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## 1.0 GENERAL SPECIFICATIONS

Frequency Range: 400-512 MHz  
Supply Voltage: 13.8VDC  
Temperature Range: -30 to +60

Model	Mode	Power Input	Power Output	Nominal Current Drain
PA6-1AE	FM	1- 6 W	70-100 W	20 amps
PA6-1BE	FM	8-20 W	70-100 W	18 amps
PA6-1FE	FM	25-40 W	70-100 W	12 amps
OPERATING Voltage. (at amplifier input terminals)	Minimum 11 VDC	Typical 13.8 VDC	Maximum 15 VDC	
Reduction of power output will occur with less than 13.8 VDC				
E.I.A. DUTY CYCLE:	100% Continuous Duty			
RECEIVER INSERTION LOSS:	400-512 MHz: 1dB maximum (with optional Transmit/Receiver relay)			
HARMONIC ATTENUATION	Meets FCC Type Acceptance requirements			

## 2.0 FUSING

An internal fuse of the following value is provided. If an external fuse is used, the same value is recommended.

PA6-1AE 25 amps  
PA6-1BE 20 amps  
PA6-1FE 20 amps

### CAUTION

Before installation check the amplifier to see that there is no visible damage. If there is, return the amplifier to your dealer immediately. TRANSISTORS AND OTHER EXPENSIVE COMPONENTS MAY BE DESTROYED IF THE AMPLIFIER IS TURNED ON IN THIS CONDITION.

### NOTE:

This amplifier has been factory-tuned to the frequency specified at the time of order and will operate within  $\pm 7$  MHz of that frequency. For operation at any other frequency, see the Tune Up Instructions section.

## 3.0 TYPE ACCEPTANCE

TPL Communications commercial model amplifiers are type accepted for operation under all parts of the Land and Maritime mobile/fixed services. However, it is the responsibility of the technician installing and tuning this amplifier to hold proper class of FCC Commercial license and to be familiar with the rules and regulations pertaining to the power output permissible under the class of station license the amplifier is to be used with.

It is also extremely important that the specification published by the manufacturer of the transceiver be consulted. This will insure that the proper level to which the transceiver will be raised will not invalidate its type acceptance because of spurious content or frequency stability.

For any further detail or questions, it is suggested that the technician consult the FCC publications regarding these regulations.

### Additional Type Acceptance Information:

- (1) For all parts requiring the measurement of final input power, consult the section of the manual dealing with the Power Input/Output measurement.
- (2) The content of spurious signals generated by this amplifier (2nd, 3rd, etc.) harmonically is attenuated in excess of that required by the FCC under all parts for which it is accepted. The attenuation of these spurious signals is guaranteed through good engineering design and the use of seven pole low-pass filter on the output of the amplifier.
- (3) The engineering design of this amplifier is such that all tuneable components can be de-tuned to create a decrease in the power output without generating spurious signals or oscillations in the amplifier.
- (4) Type Acceptance Numbers  
PA6-1AE 74 A20A  
PA6-1BE 74 A19  
PA6-1FE 74 UA21

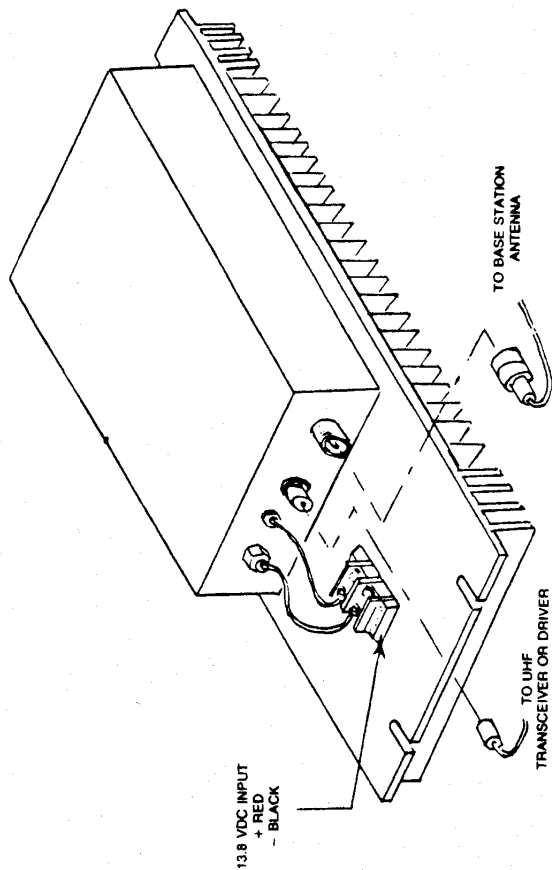


FIGURE 1  
 AMPLIFIER INSTALLATION  
 MODELS PA6-1AE,  
 PA6-1BE, PA6-1FE

#### 4.0 INSTALLATION INSTRUCTIONS

The amplifier assembly is designed for mounting in a standard 19 inch rack. When installing the unit consideration must be given to DC power and RF power output cable lengths. Ideally these runs should be as short as possible.

The DC input wires should be # 14 AWG or larger, depending on lead length, for minimum voltage drop between the power supply and the amplifier.

If the antenna is more than just a few feet from the amplifier output the use of the low loss coaxial cable is recommended. This will assure maximum power is delivered to the antenna.

#### 5.0 TUNE UP INSTRUCTIONS

These amplifiers come factory pre-tuned to the customer's requested frequency. However, should it be necessary to change operating frequencies, or should tuning be necessary, the following procedure is recommended:

- (1) Set the transceiver or transmitter to the center of the desired frequency range.
- (2) If possible adjust the power amplifier in a test set-up similar to that shown in Figure 2.
- (3) The following equipment will be needed for proper alignment:
  - a. Bird 43 thru line watt meter (2)
  - b. Plug in elements covering proper frequency and power ranges.
  - c. Regulated power supply
  - d. Insulated tuning tool
  - e. Dummy load

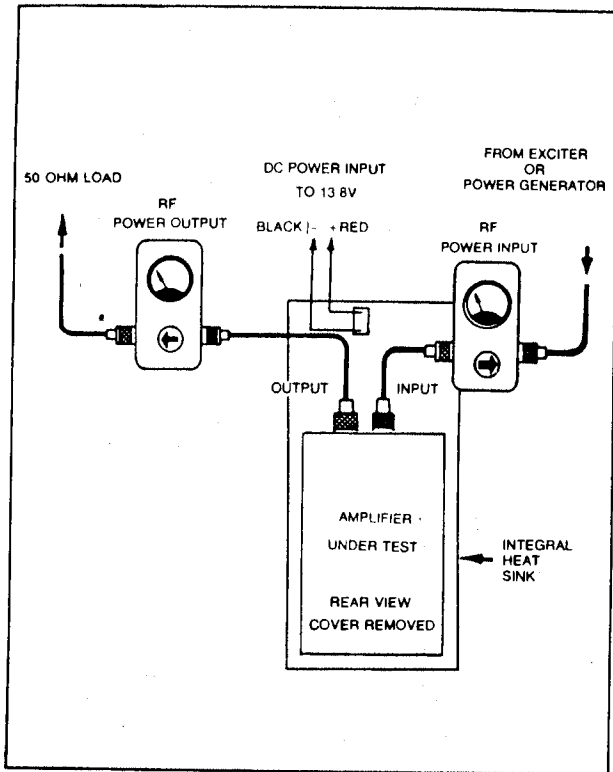


FIGURE 2 - AMPLIFIER TEST SET-UP  
MODELS PA6-1AE, PA6-1BE, PA6-1FE

### 5.1 TUNE UP INSTRUCTIONS MODEL PA6-1AE

STEP	ADJUST	FUNCTION	INSTRUCTIONS	
1.			Set up amplifier in accordance with appropriate test set-up diagram. Apply DC voltage and minimum specified RF drive at the desired frequency.	
2.	C1 C11	Left Final Board	Tune for maximum power out.	
3.	C1 C11	Right Final Board	Tune for maximum power out.	
4.			Repeat steps 2-3 Tune for maximum power out.	
5.	C1 C4	Filter Board	Filter Tuning	Tune for maximum power out.
6.	C11	Driver Board	Output Tuning	Tune for maximum power out.
7.	C1	Driver Board	Input Tuning	Tune for maximum power out.
8.	C11	Pre-Driver Board	Output Tuning	Tune for maximum power out.
9.	C1	Pre-Driver Board	Input Tuning	Tune for minimum Input reflected power.
10.			Repeat steps 2, 3, and 4 until maximum power output at minimum current are achieved.	
11.			Repeat steps 5-9 until maximum power output is achieved. If necessary to reduce output power level, turn in the direction of minimum capacitance for desired level. De-tune for maximum output of 50 watts as specified in FCC Rules for operation under Parts 95 and 93.	
12.	C11	Driver Board	Output Tuning	

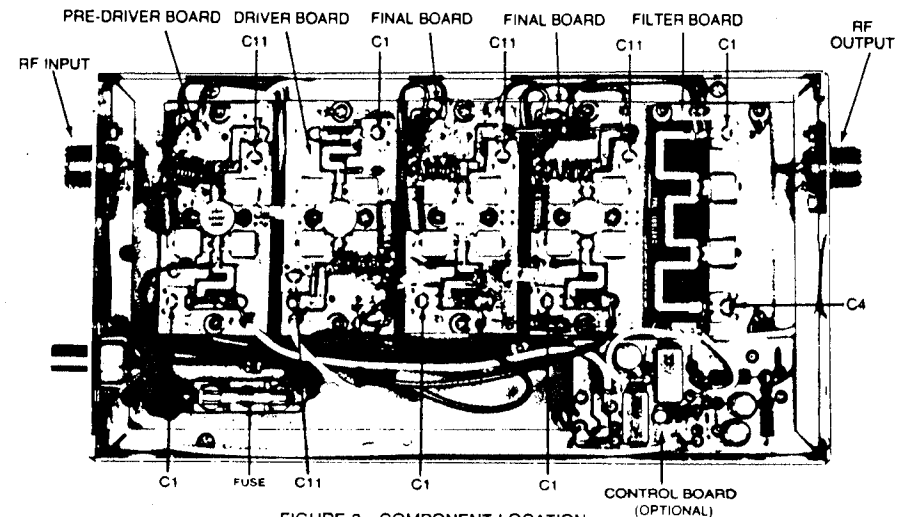


FIGURE 3 - COMPONENT LOCATION  
PA6-1AE

## 5.2 TUNE UP INSTRUCTIONS MODEL PA6-1BE

STEP	ADJUST	FUNCTION	INSTRUCTIONS
1.	Set up amplifier in accordance with appropriate test set-up diagram. Apply DC voltage and minimum specified RF drive at the desired frequency.		
2.	C1 C11	Left Final Board	Tune for maximum power out.
3.	C1 C11	Right Final Board	Tune for maximum power out.
4.	Repeat steps 2-3 Tune for maximum power out.		
5.	C1 C4	Filter Board	Tune for maximum power out.
6.	C11	Driver Board	Output Tuning
7.	C1	Driver Board	Input Tuning
8.	Repeat steps 2, 3, and 4 until maximum power output at minimum current are achieved.		
9.	Repeat steps 5-7 until maximum power output is achieved		
10.	C11	Driver Board	Output Tuning

If necessary to reduce output power level, turn in the direction of minimum capacitance for desired level. De-tune for maximum output of 50 watts as specified in FCC Rules for operation under Parts 95 and 93.

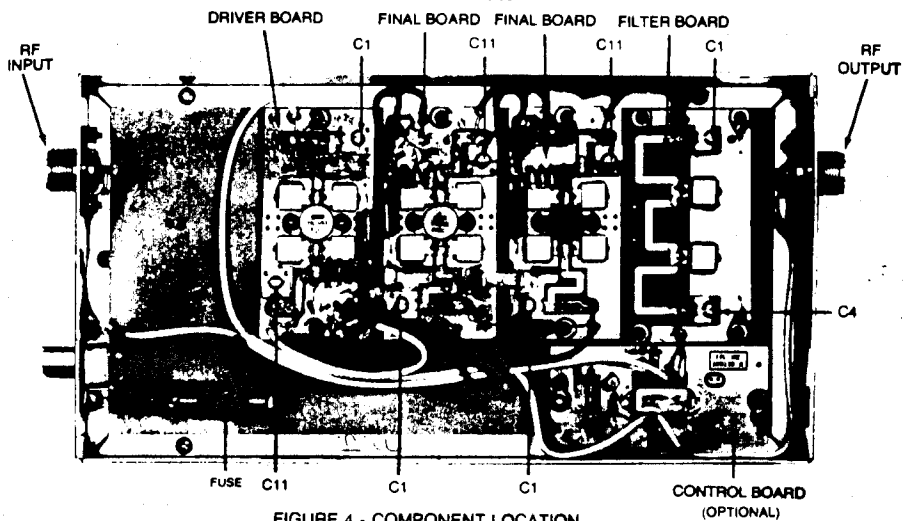


FIGURE 4 - COMPONENT LOCATION  
PA6-1BE  
CONTROL BOARD (OPTIONAL)

## 5.3 TUNE UP INSTRUCTIONS MODEL PA6-1FE

STEP	ADJUST	FUNCTION	INSTRUCTIONS
1.	Set up amplifier in accordance with appropriate test set-up diagram. Apply DC voltage and minimum specified RF drive at the desired frequency.		
2.	C1 C11	Left Final Board	Tune for maximum power out.
3.	C1 C11	Right Final Board	Tune for maximum power out.
4.	Repeat steps 2-3 Tune for maximum power out.		
5.	C1 C4	Filter Board	Filter Tuning
6.	Repeat steps 2, 3, and 5 until maximum power output at minimum current are achieved.		

If necessary to reduce output power level, turn in the direction of minimum capacitance for desired level. De-tune for maximum output of 50 watts as specified in FCC Rules for operation under Parts 95 and 93.

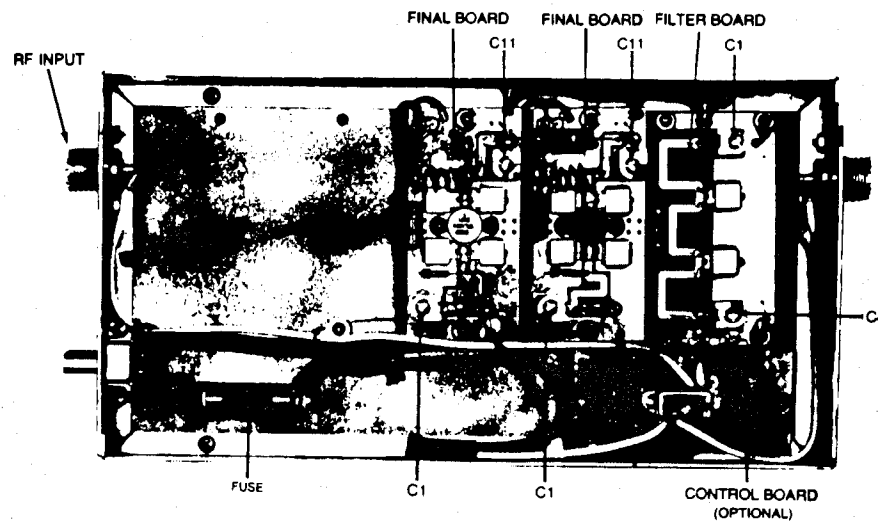


FIGURE 5 - COMPONENT LOCATION  
PA6-1FE

## 6.0 CIRCUIT DESCRIPTION

The UHF power amplifiers are comprised of a group of 50 ohm modular building blocks - - a brief description of each follows:

### 6.1 PA Predriver P/N 1002 (Power output 15 watts maximum)

This stage provides approximately 6dB gain utilizing a common emitter transistor. Input matching to Q1 is accomplished through the combination of C1, C2, C3, C4, and L1. Output matching is accomplished through L4, C10, C11 and C13. DC isolation is accomplished through L3 & L5 and C5, C6, C7, C8 and C9. Input and output impedances are 50 ohms.

### 6.2 PA Driver P/N 1003 (Power output 50 watts maximum)

This stage provides approximately 5 dB gain utilizing a common emitter transistor. Input matching to Q1 is accomplished through the combination of C1, C2, C3, C4 and L1. Output matching is accomplished through L4, C12, C13 and C11. DC isolation is accomplished through L3 & L5 and C5, C6, C7, C8 and C9. Input and output impedances are 50 ohms.

### 6.3 Low Pass Filter 100134

This is a seven pole low pass filter providing 45-55 dB of attenuation of frequencies at the 2nd harmonic and above.

### 6.4 Carrier Operated Relay (Optional)

The carrier operated relay is activated by RF input from the transmitter. It switches RF through the power amplifier during transmit and around it during receive. In some models it is also used to apply bias to the amplifier during transmit. By making appropriate connections at the board terminals the relay can be used in various applications such as single sideband or FM.

The above building blocks are combined in various ways to make up the various models. For any particular model, see the appropriate component location drawings and block diagram.

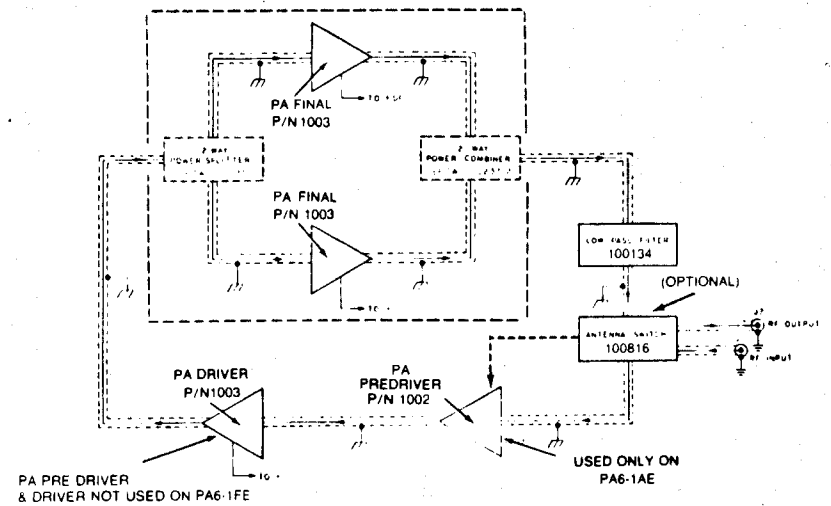


FIGURE 6 - BLOCK DIAGRAM  
UHF POWER AMPLIFIER

7.0 SCHEMATICS AND COMPONENT LOCATIONS

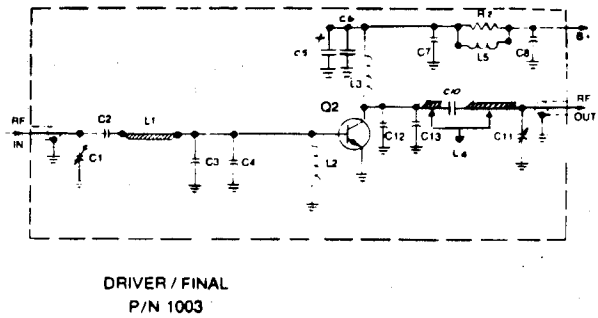
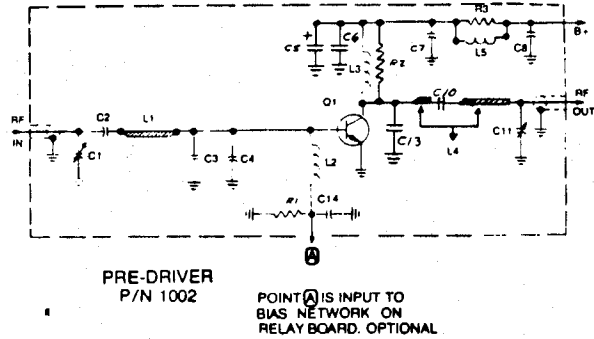


FIGURE 7 - SCHEMATICS  
MODULES - UHF POWER AMPLIFIER

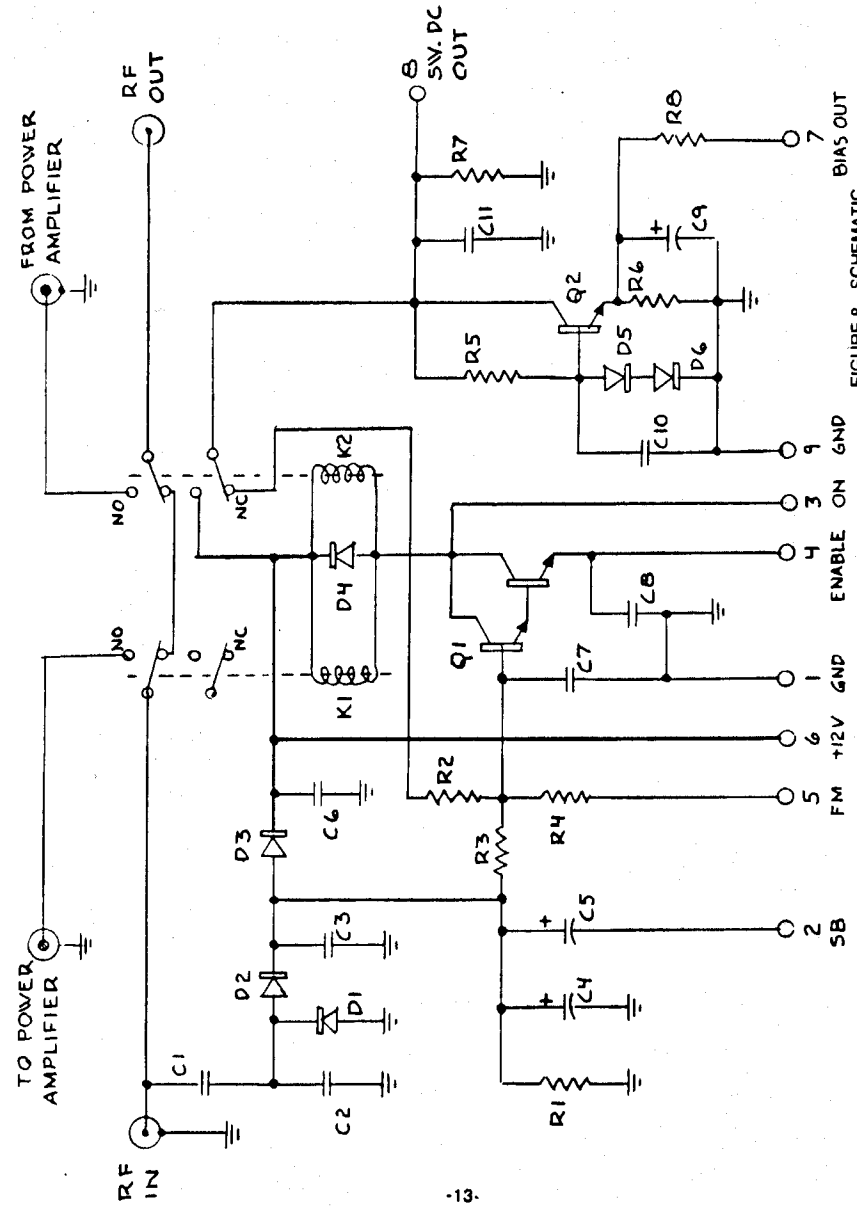
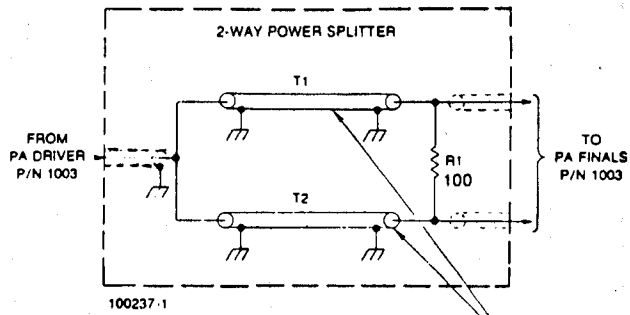
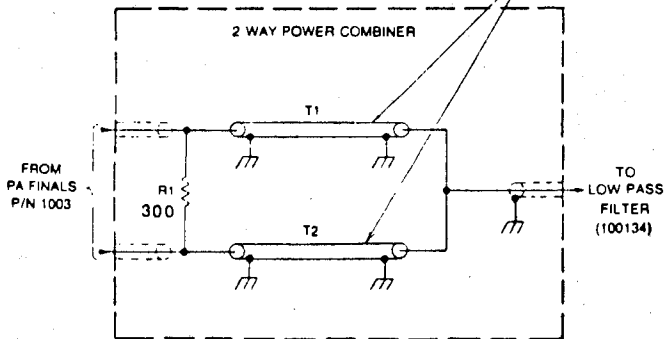


FIGURE 8 - SCHEMATIC  
GENERAL PURPOSE VHF/UHF  
CARRIER OPERATED RELAY  
PN 100816



100237-1

T1 & T2 IN -1 & -2 SCHEMATIC MADE FROM 1/4 WAVE LENGTH 75 ohm COAXIAL CABLE



100237-2

FIGURE 9 - SCHEMATIC SPLITTLER/COMBINER, UHF POWER AMPLIFIER

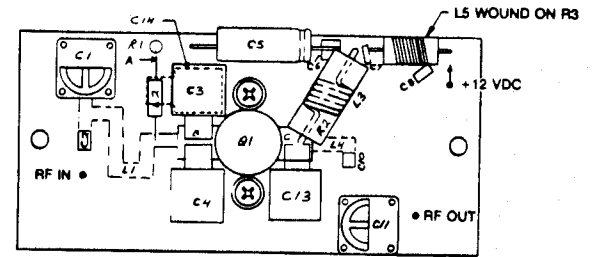


FIGURE 10 - COMPONENT LAYOUT FOR PRE-DRIVER, P/N 1002

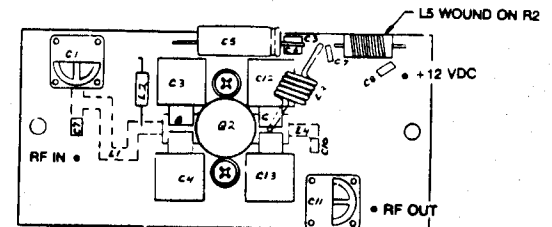


FIGURE 11 COMPONENT LAYOUT FOR DRIVER/FINAL, P/N 1003



## 8.0 PARTS LIST

### UHF CHASSIS

REF SYMBOL	TPL PART NO.	DESCRIPTION
FH1	J2-111	Fuse Holder
F1	J2-105	25 amp Fuse
TB1	F3-104	Barrier Strip
J2	F2-122	UHF Connector
J1	F2-128	BNC Connector
FL1	E3-101	Feed Thru Filter
D1	B3-112	MR751 Diode

### UHF PRE-DRIVER, P/N 1002

REF SYMBOL	TPL PART NO.	DESCRIPTION
C1, C11	A5-600	1.1-11 pf Variable Capacitor
C2, C7	A2-172	1000 pf Chip Capacitor
C3, C4	A1-104	25 pf Mica Capacitor UNELCO
C5	A4-105	33 uf, 25 V Electrolytic Capacitor
C6, C8	A2-188	.047 uF Chip Capacitor
C10	A5-148	100 pf Ceramic Disc
C13	A1-106	50 pf Mica Capacitor UNELCO
C14	A1-113	700 pf Mica Capacitor UNELCO
R1	C1-336	33 Ohm, 1/2 W Resistor
R2	C1-724	10 Ohm 2 W Resistor
R3	C1-398	12K Ohm, 1/2 W Resistor
L2	E1-113	1.0 uH Choke
L3	E2-103	5T, #16 AWG, 1/4" I.D. coil
L5	E1-106	10T, #26 AWG coil wound on R3
Q1	B2-127	MRF 641 Transistor

UHF DRIVER / FINAL, P/N 1003

REF. SYMBOL	TPL PART NO.	DESCRIPTION
C1, C11	A5-600	1.1 11 pf Variable Capacitor
C2	A5-148	100 pf Disc Capacitor
C3-C4	A1-104	25 pf Mica Capacitor UNELCO
C5	A4-105	33 uf, 25 V Electrolytic Capacitor
C6, C8	A2-188	.047 uF, Chip Capacitor
C7	A2-172	1000 pf Chip Capacitor
C10	A1-111	300 pf Mica Capacitor UNELCO
C12, C13	A1-105	35 pf Mica Capacitor
L2	E1-113	1.0 uH choke
L3	E2-103	5T #16 AWG, 1/4" I.D.
L5	E1-106	10T, #26 AWG, wound on R-3
R3	C1-398	12K Oh, 1/2 w resistor
Q2	B2-142	MFR 646 Transistor

TWO WAY POWER SPLITTER, P/N 100237-1

R1	C1-758	100 ohm, 2W
T1, T2		75 ohm cable

TWO WAY POWER COMBINER, P/N 100237-2

R1	C-759	300 ohm, 2W
T1, T2		75 ohm Cable

VHF/UHF CARRIER OPERATED RELAY, P/N 100316

REF. SYMBOL	TPL PART NO.	DESCRIPTION
	100816	Circuit Board
R1	C1-229	270 Ohm, 1/4 W, Resistor
R2, R4	C1-220	100K Ohm, 1/4 w, Resistor
R3	C1-212	47K Ohm, 1/4 w, Resistor
C1, C2	A5-300	1 pF Tubular Capacitor
C3	A5-244	.01 uF Ceramic Disc Capacitor
C4	A4-106	1.0 uF, 50 V Electrolytic Capacitor
C5	A4-117	4.7 uF, 25 V Electrolytic Capacitor
C6, C7, C8	A5-172	.001 uF Ceramic Disc Capacitor
D1, D2, D3, D4	B3-110	1N4148 Silicon Diode
Q1	B2-139	MPS-A14 NPN Darlington Transistor
K1, K2	J1-116	W76URCPCX - 34 DPDT Relay
R5 *	C1-376	1.5K Ohm, 1/2 W, Resistor
R6 *	C1-140	47 Ohm, 1/4 W, Resistor
R7 *	C1-172	1.0K Ohm, 1/4 W Resistor
R8 *	C1-124	10 Ohm, 1/4 W, Resistor
C9 *, C10 *, C11 *	A5-172	.001 uF Ceramic Disc Capacitor
D5 *, D6 *	B3-110	1N4148 Silicon Diode
Q2	B2-150	TIP 31 NPN Transistor

NOTE: \* Used on models only with biasing