3T97A250 VHF Power Amplifier

USER MANUAL

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OSHA Safety Bulletin
General Safety Information

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA) has established an electromagnetic energy safety standard which applies to the use of this equipment. Proper use of this radio will result in exposure below the OSHA limit. The following precautions are recommended.

- DO NOT operate the transmitter of a fixed radio (base station, radio paging transmitter RF equipment) when someone is within 60 cm (24 inches) of the antenna.
- DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

The following additional precautions are also recommended.

- DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- All equipment must be properly grounded according to National and Local Electrical Codes.
- All equipment should be serviced only by a qualified technician.

Refer to the appropriate section of this manual for additional pertinent safety information.

CSA Safety Bulletin

DANGER ATTENTION

To prevent electric shock, DO NOT use the (polarized) plug with an extension cord, receptacle or other outlet unless the blades can be fully inserted to prevent blade exposure.

Afin de prévenir tout chocs électrique, prière de ne pas utiliser cette prise polarisée avec un rallonge, prise de courant ou autre sortie de courant, sauf si les lames peuvent être insérées entièrement sans exposer aucune partie.

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1. GENERAL

1.1 Preface

This manual is intended for use by experienced technicians familiar with RF communication systems. It contains all the necessary information required to align, install, interface, and operate the 3T97A250 VHF Power Amplifier. Any changes which occur after the printing date, will be issued on blue sheets bearing the same document numbers as this manual.

Any questions regarding the equipment or this manual should be directed to Customer Service - RF:

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1.2 Manual Sections

Section 2, **Specifications**, lists the performance and mechanical specifications.

Section 3, **Description**, provides the overview description of the transmitter as to features and physical description.

Section 4, **P.A. Circuit And Logic Circuit Descriptions**, provides an overall block diagram discussion of the functional circuits within the transmitter.

Section 5, **Installation**, provides information needed for incoming inspection, preparation for use, such as aligning, and testing the transmitter.

Section 6, **Adjustments**, provides information on how to change the frequency of the transmitter, and the necessary adjustments that should be made.

Section 7, **Maintenance**, contains fault isolation and general maintenance information and general care of semiconductors, the proper use of test equipment, and general good practice.

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2. SPECIFICATIONS

2.1 VHF Power Amplifier

Frequency Range:	138 to 174 MHz
F.C.C. ID:	D4P6MX3T97A250
D.O.C. Type Approval:	#522 193 112 C with 3T99B4
Operating Temperature Range:	-30°C to +60°C
Power Requirements:	28 Vdc input, nominal (standby) 500 mA (operating) 21 A
RF Power Input:	4 watts typical
Input and Load Impedance:	50 ohms
RF Power Output:	Variable from 25 to 250 watts
Rated Duty Cycle:	continuous
Physical Dimensions:	48 cm wide, 27 cm high, 19 cm long (19" W, 10.5" H, 7.5" L)
Mass (Weight):	13 kg (29 lbs.)

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3. DESCRIPTION

3.1 General

3.1.1 System Overview

The 3T97A250 VHF power amplifier is designed for FM/PM operation in the 138 to 174 MHz band. The RF power output is continuously adjustable from 25 watts to 250 watts when driven by a 4 watt source. The RF input and output connectors are the N type and are mounted on the rear of the power amplifier. Input dc power is fed to the power amplifier through a two-terminal barrier strip on the rear of the power amplifier. A 15-pin D-connector (for monitoring the power amplifier's operating condition using its associated test set) is mounted near the barrier strip. Forced air circulation is through the front panel, using an internally controlled dc fan. The power amplifier is self protected against overheating and mismatched load conditions (including open and short circuit conditions). For a block diagram overview review drawing 177-0162-BD.

3.1.2 Front Panel Display and Alarms

Power Output Bar-Graph:	Indicates relative output power in ten levels (red).
RF Input LED	Indicates RF input power is applied (green).
High VSWR LED	Indicates an alarm due to high reflection at the output (red).
High Temperature LED	Indicates an alarm due to over heating (red).
Power On LED	Indicates that the dc supply is applied to the power amplifier (green).

3.2 Features

The 3T97A250 power amplifier has the features listed below.

- Adjustable power output.
- Continuous operation.
- Mounts on a 19-inch rack panel.
- Self-resetting protection circuitry.
- Modular construction.

- Status and power output display.
- Easy access to amplifiers and protection circuitry for adjustment.
- Independent fusing of each final module and the driver with open fuse indicator on the rear panel.

3.3 Physical Description

3.3.1 General

The 3T97A250 VHF power amplifier is rack panel mountable (19-inch). Front and rear covers are removable to gain access to all controls without removing the 3T97A250 from the rack. See drawing 177-0175-OV for housing assembly details.

The front panel display consists of a red LED bargraph display showing output power. Two red and two green status LEDs are also located on the front panel. See drawing 177-0161-HF for front panel LED positioning.

The rear panel consists of an RF input connector, an RF output connector, a DB-15 connector, and a two-terminal barrier strip for dc power connections. See drawing 177-0171-HR for positioning and a rear view of the power amplifier.

3.3.2 Alignment Controls

There are a total of fifteen alignment controls. Behind the front access panel are six potentiometers for setting alarm threshold levels and output power. Behind the rear access panel are nine variable capacitors to provide frequency matching across the band width.

4. P.A. CIRCUIT AND LOGIC CIRCUIT DESCRIPTIONS

4.1 Power Amplifier Circuit Description

4.1.1 General

Refer to the functional block diagram (000-1046-BD) for more information on the RF power amplifier. The RF input, which is sampled by the alarm logic, is amplified by the RF power driver. The driver's net RF power output is varied by adjusting the dc voltage supply. The driver's power output is split into two parts which become the input power to the finals. Each final amplifies this input power and the output from each final are combined and filtered. The alarm logic samples both the output forward power and reflected power.

4.1.2 Driver

The driver module (drawing 140-0723-AS in Section 8) provides two functions. Its primary function is to provide a variable power input to the final power amplifiers. In this way, the net output power of the final amplifiers can be adjusted. The second function is to provide a sampling point for the alarm logic at the the input power point to the power amplifier.

The driver (drawing 140-0723-SD in Section 8) is a common emitter class C amplifier. Capacitors C15 and C1/C23 at the input of the driver, fine tune the input match to 50 ohms. Capacitor C18 couples a small amount of input power through diodes D1 and D2. This dc, proportional to the RF input, is fed to the alarm logic via a faston tab. This rectified RF at the anode of D1 is smoothed by capacitor C19 and loaded by resistor R1. The main part of the RF input goes to a section of 25-ohm transmission line (T1). The transmission line acts as a two to one step-down transformer, or as a four to one impedance transformer. Following this are two micro stripline sections (Z1 and Z2) and capacitors (C21. C2, C3, C4, and C5) that are required to provide matching to the transistor's (Q1) input across the frequency bandwidth. Power (3 to 25 Vdc) is fed via a faston tab to the collector of transistor Q1. Matching of the transistor output across the frequency band is provided by Z3, C6, C7, C17, and Z4. In addition, C14 fine tunes the output. Transformer T2 is a one to four 25-ohm transmission line transformer that steps the impedance up to 50 ohms.

4.1.3 Splitter

The splitter (drawing 148-0316-SD in Section 8) consists of a ninety degree hybrid and a 50-ohm load. A ninety degree hybrid is a length of wire line in this case. The length is determined by the frequency band of the power amplifier. The wireline is a form of semi-rigid 50-ohm coax that has two centre conductors insulated from each other.

Within the usable bandwidth, the hydride splits the RF power into approximately two equal parts, that differ in phase by about ninety degrees. As the split and phase differ, some power is dissipated in the load resistor terminating the fourth port of the hybrid. When power is reflected from any other port, the bulk of this reflected power (nominally half) is dissipated in the load. The remaining power is split equally between the other two ports. Drawing 148-0316-SD shows the connection and phases of the hybrid and load, and drawing 148-0316-IFM shows the mechanical assembly.

CAUTION

The process of splitting and combining is very phase sensitive. Incorrect phasing will result in power wastage, increased heat through power dissipation, reduced MTBFs. and reduced output power. As a result, all cables between the splitter and the finals, and the combiner must be exactly the same length. The necessary phase adjustments for manufacturing tolerances are provided by the tuning capacitors in the finals.

4.1.4 Final

Since there are four identical final modules in 3T97A250, only one module is described. The final module amplifies the output of the splitter to about 80 watts and feeds this to the combiner.

The final is a common emitter class C amplifier. The input RF is fine tuned by capacitor C1, then transformed by a section of the 25-ohm transmission line, four to one impedance transformer. Micro stripline sections Z1 and Z2, with capacitors C4, C5, and C15 provide a match to the transistor's (Q1) input across the frequency bandwidth. Power (28 Vdc) is fed via a faston tab to the collector of transistor Q1 through a de-coupling network. Matching of the transistor output across the frequency bandwidth is provided by Z3, C6, C7, C17, and Z4. In addition, C14 and C19 fine tunes the output matching. Transformer T2 is a one to four 25-ohm transmission line transformer that steps the impedance up to 50 ohms. Drawing 140-1199-SD shows the final's schematic drawing, and drawing 140-1199-IFM shows the final's mechanical assembly.

4.1.5 Combiner

Like the splitter, the combiner consists of a ninety degree hybrid and a 50-ohm load. A ninety degree hybrid is a length of wireline in this case. The length is determined by the frequency band of the power amplifier. The wireline is a form of semi-rigid 50-ohm coax that has two centre conductors insulated from each other.

Within the useable bandwidth, the hybrid combines the approximately equal RF feeds (each feed differs in phase by about ninety degrees), into one. As the phase differs, some power is dissipated in the load resistor terminating the fourth port of the hybrid. The resistive load's most important function in the combiner is to dissipate the bulk of any reflected power (nominally half). The remainder of the reflected power is split equally between the other two ports (typically). Drawing 148-0315-SD shows the connection and phases of the hybrids and loads, and drawing 148-0315-IFM shows the mechanical assembly.

CAUTION

The process of splitting and combining is very phase sensitive. Incorrect phasing will result in power wastage, increased heat through power dissipation, reduced MTBFs. and reduced output power. As a result, all cables between the splitter and the finals, and the combiner must be exactly the same length. The necessary phase adjustments for manufacturing tolerances are provided by the tuning capacitors in the finals.

4.1.6 Low Pass Filter and Directional Coupler

The low pass filter attenuates the harmonics generated by the power amplifier. The directional coupler samples and detects, output power and reflected power. These signals are then passed to the alarm logic. The output of the combiner is fed through the low pass filter (C1, C2, C3, C4, C5, C6, C7, C8 C9, C10, L1, L2, L3, and L4) and the directional coupler to the power amplifier's output connector. The directional coupler consists of two micro striplines Z1, Z2 and Z3 with loads and detector circuits at coupled ports. The directional coupler provides about -33 dB of coupling at the centre frequency. Schottky barrier diodes (D1 and D2) are used for detection of forward and reflected RF power. Drawing 140-1273-SD shows the schematic drawing, and drawing 140-1273-AS shows the mechanical assembly.

4.1.7 DC Distribution Board

The distribution board supplies 28 Vdc to each final module and 3 to 25 Vdc to the driver module. Each final amplifier module is fused through 10 A fuses F2 to F5, current monitoring resistors R1 to R4 and EMI filters for short circuit protection and shielding purposes. Fuse F1 is for short

circuit protection on the logic board and driver module. For added protection, the current to each final may be monitored. Capacitors and the low pass EMI filters are used on each of these lines to prevent low and high frequency noise from penetrating or leaving the shielded amplifier housing.

The adjustable dc supply to the driver module and the direct current signals representing the RF input, RF output, and reflected RF are also filtered on this board. The power amplifier's dc input terminals TB2 and test set connector J1 are mounted on this board. Connections to the logic board are also made through P2. Drawing 140-1186-SD shows the schematic drawing, and drawing 140-1186-IFM shows the mechanical assembly.

4.2 Logic Circuit Description

4.2.1 General

The logic board is a control board mounted behind the front panel of the 97 series RF power amplifiers. It gives visual indication of the RF power amplifier's operating condition, and indication of the variable power supply to the driver of the RF power amplifier. The logic board also contains the RF detection circuit, power meter, temperature controller, 2-minute timer, fan driver, and optional fixed bias supply. The logic board has three connectors; a 1 x 2-pin connector for dc fan power, a 6-pin connector for the regulator, and a 2 x 8-pin connector for the power control signals. Drawing 140-0791-SD shows the logic board's schematic drawing and drawing 140-0791-AS shows the assembly of the logic board.

4.2.2 Power Supplies

Introduction

The three power supplies are: the adjustable driver supply with the ability to switch between high and low power, the 8 Vdc regulator, and the fixed bias power supply.

Adjustable Driver Supply

An adjustable voltage is produced by regulator U5 and is current boosted by the transistor assembly board 140-1131, mounted on the rear panel of PA , which produces a stable, high current variable power supply. This is used to supply the driver module with 3.5 to 25 Vdc.

The output is adjusted by resistors R52 and R53, and can be switched to high power (default), low power (high at P10-10 to switch Q6, or a high at

P10-6 when JR27 is installed), or power off (high at P10-6 to switch Q3 when JR26 is installed). When Q3 is turned ON, the adjustment pin of U5 is shorted to ground. This will cause the output of U5 to drop to a minimum voltage (about 0.9 Vdc at P10-2, 3). Filtering capacitors C33, C30, C52, C51, C54, C53, C55, C56, and C57 are used at the input and output of U5 and the external transistor, in order to reduce the ripple voltage which may be caused by the ac line voltage, dc fan, or possibly the RF signal. Resistors R55 and R57 provide minimum load current for U5 and the external transistor while D22 and D24 protect U5 from potential reverse bias conditions.

Eight Volt Supply

The 8 Vdc regulation and power to the logic circuit is handled by U6 which is protected by diode D23.

Fix Bias Supply

At P10-4, a 0.64 and 0.05 Vdc bias power supply is produced by QA1B, QA1D, QA1E, and Q5. This bias voltage is used to bias some of the power amplifier's driver transistors. The bias circuit is not required for this power amplifier.

4.2.3 RF Power Detection

The rectified RF signals (RF in, forward RF output, and reflected RF output) provided by the power amplifier's directional coupler and input detector are processed to indicate the power amplifier's status.

The RF levels are buffered and compared by U3 and U7. See Section 6.2.2, Low and High Power Adjust, for setting the comparator's reference voltage level. The forward RF output signal is fed to U8.

The linear bar graph gives an approximation of the power amplifier's output RF power. The indication range of bar graph LEDs D11 to D20 is from 10% to 100% of the power amplifier's RF output. Resistor R48 is used to adjust the bar graph. One of ten jumpers (JR12 to JR21) is used to set the relative low forward RF output; a logic high at U2's pin 5 indicates a relative low RF level detected. The second jumper (from JR2 to JR11) is selected for turning on the fan whenever output power is detected above a threshold level (about 20%).

4.2.4 Status Indication and Alarm

The power on LED D7, and RF IN LED D8, are green. LED D8 indicates the input status of the power amplifier. LED D8 is turned on whenever 50% of rated exciter power is detected. The level of triggering D8 is adjusted by R50.

The high reflection output LED D9, and overheat LED D10, are red. When these LEDs are illuminated, this indicates a problem in the power amplifier. LED D9 is latched by U1 where the reflected level is detected above a certain level (30% of rated power amplifier power) for approximately 10 ms. LED D9 is disabled only by resetting the latch (U1 and the NOR RS flip flop). It is reset on the application or removal of PTT (or by a transition from low to high or high to low power) if the alarm condition has been corrected.

The temperature sensor, mounted on the heatsink, will switch on Q2 and LED D10 when it detects the ambient temperature of the heat sink is above the rated temperature level (set by R14 and R28 or R51). There is about 10°C hysteresis built into the temperature sensor circuitry to ensure the power amplifier is cooled down before the next transmission. The overheat signal sent by the temperature sensor is latched by U1, and sends an alarm signal to the system through P10-11. The overheat alarm will only be reset when the heat sink is cool enough for the power amplifier's next transmission.

The alarm signal is fed to driver regulator switch Q3, and it will disable the power amplifier (JR26 installed) or switch the power amplifier to low power (JR27 installed) as long as the alarm condition is present. On the other hand, it is desirable to disable the alarm signal, and enable the power amplifier when a ;new antenna system is set up at a site. This can be achieved by removing JR26 or JR27 (which ever is installed). See Table 4-1 for more information.

NOTE

Remember to replace JR26 or JR27 (whichever was installed) after the antenna system is set up. The power amplifier may be shutdown remotely if desired, by supplying 8 Vdc to pin 14 on connector DB15.

Table 4-1 Truth Table

RF Alarm (pin 10 on U4)	Jumper Installed	Driver Supply	
		High Power	Low Power
0	None	High	Low
Z	None	High	Low
0	JR26	High	Low
Z	JR26	Off	Off
0	JR27	High	Low
Z	JR27	Low	Low

4.2.5 Timer and Fan Driver

The oscillator and programmable timer (U10), has its oscillatio frequency determined by R46, R47, and C48 (f_{osc} = 1/(2.3 R46 C48) whe R47 = 2*R46). This driver operates as a one shot 2-minute timer, and it counter is reset when it is powered up or pin 6 of U10 is set. The counte will count up to 2 minutes of logic low at pin 6 of U10, then reset the C output to a logic low.

There are four possible inputs that reset the 2-minute timer; power on high RF input level, high RF output level, and overheat sensor.

NOTE

The fan may be jumpered on by installing JR25.

4.2.6 Overheat Sensor and Reference Temperature Level

If the ambient temperature detected by the temperature sensor is higher than the reference temperature (set by R14, and R28, or R51), the temperature sensor turns on switch Q2. Switch Q2 then turns on overheat LED D10, and sets the alarm. The temperature sensor has hysteresis determined by R29 and R32.

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5. INSTALLATION

5.1 Overview

The transmitter location should be chosen to protect the equipment from dust and extreme environmental conditions. The transmitter can either be installed in any standard EIA 19-inch rack or ordered with one of two optional 19-inch rack cabinets. An optional cabinet can be ordered for indoor transmitter locations. Before installing the cabinet, open the transmitter's cabinet door and examine all equipment closely to ensure that all packing was removed and that all required printed circuit boards, other plug-in units, bolt-on equipment and electrical connections are secure. Replace any panels removed, and close the cabinet door after your inspection.

5.2 Cabinet Installation

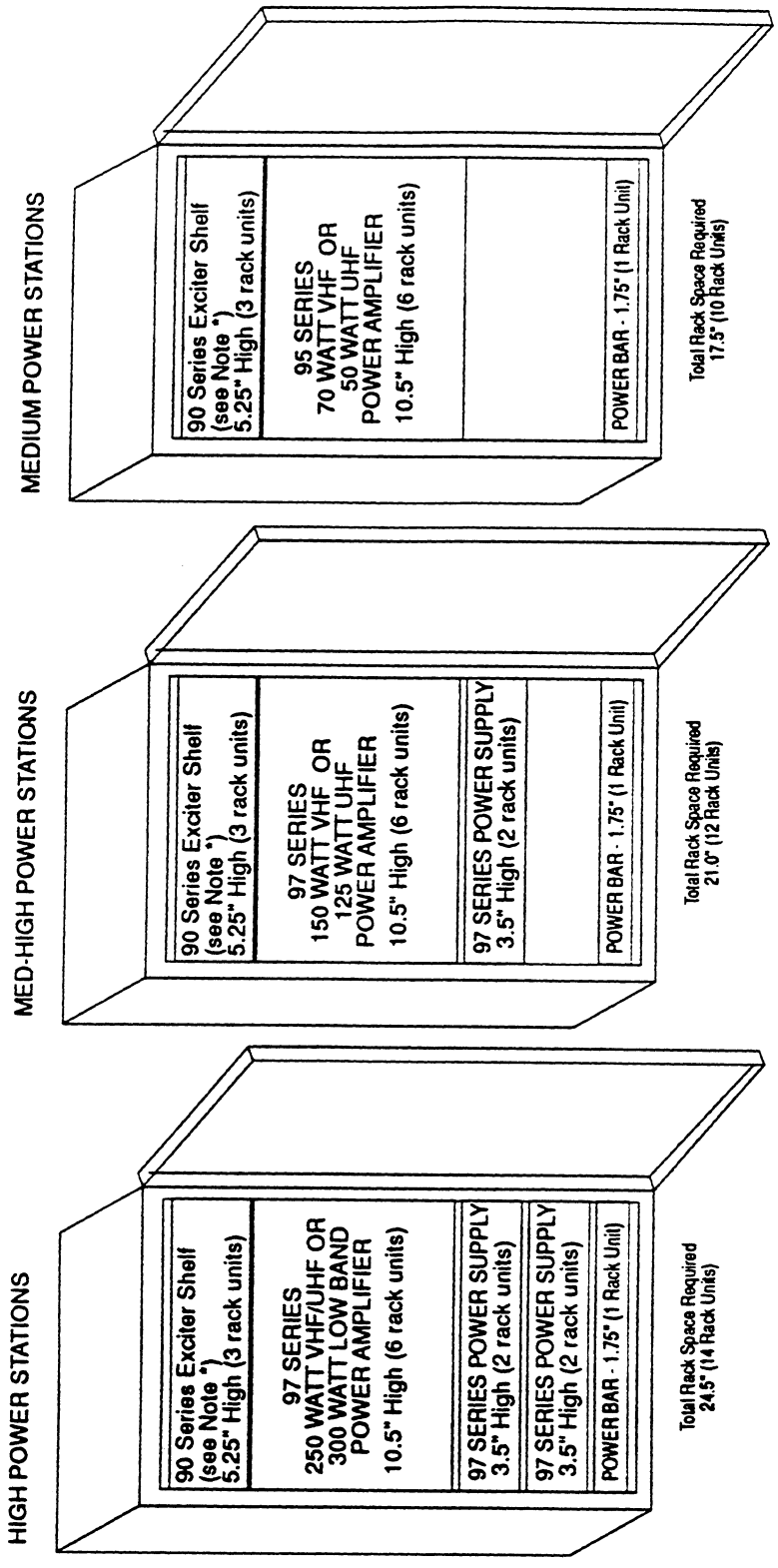
DANGER ATTENTION

The optional cabinet, with one transmitter, has an approximate mass (weight) of 76 kg (167 lbs.). Ensure that the proper equipment and the required number of persons are available when lifting or moving your cabinet-installed transmitter to prevent injury to personnel or equipment.

Le poids du cabinet d'option incluant un transmetteur est environ 76 kg. Afin d'éviter des accidents, vuillez vous assuerez que l'équipements emploie est adequat et qu'il y a sufficament de person pour sovleves ou transporter le cabinet de transmitteur a la location desiré.

5.2.1 Indoor Cabinets

Figure 5-1 details installation data for the optional indoor 19-inch rack mounting cabinets. This is an upright style cabinet with provisions in the base for bolting it down to a concrete floor. All cabinets have an ac power outlet strip with six grounded outlets and a 4.5 metre (15 foot) CSA (UL) approved, three-wire line cord installed in the cabinet's base. Remove the knockouts that best fit your installation needs when routing the ac power cord, antenna cable, and other wiring.



CABINETS AVAILABLE (all but #2443 have locking doors)

Sales Options #	Glenayre Part #	Rack Panel Space Available	Dimensions
2443	23.1443	28 inches 16 R.U.	30" H x 21" W x 17.5" D
2490	23.1490	28 inches 16 R.U.	35" H x 21" W x 24.5" D
2480	23.1480	49 inches 28 R.U.	56" H x 21" W x 24.5" D
2470	23.1470	61.25 inches 35 R.U.	68" H x 21" W x 22.5" D

Sales Options #	Glenayre Part #	Panel Rack Height
2449	23.1449	1.75 inches 1 R.U.
2450	23.1450	3.5 inches 2 R.U.
2451	23.1451	5.25 inches 3 R.U.
2452	23.1452	7.0 inches 4 R.U.

* Note: RF modules and exciter shelf power supply is removed and packaged separately, prior to shipping.

1 Duplexers, transmitter combiners and multicoupler may require additional rack space. Contact Glenayre's Applications Engineering Department for determination of configuration and space required.

112-0108-RLF

Figure 5-1 : 90/95/97 Series Radio Equipment Suggested Equipment Mounting

CAUTION

DOC and FCC Rules and Regulations require that the transmitter be installed so that all controls are protected from adjustment by unauthorized personnel. Cabinet doors must be kept locked unless the transmitter area is secure.

5.2.2 Transmitter Rack Mounting

When the transmitter is ordered without a cabinet, it is supplied with rack mounting hardware and can be installed in any standard EIA 19-inch rack. However, certain guidelines should be followed when installing the transmitter. The transmitter location should provide enough unobstructed space (at least 30 cm [12 inches]) immediately to the rear of the large finned heat sink and fan located on the rear of the PA chassis. This space is necessary for proper cooling of the amplifier power elements.

When the transmitter is installed in a cabinet, airflow through the cabinet should not be restricted, and the cabinet should have ample louver openings for airflow at both top and bottom.

5.2.3 Electrical Connections

DANGER ATTENTION

A 120 volt ac or 28 volt dc shock can be fatal! DO NOT attempt to make or break any electrical connections while line power is applied. If you are not familiar with Local Electrical Code procedures, a licensed electrician can make necessary 120 volt ac connections.

Un choc électrique de CA 120 volt ou de CC 28 volt peut être fatal. Ne touchez jamais aux connections électrique de l'équipement sous tension. Si vous n'êtes pas familier avec les normes électriques locales, un technicien dûment qualifé pourrait effectuer les connections nécessaires.

Both the exciter and power amplifier may have their own power supply or both be supplied from the same power supply. Each power supply (Model 2728, 28-Vdc/14 A) has a three-conductor cable that is equipped with a standard three-prong plug. These plugs are designed to mate with three-wire receptacles having the centre contact connected to earth ground.

When the transmitter is ordered with a cabinet, the power supply plugs can be plugged into the heavy duty ac outlet strip.

NOTE

Depending on local electrical codes, direct wiring may be required and the supplied power cord may not be allowed. In this case, consult with your local electrician for suitable wiring arrangements.

5.3 Operating and Servicing Hazards

5.3.1 Voltages

Operating voltages ranging from a few volts to 120 or 240 volts ac are present in this equipment. Care has been taken in the design of the equipment to insure personnel safety. Terminals where ac line voltages are present are enclosed by covers that require tools for removal. Do not remove these covers or service the equipment with ac power applied to the equipment.

5.3.2 Radio Frequency Radiation

Avoid exposure to strong RF fields, even at a relatively low frequency. Absorption of RF energy by human tissue is dependent on frequency. Below 30 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. Public health agencies are concerned with this hazard, even at these low frequencies.

Transmitters are specifically designed to generate and amplify radio frequency power. Relatively strong RF fields exist near the output stages of this equipment. Avoid this area!

The enclosure of this transmitter is designed to contain this RF energy. Efficient coupling of the RF energy to the antenna and keeping the power amplifier door closed at all times when the equipment is in operation will keep the RF field in the vicinity of the transmitter to a minimum.

5.4 Checks and Adjustments

Your transmitter was completely checked out and performing within operating specifications when it left the factory. Since signal levels, control voltages, and possible ac line voltage may vary from those used in factory testing, the following system checks and adjustments should be made when the equipment is initially placed into service.

5.5 Equipment Needed

The following tools and equipment will be required to install the 3T97A250 RF power amplifier.

- Glenayre VHF 4-watt transmitter (exciter) with shelf.
- Power supply: 28 Vdc 24 A minimum.
- Directional wattmeter, 50 ohms, 5-watts full scale, 5% accuracy.
- Directional wattmeter, 50 ohms, 250-watts full scale, 5% accuracy.
- 50-ohm termination 250 W.
- DC voltmeter: 30 Vdc minimum.
- DC ammeter: 25 A full scale, 2.5% accuracy.
- Rack mount hardware.
- Cables with appropriate connectors.
- One jumper: 0.1 spacing, (270-0501).

5.6 Procedure

1. Install the exciter shelf, power supply, and power amplifier into the rack, but do not interconnect.
2. Connect the voltmeter to the power supply. Check that polarity is correct. Check that the leads are not shorted out.
3. Switch ON the power supply and check that the voltage is 28 Vdc within 0.1 Vdc. Adjust the power supply if necessary.
4. Switch OFF power supply and placard.
5. Disconnect voltmeter leads after the power supply has discharged.
6. Connect the power supply to the barrier strip on the rear of the power amplifier. Check that polarity is correct.
7. Remove placard and turn ON power supply. Check that the green power light on the front panel of the power amplifier is illuminated, and the fan is operating.

7A. If the LED is not on, turn OFF the power supply and check fuses and polarity of the cables. If the LED still does not illuminate, or the fan does not start, contact Glenayre Customer Service.

8. Switch OFF the power supply and connect the exciter output through the 5-watt F.S. directional wattmeter to the 5-watt R.F. load.

9. Switch ON the power supply, and key the exciter. Check that about 4 watts is produced when the exciter is keyed. Switch OFF the power supply and disconnect the 5-watt R.F. load.

9A. If 4 watts is not produced contact Glenayre Customer Service.

10. Connect the 50-ohm cable from the power amplifier's output through the 250-watt F.S. directional wattmeter to the 250-watt R.F. load.

11. Connect the exciter's output from the 5-watt F.S. directional wattmeter to the power amplifier's input.

12. Switch ON the power supply and key the exciter momentarily. Check that the power amplifier's power output is about 250 watts.

12A. If this is not the case, follow the power amplifier alignment and logic circuit alignment procedures in Section 6 before continuing with this installation.

13. Key the exciter momentarily and note the reflected power between the exciter and the power amplifier. If this is greater than 0.2 watt, contact Glenayre Customer Service.

14. Switch OFF the power and disconnect the 5-watt F.S. directional wattmeter between the exciter and power amplifier. Connect the exciter directly to the power amplifier.

15. Switch ON the power supply and key the exciter. Check that the power amplifier's output power is acceptable.

16. Switch OFF the power supply and disconnect the 250-watt R.F. load. Remove the front panel of the power amplifier and connect the power amplifier's output to the antenna system through the 250-watt F.S. directional wattmeter.

17. Switch ON the power supply and key the exciter momentarily. Note the reflected power from the antenna system.

17A. If the power amplifier shuts down, remove JR26 or JR27 (which ever is installed) on the logic board and note the reflected power from the antenna system.

WARNING

If the reflected power is greater than 8% of the required output power, the power amplifier should not be used in this application subject to a void warranty. Contact Glenayre Customer Service.

17B. If the reflected power is less than 8%, and the power amplifier shuts down with JR26/JR27 installed, switch OFF the power supply and contact Glenayre Customer Service.

18. Replace JR26 or JR27 if removed previously. (The power amplifier did not shut down, and reflected power is less than 8%).

19. Disconnect the 250-watt F.S. directional wattmeter, and replace the front cover. The power amplifier is ready for use.

20. Measure the ac line voltage under normal operating (590 watts) load. Line voltage should be within ±10% of either the standard line voltage of 120 volts ac or the optional line voltage of 240 volts ac.

20A. If the line voltage is not within this range, contact your local utility for assistance.

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6. ADJUSTMENTS

6.1 Power Amplifier Alignment and Tuning

6.1.1 Why You Need to Tune

The 3T97A250 RF power amplifier is factory adjusted at the desired frequency. If the frequency of operation has to be changed by more than 1 MHz away from the previous frequency, then the following adjustments should be made. This is to ensure the power amplifier's optimum performance and increase the life of the RF power transistors.

6.1.2 Equipment Needed

The following tools and equipment will be required to properly align the 3T97A250 RF power amplifier.

- Directional wattmeter, 50 ohms, 5-watts full scale, 5% accuracy.
- Directional wattmeter, 50 ohms, 250-watts full scale, 5% accuracy.
- 50 ohm termination 250 W.
- Tuning tool, slot, insulated.
- DC ammeter: 25 A full scale, 2.5% accuracy.
- Cables with appropriate connectors.
- Test set: M-97.

6.1.3 Exciter Check

1. Set up the exciter and test equipment as shown in Figure 6-1.
2. Switch ON the power supply and key the exciter. Check that the output power is 4.0 watts ±0.2 watts.

2A. If the power output is not within this range, switch OFF the power supply and replace the exciter.

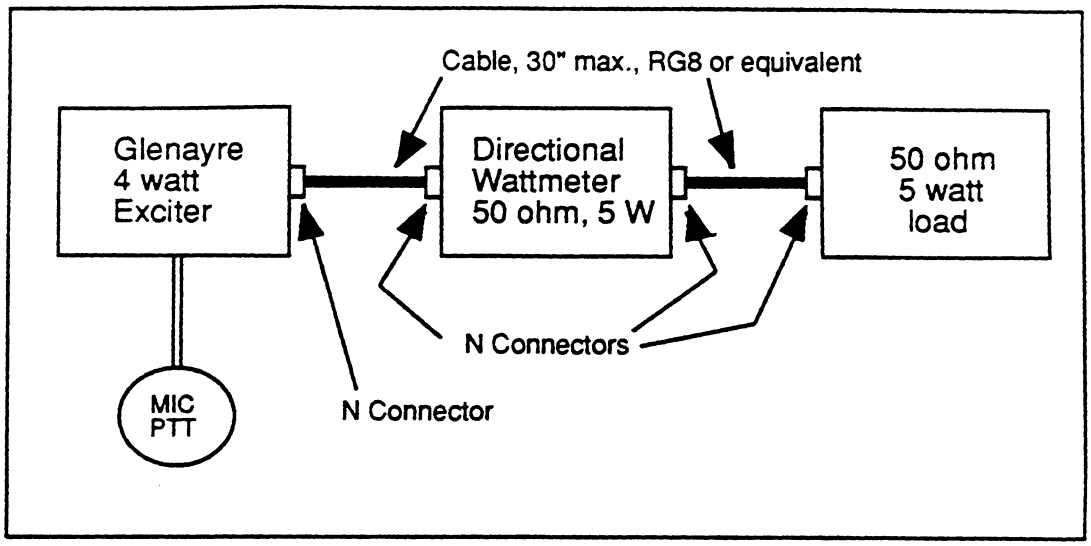

Figure 6-1 : Exciter Test Configuration

6.1.4 Power Amplifier Adjustments

1. Set up the exciter, 3T97A250 RF power amplifier, and test equipment as shown in Figure 6-2.
2. Switch ON the power supply and key the exciter.
3. Adjust C15 or C17 (depending upon the band) on the first final for maximum power (see drawing 140-1199-IFM).
4. Record the current reading of this final from the M-97 test set.
5. Increase the capacitance of C15 or C17 (depending upon the band) on the first final until the power drops by 5 watts from the maximum power peak.
6. Check that the current reading has decreased on the M-97 test set.
7. Repeat steps 3 to 6 for the second final.
8. Repeat steps 3 to 6 for the third final.
9. Repeat steps 3 to 6 for the fourth final.
10. Adjust C15 and C1 or C23 (depending upon the band) on the driver module (see drawing 140-0723-AS) for minimum reflected power from the power amplifier back to the exciter.
11. Adjust C1 or C5 (depending upon the band) on each final power amplifier module (see draiwing 140-1199-IFM) for maximum output power.
12. Adjust C14 on the driver module (see drawing 140-0723-AS) for maximum output power.

13. Adjust R52 (HIGH PWR ADJ) on the logic board (drawing 140-0791-AS) for 250 watts of output power.

14. Repeat steps 3 to 13 until tuning of each does not effect the output power of the power amplifier.

15. Check that the total dc current drawen for the power amplifier is less than 21 A on the dc ammeter, and the M-97 test set current reading for the final modules is less than 20 A.

16. Adjust R52 (HIGH PWR ADJ) for the desired output power level.

17. Switch OFF the power supply, disassemble the test equipment, and connect the exciter and power amplifier in its normal configuration.

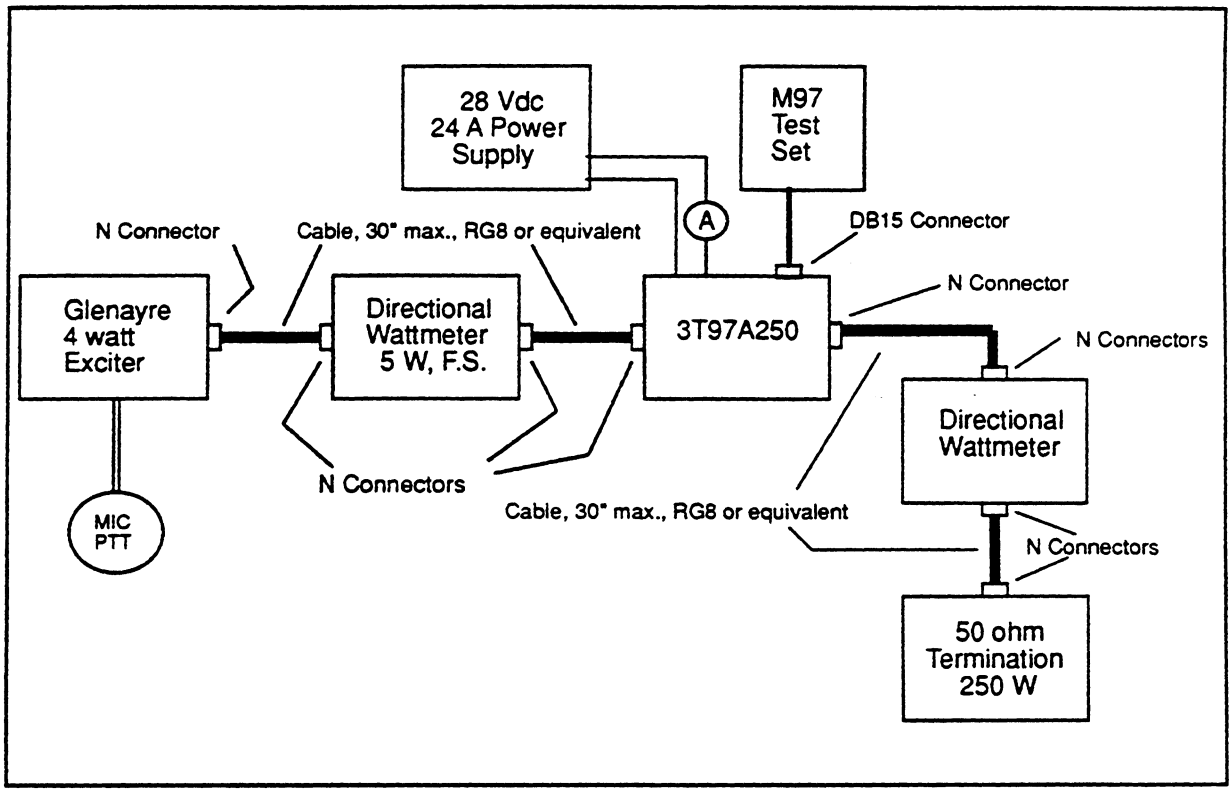

Figure 6-2 : Power Amplifier Test Configuration

6.2 Logic Alignment

6.2.1 Equipment

The following tools and equipment will be required to properly align the 3T97A250 RF power amplifier.

- Directional wattmeter, 50 ohms, 5 watts full scale, 5% accuracy.
- Directional wattmeter, 50 ohms, 250 watts full scale, 5% accuracy.
- 50-ohm termination 250 W.
- 10 Vdc minimum voltmeter.
- Two jumpers, 0.1 spacing (GL 270-0501).
- DC ammeter: 15 A full scale, 2.5% accuracy.
- 3 dB attenuator, 5 watt minimum.
- Test set: M-97 (optional).

6.2.2 Low and High Power Adjust

1. Set up the exciter, 3T97A250 RF power amplifier, and test equipment as shown in Figure 6-3.
2. Remove JR26 or JR27 (which ever is installed) to inhibit power auto shutdown.
3. Switch the M-97 test set to "LOW" power, or connect pin 12 to pin 15 of the DB15 connector, or install JR29.
4. Switch on the power and key the exciter.
5. Adjust R53 (LOW PWR ADJ) on the logic board (drawing 140-0791-AS) until the desired LOW power output is obtained.

5A. If the LOW power setting is not required, set R53 (LOW PWR ADJ) on the logic board for 50 watts.

NOTE

Turning R53 (LOW PWR ADJ) clockwise, increases output power.

6. Switch the M-97 test set to "HIGH" power, or disconnect pin 12 from pin 15 of the DB15 connector, or remove JR29 if installed.
7. Adjust R52 (HIGH PWR ADJ) on the logic board (drawing 140-0791-AS) until the power amplifier's forward output power is about 225 watts.

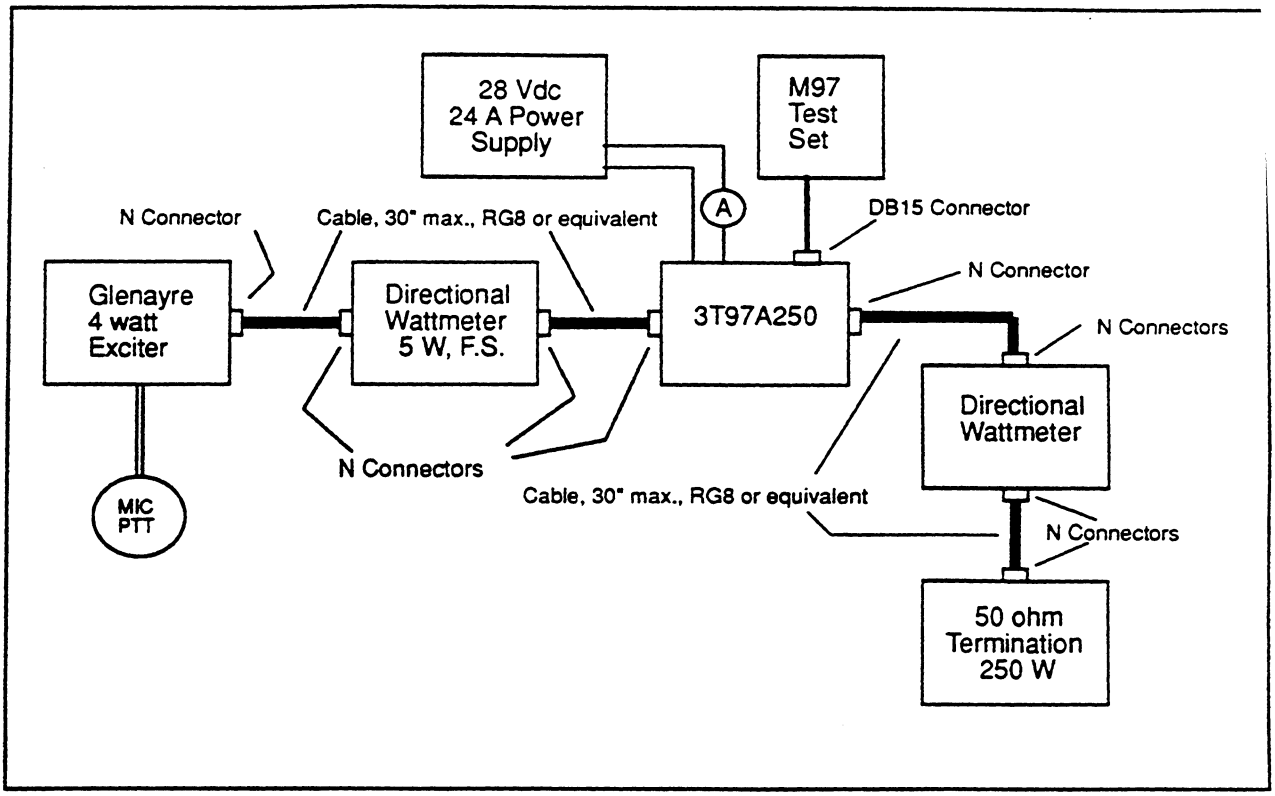

Figure 6-3 : Power Amplifier Logic Alignment

8. Turn R48 (BAR GRAPH ADJ) on the logic board (drawing 140-0791-AS) so that 100% LED D11 of the bar graph, just lights up.

NOTE

Turning R48 (BAR GRAPH ADJ) clockwise, increases the bar graph reading.

9. Rotate R52 (HIGH PWR ADJ) on the logic board until the desired HIGH power output is obtained.

NOTE

Turning R52 (HIGH PWR ADJ) clockwise, increases output power.

10. Switch off power, and install a 3 dB attenuator between the exciter and the power amplifier. Switch on the power again.
11. Adjust R50 (RF IN LEVEL SET) on the logic board until the RF IN LED D8 just lights up.

12. Install JR28 and verify that LED D8 still turns on. Adjust R50 if necessary, until D8 (RF IN LED) just turns on, then remove JR28.

13. Switch off power, and remove the 3 dB attenuator installed between the exciter and the power amplifier.

NOTE

Turning R50 (RF IN LEVEL SET) clockwise, will illuminate D8.

14. Install either JR26 or JR27 to enable the power auto shutdown to either NO POWER or LOW POWER respectively.

15. Switch on the power and connect a 10 Vdc voltmeter to test point TP4 (P13-1) on the logic board. Rotate R51 (TEMP ALARM SET) until the voltage reads 3.0 Vdc. Remove the voltmeter.

NOTE

Turning R51 (TEMP ALARM SET) clockwise, increases the voltage and turns on the LED.

CAUTION

The low RF alarm trip point is set by one of jumpers JR12 to JR21. This is set to 20% with jumper JR20 at the factory. You may increase this setting in 10% steps from 100% to 10% by installing a jumper at one of the JR positions. The 100% position is jumper JR12, and the 10%position is JR21.

WARNING

DO NOT install more than one alarm trip point jumper at any time, or else the display driver will be damaged.

16. Install JR26 unless LOW PWR is less than 60 watts. Then install JR26 or JR27 (which ever was installed previously).

7. MAINTENANCE

7.1 Semiconductor Maintenance

7.1.1 General

Due to the wide utilization of semiconductors in this electronic equipment, somewhat different techniques are necessary in maintenance procedures. In solid-state circuits, the impedances encountered are often of much lower values than those encountered in vacuum-tube circuits. Therefore, a few ohms discrepancy can greatly affect the performance of the equipment. Also, coupling and filter capacitors are of larger values and usually are tantalum. Therefore, when measuring values of capacitors, an instrument accurate in the high ranges must be used. Capacitor polarity must be observed when measuring resistance. Usually, more accurate measurements can be obtained if the semiconductors are removed from the circuits.

7.1.2 Semiconductor Test Equipment

Damage to semiconductors by test equipment is usually the result of accidentally applying too much voltage to the elements. Test equipment with transformerless power supplies are one source of high current. Before this type of test equipment can be used, use an isolation transformer in the ac power line.

7.1.3 Line Filter

It is possible to damage semiconductors from line current, even though the test equipment has a power transformer in its power supply. If the test equipment is provided with a line filter, the filter may function as a voltage divider and apply half the voltage to the semiconductor. To stop this condition, connect a ground wire from the chassis of the test equipment to the chassis of the equipment under test before making any other connections.

7.1.4 Low Sensitivity Multimeters

Another cause of semiconductor damage is a multimeter that requires excessive current to produce a proper reading. Do not use any multimeters with sensitivities of less than 20 k ohms per volt. When in doubt as to the amount of current supplied by a multimeter, check the multimeter circuits on all scales with an external, low-resistance multimeter connected in series with the multimeter leads. If more than

one milliampere is drawn on any range, this range cannot be safely used on small semiconductors.

7.1.5 Power Supplies

When using a battery power supply, always use fully charged batteries of the proper value. Check that the polarity of the power supply is correct for the equipment under test. Do not use power supplies having poor voltage regulation (voltage regulation within 5%, ripple 1%).

7.1.6 Semiconductor Voltage and Resistance Measurements

When measuring voltage or resistance in circuits containing semiconductor devices, remember that these components are polarity and voltage conscious. Since the values of capacitors used in semiconductor circuits are usually large, time is required to charge these capacitors. Thus, any reading obtained is subject to error if sufficient time is not allowed for the capacitor to fully charge. When in doubt, it may be best to isolate the components in question and measure them individually.

7.1.7 Testing of Transistors

A transistor checker should be used to properly evaluate transistors. If a transistor tester is not available, a good multimeter may be used. The multimeter MUST meet the requirements detailed above in **Low Sensitivity Multimeters.**

PNP Transistor

To check a PNP transistor, connect the positive lead of the multimeter to the base of the transistor and the negative lead to the emitter or collector. You should read a resistance of 50 k ohms or more. Reconnect the multimeter with the negative lead connected to the base. With the positive lead connected to the emitter or collector, you should read a resistance value of 500 ohms or less. If these results are not obtained, the transistor is probably defective and should be replaced.

NPN Transistor

To check a NPN transistor, connect the negative lead of the multimeter to the base of the transistor and the positive lead to the emitter or collector. You should read a resistance of 50 k ohms or more. Reconnect the multimeter with the positive lead connected to the base. With the negative lead connected to the emitter or collector, you should read a resistance value of 500 ohms or less. If these results are not obtained, the transistor is probably defective and should be replaced.

WARNING

If a transistor is found to be defective, make certain that the circuit is in good operating order before installing a replacement transistor. If a short circuit exists in the circuit, putting in a new transistor will most likely result in burning out the new component and causing further damage. Do not depend on fuses to protect transistors.

Always check the value of the bias resistors on the various elements. A transistor is sensitive to improper bias voltage; therefore, a defective bias resistor may damage the transistor.

7.2 Replacing Semiconductors

7.2.1 Replacement Techniques

Never remove or replace a semiconductor with the power supply turned on. Transients produced may damage the semiconductor or others remaining in the circuit. If a semiconductor is evaluated in an external test circuit, be sure that no more voltage is applied to the semiconductor than normally is used in the circuit from which it came. The following details special considerations when replacing semiconductors.

1. Grasp the lead to which heat is applied between the solder joint and the semiconductor with long-nosed pliers. This will dissipate some of the heat that would otherwise be conducted into the semiconductor from the soldering iron.
2. Check that all wires soldered to the semiconductor terminals have first been properly tinned so that the necessary connection can be made quickly. Excessive heat will permanently damage a semiconductor.
3. If the power transistor is mounted on a heat sink (used to dissipate heat away from the transistor) it may have to be insulated from ground.
4. Remove all thermal compound and clean all matter (filings, etc.) from the transistor, heat coupler, heat sink, etc.
5. Apply a thin layer of thermal compound to the transistor and carefully mount it.
6. If necessary place a washer (e.g. mica) between the power transistor and ground to insulate the power transistor from ground.
7. Replace the power transistor, checking that the insulating washer(s) is positioned properly.

6. Use a multimeter (before making any connections to the transistor) from the transistor case to ground to check that there is no short to ground.

WARNING

Do Not *get get any dirt, etc., on the compound. A small piece of dirt can hold the transistor above the heat coupler or heat sink and cause rapid failure. Use a thermal compound such as Wakefield No. 120-8 or equivalent.*

7.2.2 Replacing RF Stripline Power Transistors

When a power transistor fails, you should return the printed circuit board (PCB) to the factory for repair. This is due to the special procedures required to replace this item. However, if on site repair is necessary, follow the steps detailed below.

1. Remove the PCB from the equipment.
2. Remove all components within 25 mm (1 inch) around the transistor you are replacing.
3. Remove one leg of the transistor at a time, using a 60 to 100 watt soldering (electrically insulated) iron and a X-acto knife.
4. Tin the area around the removed transistor and smooth out. Then tin the replacement transistor leads.
5. Clean the mounting surface on the heat sink.
6. Apply a thin coat of thermal coumpond to the mounting surface of the replacement transistor case. Then mount the replacement transistor.
7. Solder the replacement transistor leads making sure that solder flows underneath each lead.
8. Remount the remaining components (removed previously) to the board and reinstall the PCB into the equipment.

7.3 Integrated Circuit Maintenance

A knowledge of integrated circuit fundamentals is as necessary in testing digital logic circuits involving ICs, as a knowledge of rectification fundamentals is needed to test a power supply.

7.3.1 Terminology

Several terms are used whenever logic circuits are discussed. A few are detailed below.

- A logic state is a high or low level voltage applied to the input or see at the output of a device. A high level voltage is called a HI. A lo level voltage is called a LO. Logic threshold voltage of a device is th input voltage required at the input to change the output state.
- A truth table is a list of logic states that will yield certain output logi states. A digital logic element should be thought of as a circui element with its input level being either HI or LO as programmed b the levels present on its inputs.
- Logic elements which have multiple inputs and single outputs are known as gates. The OR gate produces a high output when one o more of the inputs are high. With all the inputs LO, the output is LO. The AND gate produces a HI only when all inputs are HI. When any input is LO, the output is LO. A small circle at the output of a gate on the schematic indicates "negation", which means that the sense of the gate is reversed. An OR gate with negation is called a NOR gate and an AND gate with negation is called a NAND gate. A NOR gate produces a LO output when one or more inputs are HI and a NAND gate produces a LO output when all inputs are HI.
- The flip-flop logic element is the basic data storage element of digital logic. It has two outputs that are always at opposite logic levels. That is, when one particular output is HI, the other is LO. The flip-flop will remain in a particular state until the state is changed by an input signal.

  The operation of these flip-flops is controlled by the signals on their inputs, and is best understood by a careful study of their truth tables. It should be kept in mind that a small circle at either the input or the output indicates negation. Also, a circle on a clock input indicates that a HI to LO transition causes the flip-flop to function.
- Besides the gates and flip-flops, two other commonly used logic elements are inverters and expanders. Inverters are merely switching transistors such that if a HI is the input to a device, a LO is the output and visa-versa. An expander is a set of parallel switching transistors that depends upon another transistor to provide their supply voltage. Generally, these devices are used to expand the number of inputs available to a standard gate.

7.3.2 Voltage Measurements

Precise voltage measurements are not needed in testing digital ICs other than to see that the voltage is a HI or LO level. An oscilloscope is needed where the input levels are of short duration, either HI or LO. For instance, if a 10-microsecond (μs) pulse going from LO to HI was applied to one input of a NOR gate, while the other stayed LO, the output would go LO after 10 μs and then return HI. This, of course, could not be seen without an oscilloscope.

The fully loaded guaranteed minimum HI and maximum LO for the digital logic output levels are:

TTL (V_{CC} = 5 V)		ECL (V_{CC} = 5.2 V)		CMOS (V_{CC} = 13 V)	
HI	LO	HI	LO	HI	LO
2.4	0.5	4.25	3.48	12.5	0.5

The minimum HI and maximum LO input levels which are guaranteed to be correctly interpreted are:

TTL (V_{CC} = 5 V)		ECL (V_{CC} = 5.2 V)		CMOS (V_{CC} = 13 V)	
HI	LO	HI	LO	HI	LO
2.0	0.8	4.06	3.75	9.5	4.0

When checking the input and output levels of a logic element under question it should be remembered that an input or output may not agree with its truth table not because it has malfunctioned, but because some other component connected to the same point has shorted to ground or to the supply voltage (V_{CC}). This is not uncommon when an output on one element is connected to an input of another. A majority of digital IC failures can be grouped into three categories as shown below.

- Input(s) or output shorted to ground pin of IC.
- Input(s) or output shorted to V_{CC} pin of IC.
- Open input(s) or output.

An open ground pin does not allow a LO on the output. An open V_{CC} pin does not allow a HI on the output. (Remember to isolate the device from other components.) Two or more inputs shorted together can be checked by grounding one of the inputs under question. If the other input also goes to ground, they are probably shorted.

An input or output shorted to ground would be a constant LO and input or output shorted to V_{CC} would be a constant HI. Other failures common to digital ICs can be ground pin open, V_{CC} pin open, and inputs shorted.

WARNING

If an IC is found to be defective, verify that proper power supply voltages are present before installing a replacement IC.

7.3.3 Replacing Integrated Circuits

If an IC is known to be defective and is not used with a socket, the easiest way to remove it is to cut off each of its pins, remove the case, and then unsolder the remaining pins one-by-one from the PCB. This is preferable to removing the IC intact because such attempts may result in damage to the PCB.

7.3.4 Handling CMOS or MOS Integrated Circuits

All MOS or CMOS devices are subject to damage by large electrostatic charges. The following precautions should be observed.

- Devices should be transported in conductive carriers. Leads may be shorted by antistatic tubes, conductive foam, or foil. Do not remove devices from protective carriers until ready to use.
- Individuals and tools should be grounded before coming in contact with devices. Avoid touching device input/output pins.
- Work stations should have conductive tops on work benches connected to ground to reduced static buildup.
- Remove power from PCBs before removing or installing devices in sockets.
- After installing devices on the PCBs, short out board connectors to prevent static charges until you are ready to install the boards into your system. Conductive foam may be used.

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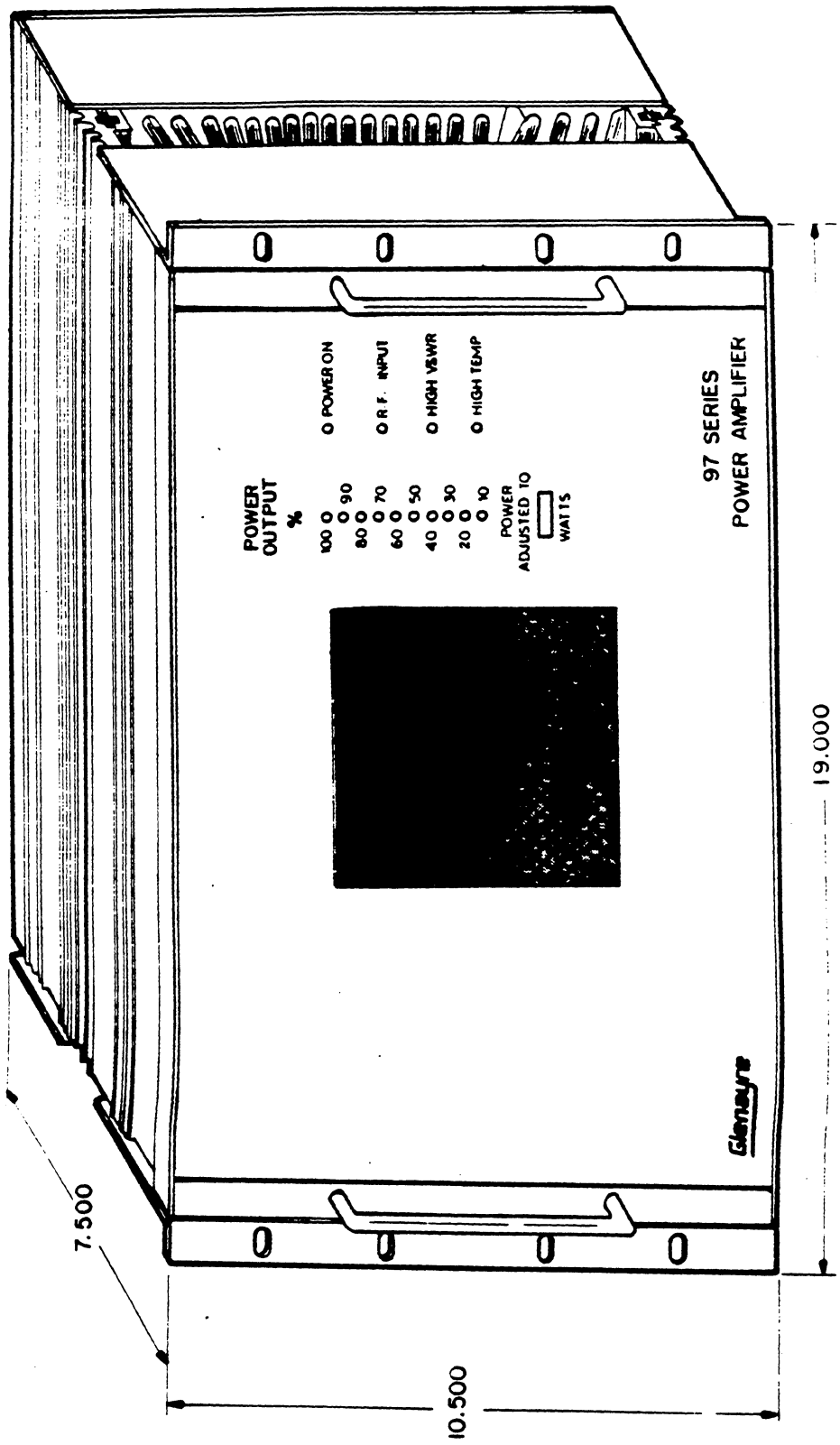
8. DRAWINGS

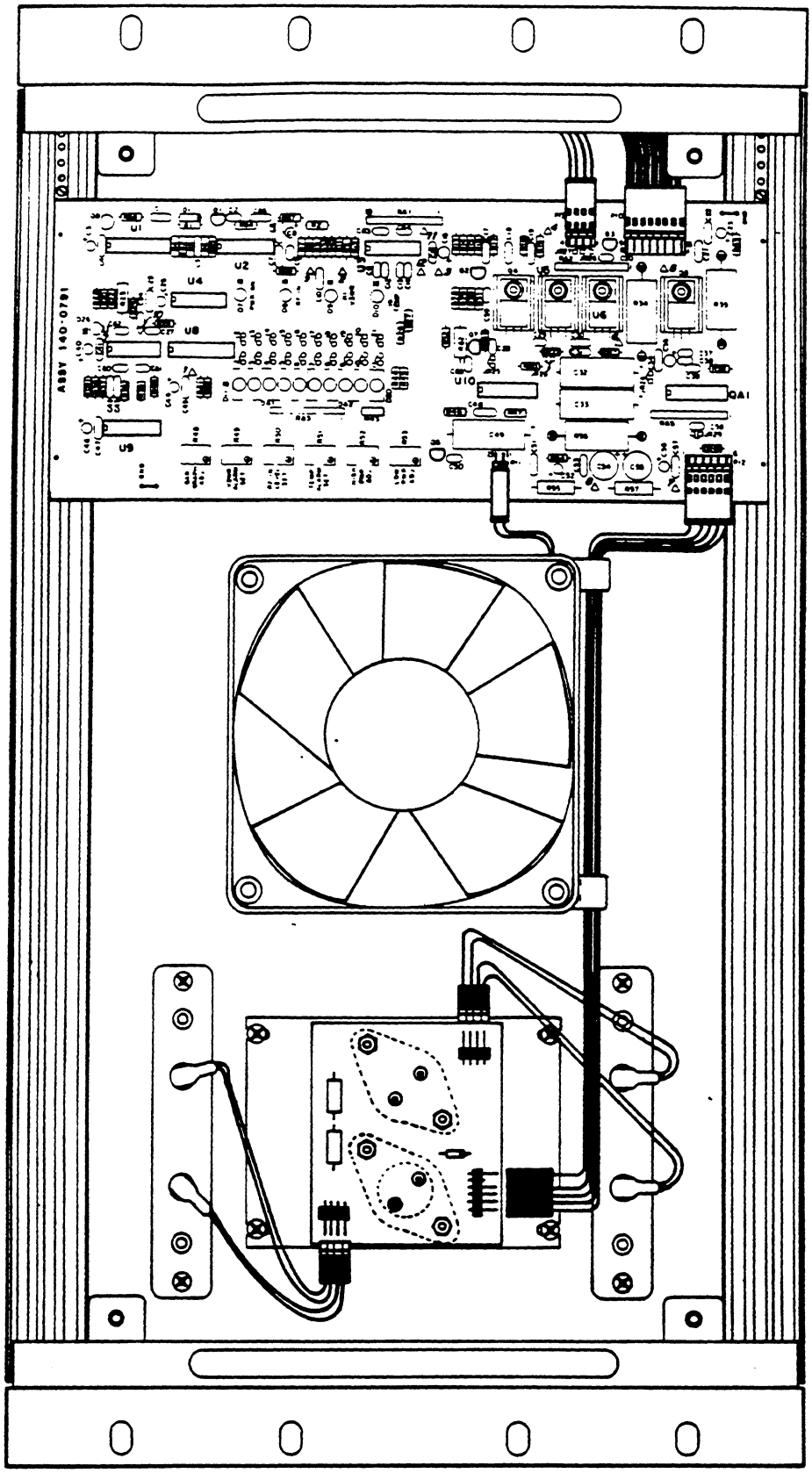
8.1 List of Drawings

This section provides the drawings necessary to align, service and troubleshoot the 3T97A250 - 250 Watt VHF 97 Series Power Amplifier. Every effort is made to insure that the following drawings are up-to-date. If any drawing that does not correspond to its actual assembly, please request the updated drawing.

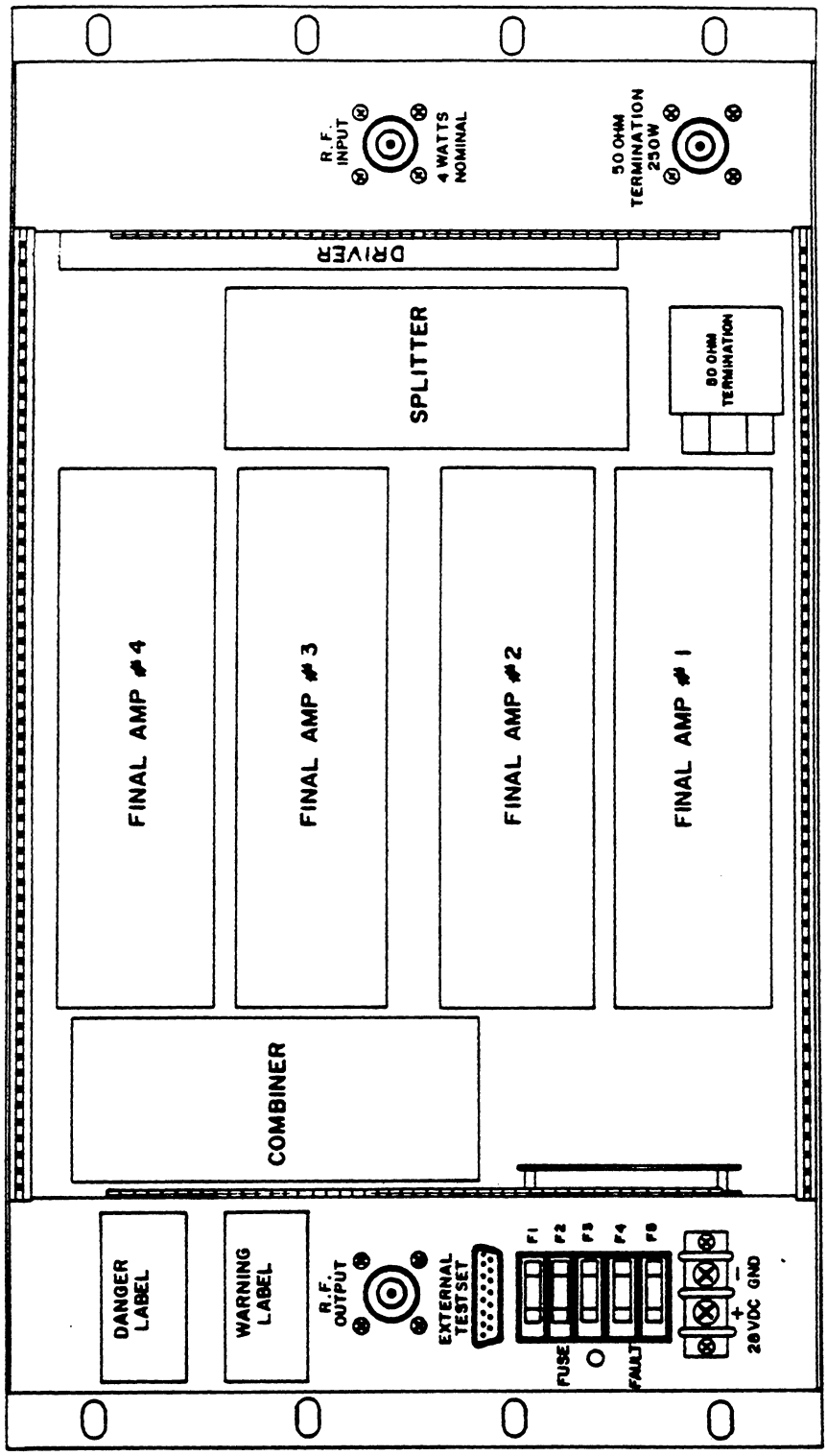
Drawing Number	Description	Page
177-0175-0V	97 Series P.A. Housing Outline View	8-2
177-0161-HF	97 Series P.A. Front View of Housing with Access Panel Off	8-3
177-0171-HR	97 Series P.A. 3T97A250 Rear View of Housing with Access Panel Off	8-4
000-1046/47/48-BD	3T97A250 VHF 250W Block Diagram	8-5
140-0723-AS	250 Watt VHF Driver Amplifier Module PC Assembly	8-6
140-0723-SD	250 Watt VHF Driver Amplifier Module Schematic	8-7
148-0316-IFM	Splitter 250Watt VHF Assembly	8-8
148-0315/16-SD	Splitter/Combiner Schematic Diagram	8-9
140-1199-IFM	3T97A150/250 Final Power Amplifier Module PC Assembly	8-10
140-1199-SD	3T97A150/250 Final Power Amplifier Module Schematic Diagram	8-11
148-0315-IFM	Combiner 150/250 Watt VHF Assembly	8-12
148-0315/16-SD	3T97A250 Splitter /Combiner Schematic Diagram	8-13
140-1186-IFM	DC Distribution RF Amplifiers 97 Series	8-14
140-1186-SD	DC Distribution RF Amplifiers 97 Series	8-15
140-1273-IFM	Low Pass Filter & Coupler VHF P.A. 3T97A250/250	8-16
140-1273-SD	Low Pass Filter & Coupler VHF P.A 3T97A250/250 Schematic Diagram	8-17
140-0786-IFM	Heat Sensor Mounting PCB - 97 Series P.A.	8-18
140-0786-SD	Heat Sensor Schematic Diagram	8-19
140-1131-AS	Regulator Transistor Assembly Board (M97-PA)	8-20
140-1131-SD	Regulator Transistor Assembly Board Schematic Diagram (M97-PA)	8-21
140-0791-AS	97 Series P.A. Logic Board PC Assembly	8-22
140-0791-SD	97 Series P.A. Logic Board Schematic Diagram	8-23



97 Series PA Housing Outline View Drawing 177-0175-OV

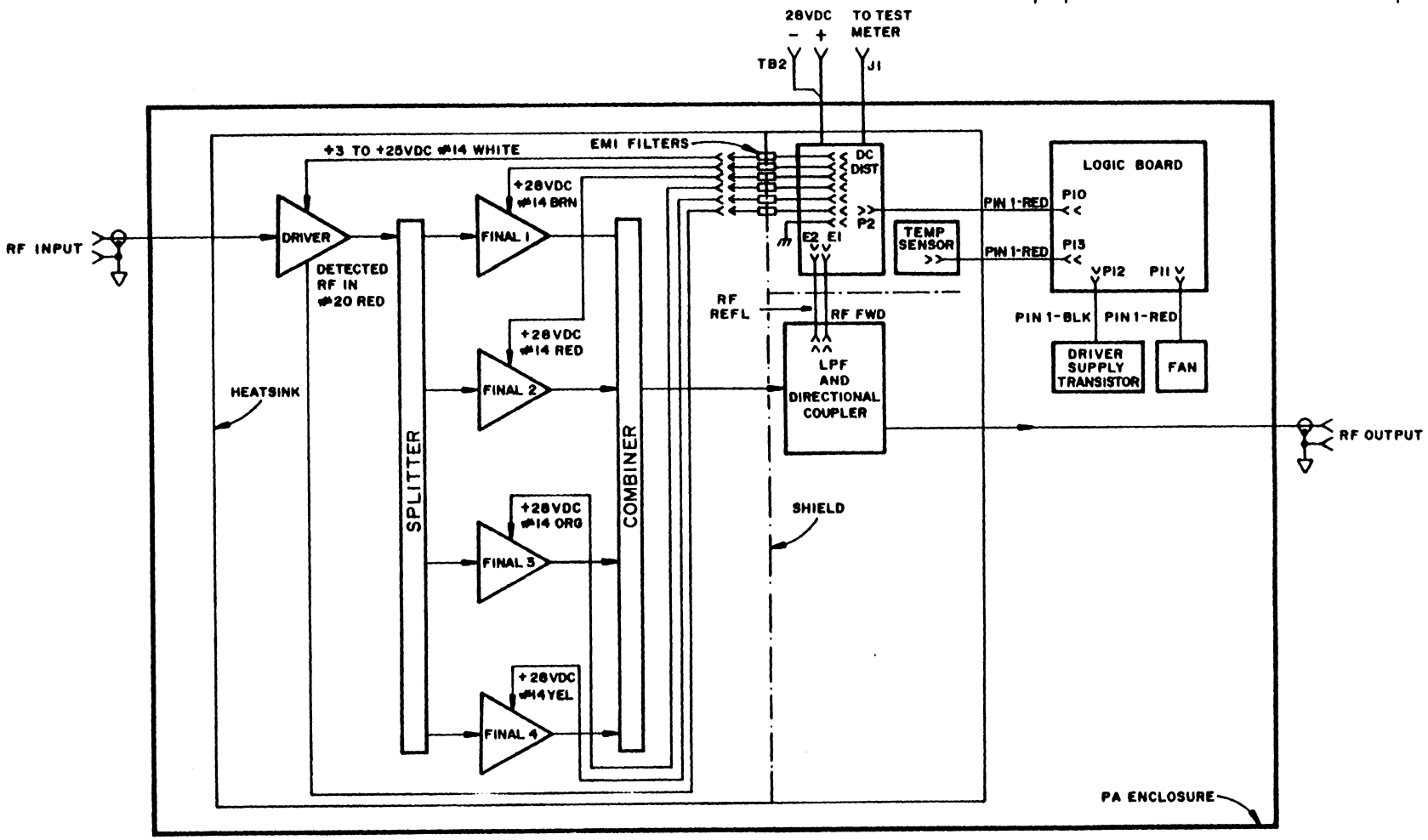


97 Series PA Front View of Housing with Access Panel Off Drawing 177-0161-HF



97 Series PA 3T97A250 Rear view with Access Panel Off Drawing 177--0171-HR

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ORIGINAL	89.6.21	



DWG STATUS		
PROTO ●	PILOT ○	PROD ○
SIGNATURE		DATE
DRAWN C. Diaz		89.6.21
CHECKED		89.7.13
DESIGNER M. Paola		89.7.12
DESIGN MGR		89/7/12

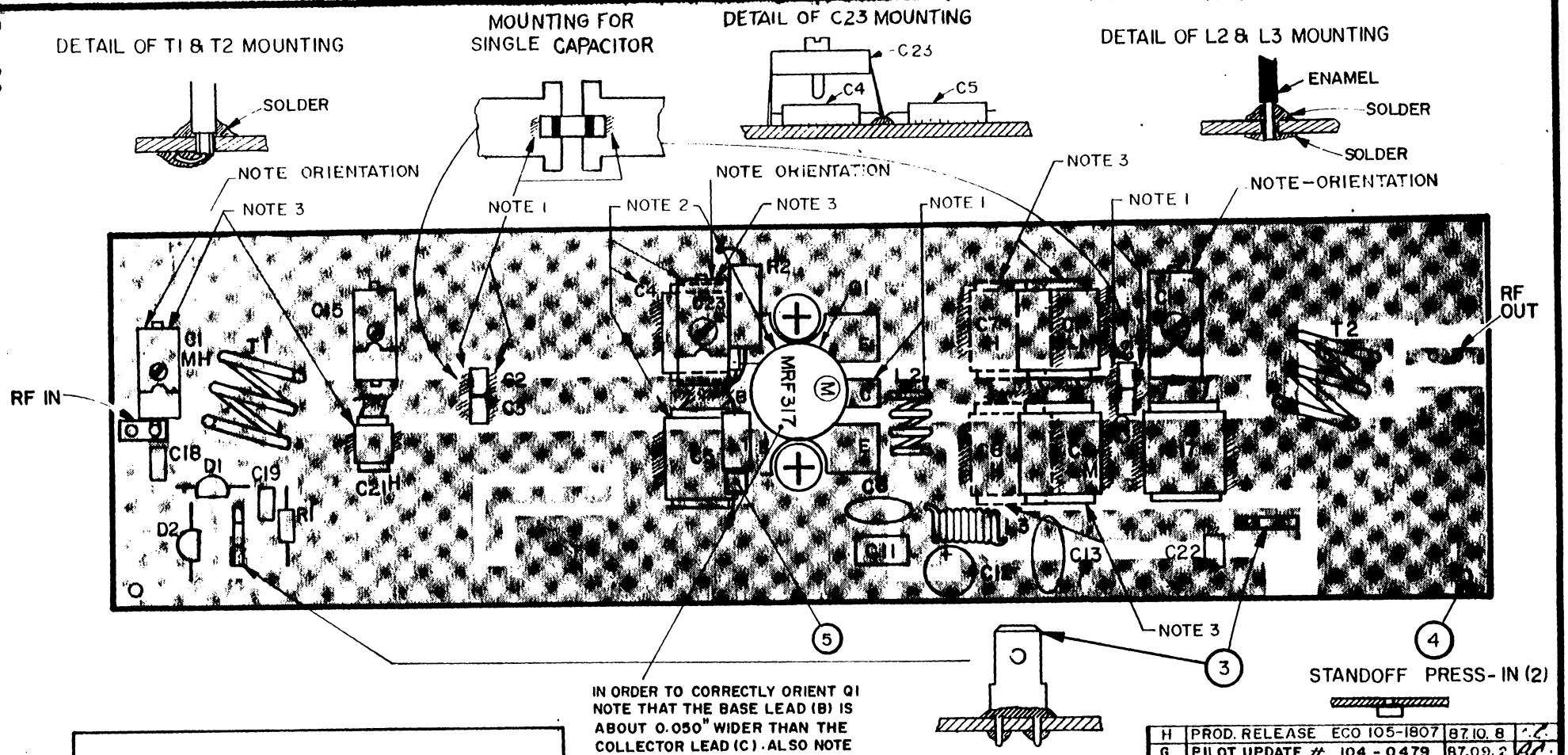
Glenayre

TITLE

97 SERIES P.A.
BLOCK DIAGRAM, 4 FINALS

SIZE	DWG NO	
C	000-1046	-BD

SCALE | PROD REL DATE | SHEET 1 OF 1



IN ORDER TO CORRECTLY ORIENT Q1 NOTE THAT THE BASE LEAD (B) IS ABOUT 0.050" WIDER THAN THE COLLECTOR LEAD (C). ALSO NOTE THE DEVICE MARKING.

NOTES:

1. SILVER SOLDER ONLY.
2. USE THE ASSY. JIG 511-0043. TIN THE TRANSISTOR LEAD AND THE PCB UNDER THE LEADS.
3. BANDED PARTS

	138 - 152 MHz	150 - 162 MHz	160 - 174 MHz
C1	0	4 - 60p	4 - 60p
C6	68p	68p	80p
C7	68p	68p	80p
C21	0	0	45p
C23	4 - 60p	4 - 60p	0

L	ECO 105-3096	89.11.30	M.P.
K	ECO 105-2907	89.09.25	R.C.
J	ECO 105-2297	88.11.18	M.P.
I	ECO 105-2061	88 05 13	M.P.

DWG STATUS	
PROTO	PILOT
●	●
PREPROD	PROD
	●

SCALE 2 1

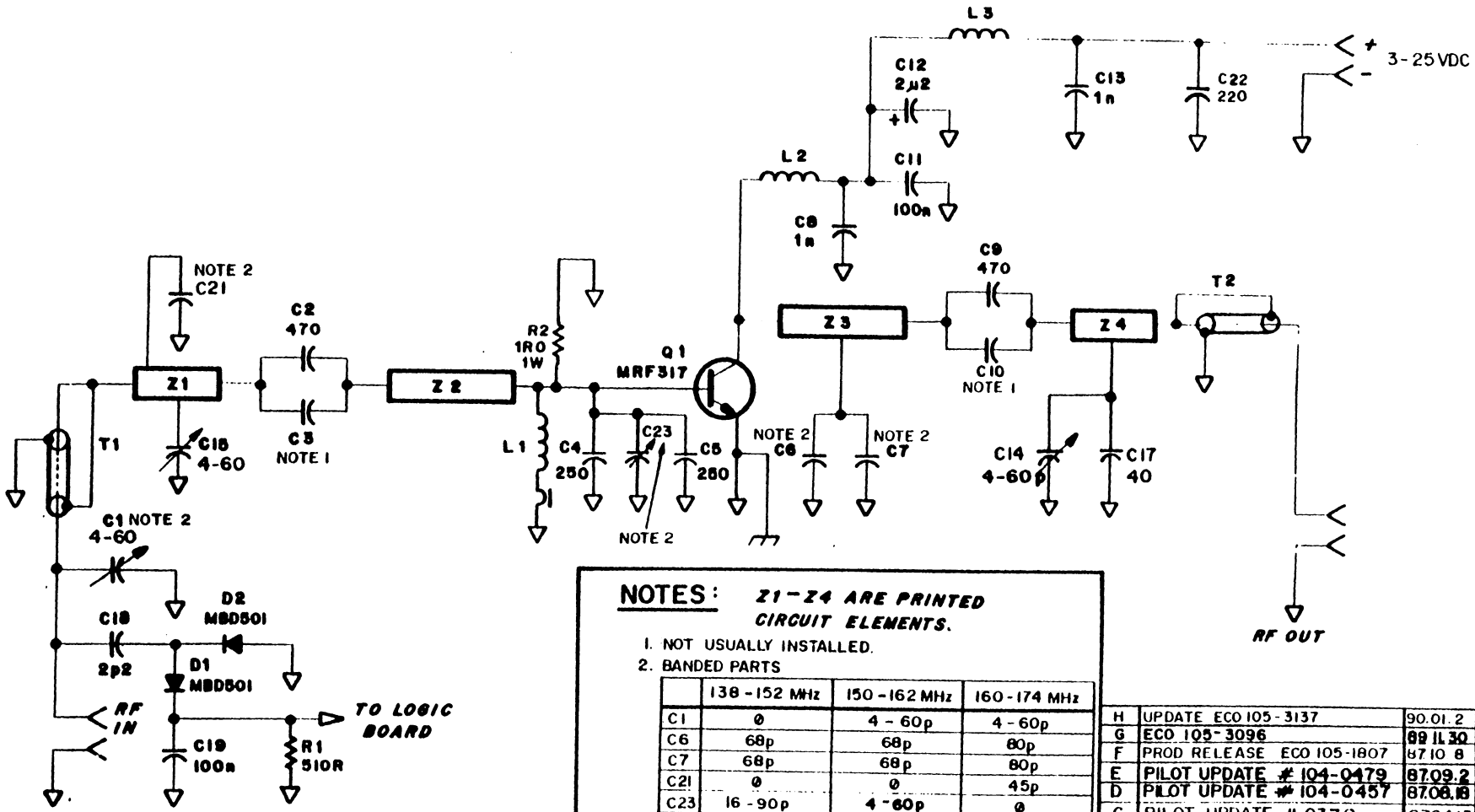
Glenayre

M.E.V. 86.07.18

H	PROD. RELEASE ECO 105-1807	87.10.8	P.C.
G	PILOT UPDATE # 104-0479	87.09.2	P.C.
F	PILOT UPDATE # 104-0457	87.08.18	P.C.
E	PILOT UPDATE # 0379	87.04.14	P.C.
D	ADD: DETAIL OF T1, T2, L2, L3	87.02.18	P.C.
C	PILOT UPDATE	86-11-17	
B	UPDATED	86.7.20	P.C.
A	ORIGINAL ISSUE	86.07.18	
CODE	REVISION	DATE	INT L.S.

TITLE
DRIVER AMPLIFIER MODULE
3T97A

DRAWING NO. 140-0723-AS REV L



NOTES: *Z1 - Z4 ARE PRINTED CIRCUIT ELEMENTS.*

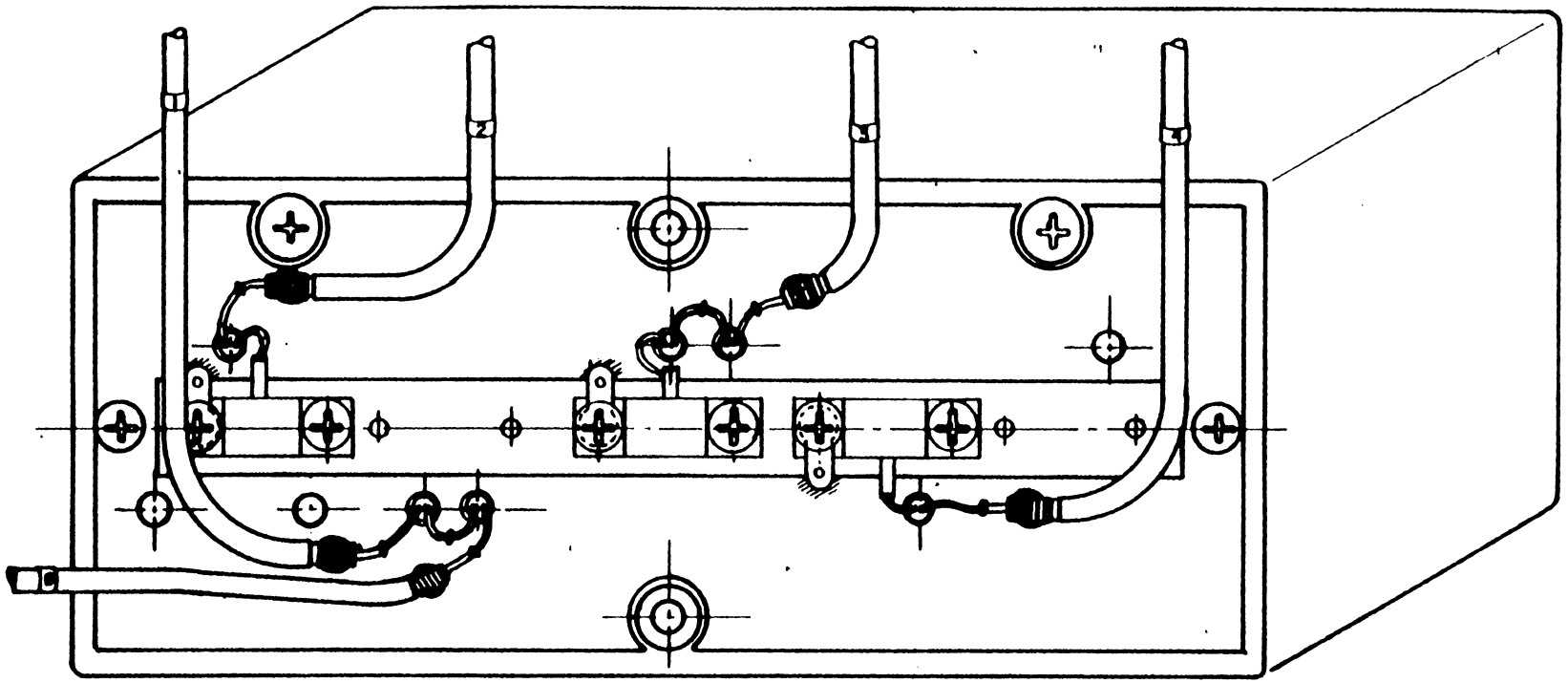
1. NOT USUALLY INSTALLED.
2. BANDED PARTS

	138 - 152 MHz	150 - 162 MHz	160 - 174 MHz
C1	Ø	4 - 60p	4 - 60p
C6	68p	68p	80p
C7	68p	68p	80p
C21	Ø	Ø	45p
C23	16 - 90p	4 - 60p	Ø

DWG STATUS		SCALE :	Glenayre electronics
PROTO ●	PILOT ●	MAT.	
PREPROD ●	PROD ●	APPLIED FINISH	
		TOL. UNLESS OTHERWISE STATED	DRAWN BY / DATE

CODE	REVISION	DATE	INITIALS
H	UPDATE ECO 105-3137	90.01.2	M.T.
G	ECO 105-3096	89 11 30	M.T.
F	PROD RELEASE ECO 105-1807	87 10 8	M.T.
E	PILOT UPDATE # 104-0479	87.09.2	M.T.
D	PILOT UPDATE # 104-0457	87.06.18	M.T.
C	PILOT UPDATE # 0379	870413	M.T.
B	PILOT UPDATE	86-11-17	M.T.
A	ORIGINAL ISSUE	86.2.26	M.T.

TITLE: **VHF AMPLIFIER MODULE DRIVER**



CODE	DETAILS	DATE	INITIALS
C	UPDATE ECO 105-2736	99.6.29	M.F.
B	PROD. RELEASE ECO 105-1808	87.10.07	
A	ORIGINAL ISSUE	87.04.01	

REVISIONS

SCALE 2:1

Glenayre

MAT

APPLIED FINISH

TOL UNLESS OTHERWISE STATED ± ± °

DRAWN BY HB

DATE 87.04.01

CHECKED BY

APPROVED

DWG STATUS PROTO ● PREPROD ● PROD ●

TITLE

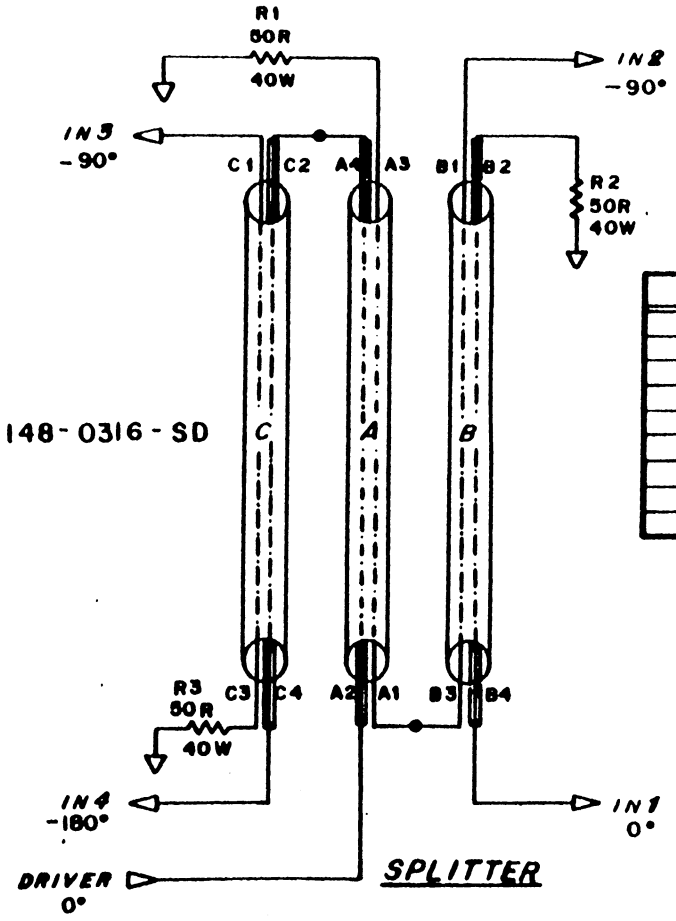
SPLITTER 250 W
VHF ASSEMBLY

SHT 1 OF 1

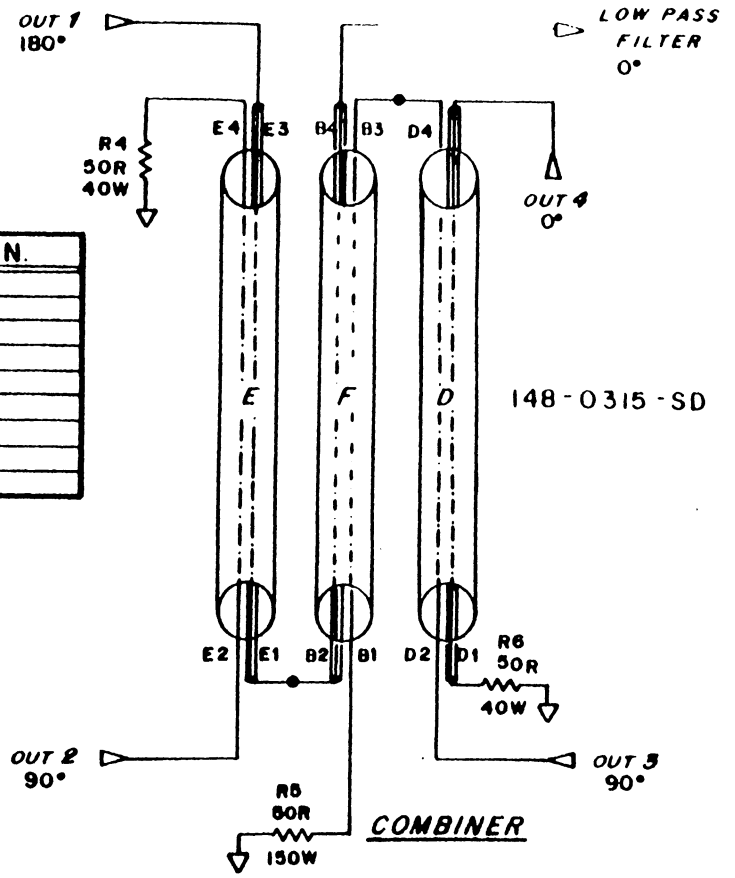
DOCUMENT NO 148-03.16-1FM

REV C

FORM NO. RDF-6118



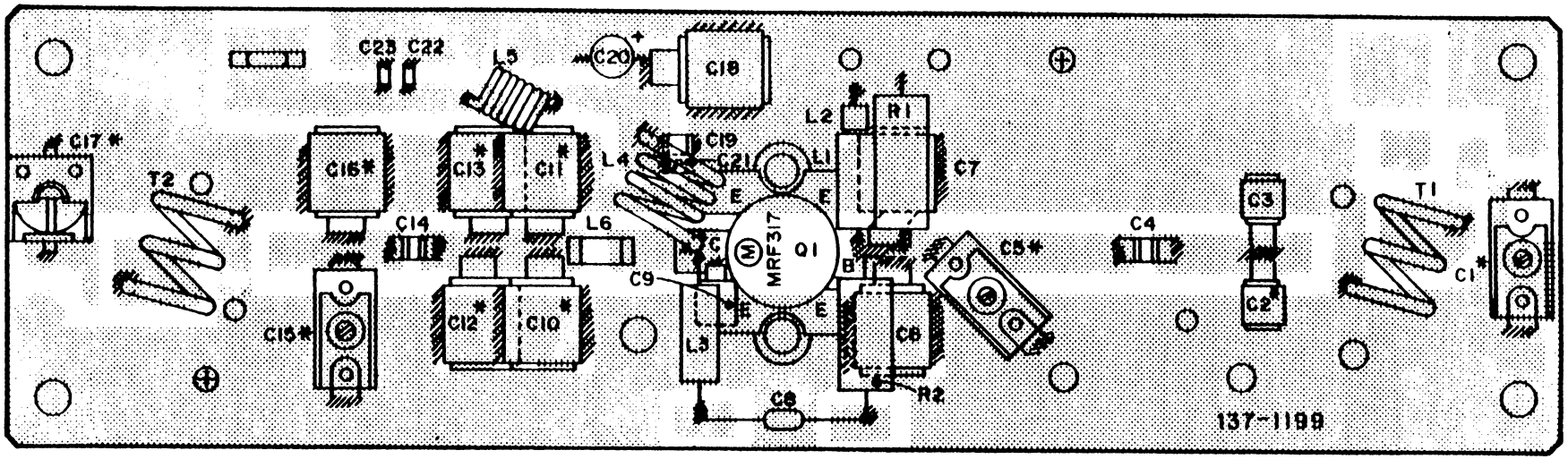
BAND	LENGTH IN.
138-174	12"



DWG STATUS		SCALE	Glenayre
PROTO ●	PILOT ●	MAT	
PRE PROD ●	PROD ●	APPLIED FINISH	
		TOL UNLESS OTHERWISE STATED	DRAWN BY / DATE

CODE	REVISION	DATE	INITIALS
C	PROD RELEASE ECO 105-1808	97.10.07	P.C.
B	PILOT RELEASE	96.12.11.	P.C.
A	ORIGINAL ISSUE	96.2.20	P.C.

TITLE
3T97A250
SPLITTER / COMBINER SCHEMATIC



✱ BANDED PARTS

BAND	C1	C2	C5	C6	C7	C10	C11	C12	C13	C15	C16	C17
138 - 150 MHz	—	45pF	4-60pF	300pF	300pF	5pF	—	68pF	68pF	—	68pF	3-19pF
150 - 162 MHz	4-60pF	45pF	—	250pF	250pF	5pF	—	68pF	68pF	4-60pF	—	—
162 - 174 MHz	4-60pF	100pF	—	250pF	250pF	80pF	80pF	—	—	4-60pF	—	—

REV	DESCRIPTION	DATE	INIT
B	ECO 105-3088	89.12.11	M.P.
A	ORIGINAL	89.8.24	M.P.

Glenayre

DATE 89.8.24 | DWN C.T. | CHK'D | DESIGNER M.P. | MGR

MAT

FINISH

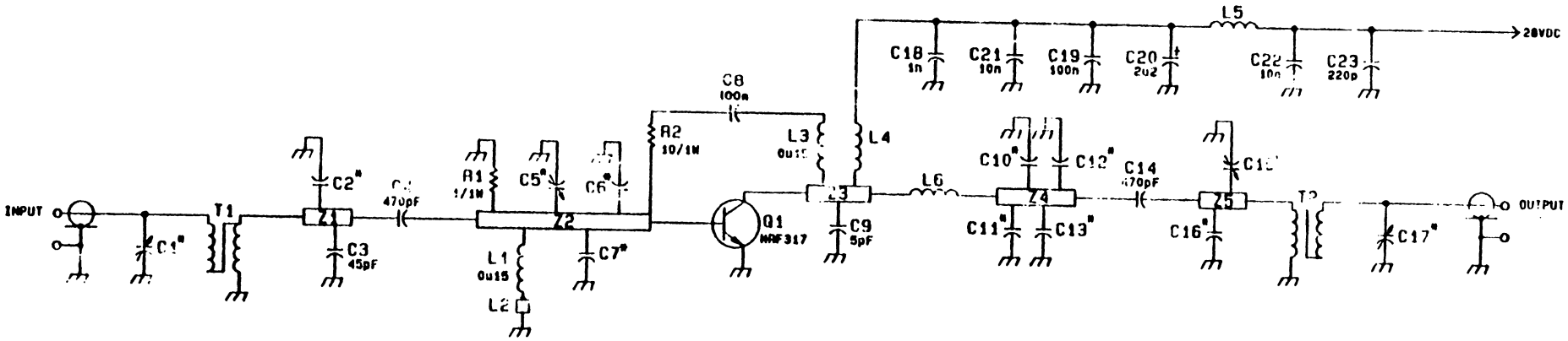
TOL UNLESS INDICATED ± ± | SCALE 2 : 1

FINAL POWER AMPLIFIER MODULE 3T97A150/250

DWG SIZE B | 140 . 1199 . 1FM | REV B

PROTO ● | PILOT ● | PROD ● | SHEET 1 OF 1

A	ORIGINAL	[illegible]	[illegible]
B	ECO 105-2631	[illegible]	[illegible]
B	PROD RELEASE ECO 105-2771	89.07.13	[illegible]
C	ECO 105-2900	89.11.20	[illegible]
D	ECO 105-3088	89.12.11	[illegible]



NOTES-

1. Z1 TO Z5 ARE PRINTED MICROSTRIPLINES.

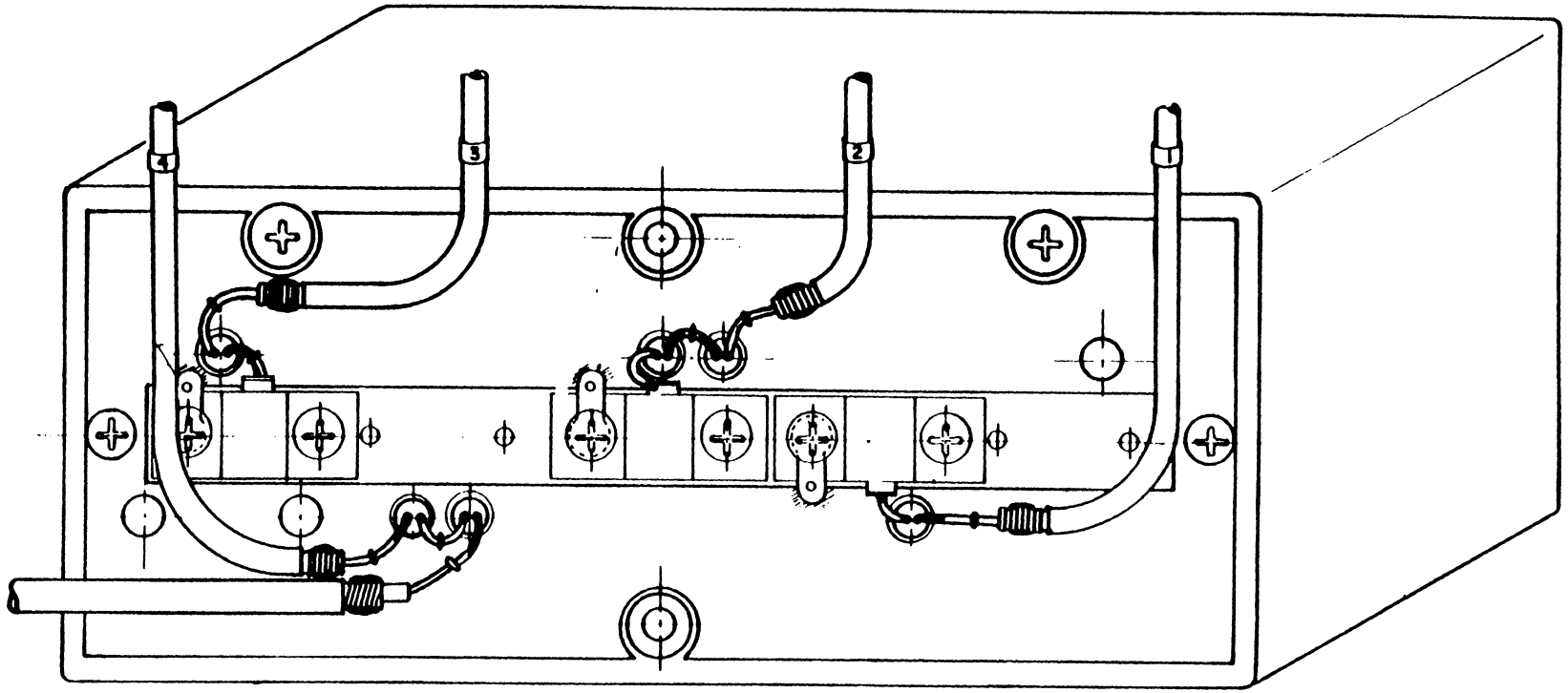
2. * - BANDED PART. SEE TABLE BELOW:

FREQUENCY (MHz)	C1	C2	C5	C6	C7	C10	C11	C12	C13	C15	C16	C17
138-150 (140.1200)	—	45pF	4-60pF	300pF	300pF	8pF	—	68pF	68pF	—	68pF	3-18pF
150-162 (140.1201)	4-60pF	45pF	—	260pF	260pF	8pF	—	68pF	68pF	1-60pF	—	—
162-174 (140.1202)	4-60pF	10pF	—	250pF	250pF	60pF	60pF	—	—	4-60pF	—	—

DRG STATUS		
PROTO	PILOT	PROD
SIGNATURE		DATE
DRAWN J. MACDONALD		89.5.5
CHECKED		

TITLE

3T97A150/250 FINAL MODULE



C	UPDATE ECO 105-2736	89.06.29	
B	PROD RELEASE ECO 105-1808	87 10 07	
A	ORIGINAL ISSUE	8704 01	

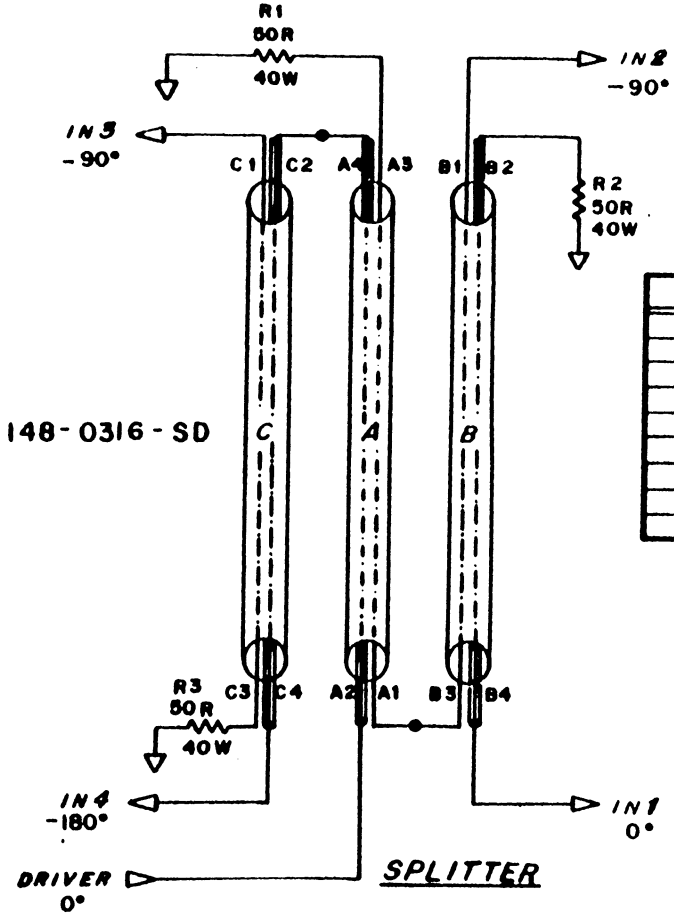
SCALE 2 : 1

Glenayre

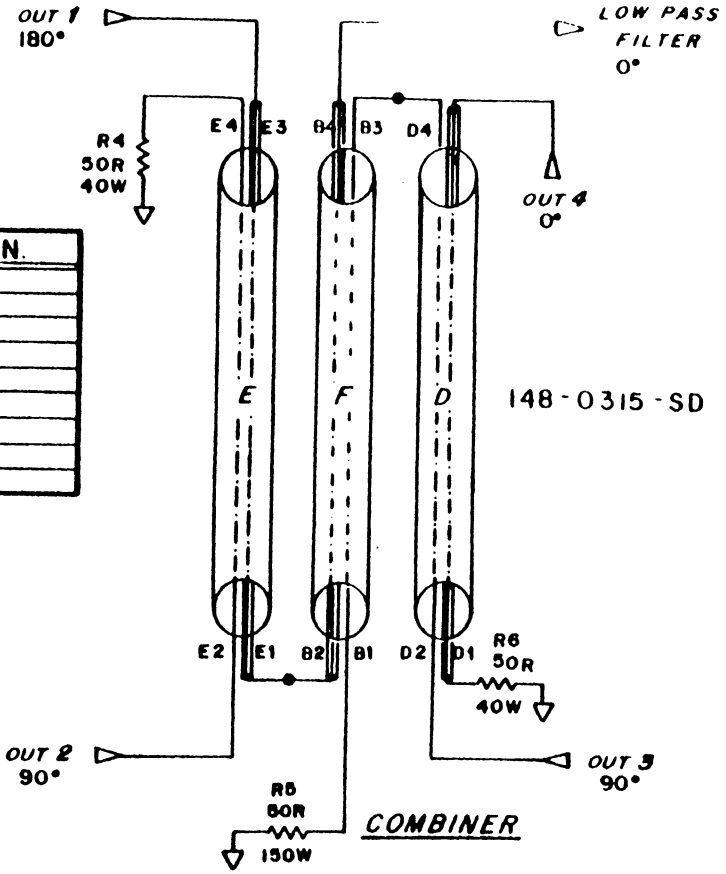
CONFIG A 250W
VHF AMPLIFIER

		HB	8704 01		

148-0315-1FM C



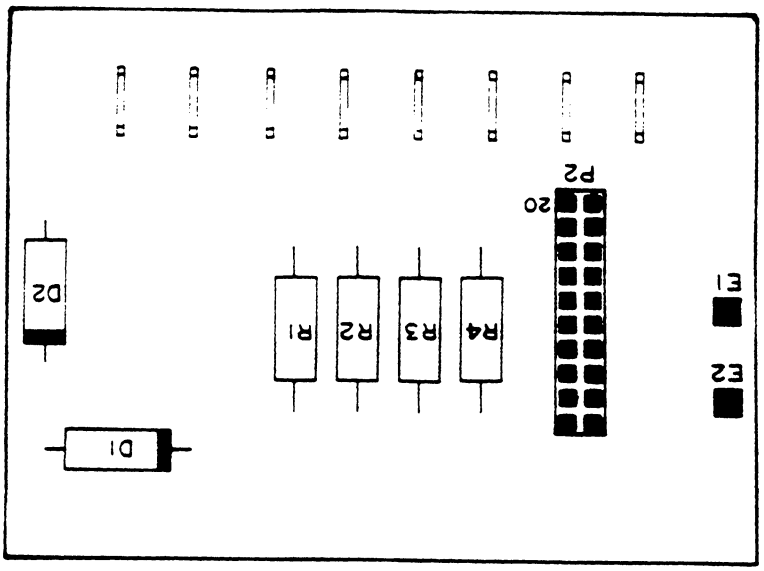
BAND	LENGTH IN.
138-174	12"

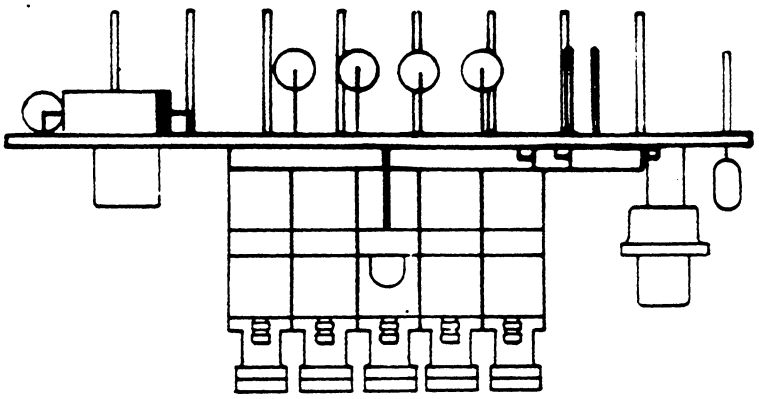


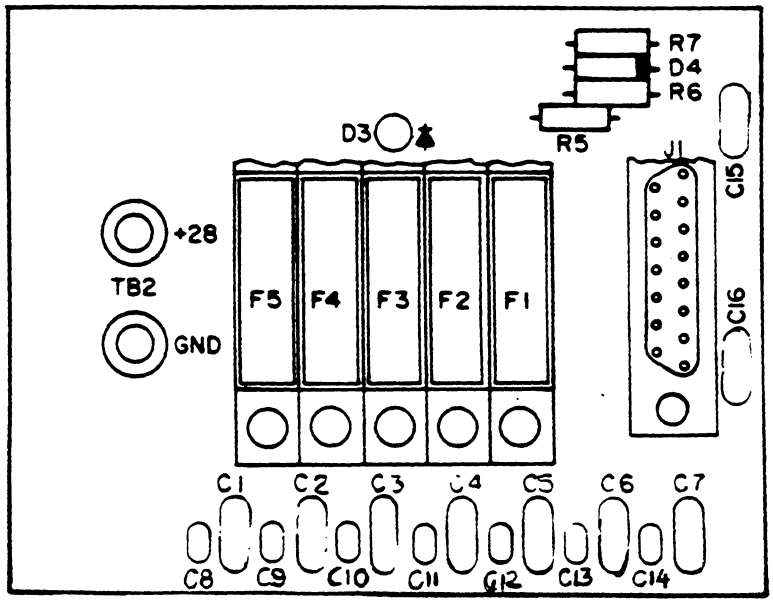
DWG STATUS		SCALE	Glenayre
PROTO ●	PILOT ●	MAT	
PRE PROD ●	PROD ●	APPLIED FINISH	

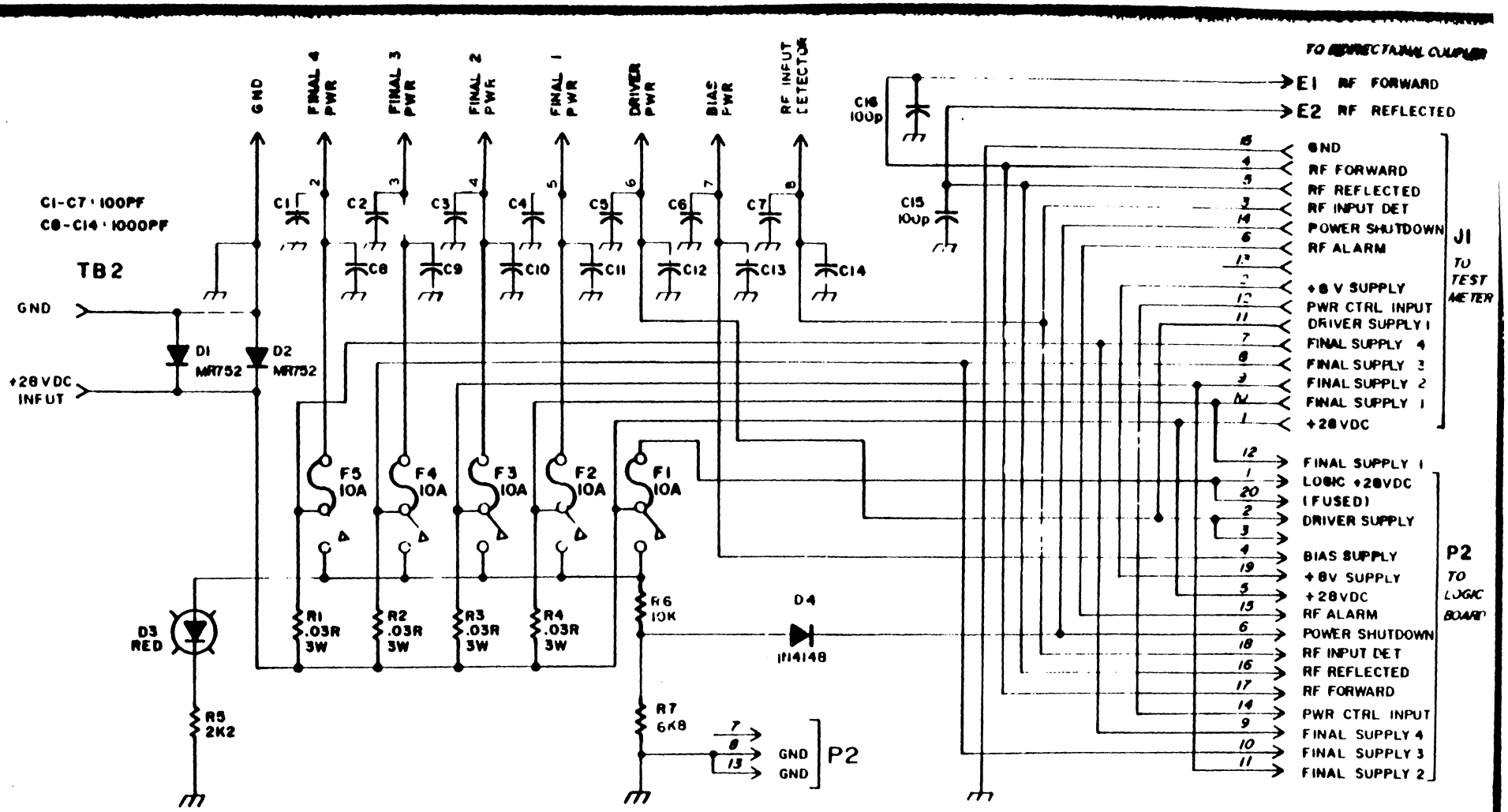
CODE	REVISION	DATE	INITIALS
C	PROD RELEASE ECO 105-1808	97.10.07	P.C.
B	PILOT RELEASE	96.12.11.	P.C.
A	ORIGINAL ISSUE	96.2.28	P.C.

TITLE
3T97A250
SPLITTER / COMBINER SCHEMATIC

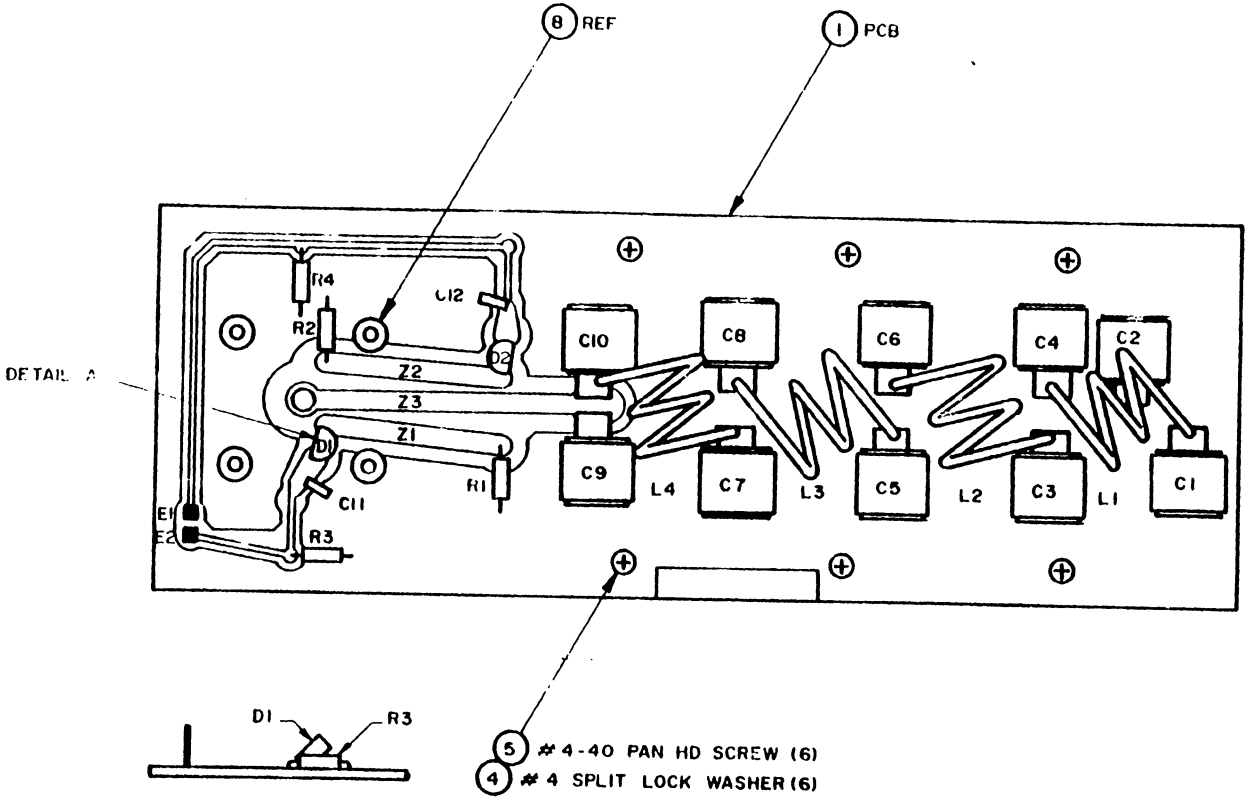

P2
20
D2
R1
R2
R3
R4
E1
E2
D1

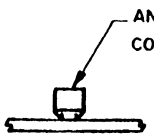



R7
D4
R6
R5
D3
J1
C15
C16
+28
TB2
GND
F5
F4
F3
F2
F1
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14

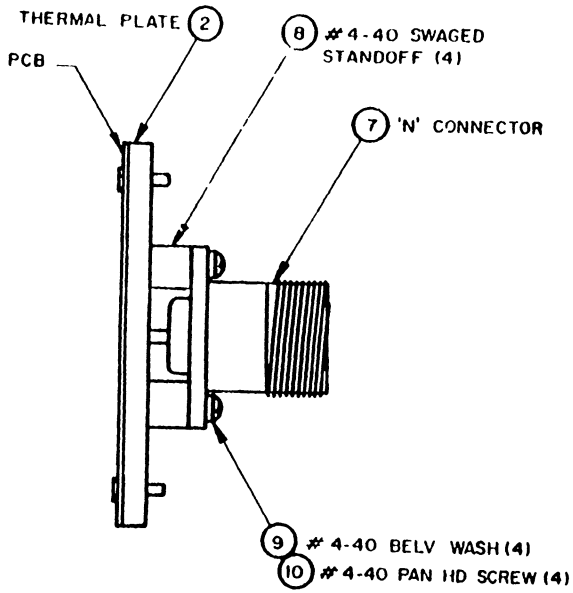

GND
FINAL 4 PWR
FINAL 3 PWR
FINAL 2 PWR
FINAL 1 PWR
DRIVER PWR
BIAS PWR
RF INPUT DETECTOR
TO DIRECTIONAL COUPLER
E1 RF FORWARD
E2 RF REFLECTED
C1-C7 : 100PF
C8-C14 : 1000PF
C16 100p
C15 100p
TB2
GND
+28 VDC INPUT
D1 MR752
D2 MR752
F5 10A
F4 10A
F3 10A
F2 10A
F1 10A
D3 RED
R1 .03R 3W
R2 .03R 3W
R3 .03R 3W
R4 .03R 3W
R5 2K2
R6 10K
R7 6K8
D4 1N4148
GND
GND
P2
J1
GND
RF FORWARD
RF REFLECTED
RF INPUT DET
POWER SHUTDOWN
RF ALARM
+8 V SUPPLY
PWR CTRL INPUT
DRIVER SUPPLY 1
FINAL SUPPLY 4
FINAL SUPPLY 3
FINAL SUPPLY 2
FINAL SUPPLY 1
+28VDC
TO TEST METER
FINAL SUPPLY 1
LOGIC +28VDC (FUSED)
DRIVER SUPPLY
BIAS SUPPLY
+8V SUPPLY
+28VDC
RF ALARM
POWER SHUTDOWN
RF INPUT DET
RF REFLECTED
RF FORWARD
PWR CTRL INPUT
FINAL SUPPLY 4
FINAL SUPPLY 3
FINAL SUPPLY 2
P2
TO LOGIC BOARD
DRAWING STATUS
PROTO
PILOT
PREPR.
PROD.
SCALE — : —
MAT.
APPLIED FINISH
Glenayre
B PROD. REL. ECO 105-2613 89-4-14
A ORIGINAL ISSUE 89-2-21
TITLE
DC DISTRIBUTION RF AMPS.
97 SERIES

REVISIONS			
REV	DESCRIPTION	DATE	APPRO
A	ORIGINAL	89.7.20	M
A	ECO 105-3044 PILOT RELEASE	89.11.16	M
A	ECO 105-3017 PROD. RELEASE	89.11.30	M





DETAIL A



NOTES:

1) USE SILVER SOLDER ONLY (GL # 196-0049)

2) PLACE COIL ENDS INTO HOLE IN TAB OF CAPACITOR - SOLDER.

DWG STATUS			
PROTO	PILOT	PROD	
		●	
SIGNATURE		DATE	
DRAWN	BJ	89.7.9	
CHECKED		89.10.12	
DESIGNER	M. Poole	89/10/12	
DESIGN MGR			

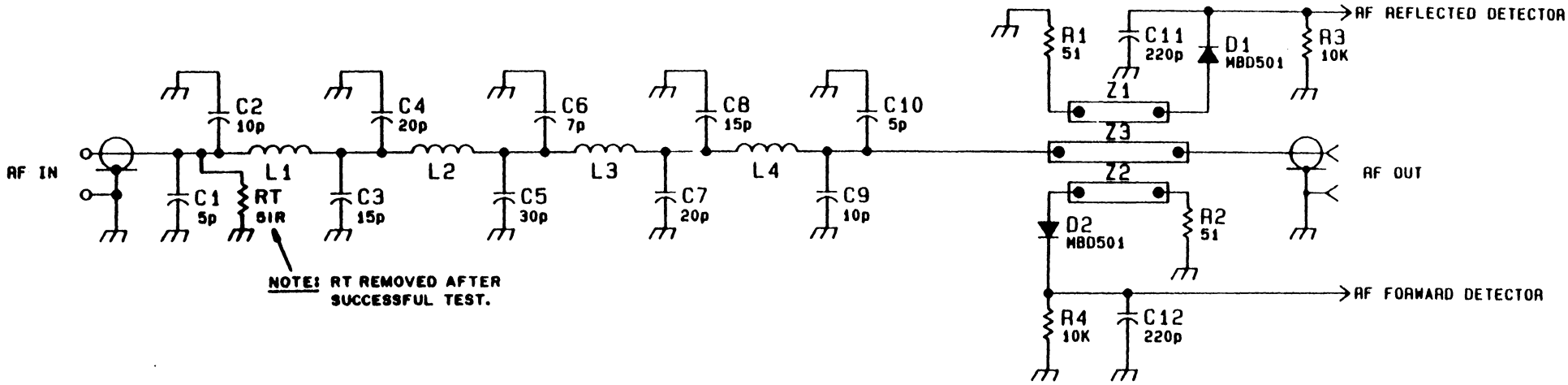
Glenayre

TITLE

LOW PASS FILTER, COUPLER
3T97A150/250

SIZE	DWG NO	
C	140 — 1273	— AS
SCALE 2:1	PROD REL DATE	SHEET 1 OF 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ORIGINAL	89-07-05	M P
A	ECO 105-3044 PILOT RELEASE	89-11-16	M. P.
A	ECO 105-3017 PROD. RELEASE	89-11-30	M. P.
B	ECO 105-3289	90-03-26	[illegible]



NOTE: ALL CAPACITOR VALUES ARE IN pF UNLESS OTHERWISE STATED.

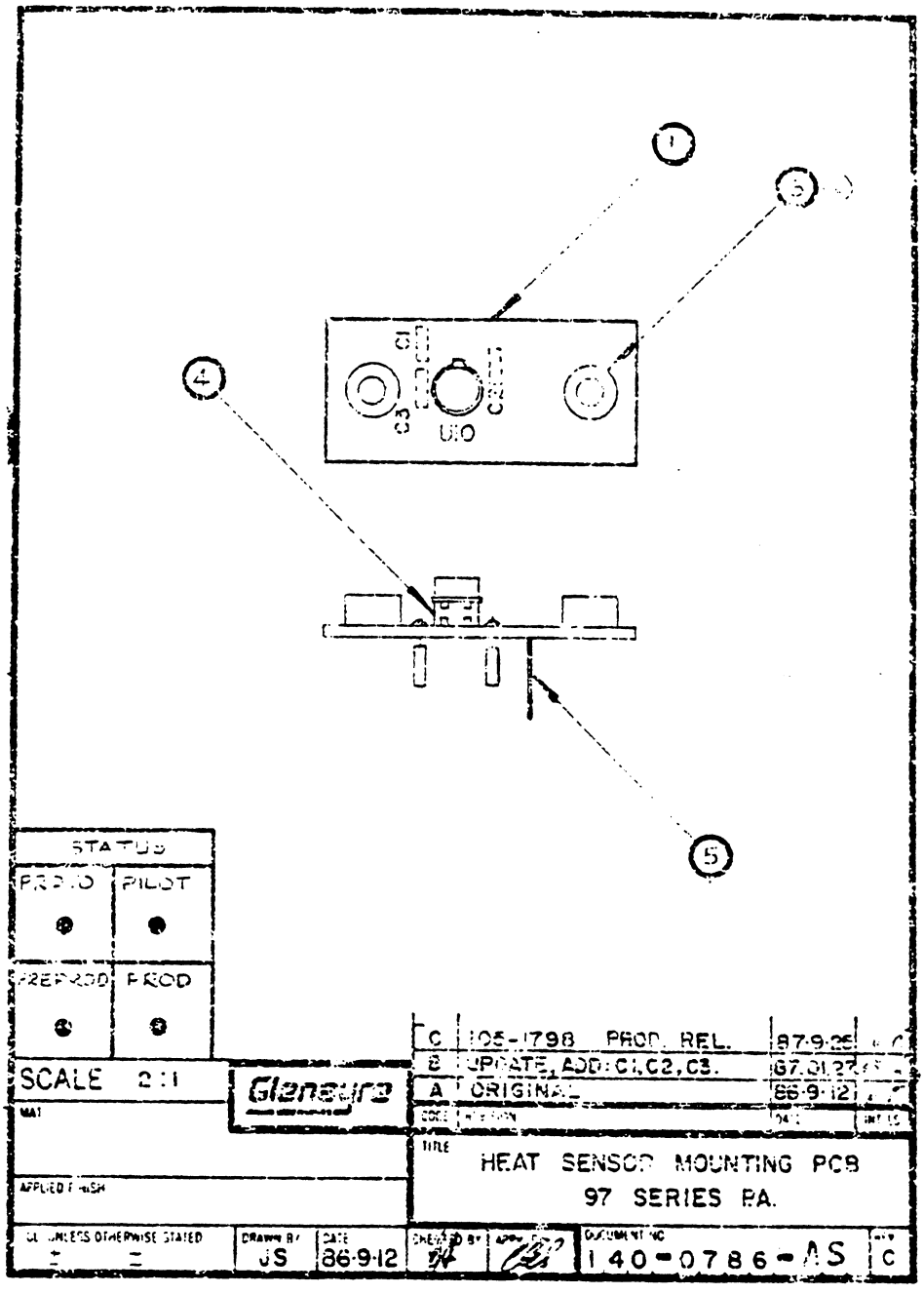
DWG STATUS		
PROTO	PILOT	PROD
●	●	●

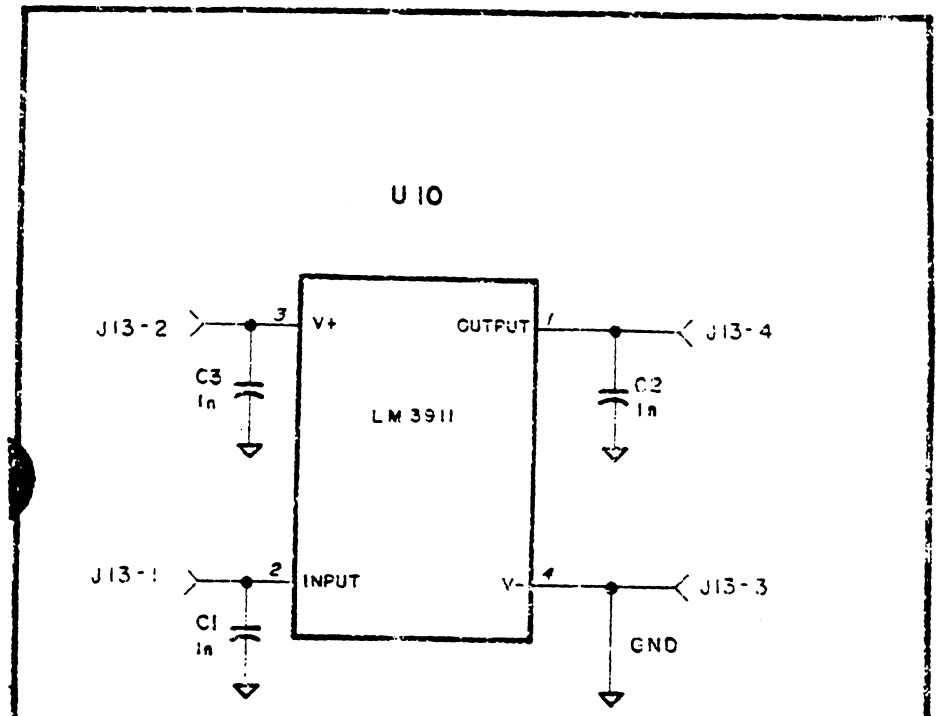
SIGNATURE		DATE
DRAWN	JM	89-7-5
CHECKED	[signature]	89.7.7
DESIGNER	M P	M 10/22
DESIGN MGR	[signature]	[illegible]

Glenayre

TITLE: LOW PASS FILTER COUPLER, 3T97A150/250

SIZE: B | DWG NO.: 140-1273-S.D.


1
2
3
4
5
U10
STATUS
PILOT
PROD
SCALE 2:1
Glenayre
C 105-1798 PROD. REL. 87-9-25
B UPDATE, ADD: C1, C2, C3. 87-01-27
A ORIGINAL 86-9-12
TITLE
HEAT SENSOR MOUNTING PCB
97 SERIES PA.
DRAWN BY JS
DATE 86-9-12
DOCUMENT NO 140-0786-AS
REV C



DWG. STATUS	
PROTO	PILOT
PREPROD	PROD.

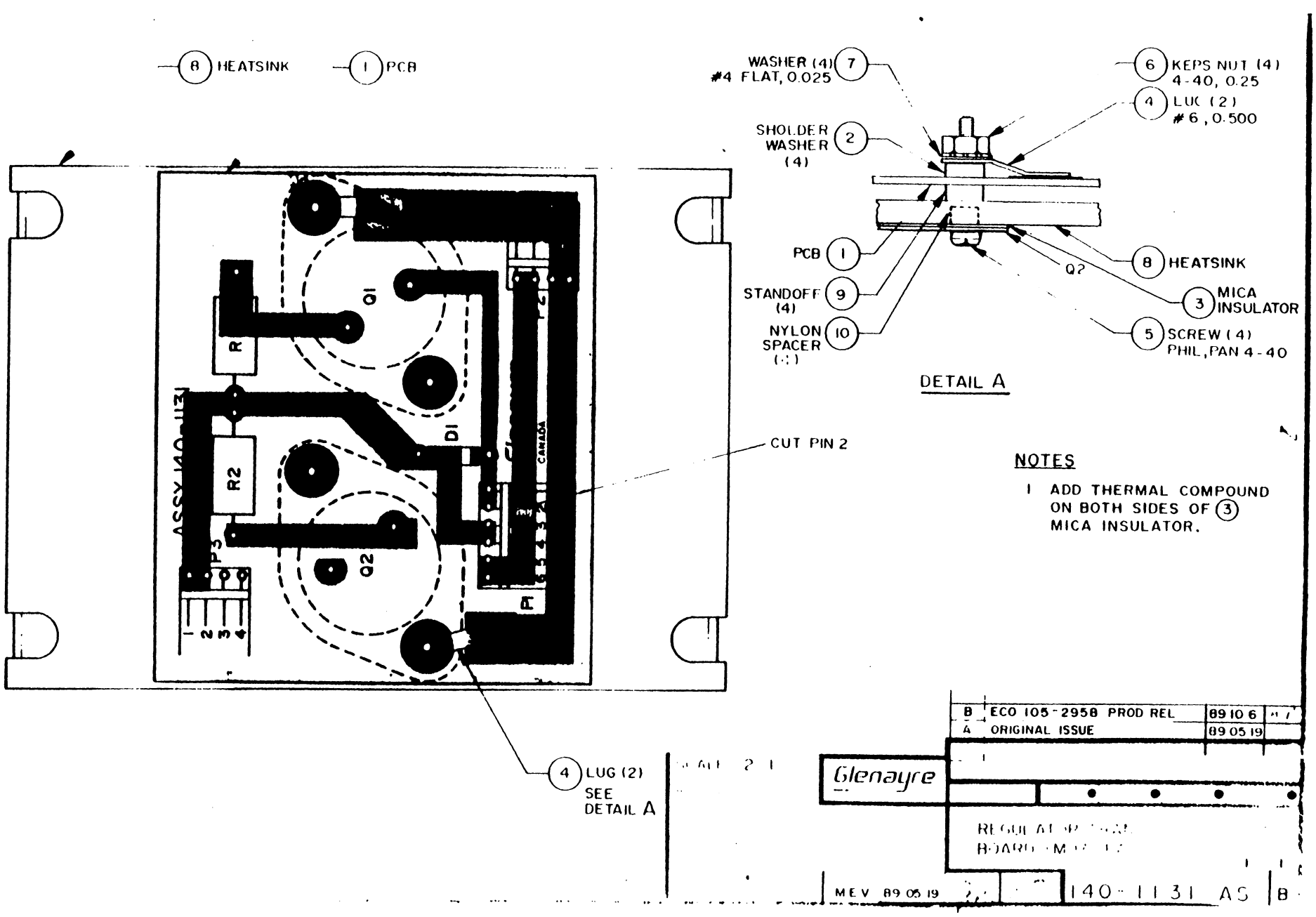
C	105-1798 PROD. RELEASE	87-09-25
B	PILOT UPDATE – 0364	87.03.11
A	ORIGINAL ISSUE	86.07.8

SCALE — : —

Glenayre

TITLE: 97 SERIES P.A. HEAT SENSOR

TOL UNLESS OTHERWISE STATED	DRAWN BY	DATE	DOCUMENT NO	REV
± ±	M.E.V.	86.07.8	140-0786-SD	C



NOTES

1 ADD THERMAL COMPOUND ON BOTH SIDES OF (3) MICA INSULATOR.

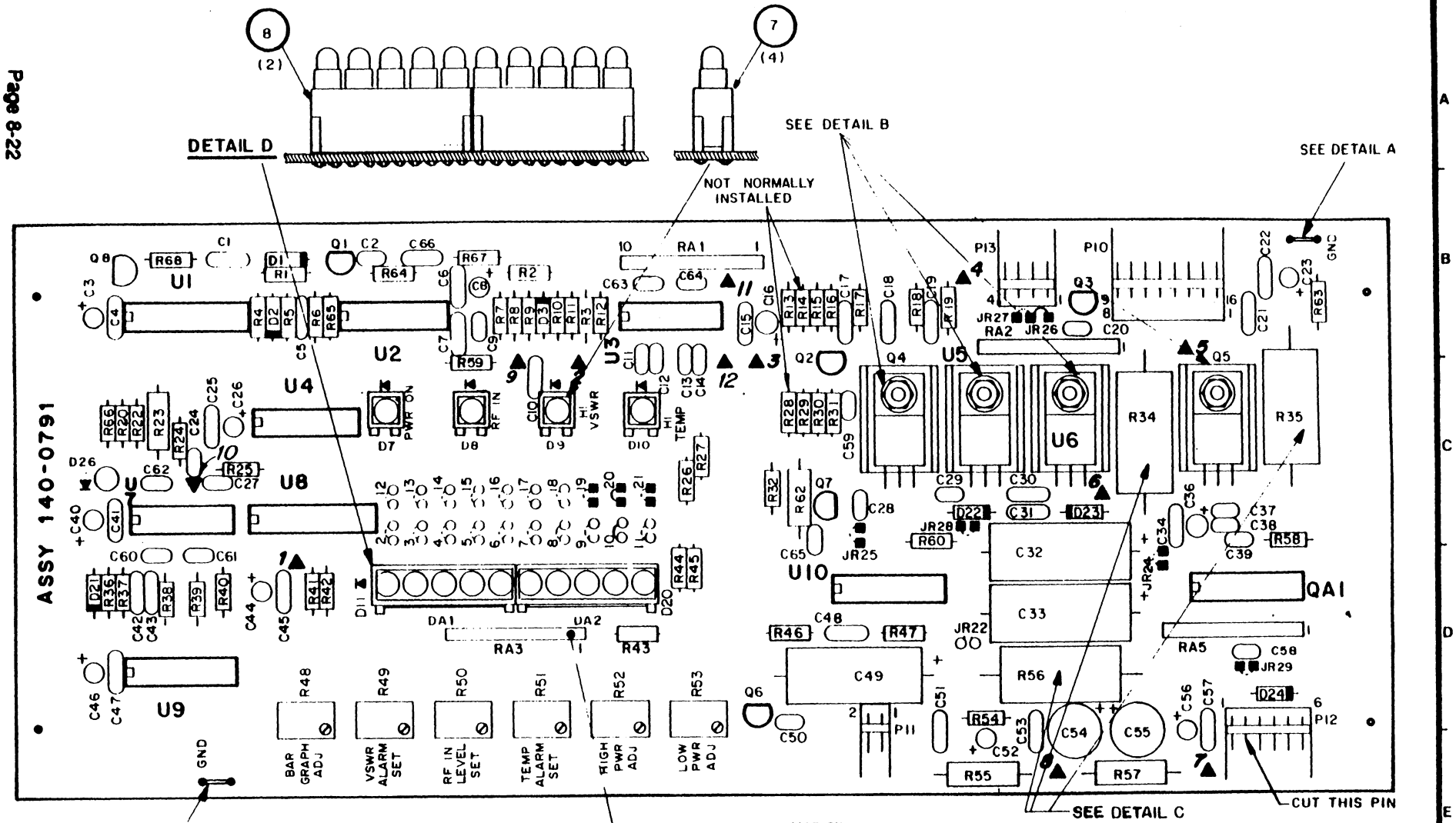
B	ECO 105-2958 PROD REL	89 10 6	
A	ORIGINAL ISSUE	89 05 19	

Glenayre

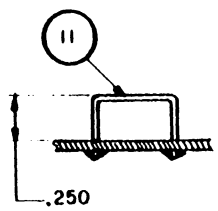
REGULATOR BOARD

MEV 89 05 19

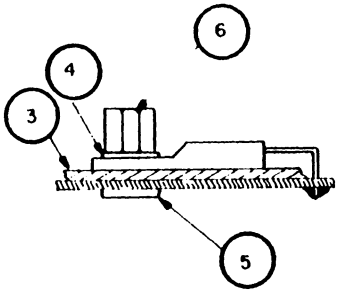
140-1131 AS B



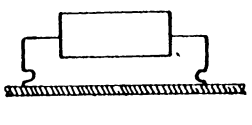
DETAIL A



DETAIL B



DETAIL C



USE TOOL GL 474-0094 TO CRIMP COMPONENT.

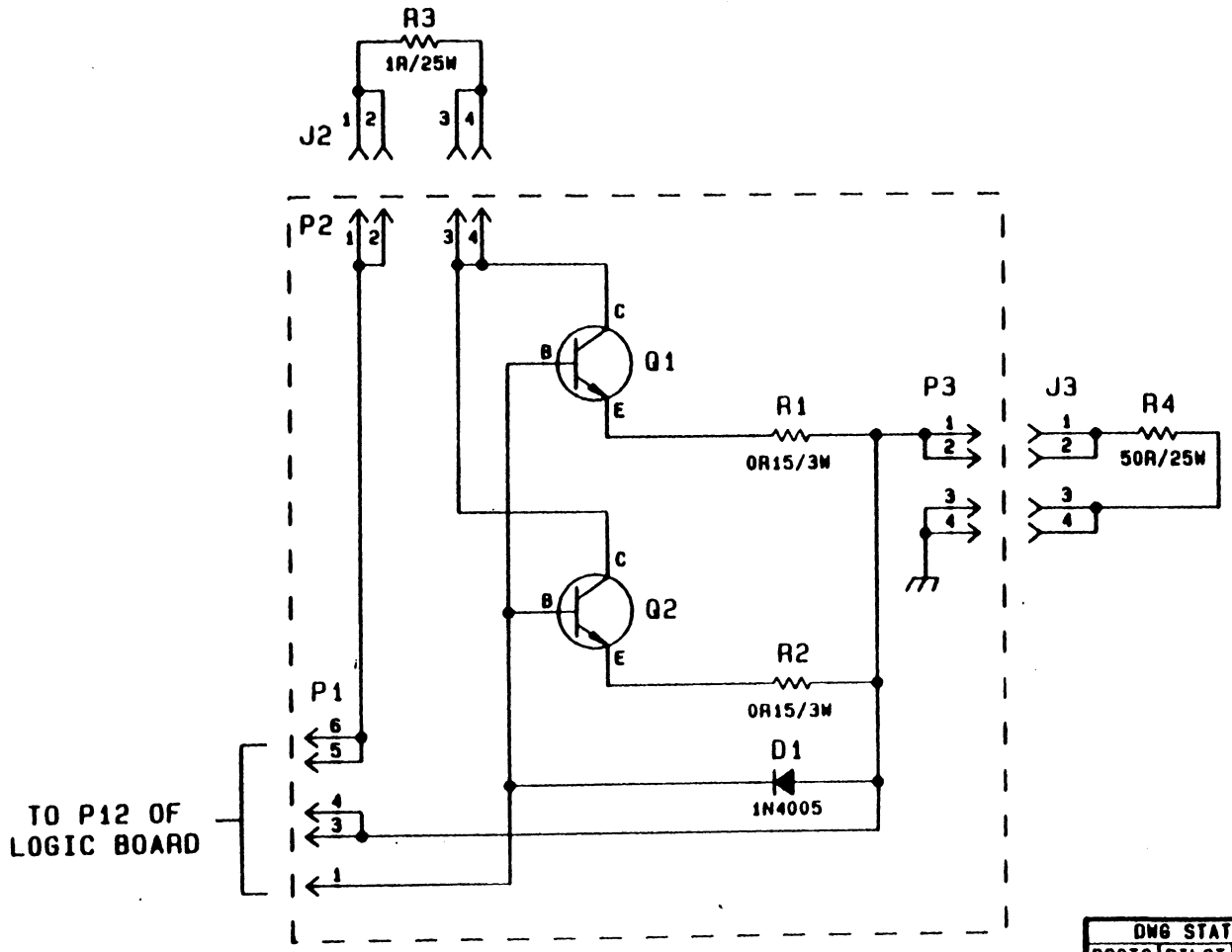
FACTORY

JR	IN	OUT	INSTALLED FUNCTION
2-11	10	OTHERS	THRESHOLD FOR FAN ON
12-21	20	OTHERS	RF POWER THRESHOLD
24		X	DISABLE BIAS SUPPLY AUTO-SHUTDOWN
25		X	DISABLE FAN AUTO-SHUTDOWN
26	X		ALARM CONDITION CAUSES SHUTDOWN
27		X	ALARM CONDITION CAUSES LOW POWER
28		X	DISABLE DRIVER SUPPLY
29		X	LOW POWER

CODE	REVISION	DATE	INT'L
J	ECO 105-2958	89 10 6	
I	ECO 105-2451	89 02 08	
H	ECO 105-2130	88.08.5	
G	PROD. REL. 105-1791	87 09 22	
F	UPDATE PU-0431	87 07 07	
E	UPDATE 104-0408	87 05 14	
D	UPDATE (JR 9,10,11)	87 04 23	
C	UPDATE	87 08 29	
B	UPDATE PER SILKSCREEN	87 01 09	
A	ORIGINAL ISSUE	86 12 3	

DWG STATUS		SCALE 2 : 1	Glenayre	TITLE
PROTO	PILOT	MAT		LOGIC BOARD 97 SERIES HA
PREPROD	PROD	APPLIED FINISH		SHEET 1 OF 1
		UNLESS OTHERWISE STATED	DRAWN BY CD / DATE 86 11 26 / CHECKED / APPD / DOCUMENT NO 140-0791	REV J

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ORIGINAL	890113	M.P.
B	PROD. RELEASE ECO 105-2958	891011	M.P.



DWG STATUS			
PROTO	PILOT	PROD	
●	●	●	

SIGNATURE		DATE
DRAWN	K.K.	890113
CHECKED	PATRICK	890113
DESIGNER	N.P.	890113
DESIGN MGR.		

TITLE: REGULATOR TRANSISTOR ASSY. BOARD (M97-PA)

SIZE: B | DWG NO.: 140 — 1131 — SD

SCALE: —

9. PARTS LIST

9.1 Parts Lists for 250 Watt VHF 97 Series P.A

This section provides the parts lists for all the major assemblies in the 97 Series 250 Watt VHF PA. Please refer to the correct assembly drawing in section 8 when searching for the part. When ordering replacement parts from Glenayre, please quote the Glenayre Part Number.

Description	Page
250 Watt VHF Driver Amplifier Module 140-0723	9-2
Splitter 250Watt VHF Assembly 148-0316	9-3
3T97A250/250 Final Power Amplifier Module PC Assembly 140-1199	9-4
Combiner 250Watt VHF Assembly 148-0315	9-5
DC Distribution RF Amplifiers 97 Series 140-1186	9-6
Low Pass Filter & Coupler VHF P.A. 3T97A250/250 140-1273	9-7
Heat Sensor Mounting PCB - 97 Series P.A. 140-0786	9-8
Regulator Transistor Assembly Board (M97-PA) 140-1131	9-9
97 Series P.A. Logic Board PC Assembly 140-0791	9-10

9.1.1 Parts List for 140-0723-AS/SD, Driver Amplifier

Circuit Ref.	Glenayre Part No.	Parts Description
C1	294-0021	Cap, Trim, Mica, 4 to 60 p, for Mid and High bands. Low Band C1 not required.
C2, & C9	290-0002	Cap, RF, 200 V, 470 p, 10%
C4, & C5	290-0131	Cap, RF, Mica, 500 V, 250 p, 5%
C6, & C7	290-0124	Cap, RF, Mica, 500 V, 68 p, 5%, for Low and Mid bands.
C6, & C7	290-0125	Cap, RF, Mica, 500 V, 80 p, 5%, for High band.
C8, C13	284-0116	Cap, Disk, Z5F, 1k0 V, 1n0, 10%
C11, & C19	282-1513	Cap, Estr, 63 V, 100 n, 10%
C12	278-6018	Cap, Alum, 50 V, 2µ2, 20%
C14, & C15	294-0021	Cap, Trim, Mica, 4 to 60 p
C17	290-0118	Cap, RF, Mica, 500 V, 40 p, 5%
C18	284-2025	Cap, Plate, NPO, 100 V, 2p2
C21	290-0016	Cap, RF, Mica, 500 V, 80 p, 5%, for High band. Low and Mid band C21 not required.
C22	286-9657	Cap, Chip, 200 V, 220 p, 10%
C23	294-0021	Cap, Trim, Mica, 4 to 60 p, for Low band. High and Mid band C23 not required.
D1, & D2	203-0039	Diode, MBD501, 50 V, Shot, TO-92
L1	298-0047	Choke, 1537, 2.4 A, 150 nH, 20%
L2	298-0094	Choke, RF, 3-1/2T
L3	298-0093	Choke, RF, 6-1/2T, Close Spacing
Q1	201-4018	Transistor, RF, NPN, MRF317
R1	261-0079	Resistor, CF, 0.4SP, 1/4 W, 510 R, 5%
R2	261-4625	Resistor, CC, Axil, 1 W, 1R0, 5%
T1-T2	296-7006	Transformer, RF, Matching 4 to 1

9.1.2 Parts List for 148-0316 AS/SD, Quad Splitter

Circuit Ref.	Glenayre Part No.	Parts Description
1 FAB B	137-0847	PCB, Splitter, PA 97 Series
4	170-0715	COAX Cable, No Connector
8	170-0895	Cable, Splitter/Combiner
6	170-0971	Coil Right Hand Splitter. 138-174 MHZ
7	170-0972	Coil Left Hand Splitter 138-174 MHz
5	262-0073	Res, RF Chip, 40W, 50 ohm, 5% DC to 4GHZ 50 ohm termination
15	315-0015	Lug, #6, 0.500
20	371-0010	Wire Marker, 0.75" Long #0 Vinyl
21	371-0011	Wire Marker, 0.75" Long #1 Vinyl
22	371-0012	Wire Marker, 0.75" Long #2 Vinyl
23	371-0013	Wire Marker, 0.75" Long #3 Vinyl
24	371-0014	Wire Marker, 0.75" Long # 4 Vinyl
14	376-1083	Screw, Phil, Pan 4-40, 0.625 Machined
10	376-1136	Screw, Phil, Pan 4-40, 6-32 Machined
12	376-1278	Screw Phil 4-40, 0.250 Machined, Filister
13	391-0202	Washer, Split Lock, #4
11	391-0204	Washer, Splti Lock, #6
1	442-0132	SPL/COM Housing, 97 Series 2 per splitter
4	442.0149	SPL/COM Cover 97 PA, VHF HF

9.1.3 Parts List for 140-1199-SD/IFM, Final Amplifier

Circuit Ref.	Glenayre Part No.	Parts Description
1 FAB C	137-1199	PCB, VHF Final Module, 3T97
C3	290-0016	Cap, RF, Mica, 300 V, 45 p, 5%
C4, & C14	290-0002	Cap, RF, 200 V, 470 p, 10%
C6 & C7	290-0131	Cap, RF, Mica, 500 V, 250 p, 5%
C8	286-1149	Cap, X7R, 100 V, 0.2, 100n, 10%
C9	290-0006	Cap, RF, Mica, 300 V, 5 p, 5%
C18	290-0134	Cap, RF, Mica, 500 V, 1000 p, 5%
C19	287-0182	Cap, 1210, X7R, 50 V, 100 n, 10%
C20	278-6018	Cap, Alum, 50 V, 2µ2, 20%
C21 & C22	287-0122	Cap, 1206, XR7, 100 V, 10 n, 10%
C23	286-9657	Cap, 1206, NPO, 200 V, 220 p, ±10%
L1 & L3	298-0047	Choke, 1537, 2.4 A, 150 nH, 20%
L5	298-0081	Choke, RF, 10ADC, 150 nH
L4	298-0192	Coil,RF, Air, Approx, 70nH 4Turns, 0.312"ID
L6	298-0206	Choke RF, 6 nH (Approx) Use Jig to coil
L2	299-1000	Ferrite Bead 65/4B
Q1	201-4018	Transistor, RF, NPN, MRF317
R1	261-4625	Resistor, CC, Axil, 1 W, 1R0, 5%
R2	261-4649	Resistor, CC, Axil, 1 W, 10R, 5%
3	316-0131	Tab, Faston, 0.250 Tab, PCMT Male Tab
5	376-1277	Screw, Fils, 4-40, 0.188 Machined Phillips
6	391-0202	Washers, Split Lock, #4
4	443-1426	Thermal Plate, 3T97A250, 0.125" AL

9.1.4 Parts List for 148-0315 IFM/SD, Quad Combiner

Circuit Ref.	Glenayre Part No.	Parts Description
1 FAB E	137-0776	PCB, Combiner, PA 97 Series
4	170-0715	COAX Cable, No Connector
7	170-0968	Coil, Right Hand Combiner. 138-174 MHZ
8	170-0969	Coil, Left Hand Combiner. 138-174 MHz
5	262-0072	Res, RF HI PWR, 150W, 50 ohm, 5% DC to 1GHZ 150 ohm at 100°C
15	315-0015	Lug, # 6, 0.500
21	371-0011	Wire Marker, 0.75" Long #1 Vinyl
22	371-0012	Wire Marker, 0.75" Long #2 Vinyl
23	371-0013	Wire Marker, 0.75" Long #3 Vinyl
24	371-0014	Wire Marker, 0.75" Long #4 Vinyl
14	376-1083	Screw, Phil, Pan 4-40, 0.625 Machined
10	376-1136	Screw, Phil, Pan 4-40, 6-32 Machined
12	376-1279	Screw Phil 4-40, 0.312 Machined, Filister
13	391-0202	Washer, Split Lock, #4
11	391-0204	Washer, Splti Lock, #6
2	442-0132	SPL/COM Housing, 97 Series 2 per splitter
3	442.0149	SPL/COM Cover 97 PA, VHF HF
9	443-1124	Shim, Combiner, 97 PA

9.1.5 Part List for 140-1186-IFM/SD, DC Distribution Assembly

Circuit Ref.	Glenayre Part No.	Parts Description
1	137-1186	PCB, DC Distribution, M-97
C1-C7, & C15-C16	284-2045	Cap, PLT, NP0, 100 V, 100 p, 2%
C8-C14	286-1125	Cap, Mono, X7R, 100 V, 1N0, 10%
D1-D2	203-0027	Diode, MR752, 200 V, 6 A, MOT194
D3	235-0004	LED, red, 65NM, DIF, TI, 60 deg
D4	203-0015	Diode, 1N4148, 0.2 A, DO-35
F1-F5	334-0707	Fuse, GMT, 10 A, 125 Vac, 60 Vdc
R1-R4	265-5504	Resistor, WW, 0.7"SP, 3 W, R020, 3%
R5	261-0094	Resistor, CF, 0.4SP, 1/4 W, 2k2, 5%
R6	261-0110	Resistor, CF, 0.4SP, 1/4 W, 10 k, 5%
R7	261-0106	Resistor, CF, 0.4SP, 1/4 W, 6k8, 5%
J1	308-2037	Connector D, Chassis MT,WW Metal Shell
E1, E2, P2	313-0026	Pin, 025"SO 0.360" Above
9	316-0131	Tab, Faston, 0.250 Tab, PCMT
10	334-0110	Fuseholder, PNL Mount, HLT for GMT Fuse
8	398-0233	Standoff, Unthreaded.

9.1.6 Parts List for 140-1273-IFM/SD, Low Pass Filter and Coupler, VHF

Circuit Ref.	Glenayre Part No.	Parts Description
1 FAB C	137-1273	PCB, VHF LO Pass Filter, 3T97
D1, D2	203-0039	Diode, MBD501, 50V, Shot., T0-92, 20mA
R3, R4	261-0110	Res. CF, 4"SP, 1/4W, 10K-ohm, 5%
RT	261-4266	Res., CC, Axil, 1/4W, 51 ohm, 5% strt leads
C11, C12	286-9657	Cap., 220pF NPO, K%, 200V
C1, C10	290-0110	Cap, 5pF, 5% Mica, 500V. One lead straight
C6	290-0111	Cap, 7pF, 5% Mica, 500V, One lead straight
C2, C9	290-0112	Cap, 10pF, 5% Mica, 500V, One lead straight
C3, C8	290-0113	Cap, 15pF, 5% Mica, 500V, One lead straight
C4, C7	290-0114	Cap, 20pF, 5% Mica,.500V, One lead straight
C5	290-0116	Cap, 30pF, 5% Mica, 500V, One lead straight
L1	298-0210	Choke, Air, 65nH(approx)2.5Trns of 12Awg
L2	298-0211	Choke, Air, 60nH(approx)2.5Trns of 12 Awg
L4	298-0212	Choke, Air, 65nH(approx)2.5Trns of 12 Awg
L3	298-0213	Choke, Air, 70nH(approx)2.5Trns of 12 Awg
7	311-0019	Conn. RF N, Type, Pnl mt, F Receptacle
E1, E2	313-0026	Pin, 0.025" SD 0.360" Above.
5	376-1078	Screw, Phil, Pan, 4-40, 0.250 Machined
10	376-1080	Screw, Phil, Pan 4-40, 0.375 Machined
4	391-0202	Washer, Split Lock, #4
9	391-0254	Washer, Bellevill, S/S, #4
8	398-0112	Standoff, Swage, 4-40, 0.250 Brass.
2	443-1463	Thermal Plate, LP FLT, 3T97

9.1.7 Parts List for 140-0786-AS/SD, Heat Sensor Mounting Board

Circuit Ref.	Glenayre Part No.	Parts Description
1	137-0786	PCB, Heat Sensor Mounting Board
4	236-0031	Standoff, T0-18, Nylon H=0. 100
U10	238-9039	IC, Temp, Con, LM 3911, T0-46 Temp Sensor
C1-C3	286-1125	Cap, X7R, 0.1, 10%, 100V 1n0. Ceramic
5	313-0026	Pin, 0.025"SO 0.360" Above
3	398-0140	Standoff, Press, 0.125 High. Unthreaded

9.1.8 Parts List for 140-1131-SD/AS, Regulator Transistor Board.

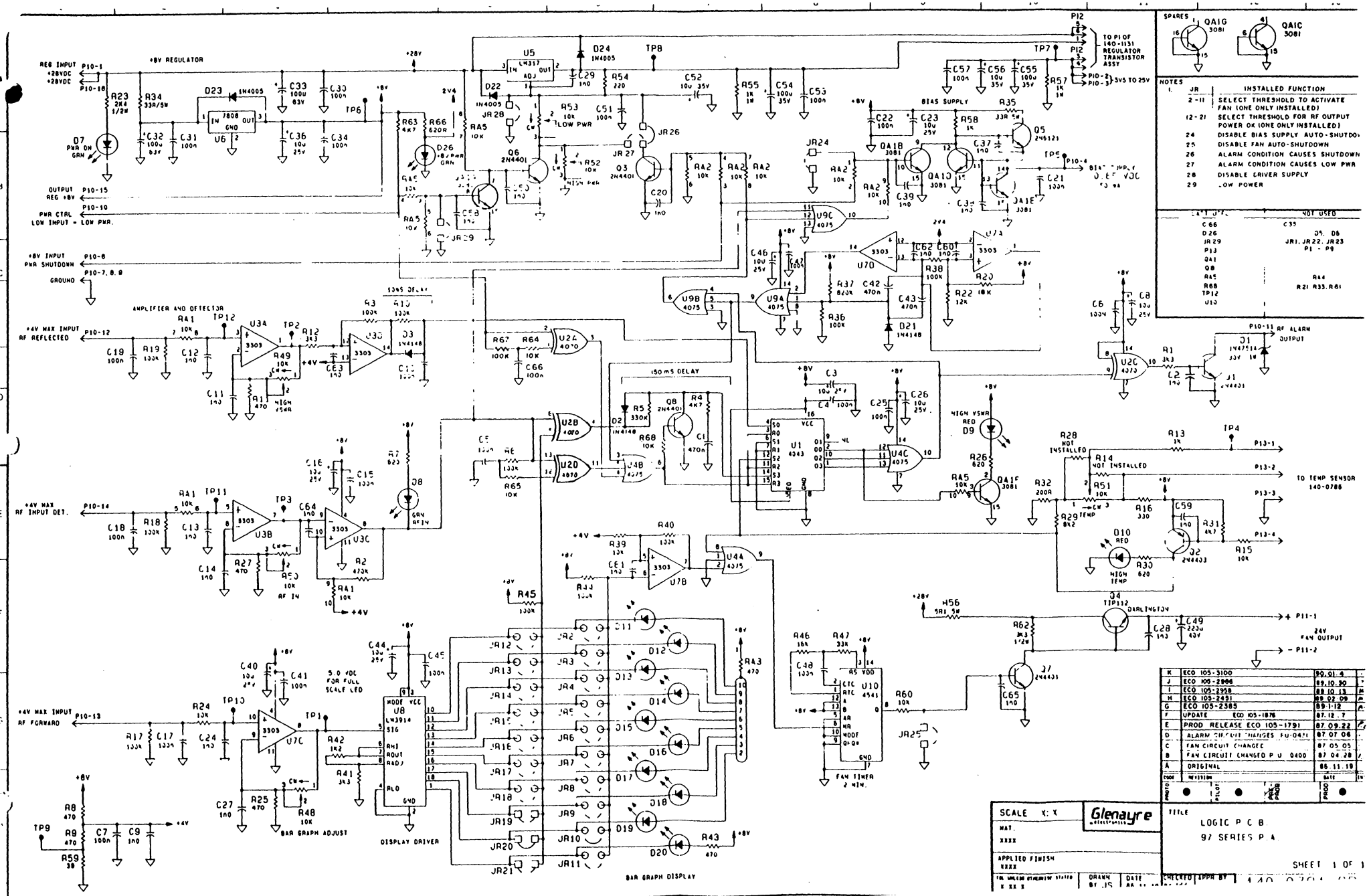
Circuit Ref.	Glenayre Part No.	Parts Description
1 FAB B	137-1131	PCB, Reg, Transistor Assembly M97 PA
Q1, Q2	201.0090	Transistors, NPN, 2N5885, PWR
D1	203.0014	Diode, 1N4005,600V, 1A. Rectifier
2	236-0033	Bushings, Nylon #4 Stud.
3	236-0040	Insulators, Mica 1.655 x 1.063 Max Dim.
8	236-0067	Heatsink, Double
R1, R2	265-5513	Res, WW, 0.7SP, 3W, R15 3% 0.25"Dia 2.4W at 75°C
P2, P3	308-5148	Connector, HDR PCMT 90DG
P1	308-5149	Connector, HDR, 90DG,
2	315-0016	Solder Lug #4 Tin Lead Plate
5	376-1084	Screw, Phil Pan, 4-40, 0.750 Machined
6	386-0241	Nut, Keps, 4-40, 0.250 A/F 0.109" thick
7	390-0202	Washers, Flat, #4, 0.281 OD 0.025 thick
9	398-0231	Standoff, Unthreaded
10	400-4004	Spacers, Nylon, #4, 0.187"OD 0.125 Long

9.1.9 Part List for Pwr Distribution and Logic Board (140-0791)

Circuit Ref.	Glenayre Part No.	Parts Description
C1, C42-C43,	286-1045	Cap, Mono, X7R, 50 V, 470 n, 10%
C2, C9, C11-C14, C20, C24, C27-C29, C37-C39, C50, & C58-C65	286-1125	Cap, Mono, X7R, 100 V, 1n0, 10%
C3, C8, C16, C23, C26, C36, C40, C44, C46, C52, & C56	280-5108	Cap, Tant, 0.2, 35 V, 10 µ, 20%
C4-C7, C10, C15, C17-C19, C21-C22, C25, C30-C31, C34, C41, C45, C47-C48, C51, C53, C57, & C66	282-1513	Cap. Estr, 63 V, 100 n, 10%
C32-C33	278-0204	Cap, Alum, 63 V, 100 µ
C49	278-0225	Cap, Alum, 40 V, 220 µ
C54-C55	278-5218	Cap, Alum, 35 V, 100 µ, 20%
D1	203-5053	Zener, 1N4751A, 1 W, 30 V, 5%
D2-D3, & D21	203-0015	Diode, 1N4148, 0.2 A, DO-35
D7-D8, & D26	235-0015	LED, green, SG205D, T1, 20 deg.
D9-D20	235-0004	LED, red, 665NM, DIF, T1, 60 deg.
D22-D24	203-0014	Diode, 1N4005, 600 V, 1 A, DO-41
Q1, Q3, Q6-Q8,	201-0007	Transistor, NPN, 2N4401, TO-92
Q2	201-0008	Transistor, PNP, 2N4403, TO-92
Q4	201-0082	Transistor, NPN, TIP112, DARL, TO-220
Q5	201-0089	Transistor, NPN, 2N6121, PWR, TO-220
QA 1	238-9011	IC, TRS Array, 3081, NPN, 16 pin
R1, R12, & R41	261-0098	Resistor, CF, 0.4SP, 1/4 W, 3k3, 5%
R2	261-0150	Resistor, CF, 0.4SP, 1/4 W, 470 k, 5%
R4, R31, & R63	261-0102	Resistor, CF, 0.4SP, 1/4 W, 4k7, 5%
R5	261-0146	Resistor, CF, 0.4SP, 1/4 W, 330 k, 5%

Circuit Ref.	Glenayre Part No.	Parts Description
R3, R6, R10, R17-R19, R36, R38, R40, R44-R45, R67	261-0134	Resistor, CF, 0.4SP, 1/4 W, 100 k, 5%
R7, R26, R30, & R66	261-0081	Resistor, CF, 0.4SP, 1/4 W, 620 R, 5%
R8-R9, R11, R25,R27, R43	261-0078	Resistor, CF, 0.4SP, 1/4 W, 470 R, 5%
RA1-RA2, & RA5	276-1033	Resistor, SIP, 10P, 5RES, 10 k, 5%
RA3	276-0116	Resistor, SIP, 10P, 9RES, 470 R, 10%
R13, & R58	261-0086	Resistor, CF, 0.4SP, 1/4 W, 1k0, 5%
R15, R24, R39, R60, R64-R65, & R68	261-0110	Resistor, CF, 0.4SP, 1/4 W, 10 k, 5%
R16	261-0074	Resistor, CF, 0.4SP, 1/4 W, 330 R, 5%
R20	261-0116	Resistor, CF, 0.4SP, 1/4 W, 18 k, 5%
R22	261-0112	Resistor, CF, 0.4SP, 1/4 W, 12 k, 5%
R23	261-0289	Resistor, CF, 0.6SP, 1/4 W, 2k4, 5%
R29	261-0108	Resistor, CF, 0.4SP, 1/4 W, 8k2, 5%
R32	261-0069	Resistor, CF, 0.4SP, 1/4 W, 200 R, 5%
R34-R35	265-5039	Resistor, WW, 1.1"SP, 5 W, 33 R, 10%
R37	261-0156	Resistor, CF, 0.4SP, 1/4 W, 820 k, 5%
R42	261-0088	Resistor, CF, 0.4SP, 1/4 W, 1k2, 5%
R46	261-0115	Resistor, CF, 0.4SP, 1/4 W, 16 k, 5%
R47	261-0122	Resistor, CF, 0.4SP, 1/4 W, 33 k, 5%
R48-R53	277-2585	Trimpot, MT, 3/8 SQU, 10 k
R54	261-0070	Resistor, CF, 0.4SP, 1/4 W, 220 R, 5%
R55, & R57	261-0474	Resistor, CF, 0.8SP, 1 W, 1k0, 5%
R56	265-5025	Resistor, WW, 1.1"SP, 5 W, 5R1, 10%
R59	261-0052	Resistor, CF, 0.4SP, 1/4 W, 39 R, 5%
R62	261-0292	Resistor, CF, 0.6SP, 1/2 W, 3k3, 5%
U1	242-0121	IC, CMOS, 4043, NOR, 16 pin
U2	242-0022	IC, CMOS, 4070, XOR, 14 pin
U3, U7,	238-1014	IC, Op Amp, 3303, QUAD, 14 pin
U4, U9	242-0151	IC, CMOS, 4075, OR, 14 pin

Circuit Ref.	Glenayre Part No.	Parts Description
U5	238-3031	IC, Regulator, LM317, Pos Adj, TO-220
U6	238-3030	IC, Regulator, 7808, Pos 8 V, TO-220
U8	238-9024	IC, LED Driver, LM3914, 18 pin
U10	242-0147	IC, CMOS, 4541, Timer, 14 pin
1 FAB K	137-0791	PCB, Power Distribution & Logic PA-97
4	236-0004	Cup Washers, #4 (0.270 OD)
3	237-0040	Heatsink, T0-220,Horizontal, 1.5W @ 40°C
P10	308-5122	Conn, HDR, PCMT, 90DG, 2x16
P11, P13	308-5148	Conn. HDR, PCMT, 90DG, 1 x 4
P12	308-5149	Conn. HDR, PCMT, 90DG, 1 x 6
7	308-9074	Conn. Housing Plug. 2 CCT
8	308-9075	Conn. Housing Plug. 10 CCT
TP1-TP8, TP9-TP12	313-0026	Pin, 0.025"SD 0.360" Above
5	376-0602	Stud, Pem, PCMT, 4-40, 0.375 Phosphor
6	400-0099	Spacer, Hex, 4-40, 0.250
JR10	270-0011	Jumper, Bare, Formed, 0.1
11	270-0012	Jumper, Bare, Formed, 0.2
JR20, 24, 25, 26, 28, 29	270-0501	Jumper, Shunt, 1"SP, Short


+8V REGULATOR
REG INPUT +28VDC
BIAS SUPPLY
AMPLIFIER AND DETECTOR
150mS DELAY
BAR GRAPH ADJUST
DISPLAY DRIVER
BAR GRAPH DISPLAY
FAN TIMER 2 MIN.
TO P1 OF 140-1131 REGULATOR TRANSISTOR ASSY
TO TEMP SENSOR 140-0788
24V FAN OUTPUT
SPARES
NOTES
JR INSTALLED FUNCTION
SELECT THRESHOLD TO ACTIVATE FAN (ONE ONLY INSTALLED)
SELECT THRESHOLD FOR RF OUTPUT POWER OK (ONE ONLY INSTALLED)
DISABLE BIAS SUPPLY AUTO-SHUTDOWN
DISABLE FAN AUTO-SHUTDOWN
ALARM CONDITION CAUSES SHUTDOWN
ALARM CONDITION CAUSES LOW PWR
DISABLE DRIVER SUPPLY
LOW POWER
NOT USED
C66
D26
JR29
P13
Q41
Q8
R45
R68
TP12
U10
C35
D5, D6
JR1, JR22, JR23
P1 - P9
R44
R21, R33, R61
SCALE X:X
MAT.
XXXX
APPLIED FINISH
XXXX
Glenayre
TITLE
LOGIC P C B
97 SERIES P.A.
SHEET 1 OF 1
DRAWN
DATE
CHECKED
APPR BY
K ECO 105-3100 90.01.4
J ECO 105-2906 89.10.30
I ECO 105-2958 89.10.13
H ECO 105-2491 89.02.09
G ECO 105-2385 89.1.12
F UPDATE ECO 105-1876 87.12.7
E PROD RELEASE ECO 105-1791 87.09.22
D ALARM CIRCUIT CHANGES EO 0421 87.07.06
C FAN CIRCUIT CHANGES 87.05.05
B FAN CIRCUIT CHANGED P.U. 0400 87.04.28
A ORIGINAL 86.11.19