

Technical Manual
 No. 11-5820-334-34
 Technical Order
 No. 31R1-2URR-422

DEPARTMENTS OF THE ARMY
 AND THE AIR FORCE

WASHINGTON 25, D. C., 21 August 1961

RADIO RECEIVER R-392/URR

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With TM 11-5820-334-10, 7 November 1960 and TM 11-5820-334-20, 27 December 1958, 27 April 1954 including C1, 30 December 1955; C2, 26 July 1956; C3 7 January 1957; C5, 6 June 1960.

*This manual, together with TM 11-5820-334-10, 7 November 1960, supersedes TM 11-5820-334-10, 27 December 1956; C4, 7 February 1957.

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CHAPTER 1

THEORY

Section I. BLOCK DIAGRAM

1. Scope

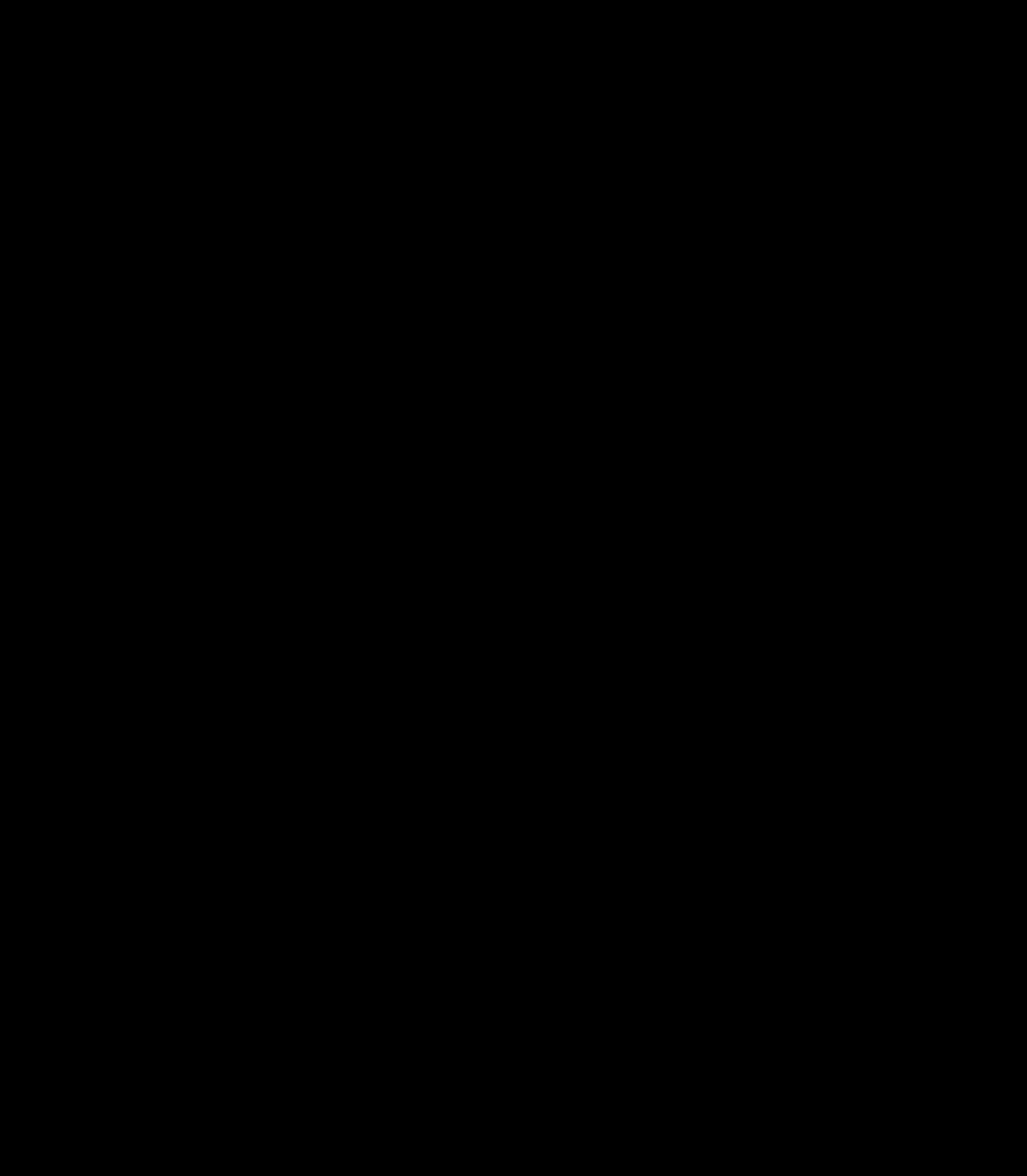
This manual covers field and depot maintenance for Radio Receiver R-392/URR. It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, aligning, and repairing specified maintenance parts. It also lists tools, materials, and test equipment required for maintenance. Detailed functions of the equipment are covered in

for use with a 600-ohm impedance headset or loudspeaker and a 455-kc intermediate-frequency (if.) signal for use with a 50-ohm impedance frequency-shift, single-channel radioteletype converter. The block diagram shows the signal path from the antenna through the various stages to the output. A schematic diagram (fig. 81) shows details of the circuits in the same order. Radio Receiver R-392/URR obtains

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THRESH control and automatically by two
connected automatic gain control (agc) cir-
cuits. The output of second af amplifier

is applied to either the first or second af amplifier
to produce an audio frequency beat note in
cw signals and calibrating the receiver.
The bfo output is heterodyned with the 455-
kc signal from a sixth af amplifier V506



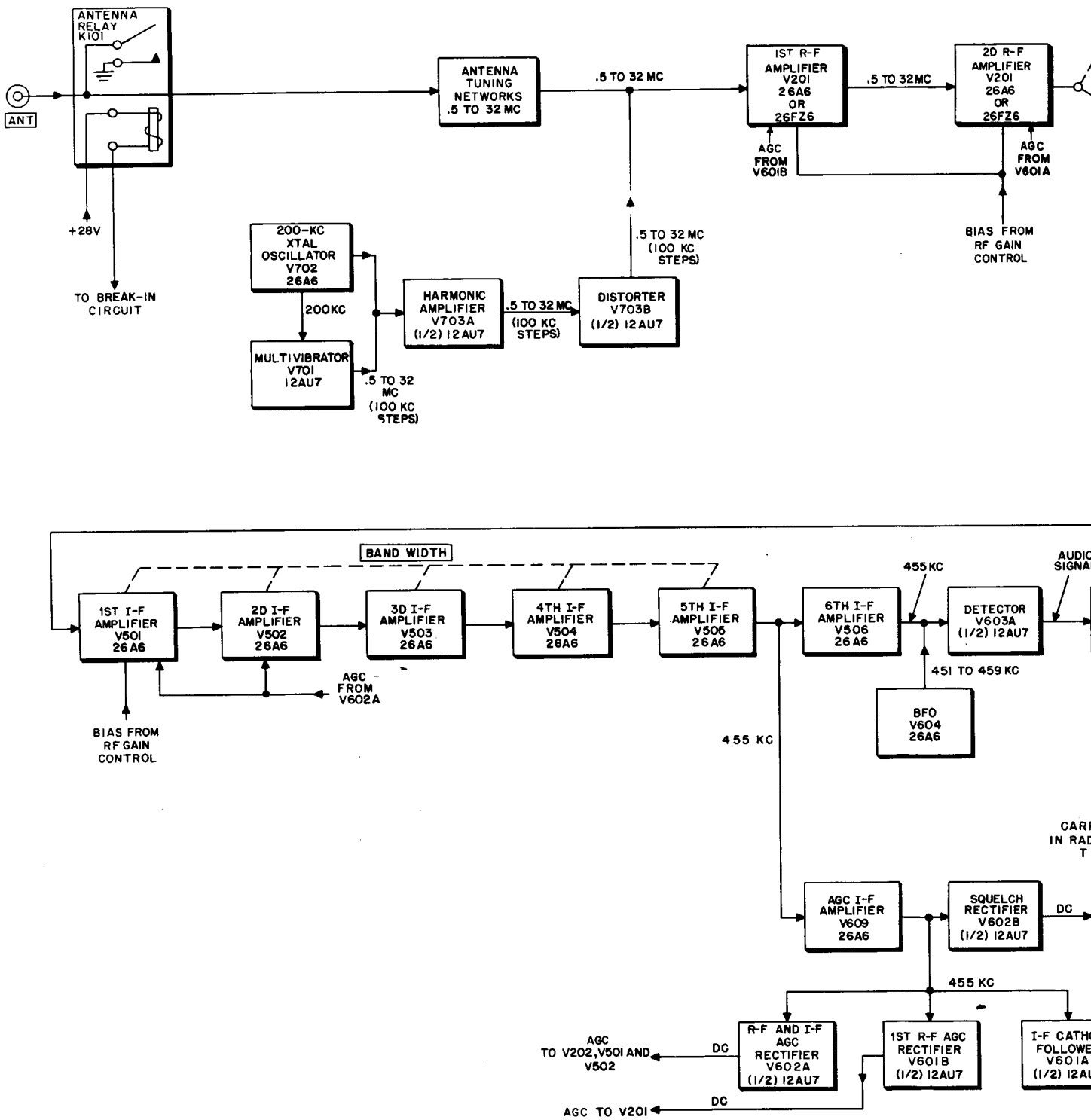
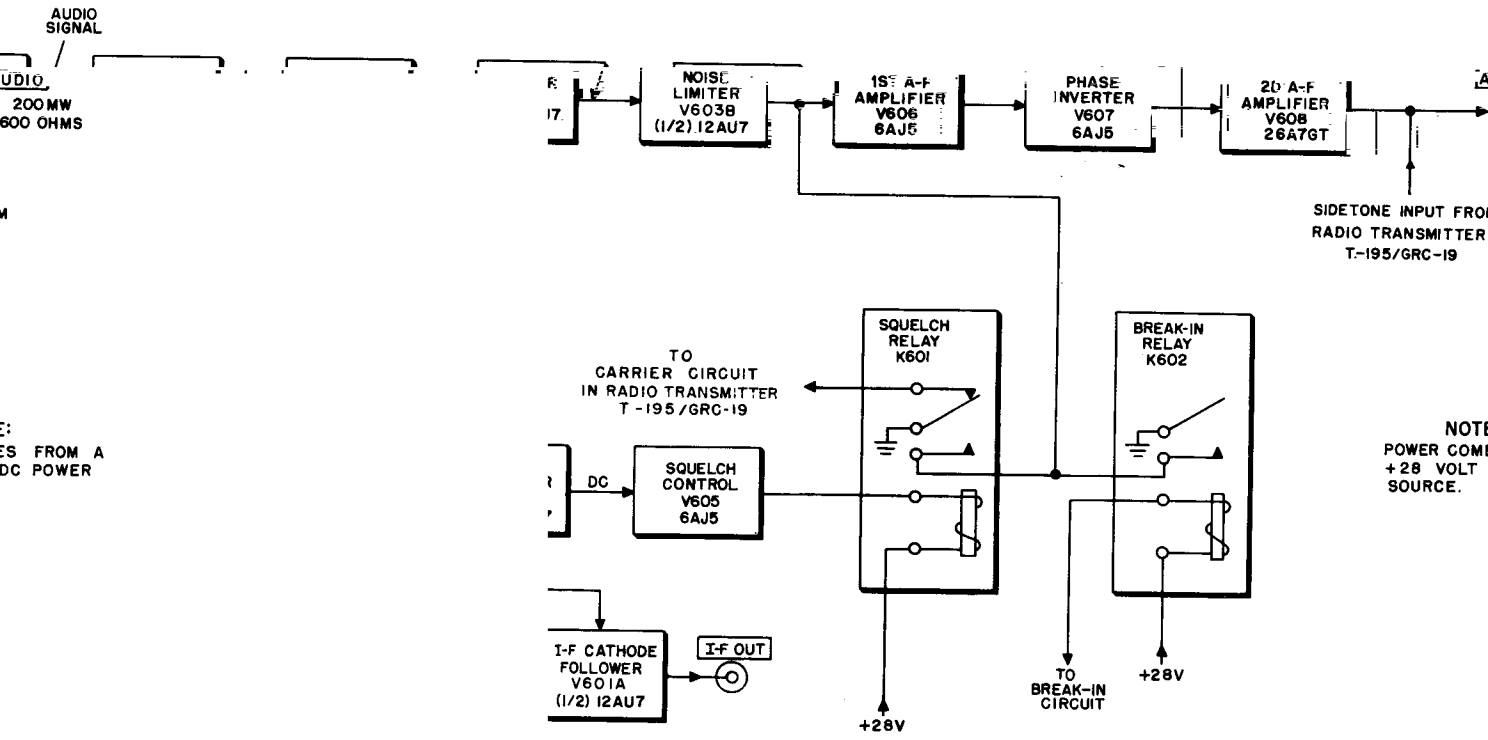
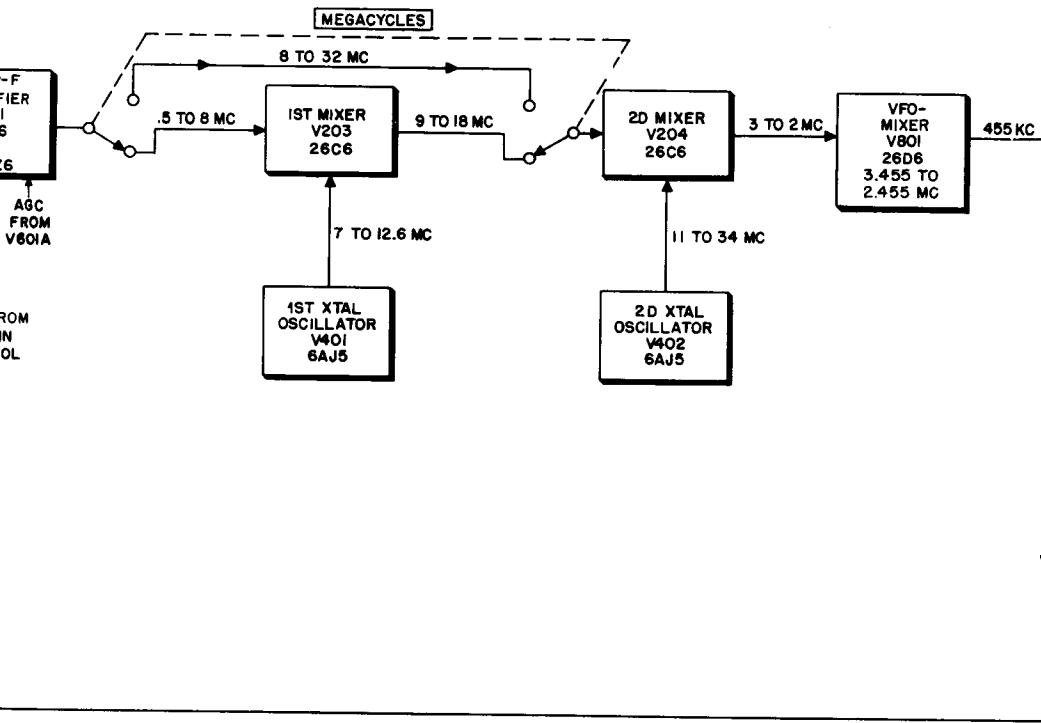


Figure 1. Radio Receiver R-392/URR, block diagram



NOTE:
POWER COME
+ 28 VOLT
SOURCE.

Section II. CIRCUIT ANALYSIS

3. General

a. The circuit analysis follows the signal path established in the block diagram (fig. 1) and the overall schematic diagram (fig. 81). The circuit analysis is limited, in most cases, to operation on the 4- to 8-mc range, ~~through all stages of the receiver. An~~ active on this range.

b. Only those switch contacts that are used in a particular circuit are shown in a referenced illustration. All switch contacts are shown in the overall schematic diagram (fig. 81).

4. Antenna Circuit (fig. 2)

The antenna circuit matches the impedance of different antennas to the input of first rf. amplifier V201. The circuit uses

~~a resonant network to protect the receiver~~ against large surges of rf power and accumulated static electrical charges that may be induced in the antenna. A relay in the antenna circuit grounds the receiver during transmission of an associated transmitter (break-in operation) and during receiver calibration (AGC switch at CAL).

a. A whip or long-wire antenna connects to ANT post E101. When the receiver is operated with an associated transmitter, the connection is from the transmitter front panel to ANT receptacle J104. (A single antenna is used for both the transmitter and receiver.) Binding post E101 and connector J104 connect to one of six

and KILOCYCLES controls. Capacitors C310 and C314 provide capacity for resonant circuits. Capacitors C311 and C313 are alignment trimmers, and C312 improves the frequency response characteristics of the transformer. In frequency ranges from 0.5 to 2 mc and 16 to 32 mc,

~~single-tuned networks are used. The rf~~ voltage developed across L23a is applied through switch S201, section 2 (rear) to the control grid of first rf amplifier V201.

c. Section 2 of S201 short-circuits Z203A, to prevent reactive effects between it and the tuning circuit in use. Antenna relay K101 grounds the antenna input circuit when either the AGC switch is set to CAL, the function switch is set to STAND BY, or during break-in operation when the receiver is used as part of Radio Set AN/GRC-19. Resistor R102 bleeds off any

static electrical charge on the antenna. unusually strong rf currents are induced in the antenna, such as might be caused by transmission from an adjacent transmitter, glowlamp I101 conducts and passes the current to ground.

d. Six-position band switch S201 is operated by the MEGACYCLES control. When the band switch is rotated, the following actions occur:

- (1) One of six antenna-tuning networks is connected into the input circuit.
- (2) One or both of the two sections ANT TRIM capacitor C202 are connected in the antenna circuit.

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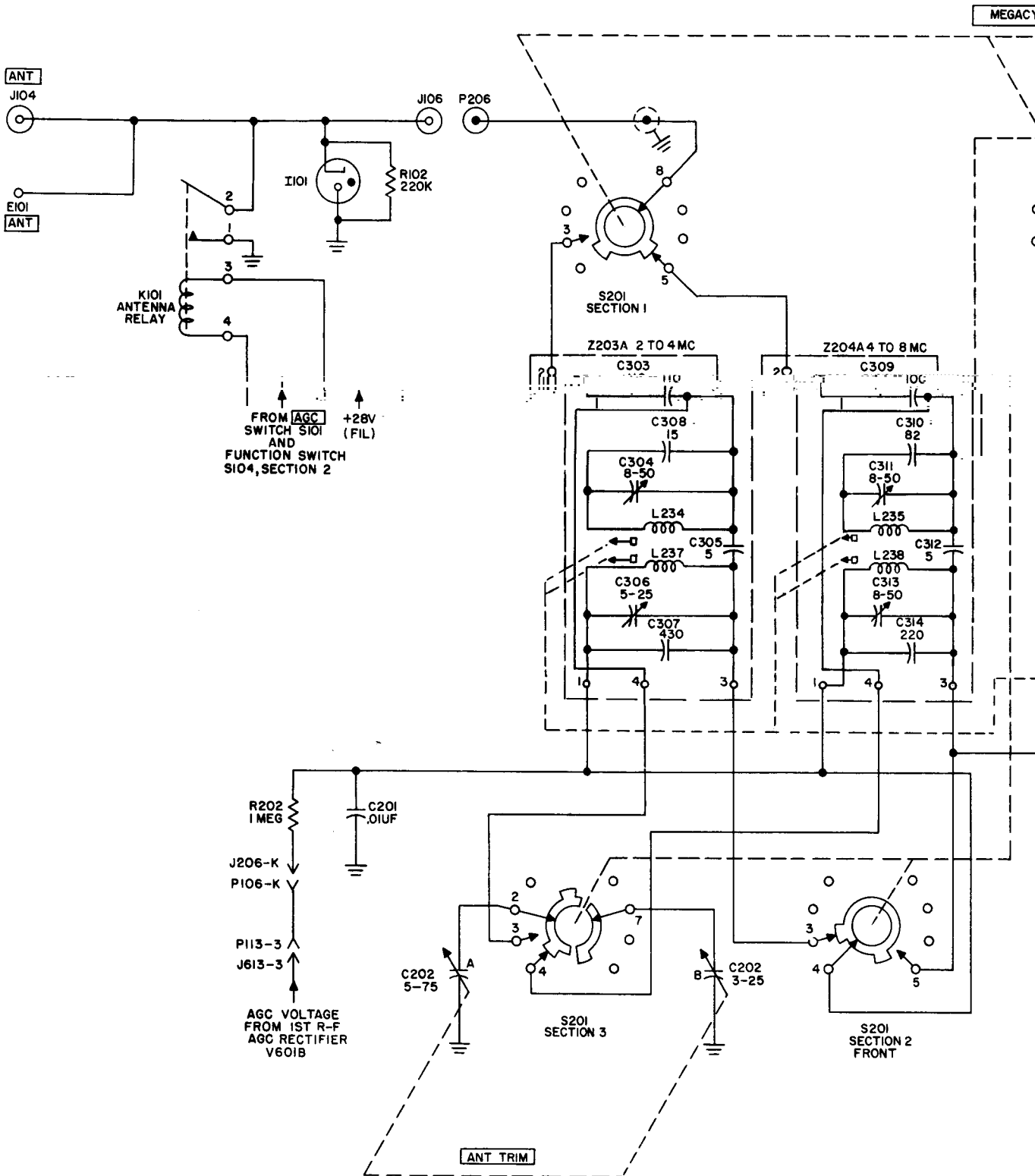


Figure 2. Ant

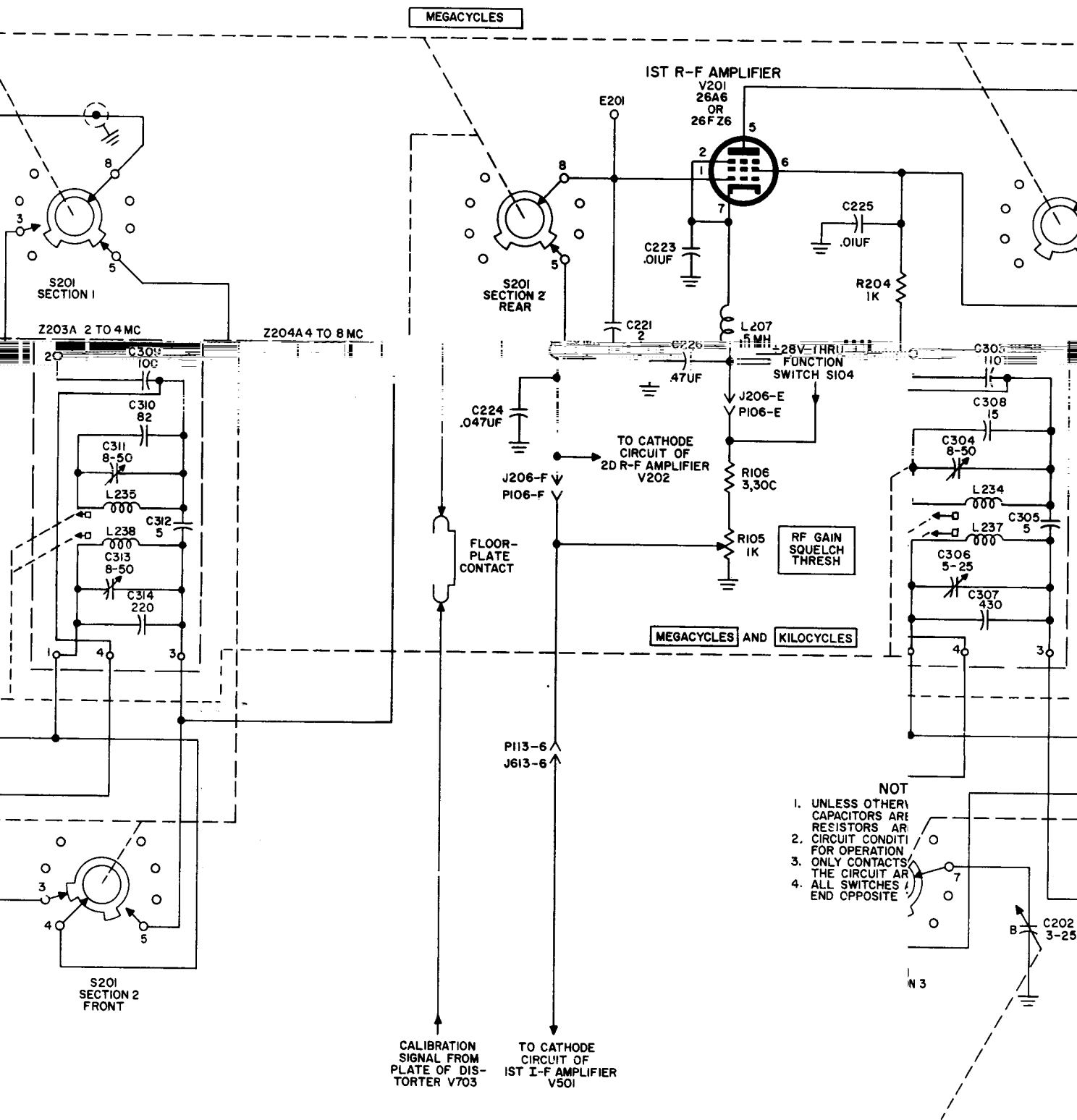
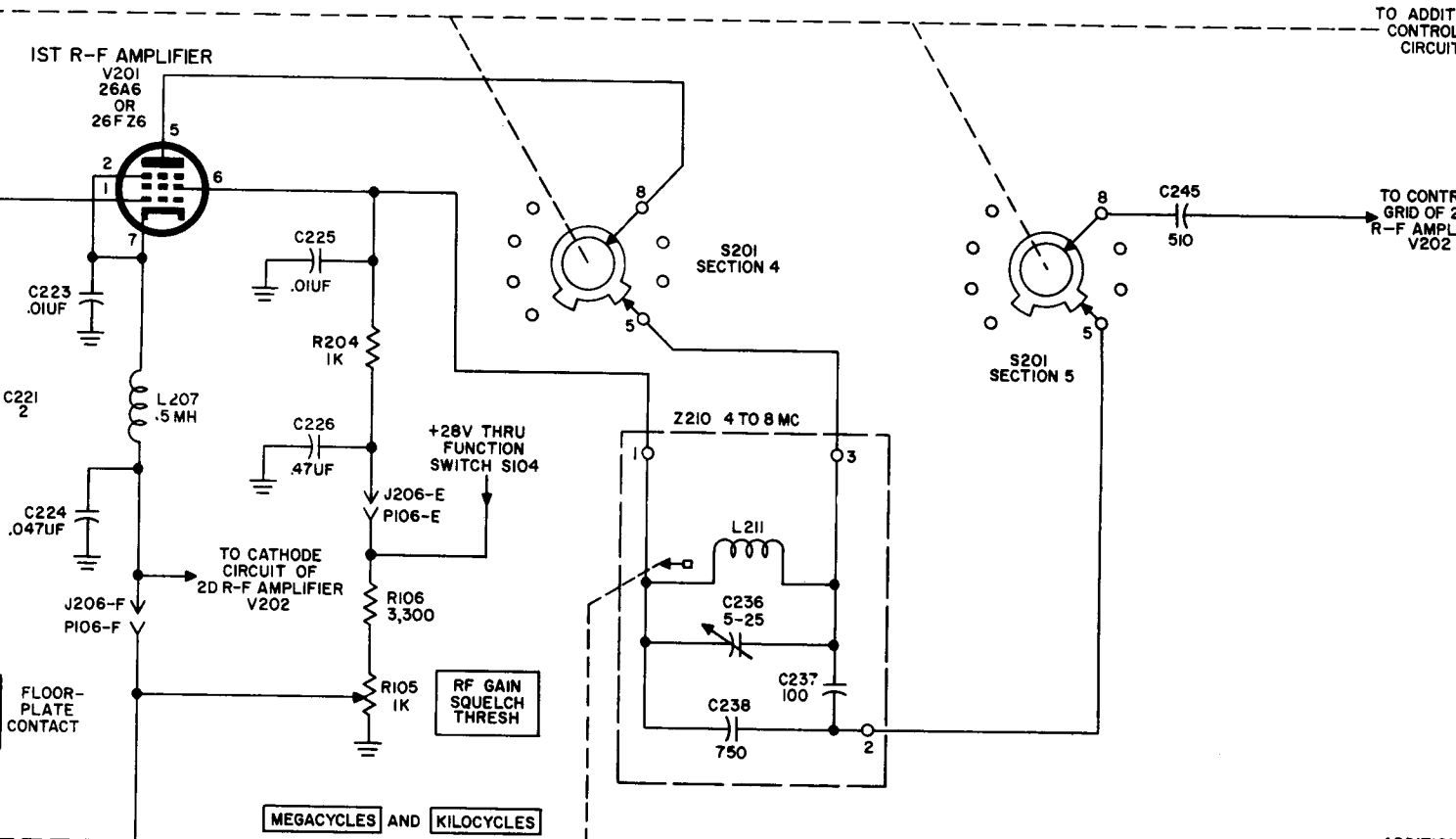
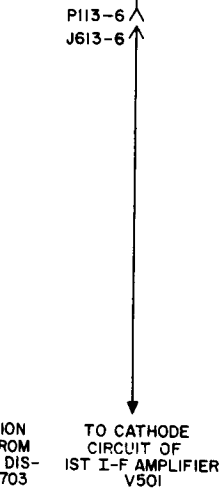


Figure 2. Antenna circuit and first rf amplifier, schematic diagram.

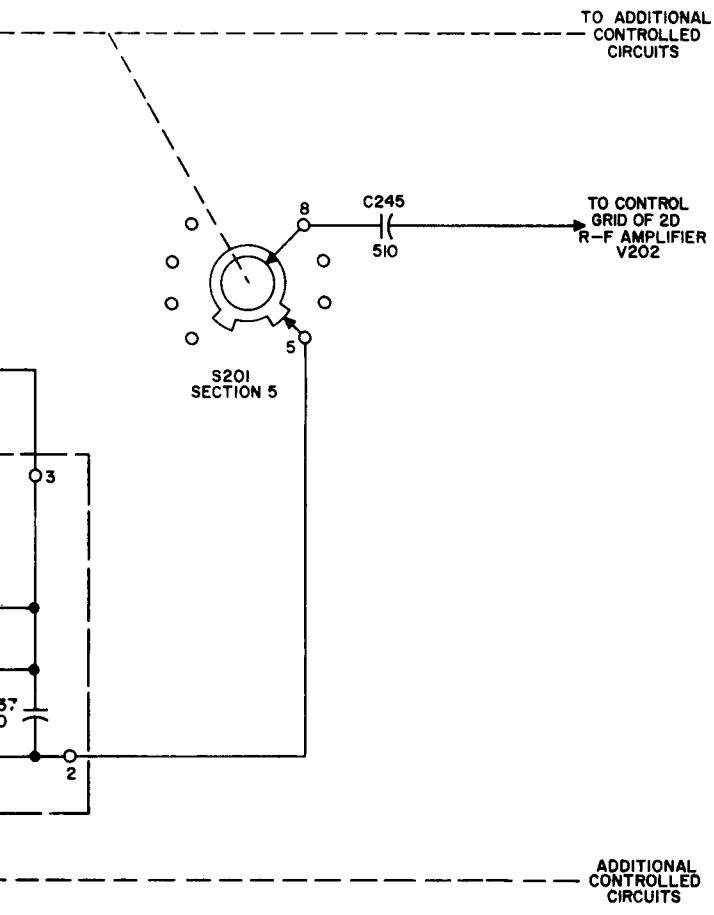


NOTES:

1. UNLESS OTHERWISE SHOWN, CAPACITORS ARE IN UUF, RESISTORS ARE IN OHMS.
2. CIRCUIT CONDITIONS ARE SHOWN FOR OPERATION IN THE 4 TO 8 MC RANGE.
3. ONLY CONTACTS OF SWITCHES USED IN THE CIRCUIT ARE SHOWN.
4. ALL SWITCHES ARE VIEWED FROM THE END OPPOSITE THE KNOB.



amplifier, schematic diagram.



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5. First Rf Amplifier V201

(fig. 2)

First rf amplifier V201 uses a type 26A6 or 26FZ6 miniature pentode tube. The following discussion is concerned only with the 4- to 8-mc range.

a. Signals from the antenna circuit are applied through the contacts of section 2 (rear) of band switch S201 to the control grid of first rf amplifier V201. The amplified signals at the plate of V201 are applied to tuned circuit Z210. The output from V201 is taken at the junction of capacitors C237 and C238; the series-connected capacitors form a voltage divider across inductor L211. This circuit arrangement reduces loading and minimizes any detuning that results from tube-capacitance variation in the following stage. The output of V201 is applied through section 5 of band switch S201 and coupling capacitor C245 to the grid circuit of second rf amplifier V202. Inductor L211 is tuned by the MEGACYCLES and KILOCYCLES controls.

S201. Capacitor C226 and resistor R204 prevent rf from entering the +28-volt line. Capacitor C225 is the screen-grid bypass capacitor. Resistor R106 and potentiometer R105 control the bias applied to the cathode of V201.

c. A calibration signal can be applied to the grid circuit of V201 through the floor-plate contact and coupling capacitor C221. Test point E201 is an accessible connection to the grid circuit for testing.

d. Six-position band switch S201, which is operated by the MEGACYCLES control, selects one of the six tuning networks in the output circuit of the first rf amplifier. The frequency range of each tuning network is as follows: Z207, 0.5 to 1 mc; Z208, 1 to 2 mc; Z209, 2 to 4 mc; Z210, 4 to 8 mc; Z211, 8 to 16 mc; and Z212, 16 to 32 mc. The core in the inductor of each tuning network is moved by the MEGACYCLES and KILOCYCLES controls, except for the 0.5- to 1-mc and the 1- to 2-mc bands, in which the cores are moved

6. Second Rf Amplifier V202

(fig. 3)

a. The signal from first rf amplifier V201 is applied through coupling capacitor C245 to the control grid of second rf amplifier V202. The amplified signal at the plate of V202 is fed through the contacts of section 6 of band switch S201 to tuning network Z216. Capacitors C259 and C260 are connected in series as a voltage-divider circuit. The signal takeoff at the junction of C259 and C260 reduces loading and minimizes detuning. The signal is then applied through section 7 of band switch S201 and coupling capacitor C267 to the grid of first mixer V203.

b. Agc voltage is applied to the grid of second rf amplifier V202, from rf and if. agc rectifier tube V602A, through J613-13, P113-13, P106-C, J206-C, resistor R206 and grid-return R205. Resistor R206 and capacitor C246 form an agc filter network. The cathode (pin 7) and suppressor grid (pin 2) are connected together and returned to ground through inductor L214,

When the AGC switch is set to ON, first rf amplifier V201 is supplied from first rf agc rectifier V601B through J613-3, P113-3, P106-K, J206-K, filter resistor R202 (bypassed by capacitor C201), inductor L238 of tuning network Z204A, and the contacts of section 2 of switch S201. First rf agc rectifier V601B supplies agc voltage to V201. Separate agc is fed to V201 to minimize receiver blocking (para 20). Positive bias is applied from RF GAIN SQUELCH potentiometer R105 through J206-F, and inductor L207 to the grid of V201. This variable bias voltage is manual gain control for V201. Capacitor C223 is the cathode bypass capacitor. Potentiometer R105 also controls the gain of second rf amplifier V202. First rf amplifier V501 (through P113-6 and J613-6); decoupling is provided by capacitor C224. The +28 volts is supplied to the plate and screen grid through function switch S104 and resistor R204. The +28-volt bias is applied through inductor L211 and the contacts of section 4 of switch

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SECTION TO THE GRID FOR TEST

J206-F, P106-F, and potentiometer R105 accessible connection. Inductor L214 and capacitor C224 decouple the cathode circuit from the first if. am-

plifier for rf. Capacitor C247 is the cathode bypass. RF GAIN SQUELCH THRESH control R105 is common to the first and second rf amplifier stages and the first if. amplifier stage. The +28 volts is obtained through function switch S104 and applied to the screen grid (pin 6) of V202 from function switch S104 and resistor R207. Plate voltage is applied from the screen grid of V202 through inductor L218 and the contacts on band switch S201, section 6. The screen grid is bypassed by capacitor C248; R207 is a screen and plate decoupling resistor.

7. First Mixer V203 (fig. 4)

First mixer V203 uses a type 26C6 miniature triode tube. The second rf amplifier output is applied to the control grid (pin 1) and the output of first crystal oscillator V401 is applied to the cathode (pin 2). The two signals are heterodyned to produce a signal between 9 and 18 mc in the plate circuit. The frequency of the mixer output signal is variable, and is the sum of the frequencies of the two input signals. In the frequency range from 8 to 32 mc, the input and output of the first mixer are grounded. This is indicated in figure 4 by the broken lines of band switch S201.

c. When the receiver operates within the 8- to 16-mc or 16- to 32-mc range, the first mixer is not used. Operation in the 8- to 16-mc range is shown by the broken lines of band switch S201. Operation in the 16- to 32-mc range is similar to that in the 8- to 16-mc range. The rf signal at the plate of the second amplifier is applied through the contacts (broken line) of section 6 of band switch S201 to tuning network Z217. Capacitor C262 and C263 form a voltage divider; only the portion of the voltage appearing across inductor L219 is applied through section 8 (front) of band switch S201 to the grid circuit of second mixer V204. The input to first mixer V203 is grounded through coupling capacitor C267 and section 7 of band switch S201. The output of first mixer V203 is grounded through section 8, rear, of band switch

a. The first mixer is used only over the 0.5- to 8-mc range. Throughout the 0.5- to 8-mc range, the signal voltage from second rf amplifier V202 is applied through section 7 of band switch S201 to the control grid of first mixer V203. The signal from first crystal oscillator V401 is at a fixed frequency for each band within the 0.5- to 8-mc range and is applied through T401, P402, J202, and resistor R209 (in parallel with capacitor C268) to the cathode of V203. The first mixer plate circuit is tuned by moving the powdered-iron cores within the inductors of Z219, Z220, and Z221. Capacitor C271, C296, C274, C297, and C277 provide fixed capacity for the tuning networks. Capacitors C270, C273, and C276 are trimmer capacitors. The output signal

thus, the tuning networks for the frequencies between 0.5 and 8 mc are inactive, when the 8- to 16-mc and 16- to 32-mc ranges are used.

from first mixer V203 is applied from Z219 through C272 to Z220, from Z220 through C275 to Z221, from Z221 through C278 and section 8 (front) of band switch S201 to the

ion 8 of S201 first mixer to 8- to 32 mc of S201 control amplifier The rear of output of the in the 8- d lines on

selection of the second rf amplifier is made by S201 which is controlled by the MEGACYCLES control. The frequency range of each tuning network is as follows: Z213, 0.5 to 1 mc; Z214, 1 to 2 mc; Z215, 2 to 4 mc; Z216, 4 to 8 mc; Z217, 8 to 16 mc; and Z218, 16 to 32 mc. Triple conversion is used in the frequency range from 0.5 to 8 mc, and double conversion is used in the frequency range from 8 to 32 mc. Test point E202 provides an

b. Cathode bias is developed across resistor R209; capacitor C268 bypasses the rf signal around R209. The grid is returned to ground through grid resistor R208. The +28 volts is applied to the plate (pin 7) of first mixer V203 through function switch S104, P106-E, J206-E, decoupling resistor R210, and inductor L221. Decoupling resistor R210 is bypassed by capacitor C269.

8. First Crystal Oscillator V401 (fig. 5)

First crystal oscillator V401 provides the injection signal for first mixer V203 (fig. 4) on the eight lower-frequency bands. Figure 5 shows circuit operation on the 4- to 5-mc band. The first crystal oscillator uses a type 6AR5 miniature pentode connected in an electron-coupled Colpitts circuit, with a crystal substituted for the conventional resonant circuit.

a. The oscillatory circuit consists of the cathode, control grid, and screen grid of tube V401; the screen grid acts as the oscillator anode. The control grid is connected to crystal Y405 through contact 4, section 1 of switch S401. The signal voltage feedback loop is from the screen grid (or anode) through capacitor C403 to ground and then to the control grid circuit; oscillations are sustained at the fundamental crystal frequency of 7 mc for the 4- to 5-mc band. The amplitude and stability of the oscillations are determined by the values of capacitors C401 and C402. The direct-current (dc) return for the cathode is inductor L401. Trimmer capacitor C408 and fixed capacitor C407 are connected, through contact 4 of section 2 of switch S401, across the primary of T401 and resonate T401. The output signal is transformer-coupled by T401 through P402 and J202 to the cathode of first mixer tube V203.

b. Cathode bias is developed across resistor R209; capacitor C268 bypasses the rf signal around R209. The grid is returned to ground through grid resistor R208. The +28 volts is applied to the plate (pin 7) of first mixer V203 through function switch S104 through resistor R213, and

of T401. The screen grid is bypassed by capacitor C403.

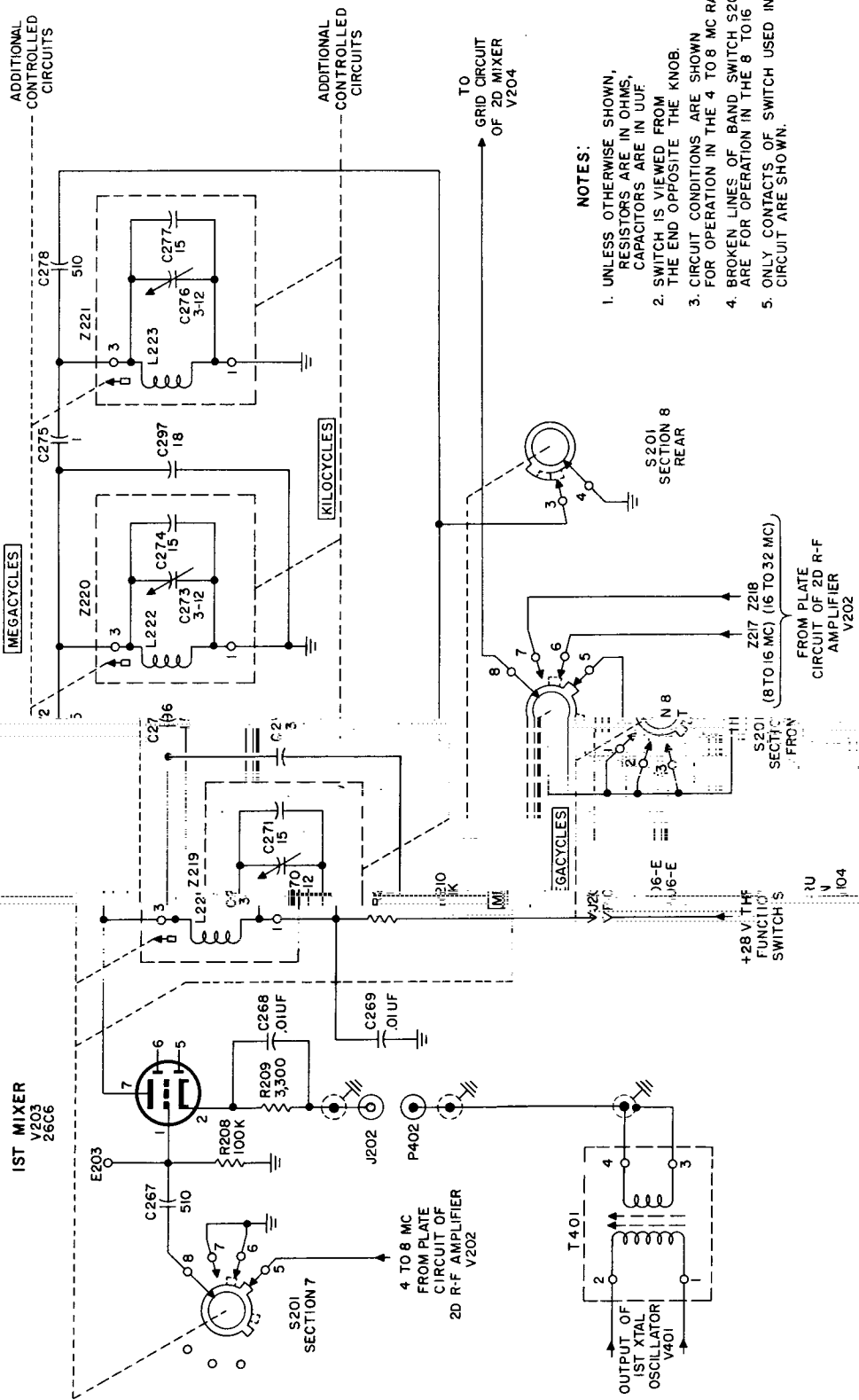
9. Second Mixer V204 (fig. 6)

Second mixer V204 uses a type 26C6 miniature triode tube. Signals from first mixer V203 (fig. 4) (or second rf amplifier V202 (fig. 3) on the 8- to 32-mc range) are applied to the grid of second mixer V204. The output of second crystal oscillator V402 is injected at the V204 cathode. The two signals heterodyne to produce a signal within the range of 3 to 2 mc on all bands except the 0.5- to 1-mc band. On the 0.5- to 1-mc band, the mixer output signal is 2.5 to 2 mc. The mixer output signal is the difference frequency between the signal of the grid and the oscillator signal at the cathode.

a. The second mixer functions on all bands. Signals from either the first mixer or the second rf amplifier are applied to the grid of V204. The injection signal from second crystal oscillator V402 is applied to the mixer cathode through T402, P403, J203, and resistor R212 (in parallel with capacitor C279). The tuning networks in the plate are Z222, Z223, and Z224. The signal from the mixer plate is applied from Z222, through C283, to Z223, from Z223 through C284 to Z224, from Z224 through P208 and J808 to the grid (pin 7) of first mixer V801. Capacitor C289 across Z222 and C298 across Z223 minimize the effects of the stray circuit capacitance across Z222 and Z223, respectively. The plate circuit is tuned to resonance by positioning the powdered-iron cores in inductors L224 of Z222, L225 of Z223, and L226 of Z224. The parallel combination of fixed capacitors C289 and C282 and trimmer C281 resonate inductor L224; the parallel combination of fixed capacitor C298 and C285 and trimmer C284 resonate inductor L225; capacitor C288 in parallel with trimmer C287 resonates inductor L226.

b. Resistor R401 is the grid-leak resistor. The +28 volts for the screen grid and the plate is applied through function switch S104, P106-B, J206-B, J201-A, P401-A, and decoupling resistor R402 and to the plate through the primary winding

C287 resonates inductor L226.
b. Cathode bias is developed across resistor R212, bypassed by capacitor C269. The B+ voltage is applied to the plate through function switch S104 through resistor R213, and



- NOTES:**
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
 2. SWITCH IS VIEWED FROM THE END OPPOSITE THE KNOB.
 3. CIRCUIT CONDITIONS ARE SHOWN FOR OPERATION IN THE 4 TO 8 MC RANGE.
 4. BROKEN LINES OF BAND SWITCH S201 ARE FOR OPERATION IN THE B TO 16 MC RANGE.
 5. ONLY CONTACTS OF SWITCH USED IN THE CIRCUIT ARE SHOWN.

Figure 4. First mixer section, simplified schematic diagram.

Figure 4. First mixer section

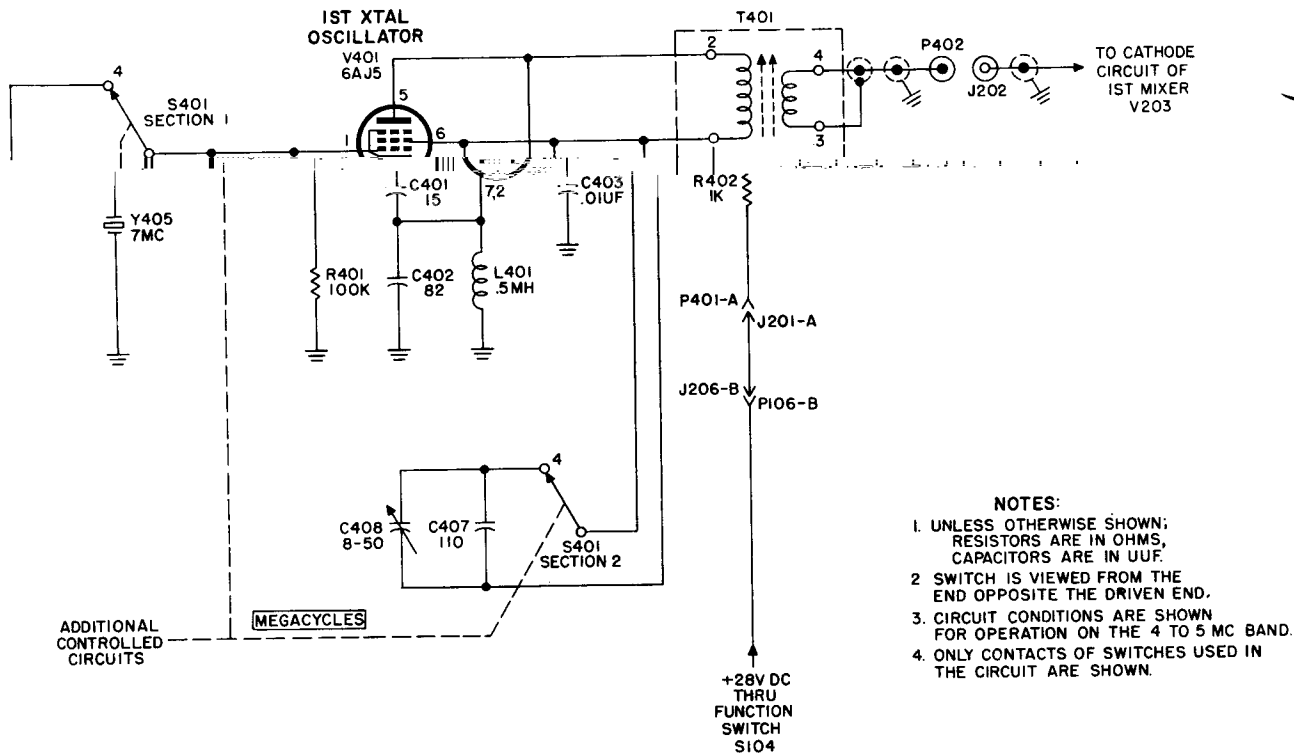


Figure 5. First crystal oscillator, simplified schematic diagram.

inductor L224. Decoupling in the plate circuit is accomplished by resistor R213 and capacitor C280. Grid voltage measurements can be made at test point E204.

10. Second Crystal Oscillator V402 (fig. 7)

Second crystal oscillator V402 provides oscillator injection signals for second mixer V204 on all 32 bands. Operation on the 4-5 mc band is shown in the figure. The oscillator uses a type 6AJ5 miniature pentode in a Colpitts circuit.

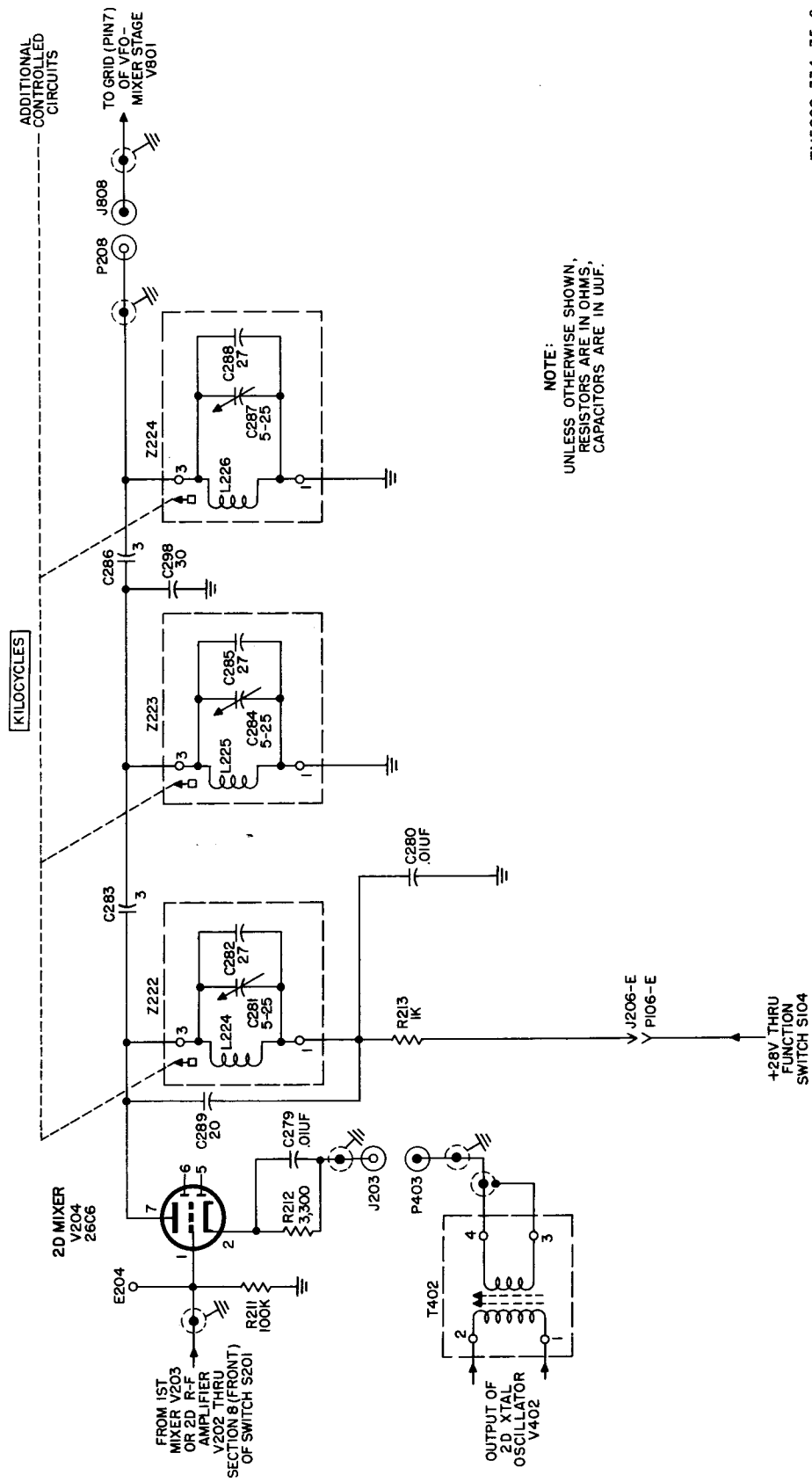
a. The second crystal oscillator is identical in construction and operation with the first crystal oscillator. The stage analysis of the second crystal oscillator is the same as the stage analysis of the first crystal oscillator (para 8) except for the difference in reference symbols.

b. The MEGACYCLES control operates switch S401. On the 4- to 5-mc band, contact 4, section 4 of switch S401 connects

V409 (14-mc fundamental frequency) to the control grid and contact 4, section 3 of switch S401 connects capacitors C421 and C420 into the plate circuit to obtain maximum output at the crystal resonant frequency.

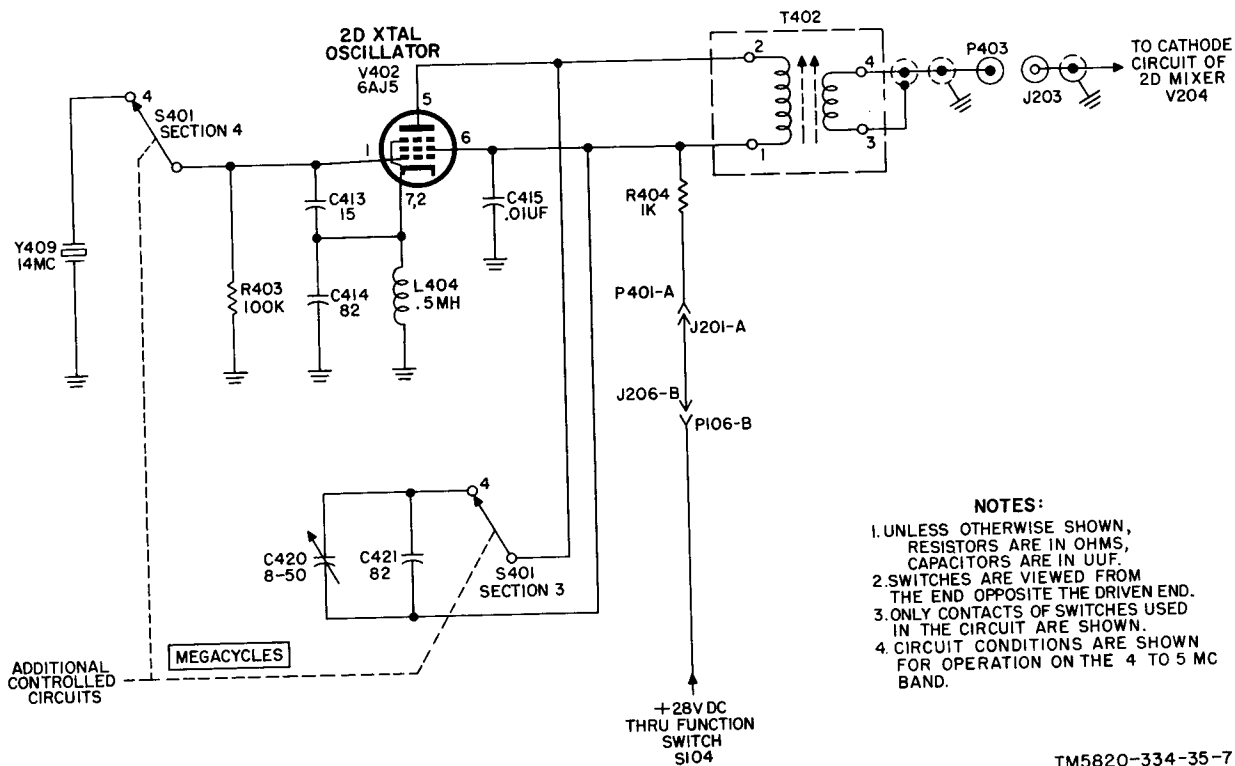
11. Vfo-Mixer V801 (fig. 8)

Vfo-mixer V801 uses a type 26D6 miniature tube, connected as a pentagrid converter. Signals from second mixer V204 are applied to the mixer grid (pin 7) of V801 and are heterodyned with the signal generated in the vfo section of V801 to produce an output signal at the plate (pin 5) of 455 kc. The vfo section of V801, connected as a Hartley oscillator, comprises the cathode (pin 2), the oscillator grid (pin 1), and the screen grid (pin 6), which acts as the oscillator anode. Feedback to sustain oscillation in the vfo section is obtained by connecting the cathode to a tap on inductor



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Figure 6. Second mixer V204, simplified schematic diagram.



- NOTES:**
1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
 2. SWITCHES ARE VIEWED FROM THE END OPPOSITE THE DRIVEN END.
 3. ONLY CONTACTS OF SWITCHES USED IN THE CIRCUIT ARE SHOWN.
 4. CIRCUIT CONDITIONS ARE SHOWN FOR OPERATION ON THE 4 TO 5 MC BAND.

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Figure 7. Second crystal oscillator, simplified schematic diagram.

L802 in tuning unit Z801 and coupling energy to the grid (pin 1) through capacitor C804. The screen grid is maintained at rf ground potential by C805. The screen grid minimizes undesired coupling by shielding the oscillator grid from the mixer grid. The suppressor connects to the cath-

duce a signal at 455 kc in the plate circuit. This signal appears across the primary of T801, and induces a signal in the secondary; transformer T801 is tuned to 455 kc. The T801 output is applied through P810 and J510 to the grid circuit of first if amplifier V501. Resistor R802 broadens

c. Tuning unit Z801 includes capacitors C801, C802, and C803 connected across inductors L801 and L802. The capacitors have the proper temperature coefficients to achieve a high degree of frequency stability.

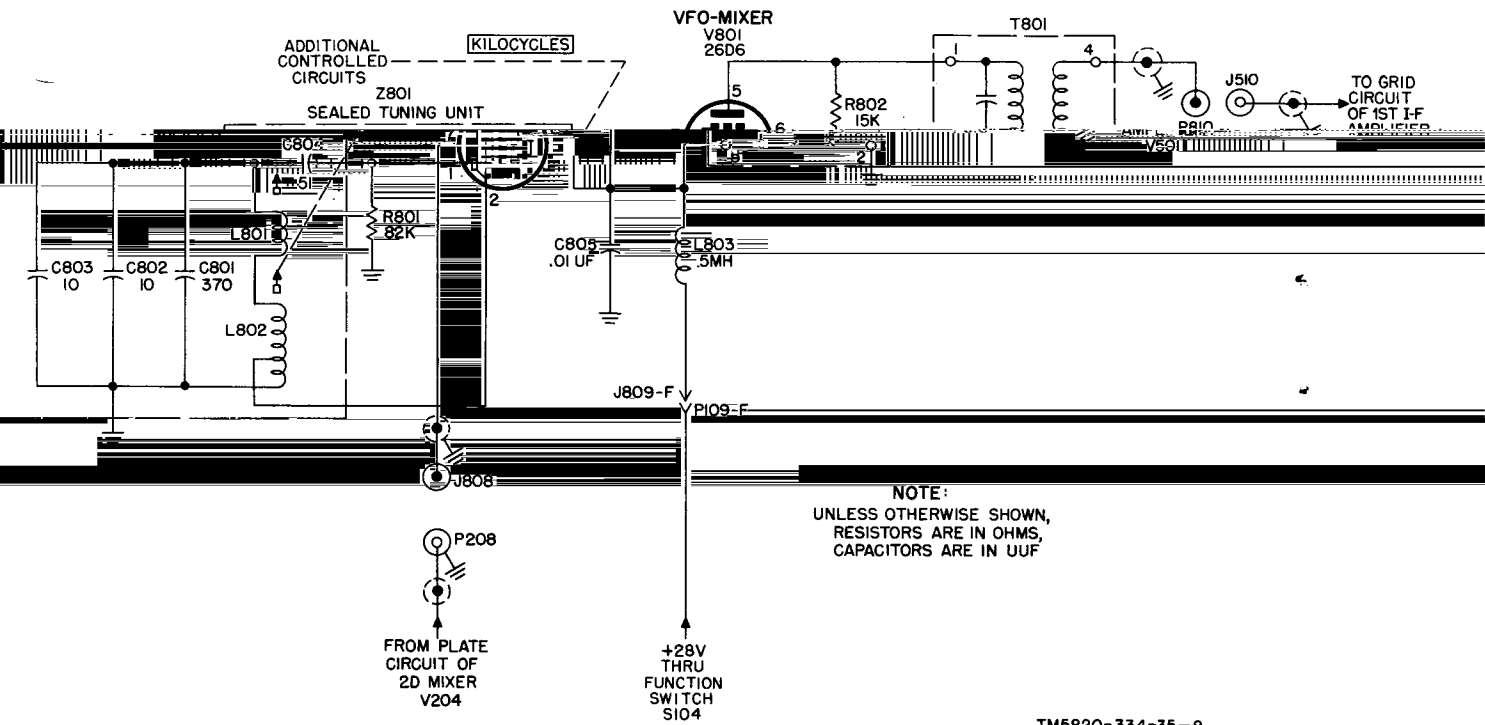
12. 455-kc If. Amplifiers
(fig. 9, 10, and 11)

The if. amplifier section consists of six voltage-amplifier stages, which use type 26A6 miniature pentode tubes, V501 through V506. The output of fifth if. amplifier V505 supplies a 455-kc signal to sixth if. amplifier V506 and agc if. amplifier

ode. The 455-kc signal across the primary plate is the difference between the signal frequency and the local oscillator frequency.

a. Capacitor C804 and resistor R801 provide grid-leak bias for the vfo section. The +28-volt function switch S104, connected through inductor L803 to the screen grid of V801, provides the primary winding of T801 to the plate circuit of V501 and capacitor C805 to prevent rf current from entering the +28-volt line.

b. The output signal of second mixer V204, applied through transformer T402 to the mixer grid (pin 7), and the signal at the oscillator grid (pin 5)



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Figure 8. Vfo-mixer, simplified schematic diagram.

9. The output signal of the sixth if. amplifier is demodulated (detected) in detector V603A. The gain of the if. amplifier section is controlled manually by the RF GAIN SQUELCH THRESH control automatically by the agc circuits when the switch is set to ON or CAL. To prevent oscillations that may occur from coupling between if. stages through the non impedance of the power source, coupling networks are used in the screen and plate circuits of all if. amplifier stages. Three degrees of selectivity (2, 8 kc) are obtained by varying the coupling between the primary and secondary windings of the if. transformer with the BAND WIDTH switch.

1st If. Amplifier V501

(fig. 9)

1st if. amplifier V501 uses a type 26A6

miniature pentode tube as a 455-kc

amplifier. The 455-kc voltage is developed across grid return resistor R501. The V501 amplified output signal develops across the tuned primary of transformer T501 and is inductively coupled to the tuned secondary for application to second if. amplifier V502.

a. The 455-kc signal from vfo-mixer V801 is coupled through P810, J510, and capacitor C501 to the control grid (pin 1) of first if. amplifier V501; the signal voltage is developed across grid return resistor R501. The V501 amplified output signal develops across the tuned primary of transformer T501 and is inductively coupled to the tuned secondary for application to second if. amplifier V502.

b. A particular degree of selectivity is obtained by connecting a winding of transformer T501 through the contacts of section 1 of BAND WIDTH switch S501. Series resistor R504 provides proper band width in the 8 KC position of S501.

c. Agc voltage from rf and if. agc rectifier V602A is applied to the grid (pin 1) through resistor R502 and grid resistor R501. Resistor R502 and capacitor C502 form a grid decoupling filter. The gain of the stage is manually controlled by varying the cathode bias with RF GAIN SQUELCH

THRESH control R105. Cathode bias is applied through P113-6, J613-6, and L531.

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C503 is the cathode bypass capacitor. The +28 volts is applied through function switch S104, P113-19, J613-19 and resistors R624 and R506 to the screen grid (pin 6) and to the plate (pin 5) through the primary of T501. Resistor R506 and capacitor C506 and resistor R624 and capacitor C714 form plate and screen-grid decoupling networks. Resistor R106 and potentiometer R105 form a voltage divider for manual control of V501 cathode bias. Capacitor C624 bypasses the +28-volt line. The capacitor across the primary of T501 and capacitor C505 in the secondary of T501 are part of the tuned circuits.

14. Second If. Amplifier V502 (fig. 9)

Second if. amplifier V502 uses a type 26A6 miniature pentode tube as a 455-kc voltage amplifier.

a. The 455-kc signal from first if. amplifier V501 is coupled through transformer T501 and capacitor C507 to the control grid of second if. amplifier V502.

The signal voltage is developed across grid return resistor R507. The output signal is developed across the tuned primary of transformer T502 and coupled to the tuned secondary for application to the grid circuit of third if. amplifier V503.

b. Agc voltage from rf and if. agc rectifier V602A is applied to the grid through resistors R508 and R507; R508 and C508 form a grid decoupling network. Cathode bias is developed across resistor R509, which is bypassed for rf by capacitor C509. Inductor L506 prevents if. signals from flowing through CARRIER LEVEL meter M101. The suppressor grid is at ground potential. The +28 volts is applied to the screen grid from the junction of R624 and R506 through decoupling resistor R512; capacitor C512 is the screen-grid bypass capacitor. The plate circuit is completed through the primary winding of T502. The voltage across R509 is applied through L506, J613-7 and P113-7, to one side of CARRIER LEVEL meter M101. The voltage between the arm of R662 and ground is applied through J613-10, P113-10, to the other side of M101. Resistor R621 and

meter zero resistor R622 for a voltage divider. The CARRIER LEVEL meter circuit is discussed in detail in paragraph 21.

c. A particular degree of selectivity is obtained by the connection of one of three windings in transformer T502, through the contacts of section 2 of BAND WIDTH switch S501. Resistor R510, in series with one winding, provides the required bandwidth.

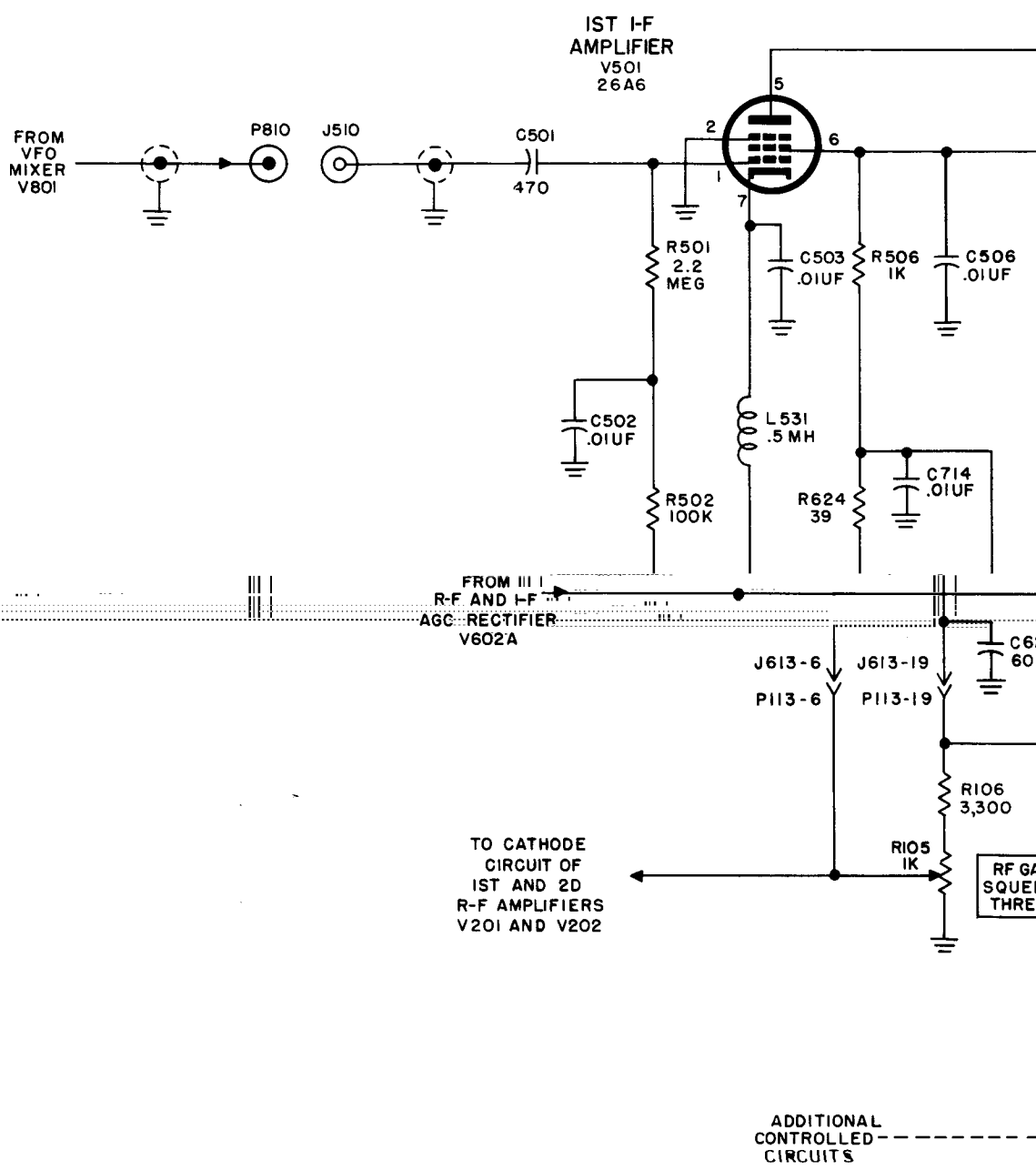
15. Third and Fourth If. Amplifiers V503 and V504 (fig. 10)

Third and fourth if. amplifiers V503 and V504 each use a type 26A6 miniature pentode tube. The gains of the third and fourth if. amplifiers are low. Third if. amplifier V503 maintains the gain of the overall if. amplifier constant for the different degrees of selectivity chosen with BAND WIDTH switch S501.

a. The 455-kc signal is coupled to the control grid of third if. amplifier V503 from second if. amplifier V502 through capacitor C513; the signal voltage is developed across grid resistor R513. The

amplified output signal appears across the tuned primary of transformer T503. The signal induced into the secondary of T503 is coupled to the control grid of V504 through capacitor C518; the signal voltage is developed across grid resistor R520. The amplified signal at the plate of V504 is applied through tuned transformer T504 and capacitor C523 to the control grid of fifth if. amplifier V505.

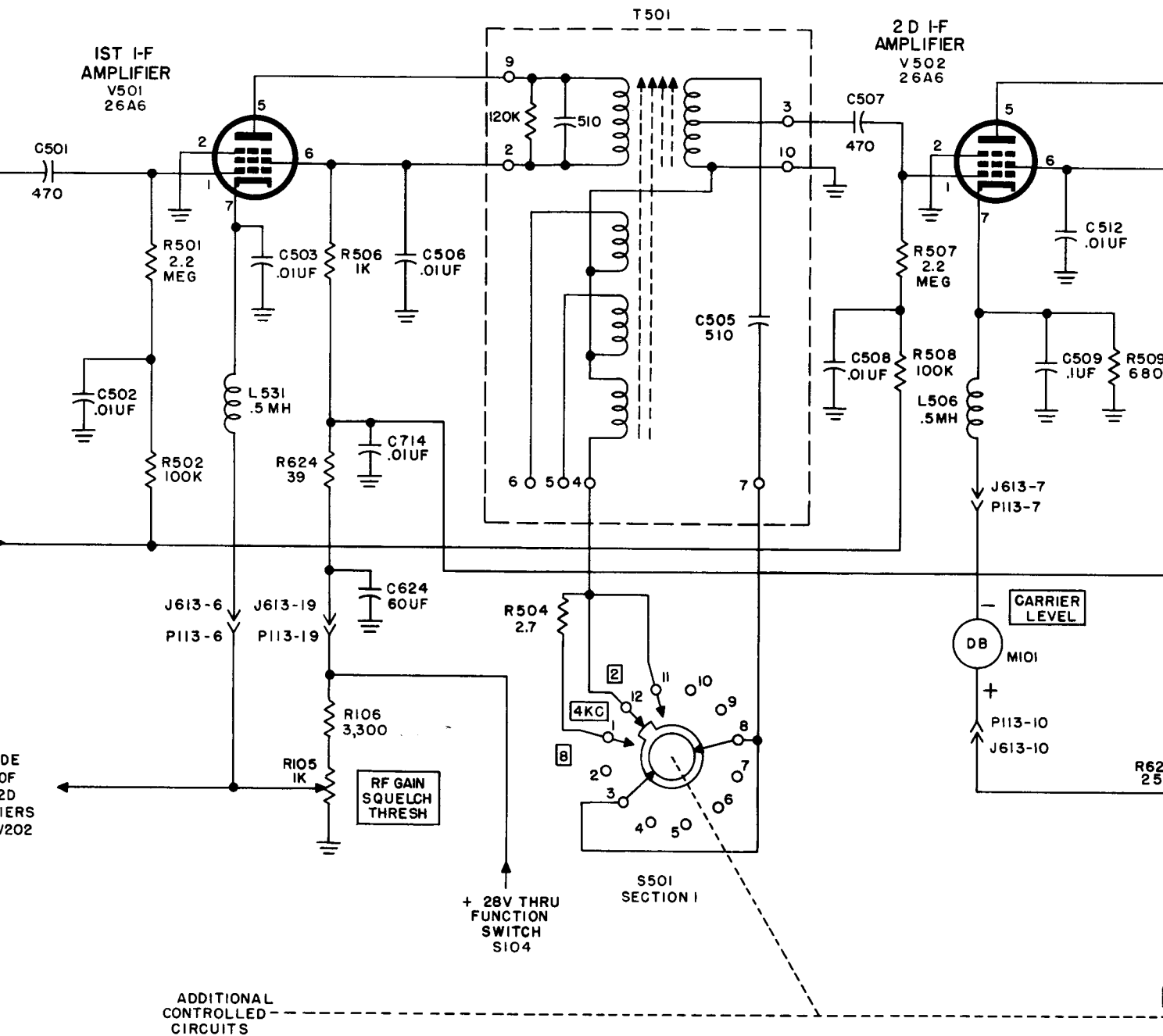
b. To keep the gain of the overall if. amplifier constant, cathode bias for V503 is changed for different positions of BAND WIDTH switch S501. Resistors R517, R518, and R519 are connected through section 3 of BAND WIDTH switch S501 to the cathode (pin 7) of V503 and change the bias for different switch positions. Cathode bias for V504 is developed across fixed resistor R533 in series with variable resistor R521. The suppressor grids are connected to ground. The +28 volts is applied to the screen grids through function switch S104 and a common circuit that



4
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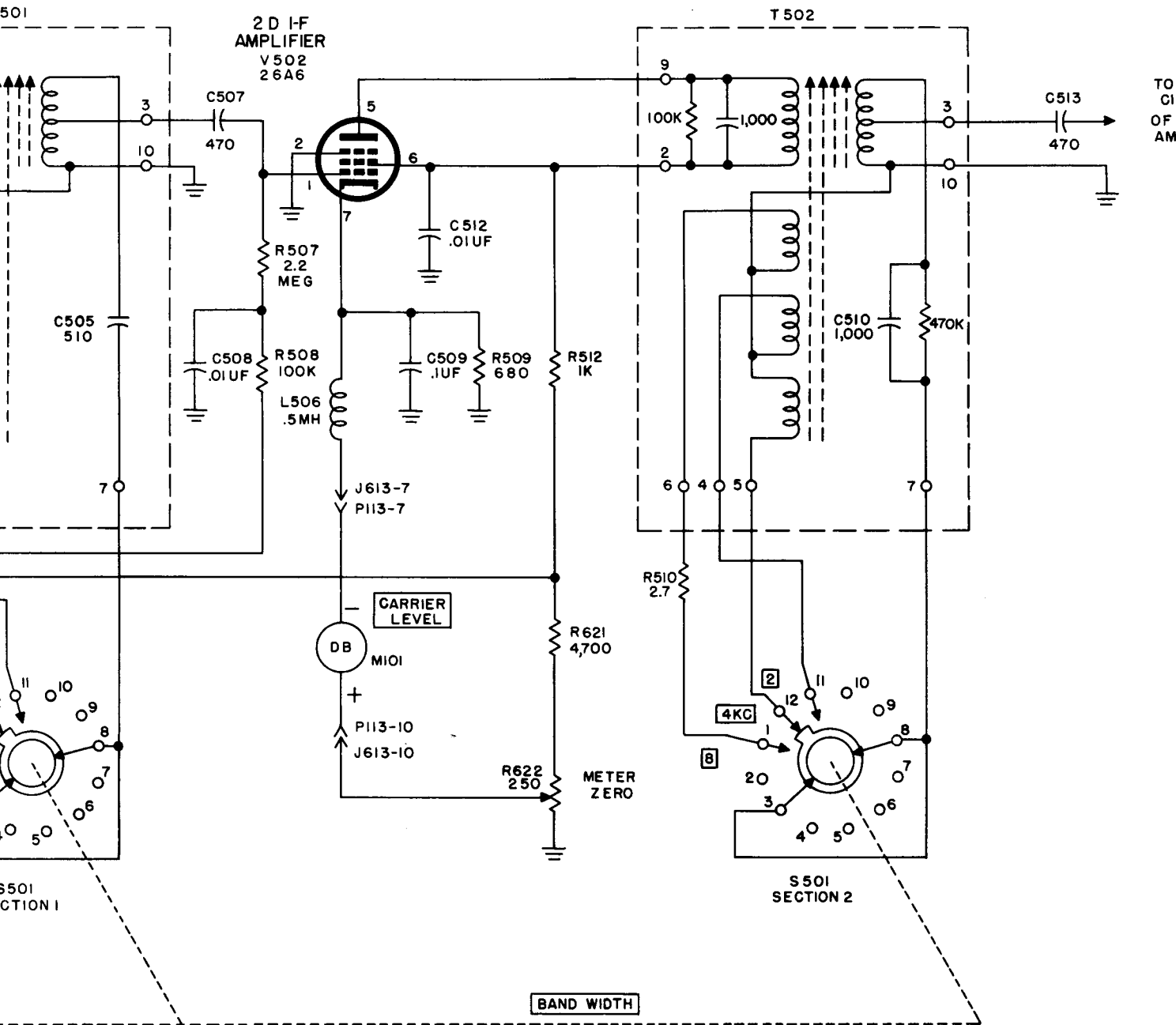
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- NOTES:**
- UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
 - BAND WIDTH** SWITCH S501 IS SHOWN IN THE **4KC** POSITION.
 - SWITCHES ARE VIEWED FROM THE END OPPOSITE THE DRIVEN END.

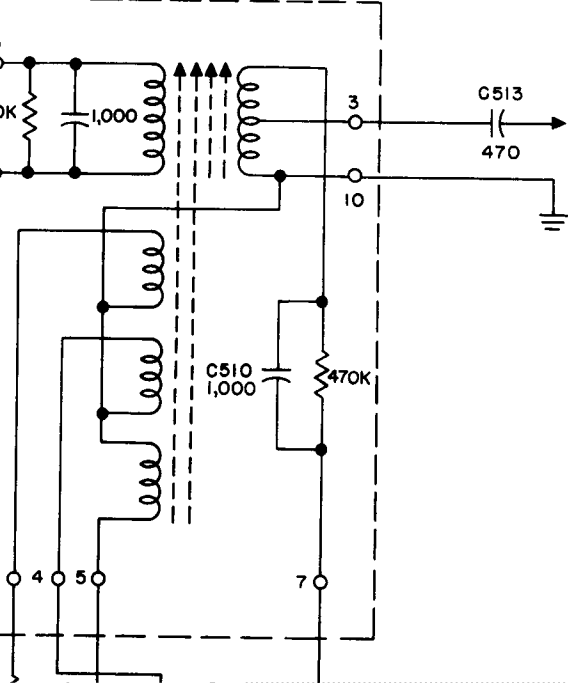
Figure 9. First and second if. amplifiers V501 and V502, simplified schematic diagram.



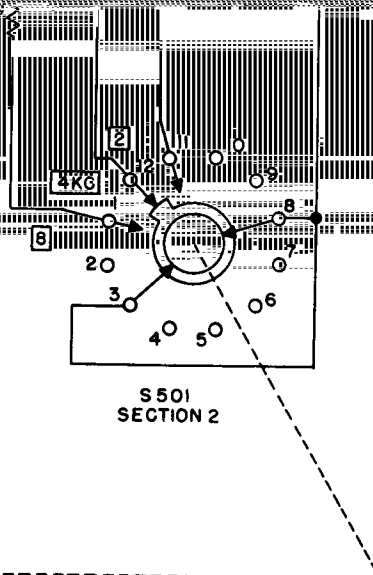
NOTES:

1. UNLESS OTHERWISE SHOWN:
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.
2. **BAND WIDTH** SWITCH S501 IS SHOWN
IN THE **4KC** POSITION.
3. SWITCHES ARE VIEWED FROM THE
END OPPOSITE THE DRIVEN END.

T 502



TO GRID
CIRCUIT
OF 3D I-F
AMPLIFIER
V503



S501
SECTION 2

comprises P113-19, J613-19, and decoupling resistor R624, which is bypassed by C714. Capacitor C624 bypasses the +28-volt line. The +28 volts is then applied through decoupling resistor R516 to the screen grid of V503, and through decoupling resistor R524 to the screen grid of V504. The +28 volts is applied to the plate (pin 5) circuits of V503 and V504 through the primary windings of T503 and T504, respectively. Capacitors C517 and C522 are screen-grid bypass capacitors.

c. A particular degree of selectivity is obtained by the connection of one of three windings in transformers T503 and T504, through sections 4 and 5 of BAND WIDTH switch S501. A small capacitor in each primary and secondary circuit forms part of the double-tuned transformer. The resistors across the transformer primaries and secondaries affect the required band-

passes the cathode. The cathode of V506 is returned directly to ground; grid-leak bias develops across R529. The +28 volts for both amplifiers is applied through function switch S104, through P113-19, J613-19, decoupling resistor R624, and decoupling resistors R508 and R509 to the screens of V505 and V506, respectively; capacitors C526 and C529 bypass the screen grids, capacitor C714 bypasses R624, and capacitor C624 bypasses the +28-volt line. The V505 plate circuit is completed to +28 volts through the primary of T505 and the V506 plate circuit is completed to +28 volts through the indicator L602.

c. A particular degree of selectivity is obtained by the connection of one of three windings in transformer T505 through section 6 of BAND WIDTH switch S501. The primary of T505 is tuned by the small shunting capacitor, and the secondary is tuned by capacitor C528. The resistors

resistor R522 is used for T504.

16. Fifth and Sixth If. Amplifiers V505 and V506 (fig. 11)

The fifth and sixth if. amplifier stages use type 26A6 miniature pentode tubes.

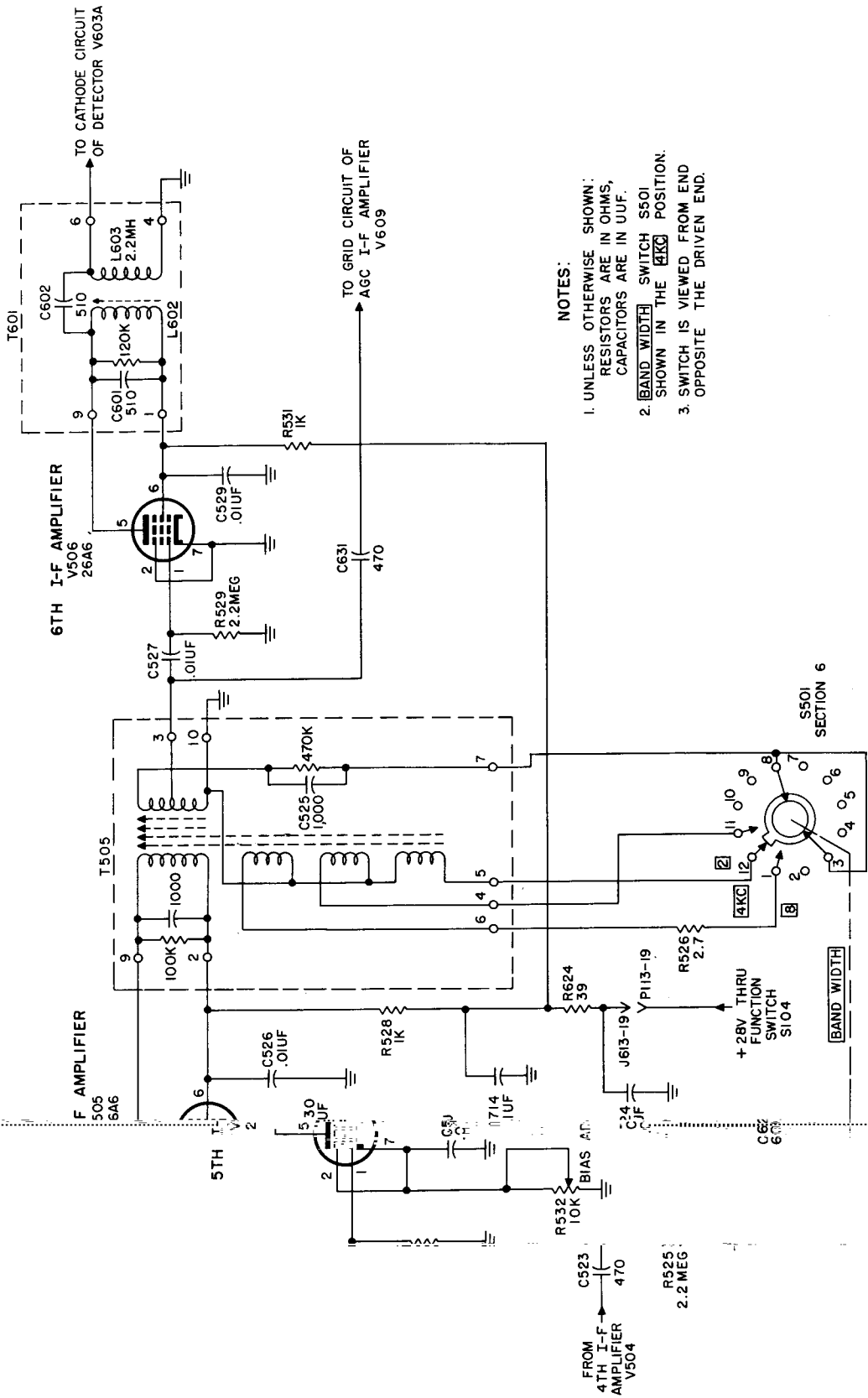
a. The 455-kc signal from fourth if. amplifier V504 is coupled through coupling capacitor C523 to the control grid of fifth if. amplifier V505. The output signal is developed across the tuned primary of transformer T505 and coupled to the tuned secondary. The signal is then coupled to the control grid of sixth if. amplifier V506 through capacitor C527; the signal voltage is developed across grid resistor R529. (The signal is also applied through capacitor C631 to the grid circuit of agc if. amplifier V609.) The V506 output signal is developed across tuned inductor L602 of T601 and coupled to inductor L603 through capacitor C602. The output of T601 is applied to the cathode circuit of detector V603A.

b. Adjustable cathode bias for V505 is provided by variable resistor R532 in the V505 cathode return; capacitor C530 by-

secondary windings affect bandwidth. Resistor R522 is used for T504. bandwidth in the 8

17. Bandwidth Selectivity (fig. 9, 10, and 11)

a. The bandwidth of the amplifier can be varied (from 4 and 8 kc) by the BAND WIDTH switch. The different bandwidths are obtained by changing the mutual coupling between the primary and secondary windings of the intermediate frequency transformers (T501 through T505). The transformers are wound on toroidal inductors wound on the primary and secondary windings of the transformer aid or opposed. If they are connected in series between the primary and secondary windings of the transformer. An increase in mutual coupling broadens the bandwidth; a decrease in mutual coupling narrows the bandwidth. The inductors nearest the cathode are most effective in obtaining the widest bandwidth; the inductors farthest from the cathode are most effective in obtaining the narrowest bandwidth. These inductors are connected in series at a time is connected



- NOTES:
1. UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
 2. BAND WIDTH SWITCH S501 SHOWN IN THE **4KC** POSITION.
 3. SWITCH IS VIEWED FROM END OPPOSITE THE DRIVEN END.

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Figure 11. Fifth and sixth i-f. amplifiers V505 and V506, simplified schematic diagram.

ADDITIONAL CONTROLLE CIRCUITS

in each transformer to produce a given degree of mutual coupling.

b. When the BAND WIDTH switch is set to 2 KC, a single coupling inductor of transformer T501 (fig. 9) and the middle inductors in transformers T502, T503, T504, and T505 are connected in series with the transformer secondaries. These middle inductors are in a phase-opposing connection and provide the sharpest selectivity, because the smallest degree of mutual coupling exists between the primary and secondary windings.

c. When the BAND WIDTH switch is set to 8 KC, resistor R504 is added in series with the inductor in T501. The inductors nearest the primary windings of T502 through T505 are placed in phase-opposing connections. These circuit connections provide the relatively flat 8-kc bandwidth.

18. Detector and Noise Limiter

(fig. 12)

The detector demodulates the 455-kc if. signal to recover the intelligence. The noise limiter minimizes interference by removing excessive noise peaks. The output of the detector is applied through the noise limiter to first af amplifier V606.

a. *Detector V603A.* Detector V603A uses half of a type 12AU7 miniature dual-triode tube connected as a half-wave diode rectifier. The 455-kc if. signal developed across inductor L603 is applied to the cathode of V603A. Diode-connected V603A conducts during negative half cycles of the applied if. signal and develops the audio voltage across diode-load resistor R605; capacitor C606 bypasses the rf component in the detector output. With the BFO switch at ON, the output of beat-frequency oscillator V604 is coupled to the V603A cathode through capacitor C618. The bfo signal is mixed in V603A with the if. input signal

and produces an audiofrequency beat note across R605. Jack J615 is a test point.

b. *Noise Limiter V603B.* The noise limiter circuit uses one triode section of a type 12AU7 miniature dual-triode tube, connected as a diode series limiter. With section 2 of function switch S104 in the LIMITER position, noise limiter V603B eliminates peak noise voltages from the audio signal fed from detector V603A to first af amplifier V606. Although noise peaks are generally 10 to 20 times as great as the incoming radio signal, they are normally of short duration. The high-

amplitude, short-duration pulses cut off noise limiter V603B and are removed from the audio signal applied to V606 with no noticeable loss in intelligence.

(1) The demodulated signal across resistor R605 is a composite of a negative average dc voltage and the

audio component. The cathode of

V603B is connected to R605 through resistors R612 and R611. Capacitor C609 couples the audio component to the plate and grid of diode-connected V603B; an audio voltage develops across resistor R608. With V603B connected as above, the plate is positive with respect to the cathode for the full audio signal and the noise limiter diode conducts. Continuous conduction maintains a low plate-to-cathode resistance of V603B and the complete audio component is coupled through capacitor C610, J613-8, and P113-8 to first af amplifier V606. At a function switch setting other than LIMITER, both the audio component and the negative average dc voltage across R605 are applied to the cathode of V603B. Thus, strong negative noise peaks (noise voltages developed across R605 are negative with respect to ground) maintain V603B conduction and are coupled through C610 to first af amplifier V606.

(2) When function switch S104 is set to LIMITER, capacitor C611 is connected between the junction of resistors R611 and R612 and ground

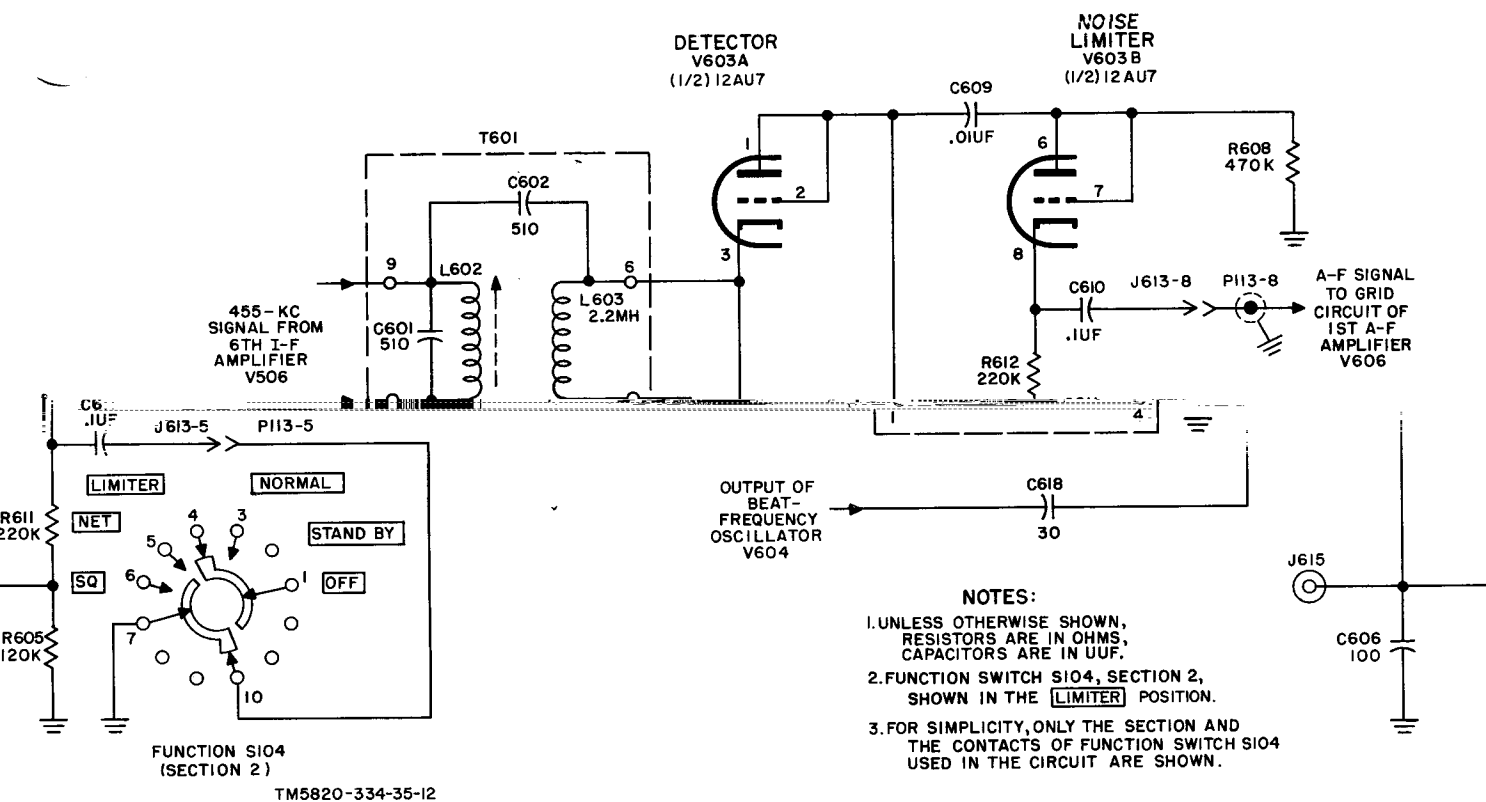
through J613-5, P113-5, and contacts 10 and 7 of S104. Capacitor C611 is charged through resistor R611 to the negative average dc voltage across R605; this voltage is applied to the cathode of V603B. Since the time constant of the network is long compared with the duration of the noise signal peaks, a noise peak causes no appreciable change in the voltage across capacitor C611. The negative noise peaks are coupled to V603B (as part of the audio component) through capacitor C609 and drive the plate more negative than the cathode (since the cathode does not change appreciably for the noise peak duration) and the tube is cut off. This action effectively removes the coupling to first af amplifier V606 for the duration of each noise peak.

19. Beat-Frequency Oscillator V604

(fig. 13)

A beat-frequency oscillator facilitates accurate tuning and permits the reception of radiotelegraph (cw) signals. When BFO switch S102 is at ON, beat frequency oscillator V604 generates a signal which is mixed with the 455-kc if. signal detector V603A. The mixing action produces an audible beat note in the output of the receiver. The bfo uses a type 26A6 miniature pentode tube connected as an electron-coupled Hartley oscillator.

a. The screen grid of V604 acts as the anode for the oscillator. The control grid is coupled through grid-leak capacitor C615 to the tuned circuit in T602, which consists of inductor L605 and parallel-connected capacitors C612, C613, and C614; capacitor C616 provides additional capacitance external to T602. The



schematic diagram.

Figure 12. Detector and noise limiter, simplified s

capacitors have the correct temperature coefficient to assure frequency stability over a wide range of temperatures. The cathode of V604 is connected to a fan on is set to 0, the output of the bfo is 455 kc. An adjustable core within s used to obtain the proper fre- range during alignment and adjust-

Delayed Agc Circuits

(fig. 14 and 15)

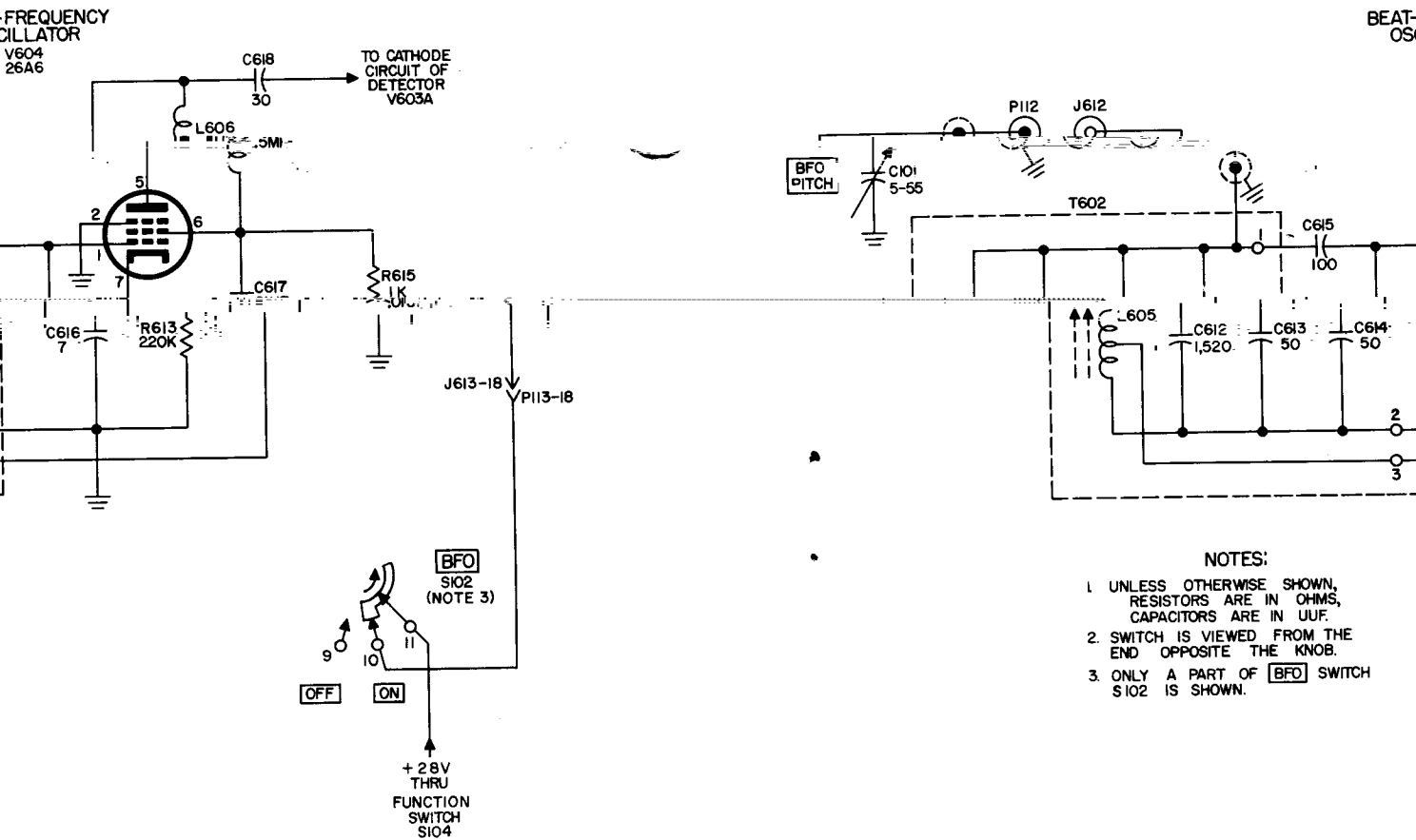
The agc circuit develops a negative dc potential which is proportional to the length of the incoming signal. This negative dc potential is used as bias on the first and second rf amplifiers, V201 and V202, and first and second if. amplifiers V401 and V502. This agc bias maintains

be varied over a range of 451 to 459 kc with BFO PITCH control C101. The frequency of the bfo is varied linearly over its entire range. When the BFO PITCH

control is set to 0, the output of the bfo is 455 kc. An adjustable core within the inductor. The output of V604 is coupled through capacitor C618 to the cathode circuit of detector V603A.

b. Resistor R613 is the grid-leak resistor. The +28 volts is applied to the screen grid (oscillator anode) through function switch S104, the contacts of BFO switch S102, P113-18, J613-18, and resistor R615. The suppressor grid (pin 2) is at ground potential. Capacitor C617 is the screen-grid bypass capacitor. The bfo output signal is developed across inductor L606. When the BFO switch is at OFF, +28 volts is disconnected from the plate and screen of the oscillator.

c. The frequency of the bfo signal can



beat-frequency oscillator, simplified schematic diagram.

Figure 13. Beat-frequency oscillator.

constant receiver output for different signal levels at the antenna. In this discussion, the agc biased tubes are called

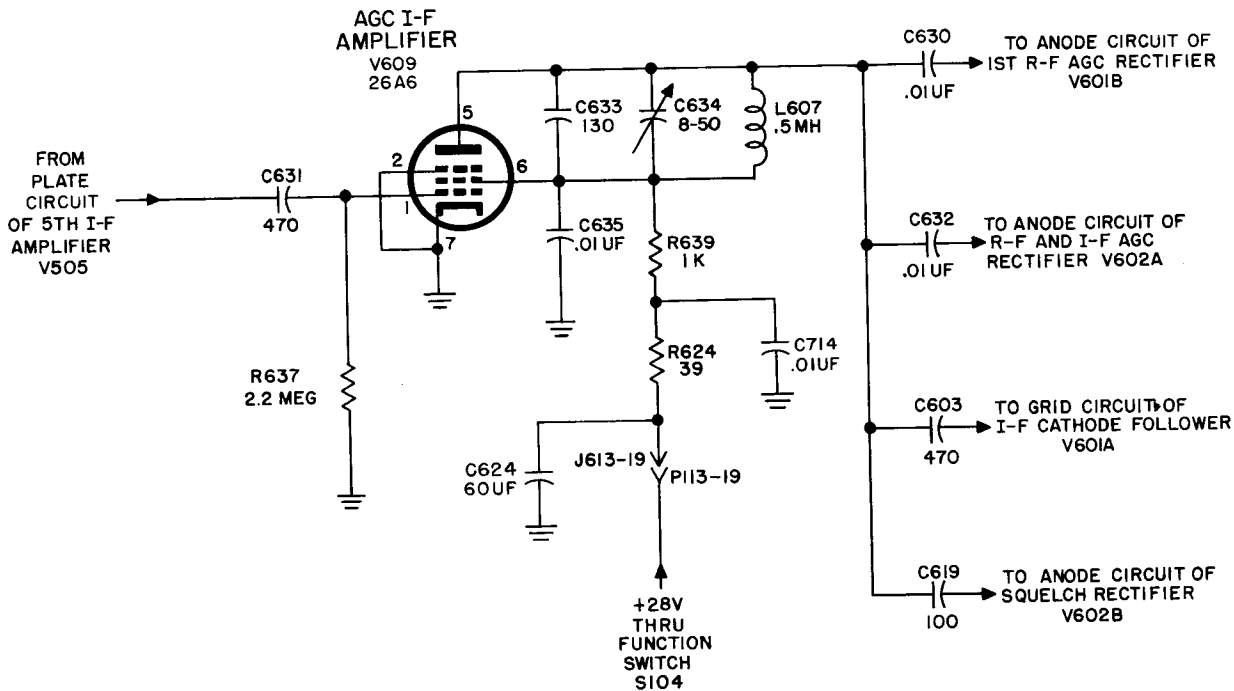
the *controlled tubes*. The delayed agc circuits prevent the application of agc bias to the *controlled tubes* for weak incoming signals to provide maximum receiver gain for these signals. The agc circuit uses a type 26A6 miniature pentode (V609) and sections of two type 12AU7 miniature dual-triode tubes (V6-1B and V602A). The agc if. amplifier is V609; tubes V601B and V602A are connected as diode rectifiers. The rectifiers function only when AGC switch S101 is set to ON or CAL and the input signal voltage is greater than the agc delay voltage. The receiver gain can be controlled manually by the RF GAIN SQUELCH THRESH control whether AGC switch S101 is at ON or OFF.

a. *Agc If. Amplifier V609* (fig. 14). Agc if. amplifier V609 operation is similar to that of if. amplifiers V501 through V506. The V609 output signal is developed across the tuned-plate circuit consisting of inductor L607 and capacitors C633 and C634. Trimmer capacitor C634 is for circuit alignment. Plate and screen-grid voltage is applied to V609 from switch S104 through P113-19 and J613-19 and through decoupling resistors R624 and R639. Capacitor C714 is an rf filter capacitor for the +28-volt line, and capacitor C635 is screen-grid and plate return bypass capacitor. The agc if. amplifier is grid-leak biased by the network consisting of capacitor C631 and resistor R637. The output of V609 is fed to four circuits: first rf agc rectifier V601B through capacitor C630; rf and if. agc rectifier V602A through capacitor C632; if. cathode follower C601A through capacitor C603; and squelch rectifier V602B through capacitor C619.

b. *Rf and If. Agc Rectifier V602A* (fig. 15). Rf and if. agc rectifier V602A is connected as a diode rectifier. The stage produces a negative dc potential, which is applied to the control grids of the second rf amplifier and the first and second if. amplifiers to control their gain. The receiver output level is held nearly constant, regardless of incoming signal strength variations.

- (1) The 455-kc signal from if. amplifier V609 is coupled through capacitor C632 to the anode (plate and grid joined) of V602A. Tube V602A conducts only when the amplitude of the positive half-cycles of the input signal is greater than the positive dc (delay) potential on the cathode. When the input signal amplitude is less than the potential of the cathode, there is no conduction. The amplitude of the signal applied to V602A must exceed a delay voltage of between 5 and 6 volts for V602A to conduct. A large positive potential (with respect to ground) applied to the cathode when the AGC switch is at OFF and V602A is off even for comparatively large signal voltages. The cathode of V602A is bypassed by capacitor C638. Pulsating negative voltage developed across resistor R607 during reception of signals which exceed the delay voltage at V602A. This pulsating voltage is filtered by resistor R607 and capacitor C103 and C104 (dependent on position of BFO switch S102). The agc voltage is also filtered by resistor R502 and capacitor C502 and applied to the grid circuit of first amplifier V501. The agc voltage is also applied to the grid circuit of second if. amplifier V502 through filter network R508 and C508, and to the grid circuit of second rf amplifier V202 through J613-13, P106-6, J206-6, and filter network R206 and C245.

- (2) Capacitor C103 or C104 is connected into the circuit by a section of BFO switch S102 to control the time constant of the agc circuit. When BFO switch S102 is at OFF, capacitor C104 is connected in the circuit to provide the time constant required for voice reception. When S102 is at ON, C104 is disconnected and C103 is connected to provide a longer time constant for cw reception. The longer time



NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

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Figure 14. Agc if. amplifier V609, simplified schematic diagram.

constant prevents noticeable variations in gain due to keying. Jack J614 is a test point.

- (3) An agc voltage is developed when a signal of approximately 3 to 5

for all incoming signals and no agc voltage is developed. When the AGC switch is at ON or CAL, a positive potential of between 5 and 6 volts (delay bias) is applied to the cathode of V602A.

When the AGC switch is set to OFF, resistor R609 is off ground and the +28 volts at the junction of resistors R624 and R610 appears at the V602A cathode. This high bias voltage maintains V602A at cutoff

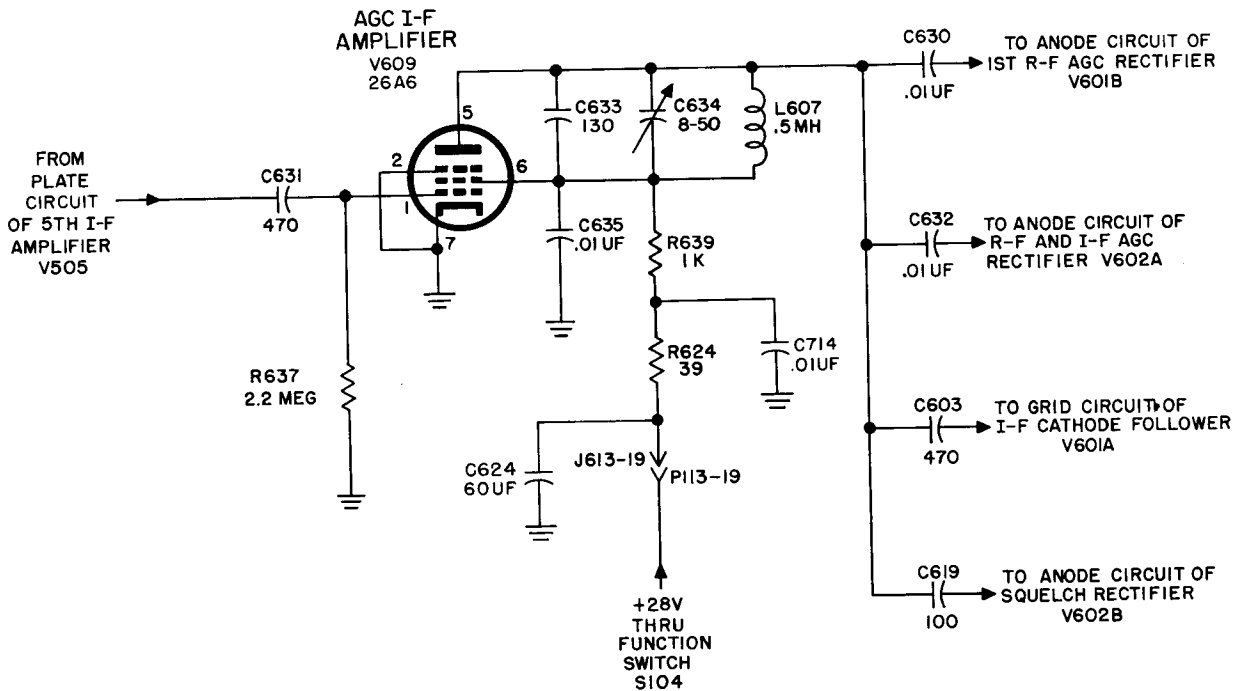
and the RF GAIN SQUELCH control is at maximum. The RF GAIN SQUELCH control is maximum clockwise. This rf signal level is the minimum signal level required to cause agc action. It develops a voltage of approximately 3.2 volts across the detector (V603A) load resistor R605 (figure 12). When the RF GAIN SQUELCH control is at a lower gain setting, a larger rf signal is required at the antenna to produce agc action.

15). First rf agc rectifier V601B operation is similar to that of rf and if. agc rectifier V602A except that the agc voltage from V601B is applied to the grid circuit of first rf amplifier V201 only. An independent agc system is provided for the first rf amplifier to prevent receiver blocking. Large off-tune rf voltages applied to the first rf amplifier might cause grid current flow and affect the biasing of

- (4) Agc delay bias is obtained from +28-volt voltage divider R610 and R609; the voltage across R609 is applied to the cathode of V602A

constant receiver output for different signal levels at the antenna. In this discussion, the agc biased tubes are called the *controlled tubes*. The delayed agc

- (1) The 455-kc signal from if. amplifier V609 is coupled through capacitor C632 to the anode (plate and grid joined) of V602A. Tube V602A



NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

TM5820-334-35-14

Figure 14. Agc if. amplifier V609, simplified schematic diagram.

constant prevents noticeable variations in gain due to keying. Jack J614 is a test point.

- (3) An agc voltage is developed when a signal of approximately 3 to 5 microvolts is applied to the antenna and the RF GAIN SQUELCH THRESH control is maximum clockwise. This rf signal level is the minimum signal (rf threshold) required to cause agc action. It develops a voltage of approximately 3.2 volts dc across the detector (V603A) load resistor R605 (fig. 12). When the RF GAIN SQUELCH THRESH control is at a lower gain setting, a larger rf signal is required at the antenna to produce agc action.
- (4) Agc delay bias is obtained from +28-volt voltage divider R610 and R609; the voltage across R609 is applied to the cathode of V602A.

When the AGC switch is set to OFF, resistor R609 is off ground and the +28 volts at the junction of resistors R624 and R610 appears at the V602A cathode. This high bias voltage maintains V602A at cutoff for all incoming signals and no agc voltage is developed. When the AGC switch is at ON or CAL, a positive potential of between 5 and 6 volts (delay bias) is applied to the cathode of V602A.

c. *First Rf Agc Rectifier V601B* (fig. 15). First rf agc rectifier V601B operation is similar to that of rf and if. agc rectifier V602A except that the agc voltage from V601B is applied to the grid circuit of first rf amplifier V201 only. An independent agc system is provided for the first rf amplifier to prevent receiver blocking. Large off-tune rf voltages applied to the first rf amplifier might cause grid current flow and affect the biasing of

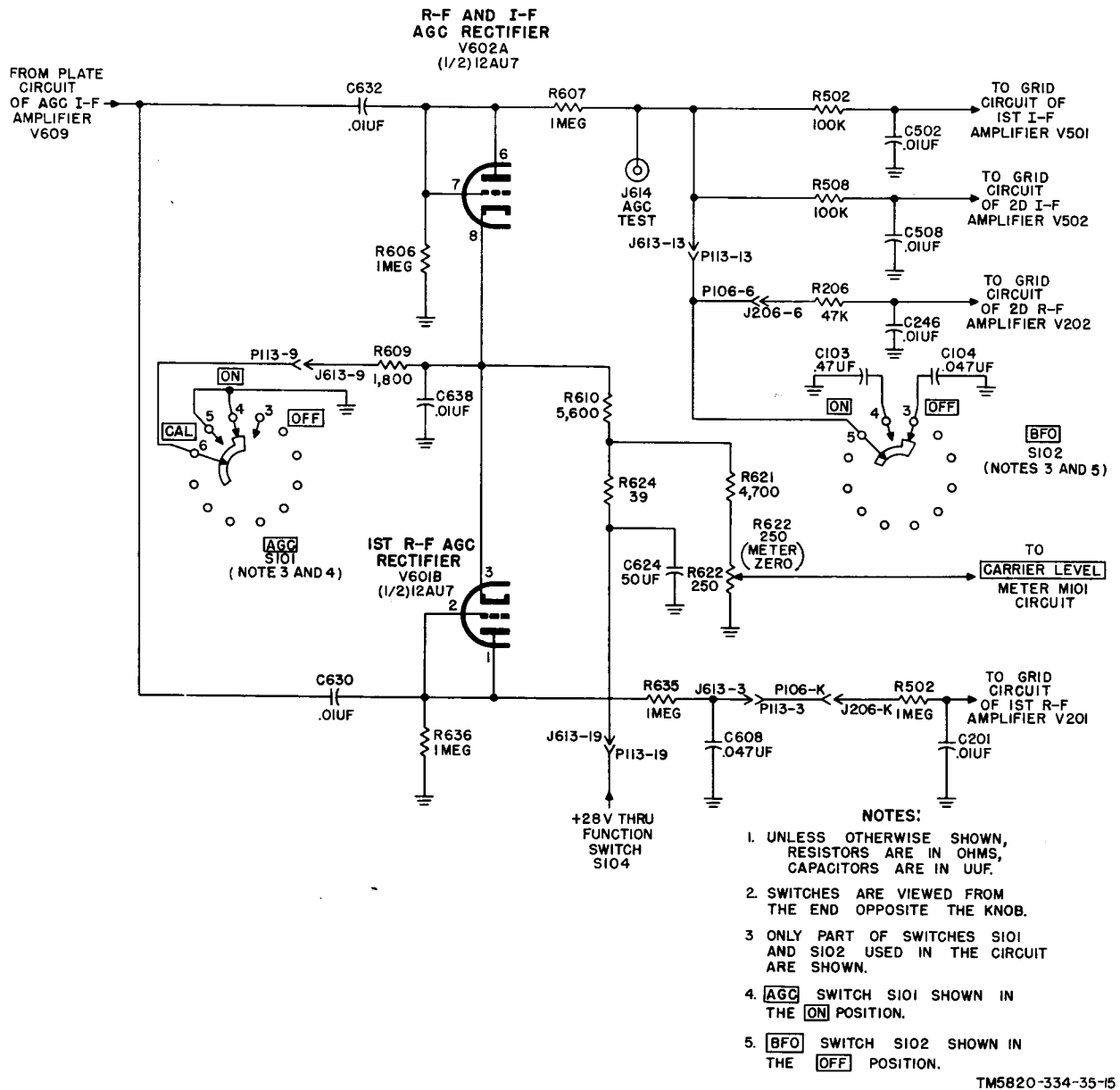


Figure 15. Agc rectifier circuits, simplified schematic diagram.

succeeding rf and if. amplifiers through a common agc system. The 455-kc output of V609 is coupled through capacitor C630 to the plate of diode-connected V601B. The plate and the grid of V601B are joined and returned to ground through resistor R636. The rectified pulsating negative dc voltage developed across R636 is filtered by resistor R635 and capacitor C608. The agc voltage is applied through J613-3, P113-3, P106-K, J206-K, and filter network R502

and C201, to the grid circuit of first rf amplifier V201. A +28-volt divider, R621 and R622, provides a meter zero voltage for CARRIER LEVEL meter M101.

21. CARRIER LEVEL Meter Circuit (fig. 16)

CARRIER LEVEL meter M101 indicates the relative signal strength in decibels (db) above the agc threshold (delay) voltage. It

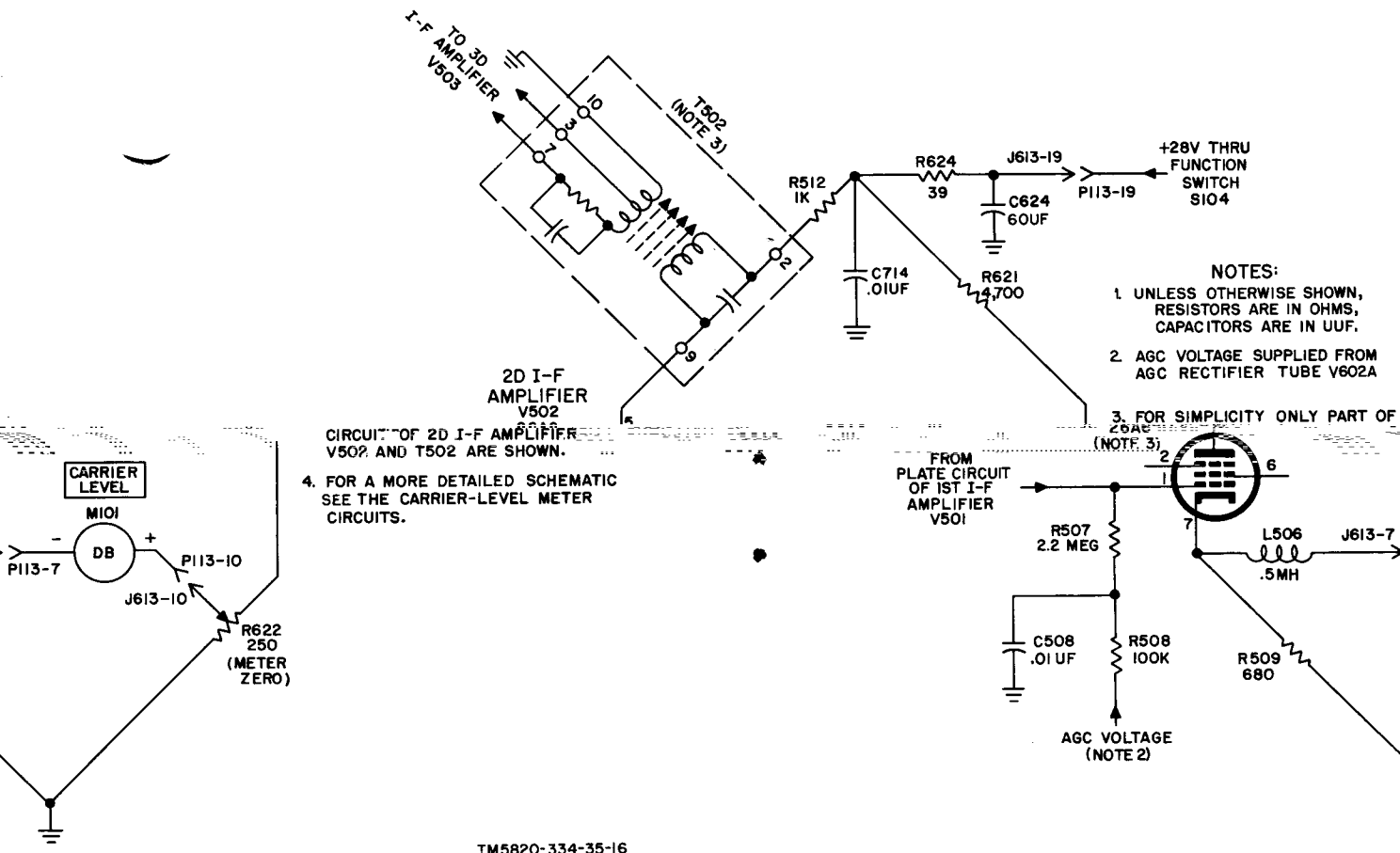
is an aid in tuning, calibration, and alignment procedures. The CARRIER LEVEL meter circuit is a part of the second i-f. amplifier circuit (para 14).

and part of R622 are the upper arms, and cathode resistor R509 and part of potentiometer R622 are the lower arms. The negative terminal of the meter is connected to

a. Cathode bias for second i-f. amplifier V502 is developed across resistor R509. The +28 volts is applied to the plate of V502 through function switch S104, P113-19, J613-19, decoupling resistors R624 and R512, and the primary of T502. The +28 volts is also applied from the junction of R624 and R512 to voltage-divider network R621 and R622.

b. CARRIER LEVEL meter M101 is connected from the junction of the cathode of V502 and resistor R509 to the arm of meter zero potentiometer R622. The circuit arrangement is a bridge; the dc plate-to-cathode resistance of V502, resistor R621,

the top of R509 through P113-7, J613-7 and L506 (L506 prevents rf voltage from entering the meter circuit). The positive meter terminal connects through P113-10 and J613-10 to the arm of meter zero potentiometer R622. The meter zero potentiometer is adjusted so that the voltage between the arm of R622 and ground equals the voltage across R509 with no signal at the receiver input. The bridge is balanced in the absence of an agc voltage and the CARRIER LEVEL meter indicates zero. When an agc voltage is developed, a negative voltage is applied to the control grid of V502 through decoupling resistors



meter circuit, simplified schematic diagram.

Figure 16. CARRIER LEVEL m

R508, and through grid resistor R507. The amplitude of the agc voltage is dependent on the signal level. The greater the signal level, the larger the agc voltage developed. This additional bias voltage reduces plate

current. As the agc voltage is increased, the resistance of V502 is increased. The lower plate current decreases the voltage across R509, and a voltage is produced across the CARRIER LEVEL meter terminals. The meter indication represents the relative level of a received signal. The CARRIER LEVEL meter gives a true indication only when the AGC switch is at ON or CAL.

22. If. Cathode Follower V601A (fig. 17)

If. cathode follower V601A uses one triode of a miniature dual-triode tube type 12AU7. It couples the 455-kc if. signal from the high impedance plate circuit of agc if. amplifier V609 to a low impedance load. This stage is necessary for operating an R-392/URR with a frequency-shift radioteletypewriter converter.

a. The cathode is connected through resistors R603 and R604 to ground. Resistor R604 is the cathode load resistor and resistor R603 develops the necessary cathode bias. The +28 volts is applied to the plate through function switch S104, decoupling resistor R624 (bypassed by C714), and through inductor L604. Inductor L604 provides a high impedance to if. signals, and capacitor C605 places the plate at ground potential for if. signals.

b. The signal developed across cathode

resistor R604 is coupled through capacitor C604, J611, and P111, to IF OUT receptacle J105.

b. A negative feedback circuit is the first af amplifier to reduce distortion in the amplifier. The feedback is fed from the secondary winding of output transformer T603, through resistor R629, J613-16, and P113-6 to AF GAIN control R103; the feedback voltage is developed across R103. Resistor R642 and capacitor C637 form an rf filter network which removes rf from the V606 grid circuit; rf might be induced in the audio coupling lines by a nearby transmitter.

c. Contact bias is developed across R623. Capacitor C621 prevents the bias from being shunted through the low resistance of resistor R642 in series with the arm and lower part of potentiometer R103. The cathode and suppressor grids are connected to ground. The +28 volts applied to the screen grid (pin 6) through function switch S104, P113-19, J613-16, and voltage-dropping resistor R625, which is bypassed by capacitor C622. The plate (pin 5) circuit is completed through resistor R626. Capacitor C624 filters plate and screen returns. Resistor R604 is coupled through C604, J611, and P111, to IF OUT receptacle J105.

24. Phase Inverter V607 (fig. 19)

Phase inverter V607 uses a type 6AJ5, miniature pentode tube, connected as a triode. Two signal voltages of equal amplitude, but 180° out of phase, are developed for application to the control grids of second af amplifier V607.

a. The audio signal from first af amplifier V606 is coupled by capacitor C623 to the grid of the phase inverter. The signal across capacitor C610 at the plate is developed across plate-load resistor R630 and is coupled by capacitor

23. First Af Amplifier V606 (fig. 18)

The first af amplifier is a resistance-coupled amplifier that uses a type 6AJ5 miniature pentode tube to amplify the audio signals from the noise limiter. The amplified audio signals are fed to phase inverter V607. The audio signal from phase inverter V603B is coupled by capacitor C610 through J613-8 and P113-8

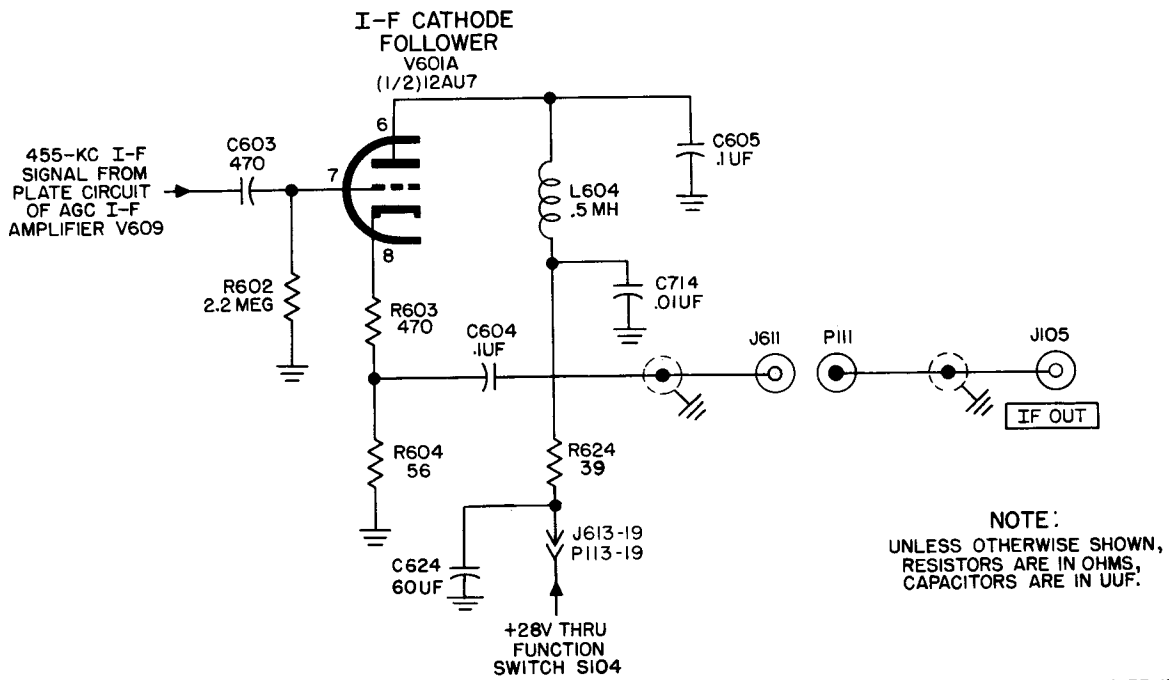


Figure 17. If. cathode follower V601A, simplified schematic diagram.

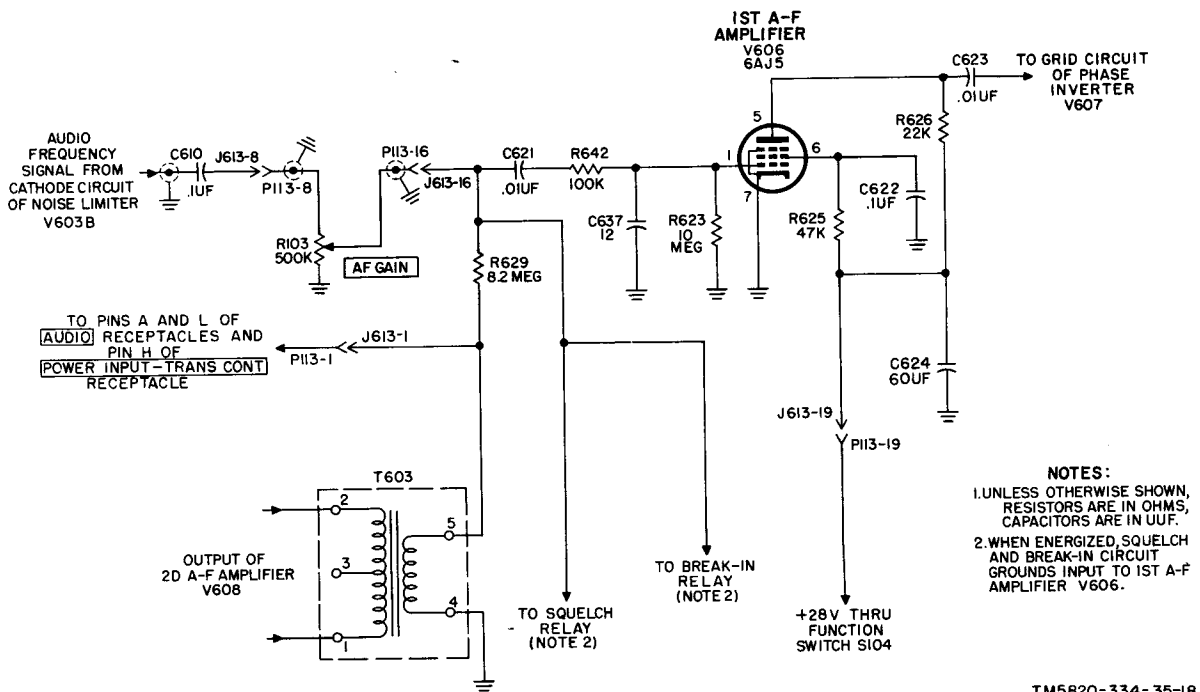


Figure 18. First of amplifier V606, simplified schematic diagram.

C626 to the control grid (pin 1) of second af amplifier V608A. An audio signal is also developed across cathode load resistor R628. This signal is equal in amplitude to the plate signal, but 180° out of phase. The cathode signal is coupled by capacitor C627 to a control grid (pin 3) of second af amplifier V608B.

b. Grid bias is developed across resistor R624. The +28 volts is applied through function switch S104, P113-19, J613-19, and plate load resistor R630 to the screen grid (pin 6) and plate (pin 5).

resistor R629 is connected directly from the cathode to the grid to accommodate signals of higher amplitude on the without the effects of cutoff limiting. amplification of the tube is slightly an one.

a push-pull amplifier. The af power output is applied to a 600-ohm headset or a loudspeaker.

a. The audio signal from phase inverter V607 is coupled to the control grids of V608 through capacitors C626 and C627. The audio voltage developed across R631 is of equal amplitude but 180° out of phase with the audio voltage developed across R632. The output from V608 is transformer-coupled to a headset or loudspeaker by transformer T603. The primary of T603 is shunted by capacitor C628, which reduces

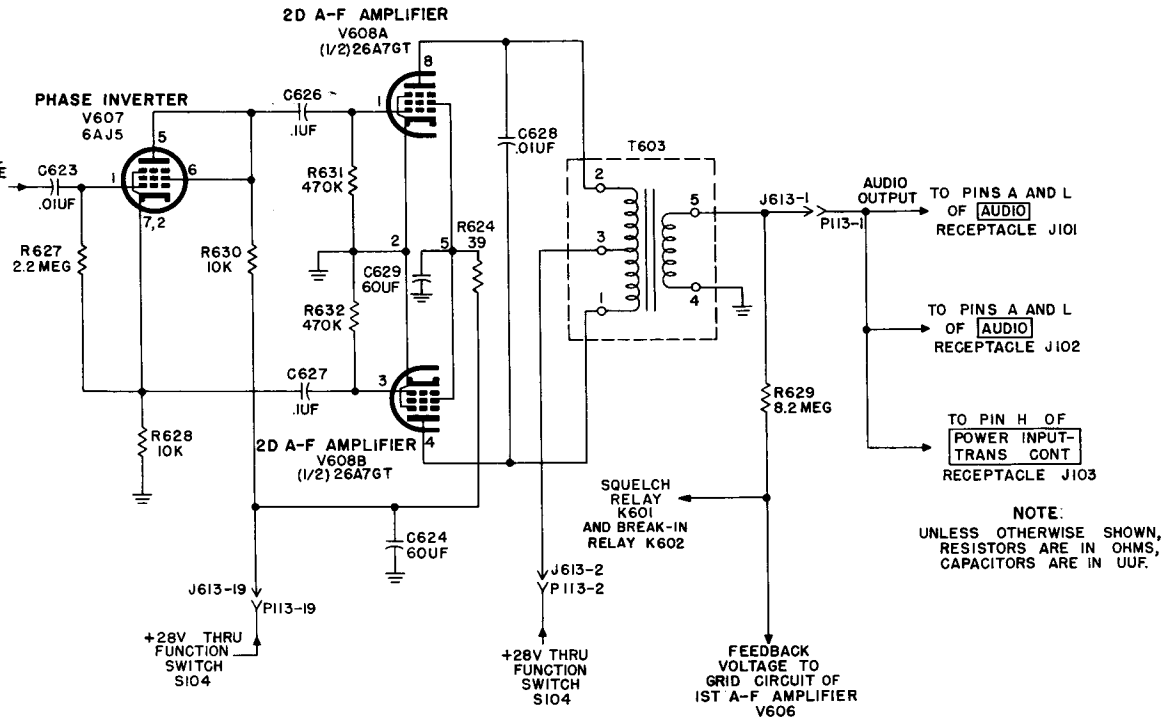
frequency response of the stage at the higher audio frequencies. The audio output from the secondary winding is applied through J613-1 and P113-1 to pins A and L of AUDIO receptacles J101 and J102; and to pin H of POWER INPUT-TRANS CONT receptacle J103. Part of the audio signal is used as negative feedback through resistor R629 to the grid circuit of first af amplifier V606.

b. Grid bias is developed over resistors R631 and R632. The +28 volts is

Second Af Amplifier V608
(fig. 19)

Second af amplifier V608 uses a type 2A7 dual-pentode tube, connected as

25. Sec
(
Seco
26A7G



A-F SIGNAL FROM PLAT CIRCUIT OF 1ST A-F AMPLIFIER V606

TO PINS A AND L OF AUDIO RECEPTACLE J101
TO PINS A AND L OF AUDIO RECEPTACLE J102
TO PIN H OF POWER INPUT-TRANS CONT RECEPTACLE J103

NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF.

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19. Phase inverter V607 and second audiofrequency amplifier V608, simplified schematic diagram.

Figure

applied to the screen grids through function switch S104, P113-19, J613-19, and resistor R624. The +28 volts is fed to the center tap (terminal 3) of the primary winding of T603 for application to the plates through function switch S104, P113-2, and J613-2.

26. Audio Module (fig. 20)

Note. An audio module is used in place of V608 in certain receivers. The theory in this paragraph applies to receivers using an audio module.

The audio module is a transistorized plug-in unit designed to directly replace second af amplifier tube V608. The maximum audio output of the audio module is 1 watt with less than 7.5 percent distortion when operated with a 28-volt dc supply voltage.

a. When an audio module is used in place of V608, V607 acts as a cathode follower. The output signal taken across cathode resistor R628 is coupled by capacitor C627 to the base of transistor Q601 of the audio module.

b. Emitter follower Q601 matches the impedance between V607 and amplifier Q602. The audio input signal is coupled from the cathode of cathode follower V607, through pin 3 of the socket to the base of Q601. The +28 volts is applied to the collector of Q601 from pin 5 of the module socket. Resistors R643 and R644 make up a divider which provides the proper base bias for Q601. Resistor R645 is the load resistor for Q601. The output of Q601 is applied to the base of Q602. The audio output of Q602 is transformer coupled by T604 to the bases of the push-pull power output stage which consists of transistors Q603 and Q604. Capacitor C638 reduces the higher frequency response of T604.

c. The +28 volts is applied from pin 6 of the audio module socket through the primary of T605 to the collectors of Q603 and Q604. Resistors R647 and R648 establish the proper base bias. Resistors R650 and R651 are in the emitter circuits to compensate for temperature variations. Resistor R649 provides a negative feedback current to Q602 for improved amplifier

gain stability and frequency response. The output signal from the collectors of Q603 and Q604 is transformer coupled through transformer T605 and applied directly through pin connections 4 and 8 of the audio module base to the primary winding of transformer T603.

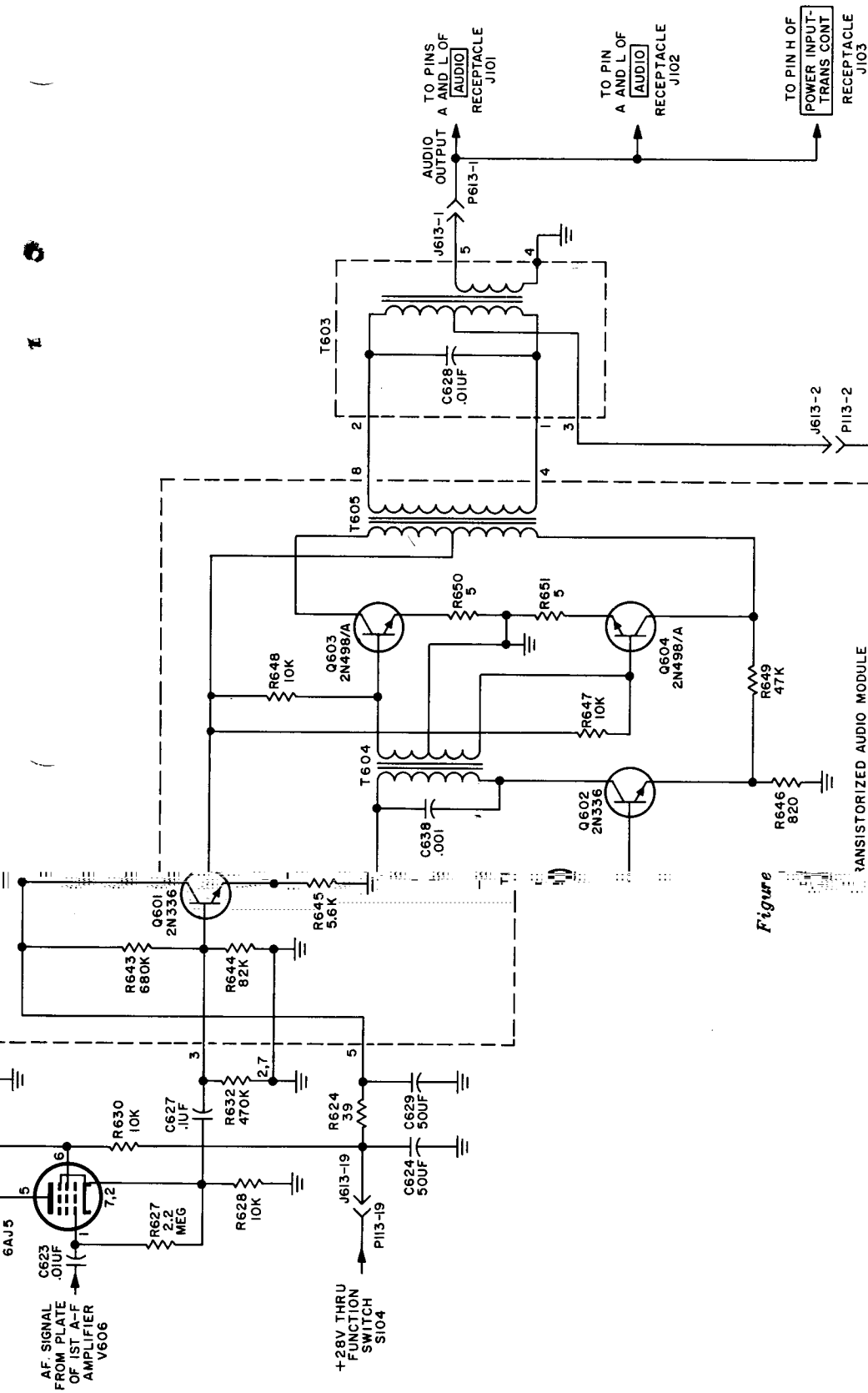
27. Squelch Circuit (fig. 21)

The squelch circuit is operative when function switch S104 is in the SQ position. In the absence of a carrier, or when a weak incoming signal carrier is received, squelch relay K601 is energized, grounding the input of first af amplifier V606. When the carrier is sufficiently strong, the squelch relay becomes deenergized, and the ground is removed from the input to first af amplifier V606. The squelch circuit uses squelch rectifier V602B and squelch control V605.

a. *Squelch Rectifier V602B.* Squelch rectifier V602B rectifies the 455-kc if. signal from agc if. amplifier V609 and develops a negative bias which controls the operation of squelch control V605. Squelch rectifier V602B is connected as a diode rectifier. The plate and control grid of V602B are connected together and the cathode is connected to ground. The if. signal from agc if. amplifier V609 is coupled by capacitor C619 to the plate of diode-connected V602B. Resistor R616 and capacitor C620 form a filter which removes rf and audio components from the rectified voltage. The filtered dc voltage developed across resistor R616 is applied to the grid of squelch control V605 as a negative bias voltage.

b. *Squelch Control V605.* Squelch control V605 activates squelch relay K601 under no signal or low signal conditions (dependent on the setting of RF GAIN SQUELCH THRESH control R105 (fig. 9)).

(1) A more negative voltage than the threshold voltage across R619 reduces the plate current of V605 and relay K601 is deenergized. A less negative voltage than the threshold voltage increases the current of V605, and relay K601 is energized.

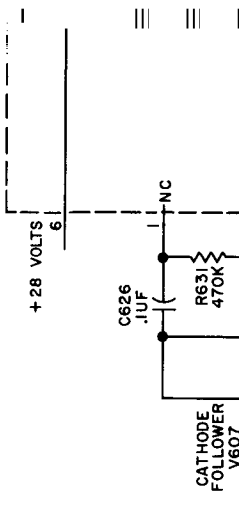


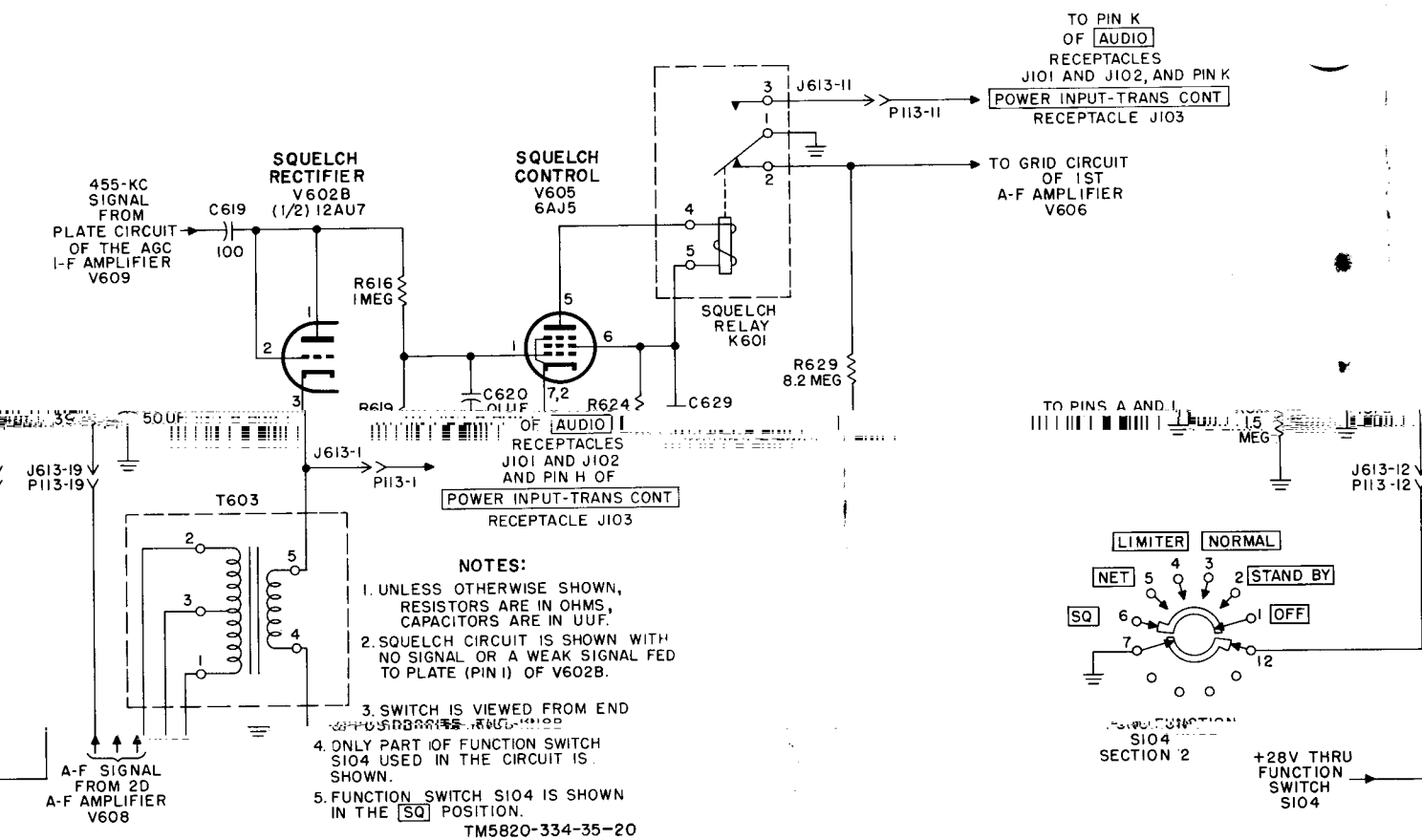
Figure

- NOTES
1. UNLESS OTHERWISE INDICATED, ALL RESISTANCES ARE IN OHMS
 2. INDICATES EQUIPMENT MARKINGS

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20. Audio module, schematic diagram.





uit, simplified schematic diagram.

Figure 21. Squelch circ

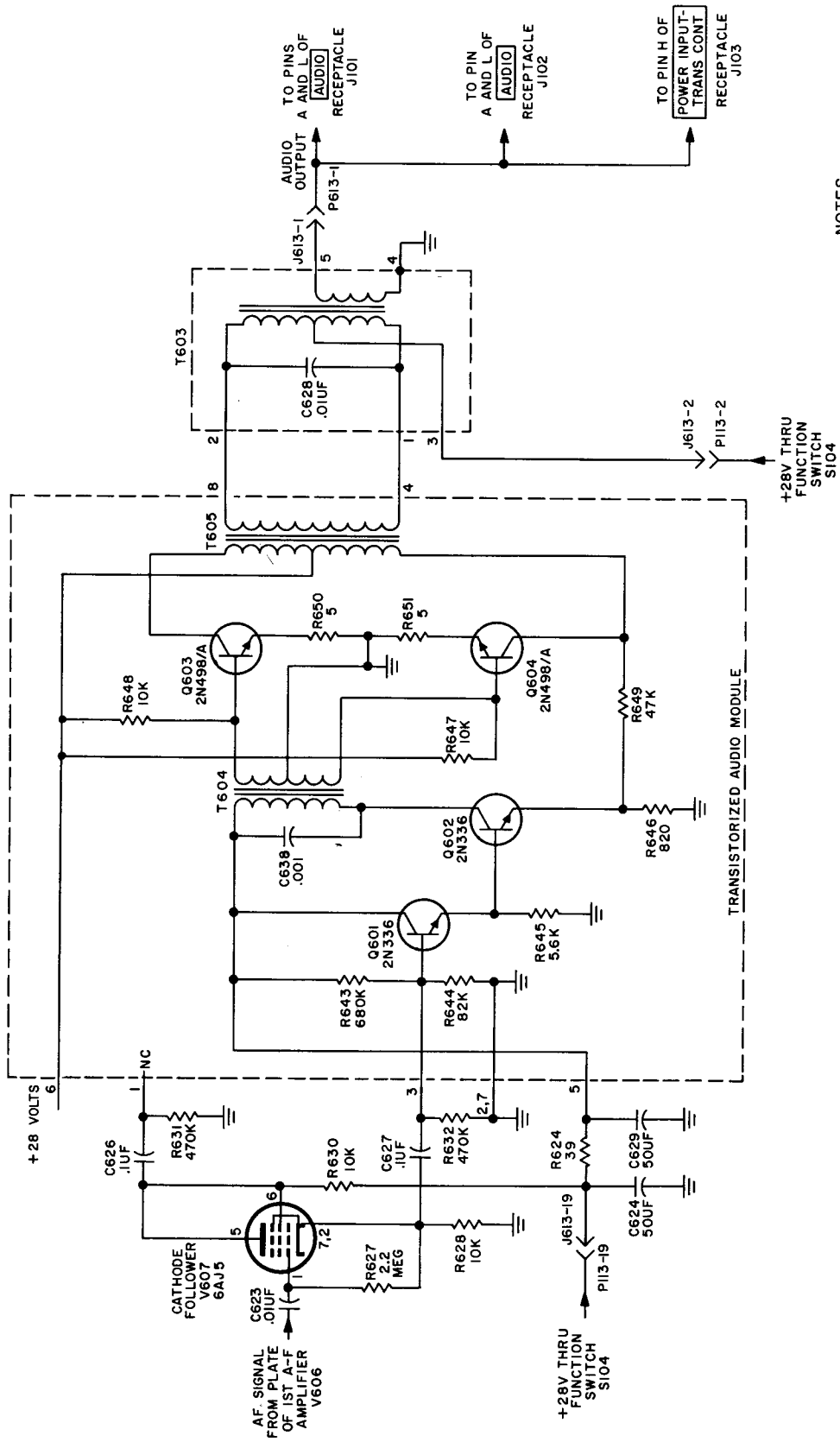
through the grid line of K601 to the plate.

(3) Capacitor C629 bypasses the screen grid and plate return. When V605 conducts, squelch relay K601 is energized, closing contacts 1 and 2 and grounding the input of first af amplifier V606. When K601 is deenergized, contacts 1 and 2 open and ground is removed from the input of first af amplifier V606.

(4) The carrier-relay (retransmission) circuit in the associated transmitter is controlled by K601. When an adequate signal is received, K601 is deenergized, contact 1 and contact 3 close, and the carrier-relay circuit of the transmitter is grounded through J613-11, P113-11, and pin K of POWER INPUT-TRANS CONT receptacle

The amplitude of the signal applied to V605 is controlled by setting the RF GAIN THRESH control. Turning the RF GAIN THRESH control counter-clockwise (lower gain setting) is to require a larger signal at the antenna to exceed the necessary threshold voltage.

(2) The cathode of V605 is connected to ground through J613-12, and the contacts of function switch S104, section 2, when the function switch is set to SQ. Grid bias is developed by the rectified signal across resistor R619. The +28 volts is applied to the grid through function switch S104, section 2, J613-19, and decoupling resistor R624, to the screen



- NOTES
1. UNLESS OTHERWISE INDICATED, ALL RESISTANCES ARE IN OHMS
 2. INDICATES EQUIPMENT MARKINGS

TM5620-334-35-80

Figure 20. Audio module, schematic diagram.

J103 or pin K of AUDIO receptacles
J101 and J102.

28. Calibration Oscillator Circuit

(fig. 22, 23, and 24)

The function of the calibration oscillator circuit is to provide standard frequencies, in 100-kc steps, in the range of 0.5 to 32 mc. When the AGC switch is at CAL, the cathode circuits in the calibration oscillator are completed to ground through AGC switch S101. The calibration oscillator circuit consists of 200-kc crystal oscillator V702, multivibrator V701, harmonic amplifier V703A, and distorter V703B.

29. Crystal Oscillator V702, 200-Kc (fig. 22)

The 200-kc crystal oscillator uses a type 26A6 miniature pentode tube, connected as an electron-coupled Pierce oscillator. The oscillator furnishes a 200-kc signal to synchronize multivibrator V701.

a. The screen grid acts as the anode of the Pierce oscillator circuit. Crystal Y701, connected between the control grid and the anode, takes the place of the conventional tuned circuit. Capacitor C708 blocks dc voltage from the crystal and couples rf from the oscillator anode to the crystal. Capacitor C709 is effectively in

decoupling resistor R624, and resistor R704, to the plate (pin 6) of V701B, and through resistor R703 to the plate (pin 1)

capacitor C706 also permits frequency adjustment of the 200-kc crystal oscillator. Electron coupling to the plate of V702 minimizes instability caused by variations in plate load. Capacitor C711

couple the output of V702 to the grid circuit of harmonic amplifier V703A; the input signal to V703A is developed across a self-tuned circuit, consisting of inductor L701 and the inductor distributed capacitance and input capacitance of V703A. V702 output signal is also coupled by capacitor C704 to the grid circuit of multivibrator V701.

Tube V702 is grid-leak biased by the voltage across resistor R706. The screen grid and cathode are connected through J613-4, P113-4, and the contacts

of AGC switch S101 to ground when the AGC switch is at CAL. The +28 volts for the screen grid is applied through function switch S104, P113-19, J613-19, decoupling resistor R624 (bypassed by capacitor C714), and through resistor R707. The plate circuit is completed through plate-load resistor R708 from the junction of resistors R707 and R624. The cathodes of the remaining tubes in the calibration oscillator circuit (V703A, 703B, and V701) are connected to the cathode of V702. Capacitors C710 and C715 prevent rf currents from entering the front panel through the lead to AGC switch S101.

30. Multivibrator V701 (fig. 23)

The signal from 200-kc crystal oscillator V702 is used to synchronize multivibrator V701 at 100 kc. The nearly square wave output of multivibrator V701 is composed of a large number of harmonics.

a. The cathodes of V701 are returned to ground through J613-4, P113-4, and the contacts of AGC switch S101, when the AGC switch is at CAL. Grid bias is developed across resistors R701 and R702 for V701A, and across resistors R705 and R702 for V701B. The +28 volts is applied through function switch S104, P113-19, J613-19, series with adjustable capacitor C706 to provide the proper amount of feedback voltage to the grid to sustain oscillations.

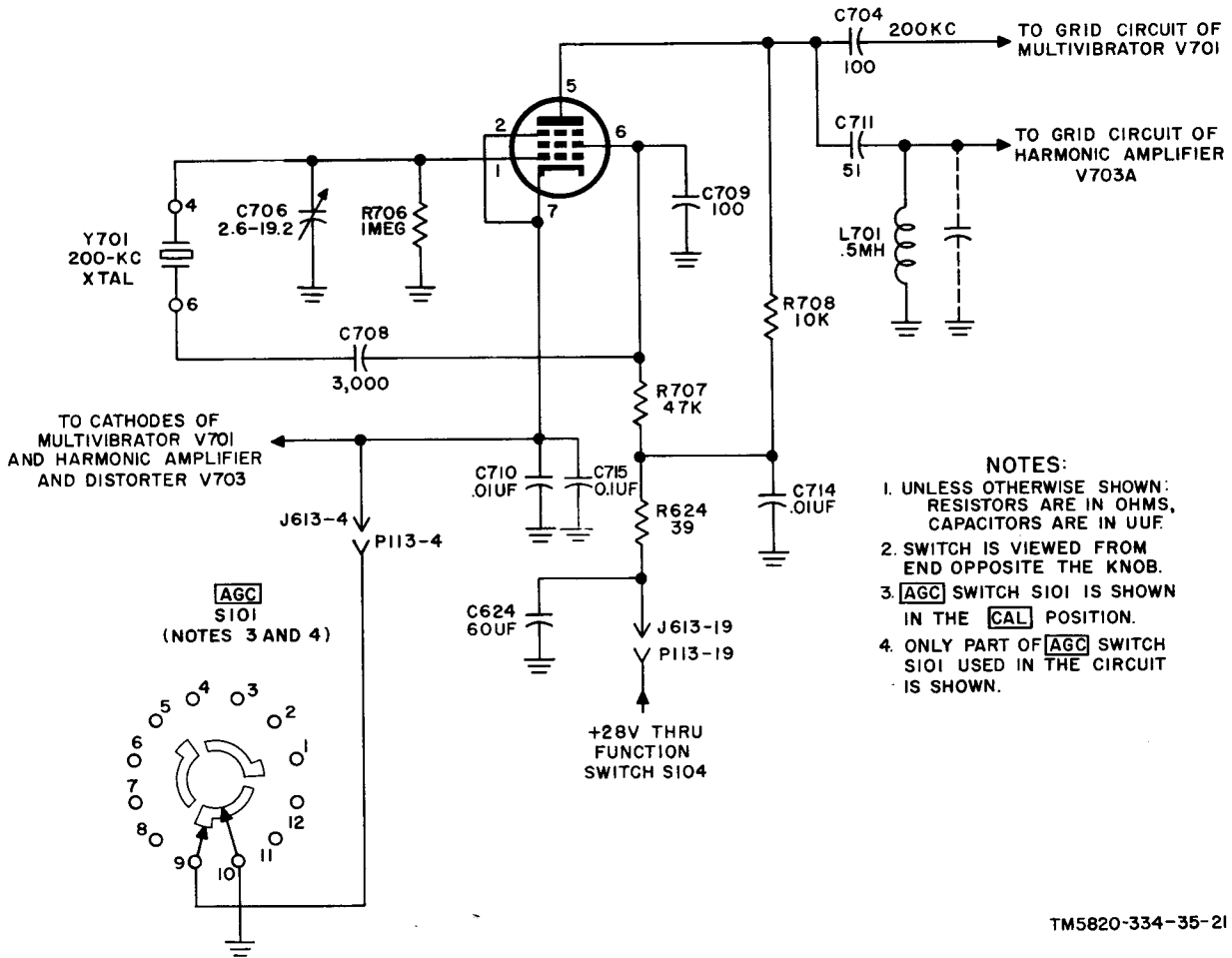
of V701A. Capacitors C710 and C715 bypass grid voltages to ground (para 29).

b. The signal from 200-kc crystal oscillator V702 is coupled by capacitor C704 to multivibrator V701. Multivibrator V701 is a free-running relaxation-type oscillator, which uses a type 12AU7 miniature dual-triode tube. Oscillations are sustained by

feedback from the plate of one tube section to the grid of the other tube section. The free-running frequency is determined by the time constants of the combination of resistors R701, R702, and R705, capacitors C701 and C702. The 200-kc signal from 200-kc crystal oscillator V702 is developed across resistor R702. This voltage synchronizes the multivibrator precisely at 100 kc. The V701 output signal is applied

200-KC XTAL OSCILLATOR

V702
26A6



- NOTES:
1. UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF.
 2. SWITCH IS VIEWED FROM END OPPOSITE THE KNOB.
 3. **AGC** SWITCH S101 IS SHOWN IN THE **CAL** POSITION.
 4. ONLY PART OF **AGC** SWITCH S101 USED IN THE CIRCUIT IS SHOWN.

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Figure 22. 200-kc crystal oscillator, simplified schematic diagram.

through capacitor C703 to the grid circuit of harmonic amplifier V703A.

31. Harmonic Amplifier V703A (fig. 24)

Harmonic amplifier V703A uses a triode section of a type 12AU7 miniature dual-triode tube. Signals from two sources are combined in the V703A grid circuit. The composite signal is amplified and the signal peaks are clipped to increase the harmonic output.

a. The cathode (pin 3) is returned to ground through J613-4, P113-4, and the contacts of AGC switch S101, when the AGC switch is set to CAL. Capacitors C710 and C715 bypass rf voltages to ground. The grid circuit is completed to ground through in-

ductor L701. The +28 volts is applied through function switch S104, P113-19, J613-19, decoupling resistor R624, and plate-load resistor R709 to the plate (pin 1) of V703A.

b. The 100-kc square wave signal from multivibrator V701 is coupled through capacitor C703 and the 200-kc sine wave signal from 200-kc crystal oscillator V702 is coupled through capacitor C711 to the control grid of V703A. These signals combine to form a complex wave which is rich in harmonics. Inductor L701, inductor distributed capacitance, and the input capacitance to V703A tune the grid circuit broadly to approximately 1,000 kc. The amplified signals developed across R709 are coupled through capacitor C712 to the control grid of distorter V703B.

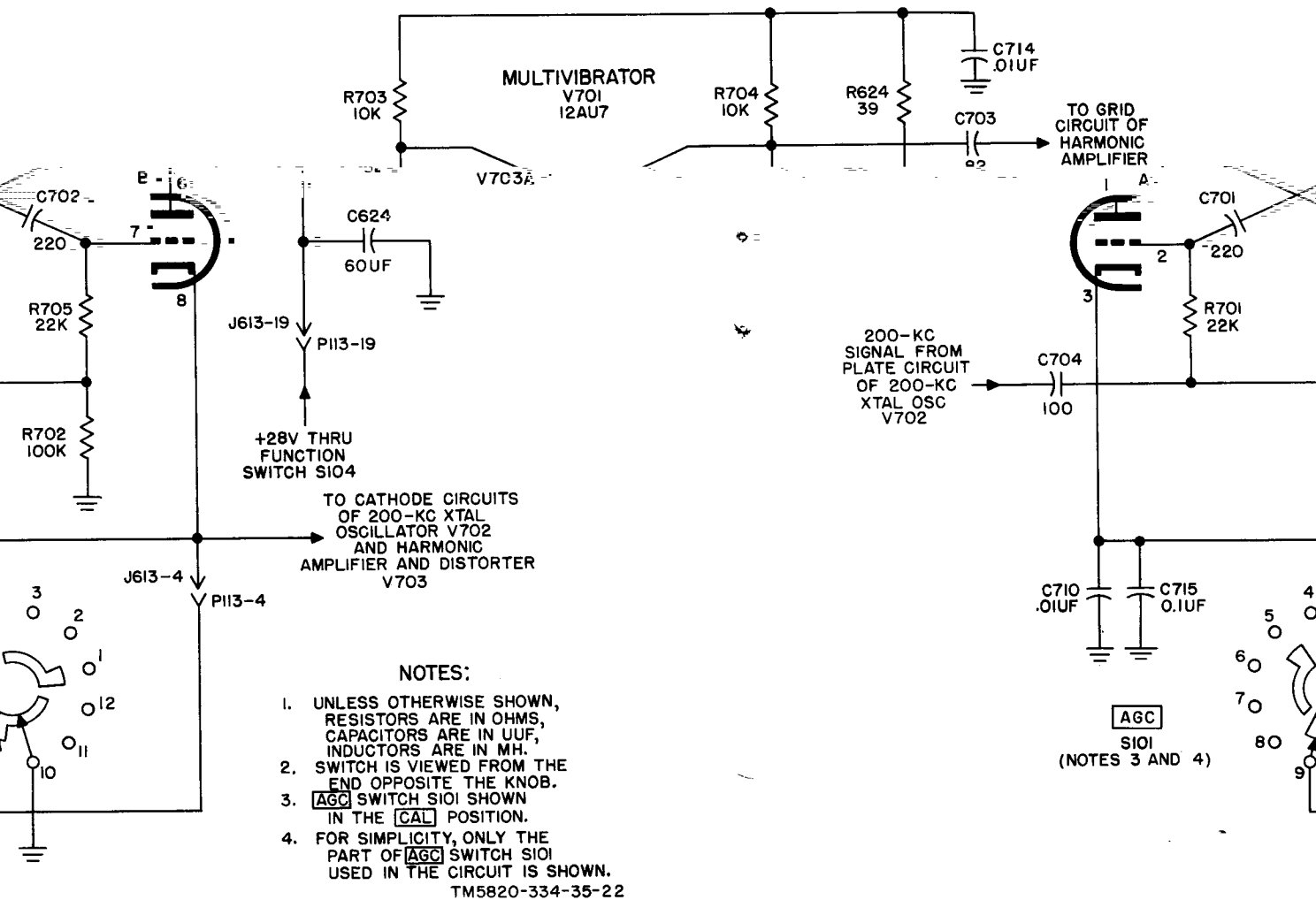


Figure 23. Multivibrator V701, simplified schematic diagram.

Figure 23. Multivibrator V701, simplified schematic diagram.

b. The signal from harmonic amplifier V703A is coupled by capacitor C712 to the grid of V703B. Distortion of the input signal results from grid limiting and plate current cutoff. The output signal of V703B is developed across plate load resistor R710 and coupled to inductor L702 through capacitor C713. Inductor L702, shunted by wiring, distributed, and tube capacitances, increases harmonics in the range of 27 to 28 mc. The signal is then coupled through the floor-plate contact to the grid circuit of first rf amplifier V201. This signal provides for calibration at all 100-kc points of the receiver.

32. Distorter V703B (fig. 24)

Distorter V703B uses a triode section of a type 12AU7 miniature dual-triode tube. Distorter V703B distorts the output of harmonic amplifier V703A. The operation of distorter V703B is similar to the operation of harmonic amplifier V703A.

a. The cathode of distorter V703B is connected to the V703A cathode. The grid is connected to ground through resistor R711. The +28 volts is applied to the plate through R624 and plate load resistor R710 throughout the range of the receiver.

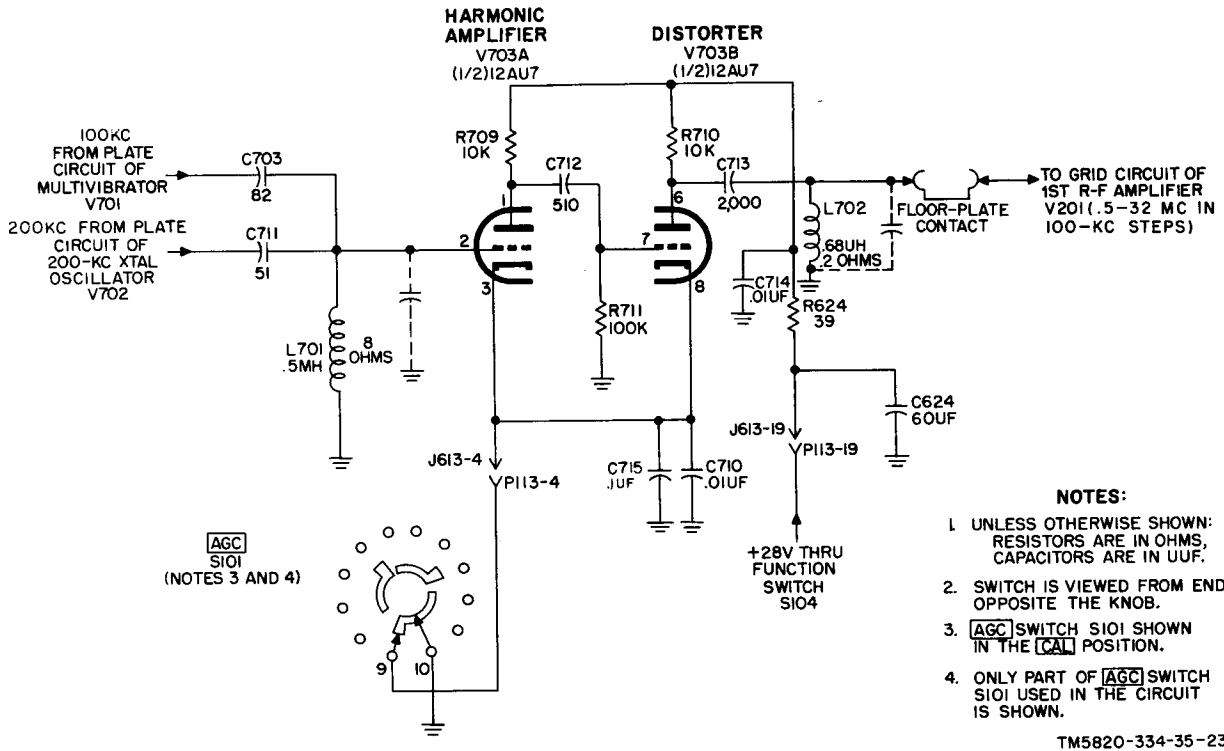


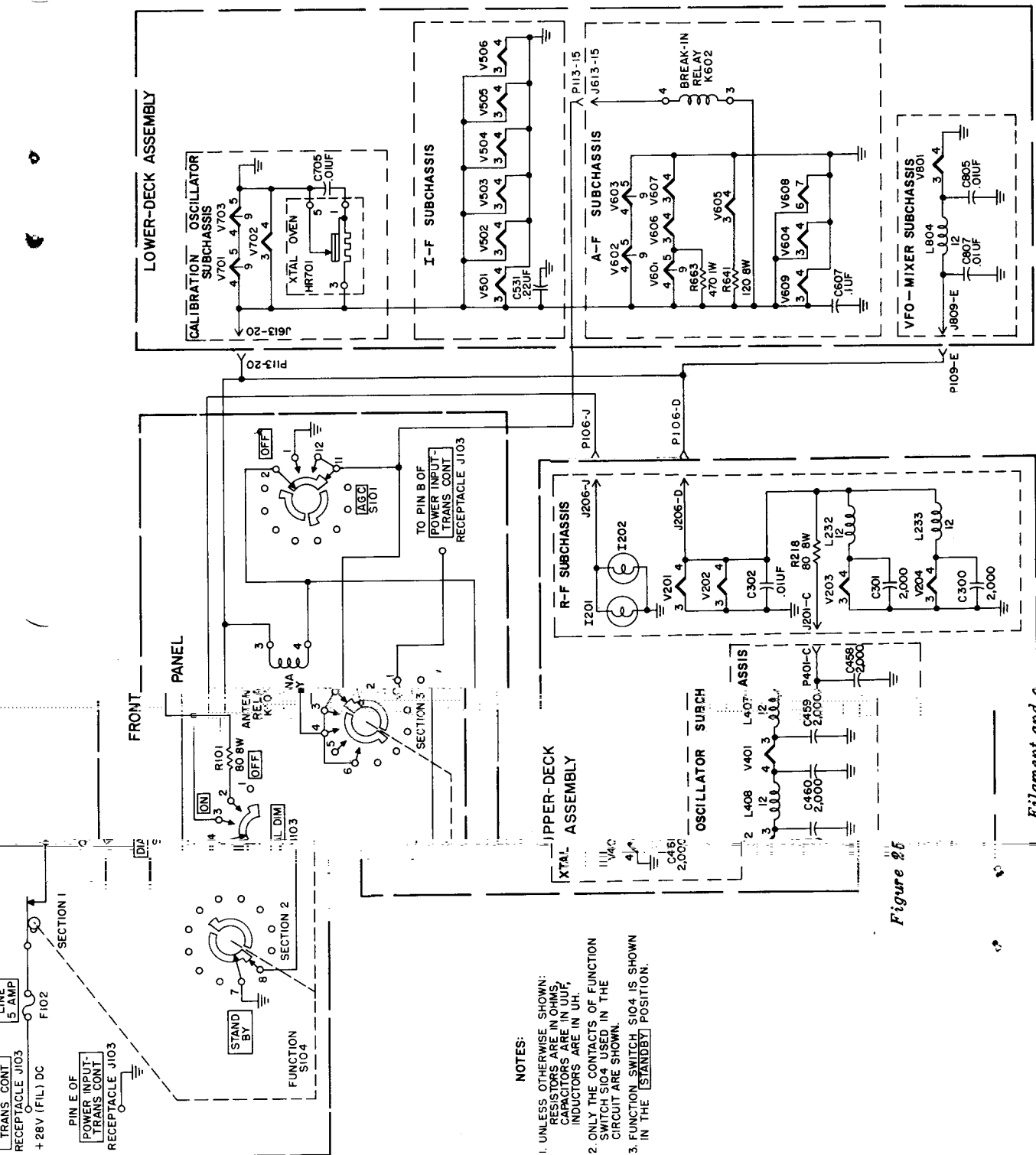
Figure 24. Harmonic amplifier V703A and distorter V703B, simplified schematic diagram.

33. Filament and Oven-Heater Circuits (fig. 25)

The external power source (28 volts dc) is applied between pins D and E (ground) of ROWEE INPUT-TRANS. CONT receptacle J103. Nominal filament voltages of 6.3, 12.6, and 25.2 volts are required for the tubes in the receiver. Dial lamps I201, I202, and the filaments which require nominal 25.2 volts are parallel-connected with the source voltage. The filaments which require 6.3 or 12.6 volts are connected in series circuits. Capacitor-inductor filter combinations are used to prevent interstage coupling of high-frequency signals through the filament circuits. These filters are C302, L232-C301, L233-C300, C458-L407-C459, C460-L408-C461, C531, C607, and C807-L804-C805. Resistor R641 reduces the voltage across the filament of V605 to 6.3 volts. Resistor R633 is a filament shunt for V601. Crystal oven HR701

stabilizes the 200-kc crystal oscillator in the calibration-oscillator subchassis. The oven temperature is controlled by a thermostatic switch. Capacitor C705 is connected across the thermostatic switch contacts to minimize interference caused by switch arcing. FUSE 5 AMP-102 protects the external power source from filament and oven-heater circuit shorts. When function switch S104 is set to OFF, filament voltage is disconnected. Filament voltage is connected in all other function switch positions. The dial lamps are fully lighted when DIAL DIM switch S103 is set to ON and are disconnected in the OFF position. At the intermediate switch position, resistor R101 is series-connected with the dial lamps and they light at reduced brilliance. Antenna relay K101 and break-in relay K602 are discussed in paragraph 35.

Note. A transistorized audio module is used in place of V608 in certain receivers.



- NOTES:
1. UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS. CAPACITORS ARE IN UUF. INDUCTORS ARE IN UH.
 2. ONLY THE CONTACTS OF FUNCTION SWITCH S104 USED IN THE CIRCUIT ARE SHOWN.
 3. FUNCTION SWITCH S104 IS SHOWN IN THE [STANDBY] POSITION.

Figure 26

Filament and

vacuum-tube receiver circuits, simplified schematic diagram.

34. Function Switch S104

(fig. 26)

a. Function switch S104 performs switching operations which affect the entire operation of the receiver. Each mode of operation and each stage is affected by the positions of the sections of this switch. A thorough understanding of the switch functions is essential to perform successful troubleshooting and maintenance.

b. The six positions of the function switch are shown in figure 26. To simplify the presentation, only those circuits which are closed by the switch contacts are identified for each position.

(1) *Section 1.* The +28 volts is applied to all filament circuits and antenna break-in relay K101 in all positions except OFF.

(2) *Sections 2 and 3.* The +28 volts is made available to the plate circuits of all stages of the receiver in all positions of sections 2 and 3 except OFF and STAND BY. At STAND BY, +28 volts is applied only to the

relay line is dis-

Voltage Distribution

source of 28 volts dc
A (+) and pin E (-)
ANS CONT recep-
switch S102 is set
applied to beat-
604. The operation
S104 is explained in
L101 and capacitor
line filter which de-
its (except V608) of
filament circuits;
cond af amplifier
rough J613-2 and
terminal of inductor

35. Control Circuits

(fig. 27)

When using Radio Receiver R-392/URR with an associated transmitter, such as Radio Transmitter T-195/GRC-19, it is necessary, under certain conditions, to disable receiver circuits during transmission to prevent damage and to silence the receiver. The 28-volt dc source voltage is applied from pin D of POWER INPUT-TRANS CONT receptacle J103 through section 1 of function switch S104 to antenna relay K101 and break-in relay K602. When function switch S104 is set to STAND BY, contacts 7 and 8 of section 2 ground ter-

terminal 4 of antenna relay K101 and terminal 4 of break-in relay K602 (through AGC switch S101). The relays are energized, and contacts 1 and 2 of K101 ground the antenna input and contacts 1 and 2 of K602 ground the input to first af amplifier V606. Function switch S104 is set to NORMAL, LIMITER, or SQ for break-in operation. In these switch positions, terminals 4 of K101 and K602 are connected through section 3 of S104 (contact 1 is connected to contact 2, 3, 4, or 6) to pin B of POWER INPUT-TRANS CONT receptacle J103. A ground, applied from the associated transmitter during transmission, energizes K602 and K101, short circuits the antenna input, and silences the receiver. Function switch S104 is set to SQ (contacts 6 and 1 and contacts 7 and 12 of section 3 are closed) for carrier-relay (retransmission) operation. The carrier-relay line is terminated at pin K of AUDIO receptacles J101 and J102 and pin K of POWER INPUT-TRANS CONT receptacle J103. When squelch relay K601 is energized (receiver squelched), contacts 1 and 3 of K601 are

gate circuits of the video mixer, the crystal oscillators, and the second af amplifier; antenna break-in relay K101 and break-in relay K602 are connected for break-in operation (para 35).

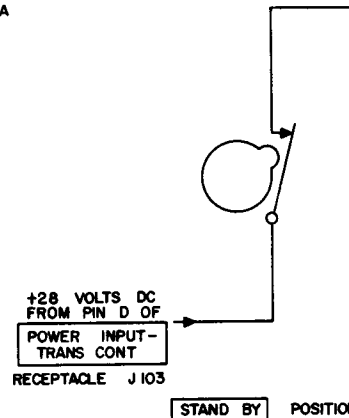
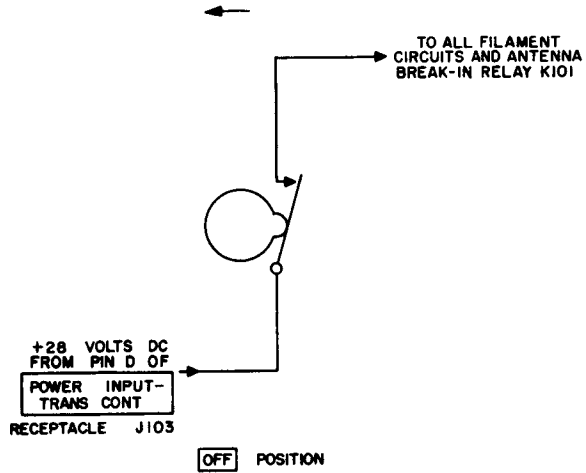
opened and the carrier is disabled.

36. Plate and Screen Voltages

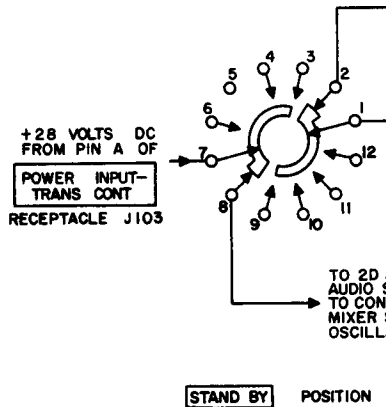
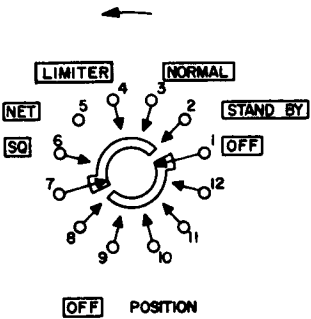
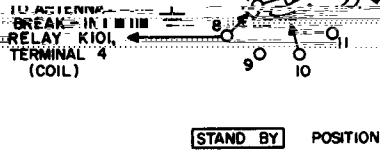
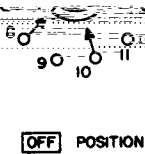
(fig. 28)

The external power source is applied between pin D of POWER INPUT-TRANS CONT receptacle J103. When BFC switch is set to ON, +28 volts is applied to frequency oscillator V604 and section 1 of function switch S104. Inductor L101 and capacitor C624 form a +28-volt line filter which couples the plate circuit of the receiver from the plate circuit of section 1 of V608 is connected through P113-2 to the input terminal of inductor L101.

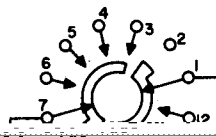
SECTION 1



SECTION 2



SECTION 3



FILAMENT
AND ANTENNA
RELAY K101

TO ALL FILAMENT
CIRCUITS AND ANTENNA
BREAK-IN RELAY K101

TO ALL FILAMENT
CIRCUITS AND ANTENNA
BREAK-IN RELAY K101

+28 VOLTS DC
FROM PIN D OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN D OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN D OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

STAND BY POSITION

NORMAL POSITION

LIMITER POSITION

TO ANTENNA
BREAK-IN
RELAY K101,
TERMINAL 4
(COIL)

+28 VOLTS DC THRU L101
FROM CONTACT 8, SECTION 3

+28 VOLTS DC THRU L101
FROM CONTACT 9, SECTION 3

STAND BY POSITION

NORMAL POSITION

LIMITER POSITION

+28 VOLTS DC
FROM PIN A OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

TO BREAK-IN RELAY
K602, TERMINAL 4
(COIL)

TO PIN B OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN A OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

TO BREAK-IN RELAY
K602, TERMINAL 4
(COIL)

TO PIN B OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN A OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

TO 2D A-F AMPLIFIER V608 ON THE
AUDIO SUBCHASSIS AND THRU L101
TO CONTACT 1 OF SECTION 2, VFO-
MIXER SUBCHASSIS AND CRYSTAL-
OSCILLATOR SUBCHASSIS

TO 2D A-F AMPLIFIER V608 ON THE
AUDIO SUBCHASSIS AND THRU L101
TO CONTACT 1 OF SECTION 2, VFO-
MIXER SUBCHASSIS AND CRYSTAL-
OSCILLATOR SUBCHASSIS

STAND BY POSITION

NORMAL POSITION

LIMITER POSITION

Figure 26. Function switch S104, schematic diagram.

TO ALL FILAMENT
CIRCUITS AND ANTENNA
BREAK-IN RELAY K101

TO ALL FILAMENT
CIRCUITS AND ANTENNA
BREAK-IN RELAY K101

TO ALL FILAMENT
CIRCUITS AND ANTENNA
BREAK-IN RELAY K101

POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN D OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN D OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

LIMITER POSITION

NET

TO R-F SUBCHASSIS, I-F
SUBCHASSIS, CALIBRATION-
OSCILLATOR SUBCHASSIS,
AND TO ALL CIRCUITS ON THE
AUDIO SUBCHASSIS EXCEPT 2D A-F
AMPLIFIER V608 PLATE

TO R-F SUBCHASSIS, I-F
SUBCHASSIS, CALIBRATION-
OSCILLATOR SUBCHASSIS,
AND TO ALL CIRCUITS ON THE
AUDIO SUBCHASSIS EXCEPT 2D A-F
AMPLIFIER V608 PLATE

TO R-F SUBCHASSIS, I-F
SUBCHASSIS, CALIBRATION-
OSCILLATOR SUBCHASSIS,
AND TO ALL CIRCUITS ON THE
AUDIO SUBCHASSIS EXCEPT 2D A-F
AMPLIFIER V608 PLATE

+28 VOLTS DC THRU L101
FROM CONTACT 11, SECTION 3

+28 VOLTS DC THRU L101
FROM CONTACT 9, SECTION 3

+28 VOLTS DC THRU L101
FROM CONTACT 10, SECTION 3

TO CATHODE CIRCUIT
OF NOISE LIMITER V608B

LIMITER POSITION

NET

TO BREAK-IN RELAY
K602, TERMINAL
(COIL)

BREAK-IN RELAY
K602, TERMINAL 4
(COIL)

TO BREAK-IN RELAY
K602, TERMINAL 4
(COIL)

+28 VOLTS DC
FROM PIN A OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN B OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN A OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

TO PIN B OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

+28 VOLTS DC
FROM PIN A OF
POWER INPUT-
TRANS CONT
RECEPTACLE J103

TO 2D A-F AMPLIFIER V608 ON THE
AUDIO SUBCHASSIS AND THRU L101
TO CONTACT 1 OF SECTION 2, VFO
MIXER SUBCHASSIS AND CRYSTAL
OSCILLATOR SUBCHASSIS

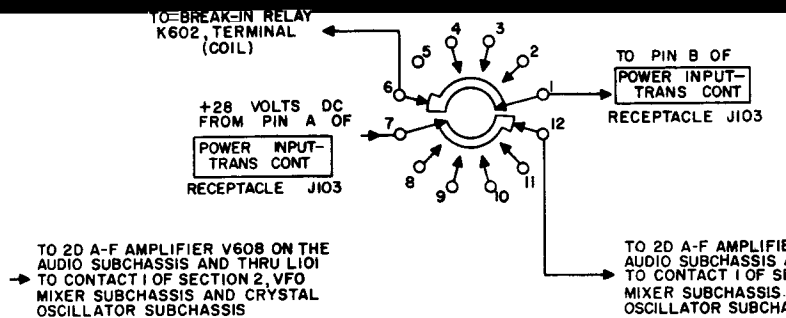
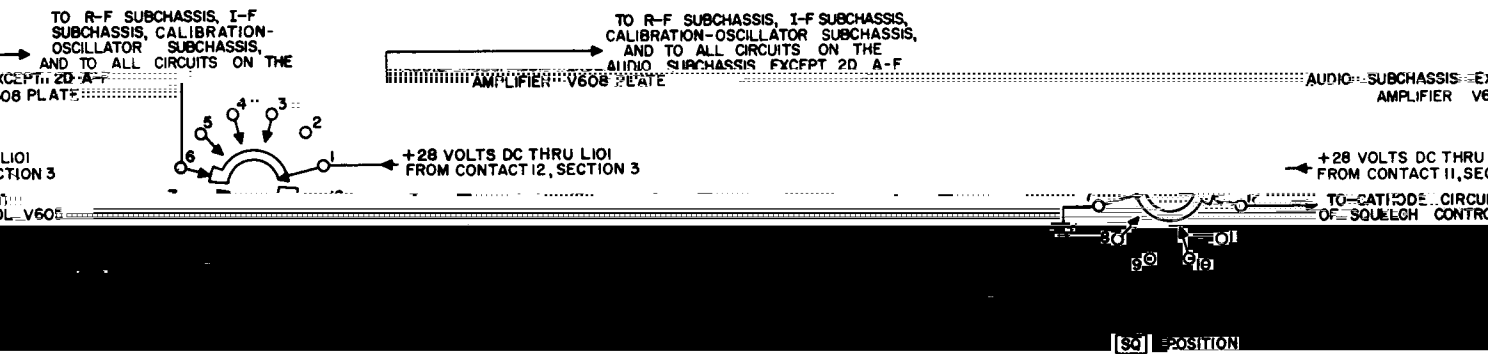
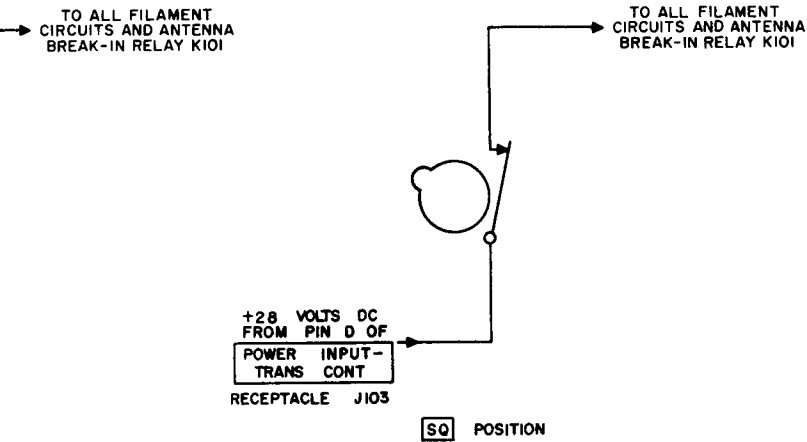
AMPLIFIER V608 ON THE
AUDIO SUBCHASSIS AND THRU L101
TO CONTACT 1 OF SECTION 2, VFO-
MIXER SUBCHASSIS AND CRYSTAL-
OSCILLATOR SUBCHASSIS

TO 2D A-F AMPLIFIER V608 ON THE
AUDIO SUBCHASSIS AND THRU L101
TO CONTACT 1 OF SECTION 2, VFO-
MIXER SUBCHASSIS AND CRYSTAL-
OSCILLATOR SUBCHASSIS

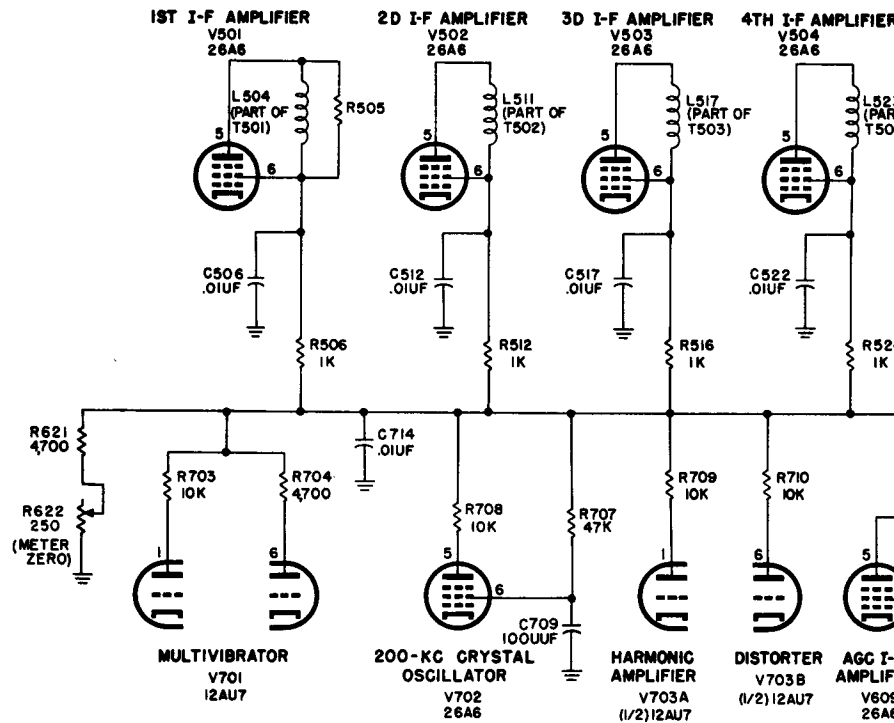
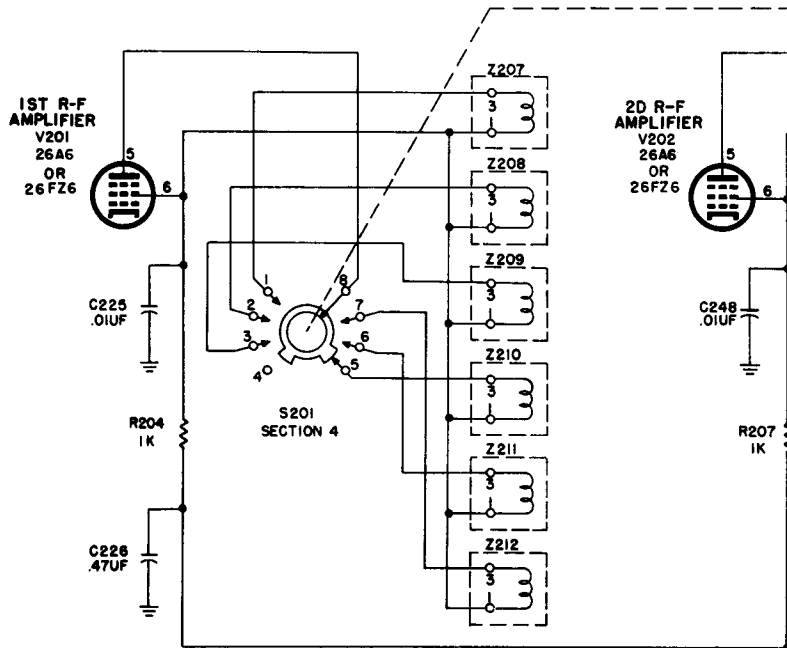
LIMITER POSITION

NET

tion switch S104, schematic diagram.



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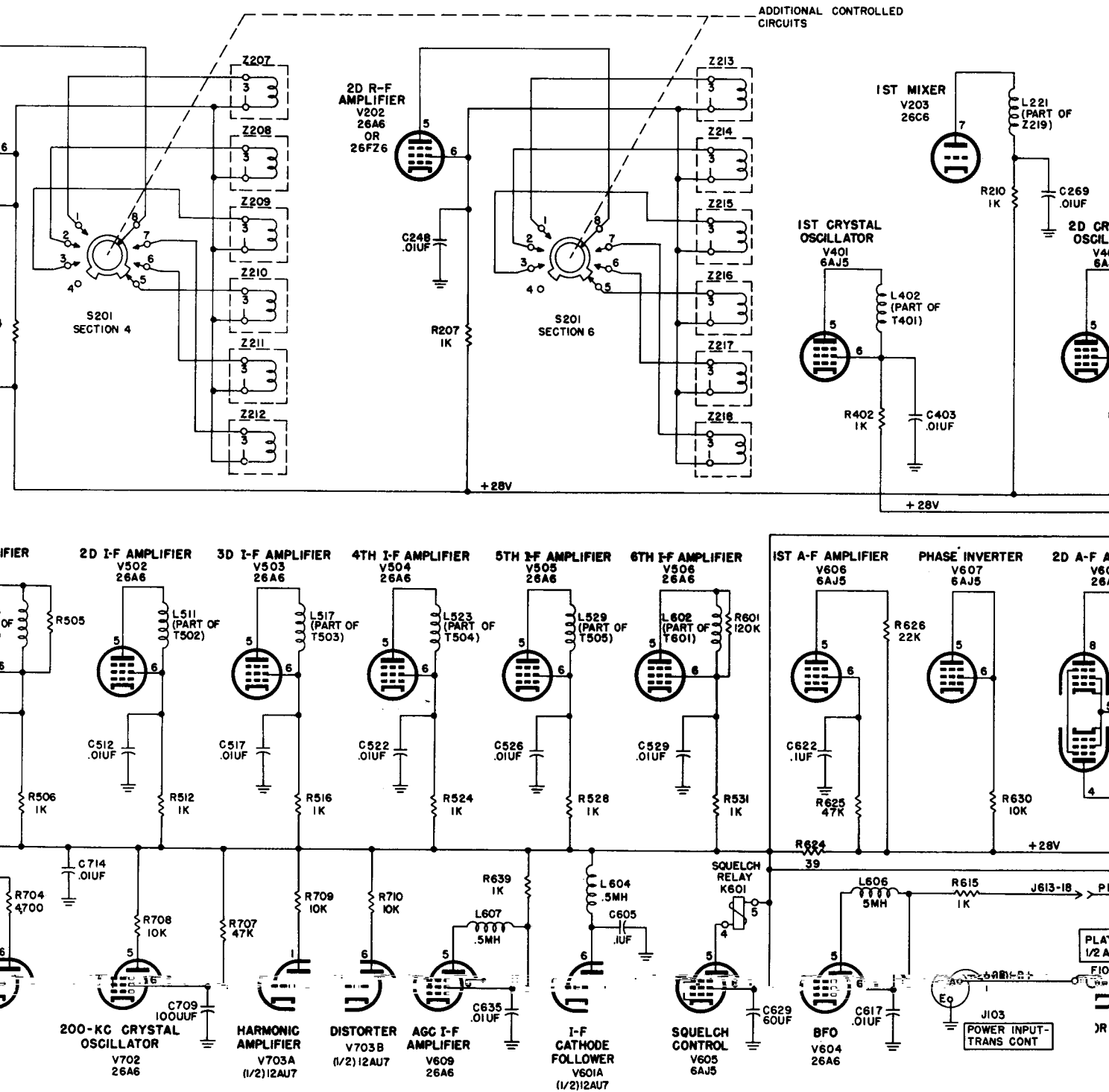
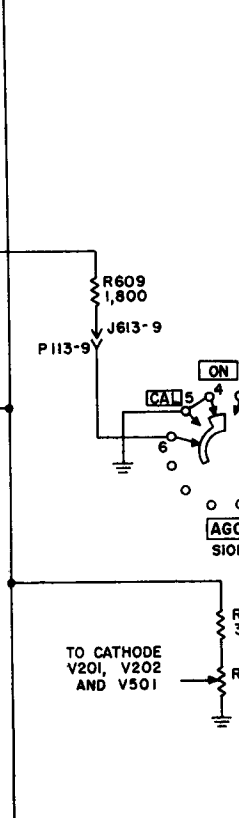
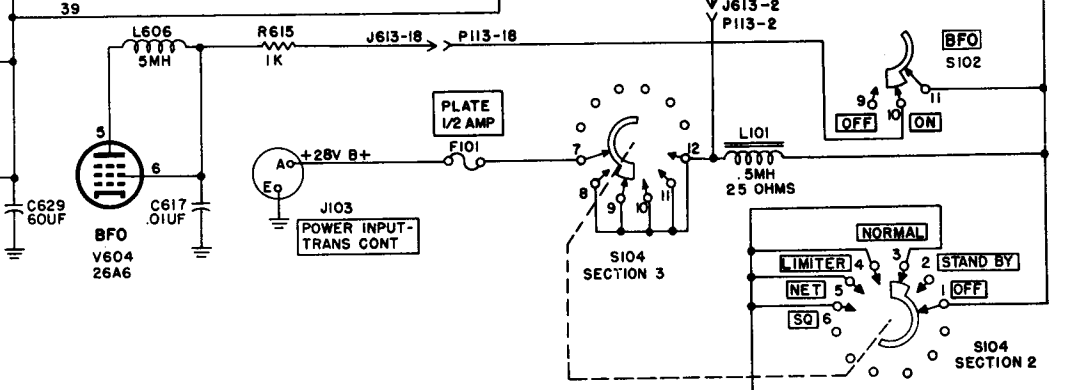
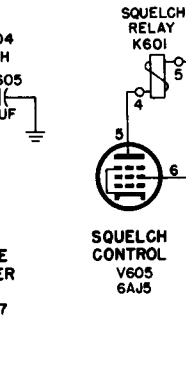
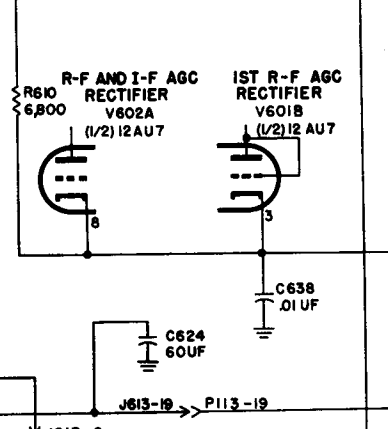
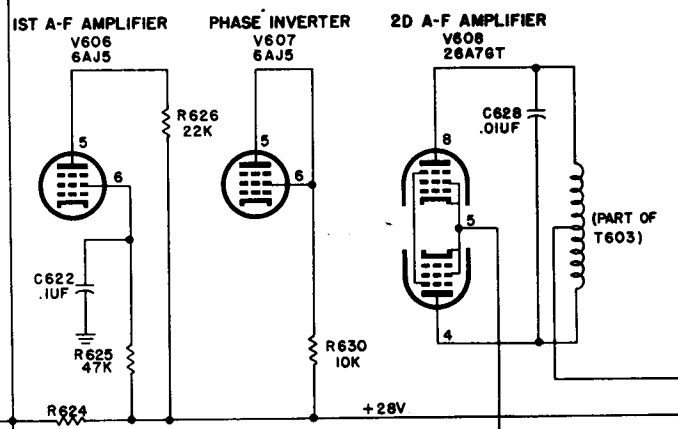
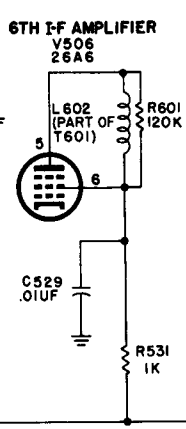
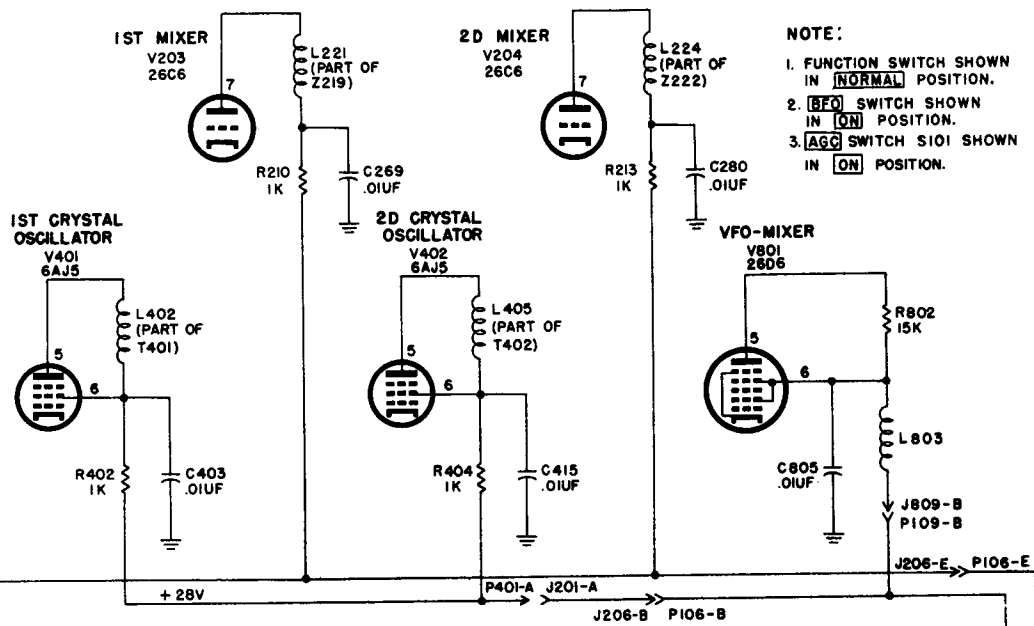
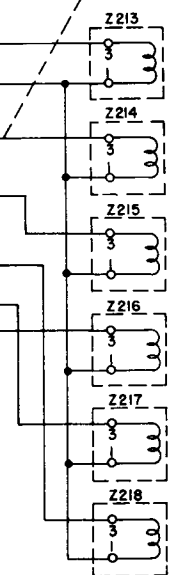


Figure 28. Plate and screen voltage distribution, schematic diagram.

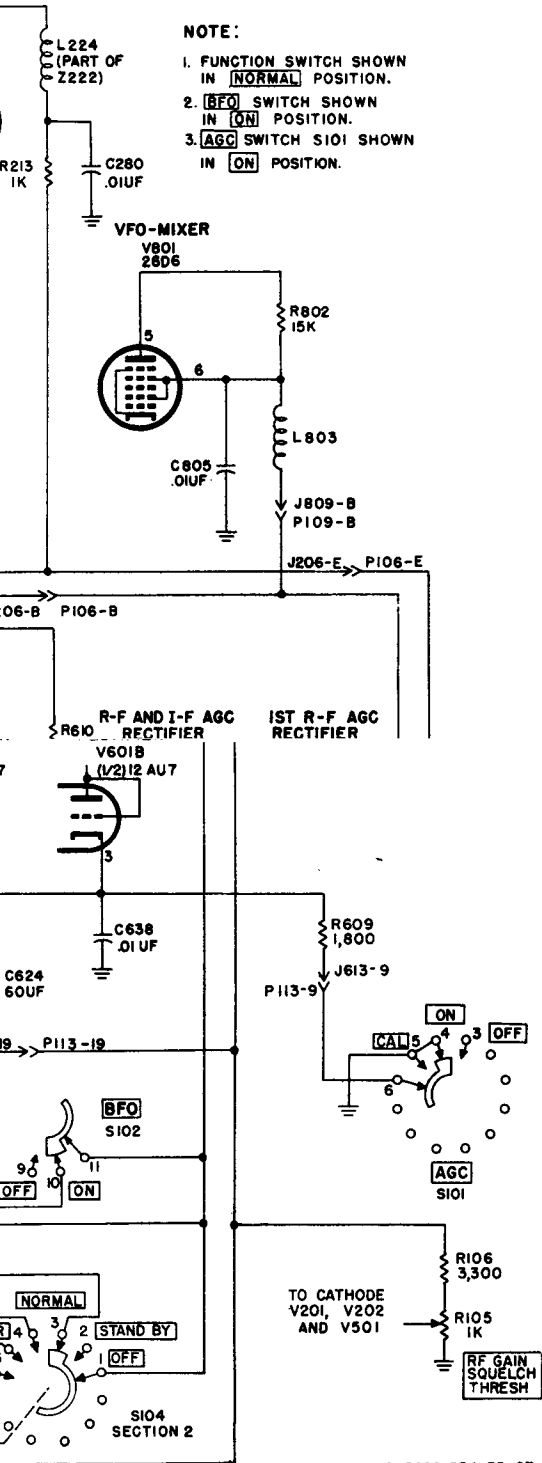
ADDITIONAL CONTROLLED CIRCUITS



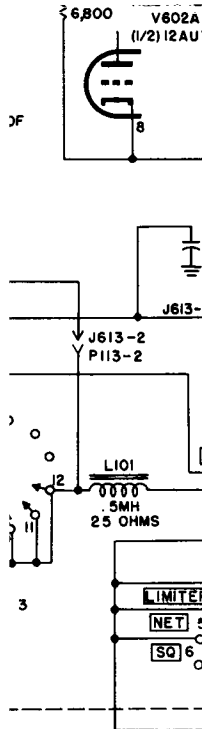
ate and screen voltage distribution, schematic diagram.

NOTE:

1. FUNCTION SWITCH SHOWN IN **NORMAL** POSITION.
2. **BFO** SWITCH SHOWN IN **ON** POSITION.
3. **AGC** SWITCH S101 SHOWN IN **ON** POSITION.



TM5820-334-35-27



Section III. ANALYSIS OF MECHANICAL TUNING SYSTEM

37. General Principles of Operation (fig. 29)

a. The tuning controls of the receiver vary the permeability-tuning and switch components to provide continuous tuning over a range of 0.5 to 32 mc in 32 bands. Each band is tuned over a 1-mc range except for the first band, which is from 0.5 to 1 mc. The frequency is indicated on a

counter-type dial.

b. Rotation of the MEGACYCLES control is limited to 10 turns (three detent positions to a turn) by a mechanical stop. As the control is turned, the first variable if. is varied, through a gear train, from 9 to 18 mc for the tuning range of 0.5 to 8 mc; the first variable if. is electrically disabled on other ranges. At the same time, the switches in the first and second crystal oscillators are rotated through 32 positions and the antenna and rf amplifier slug rack positions are changed (to obtain the megacycle change in electrical tuning) through a differential gear arrangement. The rf bandswitch (6 positions) is operated through a Geneva system and an overtravel coupler.

c. Rotation of the KILOCYCLES control limited to 10 turns by mechanical stop. The control drives the vfo-mixer directly and, through a gear train, drives the first variable if. can rack, the antenna, and rf amplifier (0.5- to 2-mc frequency ranges) slug racks, and the second variable if. slug rack

determining elements change at different rates when the tuning system is operated. For example, to cover the 0.5- to 1-mc band, the rf tuning slug rack in Z201, Z207, and Z213 moves from one extreme to the other (approximately 1 inch) while the first variable if. slug rack (Z219, Z220, and Z221) moves less than one-eighth inch. A system of gears under the control of a single knob is used to obtain the different slug rack travel distances.

b. The block diagram shows the circuits controlled by the MEGACYCLES and KILOCYCLES controls. The KILOCYCLES control, operating through a 10-turn stop, varies the position of the vfo-mixer tuning, the second variable if. slug rack, the first variable if. can rack, the 1- to 2-mc slug rack, and the 0.5- to 1-mc slug rack.

c. The MEGACYCLES control, operating through a 10-turn stop and the Geneva system and overtravel coupler, changes the position of rf bandswitch S201. The MEGACYCLES control also selects the proper crystals and oscillator output tuning capacitors for the first and second crystal oscillators by tuning 32-position switch S401 through a group of gears. The 32 bands of the receiver are covered in the antenna circuit and the first and second rf amplifier circuits with six different tuned networks for each circuit. Since each tuned network has a frequency ratio of two-to-one, six networks (switched by

S201 provide a full frequency coverage. Synchronization of 6-position switch S201 with 32-position switch S401 is accomplished with the Geneva system. The Geneva system contains a lost-motion gear with a few teeth spaced at intervals around its perimeter. A driven gear associated with the lost-motion gear rotates only when it is engaged by the teeth on the lost-motion gear. The MEGACYCLES control, through the differential, also affects the point at which the motion imparted by the KILOCYCLES control begins. The first variable if. (9 to 18 mc) slug rack is driven by the MEGACYCLES control. The first variable if. cans are mounted on a rack which is

(through a cam at the rear of the if. slug rack shaft). The KILOCYCLES control also drives the same differential movement of the remaining antenna and rf amplifier slug racks. A DIAL ZERO on the front panel permits a small correction between the kilocycle reading on the counter and the electrical setting of the tuning system.

38. Functional Analysis of Tuning System (fig. 30)

a. Figure 30 shows a detailed block diagram of the controlled components of the mechanical tuning system. The frequency-

driven by the KILOCYCLES control to keep these circuits in alignment during tuning.

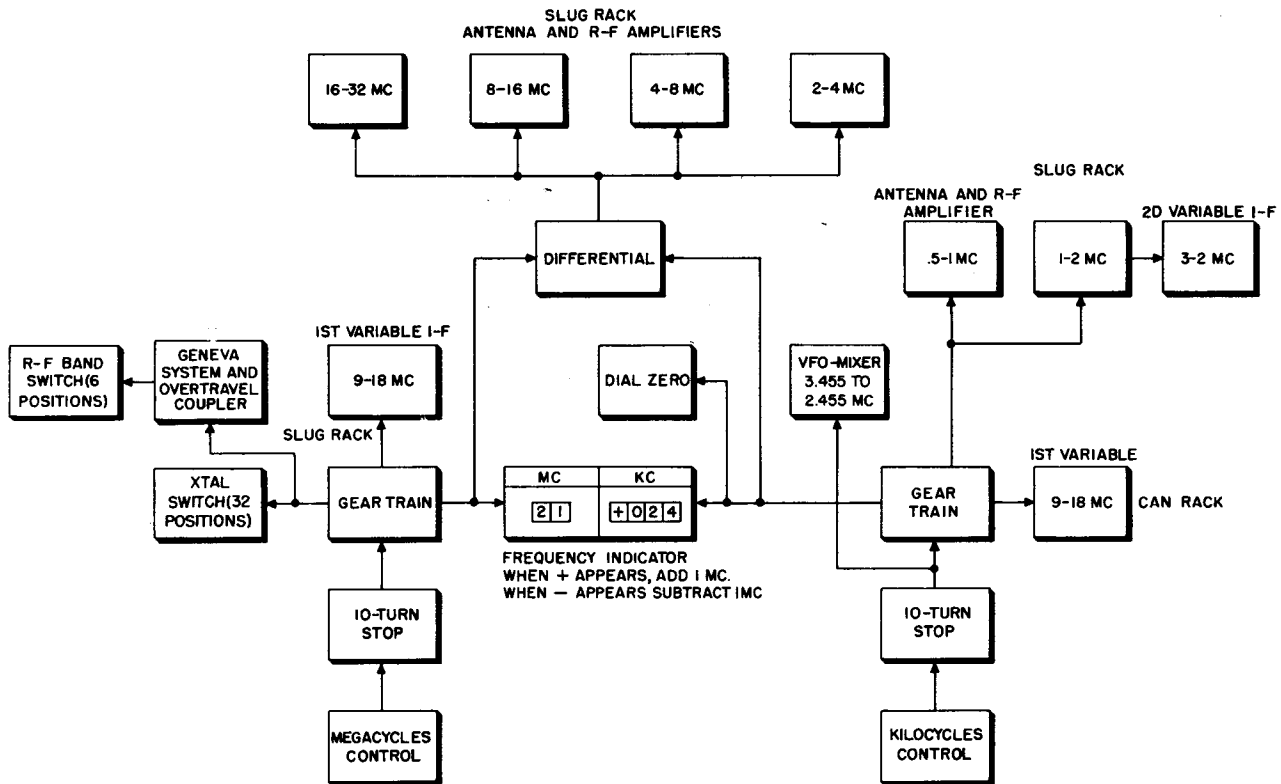
39. Detailed Analysis of Tuning System (fig. 31)

The mechanical schematic diagram of the tuning system illustrates the mechanical parts and their relationship to each other. The placement of the various mechanical components of the tuning system has been illustrated for clarity and association with related text matter and does not necessarily indicate the exact physical placement within the equipment. Gears that are physically mounted together are shown as operating from a common shaft to more clearly illustrate the mechanical action involved. The numbers which appear on the gears in the diagram indicate the number of teeth. The reference symbol callouts (example; 0324, 0297) for gears and shafts are used for identification

purposes in the related text. When gears that are physically mounted together are identified with a single reference symbol, the teeth number follows the reference symbol to distinguish between gears (example; 0319 (51), 0319 (30)). The differential and the Geneva system and overtravel coupler components are individually identified with a letter suffix on the reference symbol (example; 0317 (A), 0317 (B)).

a. KILOCYCLES Control.

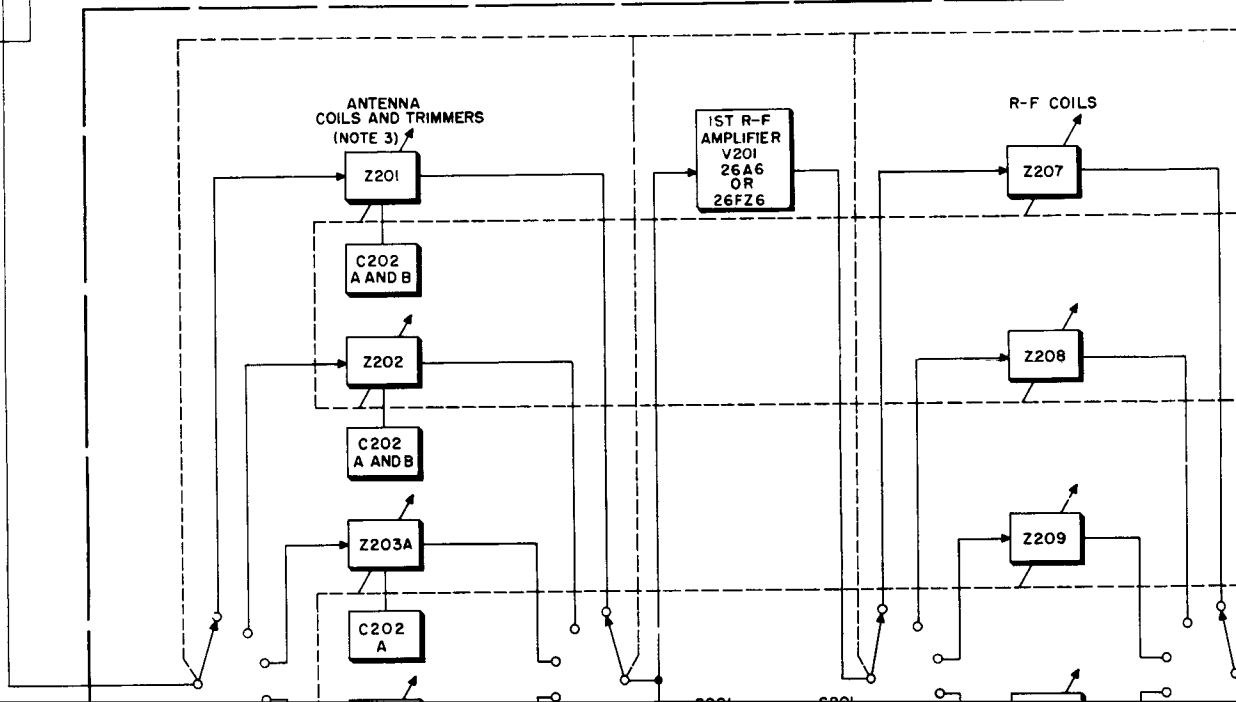
(1) As the KILOCYCLES control is turned, variable-frequency oscillator drive shaft 0331 is rotated. Antibacklash gear 0329-0330, spur gear 0318, a 10-1/2-turn stop, and an Oldham coupler are mounted on the shaft. The rotation of 0331 is limited to 10-1/2 turns by the 10-1/2-turn stop. The Oldham coupler corrects misalignment between the vfo drive shaft and the vfo tuning shaft.



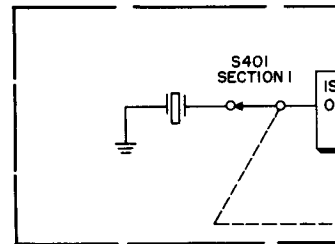
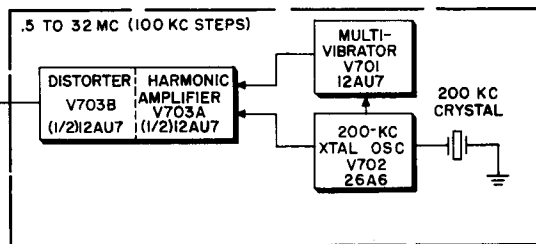
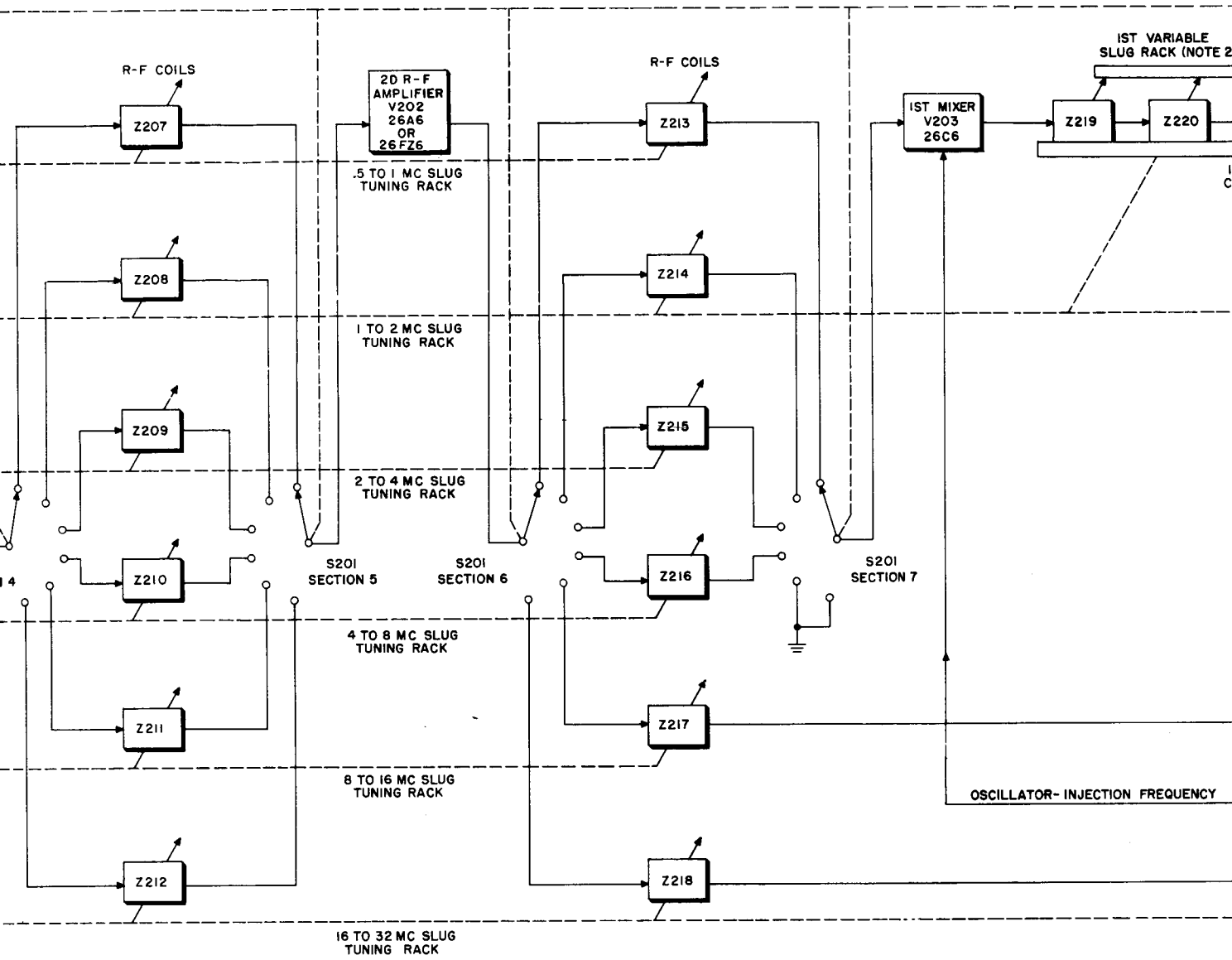
TM5820-334-35-28

Figure 29. Mechanical tuning system, block diagram.

ANTENNA



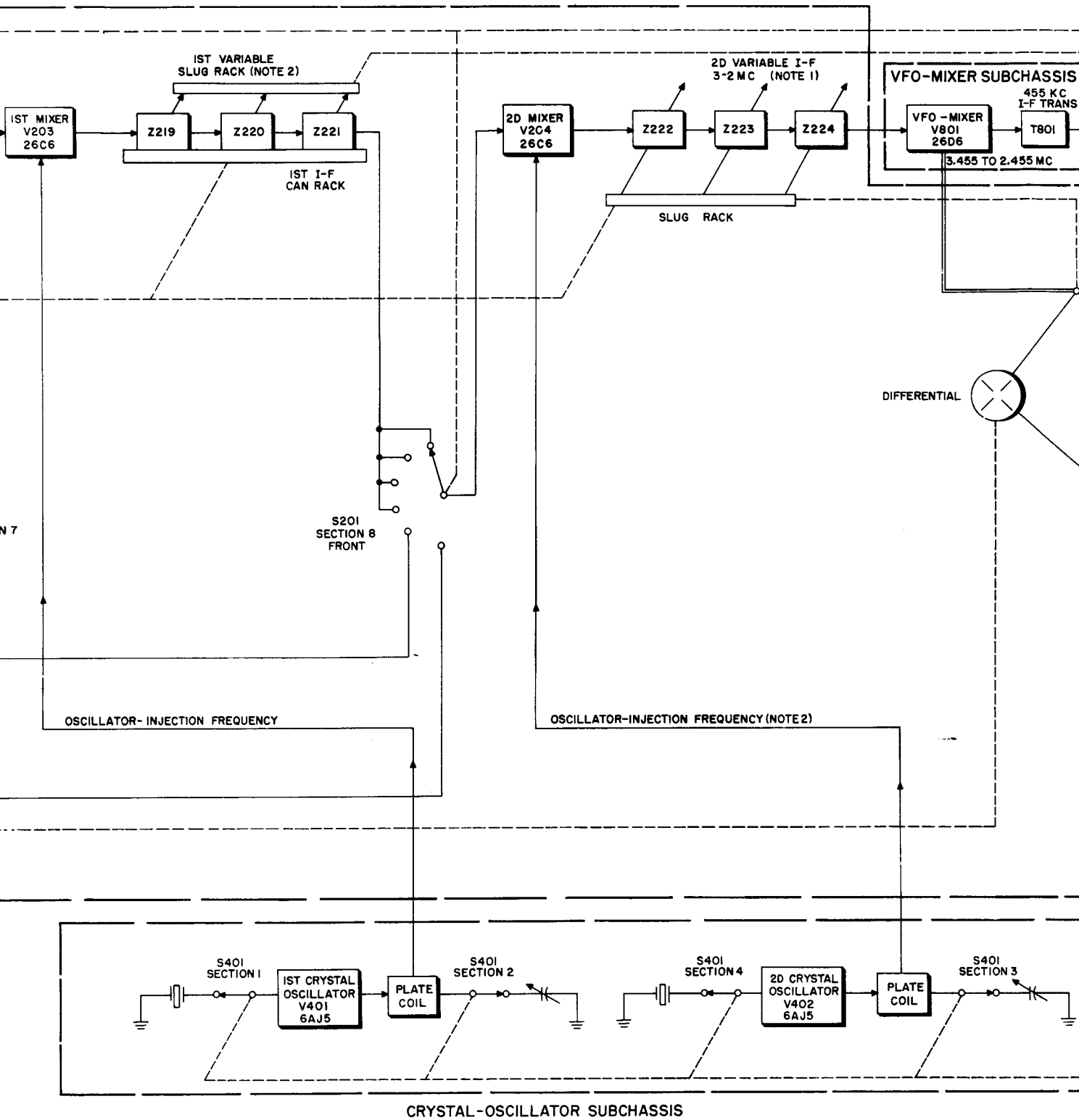
R-F SUBCHASSIS



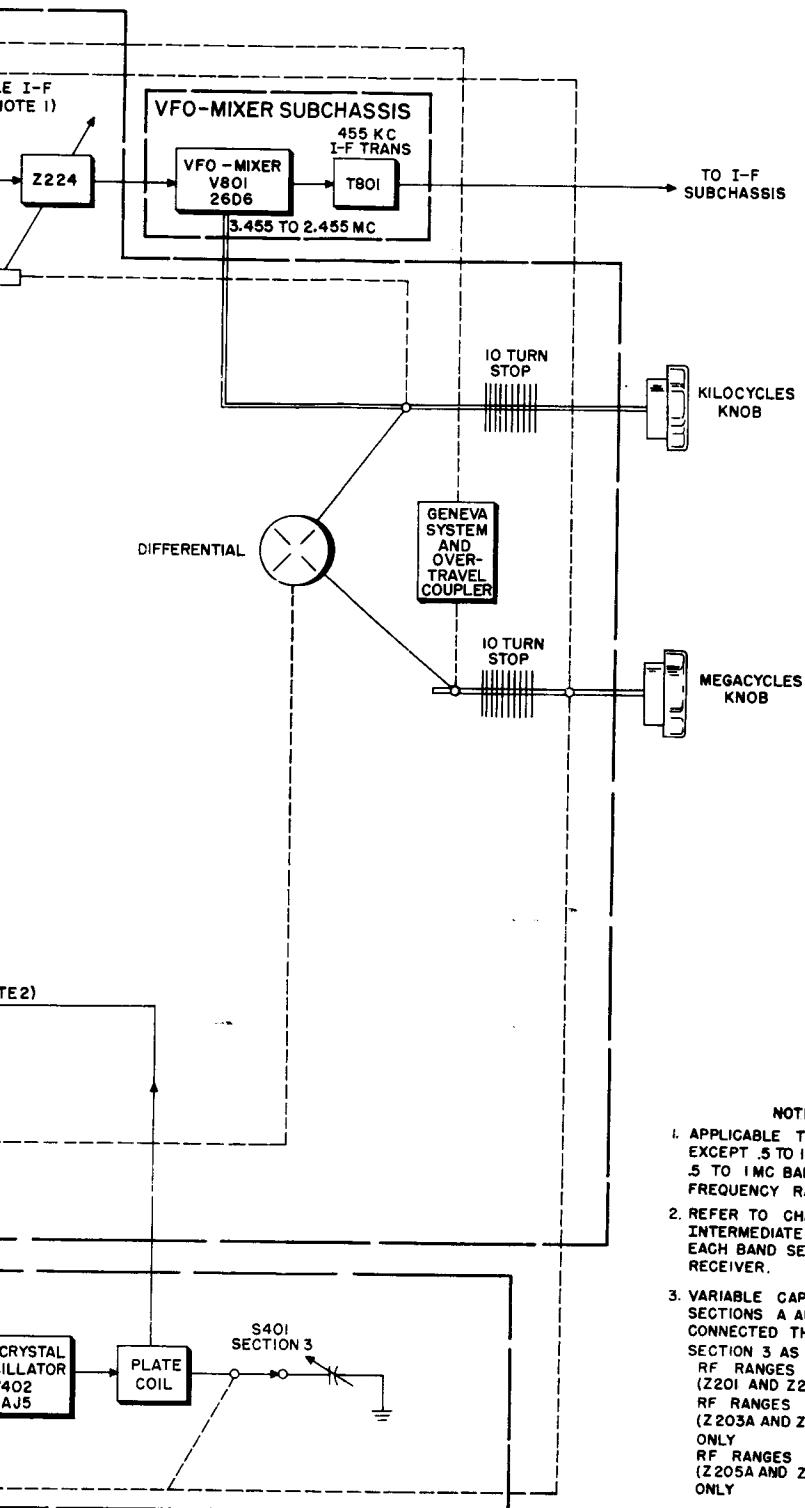
CALIBRATION-OSCILLATOR SUBCHASSIS

diagram.

Figure 30. Tuning system, functional block



System, functional block diagram.



NOTES:

1. APPLICABLE TO ALL BANDS EXCEPT .5 TO 1 MC BAND. ON .5 TO 1 MC BAND, INTERMEDIATE FREQUENCY RANGE IS 2.5-2 MC
2. REFER TO CHART SHOWING INTERMEDIATE FREQUENCY FOR EACH BAND SETTING OF THE RECEIVER.
3. VARIABLE CAPACITOR C202 SECTIONS A AND B ARE CONNECTED THROUGH S201, SECTION 3 AS FOLLOWS:
 RF RANGES OF .5-2 MC (Z201 AND Z202)-BOTH SECTIONS
 RF RANGES OF 2-8 MC (Z203A AND Z204A) SECTION A ONLY
 RF RANGES OF 8-16 MC (Z205A AND Z206)-SECTION B ONLY

(2) As the KILOCYCLES control is turned, antibacklash gear 0329-0330 rotates a group of gears comprised of clutch assembly 0342,

bevel and spur gear 0336, and bevel gear 0338, which drive the kilocycle counter (the last three digits)

on frequency indicator M201.

(3) The DIAL LOCK control engages a disk mounted on antibacklash gear 0329-0330 and is used to lock the KILOCYCLES control. When the DIAL ZERO control is turned clockwise, it engages clutch assembly 0342 which in turn, disengages the kilocycle counter from the KILOCYCLES control.

(4) Spur gear 0318 rotates with vfo drive shaft 0331 and drives spur gear 0317(G); 0317(G) is the kilocycle input gear to the differential. The kilocycle input to the differential gear drives the 0.5- to 1-mc rf slug rack through a group of gears comprised of antibacklash gear 0319 (51), spur gear 0319 (30) and gear 0346 (72). The 0.5- to 1-mc

to one end of the camshaft. A roller, which rides on the slug rack, moves the tuning slugs of Z213. Spur gear 0317(G) is mounted on the 0.5- to 1-mc rf camshaft and drives anti-backlash gear 0297-0268 which, in turn, drives the 1- to 2-mc camshaft. The 1- to 2-mc cam moves the first slug rack (Z202), and the second slug rack (Z222, Z223, and

variable if. can when the KILOCYCLES control is rotated. Gear 0317(H), on the Geneva system and overtravel coupler, drives 0317(G), gear assembly 0303, gear assembly 0305, antibacklash gear 0296-0297, which rotates the first variable if. cam. The first

gear 0317(H), rotates the 32-position crystal oscillator switch and the 6-position rf bandswitch through a system of gears. The 32-position crystal oscillator switch, S401, is driven through spur gears 0321, 0323, 0298, 0299, and 0347, shaft 0295, spur gear 0350, and Oldham coupler, and worm 0349. Worm 0349 drives worm wheel 0348 which drives the 32-position crystal switch. The Oldham coupler corrects for misalignment between shaft 0295 and the worm shaft. The 6-position rf bandswitch, S201, is driven through spur gear 0350 on shaft 0295, and drives the Geneva system and overtravel coupler and spur gears 0273 and 0274. Gear 0272(A), on the Geneva system and overtravel coupler, rotates continuously as the MEGACYCLES control is turned; however, spur gears 0273 and 0274 are driven only during the intervals

variable if. can is moved by the cam.

b. MEGACYCLES Control.

(1) The MEGACYCLES control turns shaft 0332 which is limited to 10-1/2 turns by a 10-1/2-turn stop. Spur gear 0327, antibacklash gear

0324, and spur gear 0326 are mounted on shaft 0332.

(2) As the MEGACYCLES control is turned, spur gear 0327 drives a group of gears which moves the megacycle counter (the first two digits) on frequency indicator M201. The group of gears is comprised of spur gears 0339, 0340, and 0341 (60), and bevel gears 0341 (24), and 0337.

(3) As MEGACYCLES shaft 0332 is rotated, spur gear 0326 drives gear assembly 0304, gear assembly 0305, and gear 0306. Gear 0306 turns the first variable if. cam which moves the 9- to 18-mc variable if. slug rack.

(4) Gear 0324 drives the megacycles input to differential gear 0317(H). The megacycle input to differential

gear 0317(H) is attached to the 0.5- to 1-mc rf cam which is attached to the slug rack. The cam and moving parts which contain the tuning slugs of Z201, Z207, and Z213. Gear 0346 (54) is mounted on the 1-mc rf camshaft and drives antibacklash gear 0268 which, in turn, drives the 1- to 2-mc camshaft and the second variable if. cam (Z202, Z208, and Z214). The 1- to 2-mc cam moves the first slug rack (Z202), and the second slug rack (Z222, Z223, and

(5) The 9- to 18-mc variable if. slug rack is moved by the MEGACYCLES control shaft 0332, spur gear 0327, gear assembly 0303, gear assembly 0305, antibacklash gear 0296-0297, which rotates the first variable if. can rack

that the teeth of lost motion gear 0272(B) are engaged by spur gear 0273.

c. *Differential Output.*

(1) Rotation of the KILOCYCLES control turns spur gear 0318, which drives gear 0317(G). Rotation of the MEGACYCLES control turns gear 0324, which drives gear 0317(H). As gear 0317(G) is rotated, spur gear 0317(A) is driven which, in turn, drives gear 0317(B), spur gear 0317(C), gear 0317(E), and differential output gear 0317(J).

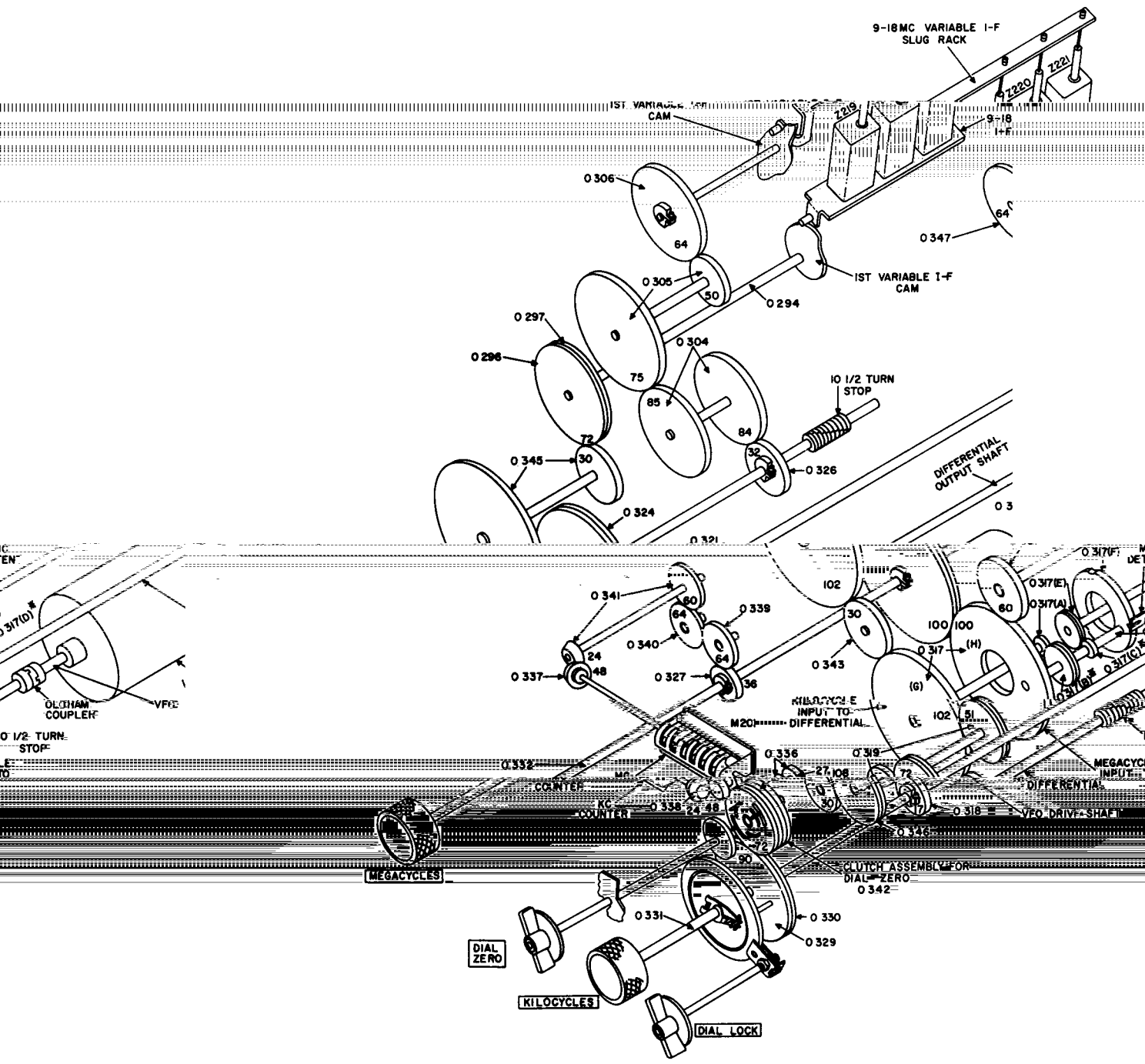
As shaft 0317(D) rotates, spur gear 0317(G) is rotated, but the gears mounted on it rotate; disk 0317(F) remains stationary, and gear 0317(H) is not affected. When gear 0317(H) is rotated, shaft 0317(I) is rotated (but not about its own axis). As shaft 0317(D) rotates, spur gear 0317(C) drives gear 0317(E), which rotates the differential output shaft and differential output gear 0317(J).

(2) The differential output gear drives the 2- to 4-mc, 4- to 8-mc, 8- to 16-mc, and the 16- to 32-mc rf slug racks through a gear train composed of gear 0308, antibacklash gear 0311-0309, antibacklash gear 0309-0310, gear 0312, gear 0316, antibacklash gear 0280, spur gear 0281, antibacklash gear 0282, spur gear 0283, and antibacklash gear 0269-0270.

(3) The MEGACYCLES control must set the circuit elements at an exact position for each band of frequency coverage. This requires that shaft 0317(D) does not turn as gear 0317(G) is rotated, but the gears mounted on it rotate; disk 0317(F) remains stationary, and gear 0317(H) is not affected. When gear

0317(H) is rotated, shaft 0317(I) is rotated (but not about its own axis). As shaft 0317(D) rotates, spur gear 0317(C) drives gear 0317(E), which rotates the differential output shaft and differential output gear 0317(J).

backlash gear 0324 bracket, made of presses against the duces an effective notch.



1. Tuning system

Figure 3

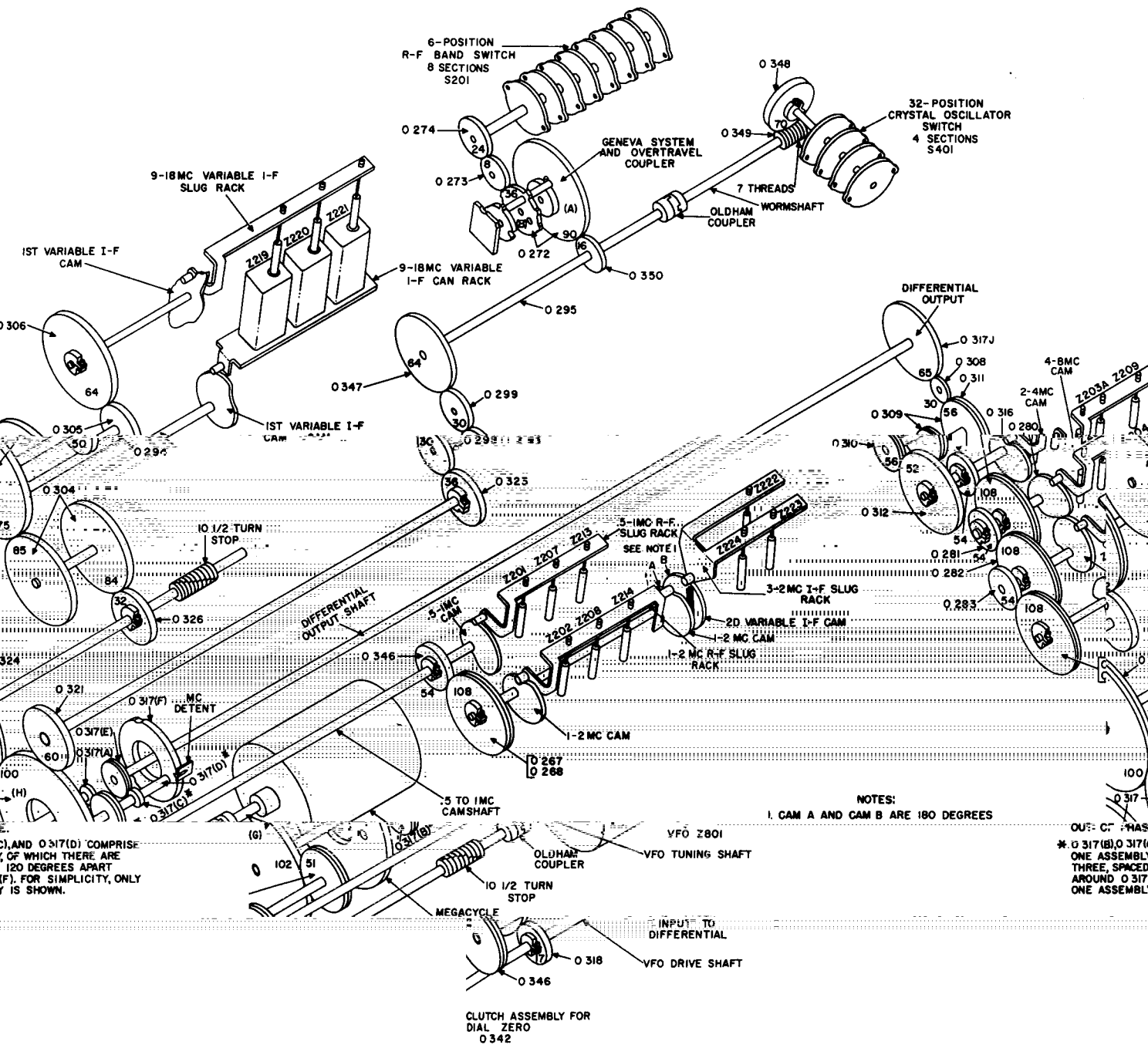


Figure 31. Tuning system, mechanical schematic.

CHAPTER 2

TROUBLESHOOTING

Note. All troubleshooting may be performed by third echelon maintenance personnel unless otherwise noted.

40. Troubleshooting Procedures

a. General. The first step in servicing a defective receiver is to sectionalize the fault. Sectionalization consists of tracing the fault to the subchassis responsible for the abnormal operation of the receiver.

b. Intermittents. In all these tests, the possibility of intermittents should not be overlooked. A type of trouble may be made to appear by tapping or jarring the subchassis or parts under test. It is possible that the trouble is not in the receiver and resistance measurements.

c. Sectionalization. Listed below is a group of tests arranged to aid in locating the fault to a subchassis.

d. Visual inspection. The purpose of visual inspection is to locate faults without circuit tests or measurements.

e. Operational tests. Operational tests (para 46) frequently indicate the location of the trouble. In many instances, the tests will help locate the trouble. Because the undersides of the subchassis are not accessible for troubleshooting when the subchassis are mounted in the receiver, it may be necessary to remove the subchassis. Most bench testing can be performed by removing the lower deck assembly from the receiver and connecting extension cable No. 1 between P810 from the vfo subchassis and J510 on the if. subchassis (fig. 32). It may sometimes be necessary to remove the subchassis under test and connect them

d. Isolation. The defective component is usually located by voltage and resistance measurements. Voltage and resistance charts (fig. 78, 79, and 80), and paragraph 56 of W. aid in locating the defective component. The resistor and capacitor color codes are given in figure 76 and 77.

The second step is to localize the fault. Localization means tracing the fault to the malfunctioning circuit in the subchassis. Finally, the defective part is isolated by

but in the installation (mounting, antenna, ground connection, vehicle, or other associated equipment.

41. Bench Testing (fig. 32, 33, and 34)

a. When a cause of equipment failure has been sectionalized to a subchassis, a bench test of the faulty subchassis and use of the troubleshooting chart may be resorted to

locate the trouble. Because the undersides of the subchassis are not accessible for troubleshooting when the subchassis are mounted in the receiver, it may be necessary to remove the subchassis. Most bench testing can be performed by removing the lower deck assembly from the receiver and connecting extension cable No. 1 between P810 from the vfo subchassis and J510 on the if. subchassis (fig. 32). It may sometimes be necessary to remove the subchassis under test and connect them

many instances, the tests will help in determining the location of the fault.

(3) *Checking plate and filament circuits for shorts.* The tests (para 45) prevent further damage to the receiver from possible short circuits.

c. Localization. The tests listed below will aid in localizing the defective circuit.

(1) *Troubleshooting charts.*

Subchassis or assembly	Extension cable No.	Connect between	Fig. No.
Rf			
Rf to front panel	3	J206-P106	54
Rf to crystal oscillator	4	J201-P401	57
Crystal oscillator to rf	1A	P402-J202	57
Vfo to rf	1A	J808-P208	53
Rf to front panel	1A	P206-J106	54
Crystal oscillator to rf	1A	P402-J202	57
Crystal oscillator			
Crystal oscillator to rf	4	P401-J201	57
Crystal oscillator to rf	1A	P403-J203	57
Crystal oscillator to rf	1A	P402-J202	57
Vfo			
Vfo to front panel	4	J809-P109	53
Vfo to rf	1A	J808-P208	53
Vfo to if.	1	P810-J510	53
Lower deck assembly			
Af to front panel	2	J613-P113	53
Front panel to af	1	P111-J611	53
Front panel to af	1	P112-J612	53
Vfo to if.	1	P810-J510	53

42. General Precautions

Whenever a receiver is to be serviced, observe the following precautions.

a. Be sure that the receiver is disconnected from the power source or is turned off before contacting exposed circuits or changing connections.

b. After removal of a subchassis, do not turn the shafts or tuning controls unless it is necessary for troubleshooting or adjustment. Careful handling may eliminate the need for synchronization procedures. When removing a subchassis, note the position of the front panel controls, because a control may be turned during servicing.

c. Careless replacement of parts often produces new faults. To prevent further damage, note the following precautions:

1. Note the position of the leads before removing a part. If the part has a number of connections, tag each lead.

2. Be careful not to damage other components while pulling or pushing them in the way.

(3) Do not allow drops of solder to fall into the receiver; they may cause short circuits.

d. In receivers using the transistorized audio module in the audio subchassis, do not troubleshoot by shorting various points to ground and listening for a *click*; transistors may become permanently damaged.

43. Visual Inspection

When a receiver is brought in for a check or repairs, remove the receiver from its case (para 60) and in addition to the items listed for organizational maintenance (TM 11-5820-334-20), inspect the following:

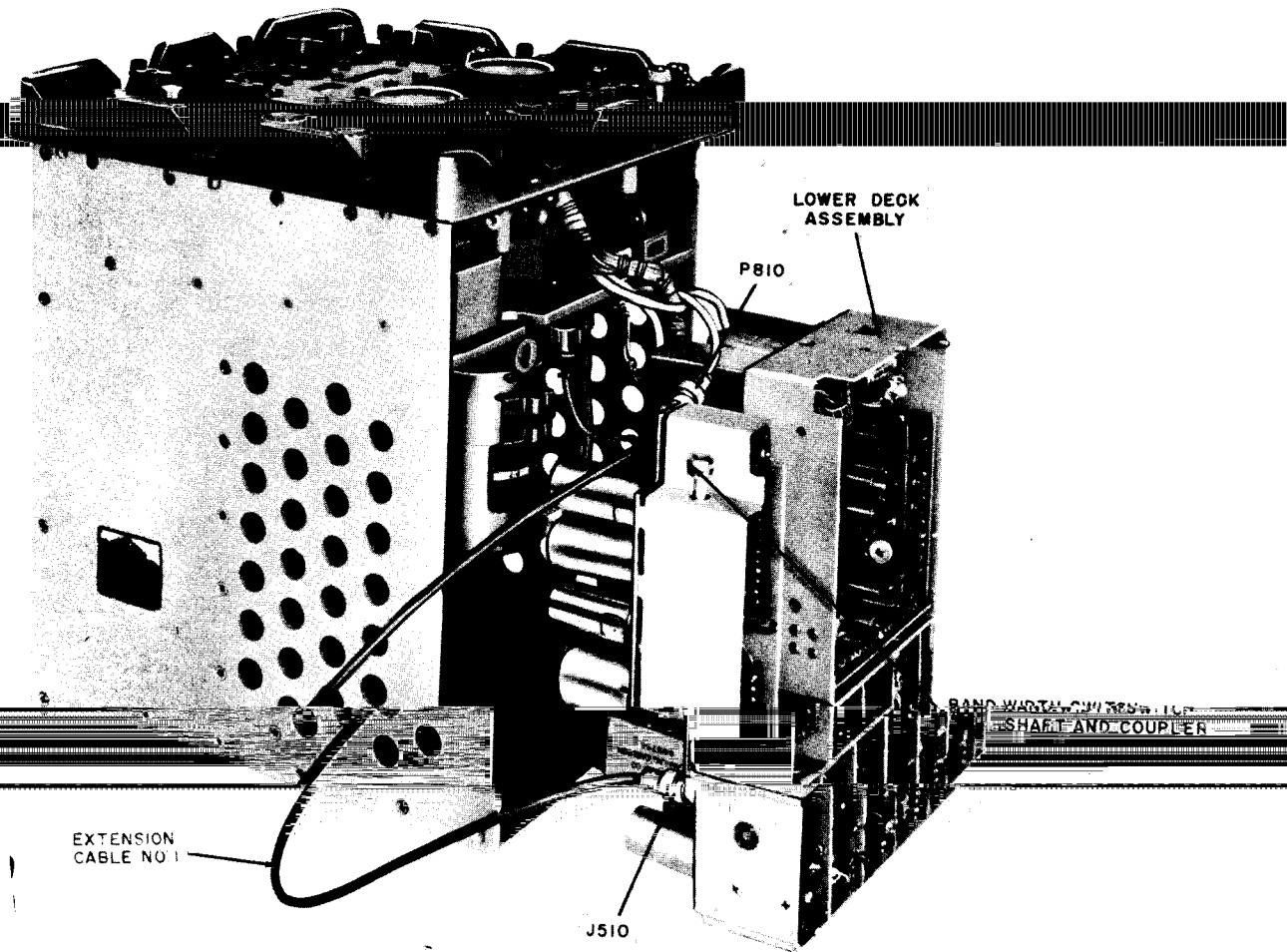
1. Resistors and insulation for signs of overheating. Check for wax leakage and discoloration of components.

b. Tube sockets, plugs, and other components for broken connections.

c. Bare wires for shorts to chassis or adjoining wires.

d. Fuses for correct rating and type.

- (1) Note unsold
a num
of its l
(2) Be ca
leads v
out of



TM5820-334-35-33

Figure 32. Bench test, lower deck assembly removed.

Check for short circuits (para 45) when a blown fuse is found.

e. MEGACYCLES and KILOCYCLES controls for rough operation or binding. Roughness of tuning mechanism operation indicates need for cleaning and lubrication

ceiver R-392/URR. The chart also lists the associated technical manuals for the test equipment.

Test equipment	Technical manual
Audio Oscillator RS-382/U	TM 11-5551
Multimeter Meter MB-28/C	TM 11-6623-200-12
Multimeter JS-382/U	TM 11-5527
Oscilloscope ANA/SM-20	TM 11-5551
RF Signal Generator AN/URM-23	TM 11-6623-274-12
Test Set Electron Tube TV-77	TM 11-5551

44. Test Equipment Required

The following chart lists test equipment required for troubleshooting Radio Re-




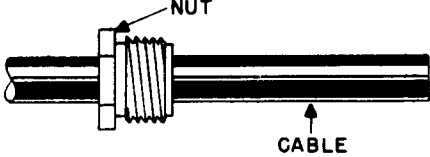
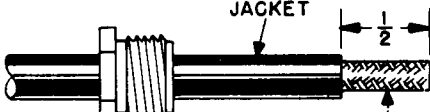
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ASSEMBLY INSTRUCTIONS FOR CABLE NO. 1

1. EXTENSION CABLE NO.1 IS TO BE FABRICATED OF A LENGTH OF RG-58C/U COAXIAL CABLE (24 IN. MAX) TERMINATED IN A TYPE UG-89/U FEMALE CONNECTOR AT ONE END AND UG-88/U MALE CONNECTOR AT OTHER END, AS SHOWN IN UPPER RIGHT-HAND SECTOR

2. INSTRUCTIONS ARE GIVEN BELOW, IN STEP-BY-STEP SEQUENCE, FOR ATTACHING THE UG-89/U FEMALE CONNECTOR TO ONE END OF THE CABLE. THE TYPE UG-88/U MALE CONNECTOR IS ATTACHED TO OTHER END OF CABLE BY FOLLOWING SAME PROCEDURE AS FOR FEMALE CONNECTOR EXCEPT THAT A MALE CONTACT AND PLUG BODY ARE SUBSTITUTED.

3. EXTENSION CABLE NO.1A IS TO BE FABRICATED OF A LENGTH OF RG-58A/U COAXIAL CABLE (24 IN. MAX) TERMINATED IN A TYPE AMPHENOL 82-831 FEMALE CONNECTOR AT ONE END AND AMPHENOL 82-830 MALE CONNECTOR AT OTHER END, AS SHOWN IN UPPER RIGHT-HAND SECTOR

ASSEMBLING RADIO FREQUENCY JACK (UG-89/U)		 NUT	 SLEEVE	 <small>FEMALE CONNECTOR</small>
STEP 1				CUT EN
STEP 2				REMOVE NICK BR

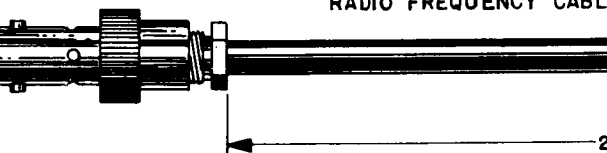
U COAXIAL CABLE
AND A TYPE
CONNECTOR OF THIS FIGURE.

FREQUENCY JACK UG-89/U

RADIO FREQUENCY CABLE

ING THE TYPE UG-89/U
CONNECTOR IS
MALE CONNECTOR,

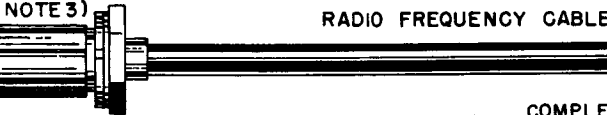
RADIO FREQ



1 COAXIAL CABLE
2 END AND A TYPE
HAND SECTOR OF THIS FIGURE.

AMPHENOL
82-831
(NOTE 3)

RADIO FREQUENCY CABLE

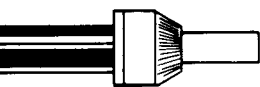


COMPLE

FEMALE
CONTACT

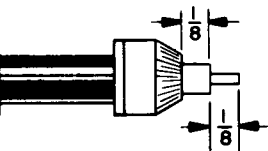
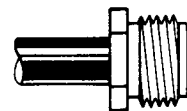


JACK BODY



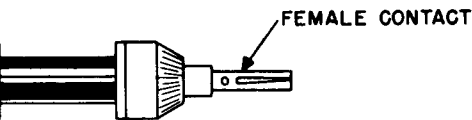
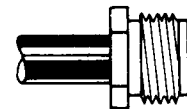
IT END OF CABLE EVEN.

STEP
6



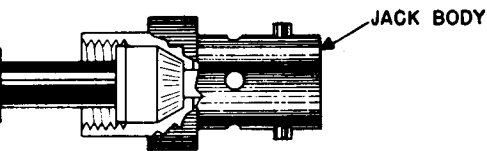
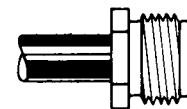
REMOVE OUTER JACKET 1/2" - DON'T
DICK BRAID.

STEP
7



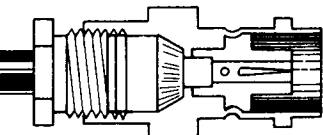
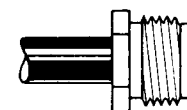
WASH BRAID BACK, AND REMOVE
1/8" OF INSULATION AND CONDUCTOR.

STEP
8



REMOVE BRAID.

STEP
9



SLIDE SLEEVE OVER TAPERED BRAID.
FIT INNER SHOULDER OF SLEEVE
FLATLY AGAINST END OF JACKET.

STEP
10

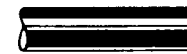
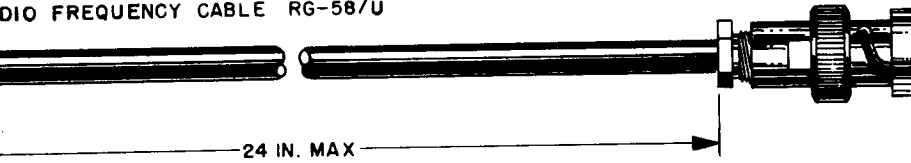


Figure 33. Cable No. 1 and 1A, assembly instructions

COMPLETED CABLE NO.1

RADIO FREQUENCY PLUG UG-88/U

RADIO FREQUENCY CABLE RG-58/U



24 IN. MAX

AMPHENOL
82-830
(NOTE 3)

RADIO FREQUENCY CABLE RG-58/U



COMPLETED CABLE NO. 1A

WITH SLEEVE IN PLACE, COMB OUT
BRAID, FOLD BACK SMOOTH AS SHOWN,
AND TRIM 3/32".

BARE CENTER CONDUCTOR 1/8" - *DO NOT*
NICK CONDUCTOR.

TIN CENTER CONDUCTOR OF CABLE. SLIP
FEMALE CONTACT IN PLACE AND SOLDER.
REMOVE EXCESS SOLDER. *BE SURE CABLE
DIELECTRIC IS NOT HEATED EXCESSIVELY
AND SWOLLEN SO AS TO PREVENT DI-
ELECTRIC ENTERING BODY.*

CONTACT

PUSH INTO BODY AS FAR AS IT WILL GO.
SLIDE NUT INTO BODY AND SCREW INTO
PLACE, WITH WRENCH, UNTIL MODERATELY
TIGHT. HOLD CABLE AND SHELL
RIGIDLY AND ROTATE NUT.

JACK BODY

ASSEMBLED CONNECTOR.

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NOTES:

1. THE MULTICONDUCTOR EXTENTION CABLES ARE TO BE FABRICATED OF NO.18 TO 22 GAGE SHIELDED, STRANDED WIRE (SUPRENET) FOR AUDIO CONDUCTORS INDICATED BY ○, NO.18 GAGE STRANDED WIRE FOR CONDUCTORS MARKED G, AND NO.22 GAGE STRANDED WIRE FOR ALL OTHER CONDUCTORS. INSULATION MUST BE RATED AT 600V.
2. CONNECTORS SHOWN VIEWED FROM REAR. COVERS TO BE USED WITH FEMALE CONNECTORS. AMPHENOL 86-834 COVER USED WITH 26-192 CONNECTOR.
3. CABLES TO BE LACED WITH NO.6 VINYLITE LACING CORD AS SHOWN IN INSERT.
4. MAXIMUM LENGTH OF ALL CABLES IS 24 INCHES.
5. CHECK CONTINUITY AFTER COMPLETING FABRICATION.
6. LABEL EXTENTION CABLES FOR IDENTIFICATION.

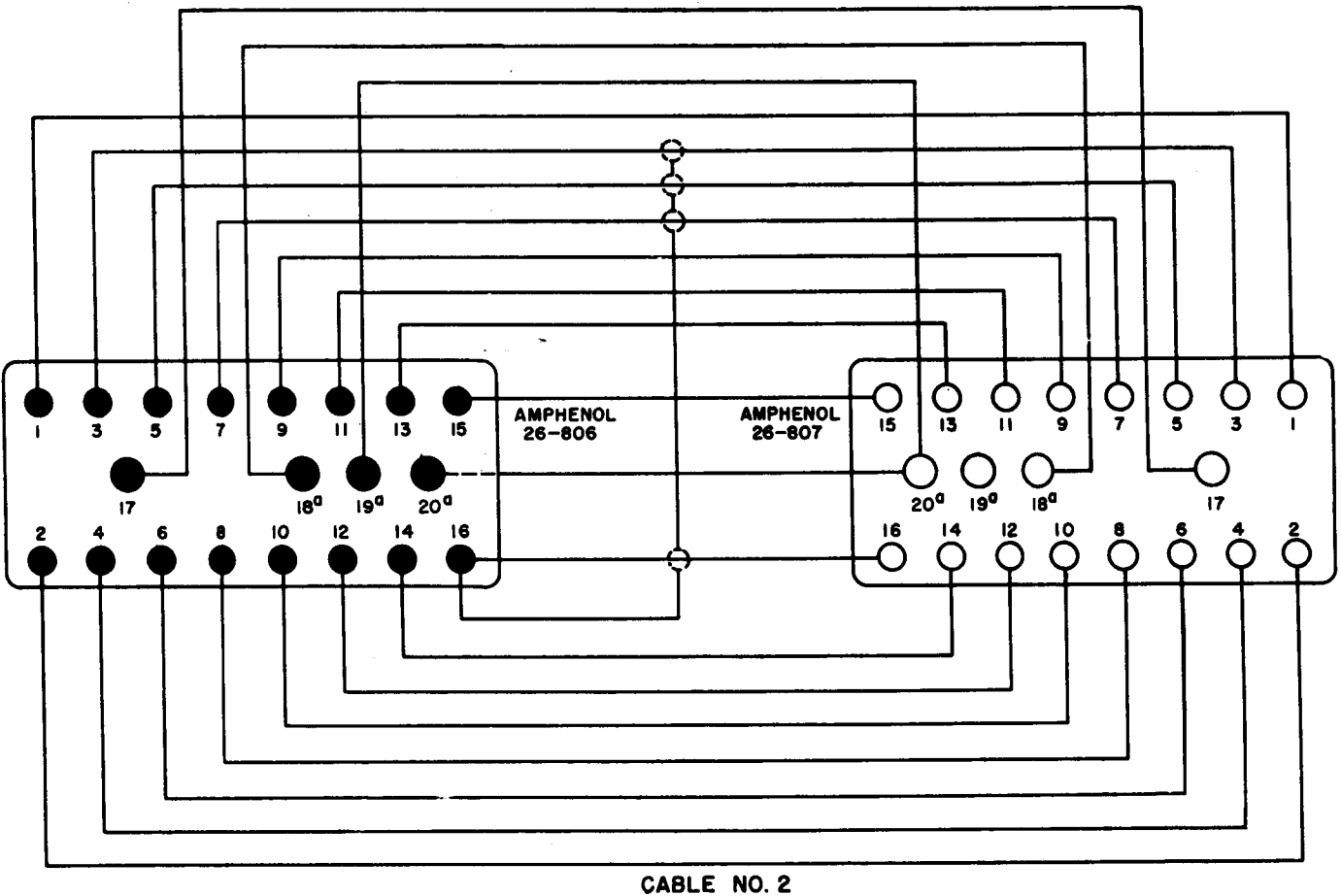
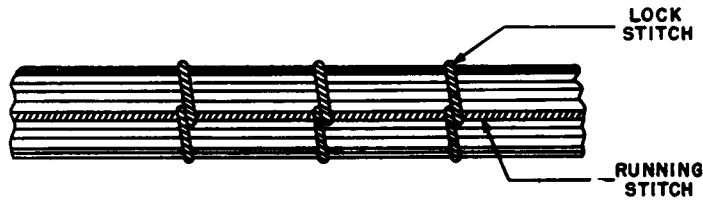
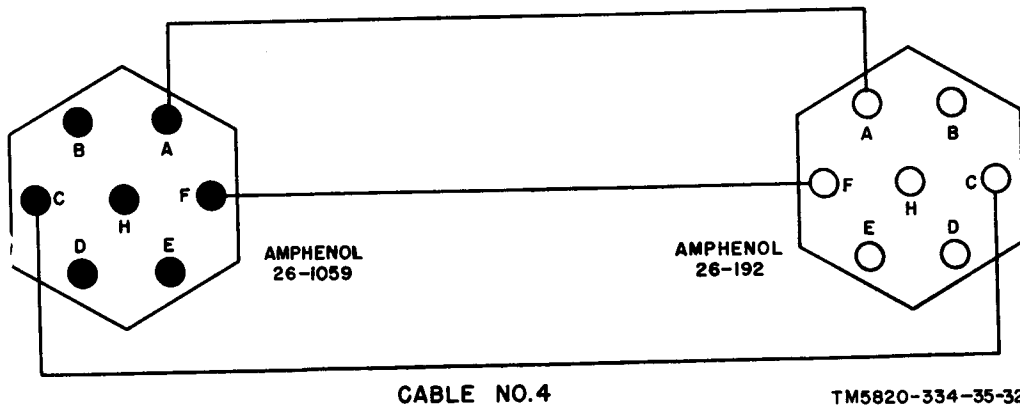
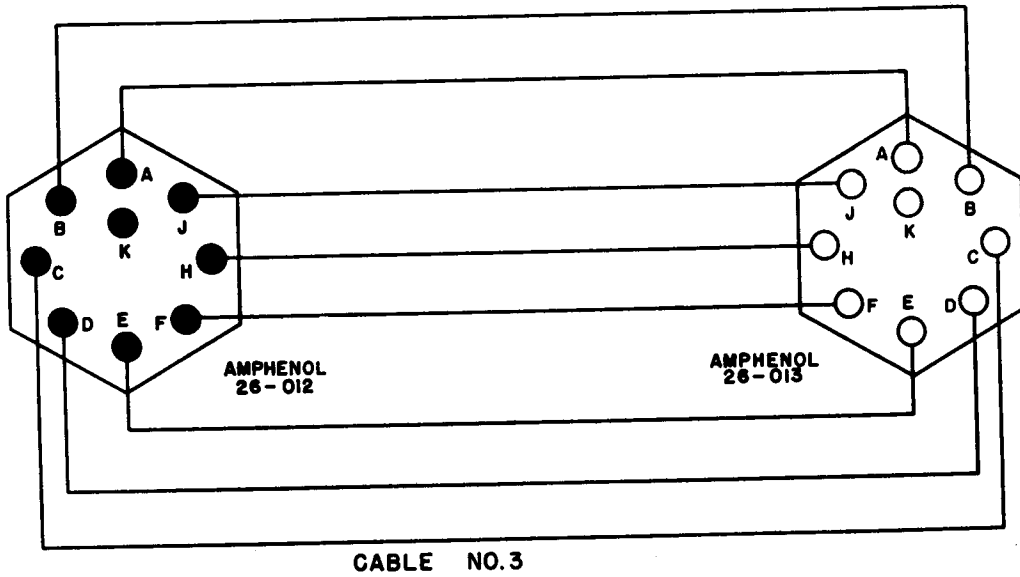


Figure 34. Cable No. 2, 3, and 4, as



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3, and 4, assembly instructions.

45. Checking Plate and Filament Circuits for Shorts

Caution: In receivers that use an audio module, remove the audio module before checking the plate or filament circuits.

a. Purpose of Tests. To prevent damage to a receiver brought in for repair, always check the resistance of the plate and filament circuits before applying power to the equipment. Repeated burning out of PLATE 1/2 AMP fuse (F101) is an indication of a short in the plate circuits. Repeated burning out of LINE 5 AMP fuse (F102) is an indication of a short in the filament or associated circuits (relays and oven heater).

b. Conditions of Tests. To prepare for the short circuit tests, perform the following steps:

- (1) Remove the receiver from its case (para 60).
- (2) Remove the cable from the POWER INPUT-TRANS CONT receptacle.

c. Measurements. Make the resistance measurements indicated in the following chart. A resistance measurement is made from either contact of a fuseholder to ground with a good fuse in place. If abnormal results are obtained, take the corrective measures outlined. When a faulty part is found, repair the trouble before applying power to the receiver.

Action	Point of measurement	Normal indication	Corrective measures
Turn function switch to STAND BY.	PLATE 1/2 AMP fuse (F101)...	Infinity	Check af, vfo, and crystal oscillator plate circuits for shorts.
Turn BFO switch ON.....	PLATE 1/2 AMP fuse (F101)...	Infinity	Check BFO plate circuit for shorts.
Turn function switch to NORMAL.	PLATE 1/2 AMP fuse (F101)...	2,300 ohms	Check the plate circuits not checked in the above procedure.
Turn function switch to STAND BY, BFO switch OFF, DIAL DIM switch OFF.	LINE 5 AMP fuse (F102).....	2.6 ohms	Check all filament circuits, antenna relay K101, break-in relay K602, crystal oven HR 701, and section 1 of switch S104.
Turn DIAL DIM switch ON.	LINE 5 AMP fuse (F102).....	2.6 ohms	Check the dial light circuit.

46. Operational Test

a. Operate the equipment as described in the equipment performance checklist (TM 11-5820-334-20). This checklist is important because it frequently aids in

troubleshooting. Check for overheated parts, and intermittent

the CARRIER LEVEL. A normal meter indicates satisfactory operation of the second if. amplifier

audio and if. stages. Connect a headset to one of the AUDIO receptacles on the front panel. Turn the function switch to NORMAL and the

switch, the rf. and audio stages are probably operating normally.

c. The calibration-oscillator signal can be used as a convenient means of quickly localizing trouble in the receiver as follows.

- (1) To check the synchronization of the rf bandswitch and the crystal switch, connect a headset to one of the AUDIO receptacles on the front panel. Set the function switch at NORMAL and the AGC switch at

AGC switch to ON. Starting at the 8 KC position of the BAND WIDTH switch, set the switch, in turn, to the 4 KC and 2 KC position. If the volume of the rushing sound heard in the headset decreases noticeably with each lower setting of the BAND WIDTH

switch, localizing the trouble for further testing. Note meter indication usually indicates operation of the agc up to and including the first.

b. To check the operation of the AUDIO receptacles, connect a headset to the function switch

CAL. Starting with the lowest detent (extreme counterclockwise) position of the MEGACYCLES control, turn the control clockwise to each detent position in succession. Adjust the BFO PITCH control to obtain a signal in the headset at each detent position. If no audible signal is heard in a detent position, trouble in the contact of the rf bandswitch or the crystal switch is indicated.

(2) The synchronization of the tuning ~~shaft can be quickly checked as follows:~~

- (a) Set the frequency indicator dial so that the first two digits are zeros and the last three digits indicate 500.
- (b) Set the function switch at NORMAL and the AGC switch at CAL.
- (c) Turn the RF GAIN SQUELCH THRESH control clockwise until an indication is obtained on the CARRIER LEVEL meter.
- (d) Remove the receiver from its case (para 60) and raise the 0.5- to 1-mc rf slug rack (fig. 59) slightly by hand; the indication on the CARRIER LEVEL meter should decrease.

(e) Depress the 0.5- to 1-mc rf slug rack slightly by hand; the indication on the meter should decrease. If the meter indication increases when the slug rack is either raised or depressed, the camshaft is out of synchronization or alignment (para 71).

(f) Repeat procedures (a) through (e) above for each rf slug rack, adjusting the MEGACYCLES control so that the first two digits on the frequency indicator dial indicates a frequency within the band covered by the slug rack being checked.

47. Troubleshooting Chart

The following chart will aid in locating defective components in the radio receiver. This chart lists the symptoms which the repairman observes, either visually or aurally, while making simple tests. The chart also shows how to localize trouble quickly to the defective audio, if., or rf section. The signal-substitution tests outlined in paragraphs 49 through 53 may be used to supplement the tests in this chart. Once the trouble has been localized to a stage, a tube check and voltage and resistance measurements of the stage should isolate the defective part.

Item	Indication	Probable trouble	Procedure
1	When function switch is in NORMAL position, receiver fails to operate and dial lamp does not light. (DIAL DIM switch at ON).	Open LINE 5 AMP fuse (F102) on front panel of receiver.	Replace fuse. If it blows again, check filament circuits for shorts (para 45). Check power connections.
2	Dial lamp lights, but CARRIER LEVEL meter pointer does not deflect (AGC switch set to ON). No reception.	No plate supply voltage. Open PLATE 1/2 AMP fuse (F101) on front panel of receiver.	Replace fuse. If it blows again, test plate circuit for shorts (para 45).
3	No receiver output. CARRIER LEVEL meter pointer rises and dips as KILOCYCLES control is turned.	Defective signal circuits following 2d if. amplifier stage.	Connect headphones with a 0.1-uf capacitor across grid circuits and plate circuits of successive audio stages to localize defective stage. If the audio stages check out, test if. amplifiers following second if. amplifier by signal-substitution (para 51).
4	Some noise in output; no signal reception.	Faulty rf or if. amplifier stage.	Test rf or if. amplifier stages by signal-substitution (para 51 and 52).
5	Hiss in output; no signal reception..	Faulty mixer, oscillator, or rf stages.	Test mixer, rf, and crystal oscillator stages by signal-substitution (para 52).

Item	Indication	Probable trouble	Procedure
6	No beat note during reception when BFO switch is turned to ON and BFO PITCH control is rotated.	Faulty bfo circuit.....	Check BFO switch and BFO PITCH control C101.
7	No calibration beat note when AGC switch is set at CAL. The beat note does not appear at approximately every 100-kc point as the KILOCYCLES control is turned.	Defective calibration-oscillator circuit, or vfo-mixer stage.	Check crystal Y701. Check calibration-oscillator and vfo circuits.
8	Weak signal.....	Weak tubes or low voltage ...	Check input voltage. Check gain of each stage to localize trouble (para 54). If the fault is not located by the above tests, check tuned circuit alignment.
9	Noisy receiver	Noisy antenna location. Poor or loose connections of parts or terminals. A noisy tube.	Short circuit antenna to ground. A considerable decrease in noise indicates a noisy signal from the antenna. Use an insulated prod to tap each tube. If tapping a tube causes more noise in the output, replace that tube. Tap the parts. Move terminals slightly and listen for noisy output. Such noise indicates either a poor solder connection or an intermitten part.
10	Receiver output noisy when controls are operated.	Dirty switch contacts. Poor contact at rotor of control.	Clean switch contacts. Clean or replace control.
11	Distorted signal	Weak tube. Incorrect voltage on tube. Leaky coupling in audio stage. No agc voltage (receiver blocks with a strong signal).	Check for leaky coupling capacitor. Check agc voltage. If agc voltage is low or zero, check agc circuits.
12	With the function switch at SQ, RF GAIN SQUELCH THRESH control at a low gain setting or at extreme counterclockwise position, noise is heard between received signal points on the dial as the KILOCYCLES control is turned.	Faulty squelch circuit.....	If no click is heard as KILOCYCLES control is rotated, check relay K601 for a mechanical bind or an open winding.
13	Receiver normal on 8- to 32-mc bands but inoperative on 0.5- to 8-mc bands.	Defective 1st mixer or 1st crystal oscillator stage.	Check 1st mixer by voltage and resistance measurements (fig. 78). Check 1st crystal oscillator by voltage and resistance measurements (fig. 78).
14	Receiver inoperative on a band.....	Defective crystal in 1st or 2d crystal oscillator stage.	Check appropriate crystal by substitution (para 53).

48. Voltage and Resistance Measurements

For example, if 100,000-ohm resistance is indicated at a given tube socket pin on

Voltage and resistance diagrams for the various subchassis of the receiver are shown in figures 78, 79, and 80. These diagrams show the voltages and resistances which should be obtained at the tube socket pins. If a reading is different from the reading given in the diagrams (outside

a diagram, and the actual indication on the meter is 30,000 ohms, the circuit diagram of the subchassis should be examined for the presence of a component in the circuit under test which could, if defective, account for the incorrect reading (such as a shorted bypass capacitor in the circuit

tolerance limits), the amount under test). To troubleshoot a defective audio module, check each circuit component with an ohmmeter and compare the of variance of variance

measurement with the value given in figure 20. If a measurement is too low, reverse the meter leads and measure again.

Transistors may be checked by substitution. Be careful when soldering transistor leads (para 58).

Caution: Use a TS-352/U on the R x 1000 range for resistance measurements. A lower range may damage the transistors.

40. Signal Substitution

a. Signal substitution in Radio Receiver R-392/URR requires Audio Oscillator TS-382/U for checking the audio circuits and RF Signal Generator AN/URM-25 for checking rf and if. circuits. After locating a defective stage, use the voltage and resistance diagrams (fig. 78, 79, and 80) to locate the defective component.

b. For the tests described in paragraphs 50 through 52, connect the ground lead of the TS-382/U or AN/URM-25 to the subchassis being tested, and connect the signal output lead, through a 0.05-uf capacitor to the point specified. Use the bench testing information (para 41) and take proper precautions (para 42) when preparing the subchassis for signal tracing. To avoid removing a subchassis to inject a signal at a tube socket pin (where no test jack is supplied) remove the tube wind one step.

50. Audio Subchassis Tests (fig. 35-38)

maintain the same signal generator level for each test connection.

tortion from the speaker or headset at various steps in the signal-substitution procedure. Work back from the output to the input stages. If possible, compare results with a receiver known to be in good condition.

d. A tuning shaft which is out of synchronization or a trimmer adjustment that is misaligned may cause reduced output or synchronization of the shafts and cams and the position of the r

switch and the crystal switch should be checked (para 71 through 74) before adjustment of individual tuning coils (para 83 through 90) is attempted. When trouble is localized to a stage, first test the tube, then measure terminal voltages, and finally, measure the resistance of the stage circuits.

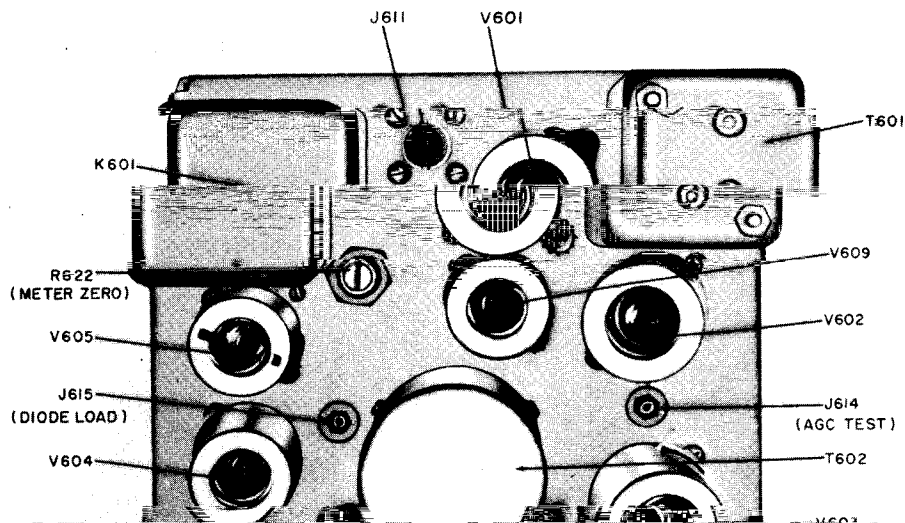
f. Trouble in a stage does not always change the voltage and resistance measurements at the tube socket. Instructions included in this paragraph merely as a guide, and should suggest other procedures, such as resistance measurements of individual parts.

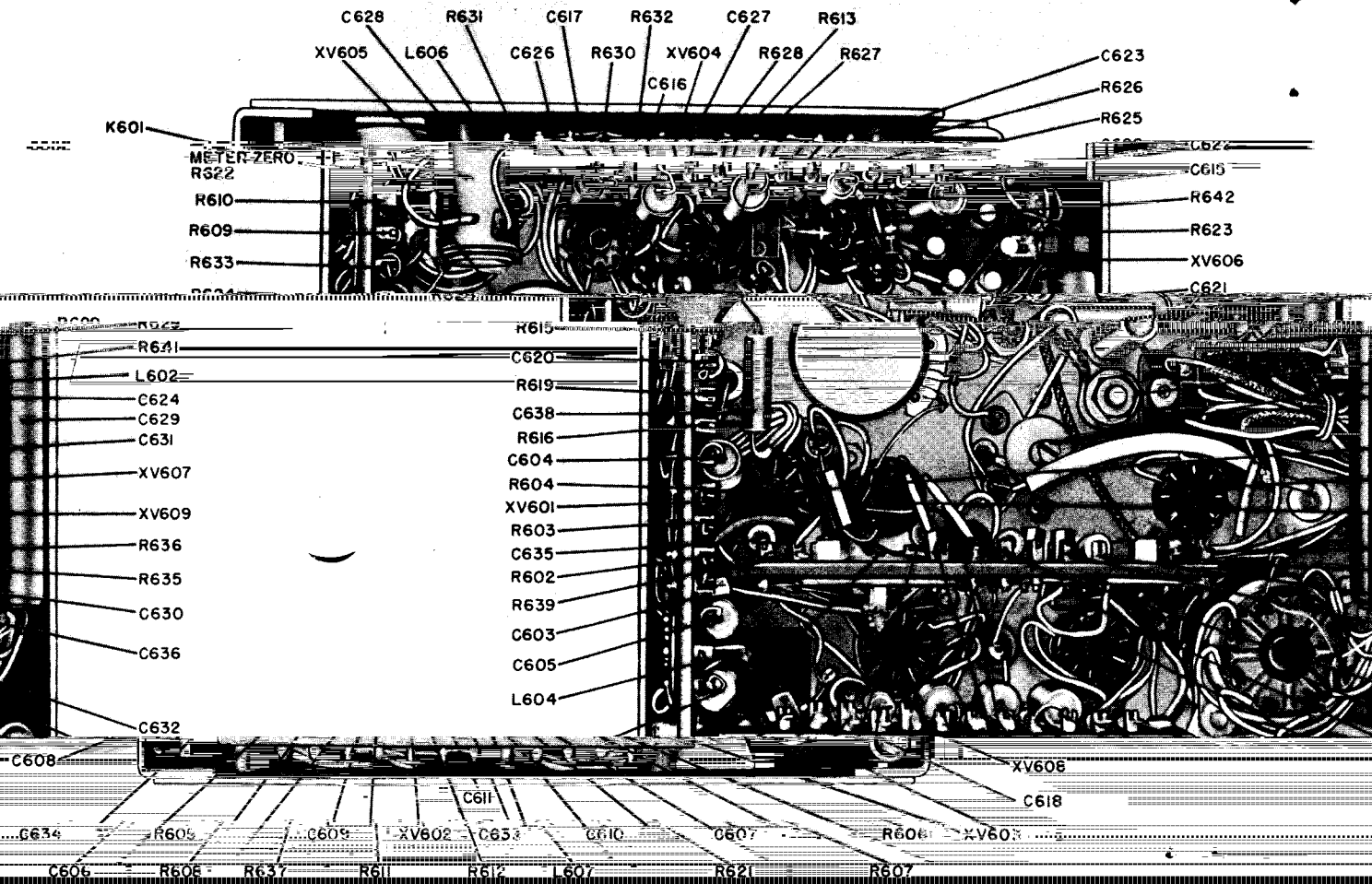
g. In each step, it is assumed that previous steps were completed satisfactorily. Isolate and clear any trouble covered before proceeding with the

turn of a short-circuited ends bared) around the tube. Injection can then be made of the wire. In

Test connection	Normal indication	Corrective measures	Step	
1000-cycle audio signal in 4 and then to pin 8 of	Low-volume tone in headset.	Check headset. Check seating of P113. Check T603. Check C628 for short.	1	Apply a 1,000-cycle audio signal first to pin 4 and then to pin 8 of V608. <i>Note.</i> Steps 2 and 3 do not apply to receiver using an audio module.
1000-cycle audio signal in 1 and then to pin 3 of	Increase in audio volume. Volume is the same for both pin test connections.	Check C626 and C627 for leakage. Check R631 and R632.	2	Apply the 1,000-cycle audio signal first to pin 1 and then to pin 3 of V608.
1000-cycle audio signal in 5 and then to pin 7 of	Audio volume the same as in step 2. Volume is the same for both pin test connections.	Check C626 and C627.	3	Apply the 1,000-cycle audio signal first to pin 5 and then to pin 7 of V607. <i>Note.</i> Steps 4 and 5 apply only to receiver using an audio module.

Step	Test connection	Normal indication	Corrective measures
4	Apply a 1,000-cycle audio signal first to pin 4 and then to pin 8 of the audio module.	Low-volume tone in headset..	Check headset. Check seating of P113. Check T603. Check C628 for short. Check C627.
5	Apply a 1,000-cycle audio signal to pin 7 of V607.	Increase in audio volume	
6	Apply the 1,000-cycle audio signal to pin 1 of V607.	Audio volume slightly less than in step 3 (V608 output) or step 5 (audio module output).	Check R627, R628, and R630. Check C623.
7	Apply the 1,000-cycle audio signal to pin 5 of V606.	Same audio volume as in step 6.	Check C623 for open.
8	Turn RF GAIN SQUELCH THRESH control R105 fully counterclockwise and turn AF GAIN control R103 fully clockwise. Apply the 1,000-cycle audio signal to pin 1 of V606.	Increase in audio volume	Check R623, R625, and R626. Check C622 and C637. Check AF GAIN control R103. Check J603, diode to open circuit.
9	Apply the 1,000-cycle audio signal to J615.	Same audio volume as in step 8.	





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Figure 36. Audio subchassis, bottom view.

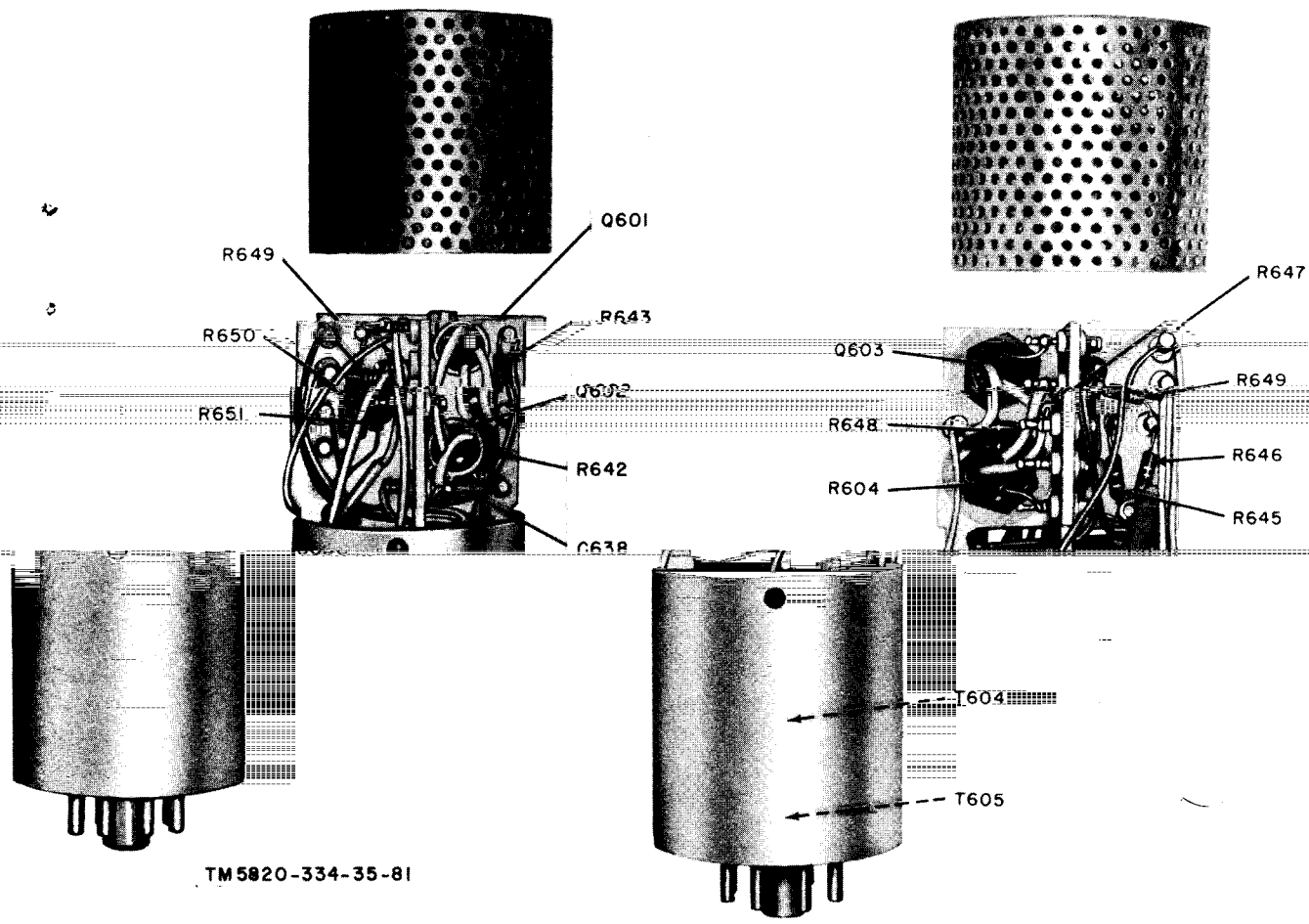


Figure 38. Audio module, right side view, cover removed.

7. Audio module, left side view, cover removed.

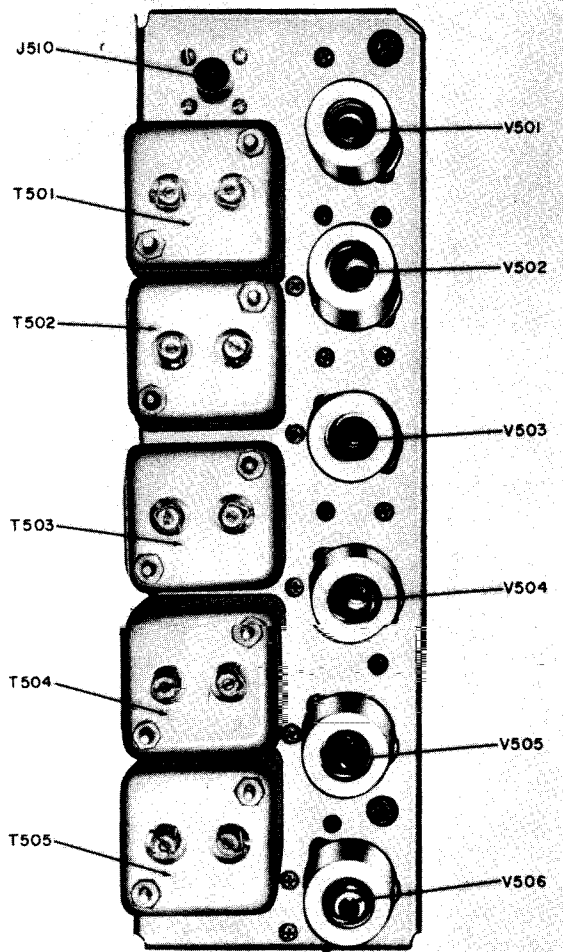
Chassis Tests
(39 and 40)

Test connection	Normal indication	Corrective measures
Modulated 455-kc signal to pin 5 of V506.	Audio heard in headset	Check T601 for open or shorted winding.
Modulated 455-kc signal to pin 1 of V506.	Increase in audio volume . . .	Check C602. Check C529 for open.
Modulated 455-kc signal to pin 5 and then to pin 1 of V504, V503, V502, and V501, in that order.	Audio volume should be approximately the same for all test connections.	Check the components of any stage that does not provide a normal indication.

Figure 39

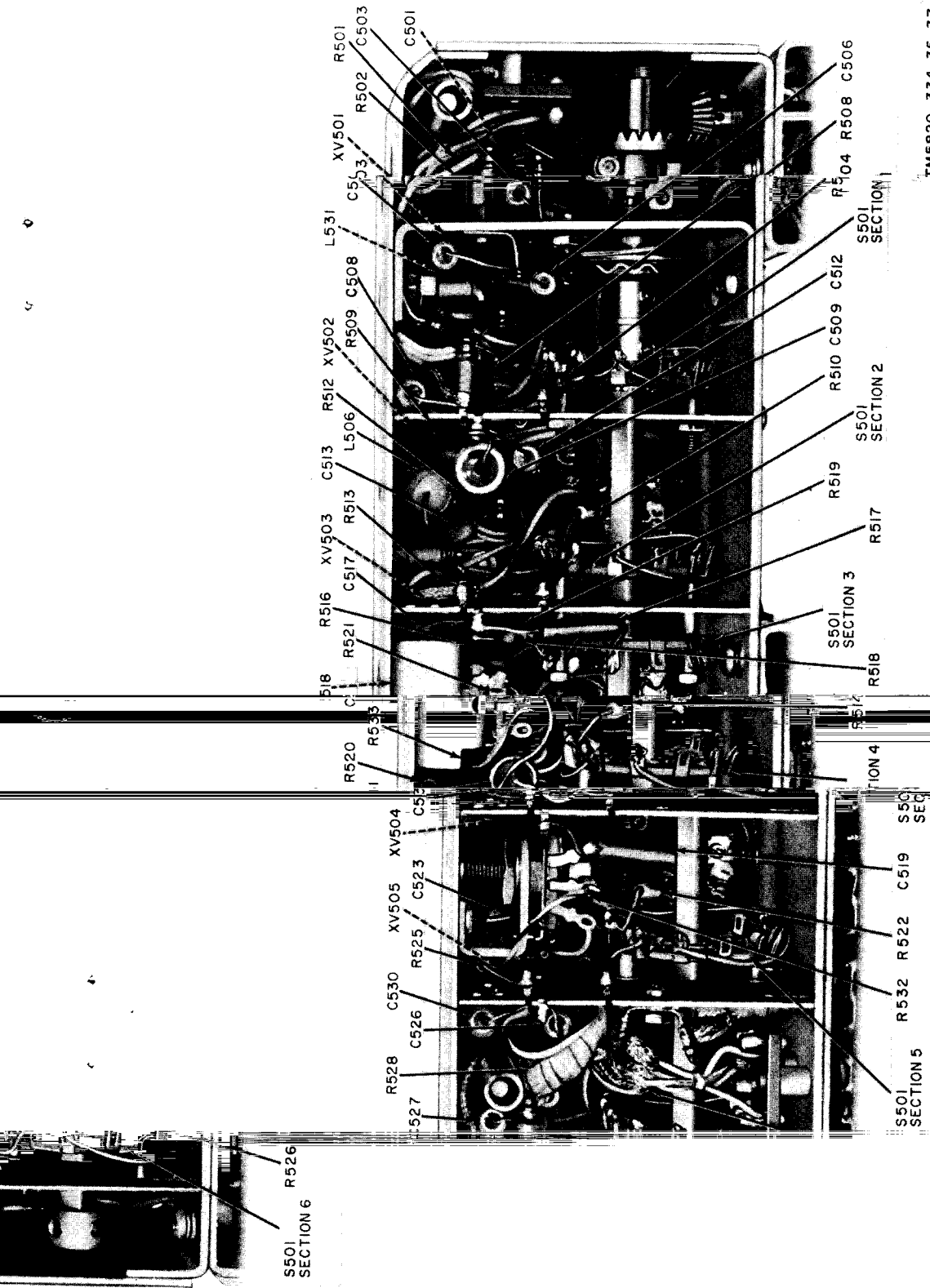
51. If. Subc
(fig.)

Step	
1	Apply a modulated 455-kc signal to pin 5 of V506.
2	Apply the modulated 455-kc signal to pin 1 of V506.
3	Make the following settings on the receiver: Function switch to NORMAL. AGC switch to OFF. GAIN SQUELCH THRESH control fully clockwise. BANDWIDTH switch to 4 KC. Apply the modulated 455-kc signal to pin 5 and then to pin 1 of V504, V503, V502, and V501, in that order.



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Figure 39. If. subchassis, top view.

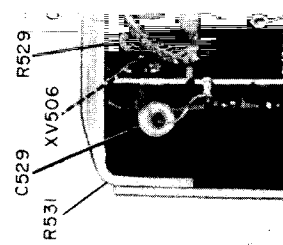


TM5820-334-35-37

Chassis, bottom view.

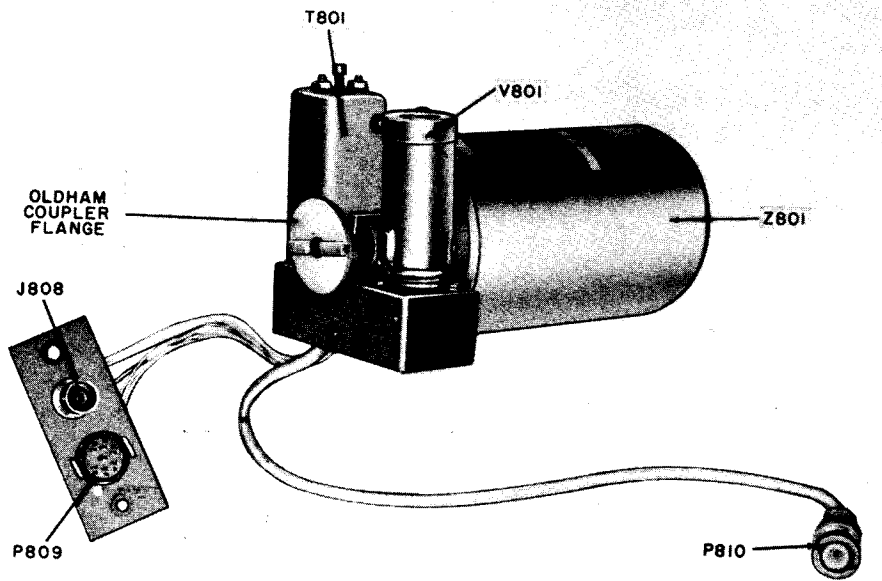
40. If. Su

Figure



52. Vfo, Upper Deck Assembly and Crystal Oscillator Tests (fig. 41-45 and 57)

Step	Test connection	Normal indication	Corrective measures
1	Apply a modulated 455-kc signal to pin 5 of V801 (fig. 41 and 42). <i>Note.</i> For the remaining steps, tune the receiver to 2 mc in the 1- to 2-mc band (indicator reading of 01+000 (note plus sign)).	Audio heard in headset	Check seating of P810. Check T801 for open or shorted winding. Check C501.
2	Disconnect P208 from J808 and apply a 2-mc modulated signal to J808 (fig. 41).	Audio heard in headset	Check alignment of Z801 (para 75).
3	Reconnect P208 to J808. Apply a 2-mc modulated signal to pin 7 of V204 (fig. 43).	Audio heard in headset	Check synchronization of Z222, Z223 and Z224 (para 73 and 87).
4	Apply a 10-mc modulated signal to E204 (fig. 43).	Audio heard in headset	Disconnect P402 from J402 (fig. 45 and 57) and check for 2 to 3 volts of rf voltage at P403. If the rf voltage is normal, check alignment of Z222, Z223, and Z224 (para 87). If the rf voltage is abnormal, check alignment of oscillator circuits (para 85).
5	Apply a 10-mc modulated signal to pin 7 of V203 (fig. 43 and 44).	Audio heard in headset	Check synchronization of first variable if. slug rack and can rack (para 73).
6	Apply a 2-mc modulated signal to E203 (fig. 43).	Audio heard in headset	Disconnect P402 from J202 (fig. 45 and 57) and check for 2 to 3 volts of rf voltage at P402. If the rf voltage is normal, check alignment of Z219, Z220, and Z221 (para 88). If the rf voltage is abnormal, check alignment of T401 (para 86).
7	Apply a 2-mc modulated signal to pin 5 of V202 (fig. 43 and 44).	Audio heard in headset	Check Z214. Check sections 6 and 7 of S201. Check synchronization of slug rack for Z214 (para 73).
8	Apply a 2-mc modulated signal to pin 1 of V202 (fig. 43 and 44).	Increase in audio volume . . .	Check V202 circuit components.
9	Apply a 2-mc modulated signal to pin 5 of V201 (fig. 43 and 44).	Same audio volume as in step 8.	Check Z208. Check sections 4 and 5 of S201. Check synchronization of slug rack for Z208 (para 73).
10	Apply a 2-mc modulated signal to pin 1 of V201 (fig. 43 and 44).	Increase in audio volume . . .	Check V201 circuit components.
11	Apply a 2-mc modulated signal to ANT post E101.	Same audio volume as in step 10.	Check seating of P206 (fig. 43). Check relay K101 (fig. 43). Check sections 1 and 2 of S201 (fig. 44). Check Z202 (fig. 43 and 44). Check synchronization of slug rack for Z202 (para 73).



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Figure 41. Vfo subchassis.

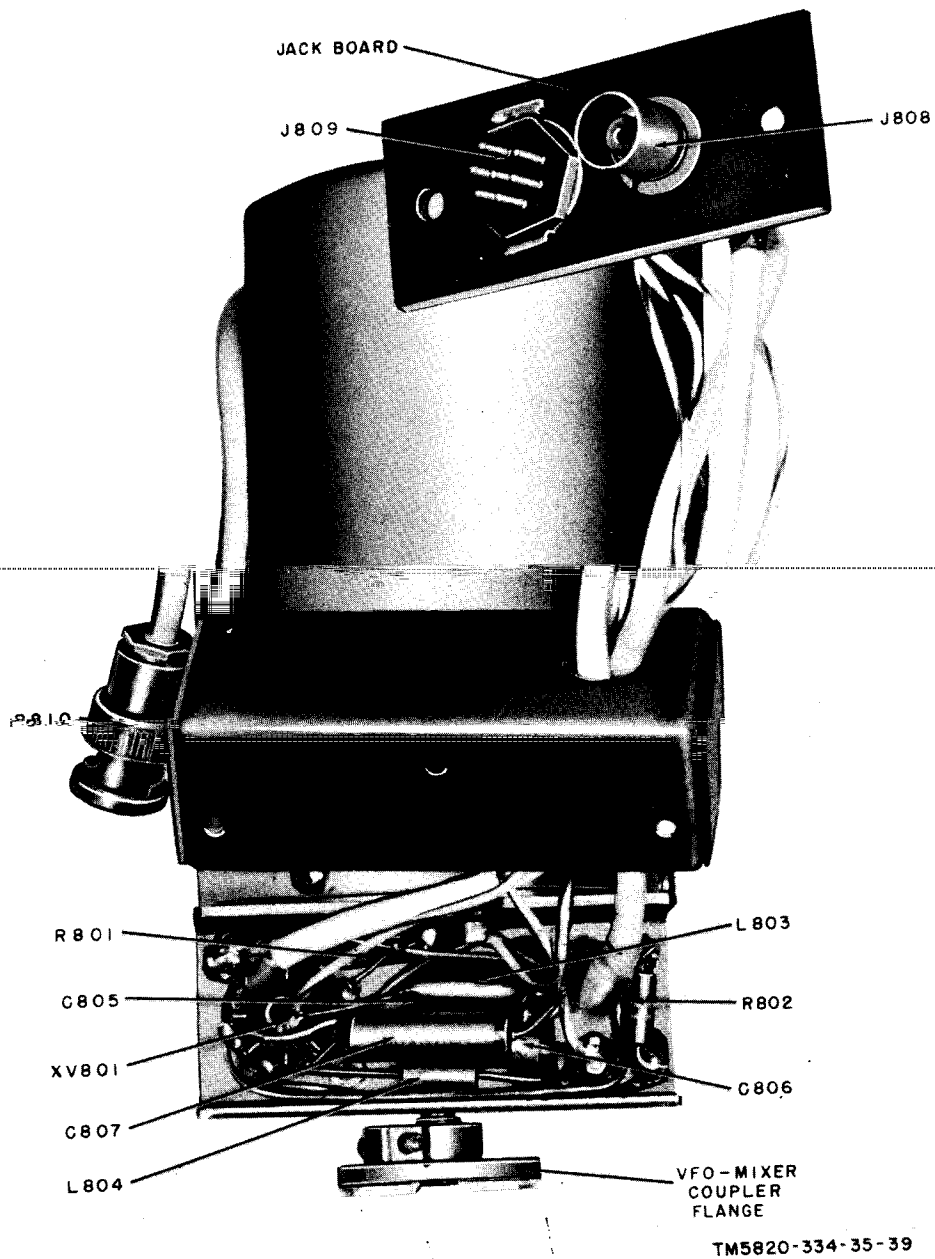
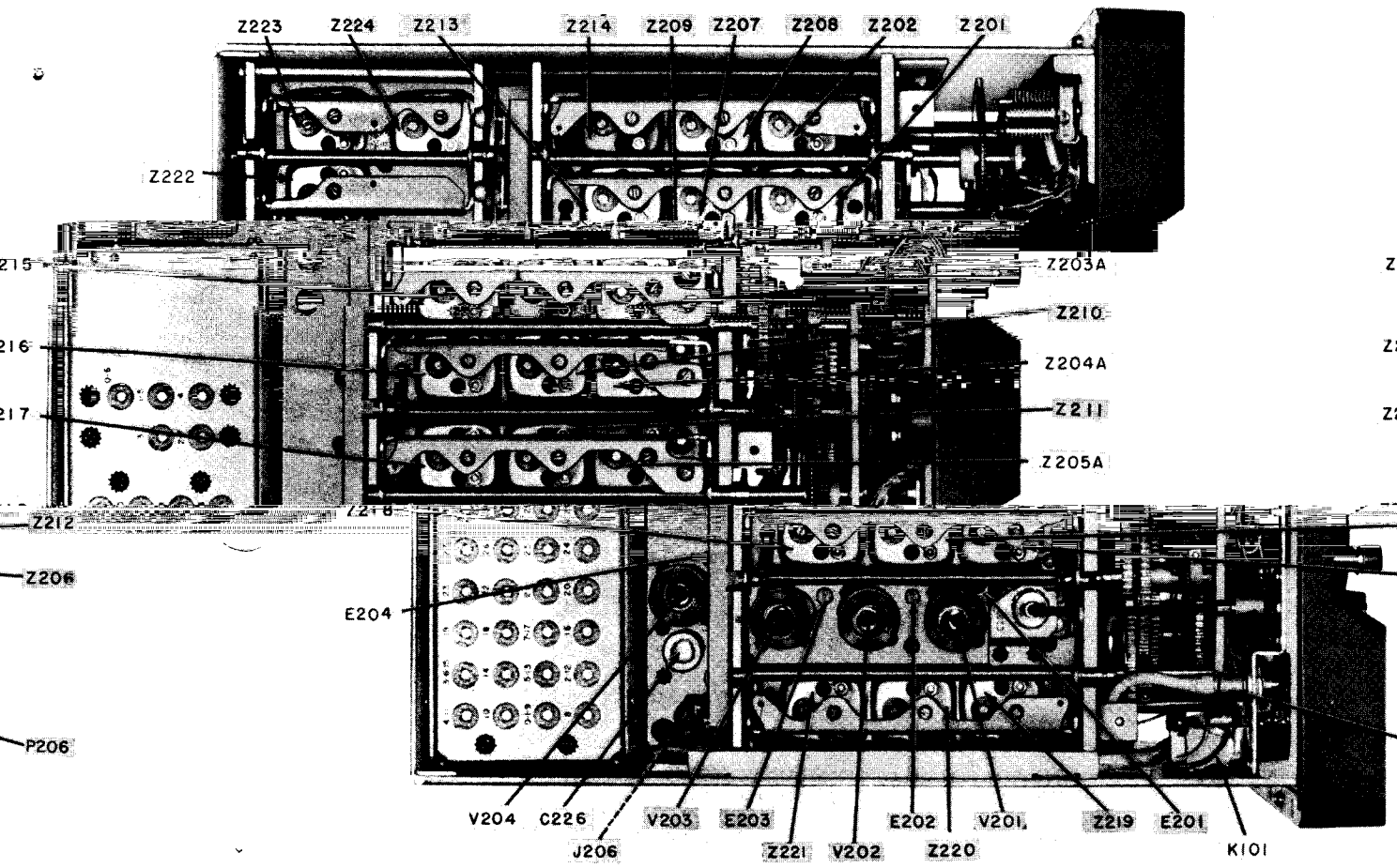


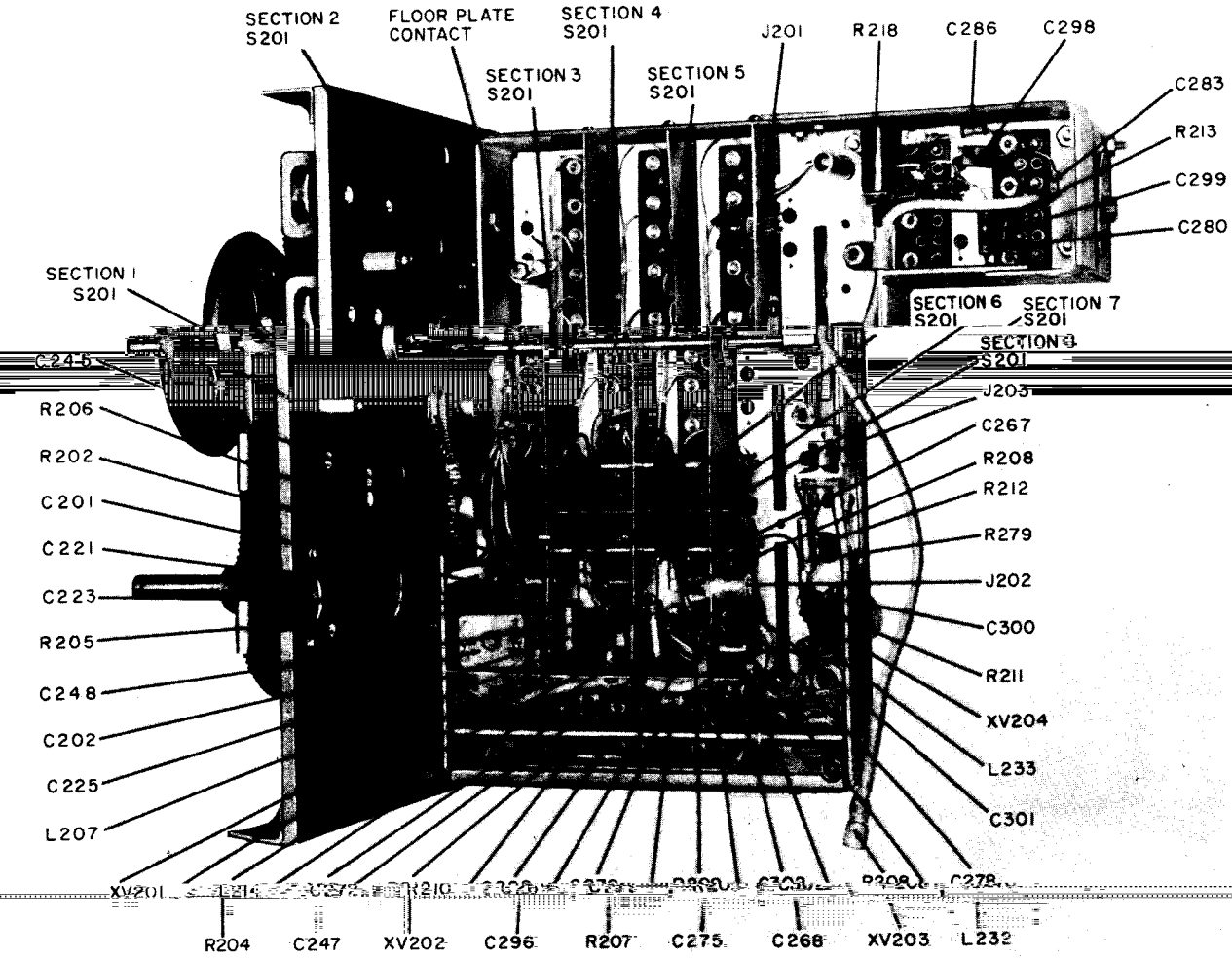
Figure 42. Vfo subchassis, bottom cover removed.



334-35-40

TM5820-3

Figure 43. Upper deck assembly, top view.



TM5820-334-35-41

Figure 44. Upper deck assembly, bottom view.

53. Checking Oscillator Crystals

Frequency (mc)	Bands (mc)
13	10-11 23-24
8.5	14-15
11.333	31-32
10.667	29-30
10.333	28-29
9.667	26-27
12.5	22-23
11.5	20-21
10.5	18-19
9.5	16-17

Gain Charts

Gain charts list the minimum and maximum voltages required at each of the stages of the receiver to produce a negative dc volts across the resistor. Use these charts as a guide when troubleshooting to check the gain of the receiver and the output of an rf or if. stage or group of stages. If the receiver output is low and not normal, localize the defect by checking the signal voltage at each stage against the chart during troubleshooting, by signal-substitution, or by measuring the individual stage gain.

For accurate readings using a meter, Meter ME-26/U connected between jack J615 (fig. 35) and ground (diode lead). Connect the ground lead of RF Signal Generator AN/URM-25 to the receiver ground, and connect the generator output through a 0.05-microfarad (uf) capacitor to the receiver points indicated in the charts.

Use a 50-micromicrofarad (uuf) capacitor to connect to the ANT binding (E101) on the front panel. When checking the 455-kc if. stages, gain access to the injection points by winding 1 turn of a length of wire around the desired pin on the tube in the stage being tested. Measure the output from the AN/URM-25 receiver to obtain the diode-load reference voltage of 2.5 volts against the figures given in the charts. The lowest figure is the minimum, and the highest is the maximum

(fig. 46, 48, and 49)

If an oscillator crystal is suspect, it can be readily checked by substituting a crystal of the same type known to be good.

a. First Crystal Oscillator Crystal Location. The following chart lists the crystal symbol, the fundamental frequency, and the bands in which each crystal in the first crystal oscillator is used. Refer to figure 49 for crystal location.

Crystal symbol	Fundamental frequency (mc)	Bands (mc)
Y401	9	0.5-1 6-7
Y402	8	1-2 5-6
Y403	10	2-3 7-8
Y404	12.6	3-4
Y405	7	4-5

b. Second Crystal Oscillator Crystal Location. The following chart lists the crystal symbol, the fundamental frequency, and the bands in which each crystal in the second crystal oscillator is used. Refer to figures 46 and 48 for crystal location.

Crystal symbol	Fundamental frequency (mc)	Bands (mc)
Y406	12	0.5-1 1-2 9-10 21-22
Y407	15	2-3 12-13
Y408	6.2	3-4
Y409	14	4-5 11-12 25-26
Y410	8	5-6 13-14
Y411	9	6-7 15-16 24-25
Y412	10	7-8 17-18 27-28
Y413	11	8-9 19-20 30-31

Y414
Y415
Y416
Y417
Y418
Y419
Y420
Y421
Y422
Y423

54. Stage-Gain

The stage-gain and maximum level of the rf and if stages produce 2.5 volts diode-load reference a standard value for the overall gain of each stage. When the tubes test, the tube test level of each stage is troubleshooted by measuring the stage gain. Obtain the stage-gain reference voltage between the diode-load and the ground lead through the diode load to the diode load chart. The capacitor is connected to the post (E101) on the front panel. When checking the 455-kc if. stages, gain access to the injection points by winding 1 turn of a length of wire around the desired pin on the tube in the stage being tested. Measure the output from the AN/URM-25 receiver to obtain the diode-load reference voltage of 2.5 volts against the figures given in the charts. The lowest figure is the minimum, and the highest is the maximum

that should be required over the specified
frequency range for normal operation

this range does not necessarily indicate
a receiver malfunction.

56. Dc Resistances of Transformers and Coils

The dc resistances of the transformer windings and the coils in Radio Receiver R-392/URR are listed in *a* and *b* below.

a. Rf and Crystal Oscillator Subchassis (fig. 43, 44, and 45).

Transformer or coil	Terminals	Ohms
Z201	1-3, 4	2.5
Z207	1-3	2.5
Z213	1-3	2.5
Z202	1-3, 4	3.0
Z208	1-3	1.9
Z214	1-3	1.9
Z203A	1-3	0.2
	1-4	1.6
Z209	1-3	1.15
Z215	1-3	1.15
Z204A	1-3	0.3
	1-4	0.6
Z210	1-3	0.33
Z216	1-3	0.33
Z205A	1-3	0.1
	1-4	0.2
Z211	1-3	0.15
Z217	1-3	0.15
Z206	1, 4-3	0.1
Z212	1-3	Less than 0.1
Z218	1, 4-3	Less than 0.1
Z219	1-3	0.16
Z220	1-3	0.16
Z221	1-3	0.16
Z222	1-3	1.7
Z223	1-3	1.7
Z224	1-3	1.7
T401	1-2	Less than 0.1
	3-4	Less than 0.1
T402	1-2	Less than 0.1
	3-4	Less than 0.1

b. Lower Deck Assembly (fig. 36 and 40).

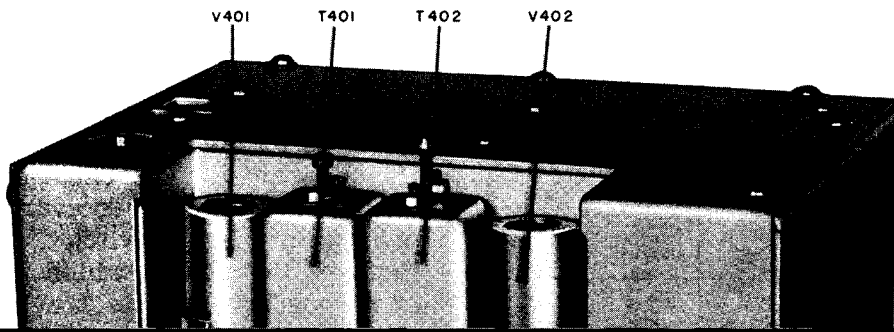
Transformer or coil	Terminals	Ohms
T501	2-9	0.9
	3-10	0.6
T502	2-9	1.2
T503	2-9	1.2
T504	3-10	0.6
T505	3-10	0.6
T601	1-9	1.4
	4-6	1.5
T603	2-3	100

second mixer (V204, column 7, *b* below). The 2.5-mc output frequency of the second

57. Rf and Variable If. Conversion Scheme (fig. 81)

The charts in *a* and *b* below are provided so that the frequency conversion scheme of Radio Receiver R-392/URR may be easily understood. The chart in *a* shows the band to which the receiver is tuned, the position of rf bandswitch S201 and the contacts of the switch which are closed for each position (there are six positions), the frequency range of the antenna and rf coil in use, and the contact of 32-position crystal oscillator switch S401. The chart in *b* shows the crystal frequency and the output frequency of the first crystal oscillator, the frequency range of the first variable intermediate frequency, the crystal frequency and the output frequency of the second crystal oscillator, the frequency range of the second variable intermediate frequency and the vfo-mixer, and the resultant intermediate frequency of 455 kc. The following is an example of the use of the charts: The frequency indicator dial reading is 05 500 (5.5 mc). The band in use is from 5 to 6 mc (column 1, *a* below). The rotating segment of rf bandswitch S201 connects contact 8 to 5 (column 2, *a* below) into the circuit, which selects the 4- to 8-mc antenna and rf coils (column 3, *a* below). The rotating arm of crystal oscillator switch S401 connects contact 5 (column 4, *a* below) in the circuit, which connects the crystal to be used in the first crystal oscillator (column 2, *b* below). This frequency is 8 mc. The output frequency of the first crystal oscillator is 8 mc (column 3, *b* below), which is heterodyned with 5.5 mc in the

first mixer (V203) to produce a variable intermediate frequency of 2.5 mc (column 4, *b* below). The frequency of the second crystal oscillator is 8 mc (column 5, *b* below), and the output frequency is 16 mc (column 6, *b* below). The 16-mc output of the second crystal oscillator is heterodyned with the signal of the first variable intermediate frequency to produce a 2.5-mc variable intermediate frequency



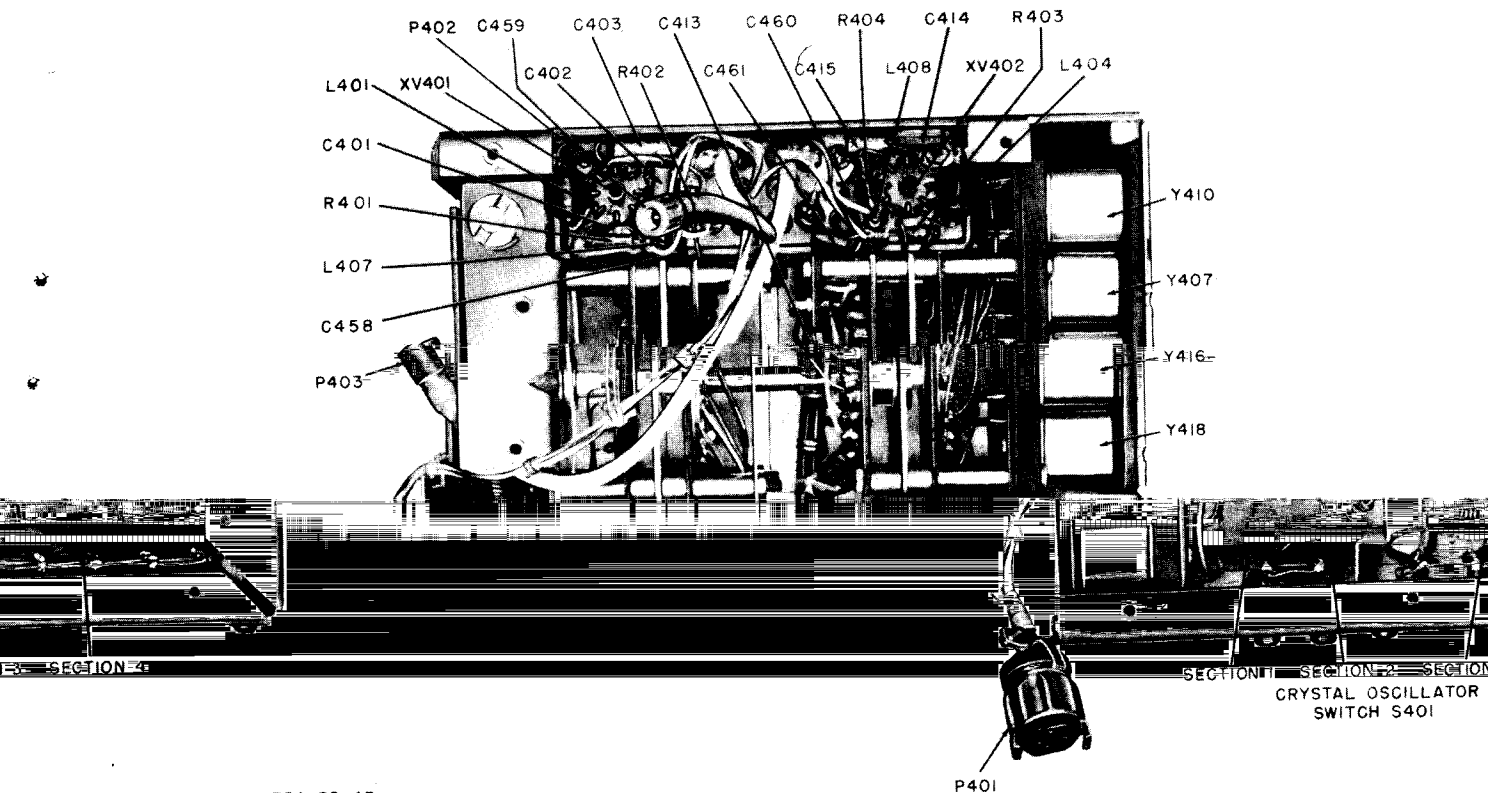
a Antenna and If. Amplifier Circuit Selection.

2		3	4	1
Rf bandswitch S201 (fig. 81)		Range of antenna and rf coils (mc)	Contact of switch S401 (fig. 81)	Band (mc)
Position	Circuit closed between contacts:			
8 and 1	0.5-1	0	0.5-1	1
1-2	1	1-2	2	8 and 2
2-4	2	2-3	3	8 and 3
2-4	3	3-4	3	8 and 3
4-8	4	4-5	4	8 and 5
4-8	5	4-5	4	8 and 5
6		6-7	4	8 and 5
7		7-8	4	8 and 5
8		8-9	5	8 and 6
9		9-10	5	8 and 6
10		10-11	5	8 and 6
11		11-12	5	8 and 6
12		12-13	5	8 and 6
13-14		13-14	5	8 and 6
14-15		13-14	5	8 and 6
15-16		15-16	5	8 and 6
16-32	14	16-17	6	8 and 7
16-32	15	17-18	6	8 and 7
16-32	16	18-19	6	8 and 7
16-32	17	19-20	6	8 and 7
16-32	18	20-21	6	8 and 7
16-32	19	21-22	6	8 and 7
16-32	20	22-23	6	8 and 7
16-32	21	23-24	6	8 and 7
16-32	22	24-25	6	8 and 7
16-32	23	25-26	6	8 and 7
16-32	24	26-27	6	8 and 7
16-32	25	27-28	6	8 and 7
16-32	26	28-29	6	8 and 7
16-32	27	29-30	6	8 and 7
16-32	28	30-31	6	8 and 7
16-32	29	31-32	6	8 and 7
16-32	30			
16-32	31			

b. Oscillator and If. Circuit Selection.

1	2	3	4	5	6	7	8	9
Band (mc)	1st xtal osc crystal freq (mc)	1st xtal osc output freq (mc)	1st variable if. range (mc)	2nd xtal osc crystal freq (mc)	2d xtal osc output freq (mc)	2d variable if. range (mc)	Vfo-mixer range (mc)	Fixed intermediate frequency (kc)
0.5-1	9	9	9.5-10	12	12	2.5-2 ^a	2.955-2.455 ^a	455
1-2	8	8	9-10	12	12	3-2	3.455-2.455	455
2-3	10	10	12-13	15	15	3-2	3.455-2.455	455
3-4	12.6	12.6	15.6-16.6	6.2	18	3-2	3.455-2.455	455
4-5	7	7	11-12	14	14	3-2	3.455-2.455	455
5-6	8	8	13-14	8	16	3-2	3.455-2.455	455
6-7	9	9	15-16	9	18	3-2	3.455-2.455	455
7-8	10	10	17-18	10	20	3-2	3.455-2.455	455
8-9	Not in use after first eight frequency bands.			11	11	3-2	3.455-2.455	455
9-10				12	12	3-2	3.455-2.455	455
10-11				13	13	3-2	3.455-2.455	455
11-12				14	14	2-3	3.455-2.455	455
12-13				15	15	3-2	3.455-2.455	455
13-14				8	16	3-2	3.455-2.455	455
14-15				8.5	17	3-2	3.455-2.455	455
15-16				9	18	3-2	3.455-2.455	455
16-17				9.5	19	3-2	3.455-2.455	455
17-18				10	20	3-2	3.455-2.455	455
18-19				10.5	21	3-2	3.455-2.455	455
19-20				11	22	3-2	3.455-2.455	455
20-21				11.5	23	3-2	3.455-2.455	455
21-22				12	24	3-2	3.455-2.455	455
22-23				12.5	25	3-2	3.455-2.455	455
23-24				13	26	3-2	3.455-2.455	455
24-25				9	27	3-2	3.455-2.455	455
25-26				14	28	3-2	3.455-2.455	455
26-27				9.666	29	3-2	3.455-2.455	455
27-28				10	30	3-2	3.455-2.455	455
28-29				10.333	31	3-2	3.455-2.455	455
29-30				10.666	32	3-2	3.455-2.455	455
30-31				11	33	3-2	3.455-2.455	455
31-32				11.333	34	3-2	3.455-2.455	455

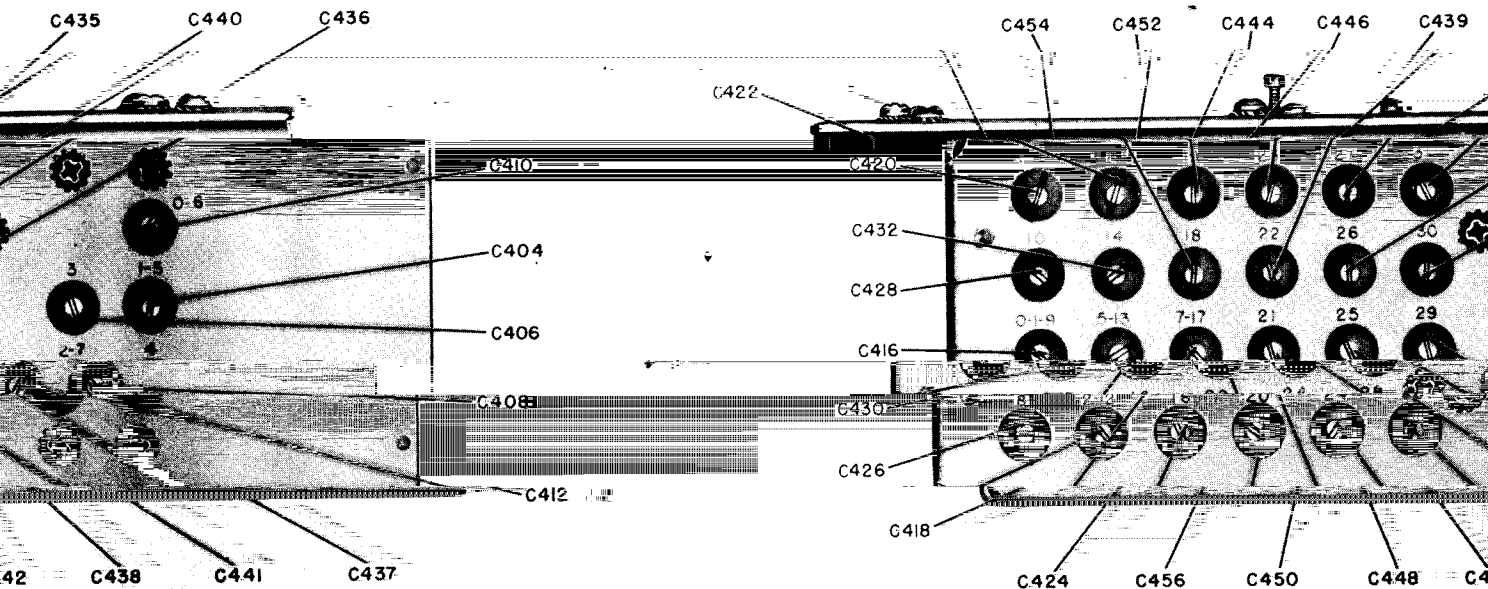
^a The range of the second variable if. is from 2.5 to 2.0 mc for the 0.5- to 1-mc band, and from 3.0 to 2.0 for all other bands.



TM5820-334-35-43

front view, cover removed.

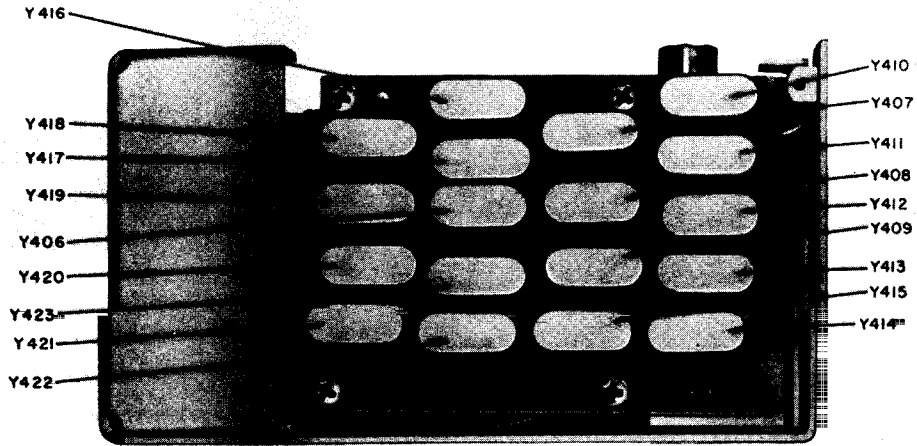
Figure 46. Crystal oscillator subchassis,



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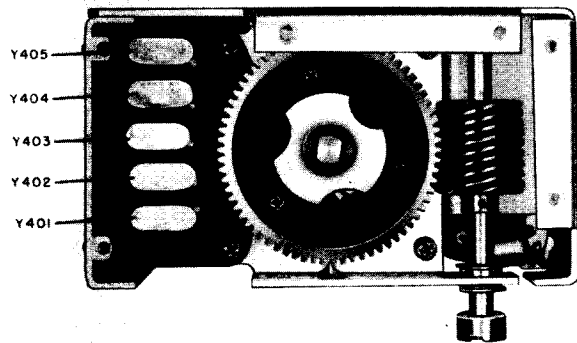
tor subchassis, top view.

Figure 47. Crystal oscilla



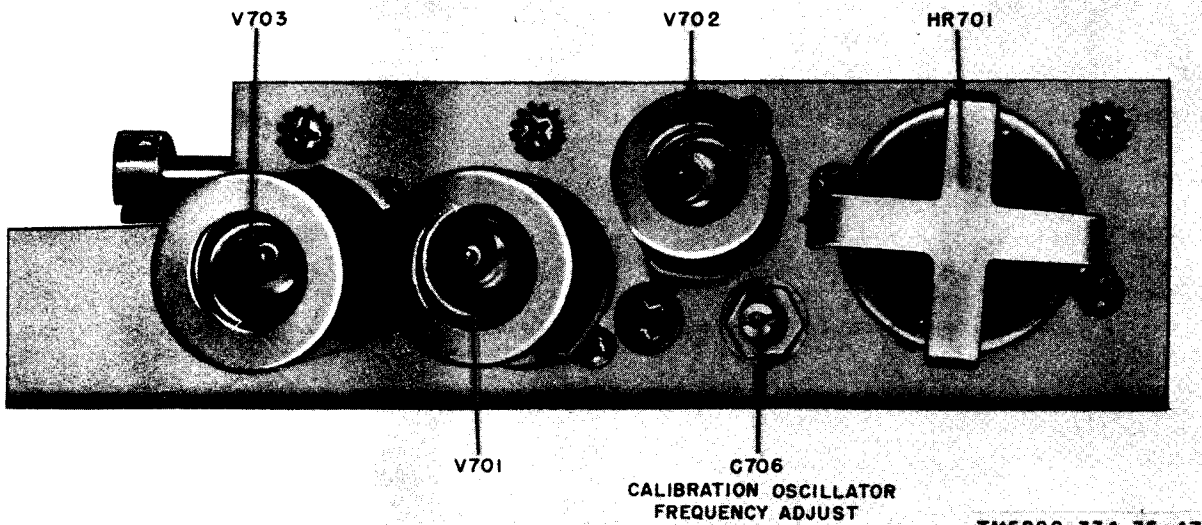
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Figure 48. Crystal oscillator subchassis, left side view, cover removed.



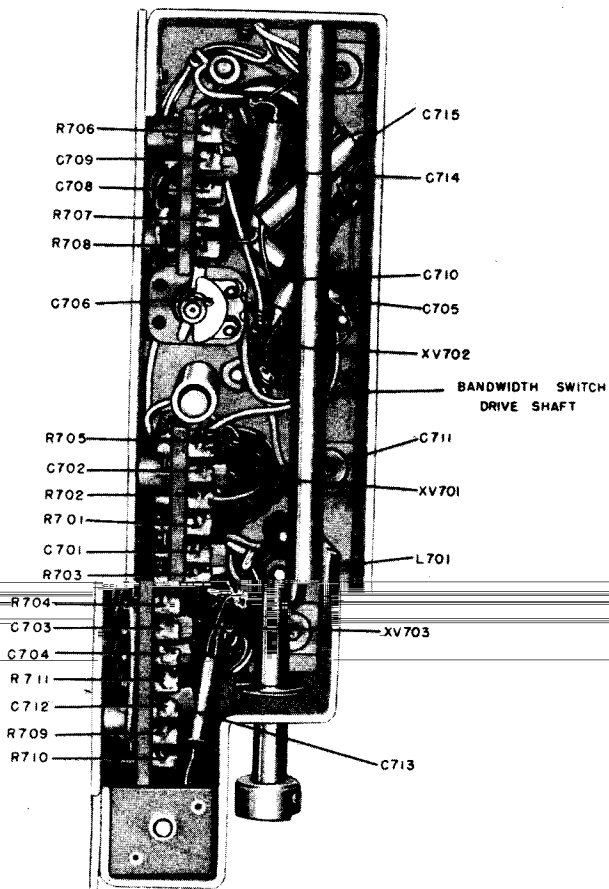
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Figure 49. Crystal oscillator subchassis, right side view, cover removed.



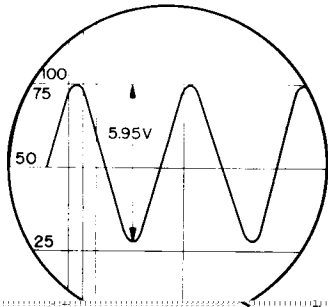
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Figure 50. Calibration oscillator subchassis, top view.

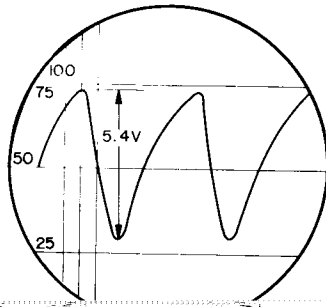


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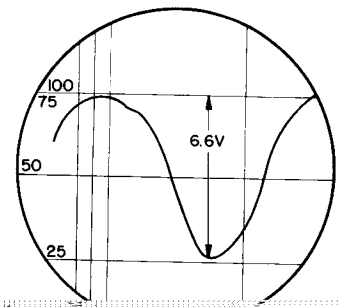
*Figure 51. Calibration oscillator subchassis,
bottom view.*



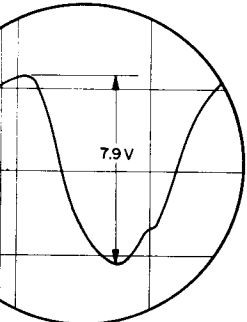
(A)
WAVEFORM AT GRID
PIN 1, V702



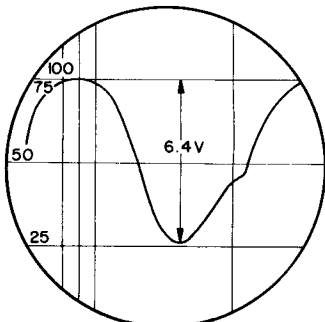
(B)
WAVEFORM AT PLATE
PIN 5, V702



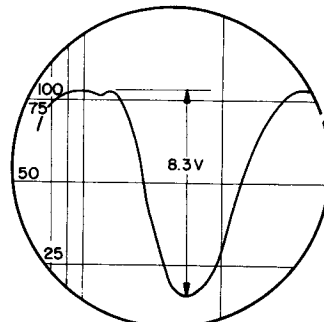
(C)
WAVEFORM AT GRID
PIN 2, V701



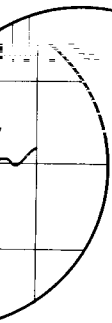
(D)
WAVEFORM AT PLATE
PIN 1, V701



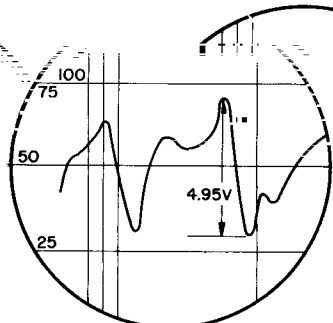
(E)
WAVEFORM AT GRID
PIN 7, V701



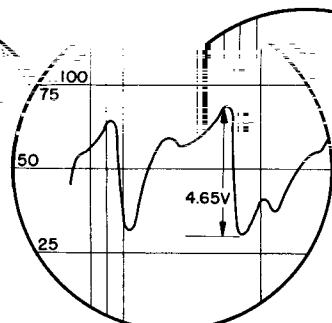
(F)
WAVEFORM AT PLATE
PIN 6, V701



(G)
WAVEFORM AT G
PIN 2, V703



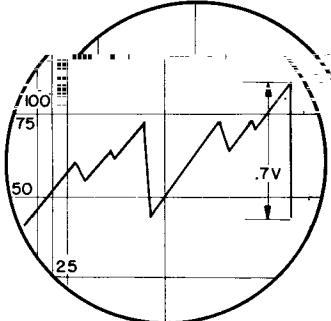
(H)
WAVEFORM AT PLATE
PIN 1, V703



(J)
WAVEFORM AT GRID
PIN 7, V703



(K)
WAVEFORM AT PLATE
PIN 6, V703
WITHOUT L702



(L)
WAVEFORM AT PLATE
PIN 6, V703

calibration oscillator subchassis.

Figure 52. Waveforms in c

CHAPTER 3

REPAIRS AND ALIGNMENT

Note. All repairs and alignment may be performed by third echelon maintenance personnel unless otherwise noted.

Section I. REPAIRS

58. General Parts Replacement Techniques

Most of the parts in the receiver can be reached and replaced without special procedures. The following precautions apply specifically to this receiver.

a. When a ceramic-type capacitor is soldered, be careful not to overheat the

capacitor. Fully insert a Bristle thread. Avoid stripping the slots in the

Case

Remove the receiver case

in the 10 captive Allen-head screws around the edges of the front panel by turning the screws counterclockwise until they are completely free of the case.

Fully tilt the receiver until it rests on its front panel. Lift off the case.

Note. Replace the receiver case as follows:

Place the receiver on its front

and place the case over the receiver.

Fully place the receiver in the normal position.

Insert the 10 captive Allen-head screws in the front panel.

To gain access to the parts in the front panel or to prepare the upper deck assembly, remove the front panel as follows:

move a coaxial plug, press the plug in slightly and twist counterclockwise to release, then pull the plug straight out. Where coaxial plugs are not readily accessible, use Tube Puller TL-201 to remove the plugs. Do not loosen gear clamp screws too much; the clamp screw nuts may drop off.

Excessive tightening of the clamp screws may strip the threads. Use a pencil-type soldering iron with a 25-watt maximum capacity.

b. When soldering in the transistorized audio module, use a pencil-type soldering iron with a 25-watt maximum capacity. Before using a soldering iron, check for a short between the element and the tip. Do not use if shorted. Use an isolating transformer when only an ac operated iron is available. When soldering a transistor, grasp the lead between the transistor and the solder connection with a pair of long-nosed pliers to dissipate the heat.

59. Removal and Replacement

Note. Removal and replacement of the rf gear train assembly is performed at fourth echelon.

All subchassis, except the rf subchassis, can be removed from the receiver without prior removal of any of the other assemblies. When the rf and vfo subchassis are removed from the receiver, avoid changing the positions of the kilocycles and vfo tuning shafts, since this will necessitate synchronization checks. Where possible, preset the receiver controls before removing the subchassis. Subchassis mounting (captive) screws are color-coded with green heads. When removing a subchassis, loosen the captive screws enough to free them from the main frame. When replacing a subchassis, properly position the subchassis and start all captive screws before tightening them all the way. To re-

may strip the threads. Use a wrench to avoid screwhead.

60. Receiver Case

a. Removal of the receiver case as follows:

- (1) Loosen the screws on the front panel.
- (2) Carefully lift the receiver case.
- (3) Lift off the receiver case.

b. Replace the receiver case as follows:

- (1) Place the receiver case on the front panel.
- (2) Slip the receiver case over the front panel.
- (3) Carefully tighten the screws to normal torque.
- (4) Tighten the screws.

61. Front Panel

a. Removal of the front panel mounted on the receiver for removal of the receiver (para 63), remove the front panel as follows:

- (1) Remove the screws.

- (2) Remove the cable clamp from the bottom of the front cam guide plate (fig. 53).
- (3) Disconnect plugs P111, P112, P113, and P106 from their associated receptacles (fig. 53 and 54).

- mechanism is in the proper position.
- (5) Replace the DIAL LOCK knob.
 - (6) Replace the BAND WIDTH knob.
 - (7) Replace the MEGACYCLES and KILOCYCLES knobs and tighten the

plug P109 on the vfo jack board (fig. 53).
 Remove the cable clamp at the top of the receiver (fig. 54) by removing the two screws which clamp to the left side-

- (8) Replace the flexible shaft coupling onto the ANT TRIM coupling at the front panel and tighten the setscrews.
- (9) Connect plug P206 to receptacle J106 (fig. 54).
- (10) Replace the gear cover plate (fig. 54).
- (11) Replace the cable clamp located at the top left side of the receiver (fig. 54).
- (12) Connect plug P109 to receptacle J809 on the vfo jackboard (fig. 53).
- (13) Connect the following plugs in their associated receptacles: P111 in J611, P112 in J612, P113 in J613 and P106 in J206 (fig. 53 and 54).
- (14) Replace the cable clamp at the bottom of the front cam guide plate (fig. 53).
- (15) Replace the receiver case (para 60).

- (4) Disconnect the jack board.
- (5) Remove the left side of the receiver by removing the screws and secure the floor plate.
- (6) Remove the receiver from the gear cover and lift off.
- (7) Disconnect the TRIM flexible shaft coupling at the front panel and remove the TRIM coupling.
- (8) Loosen the TRIM flexible shaft coupling at the front panel and remove the TRIM coupling.
- (9) Loosen the MEGACYCLES and KILOCYCLES knobs.
- (10) Remove the DIAL LOCK knob. Loosen the nut on the DIAL LOCK knob and rotate the dial lock (fig. 55) to clear the kilocycle disk.

Remove the three Phillips screws which secure the gear coverplate (fig. 54), and lift off the plate.

Remove plug P206 (fig. 54).
 Remove the setscrews on the ANT TRIM flexible shaft (fig. 54) at the front panel end, and remove the flexible shaft and cou-

Remove the setscrews in the MEGACYCLES and the KILOCYCLES knobs, and remove the

Remove the DIAL LOCK knob. Remove the nut and washer on the DIAL LOCK bushing, and rotate the dial lock (fig. 55) to clear the kilocycle disk (fig. 56).

62. Lower Deck Assembly

Remove the BAND WIDTH knob. Remove the 10 flat-head Phillips screws which secure the front panel to the side plates of the receiver.

The lower deck assembly, which consists of af, if., and calibration oscillator subchassis is removed as a single unit.

Remove the front panel from the receiver. Remove the front panel from the receiver.

a. Removal. The lower deck assembly can be removed from the receiver without prior removal of the front panel, upper deck assembly, or vfo subchassis. Proceed as follows:

- (1) Remove the receiver case (para 60) and place the receiver on the workbench with the lower deck assembly up.
- (2) Remove the cable clamp from the front cam guide plate.
- (3) Disconnect plugs P810, P111, P112, and P113 from their associated receptacles.
- (4) Loosen the five green captive screws which secure the lower deck assembly to the floor plate.

- (11) Remove the BAND WIDTH knob.
- (12) Remove the 10 flat-head screws which secure the front panel to the side plates of the receiver.
- (13) Pull the front panel from the receiver.

b. Replacement. Replace the lower deck assembly as follows:

- (1) Bring the front panel against the receiver.
- (2) Replace and tighten the Phillips screws which secure the front panel to the side plates of the receiver.
- (3) Rotate the dial lock mechanism so that the jaws of the dial lock are in the proper position to grasp the kilocycle disk (fig. 55 and 56).
- (4) Tighten the nut on the DIAL LOCK bushing. Be sure the

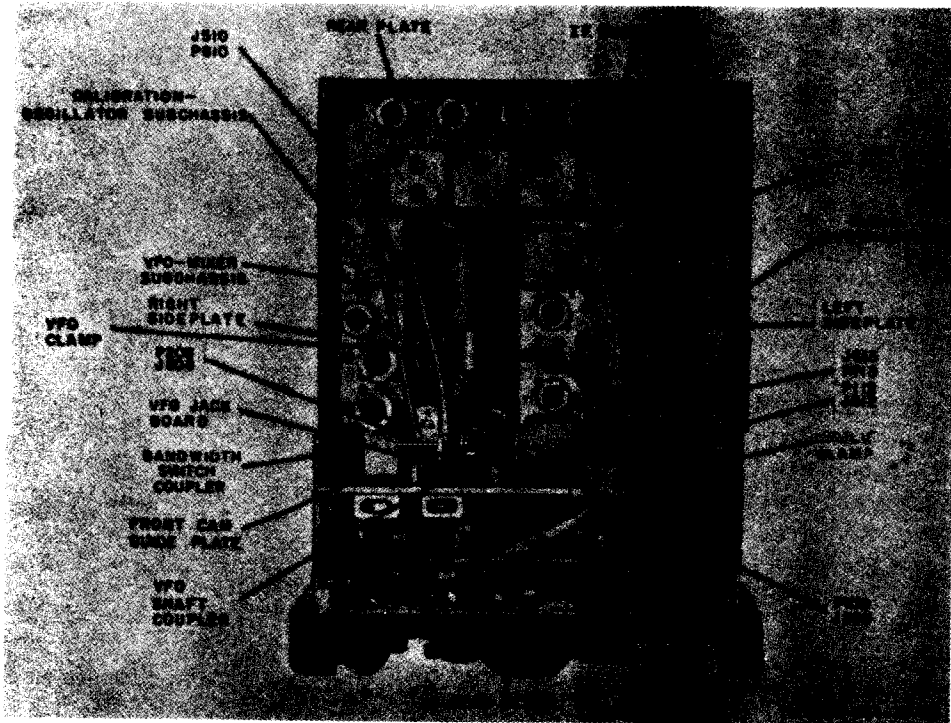


Figure 53. Receiver, bottom view, case removed.

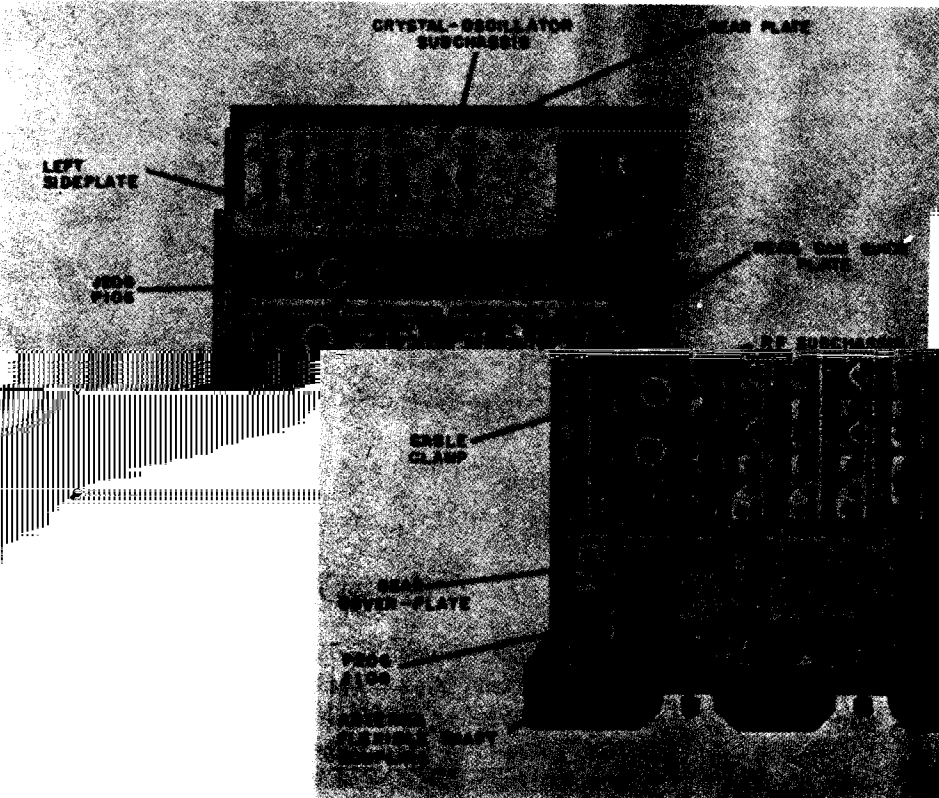
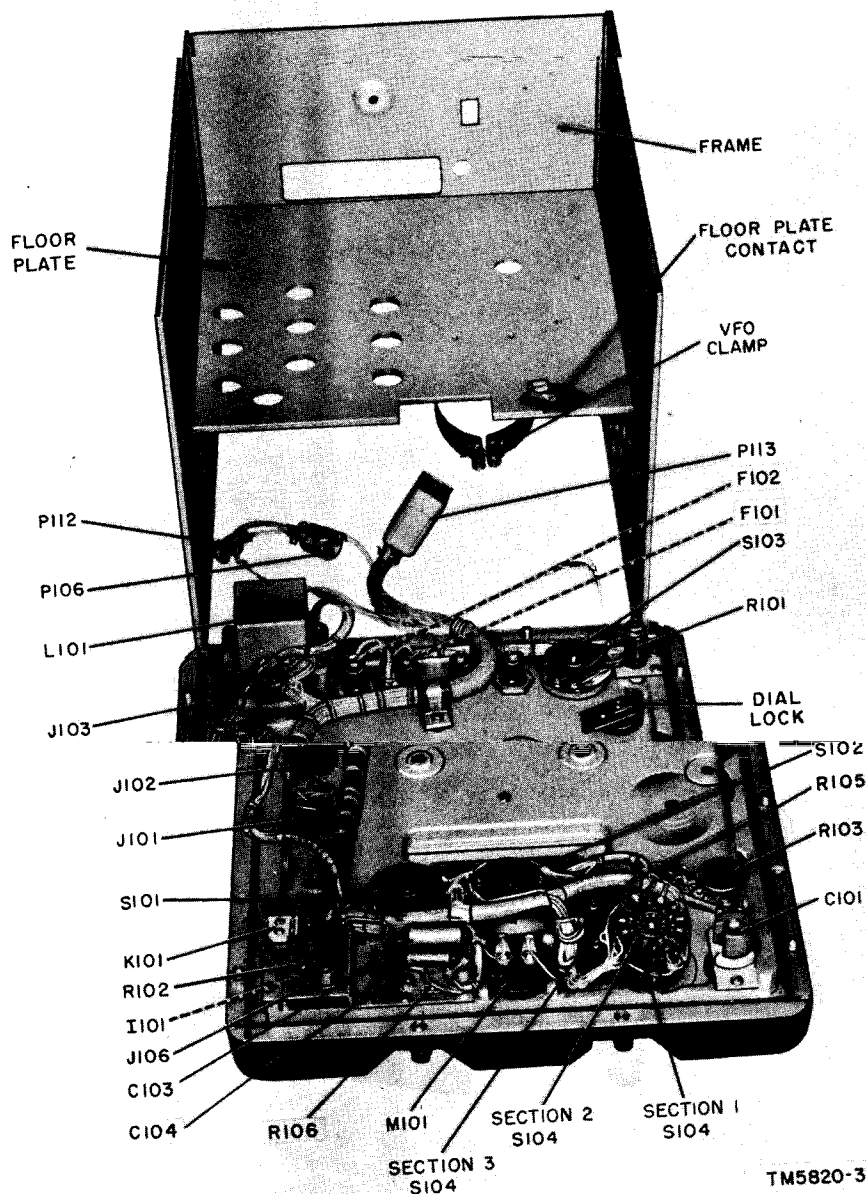


Figure 54. Receiver, top view, case removed.



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Figure 55. Front panel assembly, rear view.

- (5) Slide the lower deck assembly back and lift straight up from the frame. The BAND WIDTH switch coupler (Oldham type) insert will drop out; secure it to the sideplate of the receiver.

b. Replacement. Replace the lower deck assembly as follows:

- (1) Replace the insert in the BAND

WIDTH switch coupler (Oldham type).

- (2) Lower the lower deck assembly into position. Make sure the cable attached to plug P810 is held clear when lowering the assembly into place so that the cable will not become wedged between the assembly and receiver frame.

- (3) Tighten the five green captive screws which secure the lower deck assembly to the floor plate.
- (4) Connect the following plugs to their associated receptacles: P810, P111, P112, and P113.
- (5) Replace the cable clamp on the front cam guide plate.
- (6) Replace the case (para 60).

63. Upper Deck Assembly

(fig. 53 and 54)

The upper deck assembly, which consists of the rf and crystal oscillator subchassis, is removed as a single unit.

a. Removal. To remove the upper deck assembly from the receiver, set the KILOCYCLES control to a KILOCYCLES dial reading of 000 and remove the front panel (para 61). Although it is not imperative, removal of the lower deck assembly (para 62) facilitates removal of the upper deck assembly. Proceed as follows:

Note. After removal of the front panel, make certain that the KILOCYCLES dial reading of 000 has not been disturbed. If the setting has changed, readjust with the kilocycles control shaft.

- (1) Disconnect plug P208 on the vfo jack board.
- (2) Remove the two screws which secure the vfo jack board.
- (3) Remove the roundhead Phillips screw which secures the upper deck assembly to the rear plate.
- (4) Remove the eight flathead Phillips screws which secure the rear cam guide plate to the sideplates.
- (5) Loosen the two green captive screws at the top rear corners of the rf subchassis.
- (6) Remove the upper deck assembly by pulling the assembly forward, then upward. The BAND WIDTH switch coupler insert will drop out; secure the insert to the sideplate. Be careful not to damage the coaxial cable attached to plug P208. The vfo coupler insert will drop down; secure it to the sideplate of the receiver.

b. Replacement. If the position of the vfo tuning shaft has not been changed, make

sure that the KILOCYCLES dial setting is 000, and replace the upper deck assembly in the receiver as directed. If the position of the vfo tuning shaft has been changed, adjust the vfo (para 64e) before proceeding.

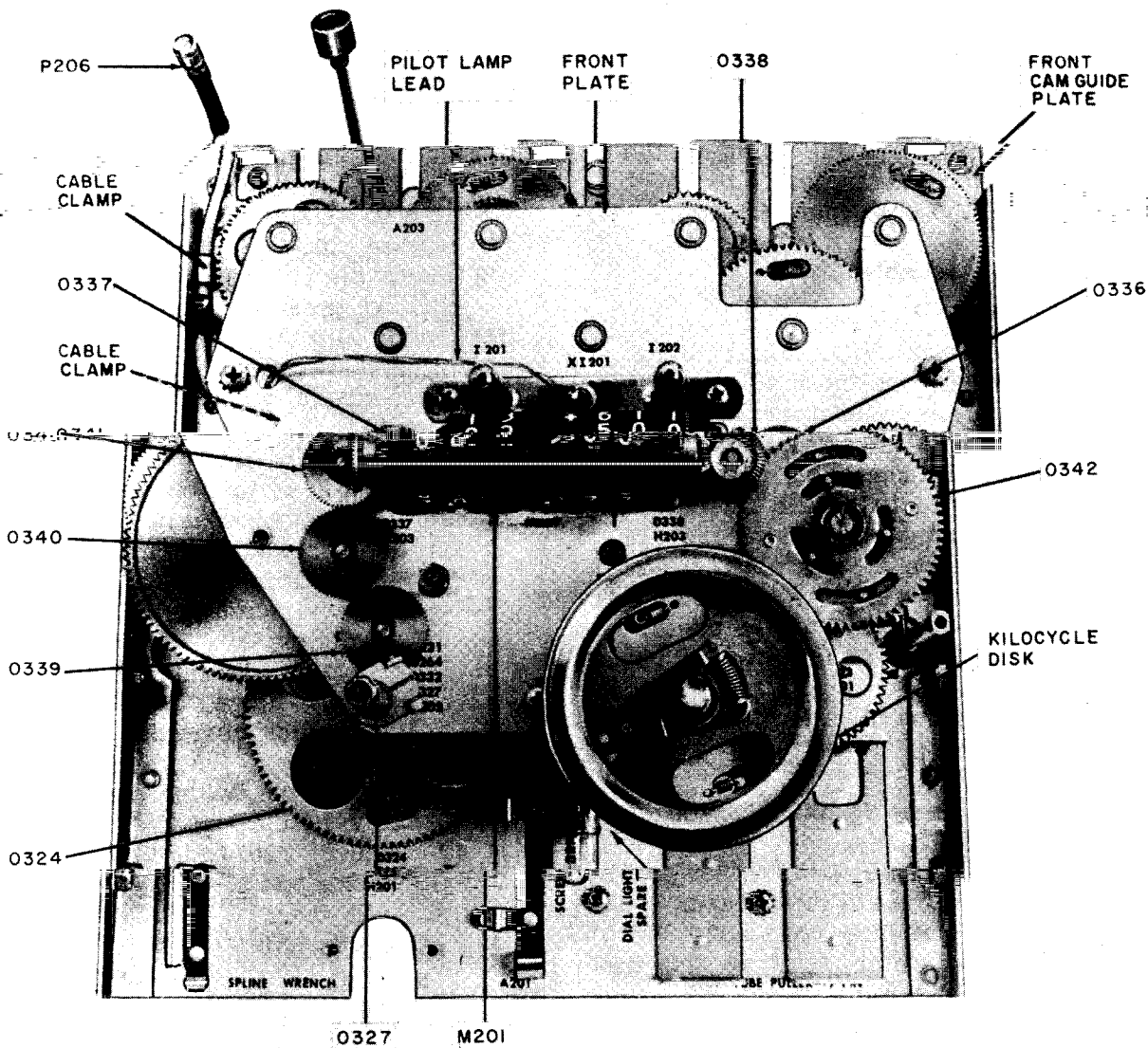
- (1) Place the receiver on its rear plate on the bench.
- (2) Set the vfo coupler insert and the BAND WIDTH switch coupler insert in place.
- (3) Insert the cable (attached to P208) through the hole in the floor plate.
- (4) Gently slip the upper deck assembly in place, observing that the couplers are aligned properly in the inserts.
- (5) Tighten the two green captive screws at the top rear corners of the rf subchassis.
- (6) Replace and tighten the eight flat-head Phillips screws which secure the rear cam guide plate to the sideplates.
- (7) Replace and tighten the roundhead Phillips screw which secures the upper deck assembly to the rear plate.
- (8) Replace the two screws and secure the vfo jack board.
- (9) Connect P208 to J808 on the vfo jack board.

64. Vfo Subchassis

(fig. 53)

a. Removal. The vfo subchassis can be removed from the receiver without prior removal of any of the other assemblies. Proceed as follows:

- (1) Set the KILOCYCLES dial at 500 (last three digits on frequency indicator dial).
- (2) Disconnect plugs P208 and P109.
- (3) Remove the two Phillips screws from the vfo jack board.
- (4) Remove the screw from the vfo clamp.
- (5) Slide the vfo subchassis toward the rear of the receiver to disengage the vfo shaft coupler and lift out the subchassis. The vfo shaft coupler insert will drop out; secure it to the receiver.



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- | | |
|-----------------------------------|------------------------------------|
| 0324 Gear, ant backlash 100-tooth | 0339 Gear, spur, 64-tooth |
| 0327 Gear, spur, 36-tooth | 0340 Gear, spur, 64-tooth |
| 0336 Gear, bevel and spur | 0341 Gear assembly, bevel and spur |
| 0337 Gear, bevel, 48-tooth | 0342 Clutch assembly |
| 0338 Gear, bevel, 24-tooth | |

Figure 56. Upper deck assembly, front view.

- Installation Procedure Vfo Shaft
- Position in the receiver slightly to the rear of its normal position.
- (3) Replace the insert in the vfo shaft coupler.
- (4) Slide the vfo subchassis toward the front of the receiver, at the same time engaging the vfo shaft coupler.
- Position not changed
- (1) Be sure that the vfo shaft is at the reference position and the vfo shaft is turned.
- (2) Place the vfo shaft

- (5) Replace and tighten the screw in the vfo clamp.
- (6) Bring the vfo jack board into place; replace and tighten the two Phillips screws.
- (7) Replace plugs P208 and P109.

c. Replacement Procedure, Vfo Shaft Position Changed.

- (1) Be sure the KILOCYCLES dial is set at 500.
- (2) Place the vfo subchassis in position in the receiver slightly to the rear of its normal position. Do not connect the vfo shaft coupler.
- (3) Bring the vfo jack board into place; replace and tighten the two Phillips screws.
- (4) Replace plugs P208 and P109.
- (5) Place a lead connected to the ANT post of another Radio Receiver R-392/URR (called a test receiver in this procedure) near vfo-mixer tube V801 of the receiver being repaired.

- (1) ~~Remove the two Phillips screws which secure the crystal oscillator subchassis to the rear of the rf subchassis.~~
- (2) Remove the two Phillips screws which secure the crystal oscillator subchassis to the rear of the rf subchassis.
- (3) Separate the crystal oscillator subchassis from the rf subchassis. The crystal oscillator Oldham coupler insert will drop out; secure it to the receiver.

b. Replacement. Replace the crystal oscillator subchassis as follows:

- (1) Place crystal oscillator subchassis in position against the rf subchassis.
- (2) Place the insert in the Oldham coupler and fit the coupler sections together.
- (3) Replace the two screws which secure the crystal oscillator subchassis to rear of the rf subchassis.
- (4) Connect the following plugs and receptacles: P401 to J201, P402 to J202, and P403 to J203.
- (5) Check the synchronization of the crystal oscillator subchassis and adjust if necessary (para 74 and 78).

coupler, slide the vfo subchassis forward and, at the same time, engage the vfo shaft coupler.

- (12) Replace and tighten the screw in the vfo clamp.

Note. The procedure given in c(1) through (12) above is designed to prevent damaging the vfo by turning its shaft beyond the mechanical limits during subsequent alignment of the receiver.

- (13) Synchronize the vfo tuning shaft as described in paragraph 79.

65. Crystal Oscillator Subchassis (fig. 57)

a. Removal. Remove the upper deck assembly from the receiver before removing the crystal oscillator subchassis (para 63). Remove the crystal oscillator subchassis from the upper deck assembly as follows:

- (1) Disconnect plugs P401, P402, and P403.

- (2) Set the MEGACYCLES control of the test receiver to a MEGACYCLES dial reading of 02 and turn the KILOCYCLES control to a KILOCYCLES dial reading of 455.
- (7) Connect a headset to the test receiver.
- (8) Set the BFO PITCH control to the BFO switch to ON on the receiver.
- (9) Turn the KILOCYCLES control of the test receiver clockwise until a zero beat is obtained. (Tap the mixer tube of the receiver being repaired and listen for sound in the test receiver headset.) Maintain the beat is with the signal from the vfo.)
- (10) Turn the KILOCYCLES control of the test receiver toward the MEGACYCLES dial reading of 95. At the same time, turn the vfo shaft of the receiver being repaired, maintaining a beat note in the headset. Turn the vfo shaft until a dial reading of 955 on the test receiver is reached. Turn the vfo shaft for a zero beat at the test receiver.
- (11) Replace the insert in the vfo shaft coupler.

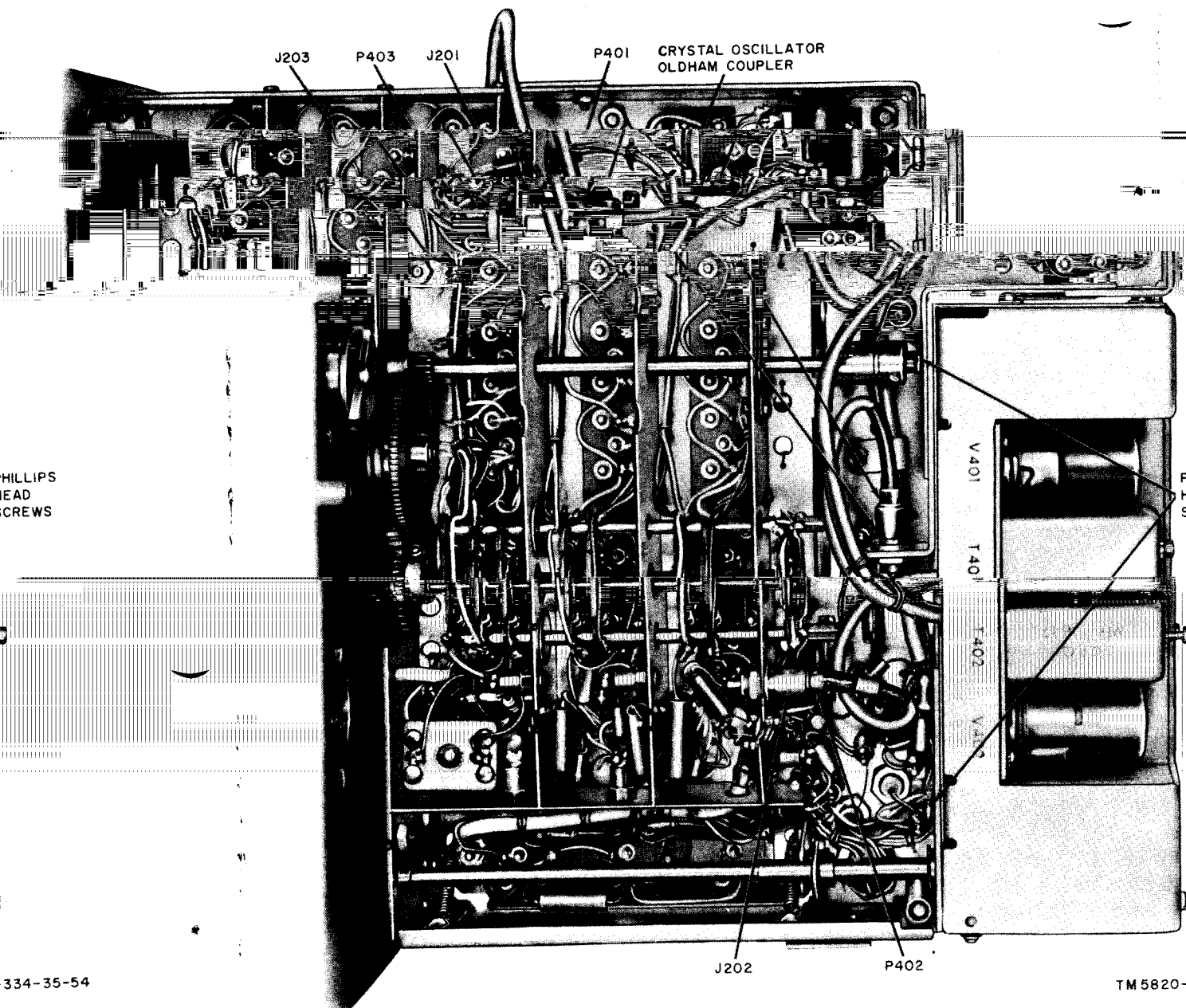


Figure 57. Upper deck assembly and crystal oscillator subchassis, bottom view.

66. Rf Tuning Coils and Transformers (fig. 59)

a. *Removal.* Remove the rf tuning coils and transformers by first removing the upper deck assembly (para 63). Proceed as follows:

- (1) Remove the eight screws on the cam guide bracket on the rear cam

- guide plate and remove the
- (2) To remove the slug rack with a coil or transformer, the spring located at each slug rack and remove the. Be careful that the spring fall into the subchassis.
- (3) Insert a small Phillips driver carefully into the

in the coil or transformer can, and loosen the screws until they are free of the subchassis.

- (4) Withdraw the coil or transformer from the subchassis.

b. Replacement. Replace the rf tuning coils and transformers as follows:

- (1) Plug the coil or transformer into its socket.
- (2) Replace the two small Phillips screws into the holes in the coil or transformer can and tighten them.
- (3) Replace the slug rack associated with the coil or transformer and hook the spring located at each end of the slug rack.

- (4) Replace the cam guide bracket on the rear cam guide plate, and replace and tighten the eight screws.

67. Removing and Replacing Parts in Mechanical Tuning System

Note. Removal and replacement of the rf gear unit assembly (from and below) is performed at fourth echelon.

a. Removal of Frequency Indicator M201 (fig. 56).

- (1) Remove the receiver from the case (para 60).

g. Removal of Bevel Gear 0337 or 0338 (fig. 56).

- (1) Remove frequency indicator M201 (a above).
- (2) Loosen the clamp screw for the bevel gear and remove the bevel gear.

h. Replacement of Bevel Gear 0337 or 0338 (fig. 56).

- (1) Slip the bevel gear on the shaft.
- (2) Replace frequency indicator M201 (b(1), (2), and (3) above).
- (3) Set frequency indicator M201 to indicate the same frequency as before removal (a(3) above).
- (4) Position the bevel gear firmly against the gear assembly and tighten the clamp screw on the bevel gear.
- (5) Replace the front panel (para 61).
- (6) Replace the receiver in the case (para 60).

c. Removal of Spur Gear 0339 or 0340 (fig. 56).

- (1) Remove the receiver from the case (para 60).
- (2) Remove the front panel from the receiver (para 61).
- (3) Remove the retaining ring from the gear shaft and remove the spur gear.

d. Replacement of Spur Gear 0339 or 0340 (fig. 56).

- (1) Replace the gear and secure with retaining ring.
- (2) Replace the front panel (para 61).
- (3) Replace the receiver in the case (para 60).

e. Removal of Gear Assembly 0341 (fig. 56).

- (1) Remove frequency indicator M201 (a above).
- (2) Remove gear assembly 0341 from its shaft.

f. Replacement of Gear Assembly 0341 (fig. 56).

- (1) Slip gear assembly 0341 on its shaft.

(2) Replace frequency indicator M201 (b above).

- (2) Remove the front panel from the receiver (para 61).

- (3) Note the frequency indicated on M201. *Do not turn the MEGACYCLES or KILOCYCLES controls during this procedure.*

- (4) Remove the four Phillips screws which hold frequency indicator M201.

- (5) Remove frequency indicator M201.

b. Replacement of Frequency Indicator M201 (fig. 56).

- (1) Set frequency indicator M201 to read the same frequency as before removal (a(3) above).

- (2) Align frequency indicator M201 with the mounting holes on the front plate.

- (3) Replace the four screws which hold frequency indicator M201.

- (4) Replace the front panel (para 61).

- (5) Replace the receiver in the case (para 60).

i. Removal of Clutch Assembly 0342 and Bevel and Spur Gear 0336 (fig. 56 and 58).

- (1) Remove frequency indicator M201 (a above).
- (2) Loosen the clamp screw below gear 0329 and remove the kilocycle disk and gear 0329 from shaft 0331.
- (3) Remove the retaining ring from the clutch assembly shaft.
- (4) Remove bevel and spur gear 0336, along with clutch assembly 0342, from its shaft.

j. Replacement of Clutch Assembly 0342 and Bevel and Spur Gear 0336 (fig. 56 and 58).

- (1) Place clutch assembly 0342 and bevel and spur gear 0336 on their shafts. Load the split gear of 0342 two teeth and mesh with the spur gear of 0336.
- (2) Replace the retaining ring on the clutch assembly shaft.
- (3) Load gear 0329 (fig. 57) two teeth and replace the kilocycle disk and gear 0329 on shaft 0331; mesh gear 0329 with the brass gear of clutch

MEGACYCLES and KILOCYCLE controls for a reading of the frequency indicator. Remove the crystal oscillator from the subchassis (para 65). Remove the cam guide bracket on the cam guide plate (fig. 59). Remove all slug rack springs (fig. 59).

Remove all slug racks (fig. 59). Work carefully to avoid damage or breakage. Identify each slug rack.

Remove gears 0329 and 0330 away from the kilocycle disk.

Unhook the loading springs from gears 0329 and 0330 and separate the gears.

Replacement of Gears 0329 and 0330 (fig. 56 and 58).

Place gear 0330 against gear 0329 and hook the two loading springs in the holes provided in the gears.

Place the assembly of gears 0329 and 0330 against the kilocycle disk with the pin of gear 0330 through the hole on the kilocycle disk (fig. 56).

- (3) Replace the retaining ring for gear 0329.
- (4) Replace the clamp on the sleeve of gear 0330.
- (5) Slip the kilocycle disk and gears 0329 and 0330 on shaft 0331.
- (6) Load gears 0329 and 0330 two gear teeth.
- (7) Turn the assembly until the slot in the 0330 sleeve is aligned with the pin in shaft 0331.
- (8) Engage the gears of the assembly with the brass gear of the clutch assembly. Do not lose the loading springs.
- (9) Move the gear assembly along the shaft so the split gears are centered on the brass gear of clutch assembly 0342.
- (10) Tighten the screw in the clamp on gear 0330. Do not overtighten.

m. Removal of Gear Train Assembly from Rf Subchassis (fig. 59-62). Remove the upper deck assembly (para 63) before removing the gear train assembly from the rf subchassis. Remove the gear train assembly as follows:

- (4) Tighten the clamp screw below gear 0329.
- (5) Replace frequency indicator M201 (b above).

k. Removal of Gears 0329 and 0330 (fig. 58).

- (1) Loosen the clamp below gear 0329.
- (2) Remove the kilocycle disk, gear 0329, and the clamp from shaft 0331.

l. Removal of the retaining ring for gear 0329.

Remove the retaining ring for gear 0329 with a pencil mark so that they can be replaced in the proper cam guide slot.

- (6) Unhook the first variable if cam rack springs (fig. 60).
- (7) Remove all rf tuning coils and transformers as follows:
 - (a) Insert a small Phillips screwdriver carefully into the two holes in a coil or transformer can, and loosen the screws until they are free of the subchassis.
 - (b) Withdraw the coil or transformer from the subchassis.

- (1) Set the CYCLE CONTROL to 02300 or 02300.
- (2) Remove the rf slug rack.
- (3) Remove the rear slug rack.
- (4) Unhook the slug rack (fig. 59).
- (5) Unhook the slug rack.

1. Replacement of Gears 0329 and 0330 (fig. 56 and 58).

- (1) Place gear 0330 against gear 0329 and hook the two loading springs in the holes provided in the gears.
- (2) Place the assembly of gears 0329 and 0330 against the kilocycle disk with the pin of gear 0330 through the hole on the kilocycle disk (fig. 56).

(c) Mark the coils and transformers for identification.

(8) Remove the tubes from the subchassis.

(9) Loosen the clamp screw for gear 0274 (fig. 60).

(10) Slip the shaft for S201 out of the gear clamp. This can be done with long-nosed pliers (fig. 60).

(11) Unsolder the pilot lamp lead from the solder lug above frequency indicator M201 on the front panel (fig. 56).

(12) Remove the two screws in the guide bracket that holds the flexible coupling, which normally connects between the ANT TRIM control and capacitor C202 (fig. 59). Slip the coupling through the hole in the front cam guide plate.

(13) Remove the two cable clamps which hold the lead to P206 to the front cam guide plate (fig. 56).

(14) Loosen the Oldham coupler on shaft 0295 and move it down the shaft (fig. 60).

(15) Remove the shaft guide from shaft 0295 (fig. 60).

(16) Remove the four second variable if. cam guide nuts (fig. 60).

(17) Remove the two screws from the mounting brackets on each side of the rf subchassis (fig. 61 and 62).

(18) Remove the two gear assembly mounting screws and nuts (fig. 60).

(19) Remove the retaining ring at the rear of shaft 0294 (fig. 60) and slip the shaft out of the rear bearing.

(20) Carefully move the rf subchassis down and away from the gear train assembly as follows:

(a) Guide the dial lamp lead and the lead to P206 through the holes in the front cam guide plate as the chassis is pulled away (fig. 56).

(b) Slip shaft 0295 through the holes in the shield plates in the front of the rf chassis (fig. 60).

(c) Work the cam on shaft 0294 through the oval hole in the front of the rf subchassis (fig. 60).

n. *Replacement of Gear Train Assembly* (fig. 59-62). Replace the gear train assembly as follows:

(1) Bring the rf subchassis into place against the gear train assembly as follows:

(a) Work the cam on shaft 0294 through the oval hole in the front of the rf chassis (fig. 60).

(b) Slip shaft 0295 through the holes in the shield plates in the rf subchassis (fig. 60).

(c) Guide the dial lamp lead and the lead to P206 through the holes in the front cam guide plate (fig. 56).

(d) Slip shaft 0294 into the bearing at the rear of the chassis (fig. 60).

(2) Replace and tighten the two screws and nuts which secure the rf subchassis to the gear train assembly (fig. 60).

(3) Replace and tighten the two screws in the mounting brackets on each side of the rf subchassis (fig. 61 and 62).

(4) Replace the retaining ring at the rear bearing of shaft 0294 (fig. 60).

(5) Replace and tighten the four second variable if. cam guide mounting nuts (fig. 60).

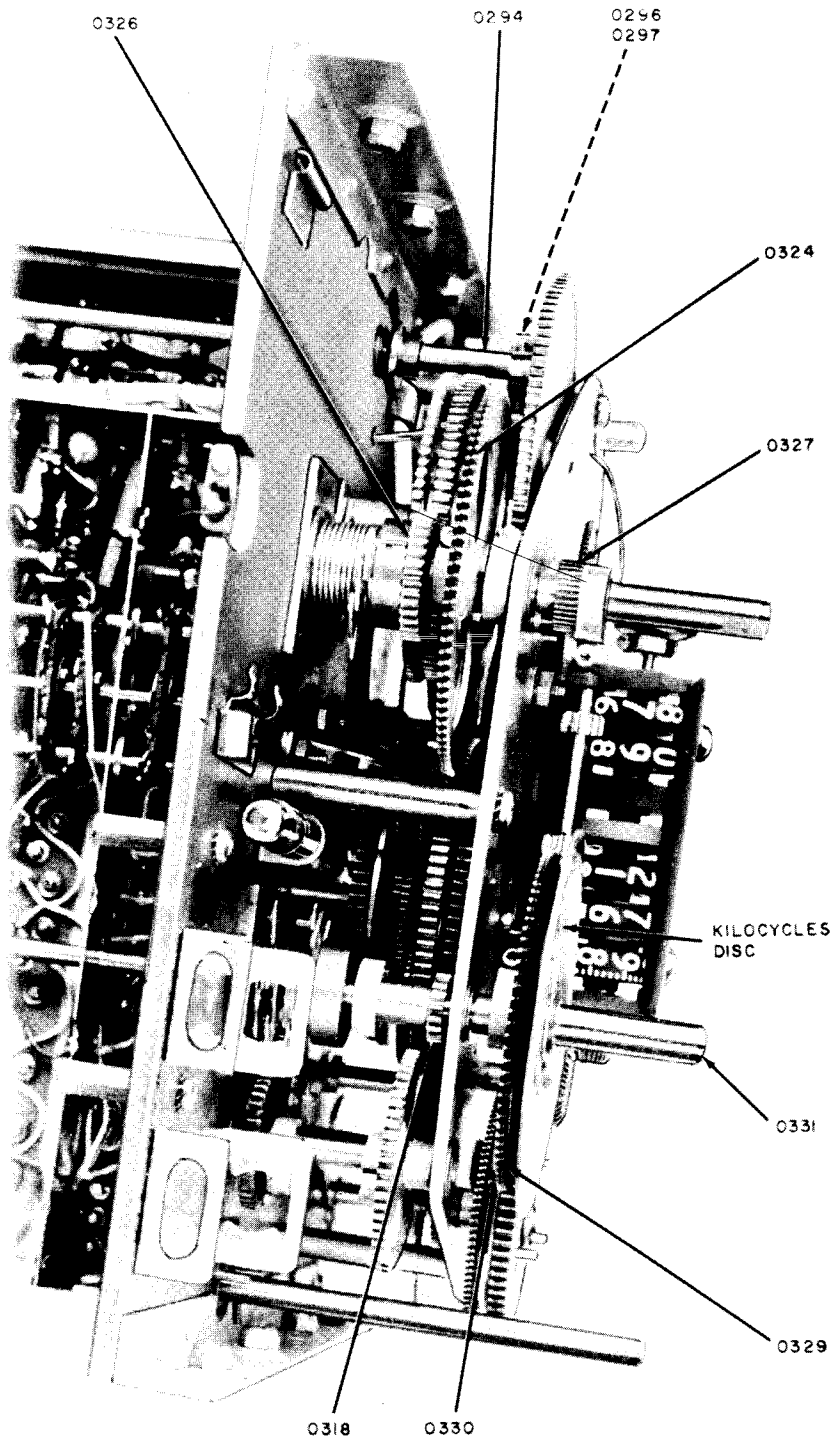
(6) Slip the shaft guide on shaft 0295. Start the screws, center the shaft guide, and tighten the two screws (fig. 60).

(7) Slip the Oldham coupler on shaft 0295 and tighten the setscrews (fig. 60).

(8) Slip the shaft for S201 into the clamp for gear 0274 and tighten the clamp screw (fig. 60). Do not over-tighten.

(9) Bring the pilot lamp lead through the hole provided in the front plate and solder it to the lug above frequency indicator M201 (fig. 56).

(10) Slip the coupling, which normally connects between the ANT TRIM control and capacitor C202 (fig. 59), through the hole in the front



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- | | | | |
|---------------|---------------------------------------|---------------|---------------------------------------|
| 0294 | Shaft, 1st variable if. cam | 0326 | Gear, spur, 32-tooth |
| 0296 and 0297 | Gear assembly, antibacklash, 72-tooth | 0327 | Gear, spur, 36-tooth |
| 0318 | Gear, spur, 17-tooth | 0329 and 0330 | Gear assembly, antibacklash, 90-tooth |
| 0324 | Gear, antibacklash, 100-tooth | 0331 | Shaft, kilocycles |

Figure 58. Gear assembly, bottom view.

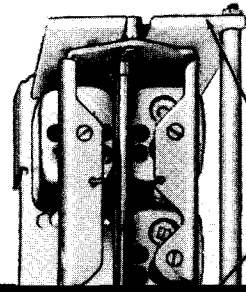
16-32 MC
SLUG RACK

8-16 MC
SLUG RACK

4-8 MC
SLUG RACK

2-4 MC
SLUG RACK

.5-1 MC
SLUG RACK



2D VAR IF
CAM GUIDE

GEAR ASSEMBLY
MOUNTING SCREWS AND NUTS

0274

IF CAN
RACK
SPRINGS

SEE
VAR

0294

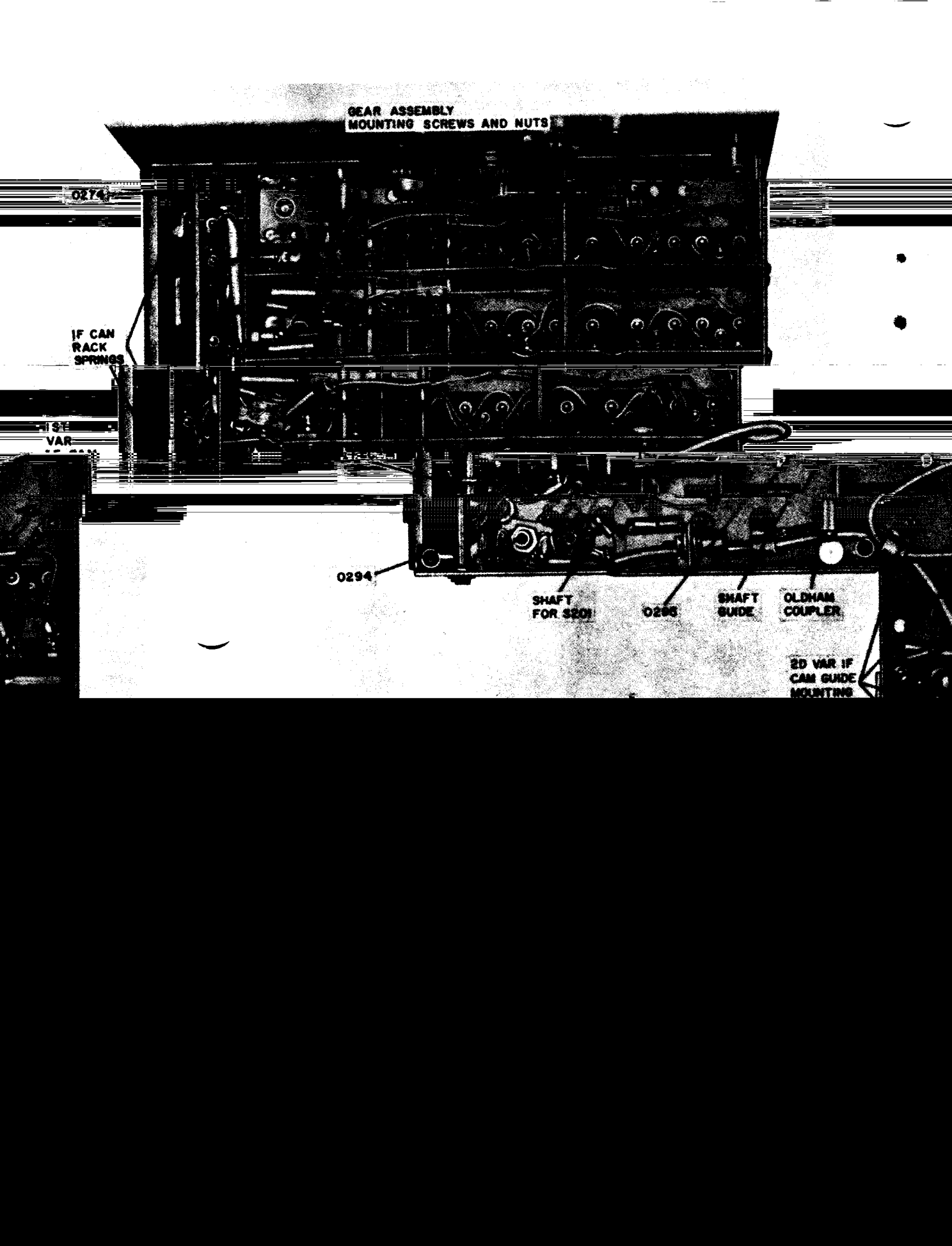
SHAFT
FOR S201

0288

SHAFT
GUIDE

OLDHAM
COUPLER

2D VAR IF
CAM GUIDE
MOUNTING



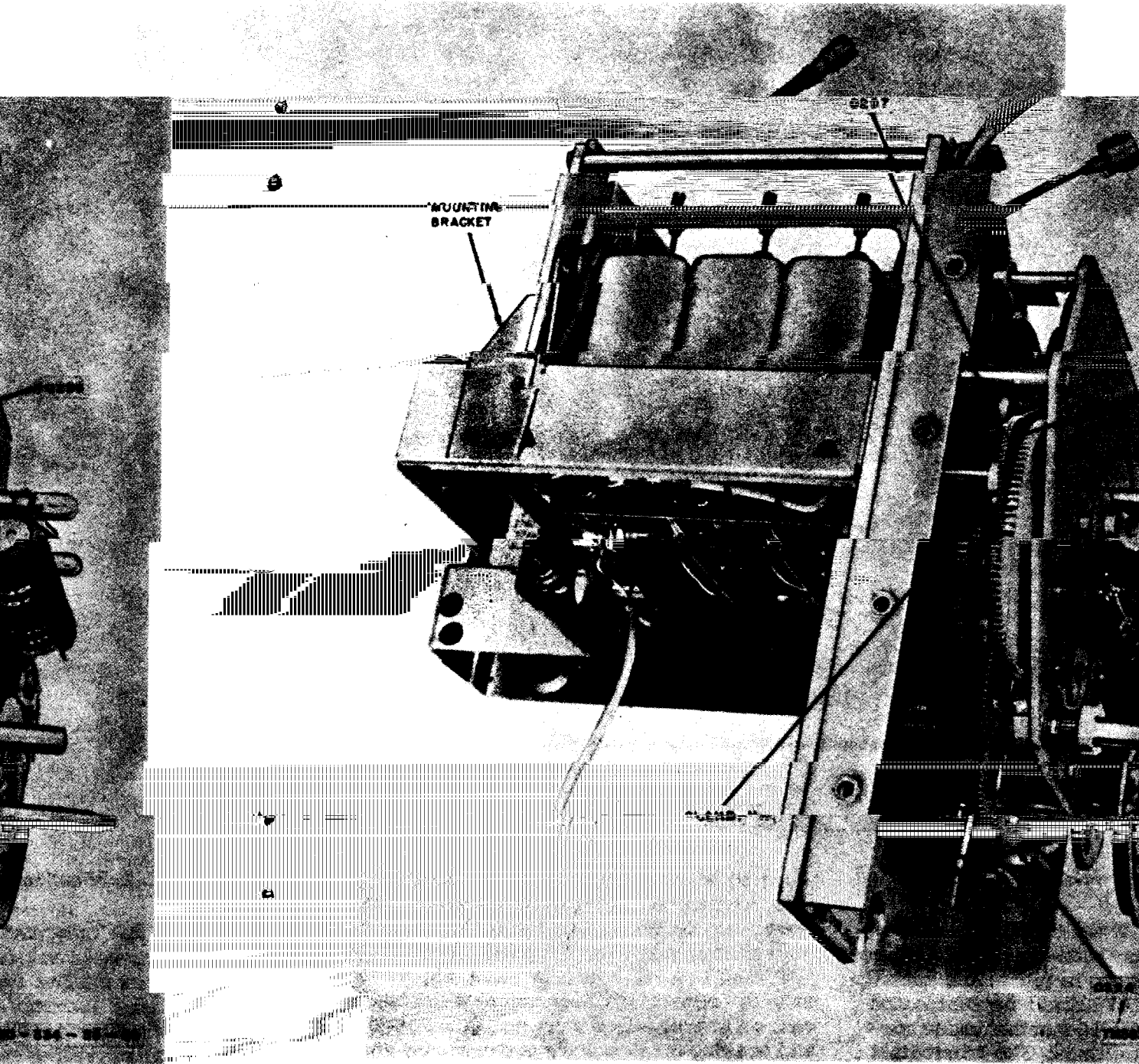
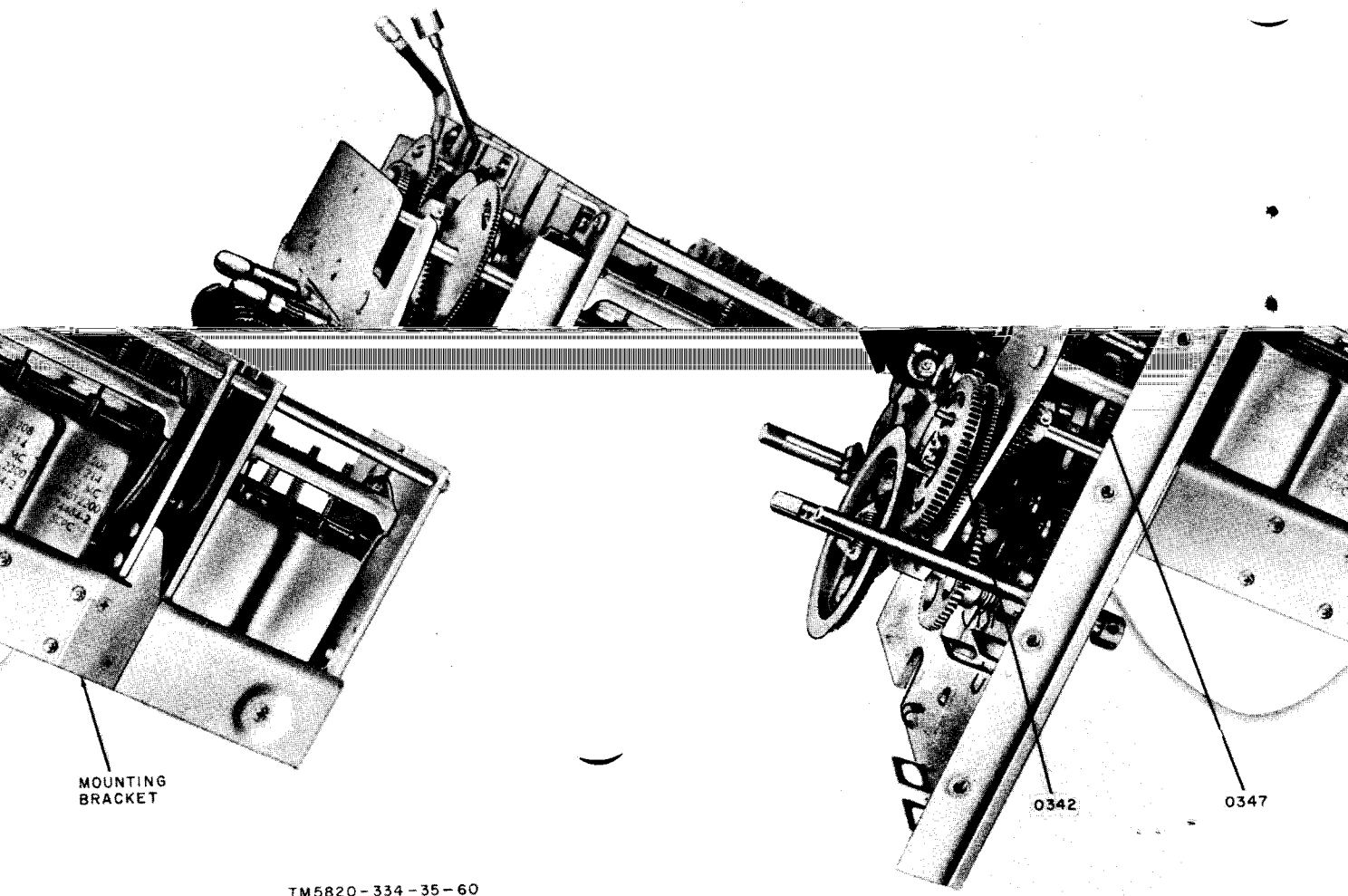


Figure 61. Gear train assembly and rf subchassis, left view.



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of subchassis, right view.

Figure 62. Gear train assembly and

LUBRICATION

Section II. LUBRI

no lubrication. Check the condition of the mechanical tuning system whenever the receiver is withdrawn from the case for work on the KILOCYCLES and MEGACYCLES controls, and check for lack of lubrication. Check for lack of lubrication of gears, guide slots, and bearings; inspect for gritty grease and oil.

Lubrication of the Mechanical Tuning System and Precautions

The only part of the receiver which requires lubrication is the mechanical tuning system. The system is lubricated initially at the factory and should be lubricated

the mechanical tuning system of the receiver is not to be serviced. Work on the MEGACYCLES controls should be done with ease of operation.

the receiver once every 6 months. Under normal operating conditions, the lubrication interval should be shortened only if the need is indicated by inspection or if abnormal conditions or activities are encountered. It must be remembered that overlubrication can often cause more harm

Caution: Never attempt to lubricate the sealed vfo, regardless of possible noisy operation during its tuning, or unstable operation of the oscillator may result.

69. Cleaning

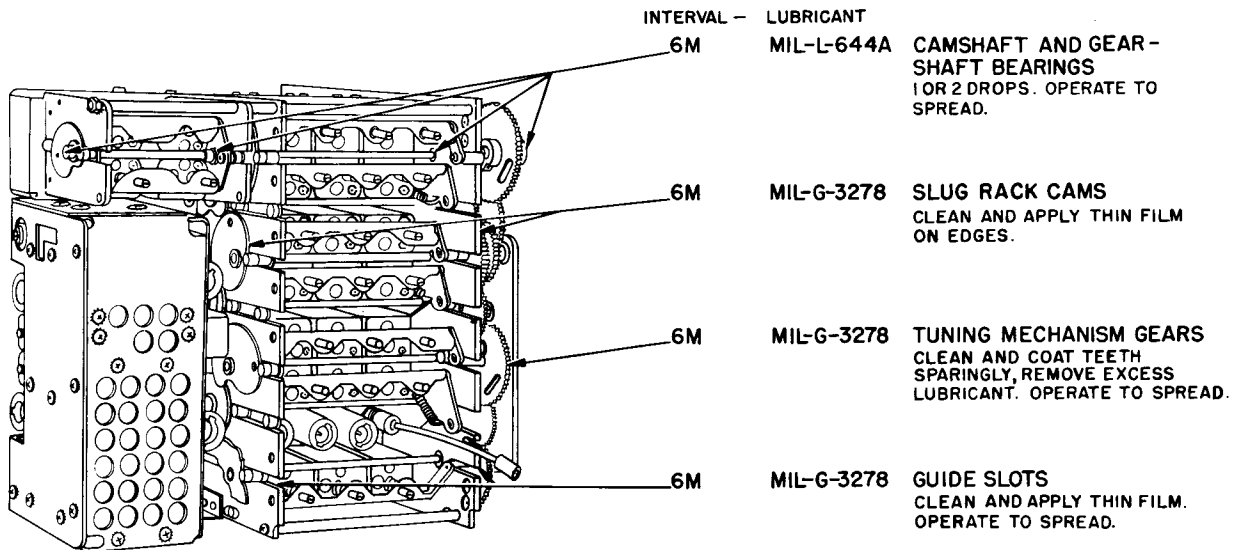
Loosen the 10-captive Allen-head screws around the edge of the front panel, and withdraw the receiver from its case (para 60). Remove the three Phillips screws from the gear cover plate (fig. 54) and remove the plate. Using a thin, long-handled, medium-bristled brush dipped in cleaning compound, remove all dirt, oil, and grease from the gears, cams, guide slots, and bearings. To gain access to all the gear teeth while cleaning, rotate the MEGACYCLES and KILOCYCLES knobs. After dipping the brush in cleaning compound, remove excess compound to prevent drops from falling onto connecting cables, wiring, or other electrical parts. Use a clean, lint-free cloth moistened with cleaning compound to remove grease from gear plates and chassis. Thoroughly

wipe all parts with a clean, dry, lint-free cloth before proceeding with lubrication.

Warning: Cleaning compound is flammable and its fumes are toxic. Do not use near a flame and provide adequate ventilation.

70. Lubrication

Lubricate the mechanical tuning system as indicated in figure 63. The illustration shows the upper deck assembly removed from the receiver. To perform lubrication, remove the receiver from the case (para 60) and remove the gear cover plate (fig. 54). To apply oil to the bearings, dip a length of wire into the oil to collect a small drop at the end, and transfer the oil to the bearing by touching the end of the wire to the edge of the bearing. Avoid the use of excessive amounts of oil. A



UPPER DECK ASSEMBLY
TOP VIEW
(DO NOT REMOVE FOR LUBRICATION)

CLEANING - SOLVENT, DRY-CLEANING, ONLY WILL BE USED TO CLEAN PARTS. BEFORE LUBRICATING CLEAN SURFACES OF PARTS WITH LINTLESS CLOTH LIGHTLY DAMPENED WITH SOLVENT, DRY-CLEANING. DO NOT ALLOW CLEANING FLUID TO GET ON OTHER PARTS OF RECEIVER.

LUBRICANTS	INTERVAL
MIL-L-644A-LUBRICATING-OIL, PRESERVATIVE, SPECIAL. LOW TEMPERATURE.	6M-6 MONTHS
MIL-G-3278-OIL FOR AIRCRAFT TANDU INSTRUMENTS. LOW AND HIGH TEMPERATURES.	

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Figure 63. Radio Receiver R-392/URR, lubrication.

grease gun and a thin long brush should be used for applying grease to gear teeth, edges of cams, and tuning-rack guide stops. Rotate the MEGACYCLES and KILOCYCLES controls as necessary to expose all gear teeth.

Section III. SYNCHRONIZING MECHANICAL TUNING SYSTEM

ing and Synchronizing Mechanical Electrical System

Following procedures are used for and synchronizing the mechanical dial system. Paragraphs 72 outline the procedure for check-mechanical and electrical syn- and must be carried out in given, otherwise the entire me- system will be misaligned. Para- through 81 outline the procedure onizing the mechanical and elec- sm.

ing Synchronization of Frequency or Dial with MEGACYCLES and CYCLES Control Shaft Stops

ing the frequency readings listed in following chart, the slug rack can be removed from the top if required

able if. rack	2d variable if. slug rack
	Top

The KILOCYCLES dial should be between -985 and -965.

c. Turn the MEGACYCLES control clockwise until the stop is reached. The MEGACYCLES dial reading should be halfway between 31 and 32.

d. Turn the MEGACYCLES control counterclockwise until the stop is reached. The MEGACYCLES dial reading should be halfway between 00 and 99.

e. If the indications in a through d above are not obtained, proceed with paragraph 73.

73. Checking Rf Cam Synchronization

Determine whether the rf cams are syn- chronized by removing the receiver from

Check the synchronization of the indi- cator dial with the control stops as fol- lows:

a. Turn the KILOCYCLES control slowly clockwise until the stop is reached. The KILOCYCLES dial reading should be be- tween +015 and +035.

b. Turn the KILOCYCLES control slowly counterclockwise until the stop is reached.

its case (para 60), set indicator to each of the the first column of the is at the top of its rise. If rack is more than 1/32 inch of its rise, synchronization (para 77).

71. Check and E

The fol- checking and about through 75 ing the n- synchronizati- the order- mechanical s- graphs 76 for synch- nical syste

72. Checkin Indicator KILOCY

Frequency indicator reading	Slug racks						1st variable if. slug rack	1st vari- can r
	1-2 mc	0.5-1 mc	2-4 mc	4-8 mc	8-16 mc	16-32 mc		
Mc ± Kc								
Any - 075								Top
Any + 025	Top	Top						
03 + 025			Top					
07 Any							Top	
07 + 025				Top			Top	
15 + 025					Top			
31 + 025						Top		

74. Checking Crystal Oscillator Bandswitch S401 Against Frequency Indicator Dial

Check crystal oscillator bandswitch S401 by comparing the MEGACYCLES reading

on the frequency indicator number under the pointer indicator at the rear of the 64). The numbers should b

the numbers are different, proceed to paragraph 75.

75. Checking Vfo Against Frequency Indicator Dial

Check the vfo against the frequency indicator dial as follows:

a. Turn the KILOCYCLES control to obtain a KILOCYCLES dial reading of 500. The MEGACYCLES dial can be set to any reading.

b. Connect an antenna to a calibrated receiver and bring the antenna near the vfo tube of the receiver under test.

c. Turn the VFO switch of the calibrated receiver to ON and set the BFO PITCH control to 0.

d. Set the calibrated receiver frequency indicator dial to 2,955 kc. Adjust the KILOCYCLES control of the calibrated receiver to obtain a zero beat with the receiver under test.

e. If a zero beat is not obtained with a slight adjustment of the KILOCYCLES control of the calibrated receiver, proceed to paragraph 79.

76. Synchronizing Frequency Indicator Dial with MEGACYCLES and KILOCYCLES Control Shaft Stops (fig. 56)

Adjust the frequency indicator dial with the control shaft stops as follows:

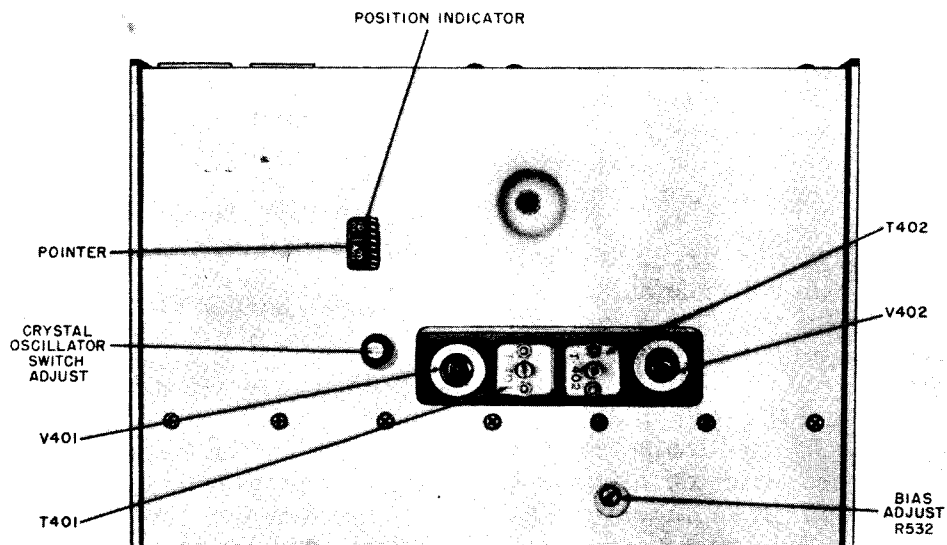
a. Loosen the clamp on KILOCYCLES frequency indicator dial bevel gear 0338.

b. Turn the KILOCYCLES control clockwise until the stop is reached.

c. Turn the indicator dial drums to KILOCYCLES dial reading of +025. Tighten the clamp on the dial bevel gear.

d. Loosen the clamp on MEGACYCLES frequency indicator dial bevel gear 0337.

e. Turn the MEGACYCLES control counterclockwise until the stop is reached.



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, case removed.

Figure 64. Receiver, rear view

f. Turn the indicator dial drums to a MEGACYCLES dial reading of slightly below 00. The tips of the 99 should just start to show. Tighten the clamp on the dial bevel gear.

g. Turn the MEGACYCLES control clockwise until the first detent position is reached (approximately one-fourth turn). The MEGACYCLES dial reading should be exactly 00.

h. If the MEGACYCLES dial does not read exactly 00, loosen the clamp on bevel gear 0327. Turn MEGACYCLES bevel gear 0337 to a MEGACYCLES dial reading of exactly 00. Tighten the clamp on 0327.

77. Synchronizing Camshafts

Adjust the camshafts as follows:

a. Remove the upper deck assembly from the receiver (para 63).

b. Set the MEGACYCLES and KILOCYCLES controls for a frequency indicator reading of 02 000.

c. Loosen clamp A (fig. 59). Rotate the 0.5- to 1.0-mc rf cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp A.

d. Loosen clamp B (fig. 59). Rotate the 1.0- to 2.0-mc rf cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp B.

e. Loosen clamp C (fig. 59). Rotate the 2.0- to 4.0-mc rf cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp C.

f. Loosen clamp D (fig. 59). Rotate the 4.0- to 8.0-mc rf cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp D.

g. Loosen clamp E (fig. 59). Rotate the 8.0- to 16.0-mc rf cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp E.

h. Loosen clamp F (fig. 59). Rotate the 16.0- to 32.0-mc rf cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp F.

i. Loosen clamp G (fig. 59). Rotate the 9- to 18-mc first variable if. cam until the hole in the rear cam is aligned with the alignment mark on the rear cam guide plate (fig. 65). Tighten clamp G.

j. Turn the KILOCYCLES dial fully counterclockwise.

k. Loosen clamp H (fig. 61). Set the small (first variable if.) can rack cam (fig. 60) so that it is almost at the top of its rise. Tighten clamp H. Check the position of the cam when the KILOCYCLES control is at the extreme clockwise position. The cam should be almost at the bottom of its rise.

78. Synchronizing Crystal Oscillator Bandswitch S401

(fig. 57 and 64)

The crystal oscillator bandswitch should be synchronized as follows:

a. Loosen the setscrews on the crystal oscillator Oldham coupler under the rf chassis (fig. 57).

b. Set the MEGACYCLES control to a MEGACYCLES dial reading of 00.

c. Turn the crystal oscillator switch adjust shaft (screwdriver adjustment) at the rear of the crystal unit (fig. 64) and set the drum dial of the position indicator to zero.

d. Tighten the setscrew on the crystal oscillator Oldham coupler (fig. 57).

79. Synchronizing Vfo Tuning Shaft

(fig. 53)

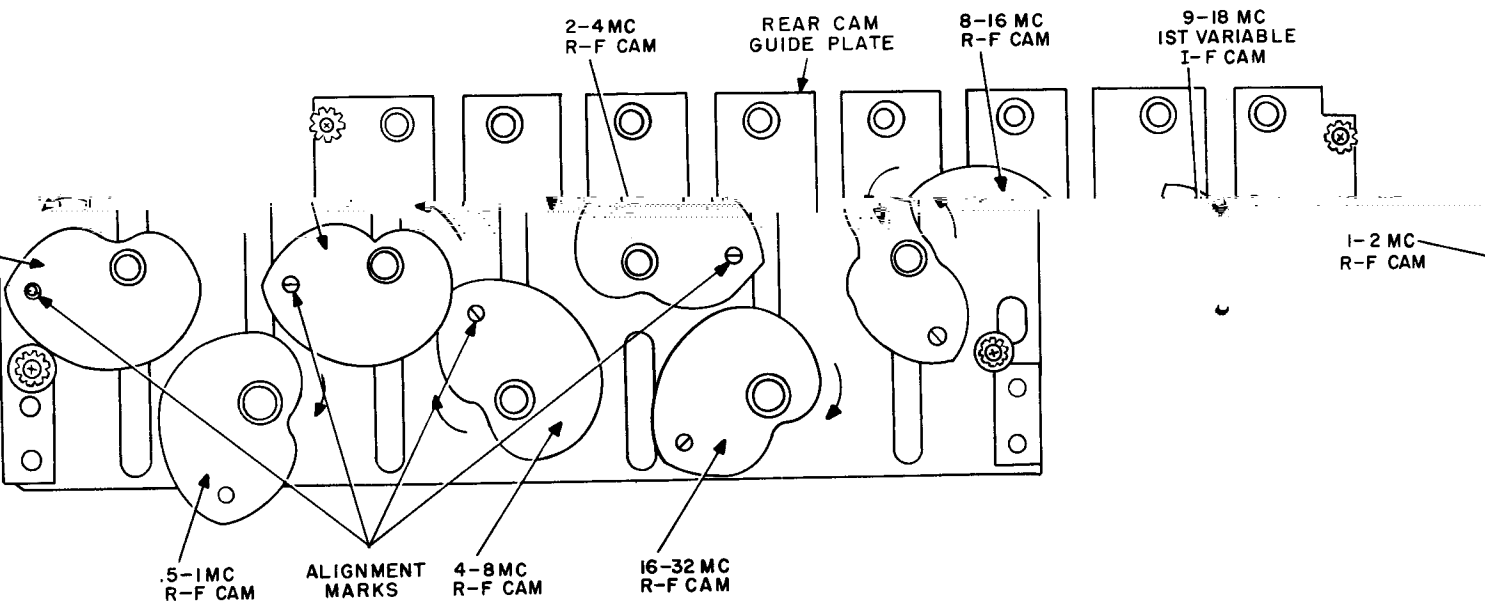
Synchronize the vfo tuning shaft as follows:

a. Turn on the receiver and allow it sufficient time to warm up.

b. Loosen the clamp on the side of the Oldham coupler that is closest to the front panel so that the vfo tuning shaft may turn freely.

c. Set the receiver controls for normal voice reception and connect a headset to AUDIO receptacle J101 or J102.

d. With the first two digits of the frequency indicator dial at any setting, slowly rotate the KILOCYCLES control clockwise, starting from its lowest frequency setting, until a rush of background noise



NOTE:

ARROWS INDICATE DIRECTION OF ROTATION TO INCREASE FREQUENCY.

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Figure 65. Rf and if. cams, rear view (synchronized at 2 mc).

the headset. Adjust the KILO-control for maximum noise. the reading of the last three e frequency indicator dial. the AGC switch to CAL, and the h to ON. Set the BFO PITCH 0, and set the frequency indi- reading at the nearest 100-kc e reading noted in e above. c the vfo shaft slightly by hand at is obtained. if should be to turn the vfo shaft more- rn in either direction to ob- at.

rf bandswitch shaft and turn the shaft to set the switch contacts so that the 0.5- to 1.0-mc coils are connected into the circuit as indicated by a continuity measurement between E201 and pin 3 of Z201 (fig. 43 and 44).

c. Tighten the clamp on gear 0274 on the rf bandswitch shaft.

d. Turn the MEGACYCLES control through its range. The rf bandswitch should move between 0 and 1, 1 and 2, 3 and 4, 7 and 8, and 15 and 16 mc. If the rf bandswitch does not move between the bands indicated, synchronization of the Geneva system and overtravel coupler (para 81) is necessary.

and Synchronizing Six-Posi- bandswitch S201

upper deck assembly (para ed as follows: MEGACYCLES control to a S dial reading of 00. the clamp on gear 0274 on the

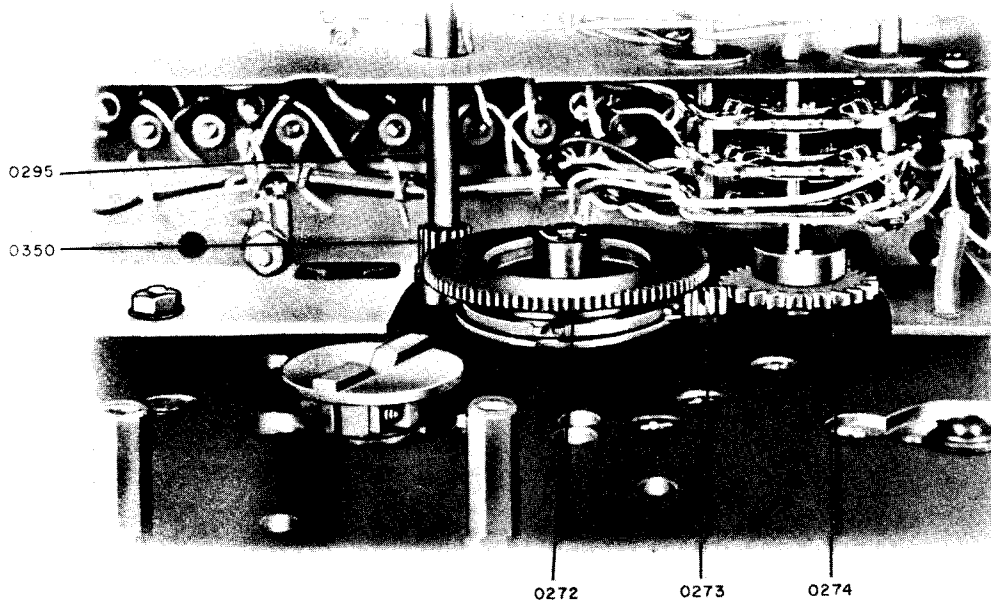
81. Checking and Synchronizing Geneva System and Overtravel Coupler (fig. 66)

a. Turn the MEGACYCLES control through its range. The rf bandswitch shaft should turn between bands 0 and 1, 1 and 2, 3 and 4, 7 and 8, and 15 and 16 mc.

is heard in CYCLES e. Note digits on the f. Turn the BFO switch control to indicator dial point to the g. Adjust until a zero be necessary than 1 full tu tain a zero be

80. Checking tion Rf Band (fig. 66)

Remove the 63) and proce a. Set the MEGACYCLE b. Loosen t



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- | | |
|---------------------------|----------------------------|
| 0272 Geneva system | 0295 Shaft, crystal switch |
| 0273 Gear, spur, 8-tooth | 0350 Gear, spur, 16-tooth |
| 0274 Gear, spur, 24-tooth | |

Figure 66. Geneva system and overtravel coupler.

a. If, after checking the synchronization of the frequency indicator (a above), the movement of bandswitch shaft 0295 does not take place between the proper bands, proceed as follows with the synchronization of the Geneva system and overtravel coupler:

- (1) Turn the MEGACYCLES control counterclockwise until the stop is reached (below 00 mc).
- (2) Loosen the clamp for gear 0347 (fig. 62).

- (3) Turn shaft 0295 until the Geneva system and overtravel coupler 0272 reaches its stop in the clockwise (0272 viewed from rear of rf subchassis) direction.
- (4) Tighten gear clamp 0347 (fig. 62).

c. This adjustment may affect synchronization of crystal oscillator bandswitch S401 and rf bandswitch S201. Check the synchronization of these systems as given in paragraphs 74 and 80.

Section IV. ALIGNMENT

82. Test Equipment and Special Tools Required for Alignment

The following test equipment and special tools are required for alignment of Radio Receiver R-392/URR.

Item	Technical manual
R. F. Signal Generator AN/URM-25	TM 11-5551
Multimeter, Meter ME-26/U Alignment tool (insulated)	TM 11-6625-200-12

83. Carrier Level Meter Adjustment

Note: If CARRIER LEVEL meter zero potentiometer R622 is improperly adjusted, serious reduction in gain may result.

- a. Disconnect the antenna from the receiver input.
- b. Set the AGC switch to ON.
- c. Set the RF GAIN SQUELCH THRESH control fully clockwise.
- d. Adjust meter zero potentiometer R622 (fig. 35) on the lower deck assembly to obtain a zero reading on the CARRIER LEVEL meter.

84. Alignment of 455-Kc If. Stages

- a. Allow at least a 5-minute warmup time for the receiver and the AN/URM-25.
- b. Connect the AN/URM-25 output lead through a 0.05-uf capacitor to J510 or pin 5 of vfo-mixer V801 (fig. 41). Set the AN/URM-25 modulation control for unmodulated output. To avoid removing a subchassis when a voltage is to be measured or when a signal is to be injected at a tube socket pin that does not have a test point, remove the tube, wrap 1 turn of a short, thin, insulated wire, with both ends bared, around the desired pin, and replace the tube. Connection for measurement or signal injection can then be made through the exposed end of the wire.
- c. Connect the ME-26/U to test jack J615 (fig. 35). The voltage measured is developed across diode-load resistor R605 and is negative with respect to ground.
- d. Make the following settings on the R-392/URR:
 - (1) BAND WIDTH switch to 2 KC.
 - (2) RF GAIN SQUELCH THRESH control fully clockwise.
 - (3) BFO switch to OFF.
 - (4) Function switch to NORMAL.
 - (5) AGC switch to OFF.
- e. Set the AN/URM-25 frequency to 455 kc and advance its signal output until an indication is obtained on the ME-26/U. Perform the adjustments described in *f* below. If no indication is obtained, perform the following steps to obtain an approximate alignment before proceeding:
 - (1) Set the AN/URM-25 to 455 kc at maximum output. Turn the BAND

W. If No Indication is Obtained at 455-Kc Output

is not yet obtained, perform the procedure outlined in (2) below.

If output indication is obtained, adjust the slugs of transformers T505, T504, T503, T502, and T501 (fig. 39), in that order, for a peak indication on the ME-26/U. Set the BAND WIDTH switch to 4 KC, and readjust the slugs for peak output. Repeat the adjustments with the BAND WIDTH switch at 2 KC. After completing the adjustments, perform the procedure described in *f* below.

- (2) The following procedure is required when the slugs have been displaced too far from their normal positions within the transformers.
 - (a) Set the BAND WIDTH switch at 2 KC and the AN/URM-25 to 455 kc. Connect the AN/URM-25 output to pin 1 of tube V505. Adjust the slugs of transformer T505 for peak output.
 - (b) Apply the 455-kc signal to pin 1 of tube V504, and adjust the slugs of transformer T504 for peak output.
 - (c) Apply the procedure described in (a) and (b) above to remaining tubes and transformers, in the following order: tube V503, transformer T503; tube V502, transformer T502; tube V501, transformer T501. Proceed with the next step in *f* below.

f. During alignment, continually adjust the attenuator of the AN/URM-25 to maintain the indication on the ME-26/U below 3 volts. Connect the AN/URM-25 to pin 5 of V801 and adjust the slugs of transformers T601 (fig. 35), T505, T504, T503, and T502 (fig. 39), in that order, for peak indication on the ME-26/U. Repeat these adjustments until no further increase in output is noticeable on the ME-26/U.

g. Turn the BAND WIDTH switch from 2 KC to 8 KC. Adjust the slugs of transformer T501 for a peak indication on the ME-26/U. Repeat the adjustment of these slugs until no further increase is noted.

h. Connect the AN/URM-25 to receptacle J510. Adjust the AN/URM-25 output for between 75 and 100 microvolts (unmodulated).

i. Set bias adjust R532 (cathode of fifth if. amplifier V505) (fig. 64) for a maximum indication on the ME-26/U. Adjust variable resistor R521 (fig. 40) for an indication of approximately 2.5 volts on the ME-26/U.

j. Repeat procedures in f and g above.

k. Adjust the AN/URM-25 output for 300 microvolts (unmodulated). Set the AGC switch at ON. Adjust capacitor C634 (fig. 36) for a peak indication on the CARRIER LEVEL meter.

Note. Remove the lower deck assembly (para 62) to adjust C634 and R521.

85. Alignment of Second Crystal Oscillator (fig. 47 and 64)

a. Connect the ME-26/U to test jack J615 (fig. 35). The voltage measured is negative with respect to ground.

b. Set the controls on the receiver as follows:

- (1) BAND WIDTH switch to 2 KC.
- (2) RF GAIN SQUELCH THRESH control fully clockwise.
- (3) BFO switch to OFF.
- (4) Function switch to NORMAL.
- (5) AGC switch to OFF.

c. Adjust the AN/URM-25 to provide an unmodulated signal at 31,500 kc. Set the receiver to 31,500 kc. Adjust the KILOCYCLES control slightly for a peak indication on the ME-26/U. If the crystal oscillator is to be aligned on all bands, set trimmer capacitor C435 for one-half capacitance (screw slot pointing toward

the rear of the receiver) and adjust the slug of transformer T402 for a peak indication on the ME-26/U.

d. Align the trimmer capacitors for the other bands as shown in the chart in 3) below.

- (i) Set the AN/URM-25 and receiver to the frequency given in the left-hand column.
- (2) Adjust the KILOCYCLES control slightly for a peak indication on the ME-26/U.

- (3) Adjust the trimmer capacitors listed in the right-hand column for a peak indication on the ME-26/U.

Frequency (kc)	Adjust trimmer (fig. 65) for maximum indication on ME-26/U
30,500	C436
29,500	C437
28,500	C438
27,500	C439
26,500	C440
25,500	C441
24,500	C442
23,500	C444
22,500	C446
21,500	C448
20,500	C450
19,500	C452
18,500	C454
17,500	C424
16,500	C456
15,500	C422
14,500	C432
13,500	C430
12,500	C418
11,500	C420
10,500	C428
9,500	C416
8,500	C426

86. Alignment of First Crystal Oscillator (fig. 47 and 64)

a. Connect the ME-26/U to test jack J615 (fig. 35). The voltage measured is negative with respect to ground.

b. Set the controls on the receiver as follows:

- (1) BAND WIDTH switch to 2 KC.
- (2) RF GAIN SQUELCH THRESH control fully clockwise.
- (3) BFO switch to OFF.
- (4) Function switch to NORMAL.
- (5) AGC switch to OFF.

c. Adjust the AN/URM-25 to provide an unmodulated signal at 31,500 kc. Set the receiver to 31,500 kc. Adjust the KILOCYCLES control slightly for a peak indication on the ME-26/U. If the crystal oscillator is to be aligned on all bands, set trimmer capacitor C405 for one-half capacitance (screw slot pointing toward the rear of the receiver) and adjust the slug in transformer T401 for a peak indication on the ME-26/U.

d. Align the trimmer capacitors for the

other bands as shown in the chart in (3) below.

L226 (fig. 67) for a peak indication on the ME-26/U.

~~When using the AN/URM-25 and the ME-26/U, the procedure is as follows:~~
 to the frequency given in the left-hand column.

- (2) Adjust the KILOCYCLES control slightly for a peak indication on the ME-26/U.
- (3) Adjust the trimmer capacitors listed in the right-hand column for a peak indication on the ME-26/U.

Frequency	Adjust trimmer (fig. 65) for maximum indication on ME-26/U
7,500	C412
6,500	C410
5,500	C404
4,500	C408

Alignment of Second Variable If. Amplifier

- a. Connect the ME-26/U between test jack J615 and ground (fig. 35).
- b. Make the following settings on the R-392/URR:
 - (1) BAND WIDTH switch to 2 KC.
 - (2) RF GAIN SQUELCH THRESH control fully clockwise.
 - (3) BFO switch to OFF.
 - (4) Function switch to NORMAL.
 - (5) AGC switch to OFF.
- c. Connect the AN/URM-25 through a 0.05-uf capacitor to the control grid (pin 1) of second mixer V204 (fig. 43). Set the AN/URM-25 modulation control for unmodulated output.
- d. Set the MEGACYCLES control to a MEGACYCLES dial reading of 01.
- e. Set the KILOCYCLES control to a KILOCYCLES dial reading of 100.
- f. Set the AN/URM-25 to 2.9 mc.
- g. Adjust trimmer capacitors C281, C284, and C287 (fig. 67) for a peak indication on the ME-26/U. Adjust the attenuator on the AN/URM-25 to maintain the ME-26/U indication at less than 3 volts.
- h. Set the KILOCYCLES control to a KILOCYCLES dial reading of 900.
- i. Set the AN/URM-25 to 2.1 mc.
- j. Adjust the slugs of L224, L225, and

88. Alignment of First Variable If. Amplifier

- a. Connect the ME-26/U to test jack J615 (fig. 35) and make the following settings on the R-392/URR:
 - (1) BAND WIDTH switch to 2 KC.
 - (2) RF GAIN SQUELCH THRESH control fully clockwise.
 - (3) BFO switch to OFF.
 - (4) Function switch to NORMAL.
 - (5) AGC switch to OFF.
- b. Connect the AN/URM-25 through a 0.05-uf capacitor to the control grid (pin 1) of first mixer V203 (fig. 43).
- c. Set the KILOCYCLES control for a KILOCYCLES dial reading of 500. Do not change this setting during the alignment procedure.
- d. Set the MEGACYCLES control for a MEGACYCLES dial reading of 01.
- e. Set the AN/URM-25 to 9.5 mc. Throughout this procedure, adjust the AN/URM-25 attenuator to maintain an indication of less than 3 volts on the ME-26/U.
- f. Adjust the slugs of coils L221, L222, and L223 (fig. 67) for a peak indication on the ME-26/U.
- g. Set the MEGACYCLES dial reading to 07.
- h. Set the AN/URM-25 to 17.5 mc.
- i. Adjust trimmer capacitors C270, C273, and C276 (fig. 67) for a peak indication on the ME-26/U.
- j. Repeat the procedures in d through i above, until no further increase can be obtained on the ME-26/U.

89. Alignment of Rf Stages

- a. Connect the ME-26/U between test jack J615 and ground (fig. 35).
- b. Make the following settings on the R-392/URR:
 - (1) BAND WIDTH switch to 2 KC.
 - (2) RF GAIN SQUELCH THRESH control fully clockwise.
 - (3) BFO switch to OFF.
 - (4) Function switch to NORMAL.

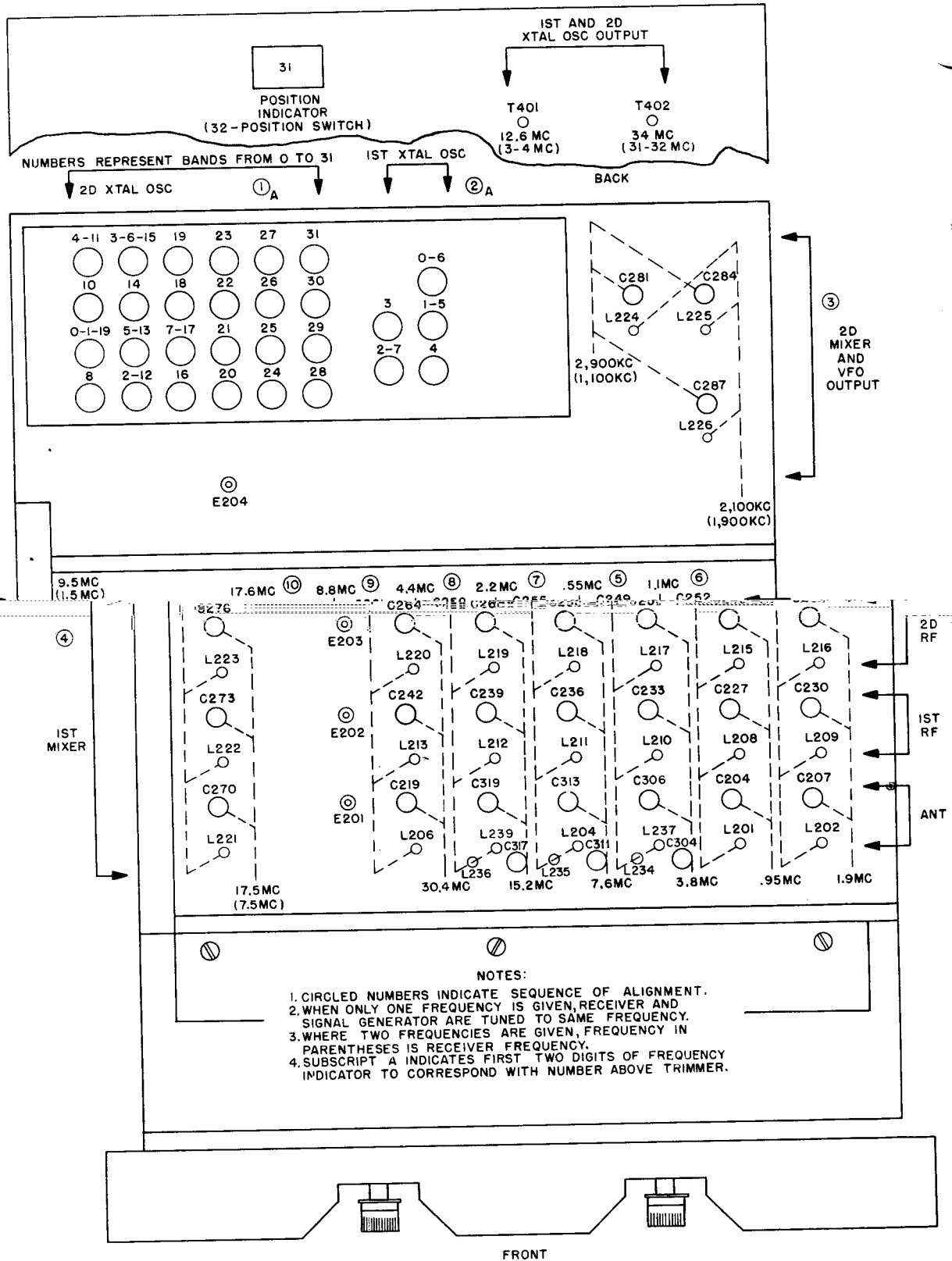


Figure 67. Receiver upper deck, alignment points.

- (5) AGC switch to OFF.
- (6) ANT TRIM control to 0.

c. Connect the AN/URM-25 through a 50-uuf capacitor to points in the order listed in column 7 of the chart in *i* below.

d. Set the MEGACYCLES and KILOCYCLES controls to indicate (on the frequency indicator) the digits in columns 2

e. Set the AN/URM-25 to the frequency listed in column 4. To obtain the exact

trimmer capacitors are through holes in the top of the they are adjusted by using alignment tool.

adjustments for each set of to further change is noticeable on ME-26/U.

25 tuning control for a peak indication on the ME-26/U. Do not depend upon the calibration of the AN/URM-25.

f. During the procedure, adjust the AN/URM-25 attenuator to maintain an indication of less than 3 volts on the ME-26/U.

g. Refer to figure 67 for location of rf adjustment screws. Adjust the slugs for a

set of tuned circuits while the receiver in the chart below.

is tuned to the lower frequency indicated in the chart for that set of tuned circuits. Adjust the trimmer capacitors while the receiver is tuned to the higher frequency. Adjust the slugs of a set of tuned circuits listed in column 5 to obtain a peak indication on the ME-26/U. After changing the frequency settings of the receiver and the

accessible through shield cans; the insulated al

h. Repeat adjustment of rf coils until measurable on the ME-

Signal generator connection (preliminary alignment only)	Set of rf coils	MEGACYCLES control setting	KILOCYCLES control setting	Signal generator frequency (tune for peak output) kc	Adjust slugs for peak output	Adjust trimmer capacitors for peak output
Pin 1, V202; pin 1, V201; ANT post E101	0.5-1 mc	00	550	550	L215 L208 L201	C249 C227 C204
Pin 1, V202; pin 1, V201; ANT post E101	1-2 mc	01	100	1,100	L216 L209 L202	C252 C230 C207
Pin 1, V202; pin 1, V201; ANT post E101	2-4 mc	02	200	2,200	L217 L210 L234 L237	C255 C233 C304 C306
Pin 1, V202; pin 1, V201; ANT post E101	4-8 mc	04	400	4,400	L218 L211 L235 L238	C258 C236 C311 C313
Pin 1, V202; pin 1, V201; ANT post E101		07	600	7,600		

Rf stage alignment

1	2	3	4	5	6	7
Set of rf coils	MEGACYCLES control setting	KILOCYCLES control setting	Signal generator frequency (tune for peak output) kc	Adjust slugs for peak output.	Adjust trimmer capacitors for peak output	Signal generator connection (preliminary alignment only)
8-16 mc	08	800	8,800	L219 L212 L236 L239		Pin 1, V202; pin 1, V201; ANT post E101
	15	200	15,200		C261 C239 C317 C319	Pin 1, V202; pin 1, V201; ANT post E101
16-32 mc	17	600	17,600	L220 L213 L206		Pin 1, V202; pin 1, V201; ANT post E101
	30	400	30,400		C264 C242 C219	Pin 1, V202; pin 1, V201; ANT post E101

90. Calibration of Bfo

- a. Connect a headset to an AUDIO receptacle on the R-392/URR.
- b. Set the AGC switch to ON.
- c. Set the MEGACYCLES and KILOCYCLES controls to receive an unmodulated signal from a station or from the AN/URM-25.
- d. Adjust the KILOCYCLES and ANT TRIM controls for a peak indication on the CARRIER LEVEL meter.
- e. Set the BAND WIDTH switch to 2 KC.
- f. Turn the BFO switch to ON.
- g. Set the BFO PITCH control to 0.
- h. If a zero beat is obtained when the BFO PITCH control is on or close to 0 (within one-half division), alignment of the bfo is not required. If a zero beat is not obtained within one-half division of 0 on the BFO PITCH control, proceed with the alignment as follows:

- (1) Remove the lower deck assembly from the receiver (para 62). Connect plugs P113 to J613, P810 to J510, P112 to J612, and P111 to J611 (fig. 53). Do not use extension cables.
- (2) Tune the receiver as described in b through g above.
- (3) Adjust the slug of T602 (fig. 40) to obtain a zero beat with the BFO PITCH control at 0.
- (4) Reassemble the lower deck assembly (para 62).

91. Adjustment of Calibration Oscillator

- a. Connect a headset to an AUDIO receptacle on the R-392/URR.
- b. Make the following settings on the R-392/URR:

- (1) Function switch to NORMAL.
- (2) AGC switch to ON.
- (3) RF GAIN THRESH SQUELCH control fully clockwise.
- (4) AF GAIN control fully clockwise.
- (5) BAND WIDTH switch to 2 KC.
- (6) BFO switch to ON and BFO PITCH to 0.

- c. Unlock the KILOCYCLES control. Tune in station WWV at 5, or 10 mc, whichever is stronger.

- d. Adjust ANT TRIM control for maximum indication on the CARRIER LEVEL meter.

- e. Adjust the KILOCYCLES control for a zero beat. Make this adjustment when WWV is unmodulated to avoid a zero beat with a sideband.

- f. If the last three digits on the frequency indicator dial are not exactly 000, turn the DIAL ZERO control completely clockwise and adjust the KILOCYCLES control for an exact 000.

- g. Set the AGC switch to CAL. No beat note should be heard. If a beat note is heard, adjust trimmer capacitor C706 (fig. 50) for a zero beat. Do not turn the BFO PITCH control during this adjustment.

CHAPTER 4

FOURTH ECHELON TESTING PROCEDURES

92. General

a. Testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service Organizations responsible for fourth echelon maintenance to determine the acceptability of repaired signal equipment. These procedures prescribe specific requirements that repaired signal equipment *must* meet before it is returned to the using organization. The procedures may also be used as a guide for testing equipment repaired at third echelon if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 103.

b. Each test depends on the preceding one for certain operating procedures and where applicable for test equipment calibrations. Comply with the instructions preceding the chart before proceeding to

Nomenclature	Federal stock No.	Technical manual
RF Signal Generator AN/URM-25F.	6625-570-5719	TM 11-5551E
Output Meter TS-585B/U.	6625-244-0501	TM 11-5017
Electronic Multimeter TS-505A/U.	6625-243-0562	TM 11-5511
Audio Oscillator TS-382 (*)/U ^a .	6625-192-5094	TM 11-2684A
Spectrum Analyzer TS-723A/U.	6625-668-9418	TM 11-5097
Electronic Equipment Maintenance Kit MK-288/URM.	6625-557-5716	TB SIG 319
Electronic Voltmeter ME-30(*)/U ^b .	6625-669-0742	TM 11-5132
Electromagnetic Shielding Enclosure MX-1761/G (or equivalent).	4940-542-0002	None

^aIndicates TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U and TS-382F/U.

^bIndicates ME-30A/U and ME-30B/U.

h. Materials and Other Equipment

the chart. Perform each test in sequence. Do not vary the sequence. For each test perform all actions required in the equipment control settings and Performance Standards columns, then perform the test procedure.

Nomenclature	Federal stock No.	Technical reference
Headset HS-30	6130-669-6640	TM 11-5111
Power Supply PP-1097A/U.	6130-542-6385	TM 11-5128
Power Supply PP-1104A/U.	5935-511-6537	None
Electrical Special Purpose Power Cable Assembly CX-1597/U ^a (power cable).	5935-511-6537	None
or both Electrical plug connector ^b and Electrical Drawer Cable WD-10/U ^c .	5935-192-4760	None
Telephone Plug PJ-058E.	6143-160-8291	None
Electrical Wire (hookup wire 12") ^d .		None

^aUsed to connect Radio Receiver R-392/URR to a power source but not authorized under TA 11-100(11-17).

^bRepair part item for Radio Set AN/GRC-19 authorized stockage at third through fifth echelon. Required to fabricate power cable if Electrical Special Purpose Power Cable Assembly CX-1597/U is not available.

^cRequired to fabricate power cable if Electrical Special Purpose Power Cable Assembly CX-1597/U is not available.

^dAny insulated, stranded, copper conductor, hookup wire; # 20 AWG is suitable.

93. Test Equipment

All test equipment given in this following chart as noted. See paragraph 103 for test procedures and performance standards for these test equipment models.

quence.
n step,
e Test
io De

92/URR control settings
perform each specific test
and verify it against its per-
formance standard.

Equipment, Materials, and Other Equipment Required

equipment, materials, and other equipment required to perform the tests in this section are listed in the following chart and are authorized under TA 11-100(11-17) except for specific models of equipment are authorized under paragraphs 95 through 101. If these procedures are performed with other equipment, an allowance must be made for any test connection or test equipment that may differ from those given in these test procedures.

Equipment.

a. Test

94. Special Test Facilities

a. Because of the sensitivity of the receiver and its construction, the electrical tests (except the operational tests (para 102)) should be conducted in a well-shielded room. Electromagnetic Shielding Enclosure MX-1761/G, listed in the chart in paragraph 93a, or its equivalent, is suitable.

b. A primary source of dc power capable of supplying 3 amperes at 28 volts is required to power the receiver for the tests. The power source output voltage must be free from any fluctuations or interference; therefore, no other equipment should be operated from the power source used to

power the receiver during the tests. Either of the power supplies listed in the chart in paragraph 93b or any other available source of power meeting the requirements may be used.

c. A special-purpose cable assembly is required to connect Radio Receiver R-392/URR to a power source. Electrical Special Purpose Cable Assembly CX-1597/U, designed for this purpose, may be used if available, or a suitable cable assembly may be fabricated by use of the connector and electrical power cable (or equivalent) listed in the chart in paragraph 93b. A wiring diagram of the power cable assembly is given in figure 68.

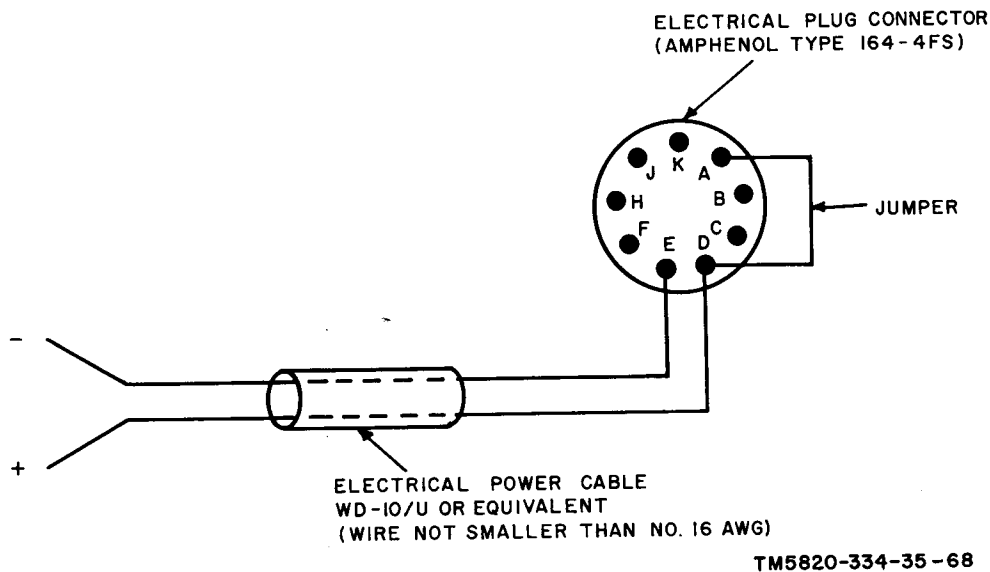


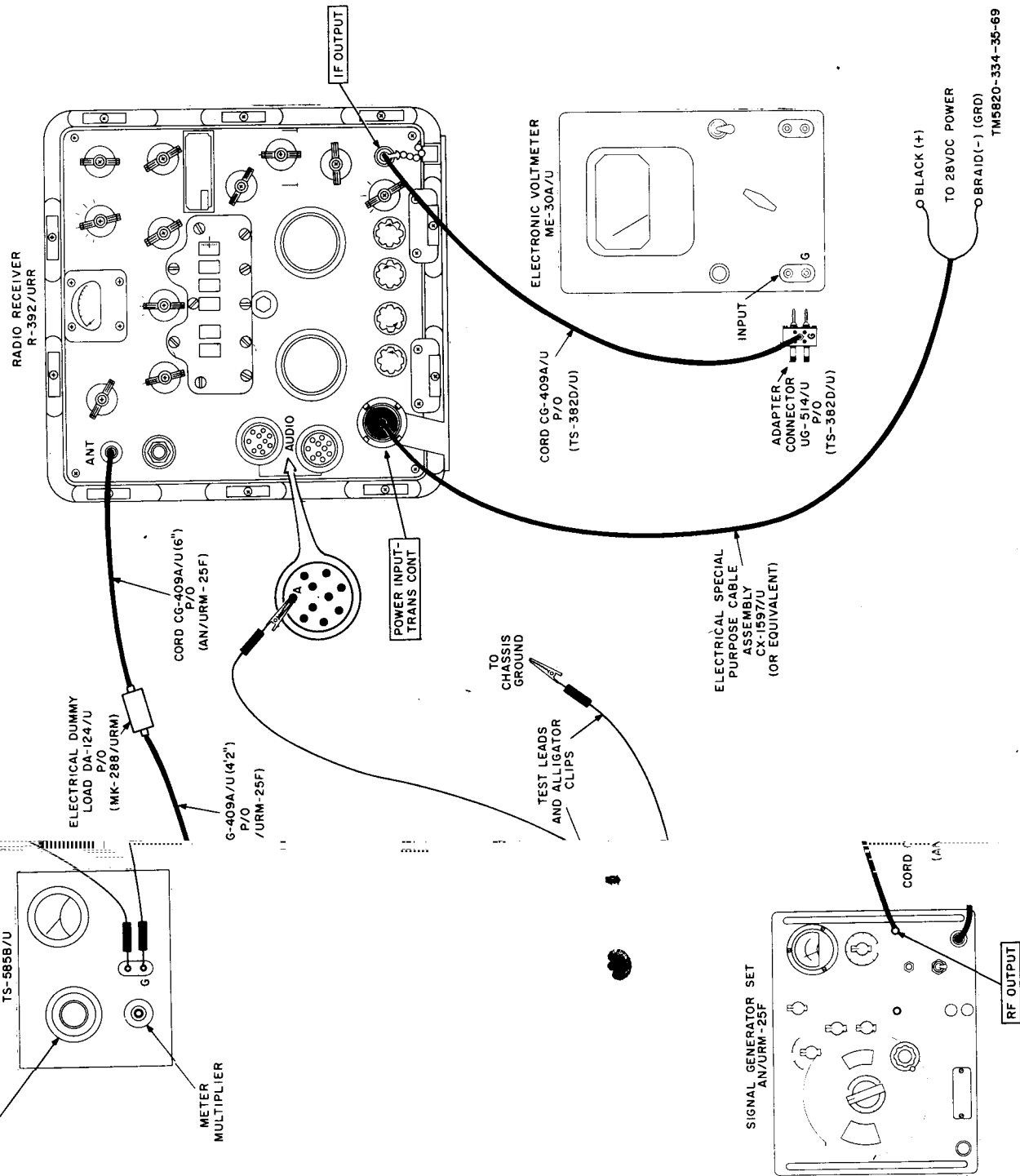
Figure 68. Power cable assembly wiring diagram.

- d. Turn the **CARRIER LEVEL** control fully counter-clockwise. Note the **MEGACYCLES** dial indication. Turn the **MEGACYCLES** control fully clockwise; note the **MEGACYCLES** dial indication. Turn the **MEGACYCLES** control fully counter-clockwise; note the **MEGACYCLES** dial indication. Turn each of the following front panel controls through their limits of travel:
- (1) **ANTENNA**.
 - (2) **STOP**.
 - (3) **RF GAIN**.
 - (4) **ANTENNA SQUELCH THRESH.**
 - (5) **ANTENNA IM.**
- h. Turn each of the following front panel switches to the position indicated:
- (1) **DIAL LIGHT**.
 - (2) **BANDWIDTH**.
 - (3) **FUNCTION** switch.
 - (4) **RF** switch.
 - (5) **ACC.**
- i. Turn the **MEGACYCLES** control fully clockwise (fingertight), then attempt to turn the **MEGACYCLES** control. **Caution:** Do not exert undue force in attempting to turn the **MEGACYCLES** control.
- Note: Turn the **MEGACYCLES** control fully counter-clockwise before proceeding.
- j. Note the indication on the **CARRIER LEVEL** meter.

- d. The **MEGACYCLES** dial indicates excess with between 00 and 99, with the control at the loose position.
- e. The **MEGACYCLES** dial indicates excess with between 00 and 99, with the control at the loose position.
- f. The **MEGACYCLES** dial indicates excess with between 00 and 99, with the control at the loose position.
- g. The **MEGACYCLES** control turns freely without binding or locking.
- h. The **MEGACYCLES** control turns freely without binding or locking.
- i. The **MEGACYCLES** control turns freely without binding or locking.
- j. The **MEGACYCLES** control turns freely without binding or locking.

- d. Turn the **MEGACYCLES** control fully counter-clockwise. Note the **MEGACYCLES** dial indication. Turn the **MEGACYCLES** control fully clockwise; note the **MEGACYCLES** dial indication. Turn the **MEGACYCLES** control fully counter-clockwise; note the **MEGACYCLES** dial indication. Turn each of the following front panel controls through their limits of travel:
- (1) **ANTENNA**.
 - (2) **STOP**.
 - (3) **RF GAIN**.
 - (4) **ANTENNA SQUELCH THRESH.**
 - (5) **ANTENNA IM.**
- h. Turn each of the following front panel switches to the position indicated:
- (1) **DIAL LIGHT**.
 - (2) **BANDWIDTH**.
 - (3) **FUNCTION** switch.
 - (4) **RF** switch.
 - (5) **ACC.**
- i. Turn the **MEGACYCLES** control fully clockwise (fingertight), then attempt to turn the **MEGACYCLES** control. **Caution:** Do not exert undue force in attempting to turn the **MEGACYCLES** control.
- Note: Turn the **MEGACYCLES** control fully counter-clockwise before proceeding.
- j. Note the indication on the **CARRIER LEVEL** meter.

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Figure 69. Sensitivity test.

<p>2</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: .75 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>ACYCLES: 00. DCYCLES: 750. KHz: 8 KC. EPA: OFF. EPC: OFF. AG: SQUELCH THRESH: fully backwise. EPA: midposition.</p>	<p>Repeat test procedures in step 1a through h.</p>	<p>g. None. h. The AN/URM-25F panel meter indicates not more than 9 microvolts.</p>
<p>3</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: .99 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>ACYCLES: 00. DCYCLES: 990. KHz: 8 KC. EPA: OFF. EPC: OFF. AG: SQUELCH THRESH: fully backwise. EPA: midposition.</p>	<p>Repeat test procedures in step 1a through h.</p>	<p>Same as step 1.</p>
<p>4</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.0 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>ACYCLES: 01. DCYCLES: 000. KHz: 8 KC. EPA: OFF. EPC: OFF. AG: SQUELCH THRESH: fully backwise. EPA: midposition.</p>	<p>Repeat test procedures in step 1a through h.</p>	<p>The AN/URM-25F panel meter indicates not more than 7 microvolts.</p>
<p>5</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.5 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>ACYCLES: 01. DCYCLES: 500. KHz: 8 KC. EPA: OFF. EPC: OFF. AG: SQUELCH THRESH: fully backwise. EPA: midposition.</p>	<p>Repeat test procedures in step No. 1a through h.</p>	<p>Same as step 4.</p>
<p>6</p> <p>AN/URM-25F: BAND SWITCH: 1.5-3.8. TUNING: 2.0 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>ACYCLES: 02. DCYCLES: 000. KHz: 8 KC. EPA: OFF. EPC: OFF. AG: SQUELCH THRESH: fully backwise. EPA: midposition.</p>	<p>Repeat test procedures in step 1a through h.</p>	<p>The AN/URM-25F panel meter indicates not more than 9 microvolts.</p>
<p>7</p> <p>AN/URM-25F: BAND SWITCH: 1.5-3.8. TUNING: 2.0 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>ACYCLES: 03. DCYCLES: 000. KHz: 8 KC. EPA: OFF. EPC: OFF. AG: SQUELCH THRESH: fully backwise. EPA: midposition.</p>	<p>Repeat test procedures in step 1a through h.</p>	<p>The AN/URM-25F panel meter indicates not more than 9 microvolts.</p>

<p>Same as step 1.</p>	<p>AF GAIN: midposition.</p>	<p>indication on the TS-585B/U meter.</p> <p>d. Adjust the receiver BFO PITCH control for a peak indication on the TS-585B/U.</p> <p>e. Adjust the AN/URM-25F MICROVOLTS control for an indication of 4 on the panel meter (3-10 MICROVOLTS scale).</p> <p>f. Adjust the receiver AF GAIN control for an indication of 10 milliwatts on the TS-585B/U.</p> <p>g. Set the receiver KILOCYCLES dial to 770 and note the indication on the TS-585B/U.</p>	<p>d. None.</p> <p>e. None.</p> <p>f. None.</p> <p>g. The TS-585B/U indicates not more than 1 milliwatt.</p>
<p>11</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.5 MEGACYCLES. ATTENUATOR: 3. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>MEGACYCLES: 01. KILOCYCLES: 500. BAND WIDTH: 4 KC. BFO: ON. BFO PITCH: 0. AGC: OFF. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: midposition.</p>	<p>a. Repeat test procedures in step 10a through d.</p> <p>b. Adjust the AN/URM-25F MICROVOLTS control for an indication of 3 on the panel meter (1-3 MICROVOLTS scale).</p> <p>c. Adjust the receiver AF GAIN control for an indication of 10 milliwatts on the TS-585B/U.</p> <p>d. Set the receiver KILOCYCLES dial to 520 and note the indication on the TS-585B/U.</p>	<p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. The TS-585B/U indicates not more than 1 milliwatt.</p>
<p>12</p> <p>AN-URM-25F: BAND SWITCH: 10-25. TUNING: 17 MEGACYCLES. ATTENUATOR: 3. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-585B/U: Same as step 1.</p>	<p>MEGACYCLES: 17. KILOCYCLES: 000. BAND WIDTH: 4 KC. BFO: ON. BFO PITCH: 0. AGC: OFF. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: midposition.</p>	<p>a. Repeat test procedures in step 10a through d.</p> <p>b. Adjust the AN/URM-25F MICROVOLTS control for an indication of 2 on the panel meter (1-3 MICROVOLTS scale).</p> <p>c. Adjust the receiver AF GAIN control for an indication of 10 milliwatts on the TS-585B/U.</p> <p>d. Set the receiver KILOCYCLES dial to 020 and note the indication on the TS-585B/U.</p>	<p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. The TS-585B/U indicates not more than 1 milliwatt.</p>
<p>13</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.5 MEGACYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. ME-30A/U: Range selector switch: .1. Note. TS-585B/U not required for this step.</p>	<p>MEGACYCLES: 01. KILOCYCLES: 500. BAND WIDTH: 4 KC. BFO: OFF. AGC: ON. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: fully counterclockwise.</p>	<p>a. Connect ME-30A/U to the receiver as shown in figure 69.</p> <p>b. Adjust the AN/URM-25F SET RF OUTPUT control for a full-scale (10) indication on the MICROVOLTS scale of the panel meter.</p> <p>c. Adjust the AN/URM-25F TUNING control (in the vicinity of 1.5 mc) for a peak indication on the ME-30A/U.</p> <p>d. Adjust the receiver ANT TRIM control for a peak indication on the ME-30A/U and note this indication.</p>	<p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>The ME-30A/U indicates not less than 24 millivolts (.24 on the 0-1.0 R.M.S. VOLTS scale).</p>

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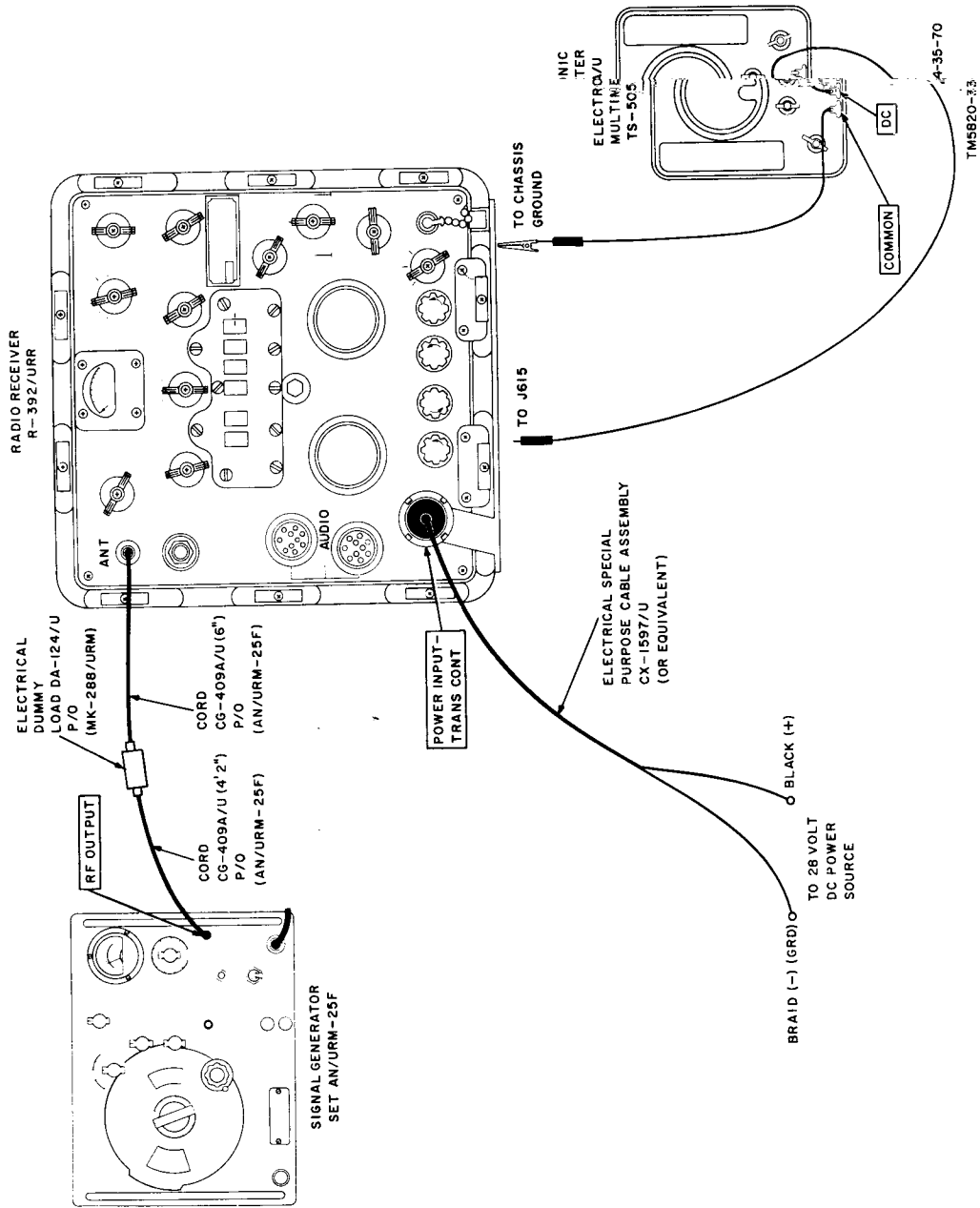


Figure 70. Selectivity test.

b. Test Connections and Conditions. Connect the
c. Procedure.

Step No.	Test equipment control settings	Radio Receiver R-3827UB control settings
1	AN/URM-25F: BAND SWITCH: 3.8-10. TUNING: 4.4 MEGA- CYCLES. ATTENUATOR: 30. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-505A/U: FUNCTION: D.C. RANGE: 10V-RX100.	DIAL LOCK: fully counterclockwise. DIAL ZERO: fully counterclockwise. MEGACYCLES: 04. KILOCYCLES: 400. BAND WIDTH: 2 KC. BFO: OFF. AGC: OFF. Function switch: NORMAL. RF GAIN SQUELCH THRESH: full counterclockwise. AF GAIN: fully counterclockwise.

ARM.

by CX-1597/U or equivalent equipment as shown in figure 70.

Test procedures	Performance standard
<p>a. Zero the TS-505A/U as follows:</p> <ol style="list-style-type: none"> (1) Remove the probe from jack J615 on the receiver. (2) Set the RANGE switch to 2.5V-RX1 position. (3) Hold the D.C. switch together and adjust control until the probe tip is exactly 0 volts and COMMON probe tips just the ZERO ADJ. control pointer indicates. <p>b. Make the following adjustments:</p> <ol style="list-style-type: none"> (1) Adjust the SEW switch to 5V-RX10 a full-scale (10) primary adjustments of MICROVOLTS. (2) Adjust the MICRF OUTPUT control for indication on the MICROVOLTS scale of the panel meter. <p>c. Adjust the AN/URM-25F MICROVOLTS control for an approximately 4.4 microvolts (1 on the TS-505A/U scale) on the panel meter.</p> <p>d. Adjust the receiver AF TUNING control (at ap- indication on the TS- for a peak indication on</p> <p><i>Note:</i> If the meter pointer indicates a peak for a peak GAIN SQUELCH THRESH 505A/U.</p> <p>e. Adjust the receiver RF control for an indication of 7 volts on the TS- 505A/U.</p> <p>f. Adjust the AN/URM-25 GAIN SQUELCH THRESH for an indication of 7 volts on the TS- meter (1.4 on the</p> <p>g. Slowly turn the receiver MICROVOLTS control until the TS-505A/U indicates 4 microvolts on the panel volts. Note and record KILOCYCLES control CYCLES dial indicator KILOCYCLES control</p> <p>h. Slowly turn the receiver again indicates 7 counterclockwise and the receiver KILO- again indicates 7.</p>	<p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. None.</p> <p>e. None.</p> <p>f. None.</p> <p>g. None.</p> <p>h. None.</p>

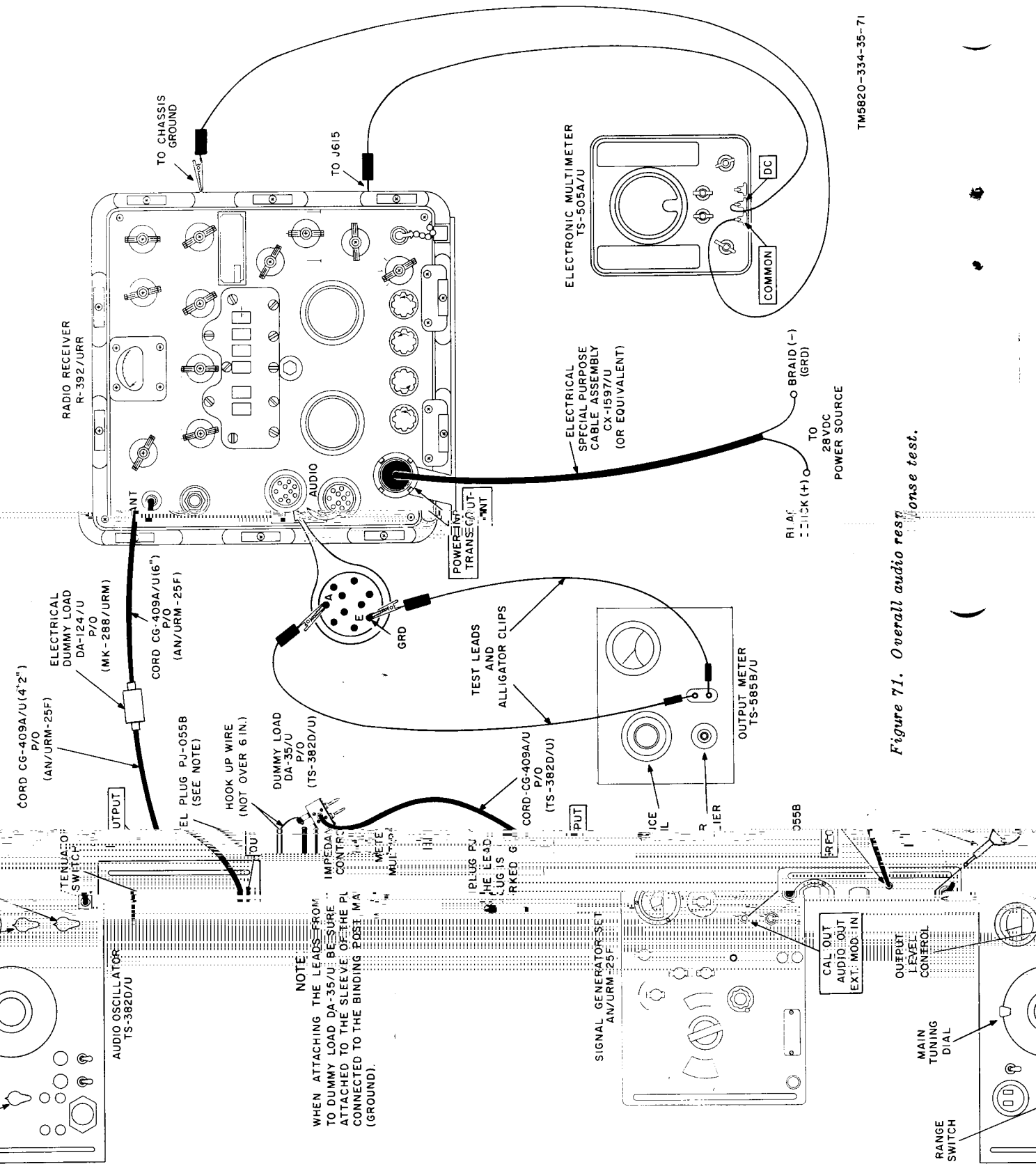
97. Selectivity Test (fig. 70)

a. Test Equipment and Materials.

- RF Signal Generator AN/URM-25F.
- Electronic Multimeter TS-505A/U.
- Electrical Equipment Maintenance Kit MK-288.
- Electrical Special Purpose Power Cable Assembly

<p>7. None.</p> <p>g. None.</p> <p>h. None.</p> <p>i. The difference between the two recorded KILOCYCLE dial indications is not more than 2.0 kc.</p>			
<p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. None.</p> <p>e. The difference between the two recorded KILOCYCLE dial indications is not more than 2.5 kc.</p>	<p>g. An indication of 14 microvolts on the panel meter (1.4 on the 1-3 MICROVOLTS scale). Slowly turn the receiver KILOCYCLES control until the TS-505A/U meter again indicates 7 volts. Note and record the receiver KILOCYCLES dial indication.</p> <p>h. Slowly turn the receiver KILOCYCLES control and interclockwise until the TS-505A/U meter again indicates 7 volts. Note and record the receiver KILOCYCLES dial indication.</p> <p>i. Compute the difference between the KILOCYCLE dial indications recorded in g and h above. This value is the bandwidth at 3 db down.</p>	<p>a. Set the receiver KILOCYCLES dial to 400.</p> <p>b. Adjust the AN/URM-25F MICROVOLTS control until an indication of 20 microvolts on the panel meter (2 on the 1-3 MICROVOLTS scale) is obtained. If the TS-505A/U meter pointer moves off scale, set the RANGE switch to the 20V-RX1000 position.</p> <p>c. Slowly turn the receiver KILOCYCLES control until the TS-505A/U meter again indicates 7 volts. Note and record the KILOCYCLES dial reading.</p> <p>d. Slowly turn the receiver KILOCYCLES control and interclockwise until the TS-505A/U meter again indicates 7 volts. Note and record the KILOCYCLES dial reading.</p> <p>e. Compute the difference between the KILOCYCLE dial indications recorded in c and d above. This value is the bandwidth at 6 db down.</p>	<p>2 Same as step 1.</p>
<p>The difference between the two recorded KILOCYCLES dial indications is between 6.8 kc and 9.2 kc.</p> <p>The difference between the two recorded KILOCYCLES dial indications is not more than 11.6 kc.</p>	<p>Repeat the test procedures step 1b through 1i.</p>	<p>3 Same as step 1 except: BAND WIDTH 8 KC.</p>	<p>3 Same as step 1.</p>
	<p>Repeat the test procedures step 2a through 2e.</p>		<p>4 Same as step 1.</p>

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Figure 71. Overall audio test response test.

98. Overall Audio Response Test
(fig. 71)

a. Test Equipment and Materials.

- RF Signal Generator AN/URM-25F.
- Audio Oscillator TS-382D/U.
- Output Meter TS-585B/U.
- Electrical Special Purpose Power Cable Assembly CX-1597/U or equivalent.
- Electronic Multimeter TS-505A/U.
- Telephone Plug PJ-055B.
- Test leads, 2 each.
- Alligator clips, 2 each.
- Electronic Equipment Maintenance Kit MK-288/URM.
- Electrical wire (hookup wire 12").

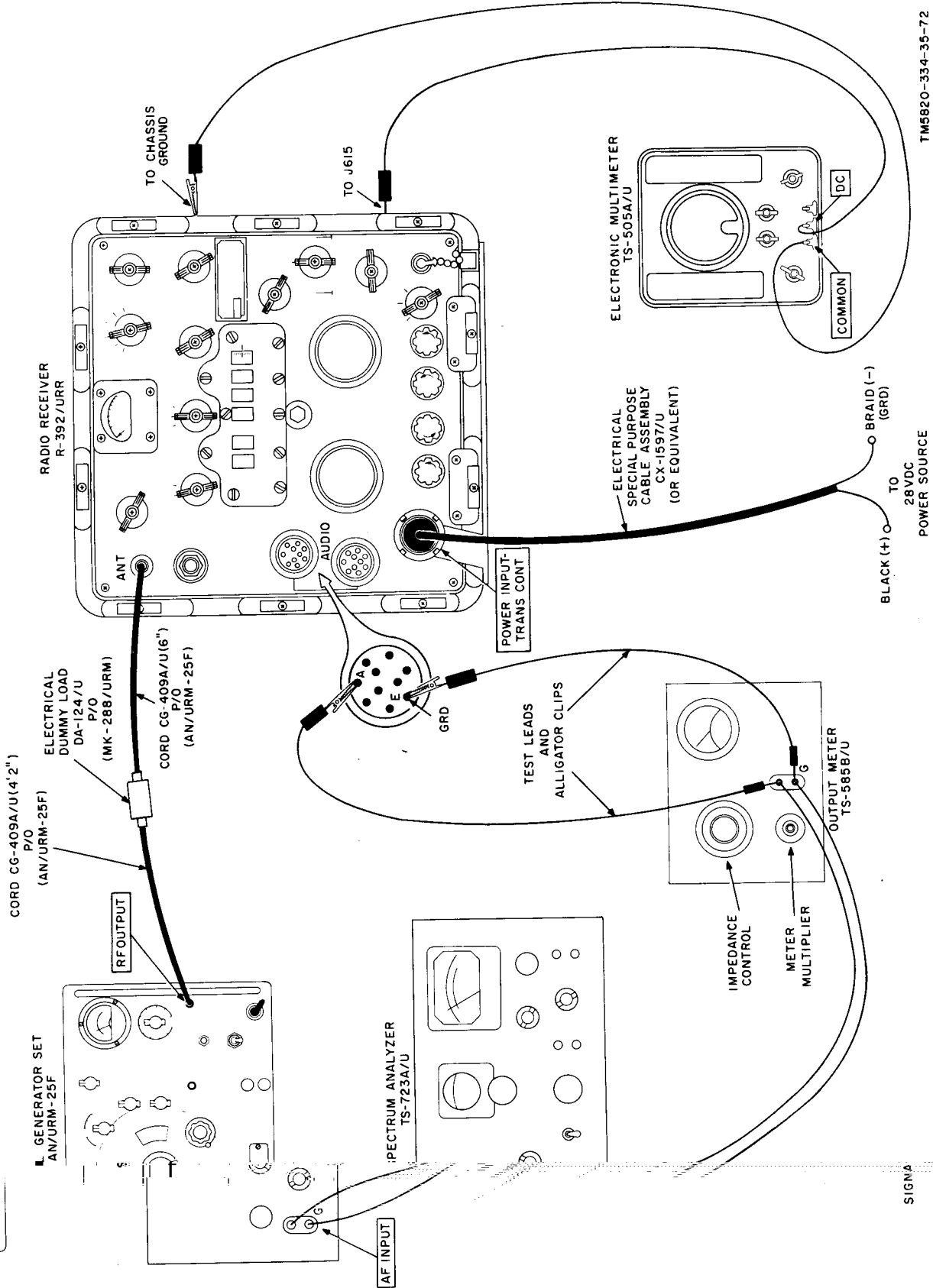
b. Test Connections and Conditions. Connect the equipment as shown in figure 71.

c. Procedures.

Step No.	Test equipment control settings	Radio Receiver R-382/URR control settings	Test procedures	Performance standard
1	AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.5 MEGA- CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-382D/U: Main tuning dial: 40. Range switch: X10. Attenuator switch: X10. OSC power: ON. Impedance control: 60 (X10 bar chart)	MEGACYCLES: 01. KILOCYCLES: 500. BANDWIDTH: 8 KC. BFO: OFF. AGC: ON. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: fully clockwise.	a. Adjust the output level control on the TS-382D/U for a full-scale indication on the panel meter. b. Make the following adjustments of the AN/URM-25F controls: (1) Adjust the SET RF OUTPUT control for a full-scale (10) indication on the panel meter. (2) Set the FUNCTION SWITCH to EXT. (3) Adjust the % MOD AUDIO OUT LEVEL control for an indication of 30 on the panel meter (% MOD scale). c. Adjust the AN/URM-25F TUNING control for a peak indication on the TS-505A/U. d. Adjust the receiver ANT TRIM control for a peak indication on the TS-505A/U. Note the TS-	a. None. b. None. c. None. d. The TS-585B/U indicates not less than

<p>1</p> <p>AN/URM-25F: BAND SWITCH: 0.6-1.5. BANDWIDTH: 1.5 MEGACYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CW. FUNCTION SWITCH: MAX. POWER: ON. MAIN tuning dial: 40. Range switch: X10. Attenuator switch: X10. CS power: ON. Inductance control: 60 (in 10 brackets). Meter multiplier: 10. FUNCTION: -D. C. RANGE: 5V-RX10.</p>	<p>MEGACYCLES: 01. KILOCYCLES: 500. BANDWIDTH: 8 KC. BFO: OFF. AGC: ON. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: fully clockwise.</p>	<p>a. Adjust the output level control on the TS-382D/U for a full-scale indication on the panel meter. b. Make the following adjustments of the AN/URM-25F controls: (1) Adjust the SET RF OUTPUT control for a full-scale (10) indication on the panel meter. (2) Set the FUNCTION SWITCH to EXT. (3) Adjust the % MOD AUDIO OUT LEVEL control for an indication of 30 on the panel meter (% MOD scale). c. Adjust the AN/URM-25F TUNING control for a peak indication on the TS-505A/U. d. Adjust the receiver ANT TRIM control for a peak indication on the TS-505A/U. Note the TS-585B/U indication.</p>	<p>a. None. b. None. c. None. d. The TS-585B/U indicates not less than 200 milliwatts.</p>
<p>2</p> <p>AN/URM-25F: FUNCTION SWITCH: CW. ATTENUATOR: 1K. Meter multiplier: 1. MAIN tuning dial: 100.</p>	<p>AF GAIN: fully counterclockwise.</p>	<p>a. Repeat test procedure step 1b. b. Adjust the receiver AF GAIN control for an indication of 10 milliwatts on the TS-585B/U. c. Set the TS-382D/U main tuning dial to 30 and note the indication on the TS-585B/U. d. Set the TS-382D/U main tuning dial to 160 and note the indication on the TS-585B/U.</p>	<p>a. None. b. None. c. The TS-585B/U indicates between 5 and 13 on the MILLIWATTS scale. d. Same as c above.</p>
<p>3</p> <p>TS-382D/U: Main tuning dial: 25. Range switch: X100. Attenuator switch: X10. CS power: ON.</p>		<p>a. Adjust the AN/URM-25F % MOD AUDIO OUT LEVEL control for an indication of 30 on the panel meter (% MOD scale). b. Note the indication on the TS-585B/U. c. Set the TS-382D/U main tuning dial to 35 and note the indication on the TS-585B/U. d. Set the TS-382D/U main tuning dial to 50 and note the indication on the TS-585B/U.</p>	<p>a. None. b. The TS-585B/U indicates between 5 and 13 on the milliwatts scale. c. The TS-585B/U indicates not more than 1 on the milliwatts scale. d. The TS-585B/U indicates not more than 1 on the MILLIWATTS scale.</p>

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Figure 72. Distortion test.

<p>CYCLES. BFO: OFF. AGC: ON. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise.</p> <p>ATTENUATOR: 1K. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON.</p> <p>TS-505A/U: FUNCTION switch: -D. C. RANGE switch: 5V-RX10. TS-585B/U: Impedance control: 60 (X10) bracket. Meter multiplier: 10. TS-723A/U: INPUT: fully counter-clockwise. RANGE: X10. AF-RF selector: AF. Function switch: SET LEVEL. Meter range switch: 100%. POWER: ON.</p>	<p>BFO: OFF. AGC: ON. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise.</p>	<p>(2) Set the FUNCTION SWITCH to 400. (3) Adjust the % MOD AUDIO OUT LEVEL control for an indication of 30 on the panel meter (% MOD scale).</p> <p>b. Adjust the AN/URM-25F TUNING control for a peak indication on the TS-505A/U. c. Adjust the receiver ANT TRIM control for a peak indication on the TS-505A/U. d. Adjust the receiver AF GAIN control for an indication of 200 milliwatts on the TS-585B/U. e. Adjust the TS-723A/U AF INPUT control for a full-scale (1.0) indication on its panel meter. f. Set the TS-723A/U function switch to DISTORTION and adjust the FREQUENCY controls for a minimum indication on its panel meter. (This minimum indication should occur when the tuning dial is in the vicinity of 40). g. Adjust the TS-723A/U BALANCE control for a minimum indication on its panel meter; then note this indication.</p>	<p>b. None. c. None. d. None. e. None. f. None. g. The indication on (10)</p>
<p>2</p> <p>Do not disturb control settings of test equipment.</p>	<p>Do not disturb control settings of the receiver.</p>	<p>Set the receiver function switch to LIMITER and note the indication on the TS-585B/U.</p>	<p>The TS- not in accordance standard watts.</p>

99. Distortion Test (fig. 72)

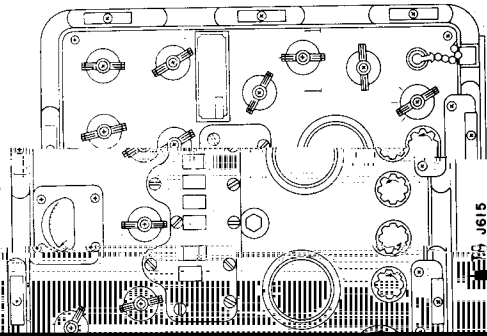
- Test Equipment and Materials.*
RF Signal Generator AN/URM-25F.
Spectrum Analyzer TS-723(A)/U.
Output Meter TS-585B/U.
Electronic Multimeter TS-505A/U.
Test leads, 4 each.
Alligator clips, 2 each.
Electronic Equipment Maintenance Kit MK-288/URM.
Electrical Special Purpose Power Cable Assembly CX-1597/U or equivalent.
Telephone Plug PJ-055B.
Electrical wire (hookup wire, 12").
- Test Connections and Conditions.* Connect the equipment as shown in figure 72.
- Procedure.*

panel meter indicates not more than .1 the 0-1.0 scale. (% distortion).
585B/U indicates more than 150 milli-

Step No.	Test equipment control settings	Radio Receiver R-392/URR control settings	Test procedure	Performance
1	AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.5 MEGA-	MEGACYCLES: 01. KILOCYCLES: 500. BAND WIDTH: 8 KC.	<ol style="list-style-type: none"> Make the following preliminary adjustments of the AN/URM-25F controls: (1) Adjust the SET RF OUTPUT control for a 	a. None.

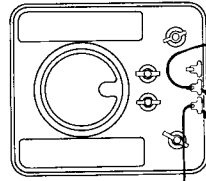
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RADIO RECEIVER
R-92/URR



TO CHASSIS
GROUND

ELECTRONIC
MULTIMETER
TS-505A/U



COMMON

DC

TM5620-334-35-73

FORM 10-54

100. Squelch Operation Test (fig. 73)

- a. *Test Equipment and Materials.*
 RF Signal Generator AN/URM-25F.
 Electronic Multimeter TS-505A/U.
 Electronic Equipment Maintenance Kit MK-288/URM.
 Electrical Special Purpose Cable Power Assembly CX-1597/U or equivalent.
- b. *Test Connections and Conditions.* Connect the equipment as shown in figure 73.
- c. *Procedure.*

Step No.	Test equipment control settings	Radio Receiver R-392/URR control settings	Test procedure	Performance standard
1	AN/URM-25F: BAND SWITCH: 0.6-1.5. TUNING: 1.5 MEGA-CYCLES. ATTENUATOR: 100. FUNCTION SWITCH: CW. MICROVOLTS: MAX. POWER: ON. TS-505A/U: FUNCTION switch: -D. C. RANGE switch: 5V-RX10.	MEGACYCLES: 01. KILOCYCLES: 500. BAND WIDTH: 2 KC. BFO: OFF. AGC: ON. Function switch: NORMAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: Midposition.	a. Make the following preliminary adjustments of the AN/URM-25F controls: (1) Adjust the SQUELCH control for a full-scale (0) indication on the panel meter. (2) Adjust the MICROVOLTS control for an indication of 5 on the panel meter (3-10 MICROVOLTS scale). (3) Set the FUNCTION SWITCH to 400. (4) Adjust the MOD AUDIO OUT LEVEL control for an indication of 30 on the panel meter (% MOD scale). b. Adjust the receiver Kilocycles control for a peak indication on the TS-505A/U. c. Adjust the receiver ANT TRIM control for a peak indication on the TS-505A/U. d. Turn the receiver F GAIN SQUELCH THRESH control fully counterclockwise and set the function switch to the SQ position. e. Turn the receiver F GAIN SQUELCH THRESH control slowly clockwise until sound is heard from the loudspeaker. Note the indication on the TS-505A/U. f. Turn the receiver F GAIN control slowly counterclockwise until the sound coming from the loudspeaker suddenly stops. Note the indication on the TS-505A/U.	a. None. b. None. c. None. d. None. e. The TS-505A/U indicates not more than 2.8 volts. f. The TS-505A/U indicates not more than 0.8 volt.

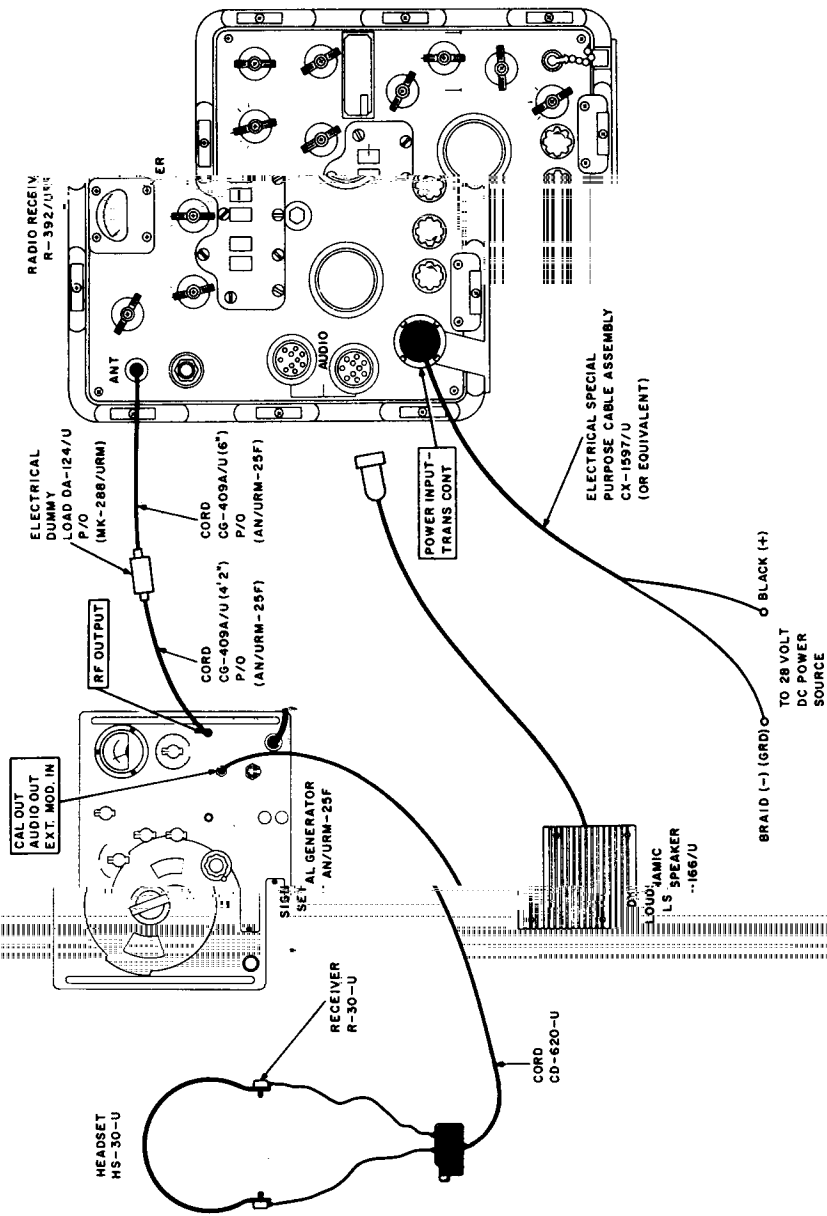


Figure 74. Calibration oscillator test.

TM5820-334-35-74

<p>TUNING: 5.0 MEGA-CYCLES. ATTENUATOR: 10. FUNCTION SWITCH: CAL. MICROVOLTS: MAX. POWER: ON.</p>	<p>BAND SWITCH: NORMAL. BFO: ON AGC: ON Function switch: position. RF GAIN: clockwise AF GAIN:</p>	<p>(3) Set the FUNCTION SWITCH to CAL. Adjust the receiver KILOCYCLES control for a zero-beat indication on the CAL. meter.</p> <p><i>Notes.</i> This adjustment is critical and must be made carefully.</p> <p>c. Adjust the receiver ANT. TRIM control for a zero-beat indication on the CAL. meter. Turn the receiver BFO SWITCH knob to adjust the BFO PITCH control for a zero-beat indication in the loudspeaker.</p> <p>d. Remove the AN/URM-25F cable from the receiver ANT. receptacle and connect the CAL. meter to the AGC control on CAL. Meter. Turn the receiver KILOCYCLES control clockwise while listening for a zero-beat from the loudspeaker.</p>	<p>Performance:</p> <p>a. None.</p> <p>b. None.</p> <p>c. None.</p> <p>d. The zero-beat is obtained within 1/2 cycle.</p> <p>e. No beat note from the CAL. meter.</p> <p>f. A zero-beat with the dial passes in the vicinity of the heard hundred megahertz speaker.</p>
<p>2</p> <p>MEGACYCLES: 24. LES: 000. DTH: 2 KC.</p> <p>BAND SWITCH: NORMAL. BFO: ON AGC: ON Function switch: position. RF GAIN: clockwise AF GAIN:</p>	<p>Turn the receiver KILOCYCLES control while listening for zero-beat indication to ON and loudspeaker.</p>	<p>Turn the receiver KILOCYCLES control for a peak while listening for zero-beat indication to ON and loudspeaker.</p>	<p>a. A zero-beat with the dial passes in the vicinity of the heard hundred megahertz speaker.</p>

101. Calibrating Oscillator Test
(fig. 74)

- a. *Test Equipment and Materials.*
RF Signal Generator AN/URM-25F or equivalent.
Dynamic Loudspeaker LS-166 or equivalent.
Electronic Equipment Maintenance Electrical Special Purpose Positioning Headset HS-30.
- b. *Test Connections and/or Control Settings.*
- c. *Procedure.*

Step No.	Test equipment control settings	Receiver control settings	Test procedure
1	AN/URM-25F: BAND SWITCH: 3.8-10.	LES: 05. LES: 000. DTH: 2 KC.	<p>a. Calibrate the AN/URM-25F as follows:</p> <p>(1) Adjust the SET POINT control on full-scale (10) indication on meter.</p> <p>(2) Adjust the TUNING control.</p>

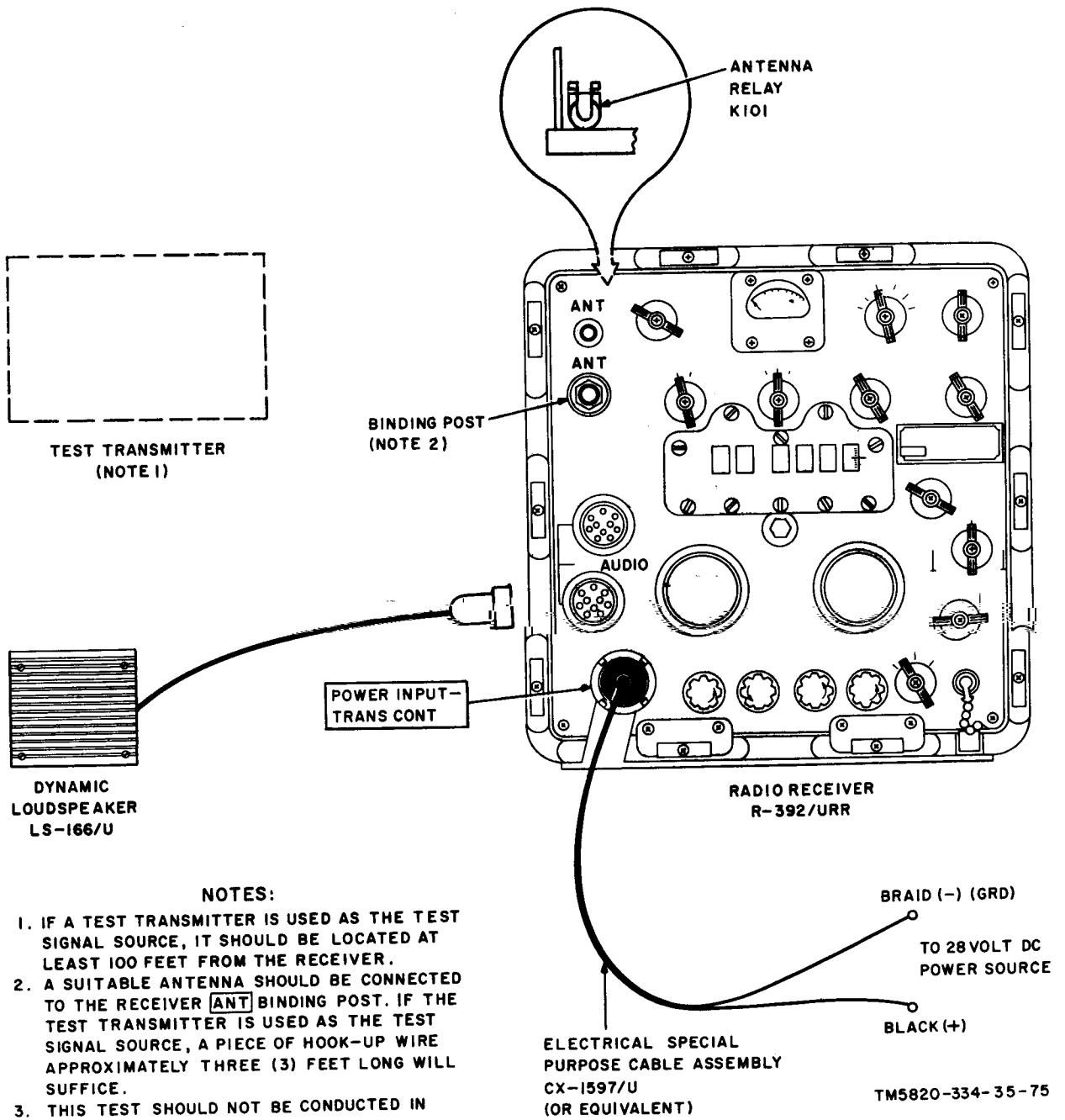


Figure 76. Operational test.

a. Test Equipment and Materials.

Electrical Special Purpose Power Cable Assembly
 Dynamic Loudspeaker LS-166/U.
 Test transmitter (not required if a signal from a commercial or government radio station may be used, see **c. Procedure.**)

b. Test Connections and/or Conditions. Connect the tube modulated, in the frequency range of 0.5 to 32 MHz, to the commercial or government radio station may be used, see **c. Procedure.**

c. Procedure.

Test procedure for meeting requirements of the receiver function switch. Connect the receiver vacuum tube modulated, in the frequency range of 0.5 to 32 MHz, to the commercial or government radio station may be used, see **c. Procedure.**

Test transmitter (not required if a signal from a commercial or government radio station may be used, see **c. Procedure.**)

b. Test Connections and/or Conditions. Connect the tube modulated, in the frequency range of 0.5 to 32 MHz, to the commercial or government radio station may be used, see **c. Procedure.**

c. Procedure.

Step No.	Test equipment control settings	Radio Receiver R-392/URR control settings	Performance standard
1	None.	MEGACYCLES: 05. KILOCYCLES: 000. BAND WIDTH: 8 KC. BFO: OFF. AGC: ON. Function switch: OFF. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: midposition. DIAL DIM: OFF.	<p>a. The vacuum tube filament there is no sound from the loudspeaker.</p> <p>b. The frequency indicator lights brightly with the dial in the ON position, and induced brilliance with the dial switch in the midposition.</p> <p>c. A hissing noise is heard at the relay operates as the switch knob is turned to the CAL position.</p> <p>d. The relay operates as the switch knob is turned to the CAL position.</p>
2	None.	MEGACYCLES: 05. KILOCYCLES: 000. BAND WIDTH: 2 KC. Function switch: NORMAL. BFO: ON. BFO PITCH: 0. AGC: CAL. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: midposition.	<p>a. Set the receiver function switch to the ON position and note the received signal.</p> <p>b. Turn the dial to the 000 position and note the received signal.</p> <p>c. Adjust the receiver function switch to the ON position and note the received signal.</p> <p>d. Turn the dial to the 000 position and note the received signal.</p>
3	None.	BAND WIDTH: 8 KC. Function switch: NORMAL. BFO: OFF. AGC: ON. RF GAIN SQUELCH THRESH: fully clockwise. AF GAIN: midposition.	<p>a. The receiver signal is intelligible.</p> <p>b. There is no intermittent or microphonic operation or vibration when the receiver is subjected to shock.</p>

102. Operational Tests (fig. 75)

103. Summary of Performance Standards
Personnel may find it convenient to ar-

range data in a manner similar to that shown below.

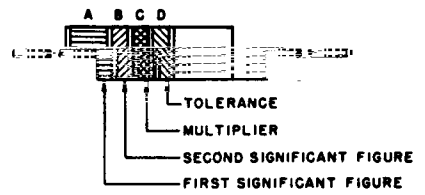
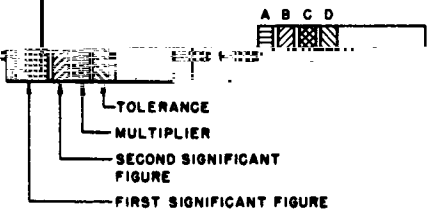
	<i>Performance Standard</i>
1. AM SENSITIVITY	
a. 0.5-0.999 mc	9 uv or less
b. 1.0-1.999 mc	7 uv or less
c. 2.0-2.999 mc	10 uv or less
d. 3.0-4.999 mc	9 uv or less
e. 5.0-8.999 mc	6 uv or less
f. 9.0-32 mc	5 uv or less

2. CW SENSITIVITY	
a. 0.5-0.999 mc	4 uv or less
b. 1.0-2.0 mc	3 uv or less
c. 2.0-32.0 mc	2 uv or less

COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS

WIREWOUND-TYPE RESISTORS



BAND A— Double Width Signifies Wire-wound Resistor

BAND A— Equal Width Band Signifies Composition-Type

TABLE

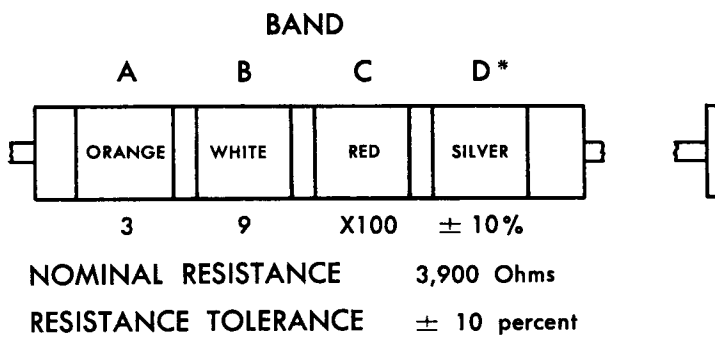
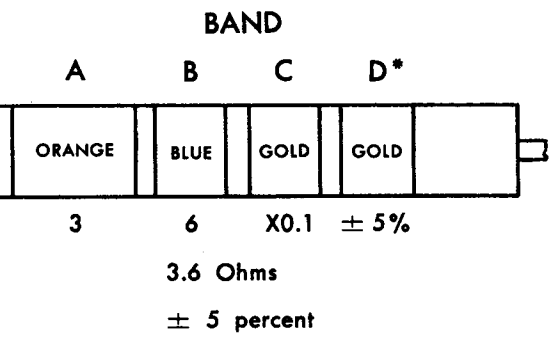
COLOR CODE T

BAND C		BAND D*	
MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	
1			
10			
100			
1,000			
10,000	SILVER	± 10	
100,000	GOLD	± 5	
1,000,000			
0.01			
0.1			

BAND A		BAND B		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR
BLACK	0	BLACK	0	BLACK
BROWN	1	BROWN	1	BROWN
RED	2	RED	2	RED
ORANGE	3	ORANGE	3	ORANGE
YELLOW	4	YELLOW	4	YELLOW
GREEN	5	GREEN	5	GREEN
BLUE	6	BLUE	6	BLUE
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7	
GRAY	8	GRAY	8	SILVER
WHITE	9	WHITE	9	GOLD

R CODING

EXAMPLES OF COLOR



STD-R2

the resistor is not Mil-Std.

*If Band D is omitted, the resistor tolerance is ± 20%, and

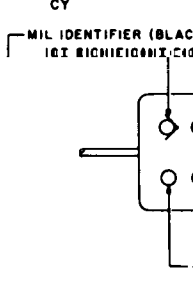
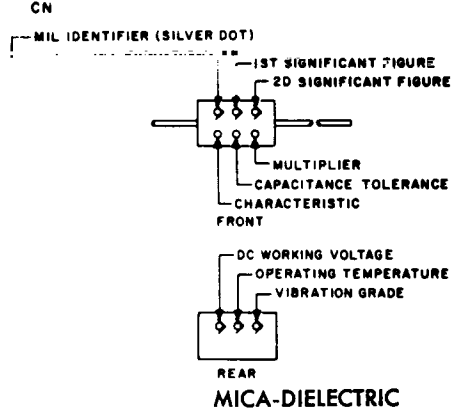
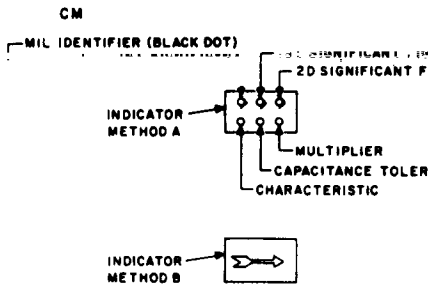
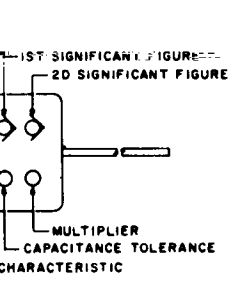
color code markings.

Figure 76. MIL-STD resistor color

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COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

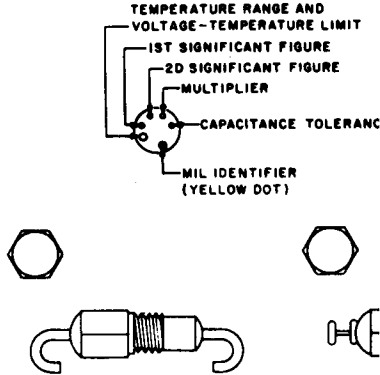
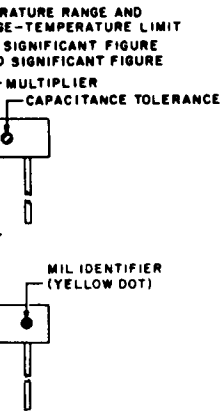
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



PER-DIELECTRIC

GLASS-DIELECTRIC, GLASS C.

General Purpose) Style CK

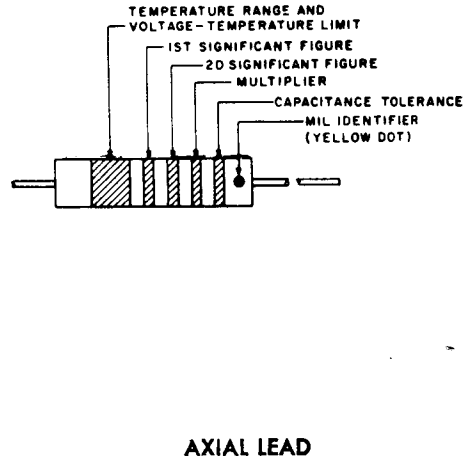


RADIAL LEAD

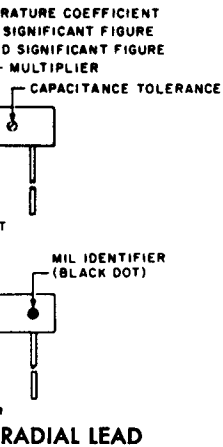
FEED-THROUGH

STAI

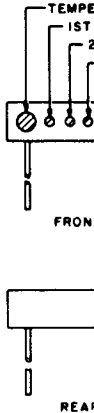
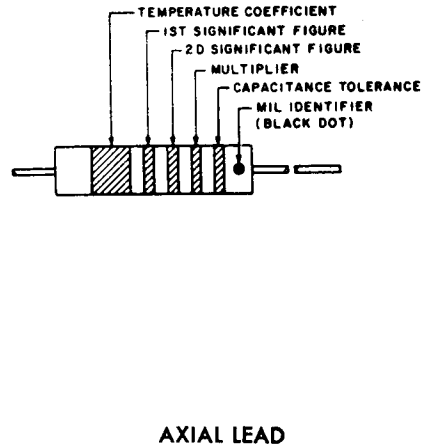
GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose)



Temperature Compensating) Style CC

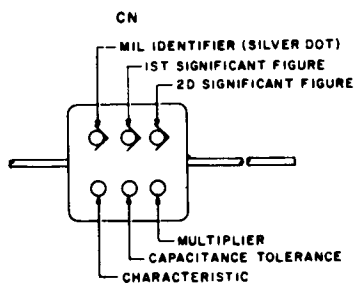


GROUP III Capacitors, Fixed, Ceramic-Dielectric (Temperature Compensating)

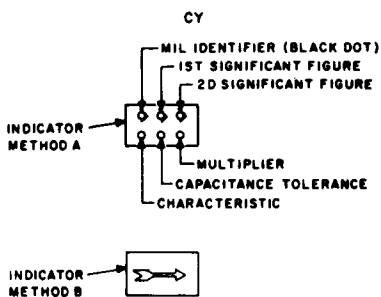


COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

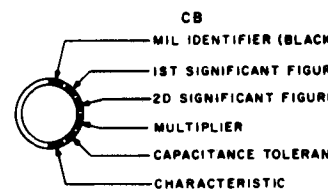
Various-Dielectrics, Styles CM, CN, CY, and CB



PAPER-DIELECTRIC



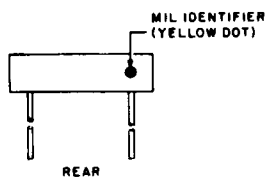
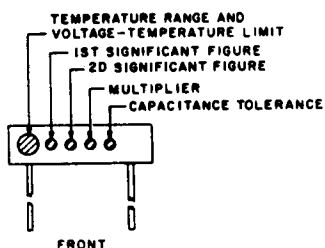
GLASS-DIELECTRIC, GLASS CASE



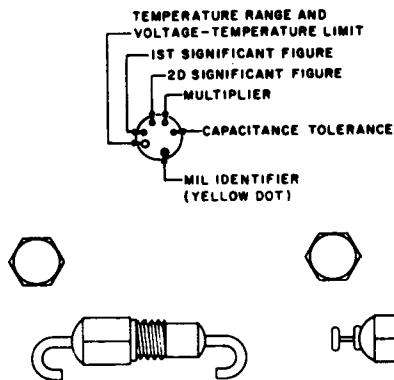
MICA, BUTTON TYPE

Ceramic-Dielectric (General Purpose) Style CK

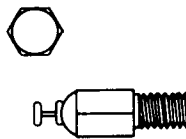
TOLERANCE
FIGURE
(DOT)



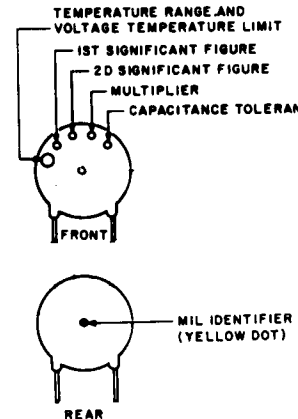
RADIAL LEAD



FEED-THROUGH



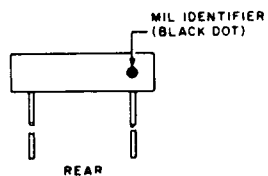
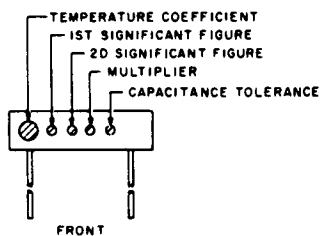
STAND-OFF



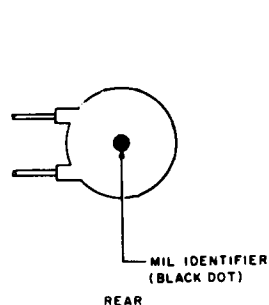
DISK-TYPE

Ceramic-Dielectric (Temperature Compensating) Style CC

TOLERANCE
FIGURE
REAR



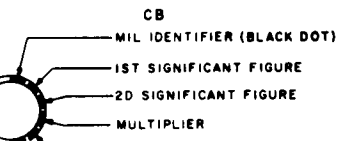
RADIAL LEAD



DISK-TYPE

Figure 77. MIL-STD capacitors

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		CHARACTERISTICS
					CM	CN	
BLACK	CM, CY	0	0	1			
BROWN		1	1	10			
RED		2	2	100			
ORANGE		3	3	1,000			
YELLOW		4	4	10,000			
GREEN		5	5				
BLUE		6	6				
PURPLE (VIOLET)		7	7				
GREY		8	8				
WHITE		9	9				
GOLD				±5%	±5%		
SILVER	CN			±10%	±10%	±10%	

±2% ±2% ±2% ±30% ±5%

CHARACTERISTICS: A, B, C, D, E, F


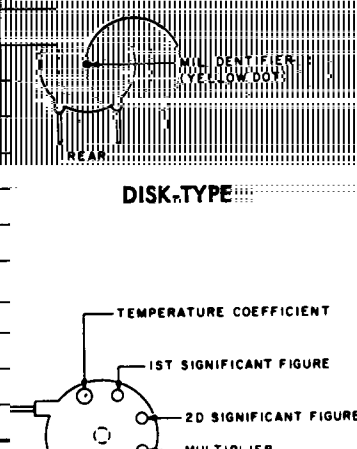
MICA, BUTTON-TYPE

TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS:
 1ST SIGNIFICANT FIGURE
 2D SIGNIFICANT FIGURE
 MULTIPLIER
 CAPACITANCE TOLERANCE

TABLE II - For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE-TEMP. LIMITS ⁴	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

COLOR	TEMP COI
BLACK	
BROWN	
RED	
ORANGE	
YELLOW	
GREEN	
BLUE	
PURPLE (VIOLET)	
GREY	
WHITE	
GOLD	
SILVER	

DISK-TYPE

FRONT

REAR

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the
2. Letters indicate the Characteristics designated in applicable specifications: MIL-C-5, MIL-C-91, M
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.

SK-TYPE

COLOR CODE TABLES

TOLERANCE	CHARACTERISTIC ²					DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
	CB	CM	CN	CY	CB	CM	CM	CM
± 20%	± 20%		A				-55° to +70°C	10-55 cps
		B	E		B			
						300		
							-55° to +125°C	10-2,000 cps
						500		
							-55° to +150°C	
± 5%	± 5%							
± 10%	± 10%							

TABLE III - For use with Group III, Temperature Compensating, Style CC

MIL ID	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			
CK	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							

are multiplied to obtain the capacitance in uuf.

15: MIL-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 respectively.

esignated in MIL-C-11015.

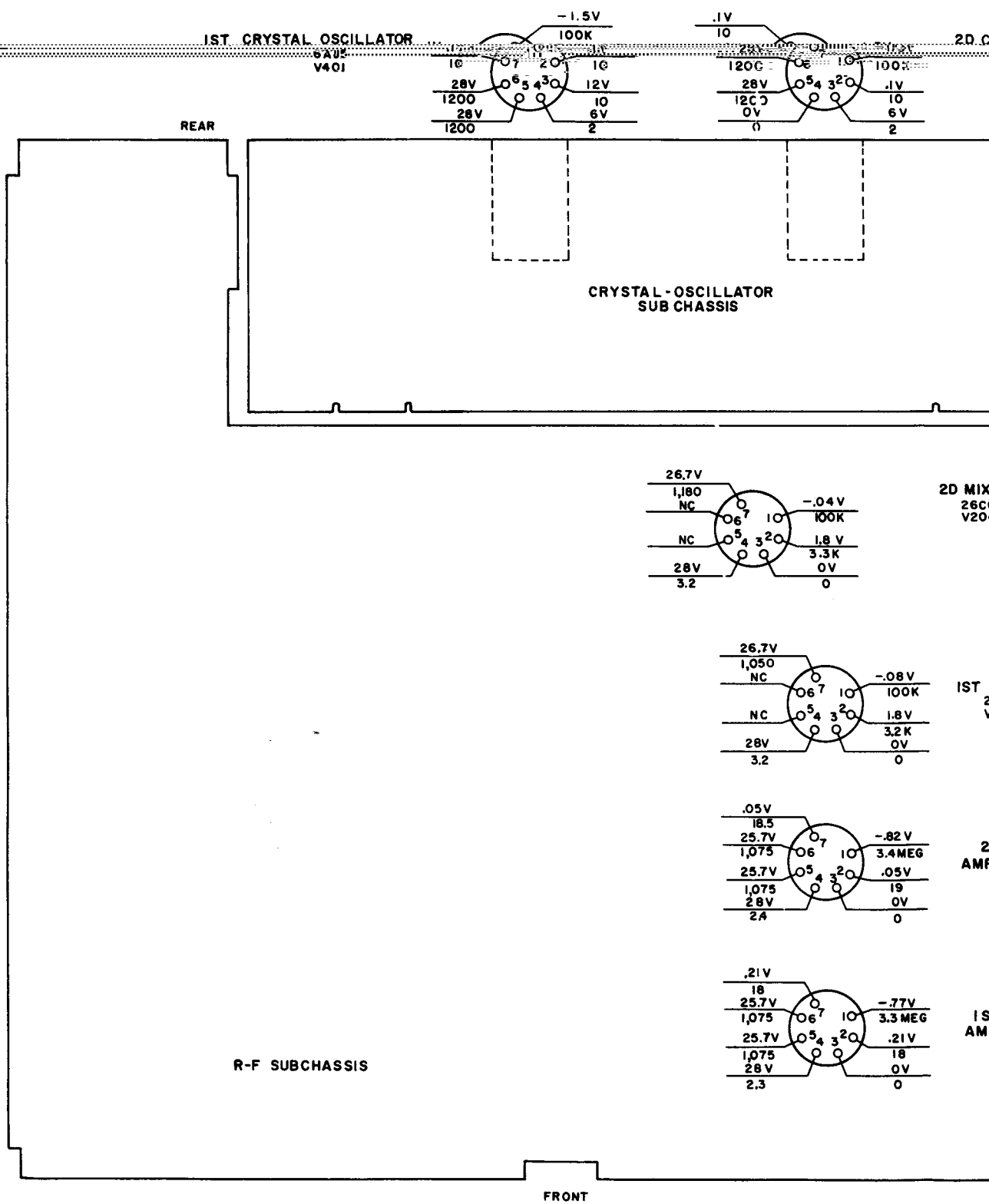
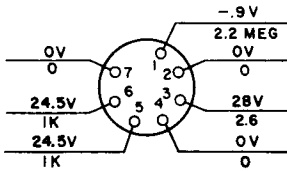


Figure 78. Upper deck, voltage and resist

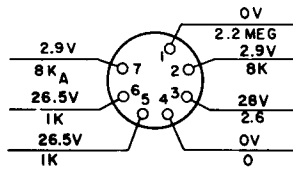
NOTES:

1. 28V D-C INPUT.
2. FUNCTION SWITCH AT **NORMAL** POSITION.
3. **RF GAIN SQUELCH THRESH** AND **AF GAIN** AT MAX CW POSITION.
4. TUNING CONTROLS AT 2.000 M.C.
5. VOLTAGES AND RESISTANCES MEASURED TO GROUND WITH VTVM.
6. HEADPHONES, ANTENNA, AND GROUND DISCONNECTED.
7. RESISTANCES ARE IN OHMS UNLESS OTHERWISE SHOWN.
8. RESISTANCE MEASUREMENTS ARE MADE WITH ALL TUBES IN SOCKETS.
9. NC DENOTES NO CONNECTION.
10. **AGC** SWITCH AT **OFF** POSITION.

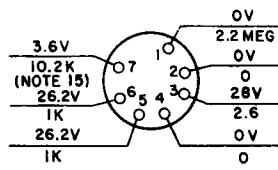
I-F SUB CHASSIS



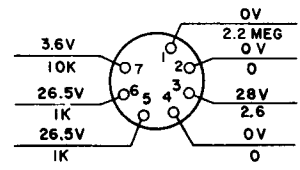
6TH I-F
AMPLIFIER
26A6
V506



5TH I-F
AMPLIFIER
26A6
V505



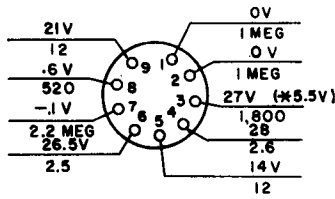
4TH I-F
AMPLIFIER
26A6
V504



3RD I-F
AMPLIFIER
26A6
V503

I-F CATHODE FOLLOWER
AND 1ST R-F AGC
RECTIFIER

12AU7
V601



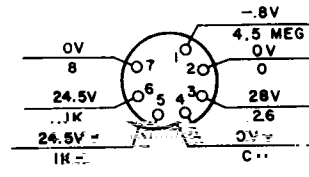
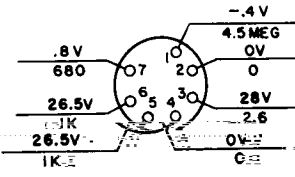
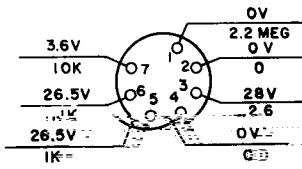
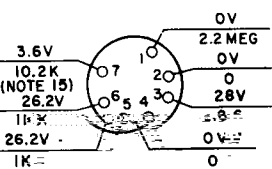
SQUELCH RECTIFIER
AND R-F AND I-F AGC

A-F
SUB CHASSIS

VFO-MIX
SUBCHAS

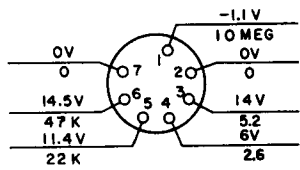
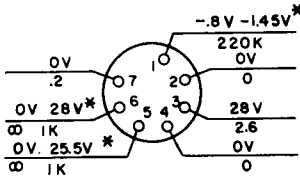
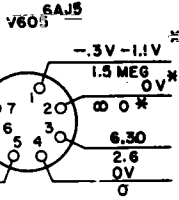
REAR

I-F SUB CHASSIS

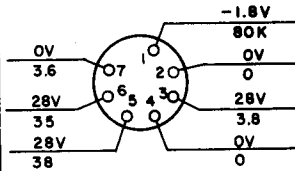


A-F SUB CHASSIS

SQUELCH CONTROL

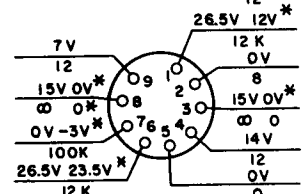
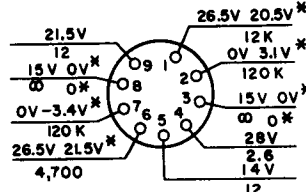
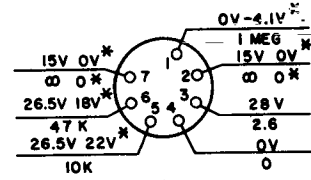


VFO-MIXER SUB CHASSIS



CALIBRATION-OSCILLATOR SUB CHASSIS

200-KC CRYSTAL OSCILLATOR

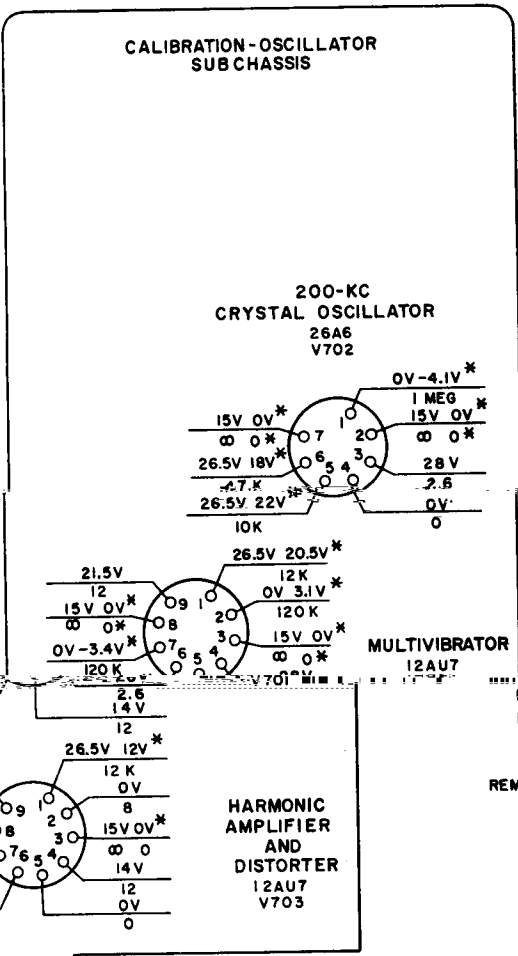
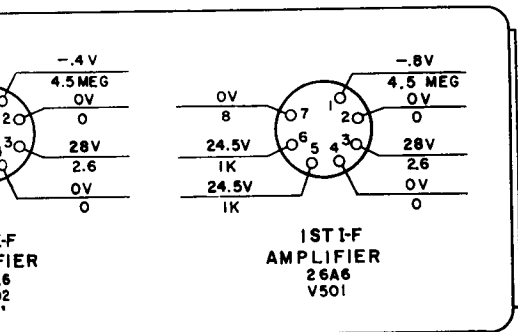


FRONT

- 1. 28
- 2. FU
- 3. A
- 4. B
- 5. C
- 6. D
- 7. E
- 8. TU
- 9. HE
- 10. VC
- 11. X
- 12. RE
- 13. J
- 14. RE
- 15. DE
- 16. WI

RE

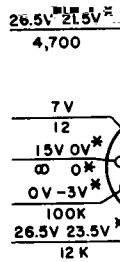
Figure 79. Lower deck, voltage and resistance diagram.



NOTES:

1. 28V D-C INPUT.
2. FUNCTION SWITCH AT **NORMAL** POSITION.
3. **AGC** SWITCH **OFF**.
4. **BAND WIDTH** SWITCH AT **2** POSITION.
5. **RF GAIN SQUELCH THRESH** AND **AF GAIN** AT MAX CW POSITION.
6. **RFO** SWITCH AT **OFF** POSITION.
7. **DIAL DIM** AT **ON** POSITION.
8. TUNING CONTROLS AT 2.000 MC.
9. HEADPHONES, ANTENNA, AND GROUND DISCONNECTED.
10. VOLTAGES MEASURED TO GROUND WITH A VTVM.
11. WHEN MEASURING **RFO** SWITCH AT **ON**, FUNCTION SWITCH AT **SO**, AND **AGC** SWITCH AT **OFF**.
12. RESISTANCES ARE IN OHMS UNLESS OTHERWISE SHOWN.
13. "A" DEPENDS ON I-F GAIN BIAS ADJUST SETTING.
14. RESISTANCE MEASUREMENTS ARE MADE WITH ALL TUBES IN SOCKETS.
15. DEPENDS ON THE ADJUSTMENT OF R521.
16. WHEN AN AUDIO MODULE IS USED IN PLACE OF V608, THE VOLTAGES ARE AS FOLLOWS:

- PIN 1 0V
PIN 2 0V
PIN 3 2V
PIN 4, 5 AND 6 28V
PIN 7 0V
PIN 8 28V
- REMOVE THE AUDIO MODULE BEFORE MEASURING RESISTANCES.



NORMAL POSITION.

AT **2** POSITION.

FRESH AND **AF GAIN** AT MAX CW POSITION.

1 POSITION.

POSITION.

AT 2.000 MC.

, AND GROUND DISCONNECTED.

TO GROUND WITH A VTVM.

SWITCH AT **ON**, FUNCTION SWITCH AT **SO**, AND **AGC** SWITCH AT **CAL**.

OHMS UNLESS OTHERWISE SHOWN.

GAIN BIAS ADJUST SETTING.

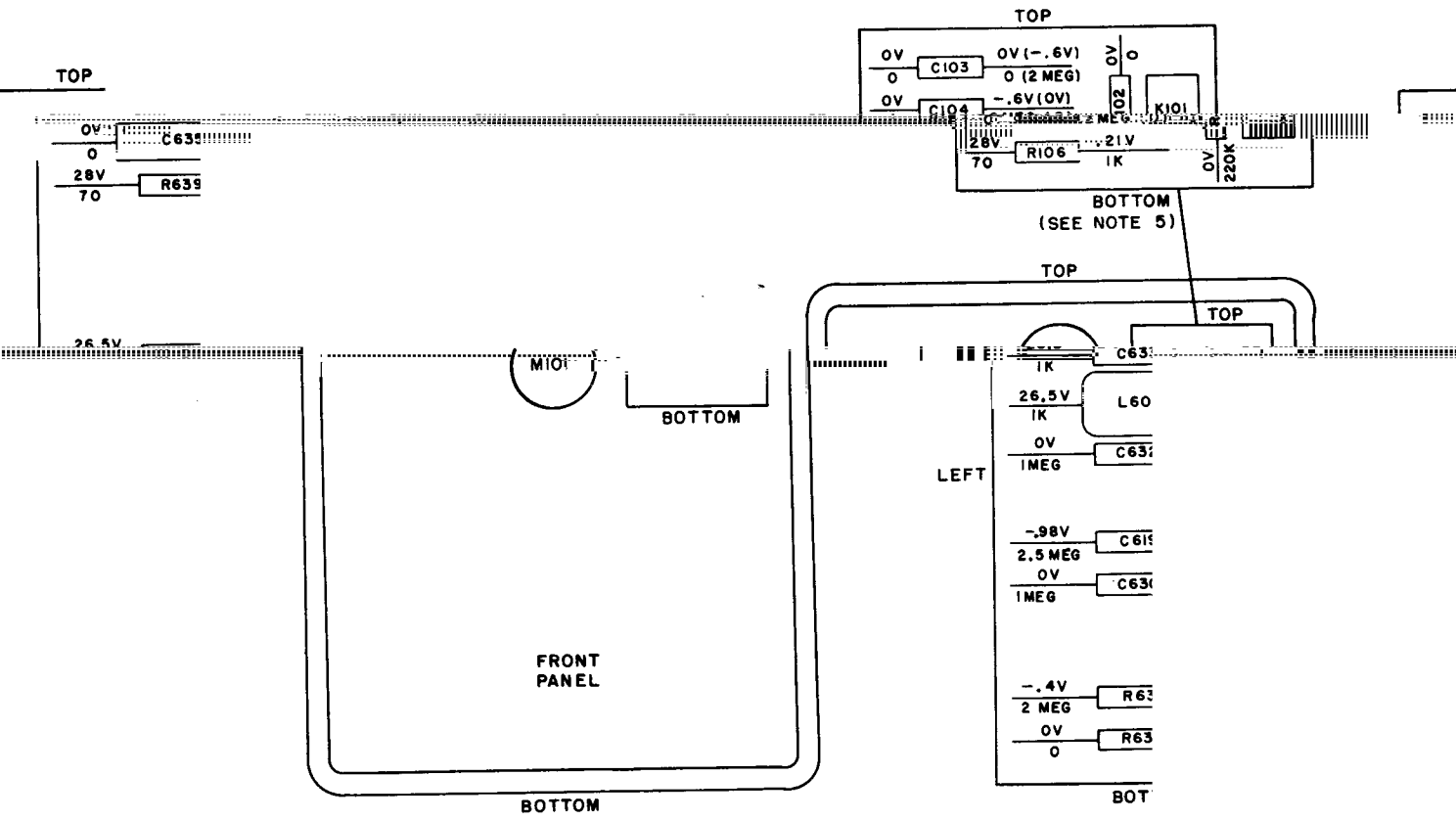
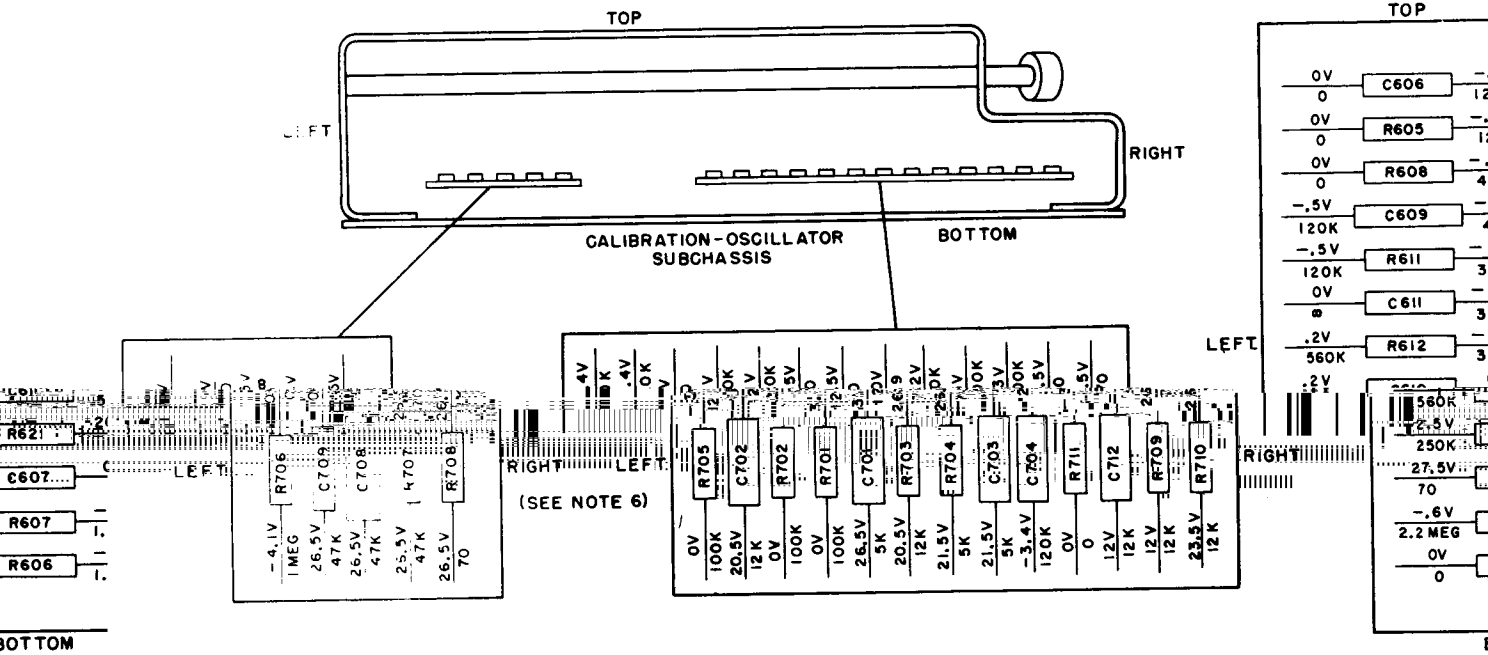
MENTS ARE MADE WITH ALL TUBES IN SOCKETS.

MENT OF R521.

IS USED IN PLACE OF V608, THE VOLTAGES ARE AS FOLLOWS:

LE BEFORE MEASURING RESISTANCES.

TM5820-334-35-50



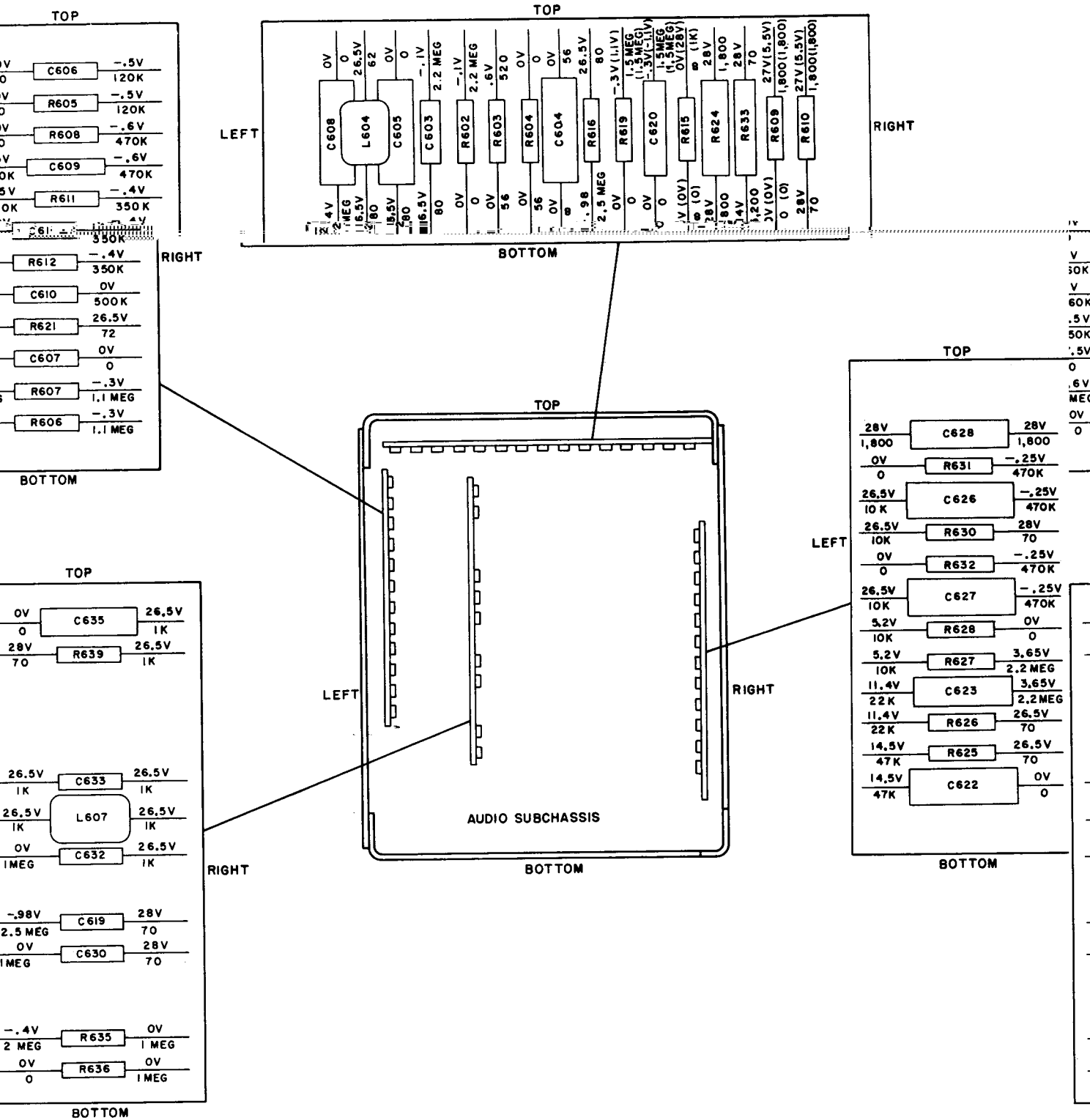
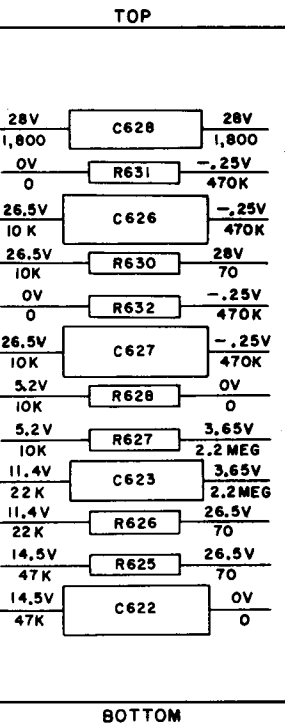


Figure 80. Terminal boards, voltage and resistance diagram.

RIGHT



RIGHT

NOTES:

1. UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS, AND ARE MEASURED FROM BOARD TERMINAL TO GROUND WITH A 20,000 OHMS-PER-VOLT METER (SUCH AS MULTIMETER TS-352)
2. READINGS ARE THE SAME ON ALL BANDS.
3. ∞ INDICATES INFINITY.
4. UNLESS OTHERWISE NOTED, SET CONTROLS AS FOLLOWS:
 FUNTION SWITCH TO **NORMAL**, **RF GAIN SQUELCH THRESH** CONTROL TO MAXIMUM CLOCKWISE, **AF GAIN** TO MAXIMUM CLOCKWISE AND **BAND WIDTH** TO **5K**

5. READINGS IN PARENTHESIS ARE MADE WITH **BFO** SWITCH AT **C**

6. READINGS ARE MADE WITH **AGC** SWITCH AT **CAL**

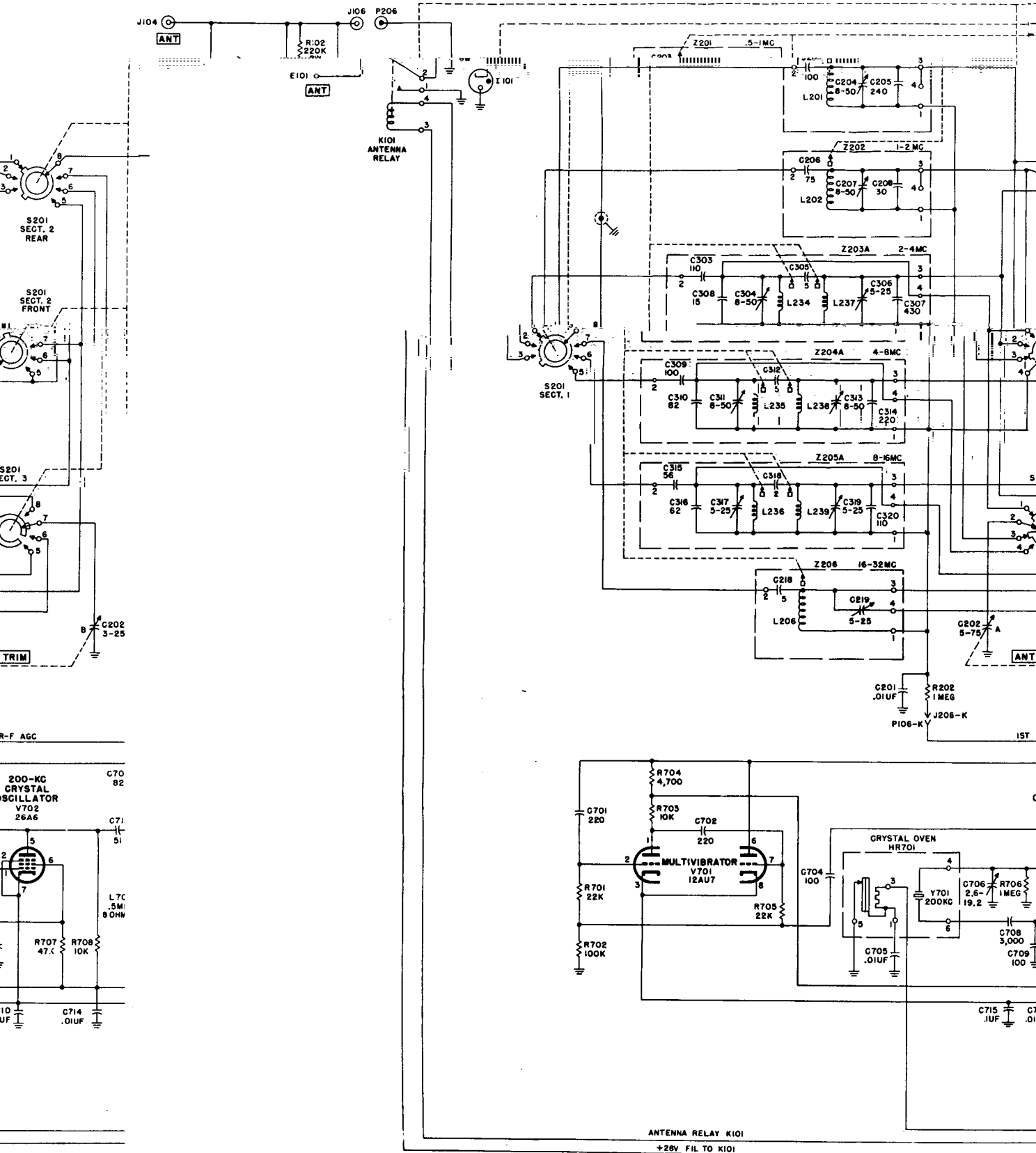


Fig 8(1)

4

BANDSWITCH S201-OPERATED BY MEGACYCLES CONTROL (SEE NOTE 7)

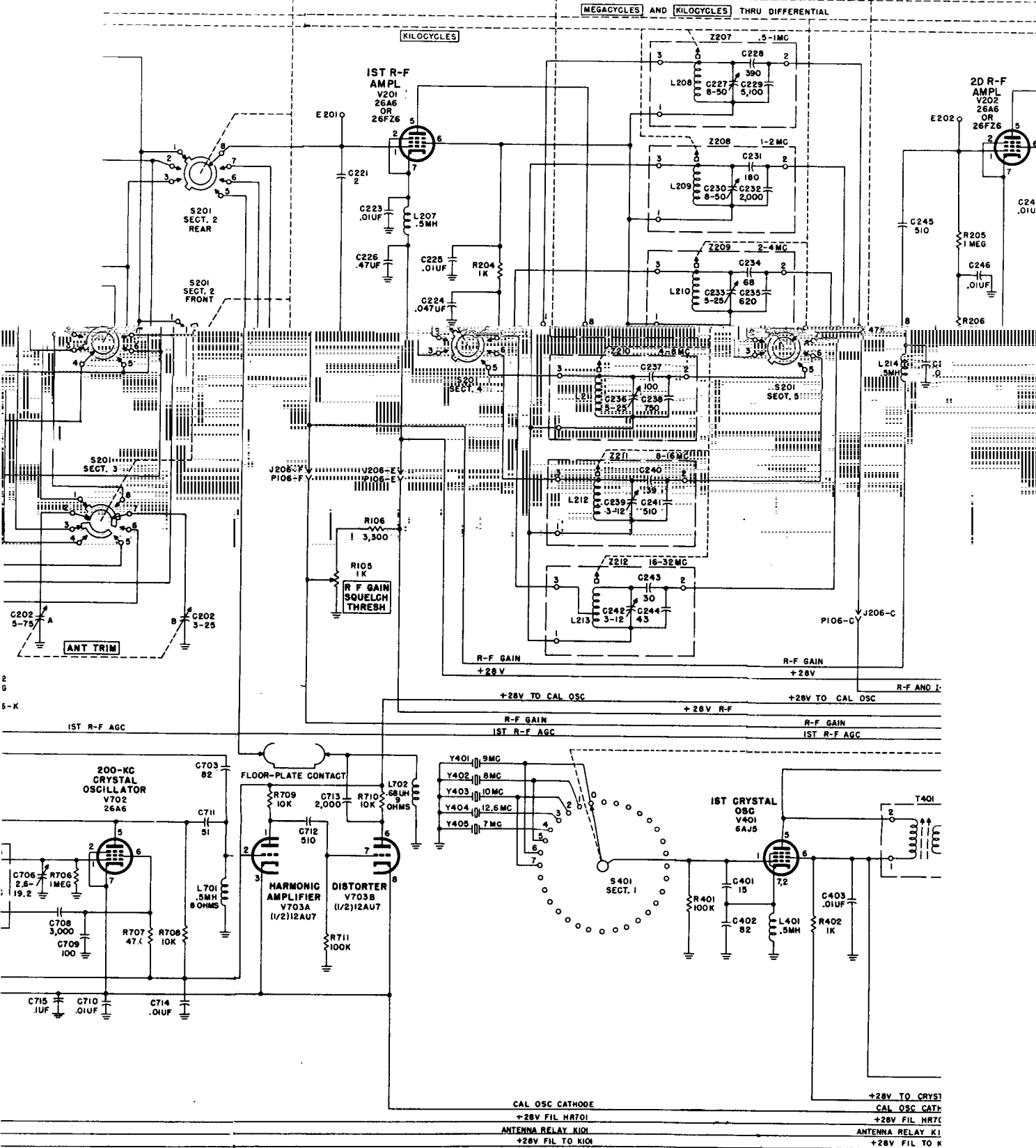


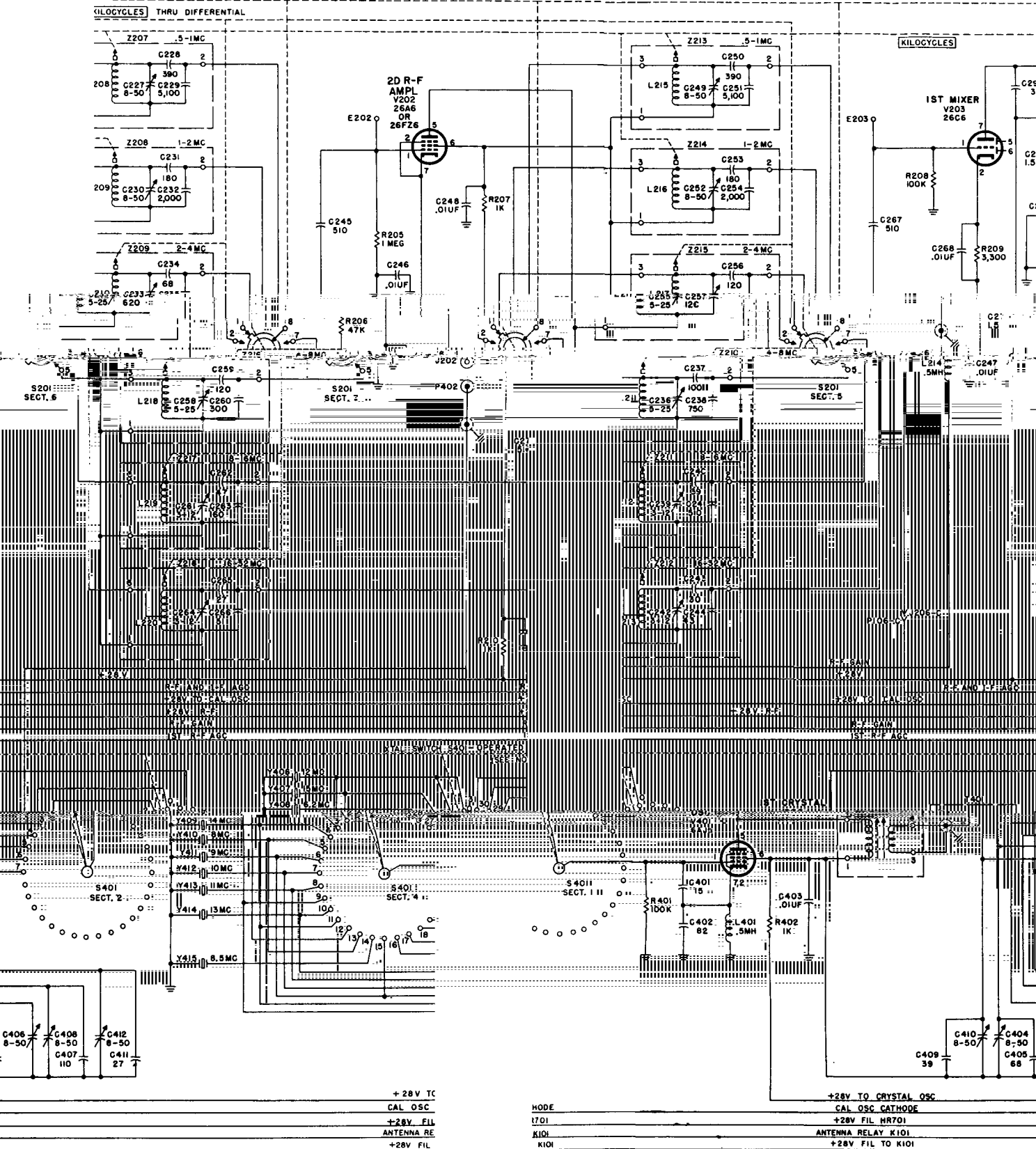
Figure 81(1)

Fig 81(1)

3201-OPERATED BY MEGACYCLES CONTROL (SEE NOTE 7)

(KILOCYCLES) THRU DIFFERENTIAL

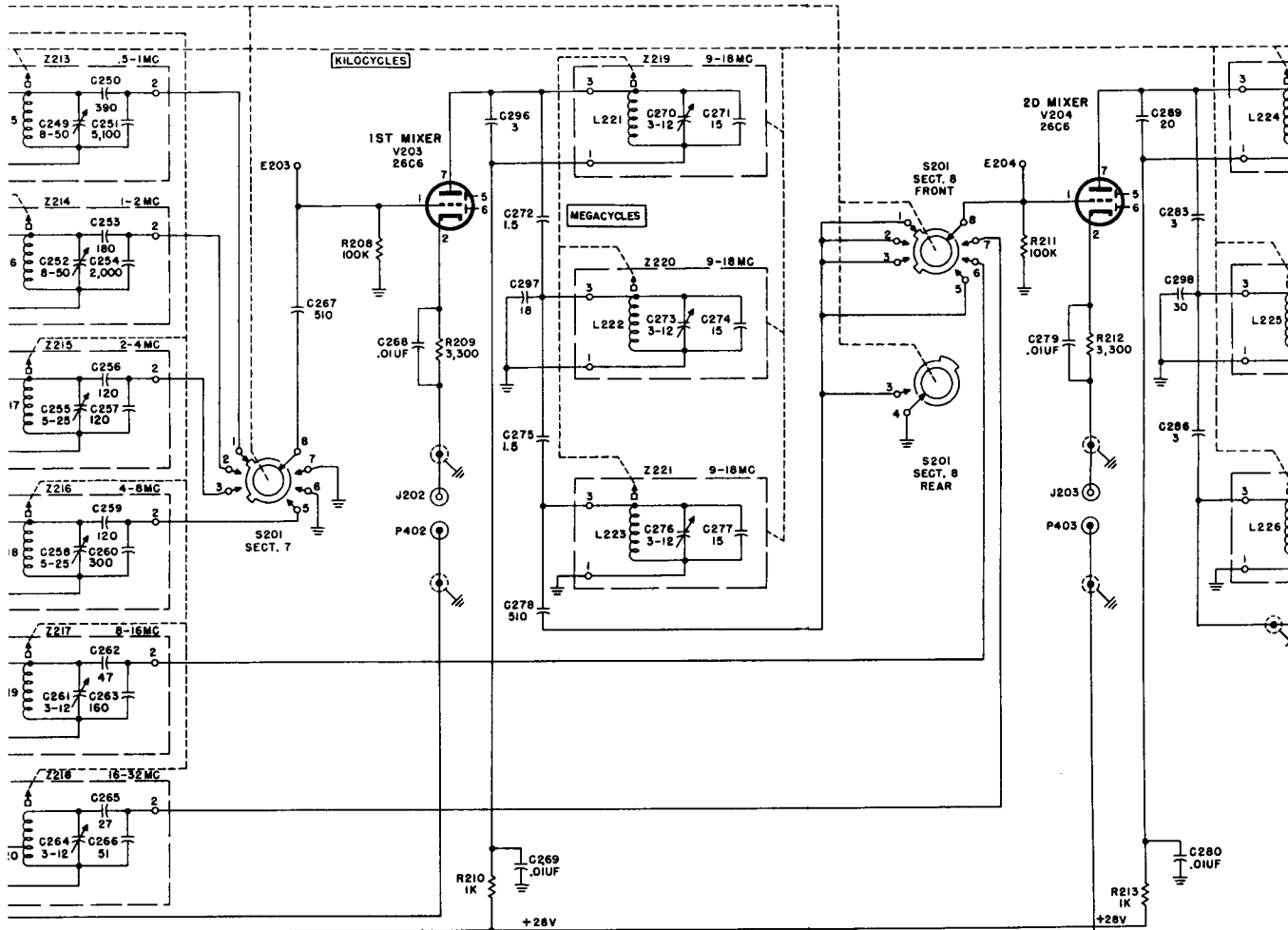
(KILOCYCLES)



Automatic diagram (part 1 of 2).

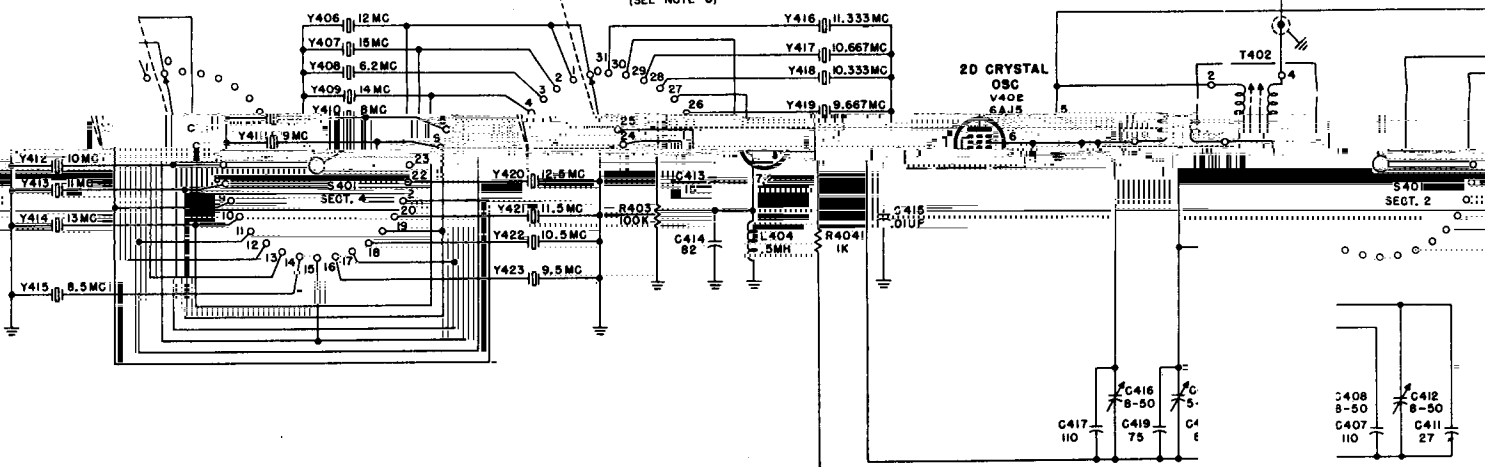
Figure 81(1). Radio receiver, schematic diagram.

fig 81(1)



- R-F AND I-F AGC
- +28V TO CAL OSC
- +28V R-F
- R-F GAIN
- 1ST R-F AGC
- R-F AND I-F AGC
- +28V TO CAL OSC
- +28V R-F
- R-F GAIN
- 1ST R-F AGC

XTAL SWITCH S401-OPERATED BY [MEGACYCLES] CONTROL (SEE NOTE 8)



- +28V TO CRYSTAL OSC
- CAL OSC CATHODE
- +28V FIL HR701
- ANTENNA RELAY K101
- +28V FIL TO K101
- +28V TO CRYSTAL OSC
- CAL OSC CATHODE
- +28V FIL HR701
- ANTENNA RELAY K101
- +28V FIL TO K101

Fug Belli

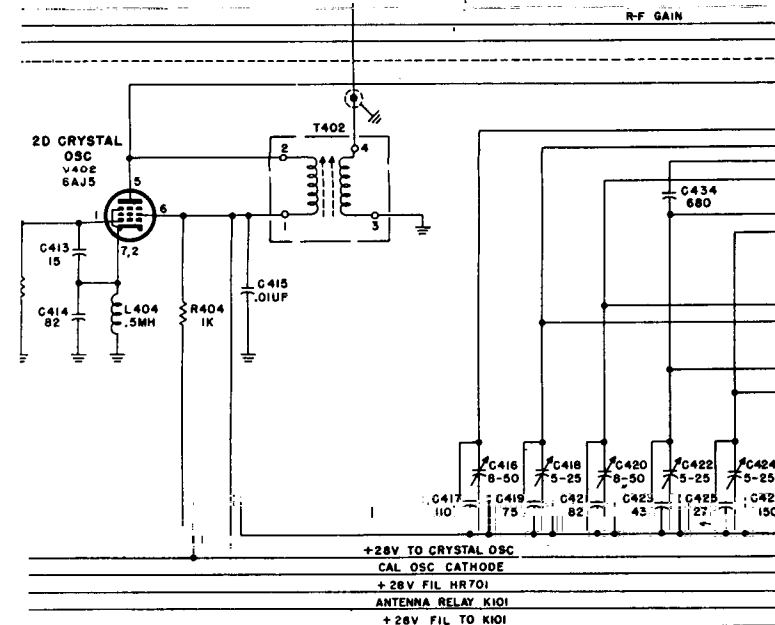
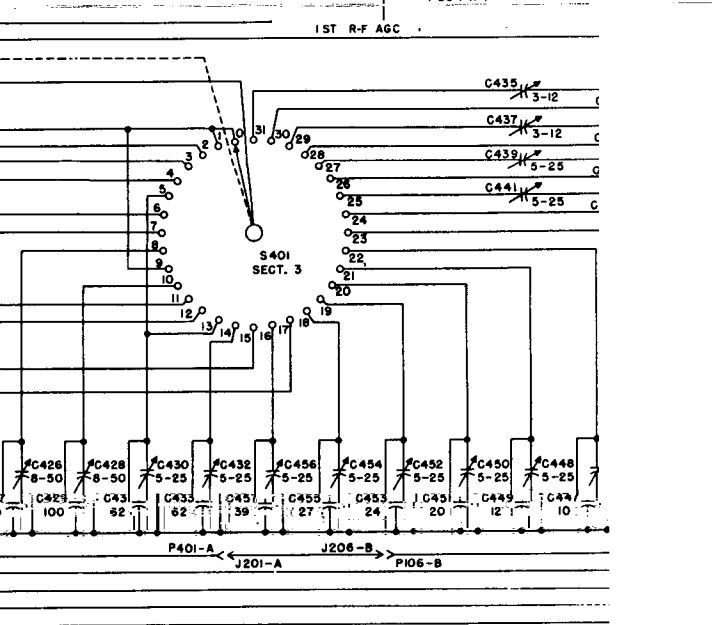
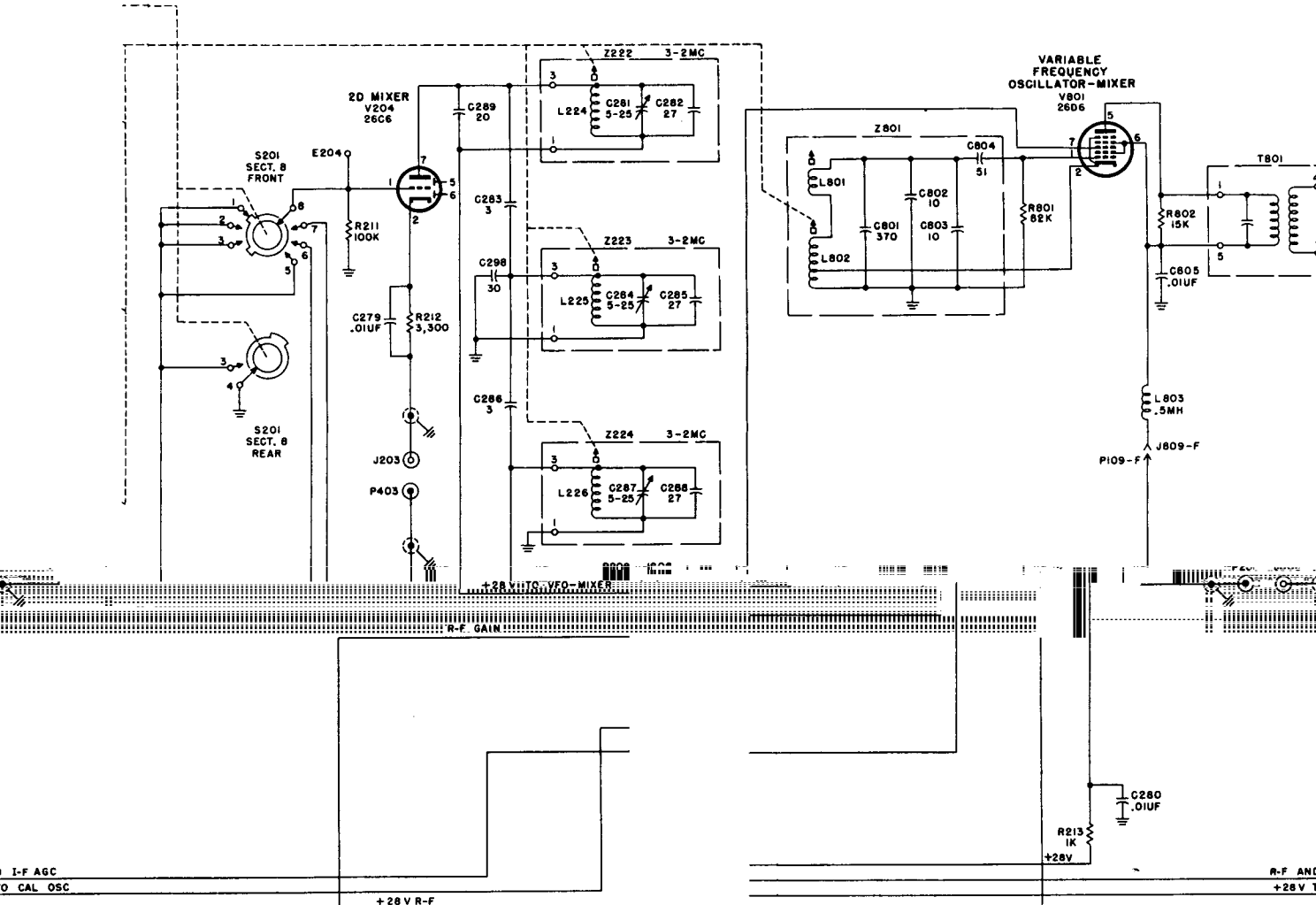
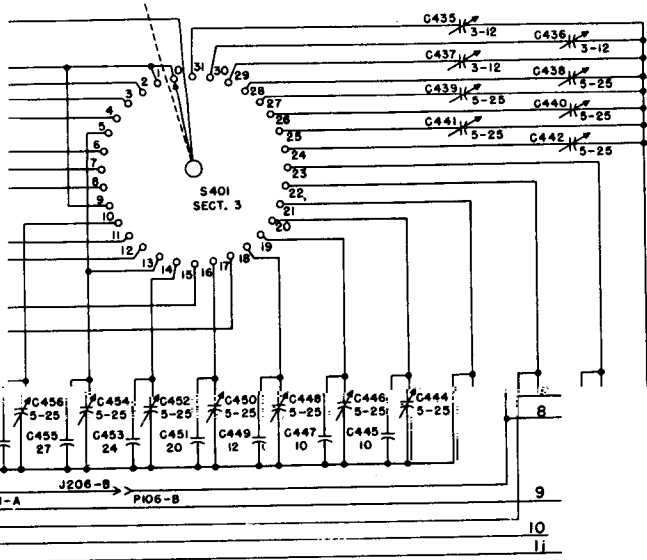
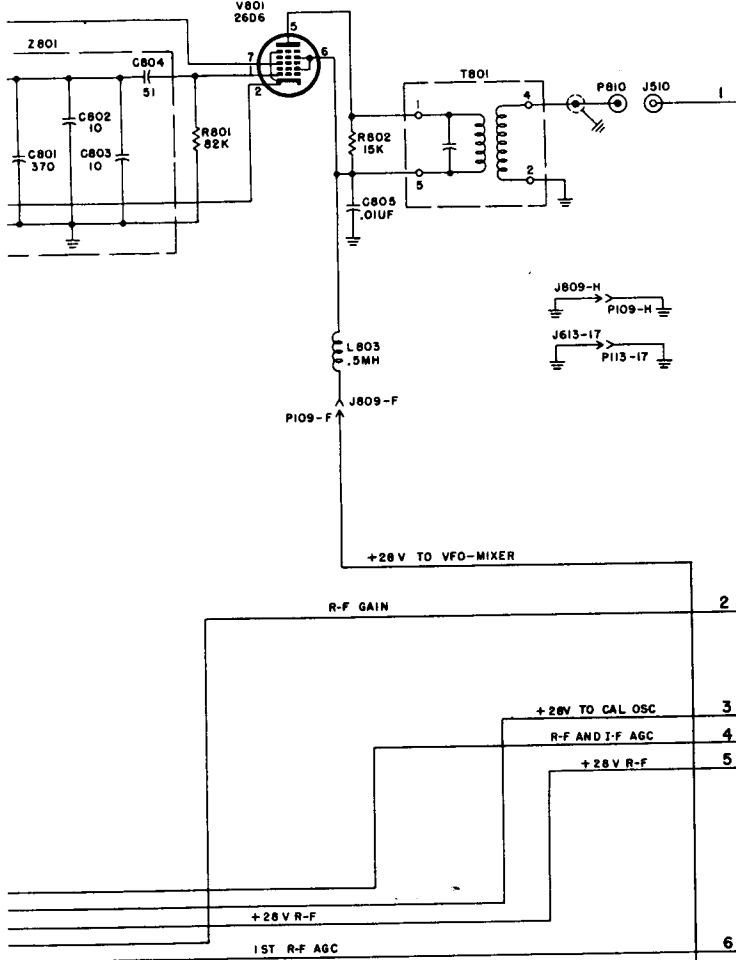


Fig 81G
5/6/6

VARIABLE
FREQUENCY
OSCILLATOR-MIXER



TM5820-334-35-76 ①

Fig 811

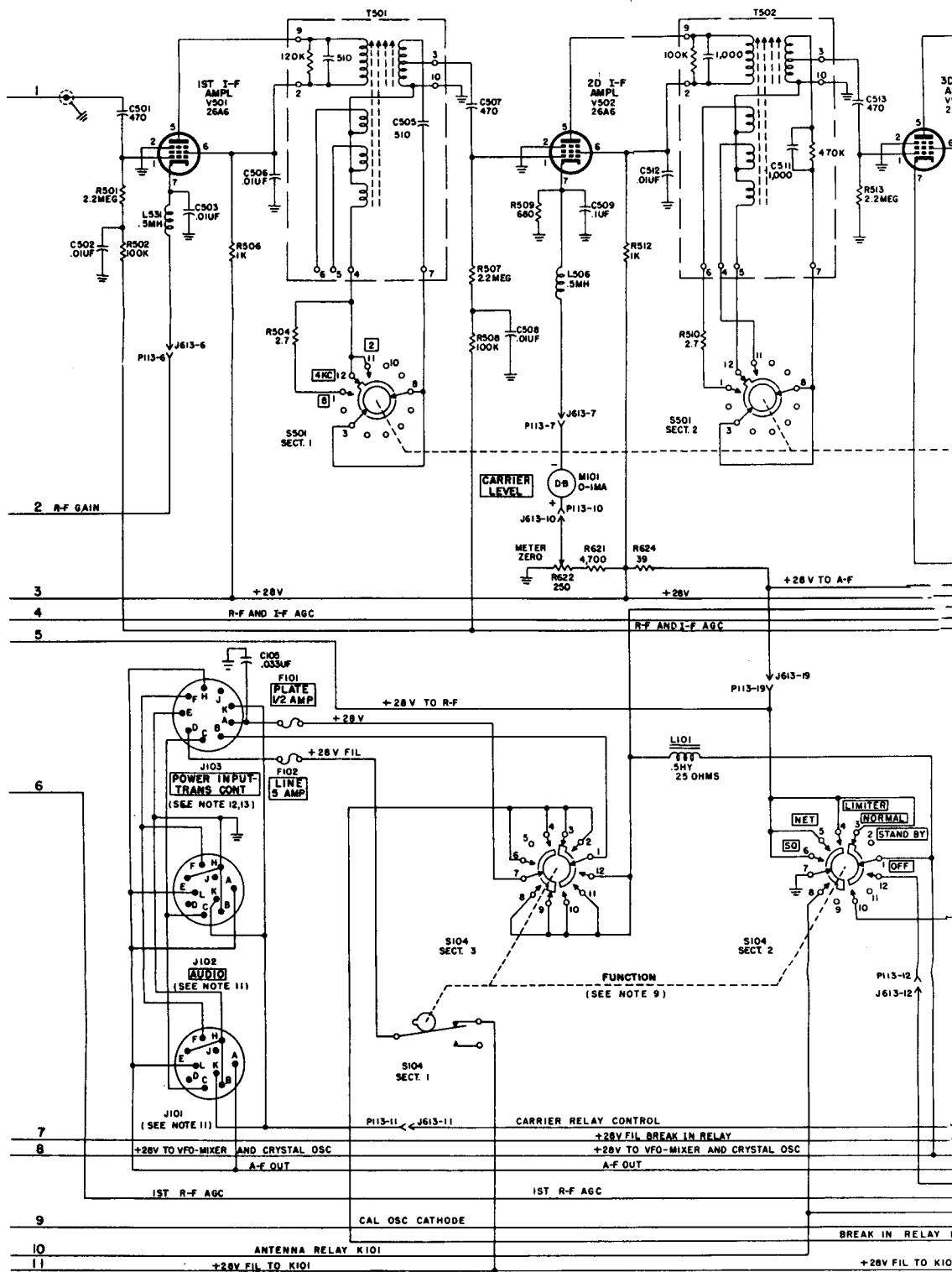
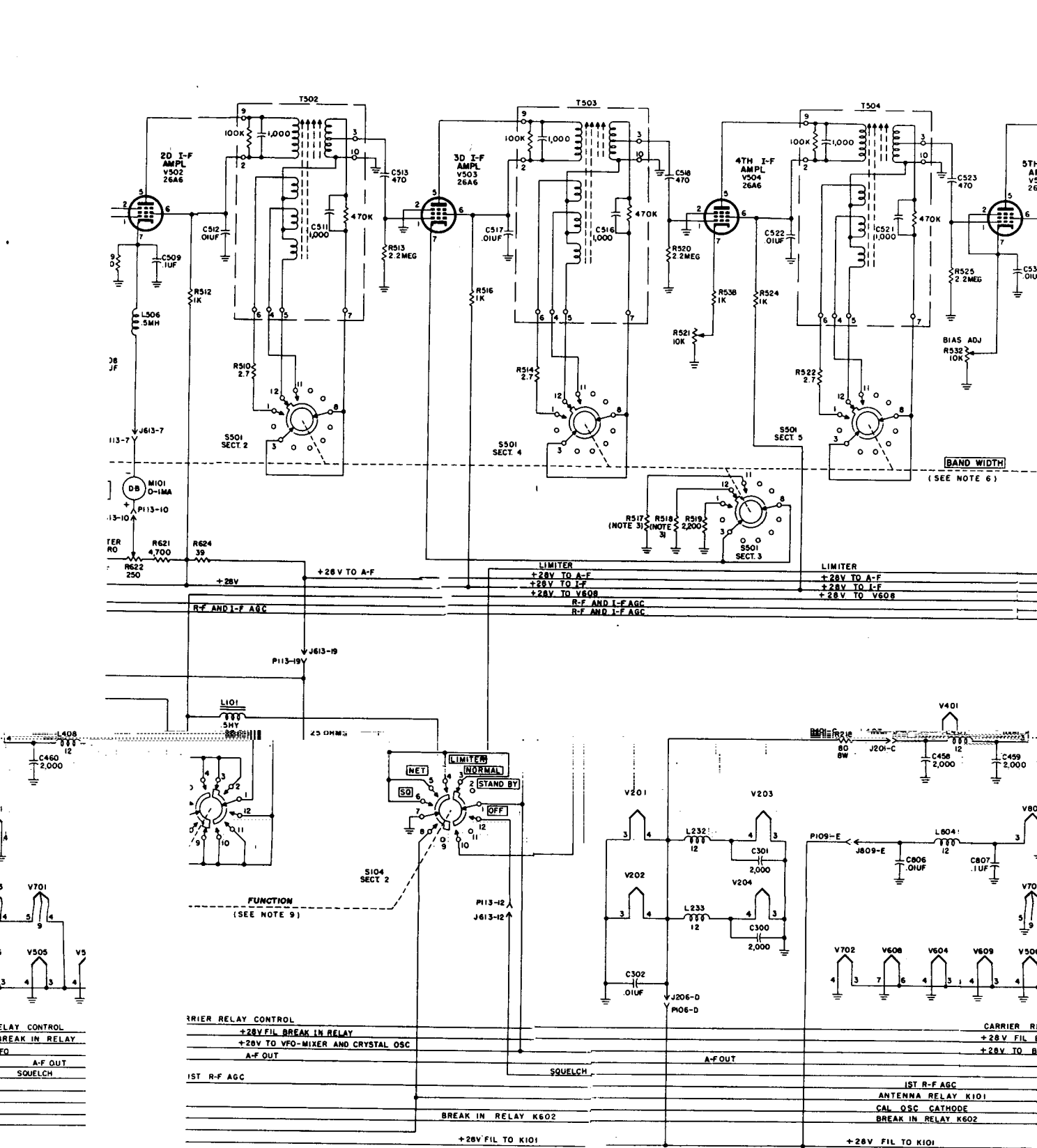
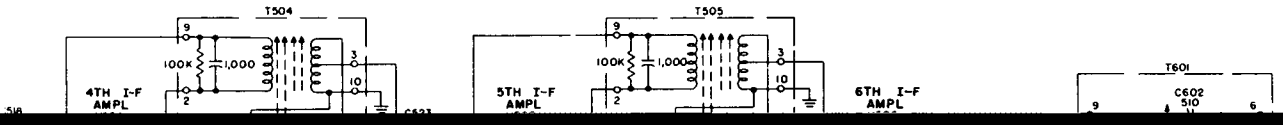
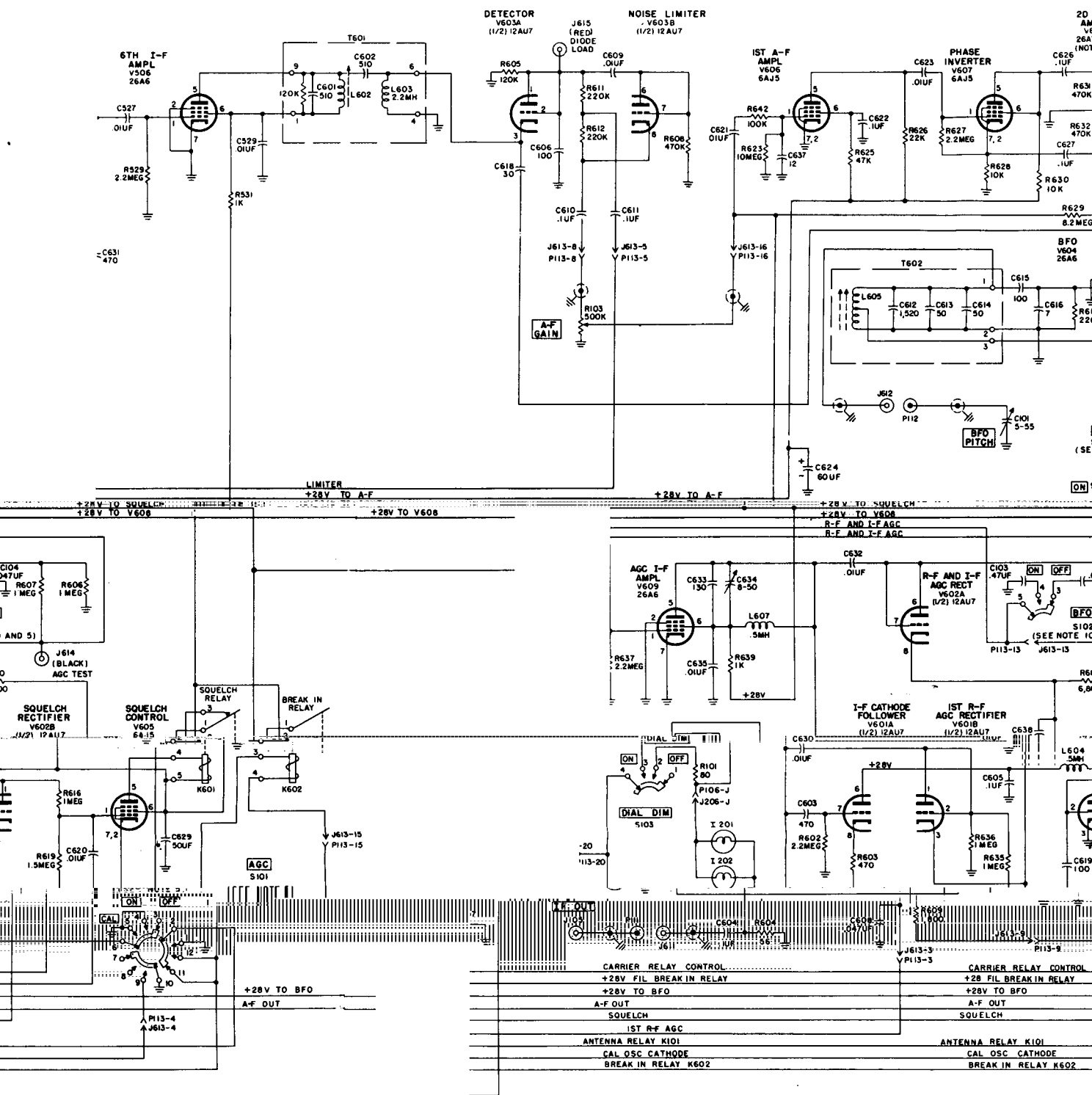


Fig 8(2)

12FC



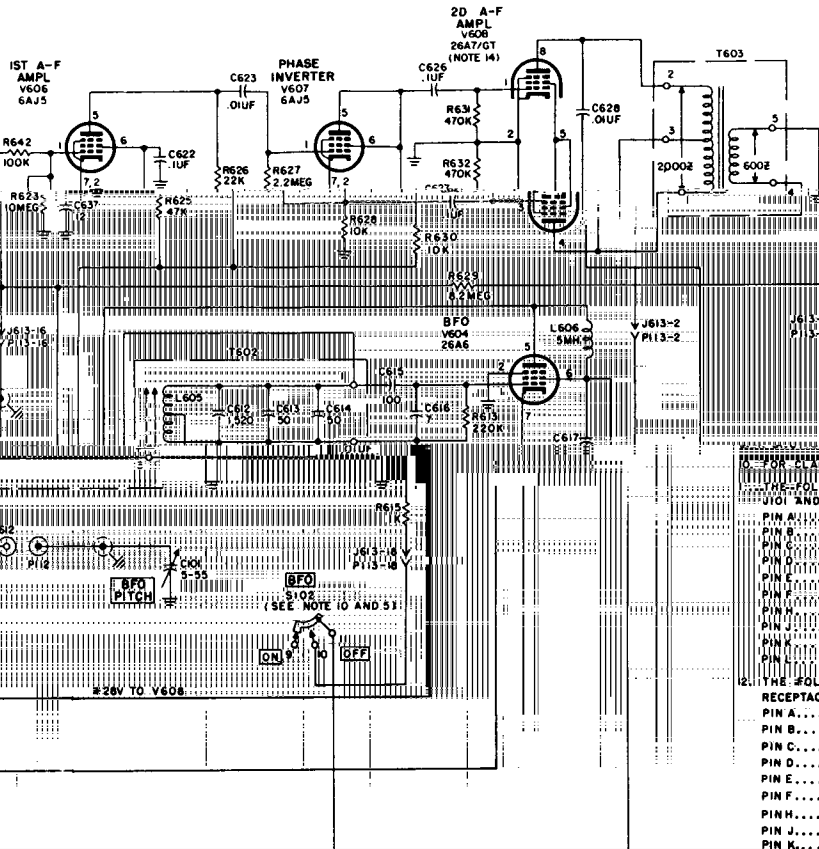




Receiver, schematic diagram (part 2 of 2).

Fig 8(2)

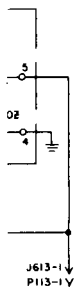
ER



NOTES:

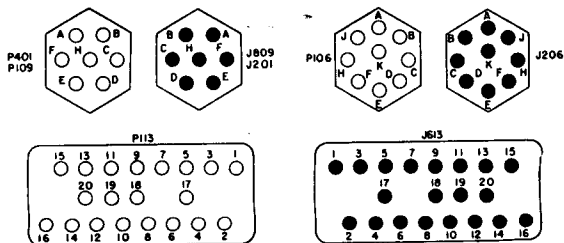
- 1. UNLESS OTHERWISE SHOWN: RESISTORS ARE IN OHMS, CAPACITORS ARE IN UUF, INDUCTORS ARE IN UH.
- 2. ALL SWITCHES ARE SHOWN ON THIS DIAGRAM AS VIEWED FROM THE END OPPOSITE THE KNOB OR DRIVEN END. SWITCHES ARE CLOSED TO THE KNOB.
- 3. R616 SELECTED AT FINAL TEST. NOMINAL VALUE R616: 2.2 MEG.
- 4. ALL RELAYS ARE SHOWN IN THEIR DEENERGIZED POSITION.
- 5. S101 SWITCH, S102 AND S104 SWITCH, S104 ARE SHOWN IN NORMAL POSITION.
- 6. BANDWIDTH SWITCH S501 IS SHOWN IN 4KC POSITION.
- 7. BANDWIDTH SWITCH S201 IS SHOWN IN 1.5 TO 1 MC FREQUENCY BAND POSITION.
- 8. CRYSTAL SWITCH S401 SHOWN IN 1.5 TO 1 MC BAND POSITION.
- 9. PIN TON, AMPLION S104 SHOWN IN NORMAL POSITION.

- THE FOLLOWING IS THE FUNCTION OF PINS IN RECEPTACLE J101 AND J102:
- PIN A.....A-F OUTPUT
 - PIN B.....GROUND
 - PIN C.....MICROPHONE
 - PIN D.....NO CONNECTION
 - PIN E.....GROUND
 - PIN F.....PUSH TO TALK SWITCH ON MICROPHONE
 - PIN G.....GROUND
 - PIN H.....NO CONNECTION
 - PIN I.....CARRIER RELAY CONTROL
 - PIN J.....A-F OUTPUT
 - PIN K.....NO CONNECTION
- THE FOLLOWING IS THE FUNCTION OF PINS OF RECEPTACLE J103:
- PIN A.....28V B+ (POSITIVE VOLTAGE)
 - PIN B.....BREAK-IN RELAY CONTROL
 - PIN C.....MICROPHONE
 - PIN D.....28V FILAMENT (POSITIVE VOLTAGE)
 - PIN E.....GROUND
 - PIN F.....PUSH TO TALK SWITCH ON MICROPHONE
 - PIN G.....A-F OUTPUT
 - PIN H.....NO CONNECTION
 - PIN I.....CARRIER CONTROL



NOTES:

1. UNLESS OTHERWISE SHOWN:
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UUF,
INDUCTORS ARE IN UH.
2. ALL SWITCHES ARE SHOWN ON THIS DIAGRAM AS VIEWED FROM
THE END OPPOSITE THE KNOB OR DRIVEN END. SECTIONS DESIGNATED
AS 1 ARE CLOSEST TO THE KNOB.
3. RS17 SELECTED AT FINAL TEST. NOMINAL VALUE 6,800 OHMS.
RS18 SELECTED AT FINAL TEST. NOMINAL VALUE 18K OHMS.
4. ALL RELAYS ARE SHOWN IN THEIR DEENERGIZED POSITIONS.
5. **AGC** SWITCH S101 AND **BFO** SWITCH S102 ARE SHOWN IN **OFF**
POSITION.
6. **BANDWIDTH** SWITCH S501 IS SHOWN IN **4KC** POSITION.
7. **BANDSWITCH** S201 IS SHOWN IN .5 TO 1 MC FREQUENCY RANGE
OR BAND POSITION.
8. CRYSTAL SWITCH S401 SHOWN IN .5 TO 1 MC BAND POSITION.
9. FUNCTION SWITCH S104 SHOWN IN **NORMAL** POSITION.
10. FOR CLARITY, BFO SWITCH S102 IS SHOWN IN 2 SECTIONS.
11. THE FOLLOWING IS THE FUNCTION OF PINS IN **AUDIO** RECEPTACLES
J101 AND J102:
PIN A.....A-F OUTPUT
PIN B.....GROUND
PIN C.....MICROPHONE
PIN D.....NO CONNECTION
PIN E.....GROUND
PIN F.....PUSH TO TALK SWITCH ON MICROPHONE OR KEY
PIN H.....GROUND
PIN J.....NO CONNECTION
PIN K.....CARRIER RELAY CONTROL
PIN L.....A-F OUTPUT
12. THE FOLLOWING IS THE FUNCTION OF PINS OF **POWER INPUT-TRANS CONT**
RECEPTACLE J103
PIN A.....28V B+ (POSITIVE VOLTAGE)
PIN B.....BREAK-IN RELAY CONTROL
PIN C.....MICROPHONE
PIN D.....28V FILAMENT (POSITIVE VOLTAGE)
PIN E.....GROUND
PIN F.....PUSH TO TALK SWITCH ON MICROPHONE OR KEY
PIN H.....A-F OUTPUT
PIN J.....NO CONNECTION
PIN K.....CARRIER CONTROL
13. CONTACTS A AND D OF J103 ARE CONNECTED TOGETHER WHEN
EITHER ELECTRICAL SPECIAL PURPOSE CABLE ASSEMBLY
CX-1597/U OR ELECTRICAL SPECIAL PURPOSE CABLE ASSEMBLY
CX-1599/U ARE USED.



14. AN AUDIO MODULE IS USED IN PLACE OF V608 IN CERTAIN RECEIVERS. SEE TEXT.

F OUT

Fig 81(2)

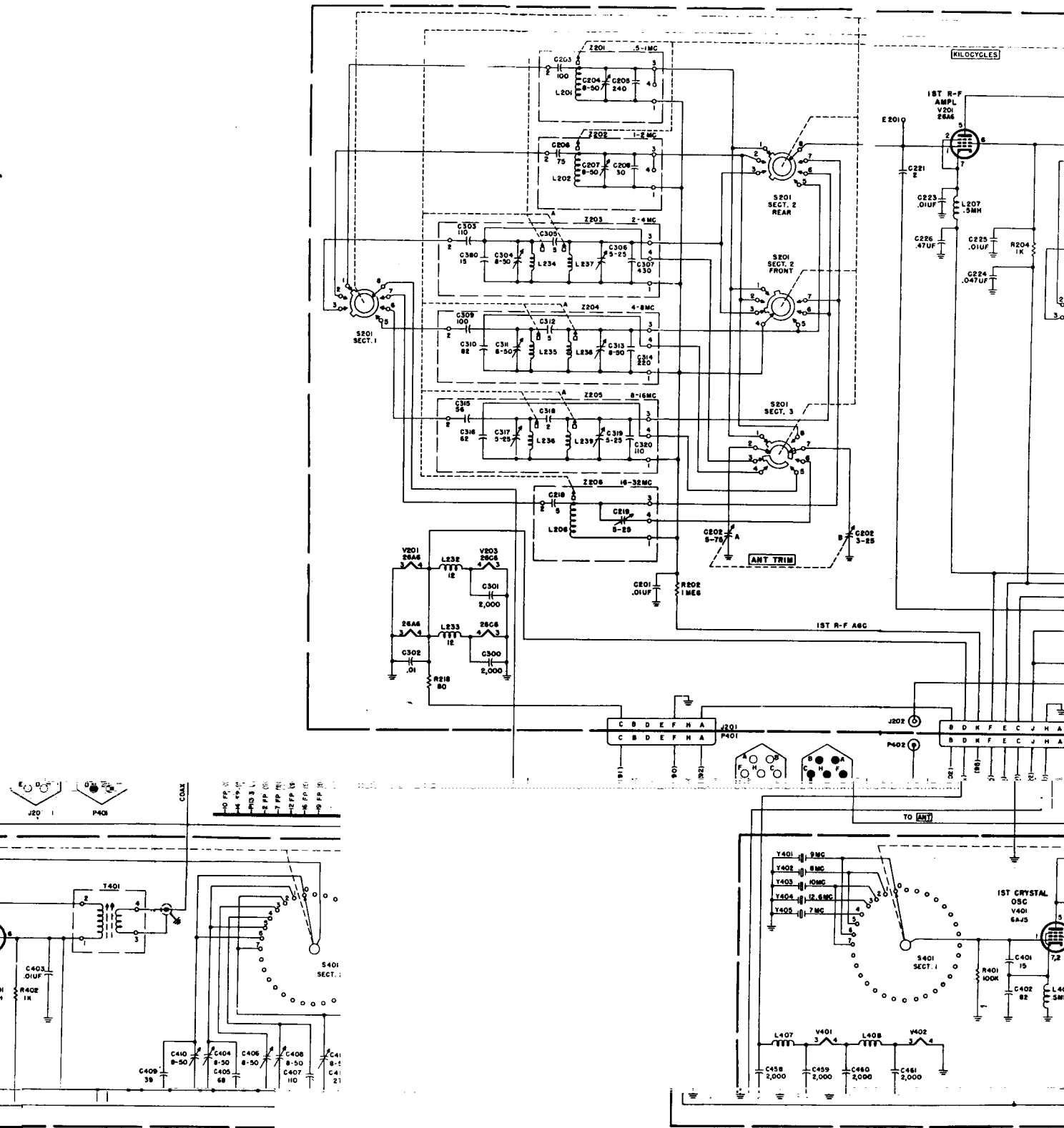


Fig 82(1)
10F6

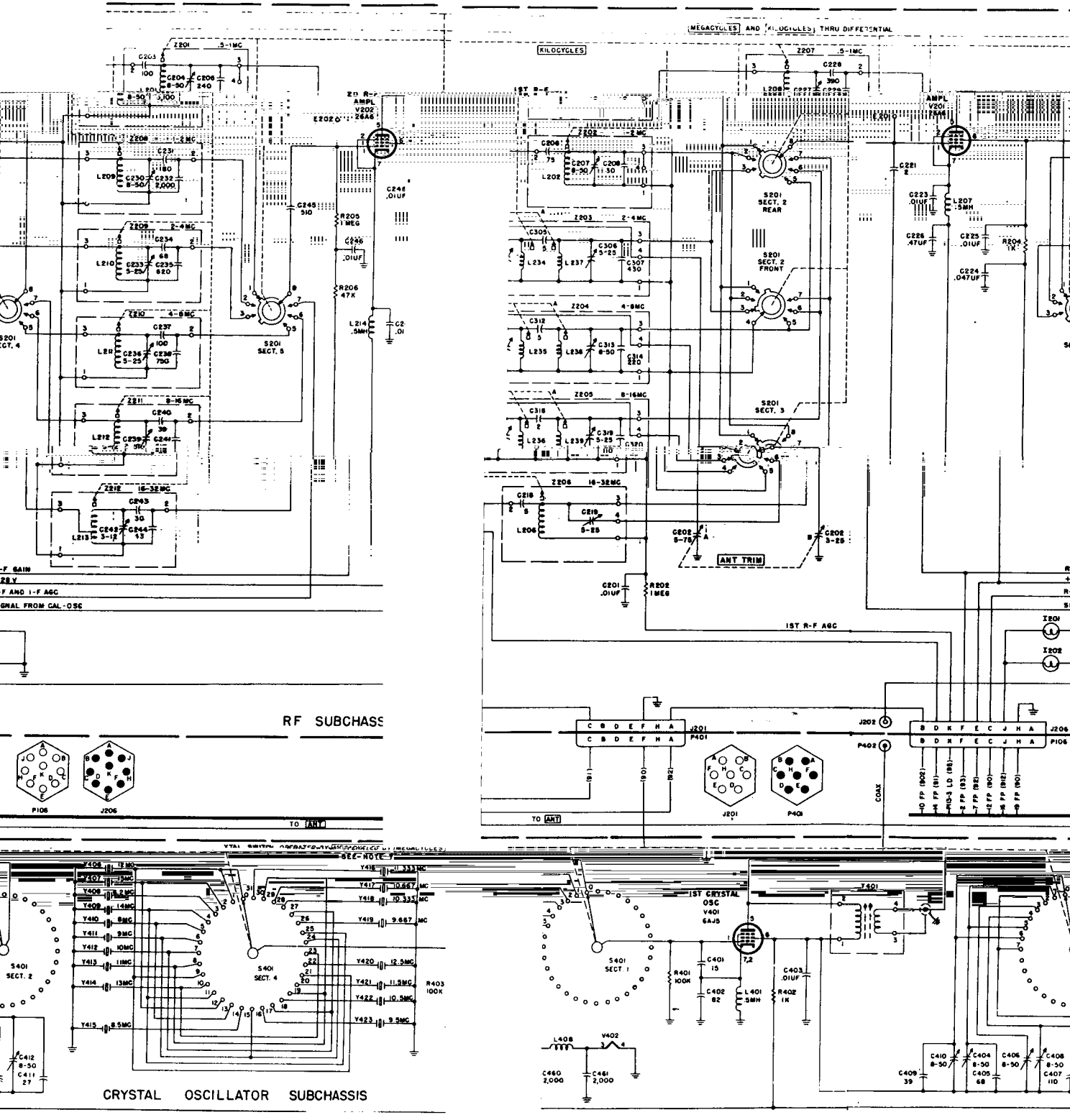


Figure 89(1). Radio receiver, wiring

Fig 82(1)

2-56

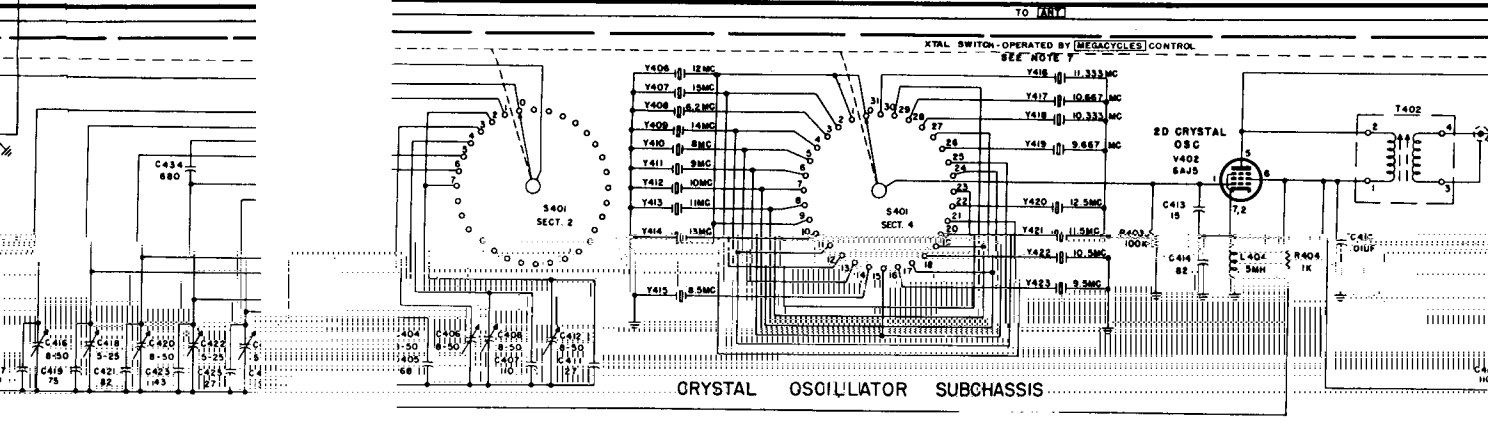
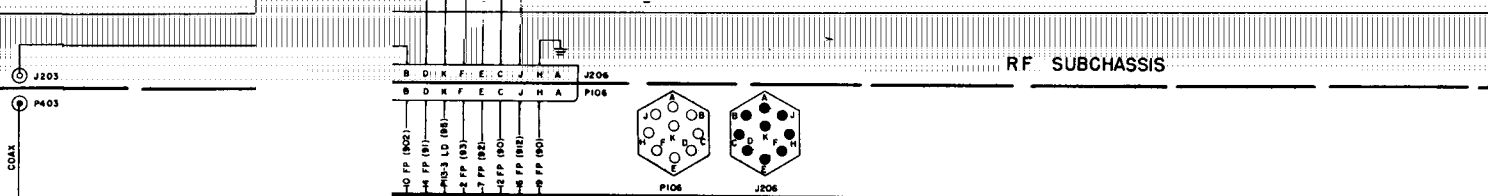
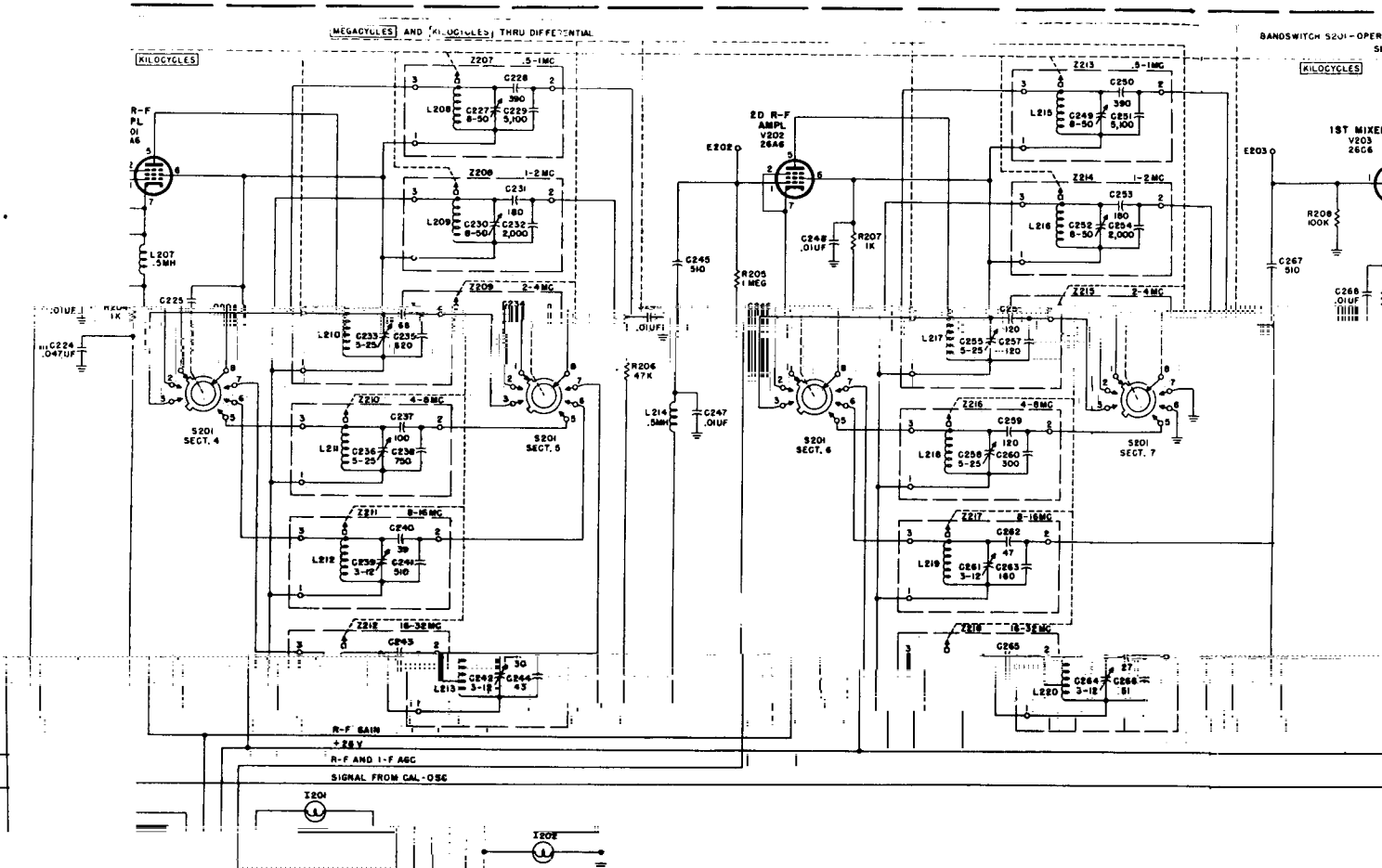
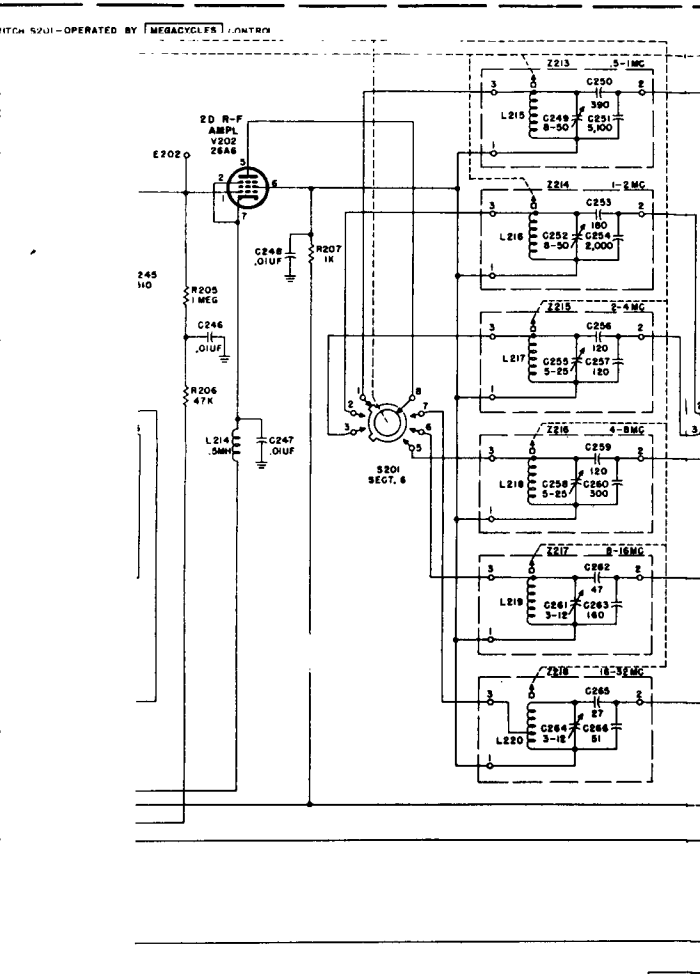
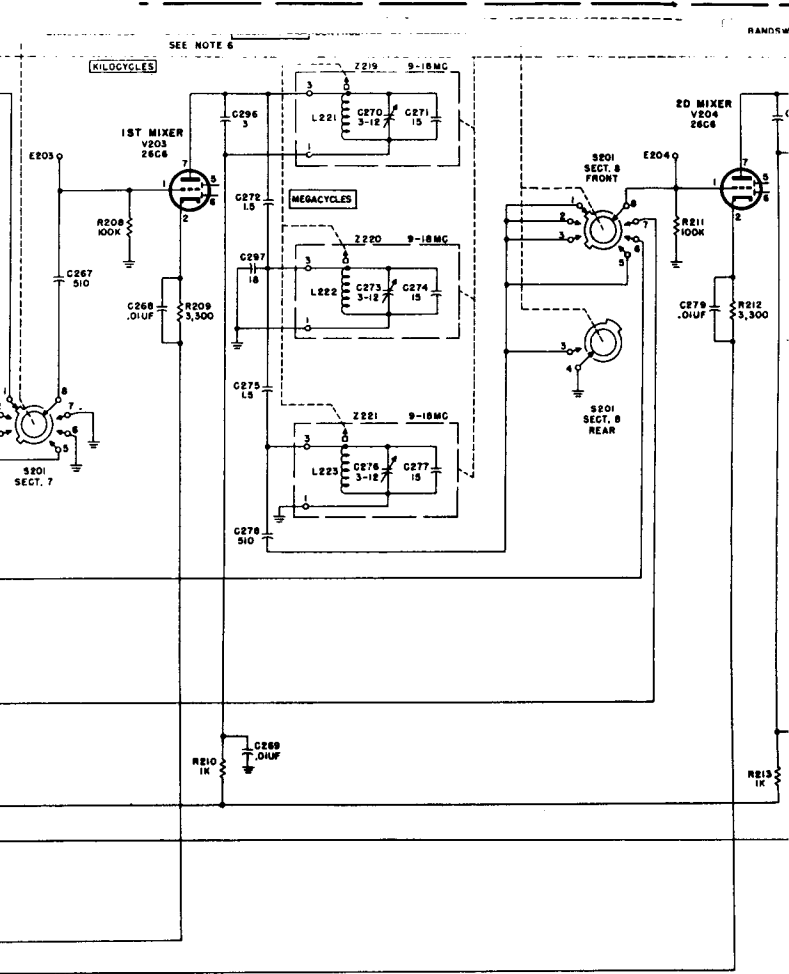
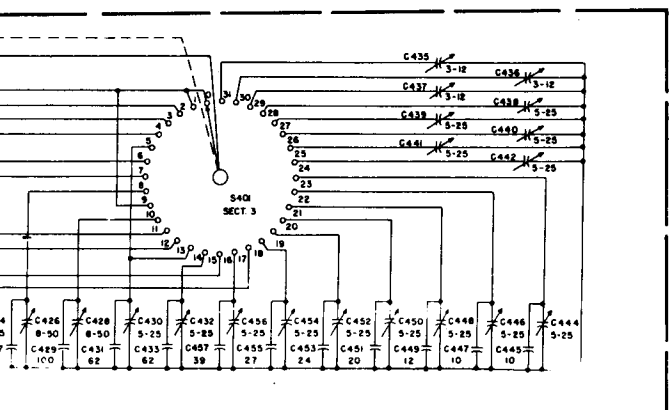
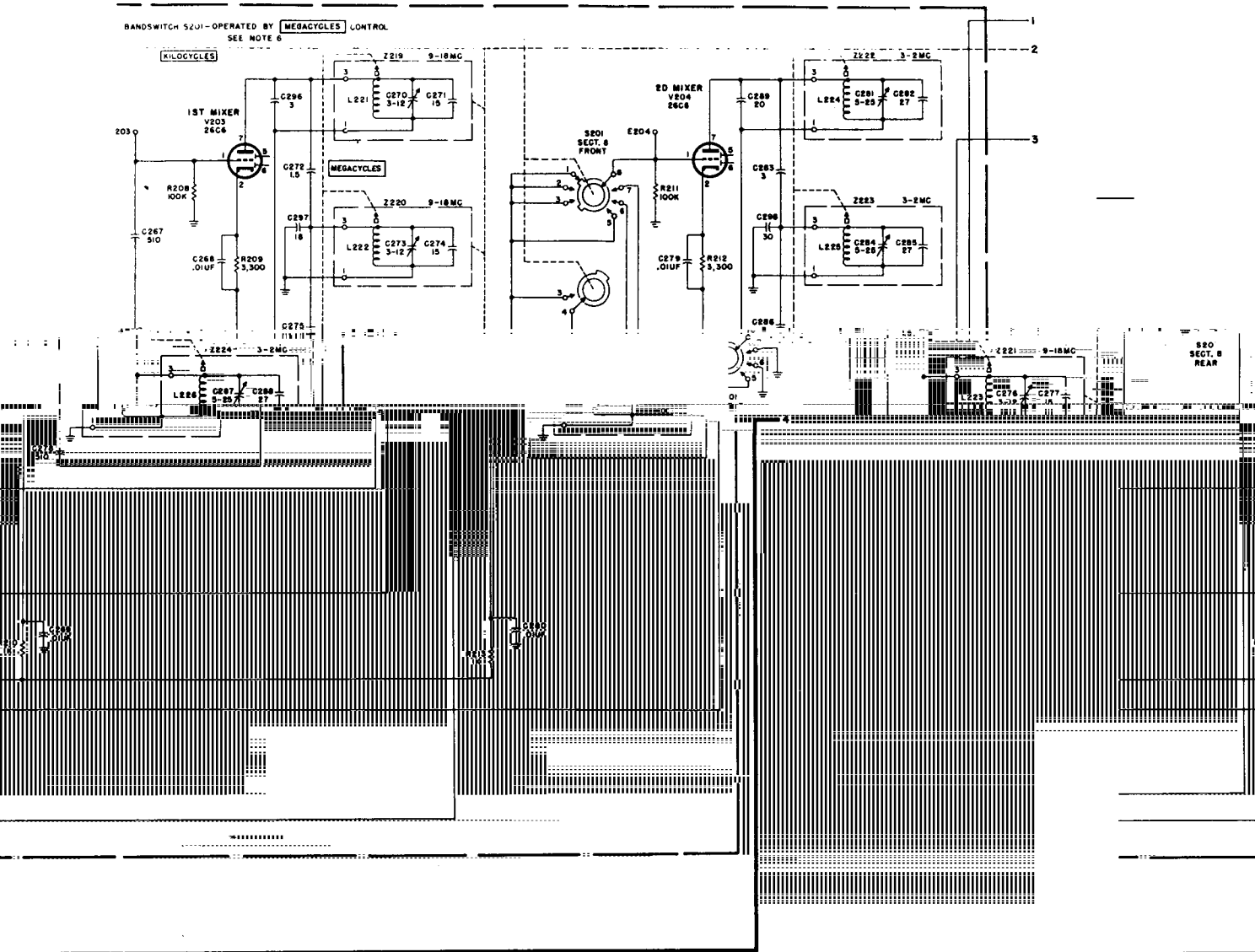


Figure 82(1). Radio receiver, wiring diagram (part 1 of 2).

Fig 82(1)



BANDSWITCH 5201-OPERATED BY MEGACYCLES CONTROL
SEE NOTE 6



UPPER DECK
CONSISTS OF RF AND
CRYSTAL OSCILLATOR
SUBCIRCUITS

TM5880-334-35-77

Fig 82C1

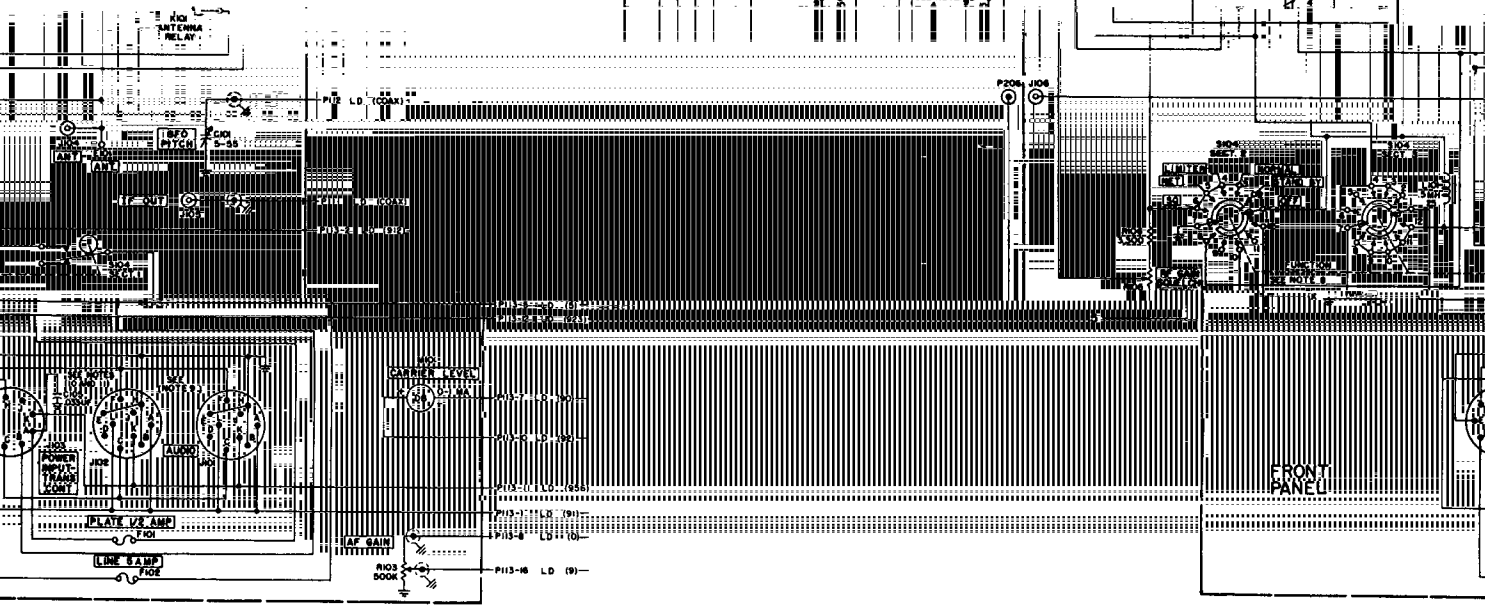
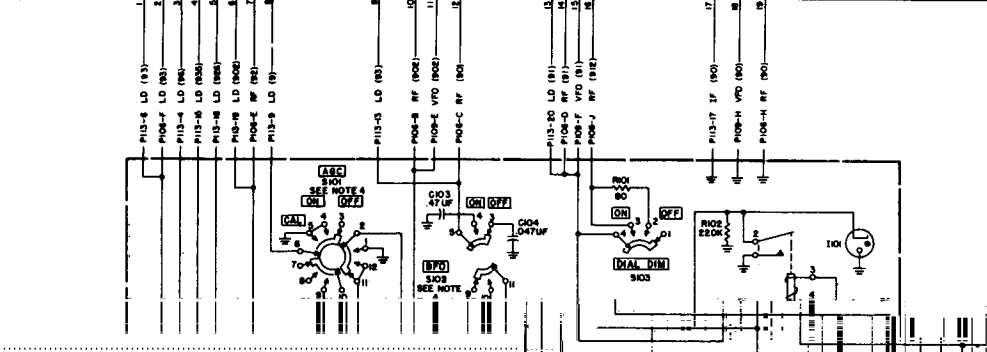
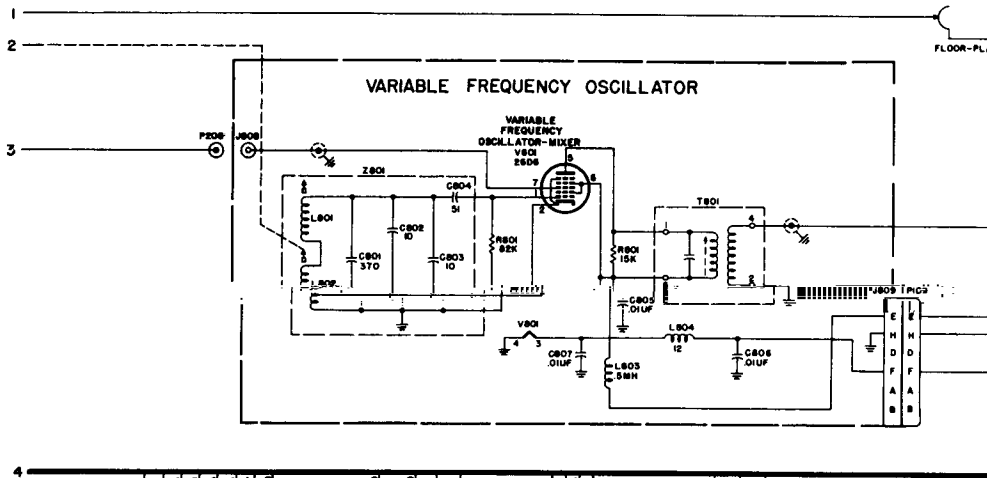


fig 82(2)

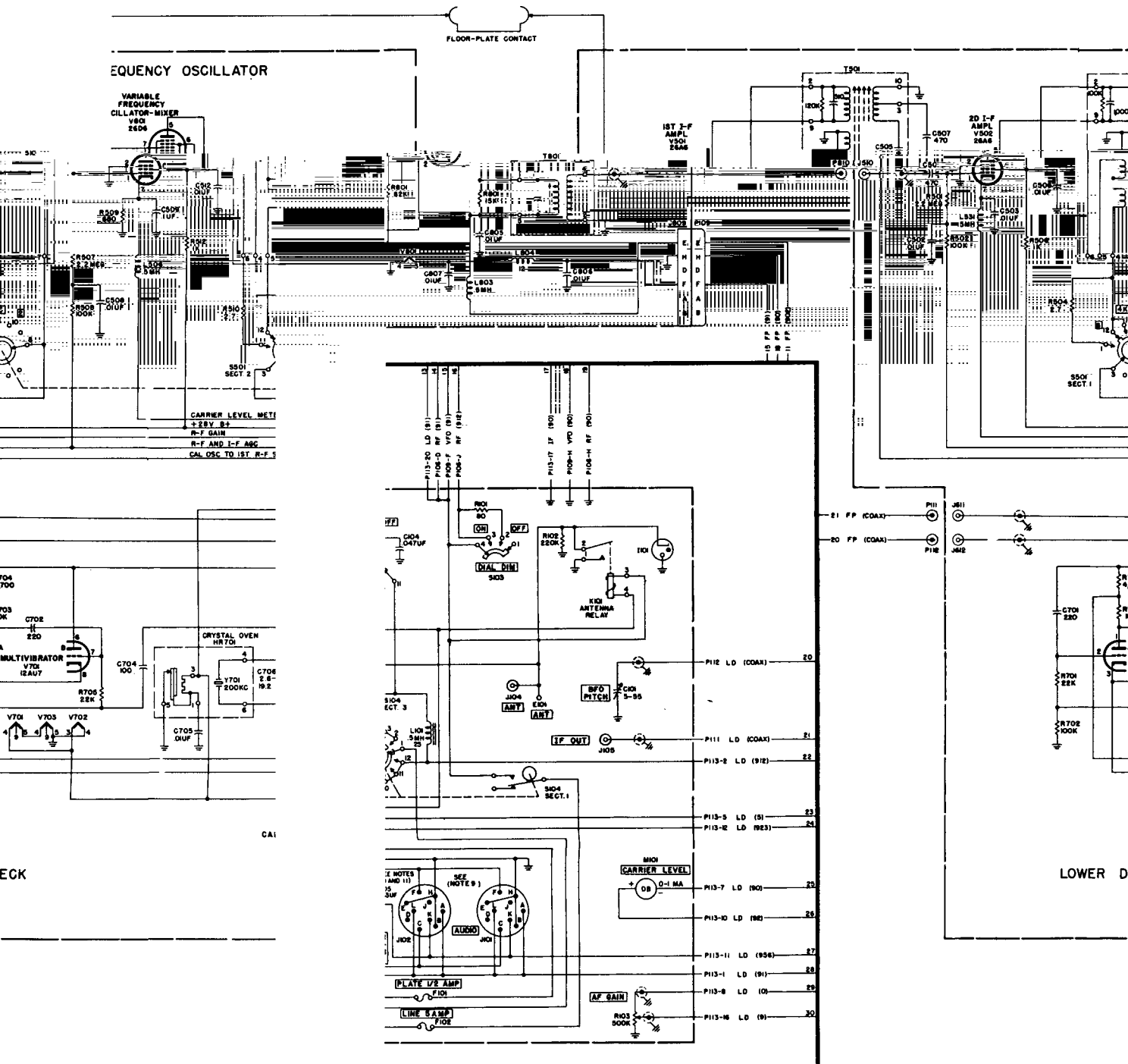
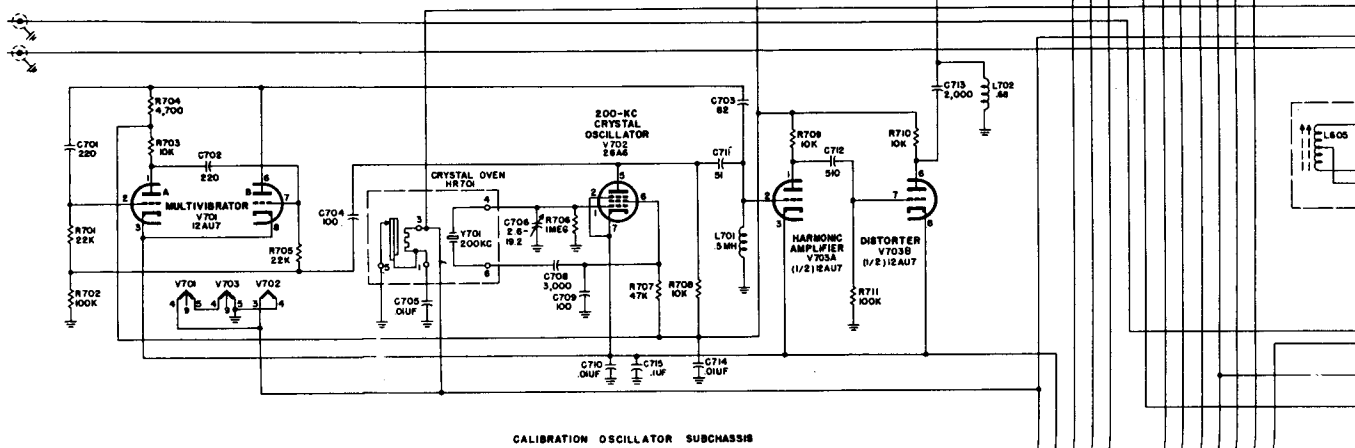
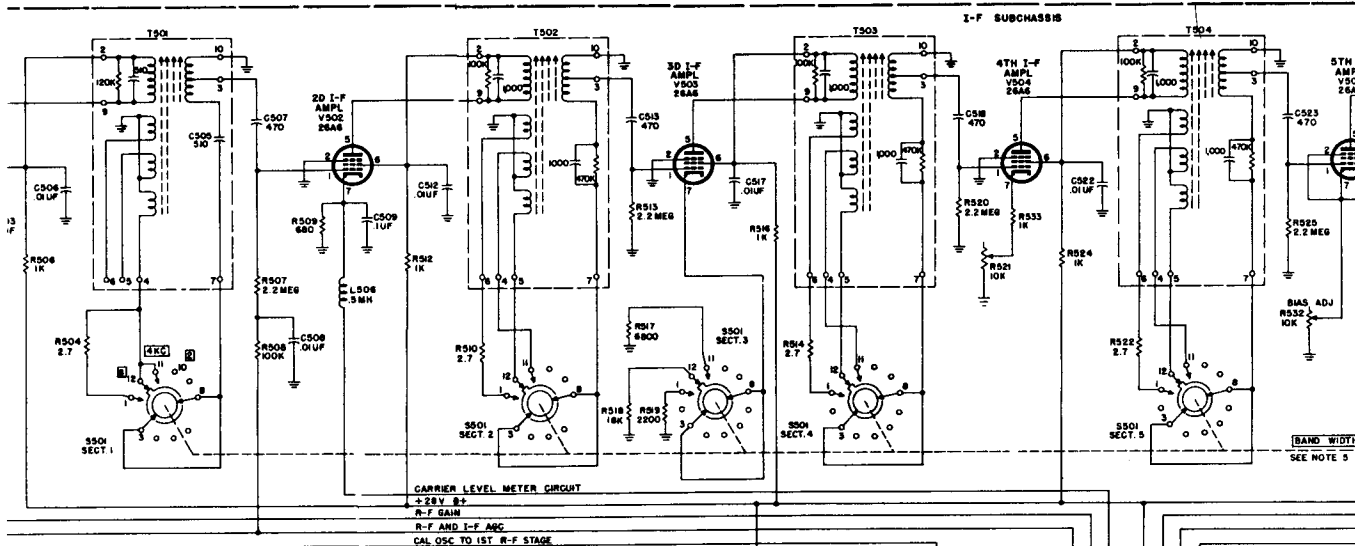


Fig 82(2)
20F6



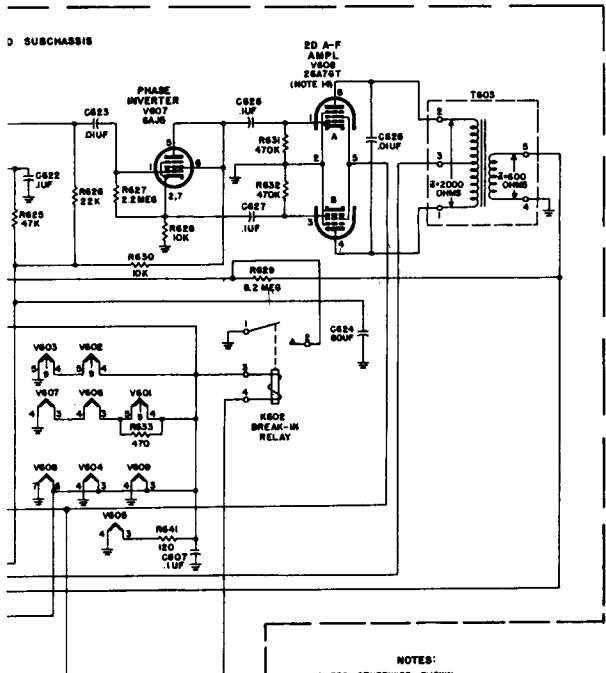
LOWER DECK

3613	20	4	13	6	7	17	10	8	5	16	19	2	1	18	9	3	12	11
PH13	20	4	13	6	7	17	10	8	5	16	19	2	1	18	9	3	12	11

- 13 PP (81)
- 3 PP (81)
- 9 PP (83)
- 1 PP (83)
- 25 PP (90)
- 17 PP (90)
- 16 PP (82)
- 23 PP (1)
- 23 PP (1)
- 50 PP (19)
- 22 PP (19)
- 28 PP (19)
- 3 PP (182)
- 8 PP (1)
- 100-1K RT (81)
- 24 PP (182)
- 27 PP (95)

Figure 89(2). Radio receiver, wiring diagram (part 2 of 2).

Fig 82(2)



NOTES:

1. RESISTORS ARE IN OHMS. CAPACITORS ARE IN UUF. INDUCTORS ARE IN UH.
2. ALL SWITCHES ARE SHOWN ON THIS DIAGRAM AS VIEWED FROM THE END OPPOSITE THE KNOB OR DRIVEN END. SECTIONS DESIGNATED AS 1 ARE CLOSEST TO THE KNOB.
3. ALL RELAY CONTACTS ARE SHOWN IN THEIR DEENERGIZED POSITIONS.
4. **ACC** SWITCH S101 AND **BP** SWITCH S102 ARE SHOWN IN **OFF** POSITION.
5. **BAND WIDTH** SWITCH S501 IS SHOWN IN **W** POSITION.
6. **BANDWIDTH** SWITCH S201 IS SHOWN IN .5 TO 1MC FREQUENCY RANGE OR BAND POSITION.
7. **CRYSTAL** SWITCH S401 IS SHOWN IN .5 TO 1MC BAND POSITION.
8. **FUNCTION** SWITCH S104 IS SHOWN **OFF** POSITION.
9. THE FOLLOWING IS THE FUNCTION OF THE PINS IN **AUDIO** RECEPTACLE J103 AND J101:

PIN A..... A-F OUTPUT	PIN H..... GROUND
PIN B..... GROUND	PIN J..... NO CONNECTION
PIN C..... MICROPHONE	PIN K..... CARRIER RELAY CONTROL
PIN D..... NO CONNECTION	PIN L..... A-F OUTPUT
PIN E..... GROUND	PIN F..... PUSH TO TALK SWITCH ON MICROPHONE OR KEY
10. THE FOLLOWING IS THE FUNCTION OF PINS OF **POWER INPUT-TRAYS CONT** RECEPTACLE J101:

PIN A..... 28 V. B+ (POSITIVE VOLTAGE)
PIN B..... BREAK-IN RELAY CONTROL
PIN C..... MICROPHONE
PIN D..... 28 V FILAMENT (POSITIVE VOLTAGE)
PIN E..... GROUND
PIN F..... PUSH TO TALK SWITCH ON MICROPHONE OR KEY
PIN H..... A-F OUTPUT
PIN J..... NO CONNECTION
PIN K..... CARRIER RELAY CONTROL
11. CONTACTS A AND D OF J103 ARE CONNECTED TOGETHER WHEN EITHER ELECTRICAL SPECIAL PURPOSE CABLE ASSEMBLY CX-1597/U OR ELECTRICAL SPECIAL PURPOSE CABLE ASSEMBLY CX-1598/U ARE USED.
12. ABBREVIATIONS:

CO = CRYSTAL-OSCILLATOR SUBCHASSIS (PART OF UPPER DECK)
RF = A-F SUBCHASSIS (PART OF UPPER DECK)
LD = LOWER DECK (I.F. AUDIO AND CALIBRATION OSCILLATOR SUBCHASSIS)
VFO = VARIABLE-FREQUENCY OSCILLATOR-MIXER SUBCHASSIS
FP = FRONT PANEL
13. WIRE COLOR CODE, APPLIES ONLY TO CABLING AND CONNECTORS

FIRST NO. - BODY COLOR	SECOND NO. - WIDE TRACER	THIRD NO. - NARROW TRACER
1 - BROWN	4 - BLUE	5 - BLUE
2 - RED	3 - ORANGE	6 - WHITE
3 - ORANGE	4 - YELLOW	7 - BLACK
4 - YELLOW	5 - GREEN	

NO CODE NUMBER = BUS WIRE
COAX = COAXIAL CABLE.
14. AN AUDIO MODULE IS USED IN PLACE OF V808 IN CERTAIN RECEIVERS. SEE TEXT.



Fig 82(2)
1-2-56

APPENDIX REFERENCES

TA 11-17	Signal Field Maintenance Shops.
TA 11-100 (11-17)	Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shops.
TB SIG 319	Electronic Equipment Maintenance Kit MK-288/URM.
TM 11-2684	Audio Oscillators TS-312/FSM-1, TS-312A/FSM-1, and TS-382/U, and Signal Generator TS-312B/FSM-1.
TM 11-2684A	Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, and TS-382E/U.
TM 11-43017	Output Meters TS-585A/U, TS-585B/U, TS-585C/U, and TS-585D/U.
TM 11-5097	Spectrum Analyzers TS-723A/U and TS-723/U.
TM 11-5111	Power Supplies PP-1097A/G and PP-1097B/G.
TM 11-5126	Power Supply PP-1104A/G.
TM 11-5129	Oscilloscope AN/USM-50A, B, and C.
TM 11-5132	Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U and ME-30C/U.
TM 11-5527	Multimeters TS-352/U, TS-352A/U, and TS-352B/U.
TM 11-5551	Instruction Book for Rf Signal Generator Set AN/URM-25.
TM 11-5551E	R. F. Signal Generator AN/URM-25F.
TM 11-5820-334-10	Operator's Manual: Radio Receiver R-392/URR.
TM 11-5820-334-20	Organizational Maintenance Manual: Radio Receiver R-392/URR.
TM 11-5820-334-20P	Organizational Maintenance Repair Parts and Special Tool List and Maintenance Allocation Chart: Receiver, Radio R-392/URR.
TM 11-5820-334-35P	Field and Depot Maintenance Repair Parts and Special Tools List: Receiver, Radio R-392/URR.
TM 11-6625-200-12	Operation and Organizational Maintenance: Multimeter ME-26B/U.
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.

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USAR: None.

For explanation of abbreviations used, see AR 320-50.