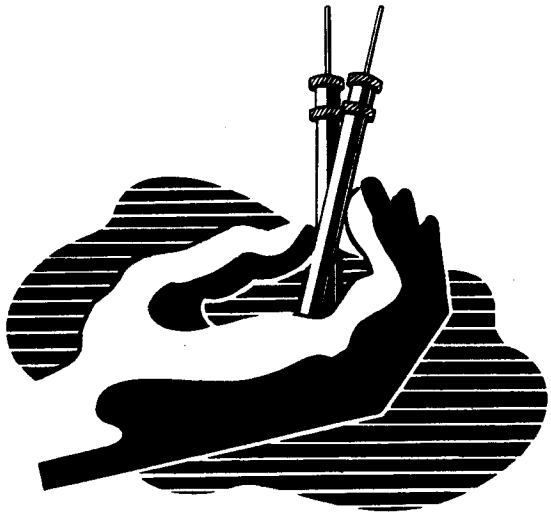
NAVSHIPS 900,719

CORRECTIVE MAINTENANCE

SECTION 7



M-A-R

RADIO TRANSMITTING AND RECEIVING EQUIPMENT

RESTRICTED

CORRECTIVE MAINTENANCE

This section will describe the correction of major troubles and overhaul procedures for such units as require this treatment to maintain peak performance. All information relative to a given unit has been grouped under the heading which describes that unit instead of under a common heading for the type of test or procedure.

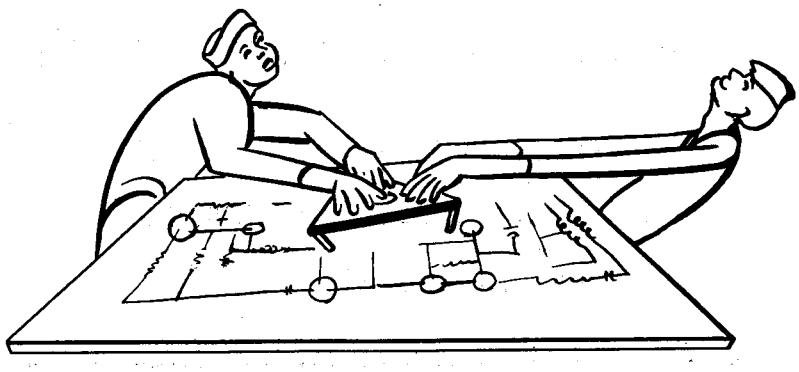
The more common troubles, such as power failure, tube replacement and similar interruptions to operation, have been described under Operator's Maintenance (Section 5).

The problem of locating trouble in the radio section of the equipment usually resolves itself into locating the particular section or unit at fault and then applying such tests to the unit as will indicate the component that is defective. Since meter readings give much information as to probable location of trouble in the radio equipment the following chart is given to acquaint the technician with the meter readings to be expected.

The trouble chart which follows is an overall guide to the cause of defective operation when well defined failure symptoms are evident.

NOTE

Additional corrective maintenance instructions will be forwarded as the information becomes available. Refer to any pages that may have been added at the end of this section before attempting repairs not covered in detail in the instructions originally issued.



TYPICAL METER INDICATIONS

METER SWITCH POSITION	CIRCUITS INVOLVED	METER DEFLECTION	FULL SCALE READING
	RECEIVING CONDITION		
1	Total plate current of oscillator-doubler, 1st and 2nd Triplers (V502, V503, and V504)	5 to 7	75 ma
2	Grid current to 3rd tripler in receiver (V203)	4.1 min	1 ma
3	Total plate current of fixed oscillator and mixer (V501, V505)	5 to 7	10 ma
4	Plate current of 3rd I F amplifier in receiver (V202)	7	75 ma
5	Heater voltage, center lead to positive on direct current	7.5	8.4 V
6	Heater voltage, center lead to ground on both A-C and D-C	7.5	8.4 V
7	Heater voltage, center lead to 13V lead on A-C	7.5	8.4 V
	TRANSMITTING CONDITION IC-OPERATE SWITCH ON TUNE		
8	1st IPA plate current (V101)	4.5 to 7.5	200 ma
9	2nd IPA grid current (V102)	2.5 to 6	20 ma
10	2nd IPA plate current (V102)	1.5 to 3.5	100 ma
11	PA grid current (V103)	4 to 9	50 ma
	IC-OPERATE SWITCH ON OPERATE		
12	PA plate current (V103)	4.5	100 ma

TROUBLE CHART

Symbols in the following chart refer to the transmitter-receiver schematic diagram on page 7-111, 112 and the modulator-dynamotor schematic diagram on page 7-63, 64.

TRANSMITTER

SYMPTOM	CAUSE	REMEDY
Transmitter inoperative, but receiver normal	Defective transmitter plate relay K102.	Replace relay.
	Defective tubes, V501, V505, V101, V102, V103.	Check tubes and replace.
	Defective transmit-receive relay K701.	Replace relay.
	Defective press-to-talk switch.	Remove and replace.
	Coupling capacitor, C513 into V501 defective.	Test and replace C513.
	Crystal X507 not operating.	Replace crystal.
	Choke L701 open, removing microphone voltage and voltage on K701.	Replace choke.
	C718 shorted, grounding microphone and relay K701 voltage.	Check and replace C718.
	Antenna transfer relay K101 not closing.	Inspect and replace relay.
Weak signal output, but meter reading normal	Antenna cable dented or broken.	Repair or replace, as necessary.
	Antenna cable plugs loose or defective.	Tighten or replace plugs.
	Antenna radiating arm loose or insulator dirty or broken.	Tighten arm. Clean or replace insulator.

SYMPTOM	CAUSE	REMEDY
	Antenna cable too close to radiating arm and parallel within five feet.	Relocate cable.
	Antenna too close to large metal object.	Relocate antenna.
No MCW, but voice normal	Audio oscillator transformer T701 defective.	Install new T701 transformer.
	MCW-Phone switch S702 defective.	Clean, repair, or replace switch.
	R725, on input to speech amplifier tube V701, defective or improperly adjusted.	Adjust or replace R725. See page 7-103
	Key or key jack defective.	Repair or replace jack or key.
No voice but MCW normal	Microphone transformer T703 defective.	Install new T703.
	R701, on microphone input to speech amplifier tube V701, defective or improperly adjusted.	Adjust or replace. See page 7-104
	MCW-Phone switch, S702, defective.	Recondition or replace switch.
	R721 open, removing microphone voltage.	Install new R721.
	C701 or C702 shorted, grounding input to tube V701.	Replace C701 or C702, as necessary.

MODULATOR-DYNAMOTOR

SYMPTOM	CAUSE	REMEDY
No modulation but R.F. output normal	Tubes V701, V702, V703 defective.	Check tubes and replace.
	Modulation transformer, T702, defective.	Replace T702.
	Microphone transformer, T703, defective.	Install new T703.
	Cable W104, from modulator to transmitter, defective or connectors loose or faulty.	Tighten or replace connectors. Repair cable.
	Transmit-receive relay K701 defective.	Replace relay.
	MCW-Phone switch S702 defective.	Recondition or replace S702.
	Defective microphone or jack.	Repair or replace microphone or jack.
Modulation weak	V701, V702, V703 defective.	Check tubes and replace.
	One of push-pull modulator tubes V702 or V703 not operating.	Check tubes and replace.
	Modulation transformer T702 defective.	Replace transformer.
	Poor contacts on MCW-Phone switch S702.	Clean or repair contacts, or replace switch.
	Defective microphone or jack.	Repair or replace as necessary.
	Defective resistor R702	Replac R702

SYMPTOM	CAUSE	REMEDY
No modulation but R.F. output and sidetone normal.	Defective resistor (R109).	Replace R109.
	IC-Operate switch S703 defective.	Inspect and repair, or replace S703.
Modulation distorted	Defective speech amplifier Tube V701.	Test and replace.
	Defective microphone transformer T703.	Install new T703 transformer.
	Faulty microphone.	Replace microphone.
	Wrong bias on V702 or V703.	Check circuit components See page 7-63,64
	Modulator inputs unbalanced.	Check for defective component in input circuit.

RECEIVER

SYMPTOM	CAUSE	REMEDY
Receiver inoperative, but transmitter normal	Defective antenna transfer relay (K101).	Replace relay.
	Defective transmitter plate relay (K102).	Replace K102.
	Defective coupling capacitor (C238).	Install new C238.
	Defective bypass capacitor (C248).	Replace C248.
	Defective coupling capacitor (C327).	Install C327 replacement.
	Defective phones or phone jacks.	Repair or replace phones or jacks.

SYMPTOM	CAUSE	REMEDY
No sidetone, receiver and transmitter normal	Defective coupling capacitor or resistor (C416 or R421).	Check and replace defective component.
IC too loud	Defective resistor (R719).	Install R719 replacement.
	On PU operation, defective resistor (R804).	Replace R804.
Audio output weak	Defective tube (V403).	Test and replace.
	Defective audio output reactor (Z401 or Z402).	Replace defective component.
	Defective grid resistor (R416).	Test and replace R416.
	Defective cathode bypass capacitor (C414).	Install new C414.
No AVC action	Potentiometer R325 in cathode of V302 not adjusted properly.	Adjust to correct value. See page 7-102
	Defective AVC load resistor (R318).	Replace with R318 replacement.
	Defective bypass capacitors (C329, C336, or C337).	Replace defective capacitor, as required.
Noise peaks not limited	Defective tube (V401).	Test and replace.
Silencer control ineffective	Defective tube (V402).	Check and replace.
	Defective grid resistor (R406).	Install R406 replacement.
	Defective silencer control (R437).	Install n w R437.

SYMPTOM	CAUSE	REMEDY
	Defective silencer switch (S401).	Replace S401.
	Defective cathode bypass capacitor (C417).	Check and replace C417.
Crystal oven at improper temperature	Defective oven bypass capacitors (C532 or C533).	Replace whichever is defective.
	Defective thermostats (S503 or S504).	Replace oven.
	Defective booster heater resistor.	Replace oven.
Receiver operative but selector motor won't run	Defective transmitter plate relay (K102).	Replace K102.
	Defective selector motor relay (K601).	Install K601 replacement.
	Defective motor field circuit resistor (R601).	Install new R601.
	Defective selector switch (S601B).	Inspect, repair, or replace S601B.
Selector motor runs without stopping	Defective limit switch S603.	Install new switch S603.
	Defective homing switch (S601A).	Inspect, repair, or replace S601A.
Selector motor runs in one direction only	Defective motor field coil.	Replace field assembly.
Interference from dynamotor	Excessive sparking at brushes.	Clean commutator; replace brushes; or install new armature.
	Defective chokes, resistors, or capacitors in 800 series.	Check and replace defective component.

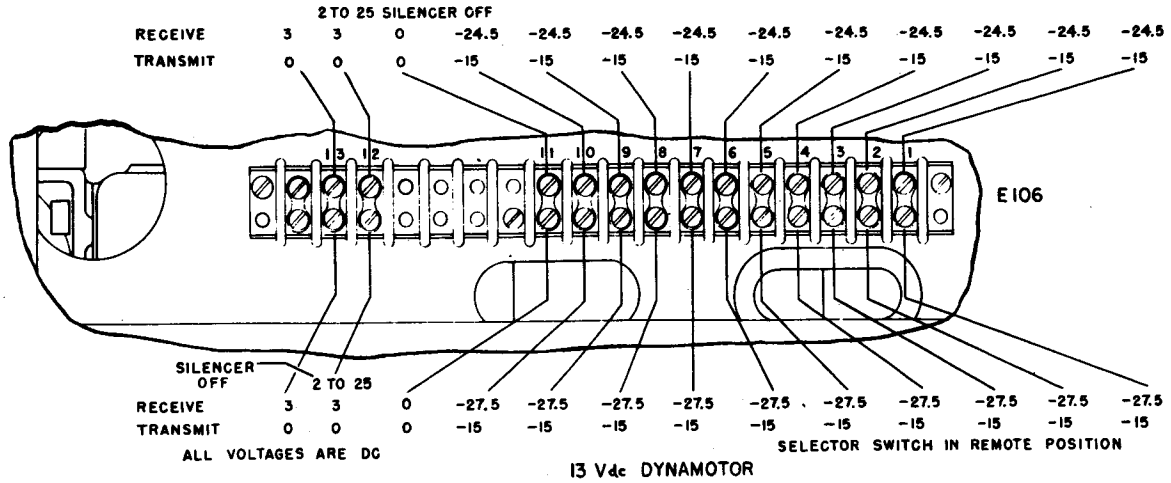
TRANSMITTER-RECEIVER GENERAL CHECK

Two general methods are employed to determine the location of defective components in the equipment, neither of which is entirely conclusive but in conjunction they will detect th unit at fault. A voltage check at various points in a circuit will indicate open or shorted circuits while a resistance and continuity test will check the voltage findings. Of the two, the resistance and continuity check is safer to use and removes the danger to personnel inherent in any voltage test. Data on both methods will be given in connection with the various units used in the MAR when practical and applicable.

A general voltage check of the transmitter-receiver can be made at terminal strips which are located on the top and bottom of the selector mechanism and at the rear of the panel receptacles as shown in the illustration. All readings should be taken with a voltmeter having a resistance of 1000 ohms per volt and readings given are obtained between the points indicated and the chassis. Conditions of test are indicated in these illustrations. Note further that readings are given for two conditions of operation from both 13V d-c supply, indicated by Dynamotor, and from the Universal Power Supply, abbreviated PU. A slight deviation from values given is permissible and a variation of 20 per cent is not always an indication of trouble.

Values for resistance and continuity tests are given in the two following charts. An ohmmeter with a top scale reading of 5 megohms will serve for these tests. Higher values, when given, are really insulation tests and may most conveniently be made with a 'megger', if available. It will be necessary to disconnect the cables from the transmitter-receiver, withdraw the chassis and place it on a support in such a position as to permit reconnection of the cables for making the voltage check.

UNIVERSAL POWER SUPPLY



13 Vdc DYNAMOTOR

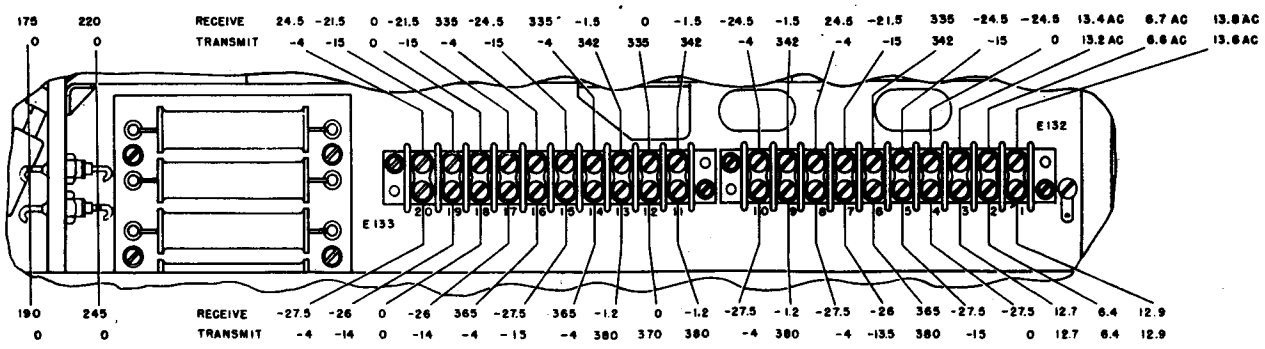
BOTTOM VIEW-TRANSMITTER-RECEIVER
GENERAL CHECK

The charts on this page show typical voltage measurements made between the referenced terminals and the equipment chassis (ground). Terminals are not accessible until the chassis is removed from the case, therefore to measure these voltages, disconnect the transmitter-receiver cables, withdraw the chassis from the case, set the chassis on end and reconnect the cables.

Typical voltage values are shown for both transmit and receive conditions of the equipment with the two types of power input; 13V d-c, and from the universal power supply unit. Note particularly that the position of the Silencer switch affects the readings at terminal 12 on the bottom of the unit. Also note that with universal power supply unit, alternating current is present in the heater circuits, as indicated in the chart, and an a-c meter must be used to take these readings.

TOP VIEW-TRANSMITTER-RECEIVER

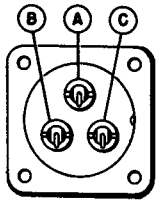
UNIVERSAL POWER SUPPLY



13 V d-c DYNAMOTOR

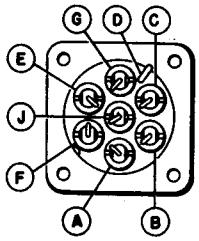
ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED

INPUT VOLTAGE CHART
TRANSMITTER-RECEIVER RECEPTACLES



Z104
MOD.

	PU-115 V AC RECEIVE	PU-115 V AC TRANSMIT	PU-115 V AC OPERATE IC	13 V DYNAMOTOR RECEIVE	13 V DYNAMOTOR TRANSMIT	13 V DYNAMOTOR OPERATE IC
A	0	335	-40	0	365	-40
B	-21.5	-15		-26	-15	
C	-21.5	-15		-26	-15	



Z602
POWER

A	-24.5	-15	-27.5	-15
B	-24.5	0	-27.5	0
C	6.7 AC	6.6 AC	6.4	6.4
D	0	0	0	0
E	13.4 AC	13.2 AC	12.8	12.8
F	335	342	365	380
G	13.8 AC	13.6 AC	12.95	12.9
J	0	0	0	0

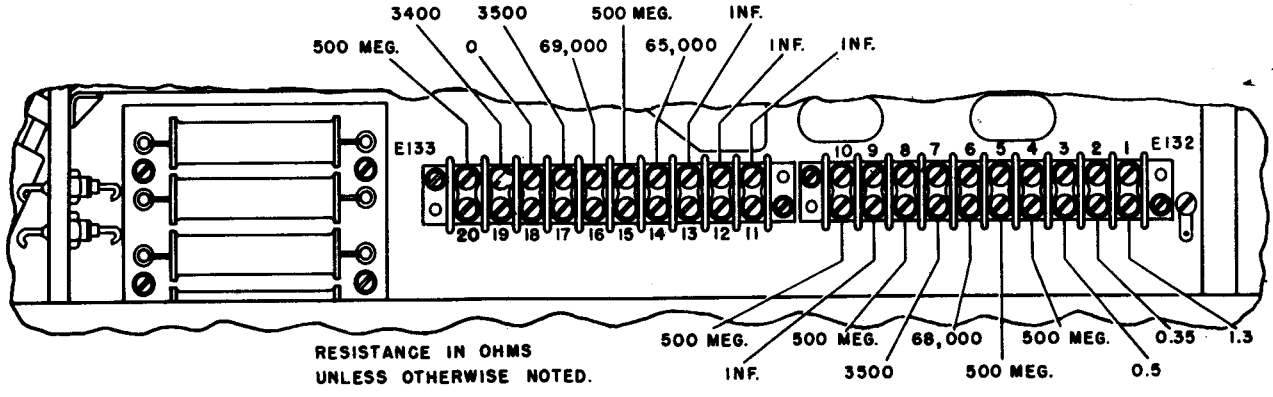
REAR OF PANEL. VOLTAGE TO GROUND.

The chart above gives typical voltage values, measured to ground, at the rear of the receptacles on the transmitter-receiver panel, accessible from the bottom of the chassis. The IC-Operate switch should be set as indicated.

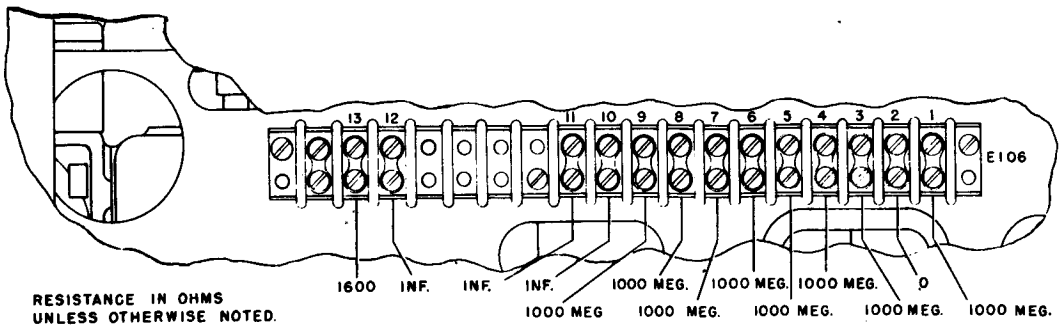
The chart below gives typical resistance values measured from the terminals shown, located on top of the chassis, to ground. A deviation of 15 percent from the values given is not always an indication of defective components in the circuit, but greater variations in resistance should be investigated by checking the circuit comp nents. Measurements must be made with all cables disconnected from the unit.

RESISTANCE AND CONTINUITY CHART

TOP VIEW-TRANSMITTER-RECEIVER



RESISTANCE IN OHMS
UNLESS OTHERWISE NOTED.

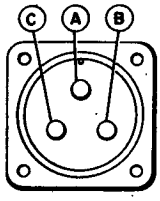


RESISTANCE AND CONTINUITY CHECK
BOTTOM VIEW-TRANSMITTER-RECEIVER

The charts on this page give typical resistance values to ground from terminals on the bottom of the transmitter-receiver unit and from the pins in the receptacles on the panel of the unit.

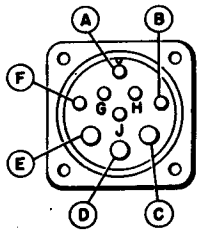
Cause for variations in excess of 15 percent in any of the voltage or resistance values given on this and the two preceding pages can be located by checking the circuit back to the section of the equipment involved, by means of the int r-connection diagram shown on page 7-13, 14. After localizing the trouble, the section at fault can be checked by means of the information given on the following pages, where each section is treated separately.

RESISTANCE AND CONTINUITY CHART
RECEPTACLES ON TRANSMITTER—RECEIVER PANEL



Z104
MOD.

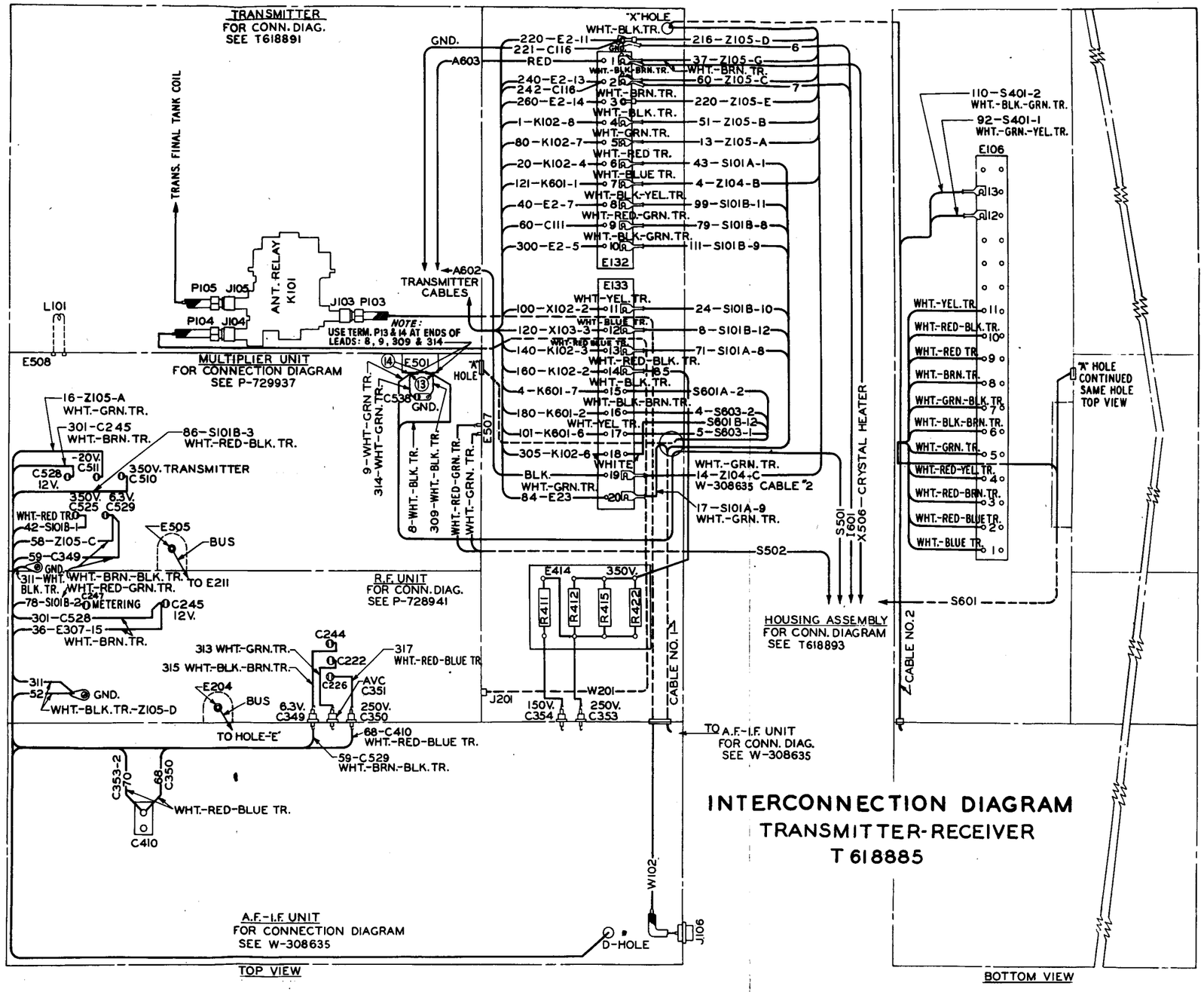
A —— INF.
B —— 3500
C —— 3500



Z602
POWER

A —— 500 MEG.
B —— 500 MEG.
C —— 0.35
D —— 0
E —— 0.5
F —— 70,000
G —— 0.45
H —— INF.
J —— 70

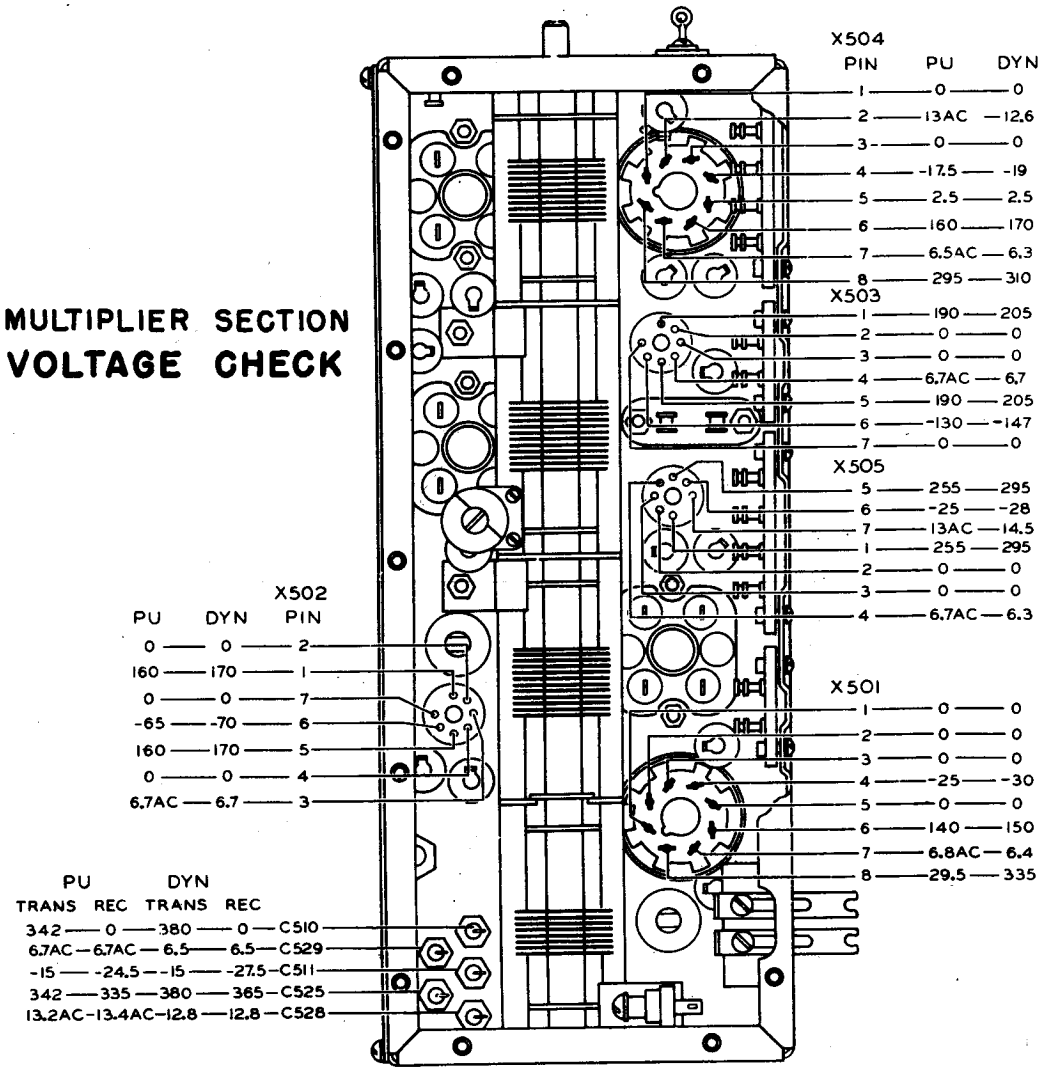
RESISTANCE IN OHMS TO GROUND UNLESS OTHERWISE NOTED. NO CABLES CONNECTED.



INTERCONNECTION DIAGRAM
TRANSMITTER-RECEIVER
T 618885

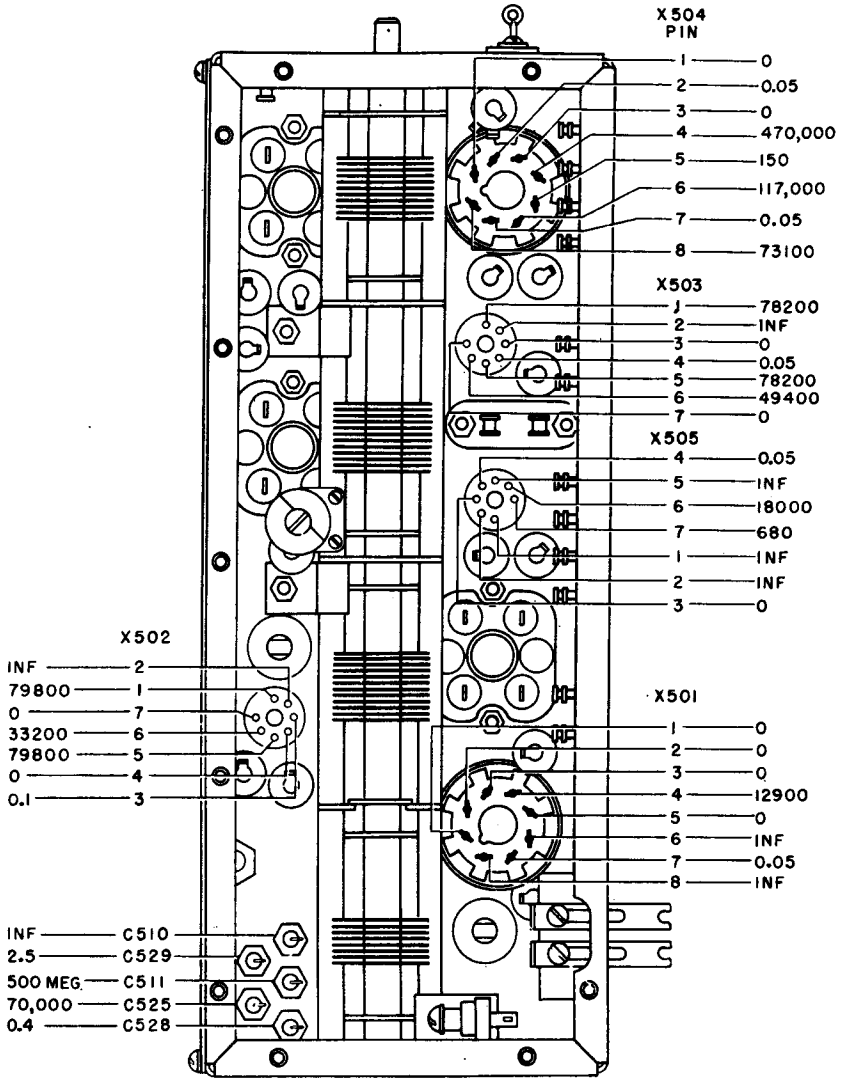
FREQUENCY MULTIPLIER SECTION

MULTIPLIER SECTION VOLTAGE CHECK



This chart gives typical voltage values to ground of the socket pins of the tubes and the terminals of the multiplier unit. These readings are taken with the tubes in place in the sockets. To make this voltage check, the cables are disconnected, the chassis removed from its cas and placed on a support in an inverted position, and the cables then reconnected. Then remove the plate covering the bottom of the multiplier unit by loosening the screws holding it in place.

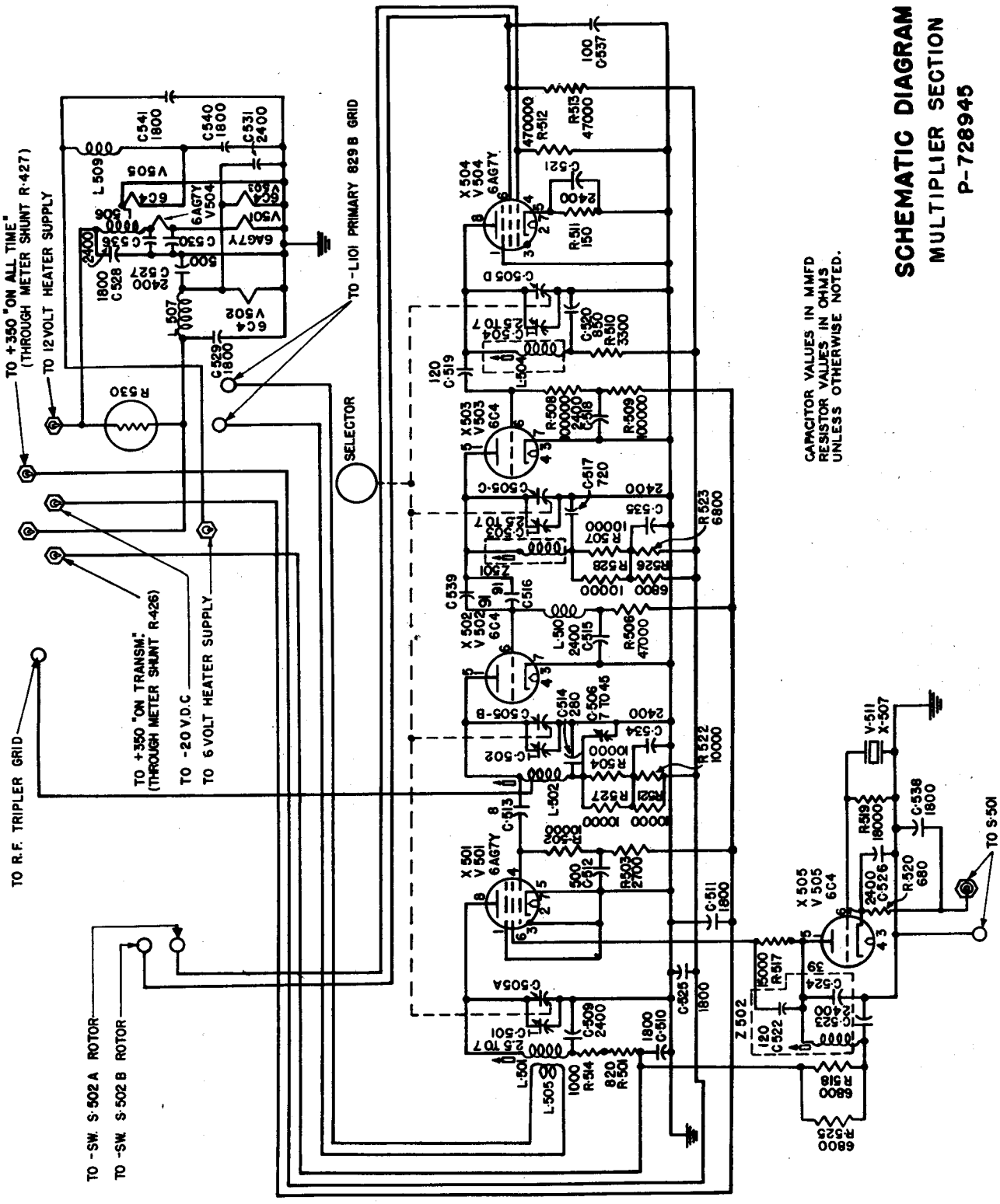
It will be necessary to use a voltmeter with an extremely high resistance to assure accuracy when making the test. A voltohmyst or similar vacuum tube voltmeter is recommended for the purpose, particularly to obtain accurate grid pin voltage readings. Variation from the above values in excess of 15 percent indicates defective components in the unit. To further check circuits, refer to the chart on Page 7-16.

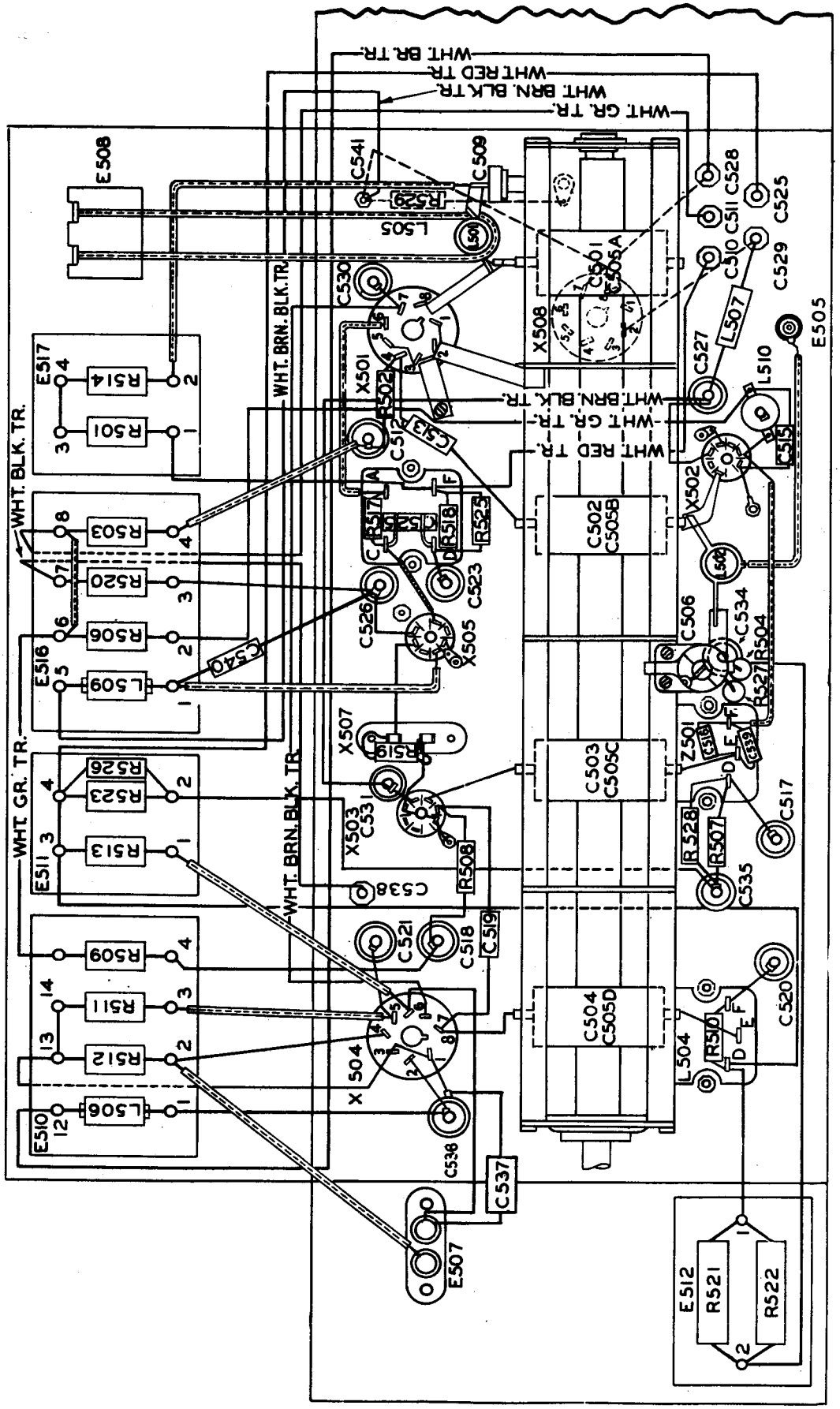


RESISTANCES TO GROUND IN OHMS UNLESS OTHERWISE NOTED.
TUBES IN SOCKETS. NO EXTERNAL CABLES CONNECTED TO UNIT.

RESISTANCE AND CONTINUITY CHART
MULTIPLIER SECTION

As a check on the voltage findings, the above chart gives typical resistance values to ground at the socket pins and terminals of the multiplier unit. The cause for deviation in eith r voltage or resistance values as given in the charts can be traced to the faulty component in the circuit by means of either the schematic diagram of the multiplier section on page 7-17 or the connection diagram on page 7-18.

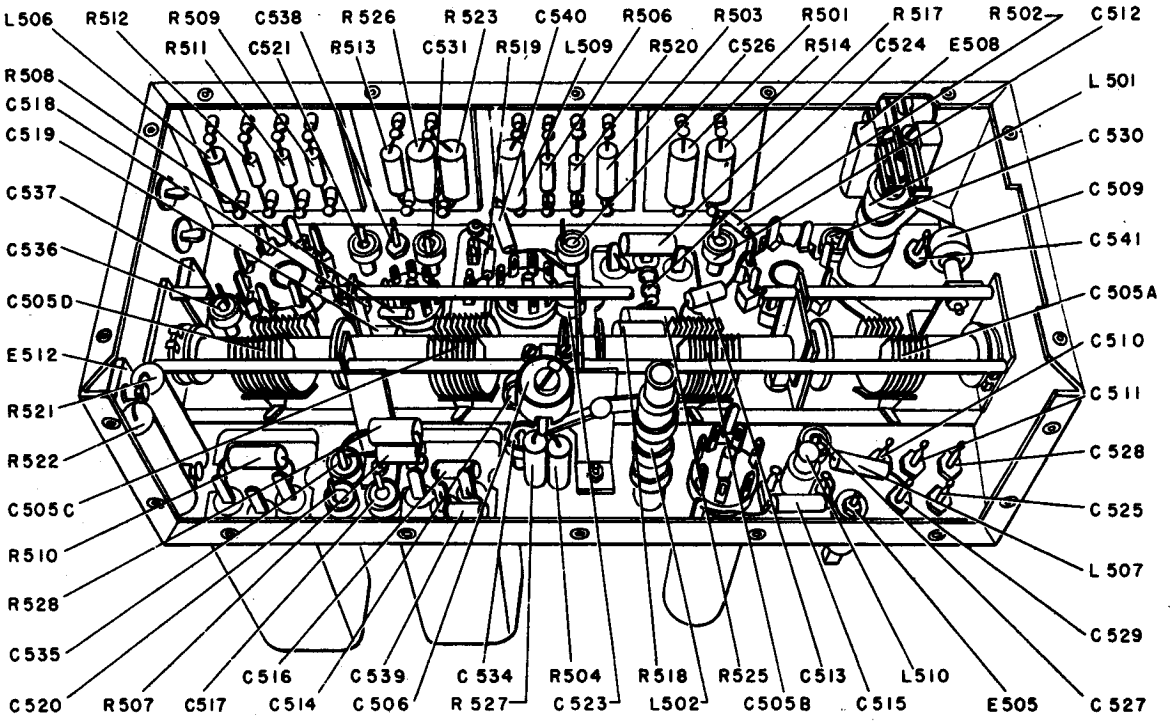

SCHEMATIC DIAGRAM
MULTIPLIER SECTION
P-728945
CAPACITOR VALUES IN MMFD
RESISTOR VALUES IN OHMS
UNLESS OTHERWISE NOTED.
TO +350 "ON ALL TIME" (THROUGH METER SHUNT R-427)
TO 12 VOLT HEATER SUPPLY
TO -L101 PRIMARY 829 B GRID
SELECTOR
TO R.F. TRIPLER GRID
TO +350 "ON TRANSM." (THROUGH METER SHUNT R-426)
TO -20 V.D.C
TO 6 VOLT HEATER SUPPLY
TO -SW. S-502 A ROTOR
TO -SW. S-502 B ROTOR
TO S-501
X 504 V 504 6AG7Y
X 503 V 503 6C4
X 502 V 502 6C4
X 501 V 501 6AG7Y
X 505 V 505 6C4
V-511 X-507
Z 502



CONNECTION DIAGRAM
MULTIPLIER SECTION
P-728937

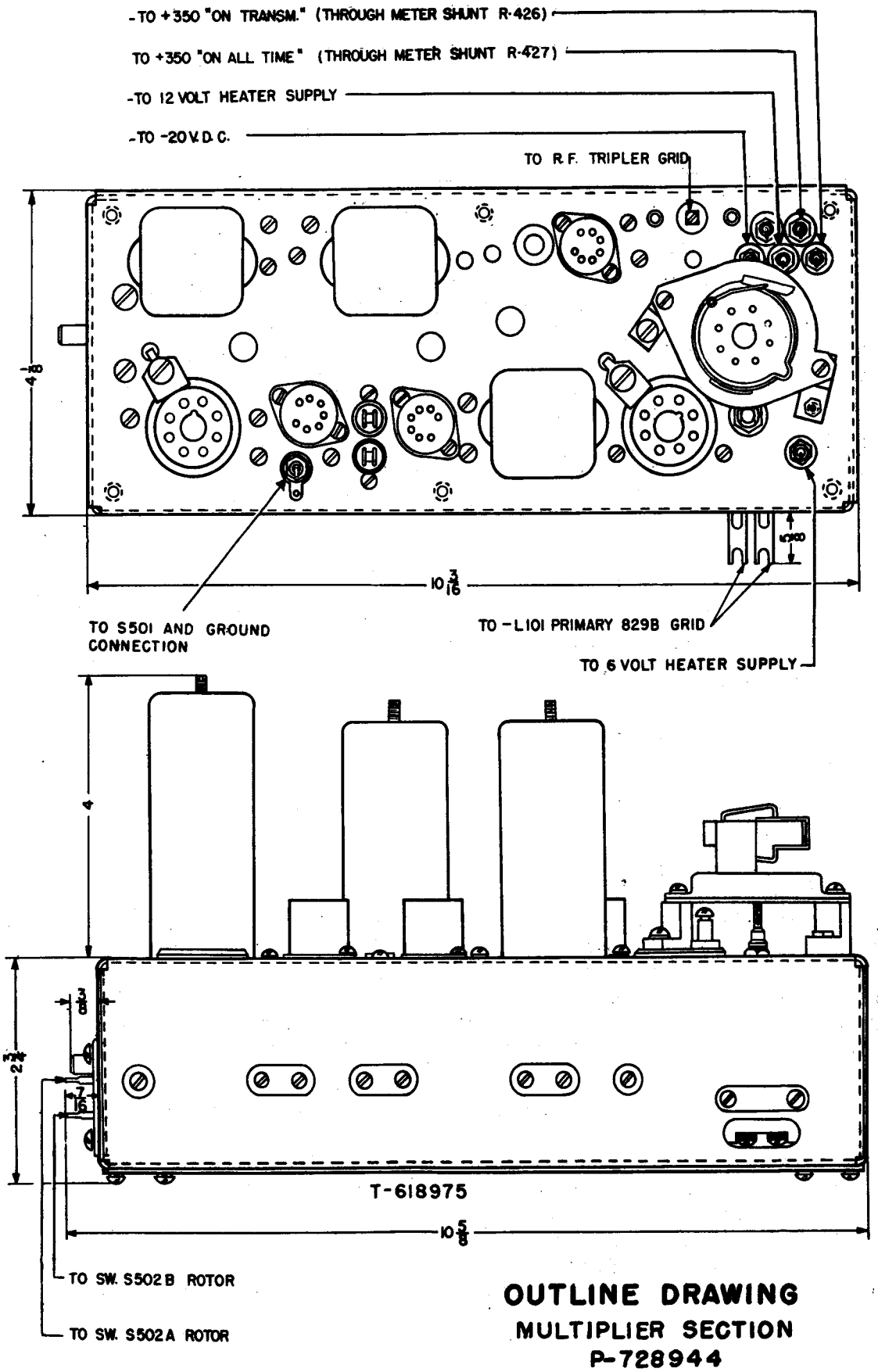
CAPACITOR AND RESISTOR CHART

MULTIPLIER SECTION



The location of the capacitors and resistors in the multiplier section is shown in the above illustration. In checking a component for deviation from its correct value, as given in the schematic diagram on page 7-17, make certain that at least one lead of the resistor or capacitor is disconnected from the circuit when its value is being checked.

The construction of the multiplier is such that little difficulty should be experienced in replacing a defective component. One side of the unit may be removed to permit greater freedom of access to the circuit components. However, location and dress of leads is important in this unit and must be maintained to assure circuit alignment. For this reason, every precaution must be taken not to disturb leads other than those to the component being replaced.



OUTLINE DRAWING
MULTIPLIER SECTION
P-728944

ALIGNMENT OF MULTIPLIER SECTION

The MAR multiplier section may be aligned without the use of any auxiliary equipment by taking advantage of the milliammeter, M101, on the panel of the transmitter-receiver unit. Output levels and resonance points will be indicated on the meter when set to the correct switch positions, as listed below.

Actual alignment of the section follows the usual proc dure in adjusting R F circuits so that they will track throughout the frequency range encountered. This requires that the adjustments be made at the high and low frequency ends of the band. In general, this tracking, or alignment of the MAR multiplier section is accomplished by means of trimmers at the higher frequencies and transformer core adjustments at the lower.

The crystals which may be employed in the MAR equipment range from 4814 kilocycles to 7777 kilocycles and these crystals, therefore, determine the operating range of the multiplier section. Two crystals are, accordingly, selected f r the alignment of this section. These crystals should be as close as possible to 4814 KC and 7777 KC respectively.

The multiplier section is aligned as described below.

A. GENERAL

1. Remove the transmitter-receiver unit from its case and place in normal operating position on the workbench. Disconnect the antenna cable but leave all other cables connected.

2. Make certain that the tube clamps on V501 and V504 are tight (these clamps are electrical grounds) and that the shields are in position over the other tubes.

3. Remove the crystal oven assembly and take off the cover over the crystals. Insert the high frequency alignment crystal (near 7777 KC) in the channel 10 position and the lower range crystal (near 4814 KC) in position 1. These channel positions are marked by numbers mold d into the oven assembly and are revealed when the crystals are removed.

4. Replace the crystal oven cover and plug the assembly into the panel jack.

5. Set the MCW-PHONE switch, S702, to the "MCW" position and the "IC-OPERATE" switch, S703, in the "TUNE" position. The positioning f switch S703 at the "TUNE" setting is important since it prevents damage to the PA tube by removing its plate voltage during alignment.

6. Place the power switch in the ON position and allow set t warm up for at least five minutes.

NOTE: MCW-PHONE switch must be placed in PHONE position when channel selector switch settings are made.

B. ALIGNMENT

1. Set selector switch to channel 10.

2. Turn meter switch to position 2.

3. Unlock the multiplier selector dial and adjust to register maximum output on the meter.

4. Using an insulated screwdriver-blade alignment tool, adjust trimmers C502, C503, and C504 for peak meter reading. The illustration on page 7-24 shows the location of these trimmers and the other components to be adjusted.

5. Turn meter switch to position 8.

6. Unlock the 1st IPA selector dial and adjust for the sudden dip in the meter reading which indicates resonance.

7. Turn meter switch to position 9.

8. Unlock the 2nd IPA selector dial and adjust for maximum meter reading, indicating maximum grid excitation on this stage.

9. Now, as a check on the above adjustments, press Frequency Test switch, S501, to the right of the panel light. This renders fixed oscillator tube, V505, inoperative and the meter reading should drop to zero. If there is no decrease, steps 5 to 8 should be repeated, tuning the 1st IPA selector dial to another minimum point.

10. Adjust trimmer C501 for peak meter reading.

11. Turn the core of Z502 clockwise until the meter reading drops to zero. Now rotate the core counter-clockwise until the meter reading is again maximum. Continue this counter-clockwise rotation for an additional two turns of the core.

12. Lock all s lectors.

This completes the preliminary alignment at the high frequency end of the multiplier tuning range.

13. Set the selector switch to channel 1.

14. Turn the meter switch to position 2.

15. Unlock the multiplier selector dial and adjust for maximum meter reading, Relock dial.

16. Adjust the cores of L504, Z501 and L502 for p ak meter reading.

17. Turn meter switch to position 8.

Unlock 1st IPA selector dial and adjust for a sudden dip in the meter reading, indicating resonance. Relock dial.

19. Repeat steps 7, 8, and 9 above.

20. Adjust L501 for peak meter reading, indicating maximum grid excitation.

This completes the preliminary alignment at the low frequency end of the multiplier tuning range.

Since some of the adjustments made during the low frequency alignment have altered the settings made in steps 1 to 12, it is necessary to recheck all adjustments made to this point. Therefore, for final alignment, repeat steps from 1 to 20, in order to secure proper tracking and maximum output from the multiplier section.

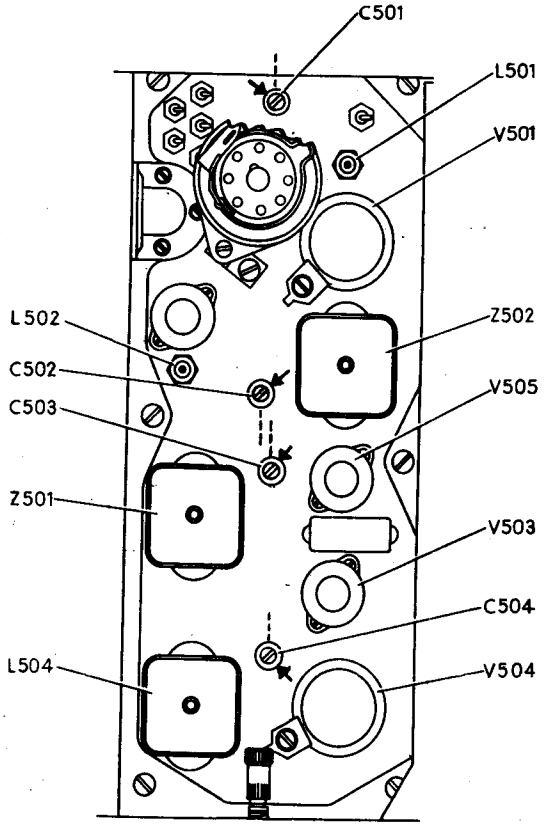
If the equipment is to be placed in operation, the desired channel crystals should be inserted in jacks 2 to 9 and the set then tuned to the various channels as outlined in the tuning chart in Section 3, page 3-22. The output at the meter setting 2 for each channel should be at least 4.8 with switch S702 in the MCW position and 4.1 in the Phone position. A lower reading indicates improper alignment and the alignment procedure should be repeated at channels 1 and 10.

After the alignment is completed, the crystals in channels 1 and 10 may be replaced by those normally used for operation on these two channels. Tuning of the equipment to the new crystal frequencies in channels 1 and 10 should foll w the procedure shown in the tuning chart on page 3-22.

C. PROCEDURE AFTER PARTS REPLACEMENT

The replacement of several of the tuning components, or accidental complete misalignment will require an additional step to be performed prior to those outlined under "B". In this event, it is advantageous to adjust the trimmer and padder capacitors to some preliminary setting before attempting alignment. The capacitors to be adjusted and the approximate percentage settings of maximum capacity are as follows:

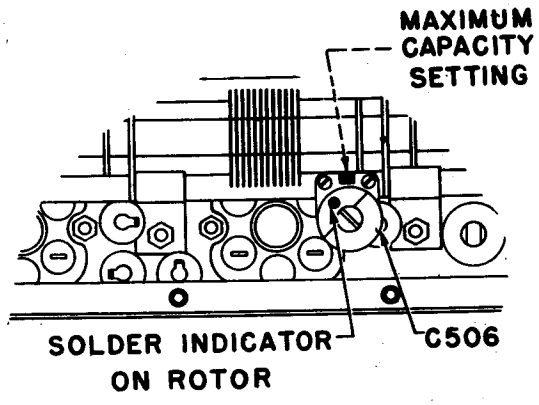
C501	20%	C504	70%
C502	70%	C506	90%
C503	15%		



The illustration shows the various capacitors and the percentage setting. Minimum capacity is indicated by the dotted lin and the proper percentage setting by the solid arrow. The adjustment slot should be turned until the end with the sold red connection is adjacent to the arrow. Reference to C506, visible at the bottom of the chassis, will clarify any questions on this point.

Padder C506, und rneath the chassis, may be adjusted only after the shield is removed. After making the percentage setting specified, the shield may be replaced, since adjustment of trimmer capacitor C502 and the core of L502 will make circuit resonance possible.

After the preceding settings have been made, the section may be aligned by following the steps outlined in "A" and "B".



TUBE OPERATING VOLTAGES AND CURRENTS

MULTIPLIER SECTION

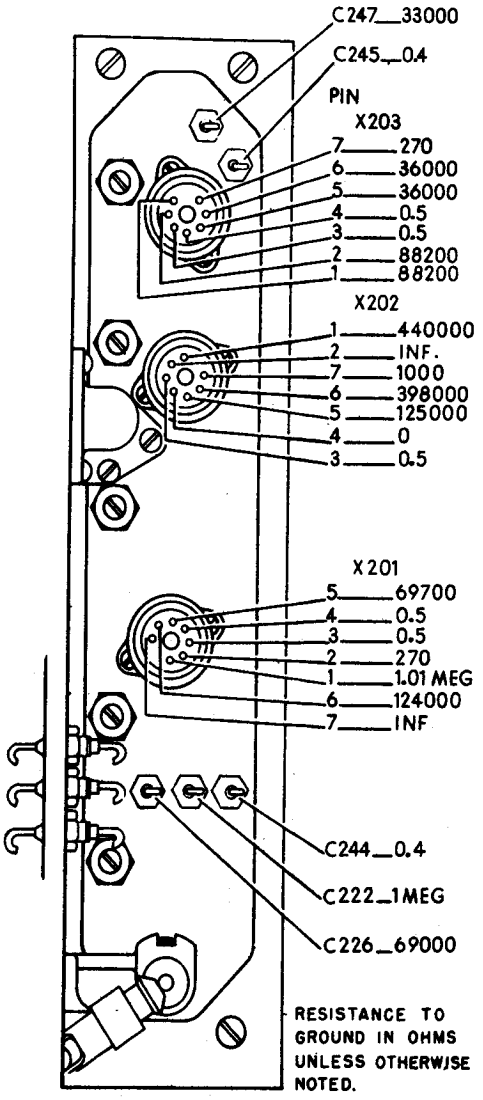
MULTIPLIER SECTION	HEATER VOLTAGE	HEATER CURRENT MA	PLATE VOLTAGE	SCREEN VOLTAGE	GRID VOLTAGE	CATHODE VOLTAGE	PLATE CURRENT MA	SCREEN CURRENT MA	GRID CURRENT MA
(P.U. operation 115V. ac)									
V501 (6AG7Y)	6.5 ac	650	295	140	-25		30	7	1
V502 (6C4)	6.7 ac	150	160		-65		16		2
V503 (6C4)	6.7 ac	150	190		-130		20		2.1
V504 (6AG7Y)	6.5 ac	650	295	160	-17.5	2.5	13	4	0.35
(Dynamotor operation 13V. dc)									
V501 (6AG7Y)	6.4	650	335	150	-30		30	7	1
V502 (6C4)	6.7	150	170		-70		17		2
V503 (6C4)	6.7	150	205		-147		21		2.1
V504 (6AG7Y)	6.3	650	310	170	-19		13	4	0.35

RECEIVER RADIO FREQUENCY SECTION

Since the socket pins of the radio frequency section are inacc ssible with the tubes in place, it is impossible to make a voltage check of this unit without employing a tube tester fitted with adapters to make connections to the sockets. Where such equipment is available, the voltage values for the three tubes in this section can be determined from the table on page 7-27 showing the operating characteristics of the tubes.

The resistance values between the tube pins and ground are shown in the illustration on this page as a means for checking the circuits in this secti n.

Failure to obtain resistance readings within 15 percent of the values given above indicates a defective component. The components involved in any portion of the circuit may be determined by means of the schematic diagram on page 7-28 and its position in the equipment located with the aid of the connection diagram on page 7-29, 30 or the illustration on page 7-26.



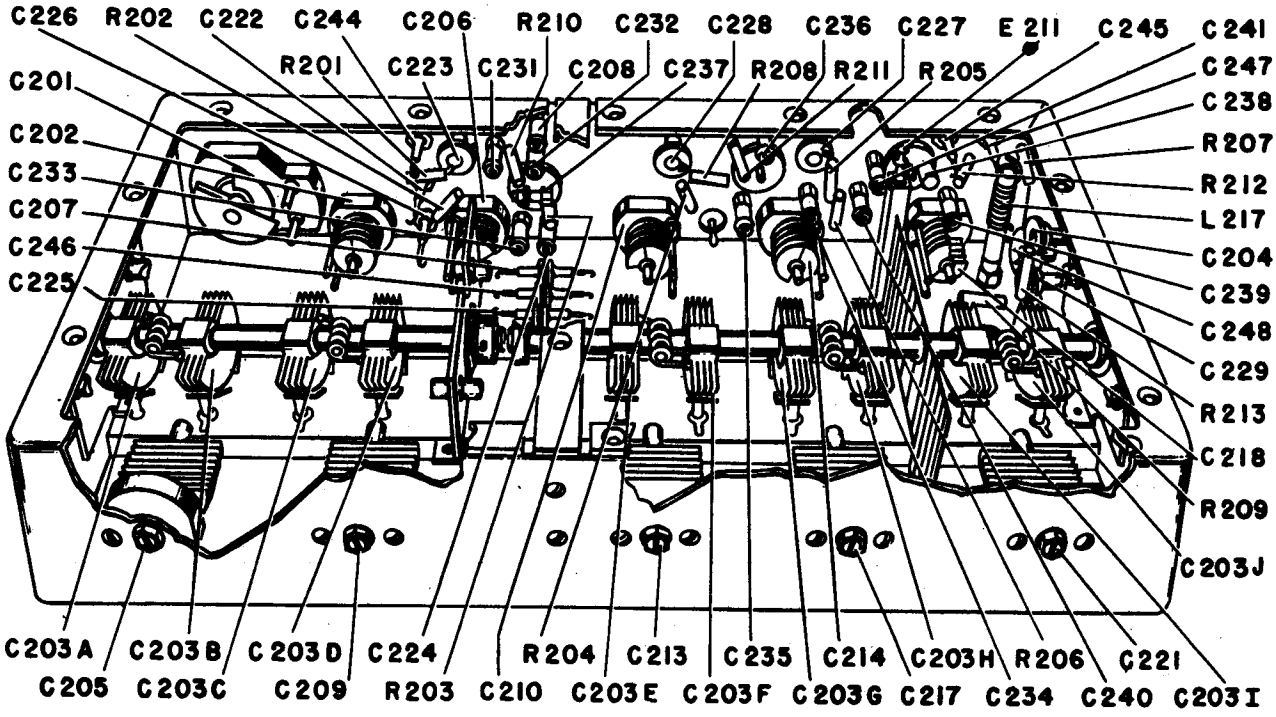
TUBES OUT OF SOCKETS.
NO EXTERNAL CABLES CONNECTED TO UNIT.

RESISTANCE AND CONTINUITY CHART
RADIO FREQUENCY SECTION

NOTE: Lead dress is very critical in this unit. When making repairs, extreme care must be exercised not to alter the position of leads not associated with a component that may have to be replaced.

CAPACITOR AND RESISTOR CHART

RADIO FREQUENCY SECTION

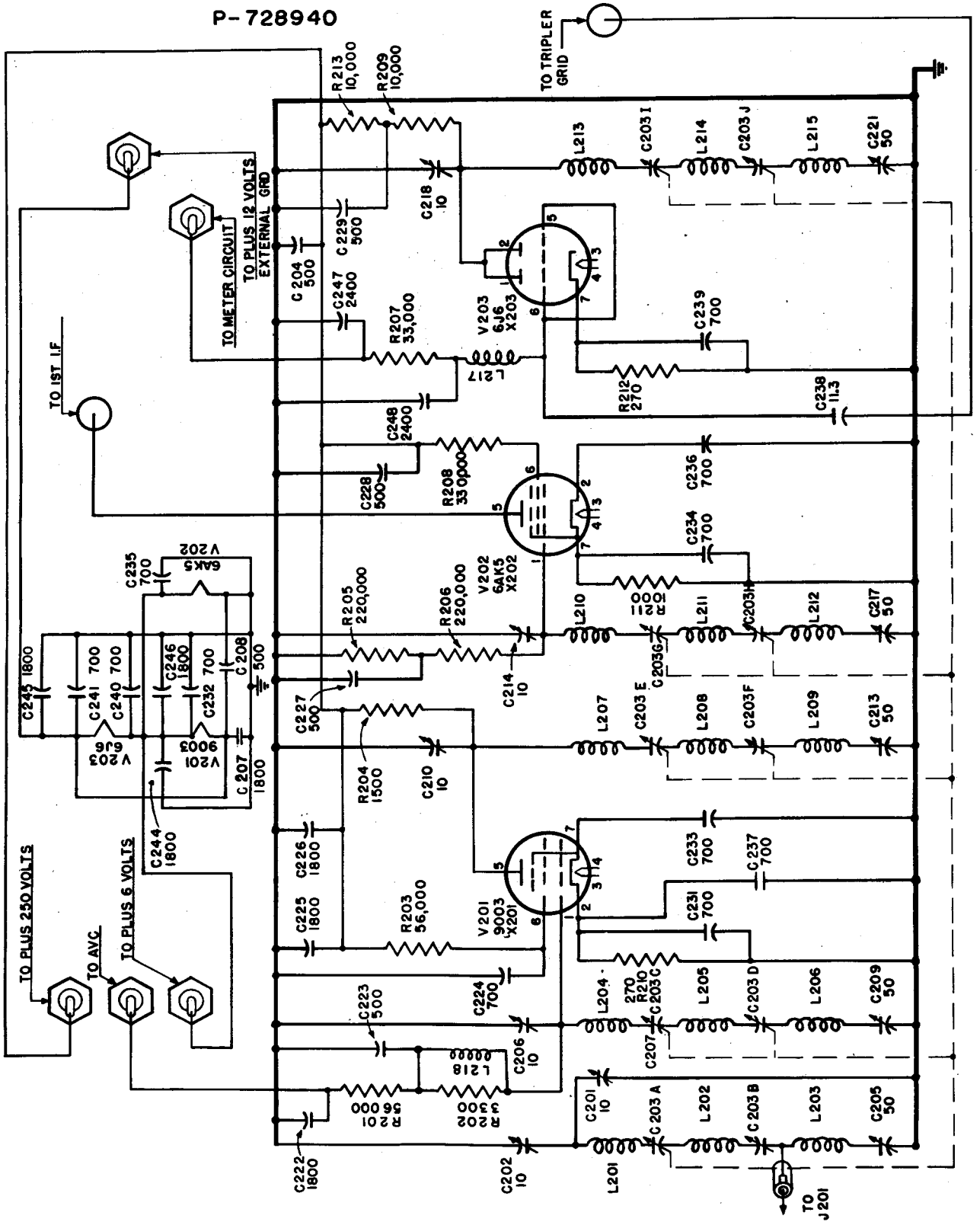


TUBE OPERATING VOLTAGES AND CURRENTS
R.F. SECTION

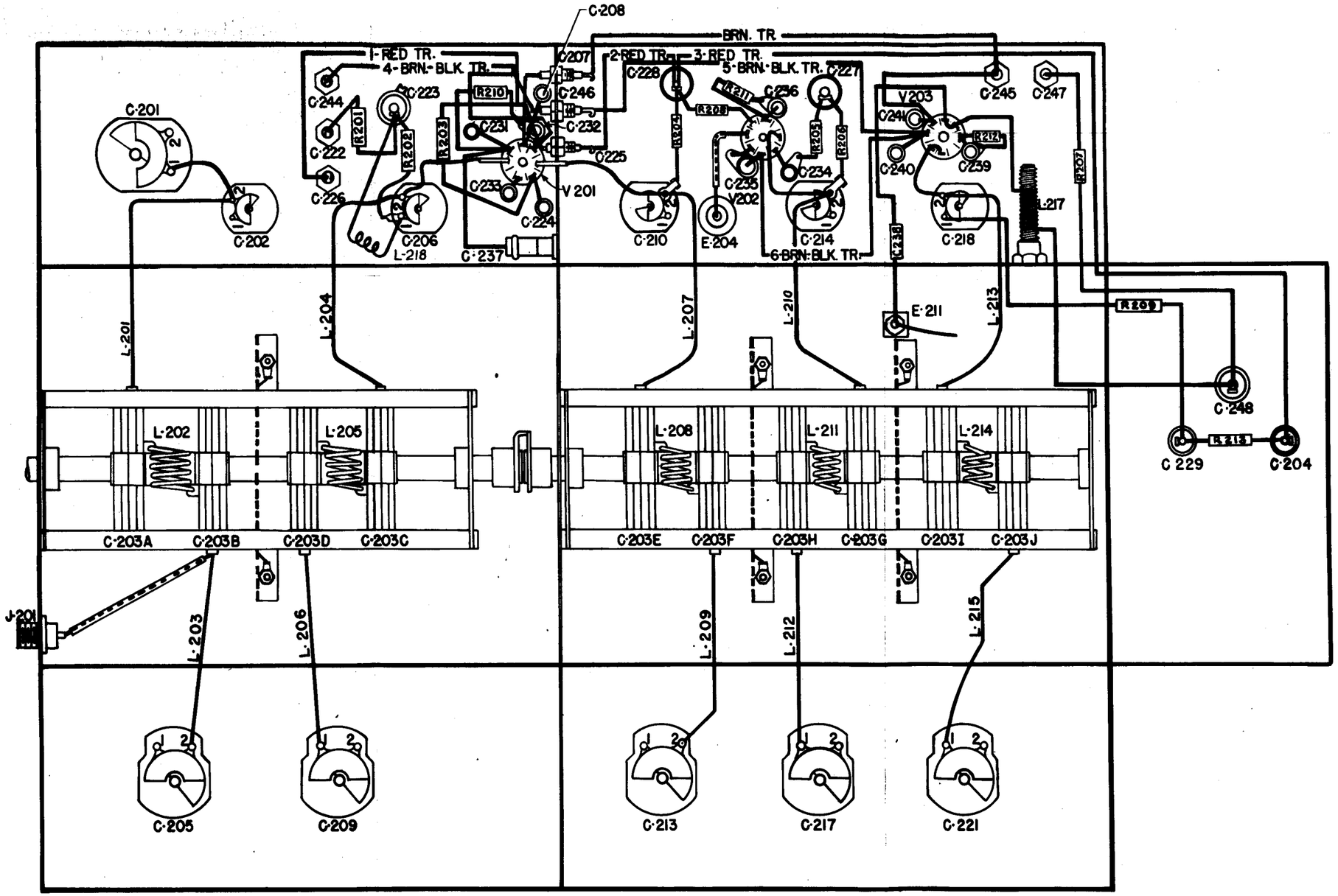
R.F. SECTION	HEATER VOLTAGE	HEATER CURRENT MA	PLATE VOLTAGE	SCREEN VOLTAGE	GRID VOLTAGE	CATHODE VOLTAGE	PLATE CURRENT MA	SCREEN CURRENT MA	GRID CURRENT MA
(Dynamotor operation 13V. dc)									
V201 (9003)	6.3	150	235	90		2.6	6.8	2.7	
V202 (6AK5)	6.3	175	145	82		2.3	1.7	0.5	
V203 (6J6)*	6.3	450	87		-16	2.5	4		0.45

*Values for one triode section only. Both sections identical.

SCHEMATIC DIAGRAM
RADIO FREQUENCY SECTION
P-728940



CONNECTION DIAGRAM
RADIO FREQUENCY SECTION
P-728941



ALIGNMENT

RADIO FREQUENCY SECTION

Alignment of the radio frequency section of the MAR receiver is a more difficult procedure than that used on the I-F or multiplier sections due to the higher frequencies encountered. For example, R-F tube V201 operates on the incoming frequencies (225-390 mc); tripler tube V203 on the 54th harmonic (255-420 mc) of the crystals, and tube V202 mixes both to produce the I-F frequency, 30.2 mc. These ultra-high frequencies necessarily require more complete facilities and make alignment correspondingly more complex.

NOTE - A COMPLETE R-F ASSEMBLY (Z201) IS FURNISHED WITH THE EQUIPMENT SPARE PARTS. BEFORE MAJOR CIRCUIT ADJUSTMENTS OR REPAIRS TO THE R-F SECTION ARE ATTEMPTED THIS SPARE ASSEMBLY SHOULD BE INSTALLED. NECESSARY REPAIRS TO THE DEFECTIVE ASSEMBLY CAN THEN BE MADE WHERE COMPLETE ALIGNMENT AND REPAIR EQUIPMENT IS AVAILABLE.

Due to the limited scope of the adjustments that may be made to the R-F section while in place in the chassis, the alignment notes may best be divided into two categories:

1. Correcting slight misalignment, or checking alignment for maximum efficiency.

2. Complete re-alignment where accident or tampering makes this step necessary.

Procedure number 1, above, may be performed with limited auxiliary equipment without removing the section from the chassis, but complete re-alignment requires more equipment and removal of the R-F section. For ease of reference, therefore, the alignment notes will be divided into two parts, "A. Checking Alignment," and "B. Complete Alignment Procedure." The multiplier section must always be in complete alignment and tuned for maximum output on each channel before attempting any adjustments on the R-F section.

Under both headings it will be necessary to align the R-F section at both the low and high frequency limits of the section. Since crystals for the channels mentioned may not be on hand, use of the nearest channel frequency available is advised. However, when attempting complete re-alignment, the recommended frequencies should be approximated as closely as possible in order to secure proper tracking and band coverage. An an aid in calculating crystal frequencies, add 30.2 mc to the desired channel frequency and divide by 54. This result will be the crystal frequency needed to produce the wanted frequency. To determine the channel frequency of a crystal, multiply the crystal frequency by 54 and subtract 30.2 mc.

A. CHECKING ALIGNMENT

Equipment required under this heading.
1 Output meter

A rectifier type a-c voltmeter may be used for the purpose. Set the meter for 0-15V scale reading. Plug a 600 ohm headset into the phone jack on the transmitter-receiver panel as an output load.
1 Signal generator

This signal generator must be capable of producing an amplitude modulated output in the frequency range of 225 to 390 mc. For proper impedance match at the antenna post, the generator connecting cable must have a 50 ohm impedance. (Th RG 8/U coaxial cable supplied with the MAR field kit has 50 ohm impedance, and may be used for the purpose. Alignment of the R F section is accomplished in the following manner:

1. Disconnect all cables and remove the chassis from its case.

2. Place the chassis on its side so that adjustments may be made on both top and bottom of the R F section, and reconn ct all cables except the antenna lead.

3. Connect the signal generator to the antenna receptacle, using a 50-ohm coaxial cable for proper impedance match.

4. Plug the voltmeter used as an output indicator into the headset jack on the modulator-dynamotor panel.

5. Turn the power on and permit the MAR equipment to warm up at least five minutes before making adjustments. (For stability, the signal generator should also be permitted to warm up.)

6. Set the output level control to approximately 8 and leave at this setting until all r-f alignment procedures have been completed.

7. Select the channel nearest 350 megacycles and operate channel selector mechanism to this point.

8. Now set the signal generator to the frequency of the channel selected and modulate it with a 400 cycle note. It will probably be necessary to vary the generator frequency setting slightly in order to get the proper beat. Maximum reading on the output meter is an indication that the generator frequency is correct. Set th generator out-

put to register approximately 5 volts on the output meter and turn back the generator level whenever the meter reading exceeds this value. (Do not use the output level knob on the equipment to maintain this figure.)

9. Unlock the R F selector dial and adjust for maximum output.

10. Tune the antenna compensator (C201) for maximum output.

11. Using an insulated alignment tool, adjust C205, C209, C213, C217 and C221 for maximum output, in the order given. These trimmers are adjustable from the bottom of the R F unit.

12. Lock all selectors.

13. Now select the channel frequency nearest 225 mc and turn the channel selector to this setting.

14. Retune the signal generator to the new channel frequency and adjust the output to approximately 5 volts.

15. Unlock the R F selector dial and tune for maximum output. (Do not change the setting of the antenna compensator.)

16. From the top of the chassis, adjust, in sequence, C202, C206, C210, C214, and C218 for maximum output.

17. Lock all selectors.

18. Repeat steps 7 to 12.

19. Repeat steps 13 to 17.

This completes the adjustment of the R-F section for any slight misalignment of the various trimmers. If trouble is experienced with increased image response, the rejection ratio may be restored if a signal generator with 0.1 volt output at 450 mc is available. The adjustments are as follows:

20. Select a channel as close to 390 mc as possible and turn the channel selector to this point.

21. Retune the signal generator to the same channel frequency and adjust the output to approximately 5 volts.

22. Unlock the R F selector dial and tune carefully for maximum output.

23. Adjust the antenna compensator for maximum output.

24. Without touching any other adjustments, set the signal generator for 0.1 volt output at a frequency equal to the sum of the channel frequency being used and twice the I-F frequency (30.2 megacycles).

25. Using an insulated alignment tool, adjust the loop of L201 for minimum output by pushing it slightly toward or away from the panel, as necessary. This adjustment may be made through the hole to the right of C201.

26. Retune the signal generator to the channel frequency and very carefully readjust the antenna compensator for maximum output.

27. Repeat steps 24 and 25.

After completing the adjustments as described, the image ratio should be correct and the section properly aligned.

B. COMPLETE ALIGNMENT PROCEDURE

Equipment required under this heading is as follows:

1 Oscilloscope

Any standard oscilloscope with a horizontal sweep will be satisfactory.

1 Ultra-high-frequency sweep generator

This sweep generator must be of the frequency-modulated type with an output range of 225 to 390 megacycles and a minimum sweep of 6 per cent.

1 Signal generator

This signal generator must be capable of an amplitude-modulated output range of 225 to 450 mc. For proper impedance match at the antenna post, the generator connecting cable must have a 50-ohm impedance. (The RG 8/U coaxial cable supplied with the MAR field kit has a 50-ohm impedance, and may be used for the purpose.)

1 Output meter. A rectifier type a-c meter may be used for this purpose, set for scale reading of 0-15V. A 600 ohm headset should be plugged into the phone jack on the transmitter-receiver panel as output load.

St ps for complet re-alignment are:

1. Disconnect all cables and remove the chassis from its case, placing it in normal operating position on the bench.

2. Unsolder the cable connections to feed-through capacitors C222, C226, C244, C245 and C247 at the top of the section. Note the cable coding and matching capacitor numbers for aid in replacement.

3. Remove the four screws, two at each end, which hold section to the chassis. Reconnect the ground lead.

4. Remove the screws which hold the two metal housings over the cables to the I-F and multiplier sections, remove the housings, and then unsolder the leads at these points.

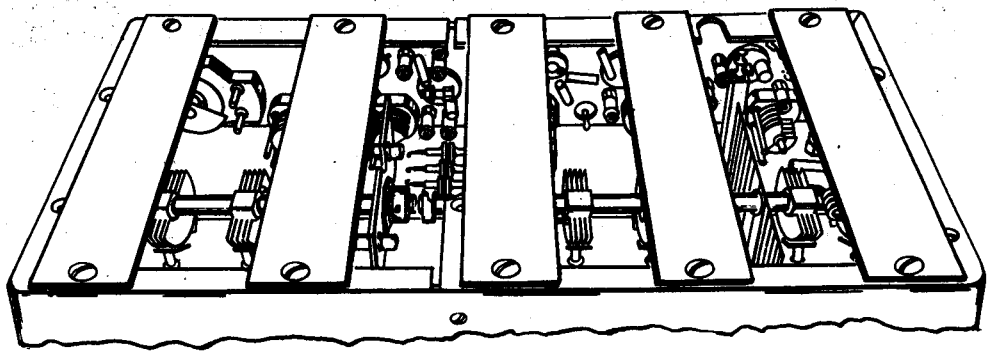
5. Turn the chassis upside down and disconnect the cable at antenna jack, J201.

6. Remove the two screws, accessible from the audio section, which hold the unit to the chassis.

7. Unlock the R-F selector dial and set it to the position at which the pin in the coupling is toward the top of the chassis. This will position the selector coupling and facilitate removal of the R-F section, which may now be accomplished by pulling the section upward and out of the chassis. The clutch below the bevel gears at C201 will separate without difficulty as the unit is extracted.

8. Take off the side shield cover by removing the seventeen screws which hold it in place.

9. For shielding purposes during realignment, and to permit access to the inductive loops, the shield must be replaced with five metal strips approximately one inch wide by four and one-half inches long. Drill screw clearance holes through the strips and then fasten them securely in place with the screws which were removed in step 8. The section with the temporary shielding strips is shown in the illustration.



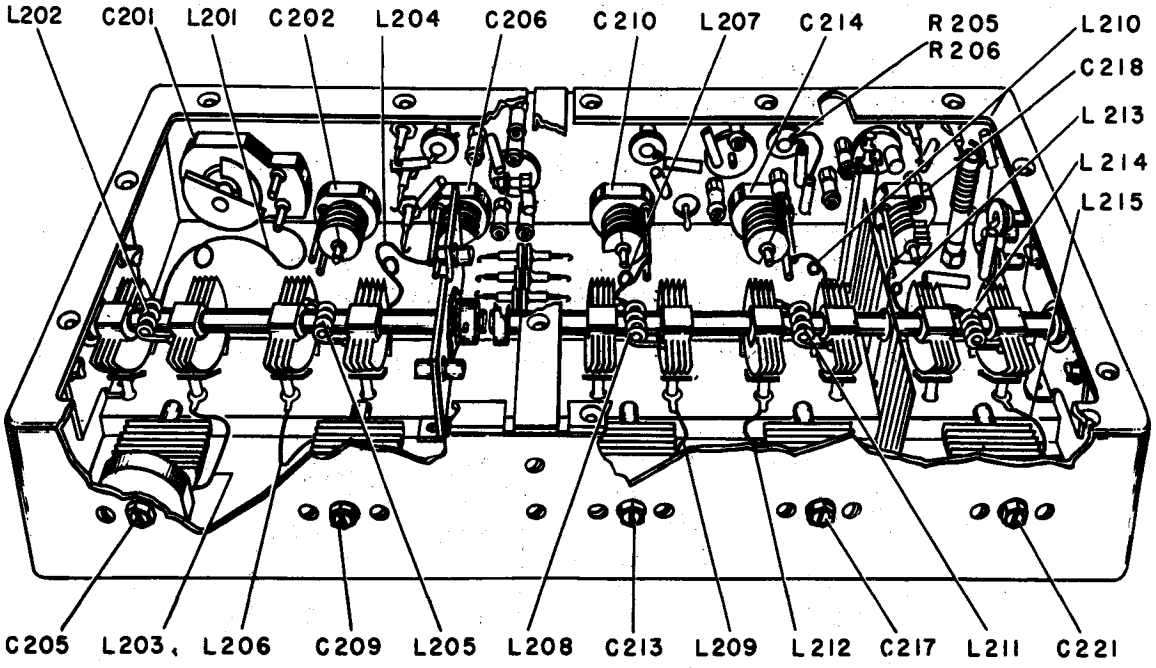
10. Obtain a dial which will fit th 1/4 inch shaft of the R-F section variable capacitors. To facilitate adjustment, this dial should be graduat d 0-100 throughout 180 degrees. Place a reference mark on the chassis, fully mesh the capacitor plates, then attach the dial to the capacitor shaft so that the 100 graduation mark coincides with the reference mark.

11. Unsolder resistor R208 from the screen terminal (pin 6) of X202.

12. Now solder short, direct leads from the MAR chassis to the R-F section, to replace the leads removed in steps 2 and 4. Do not forget to provide a ground from the R-F section chassis to the main chassis.

13. Preset the trimmer capacitors, referenced in the list which follows, to the percentage of maximum capacitance indicated.

C201	30%	C205	95%
C202	25%	C209	50%
C206	25%	C213	50%
C210	25%	C217	50%
C214	25%	C221	0
C218	25%		



14. Connect the output lead from the oscilloscope to the junction of R205 and R206 at capacitor C227, and ground the oscill scope return lead to the R-F chassis, keeping both leads direct and short.

15. Reconnect the cables which were disconnected in steps 1, 2, and 4.

16. Connect the 50-ohm output cable of the sweep generator to the antenna jack, J201, of the R-F unit.

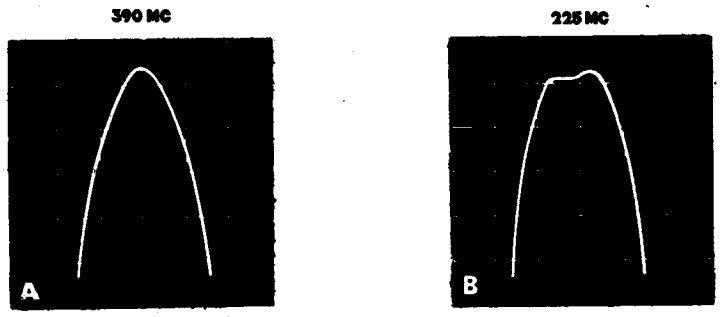
17. Turn the power on and allow the equipment to warm up at least five minutes before making adjustments.

18. Select the channel nearest 390 megacycles and operate the channel selector mechanism to this point.

19. Set the R-F dial at 5.

20. Now set the sweep generator for a minimum of 6 per cent sweep at the channel frequency, and vary the generator setting and gain until a symmetrical form (see wave form "A") appears on the oscilloscope screen.

21. Carefully tune antenna compensator C201 and with an insulated alignment tool adjust the position of wire loops L201, L204, L207 and L210, in the order given, for maximum amplitude and wave pattern as at A. The location of these wire inductive loops is shown in the illustration of th unit.



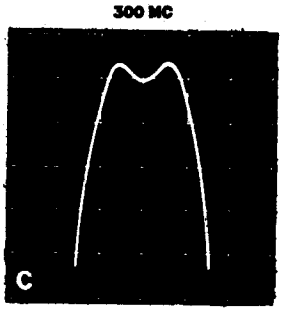
22. Select the channel nearest 225 mc and operate the channel selector mechanism to this point.

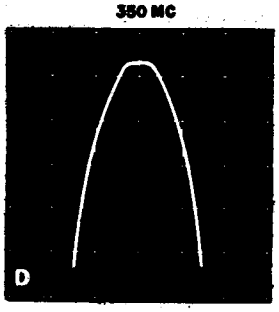
23. Set the R-F dial at 90, and adjust the sweep generator for the new channel output.

24. Adjust C202, C206, C210 and C214 for maximum amplitude and oscilloscope pattern as shown at B.

25. Operate the channel sel ctor mechanism to the channel fr quency nearest 300 mc, and s t the sweep generator to the new frequency.

26. Rotate the R-F knob to the position at which the pattern is centered on the screen, and adjust L202, L205, L208 and L211, in sequence, for peak pattern and waveform as shown at C.





27. Operate the channel selector mechanism to the channel frequency nearest 350 mc, and set the sweep generator to the new frequency.

28. Rotate the R-F knob to the position at which the pattern is centered on the screen and align C205, C209, C213 and C217 for maximum amplitude and pattern as shown t D.

If C205 lines up at less then 90 per cent of maximum capacity, or if C209, C213 or C217 line up at less than 40 per cent or more than 60 per cent of maximum, readjust C201, C204, L207 and L210. Note that one of the loops of L201 should be approximately vertical and the other approximately horizontal for proper image rejection.

If C210 or C214 line up at more than 50 per cent, readjust C213, C217, L207 and L210. These limitations are necessary for image rejection purposes.

29. Repeat steps 18 to 28.

30. Repeat steps 22 to 24.

31. Disconnect the oscilloscope and sweep generator leads, and resolder R208 to pin No. 6 of X202.

32. Connect the signal generator to the antenna receptacle, using a 50-ohm coaxial cable for proper impedance match.

33. Adjust the output meter impedance to 600 ohms and plug into one of the phone jacks on the modulator unit panel.

34. Set the output level control to approximately 8 and leave at this setting throughout.

35. Preset C214 at 25 per cent and C217 at 50 per c nt of maximum capacity.

36. Operate the channel selector mechanism to the channel frequency nearest 350 mc.

37. Now set the signal generator to the channel frequency selected and modulate it with a 400-cycle note. It will probably be necessary to vary the generator frequency setting slightly in order to get the proper beat. Maximum reading on the voltmeter in the output is an indication that the generator frequency is correct. Set the generator output to read approximately 5 volts on the output meter and turn back the generator level whenever the meter reading exce ds this value. (Do not use the output level knob on the equipment to maintain this figure.)

38. Adjust the R-F knob, antenna compensator C201, and the adjusting screw on C221 for maximum output, in the order given.

39. Operate the channel selector mechanism to the channel frequency nearest 225 mc and repeat step 37.

40. Adjust the R-F knob, antenna compensator C201, and the adjusting screw on C218 for maximum output, in the order given.

41. Operate the channel selector mechanism to the channel frequency nearest 390 mc and set the signal generator to the same frequency.

42. Adjust the R-F knob, antenna compensator C201, and adjust L210 and L213 for maximum output by adjusting dress of the inductances with respect to the case of the unit.

43. Operate the channel selector mechanism to the channel frequency nearest 225 mc and set the signal generator to the same frequency.

44. Adjust the R-F knob, antenna compesnator C201, and adjust C214 and C218 for maximum output.

45. Operate the channel selector mechanism to the channel frequency nearest 300 mc and set the signal generator to the same frequency.

46. Adjust the R-F knob, antenna compensator C201, and then adjust L211 and L214 for maximum output by adjusting dress of the inductances with respect to the case of the unit.

47. Operate the channel selector mechanism to the channel frequency nearest 350 mc and set the signal g nerator to the same frequency.

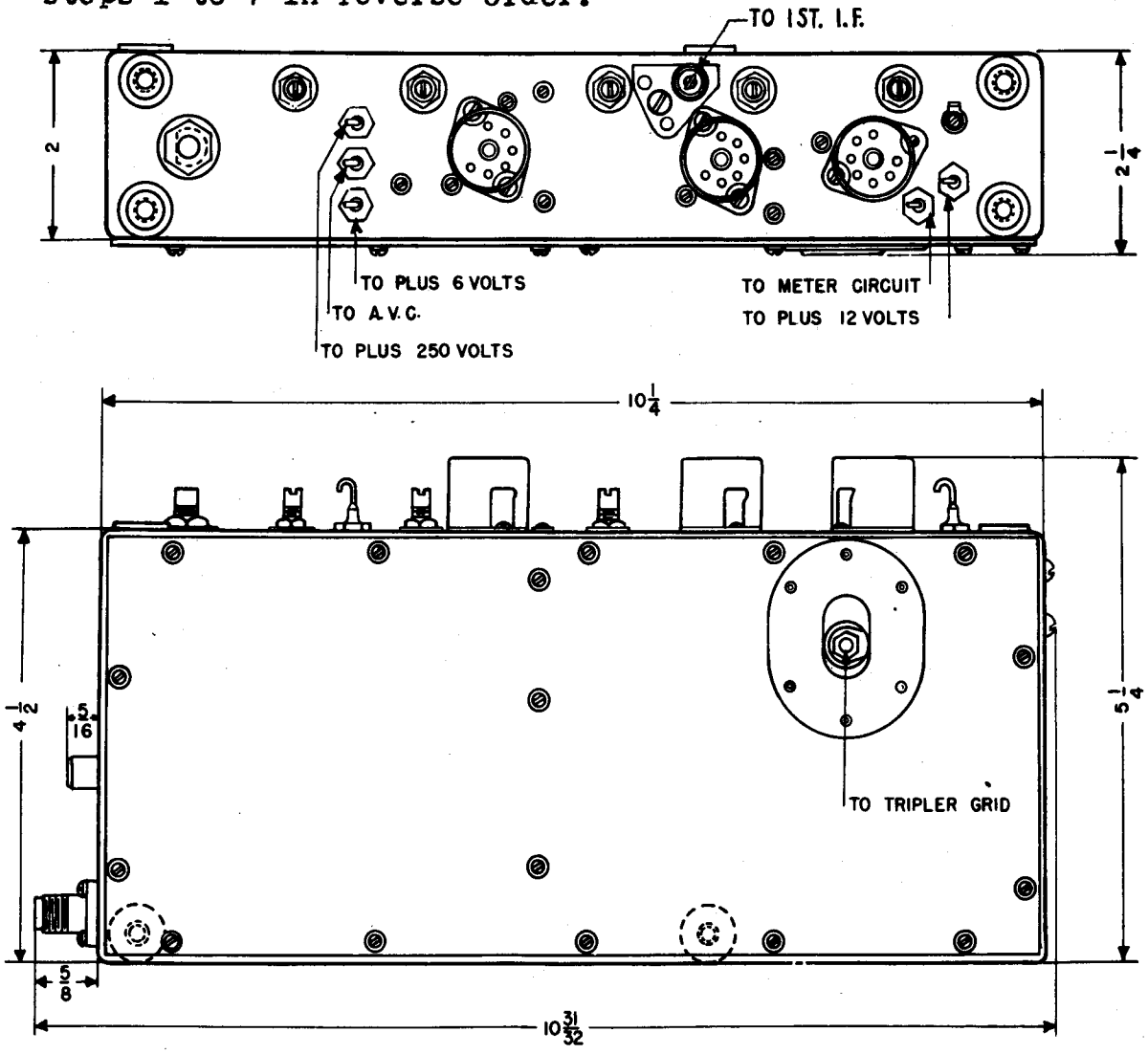
48. Adjust the R-F dial, antenna compensator C201, and then adjust C217 and C221 for maximum output. Trimmer C214 should now line up at less than 50 per c nt and C217 between 40 to 60 per cent of maximum capacity.

49. Repeat steps 41 to 48 until all circuits track properly.

50. Repeat steps 43 and 44.

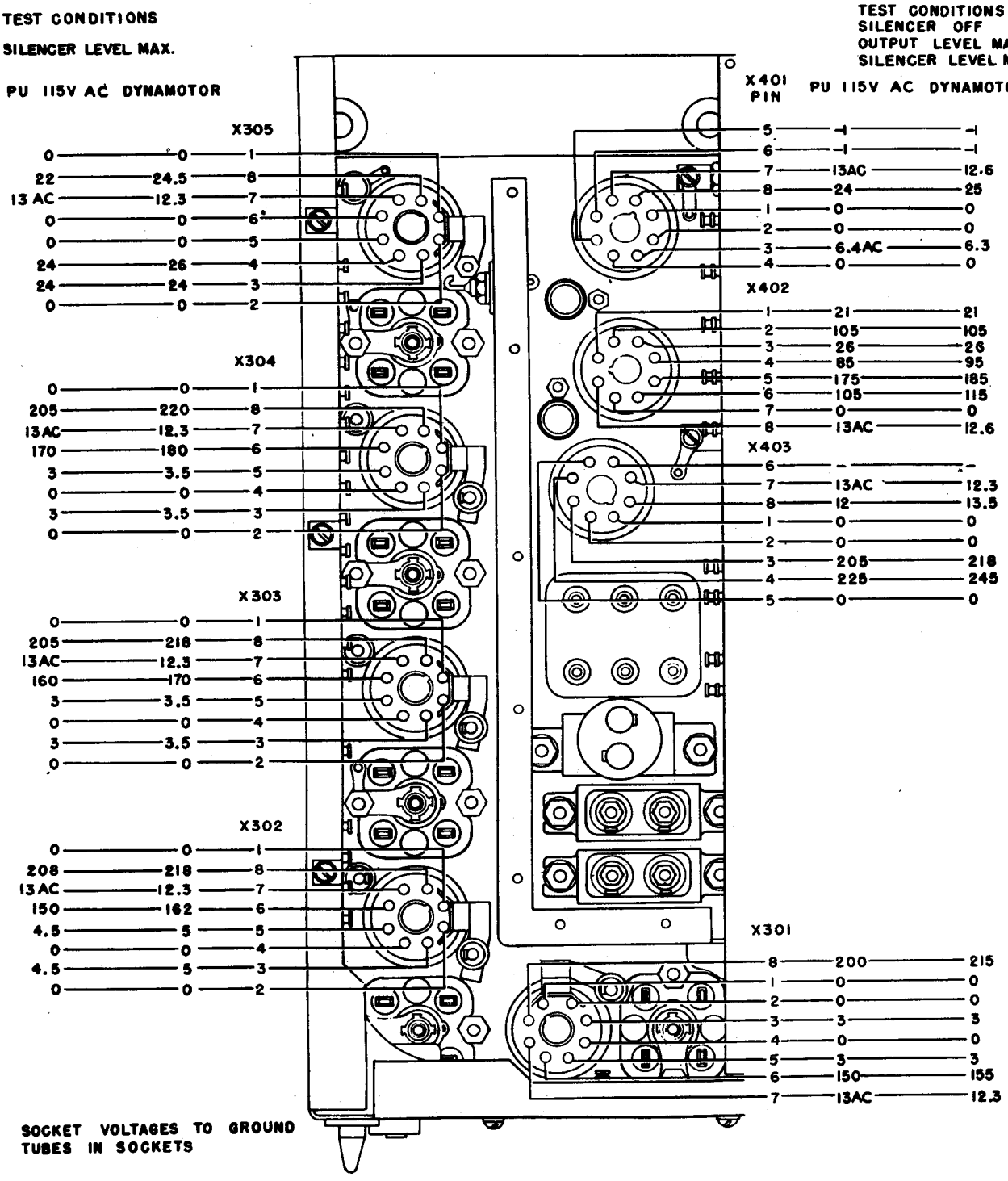
This completes the alignment of the R-F section. To adjust the image rejection ratio, repeat the complete procedure as given under "A. Checking Alignment," steps 20 to 27.

To reassemble, turn off the power and disconnect all leads and cables. Replace the permanent shield cover and follow steps 1 to 7 in reverse order.

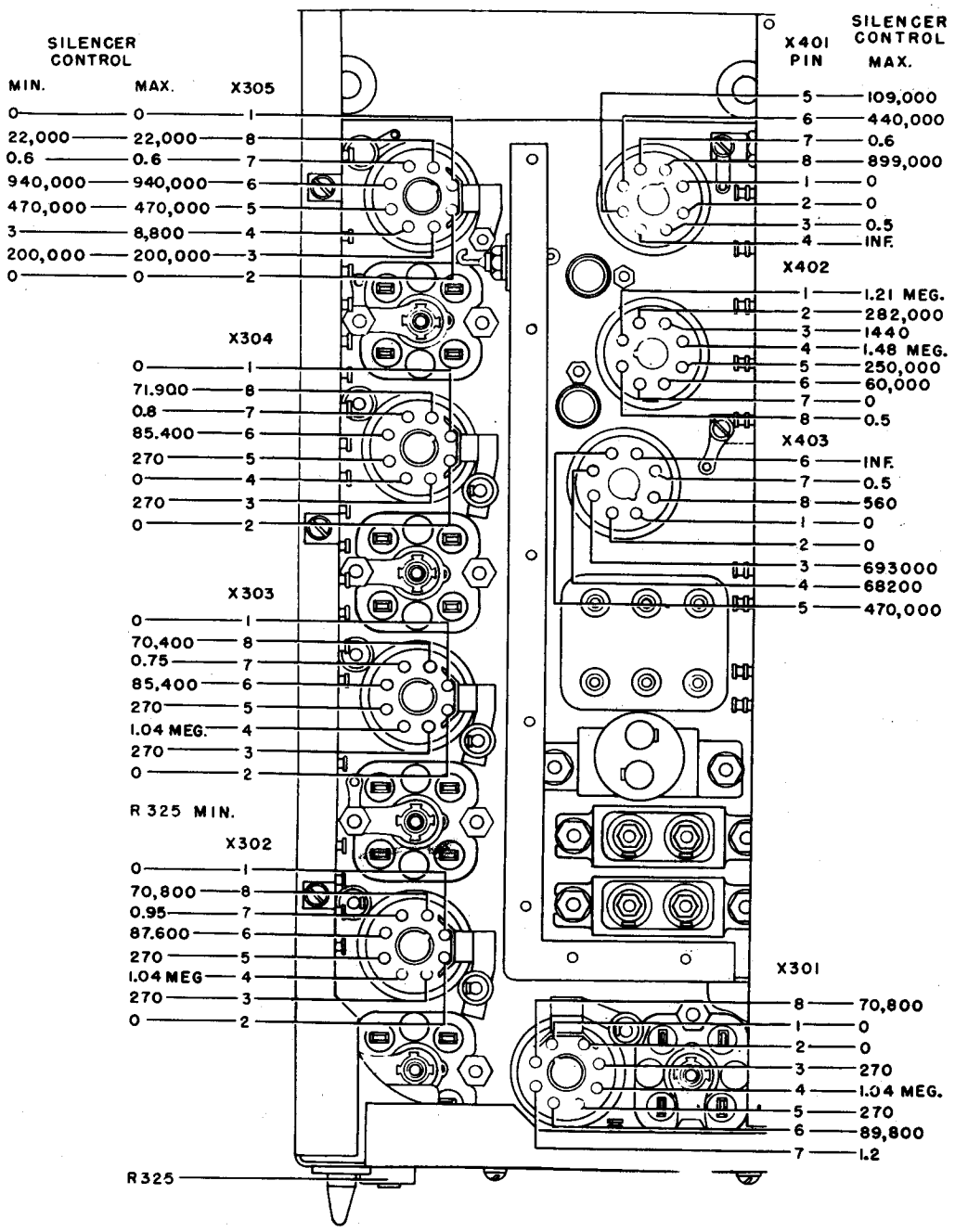


OUTLINE DRAWING
RADIO FREQUENCY SECTION

INTERMEDIATE AND AUDIO FREQUENCY SECTIONS

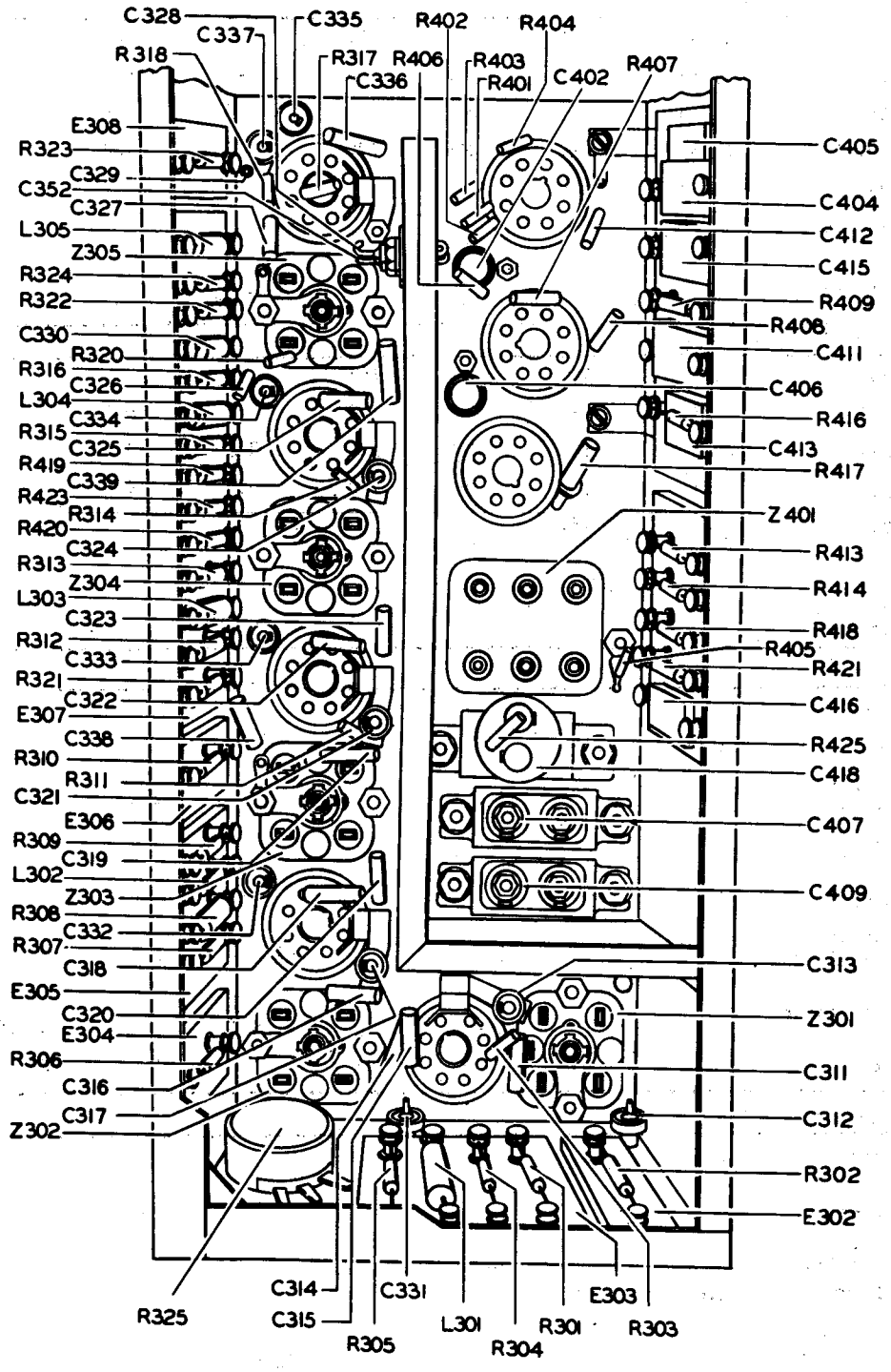


VOLTAGE CHECK
INTERMEDIATE AND AUDIO FREQUENCY SECTIONS



RESISTANCE IN OHMS TO GROUND UNLESS OTHERWISE NOTED.
NO EXTERNAL CABLES TO UNIT. TUBES IN SOCKETS.

RESISTANCE AND CONTINUITY CHECK
INTERMEDIATE AND AUDIO FREQUENCY SECTIONS



CAPACITOR AND RESISTOR CHART

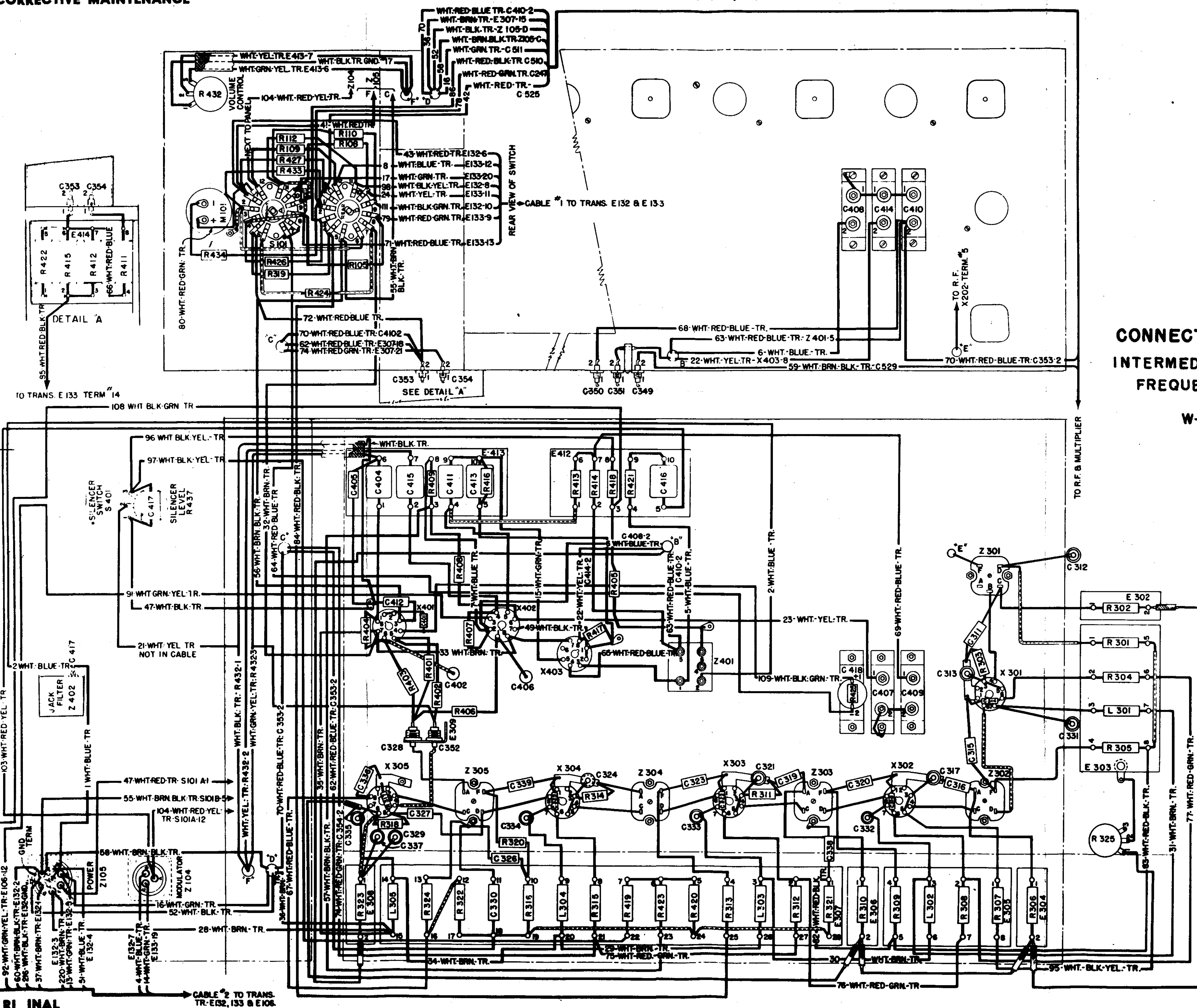
INTERMEDIATE AND AUDIO FREQUENCY SECTIONS

TUBE OPERATING VOLTAGES AND CURRENTS

I.F. SECTION	HEATER VOLTAGE	HEATER CURRENT MA	PLATE VOLTAGE	SCREEN VOLTAGE	CATHODE VOLTAGE	PLATE CURRENT MA	SCREEN CURRENT MA	
(P.U. operation 115V. ac)								
V301 (12SG7)	13 ac	150	200	150	3	7.2	3.6	
V302 (12SG7)	13 ac	150	208	150	4.5	5.5	0.3	
V303 (12SG7)	13 ac	150	205	160	3	7.2	3.6	
V304 (12SG7)	13 ac	150	205	170	3	7.0	4.5	
V305 (12H6)	13 ac	150						
Detector Diode Section			0		22			
Silencer Diode Section			0		0-24*			
(Dynamotor operation 13V. dc)								
V301 (12SG7)	12.3	150	215	155	3	7.5	3.8	
V302 (12SG7)	12.3	150	218	162	5	6.1	0.4	
V303 (12SG7)	12.3	150	218	170	3.5	9.0	4.0	
V304 (12SG7)	12.3	150	220	180	3.5	8.0	4.5	
V305 (12H6)	12.3	150						
Detector Diode Section			0		24.5			
Silencer Diode Section			0		0-26*			
A.F. SECTION								
(P.U. operation 115V. ac)								
V401 (12H6)	13 ac	150						
Noise Limiter Diode Section			0-18			0-24		
Meter Rect. Diode Section			6.4 ac					
V402 (12SL7GT)	13 ac	150						
Noise Limiter Triode Section			23-25		-1-1/2 ∠3	3	0-0.3	
1st Audio Triode Section			175-225		20-85*	75-80	0.3-0.5	
V403 (12A6)	13 ac	150	203	225		12	20	1
(Dynamotor operation 13V. dc)								
V401 (12H6)	12.6	150						
Noise Limiter Diode Section			0-20			0-25		
Meter Rect. Diode Section			6.3					
V402 (12SL7GT)	12.6	150						
Noise Limiter Triode Section			26		-1-1/2 ∠3	3	0-0.3	
1st Audio Triode Section			185-240		25-95*	85-115	0.3-0.5	
V403 (12A6)	12.3	150	218	245		13.5	23	1

*NOTE: Output level at maximum, Silencer level varied from min. to max.

CONNECTION DIAGRAM
INTERMEDIATE AND AUDIO FREQUENCY SECTIONS
W-308635



ALIGNMENT OF INTERMEDIATE FREQUENCY SECTION

The MAR intermediate frequency section may be aligned by following the usual procedure employed in aligning circuits of this type. Thus, an oscilloscope is connected to the output of the section so as to observe the selectivity of the 30.2 megacycle intermediate frequency. Then, applying the proper signal to the grid of each stage in succession, the I-F transformers should be adjusted for the correct oscilloscope pattern, aligning the last stage first and working backwards through the section. An oscilloscope is necessary for alignment in order that the transformers may be peaked properly and maximum output be obtained.

Test equipment required is as follows:

1 Oscilloscope

Any standard oscilloscope with a horizontal sweep is suitable. Adjustment of the oscilloscope for a double-trace output is also desirable since better alignment is possible.

1 8.2 mmfd. ceramic capacitor (dummy load)

1 68-ohm resistor (sweep generator terminating impedance)

1 High frequency sweep generator

This sweep, or signal generator must be of the frequency-modulated type capable of producing the required 30.2 megacycle I F signal. A minimum of two megacycles sweep is necessary.

To align the I F section, proceed as follows:

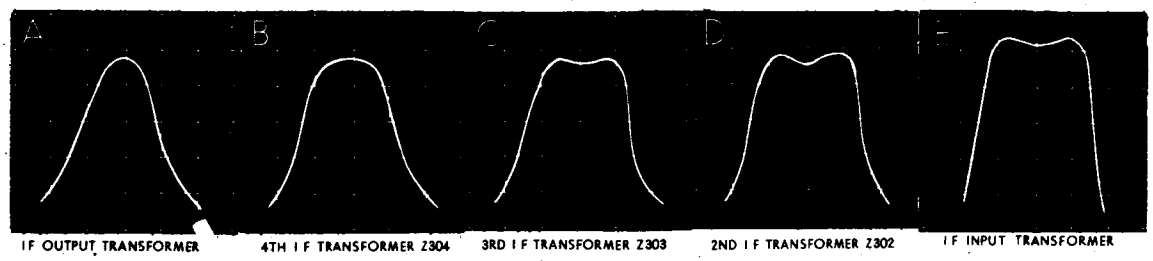
A. GENERAL

1. Disconnect all cables to the Transmitter-Receiver section.

2. Remove the chassis from its case and place on end on a convenient bench to allow access to core adjusting screws on top and bottom of intermediate transformers.

3. Reconnect the power cable only, leaving the others disconnected.

4. Turn the power switch to the ON position and allow the set to warm up for at least five minutes before making any adjustments.



B. ALIGNING I-F OUTPUT TRANSFORMER (Z305)

1. Remove tube V401 and crimp a short lead to pin No. 5. Replace tube in socket and connect the oscilloscope input to the lead which was connected to pin No. 5.

2. Connect the oscilloscope ground lead to the chassis.

3. Remove tube V304 and crimp a short lead (approximately two inches) around pin No. 4 then replace tube in socket.

4. Connect the sweep generator output to the lead which was connected to pin No. 4.

5. Ground the generator return to the tube clamp of tube V304, keeping the ground as short as possible.

6. Set the center frequency of the generator at exactly 30.2 megacycles. Adjust the generator and oscilloscope level controls until a curve appears on the screen. Now adjust the oscilloscope to obtain a double trace.

7. With a screwdriver blade alignment tool, adjust both cores of Z305 for maximum output, with the two curves of the double trace coinciding. Reduce the output of the generator, if necessary, to keep the curve on the screen. The resultant pattern should be at, or slightly less than critical coupling as shown on the oscillogram A.

If necessary the position of C327 (at pin 5 of X305) should be varied slightly with respect to the chassis so as to alter the capacity coupling and obtain the above-mentioned pattern.

C. ALIGNING THE 4th I-F TRANSFORMER (Z304)

1. Transfer the sweep generator output lead to pin No. 4 (grid) of V303 connecting it as in B-3. The generator return lead should be grounded to the tube clamp of V303 keeping the ground as short as possible. Reduce the generator output to keep the trace on the screen.

2. Adjust the cores of Z304 for maximum output, with the curves of the double trace coinciding. The pattern obtained should be flat-topped as shown at B.

D. ALIGNING THE 3rd I-F TRANSFORMER (Z303)

1. Transfer the sweep generator output lead to pin No. 4 (grid) of V302 connecting it as in B-3. The generator return lead should be grounded to the tube clamp of V302, keeping the ground as short as possible. Reduce the generator output to keep the trace on the screen.

2. Adjust the cores of Z303 for maximum output, with the double-trace curves coinciding. The oscillogram produced should be overcoupled as shown at C.

E. ALIGNING THE 2nd I-F TRANSFORMER (Z302)

1. Transfer the sweep generator output lead to pin No. 4 (grid) of V301 connecting as in B-3. The generator return lead should be grounded to the tube clamp of V301, keeping the ground as short as possible to keep the trace on the screen.

2. Adjust the cores of Z302 for maximum output, with the curves of the double-trace coinciding. This adjustment should produce an overcoupled pattern as illustrated at D.

F. ALIGNING THE I-F INPUT TRANSFORMER (Z301)

1. Remove tube V202 and crimp a short lead (approximately two inches) around pin No. 1. Replace tube V202 and run the wire through the tube shield, to the 8.2 mmfd ceramic capacitor listed with the required test equipment. Replace the tube shield.

2. Connect the other end of the 8.2 mmfd capacitor to the sweep generator output lead.

3. Ground the generator return lead directly to the tube shield of V202.

4. Adjust the cores of Z301 for maximum output, with the curves of the double trace coinciding.

5. Readjust the cores of Z302, if necessary, to produce the symmetrical overall curve shown at E. This pattern should be slightly overcoupled, as shown.

The I-F section is now properly aligned to the 30.2 megacycle intermediate frequency.

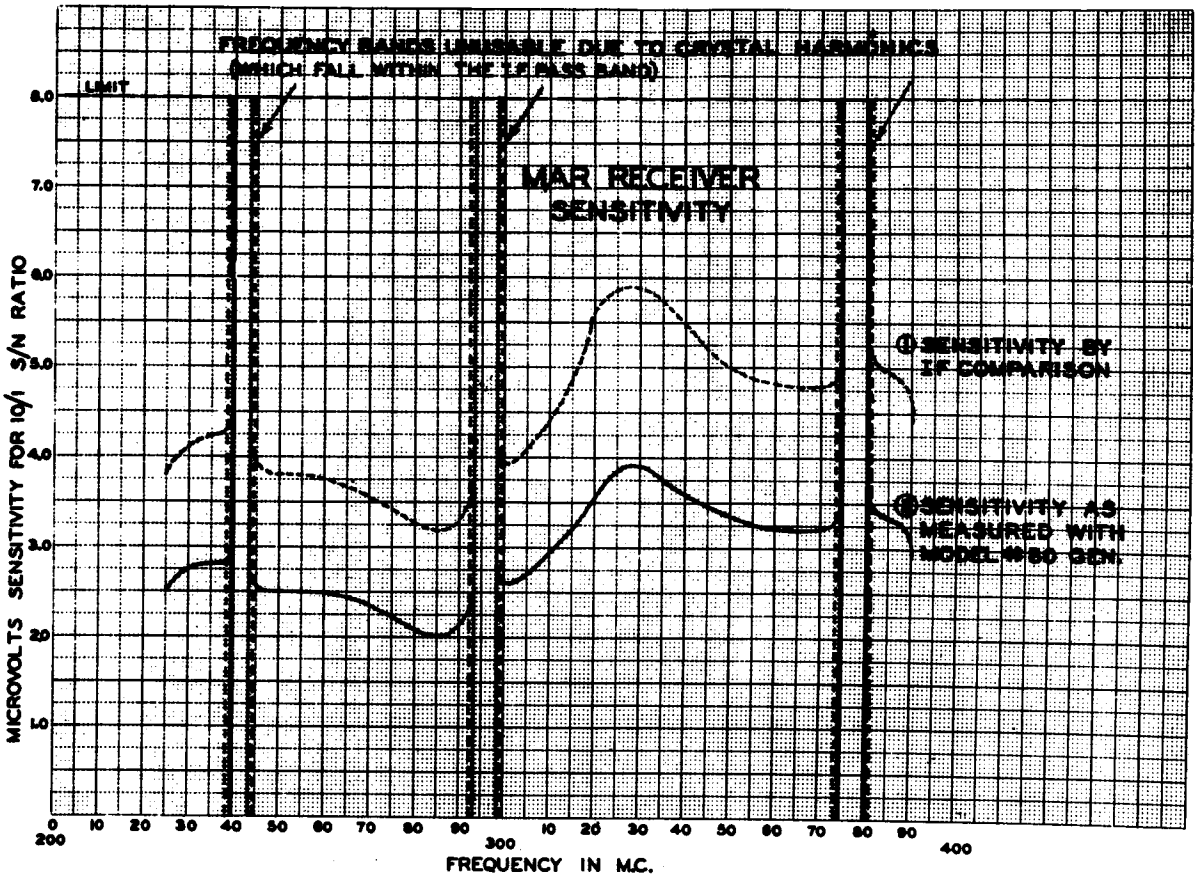
MODULATION ADJUSTMENT

Details of procedure for adjusting modulation for voice and MCW are given on pages 7-103, 104.

AVC THRESHOLD ADJUSTMENT

Details of procedure for making this adjustment are given on page 7-102.

S-853817



RECEIVER SENSITIVITY CURVE

The curves above show the sensitivity of the MAR receiver over the operating frequency range of the equipment. The lower curve can be used to check receiver sensitivity when a signal generator with calibrated output and an output meter are available. The curve gives the required input in microvolts, modulated thirty per cent at 1000 cycles, to give an output of 50 milliwatts.

The three frequency bands not available to the equipment are als shown in the illustration. Crystal harmonics fall within the IF pass bands at these frequencies and render them useless for radio reception.

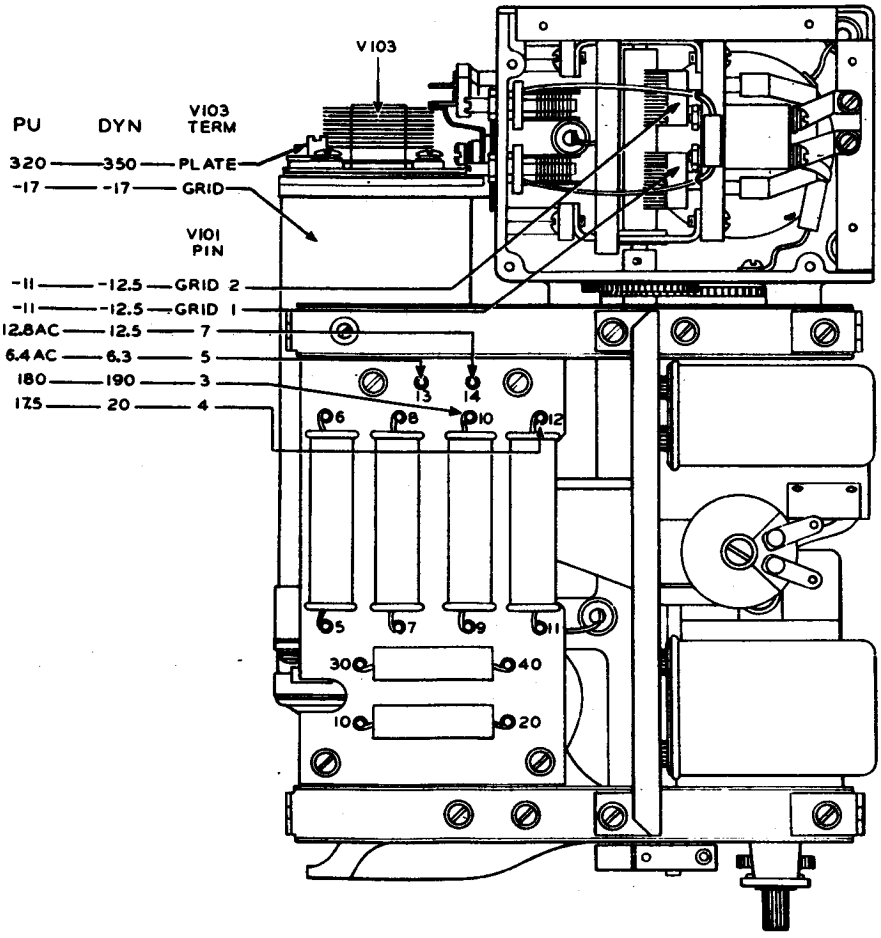
TRANSMITTER SECTION

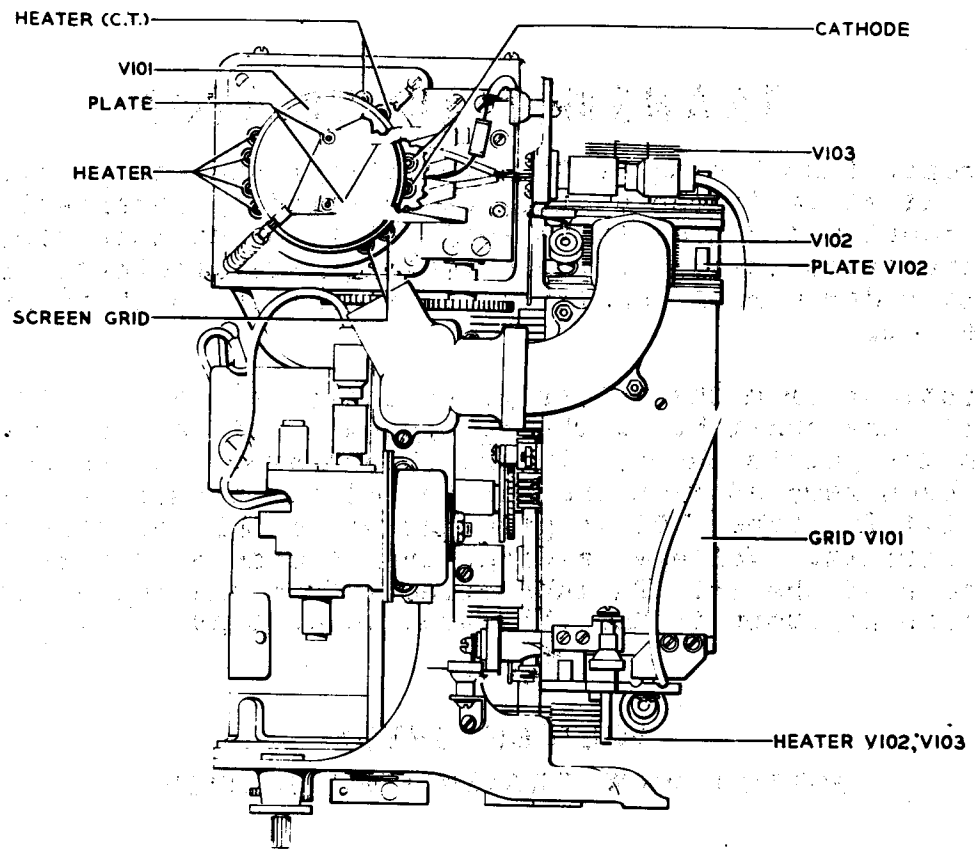
Improper functioning of the transmitter and the particular circuit at fault can usually be detected by observation of the panel meter when it is switched into the tube circuits in the transmitter. A table showing meter indications found under normal conditions of operation is given on page 7-2.

Deviations from the values given indicate the circuit t fault, the chart below giving typical voltages to ground from the points shown. In the illustration the cover has been removed from the portion of the chassis under the 1st IPA tube V101 to give access to this portion of the circuit. Voltage readings can be made on the remainder of the 1st IPA tube circuit from the top of the chassis as shown in the illustration on page 7-52.

VOLTAGE CHECK

BOTTOM VIEW TRANSMITTER SECTION





TOP OF TRANSMITTER

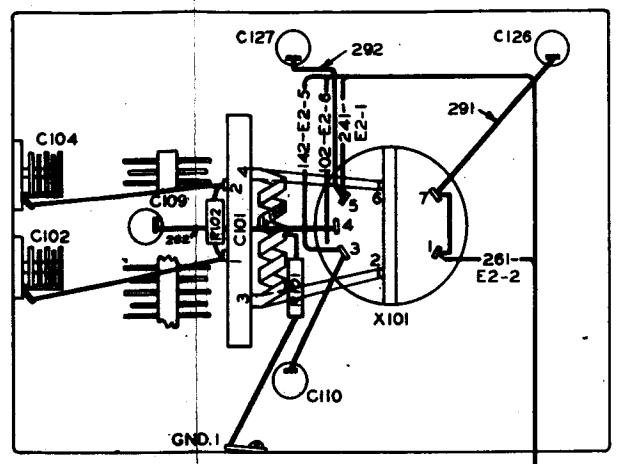
TUBE OPERATING VOLTAGE AND CURRENTS

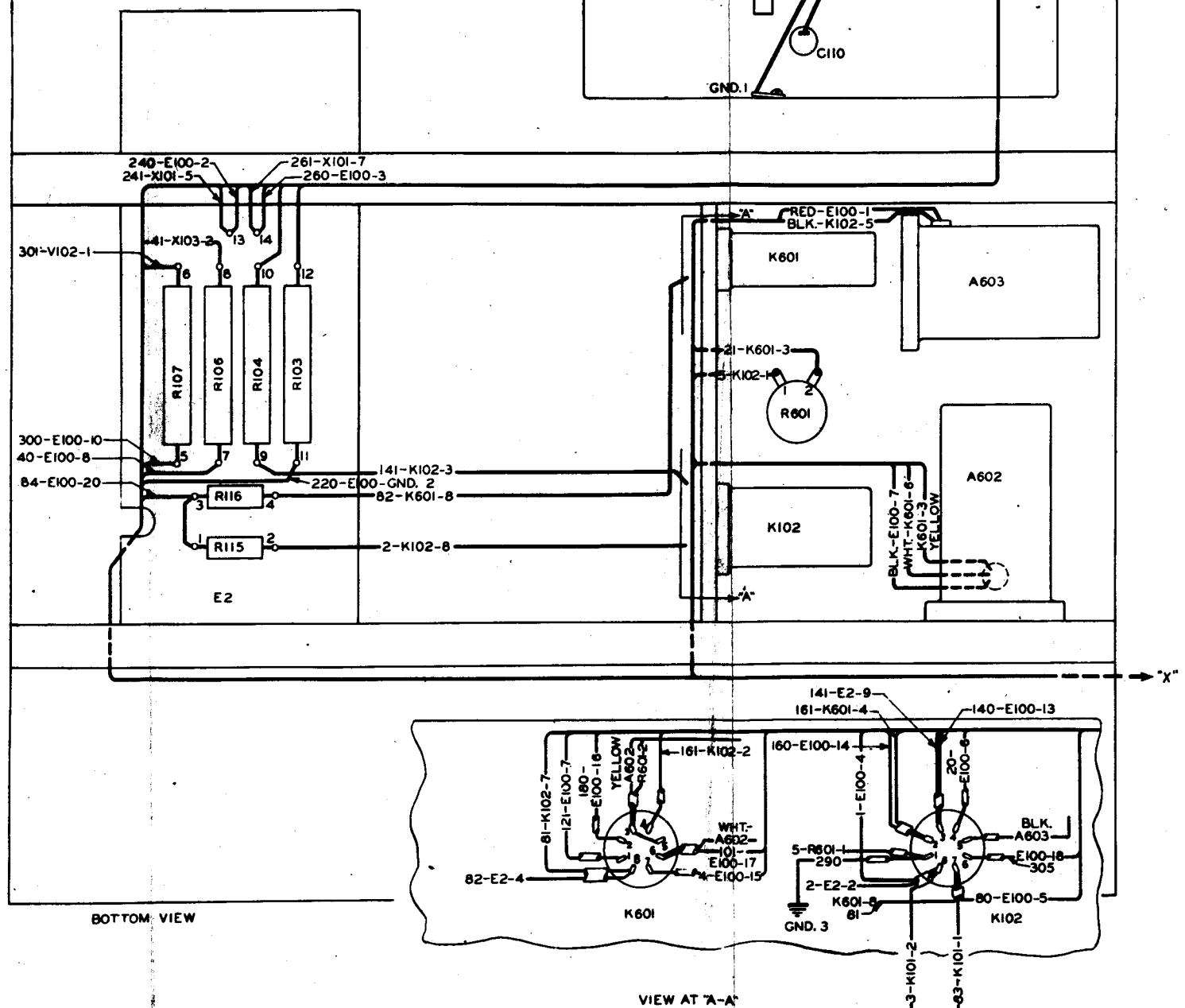
TRANSMITTER

TRANSMITTER SECTION	HEATER VOLTAGE	HEATER CURRENT AMP.	PLATE VOLTAGE	SCREEN VOLTAGE	GRID VOLTAGE	CATHODE VOLTAGE	PLATE CURRENT MA	SCREEN CURRENT MA
(P.U. operation 115V. ac)								
V101 (829B)*	12.6 ac	2.25	350	180	-11	17.5	100	17
V102 (2C39)	6.4 ac	1.1	320		-17		20	
V103 (2C39)	6.4 ac	1.1	320		-17		45	
(Dynamotor operation 13V. dc)								
V101 (829B)*	12.5	2.25	375	190	-12.5	20	110	19
V102 (2C39)	6.3	1.1	350		-17		25	
V103 (2C39)	6.3	1.1	350		-17		50	

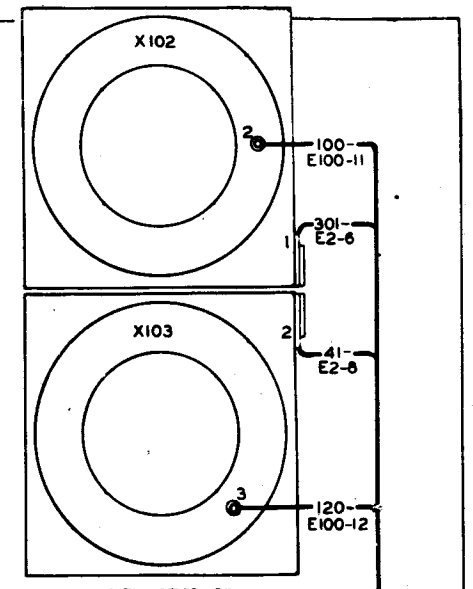
* Values given are total for both sections

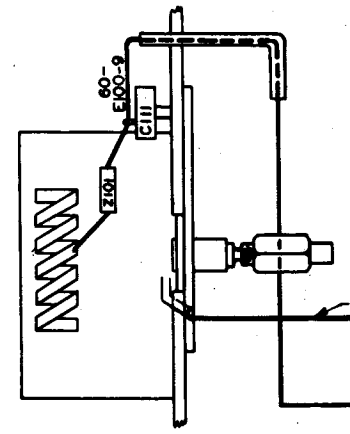
WIRE TABLE	
WIRE NO.	DESCRIPTION
1-6 INCL.	P.S.-663-31 WHITE-BLK. TR.
20 & 21	P.S.-663-31 WHITE-RED TR.
40 & 41	P.S.-663-31 WHT.-BLK. & YEL. TR.
60	P.S.-663-31 WHT.-RED & GRN. TR.
80-84 INCL.	P.S.-663-31 WHITE-GREEN TR.
100-102 INCL.	P.S.-663-31 WHITE-YEL. TR.
120 & 121	P.S.-663-31 WHITE-BLUE TR.
140-142 INCL.	P.S.-663-31 WHT.-RED & BLUE TR.
160 & 161	P.S.-663-31 WHT.-RED & BLK. TR.
180 & 181	P.S.-663-31 WHT.-BLK. & BRN. TR.
220 & 221	P.S.-663-33 WHITE-BLK. TR.
240-242 INCL.	P.S.-663-33 WHT.-BLK. & BRN. TR.
260 & 261	P.S.-663-33 WHITE-BRN. TR.
300 & 301	P.S.-663-31 WHT.-BLK. & GRN. TR.
305	P.S.-663-31 WHITE

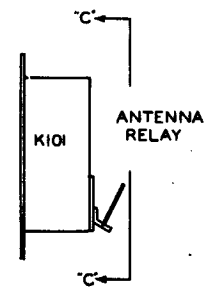


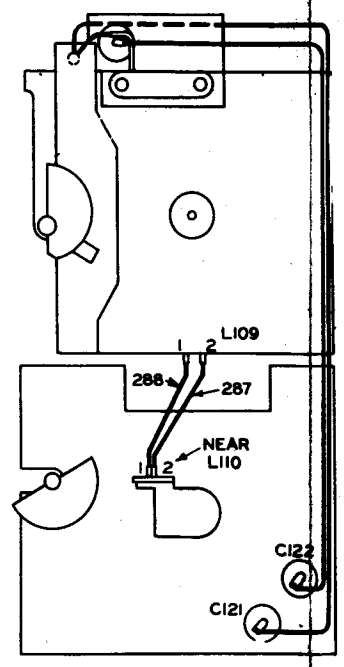


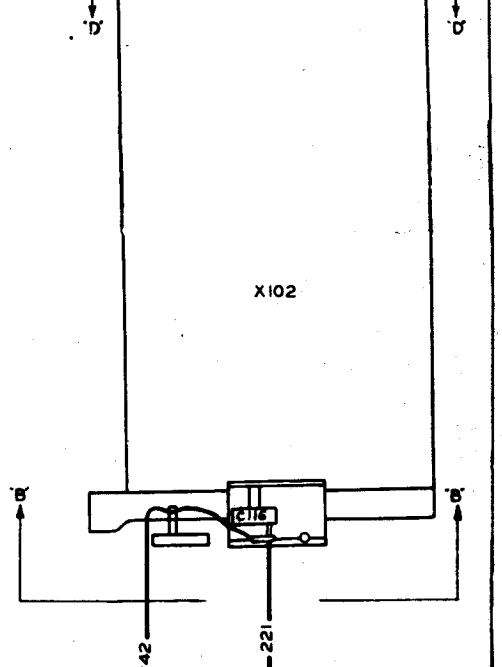
CONNECTION DIAGRAM
TRANSMITTER SECTION
T-618891

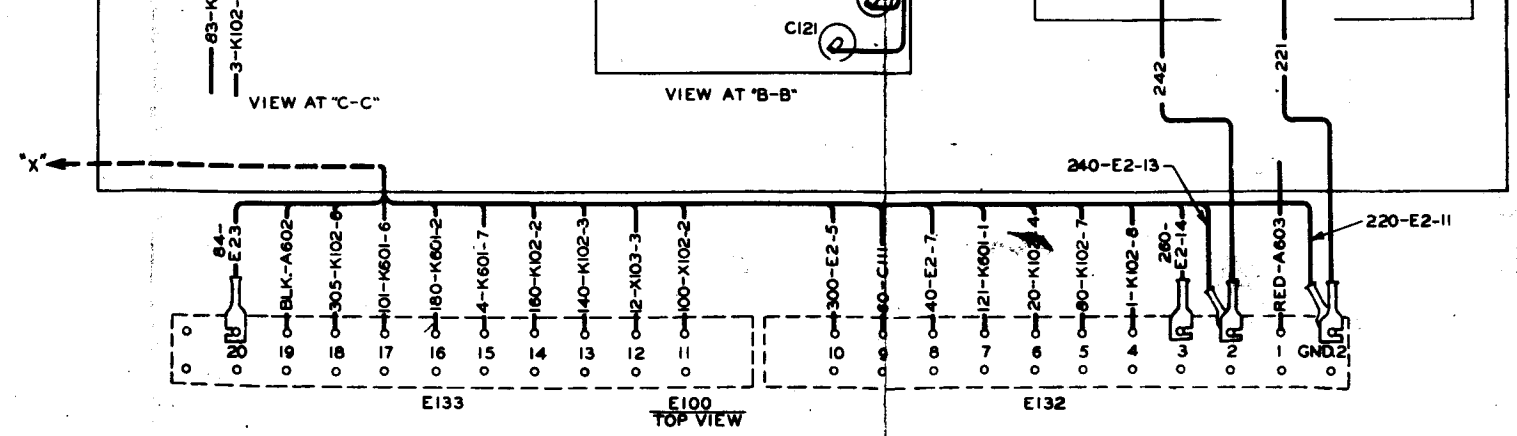




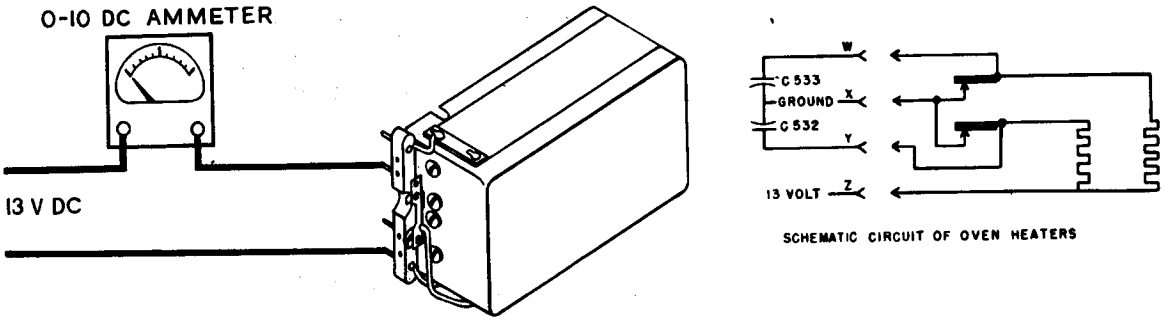








CHECKING OPERATION OF CRYSTAL OVEN



CIRCUIT FOR CHECKING CRYSTAL OVEN

If drift occurs in several of the channel frequencies, it is possible that the crystal oven is not being heated properly, thus permitting temperature deviations to affect crystal operation. To check the heaters and thermostats, remove the crystal oven assembly and take out the eight screws holding the plastic cover in place. Removal of the cover exposes the metal housing over the crystals, and the four screws fastening it to the assembly. After taking out these screws the housing may be pulled free of the jack assembly. Care should be taken in withdrawal of this cover by pulling upward evenly, holding the cover at the pin end. This avoids the possibility of bending or otherwise damaging the four pins. The oven heating units and the two thermostats are contained in this metal cover or housing.

The four pins that serve to complete the electrical connections between the cover and oven assembly fit into pin jacks marked W, X, Y, and Z on the oven jack assembly. For ease of description, all pins will hereafter be referred to by these letters.

Due to internal connections, it is not possible to make continuity tests of the heating elements nor the thermostat contacts. Therefore, they must be tested under simulated operating conditions. The first step is to connect a 13-volt supply source to pin X. Then connect the other side of the supply to an ammeter and the ammeter to pin Z. If both thermostats are functioning properly, a reading of approximately 2.5 amperes should be obtained. After a few minutes heating, the booster heater will be cut out of the circuit by its thermostat and the load will drop approximately fifty percent. Then, as the temperature of the oven rises, the other heater will be cut out by its associated thermostat and zero reading will be obtained. When the oven cools, one heater only will be put back in the circuit and the reading should reflect this load.

Any deviation from this cycle of operation is an indication that the thermostats or heating units are defective. Thus, if only one heater is turned on initially, a bad thermostat or burnt-out heater is indicated. On the other hand, after the first heating of the oven, if both heaters are again connected into the circuit and the four-ampere reading obtained, the booster thermostat is defective. Since no adjustment of the thermostats nor repair of the heating elements is possible, the entire oven assembly must be replaced if any component is faulty.

SELECTOR MOTOR SERVICING

Removal of the selector motor or blower motor from the chassis is not necessary for brush servicing. These two motors have been so installed that the brushes are accessible when the obstructing components have been loosened and swung out of the way. It is not necessary to unsolder or otherwise disconnect any of these obstructing components.

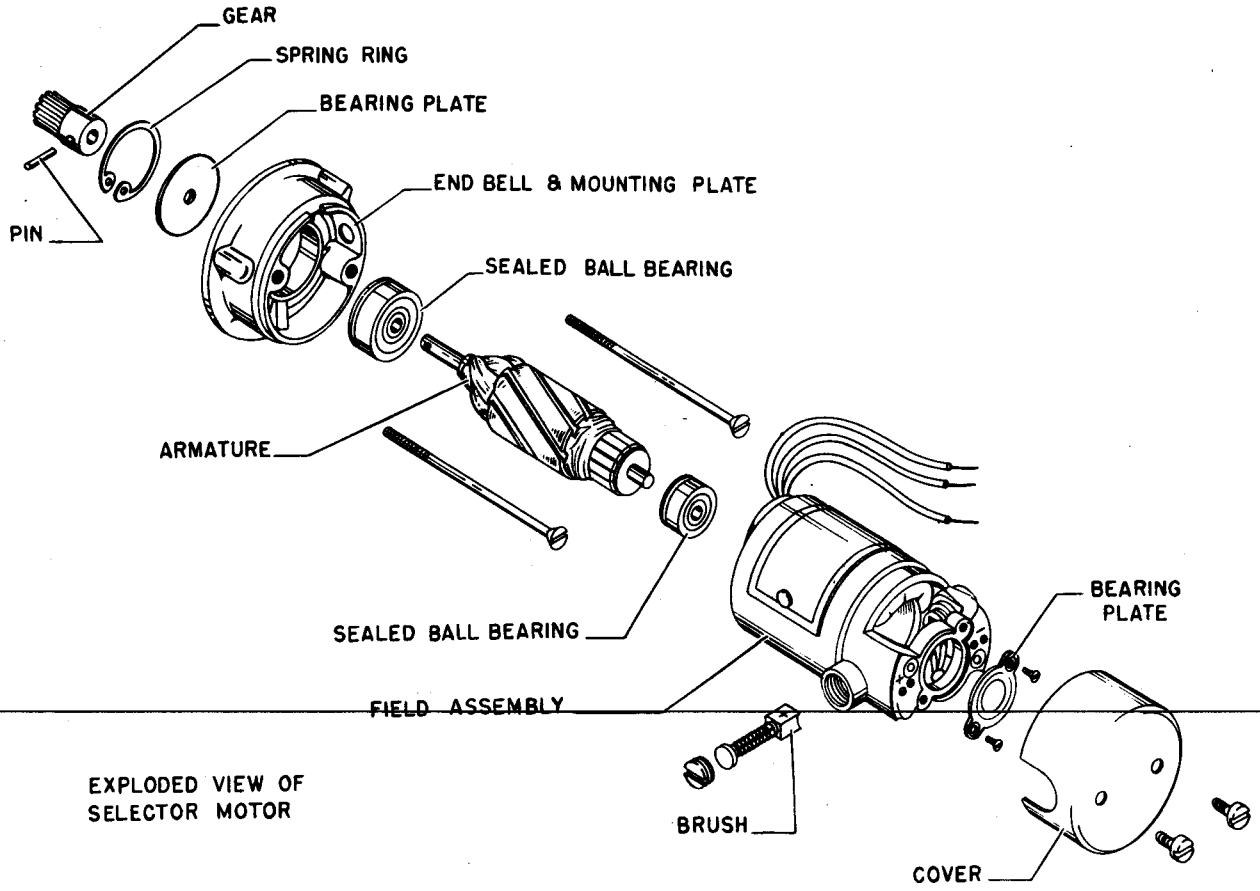
From the top of the chassis, taking out the two screws holding antenna transfer relay K101 to the framework will permit it to be moved to one side. This will make possible access to and removal of the positive brush of the selector motor and the negative brush of the blower motor.

Below the chassis, the cross brace on which relays K102 and K601, and resistor R601 are mounted must be loosened by removal of the bolt at each end. The wiring slack will then permit the entire assembly to be swung out and over to one side. The negative brush of the selector motor and the positive brush of the blower motor are now easily accessible.

The selector motor, B602, has been designed for long periods of trouble-free operation and should require only the usual periodic servicing of the brushes.

The brushes may be inspected or renewed by unscrewing the small plugs which hold them in place. Polarity marks of + or - on the brushes should be observed when replacements are made. In case of doubt, the end bell housing should be taken off by removing the two screws which hold it to the motor frame. The proper polarity marks may then be seen stamped on the end frame. Brush number $B602^{A}$ is the positive brush and $B602^{B}$ the negative.

Brush holders B602C may be replaced, if necessary, by removing the setscrew holding each in place. The Allen wrench which fits these setscrews is clamped inside the chassis, above the multiplier.



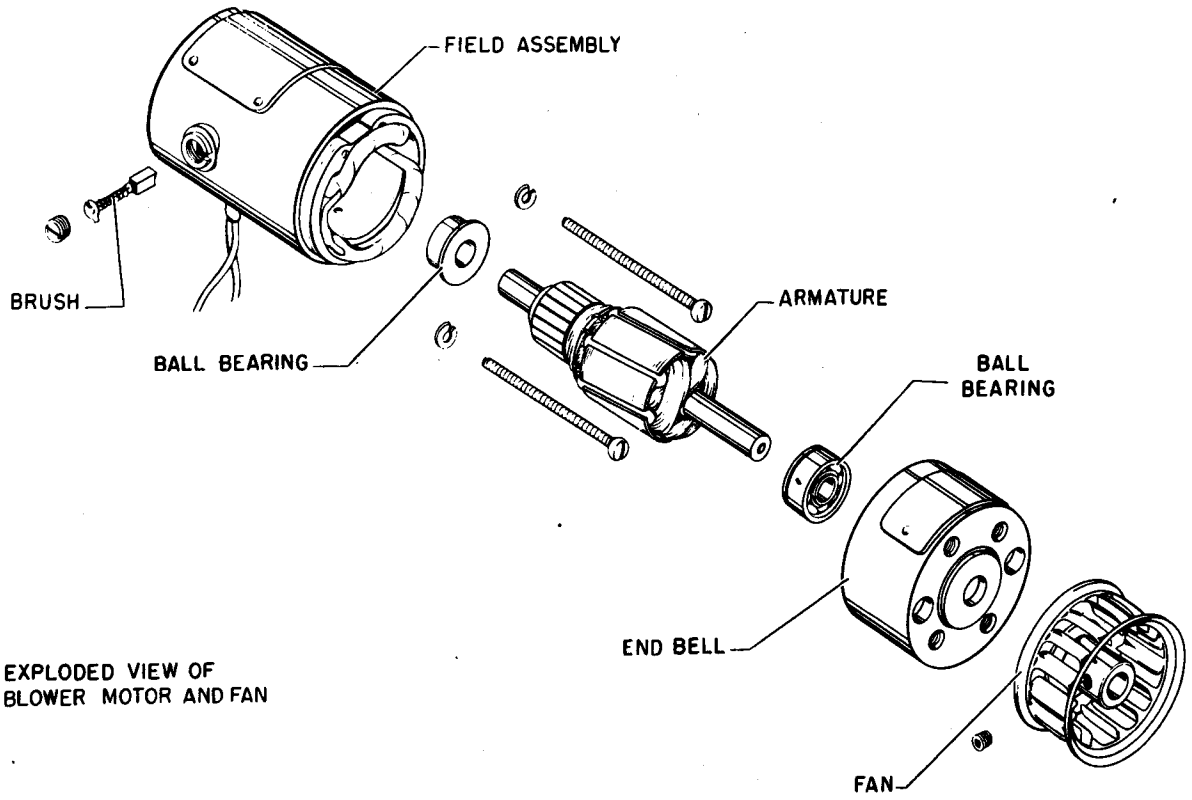
EXPLODED VIEW OF SELECTOR MOTOR

Inspection of the commutator surface may be made by removing the end bell. If the commutator is badly pitted or uneven, as evidenced by excessive sparking, the selector motor should be replaced by a unit from spares. The commutator may be reconditioned by being turned down in a lathe.

Bearing B602D, located at the commutator end of the armature, may be replaced in the following manner. First remove the bell housing, then the two bolts which pass through the end frame. The driving or gear end of the motor may now be pulled free of the motor frame, carrying the armature with it.

The bearing may be removed by prying it off the armature shaft. To reassemble the motor the foregoing procedure should be reversed making certain that the small spring washer is in its place in the bearing housing. Bearing B602B is of the sealed, factory-lubricated type, therefore, no greasing nor oiling should be attempted.

BLOWER MOTOR SERVICING



EXPLODED VIEW OF BLOWER MOTOR AND FAN

Before attempting any brush servicing on the blower motor, refer to the selector motor instructions in this section. The directions on brush access and removal have been combined for both of these motors since access to one motor makes servicing of the other motor possible at the same time.

The blower motor, B603, will require the same periodic inspection and replacement of brushes as given the other motors with the MAR equipment.

The brushes may be removed without dismantling the motor by simply unscrewing the metal plugs which hold the brushes in place and then pulling the brushes out. Note that each brush bears a + or - polarity stamp. Brushes must always be inserted so that the polarity agrees with that stamped on the motor, adjacent to the brush holders.

Inspection of the commutator surface requires first that the blower wheel, B603C, be removed by loosening its two cup-point setscrews. The Allen wrench to fit these setscrews is clipped to the chassis. Next, the four screws holding the mounting bracket should be removed. This exposes the two long bolts which hold the end bearing housing to the motor frame proper. Taking out these two bolts permits the end housing

to be pulled off and the armature to be lifted out. If the commutator surface is spotty, and not the normal smooth chocolate-brown color, it should be sanded lightly with No.0000 sandpaper while the motor is running. The sandpaper may be held against the commutator by means of a small stick.

The bearings should not be packed with grease since it may melt and cause electrical trouble by coating the brushes and commutator surface. If any grease is deemed necessary, only enough PD-535-A (AN-14-9715) grease should be added to cover the bearings.

MODULATOR - DYNAMOTOR

A chart on page 7-60 gives the typical voltages between tube socket pins and ground of the modulator section. To take these readings it will be necessary to disconnect the cables, withdraw the unit from the case and reconnect all the cables, both to transmitter-receiver and source of power. Values are given for both Phone and MCW transmission.

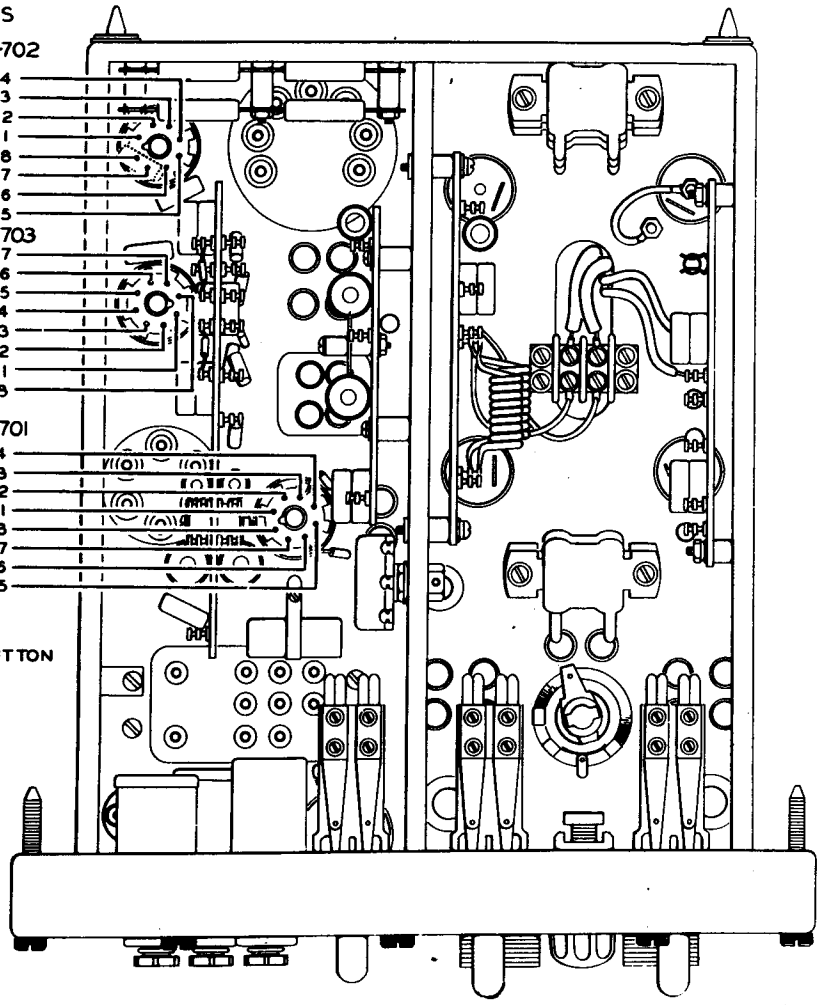
On pages 7-60 and 7-61 are resistance and continuity charts giving typical values of resistance to ground of tube socket pins and panel receptacle pins. Both voltage and resistance values may vary 15 percent from those given, but greater variations indicate that a further check of the circuits from the terminals involved should be made by means of schematic diagram on pages 7-63,64 and connection diagram on pages 7-65,66. The components in the circuit may be located by means of charts on page 7-62 and 7-67 and checked for deviation from design values. A table of the operating characteristics of the tubes in the modulator is shown on page 7-67 for reference when test equipment is available with suitable adapters.

Details of servicing the dynamotor are given on page 7-68 when this unit is defective. When it is important that the radio equipment be put back into service quickly, the best procedure is to replace the dynamotor with one from spares, if available, and repair the defective dynamotor as soon as conditions permit.

NOTE - Additional circuit diagram and test data for the power supply unit will be forwarded when available.

VOLTAGE CHART

MODULATOR SECTION

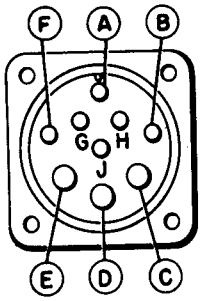


RESISTANCE AND CONTINUITY CHECK

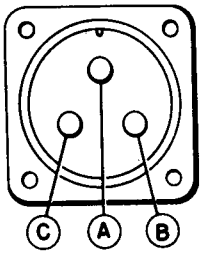
MODULATOR SECTION

	PHONE		MCW	
X-702	DYN	PU	DYN	PU
1	205	→	170	→
2	0.6	1.05	0.6	1.05
3	12000	→	→	→
4	9500	→	→	→
5	440000	→	→	→
6	195	→	165	→
7	0.2	1.95	0.2	1.95
8	INF.	→	→	→
X-703				
1	INF.	→	→	→
2	0.65	1.05	0.65	1.05
3	12000	→	→	→
4	9500	→	→	→
5	440000	→	→	→
6	INF.	→	→	→
7	0	→	→	→
8	INF.	→	→	→
X-701				
1	420000	→	380000	→
2	138000	→	25000	→
3	970	→	→	→
4	240000	→	→	→
5	139000	→	→	→
6	970	→	→	→
7	0.15	1.85	0.15	1.85
8	0	→	→	→

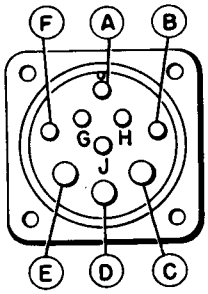
RESISTANCE AND CONTINUITY CHART
MODULATOR DYNAMOTOR RECEPTACLES



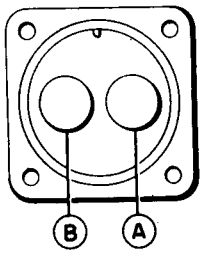
Z 803
TO T-R



Z 804
PA+B



Z 805
FROM PU

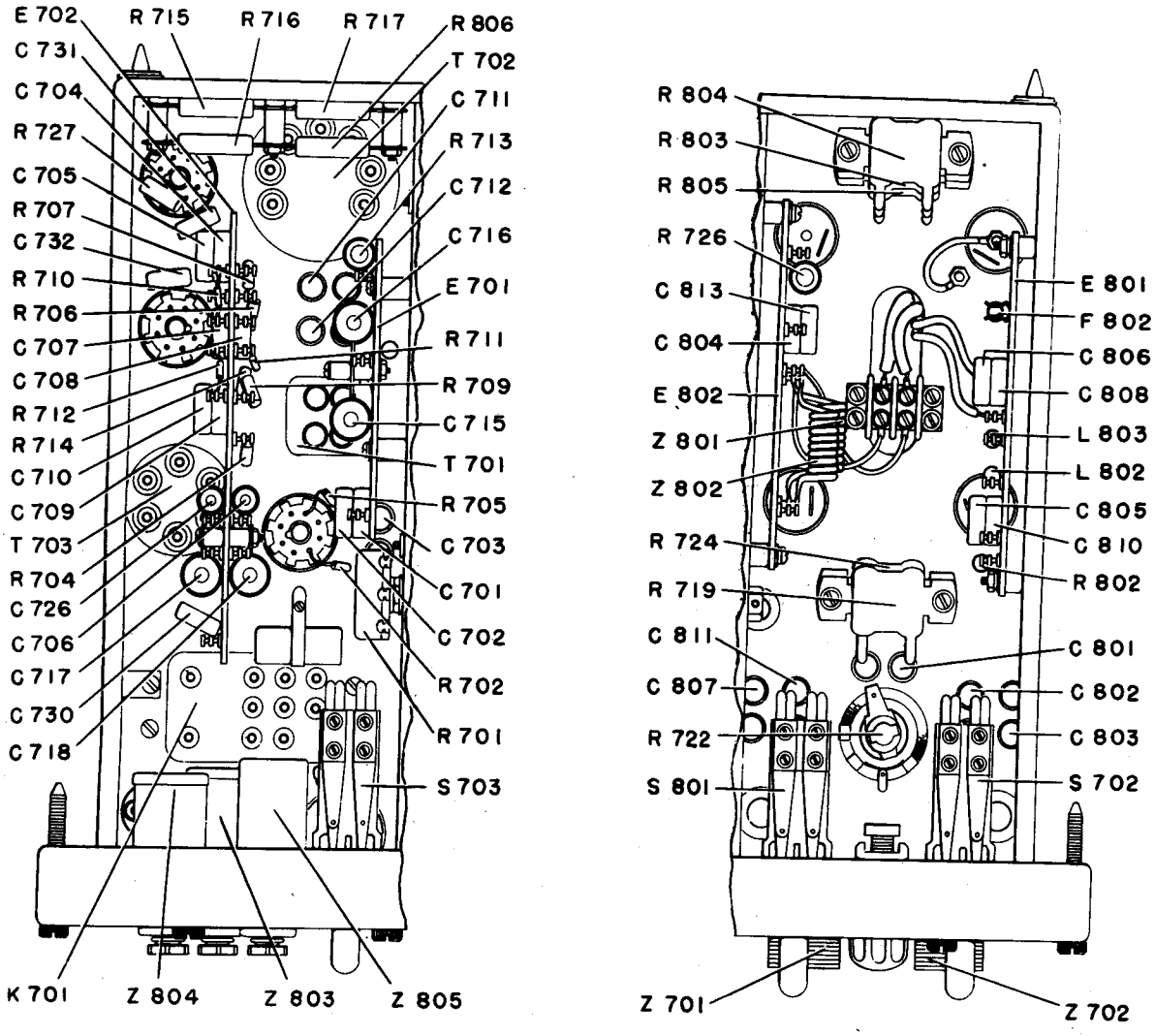


J 801
BATTERY

Resistance to ground of Receptacle Pins
Filament Rheostat at Max.

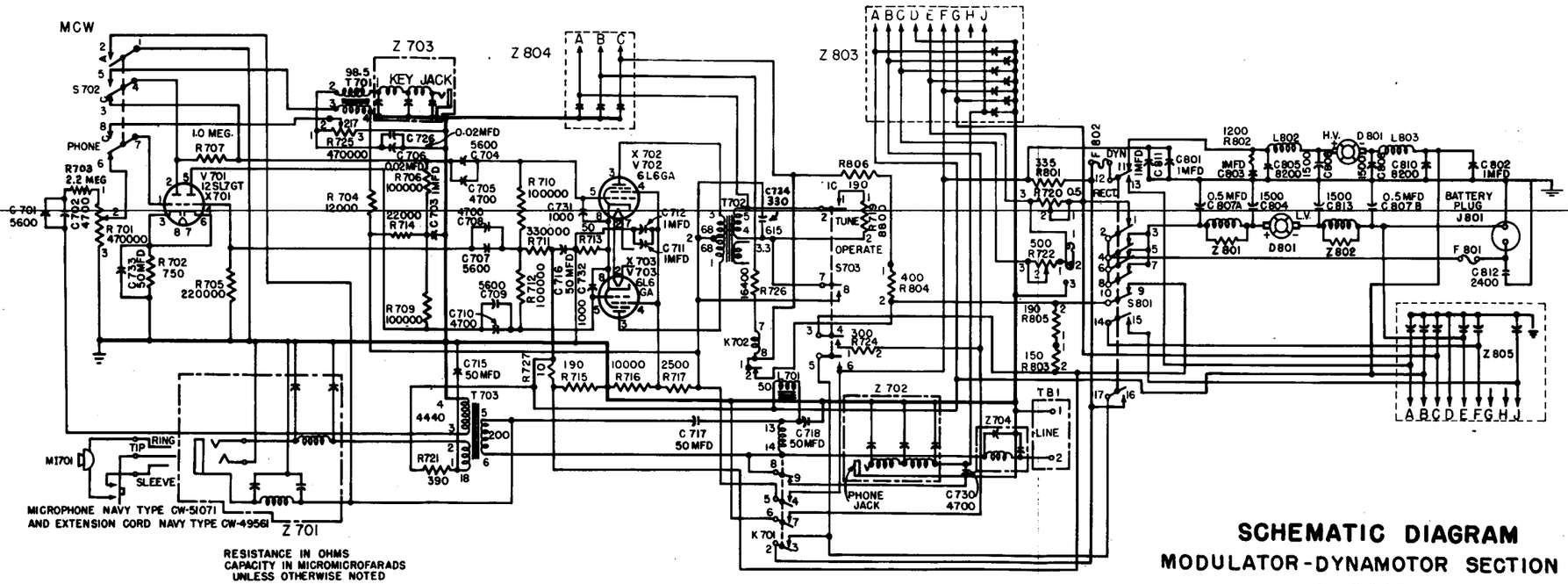
Recept.	Switch Positions							
Z803	PHONE DYN IC	PHONE DYN TUNE OR OP.	PHONE P.U. I.C.	PHONE P.U. TUNE OR OP.	MCW DYN I.C.	MCW DYN TUNE OR OP.	MCW P.U. I.C.	MCW P.U. TUNE OR OP.
A	200				170			
B	inf.	510	inf.	510	inf.	470	inf.	470
C	inf.							
D	0							
E	0.15		1.85		0.15		1.85	
F	625		inf.		625		inf.	
G	0.1		2.0		0.1		2.0	
H	inf.							
J	app. 1,800,000							
Z804								
A	inf.	12,500	inf.	12,500	inf.	12,500	inf.	12,500
B	19,500							
C	190		560		165		525	
Z805								
A	inf.							
B	2.0				1.70			
C	0.08		2.0		0.08		2.0	
D	0							
E	0							
F	inf.							
G	inf.							
H	inf.							
J	inf.							
J801								
-	.05 or less							
⊀	0.1		inf.		0.1		inf.	

NOTE: Power off position of Power switch gives same reading as PU position of this switch in all cases.

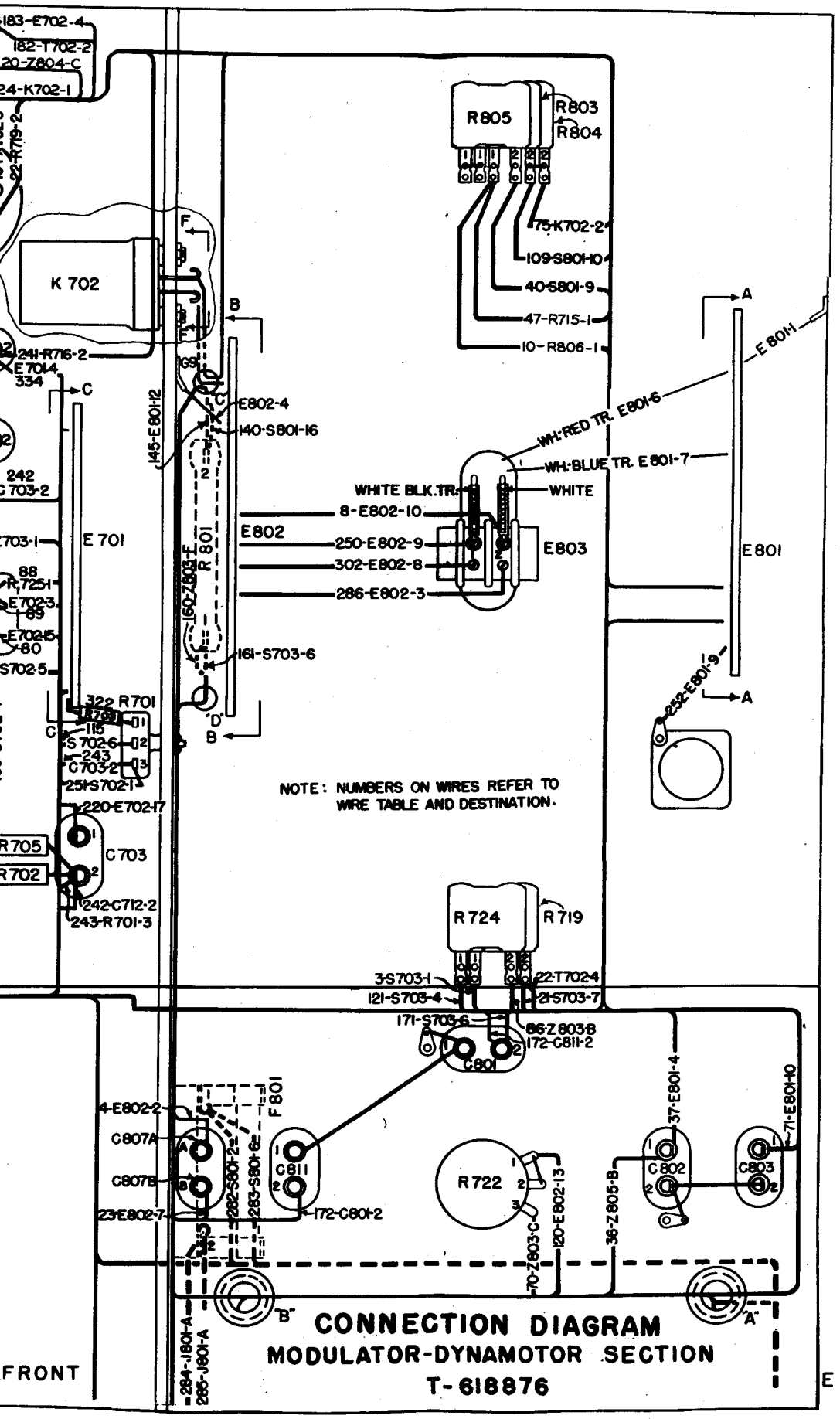


CAPACITOR AND RESISTOR CHART

BOTTOM VIEW MODULATOR-DYNAMOTOR

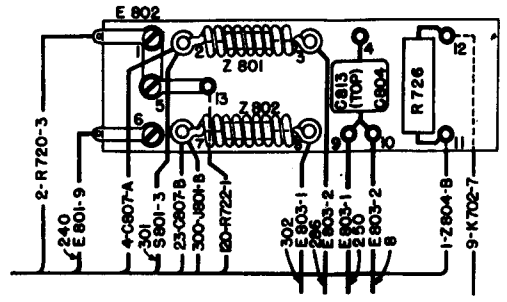


SCHEMATIC DIAGRAM
MODULATOR-DYNAMOTOR SECTION
W-308631

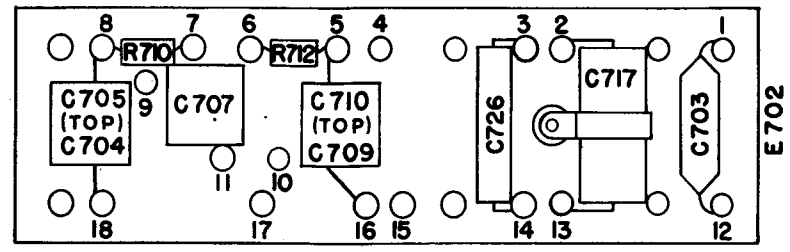


WIRE TABLE

WIRE NO.	DESCRIPTION
1-10	White - Brown tr.
20-28	White - Brn. and Blk. tr.
36-47	White - Red and Blk. tr.
56-59	White - Red and Yel. tr.
70-83	White - Red and Grn. tr.
86-92	White - Red and Blue tr.
109-115	White - Green tr.
120-121	White - Grn. and Blk. tr.
140-145	White - Grn. and Yel. tr.
160-172	White - Blue tr.
180-186	White - Red tr.
200-202	White - Yellow tr.
220-222	White - Yel. and Blk. tr.
240-252	White - Blk. tr.
260-261	White - Brown tr.
281-286	65/.010 White-Brn. tr.
300-302	65/.010 White-Blk. tr.

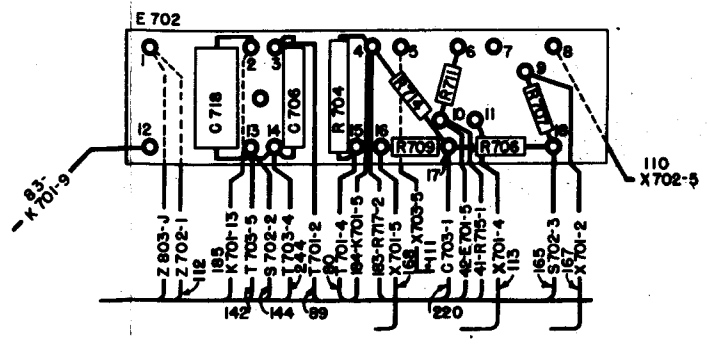


VIEW AT "B-B"

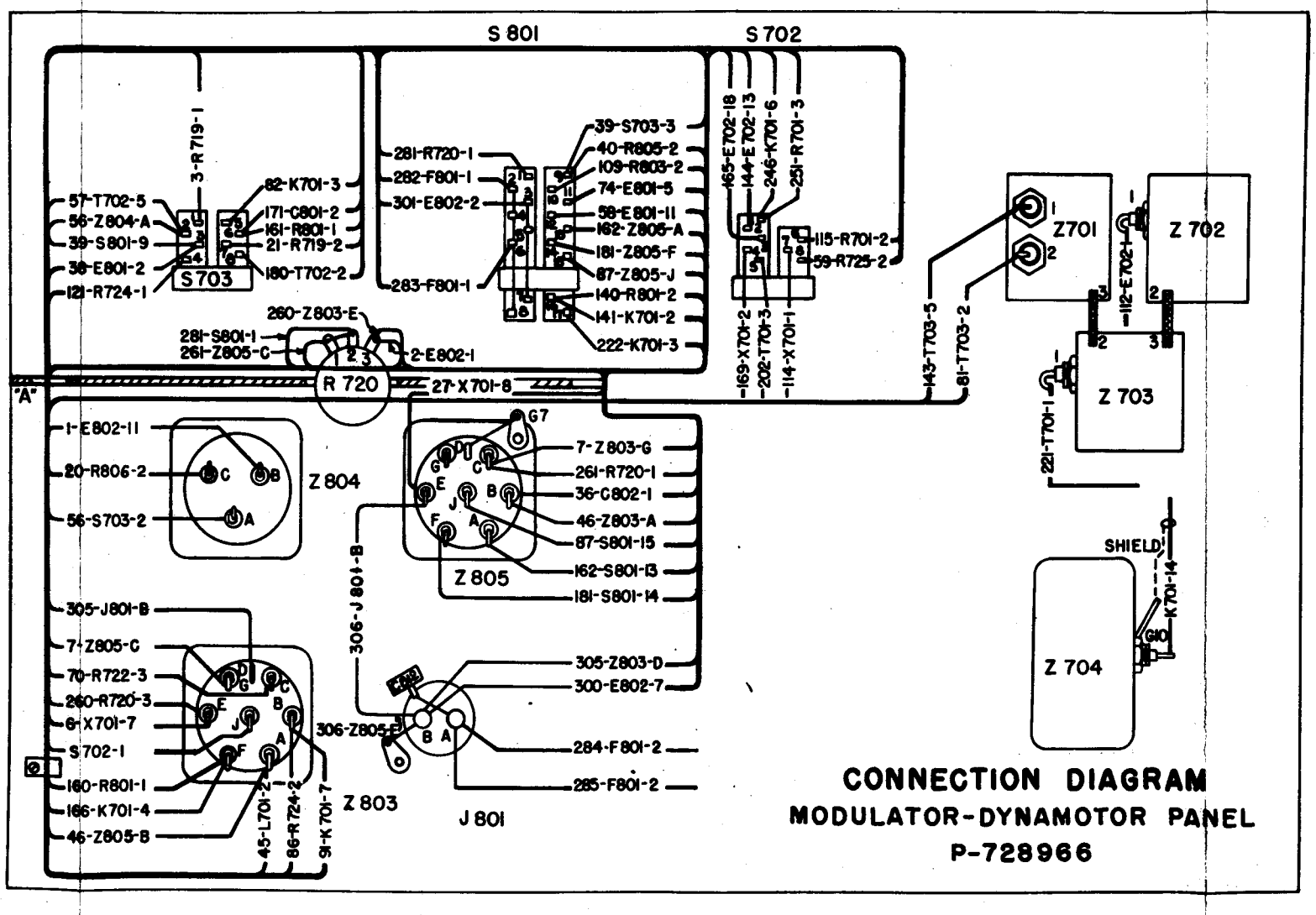


BACK VIEW OF "D-D"

CONNECTION DIAGRAM
MODULATOR-DNAMOTOR TERMINAL STRIPS
P-728967

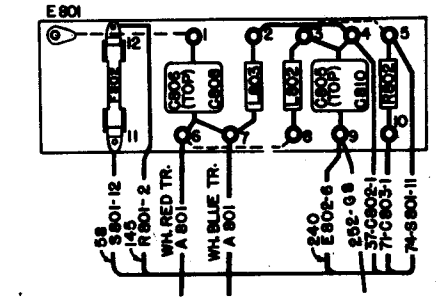


VIEW AT "D-D"

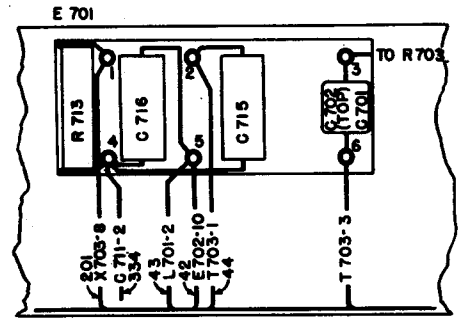


CONNECTION DIAGRAM
MODULATOR-DYNAMOTOR PANEL
P-728966

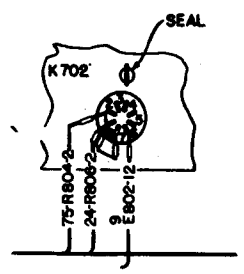
VIEW AT "E-E"



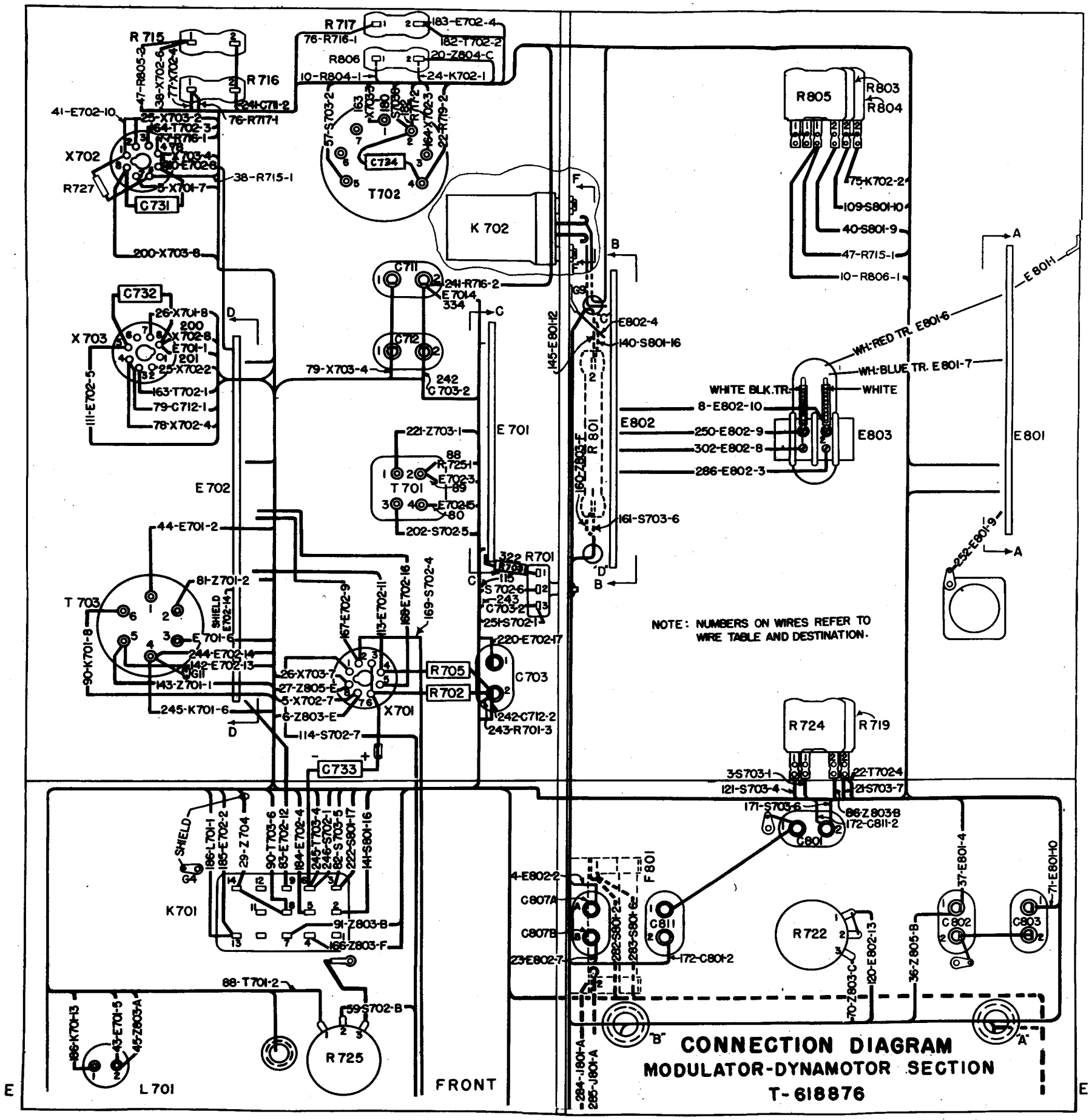
VIEW AT "A-A"



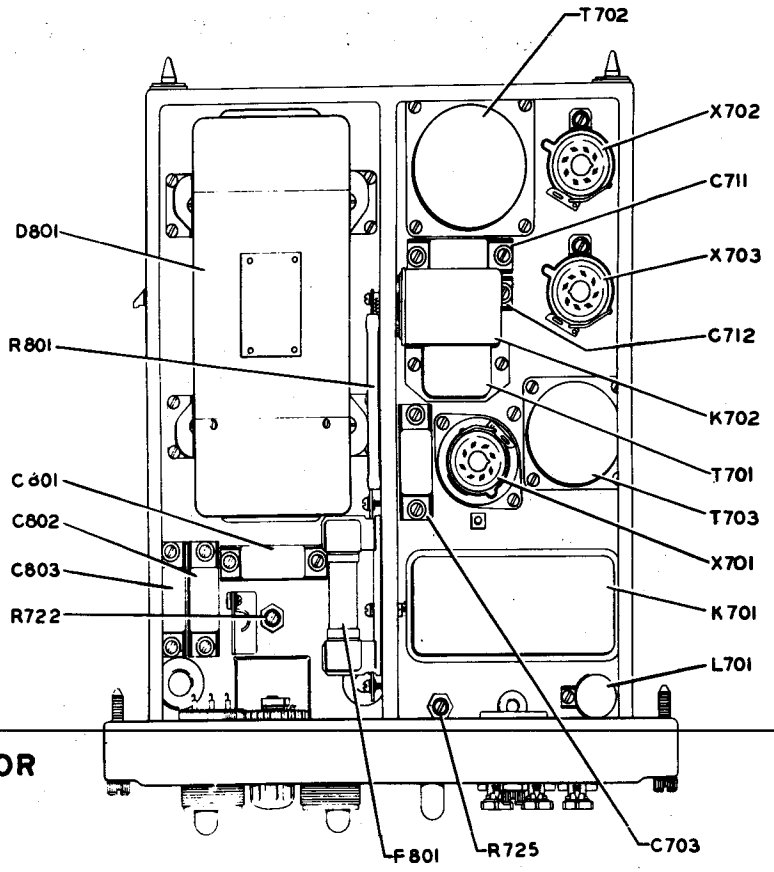
VIEW AT "C-C"



VIEW AT "F-F"



CONNECTION DIAGRAM
MODULATOR-DYNAMOTOR SECTION
T-618876



TOP OF MODULATOR-DYNAMOTOR CHASSIS

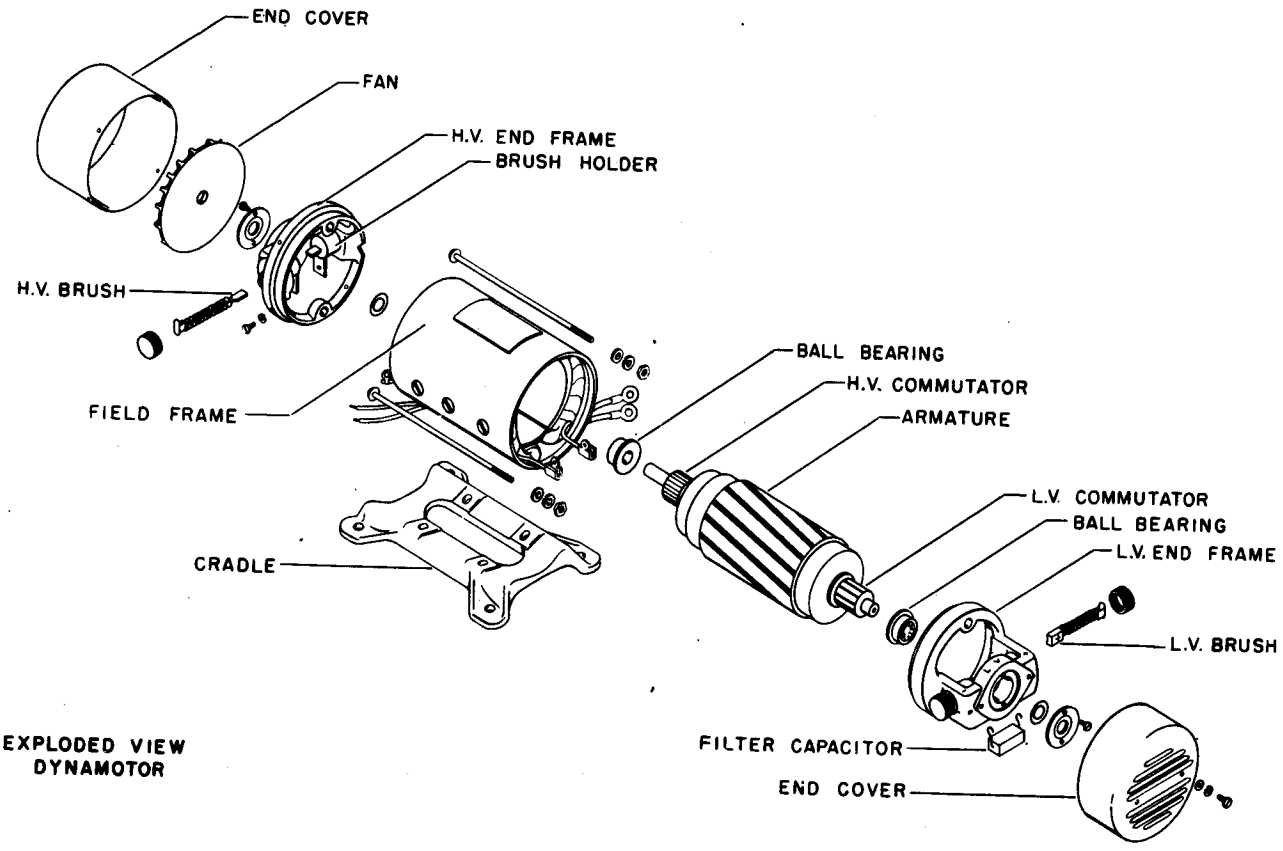
TUBE OPERATING VOLTAGES AND CURRENTS

MODULATOR-DYNAMOTOR

Dynamotor Operation 13V dc

MODULATOR SECTION	HEATER VOLTAGE	HEATER CURRENT MA	PLATE VOLTAGE	SCREEN VOLTAGE	GRID VOLTAGE	CATHODE VOLTAGE	PLATE CURRENT MA	SCREEN CURRENT MA
MCW setting of S702								
V701 (12SL7GT)	13	150						
Amp. triode section			322			1.97	0.86	
Phase Inv. section			192			1.97	0.29	
V702 (6L6)	6.3	900	353	272	-11.2	5.7	54.5	2.6
V703 (6L6)	6.3	900	353	272	-11.2	5.7	54.5	2.6
Phone setting of S702 and press-to-talk button depressed								
V701 (12SL7GT)	13	150						
Amp. triode section			200			1.97	1.0	
Phase Inv. section			190			1.97	1.1	
V702 (6L6)	6.3	900	350	267		5.95	56	3.2
V703 (6L6)	6.3	900	350	267		5.95	56	3.2

DYNAMOTOR SERVICING



EXPLODED VIEW
DYNAMOTOR

Due to the efficient utilization of space in the MAR chassis, and its compact construction, any servicing or inspection of the dynamotor requires its removal from the chassis. This involves the unsoldering of two leads, disconnecting several others from a terminal board, and removing the dynamotor base fastening bolts.

Turning the chassis upside down is necessary for disconnecting the leads below the chassis. The four coded and the two heavier wires covered with a translucent insulating sleeve are removed from terminal board E803, immediately below the dynamotor. The two high-voltage leads covered with black insulating sleeves must be unsoldered from capacitors C806 and C808. Each wire should be tagged as it is removed, thus insuring proper connection when the dynamotor is replaced.

Removal of the four base holding-screws necessitates placing the chassis on its side so that screwdrivers may be used on both sid s of the chassis at the same time. The bolts are taken out by using a screwdriver from the top to turn the bolts and another at the bottom to fit the slot in the flat circular nuts and prevent them from turning. The nut holding the ground connection on the rear bolt should be removed with a wrench before taking out the bolt itself. Make certain this grounding wire is replaced when servicing of the dynamotor is completed.

To inspect the dynamotor for evidence of brush sparking or other commutator trouble, it will be necessary to break the wire seals at each end of the dynamotor. The two bell housings may then be slipped off by removing the two holding bolts at one end and the four smaller bolts at the other end.

Inspection of the commutator surface should be made before new brushes are installed. A smooth, chocolate-brown color is an indication of normal operation and the surface should not be touched. If the surface is rough or spotty, the dynamotor should be started and the commutator sanded lightly with No. 0000 sandpaper. The condition of the grooves betwe n the commutator segments should also be observed. For efficient operation these grooves should be clean and free of any foreign matter. They may be cleaned by turning the commutator slowly and carefully cleaning each groove with a fine pick made of soft wood, using a soft clean brush afterward to remove any loose dirt.

If the brushes are worn, replacement may be made by unscrewing the plastic caps over the brush holders and inserting new brushes from spare stock. It will be noted that positive and negative polarity marks are stamped on the large, or low-voltage brushes, as well as on the dynamotor frame. This brush polarity must be observed when installing new brushes. Although both high- and low-voltage brushes are supplied ground to the curvature of the commutator, it is well to insert a piece of fine sandpaper between the commutator and new brush and slide the sandpaper back and forth. This will grind off any brush high spots and insure perfect seating and contact.

Greasing or replacement of a bearing, or the replacement of a complete armature assembly, will require that the fan and high-voltage end frame be removed. The fan is held in place by a setscrew. The Allen wrench which fits this setscrew is clamped to the receiver chassis. Since the fan and armature are balanced as a unit, identifying marks should be made on the fan and armature so that they may be re-assembled in the same relative position. After the fan is removed, all wiring to the high-voltage end frame should be disconnected. The two long bolts which hold the frames together should

also be removed, after which the high-voltage end frame may be pulled out and the armature removed. The small end-play washer which fits into the bearing housing at the low-voltage end of the armature should be taken out and set aside so that it may be replaced in its original position when the dynamotor is reassembled.

If the bearings need greasing, add only enough Navy type 14-L-3 Grade 11 (AN 14-L-90-15) grease to cover the bearings. Do not pack the bearings with grease since the excess may flow onto the commutators and cause faulty dynamotor operation. Should a commutator ever become coated with grease, clean with a cloth or soft brush dipped in carbon tetrachloride.

Removal of a ball bearing may be accomplished by inserting a screwdriver between the bearing and adjacent washer and prying off the old bearing. Once a bearing is removed, regardless of reason, it should not be re-used. Instead, a new bearing from spare stock should be installed in order to avoid bearing trouble which may result from possible damage to the old bearing during its removal.

Breakdown or cracking of the brush holder insulation may require the installation of a complete brush holder unit from sp re stock. To install a new unit, the dynamotor should be dismantled so that the armature's removal is possible, as previously outlined. The defective holder can be removed by simply loosening the setscrew which extends through the end frame castings and then pressing the holder inward. The Allen wrench to fit the setscrew will be found clamped inside the receiver chassis.

Replacement of the dynamotor field coils, if required by accidental damage or burnout, may be made by dis-assembling the dynamotor and removing the armature, as previously outlined. Removal of either of the field coils is now possible by removing the three bolts which hold the field core to the dynamotor frame. Inasmuch as the bolts were clinched at the factory, it may be necessary to use a hammer and small blunt chisel to start them turning. The bolts should be carefully retightened after installation of the new coil.

UNIVERSAL POWER SUPPLY

The most common source of trouble in the power supply unit is failure of the vibrators when the equipment is used with direct current power sources. These vibrators are readily replaced as was described in Section 5 under Replacing Vibrators. Rectifier tube trouble was also discussed in the same section.

Defects in other circuit components in the power unit may usually be located by a complete voltage and a resistance and continuity check of the circuits. The charts on the following pages give typical values of voltage and resistance normally to be expected between the points indicated and under the test conditions specified on the charts.

NOTE: - Particular attention should be paid to the characteristic of the currents met with in checking the power supply unit. In measuring voltages on this unit with d-c input voltages use a D'Arsonval type meter. Do not use an a-c/d-c dynamometer or thermal type meter. The a-c output filament voltages when operating with d-c supply are square wave and a thermal type meter must be used.

VOLTAGE CHECK
UNIVERSAL POWER SUPPLY
RECTIFIER TUBES AND TIME DELAY RELAY

AC-DC switch and High-Med-Low switch set as indicated Switches and fuses set for nominal input voltage, viz 115 a-c tc. Power supply in operating condition with full load.

	Switch Settings					
	A.C.			D.C.		
	High	Med	Low	High	Med	Low
X902, pin 4 to X901, pin 1	4.5	5	5.5	4.5	5	5.5
X901, pin 1 to 4	2.25	2.5	2.75	2.25	4.5	5.5
X902, pin 1 to 4	2.25	2.5	2.75	2.25	4.5	5.5
X903, pin 2 to 3	12.1	13	13.9	12.1	13	13.9
V901 grid cap to V902 grid cap	900	950	1000	850	900	950

All readings AC
Above Voltages To Be Within ±2%

VOLTAGE CHECK
UNIVERSAL POWER SUPPLY
VIBRATOR SOCKETS

Switches and fuses set for specified nominal input voltages.
Power supply in operating condition.
All readings are identical (±2%) at each voltage setting.

	Gnd	X904				X905				X906				X907			
		1	2	3	4	1	2	3	6	1	2	3	4	1	2	3	6
Switch Set At: 24V dc - 22V ac 115V dc - 107V ac 230V dc - 214V ac			x					x			x					x	
			x				x				x				x		
		x						x		x				x			
		x					x			x					x		
Switch Set At: 24V dc - 26V dc (±10%) 115V dc - 28V dc (±10%) 230V dc - 28V dc (±10%)				x					x			x					x
Switch Set At: 24V dc - same as input 115V dc - same as input 230V dc - same as input						x			x					x			x

The above chart gives typical voltage values between the socket pins indicated at three d-c voltage inputs, thus, in the first group, on 24 V d-c there should be 22 V a-c between the vibrator socket pins indicated by an X and connected by a dotted line. On 115 V d-c, the voltage between the same pins should be 107 V a-c and on 230 V d-c the readings should be 214 V a-c.

RESISTANCE AND CONTINUITY CHECK
UNIVERSAL POWER SUPPLY
RECTIFIER TUBES AND TIME DELAY RELAY

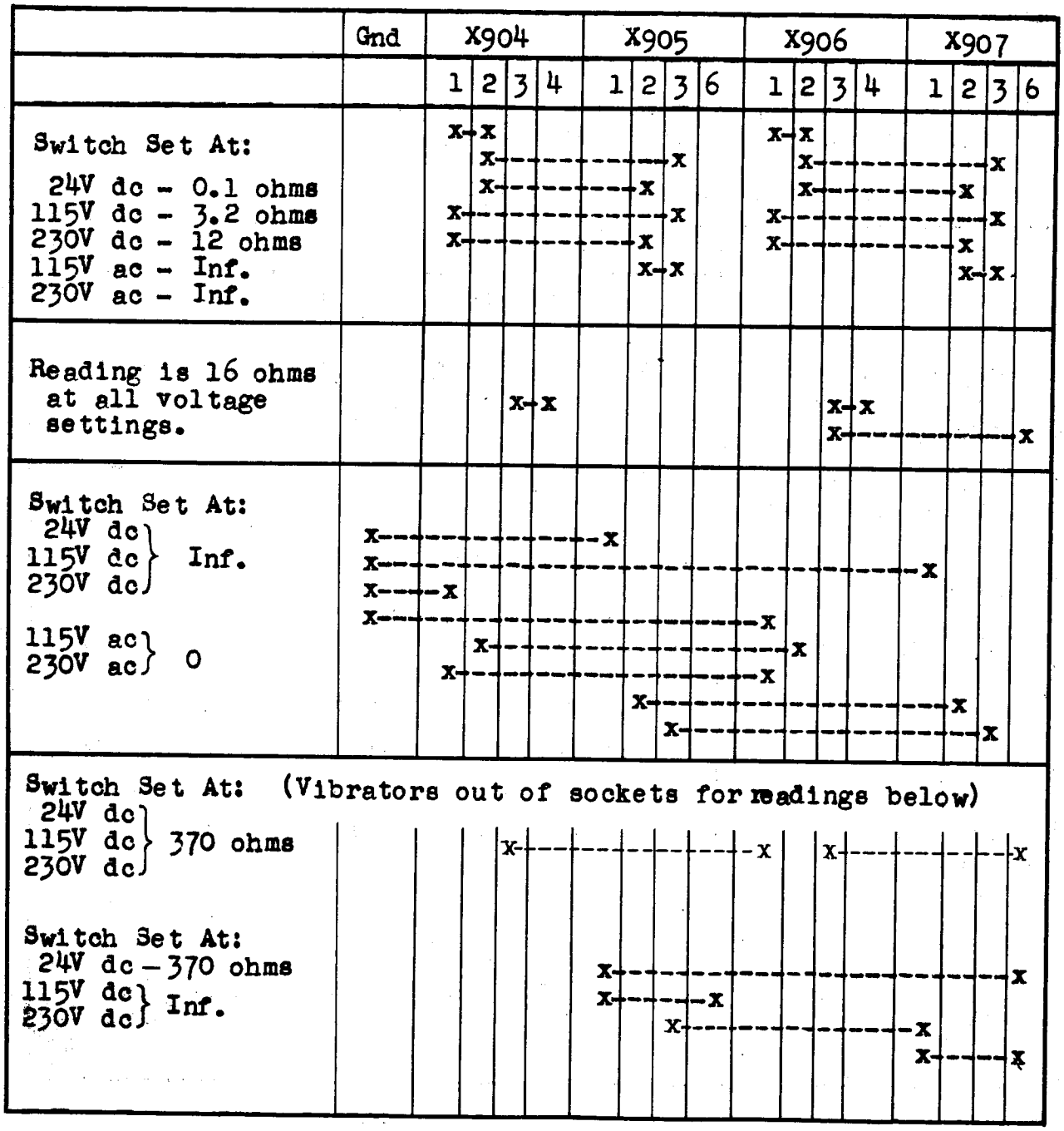
Switches set as specified.
(Tubes and relays removed from sockets, unless otherwise noted).
Voltage selector switch does not affect readings.

	A.C.			D.C.		
	High	Med	Low	High	Med	Low
X901, pin 4 to X902, pin 4 (±50%)	0.05	0.05	0.05	0.05	0.05	0.05
V901, grid cap to V902, grid cap	37	39	41	35	37	39
X903, pin 2 to ground	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
X903, pin 3 to ground	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
	(Relay K903 in socket for readings below)					
X903, pin 5 to ground	Inf	Inf	Inf	Inf	Inf	Inf
X903, pin 7 to ground	Inf	Inf	Inf	Inf	Inf	Inf
X903, pin 5 to X903, pin 7	Inf	Inf	Inf	Inf	Inf	Inf

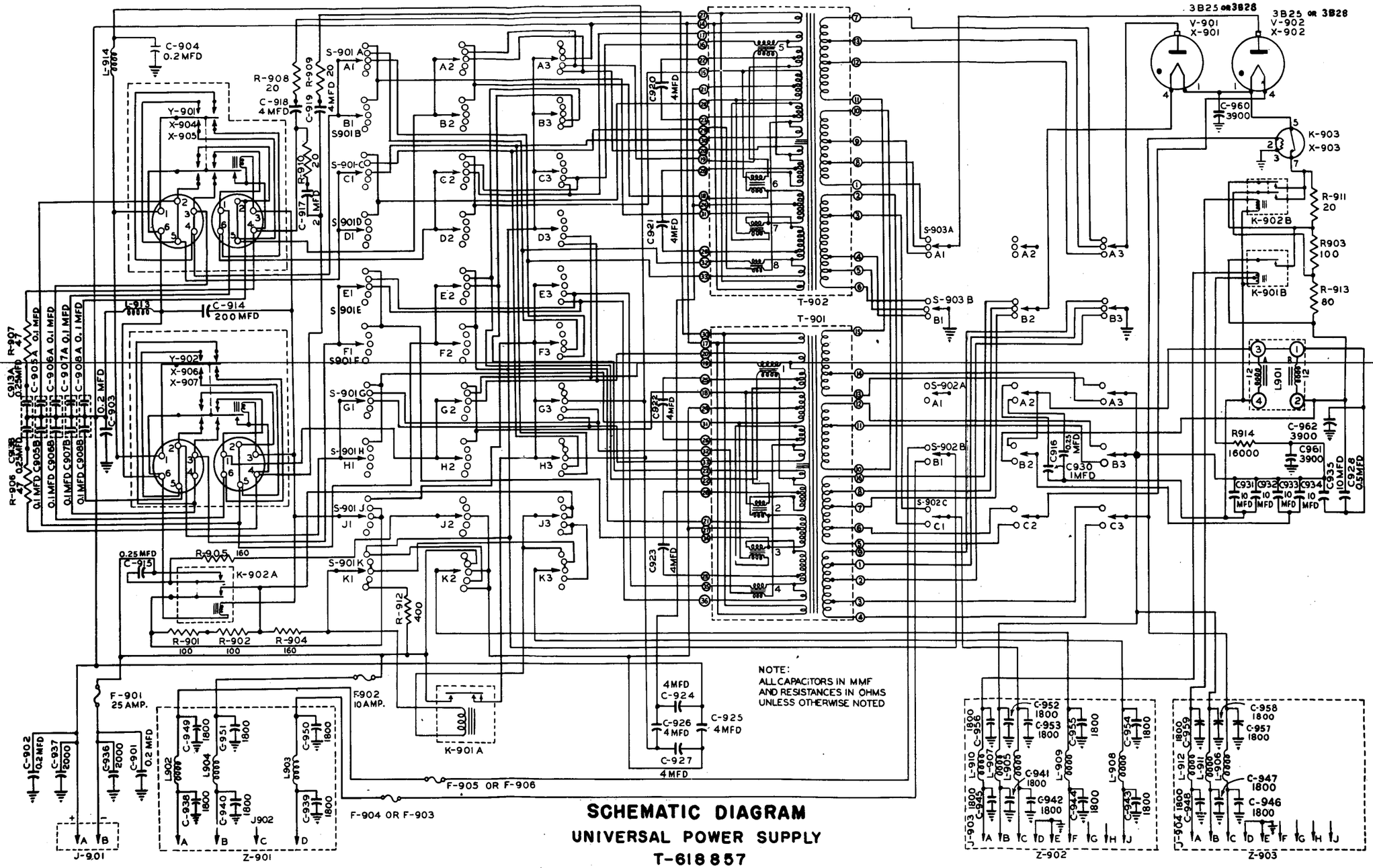
All Resistances In Ohms

RESISTANCE AND CONTINUITY CHECK
UNIVERSAL POWER SUPPLY
VIBRATOR SOCKETS

Vibrators in sockets, unless otherwise indicated.
AC - DC switch and voltage selector switch set as indicated.
Fuses and high-medium-low switch do not affect readings.
All readings are identical at each voltage setting.



Refer to page 7-72 for instructions on the method of using the chart shown above.



SCHEMATIC DIAGRAM
UNIVERSAL POWER SUPPLY
T-618857

REVISED--SEE ERRATA AT 7-75,76
THE FRONT OF THIS BOOK

ELECTRICAL CHARACTERISTICS OF UNIVERSAL POWER SUPPLY

TYPICAL VALUES-VOLTAGE & CURRENT

NAVY TYPE CLG-20379

POWER FACTOR 85 TO 100

INPUT

LOAD CONDITIONS		AMPERES		
MAR	RDR	26V.dc	115V.ac/dc	230V.ac/dc
RECEIVE	OFF	10.8	2.4	1.2
TRANSMIT	OFF	16.2	3.6	1.8
SELECT	OFF	16.5	3.7	1.9
OFF	RECEIVE	8.1	1.8	0.9
OFF	SELECT	13.5	3.0	1.5
RECEIVE	RECEIVE	14.6	3.3	1.7
TRANSMIT	RECEIVE	20	4.5	2.3
SELECT	RECEIVE	20	4.5	2.3
RECEIVE	SELECT	18.5	4.2	2.1
TRANSMIT	SELECT	23.8	5.4	2.7

ALL MEASUREMENTS ±15%.
Hi-Med-Low SWITCH SET AT "MED" FOR ABOVE READINGS.
D.C. MEASUREMENTS MADE WITH D'ARSONVAL TYPE METER

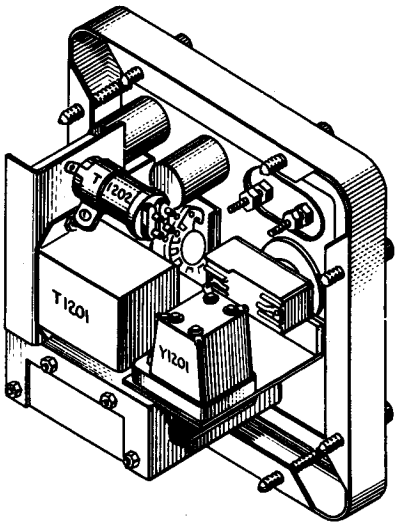
OUTPUT

LOAD CONDITIONS		VOLTS		PLATE AMPERES			FILAMENT AMPERES		
MAR	RDR	PLATE	FIL.(ac)	MAR	RDR	TOTAL	MAR	RDR	TOTAL
RECEIVE	OFF	370	13.5	0.12	-	0.12	7.4	-	7.4
TRANSMIT	OFF	365	13	0.47	-	0.47	7.7	-	7.7
SELECT	OFF	365	13	0.52	-	0.52	7.7	-	7.7
OFF	RECEIVE	370	13.5	-	0.12	0.12	-	3.3	3.3
OFF	SELECT	360	12.8	-	0.42	0.42	-	3.5	3.5
RECEIVE	RECEIVE	370	13.5	0.12	0.12	0.24	7.4	3.3	10.7
TRANSMIT	RECEIVE	365	13	0.47	0.12	0.59	7.7	3.5	11.2
SELECT	RECEIVE	360	12.8	0.53	0.13	0.66	7.8	3.5	11.3
RECEIVE	SELECT	325	12.5	0.11	0.47	0.58	8.0	3.6	11.6
TRANSMIT	SELECT	330	12.6	0.46	0.46	0.92	7.9	3.6	11.5

ALL MEASUREMENTS ±15%.
ON D.C. INPUTS, A.C. FILAMENT VOLTAGE MEASUREMENTS MUST BE MADE WITH THERMAL-TYPE METER DUE TO SQUARE WAVE OUTPUT.
NORMAL INTERMITTENT (2-5 CYCLES PER MINUTE) CRYSTAL OVEN LOAD OF 1.25 AMPERES (APPROX.) INCLUDED IN FILAMENT LOAD.
ADDITIONAL 1.25 AMPERES FILAMENT LOAD BY BOOSTER HEATER, WHICH OCCURS FOR FIRST TEN MINUTES OF OPERATION, IS NOT INCLUDED.

Transmit and Select are intermittent conditions. Normal operating load cycle is Transmit 1/3 and Receive 2/3 of the time. "Select" conditions are applied at infrequent intervals for duration of 10 seconds or less.

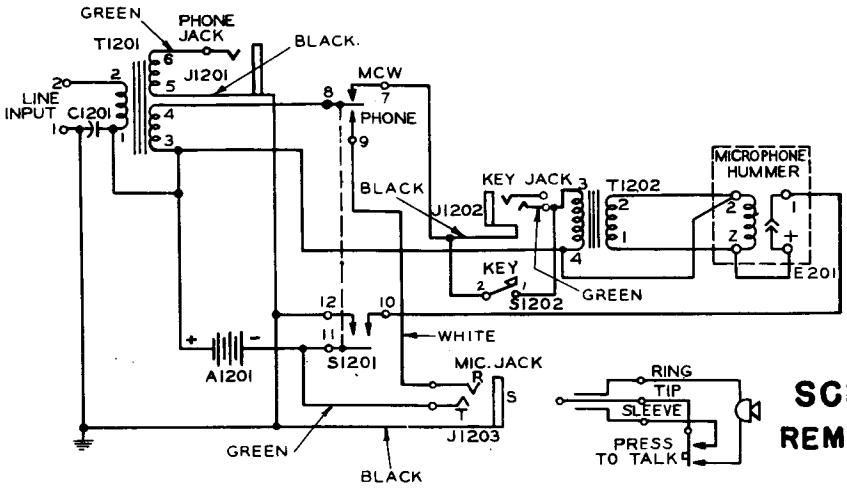
REMOTE BOX OPERATIONAL CHECK



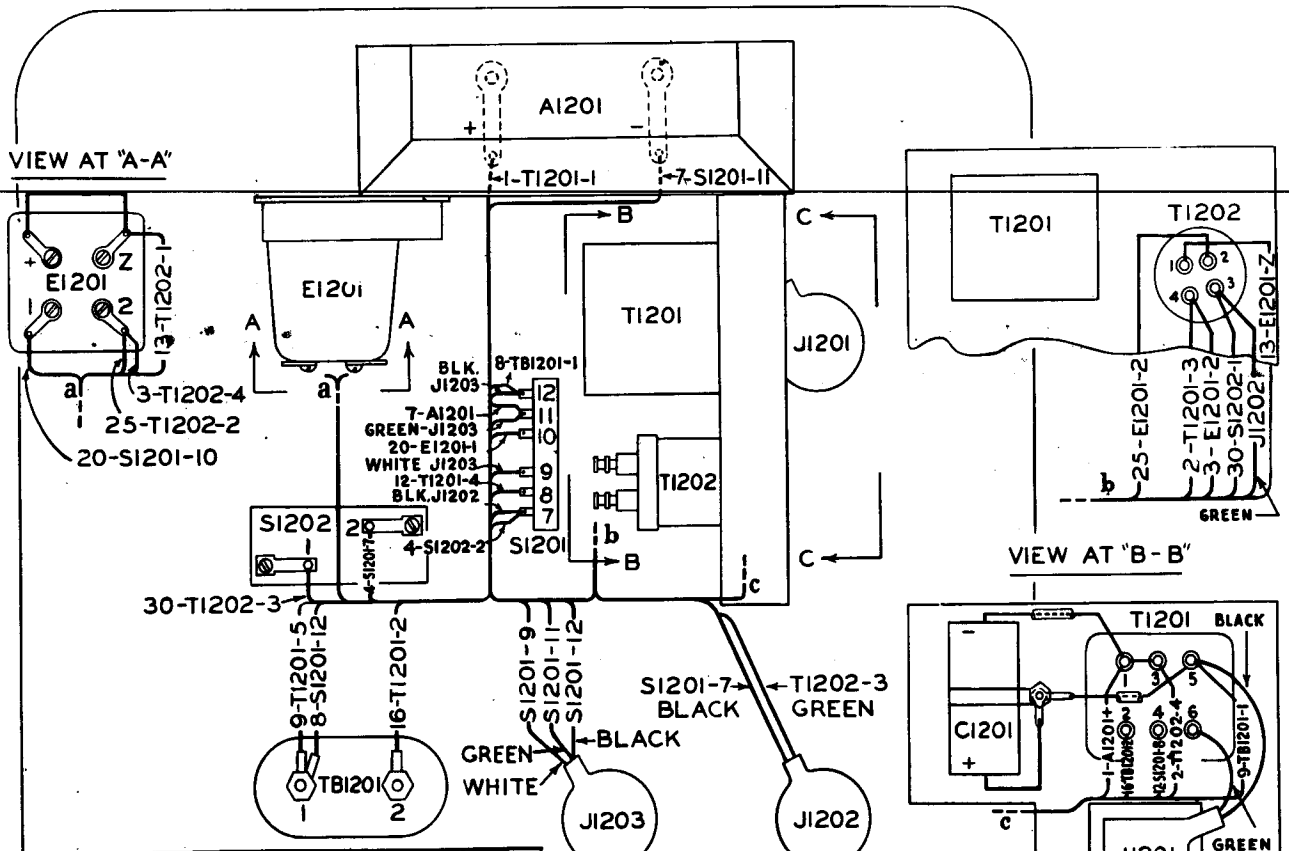
Connect a voltmeter (10 volt d-c scale) across line terminals to the remote box with the positive lead connected to terminal No. 1. With the MCW-Phone switch in the MCW position a reading of 4.5 should be obtained on the meter. A lower reading indicates failing batteries, which should be replaced before continuing test.

How to Check	What to Check
Insert headset plug in "Phone" jack and depress built-in key.	Voltage remains 4.5. Microphone hummer heard in headset.
Insert key plug in "Key" jack and depress.	Same as above.
Connect headset across "Line" terminals and depress built in key.	Same as above.
Place "MCW-Phone" switch in "Phone" position. Headset plugged into "Phone" jack.	Hummer should not operate and no voltage on line terminals when key is pressed or open.
Plug microphone into "Mic" jack and depress press-to-talk button.	Voltage remains 4.5.

Failure to obtain proper response in any of the above tests will indicate circuit or component part in the unit that is defective and necessary repair or replacement will be obvious.

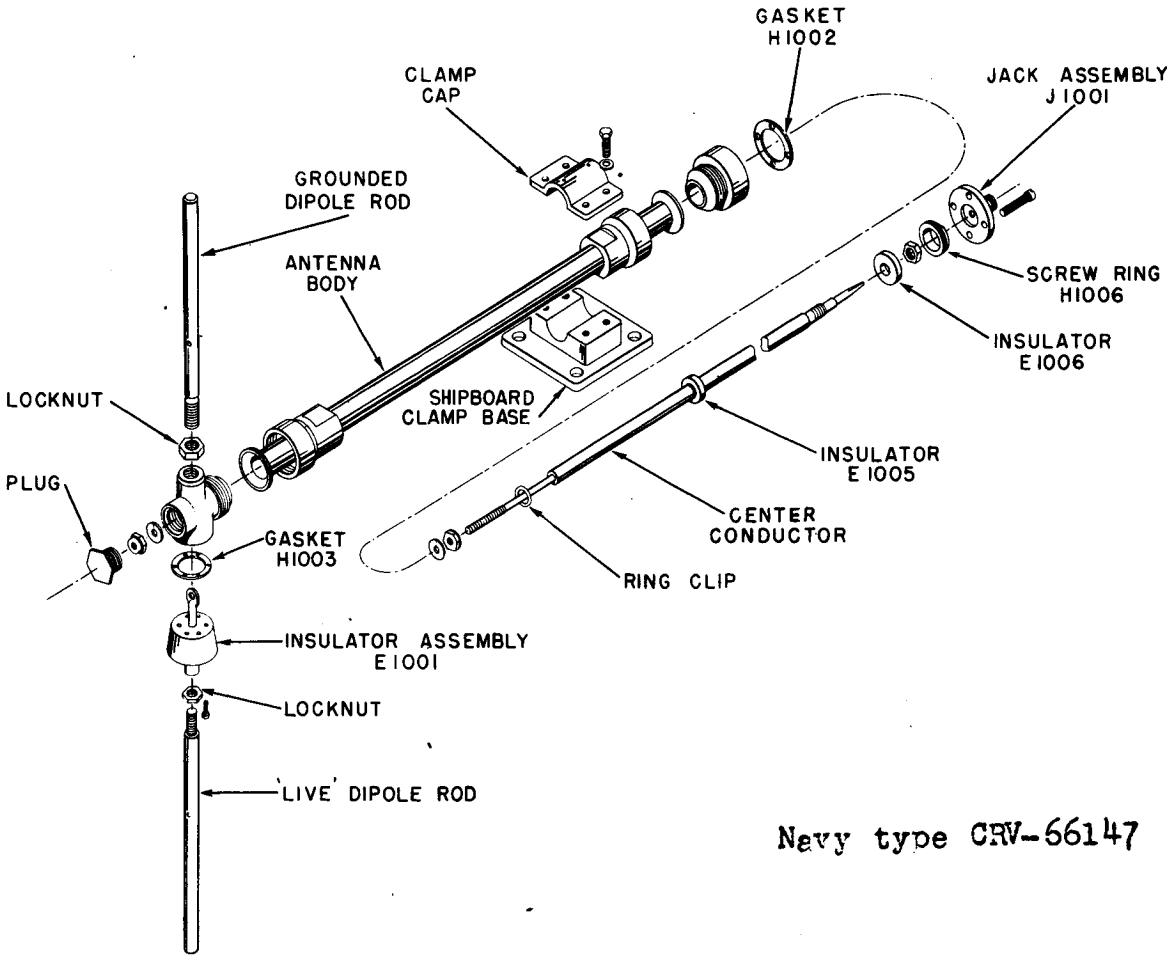


SCHEMATIC DIAGRAM
REMOTE CONTROL UNIT
K-891923



NUMBERS IN WIRES REFER TO THIS WIRE TABLE	
WIRE NO.	DESCRIPTION
1-4 INCL.	P.S.663 WHITE-RED TR.
7-9 INCL.	P.S.663 WHITE-BLK. TR.
12 & 13	P.S.663 WHITE-BROWN TR.
16	P.S.663 WHITE-YELLOW TR.
20	P.S.663 WHITE-BLUE TR.
25	P.S.663 WHITE-GREEN TR.
30	P.S.663-WHITE-RED&BLK. TR.

CONNECTION DIAGRAM
REMOTE CONTROL UNIT
P-728974



Navy type CRV-66147

ANTENNA SERVICING

The antenna assembly comprises no parts that are subject to wear or deterioration from normal operation. Its routine inspection is to detect mechanical damage and to remove any accumulation of dirt or foreign matter from the insulator supporting the live rod that may form a partial short circuit across the insulator.

The part most likely to suffer damage is the insulator which can be replaced in the following manner:

Disconnect the transmission line cable and remove cap holding antenna in place. Remove both radiating rods by loosening locknuts and unscrewing rods with the wrench.

Clamp center junction of dipole end of antenna carefully in a vise to prevent strain on the antenna center conductor. Remove the hexagonal shaped plug in the casting supporting the insulator.

Remove the nut and lockwasher fastening the insulated stud to the center conductor of the antenna inside the casting.

The insulator may then be removed by loosening the six screws which hold it in place. It will be necessary to remove the caulking compound from the holes in the insulator with a small screwdriver to reach the screws. With the screws removed, the insulator is tilted toward the rear end of the assembly to disengage the stud on the insulator from the central conductor. The insulator is replaced in the reverse order, engaging the hole in the end of the stud with the threaded center rod, before replacing screws. Recaulk the holes with Pakseal compound manufactured by Johns - Manville.

The transmission line connector on the antenna is removed by loosening the four screws holding the plate, on which the connector is mounted, to the casting on the end of the body member of the antenna. The connector comes off freely with the plate, sliding off the center post of the connector which remains in place.

To remove the inner conductor, disconnect the conductor from the lug on the insulator by removing the nut as in the case of removing the insulator. Remove the connector at the rear end of the antenna. Using the open end of the spanner wrench furnished with the antenna, remove the screw ring holding the inner conductor spacer at the rear end of the antenna. The entire inner conductor with the two insulating spacers can then be withdrawn from the tubular body of the assembly.

The larger insulating spacers may be removed from the inner conductor by loosening the hex nut which holds it on the rod. The smaller spacer may be removed by prying off one of the snap rings adjacent to the spacer.

The antenna is thus completely disassembled for most repairs that might be necessary. No attempt should be made to remove the end castings from the supporting tube without holding both tube and casting rigid while loosening nut.

GAS ENGINE FAILURE CHART

The chart lists the more common troubles and their remedy. Details of procedure for making major repairs and overhauling the engine and generator are given in the pages following the chart.

DIFFICULTY IN STARTING

Trouble	Remedy	See page
No fuel	Fill tank.	
Obstruction in fuel supply	Clean fuel line. Drain carburetor bowl. Check for air lock in fuel line.	7-96 7-96 7-96
Water in fuel	Drain and refill fuel tank.	
Carburetor improperly adjusted	Adjust.	7-97
Spark plug fouled	Clean plug and re-adjust points.	7-86
Spark plug porcelain cracked	Replace spark plug.	
Wiring defective	Check for broken or loose connection.	7-92
Ignition defective	Check breaker points, condition, and clearance.	7-92
Heavy carbon deposits	Remove.	7-86
Poor compression	Check valve seats and stems. Weak or broken valve springs. Worn piston rings. Lack of proper oil.	7-88 7-88 7-89 5-14

FAILS TO START

Trouble	Remedy	See pag
No fuel	If tank is full, remove fuel line and clean.	7-96
	Check carburetor inlet valve and float assembly.	7-96
Engine over-choked	Allow engine to stand a few minutes. Choke lever sticking or in partially-closed position.	7-97
Carburetor air jets clogged	Clean.	7-96
Magneto switch off	Turn to "On".	
Ignition de-fective	Test for spark at plug. Switch defective.	7-92
Faulty spark plug	Replace, or clean if fouled.	7-86
Vent on tank closed	Open.	
Poor com-pression	Carbon under valves.	7-88
	Warped valves or improper clearance.	7-88
	Broken valve spring.	7-88
	Piston rings or cylinder worn.	7-89
STALLS UNDER LOAD		
Insufficient fuel	Clean fuel line and strainer.	7-96
Governor stick-ing	Oil or adjust linkage.	7-94
Carburetor jets clogged	Clean.	7-96
Air cleaner clogged	Clean element or replace.	7-94
Muffler partly clogged	Clean.	7-87
Valves leaking	Grind and check clearance.	7-88

Trouble	Remedy	See Page
Piston rings worn	Replace.	7-89
Improper fuel mixture	Adjust carburetor.	7-96
Improper timing	Adjust magneto.	7-92
	UNEVEN OPERATION	
Governor sticking	Oil or adjust linkage.	7-94
Valves sticking	Overhaul.	7-88
	POUNDING OR KNOCKING	
Heavy carbon deposits	Clean.	7-86
Worn piston rings	Replace.	7-89
Worn connecting rod bearing	Replace rod.	7-89
Worn piston pins	Replace piston and pin assembly.	7-91
Valve clearance too great	Replace valves.	7-88
Improper ignition	Adjust moment of fire.	7-92
Loose flywheel	Tighten flywheel nut securely.	
	FAILS TO IDLE	
Worn carburetor body and throttle shaft	Replace shaft.	7-96
Worn main needle valve	Replace valve and seat.	7-97

Trouble	Remedy	See page
Dirt under needle valve	Clean.	7-96
Throttle sticking	Oil or adjust.	7-96
Valves sticking	Clean.	7-88
	CVERHEATING	
Improper ignition	Check magneto timing.	7-92
Excessive load	Inspect for cause.	
Choke partly closed	Adjust.	7-97
Insufficient oil	Add oil.	
Air flow obstructed	Clean flywheel housing. Clean cooling fins on engine Provide clear space around engine.	7-87
	FAILS TO STOP	
Switch defective	Repair or replace.	
Engine overheated	Close choke all way to stop engine.	
	EXCESSIVE OIL CONSUMPTION	
Worn piston rings	Replace.	7-89
Leaky gaskets	Replace.	7-90
	EXCESSIVE CARBON	
Improper fuel mixture	Adjust carburetor.	7-96
Partly-closed choke	Oil or adjust.	7-97

Trouble	Remedy	See page
Worn or stuck piston rings	Clean, or replace rings.	7-89
Worn cylinder	Rebore.	
Clogged crankcase breather	Clean.	7-87
Oil too light	Consult lubrication chart.	5-14
Oil level too high	Drain to proper level.	
	IGNITION INTERFERENCE	
Shielding assembly loose or defective	Tighten or replace.	7-92
Loose grounding strap	Tighten.	
One side of generator grounded	Check and remove short.	7-99

GAS ENGINE SERVICING

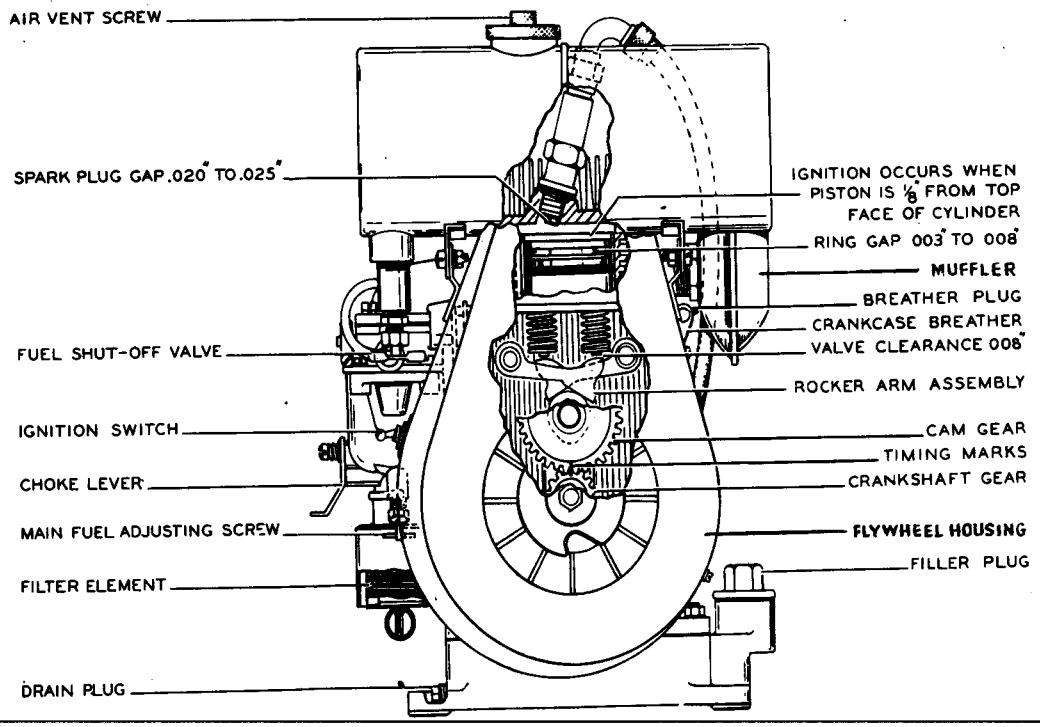
CARBON REMOVAL

At the end of every 50- to 100-hour period of operation, depending on the type gasoline used, it will probably be necessary to remove the carbon deposits in the engine. A high-test leaded gasoline will require more frequent carbon removal due to the lead present. The procedure for removing carbon is as follows:

First disconnect the plug shield and ignition cable and then remove the spark plug and gasket.

Clean off outside of plug and inspect porcelain for cracks. Discard plug if cracks are discovered. If spark plug is sooty and points are fouled, clean thoroughly and set points to 0.020 inches.

Close valve in fuel line and disconnect the line from the carburetor. Remove the flywheel blower housing with the fuel tank attached.



Remove the cylinder head nuts and washers holding the head in place. If the head does not come off easily, tap lightly on the side to loosen it. Then remove the head and gasket.

With starting cord, turn engine over slowly until piston is on top of compression stroke and both valves are closed. This is done to prevent carbon particles getting into the cylinder, intake manifold, or lubrication system.

Remove carbon from cylinder head, cylinder face, top of pistion, and valve heads, using a wire brush or dull tool.

With a soft brush, or air blast, carefully clean engine of all loose carbon.

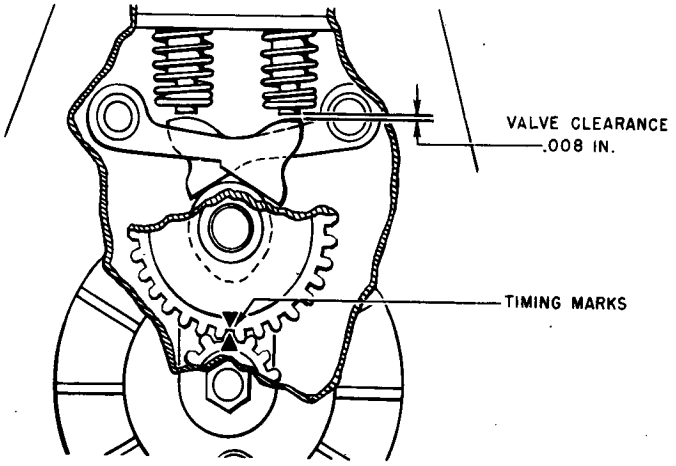
Before replacing the head, it is advisable to rotate the engine until both valves are open. Then squirt a few drops of kerosene or light penetrating oil on the valve seats and stems so that any accumulations will be loosened. Rotate both valves on their seats a few times, by means of a screwdriver inserted in the slot in the valve head, to insure proper seating.

Now apply gasket sealing compound to the top of the cylinder and place a new head gasket, from spare stock, in position. (Do not use the gasket removed unless it is absolutely necessary, since compression may be lost at a low spot in an old gasket.) Apply gasket sealing compound to the top of the gasket.

Replace the cylinder head, washers and head nuts and tighten each one slightly and in succession, working in a circle so as not to tighten any one nut too much. This prevents warping of the cylinder head and excessive pressure on one particular place in the head gasket and possible future compression loss.

Replace blower housing, fuel line, spark plug and gasket, plug shield, and ignition cable.

After the first operating period, and after the engine has cooled, retighten the head nuts.



VALVE GRINDING

After approximately 75 to 150 hours operation, the valves will probably require grinding. Steps involved are:

Remove plug shield, ignition cable, fuel line, blower housing, cylinder head, and gasket as outlined under "Carbon Removal."

Loosen the starter pulley retaining nut and back the nut off about one turn. Using a heavy-duty screwdriver as a pry between the flywheel and bearing plate, strike the pulley nut a sharp blow with a steel hammer. This will jar the flywheel loose and it may be removed.

Remove bearing plate assembly by taking out the bolts holding plate in place. Use care in removing gasket so that it may be replaced undamaged.

Valve stems and lifters are now exposed. Before proceeding further, the valve clearance should be measured. Clearance should be between six to eight thousands of an inch. If less,

file or grind off the required amount after the valve is removed. Mak certain any ground section is square with the valve stem. If the clearance exceeds fifteen thousands of an inch, the valve must be replaced with a new one from spare stock, since no adjustment for wear is provided.

To remove valves, pull pins from hole at base of valve stem by compressing springs with a valve spring compressor tool. Removal of retaining pins permits valves to be raised slightly and spring and washer will slip out.

Remove valves and clean underside of valves, valve stem, and seat. Grind valves with fine compound only, until smooth, firm seat is obtained.

Wash off all traces of grinding compound from valve and seat and put a few drops of light oil on valve stems.

Replace valves, springs, and washers. Compress spring and insert retaining pin.

To replace the bearing plate, it will be necessary to use an oil seal tool to prevent damage to the oil seal. Slip the oil seal tool supplied (80-1) over the crankshaft and push the bearing plate into place over the gasket. Remove the oil seal tool and bolt the bearing plate to the cylinder.

Replace the flywheel and starter pulley and tighten in place.

Assemble remainder of engine as described under "Removing Carbon."

In removing the valves, note that it is not necessary to remove the cam and gear assembly.

CONNECTING ROD AND PISTON REMOVAL

Proper compression is necessary for good engine operation since power is wasted when leaks occur. Compression loss may take place when valves do not seat properly, when gaskets leak, or when piston rings are worn or not fitted properly.

If valves are seated tightly and plug and head gaskets are tightened down, the only other point of loss is past the piston rings. To inspect rings for wear, proceed as follows:

Drain oil from crankcase and close valve in gas line to carburetor. Disconnect gas line at carburetor and remove blower housing.

Remove plug wiring and head as outlined in "Valve Grinding."

Remove generator as described on page 7-100.

Make an identifying mark on the cylinder and piston so that they may be re-assembled in the same relative position.

Remove four bolts holding cylinder and top of crankcase to base, and lift the cylinder off. Do not damage gasket when removing the cylinder.

Straighten and remove cotter pin at end of bolts holding lower half of connecting rod bearing in place. Remove nuts and lower half of bearing, marking the bearing halves, if not already marked, so that the lower half may be replaced in the same position.

The piston may now be pushed out through the top of the cylinder. The rings are removed from their grooves by expanding them until they are free of their respective grooves. Remove the two upper rings over the top of the piston, but slip the lower ring over the piston skirt, being careful not to cut the piston skirt. Replace in the same manner.

To check the rings for wear, remove any carbon in the upper end of the cylinder. Take one of the removed rings and place it in the cylinder head flush with the top. Ring must be square with the cylinder walls and this may be accomplished most conveniently if the piston is inserted and pushed up underneath the ring. Now measure the gap between the ends of the ring. It must not exceed 0.035 inches or the rings must be replaced.

Th connecting rod in this engine, being of the plain bearing type, must be replaced when the bearing is worn. No attempt should be made to file off the bearing cap or adjust the bolts. The connecting rod bolts should be drawn up securely at all times.

To reassemble the rings and piston, first make sure the ring grooves are clean. Then install the rings on the piston while it is still out of the cylinder. The compression, or top ring must be inserted so that the identification dot is toward the top of the piston. The oil ring (the one with holes drilled through it) is placed in the bottom groove. The gaps in all rings should be spaced evenly around the piston to prevent compression loss. Under no conditions should the gaps coincide on the piston.

To prevent damag to the rings when replacing the piston, use a ring compressor tool, if available. Otherwise, construct one of sheet steel about three-quarters of an inch wide. Fold it around the piston skirt to form almost a complete circle and then bend the ends outward about one-half inch. Squeezing the ends together will collapse the ring evenly and tapping the piston lightly will drive it into the cylinder.

Replace lower half of connecting rod bearing, making certain the identifying marks are in line. Replace and tighten the nuts previously removed. Install new cotter pins and bend the ends of the pins back so one half is on each side of the nut.

Place gasket on base, lining up the holes, and lower the cylinder on gasket. Tighten down the four holding bolts.

Replace generator, bearing plate, blower housing, head, and plug wiring.

Reconnect gas line and open valve in line.

Fill crankcase with new oil.

PISTON PIN REMOVAL

To remove the piston pins, follow all steps as outlined for "Connecting Rod and Piston Removal."

Remove piston from cylinder and take out the retaining ring on each side of the piston pin.

Heat the piston in boiling water. This will expand the hole in the piston sufficiently so that the pin may be driven out with a wooden plug.

The piston pin used in this engine is a standard size which cannot be obtained in oversizes. If worn, replacement of both piston and pin is necessary. The normal factory clearance of the pin in the bearing is between 0.0001 to 0.00015 inch.

Be sure to replace the retaining rings when re-installing the piston pins, since the cylinder walls may be scored if the pins are loose.

Replace piston and assemble remainder of engine as previously described.

MAGNETO ADJUSTMENT
(POINTS AND TIMING)

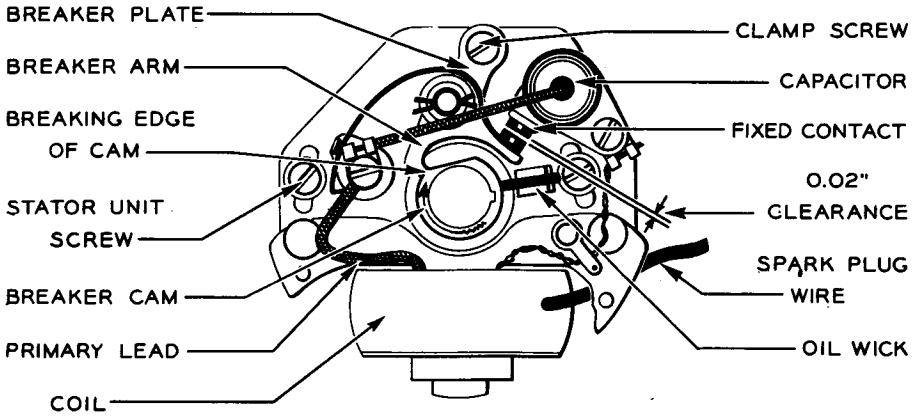
The magneto ignition system is of simple construction and has been designed to provide reliable, trouble-free performance. Under normal operating conditions the only attention necessary will be adjustment of the breaker points after approximately 150 - 200 hours operation. At other times, if ignition trouble is suspected, operation of the remainder of the system should be established before the magneto is touched.

If ignition trouble is apparent, make sure ignition switch is on, then remove plug shield and cable from the spark plug.

Holding cable by insulation to avoid shock, turn engine over with starter rope. If end of cable is held one-eighth inch from metal body of plug, a spark should appear in the gap. Appearance of the spark indicates the ignition trouble is in the spark plug which should be removed and examined for cracked porcelain or fouled points.

Non-appearance of a spark leaves only the cable and magneto itself as possible sources of trouble. Assuming the cable is in good condition, the magneto is adjusted as follows:

Close fuel valve in line to carburetor and disconnect line at the carburetor. Remove the blower housing and flywheel as previously described.



Two adjustments are possible on the magneto assembly: one sets the points; while the other adjusts the moment of fire. The illustration shows the magneto assembly, for reference during the operations described below.

Before adjusting the breaker points, be sure they are clean and come together squarely. If the points are pitted, use a small flat file until clean and smooth.

The points are adjusted by first turning the crankshaft until the breaker arm rests on the highest point of the breaker cam which is keyed to the crankshaft. If the gap between the breaker points is other than 0.020 inches, loosen the contact breaker plate screw and tap the contact breaker plate lightly until the proper gap is obtained. Be sure the plate screw is securely tightened before re-assembly.

Checking the timing, or moment of fire, may be accomplished at any time when the flywheel is off and the head is removed. No timing adjustment should be made, however, until the breaker points have the proper clearance.

The initial step is to turn the engine over until the piston is on the compression stroke (both valves closed) and the piston head is exactly one-eighth of an inch from the top of the cylinder. This is just before top dead center. At this position of the piston the breaker points should just begin to open. Adjust to obtain this result by moving the stator plate to the right or left after loosening the two clamping screws in the adjusting slots. The magneto assembly drawing shows the various parts mentioned.

If both the point setting and spark timing have been found to be in order, the fixed capacitor above the points should be removed and tested for breakdown. Replace with a capacitor from spares, if defective. Simply remove the flexible lead wire from the breaker arm post, and take out the capacitor fastening screw. After replacement, make certain that the coil ground wire is securely fastened by the capacitor screw.

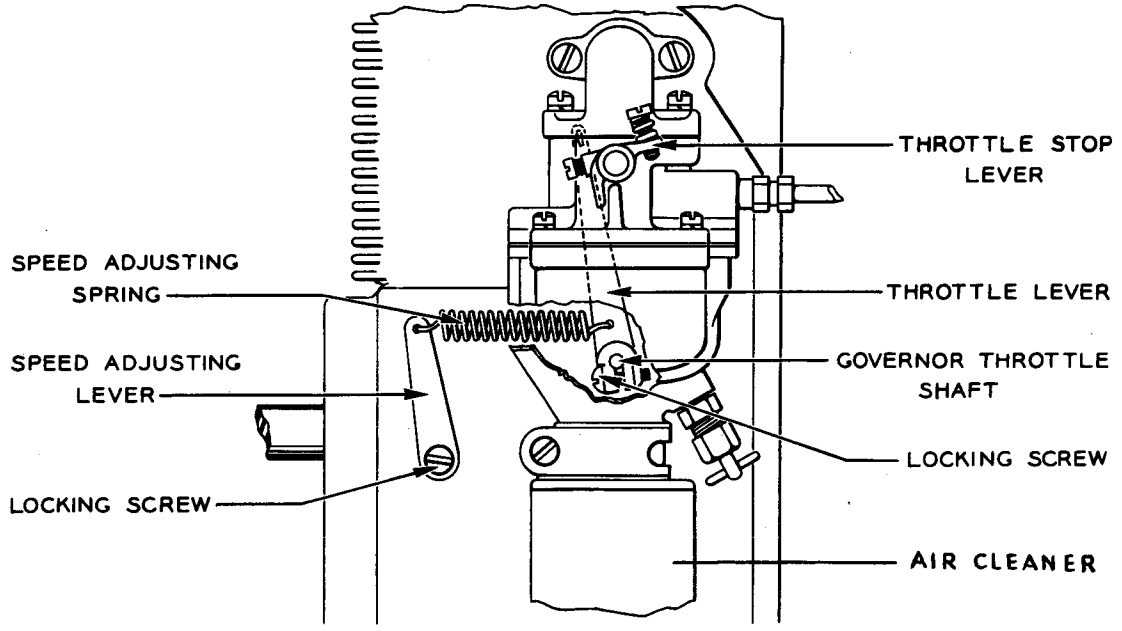
A breakdown in the spark energizing coil will also cause ignition failure if all other elements of the system are in working order. When tested with a meter, lack of continuity indicates a burnt-out coil. To renew the coil, disconnect the ignition ground wire and spark plug wire from the assembly. Remove the stator plate and the screw holding the capacitor ground wire. Bend back the coil-holding clip and pull the coil assembly from the pole piece.

The magnetic field supplied by the permanent magnets is, of course, the source of all ignition voltage. The composition of these magnets is such, however, that no appreciable loss of field strength will occur even over a long period of time. This element in the ignition system should give no trouble. A weak spark, however, signifies need for magnet replacement if the remainder of the system has been checked and found satisfactory.

GOVERNOR ADJUSTMENT

Control of the engine speed is automatically maintained by the mechanical flyball governor on the engine. Rotation of the crankshaft swings small weights (or flyballs) which produce movement of the governor throttle shaft in accordance with engine speed changes. Carburetor throttle levels are accordingly varied with engine speed. The governor is carefully adjusted at the factory for normal engine speed under load, hence, no other adjustment is necessary.

If an increase in controlled engine speed is desired, the spring tension is increased by moving the lever outward. Similarly, a decrease in tension will decrease the engine speed. Make certain the adjusting lever screw is tightened after adjustment. The illustration showing the governor linkage to the throttle indicates the location of all parts.



Should the throttle fail to open completely during operation, the governor will require additional adjustments. In this event, loosen the throttle lever screw, leaving the governor spring hooked onto the throttle lever. Grasp the end of the governor throttle shaft with a pair of pliers and turn to the left as far as its travel will permit. Now tighten the throttle lever clamp screw securely. This should restore the governor's working range. As an additional precaution, make certain the throttle lever works freely.

CRANKSHAFT REMOVAL

Should it ever become necessary to remove the crankshaft or crankshaft bearings, proceed as described below.

Disconnect the generator and remove as described on page 7-100.

Follow all steps outlined in "Connecting Rod and Piston Removal." In addition remove flywheel key and breaker cam from shaft, and remove the magneto itself.

Remove bearing plate by means of six bolts fastening plate to cylinder.

Remove the cam and gear assembly, and disconnect the governor control shaft assembly. The crankshaft may now be taken out of the cylinder by tapping the end of the shaft with a wooden block and hammer.

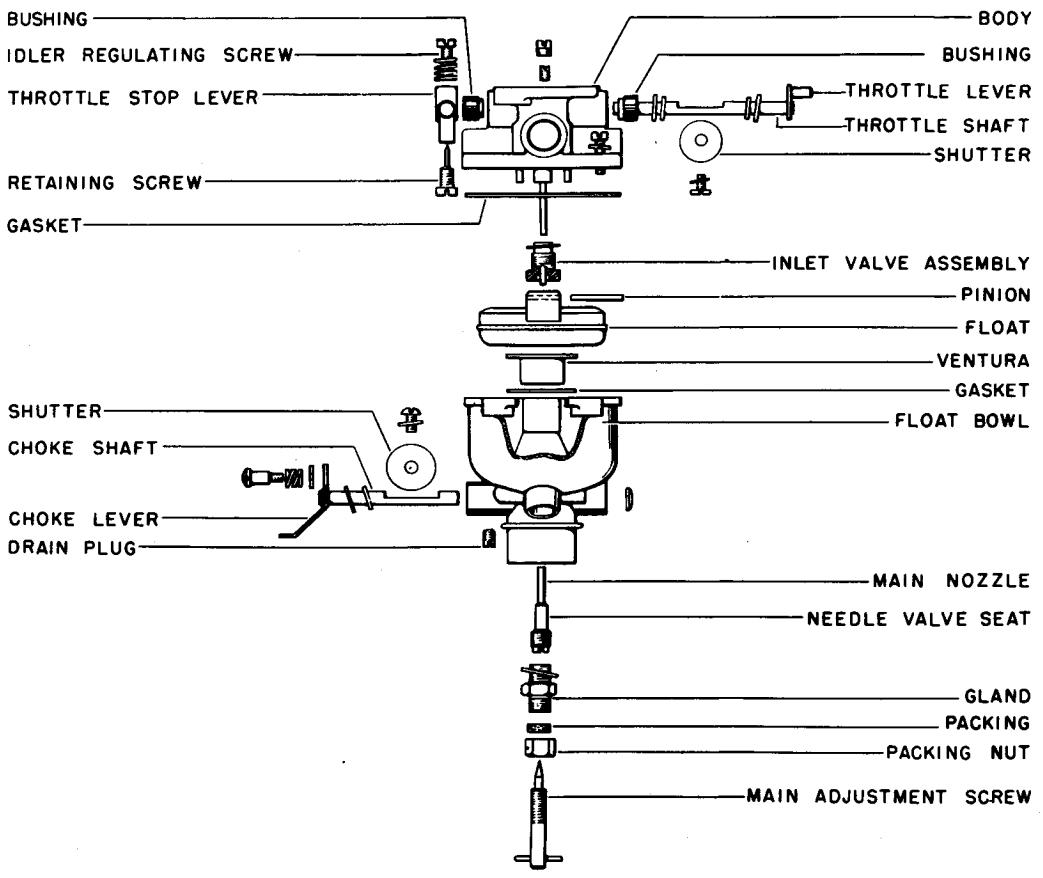
The crankshaft bearing or gear is removed most easily by use of a wheel or gear puller. If none is available, they may be driven off the shaft by tapping lightly with a brass rod or hard wooden stick. This step is unnecessary unless replacing the bearing or gear.

To replace the crankshaft in the cylinder, insert the ball bearing evenly into the bearing recess. Tap the shaft lightly with a brass rod or wooden stick until properly seated. Do not attempt to press the shaft in place.

Now install the governor control shaft assembly. Place the throttle lever onto the control rod and pull out the shaft as far as it will go, allowing a little clearance between the throttle lever and throttle shaft bearing. Hook the spring into the throttle lever. Using a pair of pliers, twist the end of the throttle control shaft to the left as far as it will go. Fasten the throttle lever screw assembly. Reference to the governor assembly drawing under "Governor Adjustment" will make this operation clear.

Replace the cam and gear assembly, being sure that the timing marks on the cam gear and crankshaft gear are in register. This position is shown in the illustration page 7-88.

Assemble the remainder of the engine as previously described.

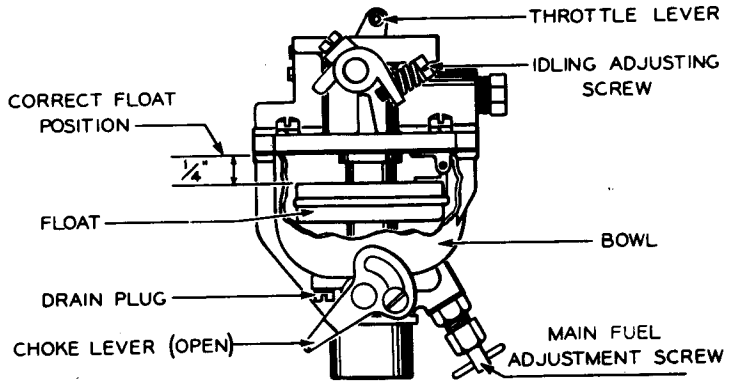


CARBURETOR ADJUSTMENT

Beyond keeping the outside of the carburetor free of dirt that might clog the air jets, and adjusting the needle valve properly, little attention need be given the carburetor itself.

The float chamber should be drained about once every three months to remove any foreign matter that may have accumulated. This is accomplished by means of the drain plug in the bottom of the chamber, first shutting off the valve in the line to the carburetor.

The idling point may require adjusting occasionally and this is regulated by means of the small adjusting screw on the throttle lever. Failure to idle may be caused by a worn carburetor body or throttle shaft. If the shaft is worn, replacement is necessary to prevent excessive air entering around the shaft.



The main fuel adjustment screw controlling the fuel mixture is the only adjustment on the carburetor proper. If the mixture is too lean or too rich, correction is made by turning the screw slightly. Clockwise rotation makes the mixture leaner while a counter-clockwise movement backs the valve off its seat, enriching the mixture. If tampering or accident has changed the valve setting, it should be reset as follows:

Close the main adjustment screw by turning clockwise slowly until it reaches the valve seat. This operation should be done gently, as force will damage the needle valve seat.

Now turn the screw counter-clockwise one and one-half turns. Start the engine and after it warms up only a slight final adjustment will be necessary.

If it is impossible to obtain a satisfactory idling speed and the motor continues to "race" even with the needle valve turned all the way down, it is probable that dirt may have lodged under the valve. Shut off gas to carburetor and remove float bowl. Clean thoroughly and replace. A bent valve or scored seat is the diagnosis if it is found that dirt is not causing the difficulty. Try a new valve from spare stock and see if the trouble is eliminated. If not, the only remedy is a new needle valve and float bowl assembly.

A leaky carburetor is probably caused by a faulty or sticking float. Shut off gasoline to carburetor and remove float bowl assembly by means of the bolts fitting into the body assembly. If the float works freely and does not contain any liquid, the trouble is in the inlet valve and seat assembly above the float. The correct position of the float at the peak of its travel is approximately one-quarter inch from top of float to the top of the bowl. This is illustrat d on the carburetor drawing.

To inspect the inlet valve and seat assembly, remove and clean the seat carefully with a soft clean cloth to insure that sediment is not causing the overflow. Place the inlet needle on its seat and very lightly turn the inlet needle several times to insure a new seating surface. Re-assemble the carburetor and open the fuel valve. If overflow continues, replace the inlet valve and seat assembly, as well as the inlet seat gasket. The exploded carburetor view shows the location of the inlet valve assembly.

In cases where an engine has been out of operation for some time it sometimes happens that the heavy fractions in the gasoline settle in the form of a jelly which may have a tendency to clog the carburetor jets, inlet needle valve and seat. Should this happen, remove the old gasoline and clean out the entire fuel system. It is also advisable to remove the spark plug and squirt a little crankcase oil into the combustion chamber. Turn the motor over several times to permit the oil to accumulate onto the valve seats and stems. This will also seal the piston and rings for better compression.

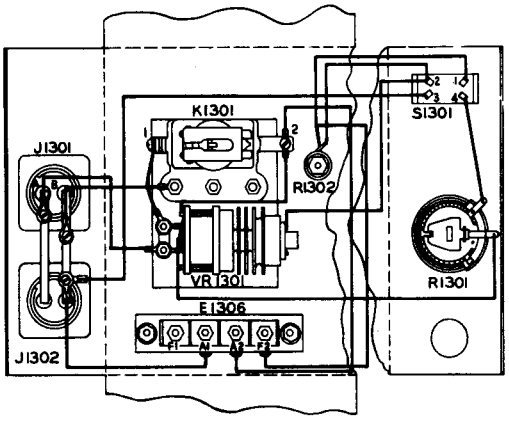
GENERATOR FAILURE CHART

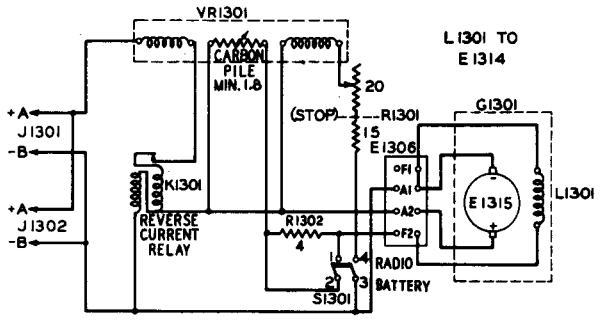
EXCESSIVE ARCING AT BRUSHES

Possible Cause	Remedy
Dirty or rough commutator	Clean with sandpaper while unit is running.
Brushes not making good contact	Make sure brush springs are not broken and brushes are not stuck in holders.
Brushes badly worn	Replace brushes. Brushes are easily accessible after removal of generator end cover and unscrewing of brush holder caps.
Open circuit or short circuited coils in armature	Repair or replace armature.

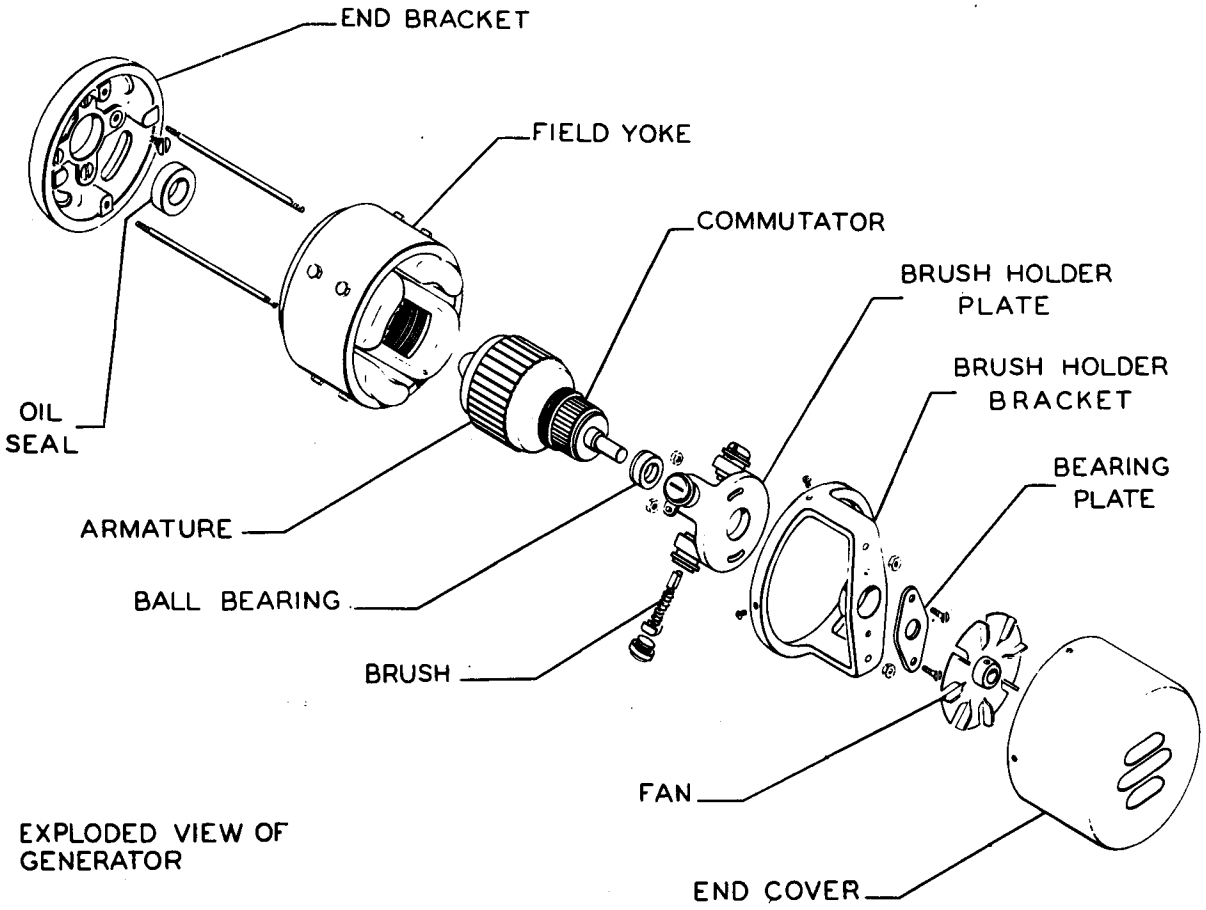
GENERATOR FAILS TO BUILD UP VOLTAGE OR DELIVER CURRENT TO OUTPUT TERMINALS

Open generator field coil	Repair or replace coil.
Loose connection or brushes badly worn	Check and tighten all connections. Replace brushes.
Brushes stuck in holders	Loosen. Rub off high spots on side of brushes with sandpaper, if necessary.
Reverse current relay does not close	Check by removing control box cover and pressing slightly on contact arm of reverse current relay. If voltage appears at output terminals, check for free action of relay spring. Correct if necessary. Also make sure engine speed is not too slow.





CONNECTION AND SCHEMATIC DIAGRAM
GENERATOR CONTROL BOX
P-728983



EXPLODED VIEW OF GENERATOR

GENERATOR SERVICING

Remove generator end cover after loosening cover screws.

Remove fan by pulling it off generator shaft after loosening set screw in fan hub.

Open control box cover and disconnect generator leads from terminal strip.

Disconnect knurled lock nut which holds end of ventilating tube to control box and remove tube end from box.

Remov the hex-head screws which fasten the upper end of the control box bracket to the generator yoke and loosen the two hex-head screws which hold the lower bracket end. Control box can then be removed from generator yoke by sliding slotted openings of lower bracket end clear of lower screws.

Unscrew nuts from the two studs which tie generator brackets and yoke together and remove front bracket by pulling it in axial direction away from yoke and over ball-b aring outer race.

Remove armature by pulling in axial direction.

Remove field yoke by pulling it away from end bracket over studs.

The four pole pieces are each screwed on to the field yoke by means of two hex-head screws. The screws of two of the pole pieces serve also as attachment screws for the control box. Two of them have already been removed and the corresponding pole piece is only prevented from dropping out by the field coil which is slipped over it. After removing the other screws of the pole pieces, all four pole pieces can be pulled out of their respective field coils and the complete set of field coils taken out.

After removing the yoke, the four flat-head screws, by which the generator end bracket is attached to the engine crankcase, become easily accessible. Unscrewing them allows the end bracket to be removed from the gas engine.

ARMATURE TESTS AND REPAIR

Test the armature for short circuits on growler. Place the armature on the growler and hold a thin strip of steel against the armature core. Rotate the armature slowly and if a short is present, the steel strip will vibrate.

Using test probes and a test lamp, touch one probe to the armature core or shaft and move the other probe slowly around the commutator, being careful not to scratch it. The lamp should not light. If it does, either the armature winding or one or more of the commutator bars are grounded. If tests on the armature indicate that it is either shorted or grounded, it should be replaced by a new one.

If the commutator is pitted or grooved, the armature should be placed in a lathe and just enough material removed to restore a smooth surface.

Undercut the mica between the commutator bars about 1/32" to prevent the mica from interferring with the brushes. After turning or undercutting the commutator, the edges of the commutator bars should be de-burred and considerable care taken to see that no copper dust or chips remain in the armature slots or imbedded in the mica.

FIELD COIL TESTS AND REPAIRS

Using test probes and a test lamp, touch one probe to one lead of the field coils and the other probe to the other lead. The lamp should light. If it does not, an open circuit is present in the coil set.

Touch one probe to one lead of the assembled field coils and the other to the generator yoke. The lamp should not light. If it does, there is a ground present in the field coil set. Repeat the test, using the other field coil lead. If the field coils show a ground or open circuit, repair or replace coil at fault.

REASSEMBLY

Remove as much dust and dirt as possible from the armature and field coils by blowing with compressed air if it is available. If compressed air is not available, use a small brush.

Proceed in reversed order of operations as used in disassembly of the unit.

AVC THRESHOLD ADJUSTMENT

The AVC circuit in the MAR receiver permits full amplification up to approximately 75% of the capability of the amplifier. Beyond this point, which is termed the AVC threshold, the amplification is reduced and the output remains essentially constant through the action of the avc circuit.

The AVC threshold in this equipment is that point at which the load voltage of the second detector V305 increases 1 db when the AVC connection to the RF section is grounded. This adjustment is made by adjusting R325 which is mounted at the rear of the transmitter-receiver chassis. The slotted control shaft of R325 extends through the rear of the chassis housing.

To make the adjustment of the AVC threshold proceed as follows:

1. Disconnect cables to receptacles on transmitter-receiver panel.

2. Loosen screws holding panel to case, withdraw chassis from cas and place it on a support adjacent to modulator-dynamotor.

3. Reconnect cables with the exception of antenna cable.

4. Remove tube V401 from its socket and crimp the bared end of a 10 inch length of insulated wire around pin No. 5 of the tube. Then replace tube in the socket.

5. Connect a vacuum tube voltmeter to the lead attached to tube V401 and to the chassis. Set the meter scale for 0-50 volts or greater.

6. Connect the output of an unmodulated signal generator to the center contact of the antenna receptacle.

7. Rotate the Silencer level control to 0 and place Silencer switch in the OFF position.

8. Switch power onto the radio equipment and allow tubes to heat for five minutes.

9. Adjust the signal generator frequency to the chann l frequency to which the receiver is set.

10. Adjust the output of the signal generator until the voltmeter indicates 25 volts.

11. With a short piece of wire, ground the center terminal of capacitor C351 to the chassis. The meter reading should increase to 27.8 volts. Capacitor C351 is located at the center of the group of three capacitors mounted on the shield between the audio and RF sections of the transmitter-receiver.

12. Should the change in meter reading differ from the value given in step 11 it will be necessary to adjust R325. Loosen the three setscrews in the collar around the shaft of R325 by means of one of the wrenches clipped to the front partition of the multiplier section.

13. Insert a screwdriver in the slotted shaft of R325 and adjust the resistor until the voltmeter reading increases 2.8 volts when C351 is grounded to the chassis.

14. When the correct setting of R325 has been made, tight n the setscrews to lock the shaft in position.

After the adjustment has been made, disconnect the voltmeter, signal generator, and remove lead from tube V401. Disconnect cables from panel receptacles and replace transmitter-receiver in case. Reconnect all cables, including antenna cable, and the equipment may be put in operation.

VOICE MODULATION ADJUSTMENT

1. Disconnect cables from receptacles on the modulator-dynamotor panel and remove the unit from the case after loosening panel holding screws.

2. Place unit on its side on a support and reconnect all the cables.

3. Connect an a-c meter having a resistance of 1000 ohms per volt to terminals 4 and 5 of the modulation transformer T702. Connect a .1 mfd, 500 volt capacitor in one lead of the voltmeter to block direct current from the meter.

4. Plug the microphone extension cord, without microphone, into the microphone jack.

5. Connect the output of a 1000 cycle audio frequency generator through a .1 mfd blocking capacitor to the jack on the end of the microphone extension cord.

6. Adjust the output of the generator to 0.8 volt.

7. Place MCW-PHONE switch in the PHONE position.

8. Place IC-RADIO switch in RADIO position.

9. Switch power onto the equipment and allow tubes to heat for five minutes.

10. Close the press-to-talk switch on the microphone cord. Meter should give an indication of 245 volts.

11. Should the meter reading differ from that given in step 10, adjust R701 by means of a screwdriver until the correct reading is obtained. Resistor R701 is located on the center shield beneath the chassis.

When the adjustment is completed, disconnect the voltmeter and signal generator. Disconnect cables and replace the modulator-dynamotor chassis in the case. After reconnecting cables, the equipment may be put in operation.

MCW MODULATION ADJUSTMENT

1. Follow steps 1, 2, and 3 as described under Voice Modulation Adjustment.

2. Plug key into key jack on panel.

3. Switch power onto the equipment and allow tubes to heat for five minutes.

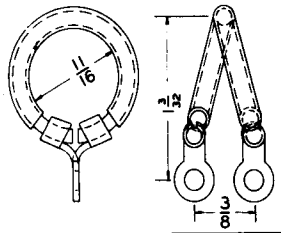
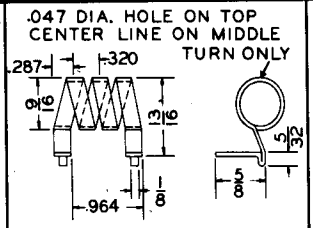
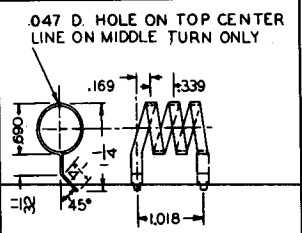
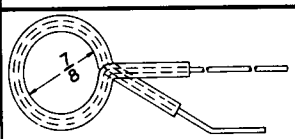
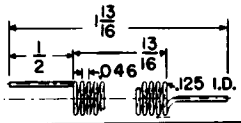
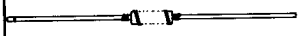
4. Place IC-RADIO switch in RADIO position.

5. Move MCW-PHONE switch to MCW position and press key. The meter should indicate 245 volts.

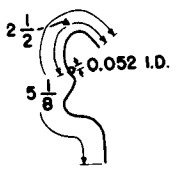
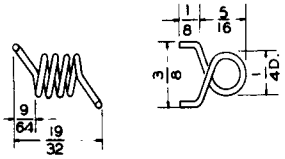
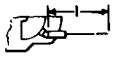
6. Should meter indicate some other value, adjust R725 until a reading of 245 volts is obtained on the meter when the key is depressed. Resistor R725 is located on the shield between the dynamotor and modulator sections on top of the chassis.

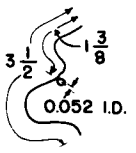
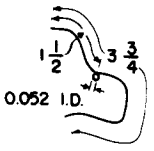
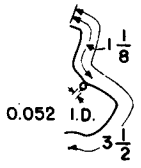
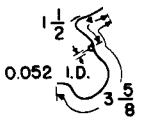
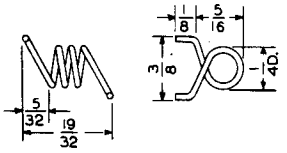
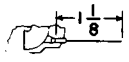
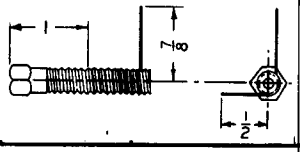
When the adjustment is completed, the voltmeter and cables may be disconnected. Replace the modulator-dynamotor in its case. The cables may then be reconnected and the equipment put into service.

COIL DATA-TRANSMITTER SECTION

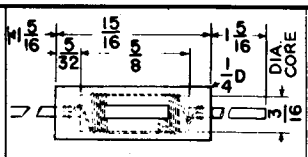
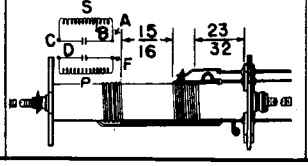
Designation Symbol	RCA Dwg. No.	Diagram	Winding	Wire Size	Turns	D.C. Resistance in ohms	Impedance Ratio	Hi-Pot AC Volts	Remarks
L-101	K-888180-2		Single	No. 12 Tinned Soft Copper	1				
L-102	K-888126-2		Single	0.0201" thick x 1/8" Wide Soft Copper	4				
L-103	K-888126-1		Single	0.0201" Thick x 3/16" Wide Soft Copper	3				
L-104	K-888145-1		Single	No. 8 Annealed Formex	1				
L-114 L-115	K-888936-1		Single	No. 20 Copper	17-1/2				
Z101	K-895045		Single	No. 28 Copper	15				Turns wound close and centered on 680 ohm 1 watt resistor.

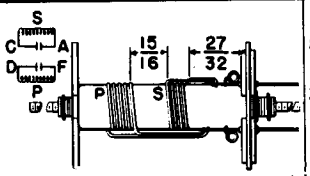
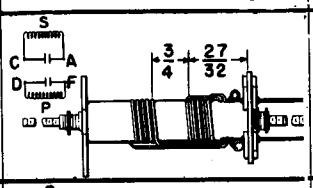
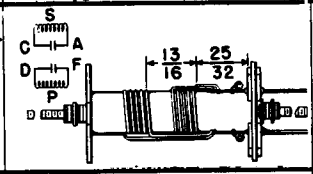
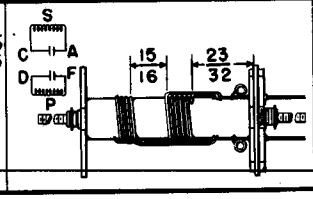
COIL DATA-RECEIVER RADIO FREQUENCY SECTION

L-201	T-618528-23		Single	No. 20 Tinned Soft Copper Bus	1				
L-202 L-205 L-208 L-211	K-889845-1		Single	No. 20 Tinned Soft Copper	4-1/2				
L-203 L-206 L-209 L-212	T-618528-28 29 30 31		Single	No. 20 Tinned Soft Copper Bus	1				

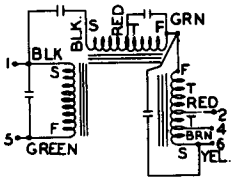
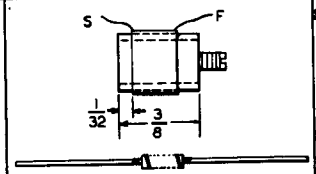
Design. Symbol	RCA Dwg. No.	Diagram	Winding	Wire Size	Turns	D.C. Resistance in ohms	Impedance Ratio	Hi-Pot AC Volts	Remarks
L-204	T-618528-24		Single	No. 20 Tinned Soft Copper Bus	1				
L-207	T-618528-25		Single	No. 20 Tinned Soft Copper Bus	1				
L-210	T-618528-26		Single	No. 20 Tinned Soft Copper Bus	1				
L-213	T-618528-27		Single	No. 20 Tinned Soft Copper Bus	1				
L-214	K-889845-2		Single	No.20 Tinned Soft Copper	3-1/2				
L-215	T-618528-32		Single	No. 20 Tinned Soft Copper Bus	1				
L-217	K-889883-501		Single	No. 20 Tinned Copper Bus, 8" long	6-1/2				
L-218	K-8855365-1		Single	No. 24 Copper	16				

COIL DATA—RECEIVER INTERMEDIATE FREQUENCY SECTION

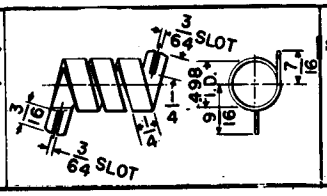
L-301 L-302 L-303 L-304 L-305	K-888776-1		Single	No. 30E Copper	45	0.3			Impedance at 50 MC, 500 ohms
Z-301	T-618106-501		Secondary Primary	No. 18 Tinned Copper No. 18 Tinned Copper	5-3/4 4-3/4				Term. A to C 0.65 mh D to F 0.51 mh

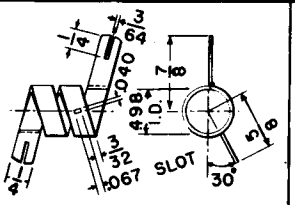
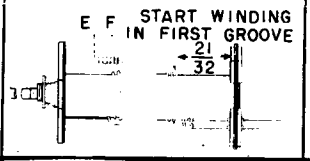
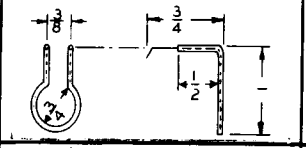
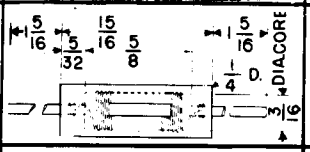
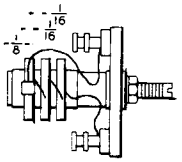
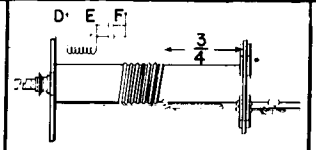
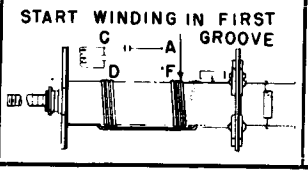
Designation Symbol	RCA Dwg. No.	Diagram	Winding	Wire Size	Turns	D.C. Resistance in ohms	Impedance Ratio	Hi-Pot AC Volts	Remarks
Z-302	T-618106-502		Secondary Primary	No. 18 Tinned Copper No. 18 Tinned Copper	4-3/4 4-3/4				Term. A to C 0.51 mh D to F 0.51 mh
Z-303	T-618106-503		Secondary Primary	No. 18 Tinned Copper No. 18 Tinned Copper	4-3/4 4-3/4				Term. A to C 0.50 mh D to F 0.50 mh
Z-304	T-618106-504		Secondary Primary	No. 18 Tinned Copper No. 18 Tinned Copper	4-3/4 4-3/4				Term. A to C 0.50 mh D to F 0.52 mh
Z-305	T-618106-505		Secondary Primary	No. 18 Tinned Copper No. 18 Tinned Copper	5-1/4 4-1/4				Term. A to C 0.57 mh D to F 0.49 mh

COIL DATA—RECEIVER AUDIO FREQUENCY SECTION

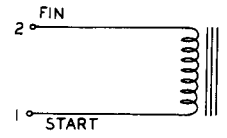
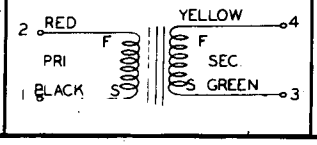
Z-401	K-901616-501		Coil#1 Primary #1	No. 39 H.F.	3400 Tapped at 2350	428		1500	Reactor adjusted to resonate shunt circuit at 7000 cycles ± 5%.
			Coil#2 Primary #1	No. 35E Copper	560	36			Reactor adjusted to resonate total circuit at 870 cycles ± 5%
			Primary #2	No. 35E Copper	258	29			
			Coil #3 Primary #1	No. 41 H.F.	5500	1102			Reactor adjusted to resonate circuit at 1050 cycles ± 5%
			Primary #3	No. 39E Copper	2180	448			Complete assembly vacuum impregnated in Trotter's Compound.
Z-402	R-722615-501		Single	No. 30E Copper	32				Natural resonant frequency between 32 and 40 MC.
			Single	No. 30E Copper	14				Natural resonant frequency shall be above 400 MC.

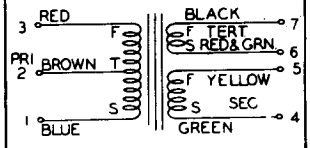
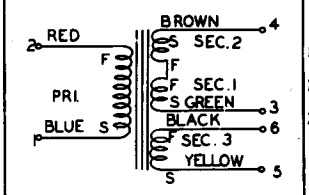
COIL DATA—FREQUENCY MULTIPLIER SECTION

L-501	P-727334-2 K-893999-1		Single	0.032" thick x 1/4" wide soft copper	3				

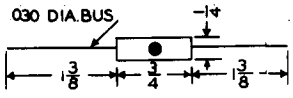
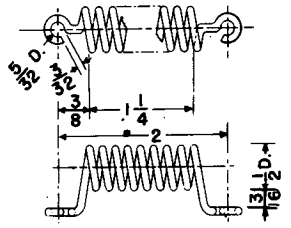
Design. RCA Symbol / Dwg. No.	Diagram	Winding	Wire Size	Turns	D.C. Resistance in ohms	Impedance Ratio	Hi-Pot AC Volts	Remarks
L-502 R-727334-6 K-893976-501 K-893974-1		Single	0.032" thick x 1/4" wide soft copper	2				
L-504 T-618106-507		Single	No. 18 Tinned Copper	2-3/4				Term. E to F 3.92 mh
L-505 T-618529-71		Single	No. 18 Tinned Copper Bus	1				
L-506 K-888776-1 L-507 L-509		Single	No. 30 Tinned Copper	45	0.3			Inductance at 50 D.C, 500 ohms.
L-510 K-899941-501		Three	No. 38 Enameled Copper - Single Silk Covered	125 per winding				
Z-501 T-618106-508		Single	No. 11 Tinned Copper	6-7/8				Term. D to E 0.43 mh
Z-502 T-618106-506		Single	No. 18 Tinned Copper	29-3/4				Term. C to D 4.40 mh

COIL DATA-MODULATOR SECTION

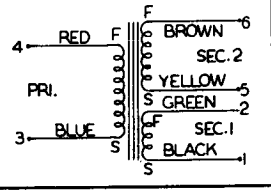
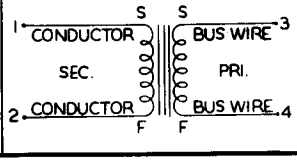
L-701 K-901801-501		Single	No. 34	1310	50		500	Air gap adjusted to obtain impedance of 150 ohms min. at 1000 cycles with 0.015 amp. in winding.
T-701 K-901788-501		Primary Secondary	No. 38 E. Copper No. 38 E. Copper	1050 2100	98.5 217	2:1	1000	Polarity additive with terms. #2 and #3 connected. Inductance - 1.31 Henrys at 1 volt, 1000 cycles, and 0 ampere D.C.

Designation Symbol	RCA Dwg. No.	Diagram	Winding	Wire Size	Turns	D.C. Resistance in ohms	Impedance Ratio	Hi-Pot AC Volts	Remarks
T-702	K-901821-501		Primary Secondary Tertiary	No. 32 E. Copper No. 37 E. Copper No. 29 E. Copper	1956 Tapped At 978 2410-1/2 80	136 615 3.3	Tert. to total pri. 1:24.5 Tert. to secondary - 1:30.0	1500	Polarity additive with terms. #3 connected to #4 and #6. Gap adjusted for primary impedance of 2800 ohms min. at 30 volt, 60 cycles with 0.060 amp. D.C. in total winding. Inductance at terminals #6 and #7, with 1, 3, 4, & 5 shorted, not to exceed 0.0003H at 3 v. 1009 cycles.
T-703	K-901787-501		Secondary #1 Secondary #2 Reverse Primary Secondary #3	No. 42 E. Copper No. 42 E. Copper No. 33 E. Copper No. 40 E. Copper	4085 4085 230 470	2220 2220 18 170	Primary to Secondary #1 and #2 - 1:35.5 Primary to Secondary #3 - 1:2.04	500	Polarity additive with term. #2 connected to #4 and term. #3 connected to term. #5. Stacked to get primary impedance of 950 ohms at 3 v. 60 cycles, with 0.050 amp. D.C.
Z-701 Z-702 Z-703 Z-704	P-722632-502 P-722615-502 K-888994-502		Single	No. 30 E. Copper, 6" long	14				Natural resonant frequency shall be above 400 MC.

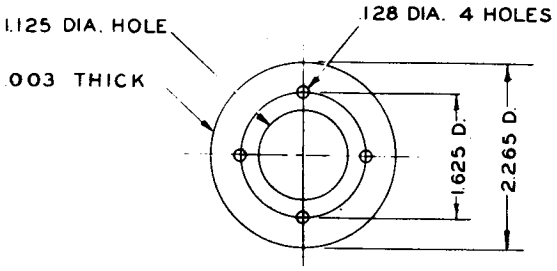
COIL DATA-DYNAMOTOR SECTION

L-802 L-803	K-889568-2		Single	No. 24 Copper	29 close wound				
Z-801 Z-802	K-888570-501		Single	0.102" Dia. Tinned Copper	8				

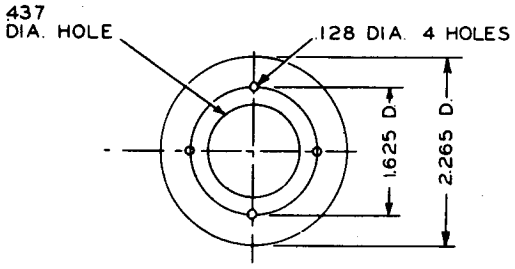
COIL DATA-REMOTE BOX

L-1201	K-901791		Pri. Sec. 1 Sec. 2	#37 copper #32 copper #37 copper	2781/2 760-1/2 638-1/2	84 14 80	Sec.1 to Pri 2.78 to 1 Sec.2 to Pri 1.19 to 1	500 V	Polarity to be additive with term #2 connected to #3 and #5.
L-1202	K-901814		Pri. Sec.	#32 copper #37 copper	559 559	14.9 49.8	1 to 1	500 V	Polarity additive with term. 2 connected to term. 3.

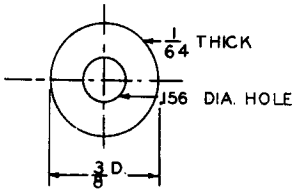
INSULATOR DATA



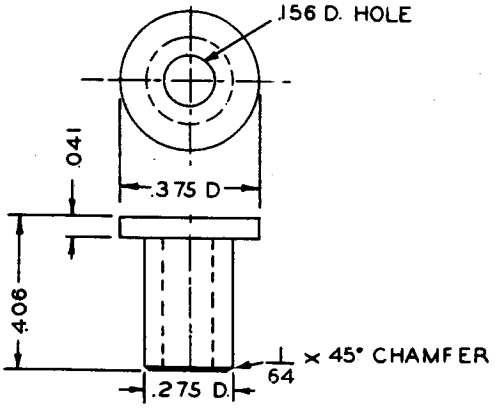
E102 Mica - PS97
(fair stained)



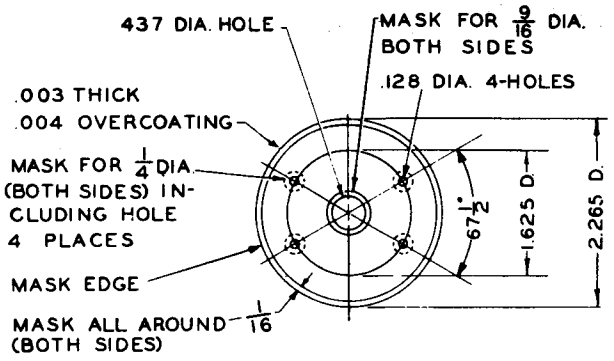
E103 Mica - PS97
(fair stained)



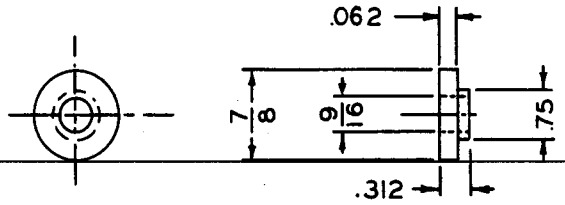
E104 Mica - PS97
(fair stained)



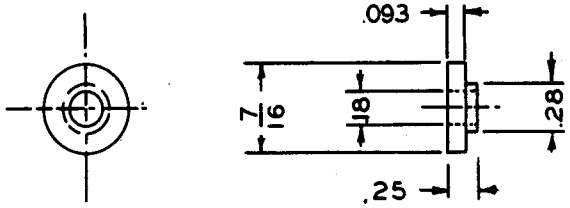
E105 Bakelite (nat)



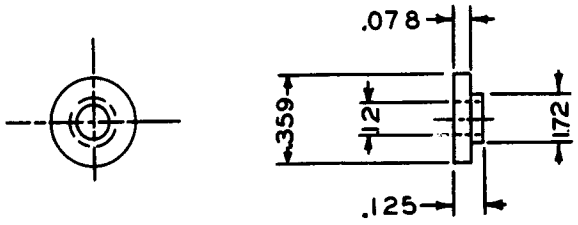
E107 Mica - PS97
Silver coat both sides



E122 Bakelite (nat)

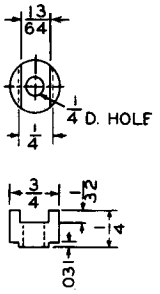


E129 Bakelite (nat)

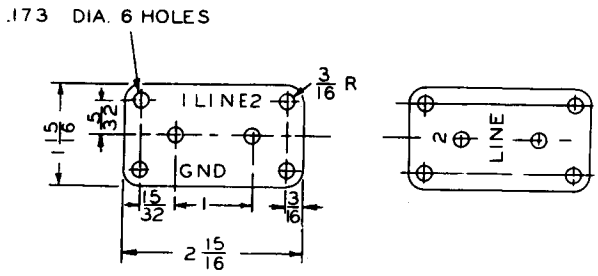


E131 Bakelite (nat)

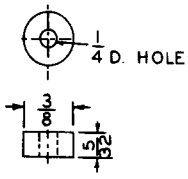
INSULATOR DATA *(CONT'D)*



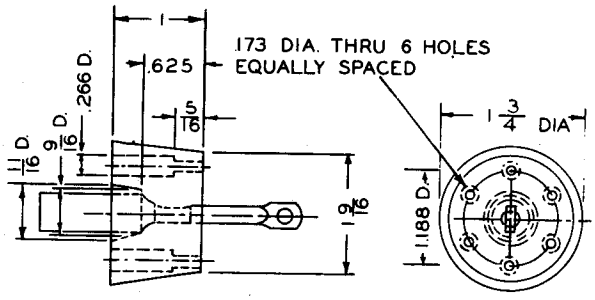
E504 Ceramic Steatite
Grade G



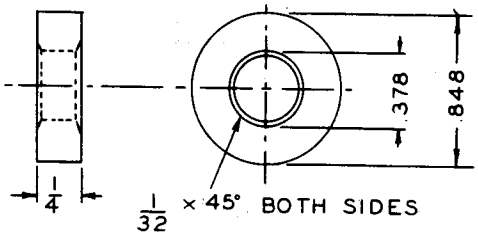
E701



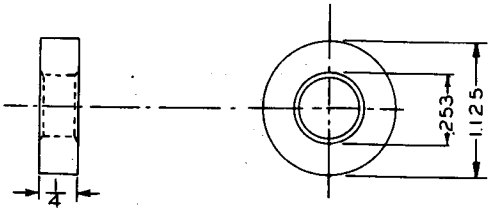
E506 Steatite
Grade L-4



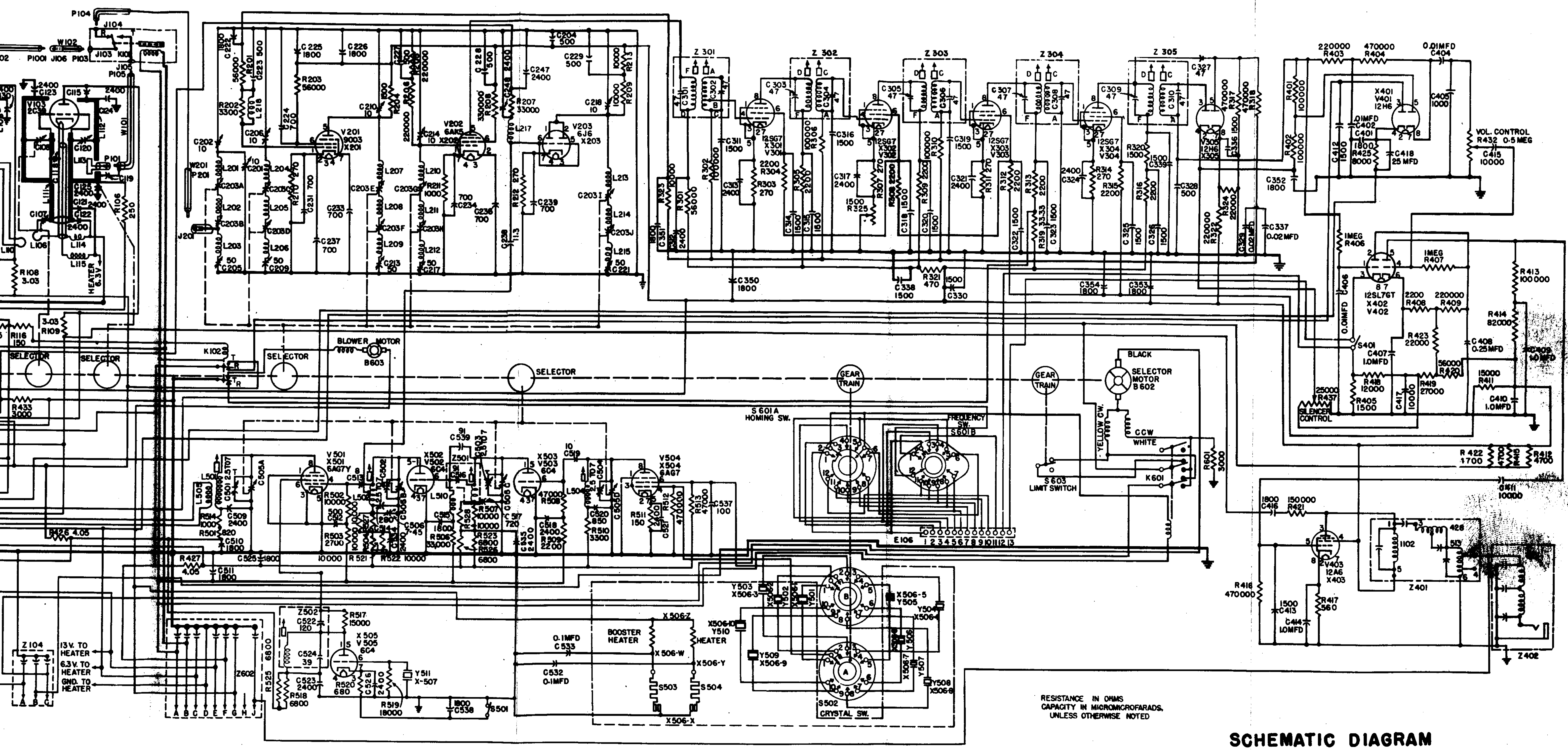
E1001 Styramic



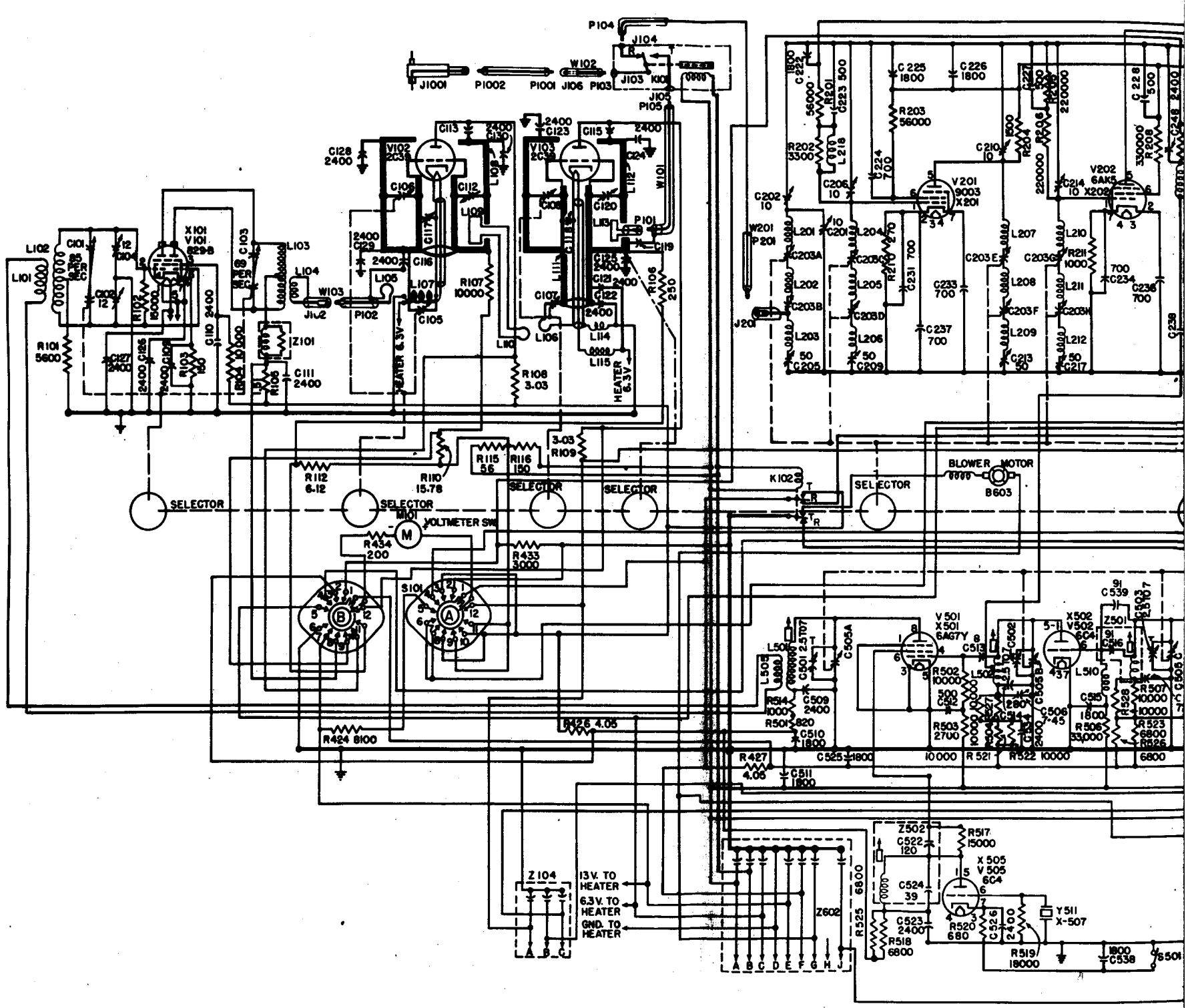
E1005 Styramic



E1006 Styramic



SCHEMATIC DIAGRAM
TRANSMITTER-RECEIVER
W-308630


SELECTOR
VOLTMETER SW
BLOWER MOTOR
B603
K102
Z104
13 V. TO HEATER
6.3 V. TO HEATER
GND. TO HEATER
Z602
HEATER 6.3V
V201 9003 X201
V202 6AK5
V501 6AG7Y
X502 V502 6CA7
X505 V505 6C4
Y511 X-507

TRANSMITTER-RECEIVER DISMANTLING

Maintenance procedures will, on occasion, require the removal of one or more of the sections of the transmitter-receiver for repair or replacement of defective parts. The instructions to follow describe the proper methods to employ in the removal and replacement of each of the four sections on which servicing cannot always be satisfactorily performed with the unit in the chassis. The procedures should be followed in detail, not only to expedite the work but to eliminate danger of damaging the units beyond repair.

It is very important that all parts removed be carefully retained and the units handled with care and protected from dust and dirt. This is a major consideration in all work done on the transmitter and selector mechanism. These sections of the equipment employ numerous mechanical assemblies built to close tolerances and their life and freedom from trouble depend largely upon the retention of the accurate construction originally built into the assembly. To this end, all wearing parts, particularly bearings and gears, should be protected from dust and dirt while the equipment is disassembled. Car must also be exercised in handling to avoid mechanical damage and misalignment of the various parts of the assemblies.

The proper operation of the multiplier and RF sections depends to a great extent upon proper lead dress in the units. Should it be necessary to remove the covers of these units, every precaution must be taken to avoid disturbing the position of the leads in the units.

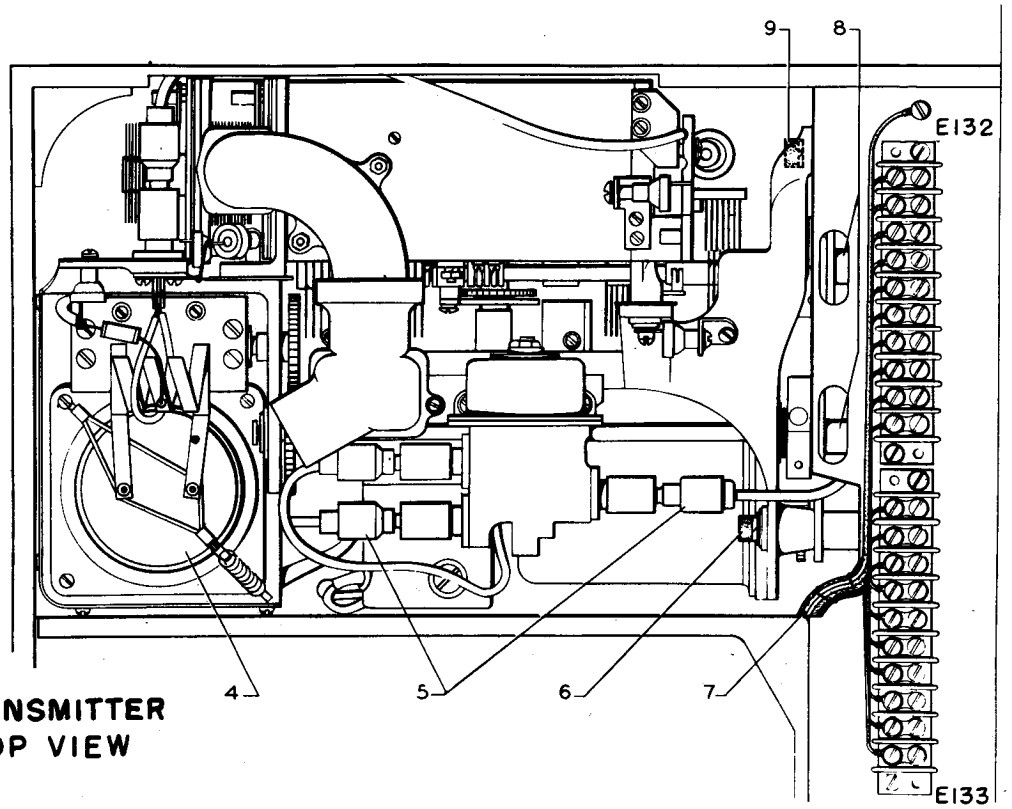
TRANSMITTER REMOVAL

The transmitter forms a complete assembly and may be removed as a unit from the chassis. It is important that thes instructions be read over carefully and thoroughly understood before undertaking the work. The numbers on the various steps in dismantling also refer to the numbers on the accompanying illustrations. The proper procedure is as follows:

1. Disconnect all cables from the transmitter-receiver, loosen the screws holding the panel to the case and withdraw the chassis from the case.

2. Place the chassis on a bench or table, standing it n end with the transmitter at the top.

3. Remove the cover over the selector dials by loosening the screws around the edge. Withdraw the crystal oven and put aside.



TRANSMITTER
TOP VIEW

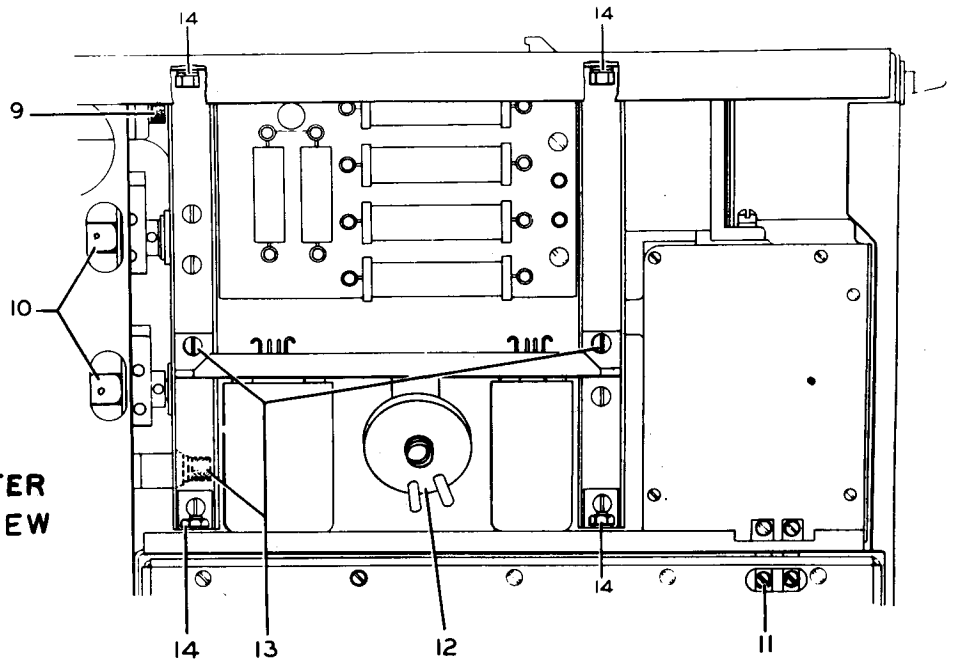
4. Remove the 1st IPA tube by loosening the sling, unclipping the plate leads, and withdrawing tube from socket. Set tube aside carefully.

5. Disconnect two of the coaxial cables to the antenna transfer relay K101 by unscrewing the clamping sleeves on the plugs attached to the cables.

6. Remove the knurled head machine screw in the casting adjacent to the selector motor. An allen wrench, clipped to the shield in the multiplier section should be used in removing this screw. Provide a clean receptacle to hold this and other parts that may be removed.

7. On the top of the chassis, disconnect the wires, that branch out from the laced cable in the transmitter compartment, from terminal strips E132 and E133. Disconnect wire t ground lead at end of terminal strip E132. Replace screws in terminal strips.

8. Two elongated holes in the top of the shield of the selector mechanism give access to two of the couplings connecting the selector dials to the tuning shafts in the transmitter. Insert a long allen wrench and loosen but do not remove the two setscrews in the half of each coupling nearest the selector. T reach th setscrews it will be necessary to unlock the dial of the sel ctor connect d to the coupling and



TRANSMITTER
BOTTOM VIEW

rotate the shaft by turning the dial until the wrench can be fitted into the setscrews. When the setscrews are loose, slide the coupling-half toward the selector, thus separating the coupling. Break both couplings in the same manner. Should the two halves of the couplings fail to completely clear each other, they may be sprung apart with a screwdriver blade.

9. Remove the two knurled screws in the casting, accessible from the top end of the chassis, by means of the short end of an allen wrench.

10. Turn the chassis around and break the two couplings accessible through the elongated holes in the bottom of the selector mechanism shield. Follow the procedure given in step 8.

11. Loosen, but do not remove, the four screws clamping the straps connecting the 1st IPA section of the transmitter to the multiplier section directly below the transmitter. These screws are reached through two slots in the shielding. Slide the straps into the multiplier housing and temporarily tight n the screws.

12. Loosen the screw in the center of the ceramic resistor R601 one full turn.

13. Remove the two screws in the transverse bar supporting relays, K102 and K601. Be careful of the loose spacer at the right end of the bar.

Swing the relay assembly up, being careful not to strain the leads on the resistor, and remove the knurled head screw in

the casting adjacent to the selector motor. Replace the relay assembly and fasten in place with the screws previously removed.

14. Loosen, but do not remove, the four nuts at the ends of the vertical bars supporting relays, K102 and K601, and resistor terminal board, E118.

15. Place the chassis flat on the bench and lift out the transmitter assembly, taking care that the coaxial cables disconnected from the antenna transfer relay (step 5) are not damaged in the process. The selector motor gearing will disengage as the transmitter is lifted out of the chassis. Further dismantling of the unit should be done in the manner described under the heading of the particular part to be repaired.

TRANSMITTER INSTALLATION

As a general rule, the transmitter is replaced in the chassis by a procedure practically the reverse of its removal, with slight modifications in the sequence of operations. The steps are summarized as follows:

1. Place chassis, bottom down, on a work table or support

2. Run nuts on studs at the bottom of the transmitter compartment out to the end of the threads and slide washers out to nuts.

3. Lower the transmitter unit into place, taking care that the coaxial cables in the chassis are clear of the unit. Rocking the unit slightly will let the notched bars slip into place on the studs and allow the selector motor gears to engage.

4. Replace knurled screw through the casting above the selector motor, do not tighten the screw.

5. Replace two knurled screws removed from casting at end of unit (disassembly step 9). Do not tighten the screws.

6. Stand chassis on end, transmitter up. Remove relays as in step 13 of dismantling instructions and replace knurled scr w in casting adjacent to selector motor and tighten.

7. Tighten the three knurled scr ws previously inserted

at the end and top of chassis. This should properly align th transmitter and selector mechanism.

8. Replace the relay supporting bar and tighten. Tighten the screw in the center of resistor R601.

9. Tighten the four nuts at the ends of the vertical bars supporting the resistor board, E118, and relays, K102 and K601.

10. Loosen screws and reconnect the straps between multiplier and 1st IPA section of the transmitter.

11. Reconnect the four couplings between selectors and transmitter tuning shafts in the following manner. Slide the coupling on the selector shaft out until the pin engages in the spring loop on the member on the transmitter tuning shaft. Allow one-sixteenth inch gap between the coupling halves and tighten both setscrews in the coupling on the selector shaft.

12. Reconnect the two coaxial cables to the antenna transfer relay.

13. Reconnect leads to ground and to terminal strips E132 and E133.

14. Replace 1st IPA tube, V101, in the socket and replace spring retaining cord. Reconnect clips on plate terminals of tube.

This completes the assembly, but it will be necessary to realign the dials because the relationship between selector mechanism and tuning shafts has been disturbed in the process of disconnecting and reconnecting the couplings.

To make this final adjustment, unlock the four transmitter tuning dials. Rotate each capacitor control dial until the variable capacitor it adjusts is at minimum setting. The position of the capacitor rotors may be determined by observation. Capacitors for the 2nd IPA and PA stages are visible from the top of the chassis and the capacitor for the 1st IPA is located below the plate inductance L103, adjacent to tube V101. Lock the dials when capacitors are properly set by depressing the lever on the dial knob.

The three dials should now read zero and correction, if necessary, can be made by loosening the screw on the face of dial and rotating the dial plate until the 0 mark on the plate coincides with the indicator V on the panel.

To adjust the Ant. dial, remove the PA tube, V103, by loosening the locking clip and withdrawing tube. Rock the dial

and observe the movement of the coupling loop inside the PA resonant cavity through the opening in the case normally closed by the tube. Adjust the dial until the long side of the loop is parallel to the axis of the inner tubular conductor of the resonant chamber.

Lock the dial when the coupling loop has been properly set. The dial reading should be 50. If correction is necessary, the dial plate may be adjusted by loosening the screw on the face of the dial and shifting the plate to the proper position. Replace the tube in the socket after the dial has been set.

Should it be found impossible to set any of the dials to z ro by moving the dial plate it will be necessary to loosen the setscrews on the selector half of the coupling when the coupling loop or the capacitors are in the correct position for calibrating, that is, long side of the coupling loop parallel to the axis of the inner tubular conductor of the resonant cavity or minimum mesh of the capacitor plates. Rotate the selector dial to approximately the correct setting and tighten the setscrews. Final adjustment of the dial setting can then be made by adjusting the dial plate.

It is advisable to check the equipment for resetability before returning the chassis to the case. To do this, connect all cables and tune the equipment, by the procedure described on pages 3-24, 25, to three channel frequencies, one at the high frequency end of the band, one at the low frequency, and the third at about the middle of the band.

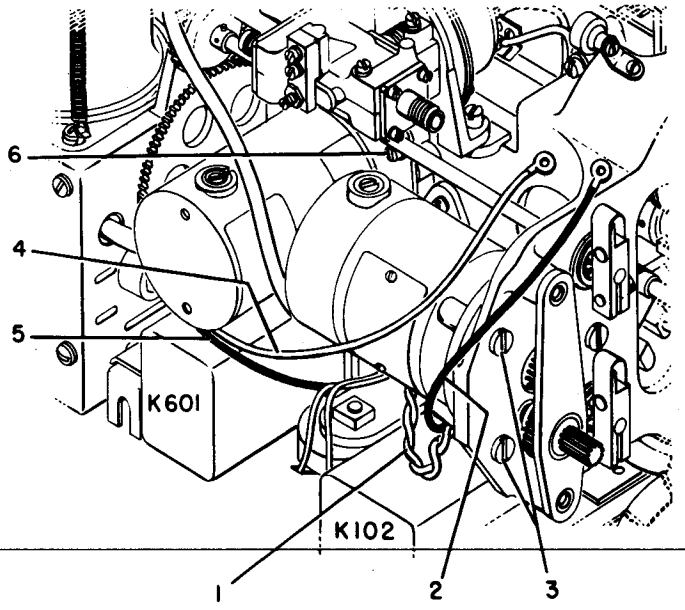
With the equipment switched on and the meter selector switch on position 12, move the channel selector to switch the equipment from one to the other of the three channel frequencies several times. Check the setting at each frequency by moving the MCW-PHONE switch to MCW on each frequency and note the radiation as indicated by the meter. Failure to obtain an indication within 10 per cent of the reading of the meter when the equipment was tuned indicates defective resetting of the selector mechanism.

Failure of the selector mechanism to properly reset may be due to mechanical misalignment of the transmitter. This condition can usually be corrected in the following manner.

Stand the transmitter-receiver chassis on a support, with the panel at the top. Partially loosen all the screws and nuts holding the transmitter in the chassis. Refer to dismantling procedure. Operate the selector mechanism several times to allow transmitter to adjust its position and gradually tighten all screws. Check the equipment for resetability as described above.

When the selector resets properly, the chassis may be replaced in the case and tightened in position. Cables should be connected and the transmitter retuned.

MOTOR REMOVAL



SELECTOR MOTOR

After removing the transmitter from the chassis it is a simple matter to dismount the selector motor for repair as described in the following:

1. To disconnect motor leads, stand the transmitter on end, couplings up, and remove the two screws through the bar supporting the two relays, K102 and K601, on the bottom of the unit. Loosen the screw in the center of R601 one turn. Swing the relays around until it is possible to reach the terminals of relay K601. Slide back the sleeving on the white and yellow leads from the selector motor and unsolder the leads from the relay terminals. Make a note of terminals of relay to which wires were connected.

2. Free the black lead to the motor from the laced cable.

3. Remove the three binder head screws holding the motor housing to the casting and lower the motor free of the assembly by tilting it to clear the blower motor.

The motor can be replaced by performing the dismounting operations in the reverse order. As motor mounting screws are tightened, make sure the rotor turns freely and the gear on the shaft meshes snugly with the gear assembly in the transmitter frame. Make certain the gears do not bind.

BLOWER MOTOR

The blower motor can be readily removed by the following procedure.

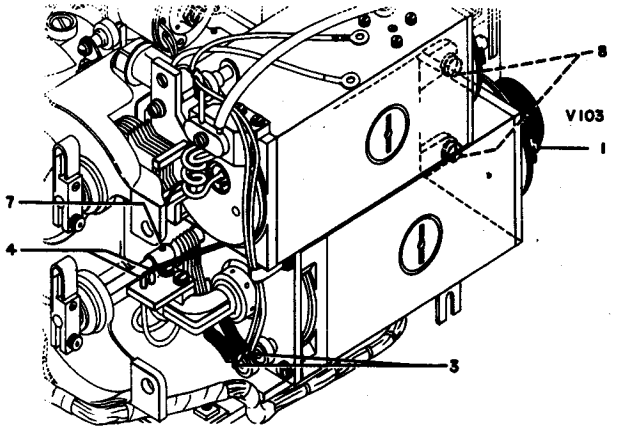
4. Free the red lead to motor from the laced cable.

5. Dismount the relay supporting bar as described in step 1 of procedure for dismounting selector motor and unsolder the black lead of the blower motor from the terminal on relay K102.

6. Remove the three binder screws in the plate attached to the motor and slide motor and blower wheel free of the casting forming the blower housing.

The motor can be replaced by reversing the above procedure.

DISMOUNTING PA RESONANT CAVITY



1. Release the clip holding the PA tube V103 and remove the tube from the socket.

2. Unsolder plate lead on post alongside tube socket.

3. Unsolder heater leads from terminals of capacitors C121 and C122 on front end of unit.

4. Unsolder the two stiff leads to the terminals of the coupling loop on the terminal strip mounted on the elbow member at the front end of the assembly.

5. Remove screws holding the bar supporting the relays on the bottom of the unit and swing relays, K102 and K601 away from chassis. Remove the screw adjacent to the casting that supports the antenna coupling loop gearing on the inner side of the PA casing. This screw extends into the end casting of the PA resonant cavity. Carefully lay aside both insulating bushing and mica washer used with the screw.

6. Disconnect the coaxial cable connected to the receptacle on the gear assembly on the side of the PA casing.

7. Loosen the two set screws in the rotor of the variable capacitor C107 at the front end of the casing and withdraw the control shaft from the rotor core by grasping the coupling.

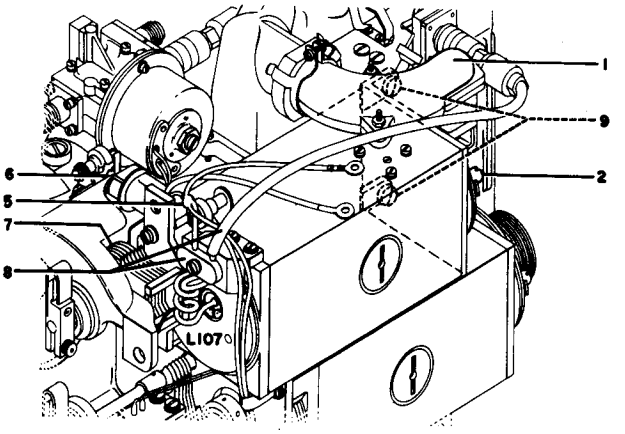
8. Remove the two screws in the lugs at the tube socket end of the resonant cavity. Removing these screws will loosen straps connecting to capacitors C124, C123, and C130. Note carefully the arrangement of these straps and lay aside the insulating bushings and mica washers that come loose with the screws.

The PA casing can then be removed from the assembly and necessary repairs or replacements made.

It is extremely important that the tuning shafts in this unit and in the 2nd IPA be properly aligned when remounting the unit and that no distortion is caused by improper placement of insulating washers or other parts. It will be impossibl to align the tuning of the units if such distortion is present. Failure of the tuning shafts, to slip smoothly into the rotor cores of the input tuning capacitors on either resonant cavity is an indication of misalignment that must be corrected by adjusting the mica spacers under the mounting lugs on the units or shifting the position of the unit under the mounting screws.

Replacement of the PA unit may be accomplished by reversing the order of the steps in the disassembly instructions. All soldered connections must be carefully made. Alignment of the resonant circuits of the unit may be done by following the instructions on page 7-129.

DISMOUNTING 2ND IPA RESONANT CAVITY



With the transmitter section out of the chassis proceed as follows:

1. Remove plastic air duct above casing.

2. Release the clip holding the tube V102 and remove tube from the socket.

3. Unsolder plate lead on post alongside tube socket.

4. Unsolder heater lead from outer sleeve of input coil L107.

5. Unsolder heater lead from terminal post at top of insulating strip supporting the stator of input tuning capacitor, C105.

6. Insert the new part from spares and reassemble in the reverse order to the preceding instructions. The entire socket assembly may then be replaced in the cavity by reversing the procedure given in steps 1 to 3.

7. Loosen set screws in front end of input tuning capacitor core and withdraw drive shaft by grasping coupling.

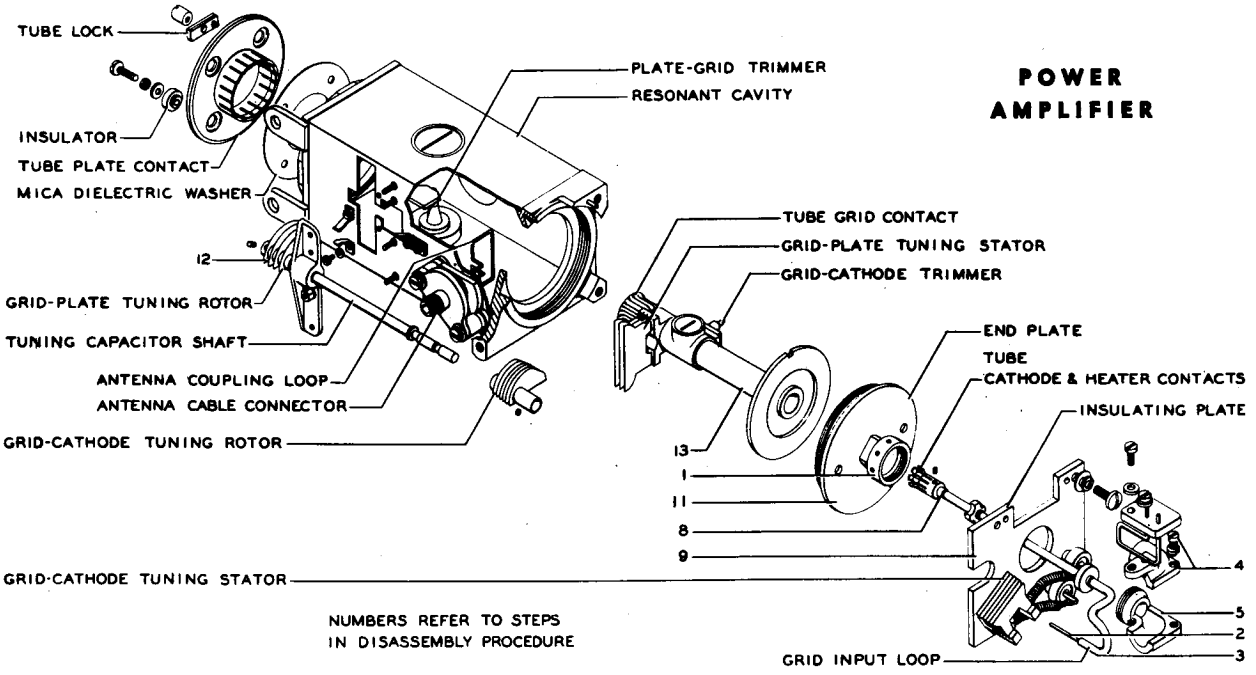
8. Loosen clamp on input loop and remove black coaxial cable.

9. Remove two screws holding back end of casing to casting. Note carefully relative positions of insulating washers and lugs released by removing these screws.

The casing can then be lifted from the transmitter chassis.

Replace the unit by following the above steps in the reverse order. Refer to description of PA replacement for precautions to be taken in replacing the 2nd IPA resonant cavity.

PA DISASSEMBLY



The description of the disassembly of the PA unit has be n divided into several parts, each covering one stage of the complete disassembly procedure. Extreme care must be taken to avoid bending or straining parts of the unit as they are removed or replaced. The numbers on the various steps in the procedure also reference the numbers in the exploded view of the unit.

REMOVING CATHODE-HEATER ASSEMBLY

1. Loosen knurled collar from elbow member by inserting spanner wrench or similar tool in holes in the collar and turning until collar is free.

2. Unsolder center lead of concentric conductors forming heater feed.

3. Heat soldered connection of outer concentric heater conductor where it is connected to the stator of the variable capacitor and withdraw the socket assembly from the resonant cavity when the solder softens.

The socket at the end of the concentric lead can then be tested and necessary repairs made. To install a new socket and lead assembly proceed as follows:

4. Remove screw in top of elbow member and lift top half of shield.

5. Withdraw socket assembly from lower half of elbow member.

6. Insert the new part from spares and reassemble in the reverse order to the preceding instructions. The entire socket assembly may then be replaced in the cavity by reversing the procedure given in steps 1 to 3.

Should the socket assembly develop trouble with no spare part available it may be necessary to make emergency repairs. To disassemble the socket for this purpose proceed as follows:

7. Drill out the three detent notches around the base of the socket outer shell.

8. Heat the solder where the outer shell fastens to the coaxial heater leads and slide outer shell back on lead when solder softens.

This will give access to the inner contact of the socket assembly, which may be removed by loosening the setscrew in the insulating collar.

The socket is reassembled by reversing steps 7 and 8. The outer shell of the socket may be staked in place by denting the outer shell with a center punch at points between the holes drilled in the shell.

REMOVING GRID ASSEMBLY

Proceed as in removing the cathode-heater assembly except that it will not be necessary to unsolder the heater leads. This can be avoided as follows:

9. After loosening collar, remove the three screws in the corners of the insulating plate on the front of the unit.

10. Swing rotor of input tuning capacitor, C107, and remove heater lead and insulating plate carrying stator of input tuning capacitor as a unit.

11. Insert a spanner wrench or similar tool in the blind holes in the round plate in the front end of the casing, unscrew and remove the plate.

12. Rotate the plate-grid tuning capacitor, C108, until the rotor is outside the case.

13. Carefully withdraw the tubular assembly from the case. Do not use force but gently work it past the trimming capacitor rotor and antenna coupling coil until it is free of the case.

With the assembly removed from th case, the necessary re-

pairs can be made. The grid-c thode trimmer capacitor is mounted on the side of the assembly, opposite to the grid-plate variable capacitor stator.

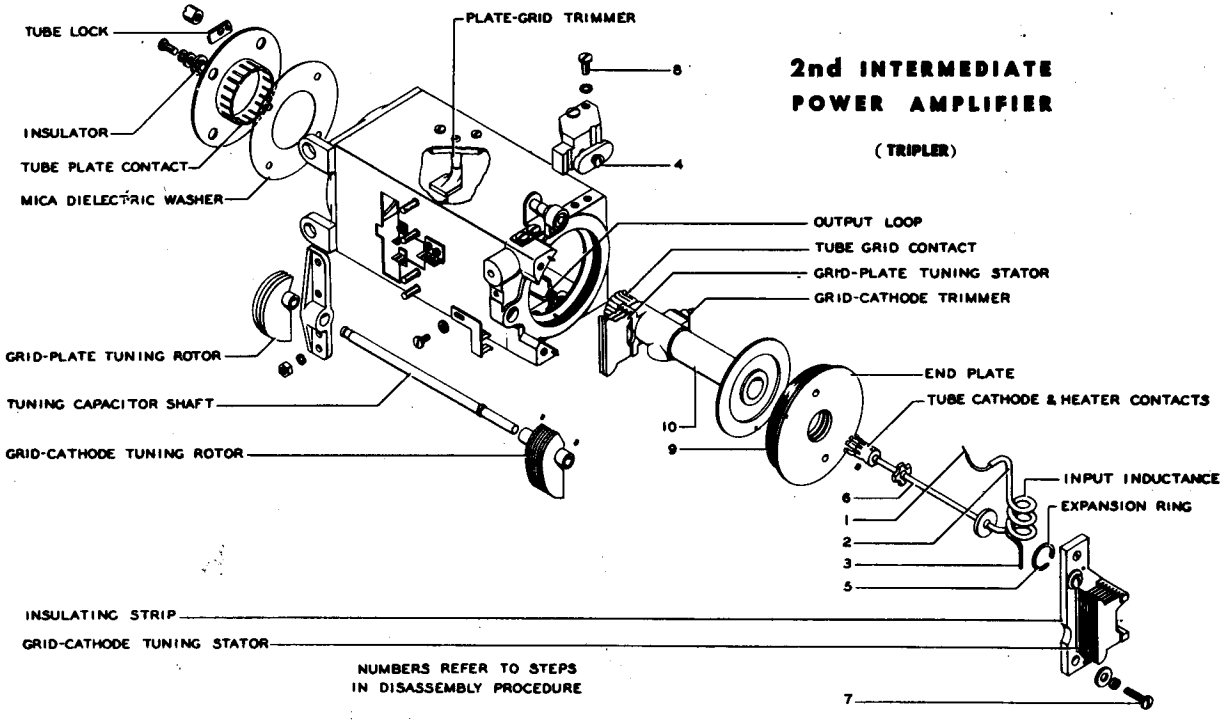
Replacement of the grid assembly will involve a reversed procedure to that given above in steps 8 to 12. Make sure the slot in the end plate of the grid assembly engages the pin in the face of the recessed flange in the casing before replacing the end plate.

General

Dismantling of the variable capacitor tuning shaft is obvious on examination. Care must be exercised to prevent the loss of the loose balls that form friction free bearings for the shaft where it passes through the bearing supports.

Removal of the antenna coupling loop or the plate-grid trimmer will require the removal of the grid assembly as described previously. From that point on the procedure is obvious.

2ND IPA DISASSEMBLY



Procedure for disassembling this unit is similar in principle, differing only in details, to that used with the PA unit. The illustration is an exploded view of the unit and its similarity to the PA unit will be evident. Numbers in the illustration refer to steps in the following procedure.

REMOVING CATHODE-HEATER ASSEMBLY

1. Unsolder center conductor of heater supply leads at post on insulating strip.

2. Unsolder heater leads and capacitor, C116, which are connected to cathode-heater assembly.

3. Unsolder tap lead on input inductance where it connects to the stator of the input tuning capacitor, C105.

4. Loosen screw and remove the clamp supporting the upper end of the input inductance and coupling coil from output of 1st IPA.

5. Insert tips of needle point pliers in the holes in the ends of the expansion ring in the center of the end plate of the assembly. Compress and remove the ring.

6. Withdraw coaxial conductor and socket assembly from center tube.

A new part may be installed by reversing the above procedure or repairs to the socket may be made as described under step 6 of PA unit disassembly.

REMOVING GRID ASSEMBLY

After the socket assembly is removed as described in steps 1 to 5, the grid assembly may be removed as follows:

7. Loosen screws and remove insulating plate supporting stator of input tuning capacitor, C105.

8. Loosen screws and remove insulating bracket on top edge of casing.

9. Unscrew end plate from casing.

10. Carefully withdraw grid assembly from casing.

All parts of the unit are now readily accessible for repair or replacement. Reassemble the unit by reversing the above procedure.

TRANSMITTER ALIGNMENT

With normal usage, alignment of the MAR transmitter section is confined to the steps described under tube replacement on page 5-10. This procedure should suffice to maintain transmitter efficiency after tube replacement or other minor servicing. The replacement of important tuning components necessitated by accident or other contingency may make it necessary in some instances to readjust trimmer and inductance relationships for proper power output. Under other circumstances, however, major realignment is not required.

Use of panel meter M101 simplifies realignment of the transmitter since all measurements may be made with this meter. The only other equipment required is a tuning wand with a powdered iron core at one end and a copper core at the other end. This wand, which is necessary for checking circuit resonance, may be constructed from thin one-quarter inch insulating tubing, a piece of copper, and a salvaged powdered iron core. Due to space limitations, the cores must be installed in an "L" at each end of the wand, with the "L" portion not over three-quarters of an inch in overall length.

WARNING:

As a reminder, extreme caution must be exercised when making adjustments since some must be made with plate voltages applied. Plate tank coils, in some instances, must be aligned while containing both DC and RF voltages. Use an insulated tool in all cases and keep one hand away from the equipment when making adjustments. It should also be noted that the end plates of the resonant chambers adjacent to tubes V102 and V103 are at a potential of 365 volts d.c. Do not touch these parts while power is on.

For uniform output throughout the MAR frequency range, the transmitter must be aligned at the band limits, as well as at the approximate mid-point of the tuning range. Crystals should, accordingly, be selected for transmitting frequencies of 225 mc, 300 mc, and 390 mc, and the transmitter tuned to these channels as described on pages 3-24, 25. This will expedite the more-critical alignment operations inasmuch as all circuits will then be approximately at resonance and ready for the final adjustments.

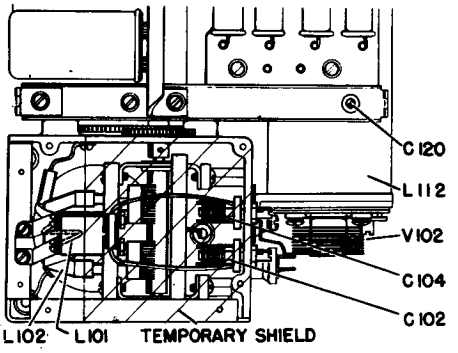
A. 1ST IPA ALIGNMENT

1. Disconnect all cables and remove the transmitter-receiver chassis from its case.

2. Turn the chassis on its back, so that all adjustments may be made without moving the chassis, and reconnect all cables.

3. Remove the shield at the bottom of the 1st IPA compartment and set capacitors C102 and C104 to one-half of maximum capacity. The drawing shows the location of these as well as the other tuning components mentioned in these alignment instructions.

1ST IPA
BOTTOM VIEW



4. Inspect coupling loops L101 and L104 to make certain they are spaced symmetrically around tank coils L102 and L103, respectively

5. Replace the permanent shield on the 1st IPA compartment with a temporary cover approximately 3-1/4 inches square to permit adjustment of L101 and L102. Fasten securely with the screws removed. The cross hatched portion of the illustration indicates the size of the temporary cover.

6. Turn the power on and permit the equipment to warm up at least five minutes before making adjustments. Set the IC-Operate switch, S703, in the Tune position and MCW-Phone switch, S702, in the MCW position.

7. Rotate the selector knob to the 390 mc channel and the met r switch to position 8. In this step and in all future steps requiring a change in channel setting, note that MCW-Phone switch, S702, must be thrown to the Phone position to operate the selector mechanism. After the channel change, S702 must be reset to the MCW position in order to restore the necessary plate voltage. The alternative is to depress the press-to-talk switch for plate voltage restoration, which may be done, if preferred.

8. Unlock the 1st IPA selector and tune for minimum meter reading.

9. Rotate the meter switch to position 9.

10. Adjust C102 and C104 for maximum meter reading. To preserve circuit symmetry, it is necessary to keep the capacities of C102 and C104 equal, i.e., have their rotor plates meshed to the same extent.

11. Lock all selectors.

12. Rotate the selector switch to the 225 mc channel and the meter switch to position 8.

13. Unlock the 1st IPA selector and tune for minimum meter reading.

14. Rotate the meter switch to position 9.

15. Unlock the 2nd IPA selector and tune for maximum meter reading.

16. Now, as a check on the 1st IPA circuit tracking, perform either "a" or "b" below, whichever is preferred, and note the direction of meter deflection.

a. Alternately insert the copper and iron cores in coil L102.

b. Or, alternately increase and decrease the capacity of C102 and C104.

If there is a decrease in meter deflection, regardless of which core is inserted, or regardless of the direction of capacity change of C102 and C104, the circuit is tracking properly.

If there is an increase in meter deflection when the iron core is inserted, or when the capacity of C102 and C104 is increased, it is necessary to spread the turns of L103 or compress the turns of L102, or to do both.

If there is an increase in meter deflection when the copper core is inserted, or when the capacity of C102 and C104 is decreased, it is necessary to compress the turns of L103 or spread the turns of L102, or to do both.

The aim in the two preceding paragraphs is to resonate the 1st IPA grid and plate circuits so that any change in inductance or capacity will result only in a decreas in meter deflection. This decre sed meter reading is an indication of less grid excitation on the 2nd IPA stage and is the

result of throwing the 1st IPA grid circuit off r sonance by the tuning wand or capacity tests.

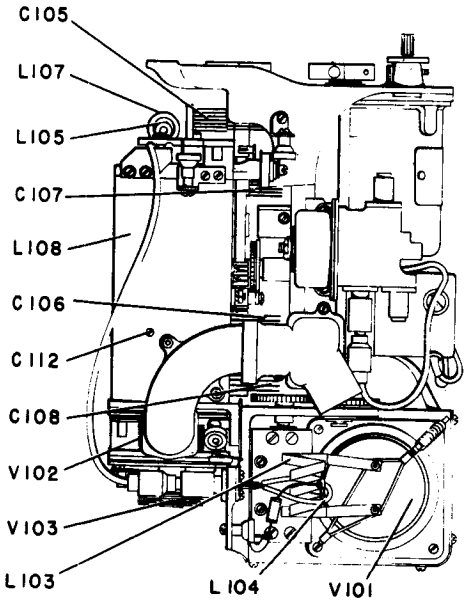
If it is necessary to spread the turns of coils L102 or L103, use an insulating bar inserted between the turns. If coil compression is necessary, use a pair of long-nose pliers, the jaws of which should be wrapped with tape to prevent damage to the silvered coil surface, highly important at UHF.

17. Steps 7 to 16 should be repeated if any adjustment to L102 or L103 has been made.

18. Rotate the selector knob to the 300 mc channel and the meter switch to position 8.

19. Repeat steps 13, 14, and 15.

20. Repeat step 16-a or 16-b. A meter deflection decrease is an indication of proper tracking and alignment. A ten per cent increase in deflection is permissible, but a greater increase in meter reading is an indication of improper tracking. In the latter event, repeat steps 7 to 19.



TRANSMITTER
TOP VIEW

B. 2ND IPA ALIGNMENT

1. Set trimmer C112 to fifty per cent of capacity. This setting is achieved when the slot in the adjusting screw of C112 is parallel to the front panel.

2. Rotate the selector knob to the 390 mc channel and the meter switch to position 10.

3. Unlock the 2nd IPA selector and tune for minimum meter deflection.

4. Rotate the meter switch to position 11.

5. Without removing the metal plug in the side of the 2nd IPA resonant chamber, insert an insulated aligning tool through the hole in the plug and adjust trimmer C117 for maximum meter deflection. This trimmer is adjusted from maximum to minimum by a continuous screw action.

If trimmer C117 is adjusted all the way in without reaching maximum meter deflection, compress the turns of L107 slightly and readjust C117.

If trimmer C117 is adjusted all the way out without reaching maximum meter deflection, spread the turns of L107 slightly and readjust C117.

6. Rotate the selector knob to the 225 mc channel and the meter switch to position 10.

7. Repeat steps B-3 and B-4.

8. Check circuit tracking by alternately inserting the copper and iron cores of the tuning wand into coil L107.

If there is a decrease in meter deflection, regardless of which core is inserted, the circuit is tracking properly.

If the meter deflection increases when the copper core is inserted, very carefully bend the outside stator plate of capacitor C105 away from the rotor until maximum reading is obtained. This outside stator plate is the one nearest the resonant chamber.

If the meter deflection increases when the iron core is inserted, very carefully bend the outside stator plate of capacitor C105 toward the rotor until maximum reading is obtained. Be careful not to decrease the space between the outside stator plate and the rotor plate to less than 0.005 inch.

9. If the adjustments in B-8 are not sufficient to resonate the 2nd IPA circuit so that the tuning wand tests cause a decrease in meter deflection, the mechanical condition of the tuning shaft of C105 should be checked. Tighten the screws holding the rear bearing in place. Then tighten all cup-point setscrews on the shaft, using one of the wrenches clipped to the chassis. Inspect the wiping contacts on the shaft and tighten the screws holding them to the resonant chamber. If there is any noticeable looseness in the bearings or at the wiping contacts, make the necessary adjustm nts or replace parts where necessary. Dirty or oxidized surface under the contacts should be cleaned with a cloth dipped in carbon tetrachloride.

10. Rotate the sel ctor knob to the 390 mc channel and th meter switch to position 10.

11. Repeat steps B-3 to B-5.

12. Rotate the selector knob to the 300 mc channel and the meter switch to position 10.

13. Repeat steps B-3 and B-4.

14. Check circuit tracking by alternately inserting the copper and iron cores of the tuning wand into coil L107. If the meter deflection decreases, regardless of which core is inserted, the circuit is tracking properly. A ten percent increase in meter deflection is permissible, but a greater increase indicates improper tracking and requires repetition of all preceding alignment steps under "B."

NOTE: Correct mechanical alignment is necessary. The 2nd IPA circuit cannot be properly aligned if the capacitor shaft is bent or thrown out of alignment due to distortion of the case when the resonant cavity mounting screws are tightened. This may be checked by loosening the mounting screws, which should not affect the tuning.

C. PA ALIGNMENT

1. Rotate the selector knob to the 390 mc channel.

2. Set trimmer C120 to fifty percent of maximum capacity. This setting is reached when the slot in the adjusting screw of C120 is at right angles to the front panel.

3. Throw the IC-Operate switch, S703, to the Operate position.

4. Unlock the PA selector and tune for maximum meter deflection.

5. Rotate the meter switch to position 12.

6. Tune the PA selector for minimum meter deflection.

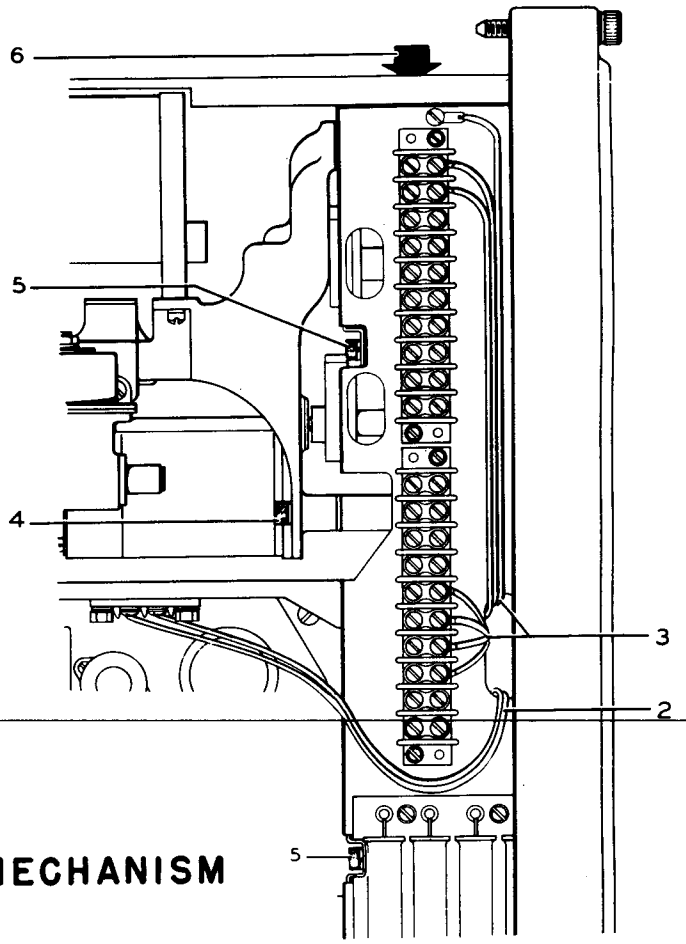
7. Rotate the meter switch to position 11.

8. Adjust trimmer C118 for maximum meter reading. This trimmer is adjusted through the hole in the metal plug on the side of the PA resonant chamber.

This completes alignment of the transmitter.

NOTE: Difficulty in aligning this circuit may be due, as in the case of the 2nd IPA, to distortion of the case. Check by loosening mounting screws which should not change the tuning.

SELECTOR MECHANISM
TOP VIEW



REMOVAL OF

CHANNEL SELECTOR MECHANISM

Replacement of defective selectors will necessitate the removal of the entire selector assembly from the chassis. The work will be expedited by following the procedure described below, always bearing in mind that the assembly must be protected from dust and dirt as well as rough handling at all times.

Before disconnecting the cables from the equipment for the removal of the chassis from the case set all the selectors in the following manner.

Remove the cover from the selector dials and withdraw the crystal oven. Switch power on the equipment and insert a screwdriver blade just below the cam holding the limit switch open. Move the channel selector switch to position 10, and, as the mechanism begins to function, moving the cam from the limit switch, hold the limit switch open by pressing the switch lever with the screwdriver blade. When the selector mechanism comes to rest, move the power switch to the OFF position. The selector drums have all been advanced to position 10 but the tuning cycle was not completed because the motor could not reverse with the limit switch in the open position. Disconnect the cables, and remove the chassis from the case.

Numbers on the various steps of the procedure reference also, when applicable, the numbers in the adjacent illustrations, indicating thereon the part being discussed.

1. Stand the chassis on one end on a work bench with the transmitter at the top.

2. Disconnect the two leads attached to the terminal strip E501 in the multiplier section.

3. Disconnect the leads to terminals of terminal strip E132 and ground connection on top of shield over selector mechanism. Lay ald the leads disconnected together and temporarily tape them into a cable.

4. Remove the knurled head screw in the casting adjacent to the selector motor, using an allen wrench for the purpose.

5. Remove the two knurled head screws, accessible through holes in the selector mechanism shield, one located in the multiplier section, the other in the transmitter section.

6. Remove the three knurled head screws located in the cast bracket at the top end of the chassis.

7. Disconnect all leads to terminal strip E106 located on the bottom of chassis. Straighten all the leads and temporarily tape them into a single cable.

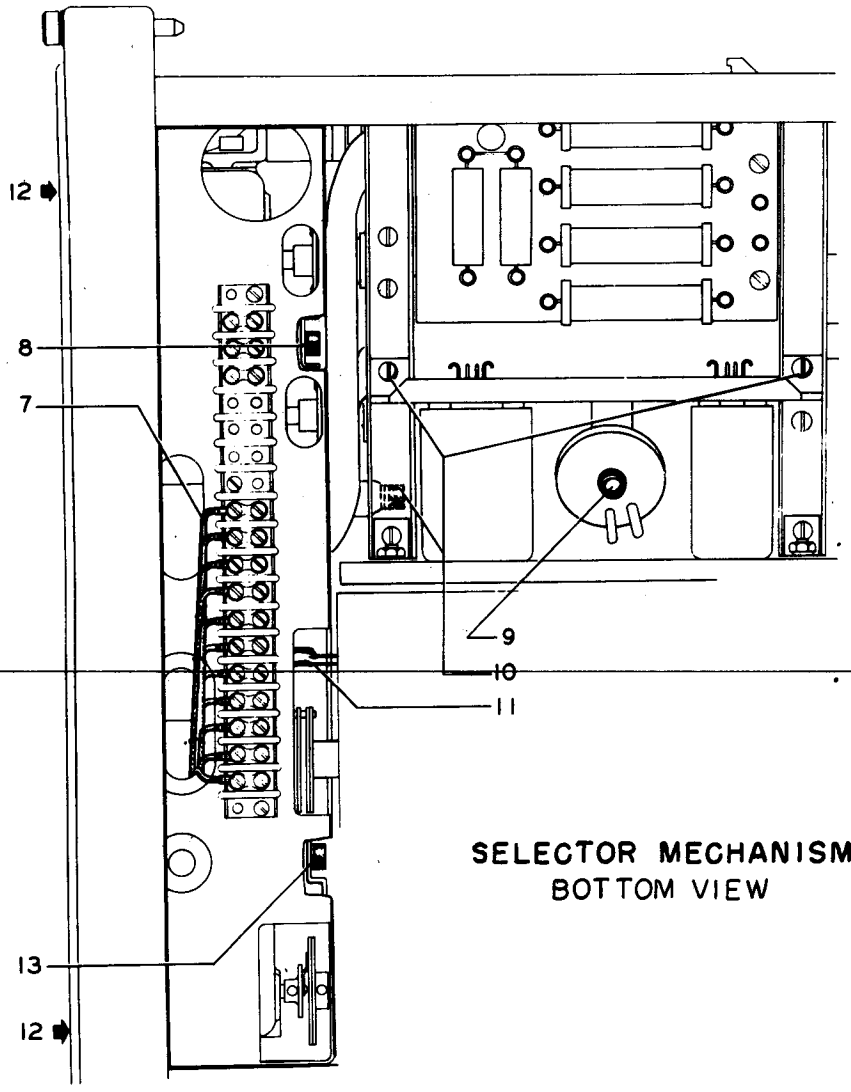
8. Push the taped cable, between the selector mechanism and the transmitter, toward the top of the chassis and remove the knurled screw accessible through a hole normally covered by the cable. An allen wrench with one leg ground short will be required to remove this screw.

9. Loosen the screw in the round ceramic resistor, R 601, mounted between relays, K 102 and K 601, to allow the resistor to turn on the screw.

10. Remove screws in the tranverse bar supporting the relays, K 102 and K 601, and swing the relay assembly up to allow of the removal of the knurled head screw adjacent to the selector motor. Return the relay assembly to its proper position and replace the screws in the mounting bar.

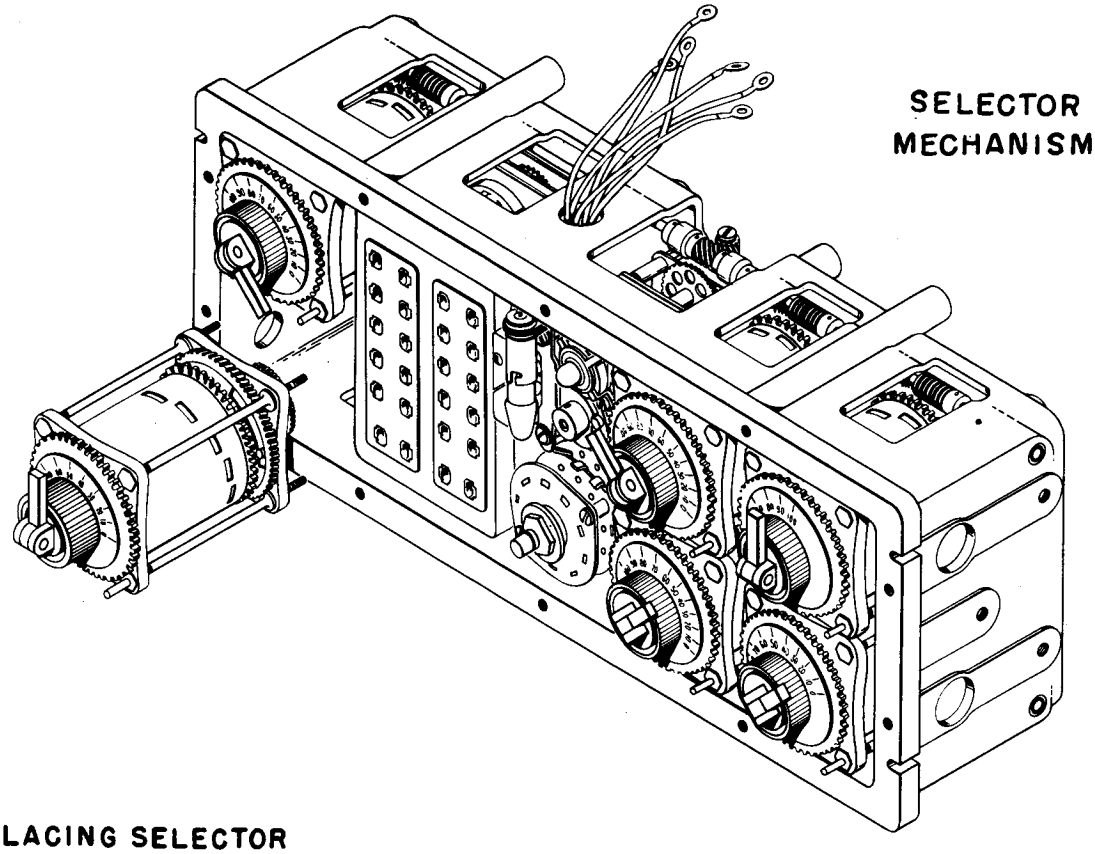
11. Unsolder the two leads to the terminals on the end of the multiplier unit adjacent to the selector mechanism.

12. Remove the four screws in the face of the selector panel.



SELECTOR MECHANISM
BOTTOM VIEW

13. The selector mechanism is now held in place by single knurled head screw located on the bottom of the chassis near the lower side of the multiplier. It is impossible to remove this screw completely without removing the multiplier. However, using a narrow nosed pliers it is possible to loosen this screw and gradually withdraw the selector mechanism from the chassis. When the screw is freed the assembly may be withdrawn completely, feeding the cables out through the grommets in the selector mechanism shield. As the assembly is pulled out, all the couplings will pull apart without difficulty.



SELECTOR MECHANISM

REPLACING SELECTOR

To replace a particular selector, loosen the front panel of the selector mechanism by removing the ten screws on the edge of the panel. Drive out the pin holding the coupling on the channel selector switch shaft, providing support for the coupling and being careful not to bend the shaft. Remove coupling and the nut attached to the channel selector switch body. The panel may then be removed from the selector assembly.

To remove the selector at fault, remove the four nuts holding the selector to the frame that houses the entire selector assembly. The selector may now be pulled forward and withdrawn from the housing. At this point make a note of the position of the vernier adjustment pin so that the new selector may be replaced with the pin in the same position.

The half coupling on the selector driving shaft must be removed and replaced at the same point on the new selector shaft. Therefore, before removing the coupling, carefully

measure the distance from the face of the coupling to the selector frame. Then reinstall it at precisely the same distance and the same angular position on the shaft of the replacement unit after the selector has been properly set for replacement in the housing.

Before replacement in the assembly housing it is necessary to synchronize the new selector so that it will be in step with the other selectors when installed. This involves,

1. Setting the drum at the same channel setting as the other selectors.

2. Positioning the driving pin and cam at the proper point.

To set the new selector drum, unlock the dial and, holding the frame firmly, rotate the drum clockwise, as viewed from the dial end, until a pawl emerges in the slot nearest the dial. This is the slot corresponding to channel 10 to which the selector assembly has been set. Place the drum in such a position that the projecting front tip of the pawl is exactly one-sixteenth of an inch from the edge of the slot. This positions the drum. Taking care not to disturb the drum and pawl setting, move the bronze gear clockwise until the pin on the bronze gear hits the projection on the cam next to the drum. When a definite "stop" is felt, insert a wedge between the gear and selector frame so that all movement of the gear will be restrained. Locking the dial at this point will also aid in holding the gear in its proper position. This completes the two adjustments on the new selector.

The replacement selector is now ready for insertion in the assembly housing. With the vernier adjustment pin in the proper position, slide the selector in place until the bronze gear meshes with its driving worm. Replace the four nuts and tighten. Remove the wedge holding the gear in position.

INSTALLING SELECTOR MECHANISM

The selector mechanism can be replaced in the chassis by reversing the order of removal with the exception that the six couplings to equipment control shafts must be properly engaged. The preferred method for connecting the couplings is as follows:

1. Stand the chassis on the work bench with the panel at the top.

2. Feed the cables attached to the selector mechanism down through the grommets, from which they were withdrawn, and lower the unit into place. Make certain the coaxial cable in the selector compartment is in no danger of being pinched by the selector unit as it is fitted into place.

3. When the couplings start to engage, line them up by rotating the coupling halves attached to the transmitter assembly until the pin on the selector-half of each coupling fits into the spring loop on the transmitter-half of the coupling.

In the case of the couplings for the multiplier and RF sections unlock the dials and rotate them to bring both pins towards the bottom of the chassis. Rotate the lower half of the couplings consisting of two discs till the narrow slot formed by the discs are under the pins. Spread the slots in the discs with a screwdriver blade to allow the pins to slip into the widened slots so formed.

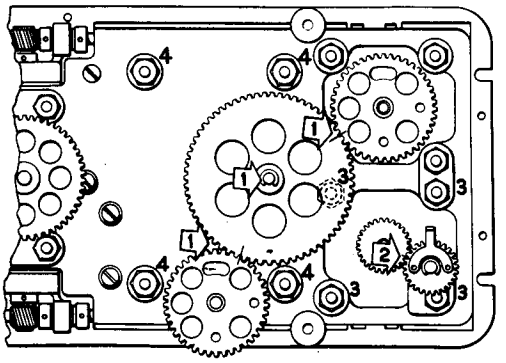
4. At some point in the alignment of the couplings the selector housing will reach the knurled screw remaining in place in the bottom of the chassis adjacent to the multiplier. This screw should be started into the threaded hole in the casting of the selector housing by means of thin jaw pliers inserted between the multiplier case and the rear of the selector shield. Do not tighten this screw until all the other knurled head screws are started into place.

Complete the assembly in the reverse order from step 12 of the dismantling instructions. When replacing the selector panel care must be taken to maintain clearance between the panel openings and the edges of the dial plates. Before tightening the screws holding the panel, check the clearance around the dials by passing a scriber point or thickness guage around the edges of all the dials. Then tighten screws and replace lockwasher and nut on channel switch collar. Friction between dials and panel will interfere with the operation of the selector mechanism. In completing step 8, pull the taped cable clear of the coupling at this point to prevent the coupling striking and damaging the cable.

Dial settings that have been disturbed may be corrected by following instructions given in this section under the assembly procedure for the section of the equipment involved. After completing the installation of the selector mechanism, the chassis may be replaced in the case, crystal oven replaced, and all cables reconnected. It will be necessary to retune the equipment as described in section 3, pages 22 to 25.

DISMOUNTING

CRYSTAL SWITCH ASSEMBLY



SELECTOR MECHANISM
REAR VIEW

The jack plate for the crystal oven is assembled with the crystal selector switch mechanism and the assembly must be removed as a unit from the selector housing to make repairs or replace switch wafers. With the selector mechanism out of the chassis the crystal switch may be removed as follows:

1. Mark the large gear on the rear of the housing to indicate points where it meshes with the smaller gears. Remove the C washer holding gear and slip gear off the stud.

2. Mark the two gears at the rear of the RF selector so that they can be engaged properly.

3. With the RF dial securely locked, remove the four nuts holding the RF selector in the housing.

4. Remove the four nuts holding the crystal switch.

5. Free the wire, white with brown tracer, that passes through the top of the selector housing and withdraw the crystal switch and RF selector until threaded studs on both are free of the rear housing. At this point the crystal switch gearing may be disengaged from the selector gear and the switch carefully removed without disturbing its setting.

6. Slide the RF selector back into the housing and replace holding nuts temporarily.

7. Mark the large brass gears in the gear section of the crystal switch, with a reference mark on the housing, so the gear can be set properly when the switch is replaced.

DISMANTLING CRYSTAL SWITCH

To replace a switch wafer in the switch proceed as follows:

1. Unsolder the wires connected to the terminal strip on the rear of the switch and the ground post.

2. Remove the four screws on the face of the crystal oven jack plate.

3. Separate the switch assembly and the gear assembly and put the gearing aside.

CAUTION: Do not move gearing in selector housing while any geared unit such as selector, crystal switch or homing switch is out of the housing.

4. Lay the crystal oven jack plate face down and remove the four screws in the back plate.

5. Remove wire lacing attached to the spacing lugs at the corner of the assembly and remove metal plate and spacers. The wiring to switch wafers will then be exposed.

6. Unsolder the leads to the defective switch wafer.

7. Place the new wafer in the position previously occupied by the switch wafer just removed and carefully resolder the leads.

The switch can now be assembled by reversing the procedure given in steps for dismantling. It will be necessary to set the rotor of the switch wafer, just installed, in the proper position to engage the drive shaft in the gearing assembly before the two assemblies can be fitted together. Rocking the gears slightly will allow the wafer rotors to slip onto the shafts.

To replace the crystal switch in the housing it will be necessary to first set the gears in the switch to the position where the marks on the gears, made in step 6 when dismounting the switch, coincide with the reference marks on the back of the switch assembly. Insert a wooden wedge in the teeth of the pinion nearest the jack plate to maintain the proper gear setting.

Remove the RF selector part way from the housing (see step 5, page 7-141) or to that point where the crystal switch can be inserted and the two pinions on the side of the switch located on opposite sides of the bronze gear on the rear of the selector. The crystal switch and selector can then be fitted into the housing. Set the selector loosely in place and then engage the geared coupling at the rear of the selector according to the marks placed on the gears. Set the crystal switch in place, engaging the

pinion on the switch in the drum gear of the selector. Replace and tighten all nuts. Remove the wooden wedge.

Replace the large gear on the back of the assembly, meshing it into smaller gears according to markings, and slide C washer into position on the end of the stud.

DISMOUNTING CHANNEL SELECTOR SWITCH ASSEMBLY

The selector mechanism must be removed from the chassis to allow removal of the switch. Procedure for removing the switch is as follows:

1. Through the opening in the bottom of the selector housing, make a mark on the brass gear below the homing switch and a matching mark on the metal plate next to the gear.

2. Remove the four screws holding the channel selector and homing switch in place.

3. Pull the two laced wires through the selector housing and through the limit switch housing until they are free of all obstructions. Then withdraw the switch assembly.

4. Rotate the switch shaft to the extreme clockwise position, viewed from the shaft end.

5. Place a mark on each of the spacer sleeves immediately below the metal switch-positioning plate. This step is necessary since these spacers are slightly shorter than the spacers between the two wafers. Accidental interchange will thus be avoided.

6. Locate the notch in the blade of the homing switch wafer and place a mark on the wafer to indicate its position. This blade is situated on the shaft side of the wafer.

7. Remove the two screws holding the switch assembly together and carefully lift off the metal position plate.

On the selector switch wafer, mark the position of the switch blade contact, which may be seen through the wafer perforations. Note that the common switch contact is the one immediately adjacent to this contact.

8. Separate the wafers slightly and unsolder the leads to the wafer requiring replacement.

9. Place a new wafer in position and resolder all leads removed. Make certain that the notch in the homing switch w fer and the common contact of the selector switch are in the same relative position.

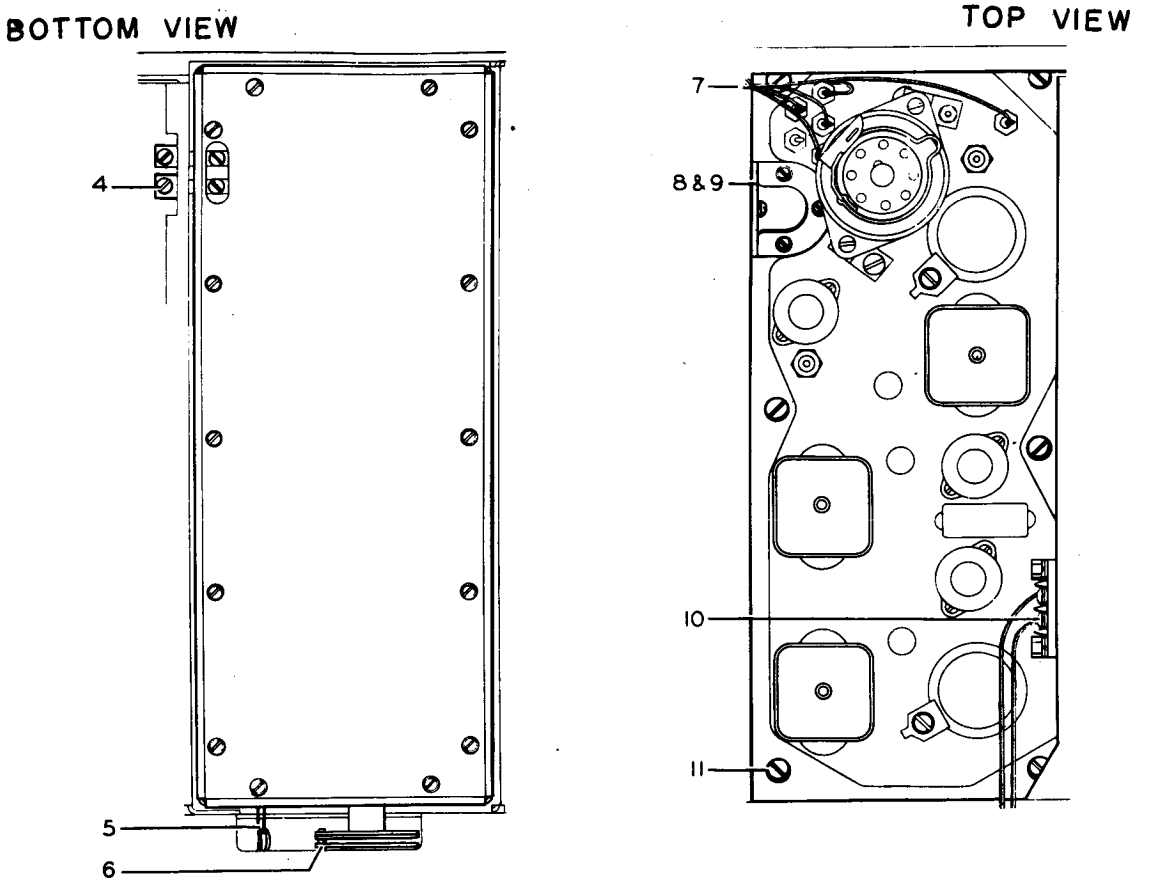
10. Reassemble the switch after first positioning the notch

in the homing switch wafer to corr spond with the location mark made previously. Also make certain the blade contact and fixed contact of the selector switch wafer are adjacent to each other and correspond to the mark made. Tighten the switch assembly screws securely.

11. Insert the switch assembly in the selector housing and position the cables in their former location.

12. From the opening in the selector housing rotate the brass gear until the match marks correspond. Then, without permitting movement of the brass gear, engage pinion on switch assembly in adjacent drum gear. Replace and tighten the four screws originally removed from the rear of the housing assembly.

REMOVING MULTIPLIER UNIT



Repairs to the multiplier can usually be made with the unit in the chassis since removal of the bottom plate of this unit gives access to all the components. When it becomes necessary to remove the unit from the chassis the procedure given below should be followed in detail. Numbers on the steps in removing the unit also refer to numbers on the illustrations.

1. Disconnect all cables from the transmitter-receiver, loosen the screws holding the panel, and withdraw the chassis from the case.

2. Place the chassis, top down, on a convenient work t ble or bench.

3. Remove the cover from the selector dials. Withdraw the crystal oven from the jack plate and carefully put aside.

4. Loosen, but do not remove, the four screws that clamp the straps connecting the multiplier to the 1st IPA of the transmitter. These screws may be reached through slots in the casings of the units. Slide the straps into the multiplier housing and tighten two of the screws to hold the straps in place.

5. Unsolder the leads connected to the posts extending from the front end of the multiplier case, adjacent to the selector mechanism. To do this, grasp the lead with needle point pliers and heat the joint with a soldering iron. The lead can be pushed out of the hole in the terminal post when the solder softens.

6. Unlock the multiplier dial. Rotate the coupling, visible at the front end of the multiplier, by means of the dial until the pin in the gear section is towards the top of the chassis. Lock the dial.

7. Turn the chassis over and unsolder the five leads which are connected to the lead-through capacitors on top of the multiplier case. Make note of the wire coding to facilitate reconnection of the leads

8. Remove the four screws holding the cast elbow shield which covers the lead to the RF section.

9. Disconnect the lead to the RF section by loosening the screw at the top of the terminal post exposed by the removal of the shield.

10. Disconnect the two leads to the terminal strip mounted on the shield between the multiplier and the audio sections.

11. Remove the six screws holding the unit in the chassis.

12. Withdraw the multiplier unit from the bottom of the chassis, the coupling will disengage as the unit is removed.

REPLACING MULTIPLIER UNIT

The multiplier is replaced in the chassis by reversing the removal procedure. The recoupling of the multiplier to the selector may present a little difficulty but is readily accomplished in the following manner.

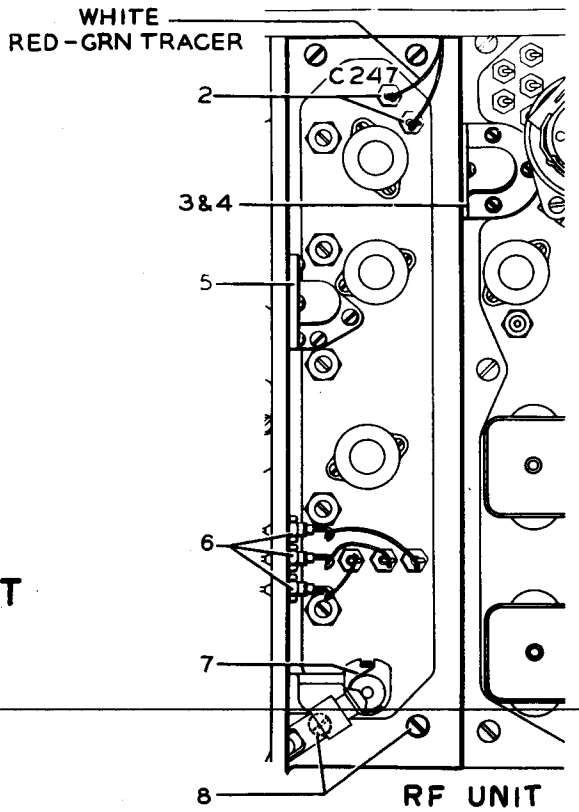
With the chassis on the work table in an inverted position, unlock the multiplier dial and rotate the gear on the back of the selector mechanism by means of the dial until the pin in the gear is toward the bottom of the chassis. Leave dial unlocked. Grasp the bottom of the multiplier unit in the left hand and insert the nose of a pair of needle point pliers in the holes in the discs, forming the coupling-half on the shaft of the multiplier. Force the nose of the pliers into the holes in the discs to open the slot in the coupling. Place the opened slot over the pin in the gear of the selector mechanism and withdraw the pliers. Press the multiplier into place in the chassis and rotate the multiplier dial simultaneously. This procedure will engage the coupling. The remainder of the assembly may readily follow in the reverse order the steps given for dismantling.

Difficulty in starting screws in the reassembly may be avoided if screws in step 10 in the dismantling procedure are not tightened until screws in step 8 are started. Make certain the collar that fits into the side of the RF unit is in place before reconnecting the lead (step 9) and fitting the elbow shield (step 8).

After replacing the multiplier unit, the dial setting may be checked in the following manner. Remove the cover on the bottom of the unit. Unlock the multiplier dial, rotate the shaft of the ganged capacitors in the unit until they are at minimum capacity and relock the dial. The dial should then read zero and may be corrected, if necessary, by loosening the screw on the dial plate and sliding the plate to line up the zero mark with the reference pointer on the panel. Tighten the dial plate locking screw and replace bottom cover plate.

After the equipment is replaced in the case, crystal oven replaced, and cables reconnected, it will be necessary to retune the multiplier. Details of the tuning procedure will be found on pages 5-22 and 5-23.

REMOVING RF UNIT



RF UNIT
TOP VIEW

A complete RF unit is furnished with the equipment spares. When trouble develops in this portion of the transmitter-receiver, it is advisable to replace the entire unit to reduce the length of time the equipment is out of service. The defective unit can then be repaired when conditions permit. The following procedure is recommended for removing the RF unit from the chassis. Numbers on the steps in dismantling also refer to numbers on the illustrations.

1. Place the chassis, with selector cover and crystal oven removed, top up, on a work bench.

2. Unsolder the two leads to C 245 and C 247. Note color coding of wires to assure proper reconnection.

3. Remove the elbow shield over the terminal and lead from the multiplier section.

4. Loosen the screw on the terminal post of the multiplier and remove the wire. Pry loose the oval collar fitting into the side of the RF unit where lead from the multiplier enters the unit.

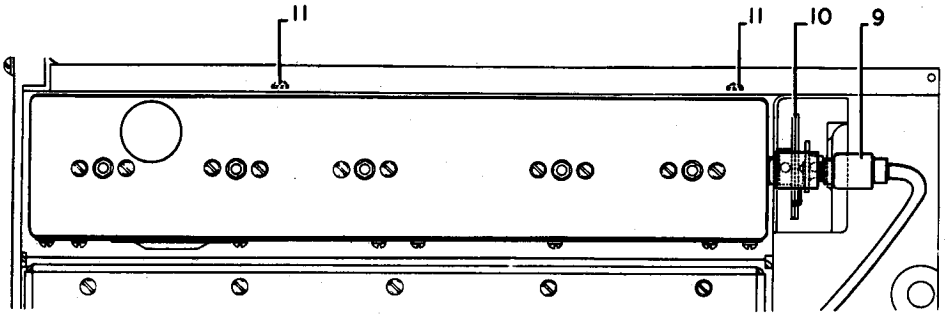
5. Remove the elbow shield over the lead to the IF s ction and unsolder the wire from the terminal on th RF unit.

6. Unsolder the three leads to the lead-through capacitors

on the audio frequency section shield. Tag the wires for ref rence in assembly.

7. Remove the spring on the antenna compensator coupling by gripping the end of the spring with needle point pliers and lifting the end of the spring clear of the notch in the flat member attached to the lower half of the coupling. The other end of the spring can then be pulled free of the snubbing hole in the top half of the coupling.

8. Remove the four binder screws in the corners of the unit.



RF UNIT
BOTTOM VIEW

9. Stand the chassis on end, transmitter down, and disconnect the coaxial cable from the bottom of the RF unit by unscrewing the knurled sleeve on the connector.

10. Unlock the RF dial and rotate the coupling on the tuning shaft of the unit until the flat member on the selector driven shaft, engaging the coupling-half on the RF unit, is toward the top of the chassis.

11. Remove the two binder head screws holding the unit to the shield of the audio section.

12. The RF section can then be withdrawn from the bottom of the chassis, the coupling between the unit and selector pulling apart in the process.

REPLACING RF UNIT

Procedure for reassembly is the reverse of the above dismantling routine. To engage the coupling when replacing the unit proceed as follows.

Rotate the RF dial until the bent member on the selector mechanism shaft is approximately 30° removed from a line

perpendicular to the bottom of the chassis. This position presents the narrow edge of the member to the bottom of the chassis. Slide the RF unit into place with the coupling discs so positioned that the narrow slot formed by the slotted discs will slip over the narrow edge of the bent member. As the unit slides into place the coupling will turn and establish the proper relationship between the two halves. The remainder of the assembly may then follow the steps in dismantling in the reverse order.

When it has been necessary to remove the coupling from the RF unit in the course of making repairs it should be replaced in approximately the same position with relation to the capacitor rotor plates it controls. This will necessitate resetting of the dials to zero position in the following manner.

Stand the chassis on end, transmitter down, and remove the round cap in the bottom of the RF unit. Unlock the RF dial and set the capacitors in the RF unit to minimum capacity while viewing them through the hole in the bottom of the case. With plates of the capacitor rotors completely out of mesh, relock the dial. Loosen the screw on the face of the dial and slide the dial plate until the zero mark lines up with the reference mark on the panel and retighten the screw.

Viewing the antenna compensating capacitor through the same hole, place it at maximum capacity by rotating the knob marked ANT COMP on panel. When the capacitor is properly set the knob pointer should be at zero on the scale on the panel. Correction can be made, if necessary, by loosening the two setscrews in the knob, moving the pointer to zero without disturbing the setting of the capacitor and re-tightening the setscrews.

AC-DC POWER SUPPLY SERVICING

NAVY TYPE CLG 20379

When failure of the radio equipment is due to loss of output from the power supply, which can be readily checked by the panel meter on the modulator-dynamotor, the first step is to check the power source and the fuses in the power supply unit as described on page 5-6. Should this fail to clear the trouble reference can then b made to the following Trouble Shooting Chart.

TROUBLE SHOOTING CHART

AC-DC POWER SUPPLY

	SYMPTOM	COMPONENTS TO BE CHECKED
FUSES	Blow when radio is turned on.	Capacitors C914, C924, C925, C926, C927. Filter Z902.
	Blow when vibrators are in one set of sockets only.	Transformers T901, T902. Filters Z902, Z903.
	Blow only when tubes V901, V902 are in sockets.	Relays K901, K902, K903. Choke L901. Filters Z902, Z903. Capacitors C931, C932, C933, C934, C935.
	Blow while radio is off.	Capacitors C901, C902, C903, C905, C906, C907, C908, C913, C915, C920, C921, C922, C923, C924, C925, C936, C937. Filters Z901, Z902. Resistor R912. Relays K901A, K902. Transformers T901, T902. Vibrators Y901, Y902.
VOLTAGES	None.	Relay K901. Filter Z902. Switches S901, S902.
	Low.	Input voltage. Cable to radio equipment. Radio DYN-PU switch S801. Setting of switch S903. Vibrators Y901, Y902.
	Rise and fall.	Resistors R908, R909, R910. Capacitors C917, C918, C919. Vibrators Y901, Y902.
	MAR heater - low or zero.	Transformer T902. Filter Z902. Switches S902-C1, S903-B1.
	RDR heater - low or zero.	Transformer T901. Filter Z903. Switches S902-C3, S903-C3.
	Low plate or no plate.	Relays K901, K902, K903. Transformers T901, T902. Vibrators Y901, Y902. Filter Z902. Choke L901. Resistors R903, R911, R913. Tubes V901, V902. Switches S902-A3, -B3, -C2; S903-A1, A3, B2.
VIBRATORS	Neither operates.	Filter Z902. Relay K901A. Switch S901. Capacitor C914.
	Only one operates.	Capacitor C913.

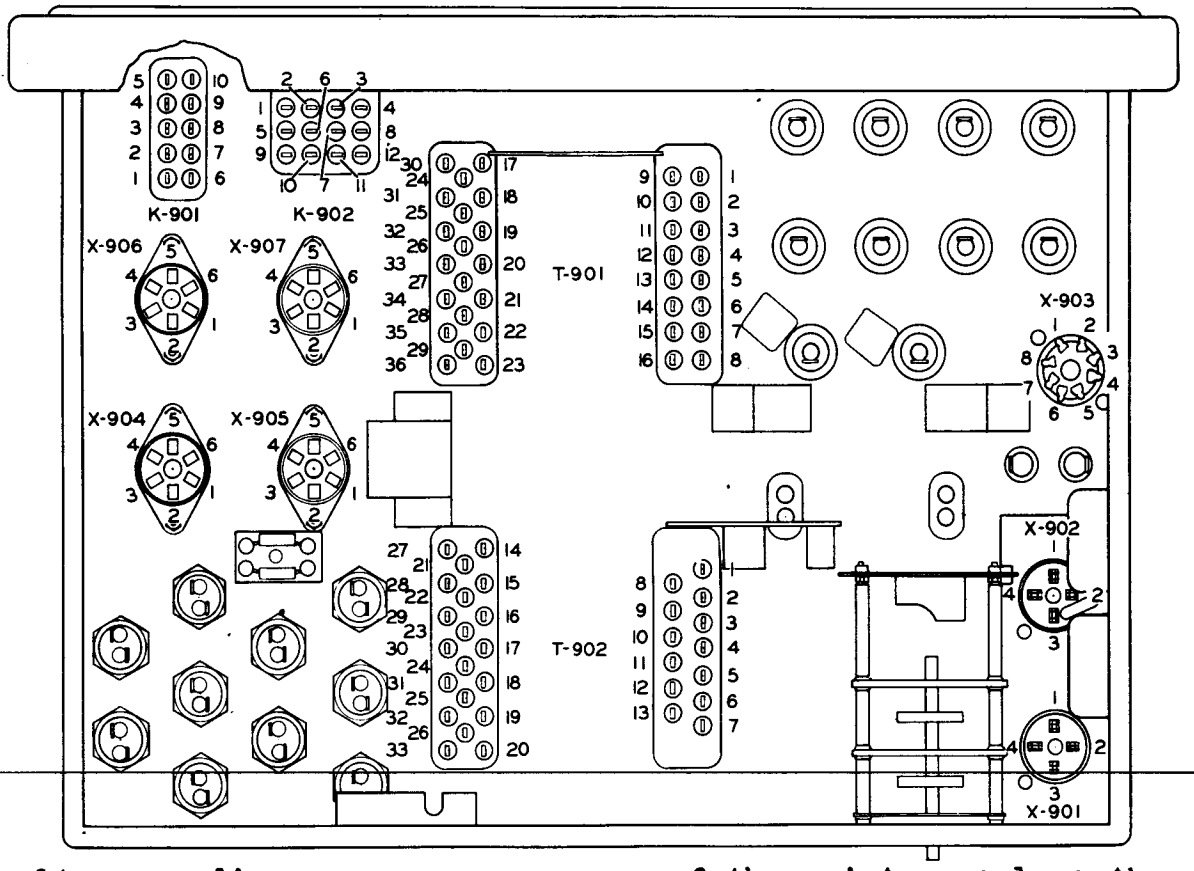
TRANSFORMER VOLTAGE CHECKS

IN THE CHASSIS

To check the transformers for proper voltage output, connect the radio equipment and power source cables to the power supply unit, switch on the radio and check the secondary t rminals of the transformer for voltage as given in the table below.

WARNING: THE TRANSFORMER OUTPUT VOLTAGES ARE DANGEROUS TO HUMAN LIFE. DO NOT TOUCH ANY COMPONENT EXCEPT WITH METER PROBES HAVING WELL INSULATED HANDLES.

The voltages will vary from the values given, in proportion to variations of input voltage from nominal. They will also vary according to whether the source of power is AC or DC. In general, a defective transformer is indicated by a zero

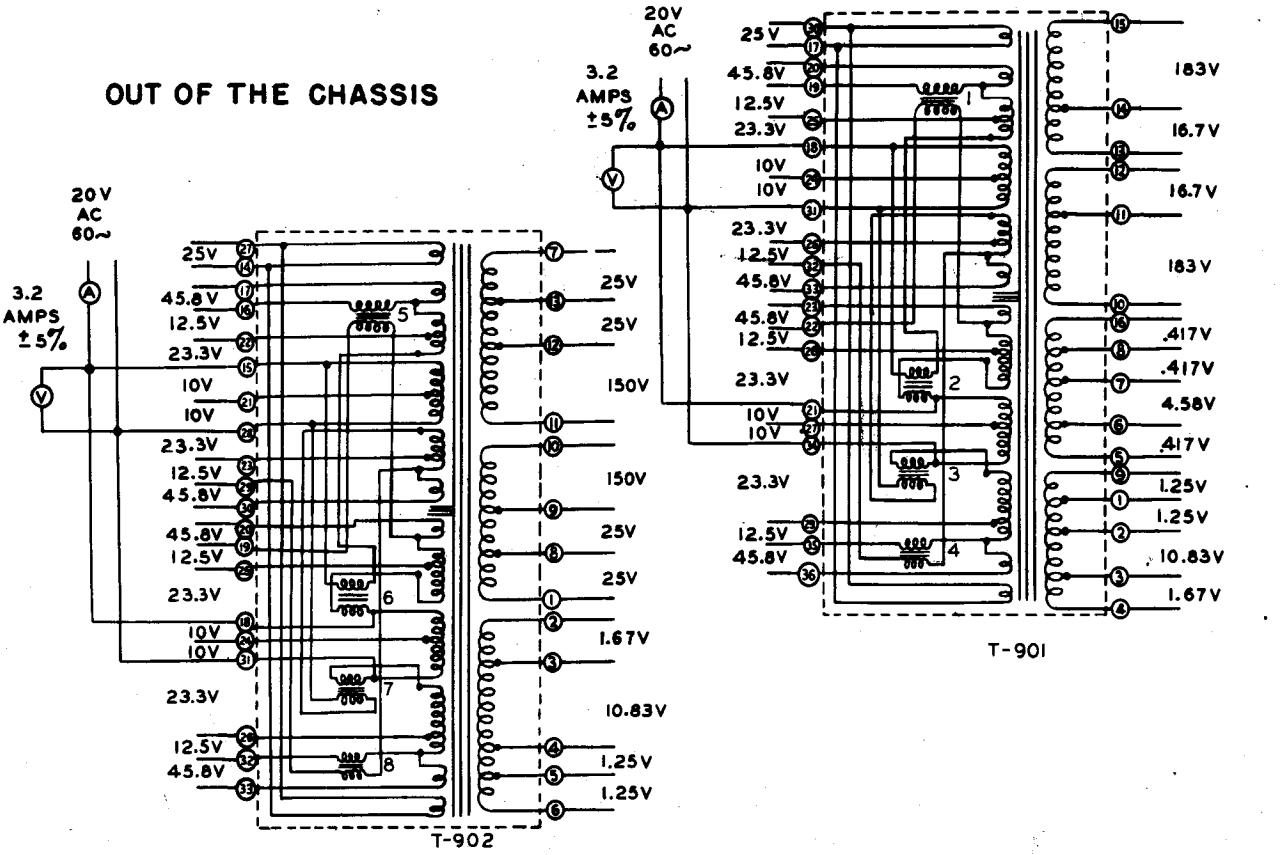


voltage reading across one or more of the points, replace the transformer. If the voltage is low, (30% under listed value) the fault may lie in the primary circuit and not the transformer.

TRANSFORMER SECONDARY VOLTAGES

Transformer T901	
Points	Voltages AC
Pin 13 to Pin 15	250
Pin 13 to Pin 14	25
Pin 12 to Pin 10	250
Pin 11 to Pin 12	25
Pin 5 to Pin 16	6
Pin 5 to Pin 6	.5
Pin 6 to Pin 7	4.5
Pin 7 to Pin 8	.5
Pin 8 to Pin 16	.5
Pin 4 to Pin 9	15
Pin 4 to Pin 3	1.2
Pin 3 to Pin 2	11.4
Pin 2 to Pin 1	1.2
Pin 1 to Pin 9	1.2

Transformer T902	
Points	Voltages AC
Pin 7 to Pin 11	250
Pin 7 to Pin 13	25
Pin 12 to Pin 13	25
Pin 1 to Pin 10	250
Pin 9 to Pin 8	25
Pin 8 to Pin 1	25
Pin 2 to Pin 6	15
Pin 2 to Pin 3	1.2
Pin 4 to Pin 5	1.2
Pin 5 to Pin 6	1.2



All windings of transformers that have been removed from the chassis may be checked by connecting a source of 20 V AC to the terminals as shown in the illustration and the remaining terminals checked for the voltage outputs shown. Voltages should be correct within 5%.

SIMPLIFIED SCHEMATIC DIAGRAMS

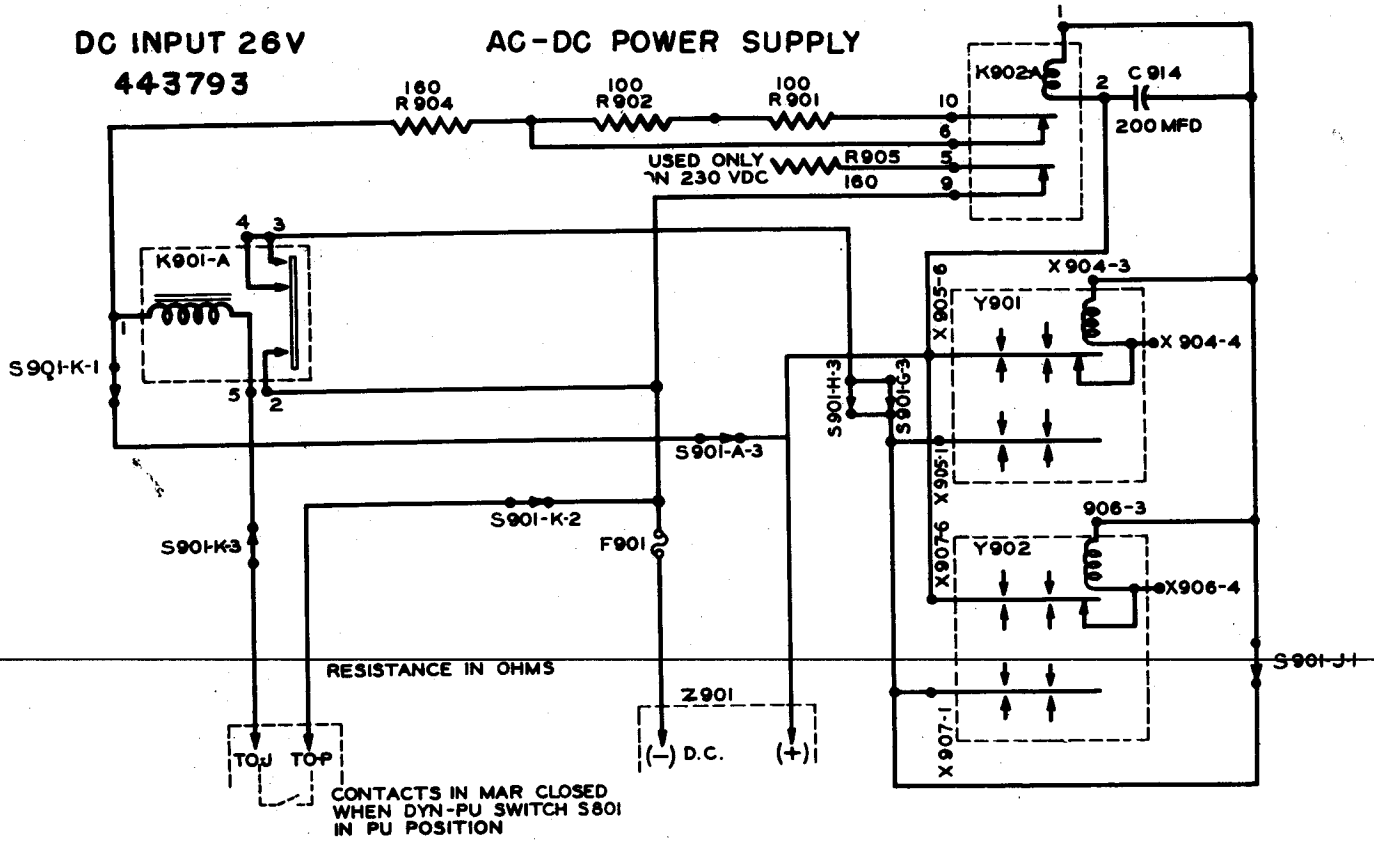
The following diagrams are intended to assist in the location of circuit faults in the switching system used in the AC-DC power supply unit.

For convenience, the three types of direct current input circuits are shown separately in simplified form. The high voltage output circuit and the vibrator synchronizing circuit are also shown in the simplified form.

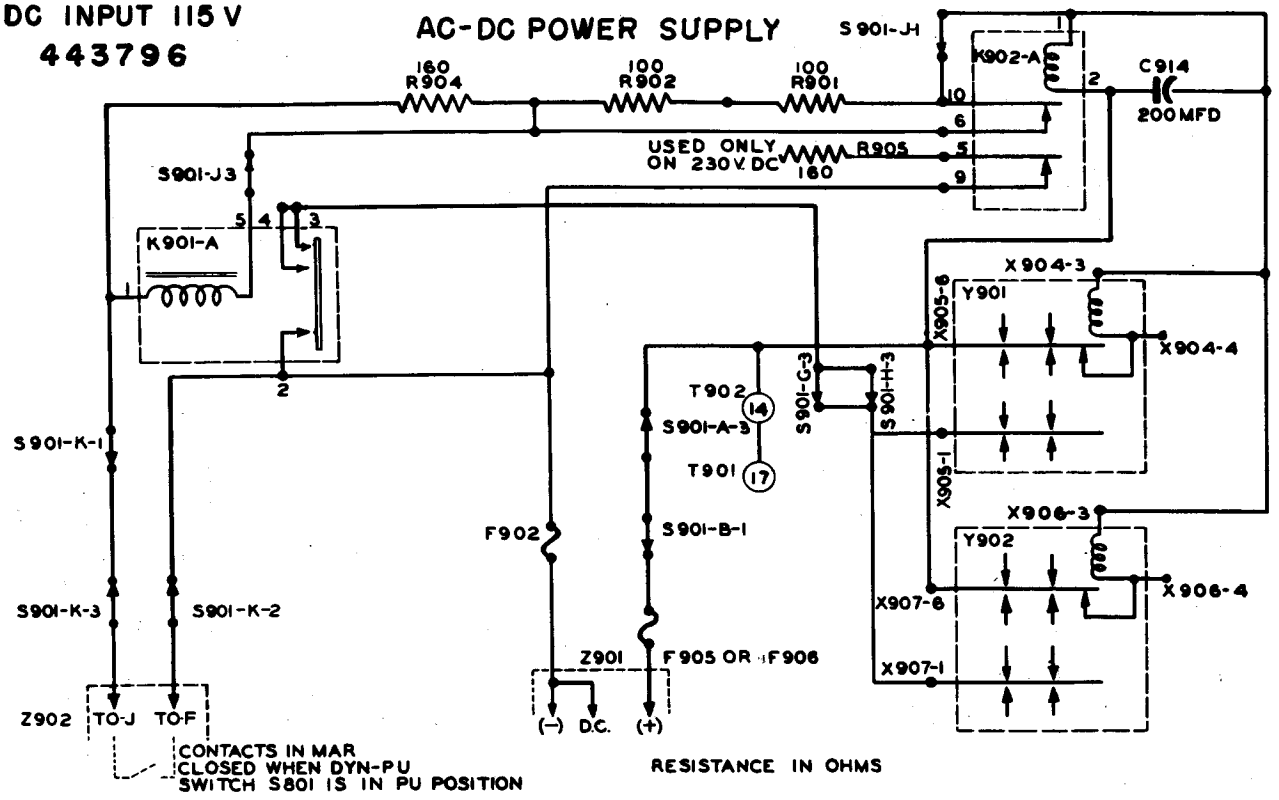
To aid in checking the switching circuits, the circuit of each switch is shown separately in the series of three connection diagrams. A connection diagram is also shown of the high voltage output circuit of the power supply.

SIMPLIFIED SCHEMATIC DIAGRAMS

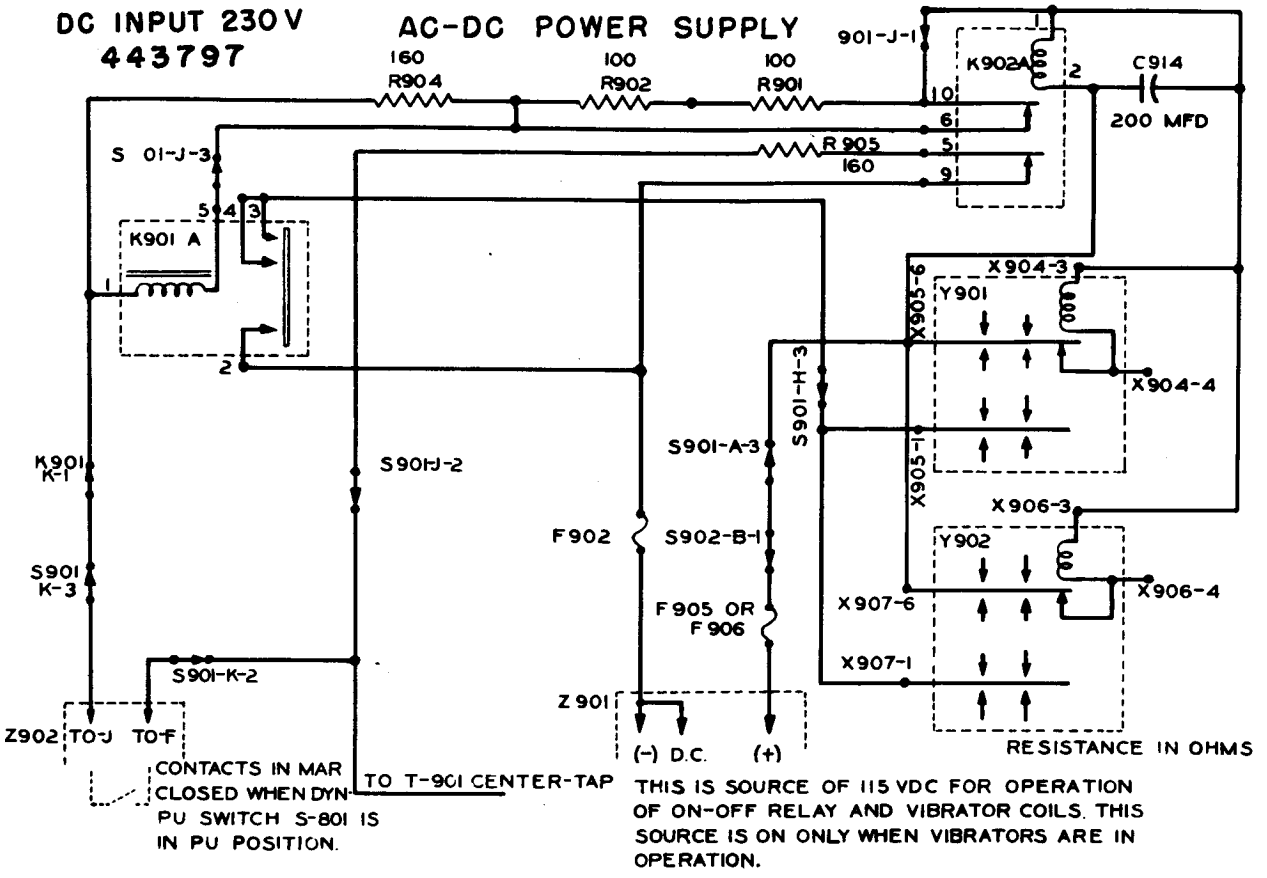
DC INPUT 26V 443793 AC-DC POWER SUPPLY

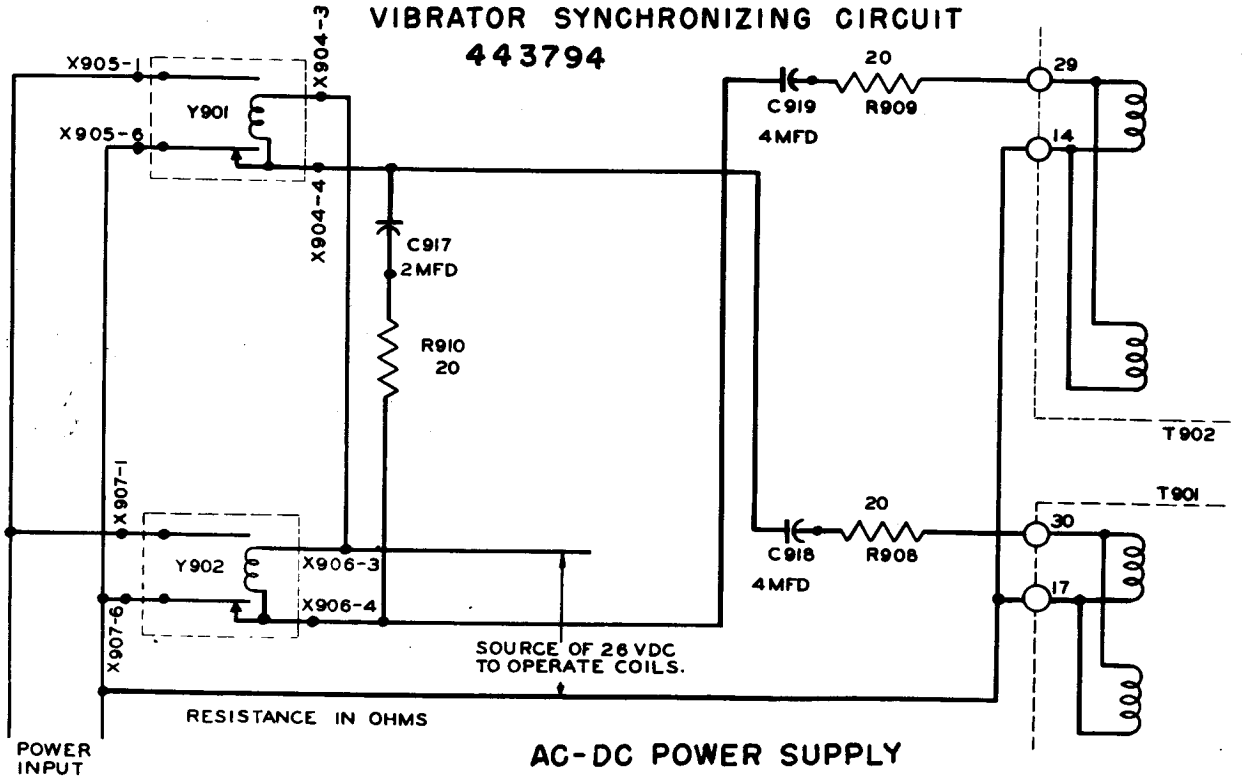


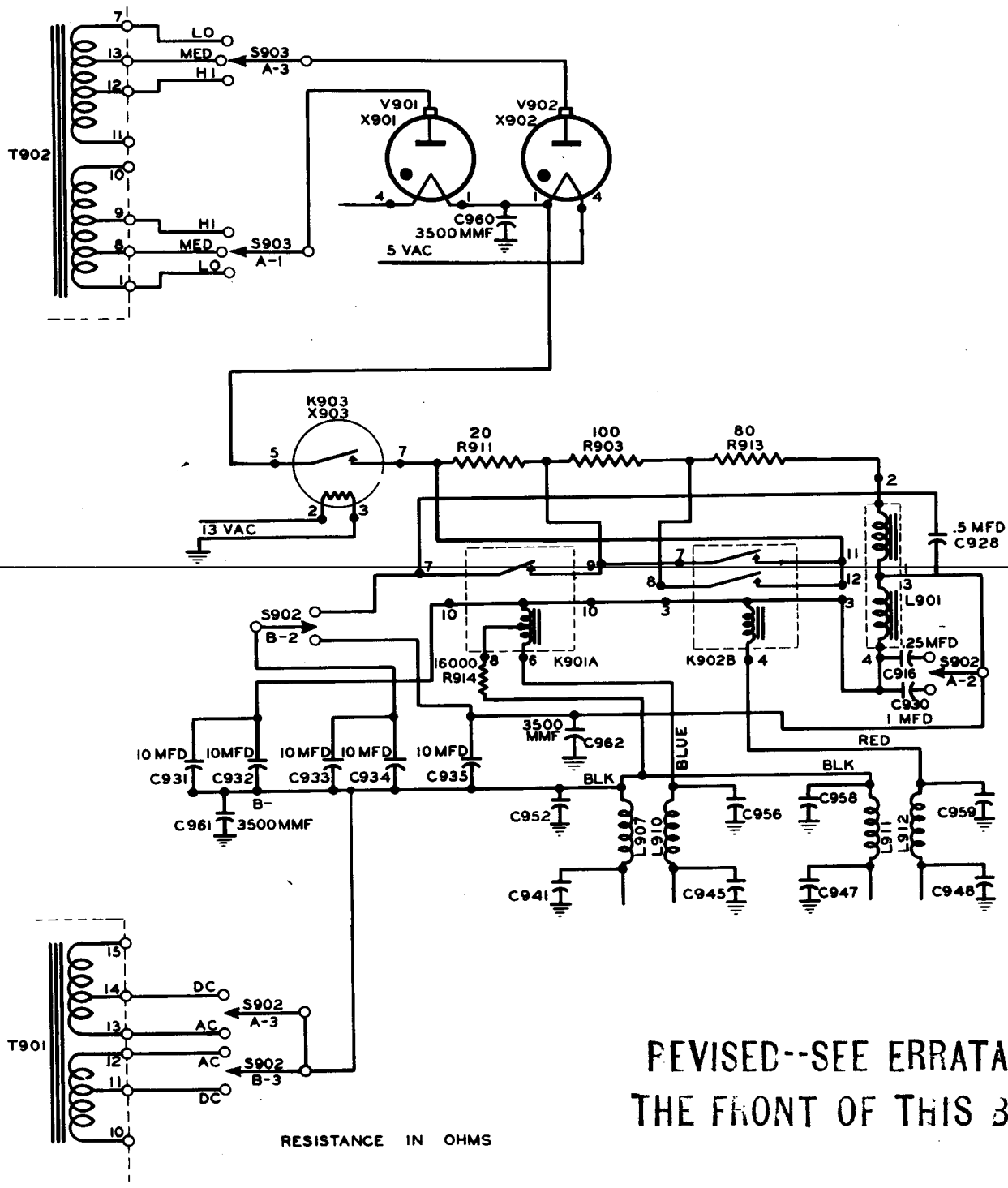
DC INPUT 115 V 443796 AC-DC POWER SUPPLY



SIMPLIFIED SCHEMATIC DIAGRAMS







RESISTANCE IN OHMS

REVISED--SEE ERRATA AT THE FRONT OF THIS BOOK

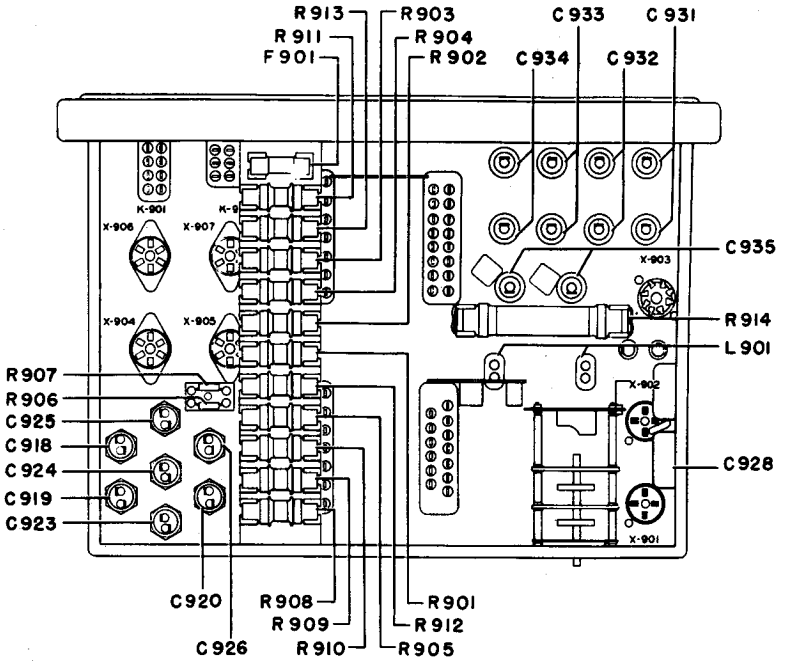
AC-DC POWER SUPPLY

SIMPLIFIED SCHEMATIC DIAGRAM

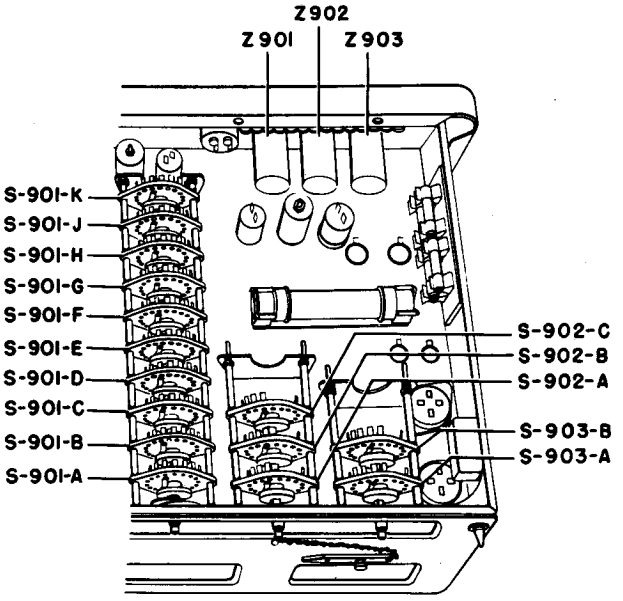
HIGH VOLTAGE OUTPUT CIRCUIT

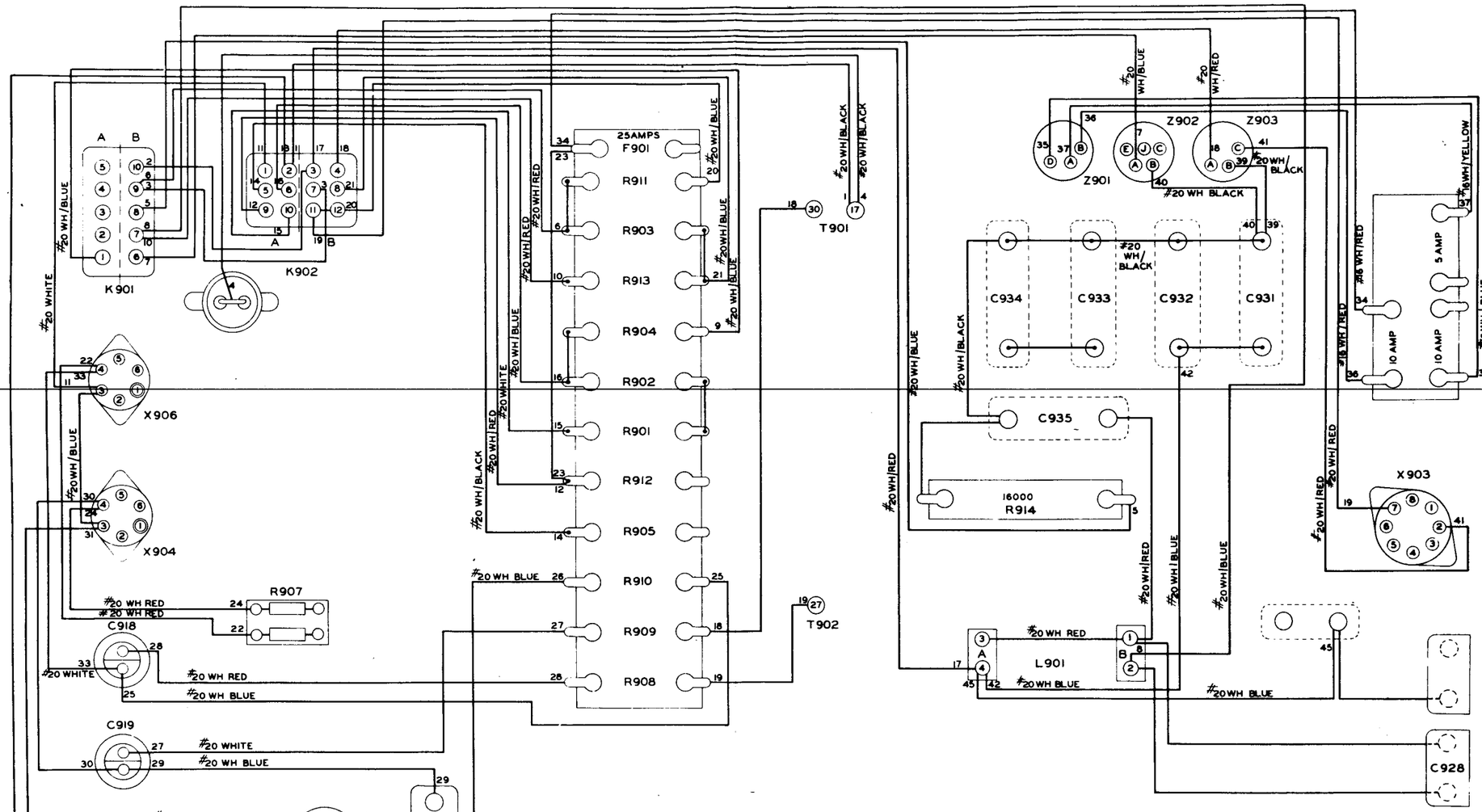
443795

RESISTOR AND CAPACITOR CHART
AC-DC POWER SUPPLY



SWITCH LOCATIONS
AC-DC POWER SUPPLY





AC-DC POWER SUPPLY
CONNECTION DIAGRAM
H.V. OUTPUT CIRCUIT
618898

K901

K902

TO 160 WATT RESISTOR

TO 400 WATT RESISTOR

T901

TYPICAL SWITCH NUMBERING ON WAFERS

Z902

TERMINAL J

TERMINAL C

S901K

S901J

S901H

S901G

S901F

S901E

S901D

S901C

S901B

S901A

X906

X907

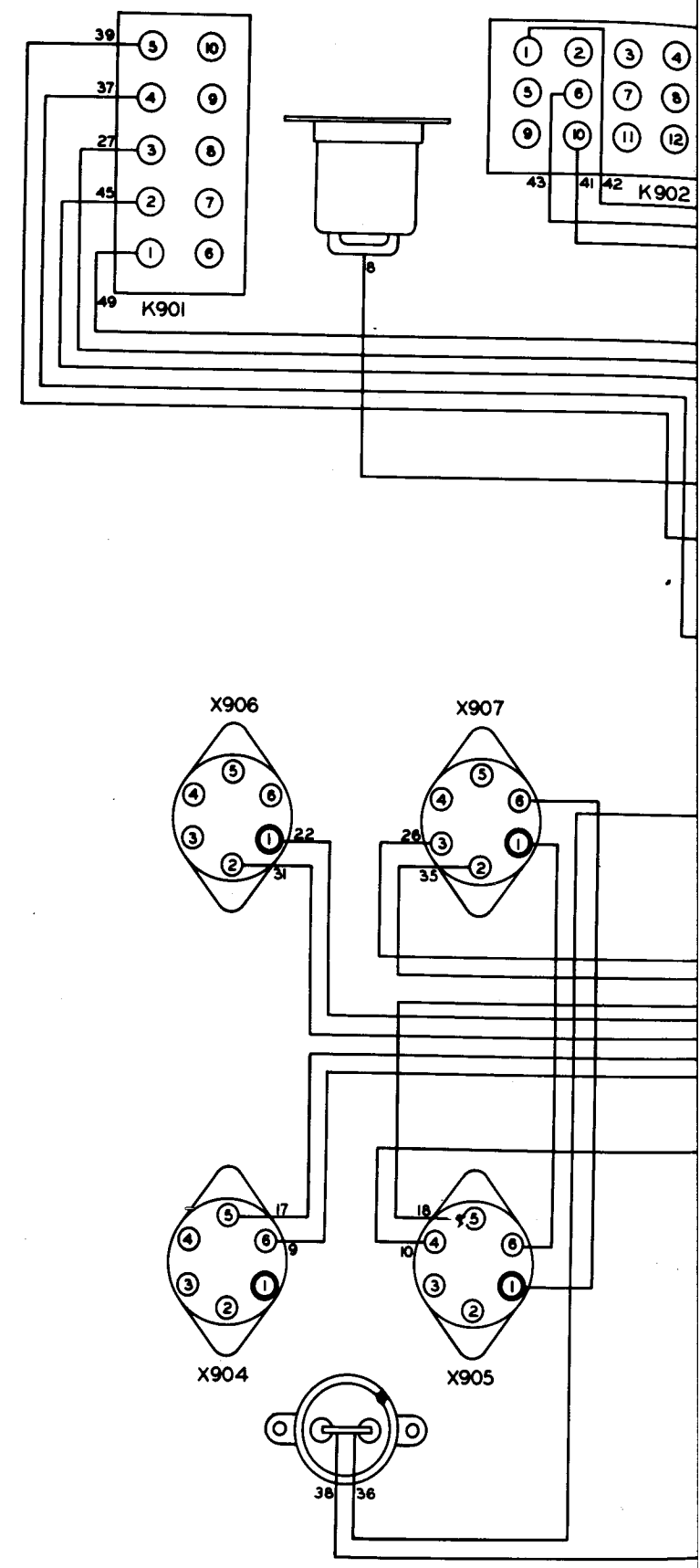
X904

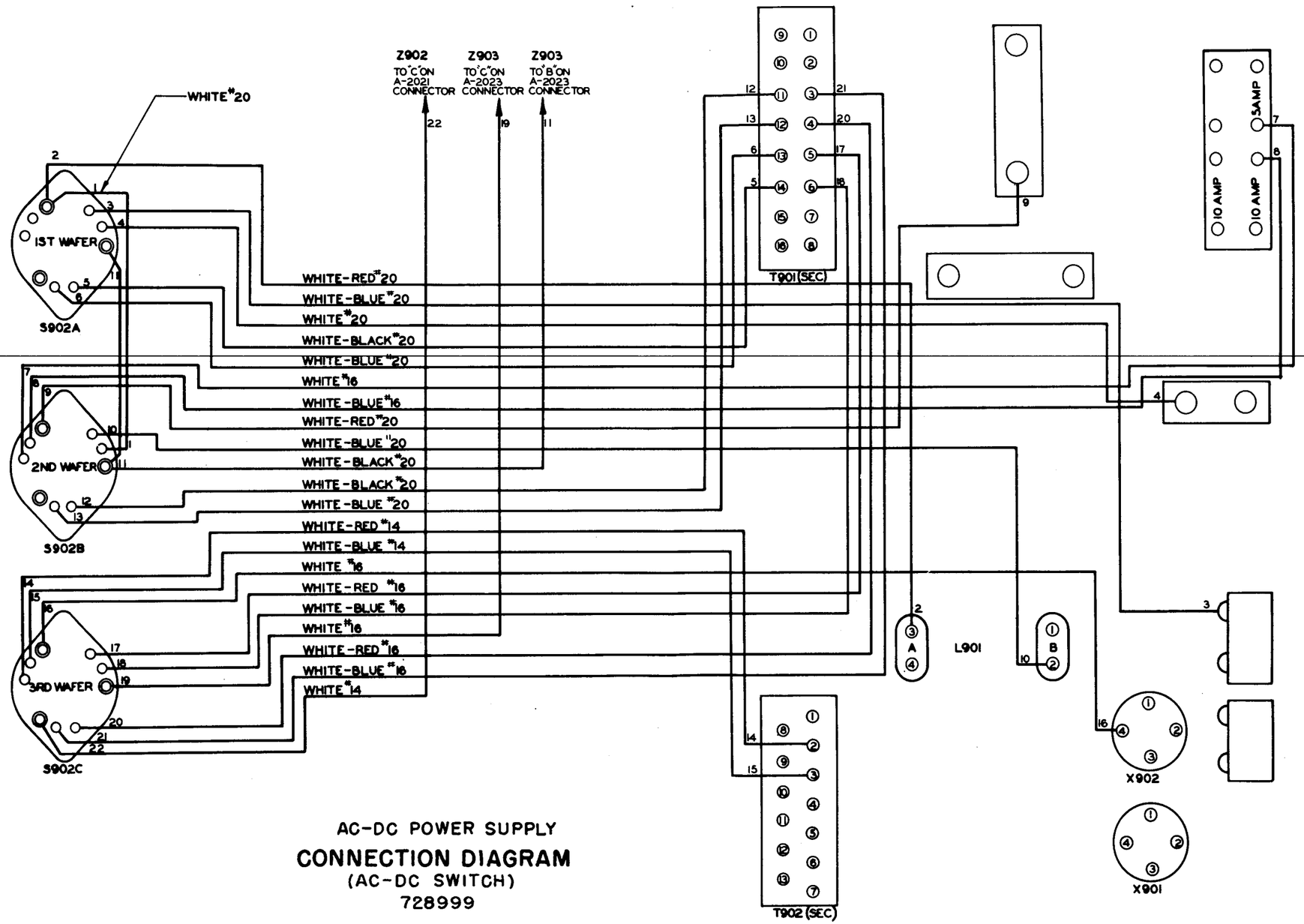
X905

T902

S902B

AC-DC POWER SUPPLY
CONNECTION DIAGRAM
VOLTAGE SWITCHES
618897


39
37
27
45
49
K901
43
41
42
K902
X906
X907
22
31
26
35
17
9
18
10
X904
X905
38
36



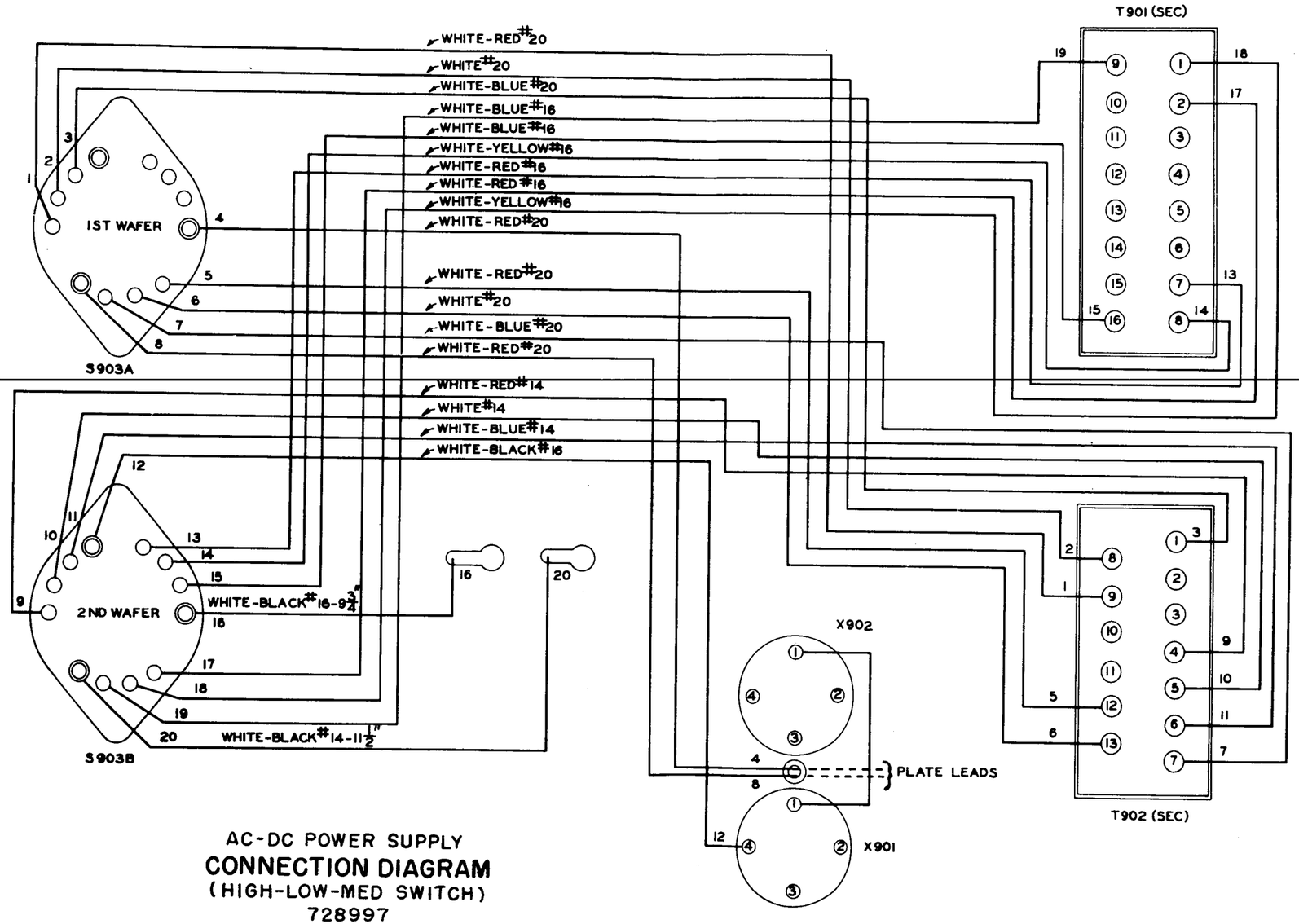
AC-DC POWER SUPPLY

CONNECTION DIAGRAM

(AC-DC SWITCH)

728999

REVISED--SEE ERRATA AT 161, 162
THE FRONT OF THIS BOOK



AC-DC POWER SUPPLY
CONNECTION DIAGRAM
(HIGH-LOW-MED SWITCH)
728997

RELAY SERVICING

The MAR equipment employs eight relays which are located as follows:

Transmitter-Receiver, transmitter section

K101 - Antenna transfer relay
K102 - High voltage change-over relay
K601 - Selector motor relay

Modulator-dynamotor

K701 - Transmit-receive relay
K702 - Voltage regulating relay

AC-DC Power Supply

K901 - A Power relay
B Output current relay

K902 - A Starting relay
B Output current relay

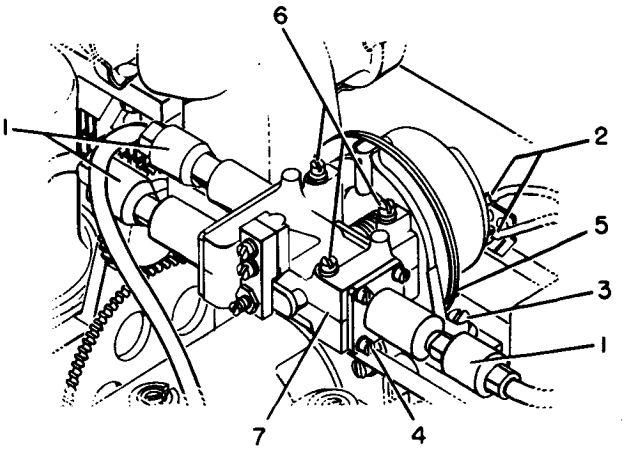
K903 - Time delay relay

NOTE: Relays K901 and K902 consist of two relays each, mounted in a common case.

All the relays, with the exception of the antenna transfer relay K101 and time delay relay K903, are of the hermetically sealed, gas-filled type enclosed in metal cases. Normally, no adjustments or repairs can be made to these relays and a defective relay must be replaced by a complete assembly.

However, in cases of extreme emergency, with no spares available and when tests show the relay contacts to be definitely at fault, it is possible to remove the case by carefully sawing around the case with a hacksaw or grinding off the bead around the edge of the base. Repairs may then be made to the contacts but the relay should be replaced by a new assembly at the first opportunity. The following diagrams show the internal connections and data necessary to check the condition of the relays. Resistance measurements made across coil terminals and across contacts that should be closed under given conditions are a direct indication of coil winding continuity and contact functioning.

ANTENNA TRANSFER RELAY
(K101)



This is a solenoid actuated SPST relay and may be dismantled to permit cleaning and adjustment of the contacts.

Cleaning and Adjusting Contacts

1. Disconnect the three coaxial cables.

2. Unsolder leads to the terminals of coil.

3. Remove two screws in the base of the relay and remove relay from chassis.

4. Remove the two bottom screws in each of the three coaxial connector plates.

5. Remove two lower screws from the coil case.

6. Remove four screws in top of casting.

7. Pry the two halves of the casting apart with a knife blade. Do not lose the taper pins in the top half of the casting.

Clean Contacts With Crocus Cloth

The clearance between open contacts in both positions of the relay should be .015 inches. Adjust the stop screw on the relay to provide proper clearance. Seal the screw with a drop of lacquer after adjustment is made.

Reverse the sequence of the steps taken is dismantling to reassemble the relay. Make certain the taper pins are in place before replacing the four screws in the casting halves.

NOTE: Do not attempt to interchange castings of K101 relays. They are machined in sets and are not interchangeable.

H.V. CHANGE-OVER RELAY (K102)
SELECTOR MOTOR RELAY (K601)

To test or replace either K102 or K601 relay it will be necessary to proceed as follows:

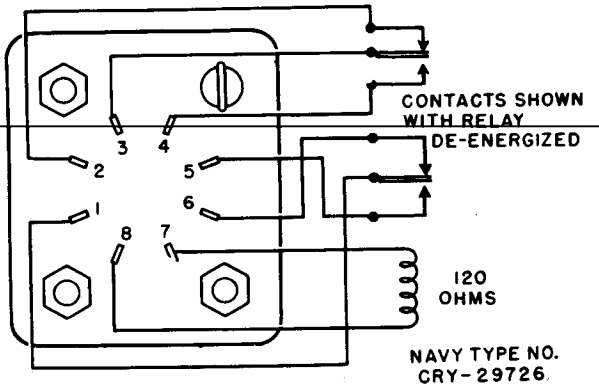
1. Stand chassis of Transmitter-receiver on end, transmitter down.

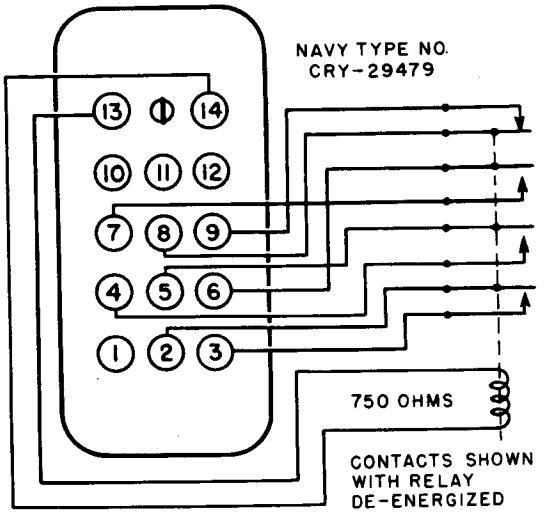
2. Remove the two screws in the ends of the bar supporting the two relays, at the bottom of the transmitter.

3. Loosen the screw in the center of the round ceramic resistor between the relays.

4. Swing the relay assembly out from the chassis to allow access to the terminals of the relays.

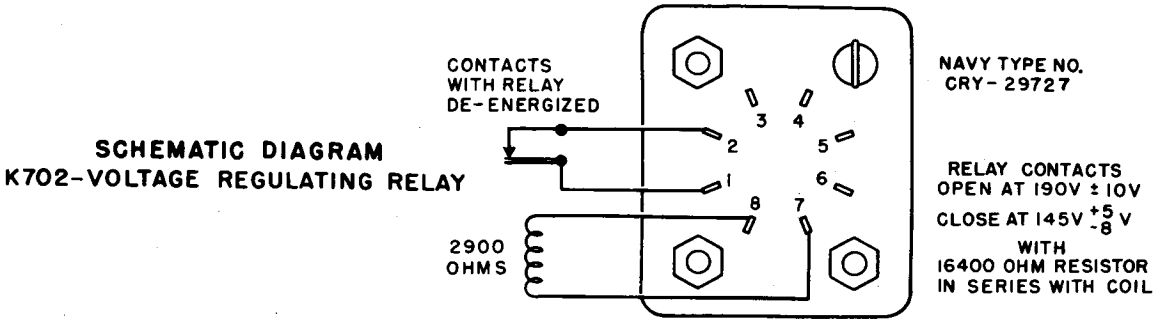
SCHEMATIC DIAGRAM
K102-HIGH VOLTAGE CHANGE-OVER
K601-SELECTOR MOTOR





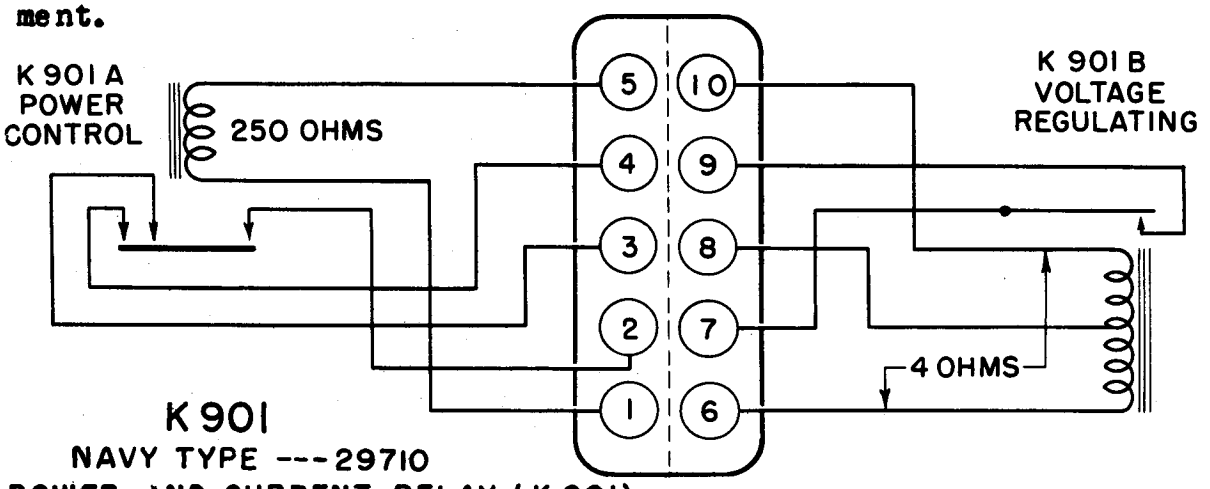
SCHEMATIC DIAGRAM
K-701- TRANSMIT-RECEIVE RELAY

TRANSMIT-RECEIVE RELAY (K701)
Terminals of this relay are readily accessible at the bottom of the modul tor-dynamotor chassis for test or for disconnection of the assembly when replacement is necessary.



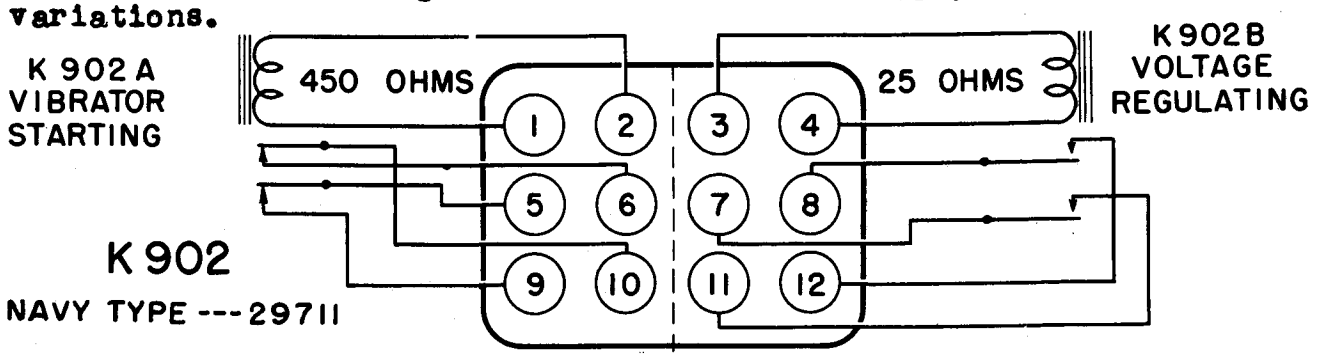
VOLTAGE REGULATING RELAY (K702)

This relay is mounted on the shield in the modulator-dynamotor. The terminals and mounting bolts can be reached in the modulator s ction for test or dismounting of the relay for replacement.



POWER AND CURRENT RELAY (K 901)

This unit consists of two relays assembled in a common sealed case. One section, K901A, is the power control for the AC-DC Power Supply and is energized when the power switch on the panel of the MAR modulator-dynamotor is moved to the PU position. The other section, K901B, functions to partially maintain a constant voltage output of the power supply under load variations.

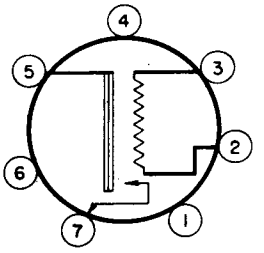


STARTING AND CURRENT RELAY (K902)

A dual relay, one section controls starting currents to the vibrators, the other furnishing additional voltage regulation on the power supply output.

TIME DELAY RELAY (K903)

This relay acts to delay application of plate voltage to the radio equipment until the heaters in the tubes have reached a suitable temperature. A thermostatic element provides the delay function, requiring the application of current for 30 seconds before closing the HV output circuit of the power supply.

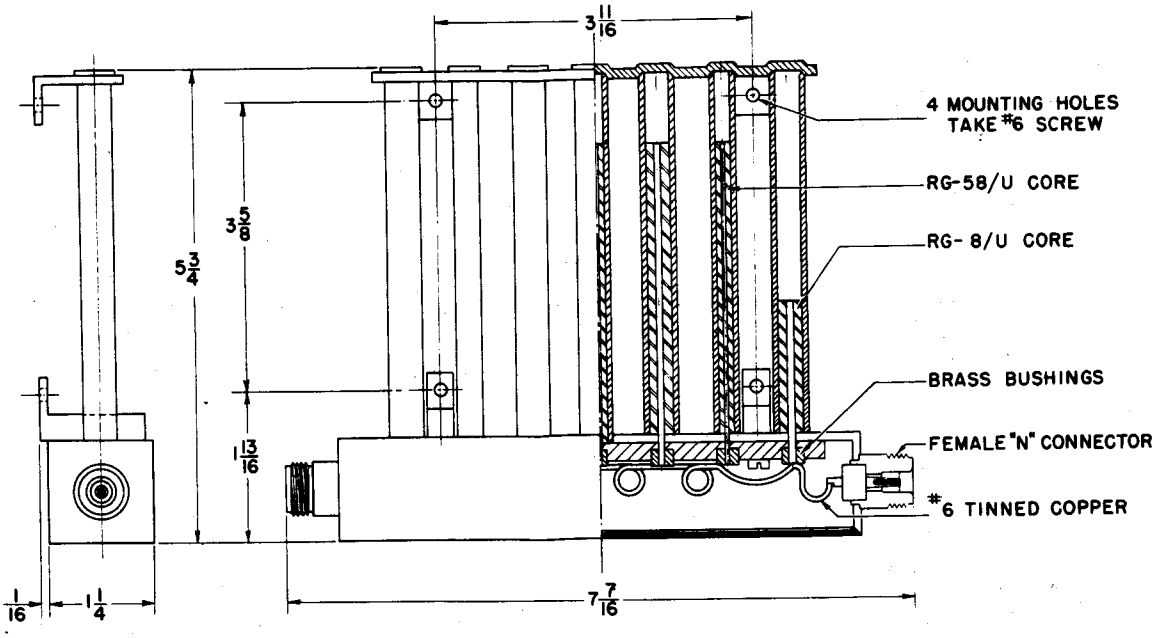


INTERNAL CONNECTIONS
K903 TIME DELAY RELAY

The relay is built into an evacuated glass envelope and a defective relay may be replaced by simply plugging a new relay into the seven prong socket.

LOW PASS FILTER

The Low Pass Filter is intended for use in the 50 ohm coaxial transmission line with the MAR radio equipment. It is designed to pass radio frequency energy having a frequency of 200 to 400 megacycles, with a cut-off frequency of not less than 400 megacycles. The attenuation band is from 500 (maximum lower limit) to 800 megacycles (minimum upper limit). Minimum attenuation within these frequency limits is 60 db. Insertion loss not to exceed 1 db in the pass band. Power handling capacity is 50 watts under continuous operation in the pass band.

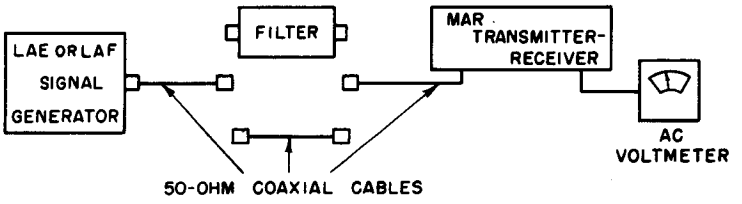


OUTLINE DIMENSIONS AND CONSTRUCTION DETAILS
CAWY-53349 LOW PASS FILTER

The filter must be installed in series with the antenna coaxial transmission line of the MAR equipment. The one-foot patch cord, with fittings, is provided to facilitate installation. The location of the unit in the transmission line is not electrically critical. It is recommended, however, that the unit be installed in the same compartment with the equipment.

The filter is not easily damaged under normal operating conditions. If faulty operation is suspected, a check for shorts between the conductor and the housing should be made. The insulation used has a resistance of several megohms. A check for continuity between the center pins of the "N" type connectors should also be made. This resistance should be practically zero on an ordinary ohm-meter. If these tests plus a visual inspection of the connectors and the housing, do not show the cause of the suspected failure then a measurement of the actual attenuation will be necessary.

TEST SETUP FOR LOW PASS FILTER



Adequate test equipment should preferrably include a signal generator capable of covering the range of 200 to 1000 megacycles. The MAR or RDR receiver can be used to measure the signal strength over the operating frequency band. Connection between the test equipment and the filter unit must be made by 50 ohm coaxial cables provided with "N" type connectors. The test arrangement is shown in the block diagram. Suggested test equipment includes Model LAF and LAE signal generators and a rectifier type AC voltmeter to be used with the MAR or RDR receiver.

TEST PROCEDURE

1. Plug a rectifier type AC voltmeter into the output jack on the panel of the MAR transmitter-receiver which is properly adjusted and plug a 600 ohm headset into the phone jack of the modulator-dynamotor as an output load. Set the voltmeter for a scale reading of 0-15 volts.

2. Provide three 50 ohm coaxial cables fitted with connectors. Connect one cable to the antenna receptacle of th receiver and a second cable to output of the LAF signal generator.

3. Insert the third cable as a jumper cable between th signal generator and receiver input cables.

4. Switch power on to both signal generator and receiver and allow tubes to heat.

5. Place output level control on receiver at 8, silencer switch off and silencer level at zero.

6. Set channel selector switch on receiver at position 1.

7. Adjust signal generator frequency to that of the receiver and adjust the attenuator on the signal generator to give an indication of 10 volts on the AC voltmeter connected to the output of the receiver.

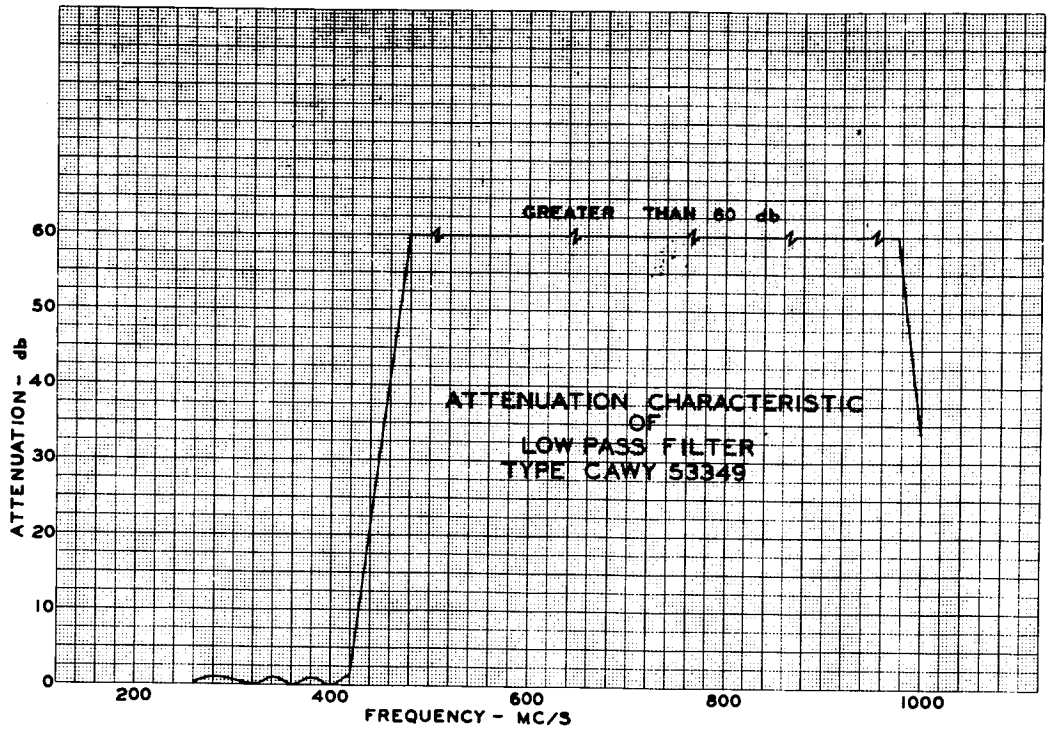
8. Insert the filter in the line between the signal generator and the receiver and readjust the attenuator on the signal generator to obtain the same output reading on the receiver as was obtained without the filter in the line. The difference in db in the two attenuator settings is the filter insertion loss at that frequency. This loss should not exceed 1 db.

9. Repeat steps 6 to 8, setting the channel selector switch to the successive channel frequencies to which the receiver is preset to check the operation of the filter on all ten frequency channels.

The above test will determine if the filter is passing radio frequencies in the desired band without excessive attenuation that would indicate a defective filter.

CHECKING FILTER CUTOFF

To check the cutoff property of the filter over the full range it will be necessary to use a signal generator with a range up to 1000 megacycles. The Model LAK will serve for the purpose up to 600 megacycles, but above this frequency, use must be made of the Model LAE. The purpose of this test is to determine the effectiveness of the filter in blocking harmonics of the channel frequencies.



S-853828

To test the filter, leave the equipment set up as in the procedure for checking the filter for its pass band, with the filter in the line.

1. Move the channel selector switch to position 1.

2. Adjust the frequency of the signal generator to the channel frequency of the receiver and adjust the attenuator on the generator to obtain an output voltmeter reading of 10 volts.

3. Adjust the frequency of the generator to approximately twice that of the channel frequency and gradually increase the output of generator, sweeping the signal frequency output through the harmonic frequency. Should harmonics pass the filter, adjust the generator output in an attempt to obtain the same reading on the meter as was obtained with the fundamental frequency. The generator output on the harmonic frequency should not be less than 60 db greater than that required on the fundamental frequency for the same output at the receiver.

Check each channel frequency in the same manner, changing to the Model LAE generator when frequencies above 550 megacycles are required for harmonics. Appreciable deviations from the values shown in curve would indicate a defective filter.

EMERGENCY REPAIR

It is intended that a faulty or damaged unit should be replaced with a new unit. However, under exceptional conditions it might be desirable to make emergency repairs. DO NOT TRY TO UNSOLDER THE BOTTOM COVER. The soldering of the bottom cover was done with special equipment and sufficient heat to release it would melt the polyethylene dielectric. A small hole should be drilled in the bottom cover about 1/4" from the side, and using curved snips or diagonal cutters cut around the bottom at a distance of 1/4" from the side. Remove the remaining flange by cutting in to the side and rolling it up like a "sardine can" sealing strip.

Note the wire loops. A severe shock may have shorted them where they cross near the dielectric. The whole insert may be removed from the housing for inspection by unsoldering the conductor from the end connectors and removing the four screws from the base. The cables are covered with a silicone plastic - (Dow Corning #4) and have a sticky appearance.

A replacement lid can be made from a piece of .032" brass that is 6-1/16" long by 1-3/16" wide. This will be smaller than the base by half the thickness of the housing. After the edges are tinned the lid can be soldered on. The soldering should be done point to point with as little heat as possible. An additional precaution is to place the filter with the tubes down in a pan of cold water up to the base while the soldering is being done.

TROPICALIZATION IN THE FIELD

The purpose of tropicalization is to protect the equipment from the effects of moisture and to prevent destructive fungus growth. The protective coating applied during the process prevents corrosion of metallic parts due to condensed moisture. It also seals the insulating members that support circuit elements to retard the entrance of moisture that may cause electrical leakage between conductors. The fungus resistant property of the coating is an effective retardant to fungus on such materials as are capable of supporting such growths.

MAR equipment has been tropicalized at the time of manufacture and treatment in the field is intended primarily to renew the fungicide content of the protective coating. Parts replaced while making repairs will also require the protection of such treatment.

A varnish containing no pentachlorinated phenol nor mercury compounds is used for providing the necessary moisture and

fungus resistant coating. The products listed in the following table, according to Joint Army and Navy Specification JAN-C-173 (Navy Specification 52C35 INT), are suitable for the purpose.

Commercial Designation		Manufacturer
Varnish	Thinner	
RCA Finish #763	RCA Thinner #10 Toluol or Solvesco No. 1 or 2	Radio Corporation of America, Camden, N.J.
Moisture and Fungus Resistant Varnish #522ASH	Reducer #8	Maas & Waldstein Newark, N.J.
Tuf-on Bakelite Resin Varnish #74 S	Tuf-on Thinner #74	Wipe-on Corp. New York, N.Y.

The varnish is applied with a spray or brush as found most practical, both procedures are usually necessary to thoroughly treat the equipment. The varnish contains a flourescent dye and failure to fully coat the equipment is readily detected, by the absence of a glow on parts not treated, when the work is exposed to ultra-violet light.

Tropicalization should not be applied to front panels or other portions of the equipment that are visible after final assembly. The chassis of the radio units, AC-DC power supply and remote box are the only parts of the MAR equipment that should require tropicalization in the field. All other components, particularly of the Field Application Kit such as shipping chest, antenna carrying case and remote control carrying case, are treated by other means to render them resistant to moisture, mildew and fungus.

PREPARING EQUIPMENT FOR TROPICALIZATION

Remove the units from the cases and clean thoroughly. Remove all dirt, dust or grease, preferably with a cloth or air blast. Do not use cleaning solutions that might affect waxed or impregnated parts. The use of cleaning solutions may also remove grease from the bearings in the transmitter assembly, leaving them without lubrication and subject to corrosion.

Excessive deposits of rosin resulting from soldering operations should be leaned off by scraping or chipping, never by the use of solvents.

TRANSMITTER-RECEIVER

Mask the following parts of the chassis, to prevent coating by the spray, by covering with paper or cloth, gummed or tied into place.

1. Front, edges, and inner grounding flange of panel and all panel controls.

2. Bottom surfaces of runner strips on side of the chassis.

3. Meter switch where it protrudes into the IF section.

4. Entire transmitter assembly, both top and bottom.

5. Selector assembly, top and bottom.

6. Remove tubes from RF, multiplier, IF and audio sections of the equipment and replace with dummy or defective tubes. Remove crystal from multiplier section and replace with dummy crystal.

7. Remove cover plate from bottom of IF-Audio section.

MODULATOR-DYNAMOTOR

Mask the following parts of the unit.

1. Front panel, edges and inner grounding flange of panel.

2. Bottom surfaces of runner strips on the side of the chassis.

3. Dynamotor.

4. Switch assemblies on rear of panel.

5. Remove tubes and replace with defective or dummy tubes. Lock tube clamps.

AC-DC POWER SUPPLY

Mask the following parts of the chassis.

1. Front panel, edges, and inner grounding edge of panel.

2. Bottom surfaces of runner strips on the side of the chassis.

3. The three multiple wafer switches on the bottom of the chassis.

4. Remove vibrators and replace with defective vibrator or dummy to protect socket sockets.

5. Remove tubes and relay K903. Replace with defective tubes and relay.

REMOTE CONTROL UNIT

Mask the following parts.

1. Panel front, edges, and grounding flange on rear of panel.

2. Remove dry cells and insert defective cells to protect spring contacts in battery compartment.

As a general rule, all exposed current carrying contact surfaces should be protected from the coating. The following parts or surfaces do not need treatment but no particular precautions need be taken to protect them other than that dripping thereon should be prevented.

Nylon, cellulose rayon or glass

Parts made of or plated with chromium, gold, nickel, rhodium or stainless steel.

Parts of natural or synthetic rubber.

Plastic insulated wire.

PREHEATING

When facilities permit, the equipment should be preheated at a temperature of 122° to 140°F (50° to 60°C) for a period of two to four hours in a convection oven before tropicalization. The time of preheating may be reduced to one hour if a forced circulation oven is used. This treatment drives off all moisture. Allow the equipment to cool to room temperature and spray immediately with the moisture and fungus resistant varnish.

SPRAYING

Thin the varnish before spraying in the proportion of two parts of varnish to one of thinner. The varnish should never be sprayed at a viscosity less than the value marked on the can for 20% of non volatile matter. Spray all unmasked metal

surfaces, parts, and wiring, applying one coat having a final thickness of not less than .002 inch.

The spray gun should be regulated to give a narrow wet spray and the varnish applied in a uniform, wet coat, spraying from all angles to get complete coverage of the parts. A spray that forms a vapor or mist should not be used.

BRUSHING

Touch up, with a brush, any areas that require coating but were rendered inaccessible by the masks during the spraying process. These would include soldered connections on switches and sockets, edges of insulating washers, etc.

INSPECTING

The flourescent dye in the varnish facilitates inspection of the coating for coverage when an ultra-violet light source is available. The absence of a glow on any area, when exposed to the light, indicates an uncoated area that should be touched up with a brush.

DRYING

Allow the equipment to air dry at room temperature for one-half hour in a well ventilated room or booth, after which time the masking material may be removed. Leave tubes and dummy fixtures in place while the coating is allowed to dry completely.

Drying may be speeded up after the first half hour of drying at room temperature by heating in an oven. The oven should be fitted with necessary equipment for handling volatile and inflammable vapors and the drying temperature should not exceed 140°F (60°C). After the coating is thoroughly dry, tubes may be replaced and the equipment put back into service.

WARNING: Under no circumstances shall the equipment be replaced in the cases or electrical power applied until the finish is thoroughly dry. Any vapor exuded by the coating is inflammable and if ignited by sparks at the switches may cause a destructive explosion.

HAZARDS

Handling of the varnish and thinner, mixing, spraying, brushing or drying must be done in properly ventilated areas, away from open lights, fires, and electric sparks.

Care must be exercised to avoid spilling the material on hands or other parts of the body. Rubber gloves and other approved protective clothing must be worn.

When ultra-violet lamps are used for inspection, suitable filters or screens shall b used to protect the operator from the extreme ultra-violet portion of the spectrum.