TECHNICAL MANUAL

HARRIS

TECHNICAL MANUAL

TE-3 FM EXCITER

994 6425 003

THIS TECHNICAL MANUAL PROVIDES THE NECESSARY INFORMATION FOR THE APPLICATION, INSTALLATION, OPERATION, ADJUSTMENT AND MAINTENANCE OF THE TE-3 EXCITER.

HARRIS CORPORATION

Broadcast Products Division

T.M. No. 888 1042 001

MANUAL REVISION HISTORY

MCN OR REV.NO.	MCN OR REV. DATE	ECN NO.	DESCRIPTION OF CHANGE
1	10/23/75	18408	Page 6-3, Parts List, Change L8 to read: RF Choke, 1.0 uH 494 0384 000. Page 7-7, Schematic 838 4204 001, Replace w/updated Revision C, or change L8 from 2.2 uH to 1.0 uH
2	10/27/75	18471	Page 6-9, AFC Parts List, Delete R50, Res., 51 ohm, 1/4W, 5%, Part No. 540 0881 000 Page 7-6, Schematic 842 5828 001, Delete R50, R51 from E2 to ground
3	10/27/75	17913	Schematic 842 5828 001, Replace w/updated Rev. G
4	10/27/75	18327	Page 7-9, Schematic 838 2026 001, Replace w/updated Rev. F SCA Generator Modification, 884 6507 002, Schematic 838 4726 001, Replace w/updated Rev. A. SCA Generator Modification, 994 6507 002, Part List, Change R47 to read: 540 0085 000 Res., 33k ohms, 1/2W. Change R46 to read: 540 0083 000, Res., 27K ohms, 1/2W
5	03/19/76	20520	Page 6-4, Parts List 992 1909 001, Change C2, C3, C4, C6, C7, C8 to read: Cap., .03 uF, 300V., 500 1186 000.

MANUAL REVISION HISTORY

MCN OR REV.NO.	MCN OR REV. DATE	ECN NO.	DESCRIPTION OF CHANGE
6	04/07/76	20365	Page 6-15, Change Parts List No. 994 6507 001 to 994 6507 002. Add the following components: C34, C35 - Cap., 3.9 uF, 35V - 526 0012 000 J3 - Adaptor "BNC" - 620 0455 000 J6 - Receptacle "BNC" - 612 0403 000 P3,P6 - Plug, "BNC" - 610 0238 000 R47 - Res., 33k ohm, 1/2W - 540 0085 000 R46 - Res., 27k ohm, 1/2W - 540 0083 000 R48 - Pot., 10k ohm, 1/2W - 550 0007 000 Delete R9 and description from Parts List. Replace schematic 838 2026 001 with up-dated version no. 838 4726 001.
7	01/29/77	21750	Page 6-7, Parts List, change C23 to read: Cap., 100 uF, 35V, 522 0454 000 Replace schematic 842 5828 001, Replace with updated Rev. J.
8	10/20/77	ERRATA	Page 5-2 Para. 5.9 AUDIO UNIT ALIGNMENT Change: A "Left-Right" signal of 400 Hz is applied to the left and right audio inputs and S1 is switched to the stereo mode. Adjust R18 for a minimum 400 Hz signal level at J11-10 (L-R out) to A "left-Right" signal of 400 Hz is applied to the left and right audio inputs and S1 is switched to the stereo mode. Adjust R17 for a minimum 400 Hz signal level at J11-10 (L-R out).

MANUAL REVISION HISTORY

MCN OR REV.NO.	MCN OR REV. DATE	ECN NO.	DESCRIPTION OF CHANGE
			Change: A "Left-Minus Right" signal of 400 Hz is then connected into the left and right audio inputs. Switch S1 to the stereo mode position and adjust R17 for a minimum 400 Hz signal level at J11-6 (L+R out) to A "Left-Minus Right" signal of 400 Hz is then connected into the left and right audio inputs. Switch S1 to the stereo mode position and adjust R18 for minimum 400 Hz signal level at J11-6 (L+R out).
9	09/30/81	26057	Page 6-10, Table 6.8 Change R1 from Res 300 ohm 7W, 546 0229 000 to Res. 300 ohm 10W, 5%, Non Inductive, 544 1633 000 R3 still retains same description "Same as R1".

WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as references:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

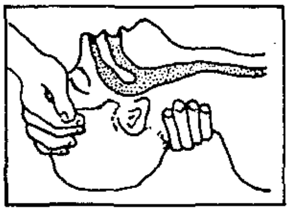
Treatment of Electrical Shock

1. If victim is not responsive follow the A-B-Cs of basic life support.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

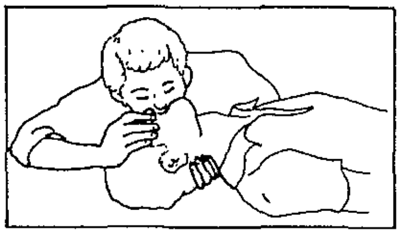
IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

(B) BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL
BREATHING

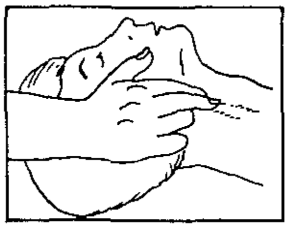


TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH RESUSCITATION
MUST BE COMMENCED AS SOON AS POSSIBLE

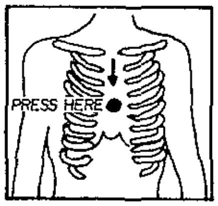
CHECK CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

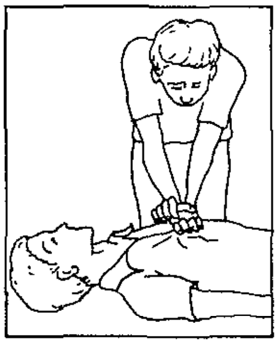
(C) CIRCULATION

DEPRESS STERNUM 1 1/2" TO 2"



APPROX. 80 SEC. { ONE RESCUER
15 COMPRESSIONS
2 QUICK BREATHS

APPROX. 60 SEC. { TWO RESCUERS
5 COMPRESSIONS
1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS
WHEN SECOND PERSON IS GIVING BREATH

Call for medical assistance as soon as possible.

2. If victim is responsive.

   a. keep them warm
   b. keep them as quiet as possible
   c. loosen their clothing
      (a reclining position is recommended)

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin

    a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
    b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
    c. Treat victim for shock as required.
    d. Arrange transportation to a hospital as quickly as possible.
    e. If arms or legs are affected keep them elevated.

NOTE

> If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)

    a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
    b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
    c. Apply clean dry dressing if necessary.
    d. Treat victim for shock as required.
    e. Arrange transportation to a hospital as quickly as possible.
    f. If arms or legs are affected keep them elevated.

REFERENCE: ILLINOIS HEART ASSOCIATION

AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

TABLE OF CONTENTS

SECTION 1 - DESCRIPTION

1.1 GENERAL

The TE-3 Exciter consists of five basic, interconnected, modular units; Power Supply, Power Amplifier, Modulated Oscillator, Automatic Frequency Control, and Audio Section. See Fig. 1.1.

The frequency range of the exciter is from 87.5 MHz to 108 MHz and it is factory tuned to the customer specified frequency.

The exciter is completely self-contained. The oscillator of the exciter operates at the carrier output frequency eliminating frequency multipliers. This insures improved carrier stability and excellent frequency response when the power level is increased in conjunction with high power transmitters. The output power of the exciter is 10 to 15 watts.

1.2 OPTIONAL EQUIPMENT

The TE-3 exciter has provisions for three optional plug in modules; two SCA Generators, and one Stereo Generator. Figure 1.1 shows the TE-3 with Stereo Generator and SCA Generator installed.

1.3 TECHNICAL CHARACTERISTICS

1.3.1 MECHANICAL:

Width:	19" (Fits standard rack mount)	
Height:	14"	
Depth:	12 ¼"	
Weight:	(Uncrated)	52 lbs. (monaural only) 3 lbs. (SCA generator) 6 lbs. (stereo generator)
Finish:	Beige	

Semiconductors used throughout.

1.3.2 ELECTRICAL: (Monaural Operation)

Frequency Range:	87.5 to 108 MHz
Power Output:	10 Watts
RF Harmonics:	Suppression meets or exceeds all FCC requirements
RF Output Impedance:	50 ohms (BNC connector)
Frequency Stability:	.001% or better
Modulation Capability:	Capable of ±100 kHz (±75 kHz=100% modulation)
Audio Input Impedance:	600 ohms balanced
Audio Input Level:	+10 dBm ±2 dB for 100% modulation at 400 Hz

Audio Frequency Response:	Standard 75 microsecond FCC pre-emphasis curve, ± 1 dB, 30-15,000 Hz
Distortion:	.5%, 30 to 15,000 Hz
FM Noise:	65 dB below 100% modulation (ref. 400 Hz)
AM Noise:	70 dB below reference carrier AM modulated 100%
Temperature:	-20° to $+50^{\circ}$ C
Altitude:	7,500 feet
Power Requirements:	117 V AC, single phase, 60 Hz, 85 watts

1.3.3 ELECTRICAL: (Stereophonic Operation)

Pilot Oscillator:	Crystal controlled
Pilot Stability:	19 kHz ± 1 Hz, 0° to 50° C
Audio Input Impedance (Left and Right):	600 ohms balanced
Audio Input Level: (Left and Right):	+10 dBm ± 1 dB for 100% modulation at 400 Hz
Audio Frequency Response (Left and Right):	Standard 75 microsecond, FCC pre-emphasis curve, ± 1 dB, 50-15,000 Hz
Distortion (Left and Right):	1% or less, 50-15,000 Hz
FM Noise (Left and Right):	60 dB (minimum) below 100% modulation (ref. 400 Hz)
Stereo Separation (Left to Right or Right to Left Channel):	35 dB (minimum) 50 to 15,000 Hz
Sub-Carrier Suppression (With or without modulation present):	42 dB (minimum) below 90% modulation
* Crosstalk (Main channel to sub-channel or sub-channel to main channel):	42 dB (minimum) below 90% modulaton, 50-15,000 Hz
Sub-Carrier 2nd Harmonic Suppression (76 kHz):	60 dB or better below 100% modulation

NOTE: Stereophonic measurements to be made with an FCC approved monitor.

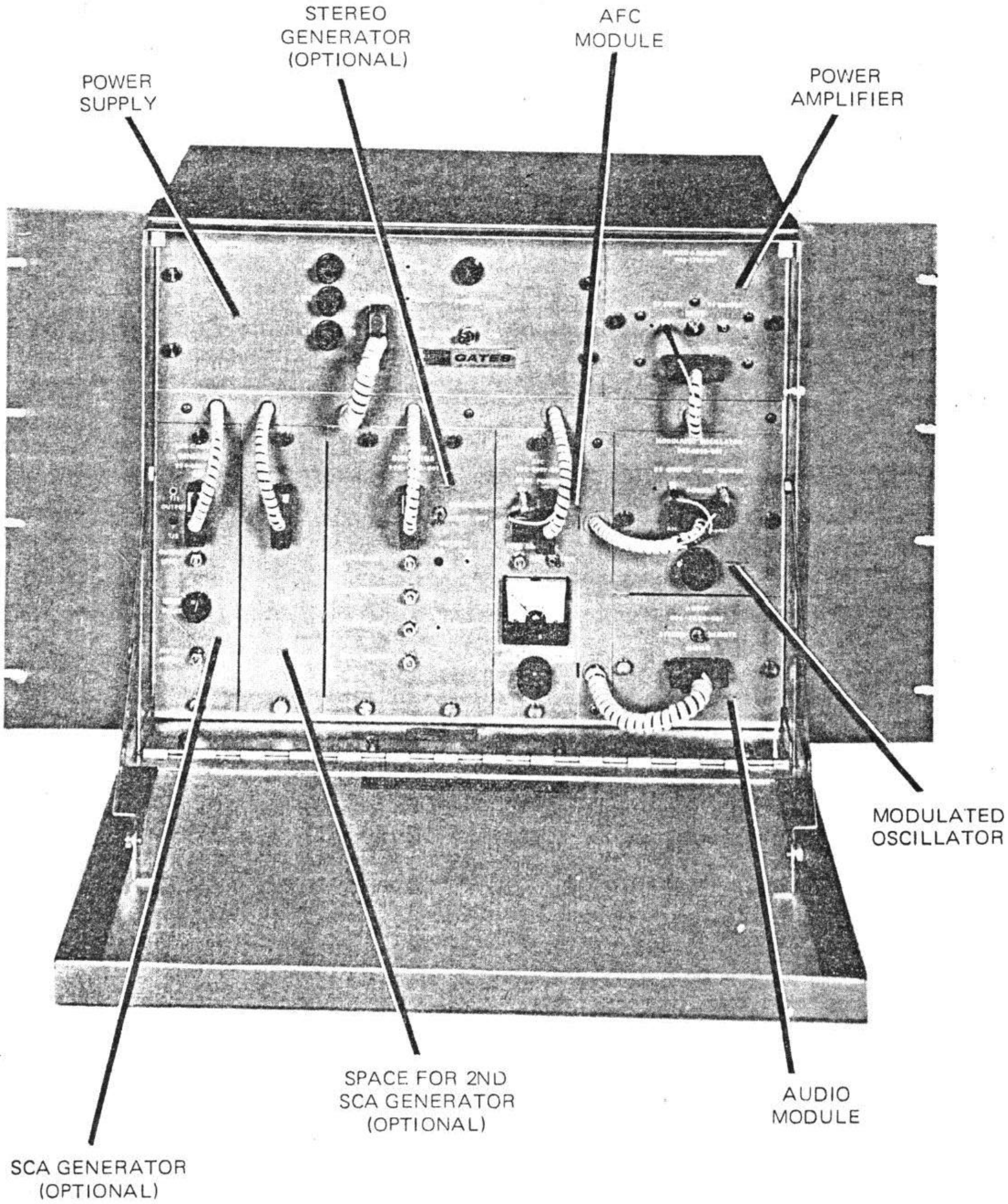
* Measurement to be made using an L=R signal for sub-channel crosstalk and an L=-R signal for main channel crosstalk.

1.3.4 ELECTRICAL: (SCA Operation)

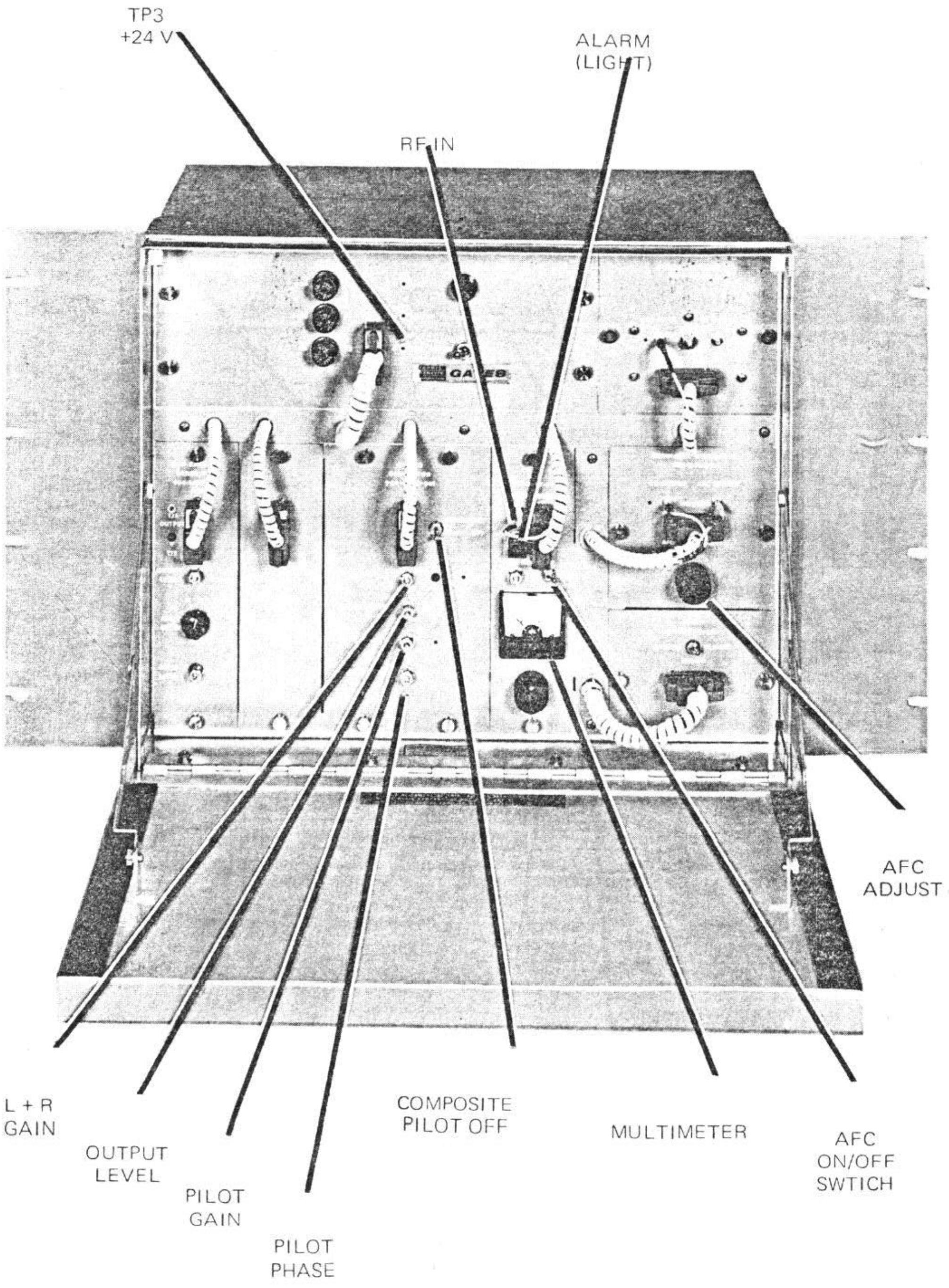
Frequency:	Any SCA channel between 25 and 75 kHz
Frequency Stability:	±500 Hz
Oscillator Type:	Two Colpitts heterodyned to produce desired output frequency
Modulation:	Direct FM
Modulation Capability:	Capable of ±7.5 kHz (±5 kHz considered 100% modulation)
Audio Input Impedance:	600 ohms balanced
Audio Input Level:	+8 dBm, ±3 dB for 100% modulation at 400 Hz
Audio Frequency Response:	41 kHz and 67 kHz, 50 microsecond, modified pre-emphasis 67 kHz response modified for proper operation when used with stereo to conform to FCC specs
Distortion:	1.5% (or better) 30-7,000 Hz
FM Noise (Main channel not modulated):	55 dB minimum (ref. 100% modulation 400 Hz)
Crosstalk (Sub-channel to main channel and stereophonic sub-channel):	-60 dB or better
** Crosstalk (Main channel to sub-channel):	50 dB below 100% modulation (ref. 400 Hz) with main channel modulated 70% by frequencies 30-15,000 Hz

** Crosstalk measurements to be made from an FCC approved monitor using 75 microsecond de-emphasis.

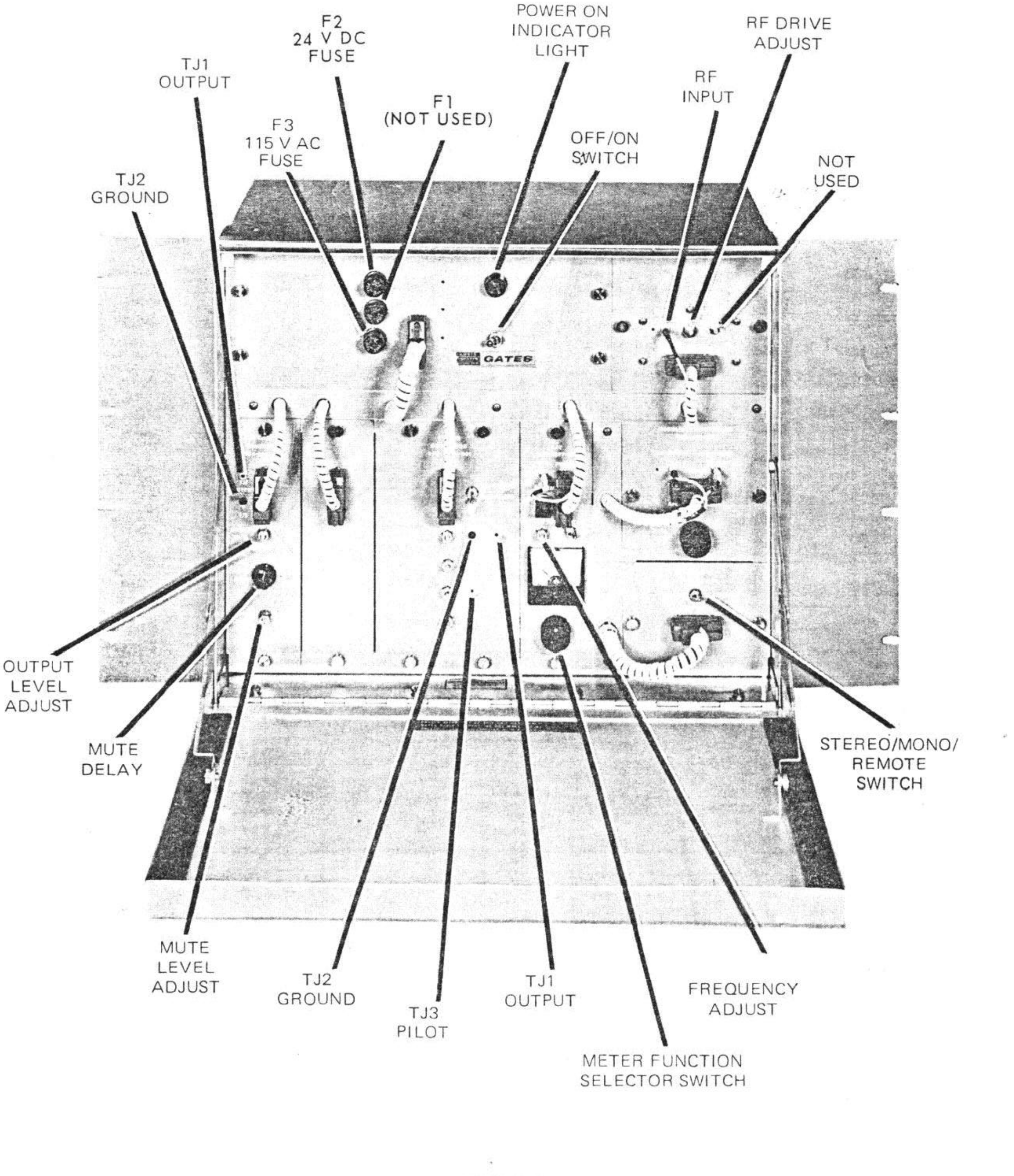
Automatic Mute Level:	Variable from 0 to 40 dB below 100% modulation
Remote Control:	Exciter is internally equipped to be locally or remotely switched from monaural to stereo operation. On monaural operation, normal right audio input connections are switched to the 41 kHz SCA position, if used. Remote functions are accomplished by a single set of external relay contacts, (closure required for stereo operation). An external relay must provide a holding function.



FRONT
VIEW
FIG. 1.1



FRONT
VIEW
FIG. 1.2



FRONT
VIEW
FIG. 1.3

SECTION 2 - INSTALLATION

2.1 DAMAGE CLAIM INFORMATION

In case of damage, notify the delivering carrier at once. After he has approved the damage report order new part(s) from Gates Radio Company, using the parts list for description and individual identification.

2.2 UNPACKING AND INSPECTION

The container and packing should be removed only after a careful examination of the outside of the carton for indications of possible mishandling.

Retain packing material until installation is complete and the TE-3 is placed in operation.

2.3 UNPACKING CHECK LIST

When the TE-3 is shipped as a separate unit, the following items are furnished and packed separately:

EQUIPMENT	GATES PART NO.
Basic TE-3 Cabinet	992 2735 001
Power Supply	992 1726 0C2
Modulated Oscillator (Module)	992 2696 001
Audio Unit (Module)	992 1830 001
AFC Control (Module)	992 2697 001
Power Amplifier (Module)	992 1715 001
Technical Manual	888 1042 001
Optional	
SCA Generator 1 or 2 Modules(s)	994 6507 001
Stereo Generator (Module)	994 6533 001

2.4 MECHANICAL DETAILS

The modular design assures easy access to all parts during inspection, routine maintenance and repair. Each module may be released from the chassis by means of thumb screws, and operated external to the chassis.

The exciter output may be connected into a dummy load, antenna, or a following amplifier stage.

2.5 POWER REQUIREMENTS & CONNECTION

A 117 V AC, 60 Hz, single phase, 85 watt, fuse or circuit breaker protected, power source is required. No additional equipment is necessary for operation.

Connect the input power to terminals 7 & 8 of TB1. See Fig. 2.1.

When the AC input is 117 VAC, the black and green/black primary leads of the transformer T1 should be used. If the AC input voltage is less than 105 VAC, the black and white/black primary leads should be used. If the AC input voltage is greater than 125 VAC, the black and white primary leads should be used.

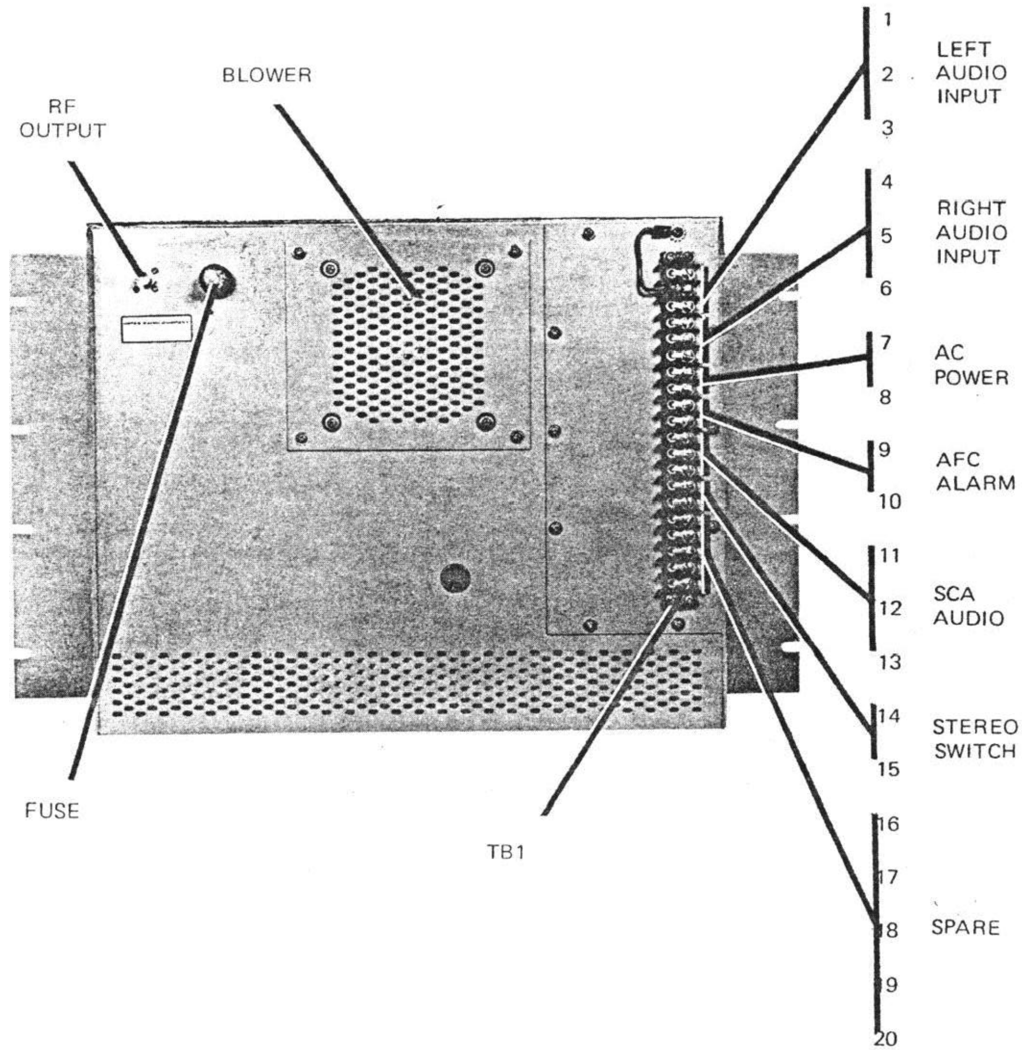
2.6 R.F. OUTPUT CONNECTION

The R.F. connection to the exciter is a BNC connector (J1) on the rear of the unit. See Fig. 2.1. Use coaxial cable type RG58A/U.

2.7 ADDITIONAL CONNECTIONS - See Fig. 2.1

Additonal connections are located on the terminal board TB1 on the rear of the exciter. They are as follows:

1–2–3:	Left Audio Input	(2 is shield)
4–5–6:	Right Audio Input or SCA	(5 is shield)
7–8:	AC Input	
9–10:	AFC Alarm	(N.C.)
11–12–13:	SCA Audio	(12 is shield)
14–15:	Stereo-Mono Switch	
16–17–18–19–20:	Spare	



REAR
VIEW
FIG. 2.1

SECTION 3 - OPERATION & ADJUSTMENT

3.1 FRONT PANEL CONTROLS

The following table gives the identification and function of the front panel controls, (See Fig. 1.1 for basic modules).

TABLE 3.1
FUSES & TEST POINTS
LOCATION AND IDENTIFICATION

IDENTIFICATION	TYPE	FUNCTION
Power Supply		
F2	3 Amp Fuse	Protect +24 Volt circuits
F3	2 Amp Fuse	Protect 115 V AC circuits
S1	Toggle Switch	Energize/De-energize unit
A1	Green Light	Indicates unit energized
Power Amplifier		
R11	Potentiometer	DRIVE Adjust
Modulated Oscillator		
R29	Knob controlled Pot.	AFC Adjust
Audio Unit		
	Toggle Switch	STEREO/MONO/REMOTE SELECT
AFC Unit		
S1	Toggle Switch	AFC - ON/OFF
R48	Potentiometer	FREQ. ADJUST
M1	DC Microammeter	Indicates indexed function
S2	5 position knob controlled switch	Indicates meter function
Stereo Generator		
S1	Toggle Switch	COMPOSITE/PILOT OFF
TJ1	Jack (Test)	COMPOSITE OUTPUT
TJ2	Jack (Test)	GROUND
R68	Potentiometer	L + R GAIN Adjust
R53	Potentiometer	OUTPUT LEVEL Adjust
R27	Potentiometer	PILOT GAIN Adjust
R24	Potentiometer	PILOT PHASE Adjust
SCA Generator		
TJ1	Jack (Test)	OUTPUT
TJ2	Jack (Test)	GROUND
R30	Potentiometer	OUTPUT LEVEL Adjust
S1	4 position knob	MUTE DELAY Select
R32	Potentiometer	MUTE LEVEL Adjust

3.2 **TURN ON PROCEDURE**

INITIAL

Connect input, output, and power leads as outlined in Section 2.

Turn on main power switch S-1 on the power supply and allow approximately thirty seconds warmup. Set the AFC "OFF/ON" switch to the "ON" position. The red "Alarm" lamp should be extinguished.

> NOTE: *If it is not, slowly rotate the "AFC Adjust" control on the modulator until it is extinguished.*

Adjust the "DRIVE" control on the Power Amplifier for required output.

Select stereo or mono operation with the toggle switch on the audio unit.

After approximately 30 minutes adjust the frequency by rotating R-48 "FREQ ADJ" on the AFC unit for correct frequency as read on a frequency monitor or counter.

The TE-3 is now ready for operation.

> NOTE: *In routine operation it is recommended that the TE-3 be left on at all times.*

3.3 **MODULATED OSCILLATOR ADJUSTMENT** - See Fig. 4.3

The front panel control "AFC ADJUSTMENT" is a vernier frequency adjustment. Two additional factory adjustments, coarse frequency adjustment (L3) and the modulator bias adjustment (R6) are located on the shock mounted chassis.

Turn the "AFC ADJUSTMENT" control to a mid-range position and turn the meter switch on the AFC unit to the "AFC" position. Turn the AFC switch to "ON".

> NOTE: *Within a few seconds the "Alarm" lamp should extinguish and the AFC meter should read on scale.*

Adjust the "AFC ADJUSTMENT" on the modulated oscillator for a reading between 29 and 31 on the AFC meter.

> NOTE: *The recommended operating range of the "AFC" position of the meter switch is from 22 to 35. Operation within this range will assure that the modulated oscillator is always within the capture range of the automatic frequency control unit. This will assure that the automatic frequency control will regain a locked condition after a power failure or other interruption of power.*

3.4 **ALARM CIRCUITS ADJUSTMENT**

The operation of the AFC alarm system may be verified in the following manner.

Momentarily disconnect the RF connector from the "AFC" input jack on the modulated oscillator. Note that the "ALARM" lamp lights immediately. Re-insert the connector and note that the lamp extinguishes within a few seconds.

Note that the AFC meter is in the "AFC" position and rotate the "AFC ADJUSTMENT" fully counterclockwise. Note that the meter reading has decreased to approximately 15. Momentarily turn the "AFC" switch off and on. Note that the "ALARM" lamp illuminates and the meter returns to mid-scale. Rotate the "AFC ADJUSTMENT" clockwise until the "ALARM" lamp is extinguished. Set the "AFC ADJUSTMENT" for a reading between 29 and 31 on the AFC meter.

3.5 AFC MULTIMETER

POSITION	INDICATION
"Mod"	Output of Modulator Frequency Divider Chain. Nominal Reading: 35-45
"Ref"	Output of Reference Frequency Divider Chain. Nominal Reading: 35-45
"AFC"	AFC Buss Voltage. Nominal Reading: 25-35
"Mod Out"	Power Output of Modulator. Nominal Reading: Refer to Final Test Data supplied with exciter.
"PA Out"	Power Output of Exciter. Nominal Reading: Refer to Final Test Data supplied with exciter.

SECTION 4 - THEORY OF OPERATION

4.1 GENERAL

The TE-3 Exciter is self-contained with capabilities in excess of minimum FCC specifications.

Each exciter is factory tested on the customer's frequency and satisfactory operation is verified.

4.2 POWER SUPPLY - See Fig. 7.3 Schematic & Fig. 4.1 Photograph

The power supply consists of a two section unit. The two sections supply a regulated 24 DC volts and a regulated 150 DC volts respectively. Both sections receive AC voltage from a common power transformer.

NOTE: The 150 volt section is not used in the TE-3.

In the 24 volt supply, the AC voltage supplied by transformer T1, is rectified by diodes CR6 through CR9. The rectified voltage is applied to filter section C3, C4, and R7. Q4 is a series control transistor that regulates the 24 volt supply. A sample of the output voltage is compared with reference voltage in Q7. The reference voltage is supplied by temperature compensated diodes CR10 and CR11. Any change in the output voltage is amplified by Q5 and Q6. This amplified output causes series control Q4 to return the output voltage to the value set by R11.

NOTE: The output voltages will remain relatively constant over a temperature range of -20 to +70^{o} C. The output voltages will remain constant as the line voltage is varied from 85 to 115% of normal 117 volt AC supply. Normal load variations will cause no voltage change in these supplies.

4.3 POWER AMPLIFIER - See Fig. 7.6 Schematic & Fig. 4.2 Photograph

The power amplifier is a four stage amplifier. Transistors Q1, Q2, and Q3 are single stage amplifiers. Q4 and Q5 are paralleled to obtain the desired output level.

Maximum power is 10 to 15 watts. Power output is determined by the setting of R11, the input drive control. Transformers T1 and T2, along with the associated capacitors C4 and C7 match the output impedance of these stages to the low input impedance of the following stages. Inductors L1, L2, and capacitors C14 and C15 match the output impedance of Q3 to the low impedance of Q4 and Q5. The output circuit of Q4 and Q5 is a modified Pi type of circuit consisting of L5, L6, and C19 and C20.

4.4 AUDIO UNIT - See Fig. 7.7 Schematic & Fig. 4.5 Photograph

The audio unit supplies the modulated oscillator with all main channel modulation (excluding SCA). When the function switch is in the "MONO" position, left audio input is filtered and pre-emphasized and applied directly to the modulated oscillator unit. The composite stereo signal including the pilot is completely removed from the modulation input of the modulated oscillator.

If the function switch is in the "STEREO" position, left and right audio inputs are filtered, pre-emphasized and applied to a resistive matrix. They then connect to the stereo generator. The composite stereo signal including pilot returns through the audio unit for application to the modulation input of the modualted oscillator.

Left audio input circuitry consists of three fundamental types of circuits. First, is a 19 kHz notch filter consisting of L1 and C1.

Resistors R1 through R5 and capacitors C2, C3, C4 along with inductor L2 form a 75 microsecond pre-emphasis section.

The primary and secondary impedance of T1 is 600 ohms. Right audio input circuitry is exactly identical to left audio input circuitry.

When selector switch S1 is in the STEREO position, output of the left pre-emphasis section is connected to the primary of T1. The secondary of T1 connects into the matrix consisting of R13 through R18. At the same time, right audio input signals are routed through the right 19 kHz filter, pre-emphasis network and T2. The secondary of T2 is also connected into the resistive matrix.

Output of the matrix then produces the L—R and L + R signals for application to the signal unit of the stereo generator. At the same time the composite signal along with the 19 kHz pilot is connected through the relay to the input terminals of the modulated oscillator.

When S1 is placed in the MONO position, audio input signals connected to the left audio input, again pass through a 19 kHz notch filter and the left pre-emphasis network. There the signal terminates in R11. R11 may be adjusted to produce the desired modulation level for a given level of audio input.

Also with S1 in the MONO position the normal right stereo input terminals are connected through relay contacts K1 for application to the input of a 41 kHz sub-carrier generator unit if it is used. The 41 kHz SCA (if used) is muted when audio is not applied.

The stereo generator is completely bypassed when S1 is in the MONO position and no stereo signals (or pilot) can modulate the main carrier.

When S1 is in the REMOTE position the mono to stereo functions may be performed by the contacts of a remote control relay. This relay must perform a holding function.

4.5 **MODULATED OSCILLATOR** - See Fig. 7.4 Schematic & Fig. 4.3 Photograph

The modulated oscillator accepts monaural, composite stereo, and SCA signals and generates a stable, low distortion, frequency modulated signal in the standard FM broadcast band of 87.5 to 108 MHz.

The modulated oscillator consists of three sections; a stable oscillator, a buffer amplifier, and a power supply regulator.

There are four inputs to the modulated oscillator; baseband for monaural or composite stereo, two isolated SCA inputs, and an automatic frequency control input.

Three outputs from the modulated oscillator are as follows: An RF output of approximately 500 millivolts into a fifty ohm load for automatic frequency control (J-2). An RF output of 20 milliwatts to drive a power amplifier (J-3) and a DC output proportional to the RF output level that provides a convenient means of monitoring the RF output of the modulator (J1-9).

4.5.1 OSCILLATOR

The oscillator is a modified "CLAPP" circuit operating at the assigned carrier frequency at a power level of approximately 150 milliwatts.

The oscillator frequency is adjusted by L3 and R29. L3 is an internal coarse frequency adjustment used to set the oscillator frequency within the adjustment range of the vernier frequency adjustment R29.

> *NOTE: L3 is factory adjusted and should not be reset in the field.*

Resistor R29 is a ten turn potentiometer located on the front panel. See Fig. 1.1. R29 provides a reverse bias voltage to CR3, a voltage variable capacitor, used as an electrically adjustable frequency control. A DC control voltage from the automatic frequency control unit maintains the electrical adjustment and is the frequency controlling element in the system.

Diodes CR1 and CR2 are connected to the oscillator tank circuit and are biased to the linear region by resistor R6, the "Modulator Bias" control. See Fig. 4.3.

Modulation from the audio unit, or SCA generators, or stereo generator is applied to the junction of diodes CR1 and CR2.

4.5.2 BUFFER AMPLIFIER

A broadband matching network consisting of L4 and C12 matches the collector circuit of the oscillator transistor Q1 to the attenuator network, R13, R14, and R15. The attenuator provides a nonreactive load and isolation for the signal. Transistor Q2 amplifies the oscillator output to approximately 500 milliwatts.

A broadband low pass filter comprised of C23, C24, and L6 matches the collector circuit of Q2 to the output attenuator, R20, R21, and R22.

The attenuator network reduces the output level of the buffer stage to a level sufficient to drive the power amplifier and provides additional isolation for the oscillator circuit.

A sample of the RF output of the buffer stage is directed to the automatic frequency control system. An additional sample of the RF output is rectified by diode CR8. The DC voltage derived from diode CR8 is used to provide a meter reading on the AFC unit proportional to the RF output of the modulated oscillator.

> *NOTE: The oscillator and buffer transistors are low noise silicon "overlay" transistors designed specifically for VHF oscillator and amplifier applications.*

4.5.3 POWER SUPPLY REGULATOR

The power supply regulator is a conventional pass transistor type using a zener, regulated reference voltage applied to the base of Q3. The reference voltage is temperature compensated by diode CR7.

4.6 AUTOMATIC FREQUENCY CONTROL UNIT

See Fig. 7.5 Schematic & Fig. 4.4 Photograph

The automatic frequency control unit is designed to operate in conjunction with the modulated oscillator to provide a stable, automatically controlled, FM broadcast signal in the standard FM broadcast band of 87.5 to 108 MHz.

The automatic frequency control unit is divided into five sections: Reference oscillator, frequency dividers, phase detector, power supply regulator, and alarm circuitry.

The AFC unit operates on the principle of the phase locked loop. The input signal frequency from the modulated oscillator is phase locked to an internal crystal controlled reference.

The AFC unit is energized from the FM exciter main frame with 24 V DC at 300 milliamps. In addition, 500 millivolts of RF at the carrier frequency is necessary for operation.

A multimeter is incorporated (see Fig. 1.2), to monitor five parameters associated with the AFC unit, the modulated oscillator, and the power amplifier. A red pilot light will indicate any malfunctions and a front panel switch disables the AFC unit during initial tune-up and in case of malfunction.

Exact center frequency adjustment is assured by a vernier frequency control.

4.6.1 REFERENCE OSCILLATOR

The reference oscillator is a standard crystal controlled oscillator utilizing an integrated circuit, Z12. The oscillator frequency is adjusted with capacitor C27 and diode CR10.

The first two transistors of the integrated circuit Z12 form an emitter coupled amplifier and the third transistor is a buffer amplifier to isolate the load from the crystal oscillator. The crystal is a high stability unit enclosed in a temperature controlled oven. The oven temperature is maintained at 60° C by the closed loop system consisting of integrated circuit Z13, a differential amplifier, thermistor RT1, transistor Q6, and resistor R38. R38 is used as the oven heater element. The oven temperature is evaluated by thermistor RT1. The output of RT1 controls the bias voltage at the base of Z13B. The bias voltage is compared with the reference setting at the base of Z13A and the difference between the two voltages is amplified and applied to the base of control transistor Q5. Q5 regulates the current through the heater resistor R38 and controls the oven temperature.

4.6.2 FREQUENCY DIVIDERS

Two frequency divider systems are incorporated in the AFC unit, one for the modulated oscillator output and one for the reference oscillator output.

The modulated oscillator divider consists of integrated circuits Z1 through Z7 and divides the input frequency by 16,384. This is necessary to eliminate the phase shift in the incoming signal caused by the frequency modulation. The large division ratio permits full range modulation from twenty hertz upward without upsetting the phase detector function.

All of the integrated circuits are bi-stable multi-vibrators or "Flip Flops". The resultant output of either side of the flip flops is a frequency one half of the input frequency. The output at test point TP1 is 1/16th of the incoming frequency.

Transistor Q1 is a buffer amplifier used to isolate and amplify the output of Z4 to a level sufficient to drive Z5. Integrated circuits Z5, Z6, Z8, and Z9 divide each incoming signal by sixteen. Integrated circuit Z7 divides the incoming signal by four.

The reference oscillator frequency divider consists of integrated circuits Z8 and Z9 and divides the frequency of the reference oscillator by 256. This is done in order to operate the crystal in the most stable range.

4.6.3 PHASE DETECTOR

The phase detector consists of integrated circuit Z10. The IC is a flip-flop circuit with the toggle input connected to the reference oscillator frequency divider which keys alternate sides of the flip-flop. The resultant output of the phase detector is a square wave with a duty cycle of fifty percent. The output of the modulated oscillator frequency dividers is also a square wave. This signal is differentiated by capacitor C9 and resistor R5 to form a sharp pulse. The pulse is used to "set" the flip-flop Z10.

> NOTE: *If the frequencies at the input of the phase detector are exactly equal, the output of the phase detector will be a square wave with a duty cycle proportional to the relative phase of the two input signals.*

The square wave output of the phase detector is amplified by transistor Q2 to a level of approximately twenty volts peak to peak. The signal is then filtered by resistors R9 and R10 and capacitors C13 and C14 to remove the reference frequency component of the signal. The amplitude of the remaining DC component is then proportional to the phase difference of the input signals and is used to control the modulated oscillator frequency.

4.6.4 ALARM CIRCUITS

Five circuits are monitored by the alarm circuits, three directly and two indirectly. The alarm output, indicating functional failures, is displayed on the front panel by indicator lamp DS-1. The alarm output is also available in the form of normally open and normally closed relay contacts through the power connector.

The circuits directly monitored by the alarm system are the reference and modulated oscillator frequency dividers and the "out of lock" condition. The circuits indirectly monitored are the reference oscillator output and the modulated oscillator output through their respective dividers.

The output of the reference frequency dividers is detected and converted to a DC voltage by diodes CR1 and CR2. The detected voltage is amplified by Z11C and Z11D.

NOTE: Both amplifier stages are biased in a saturated condition or cut off.

In normal operation both stages are saturated and there is no output from Z11D. If a failure occurs in this section, the voltage at the collector of Z11D will increase toward five volts. Diode CR5 will conduct, turning on Z14B and Q3. When Q3 conducts, alarm lamp DS-1 illuminates and relay K1 is energized. This action disables the associated transmitter.

The modulated oscillator and its associated frequency dividers are monitored in an identical manner by Z11A and Z11B and their associated components.

An "out of lock" condition exists when the modulated oscillator is operating at a frequency outside the lock in range of the phase detector and the automatic frequency control circuit. When this condition occurs the phase detector output will contain a large AC component in addition to the normal comparison frequency and DC component. The AC component is directly proportional to the frequency error between the two signals. The AC component is amplified by Z14A and detected by diodes CR11 and CR12. The resultant DC voltage turns on Z14B and Q3 in a manner identical to the presentation in the previous section.

The comparison frequency present in the normal output of the phase detector is removed by the filtering action of R27, R28, C20, and C21.

NOTE: The frequency response of the amplifier is such that it will not respond to all signals outside the capture range of the phase detector.

4.7 STEREO GENERATOR

A 19 kHz pilot signal is generated by a crystal controlled oscillator Q1 for the composite stereo. Q2 isolates this signal and the 19 kHz signal is applied to the 19 kHz tuned amplifier stage Q3. The secondary of transformer T1 is connected to a push-pull doubler circuit consisting of transistors Q4 and Q5.

This stage in conjunction with transformer T2 generates a 38 kHz signal. The 38 kHz signal is applied to the balanced sub-carrier modulator circuit consisting of transformers T3 and T4 and diodes CR1 through CR4.

An L-R input signal from the audio unit is also applied to the balanced sub-carrier modulator.

An L-R double sideband suppressed carrier signal appears at the output of T4. Harmonics of this signal are reduced by forward biasing of diodes CR1 through CR4 and by adjusting the harmonic null control R37. Sub-carrier null control R48 balances out the residual 38 kHz sub-carrier to a level of approximately -45 dB.

NOTE: Second harmonics of the double sideband signal fall into the band pass of the normal 67 kHz SCA signal. If these second harmonic signals are not attenuated, crosstalk from the stereo signal will interfere with the sub-carrier channel.

The L+R input signal from the audio unit is combined with the L-R double sideband signal at the junction of C22, R53, and R60. A circuit consisting of L3 through L6 and capacitors C29 and C30 adjusts the time delay of the L+R input to match the L-R signal. A composite stereo signal appears at the junction of C22, R53, and R60. This signal is applied to the emitter follower Q12 from the output level control R53.

The composite stereo signal is amplified by Q13 and applied to the base of emitter follower Q14.

The total composite signal with 10% 19 kHz pilot signal appears at the emitter of Q14.

A pilot signal from terminal 4 of transformer T1 is applied to emitter follower Q6. Maximum separation is maintained by the adjustment of the pilot phase by the phase control between Q6 and emitter follower Q7. A pilot gain control is incorporated at the emitter of transistor Q7. The pilot signal is added to the composite output by connecting R27 to the emitter resistor of Q14.

The second harmonic signal from R53 via Q8 is amplified and inverted by Q9. This signal is applied to emitter follower Q10 and from Q10 to the amplifier Q13, thus cancelling the harmonics.

NOTE: Crosstalk null control R33 cancels any remaining cross-talk.

4.8 SUB-CARRIER GENERATOR

The sub-carrier generator generates the sub-carrier frequencies (41 or 67 kHz) by utilizing two self-excited oscillators.

Q1 and Q2 are the individual Colpitts oscillators. Q1 oscillates at 900 kHz and Q2 oscillates at 941 or 967 kHz.

The outputs from Q1 and Q2 are mixed by diodes CR1 and CR2. Filter network L5, C13, and C14 remove all undesired frequencies.

The sub-carrier frequency is amplified by Q3 and applied to a tunable low pass filter. The filter consists of L6, L7, L8, C19, C20, C21, and C22, and removes all harmonics of the sub-carrier frequency.

By variation of the base bias voltage the oscillators are frequency modulated at an audio rate. The audio modulation is applied to the oscillators Q1 and Q2 by the push-pull audio transformer T1.

NOTE: An audio shaping network is connected prior to the primary of T1. The network is adjusted so that the audio response will increase several dB at 5 kHz with respect to the 400 Hz reference. The response will roll-off above 5 kHz.

When this generator is used as a 67 kHz sub-carrier unit for use with stereo, capacitors C1 and C2 are disconnected. The circuit then functions as a de-emphasis circuit. The roll-off is above 3 kHz to avoid generating side bands that would interfere with the stereo signal.

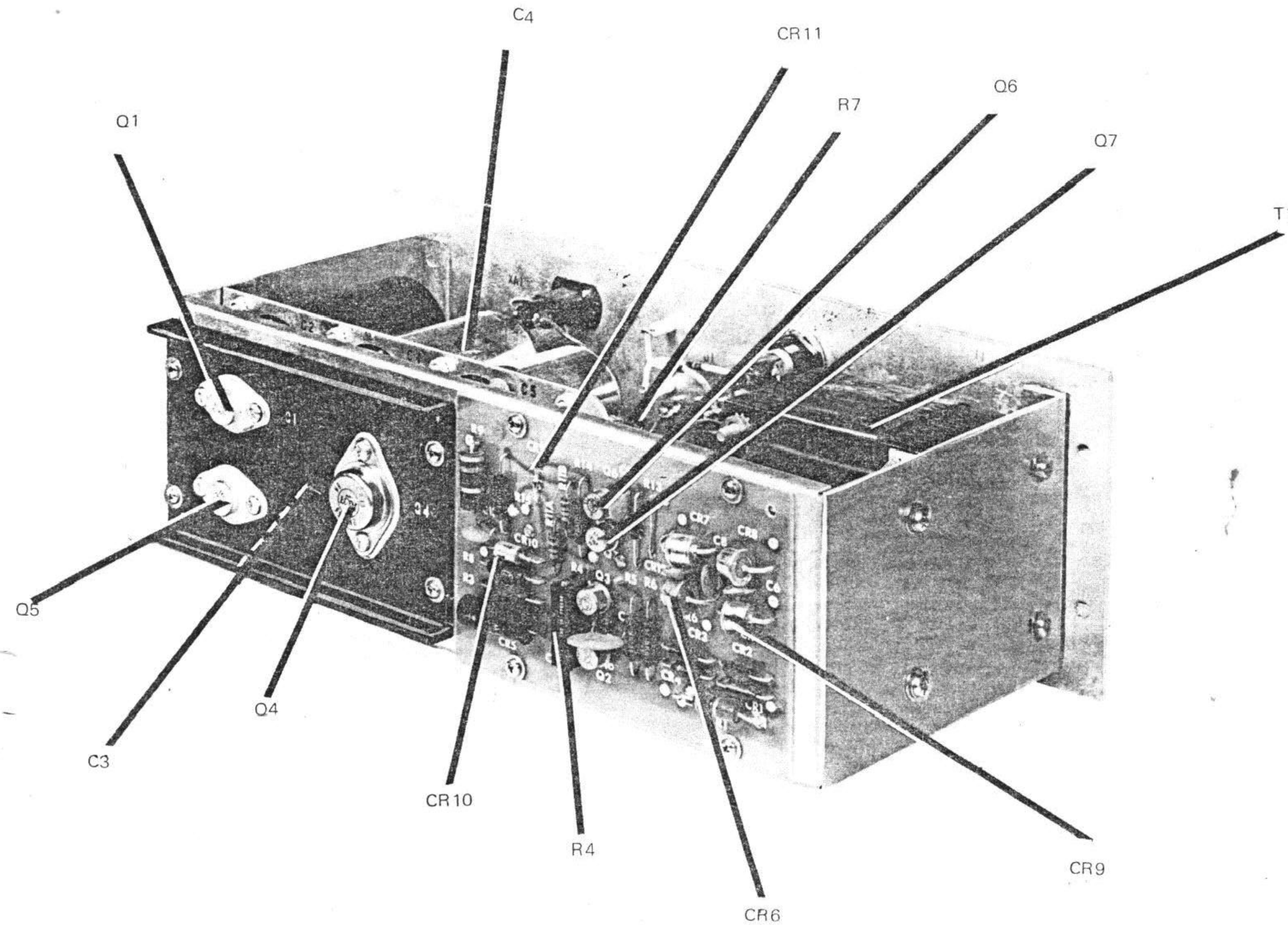
A portion of the audio input is applied to a muting circuit consisting of Q4, Q5, Q6, and Q7. Q4 and Q5 amplify and square the input audio. The resulting square wave signal is rectified by diodes CR3 and CR4.

When audio is applied to Q6 the DC level at the base of Q6 and the bias of Q7 keeps Q6 and Q7 from conducting.

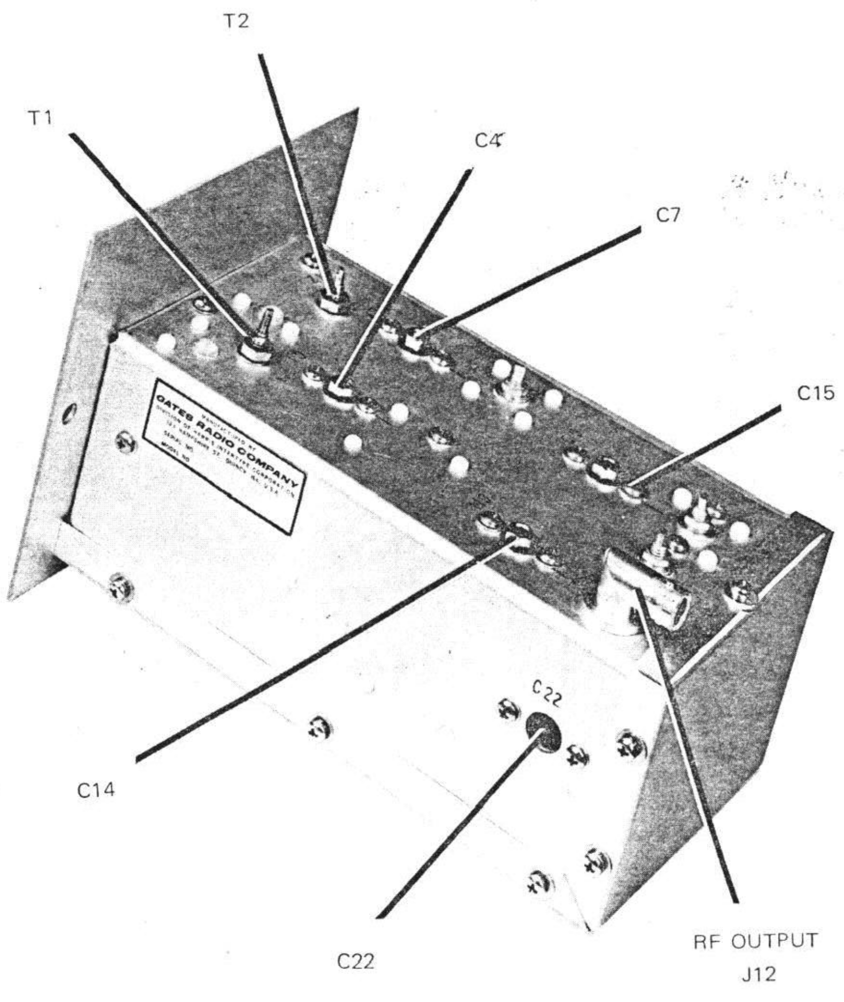
When audio input is removed, Q6 and Q7, conduct causing the impedance from the junction of C17 and C18 to chassis ground to drop to a few ohms. This causes the sub-carrier output to be attenuated approximately 50 to 60 dB.

> *NOTE:* *The length of time between sub-carrier shut off and when the audio is removed from Q4 is determined by a capacitor network at the base of Q6 in conjunction with the mute time constant switch S1.*

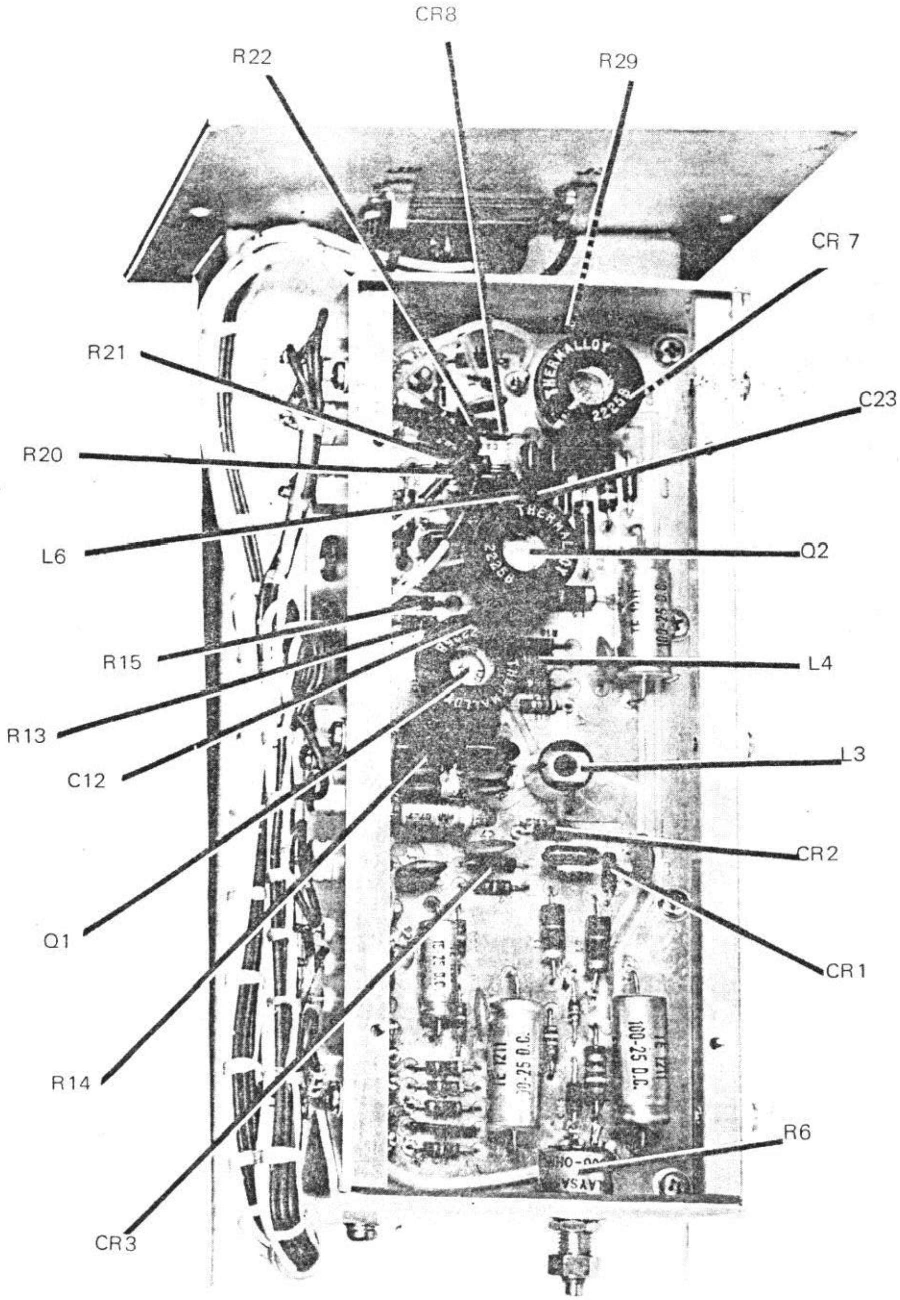
The Mute Level control, R32, determines the audio level required to turn OFF the sub-carrier.



INTERNAL VIEW
POWER SUPPLY
FIG. 4.1

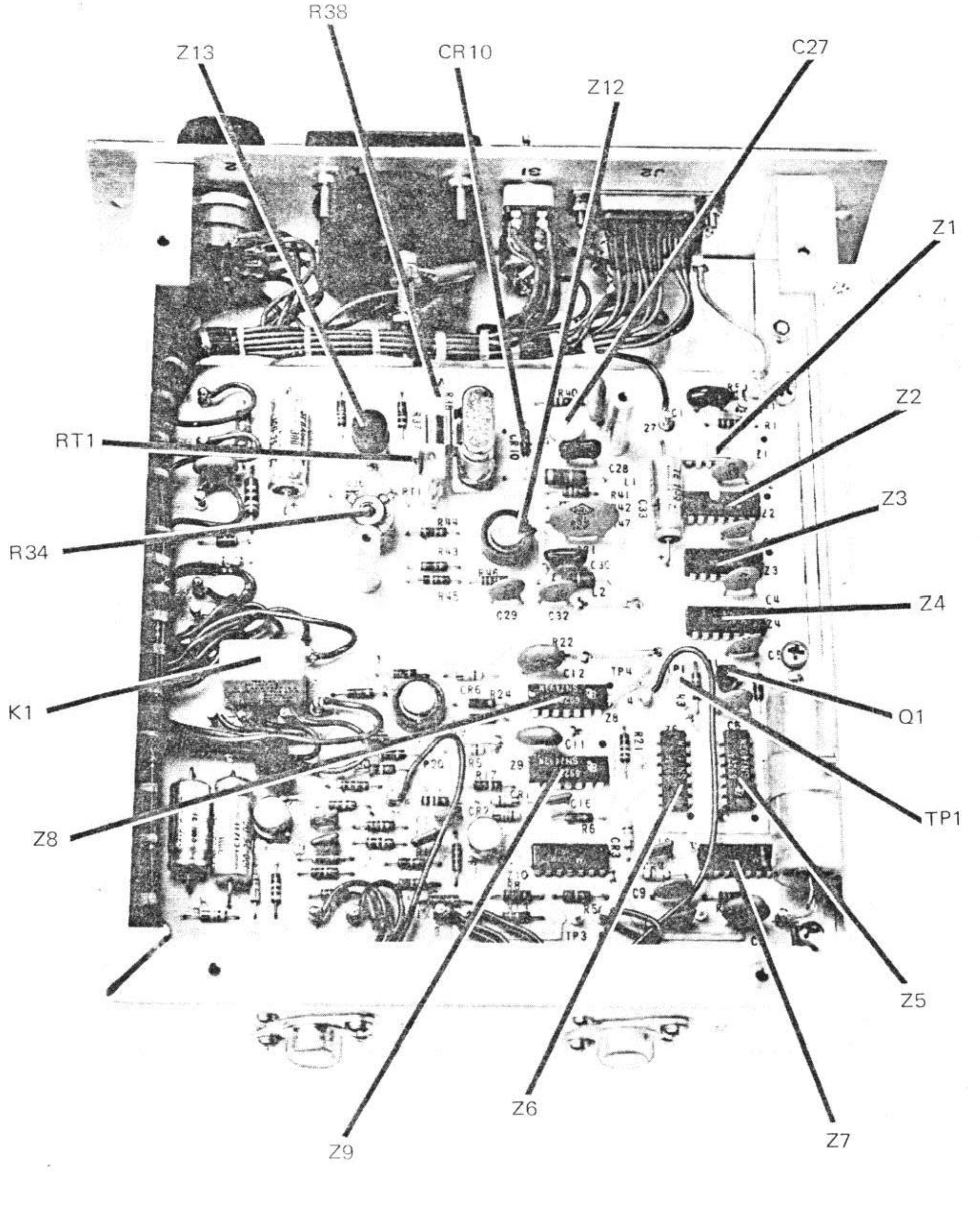


POWER AMPLIFIER
FIG. 4.2

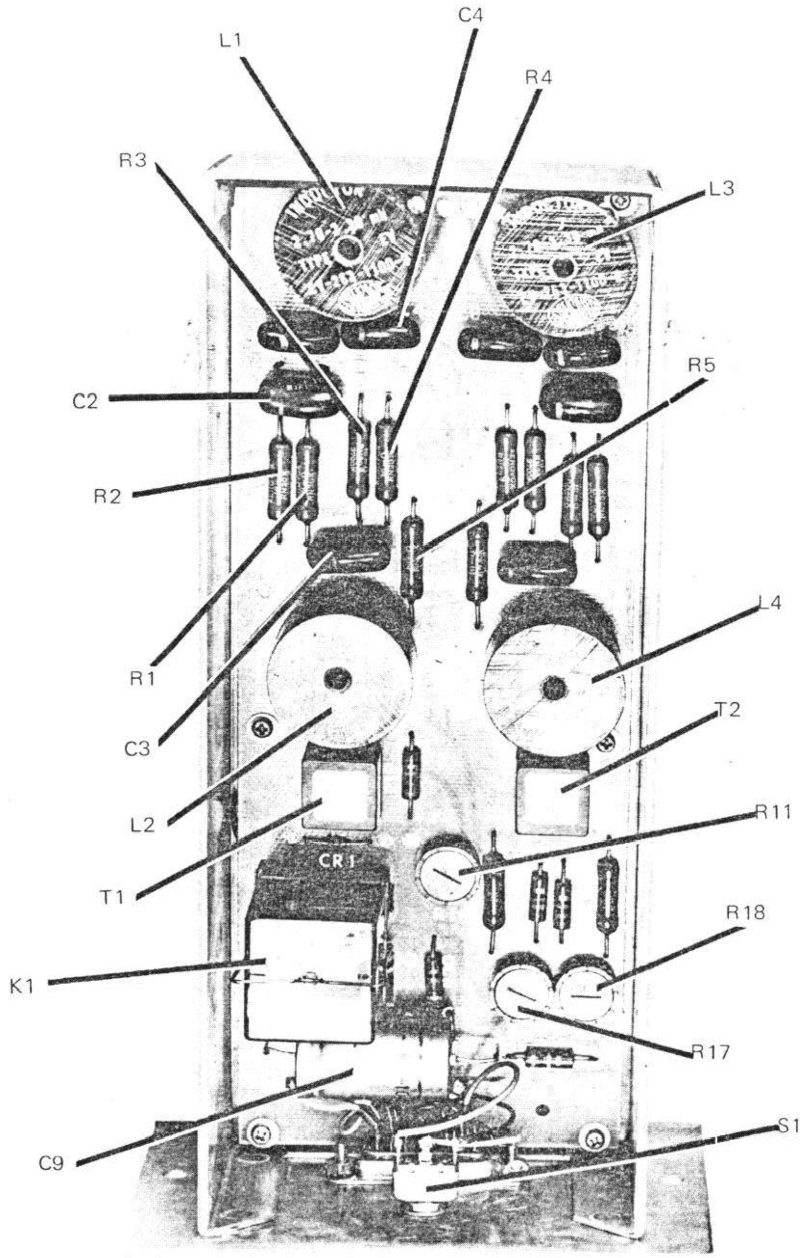


INTERNAL VIEW
MODULATED OSCILLATOR

FIG. 4.3

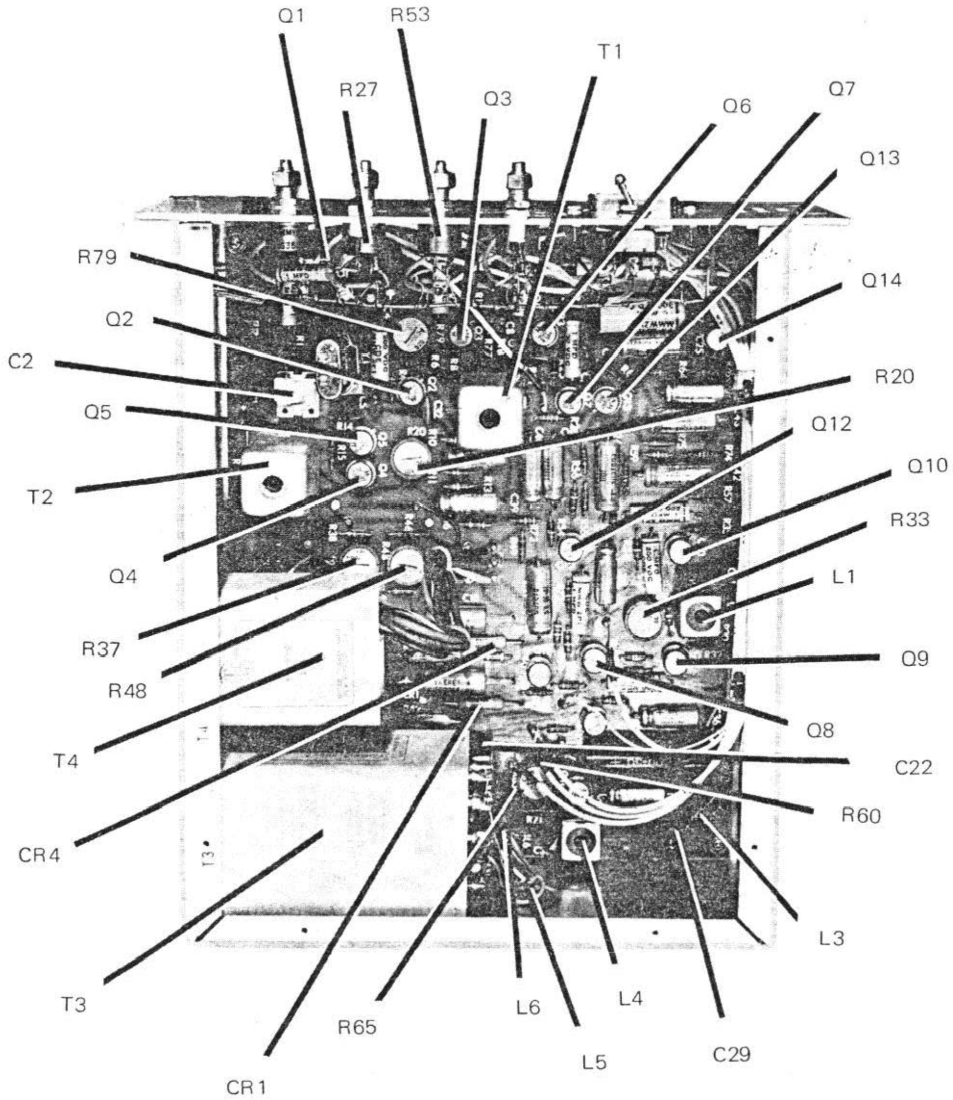


INTERNAL VIEW
(OVEN COVER REMOVED)
AFC UNIT
FIG. 4.4

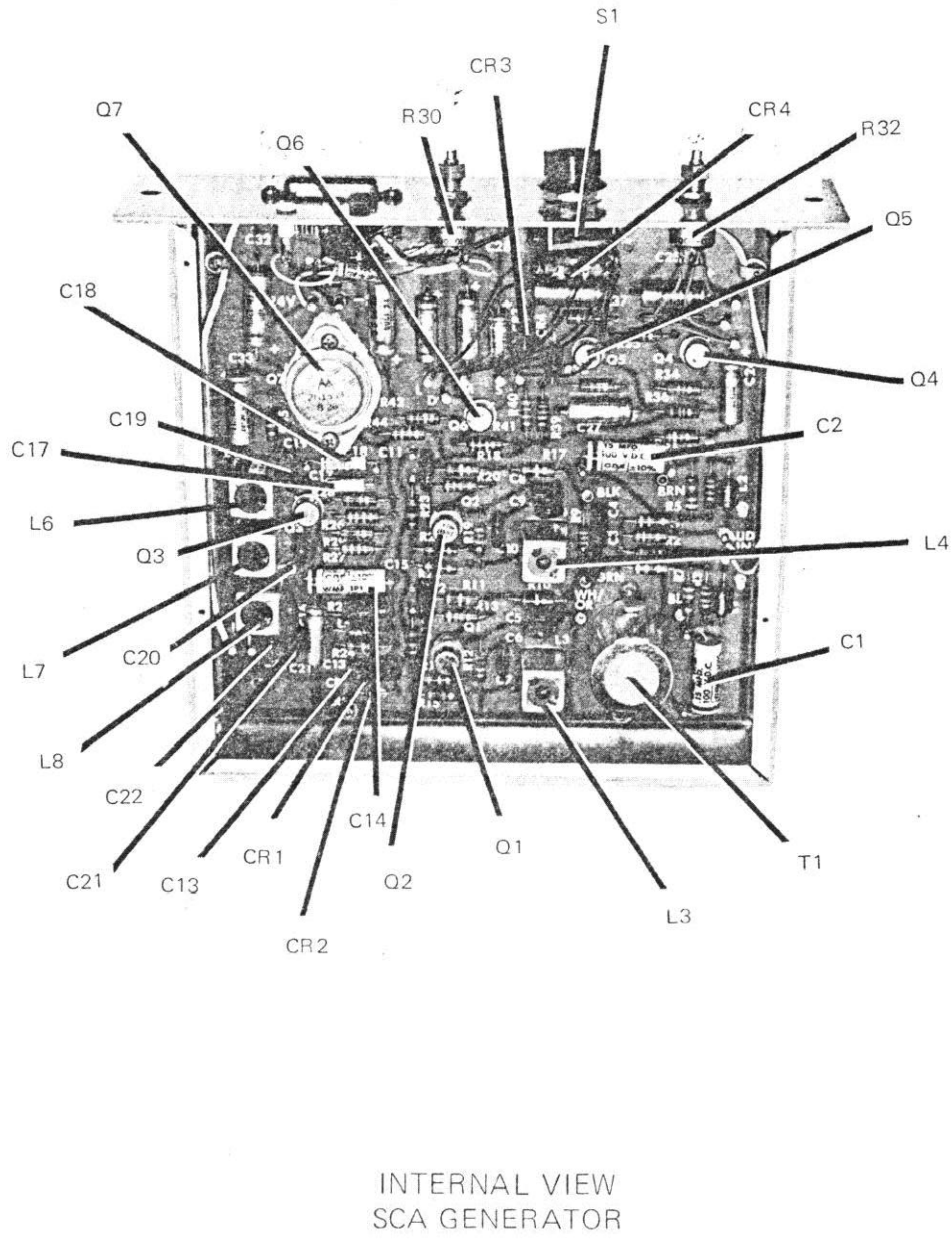


INTERNAL VIEW
AUDIO UNIT

FIG. 4 - 5



INTERNAL VIEW
STEREO GENERATOR
FIG. 4 - 6



INTERNAL VIEW
SCA GENERATOR
FIG. 4 - 7

SECTION 5 - TROUBLESHOOTING

5.1 GENERAL

Each individual unit is thoroughly tested on the customer frequency before shipment. If any unit fails to operate properly, insure that all connectors fit properly into the respective receptacles on each individual module.

Isolate a problem to an individual module by referring to the overall block diagram Fig. 7.1. Refer to the appropriate schematic of the module in question.

5.2 NO CARRIER OUTPUT

Check that the power supply is providing 24 V DC. If the pilot lamp on the power supply is extinguished, insure that S1 on the power supply is "ON". Determine the condition of the 117 V AC connections at the terminals on the rear of the exciter. Check the condition of F3, the 117 volt fuse on the power supply. Check fuse F1 located on the rear of the cabinet.

If the pilot lamp on the power supply lights; check F2, the 24 V fuse on the power supply.

If the power supply is providing the proper voltages, check the output coax of the exciter for a short or open circuit.

Determine if the modulated oscillator is providing output by listening to an FM Receiver tuned to the operating frequency. Check the output level of the modulated oscillator as read on the AFC meter.

If the modulated oscillator is functioning properly and is providing power output to the 10 watt amplifier, trace the RF signal through the amplifier stages and compare AC and DC voltages with the schematic values.

5.3 CARRIER OFF FREQUENCY

Measure the "Locked" and "Unlocked" frequency. If the frequency is further away from the correct value when the AFC defeat switch is on, the fault is probably in the AFC unit. Determine if the fine frequency control knob has been misadjusted. Check the power supply voltages.

If the AFC unit isn't functioning, the AFC switch may be turned off and the modulated oscillator tuned to carrier frequency and operated temporarily without AFC.

NOTE: Drift must be checked at short intervals when operating in this mode.

NOTE: Some types of frequency monitors will display a nearly "ON FREQUENCY" reading when the carrier is several hundred kHz off frequency. The correct frequency is the point where the AFC "Locks" instead of kicking the frequency monitor off scale.

5.4 HIGH DISTORTION

Units other than the transmitter will usually be responsible for high distortion; especially the console, amplifier, limiters, and audio lines. There are no active elements present in the exciter at audio frequencies.

5.5 **HIGH NOISE**

First establish the noise as to type. If the noise is 120 Hz ripple, check the power supply. Disconnect the audio lines. If the noise originates from the audio lines, check that the center tap of the audio output transformer of the audio equipment is not grounded. In a remote controlled system, check all isolation devices. Determine if the modulated oscillator is causing the noise by disconnecting the audio unit and any SCA generators used.

5.6 **EXCESSIVE CROSSTALK** (Main & Stereo Channel to SCA Channel)

Determine if crosstalk is present on the audio input lines. The most common cause of high crosstalk is in the detector and IF strip of the SCA monitor or SCA receiver. Determine if high crosstalk is present on more than one receiver.

NOTE: Crosstalk may occur in improperly tuned stages in either the transmitter or receiver. The tuned stages of the exciter amplifier are very broad and should not cause trouble.

5.7 **POOR STEREO SEPARATION**

Check the wave form at the output of the stereo generator and at the output of the monitor or receiver detector. Determine if the pilot is on and is modulating the main carrier 8 to 10%. Check the pilot phase.

5.8 **POWER AMPLIFIER TUNING**

All internal adjustments are tuned for maximum power output. R11, the input "DRIVE" control on the front panel is then set for the desired power output.

5.9 **AUDIO UNIT ALIGNMENT** - See Fig. 4.5

S1 is placed in the "Mono" position to adjust the audio unit.

A 400 Hz, +10 dBm signal is applied to the left audio input. Adjust R11 for 100% carrier modulation.

A "Left=Right" signal of 400 Hz is applied to the left and right audio inputs and S1 is switched to the stereo mode. Adjust R17 for a minimum 400 Hz signal level at J11-10 (L-R out).

A "Left=Minus Right" signal of 400 Hz is then connected into the left and right audio inputs. Switch S1 to the stereo mode position and adjust R18 for a minimum 400 Hz signal level at J11-6 (L+R out).

Apply a 19 kHz audio signal to the left audio input terminal and adjust L1 for a minimum 19 kHz output signal at J11-6 (L+R out). Apply a 19 kHz audio signal to the right audio input terminal and adjust L3 for a minimum 19 kHz output signal at J11-6 (L+R out). Adjust L2 and L4 for a 16.8 dB increase in output level at 15 kHz as compared to a 400 Hz reference signal. Measure this signal at J11-6 (L+R out).

Connect the L=R and L=R signals into the exciter input terminals. Adjust L1 through L4 for minimum L+R to L-R crosstalk at 15 kHz. Measure at the L-R and L+R terminals of the matrix.

5.10 **STEREO GENERATOR ALIGNMENT** - See Fig. 4.6

C2 is adjusted to set the pilot frequency as observed on a frequency counter or monitor.

R20, the doubler balance control, is adjusted for minimum 19 kHz ripple on the composite output signal. This adjustment is performed without a pilot signal.

The sub-carrier null control, R48, is adjusted for a minimum 38 kHz output. Harmonic null control, R37 is adjusted for minimum second harmonic output from the balanced modulator.

NOTE: The adjustment of R48 and R37 may be observed on an approved stereo monitor, wave analyzer, or ultrasonic display.

R53, the output level control, is adjusted to modulate the main carrier 90% with a 400 Hz left or right audio input signal of +10 dBm. This level excludes the pilot.

L1 is tuned to the second harmonic of the 38 kHz double sideband signal and R33, the crosstalk null control, is adjusted to cancel out the 76 kHz component remaining at the output of the stereo generator.

The pilot gain control R27 is adjusted to modulate the main carrier 10%. The pilot phase control, R24 is adjusted for best separation as read on a stereo monitor.

5.11 **SUB–CARRIER GENERATOR SETTING** - See Fig. 4.7

The first SCA generator adjustments consist of tuning the output filter so that there are essentially no harmonics of the sub-carrier present in the output of the SCA generator.

L6 and L8 are adjusted for maximum attenuation of the second harmonic of the SCA frequency. L7 is adjusted to minimize ripple over the sub-carrier passband.

NOTE: The passband is considered to be the sub-carrier frequency $\pm$15 kHz.

L3 is adjusted for an approximate output frequency of 900 kHz and L4 for approximately 900 kHz plus the sub-carrier frequency. The L4 frequency is generally 941 or 967 kHz. L3 or L4 is then fine tuned for the exact SCA frequency.

NOTE: The SCA frequency must be compared to a frequency standard. A non-metallic tool with narrow screwdriver type blade is necessary for this adjustment.

The output level control, R30, is set to modulate the main carrier at the required level.

The Mute Level control, R32, is adjusted to turn off the sub-carrier output if the audio input signal disappears.

NOTE: Optimum setting is 30 to 40 dB below 100% modulation of the sub-carrier.

Connect an audio signal at 400 Hz to the proper SCA input terminals of the exciter and modulate the sub-carrier 100%. Reduce the level of the audio input 30 or 40 dB and adjust R32 so the sub-carrier output disappears.

NOTE: S1, the mute delay, is adjusted to whatever muting speed is desired after the audio is removed from the input.

SECTION 6 - PARTS LIST

6.1 - CHASSIS

992 2735 001

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
B1	Fan 115 V AC 50/60 Hz	430 0037 000	Y1	Crystal, NE6A (Freq. Det. by customer)	444 000
F1	Fuse 4 Amp 250V Type AGC	398 0021 000	XF1	Fuse Holder	402 0074 000
J1	Panel Jack, BNC UG291/U	612 0418 000		RF Weather Strip	358 0834 000
P12	Plug BNC UG88/U	610 0238 000		Shock Mount	426 0003 000

6.2 - POWER SUPPLY

992 1726 002
992 1913 002 P. C. Board

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
A1	Lamp 3W 120V	396 0163 000	CR6 thru CR9	Diode 1N4720	384 0165 000
C3, C4	Cap 1000 uF 50V	524 0104 000	CR10	Zener Diode 1N3582	386 0047 000
C5	Cap 500 uF 50V	524 0094 000	CR11	Diode 1N914	384 0134 000
C6, C7	Cap 470 pF 1 kV	516 0043 000	CR12	Zener Diode 1N4749A	386 0077 000
C8 thru C14	Cap .01 uF 50V	516 0375 000	F2	Fuse 3A 250V MTH	398 0020 000
C15	Cap 2 uF 200V	506 0085 000	F3	Fuse 2A 250V AGC	398 0019 000

Warning, disconnect primary power prior to servicing.

SECTION 6 - PARTS LIST - Cont'd.

6.2 - POWER SUPPLY - Cont'd.

992 1726 002
992 1913 002 P.C. Board

SYMBOL	DESCRIPTION	GATES PART NO.
J1	Panel Connector	610 0419 000
Q4	Transistor 2N3055	380 0043 000
Q5	Transistor 2N3054	380 0041 000
Q6	Transistor 40319	380 0044 000
Q7	Transistor 2N697	380 0098 000
R7	Res 2 ohms 25W	542 0438 000
R8	Res 1K ohm 3W 1%	548 0192 000
R10	Not Used in Power Supply	
R11A, R11B	Res 510 ohms	540 0042 000
R12, R13	Not Used in Power Supply	
R14	Res 1.6K ohms 3W 1%	548 0197 000
R15	Same as R8	
R18	Res 10K ohms ¼W 5%	540 0936 000
S1	Switch Toggle SPST, 6A, 125V	604 0005 000
T1	Transformer Power	472 0536 000
XA1	Lamp Socket (Less Lens)	406 0367 000
XF2, XF3	Fuseholder	402 0013 000
XQ1	Not Used in Power Supply	
XQ4, XQ5	Not Used in Power Supply	
XQ6, XQ7	Transipad TO-5 case	404 0198 000
	Heat Sink	814 3250 701
	Lens, Green	406 0378 000

000 1042 001

Rev. 7/74

Warning, disconnect primary power prior to servicing.

6.3 - 10 W POWER AMPLIFIER 992 1715 001

SYMBOL	DESCRIPTION	GATES PART NO.
C1 thru C3	Cap .001 uF 1 kV	516 0054 000
C4	Cap Var 3.9 to 50 pF	520 0116 000
C5	Same as C1	
C6	Same as C1	
C7	Same as C4	
C8	Cap., .001 uF, 1KV	516 0054 000
C9	Same as C1	
C10	Same as C1	
C11	Cap 3.9 uF, 35 V	526 0012 000
C12	Not Used	
C13	Cap 22 pF 500 V	500 0809 000
C14	Same as C4	
C15	Same as C4	
C16	Same as C13	
C17	Cap .01 uF, 1 kV	516 0082 000
C18	Same as C1	
C19	Cap 82 pF 500 V	500 0823 000
C20	Cap 30 pF 500 V	500 0812 000
C21	Same as C1	
C22	Cap Var 1.5 to 9.1 pF	520 0341 000
C23 thru C24	Not Used in Power Amplifier	
C25	Same as C1	
CR1	Diode 1N914	384 0134 000
FL1 thru FL2	Filter	484 0065 000

SYMBOL	DESCRIPTION	GATES PART NO.
J1	Not Used in Power Amplifier	
J2	Panel Connector	610 0419 000
J3 thru J4	Receptacle Panel Male, 50 ohms	620 0355 000
J5 thru J11	Not Used in Power Amplifier	
J12	Right Angle Receptacle	612 0403 000
L1	Inductor	814 9577 001
L2	Inductor	814 9578 001
L3	RF Choke .68 uH	494 0164 000
L4	Same as L3	
L5	Inductor	814 3244 001
L6	Same as L5	
L8	RF Choke, 1.0 uH	494 0384 000
Q1	Transistor PT3134A	380 0036 000
Q2	Transistor PT3134B	380 0037 000
Q3	Transistor PT3134C	380 0038 000
Q4 thru Q5	Transistor PT3134E (Matched Pair)	380 0039 000
	Transistor Kit PT3134 (Containing Q1 thru Q5)	380 0040 000
R1	Res 1.1 K ohms ½ W 5%	540 0050 000
R2	Res 11 K ohms ½ W 5%	540 0074 000
R3	Res 56 ohms ½ W 5%	540 0019 000
R4	Res 470 ohms ½ W 10%	540 0174 000
R5	Res 2.7 K ohms ½ W 10%	540 0183 000

Warning, disconnect primary power prior to servicing.

6.3 - 10 W POWER AMPLIFIER - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
R6	Res 33 ohms 1 W 5%	540 0296 000
R7	Same as R4	
R8	Res 2.2 K ohms ½ W 10%	540 0182 000
R9	Res 27 ohms ½ W 5%	540 0011 000
R10	Same as R9	
R11	Pot 100 ohms ½ W	550 0001 000
R12	Res 1 K ohm ½ W 5%	540 0049 000
R13	Res 4.7 K ohms ½ W 5%	540 0065 000
R14	Res 47 K ohms ½ W 5%	540 0089 000
T1	Transformer Bifilar	914 3246 001
T2	Transformer Bifilar	914 3247 001
XQ1 thru XQ2	Heat Sink (For TO-5 Case)	404 0196 000

6.4 - AUDIO UNIT

992 1830 001
992 1909 001 P.C. Board

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap .025 uF 100 V	508 0308 000
C2 thru C4	Cap., .03uF 300 V.	500 1186 000
C5	Same as C1	
C6 thru C8	Same as C2	
C9	Cap 1000 uF 6 V	522 0514 000
C10	Cap .005 uF, 1 kV	516 0074 000
CR1	Diode 1N914	384 0134 000
J1 thru J10	Not Used in Audio Unit	
J11	Panel Connector	610 0419 000
K1	Relay	572 0134 000
L1 thru L4	Inductor 2.7 to 3.3 mH	492 0328 000
R1 thru R4	Res 270 ohms ½ W 1%	548 0139 000
R5	Res 110 ohms ½ W 1%	548 0217 000
R6 thru R9	Same as R1	
R10	Same as R5	
R11	Trim Pot 500 ohms 1 W	552 0800 000

Warning, disconnect primary power prior to servicing.

6.4 - AUDIO UNIT - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
R12	Res 10 K ohms ½ W 5%	540 0073 000
R13	Res 600 ohms ½ W 1%	548 0218 000
R14	Same as R13	
R15	Res 560 ohms ½ W 5%	540 0043 000
R16	Same as R15	
R17	Trim Pot 100 ohms 1 W	552 0797 000
R18	Same as R17	
R19	Res 750 ohms ½ W 5%	540 0046 000
R20	Res 300 ohms ½ W 5%	540 0036 000
S1	Switch SPDT Center Off	604 0336 000
T1 thru T2	Input Transformer (Matched Pair)	914 8783 001
XK1	Relay Socket	404 0209 000

6.5 - MODULATED OSCILLATOR

992 2696 001
992 2717 001P.C. Board

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap 100 uF 25 V	522 0246 000
C2	Cap .001 uF 1 kV	516 0054 000
C3	Same as C2	
C4	Not Used in Modulated Oscillator	
C5	Cap 27 pF 500 V (88-98 MHz)	500 0811 000
C5	Cap 18 pF 500 V (98-108 MHz)	500 0807 000
C6	Cap 15 uF 25 V	522 0240 000
C7	Same as C2	
C8	Same as C2	
C9	Cap 5uF 25V	522 0236 000
C10A	Cap 47 pF	516 0459 000
C10B	Cap 47 pF 500 V (88-98 MHz)	516 0459 000
C10B	Cap 68 pF 500 V (98-108 MHz)	500 0821 000
C10C	Cap 68 pF 500 V (88-98 MHz)	500 0821 000
C11A	Same as C10A	
C11B	Cap 47 pF 500 V (88-98 MHz)	516 0459 000
C11B	Cap 68 pF 500 V (98-108 MHz)	500 0821 000
C11C	Same as C10C	
C12	Cap 18 pF 500 V	500 0807 000
C13 thru C15	Same as C2	
C16	Cap 3 pF 500 V	500 0802 000
C17	Same as C2	
C18	Cap 5 pF 500 V	500 0803 000

Warning, disconnect primary power prior to servicing.

SECTION 6 - PARTS LIST - CONT'D.

6.5 - MODULATED OSCILLATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
C19	Same as C1	
C20	Same as C1	
C21	Same as C2	
C22	Cap 100 uF 25 V	522 0246 000
C23	Cap 22 pF 500 V	500 0809 000
C24	Cap 39 pF 500 V	500 0815 000
C25 thru C31	Cap 1000 pF 500 V	516 0319 000
CR1 thru CR3	Diode Varicap MV1650 , (Selected)	528 0024 000
CR4	Diode Zener 1N4747A	386 0100 000
CR5	Diode 1N914	384 0134 000
CR6	Diode Zener 1N4744A	386 0082 000
CR7	Same as CR5	
CR8	Same as CR5	
J1	Connector, Power	610 0419 000
J2	Receptacle, Coax	620 0355 000
J3	Same as J2	
L1	Inductor 10 uH	494 0231 000
L2	Same as L1	
L3	Inductor Variable	492 0366 000
L4	Inductor .47 uH	494 0230 000
L5	Same as L1	
L6	Inductor .1 uH	494 0229 000

SYMBOL	DESCRIPTION	GATES PART NO.
Q1	Transistor 2N5109	380 0114 000
Q2	Same as Q1	
Q3	Transistor 2N3053	380 0049 000
R1	Not Used in Modulated Oscillator	
R2	Res 10 K ohms ¼ W 5%	540 0936 000
R3	Res 4.7 K ohms ¼ W 5%	540 0928 000
R4	Same as R3	
R5	Res 2.2 K ohms ¼ W 5%	540 0920 000
R6	Pot 10 K ohms ½ W	550 0009 000
R7	Res 39 K ohms ¼ W 5%	540 0950 000
R8	Res 68 K ohms ¼ W 5%	540 0956 000
R9	Res 100 K ohms ¼ W 5%	540 0960 000
R10	Res 100 ohms ¼ W 5%	540 0888 000
R11	Res 470 ohms ¼ W 5%	540 0904 000
R12	Same as R5	
R13	Res 15 ohms ¼ W 5%	540 0868 000
R14	Res 68 ohms ¼ W 5%	540 0884 000
R15	Same as R13	
R16	Res 1.5 K ohms ¼ W 5%	540 0916 000
R17	Res 270 ohms ¼ W 5%	540 0898 000
R18	Res 15 ohms ½ W 5%	540 0005 000
R19	Res 1 K ohm ¼ W 5%	540 0912 000
R20	Res 27 ohms ½ W 5%	540 0011 000

Rev. 4/74

Warning, disconnect primary power prior to servicing.

6.5 - MODULATED OSCILLATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
R21	Same as R20	
R22	Res 39 ohms ¼ W 5%	540 0015 000
R23	Res 39 K ohms ¼ W 5%	540 0950 000
R24	Res 470 ohms ½ W 5%	540 0041 000
R25	Res 10 ohms ½ W 5%	540 0001 000
R26	Same as R2	
R27	Same as R9	
R28	Res 180 ohms ½ W 5%	540 0031 000
R29	Pot 5 K ohms 3 W	552 0818 000
R30	Res 6.8 K ohms ½ W 5%	540 0069 000
R31	Res 22 K ohms ¼ W 5%	540 0944 000
XQ1 thru XQ3	Socket, Transistor	404 0281 000

6.6 - AFC UNIT

992 2697 001
992 2702 001 P.C. Board

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap 220 pF 500 V	500 0754 000
C2 thru C6	Cap .001 uF 1 kV	516 0054 000
C7	Cap .05 uF 100 V	516 0435 000
C8	Not Used in AFC Unit	
C9	Same as C2	
C10	Not Used in AFC Unit	
C11	Cap .05 uF 100 V	516 0435 000
C12	Same as C11	
C13	Cap .22 uF 100 V	516 0475 000
C14	Same as C13	
C15	Cap 100 uF 50 V	522 0394 000
C16 thru C22	Cap .1 uF 100V	516 0453 000
C23	Cap., 100uF 35V	522 0454 000
C24	Cap 250 uF 3 V	522 0164 000
C25	Same as C23	
C26	Same as C7	
C27	Cap Variable 2.5 to 11 pF	518 0047 000
C28	Cap 120 pF 500 V	500 0826 000
C29	Same as C2	
C30	Cap 82 pF 500 V	500 0823 000
C31	Cap .01 uF 1 kV	516 0081 000
C32	Same as C2	
C33	Cap 100 uF 12 V	522 0210 000
C34	Cap 1000 uF 10 V	522 0422 000
CR1 thru CR7	Diode 1N914	384 0318 000
CR8	Diode Zener 1N4733A	386 0135 000
CR9	Same as CR1	
CR10	Varicap MV1626	528 0017 000

Warning, disconnect primary power prior to servicing.

SECTION 6 - PARTS LIST - CONT'D.

6.6 - AFC UNIT - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
CR11	Same as CR1	
CR12	Same as CR1	
DS1	Lamp	396 0060 000
J1	Connector, Coax	620 0355 000
J2	Connector, Power	610 0419 000
K1	Relay, DPDT 26.5 V.	578 0010 000
L1 thru L3	Inductor 100 uH	494 0233 000
M1	Meter 0-50 uA DC	632 0663 000
Q1	Transistor 2N3702	380 0087 000
Q2	Transistor 2N3053	380 0049 000
Q3	Transistor 2N4037	380 0146 000
Q4	Transistor 2N3054	380 0041 000
Q5	Transistor 2N3740	380 0066 000
R1	Res 82 ohms ¼ W 5%	540 0886 000
R2	Res 100 ohms ¼ W 5%	540 0888 000
R3	Res 470 ohms ¼ W 5%	540 0904 000
R4	Res 2.2 K ohm ¼ W 5%	540 0920 000
R5	Res 10 K ohm ¼ W 5%	540 0936 000
R6	Res 1.5 K ohms ¼ W 5%	540 0916 000
R7	Same as R4	
R8	Same as R2	
R9	Same as R5	
R10	Same as R5	
R11	Res 330 K ohms ¼ W 5%	540 0972 000
R12	Same as R6	
R13	Res 1.3 K ohms ¼ W 5%	540 0915 000
R14	Res 22 K ohms ¼ W 5%	540 0944 000
R15	Not Used in AFC Unit	
R16	Res 39 K ohms ¼ W 5%	540 0950 000
R17	Res 220 K ohms ¼ W 5%	540 0968 000
R18	Res 1 K ohm ¼ W 5%	540 0912 000
R19	Same as R18	
R20	Res 4.7 K ohms ¼ W 5%	540 0928 000
R21	Same as R16	
R22	Same as R17	
R23	Same as R18	
R24	Same as R18	
R25	Same as R20	
R26	Res 47 K ohms ¼ W 5%	540 0952 000

Warning, disconnect primary power prior to servicing.

6.6 - AFC UNIT - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
R27	Same as R26	
R28	Same as R14	
R29	Same as R17	
R30	Same as R5	
R31	Same as R4	
R32	Res 220 ohms ¼ W 5%	540 0896 000
R33	Same as R20	
R34	Pot 5 K ohms	550 0257 000
R35	Res 2.7 K ohms ¼ W 5%	540 0922 000
R36	Same as R26	
R37	Res 3.3 K ohms ¼ W 5%	540 0924 000
R38	Res 50 ohms 5 W	542 1143 000
R39	Res 750 ohm ½ W 5%	540 0329 000
R40	Same as R26	
R41	Res 6.8 K ohms ¼ W 5%	540 0932 000
R42	Same as R37	
R43	Same as R2	
R44	Same as R2	
R45	Same as R41	
R46	Same as R37	
R47	Same as R3	
R48	Pot 10 K ohms (Locking)	550 0007 000
R49	Res 10 K ohms ¼ W 5%	540 0936 000
R51	Same as R3	
RT1	Thermistor 45TG-2	559 0002 000

SYMBOL	DESCRIPTION	GATES PART NO.
S1	Switch Toggle DPDT	604 0320 000
S2	Switch SP 5 Pos	600 0477 000
XDS1	Socket, Lamp	406 0376 000
	Lens, Red	406 0374 000
XQ1	Not Used in AFC Unit	
XQ2	Transipad for TO-5 Case	404 0198 000
XQ3	Same as XQ2	
XQ4	Socket, Transistor	404 0206 000
XQ5	Same as XQ4	
XY1	Socket, Crystal	404 0132 000
Z1	Integrated Circuit MC-1027P	382 0032 000
Z2 thru Z4	Integrated Circuit MC-1013L	3 82 0033 000
Z5	Integrated Circuit SN7493N	382 0034 000
Z6	Same as Z5	
Z7	Integrated Circuit MC-853P	382 0035 000
Z8	Same as Z5	
Z9	Same as Z5	
Z10	Integrated Circuit MC-848P	382 0016 000
Z11	Integrated Circuit CA-3018	382 0018 000
Z12	Same as Z11	
Z13	Differential Amp TD–101	382 0020 000
Z14	Same as Z13	

Rev. A: 7/82
Warning, disconnect primary power prior to servicing.

SECTION 6 - PARTS LIST - CONT'D.

6.7 - FILTER ASSEMBLY 992 2736 001

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
C1 thru C20	Cap .001 uF 500 V	516 0319 000	L1 thru L6	Choke 100 uH	494 0233 000
C21 thru C24	Cap .025 uF 500 V ±20%	516 0393 000	L7 thru L10	Coil	814 4837 001
			L11 thru L20	Choke 3.3 uH	494 0110 000
TB1	Terminal Board	614 0087 000			

6.8 - ISOLATION PAD, 3 dB 992 2241 002

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
J5	Receptacle "BNC"	612 0237 000	R1	Res 300 ohm 7 W	546 0229 000
J6	Receptacle "N"	612 0233 000	R2	Res 20 ohm 5 W	546 0230 000
			R3	Same as R1	

Warning, disconnect primary power prior to servicing.

6.9 - STEREO GENERATOR

994 6533 001
992 1911 001 P.C. Board

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap 100 uF 50 V	522 0322 000
C2	Cap Var 2-27 pF	520 0342 000
C3	Cap .008 uF 600 V	508 0291 000
C4	Cap .1 uF 200 V	506 0088 000
C5	Cap 100 pF 500 V	500 0877 000
C6	Same as C4	
C7	Cap 5 uF 50 V	522 0251 000
C8	Same as C4	
C9	Cap 2000 pF 500 V	500 0845 000
C10 thru C13	Same as C4	
C14	Cap 2500 pF 500 V	500 0879 000
C15	Not Used in Stereo Generator	
C16	Cap 15 uF 25 V	522 0240 000
C17 thru C20	Cap 1000 uF 6 V	526 0058 000
C21	Cap 20 uF 50 V	522 0256 000
C22	Cap 250 uF 15 V	522 0336 000
C23	Same as C16	
C24	Cap 50 uF 25 V	522 0244 000
C25	Cap 35 uF 25 V	522 0243 000
C26	Not Used in Stereo Generator	
C27	Cap 1 uF 200 V	506 0087 000
C28	Cap .01 uF 200 V	506 0001 000
C29	Cap 470 pF 300 V	500 0835 000
C30	Same as C29	
C31	Cap 1000 uF 25 V	522 0306 000
C32	Cap 1000 pF 1 kV	516 0054 000
C33 thru C34	Not Used in Stereo Generator	
C35	Same as C16	
C36	Same as C16	
C37	Same as C1	
C38	Same as C4	
C39 thru C41	Same as C16	
C42	Same as C24	
C43	Same as C24	
C44	Same as C16	
C45	Cap 1000 uF 16 V	522 0391 000
C46	Cap 470 pF 300 V	500 0835 000
C47	Cap .1 uF 200 V	506 0088 000
C48	Cap .50 pF 500 V	500 0818 000
CR1 thru CR4	Diode Quad Assy	915 0064 001
J7	Panel Connector	610 0419 000
L1	Adjustable RF Coil 1.3 - 3 mH	492 0331 000
L2	Not Used in Stereo Generator	
L3	RF Choke 300 uH	494 0153 000
L4	Adjustable RF Coil .65 - 1.3 mH	492 0332 000

Warning, disconnect primary power prior to servicing.

SECTION 6 - PARTS LIST - CONT'D.

6.9 - STEREO GENERATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
L5	Same as L1	
L6	Same as L3	
Q1	Transistor, FET	380 0060 000
Q2 thru Q16	Transistor 2N697	380 0098 000
R1	Res 5.1 Megohms ¼ W 5%	540 1001 000
R2	Res 10 K ohms ¼ W 5%	540 0936 000
R3	Res 15 K ohms ¼ W 5%	540 0940 000
R4	Res 470 K ohms ¼ W 5%	540 0976 000
R5	Res 390 ohms ¼ W 5%	540 0902 000
R6	Res 620 ohms ¼ W 5%	540 0907 000
R7	Res 8.2 K ohms ¼ W 5%	540 0934 000
R8	Res 100 K ohms ¼ W 5%	540 0960 000
R9	Res 1 K ohm ¼ W 5%	540 0912 000
R10	Same as R2	
R11	Same as R2	
R12	Res 2.2 K ohms ¼ W 5%	540 0920 000
R13	Same as R8	
R14	Res 100 ohms ¼ W 5%	540 0888 000
R15	Same as R14	
R16	Res 4.7 K ohms ¼ W 5%	540 0928 000
R17	Res 2.4 K ohms ½ W 1%	548 0211 000
R18	Res 150 K ohms ¼ W 5%	540 0964 000
R19	Res 51 K ohms ¼ W 5%	540 0953 000
R20	Pot 10 K ohms 1 W	552 0795 000
R21	Same as R8	
R22	Res 2 K ohms ¼ W 5%	540 0919 000
R23	Res 510 ohms ¼ W 5%	540 0905 000
R24	Pot 50 K ohms ½ W	550 0009 000
R25	Same as R8	
R26	Res 3.3 K ohms ¼ W 5%	540 0924 000
R27	Pot 5 K ohms ½ W	550 0006 000
R28	Same as R8	
R29	Same as R22	
R30	Same as R4	
R31	Same as R8	
R32	Res 22 K ohms ¼ W 5%	540 0944 000
R33	Pot 5 K ohms 1 W	552 0796 000
R34	Same as R8	
R35	Same as R22	
R36	Res 200 ohms ¼ W 5%	540 0895 000
R37	Pot 100 ohms 1 W	552 0797 000
R38	Same as R36	
R39	Res 5.1 K ohms ¼ W 5%	540 0929 000
R40	Res 9.1 K ohms ¼ W 5%	540 0935 000

Warning, disconnect primary power prior to servicing.

6.9 - STEREO GENERATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
R41 thru R44	Res 4.75 K ohms ½ W 1%	548 0199 000
R45	Not Used in Stereo Generator	
R46	Res 10 ohms ¼ W 5%	540 0864 000
R47	Same as R46	
R48	Same as R37	
R49	Same as R9	
R50	Same as R4	
R51	Same as R22	
R52	Same as R23	
R53	Same as R27	
R54	Same as R8	
R55	Res 1.5 K ohms ¼ W 5%	540 0916 000
R56	Res 240 ohms ¼ W 5%	540 0897 000
R57	Same as R22	
R58	Same as R3	
R59	Res 120 K ohms ¼ W 5%	540 0962 000
R60	Same as R23	
R61	Same as R2	
R62	Same as R23	
R63	Res Assembly	915 3312 001
R64	Same as R8	
R65	Pot Trim 1 K ohm 1 W	552 0802 000
R66	Same as R9	
R67	Same as R4	
R68	Pot 1 K ohm ½ W	550 0004 000
R69	Same as R9	
R70	Same as R4	
R71	Same as R9	
R72	Same as R2	
R73	Same as R4	
R74	Same as R59	
R75	Same as R12	
R76	Same as R4	
R77	Same as R12	
R78	Res 10 Megohms ¼ W 5%	540 1008 000
R79	Res 500 ohms 1 W	552 0800 000
R80	Res 1200 ohms ¼ W 5%	540 0914 000
R81	Res 10 K ohms ¼ W 5%	540 0936 000
R82 thru R85	Res 100 ohms ½ W 1%	548 0049 000
R86	Same as R19	
R87	Same as R19	
R88	Res 100 ohms ½ W 5%	540 0025 000
RT1	Thermistor 1 K ohm	559 0006 000
S1	Switch Subminiature Toggle, SPDT	604 0366 000
T1	Transformer 19 kHz	478 0269 000
T2	Transformer 38 kHz	478 0270 000
T3	Transformer	478 0026 000
T4	Transformer	478 0220 000

SECTION 6 - PARTS LIST - CONT'D.

6.9 - STEREO GENERATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
TJ1	Test Point Jack White	612 0312 000
TJ2	Test Point Jack Black	612 0311 000
TJ3	Same as TJ1	
XQ1	Transipad	404 0197 000
XQ2 thru XQ16	Transipad	404 0198 000
XY1	Crystal Socket	404 0132 000
Y1	Crystal 19 kHz	444 1129 000

Warning, disconnect primary power prior to servicing.

6.10 - SCA GENERATOR

994 6507 002
992 1904 001 P.C. Board

SYMBOL	DESCRIPTION	GATES PART NO.
C1	Cap .15 uF Mylar 100 V	508 0286 000
C2	Same as C1	
C3 thru C5	Cap 100 pF 100 V	500 0844 000
C6	Cap 220 pF 500 V	500 0873 000
C7	Cap 62 pF 500 V 5%	500 0820 000
C8	Same as C3	
C9	Same as C6	
C10	Same as C7	
C11	Cap 100 pF 500 V	500 0759 000
C12	Same as C11	
C13	Cap 1500 pF 500 V	500 0878 000
C14	Same as C13	
C15	Cap .1 uF Mylar 100 V	508 0278 000
C16	Cap 15 uF 25 V	522 0240 000
C17	Cap .01 uF Mylar 100 V	508 0298 000
C18	Same as C17	
C19	Cap 250 pF 500 V	500 0831 000
C20	Cap 330 pF 100 V	500 0874 000
C21	Same as C20	
C22	Same as C19	
C23	Cap .01 uF Mylar 100 V	508 0298 000
C24	Cap 25 uF 6 V	522 0178 000
C25	Same as C24	
C26	Cap 100 uF 12 V	522 0210 000
C27	Same as C16	
C28	Cap 2 uF 25 V	522 0233 000
C29	Same as C16	
C30	Cap 25 uF 25 V	522 0242 000
C31	Cap 50 uF 25 V	522 0244 000
C32	Same as C31	
C33	Cap 20 uF 50 V	522 0256 000
C34, C35	Cap., 3.9uF 35V	526 0012 000
CR1	Diode 1N270	384 0128 000
CR2	Same as CR1	
CR3	Rectifier 1N2069	384 0018 000
CR4	Same as CR3	
J3	Adapter "BNC"	620 0455 000
J5	Receptacle	610 0419 000
J6	Receptacle "BNC"	612 0403 000
L1	Choke 4.7 mH	494 0175 000
L2	Same as L1	
L3	Choke Adjustable .28 - .65 mH	492 0321 000
L4	Same as L3	
L5	Choke 2.2 mH	494 0165 000
L6	Coil Adjustable 8 - 20 mH	492 0322 000
L7	Coil Adjustable 15 - 40 mH	492 0323 000
L8	Same as L6	
P3, P6	Plug,"BNC"	610 0238 000
Q3 thru Q6	Transistor 2N697	380 0098 000
Q7	Transistor 2N1539	380 0016 000

Rev. A: 7/82

Warning, disconnect primary power prior to servicing.

SCA GENERATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
R1	Res 1.8 K ohms ½ W 5%	540 0055 000
R2	Res 1.5 K ohms ½ W 5%	540 0053 000
R3	Res 270 ohms ½ W 5%	540 0035 000
R4	Same as R3	
R5 thru R8	Res 47 ohms ½ W 5%	540 0017 000
R10	Res 51 K ohms ½ W 5%	540 0090 000
R11	Res 100 K ohms ½ W 5%	540 0097 000
R12	Res 82 K ohms ½ W 5%	540 0095 000
R13	Res 4.7 K ohms ½ W 5%	540 0065 000
R14	Res 10 K ohms ½ W 5%	540 0073 000
R15	Res 1 K ohm ½ W 5%	540 0049 000
R16	Res 100 ohms ½ W 5%	540 0025 000
R17	Same as R10	
R18	Same as R11	
R19	Same as R12	
R20	Same as R13	
R21	Same as R14	
R22	Same as R15	
R23	Same as R16	
R24	Same as R14	
R25	Same as R14	
R26	Res 33 K ohms ½ W 5%	540 0085 000
R27	Same as R26	
R28	Res 2 K ohms ½ W 5%	540 0056 000
R29	Same as R28	
R30	Pot Min 10 K ohm ½ W Linear Taper	550 0007 000
R31	Res 6.8 K ohms ½ W 5%	540 0069 000
R32	Same as R30	
R33	Res 120 K ohms ½ W 5%	540 0099 000
R34	Res 5.1 K ohms ½ W 5%	540 0066 000
R35	Same as R28	
R36	Res 1.1 K ohms ½ W 5%	540 0050 000
R37	Res 680 ohms ½ W 5%	540 0045 000
R38	Res 510 ohms	540 0042 000
R39	Res 16 K ohms ½ W 5%	540 0078 000
R40	Same as R12	
R41	Same as R26	
R42	Res 12 K ohms ½ W 5%	540 0075 000
R43	Same as R28	
R44	Res 3.3 K ohms ½ W 5%	540 0061 000
R45	Same as R14	
R46	Res.,27k ohm, 1/2W	540 0083 000
R47	Res.,33k ohm, 1/2W	540 0085 000
R48	Pot.,10k ohm, 1/2W	550 0007 000
S1	Switch 4 Pos. Modified	600 0421 000

Warning, disconnect primary power prior to servicing.

SECTION 6 - PARTS LIST - CONT'D.

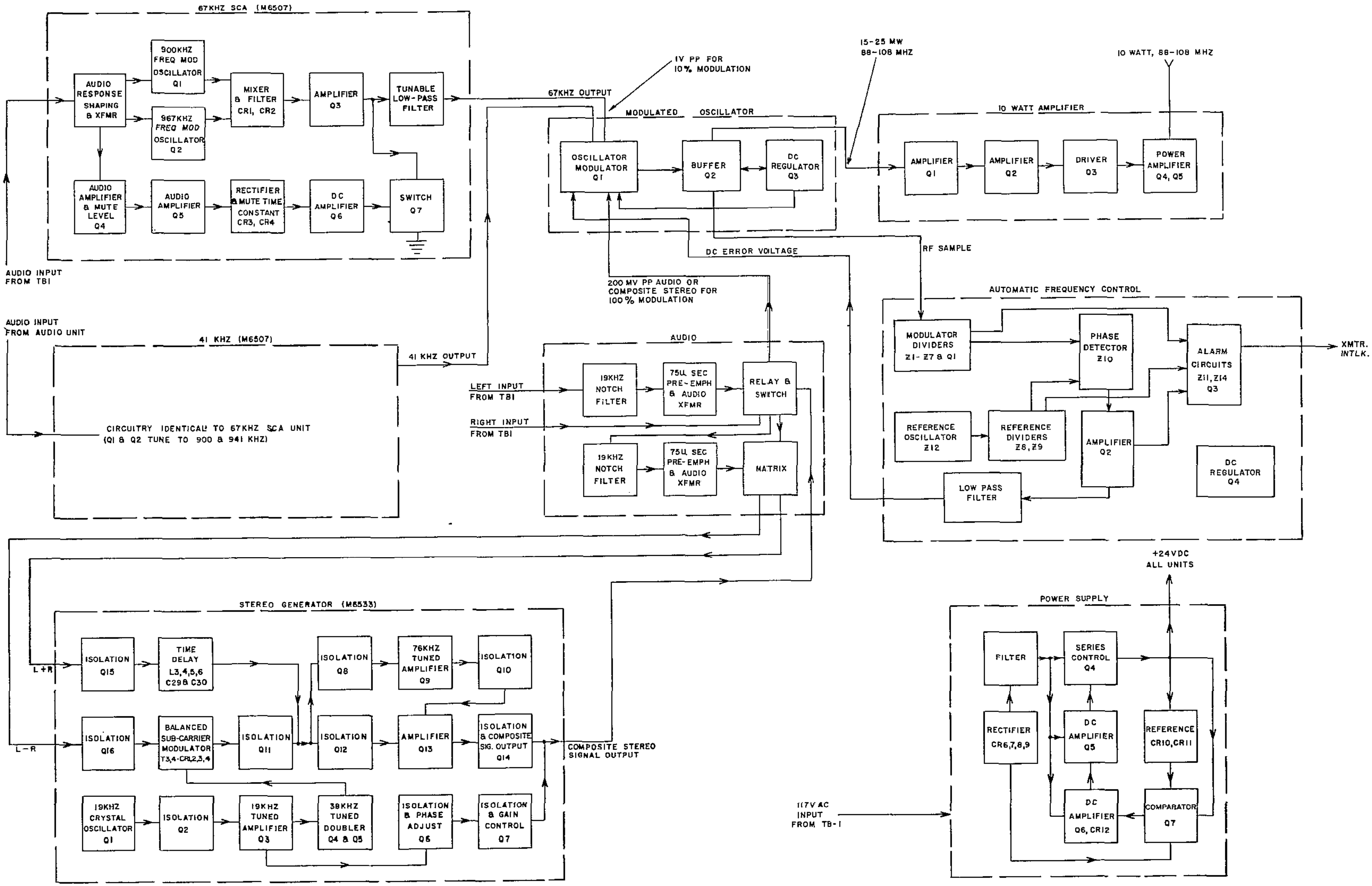
SCA GENERATOR - CONT'D.

SYMBOL	DESCRIPTION	GATES PART NO.
T1	Transformer Input	478 0145 000
TJ1	Test Point Jack White	612 0312 000
TJ2	Test Point Jack Black	612 0311 000
XQ1	Transistor Socket	404 0066 000
XQ2	Same as XQ1	
XQ3 thru XQ6	Transipad for TO-5 Case	404 0198 000
U1A/B	Int. Circuit CA3018A	382 0018 000

Rev. 4/74

Warning, disconnect primary power prior to servicing.

SECTION 7 - DRAWINGS

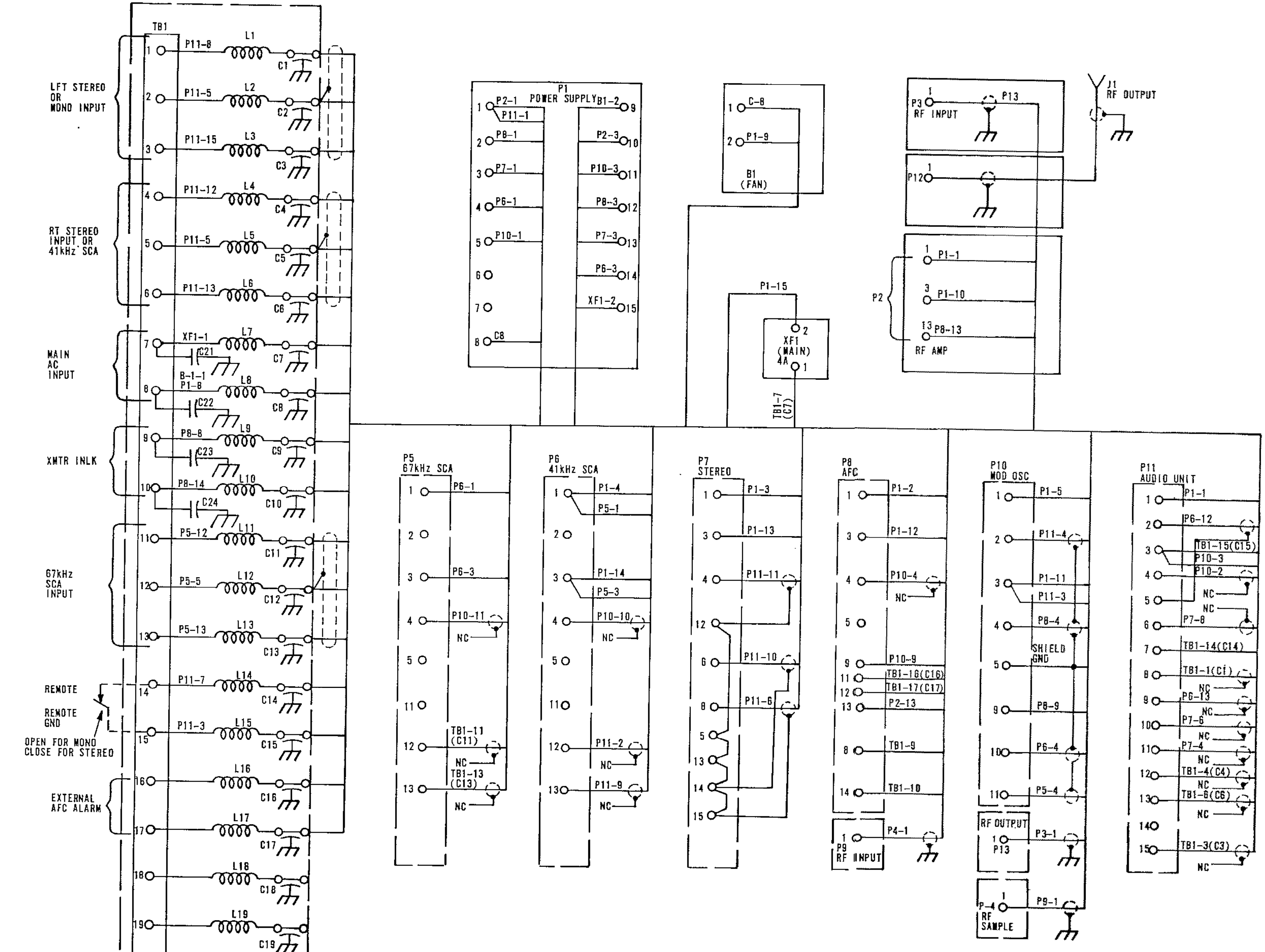


842 5878 001

BLOCK DIAGRAM
FIG. 7.1

HARRIS CORPORATION Broadcast Products Division
123 Hampshire Street Quincy Illinois 62301

Warning, disconnect primary power prior to servicing.



INTERCONNECTING DIAGRAM
FIG. 7.2

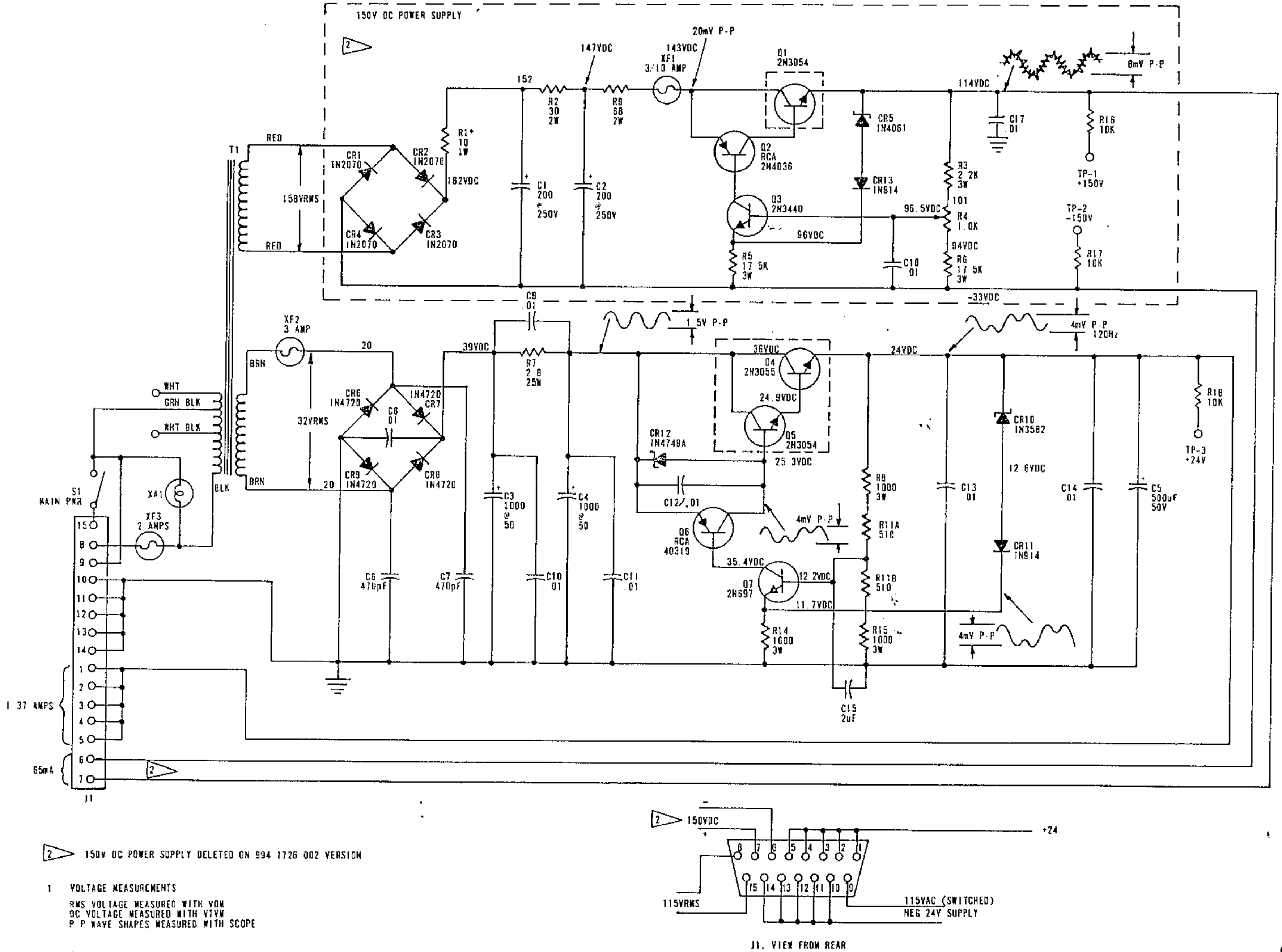
ARRIS CORPORATION Broadcast Products Division
23 Hampshire Street Quincy Illinois 62301

arning, disconnect primary power prior to servicing.

838 1955 001

HARRIS CORPORATION Broadcast Products Division
123 Hampshire Street, Quincy, Illinois 62301

Warning, disconnect primary power prior to servicing.

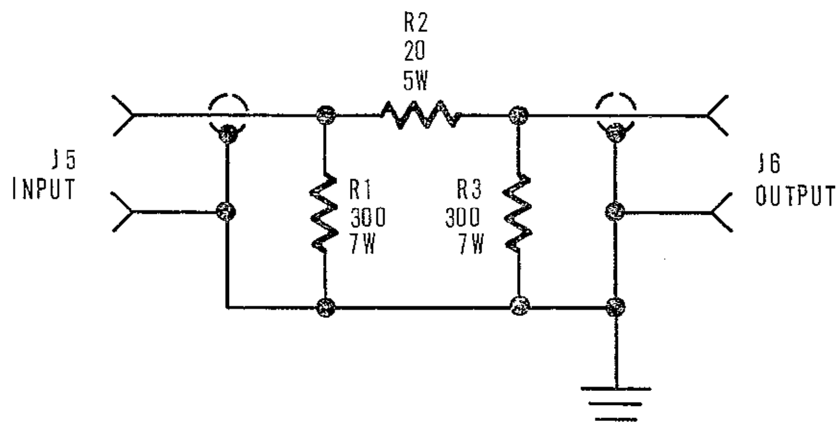


2 150V DC POWER SUPPLY DELETED ON 994 1726 002 VERSION

1 VOLTAGE MEASUREMENTS
RMS VOLTAGE MEASURED WITH VOM
DC VOLTAGE MEASURED WITH VTVM
P-P WAVE SHAPES MEASURED WITH SCOPE

* = SUBJECT TO VARIATION

POWER SUPPLY
FIG. 7.3



815 1459 001

AT-1, ISOLATION PAD FM EXCITER
FIG. 7.10

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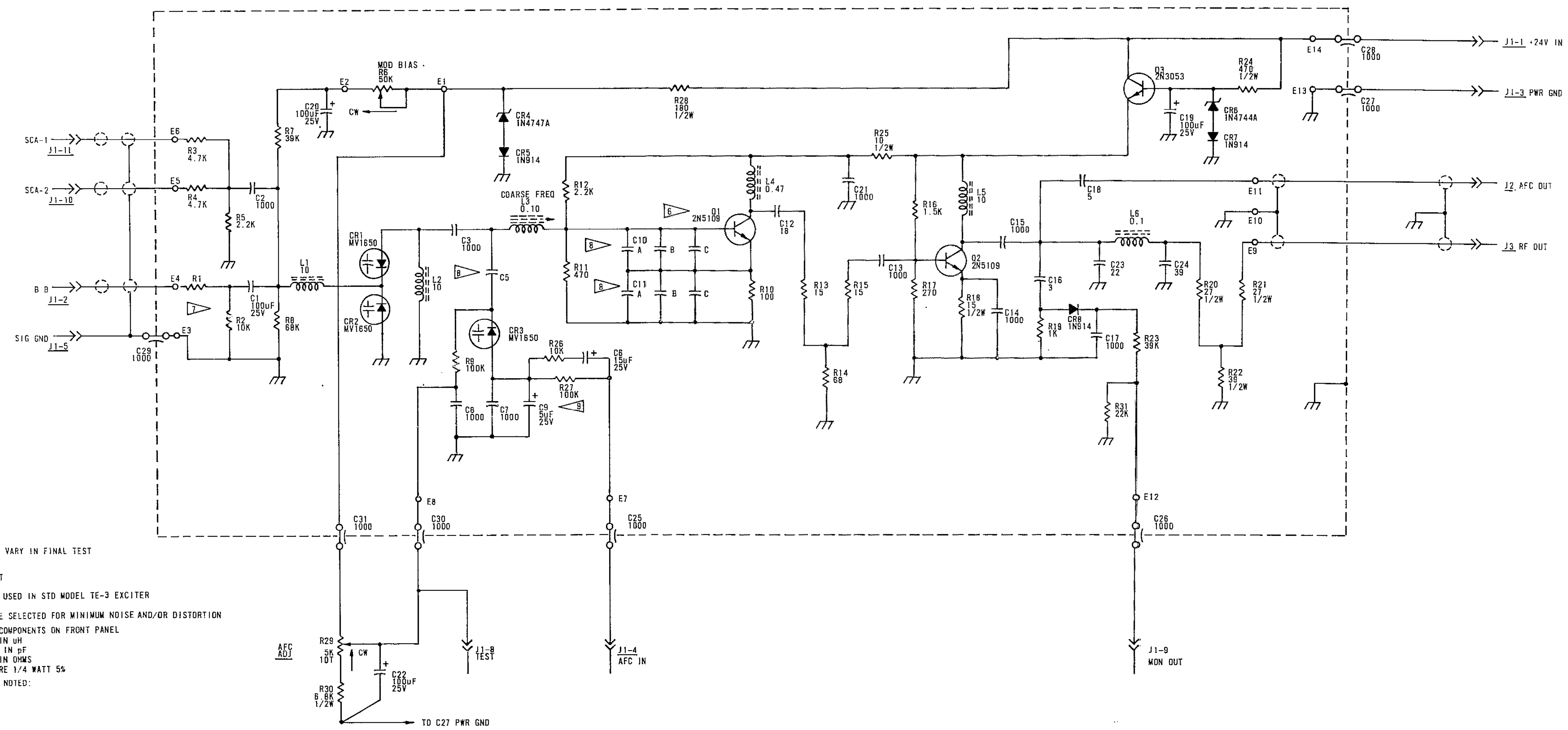
Warning, disconnect primary power prior to servicing.



9 VALUE MAY VARY IN FINAL TEST

8 SEE CHART

7 R1 IS NOT USED IN STD MODEL TE-3 EXCITER

6 Q1 MAY BE SELECTED FOR MINIMUM NOISE AND/OR DISTORTION

5. UNDERLINED COMPONENTS ON FRONT PANEL
4. INDUCTANCE IN uH
3. CAPACITANCE IN pF
2. RESISTANCE IN OHMS
1. RESISTORS ARE 1/4 WATT 5%

UNLESS OTHERWISE NOTED:

8

FREQ RANGE	C10 A	B	C	C11 A	B	C	C5
88-100 MHz	47 N750	47 N750	68 5%	47 N750	47 N750	68 5%	27pF 5%
98-108 MHz	47 N750	68 5%	NOT USED	47 N750	68 5%	NOT USED	18pF 5%

MODULATED OSCILLATOR
FIG. 7.4

842 5827 001

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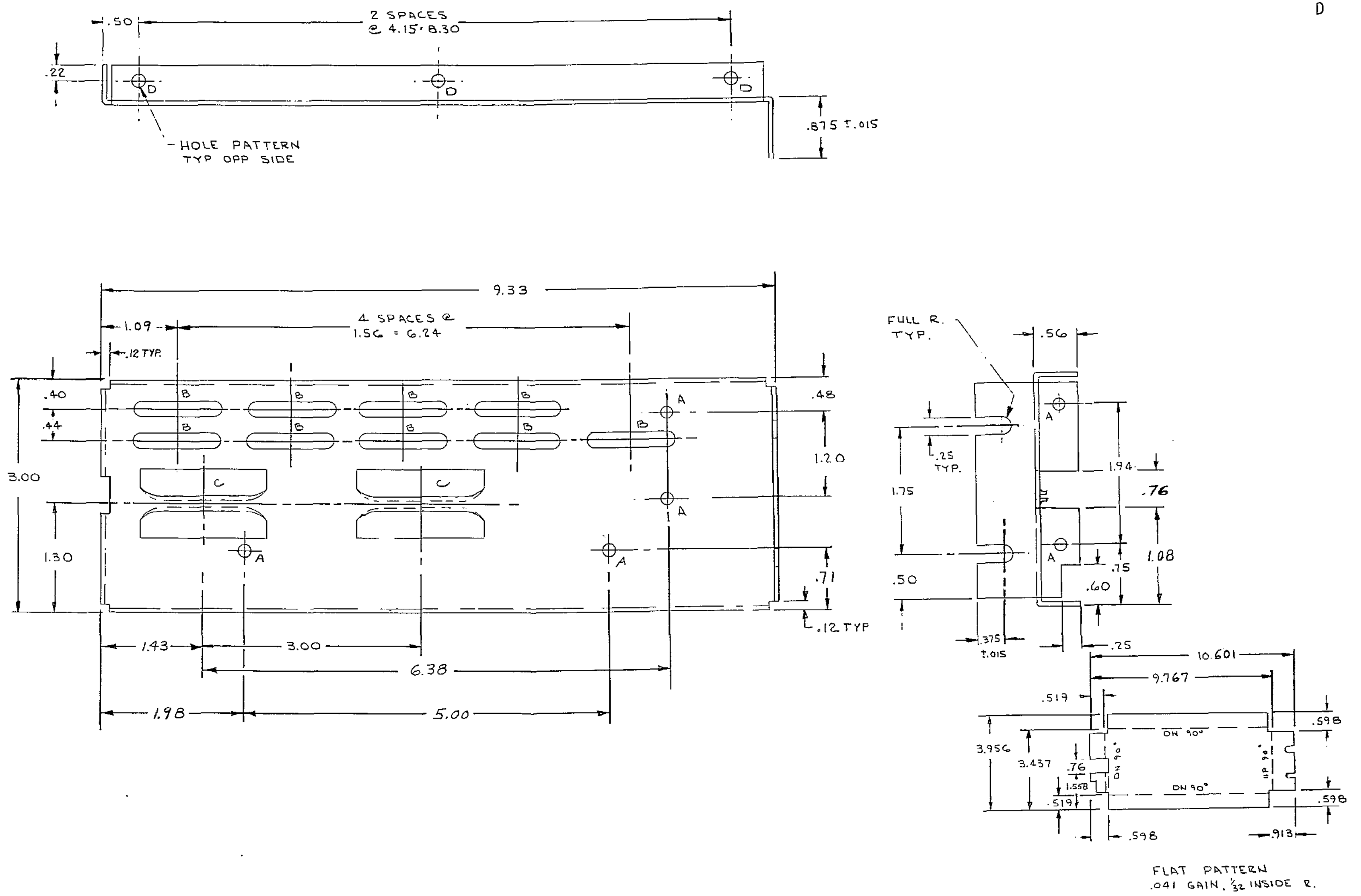
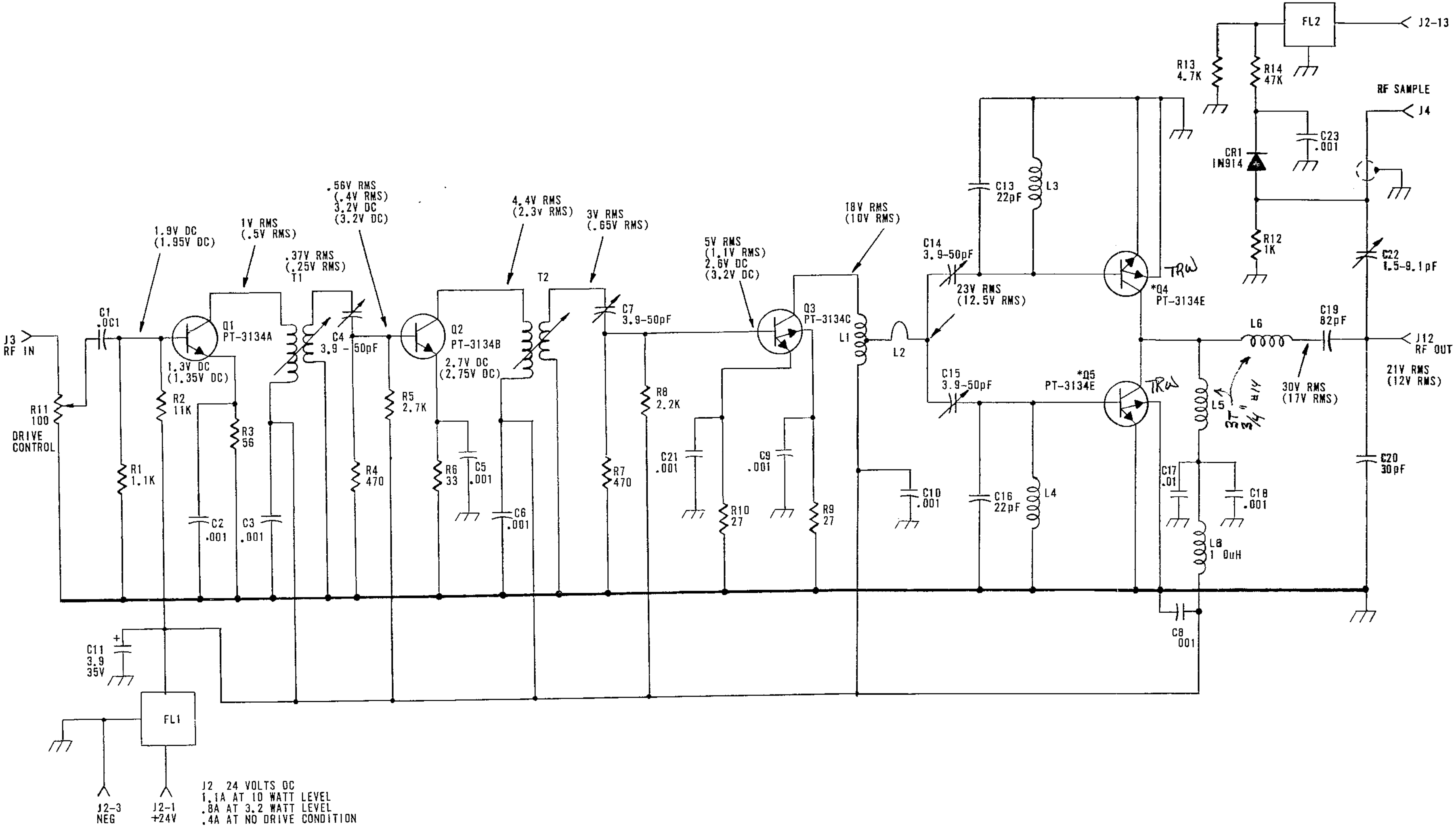


HOLE	QTY	DESCRIPTION
D	6	.187 DIA HOLE
C	2	827 6898 001 PUNCH ON
B	9	.218 X 1.218 SLOT
A	6	.171 DIA HOLE

1. SAND "C" HOLES TO REMOVE BURRS.

NOTE:

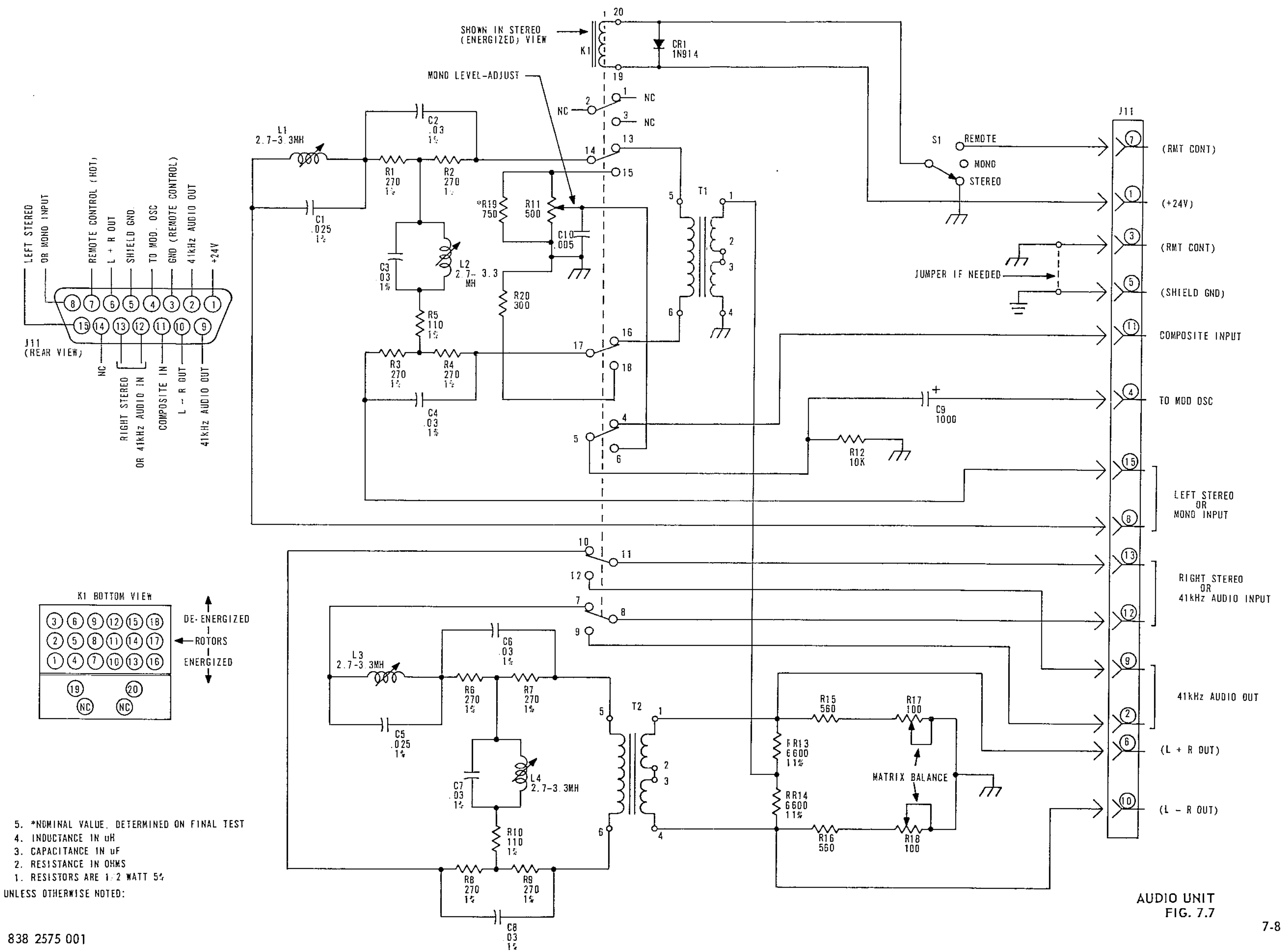
AFC UNIT
838 5828 001
FIG. 7.5



NOTE:

ALL CAPACITORS IN uF UNLESS OTHERWISE STATED
VOLTAGE MEASUREMENTS WITH HP-410B VTVM USING
RF PROBE FOR RMS VALUES
VOLTAGES IN (--) ARE AT 3W OUTPUT LEVEL
OTHERWISE 10W OUT
*Q4 & Q5 ARE A MATCHED PAIR

10W AMPLIFIER
838 4204 001
FIG. 7.6



5. *NOMINAL VALUE, DETERMINED ON FINAL TEST
4. INDUCTANCE IN uH
3. CAPACITANCE IN uF
2. RESISTANCE IN OHMS
1. RESISTORS ARE 1/2 WATT 5%

UNLESS OTHERWISE NOTED:

AUDIO UNIT
FIG. 7.7

838 2575 001

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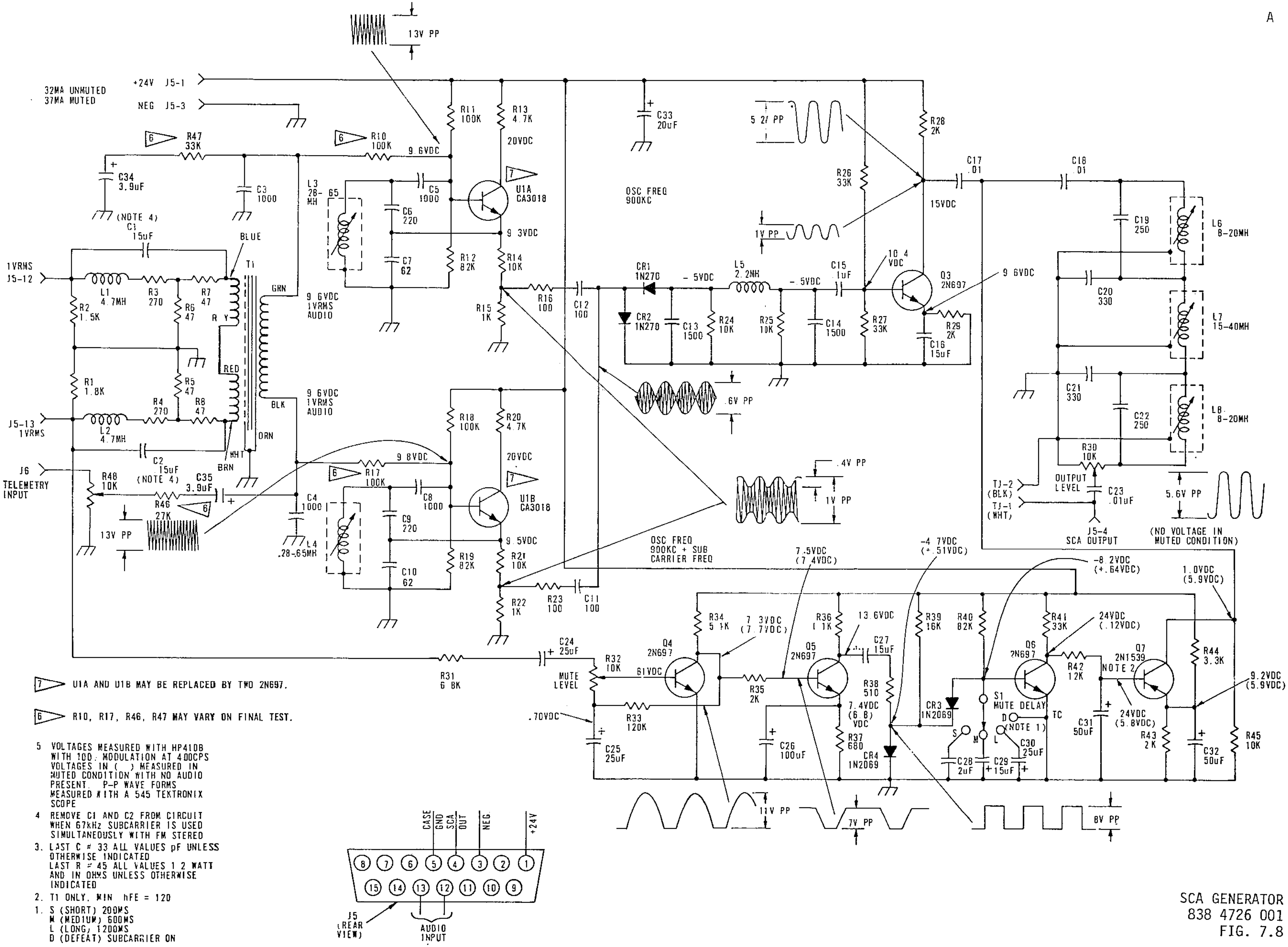
Warning, disconnect primary power prior to servicing.

A



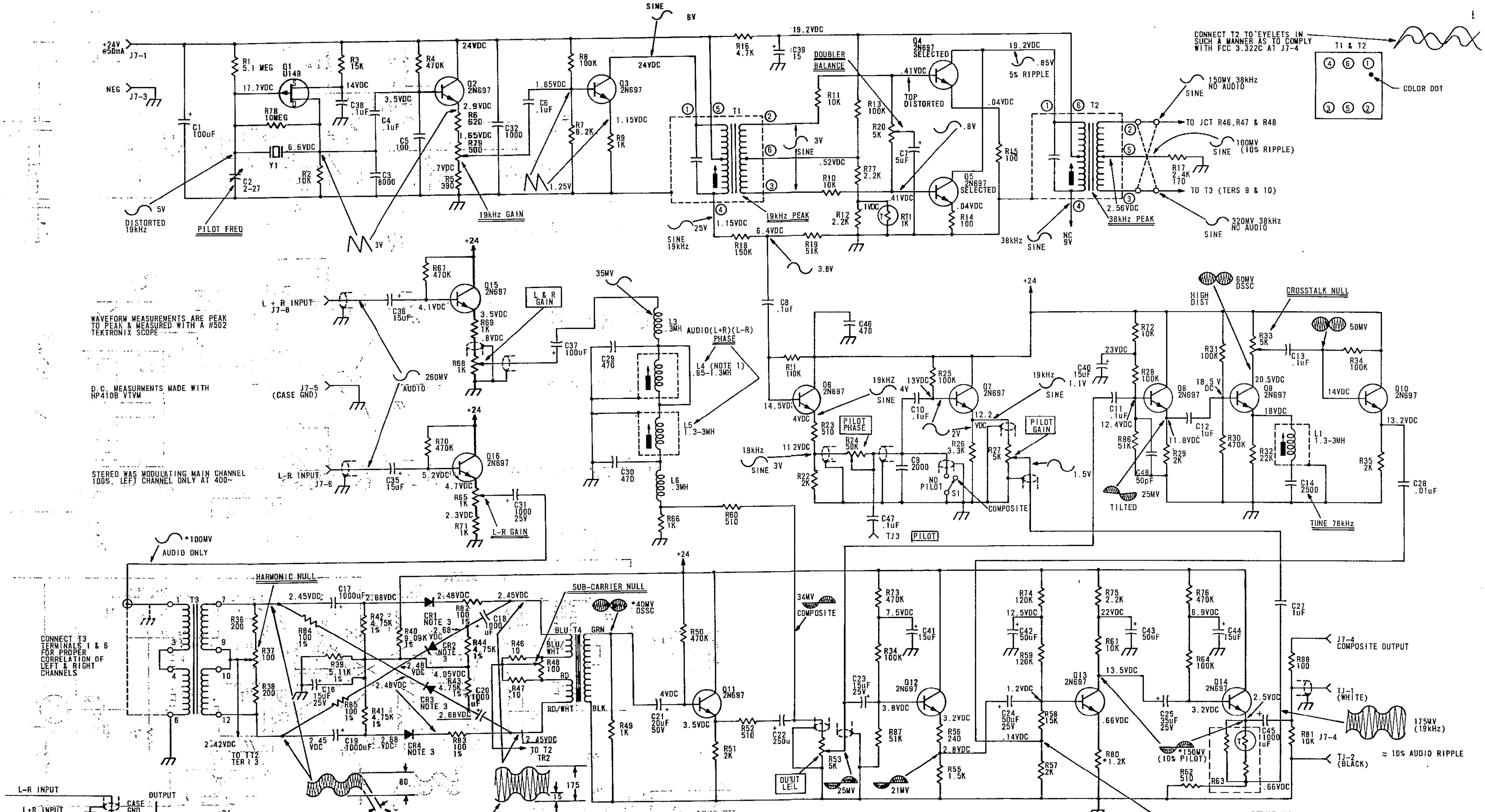
7 U1A AND U1B MAY BE REPLACED BY TWO 2N697.

6 R10, R17, R46, R47 MAY VARY ON FINAL TEST.

5. VOLTAGES MEASURED WITH HP410B WITH 100% MODULATION AT 400CPS. VOLTAGES IN ( ) MEASURED IN MUTED CONDITION WITH NO AUDIO PRESENT. P-P WAVE FORMS MEASURED WITH A 545 TEKTRONIX SCOPE
4. REMOVE C1 AND C2 FROM CIRCUIT WHEN 67kHz SUBCARRIER IS USED SIMULTANEOUSLY WITH FM STEREO
3. LAST C # 33 ALL VALUES pF UNLESS OTHERWISE INDICATED. LAST R # 45 ALL VALUES 1/2 WATT AND IN OHMS UNLESS OTHERWISE INDICATED
2. T1 ONLY. MIN hFE = 120
1. S (SHORT) 200MS
M (MEDIUM) 600MS
L (LONG) 1200MS
D (DEFEAT) SUBCARRIER ON

NOTES:

SCA GENERATOR
838 4726 001
FIG. 7.8



5. ▭ ADJUSTMENT ON FRONT PANEL
4. = ADJUSTMENTS LOCATED ON PC BOARD
3. MATCHED DIODES SEE 915 0064 001
2. *NOMINAL VALUE, MAY CHANGE IN TEST
1. THIS INDUCTOR WILL BE ADDED ON FINAL TEST IF NEEDED AND JUMPER REMOVED

NOTES:

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842 4887 001

STEREO GENERATOR, M6533
FIG. 7.9

Warning- disconnect primary power prior to servicing.