ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS

TELECOMMUNICATIONS ~~EZ 254~~/3

F 224

WIRELESS SET CDN. No. 19 Mk. III

2nd - 4th Echelon Work

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WIRELESS SET CANADIAN No. 19 Mk. III

2nd - 4th ECHELON WORK

INDEX TO SUBJECTS

INDEX TO SUBJECTS (CONTINUED) PARA

INDEX TO SUBJECTS (CONTINUED) PARA.

INDEX TO SUBJECTS—(Continued) PARA.

INDEX TO SUBJECTS—(Continued) PARA.

INDEX TO TABLES

INDEX TO TABLES—(Continued) TABLE

INDEX TO FIGURES

INDEX TO FIGURES (Continued)

INDEX TO FIGURES—(Continued) FIG.

WIRELESS SET CANADIAN No. 19 Mk. III

2nd - 4th ECHELON WORK

General

Test Equipment List

1. The following test equipment (or equivalent) will be required when testing the No. 19 set:

(a) Generator, Signal, Hickok No. 19X ....ZB/C 00006

Frequency Range—100 Kc/s. to 60 Mc/s. directly calibrated.

100 Kc/s. and 1000 Kc/s. crystal oscillators.

Calibrated Output—
R.F.—½ to 100,000 μV.
A.F.—400 cycles, 0 — 1 V.

Decibel Meter— −10 to +6, +6 to +22, +22 to +28 Dbs.

(b) GENERATOR, SIGNAL, HICKOK No. 188X................................ZB/C 00005

R.F. Output—100 Kc/s. to 110 Mc/s., modulated internally at 400 c.p.s., or externally from 50 to 15,000 c.p.s., or unmodulated.

Crystal controlled output in 100 Kc/s. and 1000 Kc/s. steps.

Frequency Modulated Output—750 Kc/s. sweep, 100 Kc/s. to 133 Mc/s.; 150 Kc/s. sweep, 1,000 Kc/s. to 133 Mc/s.; 30 Kc/s. sweep, 100 Kc/s. to 110 Mc/s. A.F. Output —100 to 10,000 c.p.s., or 400 c.p.s. fixed.

A.C. Voltmeter—calibrated in A.C. volts and —10 to +38 Dbs. when used with a 500 ohm load.

(c) GENERATOR, SIGNAL, V.H.F., G.R. 804C.

Carrier Frequency Range—7.6 to 330 Mc/s. in 5 ranges.

Output Impedance—equivalent to a resistance of 75 ohms in series with a capacitance of 100 μμfd.

Output Voltage Range—
1 μV. to 20 mV. up to 100 Mc/s.
1 μV. to 10 mV. from 100 to 330 Mc/s.

Modulation—amplitude modulated from 0 to 60%, 400 cycles, internal.

External, 100 to 20,000 cycles; approximately 7 V. required for 50% modulation. Input impedance .25 meg.

(d) OSCILLATOR, B.F., CLOUGH BRENGLE No. 79E..........................ZB/C 00019

Frequency Range—25 to 15,000 cycles per second.

Output—0 to 120 mW., 7.74 V.

Impedance—600 ohms.

(e) WAVEMETER, R.C.A., T.E. 149

Fundamental Frequency Range—2.5 to 5 Mc/s.

5 to 20 Mc/s. on 2nd and 4th harmonics.

Crystal Calibrated.

R.F. Output—10 mV.

(f) METER, Q. BOONTON No. 160A ....ZB/C 00010

Frequency Range—50 Kc/s. to 75 Mc/s. in 8 ranges.

Capacity—30 to 450 μμfd.

Q—0 to 625.

(g) METER, OUTPUT POWER, G.R. No 583A................................ZB/C 00012

Power Range—0.1 to 5,000 mW.
Impedance Range—2.5 to 20,000 ohms.

(h) OSCILLOSCOPE, C.R., DUMONT No. 208.....................................ZB/C 00020

Input Impedance, X and Y Axis—constant 2 meg., 15 μμfd. load to signal source.

Frequency Range—2 to 100,000 sinusoidal cycles.

Voltage Gain—
Y axis—2000.
X axis—43.

Deflection Sensitivity—
Max., Y axis, 0.01 r.m.s. V./in.
Max., X axis, 0.5 r.m.s. V./in.

Direct to Deflection Plates—
21 r.m.s. V./in. Y axis.
22 r.m.s. V./in. X axis.

Sweep—2 to 50,000 cycles, left to right.

(i) TEST SET, Voltohmyst, R.C.A. No. 165 .... ZB/C 00030
D.C. Voltmeter—3, 10, 30, 100, 300, 1000 V.
Input resistance of 11 meg. on all D.C. ranges.
A.C. Voltmeter—10, 30, 100, 300, 1000 V. using copper oxide rectifier.
1,000 ohms per volt on all A.C. ranges.
Electronic Ohmmeter—0.1 ohms to 1,000 meg. in 6 ranges.

(j) VOLTMETER, VALVE, MEASUREMENTS CORP. No. 62.
A.C. or D.C. Voltmeter—5 ranges; 1, 3, 10, 30, 100 V. full scale.
Frequency Range—30 cycles to 350 Mc/s.
A.C. Input Impedance—
2 meg. at .01 Mc/s.
1 meg. at 1.0 Mc/s.
.01 meg. at 100 Mc/s.
D.C. Input Impedance—5.4 meg. or 10 meg.

(k) L.F. Receiver, 150—230 Kc/s.

(l) No. 19 set meter—500μA., 360 ohms (P.C. 90609C).

(m) R.F. Ammeter (thermocouple)—0—1 amps.

(n) Voltmeter, A.C., 0—5 volts, 1000 ohms per volt.

(o) Complete No. 19 set station. (For operational check on set under test).

Additional Accessories

2. The following additional equipment will be required:

(a) All the components necessary for a No. 19 set station, except the sender-receiver unit. (Required to operate the set under test.)

(b) Aligning tool.

(c) Glyptal Cement.

(d) Sealing compound, Sarco No. 135 Asphalt.

(e) Small 30 V. battery. (For bias purposes).

(f) Dummy 807 valve (screen grid, pin No. 2 removed).

(g) Dummy Morse key plug, with terminals shorted.

(h) The following resistors:
- (i) 24 ohm, 10 W., non-inductive.
- (ii) 40 ohm, ½ W., non-inductive.
- (iii) 52 ohm, ¼ W., non-inductive.
- (iv) 100 ohm, ¼ W., non-inductive.
- (v) 620 ohm, ¼ W., non-inductive.
- (vi) 820 ohm, ¼ W., non-inductive.
- (vii) 1000 ohm, ¼ W., non-inductive.
- (viii) 1600 ohm, ¼ W., non-inductive.
- (ix) 2000 ohm, ¼ W., non-ductive.
- (x) 3300 ohm, ¼ W., non-inductive.
- (xi) 3500 ohm, ¼ W., non-inductive.
- (xii) 10,000 ohm, ¼ W., non-inductive.
- (xiii) 100,000 ohm, ¼ W., non-inductive.

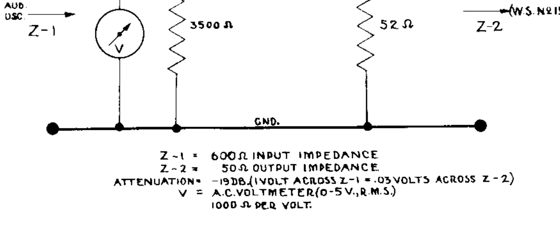
(i) The following condensers:
- (i) .01 μfd., paper, 200 V.
- (ii) .002 μfd., paper, 200 V.
- (iii) .003 μfd., mica, 1000 V.
- (iv) 45. $\mu\mu$fd., mica, 400 V.
- (v) 45. $\mu\mu$fd. maximum, variable air.

(j) Valve, type E-1148.

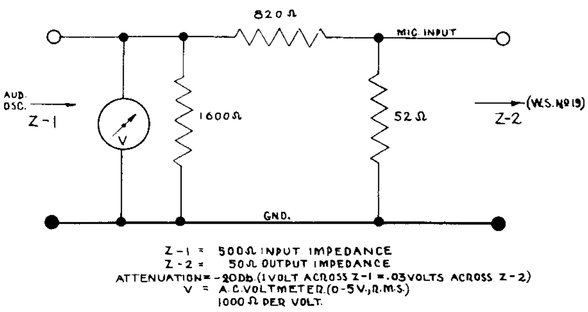
(k) Octal valve socket.

ATTENUATOR PADS

3. Impedance matching, calibrated attenuation pads are required to match the impedance of the audio oscillator to the 50 ohms of the No. 19 set microphone input transformers. They are also calibrated for proper attenuation., e.g.—one volt applied at the audio oscillator end of the pad is reduced to exactly .03 V. at the No. 19 set. Thus, a normal A.C. voltmeter across the audio oscillator terminals will give readings easily converted to represent the required decimal voltages at the No. 19 set end of the pad.



T FZ 254/3 / 1-1 FIG. 1—ATTENUATOR PAD NO. 1



T $\frac{\text{FZ 254/3}}{\text{1 - 2}}$ FIG. 2—ATTENUATOR PAD NO. 2

Pad No. 1 (Fig. 1) may be used with the Oscillator, B.F., Clough Brengle No. 79E which has 600 ohms impedance. Pad No. 2 (Fig. 2) is required for the type 79D or the audio oscillator portion of the Hickok 188X, both of which have an impedance of 500 ohms.

DECIBEL METERS

4. It will be noted that some of the test readings given during alignment are in decibels. This was done to allow the Db. Meter on the Hickok signal generator to be used as an output meter when shunted across the proper value of load resistor stated for each set. The readings given are NOT true Dbs., but are the indicated Dbs. that will be shown on the Hickok meter. This was necessary as the meter is merely a voltmeter movement calibrated in Dbs. The standard calibrating reference level was 6 mW. through a 500 ohm load = 0 Db. Thus the meter would only be correct when reading across 500 ohms, and would be incorrect when reading across the smaller No. 19 set loads. The readings given allow for this and, as stated above, are the indicated Dbs. actually read on the meter; not true Dbs. For reference only:—

True Dbs. =

$$\text{Indicated Dbs.} + 10 \log \frac{500}{\text{actual load resistance.}}$$

Method of Numbering Terminals

5. VALVE SOCKETS:—

Valve socket pins shall number clockwise from the key, viewed from the underside of the chassis.

6. TERMINALS:—

The terminals on all resistor boards, etc., shall number consecutively:

(a) From left to right as viewed from the REAR of the set. This also applies to the inverted chassis for under chassis terminals.

(b) From the front panel to the rear of of the set.

(c) From the chassis up or down in the case of vertical boards.

This is important when interpreting references to terminal board contacts in the section dealing with connections and colour coding to components. "TOP" shall refer to the upward side whether the chassis be upright or inverted.

7. I.F. TRANSFORMER TERMINALS:—

These shall also number from left to right except in the case of those built by R.C.A. Victor. The R.C.A. units have their terminals arranged in a rectangular formation, with the terminal numbers stamped on the fibre board.

8. CONNECTOR SOCKETS:—

These all have their terminal numbers stamped on the fibre insert.

Location of Components

9. The mechanical location of the No. 19 Set components is shown in Table 1. The position of sub-chassis items is indicated by a "grid reference" to Fig. 6. The location of some minor components may vary slightly on the sets produced by different manufacturers. However, they will generally be located in close proximity to the indicated position.

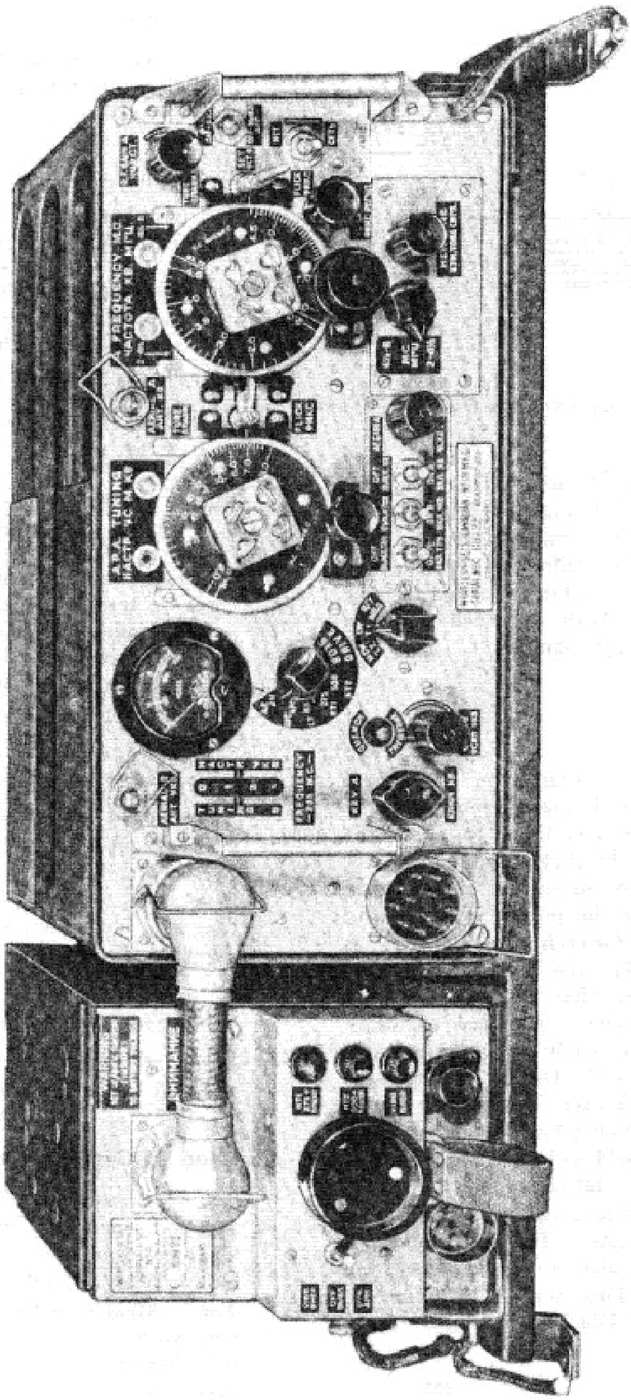


FIG. 3—WIRELESS SET (CDN.) No. 19 MK. III—(FRONT VIEW)

T FZ 254/3 / 1 - 3

TABLE 1—LOCATION OF COMPONENTS

Component	Fig.	Location	Remarks
Main term. board	6	4.60—C.50	
Quench Cap. board	6	2.80—D.20	
L9A board	6	4.80—A.60	
V4A board	6	3.50—D.05	
V2A board	6	7.65—A.90	
I.C. input board	6	1.30—C.50	
"B" & I.C. board	6	2.00—A.10	
A.V.C. board	6	4.50—A.90	
Drive Term. board	6	5.20—C.85	
Gang-isolator board	6	6.20—C.15	
Meter board	5	Rear of meter	
P.A. board	5	Rear of P.A. tuning condenser, C3A.	
"B" AE. board	5	"B" Osc. can.	Jct. L26A and L12A.
"B" Osc. resistor board	5	"B" Osc. can.	Vertical 6 term. board.
Transformer board	Supply Unit	Beneath T/C-101A	Left side.
Choke board	Supply Unit	Beside L/C-101A	Right side.
PL-1C board	Supply Unit	Beside PL-1C.	
PL-2C board	Supply Unit	Beside PL-2C	
R1A	6	2.60—B.35	Pin 4 to Pin 6, V1E.
R1B	6	4.57—B.05	Pin 8, V3A to term. 2, L9A board.
R1C	6	5.30—B.85	Pin 1 to pin 3, V6A.
R1D	6	5.20—B.85	Pin 3 to pin 6, V6A.
R1E	6	6.45—D.40	L21A top terms. (front & right).
R1F	6	1.70—B.80	Pin 4 to pin 6, V1F.
R2A	6	8.00—B.90	Pin 1, V2A to pin 8, V1A under C4A.
R2B	6	7.60—C.65	Pin 7 to pin 8, V2B.
R2C	6	1.75—A.10	Terms. 1 & 3, B & I.C. board.
R2D	6	1.30—C.70	I.C. input board.
R2E	6	2.30—A.10	Terms. 4 & 6, B & I.C. board.
R2F	6	7.00—B.40	Term. top 2, S11A rear section.
R3A	6	7.15—B.40	Pin 8, V2A, to Gnd.
R3B	6	5.55—A.65	Pin 8 to pin 5, V1C.
R4A	6	7.70—B.40	Pin 1 to pin 4, V2A.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
R4D	6	7.45—C.50	Pin 4, V2B to pin 7, V1A.
R5A	6	6.90—C.55	L23A-B top front to top right terms.
R5B	6	7.42—A.35	Pin 3 to pin 4, L8A (R.C.A.) Pin 1 to pin 4, L8A (N.E.)
R5C	6	4.47—A.45	Term. 2, L9A to term. 1, L9A board.
R5D	6	5.17—C.38	Top left term. L4A to Drive Term. Board.
R5E	6	6.45—D.20	See Fig. 28.
R6B	6	7.70—B.60	Pin 5 to pin 8, V2A.
R6D	6	7.50—D.00	Pin 5 to pin 7, V2B.
R6F	6	4.85—C.47	Terms. 5 & 6, right side, main term. board.
R6G	6	2.55—C.08	Pin 1 to pin 8, V1D.
R6H	6	2.77—C.59	Quench capacity board.
R7A		Across L8A primary. Terms: 2-4	Found only on old style, wax seal I.F. transformers.
R7B		Across L8B primary Terms: 2-4	Found only on old style, wax seal I.F. transformers.
R7C	6	4.60—A.55	Term. 2, L9A board to term. 3, L9A.
R7D	6	4.30—D.05	Terms. 2 & 3, left side, main term. board.
R7G	6	4.30—C.90	Terms. 3 & 4, left side, main term. board
R7H	5	Meter board	Right side term. to bottom 5 term.
R7J	6	2.60—B.05	Pin 3 to pin 1, V1E.
R7K	6	1.75—B.05	Pin 3 to pin 1, V1F.
R7L	6	6.90—A.70	Pin 5 to pin 6, V1B.
R7.1J	6	7.20—B.95	Pin 4, V1A to Gnd.
R8A	6	4.87—A.85	Pin 4 (R.C.A.) or Pin 5 (N.E.), V3A, to term 3, L9A board.
R8B	6	4.60—A.95	Pin 4 (R.C.A.) or Pin 5 (N.E.), V3A, to A.V.C. board.
R8D	6	2.35—A.70	Pin 5, V8A to Gnd.
R8F	6	1.97—A.68	Pin 5, V8B to Gnd.
R9A	6	7.00—A.25	Pin 8 to pin 1, V1B.
R9B	6	Under "B" relay	Pin 8, V1E, to Gnd.
R9C	6	2.13—B.05	Pin 8, V1F, to Gnd.
R9D	6	2.85—A.70 under "B" relay.	Pin 6, V8A, to Gnd.
R9E	6	4.80—C.30 under C4N	Term. 5 to term. 7, right side, main term. board.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
R10A	8	Top of Variometer	Inside AE. transformer can.
R10C	6	3.65—D.30	Term 2 to term. 6, rear section, S7A.
R11A	6	4.73—C.63	Term. 3 to term. 5, right side, main term. board.
R11B	6	1.80—C.25	Pin 6 to pin 1, V7A.
R12A	6	4.67—B.15	Pin 1 to pin 6, V3A.
R13A	6	5.50—D.85	A.F. GAIN A control.
R14A	6	7.00—E.00	HET. TONE control.
R15B	6	4.35—D.50	Front centre term. to left No. 1 term., main term. board.
R16A	7	Top right corner	Inside B.F.O. can., L5A.
R17A	6	5.32—C.75	Term. 2, V5A to Drive term. board.
R18A	6	6.60—C.40	Top front to top rear terms., L23A-B.
R18B	6	4.50—B.83	Terms. 2 & 3, rear of main term. board.
R18C	5	"B" Osc. resistor board.	Term. 3 to term. 1.
R19A	6	3.75—C.52	Pin 4, V4A, to Gnd.
R19B	6	5.45—A.50	Pin 4 to pin 6, V1C.
R20A	6	3.65—D.05	Pin 2, V4A to term. 2, V4A board.
R20B	6	5.50—D.40	Pin 6, V5A, to Gnd.
R21A	6	4.32—C.35	Term. 5 to term. 7, left side, main term. board.
R21B	6	2.20—A.18	Terms. 4 & 5, B. & I.C. board.
R21C	5	Meter board	Term. 4, top row, to term. 4, bottom row.
R22A	5	V4A	Plate cap.
R23B	5	V1E	Grid cap.
R23C	6	2.77—B.20	Pin 1 to pin 6, V1E.
R23D	5	V1F	Grid cap.
R23E	6	1.90—B.25	Pin 1 to pin 6, V1F.
R24A	5	Meter board	Term. 2, top row, to term. 2., bottom row.
R25A	5	Meter board (Front)	Term. 1, top row, to term. 1, bottom row.
R26A	5	Meter board	Term. 3, top row, to term. 3, bottom row.
R28A	8	Top of variometer.	Inside AE. transformer can.
R29A	62		Inside variometer case.
R30A	6	5.82—B.98	Pin 7, V6A, to Gnd.
R31A	5	"B" Osc. can	Centre tap, L11A.
R32A	5	"B" Osc. resistor board.	Term. 4 to term. 3.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
R33A	6	1.95—B.70	Pin 6, V7A, to top rear term., L15A.
R33.1A	6	1.95—B.70	Pin 6, V7A, to top rear term., L15A.
R34A	6	2.10—C.40	Pin 4, V1D, to pin 6, V7A.
R34B	6	7.30—A.60	Pin 6, V2A, to (term 1., L8A; N.E.) (term. 4, L8A; R.C.A.)
R34C	6	8.00—D.00	(Under C4Q) Pin 6 to pin 1, V2B
R35A	6	2.80—D.95	GAIN B control.
R36A	6	1.85—A.20	Terms. 2 to 3, B. & I.C. board.
R37A	6	3.03—A.20	Pin 8 to pin 6, V8A.
R38A	6	1.90—C.00	Pin 2, V7A, to Gnd.
R39A	6	1.85—A.25	Pin 8 to pin 2, V8B.
R39B	6	7.15—B.30	Term. top 3, rear section, S11A, to top front term., L25A-B.
R40A		Supply unit	Pilot lamp to Gnd.
R42A	6	6.17—B.95	Connected across C5A.
R42B	6	4.65—D.45	Front centre term. to term. 1, right side, main term. board.
R42C	6	7.20—A.68	Pin 6, V1B, to V2A term. board.
R43A	6	5.20—A.65	Pin 4, V6A, to Gnd.
R44A	6	7.70—B.95	Pin 4 to pin 1, V1A.
R45A	6	8.00—A.80	(Under C4D) Pin 4, V2A, to (term. 1, L8A; N.E.) (term. 4, L8A; R.C.A.)
R45B	6	7.35—C.50	Pin 4, V2B, to pin 6, V1A.
R/C-101A	12	Supply unit	Pin 8, V/C-101A to right rear term. of C/C-105A-B.
R/C-102A	12	Supply unit	Pin 2 to pin 5, V/C-101A.
R/C-103A	6	4.60—A.85	A.V.C. board, to term. 4 on L9A board.
R/C-104A	6	4.50—D.30	Term. 2, left side to term. 1, right side, main term. board.
R/C-105A		Front panel	R.F. GAIN A control.
C1A	5	P.A. board	Bottom left term., L3A, to "A" AE. lead.
C2A	5	P.A. board	Top term., C36A, to top front term., L3A.
C2B	6	7.20—A.77	Pin 6, V2A, to top rear term. L24A-B.
C2C	6	6.45—D.60	Top front term., L21A, to top front term. L7A.
C2D	6	5.10—B.95 (under L6A)	Pin 3 to pin 5, V6A.
C2E	6	5.20—C.75	Pin 3, V5A, to pin 5, V6A.
C3A	5	P.A. dial	P.A. tuning condenser.
C4A	6	7.85—C.20	Pin 4, V1A, to Gnd.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
C4B	6	7.85—C.20	(Under C4A) Pin 8, V1A, to Gnd.
C4C	6	7.10—B.70	Top right term., L22A-B to Gnd.
C4D	6	7.90—A.70	(Under C4E) Pin 4, V2A, to Gnd.
C4E	6	7.90—A.70	Pin 8, V2A, to Gnd.
C4F	6	7.80—A.15	Term. 4, L8A, to Gnd. (N.E.) Term. 3, L8A, to Gnd. (R.C.A.)
C4H	6	6.65—A.15	Pin 8, V1B, to Gnd.
C4I	6	6.20—A.15	Term. 2, L8B to Gnd. (N.E.) Term. 3, L8B to Gnd. (R.C.A.)
C4K	6	5.00—A.15	Pin 8, V1C, to Gnd.
C4L	6	4.60—A.15	Term. 2, L9A, to Gnd.
C4M	6	5.45—B.40	Pin 6, V3A, to Gnd.
C4N	6	4.80—C.00	Term. 5, right side, main Term. board, to Gnd.
C4O	6	5.75—B.40	Pin 4, V1C, to Gnd.
C4Q	6	7.85—C.80	(Under C4U) Pin 8, V2B, to Gnd.
C4R	6	5.20—D.20	Top left term., L4A, to Gnd.
C4S	6	5.20—D.50	Pin 6, V5A, to Gnd.
C4T	6	7.20—C.75	Bottom term., L7A (R.C.A.) to Gnd. Term., top 4, front section, S11A (N.E.), to Gnd.
C4U	6	7.85—C.80	Pin 4, V2B, to Gnd.
C4V	6	2.90—C.30	Pin 4 to pin 8, V1D.
C4W	6	1.20—B.85	Pin 4, V1E, to Gnd.
C4X	6	1.20—B.45	Pin 4, V1F, to Gnd.
C4AP	12	Supply unit	Right rear to left rear Dyn. motor brushes.
C4BP	12	Supply unit	Right front Dyn. motor brush to Gnd.
C4CP	11	Supply unit	Bottom left term., PL2C board to Gnd.
C5A	6	6.00—C.05	C9A stator to term. 1, top, S11A, No. 3 section.
C5B	6	6.00—C.25	C9C stator to term. 1, top, S11A, No. 2 section.
C5C	6	6.05—D.10	Bottom front term., L21A, to term. 1, top, S11A, No. 1 section.
C6A	6	6.77—A.90	Top rear term., L24A-B, to Gnd.
C7A	6	7.57—B.00	Pin 5, V2A, to top rear term., L25A-B.
C7B	6	7.70—D.50	Inside B.F.O. can.
C8A	6		(Under L24A-B)Front right term., L24A-B to L/C-103A.
C9A	5	M.C. gang	Rec. mixer section.
C9B	5	M.C. gang	Rec. Osc. section.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
C9C	5	M.C. gang	Driver Output section.
C9D	5	M.C. gang	V2B Drive section.
C10A	5	M.C. gang	H.F. Rec. mixer trimmer.
C10B	5	M.C. gang	H.F. Driver Output trimmer.
C10C	5	M.C. gang	H.F. V2B drive trimmer.
C10D	6	7.50—B.75	Top 3 term., No. 3 section, S11A to Gnd.
C10E	6	7.25—D.45	Top rear term., L21A, to Gnd.
C10F	6	5.60—B.80	Top right term., L6A, to Gnd.
C10.1A	6	6.70—B.75	Top rear to top left term., L22A-B.
C11A	6	6.28—B.08	Front right term., L25A-B to Gnd.
C12A	6		Connected in parallel with C11A.
C13A		Inside L8A can.	Across primary coil.
C13B		Inside L8A can.	Across secondary coil.
C13C		Inside L8B can.	Across primary coil.
C13D		Inside L8B can.	Across secondary coil.
C13E		Inside L9A can.	Across primary coil.
C13F		Inside L9A can.	Across secondary coil.
C14A	6	4.88—A.45	Term. 3, L9A, to term. 3, L9A board.
C14B	6	1.35—C.40	Term. 2 to term. 3, I.C. input board.
C15A	6	4.65—A.48	Term. 2 to term. 3, L9A board.
C15B	6	Under L6A	Pin 4, V6A, to Gnd.
C15C	6	3.65—C.40	Pin 4, V4A, to Gnd.
C15D	6	Under L4A	Pin 6, V6A, to Gnd.
C15E	6	Under main term. board	Term. 2, right side, to term. 4, left side, main term. board.
C15F	6	3.40—C.50	Pin 2, V4A, to term. 3, V4A board (N.E.); Pin 2, V4A, to Gnd. (R.C.A.)
C15G	6	2.50—C.50	Pin 1, V1D, to bottom rear term. L14A.
C15H	6	2.30—B.95	Pin 6, V1D, to Gnd.
C15J	6	2.20—A.90	Pin 3, V1E, to Gnd.
C15K	6	Under I.C. input board	Pin 2, V7A, to Gnd.
C15L	6	Under I.C. input board	Pin 2, V7A, to Gnd.
C15M	6	Under main term. board	Front centre term. to term. 1, right side, main term. board.
C16A	6	5.75—A.50	Pin 8, V3A to pin 5, V1C (Gnd.)
C16B	6	2.70—A.20	Pin 8, V8A to pin 2, V8B (Gnd.)
C17A	6	4.80—A.65	Term. 2 to term. 5, L9A board.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
C17B	6	Either above or beneath main term. board.	Term. 4, right side to term. 4, left side, main term. board.
C17C	5	Meter switch	Term. 7, S8A, to Gnd.
C18A	6	5.00—A.90	Pin 4 to pin 5, V3A.
C19A	6	7.60—D.80	Inside B.F.O. can.
C20A	6	7.30—D.10	Pin 6, V2B, to Gnd.
C20B	6	5.60—D.10	Pin 2, V5A, to Gnd.
C21A	6	V2A socket	Pin 5, V2A to V2A term. board.
C21B	5	"B" Osc. can	Term. 2, "B" AE. board to L11A tap.
C22A	6	Underneath main term. board	Term. 6, right side, to term. 6, left side, main term. board.
C22C	12	Supply unit	Pilot light by-pass.
C23A	6	4.50—C.70	Term. 4, right side, to term. 5, left side, main term. board.
C24A	8	Variometer	
C25A	5	"B" osc. can	"B" tuning condenser.
C26A	8	Variometer	Inside A.E. transformer can.
C27A	5	"B" Osc. can	L11A to term. 4, "B" Osc. board.
C28A	6	2.30—C.55	Bottom rear term. L14A to Gnd.
C29A	6	2.50—C.70	Top rear term. L15A to term. 1, rear, Quench capacity board.
C29B	6	2.40—A.85	Pin 3, V1E, to pin 5, V8A.
C29C	6	1.50—B.00	Pin 3, V1F, to pin 5, V8B.
C30A	6	2.70—D.25	Term. 1, front, to term. 1, rear, Quench Capacity board.
C30B	6	2.90—D.25	Term. 2, front, to term. 2, rear, Quench Capacity board.
C31A	6	1.30—C.78	Pin 6, V7A to pin 5, V1F.
C31B	6	Under C31C	Pin 6, V8B, to Gnd.
C31C	6	1.30—A.60	Pin 1, V1F, to Gnd.
C32A	11	Supply unit	Term. 3, front row, S/C-103A, to Gnd.
C33B	5	Below P.A. board	Bottom right term., L3A, to Gnd.
C34A	6	4.05—D.05	Term. 1, left side, main term. board to pin 3, V4A & term. 3, left side, main term. board.
C35A	5	M.C. gang	H.F. Osc. trimmer.
C35B	6	6.20—A.60	Front left term., L25A-B, to Gnd.
C36A	5	P.A. board	Top right term., L3A, to C3A stator.
C37A	6	2.00—C.65	Pin 5, V7A, to Gnd.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
C38A	6	7.35—A.15	Term. 3, L8A, to Gnd. (N.E.) Term. 2, L8A, to Gnd. (R.C.A.)
C/C-101A	12	Supply Unit	Pin 1, vibrator, to Gnd.
C/C-101B	12	Supply Unit	Pin 7, V/C-101A, to term. 1, transformer board.
C/C-101C	12	Supply Unit	Pin 4, PL1C, to Gnd.
C/C-101D	12	Supply Unit	Pin 8, V/C-101A, to Gnd.
C/C-101E	12	Supply Unit	+265 V., Dyn., brush to Gnd.
C/C-102A	12	Supply Unit	Inside T/C-101A.
C/C-103A	12	Supply Unit	Pin 2 to pin 3, Vibrator.
C/C-104A	12	Supply Unit	Pin 2 to pin 3, V/C-101A.
C/C-105A	11	Supply Unit	Both in electrolytic can.
C/C-105B	11	Supply Unit	
C/C-106A	12	Supply Unit	Right term., L18A, to Gnd.
C/C-107A	6		Term. 2, left side, main term. board to Gnd.
L1A	8	Variometer	Rotor & stator coils.
L2A	8	Variometer	R.F. choke.
L2.1A	8	Variometer	R.F. choke.
L2B	5	P.A. board	Meter choke.
L3A	5	Behind P.A. board.	P.A. coil.
L4A	6	5.50—C.60	H.F. Driver output.
L5A-B	6	7.70—D.60	B.F.O. coil.
L6A	6	5.50—C.00	L.F. Driver output.
L7A	6	6.75—D.25	H.F., V2B mixer.
L8A	5		1st I.F. transformer.
L8B	5		2nd I.F. transformer.
L9A	5		3rd I.F. transformer.
L10A	5	P.A. board	V1A grid choke.
L11A	5	"B" Osc. can	"B" tank coil.
L12A	5	"B" Osc. can	Term. 1, "B" AE. board, to Gnd.
L13A	6	1.70—C.60	Pin 8, V7A, to Gnd.
L14A	6	Under Quench Cap. board.	Quench tuning.
L15A	6	2.40—C.95	Choke.
L17A	11	Supply Unit	L.T. choke.
L18A	12	Supply Unit	+ H.T.2 choke.
L19A	6	Under L19B	"A" relay coil.
L19B	6	3.60—A.80	"B" relay coil.

TABLE 1—(Continued)

Component	Fig.	Location	Remarks
L21A	6	6.25—D.25	L.F., V2B mixer.
L22A-B	6	6.85—B.95	H.F., R.F. transformer.
L23A-B	6	6.85—C.40	L.F., R.F. transformer.
L24A-B	6	7.00—B.20	H.F., V2A Osc.
L25A-B	6	7.35—B.20	L.F., V2A Osc.
L26A	5	"B" Osc. can	Term. 1, "B" AE. board to "B" AE. socket.
L/C-101A	11	Supply Unit	+H.T.1 choke, Vibr.
L/C-102A	11	Inside T/C-101A	L.T. choke, Vibr.
L/C-103A	26	M.C. gang	FLICK ADJ coil.
T1A	8	Inside can on top of variometer.	AE. meter current transformer.
T2A	5		"A" Rec. output.
T3A	5		Mic. input, "A" set.
T4A	5		Mic. input, "B" set.
T4B	6	1.40—D.30	Mic. input, I.C. set.
T5A)	5	Bottom unit	Output transformer, "B" set.
T6A)	5	Top unit	Output transformer, I.C. set.
T/C-101A	7	Supply Unit	Vibr. transformer.

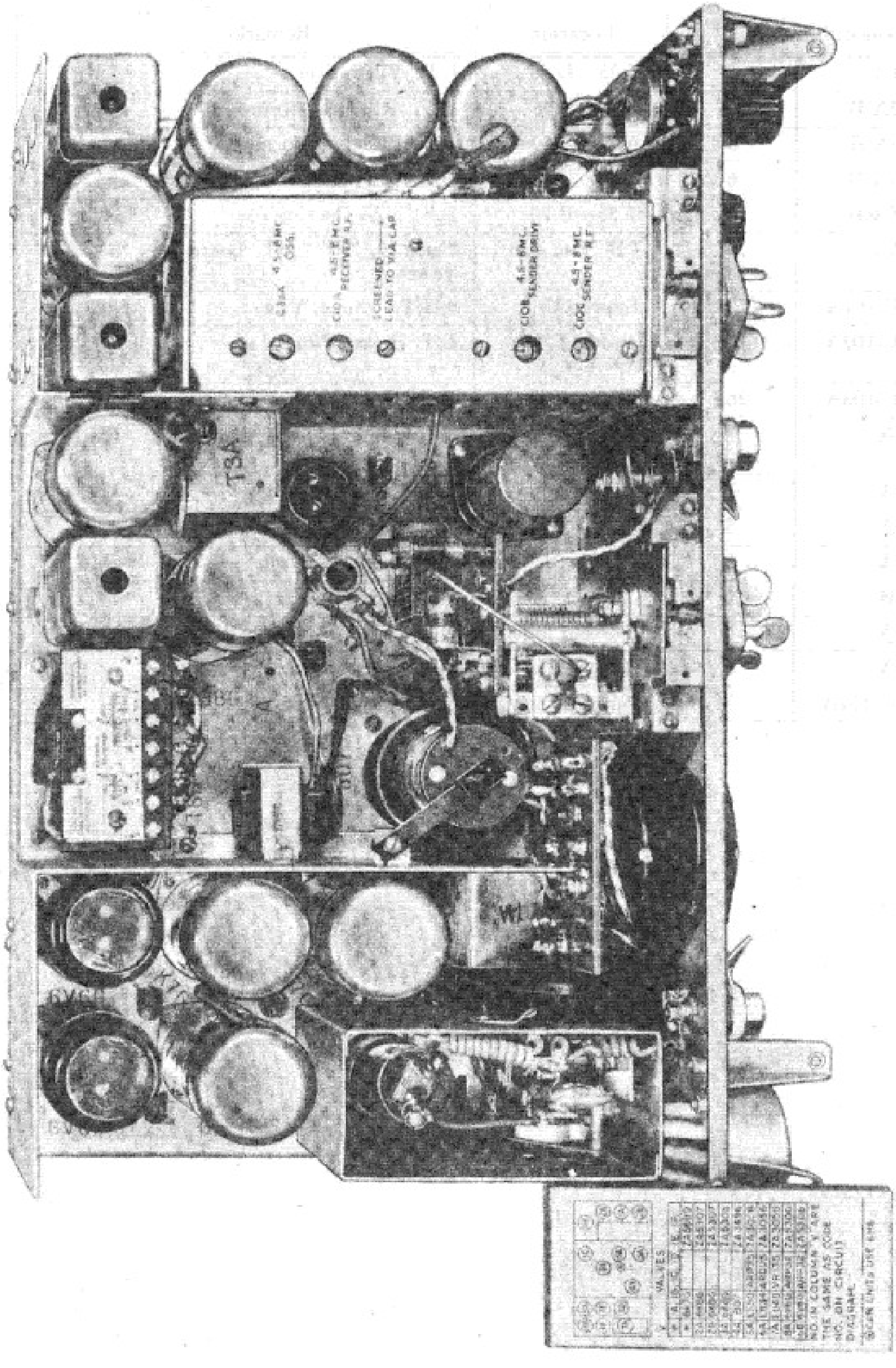


FIG. 4—TOP OF CHASSIS (PHOTO)

T $\frac{\text{FZ 254/3}}{\text{1 - 4}}$

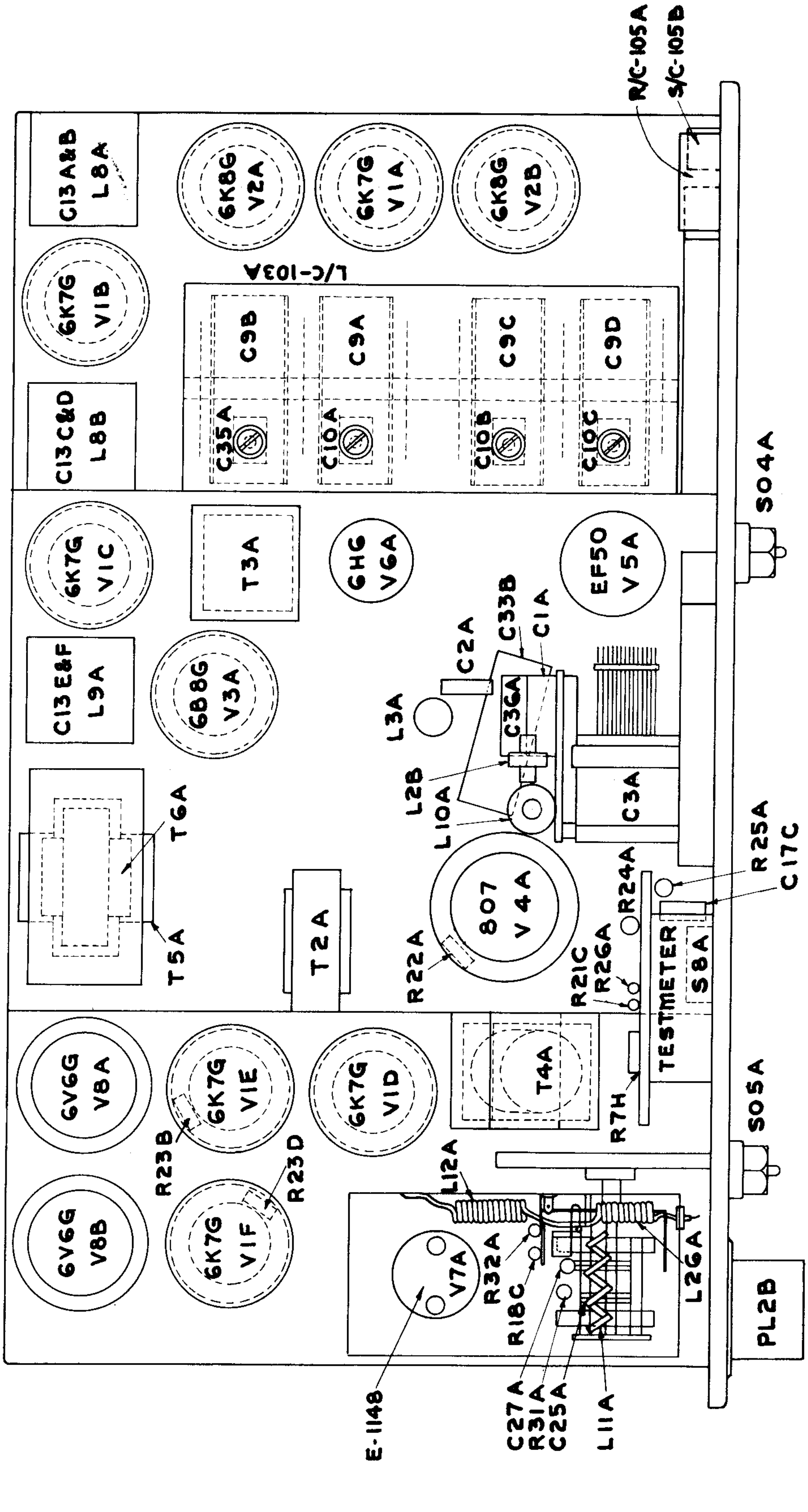


Fig. 5—Top View of Chassis

T FZ 254/3 1-5

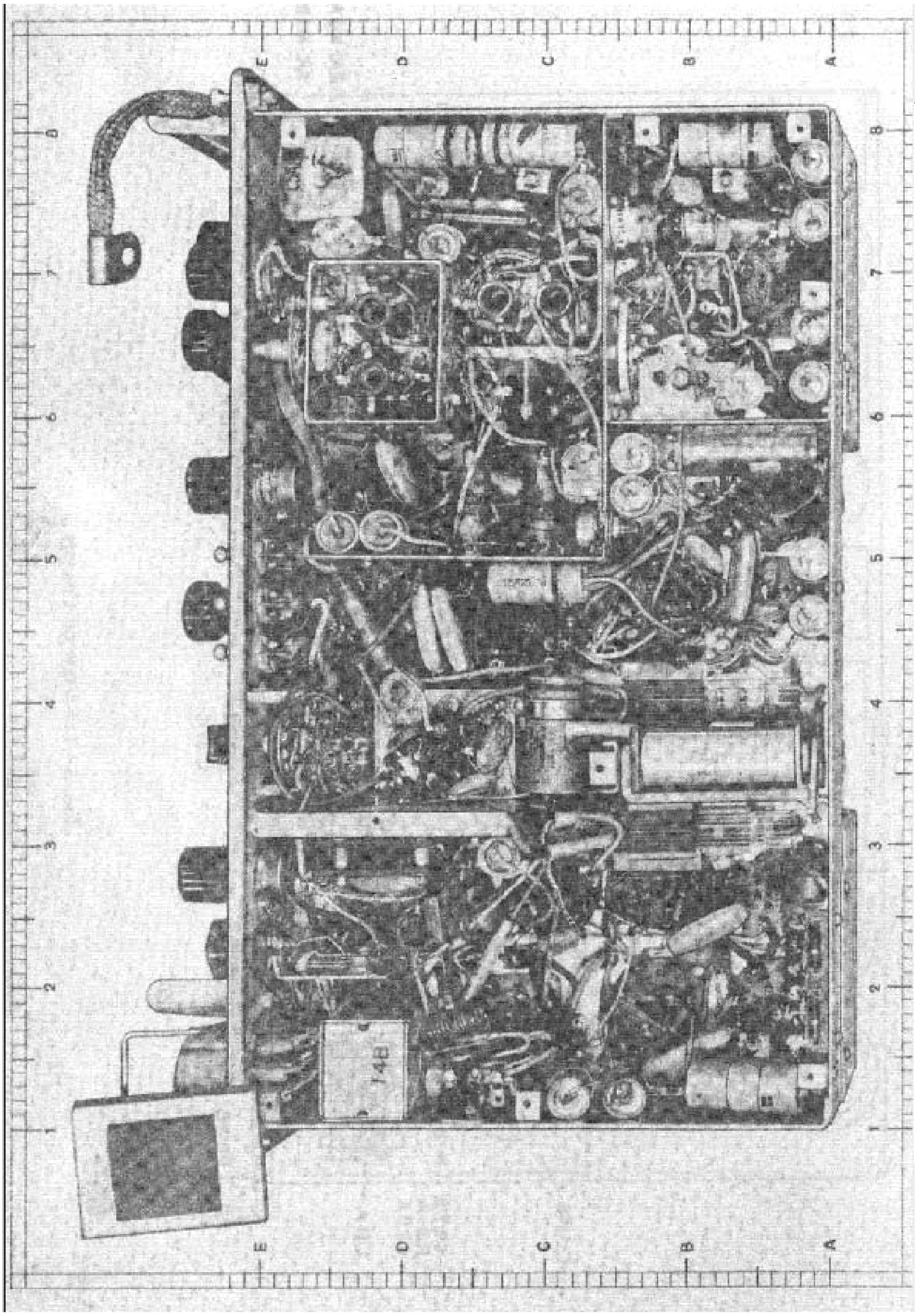


FIG. 6 BOTTOM OF CHASSIS (PHOTO)

T $\frac{\text{FZ 254/3}}{\text{1 - 6}}$

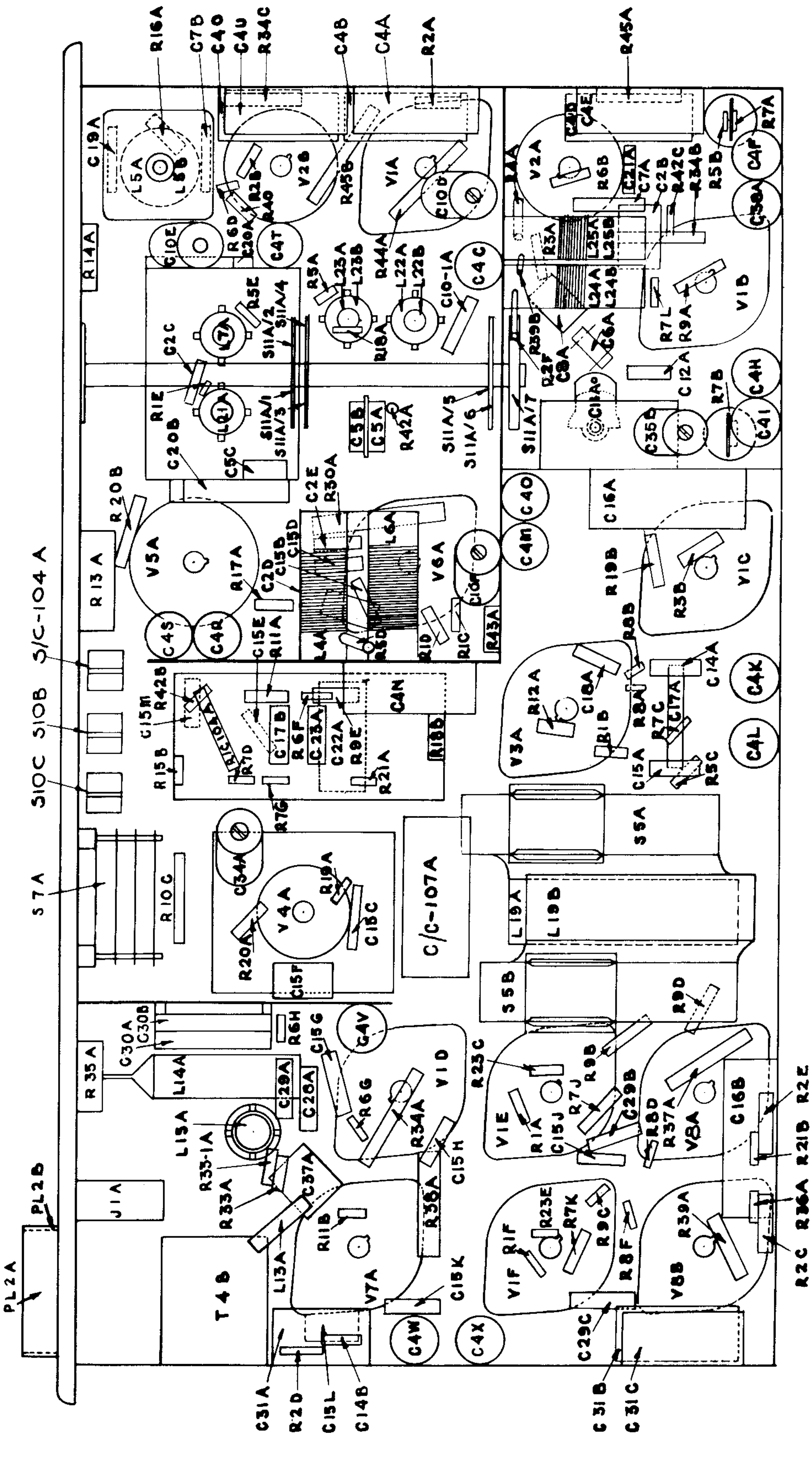
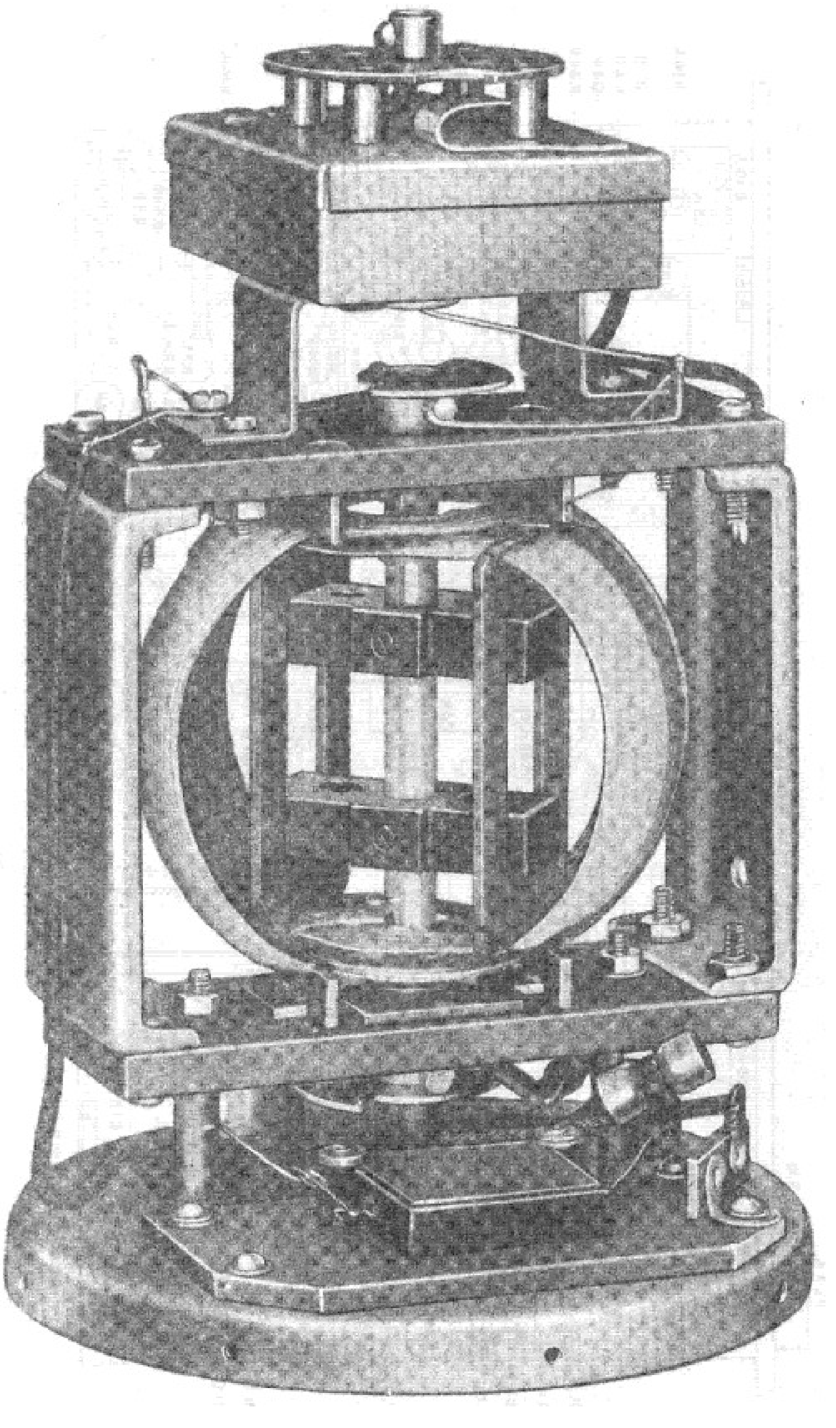


FIG. 7—BOTTOM VIEW OF CHASSIS

T $\frac{\text{FZ 254/3}}{\text{1 - 7}}$



T FZ 254/3 / 1 - 8

FIG. 8—INTERIOR OF VARIOMETER

1. Relay, S/C-103A
2. L17A
3. L/C-101A
4. V/C-101A
5. T/C-101A
6. S/C-102A
7. C/C-101D
8. C/C-101E
9. Spare OZ4A valve

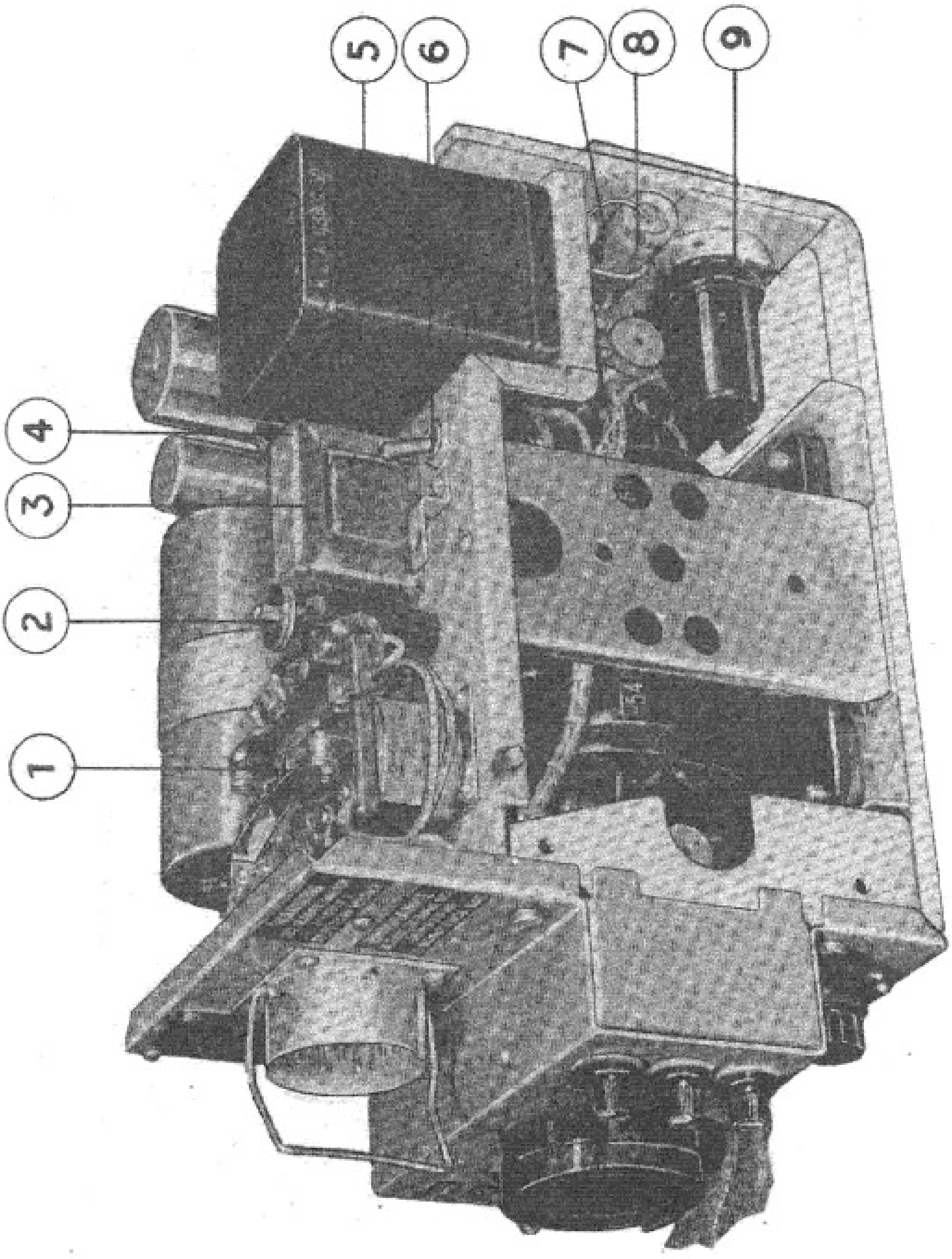


FIG. 9—SUPPLY UNIT NO. 2 (RIGHT SIDE)

1. C/C-105A-B
2. C32A
3. C/C-103A
4. S/C-101A
5. Dynamotor
6. Spare Vibrator
7. C4AP
8. C/C-101A
9. Vibrator

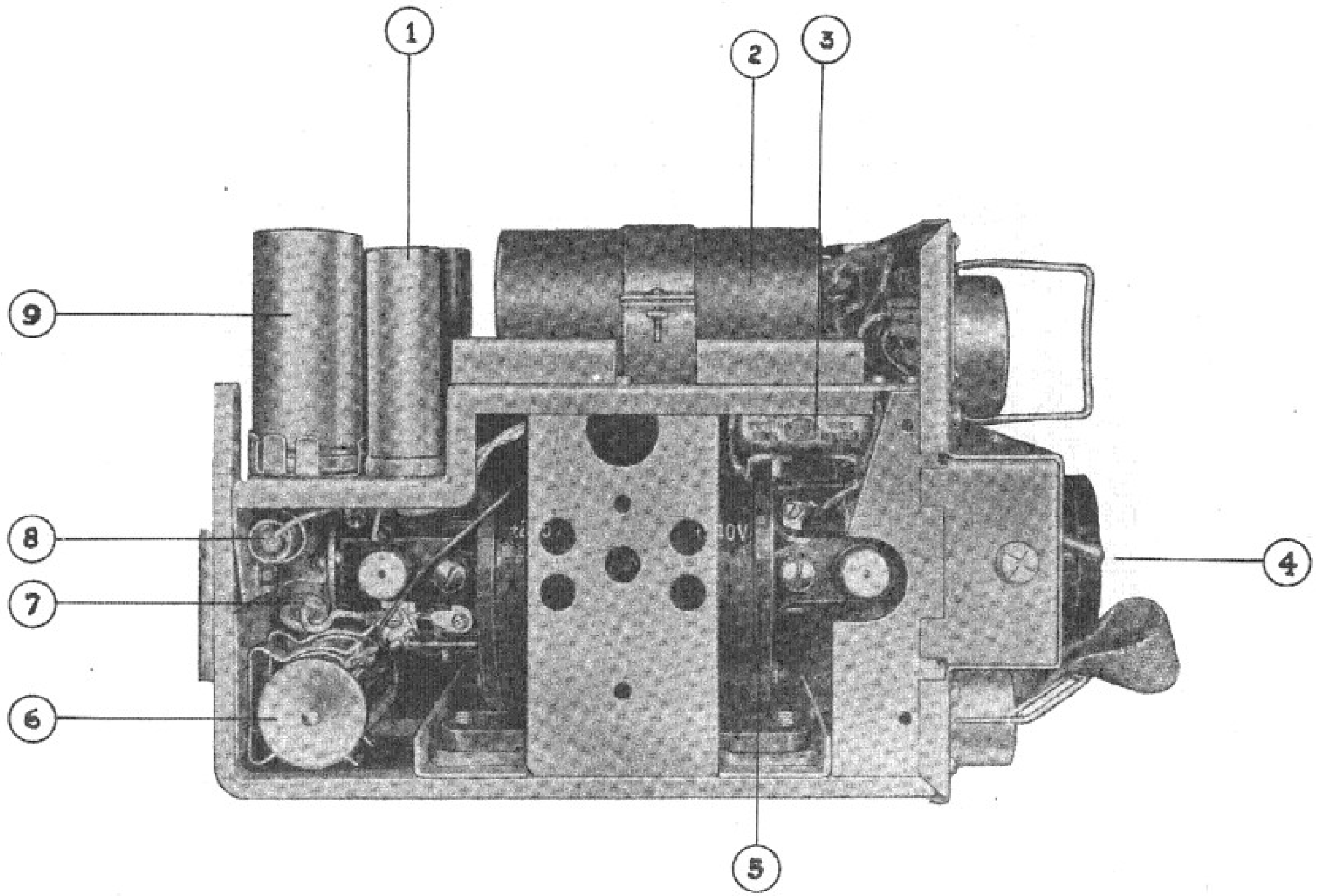
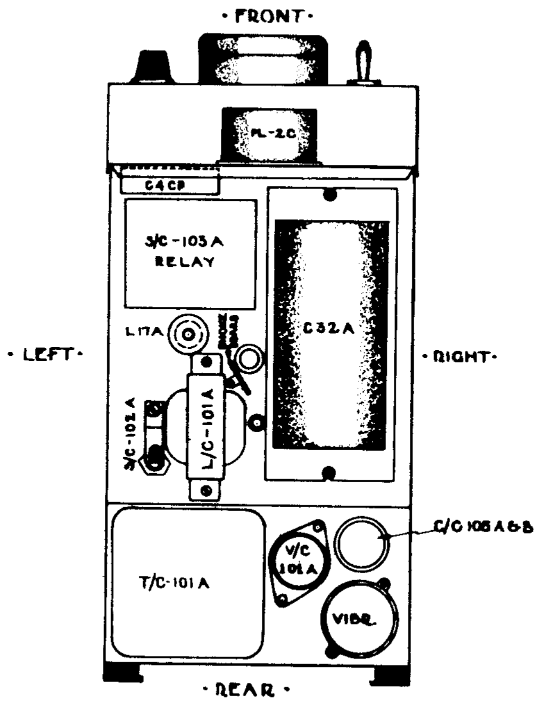


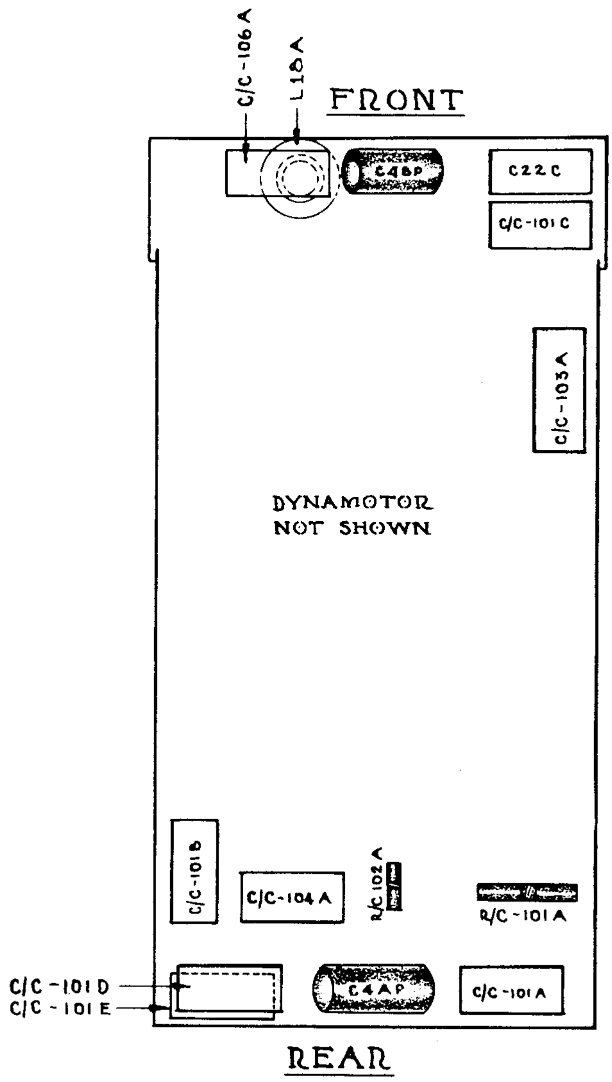
FIG. 10 SUPPLY UNIT No. 2 (LEFT SIDE)

T FZ 254/3 / 1 - 10



T FZ 254/3 / 1 - 11

Fig. 11—Supply Unit (Top Platform Layout)



T FZ 254/3 / 1 - 12

Fig. 12—Supply Unit (Below Platform Layout)

Testing Data

Visual Tests

General

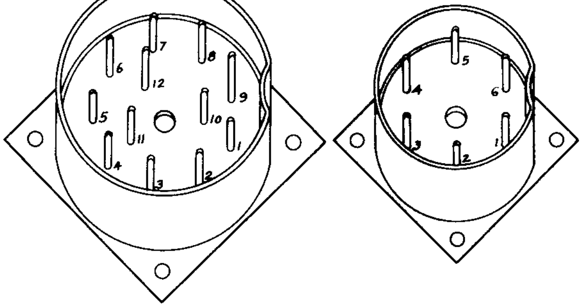
10. Aerial leads, connector cables and snatch plugs are often a source of trouble in No. 19 set installations. These should be tested quickly for continuity and shorts before proceeding with more detailed tests in case of set failure.

Feeders

11. The "B" set coaxial feeder becomes very brittle at —4° F. (—20° C.) and may snap if bent. Lack of aerial continuity may often be traced to the loosening of the small grub screw of the feeder socket. This may be tightened by a screwdriver.

Connector Plugs

12. The male connector plugs of the No. 19 set and supply unit are illustrated in Fig. 13. It will be noted that the pins are numbered CLOCKWISE. Correspondingly, in order to match up, the connector cables must have their female sockets numbered COUNTERCLOCKWISE. On occasion, in the field, it has been noticed that some connector cables have the correct numbering at one end, but the other socket has the wrong fibre insert, and is numbered CLOCKWISE. Some spare socket assemblies have also been found to have this fault. On rewiring such sockets, the faulty socket MUST BE CORRECTLY RENUMBERED, otherwise miswiring and short circuits will result.



T FZ 254/3 1 - 13

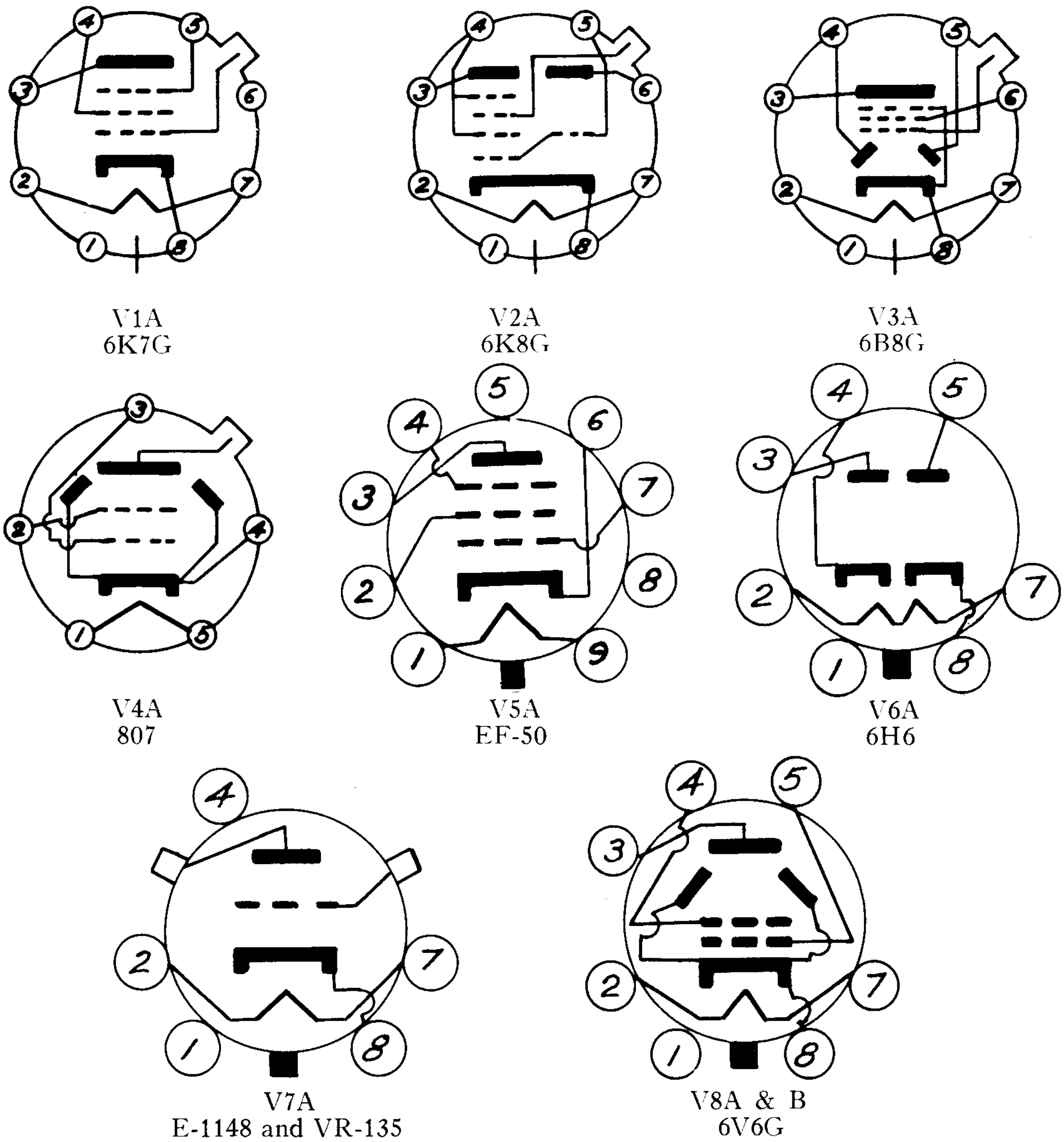
FIG. 13—MALE CONNECTOR PLUG

PRESSEL SWITCHES

13. Failure of a set to operate on Send, or to modulate on Send, often originates in faulty microphone pressel switch contacts. A quick examination should be made.

RELAY

14. Dirty relay contacts may often be the cause of failure. Although this unit is comparatively foolproof, a quick look at the contacts will often save hours of trouble shooting.



T FZ 254/3 1 - 14

FIG. 14—VALVE BASE CONNECTIONS

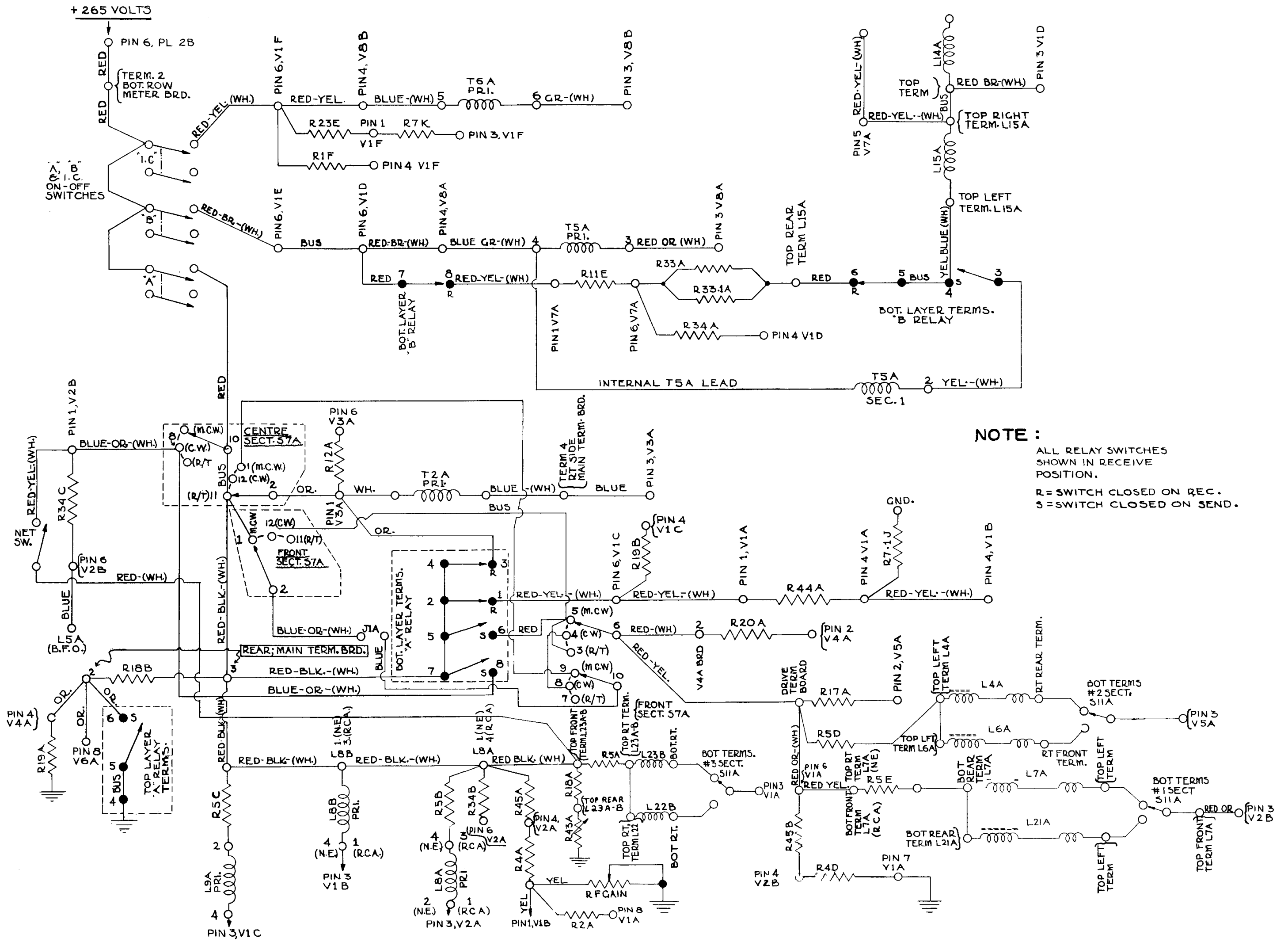
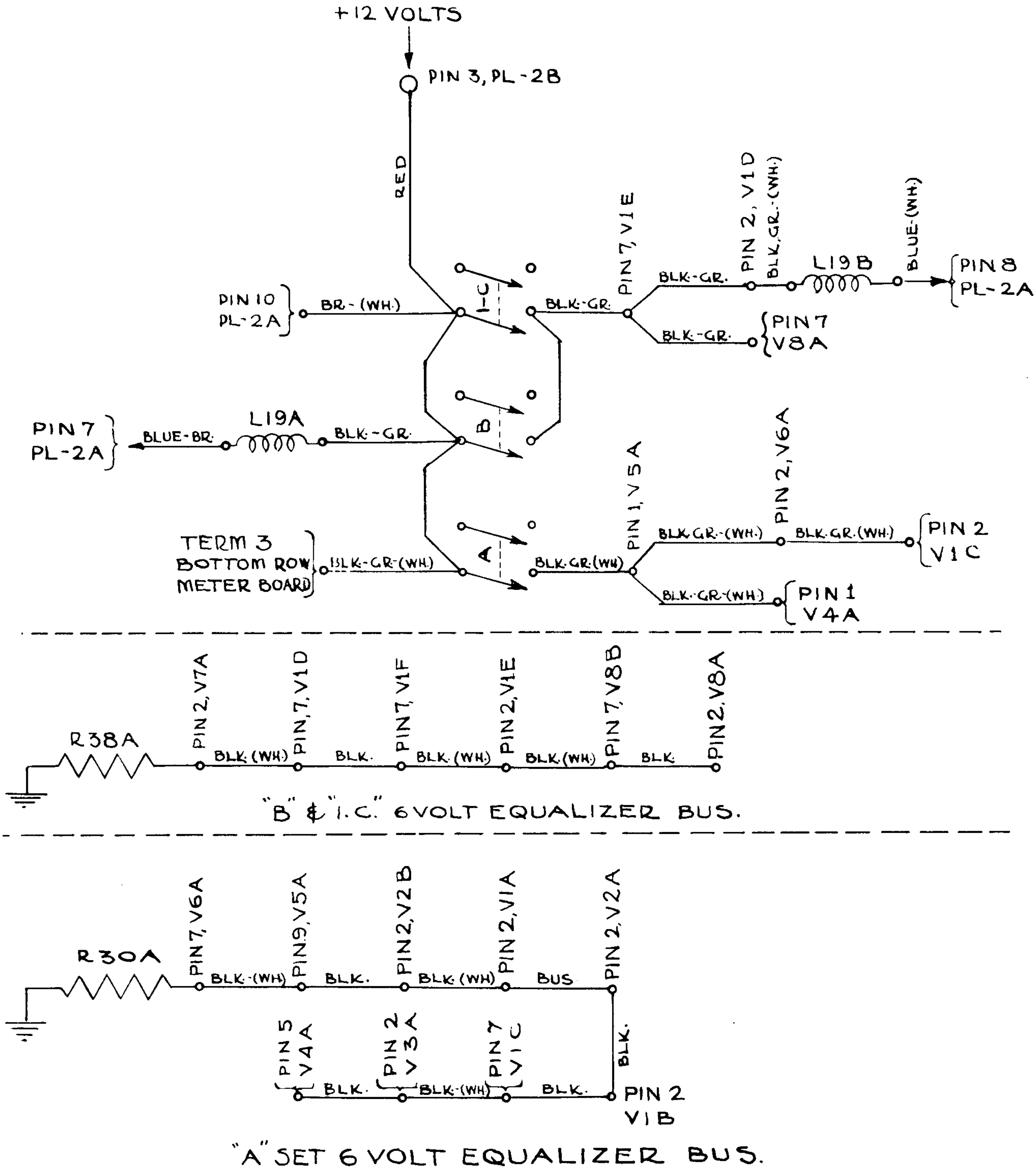
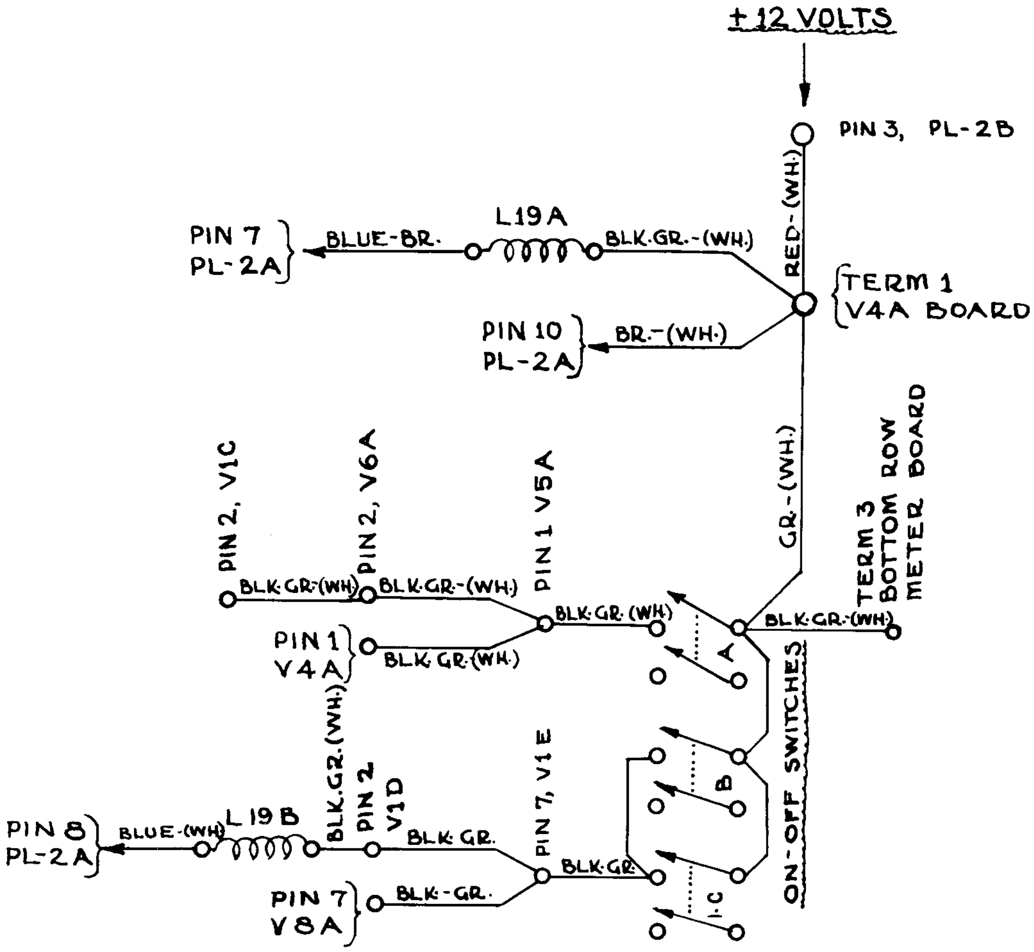


FIG 15—H.T. 1 DISTRIBUTION



T FZ 254/3 / 1 - 16a

Fig. 16a—L.T. Distribution (R.C.A.)



T FZ 254/3 / 1 - 16b

Fig. 16b—L.T. Distribution (N.E.)

Voltage Tests

Conditions

15. The voltage readings shown in Table 2 are taken under the following conditions:

(a) L.T. voltage input of 12.5V. —13 V.

(b) All sets switched ON.

(c) All gain controls fully clockwise.

(d) S/C-105A to A.V.C.

(e) Net switch to OFF.

(f) Meter switch to AE.

(g) S7A to R/T except where noted.

(h) All readings measured to ground except where otherwise stated.

(i) Readings taken on Test Set, "Volt-ohmyst" R.C.A. No. 165.

(j) Readings are only approximate and will vary with different sets, valves, supply units and L.T. voltages.

(k) Set properly tuned to approximately 6 Mc/s.; no signal being received.

Table Abbreviations

16. The following abbreviations will be used in Tables 2 and 3:

A.F.G.—Reading controlled by A.F. GAIN A control.

R.F.G.—Reading controlled by R.F. GAIN A control.

B.G. —Reading controlled by GAIN B control.

N. —Reading controlled by NET switch.

A.V.C.—Reading controlled by A.V.C. switch.

K —Reading controlled by Morse key.

A —Reading controlled by A ON-OFF switch.

B —Reading controlled by B ON-OFF switch.

C —Reading controlled by I.C. ON-OFF Switch.

2 —Reading to be taken on both H.F. and L.F. bands.

3 —Reading to be taken on R/T, C.W., and M.C.W.

Table 2—Voltage Analysis

Socket No.	Misc. Data	Pin No. 1	2	3	4	5	6	7	8	Grid Cap	Plate Cap
PL-2C (S.U.)	V1BR			13	0 to pin 7		378		13		
	DYN			12.7	605 to pin 7		300				
V1F		198	0	62	30	0	224	6.5	1.55	0	
V8B		0	0	216-C	224	0	198	6.6	15.8		
V7A	Rec.	222	6.3	0	0	94	198	0	0	—27	71
	Send	—.83		0	0	198	—.9		0	—12	175
V1D	Rec.	—25	12.6	83.5	90	0	220	6.3	0		
	Send	—.9		198	—.9	0	204		0		
V1E	Rec.	194	6.3	74	30	0	217	12.6	1.5	0	
	Send									0	
V8A	Rec.	0	6.2	215-B	218	0	12	12.6 }B }C	55		
	Send								10.5		
V4A	Rec.	12.5-A	—.3	0	53	6.3					
	Send R/T		267	—43	0						
	Send C.W.		265	-25.5	0						525
	Send MCW		265								
V6A	Rec.	0	12.6	—.3	38	0		6.3	53		
V5A	Rec.	12.6	-.3	—.3	0	0	0	—.8	0	6.3	
	Send R/T		260	252-2							
V2B	Rec. R/T	—.9	6.3	—.3	—.2	—.6	—.9/72 -N	0	0	.3	
	Rec. C.W.						84				
	Rec. MCW						—.9				
	Send R/T			262-2	88		85				
V3A	Rec. R/T	217	6.3	213-A	.15	21.5	52	0	24.5	16/18 -AFG	
	Send R/T			260						22.6	
	Send C.W.			.3						—2	
	Send MCW			265-K						—8.3	
V1C	Rec. R/T	0	12.6	205	80	0		6.3	2	.25	
V1B	Rec. R/T	0	6.3	218	80	0		0	4.6/34 RFG	.3	
	Send				—1				0/30 RFG	—420	
V2A	Rec.	0	6.3	213	70	-4.2	91	0	1.95	—2	
V1A	Rec.	215	6.3	200-2	79	0		0	2.1	.2 no signal —3.2 strong signal	

Progressive Resistance Analysis

GENERAL

17. The resistance analysis supersedes the conventional type of voltage check as it may be conducted with the power off. Also, if the resistance readings are correct, then the voltages during operation have to be correct. Further, the readings obtained do not vary with L.T. voltages and varying meter sensitivities.

18. The resistance analysis will facilitate maintenance by quickly isolating faults to a small portion of the circuit. It will locate the following faults:

Open circuits (D.C.)
Short circuits.
Miswiring.
Faulty or off-value resistors.
Shorted condensers.

However, it will NOT locate the following:

Open condensers.
Off-value condensers.
Off-value inductances.
Misalignment of circuits.
Faulty valves.

19. Many resistors in the No. 19 set have tolerances of $\pm 10\%$, $\pm 20\%$. This fact should be borne in mind when encountering a reading that is slightly faulty.

20. The analysis is performed under the following conditions:

(a) Supply unit disconnected.

(b) All valves removed from their sockets.

(c) Tuning condensers fully meshed.

(d) Meter switch to AE.

(e) All gain controls fully clockwise.

(f) All power switches ON.

(g) A.V.C. switch ON.

(h) Net switch OFF.

(i) R43A fully counterclockwise.

(j) All readings are to chassis ground except where otherwise indicated.

NOTE:—ZERO OHMS WILL BE SHOWN AS "SHORT", INFINITY AS "OPEN" IN ALL RESISTANCE TABLES.

21. The abbreviations shown in Para. 16 will also be used in Table 3.

22. All valve socket test points are numbered clockwise from the key on the underside of the chassis in the conventional manner. It will prove more convenient to conduct the valve socket test from the top of the chassis, remembering that the socket is now reversed, and the pins number counter-clockwise on the top of the chassis.

23. All circuits that would normally be checked through to the +H.T.1, +H.T.2 or L.T. lines may be read to ground since:

(a) The resistance to ground from each pin of the power socket, PL2B, is read first. This includes the H.T. and L.T. leads.

(b) A "dummy plug" is inserted in PL2B socket which grounds pins 3, 4, & 6 to pin 1. Thus the H.T. and L.T. leads are grounded for further tests.

24. An external 12 V. battery is connected with its negative terminal to chassis ground and its positive terminal through an external switch to pins 7 and 8 of a 12-pt. dummy plug, inserted in PL2A. Throwing the external switch will then control the "A" and "B" send-receive relays when desired.

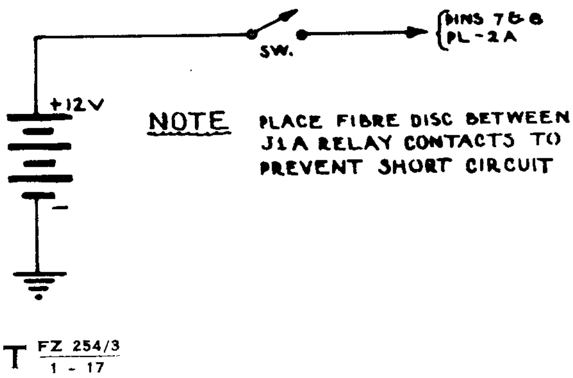


FIG. 17—RELAY ACTUATING CIRCUIT

25. Although dummy plugs facilitate testing, they are not essential as long as the circuit changes outlined in Paragraphs 23 and 24 are adhered to. Wire leads and clips may be used if preferred.

26. During the tests, a shorted dummy key plug is inserted in key jack, J1A. A SMALL PIECE OF FIBRE, PAPER, OR OTHER INSULATING MATERIAL MUST BE PLACED BETWEEN THE RELAY ACTUATING CONTACTS ON J1A (key jack) or a short circuit will result on operating the external relay switch.

TABLE 3—PROGRESSIVE RESISTANCE ANALYSIS

Socket No.		Misc. Data	Pin No. 1	2	3	4	5	6	7	8	9 or Plate Cap	Grid Cap
				Insert dummy plug in PL2A (See para. 24).								
PL2B	REC.	"A" SW. OFF R/T & MCW	Short	3.8	Open	Open	Open	Open	1500	Open		
		C.W.							Short			
		"A" SW. ON						27200-3				
	SEND	"A" SW. ON						19000-3				
	Also reads short to:— (dummy plug removed)			6-PL2A	10-PL2A		9-PL2A			7-PL2A		
				Insert dummy plug in PL2B shorting pins 1, 3, 4 & 6.								
PL2A	Rec.	R/T	1.4	5.2	5.2	5.2	18		100	100		
				Insert dummy plug in PL2A (See para. 24).								
V8B	Rec.			Short	320-C	Short	1 meg.		56	820		
V1F	Rec.			Short	122000	470000	Short		56	1000		25400
V8A	Rec.			56	180-B	Short	1 meg.		Short–B –C	1390		
	Send									390		
V1E	Rec.			56	122000	470000	Short		Short	1000		122000– 22000 } BG
	Send											25000
V1D	Rec.			Short	18000	50300	Short		56	Short		47000
	Send				750	Open						

TABLE 3—(Continued)

Socket No.	Misc. Data		Pin No. 1	2	3	4	5	6	7	8	9 or Plate Cap	Grid Cap
V7A	Rec.			56					Short	Short	20000	285,000
	Send										2840	15,000
V4A	Rec.	R/T	Short-A	44000	100000	63000	30				48	
	Send	R/T		100		Short						
	Send	C.W.		100-K								
	Send	MCW		100								
V6A	Rec.	R/T		Short	470000	73000	230000		30	63000		
V5A	Rec.	R/T	Short	48000	44000		Short	100	1.4 meg.		30	
	Send	R/T		3900	2200-2							
V3A	Rec.	R/T		30	900-A	1 meg. (OR)	575,000 (OR)	68000	Short	4300		1 Meg.-3300 -A.F.G.
	Send	R/T			900							6600
	Send	C.W.			Open							Open
	Send	MCW			900-K							50300
V1C	Rec.	R/T		Short	2200	82000	Short		30	270		3 meg.
V1B	Rec.	R/T		30	5.5	27300	Short		Short	1000-9200 } R.F.G.	R.F.G.	3 meg. } — ; 1 meg. } A.V.C.
	Send	R/T				100000						
V2A	Rec.	R/T		30	2200	11000	47000	47000	Short	270		10000-2
V1A	Rec.	R/T		30	2200-2	27300	Short		Short	220		3 meg.
V2B	Rec.	R/T		30	44000	22000	47000	47000-N	Short	220		100000
	Rec.	C.W.						47000				
	Rec.	MCW						47000-N				
	Send	R/T			2200-2	11000		47000				

TABLE 3A—ADDITIONAL RESISTANCE TEST POINTS

Test From		Test To	Resistance (Ohms)
Tap on L3A		Gnd.	.01
"B" Aerial socket		Gnd.	.01
"A" Aerial socket (S7A to C.W. and meter switch to A.V.C.)		Gnd.	470
Meter Board (Top)	Term. 1	Gnd.	1.2 meg.
	Term. 2	Gnd.	1.2 meg.
	Term. 3	Gnd.	29,000
	Term. 4	Gnd.	28,000
C9B stator		Gnd.	Open
C9C stator		Gnd.	Open
C9D stator		Gnd.	Open
C9A stator		Gnd.	10,000
Term. 1, rear, Quench Cap. board		Gnd.	147,000
HET TONE control, top term. when set inverted. S7A to R/T		Gnd.	6. variable
Main Term. Board	(M.C.W.) Term. 5 left side	Gnd.	27,000
	Term. 6 left side	Gnd.	150
	Term. 4 left side	Pin 3, V4A	100,000
Top rear term. of L25A-B S11A to 4½—8 Mc/s. S11A to 2.0—4½ Mc/s.		Top rear term. L24A-B.	 220 820
Pin 6, V1B		Term. 1, V2A Board (C21A)	(R42C) 10,000
Top rear term. L14A		Bottom rear term. L14A	12
Remove dummy plugs from PL2A and PL2B. Remove fibre insert from J1A contacts. Check for continuity across J1A contacts—short. Remove J1A dummy key plug.			

"Hot Spot" Test

27. A "hot spot" test, similar to the resistance analysis outlined in the preceding paragraphs, may be carried out. This test is a condensed resistance analysis applied only to the spots that most often give trouble. It isolates about 70% of all faults that may be traced by resistance analysis. The wireless mechanic should become familiar with the technique of the complete resistance analysis before carrying out the test outlined in Table 4.

TABLE 4—HOT SPOT TEST

Test Point	Pin	Receive			Send		
		R/T	C.W.	M.C.W.	R/T	C.W.	M.C.W.
PL2B	2	3.8					
	3	Open					
	6	27,200			19,000		
PL2A	1	1.4					
V1F	8	1,000					
V8A	8	1,390			390		
V1E	Grid	122,000-BG			25,000		
V1D	3	18,000-"B"			840-"B"		
V4A	3	550,000	100,000	550,000			
V3A	4	1 meg.					
	8	4,300					
	Grid	1 meg.-AFG			6,600	Open	50,300
V1B	8	1,000					
V2A	3	2,200					
	5	47,000					
	Grid Cap	10,000—2					
V1A	3	2,200—2					
	8	8,400–220–RFG					
	Grid	3 meg.–1 meg -AVC					
V2B	3	44,000			2,200–2	2,200-K	2,200
	6	47,000-N	47,000		47,000		
	8	220					
	Grid Cap	100,000					

28. To complete the "**hot spot**" test carry out the tests outlined in Table 3A.

29. When the resistance analysis shows a + H.T. 1 dead short at pin 6 of PL2B, the trouble may be isolated as follows:

(a) The "B" set is isolated by the "B" ON-OFF switch.

(b) The I.C. amplifier is isolated by the I.C. ON-OFF switch.

(c) The "A" set is isolated by the "A" ON-OFF switch. Moreover

(i) S7A to C.W. isolates +H.T.1 on Send so V2B mixer section, V5A and V4A screen receive no +H.T.1 unless the key is depressed.

(ii) On Send, M.C.W., the key controls V3A plate and screen circuits.

(iii) On all Send positions of S7A, the screen grid voltage is cut off V1C, V1B, and V1A.

(iv) On Receive, R/T or M.C.W., +H.T.1 is cut off the heterodyne oscillator, V2B. (Controlled by NET switch).

(v) On all Receive conditions, +H.T.1 is cut off V2B mixer section, V5A and the screen of V4A.

Resistance Analysis Index

30. The resistance analysis index was designed for use with the preceding analysis. It lists the more common faulty readings obtained at each analysis test point, and in another column, lists the only faults, located to date, capable of producing that particular faulty reading. For example, pin 5 of V8A should read 1 meg. On testing, it reads 1000 ohms. Looking up this 1000 ohm false reading in the resistance analysis index, under V8A, pin 5, tells us that if pins 5 and 6 of V8A are shorted, this reading will occur.

TABLE 5—RESISTANCE ANALYSIS INDEX

Socket	Pin No.	Conditions	True Readings	False Readings	Probable Fault
PL2B	1	Rec. R/T	Short	Open	Open Gnd. braid, pin 1 of PL2B.
	2	Rec. R/T	3.8 ohms Short to pin 6, PL2A	Short	Gnd. pin 6, PL2A
					Grounded lead Gr.– Or.– (Wh.) from term. 4, B & I.C. board.
				220 ohms	Open secondary T6A.
				Open	Open Gr.–Or.–(Wh.) to pin 6, PL2A.
	3	Rec. R/T	Open Short to pin 10 of PL2A	Short	Shorted lead, L.T. distribution, (See Fig. 16).
				100 ohms	Gnd. pin 7, PL2A.
					Short at J1A
					Short at L19A
					Gnd. pin 8, PL2B.
				1000 ohms	Short, terms. 3 & 4 bottom of meter board.
				44,000 ohms	Short, pins 1 & 2, V4A.
				48,000 ohms	C4V term. shorted to L.T. lead.
					Short–pins 1 & 2, V5A.
				470,000 ohms	Short – pins 2 & 3, V6A.
				Open to pin 10, PL2A.	Open lead.
	4	Rec. R/T	Open	Short	Pinched H.T. 2 lead.
				47 ohms	V4A plate cap touching chassis.
				25,000 ohms	Short, Terms. 3 & 4, bottom meter board.
				1.2 meg.	Place meter switch on AE., not H.T.2.

TABLE 5—(CONTINUED)

Socket	Pin No.	Conditions	True Readings	False Readings	Probable Fault
PL2B (*Cont.*)	5	Rec. R/T	Open Short to pin 9, PL2A	Open to pin 9, PL2A.	Open lead.
	6	Rec. R/T, C.W. MCW	27,200 ohms	Short	Gnd., pin 4, V8A.
					Gnd. braid shorting term. on S7A.
					Short, pins 1 & 8, V7A.
					Short, pins 1 & 2, V2B.
					Gnd. at net switch.
					Gnd. pin 1, V1A.
					Short, pins 5 & 6, V1C.
					Gnd. at ON-OFF switches.
					Gnd., pin 6, V1D.
					Gnd. Wh. lead, T2A.
					Gnd. Blue lead, T6A.
					See H.T.1 distribution, Fig. 15.
				0 — 6 ohms, controlled by HET TONE	Centre section, S7A off centre.
				4 ohms	Braid to HET TONE shorting to S7A.
				30 ohms	Short, pins 1 & 2,V2B.
				50 ohms	Short, J1A.
					Short, pins 2 & 3, V1D.
				180 ohms	Shorted terms., centre to rear sections, S7A.
				200 ohms	Gnd., pin 3, V8A.
					Gnd., primary T5A.
				220 ohms	Short, pins 1 & 8, V1A.
				250 ohms	Short, pins 1 & 8, V2B.
				350 ohms	Short, pins 2 & 3, V8B.
				470 ohms	Short at meter switch.
				650 ohms	Short, terms. 3 & 4, B and I.C. board.

TABLE 5—(Continued)

Socket	Pin No.	Conditions	True Readings	False Readings	Probable Fault
PL2B (*Cont.*)	6 (*Cont.*)	Rec. (*Cont.*) R/T, C.W. MCW (*Cont.*)	27,200 ohms (*Cont.*)	1,000 ohms	Gnd., pin 3, V3A.
				2,000 ohms	Gnd., pin 3, V5A.
				2,200 ohms	Gnd., driver or mixer coils.
				3,000 ohms	Short, pins 1 & 2, V5A.
					Short, pins 1 & 8, V3A.
				3,300 ohms	Gnd., pin 6, V7A.
				8,000 ohms	Shorted Gr. cond. in "B" Osc. can.
				10,000 ohms	Short, pins 1 & 8, V1F.
				11,000 ohms	Bent plates, B gang.
					Shorted C31B.
					Gnd., pin 5, V7A.
					Red-Yel. Gnded., "B" Osc. can.
					Gnd., pin 5, V7A.
				12,500 ohms	Short, pins 6 & 7, V2B.
				16,000 ohms	Red to Red–Blk. short at relay.
					Gnd., pin 4, V1A.
				18,000 ohms	Pinched Blue, B.F.O. can.
					Gnd., pin 6, V2B.
				19,000 ohms	Short, pins 3 & 4, V2A.
				20,000 ohms	Short, pins 3, 4 & 5, V1F.
					Gnd., pin 4, V3A.
				21,000 ohms	Gnd., pin 4, V1C.
					Gnd., pin 4, V1A.
				23,000 ohms	Short, pins 4 & 5, V2A.
				29,000 ohms	Short at meter switch.
				30,000 ohms	Blocked relay.
				34,000 ohms	Open 39,000 at V1A socket.
					Open Red–Blk. jumper at relay.
					Open Yel. to pin 1, V1A.
					Open R7.1J.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Readings	False Readings	Probable Fault
PL2B *(Cont.)*	6 *(Cont.)*	Rec. *(Cont.)*	R/T, C.W. MCW *(Cont.)*	27,200 ohms *(Cont.)*	60,000 ohms	Open Red.-Blk. 2nd or 3rd I.F. transformer.
					68,000 ohms	Open R4A at pin 4, V2A.
					75,000 ohms	Open Yel., pin 1, V2A to R.F. GAIN.
					Open	Open Red, S7A to meter board.
			C.W.	27,200 ohms	Short	Red-Yel. Gnded. at NET switch.
						Short, pins 1 & 2, V2B.
						+H.T.1 Gnd. at S7A.
					200 ohms	Pins 1 & 8, V2B, shorted.
					14,000 ohms	Blue-Or. to Red, short at relay.
					16,000 ohms	Open Red-Or. at relay.
						Short at bottom, front section, S7A.
					18,000 ohms	Gnd., pin 6, V2B.
						Shorted 90 $\mu\mu$fd. in B.F.O. can.
					19,000 ohms	Blue pinched at B.F.O.
					34,000 ohms	Open Blue from J1A to S7A.
						Open Red-Blk. at relay.
			MCW	27,200 ohms	Short	Gnded. Blue at J1A.
						Gnded. Blue jumper, front section of S7A.
						Blk. to Blue-Or. short at J1A.
					100 ohms	Shorted J1A.
					14,000 ohms	Shorted C23A.
					17,000 ohms	Short, centre to rear sections of S7A.
		Send	R/T	19,000 ohms	Short	Red-Yel. near V5A shorted to S7A braid.
						Red-Yel. Gnded. at NET switch.
						Blue-Or. pinched in B.F.O. can.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Readings	False Readings	Probable Faults
PL2B (*Cont.*)	6 (*Cont.*)	Send (*Cont.*)	R/T (*Cont.*)	19,000 ohms	800 ohms	Red-Yel. to Gr.-Blk. short in "B" Osc. can.
					1,500 ohms	Shorted condenser in L7A can.
					2,000 ohms	Gnded. pin 3, V5A.
					8,000 ohms	Shorted Gr. condenser in "B" Osc. can.
					27,000 or 34,000 ohms	Open Red lead, term. 6, bottom layer "A" relay to term. 5, front section, S7A.
						Open Red-Blk. at relay.
						Blocked relay.
						Open Red-Blk. at J1A.
			C.W.	19,000 ohms —K	34,000 ohms	Open J1A contacts.
						Bent contacts, S7A.
			MCW	19,000 ohms	Short	Shorted J1A.
					27,000 ohms	Bent S7A contacts.
					34,000 ohms	Poor S7A contacts.
PL2A	1	Rec.	R/T	1.4 ohms	Short	Gnd. term. 4, rear, main term. board.
					Open	Open Blue, T3A.
						Open T3A primary.
	2	Rec.	R/T	5.2 ohms	Short	Blue to Gnd., short, T4A.
						"B" Mic. input shorted by braid at meter board.
						Shorted primary, T4A.
					2.7 ohms	Short, pin 2 to pin 3, PL2A.
					220 ohms	Open primary, T4A.
					35,000—39,000 ohms	Open Blk. T4A.
					Open	Open Wh.-Blk. to meter board.
						Open Blue, T4A.
	3	Rec.	R/T	5.2 ohms	Short	Gnd., I.C. input board, term. 1.
					2.7 ohms	Short, pin 2 to pin 3, PL2A.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Readings	False Readings	Probable Faults
PL2A (*Cont.*)	3 (*Cont.*)	Rec. (*Cont.*)	R/T (*Cont.*)	5.2 ohms (*Cont.*)	15–60 ohms	High resistance, primary T4B.
					220 ohms	Open Blk., I.C. input board, term. 1.
						Open T4B primary.
					Open	Open Blue, term. 2, I.C. input board.
	4	Rec.	R/T	5.2 ohms	Short	Gnded. Blk. T2A.
						Gnd. pin 4, PL2A.
						Gnd. pin 1, rear, main term. board.
					Open	Yel. from T2A not Gnded.
						Open T2A secondary.
						Open Gr.-Br., pin 1, rear, main term. board.
	5	Rec.	R/T	18 ohms	220 ohms	Open T5A secondary.
					Open	Open lead, pin 5, PL2A.
	6	Rec.	R/T	—	—	See pin 2, PL2B.
	7	Rec.	R/T	100 ohms	Short	Shorted J1A.
					Open	Open L19A.
	8	Rec.	R/T	100 ohms	Open	Open L19B.
						Open S10B.
V8B	3	Rec.	R/T	320 ohms	Short	Pins 3 & 4, V8B, shorted.
					Open	Open "B" ON-OFF switch.
						Open primary, T6A.
						Broken socket lug.
	5	Rec.	R/T	1 meg.	Short	Pins 4 & 5, shorted, V8B.
					20,000 ohms	Pins 5 & 6 shorted, V8B.
					200,000 ohms	Leaky C29C.
					Open	Open 1 meg. resistor.
	7	Rec.	R/T	56 ohms	Short	Shorted pins 7 & 8, V8B.
					Open	Open 56 ohm resistor.
	8	Rec.	R/T	820 ohms	50 ohms	Short pins 7 & 8, V8B.
					Open	Open R39A.
V1F	3	Rec.	R/T	122,000 ohms	Open	Open R7K or R23E.
	4	Rec.	R/T	470,000 ohms	Short	Shorted C4X.
					Open	Open R1F.

TABLE 5—(Continued)

Socket	Pin No.	Conditions	True Reading	False Readings	Probable Fault
V1F (*Cont.*)	8	Rec. R/T	1,000 ohms	Open	Open R9C.
	Grid Cap	Rec. R/T	25,400 ohms	22,000 ohms	Shorted secondary, T4B.
				Open	Open secondary T4B.
					Open Wh., T4B.
V8A	3	Rec. R/T	180 ohms	Short	Shorted lugs, T5A.
				Open	Broken socket lug.
					Open primary, T5A.
	4	Rec. R/T	Short	Open	Open S10B.
	5	Rec. R/T	1 meg.	Short	Pins 4 & 5 shorted, V8A.
				1,000 ohms	Pins 5 & 6 shorted, V8A.
				125,000 ohms	Leaky C29B.
				Open	Open R8D.
	8	Rec. R/T	1,390 ohms	390 ohms	Bent relay contacts.
					Gnd. at 390 ohm resistor.
				Open	Open R37A or R9D.
		Send R/T	390 ohms	1,390 ohms	Poor relay contacts.
					Open Blk.-Gr. at "B" relay.
					Blocked relay.
V1E	2	Rec. R/T	56 ohms	Open	Broken socket lug.
	3	Rec. R/T	122,000 ohms	22,000 ohms	Shorted brown shielded leads at "B" relay.
				Off value	Off value R7J or R23C.
				Open	Broken lead, S10B.
					Open R7J or R23C.
					Open jumper, pin 6, V1D to pin 6, V1E.
	4	Rec. R/T	470,000 ohms	Short	Shorted C4W.
				Open	Open R1A.
	8	Rec. R/T	1,000 ohms	Open	Open R9B.
	Grid Cap	Rec. R/T	122,000 ohms —BG	22,000 ohms	Bent relay contacts.
					Shorted C30B.
					Shorted B GAIN control lugs.
					Gnded. relay contact.
					Gnded. R6H.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Reading	False Readings	Probable Fault
V1E (*Cont.*)	Grid Cap (*Cont.*)	Rec. (*Cont.*)	R/T (*Cont.*)	122,000 ohms —BG (*Cont.*)	69,000 ohms	Shorted C30A.
					Open	Open grid lead.
						Open B GAIN control.
						Open lead, B GAIN to relay.
						Poor relay contacts.
		Send	R/T	25,000 ohms	120,000 ohms	Open Wh. from T4A to meter board.
						Blocked relay.
					Open	Poor relay contacts.
						Open Br. relay to meter board.
						Open Br. at S7A.
V1D	2	Rec.	R/T	Short	Open	Broken socket lug.
	3	Rec.	R/T	18,000 ohms	Short	Gnd. pin 5, V7A.
					750 ohms	Yel. to Yel-Gr. short at "B" relay.
					2,000 ohms	Gnded. V7A plate lead.
					3,000 ohms	Pins 5 & 6, V1D, shorted.
					50,000 ohms	Open R33A.
					Open	Open R11B.
						Open L15A.
						Open Yel. at relay.
						Poor relay contacts.
		Send	R/T	750 ohms	50,300 ohms	Broken ceramic, "B" relay.
					Open	Poor relay contacts.
						Open T5A secondary.
						Open Yel. at "B" relay.
						Blocked relay.
	4	Rec.	R/T	50,300 ohms	Short	Short C4V.
		Send	R/T	Open	70,000 ohms	Blocked relay.
	Grid Cap	Rec.	R/T	47,000 ohms	Short	Shorted grid lead.
					Open	Open R6G.
V7A	Plate Cap	Rec.	R/T	20,000 ohms	Open	Open R31A.
						Open L15A.
		Send	R/T	2,840 ohms	Open	Poor relay contacts.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Reading	False Readings	Probable Fault
V7A (*Cont.*)	Grid Cap	Rec.	R/T	285,000 ohms	2,200 ohms	Gnded. pin 5, V7A.
					22,000 ohms	Shorted Gr. condenser in "B" Osc. can.
					Open	Open R32A or R18C.
		Send	R/T	15,000 ohms	285,000 ohms	Poor relay contacts.
						Open lead to relay.
V4A	2	Rec.	R/T	44,000 ohms	100 ohms	Blocked relay.
						Red from S7A shorted at relay.
					2,200 ohms	Lower lug of mixer or driver output coils Gnded
					3,000 ohms	Gnd. pin 2, V7A.
					15,000 ohms	Red to Red-Blk. short at relay.
					Open	Open R20A.
		Send	R/T	100 ohms	44,000 ohms	Blocked relay.
						Poor relay contacts.
					Open	Open Red.-Blk. at relay.
						Poor S7A contacts.
						Open Red, pin 2 to S7A.
			C.W.	100 ohms —K	100 ohms (Key has no effect)	Shorted Blue from J1A to S7A.
						Shorted J1A.
					Open	Poor J1A contacts.
						Open Blue-Or. J1A to S7A.
			MCW	100 ohms	Open	Poor S7A contacts.
	3	Rec.	R/T	100,000 ohms	50,000 ohms	Short C15E.
					50,500 ohms	Short C17B.
	4	Rec.	R/T	63,000 ohms	30 ohms	Short, pins 7 & 8, V6A.
		Send	R/T	Short	63,000 ohms	Poor relay contacts.
						Open Blk., relay to Gnd.
	Plate Cap	Rec.	R/T	48 ohms	Open	Open L3A.
						Broken lug, L3A.
						Open Red, L3A to meter board.
V6A	3	Rec.	R/T	470,000 ohms	70,000 ohms	Short, pin 3 to pin 4, V6A.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Reading	False Readings	Probable Fault
V6A (*Cont.*)	4	Rec.	R/T	73,000 ohms	Short	R43A term. Gnded.
					55,000 ohms	Short, pins 4 & 5, V6A.
					270,000 ohms	Open R43A.
	5	Rec.	R/T	230,000 ohms	Open	Open R15B or R42B.
V5A	2	Rec.	R/T	48,000 ohms	3,900 ohms	Gnded. lug on V5A term. board.
					39,000 ohms	Short, pins 4 & 5, V2B.
	3	Rec.	R/T	44,000 ohms	Short	Gnded. L4A-L6A.
					Open	Open L4A-L6A.
						Poor S11A contacts.
	6	Rec.	R/T	100 ohms	Open	Open R20B.
	7	Rec.	R/T	1.4 meg.	Short	Gnded. pin 7, V5A.
					800,000 ohms	Pins 4 & 6 shorted, V5A.
V3A	3	Rec.	R/T	900 ohms	Open	Open primary T2A.
			C.W.	900 ohms	Open	Open Or. to relay.
		Send	R/T	900 ohms	Open	Poor contacts S7A.
			C.W.	Open	900 ohms	Red-Blk. to Or. short at relay.
						Short at S7A.
			MCW	900 ohms —K.	900 ohms (Key has no effect)	Red-Blk. to Or. short at relay.
						Poor S7A contacts.
	4	Rec.	R/T	1 meg.	666,000 ohms	Gnded. grid return, L8A.
						C38A shorted to +H.T.1
						Gnded. Br. at P.A. board.
						Grid return, L8A or L8B, shorted to +H.T.1.
					Open	Open R8A.
	5	Rec.	R/T	575,000 ohms	Short	Internal short, L9A secondary.
					2,200	Internal short, primary to secondary, L9A.
					100,000 ohms	Cap lead shorted to lug on L9A board.
					115,000 ohms	Leaky 500 $\mu\mu$fd. at L9A board.
					150,000 ohms	R1B shorted at pin 6.
					Open	Open R1B or R7C.
						Open L9A secondary.

TABLE 5—(Continued)

Socket	Pin No.	Conditions	True Reading	False Readings	Probable Fault
V3A	6	Rec. R/T	68,000 ohms	Off value	Leaky C4M.
				Open	Open R12A.
	8	Rec. R/T	4,300 ohms	Short	Gnded. pin 7, right side of main term. board.
				2 ohms	Right 7 to right 8 short on main term. board.
				1,000	Gnded. right 5, main term. board.
					Gnded. Red lead, T2A.
					Gnded., A.F. GAIN A control.
					Leaky C16A.
					Red to Yel. short, T2A.
				2,500 ohms	Red-Blk. Gnded. at relay.
					Gnded. Br. lead, T2A.
					Gnded. Br.'s at S7A.
				Open	Broken socket lug.
					Open Gnd., right 3, main term. board.
					Open Or. to main term. board.
	Grid Cap	Rec. R/T	1. meg. A.F.G.	Short	Shorted relay contacts.
					Particles in S7A.
					Gnded. A.F. GAIN A control.
				3,300 ohms	Gain at minimum.
					Gnded. Gain control.
				6,000 ohms	Terms. shorted "A" relay.
				20,000 ohms	C17A shorted.
				65,000 ohms	Damaged relay contacts.
				80,000 ohms	Pin 4, V1C shorted to C17A.
				Open	Open Br. at relay.
					Open Yel. jumper on relay.
					Open lead to A.F. GAIN.
					Open GAIN.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Reading	False Readings	Probable Fault
V3A *(Cont.)*	Grid Cap *(Cont.)*	Rec. *(Cont.)*	R/T *(Cont.)*	1. meg. A.F.G. *(Cont.)*	Open *(Cont.)*	Open Blk. at relay.
						Poor relay contacts.
						Poor S7A contacts.
		Send	R/T	6,600 ohms	Short	Short at T3A.
						Gnded. rear section, bottom S7A.
					500 ohms	Broken rear section S7A.
					3,000 ohms	Gnded. Red, T3A.
						Gnded. A.F. GAIN A.
					Open	Poor S7A contacts.
						Open Wh., T3A.
						Open Br., relay to S7A.
						Open Br., T3A.
						Poor Relay contacts.
						Open T3A secondary.
			C.W.	Open	Short	Shielded lead, A.F. GAIN A to relay, Gnded.
						Gnded. term to braid on rear section of S7A.
		Send	MCW	50,300 ohms	Short	Gnded. Br. at S7A.
					3,300 ohms	Shorted R6F, main term. board.
					Open	Open R6F.
						Poor S7A contacts.
						Poor relay contacts.
V1C	3	Rec.	R/T	2,200 ohms	15 ohms	Shorted C4L.
					Open	Open R5C.
						Open L9A primary.
	4	Rec.	R/T	82,000 ohms	Short	Pins 4 & 8 shorted, V1C.
						Shorted C4O.
					120,000 ohms	Poor relay contacts.
						Open +H.T.1. at relay or pin 6, V1C.
					Open	Poor relay contacts.
						Open R19B.
	8	Rec.	R/T	270 ohms	Short	Gnded. pin 8, V1C.
						Shorted C4K.
					Open	Open R3B.

TABLE 5—(Continued)

Socket	Pin No.	Conditions	True Reading	False Readings	Probable Fault
V1C *(Cont.)*	Grid Cap	Rec. R/T	3. meg. (Test with A.V.C. ON)	Open	Open L8B secondary.
					Open Br., L9A.
					Open R/C-103A.
					Open R8B.
V1B	3	Rec. R/T	5.5 ohms	Open	Open primary, L8B.
	4	Rec. R/T	27,300 ohms	39,000 ohms	R7.1J open.
				100,000 ohms	R44A open.
				Open	Open Or.-Yel. to pin 4, V1A.
	8	Rec. R/T	1,000 ohms (Meter switch on AE.)	Short	Brown and Red-Yel. shorted on meter board.
					Br. Gnded. at meter board.
				11,000 ohms	R.F.G. at minimum.
					Broken R.F. GAIN.
				45,000 ohms	Open R.F. GAIN.
				Open	Open R9A.
	Grid Cap	Rec. R/T	3. meg.	Short	Valve shield can cap cut through grid lead.
				Open	Open L8A secondary.
V2A	2	Rec. R/T	30 ohms	Short	Pins 2 & 3 shorted, V2A.
	3	Rec. R/T	2,200 ohms	10 ohms	Shorted C 4F.
				100,000 ohms	Defective L8A primary.
				Open	Open R5B.
					Open L8A primary.
	4	Rec. R/T	11,000 ohms	22,000 ohms	Open R45A or R4A.
	5	Rec. R/T	47,000 ohms	18,000 ohms	Pins 4 & 5 shorted, V2A.
				20,000 ohms	Pins 5 & 6 shorted, V2A.
				Open	Open R6B or R3A.
	6	Rec. R/T	47,000 ohms	Open	Open R34B.
	Grid Cap	Rec. R/T	10,000—2.	Short	Gnded. grid lead at gang.
					Bent or shorted M.C. gang stator plates.
					Shorted C10A or C10D.
				6,000 ohms	Shorted Br.'s at "A" relay.
				Open	Poor S11A contacts.
					Open R.F. coils.
					Open R42A.

TABLE 5—(Continued)

Socket	Pin No.	Conditions	True Reading	False Readings	Probable Fault
V1A	3	Rec. R/T	2,200—2	Short	Short at R.F. coils.
					Short at S11A.
				30,000 ohms	Open Red-Blk. at R.F. coils.
				Open	Open R.F. coils.
					Poor S11A contacts.
					Open R5A.
	4	Rec. R/T	27,300 ohms	39,000 ohms	Open R7.1J.
				Open	Broken socket lug.
	8	Rec. R/T	220 ohms	1,200 ohms	Open R/C-105A.
				Open	Open R2A.
	Grid Cap	Rec. R/T	3. meg.	Open	Open L10A.
V2B	3	Rec. R/T	44,000 ohms	Short	S11A term. touching Gnd. wiper.
					Shorted C10C or C10E.
				2,000 ohms	Gnded. +H.T.1 at relay.
				Open	Poor S11A contacts.
					Open L7A or L21A.
					Open R5E, R45B, R4D.
		Send R/T	2,200 ohms —2	44,000 ohms	Poor relay contacts.
				Open	Open S11A contacts.
	4	Rec. R/T	22,000 ohms	Short	C4U shorted.
				15,000 ohms	Pins 4 & 5 shorted, V2B.
				Open	Open R4D.
					Broken socket lug.
	5	Rec. R/T	47,000 ohms	14,000 ohms	Pins 5 & 6 shorted, V2B.
				Open	Open R6D.
	6	Rec. R/T	47,000 ohms —N.	Short	Blue pinched at B.F.O.
					Pin 6, V2B Gnded.
					Red-Blk. to Blue-Or. short at relay.
				11 ohms	Gnded. 90 $\mu\mu$fd. in B.F.O. can.
				2,500 ohms	Leaky C20A.
				47,000 (NET switch OFF)	Short at NET switch.
					Red-Yel. at NET switch Gnded.

TABLE 5—(Continued)

Socket	Pin No.	Conditions		True Reading	False Readings	Probable Fault
V2B *(Cont.)*	6 *(Cont.)*	Rec. *(Cont.)*	R/T *(Cont.)*	47,000 ohms —N. *(Cont.)*	47,000 (NET switch OFF) *(Cont.)*	Bent relay contacts.
						Red-Blk. to Blue-Or. short at "A" relay.
						Short at S7A centre section contacts.
					Open	Broken NET switch.
						Open Red-Yel. at NET switch.
		Send	R/T	47,000 ohms	Open	Poor relay contacts.
	Grid Cap	Rec.	R/T	100,000 ohms	Open	Bent contacts S7A.
						Open R7L.
"A" AERIAL		Rec.	C.W. & Meter Switch to AVC	470 ohms	15 ohms	Shorted contacts on meter switch.
						Shorted rotor sections of S7A.
					Open	Open L2B.
						Open L3A.
						Open AE. circuit leads.
						Poor S7A contacts.
						Open R10C.
Meter Board Top	1	Rec.	R/T and Meter Switch to AVC	1.2 meg.	Open	Open R25A.
	2	Rec.	R/T and Meter switch to AVC	1.2 meg.	Open	Open R24A.
	3	Rec.	R/T and Meter switch to AVC	29,000 ohms	Short	Gnded. term.
					56,000 ohms	One of parallel 56,000 ohms of R26A open.
	4	Rec.	R/T and Meter switch to AVC	28,000 ohms	Short	Gnded. term. at meter switch.
					320 ohms	Br. to Yel. short at meter switch.
					Open	Poor meter switch contacts.
						Open R21C.
						Open R9A.

FAULT LOCATOR

31. The fault locator chart lists the **more peculiar** symptoms and under each heading describes the more common faults located to date that are capable of producing such symptoms. See also FZ 253/3, Tables 1, 2, 4, 5, 6, 7 and 8. Any new faults located in the shops should be recorded in a similar manner, and periodically forwarded to N.D.H.Q. for editing and publication.

32. To cure noisy M.C. gang condenser: When caused by dirty wiper contacts, use Intava Instrument Oil. Apply one drop of fluid to front and rear wipers on the Osc. and R.F. sections of the gang. Rotate gang back and forth 8-10 times and noise will gradually disappear.

TABLE 6—FAULT LOCATOR CHART

Set	Conditions	Symptom	Probable Fault
I.C.		Weak output	Faulty T6A.
			Defective T4B.
			Low value R21B.
			Leaky C29C.
		High output; Oscillation	Open R21B.
			Reversed T6A secondary.
			Reversed T4B primary.
"B"	Rec.	Poor sensitivity	V7A, V8B, T5A weak.
			Open C16B.
			Poor relay contacts.
		Will not super-regenerate over entire band	Dress AE. chokes away from can.
			Dress V7A plate and grid leads.
			Add SHORT braid from "B" Osc. can to C25A rotor term.
		Hum	V1E grid shield braid not grounded.
		Noisy when tapped	V7A, V1E, V8B defective.
			Poor relay contacts.
			Shorting C25A.
		Noisy "B" dial	C25A rotor not properly GNDED. Add short GND. braid.
	Send	Low R.F. output	Weak V7A.
		No sidetone	Faulty T4A or T5A.
			Poor relay contacts.
		Weak sidetone	Defective T4A, T5A.
			Low value R36A.
			Leaky C29B.
		High sidetone; Oscillation	Open R36A.
			Reversed T5A secondary.
			Reversed T4A primary.

TABLE 6—(Continued)

Set	Conditions	Symptom	Probable Fault
"A"	Rec.	Poor sensitivity R/T	Poor I.F. alignment.
			Poor adjustment, C10A-C10D
			Weak valves.
			Faulty T2A.
		Poor sensitivity, C.W.	V2B too powerful; replace.
		I.F. oscillation	Faulty V2A.
			I.F. transformers peaked in excess of normal sensitivity.
		Hum on Send & Rec.	Dirty dynamotor commutator.
			Poorly bedded brushes.
		"Motorboating"	I.F. transformers peaked in excess of normal sensitivity.
			Open R8B or R/C-103A.
			Open C38A.
		No. A.V.C. indication on meter	Shorted R9A.
			Short in R9A leads to meter switch.
		No "dip" in A.V.C. reading when tuning past a strong signal on R/T	A.V.C. switch shorted.
			A.V.C. line shorted.
			Shorted C38A.
		Noisy when tuning	Loose or dirty fork wipers on tuning condensers.
			Condenser plates bent and scraping.
		Noisy when tapped	Valves.
			Shorted gangs.
			Shorted trimmers.
			Dirty relay contacts.
			Dirty switch contacts, S11A or S7A.
	Send	Low R.F. Output	Valves.
			Low drive.
			C34A or R43A out of adjustment.
		No. AE. reading but a neon bulb lights on L3A tank	Broken tap, L3A.
			Open AE. meter circuit.
			Open R29A in variometer.
			Defective variometer.
			Defective T1A or W1A.
		Low AE. reading but a neon bulb indicates normal AE. output	Faulty or maladjusted R29A.

TABLE 6—(Continued)

Set	Conditions	Symptom	Probable Fault
"A" (*Cont.*)	Send (*Cont.*)	19 Set AE. meter reading on R/T is very low as compared with C.W.	Faulty R10C or its S7A contacts. Check setting of C34A, see para. 152.
		Low drive	Drive circuits out of alignment.
			Faulty V2A, V2B, V5A, V6A, or V4A.
			Faulty C34A or R43A.
		Erratic drive	Valves.
			C34A or R43A.
			Drive alignment.
			Relay contacts.
			S11A contacts.
			M.C. gang off centre.
			Faulty Rec. Osc. & B.F.O. alignment.
		Drive drops at one particular frequency	Shorted M.C. gang plates.
			If the drop occurs when the P.A. dial is tuned to resonance, it may be cured by adding a shield to V1A grid cap lead.
		Drive oscillates (See Para. 160)	V5A, V6A or V4A faulty.
			V5A centre key not being properly grounded.
			Open V5A suppressor.
			Open C20B.
		Large netting error	Faulty V2B.
		Low sidetone	Faulty T2A or T3A.
		Rec. O.K. but loud howl on Send	Relay not opening +H.T.1 line to I.F. valves.
		L10A burns out	A.V.C. line shorted to Gnd.

Removal of Components

General

33. The Wireless Set (Cdn.) No. 19, Mk. III presents such a complex array of components and wiring, compressed into such a compact space, that completely adequate repair instructions become rather difficult to present with any degree of conciseness. Hence, should it become necessary to completely rebuild a set, the logical procedure is to use another set as a model. IT IS PARTICULARLY IMPORTANT that the mechanical layout of the wiring be followed EXACTLY, otherwise the completed job is very apt to suffer from stray coupling effects to such an extent that it may be non-serviceable. Standard colour coding of leads should be followed to facilitate future maintenance.

34. The method of removal or replacement of the majority of the components of the set is so instantly obvious as to make a written description superfluous in most cases. Occasionally it may prove necessary to loosen nearby components to obtain access to a particular section. However, in certain instances where special difficulties may be encountered, full removal instructions are supplied. Replacement merely consists of performing the converse of the removal procedure.

35. Where it is necessary to unsolder many leads during the removal of a component, these leads should be tagged to facilitate accurate replacement on the proper terminals.

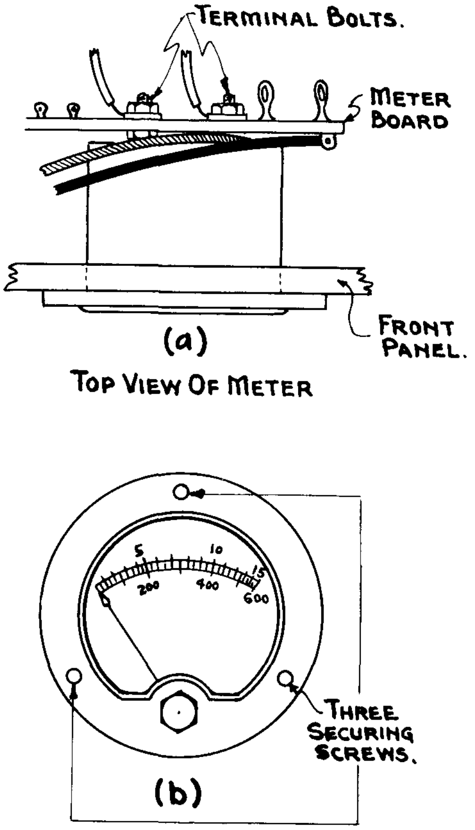
Meter

36. To remove the No. 19 set meter:

(a) Remove nuts, washers and leads from the two meter terminal bolts, protruding through the back of the meter resistor board. (See Fig. 18).

(b) Remove the three screws that secure the meter in position. (See Fig. 18).

(c) Pull the meter forward and remove, leaving the meter board in the set.



T FZ 254/3 1 - 18 FIG. 18—REMOVING METER

Meter Switch

37. After the meter has been removed, the meter switch may be changed quite easily, as follows:

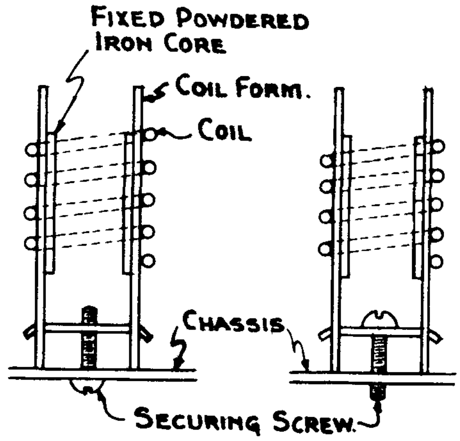
(a) Remove the meter switch knob by loosening the radial grub screw and pulling the knob off the shaft.

(b) Remove the retaining nut securing the switch hub to the front panel.

(c) Unsolder the leads from the meter switch terminals, tagging the leads to facilitate replacement.

Coils

38. Fig. 19 shows a cut-away view of typical No. 19 set coils. The methods of mounting the coils on sub-panels, brackets, or the chassis are clearly indicated.



T FZ 254/3 1 - 19 FIG. 19—REMOVING COILS

I.F. Transformers

39. To remove I.F. transformers:

(a) Remove I.F. transformer lead from valve grid cap (where applicable).

(b) In some cases it will be necessary to move certain .1 μfd. paper condensers in order to obtain ready access to the I.F. transformer terminals beneath the chassis. If this is necessary, remove the appropriate condenser mounting bracket, and shift the condensers temporarily to one side.

(c) Unsolder the leads from the I.F. terminals beneath the chassis. Tag the leads to facilitate replacement.

(d) Remove the nuts marked "N" from each of the two I.F. transformer threaded mounting lugs, located on opposite sides of the container. The I.F. transformer can now be removed.

(e) When replacing with a different type of I.F. transformer, note that the type using the wax-sealed tuning slugs have a 100,000 ohm resistor across the primary windings of L8A and L8B, not found on other types. (See FZ 252/3, Para. 85).

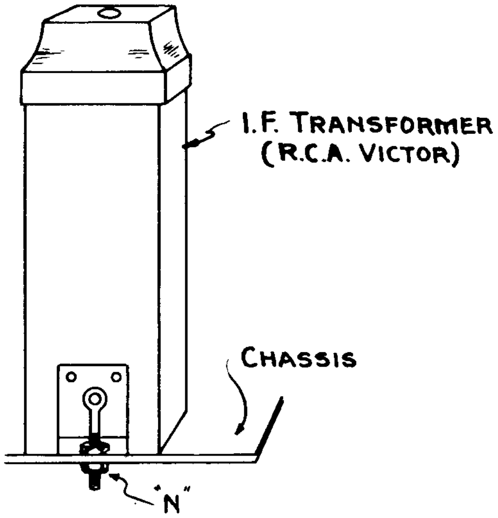


FIG. 20—REMOVING I.F. TRANSFORMER

T FZ 254/3 1 - 20

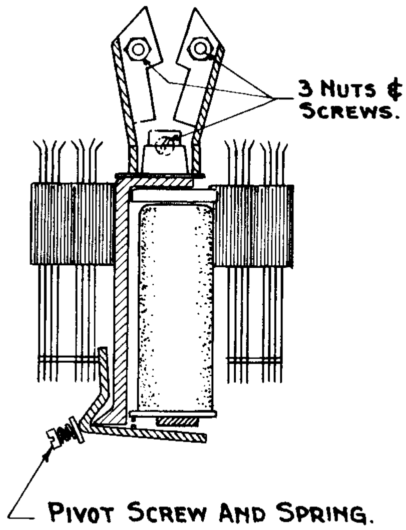


FIG. 21—REMOVING S/R UNIT RELAYS

T FZ 254/3 1 - 21

S/R Unit Relays

40. To remove the entire relay:

(a) Invert No. 19 set and place so that the front panel faces AWAY.

(b) Remove base plate.

(c) Remove the right rear screw retaining V4A socket platform.

(d) Remove the mounting bracket which holds C/C-107A in position at V4A socket platform. This allows the 12 μfd. condenser to be moved aside, facilitating access to the relay and the wiring.

(e) Unsolder and remove all leads from relay terminals and solenoids. Leads should be tagged to facilitate replacement.

(f) Remove three screws and nuts holding relay mounting bracket to the underside of the chassis. (See Fig. 21).

(g) The relays, complete with mounting bracket, may now be removed.

41. To change a solenoid without removing the relay:

(a) Carry out steps (a), (b), (c), (d) and (f), Para. 40.

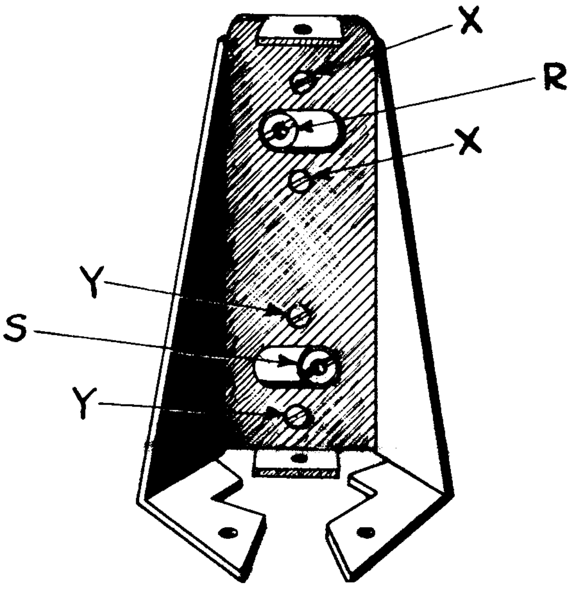
(b) Remove two screws (X or Y) inside relay bracket, holding the required relay in position. (X = "B" set; Y = "A" Set).

(c) Unsolder the two leads from the specific solenoid that is to be changed.

(d) Remove screw and spring retaining the specific relay armature at the pivot. Remove the armature.

(e) Remove the required special nut (R or S) holding the solenoid core in position. See Fig. 22 (R = "B" set; S = "A" set).

(f) Remove solenoid coil.



T FZ 254/3 1 - 22 FIG. 22—REMOVING SOLENOID

P.A. Tuning Condenser and Drive Assembly

42. To remove the P.A. condenser, C3A, and drive assembly (See Fig. 23):

(a) Turn the TUNE-SET-FLICK lever to SET and remove the four flick locking screws from the P.A. dial knob.

(b) Remove the index bracket by removing its two retaining screws.

(c) Remove screw "P" from the pivot at the left of the slow motion drive assembly. The spring and "C" washer may now be removed. The slow motion drive may also be removed by sliding it to the left so that its actuating stud slides out of the slot in the flick operating arm behind the front panel.

(d) Remove the large centre fixing bolt "C" and washer from the hub of the dial knob.

(e) Loosen the radial grub screw in the side of the dial knob.

(f) Remove the dial knob by pulling forward. Remove dial.

(g) Remove the two fixing screws from the dial stops. These go right through the front panel into the flick mechanism case, ("dial mounting plate").

(h) Remove the TUNE-SET-FLICK lever by removing the hub fixing screw marked "H", loosening the radial grub screw and pulling the lever forward.

(i) Remove the two screws securing the lower right and left hand corners of the dial mounting plate to the chassis base.

(j) Unsolder the red lead at AERIAL A socket.

(k) Unsolder the heavy bus from the terminal on the ceramic block; on top of the P.A. condenser, C3A. This bus leads to the P.A. terminal board at the rear of C3A.

(l) Unsolder C36A ground lead from C3A frame.

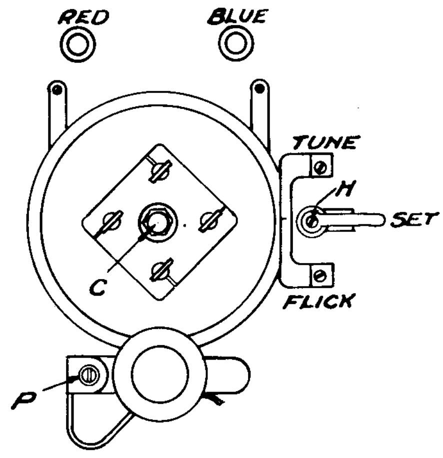
(m) Remove the screw securing the brackets on which are mounted L3A and C36A.

(n) Remove V3A. Remove three screws and spacers securing the P.A. resistor board to the rear of the P.A. tuning condenser, C3A.

(o) Move L3A, C36A, and the P.A. resistor board towards the rear of the set to allow sufficient working room.

(p) Remove V5A.

(q) Push the P.A. tuning condenser and the flick mechanism unit to the rear and lift out.



T FZ 254/3 1 - 23 FIG. 23—DIAL MECHANISM

43. To remove the P.A. tuning condenser, C3A, from the flick mechanism (See Figs. 24 & 25):

(a) Complete the steps outlined in Para. 42.

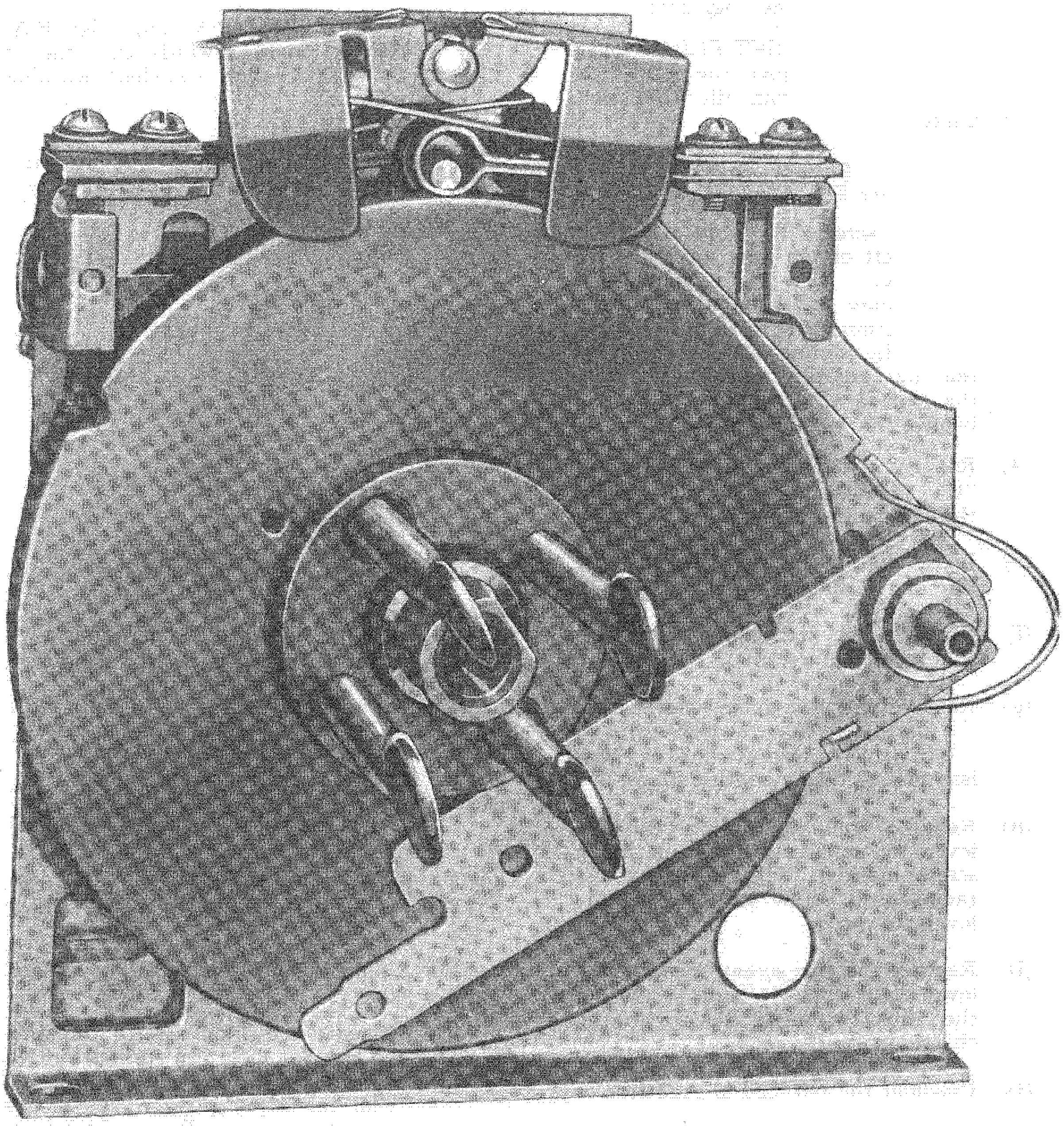
(b) Remove the four screws retaining the two flat flick arm springs located on top of the P.A. tuning condenser "dial mounting plate". (2 screws to each spring). Remove washers, spacers and flick springs.

(c) Remove the two flick indicator flaps and spring.

(d) Remove the two flick operating arms and spring.

(e) Remove the taper pin from the drive mechanism boss. It may be extracted only in one direction due to the taper.

(f) Remove the flick clamping washer, noting position of assembly.



T FZ 254/3
1 - 24

FIG. 24—FLICK MECHANISM ASSEMBLY

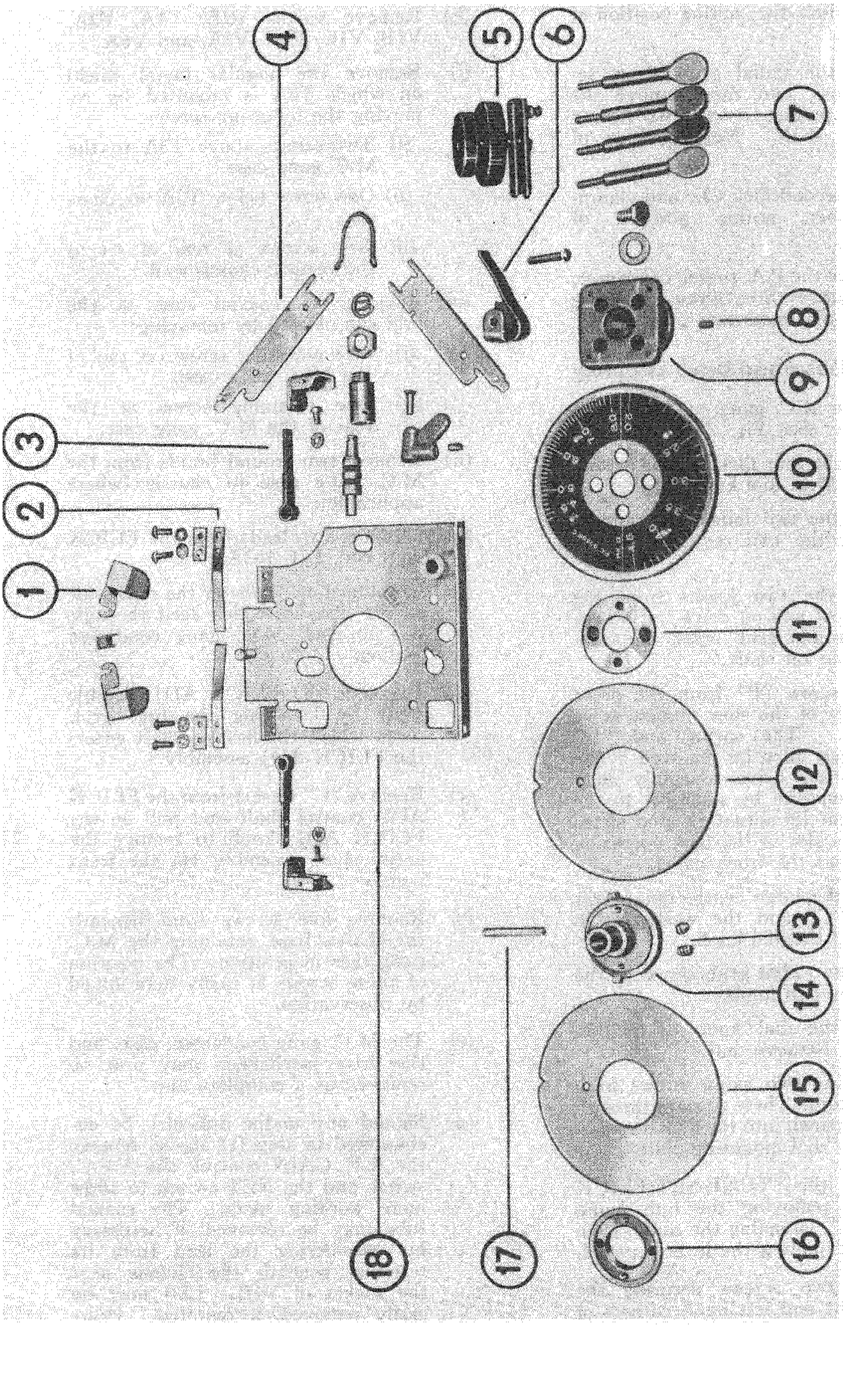


Fig. 25—Flick Mechanism Components

1—INDICATOR, Flap, Right.
2—SPRING, Flick Arm.
3—ARM, Flick.
4—ARM, Operating, No. 1.
5—SLOW MOTION DRIVE.
6—BRACKET & SPRING.
7—SCREWS, Dial Clamping.
8—SCREW, Grub.
9—KNOB, No. 2.
10—DIAL.
11—WASHER, Clamping, Front.
12—DISC, Flick.
13—SCREW, Grub.
14—BOSS, Disc.
15—DISC, Flick.
16—WASHER, Clamping, Rear.
17—PIN, Taper.
18—PLATE, Dial Mounting.

T FZ 254/3 1 - 25

(g) Remove flick disc, noting position of assembly.

(h) Remove the radial grub screw securing boss, and then remove the boss by pulling it off the tuning condenser shaft. Note position of assembly.

(i) Remove second flick disc and clamping washer, noting position of assembly.

(j) To remove the P.A. tuning condenser, C3A, remove three screws securing it to the dial mounting plate.

M.C. Gang Condenser and Drive Assembly

44. To remove the M.C. gang condenser and drive assembly (See Fig. 23):

(a) Remove the four flick locking screws from the M.C. dial knob.

(b) Remove the two index brackets by removing the two retaining screws on each.

(c) Remove the two knobs from the special slow motion drive by loosening the radial grub screw on each. Slide knobs off shaft.

(d) Remove screw "P" from the pivot at the left of the slow motion drive assembly. The spring and "C" washer may now be removed. The slow motion drive assembly may also be removed by sliding it to the left so that its actuating stud slides out of the slot in the flick operating arm behind the front panel.

(e) Remove the large centre fixing bolt marked "C" and the washer from the hub of the dial knob.

(f) Loosen the radial grub screw in the side of the dial knob.

(g) Remove the dial knob by pulling forward. Remove dial.

(h) Remove the two fixing screws from the dial stops. These go right through the front panel, into the flick mechanism case; "dial mounting plate".

(i) Remove the TUNE-SET-FLICK lever by removing the hub fixing screw "H", loosening the radial grub screw and pulling the lever forward.

(j) Remove two screws securing the lower right and left hand corners of the condenser and drive "dial mounting plate" to the chassis base.

(k) Remove valves V2B, V1A, V2A, V1B, V1C, V3A, V5A, and V6A.

(l) Remove the angular metal shield on which T3A is mounted by removing the following screws:

(i) Two screws above T3A to the M.C. gang case.

(ii) One screw below T3A to chassis.

(iii) Two screws at rear of set to the vertical chassis wall.

(m) Remove the coaxial tube to the grid cap of V2B by removing:

(i) One retaining screw on top of the M.C. gang case.

(ii) One retaining screw at the rear of the M.C. gang case.

(n) Remove two ground braids from the M.C. gang case to chassis (where applicable).

(o) Unsolder two leads from the FLICK ADJ coil, L/C-103A.

(p) Unsolder four leads on the underside of the chassis, which feed through, one to each M.C. gang condenser section.

(q) Uncouple the FLICK ADJ flexible shaft by loosening the first grub screw where the flexible shaft enters the FLICK ADJ assembly.

(r) Remove "C" washer from the FLICK ADJ control shaft and pull on the FLICK ADJ knob to remove the entire shaft assembly via the front panel.

(s) Remove five screws from beneath the chassis base, retaining the M.C. gang case in position. The position of these screws is easily determined by observation.

(t) The M.C. gang condenser, case, and the drive mechanism may now be removed as a complete unit.

(u) Should any undue difficulty be encountered in step (t) above, remove the R.F. GAIN control, the A.V.C. switch and the NET switch to allow more working room. The coaxial tube may be removed, if necessary by unsoldering the lead from its terminal beneath the chassis near the socket of V1B. L8B may be easily removed, if required. However, it should not be necessary to remove any of the above components.

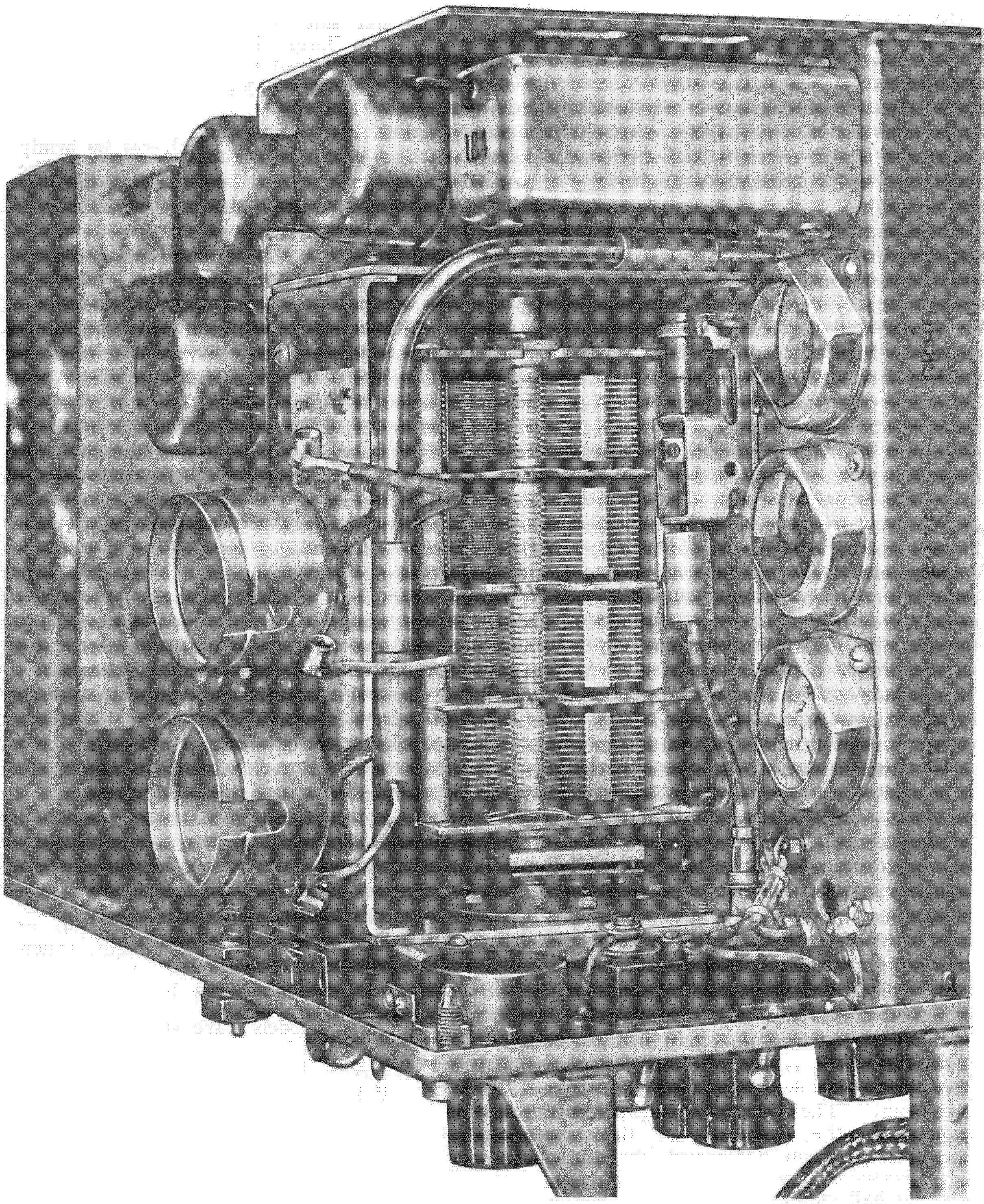


FIG. 26—M.C. GANG AND FLICK ADJ MECHANISM

T FZ 254/3 1 - 26

45. To remove the M.C. gang condenser from its case (on completion of the steps outlined in Para. 44):

(a) Unsolder the three braids grounding the M.C. gang sections to the case.

(b) Unsolder four leads on top of the M.C. gang, connecting each section to its respective trimmer capacitor.

(c) Remove three screws securing the M.C. gang to the case. Two screws are located on the outer side of the gang case near the front at the top and bottom. The other screw is located on the outer side of the gang case at the vertical centre and towards the rear. It is normally hidden under T3A and shield.

(d) Slide the gang to the rear to disengage the drive coupling. Do NOT lose the spring wire tension clip.

46. Stripping the flick mechanism is accomplished exactly as for the P.A. assembly outlined in Para. 43, except that the boss (Para. 43 (h)) has two grub screws.

Reassembling the Flick Mechanism

47. In general, reassembling the flick mechanism is merely the converse of the stripping instructions. However, the following important points should be noted when replacing the clamping screws, flick discs, etc.:

(a) The first flick clamping washer to be replaced should have its flat side to the REAR and its two small tapped holes in the vertical plane.

(b) The first flick disc to be replaced should have its projecting stud to the FRONT, and its periphery slot to the top.

(c) The boss is replaced with its two large, untapped holes in the vertical plane, lining up with the vertical tapped holes mentioned in (a) above. Make certain that the radial hole drilled through the boss hub lines up with the equivalent hole through the drive shaft, to receive the taper pin. The two flanges protruding from the periphery of the boss should point downward like an inverted "V" when the P.A. condenser is half closed. Should these flanges point upward, a 180° error has been made when sliding the boss on the drive shaft.

(d) The second flick disc should be replaced with its projecting stud to the REAR, and its periphery slot to the top.

(e) The second flick clamping washer should now be replaced with its flat side to the FRONT, and its two large holes in the vertical plane, lined up with the two large untapped holes in the boss. (See (c) above).

(f) The taper pin should now be firmly driven into its position through the boss hub and drive shaft. Tighten radial grub screws, if any.

(g) Replace two flick operating arms and spring. Replace the two flick arms, springs, indicator flaps, etc.

(h) The dial and knob are added after the drive mechanism is mounted in the No. 19 set chassis. Make certain that the three shallow studs on the front face of the dial are properly seated in the receptacles provided on the inner face of the hub. Do NOT forget to tighten the central fixing screw before tightening the grub screw.

(i) When replacing the slow motion drive, make certain that the stud is inserted through the panel and secured in the slot of the lower flick operating arm. Add dial spring and securing screw to this assembly. Using leverage, bend this spring so that its stud catches in the small hole drilled through the panel, then tighten screw. This retains proper tension on the spring. Do NOT forget the small "C" washer between the spring and the panel.

(j) When replacing the four flick locking screws it is necessary that the holes in the boss and the two clamping washers be properly lined up as described in this paragraph; otherwise the screws will not go fully home and can not be secured.

(k) Later models have small spring retaining wires to prevent flick locking screws from accidently falling out if loosened too far.

Band Switch, S11A

48. To remove a section of the band switch, S11A, the chassis base plate being removed:

(a) Remove knobs from the band switch and the HET TONE control.

(b) Remove four screws from the front panel retaining the front cover plate on which these two controls are mounted. Pull the cover plate to the front and move to one side. It should not be necessary to disconnect the leads to the HET TONE control.

(c) Undo two screws mounting the switch click plate on the coil can (L21A—L7A).

(d) The switch click plate and rotor spindle may now be withdrawn to the front, making possible the changing of any switch wafer as a separate unit.

(e) When replacing the rotor spindle and click plate, be very careful to line up the holes in the switch rotors. It should then slide in easily. It may be necessary to spread the clip on the inside rear wall of the coil can to re-insert spindle.

(f) Carefully examine the switch rotor sections as a 180° error may easily be made on one or more wafers when inserting spindle.

(g) The click plate must be insulated from the chassis for proper performance of the set. Therefore it is necessary to properly replace the four insulating washers when remounting the click plate.

Function Switch, S7A

49. To remove the MCW CW R/T function switch:

(a) Remove the function switch control knob.

(b) Remove from the front panel two screws located on each side of the function switch shaft.

(c) Remove V4A.

(d) Invert set and remove two screws mounting V4A socket platform.

(e) Remove two screws mounting main resistor board.

(f) Remove bracket mounting C4N.

(g) Unsolder all leads from V4A board, and leads from C34A to the main resistor board. Tag all leads to facilitate replacement.

(h) Ease off the position of the main resistor board, and V4A socket platform. This allows access to S7A.

(i) Unsolder all leads to S7A, tagging them to facilitate replacement. S7A may now be removed.

(j) The three wafers of S7A may be changed independently, if desired. The switch is dismantled by removing the two screws at the rear. The wafers may now be slid off the spindle. Thus, only the wiring to the defective wafer need be unsoldered.

Dynamotor

50. To remove the dynamotor from Supply Unit No. 2:

(a) Remove the supply unit from the case.

(b) Remove four screws and nuts securing the front panel of the supply unit to its frame. (See Fig. 27).

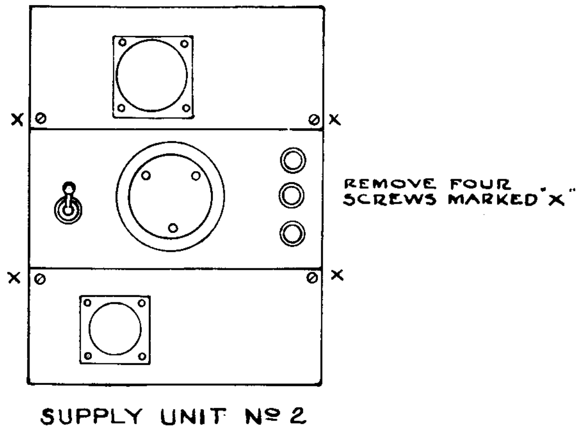


FIG. 27—LOOSENING SUPPLY UNIT FRONT PANEL

T FZ 254/3 1 - 27

(c) Face the rear of the supply unit and remove the two countersunk screws securing the top platform to the rear left and right frame uprights.

(d) Remove the four remaining screws and nuts securing the top platform to each sideplate and front upright respectively.

(e) Invert the supply unit, and remove two countersunk screws securing the two side plates to the bottom longitudinals. Remove the side plates.

(f) Disconnect all wiring to the dynamotor, tagging the leads to facilitate replacement.

(g) Remove from the bottom plate, four bolts, securing dynamotor. The dynamotor may now be eased out of the frame.

(h) On re-assembling, make certain to replace the dynamotor rubber foot-pads to absorb vibration.

Connections and Colour Coding

GENERAL

51. Sets constructed by different manufacturers may differ in the wiring layout to certain minor circuits. In general, however, the mechanical wiring to the more complex circuits is identical or similar. An effort has been made by all manufacturers to conform to a standard colour coding throughout. On occasion, however, the shortage of a specific colour has necessitated the temporary substitution of another. In such cases an effort has been made to employ a similar colour. Hence, a normal red-black lead might become a white lead with red and black tracers. Occasionally a totally different colour may be used. Due to increasing shortages of desired colours, a later practice has been to employ any available colour, but to paint both ends of the lead with the proper coding. The set described in the following section was manufactured by the R.C.A. Victor Co. Ltd.

Valve Sockets

52. Valve socket connections are described in the following tables:

Table 7—V1F
Table 8—V8B
Table 9—V7A
Table 10—V1D
Table 11—V1E
Table 12—V8A
Table 13—V1A
Table 14—V2A
Table 15—V1B
Table 16—V1C
Table 17—V3A
Table 18—V2B
Table 19—V5A
Table 20—V6A
Table 21—V4A.

TABLE 7—V1F CONNECTIONS

V1F (6K7G) 1st A.F. AMPLIFIER (I.C.)	
Pin No.	Connections
1	R7K (100,000 ohms) to pin 3, V1F. R23E (22,000 ohms) to pin 6, V1F. C31C positive (2. μfd. electrolytic).
2	Chassis (Gnd.).
3	R7K (100,000 ohms) to pin 1, V1F. C29C (.01 μfd. mica) to pin 5, V8B.
4	C4X (.1 μfd. paper) to Gnd. R1F (470,000 ohms) to pin 6, V1F.
5	Chassis (Gnd.). C4X and C4W Gnds., (twisted) (.1 μfd. paper). C31A negative (2. μfd. electrolytic). Blk.-(Wh.) to pin 5, V1E.
6	Red-Yel. to pin 4, V8B. Red-Yel.-(Wh.) to top left I.C., ON-OFF Sw. R1F (470,000 ohms) to pin 4, V1F. R23E (22,000 ohms) to pin 1, V1F.
7	Blk. to pin 7, V1D. Blk. -(Wh.) to pin 2, V1E.
8	R9C (1,000 ohms) to Gnd.

TABLE 8—V8B CONNECTIONS

V8B (6V6G) Output A.F. Amplifier (I.C.)	
Pin No.	Connections
1	
2	Blk.-(Wh.) to Gnd. C16B negative (12. μfd. electrolytic). R39A (820 ohms) to pin 8, V8B.
3	Gr.-(Wh.) to pin 6, T6A.
4	Blue-(Wh.) to pin 5, T6A. Red-Yel. to pin 6, V1F.
5	C29C (.01 μfd. mica) to pin 3, V1F. R8F (1. meg.) to Gnd.
6	Red to pin 1, V1E. C31B positive (2. μfd. electrolytic).
7	Blk. to pin 2, V8A. Blk.-(Wh.) to pin 2, V1E.
8	R39A (820 ohms) to Gnd.

TABLE 9—V7A CONNECTIONS

V7A (E-1148) Superregenerative Detector ("B" Set).	
Pin No.	Connections
1	Red-Yel.-(Wh.) to Term. 8, bottom layer, "B" relay. R11B (3,300 ohms) to pin 6, V7A.
2	C15K (500. μμfd. mica) to Gnd. C15L (500. μμfd. mica) to Gnd. R38A (56 ohms) to Gnd. Blk.-(Wh.) to pin 7, V1D.
3	
4	
5	C37A (500. μμfd. mica) to Gnd. Red-Yel.-(Wh.) to top right term. of L15A. Red-Yel.-(Wh.) to Term. 2, "B" osc. can resistor board.
6	R11B (3,300 ohms) to pin 1, V7A. R33A (27,000 ohms) to top rear term., L15A. R33.1A (47,000 ohms) to top rear term., L15A. R34A (47,000 ohms) to pin 4, V1D. C31A positive (2. μfd. electrolytic).
7	Chassis (Gnd.).
8	L13A to Gnd.

TABLE 10—V1D CONNECTIONS

V1D (6K7G) Quench Oscillator ("B" Set)	
Pin No.	Connections
1	R6G (47,000 ohms) to pin 8, V1D. C15G (500. μμfd. mica) to bottom term., L14A. Shielded lead to grid cap, V1D.
2	Blk.-Gr. to pin 7, V1E. Blk-Gr.-(Wh.) to bottom fron term., "B" relay coil, L19B.
3	Red-Br.-(Wh.) to top term., L14A.
4	R34A (47,000 ohms) to pin 6, V7A. C4V (.1 μfd. paper) to pin 8, V1D (Gnd.).
5	Blk. to pin 8, V1D (Gnd.). Blk.-(Wh.) to term. 5, top layer "B" relay. Shield braid from lead connected to term. 2, top layer, "B" relay.

TABLE 10—(Continued)

6	Red-Br.-(Wh.) to pin 4, V8A. Red to term. 7, bottom layer, "B" relay. Bus to pin 6, V1E. C15H (500. μμfd. mica) to Gnd.
7	Blk. to pin 7, V1F. Blk.-(Wh.) to pin 2, V7A.
8	Chassis (Gnd.). R6G (47,000 ohms) to pin 1, V1D. Blk. to pin 5, V1D. C4V (.1 μfd. paper) to pin 4, V1D.

TABLE 11—V1E CONNECTIONS

V1E (6K7G) 1st A.F. Amplifier ("B" Set)	
Pin No.	Connections
1	Red to pin 6, V8B. R7J (100,000 ohms) to pin 3, V1E. R23C (22,000 ohms) to pin 6, V1E.
2	Blk.-(Wh.) to pin 7, V8B. Blk.-(Wh.) to pin 7, V1F.
3	R7J (100,000 ohms) to pin 1, V1E. C15J (500. μμfd. mica) to Gnd. C29B (.01 μfd. mica) to pin 5, V8A.
4	R1A (470,000 ohms) to pin 6, V1E. C4W (.1 μfd. paper) to Gnd.
5	Blk.-(Wh.) to pin 5, V1F.
6	R1A (470,000 ohms) to pin 4, V1E. Bus to pin 6, V1D. R23C (22,000 ohms) to pin 1, V1E. Red-Br.-(Wh.) to top left, "B" ON-OFF Sw.
7	Blk.-Gr. to pin 7, V8A. Blk.-Gr. to pin 2, V1D. Blk.-Gr.-(Wh.) to top right I.C. ON-OFF Sw. (R.C.A.) or to "B" ON-OFF Sw. (N.E.).
8	R9B (1,000 ohms) to Gnd.

TABLE 12—V8A CONNECTIONS

V8A (6V6G) Output A.F. Amplifier ("B" Set)	
Pin No.	Connections
1	
2	Blk. to pin 7, V8B.
3	Red-Or.-(Wh.) to Term. 3, T5A.

TABLE 12—(Continued)

4	Red-Br.-(Wh.) to pin 6, V1D. Blue-Gr.-(Wh.) to term. 4, T5A.
5	C29B (.01 μfd. mica) to pin 3, V1E. R8D (1. meg.) to Gnd.
6	Blk.-Gr.-(Wh.) to term. 1, bottom layer, "B" relay. R37A (390 ohms) to pin 8, V8A. R9D (1,000 ohms) to Gnd.
7	Blk-Gr. to pin 7, V1E.
8	R37A (390 ohms) to pin 6, V8A. C16B positive (12. μfd. electrolytic)

TABLE 13—V1A CONNECTIONS

V1A (6K7G) R.F. Amplifier ("A" Set)	
Pin No.	Connections
1	R44A (39,000 ohms) to pin 4, V1A. Red-Yel. to pin 6, V1C.
2	Bus to pin 2, V2A. Blk.-(Wh.) to pin 2, V2B.
3	Bus to section 3 of band switch, S11A (See Fig. 28).
4	R44A (39,000 ohms) to pin 1, V1A. R7.1J (100,000 ohms) to Gnd. C4A (.1 μfd. paper) to Gnd. Red-Yel. to pin 4, V1B.
5	Bus to Chassis (Gnd.).
6	R45B (22,000 ohms) to pin 4, V2B. Red-Or. to Drive terminal board. Red-Yel. to bottom front, L7A (R.C.A. Victor). **or:—** Red-(Wh.) to top right, L7A (Northern Electric).
7	Bus to chassis (Gnd.). R4D (22,000 ohms) to pin 4, V2B.
8	R2A (220 ohms) to pin 1, V2A. C4B (.1 μfd. paper) to Gnd.

TABLE 14—V2A CONNECTIONS

V2A (6K8G) Receive Frequency Converter ("A" Set)	
Pin No.	Connections
1	R4A (22,000 ohms) to pin 4, V2A. R2A (220 ohms) to pin 8, V1A. Yel. to pin 1, V1B. Yel. to top right R.F. GAIN control, R/C-105A (R.C.A.). **or:—** Blk.-Gr.-(Wh.) to lower left R.F. GAIN (Northern Electric.) Yel. to term. 2, meter sw. S8A.

TABLE 14—(Continued)

2	Bus to pin 2, V1A. Blk. to pin 2, V1B.
3	Red-Yel. to term. 1, L8A. (R.C.A.), **or,** to term. 2, L8A (N.E.).
4	C4D (.1 μfd. paper) to Gnd. R45A (22,000 ohms) to +H.T.1, Term. 4, L8A (R.C.A.), or term. 1, L8A (N.E.). R4A (22,000 ohms) to pin 1, V2A.
5	R6B (47,000 ohms) to pin 8, V2A. C7A (30 μμfd. mica) to top rear term., L25A-B. C21A (30 μμfd. mica) to V2A terminal board.
6	R34B (47,000 ohms) to +H.T.1, Term. 4, L8A (R.C.A.), or term. 1, L8A (N.E.). C2B (100. μμfd. mica) to top rear terminal L24A-B.
7	Bus to chassis (Gnd.). Blk.-(Wh.) to pin 7, V1B.
8	R3A (270 ohms) to Gnd. R6B (47,000 ohms) to pin 5, V2A. C4E (.1 μfd. paper) to Gnd.

TABLE 15—V1B CONNECTIONS

V1B (6K7G) 1st I.F. Amplifier ("A" Set)	
Pin No.	Connections
1	R9A (1,000 ohms) to pin 8, V1B. Yel. to pin 1, V2A.
2	Blk. to pin 7, V1C. Blk. to pin 2, V2A.
3	Bus to pin 1, L8B. (R.C.A.). **or:—** Bus to pin 4, L8B. (N.E.).
4	Red-Yel. -(Wh.) to pin 4, V1A.
5	Bus to chassis (Gnd.). R7L (100,000 ohms) to pin 6, V1B.
6	R7L (100,000 ohms) to pin 5, V1B. R42C (10,000 ohms) to V2A terminal board (C21A). Bus to terminal of coaxial tube leading to V2B grid cap.
7	Blk.-(Wh.) to pin 7, V2A.
8	R9A (1,000 ohms) to pin 1, V1B. C4H (.1 μfd. paper) to Gnd. Br.-(Wh.) to term. 4, bottom of meter board.

TABLE 16—V1C CONNECTIONS

V1C (6K7G) 2nd I.F. Amplifier ("A" Set)	
Pin No.	Connections
1	
2	Blk.-Gr.-(Wh.) to pin 2, V6A.
3	Bus to term. 4, L9A.
4	R19B (82,000 ohms) to pin 6, V1C. C4O (.1 μfd. paper) to Gnd.
5	Bus to chassis (Gnd.). Shield for lead on term. 5, L9A terminal board. C16A (12. μfd. electrolytic) negative lead. R3B (270 ohms) to pin 8, V1C.
6	R19B (82,000 ohms) to pin 4, V1C. Red-Yel.-(Wh.) to pin 1, V1A. Red-Yel.-(Wh.) to term. 1, bottom layer, "A" relay.
7	Blk. to pin 2, V1B. Blk.-(Wh.) to pin 2, V3A.
8	R3B (270 ohms) to pin 5, V1C. C4K (.1 μfd. paper) to Gnd.

TABLE 17—V3A CONNECTIONS

V3A (6B8G) 2nd DETECTOR; A.V.C.; A.F. AMPLIFIER ("A" Set)	
Pin No.	Connections
1	R12A (68,000 ohms) to pin 6, V3A. Wh. to T2A. Or. to term. 2, centre section, S7A. Or. to term. 3, bottom layer, "A" relay.
2	Blk.-(Wh.) to pin 7, V1C. Blk. to pin 5, V4A.
3	Blue to term. 4, right side of main term. board.
4	R8A (1. meg.) to term. 3, L9A board. (Gnd.). R8B (1. meg.) to A.V.C. board. C18A (20. μμfd. mica) to pin 4 ,V3A.
5	C18A (20. μμfd. mica) to pin 4, V3A. Blue to term. 1, L9A. (Or.-(Wh.) on N.E. sets).

TABLE 17—(Continued)

6	R12A (68,000 ohms) to pin 1, V3A. C4M (.1 μfd. paper) to Gnd.
7	Blk.-(Wh.) to chassis (Gnd.) C4N Gnd. lead.
8	Or. to term. 7, right side, main term. board. C16A positive (12. μfd. electrolytic). R1B (470,000 ohms) to term. 2, L9A board.
NOTE:—WIRING TO PINS 4 & 5 MAY BE REVERSED ON SETS MANUFACTURED BY NORTHERN ELECTRIC COMPANY.	

TABLE 18—V2B CONNECTIONS

V2B (6K8G) B.F.O. & SENDER FREQUENCY CHANGER ("A" SET)	
Pin No.	Connections
1	Red-Yel.-(Wh.) to bottom left term. of NET Sw. S/C-105B. Blue-Or.-(Wh.) to term. 8, centre section, S7A. R34C (47,000 ohms) to pin 6, V2B.
2	Blk.-(Wh.) to pin 2, V1A. Blk. to pin 9, V5A.
3	Red-Or.-(Wh.) to top front of L7A.
4	R4D (22,000 ohms) to pin 7, V1A (Gnd.). R45B (22,000 ohms) to pin 6, V1A. C4U (.1 μfd. paper) to Gnd.
5	R6D (47,000 ohms) to pin 7, V2B (or any Gnd.). Red-Gr.-(Wh.) to B.F.O. can, L5A.
6	Blue to B.F.O. coil, L5A. R34C (47,000 ohms) to pin 1, V2B. C20A (.002 μfd. mica) to Gnd.
7	Bus to chassis (Gnd.). R6D (47,000 ohms) to pin 5, V2B. R2B (220 ohms) to pin 8, V2B.
8	R2B (220 ohms) to pin 7, V2B. C4Q (.1 μfd. paper) to Gnd.

TABLE 19—V5A CONNECTIONS

V5A (EF50) SENDER DRIVER ("A" SET)	
Pin No.	Connections
1	Blk.-Gr.-(Wh.) to pin 2, V6A. Blk.-Gr.-(Wh.) to top right term., "A" ON-OFF Sw. Blk.-Gr.-(Wh.) to pin 1, V4A.
2	R17A (3,900 ohms) to Drive terminal board. C20B (.002 μfd. mica) to Gnd.
3	C2E (100 μμfd. mica) to pin 5, V6A. Bus to term. 5, section 2, Band Sw., S11A.
4	Bus to chassis (Gnd.). Bus to pin 5, V5A.
5	Bus to pin 4, V5A (Gnd.). Bus to V5A socket centre lock.
6	R20B (100 ohms) to Gnd. C4S (.1 μfd. paper) to Gnd.
7	Gr.-(Wh.) to top front term., L21A.
8	Bus to V5A socket centre lock (Gnd.).
9	Blk. to pin 2, V2B. Blk.-(Wh.) to pin 7, V6A.

TABLE 20—V6A CONNECTIONS

V6A (6H6) SENDER AUTOMATIC DRIVE CONTROL ("A" SET)	
Pin No.	Connections
1	Blk. to Gnd. Bus to C10 F. R1C (470,000 ohms) to pin 3, V6A.
2	Blk.-Gr.-(Wh.) to pin 2, V1C. Blk.-Gr.-(Wh.) to pin 1, V5A.

TABLE 20—(Continued)

3	R1C (470,000 ohms) to pin 1, V6A. R1D (470,000 ohms) to pin 6, V6A. C2D (100 μμfd. mica) to pin 5, V6A.
4	C15B (500. μμfd. mica) to Gnd. Orange to centre term., R43A.
5	Gr.-Or.-(Wh.) to term. 1, left side, main term. board. C2D (100. μμfd. mica) to pin 3, V6A. C2E (100. μμfd. mica) to pin 3, V5A.
6	R1D (470,000 ohms) to pin 3, V6A. C15D (500 μμfd. mica) to Gnd. Br. to top right term., L21A.
7	Blk.-(Wh.) to pin 9, V5A. R30A (30 ohms) to Gnd.
8	Orange to term. 2, rear, main term. board.

TABLE 21—V4A CONNECTIONS

V4A (807) SENDER R.F. POWER AMPLIFIER ("A" SET)	
Pin No.	Connections
1	Blk.-Gr.-(Wh.) to pin 1, V5A.
2	R20A (100 ohms) to term. 2, V4A board. C15F (500. μμfd. mica) to term. 3, V4A board (Gnd.).
3	Bus to right side, C34A and term. 3, left side of main term. board.
4	R19A (82,000 ohms) to Gnd. C15C (500. μμfd. mica) to Gnd. Orange to term. 2, rear, main term. board.
5	Blk. to pin 2, V3A.

TABLE 22—PL-2A COMMUNICATIONS PLUG

Pin No.	Connections
1	Yel.-Br.-(Wh.) to term. 4, rear, main terminal board.
2	Blk.-(Wh.) to term., 6, bottom row, meter board.
3	Gr.-Br.-(Wh.) to term. 1, I.C. input board.
4	Gr.-Br.-(Wh.) to term. 1, rear, main terminal board.
5	Gr.-(Wh.) to term. 3, B & I.C. board.
6	Gr.-Or. to pin 2, PL-2B. Gr.-Or.-(Wh.) to term. 4, B. & I.C. board.
7	Blue-Br. to top front term., "A" relay coil, L19A. Blue-Br.-(Wh.) to bottom term., key jack, J1A.
8	Blue-(Wh.) to top front term., "B" relay coil, L19B.
9	Gr.-Br.-(Wh.) to pin 5, PL-2B.
10	Br.-(Wh.) to bottom right, I.C. ON-OFF Sw., S10C (R.C.A. Victor) OR:— Br.-(Wh.) to term. 1, V4A board (Northern Electric).
11	
12	

TABLE 23—PL-2B POWER PLUG

Pin No.	Connections
1	Heavy braid to chassis (Gnd.).
2	Gr.-Or. to pin 6, PL-2A.
3	Red to lower right term., I.C. ON-OFF Sw., S10C (R.C.A. Victor) OR:— Red-(Wh.) to term. 1, V4A board (Northern Electric).
4	Red-(Wh.) to term. 1, bottom row, meter board.
5	Gr.-Br.-(Wh.) to pin 9, PL-2A.
6	Red to term. 2, bottom row, meter board.
7	Yel. to term. 2, left side, main term. board. (R.C.A. Victor) OR:— Gr.-Or.-(Wh.) to term. 2, left side, main term. board. (Northern Electric).
8	Gr.-(Wh.) to bottom term., key jack, J1A.
9	
10	
11	
12	

"B" Set Relay (Top left unit)

TABLE 24—L19B "B" RELAY COIL

Term. No.	Connections
Top right—front	Blue-(Wh.) to pin 8, PL-2A.
Bottom right—front	Gr.-Blk.-(Wh.) to pin 2, V1D.

TABLE 25—S5B "B" RELAY, TOP LAYER TERMINALS

Term. No.	Connections
1	No connection; terminal grounded to relay frame.
2	Shielded lead to grid cap, V1E. Bus to term. 9, top layer, "B" relay, S5B.
3	Shielded lead to right side term. on meter board.
4	Gr.-Violet-(Wh.) to term. 3, "B" Osc. resistor board.
5	Bus to Gnd. Bus to term. 2, bottom layer, "B" relay, S5B.
6	
7	
8	Shielded lead to GAIN B centre term., R35A.
9	Bus to term. 2, top layer, "B" relay, S5B.
Note:	Bus connects terms. 2 & 9. Bus connects term. 5 to term. 2, bottom layer and also to Gnd.

TABLE 26—S5B, "B" RELAY, BOTTOM LAYER TERMINALS

Term. No.	Connections
1	Blk.-Gr.-(Wh.) to pin 6, V8A.
2	Bus to Gnd.; also to term. 5, top layer, "B" relay, S5B.
3	Yel.-(Wh.) to term. 2, T5A.
4	Yel.-Blue.-(Wh.) to top left term., quench choke, L15A. Bus to term. 5, bottom layer, "B" relay, S5B.
5	Bus to term. 4, bottom layer, "B" relay, S5B.
6	Red to top rear term., quench choke, L15A.
7	Red to pin 6, V1D.
8	Red-Yel.-(Wh.) to pin 1, V7A.
Note:	Bus connects terms. 4 & 5.

"A" Set Relay (Lower Right Unit)

TABLE 27—L19A, "A" RELAY COIL

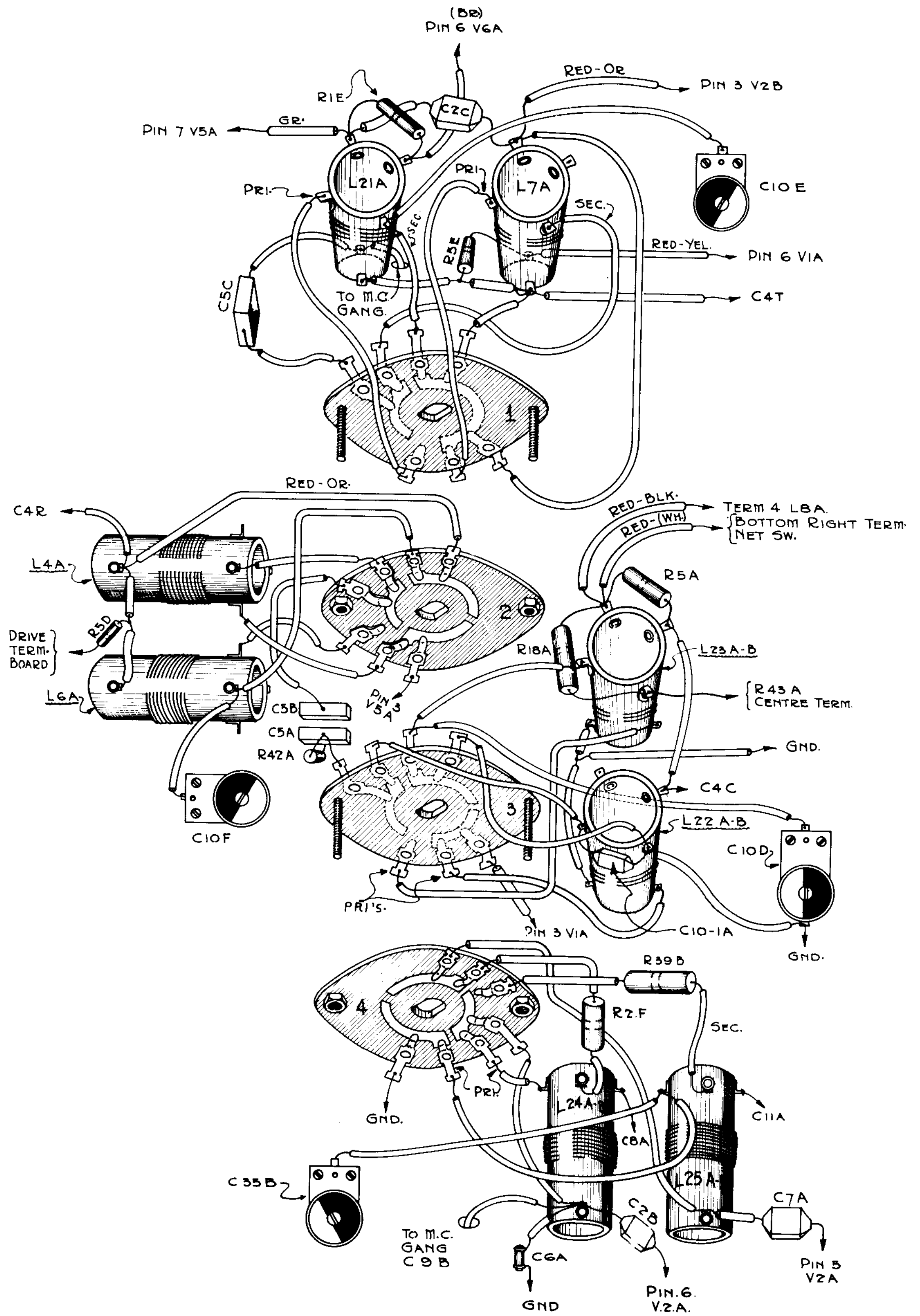
Term. No.	Connections
Top left front	Blue-Br. to pin 7, PL-2A.
Bottom left front	Blk.-Gr. to bottom right term., "B" ON-OFF Sw., S10B. (R.C.A. Victor) OR:— Blk.-Gr.-(Wh.) to term. 1, V4A board. (Northern Electric).

TABLE 28—S5A "A" RELAY, TOP LAYER TERMINALS

Term. No.	Schematic Reference*	Connections
1	4 left	Shielded lead to A.F. GAIN A, R13A, center term.
2	4 arm	Bus to term. 7, top layer, "A" relay, S5A.
3	1 left	Bus to term. 4, centre section, function sw., S7A.
4	1 arm	Bus to Gnd. Bus to term. 5, top layer, "A" relay, S5A.
5	1 arm	Bus to term. 4, top layer, "A" relay, S5A (Gnd.).
6	1 right	Orange to term. 2, rear, main terminal board.
7	4 arm	Shielded lead to grid cap, V3A. Bus to term. 2, top layer, "A" relay, S5A.
8	4 right	Shielded lead to term. 10, rear section function Sw., S7A.
Note:	1	Bus connects terms. 4 and 5 to Gnd.
	2	Bus connects terms. 2 and 7.
	3	Terms. 2 and 7 are both marked 4 arm because they are joined by a bus. This is necessary since, although the schematic diagram shows the relay to consist of two-throw switches, the actual relay is only single throw. Therefore, two sections must be paralleled to produce the two-throw effect. * The schematic reference column refers to Fig. 42 of FZ 252/3. For example, term. 1 has a schematic reference of 4 left. On the circuit diagram it will be found to be the left hand terminal of section 4 of the Send-Receive Relay, S5A. Likewise, terminal 2 is the moving arm of section 4.

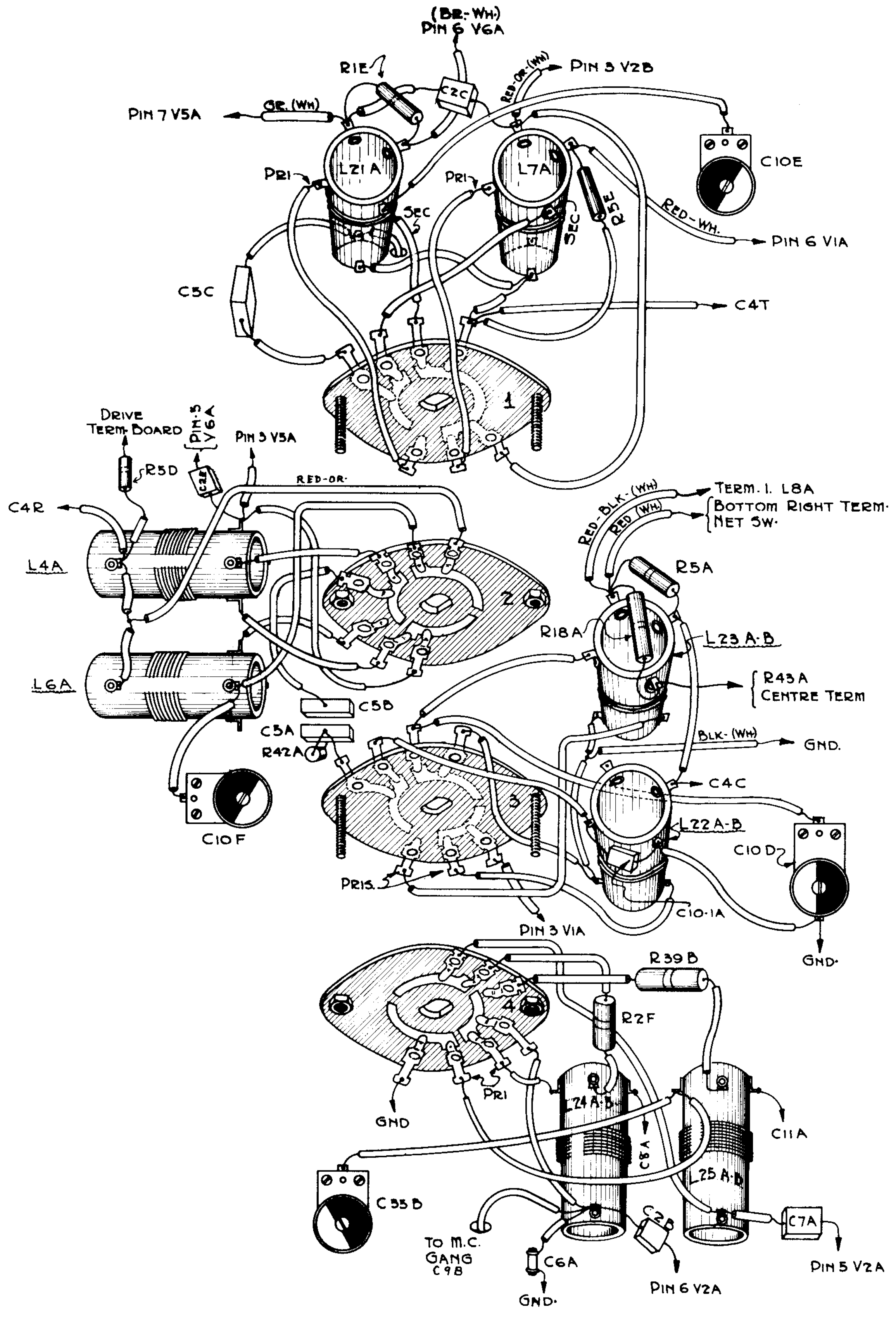
TABLE 29—S5A, "A" RELAY, BOTTOM LAYER TERMINALS

Term. No.	Schematic Reference *	Connections
1	2 left	Red-Yel.-(Wh.) to pin 6 V1C.
2	2 arm	Bus to terms. 4, 5 and 7, bottom layer, "A" relay, S5A.
3	3 left	Or. to pin 1, V3A.
4	3 arm	Bus to terms. 2, 5 and 7, bottom layer, "A" relay, S5A.
5	2 arm	Bus to terms. 2, 4 and 7, bottom layer, "A" relay, S5A.
6	2 right	Red to term. 5, front section, function Sw., S7A.
7	3 arm	Bus to terms. 5, 4 and 2, bottom layer, "A" relay, S5A. Red-Blk.-(Wh.) to term. 3, rear, main term. board.
8	3 right	Blue-Or.(Wh.) to term. 8, centre section, function Sw., S7A.
Note:		Bus connects terms. 2, 4, 5 and 7. * See Table 28.



T FZ 254/3 / 1 - 28A

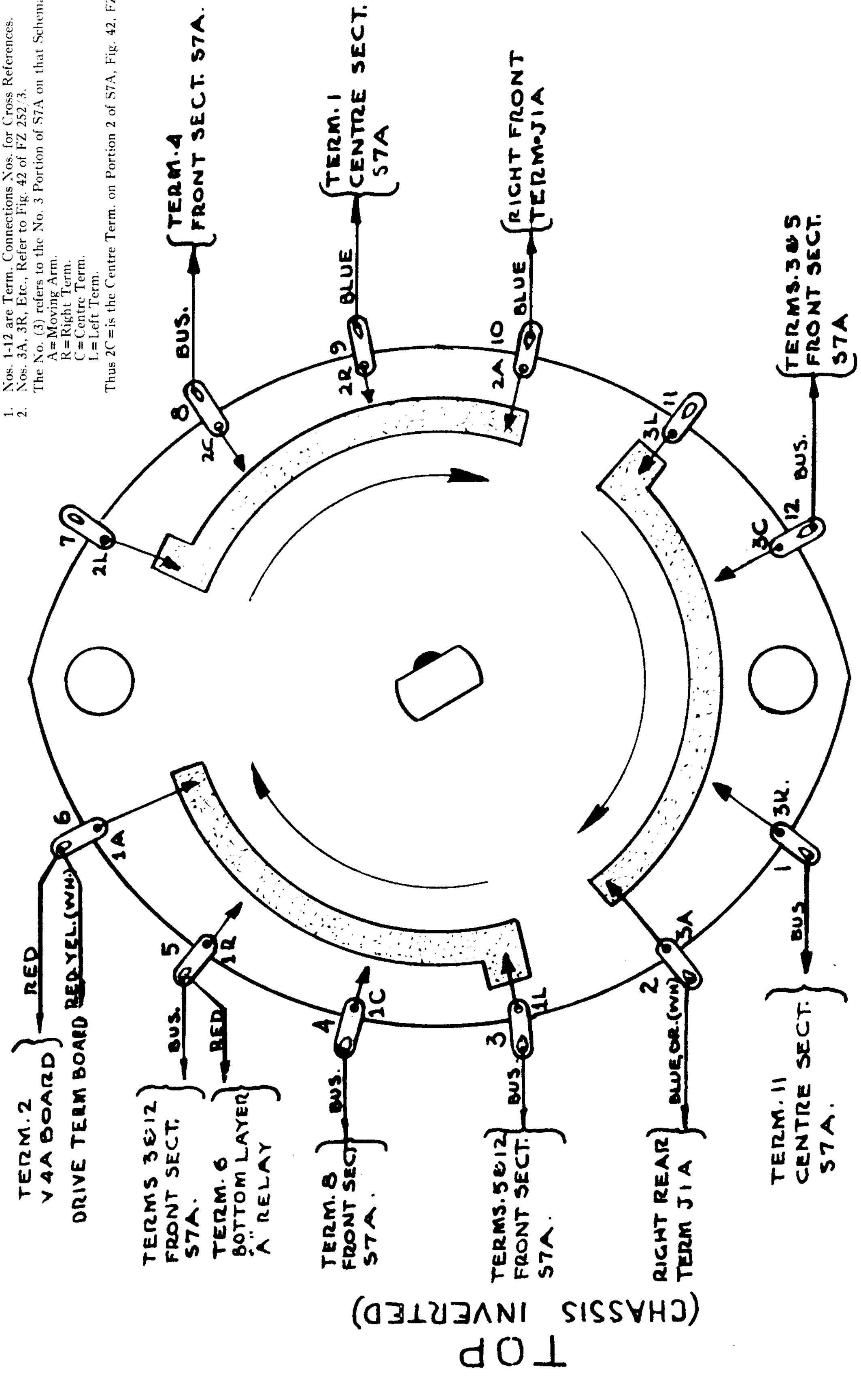
FIG. 28 (a)—S11A, BAND SWITCH AND ASSOCIATED COILS (R.C.A. VICTOR COMPANY)



T $\frac{\text{FZ 254/3}}{\text{1 - 28B}}$

FIG. 28 (b)—S11A, BAND SWITCH AND ASSOCIATED COILS (NORTHERN ELECTRIC CO.)

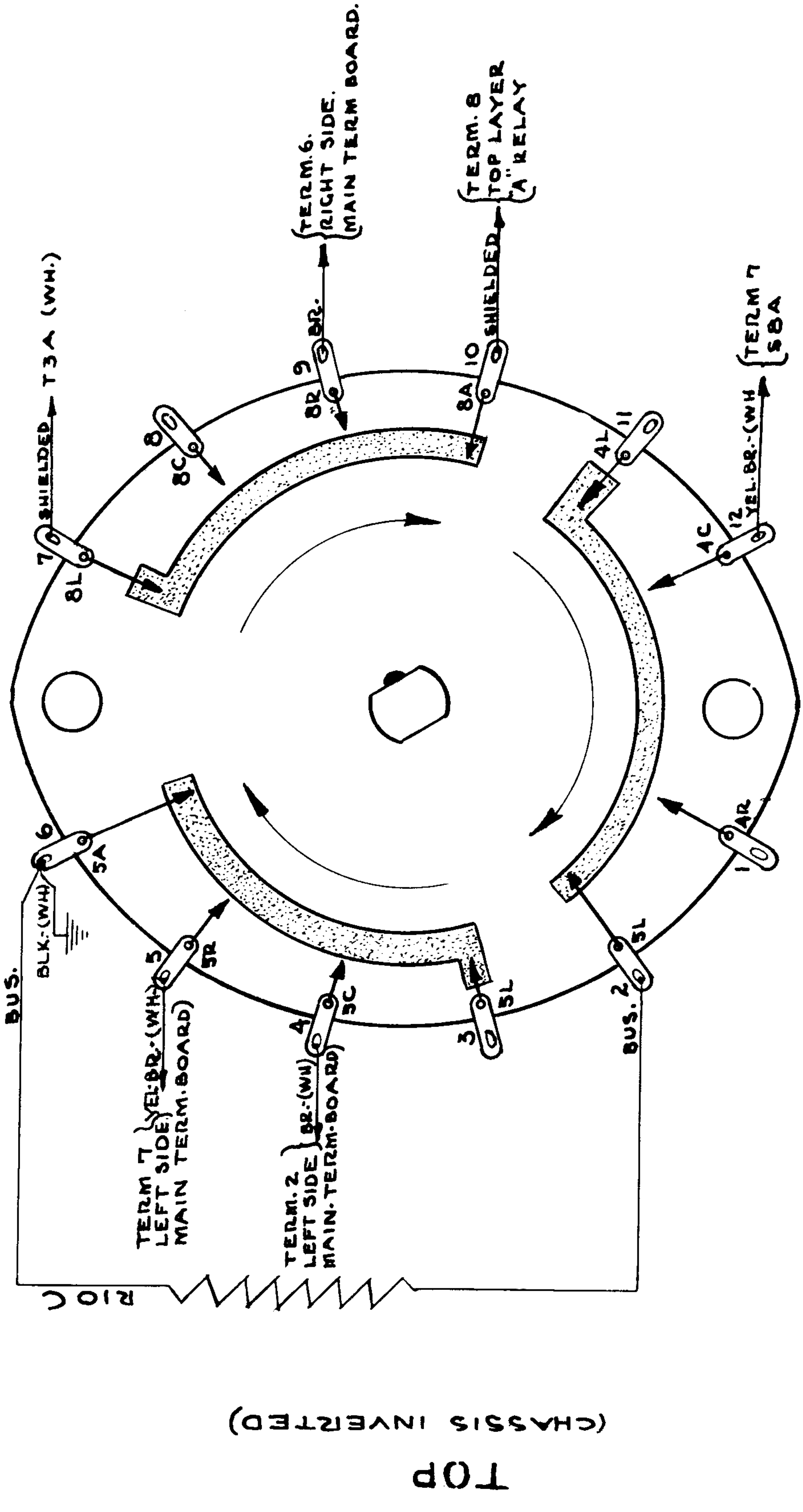
1. Nos. 1-12 are Term. Connections Nos. for Cross References.
2. Nos. 3A, 3R, Etc., Refer to Fig. 42 of FZ 252/3.
The No. (3) refers to the No. 3 Portion of S7A on that Schematic.
A = Moving Arm.
R = Right Term.
C = Centre Term.
L = Left Term.
Thus 2C = is the Centre Term. on Portion 2 of S7A, Fig. 42, FZ 252/3.



SWITCH SHOWN IN R/T POSITION (REAR VIEW)

FIG. 29—S7A, FUNCTION SWITCH, (MCW CW R/T) (FRONT SECTION)

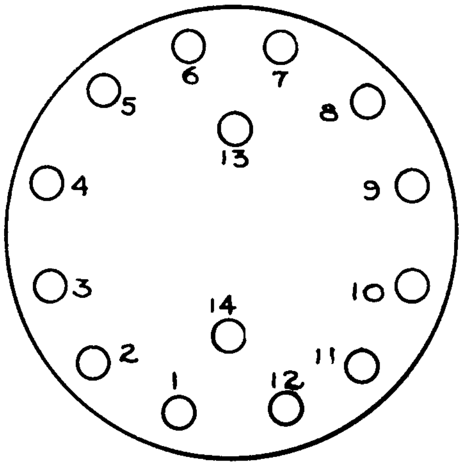
T FZ 254/3 1 - 29



SWITCH SHOWN IN R/T POSITION (REAR VIEW) SEE NOTES, FIG. 29

FIG. 31—S7A, FUNCTION SWITCH, (MCW CW R/T) (REAR SECTION)

T FZ 254/3 1 - 31

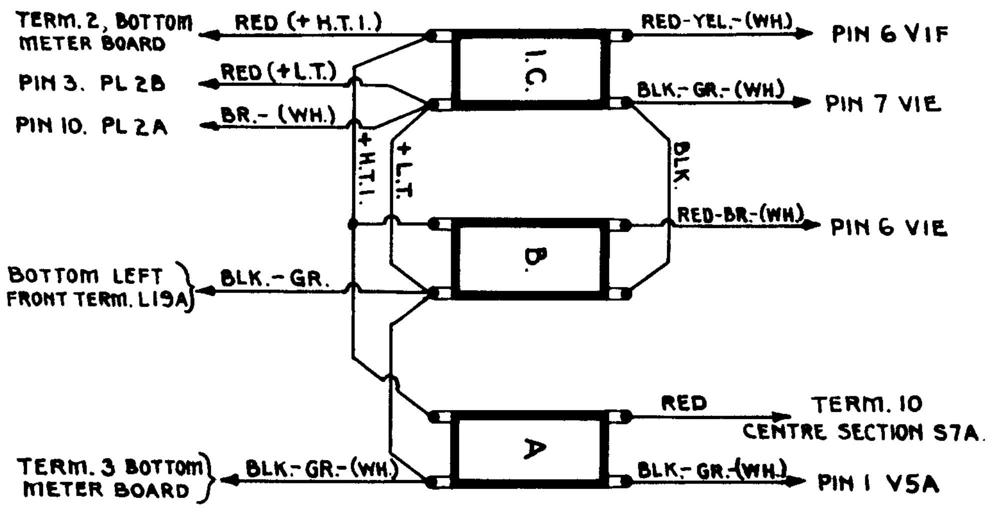


T FZ 254/3 / 1 - 32

FIG. 32—S8A, METER SWITCH

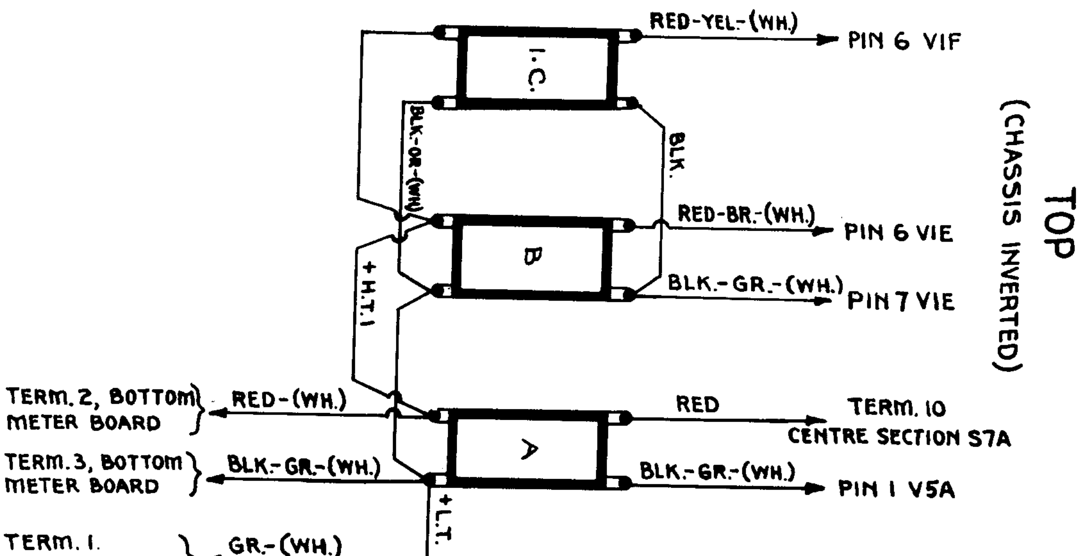
TABLE 30—S8A, METER SWITCH

Term. No.	Schematic Reference *	Connections
NOTE:		Bus connects together terms. 1, 3, 4, 5, & 12 (To Gnd.).
1	1 right	Blk.-(Wh.) to chassis (Gnd.) (See Note).
2	2 right	Yel. to pin 1, V2A.
3	3 right	See Note.
4	4 right	See Note.
5	5 right	See Note.
6	6 right	Yel.-(Wh.) to front centre term., main term. board.
7	1 left	Yel. to right term., choke, L2B, mounted on P.A. board. Yel.-Br.(Wh.) to term. 12, rear section, function sw., S7A. C17C (.002 μfd. mica) to Gnd.
8	2 left	Br.-(Wh.) to term. 4, top row, meter board.
9	3 left	Blk.-Gr.-(Wh.) to term. 3, top row, meter board.
10	4 left	Red.-Blk.-(Wh.) to term. 2, top row, meter board.
11	5 left	Red-(Wh.) to term. 1, top row, meter board.
12	6 left	See Note.
13	right arm	Blk.-Gr.-(Wh.) to left centre term., meter board.
14	left arm	Red-Yel.-(Wh.) to right centre term., meter board.
		*See Table 28.



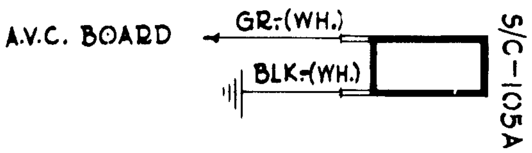
T $\frac{\text{FZ 254/3}}{\text{1 - 33A}}$

FIG. 33 (a)—S/C-104A, S10B AND S10C. "A", "B" AND I.C. ON-OFF SWITCHES (R.C.A. VICTOR)

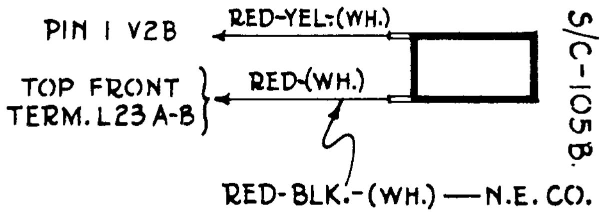


T $\frac{\text{FZ 254/3}}{\text{1 - 33B}}$

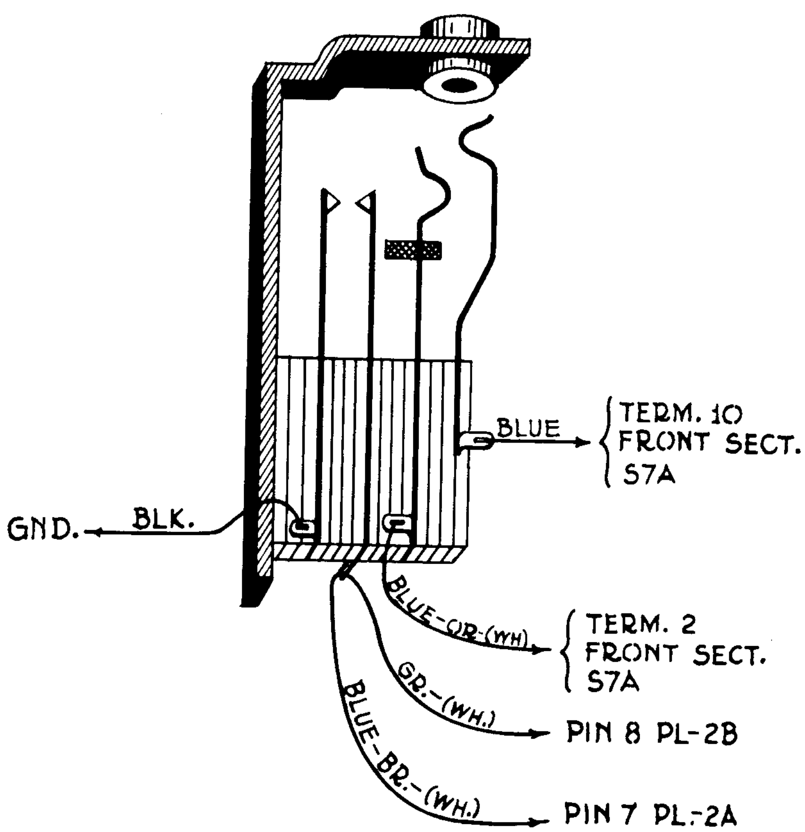
FIG. 33 (b)—S/C-104A, S10B AND S10C. "A", "B" AND I.C. ON-OFF SWITCHES (NORTHERN ELECTRIC)



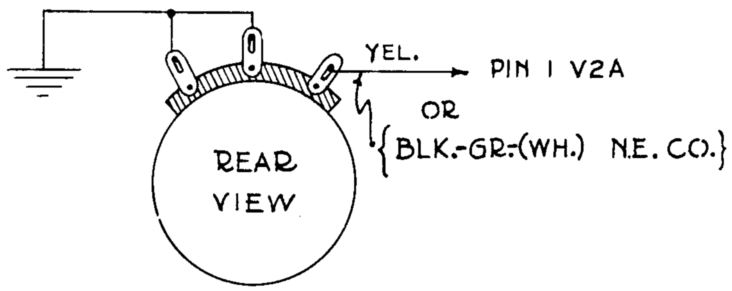
T $\frac{FZ\ 254/3}{1-34}$ FIG. 34—S/C-105A, A.V.C. SWITCH



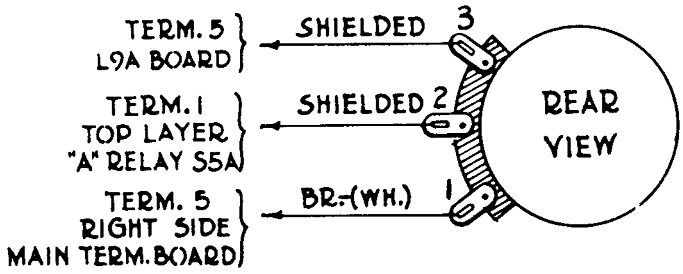
T $\frac{FZ\ 254/3}{1-35}$ FIG. 35—S/C-105B, NET SWITCH



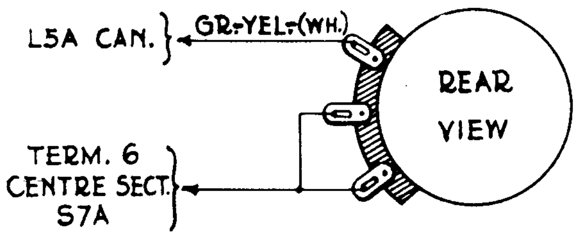
T $\frac{FZ\ 254/3}{1-36}$ FIG. 36—J1A, KEY JACK



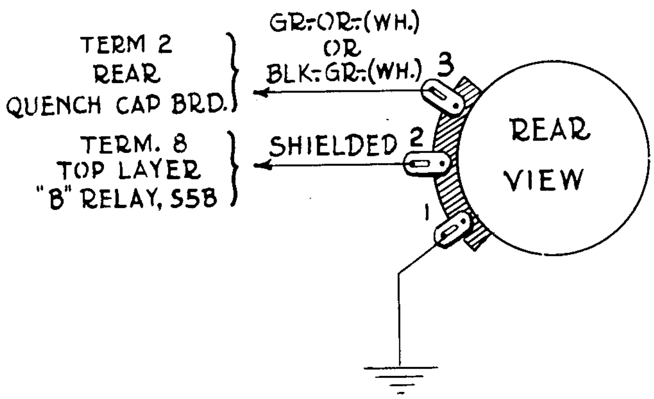
T $\frac{FZ\ 254/3}{1-37}$ FIG. 37—R/C-105A, R.F. GAIN A CONTROL



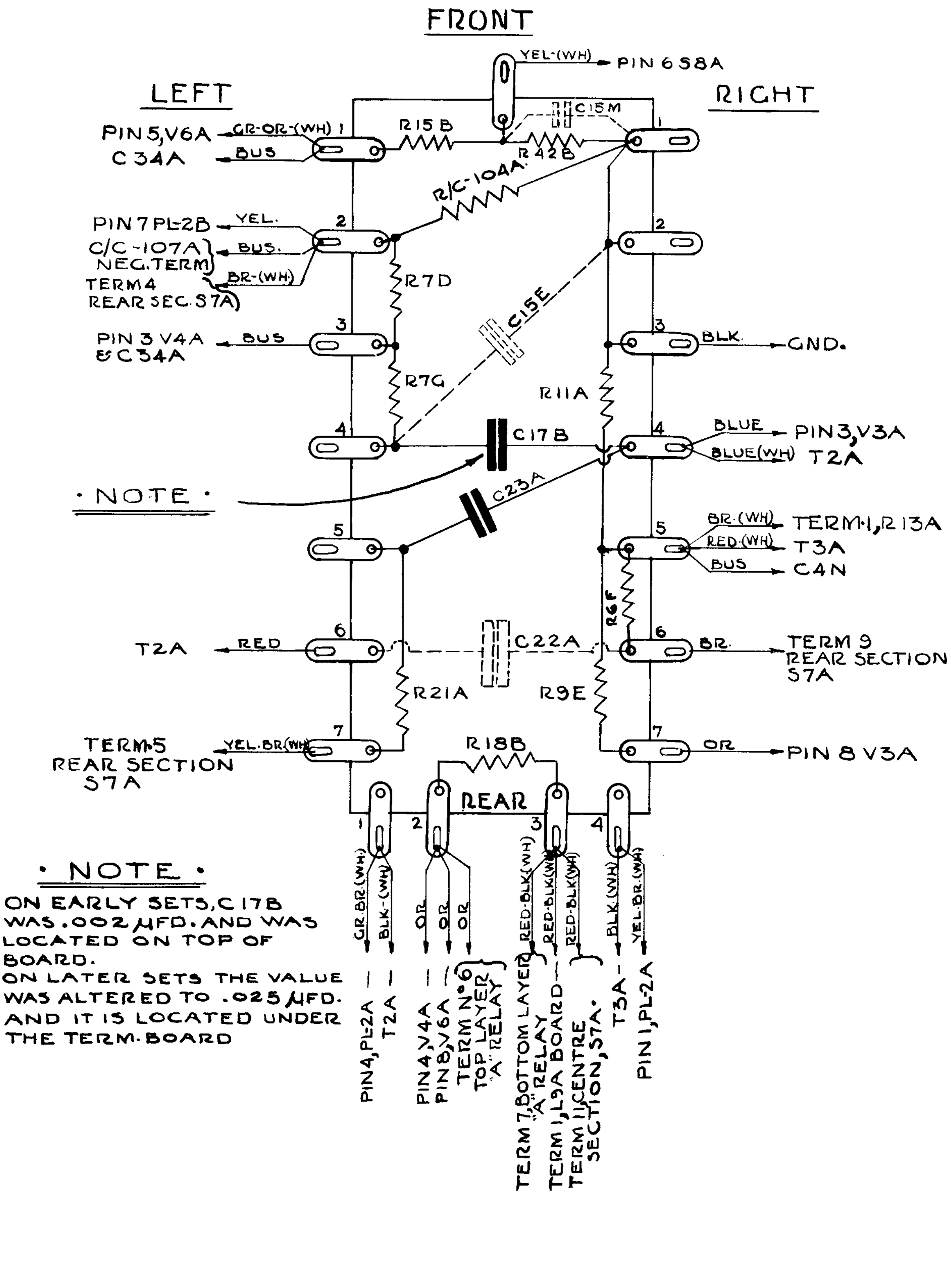
T $\frac{\text{FZ 254/3}}{\text{1 - 38}}$ FIG. 38—R13A, A.F. GAIN A CONTROL



T $\frac{\text{FZ 254/3}}{\text{1 - 39}}$ FIG. 39—R14A, HET TONE CONTROL



T $\frac{\text{FZ 254/3}}{\text{1 - 40}}$ FIG. 40—R35A, GAIN B CONTROL



T FZ 254/3 1 - 41

FIG. 41—MAIN TERMINAL BOARD

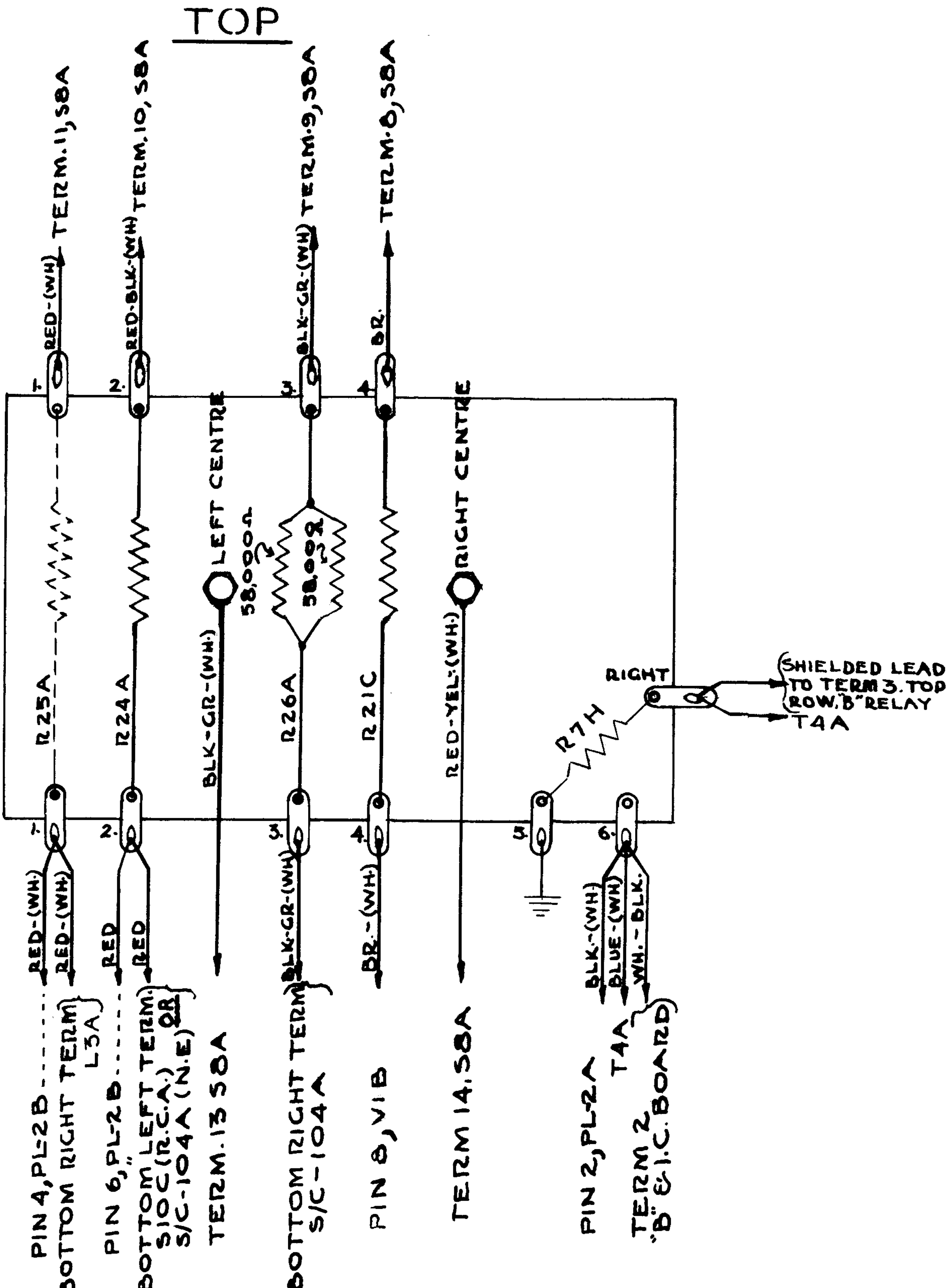
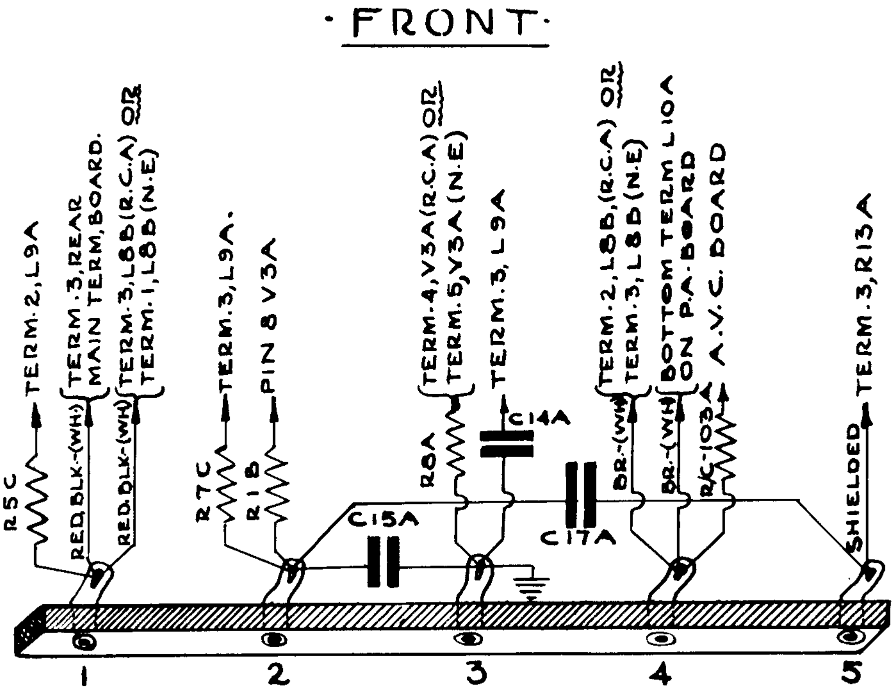
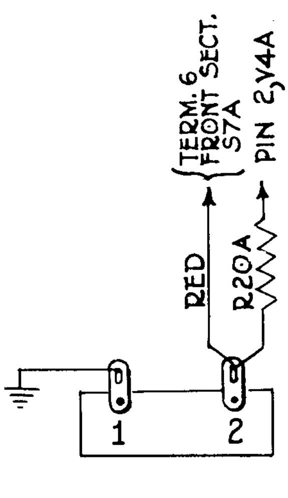


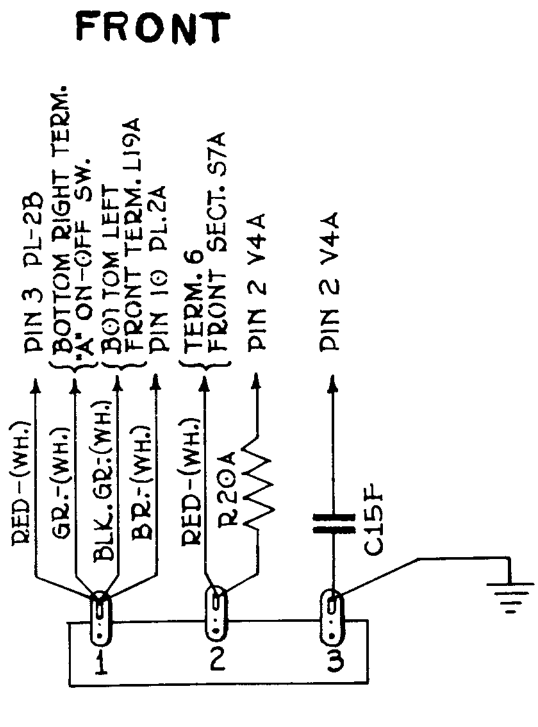
Fig. 42—Meter Board (Rear View)

T $\frac{\text{FZ 254/3}}{\text{1 - 42}}$



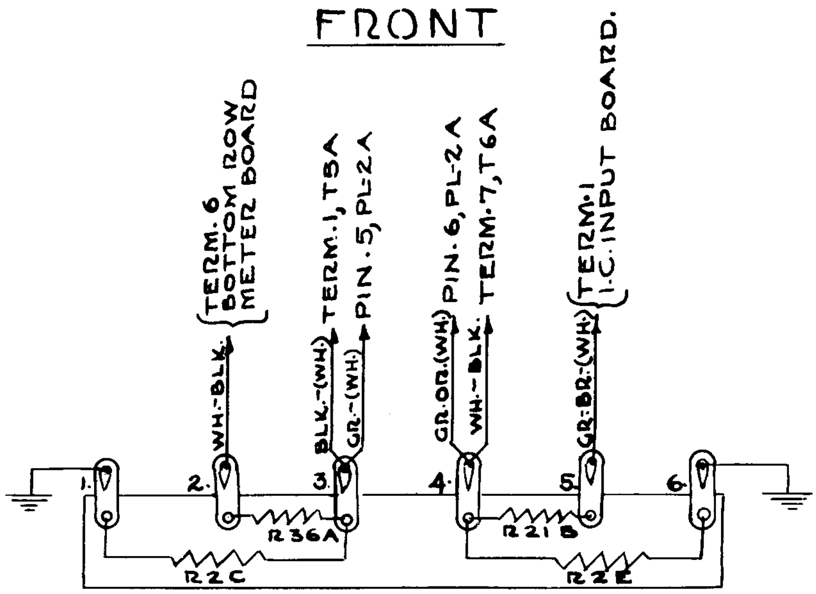
T $\frac{\text{FZ 254/3}}{\text{1 - 43}}$ FIG. 43—L9A BOARD



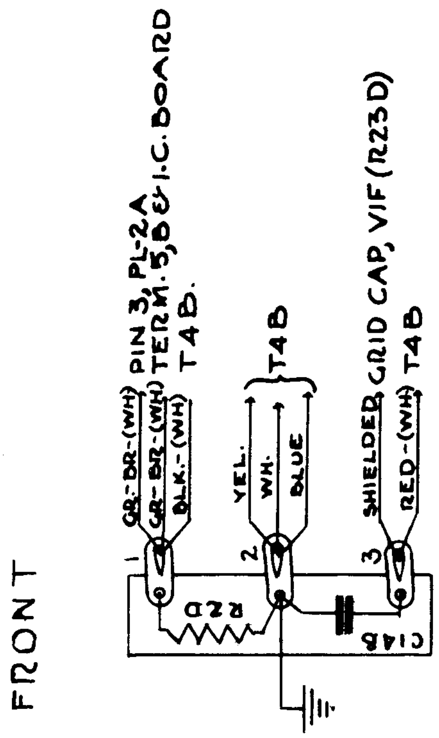


T $\frac{\text{FZ 254/3}}{\text{1 - 44A}}$ FIG. 44 (a)—V4A BOARD (R.C.A. VICTOR COMPANY)

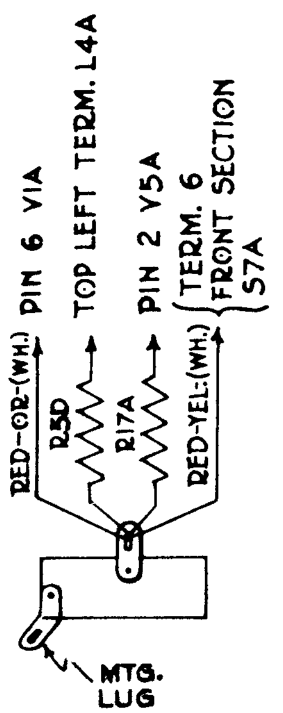
T $\frac{\text{FZ 254/3}}{\text{1 - 44B}}$ FIG. 44 (b)—V4A BOARD (NORTHERN ELECTRIC COMPANY)



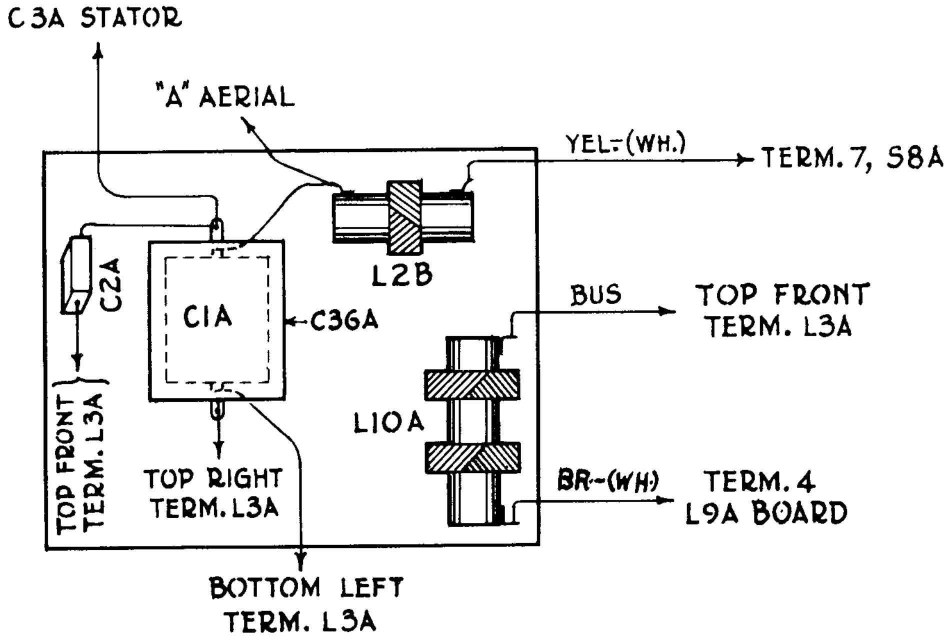
T $\frac{\text{FZ 254/3}}{\text{1 - 45}}$ FIG. 45—"B" & I.C. BOARD



T $\frac{\text{FZ 254/3}}{\text{1 - 46}}$ FIG. 46—I.C. INPUT BOARD

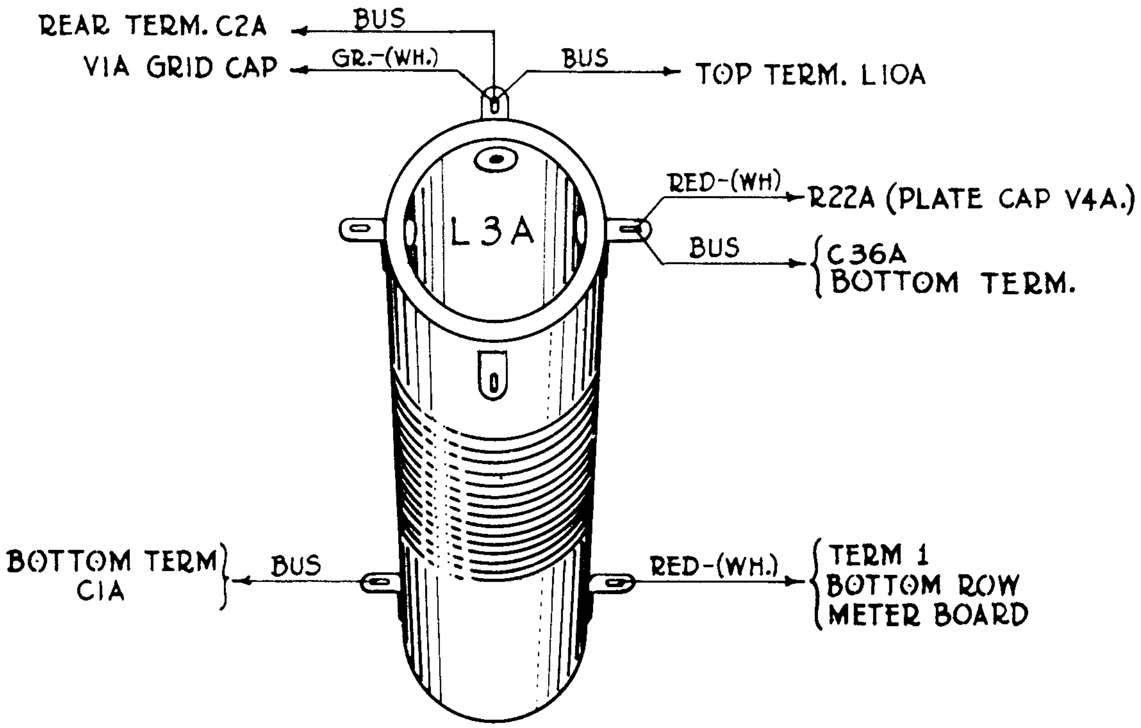


T $\frac{\text{FZ 254/3}}{\text{1 - 47}}$ FIG. 47—DRIVE TERMINAL BOARD



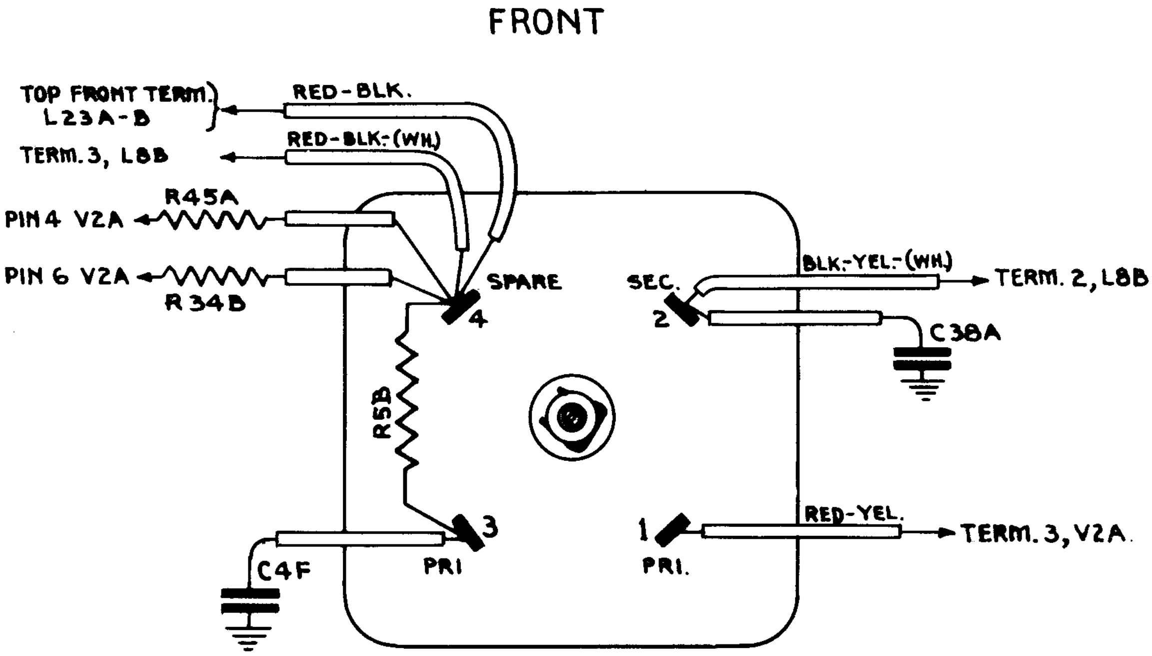
T FZ 254/3 / 1 - 48

FIG. 48—P.A. BOARD (REAR VIEW)

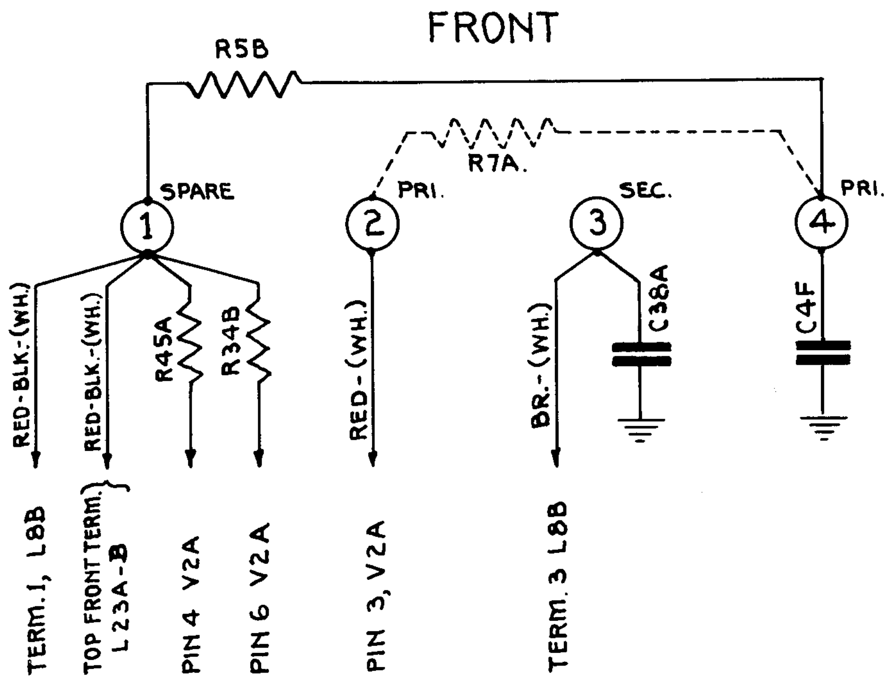


T FZ 254/3 / 1 - 49

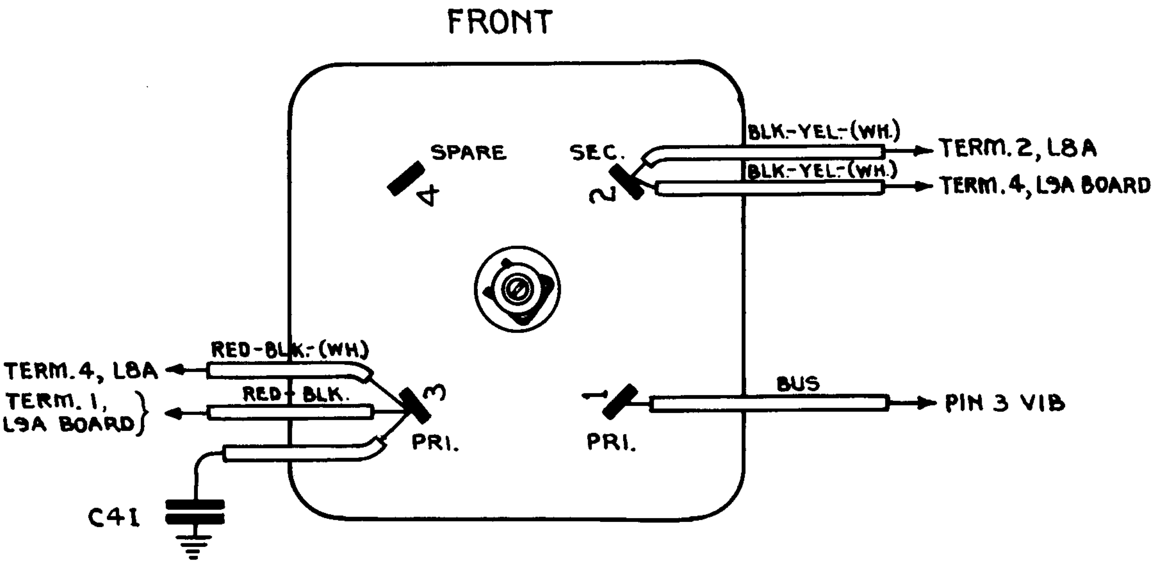
FIG. 49—L3A, P.A. TANK COIL



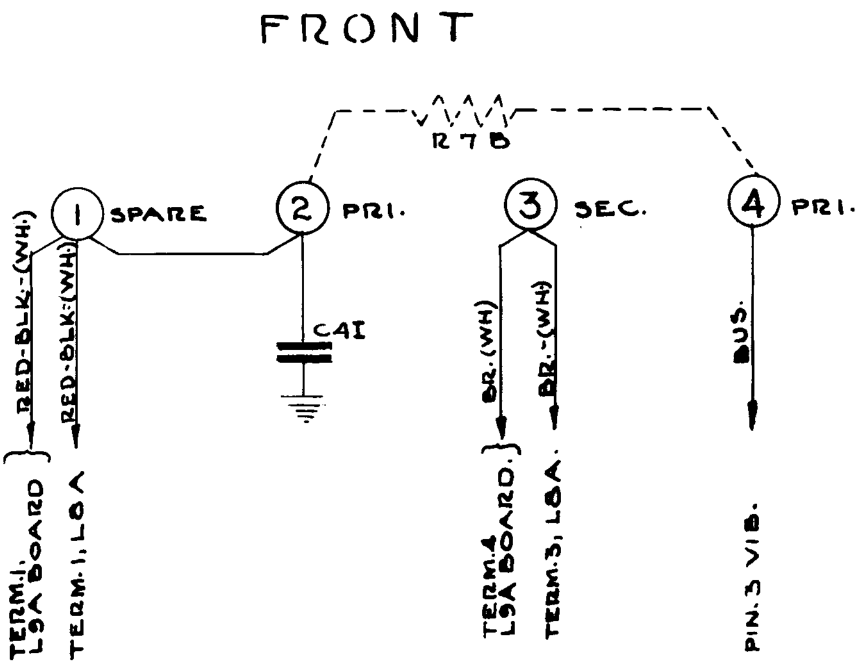
T $\frac{\text{FZ 254/3}}{\text{1 - 50A}}$ FIG. 50 (a)—L8A, 1ST I.F. TRANSFORMER, (R.C.A. VICTOR)



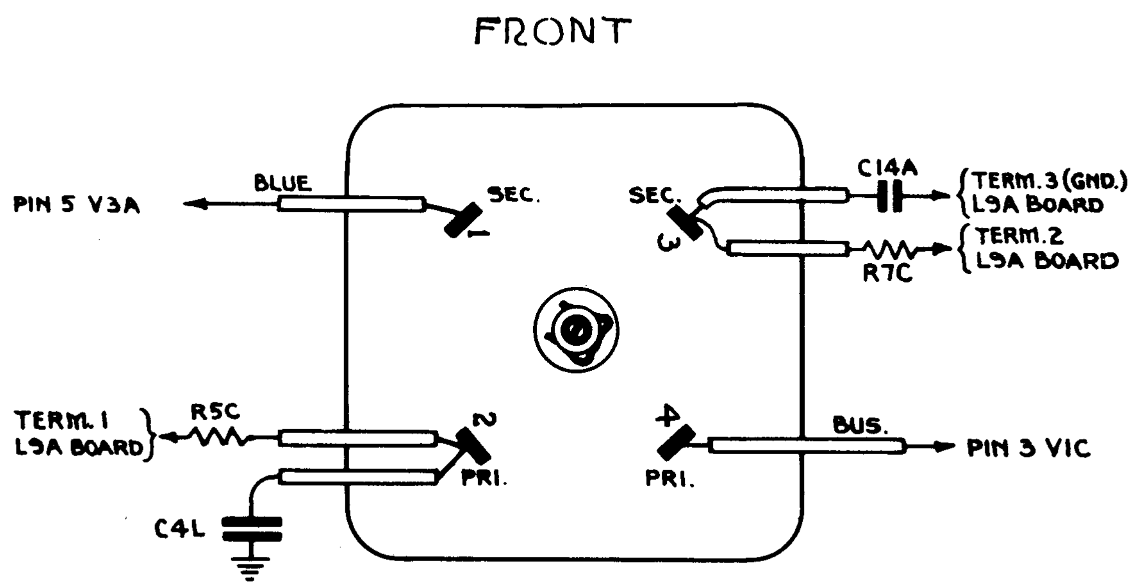
T $\frac{\text{FZ 254/3}}{\text{1 - 50B}}$ FIG. 50 (b)—L8A, 1ST I.F. TRANSFORMER, (NORTHERN ELECTRIC)



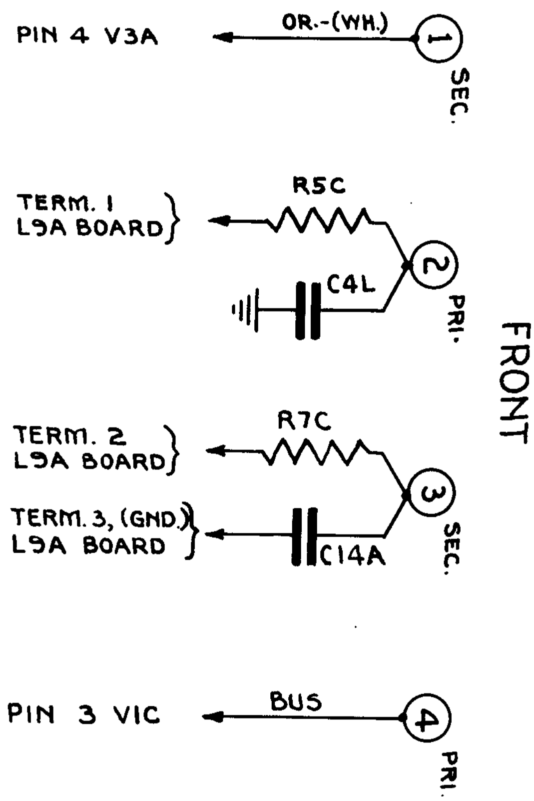
T $\frac{\text{FZ 254/3}}{\text{1 - 51A}}$ FIG. 51 (a)—L8B, 2ND I.F. TRANSFORMER, (R.C.A. VICTOR)



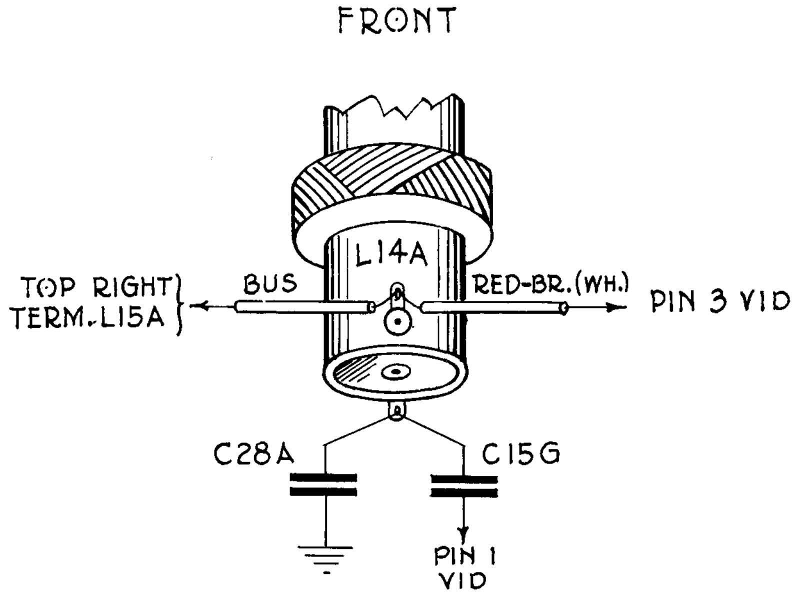
T $\frac{\text{FZ 254/3}}{\text{1 - 51B}}$ FIG. 51 (b)—L8B, 2ND I.F. TRANSFORMER, (NORTHERN ELECTRIC)



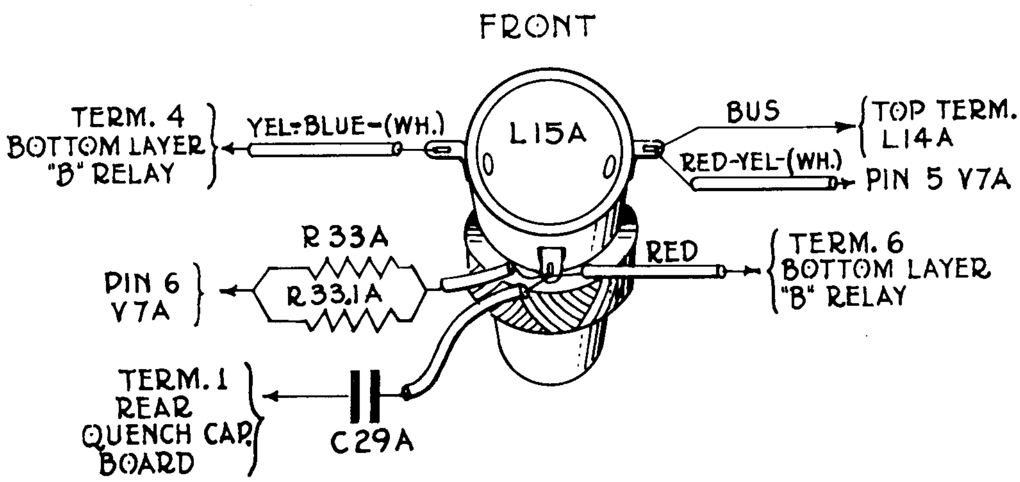
T $\frac{\text{FZ 254/3}}{\text{1 - 52A}}$ FIG. 52 (a)—L9A, 3RD I.F. TRANSFORMER, (R.C.A. VICTOR)



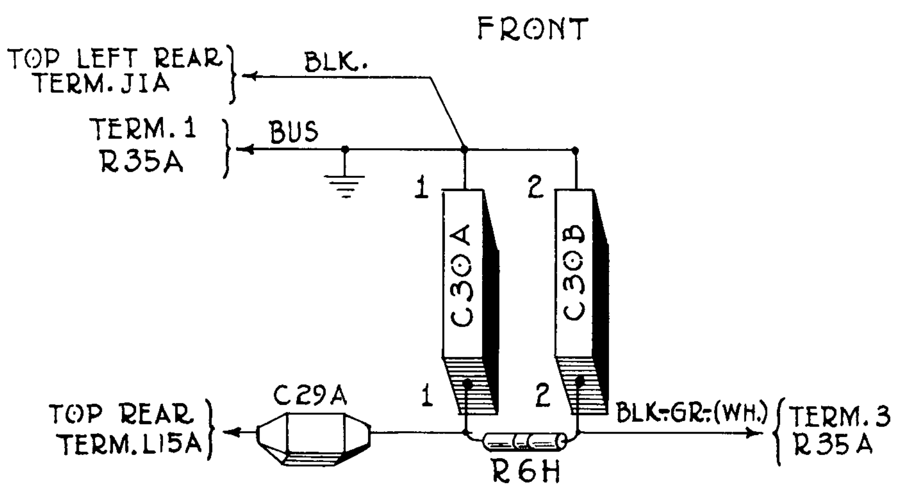
T $\frac{\text{FZ 254/3}}{\text{1 - 52B}}$ FIG. 52 (b)—L9A, 3RD I.F. TRANSFORMER, (NORTHERN ELECTRIC)



T $\frac{\text{FZ 254/3}}{\text{1 - 53}}$ FIG. 53—L14A, QUENCH TUNING COIL



T $\frac{\text{FZ 254/3}}{\text{1 - 54}}$ FIG. 54—L15A, QUENCH CHOKE



T $\frac{\text{FZ 254/3}}{\text{1 - 55}}$ FIG. 55—QUENCH CAPACITY BOARD

TABLE 31—T2A, "A" SET A.F. OUTPUT TRANSFORMER

Lead	Connection
Wh.	Pin 1, V3A.
Blue-(Wh.)	Term. 4, right side, main terminal board.
Blk.-(Wh.)	Term. 1, rear, main terminal board.
Red	Term. 6, left side, main terminal board.
Yel.	Gnd.

TABLE 32—T3A, "A" SET MIC. TRANSFORMER

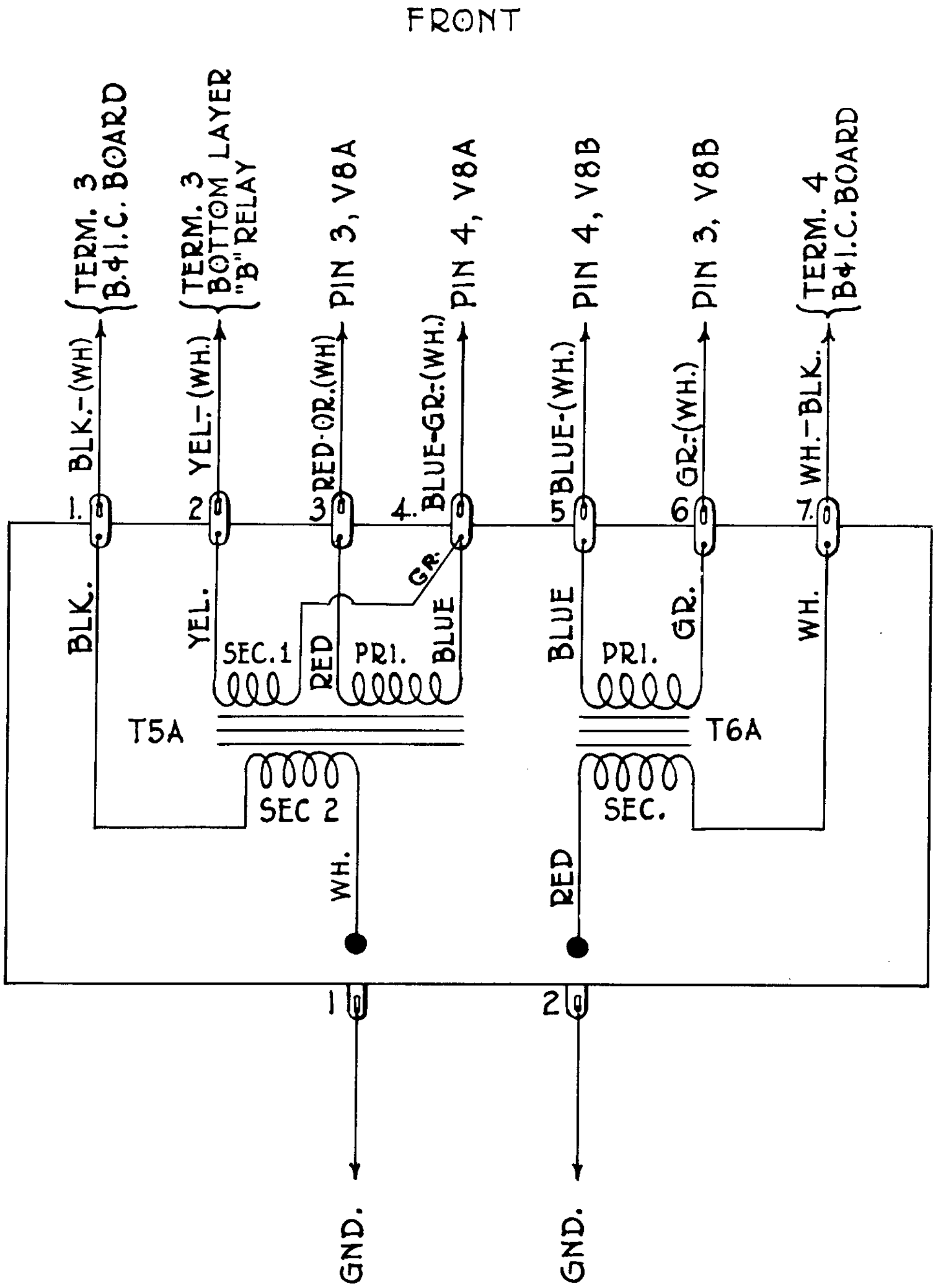
Lead	Connection
Blk.-(Wh.)	Term. 4, rear, main terminal board.
Blue	Gnd.
Red-(Wh.)	Term. 5, right side, main terminal board.
Wh.	Shielded lead to term. 7, rear section, S7A.
Yel.	Gnd.

TABLE 33—T4A, "B" SET MIC. TRANSFORMER

Lead	Connection
Blue-(Wh.)	Term. 6, bottom row, meter board.
Blk.	Gnd.
Red-(Wh.)	To right side terminal, meter board.
Wh.	Gnd.
Yel.	Gnd.

TABLE 34—T4B, I.C. MIC. TRANSFORMER

Lead	Connection
Blk.-(Wh.)	Term. 1, I.C. input board.
Red-(Wh.)	Term. 3, I.C. input board.
Yel.	Term. 2, I.C. input board. (Gnd.).
Wh.	Term. 2, I.C. input board. (Gnd.).
Blue	Term. 2, I.C. input board. (Gnd.).



T FZ 254/3 / 1 - 56 FIG. 56—T5A & T6A, "B" & I.C. OUTPUT TRANSFORMER UNIT

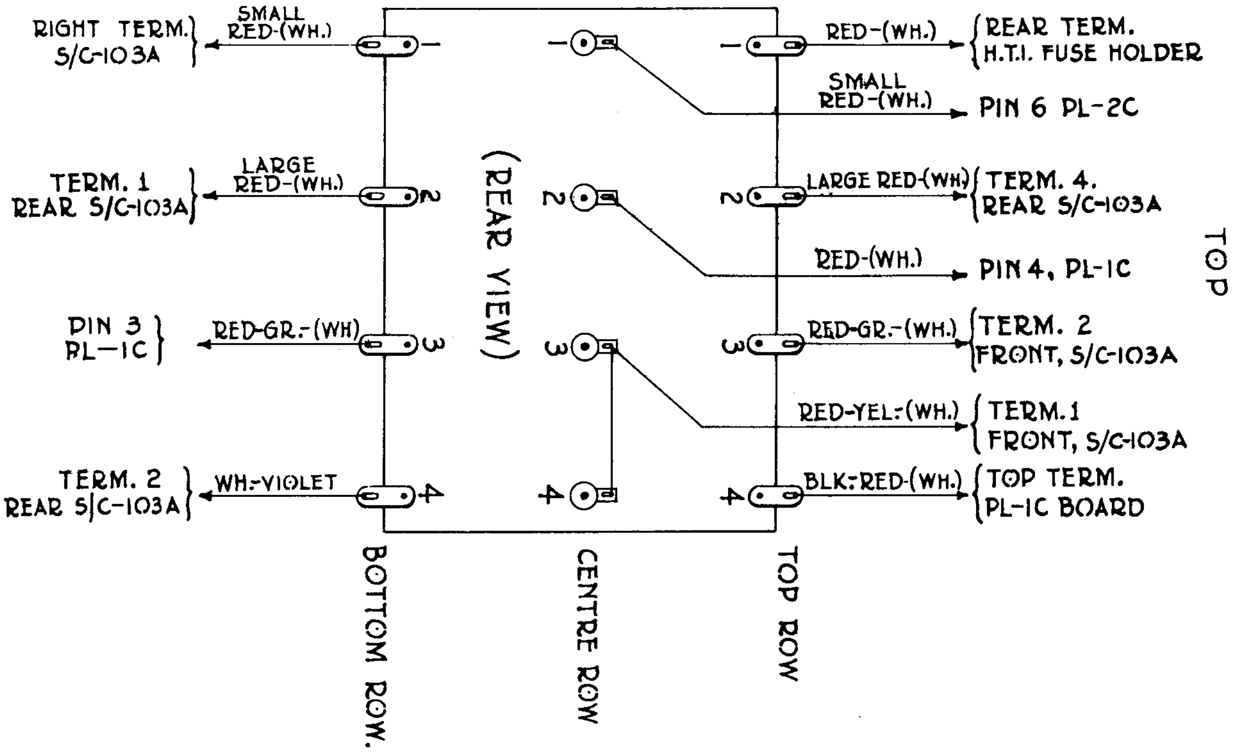
Supply Unit No. 2

TABLE 35—PL-1C, L.T. INLET PLUG

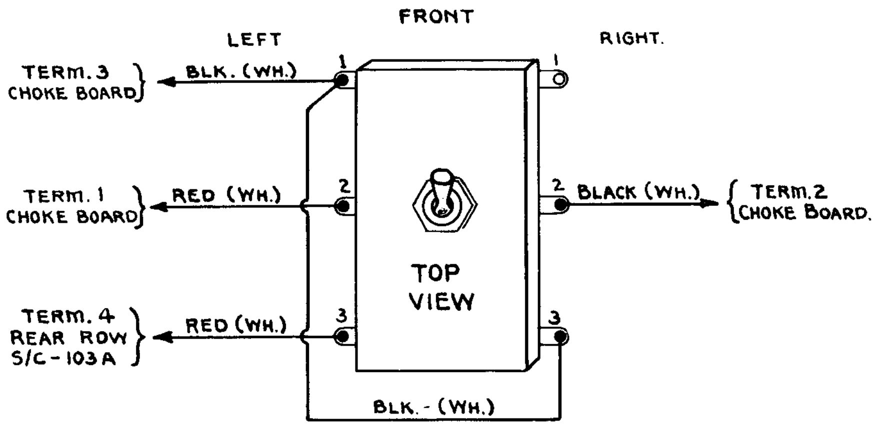
Pin No.	Connections
1	Heavy braid to chassis. (Gnd.).
2	Yel.-Gr.-(Wh.) to pin 2, PL-2C.
3	Red-Gr.-(Wh.) to term. 3, bottom row, power sw., S/C-101A.
4	Red-(Wh.) (large) to term. 2, centre row, power switch, S/C-101A. C/C-101C (.1 μfd. paper) to Gnd.
5	Wh.-Violet to pin 5, PL-2C.
6	Blk.-(Wh.) (large) to term. 1, transformer board.

TABLE 36—PL-2C, POWER OUTLET PLUG

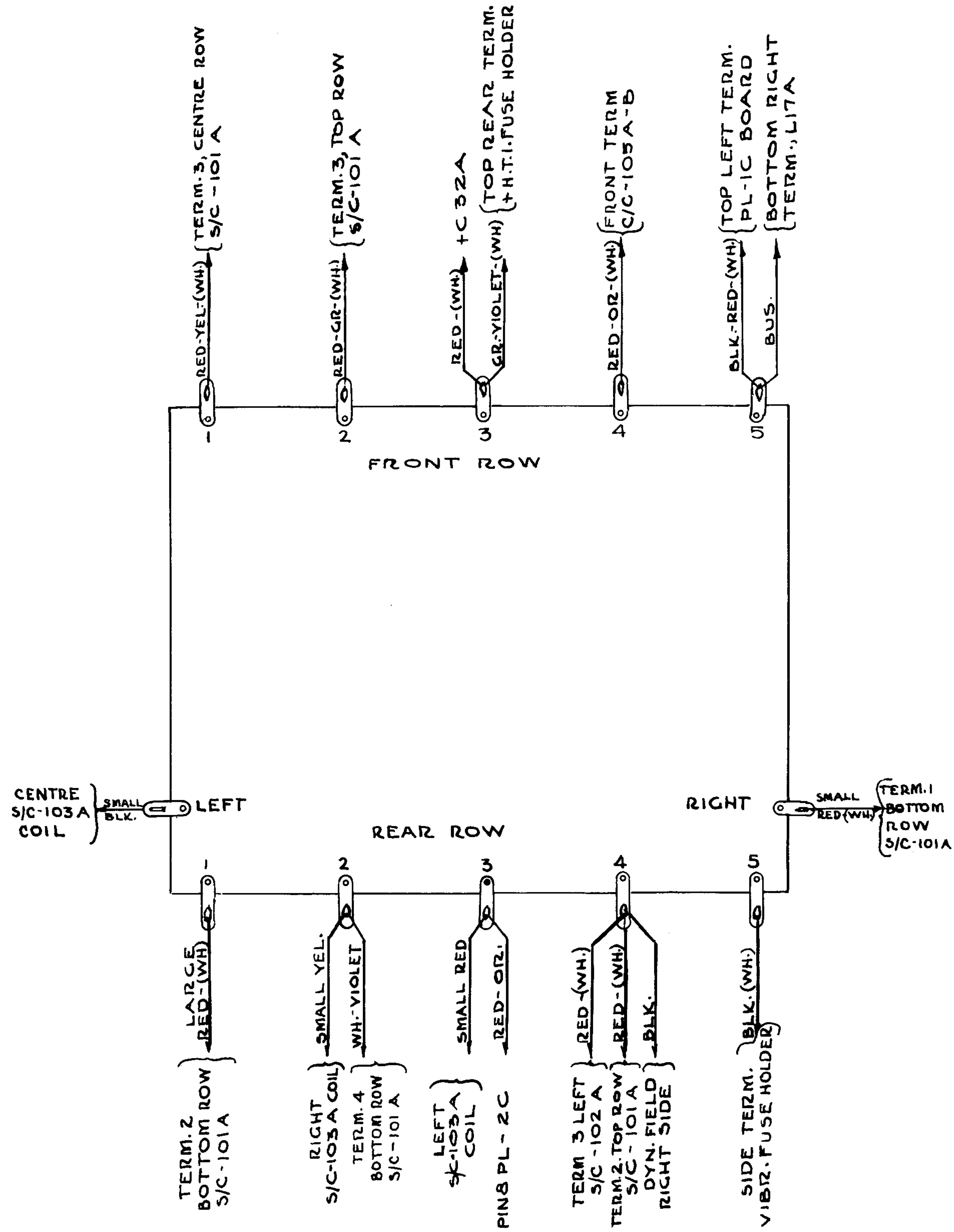
Pin No.	Connections
1	Heavy braid to chassis (Gnd.).
2	Yel.-Gr.-(Wh.) to pin 2, PL-1C.
3	Red-Gr.-(Wh.) to top right term., PL-2C board.
4	Red-(Wh.) (large) to rear term., H.T.2 fuse holder.
5	Wh.-Violet to pin 5, PL-1C.
6	Red-(Wh.) to term. 1, centre row, power switch, S/C-101A.
7	Blk.-Red.-(Wh.) to bottom left term., PL-2C board.
8	Red-Or. to term. 3, rear row, relay sw., S/C-103A.
9	
10	
11	
12	



T $\frac{\text{FZ 254/3}}{\text{1 - 57}}$ Fig. 57—S/C-101A, Power Switch



T $\frac{\text{FZ 254/3}}{\text{1 - 58}}$ Fig. 58—S/C-102A, 12V.—24V. L.T. Switch



T FZ 254/3 / 1 - 59

FIG. 59—S/C-103A. SUPPLY UNIT RELAY SWITCH

TABLE 37—V/C-101A (OZ4A) RECTIFIER VALVE

Pin No.	Connections
1	Gnd.
2	C/C-104A (.004 μfd. paper) to pin 6, V/C-101A. R/C-102A (15,000 ohms) to pin 4, V/C-101A.
3	Red-Yel. to T/C-101A (front). C/C-104A (.004 μfd. paper) to pin 7, V/C-101A.
4	
5	R/C-102A (15,000 ohms) to pin 7, V/C-101A. Red to T/C-101A (front).
6	
7	Red-(Wh.) to term. 3, transformer board. Blk. to T/C-101A (front). C/C-101B to term. 1, transformer board.
8	R/C-101A (47 ohms) to rear term., C/C-105A-B. C/C-101D (.1 μfd.) to Gnd.

TABLE 38—VIBRATOR, MALLORY, G 634 C

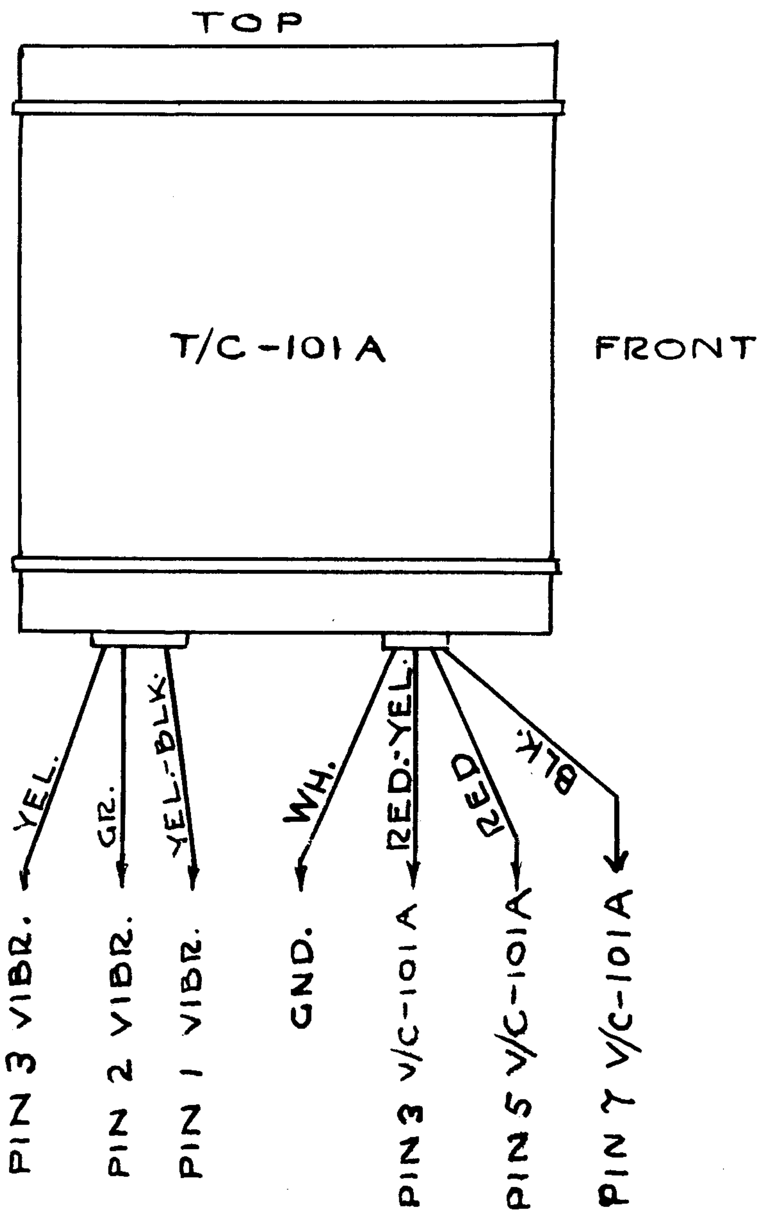
Pin No.	Connections
1	Blk. -(Wh.) to term. 1, transformer board. Yel.-Blk. to T/C-101A (rear). C/C-101A (.1 μfd. paper) to Gnd.
2	Gr.-Violet-(Wh.) to C/C-103A. Gr. to T/C-101A (rear).
3	Red-Or.-(Wh.) to C/C-103A. Yel. to T/C-101A (rear).
4	

TABLE 39—L17A CONNECTIONS

Term. No.	Connections
Bottom right	Bus to term. 5, front row, relay, S/C-103A.
Bottom front	Bus to top right term., PL-2C board.

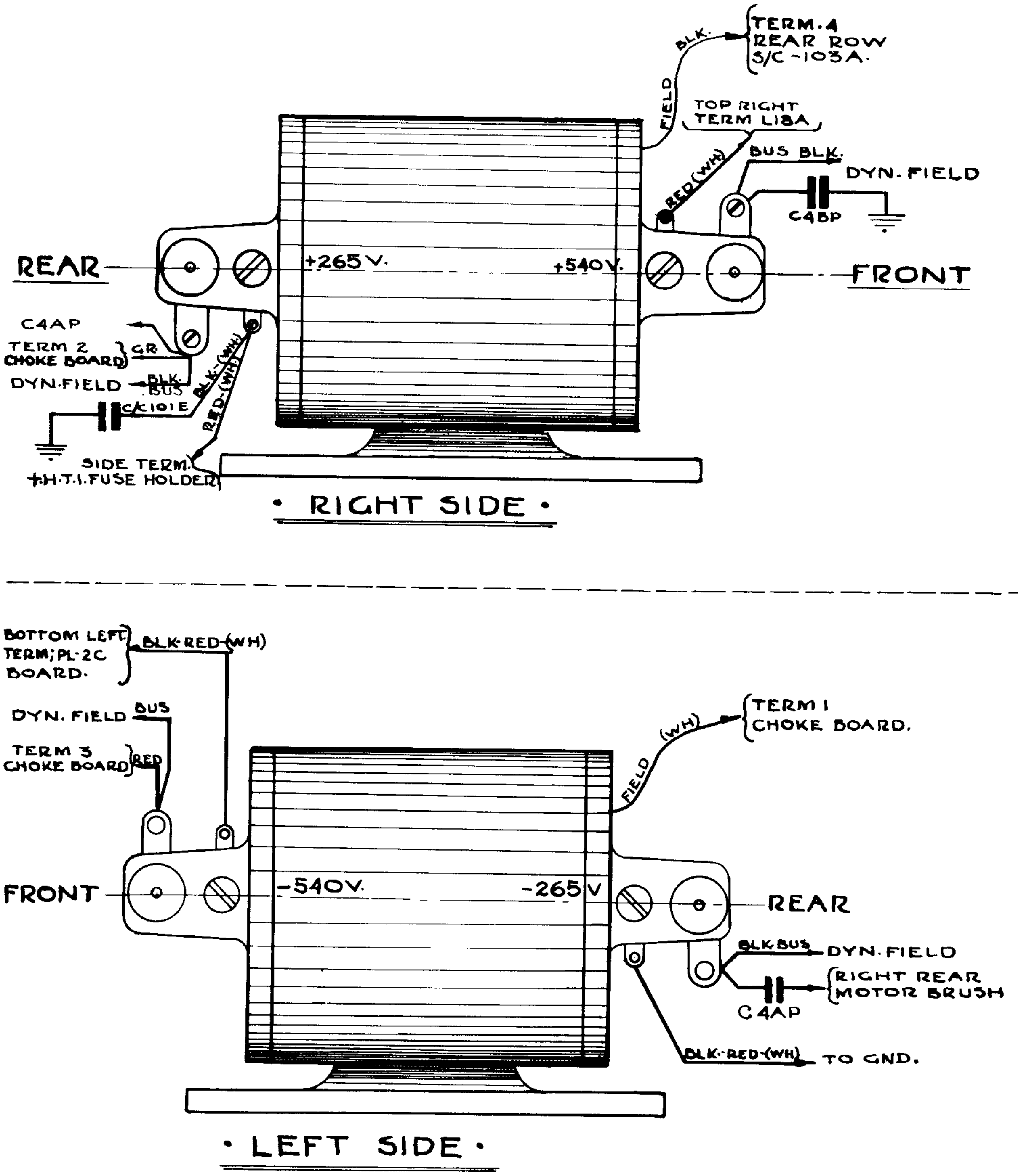
TABLE 40—L18A CONNECTIONS

Term. No.	Connections
Right	Red-(Wh.) to right front dynamotor +540 V. brush. C/C-106A (.1 μfd.) to Gnd.
Left	Bus to side term., H.T. 2 fuse holder.



T $\frac{\text{FZ 254/3}}{\text{1 - 60}}$

FIG. 60—T/C-101A, VIBRATOR TRANSFORMER



T $\frac{FZ\ 254/3}{1\ -\ 61}$

Fig. 61—Dynamotor

TABLE 41—L/C-101A CONNECTIONS

Term. No.	Connections
Right front	Yel.-(Wh.) to front term., C/C-105A-B.
Right rear	Yel.-(Wh.) to rear term., C/C-105A-B.

TABLE 42—C/C-105A-B CONNECTIONS

Term. No.	Connections
Front	Yel.-(Wh.) to right front term., L/C-101A. Red-Or.-(Wh.) to term. 4, front row, relay, S/C-103A.
Rear	Yel.-(Wh.) to rear term., L/C-101A. R/C-101A (47 ohms) to pin 8, V/C-101A.

TABLE 43—C32A CONNECTIONS

Term. No.	Connections
Pos.	Red-(Wh.) to term. 3, front row, S/C-103A relay.
Neg.	Gr.-Violet-(Wh.) to centre term., PL-2C board. (Gnd.).

TABLE 44—FUSE HOLDERS

Holder	Term.	Connections
H.T.1	Rear	Red-(Wh.) to term. 1, top row, power sw., S/C-101A. Gr.-Violet-(Wh.) to term. 3, front row, relay, S/C-103A.
	Side	Red-(Wh.) to right rear dynamotor, + 265 V. term.
H.T.2	Rear	Red.-(Wh.) to pin 4, PL-2C.
	Side	Bus to left top term., L18A.
VIBR.	Rear	Red-(Wh.) to term. 3, transformer board.
	Side	Blk.-(Wh.) to term. 5, rear, relay, S/C-103A.

TABLE 45—TERMINAL BOARDS

Board	Term.	Connections
Transformer Board	1	Blk.-(Wh.) to pin 6, PL-1C. Blk.-(Wh.) to pin 1, vibrator socket. C/C-101B to pin 7, V/C-101A.
	2	
	3	Red-(Wh.) to rear term., VIBR. fuse holder. Red-(Wh.) to pin 7, V/C-101A.
Choke Board	1	Red-Br.-(Wh.) to term. 2, front, relay, S/C-103A. Red-(Wh.) to term. 2, left row, S/C-102A (top view). Wh. to dynamotor field winding, left rear of Dyn.
	2	Gr. to right rear of Dyn., L.T. brush. Blk.-(Wh.) to term. 2, right side, S/C-102A (top view).
	3	Blk.-(Wh.) to term. 1, left side, S/C-102A (top view). Red to left front of Dyn., L.T. brush.
PL-1C Board	Top left	Red-Or.-(Wh.) to bottom term., pilot lamp, P1A. Blk.-Red.-(Wh.) to term. 5, front, relay, S/C-103A. Blk.-Red.-(Wh.) to term. 4, top row, power sw., S/C-101A. C22C (.025 μfd.) to Gnd.
	Centre Gnd.	
	Bottom right	
PL-2C Board	Top right	Red-Gr.-(Wh.) to pin 3, PL-2C. Bus to bottom front term., L17A.
	Centre	Gnd. Gr.-Violet-(Wh.) to C32A neg. C4CP Gnd. lead.
	Bottom left	Blk.-Red.-(Wh.) to front left dyn., —540 V. brush. Blk.-Red.-(Wh.) to pin 7, PL-2C. C4CP (.1 μfd.).
Pilot lamp, P1A	Bottom	Red.-Or.-(Wh.) to top left term., PL-1C board.
	Top	R40A (20 ohms) to Gnd.

Mechanical Adjustments and Maintenance

Alteration of Variometer Window Position

53. To change the position of the variometer window, to one which allows the scale to be more easily read:

(a) Note the number stamped on the case over the fixing screw nearest the position chosen.

(b) Loosen the eight screws marked "F" (Fig. 62) and remove the end cover which carries the variometer knob.

(c) Loosen the four screws marked "C" and turn the scale "S" so that the internal number opposite the pointer "P" corresponds to the number noted in (a) above.

(d) Tighten the four screws marked "C" until a stiff but smooth movement of the knob is obtained.

(e) Rotate the knob until the pointer "P" is opposite the hair-line in the centre of the index window.

(f) Bring the coupling fork "Y" opposite the number on the outer case corresponding to the internal number indicated by pointer "P".

(g) Carefully replace the end cover on the variometer case so that the centre line of the index window is opposite the desired number on the outer case.

(h) Tighten the eight screws marked "F".

(i) Test the motion and action of the variometer.

NOTE:—THE SEQUENCE OUTLINED IN PARA. 53 ABOVE MUST BE FOLLOWED CAREFULLY SINCE IMPROPER ASSEMBLY WILL RESULT IN THE INTERNAL VARIOMETER SERIES-PARALLEL SWITCHING NOT BEING IN THE CHANGE-OVER POSITION WHEN RED SHOWS IN THE WINDOW.

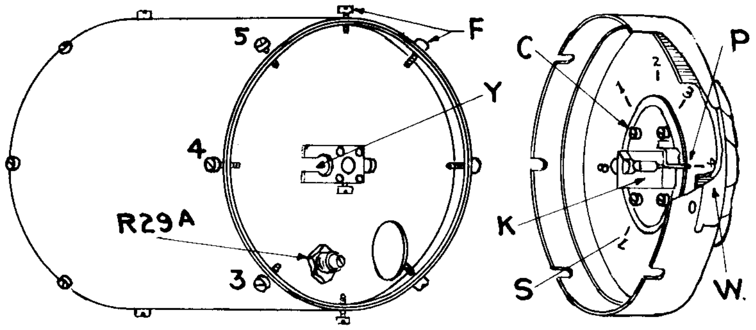
(e) Remove the old discs.

(f) Smear the new friction discs with anti-freeze grease and insert.

(g) When replacing the end cover, take care that the window is in its correct position and observe all precautions outlined in Para. 53.

Variometer Change-Over Contacts

56. To check the operation of the series-parallel, change-over contacts, listen carefully on the receiver headgear with the No. 19 set operating on Receive, in a normal installation. The absence of any unduly loud clicks in the headphones, while rotating the variometer knob slowly, indicates that the change-over contacts are operating smoothly.



T FZ 254/3 1 - 62 FIG. 62—DETAIL OF VARIOMETER

Adjustment of Variometer Tuning Knob Movement

54. If the variometer tuning knob becomes too loose or too tight, it may be adjusted as follows:

(a) Remove the variometer end cover as described in Para. 53.

(b) Adjust the screws marked "C" (Fig. 62) until a satisfactory stiff, smooth movement of the control knob is obtained.

(c) Replace the end cover as in Para. 53.

Replacing Cork Friction Discs in Variometer

55. If the cork friction discs in the variometer are worn, they may be replaced as follows:

(a) Note the position of the index window.

(b) Remove the end cover of the variometer as in Para. 53.

(c) Remove the coupling marked "K" by loosening the set screw.

(d) Remove the four screws marked "C" and the assembly may now be taken apart.

Relay and Switch Contacts

57. Relay and switch contacts are of the self-wiping type and should seldom give trouble. If high resistance occurs, clean with carbon tetrachloride. Do NOT use an abrasive unless badly burned or pitted.

Controls

58. If the controls become stiff, they should be lightly lubricated with oildag, or thick oil.

Dynamotor

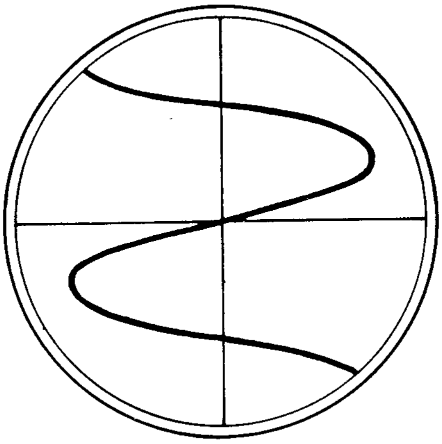
59. See Paras. 173—176 (incl.)

Alignment and Specification Tests

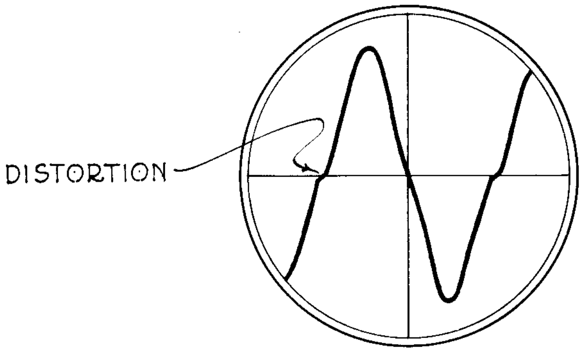
General

60. Alignment of the "A" set must be done in sequence, as the sender adjustments depend largely upon previous receiver adjustments, certain circuits being com-

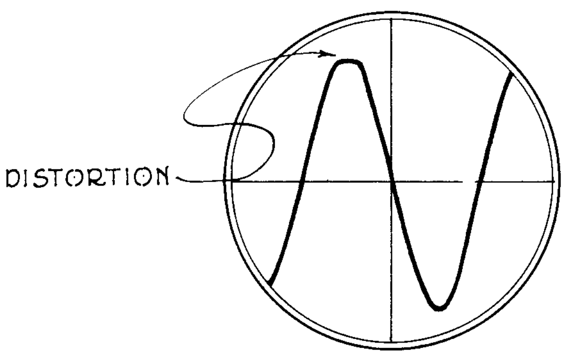
mon. In general, if a receiver oscillator or B.F.O. adjustment is made, it will be necessary to also realign the sender drive circuits. Similarly, the H.F. (4½—8 Mc/s.) band must be aligned before the L.F. band in each case, as the H.F. trimmers are common to both bands.



T $\frac{\text{FZ 254/3}}{\text{1 - 63}}$ FIG. 63—NORMAL A.F. PATTERN



(a)



(b)

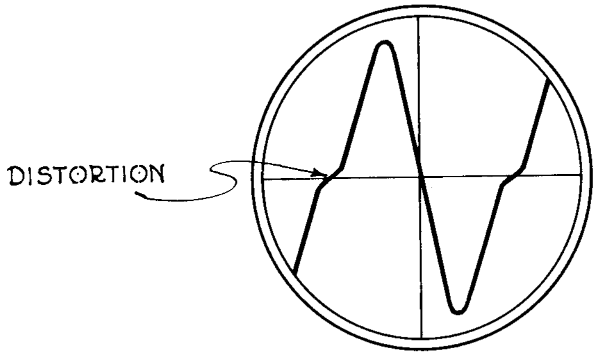
NOTE:—PATTERN MAY APPEAR AS IN (a) OR (b) DEPENDING UPON THE PHASE RELATIONSHIP OF THE 2ND. HARMONIC DISTORTION TO THE FUNDAMENTAL FREQUENCY. OTHER PATTERNS ARE ALSO POSSIBLE.

T $\frac{\text{FZ 254/3}}{\text{1 - 64}}$ FIG. 64—4% DISTORTION

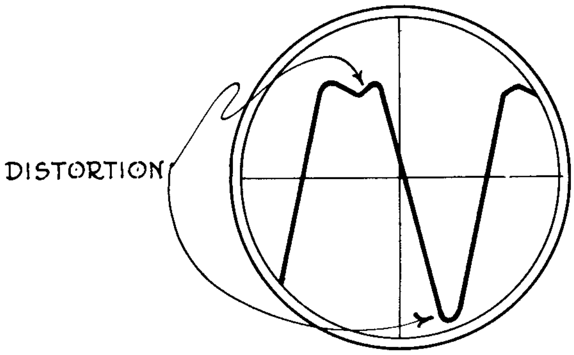
61. When performing A.F power output tests, the C.R.O. should be connected in parallel with the output meter. With a reasonably pure sine wave input, the C.R.O. pattern should be distortionless at the standard 50 mW. output.

On increasing the input signal, the first trace of output distortion can be determined when the upper peaks of the C.R.O. pattern first begin to break, as in Fig. 64.

When this occurs, the distortion present is 3 or 4%. A further input signal increase will result in greater distortion.



(a)



(b)

NOTE:—PATTERN MAY APPEAR AS IN (a) OR (b) DEPENDING UPON THE PHASE RELATIONSHIP OF THE 2ND. HARMONIC DISTORTION TO THE FUNDAMENTAL FREQUENCY. OTHER PATTERNS ARE ALSO POSSIBLE.

T $\frac{\text{FZ 254/3}}{\text{1 - 65}}$ FIG. 65—20% DISTORTION

I.C. Amplifier Tests

EQUIPMENT REQUIRED

62. The following equipment (or equivalent) will be used when testing the I.C. amplifier:

(a) Oscillator, B.F. Clough Brengle No. 79E.

(b) Voltmeter, A.C., 0—5 volts, r.m.s., 1000 ohms per volt.

(c) Attenuator pad No. 1, Fig. 1.

(d) Meter, output power G.R. No. 583A.

OR

A.C. Voltmeter, 0—5 volts, r.m.s., and a 40 ohms, ½W., non-inductive resistor.

OR

Decibel Meter, Power, —12 to +8 Dbs., calibrated against a 0 Db. reference level of 6 mW. as measured across a 500 ohm load; and a 40 ohm, ½ W., non-inductive resistor.

PROCEDURE (GENERAL)

63. (a) Prepare W/S No. 19 for operation by removing from case, and properly connecting to supply unit, control unit and headgear. All variometer and aerial leads should remain disconnected.

(b) Connect the supply unit to the appropriate L.T. power source.

(c) Turn the following switches to the positions shown.

(i) S10C (I.C. ON-OFF)—"ON"

(ii) S10B ("B" ON-OFF)—"OFF"

(iii) S/C-104A ("A" ON-OFF)—"OFF"

(iv) Control Unit Switches—"I.C." and "N".

(v) S/C-101A (Supply Unit)—"VIBR." or "DYN." as required.

(d) Press the pressel switch and speak into the microphone. Listen on the headphones to check the I.C. channel for normal operation, clarity of speech and sufficient volume. If unsatisfactory, check microphone and headphones by substitution, before trouble shooting on set.

(e) Remove the 12-pt. connector from the communications outlet, PL2A, on the front panel of the No. 19 set.

(f) CONNECT:—

(i) An output meter between chassis ground and I.C. output, pin 6—PL2A. Adjust the output meter for 40 ohms impedance.

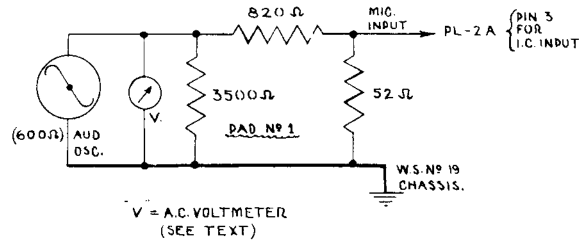
OR

(ii) An A.C. voltmeter (0—5) between chassis ground and I.C. output, pin 6—PL2A, in parallel with a 40 ohm resistor.

OR

(iii) Db. Meter between chassis ground and I.C. output, pin 6—PL2A, in parallel with a 40 ohm resistor.

(g) Connect an audio oscillator to the No. 19 set as illustrated in Fig. 66.



T FZ 254/3 1 - 66 FIG. 66—I.C. INPUT CIRCUIT

(h) Shunt an A.C. voltmeter (0—5, 1000 ohms per volt) across the output of the audio oscillator as shown in Fig. 66. Its reading will be referred to as "Input Volts".

STABILITY TEST

64. With the audio oscillator attenuator set for zero input to the No. 19 set, the output shall be:—

(a) Less than 5 mW. (Output meter)

OR

(b) Less than .45 A.C. volts r.m.s. (A.C. Voltmeter)

OR

(c) Less than —11.75 Db. (Db. meter).

POWER OUTPUT TEST

65. Adjust the audio oscillator for a signal of 400 c.p.s. Increase the input from the audio oscillator, noting the output meter reading. With sufficient input the maximum output of the I.C. amplifier must be capable of exceeding:—

(a) 400 mW. (Output meter)

OR

(b) 4.0 A.C. volts r.m.s. (A.C. Voltmeter)

OR

(c) +7.3 Db. (Db. meter).

(d) Distortion must not exceed 20% when making this test. See Para. 61.

SENSITIVITY TEST

66. With the audio oscillator set for a signal

of 400 c.p.s. adjust its attenuator control until the output is exactly:—

(a) 200 mW. (Output meter)

OR

(b) 2.83 A.C. volts r.m.s. (A.C. Voltmeter)

OR

(c) +4.3 Db. (Db. meter).

67. The required input to produce the output readings shown in Para. 66 must not exceed:

(a) 1 V. on input voltmeter

OR

(b) .03 A.C. volts r.m.s. measured at pin 3 of PL2A (I.C. input).

FIDELITY TEST

68. (a) Adjust the attenuator of the audio oscillator until the output of the I.C. amplifier is the same as in Para. 66 noting the input volts required at 400 c.p.s.

(b) Adjust the audio oscillator for a signal of 150 c.p.s.

(c) If necessary, readjust the attenuator for the same input volts as noted on completion of step (a).

(d) The output of the I.C. amplifier must exceed:

(i) 50 mW. (Output meter)

OR

(ii) 1.4 A.C. volts r.m.s.—(A.C. Voltmeter)

OR

(iii) —1.8 Db. (Db. meter).

(e) Adjust the audio oscillator for a signal of 5000 c.p.s.

(f) If necessary, readjust the attenuator for the same input volts as noted on completion of step (a).

(g) The output of the I.C. amplifier must exceed:

(i) 100 mW. (Output meter)

OR

(ii) 2.0 A.C. volts r.m.s. (A.C. Voltmeter)

OR

(iii) +1.24 Db. (Db. meter).

NOISE TEST

69. With input and output conditions as outlined in Para. 66 pound the set with a rubber mallet, or other percussion device suitably padded and note any undue fluctuation on output meter. If this occurs, locate cause of "noise" and remedy it.

"B" Modulator and Rec. A.F. Channel Tests

EQUIPMENT REQUIRED

70. The equipment listed in Para. 62 will be required for the following tests. A 100 ohm, ¼ W., non-inductive resistor will be used instead of the 40 ohm resistor mentioned.

PROCEDURE (GENERAL)

71. (a) Prepare W/S No. 19 for operation by removing from the case and properly connecting to the supply unit, control unit and headgear. Leave off the variometer and aerial leads.

(b) Connect the supply unit to the appropriate L.T. source.

(c) Turn the following switches to the positions shown:

(i) S10B ("B" ON-OFF) to "ON".

(ii) S10C (I.C. ON-OFF) to "OFF".

(iii) S/C-104A ("A" ON-OFF) to "OFF".

(iv) Control Unit switches to "B" and "N".

(v) S/C-101A (Supply Unit) to "VIBR" or "DYN" as required.

(d) Press the pressel switch and speak into the microphone. Listen on the headphones to check "B" sidetone for normal operation of modulator channel, clarity of speech and sufficient volume.

(e) Remove the 12-pt. connector from the communications outlet, PL2A, at the lower left corner of the front panel.

(f) CONNECT:

(i) An output meter between chassis ground and "B" output, pin 5 of PL2A. Adjust the output meter for 100 ohms impedance.

OR

(ii) An A.C. voltmeter (0—5) between chassis ground and pin 5 of PL2A, in parallel with a 100 ohm resistor.

OR

(iii) A Db. meter between chassis ground and pin 5 of PL2A, in parallel with a 100 ohm resistor.

(g) Connect an audio oscillator through an impedance matching attenuator network to pin 2 of PL2A (See Fig. 66). (Pin 2 of PL2A is the "B" modulator microphone input pin).

(h) Shunt an A.C. voltmeter (0—5; 1000 ohms per volt) across the output of the audio oscillator as shown in Fig. 66. Its readings will be referred to as "input volts".

(i) Short pin 8 of PL2A to chassis to throw "B" relay to "Send".

STABILITY TEST

72. With the audio oscillator attenuator set for zero input to the No. 19 set, the output shall be:

(a) Less than 5 mW. (Output meter).

OR

(b) Less than .71 A.C. volts r.m.s. (A.C. voltmeter)

OR

(c) Less than —7.79 Db. (Db. meter).

SENSITIVITY TEST

73. With the audio oscillator adjusted for a signal of 400 c.p.s., adjust its attenuator control until the output meter reads exactly:

(a) 50 mW. (Output meter)

OR

(b) 2.24 A.C. volts r.m.s. (A.C. Voltmeter)

OR

(c) +2.21 Db. (Db. meter).

74. The input required to produce the output shown in Para. 73 must not exceed:

(a) .5 A.C. volts r.m.s. on the input voltmeter

OR

(b) .015 A.C. volts r.m.s. measured at pin 2 of PL2A ("B" microphone input).

FIDELITY TEST

75. (a) Adjust the audio oscillator attenuator until the output of the "B" modulator is the same as in Para. 73 for a 400 c.p.s. input frequency. Note the "input volts" required.

(b) Adjust the audio oscillator to a frequency of 150 c.p.s. and make certain that the input volts are the same as in (a) above.

(c) The "B" modulator output shall be:

(i) Not more than 6.3 mW., or 2.50 A.C. volts, r.m.s., or +3.23 indicated Dbs.

(ii) Not less than 30 mW. or 1.73 A.C. volts, r.m.s., or 0. indicated Dbs.

(d) Adjust the audio oscillator to a frequency of 5000 c.p.s. and make certain that the input volts are the same as in (a) above.

(e) The "B" modulator output shall be:

(i) Not more than 90. mW., or 3.00 A.C. volts, r.m.s. or + 4.78 indicated Dbs.

(ii) Not less than 36 mW., or 1.90 A.C. volts, r.m.s., or + 0.79 indicated Dbs.

(f) Disconnect the test instruments from PL-2A and reconnect the headgear to the set.

"B" Set Quench Oscillator Tests

EQUIPMENT REQUIRED

76. The following equipment (or equivalent) will be required to carry out these tests:

(a) L.F. receiver, 150—230 Kc/s.

(b) Test Set, Voltohmyst, R.C.A. No. 165.

PROCEDURE (GENERAL)

77. Carry out steps (a), (b) and (c) of Para. 71.

FREQUENCY RANGE TEST

78. (a) Screw the QUENCH adjustment on the front panel all the way out. (fully counterclockwise).

(b) Switch "ON" a calibrated L.F. receiver (C.W.) and place it near the No. 19 set. No other coupling is necessary.

(c) Tune the L.F. receiver until the quench oscillator is picked up. Vary the front panel QUENCH adjustment if necessary.

(d) Slowly screw the QUENCH adjustment all the way in, "following" with the L.F. receiver tuning.

(e) While performing (d) above, ascertain that the quench oscillator can be tuned over a range of at least 45 Kc/s. and this range MUST lie between 165 and 220 Kc/s. or interference with the "A" set will result.

(f) Tune the quench oscillator to 190 Kc/s. and allow it to remain there during further "B" set tests.

QUENCH OUTPUT TEST

79. (a) Ground a voltohmyst to the No. 19 set chassis.

(b) Connect the probe to the grid cap of V1D.

(c) Quench bias volts should be approximately —25 V., D.C.

"B" Receiver Tests

EQUIPMENT REQUIRED

80. The following equipment (or equivalent) will be required:

(a) Generator, Signal, V.H.F., G.R. No. 804C.

OR

Wavemeter, T.E. 149, and any standard signal generator up to 40 Mc/s.

OR

Another "B" set set up ready for operation at some point removed from the test bench, and working into a suitable dummy aerial, to reduce radiation.

(b) Meter, Output Power. G.R. No. 583A.

OR

A.C. Voltmeter, 0—5 volts r.m.s., and a 100 ohm ¼ W., non-inductive resistor.

OR

Decibel Meter, —8 to +8 Dbs., calibrated against a 0 Db. reference level of 6 mW. across a 500 ohm load; and a 100 ohm, ¼ W., non-inductive resistor.

(c) A 100 ohm, ¼ W., non-inductive resistor.

(d) A 2000 ohm, ¼ W., non-inductive resistor.

PROCEDURE (GENERAL)

81. The sensitivity of the "B" receiver is such that not more than 1000 uV. input from a signal generator is required for 50 mW. output as measured on General Radio Type 804-C V.H.F. Signal Generator.

82. A 235 Mc/s. signal is required in making tests on the "B" receiver. There are three main sources from which this 235 Mc/s. signal may be obtained. A 235 Mc/s. signal generator may be used, if available, or a 235 Mc/s. frequency standard (crystal and multipliers). Another optional source is the combined use of a crystal calibrated wavemeter, and any standard signal generator that may be tuned to 40 Mc/s. on either the fundamental frequency or the second harmonic. The procedure is as follows:

(a) Tune the wavemeter to an accurate 4.895 Mc/s. after having crystal calibrated to the nearest check point.

(b) Ground the wavemeter to the chassis of the signal generator, and connect the signal generator output lead directly to the wavemeter output.

(c) Adjust the signal gerenator for maximum PURE R.F. output, and tune in vicinity of 39 Mc/s.

(d) Listen very carefully to wavemeter headphones, and SLOWLY tune the signal generator in the vicinity of 39 Mc/s. until a heterodyne whistle is heard. Tune the signal generator to zero beat. This whistle will be exceedingly faint. Dead silence in the shop is necessary.

(e) Being careful not to move the dial setting, adjust the signal generator for 30% amplitude modulation by a 400 cycle note. (30% is the normal standard for most signal generators that have no modulation percentage control).

(f) Disconnect the wavemeter and set it aside. Ground the signal generator to the No. 19 set chassis, and couple the signal generator output lead to the "B" set aerial socket by a 2000 ohm series resistor as shown in Fig. 68.

(g) In (d) above, the 8th harmonic of the wavemeter (4.895 Mc/s.) is exactly 39.16 Mc/s. This can be heard faintly heterodyning against the signal generator's 39.16 Mc/s. signal on the wavemeter phones. It merely serves as a crystal calibrated check on the signal generator calibration.

(h) In (e) above, the 6th harmonic of the signal generator (39.16 Mc/s.) is exactly 234.96 Mc/s. or within .02% of 235 Mc/s. This is close enough, and is usually sufficiently loud to be heard plainly on the "B" set.

83. In Para. 82 (d), if the wavemeter batteries are at all weak, the 8th harmonic may be inaudible, but the 6th harmonic can generally be heard. If this is the case, proceed as follows:

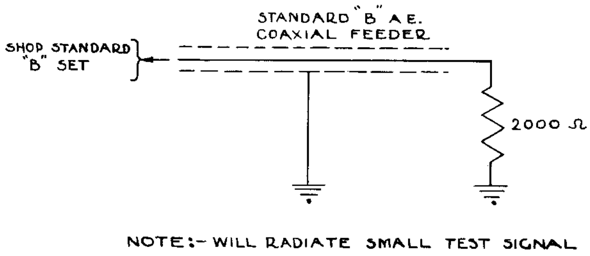
(a) With the wavemeter crystal calibrated to 4.895 Mc/s., tune the signal generator SLOWLY in the vicinity of 29.37 Mc/s. until a faint heterodyne note is heard, and tune to zero beat in the wavemeter headphones.

(b) Note the exact dial calibration of the signal generator at this point. Add 4.895 to this figure TWICE and the resultant figure will be the approximate location of the inaudible 8th harmonic near 39.16 Mc/s.

(c) The foregoing procedure will correct for signal generator calibration error, assuming that this error is constant over the range from 29 to 39 Mc/s. This procedure is only applicable where 29 and 39 Mc/s. are both found on the same signal generator frequency band.

84. Another "B" set, correctly calibrated and set up for operation may also be used as a shop standard. It is advisable to have this standard operating into a dummy aerial as illustrated in Fig. 67, and also located a short distance from the actual test bench. This is necessary, or otherwise the output of the "standard" will be so great that the set under test will receive the signal with almost equal strength at any position on the dial, so that accurate calibration will be difficult. No additional coupling is required.

85. Lacking a V.H.F. signal generator, the suitable harmonics of any standard signal generator may be used—down to the 2nd



T FZ 254/3 / 1 - 67

FIG. 67—"B" SET DUMMY AERIAL (SENDER)

harmonic of 117.5 Mc/s. fundamental (available on some of these instruments). Increased signal strength, facilitating testing, will accompany the use of these lower number harmonics (2nd—3rd) where available. However, for the CALIBRATION test, (Para. 87), experience has shown that the dial calibration of most standard signal generators cannot be consistently relied upon at frequencies above 50 Mc/s. Therefore, **for this one test** crystal calibration by a wavemeter and the use of higher number harmonics as outlined in Para. 82 is advisable.

86. (a) Proceed as in Para. 71 (a), (b) and (c) and turn the "B" GAIN control fully clockwise.

(b) Select a suitable V.H.F. signal source. (See Para. 82).

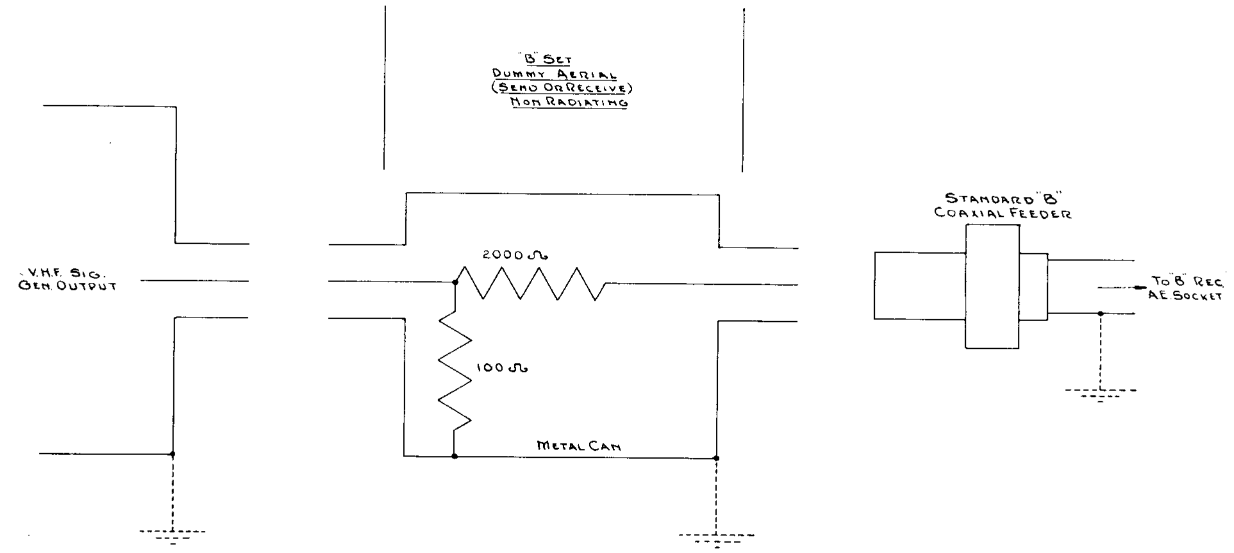
(c) Where applicable, couple the V.H.F. signal source to the "B" set aerial socket as shown in Fig. 68. This is not necessary when using a "shop standard" "B" set (Para. 84) but in that case, the set under test must be connected to a standard "B" set feeder and aerial for "pick up".

(d) The cover must be left on the "B" oscillator can during all tests.

(e) Adjust the V.H.F. source to deliver a signal of 235 Mc/s.

(f) If using a signal generator, adjust for amplitude modulation to a depth of 30% using a 400 c.p.s. note.

(g) If using a "standard" set, it is sufficient to leave on Send, although an assistant may speak or whistle into its microphone if modulation is desired.



T FZ 254/3 1 - 68

FIG. 68—"B" SET DUMMY AERIAL (RECEIVE)

CALIBRATION TEST AND ALIGNMENT

87. (a) Tune the "B" frequency dial of the set under test until the 235 Mc/s. signal from the V.H.F. source is heard in the headphones. If an unmodulated V.H.F. source is employed, the signal may be identified by a sharp reduction in the superregenerative hiss at some spot on the dial of the set being tested. Do not use a too powerful V.H.F. signal or it will be spread over a considerable portion of the receiver dial. If the receiver tuning is broad, then always tune to the centre of the signal.

(b) A 235 Mc/s. signal should be received at figure 5 on the "B" set dial. The dial is numbered from 0—10 and an error of ±1 division is allowable.

(c) If the signal is received at a "B" dial setting LESS than the figure 5, COMPRESS the "B" tank coil, L11A, so that the turns are closer together. Retune the set and repeat this action, if necessary, until the signal is received at the figure 5 on the dial.

(d) If the V.H.F. signal is received at a "B" dial setting GREATER than the figure 5, SPREAD the "B" tank coil, L11A, so that there is more space between turns. Retune the set and repeat this action, if necessary, until the signal is received at figure 5 on the dial.

(e) If the "B" set is so far out of calibration that steps (c) or (d) above cannot correct it, it may be necessary to take further action as outlined in steps (f), (g) and (h) below.

(f) With a screw driver, short circuit the rotor terminal of the "B" tuning condenser, C25A, to the side of "B" oscillator box.

(g) If this improves superregeneration and alters the "B" frequency, then it will be necessary to solder the shortest possible ground braid from the C25A rotor terminal to the side of the "B" oscillator box (approximately 1½").

(h) Repeat steps (a) and (b).

POWER OUTPUT TEST

88. (a) Remove the 12-pt. connector from PL2A, at the lower left of the front panel.

(b) CONNECT:

(i) An output meter between chassis ground and "B" output, pin 5 of PL2A. Adjust the output meter for 100 ohms impedance.

OR

(ii) An A.C. voltmeter (0—5) between chassis ground and pin 5 of PL2A, in parallel with a 100 ohm resistor.

OR

(iii) A Db. meter between chassis ground and pin 5 of PL2A in parallel with a 100 ohm resistor.

(c) Tune the "B" set dial to the figure 5 exactly.

(d) Amplitude modulate the V.H.F. signal source to a depth of 30% by a 400 cycle note, and with the attenuator set for maximum output, vary the frequency in the vicinity of 235 Mc/s. until the output indicating meter shows maximum deflection. Reduce the R.F. input as required.

(e) With sufficient input, the maximum audio output of the "B" receiver must be capable of exceeding:

(i) 150 mW. (Output meter)

OR

(ii) 3.87 A.C. volts r.m.s. (Voltmeter)

OR

(iii) +6.98 Db. (Db. meter).

(f) Distortion must not exceed 20% during step (e) above. (See Para. 61).

NOISE TEST

89. (a) Reduce the V.H.F., R.F. input, for "Standard "B" Receiver Output" as indicated below:

(i) 50 mW. (Output meter)

OR

(ii) 2.24 A.C. volts r.m.s. (Voltmeter)

OR

(iii) +2.21 Db. (Db. meter).

(b) Pound the set with a rubber mallet or other suitably padded percussion device and note any undue fluctuation of output meter reading. If this occurs, locate the cause of the noise and remedy it.

SENSITIVITY TEST

90. This test is carried out when using a V.H.F. signal generator with microvolt calibrated output. The test is not applicable when using other V.H.F. sources.

(a) By the combined use of the signal generator attenuator and the "B" GAIN control, adjust for a 4:1 signal to noise power ratio or a 2:1 signal to noise voltage ratio (as outlined in Para. 91).

(b) The modulated V.H.F. input required to give the standard audio output as outlined in Para. 89 (a) shall not exceed 1,000 uV. Tuning of the QUENCH control shall not appreciably affect sensitivity.

91. (a) The V.H.F. signal generator is tuned to 235 Mc/s. and is modulated 30% by a 400 cycle note. It is coupled to the "B" set as shown in Fig. 68 and with the signal generator attenuator at maximum, the signal is tuned in accurately on the "B" set for maximum deflection of the output meter.

(b) Now, by using both the signal generator output attenuator and the "B" GAIN control, a compromise is reached so that:

(i) With the signal generator modulation switch ON, the output meter will read the same as in Para. 89.

(ii) With the signal generator modulation switched OFF, the output meter will read a noise level of:

12.5 mW. (Output meter)

OR

1.12 A.C. volts r.m.s. (Voltmeter)

OR

—3.81 Db. (Db. meter).

(c) It will be seen that the ratio of modulated signal level to unmodulated noise level is:

4:1 power ratio

OR

2:1 voltage ratio.

Sensitivity tests are always taken at this ratio.

92. Lacking the necessary equipment to make a sensitivity test, then, in general, if the "B" sender functions correctly, and if, on receive, the superregenerative hiss is heard loudly across the dial with normal aerial and lead attached, it can be assumed that the receiver is functioning correctly.

"B" Sender Tests

EQUIPMENT REQUIRED

93. The following equipment (or equivalent) will be used:

(a) Oscillator, B.F. Clough Brengle, No. 79E.

(b) Attenuator Pad No. 1, Fig. 1.

(c) "B" Sender Test Circuit, Fig. 69.

PROCEDURE (GENERAL)

94. (a) Proceed as in Para. 71 (g) and (h).

(b) Switch S10B ("B" ON-OFF) to OFF.

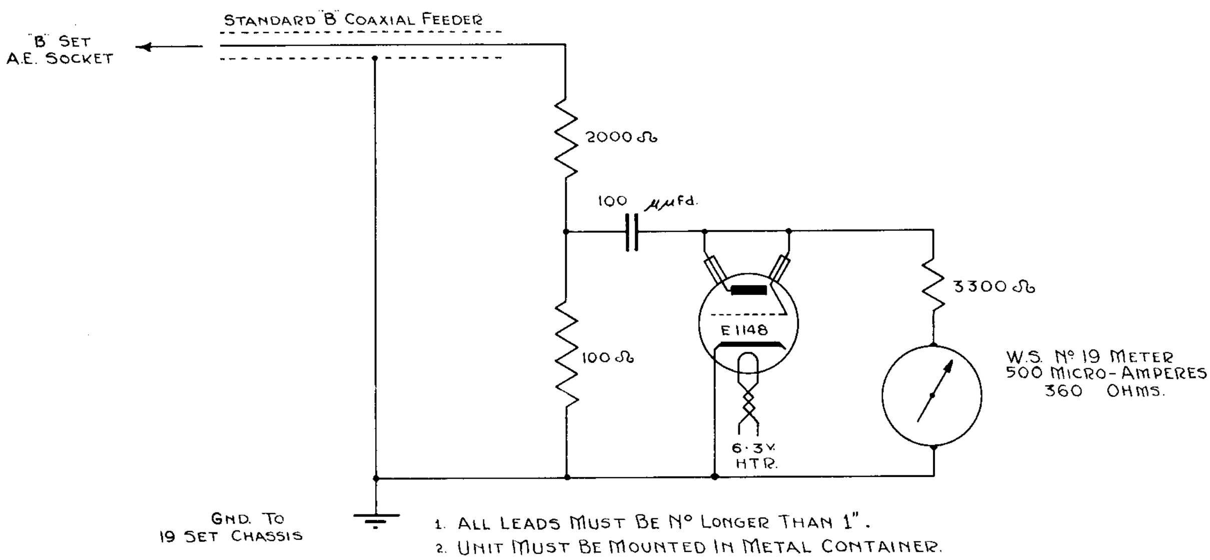
(c) Connect "B" sender test circuit to "B" aerial socket (S0-5A) as shown in Fig. 69.

(c) The INCREASE in the test circuit meter reading due to the radiated power on Receive shall be not more than 60 V.

(d) Short pin 8 of PL2A to chassis to throw the "B" relay to Send.

(e) With zero modulation from the audio oscillator, the further INCREASE in the test circuit meter readings due to rectified V.H.F. carrier shall be approximately 330 V.

(f) Turn the attenuator control on the audio oscillator clockwise. The further INCREASE in the test circuit meter reading due to MAXIMUM 400 c.p.s. modulation shall be approximately 110 V.



T FZ 254/3 1 - 69

FIG. 69—"B" SENDER TEST CIRCUIT

(d) Tune "B" dial to the figure 5 (235 Mc/s.).

R.F. TESTS

95. The following tests will be carried out with the cover on the "B" set oscillator can. All test readings will be taken on the 600 V. meter scale. The meter will never read zero due to the space charge effect in the rectifier valve. Thus all test figures are given as voltage "increase" from the last test position. Readings are only approximate and will vary considerably with the test valve, etc.

(a) Note space charge meter reading.

(b) Switch S10B ("B" ON-OFF) to "ON".

(g) Tune the "B" dial across the entire band. The meter reading must not drop off by more than 60 V.

(h) Falling output at the band extremities can usually be corrected by adjusting the dressing of the series aerial coil, L26A.

96. Typical 19 set readings on the 600 V. scale are as follows:

Test valve heater on—	65 V. (space charge)
"B" receiver ON—	90 V.
"B" Send (Unmod.)—	420 V.
"B" Send (Mod.)—	530 V.

NOISE TEST

97. During Para. 95 (e), pound the set with a rubber mallet or other percussion device. There should be no undue fluctuation of test circuit meter reading.

"A" Receiver

AUDIO CHANNEL (SENSITIVITY)

EQUIPMENT REQUIRED

98. The following equipment (or equivalent) will be used:

(a) Oscillator, B.F., Clough Brengle No. 79E.

(b) Meter, Output Power, G.R. No. 583A.

OR

A.C. Voltmeter, 0—5 volts, r.m.s. and a 100 ohm, ¼ W., non-inductive resistor.

OR

Decibel meter, —8 to +8 Dbs., calibrated against a 0 Db. reference level of 6 mW. across a 500 ohm load; and a 100 ohm, ¼ W., non-inductive resistor.

(c) A.C. Voltmeter, 0—5 volts r.m.s., 1000 ohms per volt.

(d) 650 ohm, ¼ W., non-inductive resistor.

(e) .01 μfd. paper condenser, 200 V.

PROCEDURE (GENERAL)

99. (a) Remove the No. 19 set base plate and all aerial leads.

(b) Set up for operation on "A" Receive, R/T, with A.F. GAIN A control fully clockwise.

(c) Remove the 12-pt. connector from PL2A.

(d) CONNECT:

(i) An output meter between the No. 19 set chassis and pin 4 of PL2A. ("A" phone output) and adjust for 100 ohms impedance.

OR

(ii) An A.C. voltmeter (0—5) between the No. 19 set chassis and pin 4 of PL2A in parallel with a 100 ohm resistor.

OR

(iii) A Db. meter between the chassis of the No. 19 set and pin 4 of PL2A in parallel with a 100 ohm resistor.

(e) "Kill" the local oscillator by shorting to ground pin 5 of V2A.

(f) Using the circuit shown in Fig. 70, apply a 400 c.p.s. signal to the junction of R7C and R1B (Term. 2, L9A board).

(g) Adjust the output of the audio oscillator until the output meter indicates:

(i) 50 mW. (Output meter)

OR

(ii) 2.24 V. r.m.s. (A.C. voltmeter)

OR

(iii) +2.21 Db. (Db. meter).

(h) The input volts required for (g) above should not exceed:

3.3 volts at 400 c.p.s.

2.3 volts at 3000 c.p.s.

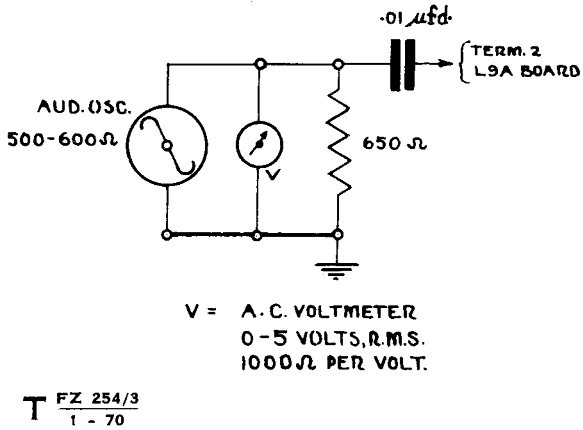


FIG. 70—"A" A.F. INPUT CIRCUIT

VISUAL I.F. AND B.F.O. ALIGNMENT

EQUIPMENT REQUIRED

100. The following equipment will be required:

(a) Generator, Signal, Hickok, No. 188X.

(b) Oscilloscope, C.R., Dumont, No. 208.

(c) Aligning tool.

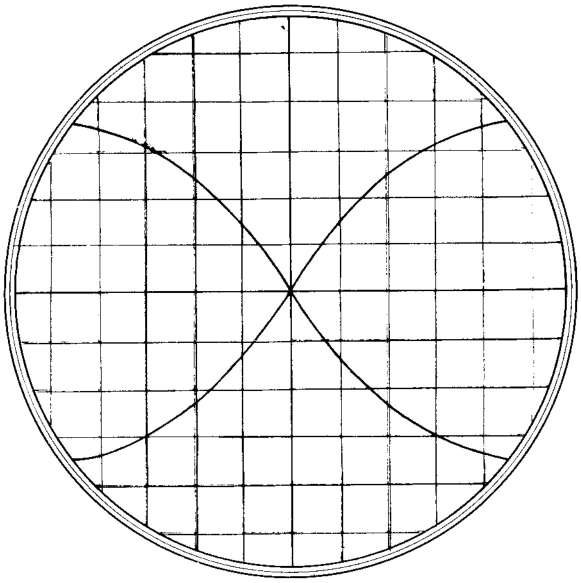
(d) Sealing compound, Sarco No. 135 Asphalt (or other suitable substitute of the beeswax type).

(e) Small soldering iron.

(f) .01 μfd., 200 V., paper condenser.

(b) Leave the C.R.O. ungrounded, and when the vertical input lead is grasped in the hand, there should be enough pick-up of power line frequency from stray fields to give a satisfactory signal through the C.R.O. vertical amplifier.

(c) Adjust the C.R.O. for one "sine" wave on the screen, and then double the sweep frequency until the pattern shown in Fig. 71 is produced. This sweep frequency will be 120 c.p.s. on 60 cycle power line.



T FZ 254/3 1 - 71

FIG. 71—DOUBLE SWEEP PATTERN

(d) Connect the C.R.O. chassis to an actual ground connection to avoid pick up from the power line field. Also ground the oscilloscope to the No. 19 set chassis.

(e) Connect the C.R.O. vertical input to the junction of R7C and R1B on the No. 19 set (Term. 2 of L9A board).

(f) Turn the "vertical gain" control on the C.R.O. almost fully clockwise (nearly fully on).

(g) Switch the C. R. O. to "external sync."

(h) Connect the lead from the "external sync. voltage" pin jack on the signal generator to the "external sync." terminal on the C.R.O.

(i) Instead of (g) and (h) above, "internal 60 cycle sync." may be used as an alternative.

(j) "Kill" the receive conversion oscillator on the No. 19 set by shorting to ground the oscillator grid (pin 5) of V2A.

OR

Rotate the FREQUENCY MC dial slightly to make certain that there is no interference pick up ± 15 Kc/s. of whatever FREQUENCY MC dial setting near 8 Mc/s. may be used. Switch S/C-105B to NET during this test and switch it OFF afterwards.

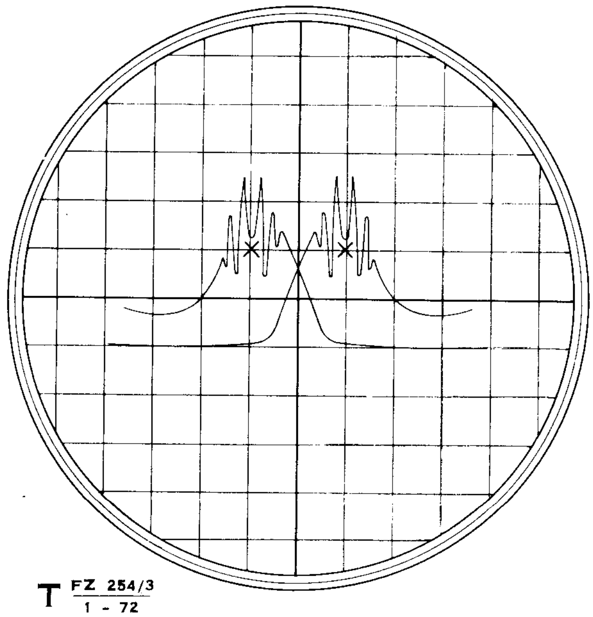
106. To calibrate the signal generator for a 465 Kc/s. F.M. signal:

(a) Adjust the signal generator to produce a 465 Kc/s. F.M. signal, frequency modulated by a 60 cycle note with a 30 Kc/s. sweep.

(b) Rotate the A.F. GAIN A control of the No. 19 set fully counterclockwise.

(c) Switch the netting switch to NET.

(d) Adjust the signal generator frequency to a visual zero beat with the netting B.F.O. on the C.R.O. screen. (The condition where the two visual F.M. zero beats "cover each other off" vertically on the C.R.O. double pattern). Control the signal generator output and the C.R.O. vertical gain as required. This is done to correct for any error in the signal generator's F.M. oscillator, i.e.—to make certain that the **fundamental** F.M. fre-



T FZ 254/3 1 - 72

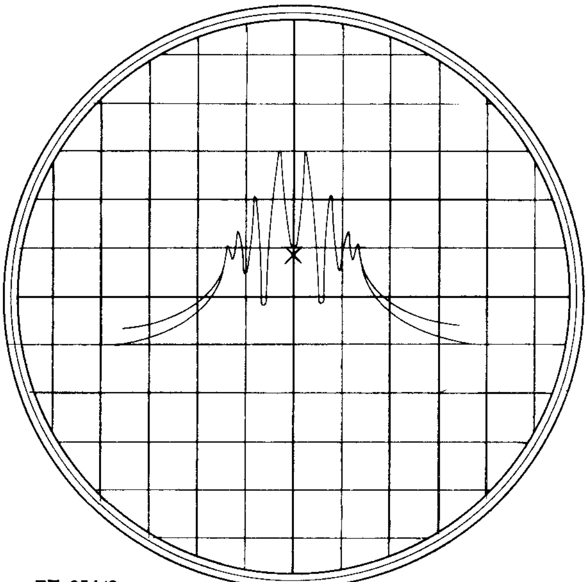
FIG. 72—CALIBRATING SIGNAL GENERATOR (A)

quency (centre of the 30 Kc/s. sweep) is exactly 465 Kc/s., the same as the frequency of the B.F.O.

(e) Point X on Fig. 72 marks each zero beat as the F.M. signal sweeps past the B.F.O., producing an audio beat note, and then sweeps back again. (Double Pattern).

(f) Varying the signal generator frequency causes the two zero beats to move towards or away from each other.

(g) When the two points marked X cover each other off vertically, the **fundamental** F.M. frequency is 465 Kc/s., or exactly the same as the frequency of the B.F.O. (See Fig. 73).



T FZ 254/3 / 1 - 73
FIG. 73—CALIBRATING SIGNAL GENERATOR (B)

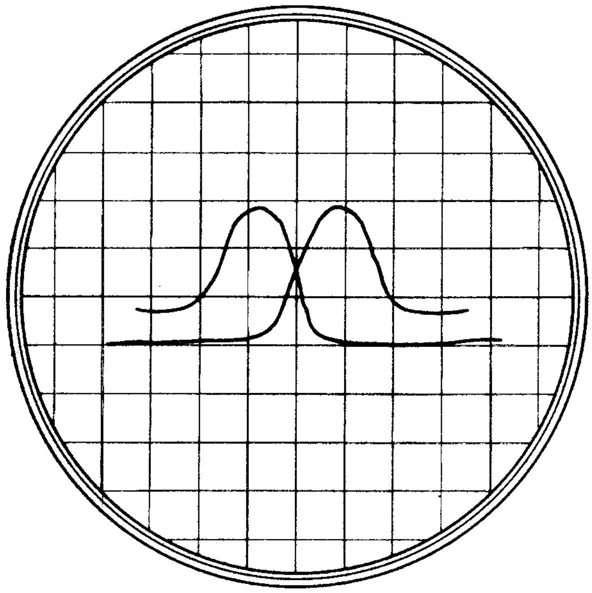
(h) Switch the netting switch to OFF.

107. L9A I.F. alignment is carried out as follows:

(a) Apply the output of the signal generator through a .01 μfd. condenser to the control grid cap of V1C (2nd I.F. amplifier) leaving the grid lead in position.

(b) Increase the output of the signal generator as required. (C.R.O. vertical gain fully ON).

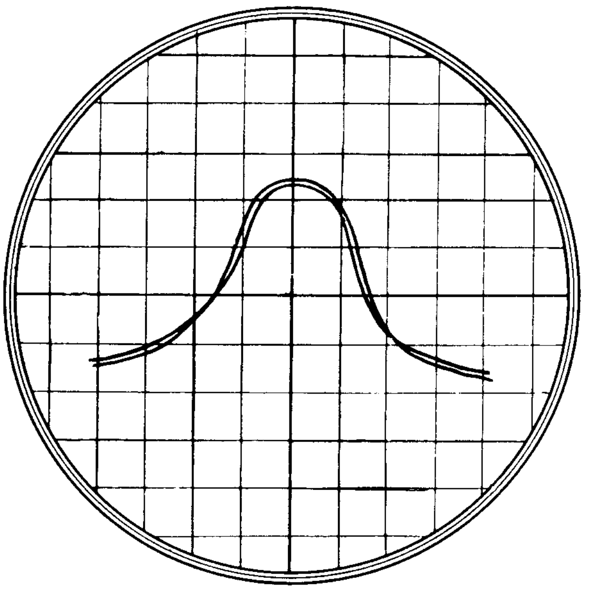
(c) The pattern on the C.R.O. may appear as in Fig. 74 or it may be INVERTED.



T FZ 254/3 / 1 - 74 FIG. 74—PRELIMINARY PATTERN

(d) Adjust the cores on both primary and secondary of I.F. transformer, L9A, until the pattern in Fig. 74 has the two "peaks" covering off, and these peaks are at the maximum possible amplitude. The peaks will move towards or away from each other as well as vary in amplitude as the cores are tuned.

(e) Adjust the signal generator output as required. The pattern on the C.R.O. should appear approximately as in Fig. 75 or it may be inverted.



T FZ 254/3 / 1 - 75 FIG. 75—L9A RESPONSE

(f) In all operations leave the C.R.O. vertical gain control almost fully on, and vary the signal generator output attenuator as required.

(g) The pattern centre in Fig. 75 need not be along the vertical centre line of the etched screen, but, the double pattern MUST COVER OFF.

(h) Seal or lock the cores (where applicable.) (See Para. 101).

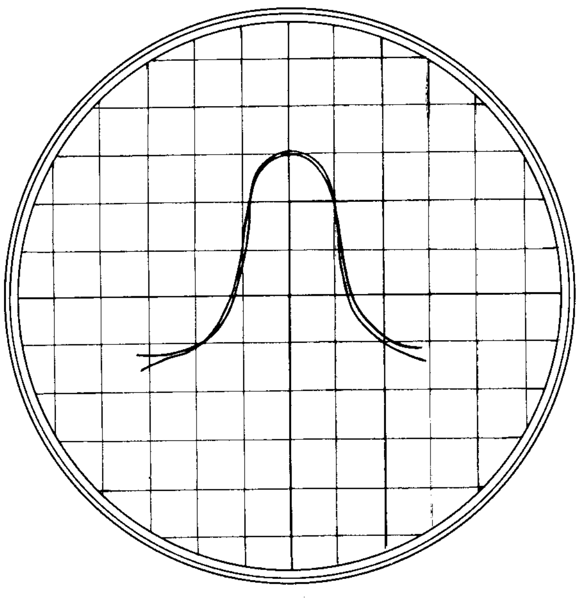
108. L8B, I.F. Alignment is carried out as follows:

(a) Apply the output of the signal generator through a .01 μfd. condenser to the control grid cap of V1B (1st I.F. Amplifier) leaving the grid lead in position.

(b) Decrease the output of the signal generator as required.

(c) Adjust the cores of I.F. transformer, L8B, until the two peaks of the C.R.O. double pattern are covering off and are the maximum possible amplitude. The pattern should appear approximately as in Fig. 76 or it may be inverted.

(d) Seal or lock cores (if necessary). (See Para. 101).



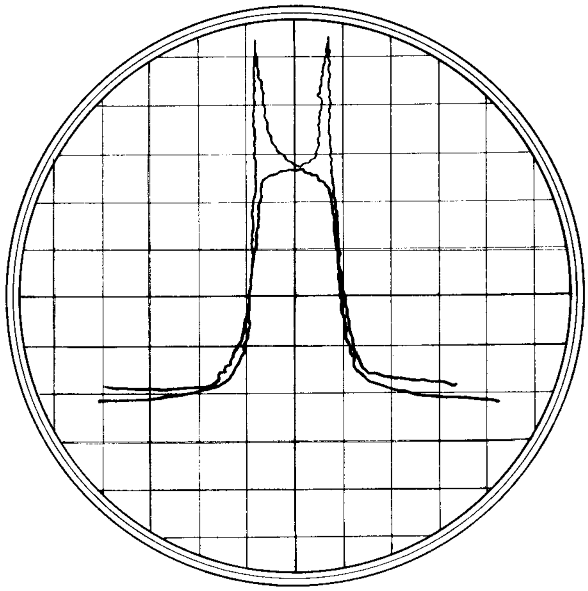
T FZ 254/3 1 - 76 FIG. 76—L8B RESPONSE

109. L8A, I.F. Alignment is carried out as follows:

(a) Apply the output of the signal generator through a .01 μfd. condenser to the control grid cap of V2A (Receive mixer) leaving the grid lead in position.

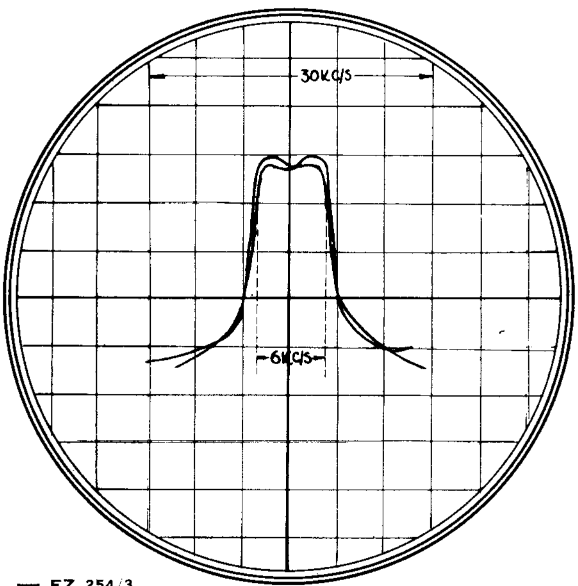
(b) Reduce the C.R.O. vertical gain slightly.

(c) Vary the signal generator output as required.



T FZ 254/3 1 - 77 FIG. 77—L8A RESPONSE

(d) Adjust the cores of I.F. transformer, L8A, until the two sides of the C.R.O. double pattern are covering off and are the maximum possible amplitude. The pattern should appear approximately as in Fig. 77 or it may be inverted.



T FZ 254/3 1 - 78

FIG. 78—I.F. CHANNEL RESPONSE

(e) Now slightly adjust the cores on L8A (one in and one out) until the sharp peaks of the double pattern in Fig. 77 are "pulled in" somewhat as shown in Fig. 78. Do not overdo this or I.F. sensitivity will be sacrificed. During this operation increase the output of the signal generator as required.

(f) Seal or lock the cores (if necessary). (See Para. 101).

(g) Fig. 78 is now a true picture of the proper symmetrical response curve of the I.F. channel.

I.F. & B.F.O. ALIGNMENT USING OUTPUT METER (OPTIONAL)

Equipment Required

110. The following equipment (or equivalent) will be used:

(a) Generator, Signal, Hickok, No. 19X.
(b) Meter, Output Power, G.R. No. 583A.

OR

A.C. Voltmeter, 0—5 volts r.m.s., and a 100 ohm, ¼ W., non-inductive resistor.

OR

Decibel meter, —8 to +8 Dbs., calibrated against a 0 Db. reference level of 6 mW. across a 500 ohm load; and a 100 ohm, ¼ W., non-inductive resistor.

(c) 10,000 ohm, ¼ W., non-inductive resistor.

(d) .01 μfd., 200 V., paper condenser.

Procedure (General)

111. (a) Proceed as in Para. 103 and Table 46 but LEAVE THE No. 19 SET BASE PLATE ON except on R.C.A. Victor sets.

(b) Remove the 12-pt. connector from the communications outlet, PL2A, at the lower left of the No. 19 set front panel.

(c) Connect:

(i) An output meter between the No. 19 set chassis ground, and "A" phone output, pin 4 of PL2A. Adjust the output meter for 100 ohms impedance.

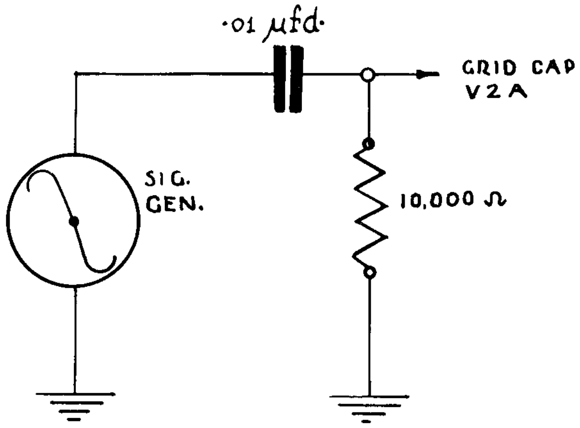
OR

(ii) An A.C. Voltmeter (0—5) between the No. 19 set chassis ground and pin 4 of PL2A in parallel with a 100 ohm resistor.

OR

(iii) A Db. meter between chassis ground and pin 4 of PL2A in parallel with a 100 ohm resistor.

(d) Connect the signal generator to the grid cap of V2A by the circuit shown in Fig. 79. The grid lead **must** be removed from V2A.



T FZ 254/3 1 - 79 Fig. 79—I.F. Input Circuit

I.F. Alignment Procedure

112. (a) Set the signal generator to 465 Kc/s. amplitude modulated 30% by a 400 c.p.s. note.

(b) Adjust the signal generator output until a deflection is noted on the output meter.

(c) Peak the six I.F. cores for maximum output, reducing the input signal strength progressively as required. The I.F. cores are to be adjusted in the following order:

(i) 3rd I.F. transformer (L9A).

(ii) 2nd I.F. transformer (L8B).

(iii) 1st I.F. transformer (L8A).

(d) Adjust the signal input to the No. 19 set until the output meter indicates:

(i) 50 mW. (Output meter)

OR

(ii) 2.24 volts r.m.s. (A.C. voltmeter)

OR

(iii) +2.21 Db. (Db. meter).

(e) Note the microvolts input required to give the output shown in (d) above. This should lie between the limits of 50 and 200 µV. (Average is 60 to 100 µV.).

(f) Should the sensitivity figure shown in (e) above lie below 50, I.F. oscillation may result, so the following action should be taken to decrease sensitivity to approximately 60 µV.: (assume sensitivity to be 35 µV.).

(i) Note the difference between the actual sensitivity and 60 (25 µV.).

(ii) Adjust the TOP core of L8A **clockwise** until sensitivity figure is altered half way to 60 (47½ µV.).

(iii) Adjust the BOTTOM core of L8A **counterclockwise** until the sensitivity becomes 60 µV.

(g) Seal or lock I.F. cores, where necessary. (See Para. 101).

B.F.O. Calibration

113. (a) "Rock" the signal generator frequency until the output meter deflection is at maximum (centre of I.F. channel). This must lie between 463 and 467 Kc/s.

(b) Switch the signal generator to Unmodulated R.F.

(c) Switch S/C-105B to NET and adjust the core of the B.F.O. coil, L5A, to zero beat. (Headphones may be connected now if desired).

(d) Seal or lock the B.F.O. core where necessary (see Para. 101) and switch the net switch to OFF.

I.F. AND B.F.O. TESTS

General

114. The tests described in Paras. 115-117 (incl.) will be carried out on completion of I.F. and B.F.O. alignment.

Sensitivity and Alignment

115. The sensitivity and alignment of the I.F.'s and B.F.O. must conform to the specifications given in Paras. 112 (e) and 113. For trouble shooting information, a list of approximate I.F. sensitivities follows:

Control grid, V1C....200,000 µV.

Control grid, V1B.... 3,000 µV.

Control grid, V2A 50 µV.

Bandwidth

116. The band width shall be tested as follows:

(a) Adjust the modulated signal generator to two times the sensitivity figure obtained in Para 112 above. Detune the signal generator plus and minus from 465 Kc/s. until the output meter reads standard (50 mW.). Note the plus and minus frequency settings. The band width should be more than 6 Kc/s.

(b) Repeat (a) above, using 1000 times sensitivity input. The band width should be less than 40 Kc/s.

(c) This specification need not be rigid and no action is necessary unless serious trouble is indicated.

HET TONE Control

117. (a) Adjust the signal generator for PURE R.F. (approximately 465 Kc/s.) and using the net switch, tune the signal generator to zero beat (headphones).

(b) Switch S7A to C.W. and rotate the HET TONE control. The beat note frequency range should vary from 700 to 1800 c.p.s., and should never fall much below the 700 limit.

ADJUSTMENT OF DIAL INDEX BRACKETS AND STOPS

Dial Stops

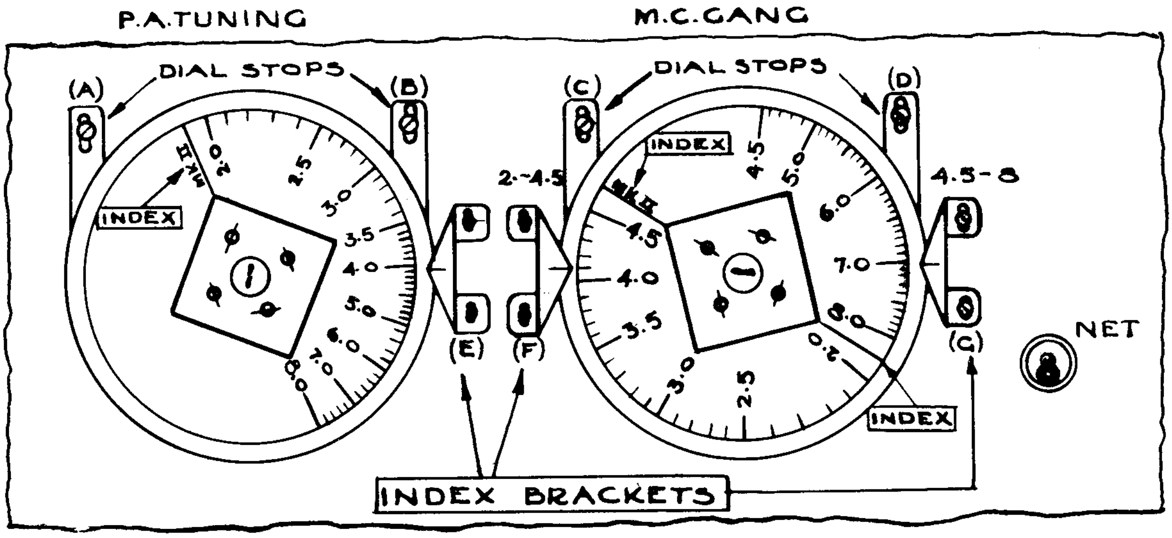
118. The dial stops for the P.A. dial, marked (A) and (B), and those for the M.C. gang, marked (C) and (D) on Fig. 80 may be moved up or down a limited amount by means of a slot and set screw. The purpose of these dial stops is to protect the main tuning condensers from damage and strain due to rough use.

Index Brackets

119. The index bracket for the P.A. dial is marked (E) on the diagram (Fig. 80); for the M.C. gang 2.0—4.5 range, it is marked (F) and on the 4.5—8.0 range, (G). These index brackets may be moved up or down a limited amount by means of a slot and set screw. They are used to aid in dial calibration.

Index Lines

120. The index lines, indicated by labelled arrows on Fig. 80, aid in setting the index brackets for initial dial calibration.



T FZ 254/3 1 - 80

FIG. 80—DIAL STOPS AND INDEX BRACKETS

PROCEDURE

121. To adjust the dial stops and index brackets on the M.C. gang:

(a) Slacken off the set screws on dial stops (C) and (D).

(b) Turn the M.C. gang to maximum capacity (fully clockwise).

(c) Set index bracket (G) so that its indicating mark is lined up with the index line (Mk. II) near the figure 4.5 on the dial.

(d) Set the index bracket (F) so that its indicating mark is lined up with the unmarked index line between the figures 2.0 and 8.0 on the M.C. dial.

(e) Set the dial stop (C) so that the condenser gang is just prevented from being fully closed.

(f) Rotate the M.C. gang to minimum capacity (fully counterclockwise).

(g) Set dial stop (D) so that the condenser gang is just prevented from being fully opened.

122. To adjust the P.A. dial stops and index brackets (see Fig. 80):

(a) Slacken off set screws to dial stops (A) and (B).

(b) Rotate the P.A. condenser to maximum capacity (fully clockwise).

(c) Set index bracket (E) so that its indicating mark is lined up with index line (Mk. II) near figure 2.0 on the dial.

(d) Set the dial stop (A) so that the P.A. condenser is just prevented from being fully closed.

(e) Rotate the P.A. condenser to minimum capacity (fully counterclockwise).

(f) Set dial stop (B) so that the condenser is just barely prevented from being fully opened.

"A" RECEIVER OSCILLATOR AND R.F. ALIGNMENT

EQUIPMENT REQUIRED

123. The following equipment will be used:

(a) Generator, Signal, Hickok, No. 19X.

(b) Aligning tool.

(c) .01 μfd., 200 V., paper condenser.

(d) .002 μfd., paper condenser, 200 V.

GENERAL

124. (a) The A.V.C. meter may be used as a tuning meter as it will give a decided dip when the signal is tuned in. Trimmers should always be adjusted for maximum dip.

(b) The signal generator must be coupled to V1A grid through a blocking condenser, or A.V.C. will be short circuited, and the meter will not indicate.

(c) It is possible, on the H.F. band, to align the set to a "false peak", so care must be taken, as outlined in

Para. 126 (c) and (d), to test for a false peak.

125. (a) Proceed as in Para. 103 and Table 46.

(b) Set the flick levers to FLICK.

(c) Set the signal generator for a powerful 8.0 Mc/s. signal, amplitude modulated 30% by a 400 c.p.s. note.

(d) Ground the signal generator to the No. 19 set and apply the output through a .002 μfd. condenser to the control grid of V1A, the grid lead being left on.

Receiver Alignment, H.F. Band (4½—8.0 Mc/s.)

126. (a) Adjust the oscillator trimmer, C35A (on top of the M.C. gang) until a signal is heard in the phones; and peak by adjusting until maximum dip is obtained on A.V.C. meter. Adjust the signal generator output as required.

(b) Peak R.F trimmer, C10A, (on top of M.C. gang) for greatest volume (or maximum meter dip).

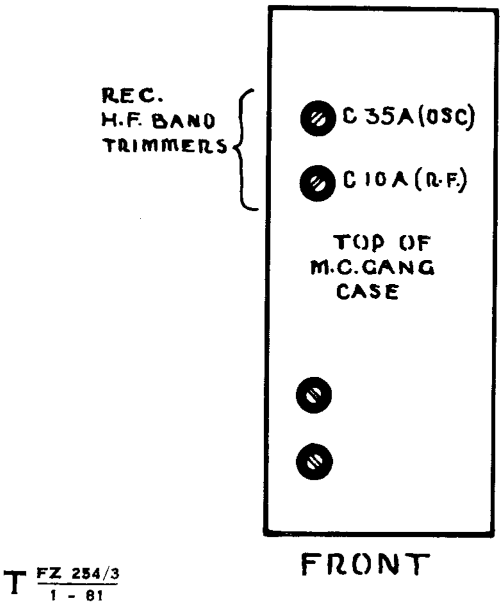


Fig. 81—Location of H.F. Band Osc. and R.F. Trimmers

(c) Tune the M.C. gang to approximately 7.07 Mc/s. Increase the signal generator output and tune around 7.07 Mc/s. position to ascertain if an "image" signal can be heard. LEAVE THE SIGNAL GENERATOR AT 8 Mc/s. DURING THIS STEP.

(d) If an image is heard, then the No. 19 set is tuned to the correct peak. If an image is NOT heard, retune the M.C. dial to 8.0 Mc/s. and repeat steps (a) to (c) above, searching for a signal with a different setting of C35A as the present signal is a "false peak".

(e) Tune the signal generator and M.C. dial to 4.5 Mc/s.

(f) Tune the M.C. gang until the signal is picked up at maximum strength, as indicated on the meter.

(g) Set the right hand index bracket (G) exactly on 4.5 Mc/s.

(h) Tune the signal generator, and M.C. gang to 8.0 Mc/s. again.

(i) If necessary, readjust the oscillator trimmer and then the R.F. trimmer to get maximum signal at exactly 8.0 Mc/s. on the dial.

(j) Tune the signal generator, and M.C. gang to 6 Mc/s.

(k) Tune the M.C. gang to pick up the signal. It must be within ±½ a dial division of the 6 Mc/s. mark on the dial as well as at 4.5 Mc/s. and 8.0 Mc/s.

(l) If the signal is picked up beyond the limits in (k) above, repeat steps (e) to (k) inclusive.

Receiver Alignment, L.F. Band (2.0—4.5 Mc/s.)

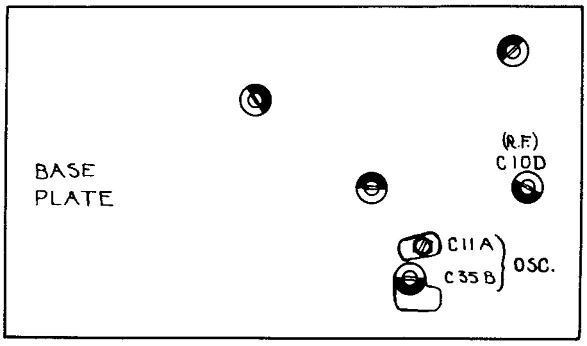
127. (a) Switch the band switch, S11A, to the 2.0—4.5 Mc/s. band.

(b) Tune the signal generator and the M.C. gang to 4.5 Mc/s. (The frequency of the M.C. gang is now read on the L.F. band as indicated by the left hand index bracket).

(c) Adjust the L.F. band oscillator trimmer, C35B, located as shown in Fig. 82. This trimmer can be reached through a hole in the base plate. Adjust slowly, until the signal is heard, and brought to maximum (greatest meter dip).

(d) Adjust the low band R.F. trimmer, C10D, (see Fig. 82 for location). This trimmer can be reached through a hole in the base plate. Adjust for maximum output (or meter dip).

(e) Tune the signal generator and M.C. gang to 2.5 Mc/s.



T FZ 254/3 / 1 - 82

FIG. 82—LOCATION OF L.F. BAND OSC. AND R.F. TRIMMERS

(f) Tune padder condenser, C11A, for maximum gain. This padder is located beside the I.F. oscillator trimmer, C35A and can be reached through a hole in the base plate. (See Fig. 82). If C11A does not materially affect the output, tune the M.C. gang for maximum signal.

(g) Set the left hand index bracket of the M.C. dial exactly on 2.5 Mc/s.

(h) Repeat steps (b) to (d) inclusive.

(i) Tune the signal generator, and M.C gang to 3.5 Mc/s. Tune in signal with the M.C. gang for maximum volume.

(j) The signal must come within $\pm 1/3$ of a division of 3.5 Mc/s. on the M.C. dial, as well as at 2.5 Mc/s. and 4.5 Mc/s.

(k) If the signal is beyond the limits of (j) above, repeat steps (e) to (j).

"A" RECEIVER TESTS

GENERAL

128. On completion of the Oscillator and R.F. alignment the tests described in Paras. 131—143 (incl.) will be carried out.

EQUIPMENT REQUIRED

129. The following equipment (or equivalent) will be used:

(a) Generator, Signal, Hickock, No. 19X.

(b) Meter, Output Power, G.R. No. 583A.

OR

A.C. Voltmeter, 0—5 volts r.m.s., and a 100 ohm, ¼ W., non-inductive resistor.

OR

Decibel Meter, —8 to +8 Dbs., calibrated against a 0 Db. reference level of 6 mW. across a 500 ohm load; and a 100 ohm, ¼ W., non-inductive resistor.

(c) 45 $\mu\mu$fd. mica condenser, 400 V.

(d) .002 μfd., 200 V. paper condenser.

PROCEDURE (GENERAL)

130. (a) Remove the 12-pt. connector from the communications outlet, PL2A, on the No. 19 set front panel.

(b) Connect an output meter, A.C. voltmeter, or a Db. meter between pin 4 of PL2A and chassis ground.

Adjust the output meter for 100 ohms impedance, or shunt the A.C. voltmeter or Db. meter with a 100 ohm resistor.

(c) Connect the No. 19 set to the variometer.

(d) Connect the signal generator to the variometer through a 45 $\mu\mu$fd. condenser, and ground the case to the chassis of the No. 19 set.

OVERALL SENSITIVITY ON R/T AND M.C.W.

131. (a) Adjust the signal generator for a 6.0 Mc/s. signal, amplitude modulated 30% by a 400 c.p.s. note.

(b) Properly tune the No. 19 set to the signal on R/T. With the R.F. GAIN A at maximum, adjust the signal generator and A.F. GAIN A controls for a 2:1 signal to noise voltage ratio (4:1 power ratio), so the output meter reads as in Table 47.

TABLE 47—SIGNAL TO NOISE RATIO ADJUSTMENT

Meter	Modulated	Unmodulated
Output meter	50 mW.	12½ mW.
A.C. Voltmeter	2.24 V. r.m.s.	1.12 V. r.m.s.
Db. meter	+2.21 Db.	—3.81 Db.

(c) The input required to obtain the output readings shown in Table 47 shall not be greater than 5 μV.

(d) Repeat the above tests on M.C.W. The signal should be as clear and undistorted as it was on R/T.

(e) Repeat steps (a) to (d) above at 2.5 Mc/s.

OVERALL SENSITIVITY ON C.W.

132. (a) Tune the signal generator to 2.5 Mc/s. unmodulated.

(b) Properly net the No. 19 set to the signal.

(c) Switch S7A to C.W. and adjust the HET TONE control for a 1000 c.p.s. note.

(d) Adjust for signal to noise ratio readings as in Table 47, except that the "Modulated" readings are taken with the receiver on C.W. and the "Unmodulated" readings with the receiver on R/T. The signal generator is left on PURE R.F. during this test.

(e) The input required shall be not greater than 10 μV.

(f) If more than 10 μV. is required, replace V2B.

TABLE 48—R.F. SENSITIVITY REQUIRED FOR 50 mW. (2.25 V.) INTO A 100 OHM LOAD

Freq. Mc/s.	Signal Generator Output Applied To:			Allowable M.C. Dial Error	Allowable P.A. Dial Error
	Control grid of Mixer, V2A.	Control grid of V1A.	"A" Aerial socket on front panel	Dial Divisions	Dial Divisions
	Microvolts	Microvolts	Microvolts		
8.0	Average 50	Less than 10	Less than 5	SET	±1
6.0	Average 65	Less than 15	Less than 5	±½	±¾
4.5	Average 80	Less than 20	Less than 5	±¼	±1¼
	SWITCH S11A TO 2.0—4.5 MC/S. BAND				
4.5	Average 50	Less than 10	Less than 5	SET	±1¼
3.5	Average 50	Less than 15	Less than 5	±1/3	±1
2.5	Average 70	Less than 20	Less than 5	±¼	±¾
	Reference only	Reference only	Reference only	TEST	TEST

133. (a) If the set will not meet the sensitivity specifications shown in Table 48:

(i) Change the receiver valves

OR

(ii) Realign, if necessary

OR

(iii) Trouble shoot as required.

(b) If the set will not meet the M.C. calibrations tests:

(i) Realign.

(ii) If realignment does not correct, tracking of the local oscillator section of the M.C. gang condenser is required. This is done by bending the trimming tabs AND THIS MUST BE CARRIED OUT BY AN ARMAMENT ARTIFICER (WIRELESS) ONLY.

(c) If the P.A. tuning will not track within the proper limits, adjustments on tuning condenser tabs or coil, L3A, must be carried out by an ARMAMENT ARTIFICER (WIRELESS) ONLY.

FLICK ADJUSTER RANGE TEST

134. (a) The frequency shift, due to operation of the FLICK ADJ shall not be less than:

±700 c.p.s. at 2.0 Mc/s.

±900 c.p.s. at 4.5 Mc/s.

±3000 c.p.s. at 4.5 Mc/s.(H.F.Band).

±3500 c.p.s. at 8.0 Mc/s.

(b) The frequency shift shall not be more than:

±1500 c.p.s. at 2.0 Mc/s.

(c) The detent in the zero (central) position shall be distinctly noticeable, and the reset error at 4.5 Mc/s. on the L.F. band shall not exceed ±230 c.p.s.

R.F. GAIN CONTROL TEST

135. (a) With the R.F. GAIN control fully clockwise, and the signal generator at 6.0 Mc/s., (modulated) tune in the signal.

(b) Adjust the input signal for "Standard" output (50 mW.) and note the input (μV.).

(c) Turn the R.F. GAIN control fully counterclockwise, and increase the input to once again obtain "Standard" output. The input required should be at least 1000 times the input in (b) above.

(d) Return the R.F. GAIN control to maximum.

IMAGE RATIO TEST

136. (a) Adjust a signal generator for 10 μV. at 6.0 Mc/s. (modulated).

(b) Tune the signal in with the set on R/T and with all gain controls at maximum. Adjust the No. 19 set A.F. GAIN A control for "Standard" output..

(c) Tune the signal generator to the image frequency (approximately 6.93 Mc/s.).

(d) Increase the signal generator output and tune the signal generator accurately, until the No. 19 set output is once again "Standard".

(e) The required input in (d) above shall not be less than 2500 μV.

(f) Repeat at 3.5 Mc/s. The image frequency is approximately 4.43 Mc/s. and the input required should be not less than 15000 μV.

I.F. REJECTION RATIO

137. On completion of Para. 136, adjust the signal generator to 465 Kc/s. The signal inputs required for "Standard" (50 mW.) output shall not be less than:

1.0 V. at 3.5 Mc/s.

1.0 V. at 6.0 Mc/s.

SELECTIVITY TESTS

138. (a) Adjust the signal generator for 10 μV. input at 2.5 Mc/s. (Modulated) and tune in the signal on the No. 19 set.

(b) With the A.F. GAIN A at maximum, adjust the R.F. GAIN A control for "Standard" (50 mW.) output.

(c) Increase the input to 20 μV. and detune the signal generator plus and minus until "Standard" No. 19 set output is reached. Note the settings of the signal generator.

(d) The band width shall be not less than 6 Kc/s.

(e) Repeat, using 100,000 μV. The band width shall be not more than 60 Kc/s.

RECEIVER POWER OUTPUT TEST

139. With sufficient input from the signal generator at 2.5 Mc/s. (modulated) and with all the No. 19 set gain controls at maximum, the output must be capable of exceeding:

150 mW. (Output meter)

OR

3.87 volts r.m.s. (A.C. voltmeter)

OR

+6.98 Db. (Db. meter)

The harmonic distortion shall not exceed 20%. (See Para. 61).

FIDELITY TEST

140. Operate the "A" receiver on R/T with an input signal of 1000 μV. at 2.5 Mc/s. The A.F. GAIN A control shall be adjusted for "Standard" output (50 mW.) when the source is modulated 30% at 400 c.p.s. At other modulation frequencies the output powers shall not be less than the figures shown in Table 49.

TABLE 49—RECEIVER OUTPUT READINGS

		Modulation Frequencies C.P.S.		
		150	400	3000
Output	mW.	8	50	2.5
	r.m.s. volts	.89	2.24	
	Db.	—5.73	+2.21	—10.8

A.V.C. TEST

141. (a) Adjust the signal generator to an output of 6.0 Mc/s. 30% amplitude modulated by 400 c.p.s. Apply the signal generator output to the "A" aerial socket on the front panel of the No. 19 set, through a .002 μfd. condenser.

(b) Adjust the signal generator attenuator output to 100 μV.

(c) Tune in the signal exactly on the No. 19 set (R/T).

(d) Increase the signal generator output to 100,000 μV.

(e) Adjust the No. 19 set A.F. GAIN A control so that the output is exactly 50 mW., 2.25 V. r.m.s. or +2.21 Db.

(f) Decrease the signal generator output to 10,000 μV.

(g) The receiver output should be more than 10 mW., 1 V. r.m.s., or —4.77 Db.

(h) Decrease the signal generator output to 100 μV.

(i) The receiver output should be more than 2.5 mW., .5 V. r.m.s., or —10.8 Db.

(j) If the A.V.C. will not meet the above tests:

(i) Replace V3A.

(ii) Trouble-shoot as required.

FLICK TESTS

142. (a) See that the M.C. and P.A. dials are secure on their shafts. Tighten the dial set screw, or backlash may be noticed when turning the dials.

(b) At the top and just inside the front panel, immediately above the M.C. and P.A. dials are small leaf springs secured at the base by screws. These springs control the flick mechanism, and if the securing screws are loose they must be tightened to prevent the flick positions from becoming sloppy, resulting in a large flick error.

(c) Switch the signal generator to PURE R.F., and set for 5 μV. input at 6.0 Mc/s.

(d) Slacken off all flick locking screws on the No. 19 set.

(e) Turn the flick levers to FLICK and turn the No. 19 set M.C. and and P.A. dials until both "flaps" appear in the two flick windows above each dial (white showing).

(f) Turn the flick levers to SET and switch S/C-105B to NET.

(g) Net the No. 19 set to zero beat with the signal generator and tighten the blue flick screws.

(h) Check the netting again after tightening the blue flick locking screws. If not at zero beat, correct by using the FLICK ADJ control.

(i) Turn the flick lever from SET to FLICK. The frequency must not shift by more than ±1800 c.p.s. If it does the M.C. gang needs replacing. Return to zero beat position by using the FLICK ADJ control.

(j) Rotate the M.C. gang fully clockwise, and return to the "flick" position.

(k) Check for netting accuracy. It should return to the original position within ±3000 cycles, judged aurally. Repeat this step several times.

(l) Repeat step (k) above, turning the M.C. gang counterclockwise.

(m) Tune the signal generator to PURE R.F., with 5 μV. input at 3.5 Mc/s.

(n) Repeat steps (g) to (l) inclusive, using the RED flick locking screws instead of the blue. Returnability = ±1750 c.p.s.

(o) If the flick error is too great, strip the flick mechanism and replace.

NOISE TEST

143. (a) With the signal generator set to 6.0 Mc/s., PURE R.F. (5 μV.) and the signal generator output applied to the "A" aerial socket, tune in the signal on the No. 19 set.

(b) Tap all around the set with a rubber mallet or other cushioned percussion instrument and listen for noise. Tap the front panel, chassis, top of M.C. gang case, I.F. transformers and valve shields.

(c) Replace any noisy valves, and investigate for faulty connections or intermittent short circuits if noise is still heard in the headphones.

"A" Sender

"A" SENDER ALIGNMENT

EQUIPMENT

144. The following equipment (or equivalent) will be used:

(a) Dummy 807 valve (pin 2 removed)

(b) Test Set, Voltohmyst, R.C.A. No. 165.

OR

30 Volt Battery.

(c) Shorted dummy key plug.

PROCEDURE (GENERAL)

145. (a) Remove the No. 19 set from its case and remove the base plate.

(b) **Make certain** that the cover is on the shielded coil can containing L21A and L7A.

(c) Paste a piece of paper ¼″ x 1½″ horizontally across the centre of the the No. 19 set meter crystal.

(d) Switch the meter to DRIVE.

(e) Remove V4A and insert a "dummy valve". This prevents overloading of the power supply.

(f) Set the following No. 19 set switches to the positions shown:

S10B (B ON-OFF) to OFF.
S10C (I.C. ON-OFF) to OFF.
S/C-104A (A ON-OFF) to ON.
S7A to R/T.
S11A to 4½—8 Mc/s.
Flick levers to FLICK.

(g) Properly connect the No. 19 set to its supply unit. All aerial leads must be left off.

(h) Switch the control units to "A" and "N".

(i) Turn the supply unit switch to OFF.

LOCATING MINIMUM DRIVE POINT ON METER

146. Two methods may be employed to locate the exact point below which the DRIVE must not be allowed to fall when drive circuits are aligned. (Approx. figure 5 on 15 V. meter scale). These two methods are described in Paras. 147 and 148.

147. Method 1 (optional):

Apply —30 V. between the junction of C34A—R15B and chassis as follows:

(a) Locate the variable ceramic trimmer, C 34A, and apply—30 V. from an external battery to the terminal of C34A that **does not** connect to pin 3 of V4A. Connect battery positive to chassis.

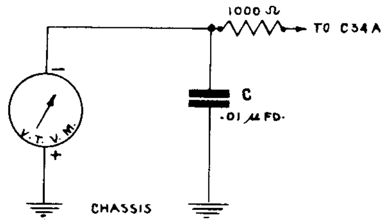
(b) Note the position of the No. 19 set meter needle when on DRIVE, and draw a line on the paper strip on the meter crystal to record this position.

(c) Remove external battery.

148. Method 2 (optional):

(a) Switch the supply unit ON (Vibr. or Dyn.).

(b) Use a vacuum tube voltmeter connected as shown in Fig. 83.



NOTE 1. R & C MUST BE CONNECTED AS CLOSE TO C 34 A AS POSSIBLE.

2. R & C MAY BE DELETED IF THE TEST METER USED IS THE R.C.A. VOLT OHMYST JR., WITH THE SHIELDED PROBE LEAD.

T $\frac{\text{FZ 254/3}}{\text{1 - 83}}$ FIG. 83—DRIVE TEST CIRCUIT

(c) Contact the probe of the V.T.V.M. to the terminal of C34A that **does not** connect up to pin 3 of V4A.

(d) Insert the dummy plug in the key jack to throw the "A" set relay to Send.

(e) Adjust R43A until the V.T.V.M. reads —30 V., D.C.

(f) Note the position of the No. 19 set meter needle when on DRIVE, and mark this position with a line on the paper strip on the meter crystal.

(g) Remove the V.T.V.M. and dummy key plug.

(h) During the above operations, if the V.T.V.M. voltage cannot be raised to the 30 V. mark, it may be necessary to quickly alter the settings of C10C and C10B to obtain a "drive peak". These trimmers are respectively the 1st and 2nd on top of the M.C. gang condenser.

DRIVE ALIGNMENT, H.F. BAND (4½—8 Mc/s.)

149. It is necessary to align the H.F. band before doing the L.F. band. Carry out the alignment in the following sequence:

(a) Using a screwdriver, rotate R43A fully COUNTERCLOCKWISE to place the maximum positive bias on V6A cathode, thus preventing the automatic drive control from functioning.

(b) ADJUST C34A TO APPROXIMATELY MAXIMUM CAPACITY.

(c) Replace the No. 19 set base plate temporarily, using two screws only.

(d) Tune the M.C. dial to 7.5 Mc/s.

(e) With S7A on R/T, insert the dummy plug in the key jack to throw the "A" relay to Send.

(f) Adjust trimmers C10C and C10B (See Fig. 84) until DRIVE reads maximum on meter.

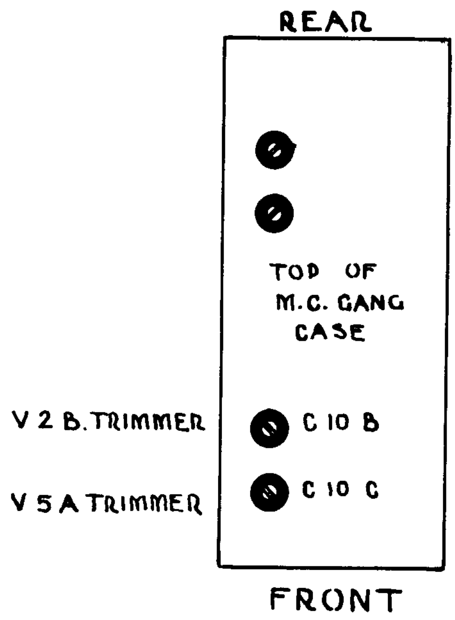


FIG. 84—LOCATION OF H.F. DRIVE TRIMMERS

T FZ 254/3 1 - 84

(g) Check for correct drive peak as follows:

(i) To check for the correct peak, momentarily short to chassis the oscillator grids of V2A and V2B (Pin 5) in turn. The drive reading on the meter should drop off sharply to almost zero.

(ii) The correct drive peak is the "difference beat frequency" produced by the local oscillator and the B.F.O. It is possible to tune the drive circuit to either the local oscillator frequency or a B.F.O. harmonic. These are false peaks, and the No. 19 set would not be sending on the same frequency that it is rereceiving.

(iii) As the correct peak required both the local oscillator and the B.F.O. for its production, "killing" each oscillator in turn by shorting its grid to chassis should kill the drive.

(iv) An incorrect peak will be indicated by the fact that while the drive may drop off when one oscillator grid is shorted, yet, when the other oscillator grid is shorted, the drive may either remain level, or even increase.

(h) If a "false peak" has been selected, detune C10B a quarter turn in either direction and retune C10C and C10B for another peak. Test for the proper peak as in (g) above. Repeat, if necessary, until the correct peak is found.

(i) Tune the M.C. gang slowly to 4.5 Mc/s. The drive should hold fairly level across the band, and, in any case, must NOT drop off below the "30 V." pencil mark made on the meter.

(j) If the drive reading does drop below this mark, check again for a correct peak. If it is correct, tune M.C. gang to the position of lowest drive and slightly retune either C10B or C10C, whichever appears to have the greatest effect, until the drive is brought **just safely above** the minimum line. DO NOT PEAK.

(k) Check the drive again across the entire band. It may vary but must stay above the pencil mark, between 8.0 and 4.5 Mc/s. Do not test over the blank portion of the dial below 4.5 Mc/s.

(l) Re-compensate, if necessary, as in (j) above, always checking for correct peak. When completed DO NOT TOUCH THESE TRIMMERS AGAIN.

DRIVE ALIGNMENT, L.F. BAND (2—4½ Mc/s.)

150. (a) Switch the band switch, S11A, to low band (2.0—4½ Mc/s.).

(b) The low band trimmers, C10E and C10F, are reached through holes in the chassis base plate, as illustrated in Fig. 85.

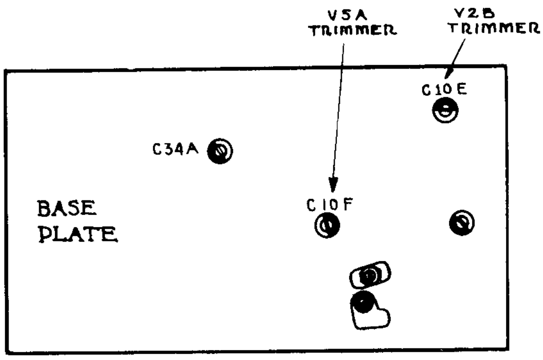


FIG. 85—LOCATION OF L.F. DRIVE TRIMMERS

T FZ 254/3 / 1 - 85

(c) Tune the M.C. gang to 4.5 Mc/s. (L.F. Band).

(d) Adjust trimmers C10E and C10F until drive reads maximum on meter.

(e) Check for correct drive peak as in Para. 149 (g). Re-peak if necessary.

(f) Tune the M.C. gang slowly to 2.0 Mc/s. The drive should hold fairly level across the band, and, in any case, must NOT drop off below the "30 V." pencil mark on the paper pasted to the meter crystal.

(g) If the drive does drop below this mark, check again for correct peak. If it is correct, **slightly** retune either C10E or C10F, whichever appears to have the greatest effect, until the drive is brought **just safely above** the minimum line. DO NOT PEAK.

(h) Check the drive again across the entire band from 4.5 to 2.0 Mc/s. It may vary but must stay above the minimum line (pencil mark).

(i) Re-compensate, if necessary, as in (g) above, always checking for correct peak.

(j) Remove the dummy plug from the key jack.

AUTOMATIC DRIVE CONTROL ADJUSTMENT

151. The Automatic Drive Control prevents drive from exceeding a pre-determined level, thus providing constant excitation for V4A at all frequencies. To adjust:

(a) Remove the base plate from the No. 19 set.

(b) Connect a V.T.V.M. or a 20,000 ohms per volt D.C. Meter across the two **wired** terminals of variable resistor, R43A, ignoring the third, unwired terminal.

(c) With the No. 19 set operating on Receive, adjust R43A by means of a screwdriver until the voltmeter reads +40 V., D.C.

(d) Seal the R43A adjustment with glyptal, or service cement, and replace the base plate.

(e) Insert the dummy plug in the key jack and throw the "A" set relay to Send.

(f) Check the drive on the high band between 8.0 and 4.5 Mc/s. and check on low band between 4.5 and 2.0 Mc/s. It should hold practically steady across both bands with a maximum allowable variation of ± 1 division on the No. 19 set meter, and at no time should it drop below the pencil mark on the meter.

If detuning the P.A. dial from resonance corrects a "dip" this adjustment is still correct.

(g) Remove the dummy plug from the key jack.

V4A EXCITATION ADJUSTMENT (C34A)

152. In the Mk. III set, V4A has automatic cathode bias. When the excitation to V4A grid is decreased by adjusting C34A, the reduced instantaneous cathode-plate current causes reduced bias so that the output is relatively constant. Conversely, increased excitation through C34A has a similar but opposite action on the bias. Any apparent change in output is due merely to C34A detuning the previous drive stage, and would be compensated for if the drive were re-peaked, as long as C34A is set above a certain minumum capacity. THEREFORE, ON THE Mk III SETS ONLY, C34A IS LEFT AT FULL CAPACITY, AS WHEN ALIGNING THE DRIVE.

"A" SENDER TESTS

EQUIPMENT REQUIRED

153. The following equipment(or equivalent) will be used:

(a) Oscillator, B.F. Clough Brengle No. 79E.

(b) Oscilloscope, C.R., Dumont No. 208.

(c) Wavemeter, T.E. 149.

(d) Test Set, Voltohmyst, R.C.A. No. 165.

(e) Attenuator Pad No. 1 (See Fig. 1).

(f) A.C. Voltmeter, 0—5 volts r.m.s. 1000 ohms per volt.

(g) Meter, Output Power, G.R. No. 583A.

OR

A.C. Voltmeter, 0—5 Volts r.m.s. and a 100 ohm, ¼ W. non-inductive resistor.

OR

Decibel Meter, —8 to +8 Dbs., calibrated against a 0 Db. reference level of 6 mW. across a 500 ohm load; and a 100 ohm, ¼ W., non-inductive resistor.

(h) "A" Sender Test Circuit (See Fig 86).

(i) Shorted dummy key plug.

PROCEDURE (GENERAL)

154. Properly connect up the No. 19 set for operation as in Para. 145.

AUTOMATIC DRIVE CONTROL ADJUSTMENT

155. Check, with a V.T.V.M., for 40 V. across R43A as in Para. 151. Replace the base plate.

DRIVE STABILITY

156. Check for constant drive across both bands. The drive must not vary more than ±1 division on the No. 19 set meter. (See Para. 151 (f)). The drive must not be below 3.5 V. on the No. 19 set meter (15 V. scale).

MODULATION AND SIDETONE TESTS (R/T AND M.C.W.)

157. (a) Connect the coaxial feeder and variometer to the "A" set.

(b) Connect the sender test circuit, Fig. 86, to the variometer, using the shortest possible leads.

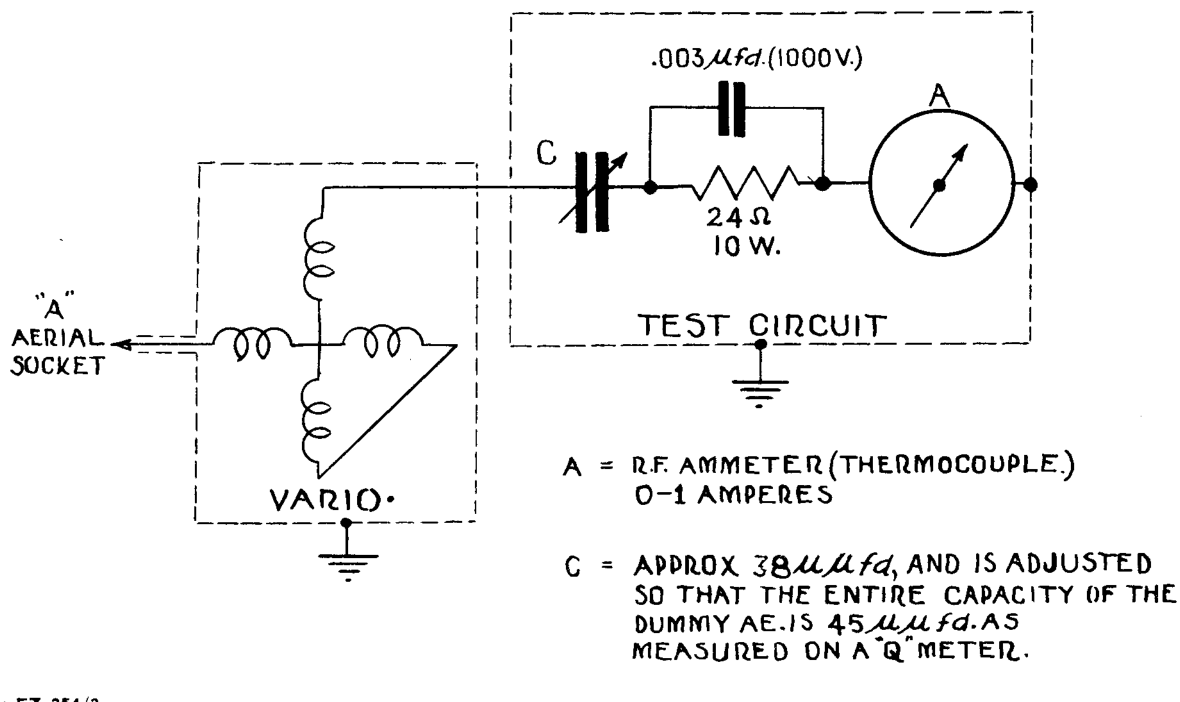
(c) Couple a C.R.O. loosely to the "A" sender by wrapping its insulated "Vertical Input" lead around the wire connecting the variometer to the dummy aerial. About two turns should suffice. Ground the C.R.O. case to the No. 19 set chassis.

(d) Adjust the C.R.O. for direct input; "Vertical Amplifier" OFF.

(e) Connect an output meter between pin 4 of PL2A and ground. (See Para. 111).

(f) Connect audio oscillator through attenuator pad to pin 1, PL-2A. (See Fig. 66).

(g) Insert the shorted dummy plug in the key jack to throw the "A" set relay to Send, and properly tune



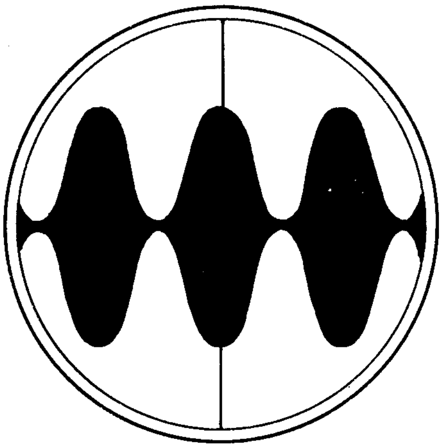
T FZ 254/3 1 - 86

FIG. 86—"A" SENDER TEST CIRCUIT

the No. 19 set for maximum R/T output at 8.0 Mc/s.

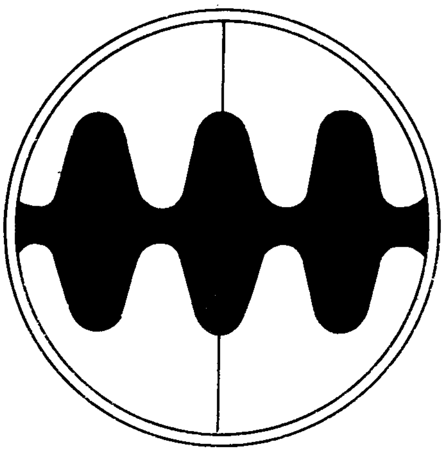
(h) Adjust the audio oscillator for 400 c.p.s., and increase the output until the C.R.O. shows 100% modulation when synchronized to the modulation envelope pattern. (See Fig. 87).

The set must be capable of 100% modulation.



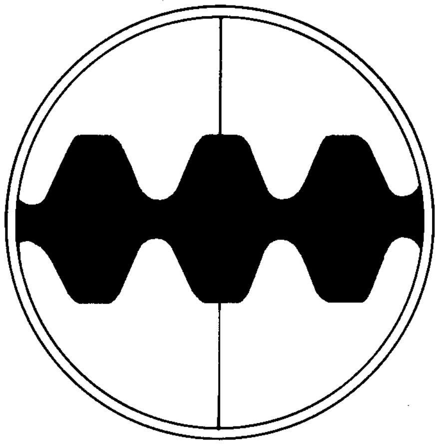
T FZ 254/3 1 - 87 FIG. 87—100% MODULATION

(i) Reduce the audio oscillator input to give 75% modulation. The C.R.O. modulation envelope should be free from distortion. (See Fig. 88).



T FZ 254/3 1 - 88 FIG. 88—75% MODULATION

(j) The C.R.O. pattern should not have flattened peaks as in Fig. 89. Slightly reduce the coupling of C34A to cure.



T FZ 254/3 1 - 89 FIG. 89—DISTORTION

(k) As measured across the audio oscillator terminals, the input volts required for 75% modulation shall not exceed:

1. V. (r.m.s.) at 400 c.p.s.
5. V. (r.m.s.) at 150 c.p.s.
7. V. (r.m.s.) at 5000 c.p.s.

(l) At 400 c.p.s. and 75% modulation, the sidetone output shall not be less than:

5. mW. (Output meter)

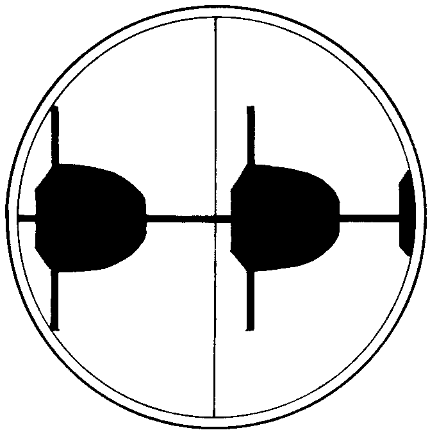
OR

.71 V. r.m.s. (A.C. voltmeter)

OR

− 7.78 Db. (Db. meter).

(m) Turn S7A to M.C.W. Synchronize the C.R.O. There must be well over 100% modulation, and the C.R.O. pattern should appear as in Fig. 90, and should be free from transient distortion.



T FZ 254/3 1 - 90 FIG. 90—M.C.W. PATTERN

(n) During (m) above, the M.C.W. side-tone reading shall NOT be less than:

60 mW. (Output meter)

OR

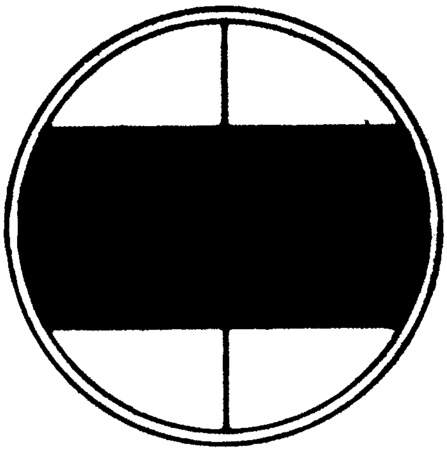
2.45 V. r.m.s. (A.C. voltmeter)

OR

+3 Db. (Db. meter).

(o) If headphones are momentarily shunted across the output meter, the M.C.W. note shall be between 600 and 1400 c.p.s., judged aurally.

(p) Switch S7A to C.W. The C.R.O. pattern should be approximately twice as wide as unmodulated R/T, and should be free from any transient modulation. (See Fig. 91).



T FZ 254/3 1 - 91 FIG. 91—C.W. PATTERN

DRIVE STAGE SELF-OSCILLATION (V5A)

160. At each test frequency in Table 50, momentarily short to chassis the mixer grid of V2B (grid cap). With the No. 19 set meter on DRIVE, the needle should drop to less than 2 V. on the 15 V. scale. Failure to do so indicates self-oscillation of V5A.

TABLE 50—SENDER R.F. OUTPUT READINGS

Frequency Mc/s.	Output R.F. Amps.			P.A. Dial Error (R/T)
	R/T Unmod.	M.C.W.	C.W.	
8.0	.313	.448	.63	±1 division
6.0	.383	.448	.63	±¾ division
4.5	.340	.448	.63	±1¼ division
		SWITCH S11A to 2—4½ Mc/s. BAND		
4.5	.340	.448	.63	±1¼ division
3.5	.260	.370	.63	±1 division
2.5	.250	.360	.45	±¾ division

R.F OUTPUT TEST

158. The sender R.F. output, as measured on the test circuit, (Fig. 86) must not be less than the readings shown in Table 50.

P.A. DIAL CALIBRATION

159. At each of the frequencies listed in Table 50, slightly detune the P.A. dial and re-peak the R.F. output by the variometer. "Rock" both these controls in this manner until the best possible combination setting for R.F. output is obtained. At each frequency, the P.A. dial setting must not vary from that of the M.C. dial by a greater amount than that shown in Table 50. (Also see Para. 133).

KEY JACK TEST

161. When on Send M.C.W. or C.W., wiggle and twist the dummy plug in the key jack to test for intermittent operation.

SENDER FLICK TEST (P.A. DIAL)

162. The M.C. dial has been tested (Para. 142), test the P.A. dial as follows:

(a) Properly adjust the No. 19 set sender for maximum output at 7.0 Mc/s. (R/T) and adjust the red flicks.

(b) Properly adjust the No. 19 set

sender for maximum output at 5.0 Mc/s. and adjust the blue flicks.

(c) At each flick position, with the flick selector level at FLICK:

(i) Note the reading of the aerial meter.

(ii) Detune the P.A. dial.

(iii) Return the P.A. dial to the flick position. The aerial reading should return to normal.

"A" Sender Frequency Stability (Under Vibration)

163. With the "A" sender on Send, R/T, at 5.0 Mc/s. and locked in the flick positions mentioned in Para. 162 carry out the following tests:

(a) Take a wavemeter of the oscillating detector type; attach a lead to the output terminal and place near the dummy aerial.

(b) Listen in on the wavemeter phones, and tune the wavemeter to zero beat with the No. 19 set sender.

(c) Pound the No. 19 set with a rubber mallet or other device. The frequency must not shift from zero beat more than 750 c.p.s. It may momentarily shift more than that amount but should return to within 750 c.p.s of zero beat.

(d) Note that pounding does not cause excessive modulation of the "A" sender carrier wave.

Netting Error Test

164. (a) Set the wavemeter to 5.0 Mc/s.

(b) Net the No. 19 set receiver to the wavemeter signal.

(c) Switch the No. 19 set to Send.

(d) Listen on the wavemeter headphones and tune the wavemeter to zero beat with the No. 19 set. Note the calibration of the wavemeter.

(e) The No. 19 set frequency shift from receive to send must not exceed ±750 c.p.s.

(f) Repeat at 2.5 Mc/s. Error not to exceed 350 c.p.s.

Variometer Tests

ADJUSTMENT OF R29A

165. R29A is the calibrating resistor for the variometer metal rectifier used to obtain an AE. current reading on the meter when the No. 19 set is on Send. These readings are only a tuning aid, and not a test of calibrated output. Hence, R29A should only be adjusted when the aerial current indicated on the No. 19 set meter is either too high or too low for accurate tuning. Before adjustment, try another No. 19 set in conjunction with the suspected variometer; as the set itself might be the offender. Alternatively, a No. 19 set R.F. output test circuit may be employed to ascertain normal output.

166. To adjust R29A:

(a) Connect the variometer (with end cover removed) into a normal No. 19 set installation, using the "A" Sender Test Circuit shown in Fig. 86.

(b) Locate L2B on meter board. Disconnect from L2B right terminal the Yel.-Br. lead which connects to the meter switch.

(c) Connect to the right term., L2B, the test circuit shown in Fig. 92.

(d) Tune the "A" set sender on C.W. at 6.0 Mc/s. for 600 Ma. R.F. output through dummy AE. meter.

(e) Using an aligning tool, adjust R29A for a D.C. output of 420 μA. on test circuit, Fig. 92.

(f) Seal with glyptal cement. Check after cement has dried to make certain that the adjustment has not altered.

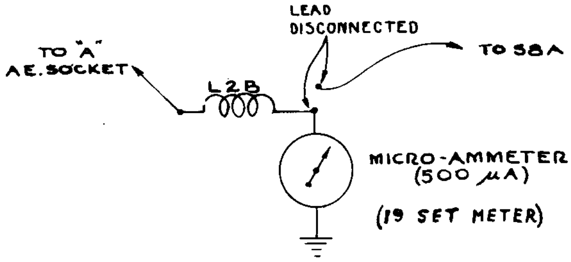


Fig. 92—R29A Test Circuit

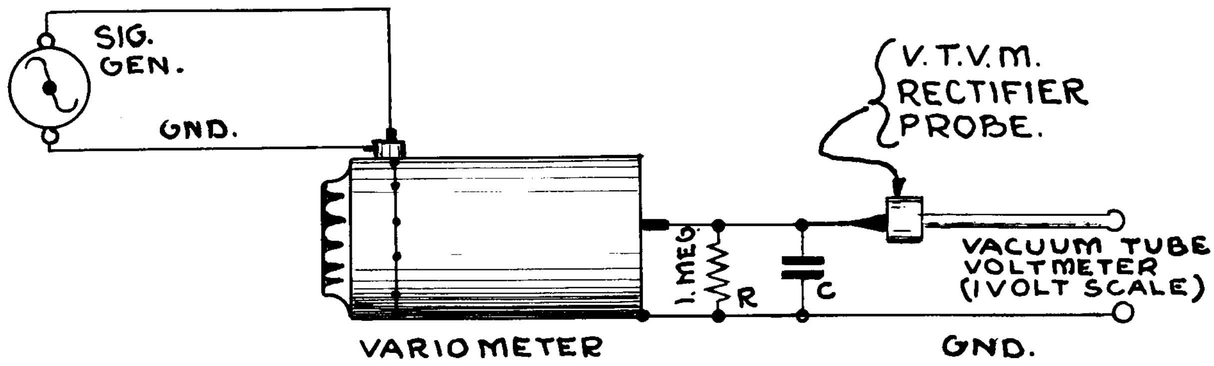
T1A D.C. OUTPUT RESPONSE

167. The response of the variometer meter transformer should also be checked at all frequencies from 2.0 to 8.0 Mc/s. at 400 Ma. R.F. current. (See Fig. 92). The D.C. output should not drop more than 50% between 6 and 2 Mc/s., nor should it rise more than 25% between 6 and 8 Mc/s., compared with the standard output obtained at 6.0 Mc/s.

RANGE COVERAGE AND GAIN TEST

Equipment Required

168. (a) Generator, Signal, Hickock, No. 19X ZB/C 00006.



T FZ 254/3 1 - 93

FIG. 93—VARIOMETER RANGE TEST CIRCUIT

(b) Voltmeter, Valve, G.R. No. 726A ZB/C 00035.

GENERAL

169. (a) The V.T.V.M. rectifier probe grid lead should be as short as possible, and should be connected to the fixing bushing on top of T1A.

(b) The value of C, Fig. 93, should be adjusted so that the total capacity across the rectifier probe is 45 $\mu\mu$fd. including leads and resistor.

PROCEDURE

170. (a) Connect the test circuit as shown in Fig. 93.

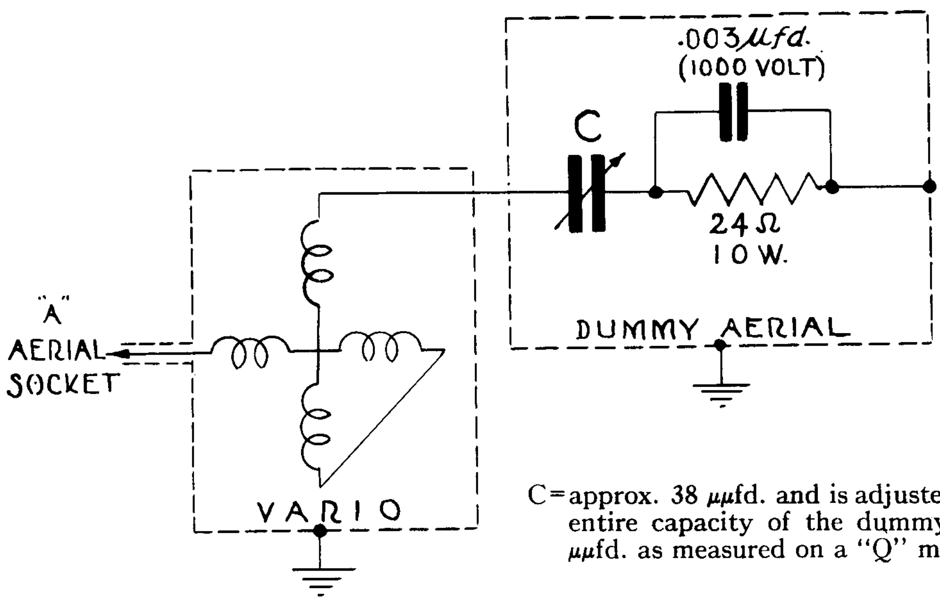
(b) The V.T.V.M. must read less than .5 V. for each test condition outlined in Table 51.

TABLE 51—VARIOMETER GAIN TEST

Signal Generator		Variometer Tuning
Freq. Mc/s.	Output mV.	
2.0	30	Not to tune below 20.
4.0	55	Not to tune below 85.
4.0	50	Not to tune below 165.
8.0	55	Not to tune below 106.

CALIBRATION TEST

171. When the variometer is connected to a No. 19 set and the standard dummy aerial (Fig. 94) the variometer should be capable of tuning for maximum R.F. output at 8.0 Mc/s. when its dial is set to not less than 106. The action of the shorting switch shall be such that there



C = approx. 38 $\mu\mu$fd. and is adjusted so that the entire capacity of the dummy AE., is 45 $\mu\mu$fd. as measured on a "Q" meter.

T FZ 254/3 1 - 94

FIG. 94—"A" SENDER DUMMY AERIAL

shall be a minimum of 1 variometer division between 8.0 Mc/s. maximum current point and the starting point. e.g.—with peak current at 106, the shorting point should occur at 105 or less.

RESIDUAL READING TEST

172. When the variometer on an "A" sender is untuned, the residual AE. reading shall not exceed 1 V. on the 15 V. scale of the No. 19 set meter.

Supply Unit Specifications and Tests

DYNAMOTOR

Armature Balance

173. The armature is to be dynamically balanced and the dynamotor shall be reasonably free from vibration.

Commutator Eccentricity

174. Commutator eccentricity must not exceed .001" when measured by the variation in reading of a dial type gauge resting on the working surface of the commutator while the armature is slowly turned. The surface of commutators shall be polished.

Lubrication

175. Special attention must be paid to lubrication of bearings to meet the low temperature operating test. Two possible lubricants are:

(a) Lubrico-M-6 (Masters Lubricating Company, Philadelphia, Pa.).

(b) Androk-C (Standard Oil Company of New Jersey.)

Bearings need only be packed with grease after extensive use. (e.g., when commutators require undercutting in the shop).

Brush Bedding

176. The dynamotors shall be run at their specified voltage and on rated load until carbon brushes are 75% to 80% bedded.

Nominal Rating

177. The nominal rating is shown in Table 52.

Load Ratings

178. The dynamotor load ratings are as follows:

265 V. winding—2,200 ohms.
540 V. winding—20,000 ohms.
24 V. connection—3.75 ohms across 12 V. winding connection.

Insulation Flash Test

179. The windings shall be subjected to and shall pass the breakdown tests outlined in Table 53.

Table 52—Dynamotor Nominal Rating

Parallel Connection	Voltage	Current
Primary	12 volts	10 amps. max.
Secondary	265 volts ±3%	120 Ma.
Secondary	540 volts ±3%	26 Ma. (capable of delivering up to 65 Ma. at not less than 490V.).
Series Connection		
Primary	24 volts	6.5 amps. max.
Secondary	265 volts ±3%	120 Ma.
Secondary	540 volts ±3%	26 Ma. (capable of delivering up to 65 Ma. at not less than 490 V.).
Primary Tap Load	12 volts ±3%	3.2 amps.

TABLE 53—VOLTAGE BREAKDOWN TEST

Test No.	Condition	Applied Voltage
1	From 540 V. winding brushes to frame. (with 265 V. and 12/24 V. windings grounded to frame)	2000 V. r.m.s., 60 cycles for a period of one minute.
2	From 265 V. winding brushes to frame. (with 540 V. and 12/24 V. windings grounded to frame)	1500 V. r.m.s., 60 cycles for a period of one minute.
3	From 12/24 V. motor winding brushes to frame. (with 540 V. and 265V. windings grounded to frame)	500 V. r.m.s., 60 cycles for a period of one minute.
4	From one 12 V. winding to the other 12 V. winding	150 V. r.m.s., 60 cycles for a period of one minute.

MEGGER INSULATION RESISTANCE TEST

180. The insulation resistance shall not be less than:

(a) From motor armature and field winding to frame: 8 megohms at 500 V. D.C.

(b) From 540 V. armature to frame: 35 megohms at 500 V. D.C.

(c) From 265 V. armature to frame: 35 megohms at 500 V. D.C.

OVERLOAD AND OVERSPEED TESTS

181. (a) The dynamotor shall be capable of operating for a period of one hour at an ambient temperature of +70° C. loaded as follows:

265 V. winding—2200 ohms.

540 V. winding—20,000 ohms.

12 V. centre tap—3.75 ohms.

with 32 V. applied to the 24 V. primary terminals. During this period commutation at all brushes should be sparkless.

The dynamotor should also meet these requirements with 16 V. applied to the 12 V. primary treminals, without the 3.75 ohm load.

(b) The machine shall run for a period of 3 minutes with 16 V. applied to the 12 V. input terminals at no load. During this test the following voltages should not be exceeded:

265 V. winding—410 V.

540 V. winding—790 V.

The high tension output voltages must remain steady and no excessive vibration or mechanical noise shall be apparent during this time.

OVERHEATING

182. The machine shall be run at full load under the conditions of Para. 173, for a period of 30 minutes, at the end of which time the temperature of the hottest part of the machine shall not be in excess of 50° C. above the ambient.

CLIMATIC TEMPERATURE CONDITIONS

183. The machine shall be capable of operating without bearing seizure or insulation failure through the temperature range of —50° C. to +70° C. See Para. 178. It shall be capable of starting at —50° C. with a primary voltage of 10 V. applied to the 12 V. connection or 20 V. applied to the 24 V. connection.

COMPLETE SUPPLY UNIT

OUTPUT VOLTAGES

184. The output voltages under "standard" load shall be within the following limits:

(a) H.T. 1 (Vibrator) 265 V. ±10%

(b) H.T. 1 (Dynamotor) 265 V. ± 5%

(c) H.T. 2 (Dynamotor) 540 V. ± 5%

(d) L.T. (for 24 V. only) 11.5 V. ± 5%

VOLTAGE REGULATION

185. The voltage variation shall not be greater than:

(a) H.T. 1 (Vibrator) 20% from normal load to 30 Ma. load.

(b) H.T. 1 (Dynamotor) 15% from full load to no load.

(c) H.T. 2 (Dynamotor) 12.5% from full load to no load.

INPUT CURRENTS

186. (a) The input current under "no load" shall not exceed the following values:

For vibrator operation 0.75 amps.

For dynamotor operation 5.5 amps.

(b) The input current under "normal load" shall not exceed the following values:

For vibrator operation 2.5 amps.

For dynamotor operation on 12 V. 10.0 amps.

For dynamotor operation on 24 V. 7.0 amps.

EFFICIENCY

187. The efficiency of the supply unit with the pilot lamp lit shall not be less than the following values:

For vibrator operation.................45%

For dynamotor operation with H.T. 1 load only.........................20%

For dynamotor operation with full load.......................................35%

NOTE:

$$\text{Efficiency } \% = \frac{\text{EI output}}{\text{EI input}} \times 100.$$

VIBRATOR STABILITY

188. All the units must be switched on and off several times at the maximum voltage of 16 V. and the vibrator fuse must not blow.

RIPPLE VOLTAGE

189. The ripple voltage on the output circuits with full load shall not exceed the following values:

H.T. 1 (Vibrator).......................0.2%

H.T. 1 (Dynamotor)..................0.2%

H.T. 2 (Dynamotor)..................0.75%

These measurements shall be made with a rectifier type voltmeter having a resistance of 1000 ohms per volt connected in series with a blocking condenser of not less than 2.0 μfd.

H.F. INTERFERENCE AND HASH

190. The supply unit shall be connected to a standard No. 19 set. The H.F. interference shall not be such as to cause serious interference with the transmission or reception of sender or receiver units of the "A" and "B" sets. This applies to both the dynamotor and the vibrator. The interference shall be measured in the following manner:

(a) Connect the supply unit to a No. 19 set.

(b) Connect the receiver to its variometer and through a standard dummy aerial of 45 $\mu\mu$fd. to a signal generator. The dummy aerial leads shall be kept as short as possible.

(c) Under these conditions the receiver must be capable of supplying 50 mW. output for 3 μV. input at a signal plus noise to noise power ratio of not less than 4:1.

FUNCTIONAL OPERATION

191. The supply unit shall be connected to a No. 19 set and shall perform all required operations satisfactorily. Special attention shall be given to the functioning of the send-receive relay and the correct operation of the Vibrator-Dynamotor switch. For safety, every supply unit that leaves the shop must have the internal voltage switch in the 24 V. position.

192. The equipment shall operate satisfactorily over a battery voltage range of from 10 to 16 V. for a nominal 12 V. system, and from 20 to 32 V. for a nominal 24 V. system. On a 3-wire 24 V. system, when connected to a Wireless Set No. 19 Mk. III and under any operating conditions, the unbalance shall not be greater than 1.5 amps. On 24 V. the equipment shall operate from a 2-wire as well as a 3-wire system.

No. 19 Set Operational Tests

EQUIPMENT REQUIRED

193. The following equipment (or equivalent) will be required:

(a) Wavemeter, TE 149.

(b) Complete No. 19 set station.

FINAL NET ALIGNMENT

194. (a) Adjust a wavemeter to 3750 Kc/s.

(b) Tune the No. 19 set receiver to the second harmonic of the wavemeter (7500 Kc/s.) on R/T, for maximum dip on the A.V.C. meter. (DO NOT NET).

(c) Switch S/C-105B to NET.

(d) The beat note must be less than 1500 c.p.s. judged aurally.

(e) Should the beat note exceed this limit, the B.F.O. coil must have its core carefully re-adjusted to zero beat.

TOTAL FREQUENCY SHIFT TEST

195. (a) Tune the wavemeter to 7500 Kc/s. (or 3750 Kc/s.).

(b) Net the No. 19 set receiver to the wavemeter fundamental (or 2nd harmonic) of the 7500 Kc/s., and adjust the blue flicks. Turn the flick lever to FLICK.

(c) Detune the M.C. dial, and then rotate back to the flick position of 7.5 Mc/s., and throw the No. 19 set to Send R/T by inserting the plug in the key jack.

(d) Listen on the wavemeter phones, and tune the wavemeter to zero beat with the No. 19 set sender. The frequency shift must not exceed 3 Kc/s. or the set must be rejected until repaired. (1.5 Kc/s. for second harmonic operation).

(e) Repeat steps (a) to (d) at 3500 Kc/s., using the red flicks.

METER CALIBRATION

196. Check the calibration of the No. 19 set meter on all positions.

FUNCTIONAL OPERATION

197. When properly connected for normal operation and engaged in two-way operation with another No. 19 set, the unit shall be completely satisfactory in all its functions, from an operational viewpoint.

OUT TEST

198. An out test to be performed on all sets before leaving the shop shall consist of the following:

I. C. Amplifier—	Paras.	62-69
"B" A.F. Channel—	Paras.	70-75
"B" Quench Oscillator—	Paras.	76-79
"B" Receiver—	Paras.	80-92
"B" Sender—	Paras.	93-97
"A" A.F. Channel—	Paras.	98-99
"A" I.F. & B.F.O. Tests—	Paras.	114-117
"A" Receiver Tests—	Paras.	128-143
"A" Sender Tests—	Paras.	153-164
Variometer—	Paras.	165-172
Supply Unit No. 2—	Paras.	173-192
Operational Test—	Paras.	193-197

TABLE 54—FINAL TEST CHART

WIRELESS SET (CDN.) Nº 19 MK III
TEST REPORT

PLACE: ____________________

DATE: ____________________

SET SERIAL Nº ____________

SUPPLY UNIT SERIAL Nº ____________

VARIOMETER SERIAL Nº ____________

VISUAL CHECK (S/R UNIT) REMARKS: *Het-Tone Control loose. Tightened O.K.*

Visual check	Test	Set tested	Standard specifications	E.M.E.R. para.
Intercommunication amplifier	Stability	*1. mW.*	<5. mW.	64
Intercommunication amplifier	Pwr. output	*450 mW.*	>400. mW.	65
Intercommunication amplifier	Sensitivity	*.025 volts*	<.03 volts	66
Intercommunication amplifier	Fidelity 150	*62 mW.*	>50 mW.	68
Intercommunication amplifier	Fidelity 5000	*120 mW.*	>100 mW.	68
Intercommunication amplifier	Noise	✓	See text	69
"B" set — A.F. channel	Stability		<5. mW.	72
"B" set — A.F. channel	Sensitivity		<.015 volts	73
"B" set — A.F. channel	Fidelity 150		30-63 mW.	75
"B" set — A.F. channel	Fidelity 5000		36-90 mW.	75
"B" set — Quench	Freq. range		165-220 KC/S	78
"B" set — Quench	Output		-25. volts	79
"B" set — Rec.	Calibration		Fig. 5 ± 1	87
"B" set — Rec.	Pwr. output		>150. mW.	88
"B" set — Rec.	Noise		See text	89
"B" set — Rec.	Sensitivity		<1000 µV.	90
"B" set — Send	Space charge		65	95-96.
"B" set — Send	Receive		90	Ref. only
"B" set — Send	Send		420	Ref. only
"B" set — Send	Modulated		530	Ref. only
"B" set — Send	Noise		See text	97
"A" set — A.F.	Sensitivity & fidelity 400		<3.3 volts	98-99.
"A" set — A.F.	Sensitivity & fidelity 3000		<2.3 volts	98-99.
"A" set — I.F.	Alignment		465 ±2KC	113
"A" set — I.F.	Sensitivity		50-200 µV.	112 (e)
"A" set — I.F.	Bandwidth min.		6. KC/S.	1.16
"A" set — I.F.	Bandwidth max.		40 KC/S.	1.16
"A" set — B.F.O.	Alignment		Centre I.F. band	113
"A" set — B.F.O.	Het. tone min.		700 C.P.S.	117
"A" set — B.F.O.	Het. tone max.		1800 C.P.S.	117

VISUAL CHECK — SUPPLY UNIT REMARKS:

Visual check	Test	Set tested	Standard specifications	E.M.E.R. para.
"A" set (cont'd) — Receiver	Dial stops & index brackets M.C.		See text	118-122
"A" set (cont'd) — Receiver	Dial stops & index brackets P.A.		See text	118-122
"A" set (cont'd) — Receiver	M.C. dial calibration 8.0		Set	Table 48
"A" set (cont'd) — Receiver	M.C. dial calibration 6.0		± 1/2 div.	Table 48
"A" set (cont'd) — Receiver	M.C. dial calibration 4.5		± 1/4 div.	Table 48
"A" set (cont'd) — Receiver	M.C. dial calibration 4.5		Set	Table 48
"A" set (cont'd) — Receiver	M.C. dial calibration 3.5		± 1/3 div.	Table 48
"A" set (cont'd) — Receiver	M.C. dial calibration 2.5		± 1/4 div.	Table 48
"A" set (cont'd) — Receiver	Overall sensitivity R/T		< 5. µV.	131
"A" set (cont'd) — Receiver	Overall sensitivity C.W.		< 10. µV.	132
"A" set (cont'd) — Receiver	Flick adj.		See text	134
"A" set (cont'd) — Receiver	R.F. gain		>1000 X	135
"A" set (cont'd) — Receiver	Image ratio		See text	136
"A" set (cont'd) — Receiver	I.F. rejection		> 1.0 volt	137
"A" set (cont'd) — Receiver	Selectivity min.		6. KC/S.	138
"A" set (cont'd) — Receiver	Selectivity max.		60 KC/S.	138
"A" set (cont'd) — Receiver	Pwr. output		>150 mW.	139
"A" set (cont'd) — Receiver	Fidelity 150		8. mW.	140
"A" set (cont'd) — Receiver	Fidelity 3000		2.5 mW.	140
"A" set (cont'd) — Receiver	A.V.C.		See text	141
"A" set (cont'd) — Receiver	M.C. dial flick tests		See text	142
"A" set (cont'd) — Receiver	Noise		See text	143
"A" set (cont'd) — Drive	R43A adj.		+40 volts	155
"A" set (cont'd) — Drive	Constant drive		± 1 div.	156
"A" set (cont'd) — Drive	Min. drive		3.5	156
"A" set (cont'd) — Sender	Modulation R/T		See text	157
"A" set (cont'd) — Sender	Modulation MCW		See text	157
"A" set (cont'd) — Sender	Sidetone R/T		>5. mW.	157
"A" set (cont'd) — Sender	Sidetone MCW		>60. mW.	157
"A" set (cont'd) — Sender	M.C.W. freq.		600-1400	157 (0)
"A" set (cont'd) — Sender	P.A. dial calibration		See text	Table 50

VISUAL CHECK — VARIOMETER REMARKS:

Visual check	Test	Set tested	Standard specifications	E.M.E.R. para.
"A" set (cont'd) — Sender (cont'd)	Sender output (R.F. amps) R/T 8.0		>.313	Table 50
"A" set (cont'd) — Sender (cont'd)	Sender output (R.F. amps) C.W. 4.5		>.63	Table 50
"A" set (cont'd) — Sender (cont'd)	Sender output (R.F. amps) MCW 2.5		>.36	Table 50
"A" set (cont'd) — Sender (cont'd)	Drive stage self-oscillation		See text	160
"A" set (cont'd) — Sender (cont'd)	P.A. dial flick tests		See text	162
"A" set (cont'd) — Sender (cont'd)	Freq. stability		±750 C.P.S.	163
"A" set (cont'd) — Sender (cont'd)	Netting error 5.0		750 C.P.S.	164
"A" set (cont'd) — Sender (cont'd)	Netting error 2.5		350 C.P.S.	164
Variometer	R29A adj.		See text	165-166
Variometer	Range test		See text	168-170
Variometer	Calibration		See text	171
Supply unit	Lubrication		See text	175
Supply unit	Commutator		See text	174
Supply unit	Brushes		See text	176
Supply unit	Output voltages (std. load) (12V. input) Vib.		265 ±25V.	184
Supply unit	Output voltages (std. load) (12V. input) Dyn.		265 ±13V.	184
Supply unit	Output voltages (std. load) (12V. input) Dyn.		540 ±27V.	184
Supply unit	Input currents (12V) no load & std. load Vib.		<.75	186
Supply unit	Input currents (12V) no load & std. load Vib.		<2.5	186
Supply unit	Input currents (12V) no load & std. load Dyn.		<5.5	186
Supply unit	Input currents (12V) no load & std. load Dyn.		<10.	186
Supply unit	Ripple		See text	189
Supply unit	H.F. hash		See text	190
Operational tests	Supply unit		See text	191-192
Operational tests	I.C. amplifier		See text	63 (d)
Operational tests	"B" set		See text	92
Operational tests	"A" set (test both) (freq. bands) (send & rec.) R/T, C.W., MCW		See text	197
Operational tests	Total freq. shift		< 3. KC/S.	195
Operational tests	Meter calibration		See text	196
Operational tests	Final net alignment		See text	194
Operational tests	Mechanical controls		See text	54-58

NOTES:

1. The Test Rating Of The Specific Set Under Test Is To Be Entered In The "Set Tested" Column, So That The Figures May Be Rapidly Compared With The Adjacent "Standard Specification" Column When Estimating The Set's Relative Performance.
2. Where The "Standard Specifications" Column Contains The Reference "See Text," Then The "Set Tested" Column Should Be Filled In With A Check Mark If O.K., Or An "X" If Not Satisfactory.
3. The Specimen Sheet Above Has Been Partly Filled Out, For Illustration.

REMARKS:

SIGNED ____________________
OUT TESTER

Reconstruction Data

Components to be Salvaged

199. The following components should be salvaged for reconstruction:

(a) Chassis, base plate, containers, shields and panels when only slightly damaged.

(b) Dynamotors, transformers and iron core chokes.

(c) Valve shields, caps and grid clips.

(d) Undamaged wafers of gang switches.

(e) All coils and coil forms except where crushed, mildewed or water saturated.

(f) Meters.

(g) Undamaged dials and knobs.

(h) Relays and solenoids.

(i) Undamaged components of mechanical assemblies.

(j) Headphone and microphone capsules.

(k) Fibre terminal boards.

Coils and Inductances

GENERAL

200. In an emergency, most of the coils can be duplicated without the aid of a "Q" meter. Inspect the defective coil and determine the size and length of the original wire, the number of turns, and the spacing. Then wind the new coil on a dry form of the proper size.

201. The rewound coil may be tracked by wiring into the set and carefully spreading or compressing the turns until the circuit is peaked. Then the turns should be cemented in position with amphenol cement. During this operation the circuit trimmer condenser should be set at approximately half capacity.

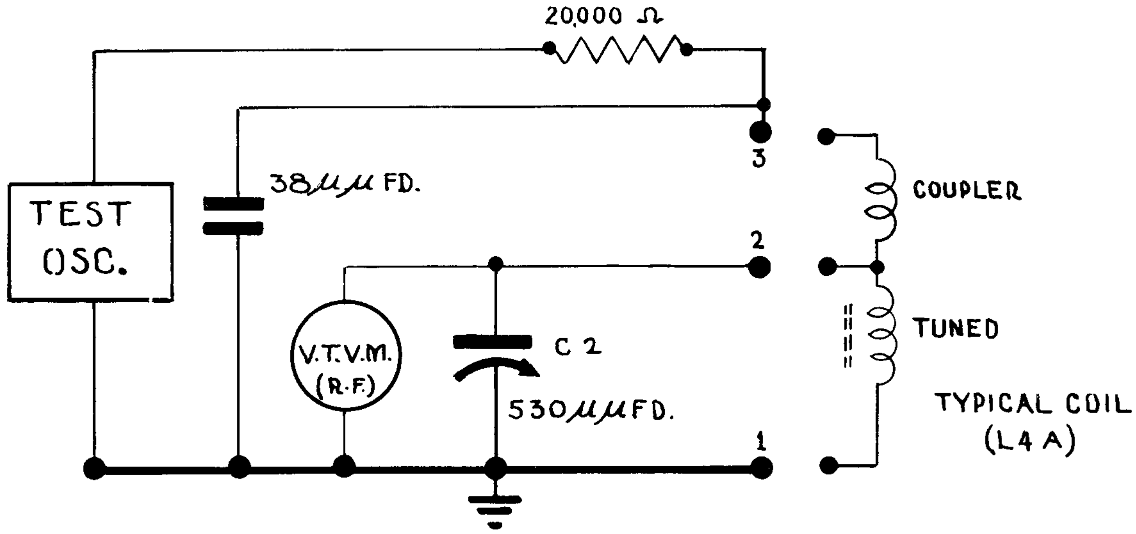
202. If a "standard coil" of the required type is available, the rewound component may be matched to the standard by matching circuits as outlined in Para. 205 and Fig. 95. This is the method used by the manufacturers.

203. A "Q" meter, where available, presents the simplest and most reliable answer to the problem. If the coil turns are spaced to the proper inductance and then cemented, and if the "Q" is satisfactory, no alignment diffculty should be encountered. Matching to a "standard coil" is also simplified when using the "Q" meter.

204. Certain coils and chokes have machine wound, universal windings and cannot be easily duplicated by hand. They are L2A, L2.1A, L2B, L5A-B, L8A, L8B, L9A, L10A, L14A, L15A and L18A.

MATCHING CIRCUIT

205. The following procedure will be satisfactory for matching a rewound coil to a "standard coil":



NOTE:

WHEN MATCHING AN ORDINARY "SINGLE CIRCUIT" COIL, TERMINALS 2 & 3 SHOULD BE JOINED BY A BUS, AND THE COIL CONNECTED BETWEEN TERMS. 1 & 3

T FZ 254/3 1 - 95

FIG. 95—MATCHING CIRCUIT

(a) Using the circuit in Fig. 95, insert a "standard coil" of the required type.

(b) Set the oscillator to the approximate frequency outlined in these specifications for the particular coil employed.

(c) Tune C2 until resonance is indicated by an upswing of the vacuum tube voltmeter. Record C2 dial reading.

(d) Remove the "standard coil" and replace with the rewound coil.

(e) Tune C2 until resonance is indicated. Record C2 dial setting.

(f) Dress the turns of the coil until resonance may be recorded at a setting of C2 dial approximately the same as that recorded in (c) above.

(g) If more C2 capacity is required for resonance in (f) above, the coil must be compressed. If less capacity is required, the coil must be spread.

(h) Repeat at other test frequencies indicated.

(i) Seal adjusted coil with amphenol cement.

(j) The test oscillator may be any powerful oscillator or a low power transmitter.

(k) This same sequence may be employed when using a "Q" meter.

COIL TREATMENT

206. Outlined in Paras. 207 and 208 are two different methods of treating coils. The treatment to be given each coil in the No. 19 set is specified in the description of that particular coil.

207. Coil Treatment No. 1:

(a) Bake the coil in a ventilated oven for one hour at 212° - 220° F.

(b) Dip the hot coils in Zophar Mills No. 1436 wax at 250° F. for 30 seconds. The coating must be even.

(c) After cooling, dip in Duco Household Cement, manufactured by Canadian Industries Limited. Allow eight hours for cement to dry.

(d) The specified "Q" was measured on a Boonton "Q" meter, Model 160A.

208. Coil Treatment No. 2:

(a) Powdered iron cores must be separated by fish paper spacers and must be held in position by Glyptal cement, manufactured by the Canadian General Electric Co. The hole through the centre of the cores must be left open.

(b) Flash dip the coils in Zophar Mills No. 1436 wax at 250° F. The dipping operation must be controlled to give a thin, even coating of wax.

(c) After cooling, dip the coil in Duco Household Cement, manufactured by Canadian Industries Limited. Allow eight hours for the cement to dry.

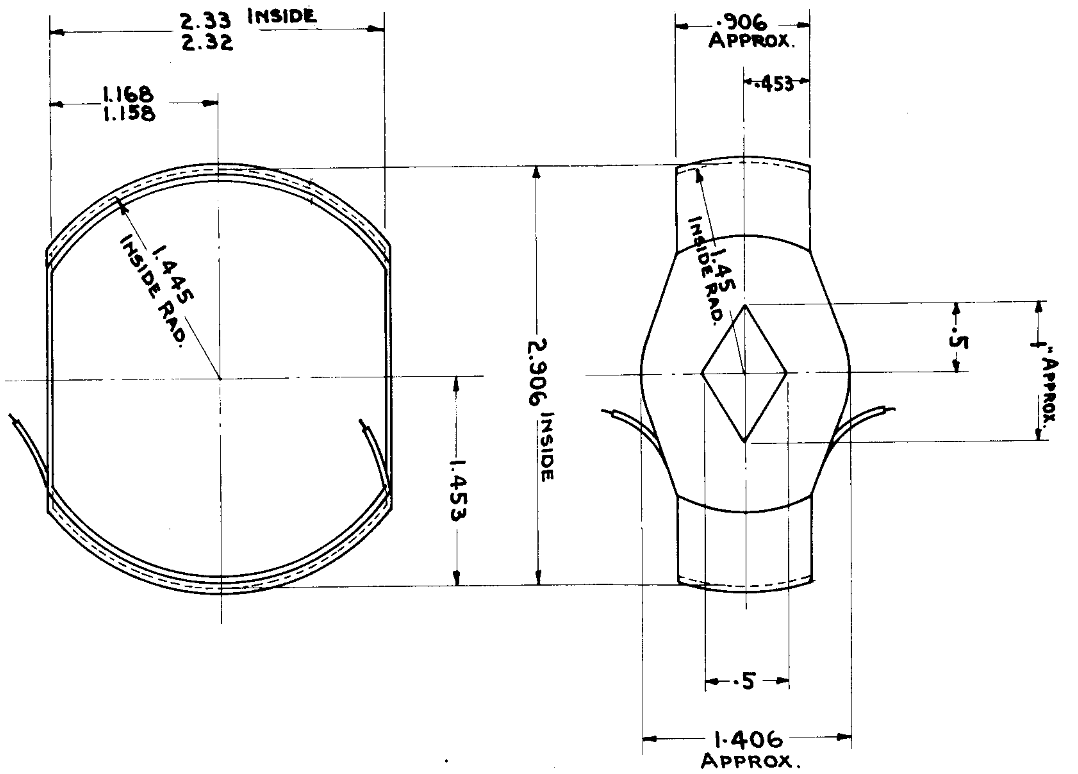
(d) The specified "Q" was measured on a Boonton Research Corp. "Q" meter, Model 160A, with loading as indicated on the specific coil table.

COIL TESTS

209. After treatment, the coil must:

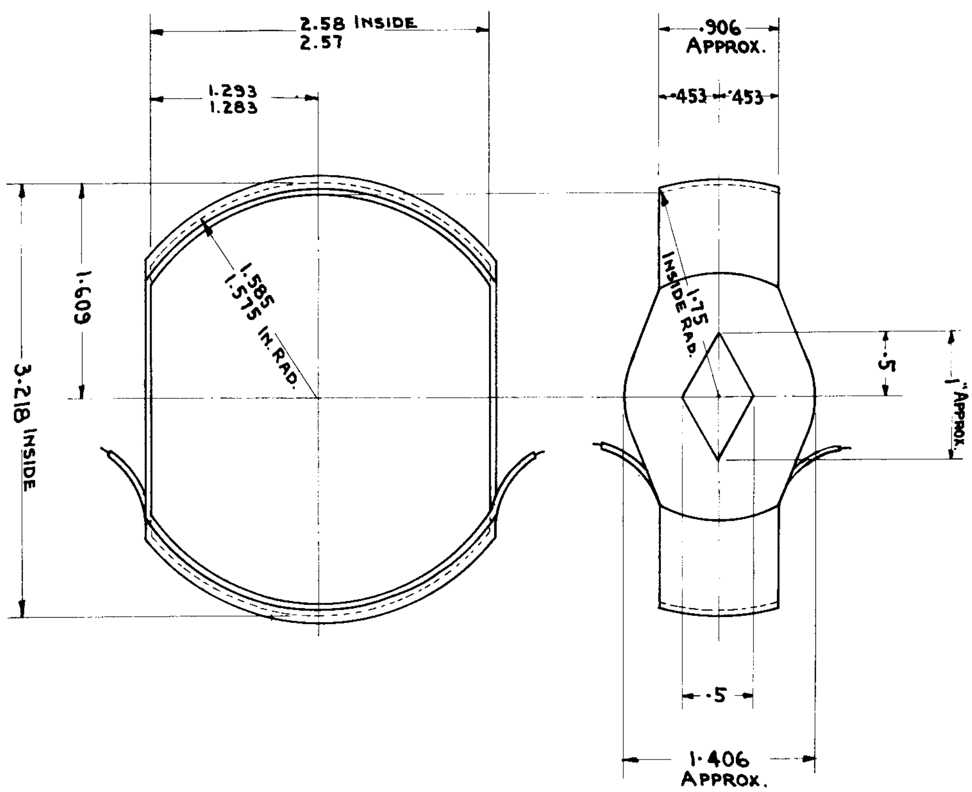
(a) Stand humidity test of 48 hours at +50° C. and 95% humidity.

(b) Operate over a temperature range of —50° C. to +70° C.



T FZ 254/3 / 1 - 96

FIG. 96—L1A ROTOR COIL



T FZ 254/3 / 1 - 97

FIG. 97—L1A STATOR COIL

L1A VARIOMETER INDUCTANCE

210. The inductance of L1A rotor coil at 1000 c.p.s. =39 μH. $\pm 3\%$.

The "Q", measured at 2 Mc/s. =175 $+25\%$ -10%

211. The inductance of L1A stator coil at 1000 c.p.s. =46 μH. $\pm 3\%$. The "Q", measured at 2 Mc/s. =190 $+25\%$ -10%.

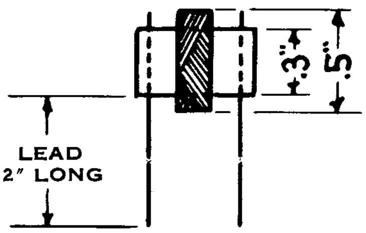
212. Additional information regarding L1A variometer inductance follows:

(a) Rotor and stator to consist of 21.5 turns of No. 26 B. & S. (.0159″ bare diameter) double, celanese-covered, enamelled wire.

(b) Start and finish leads to extend 1.5″ and to be stripped and tinned.

(c) Interwind between turns of wire, celanese rayon string—8/300 Dernier, 3s x 10As turns, 80 filament.

(d) While winding coil, run string and wire through a bath of cellulose acetate, Ex 1410, and cellulose acetate dope thinner, Ex 1461, as furnished by James B. Day and Co., Chicago, Illinois, U.S.A.; or equivalent.



T FZ 254/3 1 - 98 FIG. 98—L2A AND L2.1A (P.C. 79115C)

TABLE 55—L2A AND L2.1A DATA

Coil Form	Wire Size	Winding Type	Q Min.	Matching	Nom. Induct.	Nom. Res.
P.C. 63341	No. 38 (B & S.) S.S.E.	Universal 3/16″ wide 234 turns.	45 at 600 Kc/s.	Match to Standard $\pm 5\%$ at 600 Kc/s.	470 μH. at 1000 c.p.s.	16.5 ohms Ref. only.

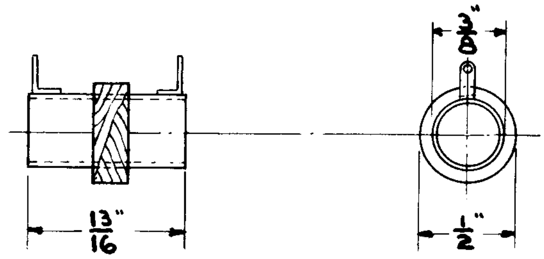
NOTES:

(a) Coil form to be fitted with stiff wire ends, (No. 19 B. & S.) before winding, and then baked at 212° - 220° F. for one hour. Dip hot form in Zophar Mills No. 1436 wax at 250° F. for 10 minutes.

(b) After winding and matching apply Coil Treatment No. 1 (Para. 207) and Coil Test (Para. 209).

(c) This coil must have no resonant dips when checked over the range of 2.0—8.0 Mc/s. by paralleling across a resonant circuit.

(d) P.C. 79115C is to be used only for L2A and L2.1A. For L2B, use P.C. 79115C-191.



T FZ 254/3 1 - 99 FIG. 99—L2B (P.C. 79115C-191)

TABLE 56—L2B DATA

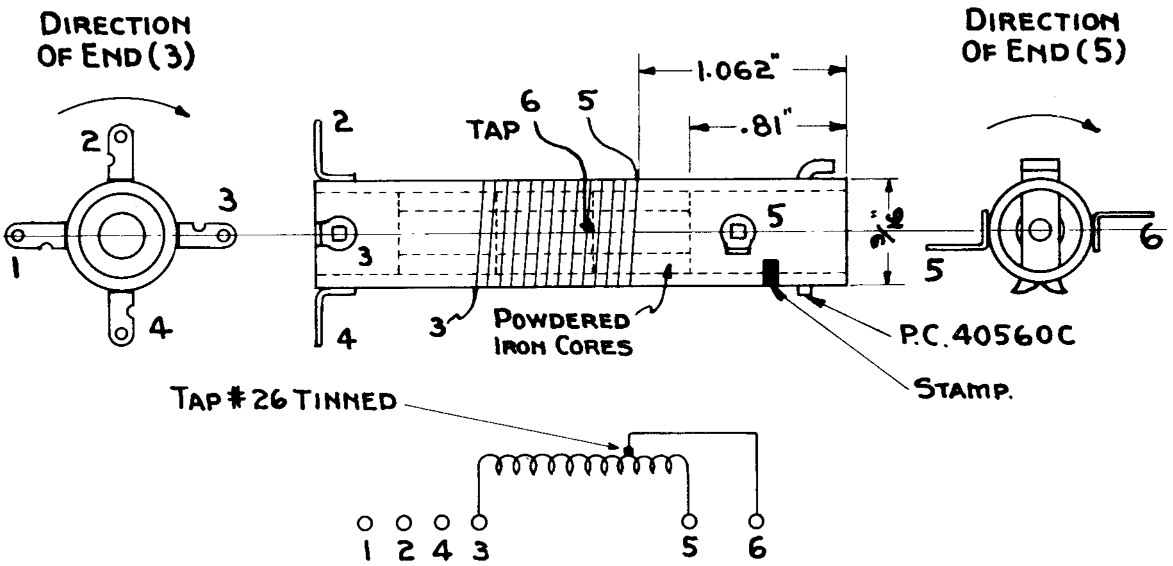
Coil Form	Wire Size	Winding Type	Q Min.	Matching	Nom. Induct.	Nom. Res.
P.C. 63341C-191	No. 38 (B. & S) S.S.E.	Universal 3/16″ wide 208 turns.	45 at 600 Kc/s.	Match to Standard ±5% at 600 Kc/s.	470 μH at 1000 c.p.s.	16.5 ohms Ref. only.

NOTES:

(a) After winding, apply Coil Treatment No. 1, Para. 207, and Coil Test, Para. 209.

(b) This coil must have no resonant dips when checked over the range of 2.0 - 8.0 Mc/s. by paralleling across a resonant circuit.

(c) P.C. 79115C-191 is to be used only for L2B. For L2A and L2.1A use P.C. 79115C.



T FZ 254/3 / 1 - 100

FIG. 100—L3A

TABLE 57—L3A DATA

Coil Form	Winding Connections	Wire Size	Winding Type	"Q" Min.	Matching	Iron Core
P.C. 62171C	Terminals 3 & 5 Tap —6	No. 24 (B & S) Enamel	Solenoid 27 turns— 23 turns per inch — Tap at 4 turns from Term. 5 end	8.0 Mc/s. 110 5.0 Mc/s. 160 2.5 Mc/s. 170	Match to Standard ±½ of 1% at 7.0 and 2.5 Mc/s.	P.C. 71571C. Three required.

NOTE:—After winding and matching, apply Coil Treatment No. 2 (Para. 208) and Coil Test, (Para. 209).

TABLE 58—TYPICAL "Q" METER READINGS, L3A

Coil Terminals	Freq.	Resonating Capacity	"Q"	Calculated Inductance
3 & 5	4.5 Mc/s.	105 $\mu\mu$fd.	200	11.9 μH.
3 & 6	4.5 Mc/s.	133 $\mu\mu$fd.	170	9.4 μH.

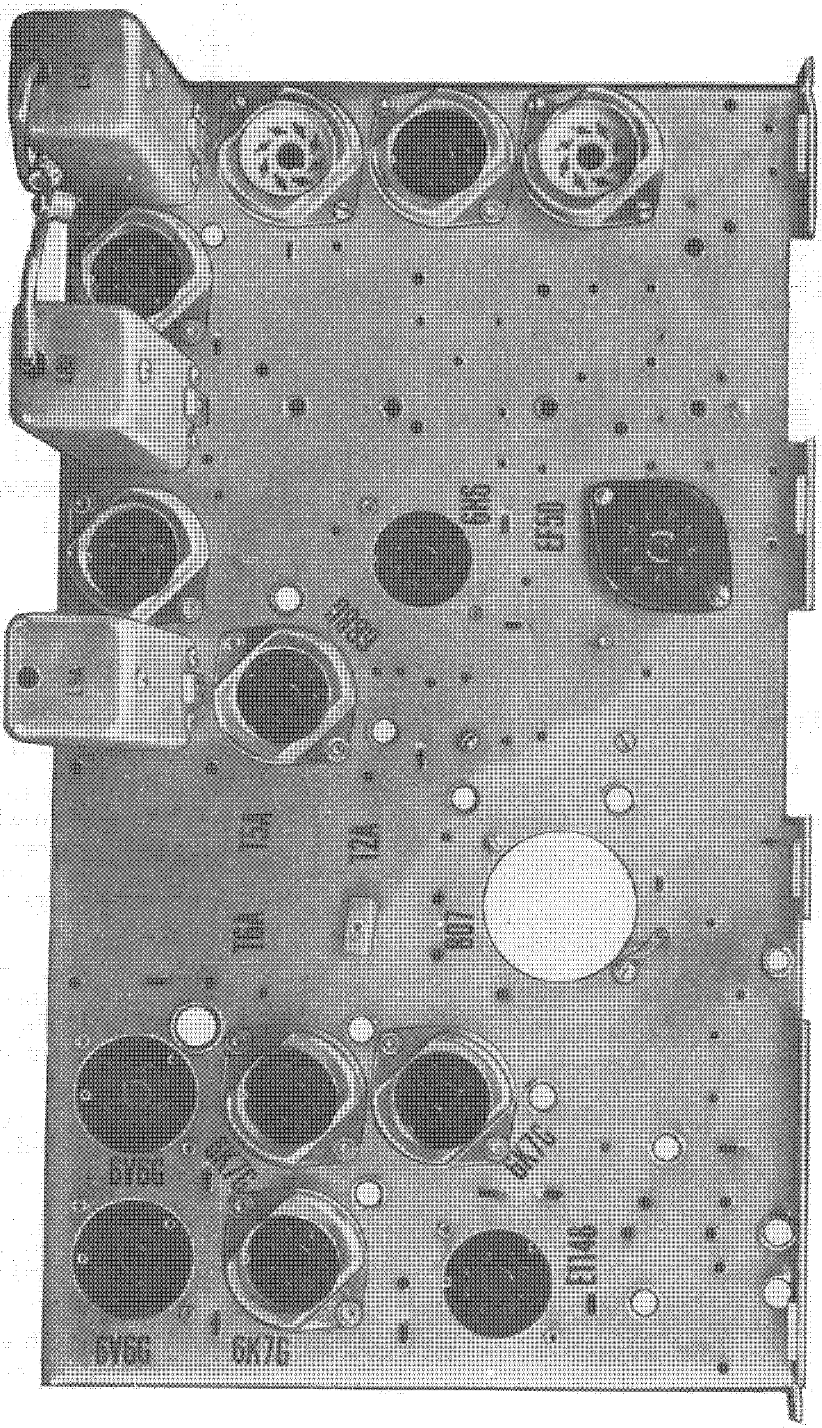
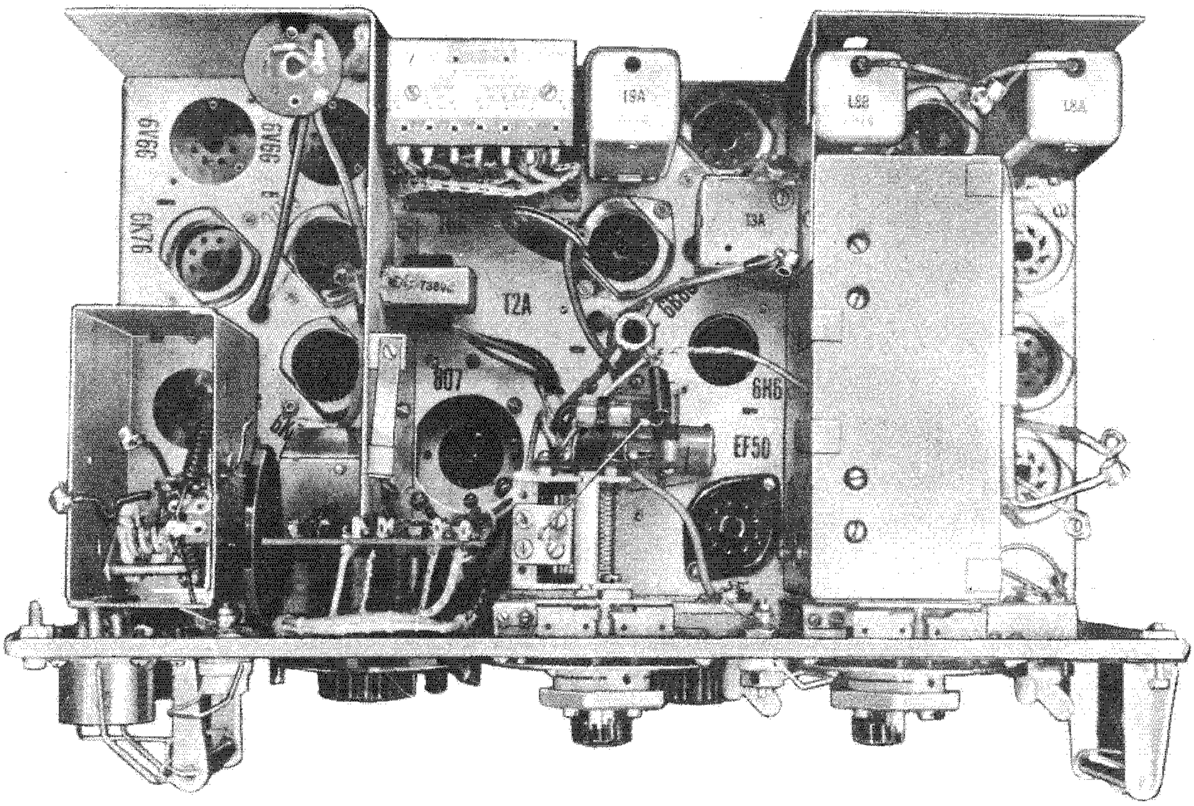


FIG. 144—STRIPPED CHASSIS

T FZ 254/3 / 1 - 144



T FZ 254/3 / 1 - 145

FIG. 145—ASSEMBLED CHASSIS

Decalcomania Transfers

EQUIPMENT REQUIRED

227. The following equipment will be needed:

(a) No. 202 Decalcomania cement.

(b) Varnish.

(c) Benzine.

(d) One damp cloth and one dry cloth.

(e) Duplex paper Decalcomania transfers (printing appears reversed).

PROCEDURE

228. To apply Decalcomania transfers:

(a) Thoroughly clean the wireless set panel.

(b) Split one corner of the transfer heavy paper backing so it may be easily removed from the transfer during a later operation.

(c) Apply a very thin coating of transfer cement to the colour side of the transfer. Allow the cement to dry for several minutes until it becomes very sticky or "tacky".

(d) Wet the wireless set surface to which the transfer is to be applied.

(e) Apply the transfer to the panel and press it firmly down with a dry cloth. This should be done very carefully, especially around the lettering if wrinkles and blisters are to be avoided.

(f) Grasping the split corner, carefully peel the heavy paper backing from the transfer. This leaves only a thin paper covering over the transfer.

(g) With a dry cloth, press the transfer carefully and firmly against the front panel.

(h) Soak the thin paper cover thoroughly, while still pressing down on the lettering. This surface may then be rubbed off easily.

(i) Wash the panel with water, and then benzine, to remove excess cement.

(j) Carefully dry the panel **immediately** to prevent injury to the transfer lettering by the benzine.

(k) Allow the transfer to dry thoroughly over night and then varnish.

END