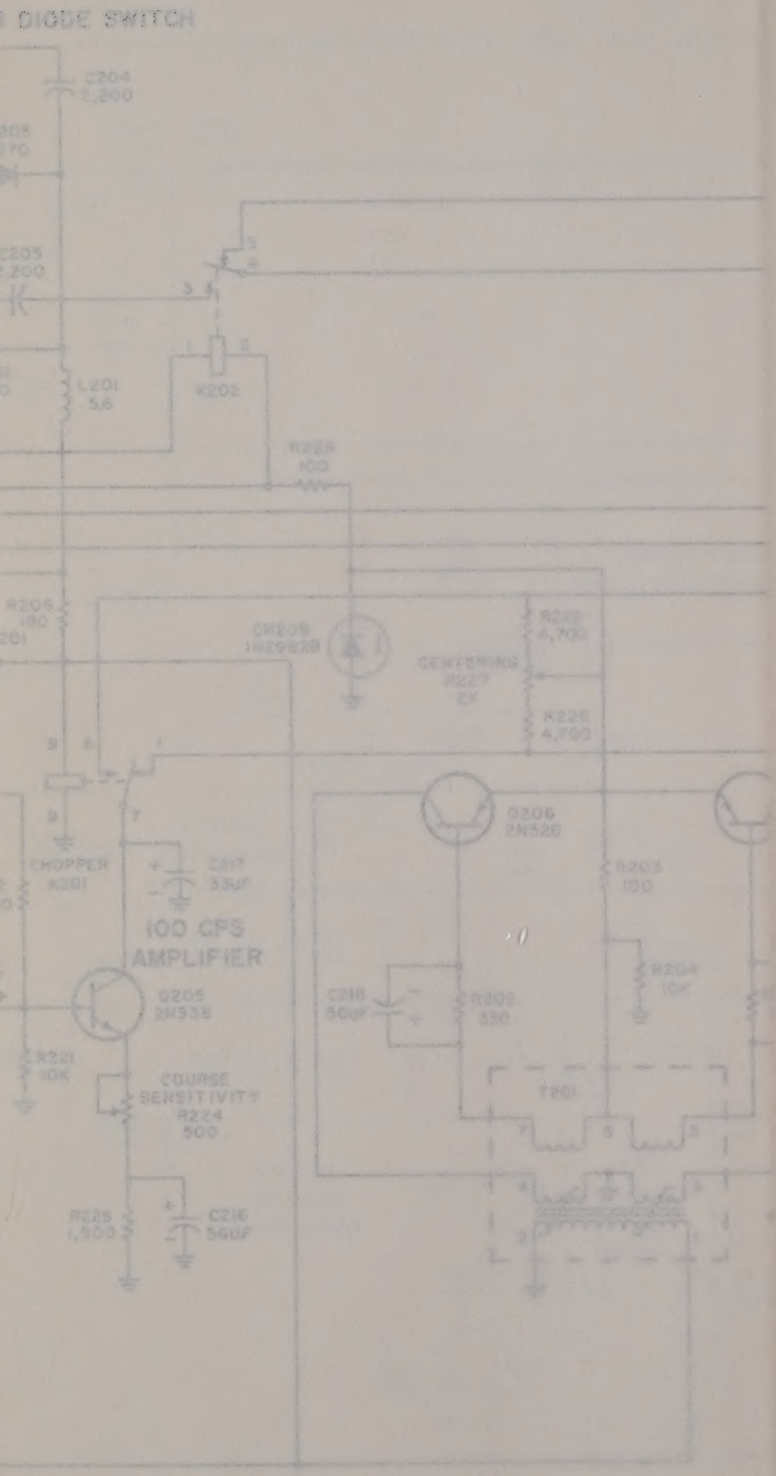


NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MILLIHENRIES
2. ☐ INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



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schematic, schematic diagram

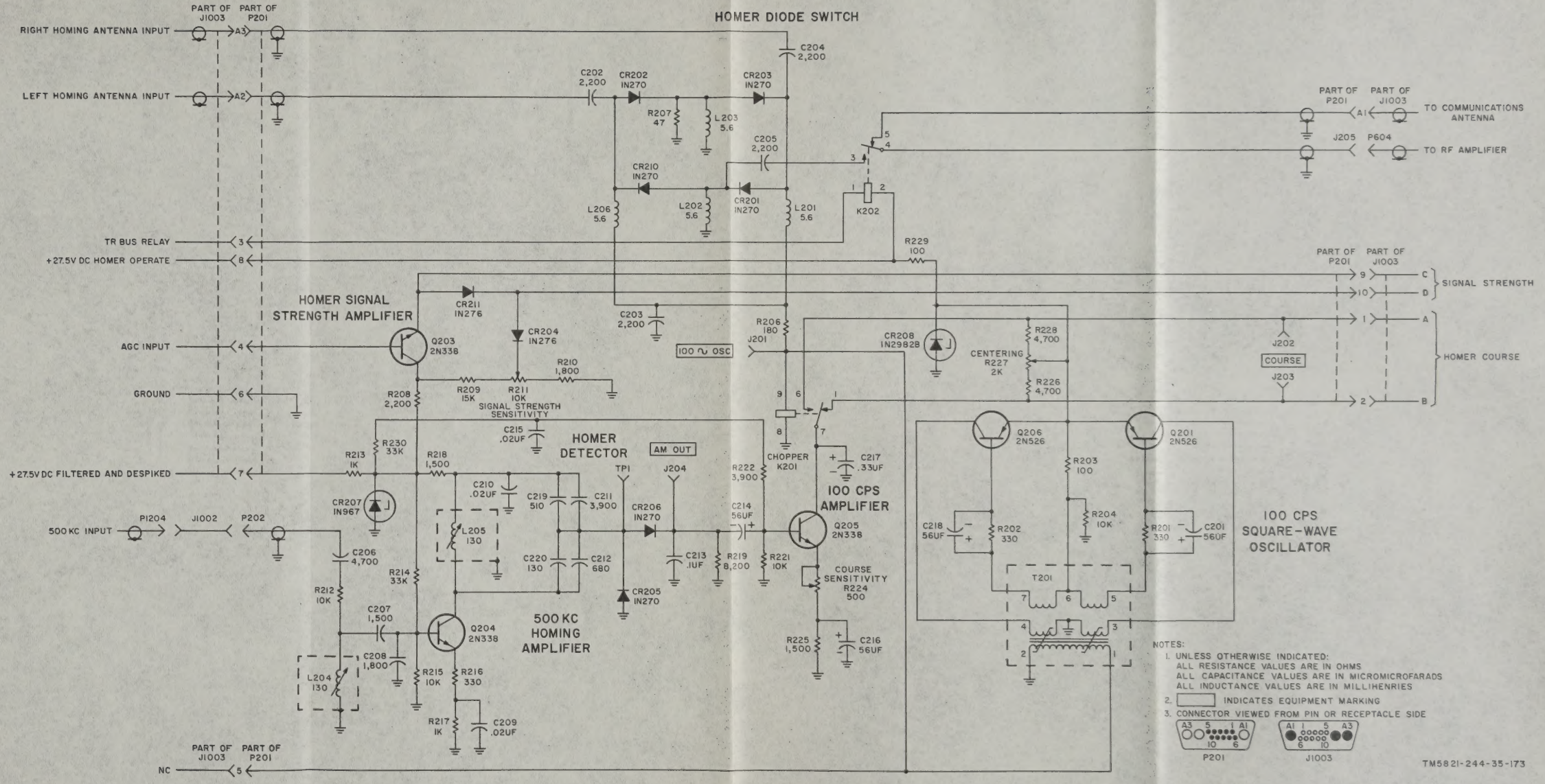
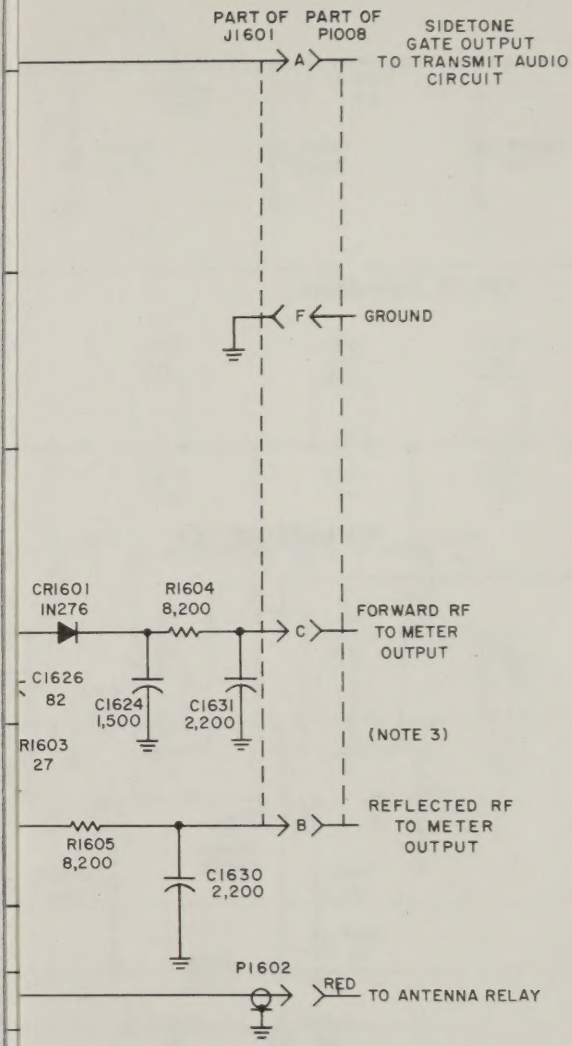
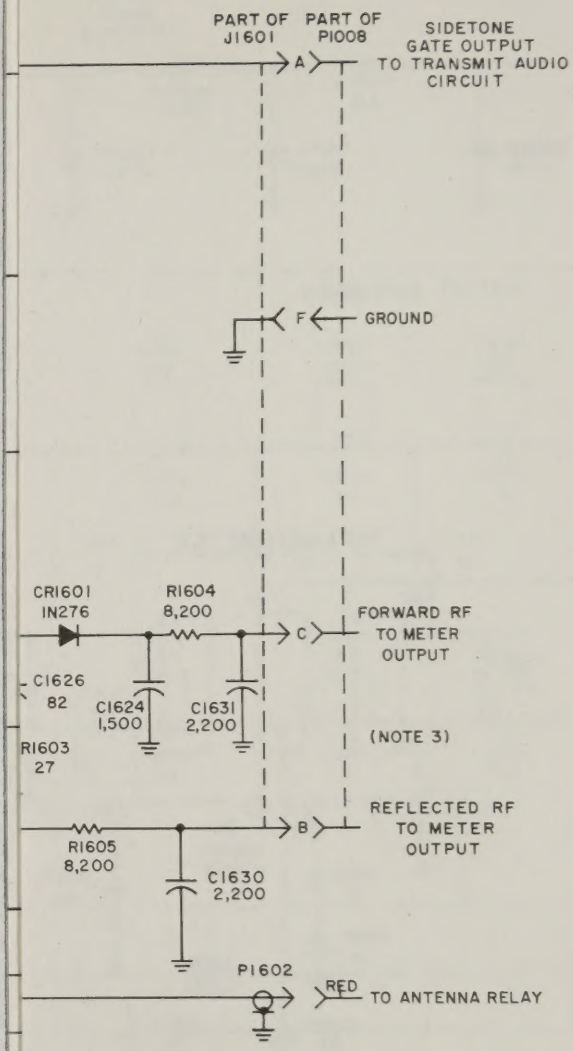


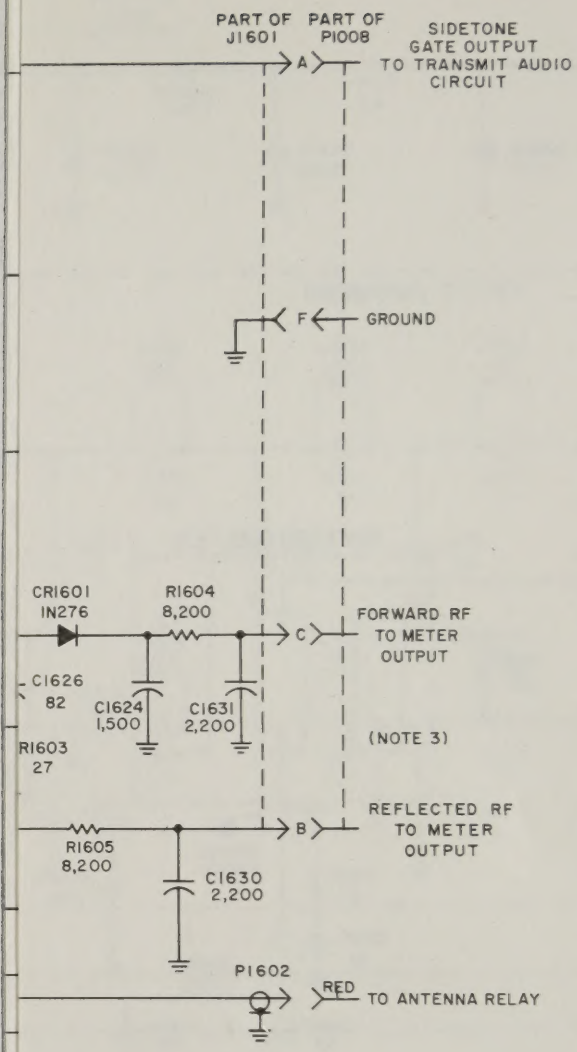
Figure 6-12. Homer module, schematic diagram.



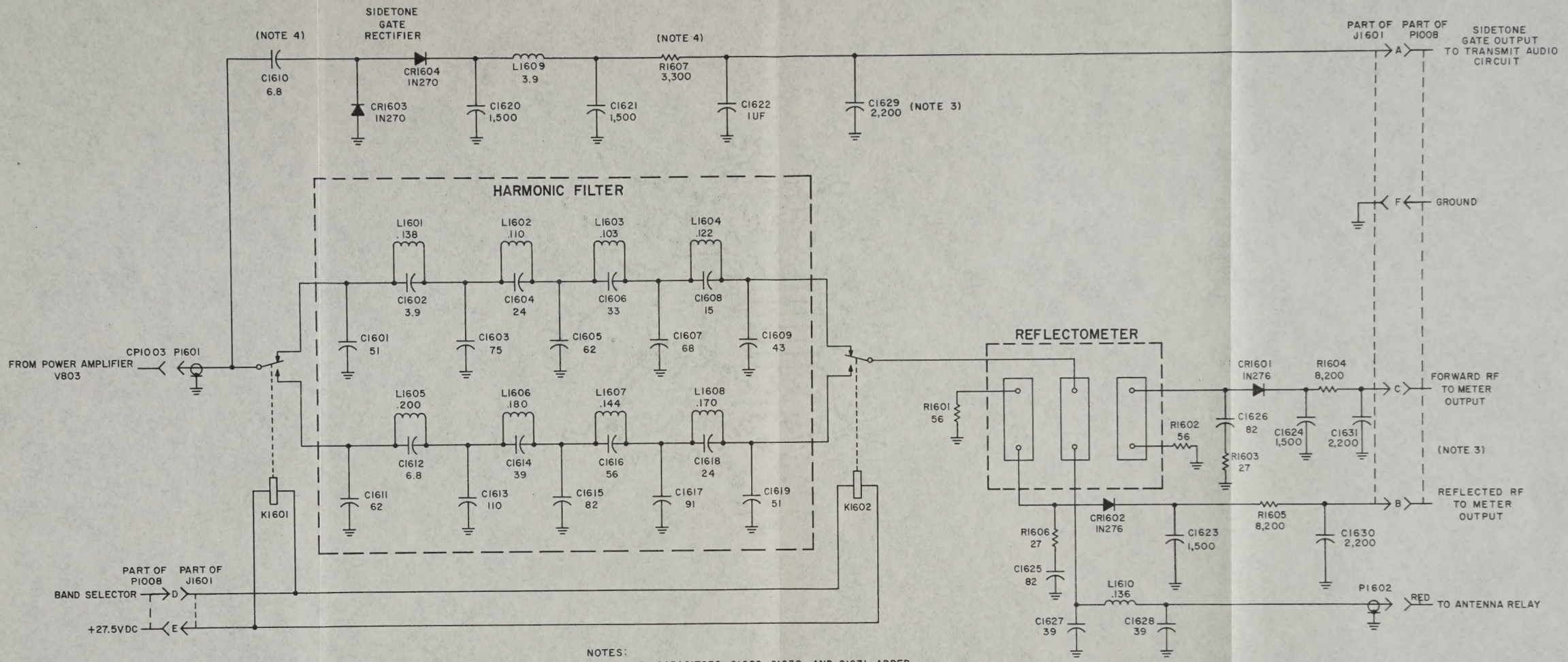
TM5821-244-35-175



TM5821-244-35-175

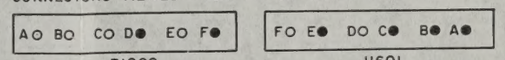


TM5821-244-35-175



NOTES:

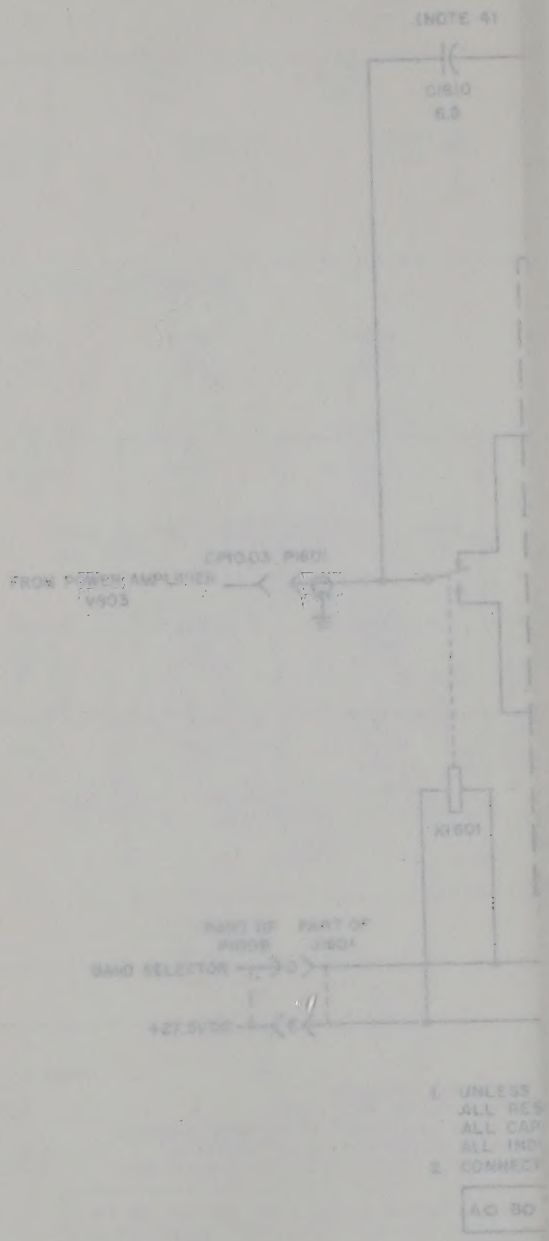
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE

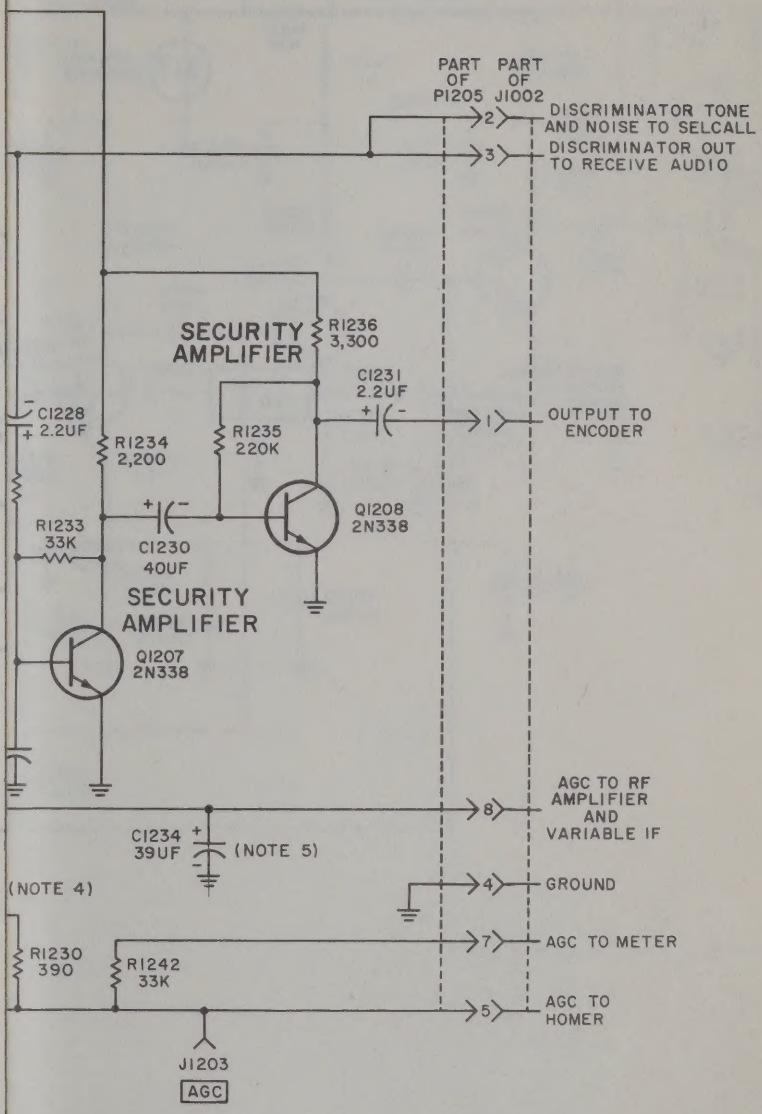


3. CAPACITORS C1629, C1630, AND C1631 ADDED ON SETS WITH SERIAL NUMBERS 1160 AND ABOVE.
4. ON SETS WITH SERIAL NUMBERS UNDER 1160 CAPACITORS C1629 (1630 AND 1631 ARE NOT USED; ALSO, CAPACITOR C1610 IS 6.8 UUF AND RESISTOR R1607 IS 3,300 OHMS.

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Figure 6-13. Harmonic filter module, schematic diagram.


(NOTE 4)
C1810
6.0
C1903 P601
FROM POWER AMPLIFIER
V903
A601
XI601
BAND OF
P1008
PART OF
J1401
BAND SELECTOR
+27.5VDC
F
1. UNLESS
ALL RES
ALL CAP
ALL IND
2. CONNECT
A.O. 80

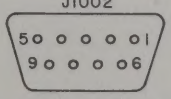


CATED:
ARE IN OHMS
S ARE IN MICROMICROFARADS.
S ARE IN MICROHENRIES.

IENT MARKING

PIN OR RECEPTACLE SIDE.

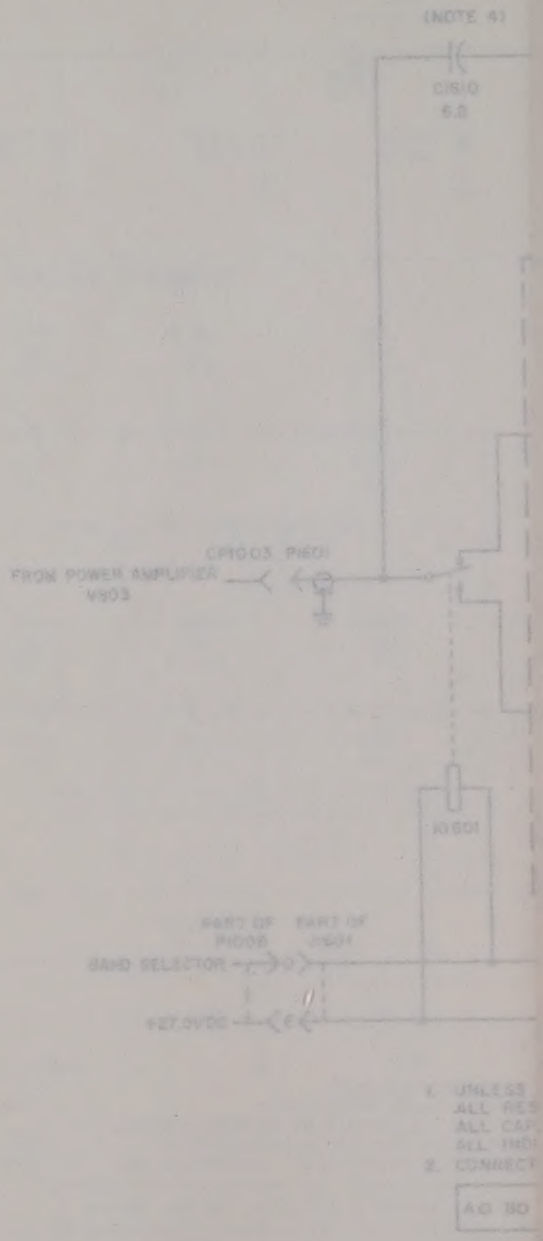
J1002



UMBERS BELOW 1160 THE
Y:
ARE 10UF.

UMBERS BELOW 1160
T USED.

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1. UNLESS
ALL RES
ALL CAP
ALL IND
2. CONNECT

A-0 80

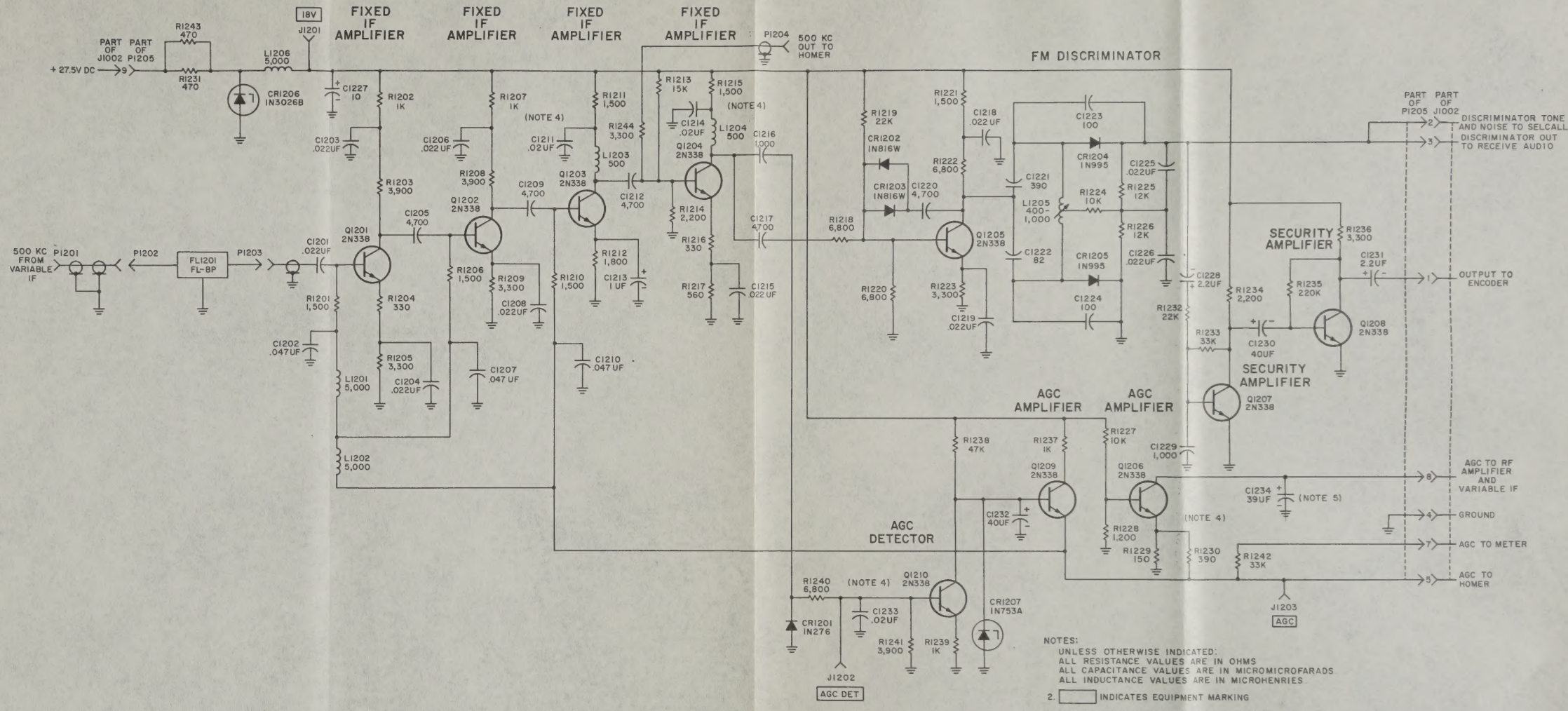
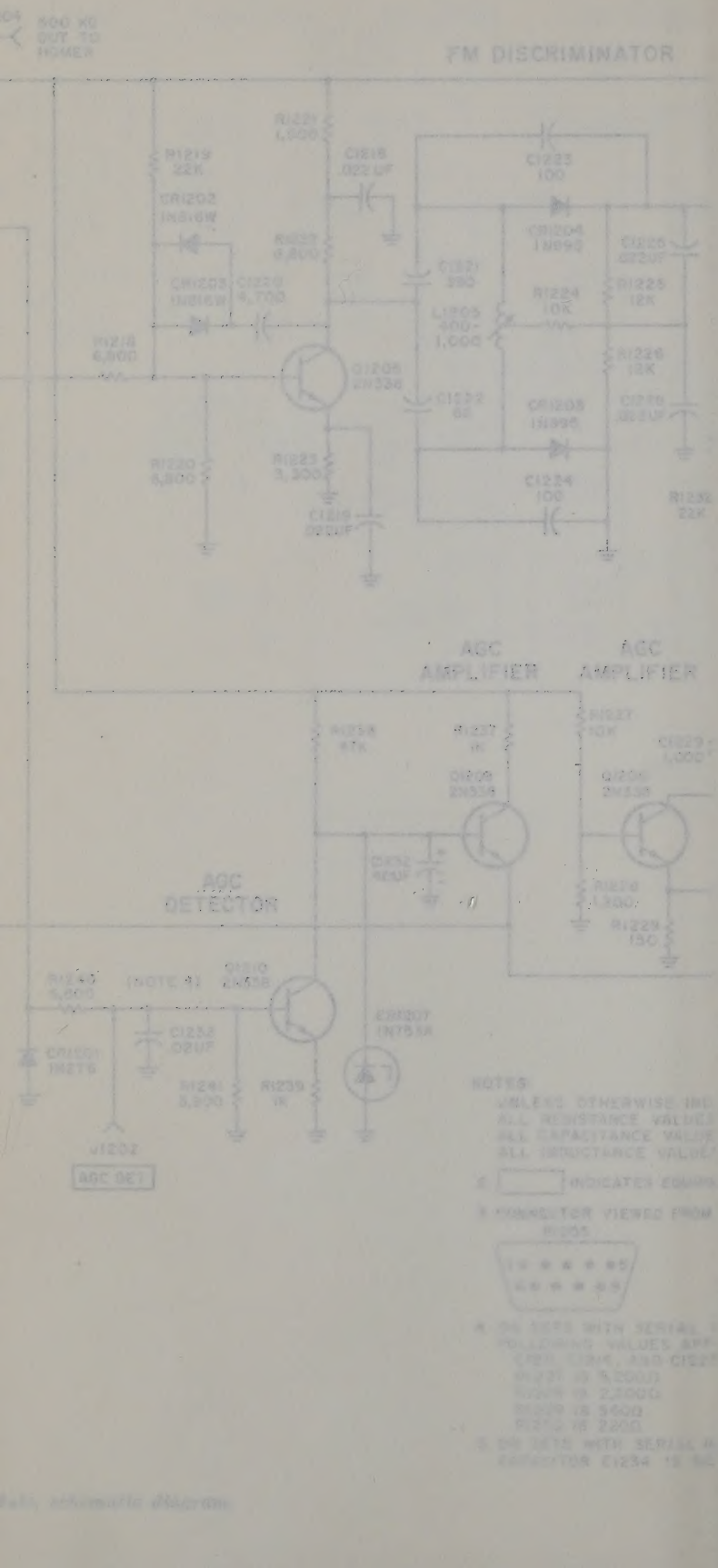
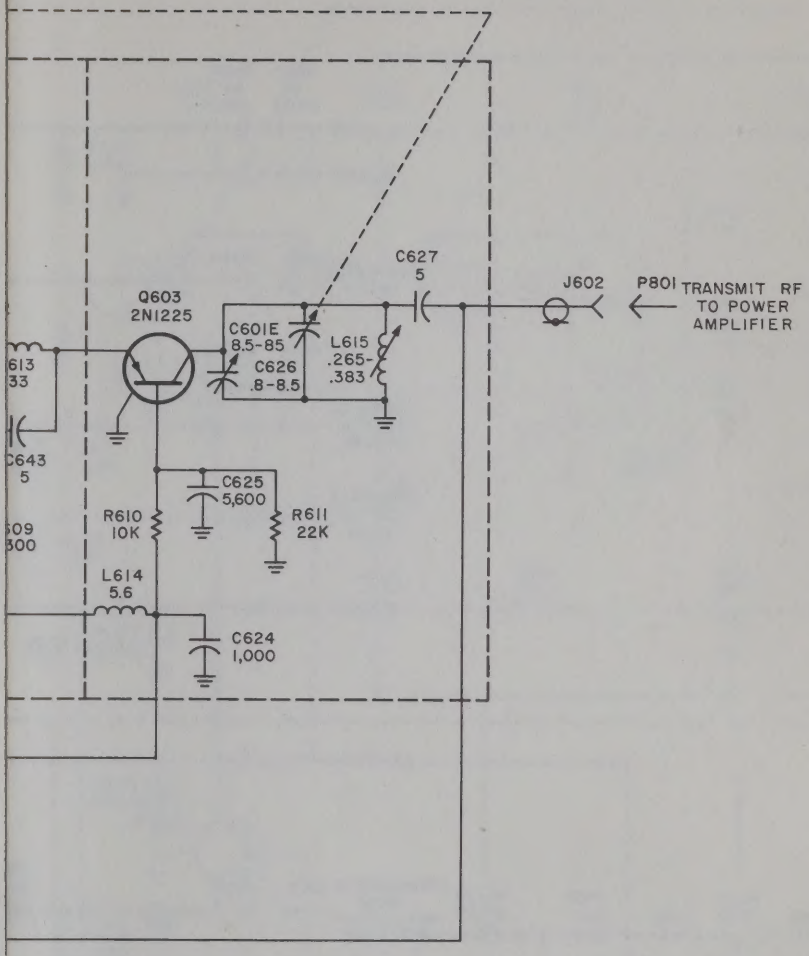


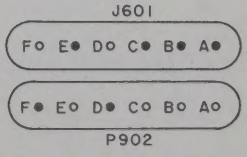
Figure 6-14. Fixed IF module, schematic diagram.


500 KC
OUT TO
HOMER
FM DISCRIMINATOR
R1221
1,000
R1219
22K
C1218
.022 UF
CR1202
1N816W
R1222
6,800
CR1203
1N816W
C1220
4,700
R1218
6,800
C1221
220
L1205
300-
1,000
C1223
100
CR1204
1N898
C1225
.022UF
R1224
10K
R1225
12K
R1226
12K
C1227
.003UF
Q1205
2N336
C1222
82
CR1205
1N398
C1224
100
R1230
6,800
R1223
3,300
C1219
.022UF
R1232
22K
AGC
AMPLIFIER
AGC
AMPLIFIER
R1228
47K
R1227
1K
R1227
10K
C1223
1,000
Q1206
2N336
Q1206
2N336
C1226
.022UF
AGC
DETECTOR
R1230
3,300
R1229
150
R1240
5,600
(NOTE 4)
Q1210
2N336
CR1207
1N758
C1232
.02UF
CR1201
1N276
R1241
5,600
R1239
1K
J1202
AGC DET
NOTES
UNLESS OTHERWISE IND
ALL RESISTANCE VALUES
ALL CAPACITANCE VALUE
ALL INDUCTANCE VALUE
INDICATES EQUIPM
TRANSISTOR VIEWED FROM
R1205
A ON SETS WITH SERIAL
FOLLOWING VALUES ARE
C1221, C1224, AND C1227
R1221 IS 1,200Ω
R1222 IS 2,200Ω
R1223 IS 5600
R1230 IS 2200
B ON SETS WITH SERIAL
CAPACITOR C1234 IS



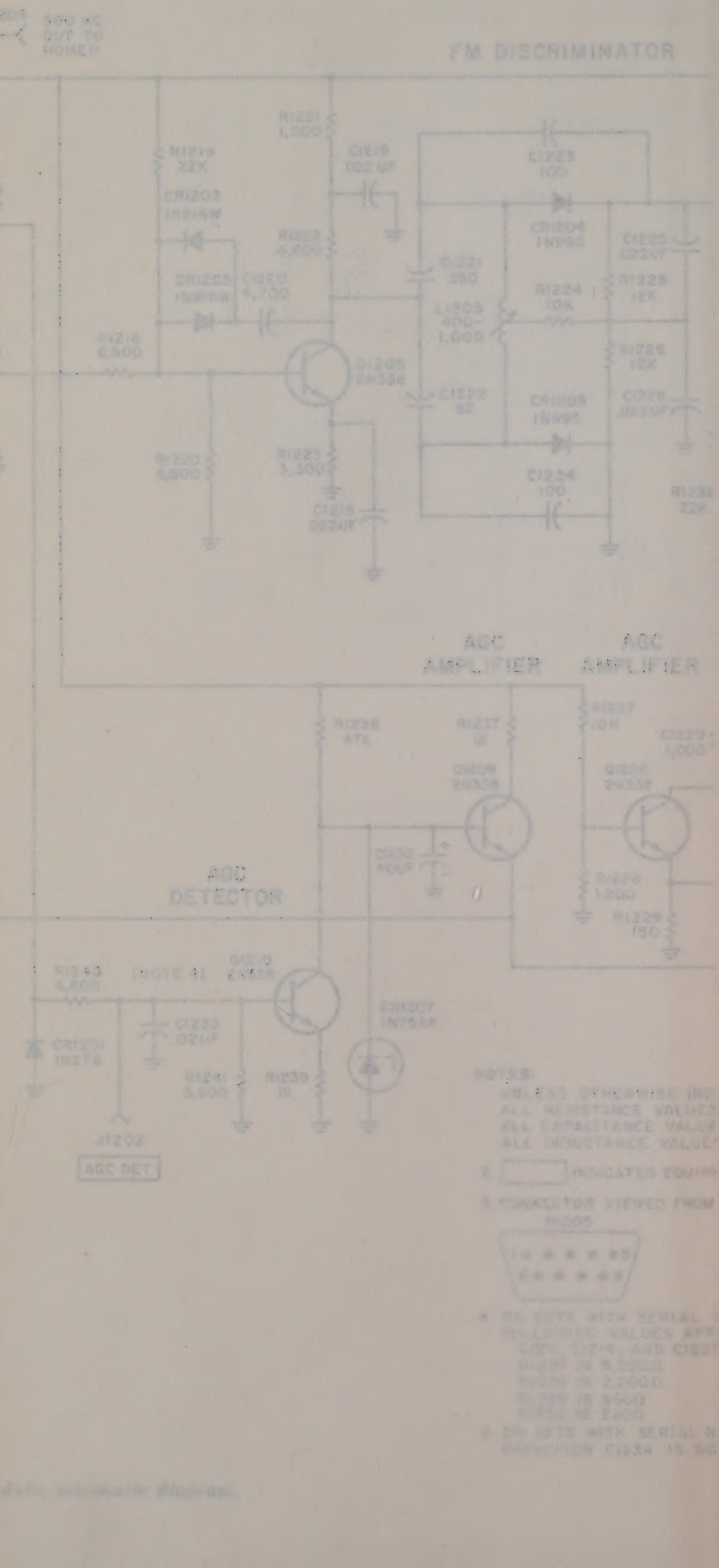
NOTES:

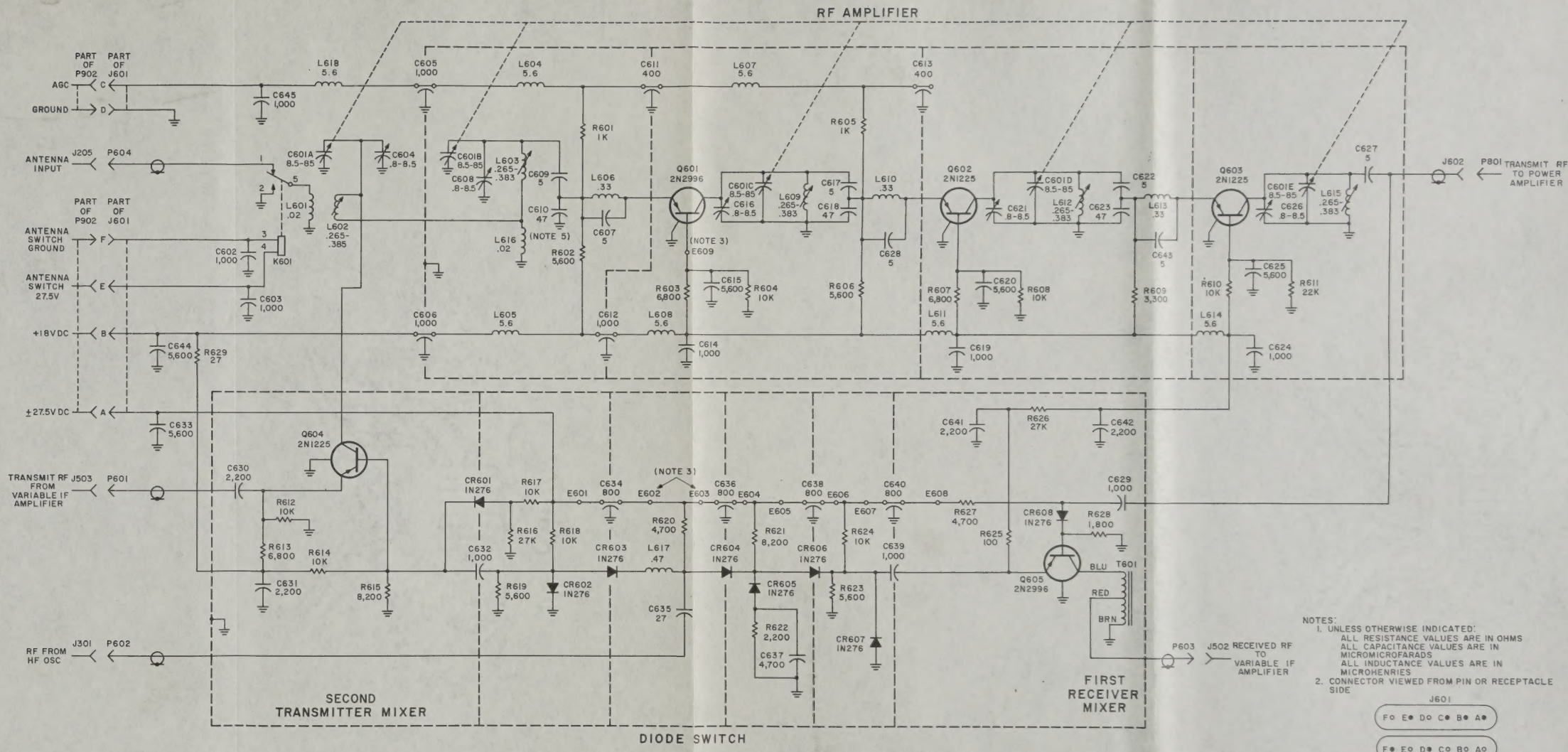
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



3. COMPONENTS WITH E REFERENCE DESIGNATIONS ARE FERRITE BEAD ISOLATORS
4. DASHED LINES (EXCEPT MECHANICAL LINKAGE OF C601) INDICATE RF SHIELDING
5. CAPACITOR C610 NOT PRESENT ON SETS WITH SERIAL NUMBERS 1160 AND ABOVE.

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FM DISCRIMINATOR
AGC AMPLIFIER
AGC AMPLIFIER
AGC DETECTOR
AGC OUT TO HOMER
R1221 4,000
R1219 22K
C1218 .022 UF
CR1202 1N816W
R1222 6,800
CR1203 1N816W
C1220 4,700
R1218 6,800
Q1205 2N336
R1220 6,800
R1223 3,300
C1219 .022UF
C1223 100
CR1204 1N995
C1221 250
R1224 10K
L1209 600-1,600
C1222 82
CR1205 1N995
C1225 .022UF
R1225 12K
C1226 .033UF
C1224 100
R1232 22K
R1238 47K
R1237 1K
Q1206 2N336
C1227 .022UF
R1237 10K
C1229 1,000
Q1204 2N336
R1228 1,200
R1229 150
R1242 6,800
(NOTE 4)
Q1210 2N336
CR1207 1N754A
CR1201 1N276
C1233 .022UF
R1241 3,300
R1239 1K
J1202
AGC OUT
NOTES:
1. UNLESS OTHERWISE IND
ALL RESISTANCE VALUES
ALL CAPACITANCE VALUE
ALL INDUCTANCE VALUES
2. [ ] INDICATES EQUIPM
3. CONNECTOR VIEWED FROM
P1205
4. ON UNITS WITH SERIAL
RESISTANCE VALUES APP
C1219, C1218, AND C1227
R1237 IS 3,300Ω
R1238 IS 2,200Ω
R1239 IS 590Ω
R1242 IS 2,200Ω
5. ON UNITS WITH SERIAL N
CONNECTION C1234 IS NO



NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE

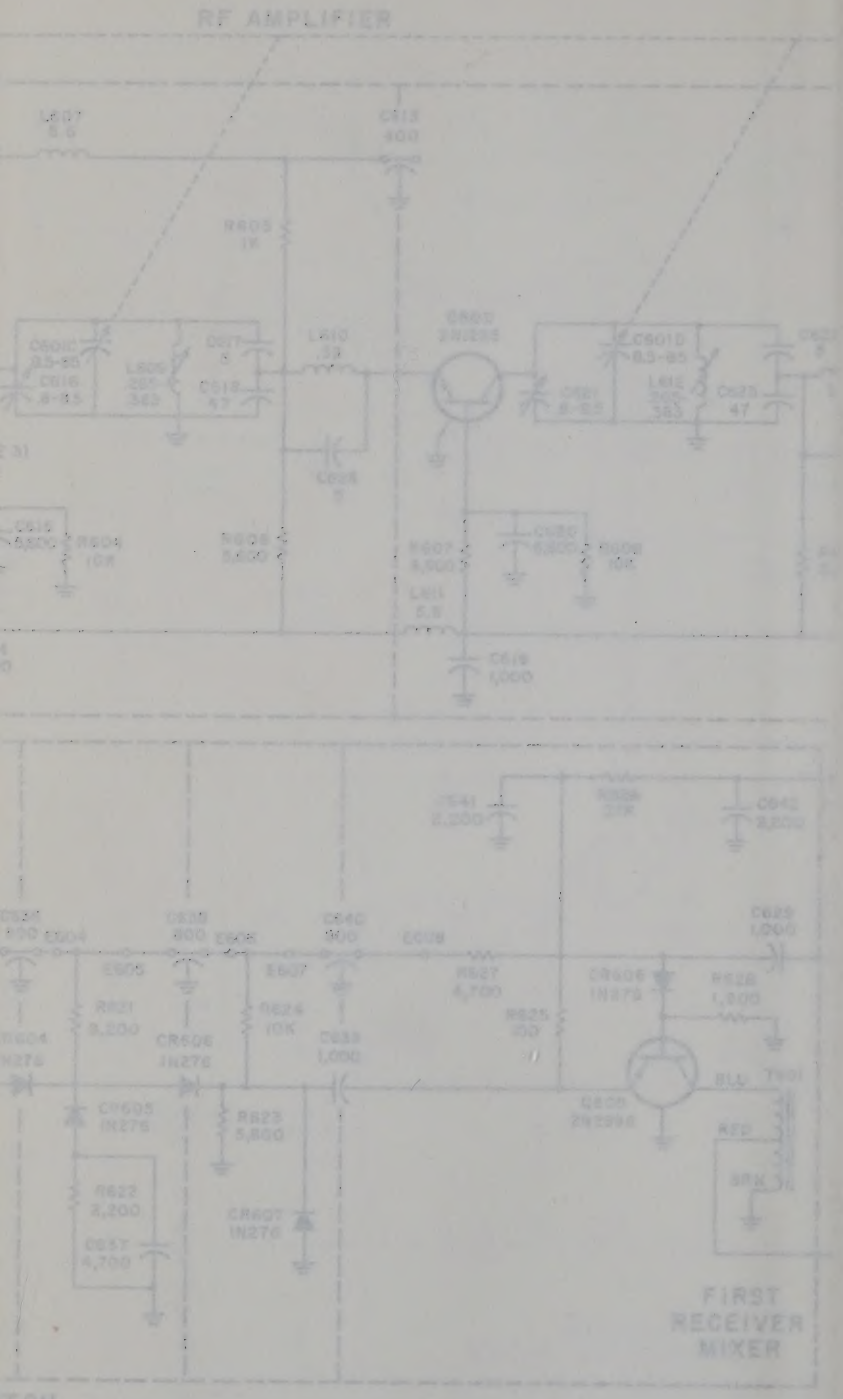
J601: F○ E● D○ C● B● A●

P902: F● E○ D● C○ B○ A○

3. COMPONENTS WITH E REFERENCE DESIGNATIONS ARE FERRITE BEAD ISOLATORS
4. DASHED LINES (EXCEPT MECHANICAL LINKAGE OF C601) INDICATE RF SHIELDING
5. CAPACITOR C610 NOT PRESENT ON SETS WITH SERIAL NUMBERS 1160 AND ABOVE.

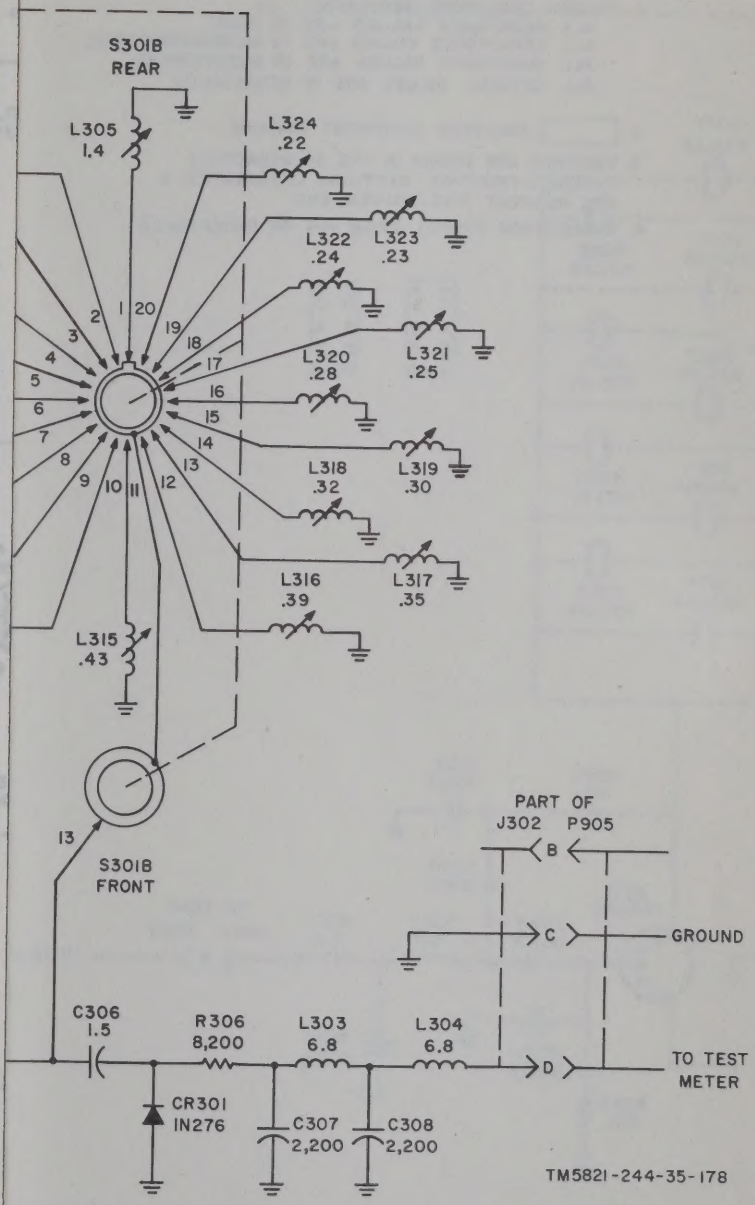
TM5821-244-35-177

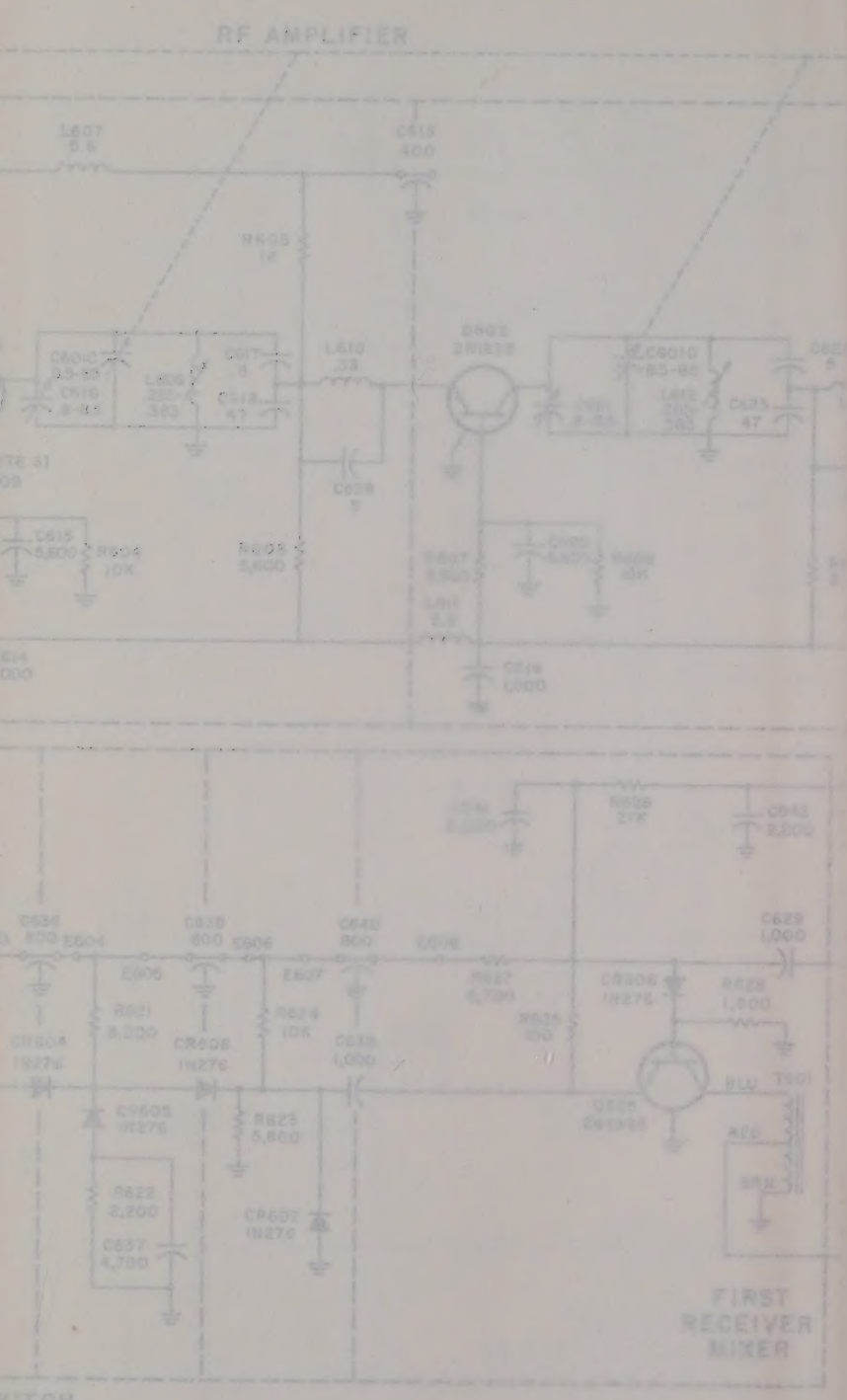
Figure 6-15. RF amplifier module, schematic diagram.



TCH

RF amplifier module, schematic diagram.

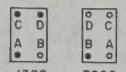

S3018
REAR
L305
1.4
L324
.22
L322
.24
L323
.23
L320
.28
L321
.25
L318
.32
L319
.30
L316
.39
L317
.35
L315
.43
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
S3018
FRONT
13
PART OF
J302 P905
B
C
GROUND
C306
1.5
R306
8,200
L303
6.8
L304
6.8
D
TO TEST
METER
CR301
IN276
C307
2,200
C308
2,200
TM5821-244-35-178



RF amplifier module, schematic diagram.

NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
   ALL CRYSTAL VALUES ARE IN MEGACYCLES
2. [ ] INDICATES EQUIPMENT MARKING
3. SWITCHES ARE SHOWN IN THE 30 MEGACYCLE CHANNEL POSITION. SECTIONS DESIGNATED A ARE NEAREST THE DRIVEN END
4. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



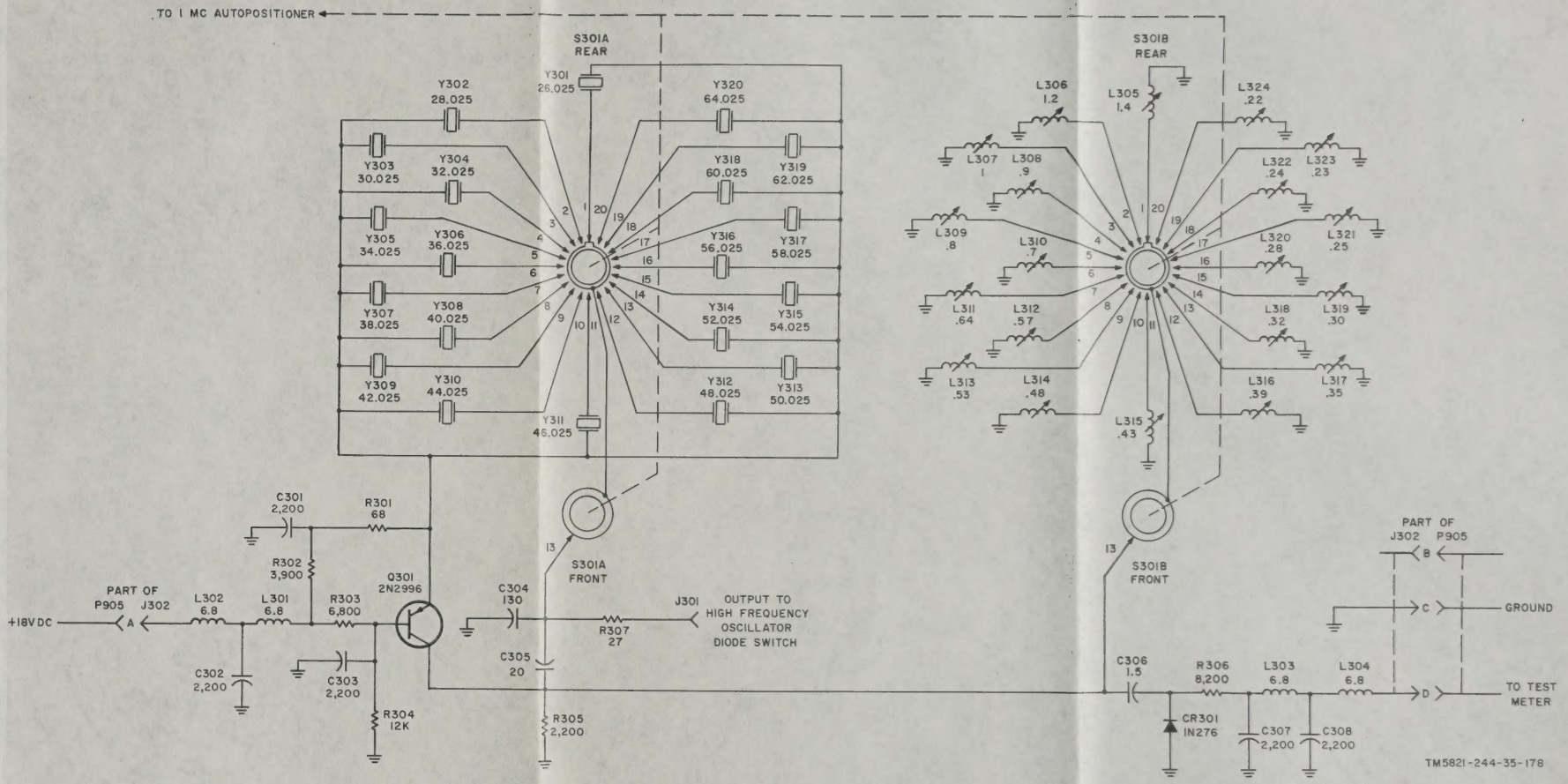
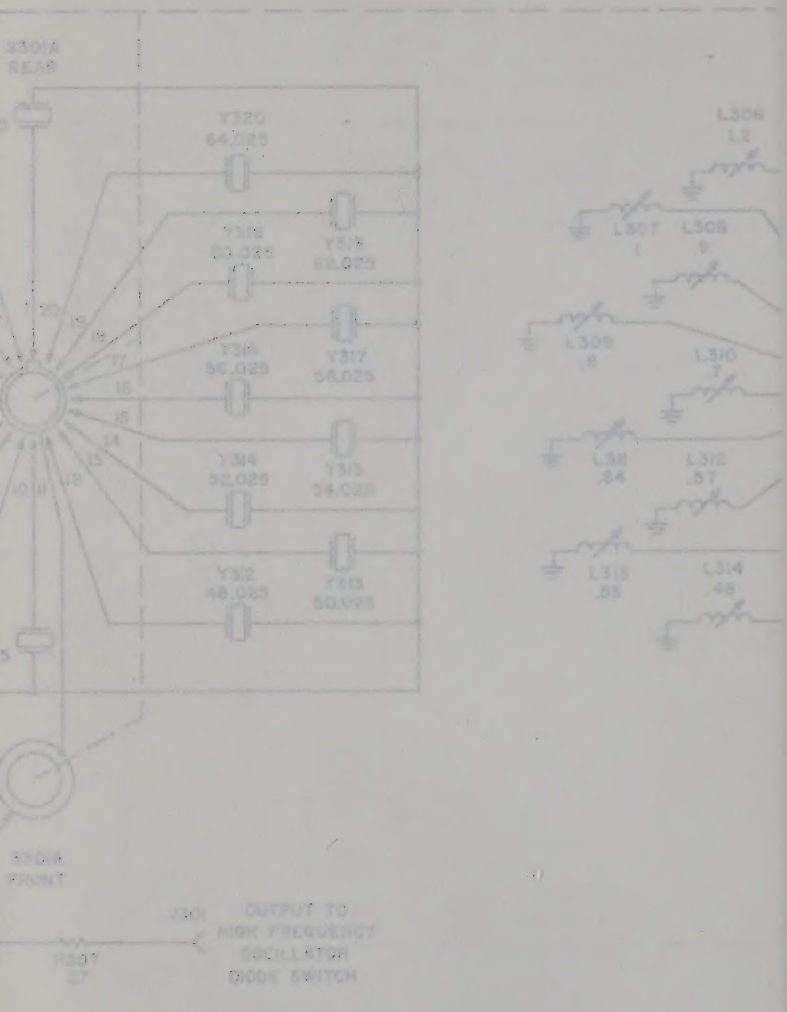
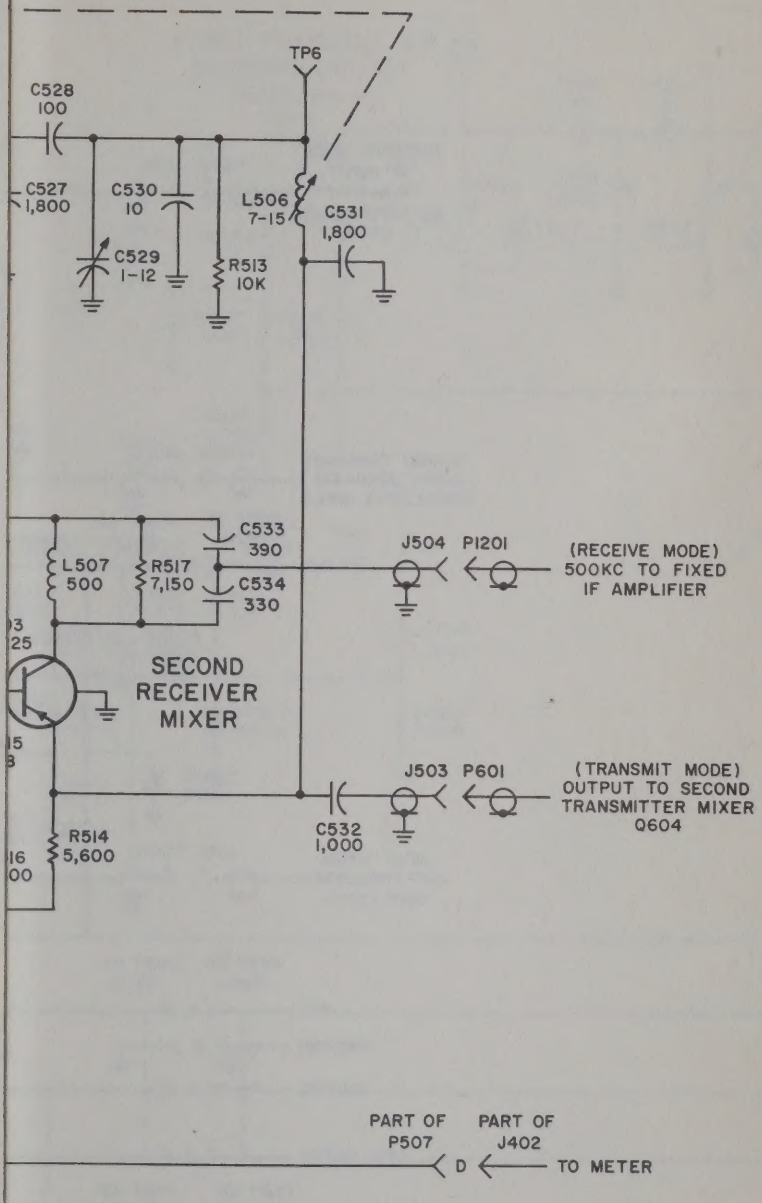


Figure 6–16. High-frequency oscillator module, schematic diagram.

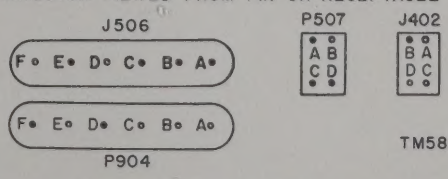


illator module, schematic diagram.

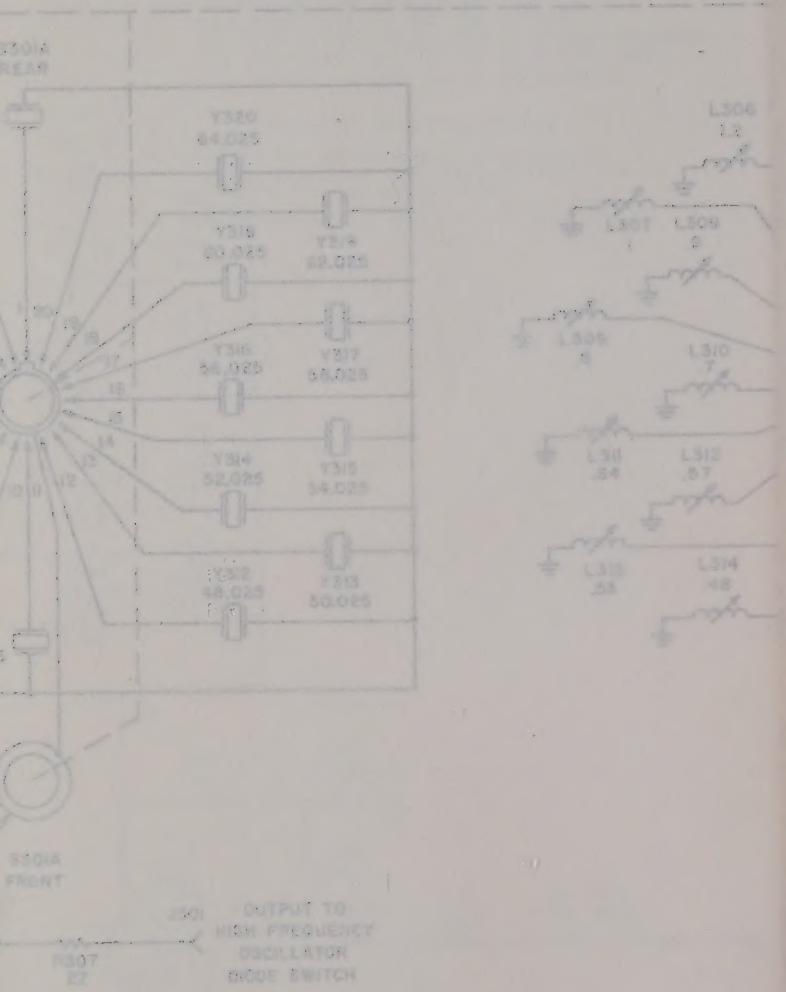


NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



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illator module, schematic diagram.

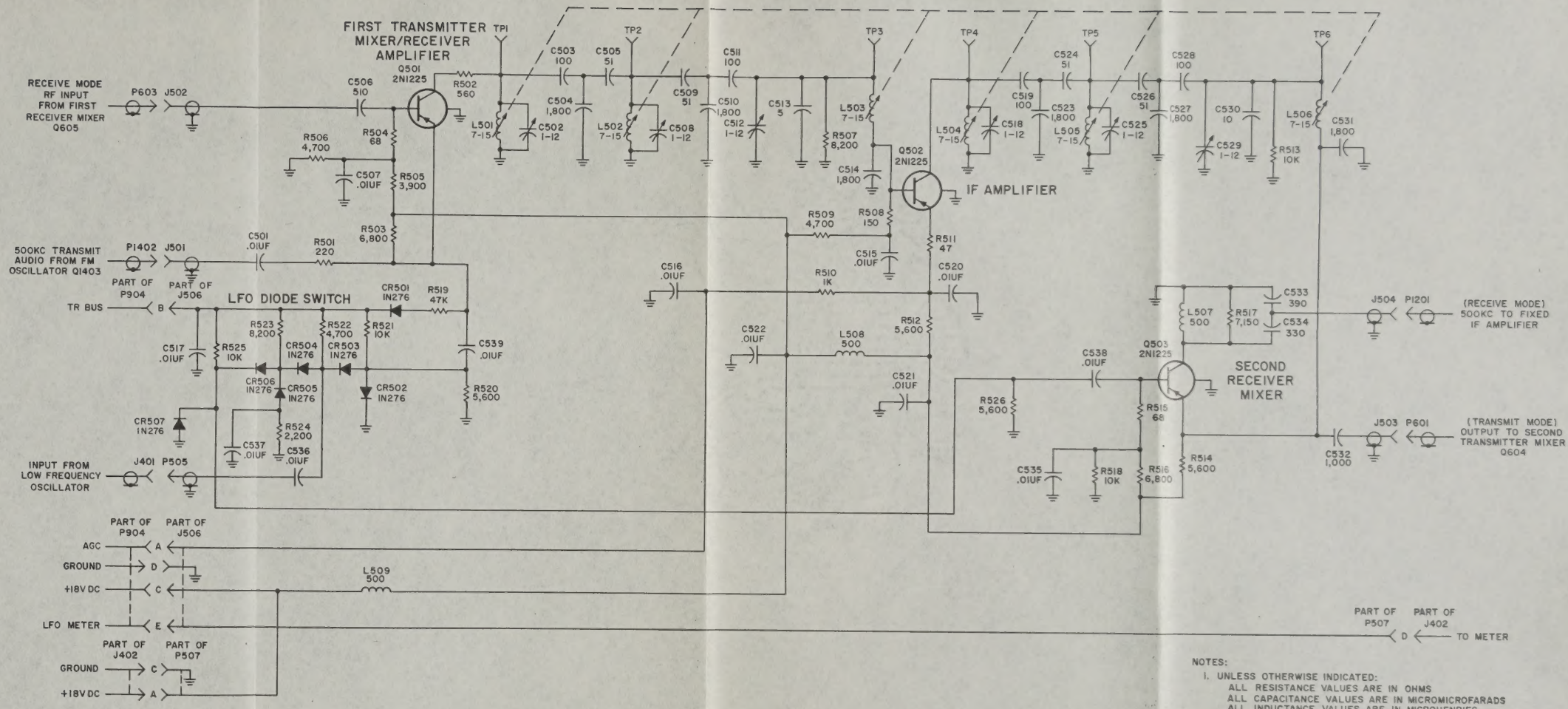
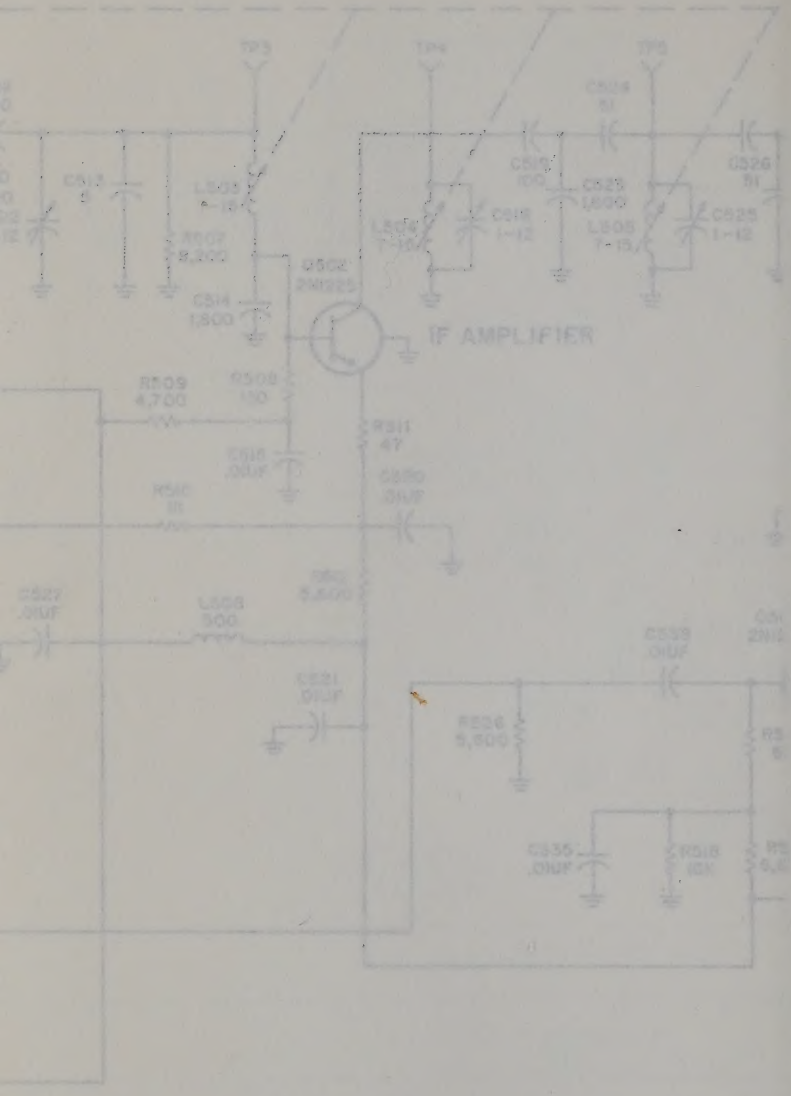
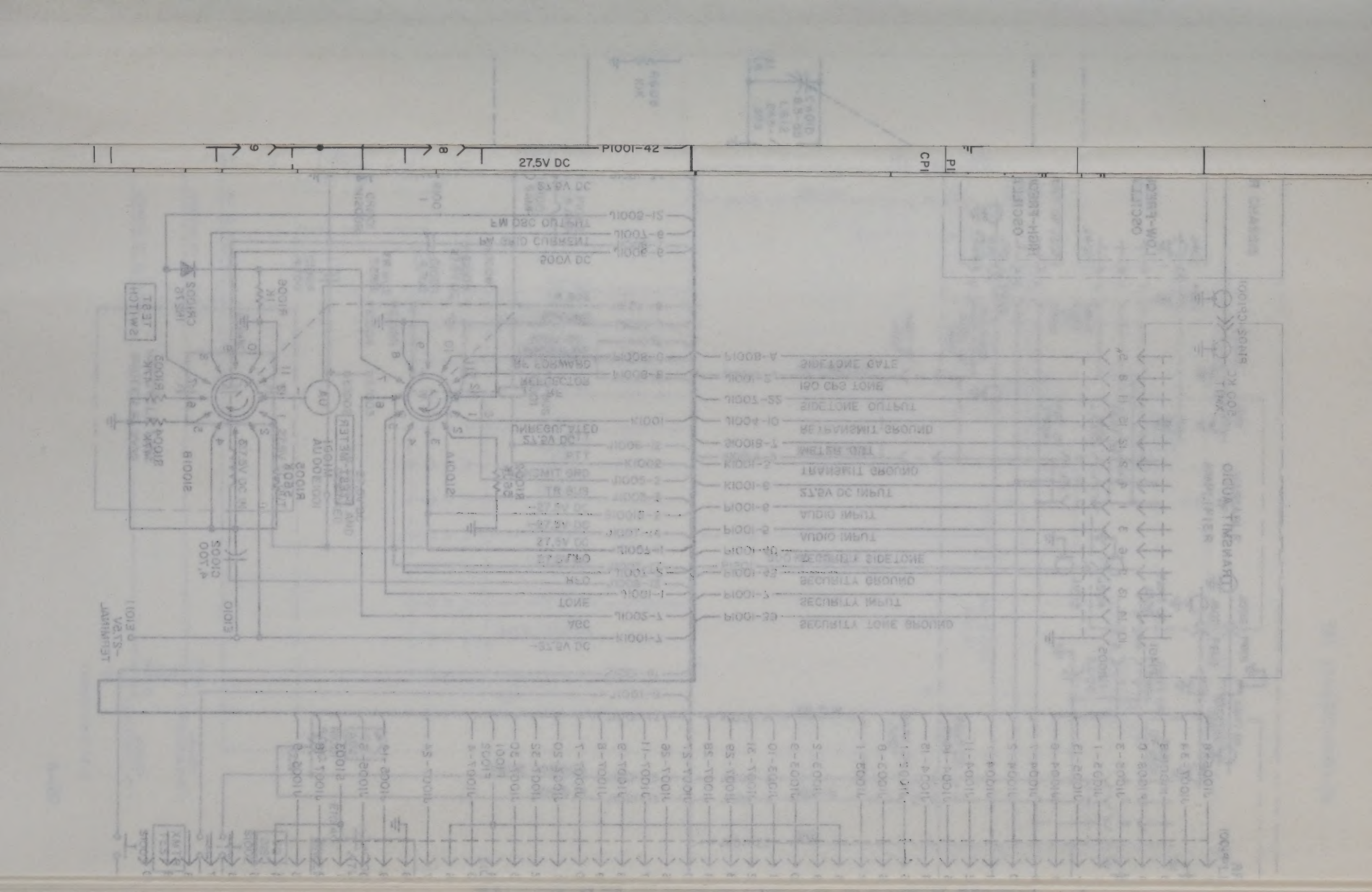


Figure 6-17. Variable IF module, schematic diagram.


TP3
TP4
TP5
C512
6
L503
7-15
R507
8,200
C514
1,800
Q502
2N3225
C515
1-12
C516
100
C523
1,800
L504
7-15
L505
7-15
C525
1-12
C526
.01
IF AMPLIFIER
R509
4,700
R508
130
R511
47
C518
.01UF
R510
10
C520
.01UF
R512
5,600
C527
.01UF
L506
500
C521
.01UF
C539
.01UF
R526
5,600
C535
.01UF
R518
10K


27.5V DC
P1001-42

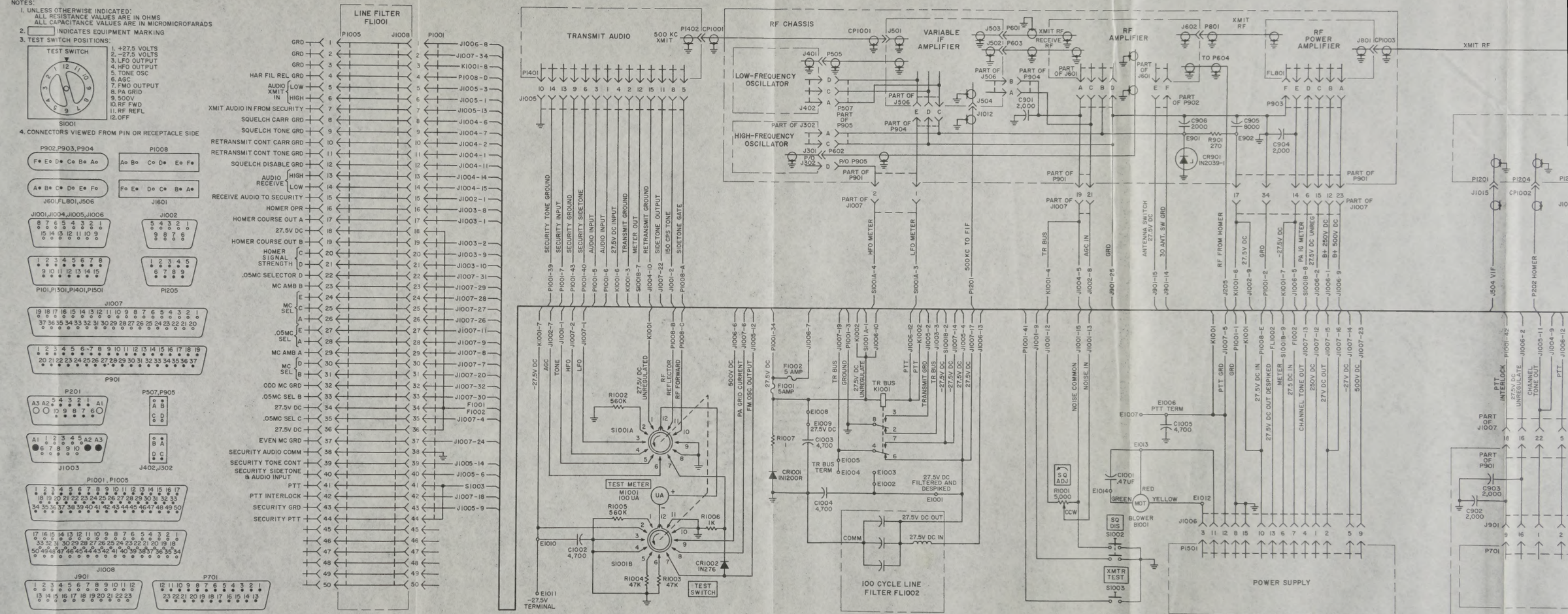


Figure 6–18. Receiver-Transmitter, Radio RT–348/ARC–54, wiring diagram.

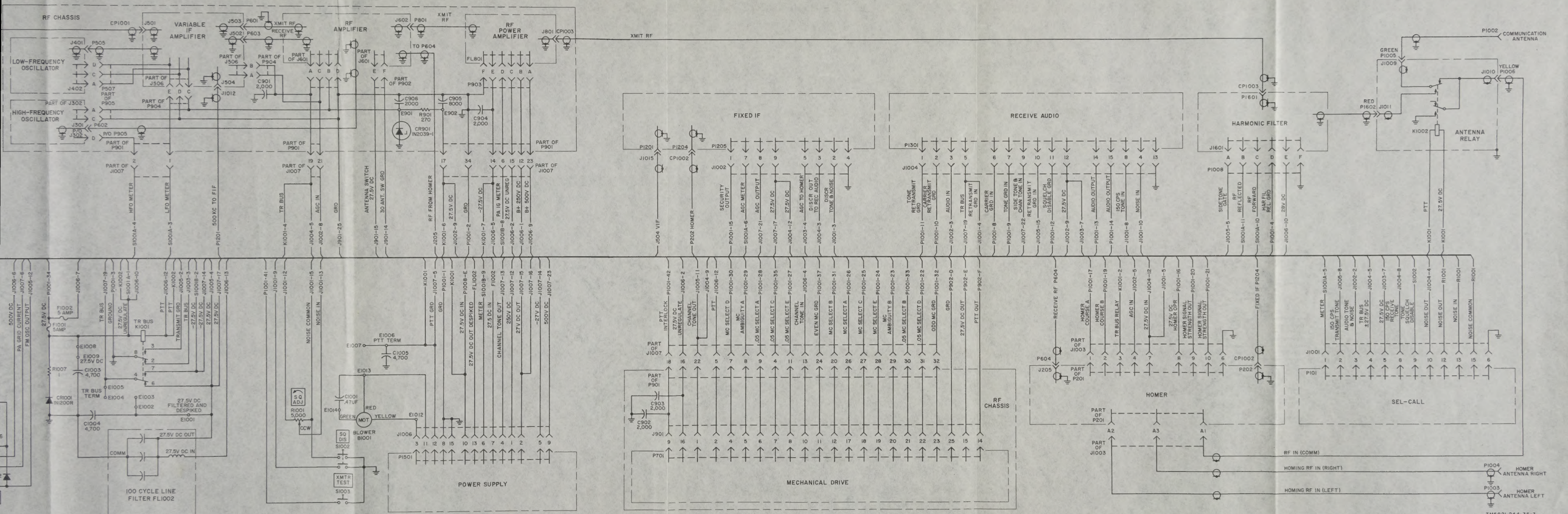
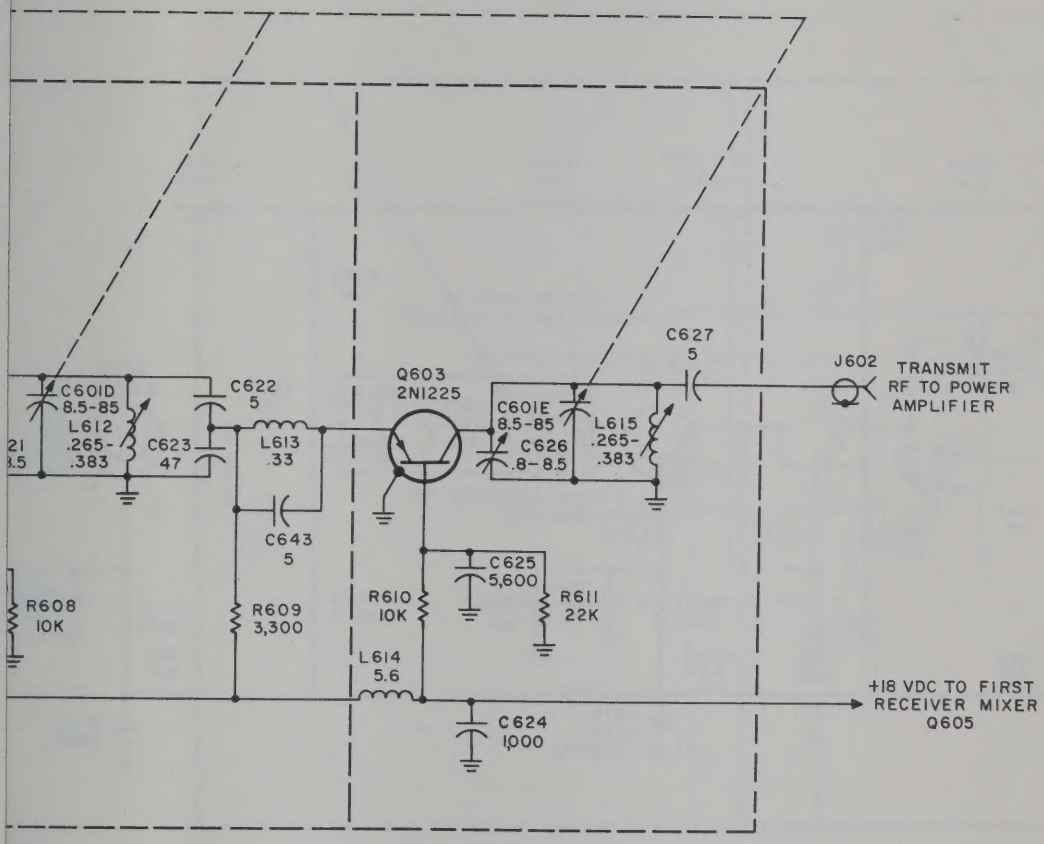


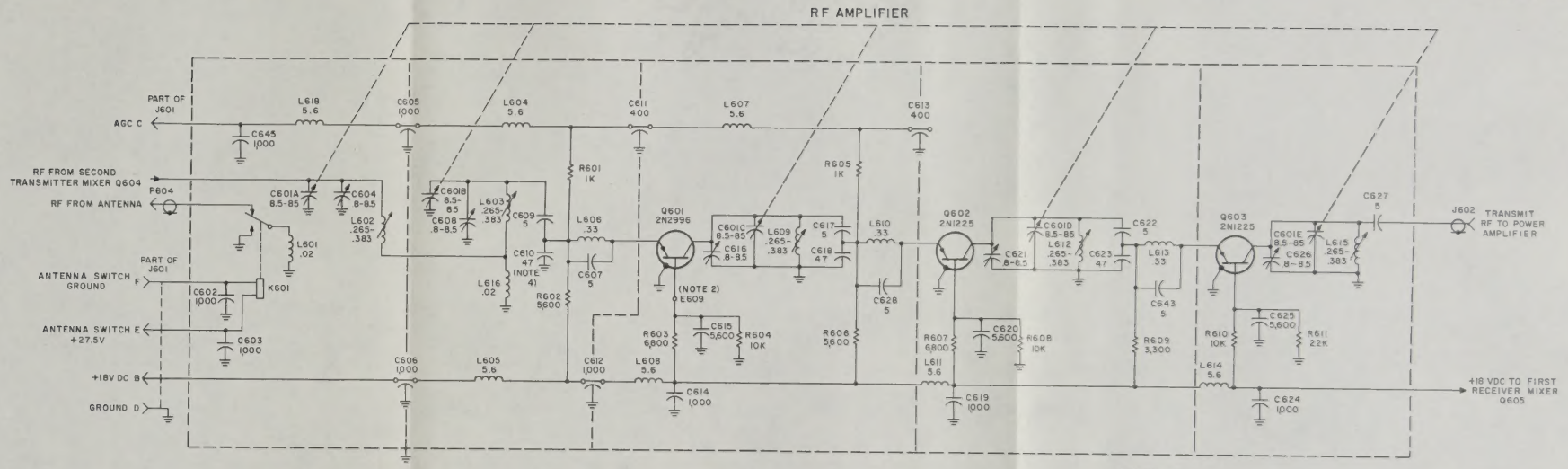
Figure 6-18. Receiver-Transmitter, Radio RT-348/ARC-54, wiring diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. E609 IS A FERRITE-BEAD ISOLATOR
3. DASHED LINES (EXCEPT MECHANICAL LINKAGE OF C601) INDICATE RF SHIELDING
4. CAPACITOR C610 NOT PRESENT IN SETS WITH SERIAL NUMBERS 1160 AND ABOVE.

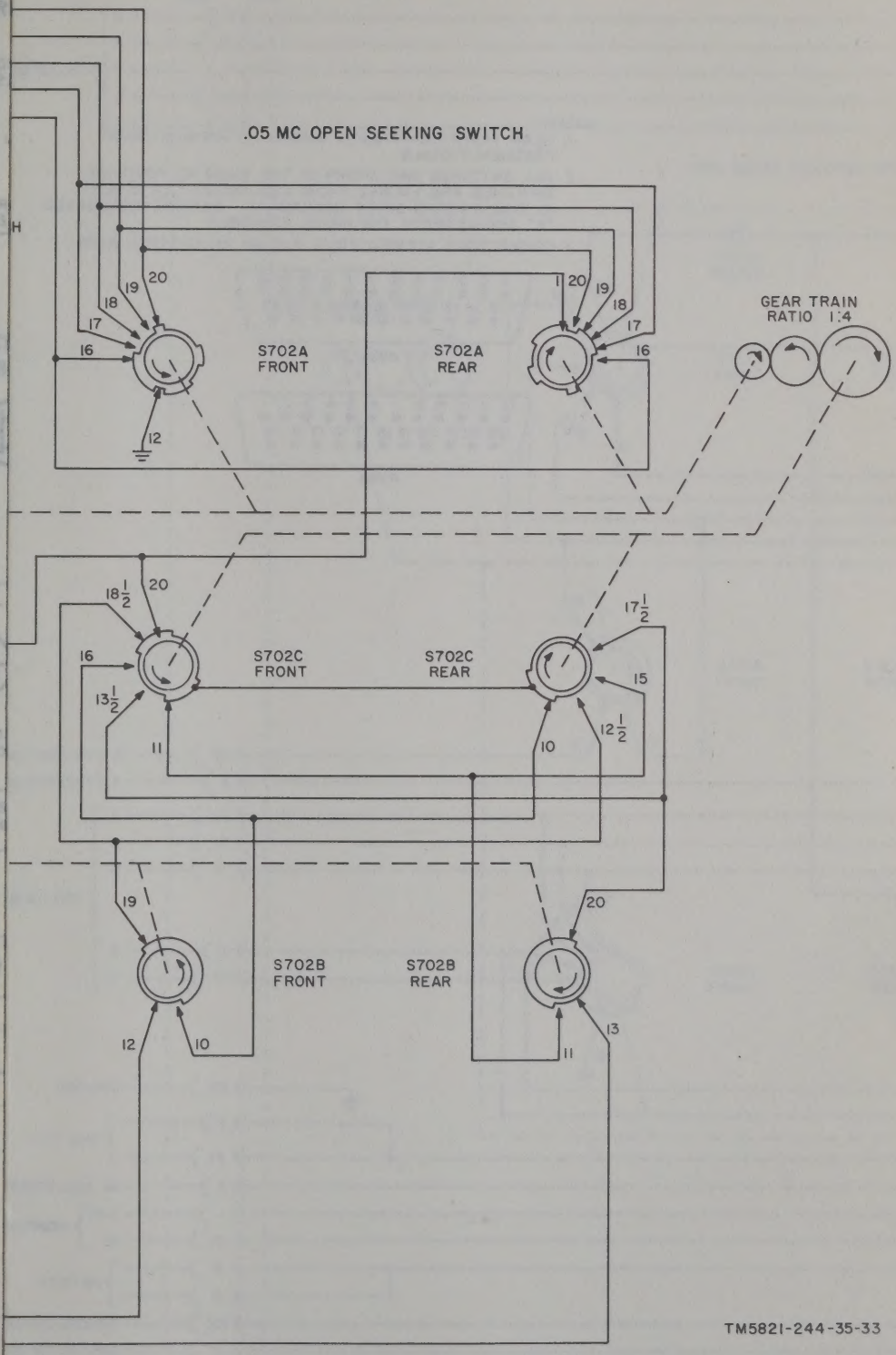
TM5821-244-35-10



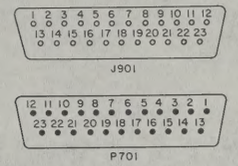
NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. E609 IS A FERRITE-BEAD ISOLATOR
3. DASHED LINES (EXCEPT MECHANICAL LINKAGE OF C601) INDICATE RF SHIELDING
4. CAPACITOR C610 NOT PRESENT IN SETS WITH SERIAL NUMBERS 1160 AND ABOVE.

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Figure 6-19. RF amplifier circuits, schematic diagram.


.05 MC OPEN SEEKING SWITCH
GEAR TRAIN RATIO 1:4
S702A FRONT
S702A REAR
S702C FRONT
S702C REAR
S702B FRONT
S702B REAR
TM5821-244-35-33

NOTES:
1. GEAR TRAIN ROTATION IS SHOWN AS VIEWED FROM FREQUENCY DIALS
2. ALL SWITCHES ARE SHOWN IN THE 30.00 MC POSITION. SWITCHES ARE VIEWED FROM SIDE INDICATED (FRONT IS SIDE TOWARD DRIVE ASSEMBLY). WAFERS DESIGNATED "A" ARE NEAREST THE DRIVE ASSEMBLY
3. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



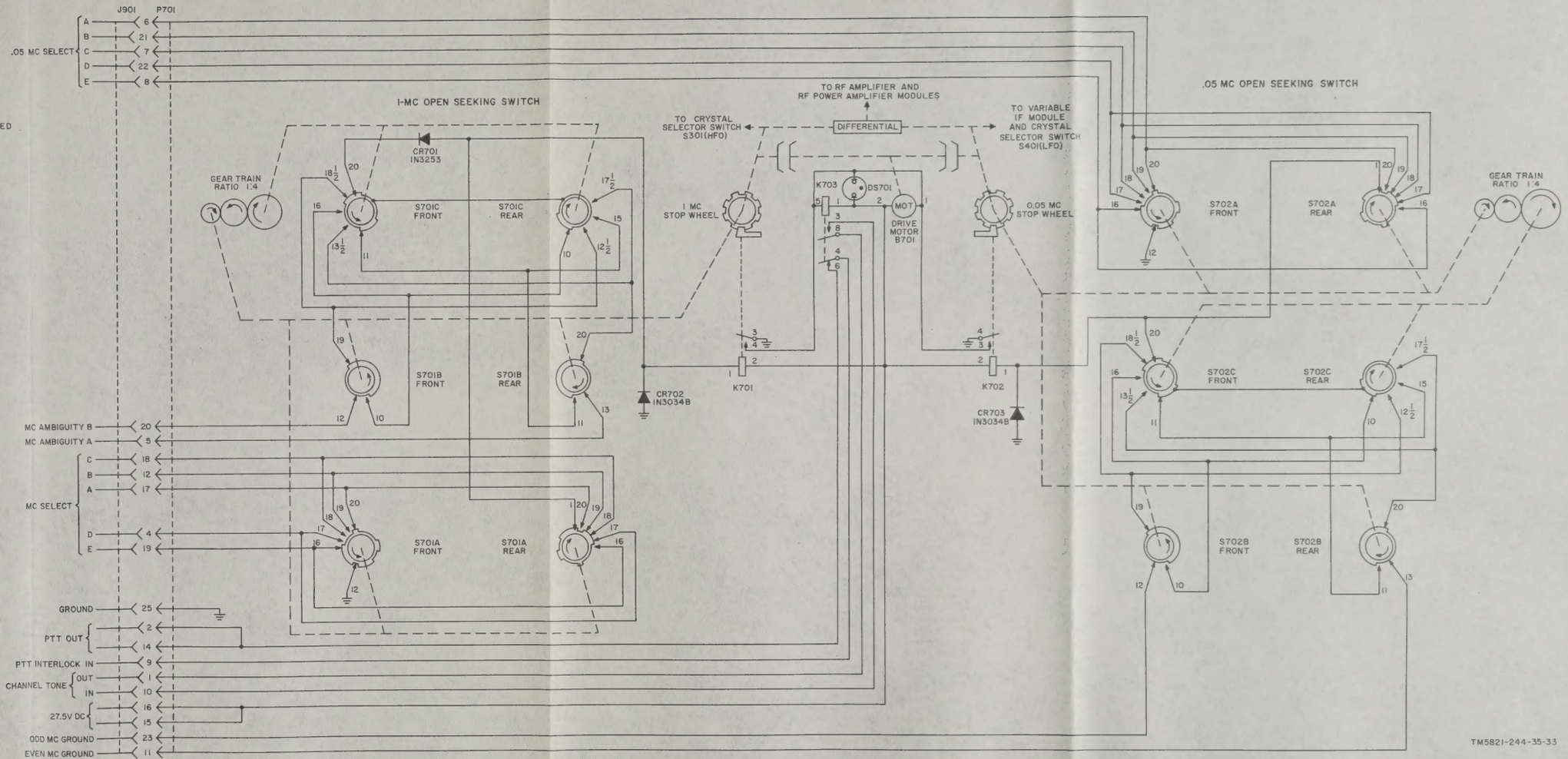
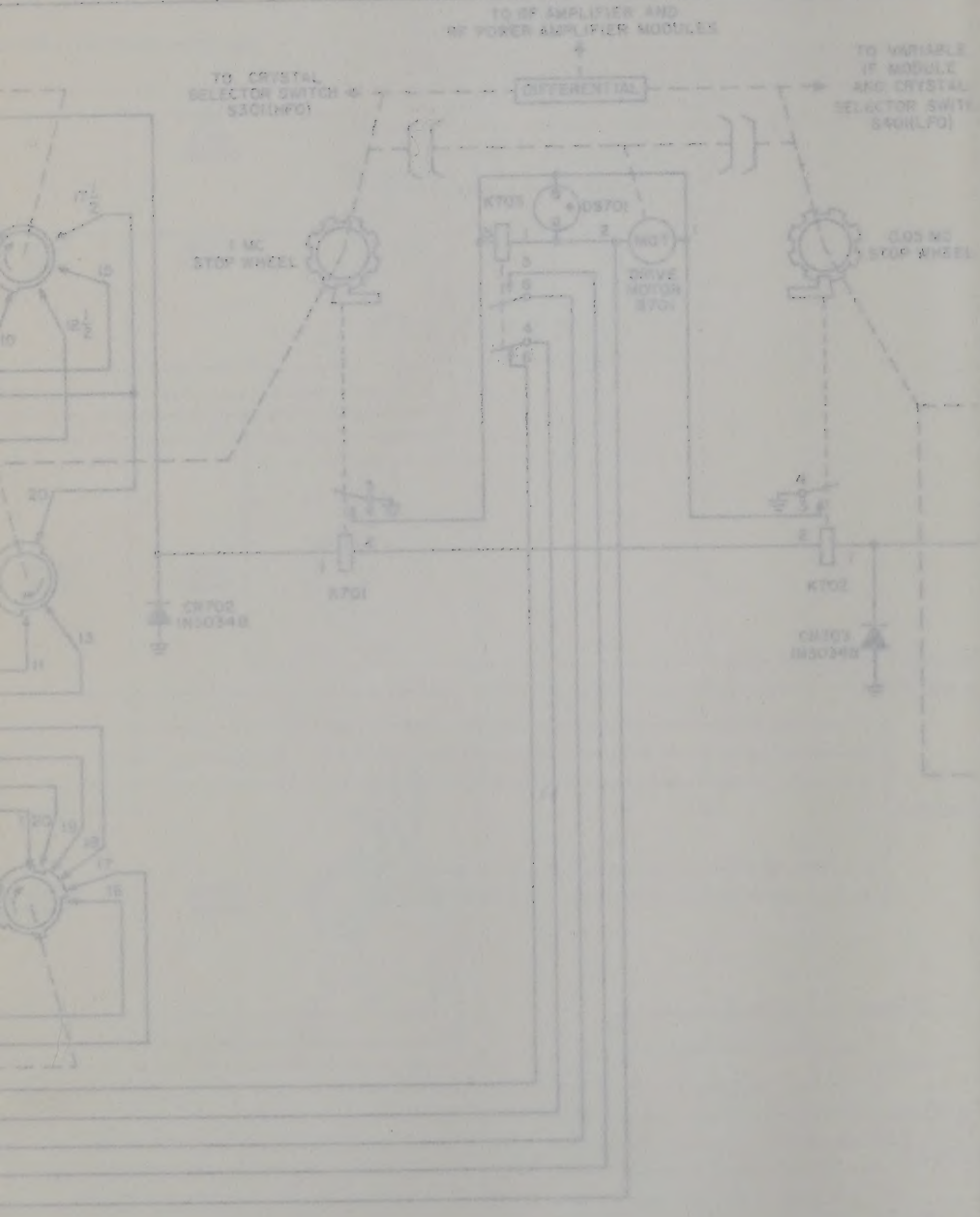
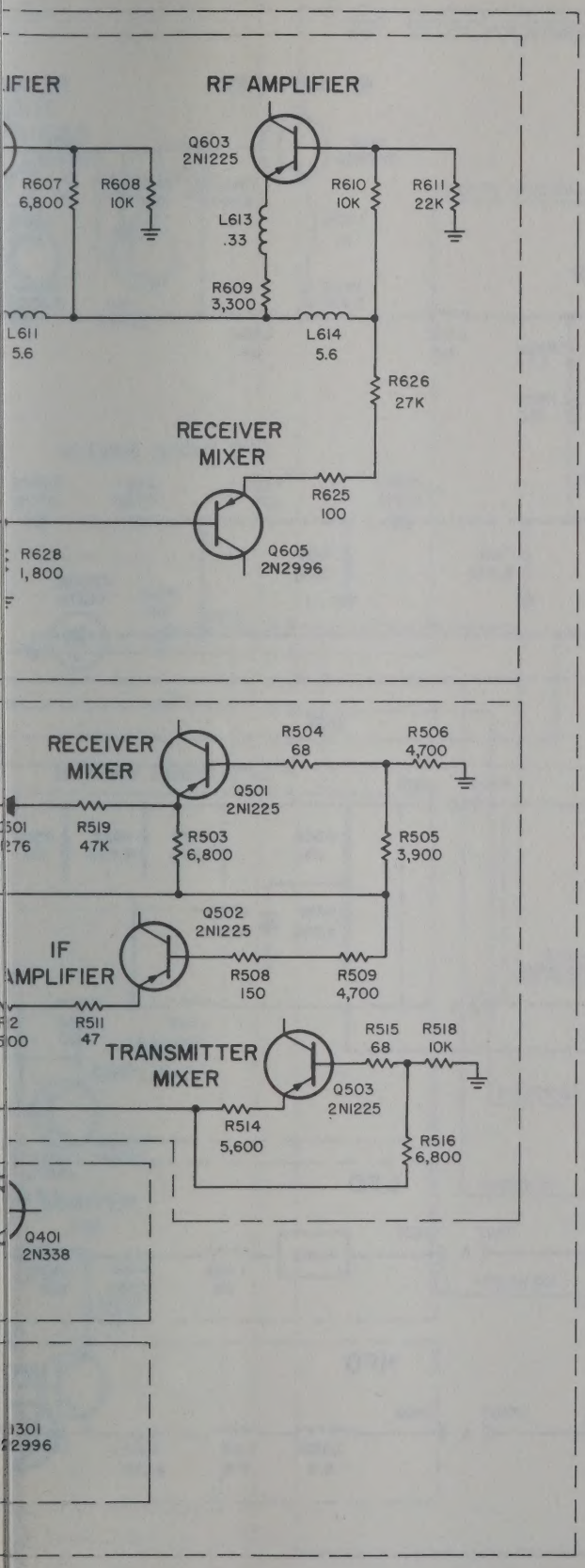


Figure 6–20. Mechanical drive circuits, schematic diagram.

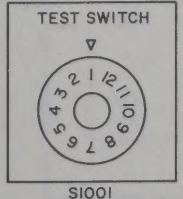


Mechanical drive circuits, schematic diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MILLIHENRYS
2. [ ] INDICATES EQUIPMENT MARKING
3. SWITCH POSITIONS OF S1001 AND POSITION FUNCTIONS



S1001

1. +27.5 VOLTS	7. FMO OUTPUT
2. -27.5 VOLTS	8. PA GRID
3. LFO OUTPUT	9. 500 V
4. HFO OUTPUT	10. RF FWD
5. TONE OSC	11. RF REFL
6. AGC	12. OFF

4. SECTIONS DESIGNATED A ARE NEAREST THE CONTROL KNOB. FRONT OF SECTION IS SIDE TOWARD CONTROL KNOB.

TM5821-244-35-34

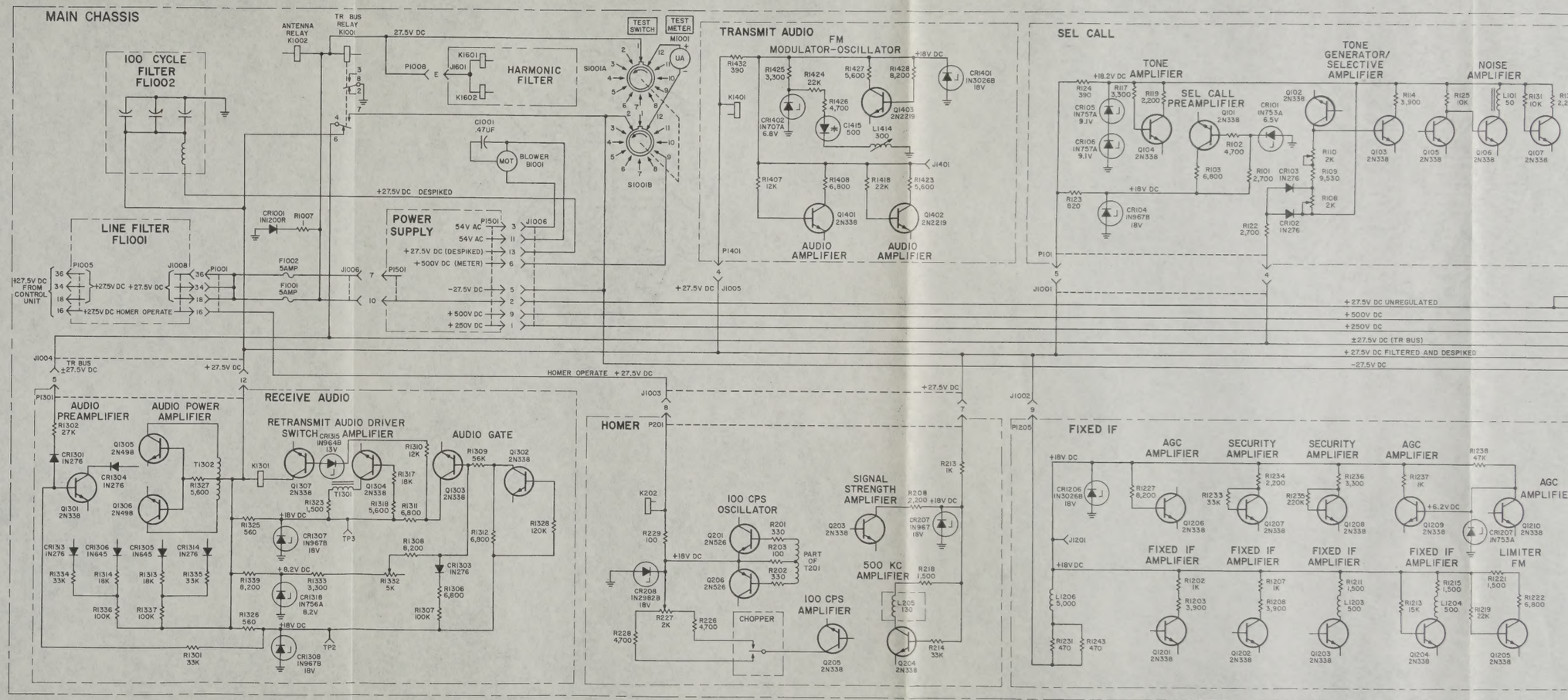


Figure 6-21. Intraunit power distribution and

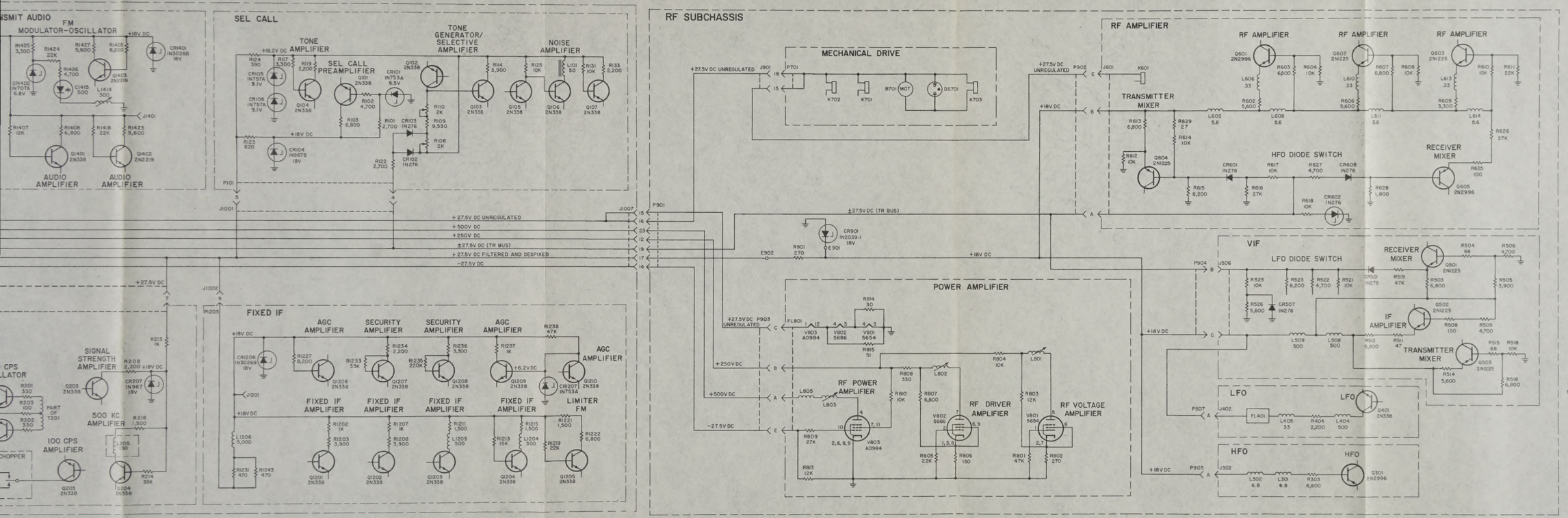
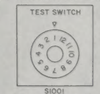


Figure 6-21. Intraunit power distribution and regulation circuits, schematic diagram.

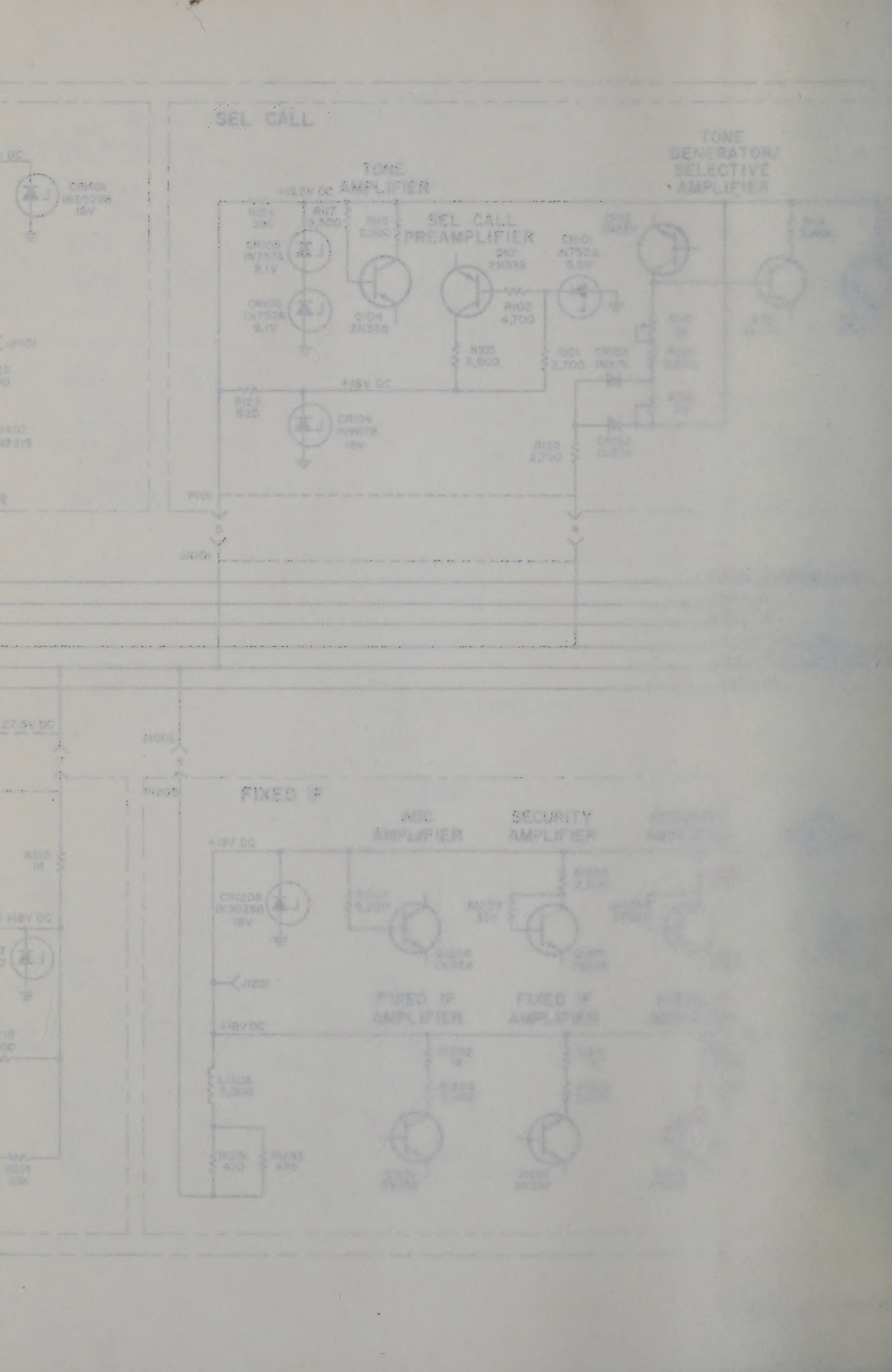
NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL RESISTANCE VALUES ARE IN OHMS
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MILLIHENRYS
2. ▭ INDICATES EQUIPMENT MARKING
3. SWITCH POSITIONS OF S100I AND POSITION FUNCTIONS:

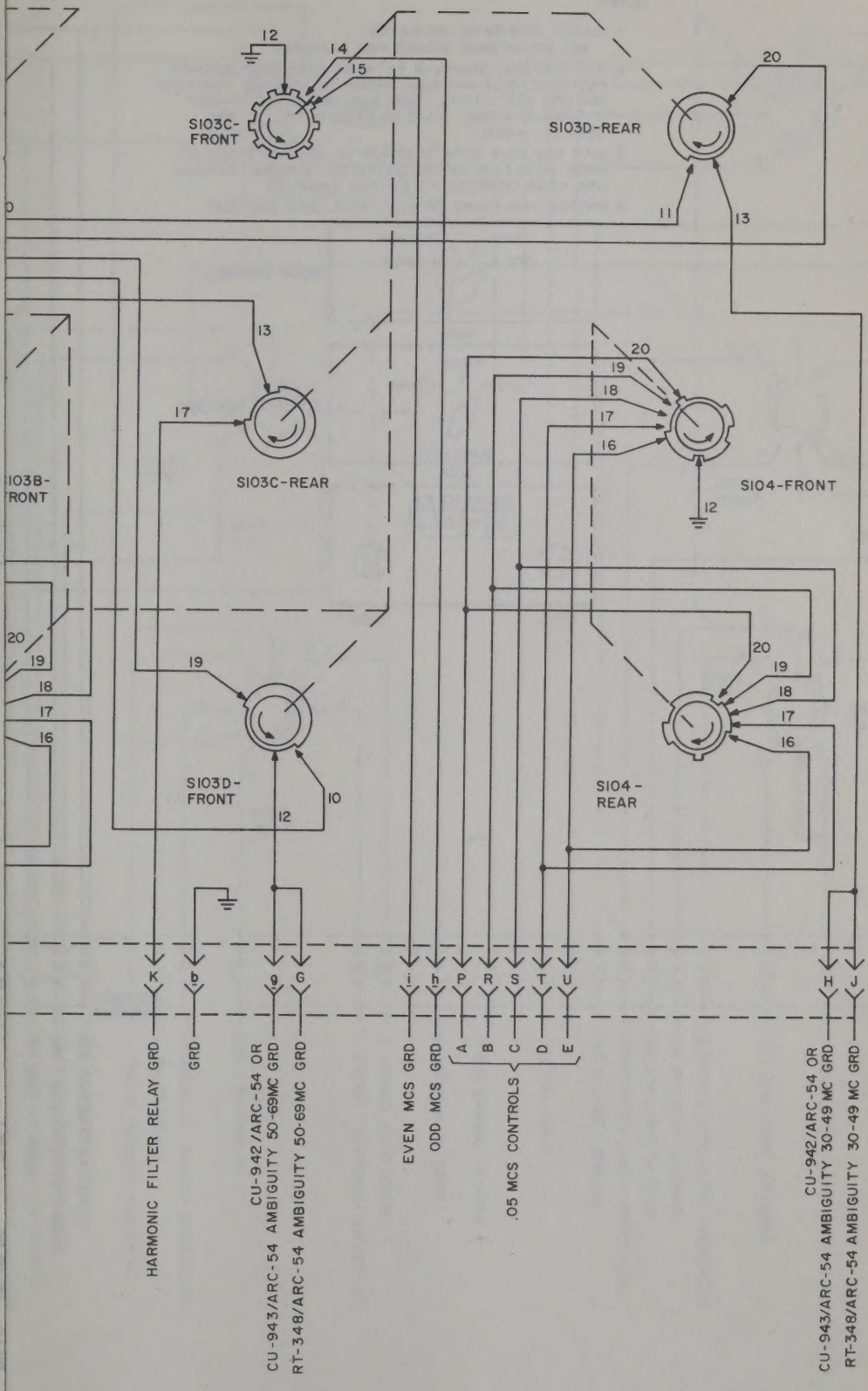


1. +27.5 VOLTS
2. -27.5 VOLTS
3. LFO OUTPUT
4. HFO OUTPUT
5. TONE OSC
6. AGC
7. FMG OUTPUT
8. PA GRID
9. 500 V
10. RF FWD
11. RF REFL
12. OFF

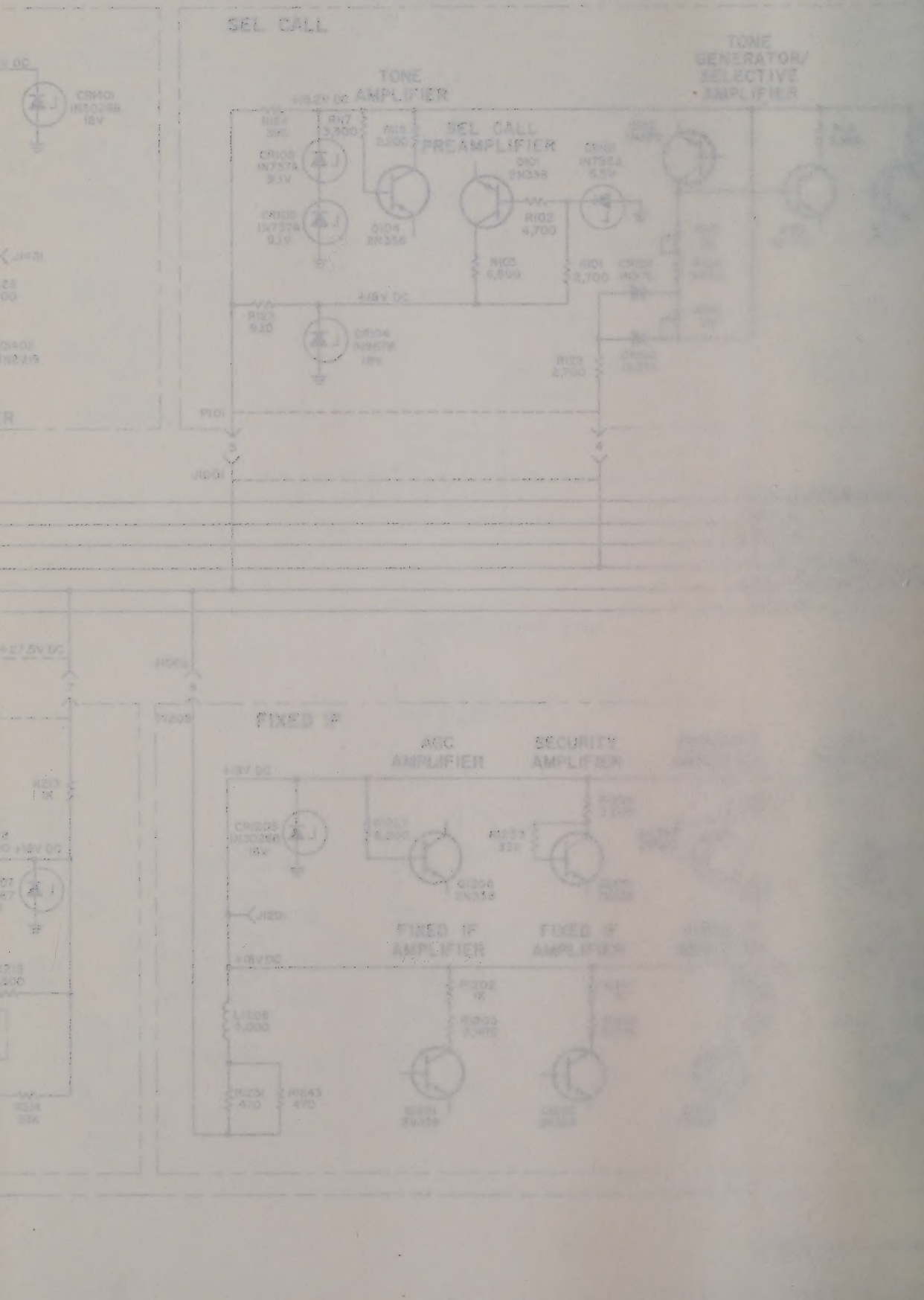
4. SECTIONS DESIGNATED A ARE NEAREST THE CONTROL KNOB. FRONT OF SECTION IS SIDE TOWARD CONTROL KNOB.

TM5821-244-35-34


SEL CALL
TONE AMPLIFIER
SEL CALL PREAMPLIFIER
TONE GENERATOR/ SELECTIVE AMPLIFIER
+18V DC
FIXED IF
AGC AMPLIFIER
SECURITY AMPLIFIER
FIXED IF AMPLIFIER
FIXED IF AMPLIFIER

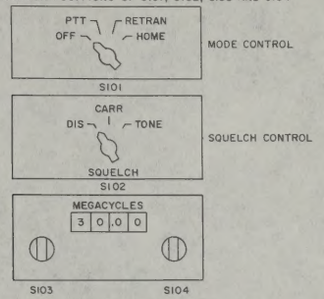


TM5821-244-35-36


SEL CALL
TONE AMPLIFIER
TONE GENERATOR/ SELECTIVE AMPLIFIER
SEL CALL PREAMPLIFIER
+18V DC
FIXED IF
AGC AMPLIFIER
SECURITY AMPLIFIER
FIXED IF AMPLIFIER
FIXED IF AMPLIFIER

NOTES:

1. UNLESS OTHERWISE INDICATED: ALL RESISTANCE VALUES ARE IN OHMS
2. S101 AND S102 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION; S103 AND S104 SHOWN IN 30.00 MC POSITION. WAFERS ARE VIEWED FROM SIDE INDICATED (FRONT IS TOWARD KNOB). WAFERS DESIGNATED "A" ARE NEAREST KNOB.
3. S103 AND S104 ROTATE OPPOSITE TO DIRECTION OF KNOB ROTATION AS INDICATED BY ARROWS. (KNOBS ARE GEAR COUPLED TO SWITCH SHAFTS.)
4. SWITCH POSITIONS OF S101, S102, S103 AND S104



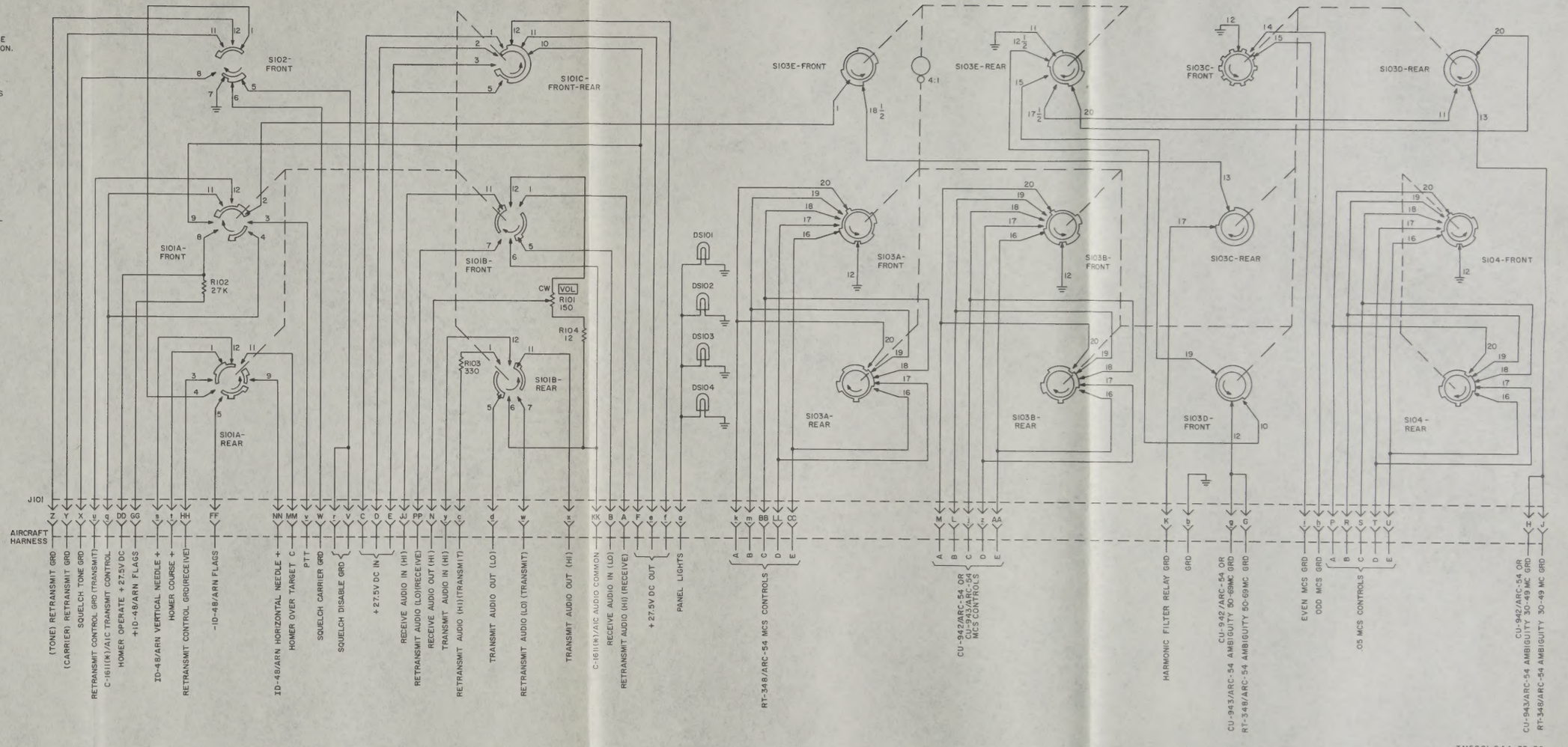
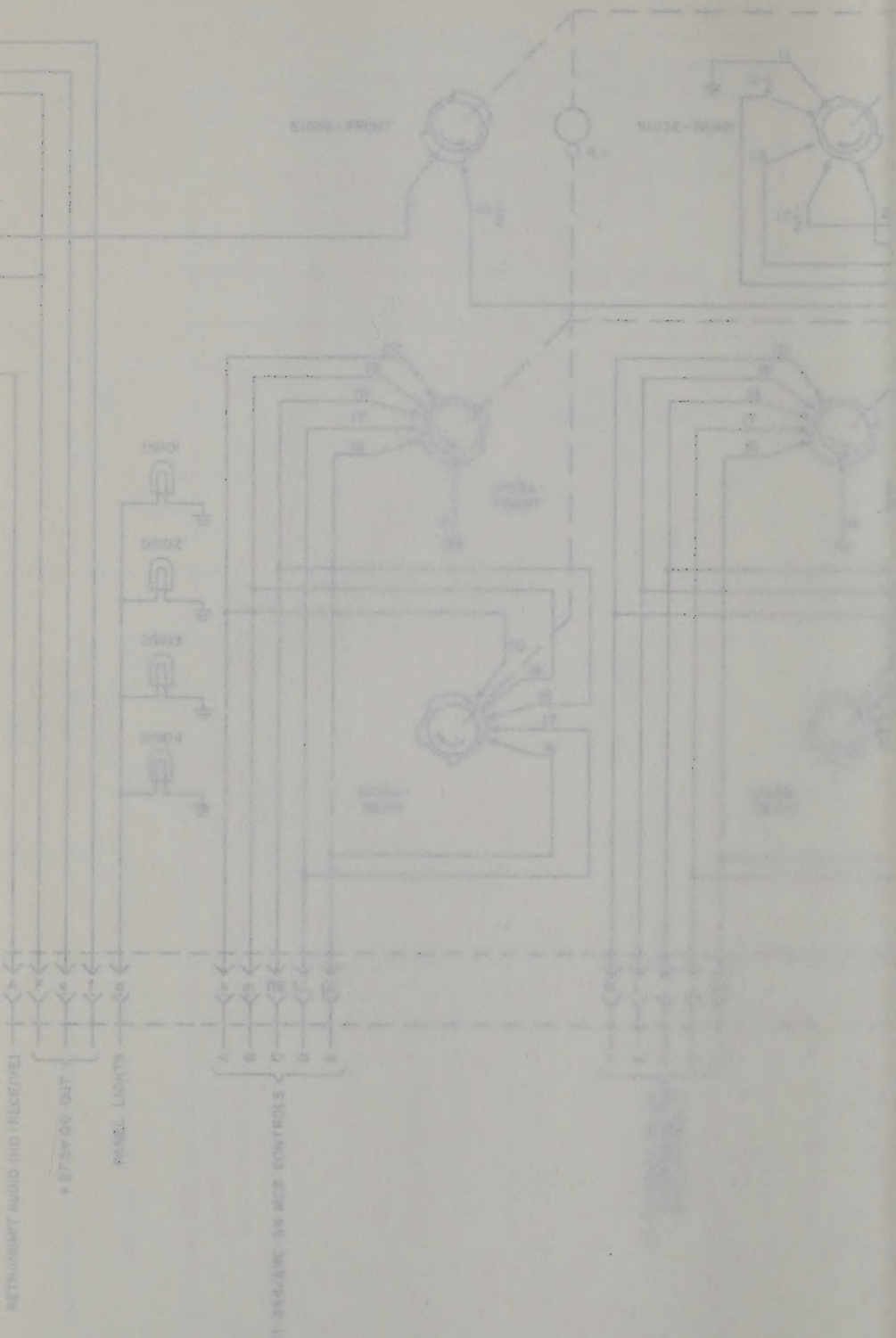
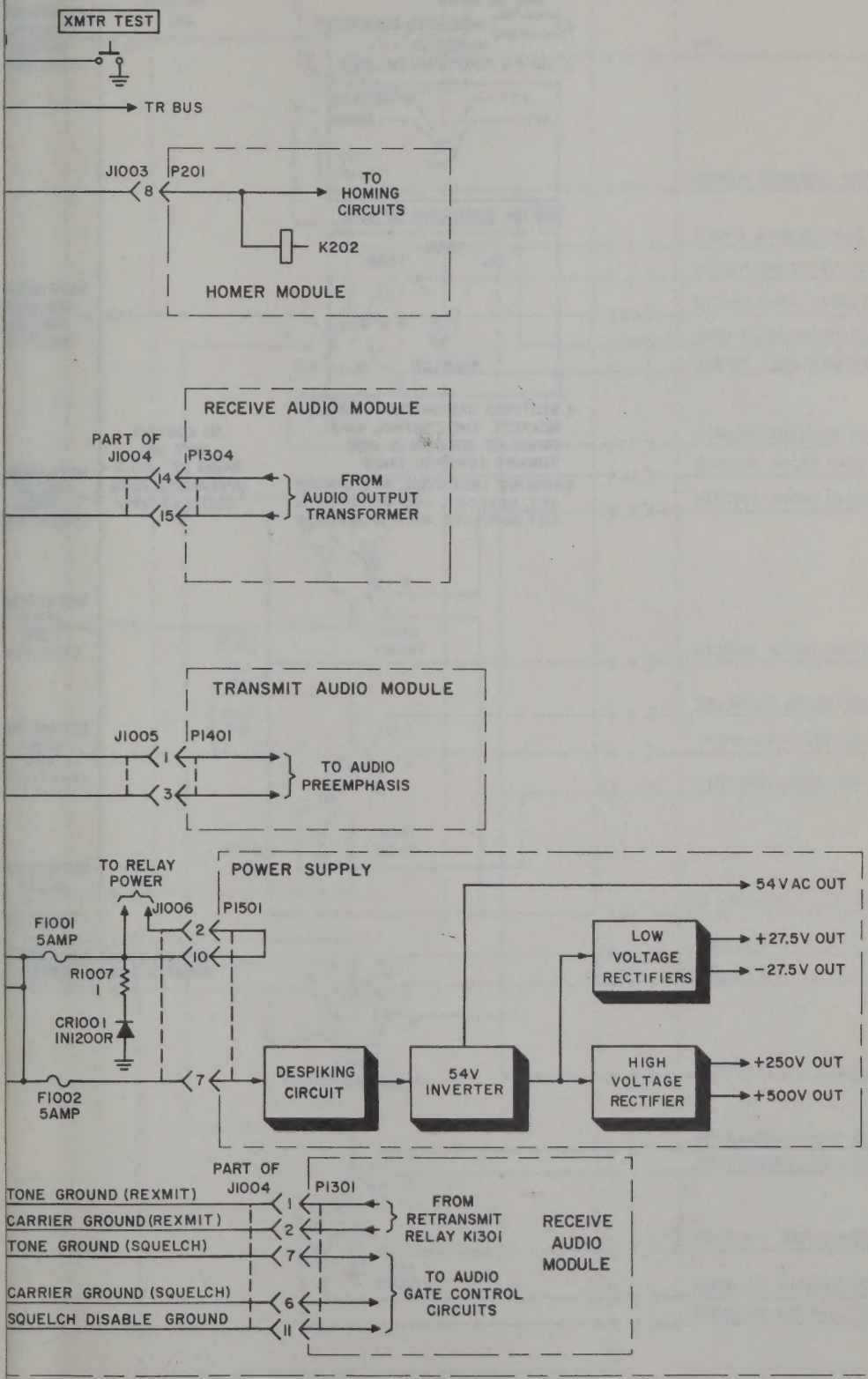


Figure 6–22. Control, Radio Set C–3835/ARC–54, schematic diagram.

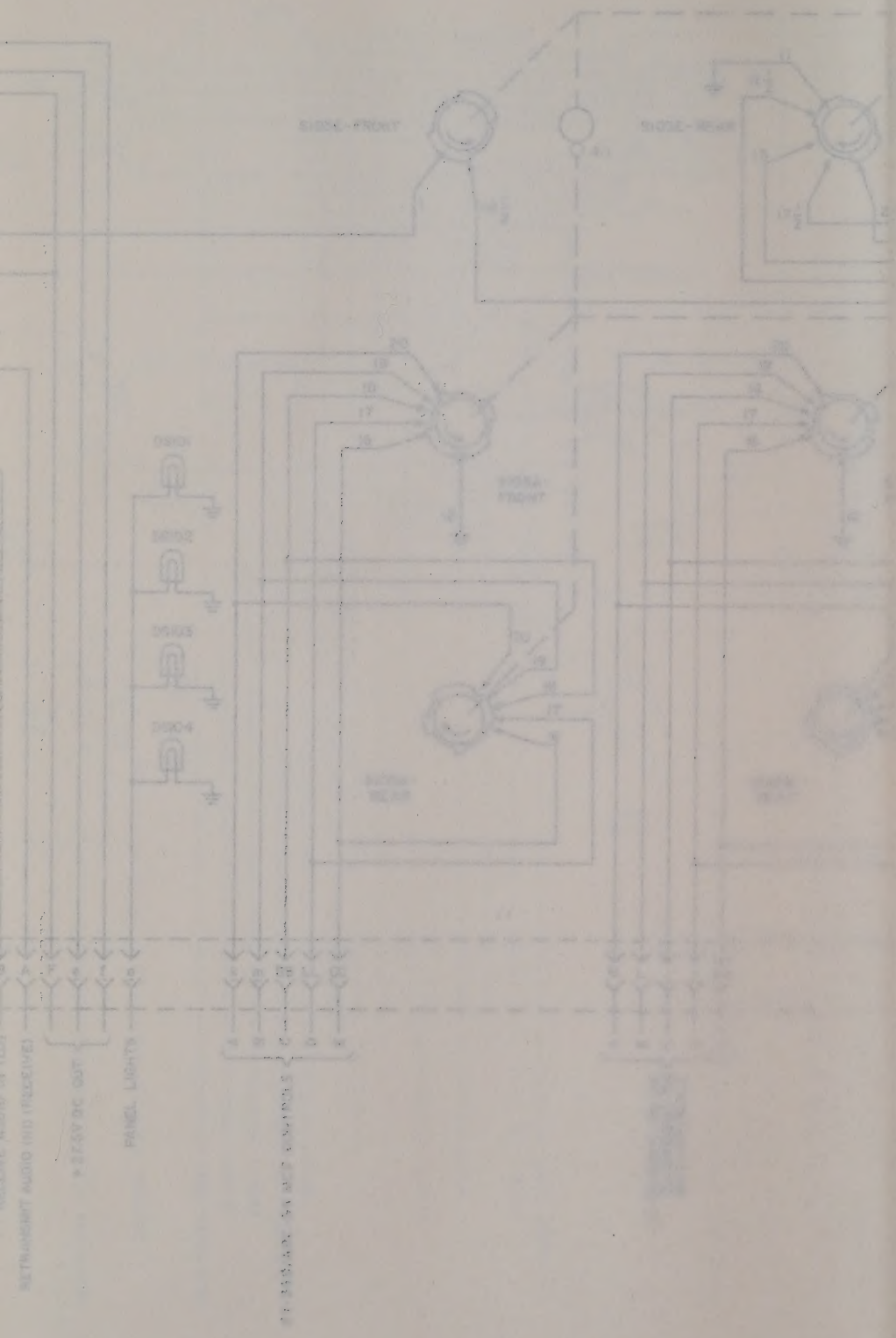


Navy Dept. C-3855/2 RC-54, schematic diagram.

RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54



TM5821-244-35-40


DIODE-FRONT
DIODE-REAR
DS01
DS02
DS03
DS04
PANEL LIGHTS
+12 V DC OUT

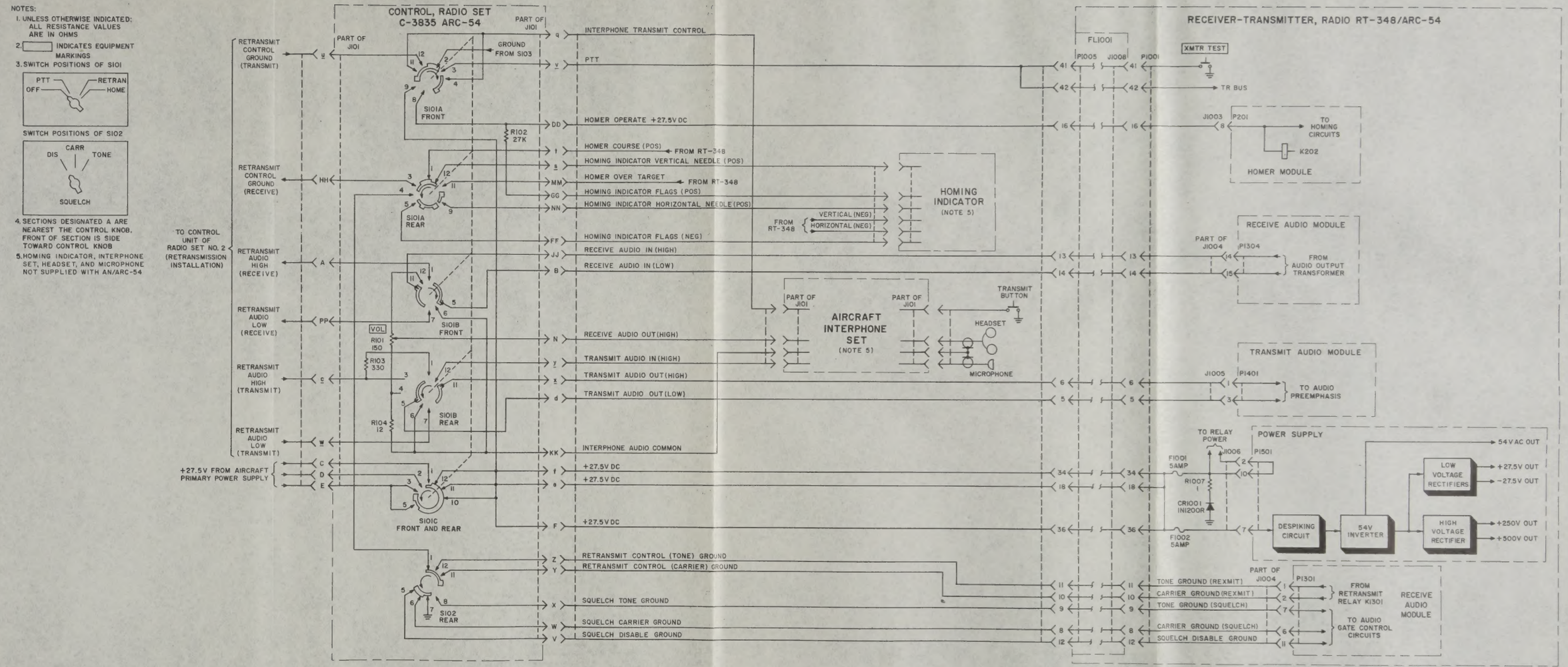
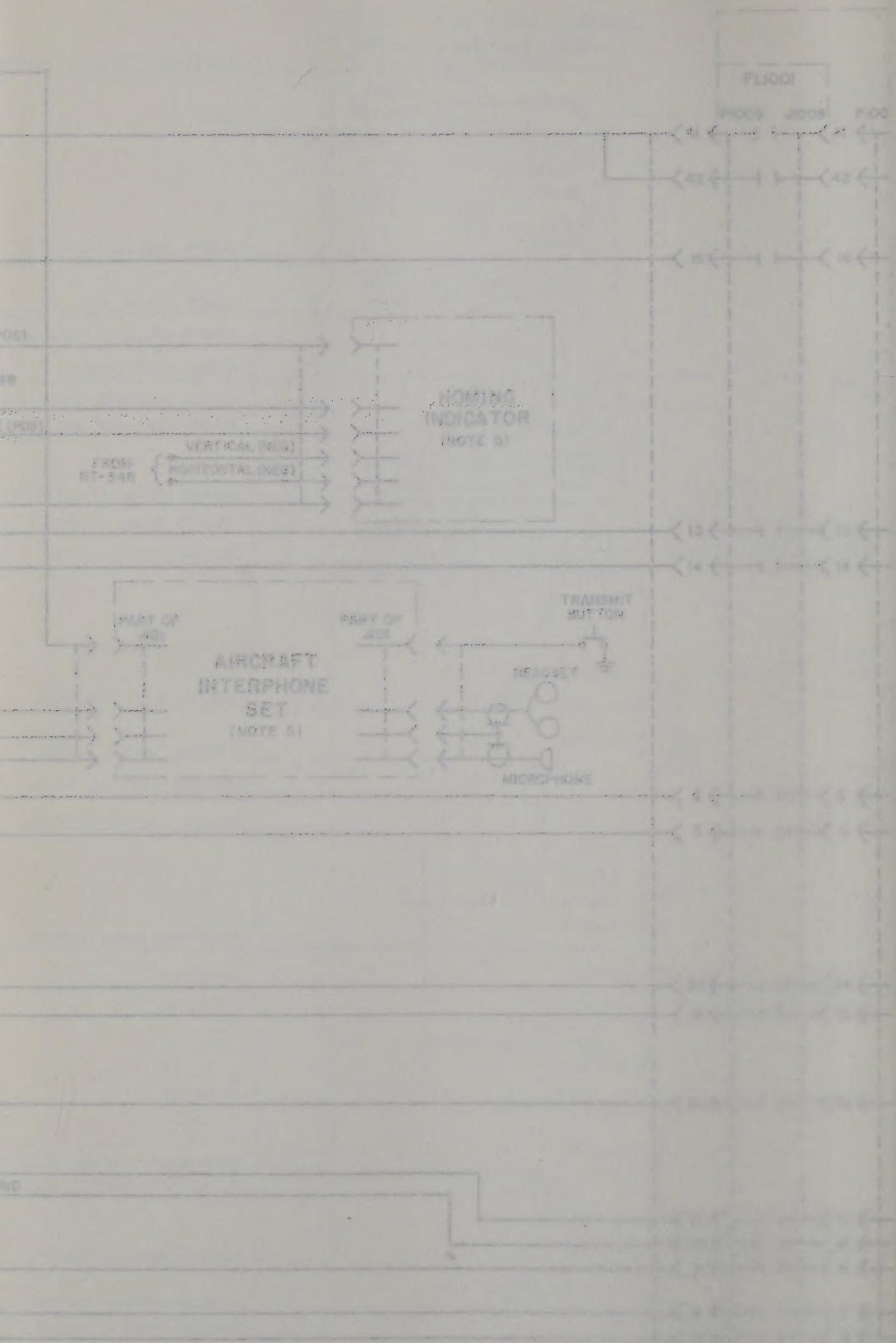
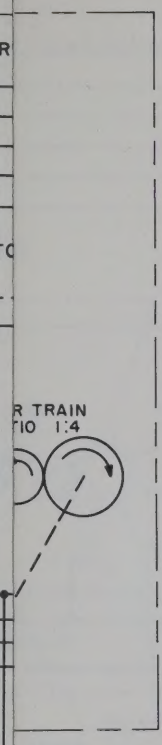


Figure 6-23. Mode of operation control circuits for Radio Set AN/ARC-54.

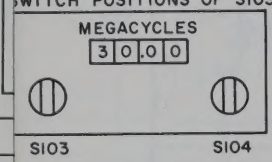

FROM ST-54A
VERTICAL (NEG)
HORIZONTAL (NEG)
HOMING INDICATOR
(NOTE 5)
PART OF J601
AIRCRAFT INTERPHONE SET
(NOTE 5)
PART OF J601
TRANSMIT BUTTON
HEADSET
MICROPHONE



R TRAIN
TIO 1:4

ALL SWITCHES ARE SHOWN IN 30.00 MC POSITION AND ARE VIEWED FROM SIDE INDICATED (FRONT S SIDE TOWARD KNOB OR DRIVEN END). WAFERS DESIGNATED "A" ARE NEAREST KNOB OR DRIVEN END

SWITCH POSITIONS OF S103 AND S104



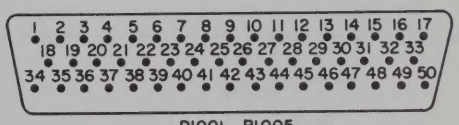
CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



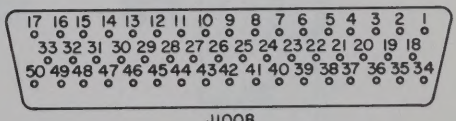
J101
ANTENNA COUPLER UNIT



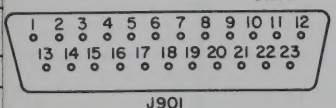
J101
RADIO CONTROL UNIT



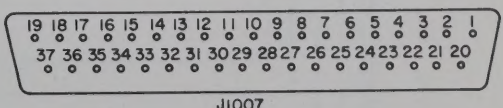
P1001, P1005



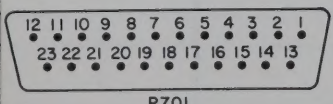
J1008



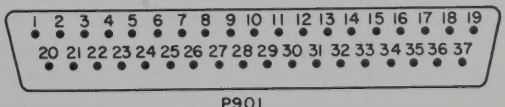
J901



J1007



P701



P901

TM5821-244-35-44

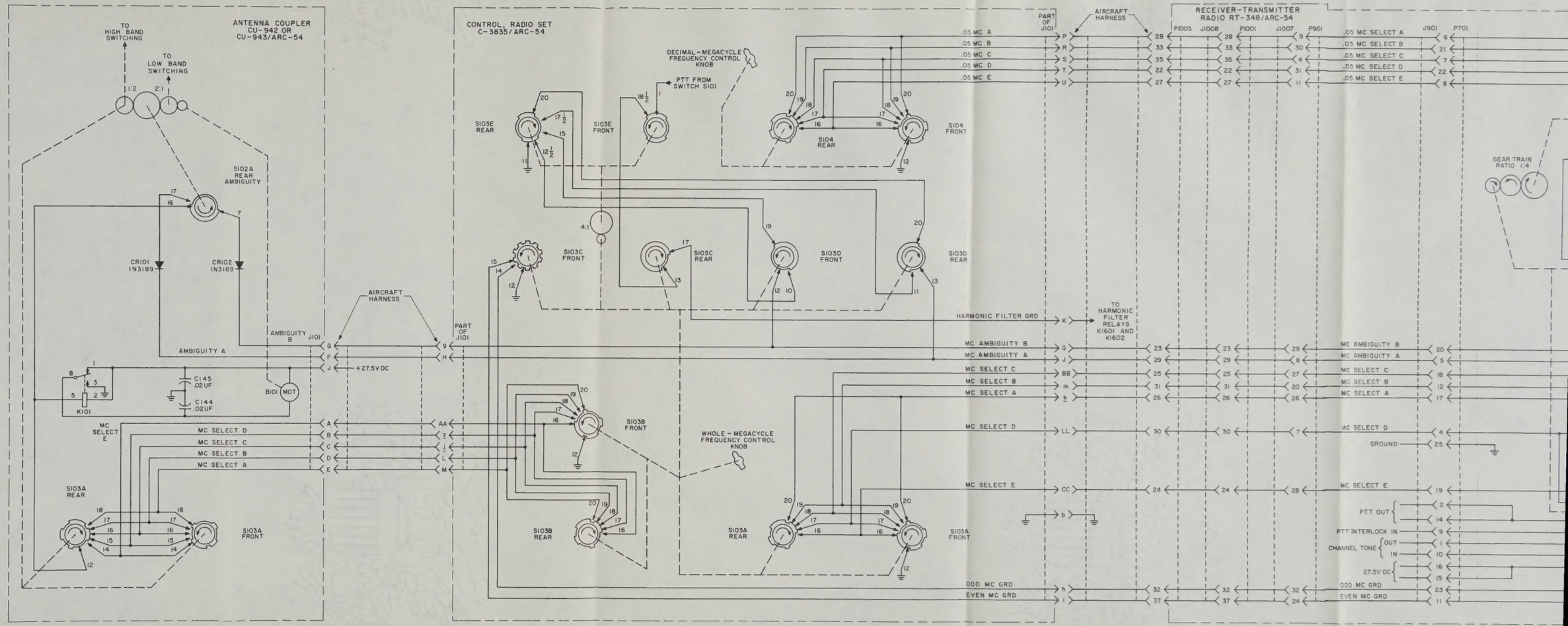


Figure 6-24. Tuning system schematic diagram.

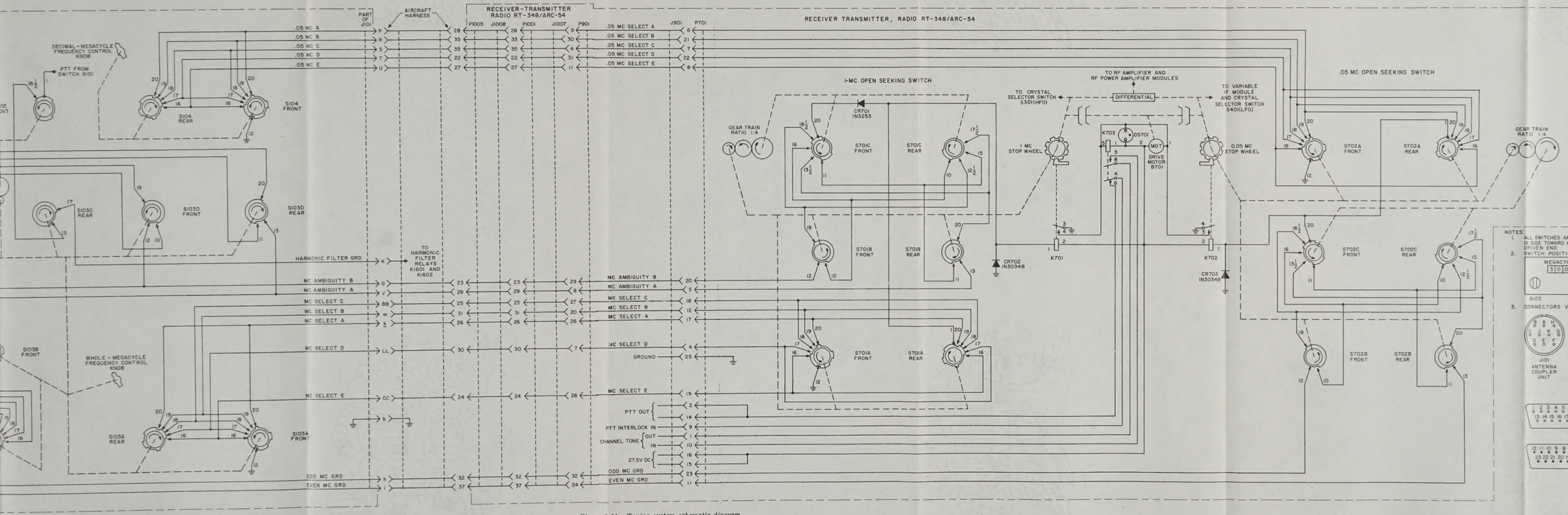
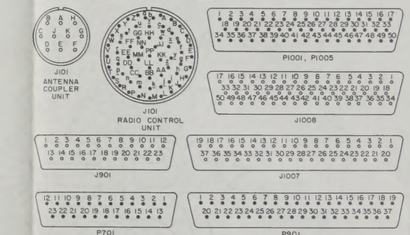


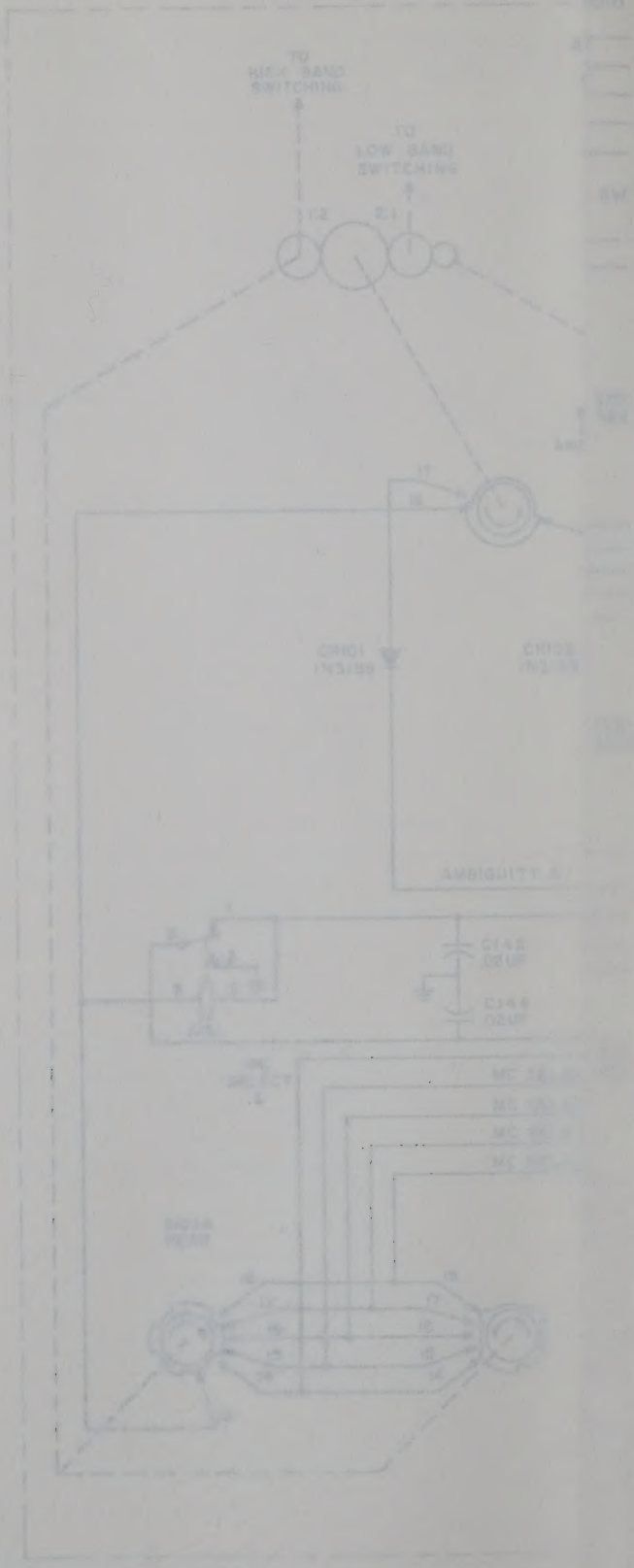
Figure 6-24. Tuning system schematic diagram.

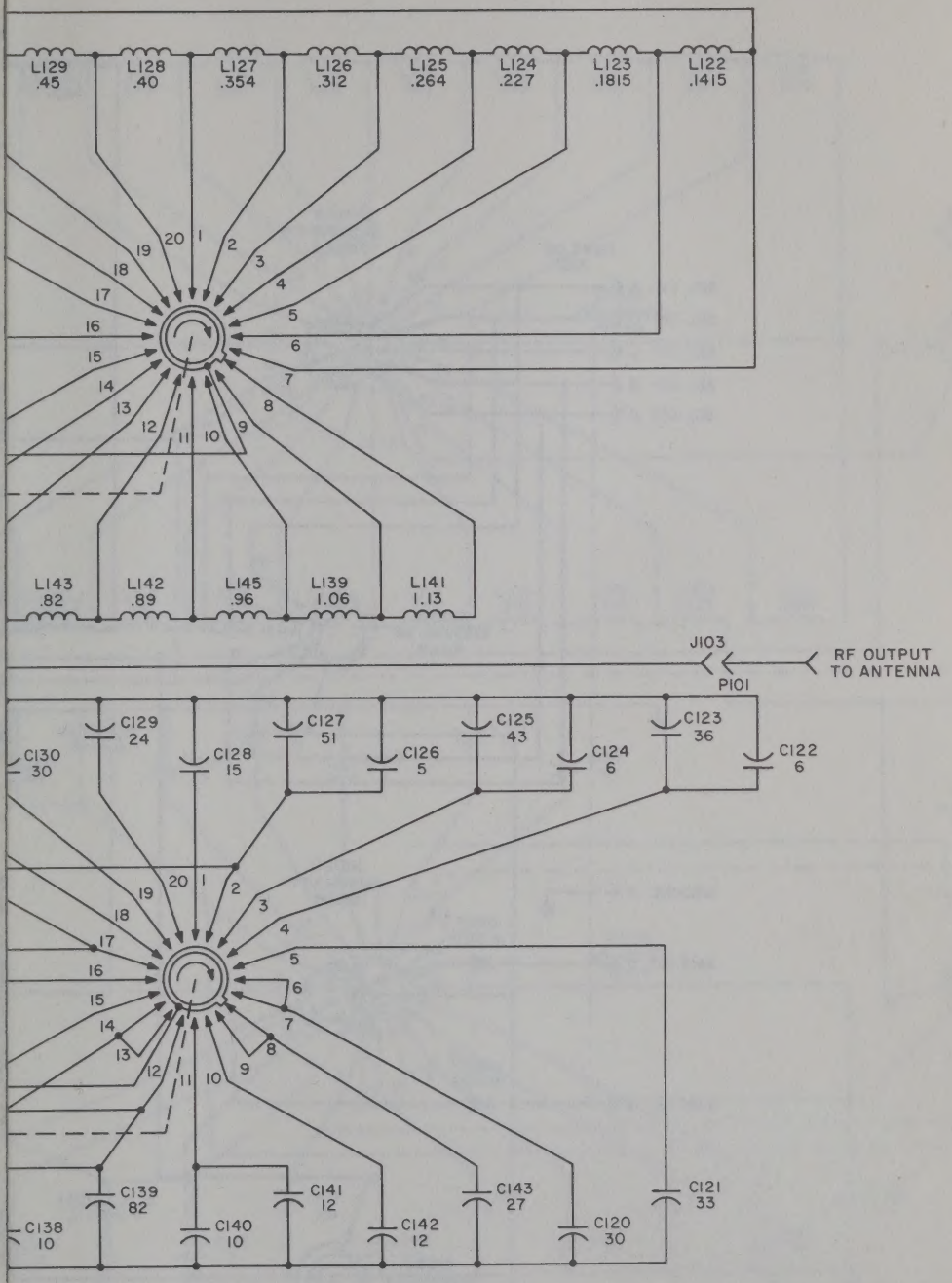
NOTES:
1. ALL SWITCHES ARE SHOWN IN 30.00 MC POSITION AND ARE VIEWED FROM SIDE INDICATED (FRONT IS SIDE TOWARD KNOB OR DRIVEN END). WAFERS DESIGNATED "A" ARE NEAREST KNOB OR DRIVEN END.
2. SWITCH POSITIONS OF S103 AND S104

3. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



TM5821-244-35-44


TV
HIGH BAND
SWITCHING
TV
LOW BAND
SWITCHING
C2
C1
AMBIGUITY A



S OTHERWISE INDICATED:
CAPACITANCE VALUES ARE IN MICROMICROFARADS
INDUCTANCE VALUES ARE IN MICROHENRIES

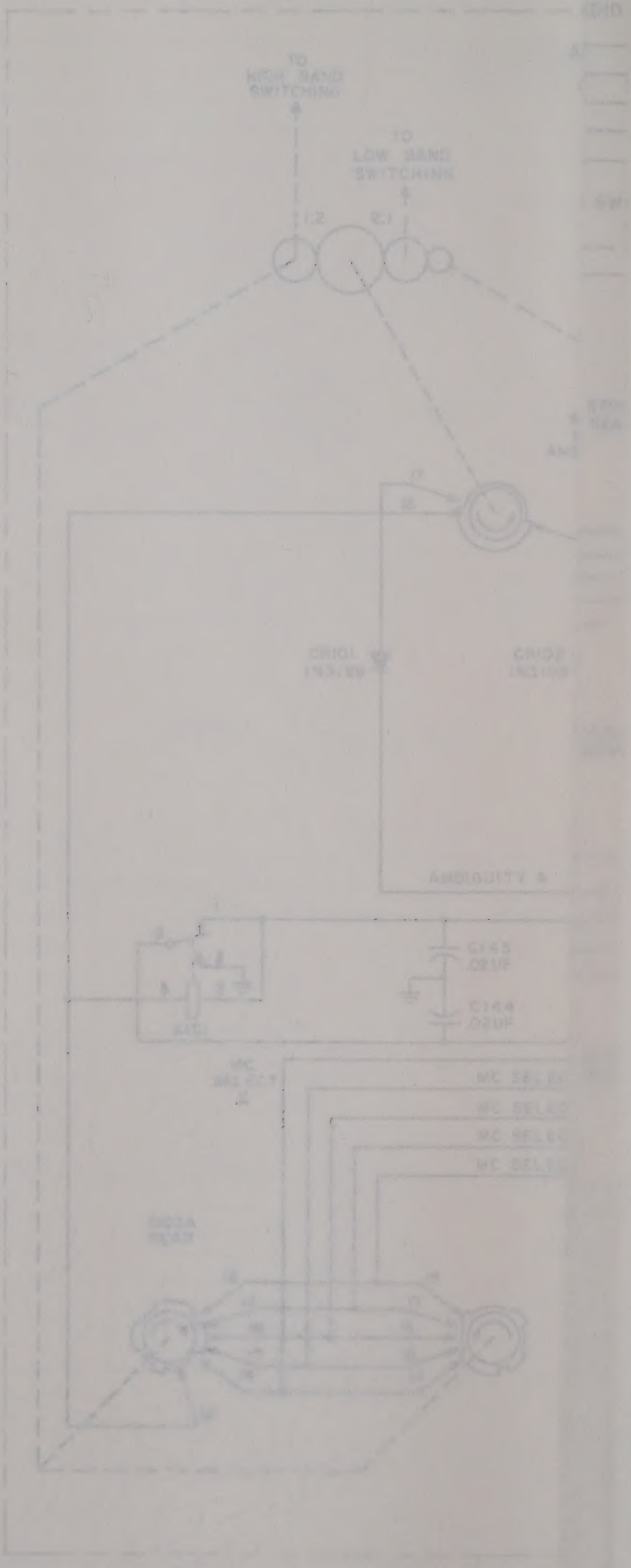
WITCHES ARE SHOWN IN 30MC POSITION. WAFERS ARE
D FROM SIDE INDICATED. (FRONT IS TOWARD GEARS.)
'S DESIGNATED "A" ARE NEAREST THE GEARS

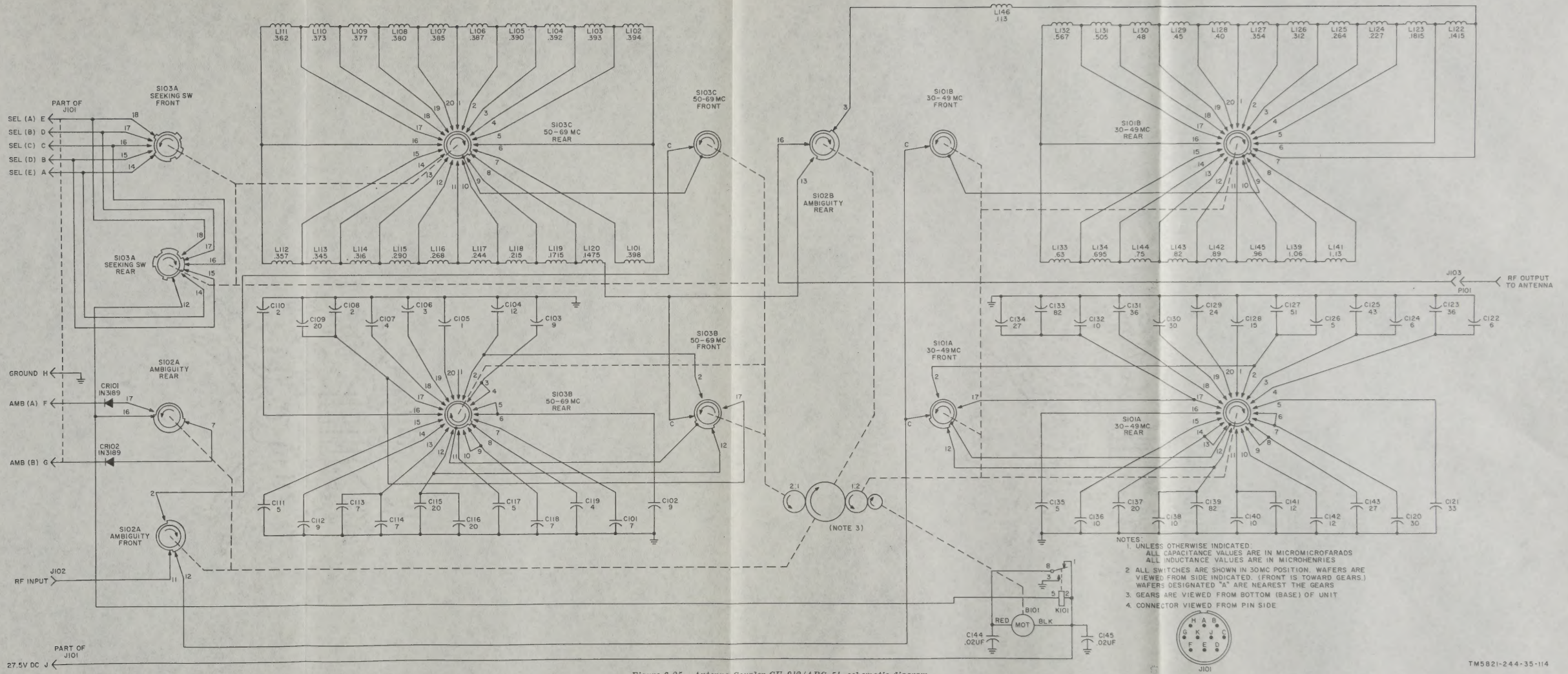
ARE VIEWED FROM BOTTOM (BASE) OF UNIT

CTOR VIEWED FROM PIN SIDE



TM5821-244-35-114


TO
HIGH BAND
SWITCHING
TO
LOW BAND
SWITCHING
AMBIGUITY A
C145
.02UF
C144
.02UF

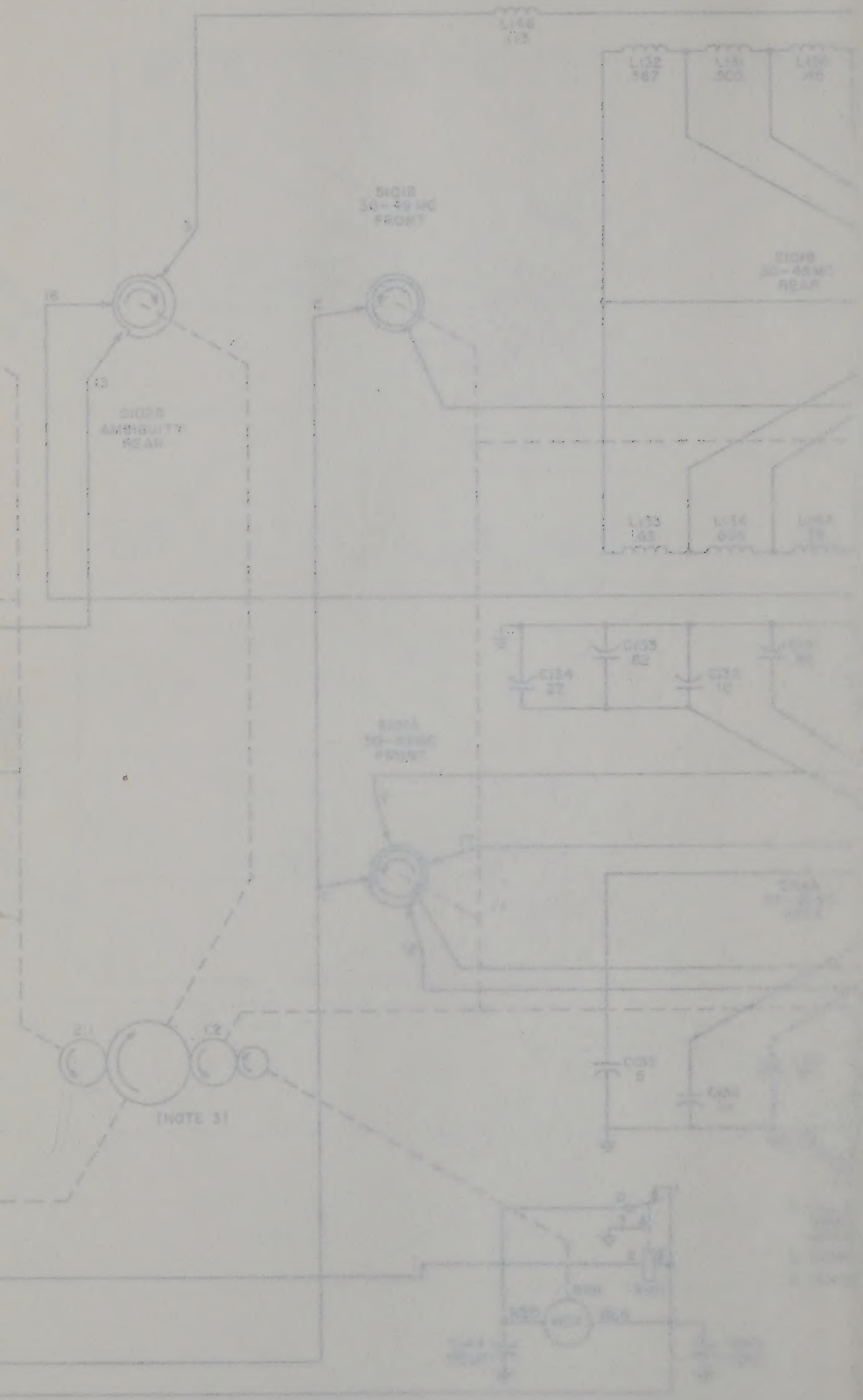


NOTES:
1. UNLESS OTHERWISE INDICATED:
   ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
   ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. ALL SWITCHES ARE SHOWN IN 30MC POSITION. WAFERS ARE VIEWED FROM SIDE INDICATED. (FRONT IS TOWARD GEARS.) WAFERS DESIGNATED "A" ARE NEAREST THE GEARS
3. GEARS ARE VIEWED FROM BOTTOM (BASE) OF UNIT
4. CONNECTOR VIEWED FROM PIN SIDE

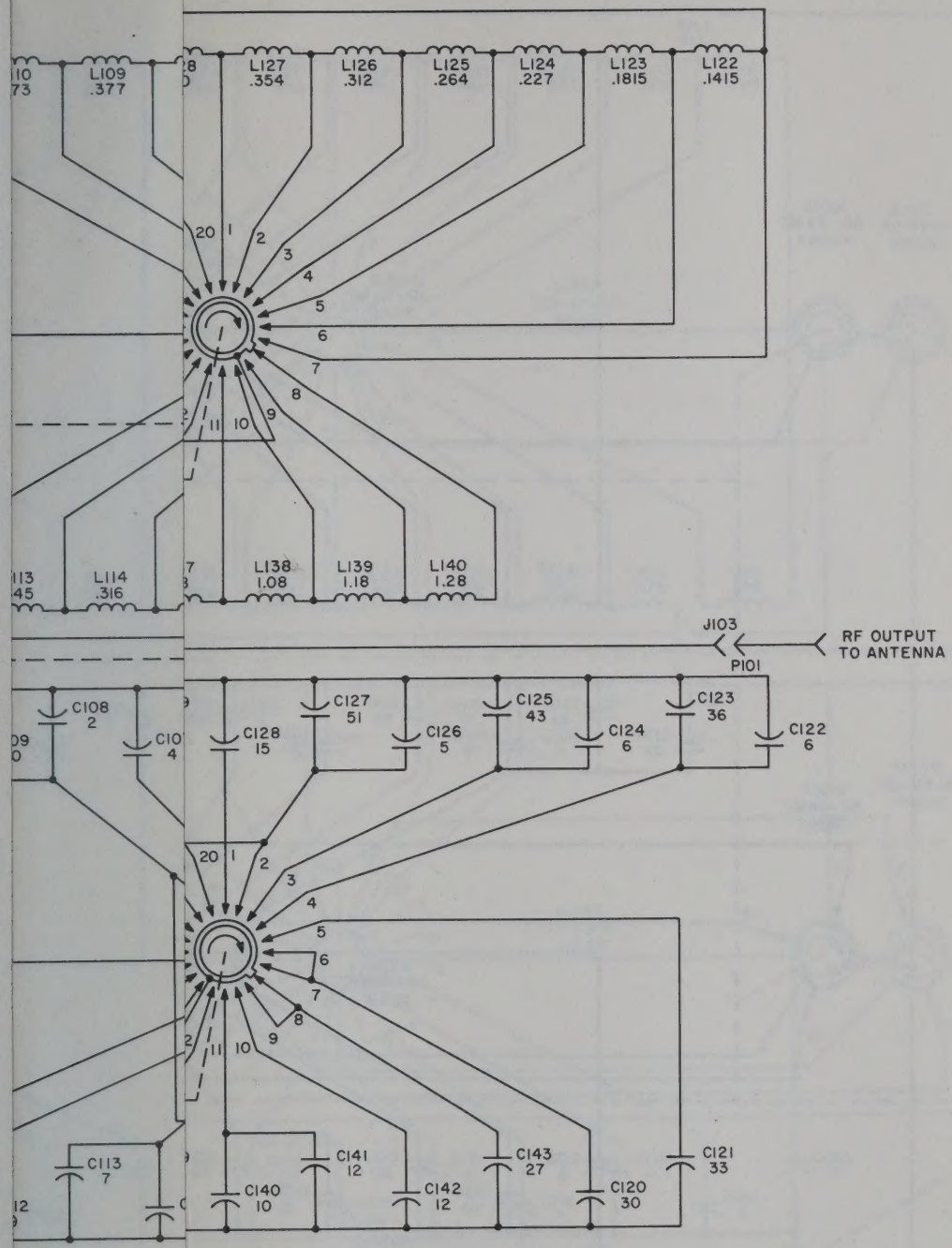
J101

TM5821-244-35-114

Figure 6-25. Antenna Coupler CU-942/ARC-54, schematic diagram.

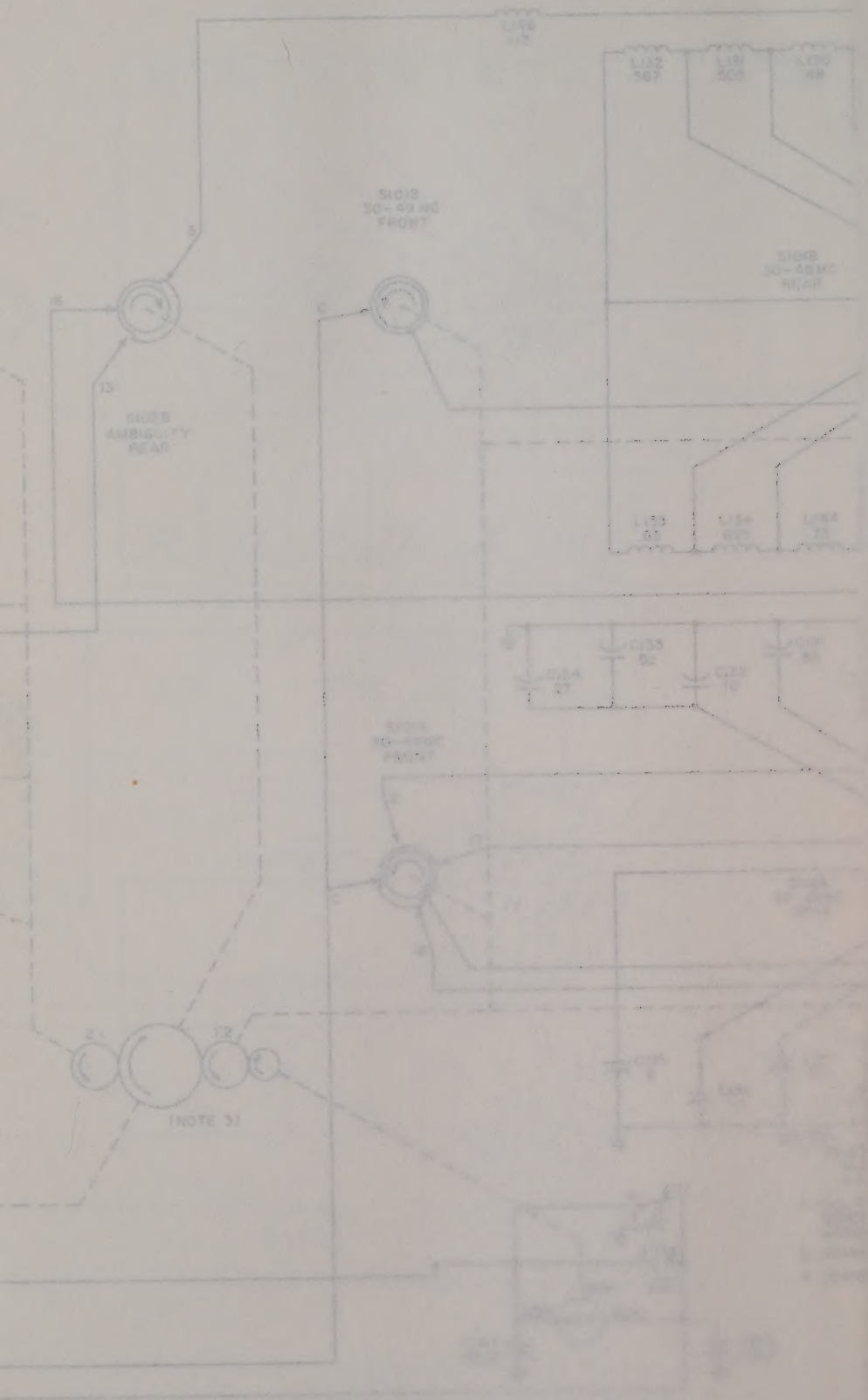


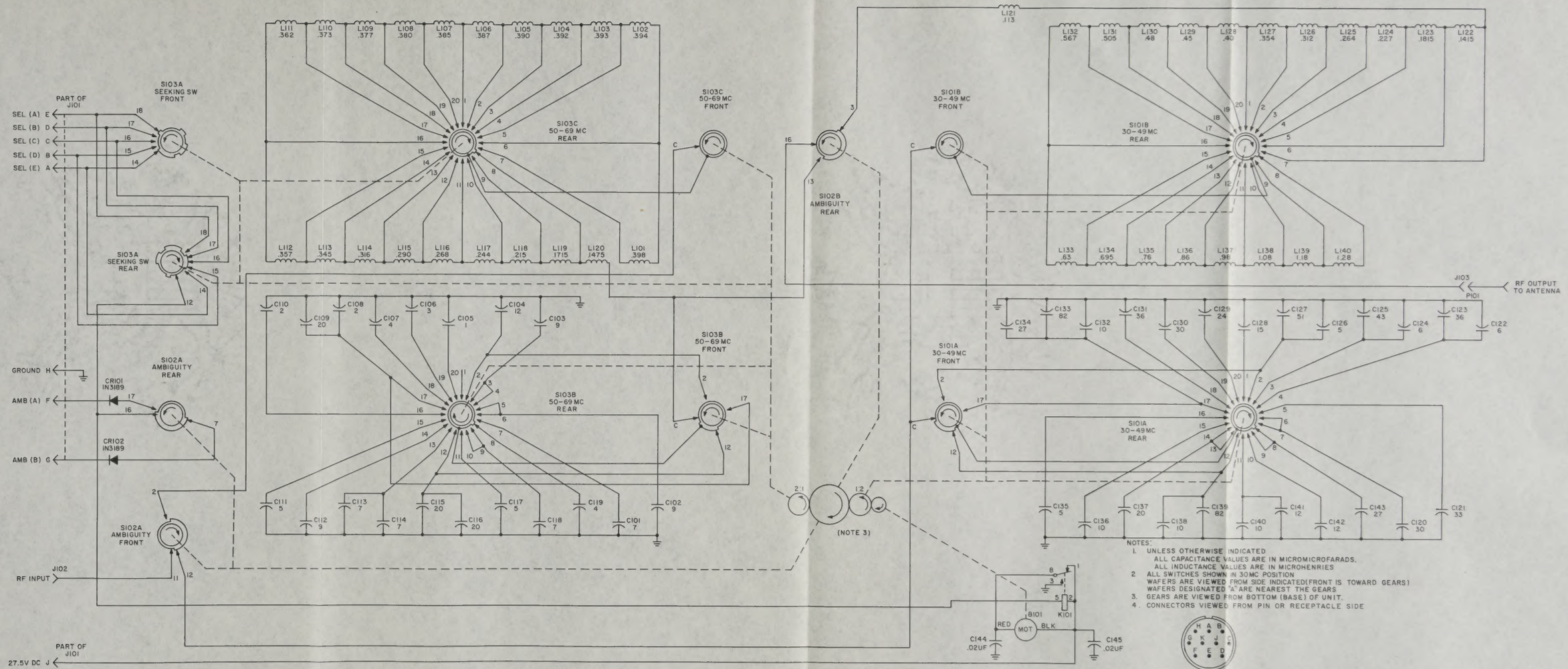
...or CC-932/ARC-34, schematic diagram.



INDICATED
VALUES ARE IN MICROMICROFARADS.
ALUES ARE IN MICROHENRIES
IN 30MC POSITION
FROM SIDE INDICATED(FRONT IS TOWARD GEARS)
"A" ARE NEAREST THE GEARS
ROM BOTTOM (BASE) OF UNIT.
FROM PIN OR RECEPTACLE SIDE

TM5821-244-35-115

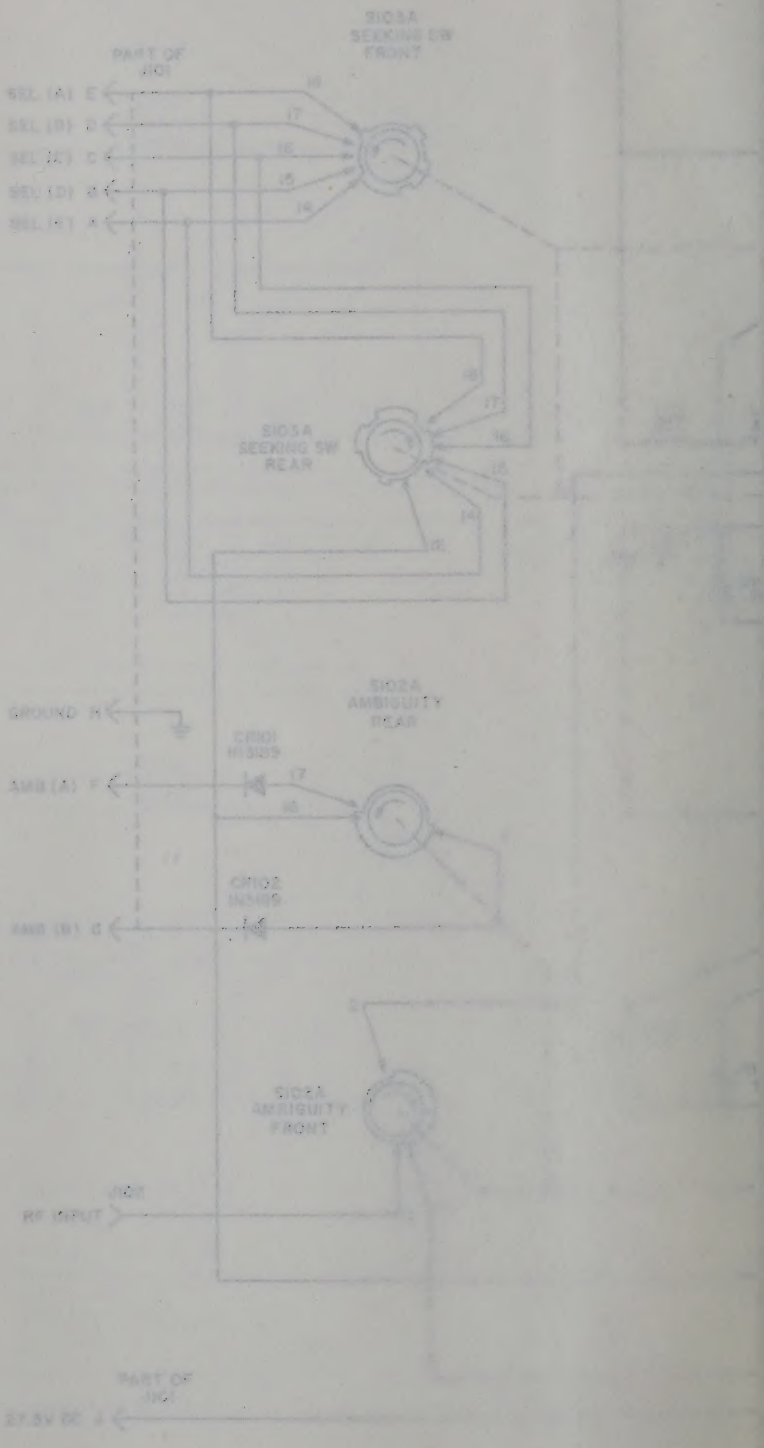

SIC/S
30-49 MC
FRONT
SIC/S
30-49 MC
REAR
SIC/S
AMBIGUITY
REAR
(NOTE 3)

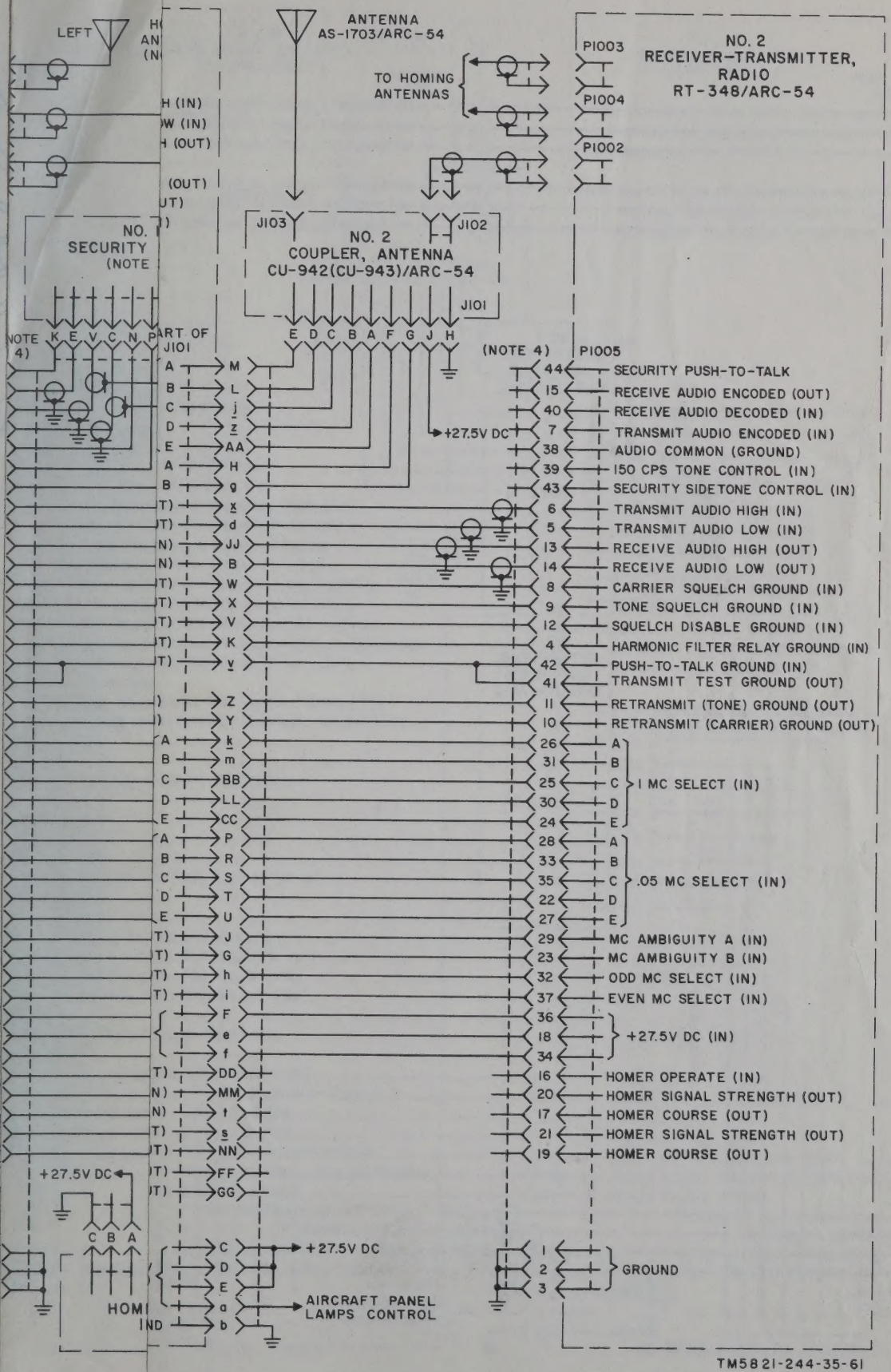


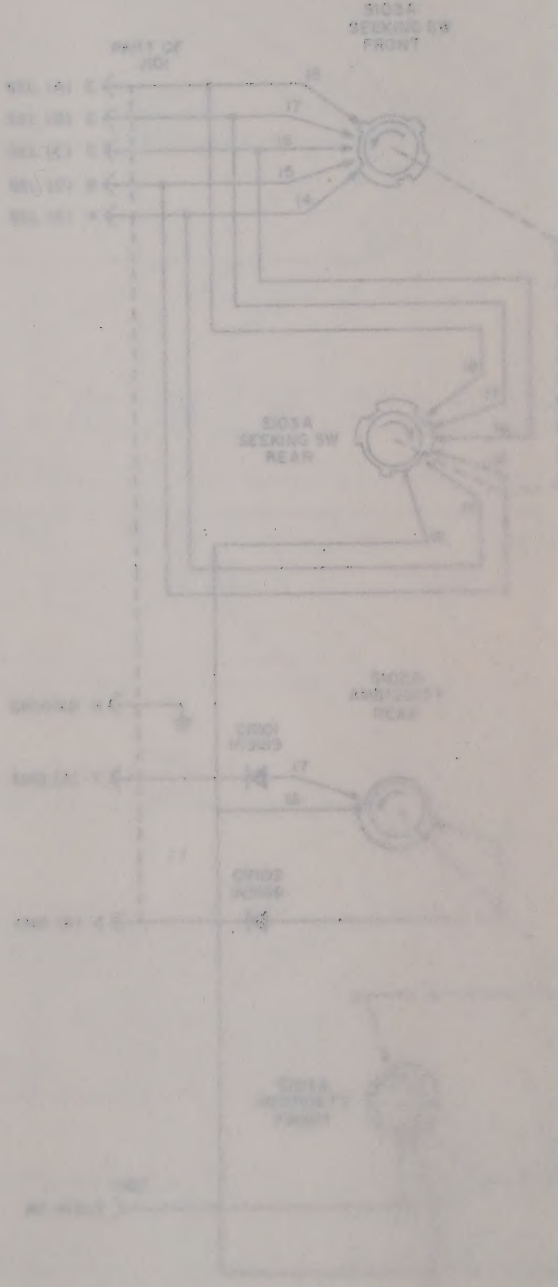
NOTES:
1. UNLESS OTHERWISE INDICATED ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS. ALL INDUCTANCE VALUES ARE IN MICROHENRIES
2. ALL SWITCHES SHOWN IN 30MC POSITION WAFERS ARE VIEWED FROM SIDE INDICATED(FRONT IS TOWARD GEARS) WAFERS DESIGNATED "A" ARE NEAREST THE GEARS
3. GEARS ARE VIEWED FROM BOTTOM (BASE) OF UNIT.
4. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE

Figure 6-26. Antenna Coupler CU-943/ARC-54, schematic diagram.

TM5821-244-35-115


SIO3A
SEEKING SW
FRONT
PART OF
J101
SEL (A) E
SEL (B) D
SEL (C) C
SEL (D) B
SEL (E) A
SIO3A
SEEKING SW
REAR
SIO2A
AMBIGUITY
REAR
GROUND H
CR101
1N3595
AMB (A) F
CR102
1N3595
AMB (B) G
SIO2A
AMBIGUITY
FRONT
RF INPUT
PART OF
J101
27.5V DC J


ANTENNA
AS-1703/ARC-54
TO HOMING
ANTENNAS
P1003
P1004
P1002
NO. 2
RECEIVER-TRANSMITTER,
RADIO
RT-348/ARC-54
LEFT
J103
NO. 2
COUPLER, ANTENNA
CU-942(CU-943)/ARC-54
J102
J101
NO.
SECURITY
(NOTE
NOTE 4)
PART OF
J101
(NOTE 4)
P1005
+27.5V DC
SECURITY PUSH-TO-TALK
RECEIVE AUDIO ENCODED (OUT)
RECEIVE AUDIO DECODED (IN)
TRANSMIT AUDIO ENCODED (IN)
AUDIO COMMON (GROUND)
150 CPS TONE CONTROL (IN)
SECURITY SIDETONE CONTROL (IN)
TRANSMIT AUDIO HIGH (IN)
TRANSMIT AUDIO LOW (IN)
RECEIVE AUDIO HIGH (OUT)
RECEIVE AUDIO LOW (OUT)
CARRIER SQUELCH GROUND (IN)
TONE SQUELCH GROUND (IN)
SQUELCH DISABLE GROUND (IN)
HARMONIC FILTER RELAY GROUND (IN)
PUSH-TO-TALK GROUND (IN)
TRANSMIT TEST GROUND (OUT)
RETRANSMIT (TONE) GROUND (OUT)
RETRANSMIT (CARRIER) GROUND (OUT)
1 MC SELECT (IN)
.05 MC SELECT (IN)
MC AMBIGUITY A (IN)
MC AMBIGUITY B (IN)
ODD MC SELECT (IN)
EVEN MC SELECT (IN)
+27.5V DC (IN)
HOMER OPERATE (IN)
HOMER SIGNAL STRENGTH (OUT)
HOMER COURSE (OUT)
HOMER SIGNAL STRENGTH (OUT)
HOMER COURSE (OUT)
GROUND
+27.5V DC
AIRCRAFT PANEL
LAMPS CONTROL
TM5821-244-35-61



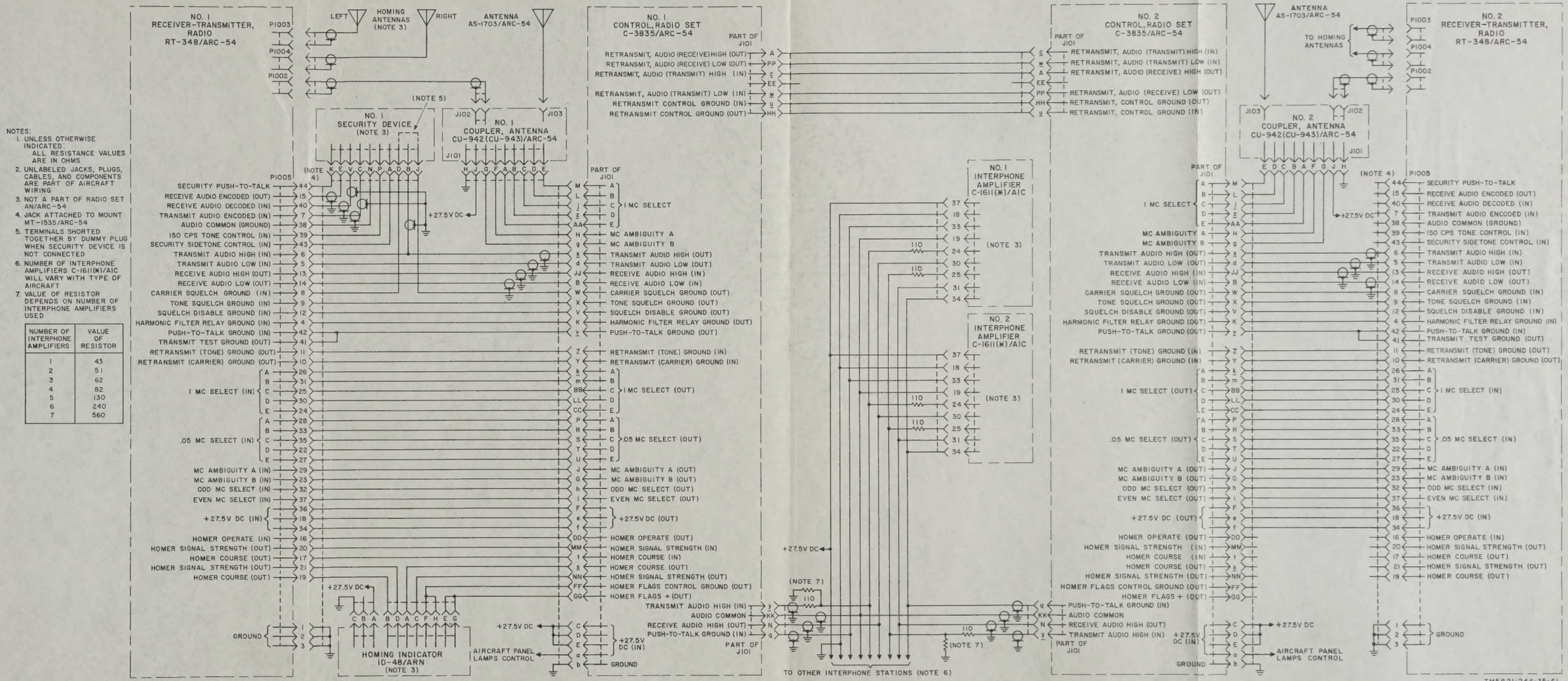
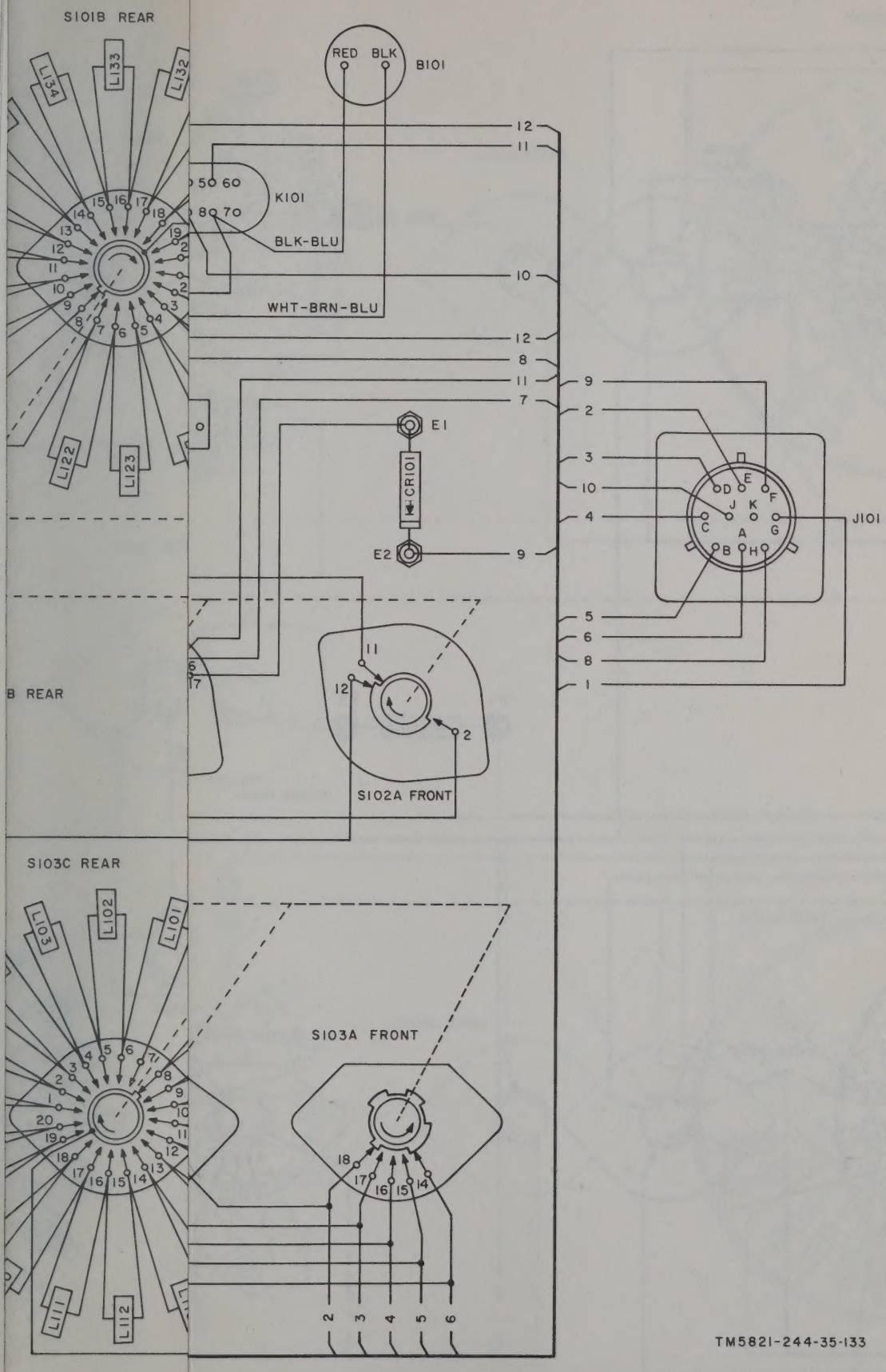


Figure 6-27. Radio Set AN/ARC-54, retransmit system interconnection wiring diagram.

NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS.
2. UNLABELED JACKS, PLUGS, CABLES, AND CONNECTORS ARE PART OF AIRCRAFT WIRING.
3. NOT A PART OF RADIO SET AN/ARC-34.
4. JACK ATTACHED TO MOUNT MT-1535/ARC-34.
5. TERMINALS SHORTED TOGETHER BY DUMMY PLUG WHEN SECURITY DEVICE IS NOT CONNECTED.
6. NUMBER OF INTERPHONE AMPLIFIERS (C-1618/AIC) WILL VARY WITH TYPE OF AIRCRAFT.
7. VALUE OF RESISTOR DEPENDS ON NUMBER OF INTERPHONE AMPLIFIERS USED.

NUMBER OF INTERPHONE AMPLIFIERS	VALUE OF RESISTOR
1	43
2	51
3	67
4	82
5	130
6	240
7	360


S101B REAR
L134
L133
L132
L122
L123
RED
BLK
B101
K101
BLK-BLU
WHT-BRN-BLU
E1
CR101
E2
J101
S102A FRONT
S103C REAR
L103
L102
L101
L111
L112
S103A FRONT
TM5821-244-35-133

NO. 1
RECEIVER-TRANSMITTER
RADIO
RT-346/ARC-

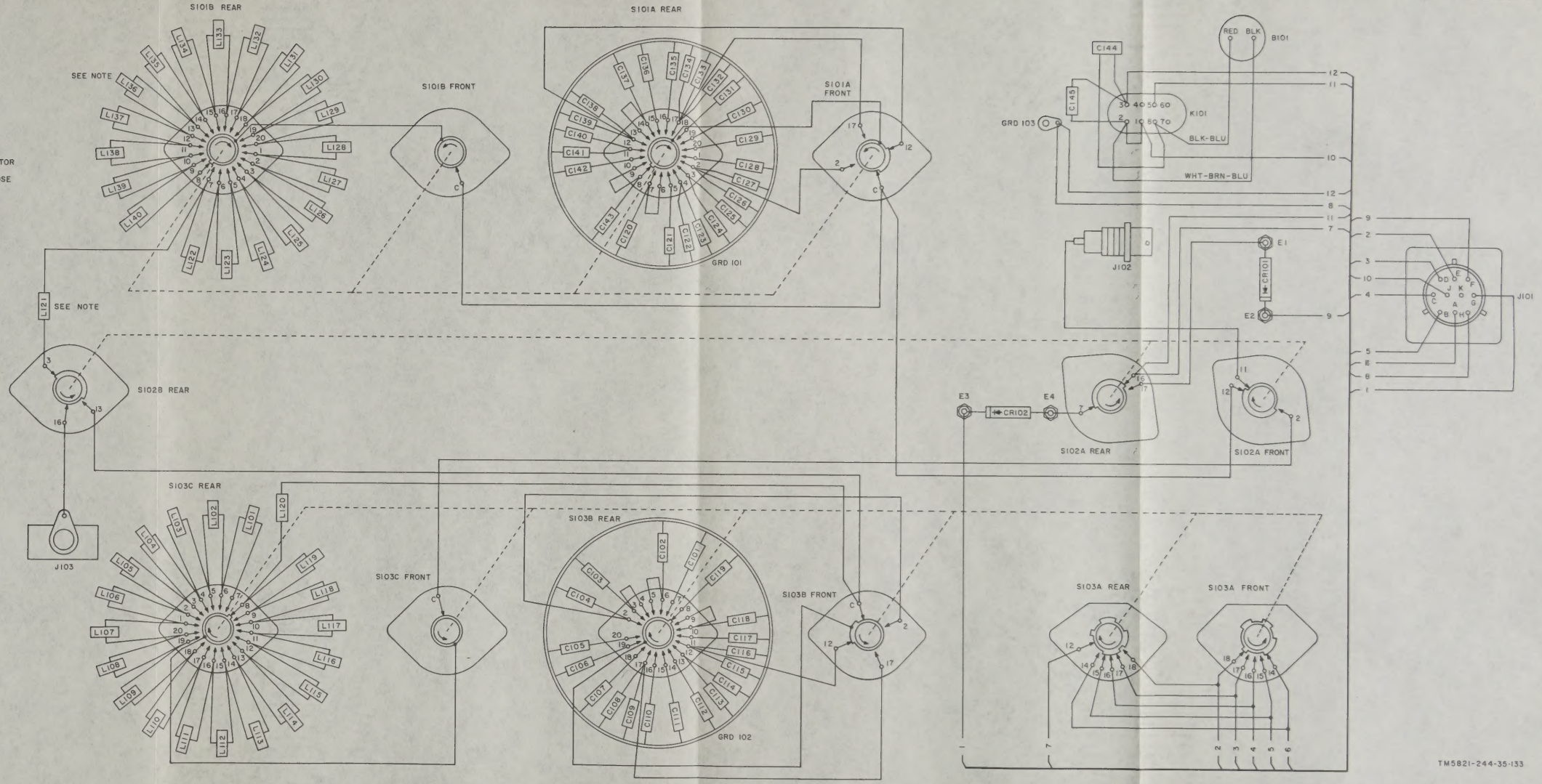
NOTES:

1. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS.
2. UNLABELED JACKS, PLUGS, CABLES, AND COMPONENTS ARE PART OF AIRCRAFT WIRING.
3. NOT A PART OF RADIO SET AN/ARC-94.
4. JACK ATTACHED TO MOUNT MT-1535/ARC-94.
5. TERMINALS SHORTED TOGETHER BY DUMMY PLUG WHEN SECURITY DEVICE IS NOT CONNECTED.
6. NUMBER OF INTERPHONE AMPLIFIERS C-1611/ARC WILL VARY WITH TYPE OF AIRCRAFT.
7. VALUE OF RESISTOR DEPENDS ON NUMBER OF INTERPHONE AMPLIFIERS USED.

NUMBER OF INTERPHONE AMPLIFIERS	VALUE OF RESISTOR
1	43
2	91
3	67
4	82
5	130
6	240
7	360

NOTE:
INDUCTOR REFERENCE DESIGNATIONS SHOWN ARE FOR CU-943/ARC-54. ALL INDUCTOR REFERENCE DESIGNATIONS REMAIN THE SAME FOR THE CU-942/ARC-54 EXCEPT THOSE SHOWN BELOW

CU-942/ARC-54	CU-943/ARC-54
L135	L144
L136	L143
L137	L142
L138	L145
L140	L141
L121	L146



TM5821-244-35-133

Figure 6-28. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54, wiring diagram.

NOTE
INDUCTOR REFERENCE DESIGNATIONS SHOWN ARE FOR CU-943/ARC-54. ALL INDUCTOR REFERENCE DESIGNATIONS REMAIN THE SAME FOR THE CU-942/ARC-54 EXCEPT THOSE SHOWN BELOW

CU-942/ARC-54	CU-943/ARC-54
L133	L144
L139	L143
L137	L142
L138	L145
L140	L141
L131	L146



:5
32 x 7/16-inch
:5
-40 x 1⅛ inches
tallic No. 5
mbly S101B (includes coils and
30)
A
4 (capacitors shown attached to
, 5–40
5–40 x 1½ inches
tallic No. 5
2B
-40 x 2 inches
ip
mbly S103C (includes coils and
30)
3B
4 (capacitors shown attached to
, 5–40
2 μf
2 μf
MP5
H21
, 4–40
H22
H21
, 4–40
ng 4–40
o. 4
01
40 x 5/16-inch
H21
MP33, or MP34
40 x 5/16-inch
40 x 5/16-inch
-40 x 3/16-inch
-40 x ¼-inch
-40 x ⅞-inch

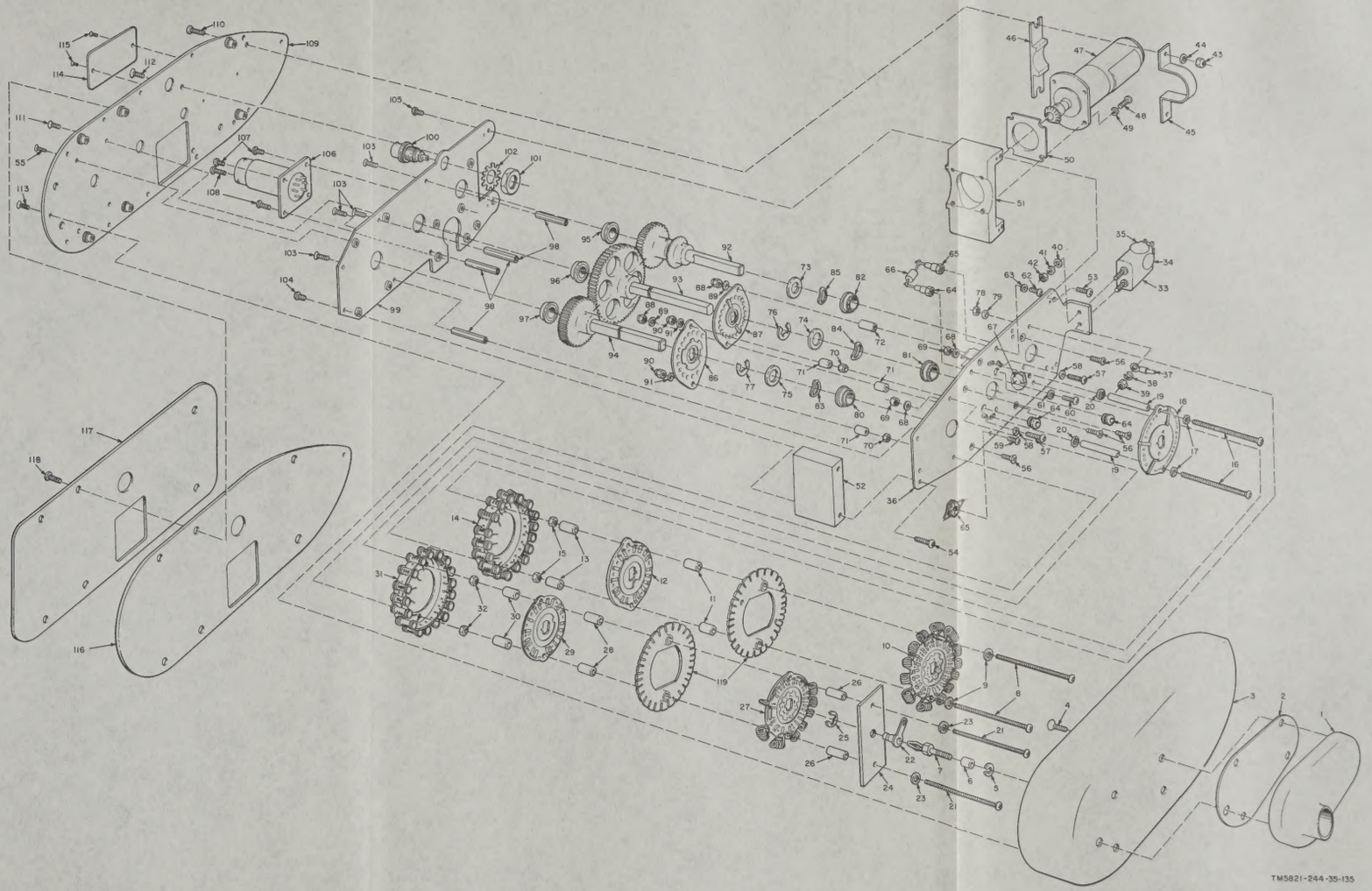
59 Screw H2, PPH, 4–40 x 5/16-inch
60 Screw H44, PPH, 2–56 x 3/16-inch
61 Lockwasher, No. 2
62 Screw H44, PPH, 2–56 x 3/16-inch
63 Lockwasher, No. 2
64 Grommet H15, rubber
65 Cable button H8
66 Diode CR102, 1N3189
67 Diode CR101, 1N3189
68 Flat washer H46
69 Nut H23, self-locking, 5–40
70 Hexagonal nut H45
71 Spacer, No. 2, MP20
72 Spacer, No. 3, MP18
73 Flat washer H16
74 Flat washer H16
75 Flat washer H16
76 Retainer ring H9
77 Retainer ring H9
78 Nut H23, self-locking, 5–40
79 Flat washer H46
80 Ball bearing MP8
81 Ball bearing MP8
82 Ball bearing MP8
83 Spring washer H26
84 Spring washer H26
85 Spring washer H26
86 Rotary switch S103A
87 Rotary switch S102A
88 Nut H23, self-locking, 5–40
89 Flat washer H46
90 Nut H23, self-locking, 5–40
91 Flat washer H46
92 Shaft assembly No. 1 MP15
93 Shaft assembly No. 2 MP12
94 Shaft assembly No. 3 MP10
95 Ball bearing MP8
96 Ball bearing MP8
97 Ball bearing MP8
98 Hexagonal post H48
99 Lower bearing plate MP3
100 Rf connector J101
101 Part of item 100 (hexagonal nut)
102 Part of item 100 (external-tooth lockwasher)
103 Screw H49, PFH, 4–40 x ¼-inch
104 Screw H2, PPH, 4–40 x 5/16-inch
105 Screw H2, PPH, 4–40 x 5/16-inch
106 Electrical connector J101 (includes interference filter)
107 Screw H17, PPH, 4–40 x 3/16-inch
108 Screw H25, PPH, 4–40 x ¼-inch
109 Mounting plate MP22
110 Screw H39, PPH, 4–40 x 7/16-inch
111 Screw H37, PHF, 4–40 x 3/16-inch
112 Screw H37, PHF, 4–40 x 3/16-inch
113 Screw H52, PHF, 4–40 x ¼-inch
114 Nameplate MP35
115 Screw H33, PPH, 2–56 x ⅛-inch
116 Gasket R28
117 Doubler plate MP24
118 Screw H32, PPH, 8–32 x ½-inch
119 Coil-mounting plate MP30

-29. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54, exploded view.

NOTE
INDUCTOR REFERENCE DESIGNATIONS SHOWN ARE FOR CU-943/ARC-54. ALL INDUCTOR REFERENCE DESIGNATIONS REMAIN THE SAME FOR THE CU-942/ARC-54 EXCEPT THOSE SHOWN BELOW

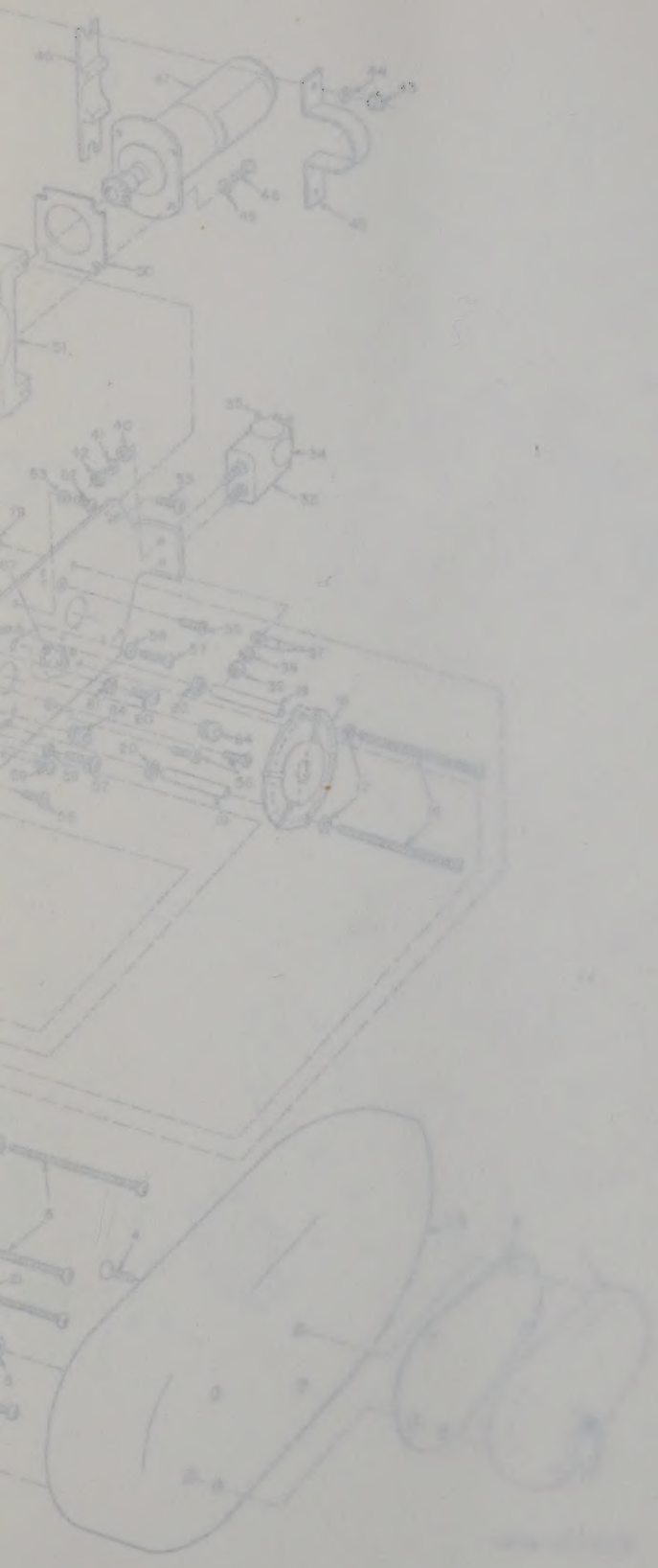
CU-942/ARC-54	CU-943/ARC-54
L135	L144
L136	L143
L137	L142
L138	L145
L140	L141
L139	L146

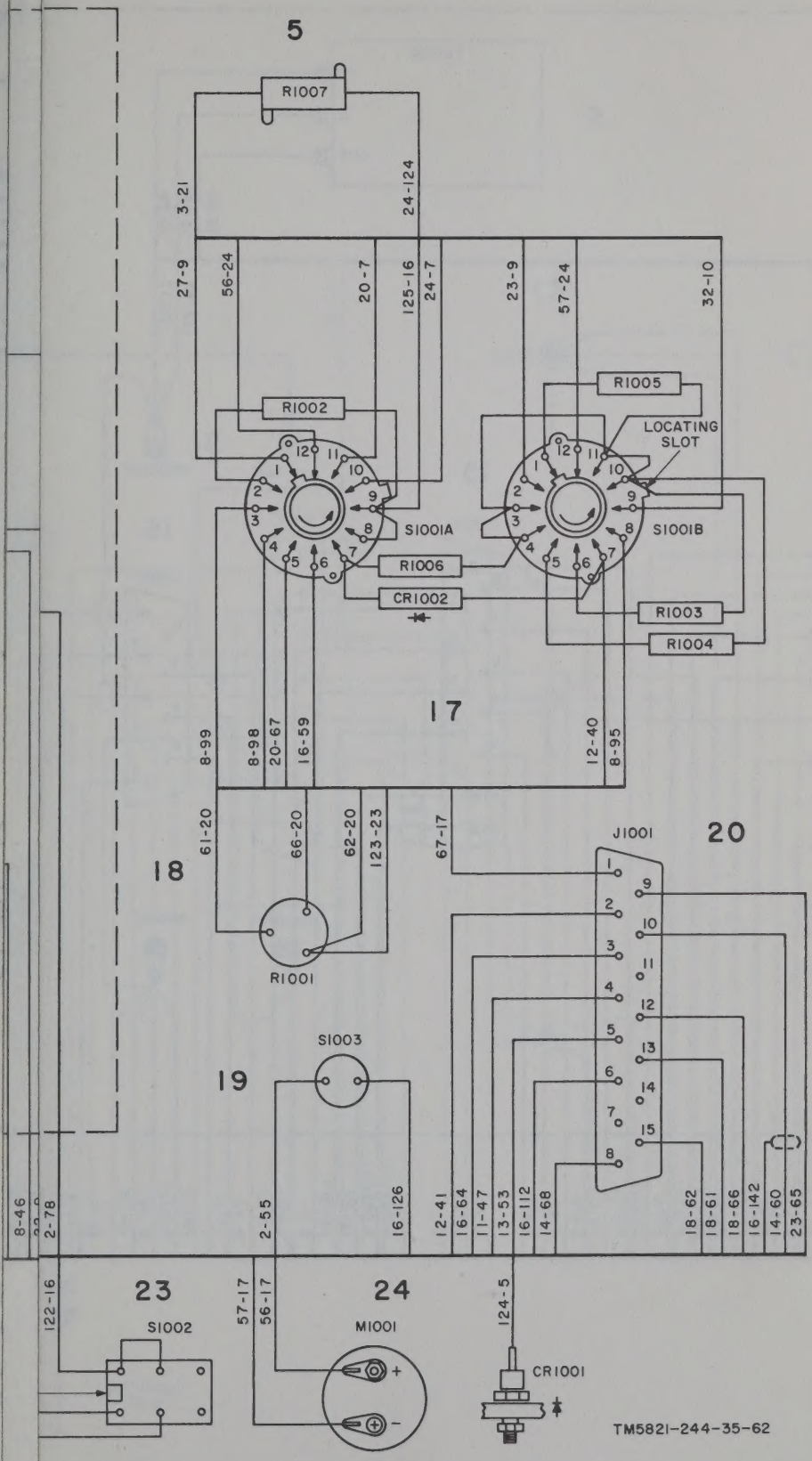




1 Mast plate MP27
2 Mast gasket H35
3 Antenna cover MP25
4 Screw H34, PFH 6-32 x 7/16-inch
5 Lockwasher H50
6 Spacing sleeve MP35
7 Plug tip P1
8 Screw H51, PPH, 5-40 x 1⅛ inches
9 Washer H47, nonmetallic No. 5
10 Rotary switch assembly S101B (includes coils and mounting plate MP30)
11 Spacer, No. 2 MP20
12 Rotary switch S101A
13 Spacer, No. 1 MP19
14 Grounding ring H14 (capacitors shown attached to ground ring)
15 Hexagonal nut H45, 5-40
16 Screw H19, PPH, 5-40 x 1½ inches
17 Washer H47, nonmetallic No. 5
18 Rotary switch S102B
19 Spacer, No. 4 MP21
20 Flat washer H46
21 Screw H20, PPH, 5-40 x 2 inches
22 Connector J103
23 Flat washer H46
24 Bracket H12, jack tip
25 Retaining ring H43
26 Spacer, No. 3 MP18
27 Rotary switch assembly S103C (includes coils and mounting plate MP30)
28 Spacer, No. 2 MP20
29 Rotary switch S103B
30 Spacer, No. 1 MP19
31 Grounding ring H14 (capacitors shown attached to ground ring)
32 Hexagonal nut H45, 5-40
33 Relay K101
34 Capacitor C144, 0.02 μf
35 Capacitor C145, 0.02 μf
36 Upper bearing plate MP5
37 Solderless terminal
38 Lockwasher, No. 4 H21
39 Hexagonal nut H24, 4-40
40 Flat washer, No. 4 H22
41 Lockwasher, No. 4 H21
42 Hexagonal nut H24, 4-40
43 Nut H41, self-locking 4-40
44 Flat washer H40, No. 4
45 Motor clamp H38
46 Motor spacer MP29
47 Motor assembly B101
48 Screw H2, PPH, 4-40 x 5/16-inch
49 Lockwasher, No. 4 H21
50 Shim MP31, MP32, MP33, or MP34
51 Rear spacer MP7
52 Front spacer MP6
53 Screw H2, PPH, 4-40 x 5/16-inch
54 Screw H2, PPH, 4-40 x 5/16-inch
55 Screw H37, PHF, 4-40 x 3/16-inch
56 Screw H49, PFH, 4-40 x ¼-inch
57 Screw H42, PPH, 5-40 x ⅜-inch
58 Flat washer H46
59 Screw H2, PPH, 4-40 x 5/16-inch
60 Screw H44, PPH, 2-56 x 3/16-inch
61 Lockwasher, No. 2
62 Screw H44, PPH, 2-56 x 3/16-inch
63 Lockwasher, No. 2
64 Grommet H15, rubber
65 Cable button H8
66 Diode CR102, 1N3189
67 Diode CR101, 1N3189
68 Flat washer H46
69 Nut H23, self-locking, 5-40
70 Hexagonal nut H45
71 Spacer, No. 2, MP20
72 Spacer, No. 3, MP18
73 Flat washer H16
74 Flat washer H16
75 Flat washer H16
76 Retainer ring H9
77 Retainer ring H9
78 Nut H23, self-locking, 5-40
79 Flat washer H46
80 Ball bearing MP8
81 Ball bearing MP8
82 Ball bearing MP8
83 Spring washer H26
84 Spring washer H26
85 Spring washer H26
86 Rotary switch S103A
87 Rotary switch S102A
88 Nut H23, self-locking, 5-40
89 Flat washer H46
90 Nut H23, self-locking, 5-40
91 Flat washer H46
92 Shaft assembly No. 1 MP15
93 Shaft assembly No. 2 MP12
94 Shaft assembly No. 3 MP10
95 Ball bearing MP8
96 Ball bearing MP8
97 Ball bearing MP8
98 Hexagonal post H48
99 Lower bearing plate MP3
100 Rf connector J101
101 Part of item 100 (hexagonal nut)
102 Part of item 100 (external-tooth lockwasher)
103 Screw H49, PFH, 4-40 x ¼-inch
104 Screw H2, PPH, 4-40 x 5/16-inch
105 Screw H2, PPH, 4-40 x 5/16-inch
106 Electrical connector J101 (includes interference filter)
107 Screw H17, PPH, 4-40 x 3/16-inch
108 Screw H25, PPH, 4-40 x ¼-inch
109 Mounting plate MP22
110 Screw H39, PPH, 4-40 x 7/16-inch
111 Screw H37, PHF, 4-40 x 3/16-inch
112 Screw H37, PHF, 4-40 x 3/16-inch
113 Screw H52, PHF, 4-40 x ¼-inch
114 Nameplate MP35
115 Screw H33, PPH, 2-56 x ⅛-inch
116 Gasket R28
117 Doubler plate MP24
118 Screw H32, PPH, 8-32 x ½-inch
119 Coil-mounting plate MP30

Figure 6-29. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54, exploded view.




5
R1007
3-21
24-124
27-9
56-24
20-7
125-16
24-7
23-9
57-24
32-10
R1002
R1005
LOCATING SLOT
S1001A
S1001B
R1006
CR1002
R1003
R1004
17
8-99
8-98
20-67
16-59
12-40
8-95
18
61-20
66-20
62-20
123-23
67-17
R1001
J1001
20
S1003
19
8-46
2-78
2-55
16-126
12-41
16-64
11-47
13-53
16-112
14-68
18-62
18-61
18-66
16-142
14-60
23-65
122-16
23
S1002
57-17
56-17
24
M1001
124-5
CR1001
TM5821-244-35-62

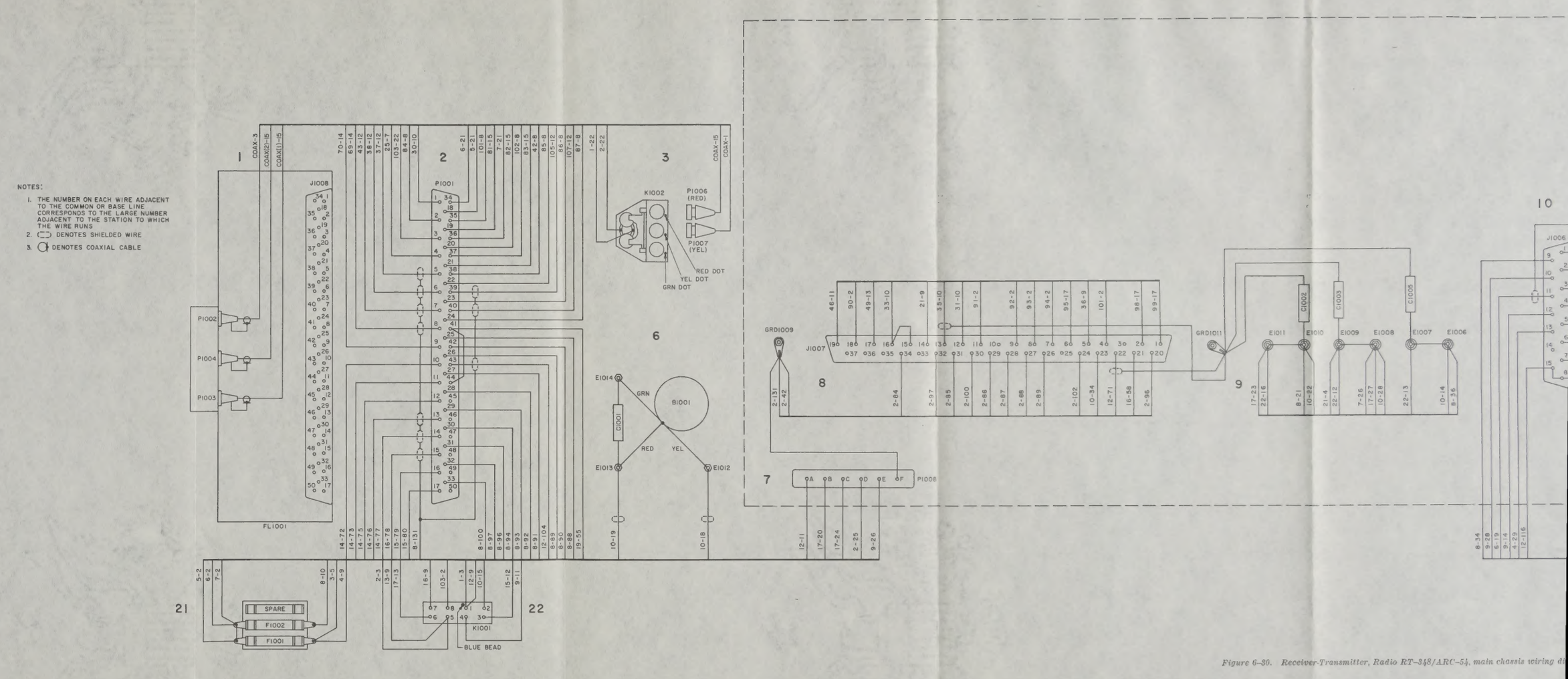


Figure 6–30. Receiver-Transmitter, Radio RT–348/ARC–54, main chassis wiring di

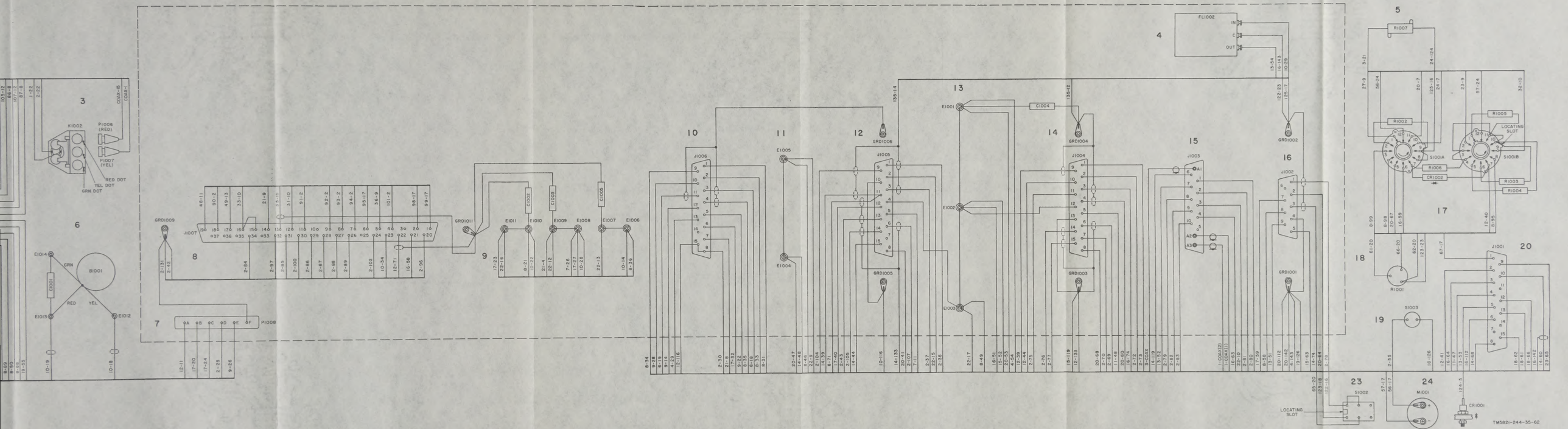
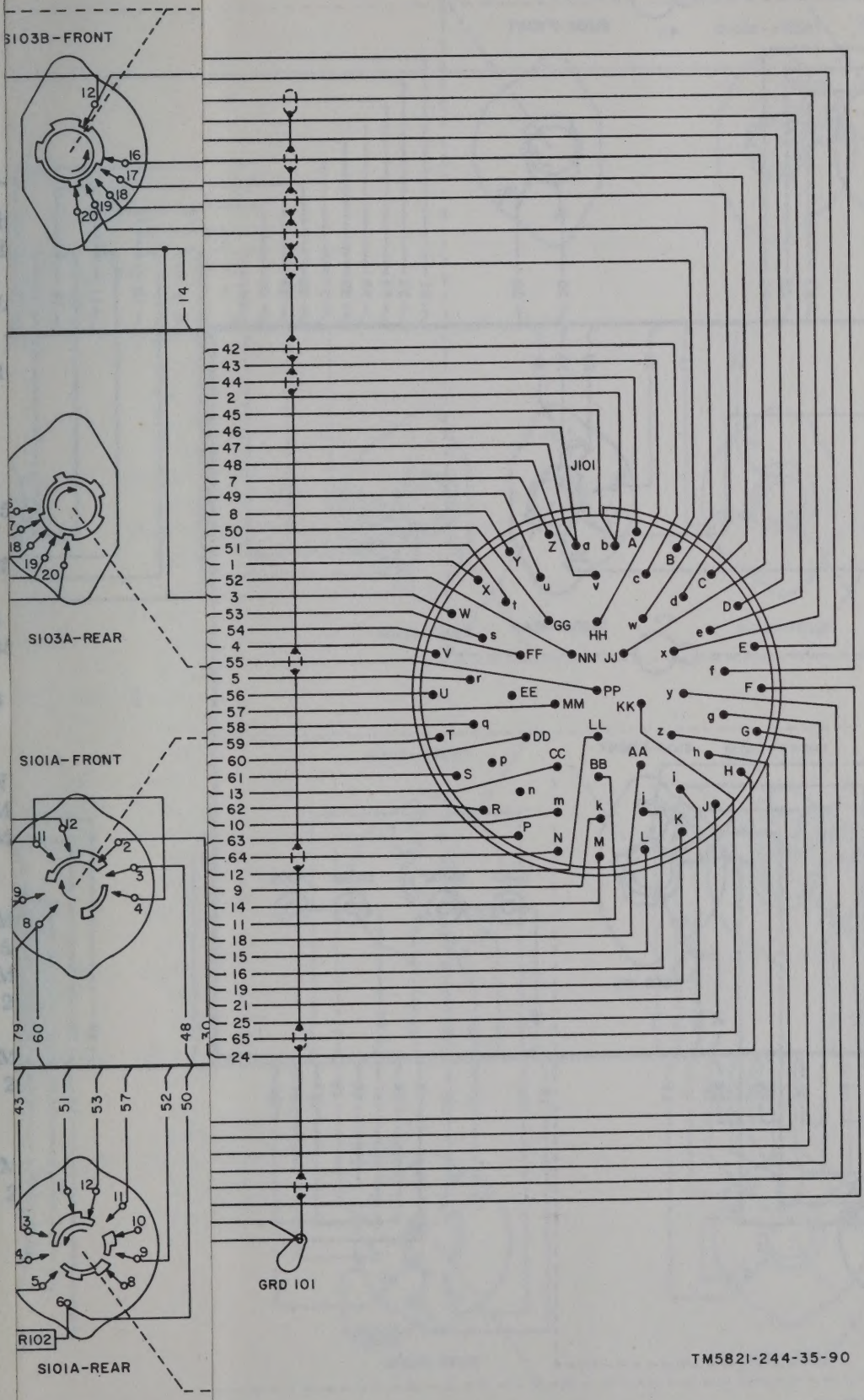


Figure 6-36. Receiver-Transmitter, Radio RT-348/ARC-54, main chassis wiring diagram.

NOTES:

1. THE NUMBER ON EACH WIRE ADJACENT TO THE CORNER OF BASE LINE CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. ⊂⊃ DENOTES SHIELDED WIRE
3. ⊃ DENOTES COAXIAL CABLE



TM5821-244-35-90

NOTES:

1. THE NUMBER ON EACH WIRE ADJACENT TO THE LOWER ON BASE LINE CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. ⬭ DENOTES SHIELDED WIRE
3. ◯ DENOTES COAXIAL CABLE

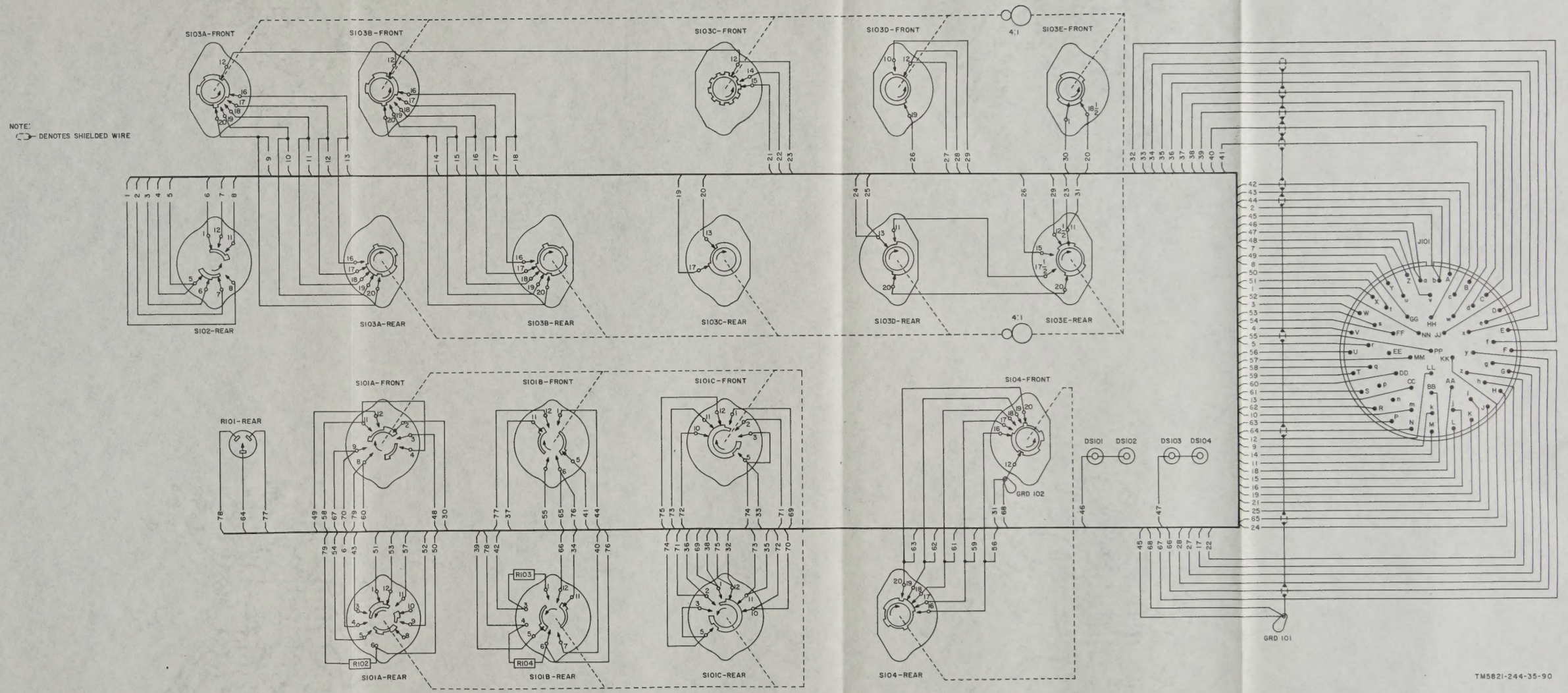
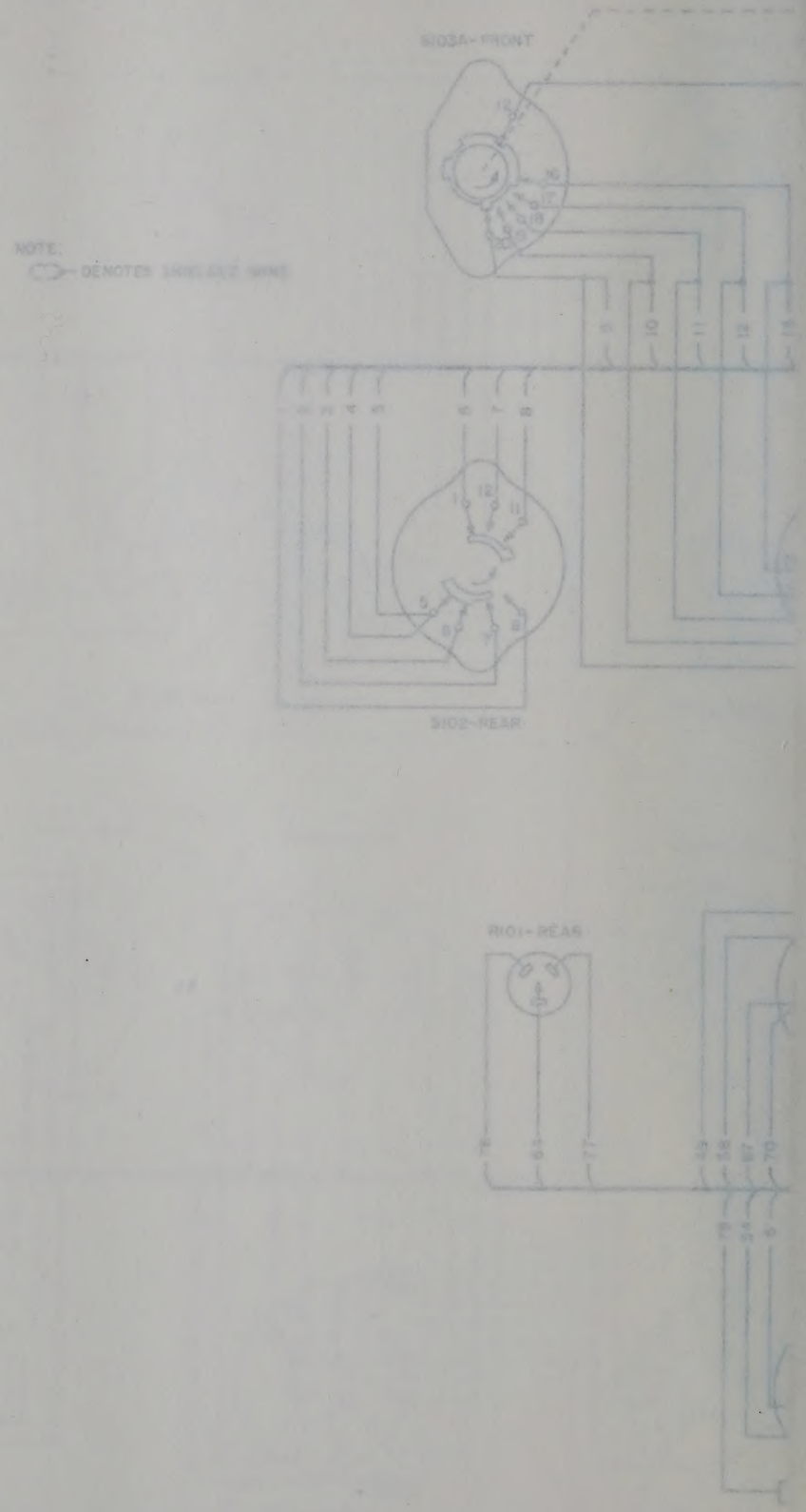


Figure 6-31. Control, Radio Set C-3835/ARC-54, wiring diagram.


S103A-FRONT
NOTE:
DENOTES SHIELDED WIRE
S102-REAR
R101-REAR

APPENDIX I

REFERENCES

The following is a list of applicable references available to the direct support, general support, and depot maintenance repairman of Radio Set AN/ARC–54.

DA Pam 310–4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
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.
TB SIG 364	Field Instructions for Painting and Preserving Electronics Command Equipment.
TN 11–1257	Signal Generator AN/URM–48.
TM 11–5057	Frequency Meter AN/USM–26.
TM 11–5097	Spectrum Analyzers TS–723A/U, TS–723B/U, TS–723C/U, and TS–723D/U.
TM 11–5551E	RF Signal Generator AN/URM–25F.
TM 11–5821–244–12	Operator and Organizational Maintenance Manual: Radio Set AN/ARC–54.
TM 11–6625–200–12	Operator and Organizational Maintenance Manual: Multimeters ME–26A/U, ME–26B/U, and ME–26C/U.
TM 11–6625–219–12	Operator's and Organizational Maintenance Manual: Oscilloscope AN/USM–81.
TM 11–6625–274–12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV–7/U, TV–7A/U, TV–7B/U, and TV–7D/U.
TM 11–6625–320–12	Organizational Maintenance Manual: Voltmeter, Meter ME–30A/U and Voltmeters, Electronic ME–30B/U, ME–30C/U, and ME–30E/U.
TM 11–6625–351–12	Operator and Organizational Maintenance Manual: Radio Interference Measuring Set AN/URM–85.
TM 11–6625–400–12	Operator and Organizational Maintenance Manual: Meter, Modulation ME–57/U.
TM 11–6625–467–12	Organizational Maintenance Manual: Test Set, Electronic Circuit Plug-in Unit TS–2061/ARC–54.
TM 11–6625–508–10	Operator's Manual: Signal Generators AN/USM–44 and AN/USM–44A.
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 11–6625–601–12	Organizational Maintenance Manual: Maintenance Kit, Electronic Equipment MK–733/ARC–54.

APPENDIX II

REFERENCE DESIGNATIONS

Components	Reference series for designations of parts
Receiver-transmitter main chassis	1, 000
Sel-call module	100
Homer module	200
Fixed IF module	1, 200
Receive audio module	1, 300
Transmit audio module	1, 400
Power supply module	1, 500
Harmonic filter module	1, 600
RF subchassis	900
High-frequency oscillator module	300
Low-frequency oscillator module	400
Variable IF module	500
RF amplifier module	600
Mechanical drive module	700
Power amplifier module	800
Control, Radio Set C-3835/ARC-54	100
Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54	100

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