



1. GENERAL

The *MSF 5000* Power Amplifier (PA) is designed for continuous duty operation over the full -30°C to $+60^{\circ}\text{C}$ range of ambient temperatures. The amplifier employs ceramic hybrid modules with 50-ohm interfaces between all stages. A built-in circulator provides for optimum performance of the PA regardless of the VSWR produced by the antenna. See Figure 1.

2. THEORY OF OPERATION

2.1 Depending upon the station configuration, the input signal to the PA comes from the prefilter (C675 or C677 options) or directly from the IPA (standard or C676 option). Under nominal operating conditions, the input level to the PA is 3 to 4.5 W. The predriver stage (Q501) amplifies the input signal to a level of 15 to 20 W.

The signal at the output of the driver stage (Q502) is then amplified to a 50 to 60 W level. At this point, the signal is split three ways and applied to the final amplifier modules (Q503, 504, 505). After combining the outputs of the final amplifier modules, power of 150 to 165 W is delivered to the circulator. A directional coupler for sensing output power is incorporated onto the combiner module. The output power from the circulator is nominally 80 to 90 W (triple circulator) or 120 to 125 W (single circulator).

2.2 Operating temperature of the PA is sensed by two thermistors. One thermistor (RT501) senses the temperature of the heat sink backplane and the other (RT571) senses the temperature of the circulator load. See Figure 2. The temperature information is used by the power control circuit to control the PA.

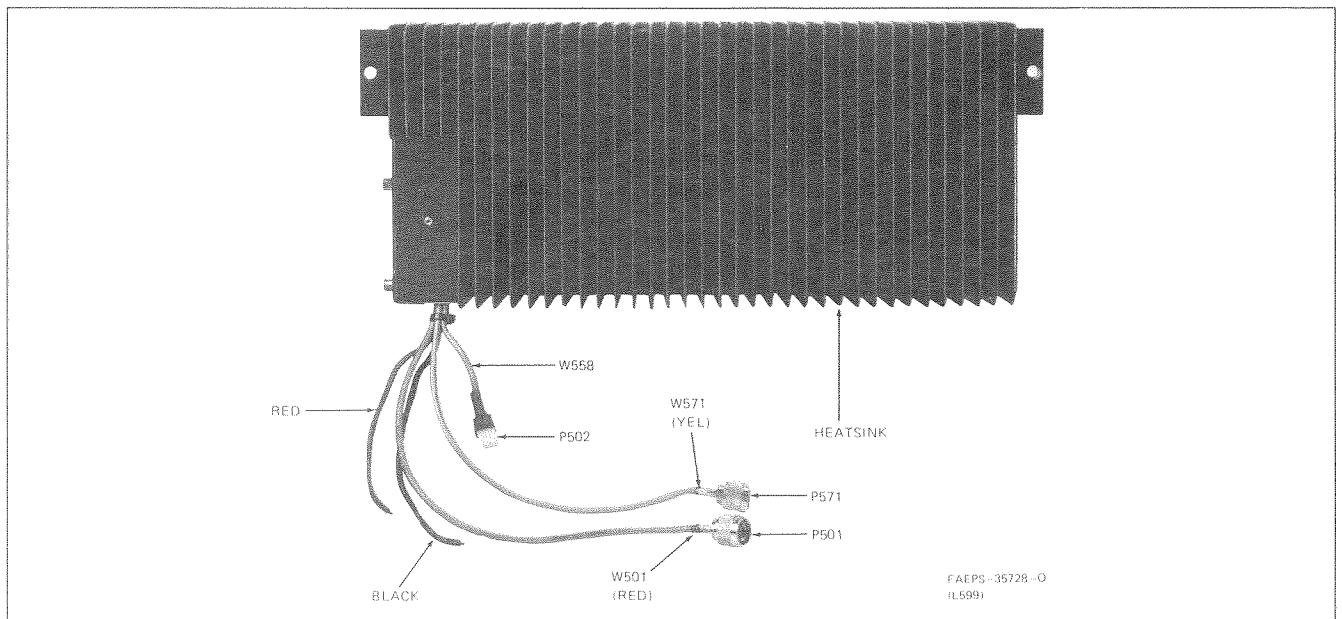


Figure 1. Front View of Power Amplifier Deck

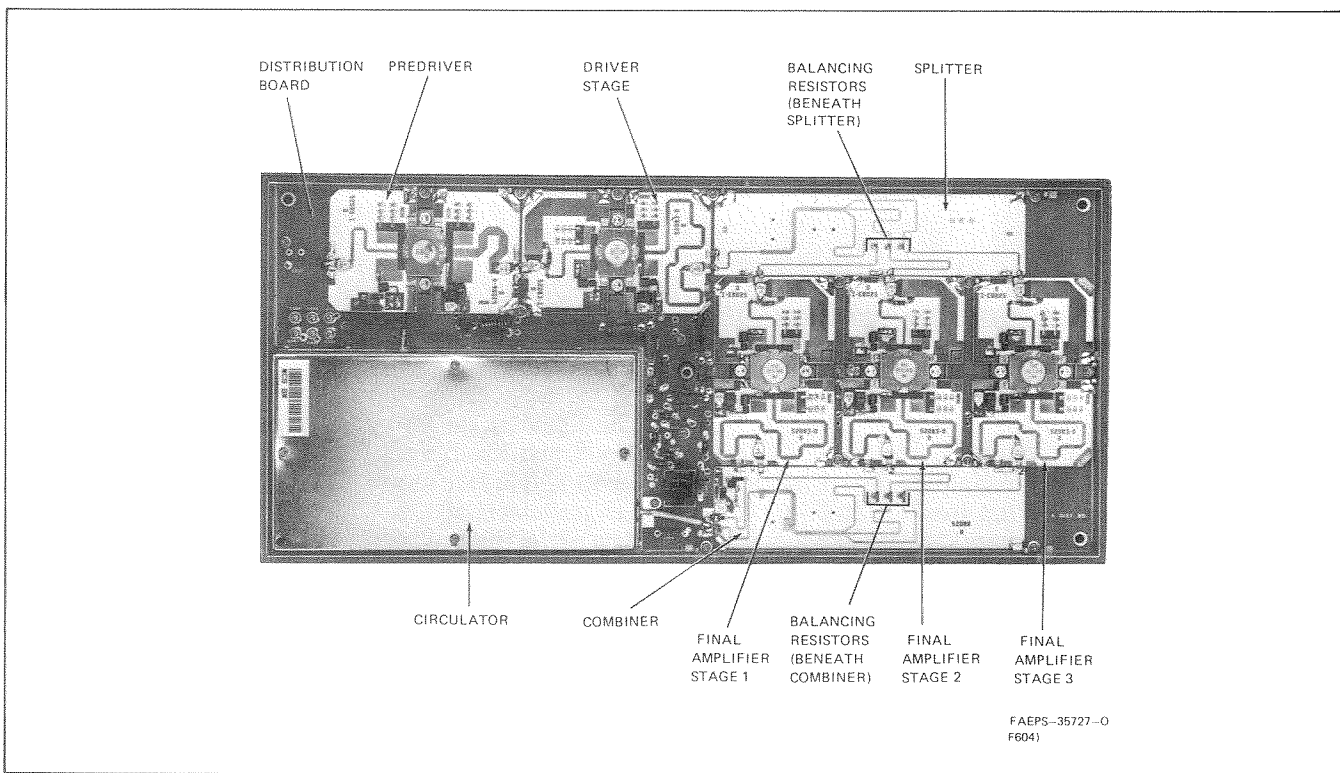


Figure 2.
Rear View (Cover Removed) of Power Amplifier Deck

3. SERVICING

3.1 GENERAL

Repair of the *MSF 5000* microstrip ceramic substrates is not recommended and should be avoided. The *MSF 5000* modules are built and tested at the factory employing special fixtures and processes to ensure proper operation. The repair procedure consists of replacing a defective module rather than components on the module.

IMPORTANT

All five cover screws must be tight to ensure optimum performance.

3.2 MODULE ASSEMBLY REMOVAL

3.2.1 The *MSF 5000* rf power modules consist of an rf power transistor and associated circuits bonded to a copper heat spreader. This assembly should be removed as a unit by first unsoldering the dc and rf connections to the module. Next, remove the two M4 × 18 hold-down screws. Long nose pliers can now be used to grasp the copper heat spreader and remove the module. The large surface area of the copper heat spreader may cause the surface tension of the thermal compound to exert a large amount of force on the module; rocking the module from side to side may be necessary to overcome the force.

3.2.2 During servicing of the transmitter, it may be necessary to defeat the transmitter shutdown section of the power control. Under normal operation, the transmitter shutdown circuit signals the station control to turn off the transmitter when power control cannot level power. Transmitter shutdown can be prevented by installation of the service jumper JU1, on the Station Control board. This allows the serviceman to make measurements in the areas of power control, IPA, and power amplifier regardless of conditions in the transmitter.

CAUTION

Installation of JU1 allows the transmitter to continue to operate, although a potentially damaging condition may exist. Therefore, key the transmitter for only short periods during servicing. Refer to the troubleshooting chart for fault isolation.

3.3 INTERSTAGE POWER MEASUREMENT AND 'OMEGA' STRAP REPLACEMENT

3.3.1 If it is desirable to measure rf power at any of the 50-ohm interfaces in the transmitter, care should be exercised in removal of the "Omega" straps between modules and their reinstallation. Care should be exercised when soldering the "Omega" strap interconnects between hybrid modules. The "Omega" straps

(Motorola p/n 42-84510M04 & 42-83680N01) absorb mechanical stresses caused during temperature excursions of the station and therefore must remain flexible after installation. When soldering these connections, do not allow solder to bridge over the top or to fill the underside of the "Omega" strap. Figure 3a shows how a correctly soldered "Omega" strap should look. Incorrect soldering is shown in Figure 3b. Furthermore, do not substitute any rigid material or attempt to replace an "Omega" strap by "solder bridging". If proper soldering techniques are not observed during installation of "Omega" straps, premature failure of the hybrid module can result.

IMPORTANT

Power measurements of the individual *final* amplifier modules should *not* be attempted. The splitter and combiner cir-

IMPORTANT (Cont'd.)

cuits serve to prevent imbalances in drive and output of the three final amplifier stages. If input or output connections to the individual final modules are broken, power measurements will be incorrect.

3.3.2 Balance between the finals should be checked by metering their currents (M1, M2, and M3). The balance in meter readings between the final amplifiers should be within 5 uA of one another. If greater than 5 uA imbalance is indicated, the lower of the device meter readings is probably the bad module(s). When replacing any of the final amplifier modules, unsolder the connections to the balancing resistors (input and output) and measure their value. All resistors should be approximately 50 ohms and within 5 ohms of one another.

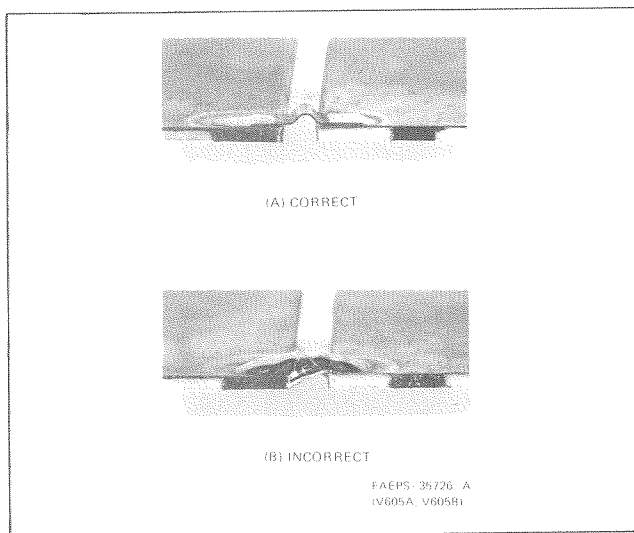
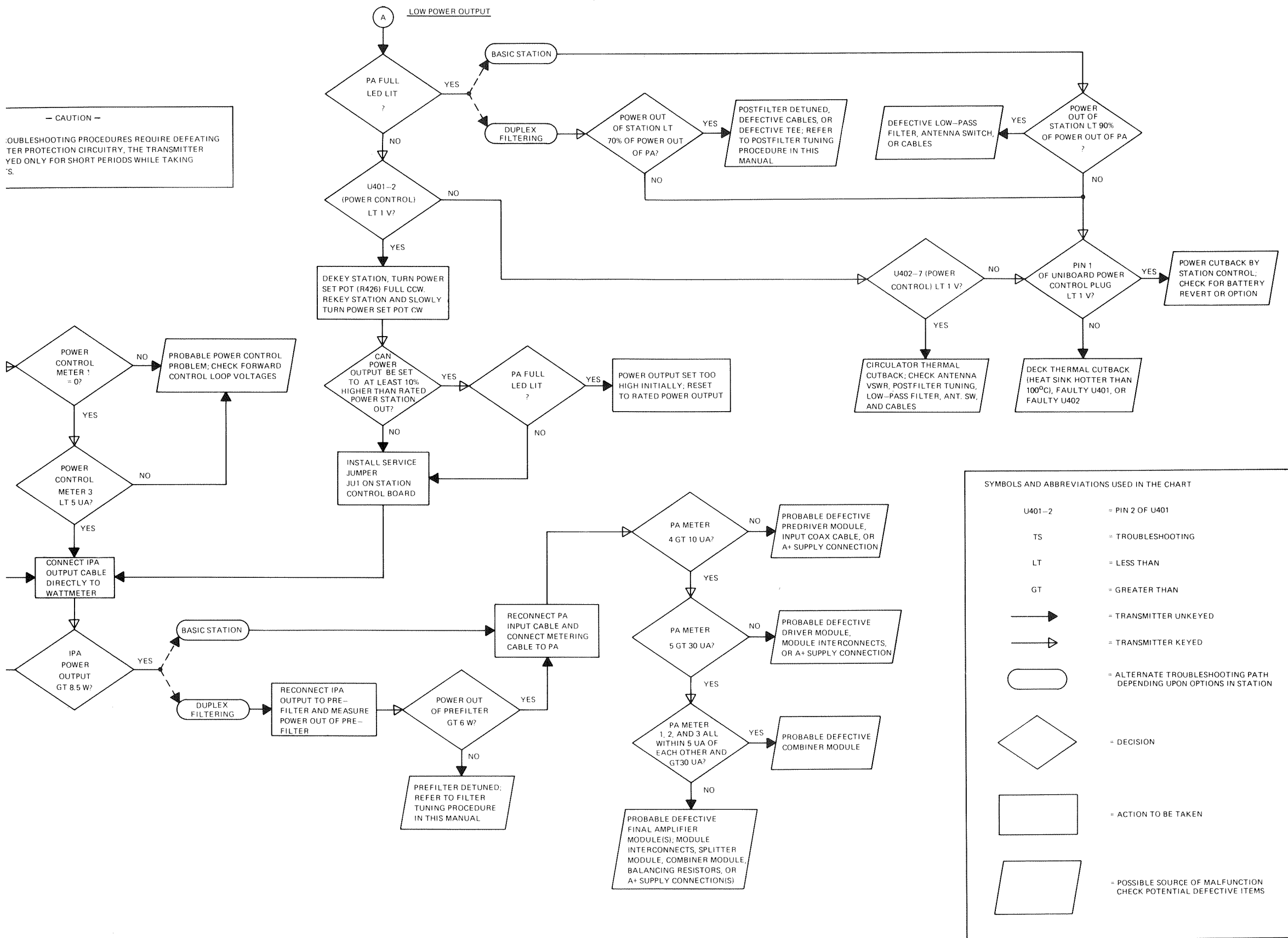


Figure 3.
"Omega" Strap Replacement Soldering Technique

POWER AMPLIFIER DECK

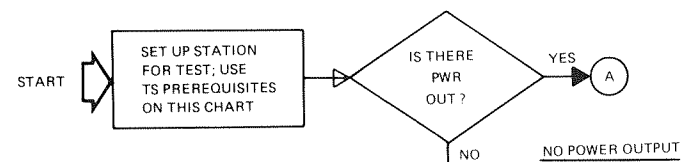
TTE1450A SERIES, 60A SERIES
TRANSMITTER TROUBLESHOOTING CHART

— CAUTION —
TROUBLESHOOTING PROCEDURES REQUIRE DEFEATING TRANSMITTER PROTECTION CIRCUITRY. THE TRANSMITTER SHOULD BE KEPT OPERATED ONLY FOR SHORT PERIODS WHILE TAKING MEASUREMENTS.



- TROUBLESHOOTING PREREQUISITES:**
1. CONNECT THE STATION ANTENNA CONNECTOR (OR TRANSMITTER OUTPUT CONNECTOR ON STANDARD REPEATER MODELS) TO A WATTMETER TERMINATED WITH A 150 WATT DUMMY LOAD.
 2. CONNECT THE STATION TO ITS POWER SOURCE (AC OR BATTERY).
 3. USE A TEK-37A TEST SET ADAPTER WITH RPX4221A CABLES AND MOTOROLA S1056 PORTABLE TEST SET FOR METERING.

EEPS-35643-A



POSSIBLE POWER SUPPLY OR SYNTHESIZER PROBLEM; REFER TO SYNTHESIZER TROUBLESHOOTING SECTION.

TRANSMIT TX. LOCK LED LIT?

NO

FLASHES ON AND GOES OUT

YES

NO

REFER TO STATION CONTROL BOARD TS CHART IN THIS MANUAL.

NO OR FLASHES

INSTALL SERVICE JUMPER JU1 ON STATION CONTROL BOARD

NO

CONNECT PA OUTPUT CABLE DIRECTLY TO WATTMETER.

POWER OUT OF PA DECK?

NO

CHECK INPUT CONNECTION TO CIRCULATOR; IF OK, THEN CIRCULATOR IS DEFECTIVE.

YES

DEFECTIVE LOW-PASS FILTER, ANTENNA SWITCH, OR CABLES.

BASIC STATION

DUPLEX FILTERING

POSTFILTER DETUNED, DEFECTIVE CABLES, OR DEFECTIVE TEE; REFER TO POSTFILTER TUNING PROCEDURE.

— CAUTION —
SINCE SOME TROUBLESHOOTING PROCEDURES REQUIRE DEFEATING THE TRANSMITTER PROTECTION CIRCUITRY, THE TRANSMITTER SHOULD BE KEYED ONLY FOR SHORT PERIODS WHILE TAKING MEASUREMENTS.

POWER OUTPUT = 0?

YES

PROBABLE POWER CONTROL PROBLEM; CHECK FORWARD CONTROL LOOP VOLTAGES

NO

POWER CONTROL METER 1 = 0?

YES

CHECK FORWARD POWER DETECTOR ON PA COMBINER; CHECK POWER CONTROL CABLE AND ITS CONNECTIONS

NO

POWER CONTROL METER 3 LT 5 UA?

YES

CONNECT IPA OUTPUT CABLE DIRECTLY TO WATTMETER

NO

CHECK FOR SHORTED Q451 ON IPA; REFER TO IPA T5 CHART IN THIS MANUAL

PROBABLE IPA PROBLEM; REFER TO IPA T5 CHART IN THIS MANUAL

IPA POWER OUTPUT GT 8.5 W?

YES

BASIC STATION

DUPLEX FILTERING

RECONNECT IPA OUTPUT TO PRE-FILTER AND MEASURE POWER OUT OF PRE-FILTER

POWER OUT OF PREFILTER GT 6 W?

YES

RECONNECT PA INPUT CABLE AND CONNECT METERING CABLE TO PA

PREFILTER DETUNED; REFER TO FILTER TUNING PROCEDURE IN THIS MANUAL

NO

LOW POWER OUTPUT

PA FULL LED LIT?

YES

BASIC STATION

NO

U401-2 (POWER CONTROL) LT 1 V?

NO

DUPLEX FILTERING

POWER OUT OF STATION LT 70% OF POWER OUT OF PA?

YES

POSTFILTER DETUNED, DEFECTIVE CABLES, OR DEFECTIVE TEE; REFER TO POSTFILTER TUNING PROCEDURE IN THIS MANUAL

NO

DEKEY STATION, TURN POWER SET POT (R426) FULL CCW. REKEY STATION AND SLOWLY TURN POWER SET POT CW

CAN POWER OUTPUT BE SET TO AT LEAST 10% HIGHER THAN RATED POWER STATION OUT?

NO

INSTALL SERVICE JUMPER JU1 ON STATION CONTROL BOARD

PA FULL LED LIT?

YES

POWER OUTPUT SET TOO HIGH INITIALLY; RESET TO RATED POWER OUTPUT

NO

PA METER 4 GT 10 UA?

NO

PROBABLE DEFECTIVE DRIVER MODULE, INPUT COAX CABLE, OR A+ SUPPLY CONNECTION

YES

PA METER 5 GT 30 UA?

NO

PROBABLE DEFECTIVE DRIVER MODULE, MODULE INTERCONNECTS, OR A+ SUPPLY CONNECTION

YES

PA METER 1, 2, AND 3 ALL WITHIN 5 UA OF EACH OTHER AND GT 30 UA?

YES

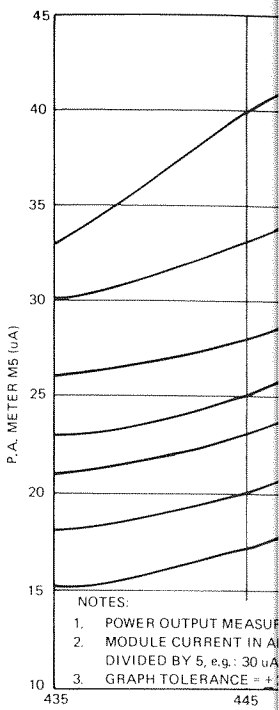
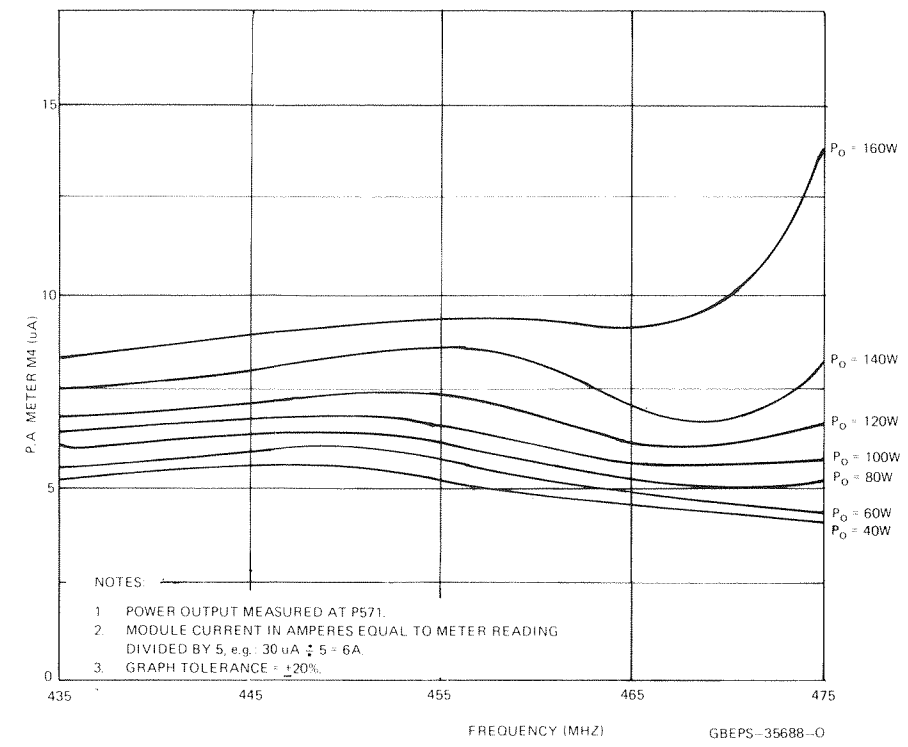
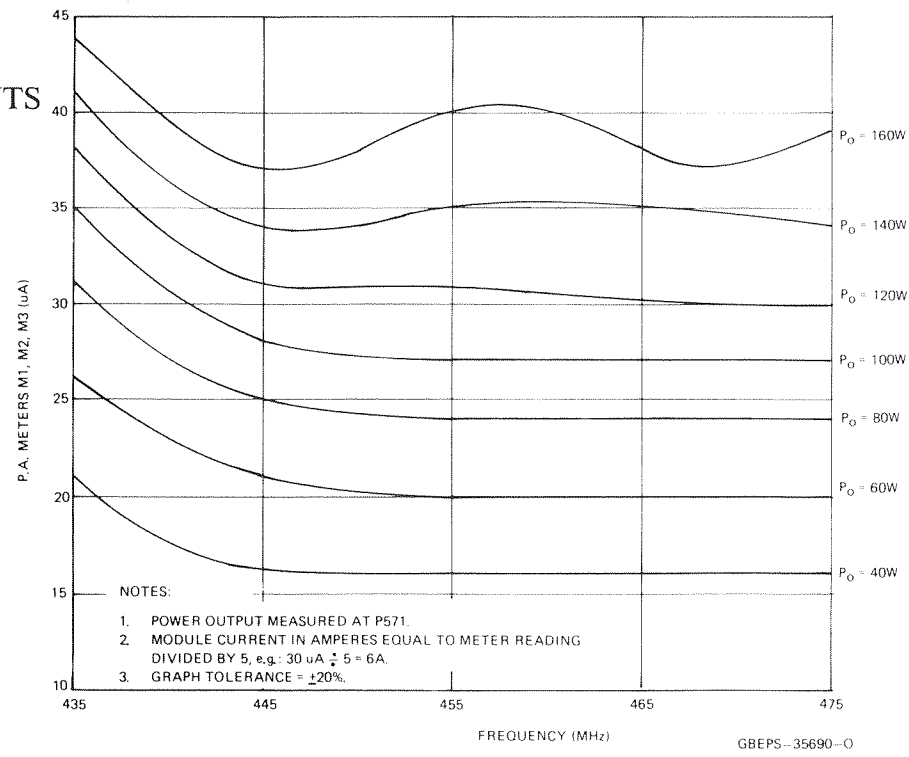
PROBABLE DEFECTIVE COMBINER MODULE

NO

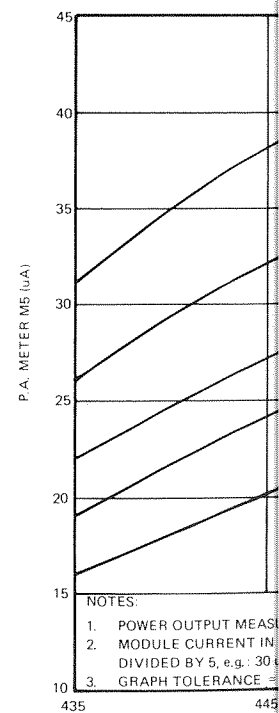
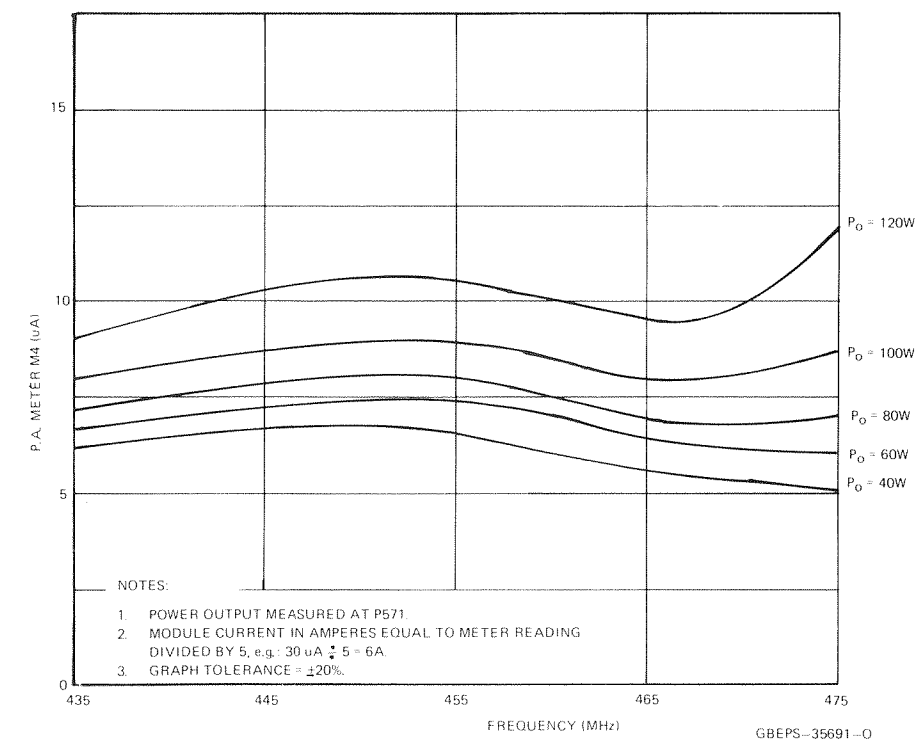
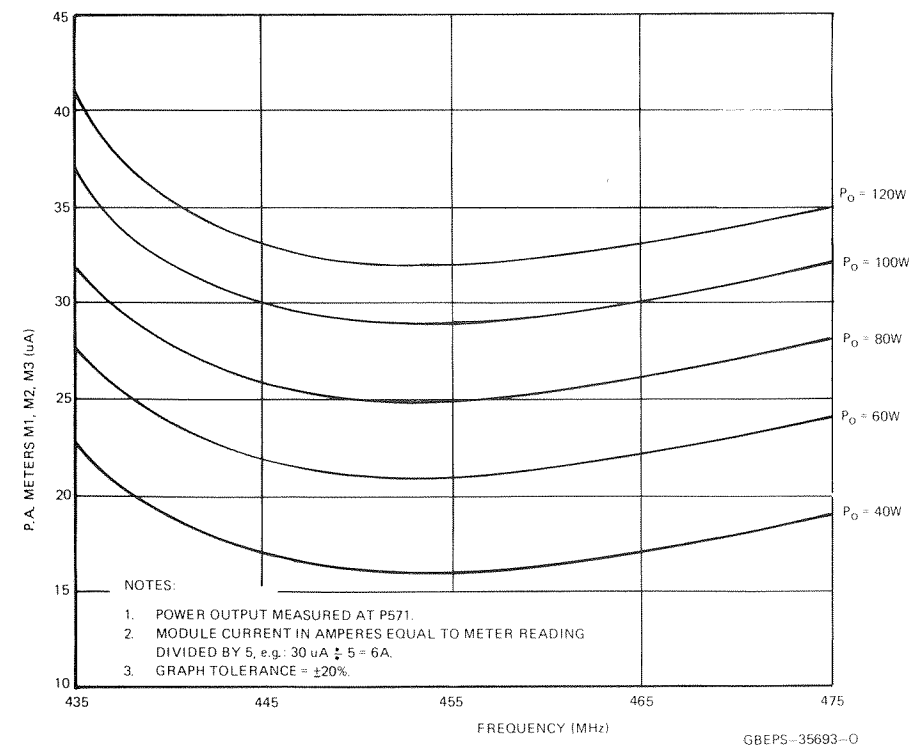
PROBABLE DEFECTIVE FINAL AMPLIFIER MODULE(S); MODULE INTERCONNECTS, SPLITTER MODULE, COMBINER MODULE, BALANCING RESISTORS, OR A+ SUPPLY CONNECTION(S)

CIRCUIT BOARD VSWR LOW AND

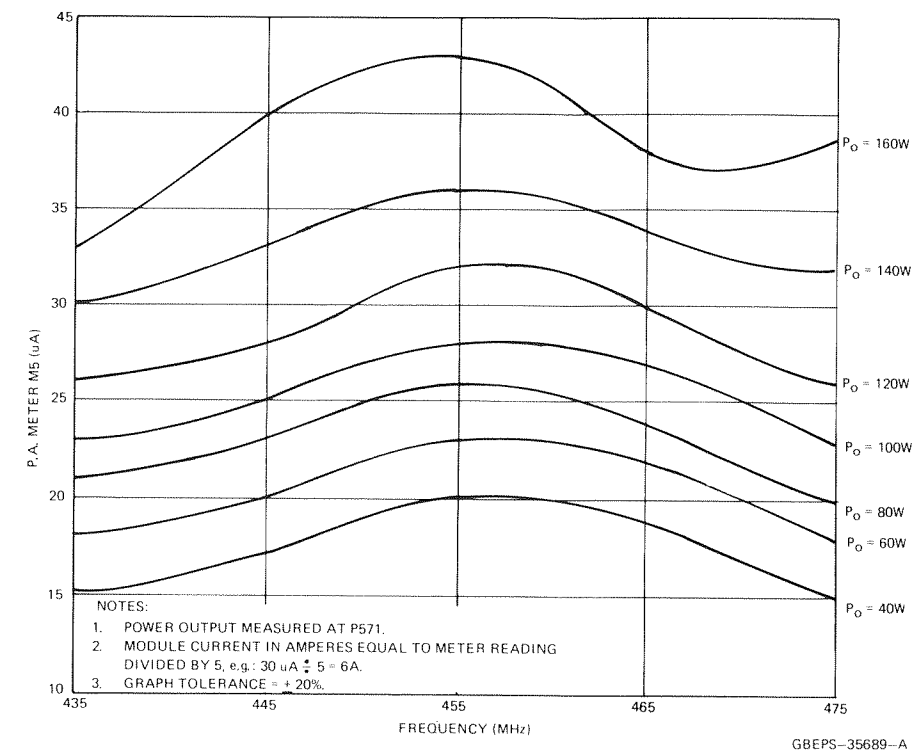
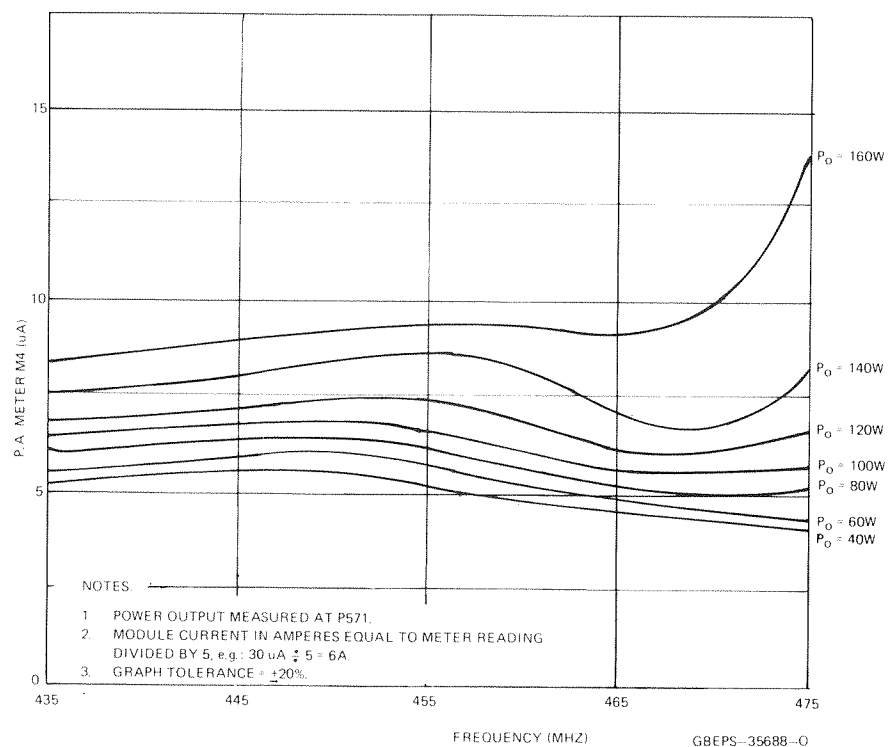
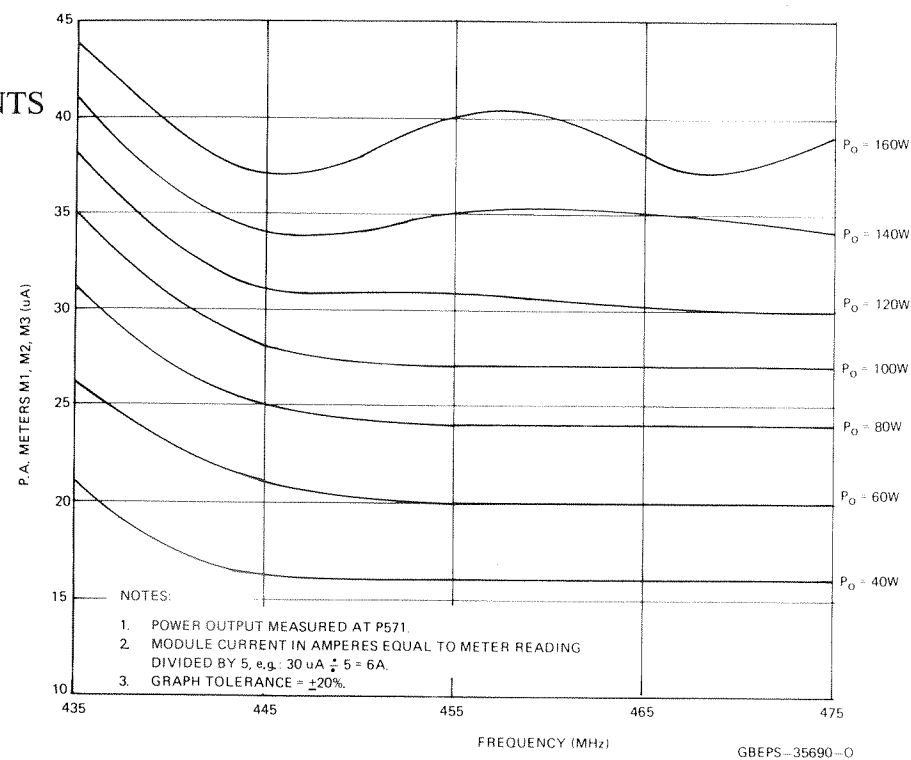
POWER AMPLIFIER DECK
TTE1450A SERIES, 60A SERIES
TYPICAL POWER AMPLIFIER MEASUREMENTS



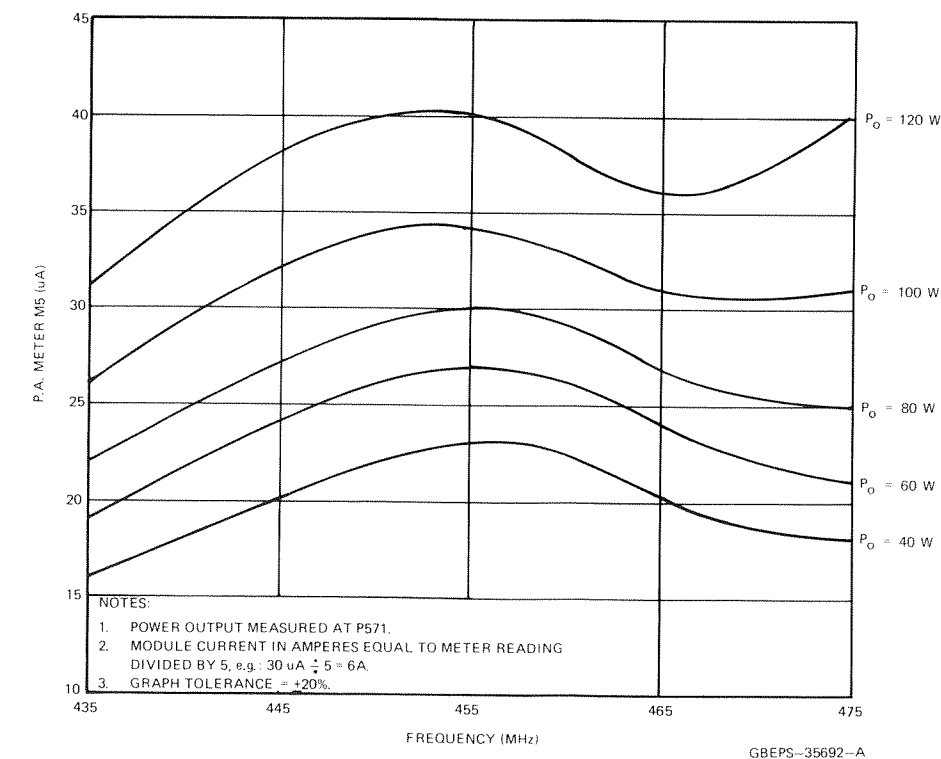
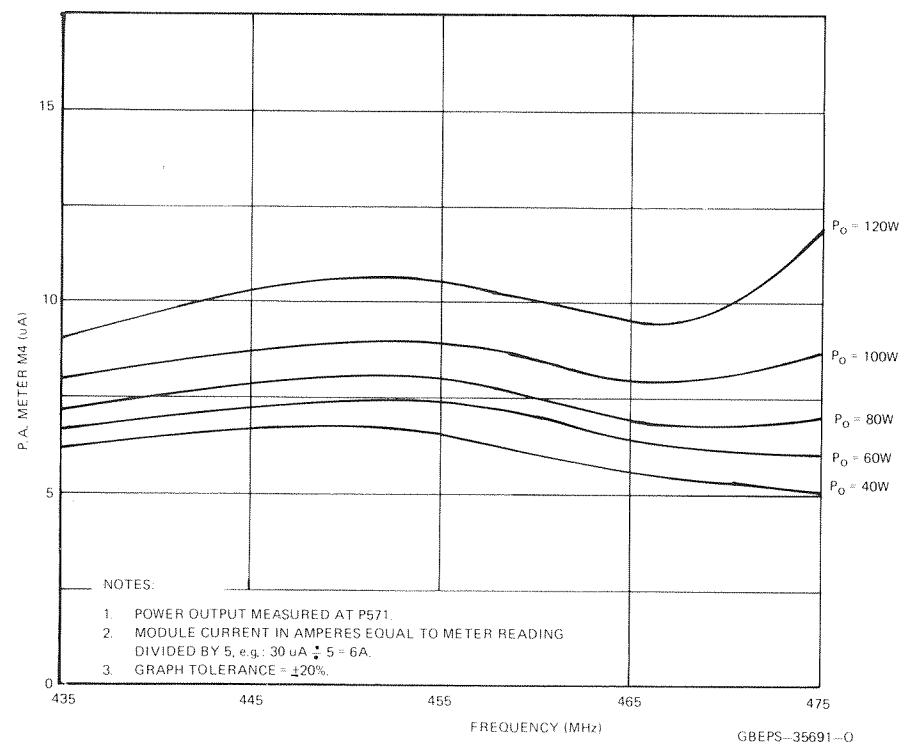
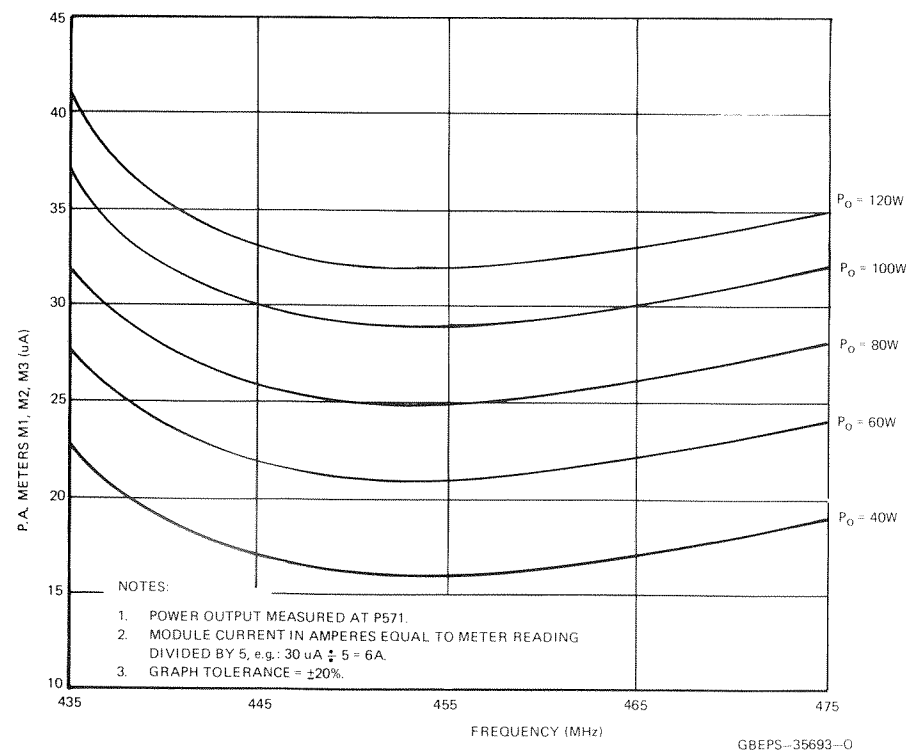
TYPICAL READINGS FOR SINGLE CIRCULATOR (TTE1432A) POWER AMPLIFIER DECK



TYPICAL READINGS FOR TRIPLE CIRCULATOR (TTE1442A) POWER AMPLIFIER DECK



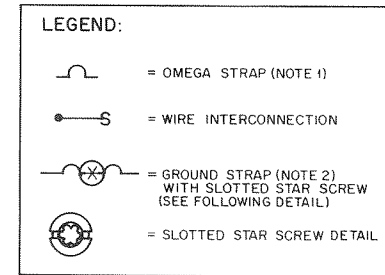
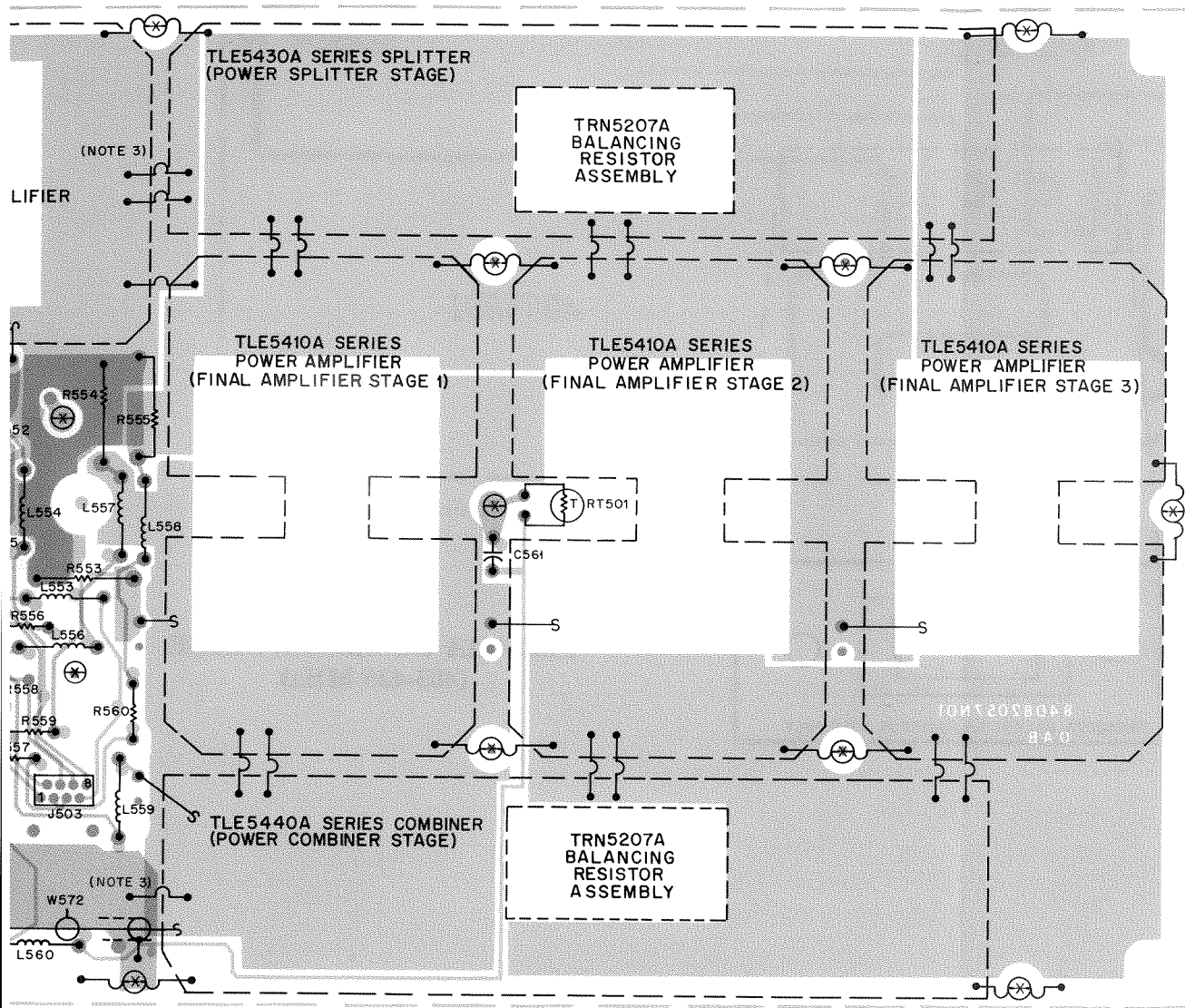
TYPICAL READINGS FOR SINGLE CIRCULATOR (TTE1432A) POWER AMPLIFIER DECK



TYPICAL READINGS FOR TRIPLE CIRCULATOR (TTE1442A) POWER AMPLIFIER DECK

POWER AMPLIFIER DECK

TTE1450A SERIES, 60A SERIES
CIRCUIT BOARD DETAILS AND PARTS LISTS



- NOTES:**
1. OMEGA STRAPS PART OF MODULE ASSEMBLIES. REFER TO MODULE DETAILS.
 2. GROUND STRAPS PART OF PA HARDWARE KIT.
 3. OMEGA STRAPS FOR SPLITTER OR COMBINER GND CONNECTIONS ARE PART OF PA HARDWARE KIT.

- J503 [METER]**
- 1- METER 1 (FINAL STAGE 1)
 - 2- METER 2 (FINAL STAGE 2)
 - 3- METER 3 (FINAL STAGE 3)
 - 4- METER 4 (PREDRIVER STAGE)
 - 5- METER 5 (DRIVER STAGE)
 - 6- METER 6 (FACTORY TEST)
 - 7- METER 7 (A+ METERING REFERENCE)
 - 8- METER 8 (FACTORY TEST)

COMPONENT SIDE ● BD-DEPS-35196-A
SOLDER SIDE ● BD-DEPS-35197-A
OL - EEPS-35198-C

PL-8654-O

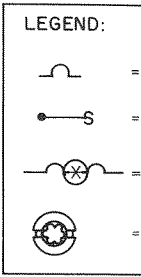
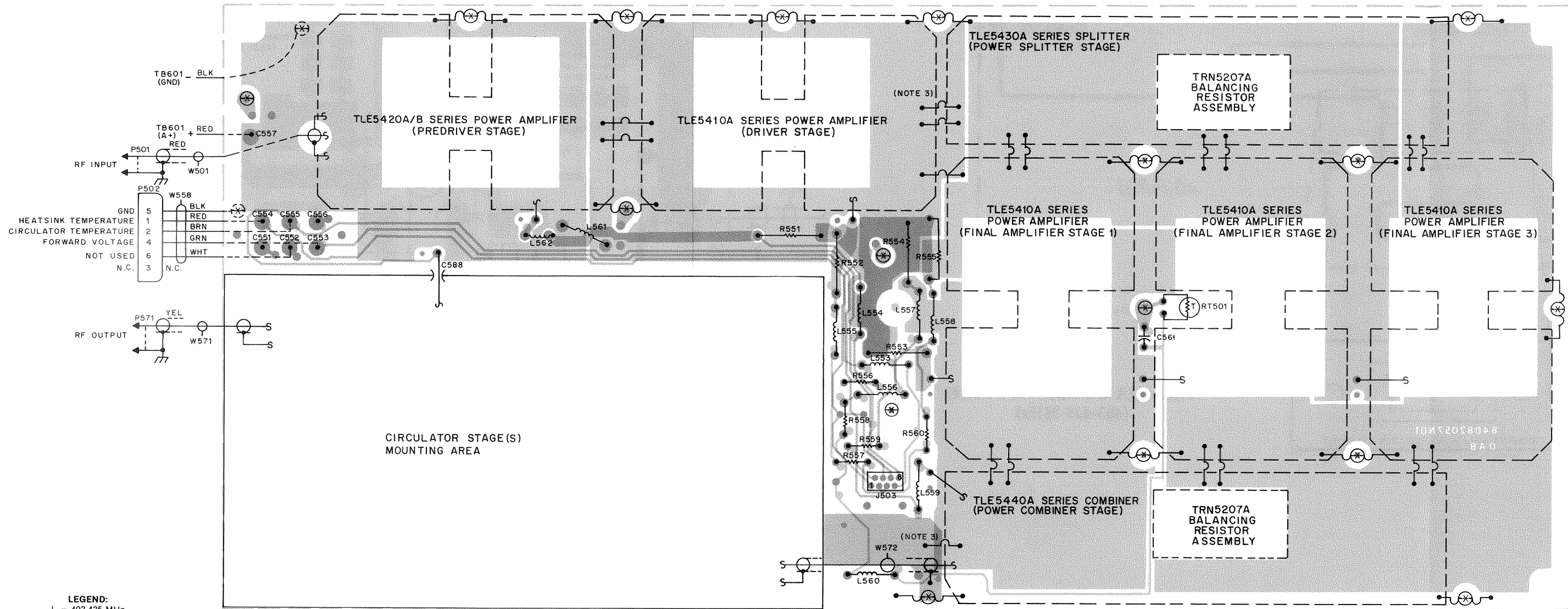
TKN8483A Power Amplifier Cable

PL-10293-O

DESCRIPTION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
connector, plug: single contact	P501	28-84476G01	connector, plug: male, single contact
ably, input cable (RED) includes: P501 3LE, coaxial; 17" used CAL, color strip red SHING, cable	W501	1-80799D32	assembly cable input; includes: P501
		30-84173E01	CABLE, coaxial shielded; 13.63" used
		33-88083C02	DECAL, color strip RED
parts MBLY wire and lug includes: IMINAL, ring MBLY wire and lug (BLK) includes: IMINAL, receptacle	W502	43-83152N02	BUSHING
		1-80752D78	assembly, battery cable; includes:
		29-82907N05	TERMINAL, ring YEL
		30-831572	BATTERY, wire (BLK); 9.5" used
		1-80746D52	assembly, battery cable; includes:
		29-83897M02	TERMINAL, wire grip
		30-813233	BATTERY, wire (RED); 8.5" used

MODEL COMPLEMENT

				MODEL	DESCRIPTION
				TTE1451A	110 W PA Deck (Single Circulator); 403-435 MHz
				TTE1452A	110 W PA Deck (Single Circulator); 435-475 MHz
				TTE1461A	110 W PA Deck (Triple Circulator); 403-435 MHz
				TTE1462A	110 W PA Deck (Triple Circulator); 435-475 MHz
LEGEND: X = one item supplied 2,4 = quantity supplied ** = order from factory only					
				KIT	DESCRIPTION
X	X	X	X	TKN8306A	Power Amplifier Cable
X				TKN8442A	Single Circulator Cable Kit
		X		TKN8443A	Triple Circulator Cable Kit
4		4		TLE5411A	Power Amplifier Module (403-435 MHz); Driver & Finals
	4		4	TLE5412A	Power Amplifier Module (435-475 MHz); Driver & Finals
X		X		TLE5421A	Power Amplifier Module (403-435 MHz); Predriver
	X		X	TLE5422B	Power Amplifier Module (435-475 MHz); Predriver
X		X		TLE5431A	Power Splitter (403-435 MHz)
	X		X	TLE5432A	Power Splitter (435-475 MHz)
X		X		TLE5441A	Power Combiner (403-435 MHz)
	X		X	TLE5442A	Power Combiner (435-475 MHz)
X	X	X	X	TRN5204A	Power Amplifier Distribution Board
X	X	X	X	TRN5205A	Power Amplifier Feedthru Plate Kit
X	X	X	X	TRN5206A	Power Amplifier Hardware Kit
2	2	2	2	TRN5207A	Balancing Resistor Kit
	X			TTE1432A	Single Circulator (435-475 MHz)**
			X	TTE1442A	Triple Circulator (435-475 MHz)**
X		2		TTE6211A	Single Small Circulator (403-435 MHz)**
		X		TTE6221A	Single Large Circulator (403-435 MHz)**



- NOTES:
1. OMEGA ST...
 2. GROUND...
 3. OMEGA ST...

LEGEND:
 L = 403-435 MHz
 M = 435-475 MHz
 No Code = 403-475 MHz

SHOWN FROM COMPONENT SIDE

- J503 [METER]
- 1-METER 1 (FINAL STAGE 1)
 - 2-METER 2 (FINAL STAGE 2)
 - 3-METER 3 (FINAL STAGE 3)
 - 4-METER 4 (PREDRIVER STAGE)
 - 5-METER 5 (DRIVER STAGE)
 - 6-METER 6 (FACTORY TEST)
 - 7-METER 7 (A+ METERING REFERENCE)
 - 8-METER 8 (FACTORY TEST)

COMPONENT SIDE Ⓢ BD-DEPS-35196-A
 SOLDER SIDE Ⓢ BD-DEPS-35197-A
 OL-EEPS-35198-C

IMPORTANT
 Field repair of this kit is not recommended. It should be replaced in its entirety. The following parts are listed for reference purposes only.

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
A Power Amplifier Module L (Driver-Final)		
A Power Amplifier Module; M (Driver-Final)		
PL-8262-B		
capacitor, fixed: pF ± 10%; 250 V: unless otherwise stated replace entire module		
1514	not repairable	
	21-84366F32	100
	23-84677D12	6.8 uF; 35 V
	21-84366F32	100
	21-11059B05	.01 uF ± 20%; 50 V
coil, rf:		
	24-84331M25	8-turns
	24-80202B04	choke, 5.5-turns with bead
	24-84331M25	8-turns
transistor: replace entire module		
	not repairable	
resistor, fixed:		
	6-11009C05	15 ± 5%; 1/4 W
	6-124B55	2.7 ± 5%; 1/4 W
	screened	nominal value on schematic
non-referenced items		
	1-80785D94	ASSEMBLY, wire and bead (TLE5411A) includes:
	76-84069B08	CORE, ferrite bead
	29-83208M01	LUG, solder
	42-84510M04	STRAP, omega; 4-used
	42-84952P01	CLIP, jumper

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRN5207A Balancing Resistor Kit		
PL-8255-O		
	7-83108N01	BRACKET, resistor
	7-84102N01	FRAME, LD
TKN8442A Power Amplifier Output Cable Kit (403-435 MHz)		
PL-9503-O		
REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
P571	not repairable	connector, plug: p/o ref. item W571
W571	1-80786D85	cable, PA output assembly: coded YEL, 22.5"-used; includes: ref. item P571
TLE5431A Power Splitter (403-435 MHz)		
TLE5432A Power Splitter (435-475 MHz)		
PL-8263-A		
REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
	84-83466N01	for reference only parts, replace by kit HYBRID; power splitter circuitry (TLE5432A)
	84-84034P01	HYBRID; power splitter circuitry (TLE5431A)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TKN8953A Power Amplifier Cable		
PL-8654-O		
P501	28-84476G01	connector, plug: male, single contact
W501	1-80777D29	cable: assembly, input cable (RED) includes: P501
	30-84173E01	CABLE, coaxial; 17" used
	33-88083C02	DECAL, color strip red
	43-83152N02	BUSHING, cable
mechanical parts		
	1-80752D78	ASSEMBLY wire and lug includes:
	29-82907N03	TERMINAL, ring
	1-80776D78	ASSEMBLY wire and lug (BLK) includes:
	29-83897M02	TERMINAL, receptacle

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TKN8483A Power Amplifier Cable		
PL-10293-O		
P501	28-84476G01	connector, plug: male, single contact
W501	1-80799D32	assembly cable input; includes: P501
	30-84173E01	CABLE, coaxial shielded; 13.63" used
	33-88083C02	DECAL, color strip RED
	43-83152N02	BUSHING
W502	1-80752D78	assembly, battery cable; includes:
	29-82907N05	TERMINAL, ring YEL
	30-831572	BATTERY, wire (BLK); 9.5" used
	1-80746D52	assembly, battery cable; includes:
	29-83897M02	TERMINAL, wire grip
	30-813233	BATTERY, wire (RED); 8.5" used

parts list

TRN5204A Power Amplifier Distribution Board PL-8258-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C561	21-82610C13	capacitor, fixed: 20 pF ± 5%; 200 V
J503	9-83365N01	connector, receptacle: 8 contact phone line
L553 thru 560	24-82835G14	coil, rf: choke: 1 uH
L561	24-84235B02	7.5 turns
L562	24-84235B04	4-1/2 turns
R551 thru 555	17-82620B04	resistor, fixed: .02 ± 3%; 3 W; wire wound
R556 thru 560	6-124A56	2k ± 5%; 1/4 W
RT501	6-83600K05	thermistor: 100k at 25°C

TRN5205A Feedthru Plate Kit PL-8257-B

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
C551 thru 556	21-82812H03	capacitor, fixed: 1000 pF + 100.0%; feed-thru
P502	15-84953L01	connector, receptacle: housing, 6-position
W558	1-80746D50	cable: assembly; power control includes P502, and;
	29-83426B01	LUG, terminal; 4-used
	29-84706E06	TERMINAL, crimp socket; 5-used
	30-864145	CABLE, 5-conductor; 13.5"-used
	42-35424B01	TIE-WRAP; cable; 4"
non-referenced items		
	29-3046	LUG, solder
	42-10217A02	STRAP, tie-wrap
	4-83755H01	WASHER, shoulder; 6-used
	64-83165N01	PLATE, feed-thru; 6-position

TRN5206A Power Amplifier Hardware Kit (435-475 MHz) PL-8256-C

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
C557	21-84211B01	capacitor, fixed: .01 uF; 250 V
W572	30-84173E01	cable, circulator input coaxial, double shielded; 2.75"-used (TRN9670A)
non-referenced items		
	2-8364	NUT, hex; 3/8-32 x 1/2 x 3/32"
	2-115968	NUT, hex; 1/4-28 x 3/8 x 1/8"
	3-83498N04	SCREW, tapping; slotted star; 3-used (TRN9670A)
	3-83498N05	SCREW, tapping; slotted star; 6-used
	3-83498N07	SCREW, tapping; slotted star; 4-used
	3-10943M20	SCREW, tapping; slotted star; 2-used (TRN9670A)
	3-83677N03	SCREW, captive
	3-83678N02	SCREW, tapping; slotted star; 10-used
	3-83678N03	SCREW, tapping; slotted star; 29-used (TRN5206A)
	3-83678N03	SCREW, tapping; slotted star; 25-used (TRN9670A)
	4-7557	WASHER, flat
	4-7657	LOCKWASHER, #8 external (TRN9670A)
	4-7670	LOCKWASHER, 1/4" internal
	4-10058A36	WASHER, insulator; #8; 5-used
	4-139423	WASHER, flat; 13-used
	4-7691	LOCKWASHER; 3/8" internal
	7-80078A01	BRACKET, thermister mounting
	7-83107N01	BRACKET, PA mounting; 2-used
	15-83177N01	COVER, power amplifier
	15-83178N01	COVER, PA interconnect
	26-83128N01	HEATSINK, PA (TRN5206A)
	26-84932P01	HEATSINK, PA (TRN9670A)
	32-82796H02	GASKET; 49.25"-used
	32-82796H03	GASKET; 3.75"-used
	32-83140N01	GASKET, feed-thru; 6-position
	42-10217A04	STRAP, tie-wrap; BLK
	42-82387D08	CLAMP; cable
	42-83150N01	STRAP ground; 13-used
	42-84510M04	STRAP, omega; 2-used
	43-82092R01	SPACER, circulator (TRN9670A)
	43-82267P01	SPACER, circulator (TRN5206A)
	43-82267P02	SPACER, circulator; 2-used (TRN5206A)
	76-84069B04	CORE, ferrite bead; 7-used

TKN8306A Power Amplifier Cable PL-8260-A

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
P501	28-84476G01	connector, plug: male; single contact
W501	1-80752D81	cable: assembly, input cable; RED includes P501 and;
	30-84173E01	CABLE, coaxial; double shield; 11.5" used
	43-83152N02	BUSHING, cable
non-referenced items		
	1-80746D52	ASSEMBLY, wire and lug; RED includes:
	29-83897M02	LUG, terminal
	1-80752D78	ASSEMBLY, wire and lug; BLK includes:
	29-82907N05	LUG, ring

LEGEND:

L = 403-435 MHz
M = 435-475 MHz
No Code = 403-475 MHz

IMPORTANT

Field repair of this kit is not recommended. It should be replaced in its entirety. The following parts are listed for reference purposes only.

TLE5421A Power Amplifier Module; L (Predriver) PL-8259-B
TLE5422B Power Amplifier Module; M (Predriver)

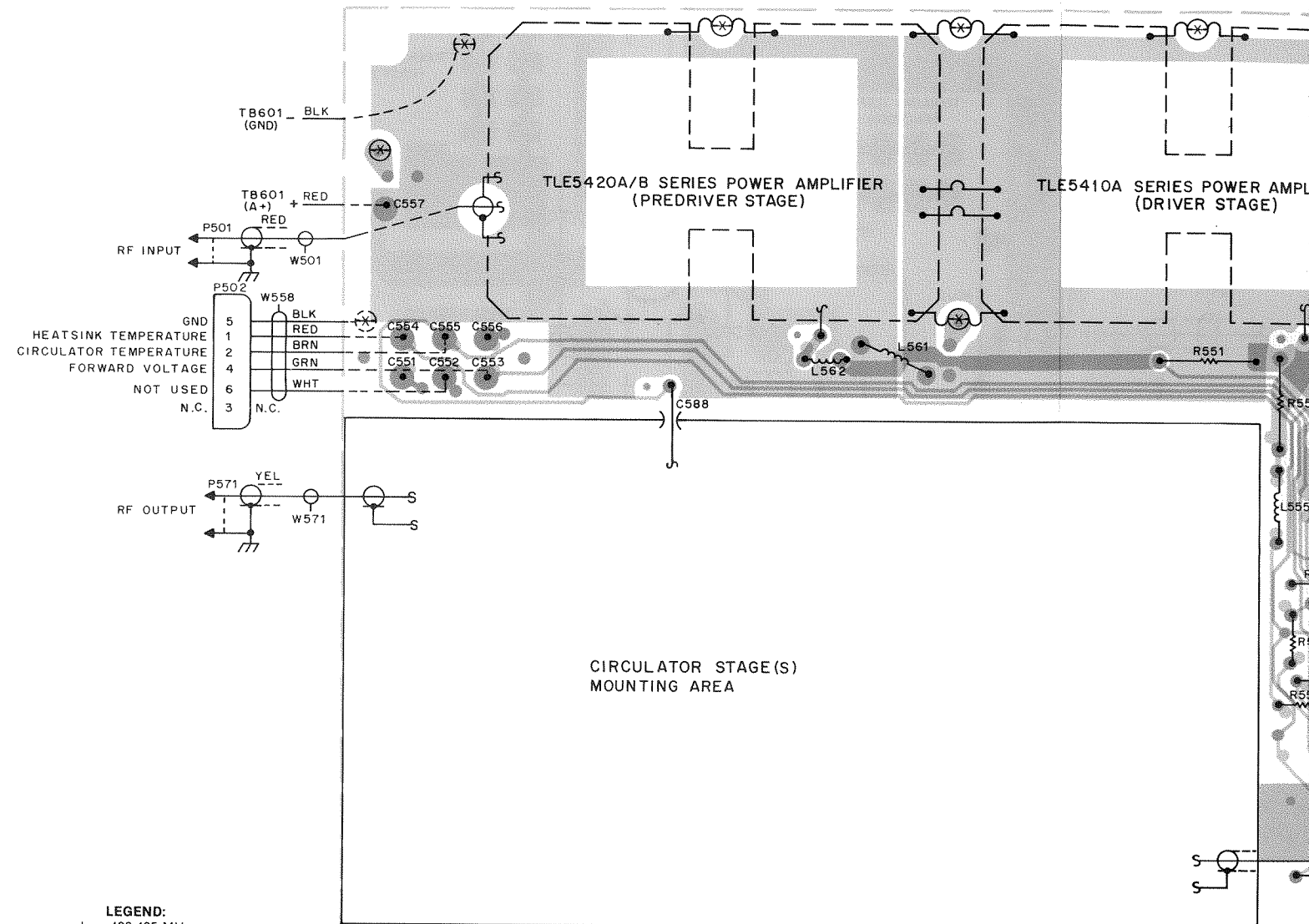
REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
C501 thru 504	not repairable	capacitor, fixed: pF ± 10%; 250 V; unless otherwise stated replace entire module
C505	21-84366F32	100
C506	23-84677D12	6.8 uF; 35 V
C507L	21-11059B05	.01 uF ± 20%; 50 V
C507M	21-82450B10	4.3; 500 V
C508, 509	21-84366F32	100
L501L	24-84331M25	coil, rf: 8-turns
L501M	24-80202B05	5.5-turns
L502	24-80202B04	choke, 5.5-turns with bead
L503	24-82835G14	choke; 1 uH; BRN-BLK
L504L	24-84331M25	8-turns
Q501	not repairable	transistor: replace entire module
R501	6-124A05	resistor, fixed: 15 ± 5%; 1/4 W
R502L	screened	nominal value on schematic
R503L	6-124A05	15 ± 5%; 1/4 W
non-referenced items		
	29-83208M01	LUG, solder
	42-84510M04	STRAP, omega; 4-used
	42-84952P01	CLIP, jumper

LEGEND:

L = 403-435 MHz
M = 435-475 MHz
No Code = 403-475 MHz

TLE5441A Power Combiner; L PL-8264-B
TLE5442A Power Combiner; M

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
C560	21-84366F32	capacitor, fixed: 100 pF ± 10%; 250 V
CR551	48-84616A01	diode (see note) hot carrier
L563	24-84331M50	coil, rf: 7-turns
R561L	6-11041C51	resistor, fixed: 270 ± 5%; 1/8 W
R561M	6-185A29	150 ± 5%; 1/8 W
R562	screened	nominal value on schematic
R563	6-11041C59	560 ± 5%; 1/8 W
RT502	6-82990E10	thermistor: 70k @ 25C
non-referenced items		
	29-83208M01	LUG, soldering
for reference only parts, replace by kit		
	84-83467N01	HYBRID; power combiner circuitry (TLE5442A)
	84-84035P01	HYBRID; power combiner circuitry (TLE5441A)



SHOWN FROM COMPONENT SIDE

TLE5411A Power Amplifier Module L (Driver-Final) PL-8262-B
TLE5412A Power Amplifier Module; M (Driver-Final)

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
C511 thru 514	not repairable	capacitor, fixed: pF ± 10%; 250 V; unless otherwise stated replace entire module
C515	21-84366F32	100
C516	23-84677D12	6.8 uF; 35 V
C517,518	21-84366F32	100
C519L	21-11059B05	.01 uF ± 20%; 50 V
L511L	24-84331M25	coil, rf: 8-turns
L511M,512	24-80202B04	choke, 5.5-turns with bead
L513L	24-84331M25	8-turns
Q511	not repairable	transistor: replace entire module
R511	6-11009C05	resistor, fixed: 15 ± 5%; 1/4 W
R512L	6-124B55	2.7 ± 5%; 1/4 W
R513L	screened	nominal value on schematic
non-referenced items		
	1-80785D94	ASSEMBLY, wire and bead (TLE5411A) includes:
	76-84069B08	CORE, ferrite bead
	29-83208M01	LUG, solder
	42-84510M04	STRAP, omega; 4-used
	42-84952P01	CLIP, jumper

TRN5207A Balancing Resistor Kit PL-8255-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	7-83108N01	BRACKET, resistor
	7-84102N01	FRAME, LD

TKN8442A Power Amplifier Output Cable Kit (403-435 MHz) PL-9503-O

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
P571	not repairable	connector, plug: p/o ref. item W571
W571	1-80786D85	cable, PA output assembly: coded YEL, 22.5"-used; includes: ref. item P571

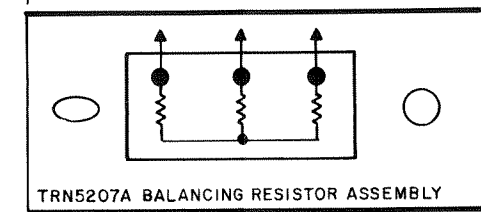
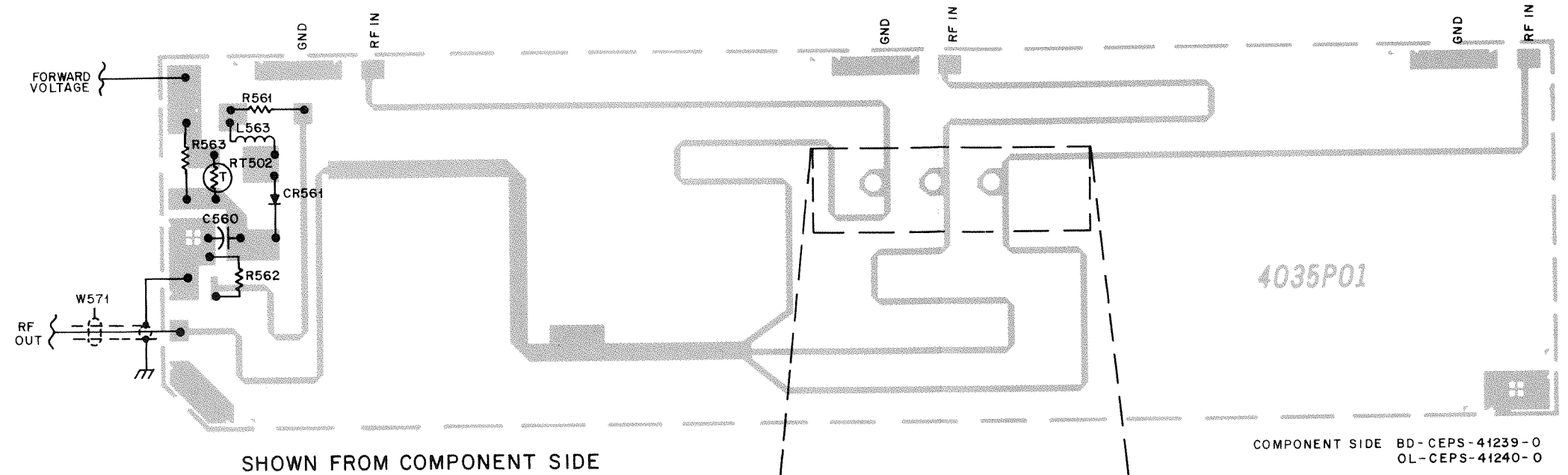
TLE5431A Power Splitter (403-435 MHz) PL-8263-A
TLE5432A Power Splitter (435-475 MHz)

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
	84-83466N01	for reference only parts, replace by kit HYBRID; power splitter circuitry (TLE5432A)
	84-84034P01	HYBRID; power splitter circuitry (TLE5431A)

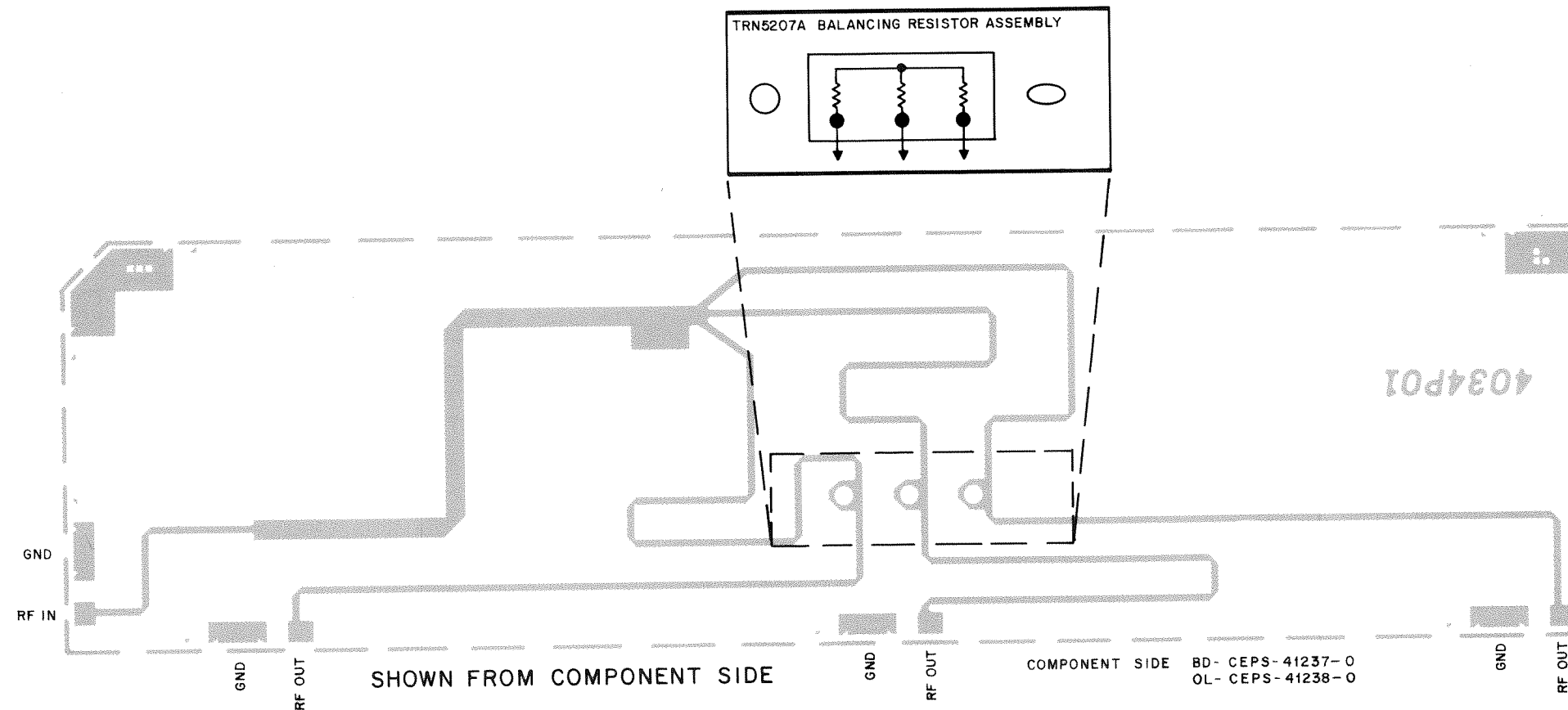
TKN8953A Power Amplifier Cable

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P501	28-84476G01	connector, plug: male, single contact
W501	1-80777D29	cable: assembly; includes: ref. item W571
	30-84173E01	CABLE, coaxial; double shield; 11.5" used
	33-88083C02	DECAL
	43-83152N02	BUSHING, cable
mechanical parts		
	1-80752D78	ASSEMBLY, wire and lug; RED includes:
	29-82907N03	LUG, terminal
	1-80776D78	ASSEMBLY, wire and lug; BLK includes:
	29-83897M02	LUG, ring

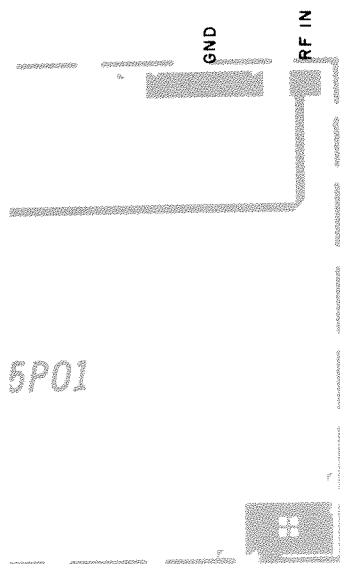
POWER AMPLIFIER DECK
TTE1450A SERIES, 60A SERIES
403-435 MHZ MODULE COMPONENT DETAILS



TLE5441A COMBINER STAGE
(403-435 MHz)

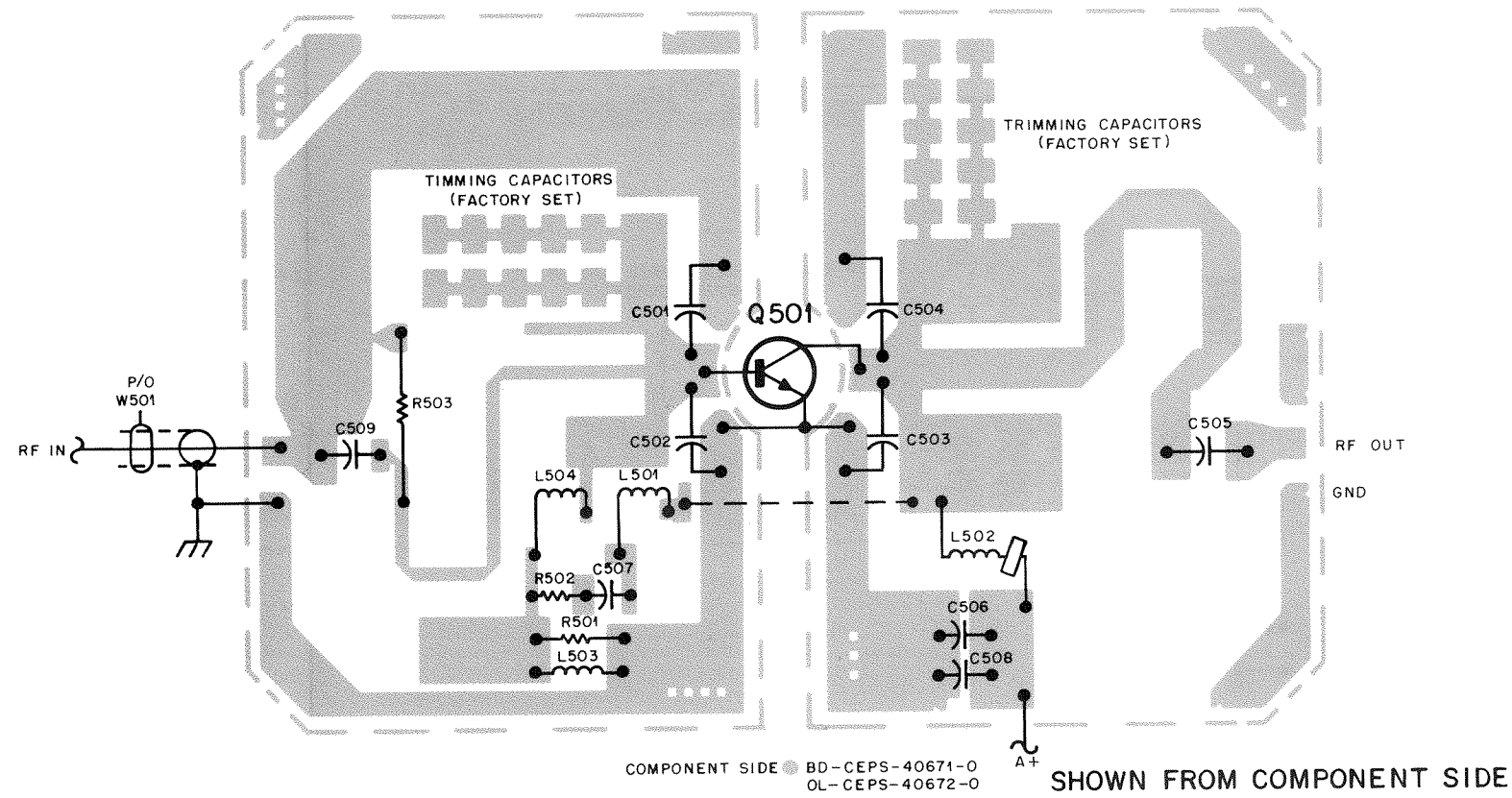


TLE5431A SPLITTER STAGE
(403-435 MHz)



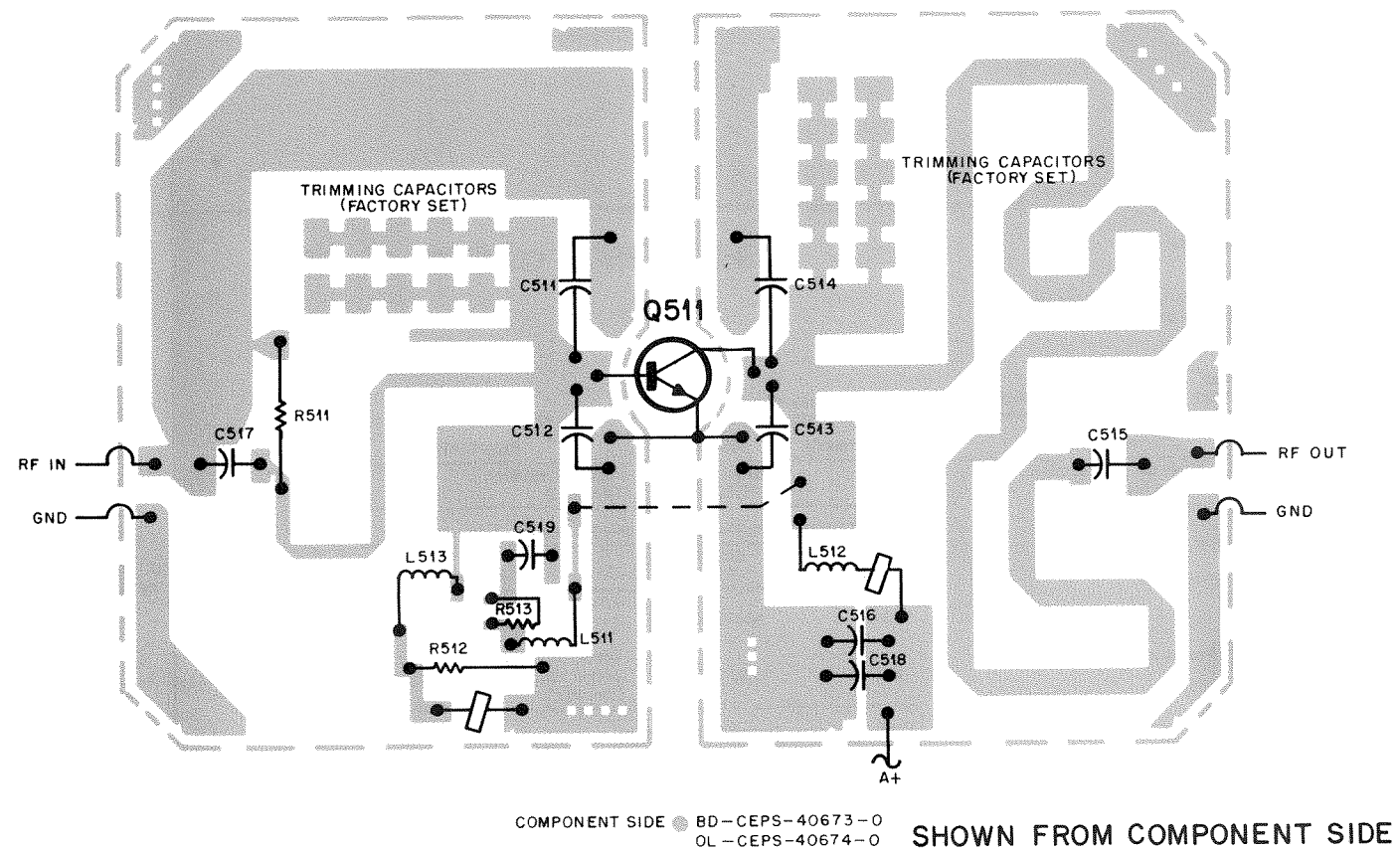
COMPONENT SIDE BD-CEPS-41239-0
OL-CEPS-41240-0

5441A COMBINER STAGE
(403-435 MHz)



TLE5421A PREDRIVER STAGE
(403-435 MHz)

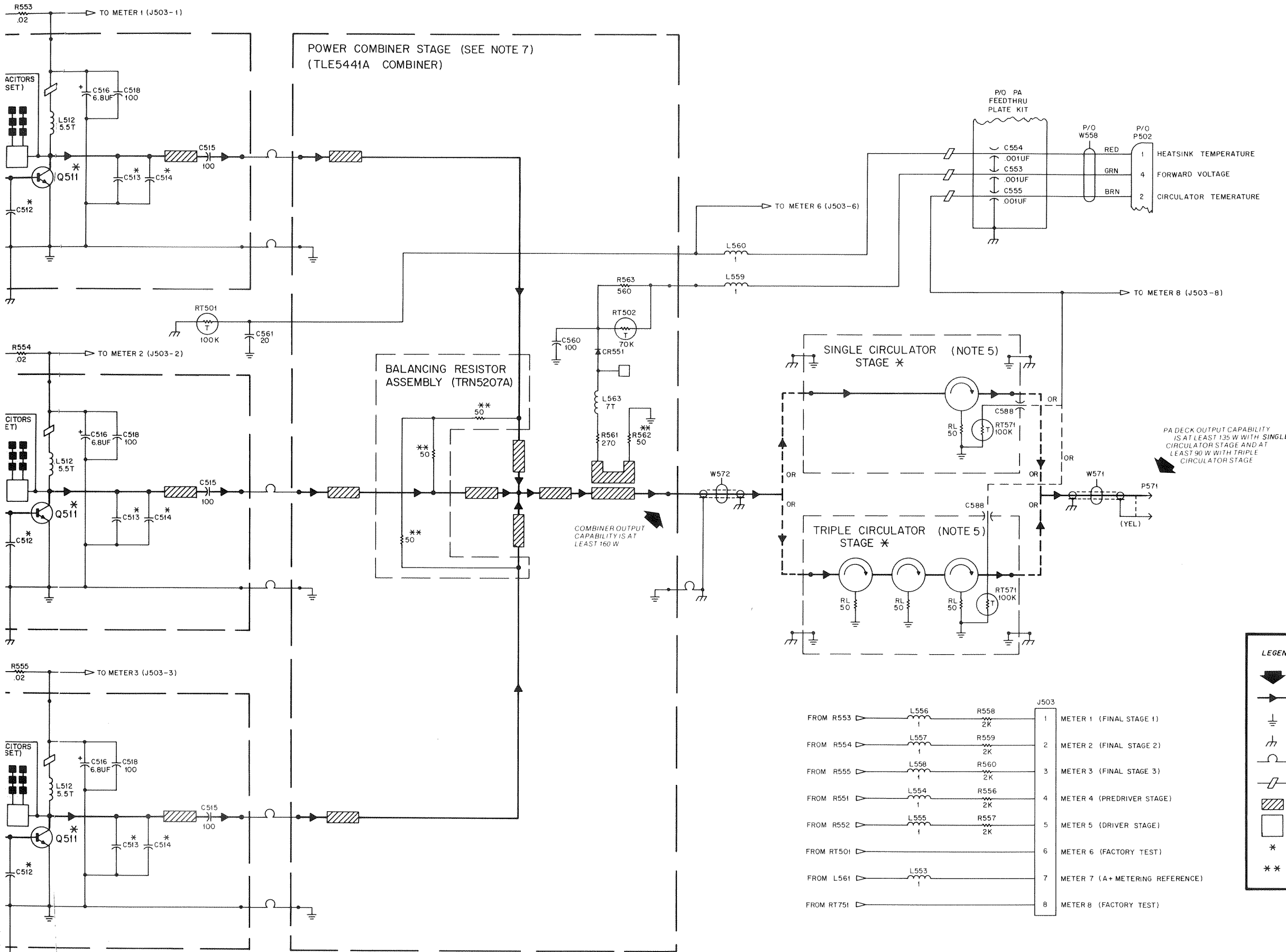
LE5431A SPLITTER STAGE
(403-435 MHz)



TLE5411A DRIVER/FINAL STAGE
(403-435 MHz)

POWER AMPLIFIER DECK

TTE1450A SERIES, 60A SERIES
403-435 MHZ SCHEMATIC DIAGRAM



NOTES:

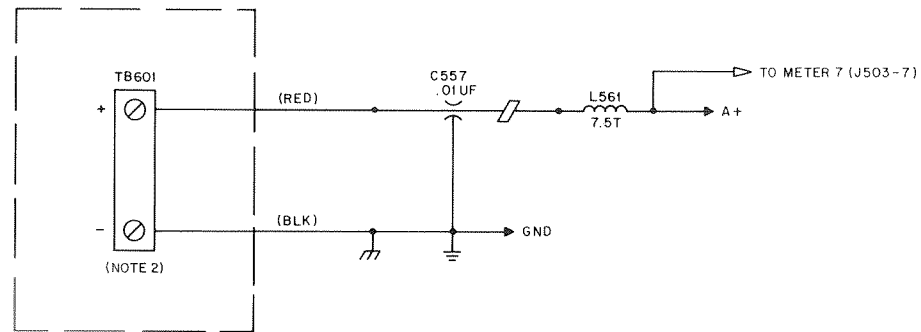
- UNLESS OTHERWISE SPECIFIED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN PICOFARADS, AND INDUCTOR VALUES ARE IN MICROHENRIES.
- TERMINAL BOARD TB601 IS LOCATED ON THE POWER SUPPLY AND IS NOT PART OF THE POWER AMPLIFIER.
- THE GREEK SYMBOL OMEGA DEMOTES AN "OMEGA STRAP," WHICH IS USED TO PROVIDE CIRCUIT CONNECTIONS BETWEEN THE PA SUBSTRATES AND PROVIDE THE NECESSARY STRAIN RELIEF FOR THERMAL EXPANSION AND CONTRACTION.
- COMPONENTS MARKED WITH AN ASTERISK (*) ARE NOT REPAIRABLE AND ARE SHOWN FOR REFERENCE PURPOSES ONLY.
- REPAIR AND/OR TUNING OF THE CIRCULATOR STAGE SHOULD NOT BE ATTEMPTED BECAUSE OF THE NEED FOR SPECIAL FIXTURES AND TEST EQUIPMENT. REPAIR SHOULD BE BY REPLACEMENT ONLY.
- TRANSMISSION LINE LENGTHS BETWEEN THE POWER SPLITTER STAGE OUTPUTS AND FINAL AMPLIFIER STAGE INPUTS ARE CRITICAL TO PROPER AMPLIFIER OPERATION. DO NOT INSERT TEST INSTRUMENTS (WATTMETER, LOAD TERMINATION, ETC.) AT THESE LOCATIONS.
- TRANSMISSION LINE LENGTHS BETWEEN THE POWER COMBINER STAGE INPUTS AND FINAL AMPLIFIER STAGE OUTPUTS ARE CRITICAL TO PROPER AMPLIFIER OPERATION. DO NOT INSERT TEST INSTRUMENTS (WATTMETER, LOAD TERMINATION, ETC.) AT THESE LOCATIONS.

PA DECK OUTPUT CAPABILITY IS AT LEAST 135 W WITH SINGLE CIRCULATOR STAGE AND AT LEAST 90 W WITH TRIPLE CIRCULATOR STAGE

LEGEND:

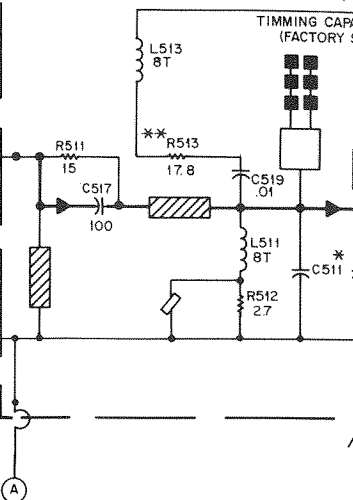
- THEORY NOTE
- PRIMARY SIGNAL FLOW
- SUBSTRATE GND
- CHASSIS GND
- OMEGA STRAP (NOTE 3)
- FERRITE BEAD
- MICROSTRIP LINE
- AREA CAPACITOR
- NOT REPAIRABLE (NOTE 4)
- THICK FILM RESISTOR

FROM	COMPONENT	TO	DESCRIPTION
FROM R553	L556	R558	METER 1 (FINAL STAGE 1)
FROM R554	L557	R559	METER 2 (FINAL STAGE 2)
FROM R555	L558	R560	METER 3 (FINAL STAGE 3)
FROM R551	L554	R556	METER 4 (PREDRIVER STAGE)
FROM R552	L555	R557	METER 5 (DRIVER STAGE)
FROM RT501			METER 6 (FACTORY TEST)
FROM L561	L553		METER 7 (A+ METERING REFERENCE)
FROM RT751			METER 8 (FACTORY TEST)

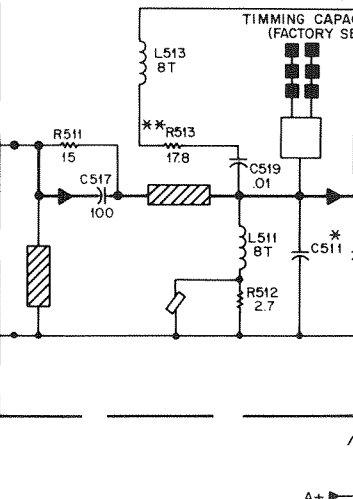


POWER SPLITTER STAGE (SEE NOTE 6)
(TLE 5431A SPLITTER)

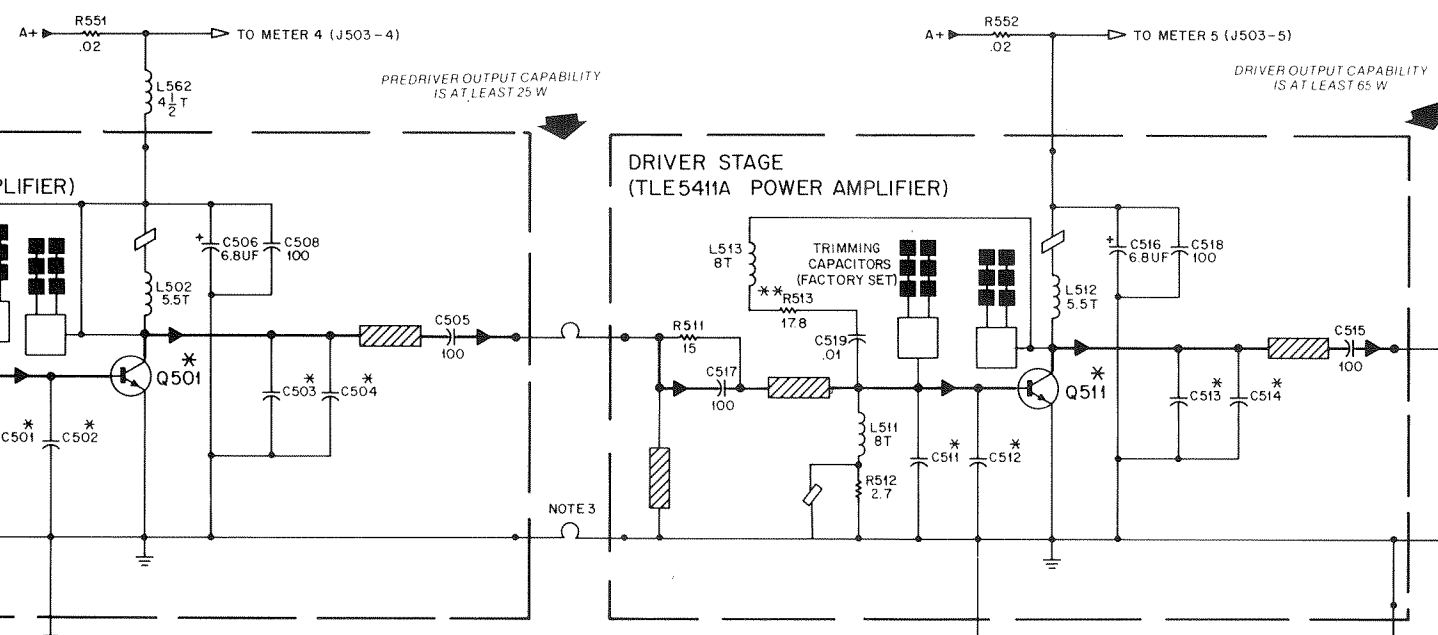
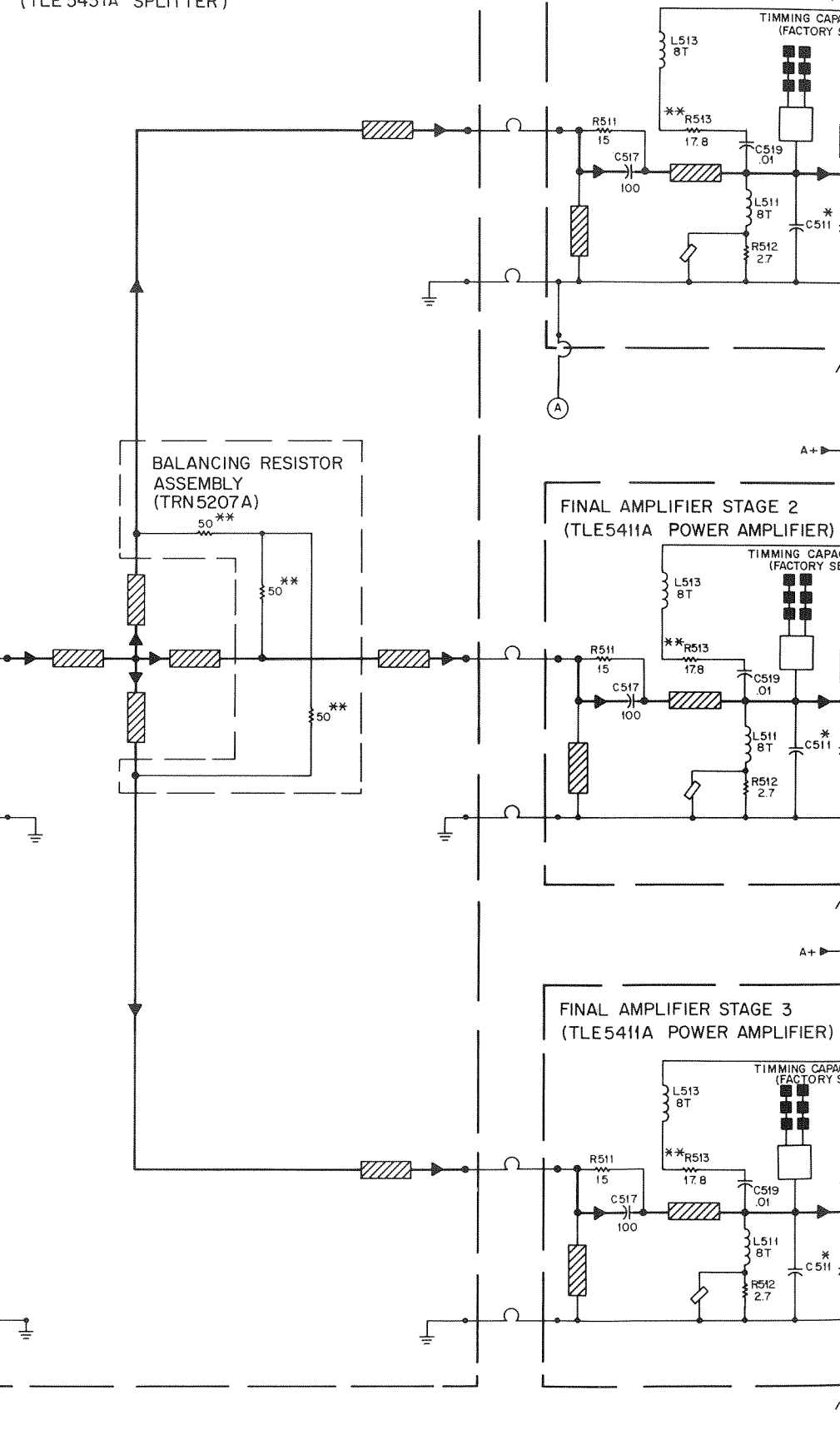
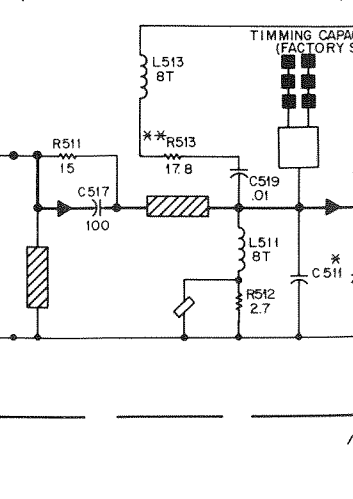
FINAL AMPLIFIER STAGE 1
(TLE5411A POWER AMPLIFIER)



FINAL AMPLIFIER STAGE 2
(TLE5411A POWER AMPLIFIER)



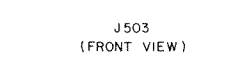
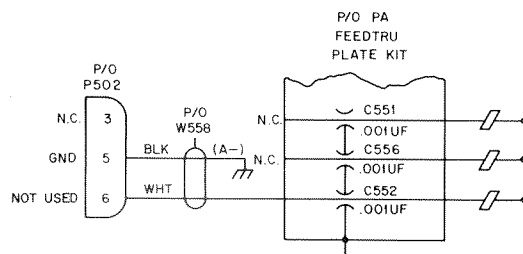
FINAL AMPLIFIER STAGE 3
(TLE5411A POWER AMPLIFIER)



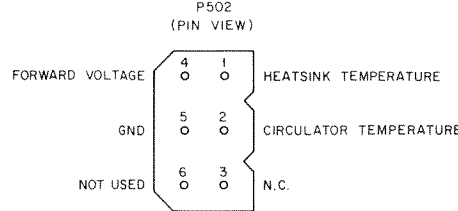
POWER INPUT IS
3.5 W (NOMINAL)

PREDRIVER OUTPUT CAPABILITY
IS AT LEAST 25 W

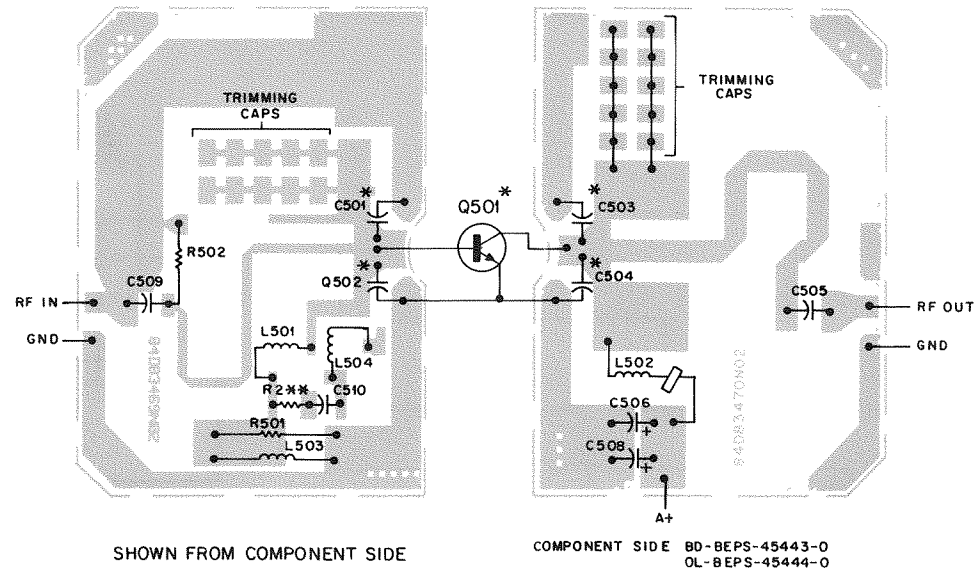
DRIVER OUTPUT CAPABILITY
IS AT LEAST 65 W



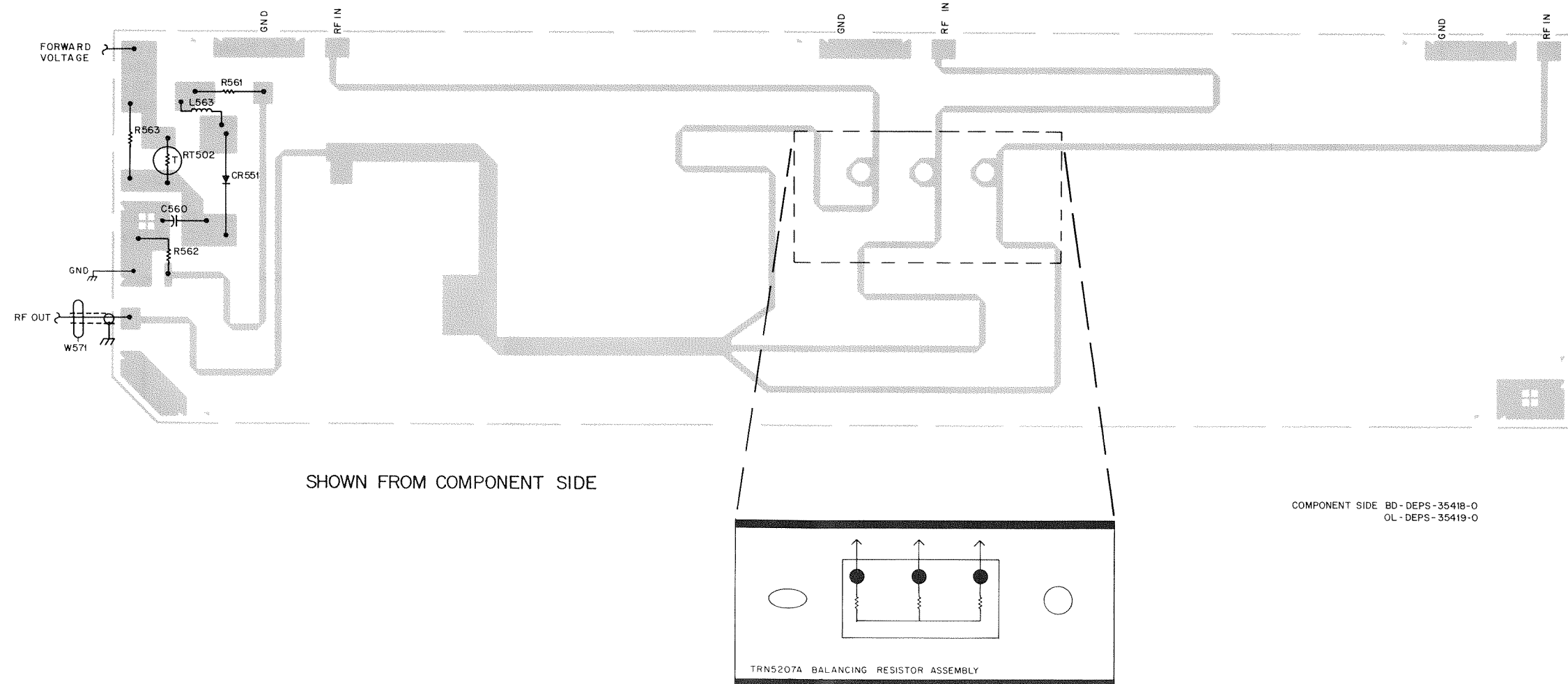
- METER 8 (FACTORY TEST)
- METER 7 (A+ METERING REFERENCE)
- METER 6 (FACTORY TEST)
- METER 5 (DRIVER STAGE)
- METER 4 (PREDRIVER STAGE)
- METER 3 (FINAL STAGE 3)
- METER 2 (FINAL STAGE 2)
- METER 1 (FINAL STAGE 1)



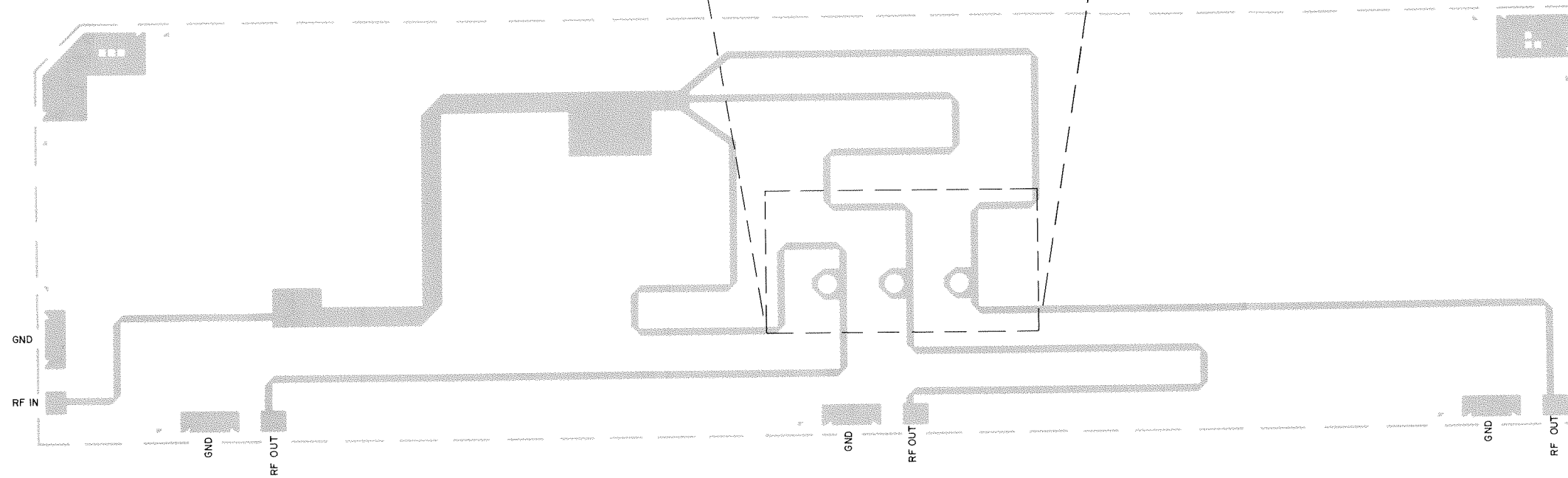
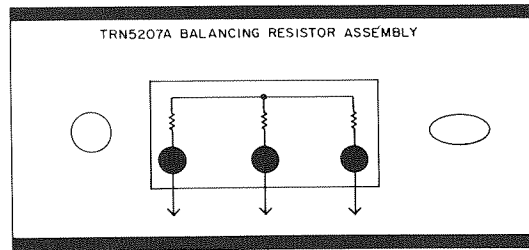
POWER AMPLIFIER DECK
 TTE1450A SERIES, 60A SERIES
 435-475 MHZ MODULE COMPONENT DETAILS



TLE5422B PREDRIVER STAGE
(435-475 MHz)



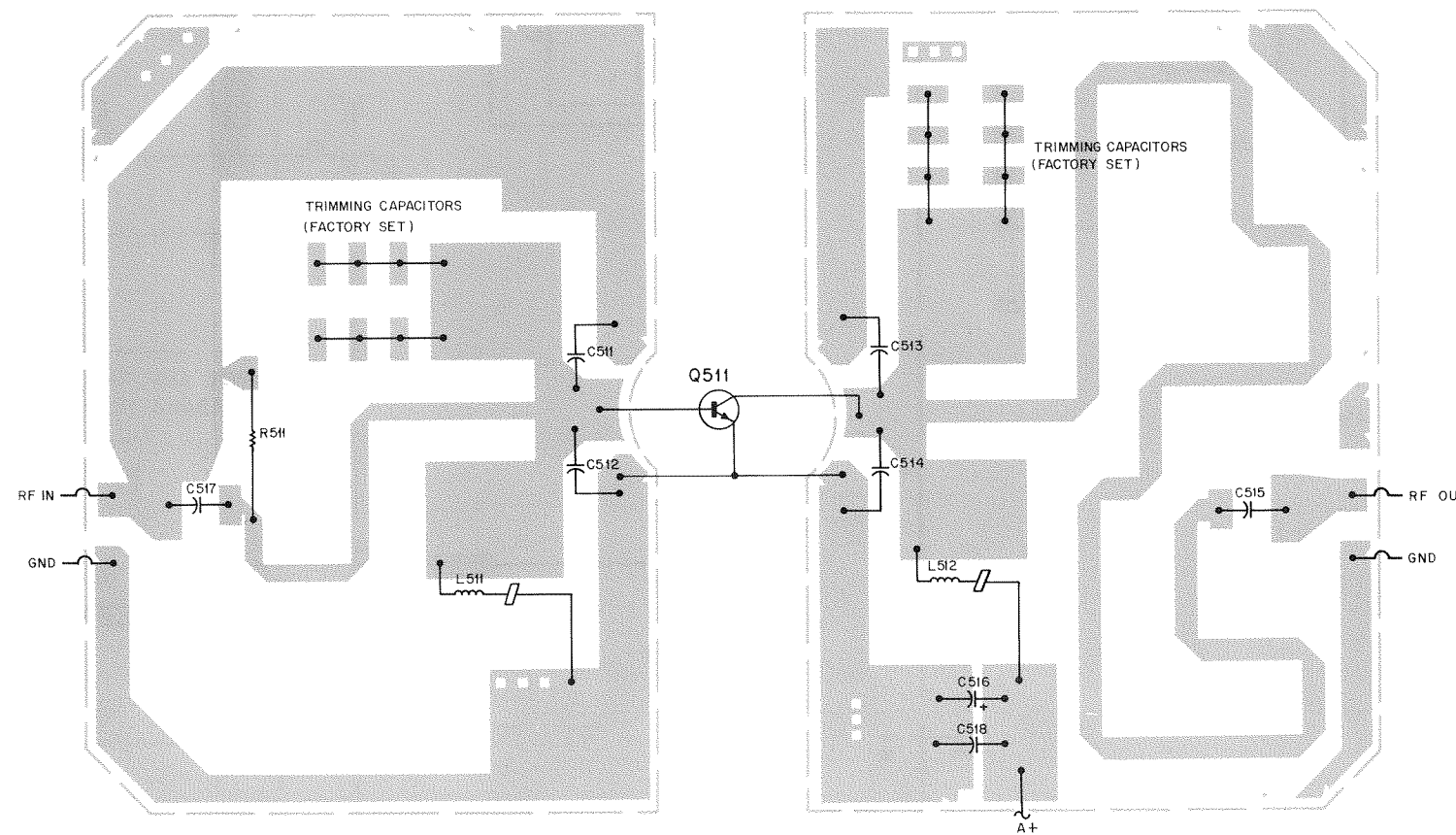
TLE5442A COMBINER STAGE
(435-475 MHz)



**TLE5432A SPLITTER STAGE
(435-475 MHz)**

COMPONENT SIDE BD-DEPS-35416-0
OL-DEPS-35417-0

SHOWN FROM COMPONENT SIDE



**TLE5412A DRIVER/FINAL STAGE
(435-475 MHz)**

COMPONENT SIDE BD-CEPS-35414-0
OL-CEPS-35415-0

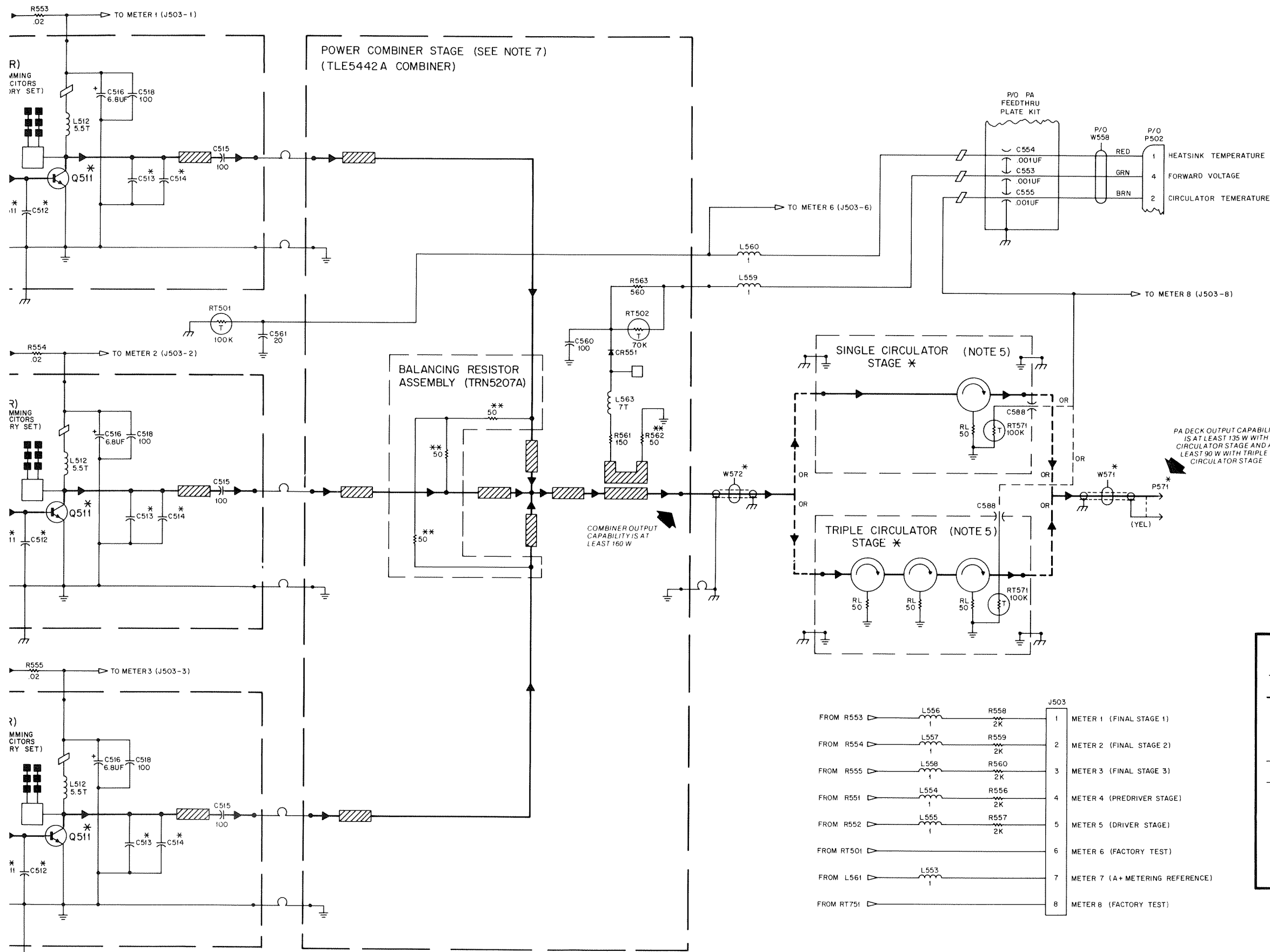
SHOWN FROM COMPONENT SIDE

GE

**E5442A COMBINER STAGE
(435-475 MHz)**

POWER AMPLIFIER DECK

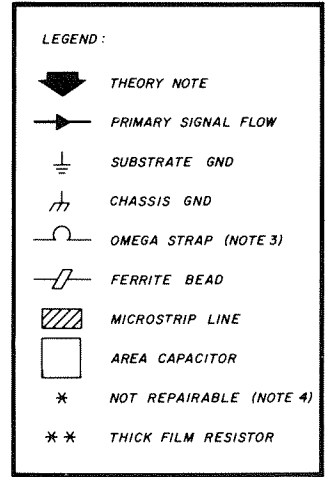
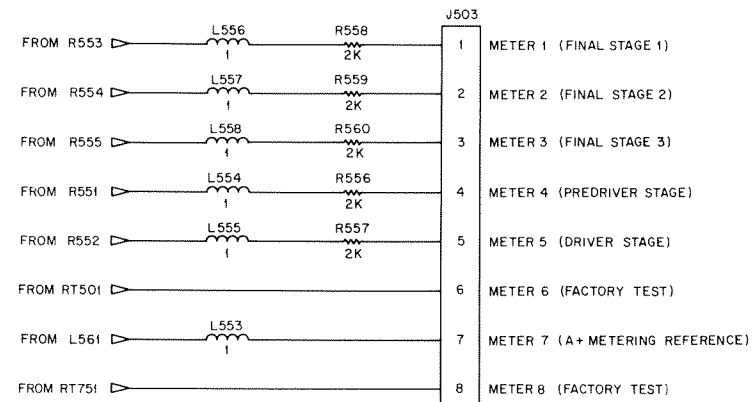
TTE1450A SERIES, 60A SERIES
435-475 MHZ SCHEMATIC DIAGRAM



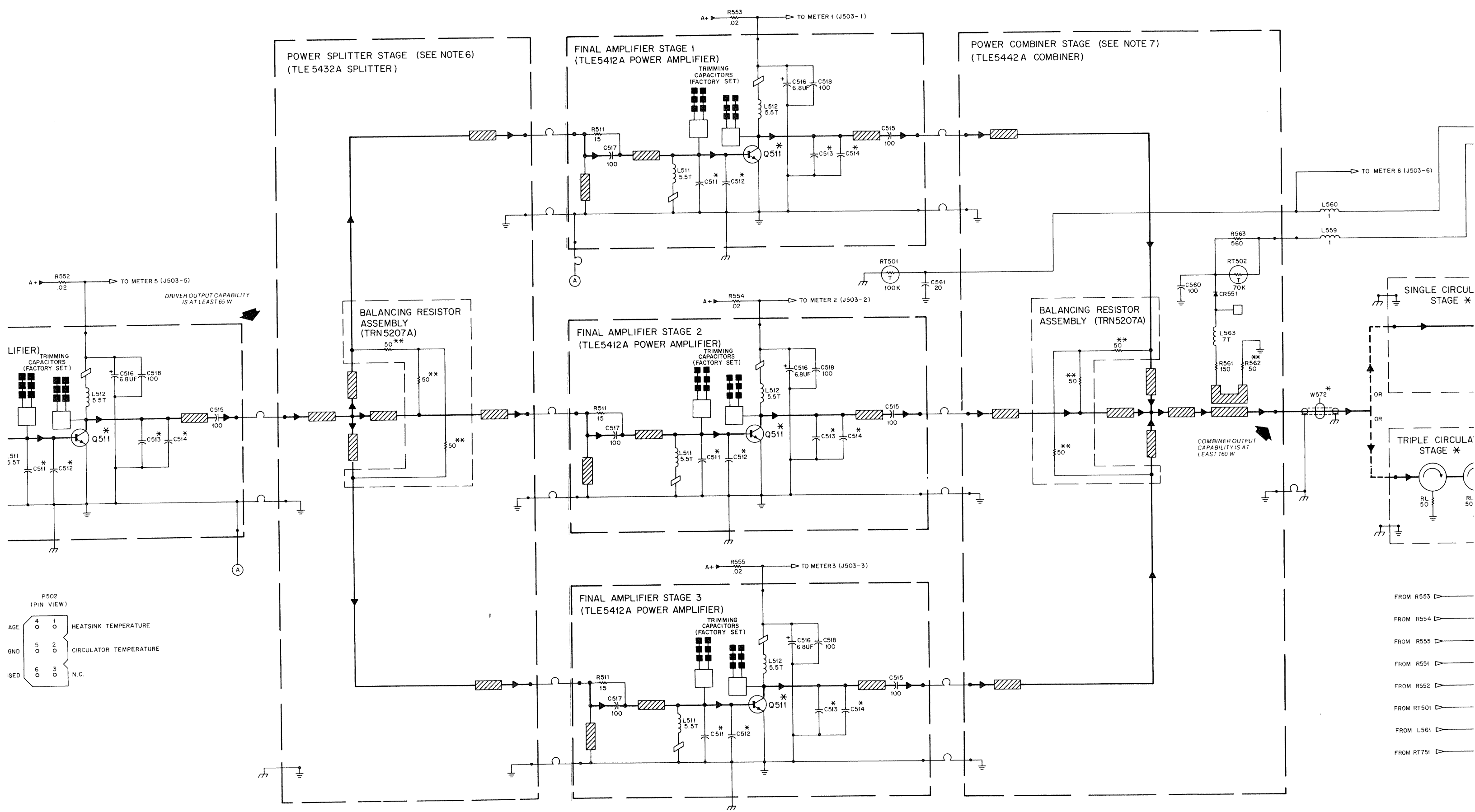
NOTES:

1. Unless otherwise specified, resistor values are in ohms, capacitor values are in picofarads, and inductor values are in microhenries.
2. Terminal board TB601 is located on the power supply and is not part of the power amplifier.
3. The Greek symbol Omega denotes an "Omega Strap," which is used to provide circuit connections between the PA substrates, and provide the necessary strain relief for thermal expansion and contraction.
4. COMPONENTS MARKED WITH AN ASTERISK (*) are not repairable and are shown for reference purposes only.
5. Repair and/or tuning of the circulator stage should not be attempted because of the need for special fixtures and test equipment. Repair should be by replacement only.
6. Transmission line lengths between the power splitter stage outputs and final amplifier stage inputs are critical to proper amplifier operation. Do not insert test instruments (wattmeter, load termination, etc.) at those locations.
7. Transmission line lengths between the power combiner stage inputs and final amplifier stage outputs are critical to proper amplifier operation. Do not insert test instruments (wattmeter, load termination, etc.) at these locations.

PA DECK OUTPUT CAPABILITY IS AT LEAST 135 W WITH SINGLE CIRCULATOR STAGE AND AT LEAST 90 W WITH TRIPLE CIRCULATOR STAGE

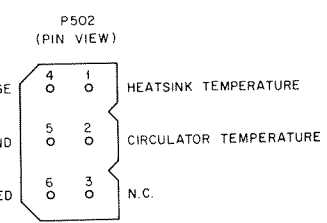
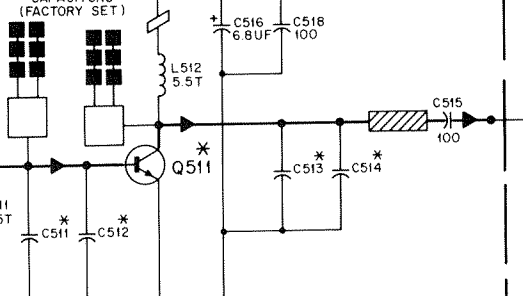


EEPS-35039-B



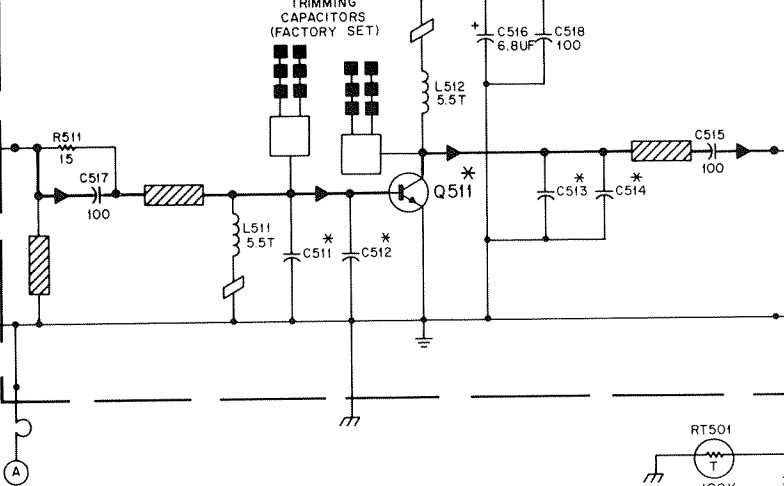
R552 .02 TO METER 5 (J503-5)

TRIMMING CAPACITORS (FACTORY SET)



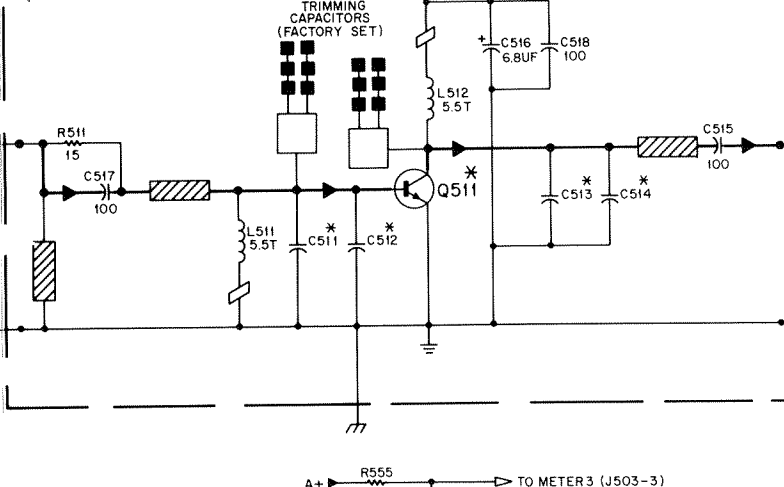
R553 .02 TO METER 1 (J503-1)

TRIMMING CAPACITORS (FACTORY SET)



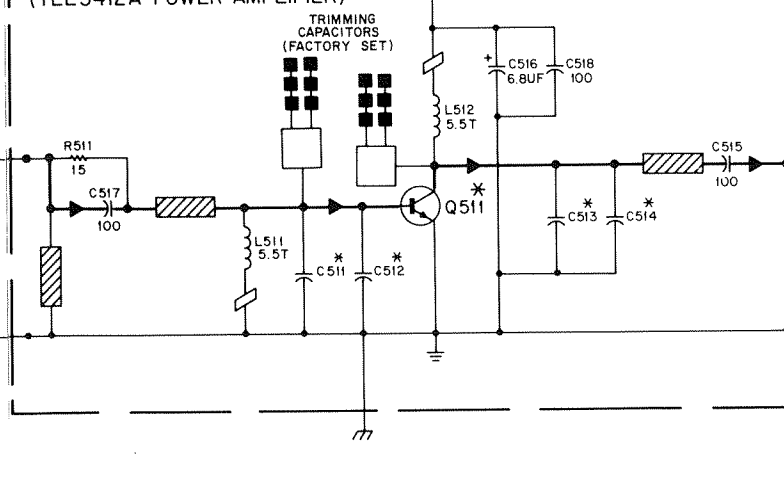
R554 .02 TO METER 2 (J503-2)

TRIMMING CAPACITORS (FACTORY SET)

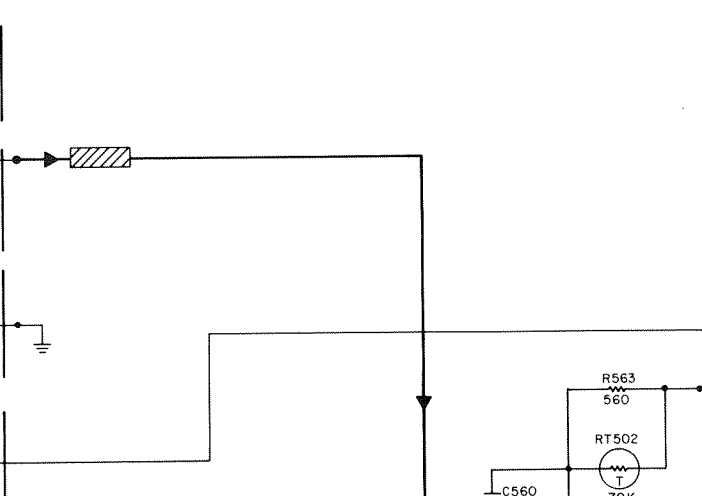


R555 .02 TO METER 3 (J503-3)

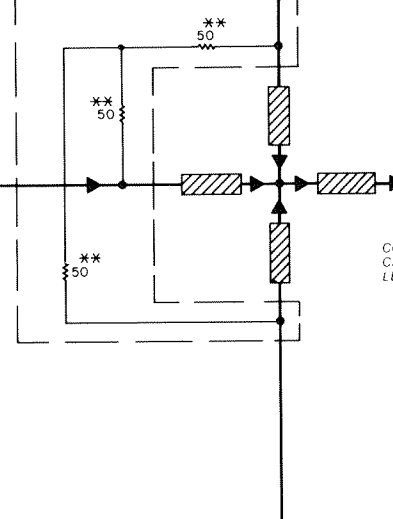
TRIMMING CAPACITORS (FACTORY SET)



TRIMMING CAPACITORS (FACTORY SET)



TRIMMING CAPACITORS (FACTORY SET)



R563 560

RT502 70K

CR551

L563 7T

R561 150

R562 50

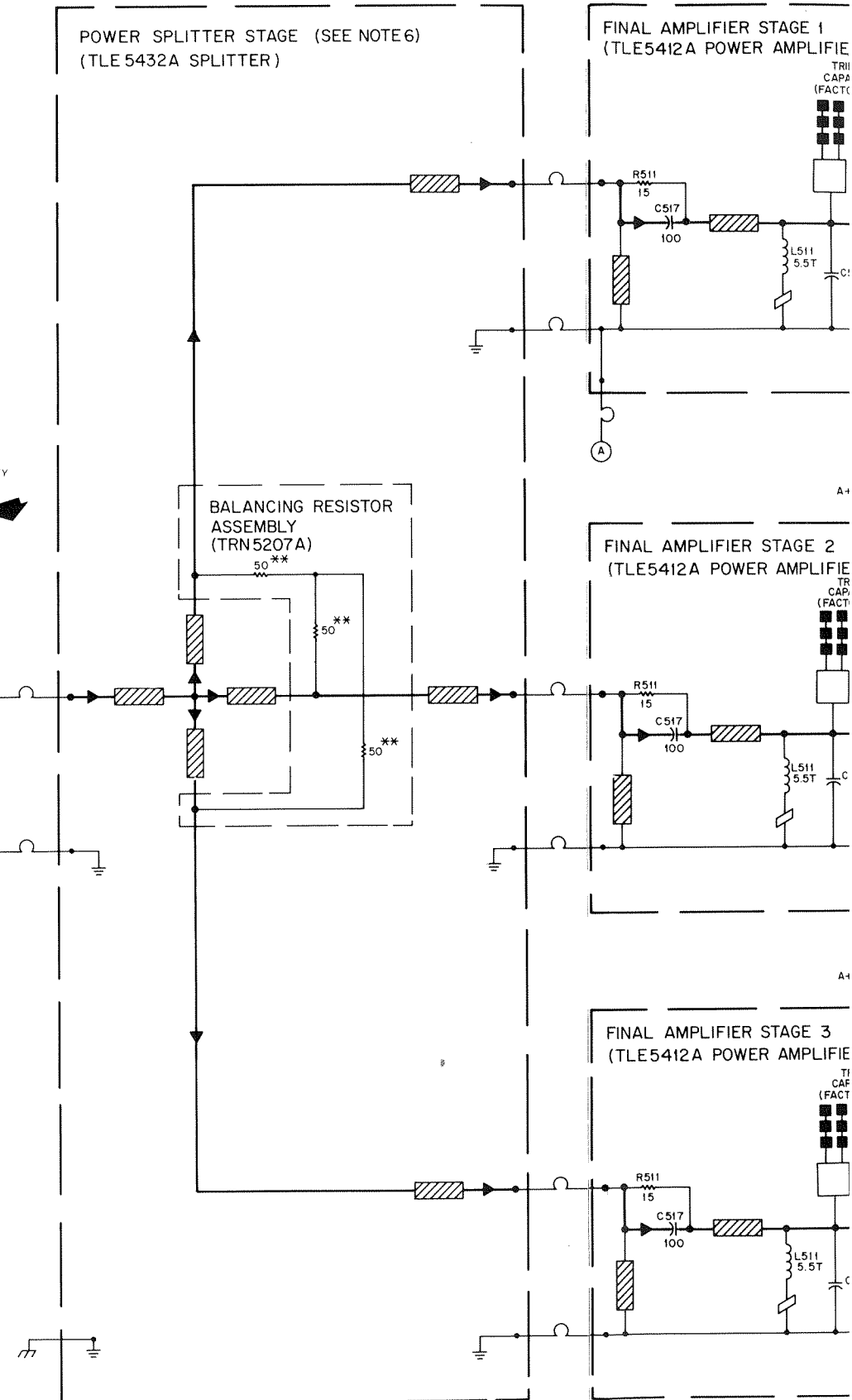
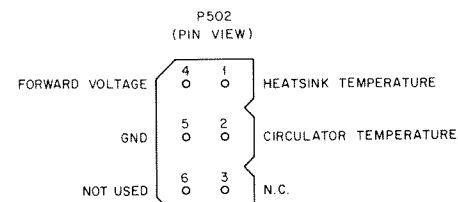
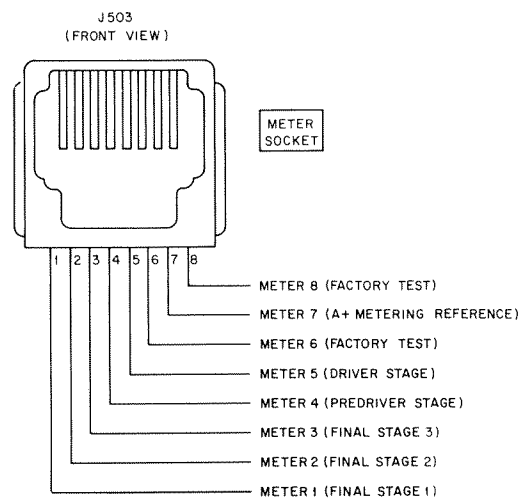
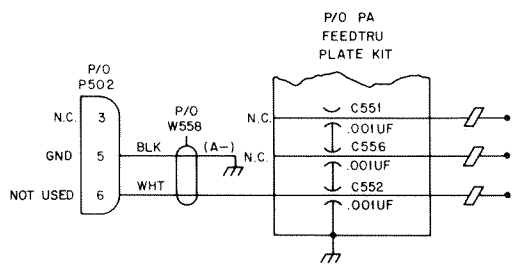
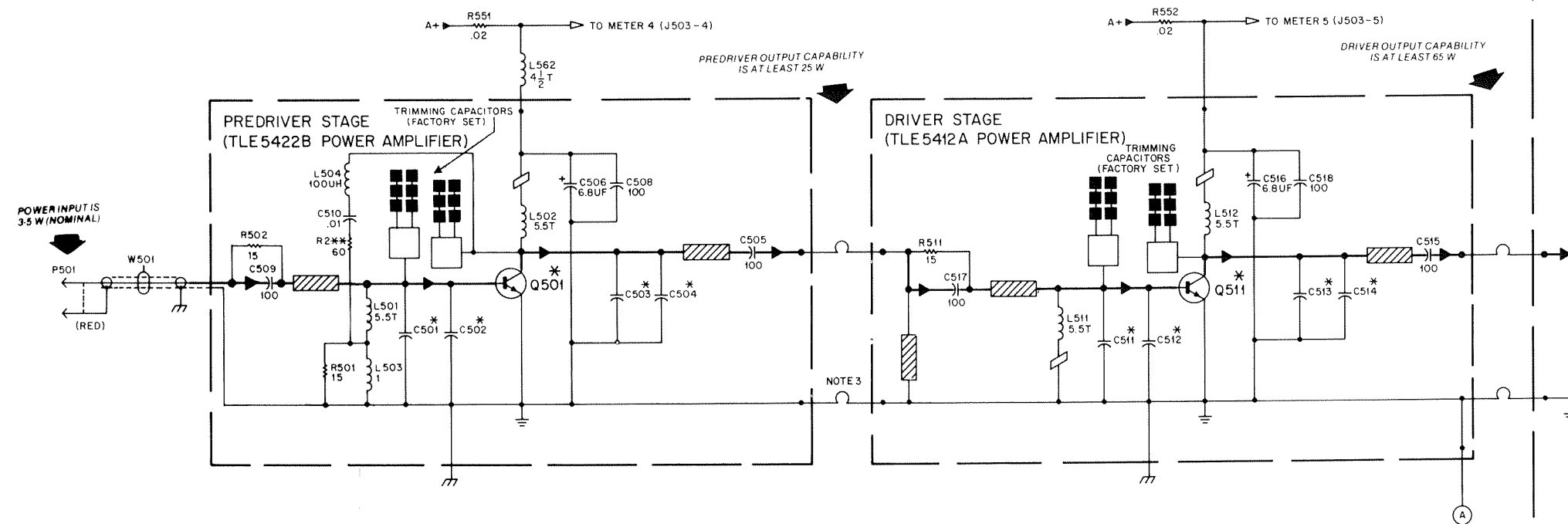
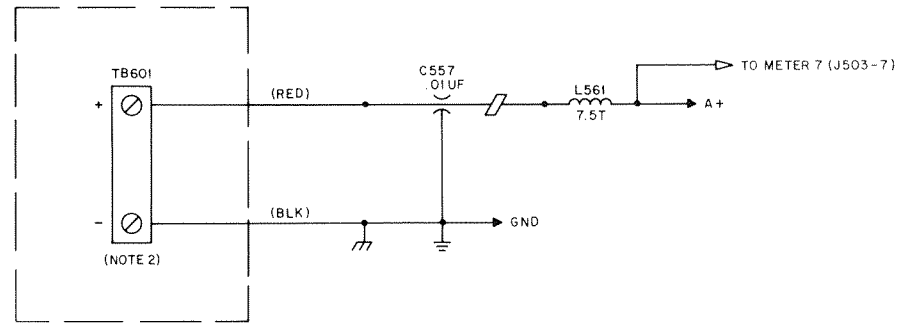
W572

L560

L559

C560 100

- FROM R553
- FROM R554
- FROM R555
- FROM R551
- FROM R552
- FROM RT501
- FROM L561
- FROM RT51



NG TUNING PROCEDURE

nect a 50-ohm load to J501, the output of the prefilter. This mit filters and also completely disables the transmitter. Figures ment locations.

une-up frequency* and apply a signal level of 225 mV (0 dBm)

ropriate tune-up frequency.

NOTE

th a TEE (options C675 or C677), the signal nna port at the junction box *if* and *only if* the tuned to its proper receive tune-up frequency. 0.

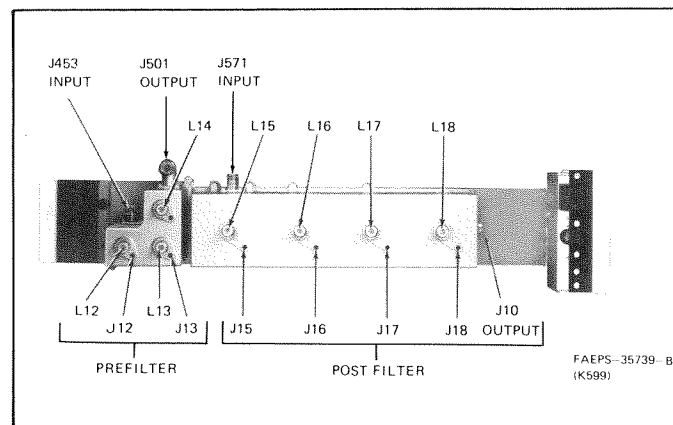


Figure 1. TFE6492A Transmit Prefilter and Postfilter Adjustment Locations

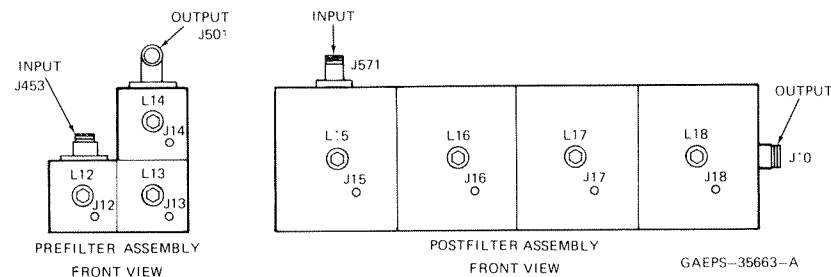


Figure 2. TFE6492A Transmit Prefilter and Postfilter

Stage and Procedure
Connect probe cable to rf millivoltmeter and insert probe tip into J18.
Postfilter — Completely detune; back out four tuning screws counter-clockwise until approximately 1/2 inch of the threaded portion of each tuning screw is beyond tension nut.
Adjust L18 for PEAK. While tuning for a peak or a dip, turn tuning screw 1/2 turn past the peak or dip to ensure that you have a true peak or dip.
Adjust L17 for DIP.
Move probe tip to J17. Adjust L16 for DIP.
Move probe tip to J16. Adjust L15 for DIP.
NOTE
The L15 DIP will not be as sharp as L16 or L17.
IGNMENT IS COMPLETE
Connect signal generator to the input of prefilter J453.
NOTE
There should already be a 50-ohm load on the output of the prefilter.
Connect probe cable to rf millivoltmeter and insert probe tip into J12.
Prefilter — Completely detune; back out three tuning screws counter-clockwise until approximately 1/2 inch of the threaded portion of each tuning screw is beyond tension nut.
Adjust L12 for PEAK.
Adjust L13 for a DIP.
Move probe tip to J13. Adjust L14 for DIP.
NOTE
The L14 DIP will not be as sharp as L13.
IGNMENT IS COMPLETE.
Disconnect all test equipment, and reconnect cables (W501 & W601) to prefilter.
IGNMENT IS COMPLETE.

NOTE

lter by peaking for maximum power output. This technique up frequency and may result in extreme detuning under con-

parts list

**TFE6491A Transmit Incabinet Filters (FL500); 403-435 MHz (see note)
 **TFE6492A Transmit Incabinet Filters (FL500); 435-475 MHz (see note)
 **TFE6561A Transmit Incabinet Filters (FL500); 403-435 MHz (see note) PL-8283-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J10, 571	—	connector, receptacle: p/o postfilter loop and connector assembly
J453	—	p/o prefilter input loop and connector assembly
J501	—	p/o prefilter output loop and connector assembly
mechanical parts		
	1-80752D68	ASSEMBLY, postfilter loop and connector; 2 used (TFE6491A) includes: ref. items J10 and J571
	1-80752D69	ASSEMBLY, postfilter loop and connector; 2 used (TFE6492) includes: ref. items J10 and J571
	1-80752D72	ASSEMBLY, prefilter input loop and connector; (TFE6491, TFE6492) includes: ref. item J453
	1-80758D04	ASSEMBLY, prefilter output loop and connector; (TFE6491A, TFE6492A) includes: ref. item J501
	1-80783D58	ASSEMBLY, prefilter input loop and connector; (TFE6561A) includes: ref. item J453
	1-80783D59	ASSEMBLY, postfilter loop and connector; (TFE6561A) includes: ref. items J10 and J571
	1-80783D60	ASSEMBLY, prefilter output loop and connector; (TFE6561A) includes: ref. item J501
	2-83718N01	NUT, tension; 7 used
	3-10917A07	SCREW, locking; M3 x 0.5 x 4mm; 21 used
	3-10943J16	SCREW, tapping; 3.5 x 0.6 x 8mm; 37 used
	3-10943M10	SCREW, tapping; 3 x 0.5 x 10mm; 16 used
	3-83100N08	SCREW, prefilter tuning; 3 used (435-450 MHz)
	3-83100N15	SCREW, postfilter tuning; 4 used (TFE6492A)
	3-83100N16	SCREW, prefilter tuning; 3 used (450-470 MHz)
	3-83100N18	SCREW, postfilter tuning; 4 used
	3-83100N19	SCREW, prefilter tuning; 3 used (413-425 MHz)
	3-83100N20	SCREW, prefilter tuning; 3 used (415-435 MHz)
	3-83100N12	SCREW, prefilter tuning; 3 used (403-413 MHz)
	15-83181N02	COVER, pre & post filter (TFE6492A)
	15-83181N02	COVER, pre & post filter
	15-83187N09	HOUSING, postfilter (TFE6491A)
	15-83187N07	HOUSING, postfilter (TFE6492A)
	15-83187N08	HOUSING, postfilter (TFE6561A)
	15-83188N09	HOUSING, prefilter (TFE6491A)
	15-83188N07	HOUSING, prefilter (TFE6492A)
	15-83188N08	HOUSING, prefilter (TFE6561A)
	32-82796H04	GASKET, postfilter; 29.25 used
	32-82796H04	GASKET, prefilter; 12" used
	42-83128R02	CLIP, contact; 3 used

NOTE: Order from factory only. Designate transmit frequency when ordering.

TRN5580A Transmit Incabinet Hardware Kit PL-8280-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-83498N10	SCREW, tapping, 3.5 x 0.6 x 8mm; 4 used

TRANSMIT FILTERING

MODELS TFE6491A
 TFE6492A
 TFE6561A

FUNCTION

Replaces straight adapter (with prefilter) and low-pass harmonic filter (with postfilter). The single assembly (FL500) is normally added to a station to provide the additional filtering required for single antenna duplexer applications, via an incabinet combining TEE duplexer.

Model Usage Table

Model	Frequency	T/R Separation
TFE6491A	403-435 MHz	5-20 MHz
TFE6492A	435-475 MHz	5-20 MHz
TFE6561A	403-435 MHz	3-20 MHz

TRANSMIT FILTERING TUNING PROCEDURE

Disconnect output cable from the prefilter and connect a 50-ohm load to J501, the output of the prefilter. This procedure is required during the alignment of the transmit filters and also completely disables the transmitter. Figures 1 and 2 show the transmit prefilter and postfilter adjustment locations.

Set the signal generator to the desired transmitter *tune-up* frequency* and apply a signal level of 225 mV (0 dBm) to the output of the postfilter.

* Refer to the Station Parameter Booklet for the appropriate tune-up frequency.

NOTE

If the station is internally duplexed with a TEE (options C675 or C677), the signal generator may be connected to the antenna port at the junction box *if and only if* the receiver preselector has previously been tuned to its proper receive tune-up frequency. Otherwise, connect signal generator to J10.

Step	Adjust	Probe Position	Stage and Procedure
1	—	J18	Connect probe cable to rf millivoltmeter and insert probe tip into J18.
2	L15-L18	J18	<i>Postfilter</i> — Completely detune; back out four tuning screws counter-clockwise until approximately 1/2 inch of the threaded portion of each tuning screw is beyond tension nut.
3	L18	J18	Adjust L18 for PEAK. While tuning for a peak or a dip, turn tuning screw 1/2 turn past the peak or dip to ensure that you have a true peak or dip.
4	L17	J18	Adjust L17 for DIP.
5	L16	J17	Move probe tip to J17. Adjust L16 for DIP.
6	L15	J16	Move probe tip to J16. Adjust L15 for DIP. NOTE The L15 DIP will not be as sharp as L16 or L17.
POSTFILTER ALIGNMENT IS COMPLETE			
7	—	—	Connect signal generator to the input of prefilter J453. NOTE There should already be a 50-ohm load on the output of the prefilter.
8	—	J12	Connect probe cable to rf millivoltmeter and insert probe tip into J12.
9	L12-L14	J12	<i>Prefilter</i> — Completely detune; back out three tuning screws counter-clockwise until approximately 1/2 inch of the threaded portion of each tuning screw is beyond tension nut.
10	L12	J12	Adjust L12 for PEAK.
11	L13	J12	Adjust L13 for a DIP.
12	L14	J13	Move probe tip to J13. Adjust L14 for DIP. NOTE The L14 DIP will not be as sharp as L13.
PREFILTER ALIGNMENT IS COMPLETE.			
13	—	—	Disconnect all test equipment, and reconnect cables (W501 & W601) to prefilter. TRANSMIT FILTERING ALIGNMENT IS COMPLETE.

NOTE

Do NOT attempt to align the prefilter or the postfilter by peaking for maximum power output. This technique will not align each individual cell to its proper tune-up frequency and may result in extreme detuning under conditions of temperature variations.

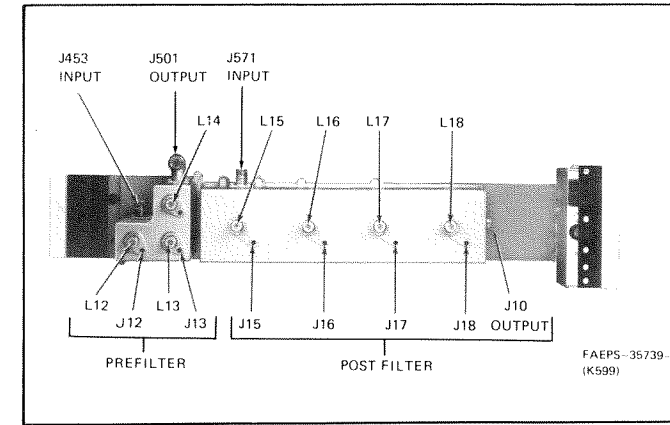


Figure 1. TFE6492A Transmit Prefilter and Postfilter Adjustment Locations

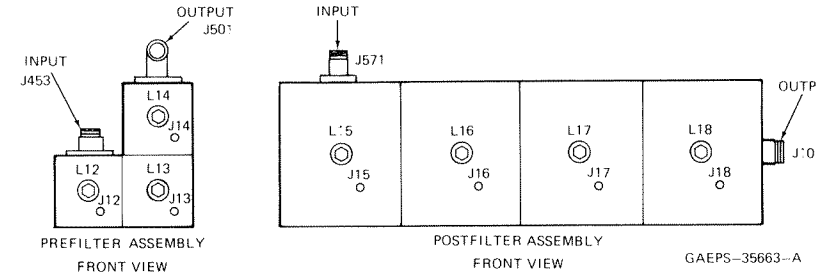


Figure 2. TFE6492A Transmit Prefilter and Postfilter

parts list

**TFE6491A Transmit Incabinet Filters (FL500); 403-435 MHz (see nc)
 **TFE6492A Transmit Incabinet Filters (FL500); 435-475 MHz (see nc)
 **TFE6561A Transmit Incabinet Filters (FL500); 403-435 MHz (see nc)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J10, 571	—	connector, receptacle: p/o postfilter loop and conn
J453	—	p/o prefilter input loop and c
J501	—	assembly p/o prefilter output loop and assembly
mechanical parts		
	1-80752D68	ASSEMBLY, postfilter loop ar 2 used (TFE6491A) includes: ref. iter J571
	1-80752D69	ASSEMBLY, postfilter loop ar 2 used (TFE6492) includes: re and J571
	1-80752D72	ASSEMBLY, prefilter input lo connector; (TFE6491, TFE649
	1-80758D04	ASSEMBLY, prefilter output l connector; (TFE6491A, TFE6492) includes: ref. item J501
	1-80783D58	ASSEMBLY, prefilter input lo connector; (TFE6561A) includ
	1-80783D59	ASSEMBLY, postfilter loop ar 2 used (TFE6561A) includes: ref. iter J571
	1-80783D60	ASSEMBLY, prefilter output l connector; (TFE6561A) includ J501
	2-83718N01	NUT, tension; 7 used
	3-10917A07	SCREW, locking: M3 x 0.5 x 3.5
	3-10943J16	SCREW, tapping: 3.5 x 0.6 x 3.5
	3-10943M10	SCREW, tapping: 3 x 0.5 x 3.5
	3-83100N08	SCREW, prefilter tuning; 3 us MHz
	3-83100N15	SCREW, postfilter tuning; 4 t (TFE6492A)
	3-83100N16	SCREW, prefilter tuning; 3 us MHz
	3-83100N18	SCREW, postfilter tuning; 4 t
	3-83100N19	SCREW, prefilter tuning; 3 us MHz
	3-83100N20	SCREW, prefilter tuning; 3 us MHz
	3-83100N12	SCREW, prefilter tuning; 3 us MHz
	15-83181N02	COVER, pre & post filter (TFE6491)
	15-83181N02	COVER, pre & post filter (TFE6492)
	15-83187N09	HOUSING, postfilter (TFE6491)
	15-83187N07	HOUSING, postfilter (TFE6492)
	15-83187N08	HOUSING, postfilter (TFE6561)
	15-83188N09	HOUSING, prefilter (TFE6491)
	15-83188N07	HOUSING, prefilter (TFE6492)
	15-83188N08	HOUSING, prefilter (TFE6561)
	32-82796H04	GASKET, postfilter; 29.25 us
	32-82796H04	GASKET, prefilter; 12" used
	42-83128R02	CLIP, contact; 3 used

NOTE: Order from factory only. Designate transmit frequency when

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-83498N10	SCREW, tapping, 3.5 x 0.6 x 3.5

TRN5580A Transmit Incabinet Hardware Kit

COMBINING TEE DUPLEXER

MODEL TLE5721A; T BELOW R; T/R = 3-20 MHz
 MODEL TLE5730A SERIES; T BELOW R; T/R = 5-20 MHz
 MODEL TLE5770A SERIES; T ABOVE R; T/R = 5-20 MHz
 MODEL TLE5781A; T ABOVE R; T/R = 3-20 MHz

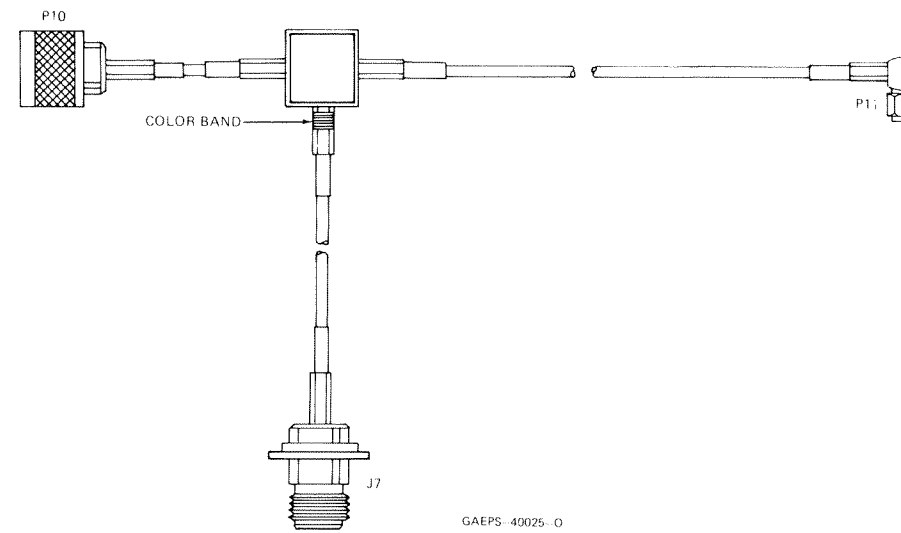


Figure 1. Combining TEE Duplexer For T Below R

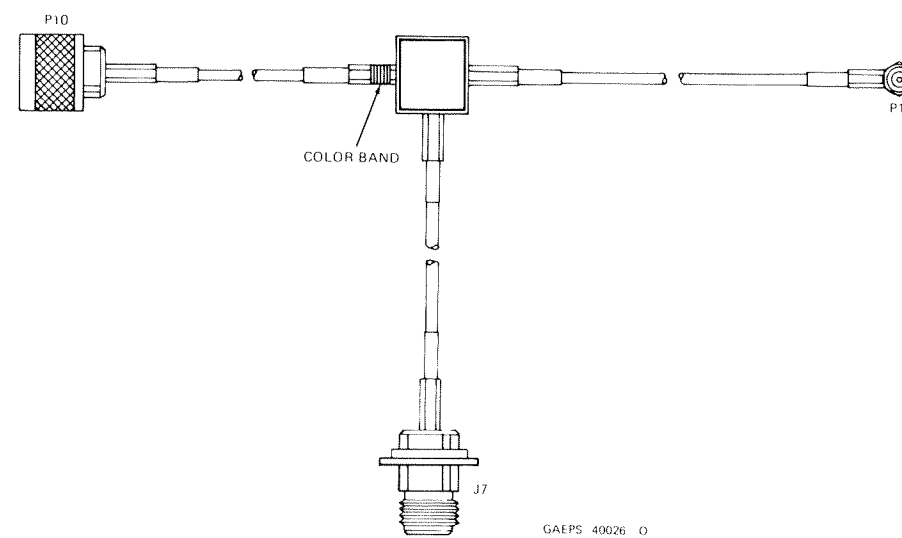


Figure 2. Combining TEE Duplexer For T Above R

FUNCTION

The combining TEE duplexer kits, when used in conjunction with appropriate incabinet transmit filtering, provide the specific electrical lengths of cable required to accomplish incabinet duplexer operation for single antenna applications. For T below R applications, the transmitter leg is approximately 1/4-wavelength long and the receiver leg is approximately 5/4-wavelength long. For T above R applications, both the transmitter and receiver legs are approximately 3/4-wavelength long. The combining TEE duplexer kits are factory assembled and are not field repairable. Refer to Table 1 for application information.

Table 1. Combining TEE Duplexer Application Information

Model	Frequency	Color Code	Description
TLE5721A	403-435 MHz	RED	T below R, 3-20 MHz
TLE5731A	403-435 MHz	PNK	T below R, 5-20 MHz
TLE5732A	435-475 MHz	GRN	T below R, 5-20 MHz
TLE5771A	403-435 MHz	GRY	T above R, 5-20 MHz
TLE5772A	435-475 MHz	YEL	T above R, 5-20 MHz
TLE5781A	403-435 MHz	ORG	T above R, 3-20 MHz