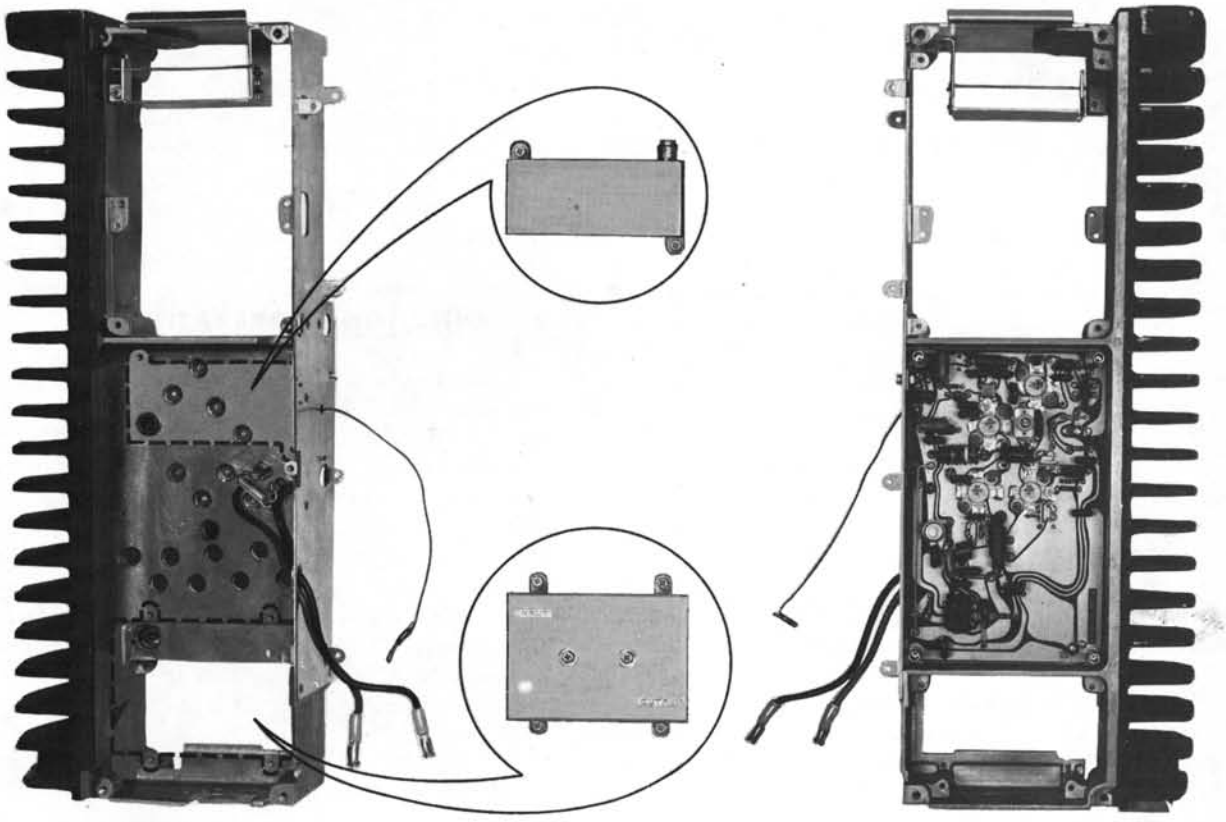
NOTE: This was excerpted from Motorola Manual 68P81008E40-H

45 W POWER AMPLIFIER

TLD1600A SERIES



BOTTOM VIEW

BEPS-6217-B

TOP VIEW

MODEL	FREQ. RANGE
TLD1602A	132-150.8 MHz
TLD1603A	150.8-162 MHz
TLD1604A	162-174 MHz

TECHNICAL CHARACTERISTICS*	
RF Power In	400 mw
Input Impedance	50 ohms
RF Power Out	45 watts
Output Impedance	50 ohms

*All values are typical

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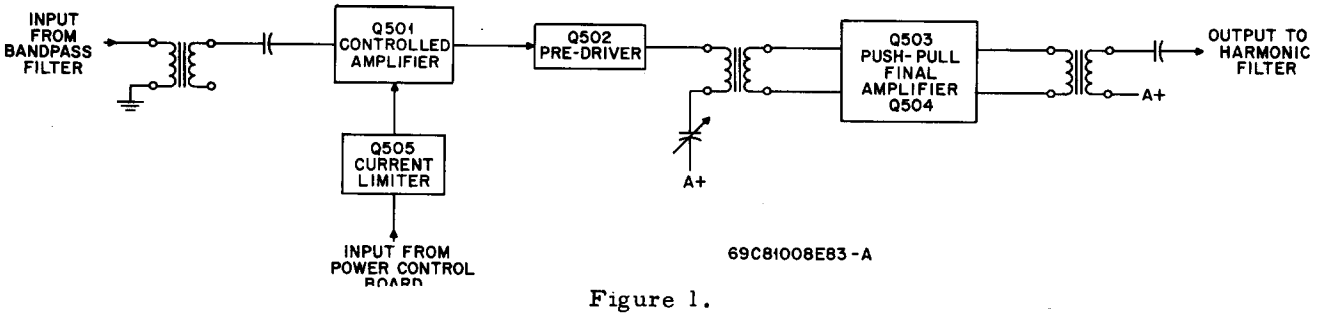


Figure 1.
Block Diagram

1. DESCRIPTION

Motorola's TLD1600A Series Power-Amplifiers provide the following features:

-- A minimum of 45 W RF output.

-- All circuitry except power transistors contained on one single-sided circuit board.

-- Power transistors mounted directly to (but electrically isolated from) the heat sink.

-- RF connections made through two coaxial connectors which plug directly into the input and output filter assemblies located below the heat sink shelf.

-- DC power supplied via two feed-through capacitors that also provide filtering.

-- Input, output and all other interstage matching (with the exception of a single fixed-tuned matching network between the controlled amplifier stage and the driver stage) is accomplished by the use of rf transformers wound around ferrite cores. Only one tuning adjustment is required due to the relatively broadband matching characteristics of the ferrite transformers and the low inductance leads of the silicon opposed emitter transistors.

-- One metering socket which is accessible from the component side of the circuit board allows three major test points to be monitored and permits measurement of the dc current drawn by the final amplifier stage.

-- Due to the heat sink mounting requirements for this board, servicing is accomplished from the component side of the board.

-- Diode protection against reverse polarity voltage (board mounted diode).

-- Output protection provided by current limiter transistor driven by power control circuit. (Controls gain of the first stage.) Single-wire w/push-on connector provides interconnection between power control and PA circuitry.

-- No high voltage required; operates directly from 12-volt battery.

2. FUNCTIONAL OPERATION

Refer to the block diagram, Figure 1, and the schematic diagram. This series of power amplifier requires a 400 mW rf input from the exciter board. This input is passed through a band-pass filter assembly and a ferrite step-down transformer (to match the input impedance to the first stage) to the gain-controlled amplifier stage. The external power control circuit which drives the current limiter transistor determines the gain of this stage. The power control circuit monitors the output of the final stages of the power amplifier, the load condition and the heat sink temperature.

The output of the gain controlled amplifier is passed through a fixed-tuned broadband, matching network and applied to the driver stage. A second ferrite transformer is utilized to match the single-ended output of the driver stage to the input of the push-pull power amplifier stage. The output from the final stage is stepped up in impedance by ferrite transformer and paralleled to provide the 50-ohm output impedance to match the input impedance of the harmonic filter.

Pin 1 of the metering receptacle provides a means of checking the incoming signal from the exciter. Pin 2 permits observation of the drive output of the first stage and an indication of the operation of the driver stage. Pin 3 reflects the drive signal and operation of the two push-pull power amplifier stages. Reference position A on the Motorola Portable Test Set uses pin 7 of the metering socket as an A+ reference against which the outputs of pins 1, 2, & 3 are checked. Switch the test set to reference position B which uses pin 6 as a reference and then switch to meter

position 5. This provides a reading across a calibrated resistor through which the current is drawn by the final amplifier stages.

3. MAINTENANCE

a. General

NOTE

Because of the complexity involved and time required to remove the PA board, compared to plug-in boards, it is not recommended that the PA board be removed. Proper troubleshooting techniques will usually locate defective components "on the spot". Removal and replacement instructions, however, are given in the event removal is necessary.

This section of the manual provides the maintenance shop procedures for the PA board. It assumes that preliminary tests have already localized the trouble to the PA board. These procedures include measurements with a Motorola portable test set, a vom, a complete set of performance tests and extensive troubleshooting procedures.

CAUTION

The PA board must be installed in a radio set for testing to provide the necessary power, ground control, heat sinking and signal connections.

b. Recommended Test Equipment

The following test equipment is the minimum required for troubleshooting and adjusting the PA. All such equipment is battery operated which permits testing to be performed in the field where no commercial power is available for bench type test equipment.

(1) Motorola S1056A through S1059A Portable Test Set and Model TEK-37 or TEK-37A Adapter Cable. The portable test set is required for checking each stage for proper operation.

(2) A Motorola Solid-State DC Multimeter or a 20,000 ohm-per-volt multimeter should be used, however a low impedance multimeter is acceptable for dc voltage measurements only.

(3) Motorola T1013A RF Load Resistor (dummy load) or equivalent.

CAUTION

For bench testing, use only a power supply that will provide terminal voltage of 13.4 volts under full load with the transmitter keyed, but not exceed 16.5 volts (including transients) when switched to the no load (unkeyed) condition. Most power supplies will not meet this requirement; in fact, some SCR regulated power supplies have transient response that allows the output voltage to momentarily triple when switched from full load to no load. The following bench supplies are approved for testing the "Micor" radio:

Motorola S1303A or S1305A Regulated Power Supply

Motorola T1261A Transistorized 24-Volt to 12-Volt Converter driven by a Motorola T1012A Power Supply

12-Volt automotive battery with Motorola T1012A Power Supply used as a battery charger.

c. Test Set Metering

The PA is equipped with a metering receptacle which allows four major test points to be measured on a Motorola portable test set. The portable test set can be connected to the PA metering receptacle and readings made at each of the test points by merely rotating a selector switch on the test set. A failure in almost any portion of the PA will produce a low or zero meter reading for one or more of the test points. Improper alignment will also cause improper meter readings.

To make the measurements, the portable test set must be connected to the radio set as shown in Figure 2 and listed in the following procedure.

(1) Set the function selector switch of the portable test set to the XMTR position.

(2) Set the meter reversing switch of the test set to the METER REV position, the selector switch to position 1 and reference switch to position A.

(3) Connect the 20-pin meter cable plug to the test set. When the test set is not in use, disconnect the 20-pin plug to conserve battery life. The plug acts as an on-off switch completing the battery circuit.

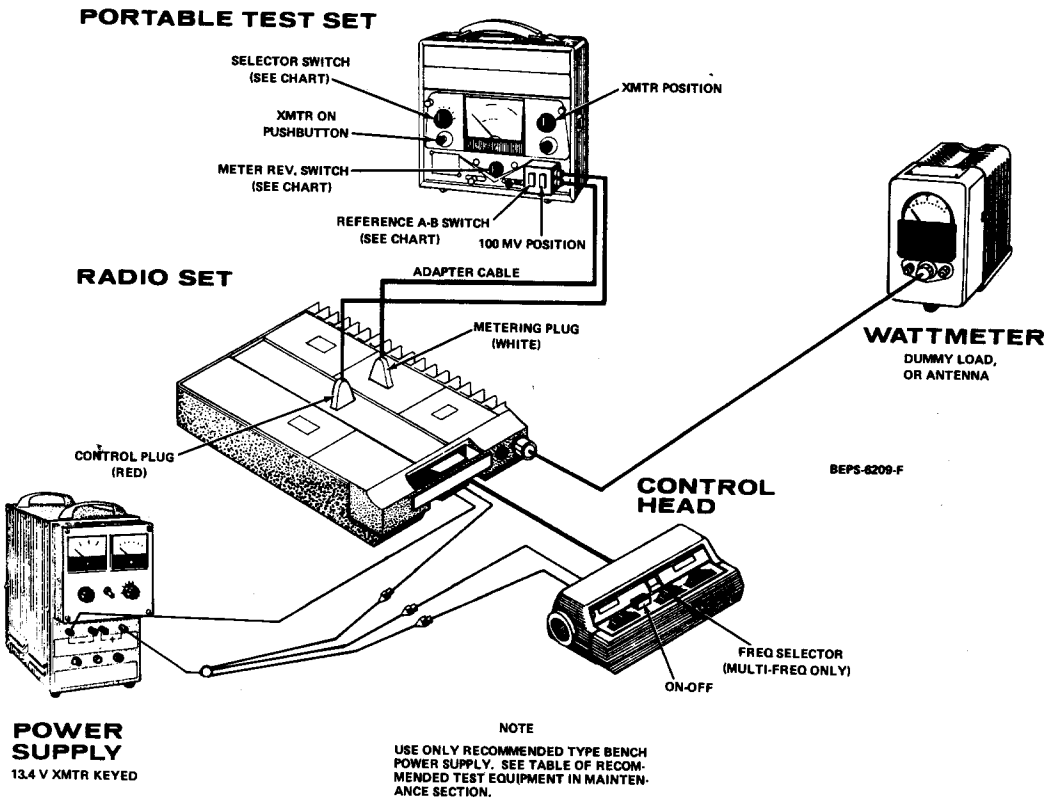


Figure 2.
PA Metering Test Set-Up

(4) Connect the red "control" plug of the adapter cable to the receptacle on the control circuit board of the radio set. Connect the white "metering" plug of the adapter cable to the receptacle on the PA circuit board.

(5) The entire transmitter is necessary for testing PA boards including the power control board for proper control.

(6) The output of the radio must be terminated in one of three types of loads:

-- The antenna load.

-- A dummy load such as Motorola's T1013A RF Load Resistor.

-- An RF wattmeter.

NOTE

A dummy load is preferred to the antenna to eliminate the possibility of shutback by the power control board due to a defective antenna.

(7) Connect power to the radio set cable. If the radio set is installed in a vehicle, it may be desirable to start the engine to keep the battery fully charged during testing.

(8) Set the ON-OFF switch of the radio's control head to ON.

(9) Key the transmitter with the XMTR ON button on the test set. Observe meter 1. Unkey the transmitter.

(10) Set the selector switch to positions 2 & 3, then switch to reference position B and switch to meter position 5 respectively, keying the transmitter and observing the meter reading for each. On multi-frequency radio sets, repeat the readings for each exciter frequency. An analysis of the meter readings for determining whether each circuit is good or bad follows:

Each time maintenance is performed on the PA, the readings should be compared with the previous set of readings. Any degradation of performance will quickly be noted. Often, a lower reading may indicate an impending failure and corrective action may be taken before the circuit fails entirely.

MINIMUM PA METER READINGS

SELECTOR SWITCH POSITION	REFERENCE SWITCH POSITION	MINIMUM METER READINGS	CIRCUIT METERED	IF LOW, DEFECTIVE CIRCUIT IS: (SEE TROUBLESHOOTING CHARTS)
1	A	15 uA	Exciter Output (Input to Controlled Amplifier Stage Q501)	Exciter output, input circuit of controlled amplifier stage Q501
2	A	5 uA	Input of Driver Stage Q502	Output of controlled amplifier stage, input circuitry of driver stage Q502
3	A	15 uA	Input to Final Amplifier Stage Q503, Q504	Output of driver stage Q502. Input circuit of final amplifier Q503, Q504
4	NOT USED			
5	B	25 uA min. 40 uA max.	Total Current of Final Amplifier Stage Q503, Q504	Output of final amplifier stage Q503, Q504, power control board antenna switch, antenna
6	B	12 V (0-30 V scale)	Final Amplifier Voltage	Final amplifier A+ or A- inputs

d. Performance Tests

(1) No performance test of the power amplifier is required other than rf power output from the radio as a whole. Before checking power output:

(a) The exciter board should be known to be operating normally.

(b) The power control board should be known to be functioning normally.

(c) The antenna switch should be known to be functioning normally.

(2) Key the transmitter and observe power out which should be 45 watts.

(3) If necessary, adjust POWER SET control for rated power output.

e. Removal and Replacement

Refer to Figure 3 for instructions to remove and replace the PA circuit board. The PA shield must always be in place during operation of the radio set and should be kept in place as much as possible while testing and troubleshooting. The circuit board must always be secured in place with all mounting screws. The transistors (including the control transistors mounted on the inner wall) must be secured in place to provide proper heat sinking, and the feedthrough connectors must be soldered in place to provide dc power and good rf grounding.

4. TROUBLESHOOTING

If a problem has been localized to the PA deck, several checks can be made prior to extensive troubleshooting.

a. Visual

Visually check for obvious physical defects such as broken leads, broken plating, broken or disconnected components or overheated parts. Before any attempt is made to change parts, the circuit should be checked to insure that the problem causing the original failure has been identified and corrected, otherwise damage to the new part may occur.

b. Voltage Checks

Check for A+ and A- at the feedthrough connections and for proper voltages at the collectors of each transistor. Certain defects such as broken plating, broken leads etc. may not be obvious to a visual inspection.

c. Troubleshooting

If test set readings are abnormal or tests indicate subnormal performance, logical troubleshooting procedure is required to isolate the defective component efficiently. The accompanying troubleshooting charts summarize these results in a logical sequence. A few voltage and resistance checks in the suspected circuit should readily isolate the defective component. Note that all power for the circuits in the

PA is from A- referenced to A+ (not to chassis ground, this feature allows operation from positive or negative ground power sources).

CAUTION

Due to the voltage requirements of P-N-P transistors, all "RF ground" plating is A+ and is "hot" with respect to chassis ground in negative ground vehicles. Because of this, caution should be used to prevent connection of "ground" plating on the PA board to chassis ground either directly or by the use of test equipment ground leads. If ac operated test equipment is used, the ground lead must not be electrically connected to ac line ground.

The schematic diagram of the PA board contains the voltage readings required for troubleshooting. The readings are typical for normal operating conditions at rated power output for the radio. Refer to troubleshooting charts and the schematic when a defect is suspected in the PA board.

5. PA REPAIR NOTES

a. Resistance Measurements of Transistors in Push-Pull Pairs

Due to the fact that transistors in push-pull pairs are dc connected at both base and emitter, BOTH devices should be measured when a defect in the pair is suspected.

b. Transistor Removal Procedure

(1) Unscrew both mounting screws from the base of the transistor. The nuts for the mounting screws on the reverse side of the shelf are captivated and will not fall out.

(2) Remove excess solder from around transistor tabs with a vacuum bulb type desoldering device.

(3) Gently lift each lead, one at a time while applying heat.

(4) When all four leads are loose from the board, carefully lift out the transistor.

c. Transistor Installation Procedure

(1) Pre-tin underside of each transistor lead.

(2) Apply a light coat of Wakefield Thermal Compound to the underside of the transistor mounting base and to the heat sink.

(3) Install the transistor making sure that all collector leads except on Q501, face the front of the radio. The collector lead of Q501 faces the inner wall of the radio. Refer to the circuit board detail.

(4) Screw down the two mounting screws securely.

(5) Solder each transistor lead one at a time to the circuit board. The use of a generous amount of solder will insure good contact of the entire tab to the board. Use care that solder does not bridge to other plating or that solder does not flow into the cutout in the circuit board.

d. Procedure for Resistance Measurements of Transistors

(1) Set ohmmeter to RX1, RX10, or RX100 scale (preferably RX10 if available).

(2) Measure the resistance from lead to lead as described:

(a) With the positive probe on the base no indication (very high impedance) should be observed when the negative probe is touched to the collector or emitter. (Reverse drop measurement.)

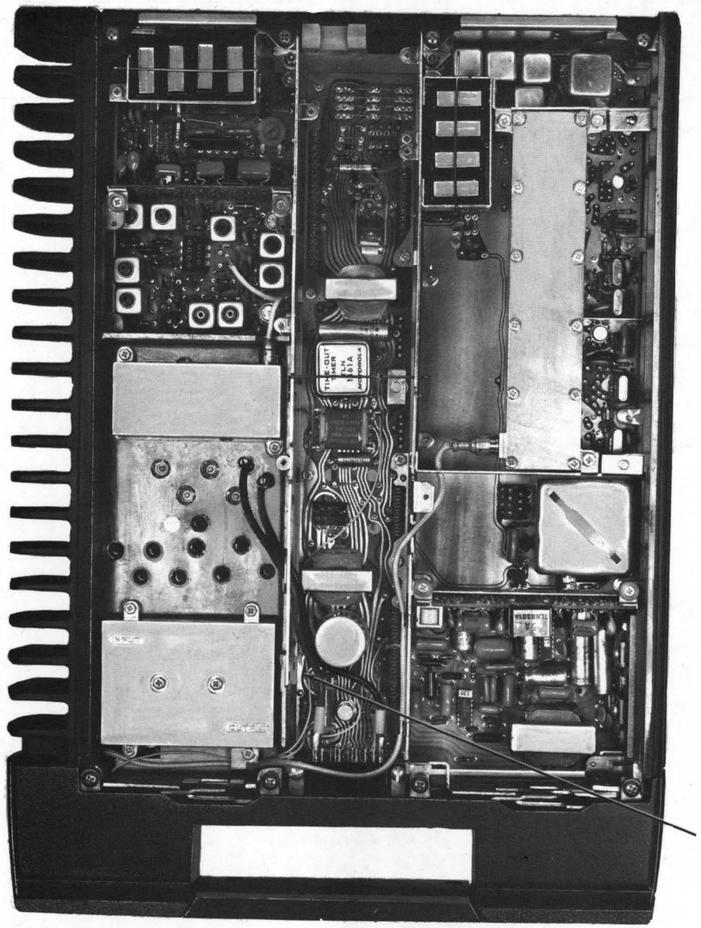
(b) With the negative probe on the base, a relatively low impedance should be observed when touching the positive probe to the collector and emitter. (Forward drop measurement.)

(c) No indication should be observed from collector to emitter regardless of the polarity of the ohmmeter probes.

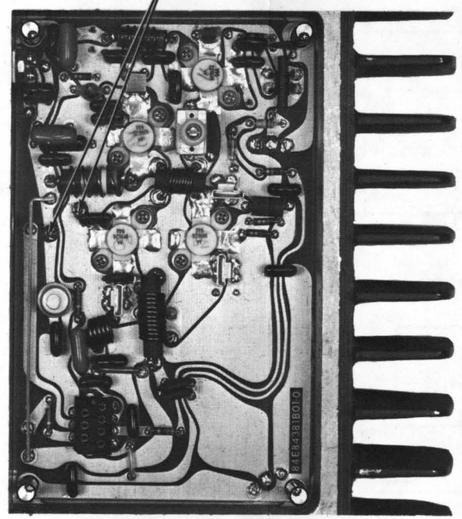
Should any indication be observed in measurements (a) or (c), the transistor is defective and should be replaced.

REMOVAL PROCEDURE

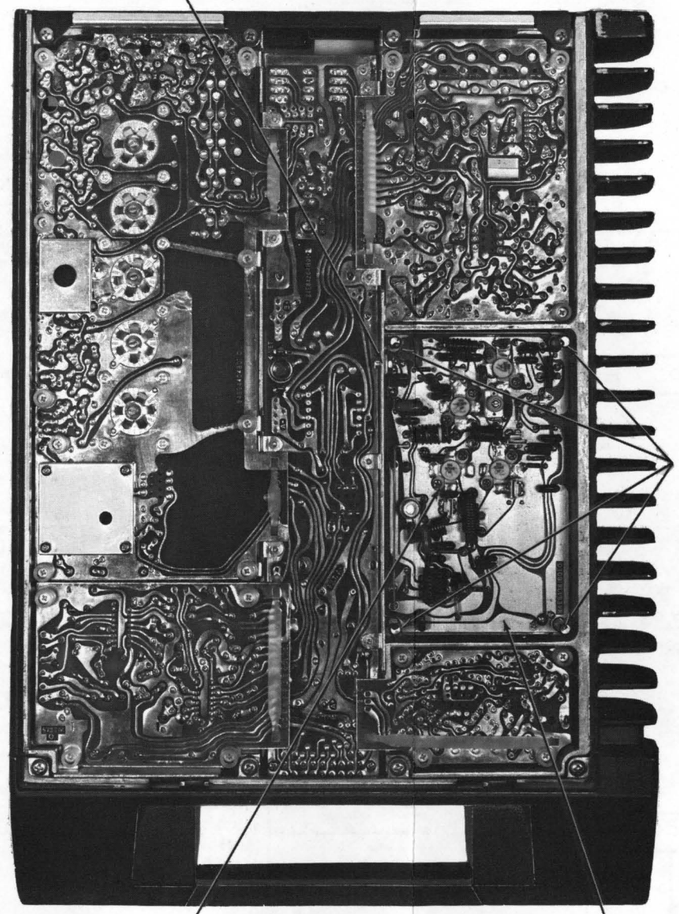
1. TURN OFF RADIO POWER
2. REMOVE POWER AMPLIFIER SHIELD



3. THOROUGHLY REMOVE SOLDER FROM A+ AND A- FEED-THROUGH LEAD CONNECTIONS.



4. UNSCREW CONTROL TRANSISTOR FROM INNER WALL; RETAIN SHOULDER WASHER AND MICA INSULATOR.



5. UNPLUG CONTROL LEAD

6. UNSCREW 8 SCREWS FROM TRANSISTOR MOUNTING BASES; NUTS ARE CAPTIVATED ON THE BOTTOM SIDE OF HEAT SINK.

7. INSERT SCREWDRIVER INTO SPACER AND UNSCREW THE 4 SPACER ASSEMBLIES.

8. CAREFULLY LIFT OUT BOARD.

9. EACH TRANSISTOR MAY BE REMOVED BY UNSOLDERING 4 TABS FROM BOARD AND LIFTING UPWARD.

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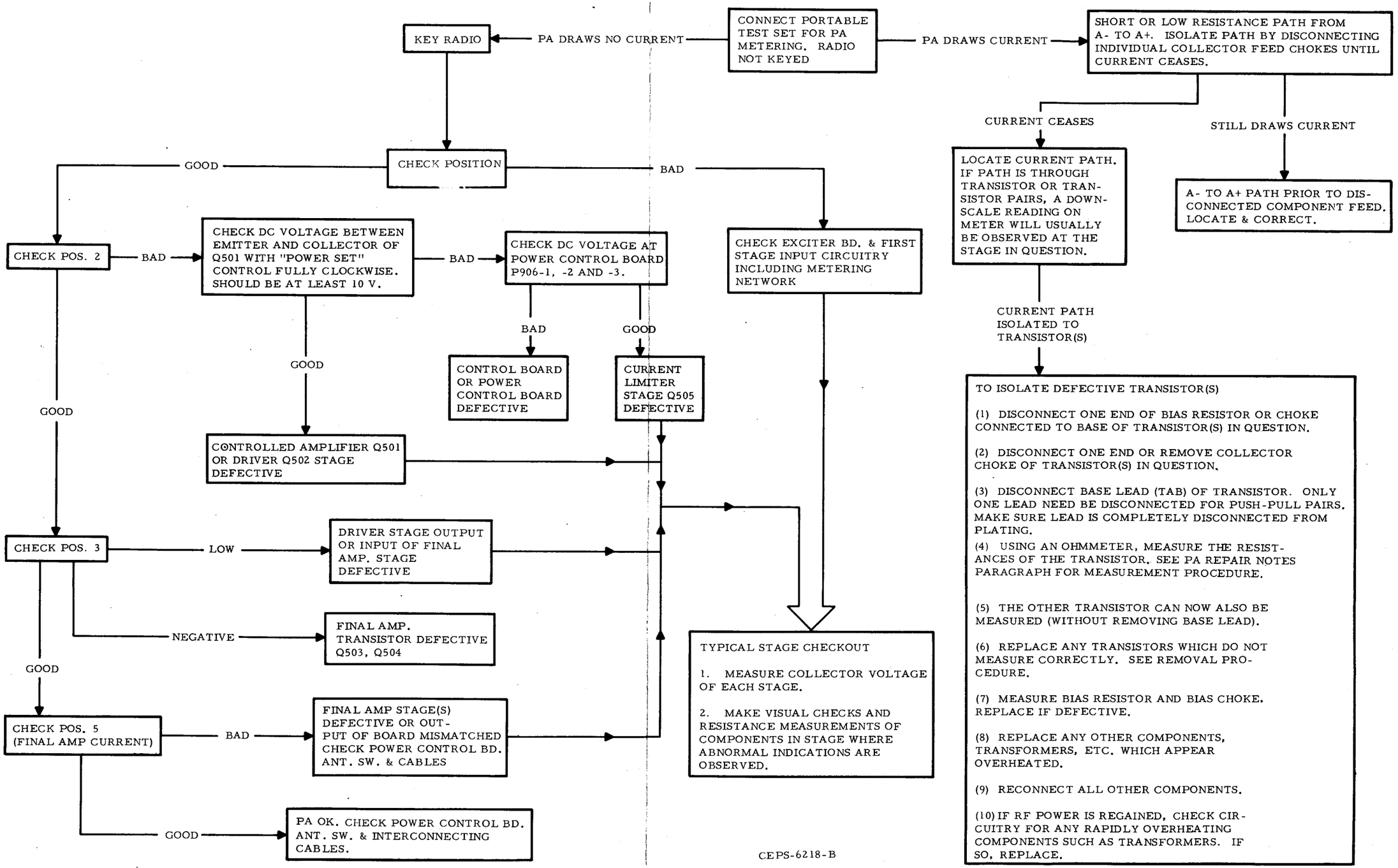
REPLACEMENT PROCEDURE

10. REPLACE BOARD MAKING SURE CONNECTORS AND HOLES ARE LINED UP.
11. REPLACE MOUNTING POSTS.
12. REPLACE CONTROL TRANSISTOR, WASHER, AND INSULATOR IN CORRECT ORDER.
13. PLUG IN CONTROL LEAD.
14. RESOLDER A+ AND A- LEADS.
15. IF TRANSISTORS WERE REMOVED, REPLACE AS SHOWN; INSERT AND TIGHTEN SCREWS BEFORE RESOLDERING TABS.

Figure 3.
Removal and Replacement of PA Circuit Board

45-WATT POWER AMPLIFIER
TROUBLESHOOTING CHART



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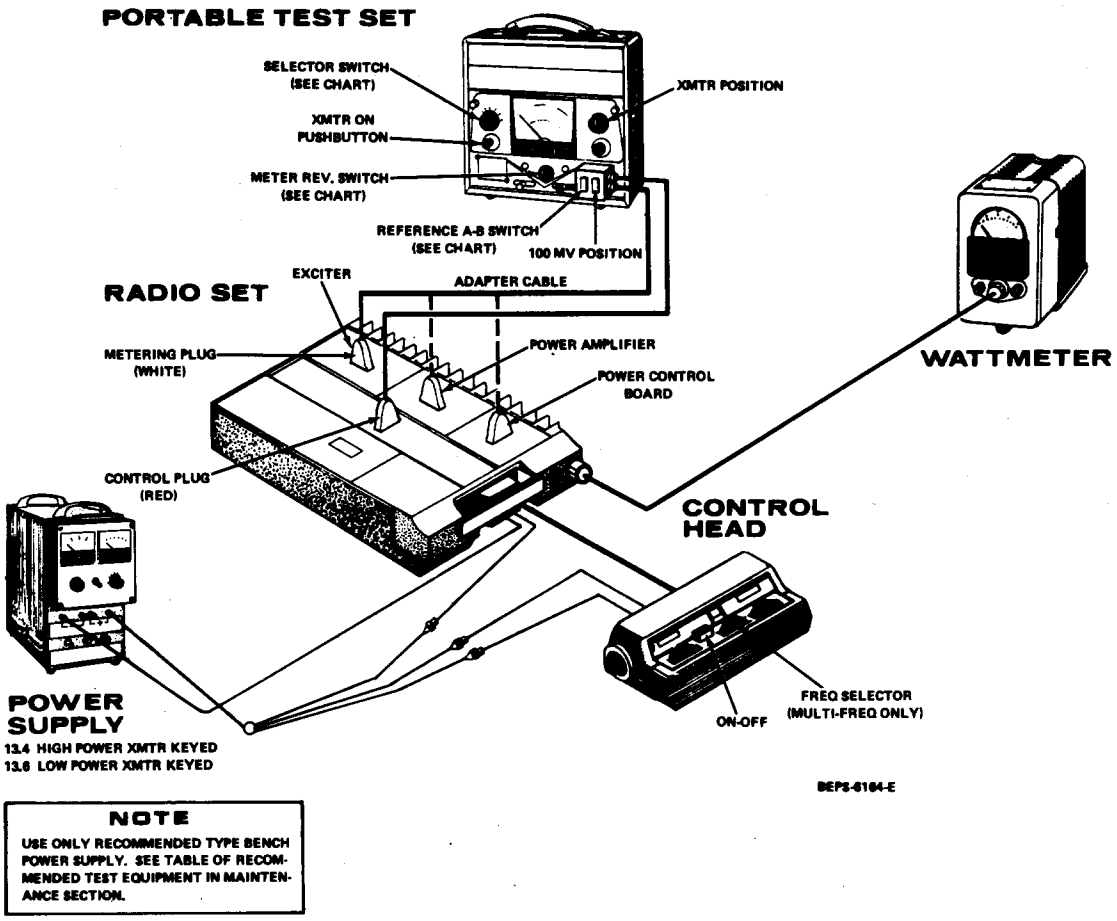

NOTE

USE ONLY RECOMMENDED TYPE BENCH POWER SUPPLY. SEE TABLE OF RECOMMENDED TEST EQUIPMENT IN MAINTENANCE SECTION.

Alignment Set-Up

EXCERPTS FROM FCC REGULATIONS

FCC Regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a first or second class commercial radiotelephone operator's license or by personnel working directly under their immediate supervision.
2. The power input to the final radio frequency stage shall not exceed the maximum figure specified on the current station authorization. This power input shall be measured and the results recorded:

   a. When the transmitter is initially installed.
   b. When any change is made in the transmitter which may increase the power input.
   c. At intervals not to exceed one year.

3. Frequency and deviation of a transmitter must be checked:

   a. When it is intially installed.
   b. When any change is made in the transmitter which may affect the carrier frequency or modulation characteristics.
   c. At intervals not to exceed one year.

COMPLETE POWER AMPLIFIER ALIGNMENT PROCEDURE

45/60/90/110 WATTS

NOTE: Portable Test Set meter sensitivity switch should be on 100 mV for all readings.

STEP	ADJUST	METERING PLUG LOCATION	TEST SET SWITCH POSITION	REF. & METER REV. SWITCH POSITION	PROCEDURE
1					Turn the POWER SET control fully counterclockwise (minimum power output). If the power amplifier is to be realigned less than ±1 MHz, proceed with Step 2. Otherwise, prealign the board by setting C501 fully clockwise and C502 fully meshed.
2	POWER SET (R611)	POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF. A	Key transmitter and slowly turn POWER SET control clockwise until rated power is attained or until no further increase in power output is observed.
3	POWER SET C501 *C502	POWER CONTROL	5	METER REV. REF. B	Adjust C501, then C502, for a dip on meter 5. If a dip cannot be found, reduce POWER SET until meter 5 is less than 20 uA.
4		POWER CONTROL BOARD	Wattmeter or 1	METER REV. REF. A	Repeat Steps 2 and 3 until rated power is reached. Proceed to Step 7 when rated power is attained and meter 5 is less than 30 uA. If rated power cannot be reached and meter 5 is less than 30 uA proceed with Step 5. If at this point meter 5 is greater than 30 uA and rated power has not been attained, refer to the power control troubleshooting chart.
5	R610	POWER CONTROL	Wattmeter or 1	METER REV. REF. A	Remove the power control board shield. Use tuning tool #66A82846D01, or equivalent, to adjust R610. Access to this control is provided by a small slot located approximately 3/4 inch from the POWER SET hole, toward the rear of the radio. Use the tuning tool to rotate the outer edge of the serrated knob toward the heat sink until either rated power is attained or no further increase in power output is observed. Replace power control shield.
6					Repeat Steps 3 and 4.

* C502 is used only on 90/110 watt models.

COMPLETE POWER AMPLIFIER ALIGNMENT PROCEDURE

45/60/90/110 WATTS (Cont'd)

STEP	ADJUST	METERING PLUG LOCATION	TEST SET SWITCH POSITION	REF. & METER REV. SWITCH POSITION	PROCEDURE
7		PA	5	METER REV. REF. B	FINAL COLLECTOR CURRENT - Move the metering plug to the PA. Measure the final collector current (IC). IC, in amperes, is the meter 5 reading (10 A full scale) for 45- and 60-watt models; meter 5 reading (25 A full scale) for 90/110-watt models.
8		PA	6	METER REV. REF. B	FINAL COLLECTOR VOLTAGE - Measure the final collector voltage (Vc). Vc is the meter 6 reading (0-30 V scale).
9					Determine the final input power (Pin). Pin equals Vc x Ic. Pin should be less than: 90 W for 45 W models 120 W for 60 W models 180 W for 90 W models 200 W for 110 W models If Pin exceeds these levels, refer to Power Amplifier Troubleshooting Chart.

EPS-6543-B

45-WATT POWER AMPLIFIER COMPONENT LOCATIONS

REF. SYM.	LOCATION
C501	B1
C502	A1
C503	A1
C504	A2
C505	C4
C506	A1
C507	C1
C508	A1
C509	C1
C510	C1
C511	C1
C512	B1
C513	B1
C514	C1
C515	C1
C516	C4
C517	C1
C518	C1
C519	B1
C520	C2
C521	A2
C522	B4
C524	C3
C525	A3
C526	B4
C527	B4
C528	A3
C529	C3
C530	C3
C531	C2
C532	C1
C534	C3
C537	A1
C539	A1

REF. SYM.	LOCATION
CR501	A2
CR502	C3
J501	A2
J502	A4
J503	C4
L501	B1
L502	B1
L503	B1
L504	C1
L505	C2
L506	A2
L507	C3
Q501	B1
Q502	B2
Q503	B2
Q504	B2
Q505	C1
R501	A2
R502	A1
R503	C1
R504	C3
R505	B4
R506	A2
R507	A2
R509	C3
R510	C1
T501	A1
T502	B2
T503	B3
Z503	B1
Z504	B2
Z505	B2

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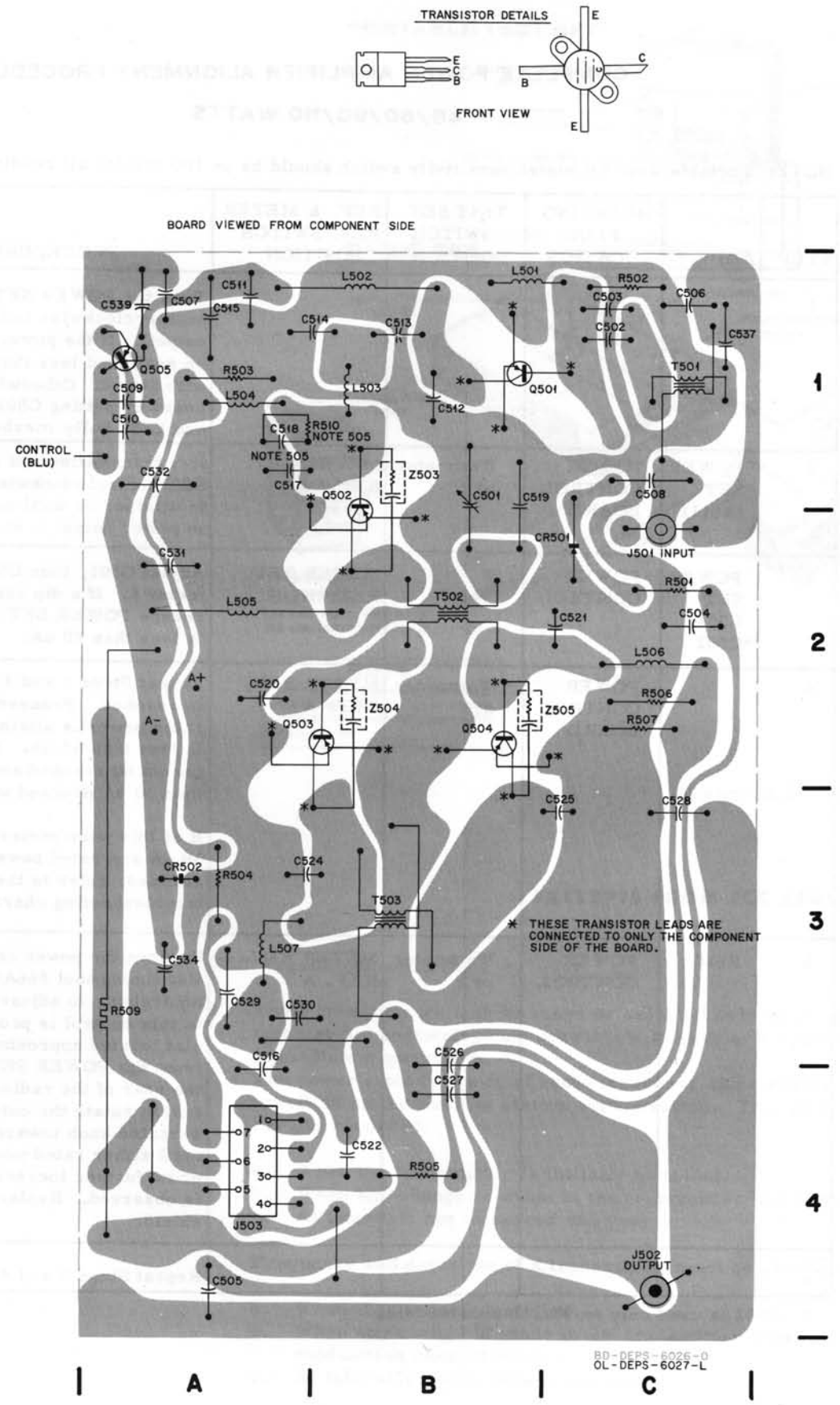
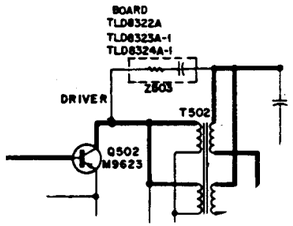
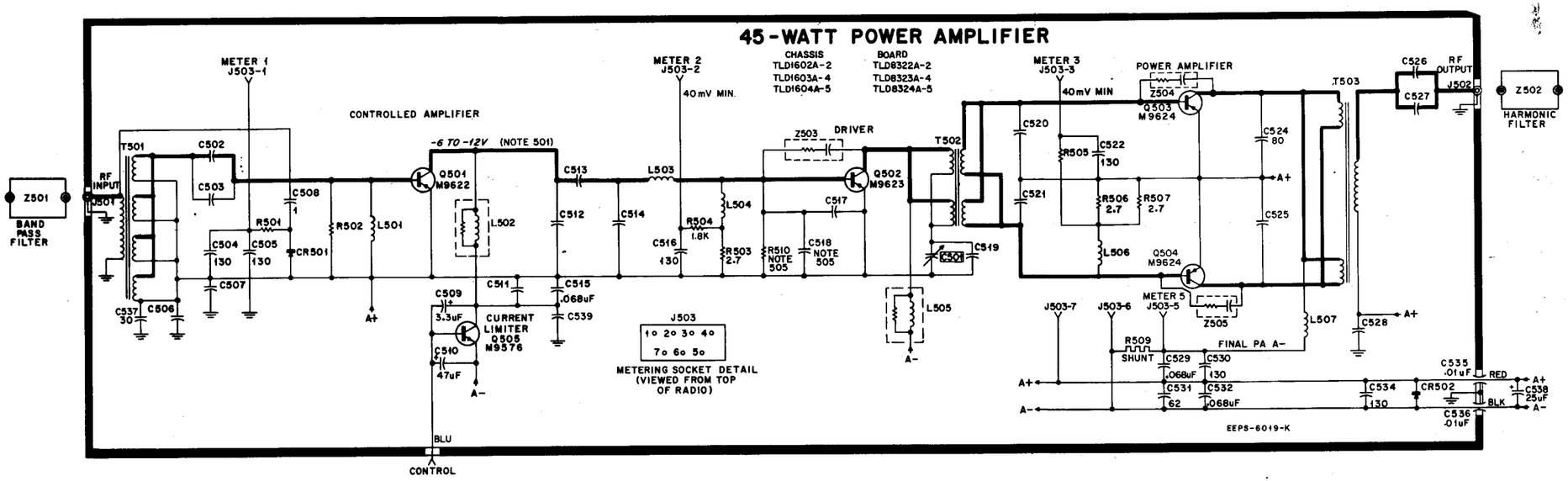

TRANSISTOR DETAILS
E
C
B
FRONT VIEW
BOARD VIEWED FROM COMPONENT SIDE
CONTROL (BLU)
A+
A-
J501 INPUT
J502 OUTPUT
J503
NOTE 505
* THESE TRANSISTOR LEADS ARE CONNECTED TO ONLY THE COMPONENT SIDE OF THE BOARD.
BD-DEPS-6026-0
OL-DEPS-6027-L
A
B
C
1
2
3
4

REVISIONS

63P81008E44 G

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
TLD1602A		ADDED TO COVER 132-150.8 MHz RANGE		
TLD1603A TLD1604A	C503	WAS 21D84494B30, 34 pF (150.8-174 MHz)	Q501 BASE	
	C523	REMOVED; WAS 21C82372C04; 0.05 uF +80-20%; 25 V	PARALLEL WITH C524	
	C524	WAS 21D84395B02, 100 pF (150.8-174 MHz)	T503 PRIMARY	
	C525	WAS 21D84395B02, 100 pF (162-174 MHz)		
	C526	WAS 21D84936A02, 7 pF (150.8-162 MHz)	T503 SECONDARY	
	C527	WAS 21D84936A02, 7 pF (150.8-162 MHz)		
TLD1604A-1	C524	WAS 21D84395B01, 40 pF (162-174 MHz)	Q503 COLLECTOR	
	C525	WAS 21D84395B03, 40 pF (162-174 MHz)	Q504 COLLECTOR	
	R504	WAS 6S129432, 820 (162-174 MHz)	J503-2	
	R505	WAS 6S128689, 2.2K (162-174 MHz)	J503-3	
	Z503	RELOCATED; WAS AS SHOWN	Q502 COLLECTOR	
TLD1602A-1 TLD1603A-2 TLD1604A-3	C537	ADDED	T501 SECONDARY	
TLD1602A-2 TLD1603A-3 TLD1604A-4	C533	REMOVED; WAS 23D83214C16, 15 uF	BETWEEN A+ & A- INPUT	
	C538	ADDED		
TLD1603A-3 (TLD8323A-3)	C502	WAS 21D84494B25, 49 pF (150.8-162 MHz)	Q501 BASE	
	C512	WAS 21D84494B29, 10 pF (150.8-162 MHz)	Q501 COLLECTOR	
	C513	WAS 21D84494B27, 140 pF (150.8-162 MHz)	Q501 COLLECTOR	
	C514	WAS 21D84494B01, 51 pF (150.8-162 MHz)	Q501 COLLECTOR	
	C518	WAS 21D84494B25, 49 pF (150.8-162 MHz)	Q502 BASE	
	L504	WAS 24C83961B01, 3 turns (150.8-162 MHz)	Q502 BASE	
	R502	WAS 6S124B17, 47 OHM (150.8-162 MHz)	Q501 BASE	
TLD1603A-4 (TLD8323A-4)	R510	ADDED, USED IN PLACE OF C518 IN 150.8-162 MHz MODEL	Q502 BASE	
TLD1602A-2 TLD1603A-4 TLD1604A-4				
TLD1604A-5 (TLD8324A-5)	C539	ADDED 21C82187E14, .001 uF	Q505 COLL.	45 W P.A. BD. PEPS-6219-E
TLD1602A-2 TLD1603A-4 TLD1604A-5	Q505	FROM 48-869576, TYPE M9576 TO 48-869576, TYPE M9576 OR 48-869779 TYPE M9779	CURRENT LIMITER	
TLD1602A-3 TLD1603A-5 TLD1604A-6	Z503L, 504L, 505L	CHANGED TO Z503, 504, 505	PARTS LIST	
	L502L	ADDED 24-84392B03, CHOKE; 6 TURNS		
	L503L	ADDED 7-84400B03, INDUCTOR BRACKET		





POWER AMPLIFIER

501. VOLTAGES DEPENDENT UPON AMOUNT OF CUTBACK FROM POWER CONTROL BOARD.
502. VOLTAGES MEASURED IN RESPECT TO A+ UNLESS OTHERWISE SPECIFIED.
503. UNLESS OTHERWISE SPECIFIED:
CAPACITOR VALUES ARE IN PICOFARADS
RESISTOR VALUES ARE IN OHMS
504. FOR COMPONENT VALUES NOT STATED ON THE SCHEMATIC DIAGRAM, REFER TO THE ACCOMPANYING TABLE.
505. C518 IS USED FOR 132-150.8 MHz AND 162-174 MHz, R510 IS USED FOR 150.8-162 MHz.

EPS-6214-C

45-WATT POWER AMPLIFIER COMPONENT VALUES

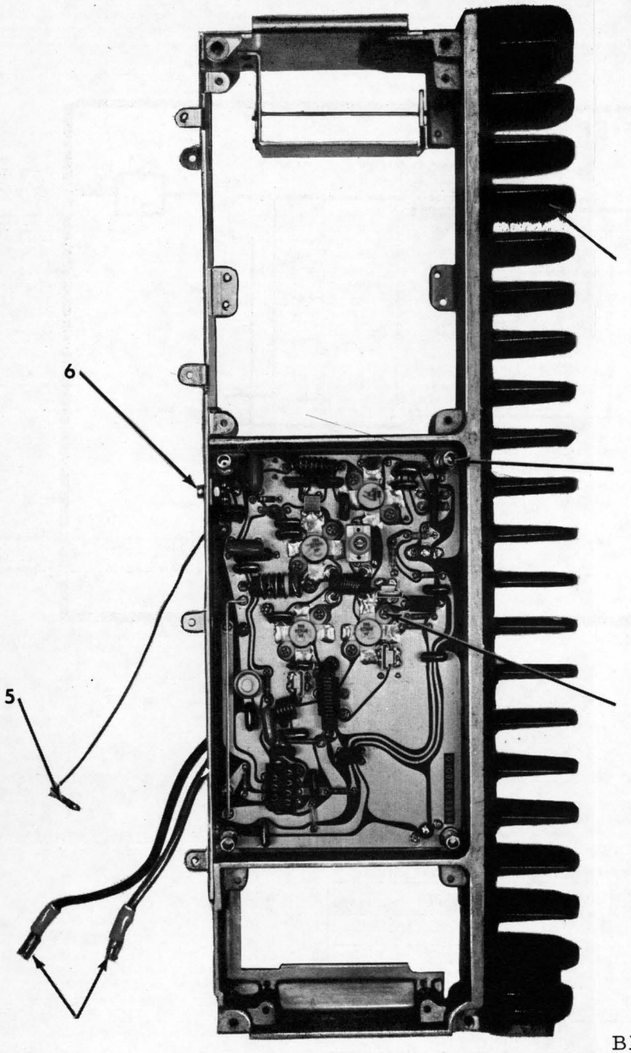
REFERENCE SYMBOL	132-150.8 MHz	150.8-162 MHz	162-174 MHz
C501	4-40	1.5-18	1.5-18
C502	80	62	39
C503	68	51	39
C506	62	51	34
C507	.05 uF	130	OMIT
C511	100	OMIT	43
C512	15	15	6
C513	175	100	140
C514	62	62	39
C517	49	30	39
C518	49	OMIT	49
C519	20	20	12
C520	91	51	75
C521	80	40	40
C525	100	100	130
C526	30	OMIT	7
C527	OMIT	20	7
C528	68	62	62
C539	OMIT	OMIT	.001 uF
C556	OMIT	30	OMIT
R501	68K	68K	82K
R502	10	10	47
R505	3.3K	3.3K	4.7K
R510	OMIT	68	OMIT
Z503	ADD	OMIT	OMIT

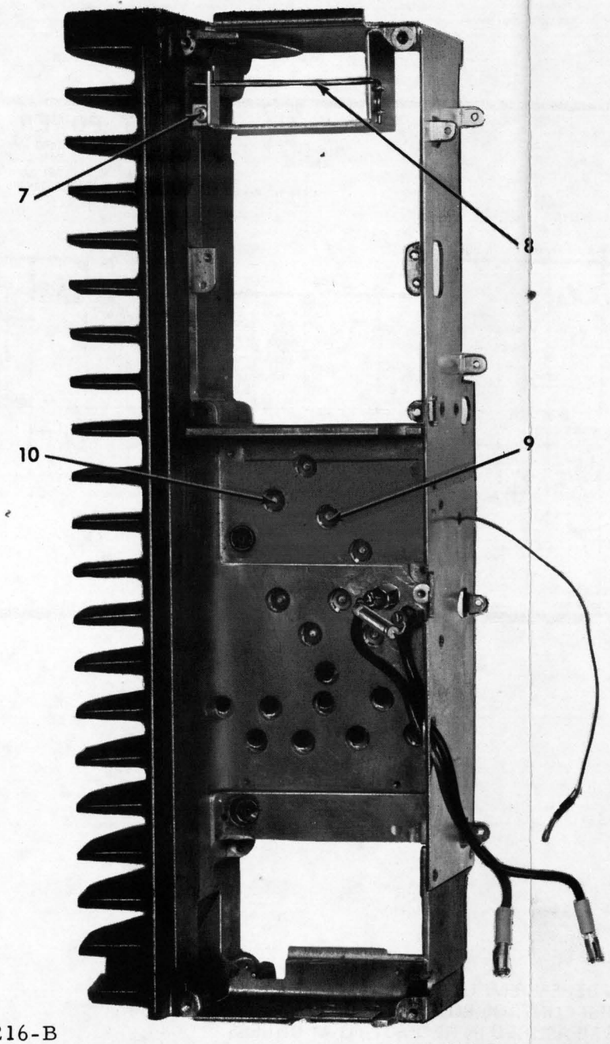
EPS-6169-J

45 W POWER AMPLIFIER

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

45 Watt Power Amplifier
Schematic Diagram
Motorola No. 63P81008E44-G
3/13/73





BEPS-6216-B

MECHANICAL PARTS LIST

PL-989-A

CODE	MOTOROLA PART NO.	DESCRIPTION
1	26E84198B01	HEATSINK
2	43B84219C01	SPACER & SCREW ASSEMBLY
3	3S136910	SCREW, machine: No. 4-40 x 1/2"; 8 used
4	9C84282B01	CONNECTOR, receptacle: female; 2 used
5	29A84532B01	LUG, special: 1 used
6	4A84152B01	WASHER, shoulder
7	3S134212	LOCKSCREW: No. 4 x 5/16"
8	41A84226B01	SPRING, retaining
9	2S136912	NUT, square: No. 4-40 x 1/4" 8 used
10	42A10438A01	RETAINER, square nut: 8 used

45 W POWER AMPLIFIER

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

ELECTRICAL PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

LEGEND
L = 132-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

TLD1602A 45 Watt Power Amplifier (132-150.8 MHz)
TLD1603A 45 Watt Power Amplifier (150.8-162 MHz)
TLD1604A 45 Watt Power Amplifier (162-174 MHz) PL-851-H

		CAPACITOR, fixed: pF ±5%; 500 V unl stated
C501L	20-83201B09	var: 4-40
C501M	20-83201B09	var: 4-40
C501H	20-83201B07	var: 1.5-18
C502L	21-84494B03	80
C502M	21-84494B02	62
C502H	21-84494B24	39
C503L	21-84494B34	68
C503M	21-84494B01	51
C503H	31-84494B24	39
C504	21-84494B26	130
C505	21-84494B26	130
C506L	21-82372C04	.05 uF +80-20%; 25 V
C506M	21-82428B59	.01 uF +80-20%; 200 V
C506H	21-82428B59	.01 uF +80-20%; 200 V
C507L	21-82372C04	.05 uF +80-20%; 25 V
C507M	21-84494B26	130
C508	21-864518	1 ±10%
C509	23-83214C17	3.3 uF ±20%; 15 V
C510	23-83214C10	47 uF ±20%; 6 V
C511L	21-84494B04	100
C511H	21-84494B28	43
C512L	21-84494B38	15
C512M	21-84494B38	15
C512H	21-82204B03	6 ±0.5 pF; NP0
C513L	21-84494B09	175
C513M	21-84494B04	100
C513H	21-84494B27	140
C514L	21-84494B02	62
C514M	21-84494B02	62
C514H	21-84494B24	39
C515	8-83813H05	.068 uF ±10%; 100 V
C516	21-84494B26	130
C517L	21-84494B25	49
C517M	21-84494B33	30
C517H	21-84494B24	39
C518L	21-84494B25	49
C518H	21-84494B25	49
C519L	21-84936A03	20
C519M	21-84936A03	20
C519H	21-84936A05	12
C520L	21-84494B52	91
C520M	21-84494B01	51
C520H	21-84494B31	75
C521L	21-84395B03	80; 250 V
C521M	21-84395B01	40; 250 V
C521H	21-84395B01	40; 250 V
C522	21-84494B26	130
C524	21-84494B03	80; 250 V
C525L	21-84395B02	100; 250 V
C525M	21-84395B02	100; 250 V
C525H	21-84395B05	130; 250 V
C526L	21-84936A06	30 ±0.4 pF; 2000 V; P120
C526H	21-84936A02	7 ±0.35 pF; 2000 V; P120
C527M	21-84936A03	20 ±1 pF; 2000 V; P120
C527H	21-84936A02	7 ±0.35 pF; 2000 V; P120
C528L	21-84494B34	68
C528M	21-84494B02	62
C528H	21-84494B02	62
C529	8-83813H05	.068 uF ±10%; 100 V
C530	21-84494B26	130
C531	21-84494B02	62
C532	8-83813H05	.068 uF ±10%; 100 V
C534	21-84494B26	130
C535	21-84211B01	.01 uF +100-0%; 250 V
C536	21-84211B01	.01 uF +100-0%; 250 V
C537	21-84494B33	30
C538	23-83210A01	25 uF +150-10%; 25 V
C539H	21-82187E14	.001 uF ±10%; 100 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		SEMICONDUCTOR DEVICE, diode:
CR501	48-82139G01	germanium
CR502	48-82525G01	silicon
		CONNECTOR, receptacle:
J501	28-84227B01	male; single contact
J502	28-84227B01	male; single contact
J503	9-84207B01	female; 7 contact
		COIL, RF:
L501	24-83961B01	choke; 3 turns; coded BRN
L502L	24-84392B03	choke; 6 turns
L502M	24-84392B03	choke; 6 turns
L502H	24-84392B01	choke; 6 turns
L503L	7-84400B03	(inductor bracket)
L503M	7-84400B03	bracket, inductor
L503H	7-84400B01	bracket, inductor
L504L	24-83961B01	choke; 3 turns; coded BRN
L504M	24-83961B03	choke; 1 turn; coded WHT
L504H	24-83961B01	choke; 3 turns; coded BRN
L505	24-84392B02	choke; 4 turns
L506L	24-83977B03	choke; ferrite; 1-1/2 turns
L506M	24-83977B01	choke; ferrite; 1-1/2 turns
L506H	24-83977B01	choke; ferrite; 1-1/2 turns
L507	24-84393B01	choke; 4-1/2 turns
		TRANSISTOR:
Q501	48-869622	P-N-P; type M9622
Q502	48-869623	P-N-P; type M9623
Q503	48-869624	P-N-P; type M9624
Q504	48-869624	P-N-P; type M9624
Q505	48-869576 or 48-869779	N-P-N; type M9576 N-P-N; type M9779
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R501L	6-129144	68k
R501M	6-129144	68k
R501H	6-129145	82k
R502L	6-129755	10
R502M	6-129755	10
R502H	6-124B17	47
R503	6-124B55	2.7 ±5%
R504	6-128689	1.8k
R505L	6-129231	3.3k
R505M	6-129231	3.3k
R505H	6-127804	4.7k
R506	6-124B55	2.7 ±5%
R507	6-124B55	2.7 ±5%
R509	6-84232B03	shunt, meter
R510M	6-124A21	68
		TRANSFORMER, RF:
T501	25-84396B01	pri: 5 turns sec: 1, 2, 3 & 4; 1 turn each
T502	25-84397B01	pri: 1-3/4 turns sec: 1 & 2; 1-3/4 turns each
T503	25-84399B01	pri: 5 turns sec: 1 & 2; 2-1/2 turns each
		FILTER:
Z501	TFD6112A	exciter
Z502	TFD6102A	harmonic
		NETWORK:
Z503 thru 505	1V80734B40	thick film
NON-REFERENCED ITEMS		
	TLD8322A	CIRCUIT BOARD ASSEMBLY (132-150.8 MHz)
	TLD8323A	CIRCUIT BOARD ASSEMBLY (150.8-162 MHz)
	TLD8324A	CIRCUIT BOARD ASSEMBLY (162-174 MHz)
		NOTE The above circuit board assemblies include all referenced electrical parts except the following: C535, C536 J501, J502, J503 Q501 thru Q505 Z501, Z502